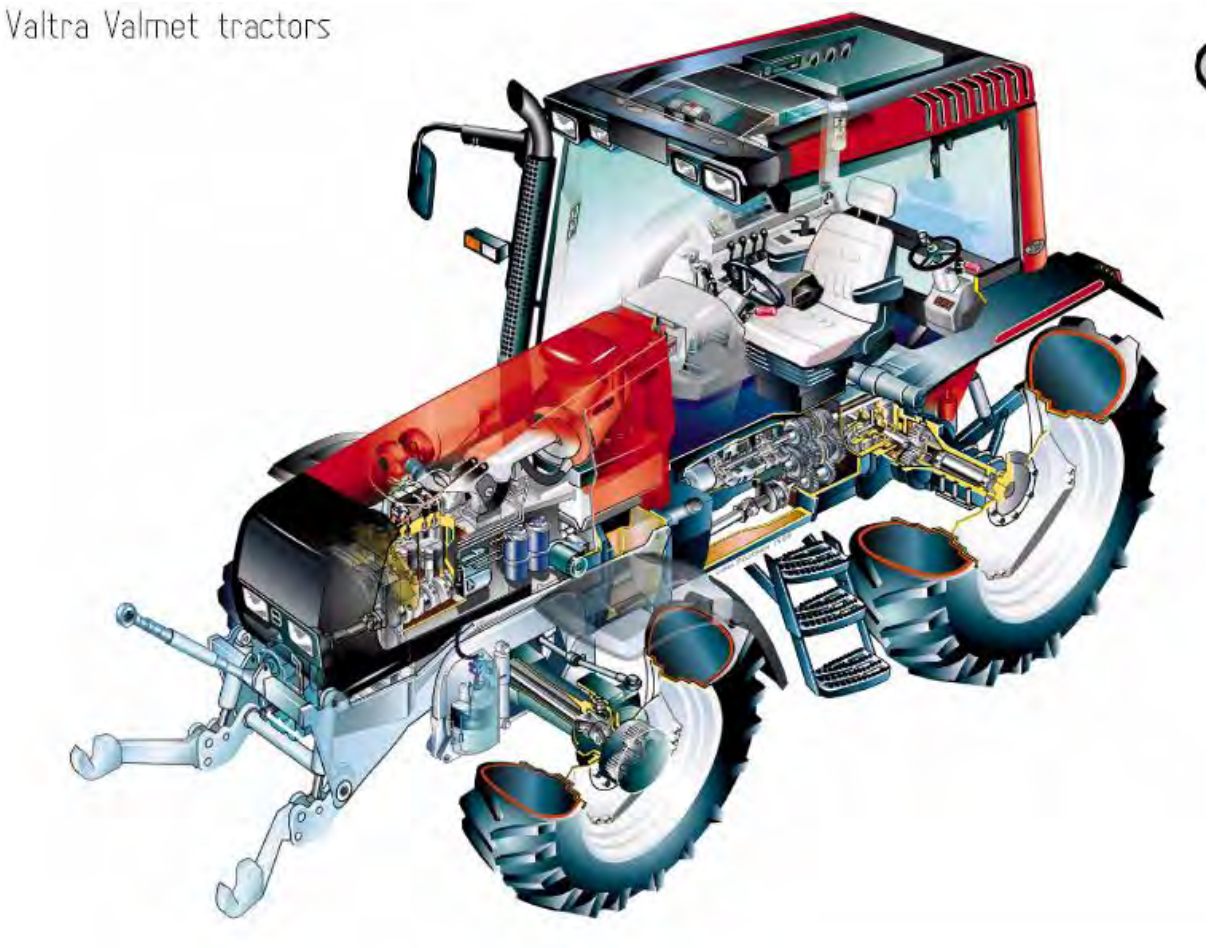
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VALTRA – VALMET

MEGA MEZZO HI-TEC



WORKSHOP MANUAL

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VALTRA

6000, 6100, 6200
6250, 6300, 6350
6400, 6550, 6600
6650, 6800, 6850
6900, 8000, 8100
8200, 8400, 8050
8150, 8450, 8550
8750, 8950
6600E–8750E

Service Manual

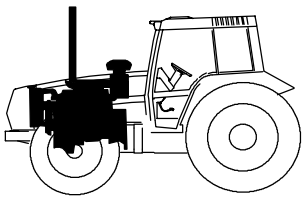
Tractors

Groups 10–100

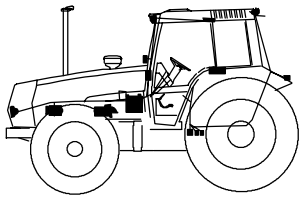
Valtra Inc.
44200 Suolahti, Finland



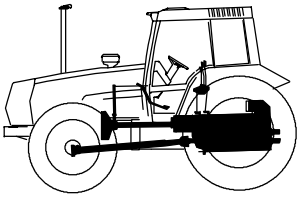
10 General



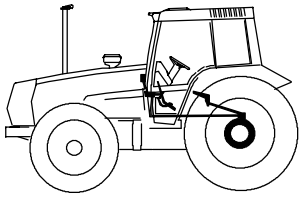
20 Engine



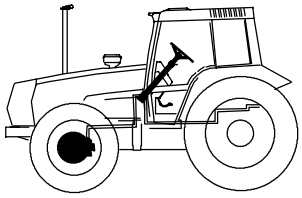
30 Electrical system



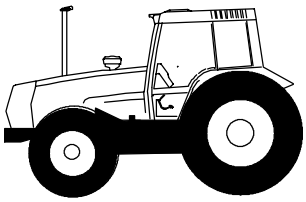
40 Power transmission



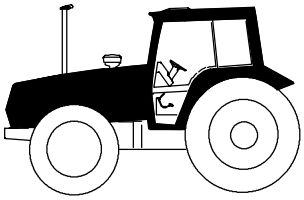
50 Brake system



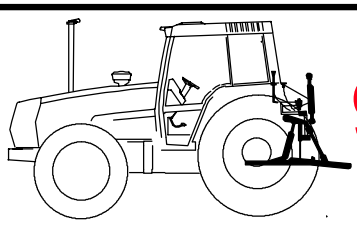
60 Steering system and Front axle



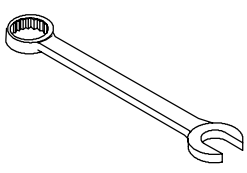
70 Frame and Wheels



80 Cab and Shields



90 Hydraulics



100 Tools

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10. General

11. Layout

12. Repairs

13. Maintenance

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To the reader

The Service Manual for the Valmet tractors is intended to be a practical reference source to be used in workshop. The repair instructions in the manual are based on methods which have been worked out in practice during normal workshop conditions and which are based on the use of special tools from the manufacturer when stated in the instructions. The manual also contains descriptions of the design and function of the components.

Detailed maintenance instructions can be found in Operator's Manual.

The Service Manual will be continually updated with new revised pages which should be inserted in the manual. Alterations and additions will first appear as service bulletins.

Only genuine Valmet spare parts should be used to ensure the best possible function of the machine. Certain operations should be carried out with the aid of special tools designed by Valmet.

Valmet Tractors Inc.
Tractor Service

11. General	~~1. 8. 2000~~ 1. 9. 2002	Model 6000–8950	Code 110	Page 0

The following supplements have been published for the Valmet 6000–8950 Service Manual:

Ordering number	Date	Notes
39 256 211	15. 6. 1992	
39 256 212	1. 9. 1992	
39 256 213	15. 5. 1993	
39 256 214	1. 1. 1994	
39 256 215	1. 1. 1995	
39 256 216	15. 4. 1995	
39 256 217	15. 5. 1996	
39 256 218	1. 4. 1997	
39 256 219	1. 8. 1998	
39 260 211	1. 11. 1998	
39 260 212	1. 6. 1999	
39 260 213	1. 10. 1999	
39 260 214	1. 8. 2000	
39 260 215	1. 9. 2002	

Supplement no. 39 256 211 (15. 6. 1992)
Includes:
– Autocontrol III
– air conditioning
– tractor 8000
– amendments

Supplement no. 39 256 212 (1. 9. 1992)
Includes:
– 20–series engines
– amendments

Supplement no. 39 256 213 (15. 5. 1993)
Includes:
– Delta Powershift
– tractor 8400
– amendments
– the latest fitting instructions of optional equipment

Supplement no. 39 256 214 (1. 1. 1994)
Includes:
– tractors 6000 and 8200
– Autocontrol II
– Autocontrol IV
– Sige–axle differential lock
– industrial front axle
– latest air conditioning
– amendments

Supplement no. 39 256 215 (1. 1. 1995)
Includes:
– amendments
– the latest fitting instructions of optional equipment

Supplement no. 39 256 216 (15. 4. 1995)
Includes:
– engine intake air system and cooling system, modifications
– Autocontrol 2.1
– Agrodata–instrument
– hydraulic type clutch release mechanism
– DPS, modifications

Supplement no. 39 256 217 (15. 5. 1996)
Includes:
– tractor 6800
– tractors 8050–8750
– amendments

Supplement no. 39 256 218 (1. 4. 1997)
Includes:
– tractors 6200 and 8000R
– front PTO
– CareTel
– Hi Shift
– amendments
– the latest fitting instructions of optional equipment

Supplement no. 39 256 219 (1. 8. 1998)
Includes:
– FieldMaster
– pressure air brakes for trailer (optional)
– latest fitting instructions for optional equipment
– amendments
– new folder, new index leaves (10–30 and 40–100) and new spine labels.

Supplement no. 39 260 211 (1. 11. 1998)
Includes:
– HiTech reverse shuttle
– Autocontrol V
– New 50–series models
– Front axle air suspension
– E–engines
– Amendments

Supplement no. 39 260 212 (1. 6. 1999)
Includes:
– Autocontrol 2.2
– amendments (e.g. for AC V)
– fitting instructions for optional equipment

Supplement no. 39 260 213 (1. 10. 1999)
Includes:
– Carraro 20.29 front axle
– amendments (e.g. version 42 of AC V)

Supplement no. 39 260 214 (1. 8. 2000)
Includes:
– HiTech gen. 2, AC–5.2
– front PTO on 6250H–6850Hi tractors
– modified lubricating oil pump for 6–cyl. engines
– new rear axle housing for transmissions 650/550
– amendments
– updated fitting instructions for optional equipment

Supplement no. 39 260 215 (1. 9. 2002)
Includes:
– transmission and final drives 700
– Agroline–instrument
– technical modifications

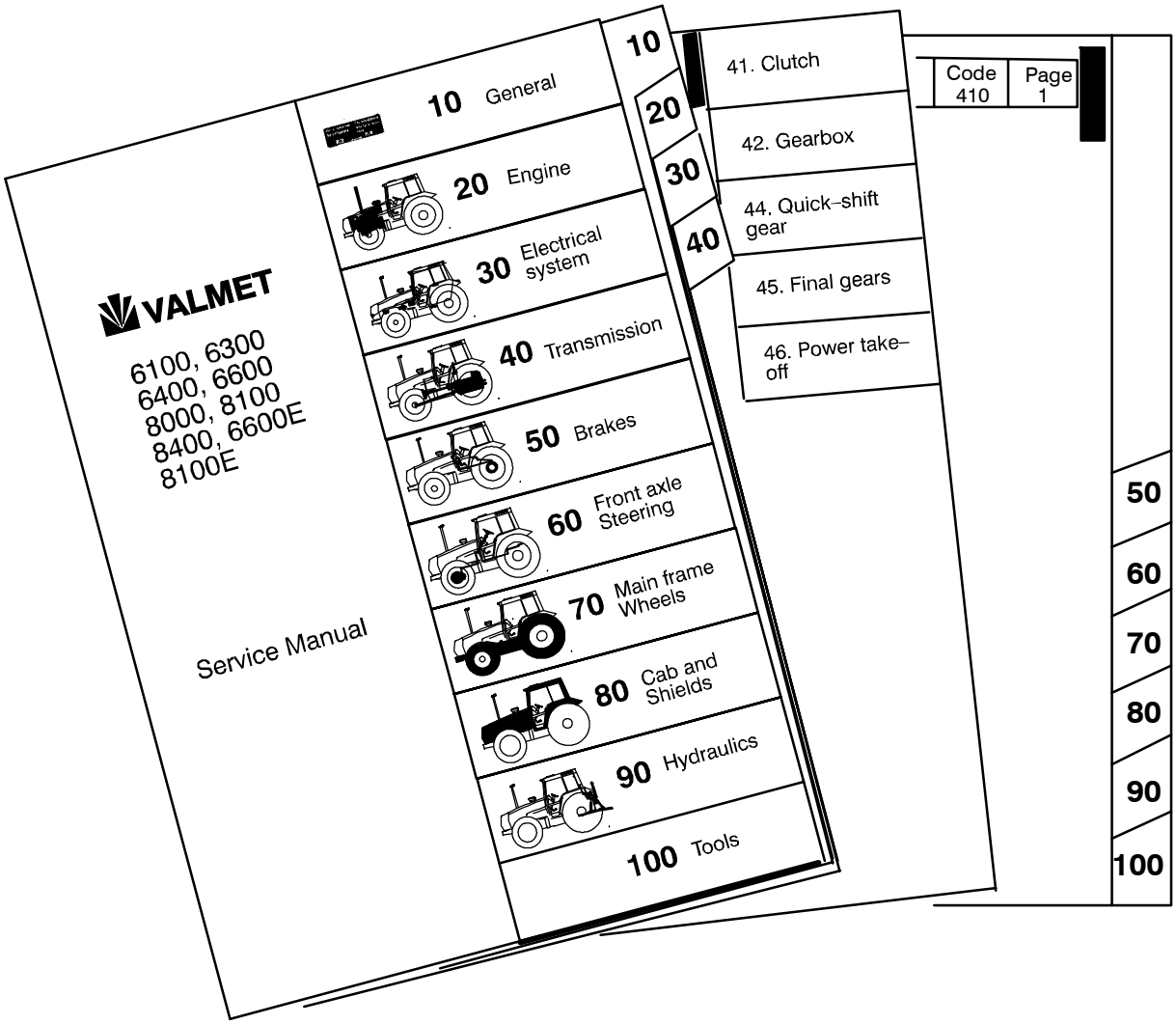
Layout of Service Manual

1. Division into groups

The manual is divided into groups (10 – 100) which are based on the make – up of the tractor. The groups are listed on the first index leaf.

Example. 10. General
20. Engine, fuel and cooling systems
30. Electrical system
40. Power transmission
a.s.o.

The number designation for each group is given in the top left box of the respective pages (and the first figure in the code designation)



2. Division into components or sub – groups

Each group is further divided into components or sub – groups. The number and the name of each component is given in the top left box on each page (and comprise the two first figures in the code designation).

Example. 41. Clutch
42. Gearbox
44. Quick – shift gear
45. Final drives etc.

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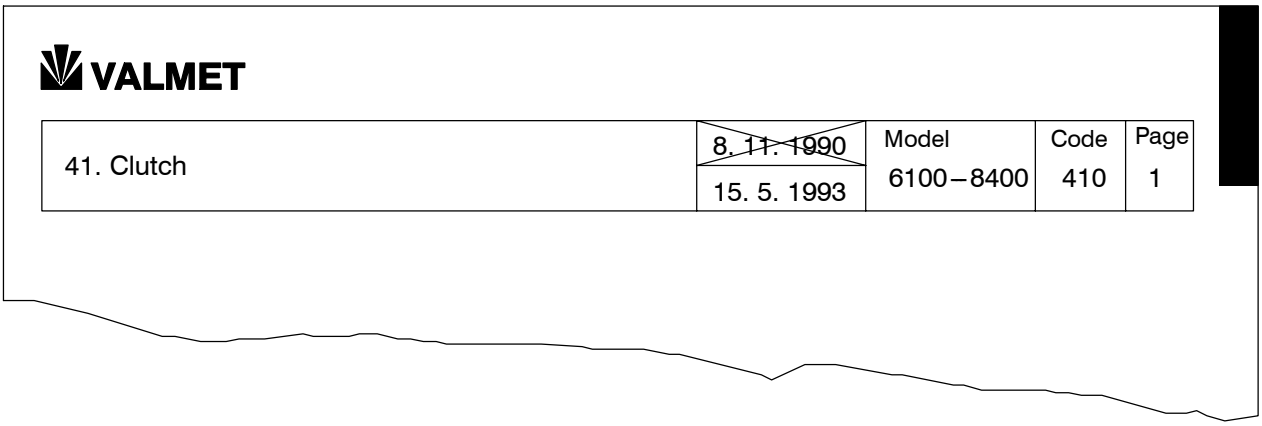
3. Code designation

Three–digit code designations are used to distinguish the different document groups for the respective components. The same code is also used in the Time List as a reference to the text in this Manual. The code designation numbers appear both in the box at the top of the page and also in the headings.

Example: Code 410:
– Group: Power transmission (4)
– Component: Clutch (41)
– Document group: General (410)

4. Page numbers

The instructions for all components are numbered in consecutive order in the right–hand box at the top of the page. The page numbers begin with page 1 for each component.



5. Date

At the top of each page there are two boxes for dates. In the case of a revised issue, the date of the earlier issue is printed in the crossed–over box and the date of the current issue is printed in the ”real” date box.

6. Model

At the top of each page the tractor model for which the page is valid is indicated.

7. Additions and amendments of the service manual

New and up–dated pages will be continually added to the service manual. The new pages should be inserted as indicated by the code: the first digit (also the first digit on the index leaf) indicated the group:
– the two first digits indicate the component or sub–group
– the third digit indicates the document group for the respective components
– the page number indicates the definite position of the page within the service manual

If there are two pages with the same code and page number the page with the later date in the date box (and the old date in the crossed–over box) is valid (or the current page).

N.B. Fitting instructions for extra equipment are inserted into the service manual at the end of group concerned (E.g. code 39 is inserted at the end of group 30).

Code designation in the Service Manual

10. General
- 110 Layout
- 120 Repairs
- 130 Maintenance

20 Engine

21. Engine
- 210 Technical data, tools, description
- 211 Cylinder block and flywheel housing
- 212 Cylinder head and valve mechanism
- 213 Crank mechanism
- 214 Timing gears
- 215 Lubrication system and oil sump
- 216 Induction and exhaust system, turbocharger
- 219 Removing and fitting engine

22. Fuel system
- 220 Technical data, tools, description
- 222 Fuel feed pump and fuel filters
- 223 Injection pump and injectors

23. Cooling system
- 230 Technical data, tools, description
- 231 Thermostat and coolant pump

30. Electrical system
- 310 Specifications, wiring diagrams
- 311 Autocontrol II
- 312 Autocontrol 2.1
- 313 Sigma–power
- 320 AC power lift
- 321 ACD power lift
- 330 Agrodata
- 331 AD–instrument
- 340 Autocontrol–III
- 350 Autocontrol IV
- 360 CareTel

40. Power transmission

41. Clutch
- 410 Technical data, tools, description
- 411 Clutch assembly and pedal rods
- 412 Hydraulic coupling

42. Gearbox
- 420 Technical data, tools, description
- 421 Selector forks
- 422 Gear shift levers
- 423 Shafts and gear wheels
- 424 Differential

44. Quick–shift gear, DPS, reverse shuttle, 4WD clutch
- 440A Quick–shift gear, technical data, tools, description
- 440B Reverse shuttle, technical data, tools, description
- 440C 4WD clutch, technical data, tools, description
- 441 Quick–shift gear, repair instructions
- 442 Reverse shuttle, repair instructions
- 443 4WD clutch, repair instructions
- 444 DPS, repair instructions

45. Final drives
- 450 Technical data, tools, description
- 451 Final drives, repair instructions

46 Power take–off
- 460 Technical data, tools, description
- 461 Power take–off, repair instructions
- 463 Front PTO, repair instructions

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50. Brakes

510 Technical data, description
511. Service brakes
520 Parking brake

60. Steering system and front axle

61. Steering system

610 Technical data, tools, description
611 Steering valve
612 Priority valve
613 Steering cylinder
614 Adjustment

64. Powered front axle

640 Technical data, tools, description
641 Front axle housing and front axle suspension
643 Hubs
644 Differential
645 Industrial front axle

70 Frame and wheels

710 Tractor frame
720 Tyres and wheel discs

80 Cab and shields

810 Cab
820 Shields
830 Air conditioner

90 Hydraulics

910 Technical data, tools, description
911 Pump and pipes
912 Working hydraulics
913 Three–point linkage, towing hook
920 AC power lift

100. Special tools

101 Special tools (ETV)
102 Locally manufactured tools

Note! Separate fitting instructions for the optional equipments are inserted into the Service Manual. These instructions are positioned to the end of each main group. E.g. code 39 are placed to the end of group 30.

General instructions for repairs

Outer oil seals

The Service Manual contains instructions for changing all outer oil seals, (e.g. oil seals on the PTO shaft end, on the output shaft to the front wheel drive and on the pinion shaft on the powered front axle, and so on).

Sealing compound and glue

If sealing compounds or glue are required for the repair work, the instructions will specify a sealing compound or glue which is readily available through specialist dealers. Some seals should be greased before fitting and the space between the lips of the seal should be filled with universal grease. If the seal is to be pushed over splines or sharp edges the seal should be protected with for example a thin plastic foil.

Tightening torques and setting values

All necessary tightening torques and setting values for each repair operation are given at the beginning of each repair section under the heading Technical Data. The most important values can also be found in the repair instructions.

Table 1 later gives the tightening torques in order of dimension, quality and surface treatment. The values given in the table should be used if the tightening torque is not given in the repair instructions.

Safety

Always bear safety in mind when repairing or servicing the tractor. Use tools and lifting devices in the correct way . When you are removing tractor components or splitting the tractor, every tractor part must be supported in such a way, that no risk of accident exists. Avoid working under the supported tractor part if it is not absolutely necessary. When supporting the tractor the centre of gravity of the frame part must always be checked. For instance the wedges must always be fitted between front axle and engine to prevent axle oscillation when splitting the front frame of the tractor.

Trouble–shooting

The following procedure, combined with the information contained in the workshop manual will be helpful in tracing faults accurately. It consists of following a number of logical steps to locate and correct the problem:

a) Determine the problem

b) List possible causes

c) Differentiate the causes

d) Conduct checks in logical order to determine the exact cause

e) Consider approximate remaining service life against cost of parts and labour..

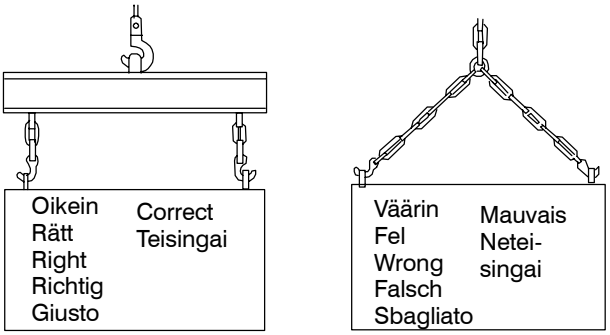
f) Make any necessary repairs.

g) Recheck the parts and functions for correct operation

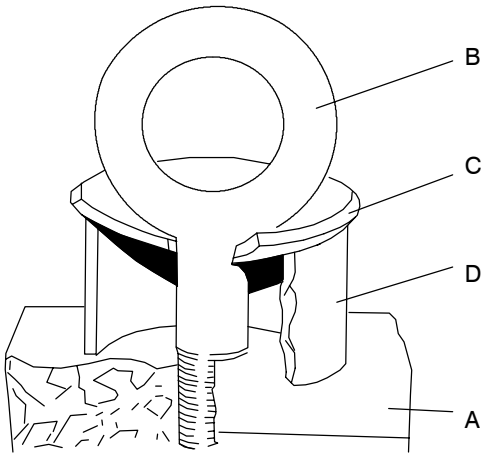
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Handling of heavy components

Unless otherwise specified, all removals should be accomplished using adjustable lifting equipment. All supporting slings must be parallel to each other and as near vertical as possible in relation to the object being lifted. However, where slings are of a far greater capacity than the weight of the load to be fitted, a triangular lifting arrangement may be used.



When removing a component at an angle, remember that the capacity of an eyebolt is reduced when the angle between the supporting members and the object becomes less than 90˚.



Forged eyebolt support

A. Load
B. Lifting shackle
C. Shackle retaining plate (3 mm thick)
D. Sleeve

When necessary the forged eyebolt can be supported in the way shown in figure above. Sleeve D may or may not be welded to plate.

Warning! If a part resists removal, check that all nuts and bolts have been removed and that there is no interference from adjacent parts.

Cleanliness

To ensure long life of a machine, it is important to keep dirt and foreign material out of its vital working components. Precautions must be taken to safeguard against this. Enclosed compartments, seals and filters have been provided to keep the supply of air, fuel and lubricant clean. These protective devices must not be removed.

Whenever hydraulic, fuel, lubricating oil or lines are disconnected, clean the point of disconnection and the surrounding area. As soon as a line has been disconnected, cap, plug or tape the line or opening to prevent the ingress of foreign material.

The same cleaning and covering precautions should be taken when access covers or inspection plates are removed.

Clean and inspect all parts. Make sure that all passages and holes are clear. Cover all parts to keep them clean. Make sure parts are clean when they are reassembled. Leave new parts in their wrapping until they are actually needed for reassembly

Assembly

When reassembling a machine, complete each step in sequence. never partially assemble one part then start to assemble another. Make all recommended adjustments. Always check the job on completion to ensure that nothing has been overlooked. Recheck the various adjustments before putting the machine back into service.

Note! Before fitting new parts, remove rust preventative compound from all machined surfaces (usually ”peel–off substances).

Lubrication

Where applicable, fill the compartments of repaired or renewed components with the quantity, type and grade of clean lubricant recommended in the routine maintenance section of the Operator’s Manual.

Shims

When shims are removed, tie them together and identify their location. Keep shims clean and take care not to bend them before refitting them.

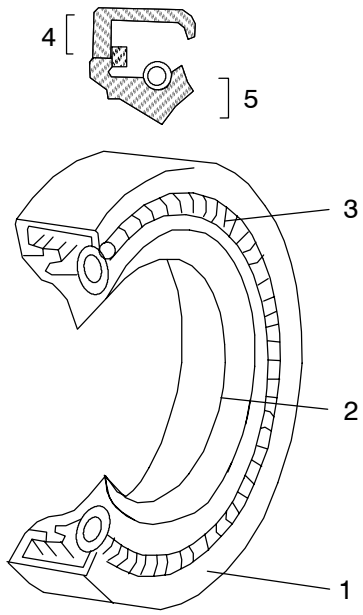
Gaskets

Make sure that the holes in gaskets line up with lubricating oil passages in the mating parts. If gaskets have to be made, use material of the correct type and thickness. Make sure that holes are punched in the right places.
Incorrectly punched gaskets can cause serious damage.

Lip type rubber seals

Lubricate the lips of lip–type rubber seals with oil before fitment. Do not use grease on seals, except for grease seals.

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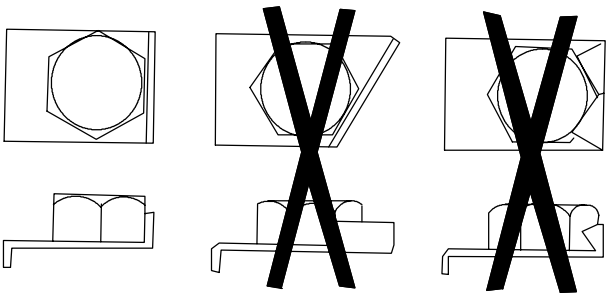
The main parts of lip–type seal:
1. Case
2. Sealing element
3. Ring spring

The figure above shows the construction of a simple lip–type seal. The cross section shows the heel (4) and the toe (5), used to identify the sides of a single element seal. With a few exceptions, the toe of a single–lip is located on the lubricant side. Some seals have a second auxiliary lip which has no spring.

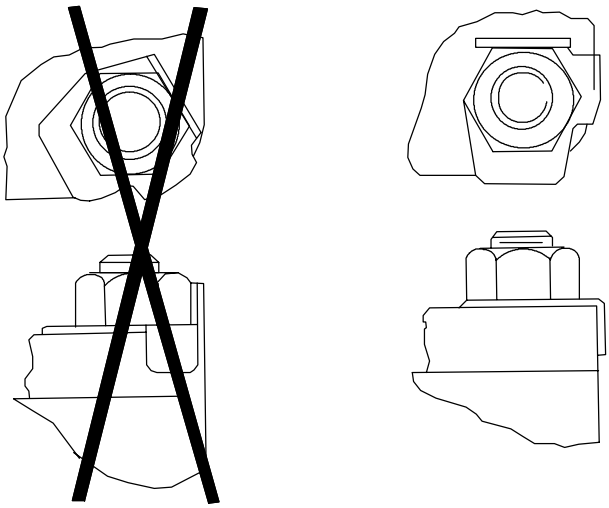
Cables and wires

When removing or disconnecting a group of cables or wires, label each one to ensure correct refitment.

Locking devices



Correct and incorrect use of retainers



Correct and incorrect method of fitting and bending locking tabs.

Slackening of nuts and bolts is prevented by mechanical means such as lockwashers, tab washers and cotter pins, or by Loctite–type locking agents.

Flat retainers must be installed properly to be effective. Bend one end of the retainer against the edge of the part. Bend the other end against one of the nut or bolt head.Always fit new retainers in compartments which house moving parts. When fitting lockwashers on aluminium housings, place a flat washer between the lockwasher and the housing.

Note!
1) Never fit a lockwasher (Grower, fan, spring, etc.) under a nut or bolt to which a specified torque has to be applied.

2) Always thoroughly degrease components before applying Loctite type locking agents.

Bushes and press fits

Do not fit bushes with a hammer alone. Use a suitable fitting tool and a hammer or, better still, a press if possible..

When using a press, ensure that pressure is applied directly in line with the bore. If the ring has an oil hole, take care to align it with the oil hole in the mating part. When press fitting a part into another part, lubricate the mating surfaces. Tapered parts should be assembled dry. Before assembly, check that the tapers are dry and free from burrs.

Fitting bolts in blind holes

Use bolts of the correct length. A bolt which is too long may ”bottom” before the head comes into contact with the part it is to hold: this will cause damage to the threads. If a bolt is too short, there may not be enough threads engaged to hold the part securely.

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Table

Table 1. Tightening torques, metric standard thread (ISO)

Dim.	Tightening torques Nm[1])									
	Quality, surface treatment, material and so on									
	8.8 lubr.	tol.±	8.8 Zne[2])	tol±	8.8 Znk[3])	tol. ±	10.9 lubr.	tol. ±	12.9 lubr	tol. ±
M4	–		–		–		–		–	
M5	6,4	0,6	5,7	0,5	–		9	1	11	1
M6	11	1	10	1	12	1,2	15	1,5	18	2
M8	25	2	23	2	30	3	35	4	45	5
M10	50	5	45	5	60	5	70	7	90	10
M12	90	10	80	8	100	10	125	10	151	15
M14	140	15	125	10	160	15	200	20	240	20
M16	220	20	195	20	250	25	300	30	370	40
M18	300	30	270	30	350	35	430	40	510	50
M20	430	40	380	40	480	50	600	60	720	70
M22	570	60	500	50	650	65	800	80	970	100
M24	740	70	660	70	830	80	1030	100	1250	120
M27	1100	100	950	100	1200	120	1500	150	1800	180
M30	1500	150	1300	130	1600	160	2040	200	2500	250

[1]) 1 Nm=0,102 kpm
[2]) Zne=zinc electroplating
[3]) Znk=hot galvanized

If the bolts differs from the standard range the values in the table must not be used.

Conversion table for common units

Quantities and units	Conversion factors
Overall and detail dimensions millimetres (mm)	100 mm=3,94 inches 1 inch=25,4 mm
Short distances e.g. turning circles metres (m)	1 m=3,28 ft 1 ft=0,305 m
Travel distances kilometres	1 km=0,62 mile 1 mile=1,61 km
Tractor weights, axle loadings kilograms (kg)	1 kg=2,2 lbs 1 lb=0,454 kg
Travel speed kilometres per h (km/h)	1 km/h=0,62 mph 1 mph=1,61 km/h
Drawbar pull kilonewtons (kN)	1 kN=224,8 lbs 1 lb=4,448 N
Power (identified by such terms as crankshaft power, pto power, belt power, drawbar power, indicating the point at which the measurement was taken) kilowatts (kW)	1 kW=1,34 hp 1 hp=0,746 kW
Engine torque newton metres (Nm)	1 Nm=0,74 ft lb 1 ft lb=1,356 Nm
Fuel consumption by weight (kilograms per hr, kg/h) (by volume) litres per hr (l/h)	1 kg/h=2,2 lb/hr 1 lb=0,454 kg 1 l/h=0,22 gal/hr 1 gal=4,54 l
Fuel economy (specific fuel consumption) grams per kilowatt hr (g/kWh)	304 g/kWh=0,5 lb/hp hr
Engine displacement litres (l)	1 l=61,02 m cu in 100 cu in=1,639 l
Hydraulic pump pressure–mecapascal (MPa) delivery–millimetres per sec (ml/s)	1 MPa=145 psi 1000 psi=6,9 MPa 100 ml/s=1,32 gpm 1 gpm=75,77 ml/s
Tyre pressure–kilopascal (kPa)	100 kPa=14,5 psi 1 psi=6,9 kPa
Area acres–hectare	To convert multiply by 0,404686
Volume bushel–litre	To convert multiply by 39,3687
Quantity pound per acre–kilogram per hectare	Multiply by 1,12085
Volume superficial foot–cubic metre	Multiply by 0,002360

Maintenance Valmet 6000–8750

N.B. Detailed maintenance instructions, see Operator's Manual.

General

Correct maintenance at the right time is a basic condition for reliable operation of the tractor. Maintenance costs are small compared with any repair costs resulting from lack of maintenance. The most important measures are those which you carry out yourself and which include lubrication and various checks and adjustments.

The service intervals shown apply for normal operating conditions but in more severe conditions servicing should be carried out more frequently.

General instructions concerning oil checks and oil filling

– Always stop the engine before starting work
– Apply the parking brake to ensure the tractor cannot move. If the ground is uneven the wheels should be scotched
– Wash down the tractor first so that the work can be done more easily and quickly.
– Always observe the utmost cleanliness in all maintenance work. Thoroughly wipe off filler caps and plugs as well as surrounding parts of the tractor before filling up with fuel or oil.
– Inspect the oil and filters when changing. Large amounts of dirt (e.g. heavily clogged filters) can point to a fault which could cause extensive and costly repairs if not corrected in time.
– When carrying out checks the tractor should stand on level ground.
– Levels should be checked in the morning when the oil is cold and has had time to run down to the bottom of the unit concerned.
– When changing the oil, bear in mind that the oil can be very hot when it drains from the tractor. Waste oil and oil filters should be handled carefully and disposed of properly
– After completion of the service work always replace all safety covers etc.

Greasing lubricating points fitted with grease nipples

– Always clean the grease nipples before applying the grease gun.
– Apply grease through the nipples until clean grease oozes out (unless otherwise instructed).
– Wipe away superfluous grease which has been pressed out at the lubricating point.
– Preferably carry out lubrication with bearing points and joints unloaded and with the bearings in different positions.

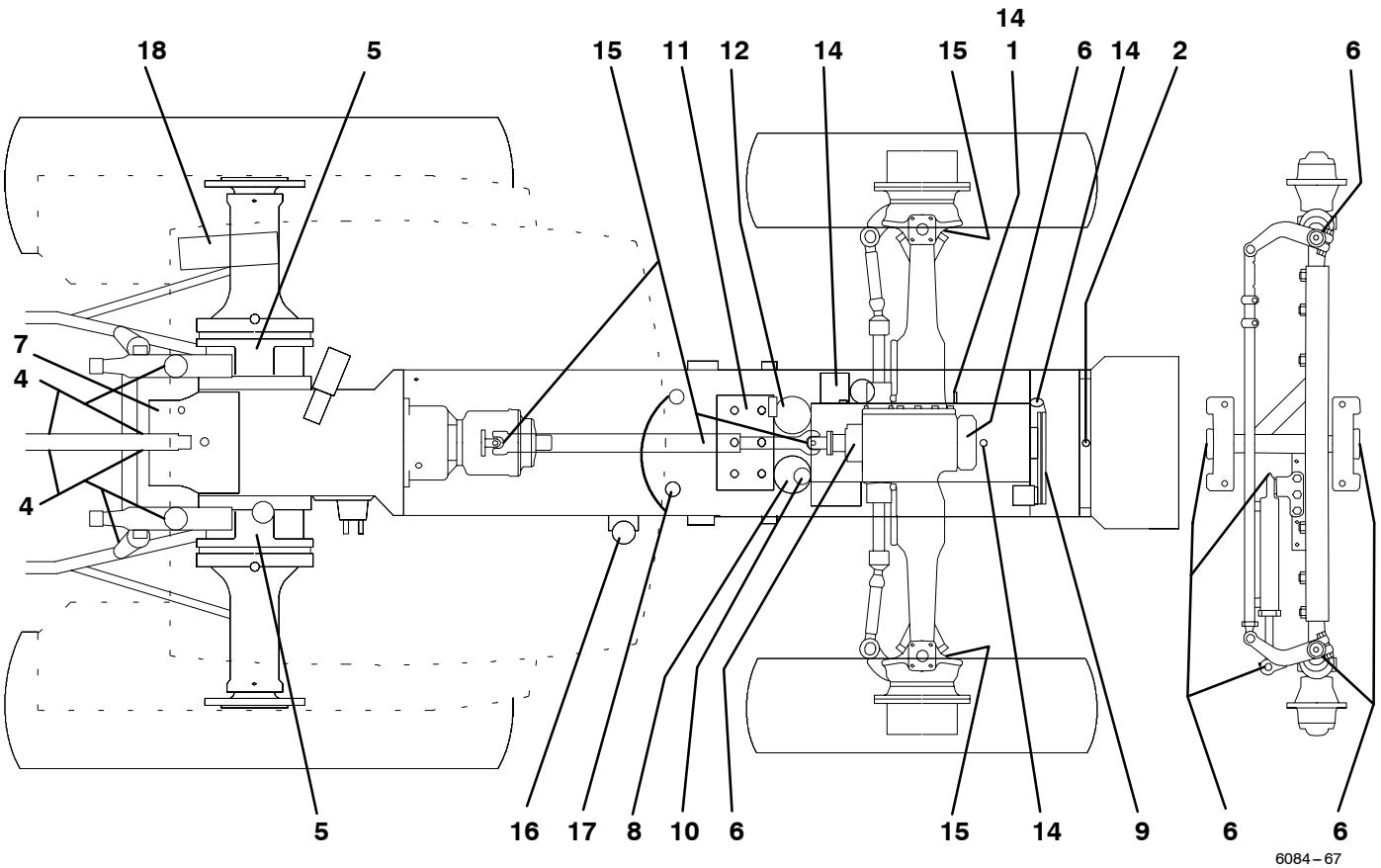
Lubrication and maintenance schedule

All intervals are counted from zero hours on the hour recorder. For example, 1000 hours service is carried out every 1000 (yearly), 2000 hours (every other year) etc. even if the guarantee service has been carried out.

Example: The 1000 hour service contains all items mentioned under 10 h/Daily, 50 h/once a week, 250 h, 500 h and 1000 h.

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Maintenance schedule



Daily/every 10 hours

1. Check engine oil level
2. Check coolant level and radiator fins
3. Check for leakage

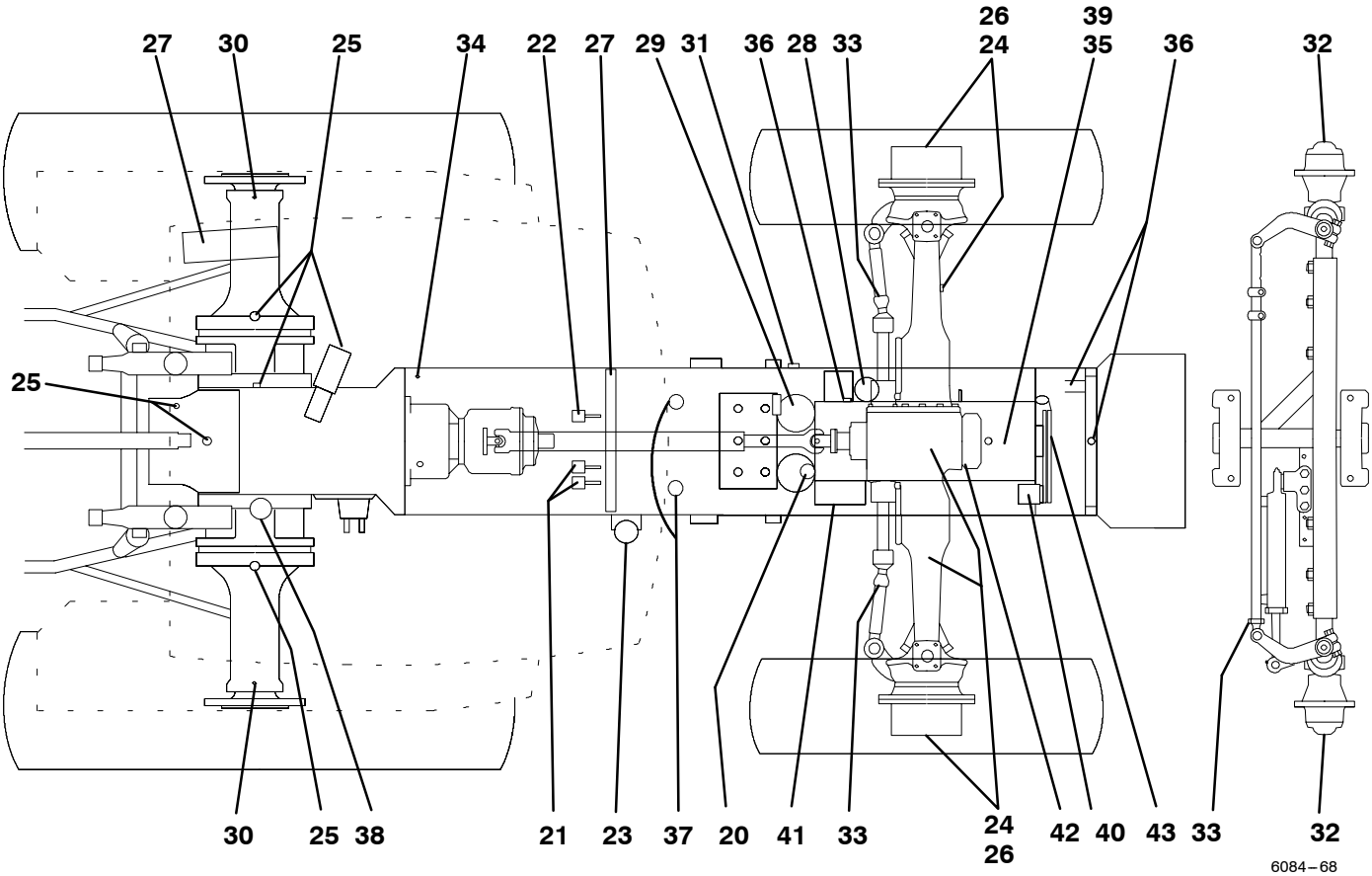
Weekly/every 50 hours

4. Grease three–point linkage and towing hook
5. Grease brake mechanism (EP grease)
6. Grease front axle brackets (also nipples on steering system and on non–powered front axle)
7. Check oil level in transmission and hydraulics
8. Clean air filter cyclone (tractors with a horizontally fitted air filter and an ejector pipe; clean suction housing hole plate)
9. Check fan belt tightness
10. Check water trap (on 6–cylinder engines. On other models on the other side. On models 8200, 8400 and 8050–8750 also under both fuel filters)
11. Check electrolyte level in battery

Every 250 hours

12. Clean engine air filter
13. Grease door and window hinges and locks
14. Change engine oil and filter
15. Grease front axle joints (powered axle)
16. Change pressure filters. First change at 100 hours warranty service, then at 250 hours and after that at 500 hours and then at intervals of 500 running hours.
17. Check brake fluid level (and clutch fluid level, 668103–)
18. Clean cab ventilation air filter
19. Check wheel nuts and bolts and tyre pressures

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Every 500 hours

20. Clean water trap (fuel system) (on 6–cylinder engines. On the other models on the other side. On models 8200, 8400 and 8050–8750 also under the fuel filters). Does not concern 6200 and 8000R tractors.
21. Check brake pedal free travel
22. Check clutch pedal free travel, –668102.
23. Change pressure filters (transmission and hydraulics)
24. Check oil level in front axle differential and hubs

24a. Calibrate first time gaspedal on HiTech models. Later at intervals of 1000 running hours.

Every 1000 hours/yearly

25. Change oil in transmission/hydraulics and clean suction strainer
26. Change oil in front axle differential and hubs
27. Change cab ventilation air filter and wash cab recirculation filter, if fitted.
28. Change fuel filters. 6200, 8000R: change also the water trap filter
29. Change safety filter (in engine air filter)
30. Grease rear drive axle bearings
31. Grease flywheel ring gear
32. Check, grease and adjust front wheel bearings on non–powered front axle
33. Check/adjust front wheel toe–in
34. Clean fuel tank
35. Adjust valves

35a Calibrate gas pedal on HiTech models

Every 2000 hours/every other year

36. Change engine coolant
37. Change brake fluid (and clutch fluid, 668103–)
38. Change transmission housing breather
39. Check and clean injectors
40. Check alternator
41. Check starter motor

Every 4000 hours

42. Check function of turbocharger at authorized workshop (if fitted)
43. Change engine rubber vibration damber on 6–cyl. engines (not 8200 and 8450–8750)

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Recommended fuel and lubricants (all capacities are incl. of filters)

Part of machine	SAE–grade	API–grade	Capacity (litres)
Engine:	15W40 +40°C...–10°C 10W/30 +30°C...–20°C	CG–4 CH–4	
– 6100 (3–cyl.)			10
– 6000, 6200–6650Hi, 6800–6850Hi (4–cyl.)			13
- 6900, 8000, 8100, 8200, 8400, 8050-8950Hi (6-cyl.)			19
Hydraulics/transmission	HT 60: –30°C...+30°C HT 100: –10°C...+40°C	GL–4 (G2–98)	34 (43 max/HiTech, 8050–, J02316–: 45 max) (extra max 50/HiTech, 8050–, J02316–: extra max 53). 6200–8950 *): min 45, max 55, extra max 65. 8950Hi **): min 45, max 55, extra max. 65.
Powered front axle:	80W/90	GL–5 (LS)	
– differential, Dana / ind. Carraro			8 / 6
– hubs, Dana			2x1
– hubs, ind. front axle Dana+Carraro			2x1,5
Fuel tank:	diesel fuel		
– 6000–8000 Hi Trol, 6250Hi–6650Hi HiTrol			158
– other models			165
– extra fuel reservoir, metallic / plastic			+82 / +121
Cooling system:	water+anti–freeze agent (standardi ASTM D3306–86a tai BS 6580:1985)		
– 6100 (with larger radiator)			13,5 (17,5)
– 6000, 6200–6600 (with openable front grille)			15,5 (17)
– 6250 Hi–6650 Hi			17
– 6800 / 6850 Hi			22 / 22
– 8000–8400 (with openable front grille)			24 (25)
– 8200, 8400, 8050, 8150 with expansion tank			28 (8400, model 2001: 30)
– 8050 Hi and 8150 Hi			28
– 8450, 8550 / 8450 Hi, 8550 Hi			25 / 27
– 8750 / 8950Hi			31 / 31
Brake fluid reservoir/Clutch fluid resesvoir	brake fluid SAE J1703		0,3 / 0,2
Window washer reservoir	washer fluid		3
Oils in front PTO units	see page 463/9.		

*) Tractor frame numbers, see page 450/6.

**) Tractor frame numbers, see page 450/8.

Oil quality and capacity in fluid couplings (Hi–Trol)

Voith TD–VA coupling used up to serial no **658205** and **Voith TD–FVA1** from serial no **666066**. Engine oil SAE 10W/30 year around or automatic transmission fluid ATF which meets standards: GM type A Suffix A, GM Dexron II (e.g. Neste ATF–X)**:**

	–658205	**666066–**
– 6000, 6100	–	7,20 litres
– 6200, 6300	7,4 litres	6200: 7,35 litres. 6300: 7,45 litres. 6250Hi: 7,40 litres. 6350Hi: 7,80 litres.
– 6400	7,6 litres	7,85 litres. 6550Hi: 7,90 litres.
– 6600	7,8 litres	7,90 litres. 6650Hi: 8,00 liter
– 6800, 8000R, 8000		6800: 8,40 litres. 6900, 8000: 8,00 litres. 6850Hi: 8,00 litres.

Transfluid – coupling with effect from tractor serial no **658206** up to tractor serial no **666065**. Engine oil SAE 10W/30 year around or automatic transmission fluid ATF which meets standards: GM type A Suffix A, GM Dexron II (e.g. Neste ATF–X)**:**

	658206–659408 *)	**659409–666065**
– 6100	5,2 l	6,4 l
– 6300	5,4 l	6,6 l
– 6400	5,6 l	6,8 l
– 6600, 8000	5,8 l	7,0 l

*) Check the manufacturing date of the coupling. If it is 1292 or later, use larger filling quantities.

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20. Engine

21. Engine

22. Fuel system

23. Cooling system

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Specifications

Engine designations

1. Basic markings: **320**, **420**, **620** and **634**. The first digit indicates the number of cylinders and the two last digits the stroke (–20=120 mm, –34=134 mm).
2. Letters after the basic markings:

– **D**=diesel engine
– **S**=turbocharger (Schwitzer)
– **W**=by-pass turbocharger, Delta turbo (Schwitzer S1BG or S2BG)
– **B**=Bosch P in–line pump
– **R**=distributor pump (Stanadyne)
– **I**=intercooler
– **E**=low emission engines (E–engines)
– **C**=emission tested engines (certificated).

Note! R24, E77 and EPA–homologations has been made for E–engines.

Tractor	**6000**	**6100**	**6200** (–K41123)	**6200** (K41124–)	**6250 Hi**	**6300**	**6300** (K41309– –L23437)
Designation	420D	320 DS	420DSRE	420DSRE	420DSRE	420 DS	420DS
Turbocharger	no	yes	yes	yes	yes	yes	yes
No of cylinders	4	3	4	4	4	4	4
Displacement (litres)	4,4	3,3	4,4	4,4	4,4	4,4	4,4
Cyl. bore (mm)	108	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	55/2300	58/2300	59/2225	59/2200	59/2200	62,5/2225	66/2200
Torque (Nm/r/min DIN)	290/1450	310/1550	320/1400	360/1400	360/1400	330/1550	360/1400
Moment rise %	27	28,5	27	41	41	23	25
Low idling (r/min)	750	800	750	750	850	750	750
Compr. press [1]) (bar)	24	24	24	24	24	24	24
Max. no-load revs (r/min)	2500	2500	2425	2400	2400	2425	2400

Tractor	**6300** (L23438–)	**6350 Hi**	**6400**	**6400** (J17109–)	**6400** (K41106–) (Delta)	**6400** (L23506–) (Delta)
Designation	420DSRE	420DSRE	420 DS	420 DW	420DW	420DWRE
Turbocharger	yes	yes	yes	yes	yes	yes
No of cylinders	4	4	4	4	4	4
Displacement (litres)	4,4	4,4	4,4	4,4	4,4	4,4
Cyl. bore (mm)	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	66/2200	66/2200	70/2225	70/2225	73,5/2200	73,5/2200
Torque (Nm/r/min DIN)	400/1400	400/1400	365/1550	390/1550	415/1400	430/1400
Moment rise %	39	39	22	31	30	35
Low idling (r/min)	750	850	750	750	750	750
Compr. press [1]) (bar)	24	24	24	24	24	24
Max. no-load revs (r/min)	2400	2400	2425	2425	2400	2400

Tractor	**6550 Hi**	**6600**	**6600E**	**6650 Hi**	**6750Hi*)**	**6800**	**6800E**
Designation	420DWRE	420 DS	420 DS	420DWRE	420DWRIE	420 DWI	420DWI
Turbocharger	yes	yes	yes	yes	yes (+interc..)	yes (+interc..)	yes (+interc..)
No of cylinders	4	4	4	4	4	4	4
Displacement (litres)	4,4	4,4	4,4	4,4	4.4	4,4	4,4
Cyl. bore (mm)	108	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	73,5/2200	77/2225	77/2225	81/2200	77/1800	85/2225	85/2225
Torque (Nm/r/min DIN)	430/1400	405/1550	405/1550	460/1400	530/1150	440/1550	440/1550
Moment rise %	35	22	22	31	29	21	21
Low idling (r/min)	850	850	850	850	800	850	850
Compr. press [1]) (bar)	24	24	24	24	24	24	24
Max. no-load revs (r/min)	2400	2425	2425	2400	2000	2425	2425

[1]) Minimum value at operating temperature and starting revs. Max permitted difference between cylinders 3,0 bar.
*) Low revs engine.
E = AC–4, Control system for tractor.
Hi = HiTech.

Specifications

Tractor	6800 (L23517–)	6850 Hi	6900	8000	8050 (–L23317)	8050 (L23318–)
Designation	420 DWRIE	420 DWRIE	620 DRE	620 D	620 DSR	620DSRE
Turbocharger	yes (+interc..)	yes (+interc..)	no	no	yes	yes
No of cylinders	4	4	6	6	6	6
Displacement (litres)	4,4	4,4	6,6	6,6	6,6	6,6
Cyl. bore (mm)	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	88/2200	88/2200	75/2225	73,5/2225	81/2200	81/2200
Torque (Nm/r/min DIN)	490/1400	490/1400	390/1400	380/1550	490/1300	490/1400
Moment rise %	28	28	21	20	39	21
Low idling (r/min)	850	850	750	750	750	850
Compr. press [1]) (bar)	24	24	24	24	24	24
Max. no-load revs (r/min)	2400	2400	2425	2425	2400	2425

Tractor	8050 Hi	8100	8100E	8150 (–L24138)	8150E	8150 (L24139–)	8150 Hi
Designation	620DSRE	620 D	620 D	620 DSR	620 DSR	620DSRE	620DSRE
Turbocharger	yes	no	no	yes	yes	yes	yes
No of cylinders	6	6	6	6	6	6	6
Displacement (litres)	6,6	6,6	6,6	6,6	6,6	6,6	6,6
Cyl. bore (mm)	108	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	81/2200	88/2225	88/2225	92/2200	92/2200	92/2200	92/2200
Torque (Nm/r/min DIN)	490/1400	455/1550	455/1550	540/1300	540/1300	540/1400	540/1400
Moment rise %	39	21	21	35	35	35	35
Low idling (r/min)	750	750	750	750	750	750	750
Compr. press [1]) (bar)	24	24	24	24	24	24	24
Max. no-load revs (r/min)	2400	2425	2425	2400	2400	2400	2400

Tractor	8200	8200E	8350Hi*)	8400 (–K34331)	8400E	8400 (K32135– –L33320)	8400 (L23130–)
Designation	634 D	634 D	620DSRIE	620 DS	620 DS	620 DS	620 DSIE
Turbocharger	no	no	yes (+interc..)	yes	yes	yes	yes (+interc..)
No of cylinders	6	6	6	6	6	6	6
Displacement (litres)	7,4	7,4	6,6	6,6	6,6	6,6	6,6
Cyl. bore (mm)	108	108	108	108	108	108	108
Stroke (mm)	134	134	120	120	120	120	120
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	95,5/2225	95,5/2225	99/1800	103/2200	103/2200	110/2200	118/2200
Torque (Nm/r/min DIN)	490/1550	490/1550	650/1100	520/1550	520/1550	625/1400	650/1400
Moment rise %	20	20	23	16	16	30	27
Low idling (r/min)	750	750	800	750	750	750	750
Compr. press [1]) (bar)	24	24	24	24	24	24	24
Max. no-load revs (r/min)	2425	2425	2000	2400	2400	2400	2400

[1]) Minimum value at operating temperature and starting revs. Max permitted difference between cylinders 3,0 bar.
*) Low revs engine.
E = AC–4, Control system for tractor.
Hi = HiTech.

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Specifications

Tractor	8450 (–L24134)	8450E	8450 (L24135–)	8450 Hi	8550 (–L24115)	8550E	8550 (L24116–)
Designation	620 DWR	620 DWR	620 DWRE	620DWRE	634 DSR	634 DSR	634DSRE
Turbocharger	yes	yes	yes	yes	yes	yes	yes
No of cylinders	6	6	6	6	6	6	6
Displacement (litres)	6,6	6,6	6,6	6,6	7,4	7,4	7,4
Cyl. bore (mm)	108	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	134	134	134
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	103/2200	103/2200	103/2200	103/2200	118/2200	118/2200	118/2200
Torque (Nm/r/min DIN)	580/1450	580/1450	615/1400	615/1400	650/1450	650/1450	650/1400
Moment rise %	30	30	38	38	27	27	27
Low idling (r/min)	750	750	750	750	750	750	750
Compr. press [1]) (bar)	24	24	24	24	24	24	24
Max. no-load revs (r/min)	2400	2400	2400	2400	2400	2400	2400

Tractor	8550 Hi	8750 (–J32215)	8750E	8950 Hi
Designation	634DSRE	634 DS	634 DS	634 DSBIE
Turbocharger	yes	yes	yes	yes (+interc..)
No of cylinders	6	6	6	6
Displacement (litres)	7,4	7,4	7,4	7,4
Cyl. bore (mm)	108	108	108	108
Stroke (mm)	134	134	134	134
Compr. ratio	16,5:1	16,5:1	16,5:1	16,5:1
Output (kW/r/min DIN)	118/2200	118/140/2200	118/140/2200	118/147/2200
Torque (Nm/r/min DIN)	650/1400	650/1450	650/1450	650/820/1400
Moment rise %	27	27	27	27/28
Low idling (r/min)	750	750	750	750
Compr. press [1]) (bar)	24	24	24	24
Max. no-load revs (r/min)	2400	2400	2400	2400

[1]) Minimum value at operating temperature and starting revs. Max permitted difference between cylinders 3,0 bar.
E = AC–4, Control system for tractor.
Hi = HiTech.

Valves, rockers and tappets

With a valve clearance of 1,0 mm:
– inlet valve opens ..... 0°±2° B.T.D.C
– inlet valve closes ..... 16°±2° A.B.D.C
– exhaust valve opens ..... 39°±2° B.B.D.C
– exhaust valve closes ..... 1°±2° A.T.D.C
Valve clearance cold and hot:
– inlet valve ..... 0,35 mm
– exhaust valve ..... 0,35 mm
Angle of valve seat in cylinder head:
– inlet valve ..... 35°+20'
– exhaust valve ..... 45°+20'
Width of valve seat in cylinder head:
– inlet valve ..... 2,9...3,7 mm
– exhaust valve ..... 1,3...2,3 mm
Angle of valve face:
– inlet valve ..... 35°–20'
– exhaust valve ..... 45°–20'
Outside diameter of valve head:
– inlet valve ..... 48 mm
– exhaust valve ..... 41 mm
Max valve movement:
– inlet valve ..... 10,9 mm
– exhaust valve ..... 12,1 mm
Inlet valve stem diameter ..... 8,960...8,975 mm
Exhaust valve stem diameter ..... 8,925...8,940 mm
Inlet valve stem clearance ..... 0,025...0,055 mm
– Reject limit ..... 0,30 mm
Exhaust valve stem clearance ..... 0,060...0,090 mm
– Reject limit ..... 0,35 mm

Inside diameter of valve guide before fitting . . . . . 9,000...9,015 mm
Outside diameter of valve guide . . . . . 16,028...16,039 mm
Diameter of valve guide bore in cylinder head . . . . . 16,000...16,018 mm
Protrusion of valve guide top above cylinder head surface . . . . . 21 mm
Depth of valve face below cylinder head surface:
– inlet valve . . . . . 0,7±0,05 mm
– exhaust valve . . . . . 0,6±0,05 mm
Valve spring free length . . . . . 69,8 mm
Spring pressure when spring compressed to a length of:
– 48,6 mm . . . . . 327±17 N
– 37,4 mm . . . . . 500±23 N
Rocker arm shaft diameter . . . . . 19,959...19,980
Inside diameter of rocker arm bearing bush:
– (when fitted in position) . . . . . 19,990...20,010 mm
Outside diameter of rocker arm bearing bush . . . . . 23,035...23,075 mm
Diameter of rocker arm bore . . . . . 23,000...23,021 mm
Max. permissible push rod deflection (when free) . . . . . 0,4 mm
Free length of rocker arm spring . . . . . 80 mm
Spring pressure when spring compressed to a length 58 mm . . . . . 80...100 N
Outside diameter of tappet . . . . . 29,939...29,960 mm
Diameter of tappet bore in cylinder block . . . . . 30,000...30,043 mm
Engines from week 34 1996:
Rocker arm shaft diameter . . . . . 22,970...22,990 mm
Diameter of rocker arm bore . . . . . 23,000...23,021 mm

Camshaft

Diameter of camshaft bearing journal no 1 . . . . . 49,925...49,950 mm
Diameter of camshaft bearing journals (others that no 1) . . . . . 49,885...49,910 mm
Diameter of camshaft bearing journals nos 2, 3 and 4 (620/634–engines) . . . . . 49,865...49,890 mm
Inside diameter of camshaft bearing bushes (when fitted in position) . . . . . 50,010...50,070 mm
Diameter of camshaft bearing bores (others than no 1) . . . . . 50,000...50,025 mm
Camshaft clearance in bearing bush no 1 . . . . . 0,060...0,145 mm
Camshaft clearance in bearing bushes (others than no 1) . . . . . 0,090...0,140 mm
Camshaft clearance in bearing bushes nos 2, 3 and 4 (620/634–engines) . . . . . 0,110...0,160 mm
Bearing bush tolerance in block (press fit) . . . . . 0,025...0,080 mm
Diameter of bearing bush bore in block 55,620...55,650 mm
Camshaft end play with 0,5 mm gasket between cylinder block and timing gear
housing and between timing gear housing and front cover . . . . . 0,5...1,0 mm
Cam height (distance between back of cam and tip of cam):
– inlet valve . . . . . 41,180...41,430 mm
– exhaust valve . . . . . 40,080...40,330 mm
Cam lift:
– inlet valve . . . . . 7,38 mm
– exhaust valve . . . . . 8,28 mm
Camshaft max permissible deflection (total indicator reading) . . . . . 0,03 mm

Cylinder liners

Protrusion of cylinder liner above cylinder block top face . . . . . 0,030...0,080 mm
Max. permissible height difference between liners (under same head) . . . . . 0,02 mm
Outer diameter of cylinder liner guide:
– at upper end of liner . . . . . 124,475...124,500 mm
– at lower end of liner . . . . . 122,961...122,986 mm
Liner bore . . . . . 108,000...108,022 mm
Height of cylinder liner flange . . . . . 9,03...9,05 mm
Height of cylinder liner flange, 1st oversize, part no 8366 47933 . . . . . 9,08...9,10 mm
Height of cylinder liner flange, 2nd oversize, part no 8366 47934 . . . . . 9,13...9,15 mm
Height of cylinder liner flange, 3rd oversize, part no 8366 47935 . . . . . 9,23...9,25 mm
Outer diameter of cylinder liner flange . 131,700...131,800 mm

Piston, rings and gudgeon pin

Minimum distance between piston and cylinder head (measured with a piece
of lead wire thought the injector location hole) . . . . . 0,900...1,150 mm
Piston diameter:
– 17 mm from lower edge (320, 420, 620–engines) . . . . . 107,873...107,887 mm
– 19 mm from lower edge (634–engines) . . . . . 107,883...107,897 mm

Pin bore in piston ..... 40,003...40,009 mm
Piston pin diameter ..... 39,991...40,000 mm
Width of ring grooves:
– 1st groove (right–angled ring; 6000, 6200, 6300, 8000R, 8000, 8100, 8050, 8150) ..... 2,560...2,580 mm
– 2nd grove ..... 2,520...2,540 mm
– 3rd groove ..... 4,040...4,060 mm
Side clearance of piston rings in their grooves:
– 1st ring (right–angled ring; 6000, 6200, 6300, 8000R, 8000, 8100, 8050, 8150) ..... 0,07...0,102 mm
– 2nd ring ..... 0,03...0,062 mm
– 3rd ring ..... 0,05...0,082 mm
– reject limit ..... 0,15 mm

Piston ring height (in direction of cylinder):
– 1st ring (right–angled ring; 6000, 6200, 6300, 8000R, 8000, 8100, 8050, 8150) ..... 2,478...2,490 mm
– 2nd ring ..... 2,478...2,490 mm
– 3rd ring ..... 3,975...3,990 mm

Piston ring gap (with piston fitted in cylinder)
– 1st ring (wedge shaped ring; 6100, 6400, 6600, 6800, 8200, 8400, 8450, 8550, 8750) ..... 0,40...0,55 mm
– 1st ring (right–angled ring; 6000, 6200, 6300, 8000R, 8000, 8100, 8050, 8150) ..... 0,30...0,45 mm
– 2nd ring ..... 0,60...0,80 mm
– 3rd ring ..... 0,30...0,60
– reject limit ..... 1,0 mm

Max. permissible weight difference between pistons in same engine ..... 25 g
Piston to be heated up to 100˚C before fitting gudgeon pin.
Piston position in cylinder: combustion chamber of piston to face towards injector.

Connecting rod

Inside diameter of piston pin bush (with bush pressed into connecting rod) ..... 40,025...40,040 mm
Outside diameter of piston pin bush ..... 44,082...44,120 mm
Interference fit: connecting rod small end bushing–connecting rod ..... 0,057...0,120 mm
Connecting rod small end bore ..... 44,000...44,025
Connecting rod big end bore ..... 71,730...71,749 mm

Big end bearing shell thickness:
– standard ..... 1,835...1,842 mm
– 1st undersize 0,25 mm ..... 1,960...1,967 mm
– 2nd undersize 0,50 mm ..... 2,085...2,092 mm
– 3rd undersize 1,00 mm ..... 2,335...2,342 mm
– 4th undersize 1,50 mm ..... 2,585...2,592 mm
Big–end bearing clearance ..... 0,046...0,098 mm
End float (side clearance) at big–end on crankshaft ..... 0,200...0,410 mm
Piston pin bushing location perpendicular to longitudinal axis of connecting rod to be within 0,15:100
Piston pin bushing location and big–end bearing location to be parallel to within 0,05:100
Weight marking (letter) at lower end.
Max. permissible weight difference between connecting rods in the same engine ..... 20 g
Position of connecting rod; order no at valve mechanism side (away from the combustion chamber in the piston)

Crankshaft

Crankpin diameter:
– standard ..... 67,981...68,000 mm
– 1. undersize 0,25 mm ..... 67,731...67,750 mm
– 2. undersize 0,50 mm ..... 67,481...67,500 mm

– 3. undersize 1,00 mm	66,981...67,000 mm
– 4. undersize 1,50 mm	66,481...66,500 mm
Crankpin length	40,000...40,160 mm
Main bearing journal diameter:	
– standard	84,985...85,020 mm
– 1st undersize 0,25 mm	84,735...84,770 mm
– 2nd undersize 0,50mm	84,485...84,520 mm
– 3rd undersize 1,00 mm	83,985...84,020 mm
– 4th undersize 1,50 mm	83,485...83,520 mm
Main bearing location diameter (in cylinder block)	91,000...91,025 mm
Main bearing shell thickness:	
– standard	2,955...2,965 mm
– 1st undersize 0,25 mm	3,080...3,090 mm
– 2nd undersize 0,50 mm	3,205...3,215 mm
– 3rd undersize 1,00 mm	3,455...3,465 mm
– 4th undersize 1,50 mm	3,705...3,715 mm
Main bearing clearance	0,050...0,127 mm
Length of thrust bearing journal (journal nearest to flywheel):	
– standard (2 standard thrust plates)	45,000...45,080 mm
– 1st oversize (one std and one 0,1 mm overthick thrust plate)	45,100...45,180 mm
– 2nd oversize (one std and one 0,2 mm overthick thrust plate)	45,200...45,280 mm
– 3rd oversize (one 0,1 mm and one 0,2 mm overthick thrust plate)	45,300...45,380 mm
– 4th oversize (two 0,2 mm overthick thrust plates)	45,400...45,480 mm

Other crankshaft journals may not be ground longer.

Crankshaft end float	0,100...0,380 mm
Max. permissible ovality and other deformity of crankpins or journals	0,03 mm
Crankshaft unbalance	1,0 Ncm Max.
Balancing unit ring gear location, diameter (420 engines)	150,220...150,260 mm
Balancing unit ring gear I.D. (420 engines)	150,000...150,040 mm

Flywheel

Flywheel ring gear no. of teeth	133 pcs
Interference fit between ring gear–flywheel	0,425...0,600 mm
Before fitting the ring gear, heat up to a temperature of	150...200˚C
Flywheel unbalance	1,0 Ncm Max
Max permissible axial wobble of flywheel clutch face, measured at inner edge of clutch face on diameter 200	0,06:ø200

Timing gears

Tooth backlash:	
Crankshaft–idler gear	0,05...0,25 mm
Idler gear–camshaft gear	0,05...0,25 mm
Idler gear–fuel injection pump gear	0,05...0,25 mm
Max. permissible side wobble of gears	0,05 mm
Idler gear shaft, diameter	54,951...54,970 mm
Inner diameter of idler gear bushing (fitted)	55,000...55,030 mm
Inner diameter of Idler gear hole	60,000...60,030 mm
Camshaft gear hole diameter	32,000...32,025 mm
Camshaft end diameter	32,043...32,059 mm

Timing marks:
Timing marks on gears are in alignment when the 1st cylinder piston is at its top dead centre between compression and power strokes.

On crankshaft gear	2 dots on tooth
On idler gear:	
– against crankshaft gear mark	0 on tooth
– against camshaft gear mark	1 dot on tooth
– against fuel injection pump gear mark	1 dot on notch
On camshaft gear	1 dot on notch
On injection pump gear	1 dot on tooth

Cylinder block

Holes for guide pins	13,250...13,320 mm
Main bearing location diameter	91,000...91,025 mm
Main bearing location (with bearings 8361 40950)	92,000...92,025 mm
Cylinder liner location, diameter:	
– upper end	124,514...124,554 mm
– lower end	123,000...123,040 mm
Inner diameter of camshaft bushing (fitted)	50,010...50,070 mm
Cylinder block height	428,170...428,430 mm

Distance between piston and top dead centre at different crank shaft angles

Grad	320, 420, 620 mm	634 mm	**Grad**	320, 420, 620 mm	634 mm
6°	0,423	0,485	21°	5,100	5,841
10°	1,173	1,344	22°	5,587	6,399
11°	1,418	1,624	23°	6,095	6,980
12°	1,686	1,931	24°	6,624	7,585
13°	1,976	2,264	25°	7,173	8,214
14°	2,289	2,623	26°	7,742	8,865
15°	2,625	3,007	27°	8,331	9,539
16°	2,983	3,417	28°	8,939	10,235
17°	3,363	3,852	29°	9,567	10,952
18°	3,765	4,312	30°	10,213	11,692
19°	4,188	4,797			
20°	4,633	5,307			

Cylinder head

Height of cylinder head	104,800...105,000 mm
Height (min.) of cylinder head after repair grinding	104,000 mm
Cylinder head straigthness:	
– in lateral direction	0,05 mm
– in longitudinal direction	0,10 mm
Valve guide inner diameter (not fitted)	9,000–9,015 mm
Valve guide outer diameter	16,028...16,039 mm
Valve guide bore diameter in cylinder head	16,000...16,018 mm
Height of valve guide upper end from cylinder head surface	21 mm
Valve head depth from cylinder head surface:	
– inlet valve	0,7±0,05 mm (max. 1,70 mm)
– exhaust valve	0,6±0,05 mm (max. 1,60 mm)
Valve sealing surface angles:	
– inlet valve	35° +20'
– exhaust valve	45° +20'
Valve sealing surface width:	
– inlet valve	2,9...3,7 mm
– exhaust valve	1,3...2,3 mm
Diameter of exhaust valve seat insert	44,070...44,132 mm
Diameter of exhaust valve seat insert location	44,000...44,025 mm
Diameter of exhaust valve seat insert (repair part 8366 52269)	44,270...44,332 mm
Diameter of exhaust valve seat insert location (repair part 8366 52269)	44,200...44,225 mm
Diameter of inlet valve seat insert (8366 47936)	48,570...48,632 mm
Diameter of inlet valve seat insert location	48,500...48,525 mm
Diameter of inlet valve seat insert (repair part 8368 55347)	48,770...48,832 mm
Diameter of inlet valve seat insert location (repair part 8368 55347)	48,700...48,725 mm

Lubricating system

Oil pressure at normal running temperature:	
– at idling speed (min.)	100 kPa (1,0 kp/cm^2)
– at running speed	250–400 kPa (2,5–4,0 kp/cm^2)
Free length of oil pressure valve spring	80 mm
Spring pressure when valve spring is compressed to a length of 52 mm	54+5 N (5,4+0,5 kp)
Diameter of oil pressure valve plunger	19,602...19,635 mm
Diameter of oil pressure valve cylinder	19,700...19,752 mm
Oil filter by–pass valve opens at a pressure difference of	2±0,5 kp/cm^2

Oil pump (320, 420 engines)

Backlash between gears when crankshaft lies firmly against the lower side of main bearings:	
– crankshaft gear–lubricating oil pump gear	0,05...0,25 mm
– between the pump gears	0,16...0,26 mm
Diameter of drive shafts:	
– at bearings for body and cover	17,966...17,984 mm
– at gear wheel pressed on shaft	18,099...18,109 mm
Diameter of shaft holes on body and cover	18,000...18,018 mm
Diameter of gear wheel holes	18,060...18,078 mm
Drive shaft gear (press fit), distance between side gear (thread side) and first shoulder	14,80...15,20 mm
Fixed shaft, diameter	18,028...18,039 mm
Protrusion of fixed shaft end below pump body face	0,5...1,0 mm
Thickness of cover gasket	0,06...0,08 mm
Outside diameter of gear	43,486...43,525 mm
Housing diameter	43,650...43,750 mm
Thickness of gears	24,000...24,027 mm
End play of gears	0,03...0,11 mm
Depth of housing	24,000...24,043 mm
Number of teeth on drive gear (320 engines)	51 pcs
Number of teeth on drive gear (420 engines)	46 pcs

Oil pump (620, 634 engines)

Backlash between gears when crankshaft lies firmly against the lower side of main bearings:	
– crankshaft gear–lubricating oil pump gear	0,05...0,25 mm
– between the pump gears	0,16...0,26 mm
Diameter of drive shafts	
– at bearings for body and cover	17,966...17,984 mm
– at gear wheel pressed on shaft	18,099...18,109 mm
Diameter of drive shaft bearing hole on body and cover	18,000...18,018 mm
Hole diameter of gear pressed on drive shaft	18,060...18,078 mm
Drive shaft gear (press fit), distance between side gear (thread side) and first shoulder	16,5±0,2 mm
Diameter of fixed shaft at gear wheel	17,966...17,984 mm
Inner diameter of bearing for gear wheel which rotates on fixed shaft	18,000...18,018 mm
Fixed shaft in pump body, diameter	20,035...20,048 mm
Protrusion of fixed shaft end below pump body face	0,5+0,5 mm
Thickness of cover gasket	0,06...0,08 mm
Outer diameter of gear wheels (620 engines)	43,486...43,525 mm
Outer diameter of gear wheels (634 engines)	55,824...55,870 mm
Housing diameter (620 engines)	43,650...43,750 mm
Housing diameter (634 engines)	56,000...56,120 mm
Thickness of gears	32,000...32,027 mm
End play of gears	0,03...0,11 mm
Depth of housing	32,000...32,043 mm
Number of teeth on drive gears	46 pcs

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Balancing unit (420 engines)

Tooth backlash:	
– crankshaft ring gear–balancer weight gear wheel	0,1...0,3 mm
– between the balancer weights gear wheels	0,05...0,250 mm
Balancing weights end float	0,1...0,5 mm
Shaft diameter at bearing surfaces	36,000...36,016 mm
Bearing bushing inner diameter (fitted)	36,050...36,075 mm
Diameter of holes in body for shafts, rear end	36,058...36,083 mm
Diameter of holes in body for shafts, front end	35,958...35,983 mm
Shim thickness, cylinder block–balancer unit	0,2 mm

Turbocharger

Schwitzer S1A (320 DS engines)

Shaft end float	max 0,14 mm
Shaft radial clearance [1])	max 0,61 mm
Turbine housing attaching bolts	22 Nm
Nut at end of shaft	6,8 Nm

Schwitzer S1B (420 DS engines) and S1BG by–pass turbo (420DW engines)

Shaft end float	max 0,14 mm
Shaft radial clearance[1])	max 0,51 mm
Turbine housing attaching bolts	22 Nm
Nut at end of shaft	8,1 Nm
By–pass passage opening pressure (S1BG)	1,035 bar

Schwitzer S2B (620DS, 634 DS engines) and S2BG by–pass turbo (620/634DW)

Shaft end float	max 0,14 mm
Shaft radial clearance[1])	max 0,95 mm
Turbine housing attaching bolts	17 Nm
Nut on end of shaft	15,6 Nm
By–pass passage opening pressure (S2BG)	0,9 bar

[1]) Measured at nut on end of shaft.

Tightening torques

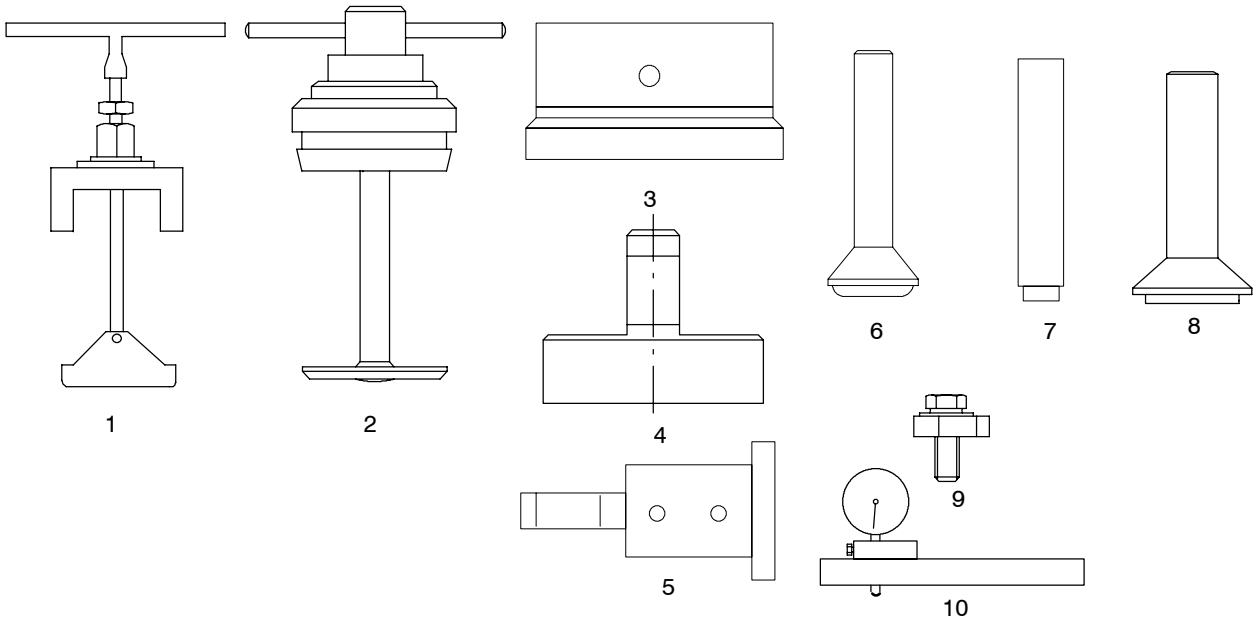
Main bearing bolts	200 Nm
Cylinder head bolts	80 Nm+90°+90°+60°
Cylinder head studs to cylinder block	30 Nm
Main bearing bolts	200 Nm
Connecting rod bolts	40 Nm + 90°
Crankshaft nut:	
– 320/420	600 Nm
– 620	1000 Nm
Flywheel bolts:	
– 10.9	140 Nm
– 12.9	160 Nm
Flywheel housing bolts:	
– outer ring M12	110 Nm (8.8), 150 Nm (12.9)
– inner ring M10	60 Nm (8.8), 90 Nm (12.9)
Idler gear bolts:	
– M10	60 Nm
– M14	200 Nm
Compressor V–belt pulley, nut	80 Nm
Balancing weights, 420	60 Nm
Crankshaft counterbalance weight bolts (320)	160 Nm
Exhaust manifold bolts	50 Nm
Inlet manifold bolts	30 Nm
Injector attaching nuts (on studs)	15 Nm
Delivery valve retainer	40 Nm
Injector nozzle sleeve	60 Nm
Engine–oil sump:	
– 320/420 engines M12 bolts	110 Nm (8.8), 140 (12.9)
– 620/634 engines M8 bolts	30 Nm
– 620/634 engines M10 bolts	90 Nm
– 620/634 engines M20 bolts	600 Nm
Nut for lubricating oil pump gear	60 Nm
Lubricating oil pump fixing bolts	60 Nm
Valve of piston cooling nozzles, 620/634	30 Nm

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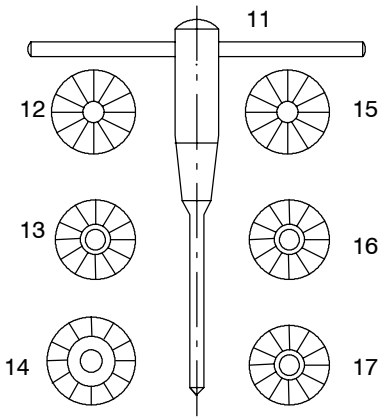
Special tools

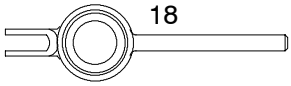
Order no	Description
1 9051 73100	Puller for cylinder liner
2 9101 65600 *)	Milling cutter for cylinder liner seat
3 9052 46400	Centring tool for flywheel housing
4 9052 46300	Drift for fitting rear crankshaft seal
5 9030 15200	Drift for fitting front crankshaft seal
6 9052 46620	Drift for 40 mm cap plug
7 9052 46650	Drift for 16 mm cap plug
8 9025 87400	Drift for fitting camshaft cup plug
9 9101 66300 *)	Press tool for cylinder liner
10 9025 79200	Holder for dial gauge
11 9101 66100 *)	T–handle for valve seat milling cutter
12 9101 71100 *)	Milling cutter for facing exhaust valve seat
13 9101 65502 *)	Milling cutter for exhaust valve seat
14 9101 65503 *)	Inner milling cutter for exhaust valve seat
15. 9101 75800 *)	Milling cutter for facing inlet valve seat
16 9101 65505 *)	Milling cutter for inlet valve seat
17 9101 65506 *)	Inner milling cutter for inlet valve seat
18 9101 66200 *)	Lever for compressing valve spring
19 9052 47200	Counter nut for lever above
20 9101 66000 *)	Milling tool for injector seat
21 9052 46660	Drift for 36 mm cup plug
22 9101 65800 *)	Drift for removing valve guide
23 9101 65900 *)	Drift for fitting valve guide
24 9024 55800	Spanner for crankshaft nut, 634–engines
25 9101 65700 *)	Spanner for crankshaft nut
26 9052 48800	Puller for crankshaft gears
27 9020 01100	Conical sleeve for fitting pistons
28 9025 98900	Drift for fitting dust cover, crankshaft front seal
29 9025 98800	Drift for fitting tension pin in timing gear casing
30 9025 98700	Drift for fitting tension pins in timing gear casing and flywheel housing
31 8366 62022	Electronical device for checking injection timing on E–engines

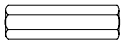
*) New tools for 20–series engines. Other tools are the same as for engines on 505–905 tractors.

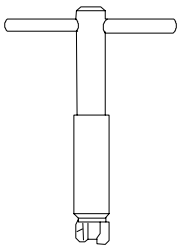


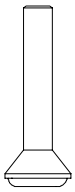
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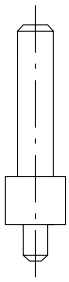


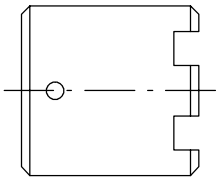


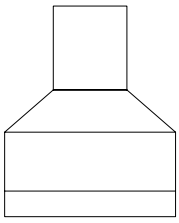


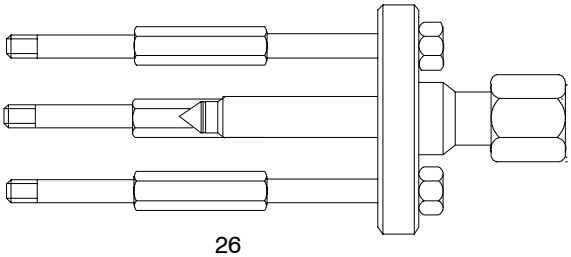


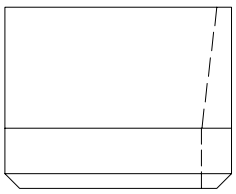


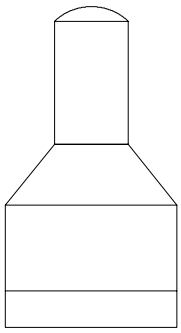


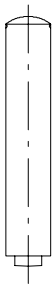




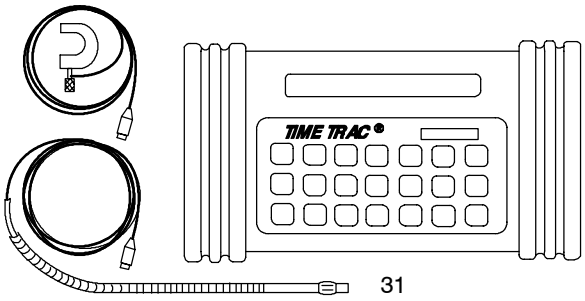












Engine, description

General

The Valmet 20–series engines (3–, 4–, or 6–cylinders) are water–cooled, four stroke, turbocharged (not 8000 and 8100), direct–injection in–line diesel engines. Technical values, see page 210/3.

The engines have a rigid and ribbed cylinder block. The crank mechanism is designed for supercharging. The cylinder liners are wet and supported at the middle, the cylinder head bolts are high tensile bolts.

Cylinder block

The cylinder block is the main body of the engine, to which other engine parts are attached. Wet and replaceable cylinder liners are supported at the middle which reduces vibrations and directs coolant circulation mainly to the upper part of the liners.

The seal between the cylinder liner lower part and the cylinder block is achieved by three o–rings, which are fitted in grooves in the liner. The upper part is sealed by the cylinder head gasket.

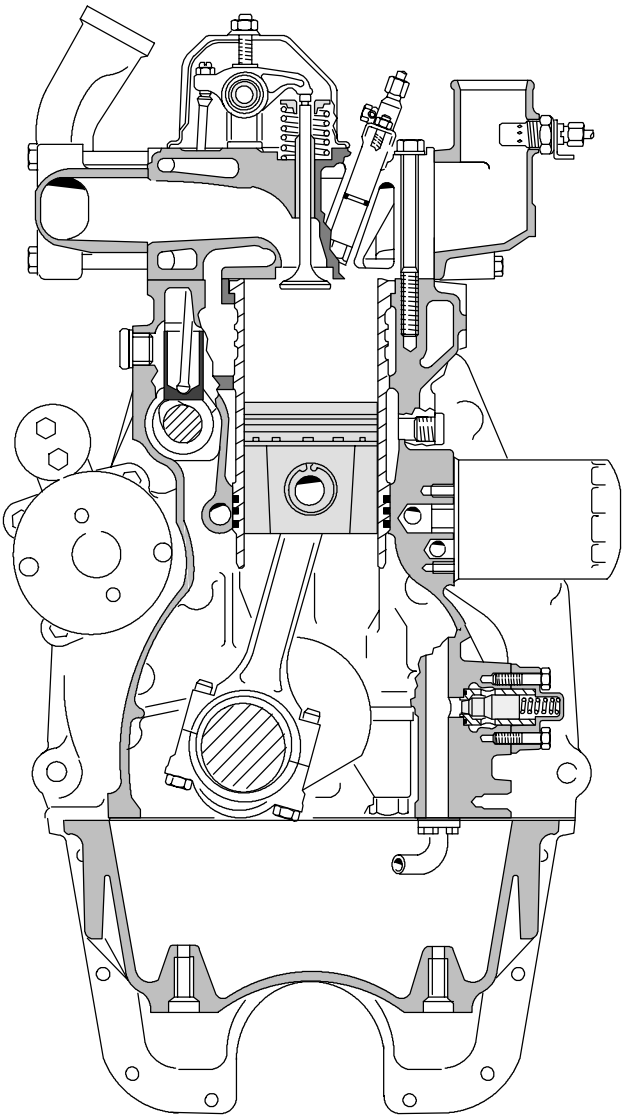
The camshaft is located in the cylinder block. The camshaft front bearing location is fitted with a separate bearing sleeve. The remaining bearing locations are machined directly in the cylinder block. The latest 620–engines have separate bearing sleeves in all camshaft bearing locations. The drilling for the camshaft rear end is covered with a plug.

There are spaces on both sides of the rear main bearing for guide bearing shims (the crankshaft thrust bearings).

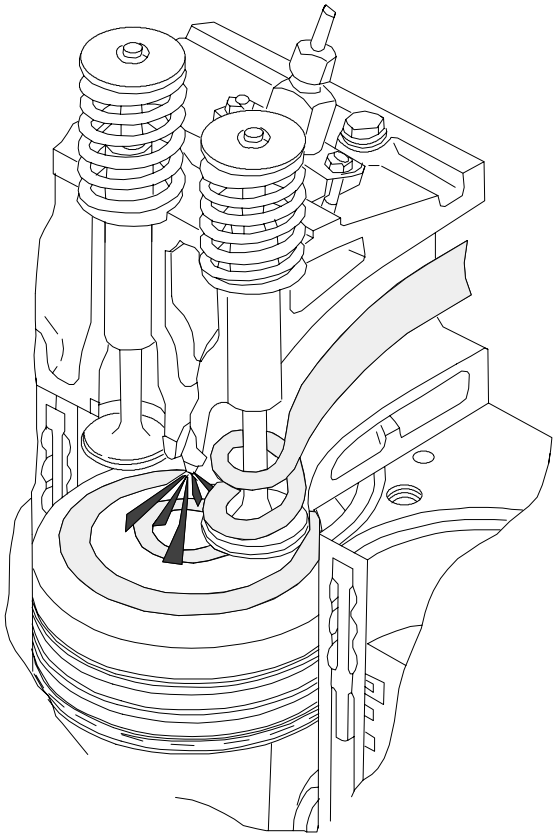
Flywheel housing

The flywheel housing is fitted at the rear end of the cylinder block. The seal for the crankshaft rear end is placed in a bore in the housing. The starter motor fixing point is fitted in the flywheel housing.

The lower face of the flywheel housing functions as a sealing surface for the oil sump gasket. This means that the lower face of the cylinder block must be level with the flywheel housing. When fitting the flywheel housing, its position is determined by tension pins.



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Cylinder head

320– and 420–engines have one cylinder head. 620–engines have two cylinder heads which are exchangeable with each other and also with the cylinder head on the 320–engine. Each cylinder has its own inlet and exhaust ports located on either side of the head. Between hot exhaust valves a cool inlet valve is fitted to balance the thermal load.

Cylinder head bolts are high tensile bolts which are tightened up to yield limit using angle tightening principle. Due to the large stretch the tightening forces are kept constant during the whole lifetime and retightening is unnecessary.

The injector locations are machined directly into the cylinder head. The inlet and exhaust valve guides are identical and can be interchanged. In addition, the exhaust valves are equipped with replaceable valve seat inserts.

Valve mechanism

The valve mechanism is operated by the camshaft which is located in the cylinder block. The drive is transferred with the help of tappets and pushrods. The camshaft gear wheel is fitted with a press fit and fixed with a key. Each bearing is lubricated by the force feed lubrication system through drilled oilways in the motor block.

Crank mechanism

The crankshaft is forged from chrome alloy special steel and is induction hardened at the bearing and sealing surfaces. This makes it possible to grind bearings four times without a new heat treatment. Gear wheels are located at the front end of the crankshaft. They are a press fit, and drive the idler wheel and oil pump. In addition, the front end of the crankshaft has splines for the hub of the V–belt pulley. An oil deflector ring is fitted between the hub and gear wheel, and a dust shield is fitted on the hub in order to protect the seal.

The crankshaft is supported on the cylinder block by main bearings which are placed on both sides of each cylinder. Thus there is one main bearing more than cylinders. The crankshaft thrust washers are placed in both sides of the rearmost main bearing.

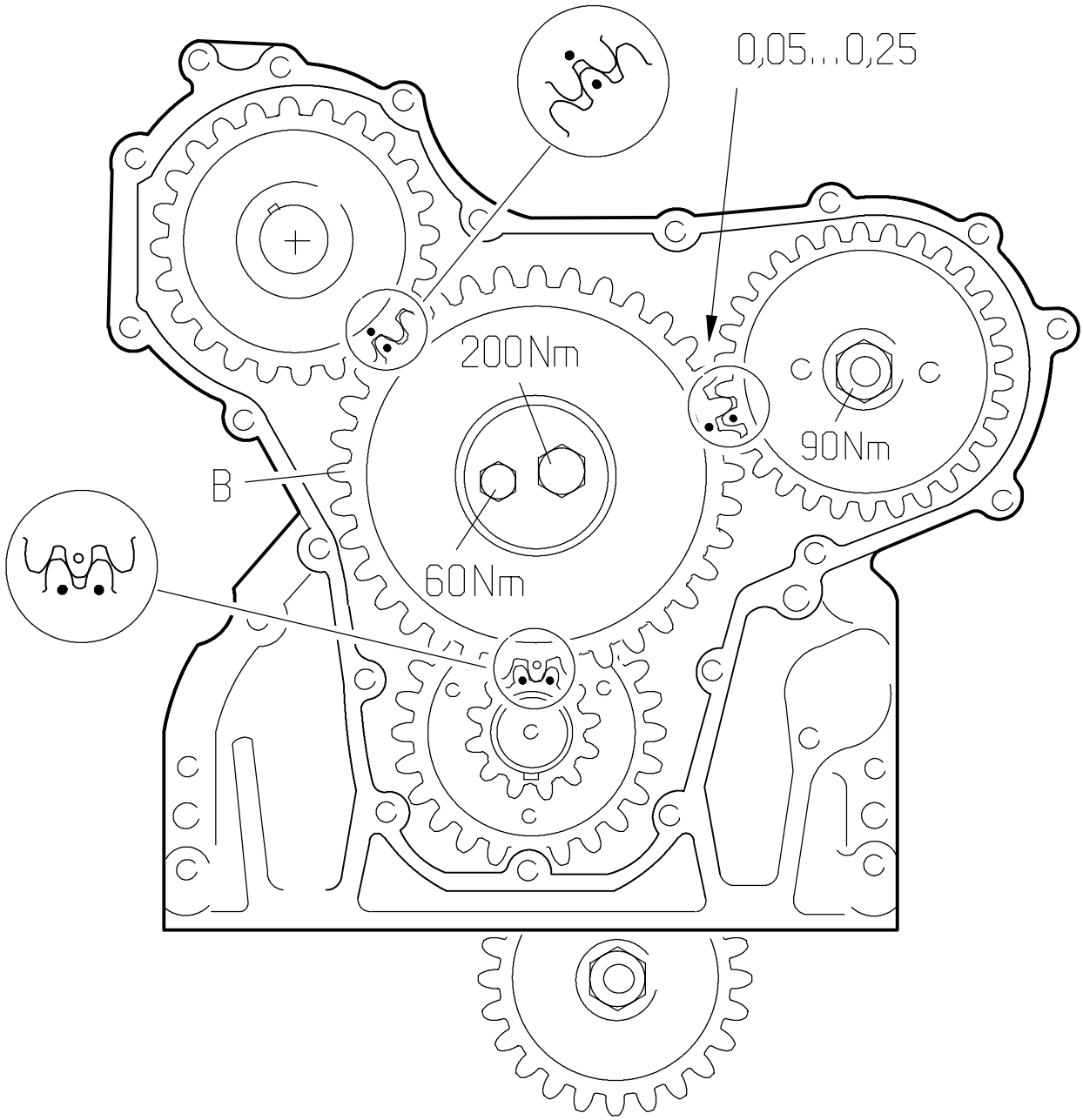
At the rear end of the crankshaft there is fitted a flywheel on which is a press–fit a starter ring gear. The forged crankshaft has an I–section cross–section. The bearing location at the bottom end of the connecting rod is split, and the bearing cup is secured by two special bolts and nuts. The upper part has a wedge–shaped bearing location, in which the piston pin bearing bushing is fitted with a press fit.

The piston is made of an eutectic aluminium alloy. In the upper face of the piston there is a combustion chamber. The shape of the chamber is intended to maximise the mixture of air and fuel. The piston has three rings. The upper molybdenum–coated ring has a wedge–shaped cross–section. On natural aspirated engines and on slight supercharged engines the upper ring is right–angled. The middle ring is tapered and it fits into its groove. The taper taking up the clearance. The oil control ring is spring loaded and it has a two–stage, chromed scraping edge.

On the turbocharged engines the upper ring location is formed in a cast iron ring which is cast in the piston. In addition, the piston on supercharged engines is graphite coated to ensure correct running–in.

Four–cylinder engines (420) are equipped with a balancer unit. The eccentric weights, which rotate at twice the engine speed, even out the vibration forces exerted by the movement of the pistons and the crank mechanism.

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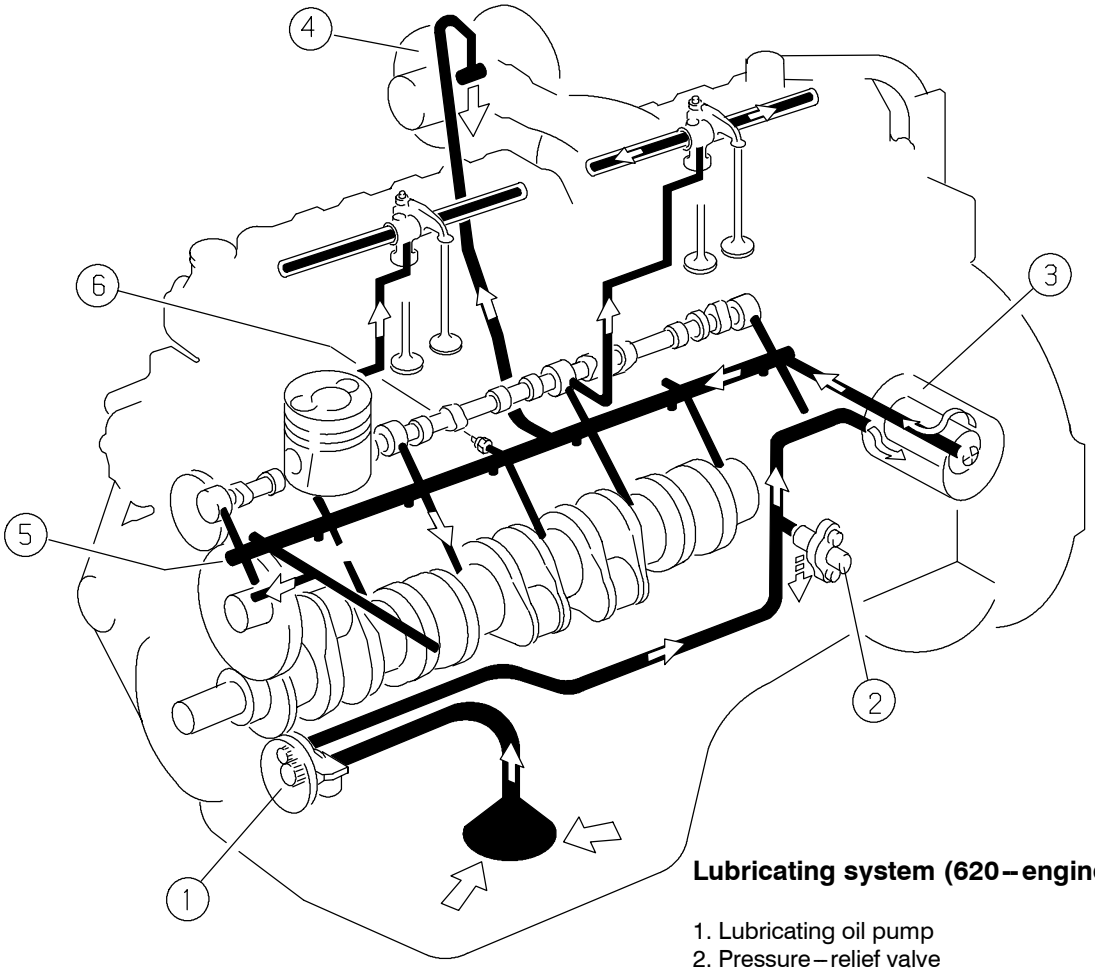


Timing gears

The timing gear train consists of hardened, helically cut gear wheels. The gears are encased by the timing gear casing which is fitted to the front of the engine. The timing gear drives the camshaft, fuel injection pump and oil pump.

The idler gear is supported with a bearing sleeve on the shaft on the front face of the cylinder block.

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Lubricating system (620–engines)

1. Lubricating oil pump
2. Pressure–relief valve
3. Oil filter
4. Turbocharger (not 8000 and 8100 tractors)
5. Main oil gallery
6. Oil pressure sensor

Lubricating system

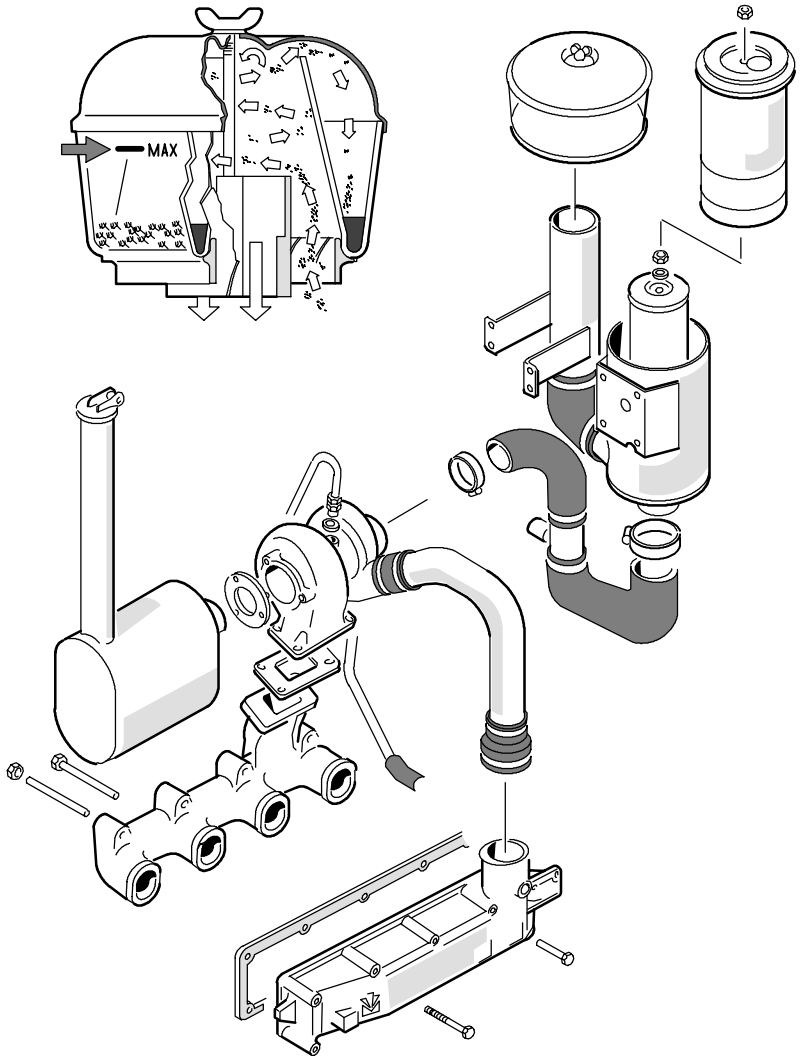
The engine has a pressure lubricating system in which the oil pump (gear pump) is attached to the cylinder block lower face. The oil is sucked up by the pump through a suction strainer. After the pump the oil is led through an oilway to the relief valve and to the oil filter. After the filter, the oil is led through the main oil gallery from which oilways branch out. The oil is led through the oilways in the main bearings and through the crankshaft to the big–end bearings.

The oil is further directed from the main gallery to the injection pump, turbocharger, balancing unit (420) and to a possible compressor. In addition, the idler gear bushing, the camshaft bearing points and the valve mechanism get their lubrication oil via the main oil gallery.

The oil pressure relief valve is located under the oil filter on the left hand side of the engine. The valve regulates the lubricating oil pressure so that it is kept constant, regardless of the engine speed. Oil pressure is about **2,5–4 bar** depending on revs, oil quality and temperature, and at engine idling speed the pressure is min **1,0 bar**.

The oil filter is full–flow disposable type and is fitted on the left–hand side of the engine. A by–pass valve is located at the base of the filter to ensure safe cold–starting or to ensure adequate lubrication in case the filter becomes blocked. In addition, there is a non–return valve which stops the filter from being emptied of oil.

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Induction and exhaust system

The filter system for the engine inlet air comprises a cyclone type precleaner, and a paper filter which acts as the main filter. The incoming air is made to rotate in the cyclone precleaner. This causes most of the impurities to settle out and collect in the cyclone precleaner dust collector. The paper filter comprises two replaceable filter elements. The paper is corrugated and surrounded by a metal support.

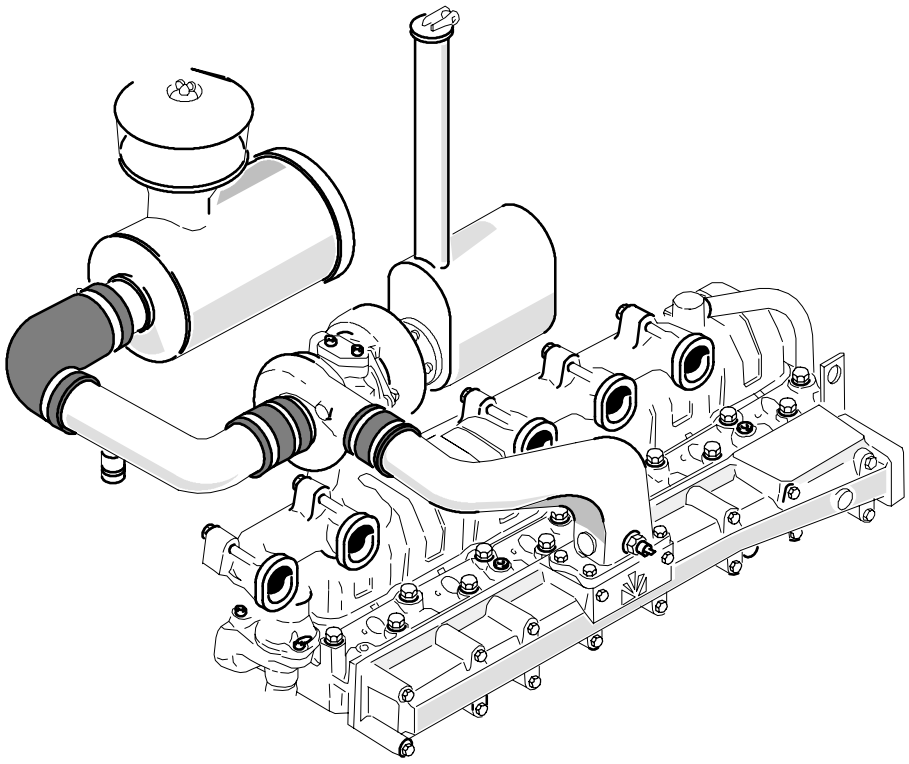
The impurities in the air collect at the larger filter element which can be cleaned when necessary. The inner safety filter prevents impurities form entering the engine should the main filter element break, or be fitted incorrectly.

An electric service indicator is located in the filter body. This sender lights a control lamp on the instrument panel when the air filter is blocked. The inlet system also includes the hoses between the air cleaner and the turbocharger and the turbocharger and the induction manifold.

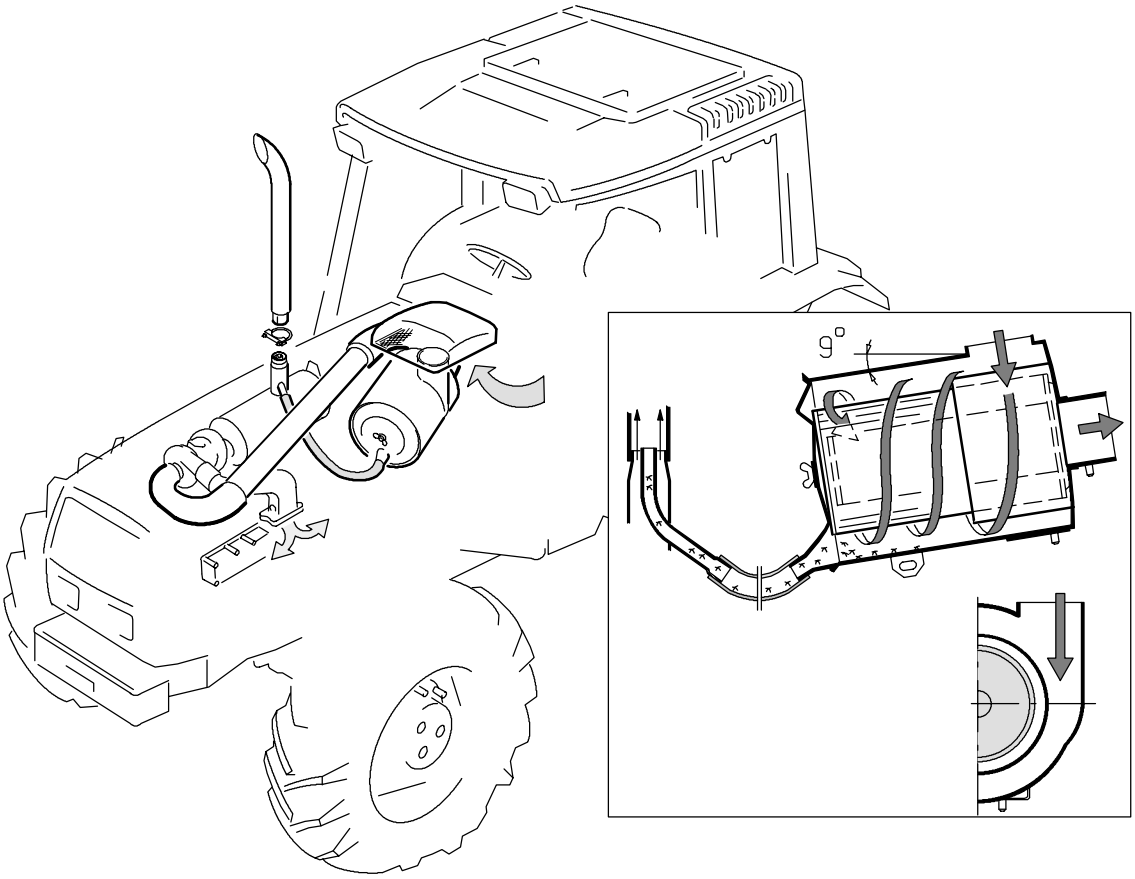
The exhaust manifold is attached to the cylinder head with high tensile bolts without a separate gasket. Retightening of the manifold bolts is unnecessary.

The turbocharger is small and thus it reacts sensitively at low engine revs. The turbocharger gets lubricating oil and cooling from the engine lubricating and cooling system.

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The picture above shows the air intake system of the 8400 tractor. 8400 has a turbocharged, 6 – cylinder engine with an output of 140 hp (103 kW). The turbocharger type is Schwitzer S2B.



Air filter on later 8200 and 8400. In this filter the filter elements are a little bigger than on other models. Also a pipe, which removes impurities with the aid of the suction created by exhaust gas flow, is standard equipment. The air intake covering above the filter has a net, which filters larger impurities.

The filter elements are accessible after removing the LH side engine hood plate. There is a wing nut at the end of the filter housing.

Note! 6200, 6800, 8000R and 8050 – 8750 tractors also have this filter and later all Mezzo/Mega – series tractors.

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Repair instructions

Cylinder block and flywheel housing (Op no 211)

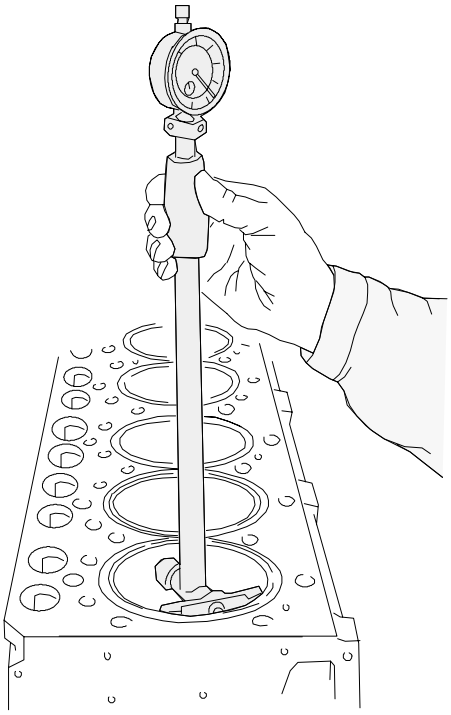
1. Cylinder block and cylinder liners

A. Measuring cylinder liner wear

Note! Cylinder liner wear can be measured when the engine is attached to the tractor. Remove only the cylinder head and crank the engine so that the piston is in the lower position.

1. Using a micrometer set the dial gauge to zero using a new cylinder liner indicating the initial dimension of the bore: 108,00 mm.

2. Clean the inner surface of the cylinder liner thoroughly before measurement.



3. Perform the measurement crosswise at the liner top end, lower end and middle.

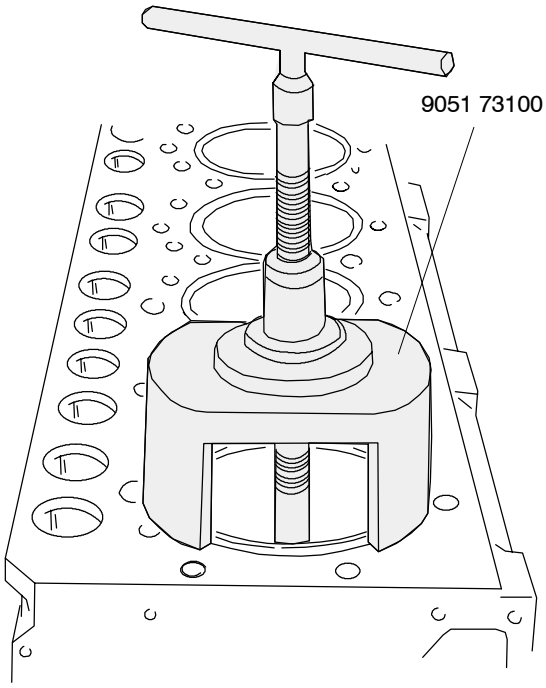
4. Check the gauge reading for maximum wear and ovalness (compare with rating on page 210/4).

B. Removing cylinder liner

Note! See also page **219/1** for working order**.**

1. If the cylinder liners are to be used again they should be marked so that they can be fitted in the same position.

2. Remove the cylinder liners using cylinder liner puller 9051 73100.



C. Checking cylinder block

1. Clean the cylinder block and all oilways.

2. Check the cooling channels and remove the scale and sediment to ensure engine cooling.

3. Check the tightness of the cup plugs and threaded plugs in the cylinder block as well as the condition of the cylinder block and sealing faces.

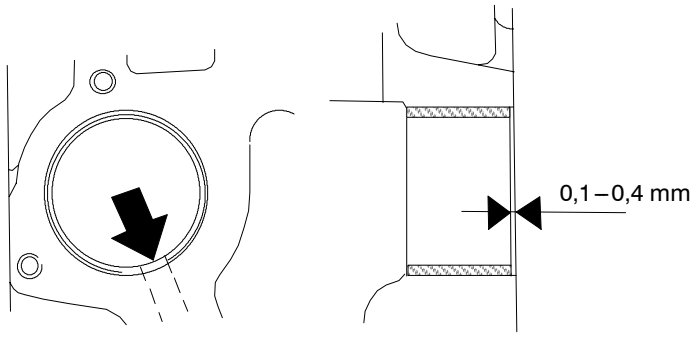
4. Measure the wear of the camshaft bearing points (compare with rating on page 210/4).

Note! If it is necessary to machine the upper face of the cylinder block, the pistons must be shortened by the same dimension. Observe the valve disc spaces on the piston upper face.

D. Changing camshaft bushing

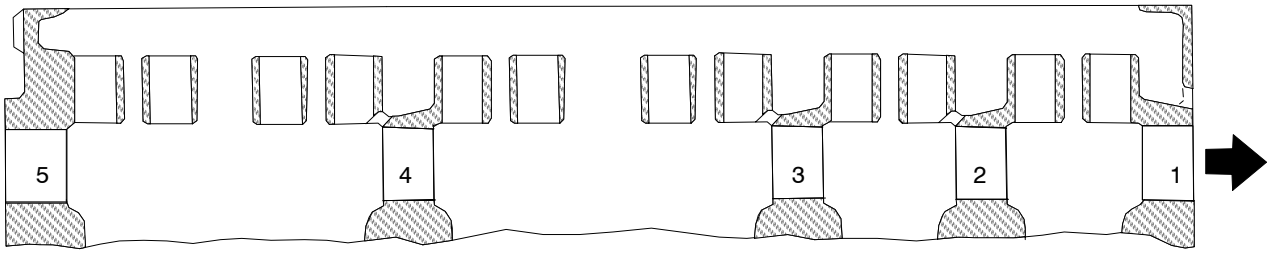
1. Extract the bushing with an internal puller, for example Sykes 854. If the camshaft rear end plug is removed the bushing can be forced out with a long drift.

2. Clean the bushing location.



3. Press in a new bushing. Note the position of the oil hole. It is unnecessary to ream the bushing because it has a correct inner diameter when it is fitted in place.

Note! On the 620 and 634 engines from the engine ser. number C2751, all camshaft bearing points are provided with a separate bearing bushing. Observe the different outer diameters when removing and fitting.



Order numbers of the camshaft bushings and hole diameters for the bushings on the 620/634 engines.

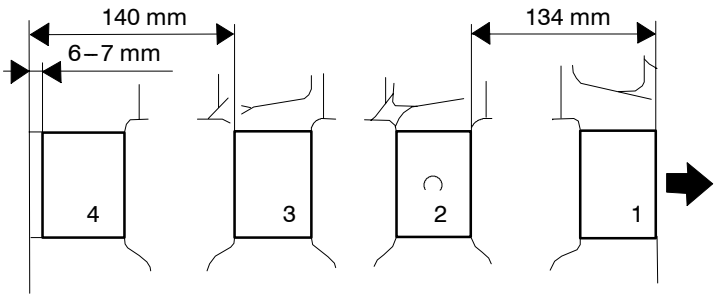
Note! Numbering begins from the front end of the engine.

Order no	Hole diameter
1. 8363 22610	55,62...55,65
2. 8368 52460	55,40...55,43
3. 8368 52459	55,20...55,23
4. 8368 52460	55,40...55,43
5. 8368 52461	55,62...55,65

E. Oversize bushings for camshaft

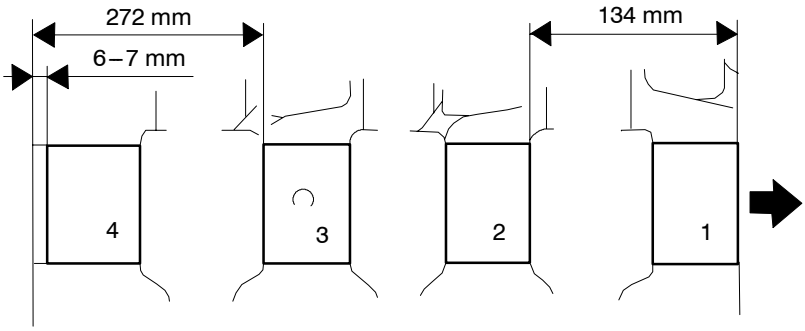
If the location of the camshaft bushing (front bearing) is damaged, a bushing with a **0,4 mm** oversize outer diameter can be fitted. Bushings are available even for other camshaft bearings which do not normally have bushings. Part numbers and machining dimensions for the bushing locations are shown in the figure.

Observe the position of the bushing oil holes. It is unnecessary to ream the bushings after fitting.



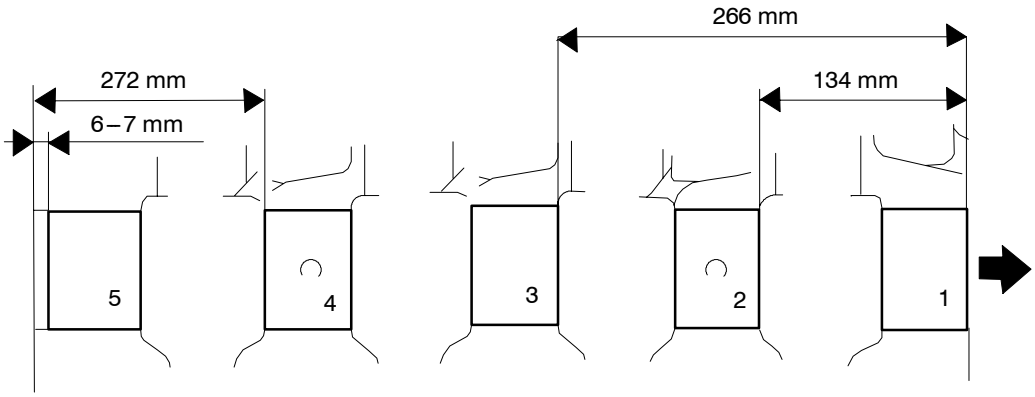
Oversize camshaft bushings for 320–engines. Numbering begins from the front end of the engine.

Order no	Hole diameter
1. 8363 24661	56,02...56,05
2. 8368 52460	55,42...55,45
3. 8368 52460	55,42...55,45
4. 8368 52461	55,64...55,67



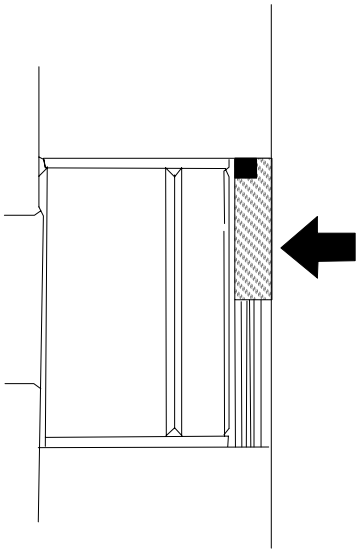
Order no	Hole diameter
1. 8363 24661	56,02...56,05
2. 8368 52460	55,42...55,45
3. 8368 52460	55,42...55,45
4. 8368 52461	55,64...55,67

Camshaft oversize bearing bushings for 420–engines. Numbering begins from the front end of the engine.



Camshaft oversize bearing bushings for 620/634 engines. Numbering begins from the front end of the engine.

Order no	Hole diameter
1. 8363 24661	56,02...56,05
2. 8368 52466	55,62...55,65
3. 8368 52460	55,42...55,45
4. 8368 52466	55,62...55,65
5. 8368 52467	55,84...55,87

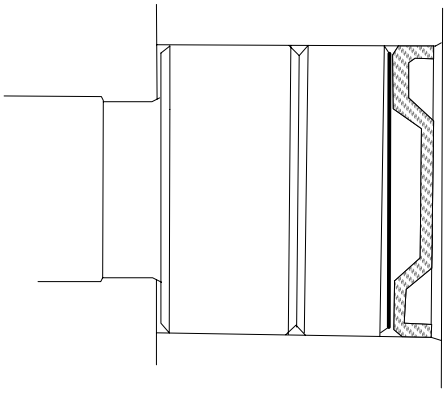


The camshaft rear end plug is replaced with plug 8363 24391 and o–ring 6146 05125 after machining.

F. Fitting plug at camshaft rear end

1. Clean the seat for the plug.

2. Apply sealing compound to the contact surface of the plug



3. Drive in the plug with fitting drift 9025 87400.

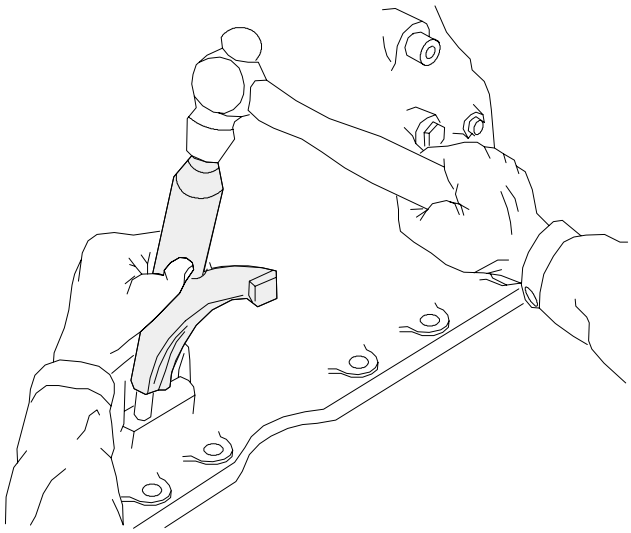
Note! Do not drive in the plug too far because it will affect the camshaft end float.

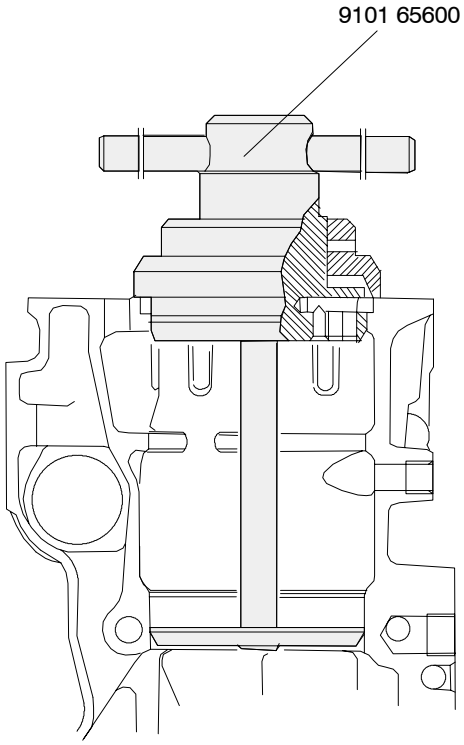
https://truckmanualshub.com/

G. Fitting pipe for oil dipstick

1. Clean the seat for the pipe.

2. Apply locking fluid Loctite 601 to the lower end of the pipe.





3. Tap the pipe in to the correct fitting height with tool 9025 95900.

Note! The position of the pipe affects an oil level in the engine.

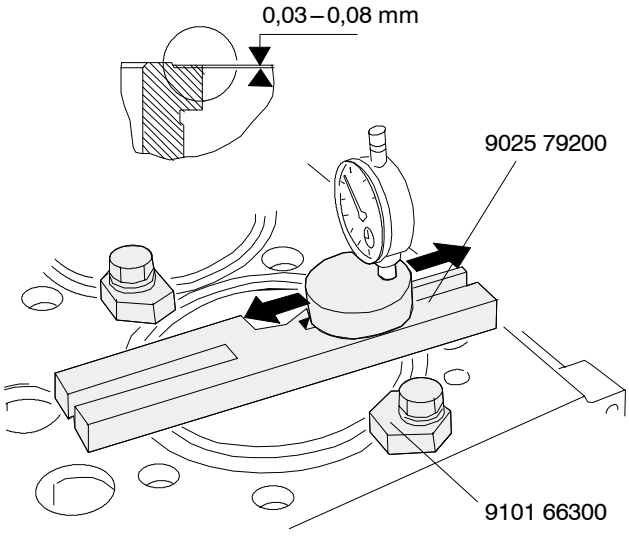
H. Fitting cylinder liner

1. Clean the cylinder liner and its recess in the cylinder block. Without o–rings the liner should rotate easily in its recess.

2. Apply a thin layer of marking paint on the underside of the cylinder liner flange. Fit the cylinder liner without o–rings and turn it forwards and backwards. Lift out the liner and check that paint has been deposited on the whole contact surface.

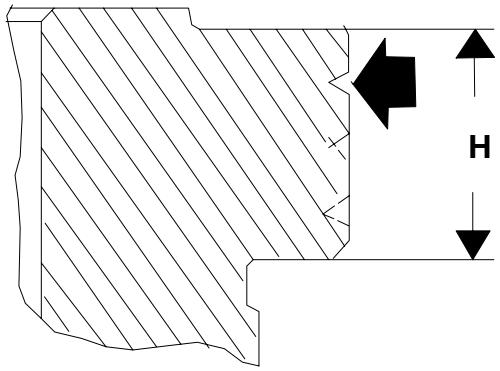
3. If the recess is damaged, or the cylinder liner height (see point 5) needs to be adjusted, use milling cutter 9101 65600. If necessary, a light lapping can be executed after milling with the help of the cylinder liner. Apply lapping paste to the underside of the cylinder liner flange, and twist the liner with twisting tool. Lapping is not suitable for adjusting the cylinder liner height.

4. Clean the contact surfaces.



5. Fit the cylinder liners and fix each liner with two press tools 910166300. Measure the cylinder liner height with a dial gauge and holder 9025 79200. Zero the dial gauge against a flat surface, for example, the cylinder block face. Measure each liner in four places. The height of the liner above the cylinder block face should be **0,03–0,08 mm**. The height difference between cylinder liners under the same cylinder head must not exceed **0,02 mm**, nor must an intermediate cylinder liner lie lower than an outer one.

6. If the cylinder liner height is too low, a liner with a higher flange is fitted.



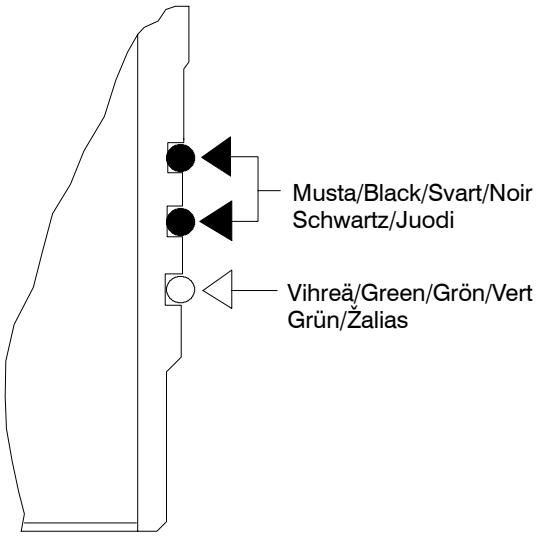
Order no	H	Marking grooves pcs
8266 47420	$9{,}03^{+0{,}02}$	– (norm)
8366 47933	$9{,}08^{+0{,}02}$	1
8366 47934	$9{,}13^{+0{,}02}$	2
8366 47935	$9{,}23^{+0{,}02}$	3

Cylinder liners with oversize flanges (higher flanges) are marked with grooves on the outer circumference as follows:

1st oversize, 0,05 mm = 1 marking groove
2nd oversize, 0,10 mm = 2 marking grooves
3rd oversize, 0,20 mm = 3 marking grooves

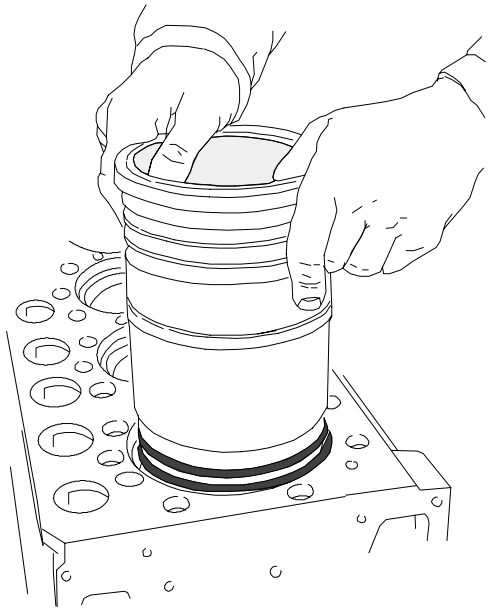
Note! Recess depth is adjusted with a cylinder liner recess cutter 9101 65600.

7. If the liner height of a cylinder liner is not the same all the way round, the cylinder liner flange and the cylinder block recess depth should be checked. Cylinder liners with warped flanges should be discarded.



8. Fit the o–rings into the grooves in the cylinder lower part and lubricate them with a liquid soap (not with engine oil).

Note! Stretch the o–rings as little as possible when fitting them. Max allowable stretching is 6 %.



9. Press the cylinder liners into the cylinder block. It should be easy to press them fully home. Make sure that the liners do not rise up after fitting.

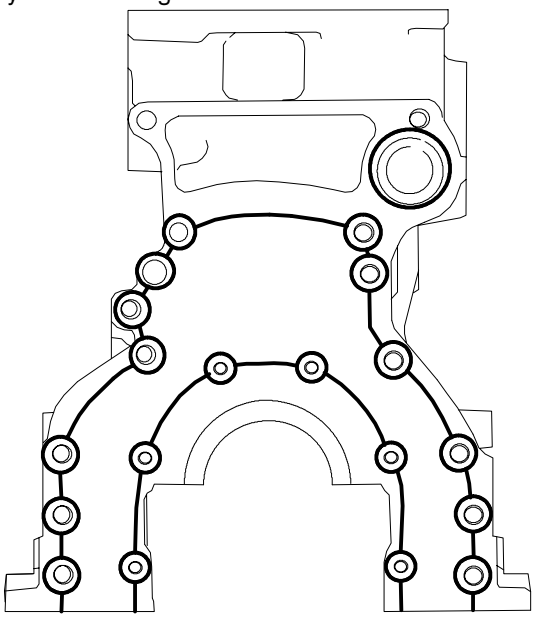
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2. Flywheel housing

A. Fitting flywheel housing

The flywheel housing is centred on the cylinder block by two tension pins. Even the flywheel housings which are delivered as spare parts have ready – made holes for the pins.

1. Clean the sealing surfaces between the cylinder block and the flywheel housing.

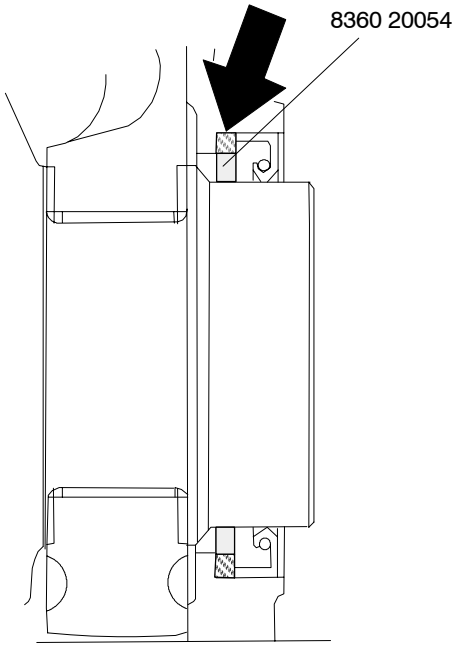


2. Apply silicone sealant as shown in figure above.

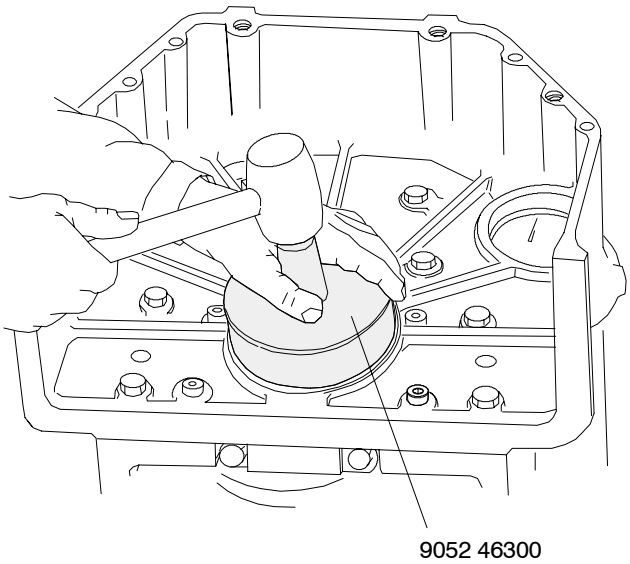
3. Lift the flywheel housing into place and fit all the bolts.

4. Centre the housing and fit the tension pins with drift 9025 98700.

5. Tighten the fixing bolts, the inner ring socket head bolts to **60 Nm** (8.8) or **90 Nm** (12.9) and outer ring hexagonal bolts to **110 Nm** (8.8) or **150 Nm** (12.9).



Note! If the crankshaft is worn at the sealing location, a 2 mm spacer ring, part no 8360 20054, can be fitted in front of the crankshaft rear oil seal.



B. Changing crankshaft rear oil seal

1. Split the tractor at clutch. Remove the clutch assembly (and possible turbine clutch).

2. Remove the flywheel.

3. Remove the oil seal. Do not damage the crankshaft.

4. Clean the seal location and grind off any burrs.

5. Lubricate the sealing surfaces on the crankshaft and on the seal. Place the seal on the crankshaft and drive it in until it bottoms using drift 9052 46300. Other tools may cause the seal to be damaged or mounted askew, resulting in leakage.

Note! The cranckshaft rear oil seal has been changed to a Teflon type. The spare part seals have a mounting sleeve, which must not be removed before fitting. The spare part numbers do not change. When fitting the seal, place the plastic sleeve on the crankshaft and push the seal on the sleeve into place. Remove the sleeve and fit the seal with the special tool. The seal must be fitted dry.

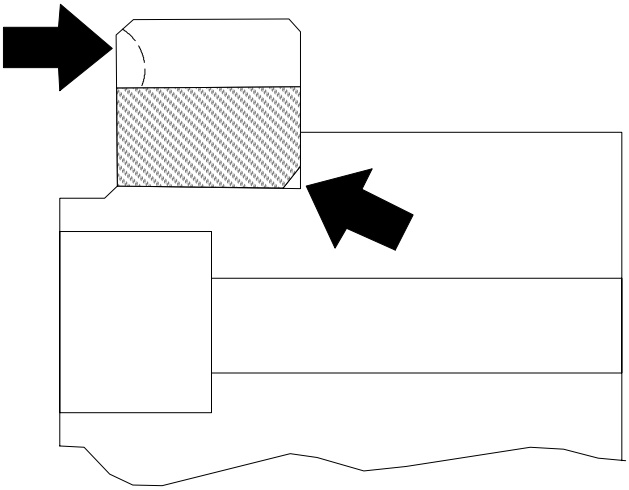
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C. Changing starter ring gear on flywheel

If the ring gear is worn, change it with a new one. The ring gear cannot be turned around because its teeth are chamfered and hardened on the starter motor side.

1. Split the tractor at clutch (see Op **411 1A**). Detach the clutch assembly (and possible turbine clutch) and the flywheel.

1. Detach the earlier ring gear by tapping it with a drift. Clean the ring gear seat on the flywheel with a steel–wire brush.



2. Warm the ring gear to the temperature of **150–200°C**. Fit the ring gear with the inner diameter chamfering turned against the flywheel and the teeth chamfering against the starter motor.

3. Allow the ring gear to cool freely without using any coolant.

D. Fitting the flywheel

1. Clean the contact surfaces on the crankshaft rear flange and on the flywheel.

2. Fasten the flywheel to the crankshaft rear end. As a guide pins can be used studs (M12, 2 pcs) which are screwed in to the flywheel fixing bolt holes.

Note! On the flywheel there is a fuel injection timing mark. Fit the flywheel in the right position according to the guide pins.

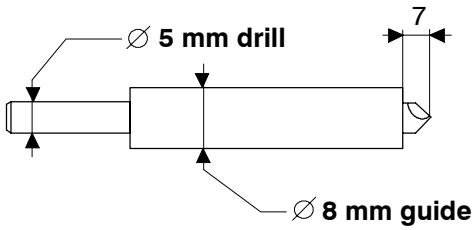
Note! In the E–engines there is an injection timing register mark on the flywheel and the flywheel has been positioned with a guide sleeve to the crankshaft.

3. Tighten the flywheel fixing bolts evenly to a torque of **140 Nm** (10.9) or **160 Nm** (12.9).

Note! If a flywheel must be changed on the E–engines, an injection timing mark must be made on a new flywheel as follows:

– Rotate the crankshaft so that the piston in the first cylinder is in the top dead centre. Drop a valve down against the piston top. Place a dial gauge stylus against the valve upper end and zero the gauge to the top dead centre. Rotate the crankshaft in the running direction until the dial gauge shows value **4,633 mm** after the top dead centre (420, 620) or **5,307 mm** after the top dead centre (634).

– Drill the injection timing mark in the flywheel with the aid of a drill shown below.



Cylinder head and valve mechanism (Op no 212)

1. Cylinder head

A. Removing cylinder head

1. Remove the engine hood plates. Clean the engine externally and drain the coolant. Disconnect the coolant hoses from the cylinder head and the thermostat housing.

2. Remove the suction hoses between the turbocharger and the air filter and between the turbocharger and the inlet manifold (turbocharger only on 6100–6600 tractors).

3. Disconnect the turbocharger pressure and return oil pipes.

4. Remove the pipes to the thermostart fuel reservoir.

5. Remove the injector leak–off fuel pipes and the delivery pipes. Remove the injectors. Fit blanking–off caps on all open connections.

6. Remove the inlet and exhaust manifolds and the thermostat housing.

Note! It is possible to remove the cylinder head even thought these parts are attached to the head.

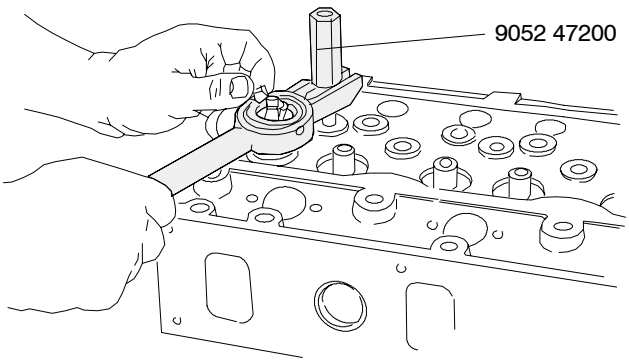
7. Remove the valve cover and the breather hose.

8. Remove the rocker arm mechanism and the push rods.

9. Loosen all the cylinder head bolts first by a 1/4 turn and then remove them. Remove the cylinder head.

B. Removing valves

Ensure that valves which are to be re–used are marked, so that they are fitted in their original locations.



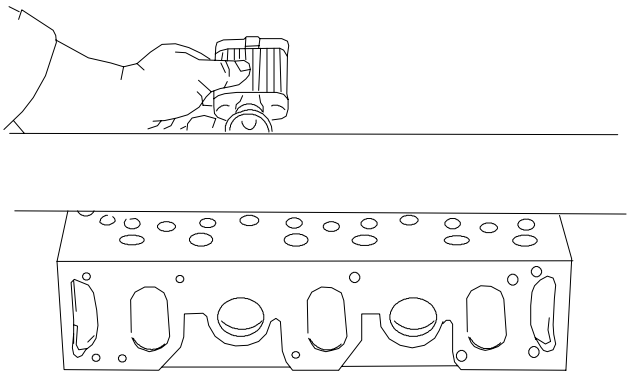
1. Thread the counterhold nuts 9052 47200 onto a screw stud for the rocker arm mechanism. On the 320–, and 620–engines there is not a screw stud at the valves for the centre cylinder. A bolt of suitable length should be used instead.

2. Compress the valve springs using lever 9101 66200. Remove the valve cotters, spring guide and spring. Remove the valves.

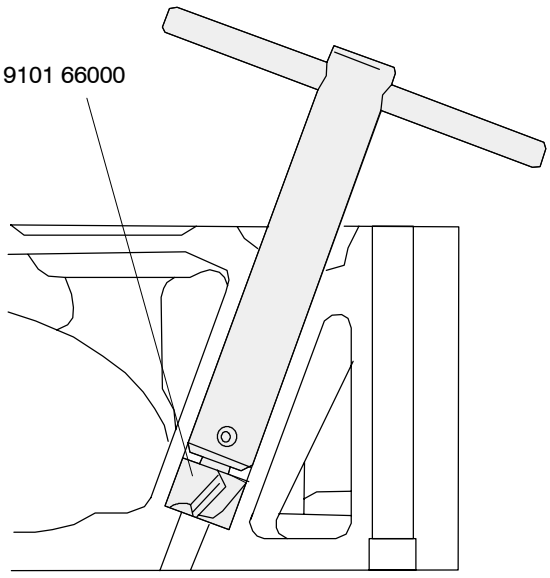
C. Checking cylinder head

1. Remove carbon deposits from the exhaust ports, clean the sealing surfaces and wash the cylinder head.

2. Check for cracks and other damage.

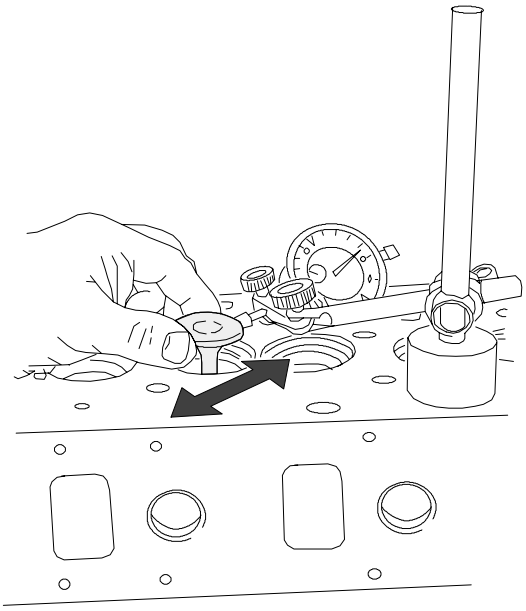


3. Check the flatness of the cylinder head by using a straight edge. An uneven or warped surface should be surface ground. The height of the cylinder head, after grinding, should not be less than **104,00 mm**. The valve disc depth from the cylinder head surface should be **0,60 mm** for the exhaust valves and **0,70 mm** for the inlet valves.



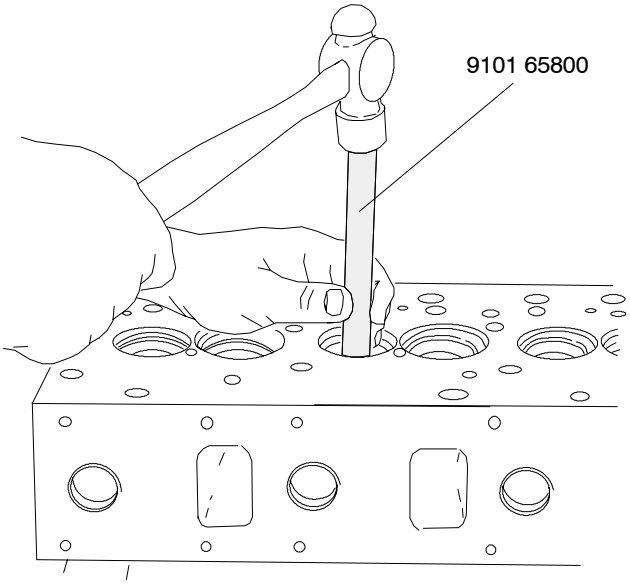
4. Straighten and clean the injector location seat in the cylinder head with cutter 9101 66000.

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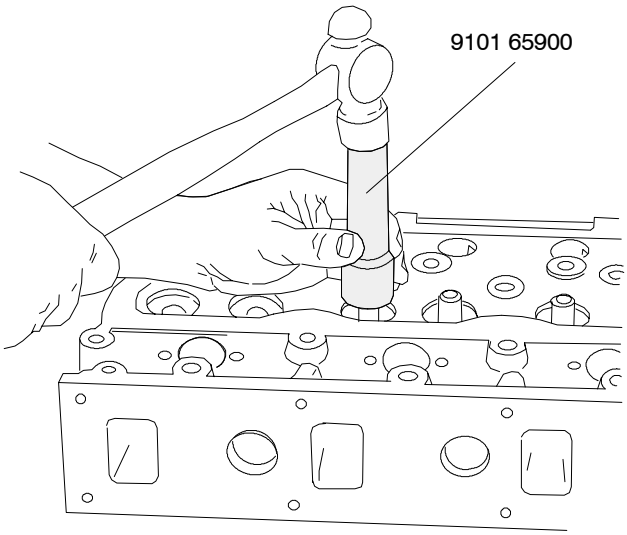
5. Measure the clearance between the valve stem and the valve guide with a dial gauge. Lift the valve so that the valve head is 15 mm from the face of the cylinder head, and measure the clearance. It must not be greater than **0,30 mm** for the inlet valves and **0,35 mm** for the exhaust valves. In order to establish the valve guide wear, a new valve should be used when measuring.

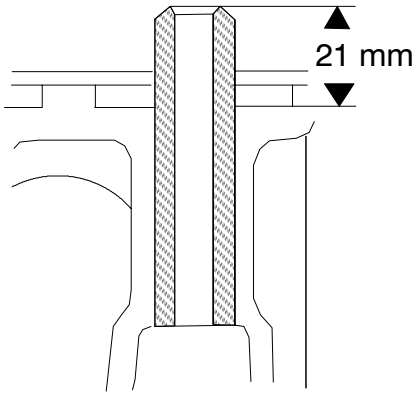
D. Changing valve guides



1. Press or knock out the old guides using drift 9101 65800. Clean the valve guide locations.

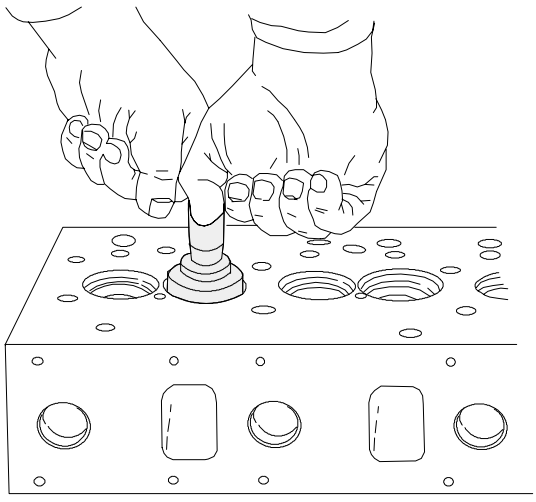
2. Lubricate the outside of the new guides and fit them using drift 9101 65900, which ensures the correct fitting height (**21 mm** over the spring face)





3. The guides are the same for the inlet and exhaust valves. Ensure that the steepest chamfer on the guide, faces the valve head. Check that the valves do not bind in the guides.

E. Machining valve seat



Machine the damaged valve seat with milling cutter (see page 210/10). If the width of the seat exceeds **2,3 mm** in exhaust and **3,7 mm** in intake, it should be reduced primarily at the outer edge.

The valve seat angle is **45°+20'** for exhaust valve and **35°+20'** for inlet valve.

F. Changing valve seat inserts

Exhaust valves are fitted with separate valve seat inserts. If the sealing surface is damaged so badly that it cannot be repaired with machining, the seat inserts should be changed.

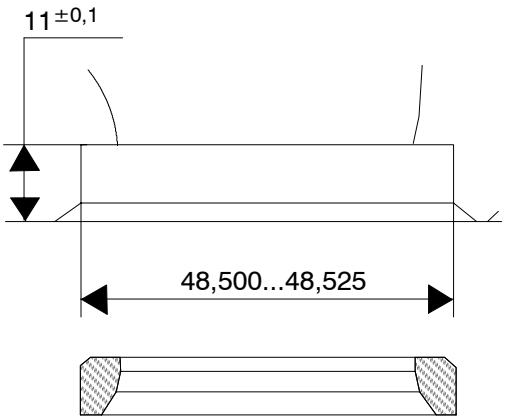
1. Grind the valve head on a discarded valve so that it sits down in the valve seat. Fit the valve and weld it in place in the seat. Cool with water.

2. Turn the cylinder head over and knock out the valve and seat.

3. Clean the valve seat location. Cool the new seat in liquid nitrogen until it stops bubbling, or alternatively place it in dry ice.

4. Fit the seat with a suitable drift. Machine the seat.

N.B. Where necessary, standard size seats can be replaced by inserts with a larger outer diameter. See Specifications.

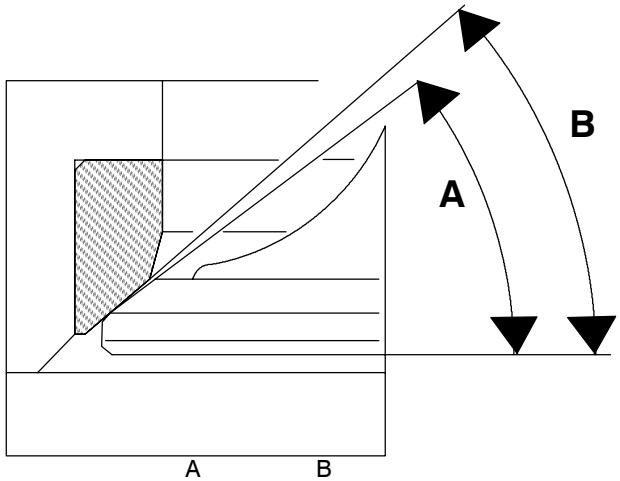


The inlet valve seat machined direct on the cylinder head, can be provided with a separate valve seat insert, order no 8366 47936. Machine the seat insert location on the cylinder head (see figure above). Fit the insert like a seat of the exhaust valve.

Note! Engines on tractors 8550 and 8750 have the valve seat inserts also on the inlet valves. From March 96 these cylinder heads have been marked with letter V, which is stamped on the cylinder head front upper surface on the exhaust side. As a spare part these heads can be fitted on all engines. The V–marked cylinder heads are also available for the 4–cylinder engines.

G. Grinding valves

In order to ensure that there is a proper seal around the valves, there is a difference in the sealing surface angles. Thus there is a very narrow sealing surface which seals effectively even after prolonged running.



	A	B
INLET	35° –20'	35° +20'
EXHAUST	45° –20'	45° +20'

1. Grind the damaged valve disc with a valve refacer. Adjust angles to **45° –20'** for exhaust valves and **35° –20'** for inlet valves.

2. If the edge of the valve head is less than **1,5 mm** after it has been ground, or if the valve stem is bent, the valve should be discarded.

3. If necessary, grind the end of the valve stem.

4. Lap the valves with lapping paste and check the contact surface with marking paint.

5. Clean the cylinder head and valves of any remaining lapping paste.

H. Fitting valves

1. Check the valve springs for straightness, length and tension using a spring tester. Compare with specifications.

2. Lubricate the valve stems and fit the valves in the correct order in the cylinder.

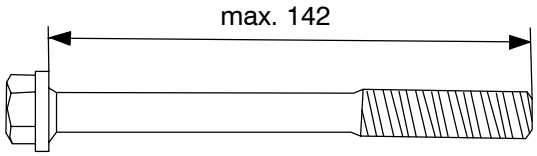
3. Fit the springs, spring guides and valve keepers with the aid of a lever for compressing valve springs, 9101 66200.

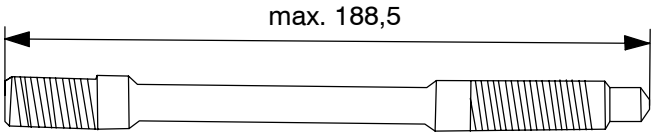
4. Tap the end of the valve stems lightly after fitting the valve in order to ensure that they are secure.

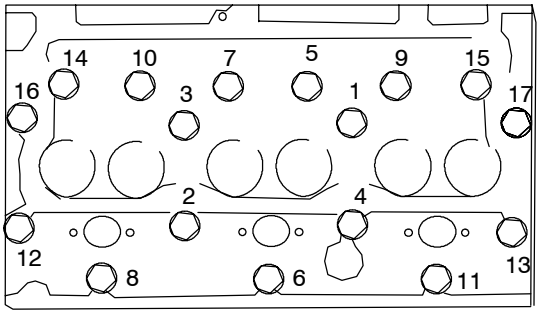
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I. Fitting cylinder head

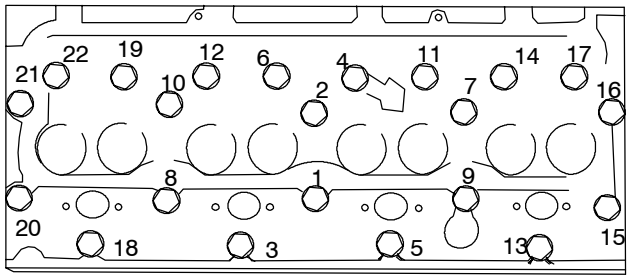
1. Measure the length of the cylinder head bolts. Compare with dimensions shown in figure below. Change too long bolts.







320, 620, 634



420

2. Screw the cylinder head stud bolts in to the cylinder block to a torque of **30 Nm**. Fit the valve tappets if removed.

3. Check that the sealing surfaces are clean and fit the cylinder head gasket(s) and the cylinder head(s). Ensure that on the six cylinder engines both cylinder heads are parallel by fastening lighty the exhaust manifold before tightening the cylinder head bolts (the exhaust manifold can damage, if the heads are not parallel). Clean and lubricate and fit the bolts.

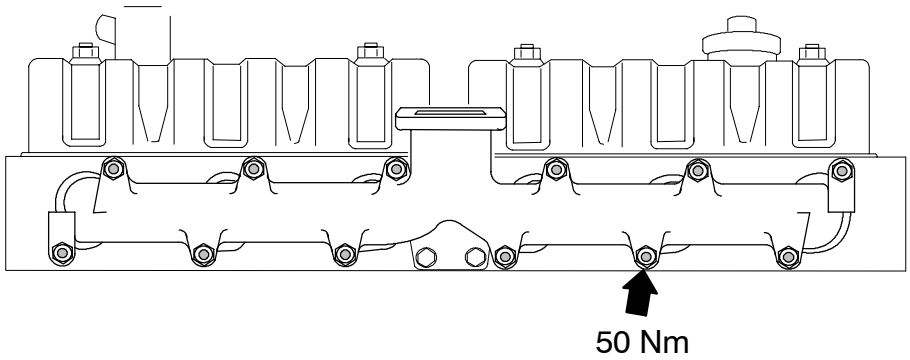
Note! The cylinder head gasket order numbers are 8366 46351 (320/620/634) and 8367 46354 (420).

4. Pictures above show the correct tightening order of the cylinder head bolts. The order has also been marked on the cylinder heads.

5. Tighten the cylinder head bolts progressively as follows:

1. First tightening to 80 Nm
2. Tightening of 90˚
3. Tightening of 90˚
4. Adjust valve clearances
5. Warm engine up to normal operating temperature with light loading (approx. +75˚C)
6. Tightening of 60˚. Adjust valves.

Tighten the exhaust manifold bolts/nuts to **50 Nm**. DO NOT OVERTIGHTEN.



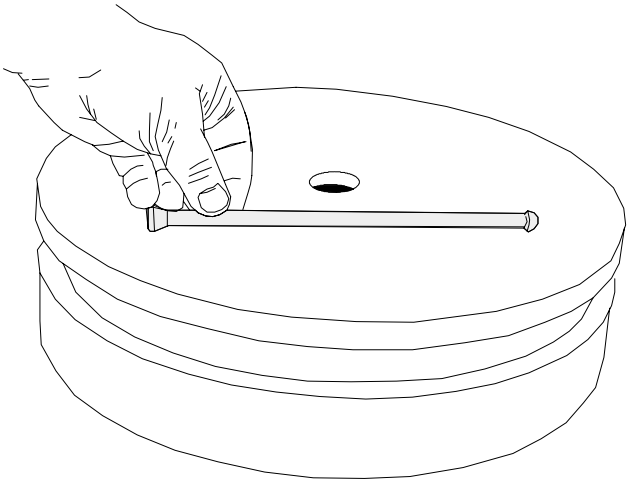
Note! On the six–cylinder engines the exhaust manifolds must always be fastened with new, thinner stud bolts and self–locking nuts (in the tractor production: F12761–). In the tractor production and in the spare parts the material of the exhaust manifolds (six–cylinder engines) has been changed into new type (6900, 8000–8200: **H01722–**. 8400, 8050–8750: **H01169–**).

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2. Valve mechanism

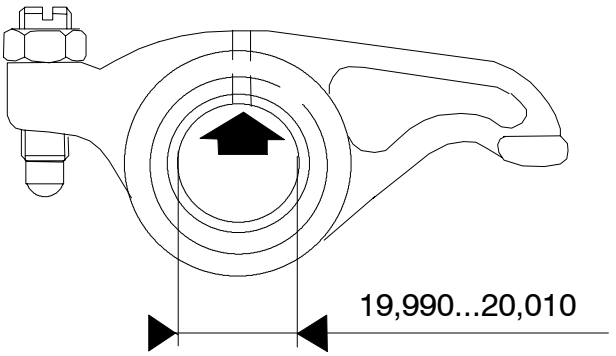
A. Reconditioning rocker arm mechanism

1. Check the valve tappets, especially the contact surface against the camshaft. Worn or damaged tappets should be discarded.

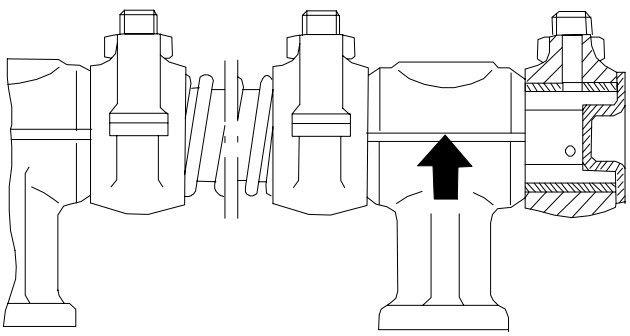


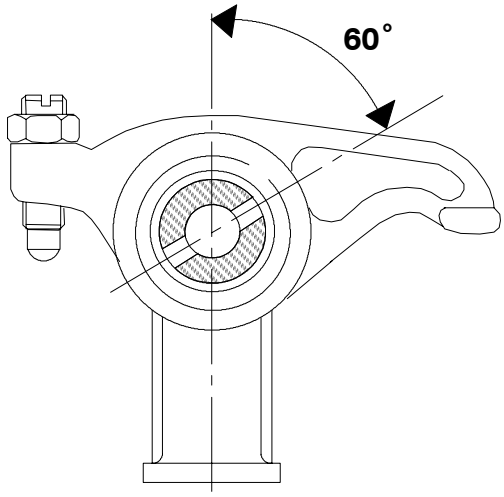
2. Check the straightness of the pushrods by rolling them on a surface table. Check also the spherical surfaces at the ends.

3. Dismantle and clean the rocker arm mechanism. Check the shaft for wear and that the oilways are clean.



4. Check that the rocker arm bushings are not worn. Ensure that the oil hole is positioned correctly when pressing in new bushings. After pressing in the bushings they should be reamed to **19,990–20,010 mm**. Where necessary grind the rocker arm valve contact surface to the correct shape. Do not grind more than necessary as the hardened layer is thin.





5. Fit the plug to the other end of the rocker arm shaft. Lubricate the shaft and fit various parts in a correct order. Note the correct position of the shaft and the bearing brackets. The split side of the bracket and the shaft oil holes must be turned to the valve side (see figure above). Fit the other end plug.

B. Changing camshaft/camshaft gear

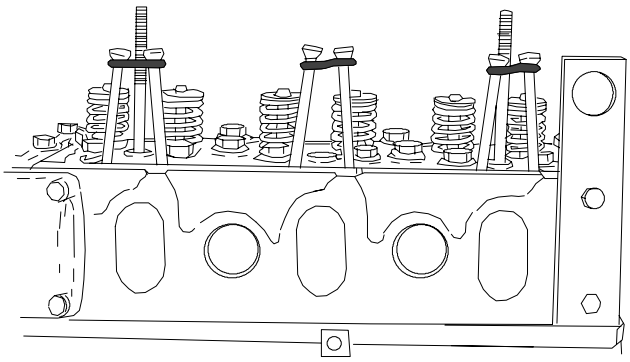
1. Remove the inlet pipe between the turbocharger and the induction manifold. Remove the valve cover and the breather pipe. Remove the rocker arm mechanism.

2. Remove the radiator, cooling fan, alternator and the v–belt.

3. Remove the crankshaft nut. Remove the V–belt pulley including the hub (on 620–engines the belt pulley must be removed first).

4. Remove the timing gear casing cover (engine front cover).

5. Connect the pushrods in pairs, using o–rings or elastic bands to prevent them from falling through.



Note! Do not connect the pushrods too tightly as this might cause them to bend or snap.

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6. Crank the engine until the aligning marks on the idler gear and camshaft gear are facing each other. Extract the camshaft.

7. Separate the camshaft from the gear wheel using a press or suitable drift.

8. Clean the parts which are to be refitted.

9. Fit the key in its groove. Heat the camshaft gear to 200˚C in an oven and fit it on the shaft.

10. Lubricate bearing surfaces and lobes and insert the shaft in the cylinder block. Ensure that the aligning marks on the gears agree.

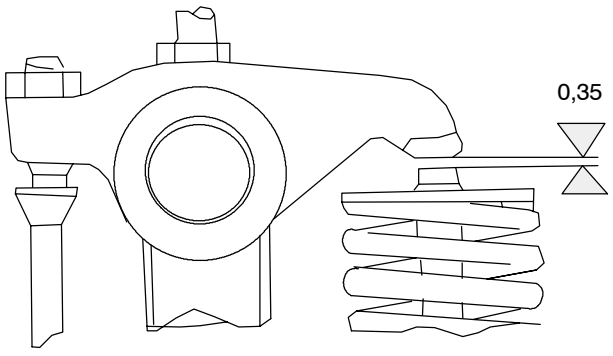
11. Fit the timing gear casing cover and the crankshaft V–belt pulley and hub.

12. Free the pushrods and fit the rocker arm mechanism. Adjust the valves. Fit the valve cover and the breather pipe and the inlet pipe between the turbocharger and the induction manifold.

13. Fit the alternator. Fit the fan and the fan belt. Fit the radiator.

C. Adjusting valves

Note! Valmet 6400 DW, 6800 DWI and 8450 DW tractors have a by–pass turbo. The adjusting rod of this turbo should be released before removing the valve cover. Detach the front end joint of the rod. Do not detach the rod rear end from the membrane box since then the by–pass passage opening pressure changes. Before adjustment, also remove the silencer, fan space protective frame (if fitted), radiator support iron in the upper part and the boost pipe (if fitted), after which the valve covers can be removed.



The valve clearance, which can be adjusted on a hot or cold engine, is **0,35 mm** for both inlet and exhaust valves. The clearance is adjusted when the respective piston is at T.D.C. in the compression stroke. The valves for the different cylinders are adjusted in the same sequence as the order of injection.

– slacken the lock nut of the adjusting screw
– measure clearance with a feeler gauge. The clearance is correct when a **0,35 mm** feeler gauge is slightly tight–fitted between the rocker arm and the valve stem end. Adjust clearance by rotating the adjusting screw.
– tighten the locking nut and check the clearance

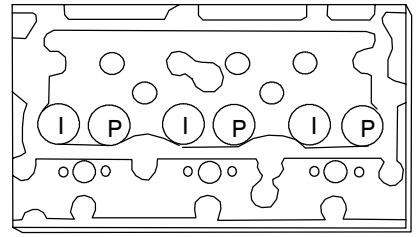
320–engines
Check the valve clearances in the injection order of the engine. Injection order is 1–2–3.
– check valves in the 1st cylinder, when the exhaust valve of no. 3 cylinder is completely open (valve no. 6)
– check valves in the 2nd cylinder, when the exhaust valve of no. 1 cylinder is completely open (valve no. 2).
– check valves in the 3rd cylinder, when the exhaust valve of no. 2 cylinder is completely open (valve no. 4).

420–engines
– rotate the crankshaft in the running direction until the valves in the 4th cylinder are rocking (exhaust closes, inlet opens). Check the valve clearance of the 1st cylinder
– Rotate the crankshaft by 1/2 of a turn in the running direction so that valves in the 3rd cylinder are rocking. Check valves in the 2nd cylinder
– continue according to the order of injection:

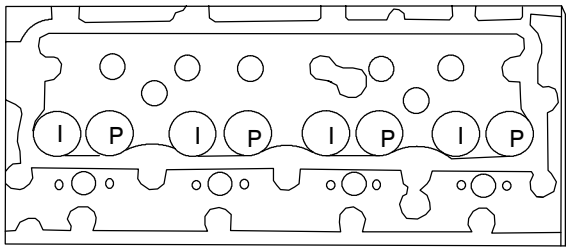
Injection order	1 2 4 3
Valves rock in cyl. no	4 3 1 2

620–engines
– rotate the crankshaft in the running direction until the valves in the 6th cylinder are rocking (exhaust closes, inlet opens). Check the valve clearance of the 1st cylinder
– rotate the crankshaft by 1/3 of a turn in the running direction so that valves in the 2nd cylinder are rocking. Check valves in the 5th cylinder
–continue according to the order of injection:

Injection order	1 5 3 6 2 4
Valves rock in cyl. no	6 2 4 1 5 3



320, 620, 634



420

I=inlet P=exhaust

Note! With effect from engine serial no. **C6828**, the support strips have been added onto the valve covers. These strips prevent the gasket from moving inwards. At the same time the cover manufacturing accurancy has been improved. Spare part numbers of the covers do not change.

Crank mechanism (Op. no 213)

1. Crankshaft

A. Removing crankshaft

1. Split the tractor at the clutch, remove the clutch assembly (and possible turbine clutch) and the flywheel. Remove the engine (see also page **219**/**1**).

2. Disconnect the balancing unit lubricating oil pipe from the cylinder block and unscrew the balancing unit fixing bolts. Remove the balancing unit and the lubricating oil pipe (only 420–engines).

3. Unscrew the lubricating oil pump pressure pipe fixing screws from the cylinder block. Remove the oil pump and the suction and pressure pipes.

4. Remove the flywheel housing.

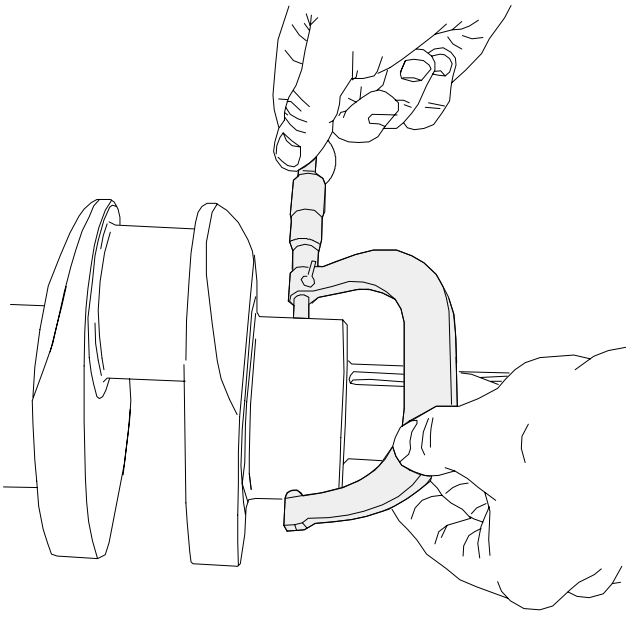
5. Detach the belt pulley/hub from the crankshaft front end (see instr. timing gears).

6. Remove the connecting rod bearing caps and push the connecting rods out of the way of the crankshaft.

7. Remove the main bearing caps and lift out the crankshaft.

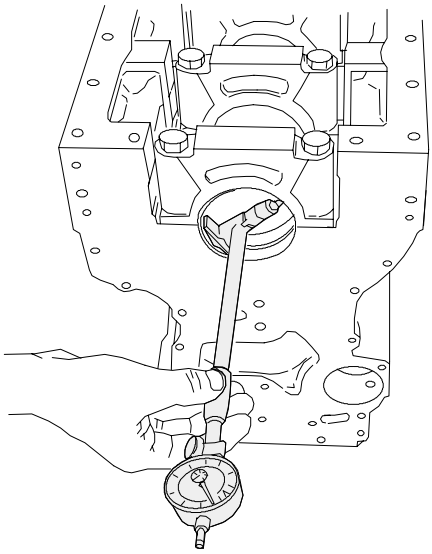
B. Checking crankshaft

1. Clean the crankshaft. Do not forget the oilways.



2. Measure the journal wear in several points. Out–of–round, taper or other wear must not exceed **0,03 mm**.

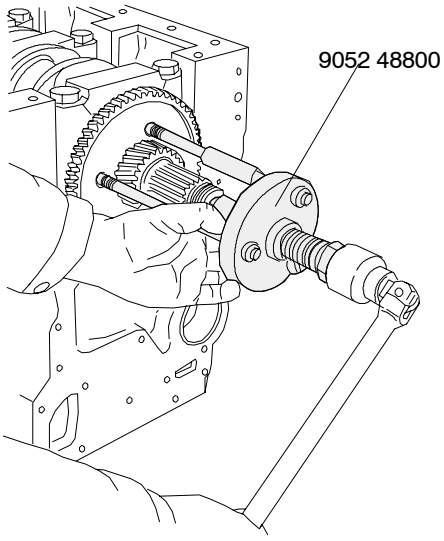
3. Refit the bearing caps with new bearing shells and tighten them to the correct torque. Measure the I.D. with a dial gauge which has been zeroed to the dimensions obtained in point 2. With this method the indicator shows the actual bearing clearance. Measure in several points in case the worn bearing housing is not round.



4. If the bearing clearance exceeds **0,18 mm** for main bearings or **0,14 mm** for connecting rod big–end bearings with new bearing shells, the bearing journals on the crankshaft should be ground. Refer to the specifications for the relevant correct undersize and the corresponding bearings. Ensure that the radii are not changed when grinding.

Note! Main bearings are available, which are 1,0 mm oversize (outer diameter) and 0,5 mm undersize (inner diameter). The cylinder block must then be machined to a dimension of 92,000–92,025 mm. The crankshaft must be machined to a dimension of 84,485–84,520 mm. The bearing shell with a hole and an oil groove must be fitted to the cylinder block and the other shell to the bearing cap.

C. Changing crankshaft gears



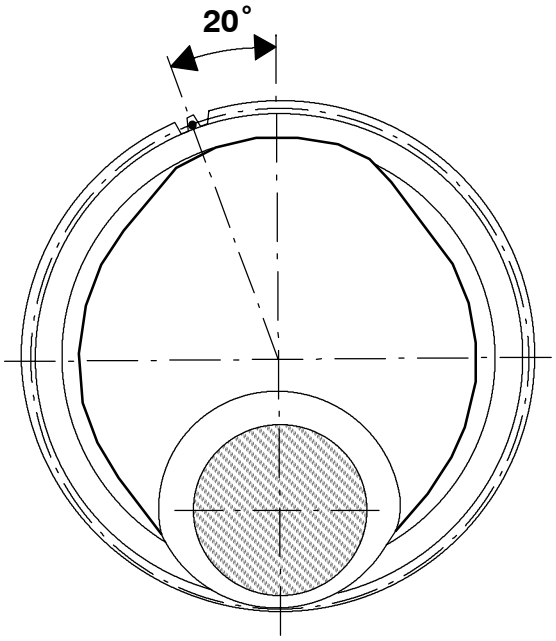
1. Apply puller for the crankshaft gears and pull off both gears.

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2. Clean the seat on the crankshaft with, for example, a wire brush.

3. Heat the new gears to **200° C**. Tap them onto the shaft with a suitable sleeve or soft drift. Note the position of the key and ensure that the aligning marks on the front gear are visible. Leave it to cool.

D. Changing camshaft ring gear (420–engines only)



1. Mark the position of the ring gear on the shaft.

2. Heat the ring gear with a welding torch and drive it off using a suitable drift.

3. Heat the new ring gear to max. **250°C**. Fit the ring gear with the chamfer facing the crankshaft flange, and with the teeth according to markings or according to figure above. Tap the ring gear down and leave it to cool.

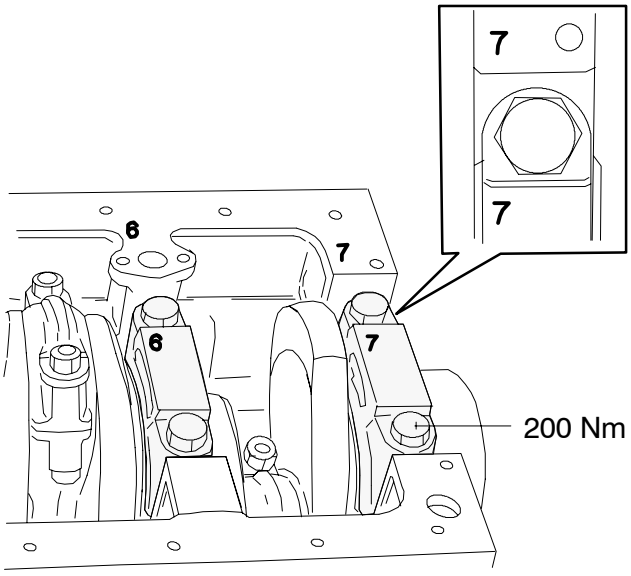
Note! The figure above shows a rear view of the crankshaft and no 2 cylinder big end bearing journal.

E. Fitting crankshaft

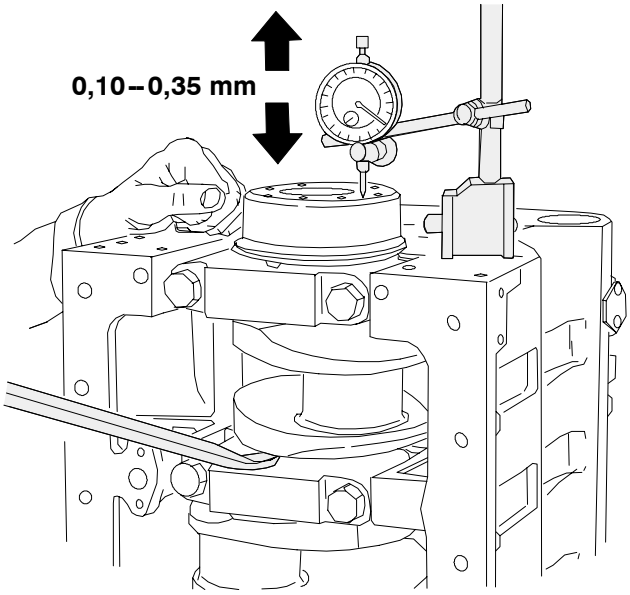
1. Clean the oilways, bearing shells and bearing locations. Check that the crankshaft is clean.

2. Fit the bearing shells into the cylinder block and the bearing caps. Ensure that the bearing shell clamping claws fit into their notches and that the shells to be fitted in the cylinder block have a hole coinciding with the oil port.

3. Lubricate the bearing surfaces and fit the crankshaft. Fit the crankshaft thrust bearings with the lubricating grooves facing the crankshaft.



4. Fit the main bearing caps according to their numbering, the rear with thrust bearings provided with guide lugs. Lubricate the bolts and tighten them to **200 Nm**.



5. Check that the crankshaft can rotate without binding. Check the end float using a dial gauge. The correct end float is **0,10–0,35 mm**. If the end float is too large, oversize thrust bearings should be fitted.

Note! Bearing shells should never be reamed or machined in any other way, nor should the sides of the bearing caps be filed

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2. Connecting rods and pistons

A. Removing pistons together with connecting rods

Note! Pistons and connecting rods can be removed from the engine when the engine is attached to the tractor by removing the front axle and the oil sump (see page **219**/**1**).

1. Detach the engine and the lubricating oil pressure and suction pipes.

2. Detach the cylinder head.

3. Scrape off the carbon edge in the cylinder liner. If the turning edge is clearly marked, smooth it down carefully with a scraper.

4. Remove the big–end bearing caps and bearing shells. Place the shells in order if they are to be re–used.

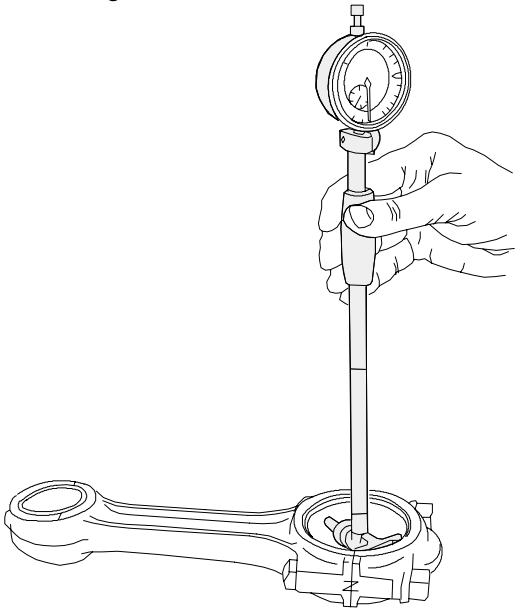
5. Push up the piston and connecting rod with the shaft of a hammer or similar wooden tool.

6. Remove the piston pin snap rings. Push out the pin.

Note! If the piston pin does not move under thumb pressure the piston should be heated to **100°C**.

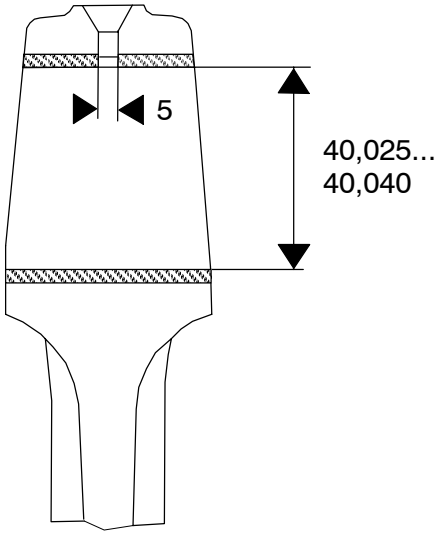
B. Changing connecting rod bearings

1. Clean the connecting rod and bearing shells. Fit them together and tighten the bolts to **40 Nm+90°**.



2. Measure the I.D. using a cylinder gauge which has been zeroed to the diameter of the respective bearing journal. If the clearance exceeds **0,14 mm** with new bearing shells, the big–end journals require grinding. Refer to the specifications for the correct undersize and the corresponding bearing. Ensure that the radii at the end of the bearing journals is not altered when grinding.

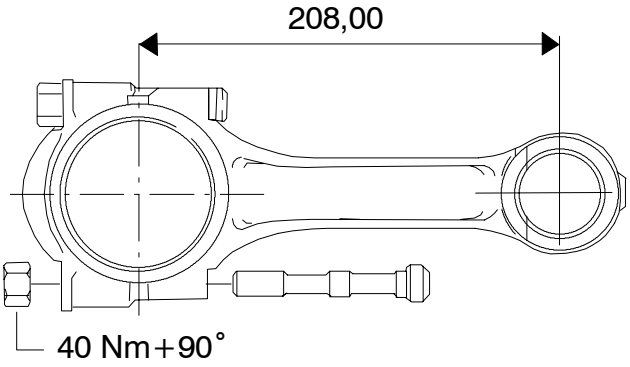
3. If the piston pin bushing is worn, it should be driven out using a suitable drift.



4. Drive in the new bushing and ensure that the oil hole is in the correct position. Ream the bushing to **40.025–40.040 mm** after it is fitted.

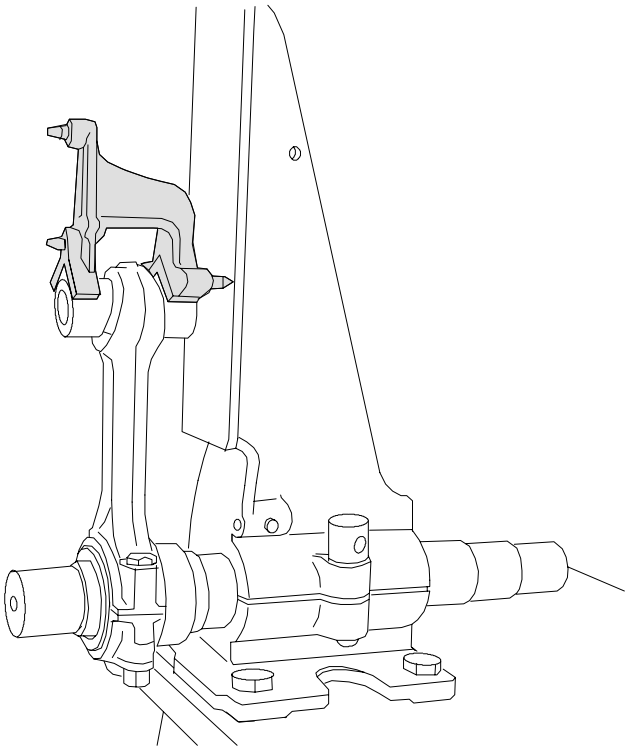
C. Checking connecting rod

The connecting rod is checked in a special fixture, intended for the purpose (e.g. Carl Larsson).

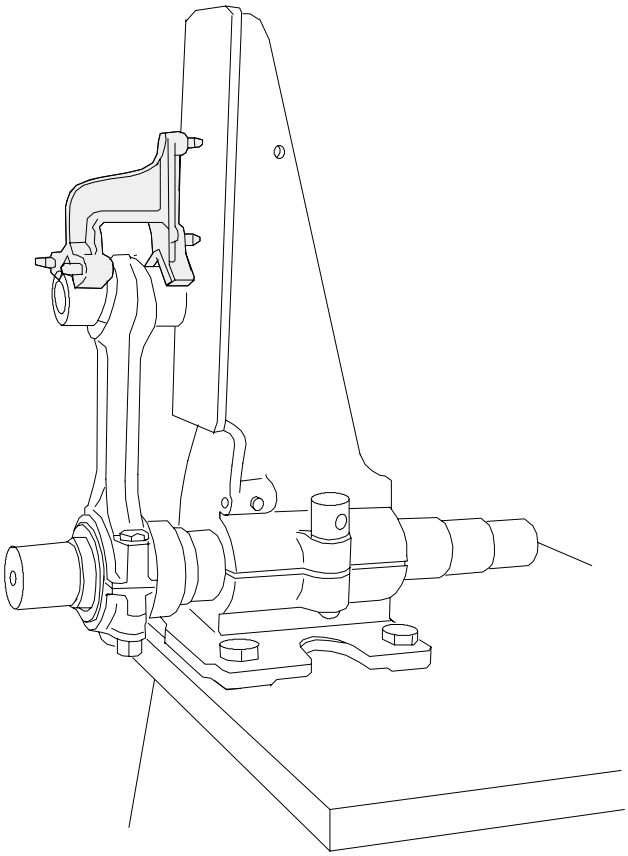


1. Fit the big–end bearing caps and tighten the bolts to **40 Nm+90°**.

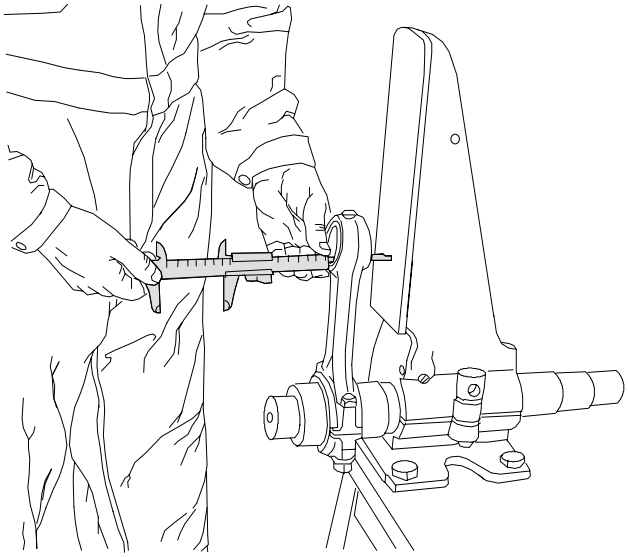
2. Fit the connecting rod in the fixture and fit the piston pin which corresponds to that connecting rod.



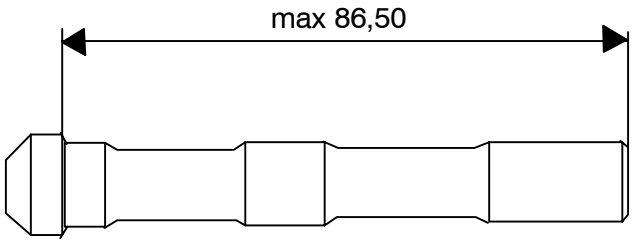
3. Check that the connecting rod is not twisted by positioning the measuring tool with the horizontally placed measuring points against the face of the fixture.



4. Turn the measuring tool round with the vertically placed measuring points against the face, and check the straightness of the connecting rod



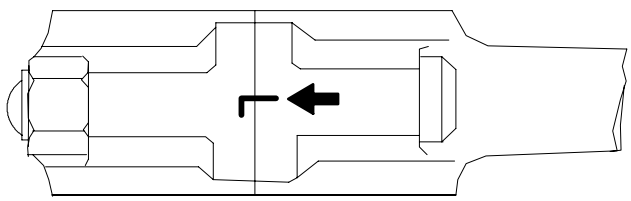
5. Also check the S – bending of the connecting rod by using sliding calipers to measure the distance between the edge of the small – end bearing bushing and the face of the fixture. turn the connecting rod round so that the other side of the connecting rod faces the fixture. Then measure the same distance. The accepted deviation is **0,6 mm**.



6. Measure the length of the connecting rod bolts. The length should be max 86,50 mm. If the bolt is longer, change it with a new one. It is recommended that the bolts are always changed when they are unscrewed.

D. Connecting rod weight classes

The connecting rods are divided into weight classes with intervals of **20 g**. The weight class (a letter) is stamped on the side face of the connecting rod. All the connecting rods in one engine should be of the same weight class, that is to say the greatest permissible weight difference is **20 g**.



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The letters show the weight classes as follows:

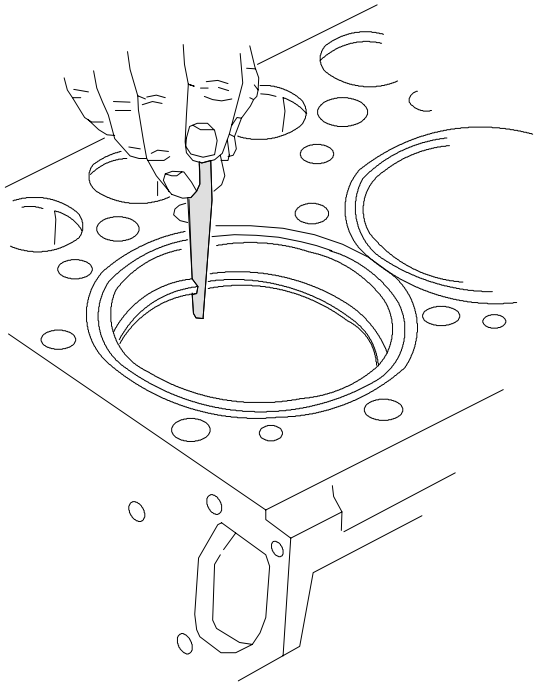
	Weight	Part no
A	2170–2189 g	8366 52104
B	2190–2209 g	8366 52105
C	2210–2229 g	8366 52106
D	2230–2249 g	8366 52107
E	2250–2269 g	8366 52108
H	2270–2289 g	8366 52109
I	2290–2309 g	8366 52110
J	2310–2329 g	8366 52111
K	2330–2349 g	8366 52112
L	2350–2369 g	8366 52113
M	2370–2389 g	8366 52114
N	2390–2409 g	8366 52115
O	2410–2429 g	8366 52116
P	2430–2449 g	8366 52117
R	2450–2469 g	8366 52118
S	2470–2489 g	8366 52119
T	2490–2509 g	8366 52120
U	2510–2529 g	8366 52121

E. Changing piston rings

1. Remove the piston rings with piston ring pliers. Do not open the rings more than necessary. If the rings are to be used again ensure that they are fitted in the same groove.

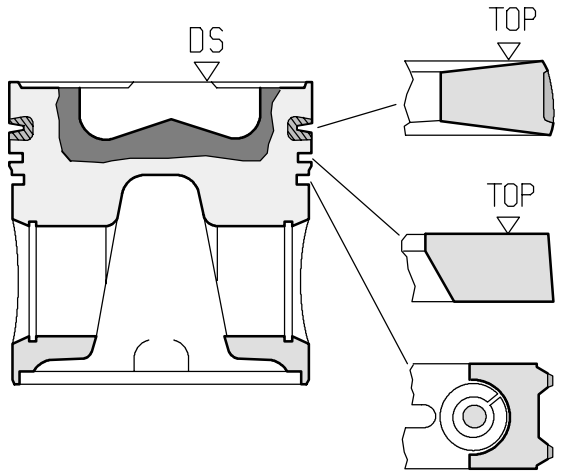


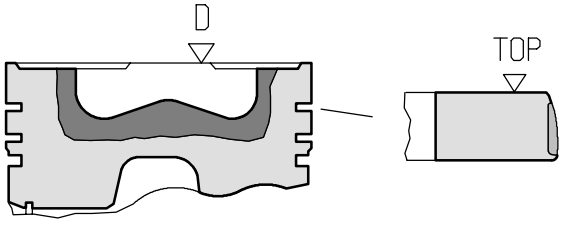
2. Clean the piston ring groove and measure the piston ring clearance, which must not exceed **0,15 mm**. Determine whether too large a clearance is due to worn rings or a worn groove. Change worn parts.



3. Measure the piston ring gap by pushing one piston ring at a time into the cylinder bore. The piston ring gap must not exceed **1 mm** on 1. and 3. piston rings and **1,5 mm** on 2. piston ring.

4. Fit the piston rings on the piston using the piston ring pliers. Ensure that the rings are fitted in the correct groove and that "TOP", or the manufacturer's designation, faces upwards.

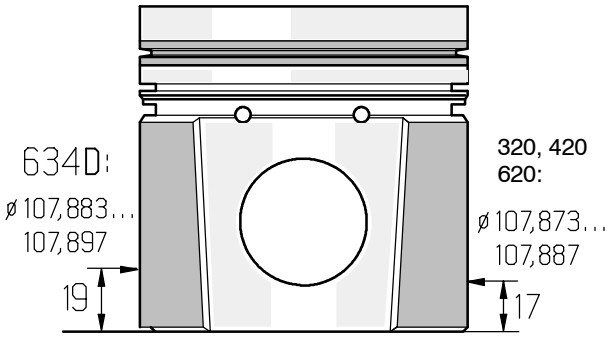




Note! The uppermost ring is square on tractors 6000, 6200, 6300, 8000R, 8000, 8100, 8050 and 8150. The uppermost ring is wedge–shaped on tractors 6100, 6400, 6600, 6800, 8200, 8400, 8450, 8550, 8750.

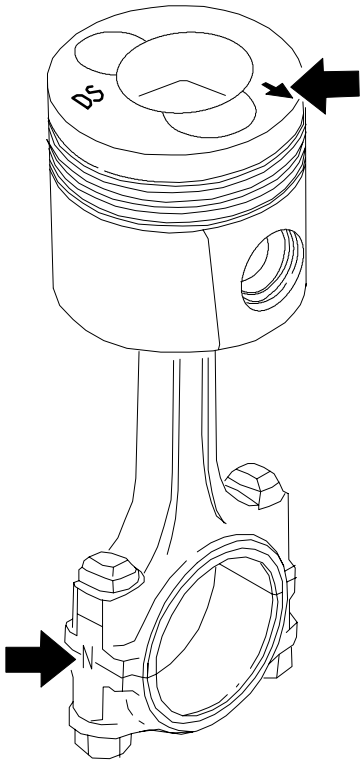
F. Checking pistons

Check the condition of the pistons and piston pins. Pay special attention to possible cracks on the edge of the combustion chamber and on the upper edge of the piston pin hole. Measure the diameter of the piston at the point shown in the figure below. Renew a piston if needed.



G. Fitting piston pin

1. Place the connecting rod inside the piston and push the piston pin into place.



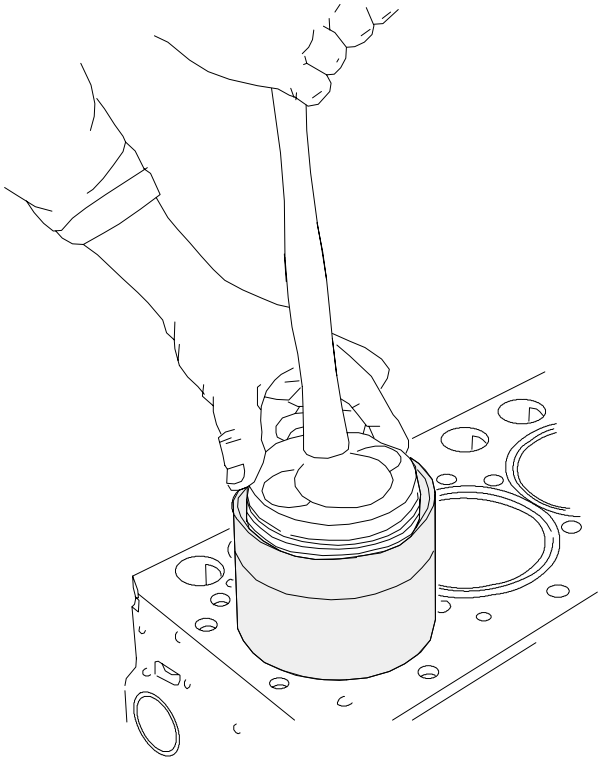
Note! The combustion chamber and the weight class letter should be on opposite sides!

2. Fit the piston pin circlips. Ensure the the circlips are pressed correctly into the grooves. The circlip ends must point upwards.

H. Fitting piston together with connecting rod.

1. Check that the bearing locations are clean and place the bearing shells in the connecting rod and bearing cap. Note the position of the bearing shells.

2. Lubricate piston, rings and cylinder bore. Ensure that the piston ring gaps are spread around the piston.



3. Fit the piston with the marking on the connecting rod (weight class) facing the camshaft (an arrow on the piston must point forward).

4. Lubricate the big–end bearing journal and bearing shells, and push the piston down. Fit the bearing cap so that the notches for the guide lugs are in the same side. Tighten the connecting rod bolts to **40 Nm+90°**.

5. Check that the connecting rod has sufficient end float on the big–end bearing journal.

3. Balancer unit, 420–engines

A. Removing and dismantling balancer unit

1. Remove the engine (**Note!** The balancer unit can also be detached when the engine is attached to the tractor. In this case, remove the front axle and the oil sump, see also page **219/1**).

2. Disconnect the lubricating oil pipe of the balancer unit.

3. Remove the balancer unit. Take care of any shims.

4. Loosen the locking screws and press out the shafts in the direction of the locking screws. Remove the counterweights and thrust washers.

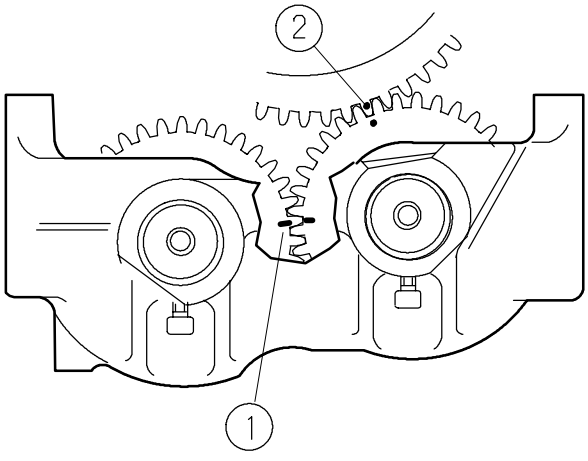
5. Clean all parts.

B. Reconditioning balancer unit

Check the shafts, gear wheels and bushings for wear and damage.

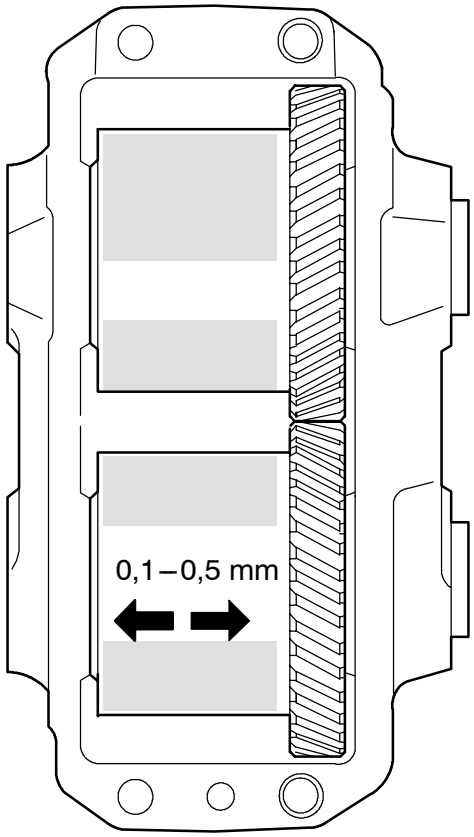
1. If one of the gear wheels is damaged, change both counter weights as a complete unit. The gear wheels are not available separately as a spare part.

2. Remove, if necessary, the old bearing bushings with a suitable drift. Before removing them, mark the position of the bushing oil groove on the counter weigh. Press in new bushings in the correct position. After fitting the bushings should be reamed to a correct dimension, see Specifications.



1. Synchronization marking (notch)
2. Marking against crankshaft (punch mark)

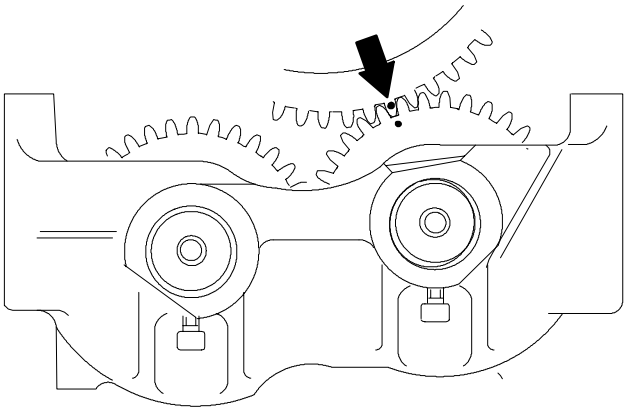
4. Place the weights in the body, observing the notch markings. The gear wheel with the punch mark runs against the crankshaft and should therefore be placed highest. Insert the shafts, remembering the thrust bearings. Apply thread lock fluid Loctite 270 to the locking screws, and lock the shafts.



4. Check that the tooth backlash is **0,05–0,25 mm** and that the end float is **0,1–0,5 mm**

C. Fitting balancer unit

1. Fit the tension pins in the balancer unit body.



2. Turn the crankshaft and weights so that the markings agree, and lift the unit into place.

3. Tighten the bolts to **60 Nm**. Check that the tooth backlash between the crankshaft and counterweight is **0,1 – 0,3 mm**. The backlash can be increased by placing shims 0,2 mm thick (order no 8361 19920) between the cylinder block and balancer unit body. One shims (0,2 mm) changes tooth backlash about 0,07 mm.

4. Fit the lubricating oil pipe, using new seals.

5. Fit the engine.

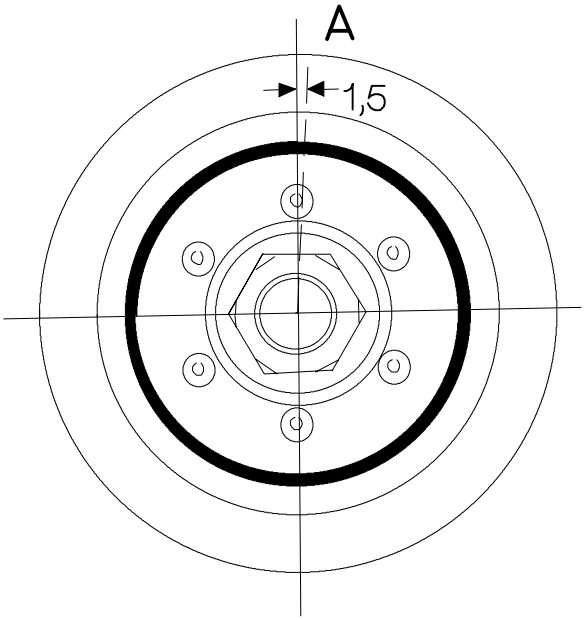
4. Rubber vibrations damper on 8000R, 8000, 8100, 8400 and 8050–8150

The outer circumference of the vibration damper (belt pulley) no 8368 46440 can twist in relation to the hub. For this reason alignment marks have been added to the damper front face, which indicate the possible twisting.

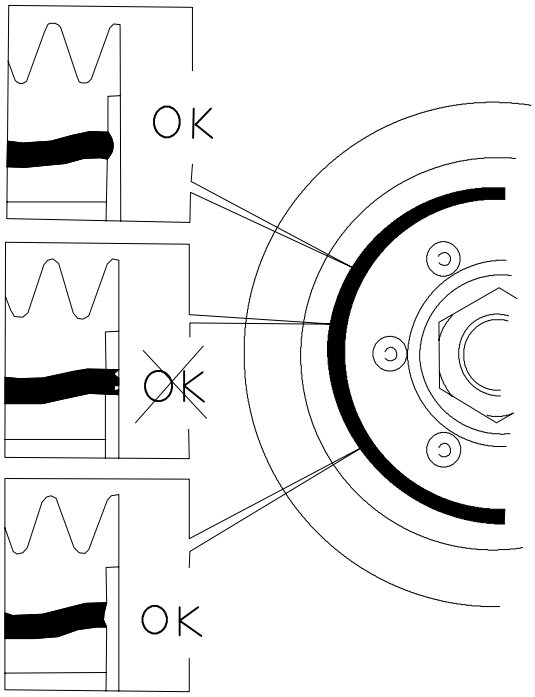
If the twisting has occured and the difference of the alignment marks is more than 1,5 mm, the vibration damper should be changed.

Note! On engines, that do not have the alignment marks, the condition of the vibration damper is checked according to instruction A. The damper should be changed at intervals of 4000 running hours.

A. Checking element of the rubber damper



1. Check the alignment marks (A) on both sides of the rubber element. If the difference is more than 1,5 mm, change the damper for a new one.



2. Check also the condition of the rubber element:

– If rubber pieces have been loosened from the element or
– if rubber has been pressed to the depth of more than 3,5 mm or
– if the outer circumference is slack or it moves in the direction of the shaft, change the damper

Note! On 8200 tractor there is a viscous vibration damper, which does not require maintenance. However, check that the damper does not have flaws caused by external shocks. Tractors 8450, 8550 and 8750 have also the viscous damper.

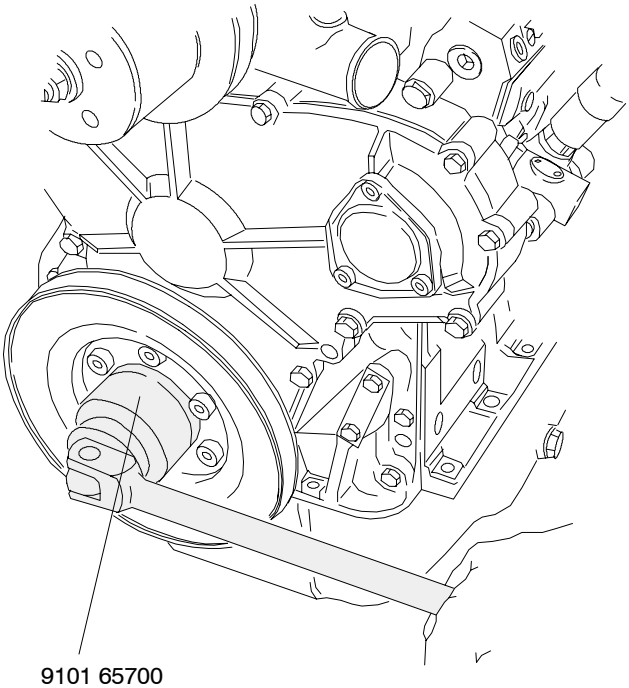
Timing gears (Op no 214)

A. Removing timing gear casing

As the timing gear casing forms a seal against the oil sump, the casing cannot be removed without first removing the front axle and the oil sump (see page **219**/**1** for working order).

1. Detach the engine (or the oil sump).

2. Remove the cooling radiator, alternator and the fan belt (if not removed earlier).



9101 65700

3. Loosen the crankshaft nut (special tool 9101 65700 for 320, 420, 620 engines and tool 9024 55800 for 634 engines) and remove the belt pulley/hub.

Note! Warm the nut with a hot–air blower before unscrewing (locking fluid. Do not damage the seal). The thread is normal RH thread. Support the key so that it cannot slip (600 Nm/1000 Nm). Rotation of the crank shaft can be prevented by fastening a support on the hub (remove the belt pulley and fasten the support to the hub) or you can use an air powered nut opener, and the crankshaft does not rotate. When needed, the hub is removed with an extractor.

Note! On 620–engines the belt pulley must be removed before unscrewing the nut.

4. Remove the timing gear casing cover and the oil deflector ring at the front end of the crankshaft.

5. Remove the injection pump.

Note! If the timing gear casing is not to be changed, the injection pump can remain in place. In which case disconnect all leads and pipes from the pump.

6. Unscrew the idler gear bolts (17 and 22 mm). Remove the flange, gear wheel and bearing journal.

7. Extract the camshaft.

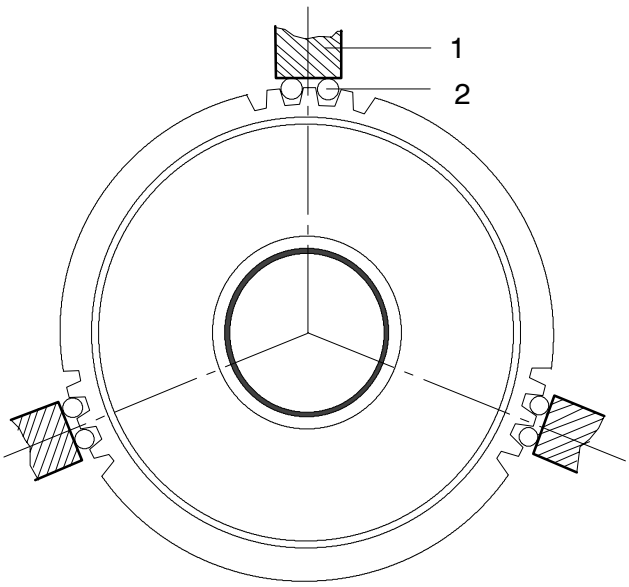
Note! If the cylinder head and valve mechanism have not been removed, the tappets must be prevented from falling down, see **Op. 212 2B**.

8. Remove the timing gear casing (13 mm). Ensure that all sealing surfaces are not damaged.

9. Remove the crankshaft front sealing ring from the front casing and clean all the parts that have been removed.

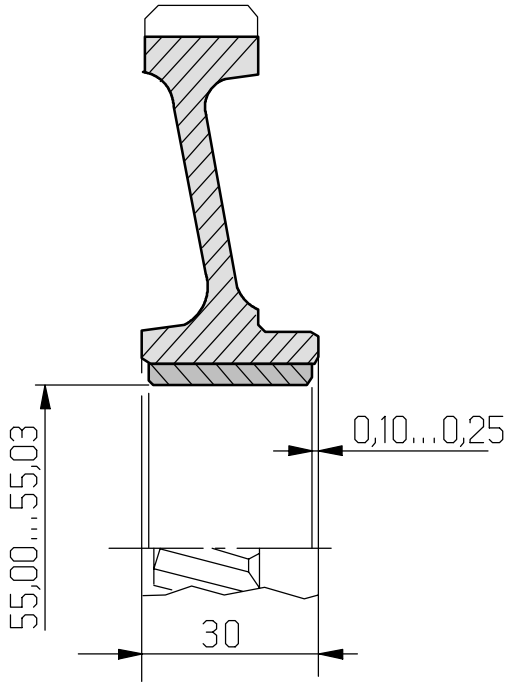
B. Reconditioning idler gear

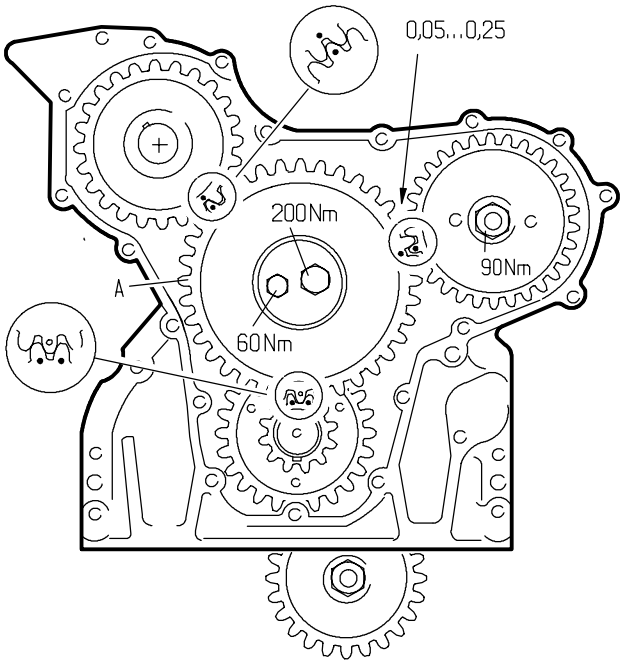
If the idler gear bushing is changed, press in a new bushing so that its rear edge is **0,1–0,25 mm** inside the gear wheel rear edge (see picture on next page).



1. Chuck of lathe
2. Roller ø=5 mm

Machine the idler gear bushing inner diameter to a correct dimension after fitting. Centre the idler gear according to figure above so that tooth backlash is kept the same.





C. Fitting timing gear casing

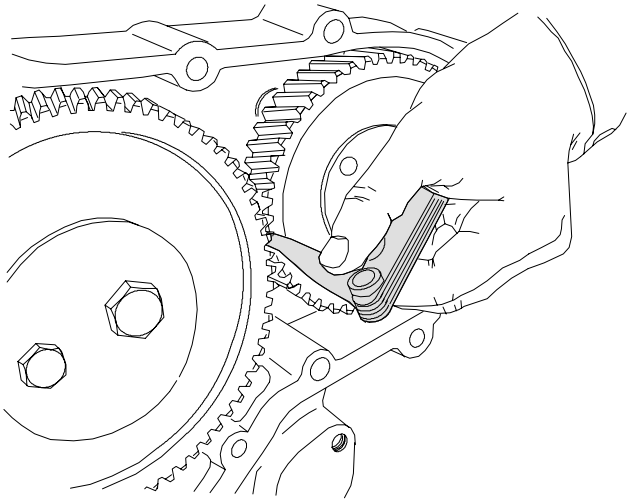
The position of the timing gear casing and cover is determined by two tension pins. Therefore centring should not be undertaken in connection with fitting. However, the tooth backlash between the different gears should be checked. Casing and covers that are delivered as spare parts also have holes for the tension pins already machined.

1. Fit the casing with a new gasket against the cylinder block. Drive in the tension pins with drift 9025 98700. Tighten bolts and nuts.

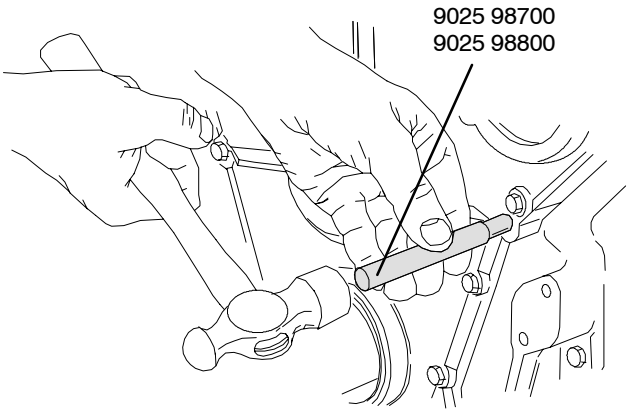
2. Fit the injection pump together with gear wheel (if removed).

3. Lubricate the camshaft bearings and insert the shaft in the cylinder block. Release the pushrods and tappets if they have been suspended.

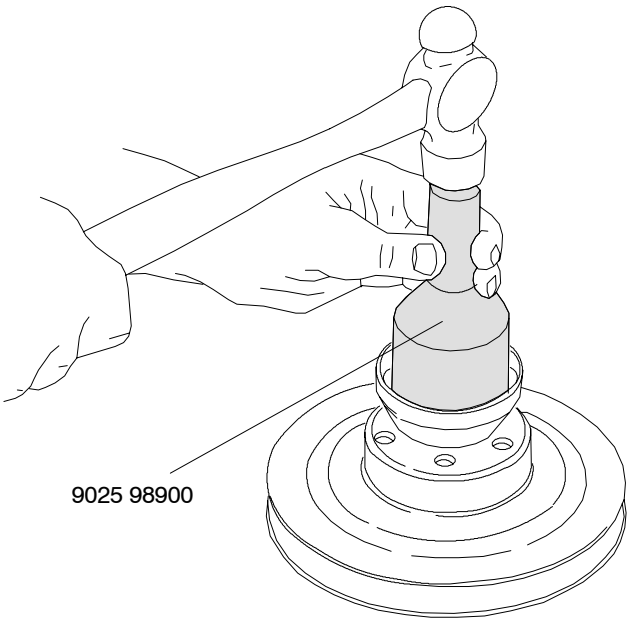
4. Fit the idler gear with shaft stud and ensure that the markings are in the correct position. Fit the washer and tighten the bolts to the correct torque.



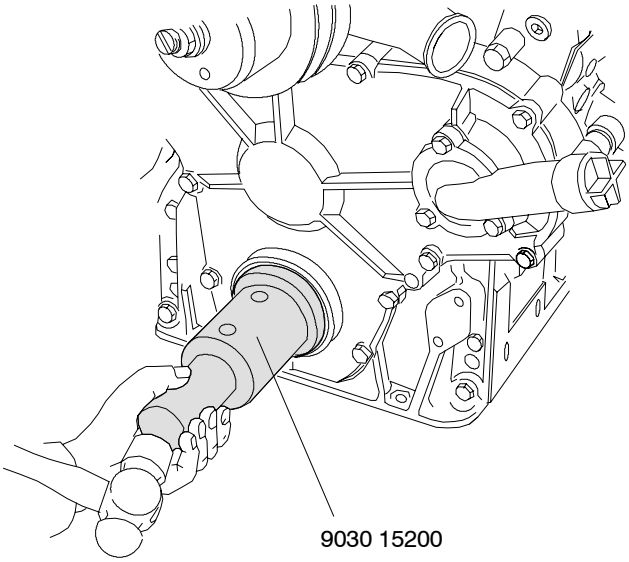
5. Check the tooth backlash which should be **0,05 – 0,25 mm**.



6. Fit the oil deflector ring on the crankshaft and fit the timing gear casing cover using a new gasket. Drive in the tension pins with drifts 9025 98700 and 9025 98800 respectively (the tubular pin round the screw stud). Tighten bolts and nuts.

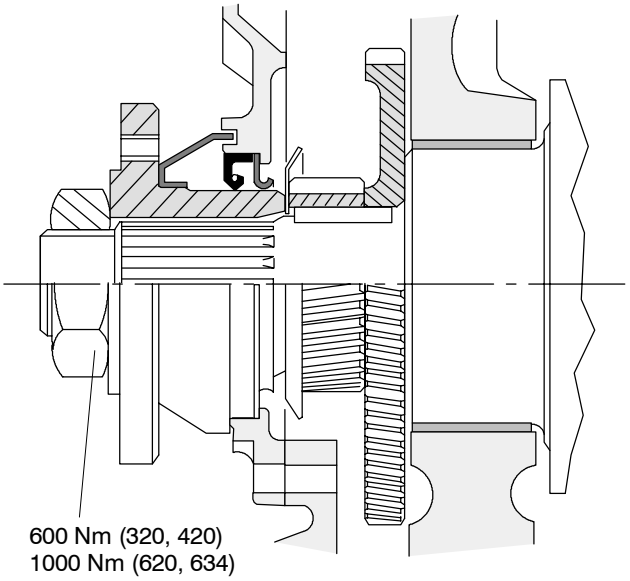


8. Fit the dust shield on the crankshaft V – belt pulley hub, if it has been removed. Use drift 9025 98900.



7. Fit the protective plate into the seal location and fit the crankshaft front seal with special tool 9030 15200.

Note! The crankshaft front oil seal can be changed while the engine is attached to the tractor. In this case, remove the cooling radiator and belt pulley/hub at the front end of the crankshaft.



9. Lubricate both the seal and sealing surfaces and fit the crankshaft V – belt pulley with hub.

10. Lubricate the crankshaft nut threads. Tighten the nut to **600 Nm** on 320 – and 420 – engines and **1000 Nm** on 620 and 634 engines.

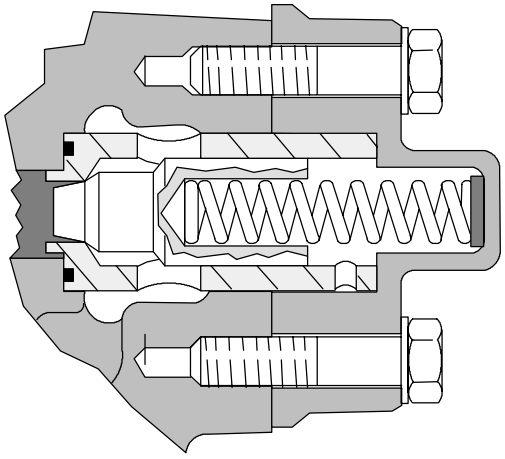
11. Fit the other detached parts.

Lubricating system (Op no 215)

A. Reconditioning of oil relief valve for lubricating oil pressure

Note! The latest relief valve, see page **215/4**.

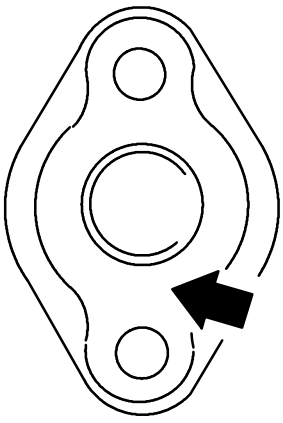
If the engine lubricating oil pressure is insufficient or if it varies, the relief valve should be checked after first checking the oil level.



1. Remove the cover over the valve (13 mm) and spring. Take care of the washer between the cover and spring. Remove the valve insert together with the valve cone and ensure that the o–ring is also removed.

2. Clean the parts and check that the valve cone slides freely in the insert and that the sealing surface are undamaged. Minor damage can be adjusted, but in general, damaged parts should be changed. Scrape off any remains of the gasket.

3. Assemble the valve with a new o–ring and insert it in the cylinder block. Place the washer and spring in the cover and fit it with a new gasket.



4. Note that the relief valve cover is not symmetrical. The greater distance between the spring housing and bolt should be turned downwards.

NOTE! The relief valve spring is shorter on tractors, which have the cooling nozzles for the pistons (8400, 8450, 8550, 8750). The valve cone has been changed for a new one in the tractor production.

B. Removing and dismantling lubricating oil pump

Note! Concerning the latest type oil pump in 6–cyl. engines from engine no. **J7034** incl., see page **215/5**.

1. Remove the engine (or detach the oil sump, see page **219/1**).

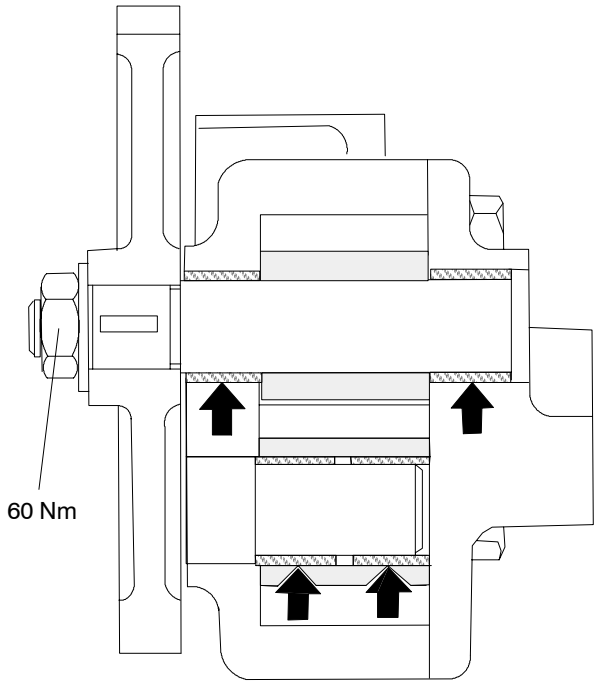
2. Remove the oil pump suction and pressure pipe.

3. Remove the oil pump together with any shims between the pump and the cylinder block.

4. Remove the pump cover and the gasket. Remove the gear on the dead axle.

5. Clamp the pump gear across the teeth in a vice fitted with soft jaws, and loosen the drive gear nut. Knock the gear wheel off by hitting the end of the shaft with a soft hammer. Pull out the drive shaft–gear wheel

6. Clean the parts and check for wear and other damage. Compare with the specifications. Change damaged parts and all seals.



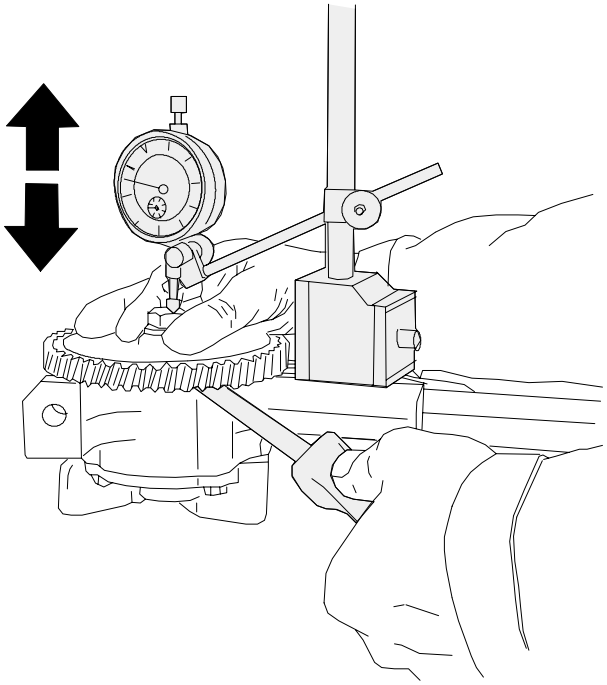
7. On 620–engines the bearing points are provided with separate bearing bushings. If You change the bushings, machine them to dimension of **18,000–18,018** after fitting.

Note! With effect from engine ser. no. C1474 (320), C1328 (420) and C1133 (620) the engine lubricating oil pump has been changed.
The fitting between gear and shaft has been changed from cylindrical type with key to a taper without key.
As a spare part the complete new pump is exchangeable with the earlier pump. The new drive gear and the shaft can be fitted in pairs on the earlier pump.

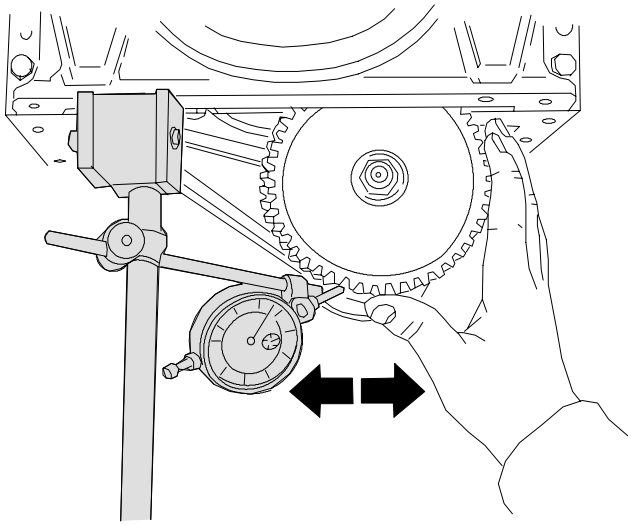
C. Assembling and fitting lubricating oil pump

1. Fit the gear wheels in the pump body. Fit the cover using a new gasket. Partly tighten the bolts. Rotate the pump shaft and tap the side of the cover lightly until the position is reached where the shaft rotates most freely. Tighten the bolts and check that the shaft still rotates freely.

2. Fit the key and drive gear onto the shaft (tapered joint without key on the later pumps). Apply Loctite 242 onto the nut threads and tighten the nut to **60 Nm**. Remember the washer under the nut.



3. Fasten the oil pump in a vice and check the end float between gear and pump housing. The clearance which should be **0,03–0,11 mm**, is adjusted by the number of gaskets between the cover and body.



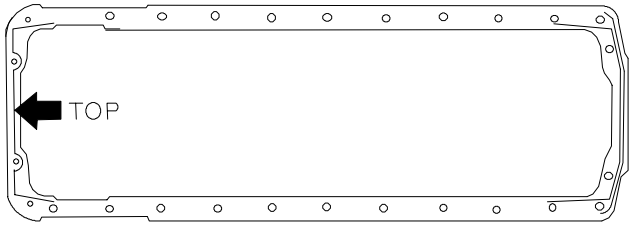
4. Fit the pump and check the tooth backlash against the crankshaft gear. The clearance, which should be **0,05–0,25 mm**, is adjusted with shims between the pump body and the cylinder block (shims 0,2 mm, order no 8360 07871). One shims increases/decreases the backlash about 0,07 mm.

Note! When measuring the tooth backlash, the engine should be the correct way up as the crankshaft bearing clearance affects the tooth backlash.

5. Connect suction and pressure pipes together with new seals.

6. Fit the engine (or the oil sump).

D. Fitting oil sump gasket

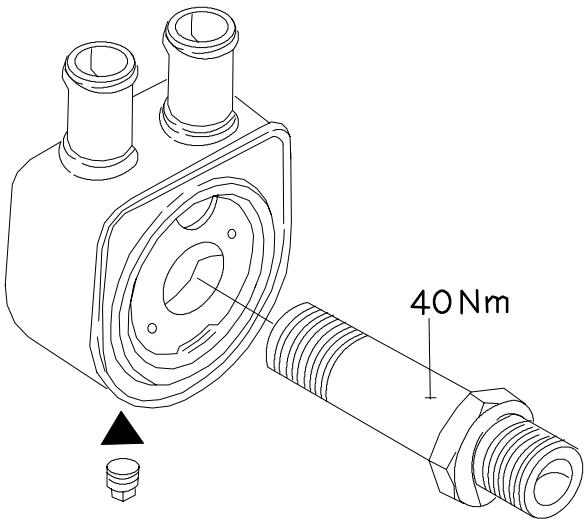


Fit the oil sump gasket with silicone stripes against the cylinder block.

E. Lubricating oil cooler on 6800, 6850, 8400 and 8350–8950

The lubricating oil cooler is placed in the oil filter housing.

1. The engine coolant should be drained before removing the lubricating oil cooler.



2. Fit new sealing rings. Fit the cooler with draining plug turned downwards. Connect coolant pipes in the correct way.

3. Apply locking fluid to the nipple (the thread which attaches to the filter head) and tighten it to a torque of **40 Nm**.

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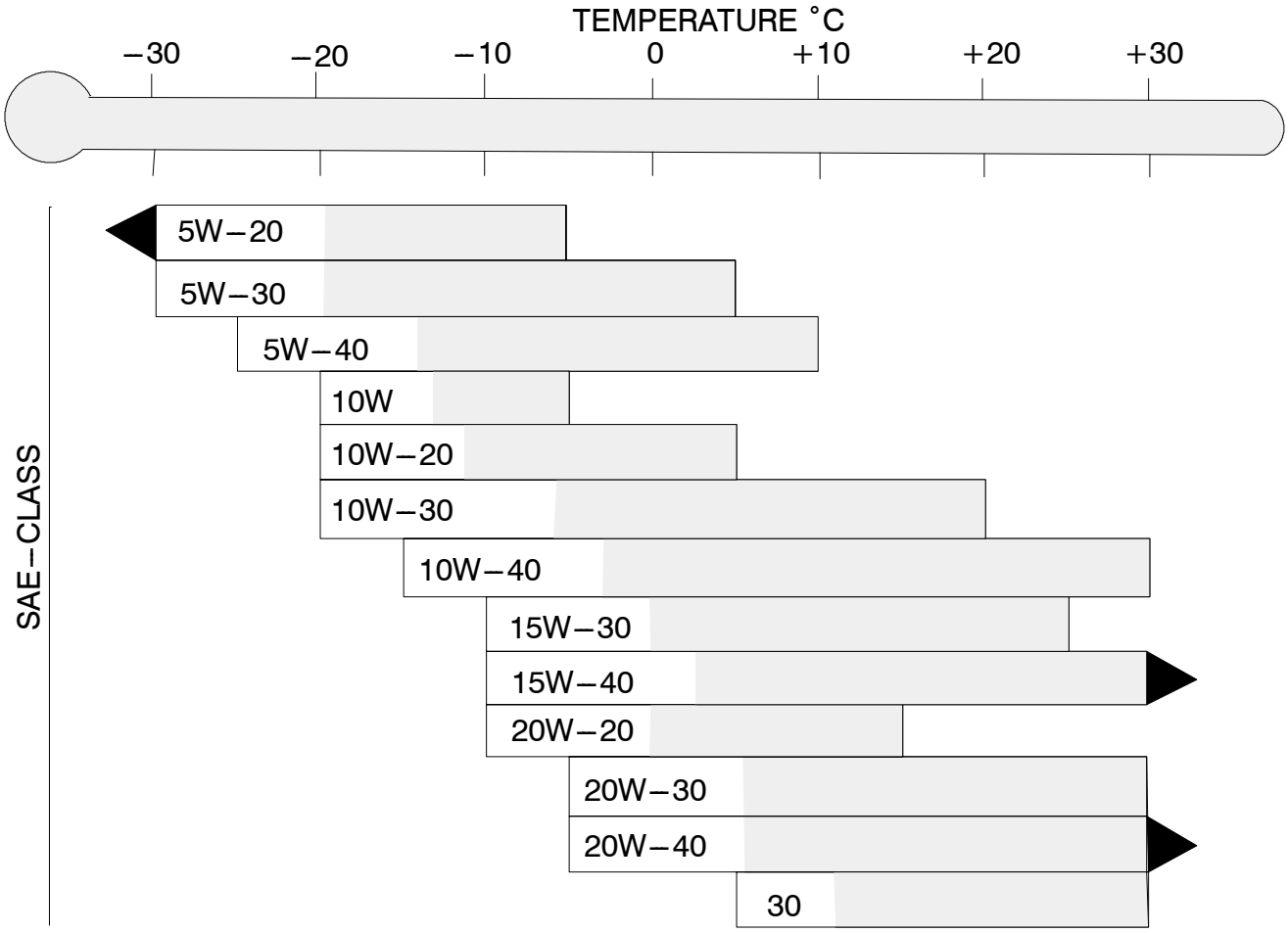
E. Lubricating oil quality requirements

1. QUALITY (API–CLASS)

– naturally aspirated engines	CCMC D2	API CC [1]) ACEA **E2–96**
– turbocharged engines	CCMC D4/D5	API CD ACEA **E2–96**/**E3–96**

[1]) API–CD can also be used in conventionally aspirated engines.

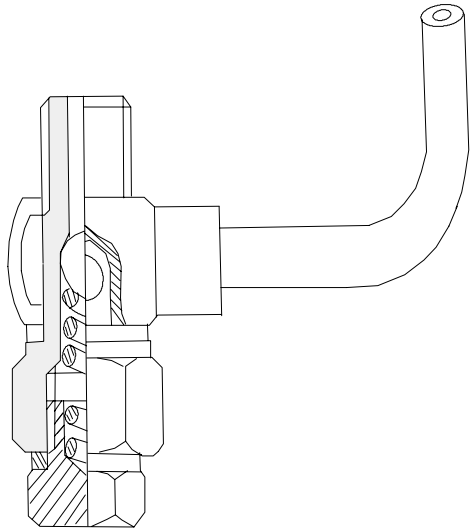
NOTE! “Valtra Engine” oil 10W30 or 15W40 is recommended for engines (see page **130**/**4**).



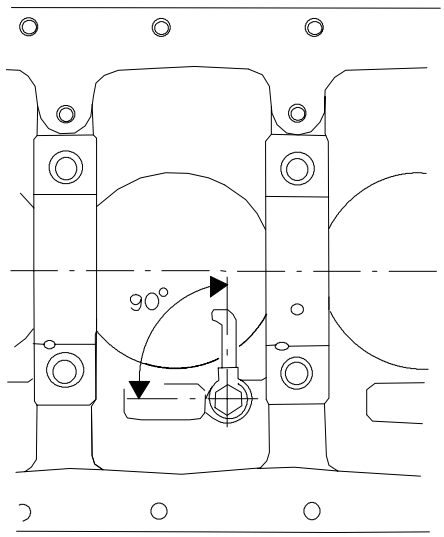
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F. Cooling nozzles for pistons, 8400, 8450, 8550, 8750 and 8950

The cooling nozzles can be removed after removing the oil sump. The nozzles have a ball valve with an opening pressure of **3±0,25 bar.**



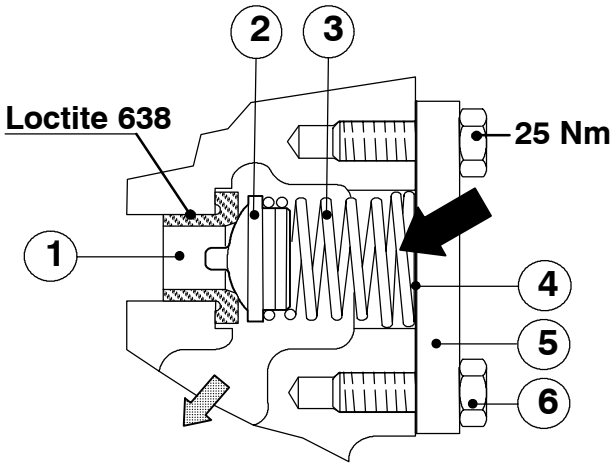
1. Change the valve if necessary. Detach the valve from the engine and remove the nozzle pipe. Fit a new valve.



2. Fit the nozzle pipe at the angle of 90˚to the centre line of the crankshaft according to the above picture. Tighten the valve to **30 Nm**. Ensure that the pipe does not touch the pistons or connecting rods when the engine is running.

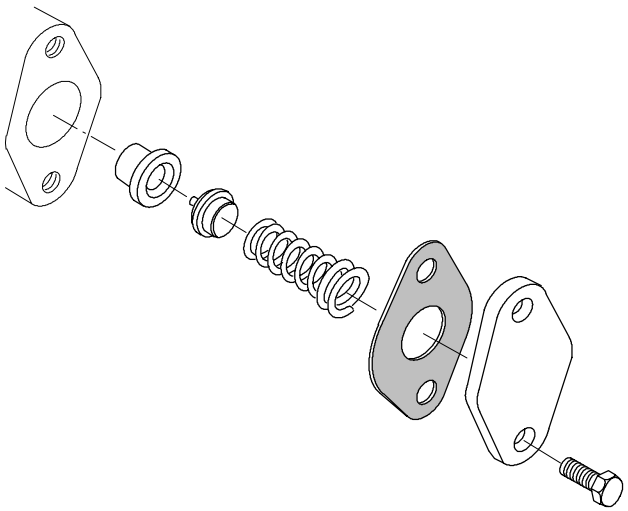
G. Latest lubricating oil pressure relief valve

J7595– (6000–8150), without piston cooling nozzles.
J14016– (8400–8950), with piston cooling nozzles



1. Valve seat insert
2. Valve head
3. Spring (engines without the piston cooling nozzles, dark colour, if cooling nozzles, colour shiny)
Note! The spring expanded end towards the valve head. In autumn 99, the spring end shape will be changed to prevent wrong mounting of the valve.
4. Gasket
5. Cover
6. Bolt, 2 pcs

Note! As a spare part the earlier complete valve can be replaced with the new valve fitting kit.



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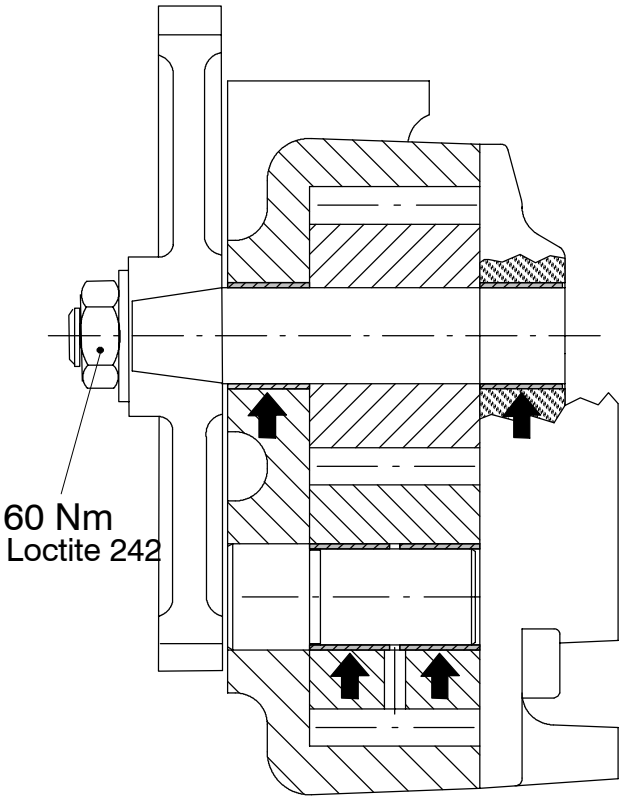
F. Lubricating oil pump from engine no. J7034 incl. in 6–cyl. engines

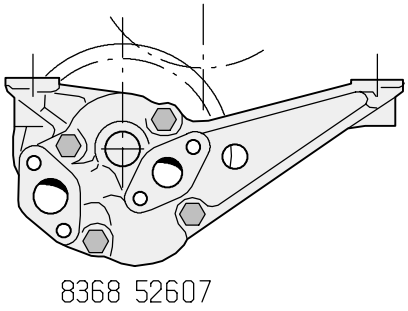
From engine no. **J7034** incl. the lubricating oil pump in 620– and 634– engines has been replaced with 645–engine's pump. Simultaneously pressure and suction pipes have been changed.

The pump of 645–engines can be fitted on earlier manufactured 620– and 634–engines, when the new suction and pressure pipes with seals are fitted. The original pump is also delivered for the earlier manufactured engines.

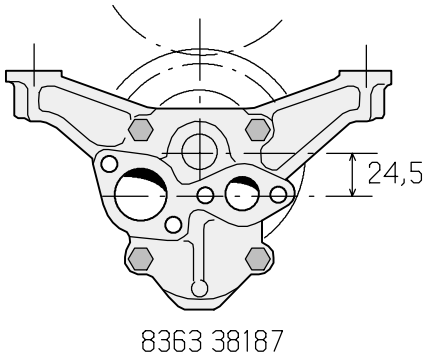
The pump of 645–engine has the same adjusting and machining values as the pump of 620–engine:
– gearwheel end float, **0,03–0,11 mm**
– tooth backlash, **0,05–0,25**
– the bearing bushings are machined after fitting to **18,000–18,018**

Note! Repair instructions for the pump of engines 620 and 634 are the same as 645–pump, see instr. **B** and **C**. Pump fixing bolt tightening torque is **60 Nm**.

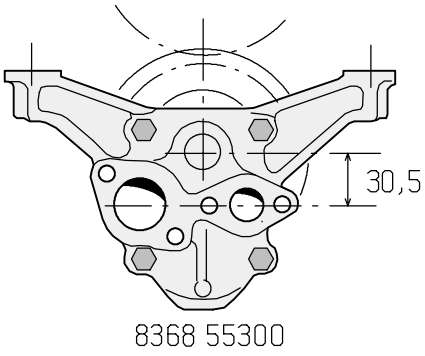




Earlier pump in 620–engines:
6900, 8000, 8050–8200
8450 (normal wheel base)
8050Hi–8350Hi



Earlier pump in 634–engines:
8450 (long wheel base)
8450Hi (long wheel base)
8550, 8750, 8550Hi



Present pump in 6–cyl. engines from J7034 incl.

Inlet and exhaust system, turbocharger (Op no 216)

An engine that is equipped with a turbocharger is a great deal more sensitive to disturbances and impurities in the inlet and exhaust systems than a conventionally aspirated engine. Therefore special attention should be given to the whole inlet and exhaust system.

A. Checking air cleaner

The engine performance and length of service life depend to a great extent on the state of the air cleaner. A defective air cleaner allows impurities to pass through, which in time damage the turbocharger and the engine. A blocked air cleaner lowers the engine output and also causes oil leakage through the sealing ring on the turbocharger shaft.

Note! The safety filter inside the main filter should not be removed unnecessarily, for checking or cleaning. The safety filter must not be cleaned, but should be changed once a year or when necessary (see Operator's Manual)

B. Checking inlet and exhaust system

Important! Leaks in the inlet or exhaust system markedly lower the effect of the turbocharger. Because of the pressure, even small leaks in the manifold or in the turbine inlet contact flange quickly increase in size. For this reason all leaks must be dealt with immediately.

1. Inspect the pipes and sealing surfaces between the air cleaner and the turbocharger, as well as between the turbocharger and the induction manifold. If the induction manifold is dusty on the inside, there is a leak in either the air cleaner or the induction pipes. Remedy the leak.

2. Clean the induction manifold sealing surface. Check that the sealing surface is flat using a straight ruler. If the surface is not flat or it has scratches, machine or renew the induction manifold. On 620 – engines ensure that the cylinder heads are parallel.

3. Fit a new gasket and fasten the induction manifold. Tighten the manifold fixing screws to a torque of **30 Nm**. Fasten the air pipes carefully..

4. Check that the exhaust manifold is air tight. Tighten the bolts to **50 Nm** and inspect for any damage (cracks, deformation, corrosion etc.). Check also the connection between the turbocharger and the exhaust manifold.

5. Remove the manifold if necessary. Clean the sealing surfaces and remove any carbon deposits. Check that the sealing surfaces are flat. If the fastening flanges are twisted or there are scratches on the sealing surfaces, machine the flanges or renew the exhaust manifold.

6. Ensure that no loose objects or impurities have entered the exhaust pipe or the silencer. Any such loose objects or impurities can increase the back pressure for the exhaust gases from the turbine wheel.

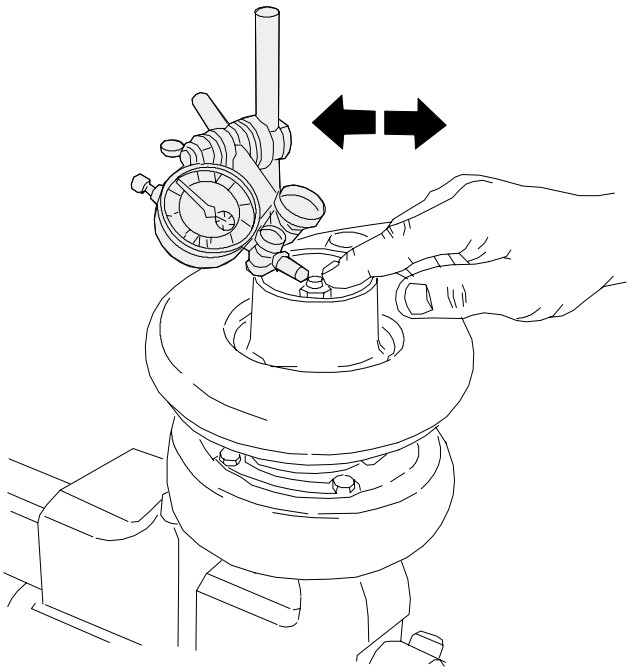
C. Checking turbocharger

If a fault is suspected in the turbocharger it can be located in the following way:

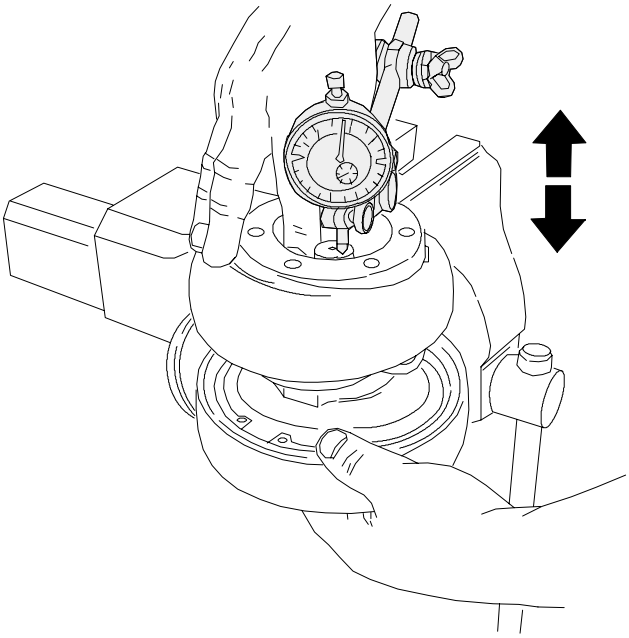
1. Visually inspect the turbine and compressor wheels. The vanes must not show any signs of damage, deformation or wear caused by foreign objects.

2. Investigate any oil leaks through the sealing rings on the shaft in the turbine and compressor housing.

N.B! At low idling there is always a certain amount of oil leakage on the compressor side. However, this should not cause too much concern unless the oil consumption is too great.



3. Check the turbine shaft running clearance. Place the stylus of a dial gauge against the shaft and move the shaft sideways. refer to the clearance given in the specifications on page 210/9.



4. Check the shaft end float. Place the stylus of the dial gauge against the end of the shaft and move the shaft axially. Refer to the clearance given in the specifications on page 210/9.

If any defects or wear are confirmed, the turbocharger should be reconditioned.

If the engine does not work correctly and the turbocharger is not defective or too worn, the fault could be traced to one of the following items:

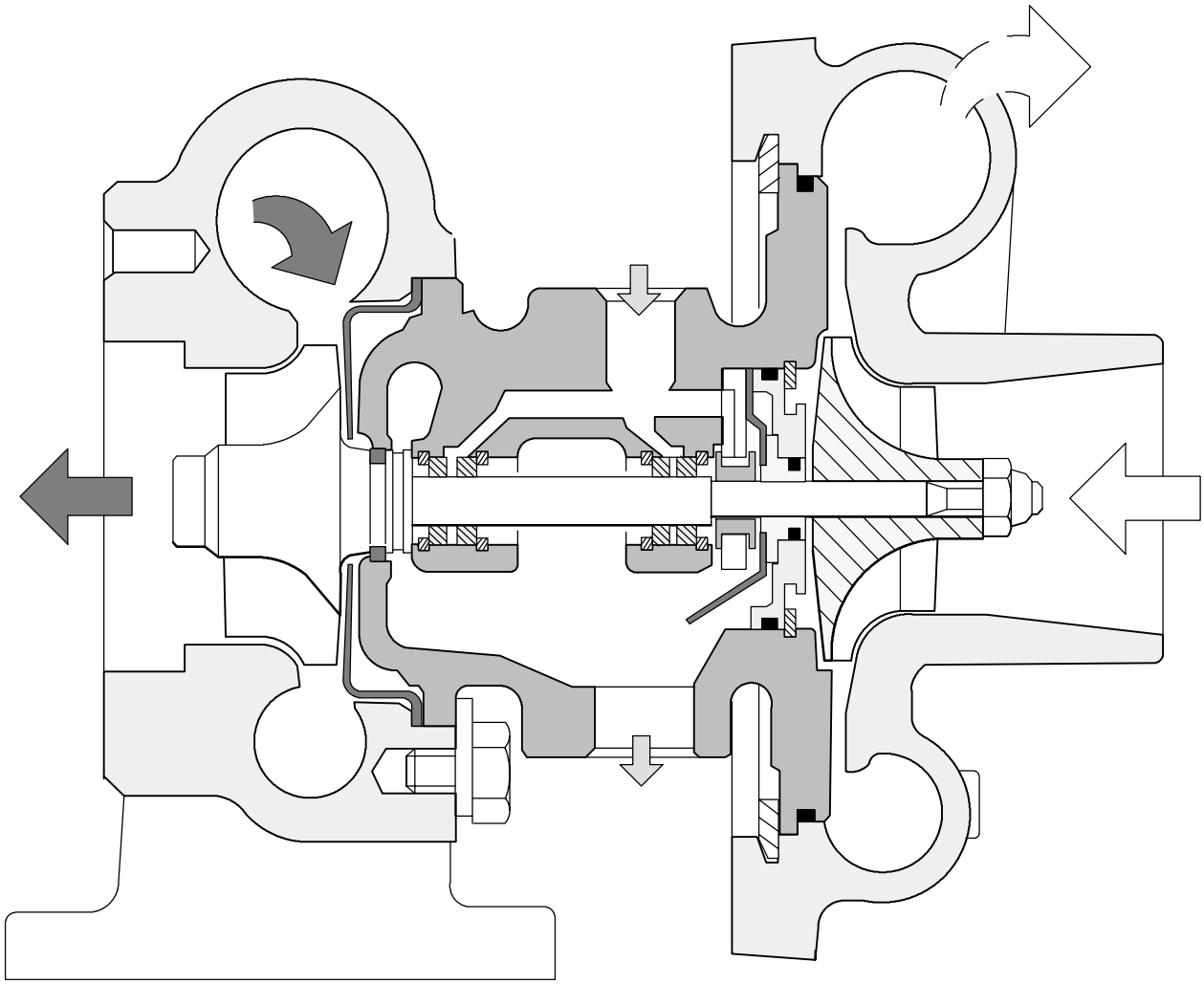
– Blocked air filter
– Leakage in the inlet or exhaust systems. Leaking flange seal
– Defective or wrongly adjusted injection pump.
– Wrongly adjusted throttle linkage
– Defective or wrongly adjusted injectors
– Low fuel pressure (e.g. blocked fuel filter)
– Low compression, wrong valve clearance

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D. Reconditioning turbocharger

(Schwitzer S1A, S1B, S2B)

N.B! The same degree of cleanliness should be observed when removing the turbocharger as with repairing the fuel system. Only remove the compressor and turbine covers if the requisite special tools, e.g. for adjusting the balance, are not available. **In general, when the turbocharger is damaged it is more economical to fit a factory reconditioned turbocharger.**



Dismantling turbocharger

1. Mark the compressor housing, turbine housing and the bearing housing in relation to each other.

2. Fix the turbocharger by the outlet flange in a vice fitted with soft jaws.

3. Remove the compressor housing circlip and remove the housing.

4. Unscrew the turbine housing fixing screws and remove the fixing plate. Detach the bearing housing from the turbine housing.

5. Hold the turbine wheel at hub and unscrew the compressor wheel nut (left – hand thread). Remove the compressor wheel.

6. Remove the turbine wheel/shaft carefully by tapping at the shaft end with a soft hammer. Do not bend the shaft.

7. Place the bearing housing on a table so that the turbine side is against the table. Remove the support flange circlip.

8. Remove the support flange and the oil deflector ring by prying with two screwdriver behind the support flange grooves. Press the deflector ring out of the support ring.

9. Remove the oil deflector plate, thrust bearing and thrust sleeve from the bearing housing. Remove the bearing outer circlips and remove the bearings and the inner circlips.

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Cleaning parts of the turbocharger

N.B. Use conventional cleaning agents. Do not clean with corrosive substances as parts of the turbocharger may be damaged.

1. Wash off all dirt with a detergent solution. Use plastic tools or brush when cleaning aluminium parts.

2. Clean all oilways with compressed air. Check that all contact surfaces are clean and in good condition.

Checking parts of the turbocharger

1. Bearing housing
– Inspect the bearing surfaces for damages and wear.
– make sure that the turbine side sealing surface is undamaged.

2. Compressor wheel
– check for bends, cracking or corrosion and possible wear on the wheel rear face. Small faults can be accepted. Change the wheel if damages affect balancing accuracy. Never bend the vanes. Check the balancing accuracy (S1A, S1B: **0,21 gm mm**. S2B: **0,36 gm mm**).

3. Shaft and turbine wheel unit
– check the bearing point wear, min diameter is S1A, S1B: **7,615 mm**. S2B: **10,15**.
– check the width of the sealing groove, S1A, S1B: **max 1,630 mm**. S2B: **1,58 mm**.
– measure the shaft ovality, S1A, S1B: **max 0,005 mm**. S2B: **0,007**.
– check balancing accuracy (S1A, S1B: **0,21 gm mm**. S2B: **0,36 gm mm**), change the part if given values are exceeded.

4. Compressor and turbine housing
– check if there are damages, cracks or overheating faults caused by wheel contact in the housings. Small damage can be accepted, otherwise change the housing.

5. Turbine side rear plate
– change the rear plate if it is bent or cracked.

6. Oil deflector ring
– check the groove width on the sealing ring, S1A, S1B: **max 1,226 mm**. S2B: **1,58** Check also for other possible damage and wear. Reject worn part.

7. Support flange
– Check wear and cracking of the seal ring counter surface. Only small wear can be accepted. In general, even a small wear causes sealing problems.

Assembling the turbocharger

It is recommended to use a repair kit when assembling the turbocharger. This kit includes necessary seals and parts which are exposed to wear.

1. Fit the inner circlips into the bearing housing. Lubricate the bearing points. Push the bearings into place and fit the outer circlips.

2. Fit a new sealing ring into the groove and push the rear plate onto the shaft against the turbine wheel.

3. Lubricate the shaft bearing points and the sealing ring. Push the shaft into the bearing housing. Do not damage the sealing ring.

4. Place the bearing housing vertically resting on the turbine housing.

5. Fit the thrust sleeve into the thrust bearing and place the parts into the bearing housing according to the position of the guide pins. Place the oil deflector plate onto the thrust bearing.

6. Fit a new o–ring into the groove of the support flange. Fit a new o–ring onto the deflector ring. Press the deflector ring into the middle of the support flange. Do not damage the sealing ring and its counter surface.

7. Lubricate the o–ring and push the support flange into the bearing housing. Fit the circlip the chamfered side outwards.

8. Push the compressor wheel onto the shaft. Tighten the shaft nut to a torque correct torque. Secure the nut with locking fluid Loctite 601.

9. Pass the compressor housing circlip over the bearing housing the circlip chamfered side towards the turbine housing. Fit the o–ring into the groove on the bearing housing. Fit the compressor housing according to the markings. Fit the circlip into groove.

10. Fit the bearing housing and the turbine housing according to the markings. Fit the fixing plate and tighten the screws to **22 Nm** (S1A/S1B) or **17 Nm** (S2B).

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E. Fitting turbocharger

Locate the cause of the defects on the turbocharger. Remedy the fault before fitting the new turbocharger.

In order for the turbocharger to work satisfactorily, it is important that the engine oil is in good condition. Likewise the oil should be to the correct quality specification. The air filter and oil filter should be serviced according to the handbook specification.

The setting of the injection pump critically affects the function of the turbocharger. The injection pump should be adjusted according to the manufacturers instructions.

1. Check the tightness of the induction and exhaust manifolds, and that they are securely fastened. Ensure that there are no loose carbon or rust particles, or other foreign objects in the manifolds.

2. Connect the turbocharger to the exhaust manifold and tighten down using a new gasket.

3. Connect the induction pipe and the silencer.

4. Pour clean engine oil into the bearing housing through the inlet oilway. This is very important in order to ensure that the turbocharger is lubricated at the time of starting.

5. Connect the pressure and return oil pipes. Use a new seal. Check that there are no tensions in the pipes when tightening.

6. Before starting, pull out the stop control and crank the engine over with the starter motor so that the oil pressure rises. Start the engine and check that there are no leaks.

F. Adjusting by–pass turbo (S1BG)

The by–pass turbo is fitted on 6400DW, 6400 DWRE, 6800DWI, 8450 DWR and 8450 DWRE tractors and also on HiTech tractors 6550 DWRE, 6650 DWRE, 6750 DWRIE and 6850 DWRIE.

N.B.: Normally the adjustment is unnecessary.

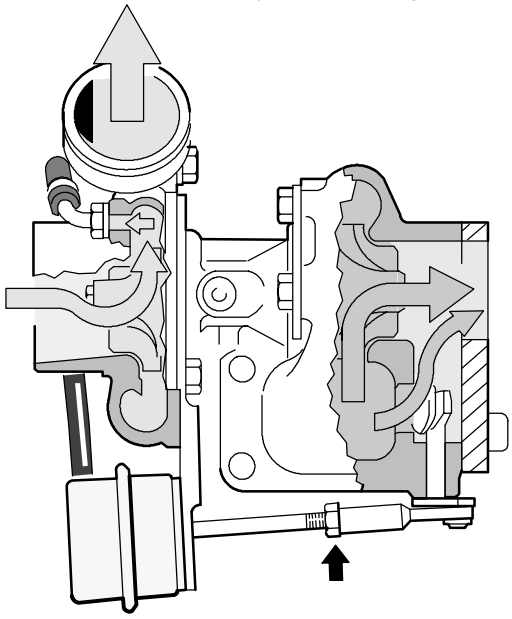
The following equipment are needed:
– surface table and fixing device for the turbo
– dial gauge equipped with magnetic base
– compressed air and pressure controller
– pressure gauge, reading accuracy 0,015 bar

1. Fasten the turbocharger on the surface table. Fasten the regulator rod to the by–pass hole lever but do not fit the circlip.

2. Place the dial gauge stylus against the regulator rod end and zero the gauge reading (ensure that the by–pass hole is closed).

3. Connect compressed air to the pressure controller. Increase pressure progressively (avoid sudden pressure rise) until the dial gauge records **0,4 mm** movement in the rod.

Note! This movement removes clearances and should be happened at a pressure of max. 1,035 bar (8450: 0,9 bar). When pressure further increases, starts the actual opening movement which opens the by–pass passage.



4. Adjust, if necessary, the rod length until the correct pressure value has been reached.

5. When the adjustment is correct, tighten the rod locking nut.

6. Fit the rod circlip and the boost pressure pipe.

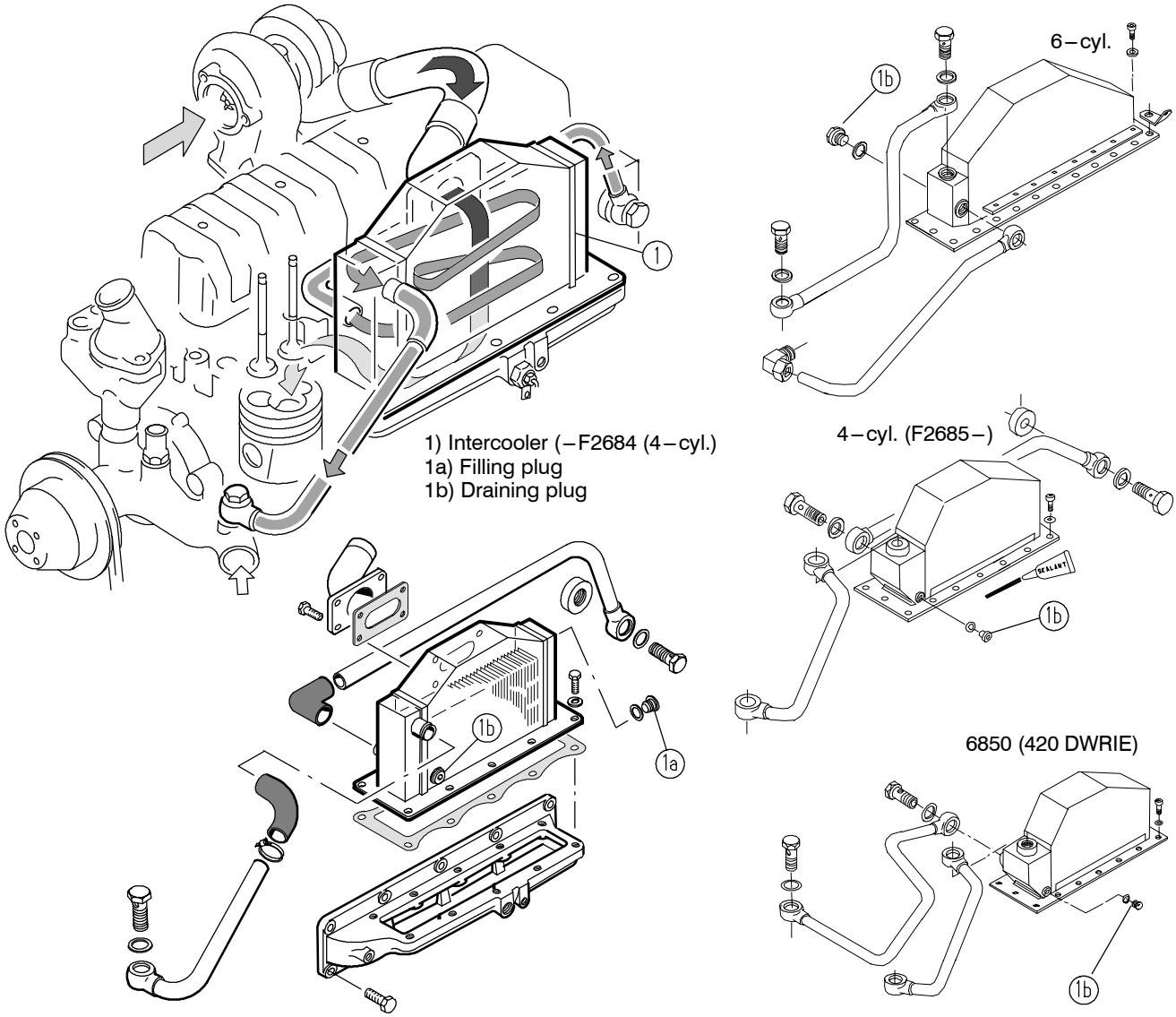
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G. Intercooler on 6800 tractor

Valmet 6800 tractor has an intercooler, which cools the engine intake air. Air density is greater in lower temperatures and more air can be charged into the engine combustion cambers at which time fuel combustion happens more effectively.

Engine coolant circulates in the cooling element of the intercooler and engine intake air is blown thought the element at which time the air, which is in working temperature, cools even from +150 °C down to +95°C.

Note! On tractor 8400 (model 2001) and on HiTech–tractors 6750 and 6850 (420 DWRIE) and on 8350 and 8950 (634 DSBIE or ESBIE) there is fitted an intercooler.



1) Intercooler (–F2684 (4–cyl.)
1a) Filling plug
1b) Draining plug

The intercooler increases engine coolant volume (compared with the normal model) by about one litre (4–cyl. engines) or about 2,5 litres (6–cyl. engines).

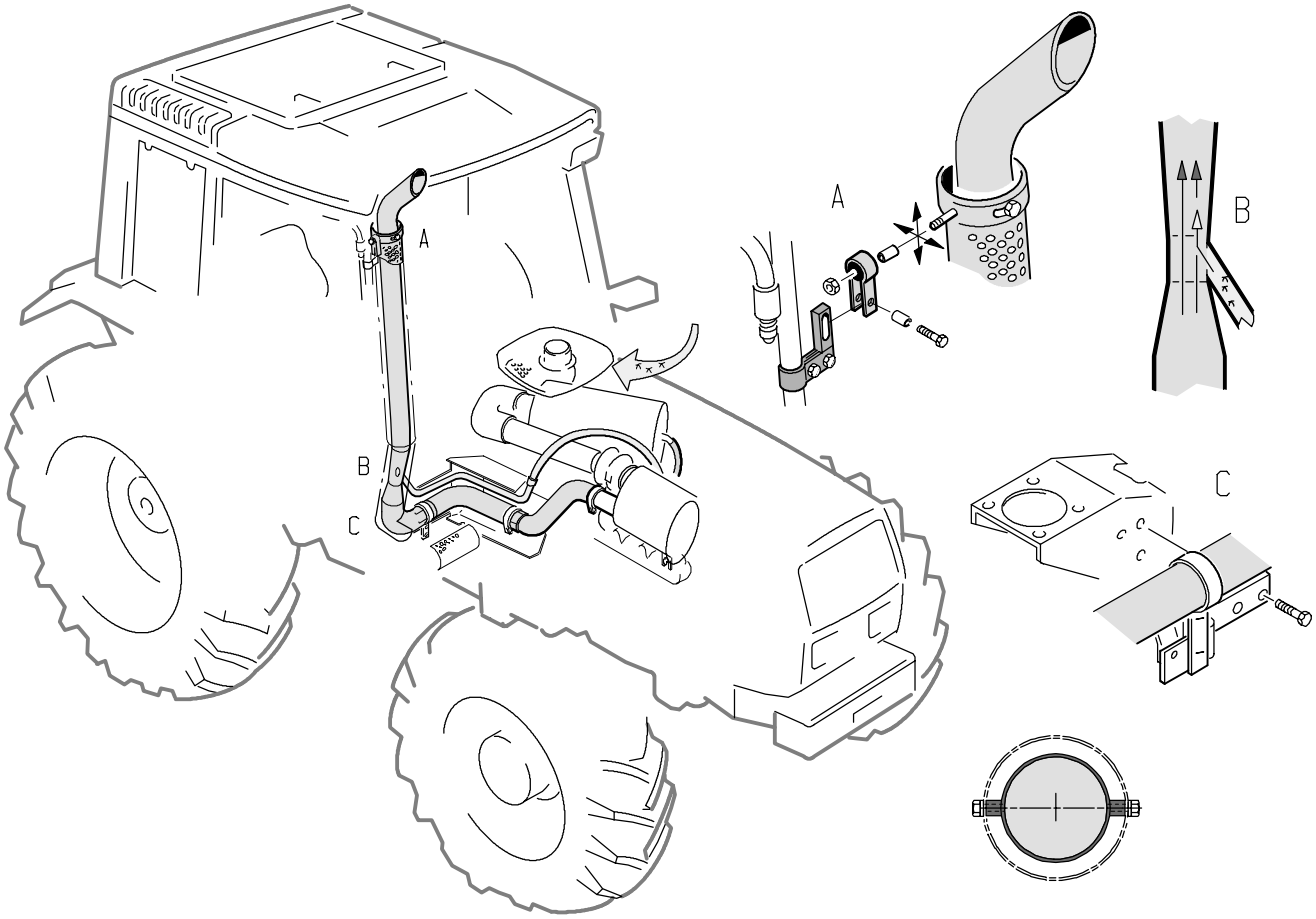
–F2684 (4–cyl.): When filling the cooling system, the intercooler should be filled separately via plug **1a**. Draining is made via draining plug **1b**.

F2685– (4–cyl. and 6–cyl.): When filling the cooling system, slacken the intercooler upper pipe union, so that air can flow out of the cooler (draining plug 1b. These do not have the filling plug).

Note! The intercooler has been modified from engine number F2685 incl. The new intercooler is interchangeable with the earlier one, if all modified parts are changed (e.g. intake manifold and pipes). As a spare part the earlier type intercooler is still delivered.

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H. Exhaust pipe on 6800 tractor



On 6800 tractor there is as standard an exhaust pipe which has been drawn up along the cab LH side front pillar. Near the cab there is a protective outer jacket round the exhaust pipe. The jacket has been centralised with aid of screws.

This type exhaust pipe can also be fitted on 6300–6600 and 8050–8750 tractors. The pipe is different on tractors which have the by–pass turbocharger (6400 DW, 6800 DWI and 8450 DW) compared with tractors with a conventional turbocharger (CD–engines).

IMPORTANT!
Concerning tractors with the ejector pipe:
When a suction apparatur for exhaust gases is used in work shop, check that its suction effect is high enough and it does not restrict the upper end of the exhaust pipe. Otherwise at high revs exhaust gases can flow through the ejector pipe into the air filter housing and damage the filter and the filter housing will become sooty.

Working orders

A. Crankshaft seals

(Rear seal, see page **211**/**6**).
(Front seal, see page **214**/**3**).

– Before changing the crankshaft rear oil seal, split the tractor at the clutch (see Op **411 1A**) and detach the clutch assembly (also possible turbine clutch) and the flywheel.

– When changing the crankshaft front seal, drain the coolant from the cooling system. Remove the cooling radiator and the belt pulley/hub at the front end of the crankshaft.

Note! The cooling radiator can also be detached so that the entire front weight bracket is detached together with parts which are fitted on it.

B. Cylinder head and valve mechanism

(Cylinder head and valves, see page **212**/**1**)
(Rocker arm mechanism, see page **212**/**5**)

– Before removing the cylinder head, remove the engine hood plates, engine coolant and detach all parts which are attached to the cylinder head. After that the cylinder head can be removed.

– Rocker arm mechanism is accessible after removing the valve cover.

– Pushrods can be removed after removing the valve cover and the rocker arm mechanism.

C. Pistons and connecting rods

(Pistons and connecting rods, see page **213**/**3**)

If only pistons/connecting rods are to be changed, the simplest working order is as follows:

– Drain the engine coolant and the engine oil. Detach the front weight bracket together with parts which are fitted on it (e.g. radiator).

– Remove the front axle. Support the engine and tractor frame and unscrew the oil sump fixing bolts and remove the oil sump (unbolt only lower bolts at the frame joint at the clutch).

– Remove the cylinder head or heads on 620–engines.

– Loosen the connecting rod big–end bearing caps and push the pistons together with connecting rods upwards and remove them through the cylinder bore.

D. Lubricating oil pump

(Lubricating oil pump, see page **215**/**1**)

– Drain the engine coolant and the engine oil. Detach the front weight bracket together with the parts which are fitted on it (e.g. radiator).

– Remove the front axle. Support the engine and tractor frame and unscrew the oil sump fixing bolts and remove the oil sump (unbolt only lower bolts at the frame joint at the clutch).

– The oil pump can now be removed from the lower face of the cylinder block.

E. Balancer unit (only 420–engines)

(Balancer unit, see page **213**/**7**)

– Drain the engine coolant and the engine oil. Detach the front weight bracket together with parts which are fitted on it (e.g. radiator).

– Remove the front axle. Support the engine and tractor frame and unscrew the oil sump fixing bolts and remove the oil sump (unbolt only lower bolts at the frame joint at the clutch).

c) The balancer unit is now accessible and can be detached from the cylinder block lower face.

F. Crankshaft

(Crankshaft, see page **213**/**1**)

– Split the tractor at the clutch. Remove the clutch assembly and possible turbine clutch and the flywheel.

– Remove the engine coolant and the radiator**.** Detach the engine.

G. Cylinder liners

(Cylinder liners, see page **211**/**1**)

– Drain the engine coolant and the engine oil. Detach the front weight bracket together with parts which are fitted on it (e.g. radiator).

– Remove the front axle. Support the engine and tractor frame and unscrew the oil sump fixing bolts and remove the oil sump (unbolt only lower bolts at the frame joint at the clutch).

– Remove the cylinder head or heads on 620–engines.

– Loosen the connecting rod big–end bearing caps and push the pistons together with connecting rods upwards and remove them through the cylinder bore.

– Remove the cylinder liners upwards.

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H. Timing gears

(Timing gears, see page **214**/**1**)

As the timing gear casing forms a seal against the oil sump, the casing cannot be removed without first removing the oil sump. The timing gear casing cover, however, can be removed without removing the oil sump.

– Remove the oil sump if the timing gear casing is to be removed. Otherwise remove the cooling radiator only.

– Remove the fan, alternator and the v–belt.
– Unscrew the crankshaft nut and remove the belt pulley/ hub. On 620–engines, the belt pulley should be removed before unscrewing the nut.
– Remove the timing gear casing front cover and remove the oil deflector ring at the front end of the crankshaft.

– Remove the fuel injection pump if the timing gear casing is to be removed. Otherwise disconnect all the pipes from the fuel injection pump.
– The timing gears are now accessible.

In addition, the following steps should be taken if the entire timing gear casing has to be changed:

– Unscrew the idler gear fixing bolts and remove the idler gear.

– Pull out the camshaft from the cylinder block.

Note! If the cylinder head and valve mechanism have not been removed, the tappets must be prevented from falling down when the camshaft is removed, see page **212**/**5**.

– The timing gear casing can now be removed.

I. Camshaft

(Camshaft, see page **212**/**5**)

Before removing the camshaft the following steps should be taken:

– Remove the timing gear casing cover (see under previous heading **H Timing gears**).

– Remove the idler gear

– Remove the valve cover and the rocker arm mechanism.

– Support the pushrods (at the same time tappets which are against the camshaft) to the upper position in pairs by using for instance o–rings (see picture on page **212**/**5**).

– Rotate the crankshaft so that the timing markings on the crankshaft gear and the camshaft gear become opposite each other (see picture on page **214**/**2**).

– Pull out the camshaft from the cylinder block.

Note! Take care when fitting the camshaft that the timing marks align.

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Specifications, Bosch in–line injection pump

Note! Stanadyne rotary distributuon pump, see page **220**/**10**.

Bosch fuel injection pump

Type (pump/governor), 6000–8750	Bosch PES...A/RSV
Type (pump/governor), 8950	Bosch P–pump
Injection order:	
– 320	1–2–3
– 420	1–2–4–3
– 620, 634	1–5–3–6–2–4
Direction of rotation	clockwise
Diameter of pump piston	9,5 mm (p: 12 mm)
Stroke	8 mm (p: 11 mm)
Injection advance:	
– 6100–6600	19˚
– 6800	18˚
– 8000, 8100	23˚
– 6000, 8400	21˚
– 8200	22˚
– 8750	20˚
– 8950	13˚
Oil fillings [1]:	
– 320	0,3 l
– 420	0,4 l
– 620/634	0,6 l

Fuel feed pump

Type:	
– 320	Bosch FP/KSG 24 AD 207
– 420, 620, 634	Bosch FP/KEG 24 AD 504
Construction: piston pump, separate hand pump	
Fuel feed pressure (overflow valve opening pressure)	0,7–1,2 bar (70–120 kPa)
Pressure from fuel feed pump (without overflow valve)	2,7 bar (270 kPa)

Injectors (see also page **220**/**15**)

Type	five hole nozzle
6000–8750:	
– Opening pressure	230+10 bar (23 MPa)
– Setting pressure [2]	240 bar (24 MPa)
8950, 6300 (model year 2000), **6400** (model year 2000), **8400** (model year 2000)**:**	
– Opening pressure	270+8 bar (27 MPa)
– Setting pressure [2]	278 bar (27,8 MPa)
Sealing ring	8999 01495

[1]) When fitting fuel injection pump.
[2]) Value to be used when adjusting the opening pressure of a new or used injector.

Tightening torques

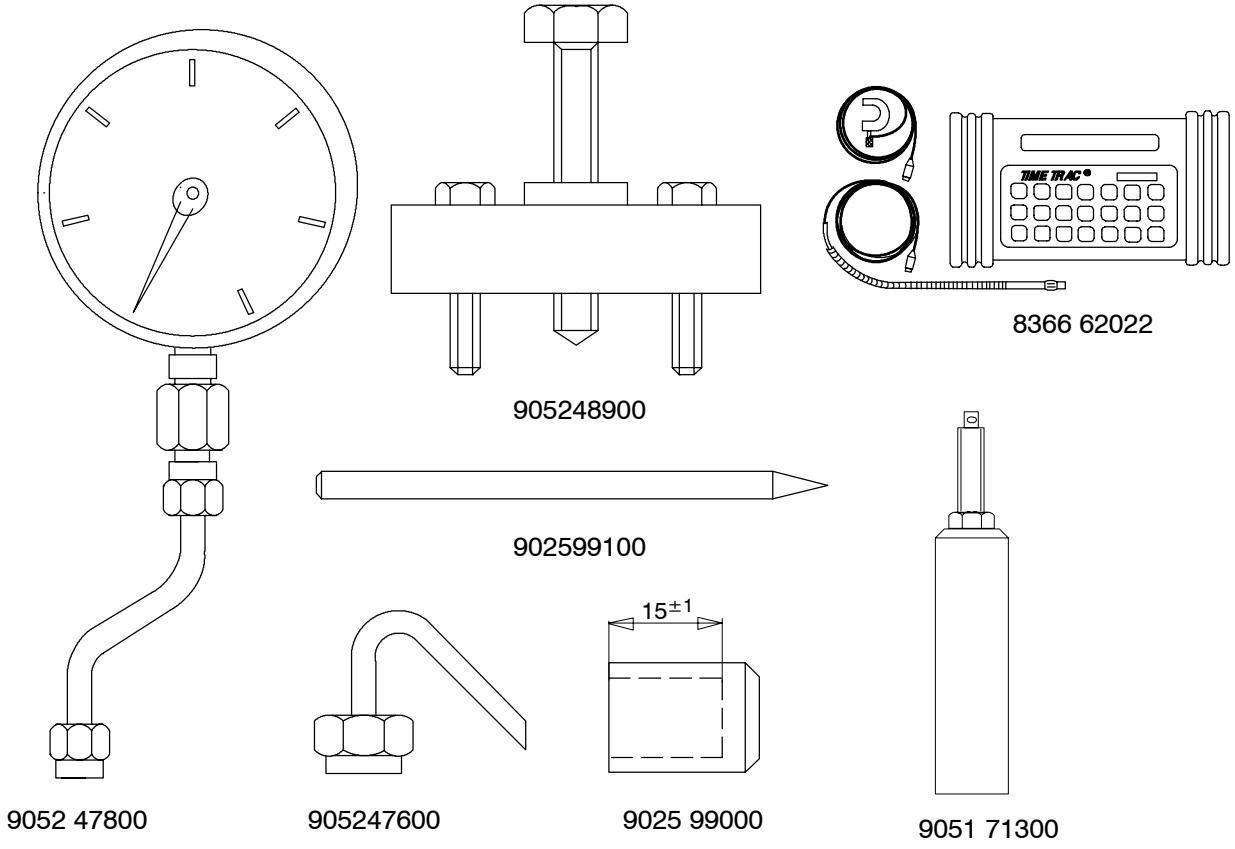
Injection pump gear nut	90 Nm
Delivery valve retainer	40 Nm
Injector nozzle sleeve	60 Nm
Injector attaching nuts (on studs)	15 Nm

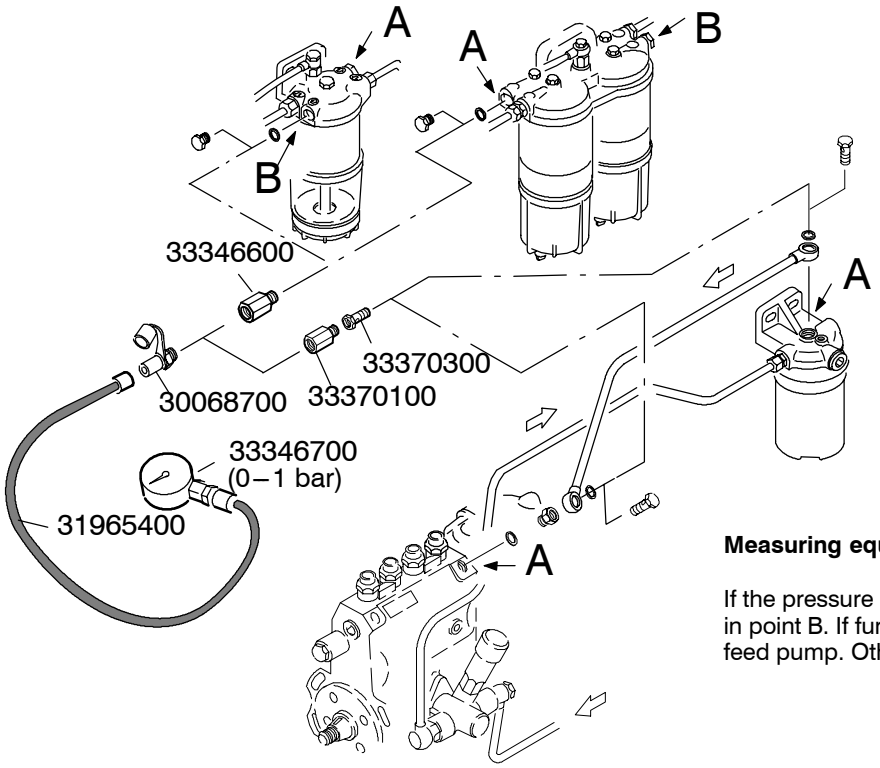
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Special tools

9052 47800 *)	Pressure gauge for checking delivery valve
9052 48900 *)	Puller for injection pump drive gear
9025 99100 *)	Locator for timing mark on the flywheel
9052 47600 *)	Control pipe for injection timing
9052 99000 *)	Sleeve for limiting control rod travel
9051 71300 *)	Extractor for injectors
8366 62022	Electronic device for checking injection timing (E–engines)

*) Same tool as for fuel system on 505–905 tractors.

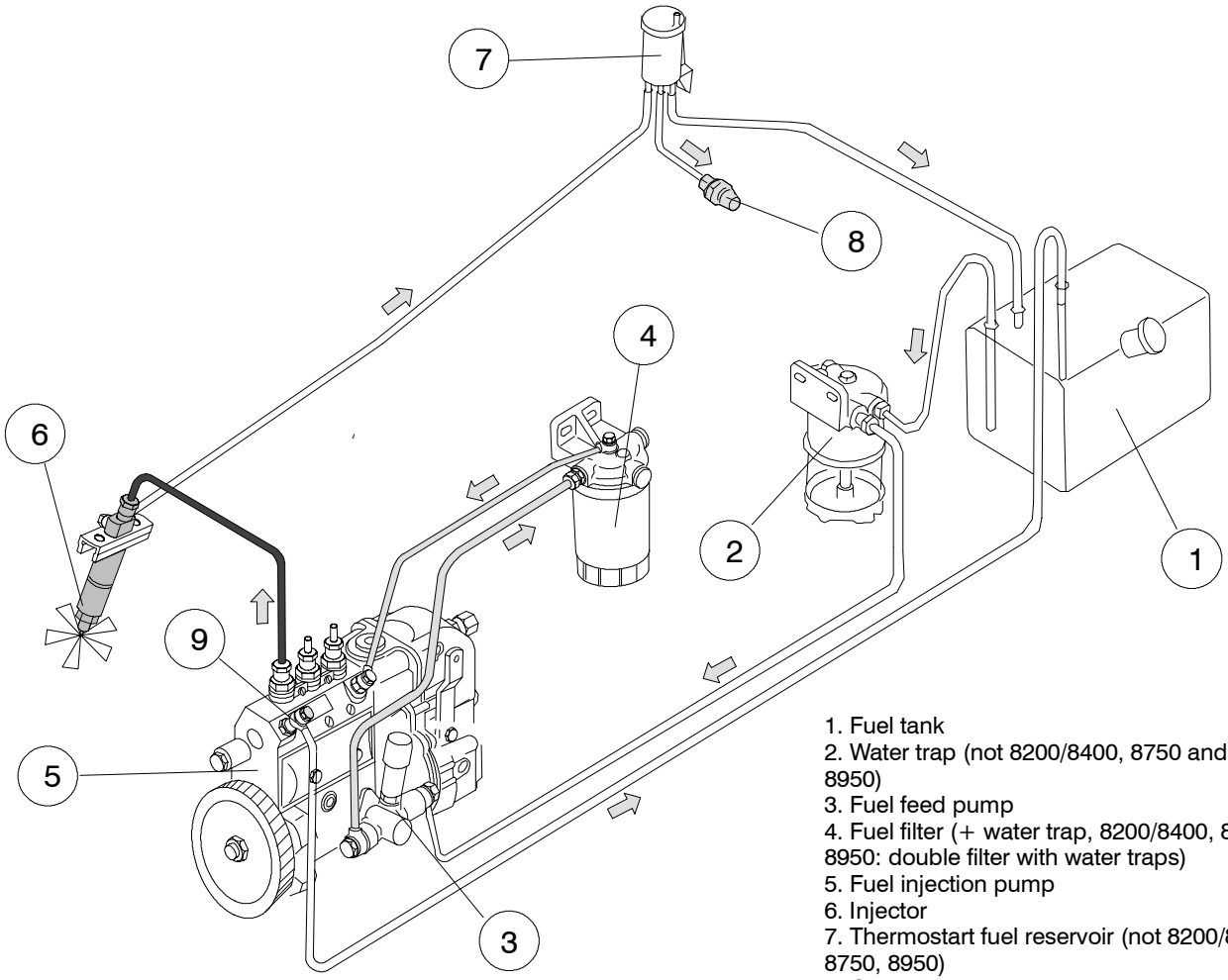




Measuring equipment for fuel feed pressure:

If the pressure is too low in point A, check the pressure in point B. If further too low, the fault lies in the fuel feed pump. Otherwise the filter is blocked.

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1. Fuel tank
2. Water trap (not 8200/8400, 8750 and 8950)
3. Fuel feed pump
4. Fuel filter (+ water trap, 8200/8400, 8750, 8950: double filter with water traps)
5. Fuel injection pump
6. Injector
7. Thermostart fuel reservoir (not 8200/8400, 8750, 8950)
8. Glow plug
9. Overflow valve

Fuel system, description

Fuel feed pump (3) draws fuel from tank (1) through water trap (2) (not 8200, 8400, 8750, 8950) and forces it through filter (4) to fuel injection pump (5). The fuel injection pump pumps fuel at high pressure through the delivery pipes to injectors (6) which inject the fuel in the form of a fine mist into the combustion chamber.
Excess fuel lubricates the nozzle valve (needle) and flows in return through the thermostart device reservoir (7) (not 8200/8400, 8750, 8950) and then on to the fuel tank. When the thermostart is on (glowing) fuel runs from reservoir (7) through glow plug (8) and is ignited in the induction manifold. Excess fuel returns from the fuel injection pump through overflow valve (9) to the fuel tank.
Important! 8200/8400, 8750, 8950 has not the Thermostart fuel reservoir but fuel flows from the injectors to the injection pump overflow valve from where a pipe goes to the glow plug. 8200/8400, 8750 and 8950 tractors have a combined fuel filter and water trap.

Maintenance

Fuel filter:
– Change the fuel filter at intervals of 100 running hours or yearly.
Water trap:
– Empty/clean the water trap at every 500 running hours.

Fuel tank:
– Empty/clean the fuel tank at every 1000 running hours or yearly.

Injectors
– Reconditioning of the injector should be carried out by an authorised workshop.

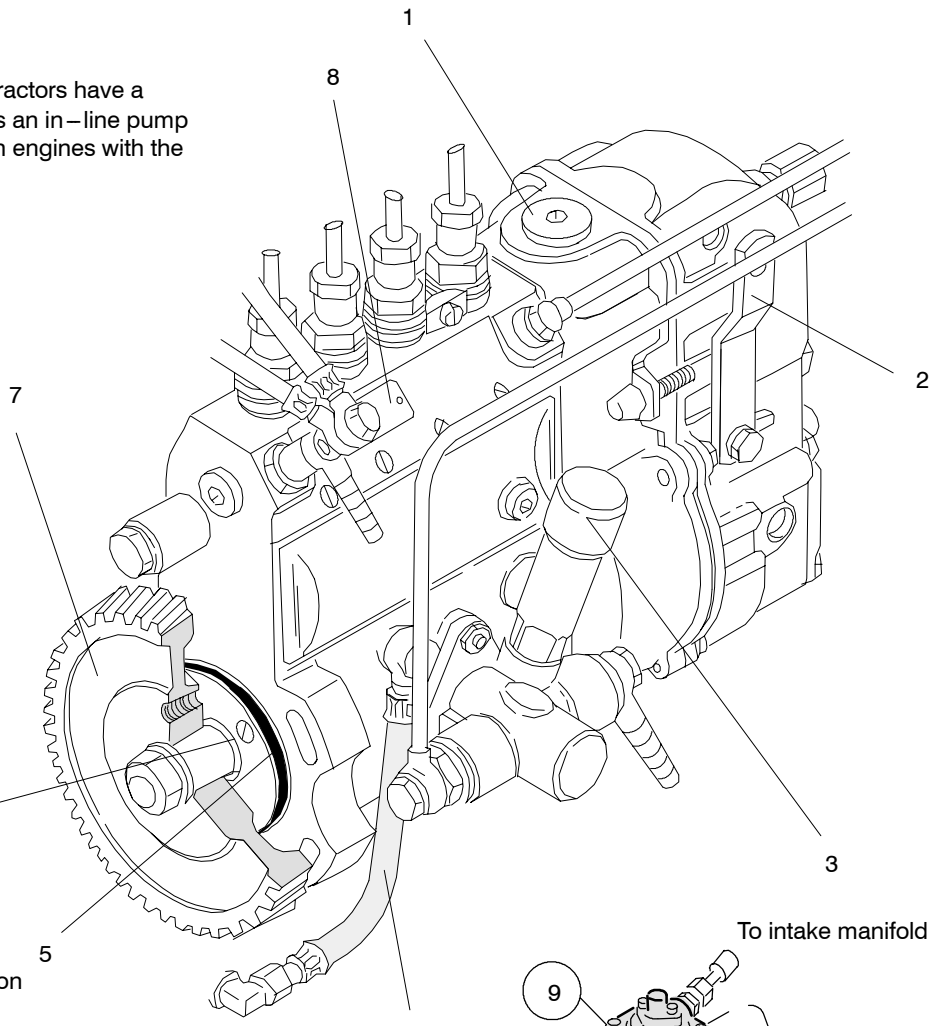
Symptoms of dirty or faulty injectors are:
– Knocking is an indication that one of the injectors is faulty. When a cold engine ticks over a certain amount of knocking is unavoidable. If the engine knocks after it has reached normal operating temperature, it is very likely that one of the injectors is faulty. Air in the fuel system can also cause knocking (which should disappear after the system has been bled of air).
– Smoky exhaust gases may indicate impaired performance of the injectors. However, this can also be caused by other faults such as a blocked air cleaner.

The fuel system should always be bled when the fuel system has been emptied (e.g. the fuel tank has been emptied during driving, in connection with maintenance or repair work or after a long idle period).

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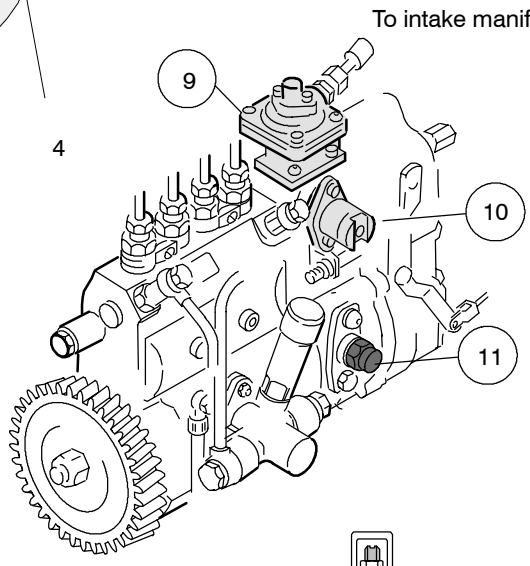
Fuel injection pump

Valmet 6000–8400 , 8750 and 8950 tractors have a Bosch–make injection pump which is an in–line pump and its basic construction is similar on engines with the different number of cylinders.



Fuel injection pump

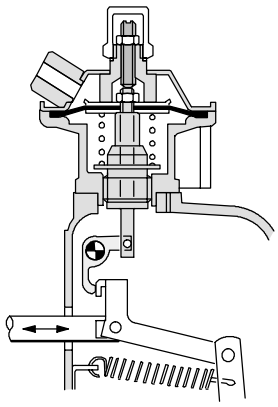
1. Oil filling plug
2. Governor control lever
3. Hand pump on fuel feed pump
4. Lubricating oil into injection pump
5. O–ring
6. Return of lubricating oil to engine
7. Drive gear
8. Type plate
9. Boost control (6800, 8750, 8950)
10. Forced–feed solenoid for starting (6800, 8750, 8950)
11. Indicator plug for adjusting injection timing (6800, 8750, 8950 + all latest tractors, which have a new governor)



The fuel injection pump is flange mounted and sealed by one o–ring (5) in the timing gear casing. The injection pump is driven from the crankshaft through an idler gear. The injection pump is connected to the engine force–feed lubrication system through an external pipe (4). Lubricating oil returns to the engine via the hole (6) at the front end of the injection pump.

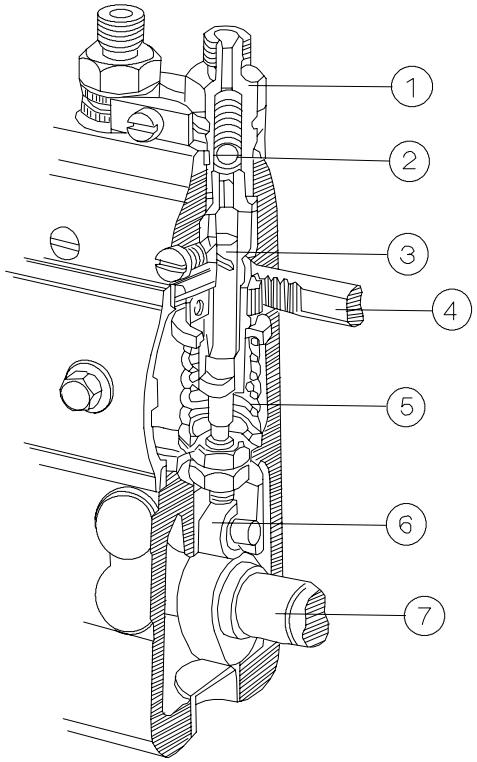
The fuel feed pressure which fills the high pressure pump elements with fuel is created by a piston pump which is attached to the side of the fuel injection pump. The piston pump is driven from an eccentric on the camshaft of the injection pump. The fuel feed pump supplies more fuel than the injection pump needs. The excess fuel flows through the overflow valve back to the fuel tank. The fuel cools the injection pump and also takes any air bubbles with it back to the tank.

Note! 6800, 8750 (SigmaPower) and 8950 (SigmaPower) tractors have a boost control (9), which is connected via a hose to the engine intake manifold. The boost control adjusts injected fuel amount to the cylinders according to the supercharging pressure in the engine intake manifold. In addition, these tractors have a forced–feed solenoid for starting (10) on the fuel injection pump, see page **223**/**9**. Adjusting injection timing on 6800, 8750 and 8950, see page **223**/**8**.



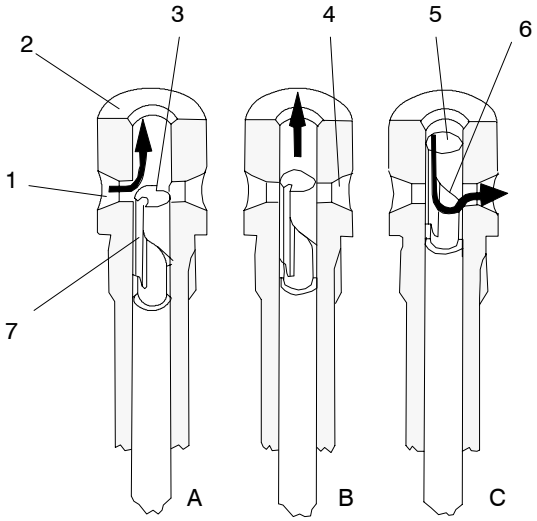
Boost control

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1. Retainer for delivery valve
2. Delivery valve
3. Pump element
4. Control rod
5. Return spring for pump plunger
6. Roller tappet
7. Camshaft

The purpose of the fuel injection pump is to meter out fuel to the combustion chamber at the correct time. Plunger (3) which is driven by the pump camshaft (7) via roller tappet (6) forces the fuel through delivery valve (2) and further through the delivery pipe to the injector.



Two–hole pump element (maximum feed)

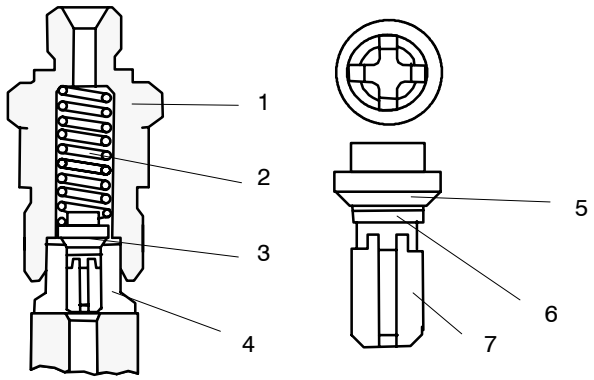
A. Bottom dead centre
B. Fuel injection begins
C. Fuel injection ends

1. Inlet passage
2. Cylinder
3. Starting groove
4. Release passage
5. Plunger
6. Metering edge
7. Vertical groove

The pump element consists of one plunger and one cylinder which are a matched pair and because of the fine tolerances the whole element should be changed as a complete unit.

The cylinder has two passages: inlet passage and release passage. Both passages allow fuel to enter the pressure space. The side of the plunger has one vertical groove and one metering edge which are used for adjusting the amount of fuel injected into the combustion chamber of the engine.

The top of the plunger is provided with a starting groove (delay groove) which delays the injection timing by approx. 8°. (This should be borne in mind when checking the fuel injection timing). This groove improves the cold starting properties of the engine. It works fully automatically. When the engine has stopped the control rod in the injection pump turns the plungers so that the starting groove faces towards the release passage. When the engine has started and when the injection pump has reached a certain speed, the governor pulls the control rod back into running position.



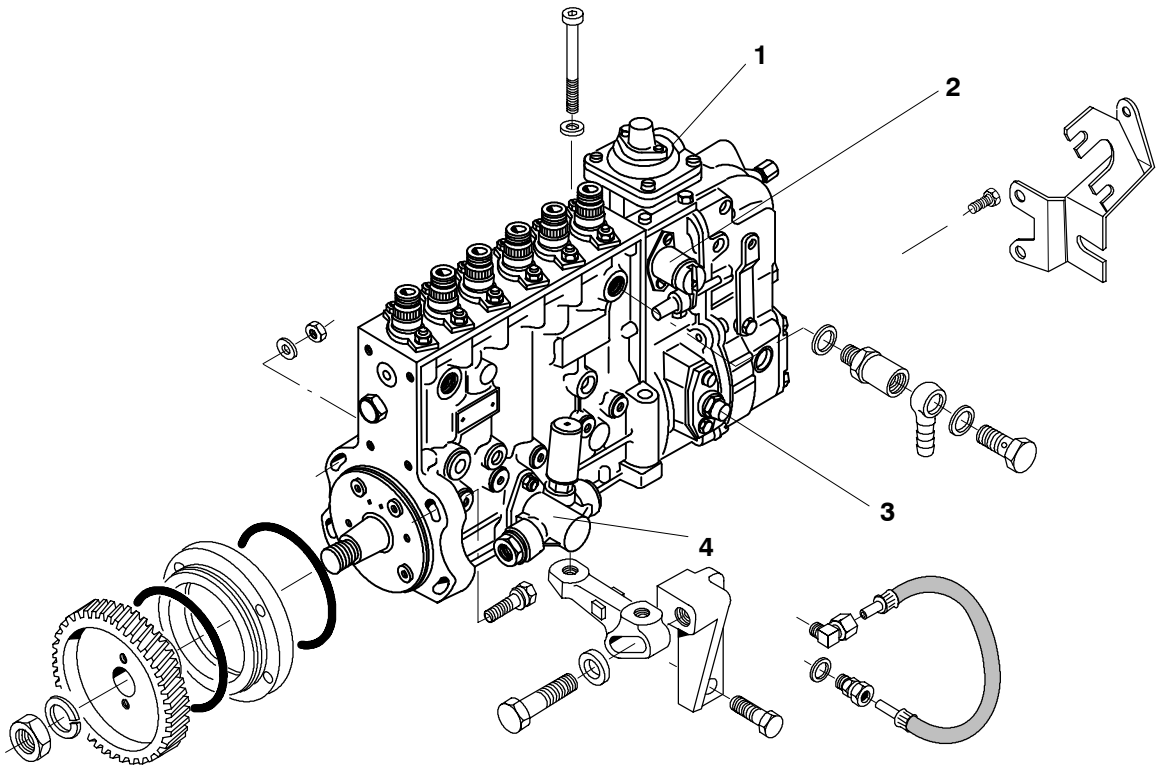
Delivery valve

1. Holder for delivery valve
2. Valve spring
3. Valve cone
4. Valve guide
5. Valve head
6. Pressure–reducing piston
7. Vertical grooves

The delivery valve is fitted on top of the pump element and its purpose is to close the connection between the pump element and the delivery pipe. This happens when the metering edge of the plunger passes the lower edge of the release passage, thus reducing the pressure in the space above the plunger. Its second purpose is to reduce the pressure in the delivery pipe. This is important as it enable the nozzle valve (needle) to close more quickly.

Delivery valve cone contains a pressure–reducing piston which, when the valve closes, is first lowered into the guide and then closes the connection between the delivery pipe and the pump element. The valve head is then pressed against its seat and the fuel in the delivery pipe is given the same space as the displacement of the pressure–reducing piston.

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Fuel injection pump (Bosch P – pump) on 8950 tractor.

1. Boost control (for SigmaPower system)
Function is similar to the boost control on 6800 and 8750 tractors, see page **223**/**9**.

2. Forced feed solenoid for starting
Function is similar to 6800 and 8750 tractors' solenoid, see page **223**/**9**.

3. Plug for injection timing behind the cover
Injection advance is adjusted according to instr. on page **223**/**8**

4. Fuel feed pump

Note! Adjusting values are shown on page **220**/**8B**.

IMPORTANT! The type of 8950 – tractor's fuel injection pump has been changed with effect from engine no. **J18597.** Simultaneously the gas lever position sensor bracket and the lever (17 mm outer) have been changed.

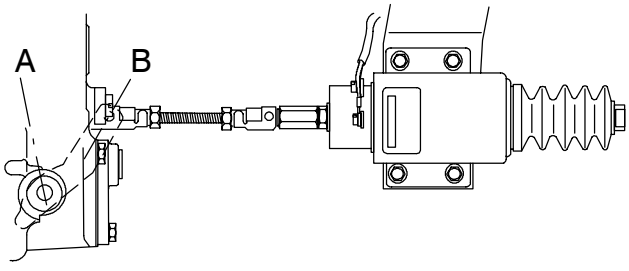
Checking electric stop solenoid (Elettrostart)

A. Running position
B. Stop position

It is important for function of the double coil solenoid (pulling and holding coil), that the piston reaches the extreme position in every stroke. The piston presses the internal switch, which connects continuous current to the holding coil which eliminates the overheating danger of the solenoid.

1. Energize the solenoid and adjust the loose lever system so that the fuel injection pump lever reaches the extreme positions in its course, see picture. The solenoid is energized during engine running.

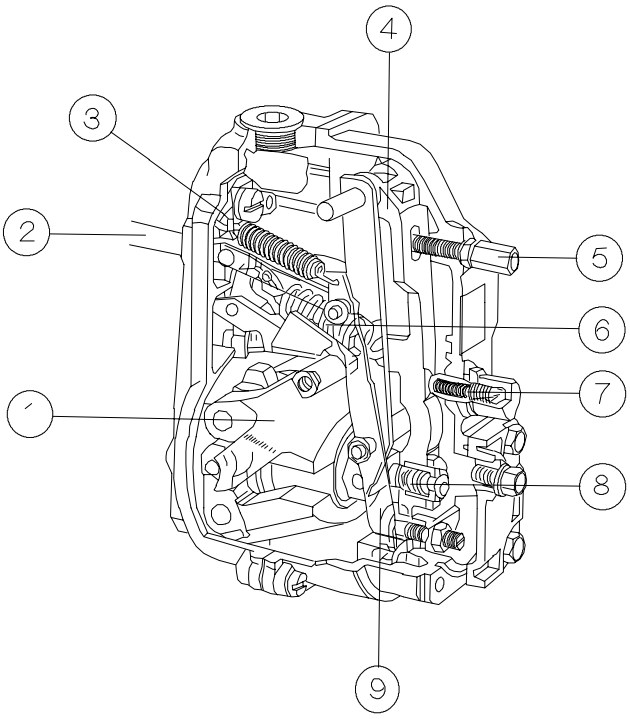
Note! Energize the solenoid with a battery of a correct voltage and keep the solenoid energized while adjusting.



Technical values:
Voltage . . . . . 12 V
Pulling coil . . . . . 41 A
Holding coil . . . . . 0,5 A
Max. stroke . . . . . 40 mm

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Governor

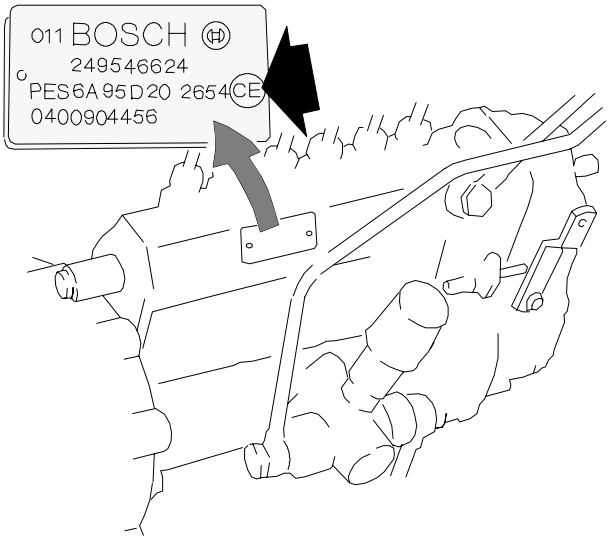


1. Governor weight
2. Control rod
3. Starting spring
4. Main lever
5. Idler screw
6. Governor spring
7. Additional spring, idling
8. Spring for equalizer
9. Governor control arm

The governor is of the centrifugal type and is fitted at the rear end of the injection pump. The governor controls the rotational speed of the engine throughout the whole speed range, and identifies the rotational speed by means of the governor weights. The position of the governor control and of the governor weights is transferred through the governor lever linkage to the control rod. The governor has one governor spring. Starter spring, which is attached to the upper end of the control lever, it pulls the control rod to the starting position when the engine stops. This means that the amount of fuel injected when the engine is started automatically becomes greater.

Fuel injection pump type plate (Bosch in – line pumps)

The injection pump type plate shows one particular letter indicating the user application, see figure below. This letter should always be quoted when ordering a replacement pump or when looking for setting values.



The letters for different pumps on 6000 – 8950 tractors can be found in the tables on pages **220**/**8**, **8B**.

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Table of the fuel metering 6000–6800 (3 and 4 cyl.)

Test equipment ISO 4008, Fluid ISO 4113
Nozzle ISO 7440 207 bar/0,60 orifice plate
Pipe diam. ø6x2x600 ISO 4093

Engine type	Tractor	Injection pump	Governor	Pump timing ° Max. output r/min Low idling r/min	Injected amount mm³ / stroke rpm mm³	RW mm	Boost control pressure bar	Control rod at least 1 mm rpm	Control rod pos. 4 mm rpm
420 D	**6000**	PES 4A 95 D 320 RS 2806 / BE	RSV 375–1175 A2C 2178–7R	21° 2350 750	1150 77–78 1000 900 600 375 11–15	10,0±0,2 +0,4...0,5 +0,8...0,9 +0,8...0,9 4,2±0,3	–	1195–1205	1270–1285
320 DS	**6100**	PES 3A 95 D 320 RS 2810 /C	RSV 375–1150 A2C 2178–10R	19° 2300 750	1150 101–103 1000 800 500 375 13–16	12,3±0,2 +0,1–0,2 +0,3–0,4 +0,3–0,4 4,4±0,3	–	1170–1190	1240–1260
420 DS 62,5 kW	**6300**	PES 4A 95 D 320 RS 2807 / B	RSV 375–1125 A2C 2178–7R	19° 2225 750	1100 81–83 1000 900 500 375 11–151	10,7±0,2 +0,2...0,4 +0,4...0,6 +0,4...0,6 4,2–4,5	–	1130–1150	1190–1220
420 DS 66 kW	**6300** K41309– L23437	PES 4A 95 D 320 RS 2807 / DM	RSV 375–1175 A2C 2178–7R	19°° 2270 850	1100 97–99 1040 700 99–101 500 425 12–14	12,3±0,2 12,4±0,2 13,0±0,2 13,0±0,2 5,1±0,3	–	1130	1210–1215
420 DS	**6400**	PES 4A 95 D 320 RS 2807	RSV 375–1125 A2C 2178–7R	19° 2225 750	1100 91–93 1000 900 500 375 11–15	11.4±0,2 +0,3–0,4 +0,5–0,6 +0,5–0,6 4,2–4,5	–	1135–1145	1210–1230
420 DW 70 kW	**6400** Delta J17109–	PES 4A 95D 320 RS 2807 /CH	RSV 375–1125 A2C 2178–7R	°19° 2225 750	1100 102–104 1000 900 500 375 11–15	13,0±0,2 13,2±0,2 13,7±0,2 13,7±0,2 4,2–4,5	–	1135–1145	1210–1230
420 DW 73,5 kW	**6400** Delta (2000) K41106– L14332	PES 4A 95D 320 RS 2807 /DL	RSV 375–1125 A2C 2178–7R	°19° 2200 850	1100 101–103 1040 104–106 900 109–111 700 109–111 425 11–13	12,8±0,2 13,2±0,2 13,3±0,2 13,3±0,2 4,3	–	1120–1130	1210–1220
420 DS	**6600**	PES 4A 95 D 320 RS 2807 /A	RSV 375–1125 A2C 2178–7R	19° 2225 750	1100 101–103 1000 900 800 500 375 11–15	12,5±0,2 ±0,2 +0,4 +0,5 ±0,5 4,2–4,5	–	1140–1150	1200–1220
420 DWI	**6800**	PES 4A 95D 320 RS 2847 /E	RSV 375–1200 A5C 2268 R	°18° 2225 850	1100 113–115 1000 800 600 Ahtop.säät. toim. 500 94–96 375 11–15	13,4±0,2 13,7±0,2 14,0±0,2 14,0±0,2 12,7±0,2 3,8±0,2	1,0 1,0 1,0 1,0 0,30 0 0	1130	1180–1210

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Table of the fuel metering, 8000–8950 (6 cyl.)

Test equipment ISO 4008. Fluid ISO 4113. Nozzle ISO 7440 207 bar/0,60 orifice plate. Pipe diam. ø6x2x600 ISO 4093.

Engine type	Tractor	Injection pump	Governor	Pump timing ° Max. output r/min Low idling r/min	Injected amount mm³ / stroke rpm mm³	RW mm	Boost control pressure bar	Control rod at least 1 mm rpm	Control rod pos. 4 mm rpm
620 D	**8000**	PES 6A 95 D 320 RS 2806 / F	RSV 325–1125 A0C 2178–8R	23° 2220 750	1100 64–66 950 700 325 13–16	7,8±0,2 8,5±0,2 9,0±0,2 4,2±0,2	–	1150–1160	1190–1210
620 D	**8100**	PES 6A 95 D 320 RS 2806	RSV 375–1150 A2C 2178 8R	23° 2225 750	1100 77–79 980 800 500 375 12–15	9,0±0,1 +0,3...0,4 +0,8...0,9 +0,8...0,9 4,0±0,2	–	1130–1150	1180–1200
634D	**8200**	PES 6A 95 D 320 RS 2806 /EG	RSV 500–1125 A0C 2178–8R	22° 2225 750	1100 86–88 1000 900 800 750 600 375 11–13	10,0±0,2 10,1+0,2 10,3+0,2 10,4+0,2 10,5+0,2 10,5+0,2 4,0±0,2	–	1130	1190–1210
620 DS 103 kW	**8400** –K34331	PES 6A 95 D 320 RS 2806 /G	RSV 325–1125 A0C 2178–8R	21° 2200 750	1100 84–86 1000 900 700 375 13–16	9,8±0,2 10,0±0,2 10,2±0,2 10,5±0,2 4,2±0,2	–	1120–1130	1180–1200
620 DS 110 kW	**8400** K32135–L33320	PES 6A 95 D 320 RS 2806 /AF	RSV 325–1125 A0C 2178–8R	21°° 2200 850	1100 103–105 1040 104–106 900 700 102–104 425 8–10	12,3±0,2 12,3±0,2 12,3±0,2 12,3±0,2 3,6±0,2	–	1120–1130	1205–1225
620 DSIE 118 kW	**8400** L23130–	PES 6A 95D 320 RS 2832 / AH	RSV 500 – 1100 A 5 C 2269 – R	19° 2200 850	1100 93–95 1040 94–96 750 99–101 500 – LDA 500 – 500 82 425 10–15	10,5...10,9 10,5...10,9 11,3...11,7 11,3...11,7 11,4...11,5 10,5...10,9 4,1...4,7	1,0 1,0 1,0 1,0 0,35 0,0	1130	1210–1220
634 DS	**8750**	PES 6A 95D 320 RS 2848 /C	RSV 500–1100 A5C 2269 R	°20° 2200 750	1100 128–130 1000 800 700 LDA 500 500 500 1100 108–110 500 12–15	13,7±0,2 13,9±0,2 14,1±0,2 14,1±0,2 13,9±0,2 3,6±0,2 11,8±0,2 11,8±0,2 4,0±0,5	1,0 1,0 1,0 1,0 0,60 0,40 0,0 0,0 –	1115	1180–1200
634 DSBIE	**8950**	PES 6P 120 320 RS 3382 /E (Tractor.no: –J49321) PES 6P 120 320 RS 3414 (Tractor.no: J49322–)	RSV 425 –1100 POA 669	°13° 2200 900	1100 133–134 1000 700 142–144 600 LDA 500 146 500 111 500 107 450 10–12	10,0±0,2 10,2±0,2 10,2±0,2 10,2±0,2 10,5±0,2 9,3±0,2 9,2±0,2 4,0±0,5	1,0 1,0 1,0 1,0 0,75 0,50 0,0 –	1120	1180–1190

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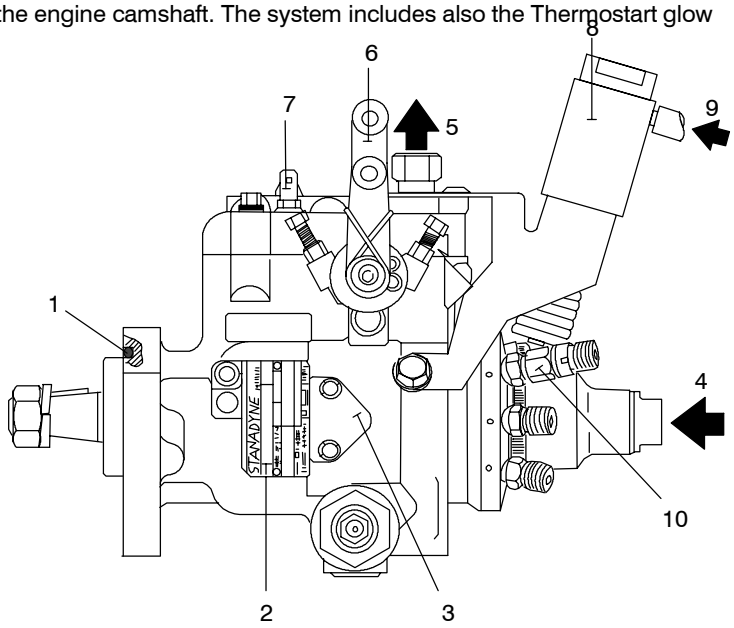
Table of fuel equipment parts 6000–8950

Engine/Tractor	Injection pump	Element	Delivery valve	Governor spring	Injector compl.	Nozzle	Nozzle holder
420 D Valmet **6000**	8367 40392	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
320 DS Valmet **6100**	8366 40199	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
420 DS (62,5 kW) Valmet **6300**	8367 40174	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
420 DS (66 kW) Valmet **6300** K41309–L23437	8367 54903	8353 31161	8353 39126	8353 31163	8366 59808 / 358	8366 59902	8366 39971
420 DS Valmet **6400**	8367 40157	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
420 DW (70 kW) Valmet **6400**DW J17109–	8367 54552	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
420 DW (73,5 kW) Valmet **6400**DW K41106–L23505	8367 54902	8353 31161	8353 39126	8353 31163	8366 59808 / 358	8366 59902	8366 39971
420 DS Valmet **6600**	8367 40173	8353 31161	8353 39126	8353 31163	8366 39956 / –	8366 39957	8366 39971
420 DWI Valmet **6800**	8367 54640	8353 31161	8353 39126	8367 54532	8366 39956 / –	8366 39957	8366 39971
620 D Valmet **8000**	8368 40210	8353 31161	8353 39126	8353 31780	8366 39956 / –	8366 39957	8366 39971
620 D Valmet **8100**	8368 40158	8353 31161	8353 39126	8353 31780	8366 39956 / –	8366 39957	8366 39971
634 D Valmet **8200**	8368 54570	8353 31161	8353 39126	8353 31780	8366 39956 / –	8366 39957	8366 39971
620 DS (103 kW) Valmet **8400** –K34331	8368 40395	8353 31161	8353 39126	8353 31780	8366 39956 / –	8366 39957	8366 39971
620 DS (110 kW) Valmet **8400** K32135–L33320	8368 54884	8353 31161	8353 39126	8353 31780	8368 54831 / 446	8368 54832	8366 39971
620 DSIE (118 kW) Valtra **8400** L23130–	8368 54939	8353 31161	8353 39126	8367 54532	8368 54940 / 301	8368 54941	8368 54756
634 DS Valmet **8750**.	8368 54670	8353 31161	8353 39126	8367 54532	8366 39956 / –	8366 39957	8366 39971
634 DSBIE Valmet **8950**	8368 54767 (Tractor.no: –J49321) 8368 54840 (Tractor.no: J49322–)	8353 54638	8353 30239	8368 64618	8368 54791 / –	8368 54792	8368 54756

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Specifications with Stanadyne distributor pump

Note! 6200, 8000R, 8050, **8150**, **8450** and **8550** (also latest **6300** and **6400** from week 24/01 incl.) tractors have Stanadyne distributor pump. Also **6250Hi–8550 Hi** tractors have this pump.The pump is equipped with an electric running solenoid (ignition switch stop) and with an automatic bleeding system. Stanadyne pump internal lubrication happens with aid of fuel. A separate fuel feed pump is of a membrane type and it is driven by the engine camshaft. The system includes also the Thermostart glow plug.



Picture. *Stanadyne distributor pump*

1. Sealing ring 8368 40858
2. Type plate with pump order number (see page 220/14)
3. Timing marks under the cover
4. Fuel inlet
5. Return fuel/overflow valve
6. Revolution lever
7. Connector for wire to electric stop solenoid
8. Aneroid (E–engines)
9. Boost pressure (E–engines)
10. Detector ring for injection timing (E–engines)

Stanadyne distributor pump

Type:	
– 6200, 6300 and 6400 (24/01–), 6250Hi–6850Hi	DB4 (four pressure plungers)
– 8000R	DB4 (four pressure plungers)
– 8050	DB 2 (two pressure plungers)
– 8150–8550	DB 4 (four pressure plungers)
Injection order:	
– 420–engines	1–2–4–3
– 620/634–engines	1–5–3–6–2–4
Direction of rotation	Clockwise
Injection advance, see page 220/14:	
Tightening torque of pump gear wheel nut	90 Nm

Fuel feed pump

Construction	membrane pump, separate hand pump
Fuel feed pressure (static)	0,48 bar (48 kPa)
Fuel feed pressure at test point	0,2–0,5 bar

Injectors (see also page 220/15).

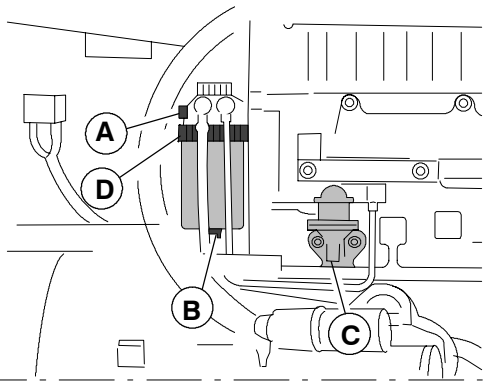
Type	five hole nozzle
Opening pressure	see page 220/15
Setting pressure [1])	see page 220/15
Sealing ring	nro 8999 01495
Injector nozzle sleeve, tightening torque	60 Nm
Injector attaching nuts (on studs)	15 Nm

[1]) Value to be used when adjusting the opening pressure of a new or used injector.

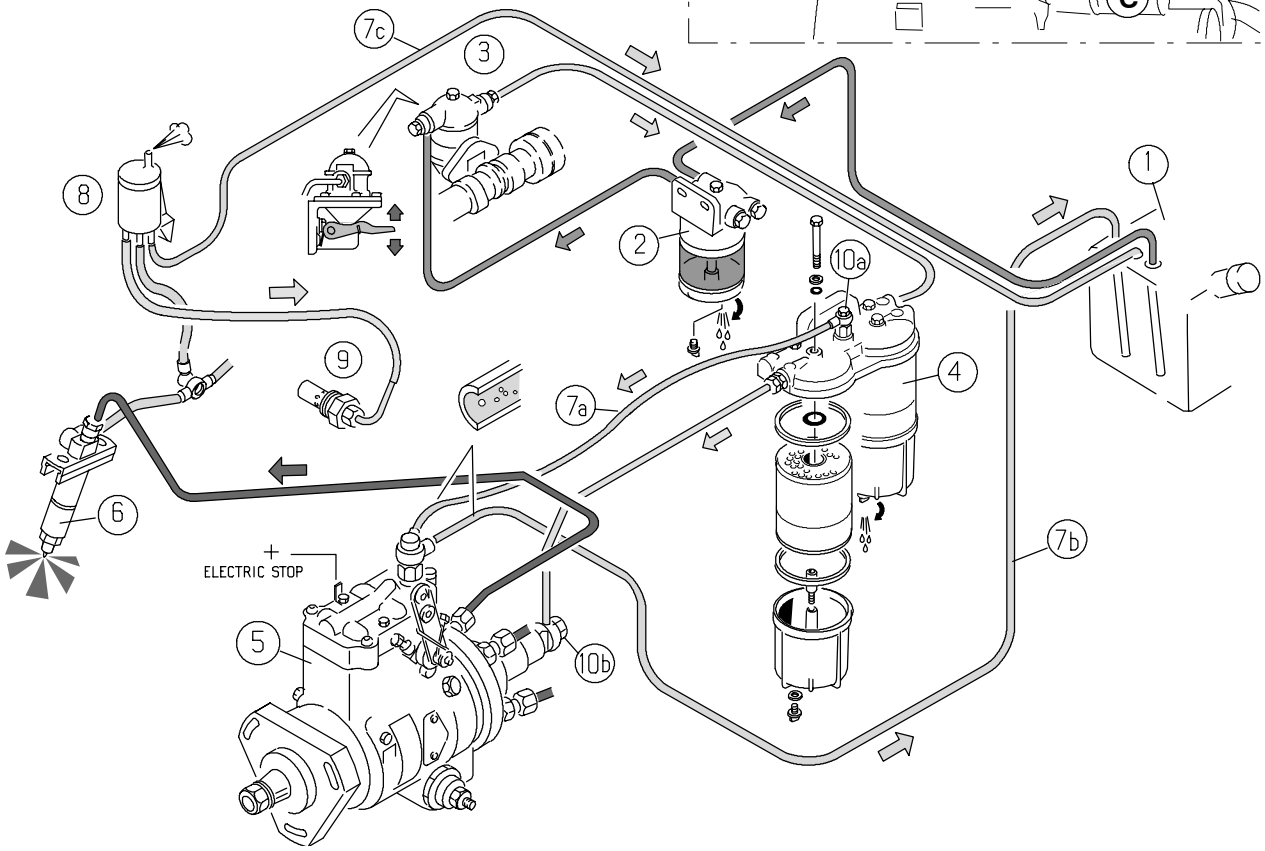
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Fuel system with distributor pump

6200, 6900, 8000R, 6300–6400 from week 24/01 incl.
All HiTech models. All latest Mezzo/Mega



1. Fuel tank
2. Water trap. 6200, 6900, 6300, 6400, 8000R and HiTech tractors have a different water trap.
3. Fuel feed pump
4. Fuel filter
5. Distributor pump
6. Injector
7a,b,c. Return fuel to tank
8. Thermostart reservoir
9. Glow plug
10a, b. Bleeding screws



In this fuel system, there is a separate fuel feed pump (3) on the RH side of the engine.

The system includes a separate water trap (2) and two fuel filters (4). The lower parts of the fuel filter housings have a space for possible impurities and there is a draining tap under both filter housings.

The fuel feed pump has a washable metal gauze filter. There is also a tapered metal net filter inside the distributor pump in the inlet line before the pump transfer pump.

Important! 6200, 6900, 8000R and all HiTech tractors have a Stanadyne water trap, which also includes a filter. There is a draining tap (B) in the bottom of the housing. Before emptying this water trap, slacken the bleeding screw (A) . After emptying, close the screws and pump fuel with the feed pump (C) lever, until the water trap is full of fuel. The Stanadyne water trap filter loosens, when securing band (D) is rotated for hand and the filter is pulled downwards. When fitting a new filter, rotate the securing band until it locks the filter (click).

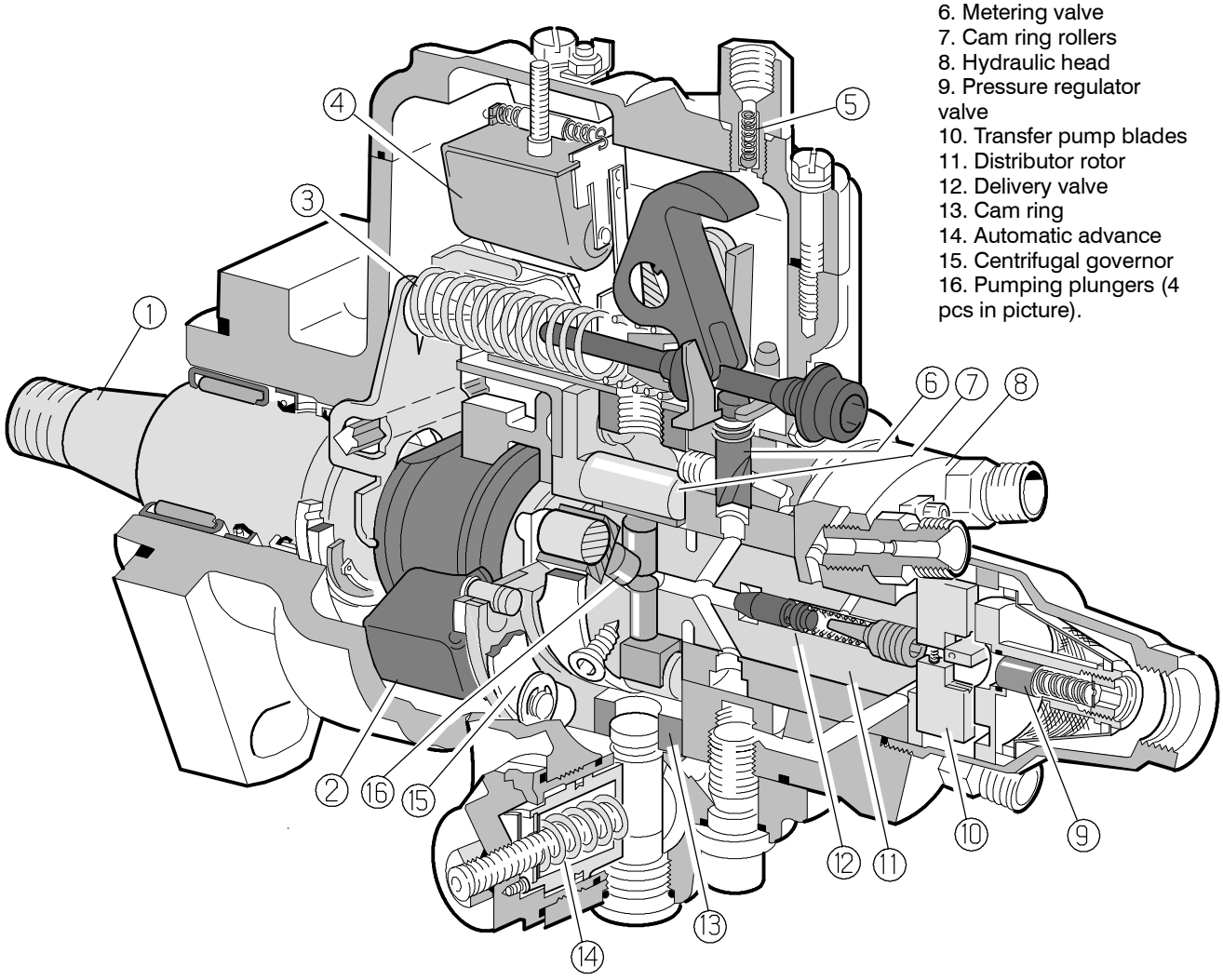
Maintenance

– Check/empty the water trap weekly/at every 50 running hours.
– Open and clean the water trap at every 500 running hours (does not concern 6200 and 8000R tractors). At the same time open the taps under both fuel filter housings and allow possible impurities to run out .
– Clean the fuel tank at every 1000 running hours/yearly and change the fuel filters (6200, 8000R: also change the water trap filter).
– Check/clean injectors at every 2000 running hours/every other year. Faulty injectors cause knocking, smoky exhaust gases and loss of engine power.

Note! When the water trap has been emptied, refill it with fuel by pumping with the fuel feed pump (3) lever. After changing the fuel filters, bleed the fuel system, see page **223**/**11**.

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Stanadyne distributor pump



1. Drive shaft
2. Governor weights
3. Governor spring
4. Stop solenoid
5. Overflow valve
6. Metering valve
7. Cam ring rollers
8. Hydraulic head
9. Pressure regulator valve
10. Transfer pump blades
11. Distributor rotor
12. Delivery valve
13. Cam ring
14. Automatic advance
15. Centrifugal governor
16. Pumping plungers (4 pcs in picture).

Construction

The main rotating components are the drive shaft, transfer pump blades, distributor rotor and governor.

The drive shaft engages the distributor rotor in the hydraulic head. The drive end of the DB2 rotor incorporates two pumping plungers and DB4 four.

The plungers are actuated toward each other simultaneously by an internal cam ring through rollers and shoes which are carried in slots at the drive end of the rotor. The numbers of cam lobes normally equals the number of cylinders (not 3–cyl. engines).

The transfer pump at the rear of the rotor is of the positive displacement vane type and is enclosed in the end cap. The end cap also houses the fuel inlet strainer and transfer pump pressure regulator. The face of the regulator assembly is compressed against the distributor rotor and forms an end seal for the transfer pump.

The pump axial force acts against the pressure regulator valve front face.

The distributor rotor incorporates two charging ports and a single axial port (pressure chamber), in which is placed the delivery valve. After the delivery valve, there is one discharge port to serve all head outlets to the fuel injection pipes.

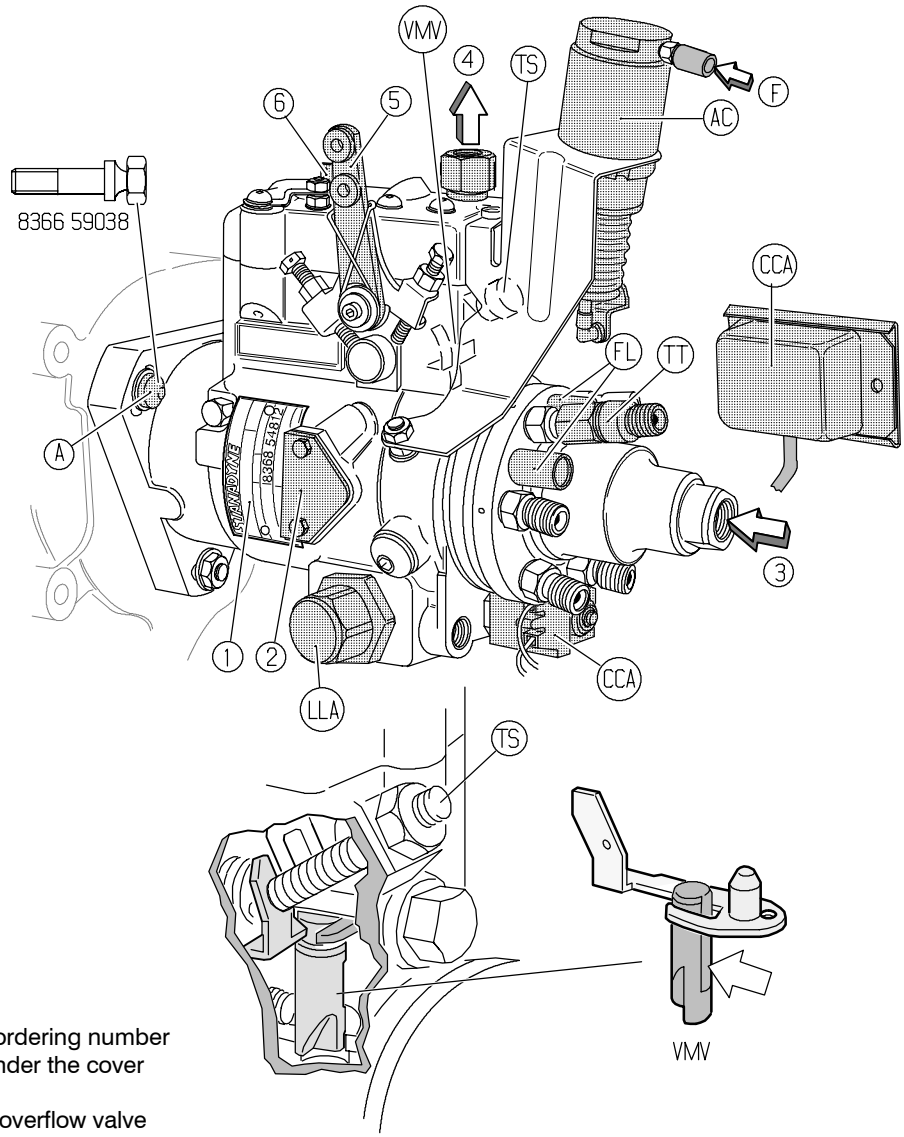
The hydraulic head contains the bore in which the rotor revolves, the metering valve bore, the charging ports and the connections to the fuel injection pipes.

The pump contains a mechanical governor. The centrifugal force of the weights is transferred to the metering valve via a linkage. The metering valve can be closed electrically with aid of the solenoid in the pump housing.

The automatic advance is a hydraulic mechanism which turns the cam ring and advances or retards the beginning of the fuel delivery from the pump.

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Stanadyne distributor pump



1. Type plate with ordering number
2. Timing marks under the cover
3. Fuel inlet
4. Fuel return flow/overflow valve
5. Revolution lever
6. Connector for wire to electric stop solenoid

Possible equipment on Stanadyne distributor pump (e.g. E–engines)

A. Interrupted screw (ordering no. 8366 59038)

TT. Detector for injection timing

FL. Fuel limiter

The fuel limiter limits the injected fuel amount nearest at low engine revs,when the air coefficient is too small.

LLA. Light load advance

Adjustment of the injection advance according to the engine revs and loading. This is controlled by the fuel feed pressure after the quantity governing valve.

AC. Aneroid control

Aneroid control (limitation of acceleration smoke) allows a full fuel injection during acceleration just when the boost pressure has risen enough.

F. Boost pressure

CCA. Compact cold advance

Electric advancing of the injection during starting and at low engine revs (below 1100 rpm) in order to decrease the cold smoking. In addition to the injection pump solenoid, the pump has a separate control unit, which follows up the engine revs.

TS. Torque screw (inside the housing).

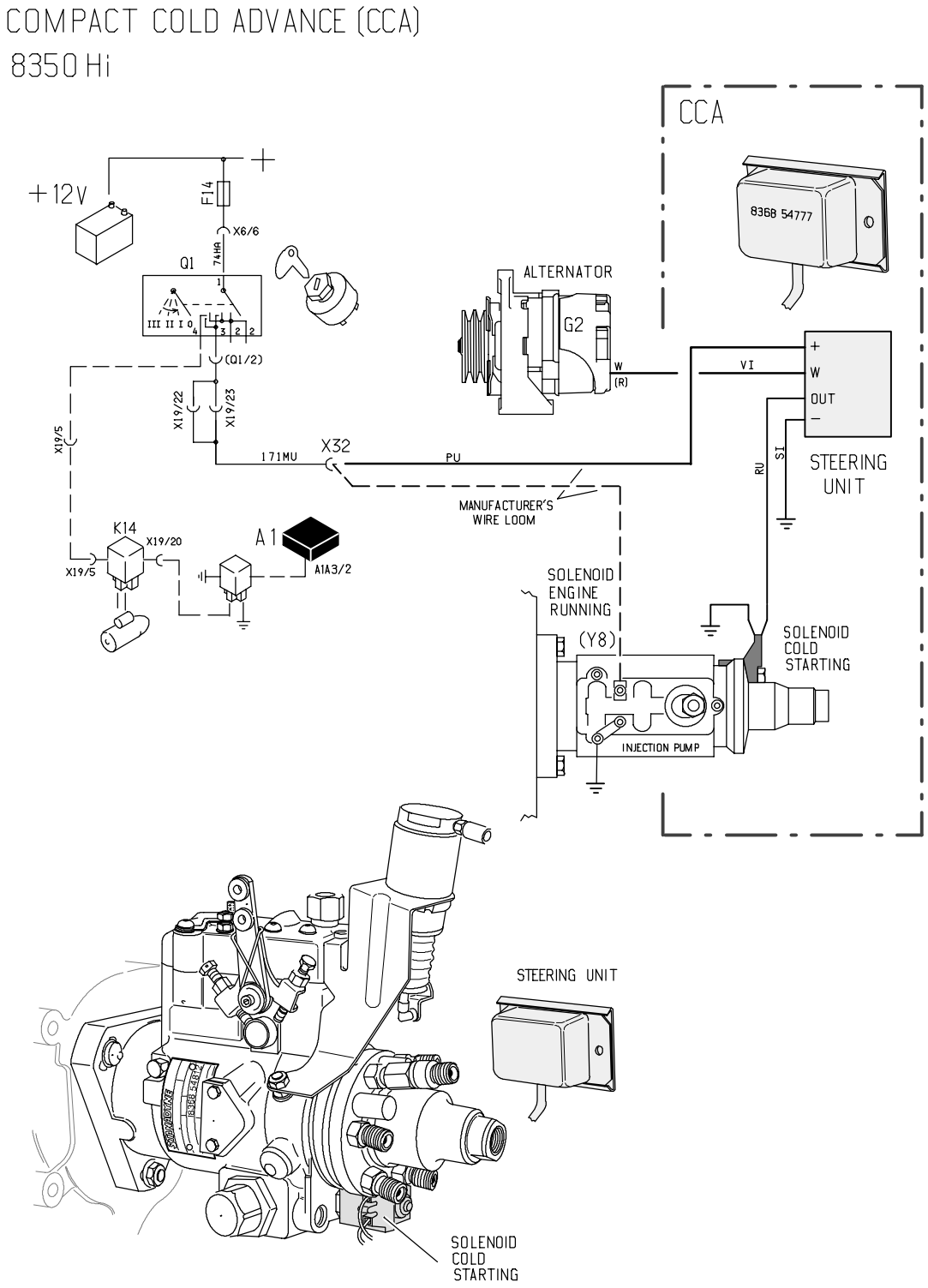
With this screw the engine specific curves for output and torque can be canged into desired form.

VMV. Vented metering valve (inside the pump housing).

The valve makes the inner bleeding of the pump better.

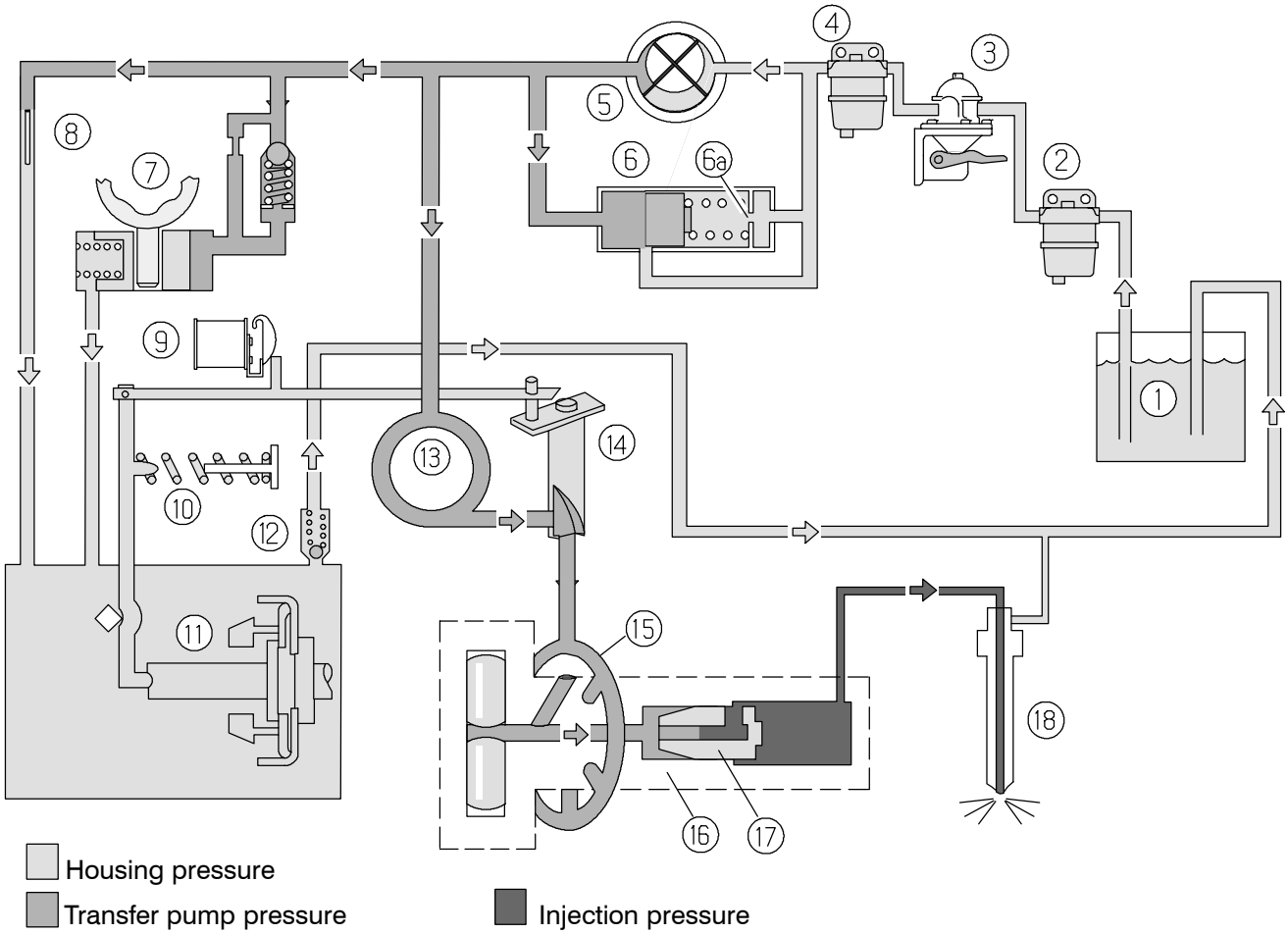
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Electric advancing of the injection (CCA), wiring diagram



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Stanadyne distributor pump



1. Fuel tank
2. Water trap
3. Fuel feed pump
4. Fuel filter
5. Transfer pump
6. Pressure regulator valve
7. Automatic advance
8. Air vent passage
9. Stop solenoid
10. Regulator spring
11. Centrifugal weights
12. Overflow valve
13. Hydraulic head connecting passage
14. Metering valve
15. Hydraulic head charging pasage
16. Distributor rotor
17. Delivery valve
18. Injector

Function

The fuel feed pump draws fuel from the tank via the water trap and the filter into the fuel injection pump.

In the pump fuel flows through the inlet filter screen into the vane type fuel transfer pump. Some fuel is bypassed through the pressure regulator assembly to the suction side.

Fuel under transfer pump pressure (1–6 bar) flows through the center of the transfer pump into the circular groove on the rotor. It then flows through a connecting passage in the head to the automatic advance and up through a radial passage and then through a connecting passage to the metering valve. The metering valve adjusts amount of injected fuel and position of the metering valve is controlled by the governor (revolution lever) and the stop solenoid. From the metering valve fuel flows to the radial charging passage and further to the head charging ports.

As the rotor revolves, the two rotor inlet passages register with the charging ports in the hydraulic head, allowing fuel to flow into the pumping chamber. With further rotation, the inlet passages close and the port to the injectors opens.

While the discharge post is opened, the rollers contact the cam lobes forcing the plungers together. Fuel trapped between the plungers is then pressurised and delivered by the nozzle to the combustion chamber.

The injection pump is self–lubricating, and it has not been connected to the engine lubrication system.

As fuel at transfer pump pressure reaches the charging ports, slots on the rotor shank allow fuel and any entrapped air to flow into the pump housing cavity. In addition, an air vent passage in the hydraulic head connects the outlet side of the transfer pump with the pump housing. This allows air and some fuel to be bled back to the fuel tank via the overflow valve.

The fuel thus bypassed fills the housing, lubricates the internal components, cools and carries off any small air bubbles. The pump operates with the housing completely full of fuel; there are no dead air spaces anywhere within the pump.

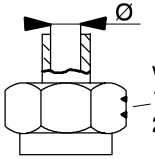
Valtra Valmet – tractors' Stanadyne – rotary pumps and delivery pipes

Tractor	Engine	Distributor pump		Static injection advance	Dynamic injection advance (°/rpm)				Extra equipment **)	Delelivery pipe inner diameter***)
	Type	Type	Ordering no		Low idling	Max revs ±1,0°	1400 rpm (full loading) ±1,0°	2200 rpm (full loading) ±1,0°		
6200 (–K41123)	420 DSRE	DB4427–5218/B	8367 54743 (836754665)*)	6°	–	–	–	–	TS	ø 1,75 mm
6250Hi **6200** (K41124–)	420 DSRE	DB4429–5569/A	8367 54825 (836754824)*)	15°	8°	11°	15°	16,5°	TS	ø 1,75 mm
6350Hi **6300** (L23438–)	420 DSRE	DB4427–5524	8367 54828	16°	>6°	10,5°	16°	17,5°	TS	ø 1,75 mm
6550Hi **6400** (L23506–)	420 DWRE	DB4427–5254/E	8367 54866 (836754737)*)	16°	>3,5°	10°	14,5°	16°	TS, AC	ø 1,75 mm
6650Hi	420 DWRE	DB4427–5525	8367 54829	16°	4°	9°	15°	17°	TS, AC	ø 1,75 mm
6750Hi	420 DWRIE	DB4427–5764	8367 54917	12°	>10°	13°	14,5° 1200 rpm	14° 1800 rpm	TS, LLA, VMV, AC	ø 1,75 mm
6800 (L23517–) **6850Hi**	420 DWRIE	DB4427–5526	8367 54822	16°	>10°	15°	15,5°	17°	TS, LLA, VMV, AC	ø 1,75 mm
6900	620 DRE	DB4629–5345/A	8368 54749 (836854738)*)	18°	>17°	22°	17°	22°	TS, FL, LLA, VMV	ø 1,5 mm
8050 (–L22533) **8050** (L22534–) **8050Hi**	620 DSR 620 DSRE 620 DSRE	DB2635–5243 DB4629–5636 DB4629–5636	8368 54679 8368 54860 8368 54860	20° 14° 14°	– 6° 6°	– 12° 12°	– 12,5° 12,5°	– 15,5° 15,5°	TS TS, VMV TS, VMV	ø 1,5 mm ø 1,75 mm ø 1,75 mm
8150 (–L24138) **8150** (L24139–) **8150Hi**	620 DSR 620 DSRE 620 DSRE	DB4629–5244 DB4629–5364 DB4629–5364	8368 54678 8368 54739 8368 54739	18° 17° 17°	– >12° >12°	– 18° 18°	– 14,5° 14,5°	– 18° 18°	TS TS, FL, LLA, VMV TS, FL, LLA, VMV	ø 1,5 mm ø 1,5 mm ø 1,5 mm
8350Hi **8350Hi**	620 DSRIE 620 DSRIE	DB4629–5346/A DB4629–5763	8368 54826 (836854744)*) 8368 54923	15° 15°	>9° >9°	16,5° 16,5°	14,5° 1100 rpm 14,5°	14,5..17° 1800 rpm 14,5..17°	TS, FL, LLA, AC, CCA TS, FL, LLA, AC, CCA	ø 1,75 mm ø 1,75 mm
8450 (–L24208) **8450** (L24209–) **8450Hi**	620 DWR 620 DWRE 620 DWRE	DB4629–5207 DB4629–5637 DB4629–5637	8368 54674 8368 54859 8368 54859	18° 14° 14°	– >14° >14°	– 18° 18°	– 14° 14°	– 16° 16°	TS TS, LLA, AC, VMV TS, LLA, AC, VMV	ø 2,0 mm ø 1,75 mm ø 1,75 mm
8550 (–L24115) **8550** (L24116–) **8550Hi**	634 DSR 634 DSRE 634 DSRE	DB4629–5208 DB4629–5527 DB4629–5527	8368 54675 8368 54827 8368 54827	16° 15° 15°	– >10° >10°	– 16,5° 16,5°	– 13,2° 13,2°	– 15,4° 15,4°	TS TS, LLA, AC, VMV TS, LLA, AC, VMV	ø 2,0 mm ø 2,0 mm ø 2,0 mm

Note! Adjusting values of Bosch in–line pumps, see pages **220/2**, **8**, **8B** and **9**.

*) Number of basic pump, marked on type plate of pump.

) See page **220/12A.



***) Delivery pipe inner diameter

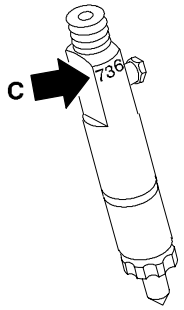
without notch, Ø 1,5 mm
1 notch, Ø 1,75 mm
2 notches, Ø 2,0 mm



The latest pipes have numbers on nut.
without numbers, Ø 1,5 mm
1.8, Ø 1,75 mm
2.0, Ø 2,0 mm

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ValtraValmet– tractors, Stanadyne injectors

Tractor	Type of injector	Ordering no of compl. injector	Ordering no of nozzle	Nozzle opening pressure, bar	Adjusting pressure, bar (value to be used both with new and used nozzles).	Shims no 1,00...2,00 mm	Code C
6000, 6100 **6200** (–K41123) **6300** (–K42118) **6400** (–K42107) **6600, 6800** (–L23516) **8000, 8100, 8200** **8400** 103 kW (–K34331) **8050** (–L22533) **8150** (–L24138) **8450**(–L24208) **8750, 8550 USA**	S/736	8366 39956	8366 39957	230+10	240	8366 40104...8366 40122	736
6900, 8000R USA, 6200 USA, 6300 USA, 8150Hi **8150** (L24139–)	M/423	8368 54755	8368 54757	270+8	278	8368 62000...8368 62020	423
8550 (–L24115)	S/655	8363 40034	8363 39985	230+10	240	8366 40104...8366 40122	655
6250Hi, 6350Hi, 6750Hi, 6850Hi,8350Hi, 8550Hi **6200** (K41124–) **6300** (K42119–) **6400** (K42108–) **6800** (L23517–) **8550** (L24116–)	M/358	8366 59808	8366 59902	270+8	278	8368 62000...8368 62020	358
6550Hi, 6650Hi, 8050Hi, 8450Hi **6400** (L23506–) **8050** (L22534–) **8400** 110 kW (K32135 – L33320) **8450** (L24209–)	M/446	8368 54831	8368 54832	270+8	278	8368 62000...8368 62020	446
8950Hi	M/876	8368 54791	8368 54792	270+8	278	8368 62000...8368 62020	876
8400 118 kW (L23130–)	M/301	8368 54940	8368 54941	270+8	278	8368 62000...8368 62020	301

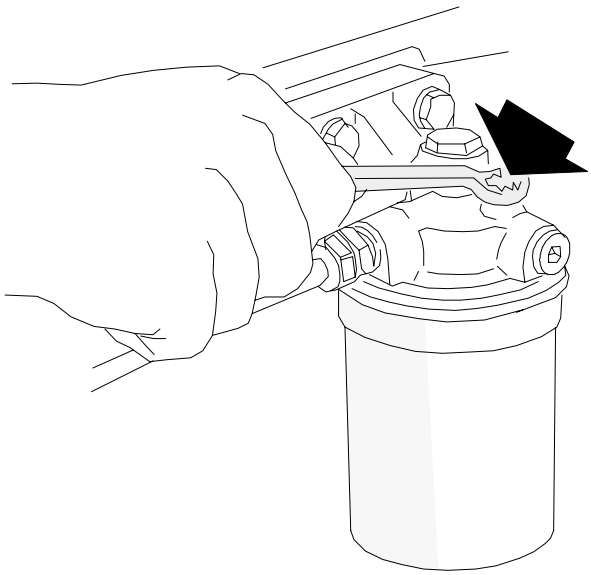
https://truckmanualshub.com/

Repair instructions

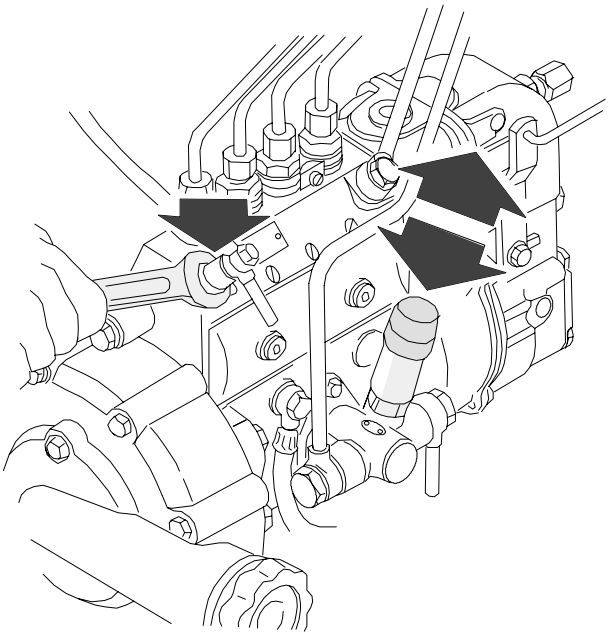
Fuel feed pump and fuel filter (Op no 222)

Bosch in–line pump

A. Bleeding fuel system



1. Slacken the bleeder screw on the filter head (8200, 8400, 8750 and 8950 have a double filter). Pump with the hand pump until the fuel flowing out at the bleeder screw is free from air bubbles. Then tighten the bleeder screw.



3. Slacken the injection pump overflow valve. Pump with the hand pump until the fuel flowing out is free from air bubbles. Tighten the overflow.

4. Wipe off any fuel from the engine.

B. Bleeding thermostart system

Always remove air from the glow plug fuel pipe when the pipe or reservoir has been emptied during repair work etc. This prevents damages to the glow plug caused by lack of fuel during starting.

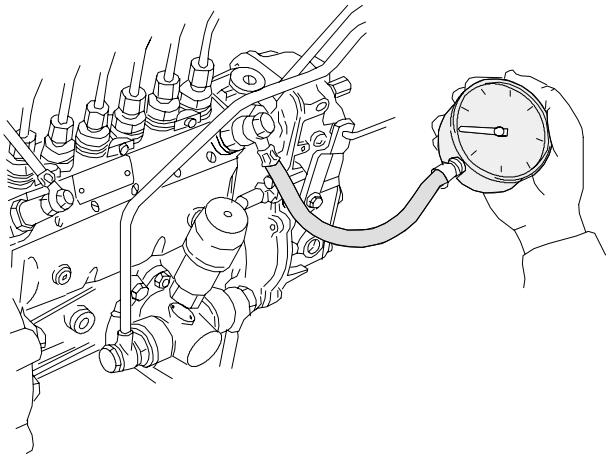
1. If the reservoir is empty, fill it e.g. with a drip pot through the breather hole on the reservoir.

2. Open the glow plug pipe connector and drain fuel from the pipe. Connect the pipe.

C. Measuring fuel feed pressure

Note! Measuring equipment, see page **220**/**3**.

1. Clean the fuel injection pump and the filter and the pipes between them.



2. Fit the gauge at the banjo connection on the pump, as shown above (between filter and injection pump).

3. Run the engine at low idling for a while and compare the gauge reading with the prescribed value (**0,6–1,0 bar)**.

N.B. If the measured pressure is below the prescribed value, this may be caused by:

– faulty overflow valve
– blocked fuel filter
– faulty fuel feed pump
– blocked or leaking fuel pipes or unions

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D. Checking overflow valve

If the fuel feed pressure deviates from the prescribed value, check the opening pressure of the overflow valve.

1. Connect a pressure gauge to the banjo union in the same way as in previous **instruction C**.

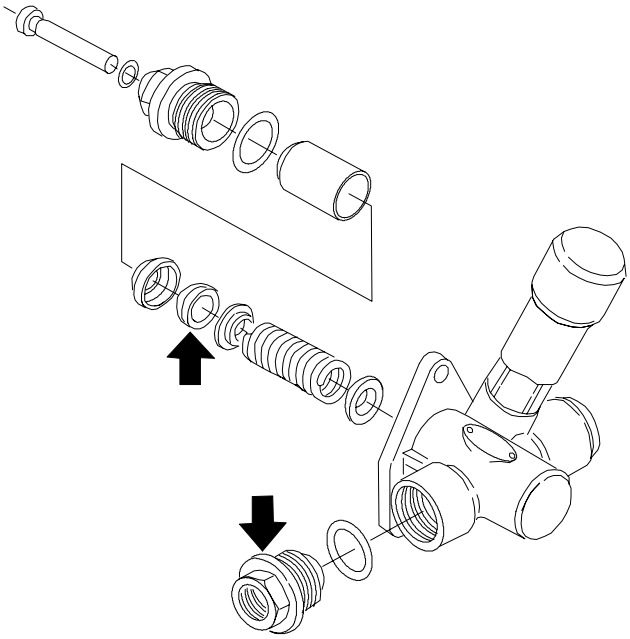
2. Pump with the hand pump until the overflow valve opens. Compare the reading on the gauge at the moment the valve opens with the prescribed value (**0,6–1,0 bar**).

3. If the recorded opening pressure deviates from the prescribed value, the overflow valve should be changed.

N.B. If the recorded pressure is considerably lower than the prescribed value, there may be a fault in the hand pump or the fuel feed pump valves.

E. Changing fuel feed pump valves

1. Clean the feed pump. Disconnect fuel pipes to the feed pump. Remove the feed pump.



2. Secure the pump in a vice provided with soft jaws. Loosen the tappet body from the pump and remove the piston, seal rings, suction valve and the spring.

3. Detach from the pump body the outlet side threaded connector, in which is placed the pressure valve.

4. Rinse the valves with clean fuel and check the function and possible wear.

5. Change the valve if needed and assemble the pump using new o–rings and gasket

Fuel injection pump and injectors (Op no 223) (Bosch in–line pump)

Note! Concerning fuel injection pumps with a new type governor, see page **223**/**8**.

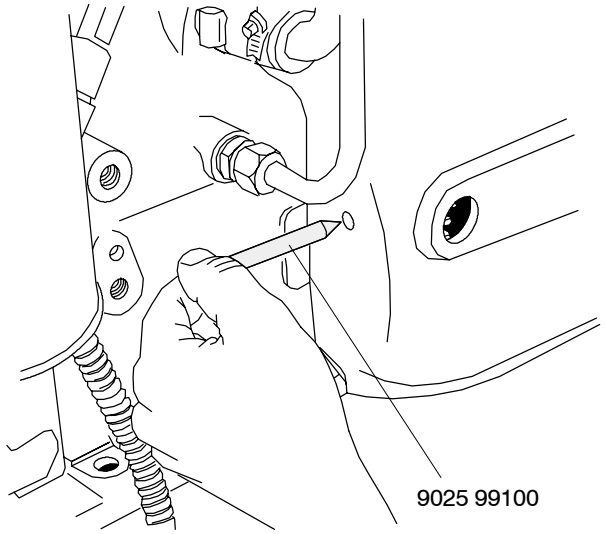
A. Checking injection timing

Note! The exact time at which the fuel should be injected into no. 1 cylinder is marked with a punch mark on the flywheel. There is an inspection hole in the flywheel housing and a hole for the locating tool. Due to the excess fuel flowing into the injection pump the control rod must be moved to the drive position when checking the injection timing. Otherwise the timing will be incorrect!

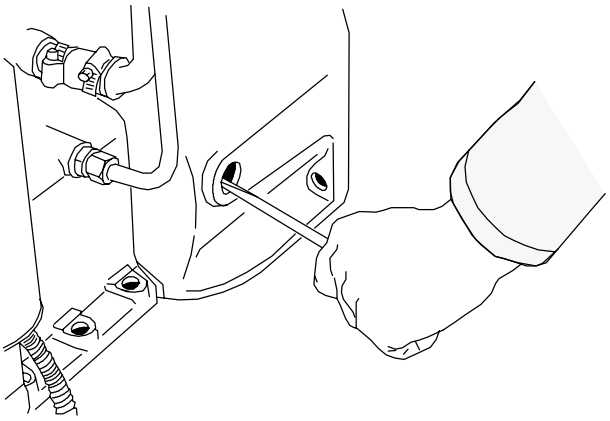
Checking method:

1. Clean the injection pump and its surroundings carefully.

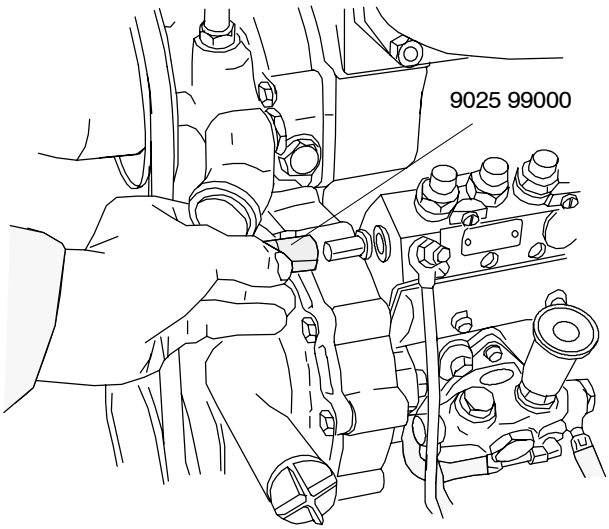
2. Remove the inspection hole rubber plug from the flywheel housing.



3. Insert the locator (9025 99100) in the hole on the flywheel housing front face.



4. Turn the crankshaft to a position where the 1st cylinder piston reaches its compression stroke top dead centre. Then turn the crankshaft backwards until the timing mark on the flywheel passes the inspection hole.



5. Remove the protecting cap for the control rod on the injection pump front face. Fit adjusting tool (sleeve for limiting control rod travel) 9025 99000. The tool moves the control rod to the ”running position”.

6. Disconnect the delivery pipe for the number one cylinder injector at the pump.

7. Clean the delivery valve of fuel. Slowly turn the crankshaft in the correct direction of rotation until the fuel level in the delivery valve just begins to rise.

8. Check if the mark on the flywheel is at the point of the locator which has been inserted into the flywheel housing. Repeat the check procedure. If the injection pump needs to be adjusted, follow the instructions under **heading B**.

9. Fit the delivery pipe and the rubber plug in the flywheel housing. Remove the locator and the sleeve which was used to limit the control rod travel. Start the engine.

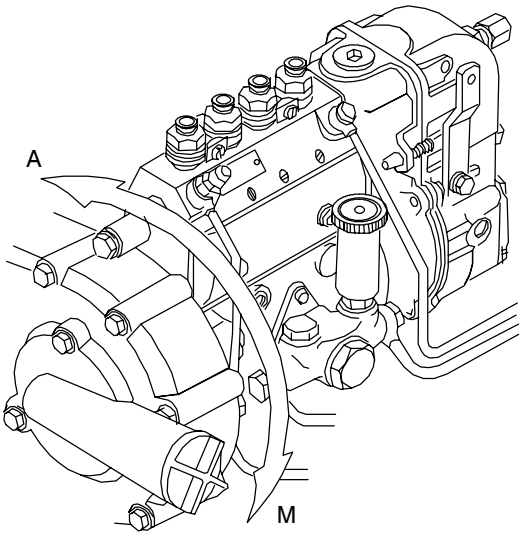
B. Adjusting fuel injection timing

Important! Adjusting fuel injection timing on 6800, 8750 and 8950 tractors, see page **223**/**8**. Later on all tractors which have Bosch in–line pump (**G4720–** (320), **G2358–** (420) and **G5294–** (620, 634), the injection timing is adjusted according to instruction on page **223**/**8**.

If the timing is incorrect, adjust as follows:

1. Loosen the retaining nuts (17 mm) of the injection pump and remove the delivery pipes (17 mm).

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2. If the injection timing is retarded, turn the pump anti – clockwise (viewed from the front end of the pump). If the timing is advanced, turn the pump clockwise.

3. Check once again the injection timing and set again if needed.

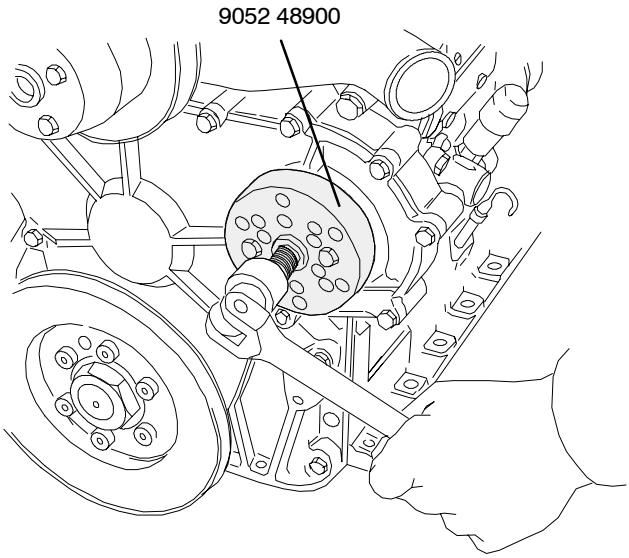
4. When the timing is correct tighten the retaining nuts of the pump and fix the delivery pipes.

C. Removing fuel injection pump

1. Clean the injection pump and surrounding engine parts and the pipes and connectors on the injection pump.

2. Disconnect the delivery pipes and the banjo bolts at the supply and return fuel connections. Disconnect the lubricating oil line. Plug all connections.

3. Detach the oil filler pipe/cover from the front cover. Unscrew the pump drive gear nut.



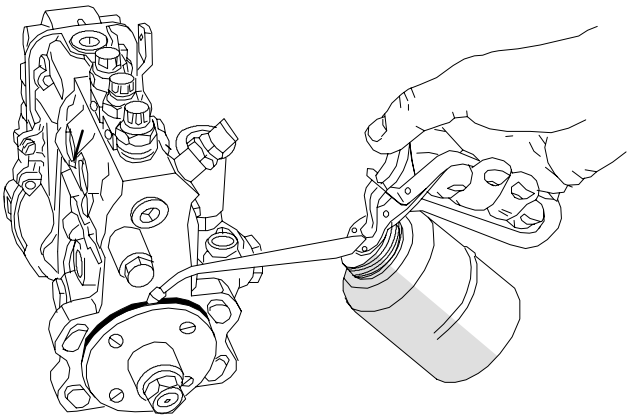
5. Use puller 9052 48900 and loosen the gear from the injection pump camshaft front end.

6. Remove the injection pump attaching nuts (17 mm). Remove the injection pump.

N.B. If the engine is not to be disturbed while the pump is removed, there is no need to secure the pump gear. The gear rests against the idler gear.

D. Fitting fuel injection pump

1. Check the condition of the o – ring between the pump and the timing gear casing. Change the o – ring if necessary.



2. Lubricate the o – ring and place the injection pump so that the key on the pump shaft aligns with the key slot inside the gear. Tighten the pump attaching nuts.

3. Tighten the gear nut to **90 Nm** . Fix the oil filler pipe/cover.

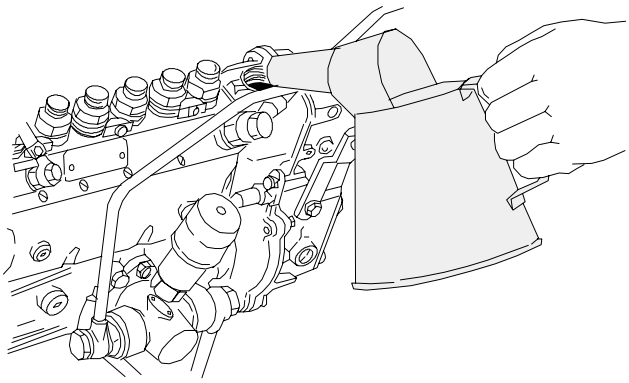
4. Connect the supply and return fuel lines. Connect the lubricating oil line. Use new sealing washers.

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5. Bleed the fuel system (**Op no 222 A**).

6. Adjust the injection timing (**Op B**).

7. Fit the delivery pipes.



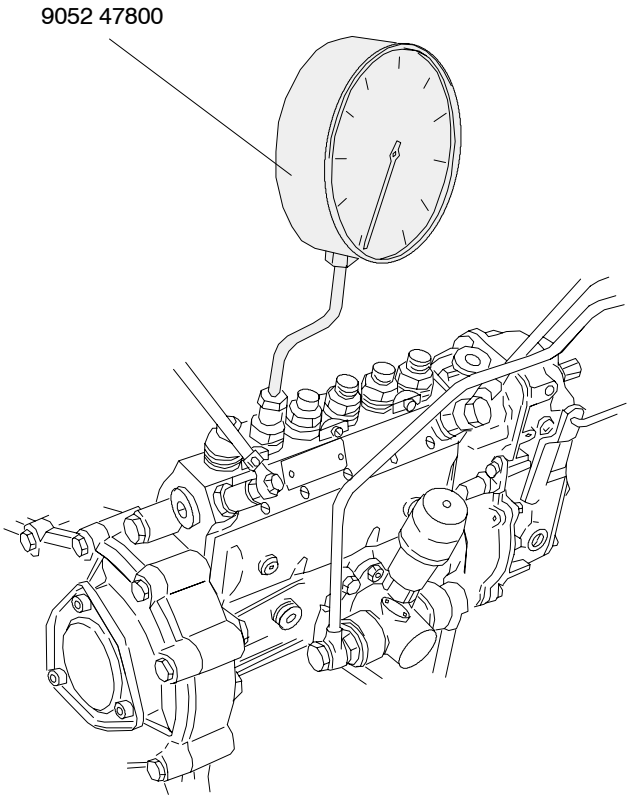
8. If the injection pump is changed or if the lubricating oil has been drained from the pump, fill the pump with lubricating oil before starting the engine. Open the hexagonal socket plug on the governor housing and pour in oil.

Filling quantity: 320–engines **0,3 l**
420–engines **0,4 l**
620–engines **0,6 l**

Same oil specification as in the engine.

E. Checking/changing delivery valve

1. Clean the injection pump, injectors and surrounding parts. Disconnect the delivery pipes.



2. Connect the pressure gauge 9052 47800 to the delivery valve holder which is to be checked.

3. Rotate the engine with the starter motor, until the gauge reading is about **330 bar**.

Note! Pressure rises fast, do not damage the gauge. Get ready to pull the stop control out as soon as the gauge reading reaches an adequate pressure value.

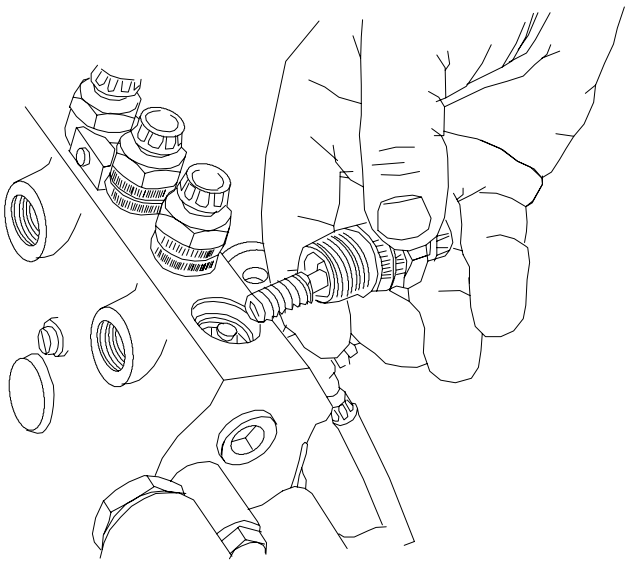
4. Let the gauge reading lower at first about **30 bar**. When the gauge shows 300 bar, observe the reading during one minute. During this time the gauge reading must not lower too much (max 30–50 bar). If the pressure lowers faster than specified, the delivery valve must be cleaned or replaced.

Note! The delivery valve plunger and guide should always be replaced in pairs.

5. Open the delivery valve holder locking and holder. Remove the valve spring, plunger and the guide.

6. Rinse the plunger and guide in clean fuel or test liquid and at the same time rotate the plunger in its guide and press the sealing surfaces against each other.

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7. Fit the delivery valve into the fuel injection pump. Place the spring in place and tighten the holder.

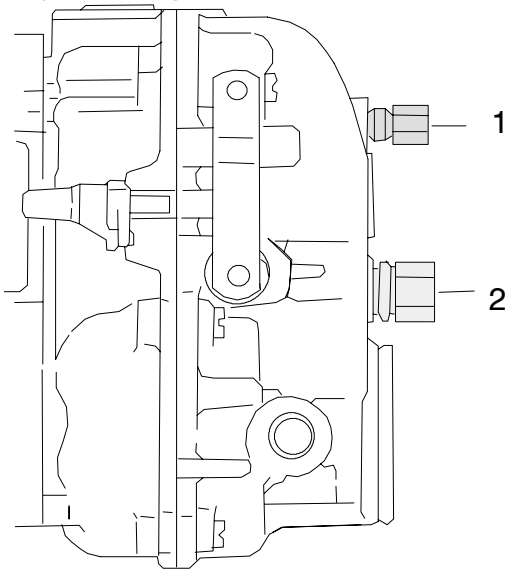
Note! Renew the sealing ring and o–ring.

8. **Tighten the holder as follows:**

– Tighten first to **30 Nm**.
– Open the holder about 1/2 a turn and tighten to **40 Nm**.
– Open the holder about 1/2 a turn and tighten to **45 Nm**.

F. Adjusting low idling speed

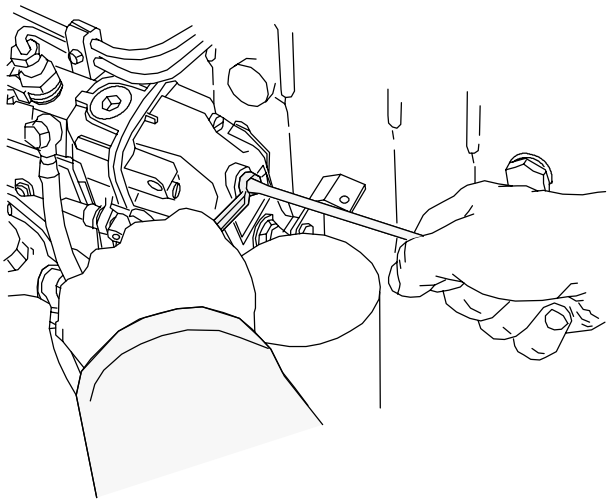
If the idling speed of the engine deviates from the value given in the specifications or if the engine revs vary at the idling speed, adjust the idling speed as follows:



1. Unscrew the idling speed adjusting nut cap (1) and the cap (2) on the idling speed additional spring adjusting screw.

2. Ensure that the throttle lever is in the idling position and that the engine is at normal operating temperature.

3. Start the engine and loosen the adjusting screw of the additional spring so that it does not affect the idling speed.



4. Adjust the idling speed using the adjusting screw to about 20 RPM below rated speed and lock the adjusting screw (10 mm).

5. Run the engine a few times and ensure that the idling speed remains as set.

6. Tighten the adjusting screw of the additional spring until the idling speed rises to the rated value. Lock the adjusting screw (17 mm) in this position.

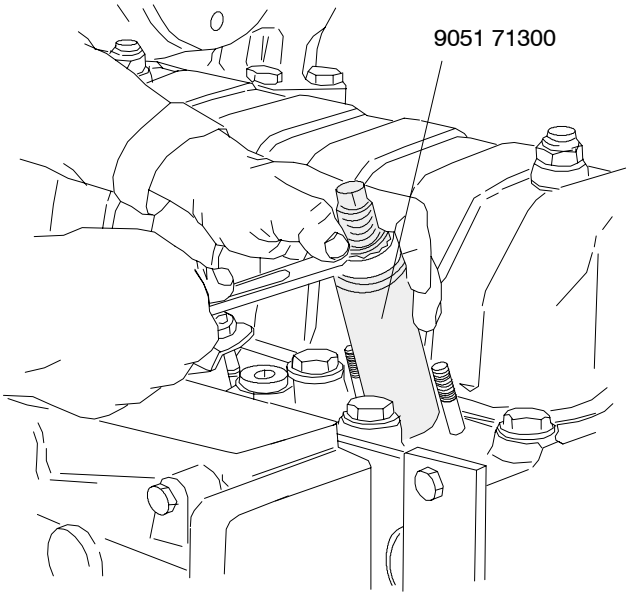
7. Fix the safety caps of the adjusting screws.

Note! Other adjustments (output and max. speed) of the injection pump can only be performed by a specially trained person who has the necessary special tools and gauges available.

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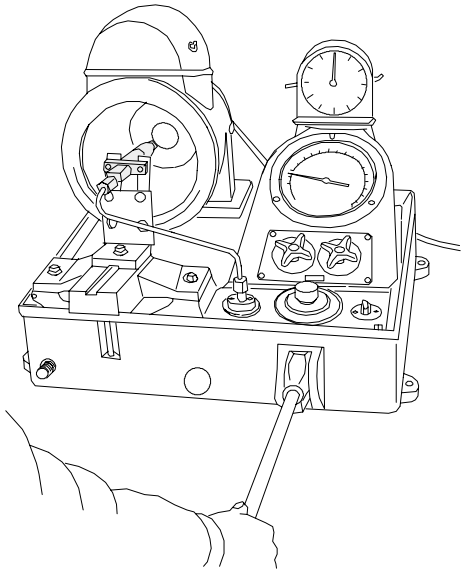
G. Removing injectors

1. Clean the injectors and the area around them. Disconnect the delivery pipes and the leak – off pipes.



3. Remove the injector attaching nuts (13 mm) and remove the injector from the cylinder head. Fit protective plugs to all connections. If the injector does not rise by hand, use puller 9051 71300.

4. Remove the sealing washers from the bottom of the injector location in the cylinder head if they do no come out with the injector



2. Secure the injector in a test bench and check the following:
– injector opening pressure
– the properties of the chattering (creaking) sound and the form of the spray pattern
– sealing of nozzle valve against its seat

Opening pressure

Pump a few times to fill the injector. Increase the pressure in the injector until the chattering (creaking) sound becomes audible. Read off the opening pressure of the injector. If the opening pressure deviates from the given value (230±5 bar), the injector should be taken apart and checked.

Adjustment is achieved by changing the shims. The thickness of the shims varies from 1.00 – 1,90 mm and they are available in increments of 0,05 mm. A thicker shim will raise the opening pressure while a thinner one lowers it. A difference in shim thickness of 0,05 mm changes the opening pressure by approx. 5,0 bar. As the opening pressure of the injector drops slightly after adjustment, the opening pressure should be set to approximately 10 bar above the value given in the specifications. This value applies both to new and used injector.

H. Inspecting injectors

N.B. When pressure testing the injectors, it is important to avoid the nozzle end as the fuel jetting out easily penetrates the skin. Also bear in mind that the fuel "mist" is dangerous to inhale.

1. Clean the injector with cleaning fluid and a soft brush.
The carbon deposits must not be knocked off or removed in any other way which may damage the nozzle.

Chattering sound properties

Testing with a hand powered pump does not create the same circumstances as when the injector is fitted in the engine. Only with new nozzles are the test results reliable. With used nozzles, there is no chattering (creaking) sound when the tester is pumped at a certain rate. This has to do with the design of the nozzles.

However, with a rapid pumping on the tester handle, it should be possible to hear the chattering (creaking) sound or/and see a mist of the fuel jetting out.

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Tightness of nozzle

Press down the tester pump lever until the pressure rises to approx. 20 bar below the adjusting value. Maintain this pressure for approximately 10 seconds and check whether drops of fuel are formed on the point of the nozzle. If the injector leaks, it should be cleaned or the nozzle should be changed.

I. Reconditioning injectors

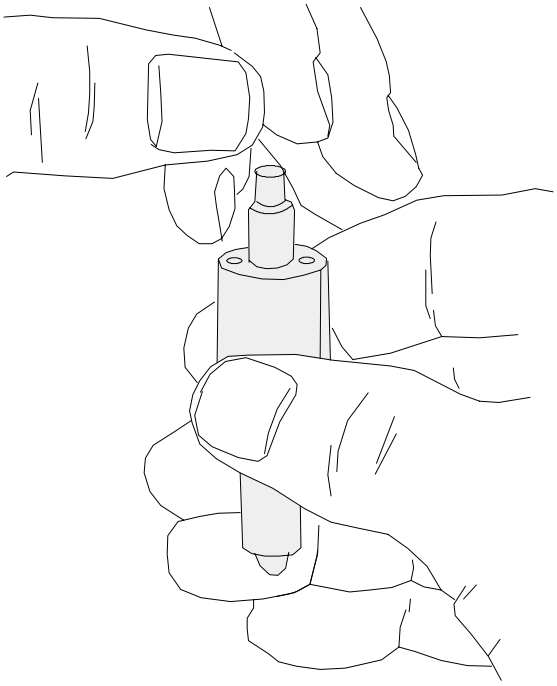
1. Secure the injector in a suitable way.

2. Unscrew the nozzle cap nut. Remove the nozzle and the parts inside the holder.

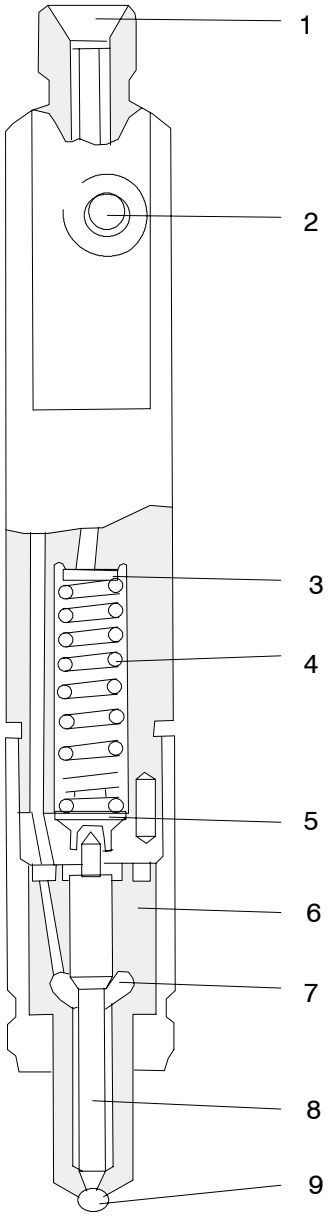
3. Clean the nozzle in cleaning fluid both inside and outside.

4. Clean the nozzle holes with a needle (including in cleaning set 8360 83288).

5. Test the movement of the nozzle valve as follows:



Rinse the parts thoroughly in fuel or testing fluid. Pull the valve out of the nozzle body to 1/3rd of its length. If the fit is correct, the valve should be able to slide down in the nozzle body under its own weight. Turn the valve slightly and repeat the test. Should the nozzle valve bind slightly, it should be changed.



Injector

1. Fuel inlet
2. Leak – off fuel
3. Shims
4. Pressure spring
5. Valve stop spacer
6. Nozzle body
7. Pressure chamber
8. Nozzle valve
9. Nozzle hole

6. Before assembling, all parts should be carefully cleaned in clean fuel or testing fluid.

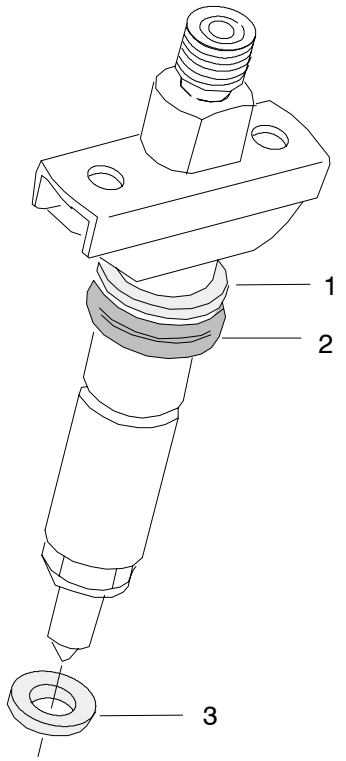
7. Put the same number of shims back as were fitted earlier. Note possible adjustment of the opening pressure. Assemble the rest of the injector. Note the position of the spring guide and the valve stop spacer.

8. Tighten the nozzle cap nut by hand and then to **60 Nm**.

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J. Fitting injector in engine

1. Clean the injector sealing surface in the cylinder head. If necessary use a reamer 9101 66000.



1. Washer
2. Rubber ring
3. Sealing washer

2. Fit the injector in the cylinder head using a new sealing washer.

N.B. The spray pattern from the injector is not symmetrical on purpose. It is therefore important that the injector is fitted correctly in the cylinder head. The connection for the leak–off line should be facing the valve mechanism.

3. Fit the attaching clamp and tighten the nuts (13 mm) evenly to **15 Nm**.

4. Connect the leak–off line (10 mm) together with new sealing washers and connect the delivery pipes (17 mm).

N.B. The screw studs in the cylinder head for the injectors should only be finger tight. If tools have to be used the studs should be tightened only lightly.

Note! Make sure, that the injector is of a correct type. Wrong injectors cause malfunctions and can damage the engine.

K. Fitting delivery pipes

1. Check the state of the pipes. If there are kinks, damage by chafing, or if the tapered sealing end is damaged, the pipes should be changed.

2. Fit the pipes without tension and check that they are at right angles to the union.

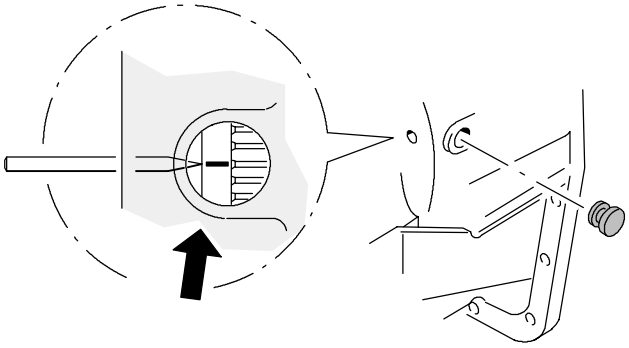
3. Fit the clamps for the pipes.

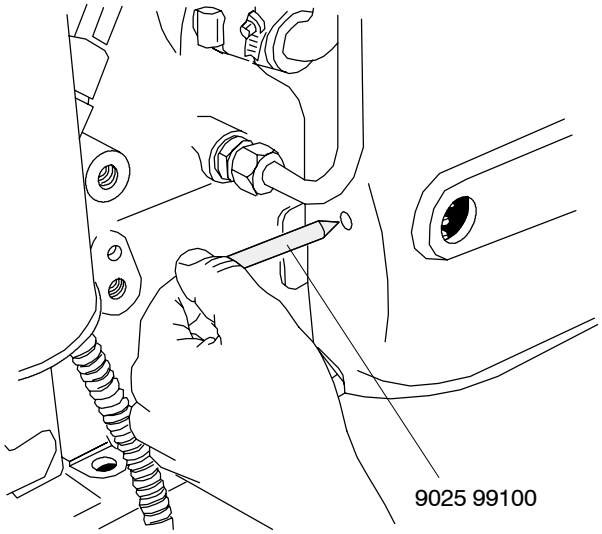
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L. Adjusting injection timing on 6800, 8750 and 8950 tractors

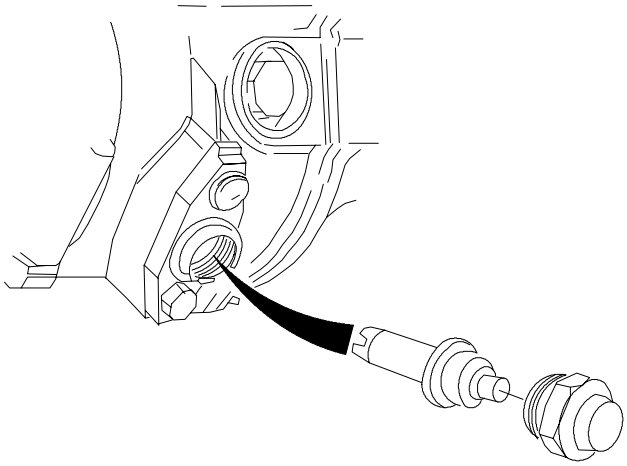
Important! Adjusting fuel injection timing on 6800, 8750 and 8950 tractors and later on all tractors which have Bosch in–line pump (**G4720–** (320), **G2358–** (420) and **G5294–** (620, 634), the injection timing is adjusted according to this instruction.

Note! On these tractors the injection starting point in the 1st cylinder has been positioned with aid of an indicator pin in the pump governor housing.





1. Turn the crankshaft to a position where the 1st cylinder piston reaches its compression stroke top dead centre. Then turn the crankshaft backwards until the timing mark on the flywheel is at the point of locator 9025 99100.



2. Unscrew the plug on the side of the injection pump. Take out the indicator pin.

3. Turn the indicator pin and push it into the hole so that the groove at the end of the pin points towards the pump.

4. If the pin groove fits on the boss on the governor weight assembly, the injection timing is correct. Otherwise, turn the pump to a position where the boss and the pin groove align.

Warning! Do not rotate the crankshaft when the groove end of the pin is inside the pump, since the pin end damages easily and metal pieces remain in the governor housing.

5. When the adjustment is correct, turn the indicator pin so that the groove points outwards (running position) and push the pin into the hole. Refit the plug.

Note! When checking the injection timing, an electric testing device can also be used, e.g. Bosch KDEP 1601 according to the instruction manual of the device.

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Manifold pressure compensator on 6800 tractor (Bosch LDA)

Note! Boost control is fitted also on 8750 and 8950 tractors which have SigmaPower system.

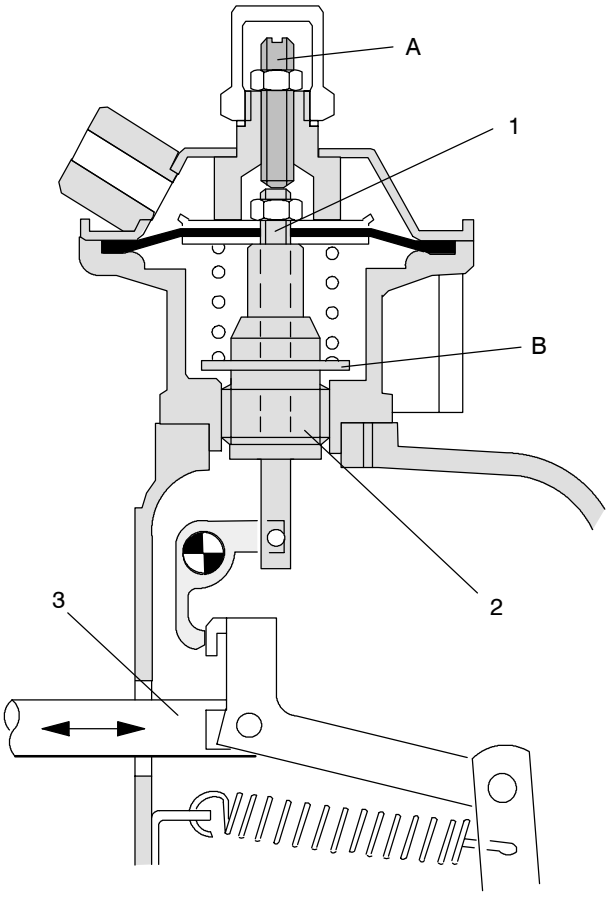
The boost control unit on the governor housing has been connected via a hose to the engine inlet manifold. At low revs the boost pressure is low and engine tends to smoke. The boost control limits amount of injected fuel at low revs so that exhaust gas emissions are below standard R24. This adjustment starts at a certain, adjusted, boost pressure.

The boost control unit membrane is pre–tightened and air tight. A spring in the unit affects the lower surface of the membrane; the other end of the spring rests against the threaded guide sleeve (2). The spring tension can thus be changed in certain limits (adjusted in factory).

With thread equipped pin (1) is attached to the membrane. The lower end of the pin transmits movement of the membrane via an angle piece to the injection pump control rod (3).

When increased boost pressure presses the membrane downwards, also the pin moves downwards against the spring force and allows the control rod to move towards the greater fuel amount, which is injected into the combustion chambers. When the boost pressure decreases, the control rod moves towards the smaller amount of injected fuel.

Important! The boost control unit has been adjusted in the factory, and adjustments afterwards are not necessary.



Picture 1. *Boost control*

A. *Adjustment screw with which is adjusted fuel amount, which the injection pump injects at low boost pressure.*

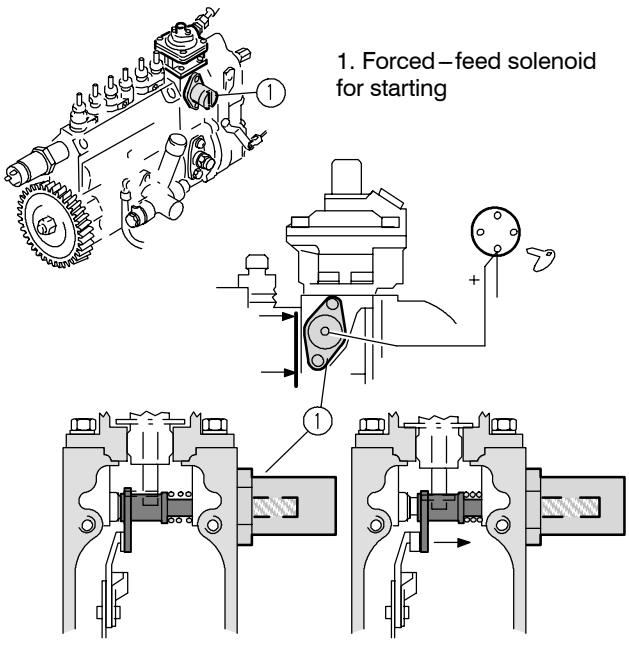
B. *The operating pressure is adjusted by removing the plug and by adjusting wheel B with a screwdriver.*

Cold start solenoid

Note! This solenoid is also fitted on 8750 and 8950 tractors.

When the engine is started, the control rod must move to the starting position. This can be done by moving the boost control lever in the direction of the axle, so that the lever cannot affect any more the injection pump control rod. The mechanism functions with aid of solenoid and a cross shaft.

The solenoid is energised, when the ignition switch is turned in a starting position. The solenoid is energised as long as the starter motor is on. In the starting position, the solenoid is magnetic. When the solenoid moves to the starting position, a click sound can be heard from the injection pump.



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2. Stanadyne distributor pump.

A. Removing pump

1. Clean the pump and the surrounding parts carefully. Remove the delivery pipes, the throttle cable wire from the revolution lever and the stop solenoid wire from the pump. Fit protective caps on the delivery pipe unions.

2. Remove the cover (+oil filler tube) of the front plastic covering so that the pump gear wheel becomes accessible.

Note! On some models the safety frame of the fan space must be removed.

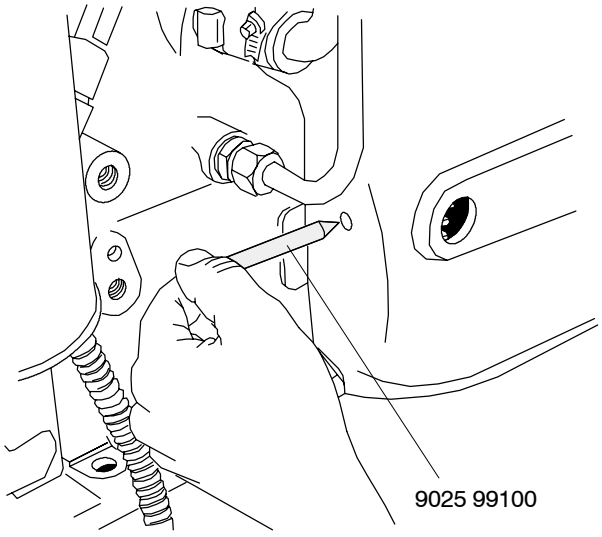
3. Unscrew the gear wheel attaching nut. Detach the gear wheel by using puller 9052 48900.

Note! If the timing gear casing has not been removed, the injection pump gear wheel remains in contact with the idler gear and it is unnecessary to mark the positions of the gears.

4. Detach the injection pump from the timing gear casing. Clean the sealing surfaces.

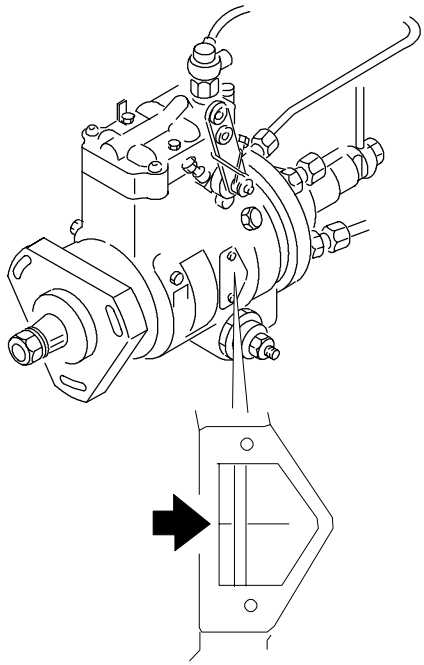
Note! In the E–engines one injection pump fixing bolt is so called interrupted screw (i.e, it cuts off when it is tightened). Open this bolt by striking to the bolt outer edge with a chisel (strike to the opening direction).

B. Fitting injection pump and adjusting injection timing



1. Turn the crankshaft to a position where the 1st cylinder piston reaches its compression stroke top dead centre. Then turn the crankshaft backwards until the timing mark on the flywheel is at the point of locator 9025 99100. (injection in no. 1 cylinder begins).

Note! Distance between the piston top face and the top dead center with different crankshaft angles, see page **210**/**7**.



2. Remove the small cover plate on the side of the injection pump. Rotate the pump shaft until the timing marks align (see arrow in picture above).

3. Place a new sealing ring on the pump flange. Push the pump into place so that the key on the shaft engages with the key slot on the gear wheel.

4. Tighten the pump into position, where the timing marks align.

5. Tighten the gear wheel nut to a torque of **90 Nm**. Fit the small cover onto the side of the pump. Fasten the pump gear wheel covering (+oil filler tube).

6. Remove the protective caps from the delivery pipe unions and fit the delivery pipes. Fit the overflow pipe, throttle cable wire and the stop solenoid wire. Bleed the fuel system (**see instruction C**).

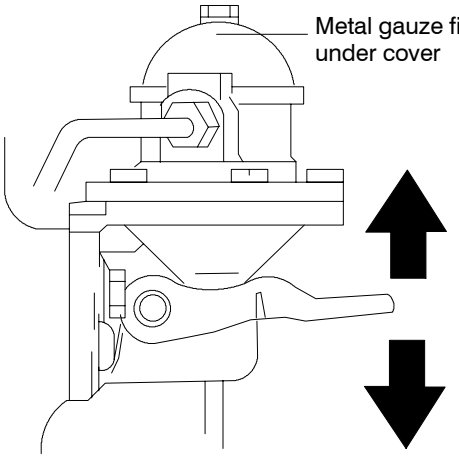
Note! Lubrication oil is not needed because fuel in the pump lubricates the internal parts.

Note! Concerning dynamic adjustment of injection timing on the E–engines, see page **223**/**13**.

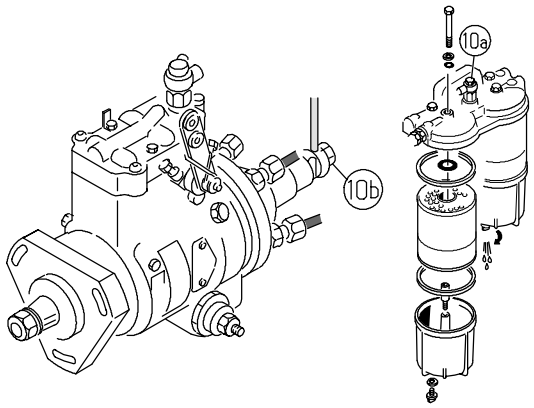
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C. Bleeding fuel system

Note! This fuel system removes automatically small amounts of air bubbles from the filter and the pump when the engine is running. However, bleed the system always, when the system has been opened or fuel has been exhausted during driving or a new spare pump has been fitted (to avoid long starting time).



1. Pump by hand the fuel feed pump lever. If the pumping seems to be ineffective, turn the engine a little so that the camshaft cam is not at the feed pump lifter.



2. Loosen the bleeding screw (10a) on the filter. Pump with the hand pump until no air bubbles flows out of the bleeding screw hole. Tighten the bleeding screw.

3. Pump further with the hand pump and loosen the fuel inlet connection (10b) on the pump, until the fuel coming out is free from air bubbles. Tighten the connection.

4. Start the engine and assure, that no leaks exist.

Note! When the bleeding is done in this way, fuel flows immediately into the internal transfer pump when the starter motor is rotating and the distributor pump housing is filled quickly with fuel. In the pump housing there is a stop solenoid, which must not be switched on for longer periods when the pump housing is empty of fuel.

D. Fuel feed pump

For the membrane type fuel feed pump no spare parts are supplied. The feed pump must be changed for a new one, if the feed pressure has dropped noticeably (rated feed pressure is **0,2–0,5 bar** at low idling speed and max 0,2 bar less when engine is accelerating) or if the fuel feed pump has been damaged.

Measuring fuel feed pressure

Measuring equipment, see page **220**/**3**.

Note! If the feed pressure value is below the rated value, possible reason can be:
– blocked fuel filter/fuel feed pump metal gauze filter
– faulty fuel feed pump
– blocked or leaked fuel pipes or pipe connections

Important! Under the fuel feed pump cover there is a washable metal gauze filter. If much impurities have gathered on this filter, fuel cannot flow to the feed pump and further to the injection pump and this causes malfunctions in the fuel system. Always when malfunctions appear, the feed pump cover should be removed and the metal gauze filter must be checked and cleaned.

Note! From manufacturing week G42 incl. the fuel feed pump gasket no. 8366 40335 has been removed and the sealing has been done with sealing glue T61050 (Weicon Lock AN 305–10 or 75), which must also be used in connection with possible leakages. Run the engine, until the cylinder block temperature is at least +60˚C. Clean the sealing surfaces well by using suitable solvent. Apply the sealing glue onto the pump sealing face and fasten the pump. Let the sealing glue dry about one hour before the engine is started (if a fuel feed pump, which has been tightened with the sealing glue, should be changed, the pump fastening flange must be warmed up to about +200˚C before removing the pump).

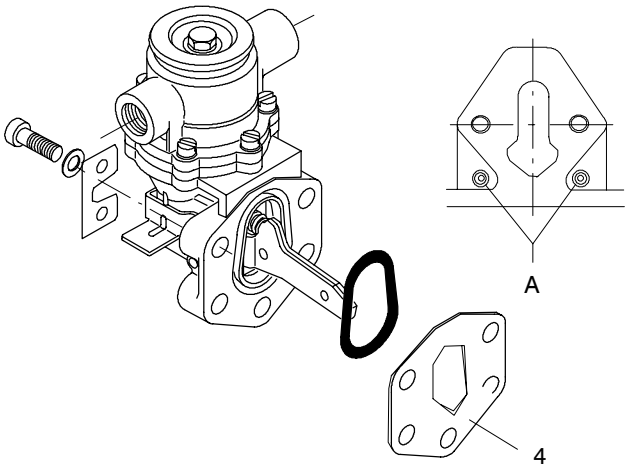
New fuel feed pump

In the tractor production has been started to fit a new fuel feed pump (420: **H7663–**. 620, 634: **H7728–**), which has an o–ring seal and four fixing bolts. This pump can be fitted also on earlier manufactured tractors, although they should have the earlier, with two bolts attached pump (mounting kit no. 8366 62052). In the cylinder block there are four fixing holes from the beginning of the year 98. The Spare Part Centre dispatches only the new pump.

On the next page there is an instruction on, how to fit the new pump.

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Fitting new fuel feed pump



– Remove the old feed pump and fuel pipes
– Clean the sealing surface on the cylinder block
– Place an o–ring into the groove on the pump
– Engines with two fixing bolts: apply sealing compound T61050 (Weicon Lock AN–305–74) on the cylinder block side of the flange 4 (if four fixing holes the flange is not fitted.
– Apply sealing compound also on the threads of the bolts (2 pcs or 4 pcs) and fasten the pump. Tightening torque is **30 Nm**.
– Bend the pipe between the filter and pump or use a flexible pipe which incl. in the kit.

Note! If the cylinder block has already four threaded bolt holes , remove plugs from points A, and fasten the pump with four bolts (sealing compound on the threads of all bolts) without the intermediate flange (4).

Sealing compound (50 ml).....6909 30030
Sealing compound (250 ml).....6909 30016

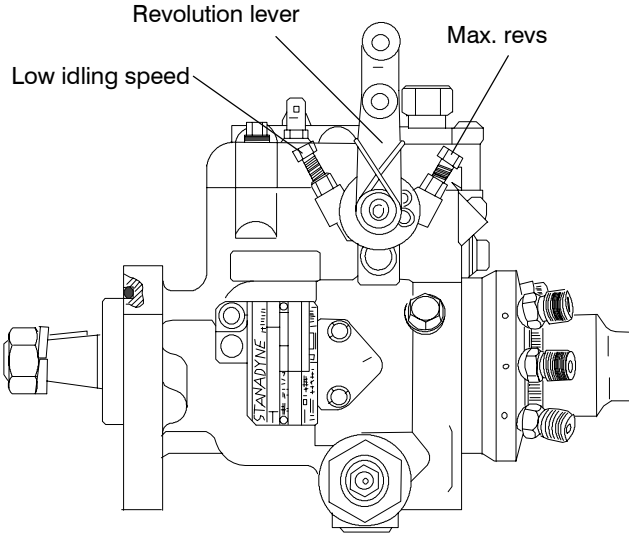
E. Injectors

Injectors are checked and serviced according to instructions **G–J** on pages **223/5–7**.

The opening pressure of the injectors, see tables on pages **220/14–15**.

Adjustment is achieved by changing the shims. The thickness of the shims varies from 1.00–1,90 mm and they are available in increments of 0,05 mm. A thicker shim will raise the opening pressure while a thinner one lowers it. A difference in shim thickness of 0,05 mm changes the opening pressure by approx. 5,0 bar. As the opening pressure of the injector drops slightly after adjustment, the opening pressure should be set to approximately 10 bar above the value given in the specifications. This value applies both to new and used injector.

F. Adjusting low idling speed



The low idling speed can be adjusted with a limiting screw in front of the revolution lever. The adjusting screw for max. revs has been sealed. This adjustment has been done in the factory, and adjustment of max. revs afterwards is prohibited.

Note! The throttle cable is attached to the revolution lever lower hole. To the upper hole is fastened a return spring.

Other information

The injection pump housing upper cover has been sealed to prevent adjustment of engine output afterwards. Also the stop solenoid is fitted under this cover. If the injection pump is damaged during the warranty period, a replacement pump must be fitted. After the warranty period it is recommended, that all pump repairs are made by an authorised Stanadyne workshop.

G. Bleeding Thermostart system

Always remove air from the glow plug fuel pipe when the pipe or reservoir has been emptied during repair work etc. This prevents damages to the glow plug caused by lack of fuel during starting.

1. If the reservoir is empty, fill it e.g. with a drip pot through the breather hole on the reservoir.

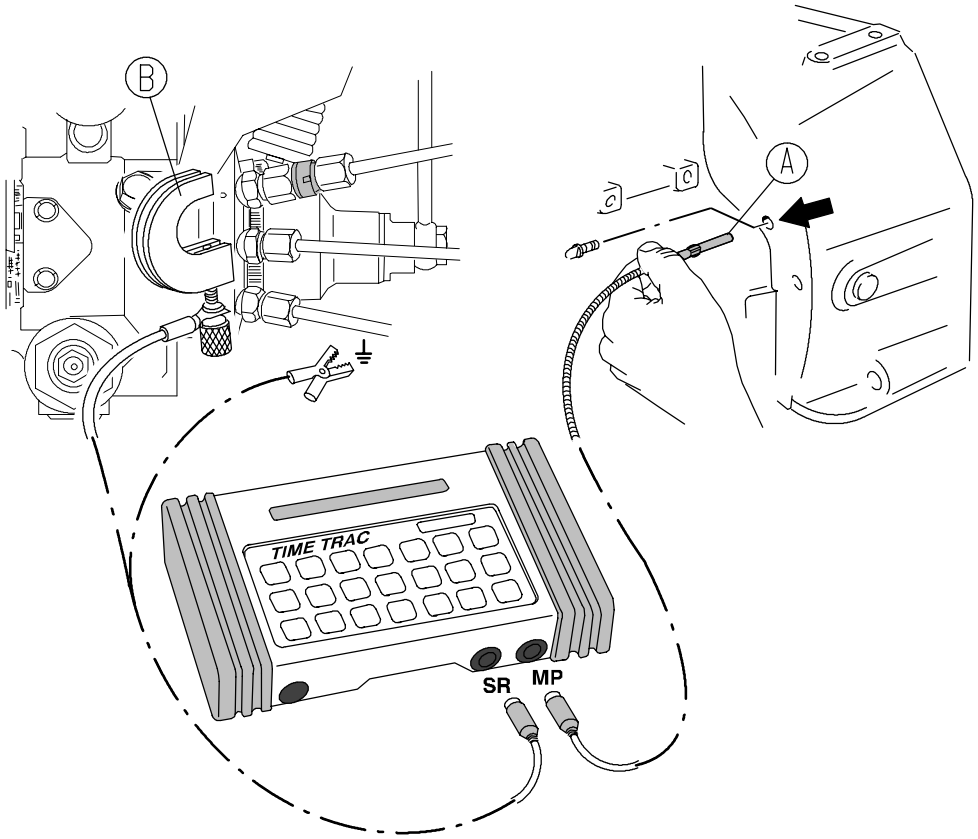
2. Open the glow plug pipe connector and drain fuel from the pipe. Connect the pipe.

H. Delivery pipes

On tractors 8050, 8150, 8450 and 8550 the delivery pipe appearance is the same, but on tractors 8050 and 8150 the inner diameter of the pipes is smaller than on tractors 8450 and 8550.

For this reason the pipes have different spare part numbers. Delivery pipes for 8450 and 8550 tractor (greater I.D.) have been labelled with tape.

I. Dynamic adjustment of injection timing



1. Let the engine run to a normal working temperature before adjustment.

Note! Stop the engine before connecting and disconnecting the adjusting device.

2. Remove the protective plug on the fly wheel housing on the LH side of the engine and fit the magnetic sensor **A** into the 8 mm hole. Press the sensor against the fly wheel . The sensor must not touch the fly wheel so pull it a little out (**0,5...1,0 mm**) . Connect the sensor connector to the test device plug MP.

3. Fit fastener **B** on the brass ring between the pump and pipe and tighten the screw. Ensure, that the screw end touches the brass ring. Connect the injection sensor connector to the test device plug SR. Connect th earth wire to the clean metal surface on the engine or fuel system.

4. Switch on the test device by pushing ON/CLEAR button. In the display is visible "Time Trac" and "Model TT 1000" and then i "R= 0". Now the device can be used as a rpm counter without other procedures.

5. Press button MAG PROBE. In the display appears "Trig Level 30%". Confirm by pushing ENTER.

6. In the display is visible "Offset 20.0°". Confirm by pushing ENTER.

7. In the display is visible "Calibrate?". Start the engine and let it run at low idling. Press ENTER so that in the display is visible "R=Set RPM". Compare the revs on the dashboard rev counter reading and specified values with TimeTrac, see pages 210/3, 210/18 and 210/19.

Note! Ensure before engine start that the wires do not touch the exhaust manifold or movable parts.

8. If the revolution reading is correct, press ENTER after which text "Calibrating...". is visible in the display

Note! If the revs signal disapperas or engine stops , in the display flashes text "Eng. Not running" and the device returns to the revs mode. Start again by pressing button MAG PROBE (return to point 5).

9. If the engine is running at 850 r/min and the pump advance is 6° btdc, in the display there is visible "R=850 MP + 6.0". Now the device is ready for adjustment.

Note! If the magnetic sensor signal is cut or the sensor is lacking, in the display there is text "R=850 No Probe". When the signal returns, the device shows again the injection advance.

10. The injection time is checked at high idling revs [TT (HI)]. If the injection timing deviates much from the specified value, adjust the base timing of the pump or check possible disturbances.
If the values of the dynamic timing cannot be adjusted to specified value, then the pump must be repaired in the authorised Stanadyne workshop. The function of the pump injection advance governor is assured by checking the injection timing at a low idling speed [TT (LI)].

Adjusting values, see tables on pages **220**/**14.**

See also instructions of the device manufacturer.

Possible disturbances

If the injection timing deviates much from the specified value, check the following points:

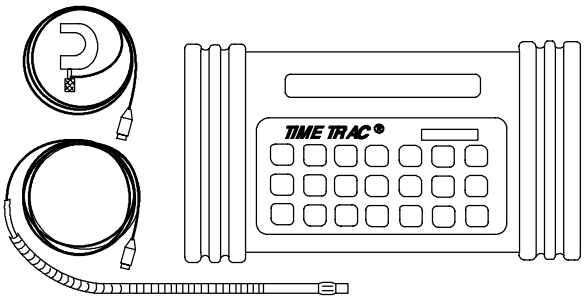
1. Vibrating delivery pipe, hold to the pipe with one hand.

2. The distance between the magnetic sensor and the flywheel is incorrect, reposition the sensor.

3. Offset or Trig Level value incorrect, reset the values.

4. Disturbing grooves on the flywheel.

5. The mutual position of the flywheel and the crankshaft incorrect, remove the flywheel and fit it to the correct position in relation to the crankshaft.



8366 62022 Electronic device for injection timing

Contents

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Specifications 2
Special tools 3
Cooling system, description and maintenance 4

Repair instructions (Op no 231):

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B. Reconditioning coolant pump (320–, and 420–engines), **–K6490** 1
C. Reconditioning coolant pump (620–engines) 2
D. Quality requirements of engine coolant 3
E. Coolant pump and thermostats on 8050 and 8150 tractors 4
F. Coolant pump and thermostats on 8450–8750 tractors 5

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Specifications

Coolant pump (320, 420 engines), –K6490.

Outside diameter of bearing	38,087...38,100 mm
Inside diameter of bearing housing in pump body	38,058...38,083 mm
Shaft diameter	15,910...15,920 mm
Impeller hole diameter	15,881...15,899 mm
Diameter of the seal recess in the pump body	36,450...36,489 mm
The impeller is pressed onto the shaft until the distance between the rear face of impeller and the rear face of the pump body is	1,8–2,2 mm
Distance of belt pulley from rear face of body:	
– 320DS; –E7535, 420D/DS; –E7054	178,3...178,7 mm
– 320DS; E7536–, 420D/DS; E7055–.	174,4–174,6 mm
Fan guide diameter	25,00...25,20 mm
Balancing precision of fan	0,3 Ncm max
Max. permissible eccentricity of fan	±0,3 mm
Belt deflection	15...20 mm

Coolant pump (620/634 engines)

Outside diameter of bearing	52 mm
Inside diameter of bearing housing in pump body	51,979...52,009 mm
Shaft diameter at bearing	19,980...19,993 mm
Shaft diameter at impeller	15,907...15,920 m
Impeller hole diameter	15,881...15,899 mm
Diameter of the seal recess in the pump body	36,450...36,489 mm
Distance between impeller and rear face of pump body	0,8–1,2 mm
Balancing precision of fan	0,3 Ncm max (30 pcm)
Belt deflection	15...20 mm

Fan diameter

– 6000–6600	483 mm
– 6800, 6900	508 mm
– 8000–8100 (later models)	508 mm (533 mm)
– 8200/8400 (later models)	533 mm (585 mm)
– 8050	533 mm
– 8150	585 mm

– On 8450–8750 the cooling fan is fitted on the viscous coupling.
8200, 8050 and 8150 has 8 cooling fan blades, other models 6 blades.

Thermostat

Spare part number	Type	Opening begins at	Fully open at	Max stroke mm
8361 15646 (6000–8400)	ø67/79˚C	79˚±2˚C	94˚C	8
8361 15718 (6000–8400)	ø67/83˚C	83˚±2˚C	97˚C	8
8360 15156 (8050–8750)	ø54/79˚C	79˚±2˚C	94˚C	7,5
8363 31590 (8050–8750)	ø67/83˚C	83˚± 2˚C	95˚C	8

Tightening torque

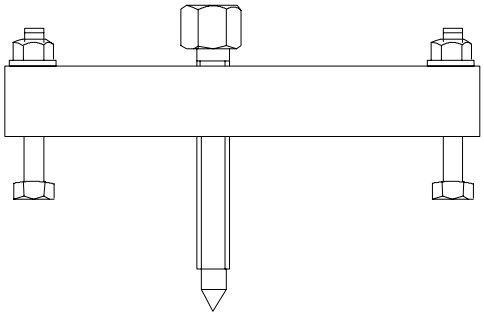
Coolant pump belt pulley nut	120 Nm
Fan attaching bolts	30 Nm

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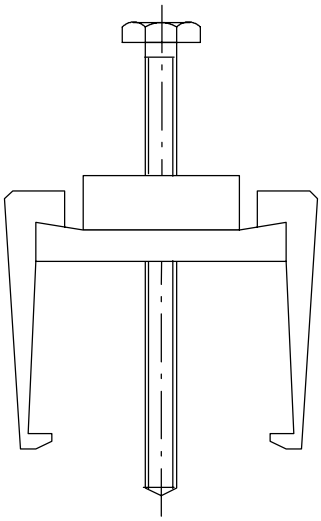
Special tools

Order no	Description
9101 93200 *)	Puller for coolant pump impeller, 620–engines
9022 03500 *)	Puller for coolant pump impeller, 320– and 420–engines (earlier no 8360 85499)
9104 27700	Puller for coolant pump impeller, new coolant pump (420, K6491–), see page **230**/**8**.
9051 40200 *)	Drift for fitting coolant pump seal (seal no 8353 31202)
9051 79300 *)	Drift for fitting coolant pump seal (seal no 8353 39425)
9051 64900 *)	Drift for fitting coolant pump shaft, 320– and 420–engines
9052 48900*)	Puller for fan hub (see Fuel system)

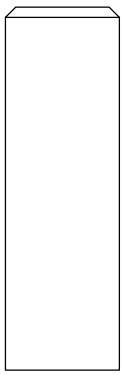
*) Same tool as for engines on 505–905 tractors.



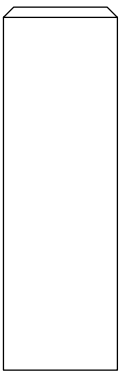
9101 93200



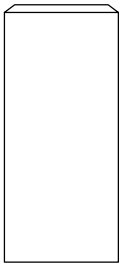
9022 03500



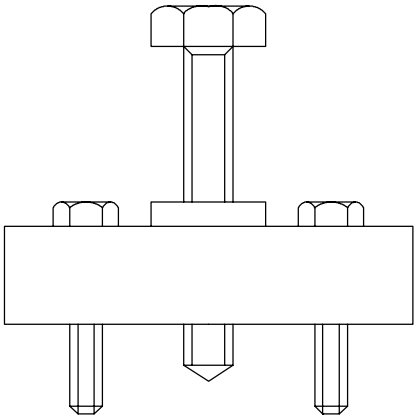
905140200



905179300



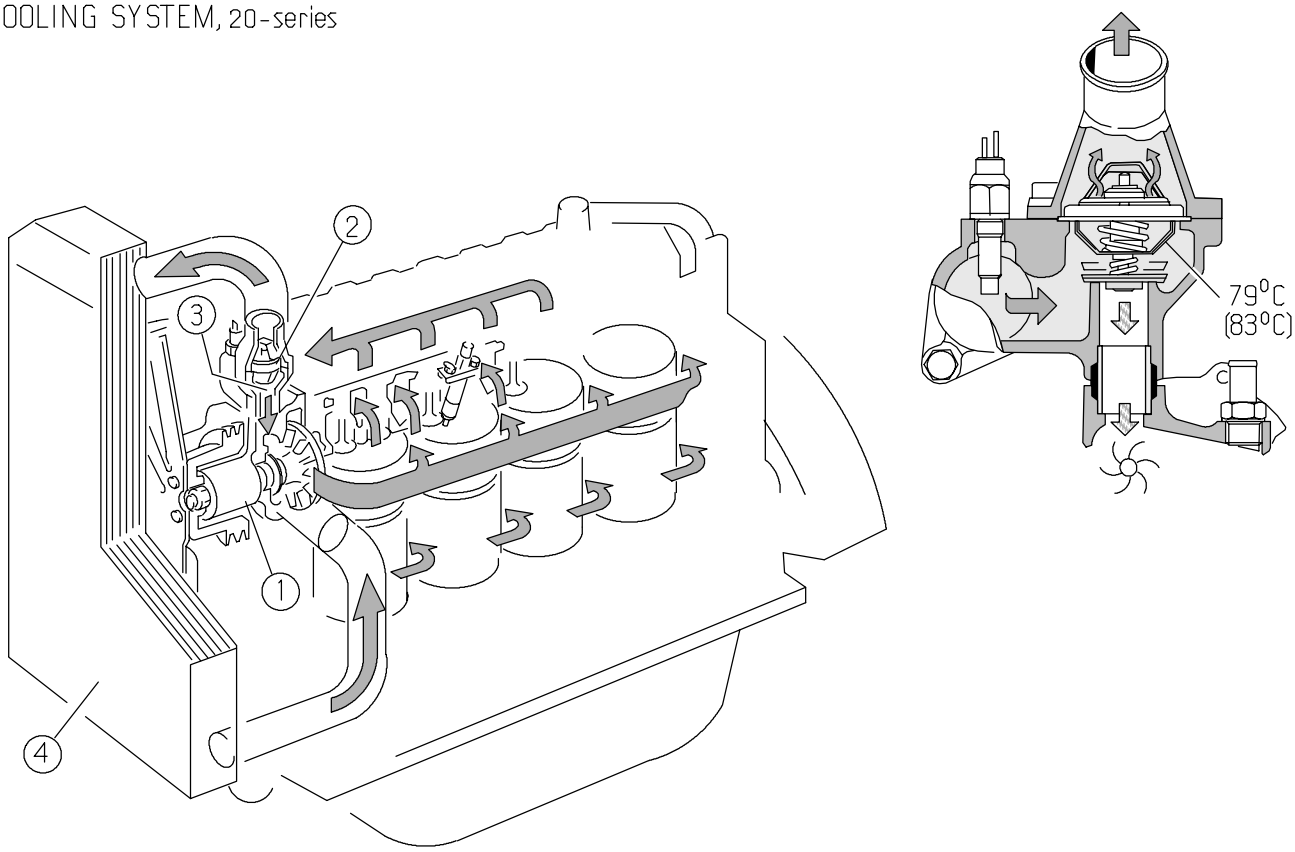
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9052 48900

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COOLING SYSTEM, 20-series



Cooling system

1. Coolant pump
2. Thermostat
3. By–pass passage
4. Radiator

Description

The belt driven, centrifugal type coolant pump is attached at the front end of the cylinder block and the thermostat housing is fitted above the pump. The system has an internal coolant circulation via the by–pass passage and the circulation is controlled by a two–way thermostat. With this is achieved an even warming in all conditions.

The coolant pump has separate ball bearings and the pump shaft and the bearings are built together to form one unit (320– and 420 engines).

The thermostat opens at 79˚C. During a cold season, a thermostat with the opening temperature of 83˚C can be use.

Maintenance

Check the coolant level daily.
The level of the coolant should be slightly above the radiator core. If the tractor has an expanison tank, see the next page. Check the condition of the fan belt since it drives the coolant pump. Stop the engine immediately if the coolant temperature rises too much.

Caution! Open the radiator cap carefully, if the coolant is hot as there will be pressure in the system. Carefully turn the radiator cap to the first stop. This will allow the pressure to be released from system.

N.B! The coolant pump is provided with a drainage hole on its underside. This hole must not be blocked. If coolant drips out of the hole, the pump seal is faulty. There may be slight leakage on a new engine before the pump has been run in.

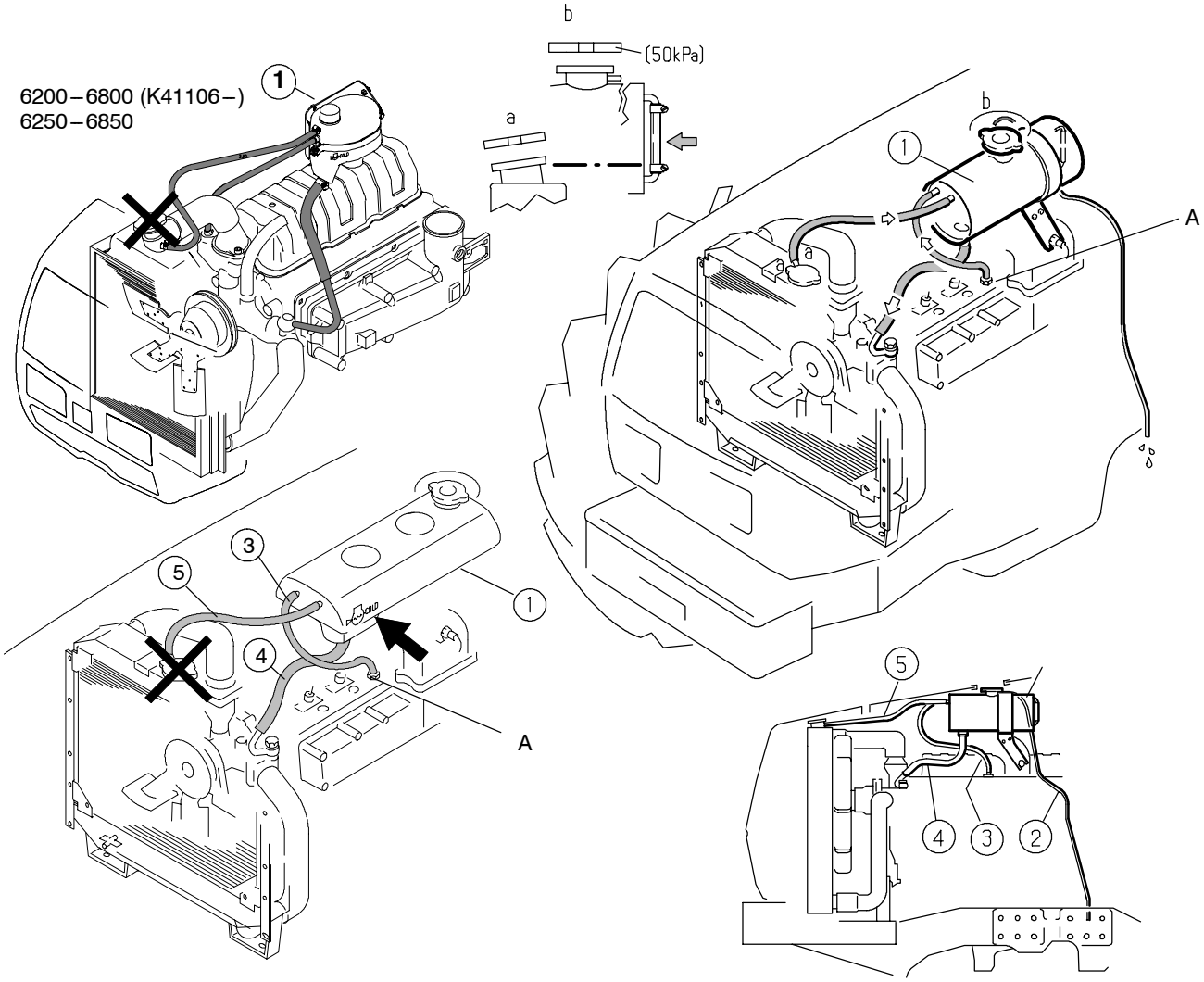
Freezing point of coolant

Check the freezing point of the coolant at the beginning of the cold season. If the freezing point is too low, drain off some of the coolant and top up with anti–freeze. Run the engine for a while until the anti–freeze has been mixed in, then re–check the freezing point of the coolant. Drain the cooling system completely every second year and refill with new coolant.
Never use just water as a coolant.

Clean regularly the radiator externally from insects and other impurities.

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Expansion tank



Picture 2. *Cooling system on 8200–8400 tractors from ser. no. 668118 and on 8050–8750 tractors and on HiTech tractors 6550–8950. On the latest 4–cyl. tractors 6200–6800 and 6250Hi–6850Hi the expansion tank has a different shape (same as on 100–series tractors)*

1. Expansion tank (volume 4 l). Earlier tractors had metallic and later plastic expansion tank.
2. Breather hose (metallic tank)
3. Filling hose
4. Outlet hose
5. Connection hose to radiator

Emptying the system in connection with repairs:

– carefully open the expansion tank cap
– empty the radiator through the emptying tap (if not the tap, disconnect the lower water hose)
– unscrew the cylinder block emptying plug
– open the oil cooler emptying plug (if fitted)
– open the cab heater adjusting knob
– empty the intercooler via the plug (if fitted)

Filling the system in connection with repairs: First fill the radiator and after that the expansion tank. The coolant level should be to the height of 1/3 of the level indication hose length (metallic tank) or in the latest tractors (plastic tank) the coolant level must stand at the expansion tank level marking (black arrow in the picture above), when coolant is cold.

The level of hot coolant is upper. Before filling the expansion tank, unscrew the bleeding plug on the RH side of the thermostat housing, until no air flows out.

Checking the coolant level: The system has enough coolant, if the coolant can be seen in the level indicator hose (metallic expansion tank) or in the plastic tank the coolant level surface stands at the mark line on the tank.

Note! The front cover has perforations to improve air flow through the radiator.

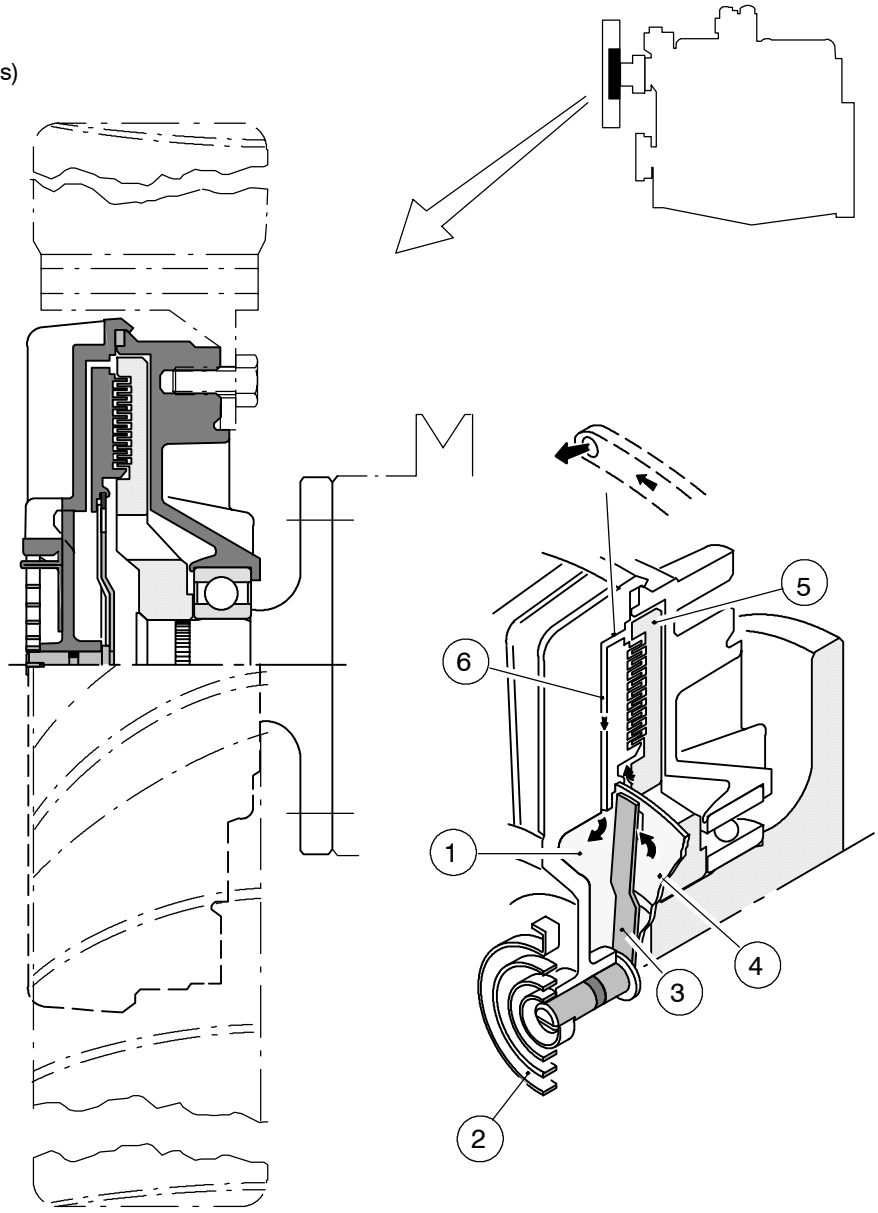
Warning! Do not open the radiator filling cap, if the coolant is hot. All maintenance works of the coolant system should be made through the expansion tank filler cap.

Important! If the cooling system has been emptied, check the restriction holes in the thermostat housing and in hose union A (see picture above) so that they are not blocked. Clean if needed.
From engine number F5239 (8450–8750) and F6150 (8200, 8400) incl, the restriction hole in the hose union A has been changed from ø 3^{+1} mm to ø $2^{\pm 0,2}$ mm. If the expansion tank foams over, the new restriction must be fitted onto the earlier manufactured tractors.

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Viscous fan

(Ø 600, 8 pcs blades)



Picture 3. *Viscous fan on 8350, 8400 (model 2001), 8450, 8550, 8750 and 8950.*

1. Reservoir (filled with silicone fluid).
2. Heat spring
3. Arm
4. Valve plate (fixed)
5. Coupling
6. Return passage

On the above mentioned tractors the engine cooling fan has been attached on the thermostatic viscous coupling.

In the fan hub there is a small reservoir for viscous oil. On the hub there is also a thermostatic valve, which senses temperature of air which flows through the radiator.

The fan and the hub are attached on the shaft which is rotated by the engine with the aid of the fan belt. In cold conditions the fan is free on the hub and does not rotate.

When air which flows through the radiator has a certain temperature, the thermostatic coupling allows a little oil to flow into the fan hub and a this creates a ”fluid drive” which drives the fan and the amount of cooling air increases.

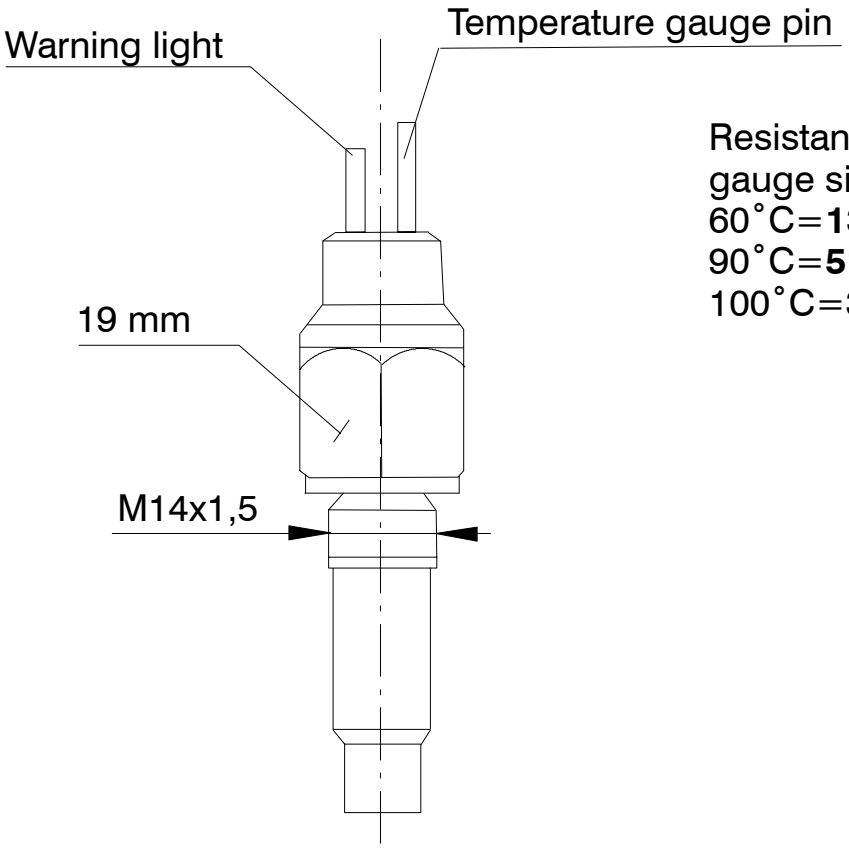
The fan hub includes a small pump, which continuously returns viscous oil into the reservoir. When the temperature lowers, the thermostatic coupling closes, fluid flow and the fan speed decreases.

Note! The viscous fan cannot be repaired, but a damaged fan must be changed for a new one. The fan function can be verified by warming the engine and by watching when the fan starts to rotate. On tractors with the viscous fan the tractor frame front piece is longer.

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Temperature sensor, engine coolant temperature:

The sensor is placed on the engine beside the thermostat housing:



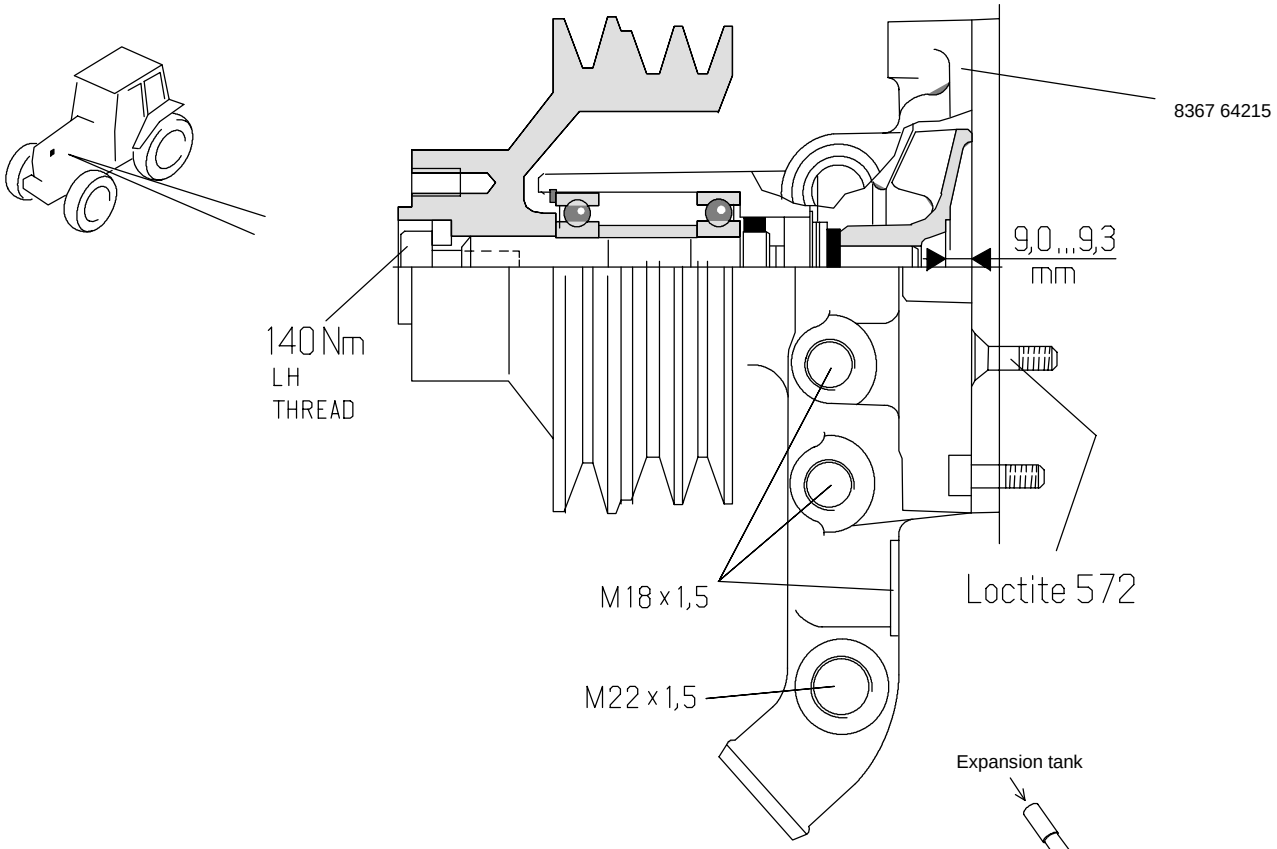
Resistance value, temperature gauge side:
60˚C=**134± 13,5 Ω**
90˚C=**51,2± 4,3 Ω**
100˚C=**38,5± 3,0 Ω**

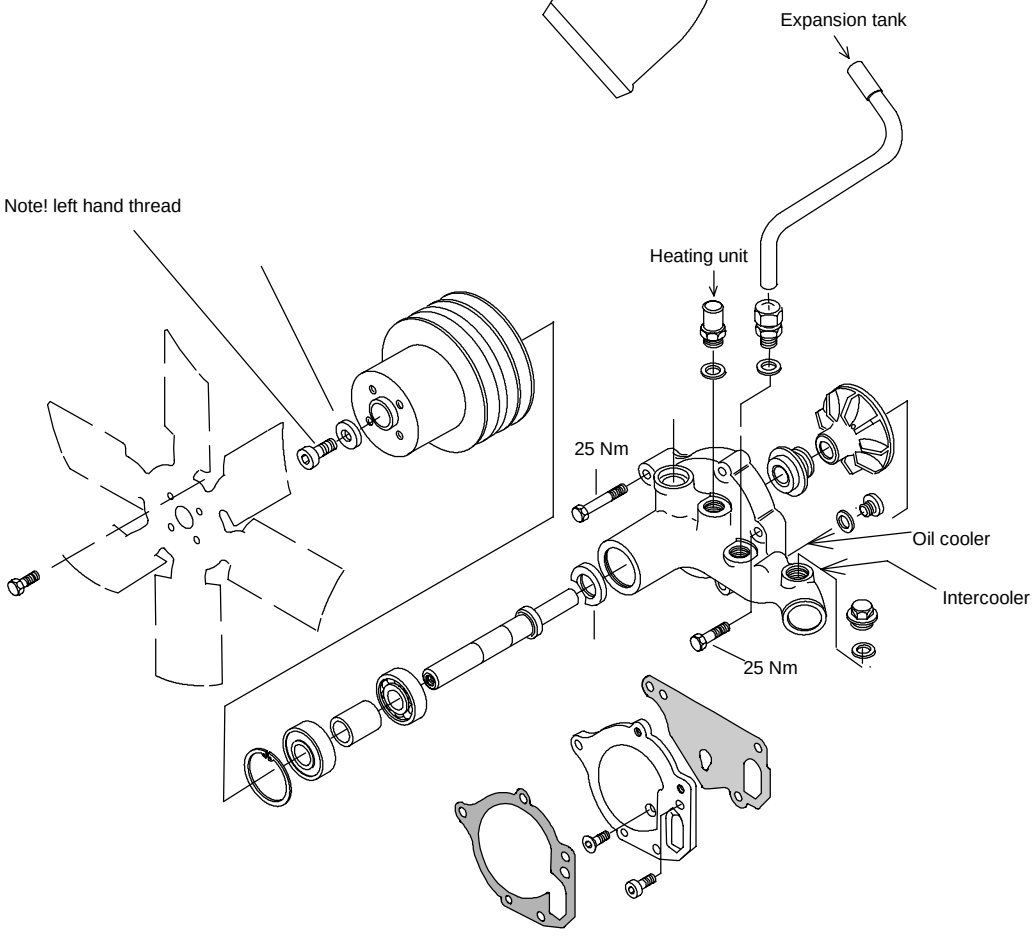
Order no	Alarm temperature
6542 71208	98 ± 3˚C
8366 40772	106 ± 3˚C

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Coolant pump

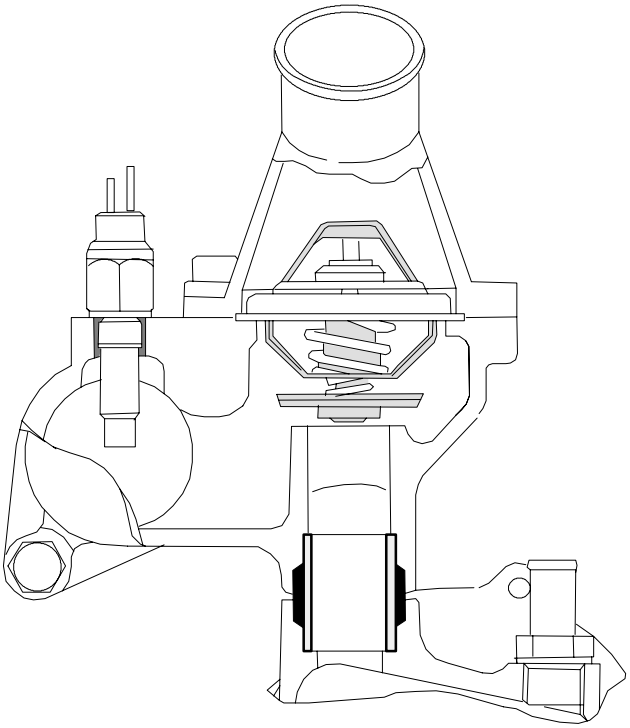
Valtra 6250Hi–6850Hi (K16108–). From engine number K6491 incl.
Valtra 6200–6400 (K41106–).





Repair instructions (Op no 231)

A. Thermostat



The thermostat is of a two–way type. Its opening temperature is 79˚C. In winter a thermostat can be used with an opening temperature of 83˚C.

Check the function of the thermostat as follows:

– lower the thermostat into a vessel of boiling water so that the thermostat does not touch the sides or bottom.
– opening must begin under 20 seconds.
– The thermostat must be fully open under 50 seconds. Stroke, see specifications.

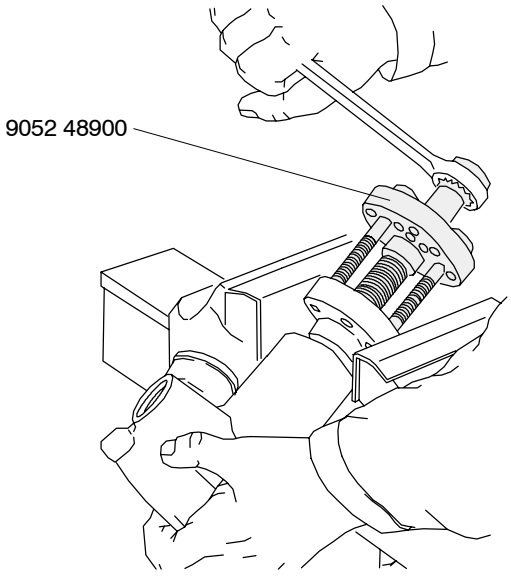
Note! On 8050–8750 tractors there are two thermostats. The opening pressure of the smaller thermostat is 79˚C and the larger thermostat 83˚C. Check the thermostat in the same way as described above.

B. Reconditioning coolant pump (320–, and 420–engines), –K6490.

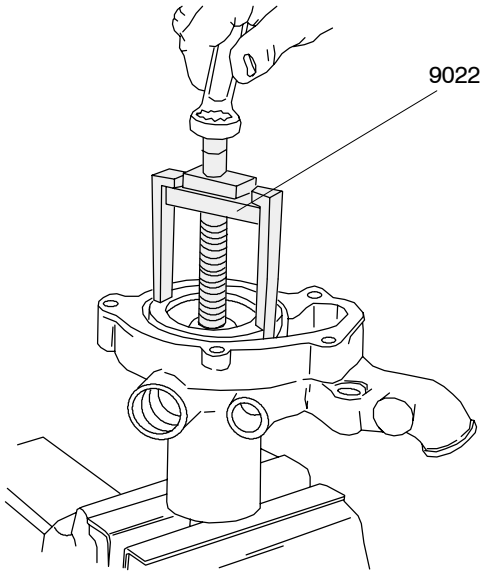
1. Drain the engine coolant. Disconnect the water hoses from the thermostat housing and from the coolant pump. Remove the thermostat housing and the by–pass hose.

2. Slacken the alternator fixing bolts. Remove the fan and the pump belt pulley. Remove the v–belt.

3. Detach the coolant pump. Remove the pump rear plate and clean the sealing surfaces.



4. Remove the fan hub using puller 9052 48900. Remove the circlip from the pump body.



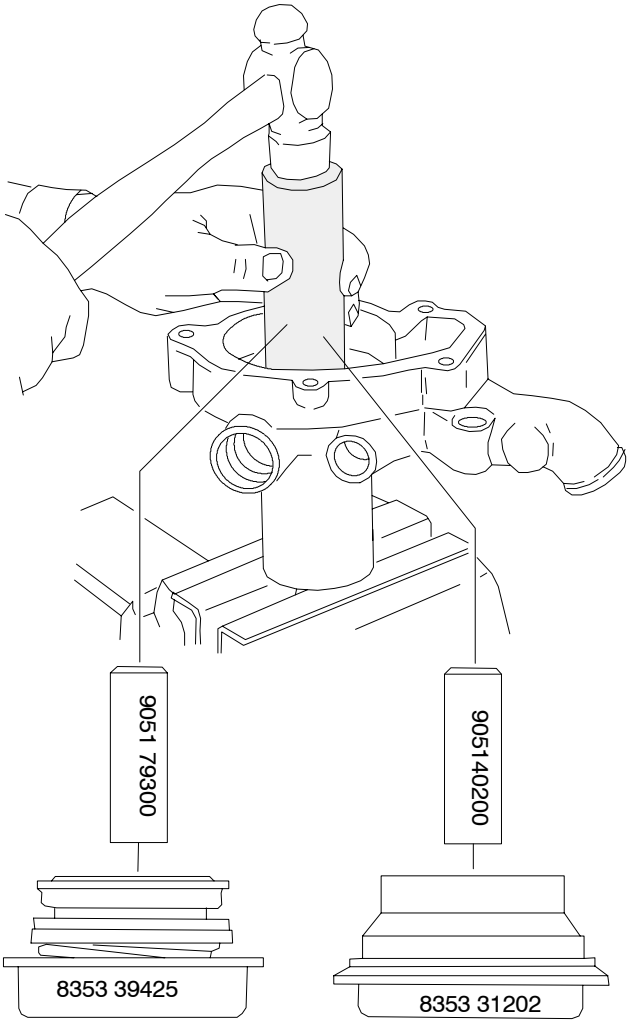
5. Remove the impeller using puller 9022 03500. Press the shaft out of the pump body in the direction of the fan. Use a hydraulic press. Support the body so that the shaft bearing unit has enough space for releasing.

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6. Tap out the shaft seal in the body using a suitable drift. Clean all parts and inspect their condition. Replace damaged parts with new ones.

N.B. If the pump shaft has to be changed, use a reconditioning kit. This kit also contains all seals (see Parts Catalogue).

7. Press the shaft into its location in the body using special tool 9051 64900 and fit the circlip.

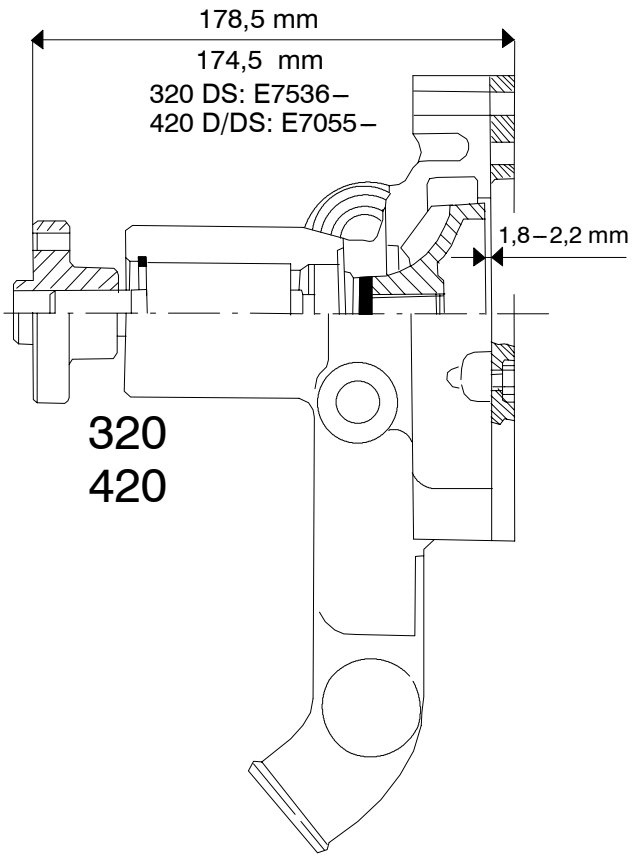


8. Fit the shaft seal. Use as a "lubricating liquid" coolant between the shaft and the seal. Two different seal types are used. Both these seals are fitted with their own drift (see figure above).

9. Press the impeller and the hub to the correct depth (see figure) and support the shaft at the other end. Ensure that the shaft can rotate freely. Fit the rear plate using a new gasket.

Note! Coolant pumps (and crankshaft belt pulleys) have been changed with effect from engine numbers mentioned below:
– 320DS–engines: E7536–
– 420D/DS–engines: E7055–.

This modification should be observed when ordering spare parts. The adjusting values, see picture above.

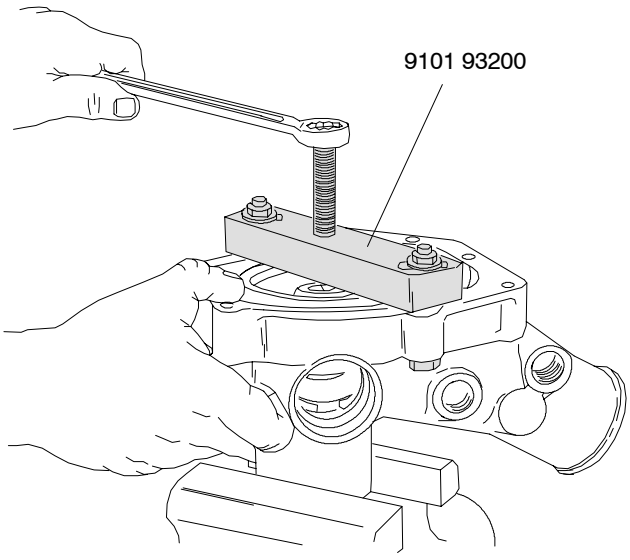


C. Coolant pump on 8000, 8100, 8200 and 8400

1. Drain the coolant. Remove the thermostat housing, fan and the v–belt.

2. Remove the coolant pump. Detach the pump rear plate and clean the sealing surfaces.

3. Unscrew the belt pulley fixing nut and remove the belt pulley. Use puller 9052 48900 if needed.



4. Remove the impeller on the shaft with puller 9101 93200.

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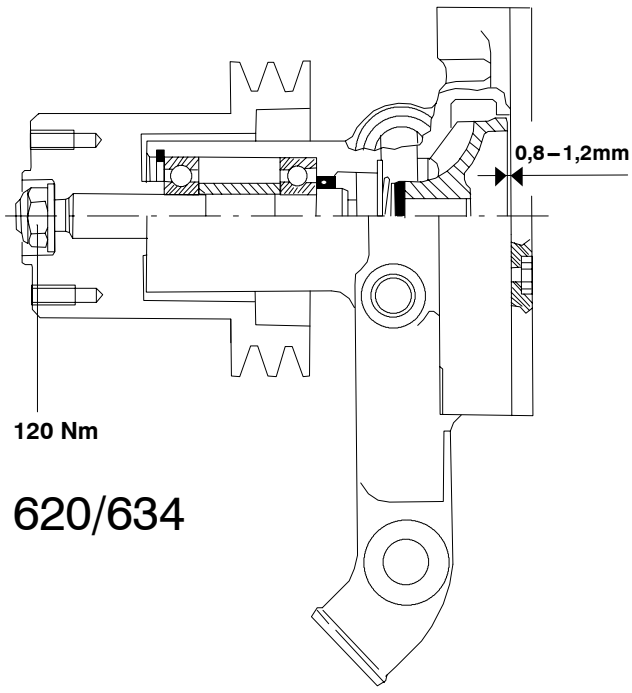
5. Remove the circlip in the pump body. Press the shaft together with bearings in the direction of the fan. Use e.g. a hydraulic press. Support the pump body so that the bearings have enough space for releasing.

6. Tap out axial and shaft seals using a drift. Clean the parts and inspect their condition. Replace faulty or worn parts with new ones.

N.B. If the pump bearings have to be changed, use a reconditioning kit. This kit also contains all seals (see Parts Catalogue).

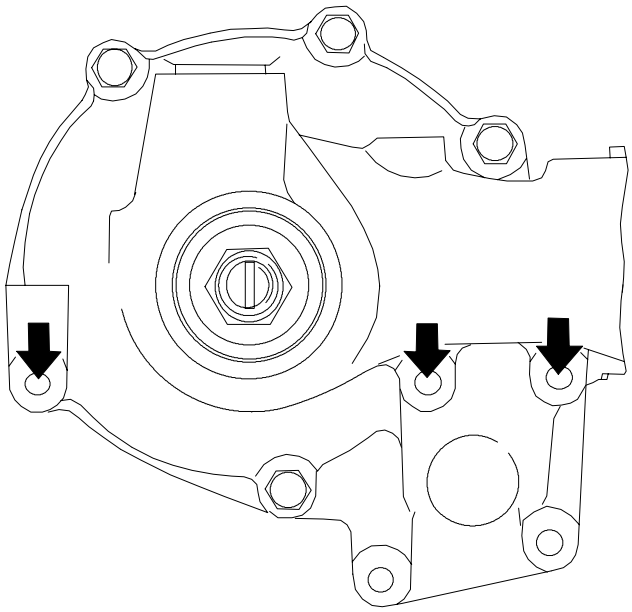
7. Drive in the new shaft seal in the housing using a suitable drift. Put the bearings and the intermediate sleeve onto the shaft. Grease bearings with heat–resistant ball bearing grease. Fit the shaft and the bearings in such a way that the pressing force is not transmitted by the bearing balls. Fit the circlip for the bearing.

8. Fit the shaft seal, see **heading B paragraph 8**.



9. Press the impeller into position while, at the same time, supporting the shaft at the other end. The mounting depth of the impeller is **0,8–1,2 mm** (see figure above). Make sure that the shaft can rotate freely.

10. Fit the belt pulley and tighten its attaching bolt to a torque of **120 Nm**.



11. Fit the rear plate using new seals. Use guide pins (ø8,5 mm) in the holes shown with arrows in the picture above.

D. Quality requirements of coolant

The coolant used must meet the standards ASTM D3306–86a or BS 6580:1985.

– Mixing proportion should be 40–60 % of ethyls–glycol based coolant and the rest water. The best ratio is 50/50 %.

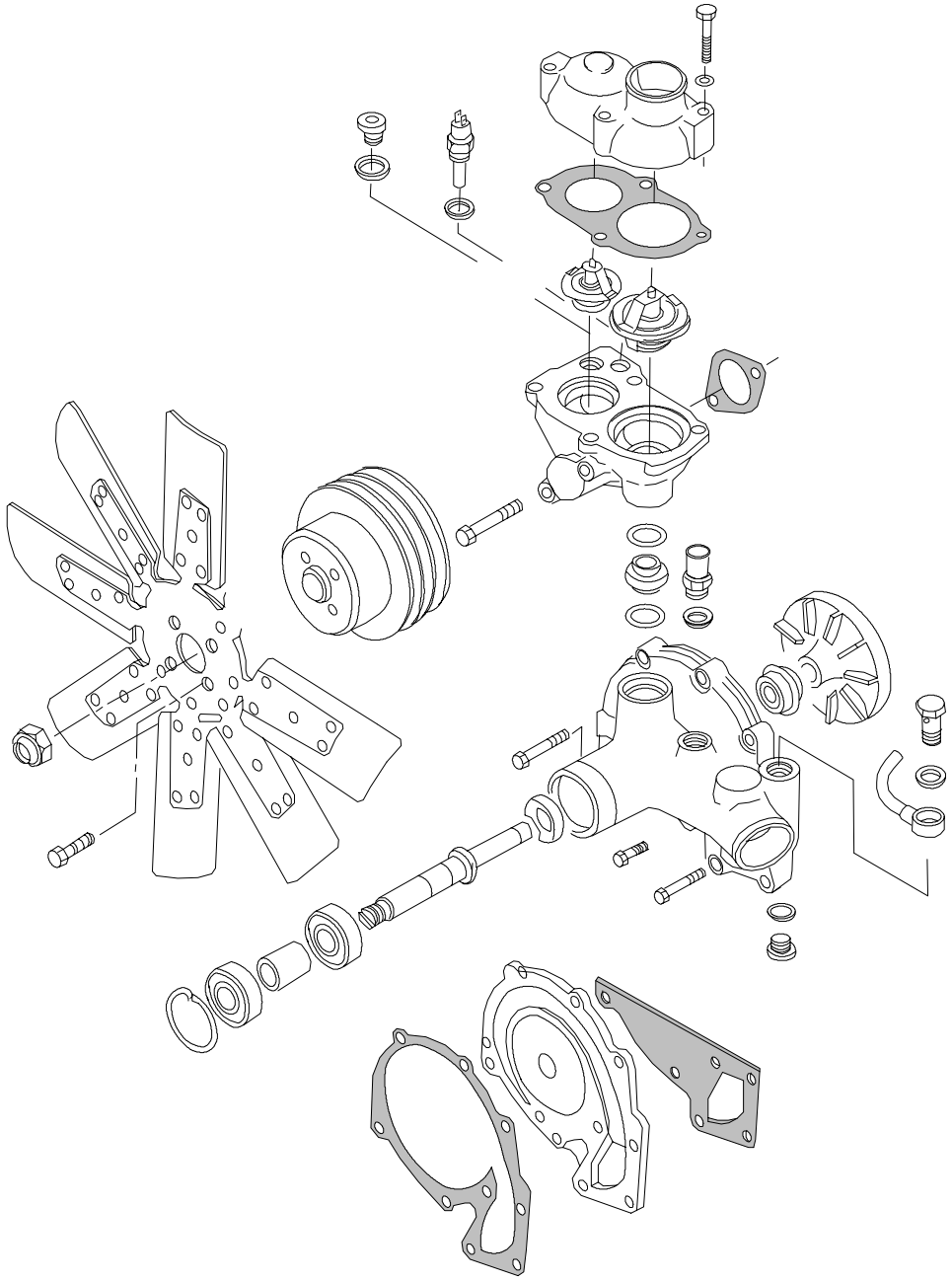
– In warm climates the 30 % mixture ratio gives enough good protection against corrosion.

– Water used should be clean and soft water i.e. that it does not include metals and their salts.

– Check the coolant frost resistance every now and then. Change the coolant every other year. Never use just water as a coolant.

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E. Coolant pump and thermostat housing on 8050 and 8150



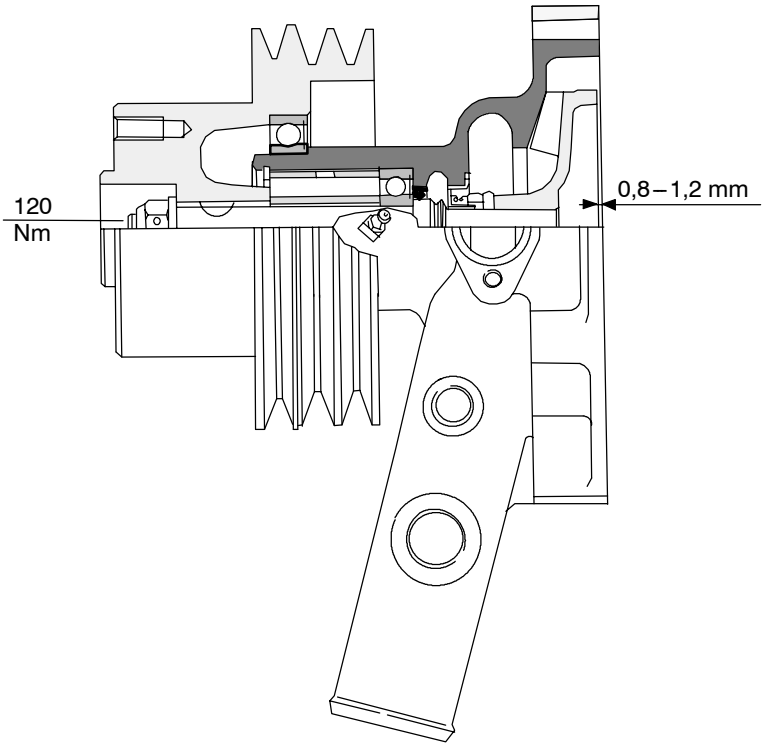
The coolant pump is the same as on 8000–8400 tractors, see instr. **C** on page **231/2**.

8050 and 8150 tractors have two thermostats. Opening pressure of the smaller thermostat is +79˚C and larger +83˚C. The circulation of the coolant has been designed so that the smaller thermostat opens first and allow a part of coolant to flow into the radiator. When temperature further rises the larger thermostat opens and allows coolant to flow into the radiator.

The coolant pump has been modified from engine ser. no. **K11636** incl. One fixing bolt has been added and the pump back plate and the gasket has been modified. The earlier pump can be fitted in place of the modified pump by leaving out the extra fixing bolt. The pumps' internal parts are the same.

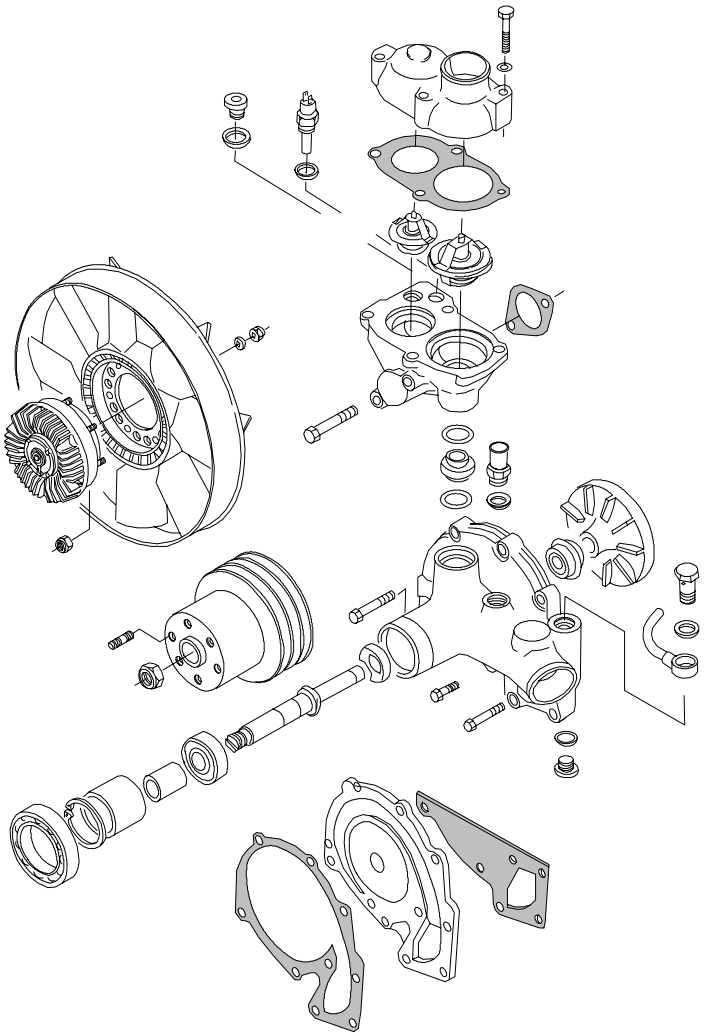
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F. Coolant pump on 8450–8750 tractors



On 8450, 8550 and 8750 tractors the coolant pump pulley bearing is different compared with other 6–cylinder engines. The belt pulley is different on 8750 tractor compared with 8450 and 8550 tractors.

The impeller can be removed with puller 9101 93200. Pump seal no 8353 39425 can be fitted with sleeve 9051 79300. When removing the pulley, tool 9052 48900 can be used (see instr. C on page 231/2).



Picture 4. *Coolant pump, viscous fan and thermostat housing on 8450–8750 tractors.*

The thermostats are the same as on 8050 and 8150 tractors.

The coolant pump has been modified from engine ser. no. **K11636** incl. One fixing bolt has been added and the pump back plate and the gasket has been modified. The earlier pump can be fitted in place of the modified pump by leaving out the extra fixing bolt. The pumps' internal parts are the same.

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Pre–cleaner (8400, vertical air filter) **32938500**
Pre–cleaner (8100, vertical air filter) **33267100**

– The self–cleaning precleaner of a cyclone type is intended to be used in very dusty conditions. Impurities are removed from the precleaner with aid of suction created by exhaust gas flow.

FITTING:

– Remove the engine side plates and the exhaust pipe, precleaner and the engine upper plate.

– Remove the vertical pipe from the air cleaner (except if the tractor has precleaner Turbo II) Remove the silencer.

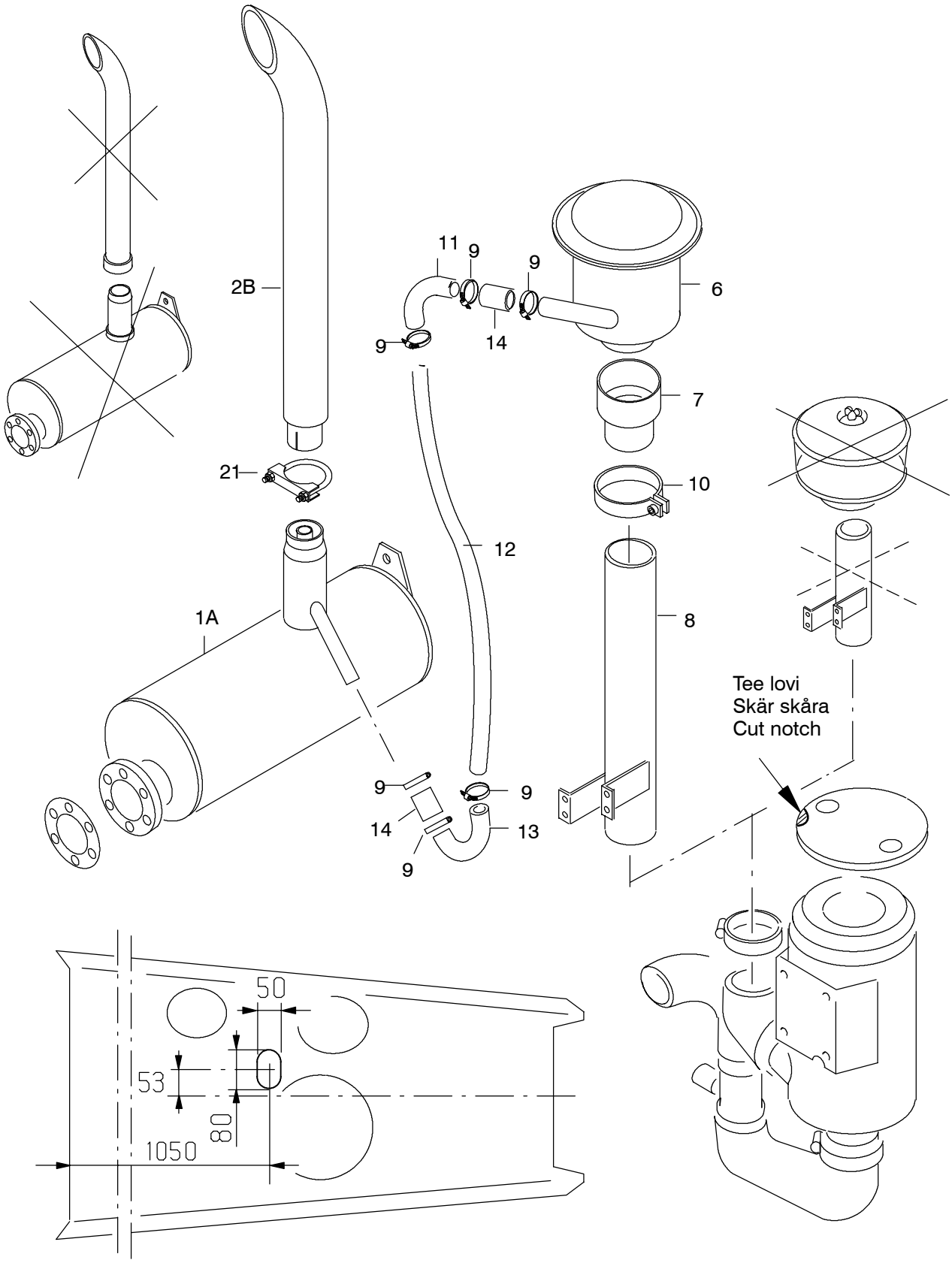
– Make an extra hole through the engine upper cover plate (see picture). Paint hole edges to prevent corrosion.

– Fit a new silencer **1A** in position. Fasten parts **9**,**14**,**13** and hose **12** onto the silencer.
Place the vertical pipe **8** in position.
Fit the engine upper plate and pass hose **12** through the hole which was made earlier.
Make, if necessary, a notch on the filter plastic cover for the hose.

– Fasten the exhaust pipe **2B** and precleaner **6** with necessary parts. Turn the precleaner so that the hose **12** does not prevent visibility from the driver's place.

	1	**32938500**	Esisuodin	Cyklon	Cyclone	Vorfilter	6800,8400 Assy DONASPIN
	1	**33267100**	Esisuodin	Cyklon	Cyclone	Vorfilter	8100 Assy DONASPIN
6	1	32938600	.Esisuodin	Cyklon	Cyclone	Vorfilter	
7	1	32941900	.Holkki	Hylsa	Sleeve	Hülse	
8	1	32803200	.Putki	Rör	Pipe	Rohr	
9	6	GP3923	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
10	1	GP3935	.Kiristin	Klämma	Clip	Klammer	
11	1	32945300	.Putki	Rör	Pipe	Rohr	
12	1	32938700	.Letku	Slang	Hose	Schlauch	
13	1	32945400	.Putki	Rör	Pipe	Rohr	
14	2	32945100	.Letku	Slang	Hose	Schlauch	
	1	32941200	.Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	8400
	1	32945800	.Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	8100
	1	32941600	.Putki	Rör	Pipe	Rohr	
	1	32949300	.Kiristin	Klämma	Clip	Klammer	
(	1	32946800	.Konepeitto	Motorhuv	Engine hood	Motorhaube	)
(	1	33267200	.Konepeitto	Motorhuv	Engine hood	Motorhaube	8100)

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30. Electrical system

31. **Tractor electrical system**
Autocontrol II (662343–)
Autocontrol 2.1 (668103–)
Σ–power
Autocontrol 2.2 / 2.3 (J05133–)

32. **AC power lift**
ACD power lift
ACB power lift

33. **Agrodata**
Agrodata–instrument
FieldMaster
Agroline–instrument

34. **Autocontrol III**
(6600E, 8100E)

35. **Autocontrol IV**
(6600E–8750E)

36 **CareTel**

37 **Autocontrol 5** (H49112–)
(HiTech)
Autocontrol 5.2 (K41107–)

General

The tractor electrical system, ACII, AC 2.1, AC 2.2 and SigmaPower are described in section 31. The tractor is also equipped with an electro–hydraulically controlled power lift, see section 32. Agrodata performance monitor, AD–instrument and FieldMaster are available as an optional equipment, see section 33. 6600E–8750E models have an electric control system ECS: Autocontrol–III, see section 34, Autocontrol IV, see section 35. CareTel is described in section 36 and AC V in section 37.

Valmet 6000–8750 tractors have 12 V electrical system (negative earthing). Battery (12 V, 160 Ah) is fitted in the engine compartment in front of the cab.

Voltage	12 V
Battery, 6000–6850	160 Ah
Battery, 8000–8950	184 Ah
Alternator:	
– Magneti Marelli	870 W
– Iskra, 6800, 8050–8750	1,28 kW
Starter motor:	
– Magneti Marelli	3 kW
– Iskra, 6000–8400 / 8050–8950	3,1/3,6 kW
Safety start	operated by the clutch pedal
Bulbs:	
– headlights	60/55 W–H4
– rear lights/brake lights	5/21 W
– direction indicators	21 W
– working lights	55 W–H3
– instrument panel and warning lights	2 W–1,2 W
– cabin light	2X10W–4 W
– parking light	5 W

Safety precautions for the electrical system:

– always connect the battery with the correct polarity
– disconnect the negative lead of the battery first and connect it last
– disconnect the battery leads before removing the alternator
– remove the battery caps during charging to prevent the build up of explosive gases in the battery

Important!
The alternator wiring must be disconnected before arc welding is carried out on the tractor or an implement which is attached to it.
Never run the engine with the alternator disconnected.
Do not attempt to connect any additional electrical equipment, as this may damage components of the existing electrical system.

Alternator

The tractor has a negative–earthed alternator which can easily be damaged if incorrect connections are made in the electrical system. For example, connection of the battery with wrong polarity can burn the alternator or rectifier. The charging current circuit must not be broken when the engine is running.

Battery checks and maintenance

– Check the charge in the battery using a hydrometer (acid tester). The density of the electrolyte should be at least **1,23**.
– Make sure that the fan belt (belts) are always correctly tensioned.
– Keep the battery clean. It can be washed with lukewarm water after removal from the tractor..
– Also clean the pole studs, the cable terminals and the battery retainer thoroughly. Wash off oxidized spots with water. Wipe the outside of the battery when it is clean, and coat the pole studs and the cable terminals with petroleum jelly.
– Refit the battery.



Caution!
It is forbidden to smoke or have a naked flame near the battery. The battery gives off explosive hydrogen gas!
Battery electrolyte is corrosive.

IMPORTANT WARNING! Always when the electric welding is done to the tractor, disconnect both battery cables (+ and –) and alternator wires. Otherwise the tractor electric system (e.g. Σ–Power, CareTel, Agrodata, AC/ACD power lifts, ACIII, ACIV, ACV etc.) can be damaged.

Note! Auxiliary equipment must be fitted according to the instructions. Fuse nominal current rating must be checked before fitting. On HiTech models any auxiliary components must not be fitted to the AC V electric circuit (e.g. F24) (safety risk).

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Fuses and relays

The fuse box is placed under the instrument panel. The fuse box should always be kept clean. It contains 30 fuses. The nominal current rating of the fuses is 5–20 A. If any of the fuses blow, the fault must be traced and remedied. Fuses must not be replaced with ones of higher a rating, since this may cause damage to the electrical equipment. There are space for reserve fuses between the fuses.

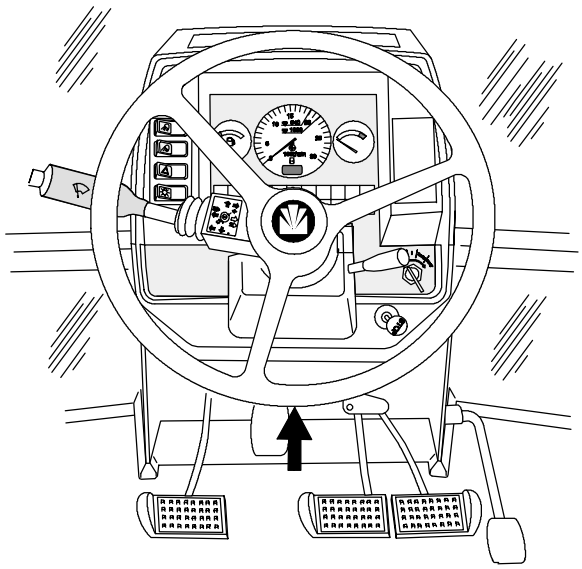
Important! Fuses on E–models, see section **34** (Autocontrol III) or section **35** (Autocontrol IV)

Fuses

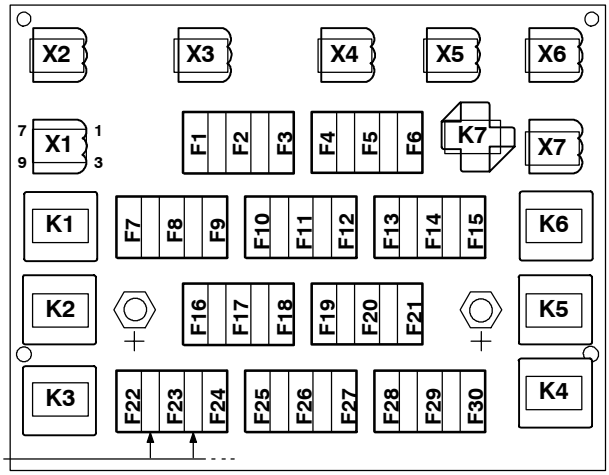
F1 15 A Hazard warning flashers, (water pump)
F2 5 A Clock, radio, tachograph, CareTel
F3 15 A Main beams, –indicator light
F4 15 A Dipped beams
F5 10 A Parking light, left
F6 10 A Parking light, right
F7 25 A Front working lights
F8 25 A Light switch
F9 15 A Trailer socket/rear fog light
F10 25 A Ignition switch, thermostart (3 pole socket) (not HiTech and AC 2.2)
F11 5 A Hydraulic power lift (+bat), buzzer (AC2) Not HiTech.
F12 10 A Rotating warning light, cab light, AC 2.2, HiTech 2.0: radio
F13 10 A Brake light. 662343–, reserve (AC II, 2.1, 2.2)
F14 15 A Reserve (water pump). HiTech and AC 2.2: Ignition switch, thermostart
F15 25 A Fan III–speed
F16 10 A Rear working lights, inner
F17 10 A Direction indicators, (Agrodata), FieldMaster Not HiTech.
F18 5 A Instruments, warning lights, Autocontrol
F19 10 A Combination control, wiper return AC 2.2: Windscreen wiper/washer, horn
F20 10 A Rear window wiper/washer. Radio.
F21 15 A Fan I, II, air conditioning, floor fan
F22 10 A Solenoid valves. 662343–, 4WD, PTO, Delta Power Shift (AC II), front PTO, 4WD (HiTech). Sensors (HiTech).
F23 10 A Rear working lights, outer
F24 10 A Reserve. 662343–, speedometer (AC–4 unit) AC5, hand brake (HiTech). Seat direction.
F25 15 A Air suspension seat, seat heating, reverse drive control lock
F26 10 A Reserve (electronic air filter)/reverse buzzer, Sigma, Hi Shift.
F27 10 A Reserve. 662343–, brake lights, diff. lock (AC II)
F28 10 A Reserve (telephone). 2 A if handsfree.
F29 10 A Cigarette lighter, 2–pole power socket
F30 10 A Rear fog light (reserv) (AC–4 sensors), CareTel 1 A, if handsfree.
(F31) 15 A . Electric air filter
F50 25A Stop solenoid, 8950.
(F51) Main current switch, control, in engine compartment.

Relays

K 1 relay, front working lights
K 2 relay, rear working lights
K 3 control relay, diff. lock/4WD. 662343–, fog lights
K 4 relay, starter switch
K 5 relay, starter switch
K 6 relay, fan III–speed
K 7 reserve. 662343–, relay for four wheel braking (AC II)
K9 interval wiper relay (in front of the fuse box)
K10 Relay direction indicators (in front of the fuse box)
K14 relay, starter motor (in engine compartment)
Relays K11, K12, K13, K15 and K16, see Autocontrol II under code 311 or Autocontrol 2.2 under code 314.
K18 Control Stop, see under code 312 (AC 2.1)
K19 Relay for Σ–power system (ETB), see code 313.
K24 Relay for Hi Shift, see code 412.
K27 Relay for 4WD in AC 2.2, see code 314
K28 Relay for hand brake, see section 50 (in lever console)
Note! X1–X7, see wiring diagrams. Fuses and relays are also listed in all wiring diagrams in this manual.



Position of fuse box



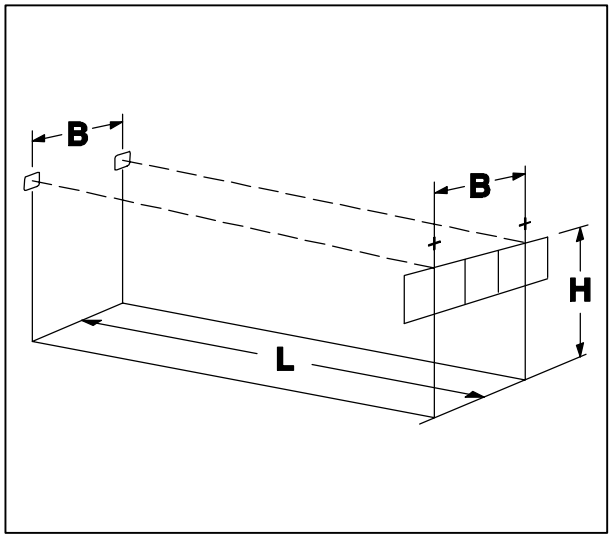
Circuit card, fuse box
(The fuse diagram is placed under the fuse box)
With effect from ser. no 662343, frames of relays K3 and K7 change places.

Note! From ser. no. **F50112** incl. the circuit card in the fuse box has been changed. At the same time wire looms have been modified. The new circuit card is interchangeable with the earlier one , except on older AC IV tractors , on which wire 353 yellow (between pins X6/2–X6/3) must be removed when the new circuit card is fitted.

Spare part numbers:
– new circuit card 31542330
– earlier circuit card 31542320

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Headlight adjustment



Correct adjustment of the headlights is very important when running on the public highway.

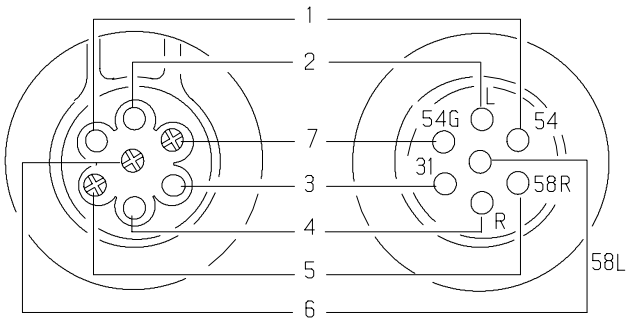
Headlight adjustment can be carried out quickly and accurately by using an optical headlight adjusting unit. If no optical instrument is available, adjustment can be done as follows:

Check before adjusting the headlight that the tractor loading is normal and tyre pressures are correct.With dipped–beam switched on, the cutoff edge of the light pattern should come at height H when the tractor is at distance L. With full–beam switched on, the distance between the light points should be B. Any necessary adjustment is done with the headlamp adjusting screws.

Measurements:

L = 5 m
B = Distance between headlight centres
H = Height of headlights above ground minus 50 mm

Standard trailer socket



1. Brake light (red)
2. LH side direction indicator (yellow)
3. Earthing (white)
4. RH side direction indicator (violet)
5. RH side parking light (brown)
6. Permanent current, max. 15 A. This current can only be cut with the main current switch (if fitted).
7. LH side parking light (black)

Electrical equipment for engine

Starter motor Magneti Marelli (Lucas) M 127/2,8 12 V

Spare part no 8353 31592

Test values, unloaded:	
– speed	5500–8000 r/min max
– current consumption	115 A
– voltage	11 V
Test values, loaded:	
– speed	1000 r/min
– current consumption	670 A
– torque	20,8 Nm
– voltage	8,0 V
Locked rotor:	
– speed	0 r/min
– current consumption	1160 A
– torque	45,4 Nm
– voltage	5,0 V
Brush spring pressure (new brush)	11,6–15,5 N
Min. brush length	8 mm
Commutator, min. diameter	38 mm

Note! Tractors 8050–8750 have starter motor **ISKRA 12 V 3,6 kW** (F2858–). Mezzo–tractors which have Bosch in–line fuel injection pump, have a new starter motor **ISKRA 12 V 3,1 kW** (6000–6800: F3792–), (8000–8400: F3818–).

Alternator Magneti Marelli (Lucas) A127–65

Spare part no 8366 40128 (6100–6600)

Spare part no 8353 39304 (8000, 8100)

Nominal voltage	12 V
Max. current 6000 r/min	65 A
Earth	minus (–)
Max permissible speed	15000 r/min
Brush length, new brush	17 mm
Min. brush length	5 mm
Brush spring pressure	1,3–2,7 N
Stator, no of poles	12
Stator, no of phases	3
Stator resistance	18 ohm
Rotor resistance	2,9 ohm
Control voltage	13,4 V
Nut for belt pulley, tightening torque	50 Nm

Note! Tractors 8050–8750 have alternator **ISKRA 95 A 12 V, 1,28 kW**.

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Alternator Iskra AAK 5118 14 V 95 A

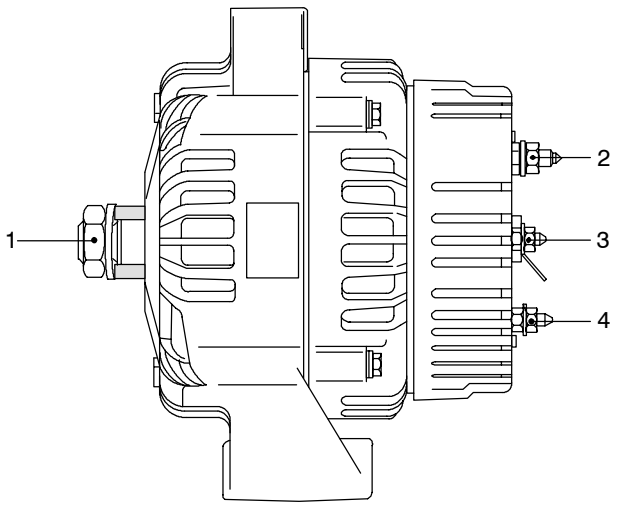
(Sisu Diesel no. 8366 40927)

Nominal voltage	12 V
Max. current (test voltage 13 V)	
2000 r/min	≥50 A
4000 r/min	≥84 A
6000 r/min	≥94 A
Charging starts at	1100 r/min
Max. permissible rotation speed	15 000 r/min
Slide ring min. diameter	15,3 mm
Min. brush length	5 mm
Rotor resistance	2,7...2,97 ohm
Stator resistance	0,33...036 ohm
Tightening torques:	
1. Shaft nut	50...70 Nm
2. Connector B+ (M6)	4,2...6,0 Nm
3. Connector D+ (M5)	2,7...3,8 Nm
4. Connector W (M 5)	2,7...3,8 Nm

Alternator Bosch NC 14 V 70–120 A

(Sisu Diesel no 8368 40939)

Nominal voltage	12 V
Max. current	(13,5 V)
– 2000 r/min	79 A
– 4000 r/min	111 A
– 6000 r/min	120 A
Charging starts at	1200 r/min
Max. permissible rotation speed	12 000 r/min
Tightening torques:	
1. Shaft nut	75...85 Nm
2. Connector B+ (M8)	Max. 18 Nm
3. Connector D+ (M5)	Max. 5 Nm



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Starter motor Iskra AZJ3234 12 V 3,1 kW

(Sisu Diesel no. 8366 40949)

Test values, unloaded:	
Rotation speed	≤1000 r/min
Current	≤140 A
Voltage	11 V
Test values, locked rotor	
Rotation speed	0 r/min (max.)
Current	≤1660 A
Voltage	5,6 V
Torque	≥45 Nm
Brush length, new brush	23 mm
Min. brush length	13 mm
Brush spring pressure	40...48 N
Commutator, min diameter	43,5 mm
Tightening torque:	
Studs (M6)	5,8 Nm
Solenoid bolts (M5)	3,2 Nm
Solenoid bolts (M6)	6,0 Nm
Field coil fixing bolts (M10)	37 Nm
Brush holder	3,2 Nm
Shift lever pin	12 Nm
Solenoid connection screw (M8)	8,5 Nm
Solenoid connectio screw (M10)	13 Nm

Starter motor Iskra AZJ3247 12 V 3,6 kW

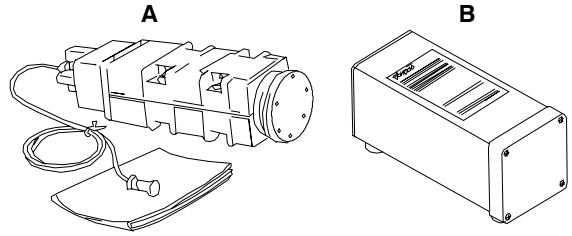
(Sisu Diesel no. 8366 40940)

Test values, unloaded	
Rotation speed	≤1000 r/min
Current	≤140 A
Voltage	11 V
Test values, locked rotor	
Rotation speed	0 r/min (max.)
Current	≤1756 A
Voltage	5,3 V
Torque	≥47 Nm
Brush length, new brush	23 mm
Min. brush length	13 mm
Brush spring pressure	40...48 N
Commutator, min diameter	43,5 mm
Tightening torques:	
Studs (M6)	5,8 Nm
Solenoid bolts (M5)	3,2 Nm
Solenoid bolts (M6)	6,0 Nm
Field coil fixing bolts (M10)	37 Nm
Brush holder	3,2 Nm
Shift lever pin	12 Nm
Solenoid connection screw (M8)	8,5 Nm
Solenoid connection screw (M10)	13 Nm

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Speed radar

The radar is used in AC III, ACIV systems and in ACD–power lift, which has a slip control. The radar is the same in these systems.



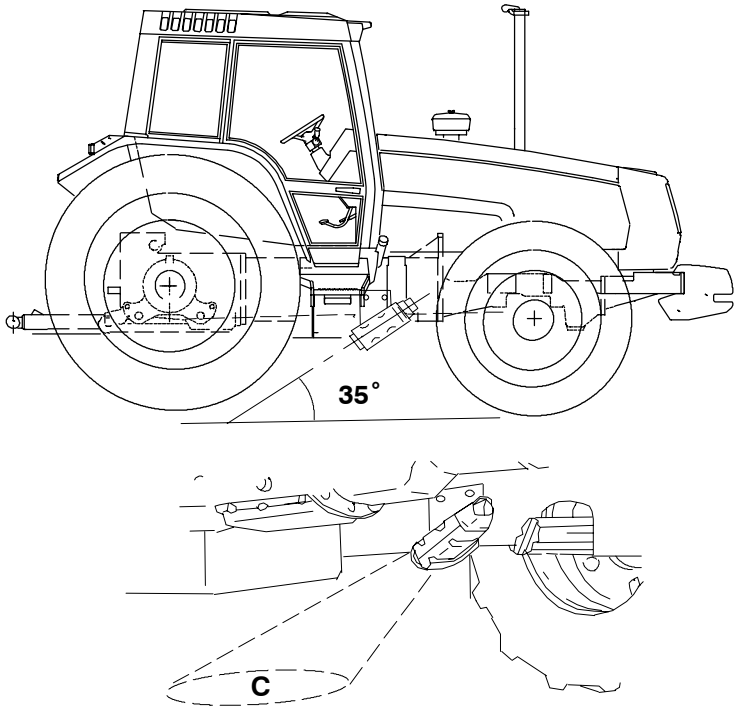
A= Dickey–john radar
B= Vansco–radar.

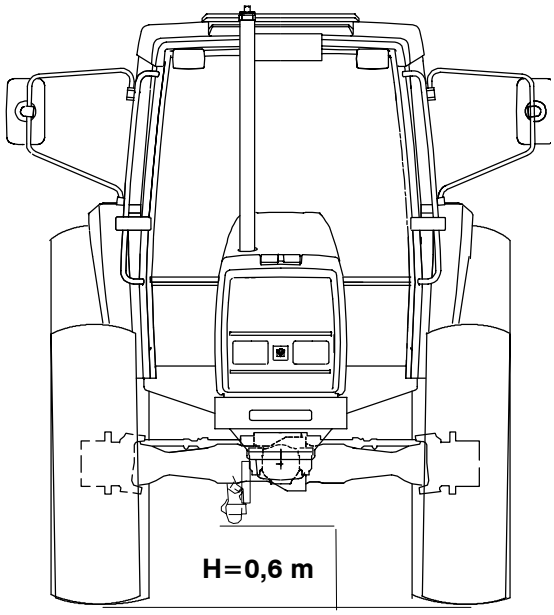
Supply voltage=9–16 V DC (battery voltage)
Signal= 130 impulses/meter
(Impulses/driving speed=constant). The function principal is so called Doppler–effect.

WARNING! When the radar is functioning, do not stay in the radar radiation area – ranger for eyes**.**

NOTE! After the radar fitting it must be calibrated according to instructions:
– AC III, see page **341**/**1**.
– AC IV, see page **351**/**2**.
– ACD–power lift, see page **321**/**6**.

Fitting





The radar is fitted so that it points rearwards at an angle of 35° (see picture above).

The ground figure C must be situated so that in this area there are no moveable points e.g. moveable soil, rotating wheel etc. E.g. movement of corn stems can cause malfunctions and also surface of water pool. The size of the elliptic ground figure is 614 mm x 437 mm, when the height of the radar from the ground is about 61 cm. In the radar radiation area there must not be hoses, tractor frame parts etc).

The metallic parts of the radar bracket must not be in the side of the radar sensor surface but a little rearwards.

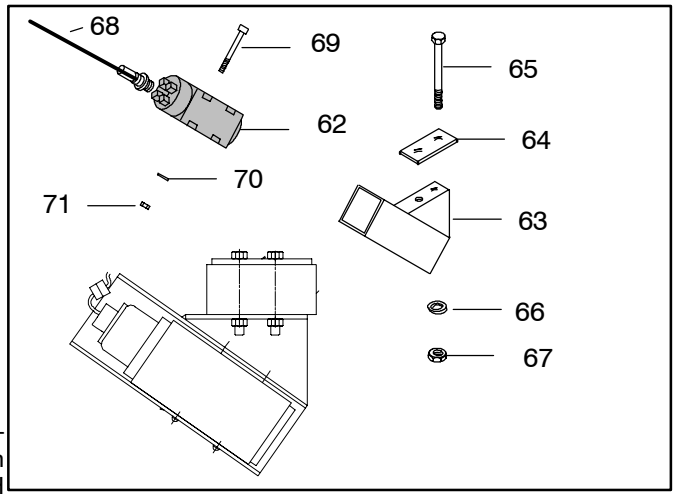
The height of the radar from the ground can be from 60 cm to 4,8 meter (Dickey–john) or from 60 cm to 1,2 meter (Vansco). The recommended height of the radar in Valtra tractors is about **60 cm**.

When fitting the radar the tractor must stand on the level ground:
– radar sensor surface must be clean (no oil or other dirt)
– The radar must not be fitted near a heat source.
– The radar bracket must be sturdy enough to prevent vibrations (min. s=8 mm). If the radar shows other digits as zero, when the tractor is stationary, the possible rearson can be vibrations
– The tractor frame or metal bracket must not touch the radar metallic rear part.

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Radar fastening parts (e.g. ACD–power lift)
(these parts can be ordered from the Spare Part Center):

62=radar=31702100
63=bracket=32912800
64=plate=32891600
65=bolt=HA8351 (2 pcs)
66=washer=JD0412 (2 pcs)
67=nut=JB8906 (2 pcs)
68=wire=33187500
69=bolt=HC8514 (4 pcs)
70=washer=JD0406 (4 pcs)
71=nut=JB8903 (4 pcs)

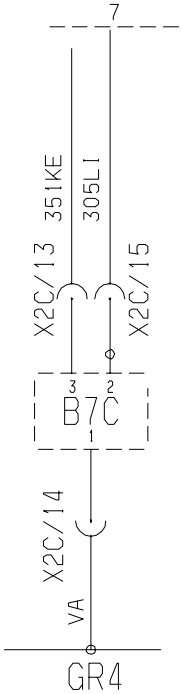


The radar bracket is fastened on the RH side door step attachment on the intermediate frame. If the tractor is equipped with pressure air systems, the radar bracket is fastened on the LH side.

Electric connections:

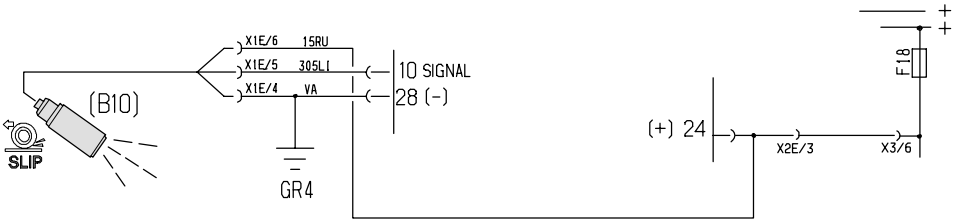
The radar is connecetd with cable 33187500 to the tractor electric system. Figures below show connections in AC IV and ACD power lift.

AC IV



X2C: Sensor connector in the lever console
B7C: Radar
GR 4: Earth point in the lever console rear part

ACD–power lift

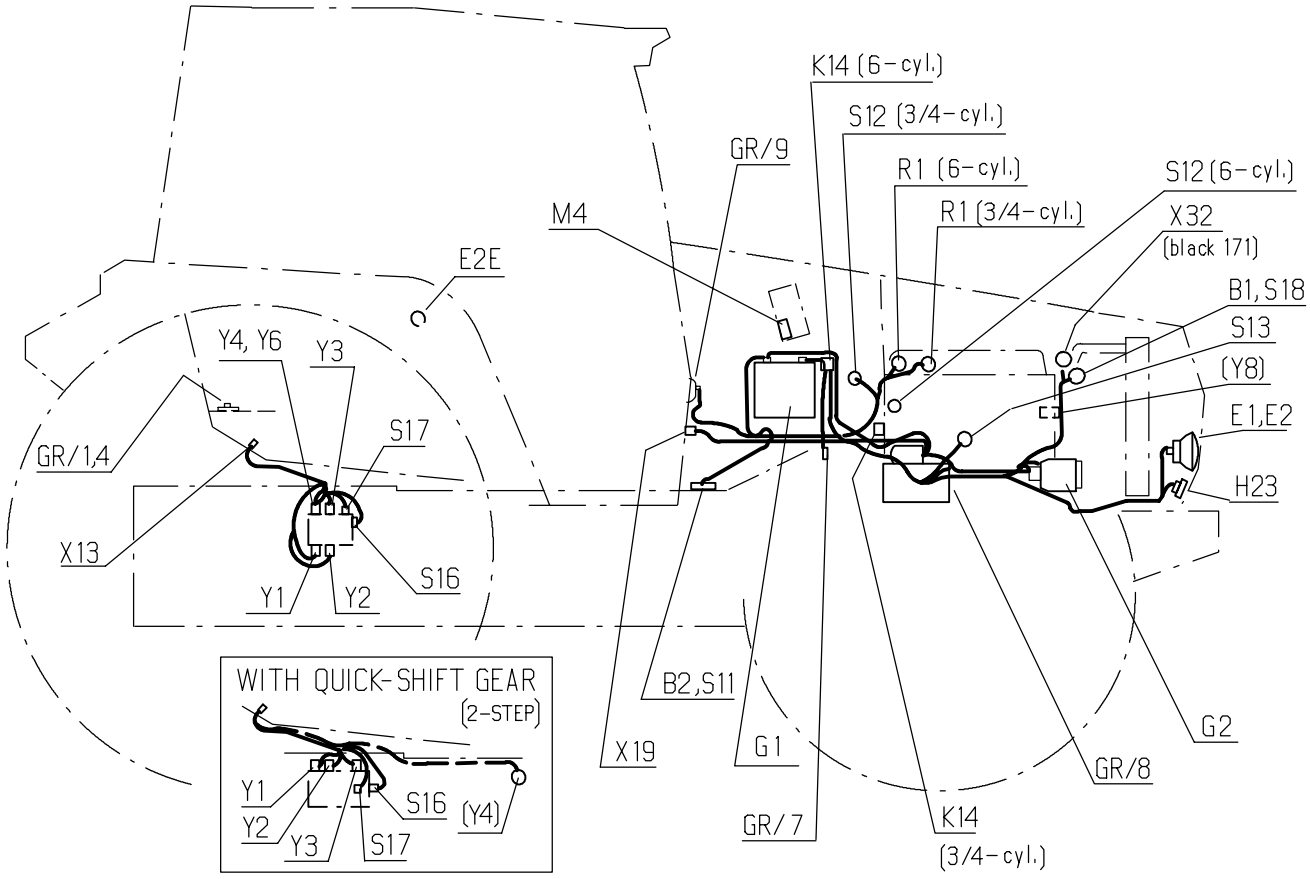


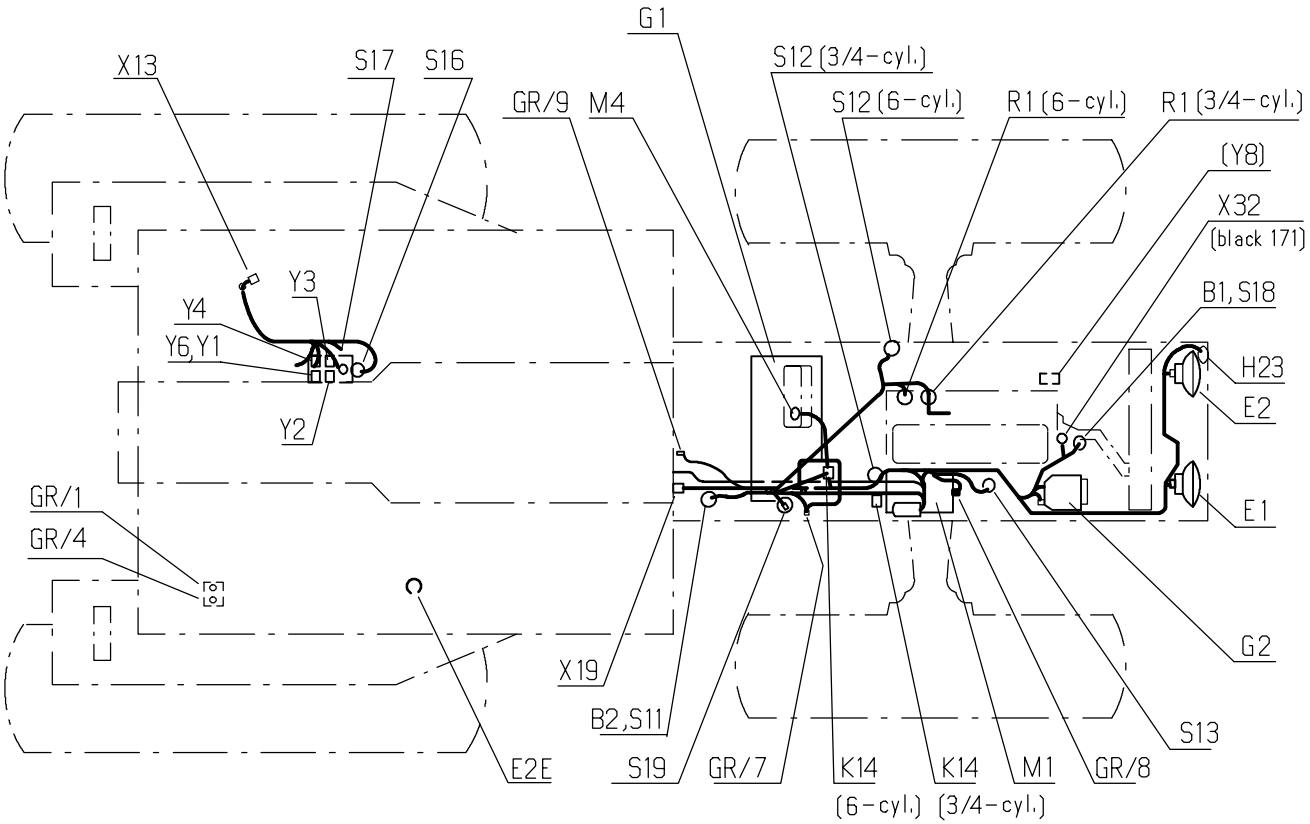
X1E: connector on the plate in the lever console (HiTech) or a separate connector in the console (not HiTech)
GR4: Earth point in the rear part of the lever console
B10: radar

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Position of electric components on frame

Note! Symbols, see component lists on pages 310/7–8, 310/11–12 and 310/16–17.

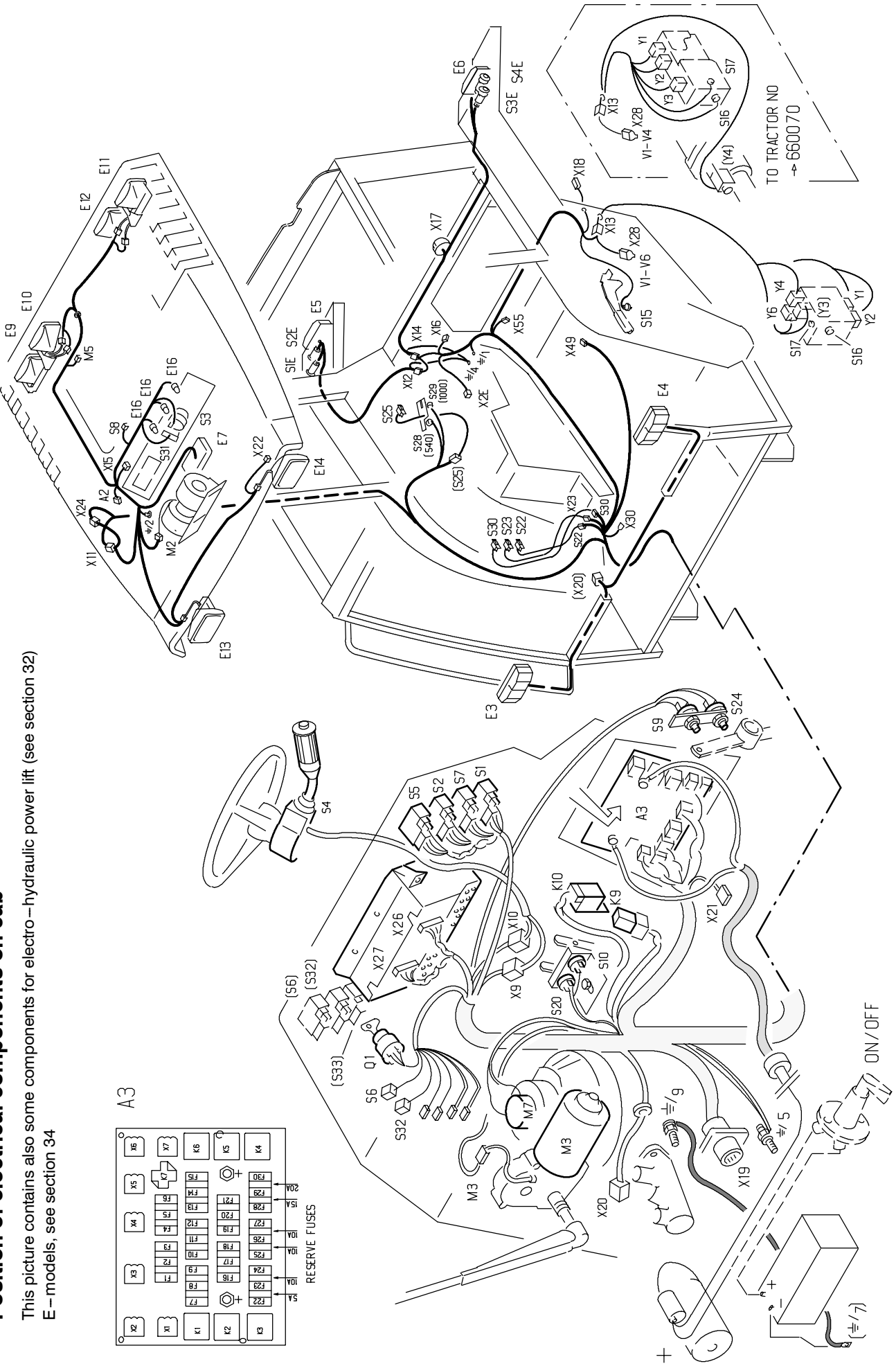




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Position of electrical components on cab

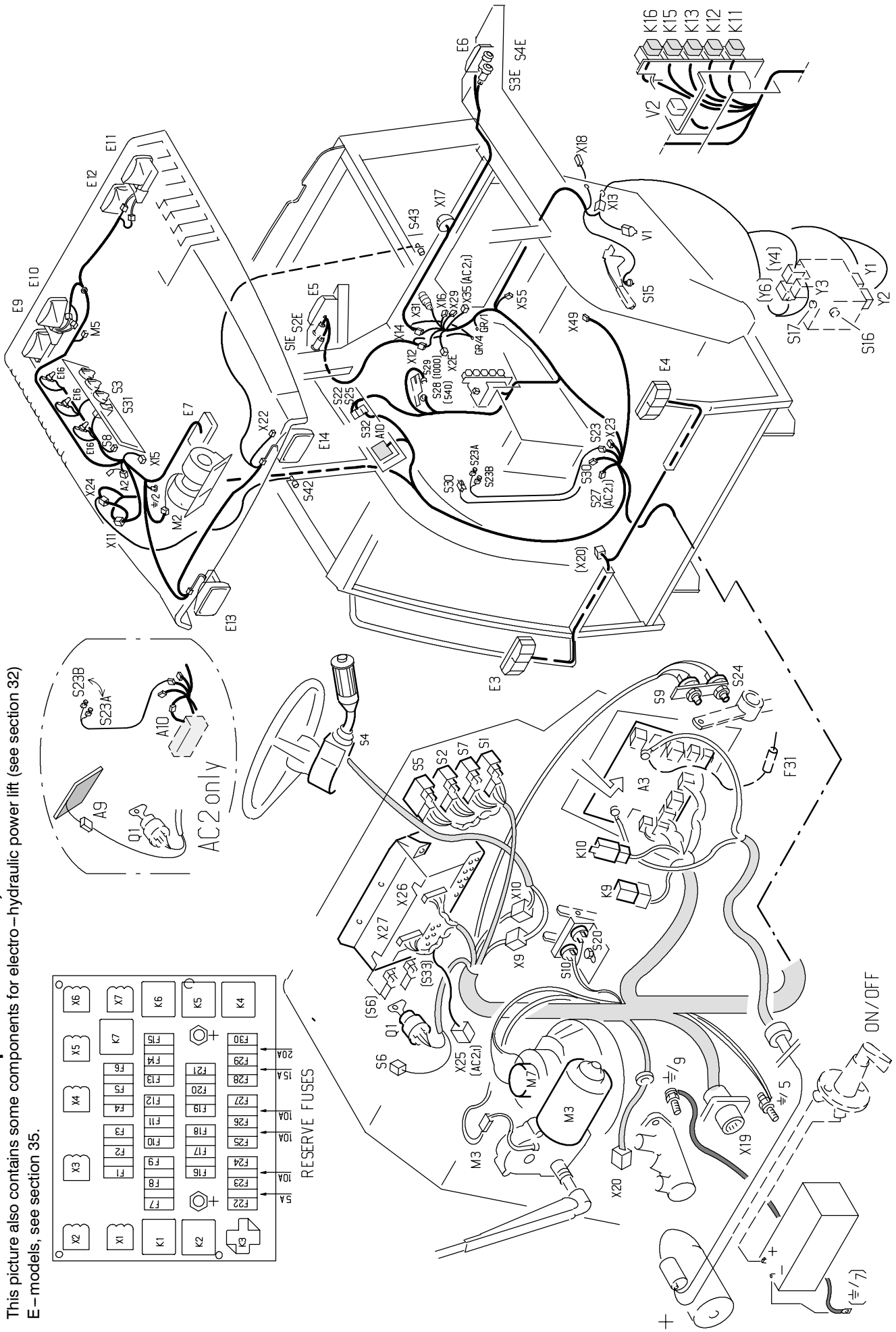
This picture contains also some components for electro–hydraulic power lift (see section 32)
E–models, see section 34



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Position of electrical components on cab, 662343–F17106

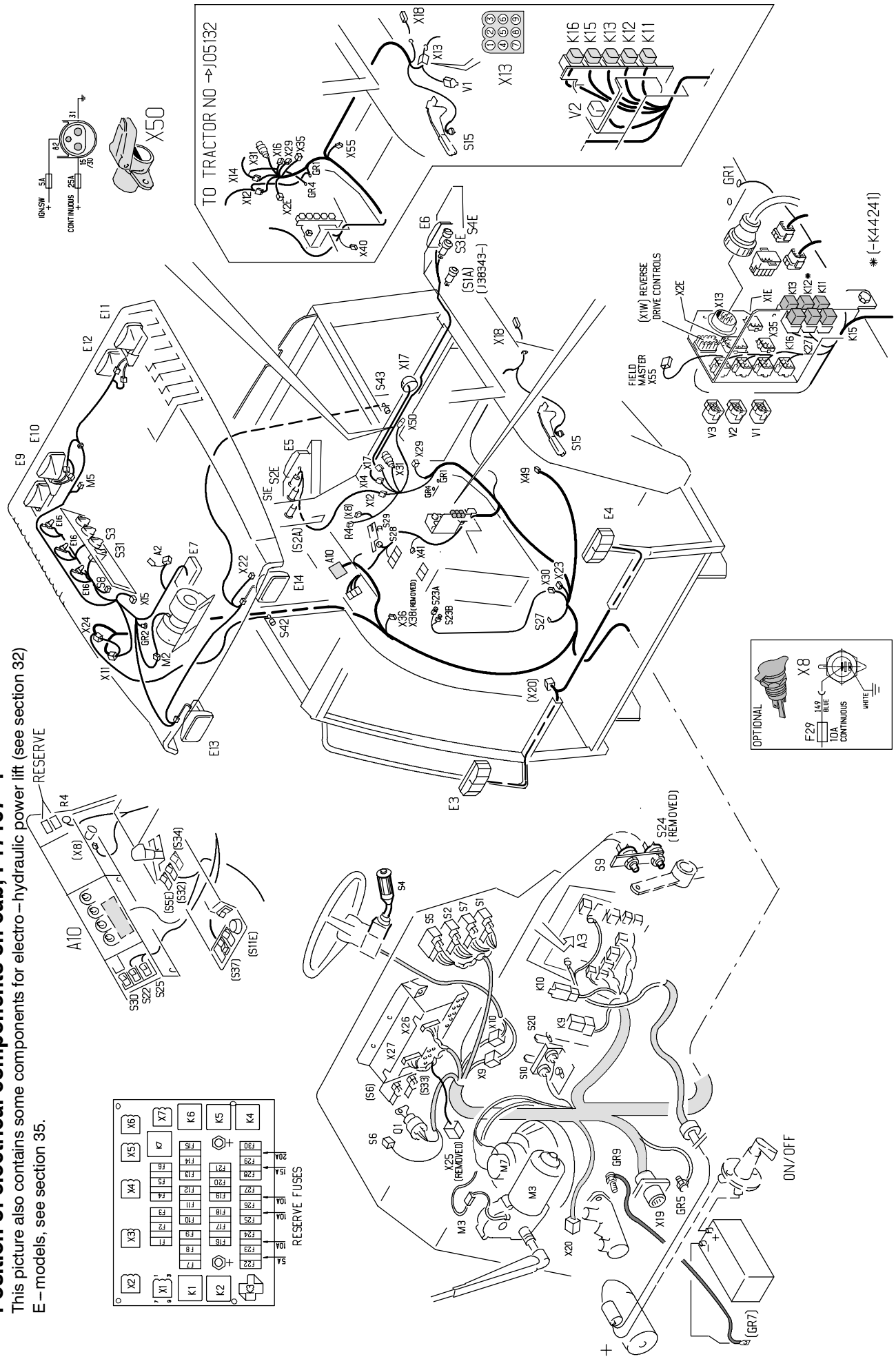
This picture also contains some components for electro–hydraulic power lift (see section 32)
E–models, see section 35.



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Position of electrical components on cab, F17107–.

This picture also contains some components for electro–hydraulic power lift (see section 32)
E–models, see section 35.

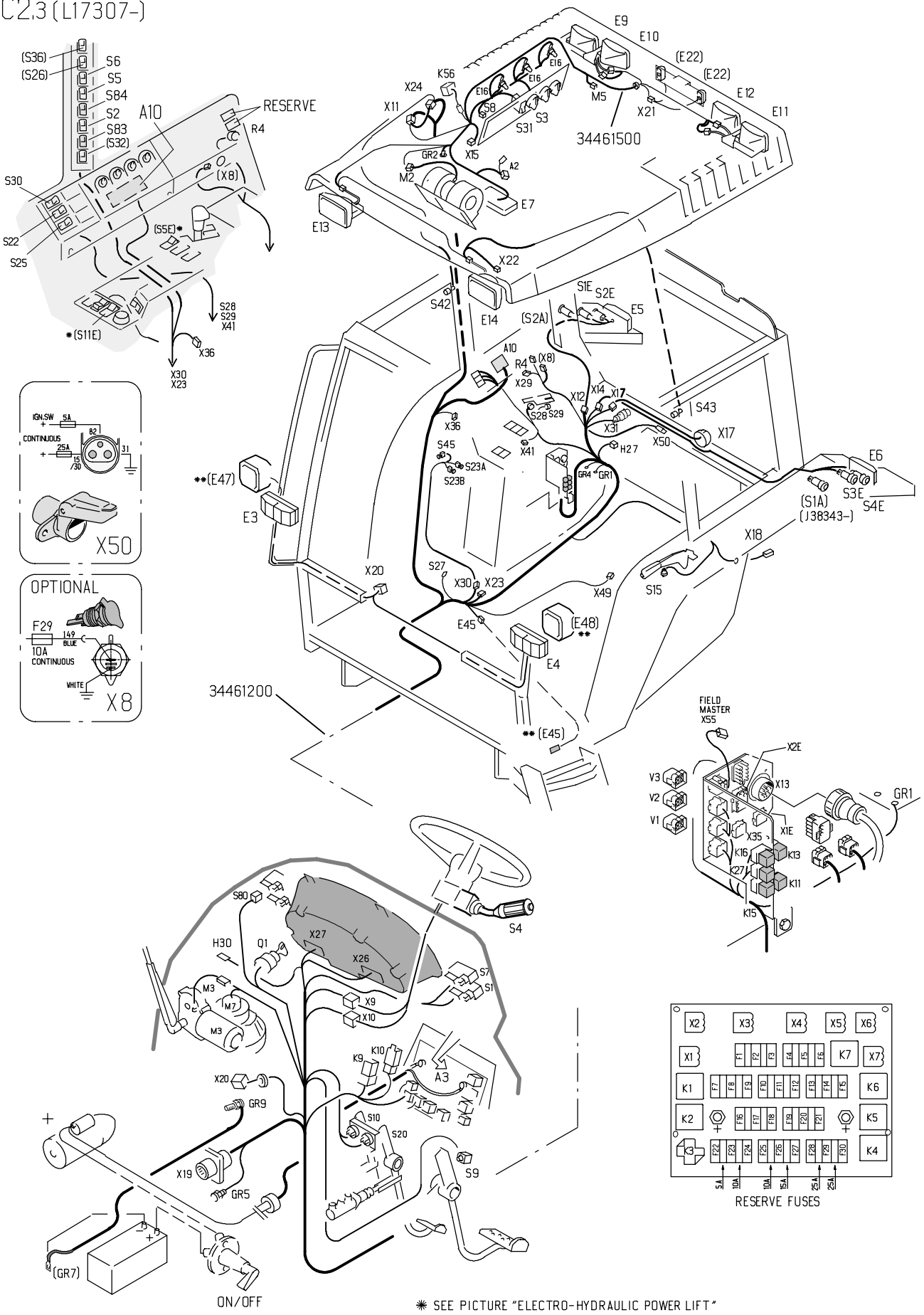


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ELECTRICAL EQUIPMENT, CAB

AC2.3 (L17307–)

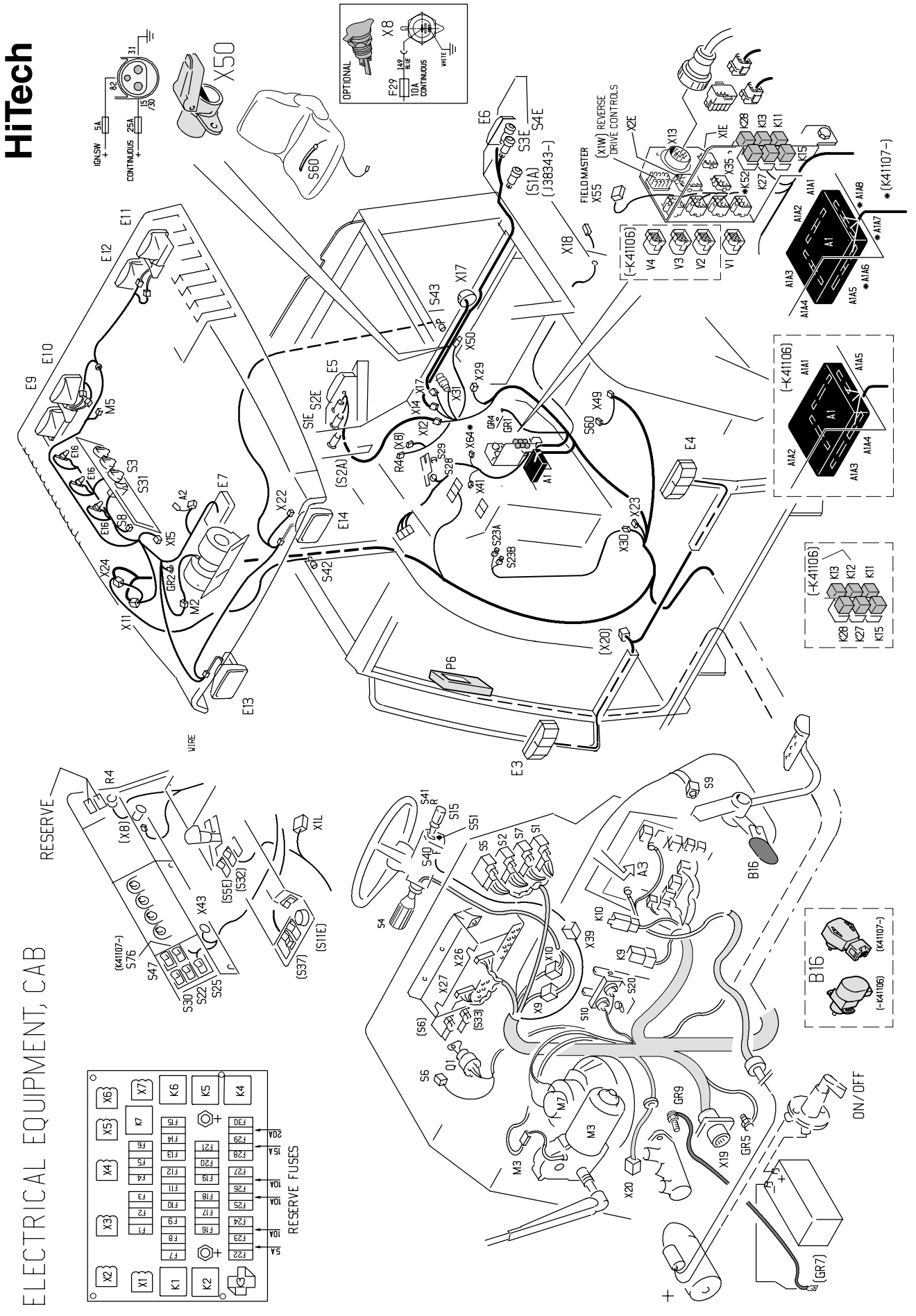
Not HiTech



✳ SEE PICTURE "ELECTRO-HYDRAULIC POWER LIFT"

✳✳ INFOLINE (OPTION)

https://truckmanualshub.com/

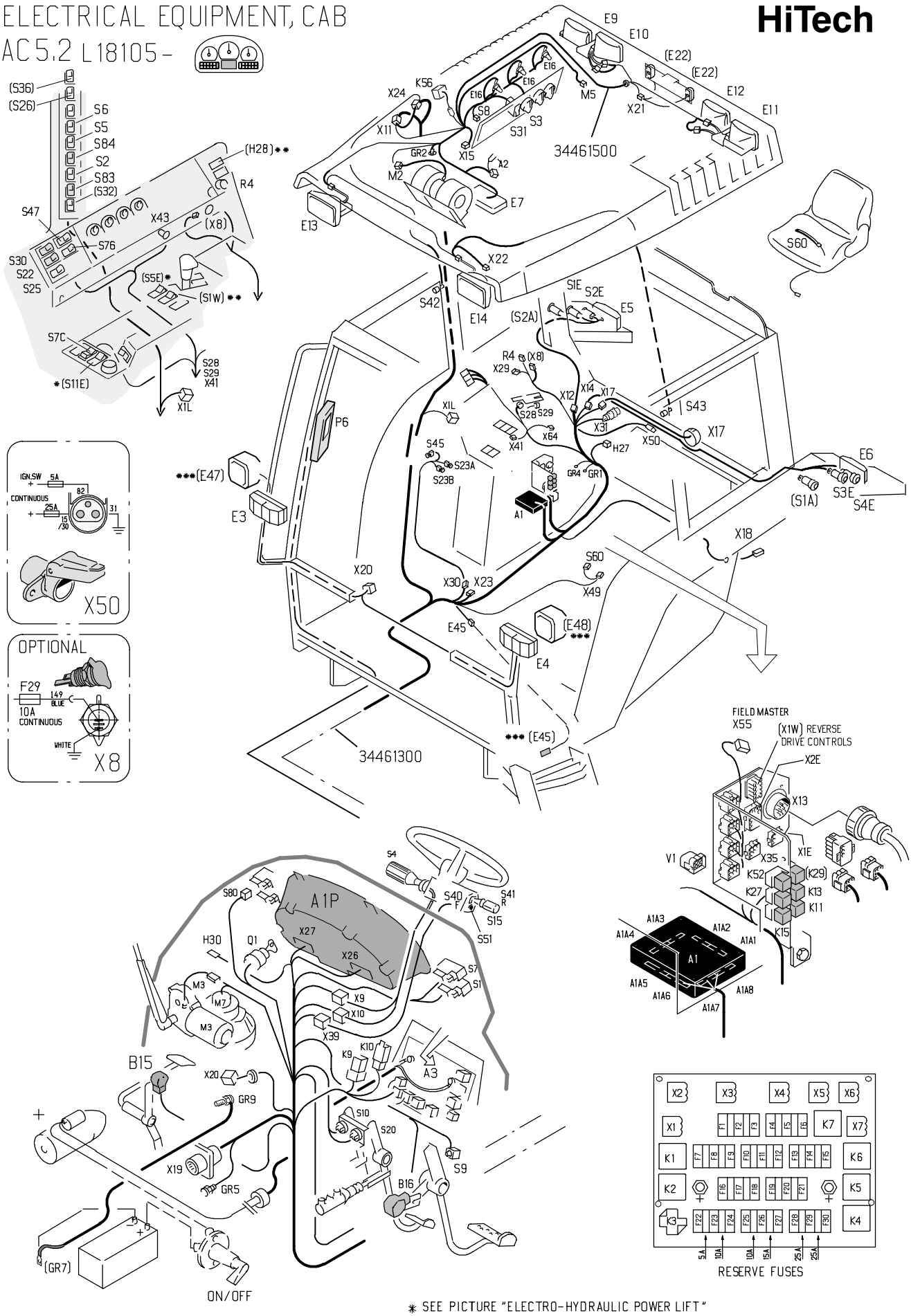


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ELECTRICAL EQUIPMENT, CAB

AC 5.2 L 18105 –

HiTech



* SEE PICTURE "ELECTRO-HYDRAULIC POWER LIFT"

** SEE PICTURE "REVERSE DRIVE CONTROLS"

*** INFOLINE (OPTION)

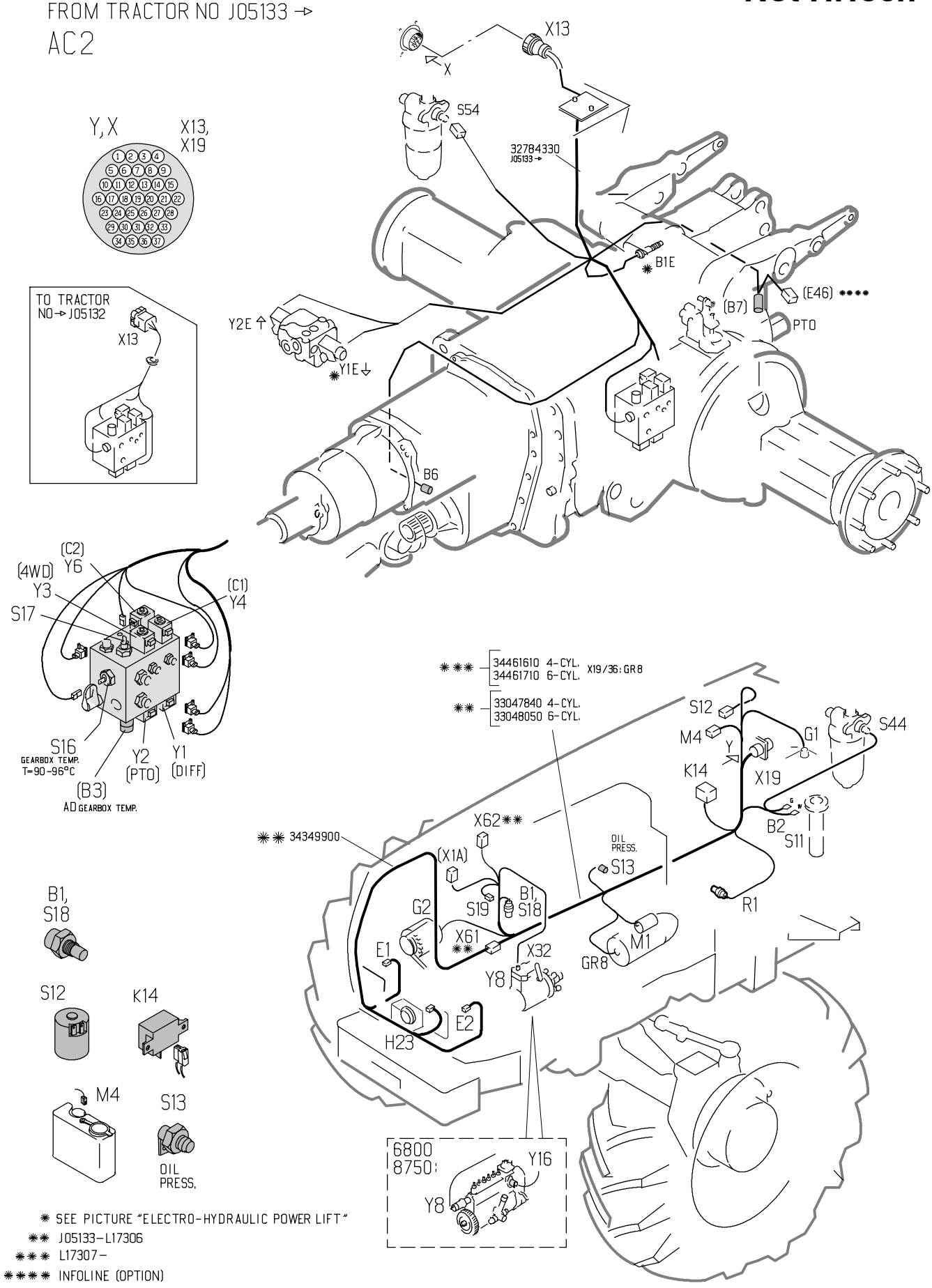
https://truckmanualshub.com/

ELECTRICAL EQUIPMENT, ENGINE + FRAME

FROM TRACTOR NO J05133 →

AC2

Not HiTech



* SEE PICTURE "ELECTRO-HYDRAULIC POWER LIFT"

** J05133–L17306

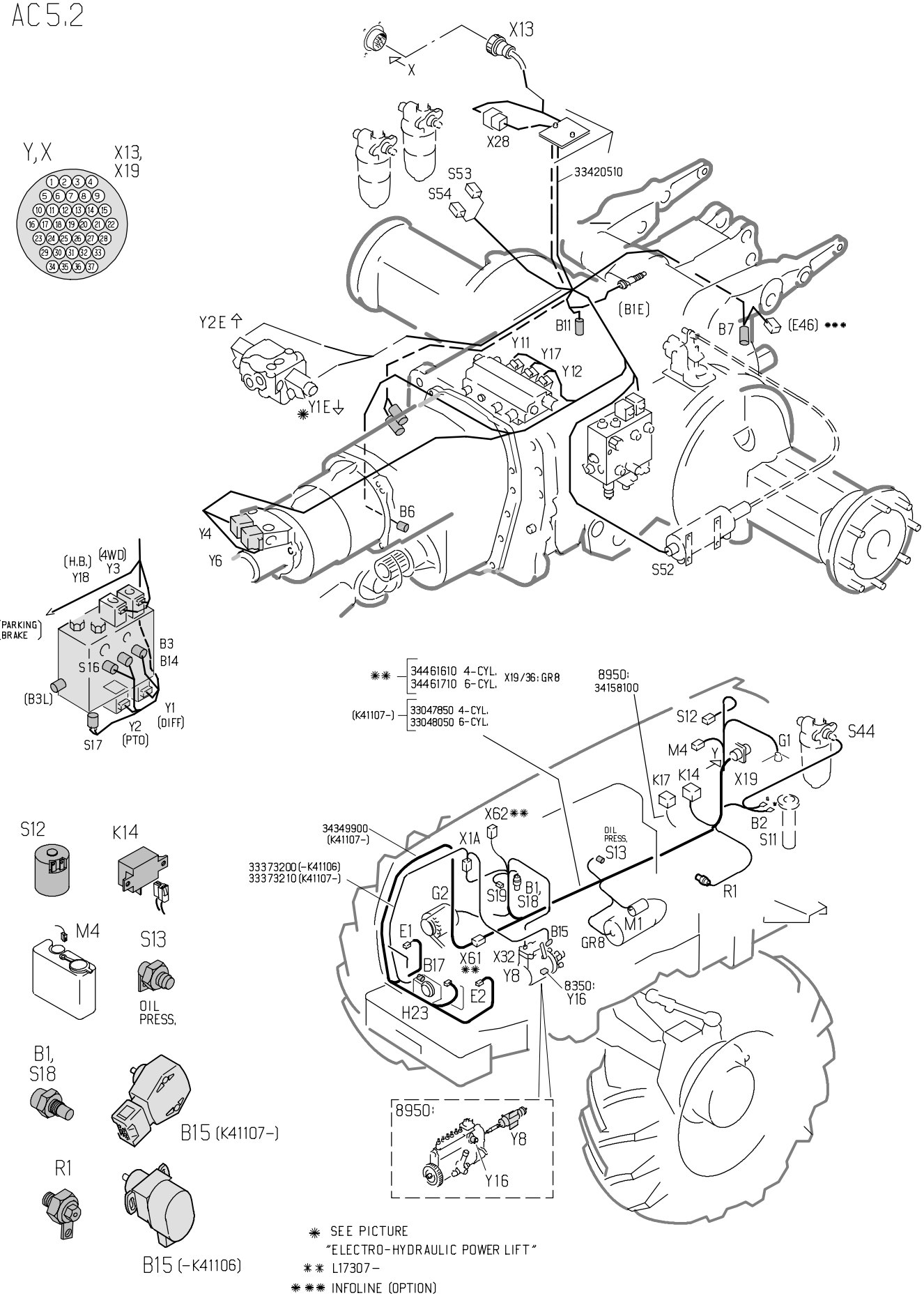
*** L17307–

**** INFOLINE (OPTION)

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ELECTRICAL EQUIPMENT, ENGINE + FRAME
AC 5.2

HiTech



* SEE PICTURE "ELECTRO-HYDRAULIC POWER LIFT"
** L17307-
*** INFOLINE (OPTION)

Wiring diagram up to serial no 660070

(E–models, see section 34). Diagram no. 318 716 10 32E.

See diagrams on pages **310/9–10**

Sym–bol	Component	Code
(A 2)	Radio	2
A3	Fuse box	
A4	Velocity meter	68
(A 5)	Air spring seat	66
(A6)	Agrodata	36–
(A7)	Electronic air filter	54
A8	Buzzer control	
B 1	Sender unit, engine temperature	13
B 2	Sender unit, fuel gauge	16
B 8	Sensor, wheel speed	67
E 1	Headlights, right	24
E 2	Headlights, left	23
E 3	Front direction indicator, right	28
E 4	Front direction indicator, left	26
E 5	Rear light, right	31
E 6	Rear light, left	30
E 7	Cabin light	43
E 9	Rear working light, right outer	38
E10	Rear working light, right inner	37
E11	Rear working light, left outer	39
E12	Rear working lights, left inner	38
E13	Front working light, right	41
E14	Front working light, left	41
E15	Instrument light	14,16
E16	Roof console light	51
(E17)	Seat heating	66
(E18)	Foot step light	42
(E20)	Parking light, right, Norway	27
(E21)	Parking light, left, Norway	27

F1	15 A	hazard warning flashers, reserve	29
F2	5 A	clock, radio	2
F3	10 A	main beams, –indicator light	23
F4	10 A	dipped beams	23
F5	5 A	parking light, left	26
F6	5 A	parking light, right	28
F7	10 A	front working lights	40
F8	20 A	light switch	26
F9	15 A	trailer socket	31
F10	15 A	ignition switch, thermostart	4
F11	5 A	hydraulic power lift	69
F12	10 A	Rot. warning light, cab light, door light	44
F13	10 A	brake light	55
F14	10 A	reserve	66
F15	20 A	fan III–speed	49
F16	10 A	rear working lights, inner	38
F17	10 A	direction indicators, (Agrodata)	29
F18	5 A	instruments, warning lights, Autocntr.	14, 25
F19	10 A	combination control, wiper return	20
F20	10 A	rear window wiper/washer	45
F21	15 A	fan I, II, air conditioning, floor fan	48
F22	10 A	solenoid valves,	57
F23	10 A	rear working lights, outer	38
F24	10 A	Reserve/velocitymeter	68
F25	10 A	air spring seat, seat heating	66
F26	10 A	reserve (electronic air filter)	54
F27	10 A	reserve	68
F28	10 A	reserve (telephone)	67
F29	10 A	cigarette lighter, power socket	35
F30	10 A	reserve	68

Sym–bol	Component	Code
G 1	Battery	1
G 2	Alternator	4
H 1	Ind. light, direction indicator III	34
H 2	Ind. light, direction indicator II	33
H 3	Ind. light, direction indicator I	32
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	13
H 7	Warning light, gearbox oil pressure	9
(H8)	Gearbox oil filter	
H 9	Ind. light, 4WD	58
H10	Ind. light, PTO 540	61
H11	Ind. light, parking brake	11
H12	Ind. light, Thermostart	6
H14	Ind. light, main beams	22
H15	Ind. light, low fuel level	12
H16	Ind light, charging	6
H18	Warning light, gearbox oil temp.	12
H20	Ind. light, diff. lock	57
H21	Ind. light, PTO 1000	61
H23	Horn	18
(H24)	Rotating warning light	44
K 1	Relay, front working lights	40
K 2	Relay, rear working lights	38
K 3	Control relay, diff. lock/4WD	55
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III–speed	49
K 7	Reserve	66
K 9	Relay, interval wiper	20
K10	Direction indicator relay	31–32
K14	Starter motor relay	4
M 1	Starter motor	3
M 2	Fan	48
M 3	Windscreen wiper	21
M 4	Windscreen washer	19
(M 5)	Rear window wiper	46
(M 6)	Rear window washer	45
(M 7)	Floor fan	50
P 1	Engine coolant thermometer	14
P 2	Fuel gauge	16
P 3	Revolution counter	16
P 4	Hour recorder, working height	17
Q 1	Starter switch	4
(Q 2)	Main circuit breaker	2
R 1	Thermostart	5
(R 4)	Cigarette lighter	35
S 1	Switch, headlights	25–26
S 2	Switch, rear working lights	37
S 3	Switch, fan	48
S 4	Combination control	19–3
S 5	Switch, front working lights	40
(S 6)	Switch, rot. warning light	44
S 7	Switch, hazard warning flashers	30
(S 8)	Switch, air conditioner	47

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Sym–bol	Component	Code
S 9	Safety circuit breaker	4
S10	Brake light contact, right	55
S11	Fuel gauge sender unit	16
S12	Pressure drop indicator, air filter	7
S13	Engine oil pressure sender unit	8
S15	Sender unit to hand brake ind. light	11
S16	Gearbox temperature sender unit	12
S17	Gearbox oil pressure sender unit	9
S18	Engine temp. sender unit (STOP)	13
(S19)	Air cond. compressor pressure switch	47
S20	Brake light contact, left	55
S22	Switch, diff. lock	56
S23	Switch, quick–shift gear (engaging)	65
S24	Switch, quick–shift gear (disengaging)	65
S25	Switch, PTO	63
S28	Switch, PTO 540	63
S29	Switch, PTO 1000	61
S30	Switch, 4WD	59–60
S31	Switch, floor fan	50
(S32)	Switch, rear window washer and wiper	45
(S49)	Switch, rpm/flow meter (Agrodata)	
(S50)	Switch, km/h, wheel sensor (Agrodata)	
(S52)	Switch, door	42
V 1...4	Diode	
X 1	Connector, 9 pins, fuse box	
X 2	Connector, 9 pins, fuse box	
X 3	Connector, 9 pins, fuse box	
X 4	Connector, 9 pins, fuse box	
X 5	Connector, 9 pins, fuse box	
X 6	Connector, 9 pins, fuse box	
X 7	Connector, 9 pins, fuse box	
(X 8)	Connector, 2 pins, power socket	36
X 9	Connector, 9 pins, combination control	
X10	Connector, 9 pins, combination control	
X11	Connector, 9 pins, upwards	
X12	Connector, 9 pins, rearwards, right	
X13	Connector, 4 pins, solenoid valves	
X14	Connector, 9 pins, rearwards, left	
X15	Connector, 3 pins. air cond. diodes	
X16	Connector, 3 pins, cigarette lighter, current socket	
X17	Trailer socket, 17 pins	30
X18	Connector, 2 pins, rear window washer	
X19	Connector, 24 pins, front wall	
X20	Connector, 9 pins, front direction indicators	
X21	Connector, 3 pins, buzzer	
X22	Connector, 1 pin, rot. warning light	
X24	Connector, 9 pins, upwards	
X26	Connector, 26 pins, instr. left white	
X27	Connector, 26 pins, instr. right blue	
X28	Connector, 6 pins, diodes	
X49	Connector, 2 pins, seat	
(X53)	Agrodata, socket for implement, 7 pins	
(X54)	Connector, 9 pins, Agrodata sensors	
(X55)	Agrodata supply, 1 pin.	36–
Y 1	Solenoid valve, diff. lock	56
Y 2	Solenoid valve, PTO	63
Y 3	Solenoid valve, 4WD	60
(Y 4)	Solenoid valve, quick–shift gear	65
(Y 5)	Solenoid valve, compressor	47

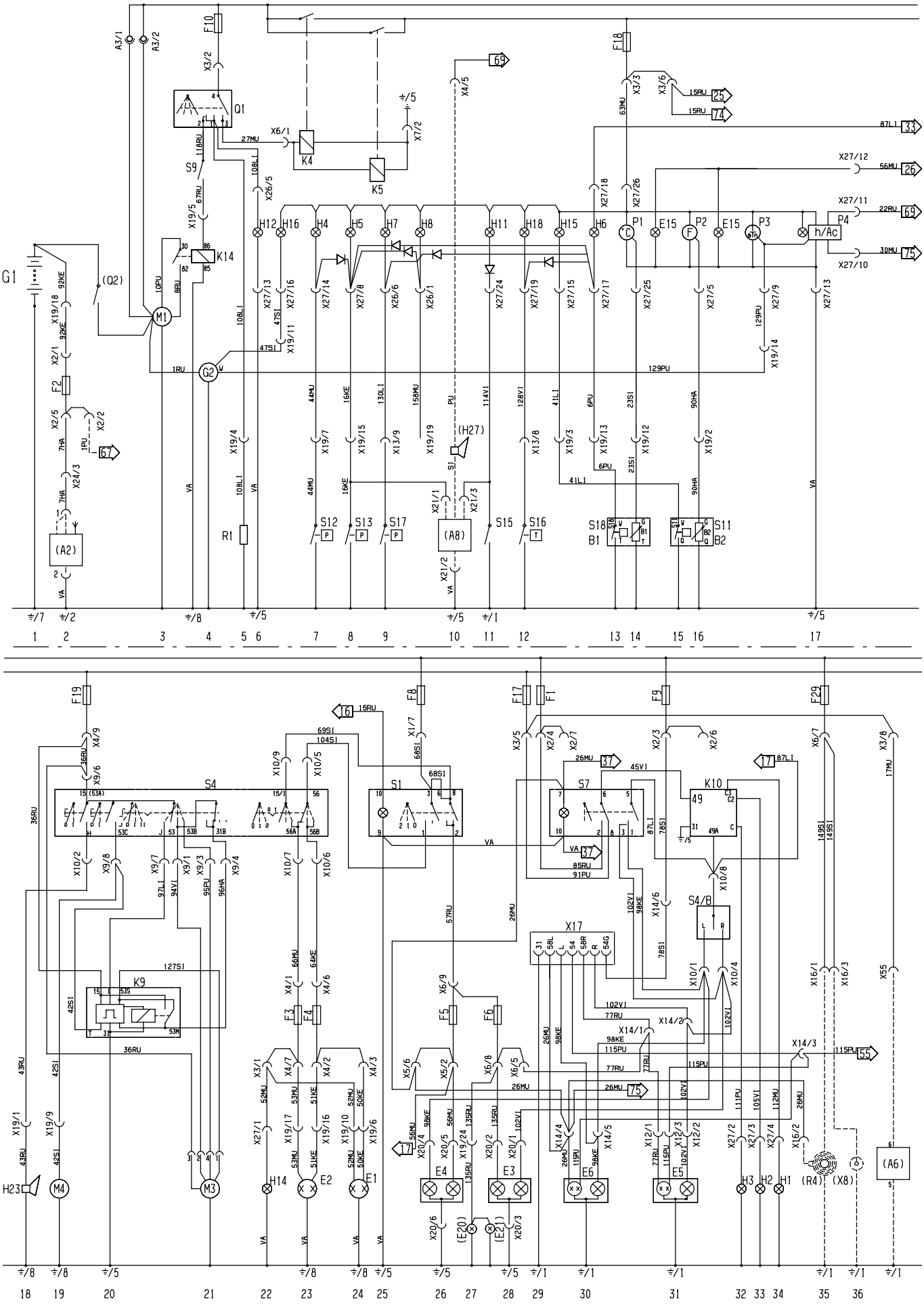
/1	Earth lead, rear lights
/2	Earth lead, roof
/4	Earth lead, Autocontrol
/5	Earth lead, cable harness instr. panel
/7	Earth lead, battery
/8	Earth lead, headlights
/9	Earth lead, cab

Symbols in brackets=optional

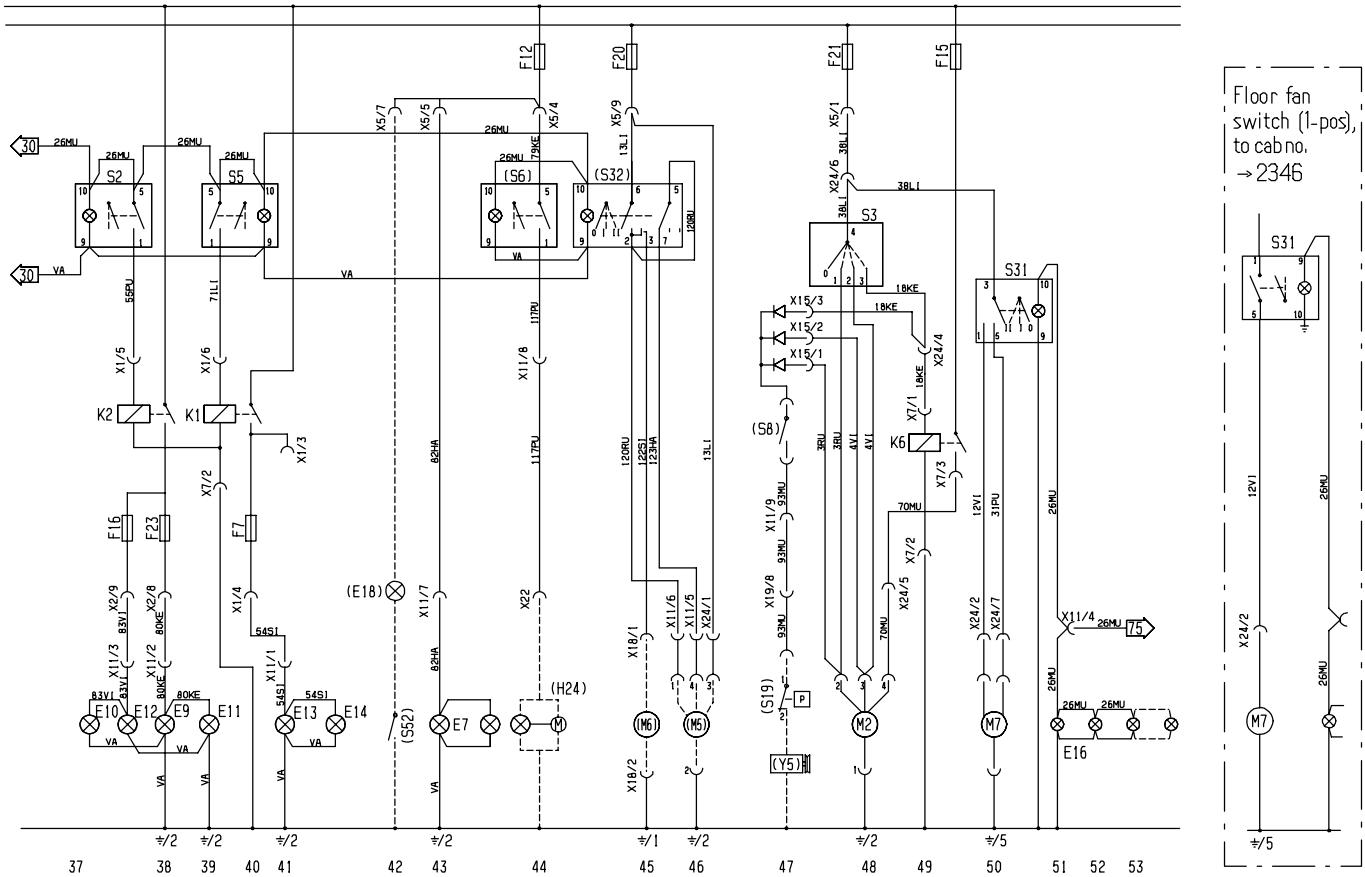
Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

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Wiring diagram from tractor serial no 660071 up to ser. no 662342

(**E–models, see section 34**). Diagram no 31871620–32. See diagrams on pages 310/13–15.

Sym–bol	Component	Code no
(A 2)	Radio	2
A 3	Electric centre	
(A 4)	Speedometer + clock	93
(A 5)	Air suspension seat	94
(A 6)	Agrodata	95
(A 7)	Electric air filter	96
(A 8)	Buzzer control unit	11
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B 8)	Sensor, wheel speed	93
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front direction indicator, right	31
E 4	Front direction indicator, left	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E18)	Footstep light	45
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	
(E23)	Upper head light, right	24
(E24)	Upper head light, left	**23**
(E25)	Parking light, upper, right	**22**
(E26)	Parking light, upper, left	**22**
F 1	15 A Hazard blinkers, reserve	31
F 2	5 A Radio, (clock)	2
F 3	10 A High beam, indicator light	25
F 4	10 A Low beam	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
f 9	15 A Trailer socket	31
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+30)	83
F12	10 A Rot. warning light, cabin and footstep light	47
F13	10 A Brake lights	61
F14	10 A Reserve	97
F15	20 A Fan III– speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, agrodata	32
F18	5 A Instruments, warning lights, autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear w. wiper /washer	48
F21	15 A Fan I, II, air conditioner., floor fan	55
F22	10 A Solenoid valves	62
F23	10 A Rear working lights, outer	41
F24	10 A Reserve / (speedometer)	93
F25	10 A Air suspension seat	94
F26	10 A Reserve / (el. air filter)	96
F27	10 A Reserve	98
F28	10 A Reserve (telephone)	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A Reserve	102
G 2	Alternator	4
H 1	Pilot light, direction indicator III	34
H 2	Pilot light, direction indicator II	34
H 3	Pilot light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gearbox oil press.	9
(H 8)	Pilot light, oil filter, gearbox	10
H 9	Pilot light, 4WD	63
H10	Pilot light PTO switch 540	65
H11	Pilot light, parking brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beams	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H18	Warning light, gearb. oil temp.	13
H20	Pilot light, diff. lock	63
H21	Pilot light, PTO switch 1000	65
H22	Reserve	
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Buzzer, parking brake	11
K 1	Relay, front working lights	43
K 2	Relay , rear working lights	41
K 3	Control relay, diff. lock/4WD	61
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Reserve	101
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K14	Starter motor relay	4
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M 5)	Rear window wiper	49
(M 6)	Rear window washer	48
(M 7**)**	Floor fan	57
P 1	Engine coolant thermometer	16
P 2	Fuel gauge	17
P 3	Revolution counter	18
P 4	Hour recorder/work. height	19
Q 1	Starter switch	4
(Q 2)	Main switch	3
R 1	Thermostart	5
(R 4)	Cigarette lighter	91
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S 3	Switch, fan	55
S 4	Combination control	25,34, 52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioner	54
S 9	Safety circuit breaker	4
S10	Brake light contact, right	61
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16

Sym–bol	Component	Code no
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	61
S22	Switch, differential lock	62
S23	Switch, quick–shift gear (engaging), 2–step	67
	3–step	68
S24	Switch, quick–shift gear, (disengaging)	67
S25	Switch, PTO release	66
S28	Switch, PTO 540	66
S29	Switch, PTO 1000	65
S30	Switch, 4WD	64
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S49)	Change over switch, rpm/flow meter (agrodata)	
(S50)	Change over switch, km/h, wheel sensor, tractor /implement (agrodata)	
(S52)	Switch, door	45

V 1...4 Diode

X 1	Connector, 9 pin., distribution box	
X 2	Connector, 9 pin., distribution box	
X 3	Connector, 9 pin., distribution box	
X 4	Connector, 9 pin., distribution box	
X 5	Connector, 9 pin., distribution box	
X 6	Connector, 9 pin., distribution box	
X 7	Connector, 9 pin., distribution box	
(X 8)	Connector, 2 pin., power socket	92
X 9	Connector, 9 pin, combination control	
X10	Connector, 9 pin., combination control	
X11	Connector, 9 pin., upwards	
X12	Connector, 9 pin., rearwards, right	
X13	Connector, 9 pin., solenoid valves.	
X14	Connector, 9 pin., rearwards, left	
X15	Connector, 3 pin., air cond., diodes	
X16	Connector, 3 pin., cigarette lighter, current socket	
X17	Rear socket, 7 pin	32
X18	Connector, 2 pin., rear window washer	
X19	Connector, 24 pin, front wall	
X20	Connector, 9–pole, front direction indicator	
X21	Connector, 3–pin., buzzer (H27)	10
X22	Connector, 1 pin., rot. roof light	
X24	Connector, 9 pin., upwards	
X26	Connector, 26 pin., instr. left, white.	
X27	Connector, 26 pin., instr. right, blue	
X28	Connector, 6 pin., diodes, (Y1,Y2,Y3,Y4,Y6)	
X30	Connector, 1 pin, 4WD control	
(X31)	Socket, 2 pin, PTO–emerg. stop	
X49	Connector, 2 pin., seat	
(X53)	Agrodata socket, 7 pin, implement	
(X54)	Connector, 9 pin Agrodata sensors	
(X55)	Connector,1 pin., Agrodata supply	28

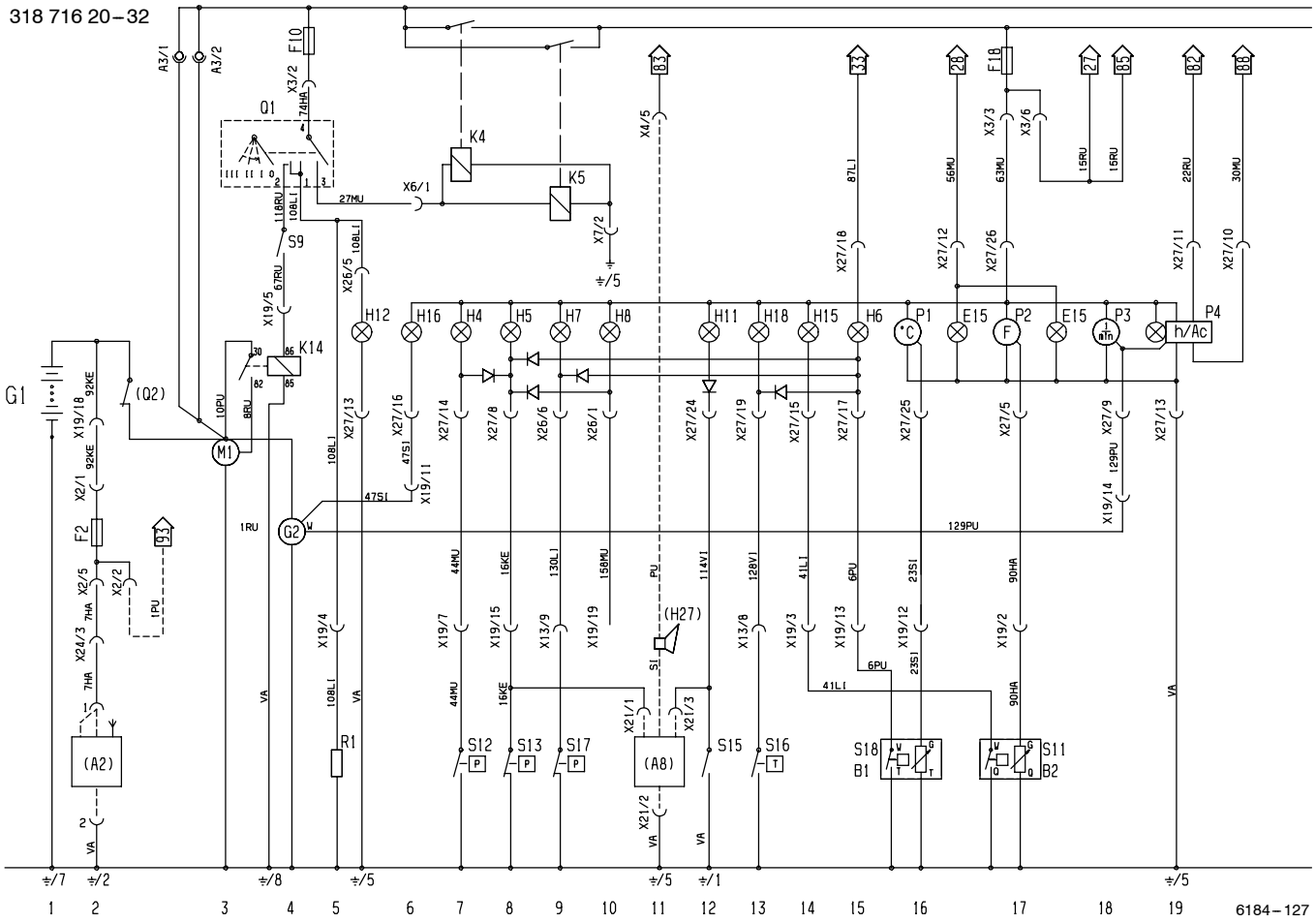
Y 1	Solenoid valve, diff lock	62
Y 2	Solenoid valve pto	66
Y 3	Solenoid valve 4WD	64
(Y 4)	Solenoid valve, quick–shift gear, lower range, 2–step	67
	3–step	69
(Y 5)	Solenoid valve compr., air con.	54
(Y 6)	Solenoid valve, quick–shift gear, higher range	68

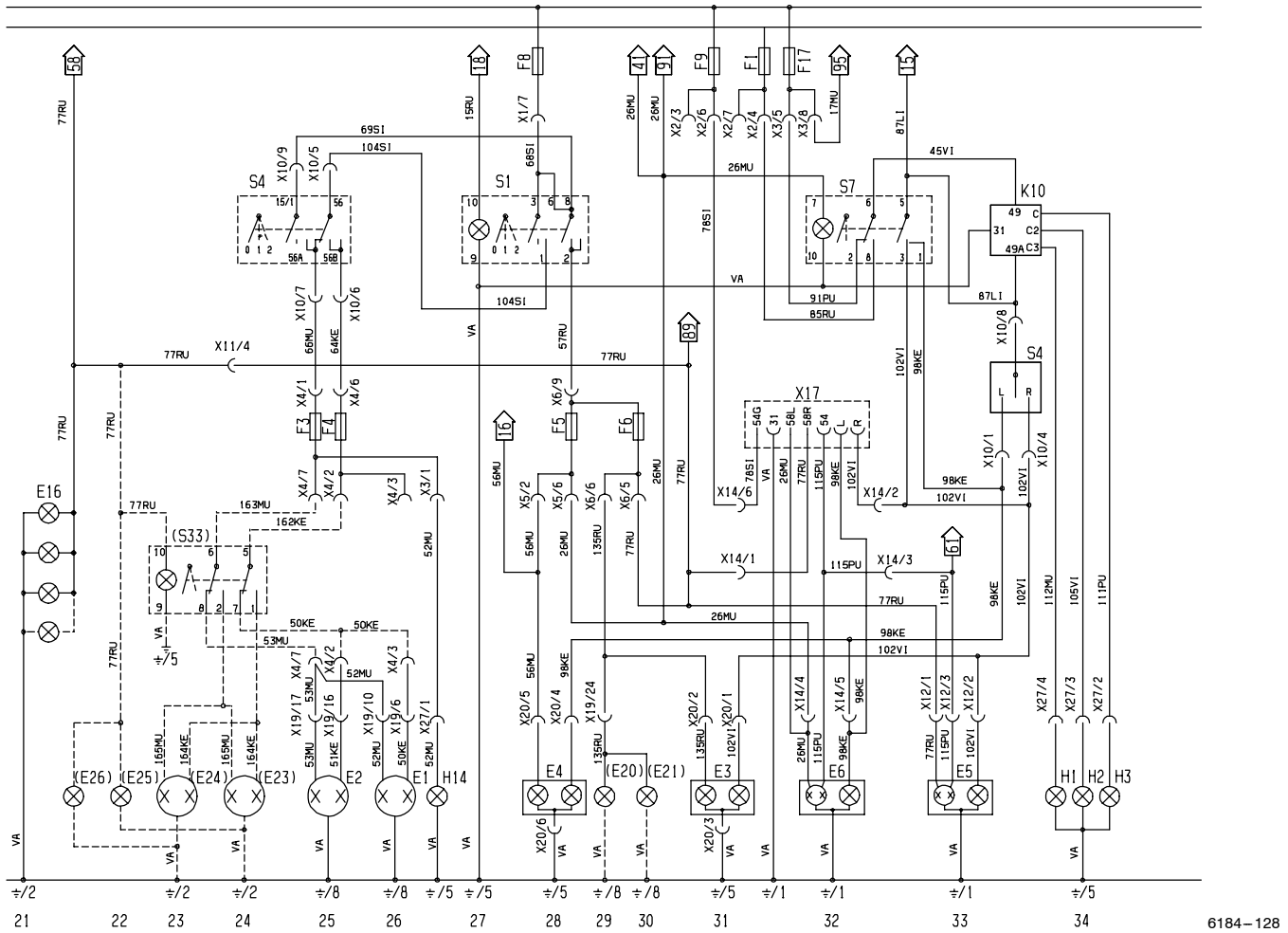
/1	Earth lead, rear lights
/2	Earth lead, roof
/4	Earth lead, Autocontrol
/5	Earth lead, cable harness, instr. panel
/7	Earth lead, battery
/8	Earth lead, headlights
/9	Earth lead, cab

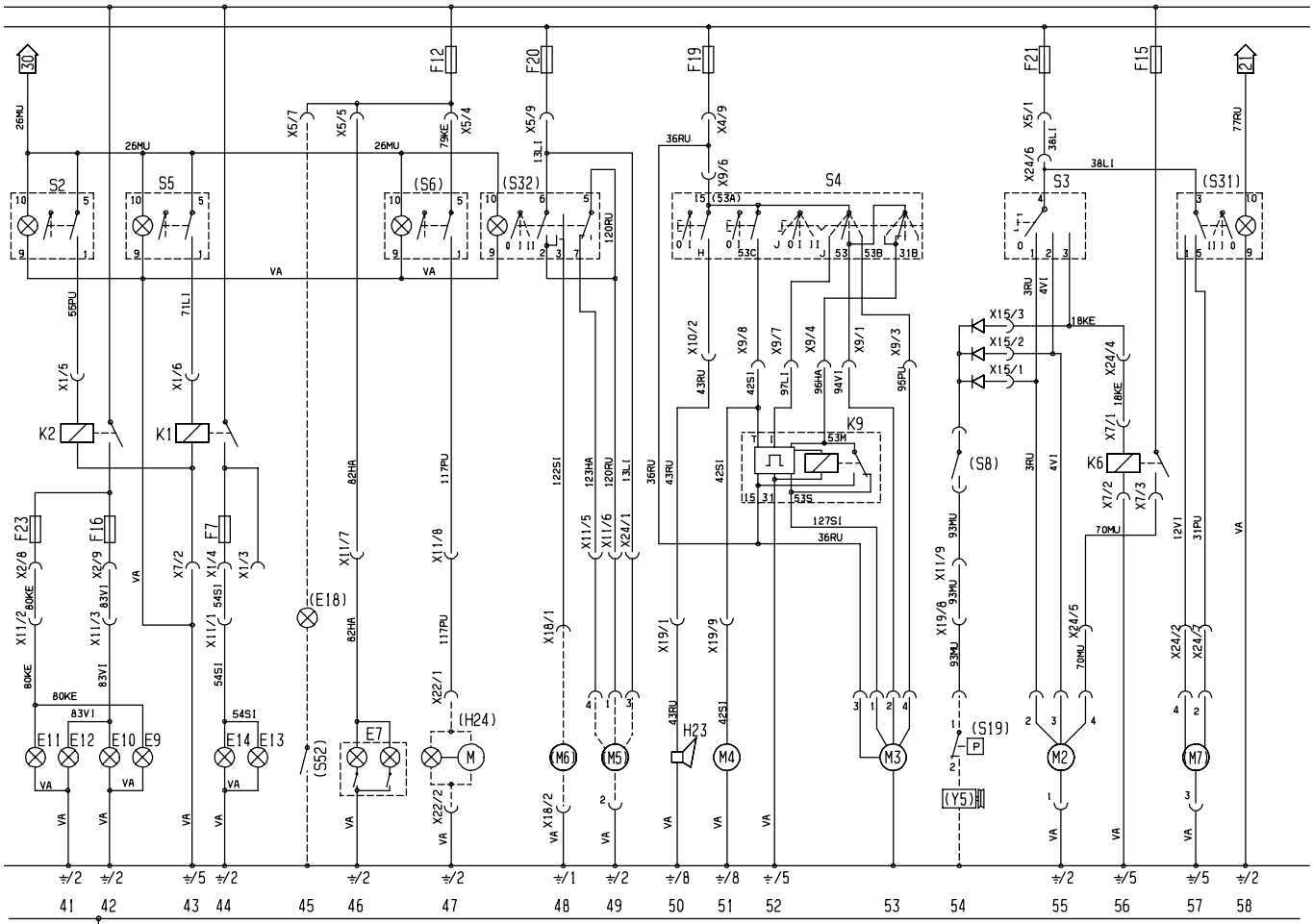
Wire colours

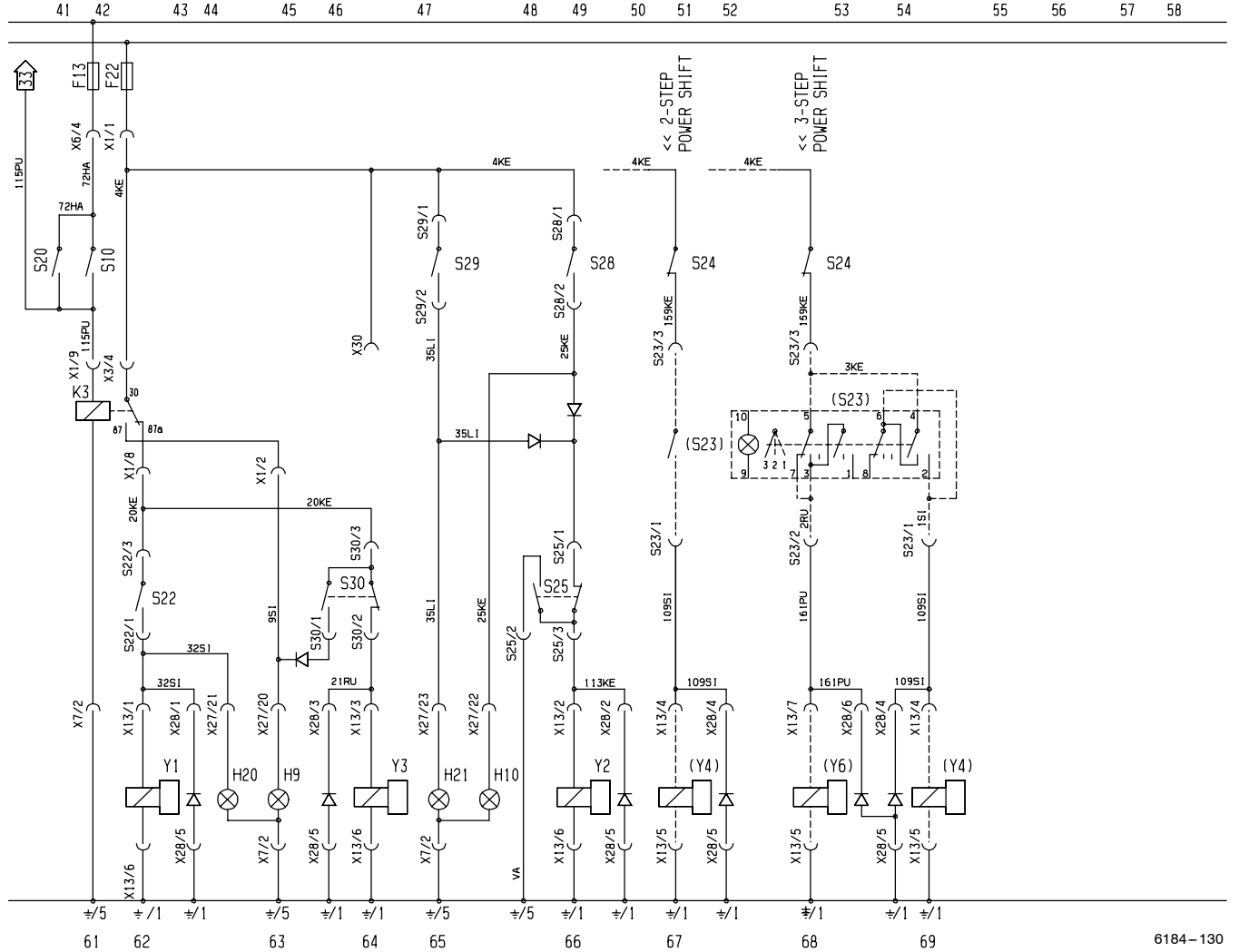
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

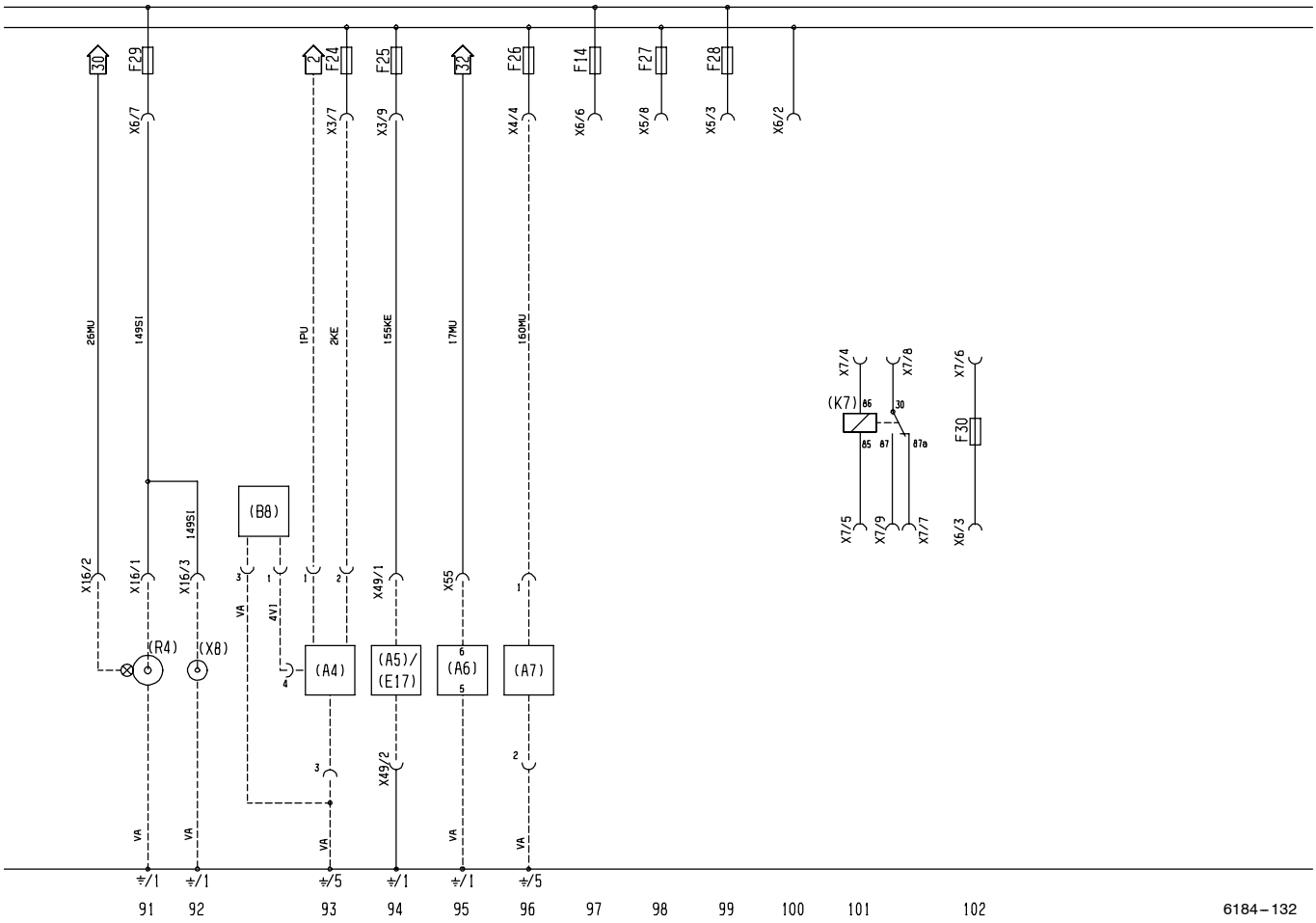
318 716 20–32


G1
(Q2)
M1
G2
F2
F10
Q1
K4
K5
K14
S9
R1
(A2)
(A8)
S12
S13
S17
S15
S16
S18
B1
S11
B2
(H27)
H12
H16
H4
H5
H7
H8
H11
H18
H15
H6
P1
E15
P2
E15
P3
P4
h/Ac
F18
1RU
129PU
6184–127


S4
S1
S7
K10
F8
F9
F1
F17
F3
F4
F5
F6
X17
S4
S33
E16
E26
E25
E24
E23
E2
E1
H14
E4
E20
E21
E3
E6
E5
H1
H2
H3
77RU
104SI
69SI
78SI
45VI
87LI
91PU
85RU
98KE
102VI
115PU
112MU
105VI
111PU
6184–128


S2
S5
(S6)
(S32)
S4
S3
(S31)
K2
K1
K9
K6
(S8)
(S19)
(Y5)
F23
F16
F7
F12
F20
F19
F21
F15
E11
E12
E10
E9
E14
E13
E7
(E18)
(S52)
(H24)
H23
M6
M5
M4
M3
M2
M7
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58


<< 2-STEP POWER SHIFT
<< 3-STEP POWER SHIFT
S20
S10
S22
S29
S28
S24
S24
S30
S25
(S23)
K3
Y1
H20
H9
Y3
H21
H10
Y2
(Y4)
(Y6)
(Y4)
61
62
63
64
65
66
67
68
69
6184–130


30
F29
X6/7
26MU
149SI
X16/2
X16/1
X16/3
149SI
(R4)
(X8)
VA
91
92
2
F24
X3/7
1PU
2KE
(B8)
VA
4VI
(A4)
93
F25
X3/9
155KE
X49/1
X49/2
(A5)/
(E17)
94
32
X55
17MU
6
(A6)
5
95
F26
X4/4
160MU
1
(A7)
2
96
F14
X6/6
97
F27
X5/8
98
F28
X5/3
99
X6/2
100
X7/4
X7/8
X7/6
(K7)
86
30
85
87
87a
F30
X7/5
X7/9
X7/7
X6/3
101
102
6184–132

Wiring diagram from tractor serial number 662343 up to no 668102.

(**E–models, see section 35**). Diagram no 318 716 30B. See diagrams on pages 310/18–20. This diagram incl. also Autocontrol II system.

Sym–bol	Component	Code no
(A 2)	Radio	2
A 3	Electric centre	
(A 4)	Speedometer + clock	93
(A 5)	Air suspension seat	94
(A 6)	Agrodata	95
(A 7)	Electric air filter	96
(A 9)	Ind. lights, Delta Powershift	71
(A 10)	Control unit, Delta Power shift	70
(A 11)	Telephone	99
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B 8)	Sensor, wheel speed	93
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front direction indicator, right	31
E 4	Front direction indicator, left	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E18)	Footstep light	45
(E19)	Rear fog light	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard blinkers, reserve	31
F 2	5 A Radio, clock	2
F 3	10 A High beam, indicator light	25
F 4	10 A Low beam	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
f 9	15 A Trailer socket, rear fog light	35
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+Bat), buzzer	83
F12	10 A Rot. warning light, cabin and footstep light	47
F13	10 A Reserve	100
F14	15 A Water pump	97
F15	20 A Fan III– speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, agrodata	32
F18	5 A Instruments, warning lights, Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear w. wiper/washer	48
F21	15 A Fan I, II, air conditioner., floor fan	55
F22	10 A 4WD, PTO, Delta Power Shift	65
F23	10 A Rear working lights, outer	41
F24	10 A Speedometer	93
F25	10 A Air suspension seat/seat heating reverse drive control lock	94
F26	10 A Electric air filter	96
F27	10 A Brake lights, differential lock	62
F28	10 A Telephone	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A Rear fog lights	102
G 1	Battery	1
G 2	Alternator	4
H 1	Pilot light, direction indicator III	34
H 2	Pilot light, direction indicator II	34
H 3	Pilot light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gearbox oil press.	9
(H 8)	Pilot light, oil filter, gearbox	10
H 9	Pilot light, 4WD	65
H10	Pilot light PTO	67
H11	Pilot light, parking brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beams	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H18	Warning light, gearb. oil temp.	13
H20	Pilot light, diff. lock	62
H22	Reserve	
H23	Horn	50
(H24)	Rotating roof light	47
K 1	Relay, front working lights	43
K 2	Relay , rear working lights	41
K 3	Rear fog lights	35
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Relay, four wheel braking	65
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights, diff. lock	63
K12	Relay, differential lock	61
K13	Relay, differential lock	63
K14	Starter motor relay	4
K15	Relay, 4WD	65
K16	Relay, PTO emergency stop	68
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M 5)	Rear window wiper	49
(M 6)	Rear window washer	48
(M 7)	Floor fan	57
(M 8)	Water pump	97
P 1	Engine coolant thermometer	16
P 2	Fuel gauge	17
P 3	Revolution counter	18
P 4	Hour recorder/work. height	19
Q 1	Starter switch	4
(Q 2)	Main switch	3
R 1	Thermostart	5
(R 4)	Cigarette lighter	91
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S 3	Switch, fan	55

Sym–bol	Component	Code no
S4	Combination control	25, 34, 52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioner	54
S 9	Safety circuit breaker	4
S10	Brake light contact, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	65
S22	Switch, differential lock	61
(S23)	Push buttons, Delta Powershift	70
(S23)	Optional push buttons, Delta Powershift	71
S24	Switch, Delta Power shift disengagement	69
S25	Switch, PTO release	68
(S26)	Switch, rear fog lights	35
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	66
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, reverse drive control lock	94
(S49)	Change over switch, rpm/flow meter (agrodata)	
(S50)	Change over switch, km/h, wheel sensor, tractor /implement (agrodata)	
(S52)	Switch, door	45
V 1	Diodes (Y1, Y2, Y3, Y4, Y6)	
V 2	Diodes (AC II)	
X 1	Connector, 9 pin., distribution box	
X 2	Connector, 9 pin., distribution box	
X 3	Connector, 9 pin., distribution box	
X 4	Connector, 9 pin., distribution box	
X 5	Connector, 9 pin., distribution box	
X 6	Connector, 9 pin., distribution box	
X 7	Connector, 9 pin., distribution box	
(X 8)	Connector, 2 pin., power socket	92
X 9	Connector, 9 pin, combination control	
X10	Connector, 9 pin., combination control	
X11	Connector, 9 pin., upwards	
X12	Connector, 9 pin., rearwards, right	
X13	Connector, 9 pin., solenoid valves.	
X14	Connector, 9 pin., rearwards, left	
(X15)	Connector, 3 pin., air cond., diodes	
(X16)	Connector, 3 pin., cigarette lighter, current socket	
X17	Rear socket, 7 pin	32
(X18)	Connector, 2 pin., rear window washer	
X19	Connector, 24 pin, front wall	
X20	Connector, 9–pole, front direction indicator	
X22	Connector, 2 pin., rot. roof light	
X23	Connector, 2 pin., Delta Powershift optional buttons	
X24	Connector, 9 pin., upwards	
X26	Connector, 26 pin., instr. left, white.	
X27	Connector, 26 pin., instr. right, blue	
(X29)	Connector, 2 pin., STOP–alarm	
X31	Socket, 2 pin, PTO–emerg. stop	
(X32)	Connector, 1 pin, electric stop	
(X33)	Connector, 3 pin, rear fog light	
(X49)	Connector, 2 pin., seat	
(X53)	Agrodata socket, 7 pin, implement	
(X54)	Connector, 9 pin Agrodata sensors	
(X55)	Connector,1 pin., Agrodata supply	28

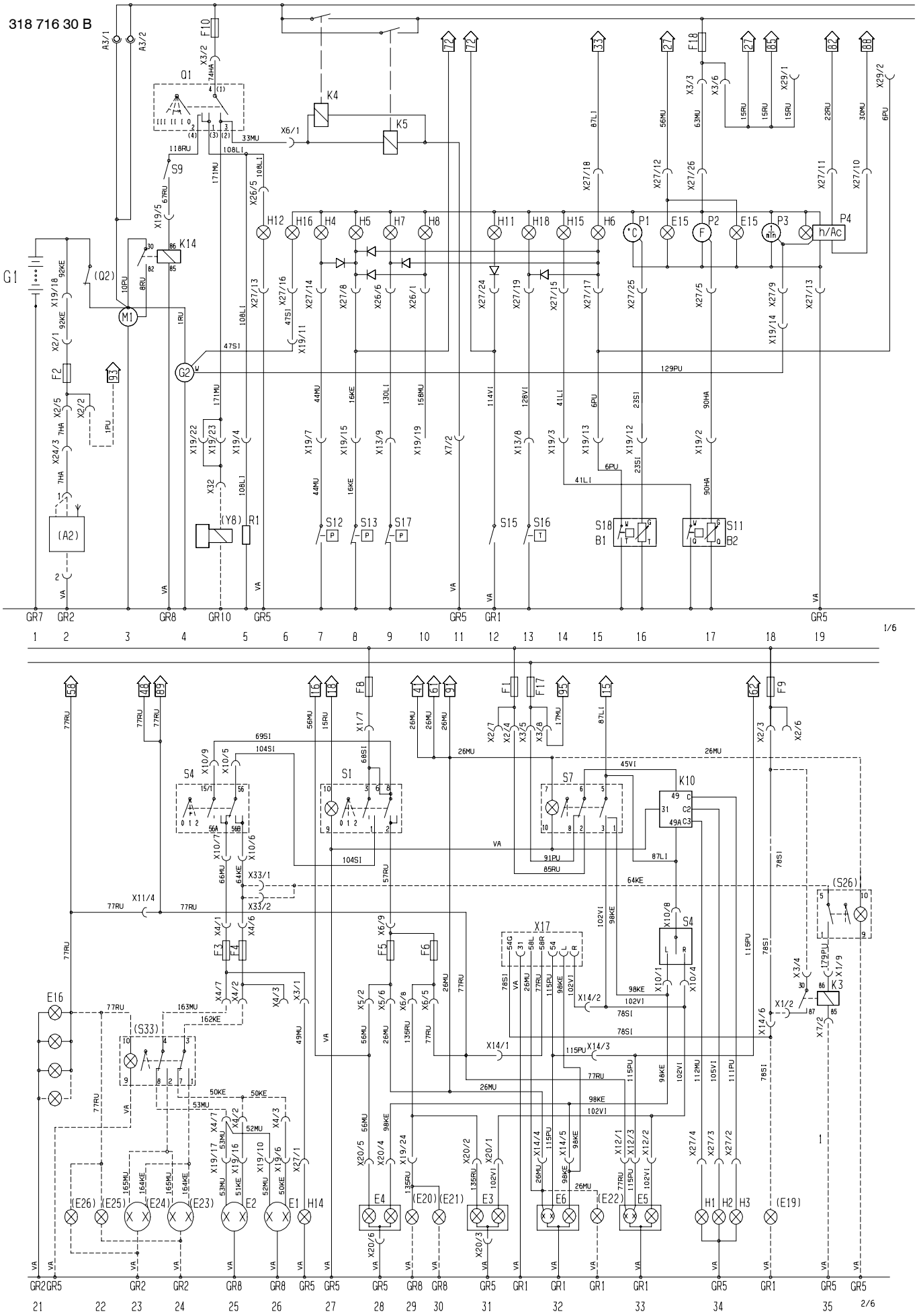
Sym–bol	Component	Code no
Y 1	Solenoid valve, diff lock	63
Y 2	Solenoid valve pto	68
Y 3	Solenoid valve 4WD	66
(Y 4)	Solenoid valve, Delta PS reduction	69
(Y 5)	Solenoid valve compr., air con.	54
(Y 6)	Solenoid valve, Delta PS overdrive	70
(Y 7)	Solenoid valve, reverse drive control lock	94
(Y 8)	Solenoid, electric stop	4
GR/1	Earth lead, rear lights	
GR/2	Earth lead, roof	
GR/4	Earth lead, Autocontrol	
GR/5	Earth lead, cable harness, instr. panel	
GR/7	Earth lead, battery	
GR/8	Earth lead, headlights	
GR/9	Earth lead, cab	
GR/10	Earth lead, electric stop	

Note! Component list of Autocontrol power lift, see page 320/3B.

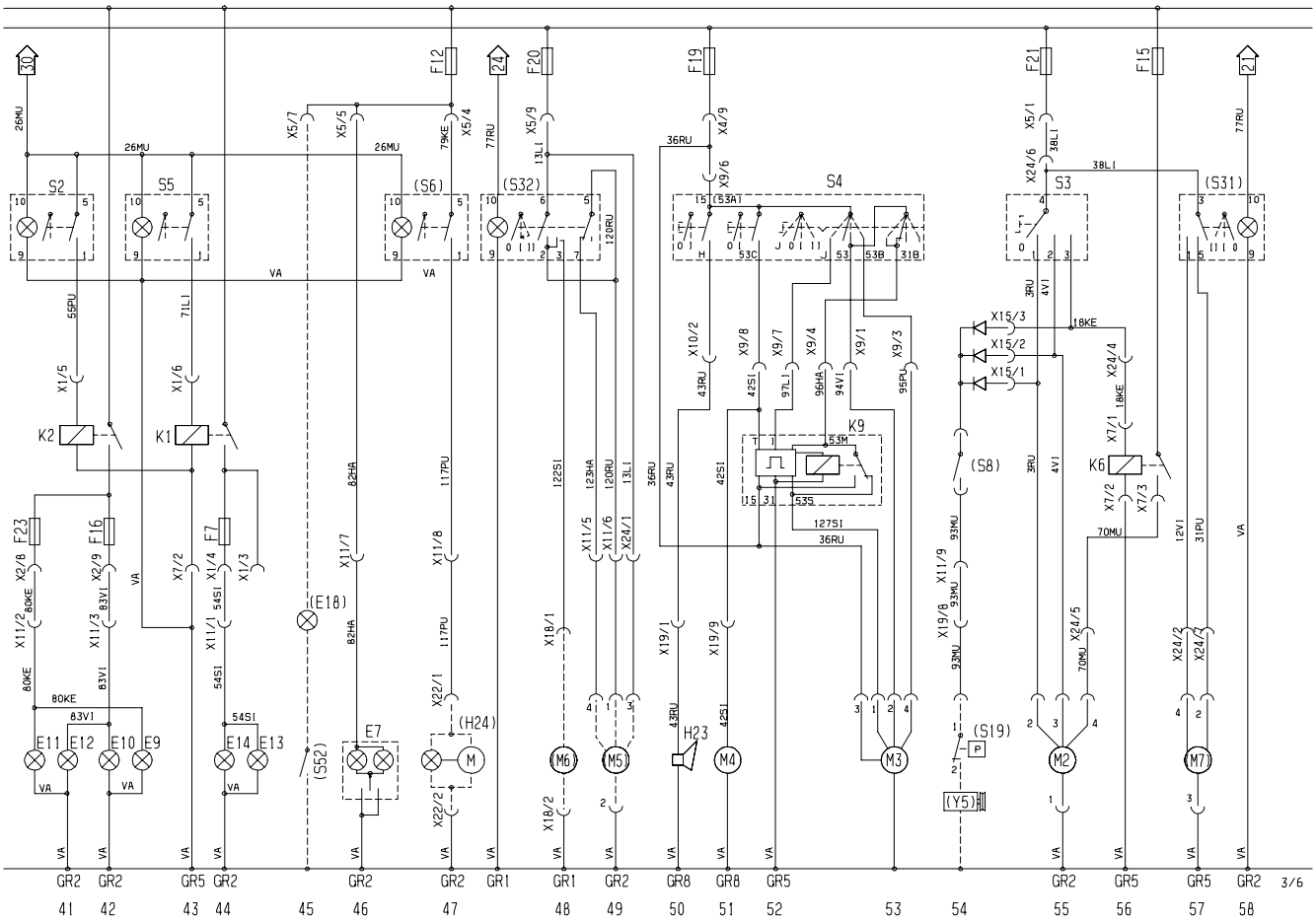
Wire colours

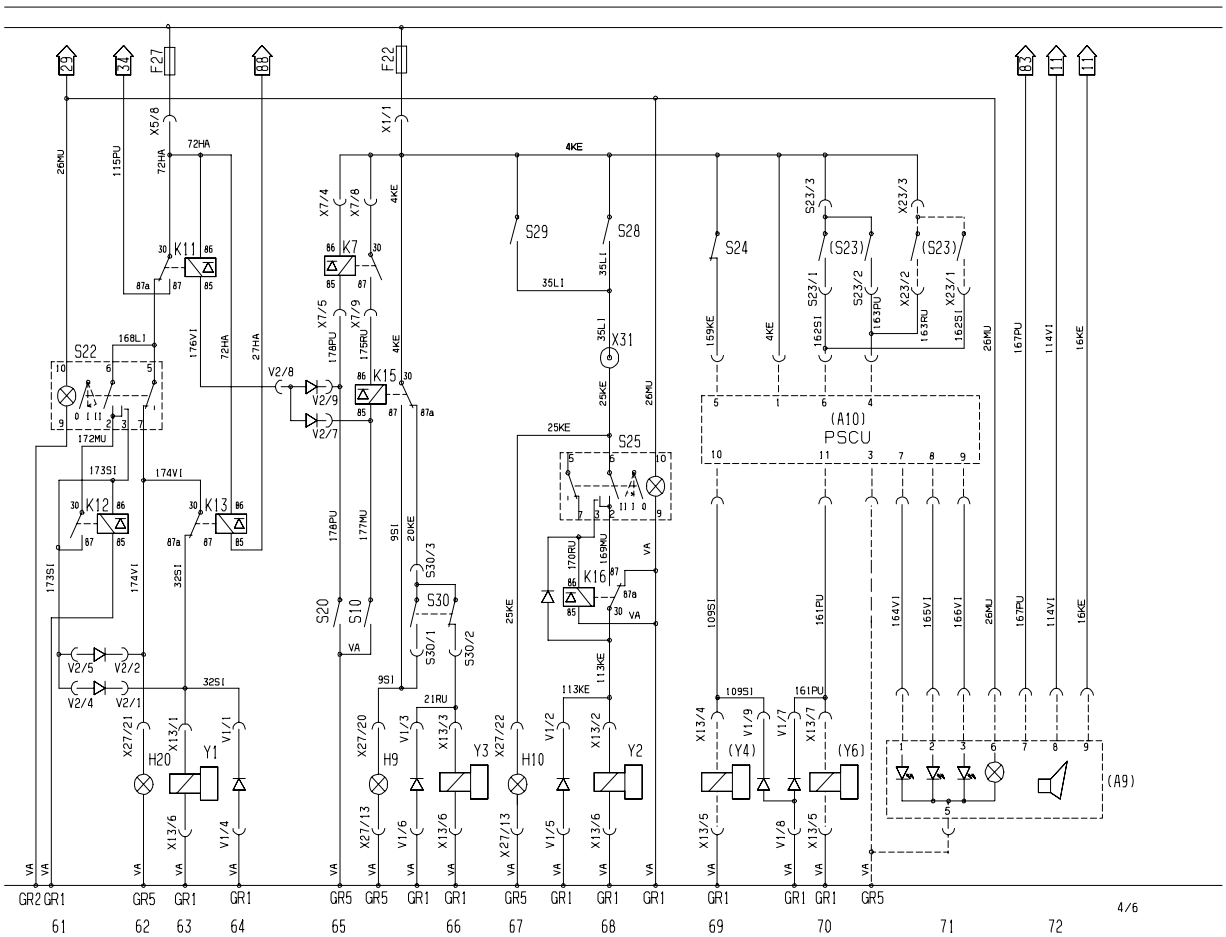
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

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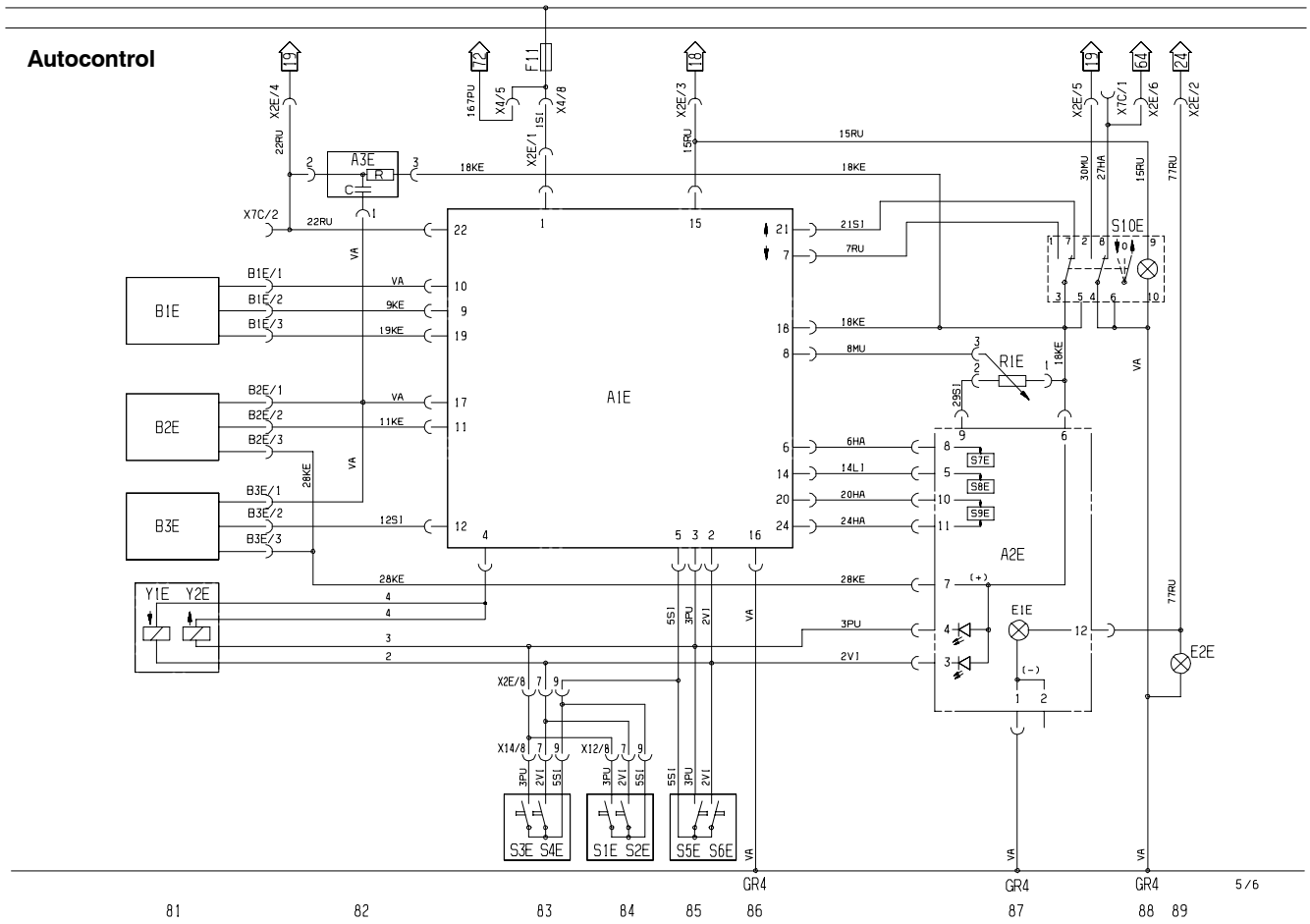
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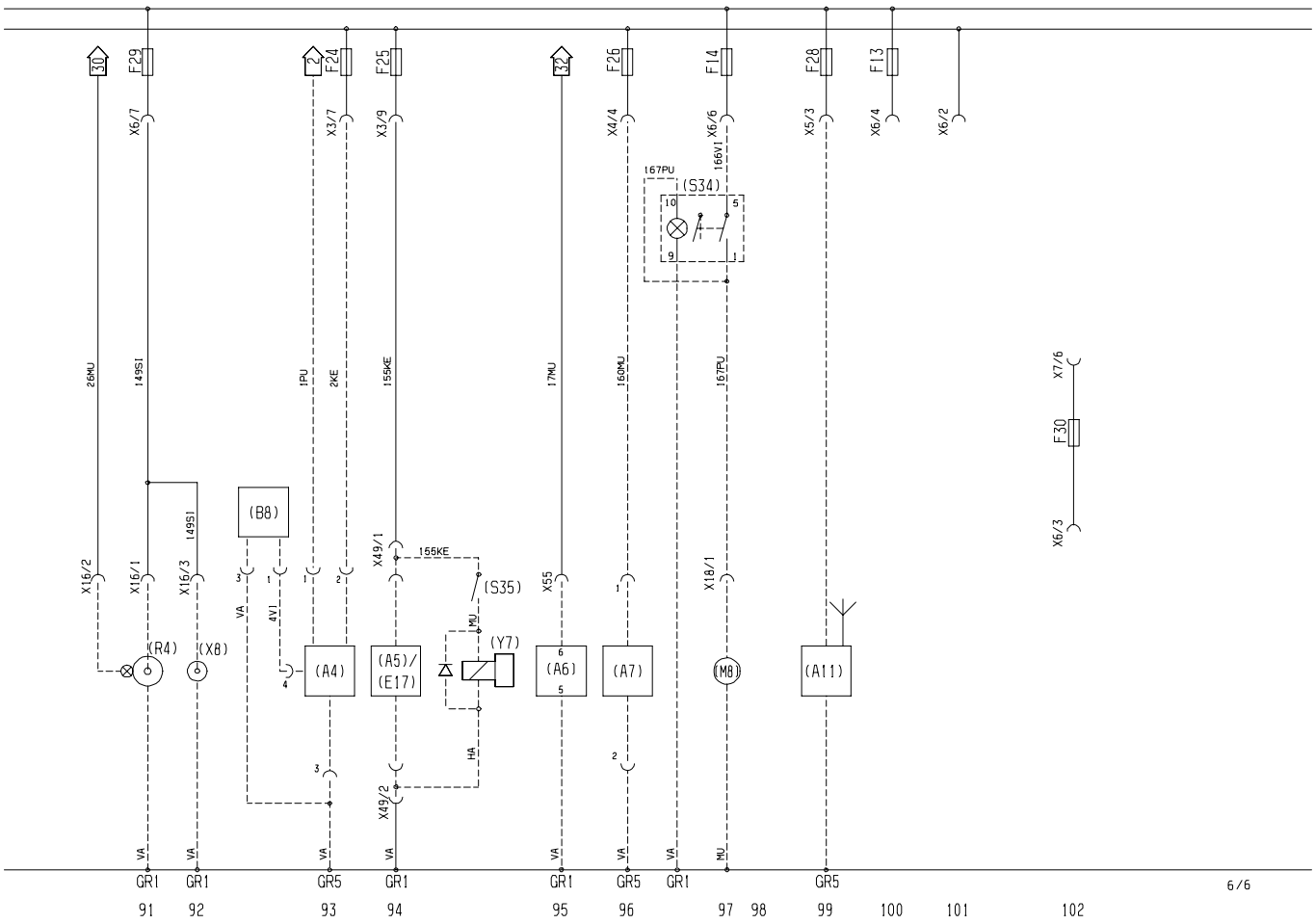




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Autocontrol





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Wiring diagram from ser. no 668103.

Diagram no **318 716 40A**. See diagrams on pages **310/23–25**.

This diagram includes also Autocontrol 2.1 system, Agrodata–Instrument and Control stop system.

Symbol	Component	Code no
(A 2)	Radio	2
A 3	Electric centre	
(A 4)	Speedometer + clock	93
(A 5)	Air suspension seat	94
(A 6)	Agrodata	95
(A 7)	Electric air filter	101
(A 10)	Delta Powershift control unit	70
(A 11)	Telephone	99
(A 14)	Tachograph	92
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B3)	Sensor, gearbox oil temperature	103
(B6)	Sensor, gearbox speed	101
(B7)	Sensor, PTO shaft speed	102
(B8)	Sensor, rear wheel speed	93
(B9)	Sensor, tachograph	92
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front direction indicator, right	31
E 4	Front direction indicator, left	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, right outer	42
E10	Rear working light, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Rear fog light	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head lights, right	24
(E24)	Upper head lights, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard blinkers, reserve	31
F 2	5 A Radio, clock, tachograph	2
F 3	10 A High beam, indicator light	25
F 4	10 A Dipped beams	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket, rear fog light	35
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+Bat.), buzzer	83
F12	10 A Rot. warning light, cabin light	47
F13	10 A Reserve	100
F14	15 A Water pump	97
F15	20 A Fan III–speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, Agrodata	32
F18	5 A Instruments, warning lights, Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/washer	48
F21	15 A Fan I and II, Air cond. floor fan	55
F22	10 A 4WD, PTO, Delta Power Shift	65
F23	10 A Rear working lights, outer	41
F24	10 A Speedometer	93
F25	10 A Air suspension seat/seat heating reverse drive control lock	94
F26	10 A Back buzzer, ETB, F/R	96
F27	10 A Brake lights, diff. lock., trailer brakes	62
F28	10 A Telephone	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A Rear fog light	102
(F31)	15 A Electric air filter	101
G 1	Battery	1
G 2	Alternator	4
H 1	Pilot light, direction indicator III	34
H 2	Pilot light, direction indicator II	34
H 3	Pilot light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gerabox oil pressure	9
(H8)	Pilot light, gearbox oil filter	10
H 9	Pilot light, 4WD	65
H10	Pilot light, PTO	67
H11	Pilot light, parking brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beam	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H18	Warning light, gearbox oil temp	13
H19	Pilot light Delta Powershift I	71
H20	Pilot light, diff. lock	62
H21	Pilot light Delta Powershift II	71
H22	Pilot light Delta Powershift III	71
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse buzzer	96
K 1	Relay, front working lights	43
K 2	Relay , rear working lights	41
(K 3)	Rear fog light	35
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Relay, four wheel braking	65
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights, diff. lock	63
K12	Relay, differential lock	61
K13	Relay, differential lock	63
K14	Starter motor relay	4
K15	Relay, 4WD	65
K16	Relay, PTO emergency stop	68
(K18)	Relay, Control stop	8
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
(M7)	Floor fan	57
(M8)	Water pump	97
P1	Engine coolant thermometer	16
P2	Fuel gauge	17
P3	Revolution counter	18
P4	Hour recorder/work. height	19
(P4)	Running hours/driving speed (Agrodata–instrument)	19
(P5)	Clock/PTO–speed/AC/distance/Gearbox temperature (Agrodata–instrument)	102
Q 1	Starter switch	4
(Q 2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91

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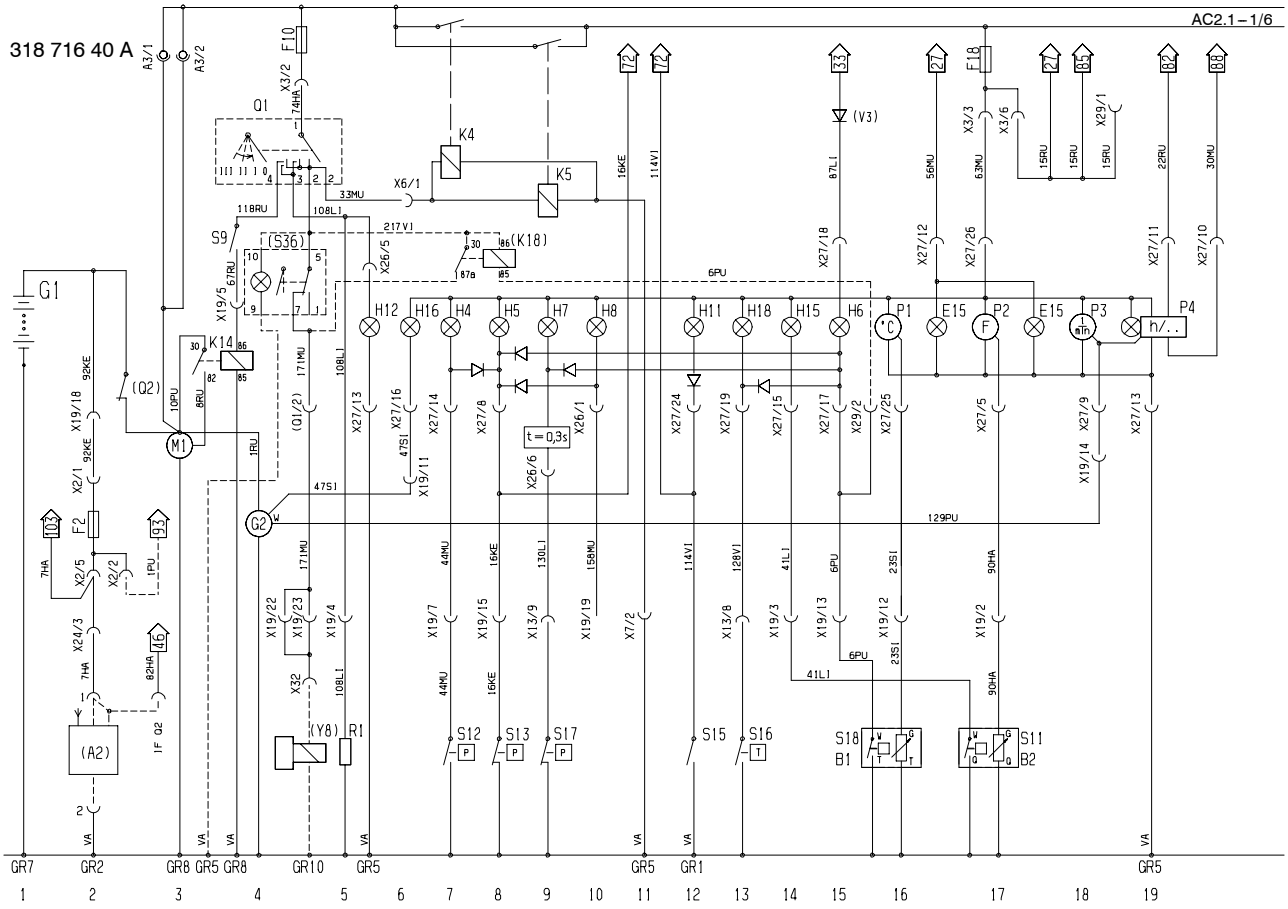
Sym–bol	Component	Code nro
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S3	Switch, fan	55
S 4	Combination control	25,34, 52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioning	54
S 9	Safety circuit breaker	4
S10	Brake light contact, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	65
S22	Switch, differential lock	61
(S23)	Push buttons, Delta Powershift	70
(S23)	Push buttons, Delta Powershift	71
S24	Switch, Delta Power shift disengagement	69
S25	Switch, PTO release	68
(S26)	Switch, rear fog lights	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	66
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, reverse drive control lock	94
(S36)	Switch, Control stop	4
(S37)	Switch, Agrodata–instrument.	102
(S42)	Door switch, right, cabin light	46
(S43)	Door switch, left, cabin light	46
(S49)	Change over switch, rpm/flow meter (agrodata)	
(S50)	Change over switch, km/h, wheel sensor, tractor /implement (agrodata)	
V 1	Diodes (Y1, Y2, Y3, Y4, Y6)	
V 2	Diodes (AC II)	
(V3)	Diodies, Control stop	15
X 1	Connector, 9 pin., distribution box	
X 2	Connector, 9 pin., distribution box	
X 3	Connector, 9 pin., distribution box	
X 4	Connector, 9 pin., distribution box	
X 5	Connector, 9 pin., distribution box	
X 6	Connector, 9 pin., distribution box	
X 7	Connector, 9 pin., distribution box	
(X 8)	Connector, 2 pin., power socket	92
X 9	Connector, 9 pin, combination control	
X10	Connector, 9 pin, combination control	
X11	Connector, 9 pin., upwards	
X12	Connector, 9 pin., rearwards, right	
X13	Connector, 9 pin., solenoid valves.	
X14	Connector, 9 pin., rearwards, left	
(X15)	Connector, 3 pin., air cond., diodes	54
(X16)	Connector, 3 pin., cigarette lighter, current socket	
X17	Rear socket, 7 pin	32
(X18)	Connector, 2 pin., rear window washer	48
X19	Connector, 24 pin, front wall	
X20	Connector, 9–pole, front direction indicator	
X22	Connector, 2 pin., rot. roof light	47
X23	Connector, 2 pin., Delta Powershift optional buttons	71
X24	Connector, 9 pin., upwards	
(X25)	Connector, 9–pin. Agrodata–instrument	
X26	Connector, 26 pin., instr. left, white.	
X27	Connector, 26 pin., instr. right, blue	

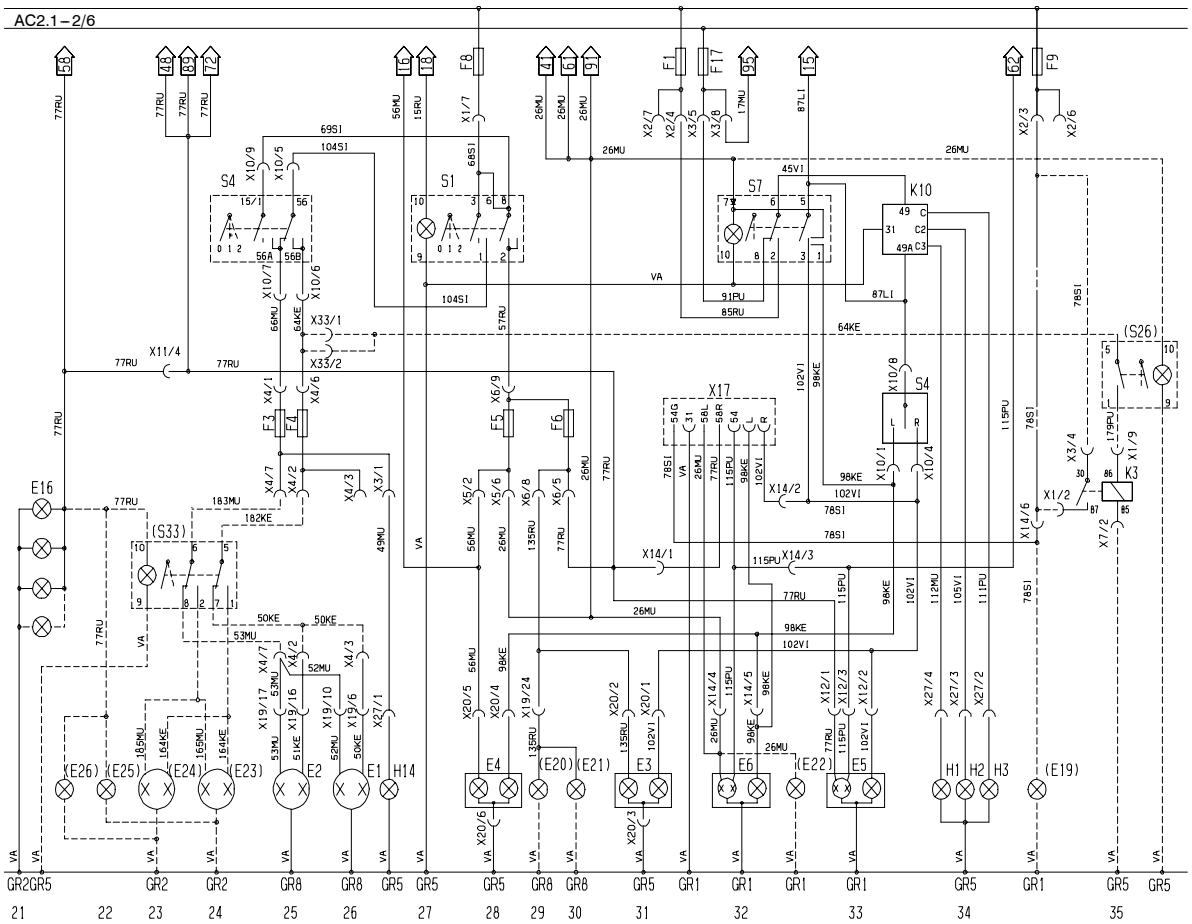
Sym–bol	Componenet	Code nro
(X29)	Connector, 2 pin., STOP–alarm (max. 2 W)	
X31	Socket, 2 pin, PTO–emerg. stop	68
(X32)	Connector, 1 pin, electric stop	5
(X33)	Connector, 3 pin, rear fog light	
(X34)	Connector, 9–pin. Agrodata–instrumrnt sensors	
(X35)	Connector, 9–pin. ETB	
(X49)	Connector, 2 pin., seat	94
(X53)	Agrodata socket, 7 pin, implement	
(X54)	Connector, 9 pin Agrodata sensors	
(X55)	Connector,1 pin., Agrodata supply	95
Y 1	Solenoid valve, diff lock	63
Y 2	Solenoid valve pto	68
Y 3	Solenoid valve 4WD	66
(Y 4)	Solenoid valve, Delta PS reduction	69
(Y 5)	Solenoid valve compr., air con.	54
(Y 6)	Solenoid valve, Delta PS overdrive	70
(Y7)	Solenoid valve, reverse drive control lock	94
(Y8)	Solenoid, electric stop	4
GR /1	Earth lead, rear lights/solenoid valves	
GR /2	Earth lead, roof	
GR /4	Earth lead, Autocontrol	
GR /5	Earth lead, cable harness, instr. panel	
GR /7	Earth lead, battery	
GR /8	Earth lead, headlights	
GR /9	Earth lead, cab	
GR /10	Earth lead, electric stop	

Note! Component list of Autocontrol power lift, see page 320/3B.

Wire colours

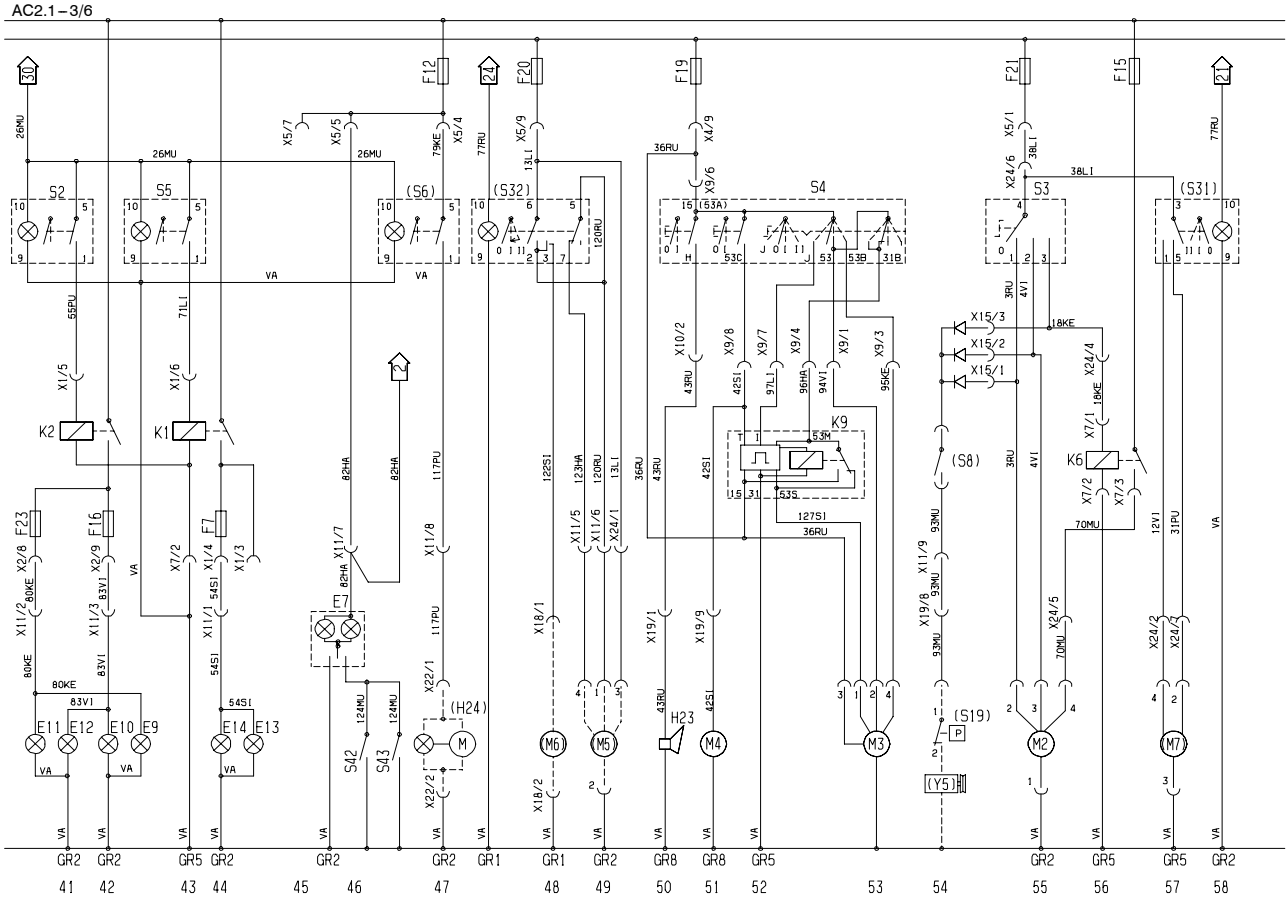
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac


318 716 40 A
AC2.1–1/6
G1
M1
G2
F10
Q1
K4
K5
S9
(S36)
(K18)
K14
(Q2)
F2
(A2)
(Y8)
R1
S12
S13
S17
S15
S16
S18
B1
S11
B2
H12
H16
H4
H5
H7
H8
H11
H18
H15
H6
P1
E15
P2
E15
P3
P4
(V3)
F18
t = 0,3s
GR7
GR2
GR8
GR5
GR8
GR10
GR5
GR5
GR1
GR5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

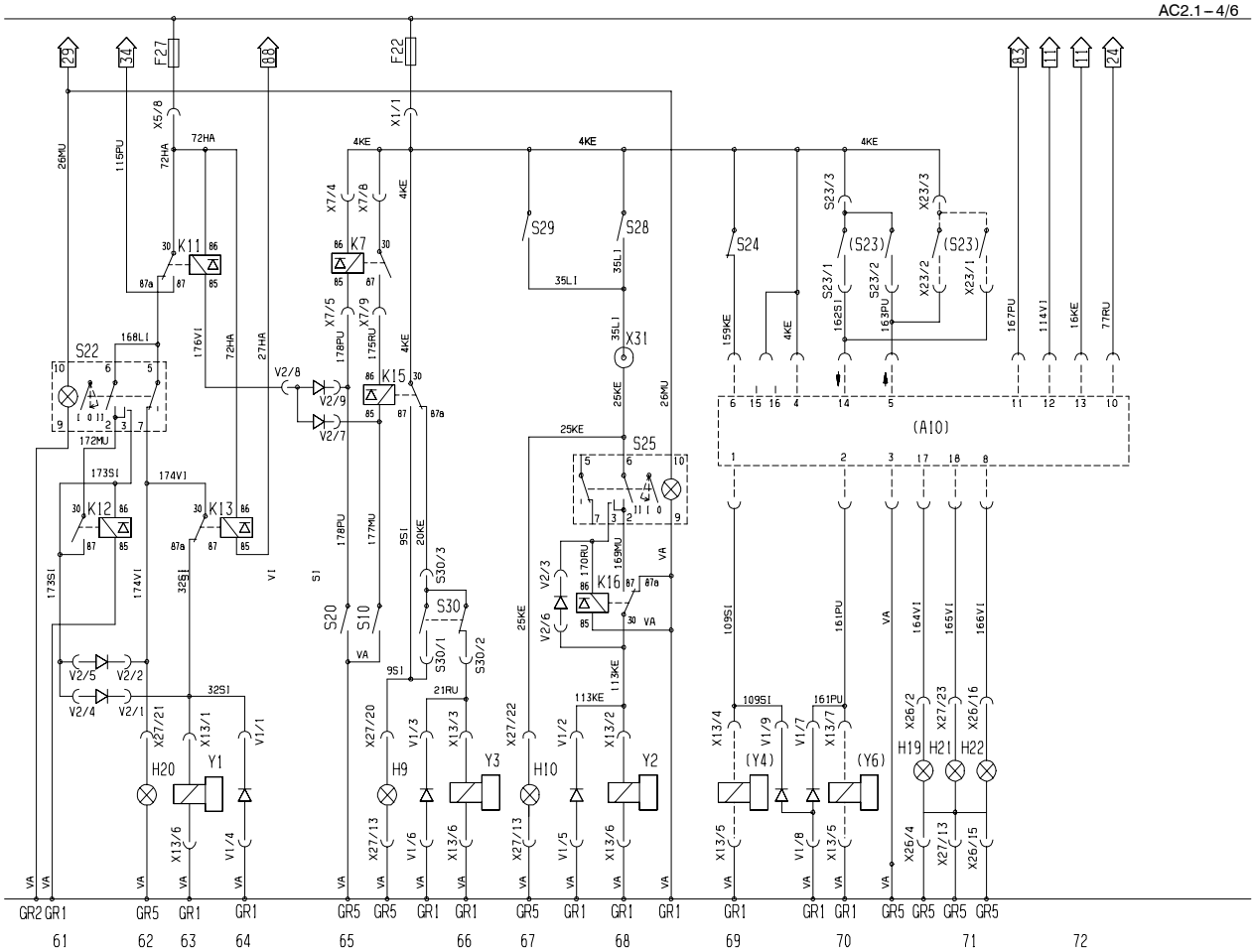

AC2.1–2/6
S4
S1
S7
K10
(S26)
F8
F1
F17
F9
F3
F4
F5
F6
X17
E16
(S33)
K3
(E26)
(E25)
(E24)
(E23)
E2
E1
H14
E4
(E20)
(E21)
E3
E6
(E22)
E5
H1
H2
H3
(E19)
GR2
GR5
GR2
GR2
GR8
GR8
GR5
GR5
GR5
GR8
GR8
GR5
GR1
GR1
GR1
GR1
GR5
GR1
GR5
GR5
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

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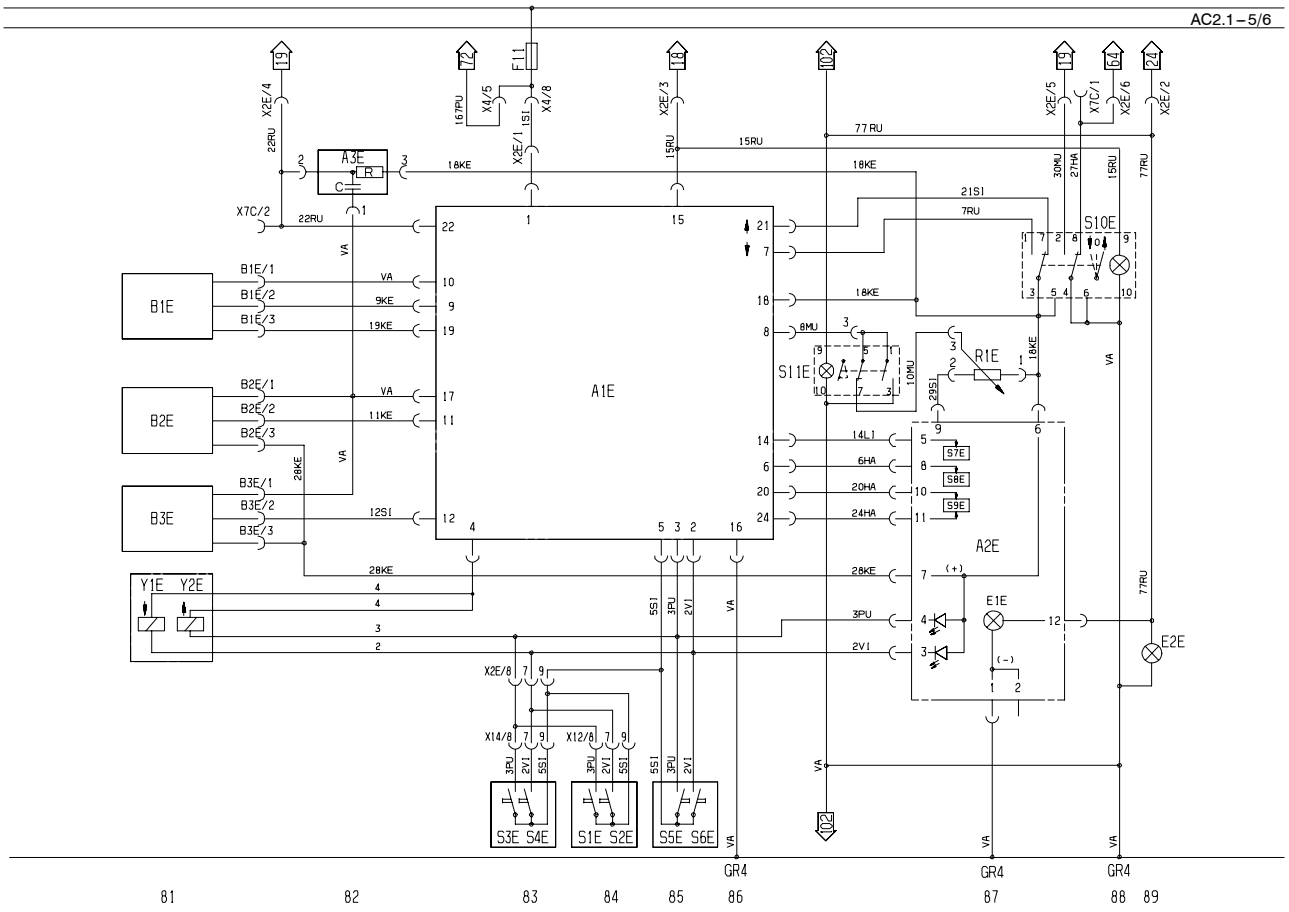
AC2.1–3/6

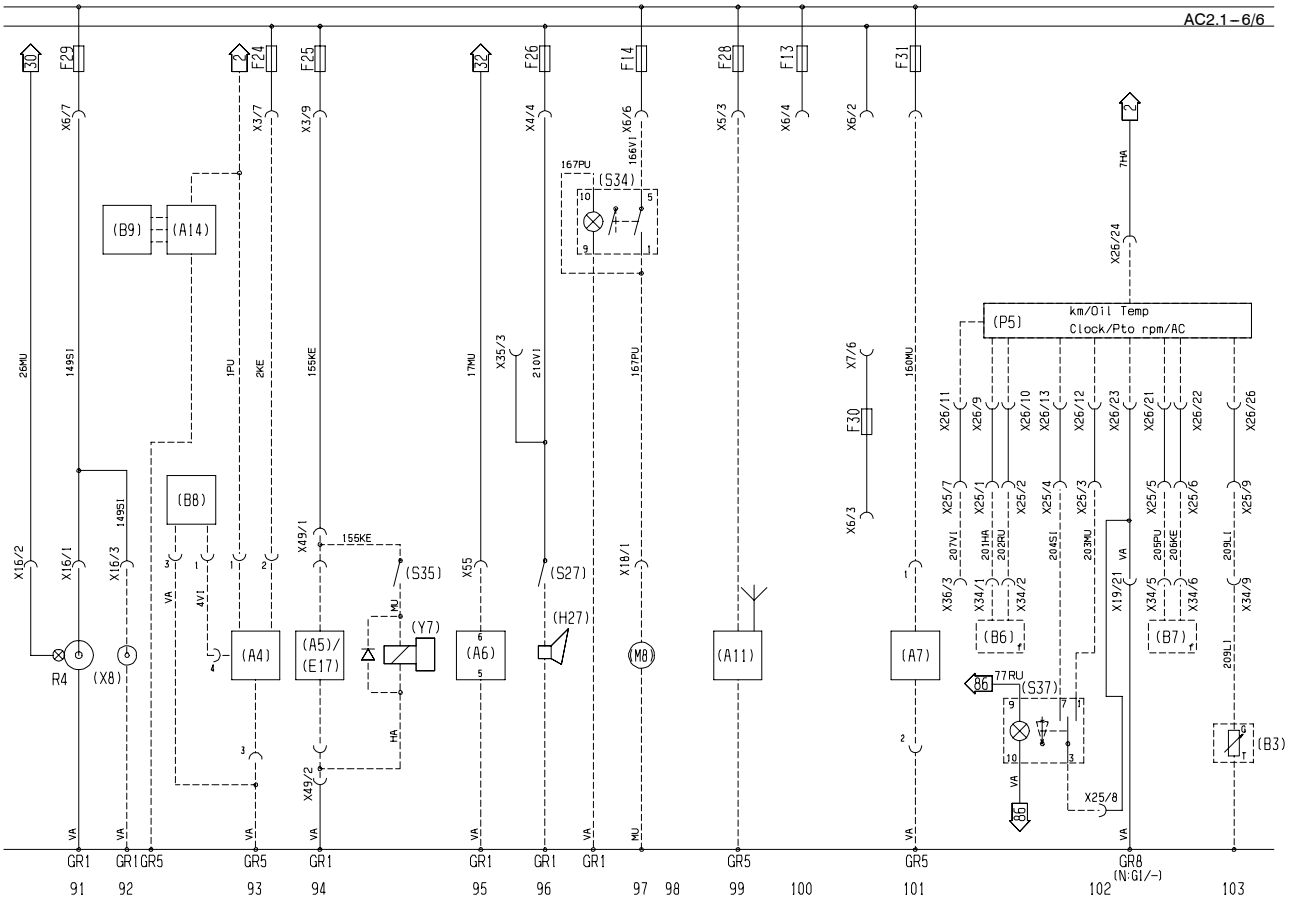


AC2.1–4/6



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Wiring diagram, F17107–.

Diagram no **318 716 40D**. Diagrams on pages **310/29–31**.

Sym–bol	Component	Code no
(A 2)	Radio	2
A 3	Electric centre	
(A 5)	Air suspension seat	94
(A 6)	Agrodata	95
(A 7)	Electric air filter	101
(A 10)	Delta Powershift control unit	70
(A 11)	Telephone	99
(A13)	Control unit, Sigma	113
(A 14)	Tachograph	93
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B3)	Sensor, gearbox oil temperature	102
B4	Sensor, Sigma, crank shaft	114
B5	Sensor, Sigma, PTO	114
(B6)	Sensor, gearbox speed	81D 102
(B7)	Sensor, PTO shaft speed	102
(B8)	Sensor, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Radar	81D
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front direction indicator, right	31
E 4	Front direction indicator, left	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, right outer	42
E10	Rear working light, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Rear fog light	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head lights, right	24
(E24)	Upper head lights, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard blinkers, reserve	31
F 2	5 A Radio, clock, tachograph	2
F 3	15 A High beam, indicator light	25
F 4	15 A Dipped beams	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket, rear fog light	35
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+Bat.), buzzer	71, 82, 82D
F12	10 A Rot. warning light, cabin light	47
F13	10 A Reserve	100
F14	15 A Water pump	97
F15	20 A Fan III–speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, Agrodata	32
F18	5 A Instruments, warning lights, Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/washer	48
F21	15 A Fan I and II, Air cond. floor fan	55
F22	10 A 4WD, PTO, Delta Power Shift	65
F23	10 A Rear working lights, outer	41
F24	10 A reserve	98
F25	15 A Air suspension seat/seat heating reverse drive control lock	94
F26	10 A Back buzzer, trailer brakes, Sigma	94
F27	10 A Brake lights, diff. lock., trailer brakes	62
F28	10 A Telephone	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A Reserve	101
(F31)	15 A Electric air filter	101
G 1	Battery	1
G 2	Alternator	4
H 1	Pilot light, direction indicator III	34
H 2	Pilot light, direction indicator II	34
H 3	Pilot light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gearbox oil pressure	9
(H8)	Pilot light, gearbox oil filter	10
H 9	Pilot light, 4WD	65
H10	Pilot light, PTO	67
H11	Pilot light, parking brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beam	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H17	Pilot light, Sigma–power	111
H18	Warning light, gearbox oil temp	13
H19	Pilot light Delta Powershift I	71
H20	Pilot light, diff. lock	62
H21	Pilot light Delta Powershift II	71
H22	Pilot light Delta Powershift III	71
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse buzzer	96
K 1	Relay, front working lights	43
K 2	Relay , rear working lights	41
(K 3)	Rear fog light	35
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Relay, four wheel braking	65
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights, diff. lock	63
K12	Relay, differential lock	61
K13	Relay, differential lock	63
K14	Starter motor relay	4
K15	Relay, 4WD	65
K16	Relay, PTO emergency stop	68
(K18)	Relay, Control stop	8
(K19)	Relay, display control, Sigma	112
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
(M7)	Floor fan	57
(M8)	Water pump	97
P1	Engine coolant thermometer	16
P2	Fuel gauge	17
P3	Revolution counter	18
P4	Hour recorder/AC	19
(P4)	Running hours/driving speed (Agrodata–instrument)	19
(P5)	Clock/PTO–speed/AC/distance/Gearbox temperature (Agrodata–instrument)	101
Q 1	Starter switch	4
(Q 2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91

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Sym–bol	Component	Code no
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S3	Switch, fan	55
S 4	Combination control	25,34, 52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioning	54
S 9	Safety circuit breaker	4
S10	Brake light contact, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	65
S22	Switch, differential lock	61
(S23)	Push buttons, Delta Powershift	70
(S23)	Push buttons, Delta Powershift	71
S24	Switch, Delta Power shift disengagement	69
S25	Switch, PTO release	68
(S26)	Switch, rear fog lights	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	66
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, reverse drive control lock	94
(S36)	Switch, Control stop	4
(S37)	Switch, Agrodata–instrument.	103
(S38)	Switch, front PTO	
(S42)	Door switch, right, cabin light	46
(S43)	Door switch, left, cabin light	46
(S44)	Sensor, Pressure filter, Working hydraulics	10
(S49)	Change over switch, rpm/flow meter (Agrodata)	
(S50)	Change over switch, km/h, wheel sensor, tractor /implement (Agrodata)	
V 1	Diodes (Y1, Y2, Y3, Y4, Y6)	
V 2	Diodes (AC II)	
(V3)	Diodes, Control stop	15
X 1	Connector, 9 pin., distribution box	
X 2	Connector, 9 pin., distribution box	
X 3	Connector, 9 pin., distribution box	
X 4	Connector, 9 pin., distribution box	
X 4C	Connector, 9 pin., tractor front part	
X 5	Connector, 9 pin., distribution box	
X 6	Connector, 9 pin., distribution box	
X 7	Connector, 9 pin., distribution box	
(X 8)	Connector, 2 pin., power socket	92
X 9	Connector, 9 pin, combination control	
X10	Connector, 9 pin, combination control	
X11	Connector, 9 pin., upwards	
X12	Connector, 9 pin., rearwards, right	
X13	Connector, 9 pin., solenoid valves.	
X14	Connector, 9 pin., rearwards, left	
(X15)	Connector, 3 pin., air cond., diodes	54
(X16)	Connector, 3 pin., cigarette lighter, current socket	
X17	Rear socket, 7 pin	32
(X18)	Connector, 2 pin., rear window washer	48
X19	Connector, 32 pin, front wall	
X20	Connector, 9–pole, front direction indicator	
X22	Connector, 2 pin., rot. roof light	47
X23	Connector, 2 pin., Delta Powershift optional buttons	71

Sym–bol	Componenet	Code no
X24	Connector, 9 pin., upwards	
(X25)	Connector, 9–pin. Agrodata–instrument	
X26	Connector, 26 pin., instr. left, white.	
X27	Connector, 26 pin., instr. right, blue	
(X29)	Connector, 2 pin., STOP–alarm (max. 2 W)	
X31	Socket, 2 pin, PTO–emerg. stop	68
(X32)	Connector, 1 pin, electric stop	5
(X33)	Connector, 3 pin, rear fog light	
(X34)	Connector, 9–pin. Agrodata–instrument sensors	
(X35)	Connector, 9–pin. ETB	
(X36)	Reserve	
X38	Connector, 3–pin. reserve	
X39	Connector, 3–pin. reserve	
X40	Connector, 3–pin. reserve	
(X49)	Connector, 2 pin., seat	94
(X53)	Agrodata socket, 7 pin, implement	
(X54)	Connector, 9 pin Agrodata sensors	
(X55)	Connector,1 pin., Agrodata supply	95
Y 1	Solenoid valve, diff lock	63
Y 2	Solenoid valve pto	68
Y 3	Solenoid valve 4WD	66
(Y 4)	Solenoid valve, Delta PS reduction	69
(Y 5)	Solenoid valve compr., air con.	54
(Y 6)	Solenoid valve, Delta PS overdrive	70
(Y7)	Solenoid valve, reverse drive control lock	94
(Y8)	Solenoid, electric stop	4
(Y9)	Solenoid valve, front PTO	
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, cold start	3
GR /1	Earth lead, rear lights/solenoid valves	
GR /2	Earth lead, roof	
GR /4	Earth lead, Autocontrol	
GR /5	Earth lead, cable harness, instr. panel	
GR /7	Earth lead, battery	
GR /8	Earth lead, headlights	
GR /9	Earth lead, cab	
GR /10	Earth lead, electric stop	

Note! Concerning AC power lift, see page 320/3C. ACD power lift, see page 321/10.

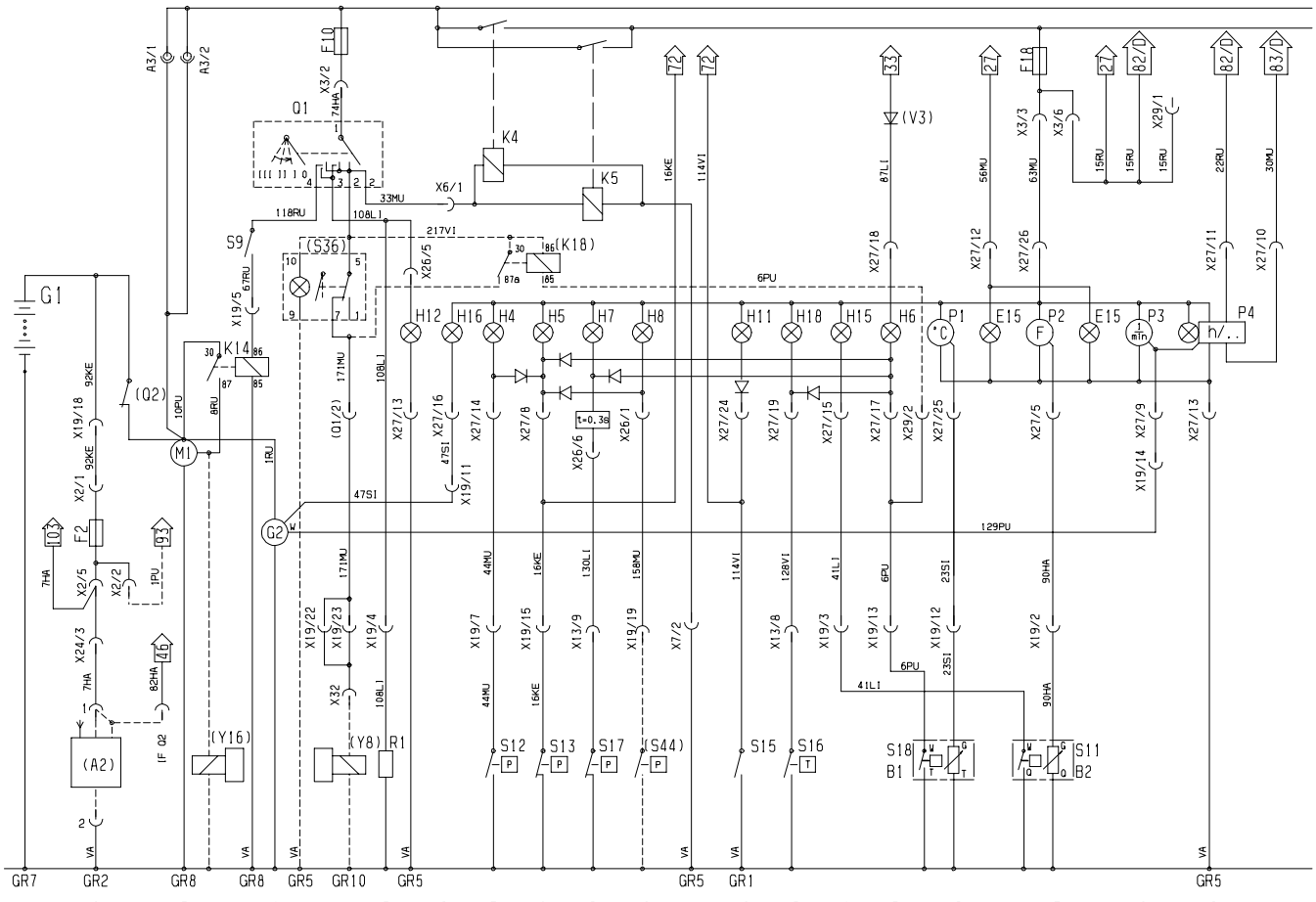
Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

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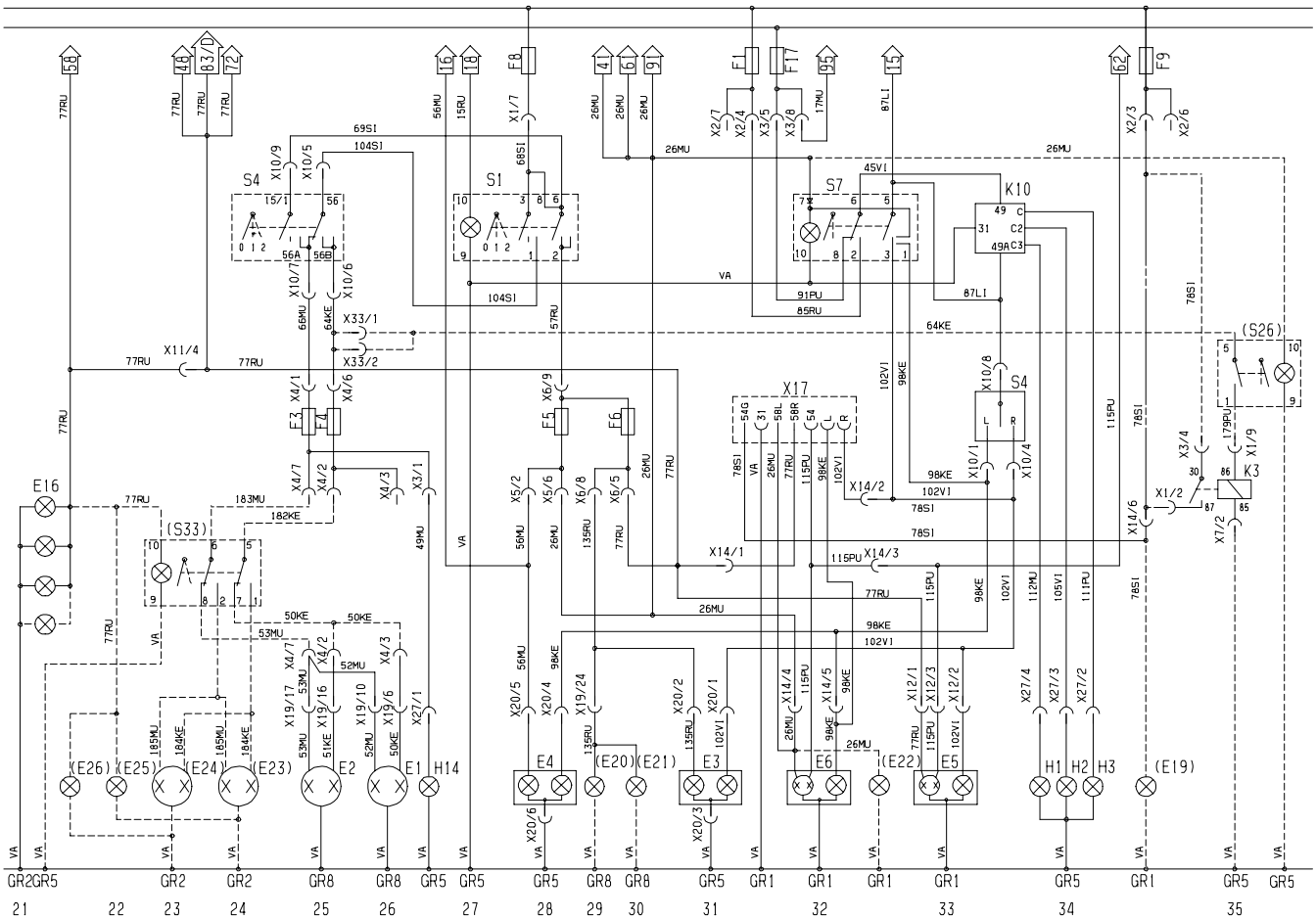
318 716 40D

ACD2.1–1/8



ACD2.1–1/

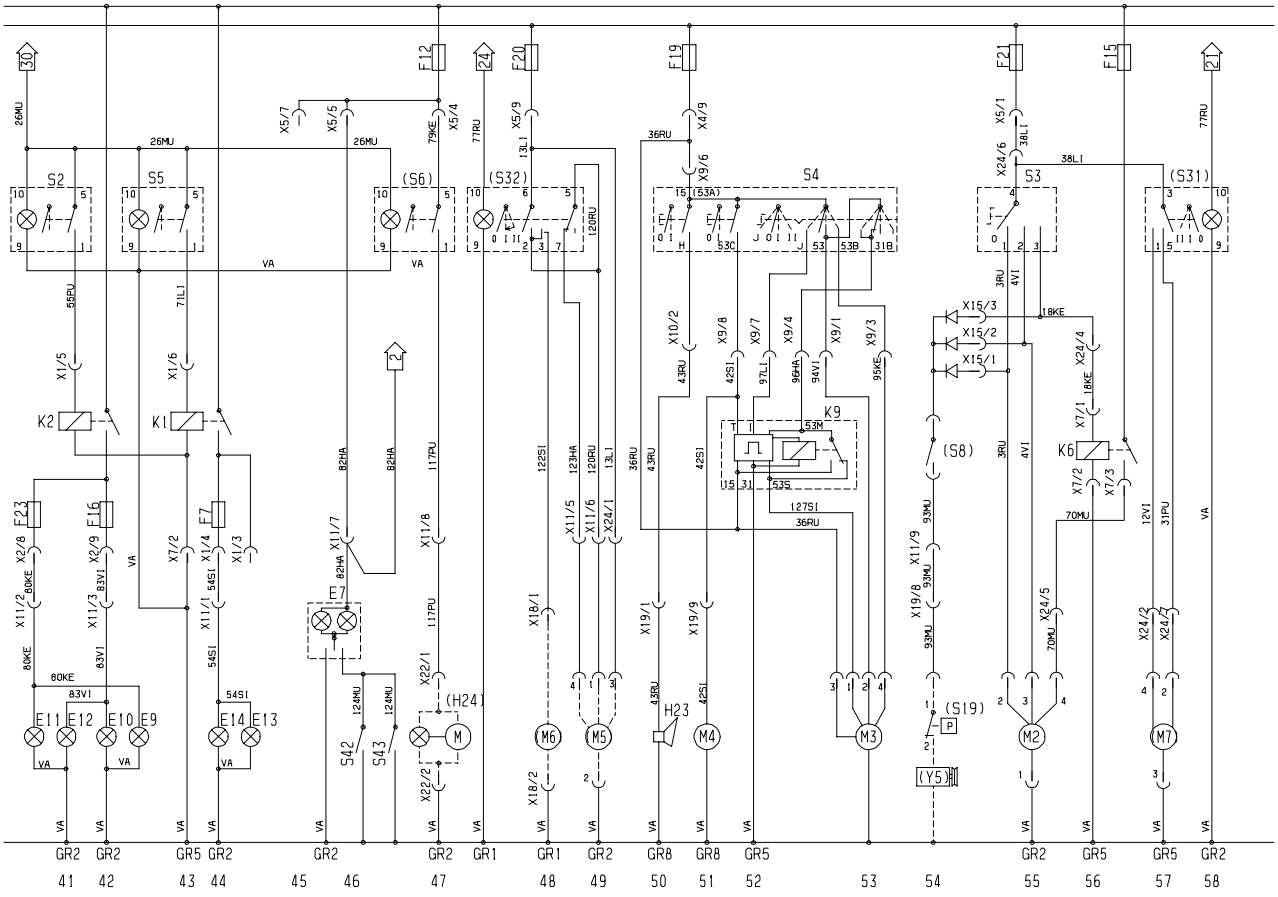
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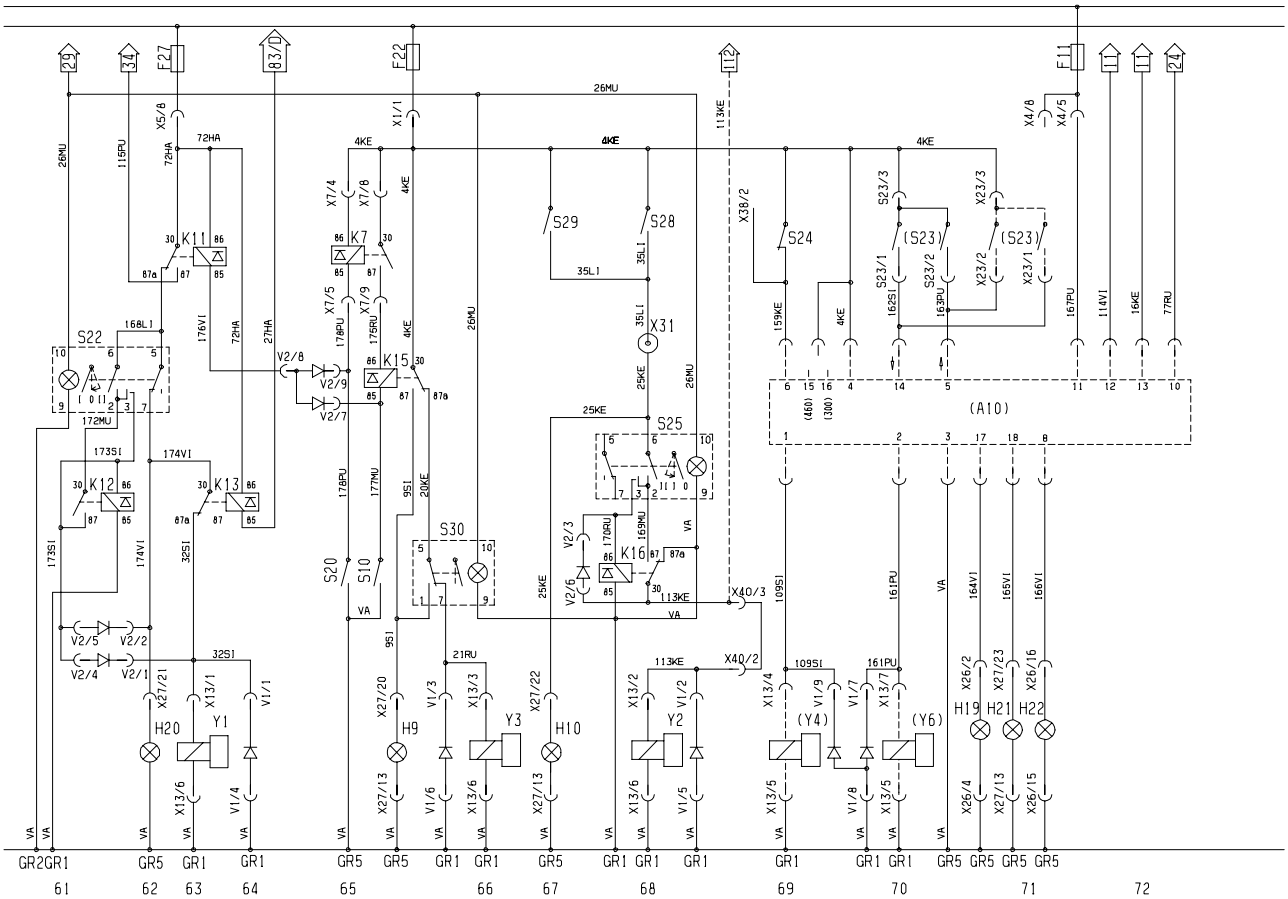
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ACD2.1–3/8

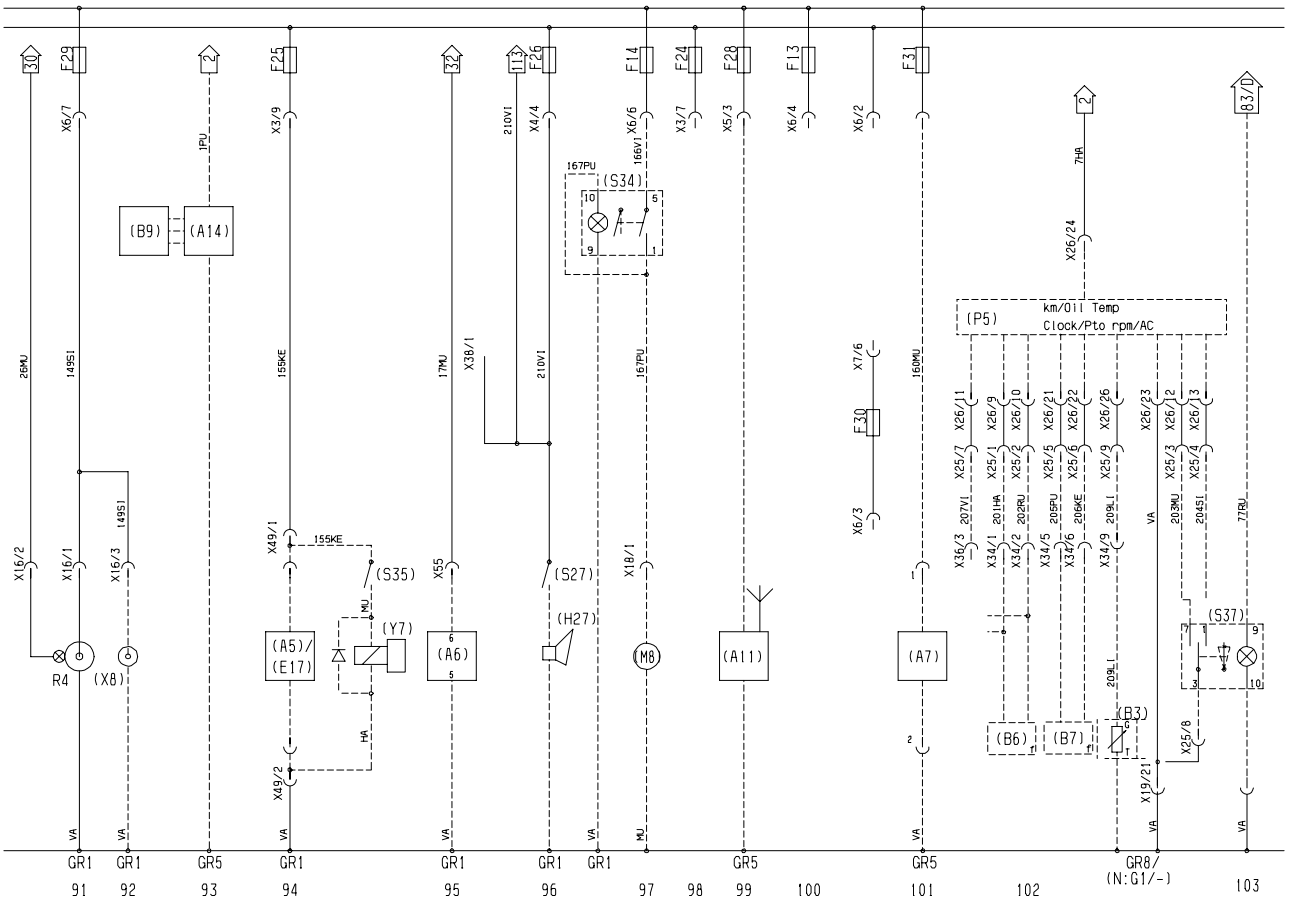


ACD2.1–4/8

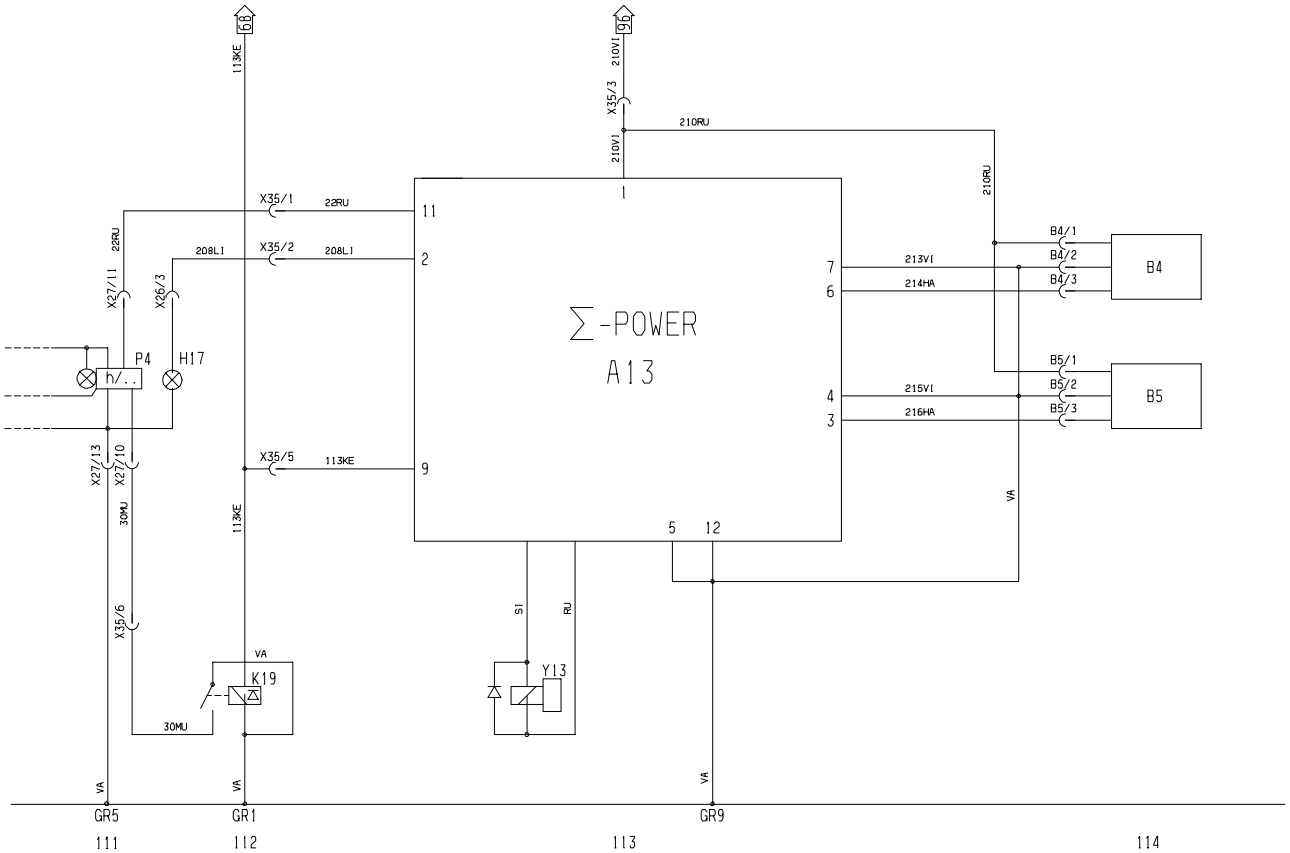


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ACD2.1–7/8



ACD2.1–8/8



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Wiring diagram, F 50112–

Diagram no **318 716 40F**. Diagrams on pages **310/35–38**.

Sym-bol	Component	Code no
(A 2)	Radio	2
A 3	Electric centre	
(A 5)	Air suspension seat	94
(A 6)	Agrodata	95
(A 7)	Electric air filter	101
(A 10)	Delta Powershift control unit	70
(A 11)	Telephone	99
(A13)	Control unit, Sigma	113
(A 14)	Tachograph	93
(A 15)	Control unit, front PTO	69
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B3)	Sensor, gearbox oil temperature	102
(B4)	Sensor, Sigma, crank shaft	114
(B5)	Sensor, Sigma, PTO	114
(B6)	Sensor, gearbox speed	81D 102
(B7)	Sensor, PTO shaft speed	102
(B8)	Sensor, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Radar	81D
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front direction indicator, right	31
E 4	Front direction indicator, left	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, right outer	42
E10	Rear working light, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Rear fog light	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head lights, right	24
(E24)	Upper head lights, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard blinkers, reserve	31
F 2	5 A Radio, clock, tachograph, CareTel	2
F 3	15 A High beam, indicator light	25
F 4	15 A Dipped beams	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket, rear fog light	35
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+Bat.), buzzer	71, 82, 82D
F12	10 A Rot. warning light, cabin light	47
F13	10 A Reserve	100
F14	15 A Water pump	97
F15	20 A Fan III–speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, Agrodata	32
F18	5 A Instruments, warning lights, Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/washer	48
F21	15 A Fan I and II, Air cond. floor fan	55
F22	10 A 4WD, PTO, Delta Power Shift	65
F23	10 A Rear working lights, outer	41
F24	10 A reserve	98
F25	15 A Air suspension seat/seat heating reverse drive control lock	94
F26	10 A Back buzzer, trailer brakes, Sigma, Hi Shift	94
F27	10 A Brake lights, diff. lock.	62
F28	10 A Telephone	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A CareTel	101
(F31)	15 A Electric air filter	101
G 1	Battery	1
G 2	Alternator	4
H 1	Pilot light, direction indicator III	34
H 2	Pilot light, direction indicator II	34
H 3	Pilot light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gearbox oil pressure	9
(H8)	Pilot light, gearbox oil filter	10
H 9	Pilot light, 4WD	65
H10	Pilot light, PTO	67
H11	Pilot light, parking brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beam	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H17	Pilot light, Sigma	111
H18	Warning light, gearbox oil temp	13
H19	Pilot light Delta Powershift I	71
H20	Pilot light, diff. lock	62
H21	Pilot light Delta Powershift II	71
H22	Pilot light Delta Powershift III	71
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse buzzer	96
(H28)	Pilot light, CareTel	120
K 1	Relay, front working lights	43
K 2	Relay , rear working lights	41
(K 3)	Rear fog light	35
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Relay, four wheel braking	65
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights, diff. lock	63
K12	Relay, differential lock	61
K13	Relay, differential lock	63
K14	Starter motor relay	4
K15	Relay, 4WD	65
K16	Relay, PTO emergency stop	68
(K18)	Relay, Control stop	8
(K19)	Relay, display control, Sigma	112
(K 24)	Control relay, Hi Shift	115
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
(M7)	Floor fan	57
(M8)	Water pump	97
P1	Engine coolant thermometer	16
P2	Fuel gauge	17
P3	Revolution counter	18
P4	Hour recorder/AC	19
(P4)	Running hours/driving speed (Agrodata–instrument)	19
(P5)	Clock/PTO–speed/AC/distance/Gearbox temperature (Agrodata–instrument)	101
Q 1	Starter switch	4
(Q 2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91

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Sym–bol	Component	Code no
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S3	Switch, fan	55
S 4	Combination control	25,34, 52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioning	54
S 9	Safety circuit breaker	4
S10	Brake light contact, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	65
S22	Switch, differential lock	61
(S23)	Push buttons, Delta Powershift	70
(S23)	Push buttons, Delta Powershift	71
S24	Switch, Delta Power shift disengagement	69
S25	Switch, PTO release	68
(S26)	Switch, rear fog lights	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	66
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, reverse drive control lock	94
(S36)	Switch, Control stop	4
(S37)	Switch, Agrodata–instrument.	103
(S38)	Switch, front PTO	69
(S42)	Door switch, right, cabin light	46
(S43)	Door switch, left, cabin light	46
(S44)	Sensor, Pressure filter, Working hydraulics	10
(S45)	Switch, Hi–Shift	115
(S45.1)	Extra switch, Hi Shift	115
(S49)	Change over switch, rpm/flow meter (Agrodata)	
(S50)	Change over switch, km/h, wheel sensor, tractor /implement (Agrodata)	
V 1	Diodes (Y1, Y2, Y3, Y4, Y6)	
V 2	Diodes (AC II)	
(V3)	Diodes, Control stop	15
(V5)	Diodes, Hi Shift	115
X 1	Connector, 9 pin., distribution box	
X 2	Connector, 9 pin., distribution box	
X 3	Connector, 9 pin., distribution box	
X 4	Connector, 9 pin., distribution box	
X 5	Connector, 9 pin., distribution box	
X 6	Connector, 9 pin., distribution box	
X 7	Connector, 9 pin., distribution box	
(X 8)	Connector, 2 pin., power socket	92
X 9	Connector, 9 pin, combination control	
X10	Connector, 9 pin, combination control	
X11	Connector, 9 pin., upwards	
X12	Connector, 9 pin., rearwards, right	
X13	Connector, 9 pin., solenoid valves.	
X14	Connector, 9 pin., rearwards, left	
(X15)	Connector, 3 pin., air cond., diodes	54
(X16)	Connector, 3 pin., cigarette lighter, current socket	
X17	Rear socket, 7 pin	32
(X18)	Connector, 2 pin., rear window washer	48
X19	Connector, 32 pin, front wall	
X20	Connector, 9–pole, front direction indicator	
X22	Connector, 2 pin., rot. roof light	47
X23	Connector, 2 pin., Delta Powershift optional buttons	71

Sym–bol	Componenet	Code no
X24	Connector, 9 pin., upwards	
(X25)	Connector, 9–pin. Agrodata–instrument	
X26	Connector, 26 pin., instr. left, white.	
X27	Connector, 26 pin., instr. right, blue	
(X29)	Connector, 2 pin., STOP–alarm (max. 2 W)	
X31	Socket, 2 pin, PTO–emerg. stop	68
(X32)	Connector, 1 pin, electric stop	5
(X33)	Connector, 3 pin, rear fog light	
(X34)	Connector, 9–pin. Agrodata–instrument sensors	
(X35)	Connector, 9–pin. ETB	
(X36)	Connector, 3 pins, Hi Shift, speed limit	116
(X38)	Connector, 3 pins, Hi Shift supply	116
X39	Connector, 3–pin. reserve	
X40	Connector, 3–pin. reserve	
X41	Connector, 2 pins, front PTO	
X42	Connector, 4 pins, front PTO	
(X43)	Socket, 8 pins, CareTel	119
(X49)	Connector, 2 pin., seat	94
(X53)	Agrodata socket, 7 pin, implement	
(X54)	Connector, 9 pin Agrodata sensors	
(X55)	Connector,1 pin., Agrodata supply	95
Y 1	Solenoid valve, diff lock	63
Y 2	Solenoid valve pto	68
Y 3	Solenoid valve 4WD	66
(Y 4)	Solenoid valve, Delta PS reduction	69
(Y 5)	Solenoid valve compr., air con.	54
(Y 6)	Solenoid valve, Delta PS overdrive	70
(Y7)	Solenoid valve, reverse drive control lock	94
(Y8)	Solenoid, electric stop	4
(Y9)	Solenoid valve, front PTO	69
(Y13)	Solenoid valve, Sigma	113
(Y14)	Solenoid valve, Hi Shift	115
(Y15)	Solenoid valve, Hi Shift, slowing	115
(Y16)	Solenoid, cold start	3
GR /1	Earth lead, rear lights/solenoid valves	
GR /2	Earth lead, roof	
GR /4	Earth lead, Autocontrol	
GR /5	Earth lead, cable harness, instr. panel	
GR /7	Earth lead, battery	
GR /8	Earth lead, headlights	
GR /9	Earth lead, cab	
GR /10	Earth lead, electric stop	

Note! Concerning AC power lift, see page 320/3C. ACD power lift, see page 321/10.

CareTel

A1L	CareTel datalogger	118
B1L	Pressure sensor, CareTel, 18 bar	117
(B2L)	Pressure sensor, CareTel, 190 bar	117
X1L	Connector, 8 pins, RS–232	117–120
X2L	Connector, 3 pins, CAN	117–120
X3L	Connector, 9 pins, option.	117–120
X4L	Connector, 3 pins, supply+NBUS	117–120

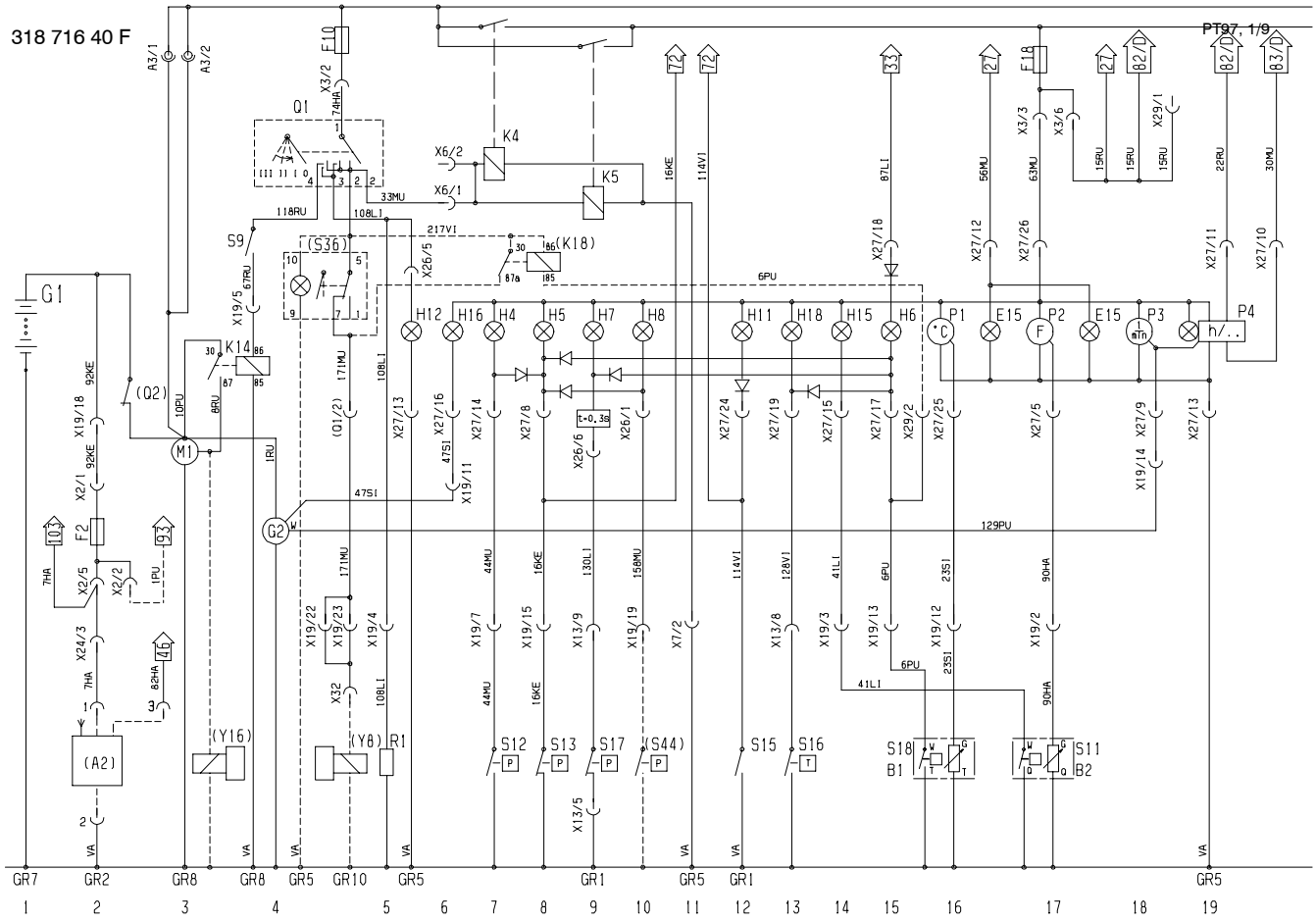
Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

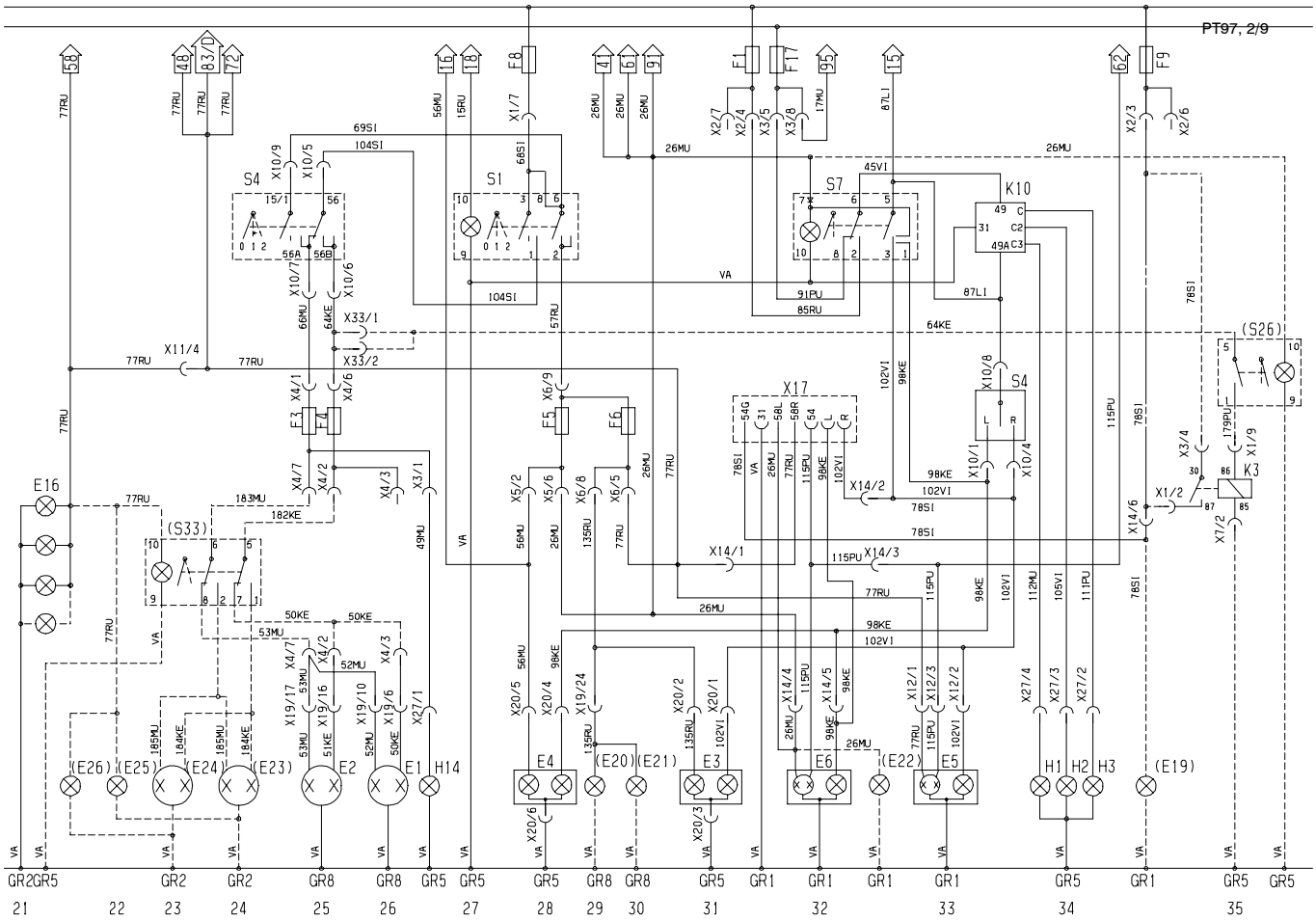
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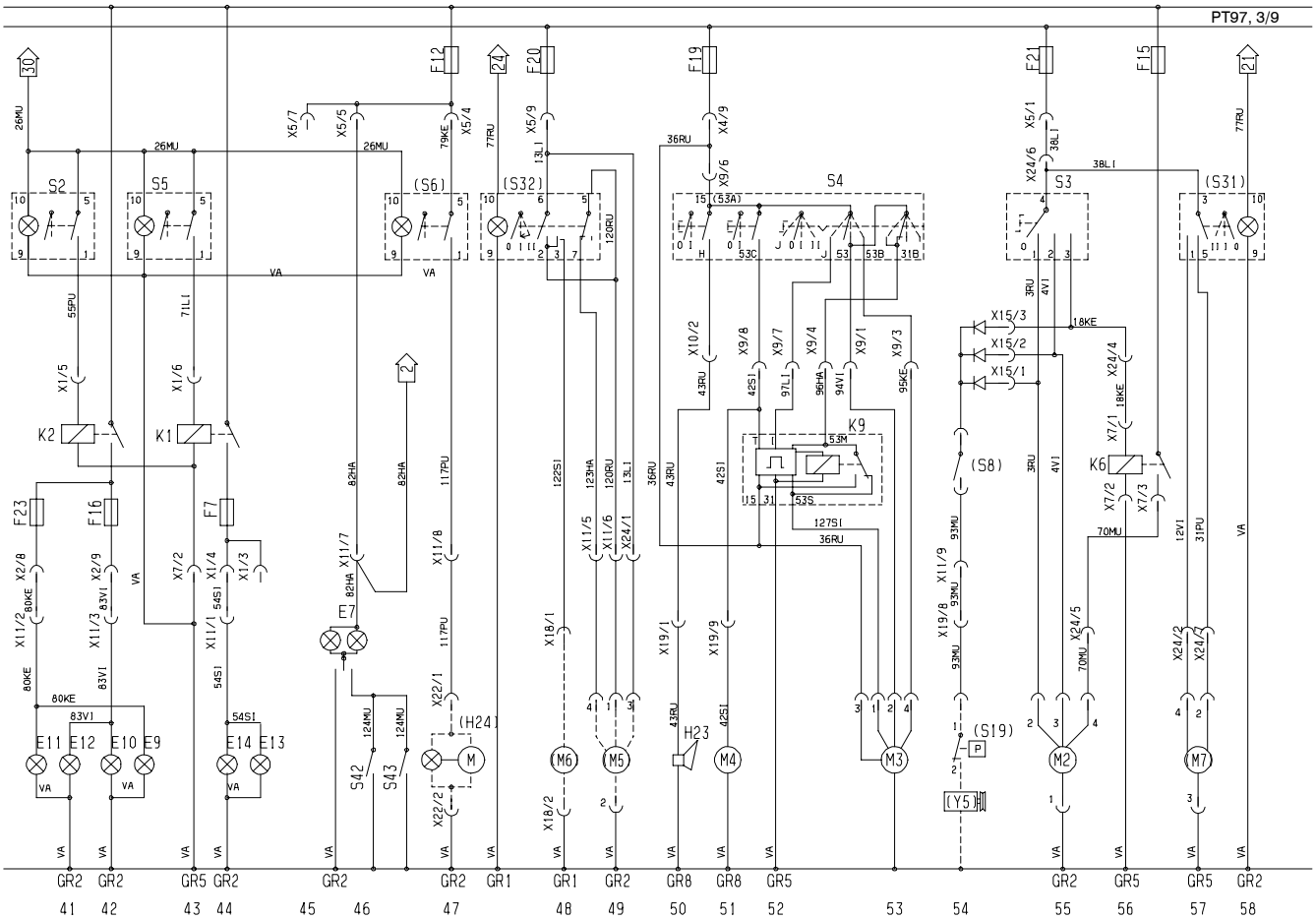
PT97, 1/9

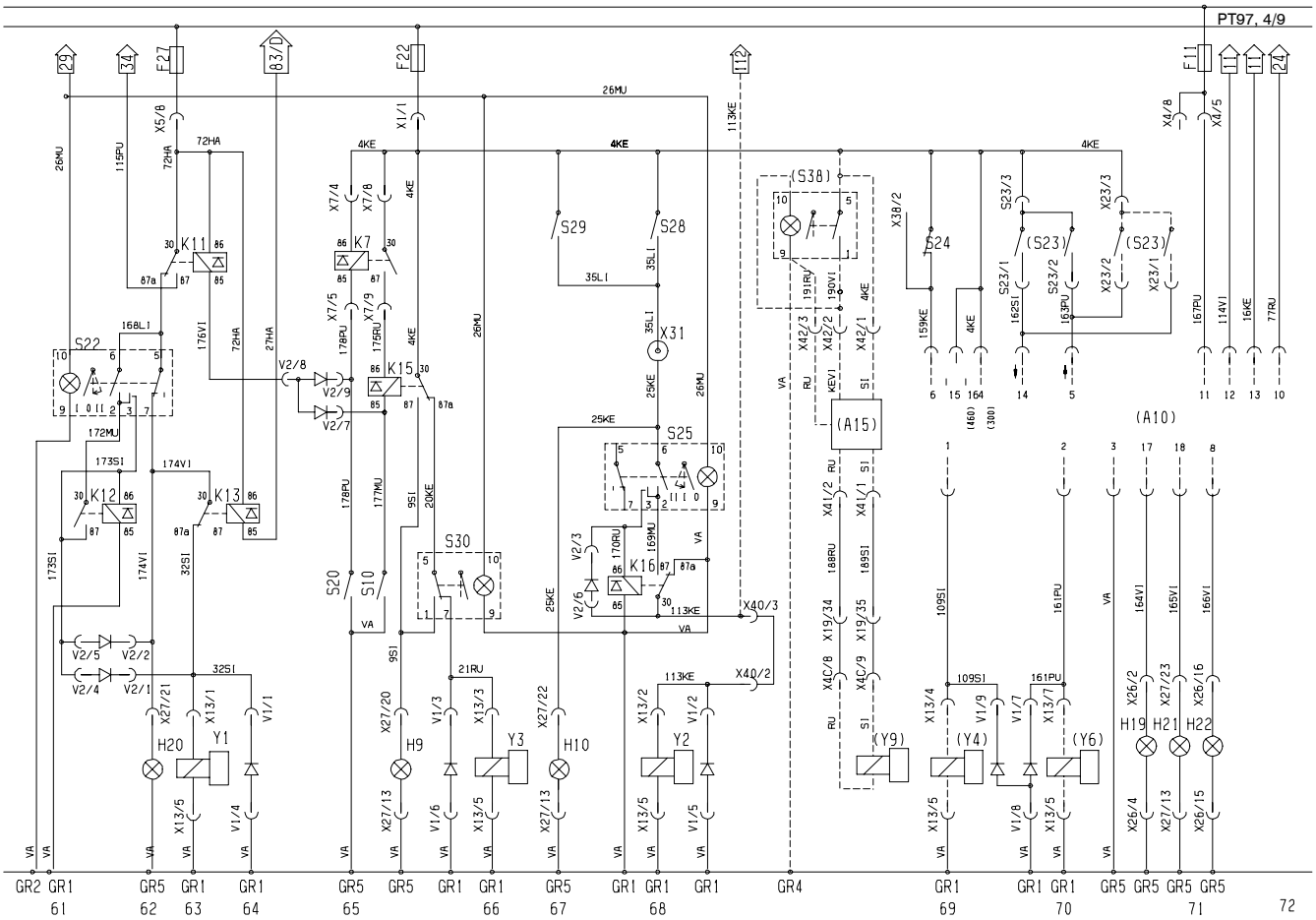


PT97, 2/9

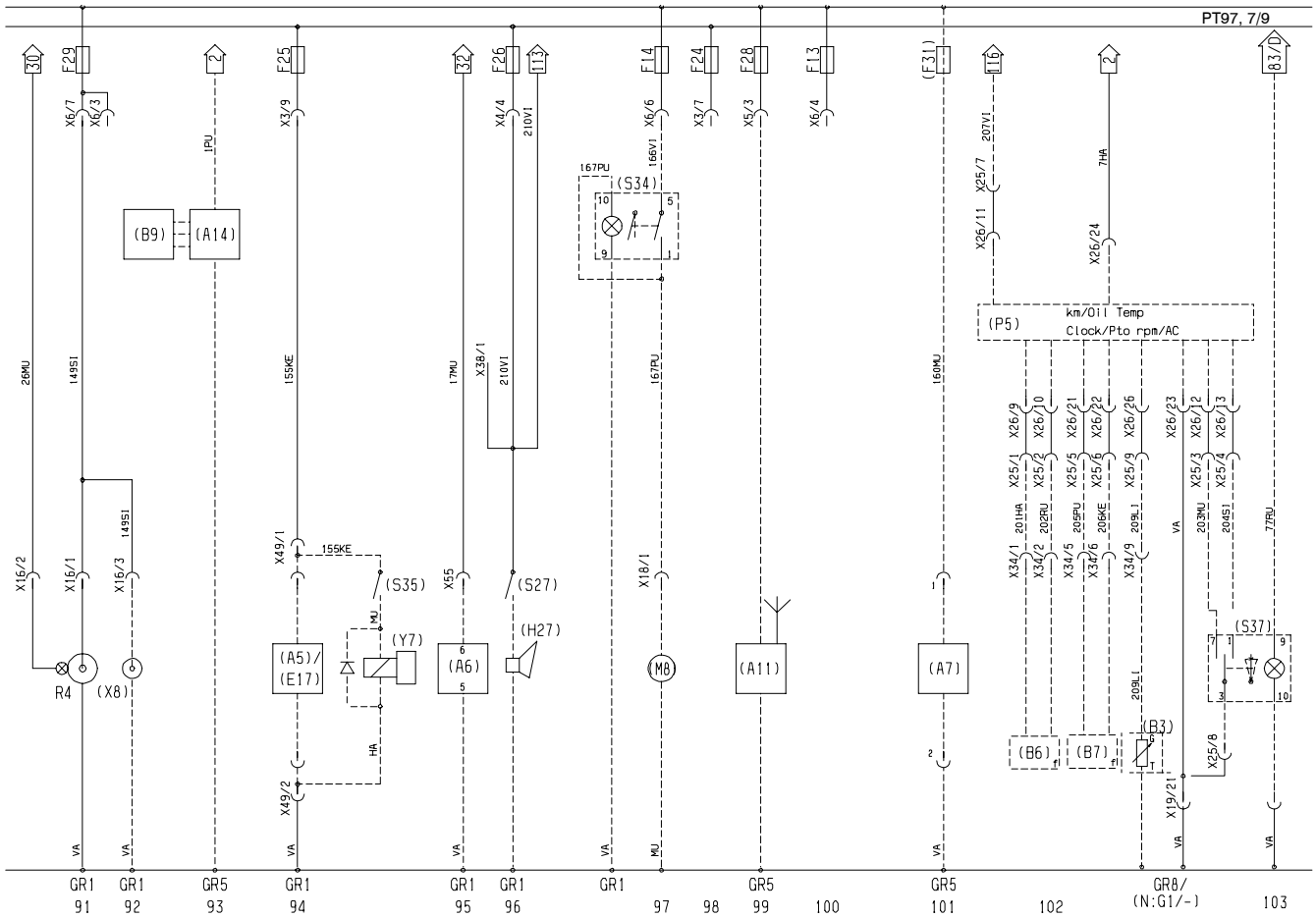


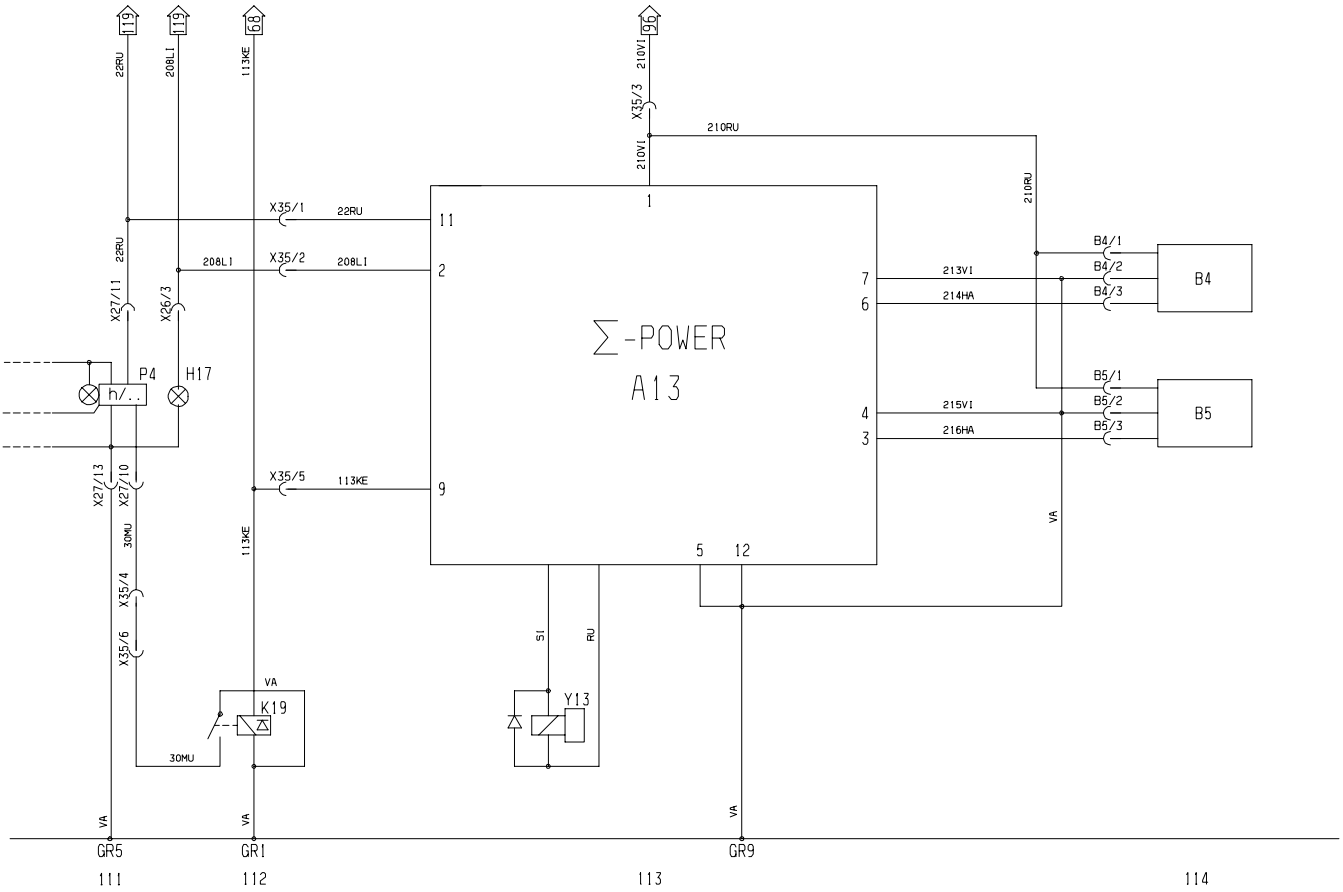
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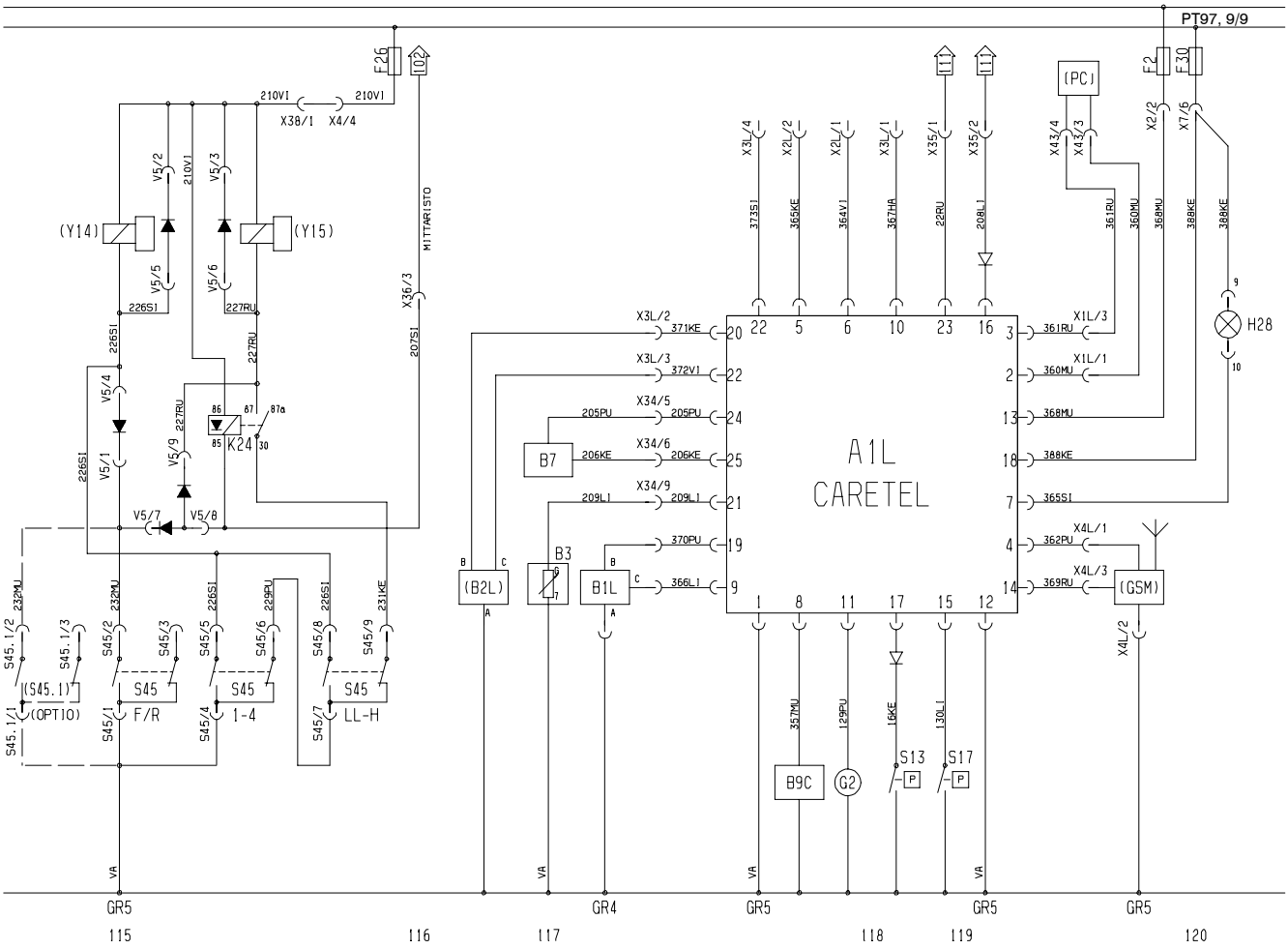


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Wiring diagram, HiTech models H49112–J38342.

The diagrams on pages **310/43–47**. Diagram no 33563500. Incl. also FieldMaster, CareTel and AC V–system.

(A1A)	Control unit, reverse shuttle	122–152
(A2)	Radio	2
A3	Distribution box (fuse box)	
(A5)	Pneumatic seat	94
(A6)	Agrodata	95
(A7)	Electric air filter	101
(A10)	Control unit, DPS	70
(A11)	Telepfone	99
(A13)	Control unit Sigma	113
(A14)	Tachograpf	93
(A16)	FieldMaster	155
(A17)	Adapter, FieldMaster signals	154
B1	Sender unit, engine temo. gauge	16
B2	Sender unit, fuel gauge	17
(B3)	Temperature sensor, gearbox AD	102
(B4)	Sensor Sigma crankshaft	114
(B5)	Sensor Sigma, PTO	
(B6)	Gearbox speed sesnor	81D, 102
(B7)	PTO speed sensor	117, 102
(B8)	Sensor, wheel sensor	
(B9)	Sensor, tachograph	93
(B10)	Radar	81D
B11	Engine speed sensor	125
B12	Sensor, HiTech shuttle	126
B13	Sensor, HiTech shuttle	127
B14	Sensor, gearbox oil temperature	139
B15	Position sensor, gas pedal	140
B16	Position sensor, clutch pedal	137
B17	Sensor, outdoor temperature	141
E1	Headlights, right	26
E2	Haedlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cabin light	46
E9	Rear working light, right, outer	42
E10	Rear working light, right, inner	42
E11	Rear working light, left, outer	41
E12	Rear working light, left, inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument light	17
E16	Roof console light	21
E17	Seat heater	94
(E19)	Rear fog light	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head lights, right	24
(E24)	Upper head lights, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Side working light	
(E28)	Side working light	

Sym–bole	Component	Code no
	Fuses	
F 1	15/20A Hazard warning flashers, water pump	31, 97
F 2	5/16A Radio, clock, tachograph, CareTel	2,120
F 3	15A Main beams	25
F 4	15A Dipped beams	25
F 5	5A Parking light, left	28
F 6	5A Parking light, right	30
F 7	10A Front working lights	44
F 8	25A Light switch	28
F 9	15A Trailer socket/rear fog light	35
F10	25A 3–pin. power socket	96
F11	5A Autocontrol (+Bat)	83B, 83D
F12	10A Rot. warning light, cabin light	47
F13	10A Reserve	100
F14	15A Ignition switch, thermostart	4
F15	20A Fan III–speed	56
F16	10A Rear working lights, inner	42
F17	10A Flashers, Agrodata/Fieldmaster	32, 154
F18	5A Instrument, ind. lights, Autocontrol	17
F19	10A Windscreen wiper/washer, signal horn	51
F20	10A Rear window wiper/washer	48
F21	15A Fan I and II–speed, air conditioning, floor fan	55
F22	10A 4WD	70
F23	10A Rear working lights, outer	41
F24	10A AC5, hand brake	67, 126
F25	15A Pneumatic seat/seat heater, reverse drive control lock	94
F26	10A Back buzzer, Sigma, HiShift	113
F27	10A Brake lights, differential lock	64
F28	10A Telefone	99
F29	10A Cigarette lighter, 2–pin. power socket	91
F30	10A CareTel	120
G1	Battery	1
G2	Alternator	4, 118
H1	Pilot light, direction indicator III	34
H2	Pilot light, direction indicator II	34
H3	Pilot light, direction indicator I	34
H4	Warning light, blocked air filter	7
H5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temperature, Hand brake wire	15
H7	Warning light, gearbox oil pressure	9
H8	Warning light, gearbox oil filter	10
H9	Pilot light, 4WD	65
H10	Pilot light, PTO	67
H11	Pilot light, hand brake	12
H12	Pilot light, Thermostart	6
H14	Pilot light, main beams	27
H15	Warning light, low fuel level	14
H16	Pilot light, charging	6
H17	Pilot light, Sigma	111
H18	Warning light, gearbox oil temperature	13
H20	Pilot light, differential lock	62
H23	Signal horn	50
(H24)	Rotating warning light	47
(H27)	Back buzzer	96
(H28)	Warning light, Stop, rear	120
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, rear fog light	35
K4	Starter switch relay	7
K5	Starter switch relay	9

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Sym-bole	Component	Code no
K6	Relay, fan III–speed	56
K7	Relay, four wheel braking	65
K9	Relay, interval wiper	53
K10	Relay, flashers	34
K11	Relay, brake lights/differential lock	63
K12	Relay, differential lock	61
K13	Relay, differential lock	63
K14	Relay, starter motor	4
K15	Relay, 4WD	65
(K18)	Relay, control stop	8
K25	Relay, upper headlights to working lights	115
K27	Relay, 4WD on/off	68
K28	Relay, hand brake	67
(K29)	Relay, back buzzer	147
M 1	Starter motor	3
M 2	Fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
(M7)	Floor fan	57
(M8)	Water pump	97
(M9)	Glass roof wiper	
P1	Engine coolant thermometer	16
P2	Fuel gauge	17
P3	Rev counter	18
P4	Hour recorder–/velocity meter (Agrodata–instrument)	19
(P5)	Upper display, AD–instrument	101
P6	Display, AC5	131
Q1	Starter switch	4
(Q2)	Main switch	3
R1	Thermostart	5
R4	Cigarette lighter	91
S1	Switch, headlights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Kombination lever	25, 34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioning	54
S9	Safety circuit breaker	66
S10	Switch, right brake lights	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator	7
S13	Engine oil pressure sender unit	8, 118
S15	Reed relay, hand brake lever	67
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Pressure switch, AC compressor pressure	54
S20	Contact, left brake light	65
S22	Switch, differential lock	61
S23	Switch, Delta Power Shift	139, 140
S25	Switch, PTO	75
(S26)	Switch, rear fog light	35
(S27)	Switch, back buzzer	96
S28	Switch, PTO 540	143
S29	Switch, PTO 1000/540E	144
S30	Switch, 4WD	66
S31	Switch, floor fan	57
(S32)	Switch, rear window washer/wiper	48
(S33)	Toggle switch, headlights up	23
(S34)	Switch, water pump	97
(S35)	Switch, reverse drive control lock	94
(S36)	Switch, control stop	4
S37	Switch, Agrodata–instrument	103
(S38)	Switch, front PTO	69
S40	Reed relay, forwards (F)	146
S41	Reed relay, rearwards (R)	147
S42	Door switch, cabin light, right	46
S43	Door switch, cabin light, left	46
S44	Sensor, pressure filter 180 bar	11
S45	Push buttons, HiShift	115, 142
S45.1	Extra push buttons, HiShift	115
S47	Switch, DPS, man./autom.	144
(S49)	Switch, rpm / flow meter (Agrodata)	
(S50)	Switch, speed sensor, tractor/implement	
S51	Push button DPS preselecting	149
S52	Ind. light switch, hand brake wire	14
S53	Ind. light sensor, return filter, low pressure hydr.	10
S54	Ind. light sensor, pressure filter, 18bar	11
(S59)	Switch, glass roof washer	
S60	Safety switch, seat	142
V1	Diode Y1, Y2, Y3, Y4, Y6	
V2	Diode, AC2	
V3	Diode, 4–veto	
V4	Diode, Y11, Y12, Y17	

Earth points:

GR1 Rear working lights, solenoid valves
GR2 Roof
GR4 Autocontrol
GR5 Dashboard wire loom
GR7 Battery
GR8 Headlights
GR9 Cab
GR10 Electric engine stop

Connectors:

X1	9 pins, distribution box	
X2	9 pins, distribution box	
X3	9 pins, distribution box	
X4	9 pins, distribution box	
X5	9 pins, distribution box	
X6	9 pins, distribution box	
X7	9 pins, distribution box	
(X8)	2 pins, power socket	92
X9	9 pins, combination lever	
X10	9 pins, combination lever	
X11	9 pins, up	
X12	9 pins, rearwards, right	
X13	37 pins, transmission	
X14	9 pins, rearwards, left	
(X15)	3 pins, air conditioning, diodes	54
X17	7 pins, trailer socket	32
(X18)	2 pins, rear window washer	48
X19	37 pins, engine	
X20	9 pins, front flashers	
(X22)	2 pins, rot. warning light	47
X23	3 pin, Delta Power Shift, option	71
X24	9 pins, upwards	
X26	26 pins, instrument, left, white	
X27	26 pins, instrument, right, blue	
X28	9 pins, shuttle speed sensors	
(X29)	2 pins, STOP–alarm (max. 2 W)	
X30	9 pins, gear lever switches	
X31	2 pins, power socket, PTO emergency switch	68
(X32)	1 pin, electric stop of engine	5

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Sym-bole	Component	Code no
(X33)	3 pins, rear fog light	
(X35)	9 pins, SIGMA supply	
X39	9 pins, shuttle lever	
(X41)	2 pins, front PTO	
(X42)	4 pins, front PTO, supply	
X43	8 pins, RS–232	
(X45)	9 pins, Fieldmaster, option	
(X46)	Socket, 7 pins, Fieldmaster	
(X47)	2 pins, GPS supply, Fieldmaster	
(X48)	3 pins, radar, Fieldmaster	
(X49)	2 pins, seat	94
X50	3 pins, power socket	96
(X53)	Agrodata socket, 7 pins, implement	
Y1	Solenoid valve, differential lock	63
Y2	Solenoid valve, PTO	68
Y3	Solenoid valve, 4WD	66
(Y4)	Solenoid valve, Delta Power Shift	69, 133
(Y5)	Magnetic clutch, AC compressor	54
(Y6)	Solenoid valve, Delta Power Shift	70, 134
(Y7)	Magnetic valve, reverse drive control lock	94
(Y8)	Solenoid, engine run	4
(Y9)	Magnetic clutch, front PTO	69
Y11	Solenoid, forwards (F)	128
Y12	Solenoid, rearwards (R)	130
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, cold start	3
Y17	Solenoid valve, Delta Power Shift	130
Y18	Solenoid valve, hand brake	67

AC5 Control System, HiTech

A1A	Control unit, AC5	122–152
S1A	Switch, PTO rear control, left	
S2A	Switch, PTO rear control, right	
X1A	Connector, 9 pins, engine sensors	140–141

ACD power lift, see page 321/10.

ACB power lift, see page 321/11A.

.

CareTel

Sym-bole	Component	Code no
A1L	CareTel, data gathering unit	118
B1L	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, CareTel, 190 Bar	116
B3L	Sensor, gearbox oil temperature	117
B4L	Engine temperature sensor	118
H1L	Indication light, CareTel	120
X1L	Connector, 9 pins, CareTel, RS–232	117–120
X2L	Connector, 3 pins, CareTel, CAN	117–120
X3L	Connector, 9 pins, CareTel, option	117–120
X4L	Connector, 3 pins, CareTel, supply+ NBUS	117–120

Wire colours

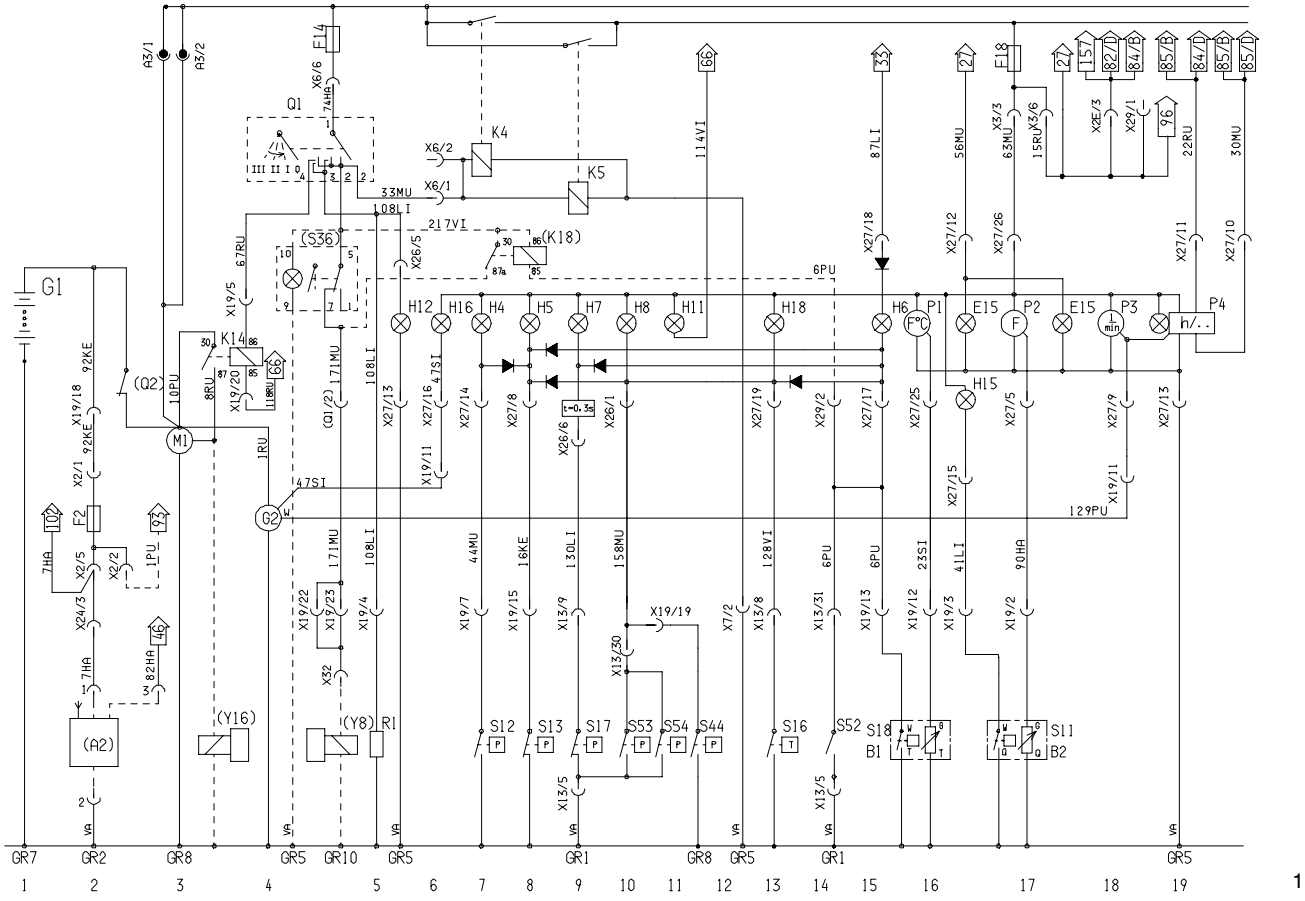
RU = braun
PU= red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

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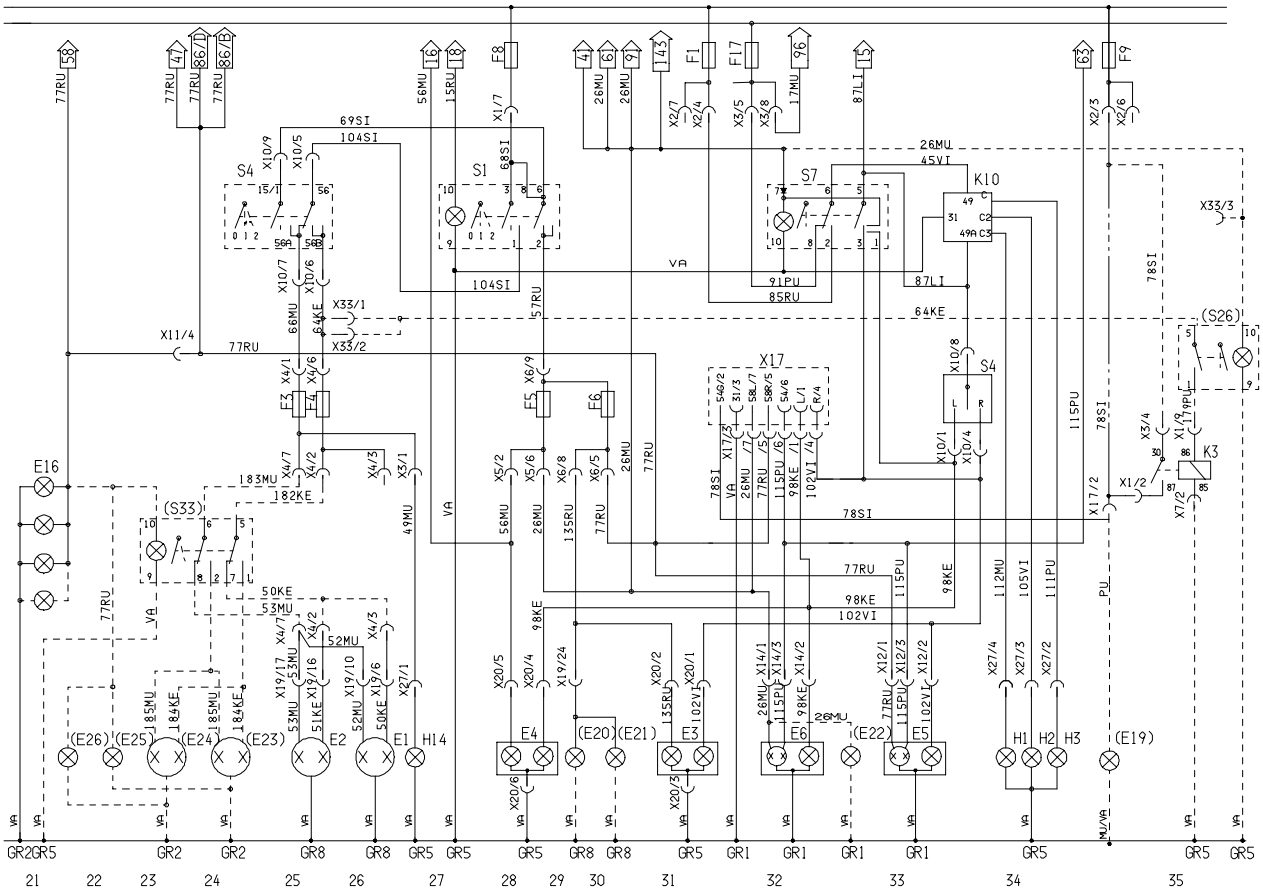
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HiTech, H49112–J38342



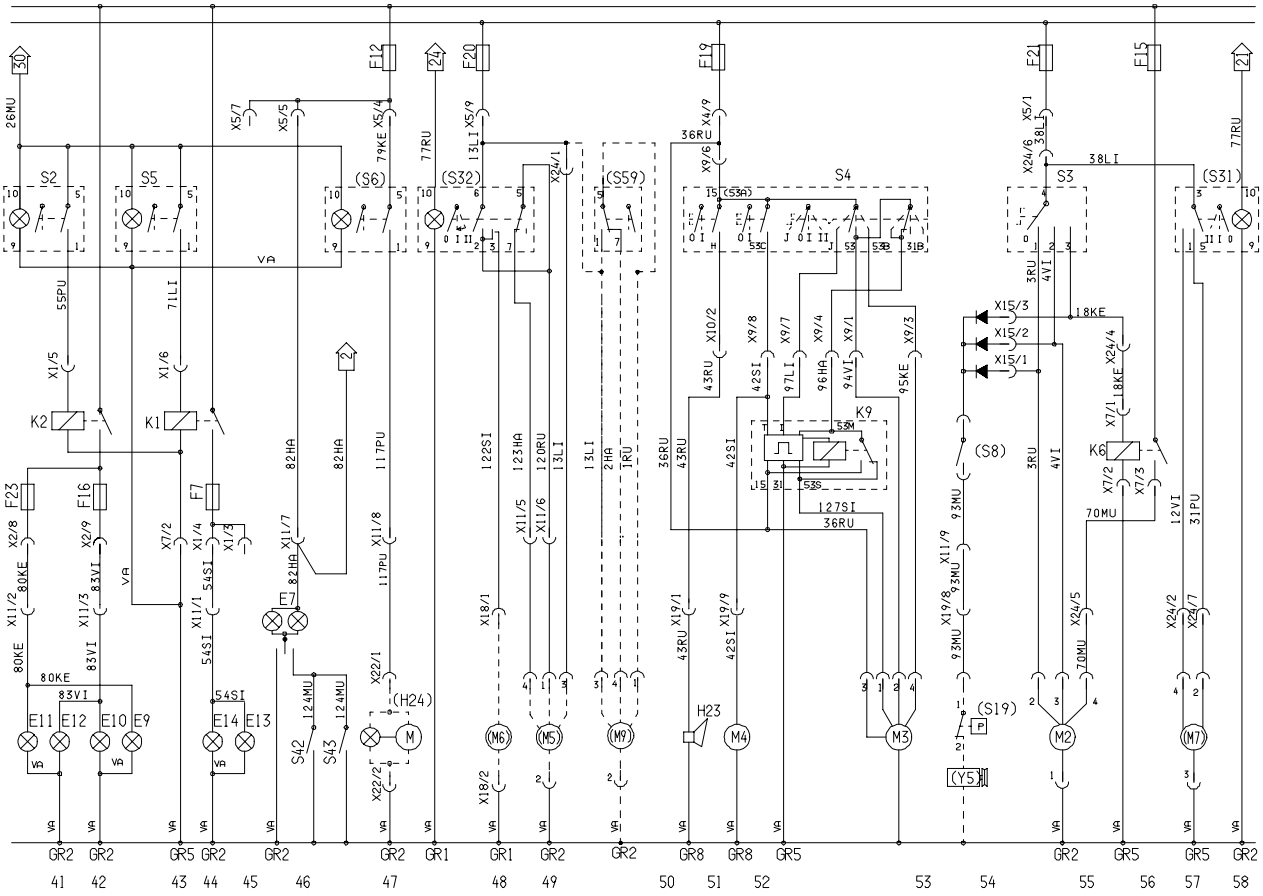
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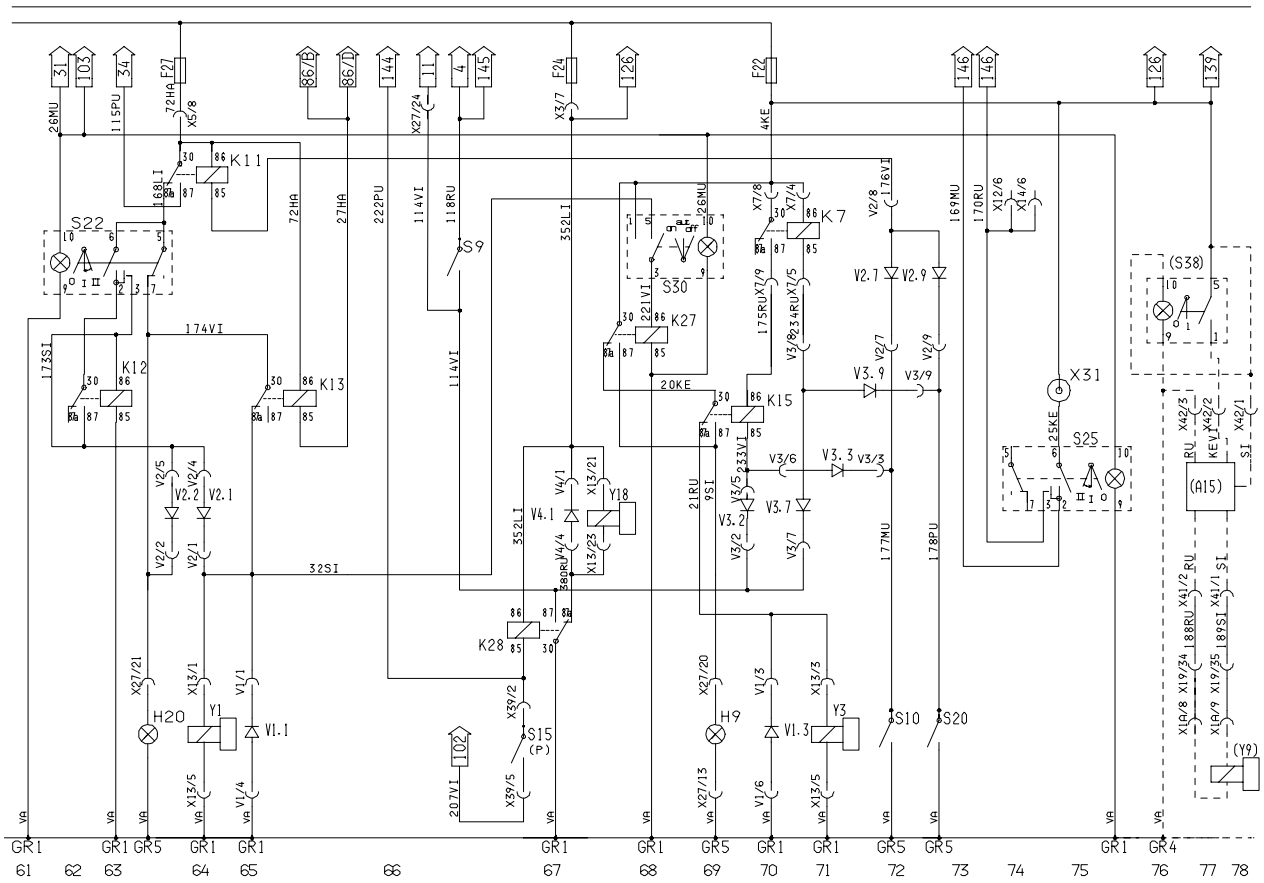
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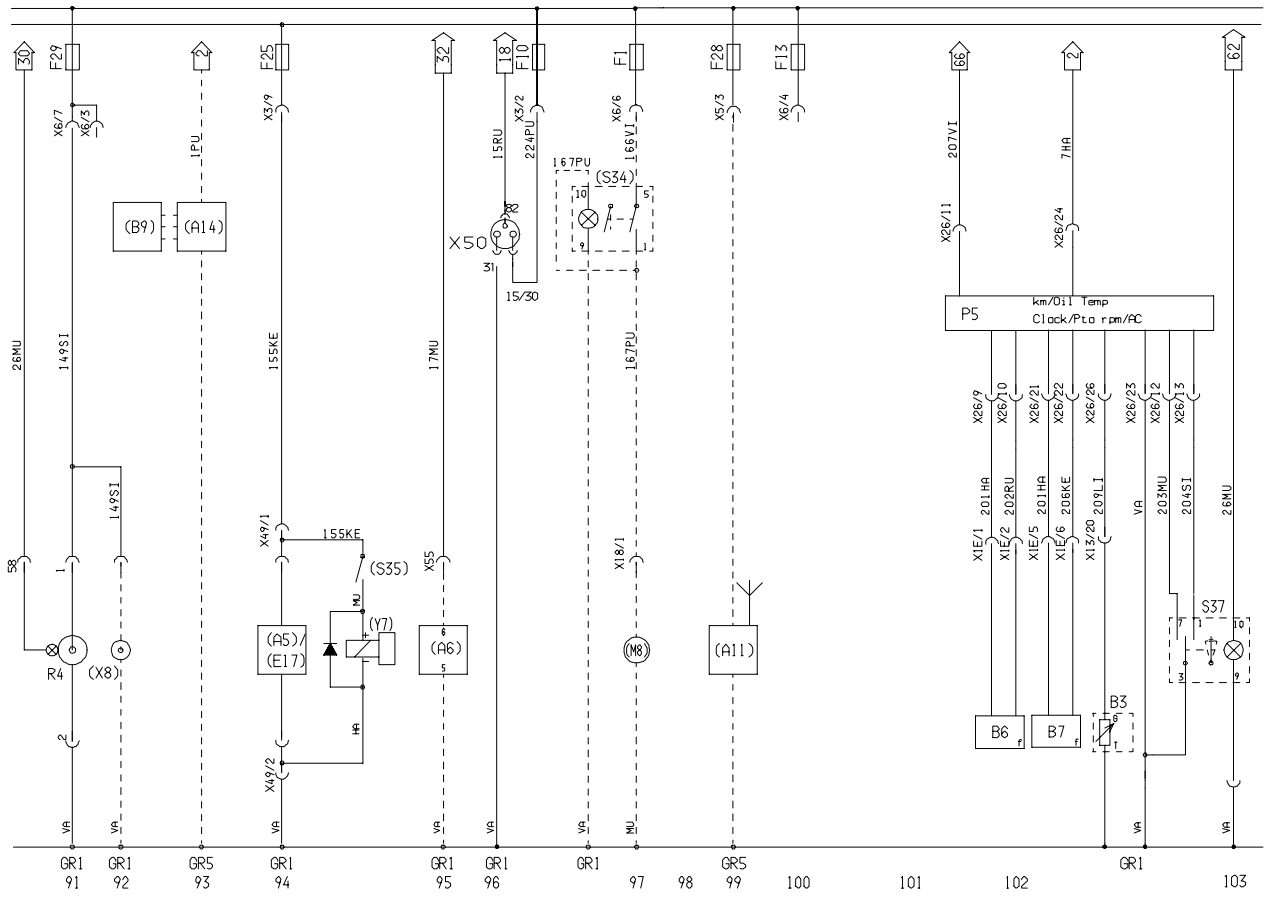
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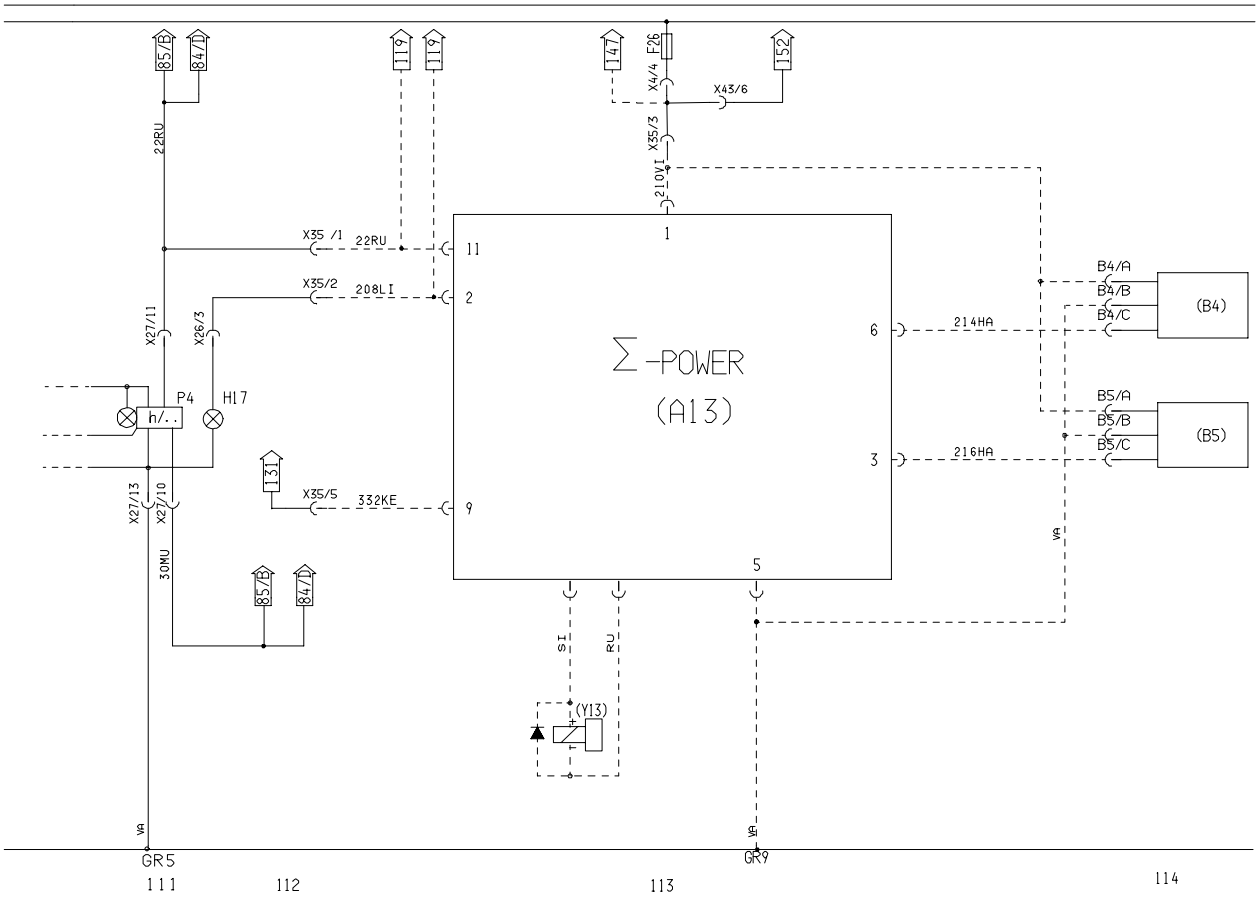
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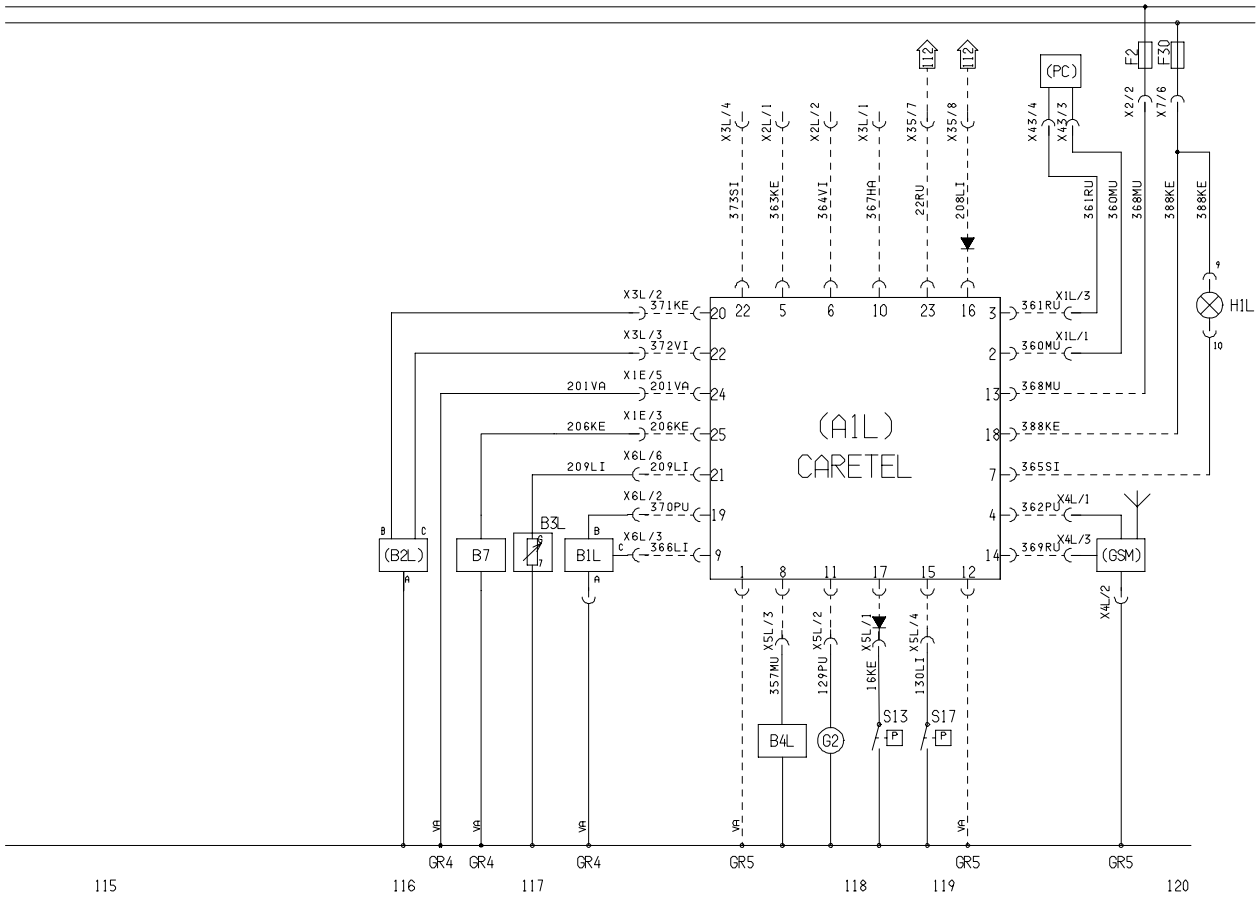
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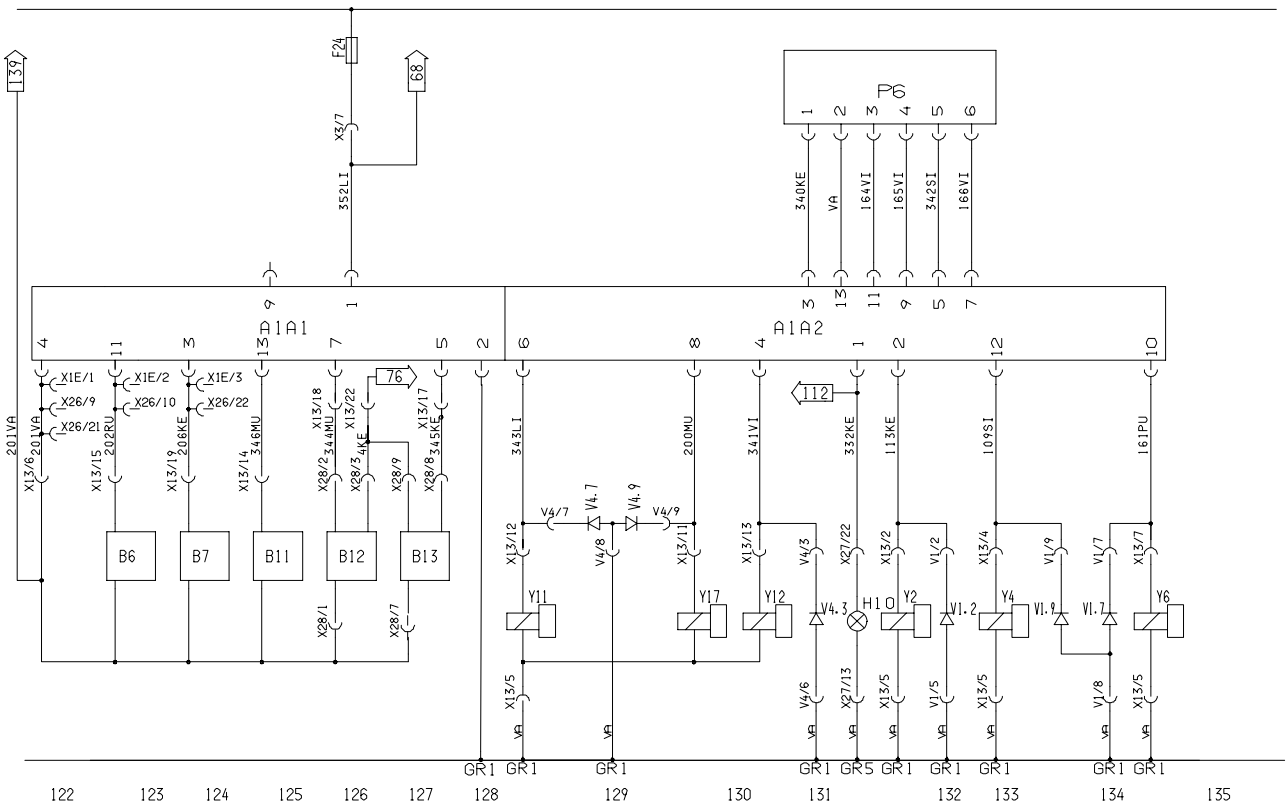
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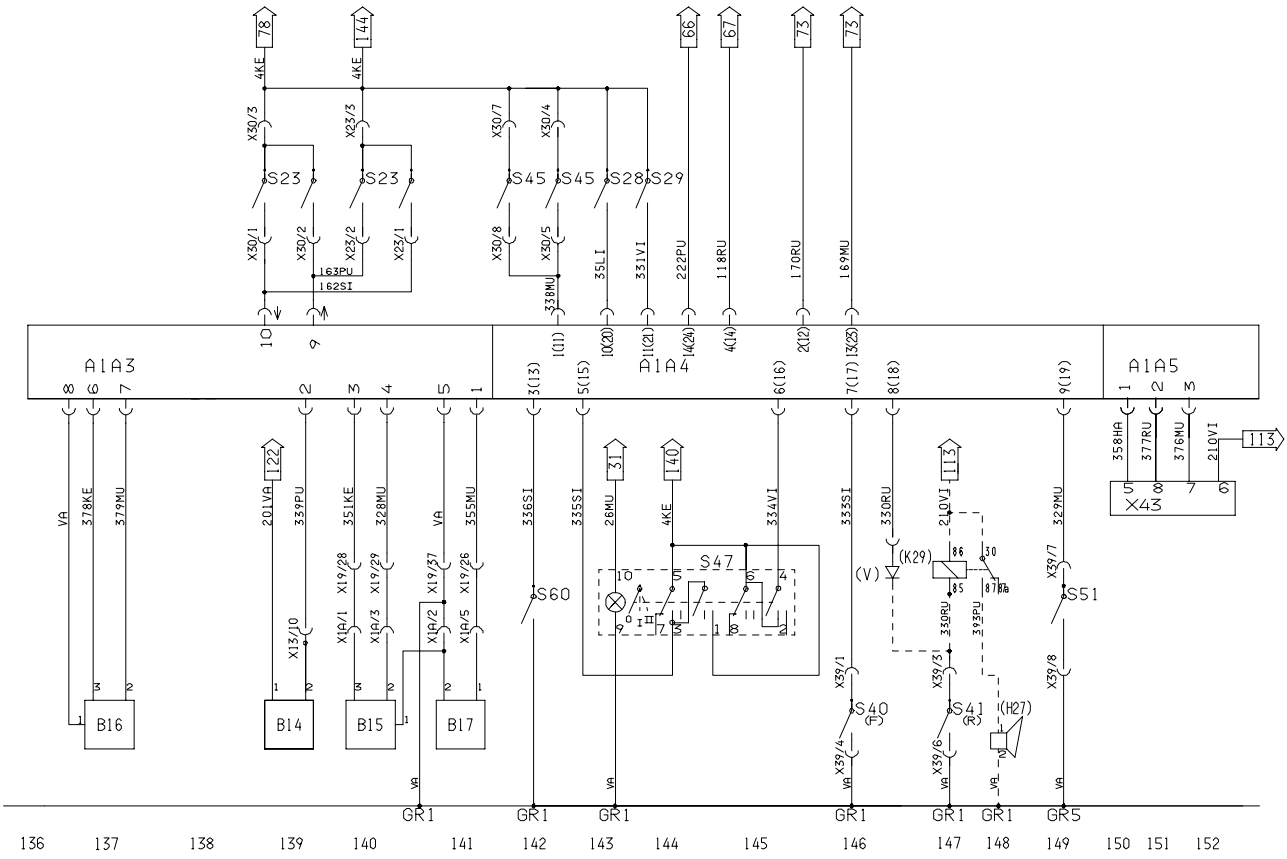


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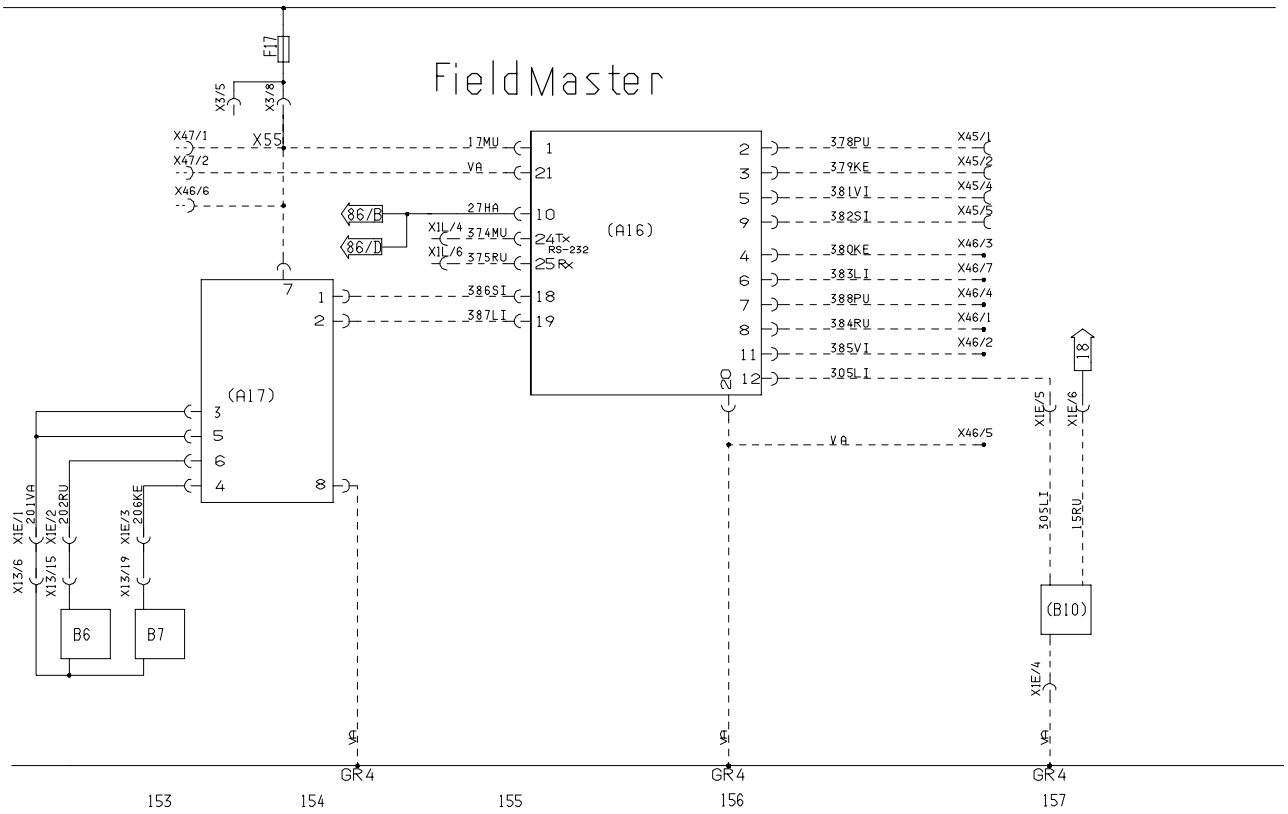


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HiTech, H49112–J38342



9



10

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Wiring diagram 6200–8750 (AC 2.2), J05133–. Diagram no. 31871650A (not HiTech)

Symbol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A6)	Agrodata	95
(A10)	Control unit, DPS	70
(A11)	Telephone	99
(A13)	Control unit, Sigma	113
(A14)	Tachograph	93
(A16)	Fieldmaster	155
B1	Sensor, engine temperature	16
B2	Sensor, fuel gauge	17
(B3)	Sensor, gearbox temperature	102
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
(B6)	Velocity sensor, gearbox	81D, 102, 123, 153
(B7)	Velocity sensor, PTO	102, 117, 124, 153
(B8)	Sender, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	46
E9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	

Fuses

F1	15A Hazard blinkers, water pump	21, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	5A Parking lights, left	28
F6	5A Parking lights, right	30
F7	10A Front working lights	44
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35
F10	25A 3–pin current socket	100
F11	5A Autocontrol (+Bat), buzzer	71, 82B, 82D
F12	10A Rot. warning light, cabin light	47
F13	10A Reserve	100
F14	15A Starter switch, thermostart	97
F15	20A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Direction indicators, Fieldmaster	32, 153
F18	5A Instruments, warning lights, Autocontrol	17
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer	48
F21	15A Fan (I, II), air conditioner, floor fan	55
F22	10A 4WD, PTO, DPS	65
F23	10A Rear working lights, outer	41
F24	10A Reserve	98
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	96, 116
F27	10A Braking lights, differential lock	62
F28	10A Telephone	99
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel	120
G1	Battery	1
G2	Alternator	4, 118
H1	Indicator light, direction indicator III	34
H2	Indicator light, direction indicator II	34
H3	Indicator light, direction indicator I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temp.	15
H7	Indicator light, gearbox oil press.	9
(H8)	Indicator light, oil filter, gearbox	10
H9	Indicator light, 4WD	65
H10	Indicator light PTO	67
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	14
H16	Indicator light, charging	6
H17	Indicator light, Sigma	111
H18	Indicator light, gearb. oil temp.	13
H19	Indicator light DPS I	71
H20	Indicator light, diff. lock	62
H21	Indicator light DPS II	71
H22	Indicator light DPS III	71
H23	Horn	50
(H24)	Rotating roof light	47, 148
(H27)	Reverse Buzzer	96
(H28)	Indicator light, STOP, rear	
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56
K7	Control relay, 4–wheel brake	65
K9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	63
K12	Control relay, differential lock	61
K13	Control relay, differential lock	64
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	65
K16	Relay, PTO–emergency stop	68
(K18)	Relay, control stop	8
(K24)	Control relay, HiShift	115
K25	Control relay, upper head lights to working lights	
K26	Control relay, speed limit, HiShift	
K27	Control relay, 4WD on/off	66, 68

Symbol	Component	Code no
M1	Starter motor	3
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
M7	Floor fan	57
(M8)	Water pump	97
(M9)	Roof window wiper	
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour meter/AC (Sigma)	19
(P4	Running hour /speed meter (AD instrumentation))	19
(P5)	Clock, PTO–speed, AC, trip, oil temperature (Agrodata–instrumentation)	101
Q1	Heat/starter switch	4
(Q2)	Main switch	3
R1	Thermostart	5
R4	Cigarette lighter	91
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25, 34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	4, 66
S10	Switch, braking lights, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Sender unit to parking brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	65
S22	Switch, differential lock	61
(S23)	Switch, DPS, selector	139, 140
(S23)	Extra switch, DPS, selector	71
S25	Switch, PTO	68, 75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	66
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	48
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
(S37)	Switch, Agrodata instrumentation, cursor+prog.	103
(S38)	Switch, front–PTO	69
(S42)	Door switch, cab light, RH	46
(S43)	Door switch, cab light, LH	46
(S44)	Indicator light switch, filter 180 bar	11
(S45)	Switch, HiShift	115, 142
(S45.1)	Extra switch, HiShift	115
(S49)	Change over switch, rpm/flow sensor	
(S50)	Change over switch, speed sensor, tractor/implement	
(S53)	Indicator light switch, filter, return	10
(S54)	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	

Symbol	Component	Code no
V1	Diodes Y1, Y2, Y3, Y4, Y6	
V2	Diodes, AC–2	
V3	Diodes, 4WD	15
V4	Diodes, Y11, Y12, (Y17)	
(V5)	Diodes, HiShift	115

Ground leads

GR1	Rear lights, solenoid valves
GR2	Roof
GR4	Autocontrol
GR5	Cable harness, instr. panel
GR7	Battery
GR8	Headlights
GR9	Cabin
GR10	Electrical stop

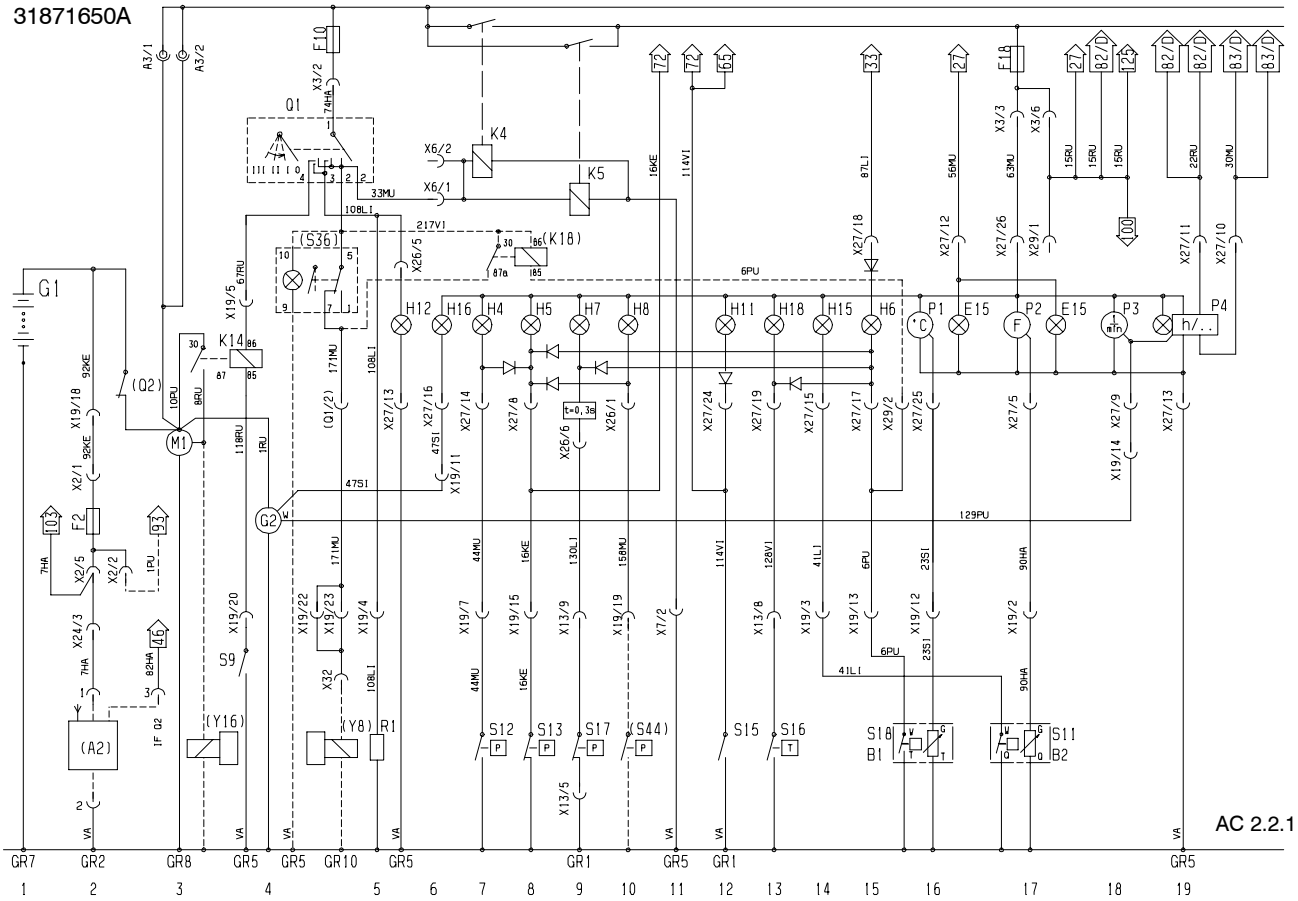
X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, power socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32
(X18)	2 pin, rear window washer	48
X19	37 pin, front wall	
X20	9 pin, front direction indicator	
(X22)	2 pin, rot. roof light	47
X23	3 pin, DPS, extra switches	71
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instr. right, blue	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
X31	2 pin, PTO–emerg. stop	68
(X32)	1–pin, electric stop	5
(X33)	3 pin, fog light, rear	
(X35)	9–pin, Sigma supply	
(X36)	3 pin, HiShift, speed–limit+ supply	
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	
(X45)	9 pin, Fieldmaster, extra equipment	
(X49)	2 pin, seat	94
(X50)	3 pin current socket	96
(X55)	1 pin, Fieldmaster	95
Y1	Solenoid valve, diff lock	63
Y2	Solenoid valve, PTO	68
Y3	Solenoid valve, 4WD	66
(Y4)	Solenoid valve, DPS	69, 133
(Y5)	Magnetic switch, compressor, air conditioner	54
(Y6)	Solenoid valve, DPS	70, 134
(Y7)	Solenoid valve, rear steering prevention	94
(Y8)	Solenoid, engine running	4
(Y9)	Magnetic clutch, front–PTO	69
(Y13)	Solenoid valve, Sigma	113
(Y14)	Solenoid valve, HiShift	115
(Y15)	Solenoid valve, HiShift, slowing	115
(Y16)	Solenoid, cold cranking	3

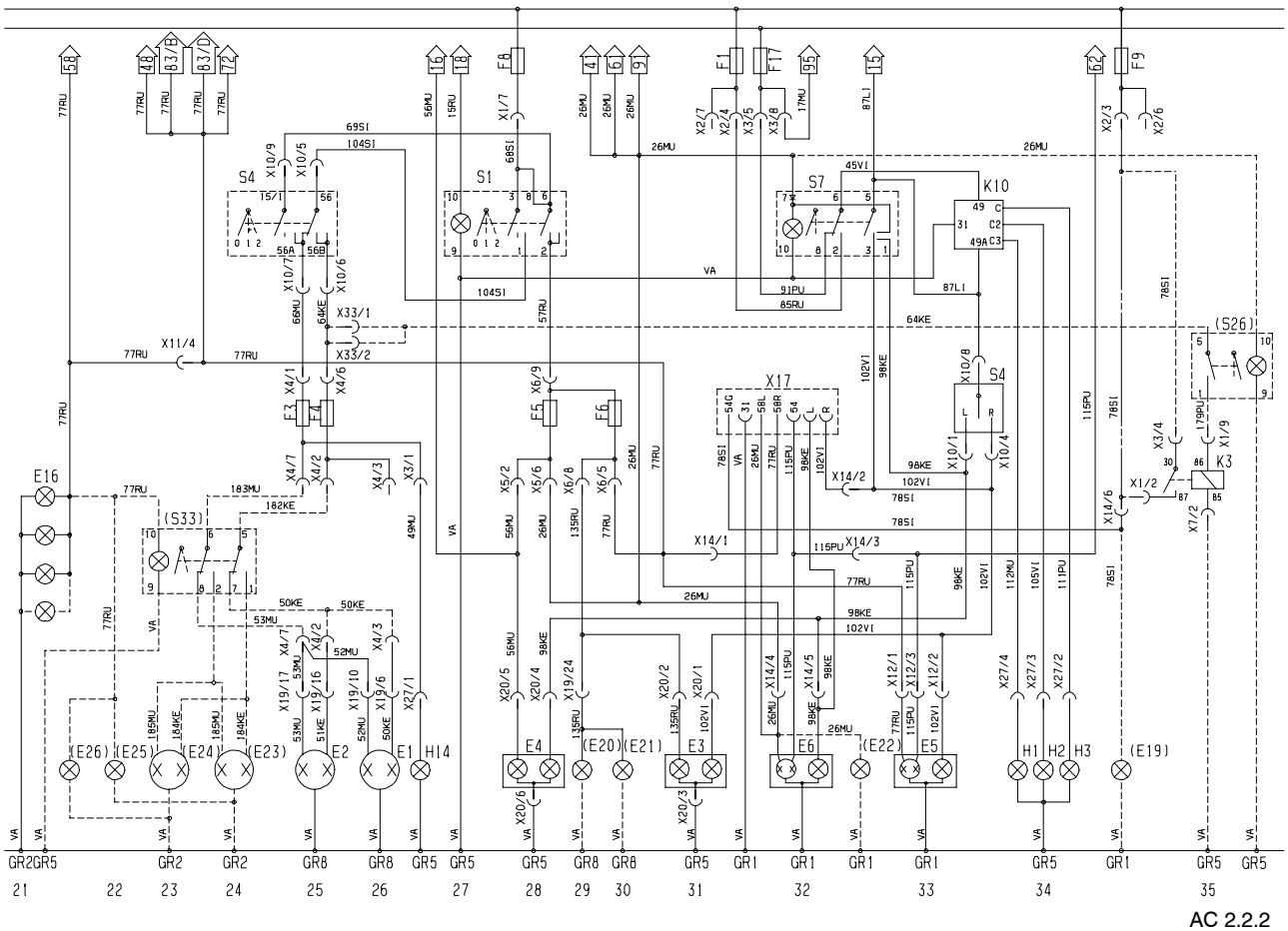
Symbol	Component	Code no
CareTel, information collecting system		
A1L	CareTel, data logger	118
B1L	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, CareTel, 190 Bar	116
B3L	Sensor, gearbox temperature	117
B4L	Temperature sensor, engine	118
H1L	Indicator light, CareTel	120
X1L	Connector housing, 9 pin, CareTel, RS–232	117–120
X2L	Connector housing, 3–pin, CareTel, CAN	117–120
X3L	Connector housing, 9 pin, CareTel, extra equipment	117–120
X4L	Connector housing, 3 pin,CareTel, supply+ NBUS	117–120

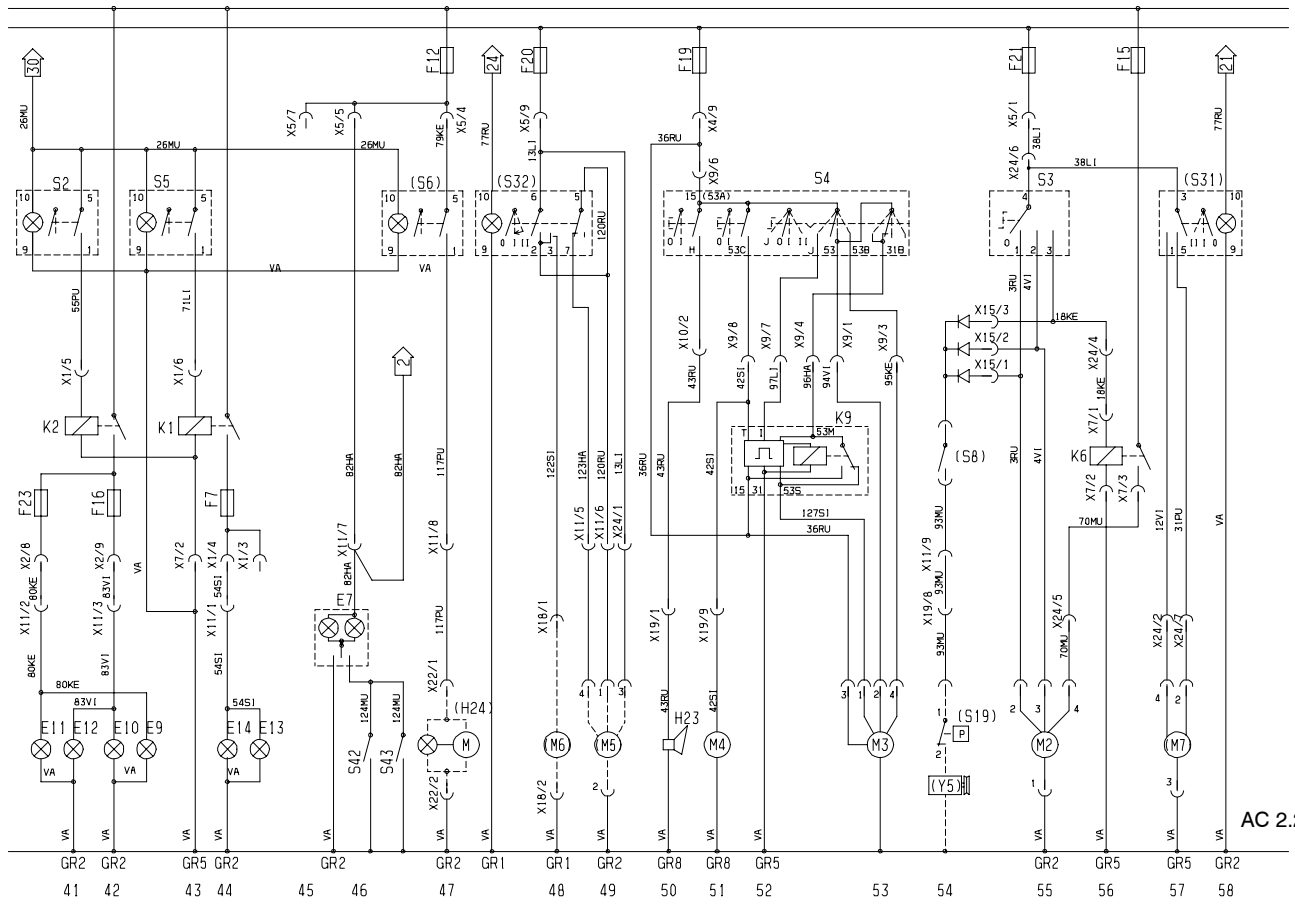
ACB–power lift, see page 321/11
ACD–power lift, see page 321/10

Wire colours

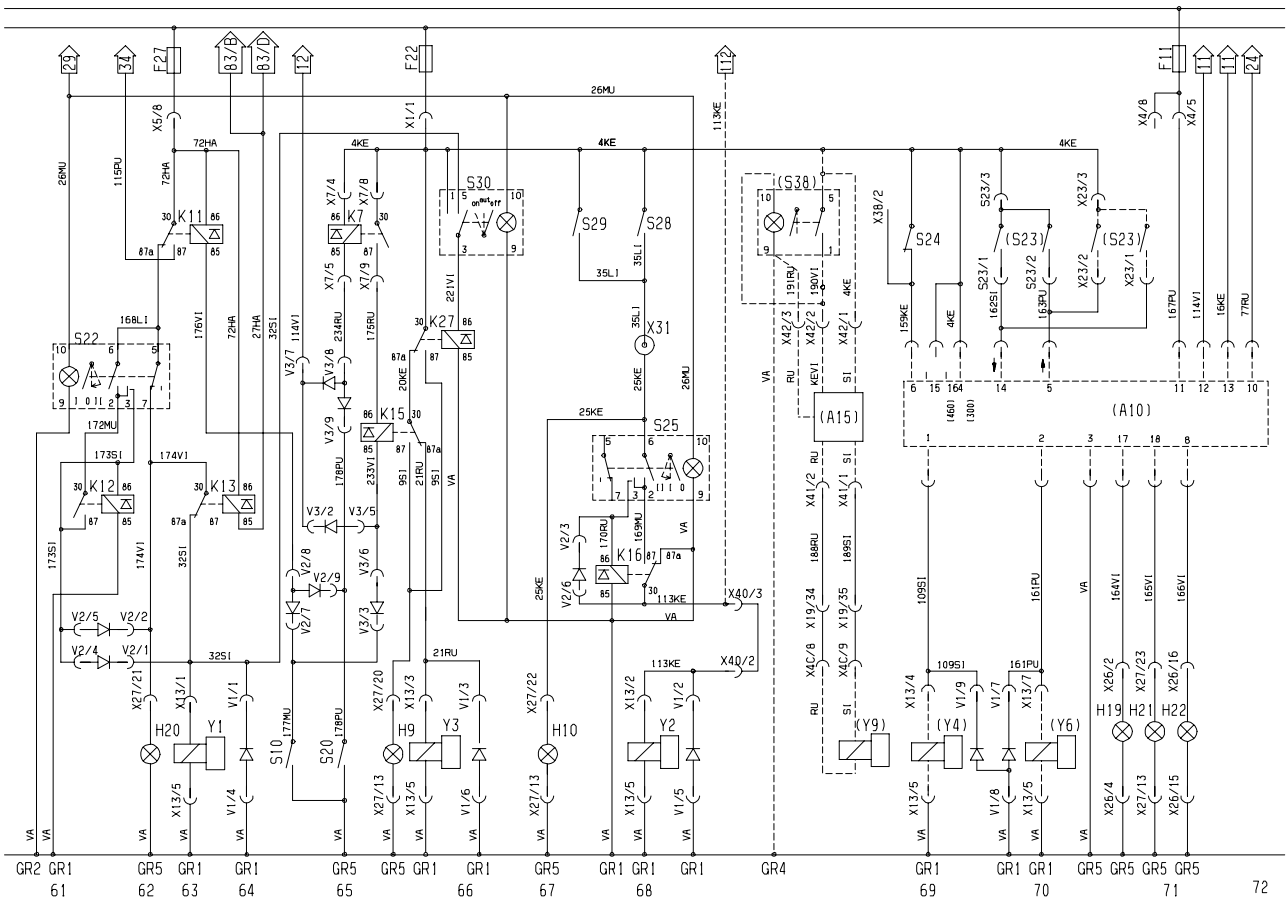
RU = braun
PU= red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac


31871650A
AC 2.2.1

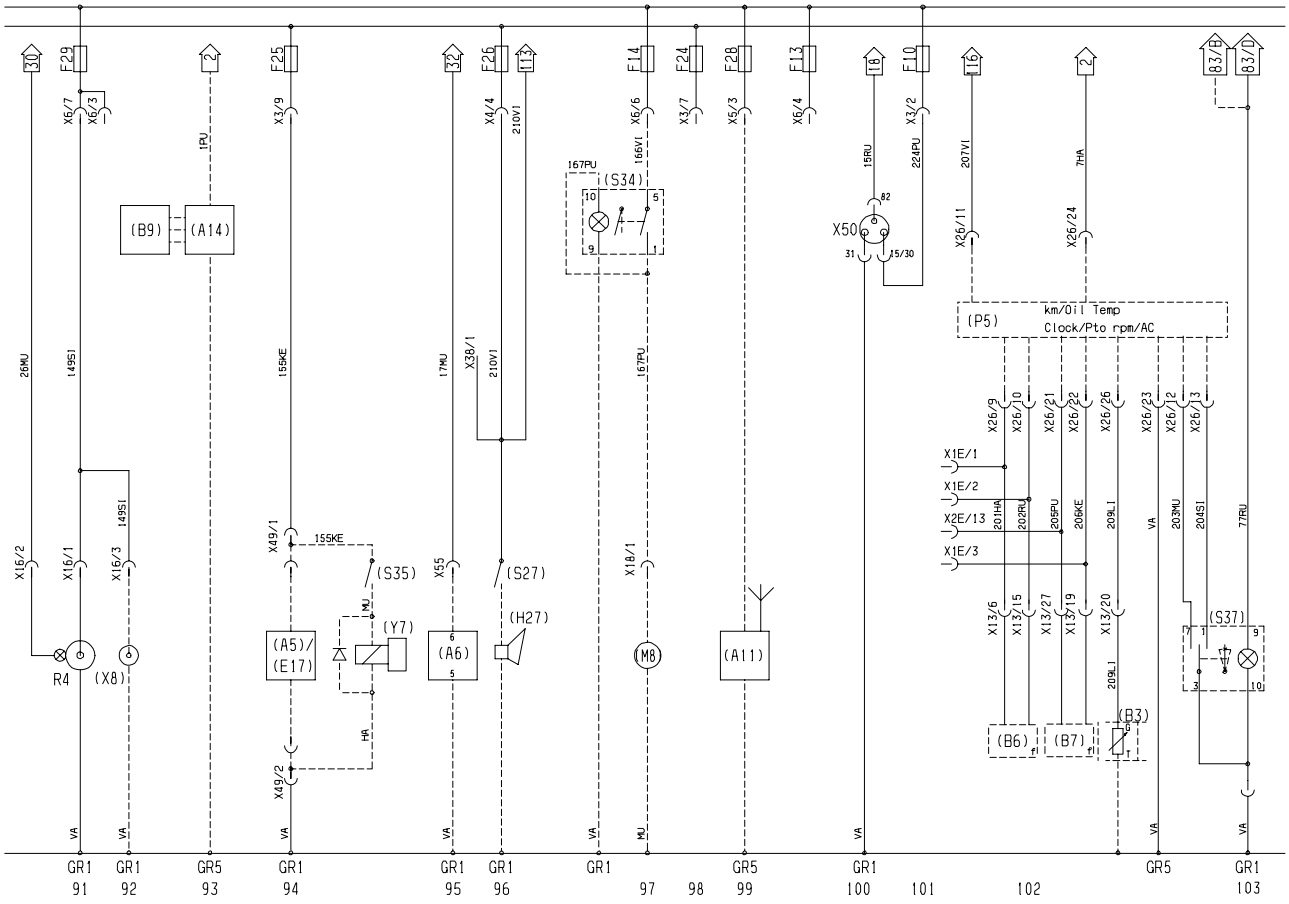

AC 2.2.2



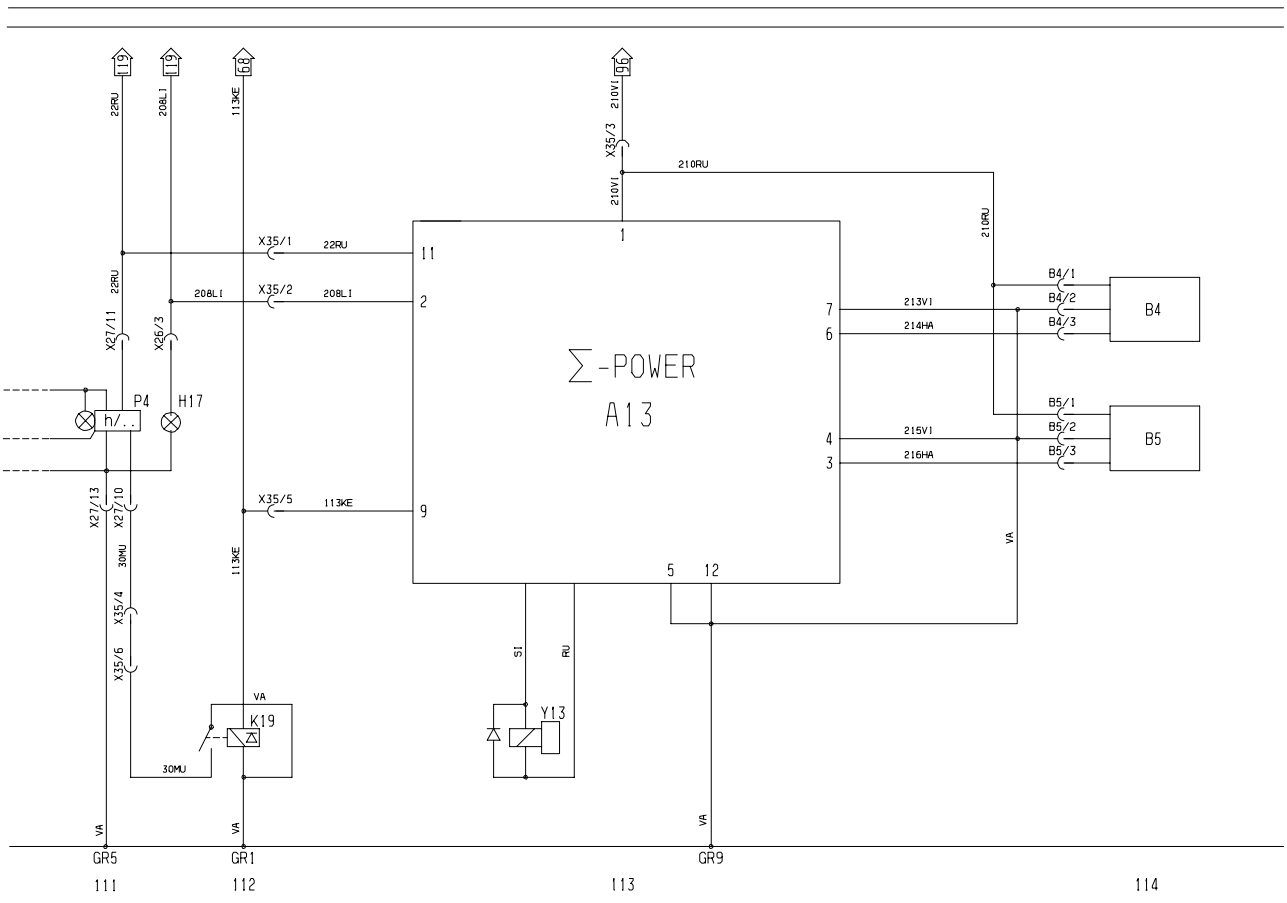
AC 2.2.3



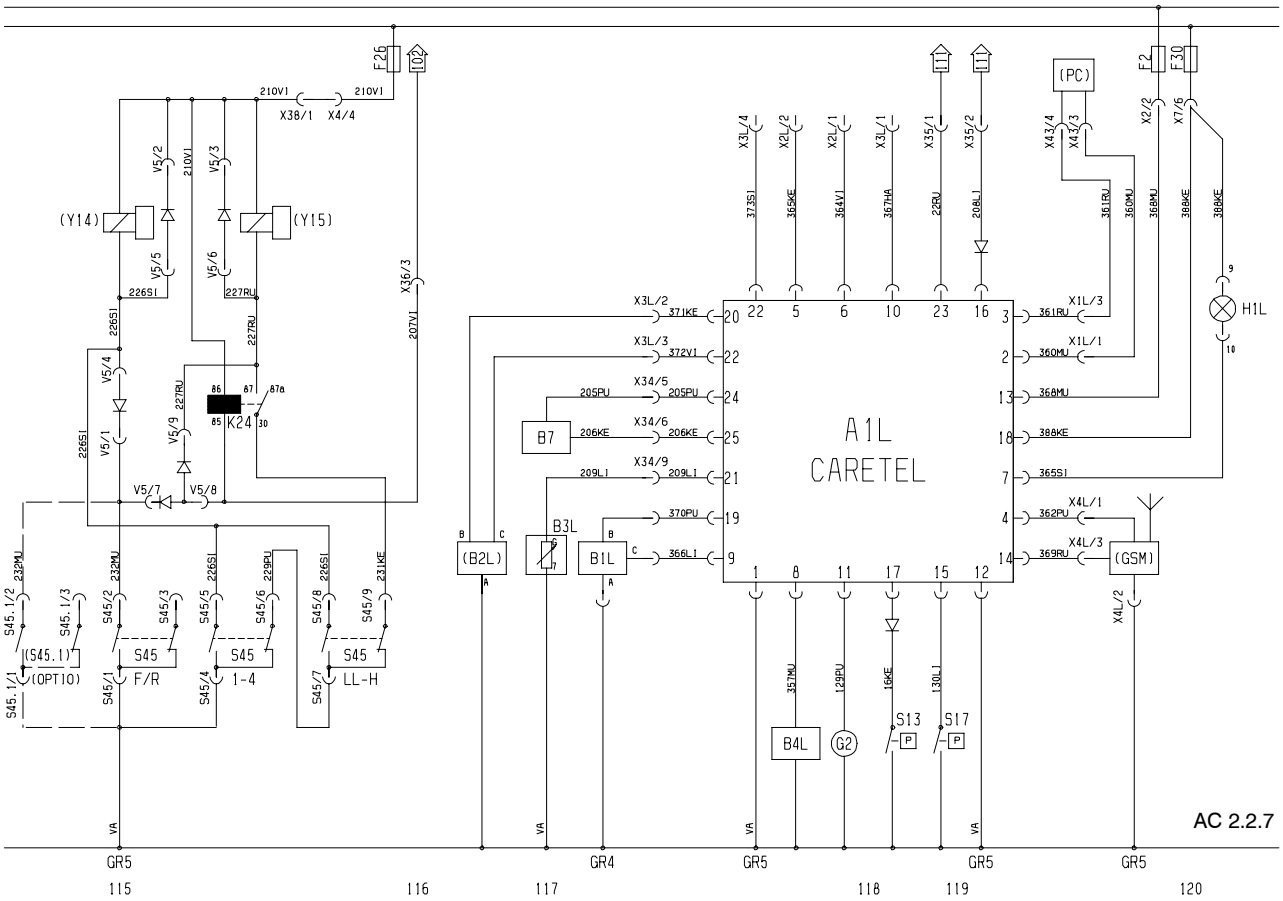
AC 2.2.4

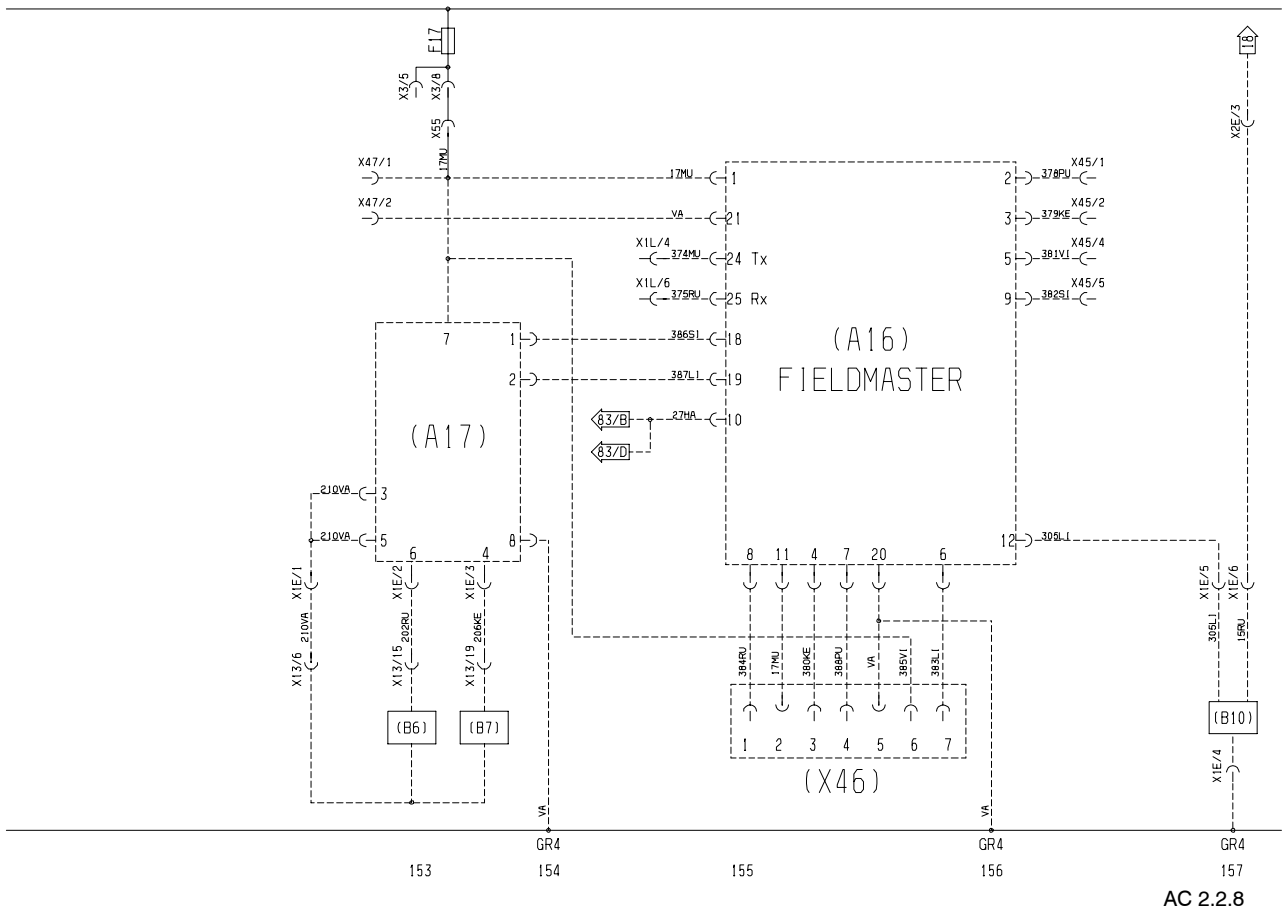

(B9)
(A14)
(S34)
X50
(P5)
km/Oil Temp
Clock/Pto rpm/AC
(S35)
(S27)
(H27)
(Y7)
(A5)/
(E17)
(A6)
(M8)
(A11)
(B6)
(B7)
(B3)
(S37)
R4
(X8)
GR1
GR5
91
92
93
94
95
96
97
98
99
100
101
102
103

AC 2.2.5


Σ-POWER
A13
B4
B5
P4
H17
K19
Y13
GR5
GR1
GR9
111
112
113
114

AC 2.2.6


(Y14)
(Y15)
K24
A1L
CARETEL
(PC)
H1L
(B2L)
B3L
B1L
B7
B4L
G2
S13
S17
(GSM)
S45
F/R
1-4
LL-H
(OPTIO)
AC 2.2.7
GR5
GR4
115
116
117
118
119
120


(A16)
FIELDMASTER
(A17)
(X46)
(B6)
(B7)
(B10)
AC 2.2.8
GR4
153
154
155
156
157

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Wiring diagram, HiTech, J38343–K41106.

Diagram no. 33563500A on pages 310/61–66. New wire loom 33412510 and Twin Trac.

Symbol	Component	Code no.
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A6)	Agrodata, drive computer	95
(A10)	Control unit, Delta Power Shift	70
(A11)	Telephone	99
(A13)	Control unit, Sigma	113
(A14	Tachograph	93
(A15)	Control unit, front PTO	77
(A16)	Fieldmaster	155
(A17)	Adapter, Fieldmaster sensor signals	154
B1	Sensor, engine temperature gauge	16
B2	Sensor, fuel gauge	17
(B3)	Temperature sensor, gearbox, AD	102
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
(B6)	Velocity sensor, gearbox	81D, 102
(B7)	Velocity sensor, PTO	117, 102
(B8)	Sender, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D
B11	Velocity sensor, engine	125
B12	Sensor, F/R power shuttle	126
B13	Sensor, F/R	127
B14	Temperature sensor, gearbox	139
B15	Angle sensor, accelerator pedal	140
B16	Angle sensor, clutch pedal	137
B17	Temperature sensor, outdoors	141
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	46
E9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
E17	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	

Symbol	Component	Haku nro
Fuses		
F1	15A Hazard blinkers, water pump	31, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	5A Parking lights, left	28
F6	5A Parking lights, right	30
F7	10A Front working lights	44
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35
F10	25A 3–pin current socket	96
F11	5A Autocontrol (+Bat)	83B, 83D
F12	10A Rot. warning light, cabin light	47
F13	10A Reserve	100
F14	15A Starter switch, thermostart	4
F15	25A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Direction indicators, Agrodata drive computer/ Fieldmaster	32, 154
F18	5A Instruments, warning lights, Autocontrol	17
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer	48
F21	15A Fan I, II, air conditioner, floor fan	55
F22	10A Sensors (HiTech), 4WD	70
F23	10A Rear working lights, outer	41
F24	10A AC5, parking brake	67, 126
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	113
F27	10A Braking lights, differential lock	64
F28	10A Telephone	99
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel	120
G1	Battery	1
G2	Alternator	4, 118
H1	Indicator light, direction indicator III	34
H2	Indicator light, direction indicator II	34
H3	Indicator light, direction indicator I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temperature, parking brake cable	15
H7	Indicator light, gearbox oil press.	9
H8	Indicator light, gearbox oil filter	10
H9	Indicator light, 4WD	69
H10	Indicator light PTO	67
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	16
H16	Indicator light, charging	6
H17	Indicator light, Sigma	111
H18	Indicator light, gearb. oil temp.	13
H20	Indicator light, diff. lock	63
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse Buzzer	148
(H28)	Indicator light, Stop, rear	
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7

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Sym–bol	Component	Code no.
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56
K7	Control relay, 4–wheel brake	70
K9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	64
K12	Control relay, differential lock	63
K13	Control relay, differential lock	65
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	69
K17	Relay, solenoid for engine running (8950Hi)	
(K18)	Relay, control stop	8
K25	Control relay, upper head lights to working lights	115
K27	Control relay, 4WD on/off	68
K28	Control relay, parking brake	67
(K29)	Relay, back buzzer	147
M1	Starter motor	3
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
(M7)	Floor fan	57
(M8)	Water pump	97
(M9)	Roof window wiper	
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour /speed meter (Agrodata instrumentation)	19
(P5)	Clock, PTO–speed, AC, trip, oil temperature (Agrodata instrumentation)	101
P6	Display, AC5	130
Q1	Heat/starter switch	4
(Q2)	Main switch	3
R1	Thermostart	5
R4	Cigarette lighter	91
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25,34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	66
S10	Switch, braking lights, right	72
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Reed relay, parking brake	149
S16	Gearbox temperature sender unit	13, 119
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	72
S22	Switch, differential lock	62
S23	Extra switch, Delta Power Shift, selector	139, 140
S25	Switch, PTO	75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	143
S29	Switch, PTO 1000/540E	144
S30	Switch, 4WD	68
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	48
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
S37	Switch, Agrodata instrumentation, cursor+prog.	103
(S38)	Switch, front–PTO	76
S40	Reed relay, direction forward (F)	146
S41	Reed relay, direction reverse (R)	147
S42	Door switch, cab light, RH	46
S43	Door switch, cab light, LH	46
S44	Indicator light switch, filter 180 bar	11
S45	Switches, HiShift	115, 142
S45.1	Extra switch, HiShift	115
S47	Switch, DPS, man./auto	144
(S49)	Change over switch, rpm/flow sensor	
(S50)	Change over switch, km/h, speed sensor, tractor/implement	
S51	Switch, DPS–preselection	149
S52	Indicator light switch, parking brake cable	14
S53	Indicator light switch, filter, return	10
S54	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	49
S60	Safety switch, seat	142
V1	DiodedY1, Y2, Y3, Y4, Y6	
V2	Diodes, AC2	
V3	Diodes, 4–veto	
V4	Diodes, Y11, Y12, Y17	

Ground leads

GR1	Rear lights, solenoid valves
GR2	Roof
GR4	Autocontrol
GR5	Cable harness, instr. panel
GR7	Battery
GR8	Headlights
GR9	Cabin
GR10	Electric stop

X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, current socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32
(X18)	2 pin, rear window washer	48
X19	37 pin, engine	
X20	9 pin, front direction indicator	
X21	2 pin, number plate light	
(X22)	2 pin, rot. roof light	47
X23	3 pin, Delta Power Shift, extra switches	71
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instr. right, blue	
X28	9 pin, sensors power shuttle	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
X31	2 pin, socket, PTO–emerg. stop	74

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Sym-bol	Component	Code no.
(X32)	1 pin, electric stop	5
(X33)	3 pin, fog light, rear	
(X35)	9 pin, SIGMA supply	
X39	9 pin, direction lever	
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	
X43	8 pin, RS–232 bus	
(X45)	9 pin, Fieldmaster, extra equipment	
(X46)	7 pin, Fieldmaster, current socket	
(X47)	2 pin, GPS–supply, Fieldmaster	
(X48)	3 pin, radar, Fieldmaster	
(X49)	2 pin, seat	94
(X50)	3 pin current socket	96
(X53)	Agrodata socket, 7 pin, implement	
(X54)	9 pin, Agrodata sensors, drive computer	
(X55)	1 pin, Agrodata, drive computer	95
Y1	Solenoid valve, differential lock	64
Y2	Solenoid valve, PTO	68
Y3	Solenoid valve, 4WD	71
(Y4)	Solenoid valve, Delta Power Shift	69, 133
(Y5)	Magnetic clutch, compressor, air conditioner	54
(Y6)	Solenoid valve, Delta Power Shift	70, 134
(Y7)	Solenoid valve, rear steering prevention	94
(Y8)	Solenoid, engine running	4
(Y9)	Magnetic clutch, front–PTO	78
Y11	Solenoid, forward	128
Y12	Solenoid, reverse	130
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, cold cranking	3
Y17	Solenoid valve, Delta Power Shift	130
Y18	Solenoid, parking brake	67

AC5 –Control system, HiTech

A1A	Control unit, AC5	122–152
(S1A)	Switch, PTO rear start, left	74
(S2A)	Switch, PTO rear start, right	74
X1A	Connector housing, 9 pin, engine sensors	140–141

TwinTrac reverse drive controls

B1W	Angle sensor, clutch pedal	166
K1W	Control relay, front/rear control	161
K2W	Control relay, front/rear sensor	161
S1W	Switch, DPS–extra	171
S2W	Limit switch, clutch pedal	66
S3W	Limit switch, seat direction	161
S4W	Programming switch	162
S5W	Reed relay, direction front (f), rear	163
S6W	Reed relay, direction reverse (r), rear	164
S7W	Reed–relay, parking brake, rear	164
X1W	Connector housing 12–pin, TwinTrac	
X2W	Connector housing 1–pin., supply (P1W)	
X3W	Connector housing 9–pin., direction lever, rear	
P1W	Rear display, AC5	128

CareTel, information collecting system

A1L	CareTel, data logger	118
B1L	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, 190 Bar	116
B3L	Sensor, gearbox temperature	117
B4L	Temperature sensor, engine	118
H1L	Indicator light, CareTel	120
X1L	Connector housing, 9 pins, CareTel, RS–232	117–120
X2L	Connector housing, 3 pins, CareTel, CAN	117–120
X3L	Connector housing, 9 pins, CareTel, extra equipment	117–120
X4L	Connector housing, 3 pins, CareTel, supply+NBUS	117–120

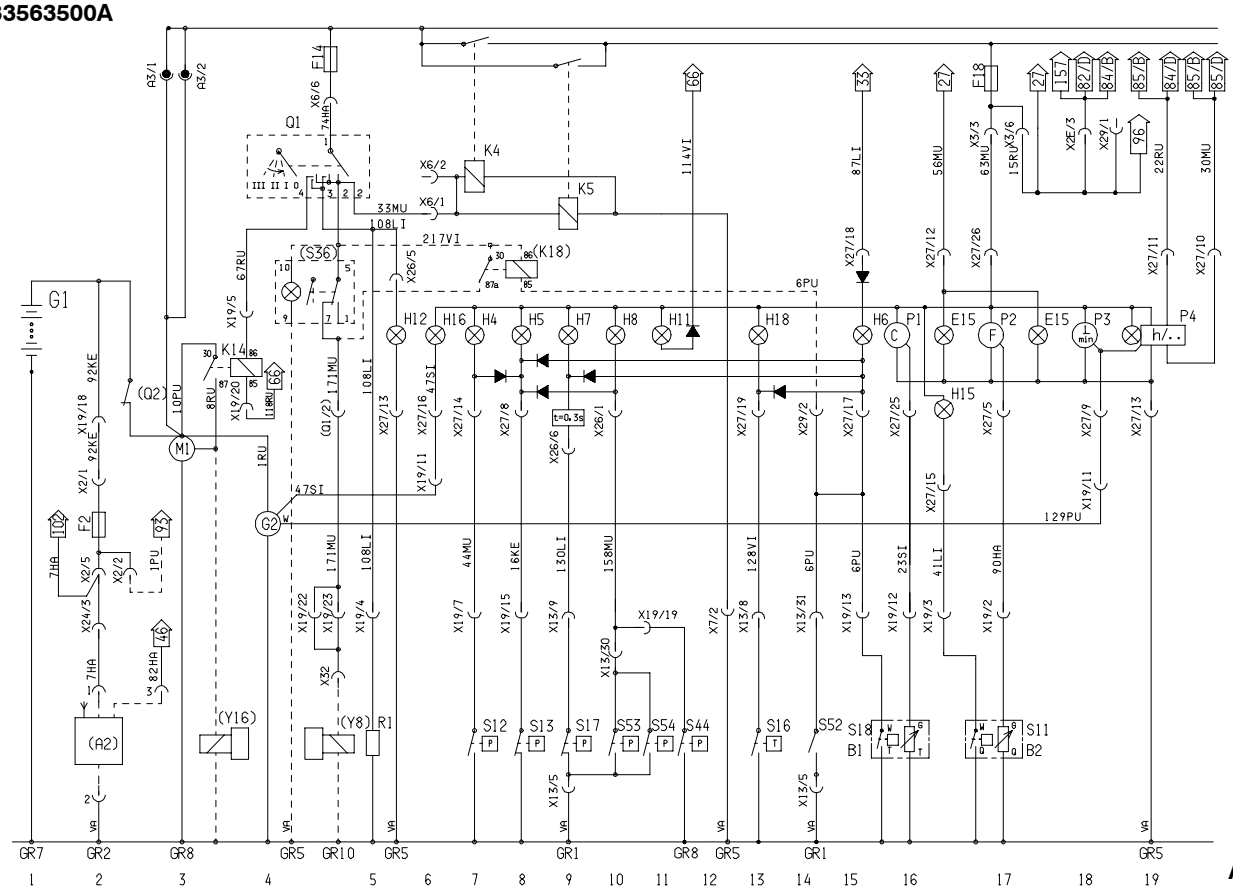
ACB Power lift, see page 321/11A
ACD Power lift, see page 321/10

Wire colours

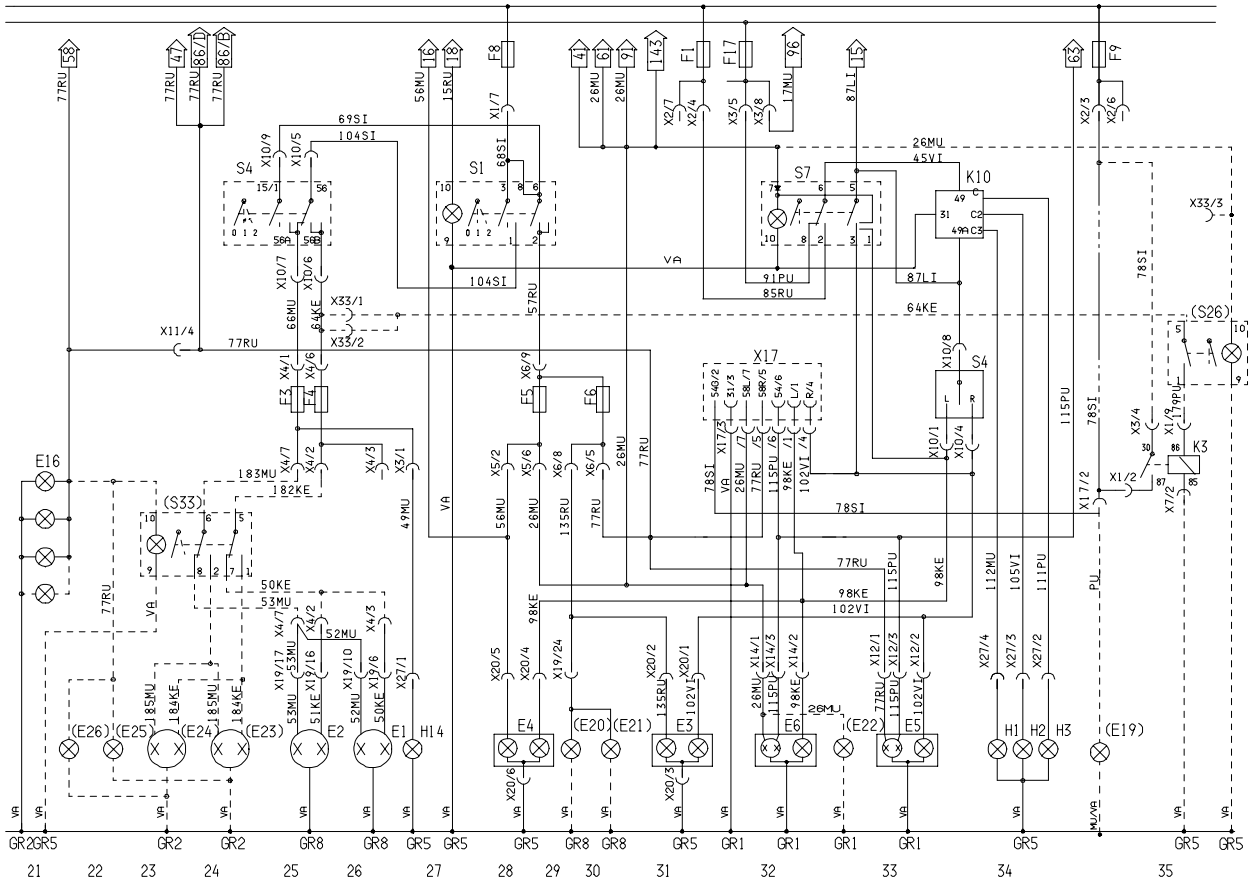
RU = brown
PU = red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

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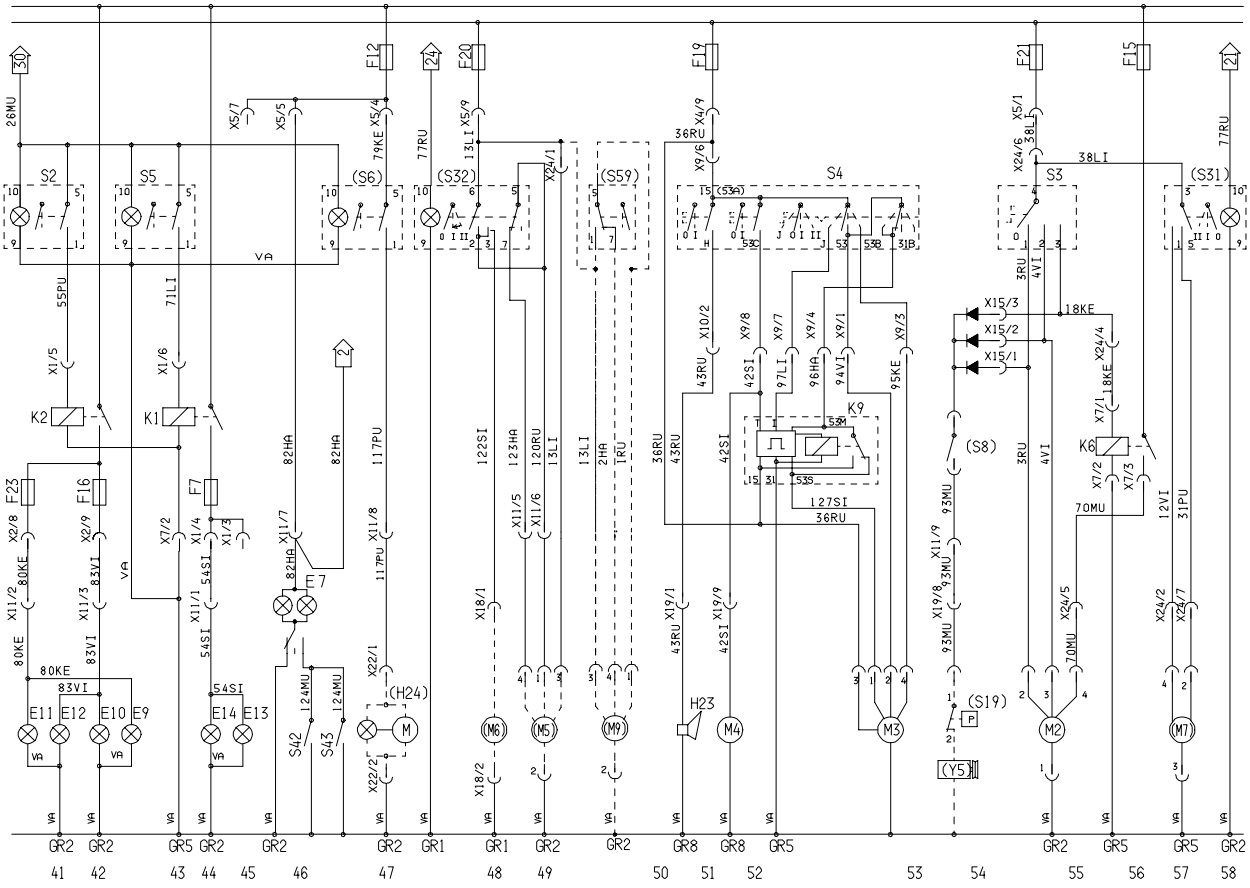


ACV I

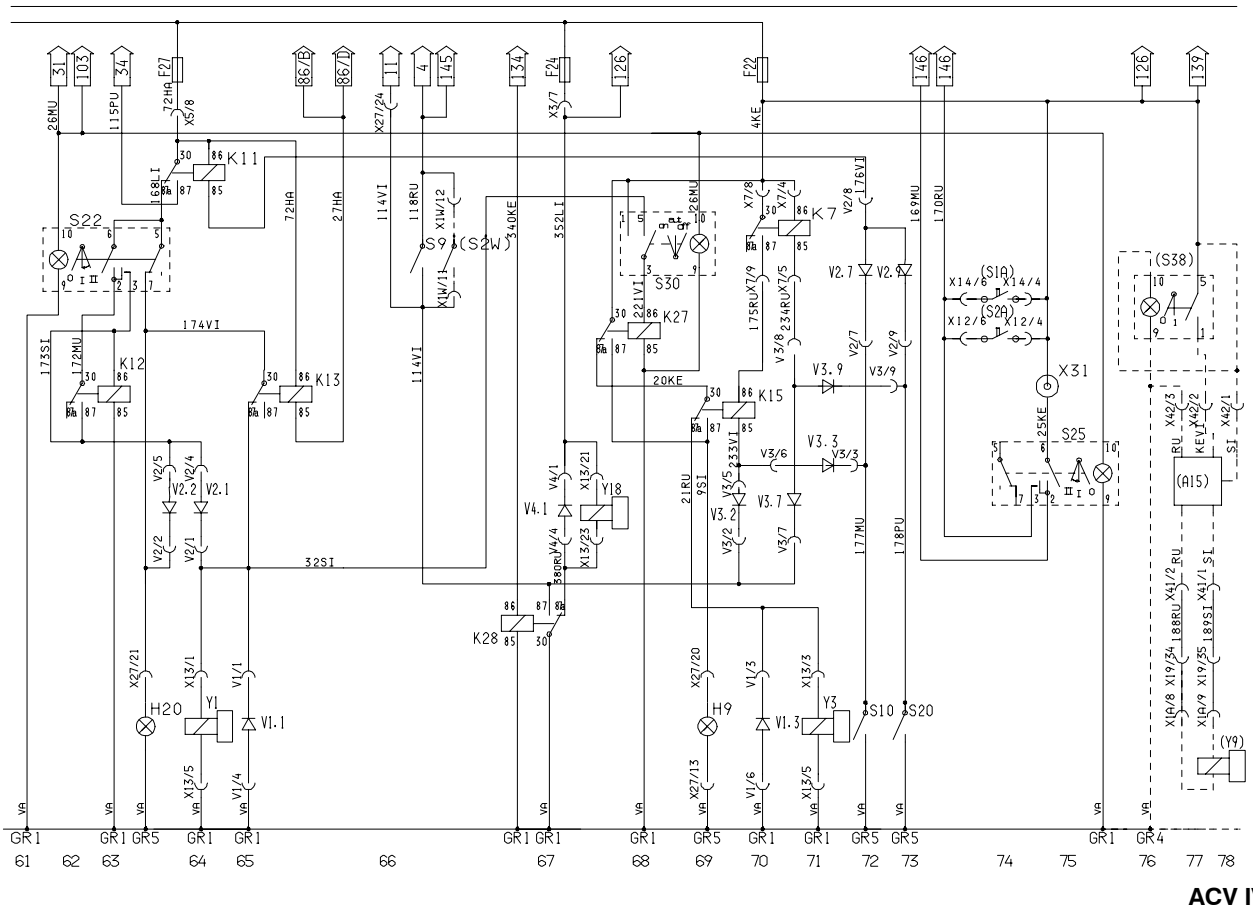


ACV II

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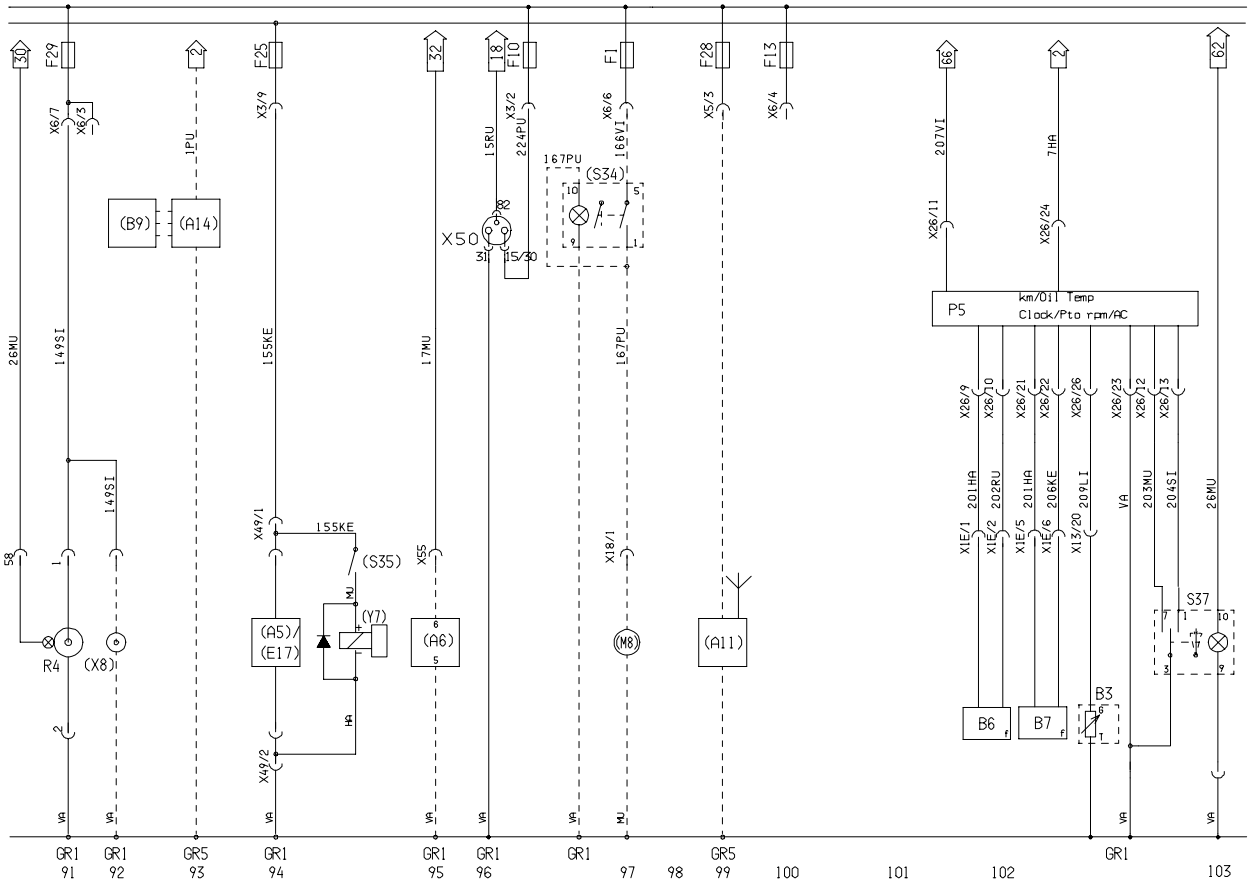


ACV III

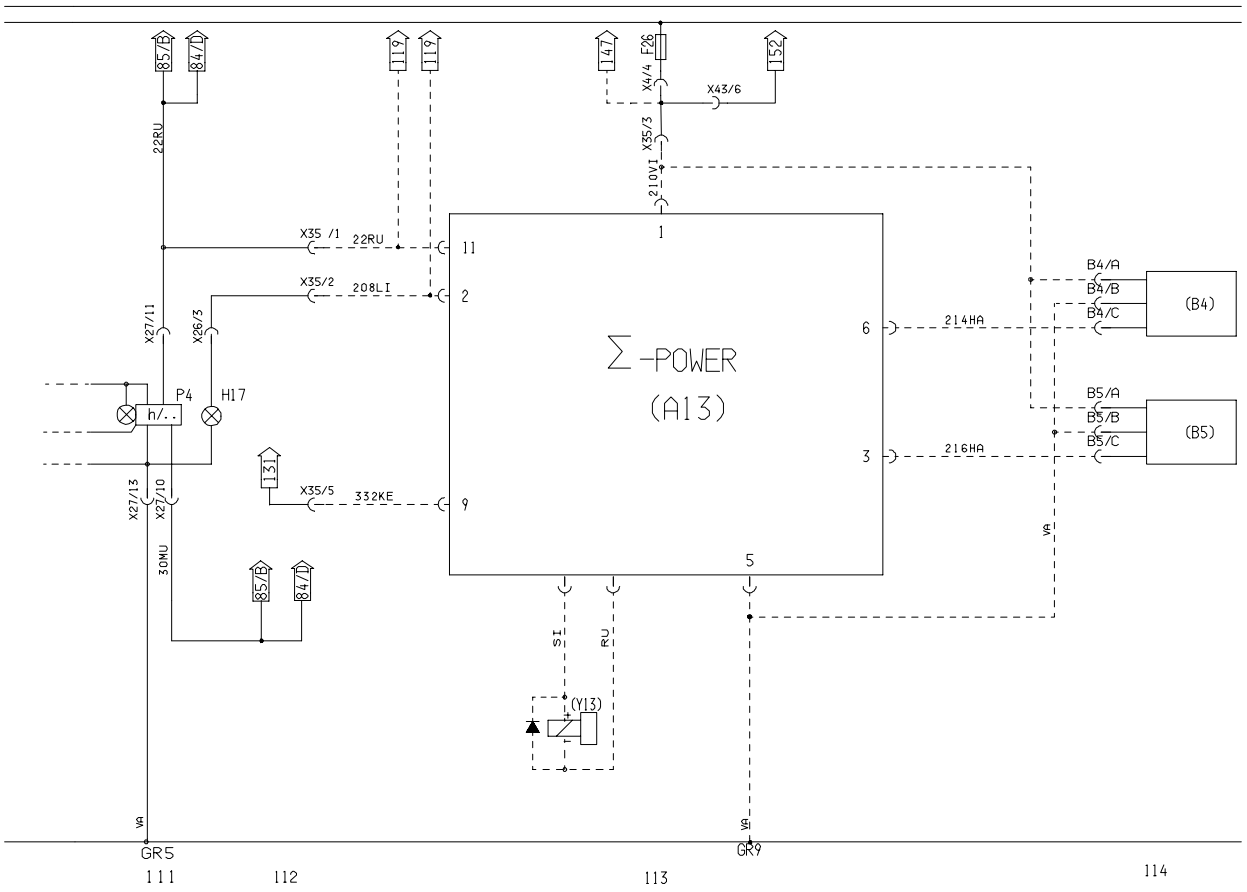


ACV IV

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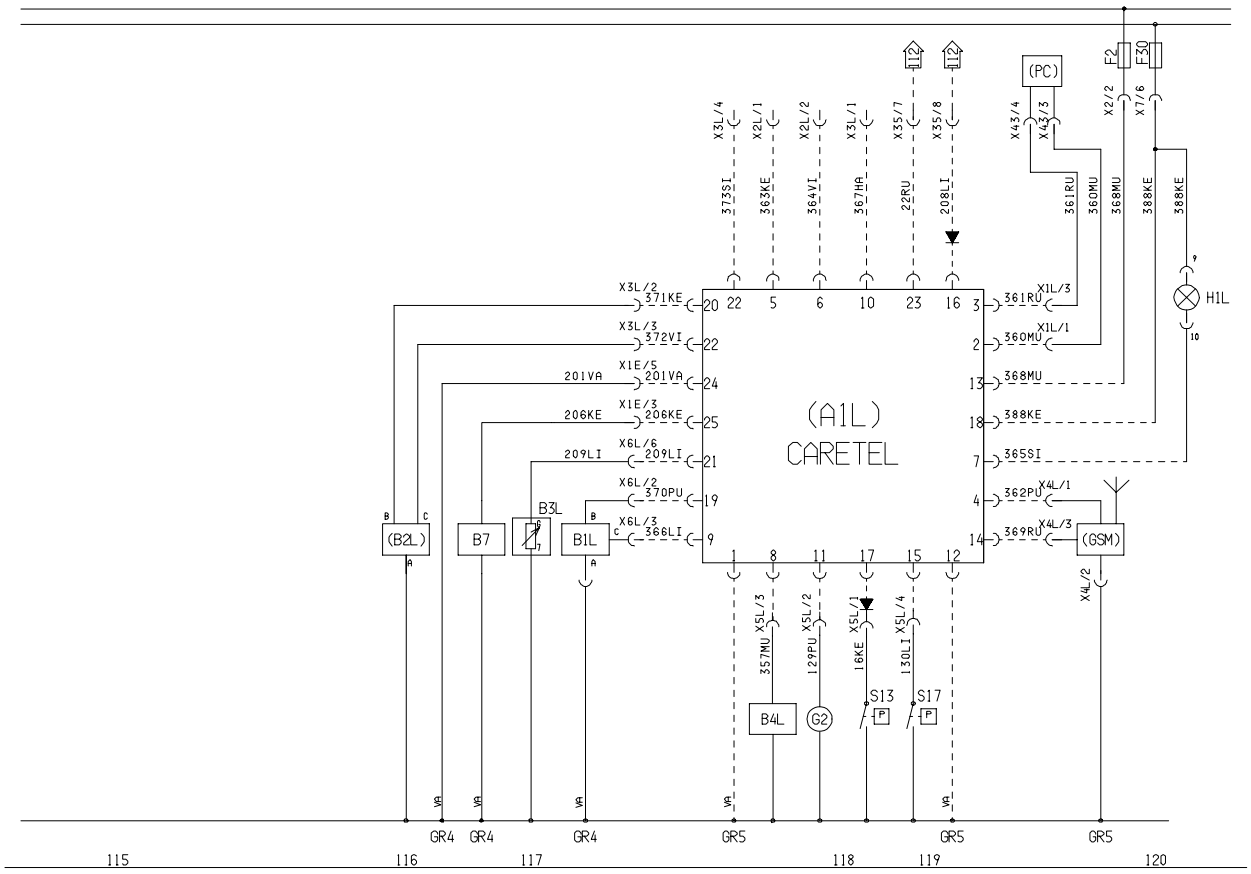


ACV V

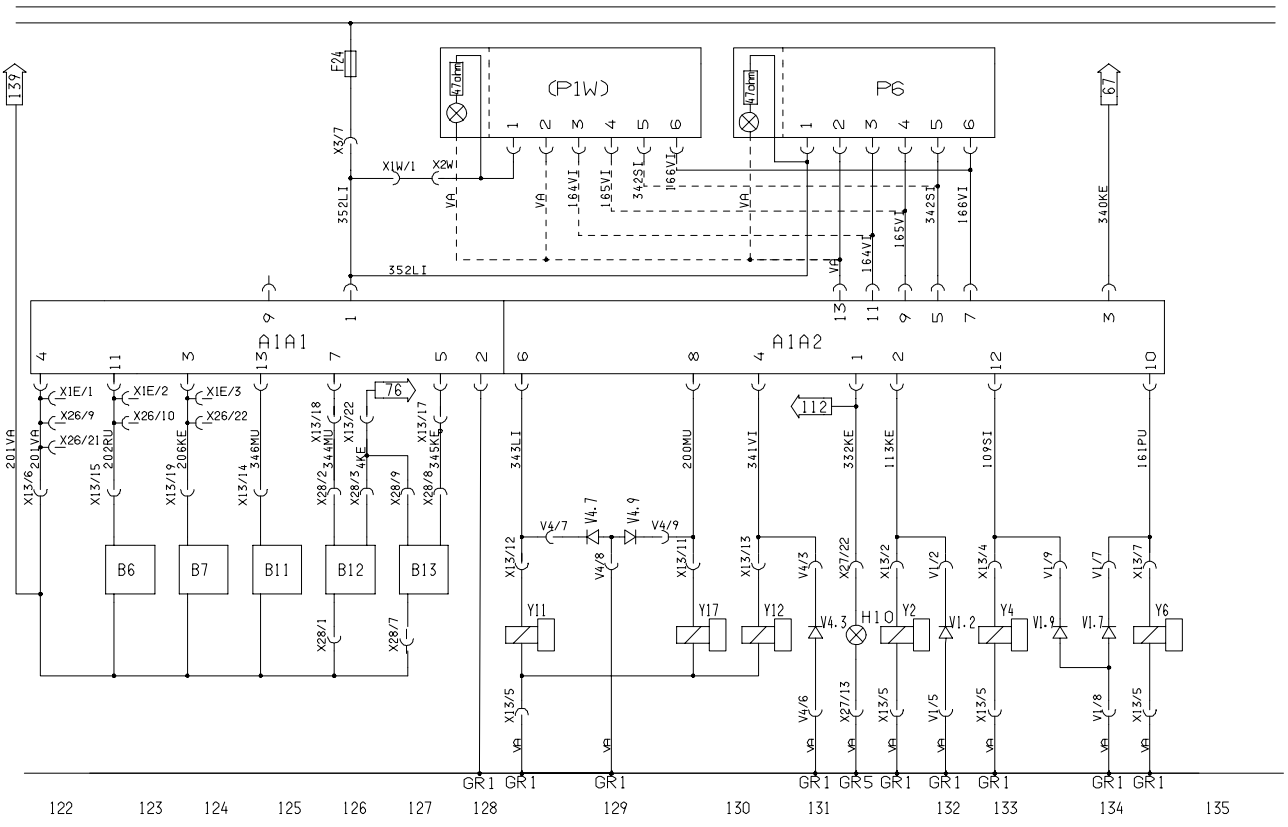


ACV VI

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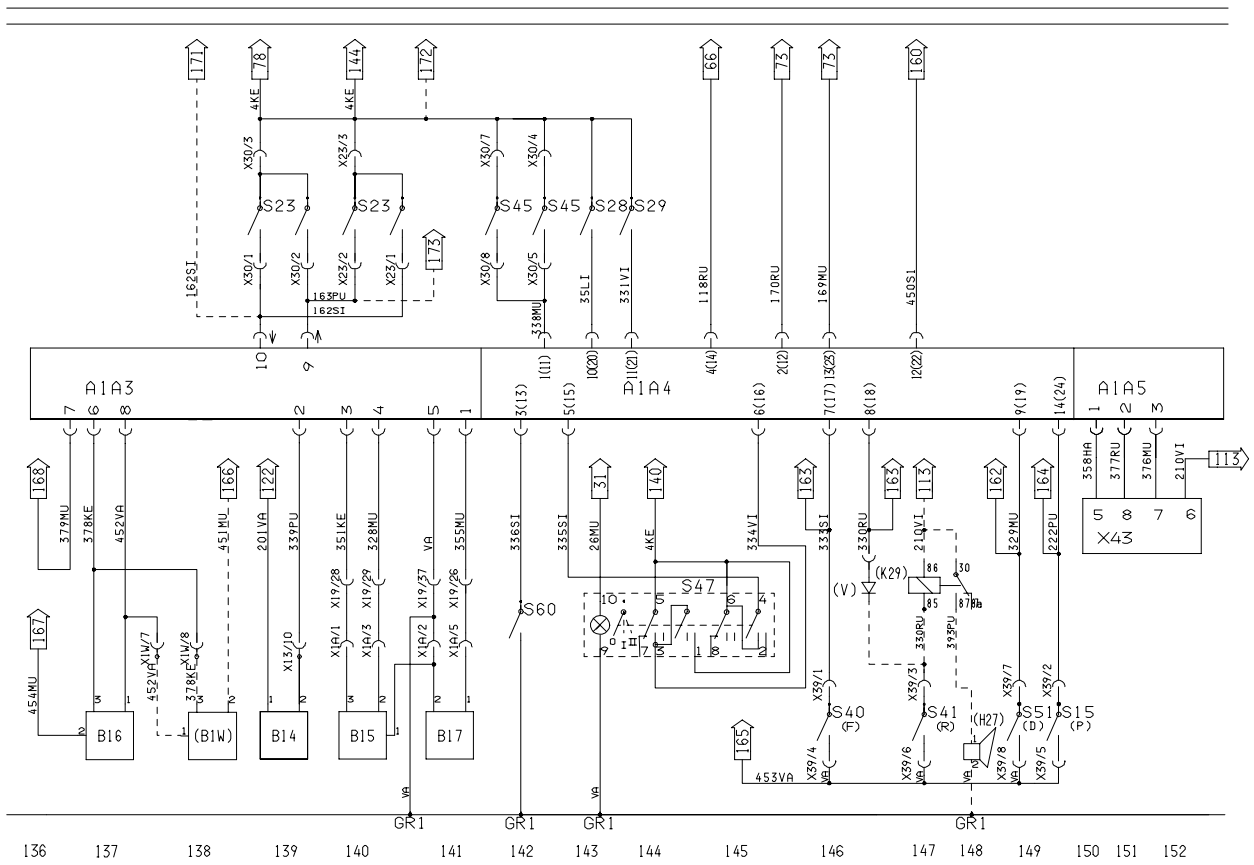


ACV VII

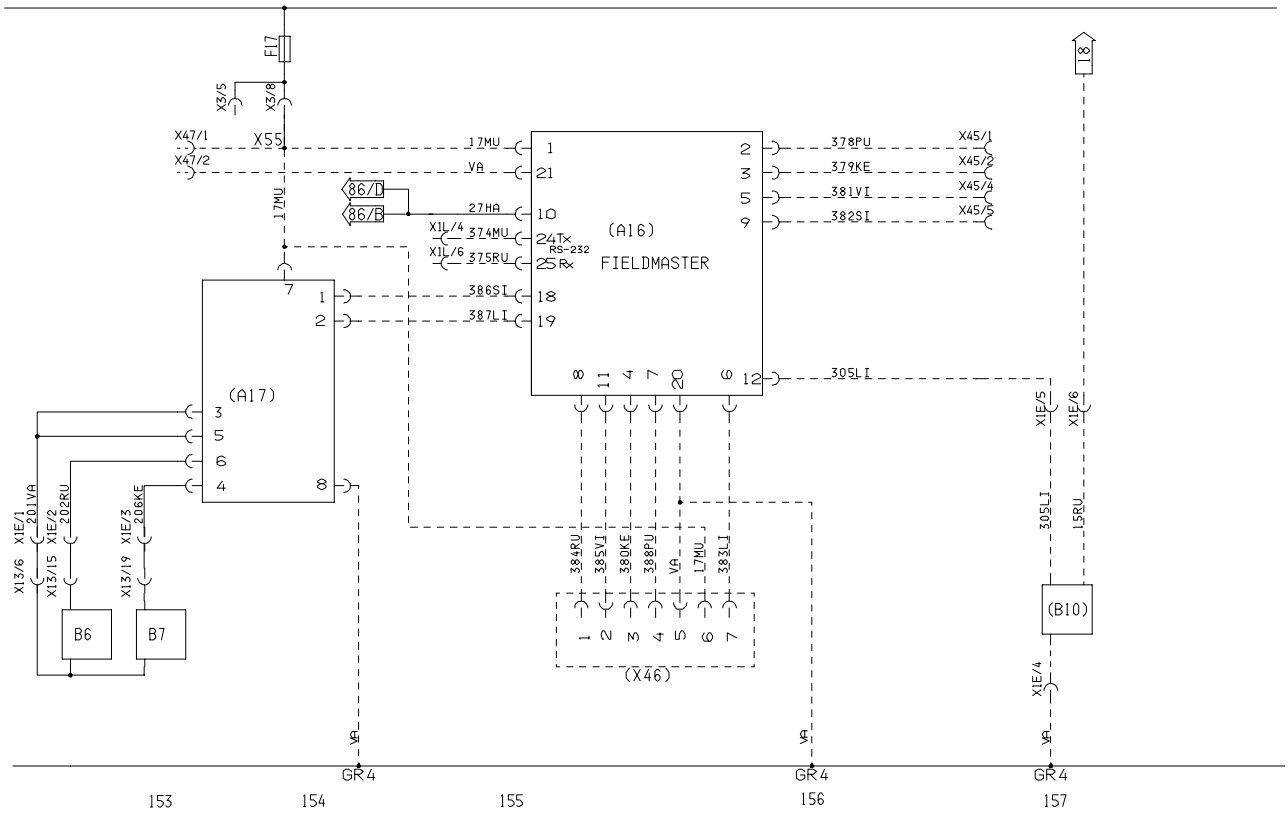


ACV VIII

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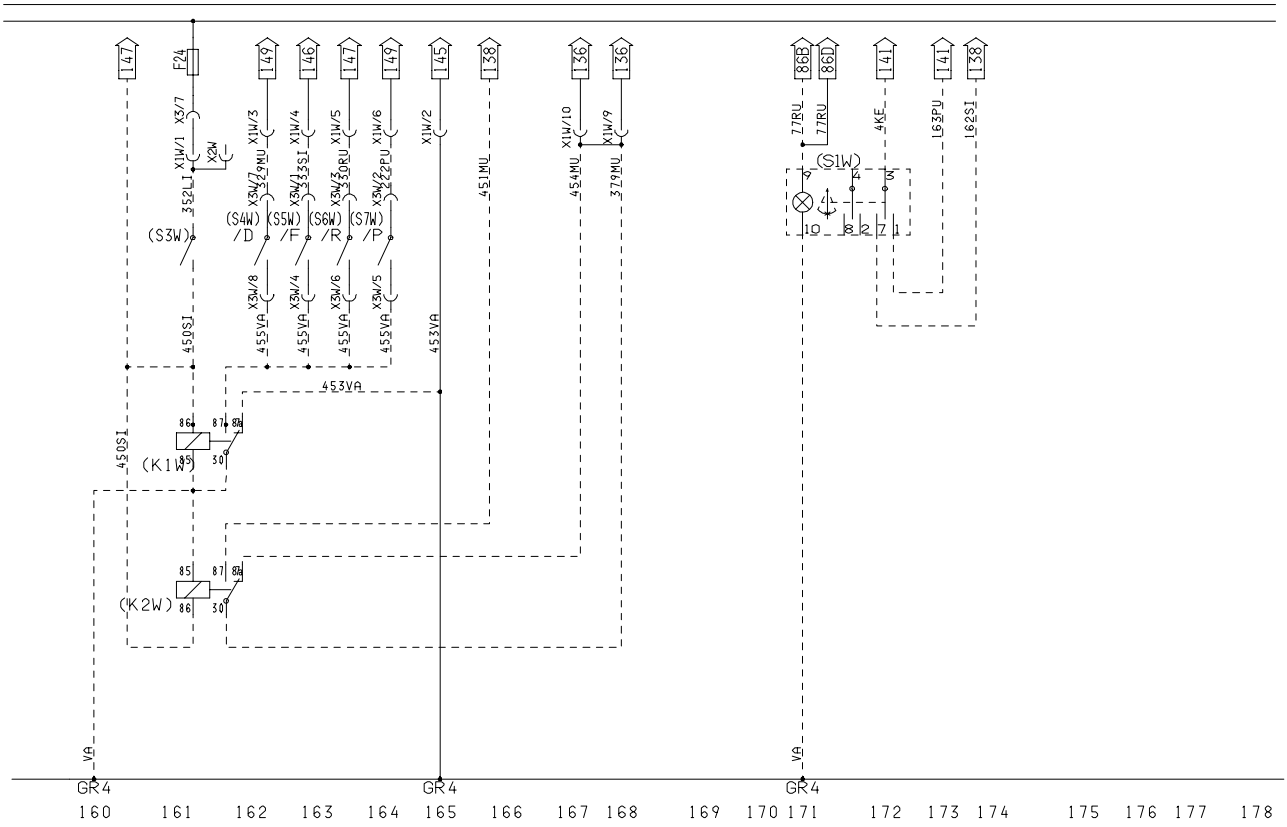


ACV IX



ACV X

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ACV XI

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Wiring diagram HiTech, K41107–.

Diagram no. 33563510C. Incl. e.g. AC 5.2 unit.
Diagrams on pages 310/71–77.

Sym-bole	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A11)	Telephone	99
(A13)	Control unit, Sigma	113
(A14	Tachograph	93
(A15)	Control unit, front PTO	181
(A16)	Fieldmaster	155
(A17)	Adapter, Fieldmaster sensor signals	154
B1	Sensor, engine temperature gauge	16
B2	Sensor, fuel gauge	17
(B3)	Temperature sensor, gearbox, AD	102
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
B6	Velocity sensor, gearbox	81D, 102, 128, 153
(B7)	Velocity sensor, PTO	116, 102, 123
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D, 157
B11	Velocity sensor, engine	127
B12	Sensor, F/R power shuttle	124
B13	Sensor, F/R	125
B14	Temperature sensor, gearbox	139
B15	Angle sensor, accelerator pedal	140
B16	Angle sensor, clutch pedal	137
B17	Temperature sensor, outdoors	141
B18	Sensor, front PTO speed	182
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	46
E9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	

Sym-bole	Component	Code no
Fuses		
F1	15A Hazard blinkers, water pump	31, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	10 A Parking lights, left	29
F6	10 A Parking lights, right	30
F7	10A Front working lights	44
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35, 187
F10	25A 3–pin current socket	96
F11	5A Autocontrol (+Bat)	83B, 83D
F12	10A Rot. warning light, cabin light, radio	47
F13	10A Reserve	100
F14	15A Starter switch, thermostart	4
F15	20A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Direction indicators, Fieldmaster	32, 154
F18	5A Instruments, warning lights, Autocontrol	17, 190
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer	48
F21	15A Fan I, II, air conditioner, floor fan	55
F22	10A Sensors (HiTech), 4WD	70, 181
F23	10A Rear working lights, outer	41
F24	10A AC5, seat direction	164, 126
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	113
F27	10A Braking lights, differential lock	64
F28	10A Telephone	99
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel	120
F50	25 A Stop solenoid, 8950	
(F51)	Main switch control, in engine compartment	197
G1	Battery	1
G2	Alternator	4, 118
H1	Indicator light, direction indicator III	34
H2	Indicator light, direction indicator II	34
H3	Indicator light, direction indicator I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temperature, parking brake cable	15
H7	Indicator light, gearbox oil press.	9
H8	Indicator light, gearbox oil filter	10
H9	Indicator light, 4WD	69
H10	Indicator light PTO	132
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	16
H16	Indicator light, charging	6
H17	Indicator light, Sigma	111
H18	Indicator light, gearb. oil temp.	13
H20	Indicator light, diff. lock	63
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Back buzzer	148
(H28)	Indicator light, Stop, rear	
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56

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Sym-bole	Component	Code no
K7	Control relay, 4–wheel brake	71
K9	Relay, interval wiper	52
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	64
K13	Control relay, differential lock	65
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	70
(K18)	Relay, control stop	8
K25	Control relay, upper head lights to working lights	
K27	Control relay, 4WD on/off	68
K28	Control relay, parking brake	66
(K29)	Relay, back buzzer	147
(K51)	Warning flasher, main switch	191
K52	Control relay, starting allowed	66
M1	Starter motor	3
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
M7	Floor fan	57
(M8)	Water pump	97
(M9)	Roof window wiper	50
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour /speed meter (Agrodata instrumentation)	111
(P5)	Clock, PTO–speed, AC, trip, oil temperature (Agrodata instrumentation)	102
P6	Display, AC5	133
Q1	Heat/starter switch	4
(Q2)	Main switch	3, 196
R1	Thermostart	5
R4	Cigarette lighter	91
R7	Potentiometer, front PTO, starting speed	184
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25,34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	142
S10	Switch, braking lights, right	72
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Reed relay, parking brake	149
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	73
S22	Switch, differential lock	61
S23	Extra switch, Delta Power Shift, selector	139, 140
S25	Switch, PTO	75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	
S28	Switch, PTO 540	146
S29	Switch, PTO 1000/540E	147
S30	Switch, 4WD	68
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	48
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
S37	Switch, Agrodata instrumentation, cursor+prog.	103
(S38)	Switch, front–PTO	183
S40	Reed relay, direction forward (F)	146
S41	Reed relay, direction reverse (R)	147
S42	Door switch, cab light, RH	46
S43	Door switch, cab light, LH	46
(S44)	Indicator light switch, filter 180 bar	11
S45	Switches, HiShift	142
(S45.1)	Extra switch, HiShift	
S47	Switch, DPS, man./auto	144
S51	Switch, DPS–preselection	149
S52	Indicator light switch, parking brake cable	14
(S53)	Indicator light switch, filter, return	10
S54	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	49
S60	Safety switch, seat	142
(S66)	Switch, PTO display, front/rear	184
(S68)	Switch, control of main switch	196
S76	AutoTraction switch, on / off	161
V1	Diodes Y1, Y2, Y3, Y4, Y6	

Ground leads

GR1 Rear lights, solenoid valves
GR2 Roof
GR4 Autocontrol
GR5 Cable harness, instr. panel
GR7 Battery
GR8 Headlights
GR9 Cabin
GR10 Electric stop

X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, current socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32
(X18)	2 pin, rear window washer	48
X19	37 pin, engine	
X20	9 pin, front direction indicator	
(X22)	2 pin, rot. roof light	47
X23	3 pin, Delta Power Shift, extra switches	
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instr. right, blue	
X28	9 pin, sensors power shuttle	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
X31	2 pin, socket, PTO–emerg. stop	74
(X32)	1 pin, electric stop	5
(X33)	3 pin, fog light, rear	
(X35)	9 pin, SIGMA supply	
X39	9 pin, direction lever	
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	

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Sym–bole	Component	Code no
X43	8 pin, RS–232 bus	151
(X45)	9 pin, Fieldmaster, extra equipment	
(X46)	7 pin, Fieldmaster, current socket	155
(X47)	2 pin, GPS–supply, Fieldmaster	
(X48)	3 pin, radar, Fieldmaster	
X49	2 pin, seat	94
X50	3 pin current socket	96
(X55)	1 pin, FieldMaster, drive computer	95
Y1	Solenoid valve, differential lock	64
Y2	Solenoid valve, PTO	133
Y3	Solenoid valve, 4WD	71
Y4	Solenoid valve, Delta Power Shift	133
(Y5)	Magnetic clutch, compressor, air conditioner	54
Y6	Solenoid valve, Delta Power Shift	134
(Y7)	Solenoid valve, rear steering prevention	94
Y8	Solenoid, engine running	4
(Y9)	Magnetic clutch, front–PTO	77
Y11	Solenoid, forward	131
Y12	Solenoid, reverse	132
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, cold cranking	3
Y17	Solenoid valve, Delta Power Shift	134
Y18	Solenoid, parking brake	67

AC 5.2 Control system, HiTech

A1A	Control unit, AC5	122–152
S1A	Button, PTO rear start, left	74
S2A	Button, PTO rear start, right	74
X1A	Connector, 9 pins, engine sensors	140–141

TwinTrac, reverse drive controls

(B1W)	Position sensor, clutch pedal	171
(S1W)	Switch, DPS–extra	173
(S2W)	Limit switch, clutch pedal	162
(S3W)	Limit switch, seat direction	163
(S4W)	Programming switch, DPS	165
(S5W)	Reed relay, direction forwards (F), rear	166
(S6W)	Reed relay, direction reverse (R), rear	167
(S7W)	Reed–relay, parking brake, rear	168
(X1W)	Connector housing 12–pin, TwinTrac	
(X2W)	Connector housing 1–pin., supply (P1W)	
(X3W)	Connector housing 9–pin., direction lever, rear	
(P1W)	Rear display, AC5	128

ACB/ACD Autocontrol power lift:

A1E	Autocontrol control unit	82B, 82D
A2E	Autocontrol, circuit card	85B, 85D
B1E	Position sensor	81B, 81D
B2E	Draft sensor, right	81B, 81D
B3E	Draft sensor, left	81B, 81D
(B4E)	Position sensor, implement (ACD)	81D
E1E	Illumination, circuit card	85B, 85D
E2E	Illumination, position potentiometer	86B, 86D
R1E	Potentiometer, position control	85B, 85D
S1E	Button, rear mudguard, lift, right	81B, 83D
S2E	Button, rear mudguard, lowering, right	81B, 83D
S3E	Button, rear mudguard, lift, left	81B, 82D
S4E	Button, rear mudguard, lowering, left	81B, 82D
S5E	Switch, in cabin, nift/lower	83B, 83D

Sym–bole	Component	Code no.
S7E	Switch, lowering speed	85B, 85D
S8E	Switch, transport height	85B, 85D
S9E	Switch, draft control	85B, 85D
S10E	Autocontrol–Switch, lift/stop/lower	86B, 86D
S11E	Switch, forced lowering	85B, 85D
S12E	Switch, oscillation damping / slip control	85B, 85D
X1E	Connector, 9 pins, speed sensors (ACD)	
X2E	Connector, 15 pins, supply & rear buttons (+implement position sensors)	
Y1E	Solenoid valve, lowering	83B, 84D
Y2E	Solenoid valve, lifting	83B, 84D

CareTel, information collecting system

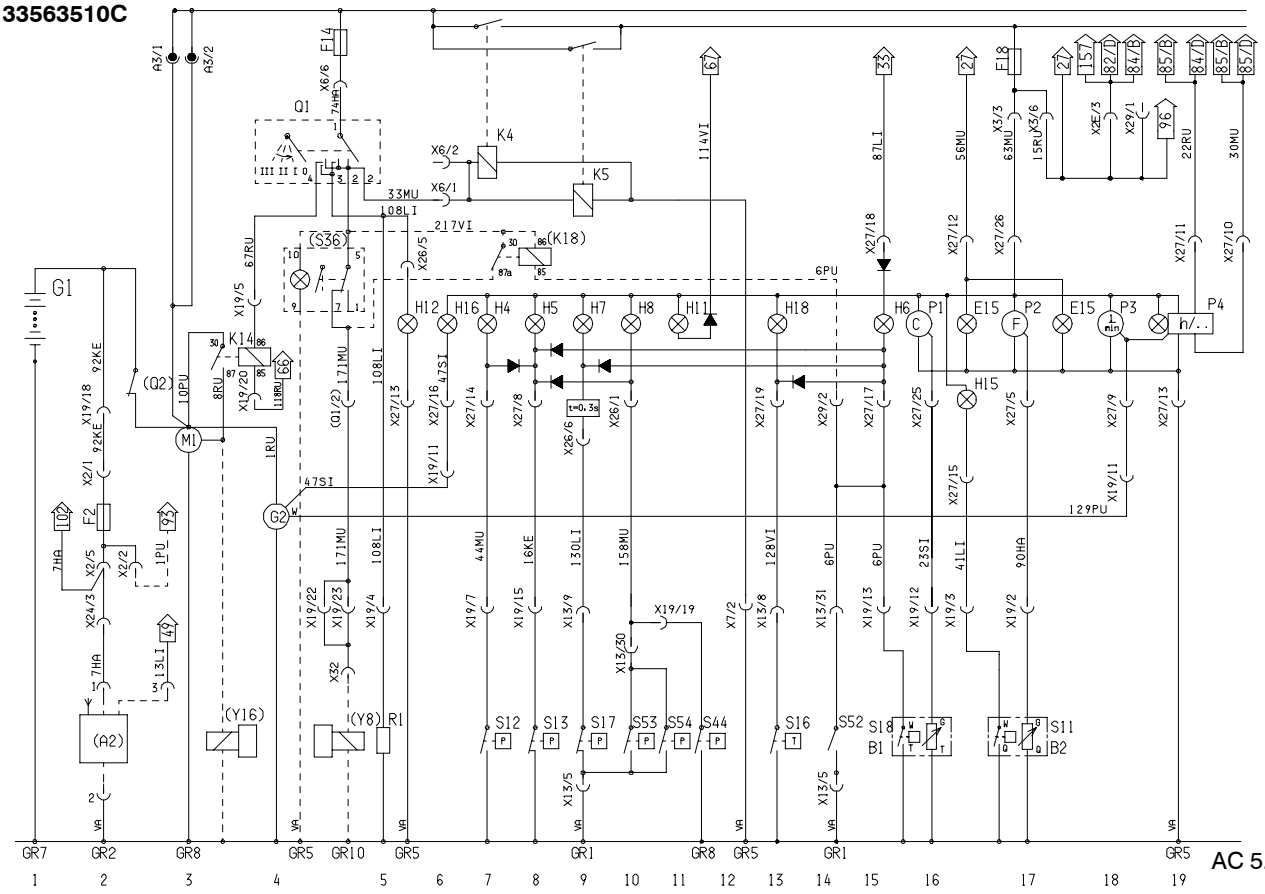
(A1L)	CareTel, data logger	118
(B1L)	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, 190 Bar	116
(B3L)	Sensor, gearbox temperature	117
(B4L)	Temperature sensor, engine	118
(H1L)	Indicator light, CareTel	120
(X1L)	Connector housing, 9 pins, CareTel, RS–232	117–120
(X2L)	Connector housing, 3 pins, CareTel, CAN	117–120
(X3L)	Connector housing, 9 pins, CareTel, extra equipment	117–120
(X4L)	Connector housing, 3 pins, CareTel, supply+NBUS	117–120

Wire colours

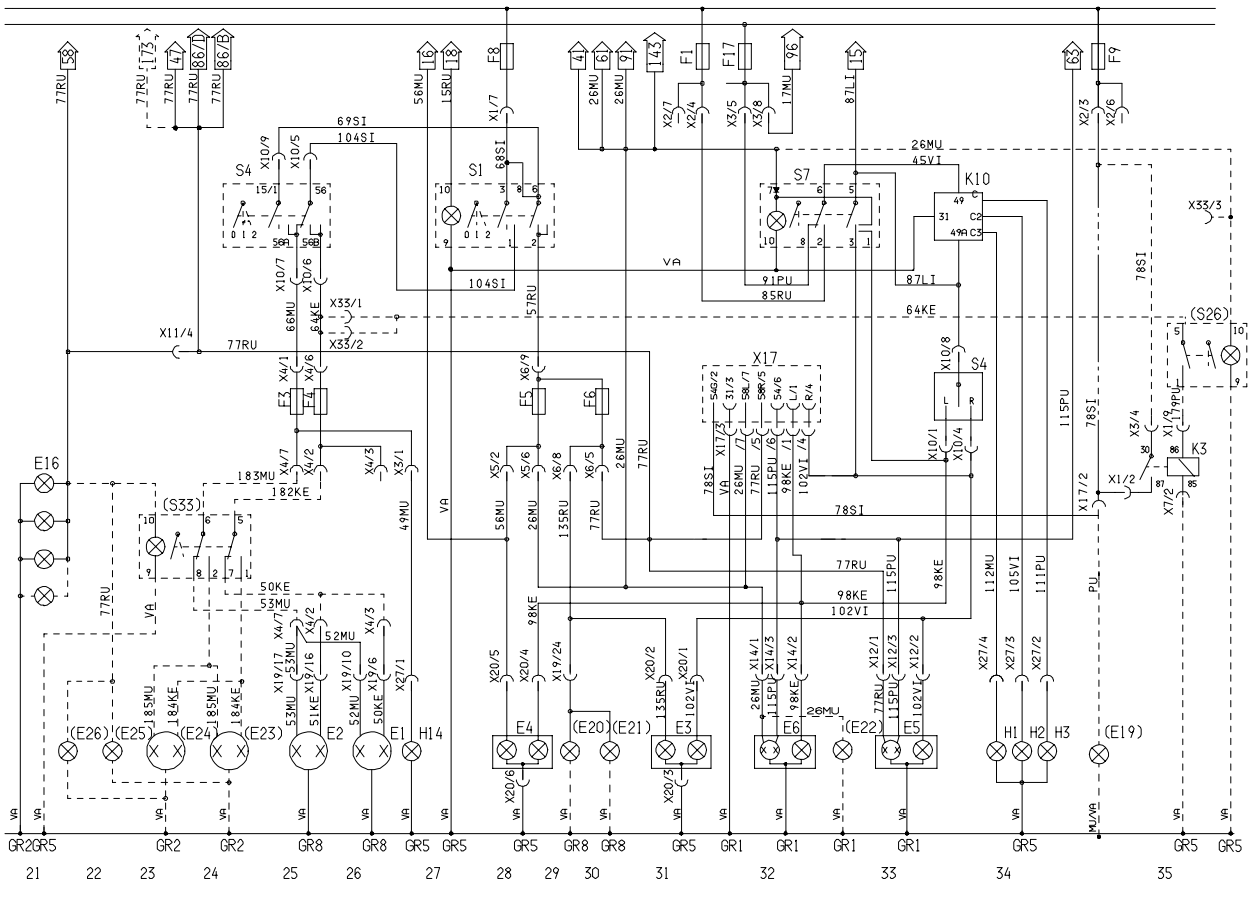
RU = brown
PU = red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

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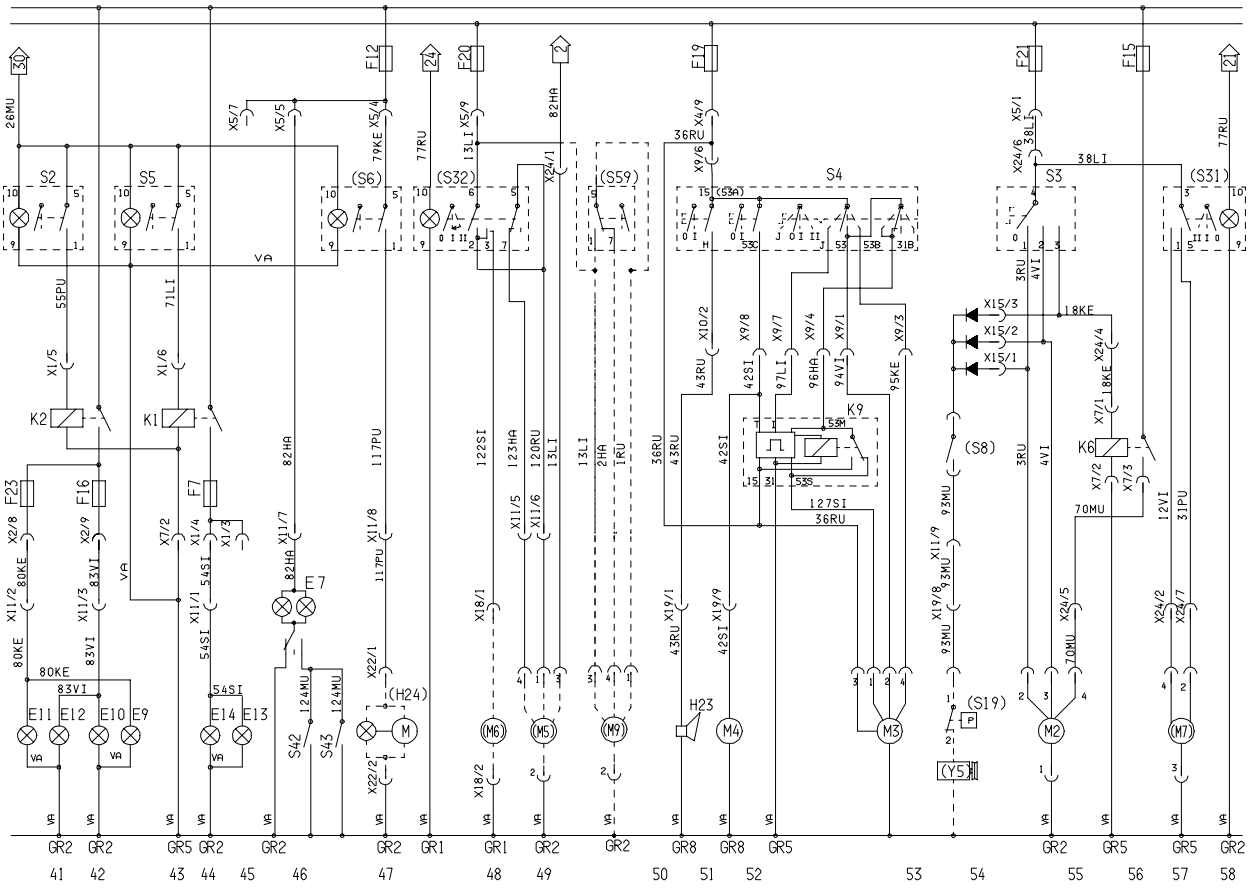


AC 5.2 1

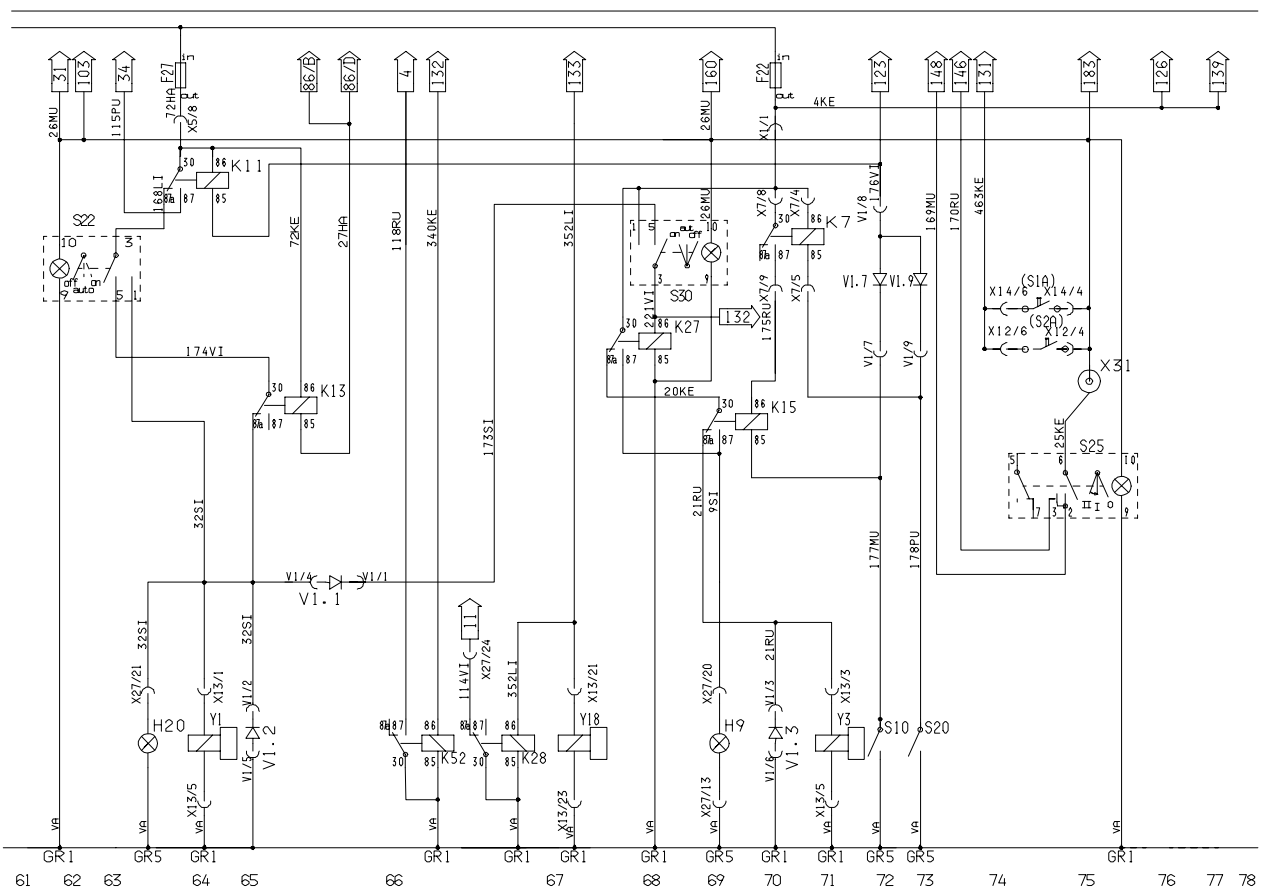


AC 5.2 2

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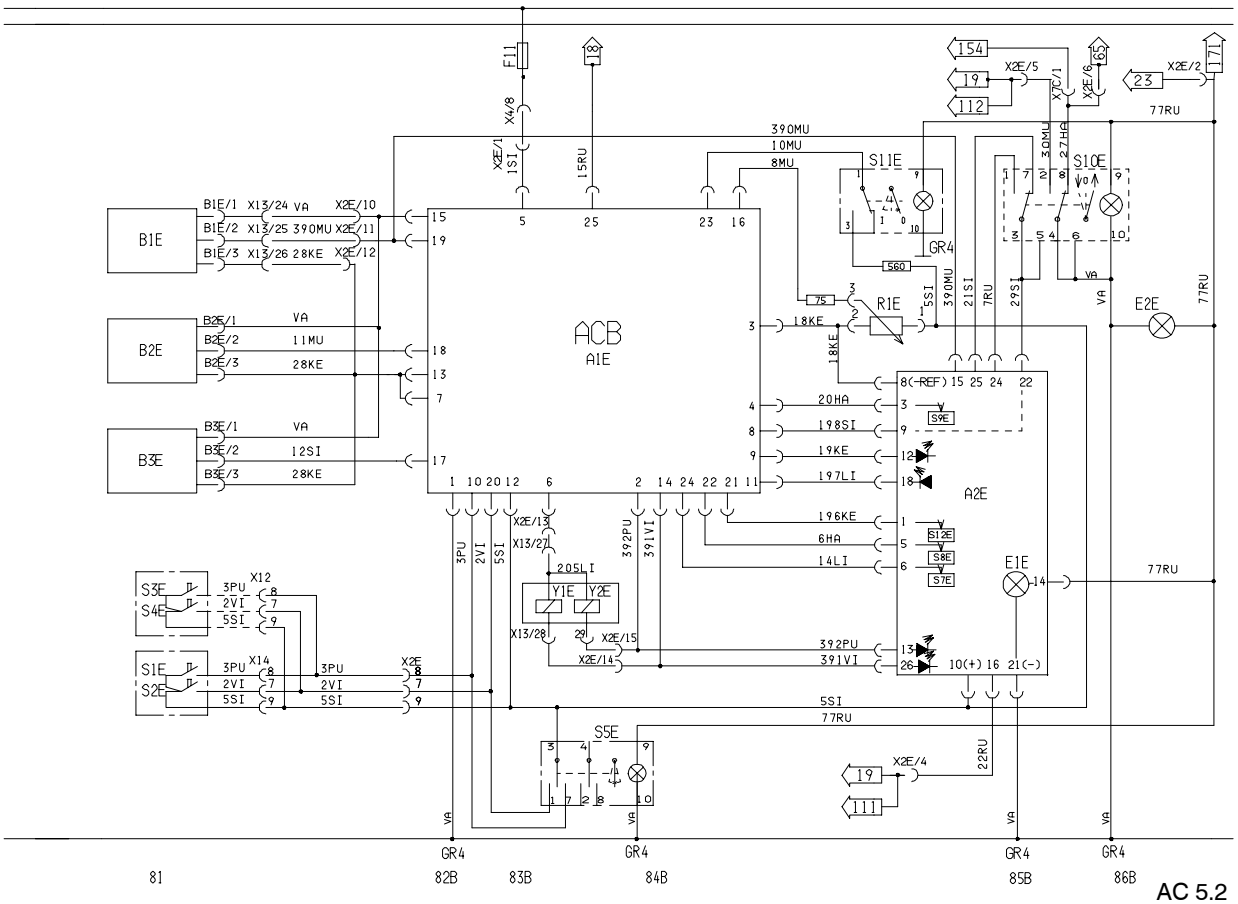


AC 5.2 3

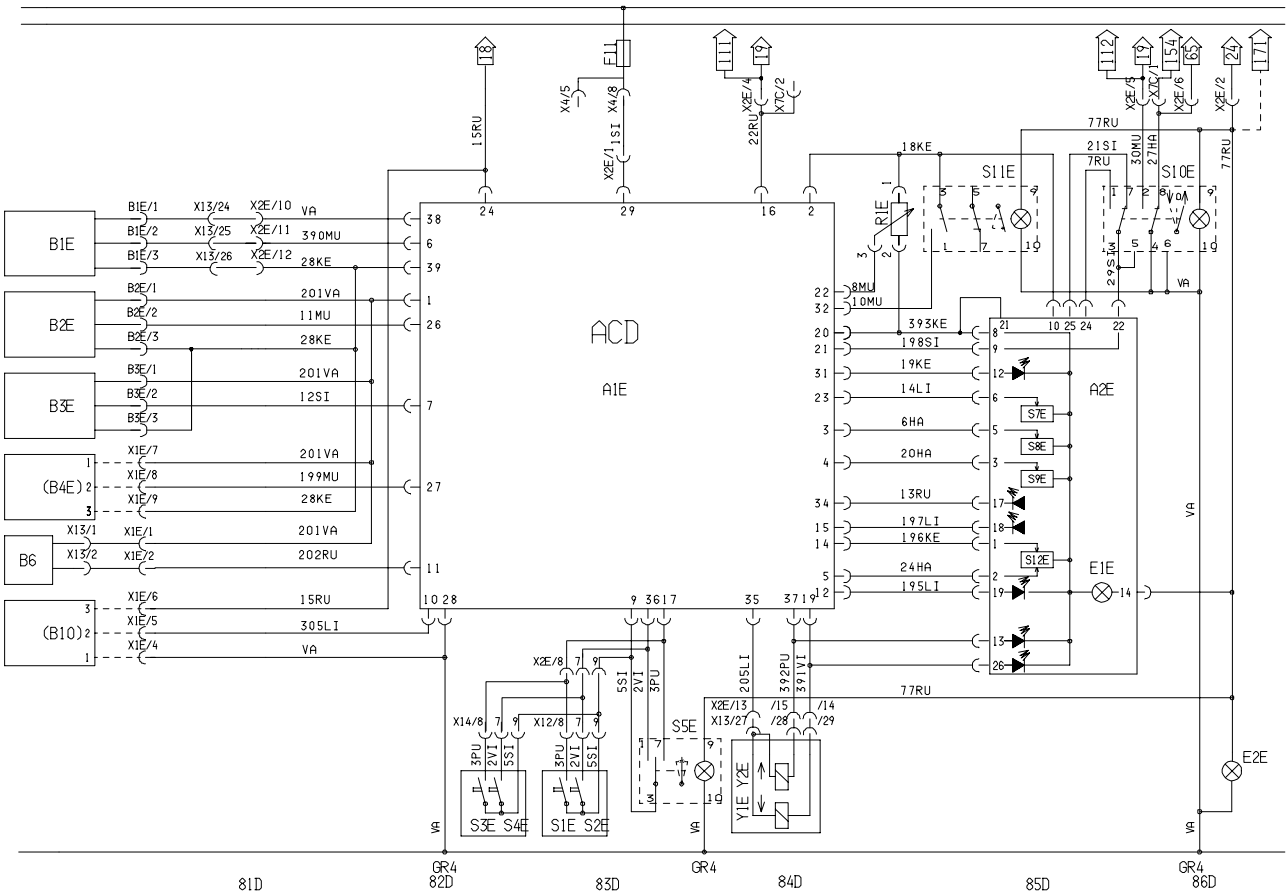


AC 5.2 4

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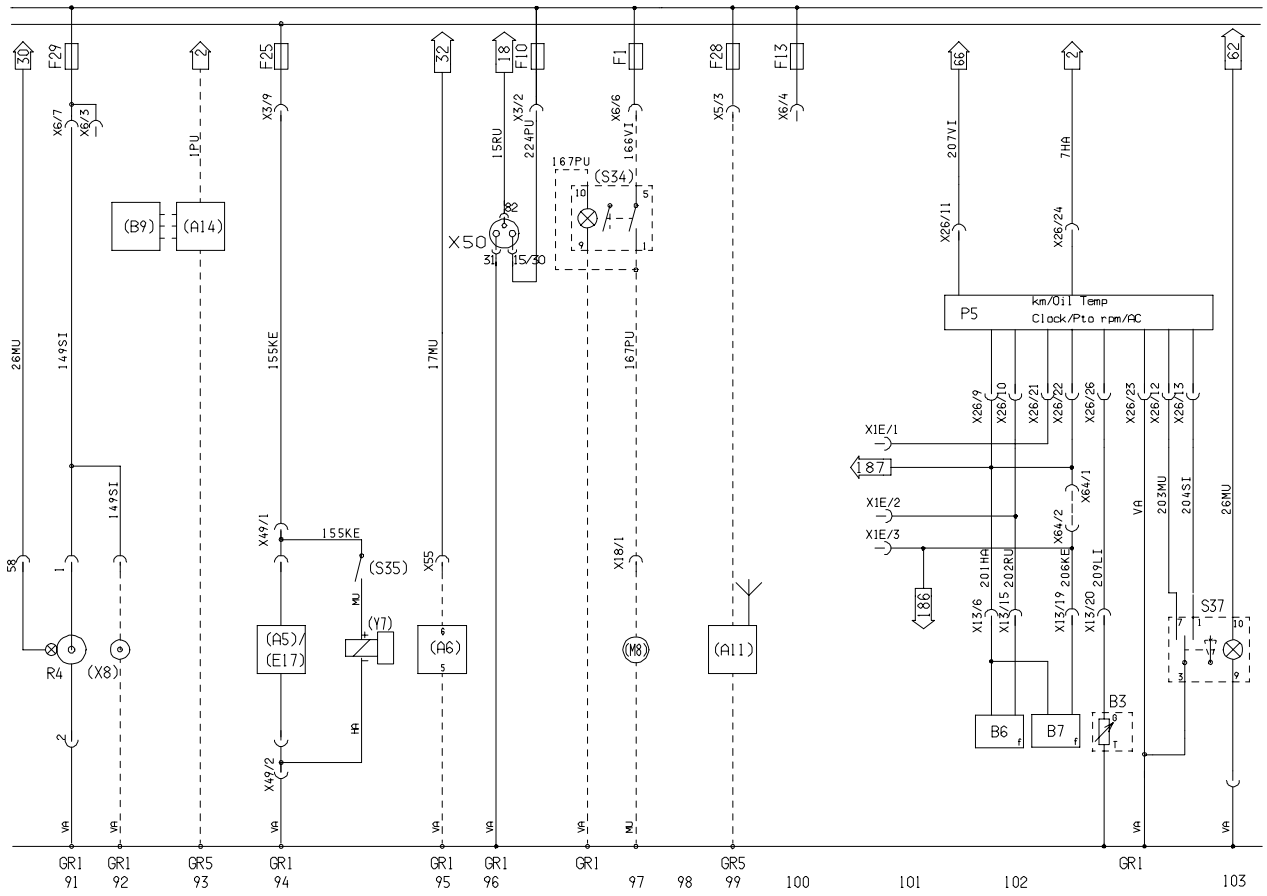


AC 5.2 5

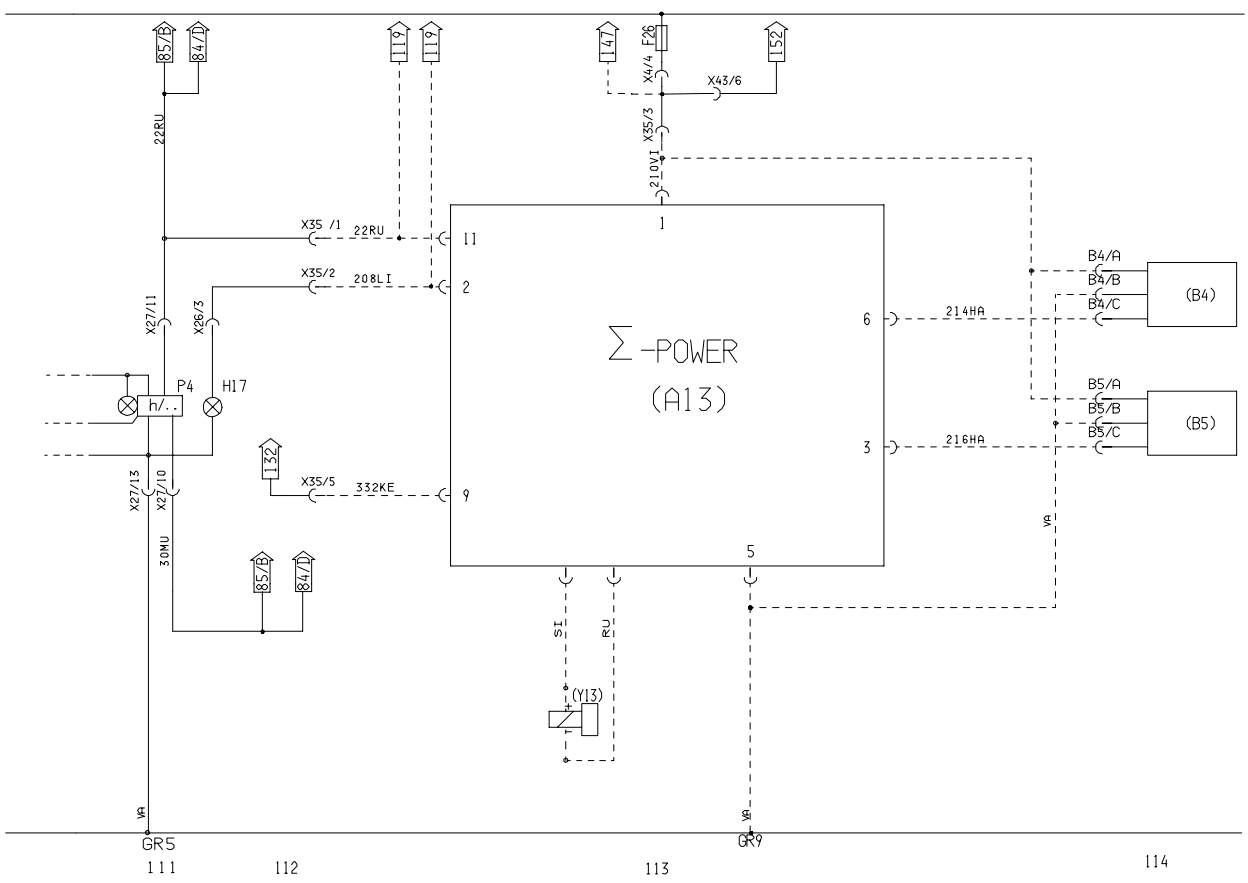


AC 5.2 6

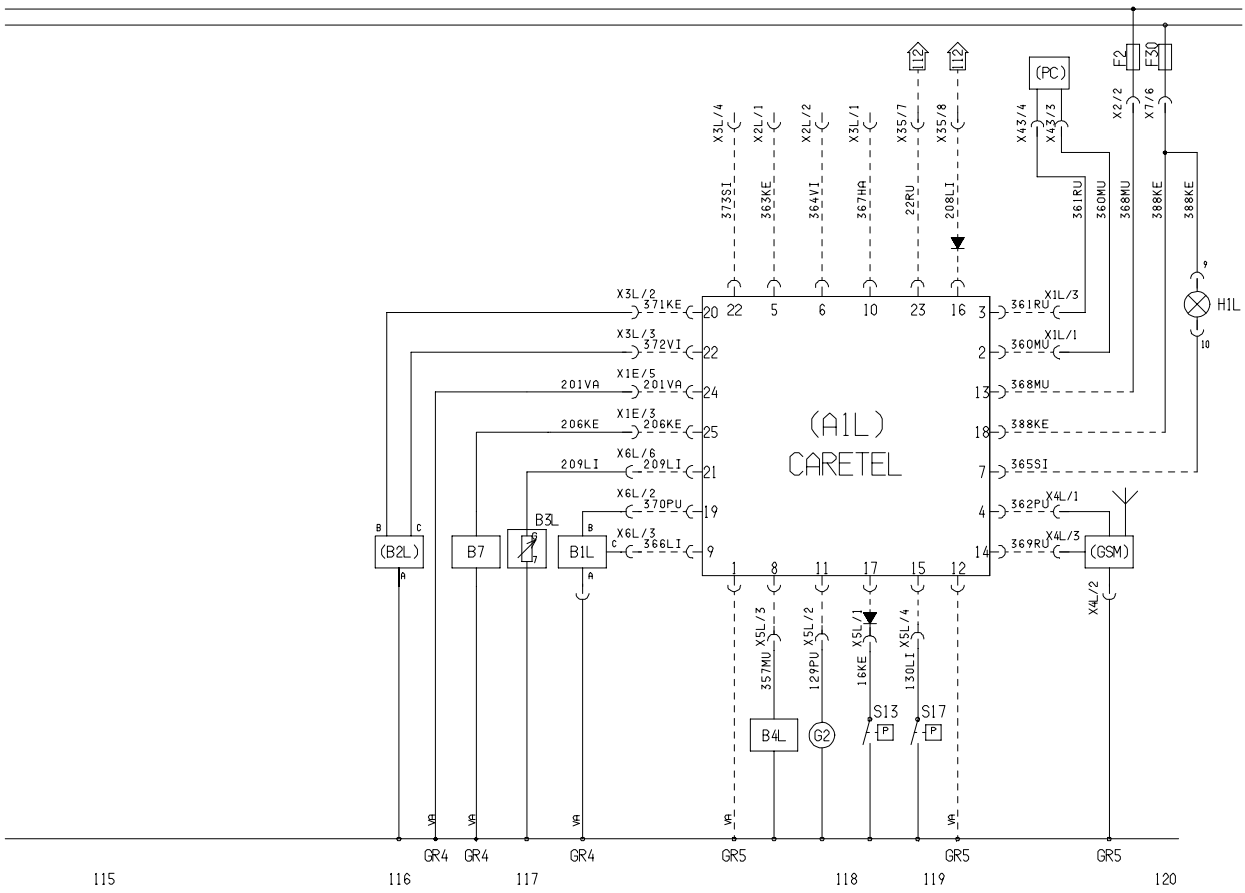
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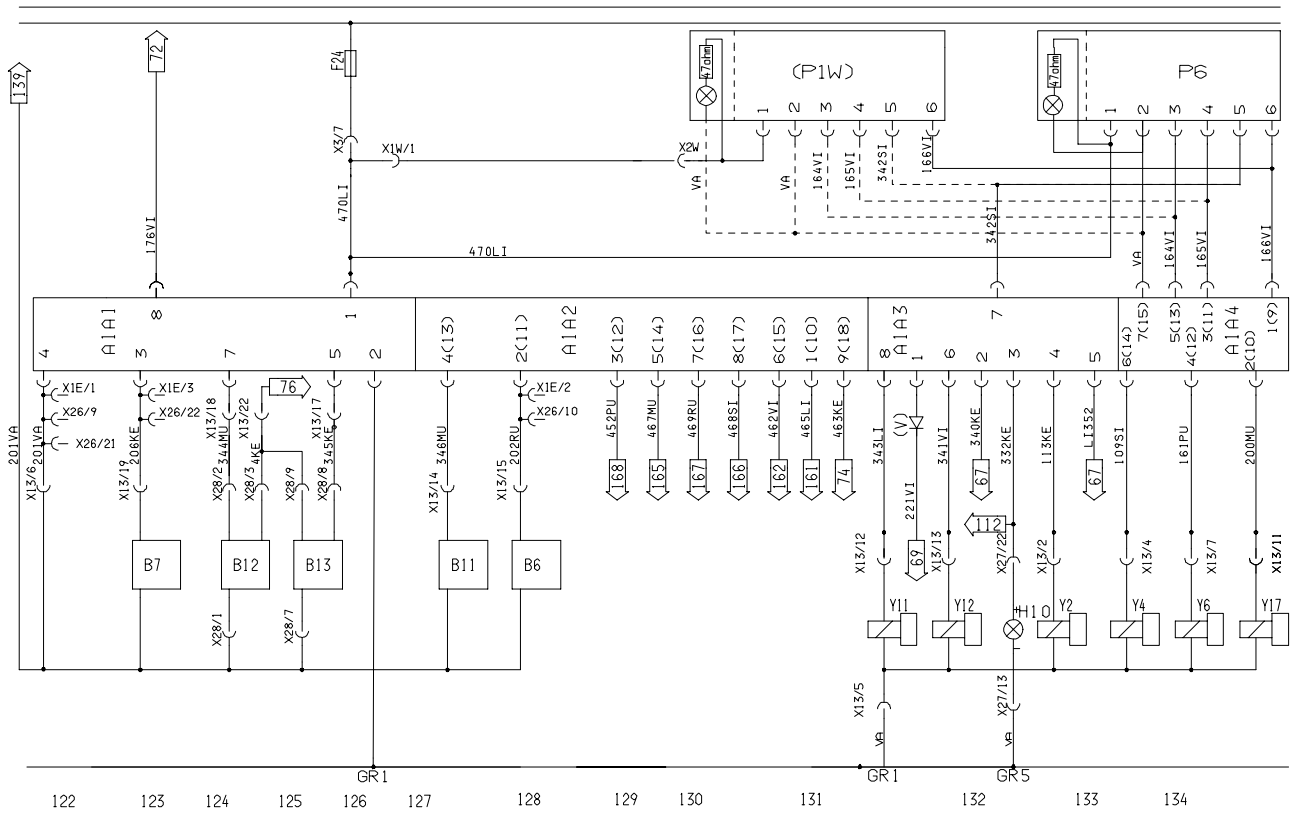
AC 5.2 7



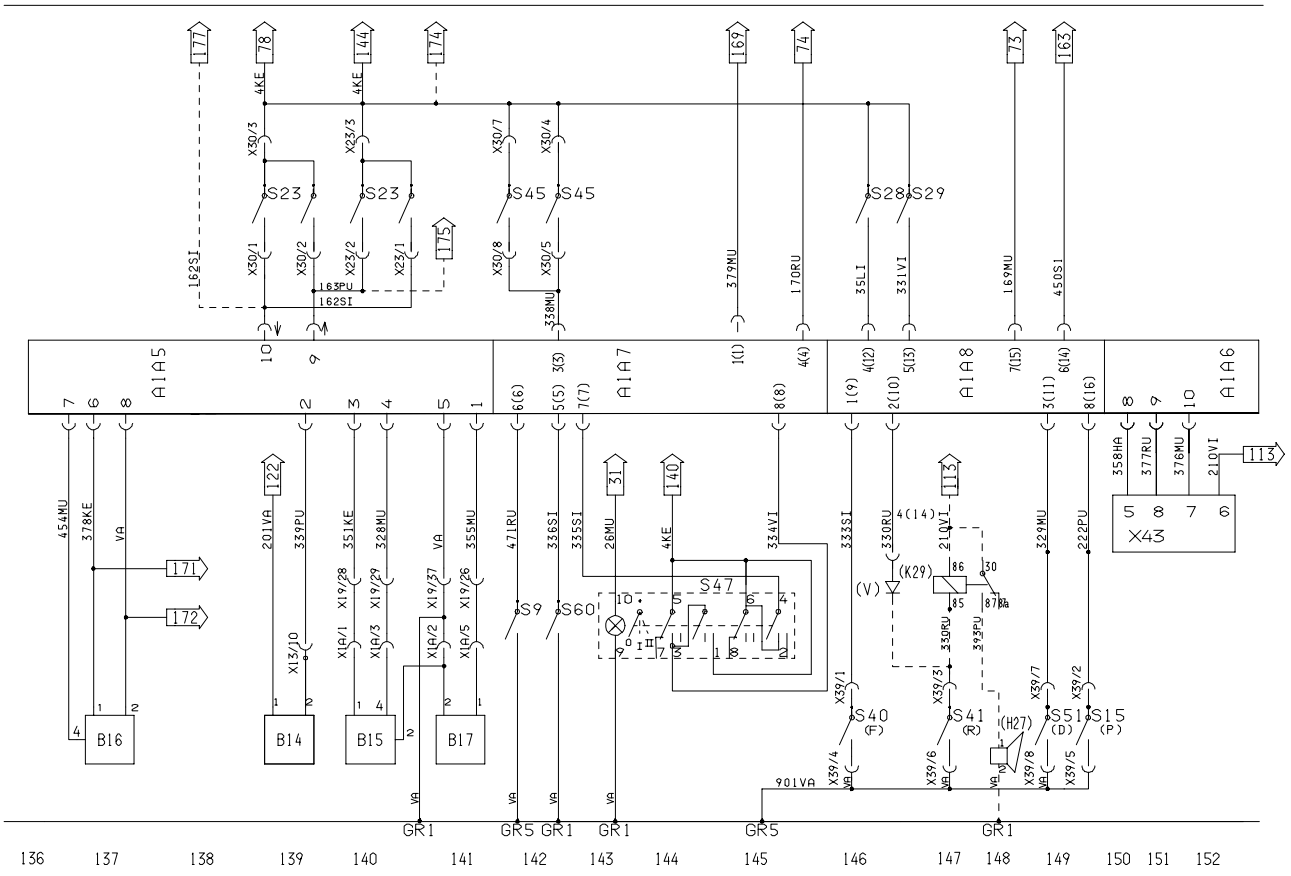
AC 5.2 8



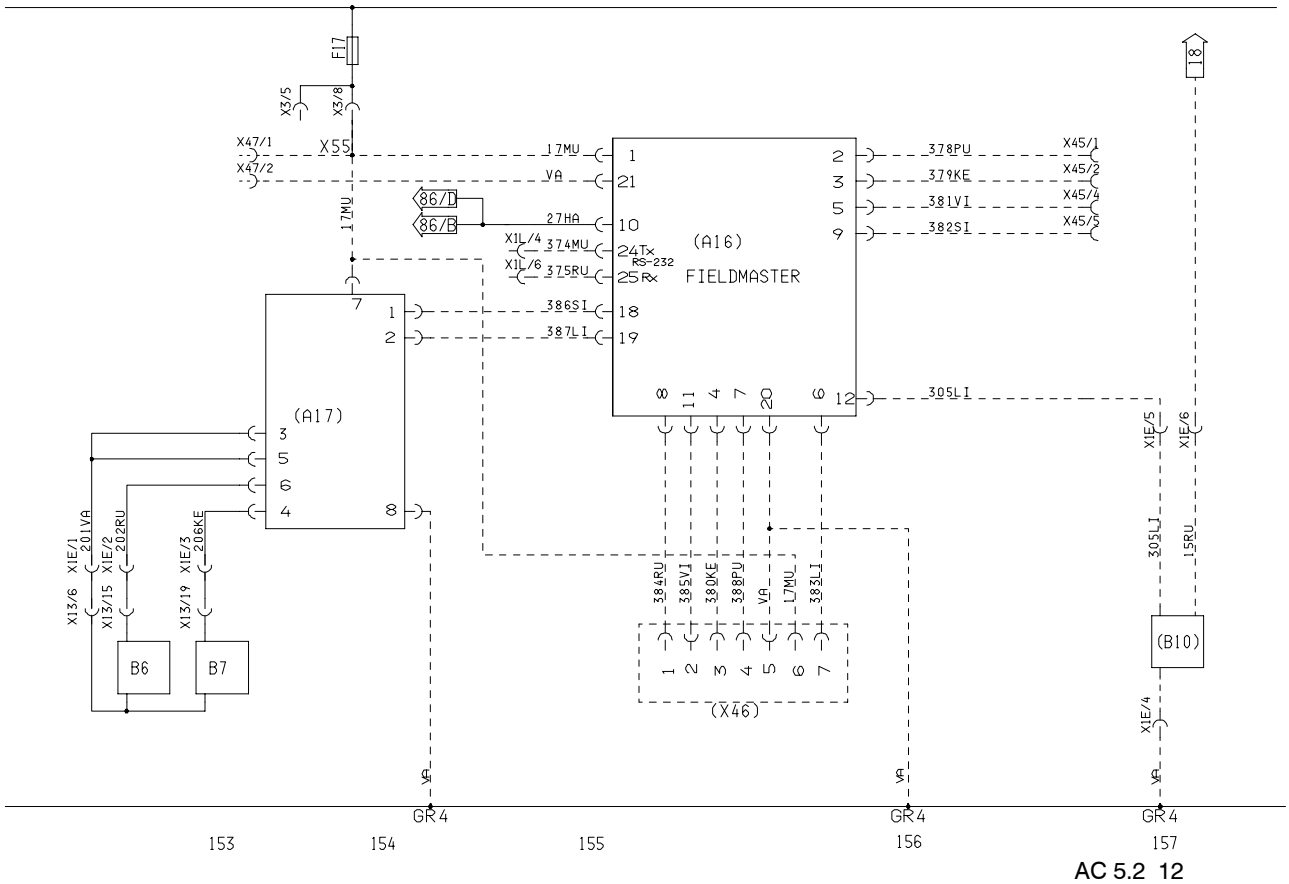
AC 5.2 9



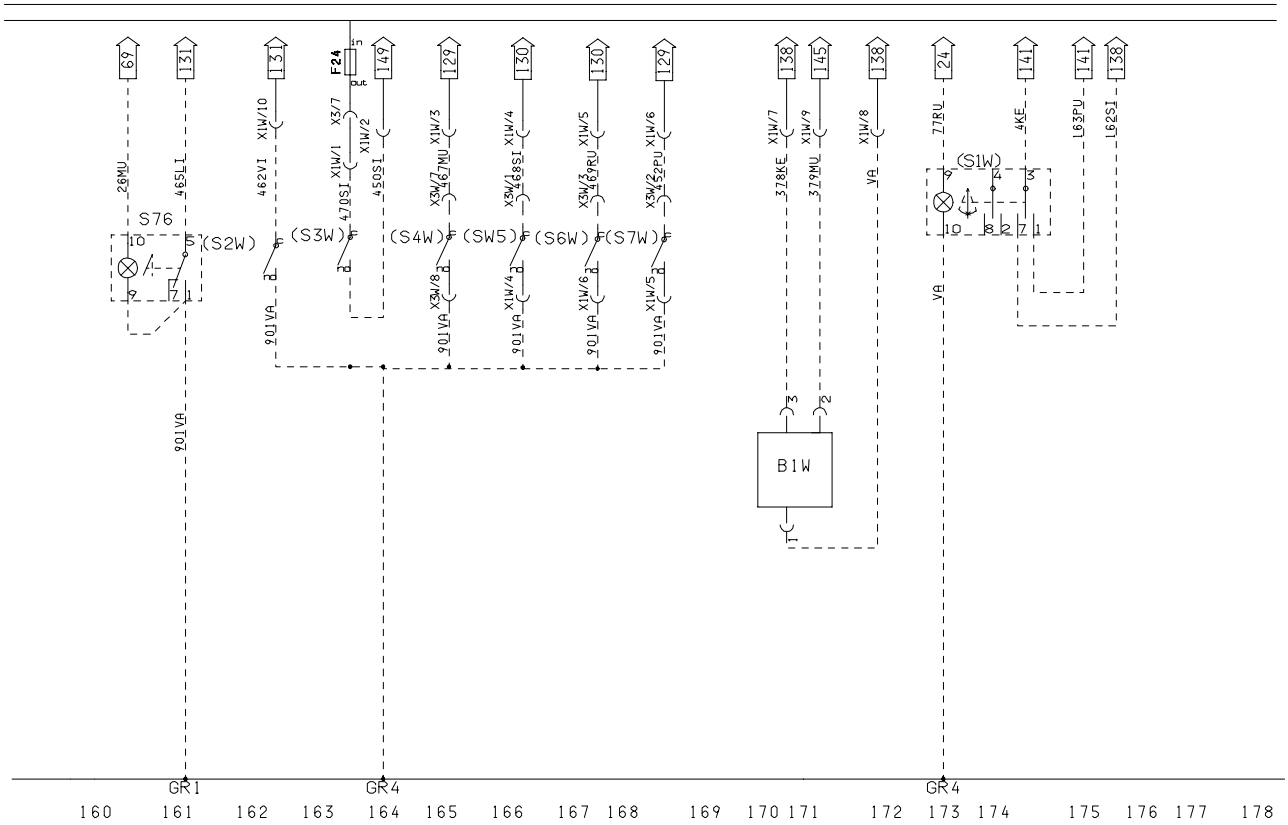
AC 5.2 10



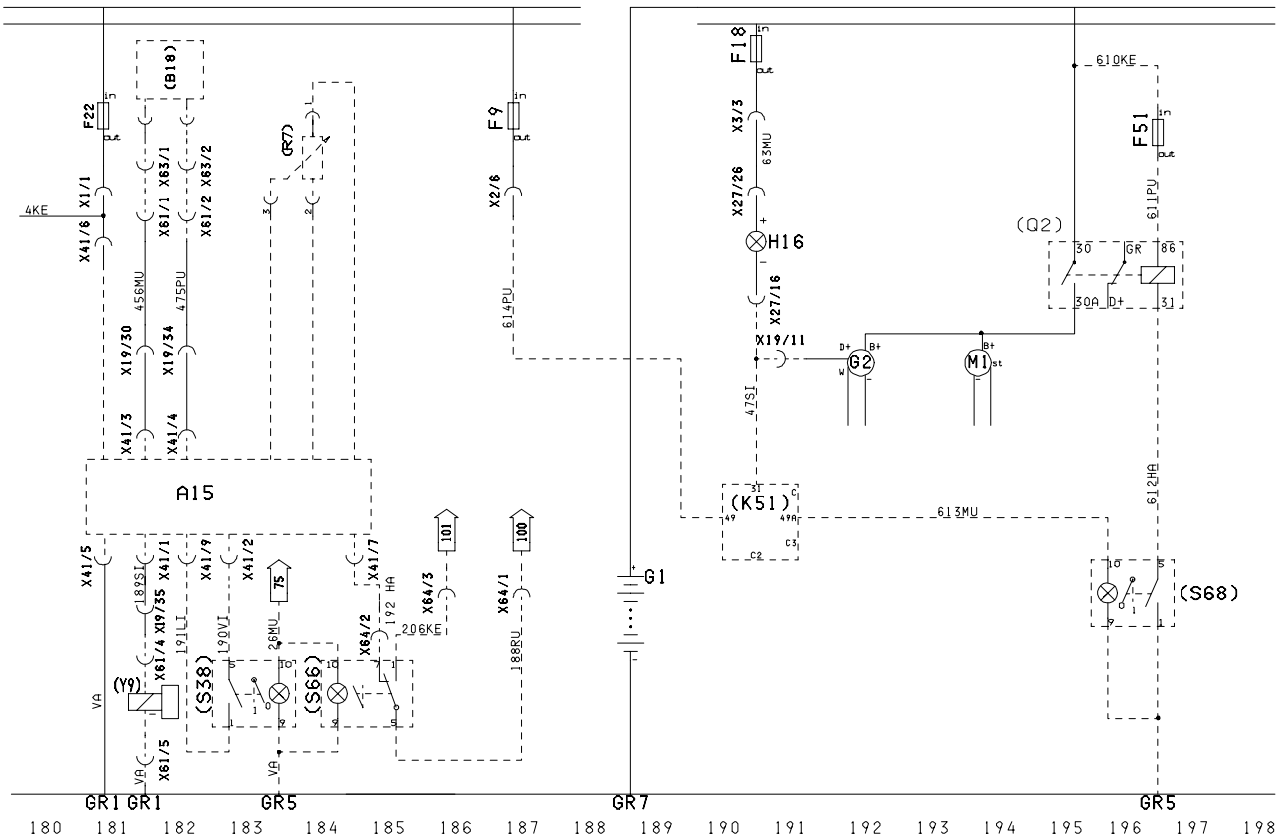
AC 5.2 11



AC 5.2 12



AC 5.2 13



AC 5.2 14

Wiring diagram 6200–8750 (AC 2.3), K44242–, (not HiTech). Diagram no. 318 716 60A. Diagrams on pages 310/83–88.

Symbol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A6)	Agrodata	95
(A10)	Control unit, DPS	70
(A11)	Telephone	99
(A13)	Control unit, Sigma	113
(A14)	Tachograph	93
(A15)	Control unit, front PTO	162
(A16)	Fieldmaster	155
(A17)	Adapter, Fieldmaster sensor signals	154
B1	Sensor, engine temperature	16
B2	Sensor, fuel gauge	17
(B3)	Sensor, gearbox temperature	102
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
(B6)	Velocity sensor, gearbox	81D, 102, 153
(B7)	Velocity sensor, PTO	102, 117, 153
(B8)	Sender, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D, 157
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	46
E9	Rear working light, right outer	42
E10	Rear working right, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	

Fuses

Symbol	Component	Code no
F1	15A Hazard blinkers, water pump	31, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	10 A Parking lights, left	28
F6	10 A Parking lights, right	30
F7	10A Front working lights	44
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35, 165
F10	25A 3–pin current socket	100
F11	5A Autocontrol (+Bat), buzzer	71, 82B, 82D
F12	10A Rot. warning light, cabin light	47
F13	10A Reserve	100
F14	15A Starter switch, thermostart	4
F15	25A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Direction indicators, Fieldmaster	32, 153
F18	5A Instruments, warning lights, Autocontrol	17, 166
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer	48
F21	15A Fan (I, II), air conditioner, floor fan	55
F22	10A 4WD, PTO, DPS	65
F23	10A Rear working lights, outer	41
F24	10A Reserve	98
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	96, 116
F27	10A Braking lights, differential lock	62
F28	10A Telephone	99
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel	120
(F51)	15 A, Main switch, control, in engine compartm.	168
G1	Battery	1
G2	Alternator	4, 118
H1	Indicator light, direction indicator III	34
H2	Indicator light, direction indicator II	34
H3	Indicator light, direction indicator I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temp.	15
H7	Indicator light, gearbox oil press.	9
(H8)	Indicator light, oil filter, gearbox	10
H9	Indicator light, 4WD	65
H10	Indicator light PTO	67
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	16
H16	Indicator light, charging	6
H17	Indicator light, Sigma	111
H18	Indicator light, gearb. oil temp.	13
H19	Indicator light DPS I	71
H20	Indicator light, diff. lock	63
H21	Indicator light DPS II	71
H22	Indicator light DPS III	71
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse Buzzer	96
(H28)	Indicator light, STOP, rear	
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56
K7	Control relay, 4–wheel brake	70
K9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	64
K13	Control relay, differential lock	65
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	69
K16	Relay, PTO–emergency stop	68
(K18)	Relay, control stop	8
(K24)	Control relay, HiShift	115
K25	Control relay, upper head lights to working lights	
K26	Control relay, speed limit, HiShift	
K27	Control relay, 4WD on/off	68
(K51)	Warning light, main current switch	166

Sym-bol	Component	Code no
M1	Starter motor	3, 167
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
M7	Floor fan	57
(M8)	Water pump	97
(M9)	Roof window wiper	
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour meter/AC (Sigma)	19
(P4	Running hour /speed meter (AD instrumentation))	19
(P5)	Clock, PTO–speed, AC, trip, oil temperature (Agrodata–instrumentation)	101
Q1	Heat/starter switch	4
(Q2)	Main switch	3, (167)
R1	Thermostart	5
R4	Cigarette lighter	91
R7	Potentiometer, front PTO, starting speed	161
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25, 34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	66
S10	Switch, braking lights, right	72
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Sender unit to parking brake ind. light	12
(S15)	Reed relay, parking brake (P)	149
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	73
S22	Switch, differential lock	62
(S23)	Switch, DPS, selector	139, 140
S24	Switch, DPS disengagement	69
S25	Switch, PTO	75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	96
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	68
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	48
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
(S44)	Indicator light switch, filter 180 bar	11
(S45)	Switch, HiShift	115, 142
(S45.1)	Extra switch, HiShift	115
(S49)	Change over switch, rpm/flow sensor	
(S50)	Change over switch, speed sensor, tractor/implement	
(S53)	Indicator light switch, filter, return	10
(S54)	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	49
(S66)	Switch, PTO display, front/rear	163
S68	Switch, main currect switch control	168

Sym-bol	Component	Code no
V1	Diodes Y1, Y2, Y3, Y4, Y6	
V2	Diodes, AC–2	
V3	Diodes Y1, Y2, Y3, Y4, Y6	65
(V5)	Diodes, HiShift	115

Ground leads

GR1	Rear lights, solenoid valves
GR2	Roof
GR4	Autocontrol
GR5	Cable harness, instr. panel
GR7	Battery
GR8	Headlights
GR9	Cabin
GR10	Electrical stop

X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, power socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32
(X18)	2 pin, rear window washer	48
X19	37 pin, front wall	
X20	9 pin, front direction indicator	
(X22)	2 pin, rot. roof light	47
X23	3 pin, DPS, extra switches	71
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instr. right, blue	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
X31	2 pin, PTO–emerg. stop	74
(X32)	1–pin, electric stop	5
(X33)	3 pin, fog light, rear	
(X35)	9–pin, Sigma supply	
(X36)	3 pin, HiShift, speed–limit+ supply	
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	
(X43)	8 pins, RS–232 canal	
(X45)	9 pin, Fieldmaster, extra equipment	
(X46)	7 pins, Fieldmaster socket	
(X47)	2 pins, GPS supply, Fieldmaster	
(X48)	3 pins, radar, Fieldmaster	
(X49)	2 pin, seat	
(X50)	3 pin current socket	
(X55)	1 pin, Fieldmaster	

Y1	Solenoid valve, diff lock	63
Y2	Solenoid valve, PTO	68
Y3	Solenoid valve, 4WD	66
(Y4)	Solenoid valve, DPS	69
(Y5)	Magnetic switch, compressor, air conditioner	54
(Y6)	Solenoid valve, DPS	70
(Y7)	Solenoid valve, rear steering prevention	94
(Y8)	Solenoid, engine running	4
(Y9)	Magnetic clutch, front–PTO	164
(Y13)	Solenoid valve, Sigma	113
(Y14)	Solenoid valve, HiShift	115
(Y15)	Solenoid valve, HiShift, slowing	115
(Y16)	Solenoid, cold cranking	3

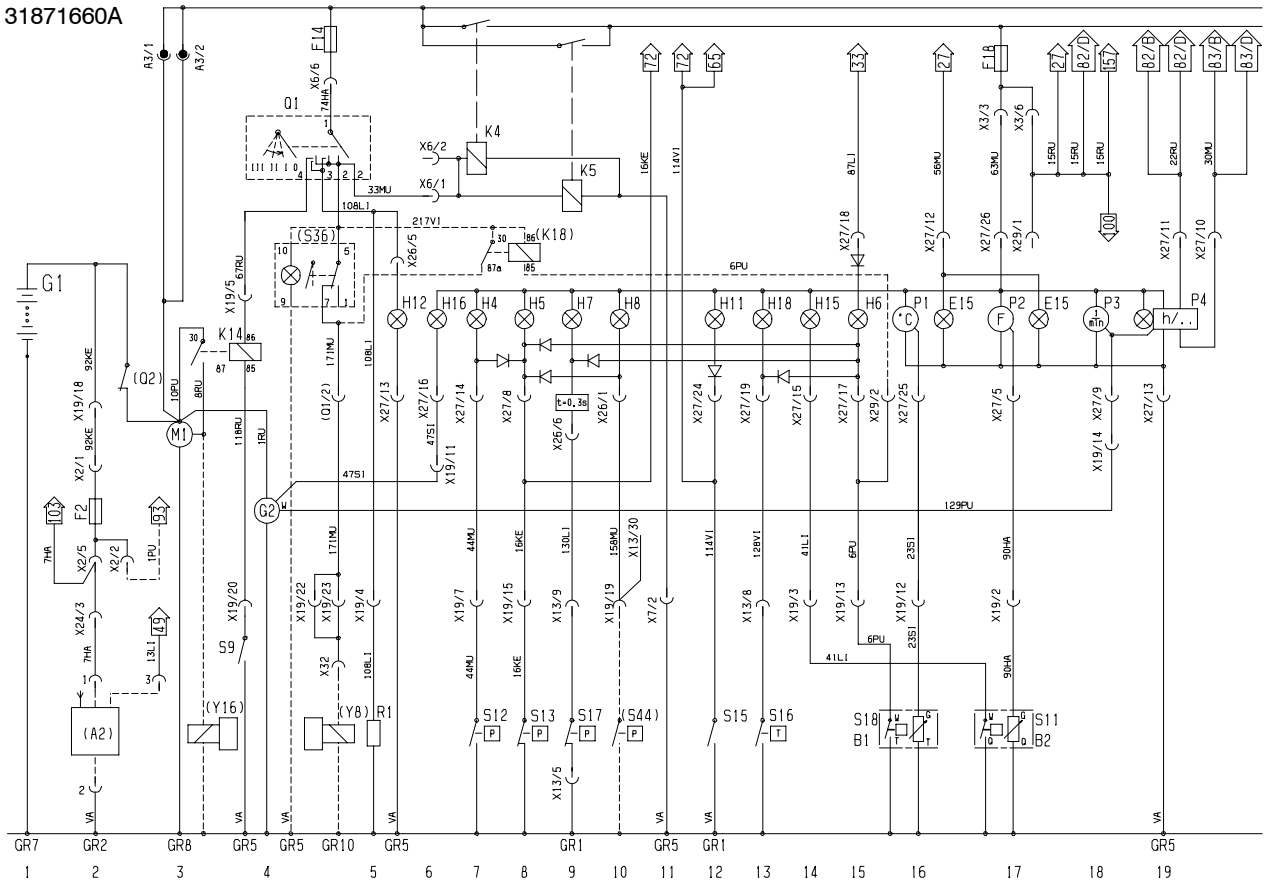
Symbol	Component	Code no
CareTel, information collecting system		
A1L	CareTel, data logger	118
B1L	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, CareTel, 190 Bar	116
B3L	Sensor, gearbox temperature	117
B4L	Temperature sensor, engine	118
H1L	Indicator light, CareTel	120
X1L	Connector housing, 9 pin, CareTel, RS–232	117–120
X2L	Connector housing, 3–pin, CareTel, CAN	117–120
X3L	Connector housing, 9 pin, CareTel, extra equipment	117–120
X4L	Connector housing, 3 pin,CareTel, supply+ NBUS	117–120
ACB/ACD Autocontrol power lift:		
A1E	Autocontrol control unit	82B, 82D
A2E	Autocontrol, circuit card	85B, 83D
B1E	Position sensor	81B, 81D
B2E	Draft sensor, right	81B, 81D
B3E	Draft sensor, left	81B, 81D
(B4E)	Position sensor, implement (ACD)	81D
E1E	Illumination, circuit card	83B, 83D
E2E	Illumination, position potentiometer	83B, 83D
R1E	Potentiometer, position control	83B, 83D
S1E	Button, rear mudguard, lift, right	81B, 81D
S2E	Button, rear mudguard, lowering, right	81B, 81D
S3E	Button, rear mudguard, lift, left	81B, 81D
S4E	Button, rear mudguard, lowering, left	81B, 81D
S5E	Switch, in cabin, nift/lower	82B, 82D
S7E	Switch, lowering speed	83B, 83D
S8E	Switch, transport height	83B, 83D
S9E	Switch, draft control	83B, 83D
S10E	Autocontrol–Switch, lift/stop/lower	83B, 83D
S11E	Switch, forced lowering	83B, 83D
S12E	Switch, oscillation damping / slip control	83B, 83D
X1E	Connector, 9 pins, speed sensors (ACD)	
X2E	Connector, 15 pins, supply & rear buttons (+implement position sensors)	
Y1E	Solenoid valve, lowering	82B, 82D
Y2E	Solenoid valve, lifting	82B, 82D

Wire colours

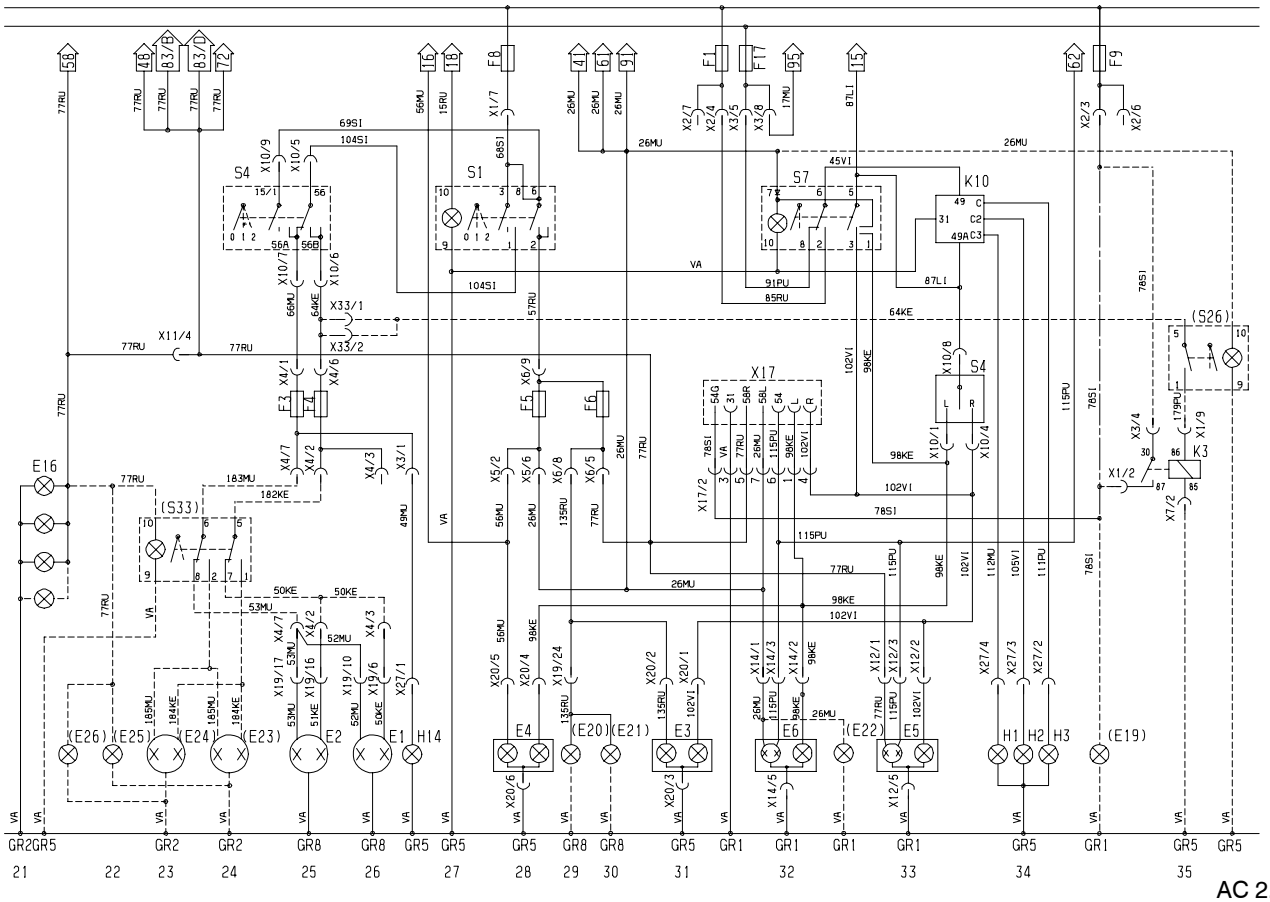
RU = braun
PU= red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

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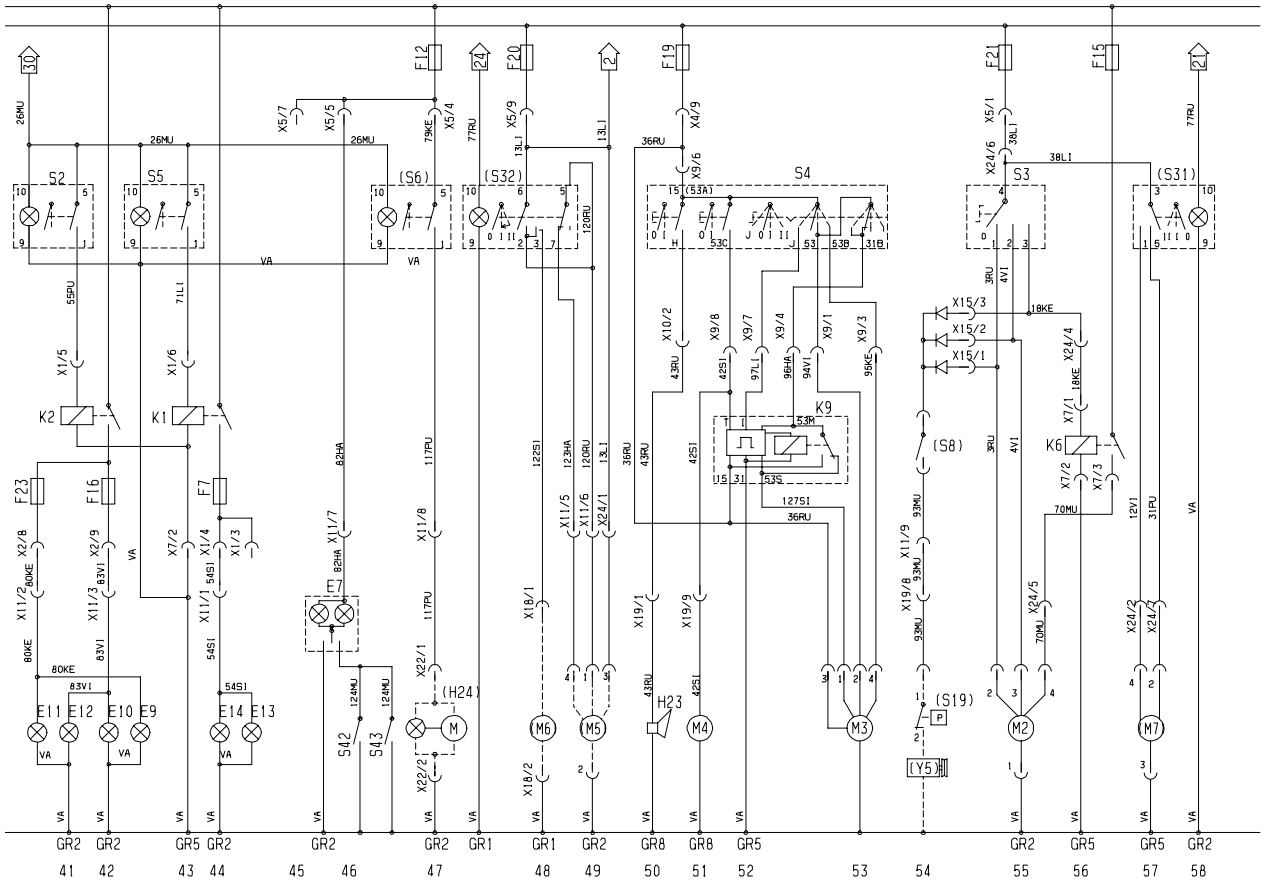
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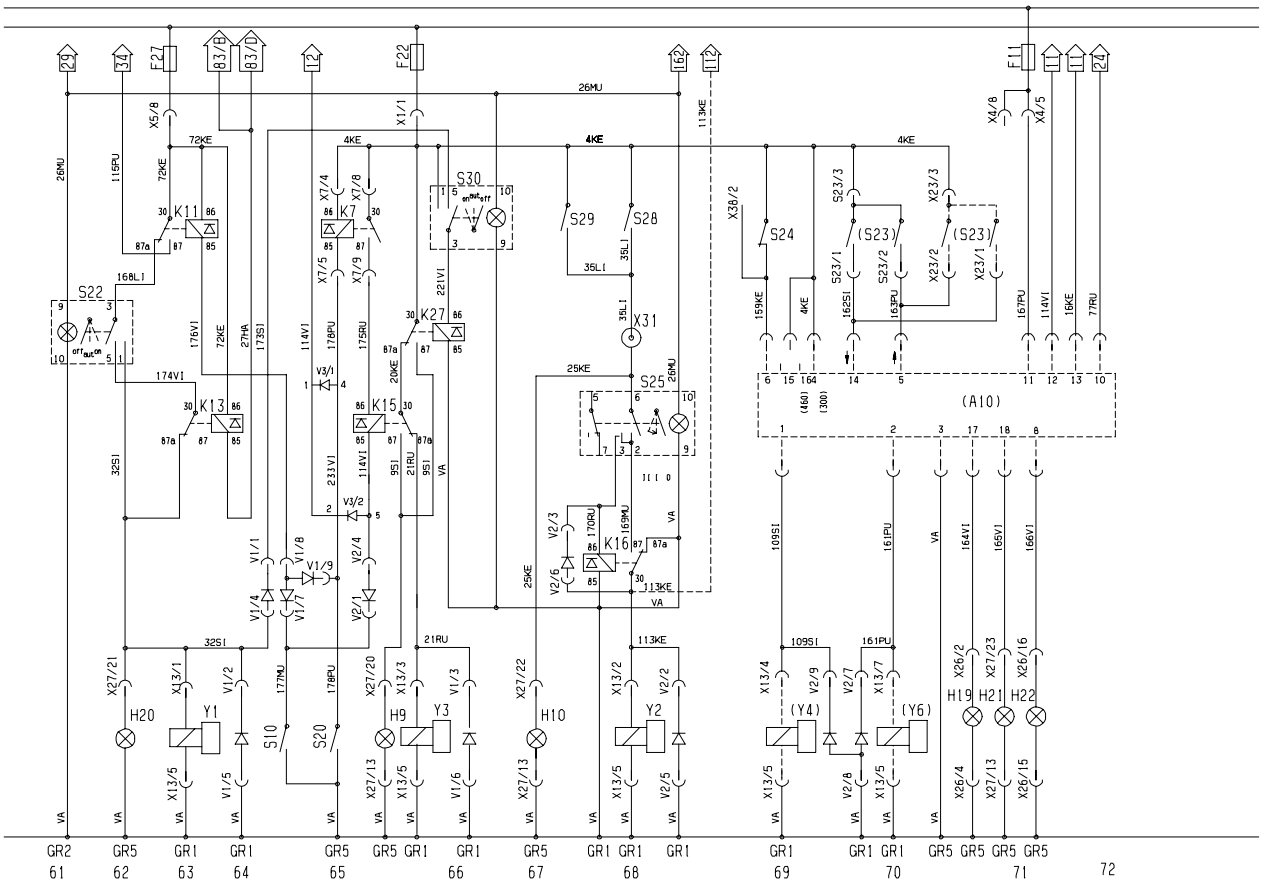
AC 2.3 1



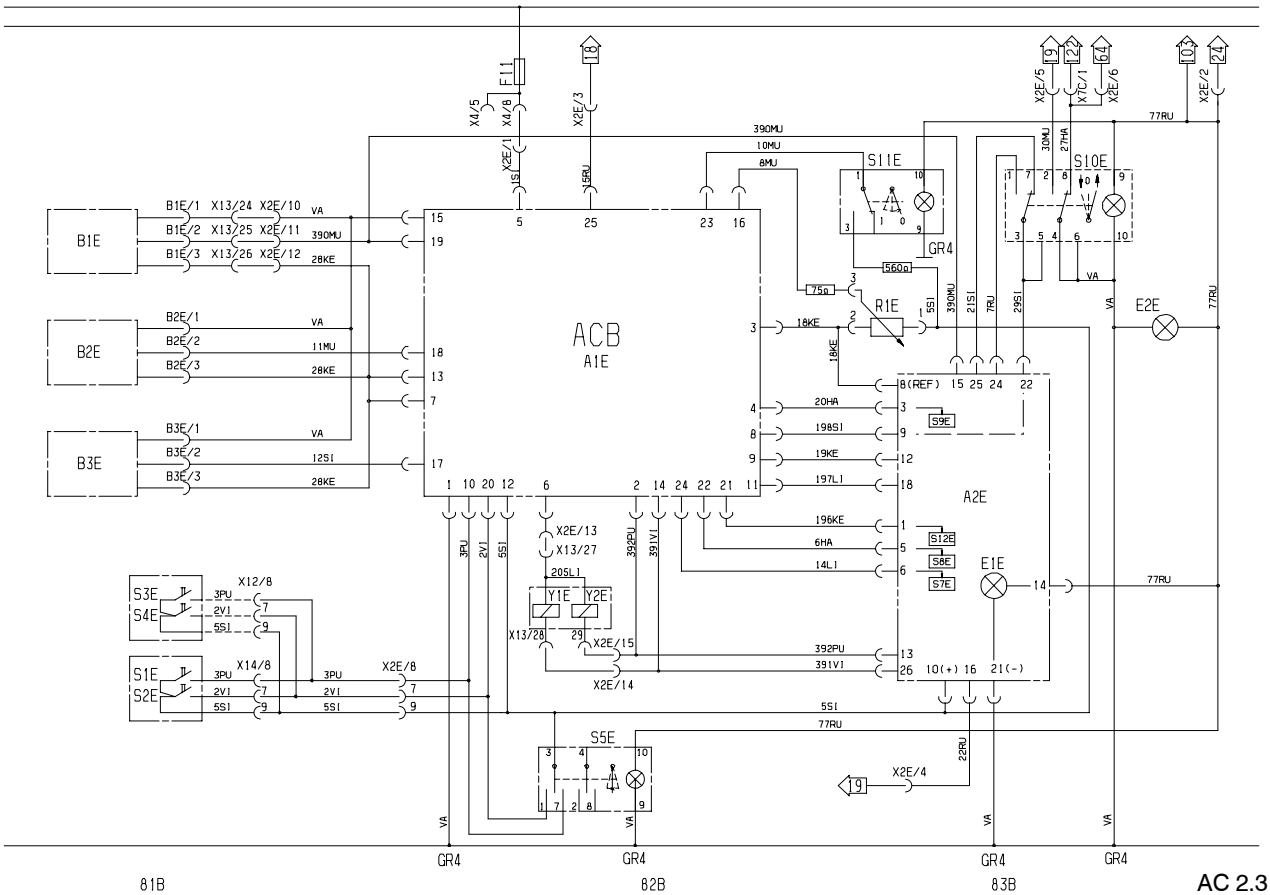
AC 2.3 2



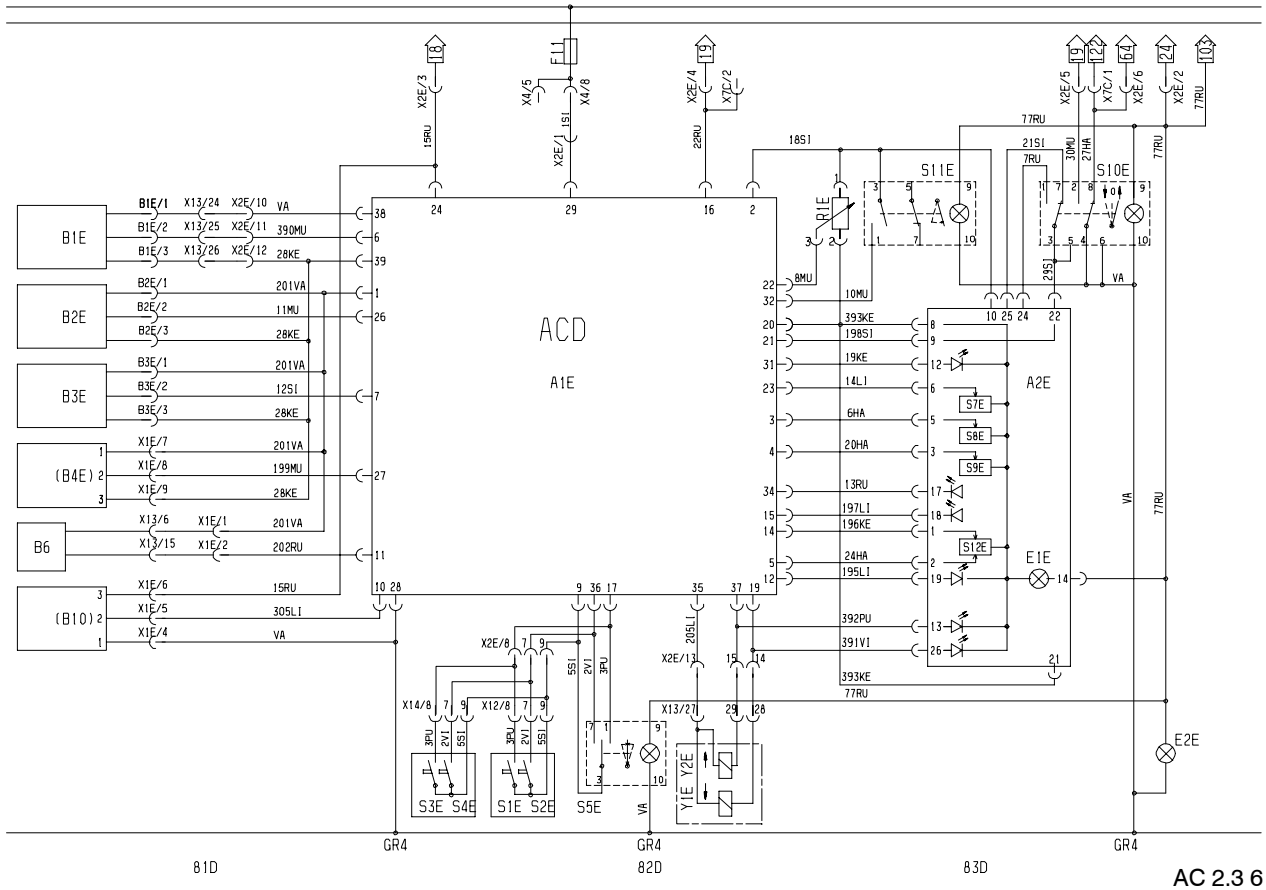
AC 2.3 3



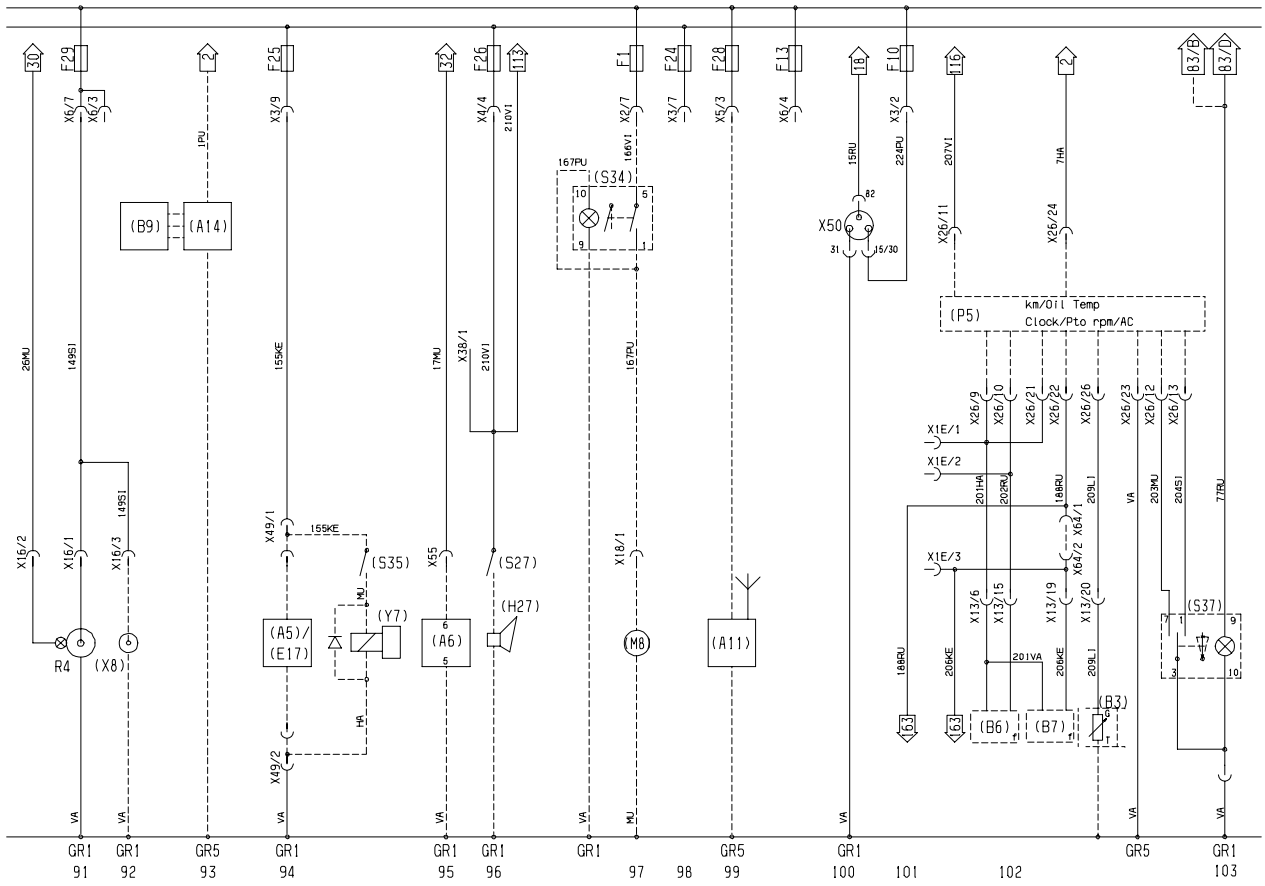
AC 2.3 4


ACB
A1E
A2E
B1E
B2E
B3E
S11E
S10E
R1E
E2E
E1E
S5E
S3E
S4E
S1E
S2E
Y1E
Y2E
S9E
S12E
S8E
S7E
GR4
81B
82B
83B

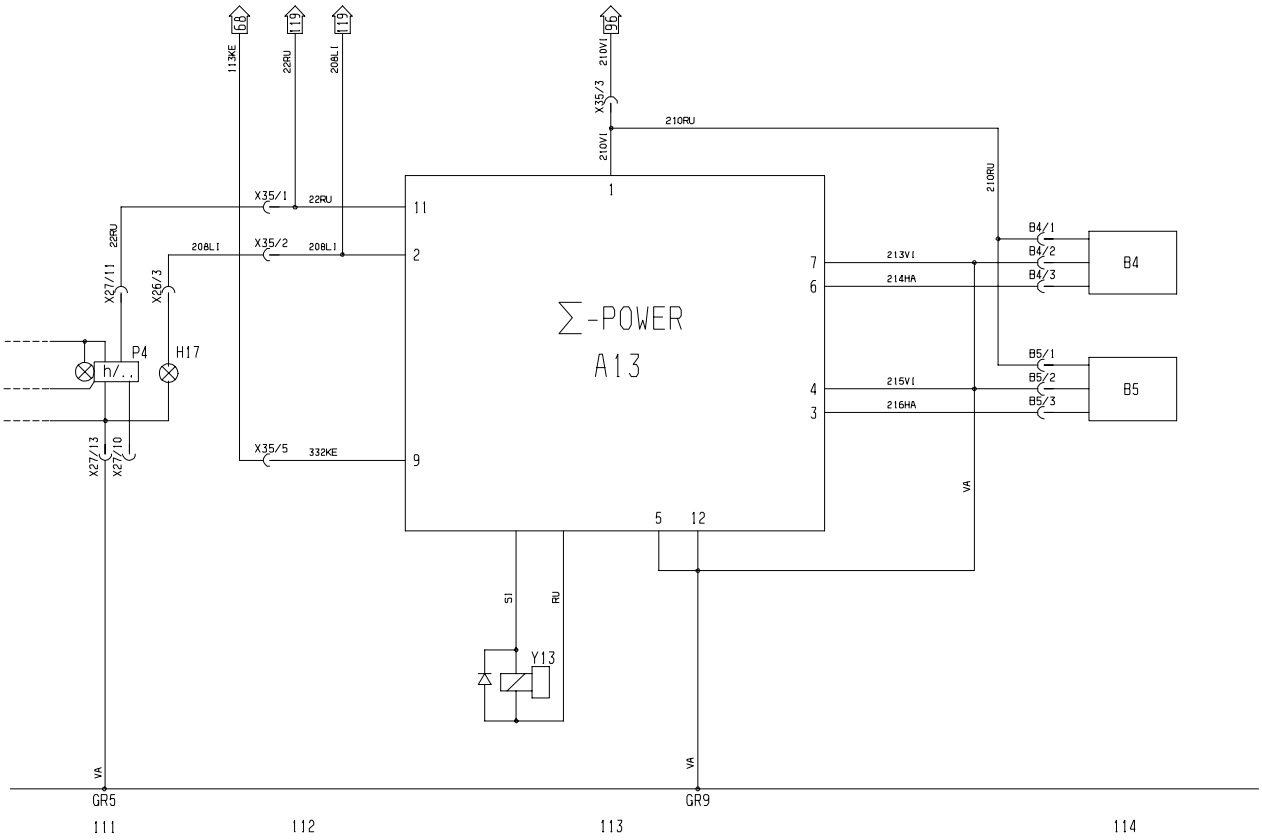
AC 2.3 5


ACD
A1E
A2E
B1E
B2E
B3E
(B4E)
B6
(B10)
S11E
S10E
R1E
E2E
E1E
S5E
S3E S4E
S1E S2E
Y1E Y2E
GR4
81D
82D
83D

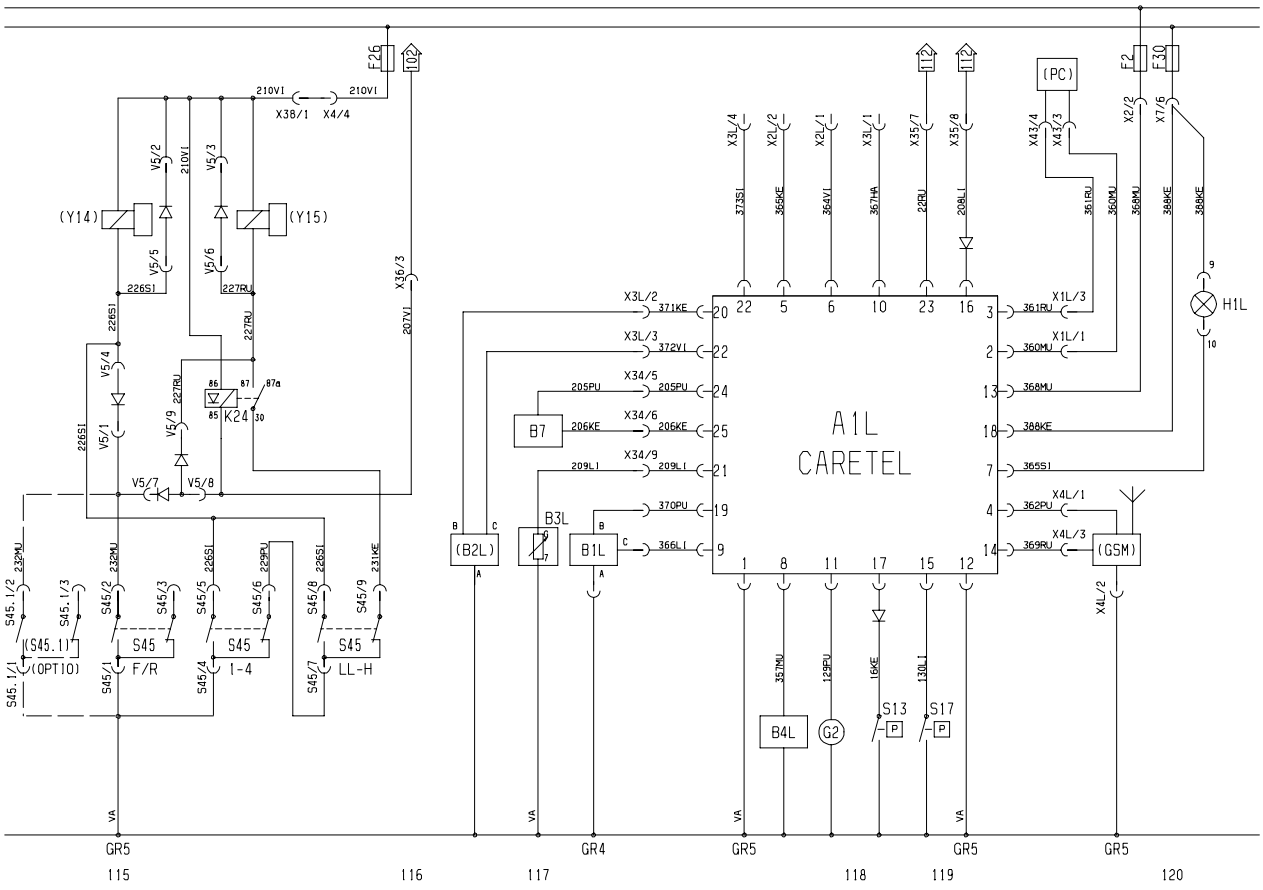
AC 2.3 6


(B9)
(A14)
(S34)
X50
(P5)
km/Oil Temp
Clock/Pto rpm/AC
(S35)
(S27)
(H27)
(Y7)
(A5)/
(E17)
(A6)
(A11)
M8
R4
(X8)
(B6)
(B7)
(B3)
(S37)
GR1
GR5
GR1
91
92
93
94
95
96
97
98
99
100
101
102
GR5
GR1
103

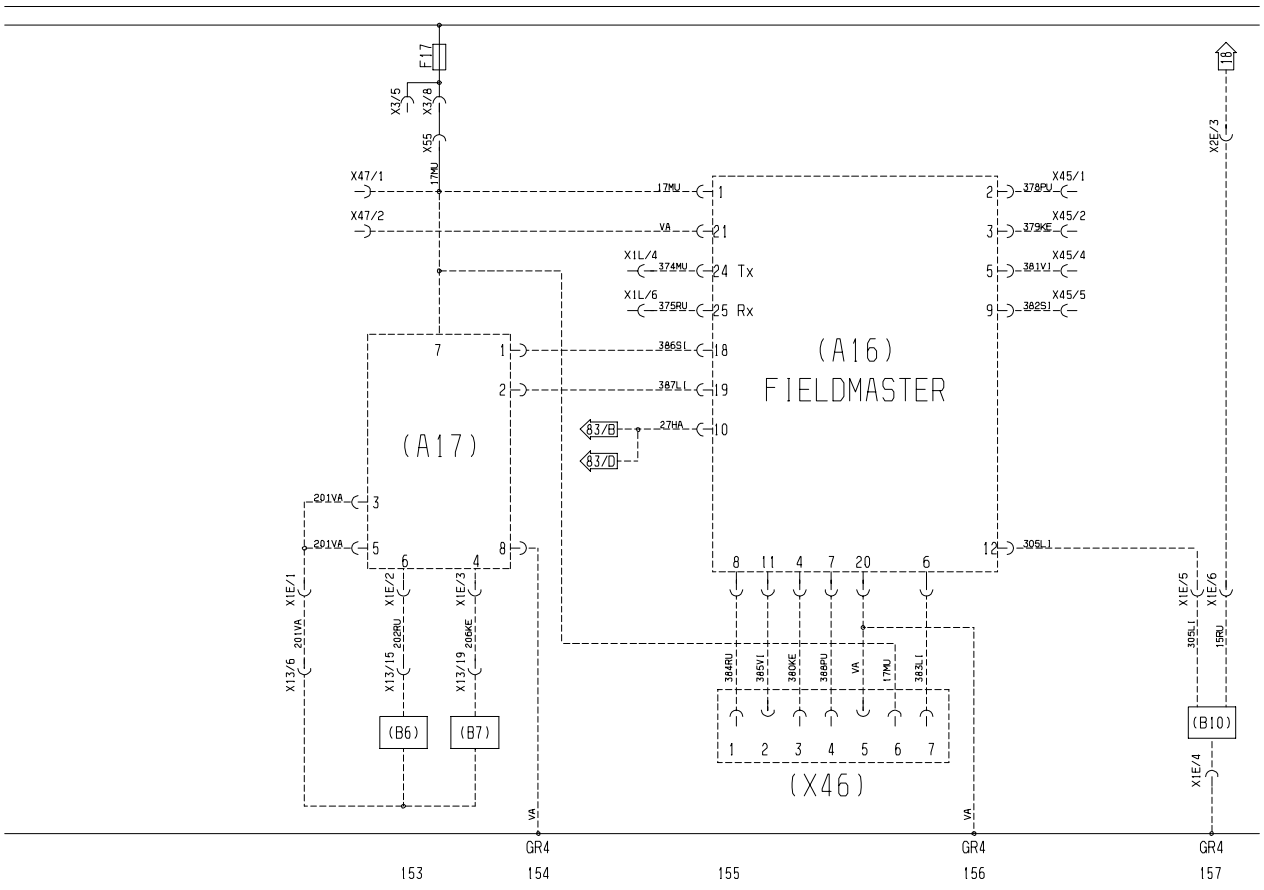
AC 2.3 7


Σ-POWER
A13
P4
H17
h/..
Y13
B4
B5
GR5
GR9
111
112
113
114

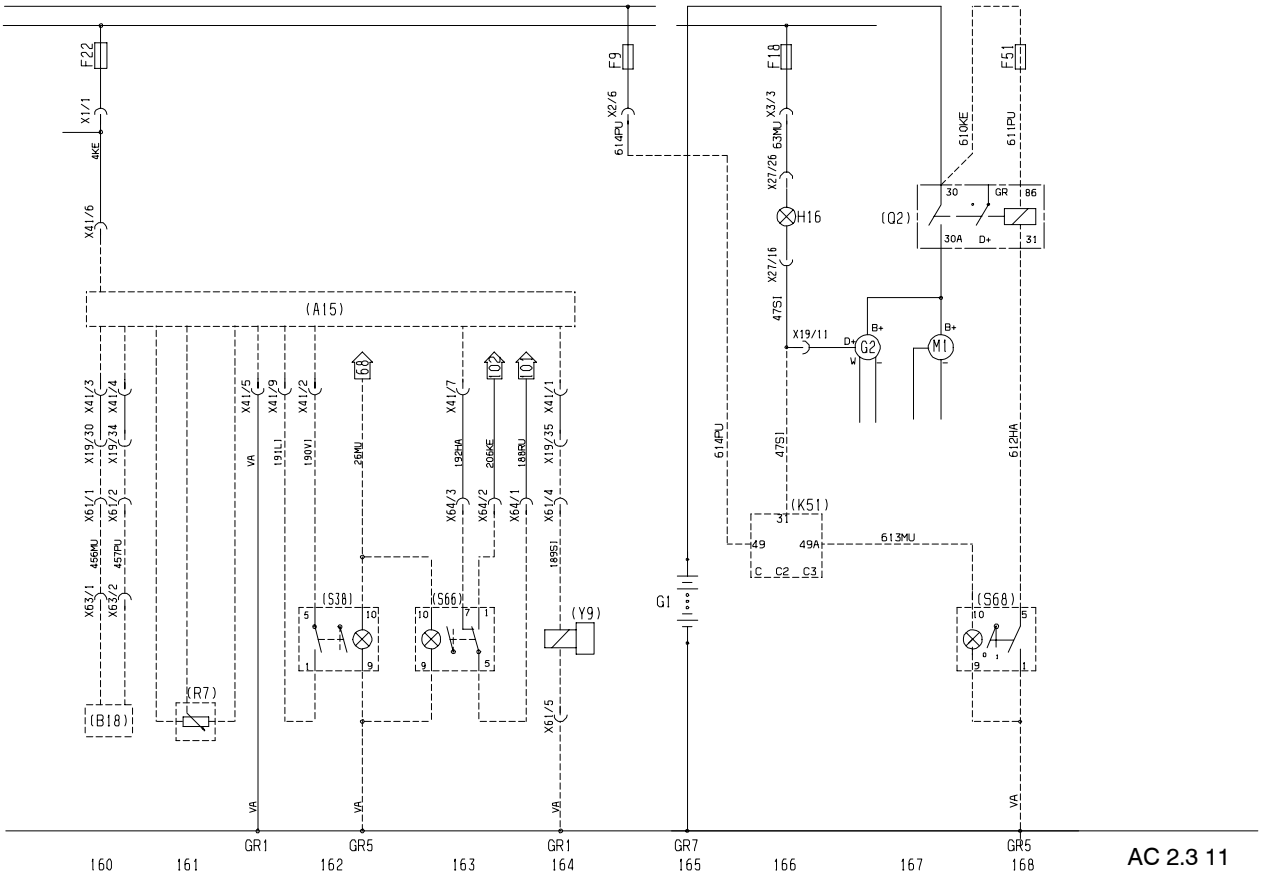
AC 2.3 8



AC 2.3 9



AC 2.3 10


F22
X1/1
4KE
X41/6
(A15)
X41/3
X19/30
X41/4
X19/34
X61/1
X61/2
456MU
457PU
X63/1
X63/2
(B18)
(R7)
X41/5
VA
X41/9
191LI
X41/2
190VI
68
26MU
(S38)
X41/7
192HA
64
2066E
(S66)
X64/3
X64/2
X64/1
X41/1
X19/35
X61/4
189SI
(Y9)
X61/5
F9
X2/6
614PU
F18
X3/3
63MU
X27/26
H16
X27/16
47SI
X19/11
D+
G2
B+
M1
F51
610KE
611PU
30
GR
86
(Q2)
30A
D+
31
614PU
47SI
612HA
(K51)
31
49
49A
C
C2
C3
613MU
G1
(S68)
10
5
9
1
GR1
GR5
GR1
GR7
GR5
160
161
162
163
164
165
166
167
168
AC 2.3 11

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Wiring diagram, HiTech, L18105–.

Diagram no. 33563520A. Diagram incl. e.g. Agroline–instrument. Diagrams on pages 310/93–100.

Symbol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A6)	Agrodata	95
(A11)	Telephone	99
(A13)	Control unit, Sigma	113
(A14)	Tachograph	93
(A15)	Control unit, front PTO	181
(A16)	Fieldmaster	155
(A17)	Adapter, Fieldmaster sensor signals	154
B1	Sensor, engine temperature gauge	16
B2	Sensor, fuel gauge	17
(B3)	Temperature sensor, gearbox	102
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
B6	Velocity sensor, gearbox	81D, 102, 128, 153
(B7)	Velocity sensor, PTO	102, 116, 123
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D, 157
B11	Velocity sensor, engine	127
B12	Sensor, F/R power shuttle	124
B13	Sensor, F/R	125
B14	Temperature sensor, gearbox	139
B15	Angle sensor, accelerator pedal	140
B16	Angle sensor, clutch pedal	137
B17	Temperature sensor, outdoors	141
B18	Sensor, front PTO –speed	182
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	46
E9	Rear working light, right outer	42
E10	Rear working light, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	
(E45)	Step light	46
(E46)	Trailer hitch light	205
(E47)	Extra front working light, right	201
(E48)	Extra front working light, left	203

Symbol	Component	Code no

Fuses

F1	15A Hazard blinkers, water pump	31, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	10A Parking lights, left	29
F6	10A Parking lights, right	30
F7	25A Front working lights	44, 201
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35, 187
F10	25A 3–pin current socket	96
F11	5A Autocontrol	83B, 83D
F12	10A Rot. warning light, cabin light, radio	47
F13	10A Reserve	100
F14	15A Starter switch, thermostart	4
F15	25A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Direction indicators, Fieldmaster	32, 154
F18	5A Instruments, warning lights, Autocontrol	17, 190
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer, radio	48
F21	15A Fan I, II, air conditioner, floor fan	55
F22	10A Sensors HiTech, 4WD	70, 181
F23	10A Rear working lights, outer	41
F24	10A AC5, seat direction	126, 164
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	113
F27	10A Braking lights, differential lock	64
F28	10A Telephone, 2A if HF*	99
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel, 1A if HF*	120
F50	25A Electric stop solenoid, 8950Hi	
(F51)	15A Main switch control, in engine room	197
	If Hands Free is fitted	
G1	Battery	1
G2	Alternator	4, 118
H1	Indicator light, direction indicator trailer II	34
H2	Indicator light, direction indicator trailer I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temperature, parking brake cable	15
H7	Indicator light, gearbox oil press.	9
H8	Indicator light, gearbox oil filter	10
H9	Indicator light, 4WD	69
H10	Indicator light PTO	132
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	16
H16	Indicator light, charging	6
H17	Indicator light, Sigma	111
H18	Indicator light, gearb. oil temp.	13
H20	Indicator light, diff. lock	63
H23	Horn	50
(H24)	Rotating roof light	47
(H27)	Reverse Buzzer	148
(H28)	Indicator light, Stop, rear	
(H31)	Indicator light, direction indicator, left instrumentation	34
(H32)	Indicator light, direction indicator, right instrumentation	34
(H33)	Indicator light front PTO, instrumentation	12

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Symbol	Component	Code no
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56
K7	Control relay, 4–wheel brake	71
K9	Relay, interval wiper	52
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	64
K13	Control relay, differential lock	65
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	70
K17	Relay, electric stop solenoid, 8950Hi	
(K18)	Relay, control stop	8
K25	Control relay, upper head lights to working lights	
K27	Control relay, 4WD on/off	68
(K29)	Relay, back buzzer	147
(K51)	Warning light, main switch	191
K52	Auxiliary relay, start allowed	66
K56	Time–delay relay, cab light	46
M1	Starter motor	3
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	49
(M6)	Rear window washer	48
M7	Floor fan	57
(M8)	Water pump	97
(M9)	Roof window wiper	50
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour meter	19, 111
P5	Clock, PTO–speed, AC, trip, oil temperature, speed, (Sigma) (Agroline instrumentation)	102
P6	Display, AC5	133
Q1	Heat/starter switch	4
(Q2)	Main switch	3, 196
R1	Thermostart	5
R4	Cigarette lighter	91
R7	Potentiometer, front PTO, starting speed	184
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25,34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	47
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	142
S10	Switch, braking lights, right	72
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Reed relay, parking brake (P)	149
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	73
S22	Switch, differential lock	61
S23	Extra switch, Delta Power Shift, selector	139, 140
S25	Switch, PTO	75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	
S28	Switch, PTO 540	146
S29	Switch, PTO 1000/540E	147
S30	Switch, 4WD	68
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	48
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	97
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
S37	Switch, Agroline instrumentation, cursor+prog.	103
(S38)	Switch, front–PTO	183
S40	Reed relay, direction forward (F)	146
S41	Reed relay, direction reverse (R)	149
S42	Door switch, cab light, RH	46
S43	Door switch, cab light, LH	46
(S44)	Indicator light switch, filter 180 bar	11
S45	Switches, HiShift	142
(S45.1)	Extra switch, HiShift	
S47	Switch, DPS, man./auto	144
S51	Switch, DPS–preselection	146
S52	Indicator light switch, parking brake cable	14
S53	Indicator light switch, filter, return	10
(S54)	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	49
S60	Safety switch, seat	142
(S68)	Switch, main switch control	196
S76	Traction control on/off	161
S80	Switch, instrumentation, display size setting	103
S83	Switch, trailer hitch light	204
S84	Switch, extra front working lights	200
V1	Diodes Y1, Y2, Y3, Y4, Y6	

Ground leads

GR1	Rear lights, solenoid valves
GR2	Roof
GR4	Autocontrol
GR5	Cable harness, instr. panel
GR7	Battery
GR8	Headlights
GR9	Cabin
GR10	Electrical stop

X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, current socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32

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Sym-bol	Component	Code no
(X18)	2 pin, rear window washer	48
X19	37 pin, engine	
X20	9 pin, front direction indicator	
(X22)	2 pin, rot. roof light	47
X23	3 pin, Delta Power Shift, extra switches	
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instrument right, blue	
X28	9 pin, sensors power shuttle	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
X31	2 pin, socket, PTO–emerg. stop	75
(X32)	1 pin, electric stop	5
(X33)	3 pin, fog light, rear	
X35	9 pin, SIGMA supply	
X39	9 pin, direction lever	
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	
X43	8 pin, RS–232 bus	151
(X45)	9 pin, Fieldmaster, extra equipment	
(X46)	7 pin, Fieldmaster, current socket	155
(X47)	2 pin, GPS–supply, Fieldmaster	
(X48)	3 pin, radar, Fieldmaster	
X49	2 pin, seat	94
(X50)	3 pin current socket	96
(X55)	1 pin, Fieldmaster	95
X64	2–speed., front PTO speed signal	102
Y1	Solenoid valve, differential lock	64
Y2	Solenoid valve, PTO	133
Y3	Solenoid valve, 4WD	71
Y4	Solenoid valve, Delta Power Shift	133
(Y5)	Magnetic clutch, compressor, air conditioner	54
Y6	Solenoid valve, Delta Power Shift	134
(Y7)	Solenoid valve, rear steering prevention	94
Y8	Solenoid, engine running	4
(Y9)	Magnetic clutch, front–PTO	77
Y11	Solenoid, forward	131
Y12	Solenoid, reverse	132
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, cold cranking	3
Y17	Solenoid valve, Delta Power Shift	134
Y18	Solenoid, parking brake	67

AC5 –Control system, HiTech

A1A	Control unit, AC5	122–152
S1A	Switch, PTO rear start, left	74
S2A	Switch, PTO rear start, right	74
X1A	Connector housing, 9 pin, engine sensors	140–141

TwinTrac reverse drive controls

(B1W)	Angle sensor, clutch pedal	171
(S1W)	Switch, DPS–extra	173
(S2W)	Limit switch, clutch pedal	162
(S3W)	Limit switch, seat direction	163
(S4W)	Switch, DPS–preselection, rear	165
(S5W)	Reed relay, direction front (F), rear	166
(S6W)	Reed relay, direction reverse (R), rear	167
(S7W)	Reed–relay, parking brake, rear	168
(S9W)	Switch, brake pedal, rear right	169
(X1W)	Connector housing 12–pin, TwinTrac	
(X2W)	Connector housing 1–pin., supply (P1W)	
(X3W)	Connector housing 9–pin., direction lever, rear	
P1W	Rear display, AC5	128

Sym-bol	Component	Code no

ACB/ACD Autocontrol power lift:

A1E	Autocontrol electronic unit	82B, 82D
A2E	Autocontrol, switch panel	85B, 85D
B1E	Position sensor	81B, 81D
B2E	Draft sensor, r.h	81B, 81D
B3E	Draft sensor, l.h	81B, 81D
(B4E)	Position sensor, implement (ACD)	81D
E1E	Lightning switch panel	85B, 85D
E2E	Lightning, position potentiometer	86B, 86D
R1E	Potentiometer, pos .control	85B, 85D
S1E	Switch, rear operation, r.h., lifting	81B, 83D
S2E	Switch, rear operation, r.h., lowering	81B, 83D
S3E	Switch, rear operation, l.h., lifting	81B, 82D
S4E	Switch, rear drive, l.h., lowering	81B, 82D
S5E	Switch, cabin, lifting/lowering	83B, 83D
S7E	Switch, lowering speed	85B, 85D
S8E	Switch, top limit	85B, 85D
S9E	Switch, mixing	85B, 85D
S10E	Switch, lifting/lowering	85B, 86D
S11E	Switch, forced lowering	85B, 85D
S12E	Switch, Drive Balance Control/Slip	85B, 85D
X1E	Connector housing, 9 pin, speed sensors (ACD)	
X2E	Connector housing, 15 pin., supply & rear push buttons (+implement position sensor)	
Y1E	Solenoid valve, lowering	83B, 84D
Y2E	Solenoid valve, lifting	83B, 84D

CareTel, information collecting system

(A1L)	CareTel, data logger	118
(B1L)	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, CareTel, 190 Bar	116
(B3L)	Sensor, gearbox temperature	117
(B4L)	Temperature sensor, engine	118
(H1L)	Indicator light, CareTel	120
(X1L)	Connector housing, 9 pins, CareTel, RS–232	117–120
(X2L)	Connector housing, 3 pins, CareTel, CAN	117–120
(X3L)	Connector housing, 9 pins, CareTel, extra equipment	117–120
(X4L)	Connector housing, 3 pins, CareTel, supply+NBUS	117–120

Wire colours

RU = brown
PU = red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

Explanations of the abbreviation

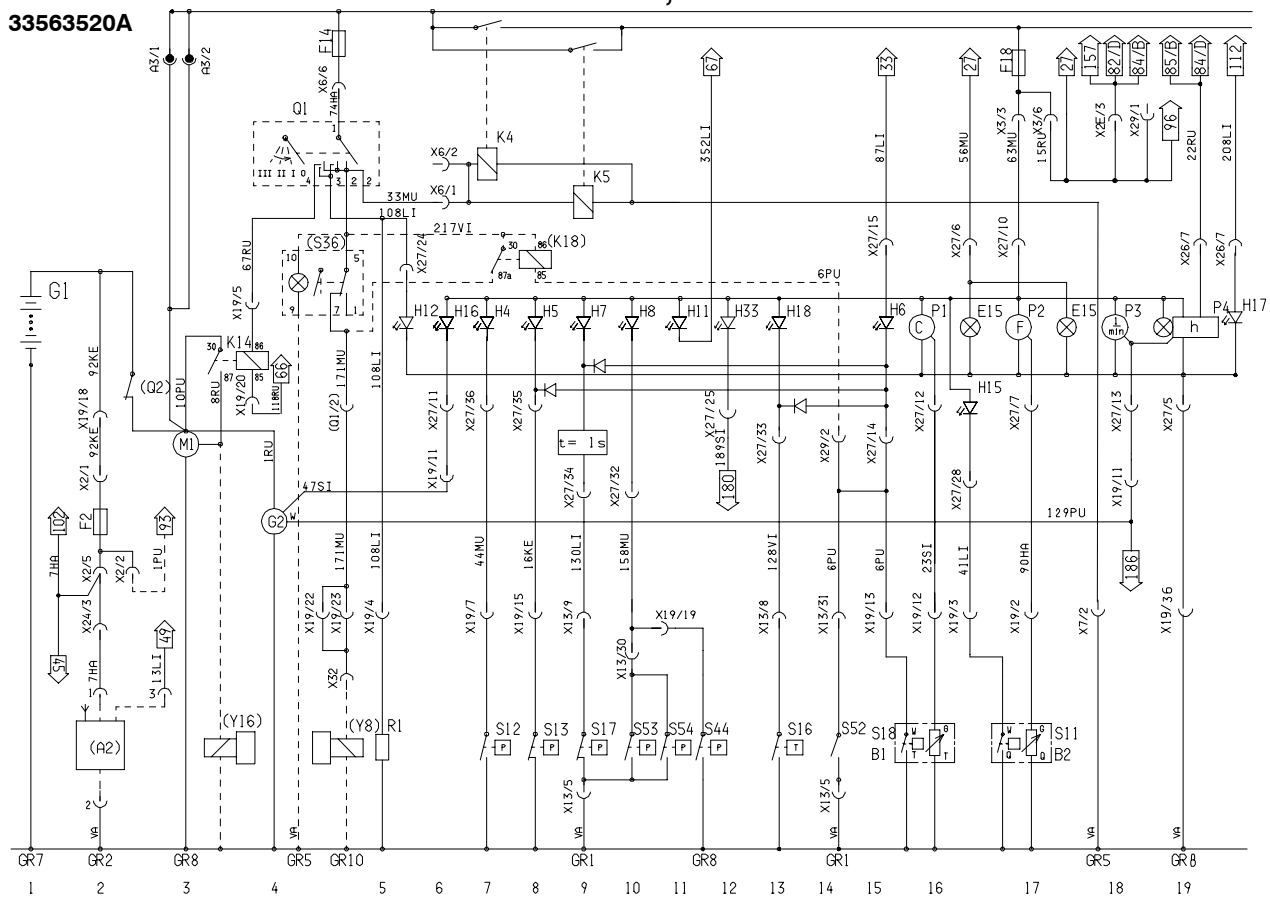
F/R = forward/reverse power shuttle
PTO = power take off
AC = Autocontrol linkage
AC5 = Autocontrol 5 control system
DPS = Delta Power Shift

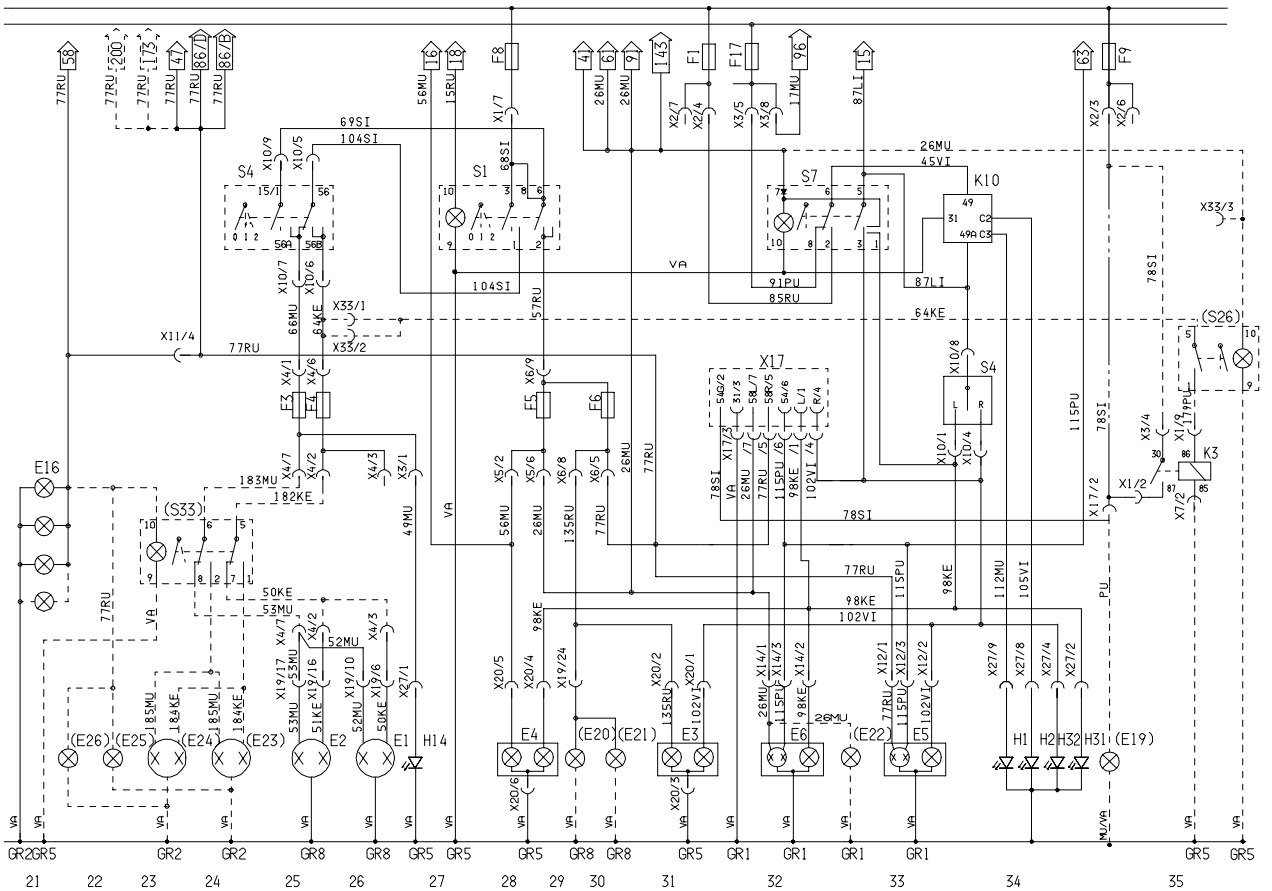
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HiTech, L18105–

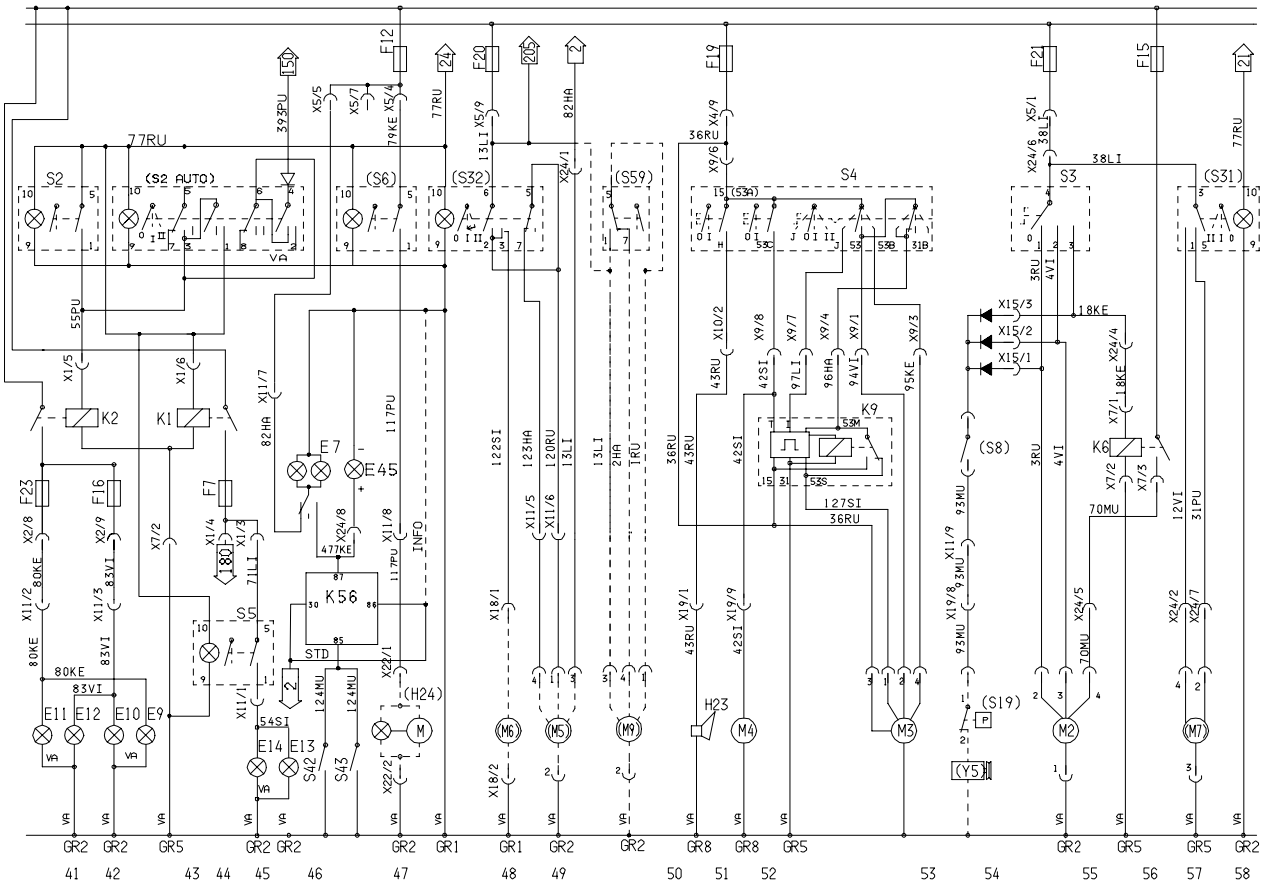
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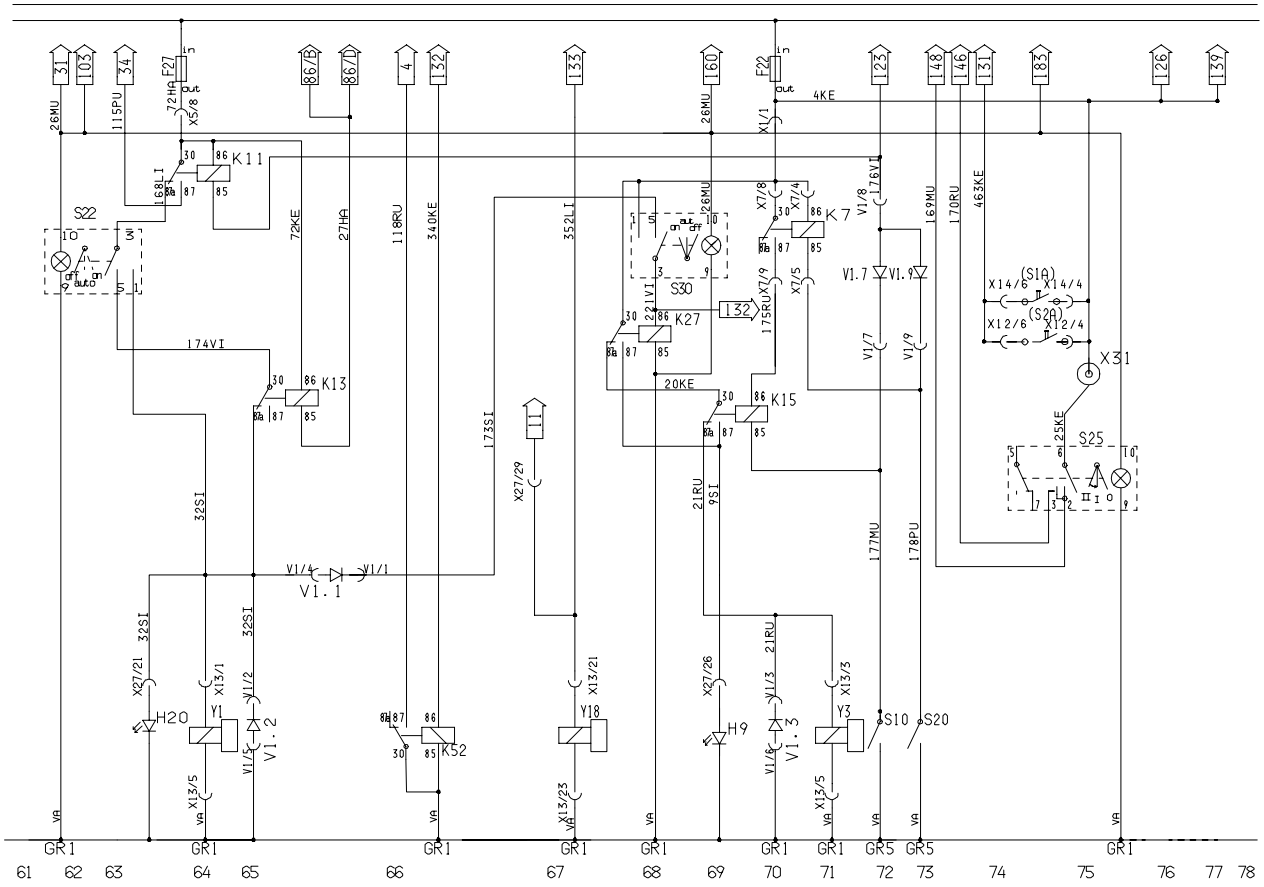




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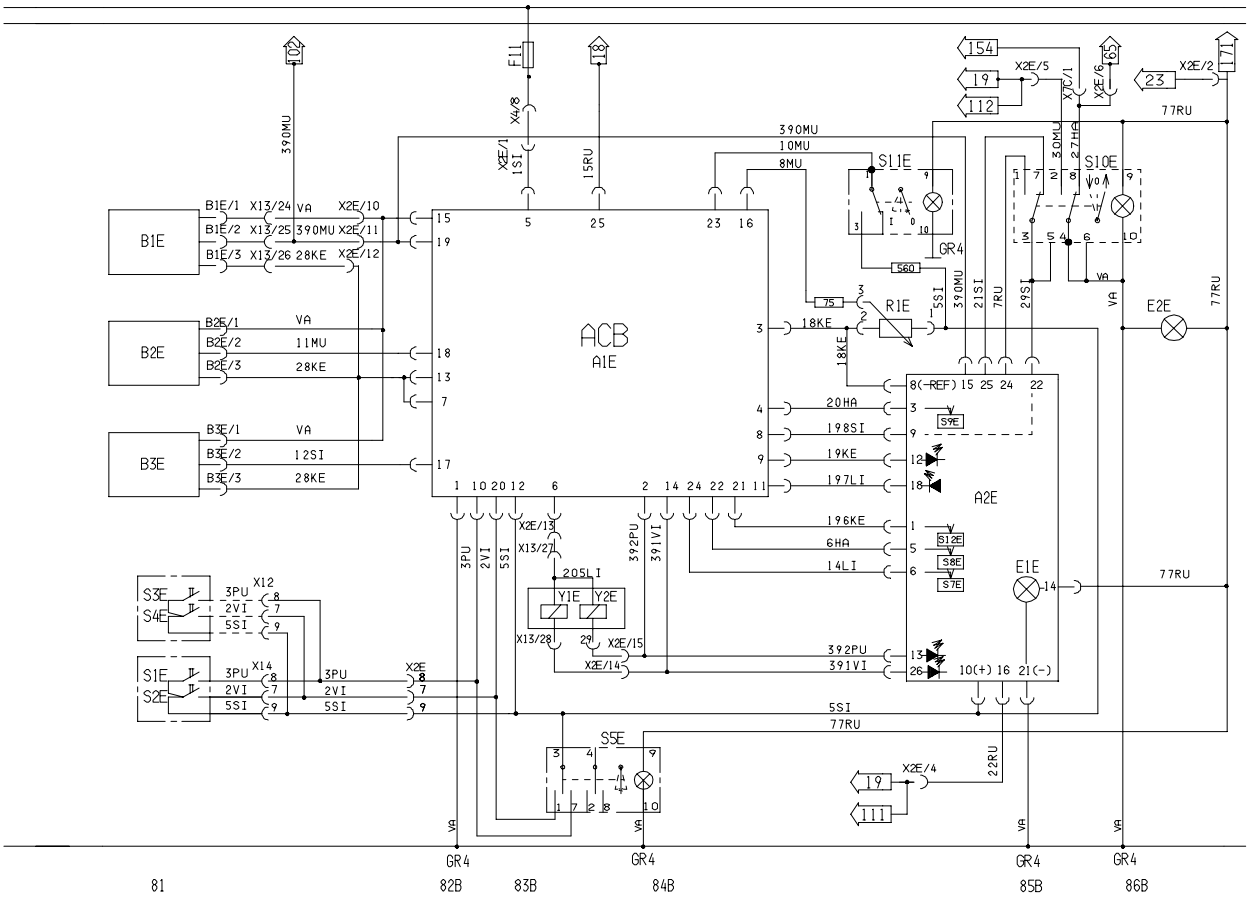
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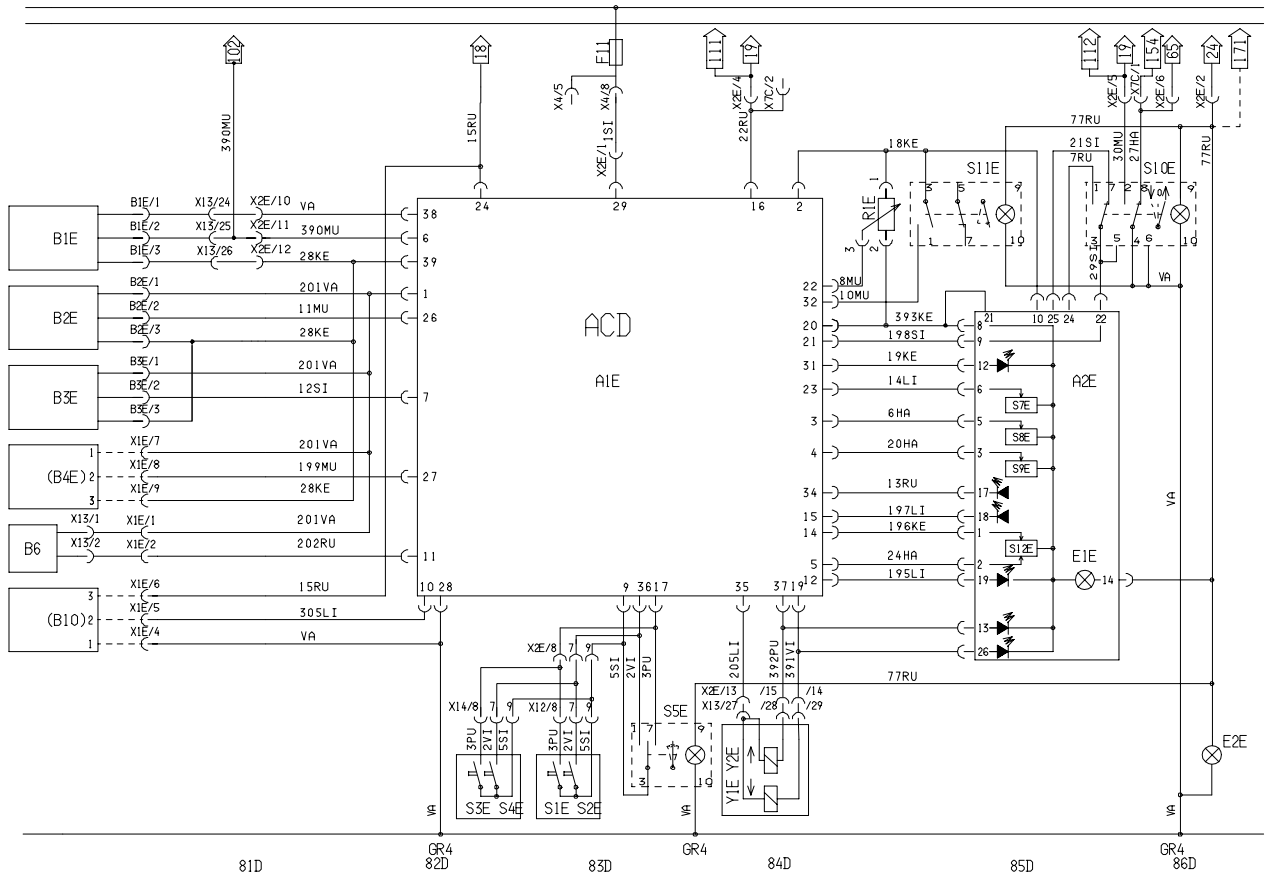




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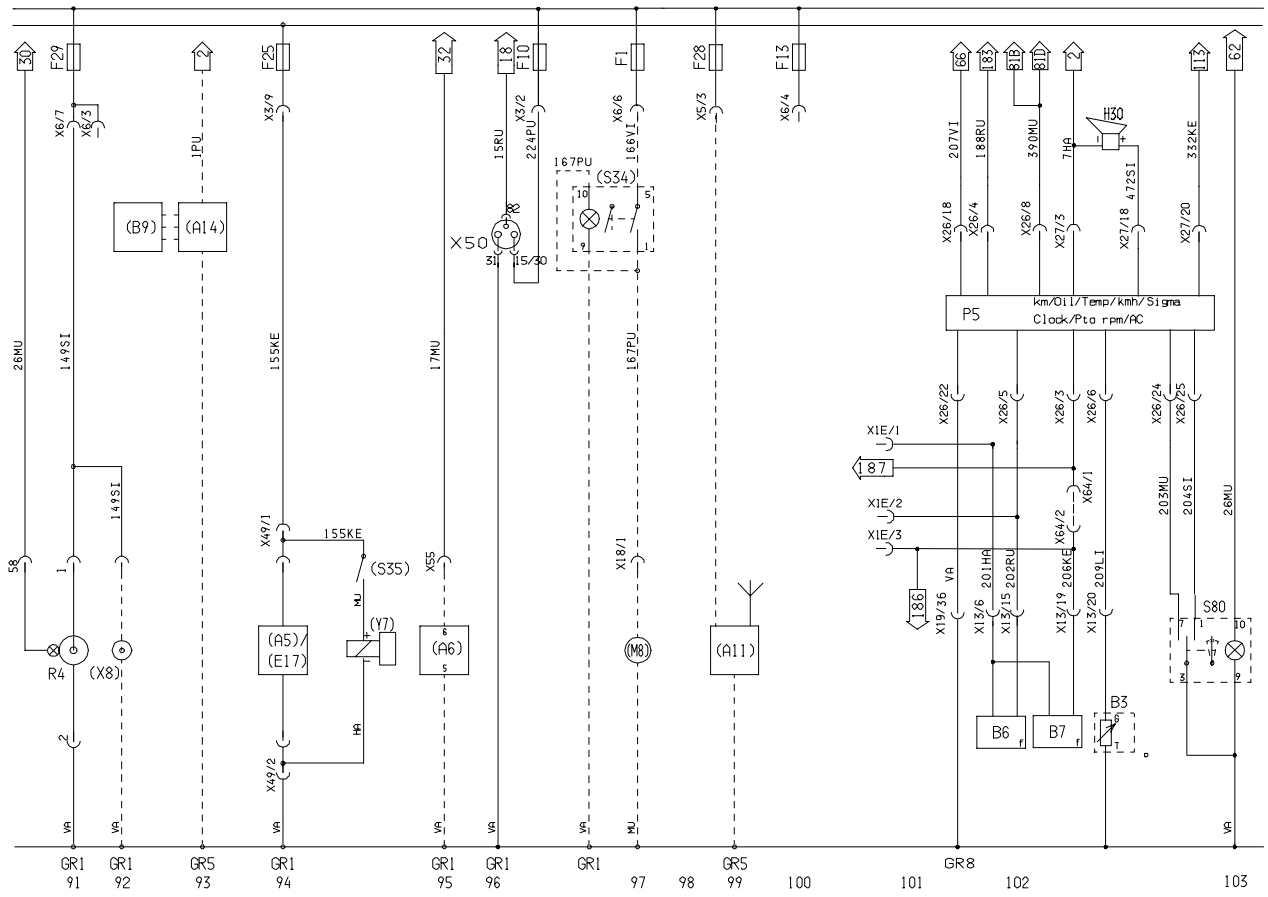
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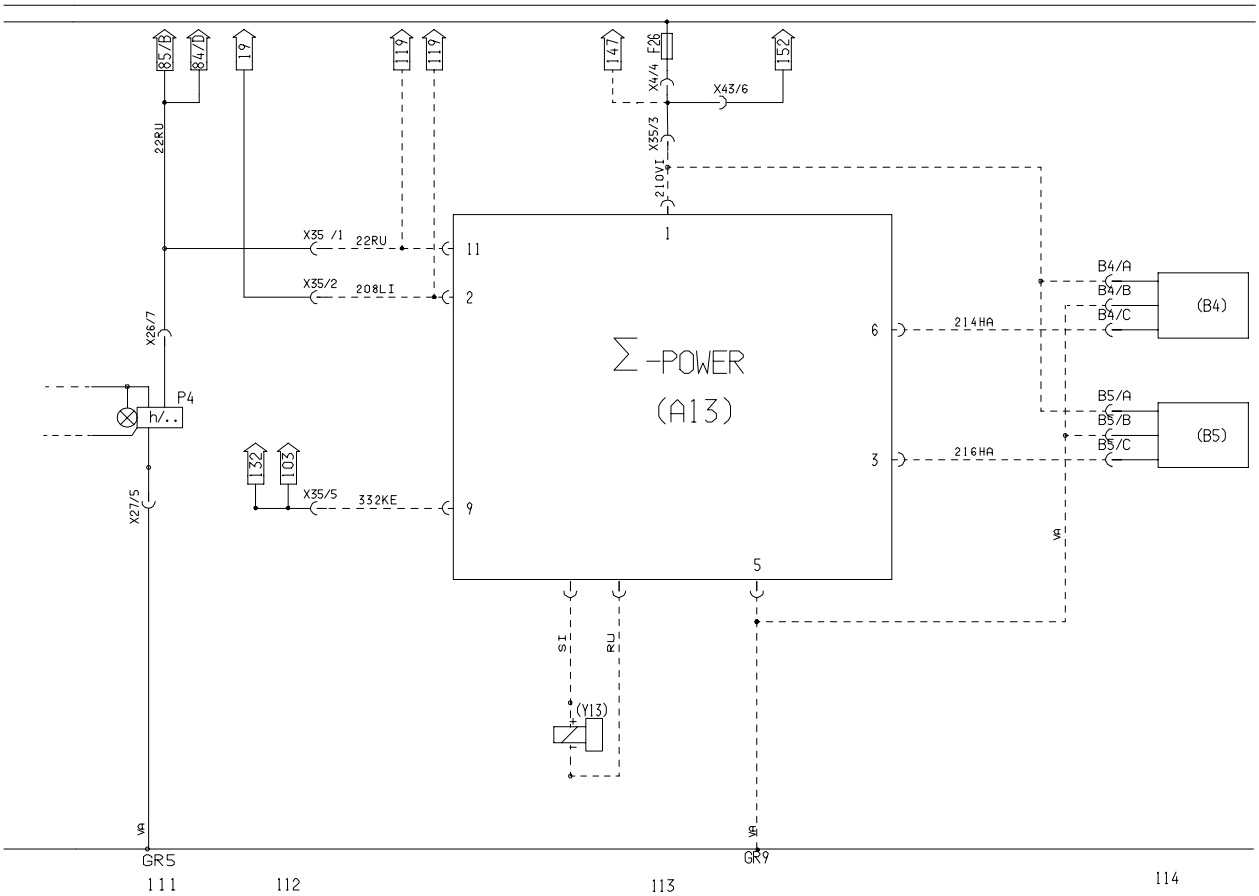




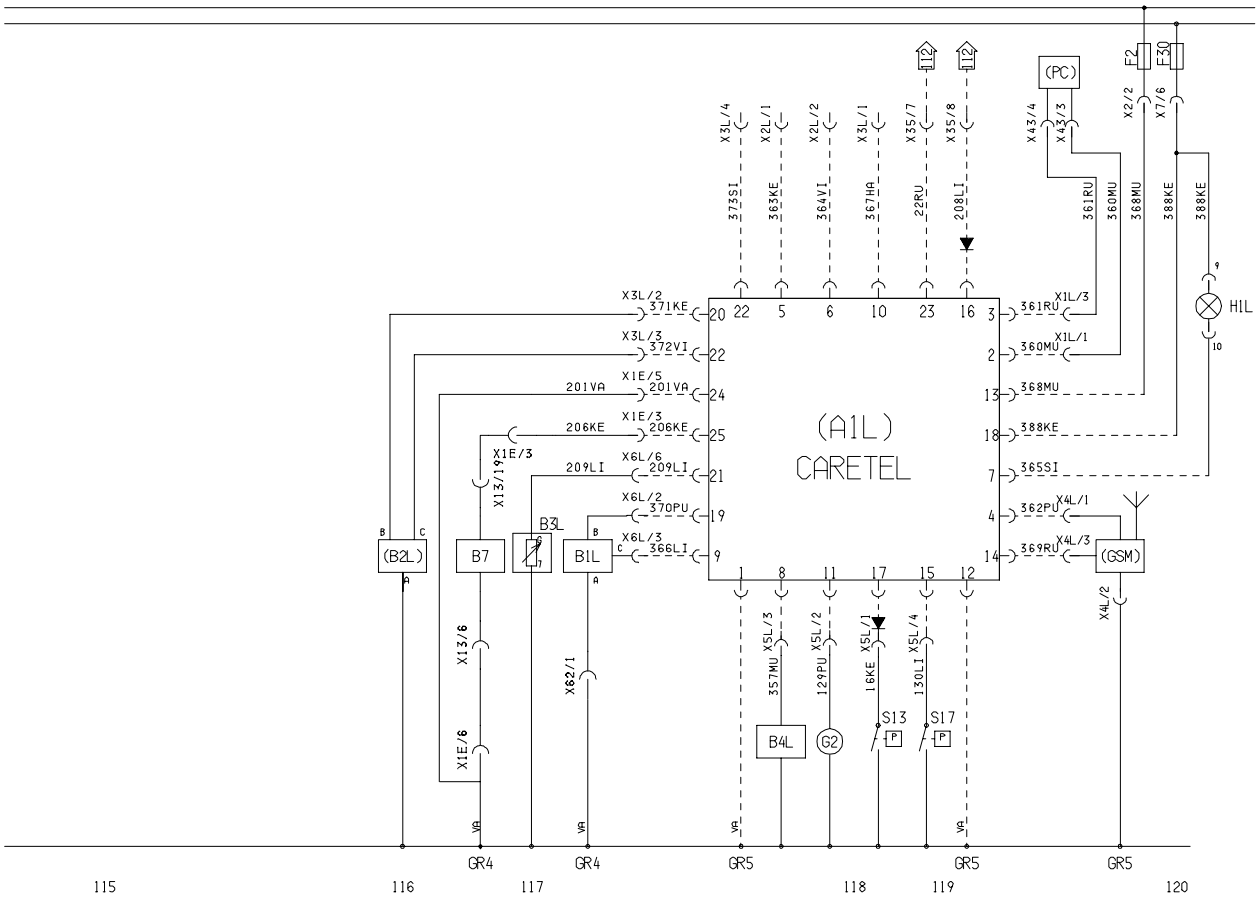
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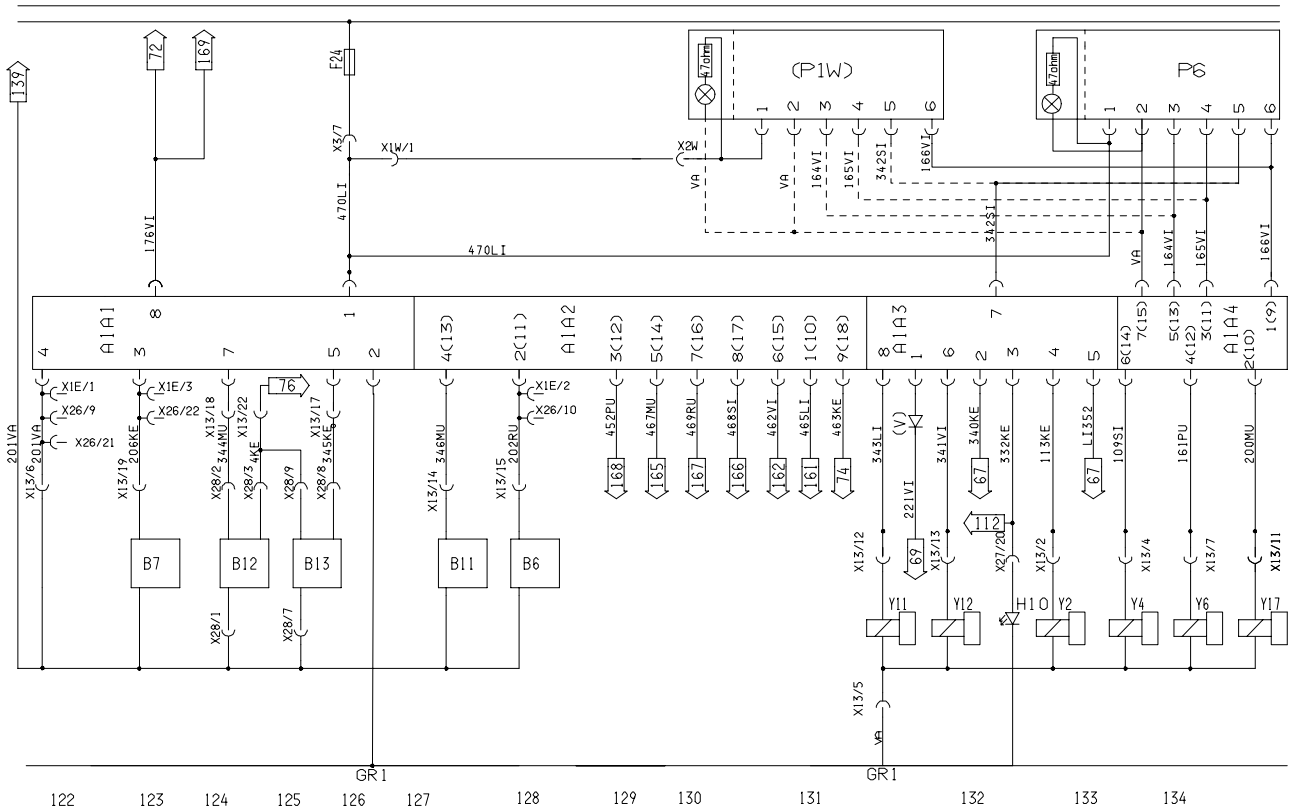
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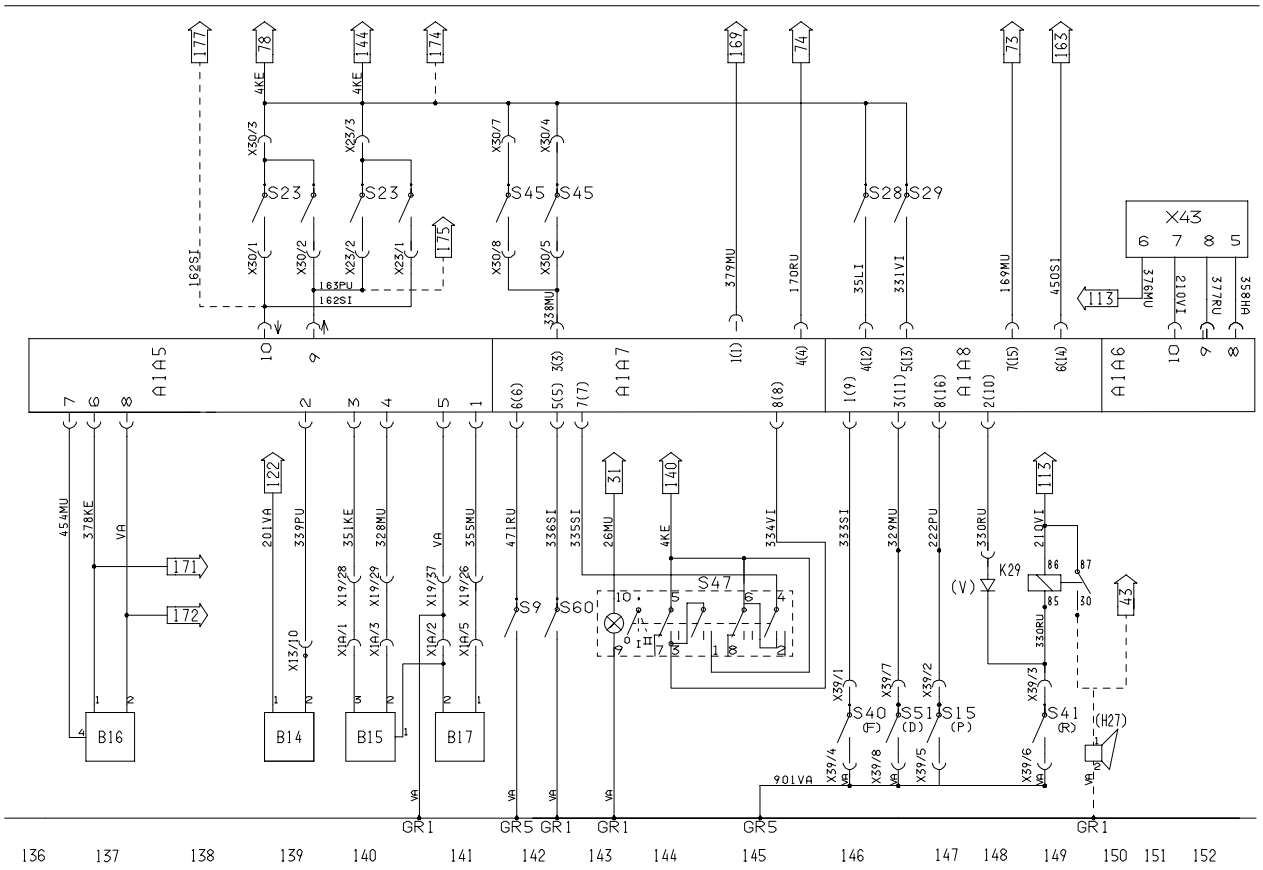


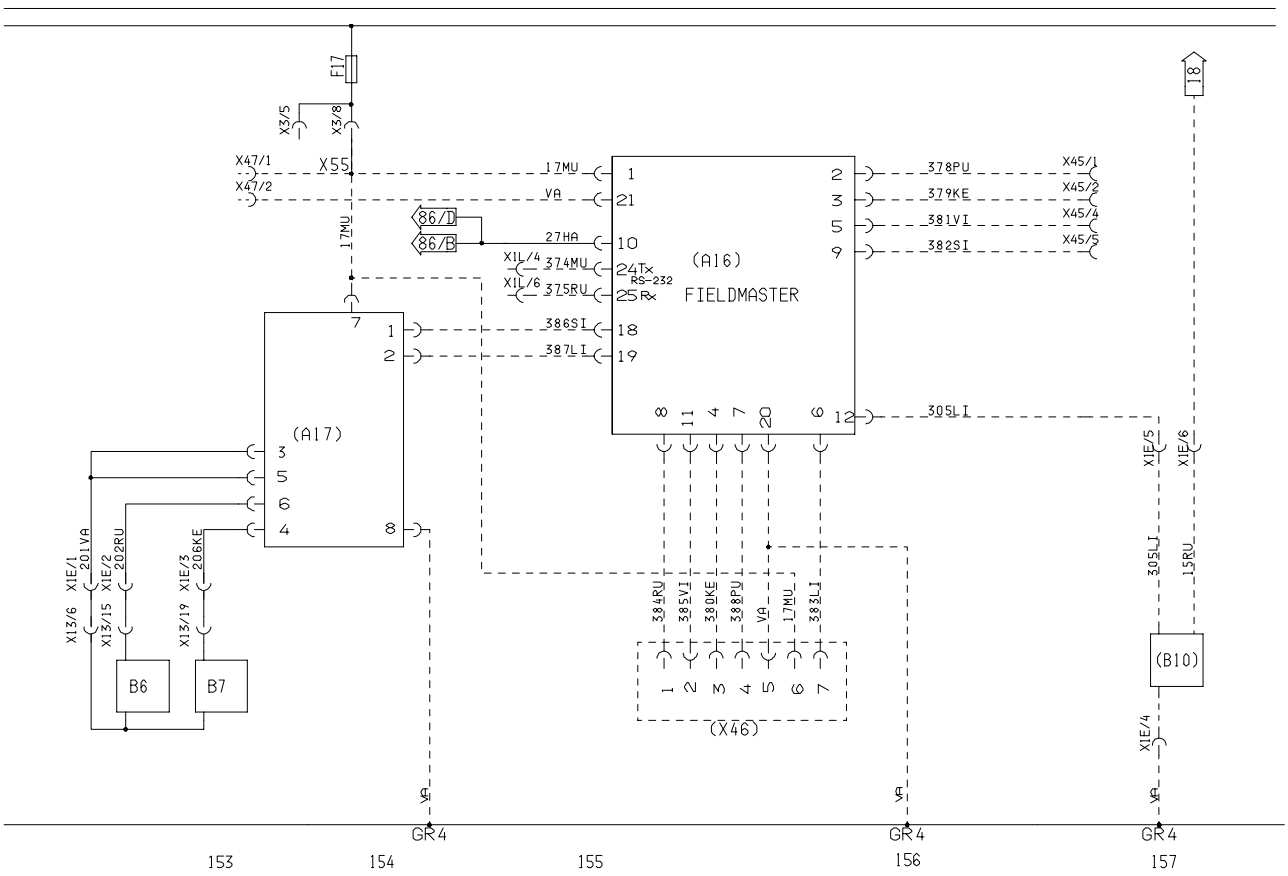
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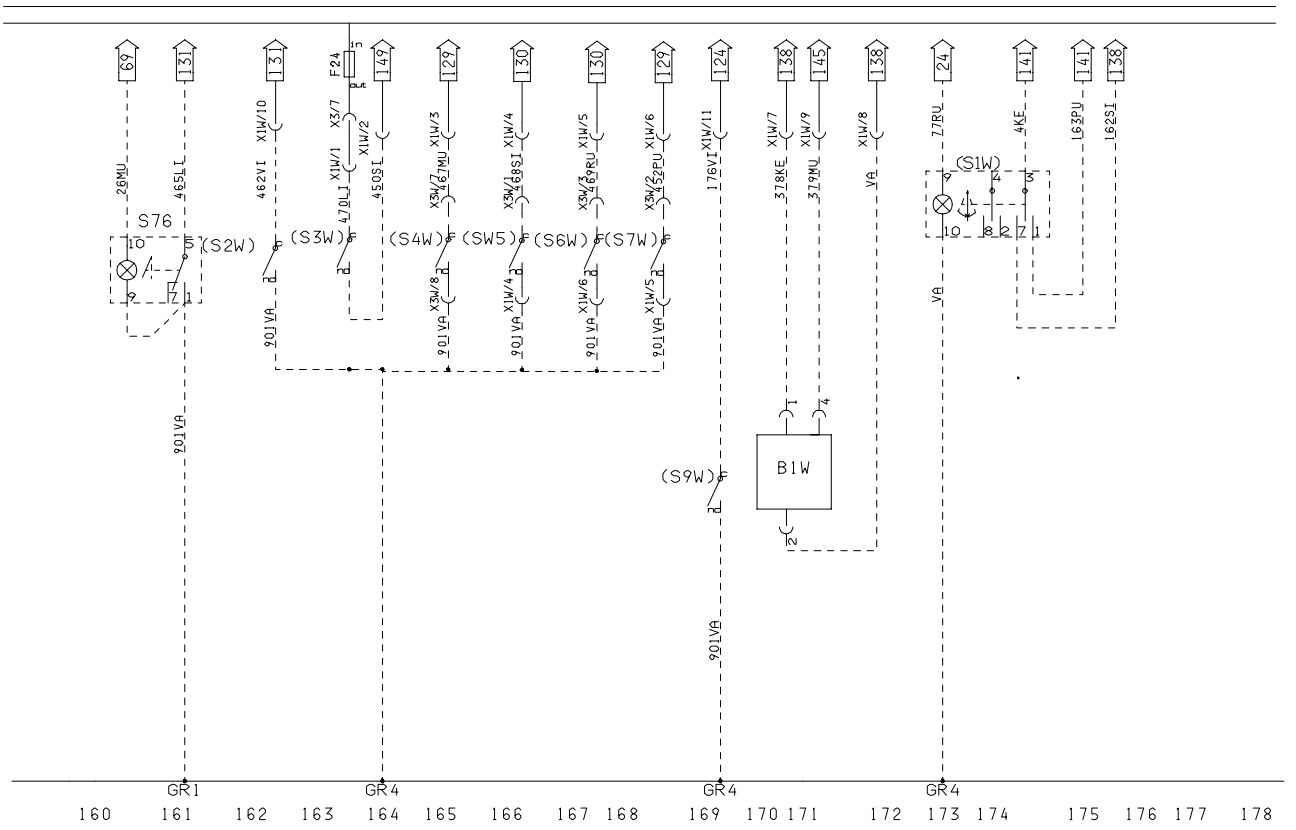


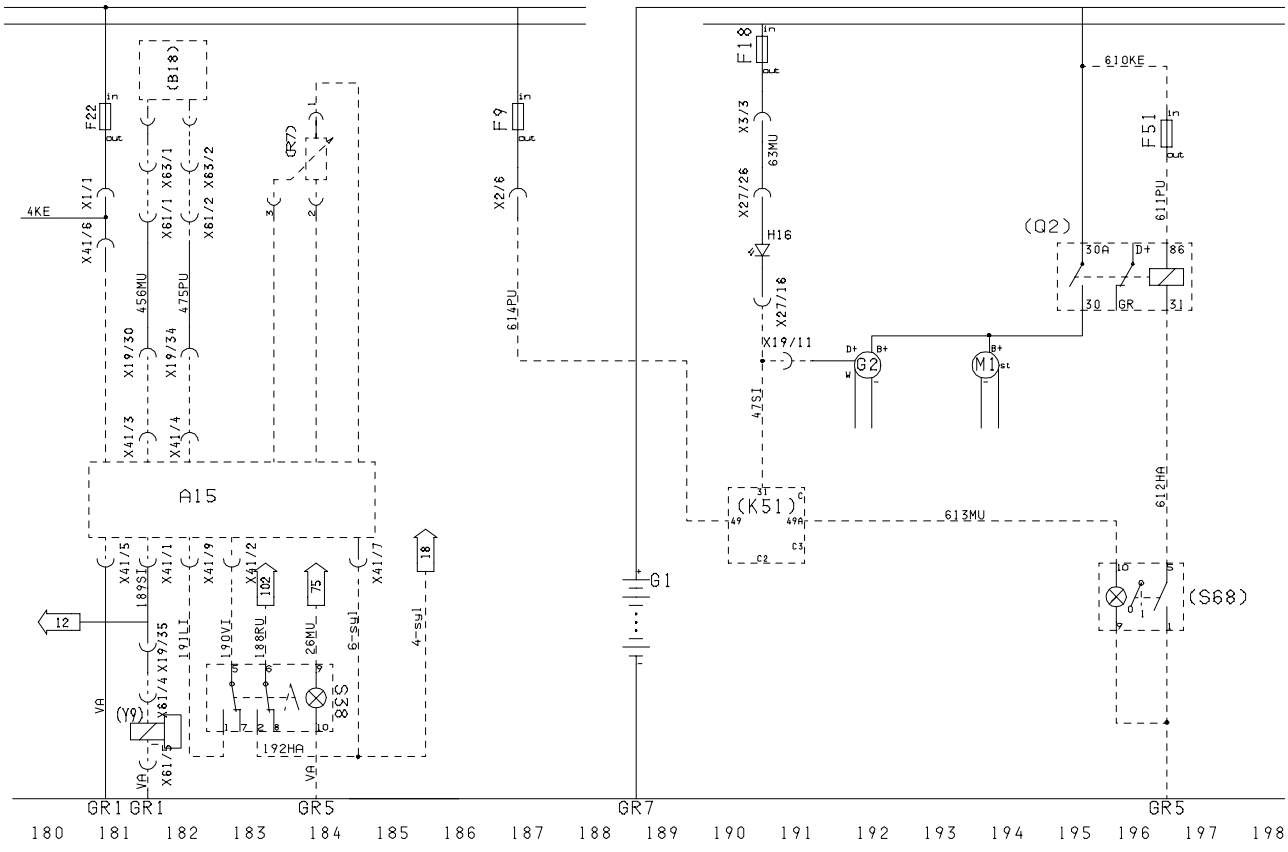


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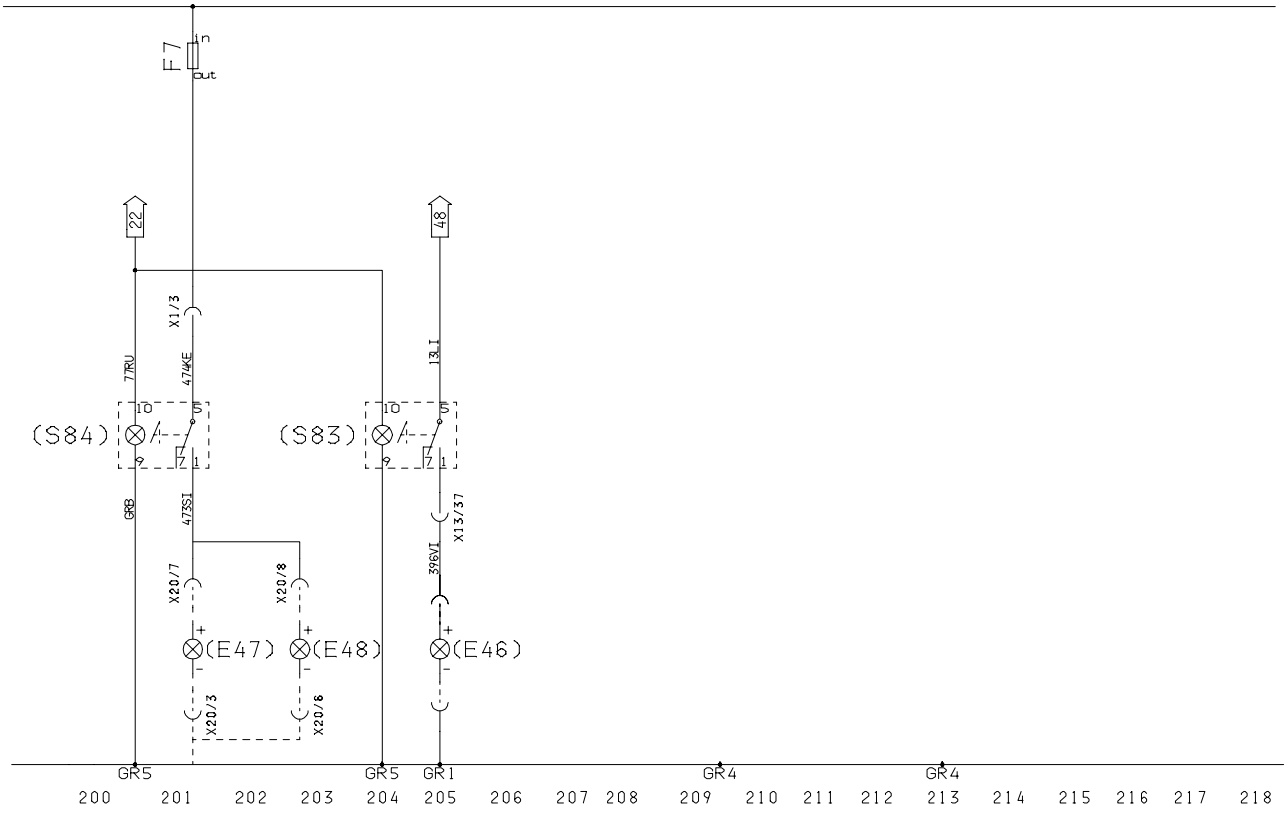





S76
(S2W)
(S3W)
(S4W)
(SW5)
(S6W)
(S7W)
(S1W)
(S9W)
B1W
GR1
GR4
GR4
GR4
160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178


A15
(B18)
F22
F9
F18
F51
(Q2)
(K51)
G1
G2
M1
(S68)
(Y9)
S38
GR1 GR1
GR5
GR7
GR5
180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198

HiTech, L18105–



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Wiring diagram, 6200–8550 (AC 2.3), L17307–,

Diagram no. 318 716 70A (not HiTech). Diagram incl. e.g. Agroline–instrument. Diagrams on pages 310/105–109.

Sym–bol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	94
(A6)	Agrodata	93
(A10)	Control unit, DPS	70
(A11)	Telephone	96
(A14)	Tachograph	93
(A15)	Control unit, front PTO	162
(A16)	Fieldmaster	155
(A17)	Adapter, Fieldmaster sensor signals	154
B1	Sensor, engine temperature	16
B2	Sensor, fuel gauge	17
B3	Sensor, gearbox temperature	102
B6	Velocity sensor, gearbox	81D, 102, 153
B7	Velocity sensor, PTO	102, 117, 153
(B8)	Sender, wheel speed	
(B9)	Sensor, tachograph	93
(B10)	Speed radar	81D, 157
B18	Sensor, front PTO –speed	160
E1	Headlights, right	26
E2	Headlights, left	25
E3	Front direction indicator, right	31
E4	Front direction indicator, left	28
E5	Rear light, right	33
E6	Rear light, left	32
E7	Cab light	97
E9	Rear working light, right outer	42
E10	Rear working light, right inner	42
E11	Rear working light, left outer	41
E12	Rear working light, left inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	Instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Register plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
(E27)	Working light, side	
(E28)	Working light, side	
(E45)	Step light	97
(E46)	Trailer hitch light	101
(E47)	Extra front working light, right	46
(E48)	Extra front working light, left	46

Sym–bol	Component	Code no

Fuses

F1	15A Hazard blinkers, water pump	31, 97
F2	5A Radio, clock, tachograph, CareTel	2, 120
F3	15A High beam	25
F4	15A Low beam	25
F5	10A Parking lights, left	28
F6	10A Parking lights, right	30
F7	25A Front working lights	44
F8	25A Light switch	28
F9	15A Trailer socket/fog light, rear	35, 165
F10	25A 3–pin current socket	97
F11	5A Autocontrol (+Bat), buzzer	71, 82B, 82D
F12	10A Rot. warning light, cabin light	99
F13	10A Reserve	94
F14	15A Starter switch, thermostart	4
F15	25A Fan III– speed	56
F16	10A Rear working lights, inner	42
F17	10A Dir. indicators, Fieldmaster, Agrodata	32, 153
F18	5A Instruments, warning lights, Autocontrol	17, 166
F19	10A Windscreen wiper/washer, horn	51
F20	10A Rear window wiper/washer, radio	48, 101
F21	15A Fan (I, II), air conditioner, floor fan	55
F22	10A 4WD, PTO, DPS	65, 160
F23	10A Rear working lights, outer	41
F24	10A Reserve	94
F25	15A Air suspension seat/seat heating, rear steering prevention	94
F26	10A Back buzzer, Sigma, HiShift	44, 96, 116
F27	10A Braking lights, differential lock	62
F28	10A Telephone, 2A if HF*	96
F29	10A Cigarette lighter, 2–pin current socket	91
F30	10A CareTel, 1A if HF*	120
(F51)	15A Main switch, control, in engine room	168

*If Hands Free is fitted

G1	Battery	1, 165
G2	Alternator	4, 118, 166
H1	Indicator light, direction indicator trailer II	34
H2	Indicator light, direction indicator trailer I	34
H4	Indicator light, air filter	7
H5	Indicator light, engine oil pressure	8
H6	Warning light, stop, engine temp.	15
H7	Indicator light, gearbox oil press.	9
(H8)	Indicator light, oil filter, gearbox	10
H9	Indicator light, 4WD	65
H10	Indicator light PTO	67
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator light, fuel reserve	16
H16	Indicator light, charging	6, 166
H18	Indicator light, gearb. oil temp.	13
H19	Indicator light DPS I	71
H20	Indicator light, diff. lock	63
H21	Indicator light DPS II	71
H22	Indicator light DPS III	71
H23	Horn	50
(H24)	Rotating roof light	99
(H27)	Reverse Buzzer	44
(H28)	Indicator light, STOP, rear	
(H30)	Buzzer, instrumentation, rear	102
(H31)	Indicator light, direction indicator, left instrumentation	34
(H32)	Indicator light, direction indicator, right instrumentation	34
(H33)	Indicator light front PTO, instrumentation	19

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Sym-bol	Component	Code no
K1	Relay, front working lights	43
K2	Relay, rear working lights	41
(K3)	Relay, fog light, rear	35
K4	Auxiliary relay, starter switch	7
K5	Auxiliary relay, starter switch	9
K6	Relay, fan III	56
K7	Control relay, 4–wheel brake	65
K9	Relay, interval wiper	53
K10	Direction indicator relay	34
K11	Relay, brake lights/differential lock	64
K13	Control relay, differential lock	65
K14	Starter motor relay	4
K15	Control relay, 4–wheel drive	69
K16	Relay, PTO–emergency stop	68
(K18)	Relay, control stop	8
(K24)	Control relay, HiShift	115
K26	Control relay, speed limit, HiShift	
K27	Control relay, 4WD on/off	68
(K51)	Warning light, main switch	166
K56	Time–delay relay, cab light	97
M1	Starter motor	3, 167
M2	Fan	55
M3	Windscreen wiper	53
M4	Windscreen washer	51
(M5)	Rear window wiper	48
(M6)	Rear window washer	47
M7	Floor fan	57
(M8)	Water pump	95
(M9)	Roof window wiper	49
P1	Engine temperature meter	16
P2	Fuel gauge	17
P3	Tachometer	18
P4	Running hour meter	19
P5	Clock, PTO–speed, AC, trip, oil temperature, speed (Agroline instrumentation)	101
Q1	Heat/starter switch	4
(Q2)	Main switch	3, (167)
R1	Thermostart	5
R4	Cigarette lighter	91
R7	Potentiometer, front PTO, starting speed	161

Sym-bol	Component	Code no
S1	Switch, head lights	28
S2	Switch, rear working lights	41
S3	Switch, fan	55
S4	Combined switch	25, 34, 52
S5	Switch, front working lights	43
(S6)	Switch, rot. warning light	99
S7	Switch, hazard warning flashers	32
(S8)	Switch, air conditioner	54
S9	Starter safety switch	4
S10	Switch, braking lights, right	72
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8, 118
S15	Sender unit to parking brake ind. light	12
(S15)	Reed relay, parking brake (P)	149
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9, 119
S18	Engine temperature sender unit (stop)	16
(S19)	Switch, compressor pressure	54
S20	Switch braking lights, left	73
S22	Switch, differential lock	62
(S23)	Switch, DPS, selector	70, 71
S24	Switch, DPS, release	69
S25	Switch, PTO	75
(S26)	Switch, fog light rear	35
(S27)	Switch, reverse buzzer	45
S28	Switch, PTO 540	68
S29	Switch, PTO 1000/540E	67
S30	Switch, 4WD	68
S31	Switch, floor fan	57
(S32)	Switch, rear window wiper and washer	47
(S33)	Change over switch, head lights up	23
(S34)	Switch, water pump	96
(S35)	Switch, rear steering prevention	94
(S36)	Switch, control stop	4
(S38)	Switch, front–PTO	162
(S42)	Door switch, cab light, RH	97
(S43)	Door switch, cab light, LH	98
(S44)	Indicator light switch, filter 180 bar	11
(S45)	Switch, HiShift	115, 142
(S45.1)	Extra switch, HiShift	115
(S49)	Change over switch, rpm/flow sensor	
(S50)	Change over switch, speed sensor, tractor/ implement	
(S53)	Indicator light switch, filter, return	10
(S54)	Indicator light switch, filter, 18 bar	11
(S59)	Switch, roof window washer	49
S68	Switch, main switch control	168
S80	Switch, instrumentation, display size setting	103
(S83)	Switch, trailer hitch light	101
(S84)	Switch, extra front working lights	46
V1	Diodes Y1, Y2, Y3, Y4, Y6	
V2	Diodes, AC–2	
V3	Diodes Y1, Y2, Y3, Y4, Y6	65
(V5)	Diodes, HiShift	115

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Sym-bol	Component	Code no
Ground leads		
GR1	Rear lights, solenoid valves	
GR2	Roof	
GR4	Autocontrol	
GR5	Cable harness, instr. panel	
GR7	Battery	
GR8	Headlights	
GR9	Cabin	
GR10	Electrical stop	
X1	9 pin, distribution box	
X2	9 pin, distribution box	
X3	9 pin, distribution box	
X4	9 pin, distribution box	
X5	9 pin, distribution box	
X6	9 pin, distribution box	
X7	9 pin, distribution box	
(X8)	2 pin, power socket	92
X9	9 pin, combination control	
X10	9 pin, combination control	
X11	9 pin, upwards	
X12	9 pin, rearwards, right	
X13	37 pin, transmission	
X14	9 pin, rearwards, left	
(X15)	3 pin, air cond., diodes	54
X17	7 pin, trailer socket	32
(X18)	2 pin, rear window washer	48
X19	37 pin, front wall	
X20	9 pin, front direction indicator	
(X22)	2 pin, rot. roof light	99
X23	3 pin, DPS, extra switches	71
X24	9 pin, upwards	
X26	26 pin, instrument left, white	
X27	26 pin, instr. right, blue	
(X29)	2 pin, STOP–alarm (max. 2 W)	
X30	9 pin, switches gear levers	
(X32)	1 pin, electric stop	5
(X33)	3 pin, fog light, rear	
(X36)	3 pin, HiShift, speed–limit+ supply	
X31	2 pin, PTO–emerg. stop	68, 74
(X41)	2 pin, front PTO	
(X42)	4 pin, front PTO, supply	
(X43)	8 pin, RS–232 bus	
(X45)	9 pin, Fieldmaster, extra equipment	
(X46)	7 pin, Fieldmaster, current socket	
(X47)	2 pin, GPS–supply, Fieldmaster	
(X48)	3 pin, radar, Fieldmaster	
(X49)	2 pin, seat	
(X50)	3 pin current socket	96
(X55)	1 pin, Fieldmaster	
X64	2–speed., front PTO speed signal	162
Y1	Solenoid valve, diff lock	63
Y2	Solenoid valve, PTO	68
Y3	Solenoid valve, 4WD	66
(Y4)	Solenoid valve, DPS	69
(Y5)	Magnetic switch, compressor, air conditioner	54
(Y6)	Solenoid valve, DPS	70
(Y7)	Solenoid valve, rear steering prevention	94
(Y8)	Solenoid, engine running	4
(Y9)	Magnetic clutch, front PTO	164
(Y14)	Solenoid valve, HiShift	115
(Y15)	Solenoid valve, HiShift, slowing	115
(Y16)	Solenoid, cold cranking	3

Sym-bol	Component	Code no
ACB/ACD Autocontrol power lift		
A1E	Autocontrol electronic unit	82B, 82D
A2E	Autocontrol, switch panel	83B, 83D
B1E	Position sensor	81B, 81D
B2E	Draft sensor, right	81B, 81D
B3E	Draft sensor, left	81B, 81D
(B4E)	Position sensor, implement (ACD)	81D
E1E	Lightning, switch panel	83B, 83D
E2E	Lightning, position potentiometer	83B, 83D
R1E	Potentiometer, pos .control	83B, 83D
S1E	Switch, rear operation, r.h., lifting	81B, 81D
S2E	Switch, rear operation, r.h., lowering	81B, 81D
S3E	Switch, rear operation, l.h., lifting	81B, 81D
S4E	Switch, rear drive, l.h., lowering	81B, 81D
S5E	Switch, cabin, lifting/lowering	82B, 82D
S7E	Switch, lowering speed	83B, 83D
S8E	Switch, top limit	83B, 83D
S9E	Switch, mixing	83B, 83D
S10E	Switch, lifting/lowering	83B, 83D
S11E	Switch, forced lowering	83B, 83D
S12E	Switch, Drive Balance Control/slip	83B, 83D
X1E	Connector housing, 9 pin, speed sensors (ACD)	
X2E	Connector housing, 15 pin., supply & rear push buttons (implement position sensor)	
Y1E	Solenoid valve, lowering	82B, 82D
Y2E	Solenoid valve, lifting	82B, 82D
CareTel, information collecting system		
A1L	CareTel, data logger	118
B1L	Pressure sensor, CareTel, 18 Bar	117
(B2L)	Pressure sensor, CareTel, 190 Bar	116
B3L	Sensor, gearbox temperature	117
B4L	Temperature sensor, engine	118
H1L	Indicator light, CareTel	120
X1L	Connector housing, 9 pin, CareTel, RS–232	117–120
X2L	Connector housing, 3 pin, CareTel, CAN	117–120
X3L	Connector housing, 9 pin, CareTel, extra equipment	117–120
X4L	Connector housing, 3 pin, CareTel, supply+ NBUS	117–120

Wire colours

RU = brown
PU = red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

Explanations of the abbreviation

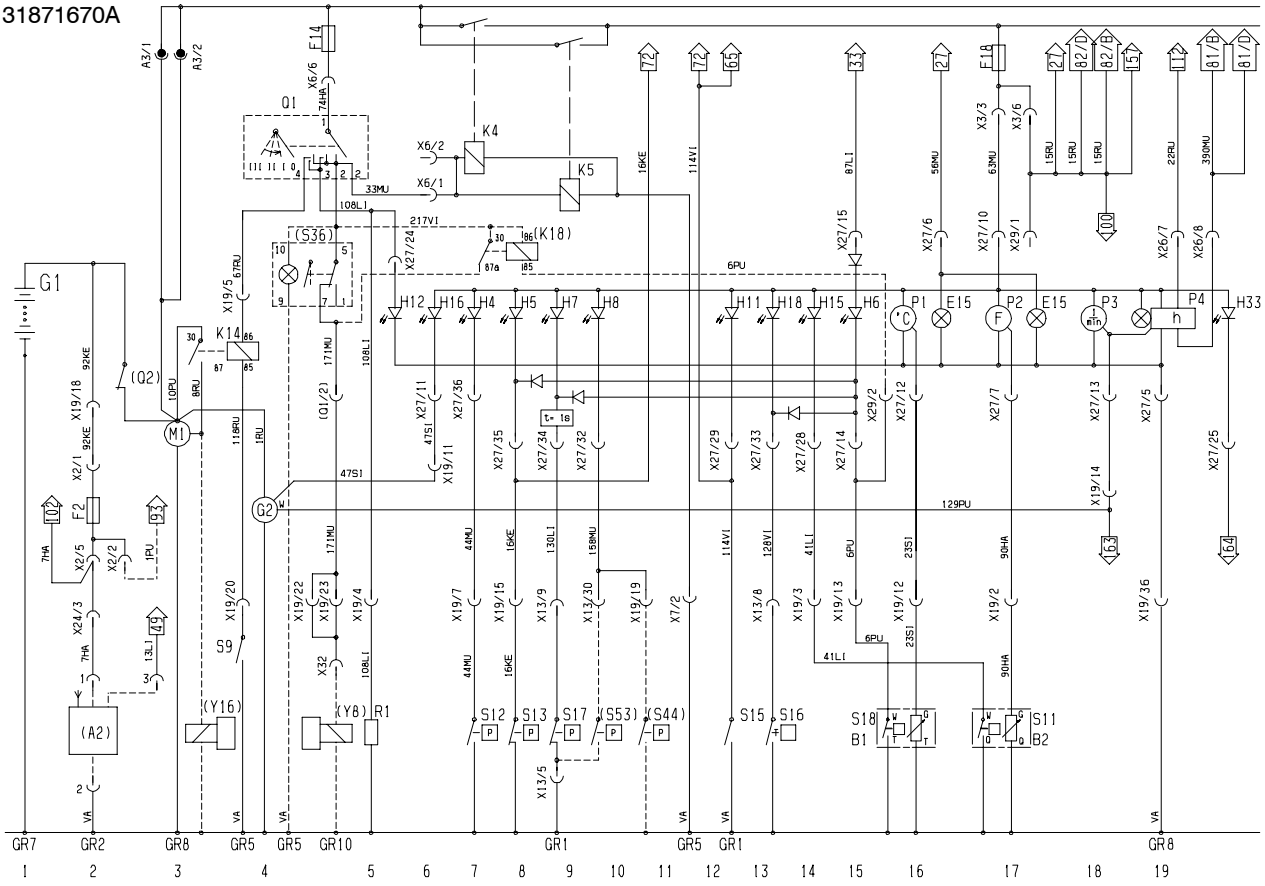
PTO = power take–off
AC = Autocontrol linkage
DPS = Delta Power Shift

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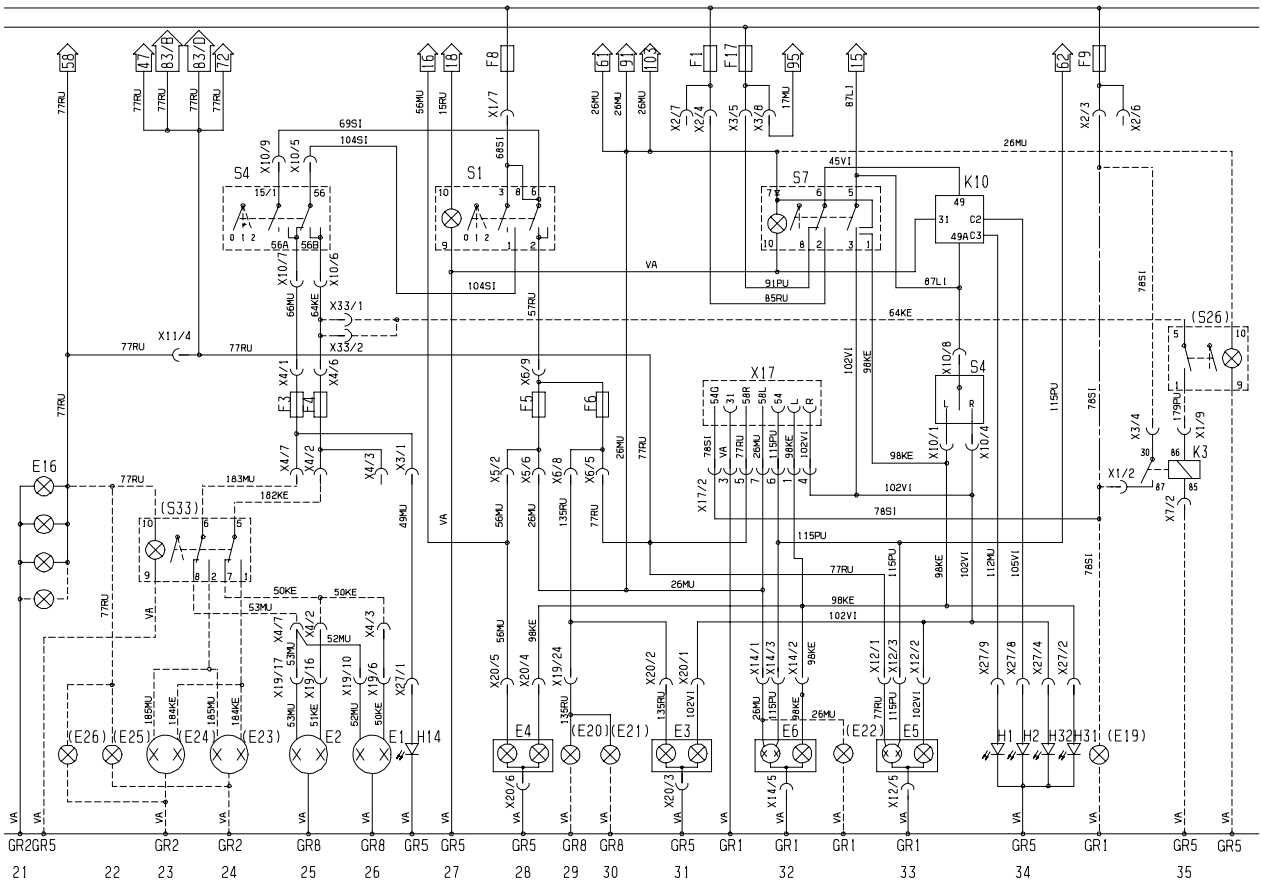
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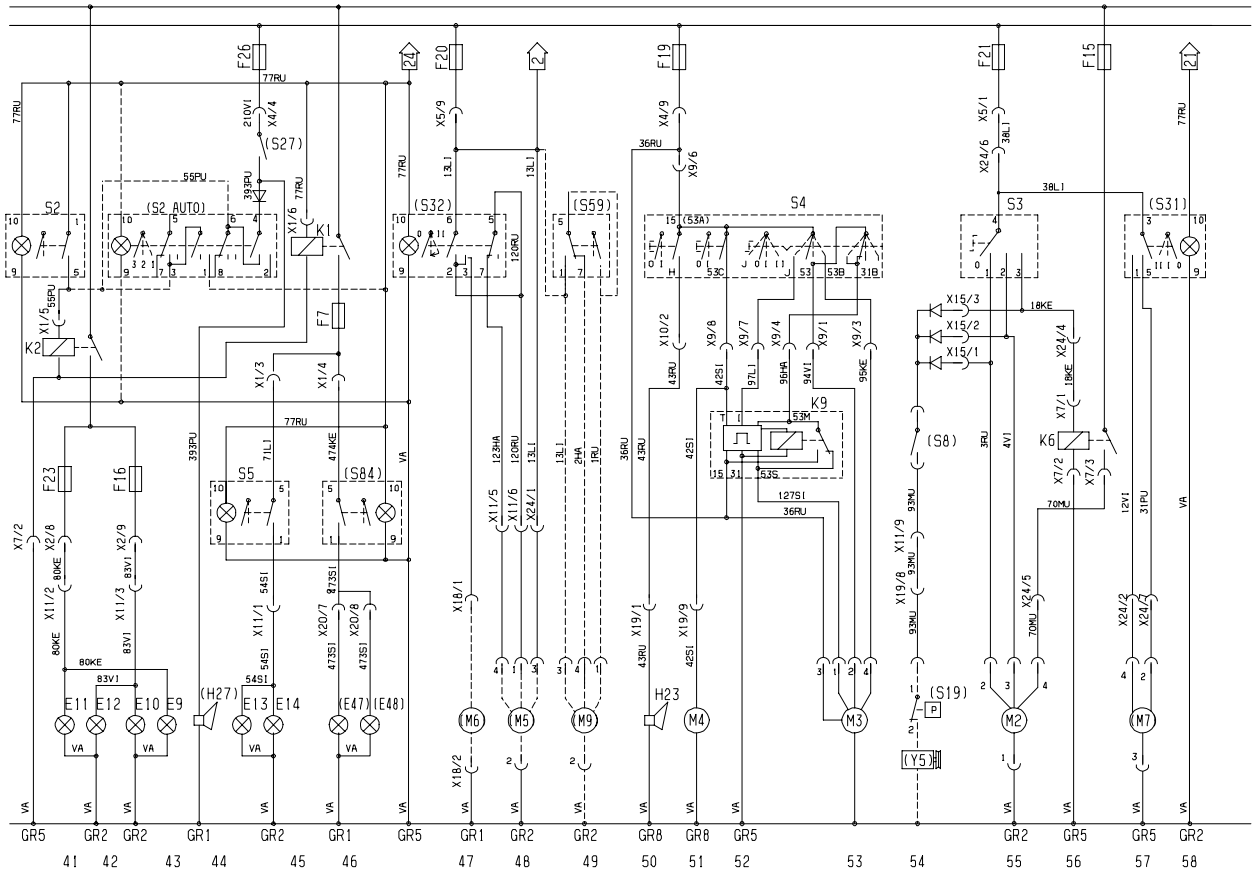
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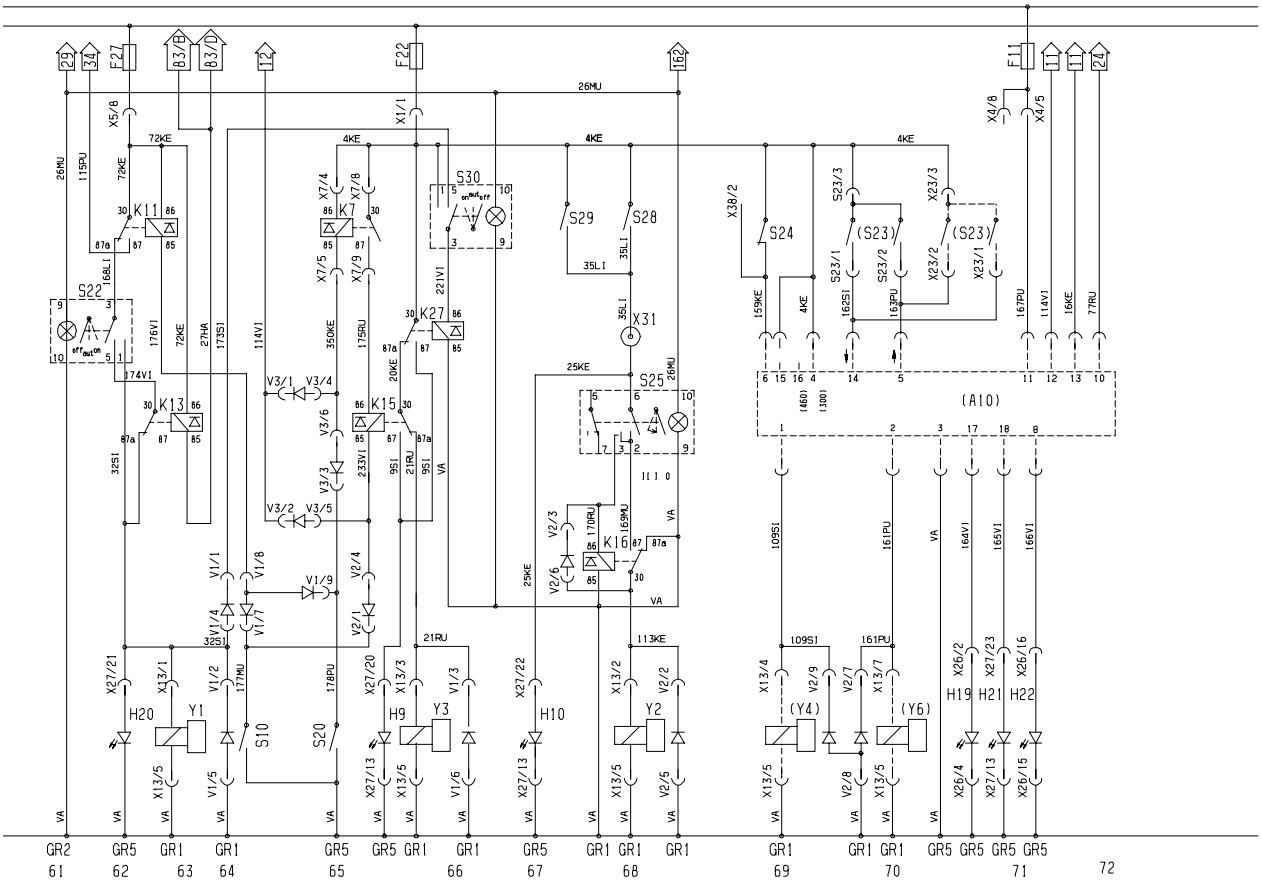
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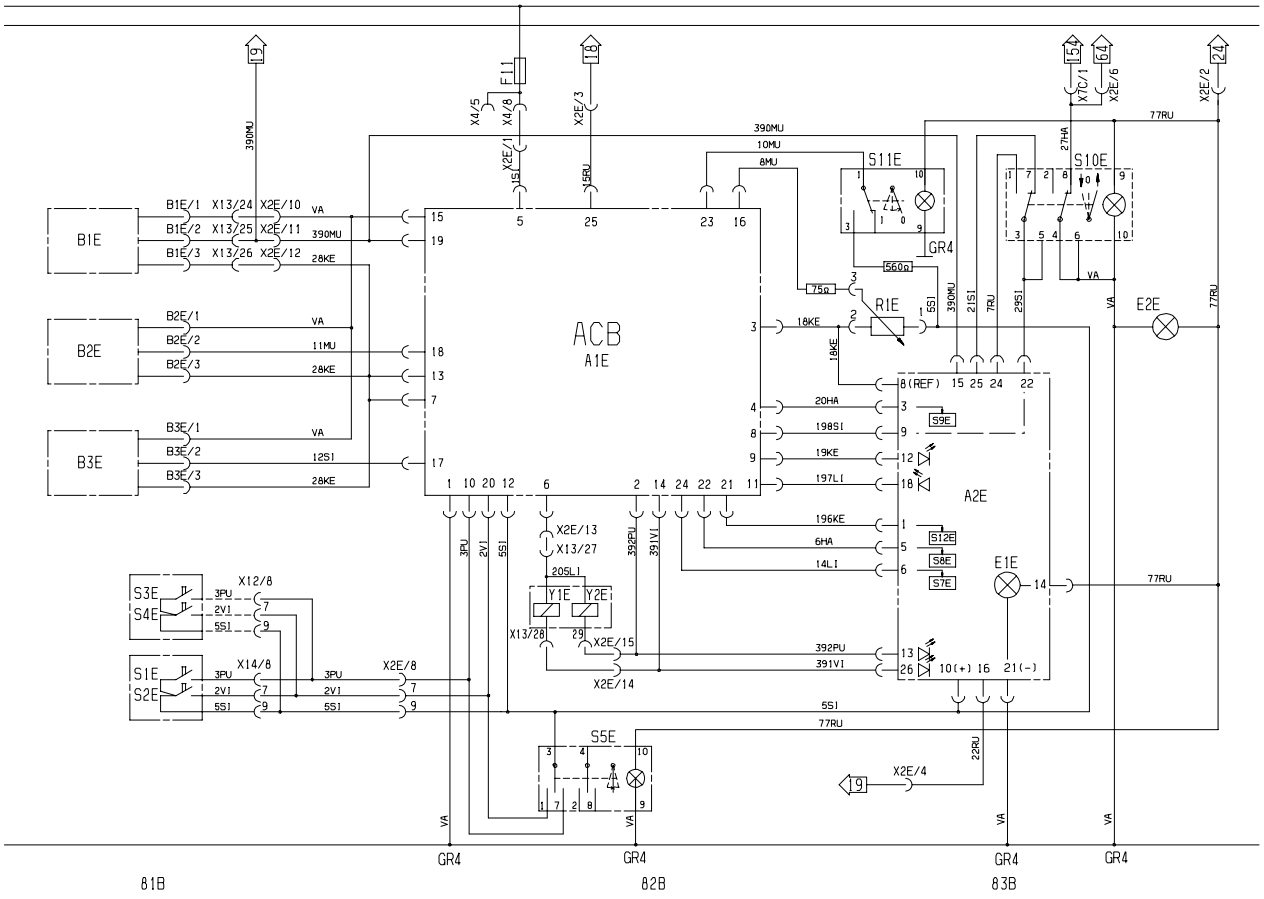
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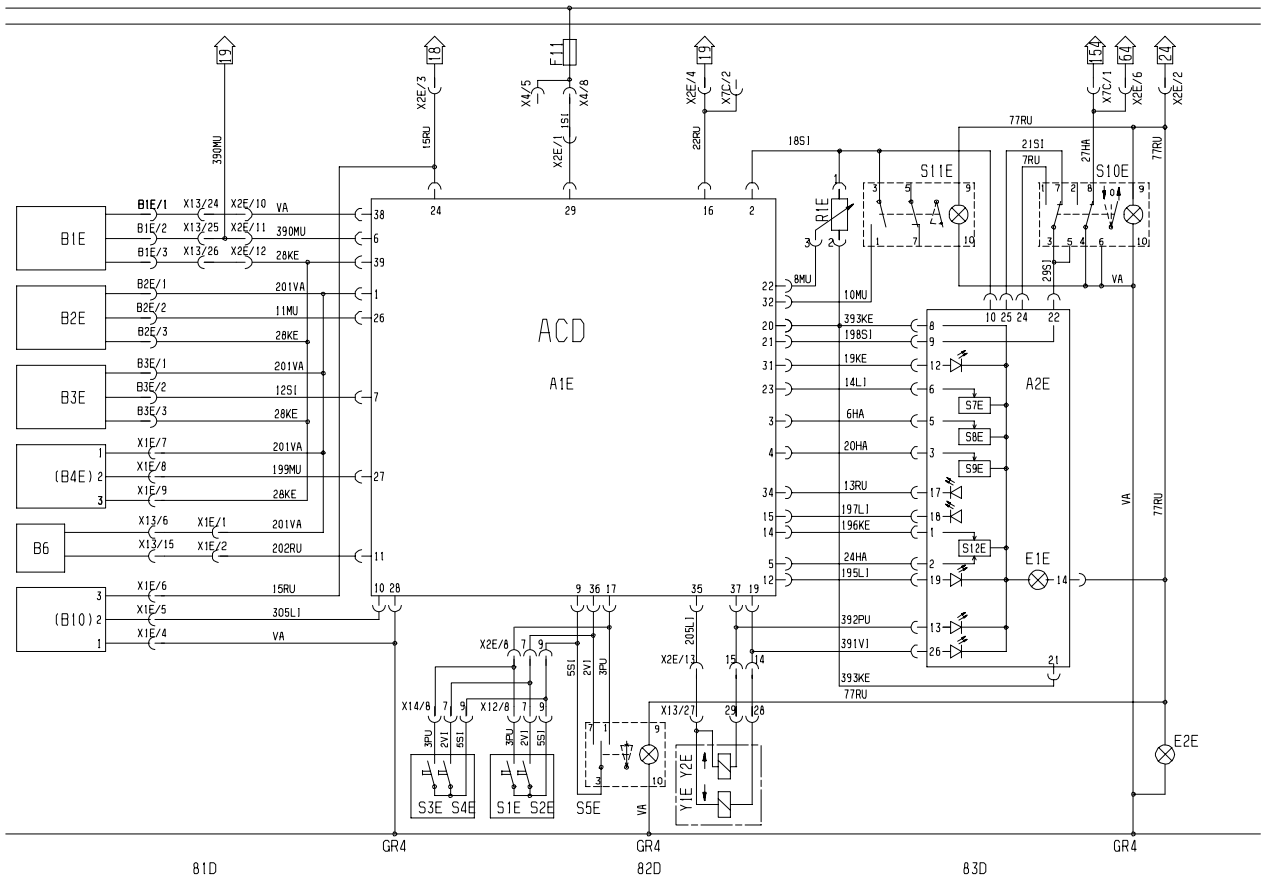
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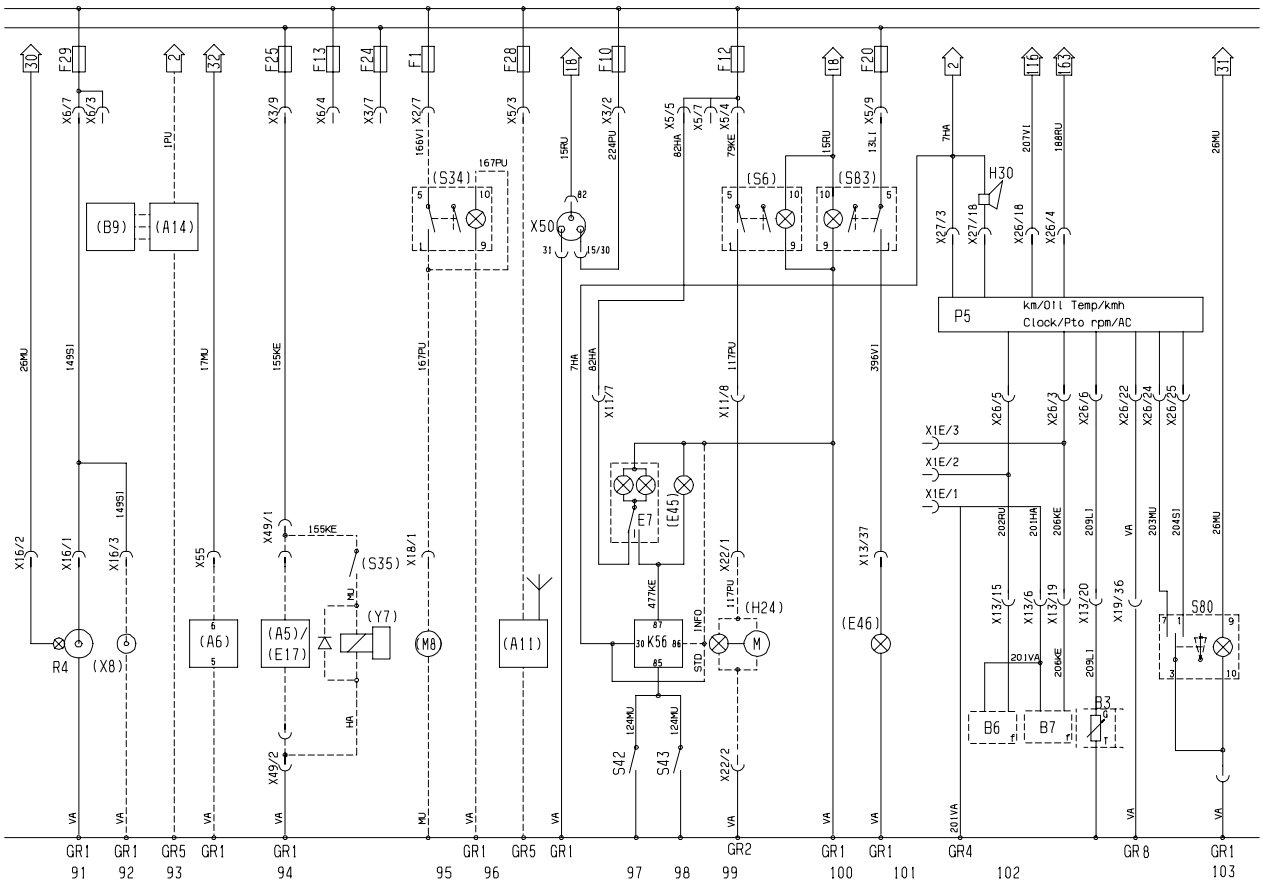
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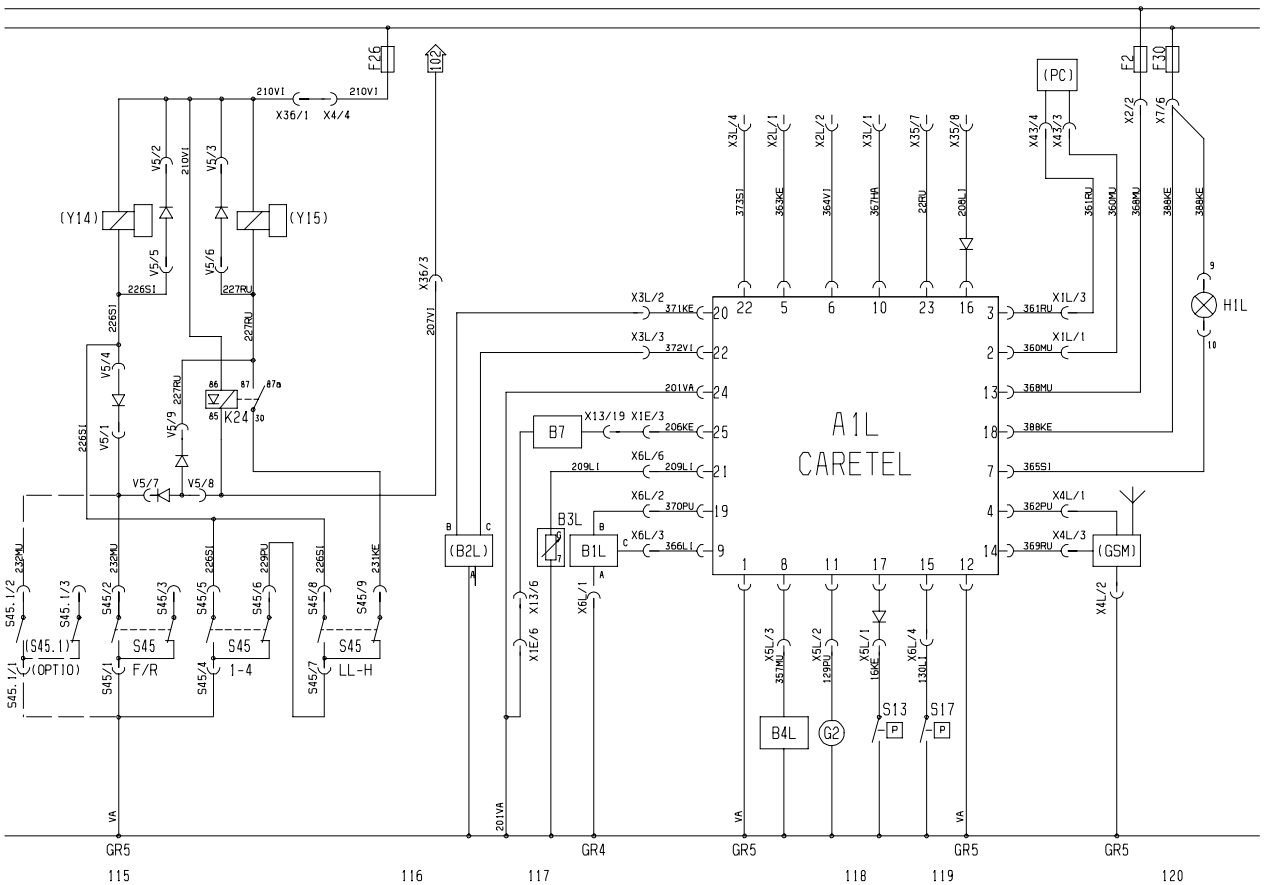
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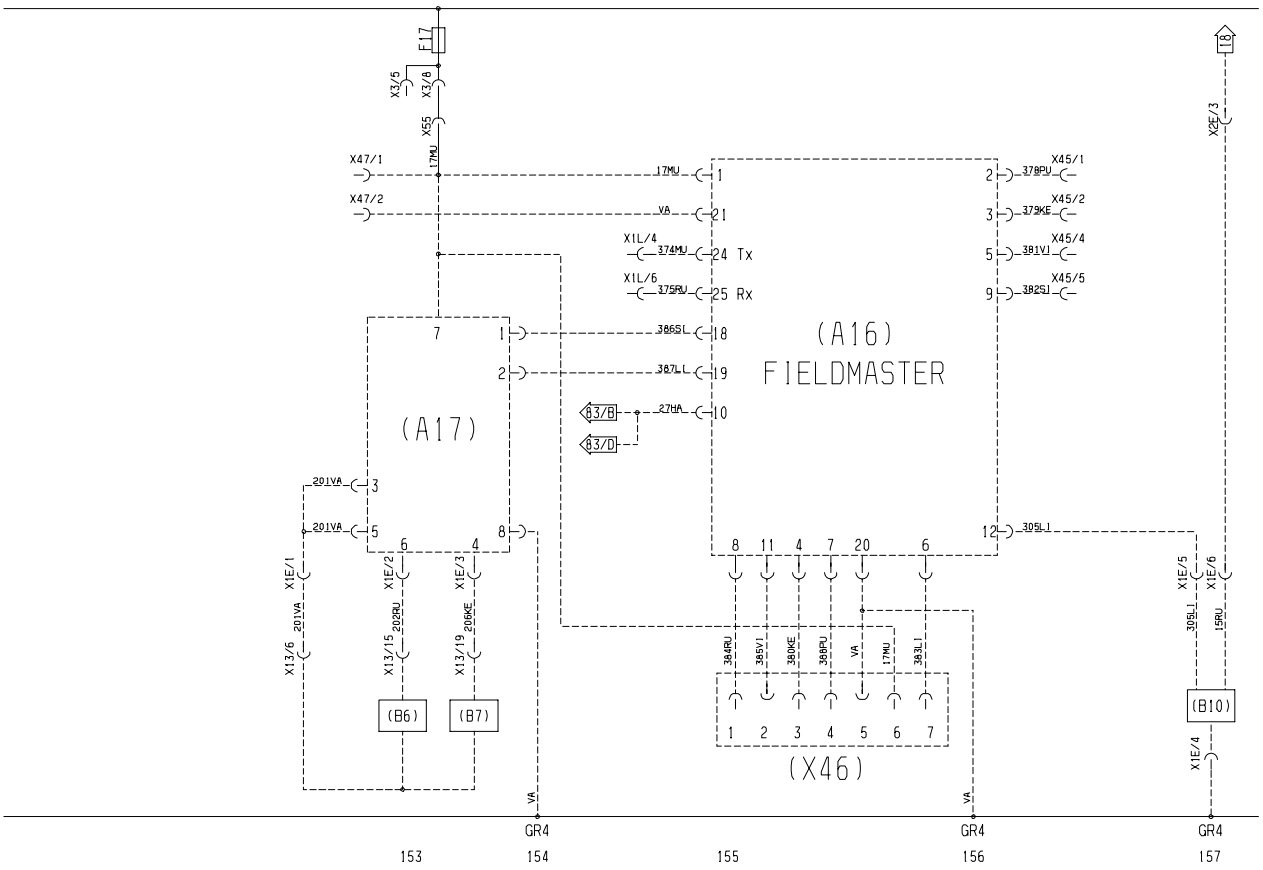


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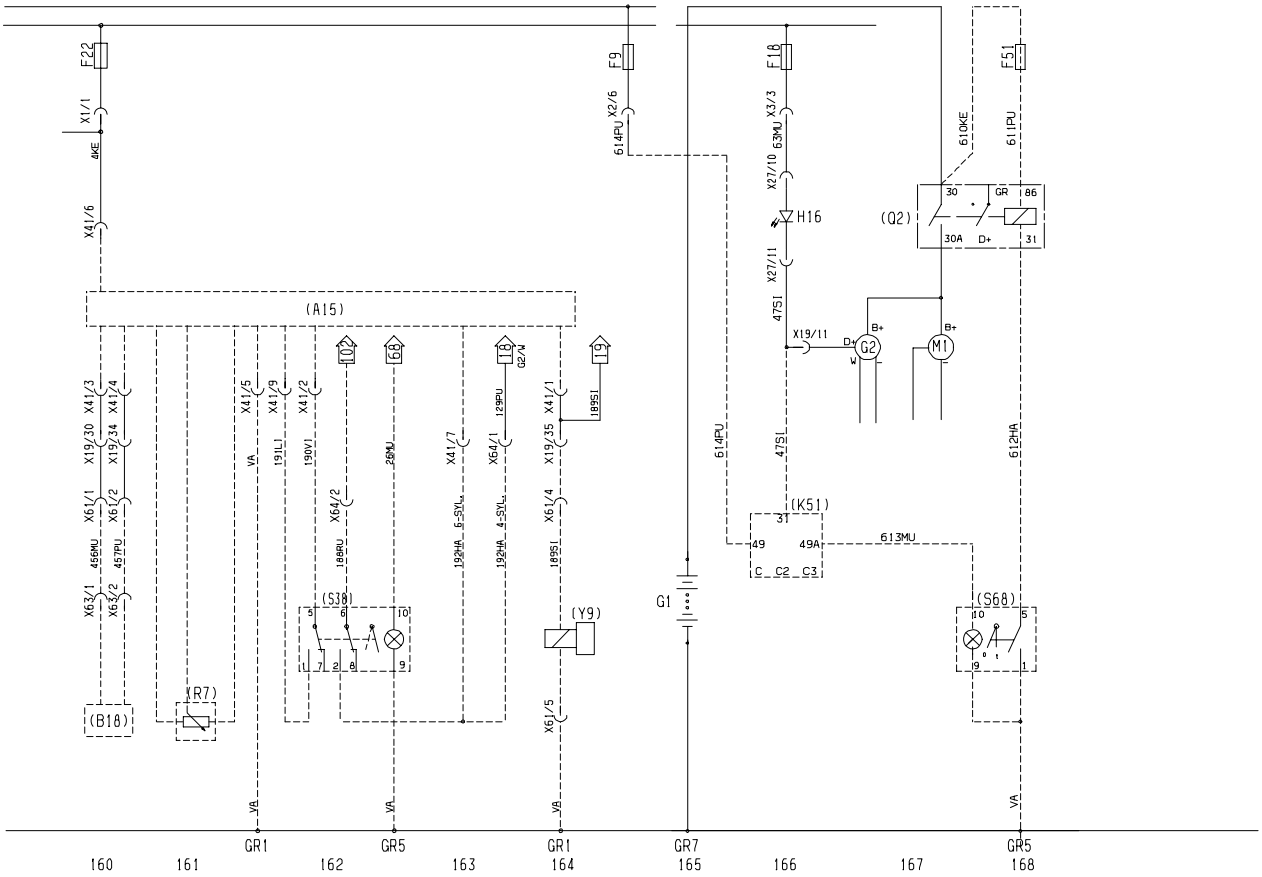


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9



10

31. Autocontrol II	~~1. 1. 1994~~ 1. 8. 1998	Model 6000–8750	Code 311	Page 1

From the beginning of 1994 (662343–) all 6000–8400 tractors (except E–models) have Autocontrol II as standard equipment. Autocontrol II includes new push buttons of the Delta Powershift (if fitted) (compared to the rocking switch as shown in section 44).

In addition, Autocontrol II has a three–position lift/lower switch for the hydraulic power lift. Autocontrol II also controls the differential lock, 4WD and PTO.

Important! From serial no. **668103** incl., Autocontrol 2.1 replaces Autocontrol II. The differences are described under code 312.

Autocontrol II controls the transmission as follows:

1. Differential lock

The lock is controlled with a three–position rocking switch on the driver's right.

A. Rocking switch front edge depressed.

– the lock is always engaged except when brake pedal/pedals are depressed or when the power lift is in the transport position (signal light illuminates however). The lock engages when the brake pedal/pedals are released or when the lift/lower switch is in the lowering position or in the middle position.

B. Rocking switch in the middle position

– the differential lock is disengaged

C. Rocking switch rear edge depressed (spring returned)

– When the switch rear edge is depressed, the lock is engaged but it disengages when the brake pedal/pedals are depressed. After that the lock re–engages only if it is done with the switch.

2. Front wheel drive

Front wheel drive is engaged and disengaged with a switch in the range gear lever knob.

A. The switch in the front position

– The 4WD is always engaged

B. The switch in the rear position

– The 4WD is disengaged except when braking with both brake pedals. If it is used only one brake pedal, the 4WD does nor engage.

3. Power take–off

The PTO is controlled with a lever and a three–position rocking switch on the driver's right.

PTO **540** or **1000** (or **540E**) is selected mechanically with the lever at which time a pilot light comes on in the instrument panel.

The rocking switch front edge depressed (OFF)	**The rocking switch in the middle position (ON)**	**The rocking switch rear edge depressed (START) (spring returned)**
– the PTO is disengaged	– after starting the PTO is engaged and the PTO shaft rotates as long as the switch is in the middle position and the supply line is not switched off.	– When the rear edge is depressed, the PTO starts. After depressing, the switch is returned to the middle position by a spring.

PTO emergency stop

There is a emergency stop socket which has a plug at the rear of the cab. When the plug is removed, the PTO is disengaged and starts only when the rocking switch rear edge is depressed (the plug must be in the socket).

After an engine stop the PTO starts only when the rocking switch rear edge is depressed.

4. Delta Powershift, –668102

The Delta Powershift is controlled with two push buttons in the speed gear lever knob.

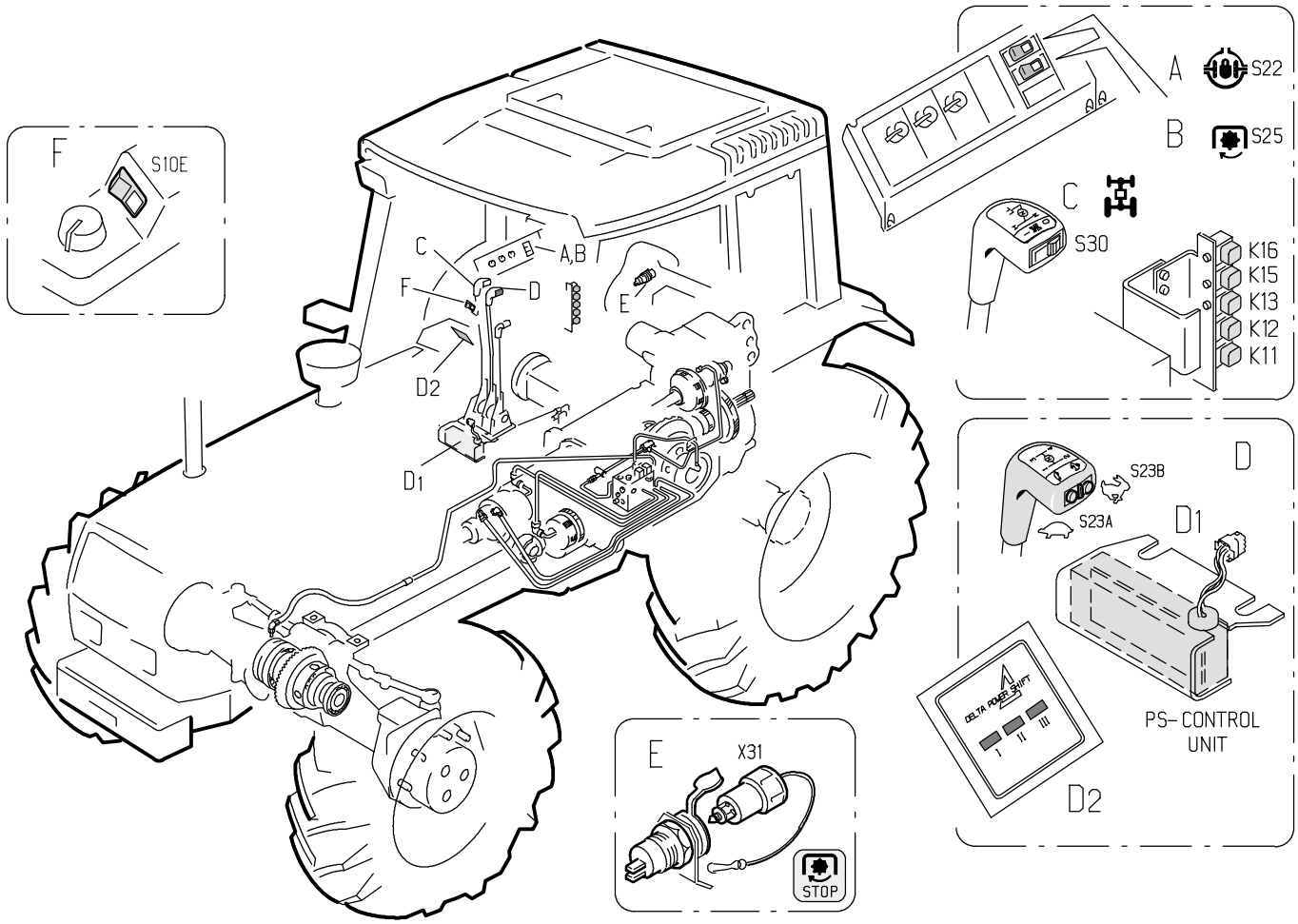
A. The front push button is depressed.	**B. The rear bush button is depressed.**
– With each press the gear ratio is changed one step down.	– With each press the gear ratio is changed one step up.

Indicator lights in the instrument panel show which gear ratio is engaged:
one light=reduction ratio
two lights=direct ratio
three lights=overdrive
When the clutch pedal is depressed, the Powershift gear is in the neutral position, but the ind. lights show the ratio which is to be engaged.

Delta Powershift has an alarm buzzer, which starts to alarm if the engine is stopped and the parking brake is not applied.

After starting the engine the gear is always engaged in the lowest ratio.

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Picture 1. *Components of the Autocontrol II*

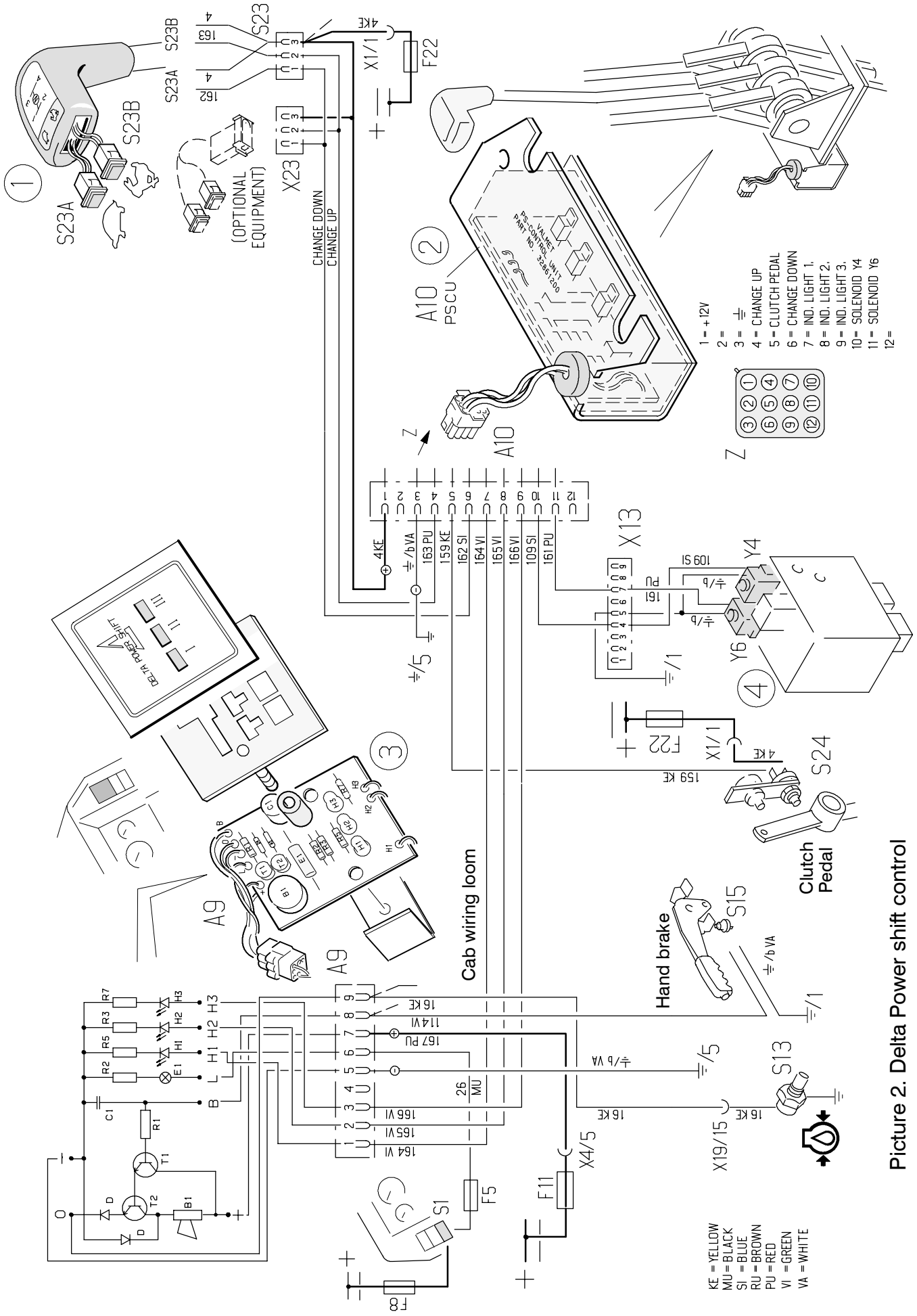
A. Differential lock rocking switch on the right hand side of the seat.
B. PTO rocking switch on the right hand side of the seat.
C. 4WD switch in the range gear lever knob.
D. Delta Powershift push buttons in the speed gear lever knob:
D_1 Delta Powershift control unit
D_2 Delta Powershift indicator lights in the instrument panel
E. PTO emergency stop socket at the rear of the cab
F. Three–position lift/lower switch of the hydraulic power lift

Control relays in the lever console on the driver's right:

K11: Differential lock relay.
K12: Differential lock relay
K13: Differential lock relay
K15: 4WD control relay**.**
K16: PTO control relay**.**

There is a relay **K7** in the fuse box for the four wheel braking.

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Picture 2. Delta Power shift control

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A. Delta Powershift

Picture 2. *Delta Powershift control.*

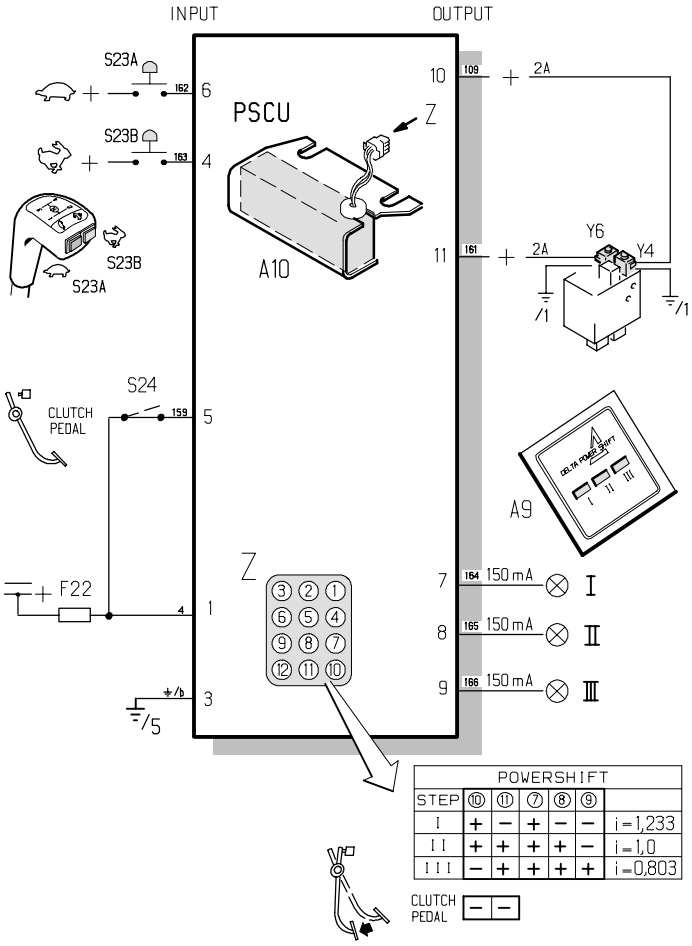
1. Powershift control buttons:
S23A=change down
S23B=change up
2. Electronic control unit A10.

3. The circuit card A9 of the buzzer and the pilot lights. The buzzer alarms if the engine is stopped (oil pressure sensor S13 indicates whether the engine is running) and the parking brake is not applied (the hand brake ind. light switch indicates whether the hand brake is applied).

4. Valve block on which is fitted the solenoid valves (see also page **440**/**13**):
Y4=energised in reduction ratio = one ind. light
Y6=energised in overdrive=three ind. lights.
In the direct ratio both solenoid valves are energised=two ind lights.

When the clutch pedal is depressed, the pedal switch S24 disconnects both solenoid valves to make gear change easier. The switch must connect current to the control unit A10 when the clutch pedal has raised 1,5–3 cm from the bottom position.
The switch function can be tested by connecting a test lamp to the wire from the switch (yellow wire no 159).
If you want remove the switch S24, disconnect both yellow wires from the switch and connect them together with connector SA1674.
Note! With effect from ser. no. F39513 the switch S24 has been removed and the safety switch S9 has been transferred to the support lower hole. On E–models there is further switch S24 and it is now fitted to the support upper hole.

Position of components:
- Delta Powershift control unit A10 and its 12 pin connector is fitted in the cab in front of the lever console. These are accessible after removing the panel in front of the lever console.
- The push button connector S23 is situated in the same place as above mentioned parts. Also connector X23 for optional push buttons and 4WD switch connector S30 are in the same place.
- The circuit card of the buzzer and pilot lights are placed in the instrument panel and they are accessible after removing the panel upper covering.
- The solenoid valve connector X13 is placed under the hand brake console on the driver's left.



Picture 3. *Input and output signals to the control unit A10. Supply voltage via the ignition switch and fuse F22.*

Important! *From tractor ser. no.* ***668103*** *incl., the control unit A10 has been modified, see Autocontrol 2.1 under code 312.*

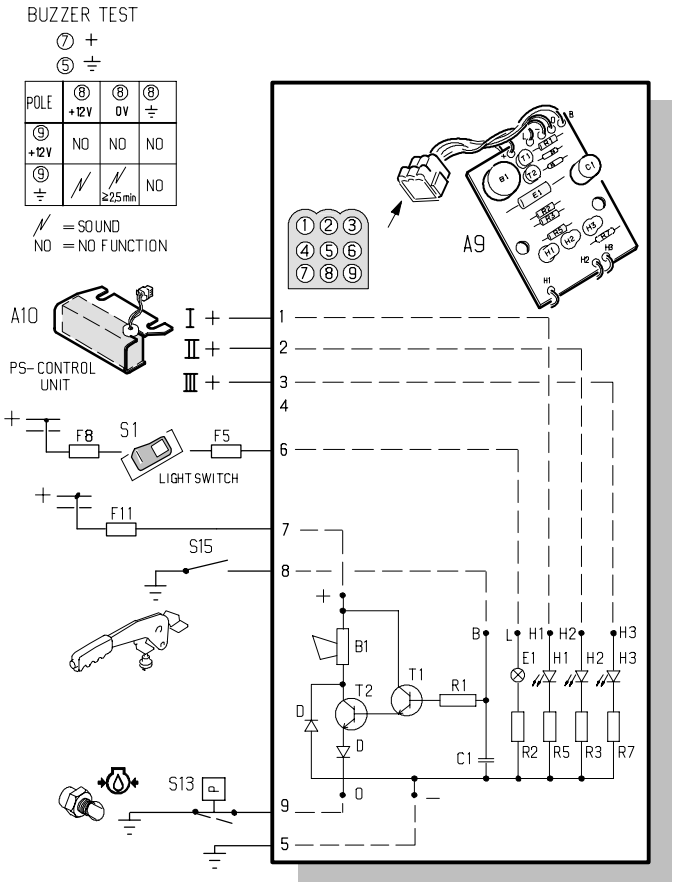
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Circuit card of buzzer and ind. lights

A. Buzzer test:
- Ground connector pin 5 and feed voltage of 12 V to pin 7.
- Ground pin 9 and feed voltage of 12 V to pin 8 at which time the buzzer should alarm continuously.
- Disconnect pin 8 after which the buzzer should alarm about 2 minutes.

B. Circuit card illumination:
- Feed voltage of 12 V to pin 6 at which time the lamp E1 should come on (pin 5 grounded).

C. Signal lights of Delta Power Shift:
With different ratios the control unit A10 feeds current to the circuit card A9 connector pins 1, 2 and 3. This current lights up leds H1, H2 and H3.
The led voltages (12 V) can be measured from pins 1, 2 and 3 of connector A9 with different gear ratios. Lacking voltage indicates that there are breaks in wires or the control unit A10 is faulty.



Picture 4. *Circuit card A9 of buzzer and ind. lights.The card is supplied with permanent voltage via fuse F11.*

Fault tracing

A. Fuses and supply voltages of Delta Powershift:
If there are malfunctions, take the following steps:
- Check the control unit fuse F22 in the fusebox.
- Check the buzzer fuse F11 in the fuse box.

If the fuses are in condition:
- Measure from the control unit A10 connector pin 1, that the unit gets the supply (12 V). Measure from the circuit card A9 connector pin 7, that the card gets the supply (12 V). Lacking supply voltage indicates that there are breaks in supply wires.

B. Solenoid valves:
Test whether the valves Y4 and Y6 get supply voltage (12 V). Engage different Powershift ratios and check whether the valve in question becomes energised. When the valve is energised, the nut at the end of the valve is magnetic. Voltage can also be measured from the valve connector. If there is no voltage, fault can lie in the control unit A10 or in wire contacts.

C. Control unit A10
The control unit has 5 input signals and 5 output signals (see picture 3). Output signals can be tested by checking the solenoid valves as described above or by measuring voltages to the signal light circuit card as shown paragraph C above.
The control unit cannot be repaired but it should be changed as a complete unit.

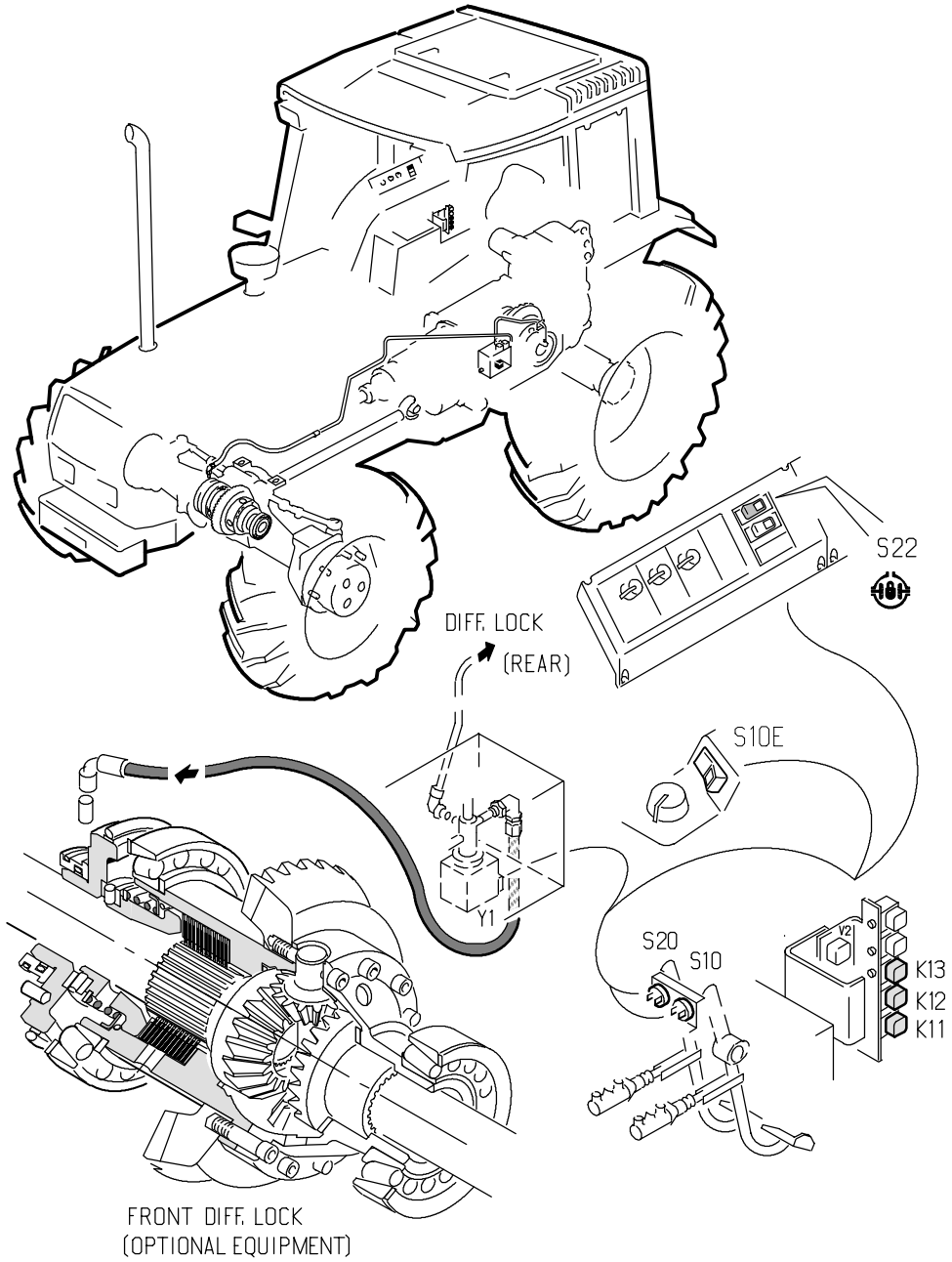
D. Push buttons:
- By pushing the foremost button, the 12 V signal is sent to the control unit connector pin 6 and ratio is changed one step down.
- By pushing the rearmost button, the 12 V signal is sent to the control unit connector pin 4 and ratio is changed one step up.

Note! Continuous pushing changes only one step up or down. In highest or lowest ratio, the ration does not change any more although the button of the direction in question is pushed.

E. Clutch pedal switch S24:
- When the pedal is in the upper position, voltage of 12 V is sent to the control unit connector pin 5.
- With depressed pedal, the voltage is zero and both solenoid valves are unenergised and power is not transmitted by the gear.
- The switch reduces the rotating masses to minimum in order to make gear change with gear levers easier.

IMPORTANT! If ind. light number 1 goes out and light 3 lights continuously, this indicates that there is line breaks in wires between the control unit A10 and the solenoid valves.

B. Differential lock control



Picture 5. *Differential lock components on tractor*

Y1: *Differential lock solenoid valve*
K11, K12 and K13: *control relays*
S10 and S20: *Brake pedal switches*
V2: *diodes*
The differential lock rocking switch is placed on the selector panel on the driver's right.
In addition, the lift/lower switch also controls the diff. lock.

The relays are places in the lever console and are accessible after removing the console side panel:

K11: Switches off voltage to the diff. lock solenoid valve and switches on current to the brake lights, when the brake pedal/pedals are depressed. Switches on voltage again to the solenoid valve, when the brake pedal/pedals are released. Ind. light comes on.

K12: Switches on voltage to the solenoid valve, when the rocking switch rear edge is depressed. Ind. light comes on. When the brake pedals after this are depressed, relay K11 is closed and current from relay K12 is cut – off and the relay opens and switches off current to the solenoid valve and the ind. lights goes out. The diff. lock does not engage after this although the brake pedals are released.

K13: Switches off voltage to the solenoid valve and the lock disengages, when the lift/lower switch is in the lifting position. The lock ind. light , however, illuminates. When the implement is lowered down to the working position, switches on voltage to the solenoid valve and the differential lock is engaged.

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Checking function of the differential lock control (engine at idling speed)

– Depress the rocking switch front edge at which time the lock indicator light comes on.
– Turn the switch to the middle position at which time the indicator light goes out.

This shows that:
– *the rocking switch front and middle positions function*
– *The lock indicator light functions*

– Depress the switch front edge at which time the indicator light comes on
– Disconnect the brake pedals and depress the pedals separately and together. When depressing the pedal/pedals, the diff. lock ind. light goes out and the brake lights comes on. When the pedal/pedals are released, the ind. light comes on and the brake lights goes out.

This shows that:
– *the brake pedal switches function*
– *the switches are correctly positioned*
– *relay K11 functions*

– Depress the switch rear edge at which time the ind. light should come on.
– Depress the brake pedal/pedals at which time the ind. light goes out.
– Release the brake pedal/pedals. The diff. lock ind lights must not come on and the lock must not engage

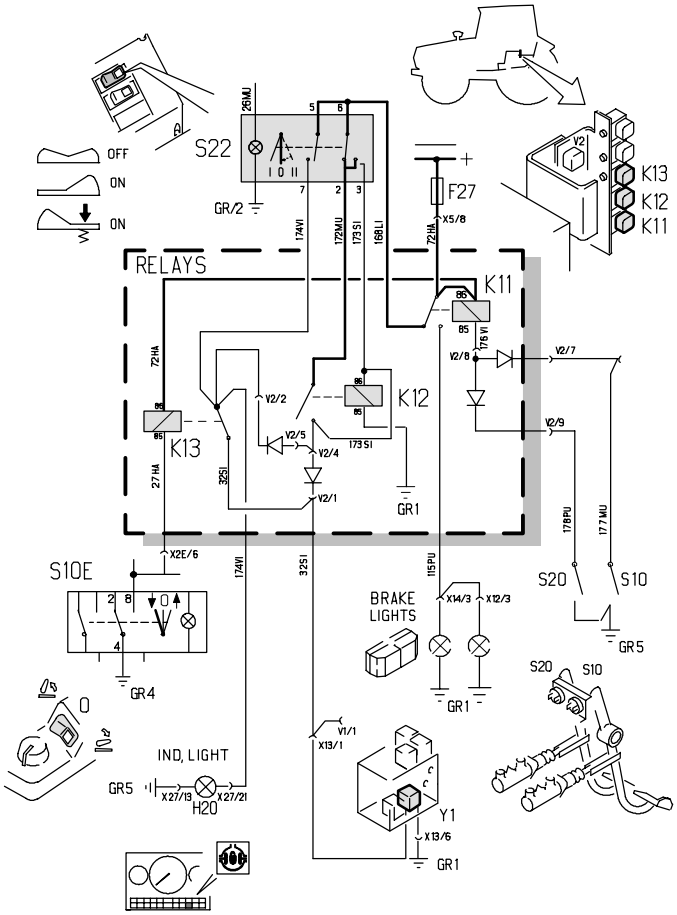
This shows that:
– *the rocking switch rear position functions*
– *relays K11 and K12 function*

– Depress the switch front edge and the ind. light comes on
– Turn the lift/lower switch to the transport position at which time the diff. lock disengages. Ind. light, however, remains on.
– Turn the lift/lower switch to the lowering position or to the middle position and the differential lock engages.

This shows that:
– *lift/lower switch functions*
– *relay K13 functions*

– Drive the tractor at speed of 4 km/h and engage the lock by pushing the rocking switch front edge down. Ind. light comes on.
– Make a tight turn, raise and lower the lift at which time the diff. lock engages and disengages.
– You should see the rear tyres skid when the differential lock is engaged and feel a jerk as you engage and disengage. The front axle lock functions in the same way, if fitted (during the test the 4WD should be disengaged).

This shows that:
– *solenoid valve functions*
– *differential lock functions*



Picture 6. *Differential lock control.*
The system is supplied via the ignition switch and via the fuse F27).

Important! Always check the fuse F27, if there is malfunctions in the control system. The diff. lock solenoid valve is fitted on the lower side of the valve block on the LH side of the gearbox. The rearmost valve Y1 is for the diff. lock. When the lock is on, the solenoid valve is energised. Then the nut on the valve is magnetic which can be verified with e.g. a screwdriver.

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C. 4WD control

Checking function (engine at low idling speed):

– Move the switch in the range gear lever knob to the front position at which time the 4WD ind. light comes on.

This shows that:
– *4WD switch functions*
– *4WD indicator light functions*

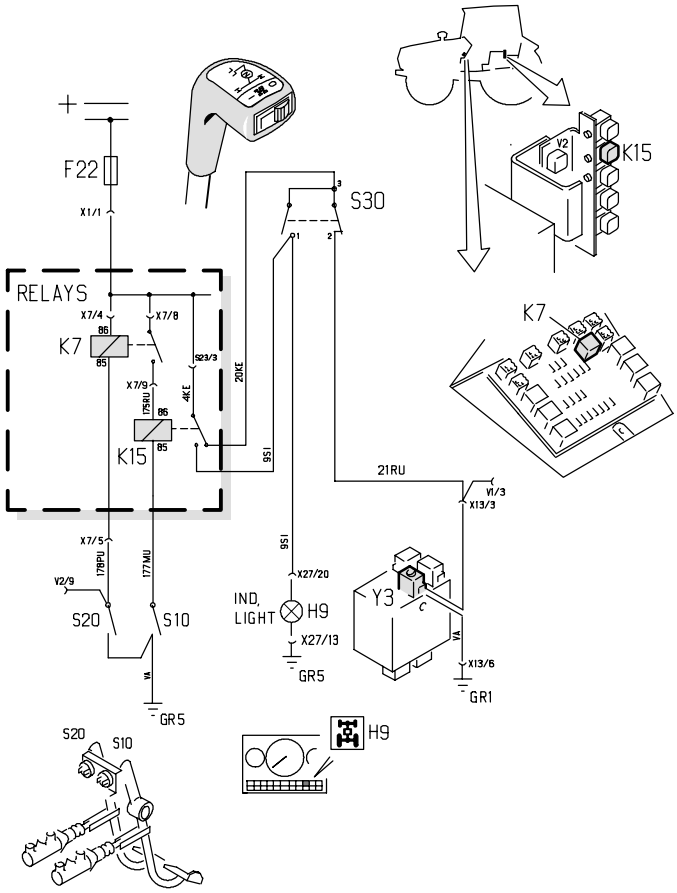
– Move the switch to the rear position and the ind. light goes out.
– Depress separately unlatched brake pedals. The 4WD ind. light must not come on.
– Connect the brake pedals together and depress the pedals at which time the 4WD engages (ind. light comes on)
– Release the brake pedals and the ind. light goes out.

This shows that:
– *brake pedal switches function*
– *relays K7 and K15 function*

– Drive the tractor at speed of 4 km/h.
– Make a tight turn
– Engage and disengage the 4WD several times. When the 4WD is engaged, you should see the front axle skid and feel a jerk as you engage and disengage.

This shows that:
– *solenoid valve functions*
– *4WD clutch functions*

Note! In case of malfunctions always check fuse F22.
When the 4WD is disengaged, the solenoid valve Y3 is energised and the nut at the end of the valve is magnetic which can be verified e.g. with a screwdriver.



Picture 7. *4WD control. The system gets the supply via the ignition switch and fuse F22.*

S30: *4WD switch in range gear lever knob*
Y3: *4WD solenoid valve*
H9: *indicator light*
S10 and S20: *brake pedal switches*
K7 and K15: *Relays which engage the 4WD when latched together brake pedals are depressed*

Note! If you want to prevent engagement of the 4WD when braking, relay K7 in the fuse box can be removed.

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D. PTO control

Checking function:
Make sure that the plug is fitted in the rear emergency socket. Move the control lever in the middle position. Check that the PTO rocking switch front edge is depressed (OFF). Switch off tractor current. Start the engine and let it run at idling speed.

– Move the PTO lever to the foremost position (540) at which time the indicator light should come on. The PTO shaft must not rotate.
– Move the lever to the middle position at which time the ind. light goes out
– Move the lever to the rear position (1000 or 540E) and the ind. light should come on. The PTO shaft must not rotate. Move the lever back to the middle position and the ind. light goes out.

This shows that:
– *ind. light switches S28 and S29 functions*
– *indicator light functions*

– Move the lever to the front position (540). Ind. light comes on.
– Turn the PTO rocking switch to the middle position (ON)
– Depress the rocking switch rear edge (START). The PTO shaft begins rotate and the rocking switch is returned to the middle position (ON) by the spring.

This shows that:
– *PTO control relay K16 functions*
– *solenoid valve functions*

– Depress the rocking switch front edge (OFF)
– PTO shaft stops to rotate
– Turn the switch to the middle position. The shaft must not rotate. Depress the switch rear edge at which time the shaft starts to rotate.

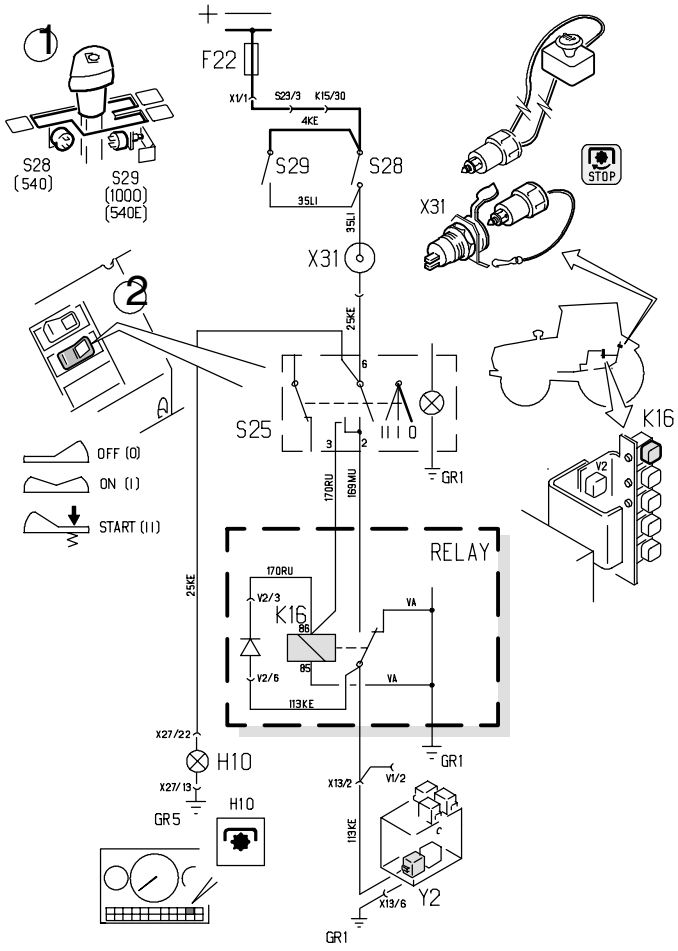
This shows that:
– *PTO rocking switch functions*

– Remove the plug from the rear socket at which time the shafts stops rotating. Also the indicator light goes out.
– Refit the plug. The shaft must not rotate but the ind. light comes on.
– Depress the switch rear edge and the PTO shaft must start to rotate.

This shows that:
– *PTO emergency stop functions*
– *relay K16 functions*

– Stop the engine.
– Start the engine. The PTO shaft must not rotate although the lever is in the engaged position
– Depress the rocking switch rear edge at which time the shaft begins to rotate.
– Move carefully the lever to the middle position. The ind. light goes out and shaft stops.
– Move the lever to the front position. The shaft must not rotate.
– Depress the rocker switch rear edge after which the PTO shaft starts to rotate.

This shows that:
– *The PTO automatic stop functions when the main current circuit is cut off.*
– *relay K16 functions*



Picture 8. *PTO control. The system is supplied via the ignition switch and fuse F22.*

1. *PTO control lever (540–free–1000 (540E)*
S28: *Lever switch*
S29: *Lewer switch*
X31: *Emergency stop socket*
2. *3–position rocking switch*
H10: *Indicator light*
Y2: *Solenoid valve*
K16: *relay which connects current to the solenoid valve, when the rocker switch rear edge is depressed (START). Solenoid is energised so far as the rocking switch is in the middle position (ON) and the circuit is not broken with the lever, emergency plug or with the ignition switch.*

Important! The solenoid valve Y2 is placed under the valve block on the LH side of the gearbox (see picture). When the solenoid is energised, pressure oil is directed to the PTO clutch and the shaft can rotate. The nut at the end of the solenoid is magnetic when the solenoid is energised.

1. Differences between AC II and AC 2.1

Autocontroll 2.1 replaces under code 311 shown Autocontrol II system from tractor serial number **668103** incl.

A. Delta Powershift control system

The order of the two push buttons on the gear lever knob have been changed. On AC 2.1 system the front button changes up and the rear button changes down.

The AC 2.1 system control unit is placed in connection with the circuit card of the Autocontrtol power lift on the driver's right and it is connected to the tractor electrical system with 18 – pin connector.

Delta Powershift pilot lights have been placed in the dashboard in connection with the other warning lights. The lights have symbols I, II and III and they light individually when different ratios are engaged (I=lowest ratio, II=intermediate ratio and III=highest ratio). The pilot lights are green.

B. Sound signals

The new circuit card (control unit) has a buzzer, which functions as follows:

a) If the engine is stopped (oil pressure drops), and the hand brake is not applied, the buzzer alarms continuously about 2 minutes, as if the driver does not apply the hand brake (also on AC II).

b) When the engine is running (oil pressure up) and the hand brake is engaged, the buzzer gives a sound signal at intervals of 2 seconds, until the hand brake is released.

c) If the ignition is switched off, and the headlights are on, the buzzer sounds, until the lights are switched off.

C. Control of transmission

Control of 4WD, differential lock and PTO happens as on AC II system, see pages **311/1 – 2** and pages **311/7 – 10**.

D. Power lift

Compared with AC II system, the power lift has one rocker switch more. This forced – lowering switch is spring returned and is fitted on the RH side of the position control potentiometer. The switch is shown under code **320**.

2. Other optional or alternative equipment

A. Control stop

In connection with the optional electric engine stop is now an automatic control stop as a standard equipment. This system stops the engine automatically, if the instrument panel stop – light starts to flash. The control stop can be fitted on tractors with effect from serial number 662343 (AC II).

The control stop stops the engine automatically, if:
– engine temperature rises too much
– gearbox temperature rises too much
– engine oil pressure falls too far
– gearbox oil temperature falls too far

The control stop is switched on with a switch on the instrument panel.

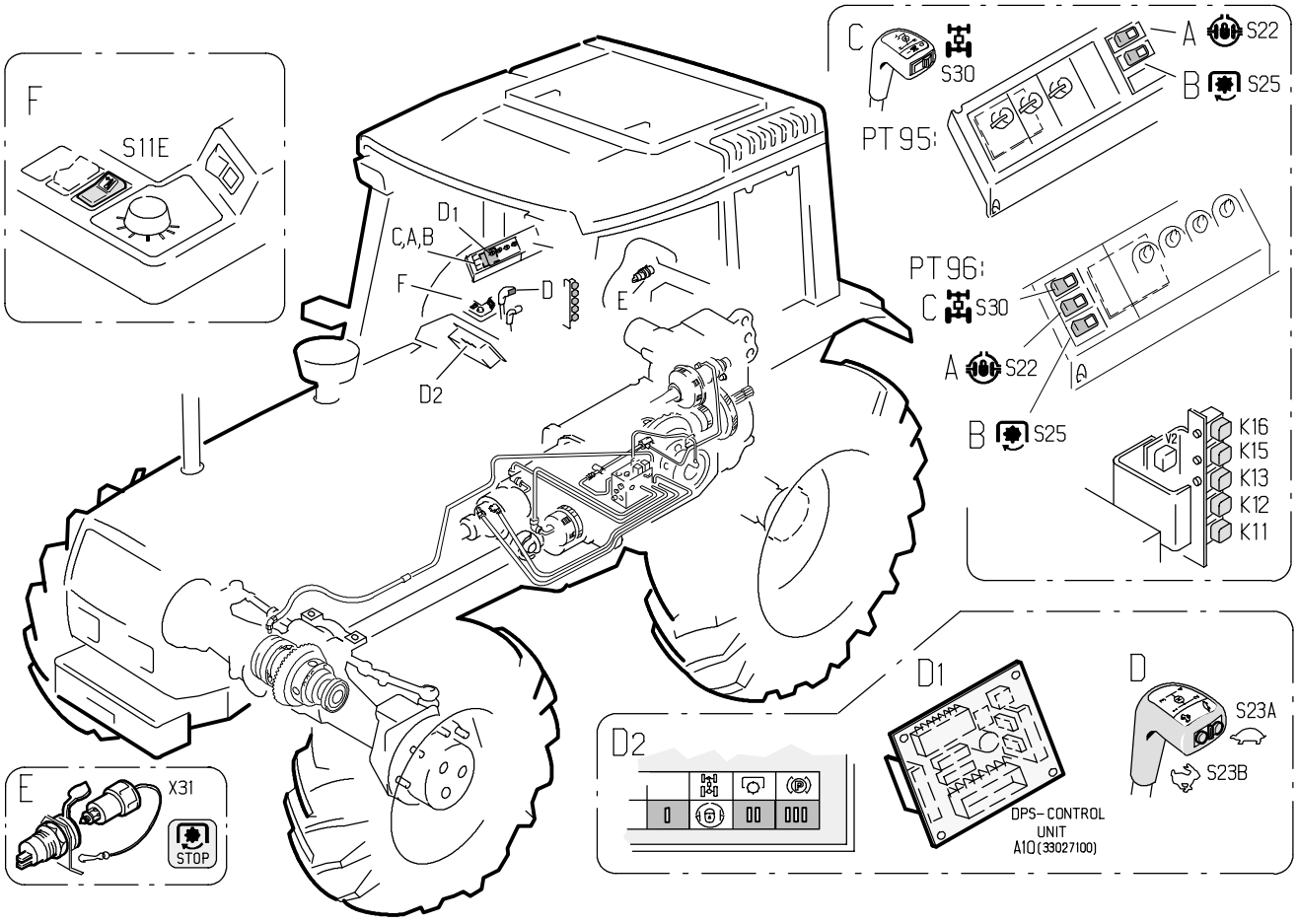
Note! The control stop must be switched on just after engine start, since the engine does not start, if the control stop is switched on.

Note! The safety stop is meant to be used just when the tractor is driving an implement without control from tractor. The safety stop must not be used when driving.
e.g. when driving the tractor gearbox oil pressure can fall temporarily too low, then control stop relay connects and the engine stops.

B. Agrodata – instrument

Agrodata – instrument is presented under code **331**.

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***Picture 1**. AC 2.1, control of Delta Powershift*

A. Differential lock switch (as on AC II).

B. PTO switch (as on AC II).

C. 4WD switch on the range gear lever knob (as on AC II). On later tractors (spring –96) the 4WD switch is placed on the lever console on the driver's right.

D. DPS push buttons on the speed gear lever knob

*D1. DPS–control unit (circuit card) (A10) in connection with the power lift circuit card. The circuit card is accessible after removing the power lift switch panel (see page **320**/**10**). On ACII system, there is a separate control unit box at the lower end of the gear levers.*

D2. Instrument panel combination instrument. DPS pilot lights have been fitted in connection with other pilot and warning lights. AC II system has a separate pilot light panel on the RH side of the instrument panel.

E. PTO emergency stop socket at the rear of the tractor (as on AC II system)

*F. S11E is the power lift forced–lowering switch (see page **320**/**15**).*

Relays K11–K16 as on AC II system, see page **311**/**3**.
If the tractor has a stop control (see page**312**/**4**), the stop control relay K18 is placed by relay K11.

Important! If on AC 2.1 system one pilot lights starts to flash when the driver changes the DPS ratio, this shows that there is a wire break, poor contacts or a short circuit between the solenoid valve in question and the DPS control unit (fault tracing, see the next page). However, the tractor can be driven with a DPS ratio, that functions i.e. the pilot light illuminates continuously.

Solenoid valve resistance is **11–12 ohms**. Measure the resistance between pin 3 and pins 1 and 2 (pins, see the following page). If the resistance is not correct, measure the resistance once again from valve pins. If not correct, the solenoid valve is faulty. If the resistance is correct, the possible fault can lie in the diodes, which should be changed. If the resistance was infinite, when it was measured from the upper end connector, check solenoid valve wires and connectors (connector X13 under the hand brake console).

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DPS circuit card

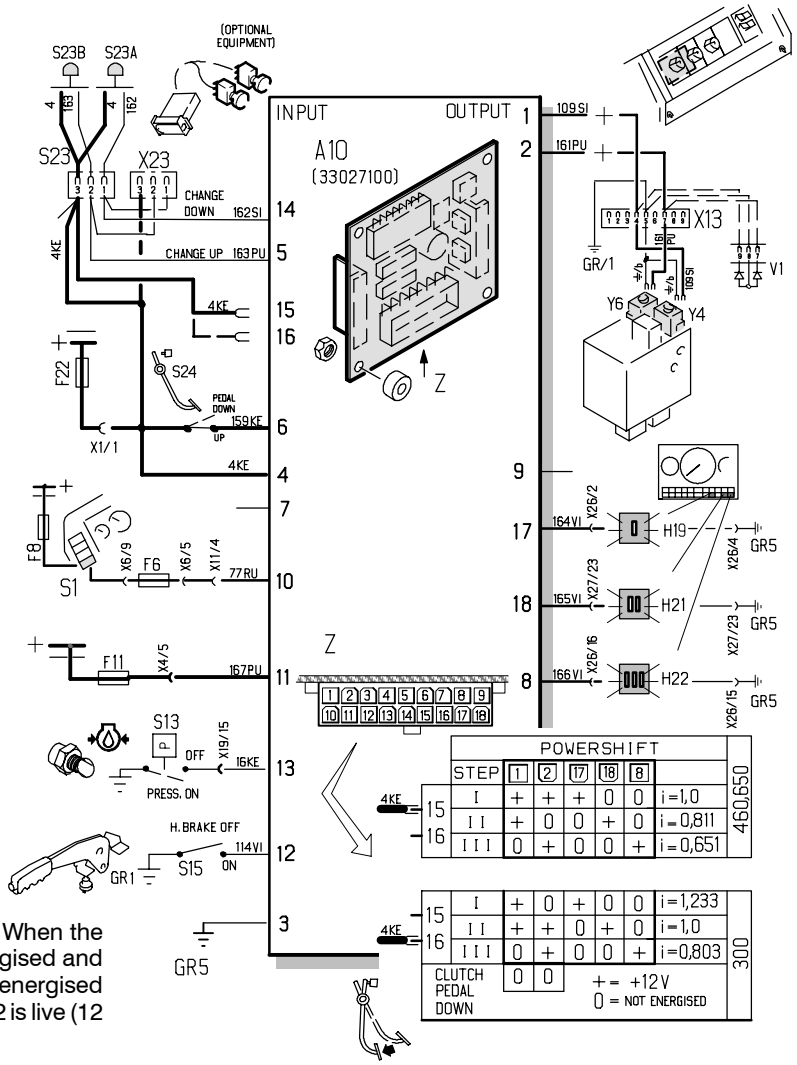
INPUT signals

Pin 3: Permanent earthing
Pin 4: 12 V via starter switch and fuse F22.
Pin 5: 12 V, when the foremost push button is pressed. Otherwise 0 V.
Pin 6: When the clutch pedal is in the upper position, this pin has 12 V voltage. When the pedal is depressed, the voltage becomes 0.
Pin 10: 12V, when headlights are on, otherwise 0 V.
Pin 11: permanent current via fuse F11 (12 V)
Pin 12: When the hand brake is applied, this pin gets earth.
Pin 13: Earthed, when engine is stopped
Pin 14: 12 V, when the rearmost push button is depressed, otherwise 0 V.
Pins 15 and 16: If the DPS ratio is direct–overdrive–overdrive, the wire is connected to pin 15. If the ratio is reduction–direct–overdrive, the wire is connected to pin 16 (wire is energised with 12 V).

OUTPUT signals

Pins 1 and 2: Current to DPS solenoids (12 V). When the clutch pedal is depressed, both pins are deenergised and also the solenoid valves Y4 and Y6. When pin 1 is energised (12 V), solenoid valve Y4 is energised. When pin 2 is live (12 V) solenoid valve Y6 is energised.
Pins 17, 18 and 8: Signals to pilot lights (12 V).

Position of connectors
X1: In fuse box
X4: In fuse box
X6: In fuse box
X11: Connector in the cab roof
X13: Solenoid valve connector under the hand brake console
X19: Plug on the cab front wall on the RH side.
X26: White connector at the rear side of the instrument panel
X27: Blue connector at the rear side of the instrument
S23: Push button connector at the lower end of gear levers
X23: Extra push button connectors at the lower end of gear levers



Picture 2. *Input and output signals to/from Delta Powershift circuit card A10*
+=energised, 0=unenergised
Z=18–pin connector seen from front
Pins 7 and 9 not in use
X23= Connector for extra buttons
GR1=Ground point in the rear part of the lever console
GR5=Ground point on the cab front wall
Note! *Position of various component and connectors and wiring diagram are shown under code 310 alla.*

Fault tracing of input signals

The input signals can be measured from the detached connector of the circuit card, when the current is switched on. When malfunctions occur, check the fuses, supply voltages and earthing.
If one of input signals is uncorrect, check wiring and connectors of this function and the sensor/switch in question.

Testing the circuit card buzzer

– Ground pin 3 and feed voltage of 12 V to pin 11.
– Ground pin 13 and feed voltage of 12 V to pin 4, at which time the buzzer must give continuous signal. Disconnect pin 4, after witch the buzzer should alarm about 2 min.
– Remove ground from pin 13 and ground pin 12 and feed a voltage of 12 V to pin 4, after which the buzzer should give discontinuous sound signal.
– Feed pin 10 with 12 V and disconnect pin 4, after which the buzzer must give discontinuous alarm signal.

Fault tracing of output signals

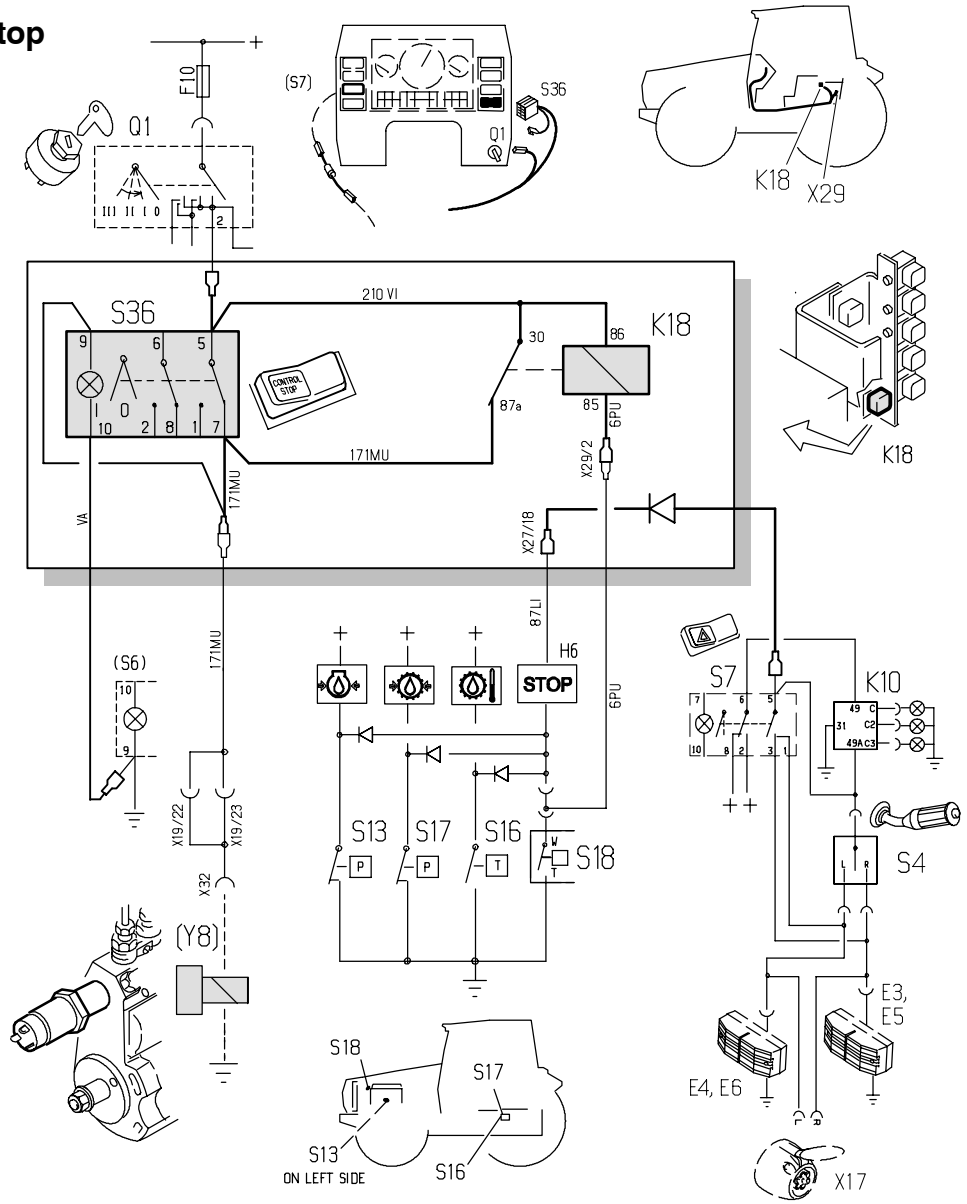
Signals from pins 1 and 2 to solenoid valves can be verified by engaging different ratios and by testing with a metal tool, whether the solenoid valve in question becomes magnetic (see +/0 table) and by measuring voltage in the solenoid valve connectors (12 V).

If there is no voltage at the solenoid valves, check connector X13 and wiring. If output signal from the circuit card A10 has no voltage, although the input signals are OK, the whole circuit card should be changed. The output signals can be measured with a multimeter from circuit card connector while current is switced on and connector Z is in place. All outputs are 12 V. When measuring on the lower pins, do not short circuit the pins. It is recommended, that the measurements are carried out on the wire side of the connector

From pins 17, 18 and 8 signals are sent to the pilot lights. The picture above shows which pins are energised with different ratios. The output signals (12 V) to the pilot lights can be measured on the card with a multimeter, when current is switched on and connector Z is in place. When the push buttons are pressed while the current is switched on, the pilot lights must come on and go out in correct order.

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Control stop



Picture 3. *Wiring diagram of control stop (optional)*
Q1=starter switch (number 32553200)
S36=control stop switch on the dashboard
Y8=stop solenoid on the fuel injection pump (in–line pump)
K18=control stop relay (in the lever console)
S4=combination control
S7=switch for hazard warning flashers
S13=engine oil pressure sensor
S16=gearbox oil temperature sensor
S17=gearbox oil pressure sensor
S18=engine temperature sensor
K10=Direction indicator relay(in front of fuse box)
X29=control stop wire loom connector in the rear part of the lever console

Function

When switch S36 is in off position (in picture), current can affect the solenoid Y8 when the starter switch is turned to the starting position and the engine can be started (engine does not start, if the switch is in the on position).

When the switch S36 is turned on, current flows to the solenoid via relay K18. If on of sensors S13, S17, S16 or S18 becomes grounded, the relay breaks the circuit and the engine stops. Warning lights illuminates normally (also stop–light flashes).

Note! Stop–light wire must be equipped with a diod. Otherwise, when driver uses the direction indicator lever S4 or hazard warning flashers, relay K18 becomes earthed via bulbs E3–E6 caused engine stop. In the year –96 a diode has been added in the instrument, and the auxiliary diode is not needed. These instruments with the diode can be recognized by a green dot beside the part no.

The gearbox oil pressure sensor is placed on the servo valve block on the RH side of the gearbox and the temperature sensor is placed on the front side of the valve block
Engine oil pressure sensor is placed on the RH side of the engine and the temperature sensor on the engine beside the thermostat housing.

Testing the function

Regarding the stop solenoid, see page **350/7**. If the tractor has Stanadyne distributor pump, the stop solenoid is as standard inside the pump, see picture on page **220/12**.

The function can be tested while the engine is running and switch S36 in the on position. When a wire connector of one of the sensors S13, S16, S17 or S18 is connected to the tractor frame, the warning light must come on and the engine must stop. Stop light flashes, when engine temperature sensor becomes earthed. Other functions have separate warning lights.

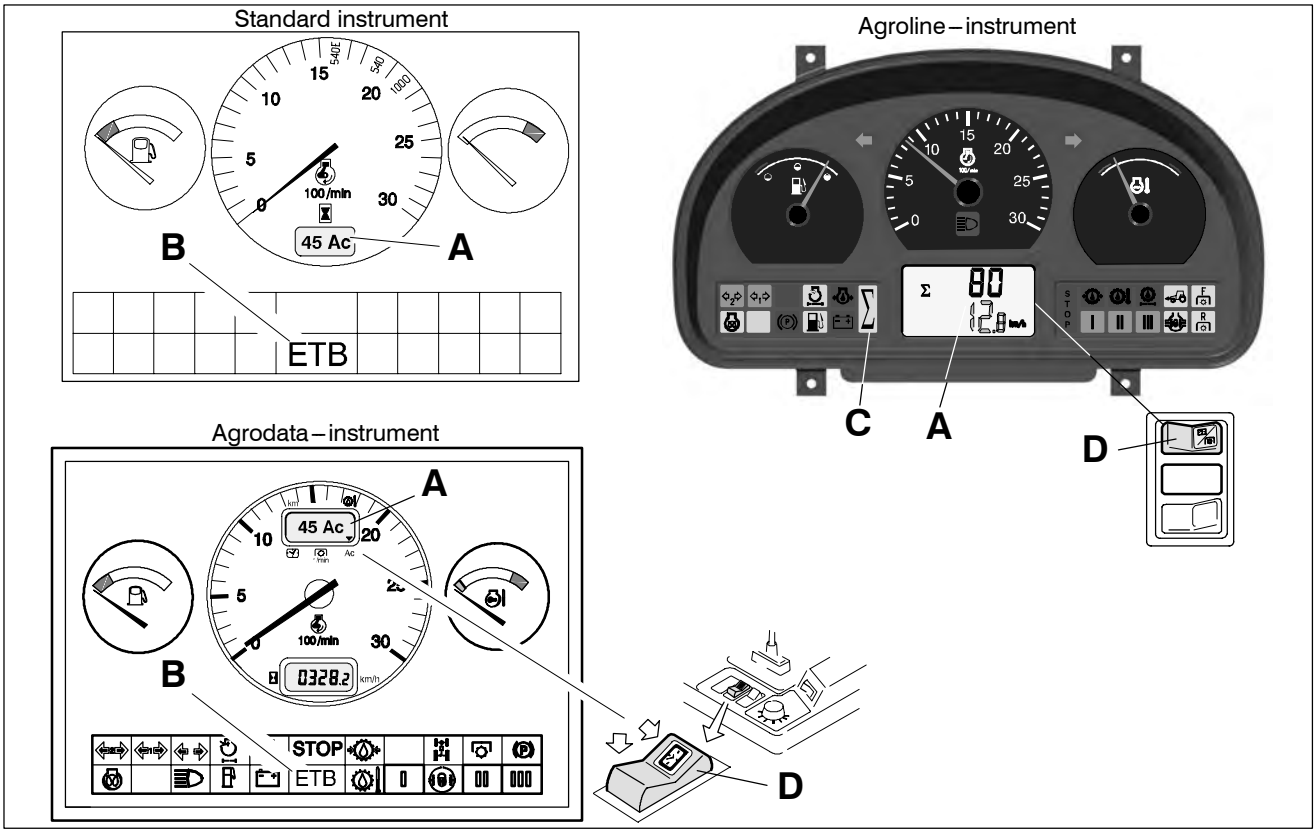
1. Description

A. General

Engine (634 DS/634DSBIE) on Valtra 8750 and 8950 tractors has as a standard equipment Σ–power system (double output system). Tractor transmission max. output is 160 hp, but max. PTO output is 190 hp (8750) / 200 hp (8950).
The automatics of the Σ–power system have been designed so that the engine output for the tractor transmission never is larger than 160 hp. The injection pump has a boost control. Pressure loading from the intake manifold can be cut with the aid of a solenoid valve. When the PTO loading is high, the intake manifold pressure affects the membrane of the boost control unit (solenoid valve energised), which facilitates movement of the fuel injection pump control rod to the high output range.
When the PTO loading decreases, the solenoid valve is closed (which is controlled fully automatically by the control unit of the system) and the fuel pump control rod can move to the low output range.

The torque of the PTO unit is measured by two sensors. One sensor is placed at the flywheel under the starter motor (earlier at the engine front end. On 8950 Hi in front of the DPS) and another in the PTO unit. These sensors indicate a twist of the long PTO shaft as a phase shift, which in turn indicates the torque transmitted by the PTO unit. Always when the PTO is disengaged, the sensor phase shift is zeroed automatically to avoid inaccuracies caused by permanent deformation of the shaft or phase shift changes caused by repair works.

The Σ–power system is controlled automatically by the control unit.



Differences in the dashboard:
On 8750 and 8950 tractors there is a digital instrument **(A)** which shows as a percentage, how large a part of the tractor total output is transmitted via the PTO unit, when the PTO is engaged. At other times the Standard instrument shows tractor running hours.

If tractor is equipped with the Agrodata–instrument (see code **331 page 1**), the Ac–display must be selected in the upper digital display by using switch **(D)** (see black arrow) before the PTO %–display can be seen.

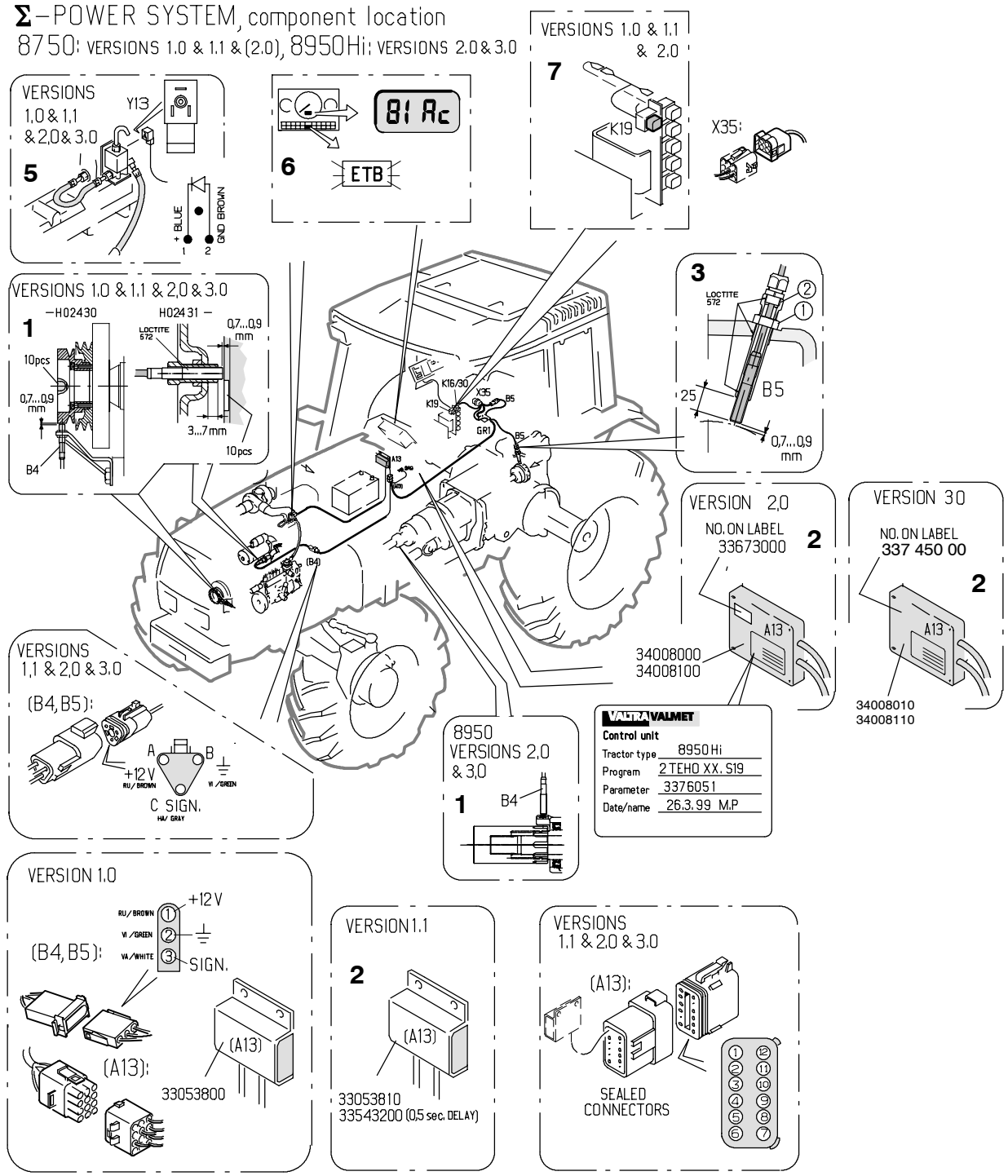
In LCD–display of the Agroline–instrument the upper row can be changed by pressing the RH side edge of the switch **(D)**, before the PTO %–display can be seen. (see code **333 page 3**)

ETB light (B) Standard and Agrodata–instruments.
When the higher output range of the engine is engaged, there is a light ETB in the warning light panel (ETB=Extra Turbo Booster). The ETB–light has also a fault diagnostic function. It indicates by flashing, if the system has malfunctions.

Σ light (C) Agroline–instrument.
When the higher output range of the engine is engaged, there is a light Σ in the warning light panel. The Σ–light has also a fault diagnostic function. It indicates by flashing, if the system has malfunctions.

Note! If an electric welding is done on the tractor or on the trailer or implement, which are attached to the tractor, both battery cables must be disconnected. Otherwise the Σ–Power system may be damaged.

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***Picture 1**. Components for Σ–power system*

***1.** Engine speed sensor B4*

***Note!** On 8950Hi tractor the engine speed sensor is placed at the front end of the DPS*

***2.** Σ–Power control unit A13.*

Note!** Modifications have been made in the control unit, when new versions have been started to use. Different versions are shown in the table on the next page **313**/**2A.

***3.** PTO speed sensor B5*

***4.** Boost control unit on the fuel injection pump governor housing (see page **313**/**3**).*

***5**. Solenoid valve Y13.*

***6.** ETB–light and output % display*

***7**. Σ–Power relay K19 in the lever console in the cabin (not in version 3.0)*

Position of connectors

- connector X35 (9 pins) is placed in the lever console and it is accessible after removing the console side cover.
- Sensor B4 connector in the engine compartment.
- Sensor B5 connector has been drawn into the lever console.
- Control unit connector A13 (12 pins) in the engine compartment near the control unit
- Control unit A13 earth point GR9 in the cab front wall
- Other Σ–Power earth point GR1 in the cab lever console rear part
- Relay K19 is placed in the lever console beside the relays for the AC 2.1 unit (not in version 3.0).

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Version markings of SigmaPower

(see picture on page **313**/**2**)

Sigma–version	Tractor	Used in production	Sigma control unit A13, part number		Sensors B4 and B5	Wire loom	Modifications
			In production.	As a spare part.			
1.0	8750	–G04413	330 538 00	34 008 000	330 545 00	330 262 00	–
	8750	G04414–			330 545 00	330 262 00	Engaging limit lowered 520 Nm –> 350 Nm.
1.1	8750	G22507–	330 538 10		330 545 10	330 262 10	Tight connectors.
	8750	H02431–			330 545 10	330 262 10	Sensor B4 placed on flywheel housing.
2.0	8950Hi	H49112–K02116 ja K05209–	336 730 00	34 008 100	330 545 10	336 839 00	New control unit, engaging limit 400 Nm, engaging delay 0,5 seconds.
	8750	J20107–		34 008 000	330 545 10	336 839 00	

Sigma power 2.0

In the tractor production Sigma 2.0 is fixed on **8950Hi** and on **8750** tractors.
Max. engine power output: 8950hi: 160 / 200 hp. 8750: 160 / 190 hp

Sigma engages at a torque of about 400 nm (350–450 Nm)
– measured at pto shaft; ac display shows 35–40 %
Sigma disengaging limit is about 50 nm lower than the engaging torque limit

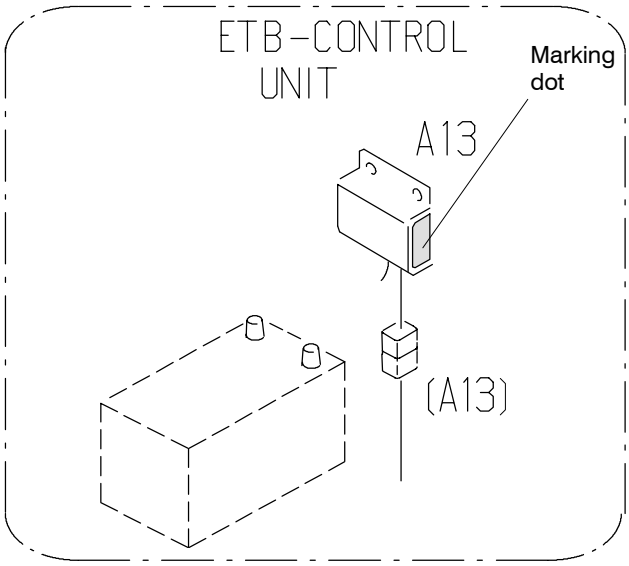
Engaging delay is 0.5 seconds (= over 400 nm min. 0.5 sec.)
Disengaging delay is 5 seconds (= below 350 nm min. 5 sec.)

The function of the 2.0 system is more accurate than earlier versions due to:
– new electronics and programs in the control unit
– zero calibration is made only with high engine speed modificated fault codes
– easier to check which sensor (b4 or b5) is faulty or wrongly adjusted

"Zero" calibration have to be done after repairs of pto and after fixing a new control unit
– disengage pto (lever & switch) > start the engine > keep engine speed at 1600 rpm 25…30 seconds > zero calibration value is saved in the memory automatically > ac display shows 0–2 %
– the zero calibration value is automatically determined and saved to memory every time when engine speed has been over 1500 rpm over 5 seconds (pto lever in off –position)
– the control unit uses always the latest zero calibration value in the memory (the value is kept in memory also when starter switch is switched to stop position)

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B. Control unit A13



The control unit is situated in the engine compartment.

Function

The control unit gathers information from the sensors and switches and sends required electric signals to the solenoid valve and the pilot lights in order to switch on/off the higher engine output range.

The torque of the PTO unit should be at least 2 sec. (0,5 sec. in versions 2.0 and 3.0) above the switch–on torque, before the higher output range is switched on. This eliminates malfunctions caused by occasional torsional vibrations, e.g. during starting. When the PTO unit torque decreases, the torque should be at least 5 sec. below the disengaging torque before the lower engine torque range is switched on. Thus e.g. a sudden loading decrease in the PTO unit (e.g. at occasional holes or puddles etc.) does not disengage the higher output range. In addition, the disengaging torque is a little lower than the engaging torque. These differences in the times and torques also prevent possible seesawing engagements.

Note! The engaging torque has been changed, see table on page 313/2A.

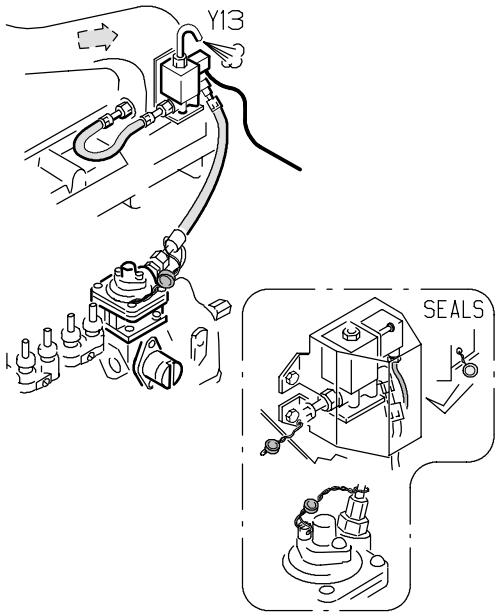
If the ETB light does not light or flash, although the PTO is loaded so that the higher output range should engage and the digital instrument does not show the percentage value of the PTO output (e.g. the instrument shows 99 Ac or 0 Ac regardless of the loading of the PTO unit), this indicates that the system has been damaged, see fault tracing on pages 313/6–13.

If there are malfunctions in engagements between the two output ranges (e.g ETB–light blinking), the control unit may be damaged or the sensors have faulty adjustments.

Spare part control units have been programmed in the factory and they can be fitted in place of the damaged units (connectors are supplied with the unit). If the control unit A13 has to be changed, the solenoid valve seal must be broken.

IMPORTANT! If on 8750 tractor is fitted the control unit of version 2.0 in place of the versions' 1.0 or 1.1 units, connector A13 wires to pins 4, 7 and 12 (on tractor wire loom side) must be disconnected and the ends of the wires must be isolated (if not made earlier)

C. Solenoid valve Y13 and boost control



When voltage of 12 V is fed to the solenoid valve pins, the valve should become magnetic and "click" must be heard from the valve. Always when the ETB light illuminates, the solenoid is energised (higher output range is on).

Seals:
To prevent overriding of the solenoid valve or supply direct to the solenoid pins, lead seals have been made on the solenoid valve and on the boost control pipe, see picture above.

If the solenoid valve has to be changed during the warranty period, the sealing must be done anew. If the control unit has to be changed, the solenoid valve seal must also be broken. If a tractor fails due to the overriding of the control unit, the warranty does not compensate the costs.

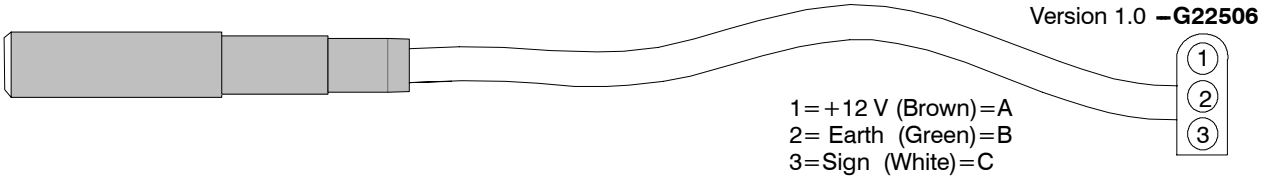
Note! The function of the boost control has been described on page 223/9, which deals with 6800 tractor, but the function is the same as on 8750 and 8950 tractors, when the solenoid valve is energised (open).

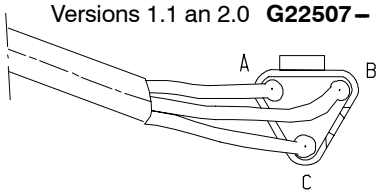
The ETB–light indicates, if the solenoid valve is not functioning, ETB–light then flashes in time **2 sec** *) on and **0,5 sec** off. This flashing indicates that the solenoid valve control is not on due to e.g. a short circuit or there is no load in the solenoid output pins, e.g. solenoid wire broken.

*) 1 sec. in versions 2.0 and 3.0.

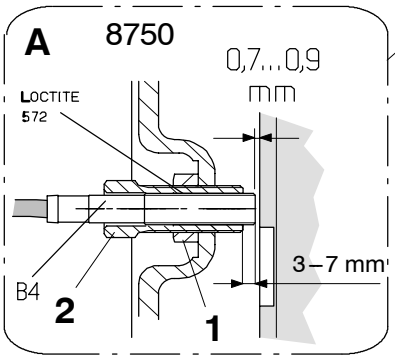
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D. Sensors B4 and B5, versions 1.0, 1.1 and 2.0



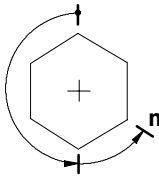


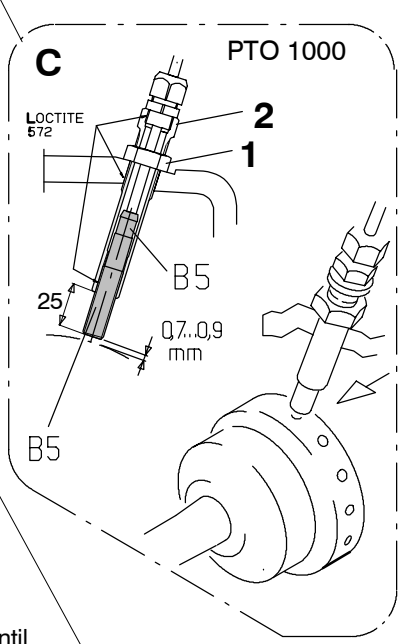
H02431–



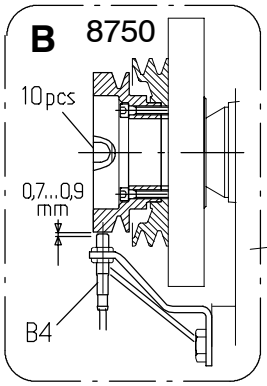
A, C and D

In connection with sensor replacement, screw a new sensor into the sleeve to the same depth as was the earlier sensor. Use Loctite 572 when fitting the sensor. Turn the sleeve 2, until the sensor touches the measuring wheel (not at the notch) and then open the sleeve **1/2–2/3 of a turn**. Lock the sensor with nut 1 (sleeve thread M18x1,5).





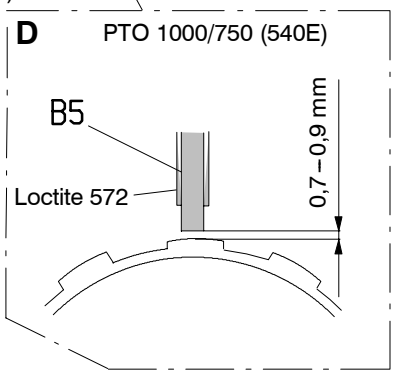
–H02430



Stop the engine before sensor adjustment.

B

Screw the sensor first fully home until the sensor end touches the measuring wheel (not at the notch) and open it then **3/4 turn**. Lock the sensor with a locking nut (sensor thread is M12X1).



Note! On 8950Hi models the foremost sensor is placed in front of the DPS and the sensor is adjusted so that the distance between the sensor end and the impulse sleeve is **0,7–0.9 mm** (not at a notch).

Note! Versions 1.0 and 1.1: The ETB–light indicates by flashing, if the sensor signals are not OK (e.g. there is no signal from one sensor), ETB–light is flashing in time **0,5 sec** on and **0,5 sec** off. This flashing indicates, that the sensor is faulty or there are poor contacts in the connectors/ wires. Also wrong adjustment can cause malfunctions.

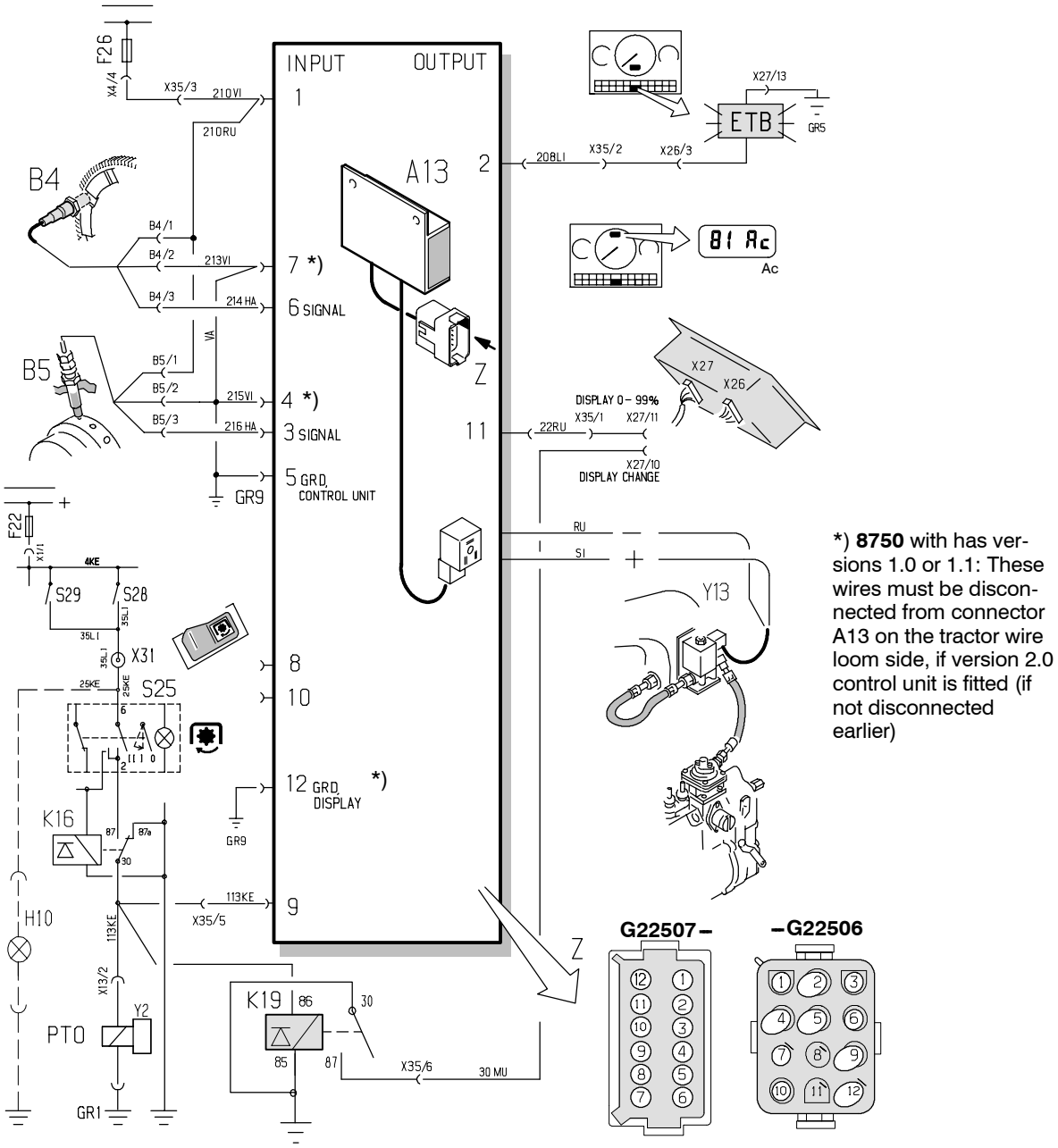
IMPORTANT! Versions 2.0 and 3.0: If the engine speed sensor is damaged, the ETB–light flashes in above mentioned time **twice**, after which there is a pause of 1,5 sec. If the PTO sensor is faulty, the ETB–light flashes **three times**, after which there is a pause of 1,5 sec.

The distance between the sensor end and the impulse surface must be at least 0,7 mm (at least 1/2 turn), otherwise the sensor can be damaged mechanically.

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2. Electric connections, versions 1.0, 1.1 and 2.0



*) **8750** with has versions 1.0 or 1.1: These wires must be disconnected from connector A13 on the tractor wire loom side, if version 2.0 control unit is fitted (if not disconnected earlier)

Picture 3. *INPUT and OUTPUT signals to/from control unit A13 in versions 1.0, 1.1 and 2.0.*

INPUT SIGNALS
Pin 1: Supply voltage (battery voltage) into the control unit A13 and into the sensors B4 and B5 via fuse F26 and starter switch.
Pin 3: Signal from the rearmost sensor B5
Pin 4: Earthing of the rearmost sensor B5 (not used in version 2.0, wire 215 Green is not connected to unit)
Pin 5: Control unit earthing
Pin 6: Signal from the foremost sensor B4
Pin 7: Earthing of the foremost sensor B4 (in version 2.0 RS232 RxD, wire 213 Green is not connected to unit)
Pin 8: Not in use
Pin 9: Control of PTO and %–display. Supply voltage, when PTO is engaged, otherwise 0 V.
Pin 10: Not in use
Pin 12: Earthing of display (in version 2.0 RS232 TxD, wire GR9 not connected to pin 12)
OUTPUT SIGNALS
Pin 2: Control of ETB–light. >10 V, when the higher output range is engaged (in %–display >25–30 %), otherwise 0 V.
Pin 11: Control of %–display. When the PTO is engaged: ~ 9 V=0 %, ~ 1 V=99 %.

Others! Supply voltage (12 V) into the solenoid valve Y13, when the higher output range is switched on (ETB–light illuminates), otherwise 0 V. Earth from relay K19 into the %–display, when the PTO is engaged. When not engaged, the digital instrument shows running hours. Relay K19 changes the display from running hours into the output percentage display. AD–instrument shows 0 Ac, although the PTO is disengaged.

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3. Fault tracing, adjustments and repairs

If the Sigma Power - system has malfunctions, the function is checked in the following order:**A.** Checking function with the aid of the ETB −light
B. Checking function and sensor adjustment with the aid of the Ac display.
C. Fault tracing by measuring voltages
D. Checking and adjustment of the sensors with the aid of Fluke123 oscilloscope (if necessary)

A. Checking function with the aid of the ETB −light

The ETB light in the dashboard indicates the engagement of the system and it also shows by flashing possible faults which are found by the control unit.

ETB -light status	Description	Possible reasons
Off [1])	Engine lower output range on (valve Y13 unenergised)	
On (when great PTO loading)	Engine higher output range on (valve Y13 is energised)	
On (although no loading in PTO) or flashes random.	Faulty function	− Sensor adjustment incorrect, control unit faulty
Flashes 2 s on *) / 0,5 s off *) New control units: 1 sec on.	− Solenoid valve Y13 control is not engaged (e.g. short circuit) − or not load in the valve electric circuit	− Valve solenoid burnt, wire short circuit, earth fault − Valve solenoid faulty, wire broken, poor connections, valve connector disconnected
Flashes 0,5 s on / 0,5 s off	− No signal from sensors B4 or B5 [1]) [2]) [3])	− Poor contacts in wires/connectors, sensor adjustment incorrect, faulty sensor

Note! [1]) If the signal from both sensors is lacking, the ETB -light does not flash or glow. In this case the adjustment and voltages of both sensors must be checked.

Note! [2]) **Versions 1.0 and 1.1**: The ETB light does not show, signal of which of the two sensors is lacking. This can be cleared up by disconnecting the engine sensor B4 connector and by starting the engine again. If the ETB -light again flashes (0,5s / 0,5s), the fault lies in the engine sensor B4 circuit. If the ETB light goes out, the fault lies in the PTO sensor B5 circuit.

Note! [3]) **Versions 2.0 and 3.0:** Flashes **twice** in time mentioned above, after which there is a pause of 1,5 sec=engine sensor faulty. Flashes **three times** , after which there is a pause of 1,5 sec.=PTO sensor faulty.

B. Checking function and adjusting sensors with the aid of Ac−display

Instructions on instrument, see page 331/1.

The Ac−display shows in percentage, how big part of the tractor PTO output is transmitted by the PTO unit, when the PTO is engaged. On the ground of the display reading the function of the Sigma can be investigated during driving.

1. Start the engine (PTO disengaged), let it runt at the low idling speed for a while (about 20 s), now the control unit has made the calibration of the 0−mode. Set the instrument so that it shows the Ac−reading (Agrodata -instrument). Run the engine up to max revs (warm the engine first). If the Ac −display shows other digits as zero, this indicates that the sensor adjustment is incorrect.

2. If the sensor adjustment must be done, it is better to start the work with the foremost sensor. Turn the sensor in the flywheel housing fully home (not at the notch), and unscrew then **1**/**2**−**2**/**3** turn (thread M18x1,5), the clearance is now 0,75−1,1 mm (locking nut; spanner width 27 mm). If the foremost sensor impulse wheel is located in the front end of the crankshaft (−H02430), the clearance is easy to check and adjust to 0,8 mm.

3. Run the engine as in paragraph 1. If the situation did not change, the rear sensor must be adjusted (engine in the running during adjustment). Unscrew the locking nut (1000; spanner width 22 mm, 1000/540 E; 27 mm) and turn the sensor outwards, and test whether the fault disappeared or the situation changed.

With the adjustment is seek situation, in which percentage readings do not appear in the Ac−display, and the ETB−light does not flash in any revolution range. The rear sensor clearance can be checked, if needed, through the hole for the free return oil connection for the auxiliary hydraulics.

4. Start the engine and let it run at the low idling speed about 20 s. Engage PTO, run the engine up to max. revs. Small readings (1−3 %) can be visible in the Ac−display when accelerating. Set the engine revs to 1800−2200, and pull at the hydraulic valve block lever. In the Ac−display there must be 10−25 % (shaft twist caused by hydraulic pump, depends on oil temperature and revs).

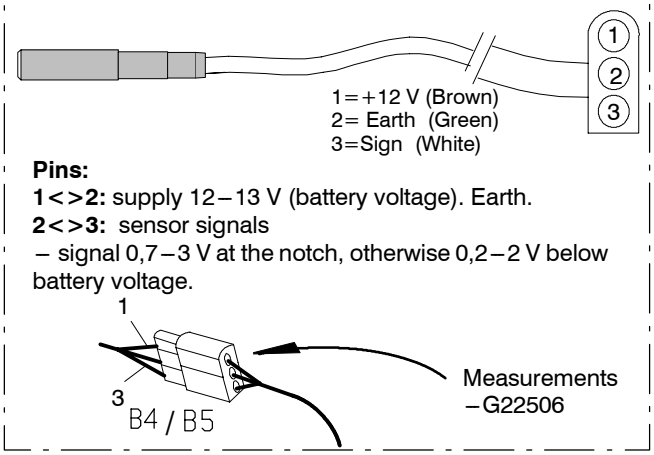
If the Sigma still has malfunctions after adjusting sensors, the possible fault is seek by measuring internal voltages of the system.

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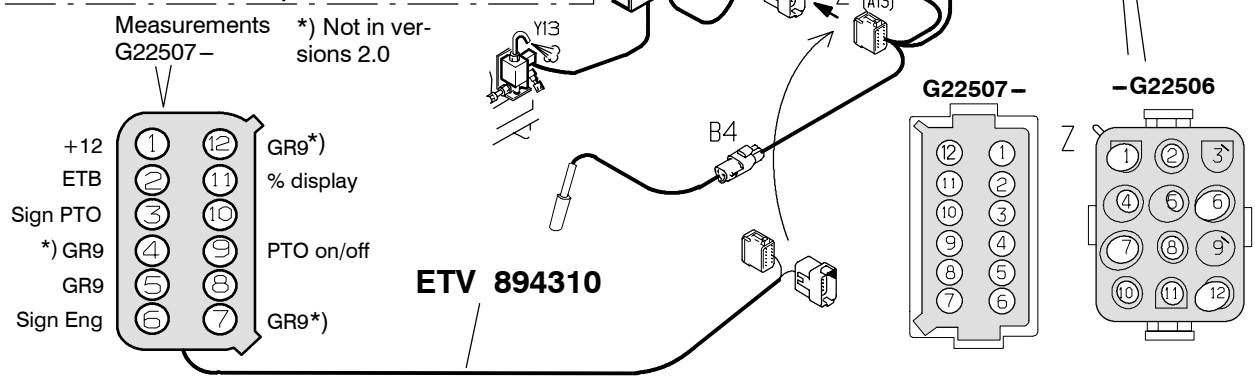
C. Fault tracing by measuring voltages

The latest connectors (**G22507–**) are tight, and connector rubber seals must not be opened, but the voltage measurements are done by connecting ETV 894 310 into the wire loom. On the earlier connectors (**–G22506**) the measurements can be done through the holes in connector A13 and/or through the holes in connectors B4 and B5. There are pin numbers on the connector housings.

Earlier connectors (–G22506): sensor voltages are measured from the connectors B4 and B5 through holes on them while the current is switched on to the tractor:



Pins:
1<>2: supply 12–13 V (battery voltage). Earth.
2<>3: sensor signals
– signal 0,7–3 V at the notch, otherwise 0,2–2 V below battery voltage.



If the Σ–Power has malfunctions, disconnect connectors B4, B5 and A13 and reconnect them, so that possible poor contacts disappear. If the malfunctions still exist, carry out the following voltage measurements:

Earlier connectors (–G22506): Carry out measurements through the holes in the connectors.
The latest connectors (G22507–): Connect measuring cable **ETV 894 310** between the control unit connector A13 and carry out measurements from the measuring cable connector.

Switch on current to the tractor and carry out the following measurements:
Pins

+<> –	measure battery voltage from the battery terminals (12–13 V)
1<>5	supply voltage (battery voltage) into the control unit, control unit earthing
1<>7	**Versions 1.0 and 1.1**: supply voltage (battery voltage) into the sensors, sensor earthing
1<>4	**Versions 1.0 and 1.1**: supply voltage (battery voltage) into the sensors, sensor earthing
6<>5	signal from foremost engine sensor B4
3<>5	signal from rearmost PTO sensor B5
	Versions 1.0, 1.1 and 2.0: signal 0,7–3 V at the notch, otherwise 0,2–2 V below battery voltage
1<>12	**Versions 1.0 and 1.1**: supply voltage (battery voltage), display earthing
9<>12	**Versions 1.0 and 1.1**: control of PTO and %–display
	– supply voltage, when the PTO is engaged, otherwise 0 V
9<>5	**Versions 2.0:** control of PTO and %–display
	– supply voltage, when the PTO is engaged, otherwise 0 V

Start the engine:
Pins

11<>12	**Versions 1.0 and 1.1**: control of %–display
	– when the PTO is engaged: ~ 9 V= display 0 %, ~ 1 V= display 99 %.
11<>5	**Versions 2.0**: control of %–display
	– when the PTO is engaged: ~ 9 V= display 0 %, ~ 1 V= display 99 %.
2<>12	**Versions 1.0 and 1.1**: Control of ETB–light
	– >10 V, when the higher output range is on (>25–30 % in display), otherwise 0 V.
2<>5	**Versions 2.0**: Control of ETB–light
	– >10 V, when the higher output range is on (>25–30 % in display), otherwise 0 V.

Incorrect voltage readings may be caused by:

Pins

+<>–: battery cable shoes, bad battery or faulty alternator.

1<>5: fuse F26, connectors X35, A13, or X4 or earth point GR9 in the cab front wall.

1<>7: **Versions 1.0 and 1.1**: connector A13 or earth point GR9.

1<>4: **Versions 1.0 and 1.1**: connector A13 or earth point GR9.

6<>5: connectors B4 or A13 or earth point GR9 or sensor B4.

3<>5: connectors B5 or A13 or earth point GR9 or sensor B5.

1<>12: **Versions 1.0 and 1.1**: fuse F26, connectors X35, X4, A13 or earth point GR9.

9<>12: **Versions 1.0 and 1.1**: fuse F22, switches S28 or S29, emergency stop socket X31, PTO switch S25, PTO emergency stop relay K16 or connector X35 or earth point GR9.

11<>12: **Versions 1.0 and 1.1**: connector A13 or earth point GR9. If these are OK, but the voltages are incorrect, fault can lie in control unit A13. If the voltages are OK, but the %–display does not function, check con nectors X35 and X27. If the %–display is still defective, check relay K19. Fault can also lie in the instrument elec tronics.

2<>12: **Versions 1.0 and 1.1**: connector A13 or earth point GR9. If these are OK, but the voltage read ings were incorrect, the fault lies in the control unit A13. If the voltages were OK, but the ETB–light does not light, check connectors X35, X26, X27 and ETB–light earth point GR5. If these are OK, but the ETB–light does not light, the lamp can be defective.

9<>5 **Version 2.0:** fuse F22, switches S28 or S29, emergency stop socket X31, PTO switch S25, PTO emergency stop relay K16 or connector X35 or earth point GR9.

11<>5: **Versions 2.0:** connector A13 or earth point GR9. If these are OK, but the voltages are incorrect, fault can lie in control unit A13.
If the voltages are OK, but the %–display does not function, check connectors X35 and X27. If the %–display is still defective, check relay K19. Fault can also lie in the instrument electronics.

2<>5 **Versions 2.0:** connector A13 or earth point GR9. If these are OK, but the voltage readings were incorrect, the fault lies in the control unit A13. If the voltages were OK, but the ETB–light does not light, check connectors X35, X26, X27 and ETB–light earth point GR5. If these are OK, but the ETB–light does not light, the lamp can be defctive.

Note! If the measurements above show, that the unit is OK, but the higher output range does not engage, although the PTO loading is high (>25–30 %), the fault lies in the control unit A13, in the solenoid valve Y13 or in its wiring.

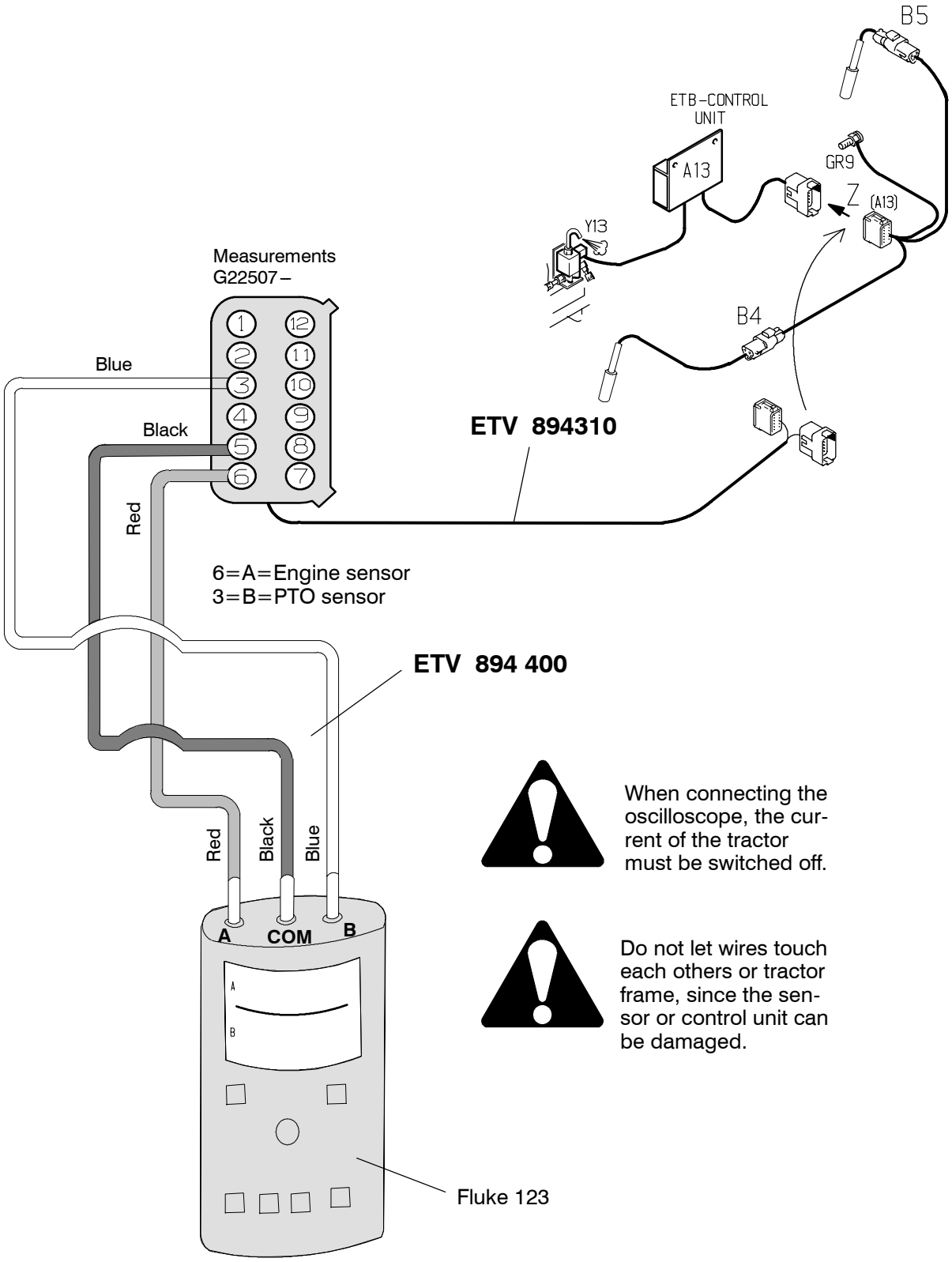
Others

If the sensor (B4, B5) wires are connected wrongly, the sensors will be damaged and also the control unit can be damaged. A damaged sensor does not damage the control unit, but too high voltage (>16 V) may damage it. The control unit does not be damaged, although the output lines (e.g. solenoid valve) are in a short circuit.

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D. Checking and adjusting sensors with Fluke123 –oscilloscope (if necessary)

1. Connect the measuring cable **ETV 894310** (requires later connectors, G22507–) to the connector (A13) of the control unit. Connect the oscilloscope (FLUKE 123 Scopemeter) to the measuring cable connector with cables ETV 894 400. A red wire to connector pin 6 (foremost sensor channel A) and blue wire to connector pin 3 (rear sensor channel B). The middle wire (black) of the oscilloscope is connected to connector pin 5 (earth) (see picture below).



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INTERPRETATION OF OSCILLOSCOPE WAVES AND SPECIFIED VALUES

2. Select oscilloscope settings; channel A DUTY (pulse ratio %) and channel B PHASE (phase difference B>A (deg)) and DUTY (pulse ratio %). Display range of both channels; 5 V/d, 2 ms. More detailed instructions for the use of the oscilloscope can be found in the end of this instruction on pages 313/12–13.

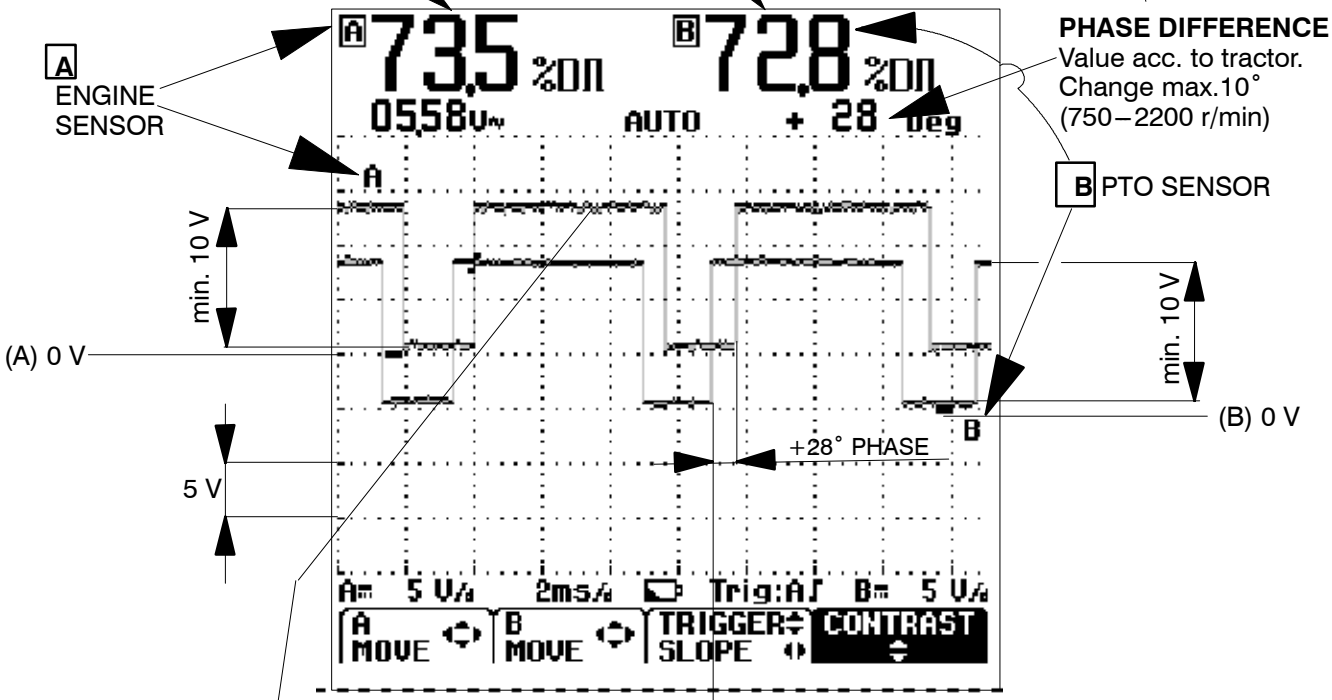
The phase difference indicates the time difference of the waves in channels A and B as degrees within −160˚...0˚...+200˚ (the total wave length is 360˚). The reading does not mean the angle of the crankshaft, since the sensor sends 10 pulses per one engine rotation. The sign (+/−) changes at degree values of 0˚ and +200˚ (=−160˚), since at these degrees the Oscilloscope changes the comparing to the previous/ next wave.

The greatness of the phase difference value is not important, only the change of this value is important. The position of the transmission mechanical parts (can be changed during reparations) and the PTO loading affect the phase difference. The sensor adjustment and the PTO unit type in the B channel affect the wave width (impulse surfaces can have different lengths).

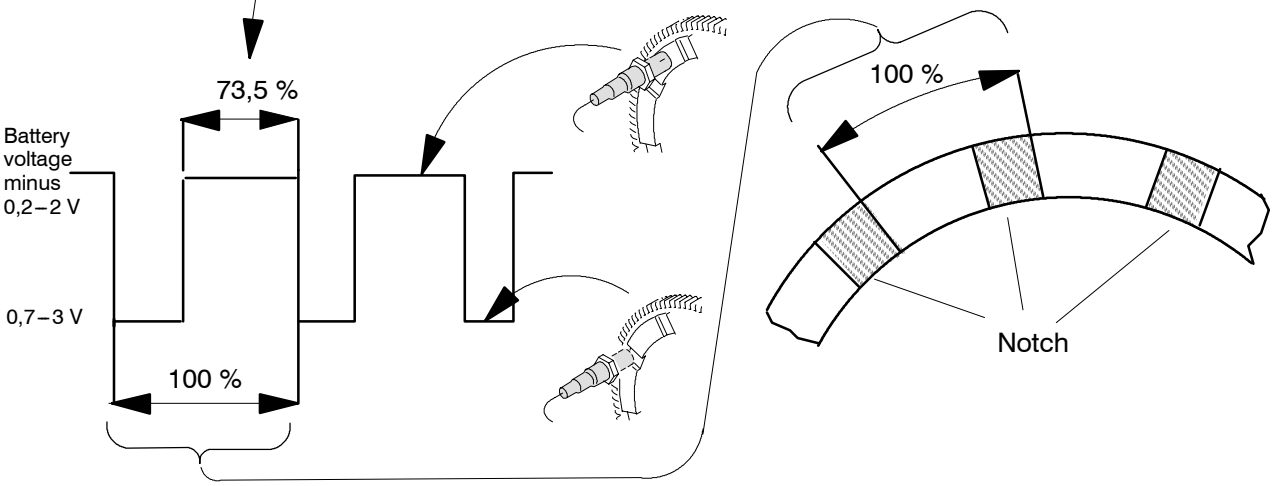
PULSE RATIO A
60–75 %
(Change max. 5 %.
750–2200 r/min)

PULSE RATIO B
PTO 1000/540E: 40–55 %
PTO 1000: 60–75 %
(Change max. 5 %.
750–2200 r/min)

PHASE DIFFERENCE
Value acc. to tractor.
Change max.10˚
(750–2200 r/min)



B–wave moves to the right, when the shaft is loaded with hydraulic valves or with PTO.



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3. Start the engine and let it run about 20 s at the low idling speed, PTO disengaged and the hydraulic pump in unloading circuit. Now the Ac –display must show 0, then the control unit has made the calibration of the zero–mode.

4. In the Fluke -instrument display there must appear two step waves (see picture). The upper A–wave shows signal from the engine sensor B4 and the lower wave signal from the PTO sensor B5.

If one of the waves does not appear, check the wires and measure internal voltages. Change the sensor(s) when necessary. Adjust the distance between the sensor and the impulse wheel to 0,8 mm. Turn the sensor fully home (not at the notch), after which open it 1/2–2/3 turn (thread M18x1,5), the clearance is then 0,75–1,1 mm (locking nut; spanner width 27 mm). If the front sensor impulse wheel is located at the front end of the crankshaft (–H02430), the clearance is easy to adjust to 0,8 mm.

5. Let the engine run at the low idling speed and read off the pulse ratio values (% D). Raise the revs evenly to the max. revs and read again off the pulse ratio values. The values are allowed to change at the most 5% –units. The readings can be between 40–75% (PTO type and position of the foremost sensor affect the reading). The change of the pulse ratio values at different engine revs must be within the permissible %–limits.

If necessary, unscrew the sensor locking nut and adjust the sensor distance from the impulse wheel by turning the sensor a little at a time and by waiting for a while to show influence of the adjustment, until the readings remain within the given limits in the whole engine revolution range. **Be careful** not to touch the impulse wheel with the sensor: sensor can be damaged. The sensor end must always be at least 0,7 mm out of the impulse wheel surface (at least 1/2 turn open).

6. Read off sensors' phase difference, the change can be at the most 10˚ between the min and max revs of the engine. The value of the phase difference is unimportant, only the change is important (the phase difference value can be any between 1..180° (or -1–180°). If the value is e.g. 175 ° at the low idling speed and at max. revs –8° the change is 13 ˚.

7. Set the display time value to 10 ms/d (with time–key). Let the engine run at low idling speed. Check that waves are in the display in even distances and that no wave is missing (stop the waves with hold–key).

8. Set the display scale to 5 ms/d, raise the engine revs to 2100 RPM. Check the same values as in stage 7. If one wave is missing, adjust the sensor and test its function.

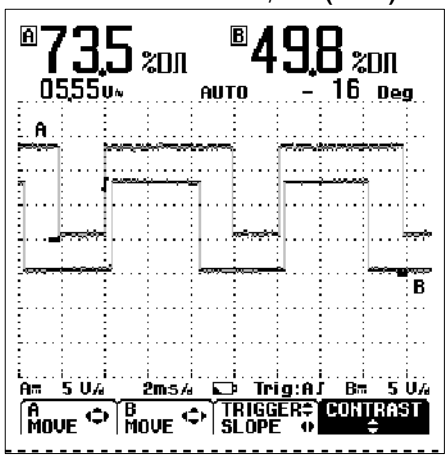
9. Carry out the same test as in instr. B in paragrapf 4. If it is possible to use a PTO brake, the ETB light must come on with readings 25..32 % in the Ac–display (ca. 350–450 Nm in the PTO shaft). When loading the PTO the B–wave (sensor B5) is moving to the right and the phase difference value must change.

If still malfunctions occur, change the control unit A13.

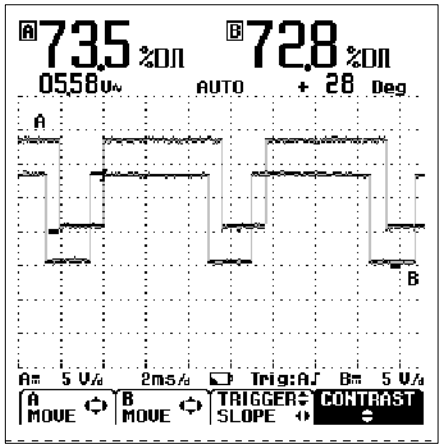
10. Disconnect the measuring cable and wires from the tractor, and connect connector A13. Ensure, that the sensor locking nuts are tightened.

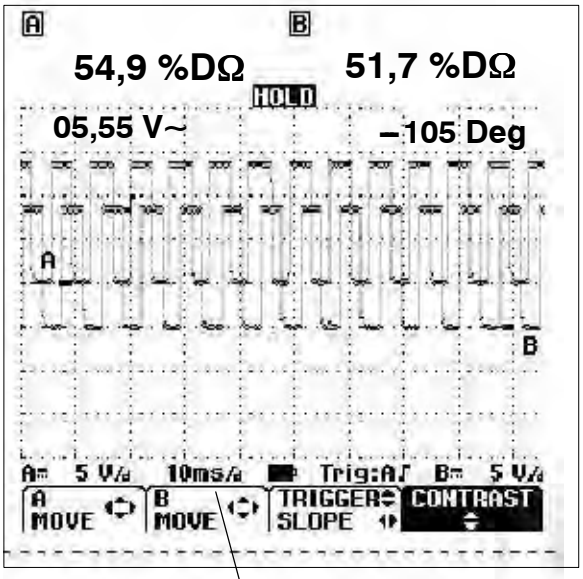
Figures below show two different measuring results from two different tractors with different PTO units (widths of waves). The position of the waves depends on a tractor, and thus the oscilloscope reading varies in different tractors.

EXAMPLE 1. PTO 1000/750 (540E)



EXAMPLE 2. PTO 1000





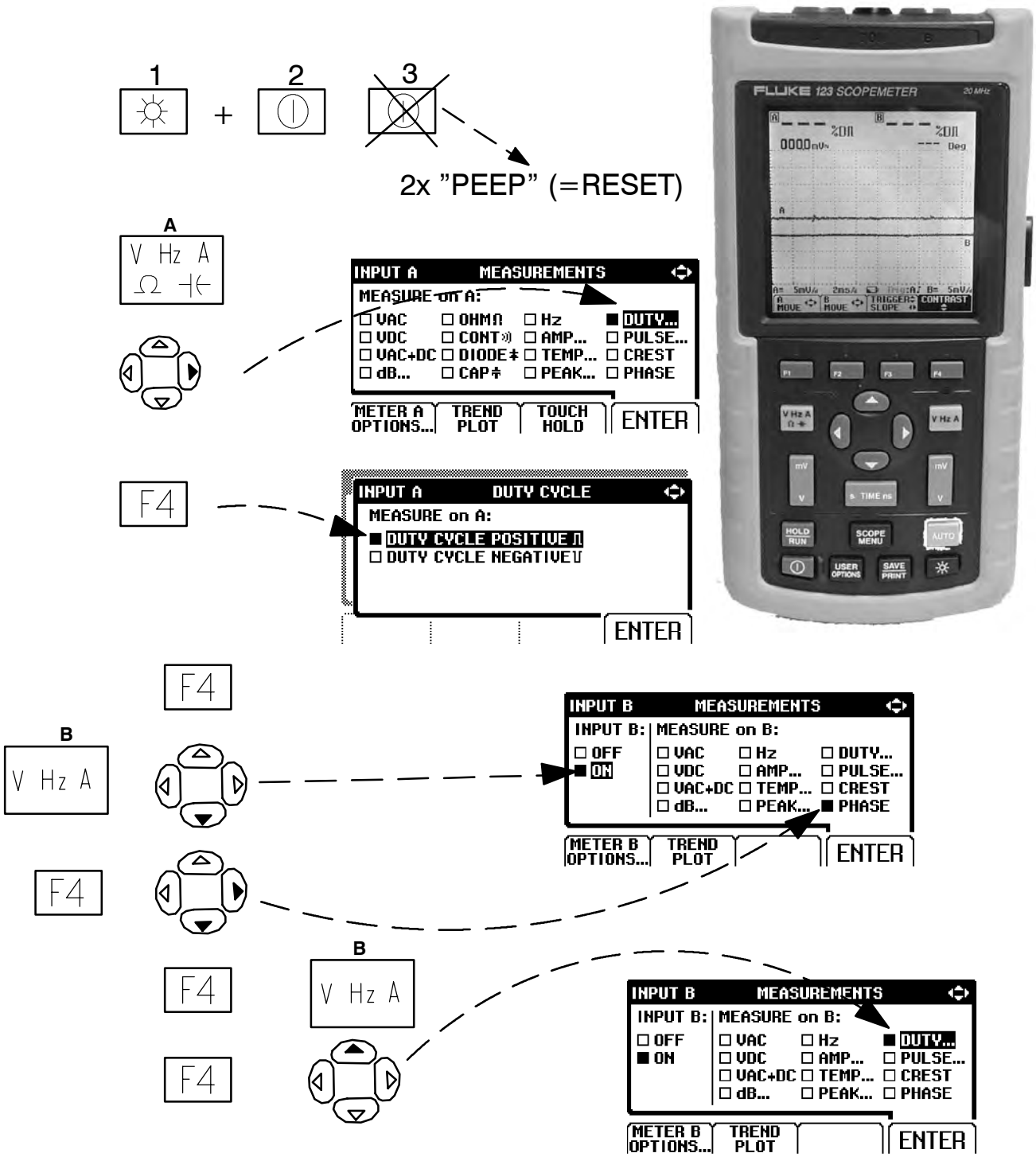
\+ –

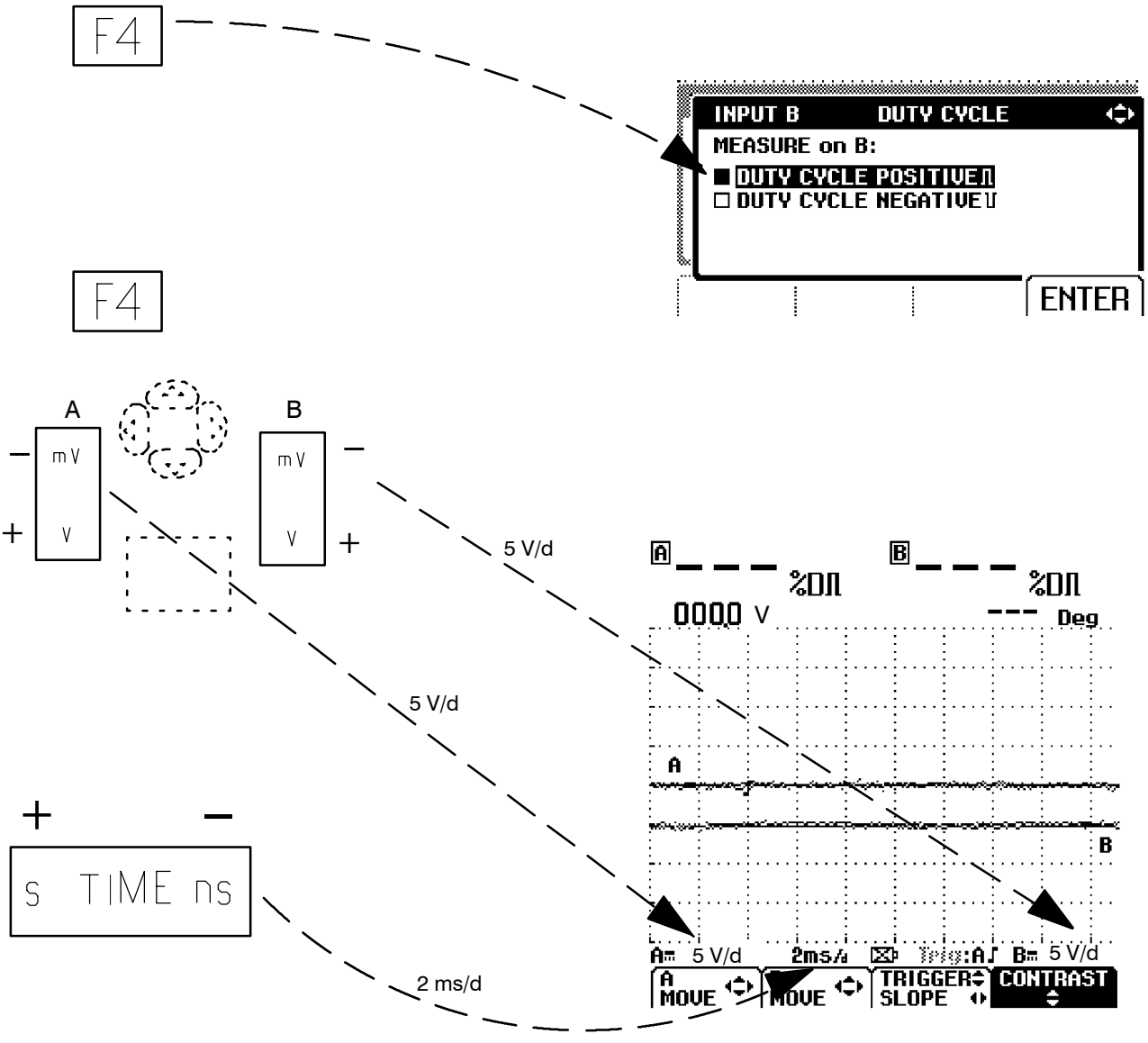
s TIME ns

10 ms/d 800–900 rpm
5 ms/d 2100–2200 rpm

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More detailed instruction on how to carry out the oscilloscope settings:




F4
INPUT B DUTY CYCLE
MEASURE on B:
DUTY CYCLE POSITIVE
DUTY CYCLE NEGATIVE
ENTER
F4
A
B
mV
V
5 V/d
5 V/d
2 ms/d
s TIME ns
%
0000 V
Deg
A 5 V/d
2ms/
B 5 V/d
A MOVE
MOVE
TRIGGER SLOPE
CONTRAST

31. Autocontrol 2.2/2.3	~~1. 6. 1999~~ 1. 8. 2000	Model 6200–8150	Code 314	Page 1

Autocontrol 2.2 replaces under code 312 presented Autocontol 2.1 from ser. no. **J05133** incl. on tractors 6200–8150 (not Hi-Tech). Autocontrol 2.2 includes also **ACB** power lift which is a standard equipment on these tractors, see code 321.
Note! AC 2.3 replaces AC 2.2. with effect from chassic no K44242.

Autocontrol 2.2/2.3 controls the transmission as follows:

1. Differential lock

The lock is controlled with a three–position rocker switch on the driver's right.

A. Rocker switch front edge depressed.

– the lock is always engaged except when brake pedal/pedals are depressed or when the power lift is in the transport position (signal light illuminates however). The lock engages when the brake pedal/pedals are released or when the lift/lower switch is in the lowering position or in the middle position.

B. Rocker switch in the middle position

– the differential lock is disengaged

C. Rocker switch rear edge depressed (spring returned)

– When the switch rear edge is depressed, the lock is engaged but it disengages when the brake pedal/pedals are depressed. After that the lock re–engages only if it is engaged with the switch again.

NOTE! The function of the differential lock has been changed in the latest tractors (AC 2.3), see page **314/10.** The function is the same as in the HiTech–tractors.

2. Front wheel drive

The 4WD is controlled with a three–position rocker switch on the driver's right.

A. Rocker switch front edge depressed

– The 4WD is disengaged except when braking with both brake pedals. If only one brake pedal is used, the 4WD does not engage.

B. Rocker switch in the middle position

– automatic position in which the 4WD engages when the diff. lock is engaged. When disengaging the diff. lock, also the 4WD disengages, but, however, not when braking with both brake pedals.

C. Rocker switch rear edge depressed

– The 4WD is always engaged. Pilot light illuminates

3. Power take–off

The PTO is controlled with a lever and a three–position rocker switch on the driver's right.

PTO **540** or **1000** (or **540E**) is selected mechanically with the lever at which time a pilot light comes on in the instrument panel.

The rocker switch front edge depressed (OFF)	**The rocker switch in the middle position (ON)**	**The rocker switch rear edge depressed (START) (spring returned)**
– the PTO is disengaged	– after starting the PTO is engaged and the PTO shaft rotates as long as the switch is in the middle position and the supply line is not switched off.	– When the rear edge is depressed, the PTO starts. After depressing, the switch is returned to the middle position by a spring.

PTO emergency stop

There is an emergency stop socket which has a plug at the rear of the cab. When the plug is removed, the PTO is disengaged and starts only when the rocker switch rear edge is depressed (the plug must be in the socket).

After an engine stop the PTO starts only when the rocker switch rear edge is depressed.

4. Delta Powershift (DPS)

The Delta Powershift is controlled with two push buttons in the speed gear lever knob.

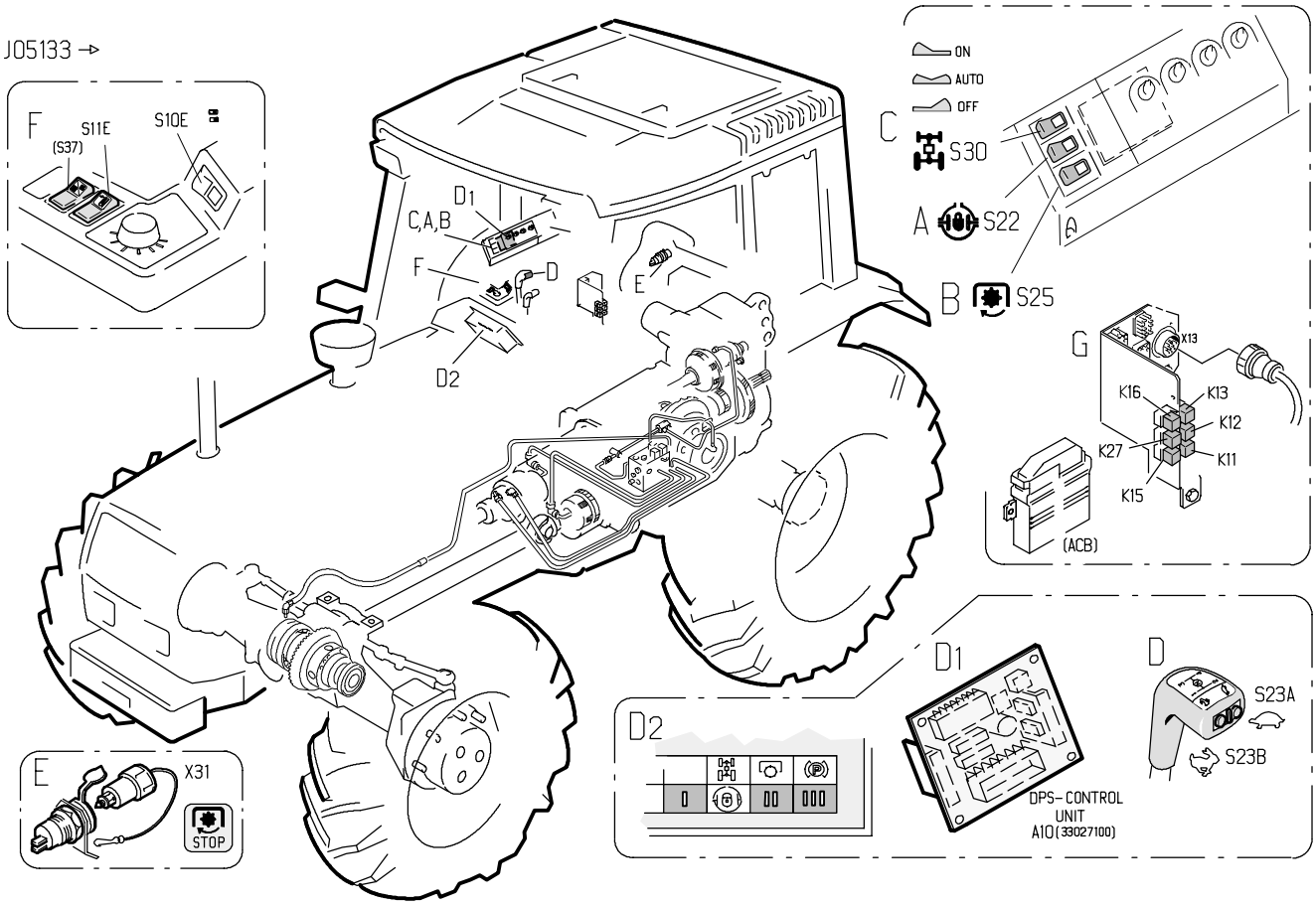
A. The front push button is depressed.	**B. The rear bush button is depressed.**
– With each press the gear ratio is changed one step up.	– With each press the gear ratio is changed one step down.

In the dashboard there are pilot lights, that show which one of the DPS ratios is engaged:
I=slowest ratio
II=middle ratio
III =fastest ratio

Delta Powershift circuit card A10 has a buzzer, which warns parking brake functions and head lights functions.

After starting the engine the DPS is always in the slowest ratio **I**. When the clutch pedal is depressed, the DPS ratios are changed which can be verified from the pilot lights.

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***Picture 1**. AC 2.2 / 2.3, components*

***A**. Diff. lock rocker switch*

***B**. PTO rocker switch*

***C**. 4WD rocker switch*

***D**. DPS push buttons in the speed gear lever knob*

***D1**. DPS circuit card (A10, not HiTech) in connection with ACB power lift switch panel. The circuit card is accessible after removing the switch panel (see page **320**/**10**).*

***D2**. Combination instrument, in which there are DPS pilot lights.*

***E**. PTO emergency plug at the rear of the tractor*

***F**. S10E: Lift/stop/lower–switch (Autocontrol–switch)*
S11E: Forced lowering switch

***G:** Relay bracket in the lever console*

Relays **K11–K13:** Diff. lock control relays (relay K12 is not fitted in AC 2.3).
Relay **K15**: 4WD control relay
Relay **K16**: PTO control relay
There is a relay **K7** in the fuse box for the four wheel braking.
Relay **K27**: 4WD control relay

Note! In the relay bracket there can also be other relays depending on the tractor equipment (e.g. HiShift–relay K24, Control stop relay K18 and/or SigmaPower relay K19).

Note! The wire looms of the AC 2.2/2.3 tractors have been standardized with the wire looms of HiTech–models. Thus there is a connector bracket in the lever console. E.g. solenoid valve connector X13 is no more placed under the parking brake console, but X13 is a 37–pole connector in the lever console (as in HiTech–tractors).

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1. Fault tracing

A. General

Note! In connection with malfunctions fuses **F6**, **F8**, **F11, F22 and F27** must be checked, which affect the function of the AC 2.2.

Important! If in AC 2.2 a pilot light (**I, II** or **III**) of engaged DPS ratio starts to flash, this indicates that the wires between the solenoid valve (Y4 or Y6) in question and the circuit card A10 of DPS have poor contacts or there is a short circuit in the solenoid valve or in wires. Tractor driving can be continued with a such DPS ratio, which is functioning i.e. the pilot ligts illuminates without flashing.

If one of the DPS pilot lights is flashing, so:
– check that the 18–pole connector is correctly fastened to the DPS circuit card A10 (the circuit card is placed under the ACB–power lift switch panel).
– check solenoid valves Y4 and Y6 and their wires and connector X13 on the support plate in the lever console (pins, see wiring diagram).

Solenoid valves:

Y1: diff. lock (magnetic, when diff. lock is engaged)
Y2: PTO (magnetic when PTO engaged)
Y3: 4WD (magnetic when 4WD disengaged)
Y4: DPS (magnetism depends on transmission type, see picture on the next page, + = magnetic)
Y6: DPS (magnetism depends on transmission type, see picture on the next page, + = magnetic)

Position of the solenoid valves on the valve block (on the LH side of the gearbox housing), see e.g. picture **5** on page **440/13**.

The resistance value of all solenoids is **11–12 ohms**. If the transmission control system has malfunctions, check the solenoid valves. The reisistance of the valves can be measured on the wire loom connectors (e.g. X13), but if it is infinite, it must be measured on the valve pins, so that possible breaks can be verified.

If the resistance value is OK when measuring on the valve pins but the resistance is zero when measuring between pins 3<>1 or 3<>2 of DPS circuit card connector A10, the diodes are in short circuit and they must be replaced (solenoid valve diode housing **V1**, see e.g. picture on page **310/6C**). In AC 2.3 diode housing V3 is for solenoid valves.

Supply voltages of DPS circuit card A10:

If the DPS has engaging problems, make sure that the DPS circuit card gets supply voltages by measuring it on pins of connector A10 (DPS circuit card):
– **pin 3**: continuous ground
– **pin 4**: 12 V via ignition switch
– **Pin 6:** 12 V via fuse F22 and ignition switch
– **pin 11**: 12 V continuous voltage via fuse F11
Check also earth points GR1 and GR5)

If no supply voltage exists, check the condition of the battery and check supply wires and various components in these circuits.

B. Buzzer functions

The buzzer notifies, when parking, that the parking brake must be applied (engine stopped) or that a driver does not drive with applied parking brake (engine running). The buzzer also alarms if the head lights remain on after the current is switched off.

Testing method:

– start the engine (oil pressure up)
– apply parking brake. The buzzer alarms at intervals of 5 seconds.
– switch on the head lights. Stop the engine and switch off current (oil pressure down). The buzzer starts to alarm about once or twice per second. Switch off the head lights, at which time the buzzer stops to alarm.
– release parking brake. The buzzer starts to alarm continuously

The buzzer is fitted on the DPS circuit card A10.

The buzzer can be tested in the loose circuit card as follows (see picture on the next page):

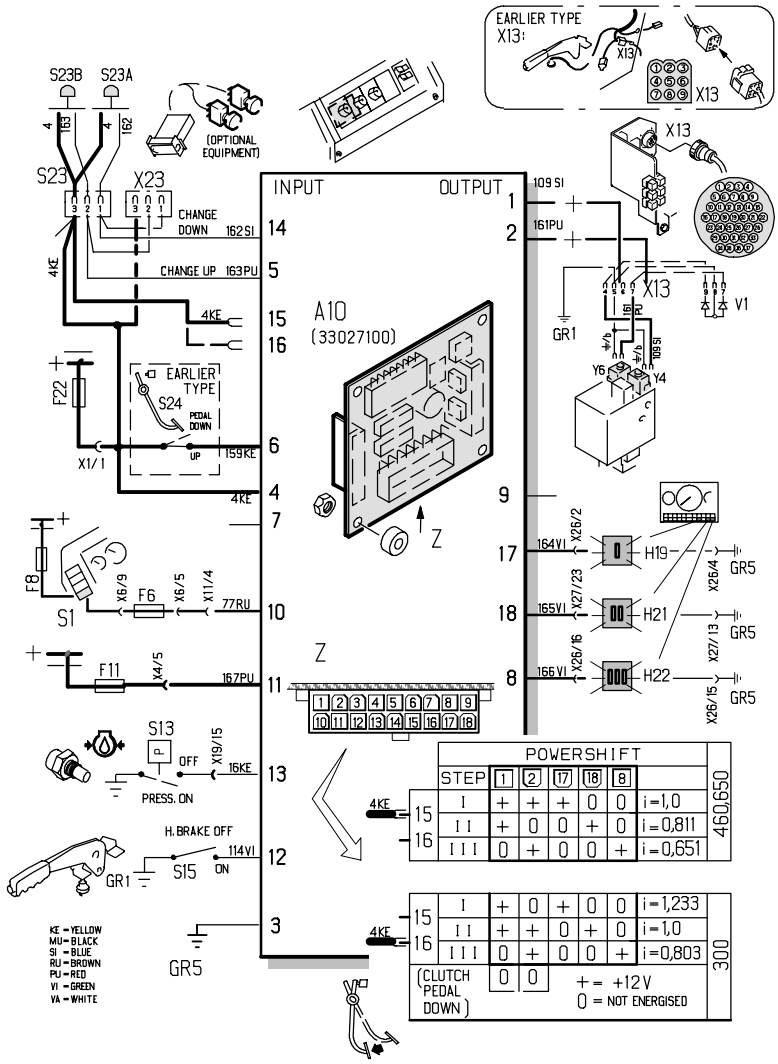
– Ground pin 3 and feed voltage of 12 V to pin 11.
– Ground pin 13 and feed voltage of 12 V to pin 4, at which time the buzzer must give continuous signal. Disconnect pin 4, after witch the buzzer should alarm about 2 min.
– Remove ground from pin 13 and ground pin 12 and feed a voltage of 12 V to pin 4, after which the buzzer should give discontinuous sound signal.
– Feed pin 10 with 12 V and disconnect pin 4, after which the buzzer must give discontinuous alarm signal.

Note! If the buzzer is damaged, the whole DPS circuit card A10 must be replaced.

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C. DPS–circuit card A10

Pins 1 and 2: Current to DPS solenoid valves (Y4, Y6), battery voltage (12 V)
Pin 3: Continuous ground
Pin 4: voltage of 12 V via ignition switch and fuse F22.
Pin 5: 12 V, when foremost DPS button is depressed. Otherwise unenergised.
Pin 6: 12 V via fuse F22 and ignition switch
Pin 10: 12V, when head lights on, otherwise unenergised
Pin 11: continuous current via fuse F11 (12 V)
Pin 12: when parking brake is applied, pin 12 is earthed.
Pin 13: earthed, when engine is stopped
Pin 14: 12 V, when rearmost DPS button depressed. Otherwise unenergised.
Pin 15 and 16: In transmissions 460 and 650 wire is connected to pin 15 and in transmission 300 to pin 16 (12 V).
Pin 17, 18 and 8: Signals to DPS pilot lights (12 V).



Picture 2. *Delta Powershift circuit card A10*
+=energised (solenoid magnetic) , 0=unenergised
Z*= 18–pin connector of the circuit card*
Pins 7 and 9 not in use
X23*= connector for extra push buttons*
GR1*= earth point in the rear part of the lever console*
GR5*= earth point on the cab front wall*
Note! *Position of various components and wiring diagram are shown under code 310.*
V1*=diode housing of solenoid valves. In AC 2.3 diode housing V3 is for solenoid valves.*

Position of connectors
X1: In fuse box
X4: In fuse box
X6: In fuse box
X11: In cab roof
X13: on support plate in lever console
X19: Socket on the cab wall on the RH side
X26: White connector on the rear face of the instrument
X27: Blue connector on the rear face of the instrument
S23: DPS push button connector at the lower end of the gear lever
X23: DPS extra push buttons connector at the lower end of the gear lever

Note! Electric signals into the circuit card A10 can be measured from pins of 18–pole connector when the ignition is switched on. Measure voltages with different switch positions (see picture above). If the measured value is faulty, check wires, switches and connectors which affect the circuit in question.

From pins 1 and 2 of the circuit card is sent current to the DPS solenoid valves Y4 and Y6 (see +/0 diagram in the picture above).
If no signal is sent to the solenoid valves, although other parts are OK, the fault lies in the circuit card.

On pins 1 and 2 can be measured voltage value when the current is switched on and the connector is fastened to the circuit card A10. When measuring on the lower pins, be carefully not to short circuit the poles. Measure rather on the wire side of the connector.

From pins 17, 18 and 8 are sent signals to the DPS pilot lights (12 V) in the dashboard instrument. When the DPS push buttons are pressed (ignition on) the pilot lights in the instrument must light up in a correct order. If the pilot lights have malfunctions, check the lamps and wires from the circuit card to the lamps. If the lamps and the wires are OK, but malfunctions occur, change the whole circuit card A10.

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D. 4WD control

Checking function (engine is running):

– Depress the 4WD rocker switch rear edge, at which time the 4WD pilot light must light up.

This shows that:
– *the 4WD switch functions*
– *the 4WD pilot light functions*

– Depressd the switch front edge, at which time the pilot light must go out
– Depress separately unlatched brake pedals. The 4WD ind. light must not come on.
– Connect the brake pedals together and depress the pedals at which time the 4WD engages (ind. light comes on)
– Release the brake pedals and the ind. light goes out.
– apply parking brake, the 4WD ind. light must come on
– release parking brake at which time the 4WD ind. light must go out

This shows that:
– *brake pedal switches function*
– *relays K7 and K15 function*
– *parking brake switch functions*

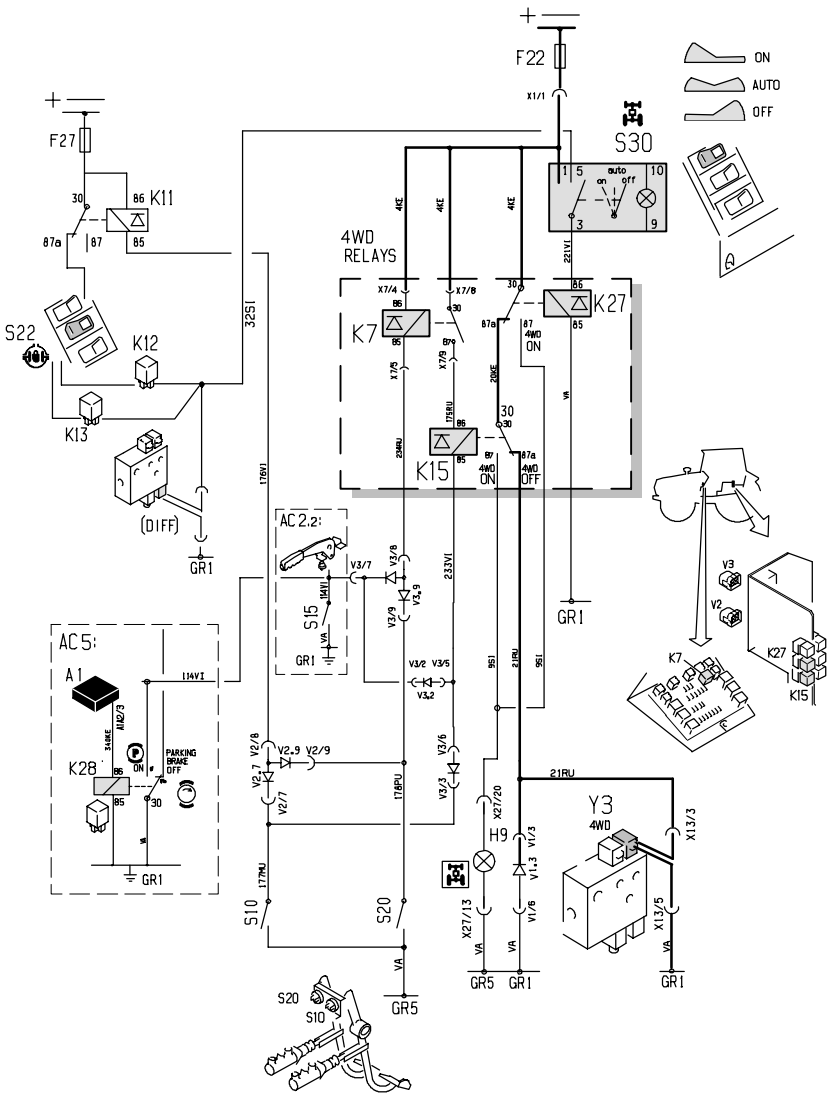
– Drive the tractor at speed of 4 km/h.
– Make a tight turn
– Engage and disengage the 4WD several times. When the 4WD is engaged, you should see the front axle skid and feel a jerk as you engage and disengage.

This shows that:
– *solenoid valve functions*
– *4WD clutch functions*

– Turn the 4WD switch to the middle position (automatic position, in which the 4WD engages, when the diff. lock is engaged). Testing of this position is made in connection with checking of the diff. lock, see page **314**/**8** (AC 2.2) or page **314**/**10** (AC 2.3).

Note! In case of malfunctions always check fuse F22. When the 4WD is disengaged, the solenoid valve Y3 is energised and the nut at the end of the valve is magnetic which can be verified e.g. with a screwdriver.

Note! 4WD is always engaged, when the engine is stopped (cup springs engage the 4WD). The use of the parking brake earths relays **K7** and **K15** and the 4WD is engaged.



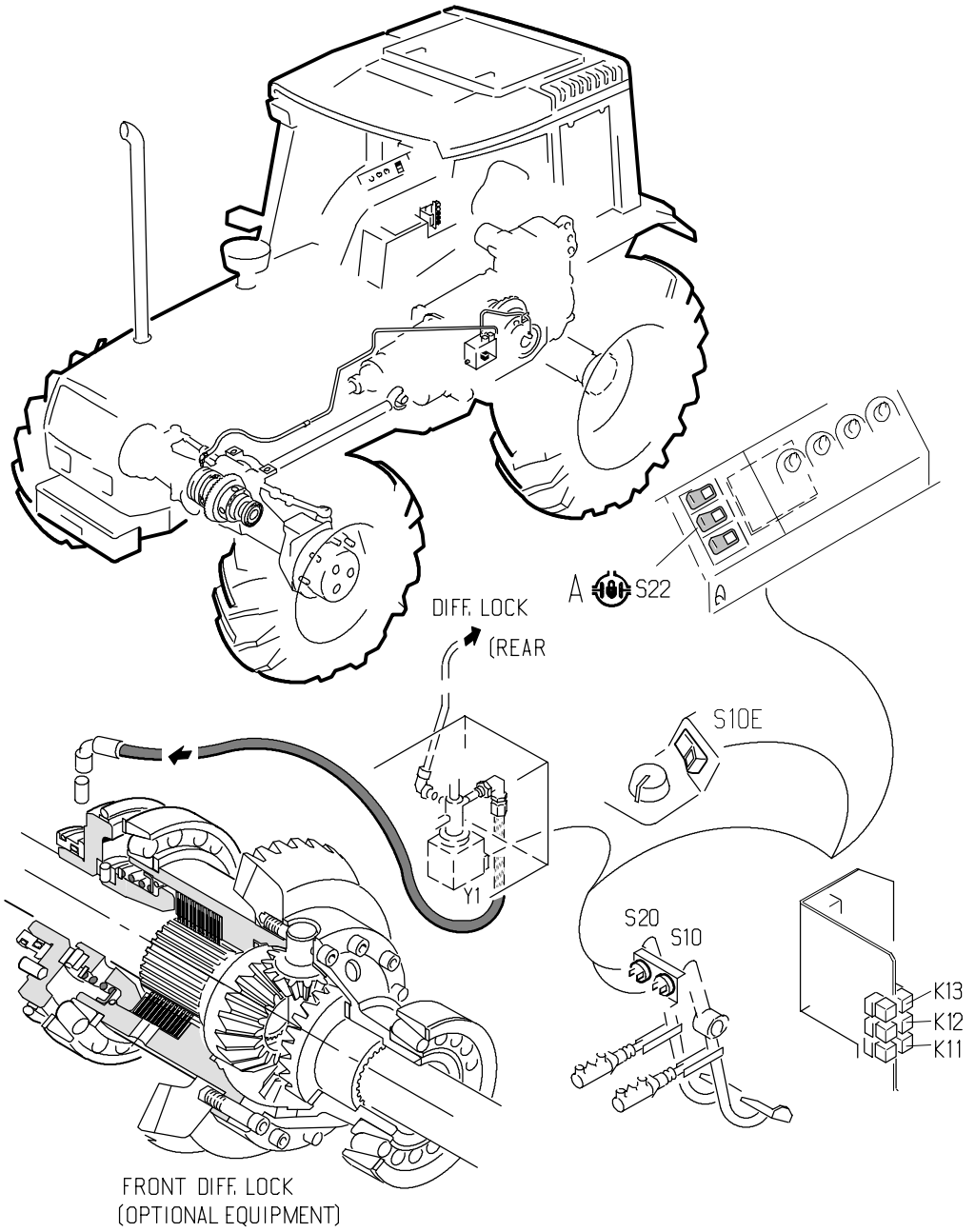
Picture 2.*4WD control. The system gets the supply via the ignition switch and fuse F22.*

F22: fuse
S30: *three–position rocker switch of 4WD*
Y3: *4WD solenoid valve*
H9: *4WD pilot light of 4WD*
S10 and S20: *brake light switches*
K7 *and* ***K15:*** *relays, which switch on 4WD, when latched together brake pedals are depressed.*
K27: *4WD relay (4WD engages, when the diff. lock is engaged).*
GR1: *earth point (solenoid valvest) in the rear part of the lever console*
GR5: *earth point under the dashboard on the cab front wall*
V1: *Solenoid valve diodes (see picture on page* ***310***/***6C****)*
V3: *4WD diode housing (see picture on page* ***310***/***6C****). This diode housing is for solenoid valves in AC 2.3.*

Note! Engagement of the 4WD during braking can be prevented, when relay K7 (in the fuse box) is removed.

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E. Differential lock control



Picture 3. *Differential lock component*

Y1: *Diff. lock solenoid*
K11, K12 *(not in AC 2.3) and* ***K13:*** *control relays*
S10 *and* ***S20:*** *brake light switches*

The differential lock rocker switch S22 is placed on the selector panel on the driver's right. In addition, the lift/stop/lower switch of the ACB power lift also controls the diff. lock.

The relays are placed in the lever console and are accessible after removing the console side panel:

K11: Switches off voltage to the diff. lock solenoid valve and switches on current to the brake lights, when the brake pedal/pedals are depressed. Switches on voltage again to the solenoid valve, when the brake pedal/pedals are released. Ind. light comes on.

K12: Switches on voltage to the solenoid valve, when the rocker switch rear edge is depressed. Ind. light comes on. When the brake pedals after this are depressed, relay K11 is closed and current from relay K12 is cut–off and the relay opens and switches off current to the solenoid valve and the ind. lights goes out. The diff. lock does not engage after this although the brake pedals are released. **Note!** This relay is not fitted in AC 2.3.

K13: Switches off voltage to the solenoid valve and the lock disengages, when the lift/lower switch is in the lifting position. The lock ind. light , however, illuminates. When the implement is lowered down to the working position, switches on voltage to the solenoid valve and the differential lock is engaged.

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Checking function of the differential lock control (engine at idling speed). Concerning AC 2.3, see page 314/10.

– Depress the rocker switch front edge at which time the lock indicator light comes on. If the 4WD switch is in the middle position, also the 4WD pilot light lights up and the 4WD is engaged.
– Turn the switch to the middle position at which time the indicator light goes out (also 4WD disengages).

This shows that:
– *the rocker switch front and middle positions function*
– *The lock indicator light functions*
– *the 4WD automatics function and also relay K27.*

– Depress the switch front edge at which time the indicator light comes on (also the 4WD engages, if the 4WD switch is in the middle position)
– Disconnect the brake pedals and depress the pedals separately and together. When depressing the pedal/pedals, the diff. lock ind. light goes out and the brake lights comes on. When the pedal/pedals are released, the ind. light comes on and the brake lights goes out. **Note!** Also 4WD disengages, when the brake pedals are depressed separately)

This shows that:
– *the brake pedal switches function*
– *the switches are correctly positioned*
– *relay K11 functions*
– *4WD relay K27 functions*

– Depress the switch rear edge at which time the ind. light should come on (also the 4WD engages, if the 4WD switch is in the middle position).
– Depress the brake pedal/pedals at which time the ind. light goes out (also 4WD disengages, when the brake pedals are depressed separately)
– Release the brake pedal/pedals. The diff. lock ind lights must not come on and the lock must not engage. 4WD remains on in the automatic position, when latched together brake pedals are depressed.

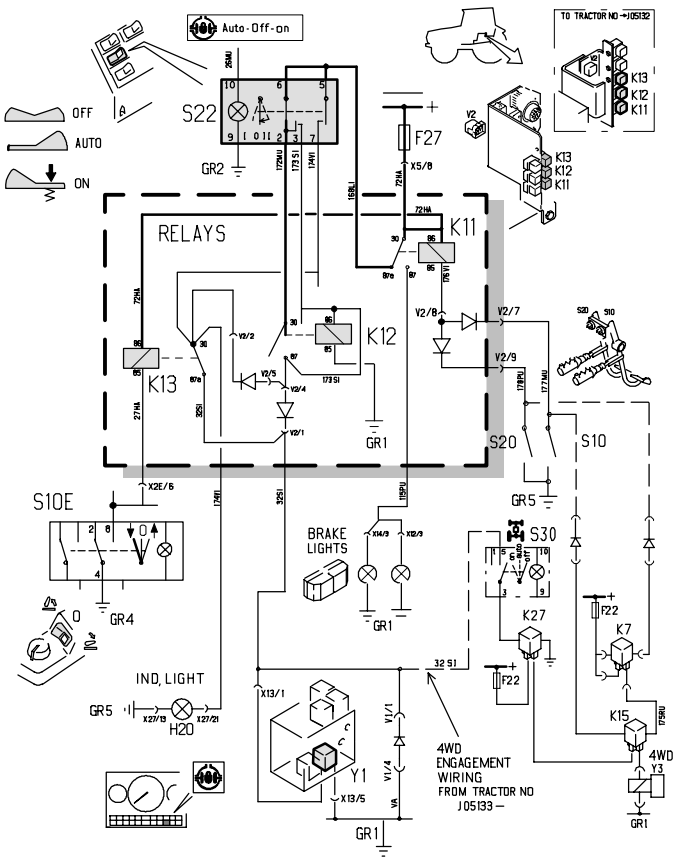
This shows that:
– *the rocker switch rear position functions*
– *relays K11 and K12 function*
– *4WD automatics function*

– Depress the switch front edge and the ind. light comes on
– Turn the lift/stop/lower switch to the transport position at which time the diff. lock disengages. Ind. light, however, remains on.
– Turn the lift/stop/lower switch to the lowering position or to the middle position and the differential lock engages.

This shows that:
– *lift/stop/lower switch functions*
– *relay K13 functions*

– Drive the tractor at speed of 4 km/h and engage the lock by pushing the rocker switch front edge down. Ind. light comes on.
– Make a tight turn, raise and lower the lift with the lift/stop/lower switch at which time the diff. lock engages and disengages.
– You should see the rear tyres skid when the differential lock is engaged and feel a jerk as you engage and disengage. The front axle lock functions in the same way, if fitted (during the test the 4WD should be disengaged).

This shows that:
– *solenoid valve functions*
– *differential lock functions*



Picture 4. *Differential lock control.*
The system is supplied via the ignition switch and via the fuse F27).

S22: *Diff. lock control switch*
K11, K12, K13: *diff. lock control relays*
S10E*: Lift/stop/lower–switch of the ACB power lift*
H20: *Diff. lock pilot light*
Y1: *Diff. lock solenoid valve*
S10 *and* ***S20:*** *brake light switches*
GR1: *earth point in the rear part of the lever console*
GR2: *earth point in the roof*
GR5*: earth point under the dashboard on the cab front wall*
V1: *Solenoid valve diode housing (see picture on page* ***310****/****6C)***
V2: *AC 2.2 diode housing (see picture on page* ***310****/****6C).***

Important! Always check the fuse F27, if there is malfunctions in the control system. The diff. lock solenoid valve is fitted on the lower side of the valve block on the LH side of the gearbox. The rearmost valve Y1 is for the diff. lock. When the lock is on, the solenoid valve is energised. Then the nut on the valve is magnetic which can be verified with e.g. a screwdriver.

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F. PTO control

Checking function:

Make sure that the plug is fitted in the rear emergency socket. Move the control lever in the middle position. Check that the PTO rocker switch front edge is depressed (OFF). Switch off tractor current. Start the engine and let it run at idling speed.

– Move the PTO lever to the foremost position (540) at which time the indicator light should come on. The PTO shaft must not rotate.
– Move the lever to the middle position at which time the ind. light goes out
– Move the lever to the rear position (1000 or 540E) and the ind. light should come on. The PTO shaft must not rotate. Move the lever back to the middle position and the ind. light goes out.

This shows that:
– *ind. light switches S28 and S29 functions*
– *indicator light functions*

– Move the lever to the front position (540). Ind. light comes on.
– Turn the PTO rocker switch to the middle position (ON)
– Depress the rocker switch rear edge (START). The PTO shaft begins rotate and the rocker switch is returned to the middle position (ON) by the spring.

This shows that:
– *PTO control relay K16 functions*
– *solenoid valve functions*

– Depress the rocker switch front edge (OFF)
– PTO shaft stops to rotate
– Turn the switch to the middle position. The shaft must not rotate. Depress the switch rear edge at which time the shaft starts to rotate.

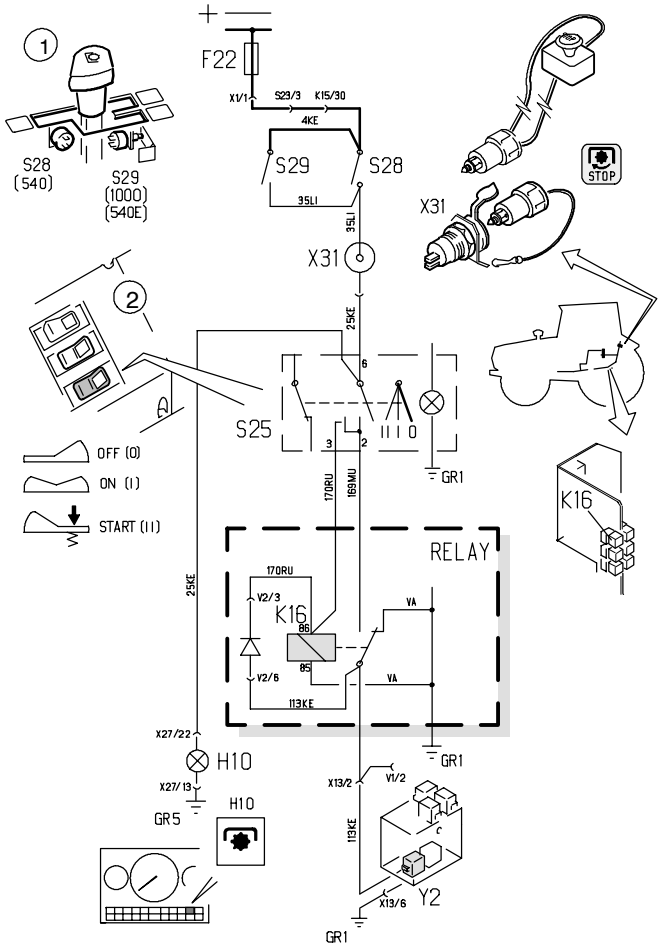
This shows that:
– *PTO rocker switch functions*

– Remove the plug from the rear socket at which time the shafts stops rotating. Also the indicator light goes out.
– Refit the plug. The shaft must not rotate but the ind. light comes on.
– Depress the switch rear edge and the PTO shaft must start to rotate.

This shows that:
– *PTO emergency stop functions*
– *relay K16 functions*

– Stop the engine.
– Start the engine. The PTO shaft must not rotate although the lever is in the engaged position
– Depress the rocker switch rear edge at which time the shaft begins to rotate.
– Move carefully the lever to the middle position. The ind. light goes out and shaft stops.
– Move the lever to the front position. The shaft must not rotate.
– Depress the rocker switch rear edge after which the PTO shaft starts to rotate.

This shows that:
– *The PTO automatic stop functions when the main current circuit is cut off.*
– *relay K16 functions*



Picture 5. *PTO control. The system is supplied via the ignition switch and fuse F22.*

1. *PTO control lever (540–neutral–1000 (540E)*
S28: *Lever switch*
S29: *Lever switch*
X31: *Emergency stop socket*
2. *3–pos. PTO rocker switch*
V1: *Solenoid valve diode housing (see picture on page **310**/**6C)***
V2: *AC 2.2 diode housing (see picture on page **310**/**6C).***
V3: *Solenoid valve diode housing in AC 2.3.*
H10: *Pilot light*
Y2: *PTO solenoid valve*
K16: *relay which connects current to the solenoid valve, when the rocker switch rear edge is depressed (START). Solenoid is energised so far as the rocker switch is in the middle position (ON) and the circuit is not broken with the lever, emergency plug or with the ignition switch.*
GR1: *earth point in the rear part of the lever console*
GR5: *earth point under the dashboard on the cab front wall.*

Important! The solenoid valve Y2 is placed under the valve block on the LH side of the gearbox (see picture). When the solenoid is energised, pressure oil is directed to the PTO clutch and the shaft can rotate. The nut at the end of the solenoid is magnetic when the solenoid is energised.

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The function of the differential lock has been changed in the latest tractors (AC 2.3):

(concerns also HiTech models 6250Hi–8950Hi).

Note! Manufacturing of AC 2.3, K44242–. In connection with modification of the differential lock function, relay K12 has been removed and diodes V3 are for solenoid valves. Wiring diagram on pages **310/83–88** incl. AC 2.3.

1. Control of differential lock

The lock is controlled with a three–position rocker switch on the driver's right.

A. Rocker switch front edge depressed.	B. Rocker switch in the middle position.	C. Rocker switch rear edge depressed.
– the differential lock is disengaged.	– the lock is always engaged except when brake pedal/pedals are depressed or when the power lift is in the transport position. The lock engages when the brake pedal/pedals are released or when the lift/stop/lower switch is in the lowering position or in the middle position.	– the lock is always engaged except when brake pedal/pedals are depressed. The lock engages when the brake pedal/pedals are released.

C. Differential lock control in AC 2.3

Depress the diff. lock rocker switch front edge. Now the lock must be disengaged and the pilot light must not be on. Solenoid valve Y1 must be unenergised.
This shows that:
– *rocker switch front position is OK.*

Press the rocker switch to the middle position, at which time the lock must become engaged and the pilot light must come on. Solenoid valve Y1 must be energised.
This shows that:
– *diff. lock pilot light and its wires are OK.*
– *rocker switch middle position is OK*

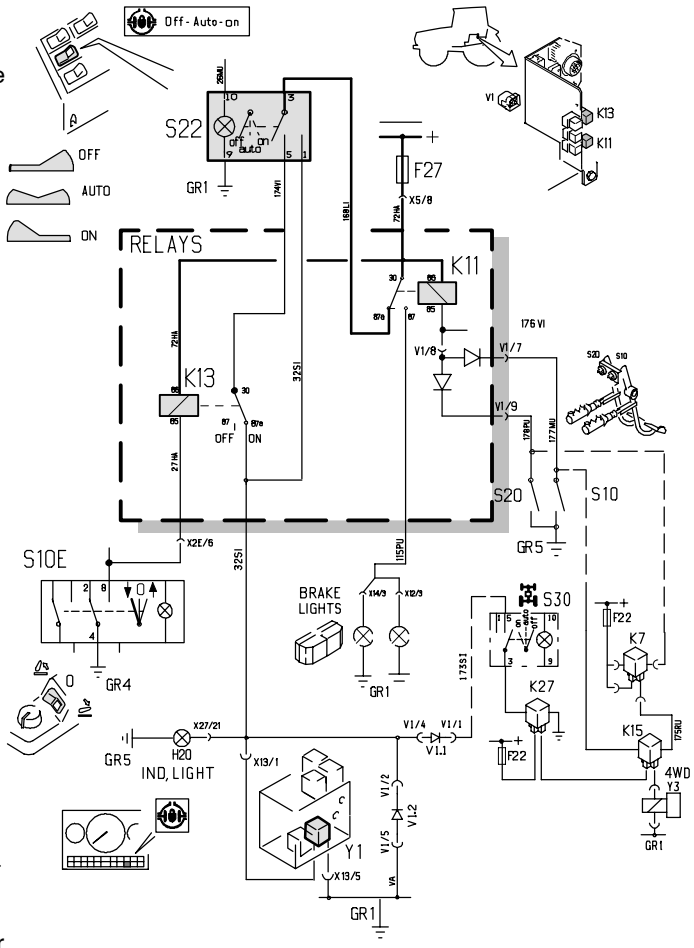
While the rocker switch is in the middle position, depress the brake pedal/pedals, at which time the lock must be disengaged and the pilot light goes out. When the brake pedals are released, the lock must be engaged and the pilot light comes on.
This shows that:
– *brake pedal switches S10 and S20 are OK*
– *relay K11 is OK*

While the diff. lock rocker switch is in the middle position, press the power lift "lower/stop/lift" switch S10E into the transport position. Now the diff. lock must be disengaged. Press the power lift switch back to the middle or lowering position and the diff. lock must be engaged.
This shows that:
– *switch S10E is functioning properly*
– *relay K13 is OK*

Depress the diff. lock rocker switch rear edge. In this position the lock must be on and also the pilot light.
This shows that:
– *diff. lock switch rear position is functioning properly.*

While the rocker switch rear edge is down, depress the brake pedal/pedals, at which time the lock must be disengaged. When the brake pedals are released, the diff. lock is engaged and the pilot light comes on. The use of the power lift switch S10E must not affect the function of the lock.
This shows that:
– *relay K11 is OK*

IMPORTANT! When the 4WD rocker switch is in the middle position, the 4WD is engaged, when the differential lock is engaged.



Picture 6. *Diagram, differential lock, AC 2.3.*

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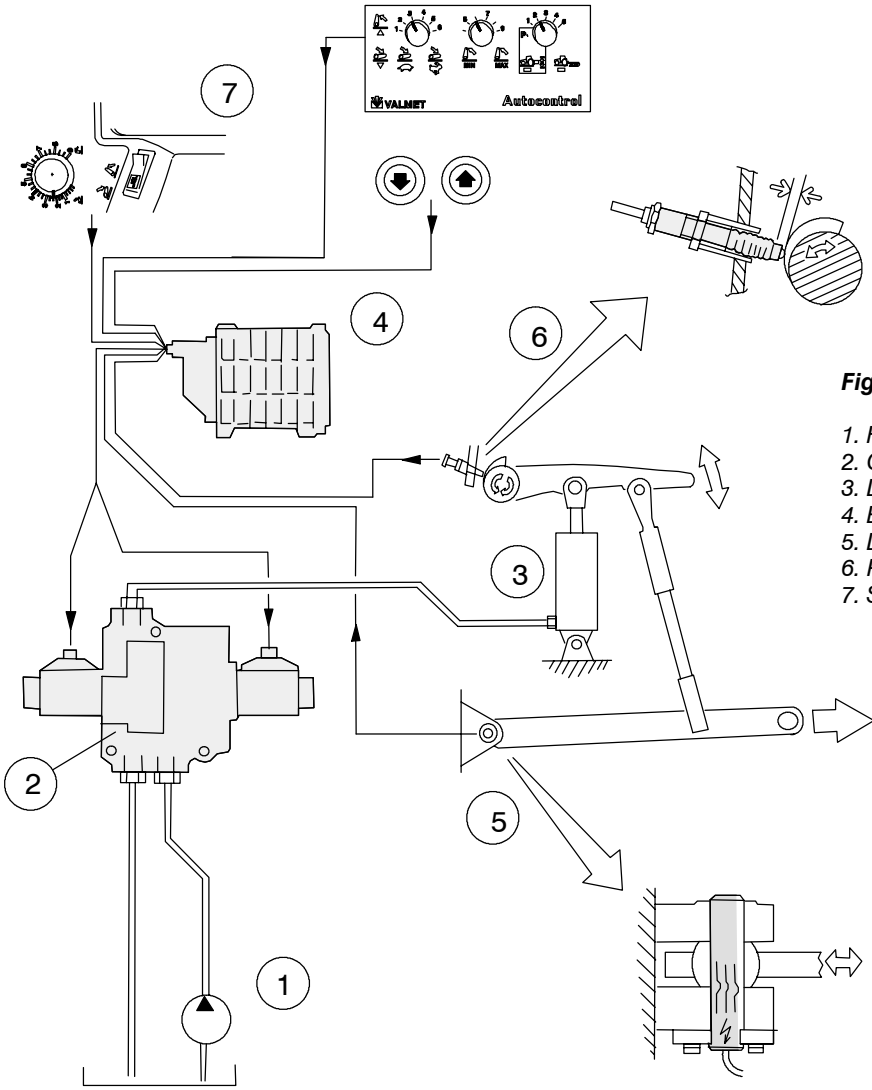


Fig. 1 *Autocontrol power lift system*

1. Hydraulic pump
2. Control valve
3. Lifting cylinder
4. Electronic unit
5. Draft sensor
6. Position sensor
7. Switch panel

1. Autocontrol – hydraulic lift, electrical system

Note! Hydraulic system of the power lift is described in section 90. This Autocontrol–hydraulic lift is the same as on Valmet 505–905 tractors.

The Valmet Autocontrol is an electrically controlled hydraulic lift. All mechanical levers have been replaced with knobs and switches. Ideal mixing/sensitivity values for draft control have been pre–programmed and can be controlled with one switch.

Operation:
The pump (1) draws oil from the oil reservoir and delivers it to the control valve (2). The control valve directs the oil to the lifting cylinders (3) for the operation of the lifting arms (lifting, lowering and holding functions). The values set on the switch panel (7), and the actual values detected by the draft sensors (5) and position sensor (6), are fed into the electronic unit (4).

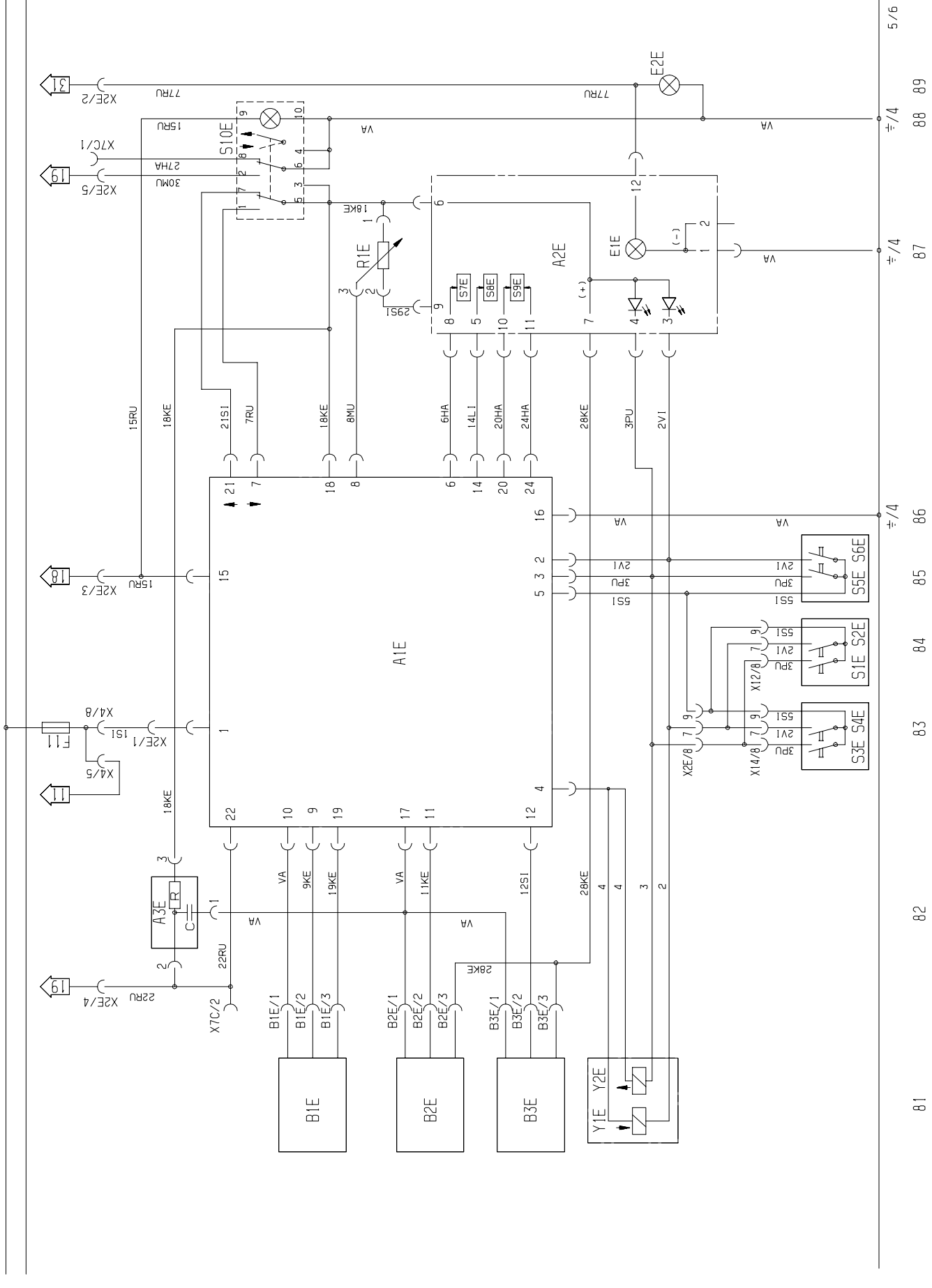
This unit determines the differences between the two sets of signals (i.e. from the sensors and switches) and feed the necessary control signal to the control valve solenoid.

The position sensor (6) is in permanent contact with an eccentric on the lift shaft. When the lower links are lifted or lowered the eccentric moves the pin, which sends a signal to the electronic unit; thus the hydraulic lift always ”knows” the position of the lower links.

The lower links are connected to the draft sensors (5). When the draft force in the lower links increases the loading on the draft sensors also increases. This loading is then converted into electrical signals by the draft sensors.
These signals are amplified by an electronic device which is built into the the draft sensors. The signals are sent to the Autocontrol hydraulic lift. If the draft force increases the hydraulic lift will raise the implement, the draft control sensitivity depending on the setting of the switches in the cab.

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Wiring diagram, electro−hydraulic power lift, −662342



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Wiring diagram, –662342

(E–models, see section34)

Note! See also picture on page **310**/**6**. This diagram concerns 6000–8400 tractors up till the end of the year 1993.

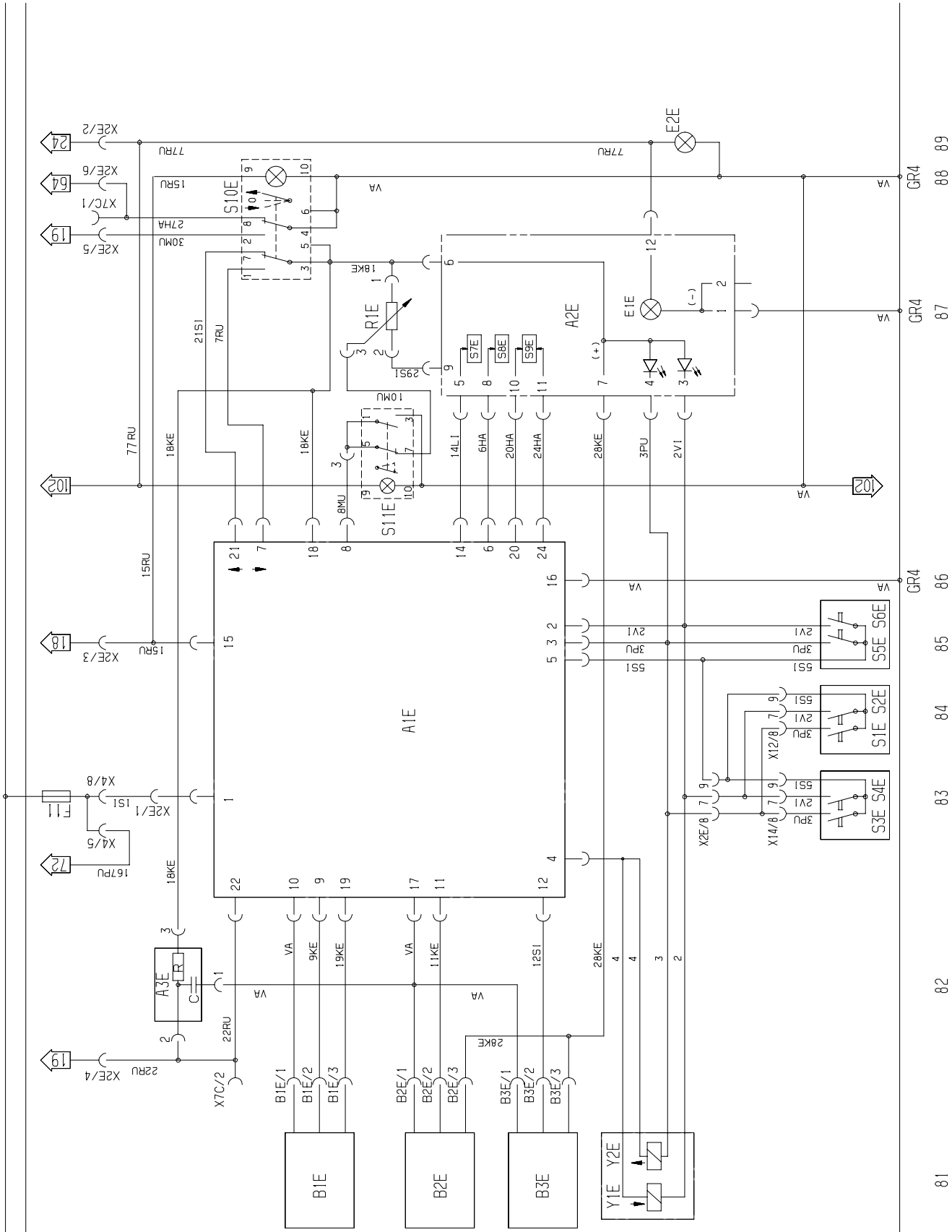
Sym–bol	Component	Code
A1E	Autocontrol electronic unit	70–73
A2E	Autocontrol, switch panel	74
A3E	Compensator	70
B1E	Position sensor	69
B2E	Draft sensor, right	69
B3E	Draft sensor, left	69
E1E	Illumination, switch panel	74
E2E	Illumination, position control knob	75
R1E	Potentiometer, position control	74
S1E	Push button, mudguard, lifting, right	71
S2E	Push button, mudguard, lowering, right	71
S3E	Push button, mudguard, lifting, left	70
S4E	Push button, mudguard, lowering, left	70
S5E	Push button, cabin, lifting	73
S6E	Push button, cabin, lowering	73
S7E	Switch, lowering speed	74
S8E	Switch, transport height	74
S9E	Switch, mixing/sensitivity	74
S10E	Rocker switch, lift/lower	74
X2E	Connector, 9 pins, supply, push buttons	
Y1E	Solenoid valve, lowering	69
Y2E	Solenoid valve, lifting	69

Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Li = lilac

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Wiring diagram,662343–



Wiring diagram 662343–F17106

Note! On 6000–8400 models the diff. lock is disengaged when the lift/lower switch is turned to the transport position, see Autocontrol II under code 311. In addition, the lift/lower switch has a middle position which stops the movement of the lower links. See also picture on page **310**/**6A**.

Note! With effect from serial number 668103 (AC 2.1), the power lift has a forced–lowering switch S11E.

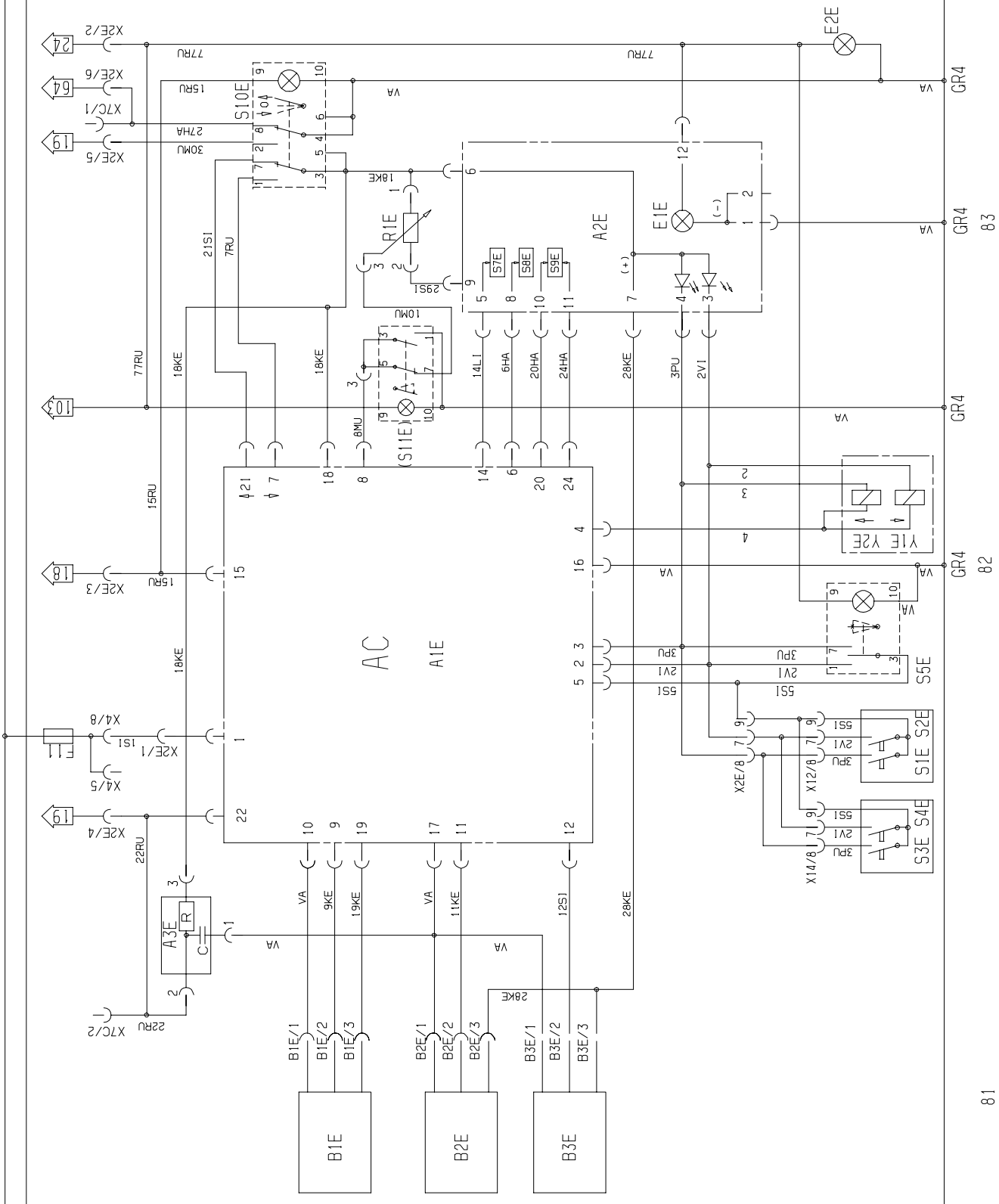
Sym–bol	Component	Code no
A1E	Autocontrol electronic unit	84
A2E	Autocontrol, switch panel	87
A3E	Compensator	82
B1E	Position sensor	81
B2E	Draft sensor, right	81
B3E	Draft sensor, left	81
E1E	Illumination, switch panel	87
E2E	Illumination, position control knob	89
R1E	Potentiometer, position control	87
S1E	Push button, mudguard, lifting, right	84
S2E	Push button, mudguard, lowering, right	84
S3E	Push button, mudguard, lifting, left	83
S4E	Push button, mudguard, lowering, left	83
S5E	Push button, cabin, lifting	85
S6E	Push button, cabin, lowering	85
S7E	Switch, lowering speed	87
S8E	Switch, transport height	87
S9E	Switch, mixing/sensitivity	87
S10E	Rocker switch, lift/lower	88
S11E	Rocker switch, forced lowering	88
X2E	Connector, 9 pins, supply, push buttons	
Y1E	Solenoid valve, lowering	81
Y2E	Solenoid valve, lifting	81

Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Li = lilac

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AC power lift, F17107–.



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AC power lift, F17107–.

Sym–bol	Component	Code no
A1E	Autocontrol electronic unit	82
A2E	Autocontrol, switch panel	83
A3E	Compensator	82
B1E	Position sensor	81
B2E	Draft sensor, right	81
B3E	Draft sensor, left	81
E1E	Illumination, switch panel	83
E2E	Illumination, position control knob	83
R1E	Potentiometer, position control	83
S1E	Push button, mudguard, lifting, right	82
S2E	Push button, mudguard, lowering, right	82
S3E	Push button, mudguard, lifting, left	82
S4E	Push button, mudguard, lowering, left	82
S5E	Rocker switch, cabin, lifting/lowering	82
S7E	Switch, lowering speed	83
S8E	Switch, transport height	83
S9E	Switch, mixing/sensitivity	83
S10E	Autocontrol rocker switch, lift/stop/lower	83
S11E	Rocker switch, forced lowering	83
X2E	Connector, 9 pins, supply, push buttons	
Y1E	Solenoid valve, lowering	82
Y2E	Solenoid valve, lifting	82

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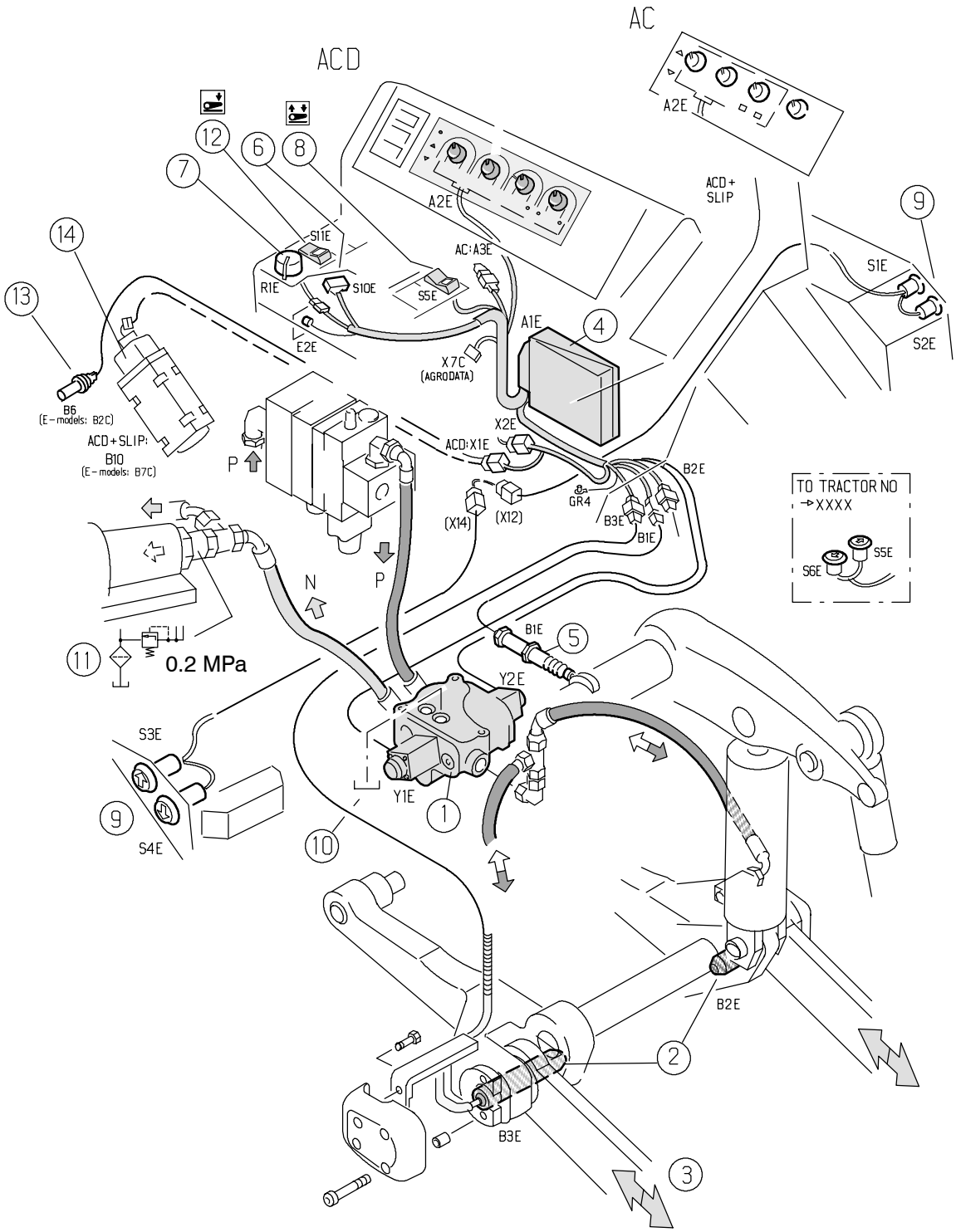


Fig. 2. *Electro–hydraulic power lift AC/ACD*

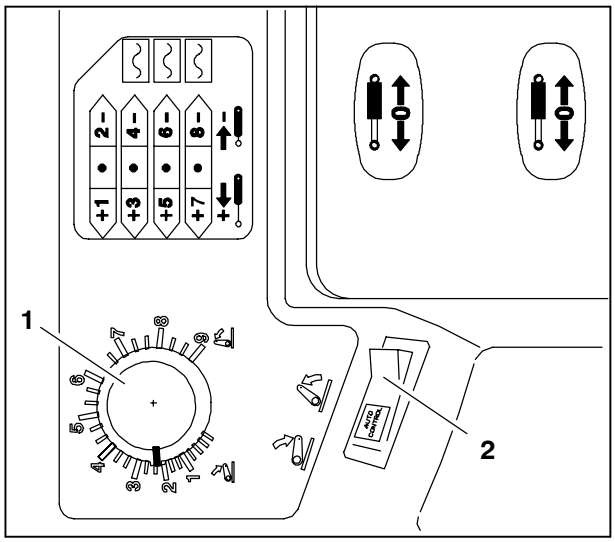
1. Control valve
2. Draft sensors
3. Lower links
4. Electronic unit (different on AC and ACD)
5. Position sensor
6. Lift/stop/lower switch (earlier two positions)
7. Potentiometer for position control
8. Rocker switch (earlier two push buttons)
9. Push buttons, rear mudguards
10. Return oil into the gearbox housing
11. Return oil from control valve
12. Switch, forced lowering (not on earlier models)
13. Gearbox speed sensor, ACD power lift
14. Radar, ACD power lift

Connectors (B1E, B2E and B3E) for position sensor and draft sensors are placed in the lever console in the cab and they are accessible after removing the console side panel. On ACD power lift, the position sensor connector is placed at the end of the sensor.

Electronic unit (A1E) and the rest of the connectors are also placed in the lever console on the driver's right.

Note! The picture above shows also parts for the ACD power lift, see under code 321.

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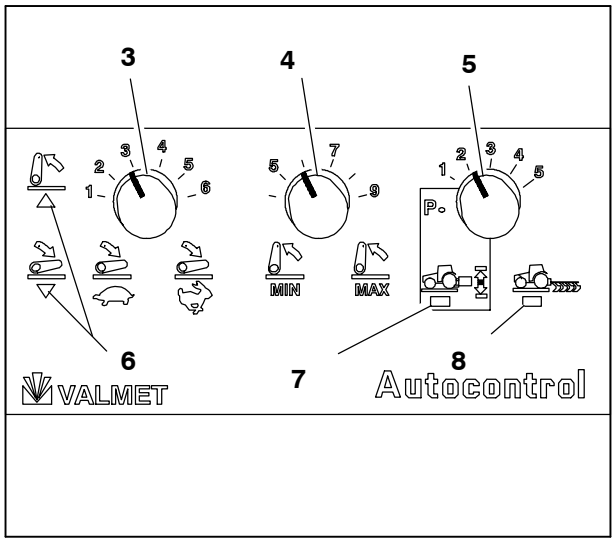


Fig. 3. Control switches for power lift

Note! For detailed instructions on how to use Autocontrol–power lift, see Operator's Manual.

1. Position control knob
– max. clockwise, lower links at transport height (with switch 4)
– max. anti–clockwise, lower links in lowest position
– does not function if system has not been activated with switch 2.

Note! With effect from serial number 668103 (AC 2.1), there is the forced–lowering switch on the RH side of the position control knob. From spring –96 the forced–lowering switch is an option.

2. Lift/lower switch
– lift to the transport height determined by switch 4.
– lower to the position determined by position control knob 1
– activate the control system (after the main power has been switched off or if push button controls have been used.

Note! From the beginning of the year 1994 (Autocontrol II), the lift/lower switch has three positions. The middle position stops the movement of the lower links. The two other positions are the same as earlier.

3. Lowering speed selector
– six different lowering speed
– lowering speed is independent of the load

4. Transport height selector
– six different upper position
– push buttons over ride these settings

5. Position control/draft control:
– position P is position control
– positions 1–5 are for draft control

6. Lift/lower indicator lights
– lifting (red)
– lowering (green)

7. Indicator light, position control
– light for position control (position P)

8. Indicator light, draft control
– light for draft control (positions 1–5)

9. Lift/lower push buttons (not illustrated)
– in the cabin and on the rear mudguards
– lift button raises lower links to max. upper position (higher than max transport position with switch 4)
– push buttons does not function, if lift/lower switch (2) is in lifting position.

Note! From spring –96, the push buttons in the cab have been replaced with a three–position rocker switch. The switch has a middle position and the both extreme positions have the same functions as the push buttons. A spring returns the rocker switch to the middle position. On both mudguards there are push buttons as earlier.

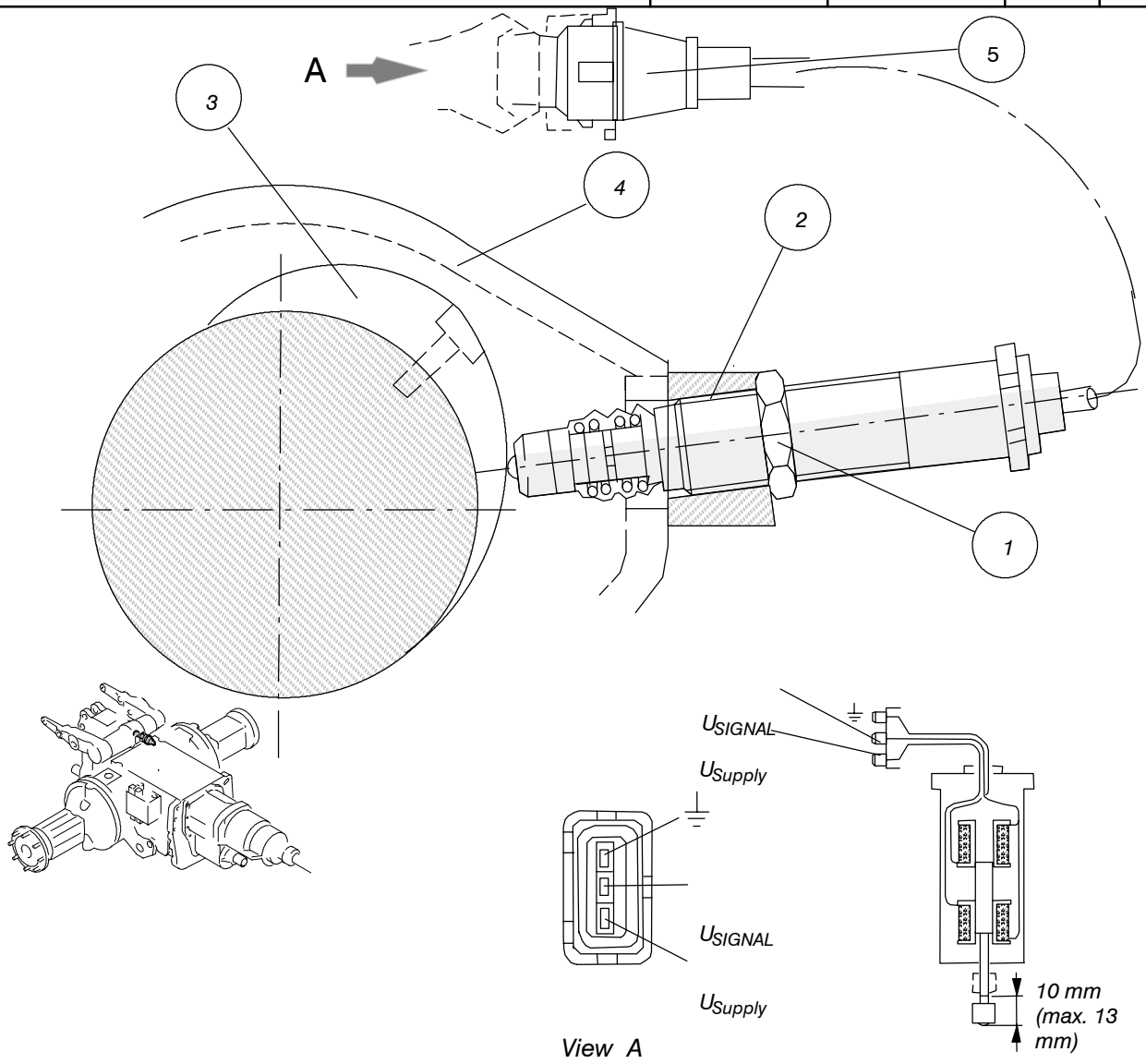


Fig. 4. *Position sensor*

1. Locking nut
2. On threads sealant Permatex Super 300
3. Eccentric on lifting arm shaft
4. Power take–off housing
5. Connector (at the rear on right side)

Note ! *The position sensor must be changed if it is damaged. If the sensor lead is damaged it can be repaired using three pin connector.*

Position sensor

The position sensor is mounted on the power take–off housing at the rear of the tractor. It supplies information on the actual position of the lower links. The sensor detects lower link position by means of an eccentric fitted to the lift shaft.

The construction of the position sensor can be compared to that of a solenoid. Inside the electromagnetic housing there is a pin which moves with the eccentric on the lift shaft.

Alternating current is fed to the coil, and the voltage in the middle of the coil depends on the position of the pin inside the housing. Thus the voltage is proportional to the position of the lower links.

U_{SUPPLY}=6,3–7,7 V_{eff} (AC) (4–7kHz)
U_{SIGNAL}=33–67 % x U_{Supply} (lower links down–up)

Measuring position sensor internal voltages,

see page **320/13.**

Adjusting the position sensor

Important! The lower links will rise a little higher when the push buttons are used instead of the lift/lower switch or position control knob (selector 4 in max upper position 9 (see figure 3)).

1. Lift the lower links to their highest level by using the push buttons.

2. Unscrew the position sensor lock nut (1). Turn the position sensor carefully by hand until it reaches the bottom. Then turn the sensor back one turn

3. Lift the power lift to transport position with the limiter at its maximum height (pos. 9) by using the lift/lower switch.
– if the power lift does not go up to the position where the cylinder stroke is **181–183 mm**, loosen the position sensor.
– if the power lift is raised too high, turn the position sensor in the reverse direction and occasionally use the lift/lower switch to lower the power lift.

Note! The sensor must not be put in the minimum position, when the links are raised. Apply sealing compound Permatex Super 300 to the threads (2) of the position sensor.

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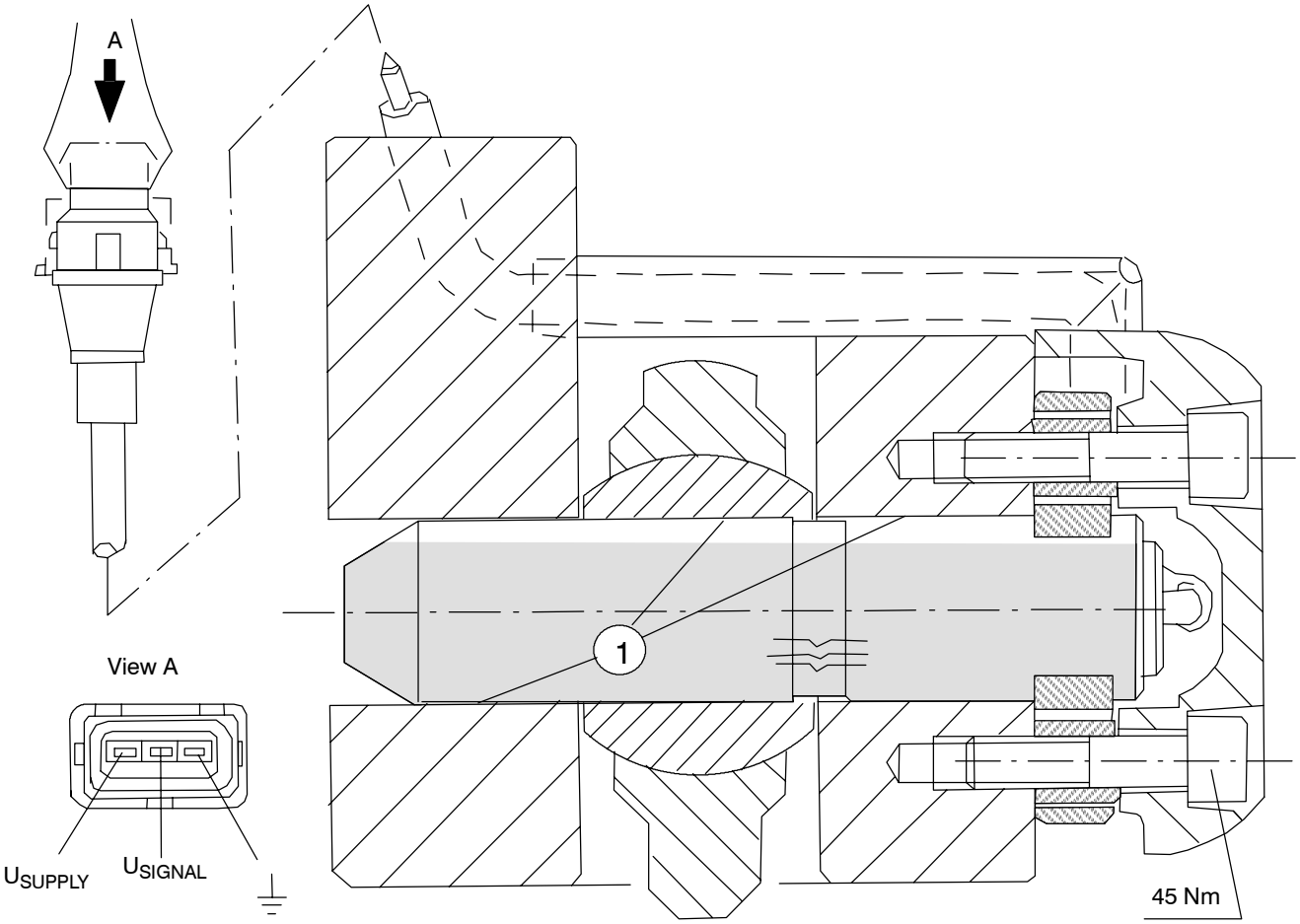


Figure 5. Draft sensor
1. Pressure resistant grease

Draft sensors

The draft sensors act as mounting bolts for the lower links. The sensors convert draft forces into electrical signals.

The draft sensors are housed in tubes manufactured from a special steel. Inside the sensor there is a carrier wave electronics unit, a signal amplifier, and a transformer which produces a magnetic field at the measuring point.

The draft force causes a shearing stress on the sensor and this changes the magnetic properties of the metal, which causes a variation in the voltage in the transformer secondary

U_{SUPPLY} = 9,5–10,5 V (DC)
U_{SIGNAL} = 2,5–7,5 V (DC) (draft max. – push max.)
(signal voltage is 5 V when the lower links are unloaded).

The draft pins must be changed if they are damaged. If the sensor lead is damaged it can be repaired using three pin connectors.

Note!
Draft sensor 31287410, 40 kN (6200–6900)
Draft sensor 33303900, 60 kN (8050–8750)

Measuring the draft sensor internal voltages

See page 320/13.

Short circuit in draft sensor line

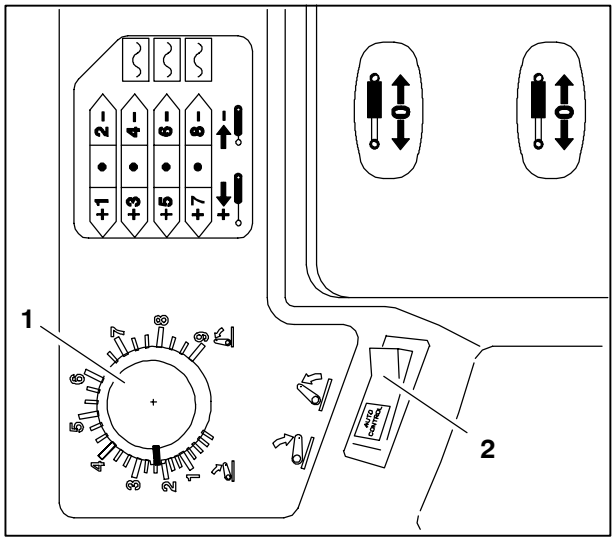
– Short circuit in the supply line causes deadlock of the whole system (current breaks also in the selector panel A2E). If this short circuit is only momentary, the system starts normally with the lift/lower switch. If the short circuit is sustained, the power lift remains locked.

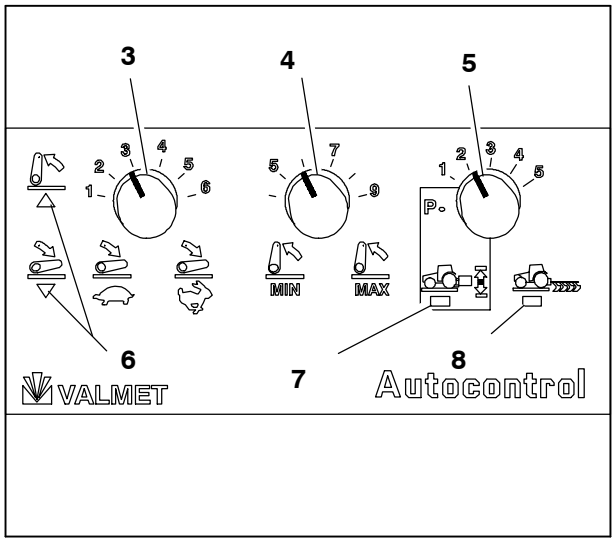
– Short circuit in the signal line causes the lifting reaction on the lower links during the short. The system returns automatically to the normal function after the short circuit (”ghost lifts”).

– Contact between the supply and signal lines causes the full lowering reaction on the lower links during the short circuit.

Note! The draft sensor internal build–up has been changed. At the same time, the sensor coverings have been changed. The earlier sensor fits with the new coverings. The new sensor cannot be fitted with the earlier covers but they must be changed. The new cover can be used inplace with the earlier covers after changing the sheet metal cover.

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Functional checks

If a malfunction should occur, the reasons may be either in the electric control system or in the hydraulic system:

1. Distinguishing between electrical and hydraulic malfunctions

– Start the tractor. Apply the parking brake.
– Press the push buttons at the ends of the solenoids on the control valve. This moves the valve plunger mechanically. The lifting solenoid is the most accessible
– If the lower links move upwards and downwards, the hydraulic circuit is in order
– If the lower links fail to move when the buttons are depressed, check the condition of the pump and oil pipes. If necessary, the control valve must be checked (see section **90**).

2. Checking the electrical operations

Important! The most likely causes of malfunction are poor contacts in the connectors and switches. In case of malfunction, all connectors and switches must be checked and cleaned. Most of the connectors are placed in the lever console. Connectors for sensors are at the rear of the tractor on right side.

A. Checking rear push buttons

– Start the tractor
– Set the lift/lower switch (2) in the lowering position
– Press the buttons on the mudguards and check if the lower links actually move upwards and downwards:

a) If the lower links respond to the push buttons, then this section is in working order

b) If the lower links do not move when the buttons are pressed:
– check the power lift fuses (F11 5 A, F18 5 A)
– check the constant current (X2E/1) and current passing through the ignition switch (X2E/3) from the power lift inlet connection (X2E)
– check the lead connections for breaks and repair if necessary

c) If the lower links e.g. lift but will not lower:
– Change round wires to the solenoids and try the buttons again:
– If the lower links still move upwards only, the lower solenoid is defective and must be changed
– If the lower links move downwards only, the valve is in order, but the other solenoid is not receiving current. In this case, check the lead connectors.

B. Checking the lift/lower switch

The power lift control system is activated with this switch. (2). If the unit is not receiving current or information about the position of the lower links (e.g. the position sensor lead is damaged), the control system will not start to function and the power lift will not respond to the position control knob (1)

If the control system does not start to function, but the lower links respond to the push buttons:

– Check the lift/lower switch and the associated connections (if the power lift is left unused for some time the switch may become oxidized, and the control system will fail to activate).
– Check the position sensor lead and the other connections
– Check the electronic unit connection

If no defect is found, the whole electronic unit must be replaced. The unit is fitted to the lever console on the cabin.

C. Checking the position control knob (1)

– Activate the control system (switch 2)
– Turn switch (4) to position 9.
– Rotate the position control knob slowly to its extreme positions. The movement of the lower links should be steady (clockwise extreme position=max transport height. Anti–clockwise extreme position=lowest position of lower links.

Note! The numbers beside the position control knob and the transport height selector correspond to each others

Note! Checking the position control knob, see page **320**/**14**.

D. Checking the indicator lights on switch panel

– Check that the position control indicator light (7) is lit when the draft control selector (5) is in position P
– Check that the draft control indicator light (8) is lit, when the draft control selector is in position 1–5
– Raise the lower links by rotating the position control knob=red lift indicator light (6) is lit
– Lower the lower links =green light (6) is lit

Note! The lift/lower indicator lights are connected in parallel with the control valve solenoids. Therefore, if the indicator lights are lit this means that the solenoids are receiving current.

Note! Reconditioning indicator lights, see page **320**/**12**.

E. Checking the transport height selector

– Activate the control system (switch 2)
– Rotate the transport height selector (4) to position 9
– Rotate the draft control selector (5) to position P
– Rotate the knob (1) max clockwise (to position 9)

The transport height selector (4) should at this point provide 6 different upper position for the lower links: the maximum upper position 9 (where the cylinder stroke is **181–183 mm**) and five lower positions, but not the lowest position

Checking the selector, see instruction on page **320**/**10**.

F. Checking the lower speed selector

– Activate the control system (switch 2)
– rotate selector (5) to position P
– rotate selector (4) to position 9
– rotate selector (3) to position 6 (max lowering speed)
– connect an enough heavy load to the three–point linkage

Put the lift/lower switch (2) in the lifting position, so that the lower links are raised to an upper position. Lower them by putting the switch in the lowering position and use a timer to measure the lowering speed. Six different speeds should be found according to the position of the selector (3) (1=slowest, 6=fastest)

Note! The lowering speed for the slowest position (1) should be at least 6 seconds regardless of the load.

If the lowering speed control is out of order, the lowering speed will be the maximum (pos. 6).

Checking the switch panel, see page **320**/**10**.

G. Checking the draft control operation

When the draft control is in use (Eg. during ploughing), the lift and lower indicator lights will flash. If the draft control is out of order, the power lift operates in the position control mode (as if selector were in position P.

Quick checking of the draft control ranges

– start the engine and activate the power lift (switch 2)
– use the position control knob (1) to set the lower links to position 4 (selector (5) in position P)
– stop the engine but leave the ignition on
– turn the draft control selector to position 2
– use the position control knob to stop the power lift fairly near the beginning of the lift cycle, ie. rotate the knob until the lift and lowering indicator lights are off, fairly close to the area where the lift light is lit
– turn the draft control selector to position 3. The lift indicator light should now be lit
– again use the position control knob to stop the power lift.
– turn the draft control selector to position 4. Now the lift indicator light should be lit
– use the position control knob to stop the power lift and turn the draft control selector to position 5. Once again, the lift indicator light should be lit.

Note! The graduation between the areas 3 and 4 is greater than elsewhere. It can be tested by turning the draft control in area 3 a little further to the lowering side. Returning to area 4, the lift indicator light is lit again.

Note! Checking draft control selector (switch panel), see page **320**/**10**.

Simple instructions for checking the operation of the draft sensors

– turn the draft control selector to position 5
– use the position control knob to lift the implement (but not to the limit)
– lock the right side check link and release the left one
– from the rear of the implement push the implement to the right. If the left draft sensor is operating, the red lift indicator light will flash, when the implement is being pushed against the check link
– test the right side sensor in a similar way

H. Three–position lift/lower switch and forced–lowering switch

Note! From the beginning of the year 1994 (AC II) the lift/lower switch has three position. The intermediate position stops the lower link movement. The other two positions are the same as before.

Note! With effect from serial no 668103 (AC 2.1) the power lift has a forced–lowering switch on the RH side of the position control knob, see page **320**/**15**.

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1. Checking switch panel A2E

If lowering speed (S7E), transport height (S8E) or draft control selector (S9E) does not function properly and the malfunction cannot be localized with the help of the preceding instruction, the switch panel A2E can be checked as follows:

N.B.! In the checking, a voltmeter (measuring scale 0–14 V DC) is needed. The voltmeter measuring heads should have sharp ends so that they can be pricked through protective lacquer.

Measurements are done on the tinned terminals on the rear side of the switch panel. Measurements are done without detaching the connector from the panel.

A. Removing the switch panel for checking

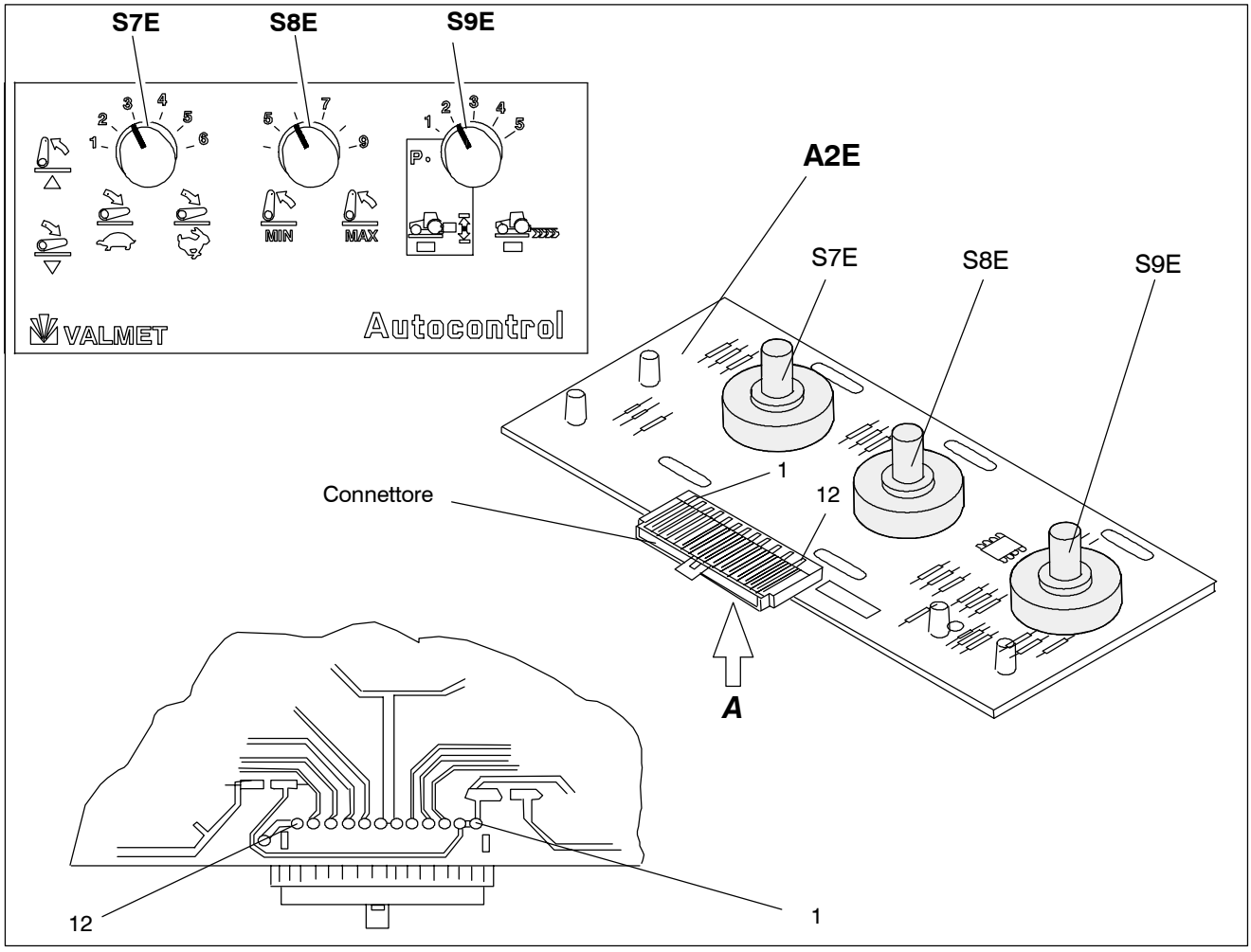
1. Detach the bracket on which the switch panel is fitted by unscrewing four crosshead screws.

Note! On E–models and on models equipped with Agrodata, the switch panel and its bracket is fitted more to the rear on the lever console.

2. Turn the bracket/switch panel so that voltage measurements can be done according to **instruction B**.

3. Turn the current on with the ignition switch and activate the control system with the lift/lower switch. Do not detach the connector from the switch panel.

Note! From serial no **668103** incl. (AC 2.1), there is the DPS circuit card fitted on the power lift switch panel. Remove, if necessary, this circuit card before measuring the power lift voltages.



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B. Voltage measurements

Turn the current on with the ignition switch and activate the control system with the lift/lower switch (do not detach the connector from the switch panel). Carry out measurements on the rear side terminals according to the figures a–d below.

Checking supply voltage

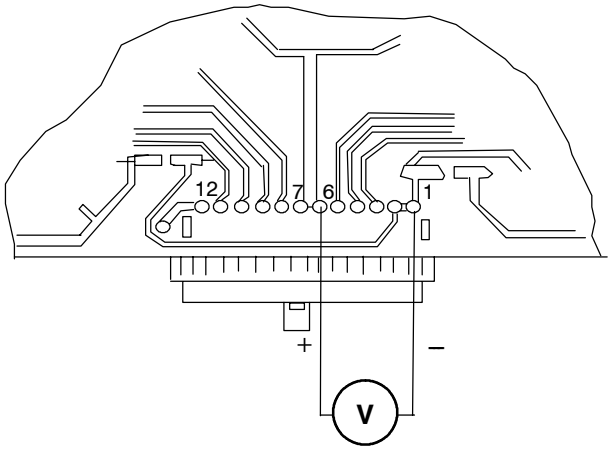
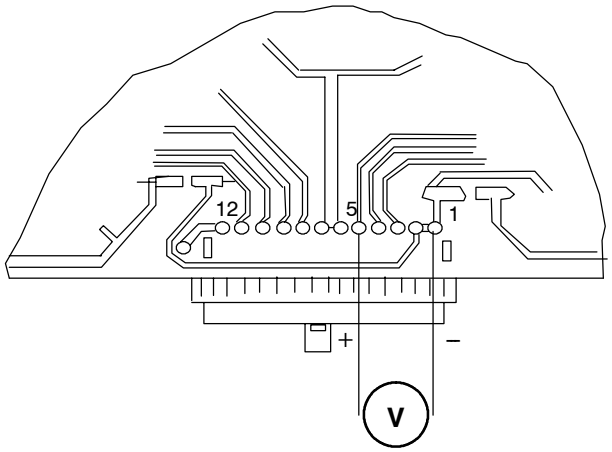


Figure a) Measuring supply voltage: measure voltage between terminals 1 and 6

Correct value is 9,5–10,5 V



Checking lowering speed selector

Figure b) Checking lowering speed selector: Measure voltage between terminals 1 (or any frame contact) and terminal 5 with every selector (S7E) positions:

Position	Terminal 5
1	0,9–1,1 V
2	1,7–1,9 V
3	2,4–2,8 V
4	4,3–4,9 V
5	6,0–6,8 V
6	9,5–10,5 V

Checking transport height selector

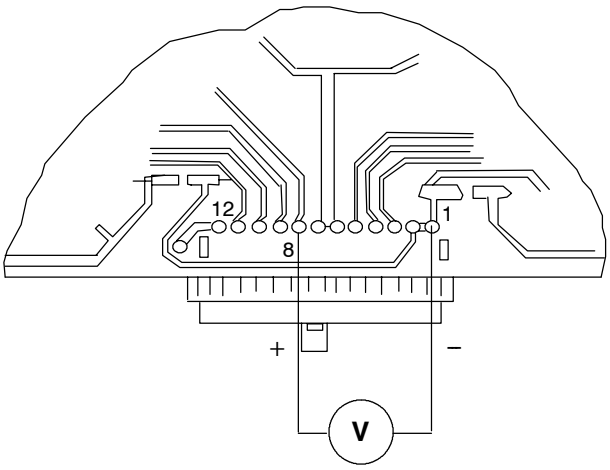


Figure c) Checking transport height selector: Measure voltage between terminals 1 (or any frame contact) and terminal 8 with every selector (S8E) positions.

Position	Terminal 8
4	9,5–10,5 V
5	7,6–8,4 V
6	5,7–6,3V
7	3,8–4,2 V
8	1,9–2,1V
9	0

Checking draft control selector

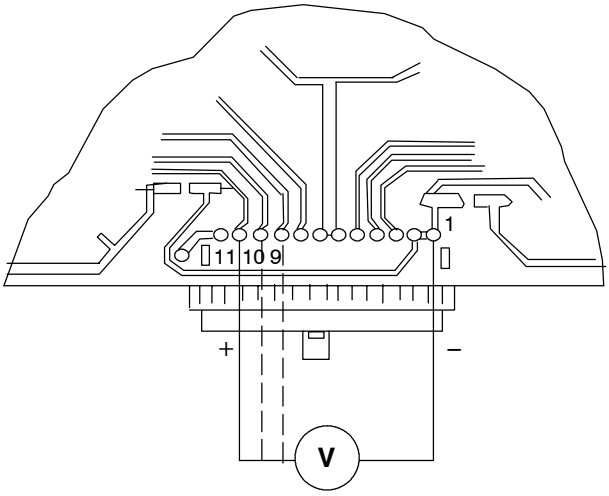


Figure d) Checking draft control selector: Measure voltage between terminals 1 (or any frame contact) and terminals 9, 10 and 11 separately with every selector (S9E) positions:

Pos.	Terminal 10	Terminal 9	Terminal 11
P	9,5–10,5 V	0–0,2	9,5–10,5 V
1	3,7–4,1 V	0–0,2	7,7–8,5V
2	1,8–2,0 V	0–0,2	7,7–8,5 V
3	1,8–2,0 V	0–0,2	9,5–10,5 V
4	0	1,7–1,9 V	7,7–8,5 V
5	0	1,7–1,9 V	9,5–10,5 V

Note! If the supply voltage deviates from the correct value, the fault lies in various connectors. If other values are incorrect, the fault lies in the switch panel, which should be changed.

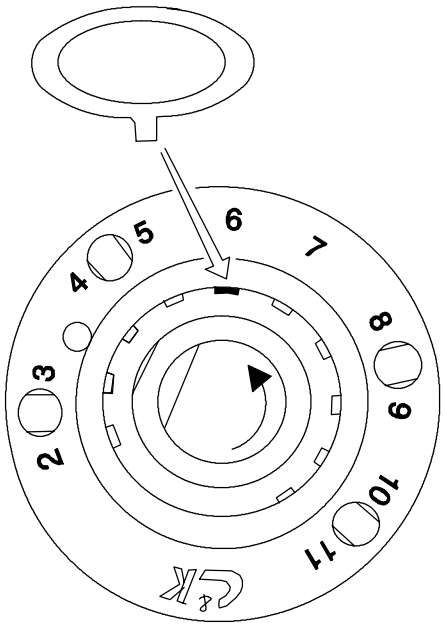
C. Changing switch panel

N.B: If the voltage measurements show that the switch panel is defective the panel must be replaced as a complete unit as follows:

1. Detach the switch panel from the bracket by removing selector knobs and by unscrewing ring nuts.

2. Remove also the lock washers and dust seals. Detach the switch panel connector so that the panel can be removed.

.



3. Fit onto new selectors washers with lugs. These washers limit selector positions. Before fitting the washers turn every selector anti–clockwise as far as possible to their extreme position. After this has been done, fit the washers so that the lugs engage in the holes at number six on every switch (see figure above). Make sure by turning the switches that they have six different positions.

4. Connect the connector to the new panel. Fit the dust covers (317 204 20). Fasten the circuit card to the panel by means of ring nuts (fit under nuts lock washers JE 9423).

5. Attach the connector to the switch panel. Fit the switch panel onto the bracket by means of the ring nuts (fit the cup washers under the nuts).

6. Fit the selector knobs and place the bracket onto the lever console with four cross head screws.

D. Checking switch panel indicator lights

If Autocontrol power lift functions properly, but indicator lights on the switch panel do not function correctly the following steps must be taken:

– Detach the switch panel **(instr. A)** and move the connector on the panel so that possible poor contacts disappear.
– If an indicator light is still out of order the voltage measurements shown in instruction **B** must be carried out.
– If voltages are between allowable limits but light is still out of order the fault is in the bulb and the whole switch panel has to be changed as a complete unit **(see instruction C**)

2. Measuring internal voltages of position sensor and draft sensors

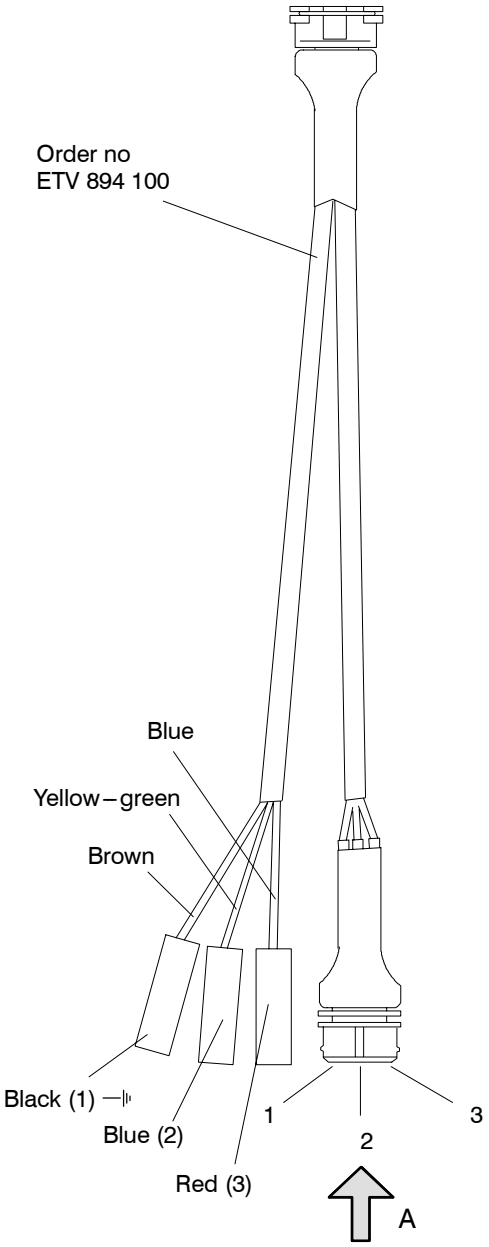
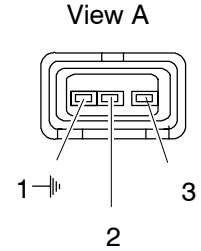


Figure 1. Tool for measuring the sensor voltages

Red = supply voltage=3
Blue = signal voltage=2
Black = earth lead=1



The condition of the sensors can be checked by measuring the sensor supply and signal voltages with the aid of a special tool.

Connect the tool into the power lift by opening the position sensor or one of the two draft sensors connectors and by fitting the tool between the lead. Switch on current and acticate the power lift with lift/lower switch.

The correct values should be:

Position sensor: (ACB / ACD)

– Measure the sensor **supply voltage** in the alternating current (AC) position of the multimeter. The value should be between the red and black connectors: 6,3–7,7 VAC

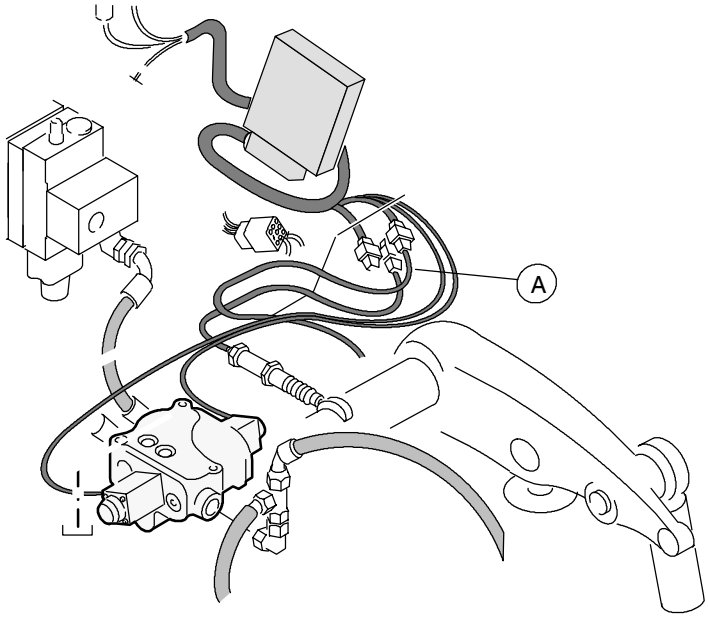
– Measure the sensor **signal voltage** in the alternating current (AC) position of the multimeter. The value should be between the blue and black connectors:
1,2...2,5 VAC lower links down.
3,0...5,0 VAC lower links up.

Draft sensors: (AC, ACB, ACD)

– Measure the sensor **supply voltage** in the direct current (DC) position of the multimeter. The value should be between the red and black connectors: 9,5–10,5 VDC

– Measure the sensor **signal voltage** in the direct current (DC) position of the multimeter. The value should be between the blue and black connectors:
2,5 VDC max pull.
7,5 VDC max push.
5,0 VDC when lower links are unloaded..

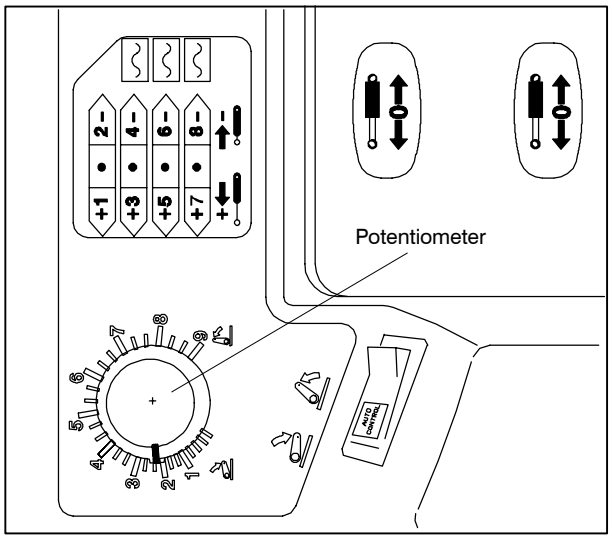
Note! If the sensors do not receive the supply voltage, check the power lift fuses and the lead connectors. If these are OK the possible fault may be inside the Autocontrol electronic unit which should be replaced.



Sensor connectors (A) are placed in the lever console in the cab and are accessible after removing console side panel.

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3. Checking the position control potentiometer



1. Stop the engine and switch off current

2. Remove the side panel of the lever console in cab and open the position control potentiometer connector.

3. Measure resistance (between blue and black leads) when the knob is in its both extreme positions and also in positions 4 and 7. Correct values should be:

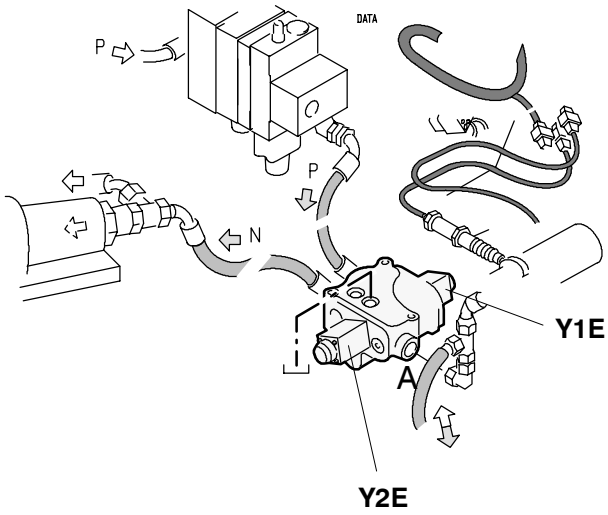
Max. anti–clockwise . . . . . 0,9 Ω (±20 %)
Point4 . . . . . 1420 Ω (±20 %)
Point 7 . . . . . 3,3 k Ω (±20 %)
Max. clockwise . . . . . 4,7 k Ω (±20 %)

4. Then rotate the position control knob slowly from one extreme position to the other and make sure that the resistance value changes linearly without steps.

4. Checking control valve and its solenoid valves

If the lifting or lowering speeds do not function correctly, it is necessary to clear up whether the fault lies in the electric system or in the control valve (valve spools can get trapped etc.).

Checking electric system:



Connect an ampere–meter in series with control valve solenoids. Y1E lowering (inner) and Y2E lifting (outer). Use ETV 894 220 when measuring these values, see page **101**/**1**.

Lifting . . . . . approx **3,45 A**
Lowering (yellow buttons) . . . . . approx **1,96 A**

Lowering speed positions:
1 . . . . . approx **1,40 A**
2 . . . . . approx **1,55 A**
3 . . . . . approx **1,70 A**
4 . . . . . approx **2,15 A**
5 . . . . . approx **2,60 A**
6 . . . . . approx **3,45 A**

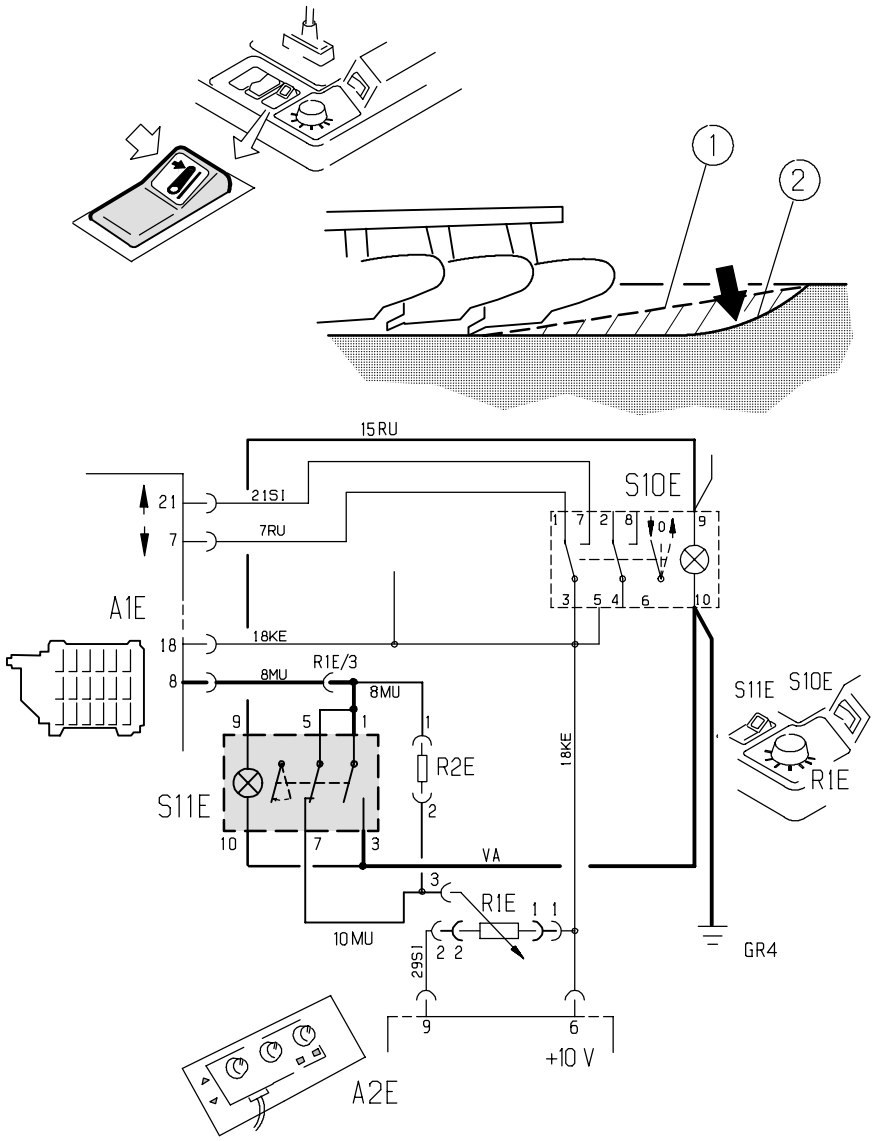
Resistance of solenoid . . . . . approx **1,6** Ω

Checking control valve:

If the measured values agree with the correct values above, but malfunctions occur in the lowering and lifting functions, the control valve should be removed and checked (see page **912**/**2**).

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Forced–lowering switch, 668103–.



Picture 2. *Forced–lowering switch*

1. Without switch
2. With switch

S11E=forced lowering switch
S10E=lift/lower switch
A1E=control unit
A2E=switch panel
R1E=position control potentiometer

The forced lowering switch is placed on the RH side of the position control knob. When the switch rear edge (spring returned) is depressed, the Autocontrol adjustements are overidden (position control knob, sensitivity/mixing), and lower links lower to the lowest position (control unit pin 8 becomes earthed).
The lower links lowers so long the switch is depressed. When the switch is released, the lower links automatically find the position determined by position control knob.

The forced lowering switch does not override the lowering speed setting. The switch does not lower the lower links, if the lift/lower switch is in the lifting position or in the intermediate position.

If the position control knob is in max lowering position (max anticlockwise), the switch does not lower the links any more.

Note! From spring –96 the forced–lowering switch is an option. On ACD hydraulic lift (see under code 321) the forced lowering switch is a standard equipment.

Note! Resistance R2E has been added in the electric circuit of the forced–lowering switch.

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1. Special instructions

A. Control unit A1E of AC power lift

Note! The internal function of the control unit has been changed from analog to digital and the analog units are not manufactured any more. In addition, a number of the analog units in the store is limited.

The new digital unit replaces principally the analog unit. On the earlier tractors, however, the lifting height display in the dashboard does not function with the digital unit.

Suitability of the spare part units:

– Unit 31287215: 6000–8750 up to 7.96
– Unit 31287220: 6000–8750 *) from 8.96 incl (also earlier tractors, which have AD–instrument).

*) Modification in instrument, instrument no. 31542060.

Note! When the new digital unit is fitted on the earlier 6000–8750 tractors, the compensator A3E (32634500) must be removed (to be disconnected from its connector). The compensator has been removed in the tractor production from new tractors (wire loom 31867940).

Note! With the new digital control unit the position sensor is adjusted in the same way as on ACD–power lift, see page **321**/**9**.

Malfunctions of position sensor and forced lowering

Position sensor

Up to manufacturing date 980331 of the digital unit the position sensor may have malfunctions. The faulty units are used in the tractor production from week 810 up to tractor no. H27415. From the date 980401 the faulty functions have been removed.

Note! The spare part units 31287220 do not cause the malfunctions.

If the AC power lift transport height has been adjusted wrongly, the lift activation can disappear and the lower links remain in the upper position.
At this time, stop the engine and switch off current. Restart the engine and lower the lower links downwards by using the push buttons. After this activate the lift normally. Carry out repair by adjusting the position sensor a little outwards, check the function..

Forced lowering

With the digital unit must always be used the forced–lowering wire loom 33009610. The earlier wire loom can cause malfunctions. This new wire loom can be fitted as a spare part in place of the earlier loom.

When using this wire loom, the forced lowering function can be fitted as an option also on all earlier manufactured tractors.

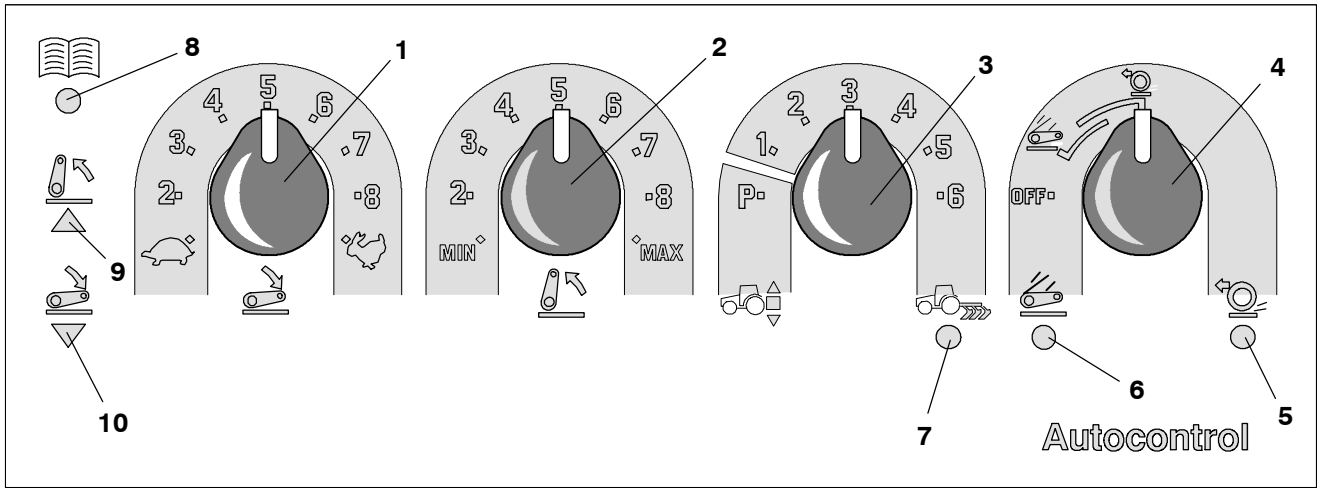
32. ACB/ACD electro–hydraulic power lift	~~1. 11. 1998~~ 1. 6. 1999	Model 6250–8950	Code 321	Page 1

Valtra–Valmet 8450, **8550, 8750** and **8950** tractors have as standard ACD power lift. Basic functions of the ACD are the same as described under code 320 showing Autocontrol power lift. ACD power lift is available as an alternative equipment also for other Mezzo–tractors. On E–models the ACD power lift is a standard equipment. Under this code are shown differences between Autocontrol power lift and ACD power lift.

Important! On HiTech tractors 6250–8150 there is as standard ACB power lift, which cannot be equipped with slip control and auxiliaty sensors cannot be connected. In addition, the engaging speed of the Drive Balance Control cannot be adjusted, but it is always engaged in the transport position, when the tractor is moving (can be switched off with a selector). The ACB power lift has not an indication light for the draft control mode. **Note!** 6200–8150 AC 2.2 tractors have as standard the **ACB**–power lift. ACB power lift can be recognized by letter B on the switch panel.

A. ACB / ACD power lift

– ACD and ACB power lift has a digital control unit
– Position sensor is different as on AC power lift.
– ACD and ACB power lift has as standard a Drive Balance Control, which damps in transport driving oscillation movements of the tractor caused a heavy implement which is attached to the three point linkage unit.
– A slip contror is available as an option (not ACB), which includes also a radar. The radar is the same as on AC III and AC IV units.
– For the slip control and Drive Balance Control the tractor has a gearbox speed sensor (not ACB) on the RH side of the shuttle unit. The sensor is the same as on AC IV unit and on Agrodata–instrument.
– The ACB and ACD power lift switch panel has a diagnostic light, which indicates self–testing and locking of the power lift and it indicates with flashing numbers of fault codes so that possible faults can be localised. The flashing of the diagnostic light also confirms that a new switch–on frequency of the Drive Balance Control is valid (not ACB).
– Lowering speed selector and draft control selector have more positions than earlier.



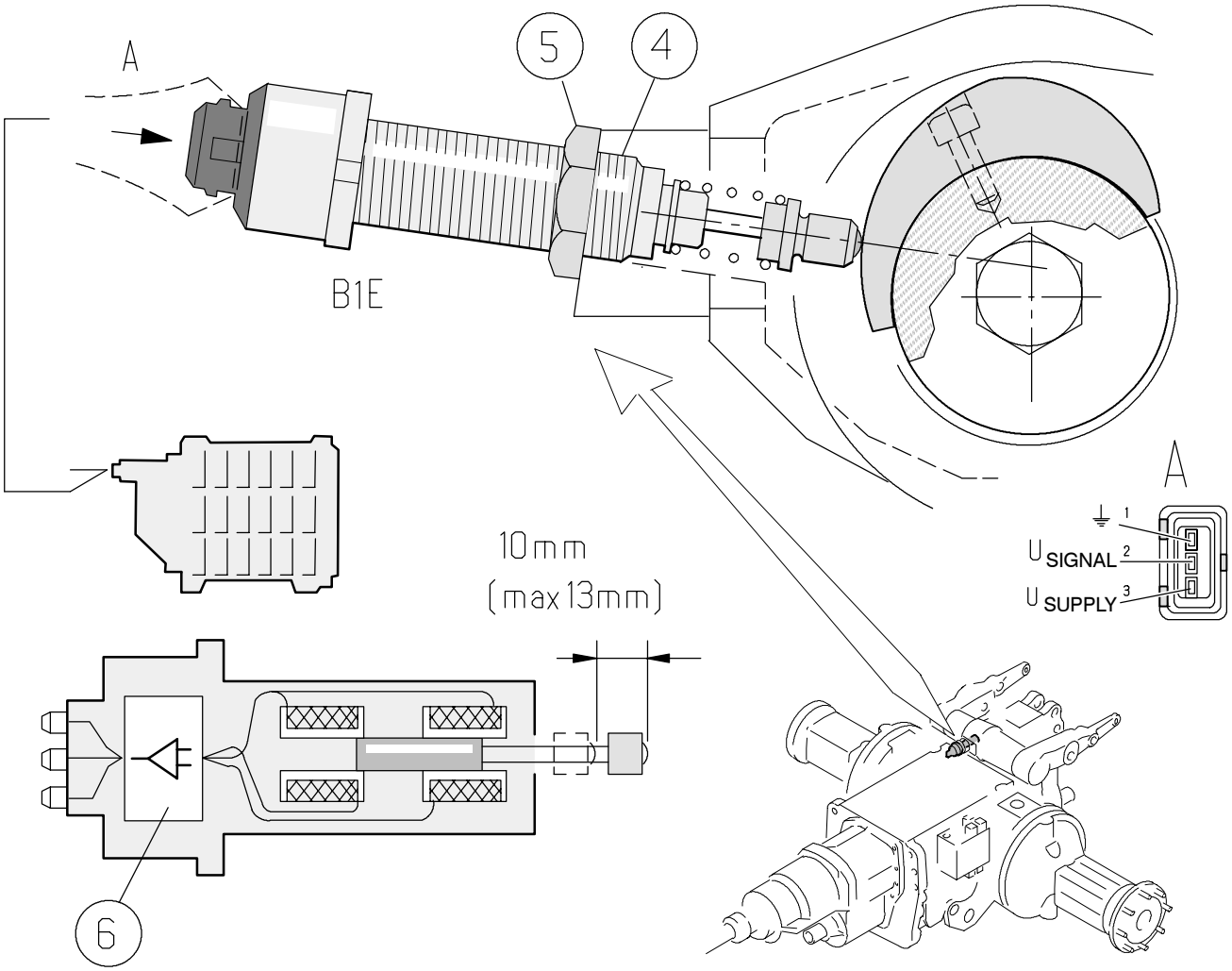
Picture 1. *ACD power lift switch panel (ACB has not an ind. light 7 and selector 4 has not the slip control position)*

1. Lowering speed selector (9 positions)
2. Transport height selector (9 position)
3. Position control/Draft control selector (position P is for position control. The draft control has 6 different positions
4. Drive Balance Control/Slip Control
  – OFF; Drive Balance Control and slip control are switched off
  – Drive Balance Control switched on
  – Both Drive Balance Control and Slip Control switched on (not ACB)
  – Position in picture; Slip control switched on (if fitted)
5. Indication light if slip control fitted
6. Indicator light, Drive Balance Control switched on
7. Indicator light, Draft control is switched on (positions 1–6) (not ACB)
8. Diagnostic light
9. Indicator light, lifting
10. Indicator light, lowering

Note! The functions of the position control potentiometer, lifting/lowering switch and the forced–lowering switch are the same as earlier (see code 320). The bush buttons in the cab have been replaced with one rocker switch, but the function is the same as earlier (also on Autocontrol power lift). There are bush buttons on the rear mudguards. The draft sensors are the same as earlier, see page **320**/**7**. Checking the function of the ACB and ACD power lifts, see page **321**/**14**.

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B. Position sensor, ACB and ACD



Picture 2. *Position sensor on ACB/ACD power lift*

4. Permatex Super 300 to threads
5. Locking nut
6. In–built amplifier
Connector A:
1. Earth wire
2. Signal wire
3. Supply wire

Direct current (DC) is fed into the ACD position sensor (earlier alternating current).

U_{Supply} = 9,5±0,3 V_{DC}
U_{SIGNal} = 25–75 % x U_{Supply} (lower links down–up)

The position sensor connector is fitted at the end of the sensor.

Note! The positon sensor cannot be repaired but a defect sensor must be changed for a new one.

Important! Fault code number **22** indicates, that the position sensor does not function. Diagnostic light and fault codes, see the following instr. **C**.

Measuring position sensor supply and signal voltages

Sensor voltages can be measured as earlier by using special tool **ETV 894 100** and a universal instrument, see page **320/13**.

Measuring values
– Supply voltage . . . . . **9,2–9,8 V_{DC}**
– Signal, lower links down . . . . . **2,3–2,5 V_{DC}**
– Signal, lower links up . . . . . **6,9–7,4 V_{DC}**

Adjusting position sensor, see page 321/9

C. Function of diagnostic light and fault codes (ACB and ACD)

When the current is switched on with an ignition switch, the diagnostic light is lit for a while (book symbol). This is the self–testing of the ACD system. After a short time the diagnostic light is lit continuously. This indicates that the power lift is locked. When the light is on, all functions are locked, but the push buttons function.

The power lift is activated by turning the lift/lower switch first to the lifting and then to the lowering position, at which time the diagnostic light goes out and the power lift responds to all switches. Immediately after the activating the ACD limits the supply current to the solenoid valves for safety. This limit delays movements of the lower links. The current supply limit disappears, when the function limit of the control unit has been achieved or if the lift/lower switch is used anew.

After use of the push buttons the ACD is locked and the diagnostic light is illuminated.

Fault codes

ACD power lift continually monitors possible malfunctions in the system. The faults are divided into three different levels according to their seriousness as follows:

1. Serious faults:
– the power lift is locked
– relay closes (protects outputs)
– diagnostic light indicates the fault
– Remedy: Repair the fault, start the tractor and activate the power lift.

2. Medium serious faults:
– the power lift is locked.
– diagnostic light indicates the fault
– Remedy: Repair the fault and activate the power lift with the lift/lower switch

3. Minor faults
– the power lift continually functions
– diagnostic light indicates the fault. When the lift/lower switch is turned, the diagnostic light goes out, if the fault has disappeared.

A possible fault can be localised with the aid of the diagnostic light, which displays by flashing the number of the fault code. For example, if the signal wire to the draft control selector is damaged or there is poor contacts in connectors (fault code 36), the diagnostic lights flashes as follows:

– Long pause **– three flashes –** short pause **– six flashes.**

During momentary faults, the diagnostic light flashes, until the lift/lower switch is turned, although the fault has already disappeared.

Faul codes of ACD power lift

1. Serious faults

Fault code number	Fault	Control unit connector pin	Description
11	Output/lifting	37	Output signal to lifting solenoid faulty or poor contacts in solenoid wire to pin 35. Battery voltage low in pin 29 (fuse fault).
12	Output lowering	19	Output signal to lowering solenoid faulty or poor contacts in solenoid wire to pin 35. Battery voltage low in pin 29 (fuse fault).
13	Short circuit	35	Measured current in pin 35 too high. Short circuit between pins 19 and 35 or between pins 37 and 35 (solenoid in short circuit)
14	Open circuit	35	No current in pin 35, altought solenoid is activated. Possible poor contacts in wires to solenoid (pins 19, 37 ja 35). Solenoid damaged. No battery voltage in pin 29 (fuse fault)
15	Push buttons	9	Signal from push buttons not OK. Push button or its wire damaged.
16	Supply	2 (+) 20 (–)	Control unit supply not in order. Supply of 9,5 V and earthing not in order
17	Battery	29	Battery voltage greater than 18 V
18	Lift/lower switch	21	Signal from switch faulty. Poor contacts or signal wire not connected.

2. Medium serious faults

Fault code number	Fault	Control unit connector pin	Description
22	Position sensor	6	Signal from sensor faulty – Poor contact or position sensor disconnected – Possible short circuit or earthing – Position sensor faulty adjusted
23	Position control potentiometer	22	Signal from potentiometer faulty. Poor contacts or wire loose.
24	Transport height selector	3	Signal from selector faulty. Poor contacts or wire loose.

3. Minor faults

Fault code numbers	Fault	Control unit connector pin	Description
31	RH side draft sensor	26	Signal from sensor faulty: – Poor contact or wire disconnected – Possible short circuit or earthing – Sensor overloaded
32	LH side draft sensor	7	Signal from sensor faulty: – Poor contact or wire disconnected – Possible short circuit or earthing – Sensor overloaded
33	Battery	24	Voltage too low (lower than 11,5 V).
34	Lowering speed selector	23	Signal from selector faulty. Poor contacts or wire disconnected.
35	Slip control selector	5	Signal from selector faulty. Poor contacts or wire disconnected.
36	Position control/ draft control selector	4	Signal from selector faulty. Poor contacts or wire disconnected.
37	Control valve		Power lift does not lift, altougth current in lifting solenoid (pin 37). Dirt in control valve. No oil pressure. Control valve damaged, valve spools does not move.
38			

Other faults

Fault code numbers	Fault	Control unit connector pin	Description
41	Radar signal	10	Radar signal low, transmission sensor signal OK (can be verify only in draft control mode). Poor contacts or radar damaged.
42	Signal from transmission sensor	11	Transmission sensor signal low, radar signal in order (can be verify only in draft control mode). Poor contacts in sensor wire or sensor faulty.

Note! Fault codes 41 and 42: the diagnostic light does not show the fault code, if both the transmission sensor signal and radar signal are low, since this is a normal situation when the tractor is stationary.

Fault codes of ACB power lift

1. Serious fault

Fault code number	Fault	Control unit connector pin	Description
11	Output/lifting	2	Output signal to lifting solenoid faulty or poor contacts in solenoid wire to pin 6.
12	Output lowering	14	Output signal to lowering solenoid faulty or poor contacts in solenoid wire to pin 6.
13	Short circuit	6	Measured current in pin 6 too high. Short circuit between pins 2 and 6 or between pins 14 and 6 (solenoid in short circuit)
14	Push button in mudguard, upwards	10	Signal from push buttons not OK. Push button or its wire damaged.
15	Push button in mudguard, downwards	20	Signal from push buttons not OK. Push button or its wire damaged.
16	Supply	12	Control unit supply not in order. Supply of 9,5 V and earthing not in order

2. Medium serious fault

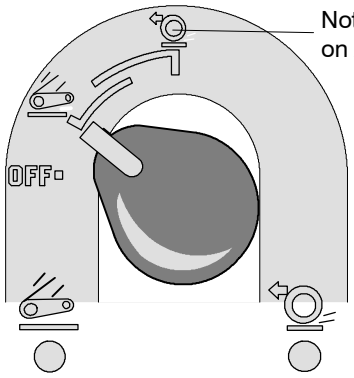
Fault code number	Fault	Control unit connector pin	Description
22	Position sensor	19	Signal from sensor faulty – Poor contact or position sensor disconnected – Possible short circuit or earthing – Position sensor faulty adjusted
23	Position control potentiometer	16	Signal from potentiometer faulty. Poor contacts or wire loose.
24	Transport height selector	22	Signal from selector faulty. Poor contacts or wire loose.
28	Up/stop/down switch	8	Signal from switch faulty. Poor contacts or wire loose.

3. Minor faults

Fault code numbers	Fault	Control unit connector pin	Description
31	RH side draft sensor	18	Signal from sensor faulty: – Poor contact or wire disconnected – Possible short circuit or earthing – Sensor overloaded
32	LH side draft sensor	17	Signal from sensor faulty: – Poor contact or wire disconnected – Possible short circuit or earthing – Sensor overloaded
34	Lowering speed selector	24	Signal from selector faulty. Poor contacts or wire disconnected.
36	Position control/ draft control selector	4	Signal from selector faulty. Poor contacts or wire disconnected.

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D. Drive Balance Control (DBC)



When a tractor is driven in transport drive and a heavy implement is attached to the power lift linkage, this causes oscillation of the tractor (front wheels tend to jump up from the ground) . ACB/ACD power lift has the Drive Balance Control (oscillation damping), which functions when the power lift is in the transport position. Shocks from an implement cause tensions in the draft sensors, and these tensions alter to electric signals, which in turn cause that the linkage makes small lift and lowering movements.

Drive Balance Control is activated, when the following four terms are valid:

a) Power lift is activated

b) Power lift is in transport position

c) Drive Balance Control is switched on (ind. light lights).

d) ACD: Transmission frequency signal (driving speed) is greater than the value, which has been saved in the memory of the control unit.

When these four terms are valid, the lower links lower about 4 % from the upper limit position to the intermediate limit position.
The lower links can lower 4 % from the intermediate limit position to the lower limit position. Thus the max. distance between the upper limit position to the lower limit position is 8 %. All percentages are counted from the total movement range of the lower links (100 %).

Note! Position of the lowering speed selector does not affect the Drive Balance Control speed.

Note! ACD: The Drive Balance Control is switched off automatically, if the driving speed drops 25 % below the speed which is saved in the memory of the ACD.

ACD: Adjusting the switch--on driving speed

The DBC is switched on automatically in the transport mode, when the driving speed is about 8 km/h (when the above gfour terms are in operation).

The switch–on driving speed can be changed as follows:

a) Adjust with the lowering speed selector to the minimum lowering speed.

b) Adjust the position control potentiometer to the max upper position

c) Drive with the tractor at the required switch–on speed. The tractor must be in motion i.e. the transmission frequency signal should be greater than 25 Hz.

d) Turn the lift/lower switch at least four times to the transport position during three seconds (CONTROL–TRANSPORT).

e) The frequency signal from the sensor remains in the memory of the ACD. After this the diagnostic lights flash for three seconds with frequency of ca. 8 Hz, which confirms that a new switch–on speed for the DBC is valid.

The DBC is activated automatically, when the signal from the transmission speed sensor (driving speed) exceeds the value in the memory.

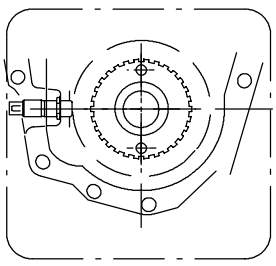
The DBC can be switched off with the selector on ACB and ACD.

Verifying the function of the DBC

When the tractor is driven in transport driving on an uneven road or field with an heavy implement attached to the power lift linkage, the shocks caused by the implement must light the indicator lights for lifting and lowering. This indicates that the DBC is functioning (the draft sensors react to shocks from the implement).

When the DBC is activated, and tractor driving speed exceeds the switch–on speed, the indicator light for the lowering must light for a while, since the lower links lower 4 % to the intermediate limit position.

ACD: Transmission speed sensor



The sensor is placed on the RH side of the reverse shuttle housing. The sensor is the same and in the same place as on AC IV unit, see page **351**/**3** sensor B2C, or on Agrodata–instrument, see page **331**/**4** sensor B6.

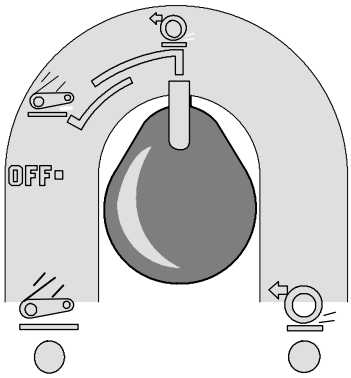
Removing, fitting and adjustment of the sensor is done in the same way as on AC IV–unit or on Agrodata–instrument.

Note! The fault code no **42** indicates that there are malfunctions in sensor wires or in the sensor. Checking the DBC selector, see instr. **F**.

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E. Clip control (option) (not on ACB)

(on E–models as standard)



In the draft control mode the ACD–power lift uses the mutual relation of the draft control and the slip per cent when adjusting the working depth. The slip is determined with a speed difference between the transmission speed and the radar speed.

Note! Before the slip control functions, the radar signal and the transmission speed sensor signal should be calibrated. The calibrating drive ensures, that the ACD control unit ”knows” the mutual relation of both these signals in an non-slip situation. When the wheels slip, the signals have different speeds, which the ACD recognises and makes a lifting reaction.

Transmission signal frequency depends on the tractor model and the wheel rolling radius. For this reason, the ACD has an automatically functioning calibrating default value.

Calibrating drive:

– Activate the ACD
– Attach load to the three point linkage, which assures that the calibrating occurs in the working condition.
– Drive the tractor on an firm surface.
With the lift/lower switch in the transport position: the driving speed should be greater than 15 km/h.

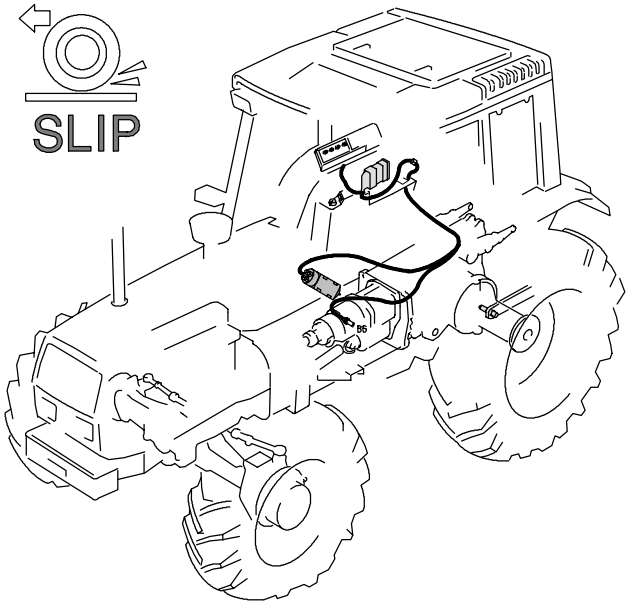
In the most difficult situation, the ACD requires a calibrating drive of 12 minutes after the first activation, to validate a correct transmission calibrating value. One term is that the radar signal is in order.

When the ACD is activated the first time, it has in the memory a calibrating value, which corresponds to the transmission frequency signal of 55 Hz / km/h. This default value is corrected continuously during the calibration drive, when the above mentioned terms are fulfilled.

The first calibration is carried out in the factory. If the ACD control unit is changed, a new calibrating drive must be done.

Functional check

– disengage the diff. lock and the 4WD
– raise the RH side rear wheel
– activate the ACD and adjust the lower links to the working position, in which they follow accurately the position control potentiometer.
– turn the draft control selector to position 6
– switch on the slip control
– start driving carefully (e.g. with gear M1). The raised rear wheel rotation can be slowed up with aid of the clutch pedal
– the lower links must raise when a ”slip effect” has been produced
– declutch (the rear wheel stops). The lower links should lower almost to the original position
– turn the slip control selector to the OFF–position. Now the rotation of the RH side rear wheel must not cause a lifting reaction.



Important! Fault code **35** indicates, that there are malfunctions in the slip control selector. Fault code **41** indicates problems in the radar (only in the draft control mode) and fault code **42** indicates problems in the transmission speed sensor (only in the draft control mode). Checking the slip control selector, see instruction **F**.

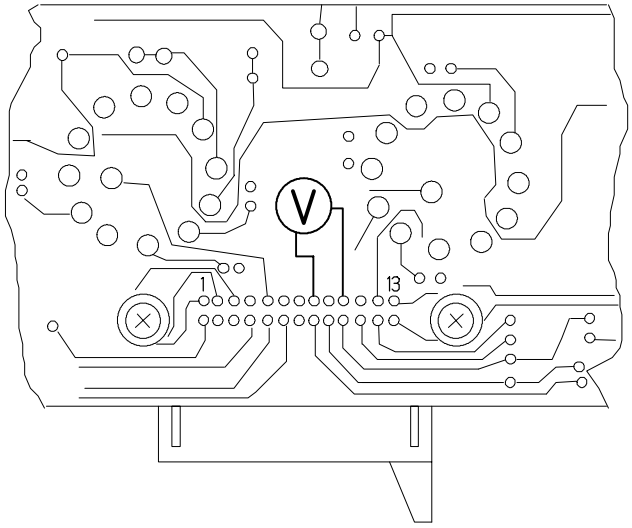
Radar – You are not allowed to go under the tractor which has radar (slip control models) before the current switch has been turned off. – **dangerous for eyes.**

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F. 1. Checking switch panel of ACD

Remove the switch panel from the lever console (do not disconnect the connector). Switch on currrent and activate the ACD power lift. Measure from the terminals on the rear side of the circuit card (DC).

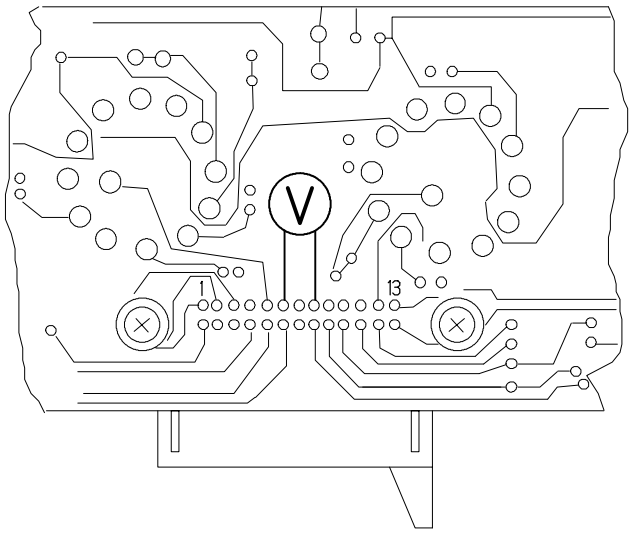
1. Measuring supply voltage



Picture a) Measure supply voltage between terminals **8** (–) and **10** (+): Correct value is **9,2–9,8 V (DC)**.

Note! If the measured value is incorrect. the fault lies in the connectors.

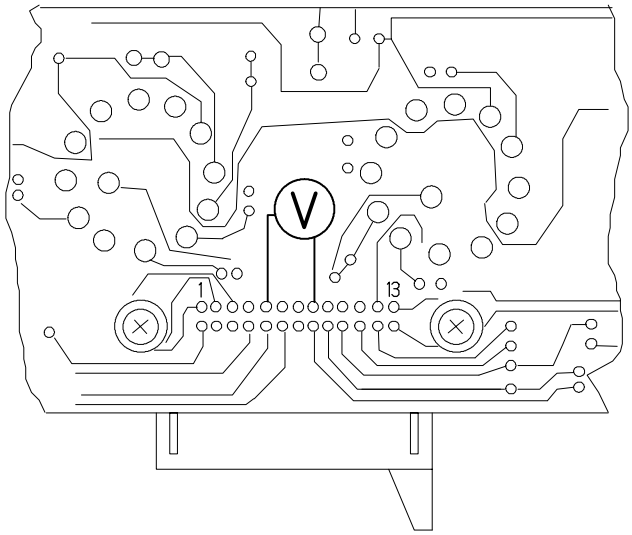
2. Checking lowering speed selector S7E



Picture b) Measure voltage (DC) between terminals **8** and **6** with all selector positions:

Position	Pin 6
1	0,4–0,6 V
2	0,9–1,3 V
3	1,3–1,8 V
4	1,9–2,4 V
5	2,8–3,5 V
6	3,8–4,5 V
7	5,0–5,6 V
8	6,9–7,4 V
9	9,2–9,8 V

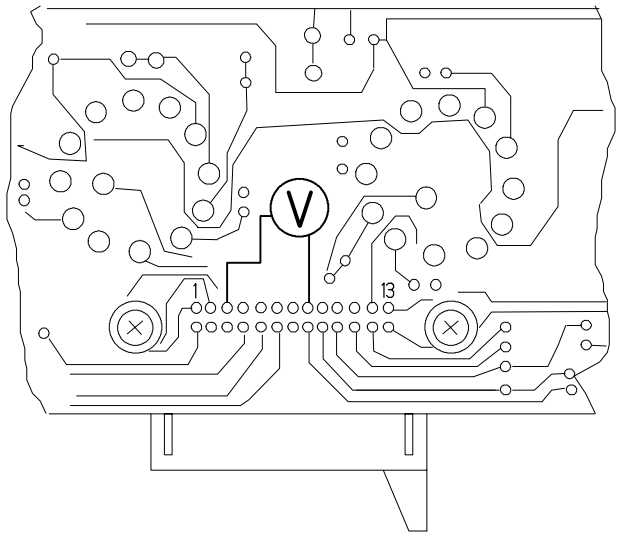
3. Checking transport height selector S8E



Picture c) Measure voltage between pins **8** and **5** with all selector positions:

Position	Pin 5
1	0
2	1,1–1,5 V
3	2,3–2,8 V
4	3,6–4,0 V
5	4,8–5,2 V
6	6,0–6,6V
7	7,2–7,8 V
8	8,5–9,1 V
9	9,2–9,8 V

4. Draft control selector S9E

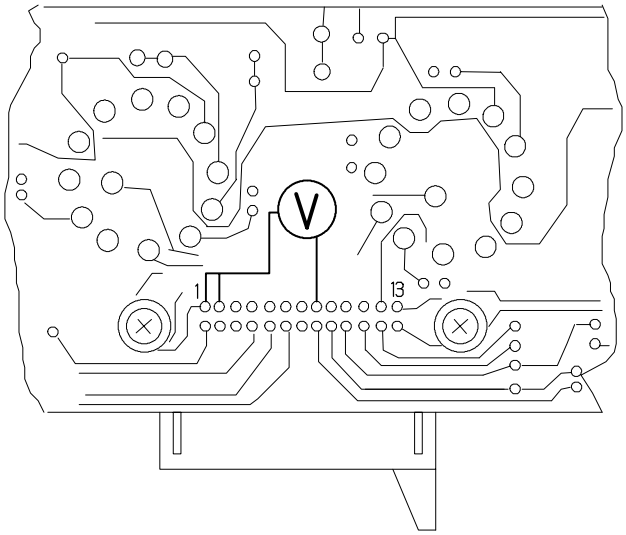


Picture d) Measure voltage between pin **8** and **3** with all selector positions:

Pos.	Pin 3
P	9,2–9,8 V
1	4,9–5,3 V
2	4,0–4,4 V
3	3,0–3,5 V
4	2,0–2,4 V
5	0,9–1,3 V
6	0

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5. Checking DBC/slip control selector S12E

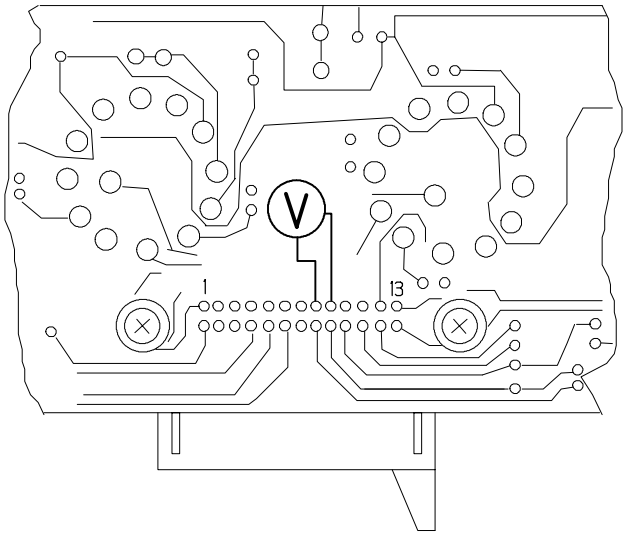


Picture e) Measure voltage between pin **8** and pins **1** (**DBC**) and **2** (**slip control**) with all selector positions:

Position	**Pin 1**	**Pin 2**
OFF	4,5–5,2 V	0
DBC	0	0
DBC+slip control	0	4,5–5,2 V
Slip control	4,5–5,2 V	4.5–5,2 V

Note! If the measured values in points **2–5** deviate from the given values, the fault lies in the switch panel circuit card which should be changed.

6. Checking lift/lower switch S10E



Picture f. Measure voltage between pin **8** and **9** in all rocker switch positions:

Position	**Pin 9**
Lowering position	3,0–3,4 V
Middle position	4,3–4,8 V
Transport position	6,0–6,6 V

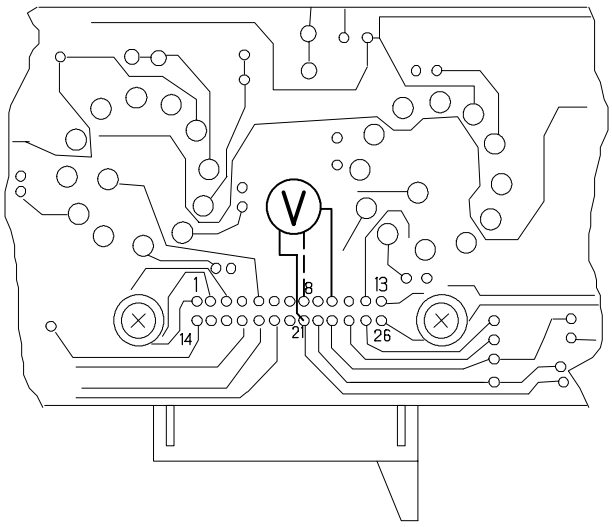
Note! If the measured values deviate from the given values, check the switch connector. If the values are further incorrect, the fault lies in the circuit card which should be changed.

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F.2. Checking switch panel of ACB

Remove the switch panel from the lever console (do not disconnect the connector). Switch on currrent and activate the ACB power lift. Measure from the terminals on the rear side of the circuit card (DC).

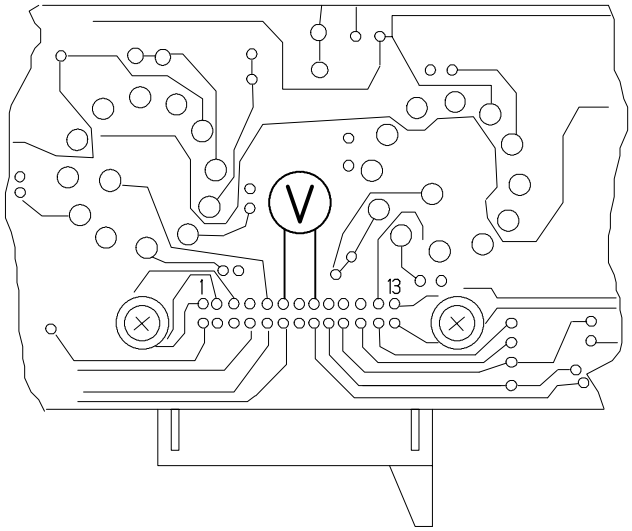
1. Measuring supply voltage



Picture a) Measure supply voltage between pins **21** (–) and **10** (+): Correct value is **9,2–9,8 V** (DC). Measure also voltage between pins **21** and **8**. Correct value is about **1,6 V**.

Note! If the supply voltage is incorrect, the fault lies in connectors/wires.

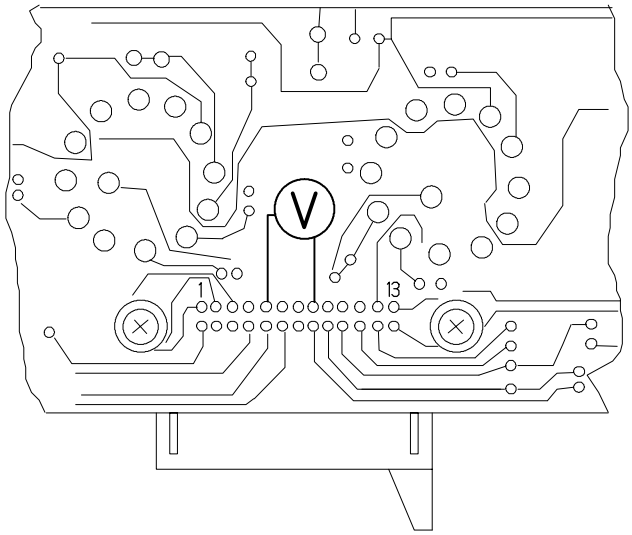
2. Checking lowering speed selector S7E



Picture b) Measure voltage between pins **8** and **6** with all selector positions:

Position	Pin 6
1	0,3–0,5 V
2	0,7–1,1 V
3	1,1–1,5 V
4	1,6–2,0 V
5	2,3–2,9 V
6	3,1–3,7 V
7	4,1–4,7 V
8	5,6–6,0 V
9	7,6–8,2 V

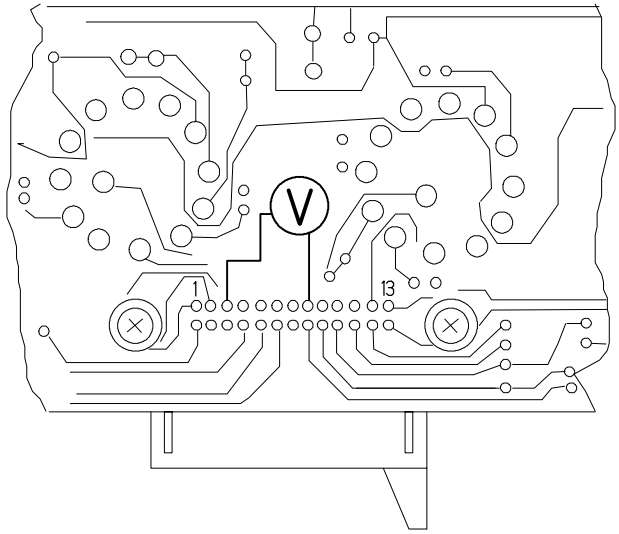
3. Checking transport height selector S8E



Picture c) Measure voltage between pins **8** and **5** with all selector positions:

Position	Pin 5
1	0
2	0,9–1,2 V
3	1,9–2,3 V
4	2,9–3,3 V
5	3,9–4,3 V
6	4,9–5,4 V
7	5,9–6,4 V
8	6,8–7,5 V
9	7,6–8,2 V

4. Draft control selector S9E

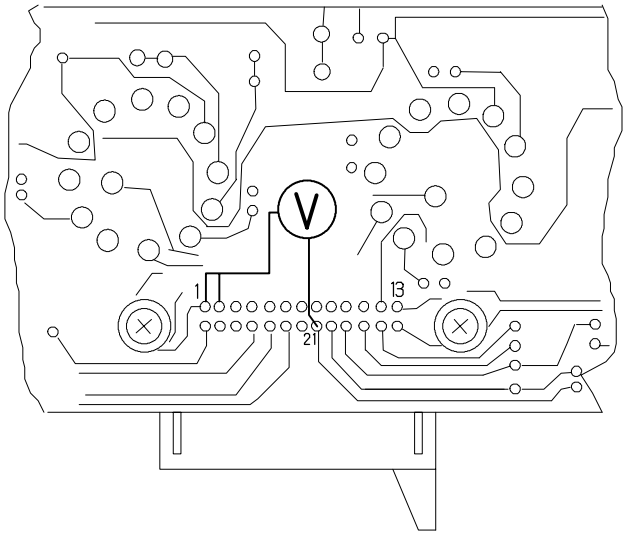


Picture d) Measure voltage between pins **8** and **3** with all selector positions:

Position	Pin 3
P	7,6–8,2 V
1	4,0–4,4 V
2	3,3–3,6 V
3	2,4–2,9 V
4	1,6–2,6 V
5	0,7–1,0 V
6	0

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5. Checking DBC selector S12E

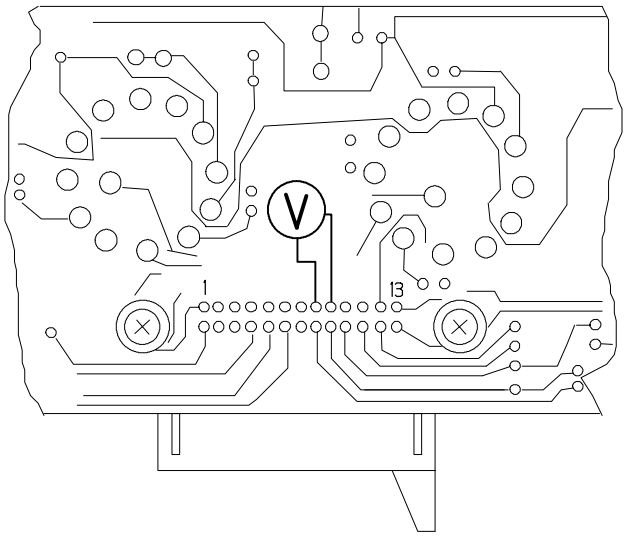


Picture e) Measure voltage between pins **21** and **1** (DBC) with two selector positions**:**

Position	**Pin 1**
OFF	2,0–2,4 V
DBC switched on	0

Note! If the measured values in points **2–5** deviate from the given values, the fault lies in the switch panel circuit card which should be changed.

6. Checking lift/stop/lowering switch S10E



Picture f. Measure voltage between pins **8** and **9** with all three switch positions:

Position	**Pin 9**
Lowering	2,4–2,8 V
Middle position (Stop)	3,5–4,0 V
Transport position	4,9–5,4 V

Note! If the measured values deviate from the given values, check the switch connector. If the values are further incorrect, the fault lies in the circuit card which should be changed.

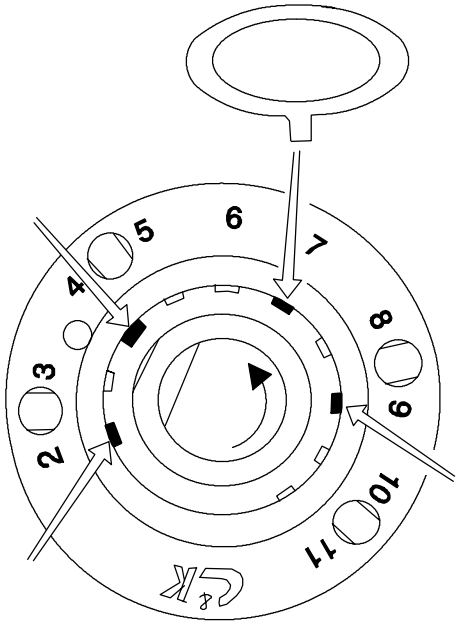
G. Changing switch panel, ACB/ACD

Note! If the voltage measurements show that the switch panel is defective the panel must be replaced as a complete unit as follows:

1. Remove the DPS circuit card support plate and the card from the ACD switch panel.

1. Detach the switch panel from the bracket by removing selector knobs and by unscrewing ring nuts. Remove the dust seals.

2. Detach the switch panel connector so that the panel can be removed.



3. Fit onto new selectors washers with lugs. These washers limit selector positions. Before fitting the washers turn every selector anti–clockwise as far as possible to their extreme positions. After this fit washers so that the lugs engage in the holes given below:
- **lowering speed selector; hole 9**.
- **transport height selector; hole 9**.
- **draft control selector; hole 7**.
- **DBC without slip control; hole 2.**
- **DBC with slip control; hole 4.**

4. Ensure by rotating the selectors, that the lowering speed and transport height selectors have 9 positions, draft control selector 7 position and DBC selector 2 (DBC) or 4 (DBC + slip control) positions.

4. Connect the connector to the new switch panel. Fit the dust covers (no 317 204 20) onto the washers and fasten the circuit card to the switch panel with the ring nuts (under the nuts locking washers JE 9423).

5. Fit the knobs and fasten the DPS circuit card. Attach the selector panel onto the lever console.

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H. Checking switch panel indicator lights

If the ACB/ACD functions properly, but the indicator lights on the switch panel do not function correctly the following steps must be taken:

– detach the switch panel and move the connector on the panel so that possible poor contacts are eliminated.
– if an indicator light is still out of order the voltage measurements shown in instruction **F** must be carried out.
–If the voltages are between allowable limits but the light is still out of order the fault is in the bulb and the whole switch panel has to be changed as a complete unit.

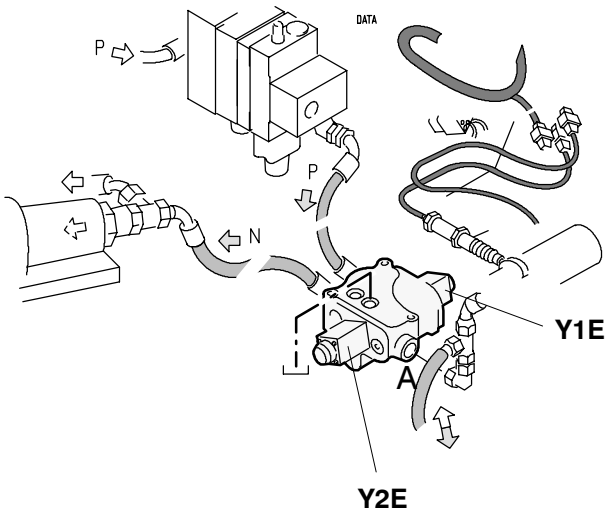
I. Checking control valve and its solenoid valves (not ACB)

If the lifting or lowering speeds do not function correctly, it is necessary to clear up whether the fault lies in the electric system or in the control valve (valve spools can get trapped etc.).

Checking electric system:

Note! Diagnostic lights and fault codes, see instr. **C**.

Note! When checking **ACB** power lift, there must be load in the three–point linkage.



Connect an ampere–meter in series with control valve solenoids. Y1E lowering (inner) and Y2E lifting (outer). Use ETV 894 220 when measuring these values, see page **101**/**1**.

Lifting (with yellow push button) . . . . . approx 1,60 A
(maximum current when the Autocontrol–rocker switch is turned into the transport height).

Lowering (with yellow push button):
– ACD . . . . . approx 1,50 A
– ACB . . . . . approx 1,40 A

Lowering speed positions:

	ACD	ACB
1	approx 0,90 A	approx 1,25 A
2	approx 1,00 A	approx 1,50 A
3	approx 1,15 A	approx 1,65 A
4	approx 1,30 A	approx 1,85 A
5	approx 1,60 A	approx 2,10 A
6	approx 1,85 A	approx 2,35 A
7	approx 2,20 A	approx 2,80 A *)
8	approx 2,65 A	approx 3,10 A *)
9	approx 3,00 A	approx 3,20 A *)

*) Values inaccurate, since lowering speed is so large, that ampere–meter reading is difficult to read off.

Resistance of solenoids . . . . . approx **1,6** Ω

Checking the control valve:

If the measured values agree with the correct values above, but malfunctions occur in the lowering and lifting functions, the control valve should be removed and checked (see page **912**/**2**).

Adjusting position sensor, ACB/ ACD

Normally the position sensor does not require any adjustment. If the sensor has been removed, adjustment is necessary.

1. Apply sealing compound to the sensor threads. Screw the sensor locking nut to a point where the distance between the nut front side and the end of the thread is about 14 mm (rough adjustment)). Screw the sensor into place until the lock nut touches the PTO housing.

Warning! If the sensor is screwed too deep, the eccentric on the lifting arm shaft damages the sensor when the shaft rotates.

2. Start the engine. Raise the lower links to the max. transport position. By turning the sensor, find a point, where the pump relief valve is blowing off *) and screw the sensor from that point inwards **1**/**4** of a turn.

3. Lower the lower links.

4. Raise the lower links again to the transport position and ensure that the relief valve is not blowing off.

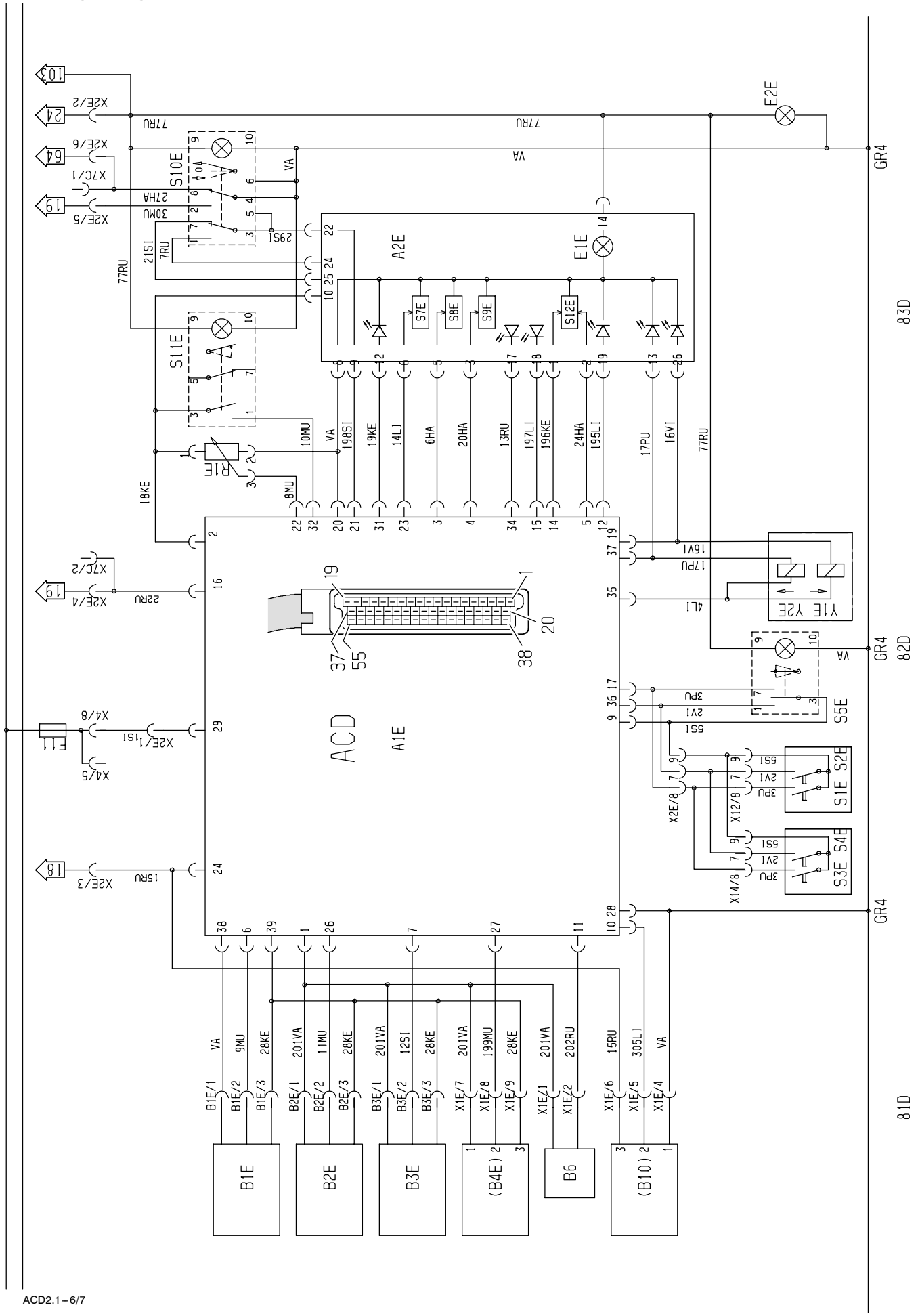
5. Raise the lower links to the max. upper position by using the yellow push button. In this position the relief valve is blowing off and the lifting cylinder stroke from the max. transport height is **3–4 mm**.

6. After adjustment, tighten the sensor locking nut.

*) When the pump is on, the load on the engine can be heard easily.

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Wiring diagram, ACD



ACD2.1 – 6/7

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ACD: List of components

Sym–bol	Component	Code no
A1E	Autocontrol electronic unit	82D
A2E	Autocontrol, switch panel	83D
A3E	Compensator	82D
B1E	Position sensor, tractor	81D
B2E	Draft sensor, right	81D
B3E	Draft sensor, left	81D
(B4E)	Position sensor, implement	81D
B6	Speed sensor, gearbox	81D
(B10)	Radar	81D
E1E	Illumination, switch panel	83D
E2E	Illumination, position control knob	83D
R1E	Potentiometer, position control	83D
S1E	Push button, mudguard, lifting, right	82D
S2E	Push button, mudguard, lowering, right	82D
S3E	Push button, mudguard, lifting, left	82D
S4E	Push button, mudguard, lowering, left	82D
S5E	Switch, cabin, lifting/lowering	82D
S7E	Switch, lowering speed	83D
S8E	Switch, transport height	83D
S9E	Switch, mixing/sensitivity	83D
S10E	Autocontrol rocker switch, lift/stop/lower	83D
S11E	Rocker switch, forced lowering	83D
S12E	Switch, Drive Balance Control (+slip control)	83D
X1E	Connector, 9 pins, ACD sensors	
X2E	Connector, 9 pins, supply, push buttons	
Y1E	Solenoid valve, lowering	82D
Y2E	Solenoid valve, lifting	82D

Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Li = lilac

Connectors:

Connector X1E for the radar (B10), for the gearbox speed sensor (B6) and for the possible position sensor on implement (B4E) are placed in the cab lever console. In addition, the sensor B6 pins have connectors. The radar connector is placed near the radar. The position sensor connector is situated at the end of the sensor.

Connector X2E for supply and for the rear push buttons is placed in the lever console. If the ACD does not respond when the push buttons are used, check then fuse F11. If the fuse is OK, check connector X2E (pin 1) and connector X4 pin 8 in the fuse box. Also check the earth point GR4 in the rear part of the lever console.

The wires from the LH side push buttons have been drawn via connector X14 (in the lever console) and the wires of the RH side push buttons have been drawn via connector X12 (in the lever console).

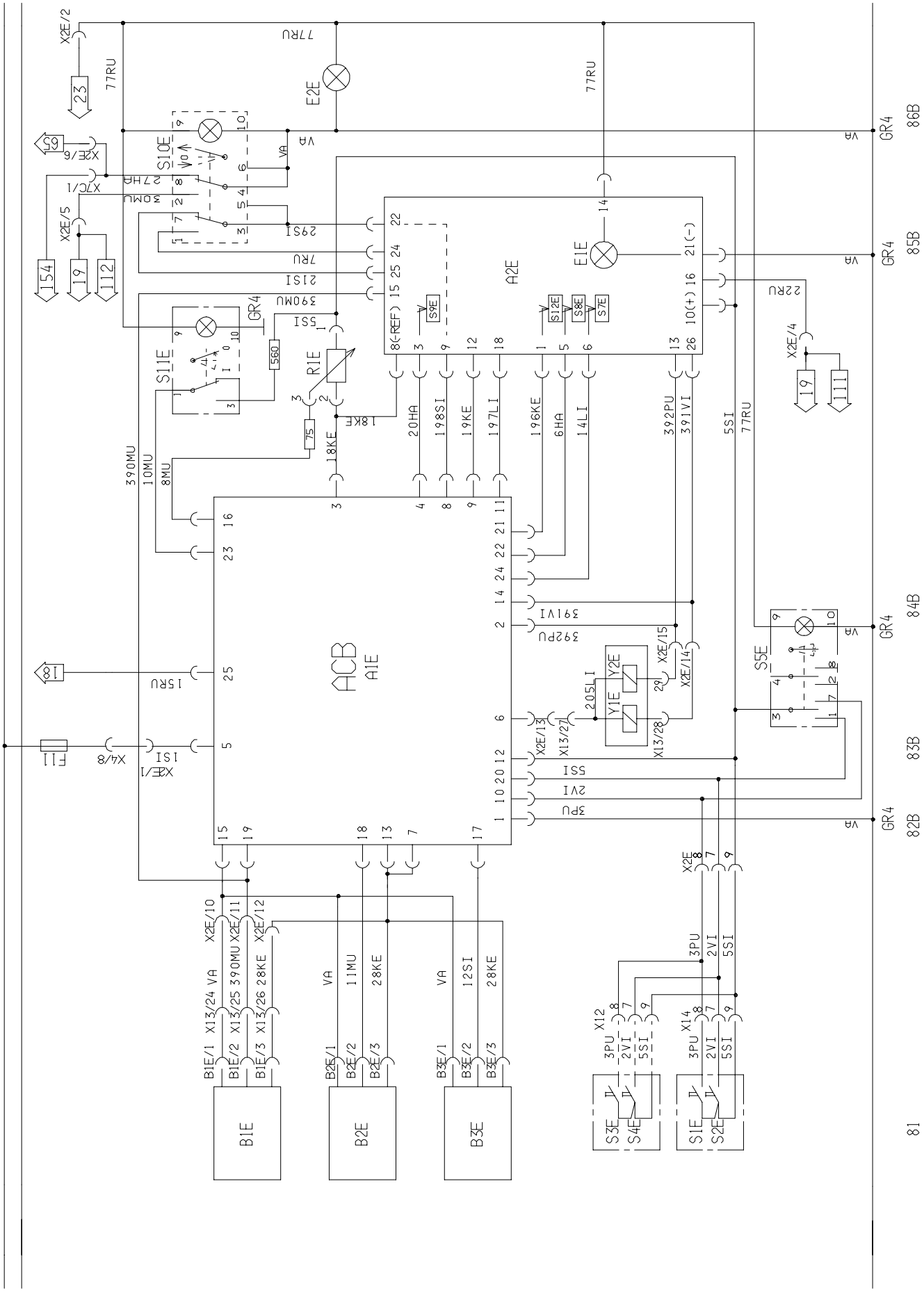
If the ACD power lift responds to the push buttons, but does not activate with the Autocontrol–switch (lift/stop/lower switch), check the Autocontrol–switch and its wires. If these are OK, but the ACD does not activate, the fault may lie in the control unit box.

Note! See also picture on page **320**/**4**.

IMPORTANT! On earlier ACD power lifts (AC 2.1), which have ACD wire loom no. **33082800**, the switch panel A2E can be either earlier panel no. **33082700** or a new spare part panel **33571200**, but not a new ACB/ACD panel no. **33497800**.

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Circuit diagram, ACB



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ACB: List of components

A1E	ACB control unit	82B
A2E	Control switch circuit card	85B
B1E	Position sensor	81B
B2E	Draft sensor, right	81B
B3E	Draft sensor, left	81B
E1E	Illumination, switch circuit card	85B
E2E	Illumination, position potentiometer	86B
R1E	Potentiometer, position control	85B
S1E	Push button, mudguard, lifting, right	83B
S2E	Push button, mudguard, lowering, right	83B
S3E	Push button, mudguard, lifting, left	82B
S4E	Push button, mudguard, lowering, left	82B
S5E	Switch, cabin, lifting/lowering	83B
S7E	Selector, lowering speed	85B
S8E	Selector, transport height	85B
S9E	Selector, position control/draft control	85B
S10E	Switch, lift/stop/lowering	86B
S11E	Switch, forced lowering	85B
S12E	Switch, oscillation damping (DBC)	85B
X2E	Connector, 15 pins, supply & rear buttons	
Y1E	Solenoid valve, lowering	84B
Y2E	Solenoid valve, lifting	84B

Wire colours:
Ru = braun
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white

Connector X2E for supply and for the rear push buttons is placed in the lever console. If the ACD does not respond when the push buttons are used, check then fuse F11. If the fuse is OK, check connector X2E (pin 1) and connector X4 pin 8 in the fuse box. Also check the earth point GR4 in the rear part of the lever console.

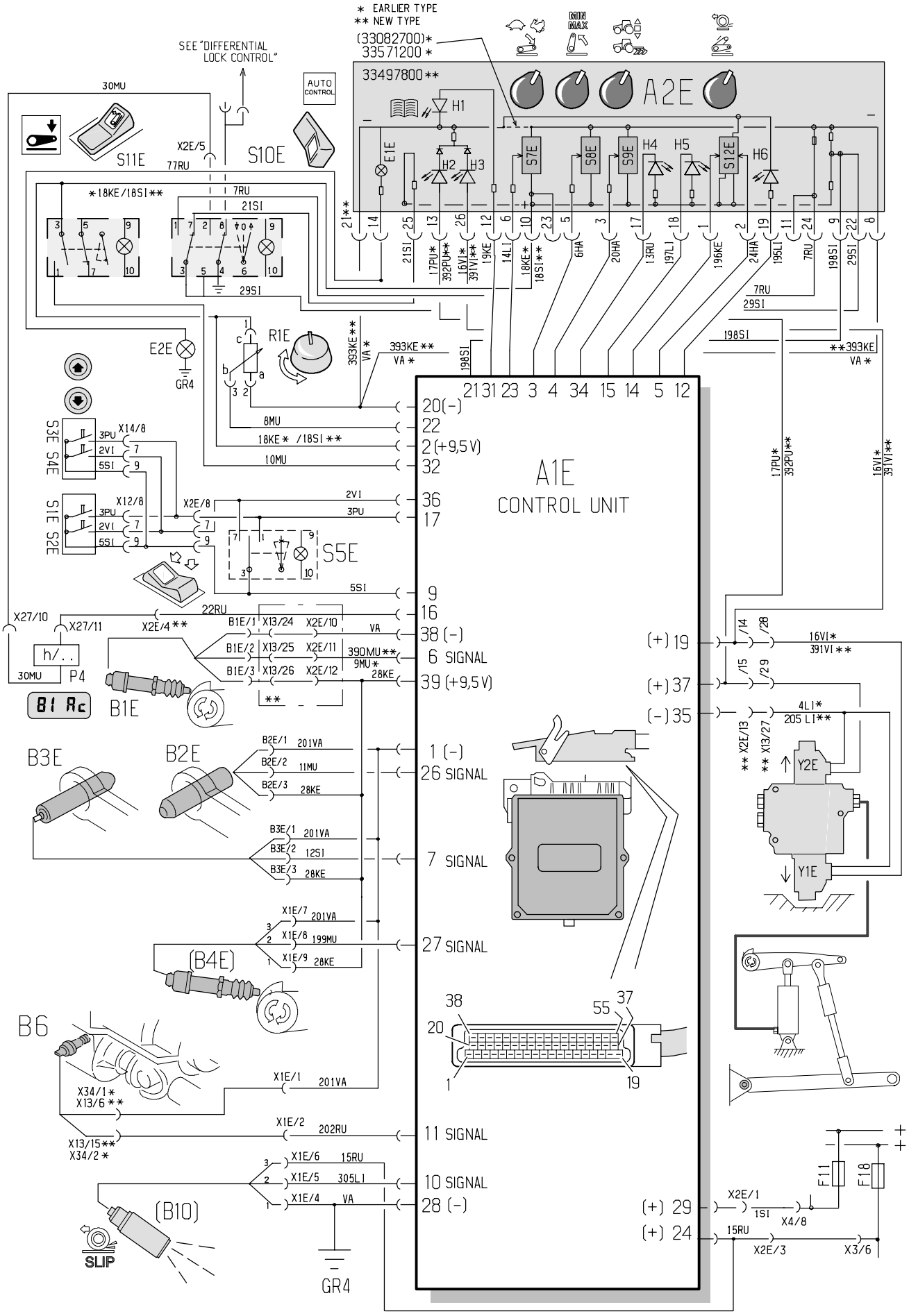
The wires from the LH side push buttons have been drawn via connector X14 (in the lever console) and the wires of the RH side push buttons have been drawn via connector X12 (in the lever console).

If the ACD power lift responds to the push buttons, but does not activate with the Autocontrol–switch (lift/stop/lower switch), check the Autocontrol–switch and its wires. If these are OK, but the ACD does not activate, the fault may lie in the control unit box.

Note! See also picture on page **320**/**4**.

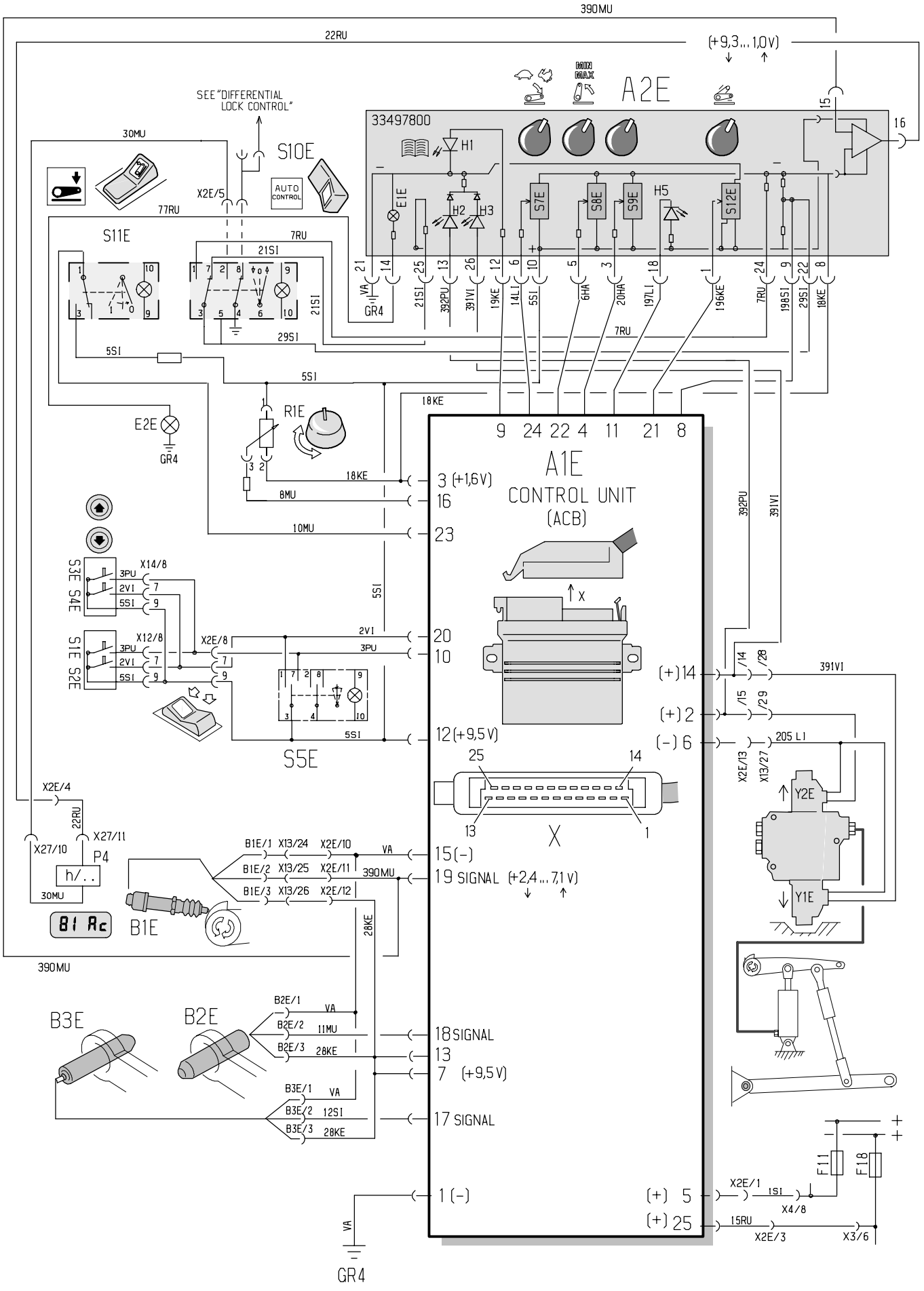
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ACD Power lift

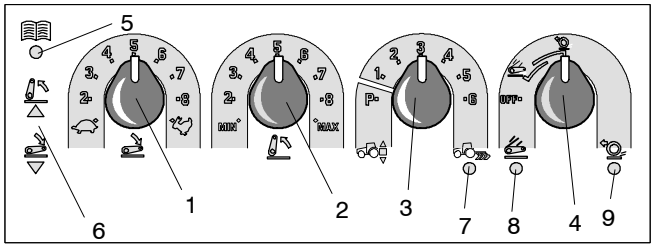


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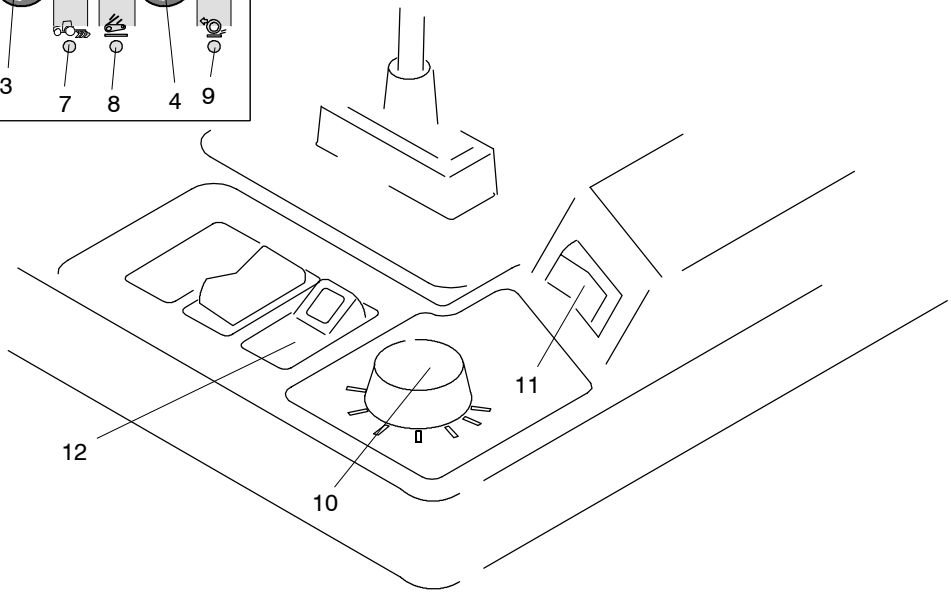
ACB Power lift



K. Checking function of ACB and ACD Power lifts



Note! The slip control is an optional equipment on ACD Power lift. ACB Power lift has not a pilot light (7) for the draft control mode. In ACB Power lift the activating speed of the DBC cannot be adjusted.



Note! The Power lift must function in the way written in this instruction.

1. Start the engine. The red diagnostic light (5) comes on. Activate the Power lift with the Autocontrol–switch (11), at which time the diagnostic light (5) goes out. Leave the Autocontrol–switch (11) in the lowering position and adjust the lower links with the position control potentiometer (10) to the lowest position.

2. Set the lowering speed (1) and transport height (2) to the minimum and position control/draft control switch (3) to position P.

3. Turn the Autocontrol–switch (11) into the transport position. The standard instrument shows running hours and the decimal point is flashing, when the engine is running (The display of AD–instrument does not change with Autocontrol–switch, but with a switch of its own).

4. Turn step by step the transport height selector (2). The lower links rise with even intervals, the red lifting ind. light (6) is lit when the lower links move up. Leave the transport height selector (2) to the max. value (pos. 9).

5. Turn the draft control switch (3) to the max. value (pos 6) and press the Autocontrol switch (11) to the lowering position. When the lower links go down, turn the lowerin speed selctor (1) to the max. value. The lowering speed increases clearly and the green light (6) is lit. Leave the lowering speed in the max. value.

6. When the lower links are in the bottom position, the green light (6) is lit (floating position), the standard instrument shows between 0–15 and text Ac (in the AD–instrument, the Ac–display must be selected in the upper display).

7. Lift the lower links up step by step (1–9) by using the position control potentiometer (10); The lifting intervals are almost the same and the red light (6) is lit when the links move up. Leave the knob (10) in the max. upper position; the display shows 100 Ac (in AD–instrument 99 Ac).

8. Raise the lower links more to the topmost position with lift/lower switch in the cab (not in picture above) (corresponding the yellow push buttons in the mudguard), diagnostic light (5) comes on and shows that the Power lift is locked. Release the towing hook and lower the lower links and towing hook with the yellow push buttons (the buttons function in all positions of the Autocontrol–switch (11)).

9. Turn the Autocontrol–switch (11) to the transport position and immediately back to the middle position; the lower links start to rise but stop immediately, when the switch is turned to the middle position. The standard instrument shows running hours in the middle and transport position (display of AD–instrument does not depend on the position of the switch (11)).

10. Turn switch (11) to the transport position, at which time the lower links rise up and the towing hook is locked by the pawl.

11. Switch on the position control mode (P). Push switch (12), at which time the lower links go down. Release the switch, at which time the lower links return to the original position. Check the position of the lower links in the Ac–display.

12. **ACB**: Turn the switch (11) to the transport position, switch on the DBC with switch (4); lower links lower approximately 4 cm. Switch off the DBC, at which time the lower links rise up to the top position.
ACD: In order to activate the DBC (to lower the lower links approximately 4 cm) the tractor must be driven over the adjusted activating speed (see page **321**/**5**).

Note! Checking the optional slip control in ACD Power lift, see page **321**/**6**.

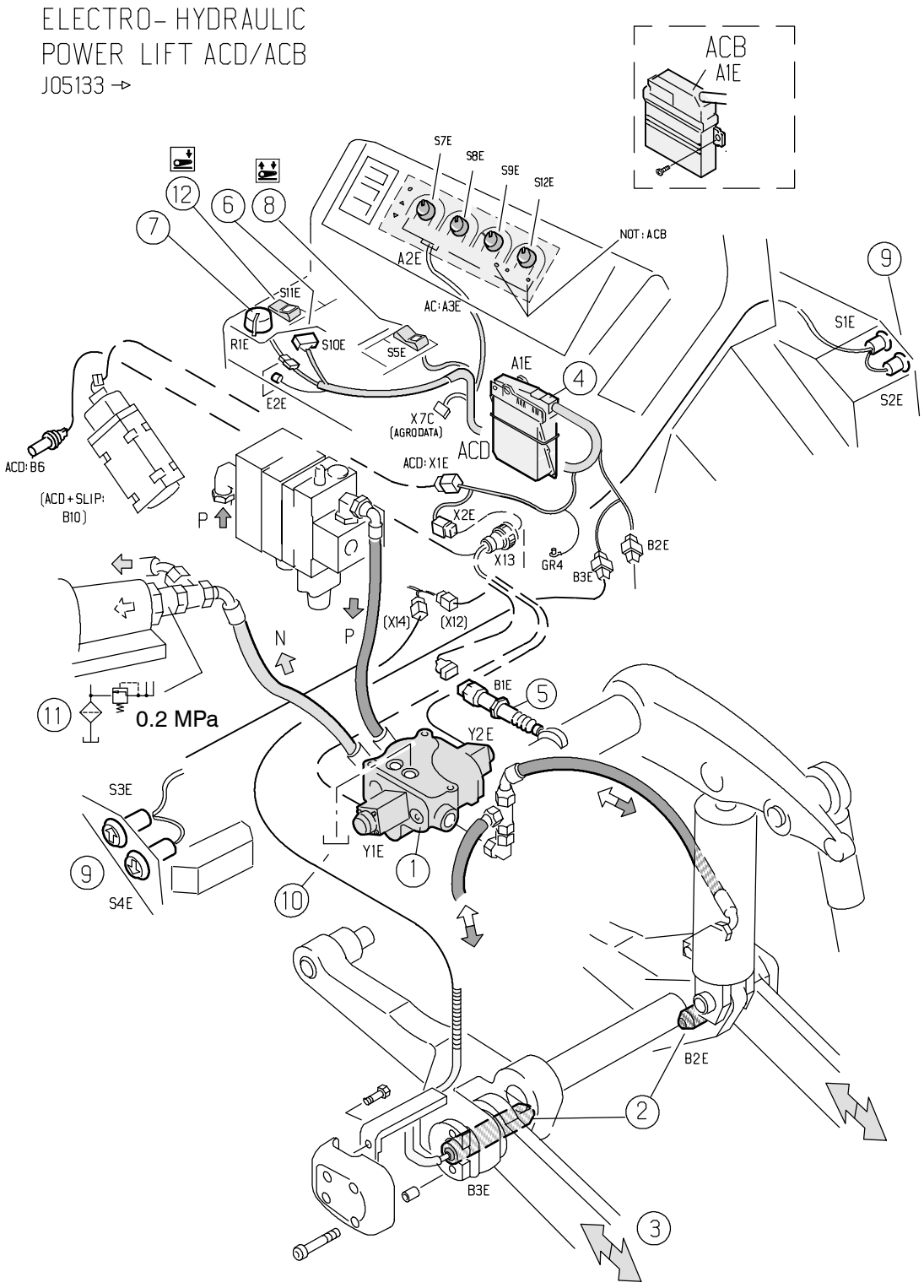


Fig. 3. *Electro–hydraulic power lift ACB/ACD, J05133–.*

1. Control valve
2. Draft sensors
3. Lower links
4. Electronic unit (different on ACB and ACD)
5. Position sensor
6. Lift/stop/lower switch
7. Potentiometer for position control
8. Rocker switch
9. Push buttons, rear mudguards
10. Return oil into the gearbox housing
11. Return oil from control valve
12. Switch, forced lowering (not on earlier models)

Valmet Agrodata performance monitor

N.B. ! These instructions deal with trouble shooting on the Agrodata unit. For detailed instructions concerning the use of the Agrodata system, please see the Operator's Manual.

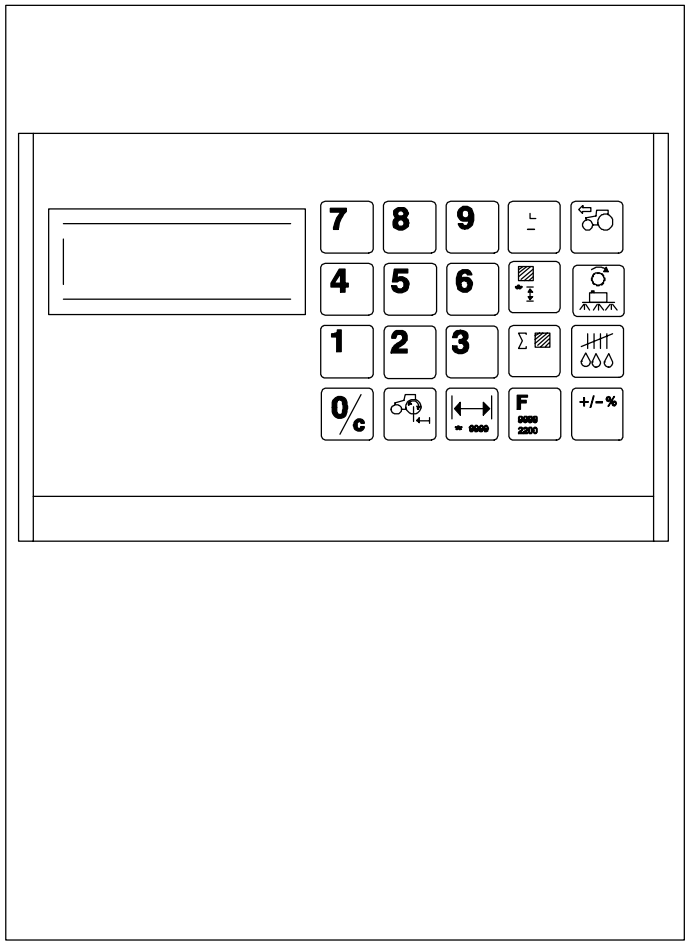


Figure 1. Agrodata function keys

1...9 Number keys (1–9)

0/c Zeroing key for time, area, total area and litres. Also used to input the figure 0.

Wheel circumference input key

Working width input key

F Function code

+/-% Flow meter calibration

Time (hours and minutes)

Speed

Area meter and distance travelled

Total area meter

Engine RPM and application rate (litres per hectare)

Piece counter and total litres consumed

Note! Additionally one rocker switch selects between tractor and implement wheel sensor for measurement of speed and area. The other switch selects between of engine revs or implement functions (Eg. piece counter or flow rate.

General

Agrodata can be fitted on Valmet tractors as an optional accessory. Agrodata is meant to be used in agricultural and contract work for measuring tractor and implement functions and work performance.

Agrodata can monitor:
– Time (h, min)
– Rotation speed (RPM)
– Area (trip and total, ha)
– Distance (current meters)
– Speed (km/h)
– Flow rate (l/ha, l)
– Numbers of items (piece counter)

The different keys are pressed to call up a display of a particular function (see Operator's Manual)

Before the Agrodata unit can be used the following three values must be input:
– the circumference of the wheel (cm) on which the magnetic sensor is mounted (LH rear wheel of tractor) divided by the number of magnets used.
– the effective working width (cm) of the implement
– the function code (9999 except when measuring flow rate and total consumption)

Important! Before measuring flow rate and total consumption, the Agrodata unit and flow meter must be calibrated in order to obtain the correct function code.

The data listed above is retained in the Agrodata unit's memory even if the battery cables are disconnected from the battery terminals.

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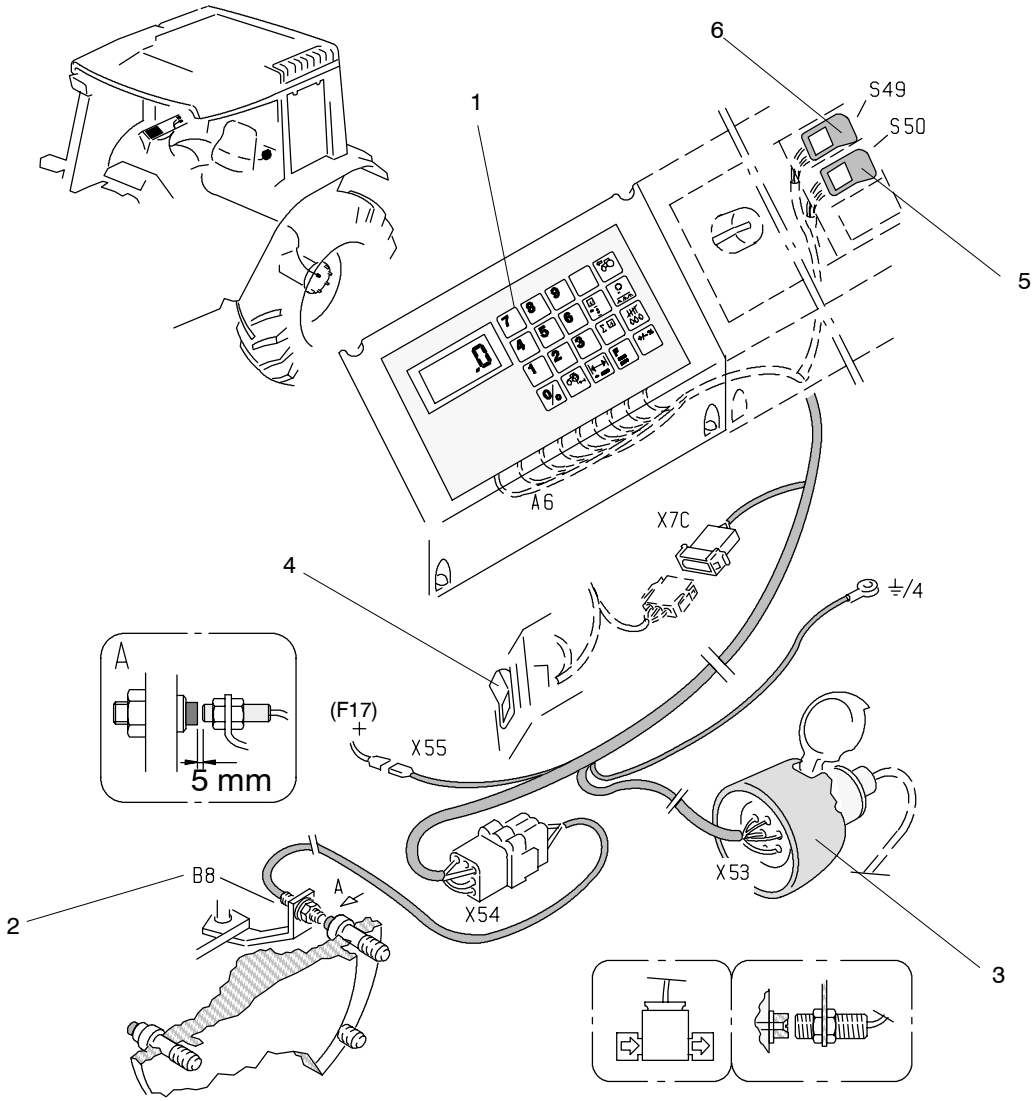


Fig. 2. Agrodata monitor and sensors
1. Agrodata unit
2. Magnetic sensor for detecting wheel rotation speed
3. Socket for connecting sensors on implement
4. Lift/lower switch for power lift (stops the area meter when the implement is raised)
5. Selector switch; selects between tractor and implement wheel sensor for measurement of speed and area
6. Selector switch; selects between measurement of engine revs and measurement of implement functions (Eg. piece counter or flow rate)

X55=supply voltage connector
X54=connector for sensors and implement socket
B8=wheel sensor
X7C=connector to lift/lower switch of power lift
X53=socket for sensors on implement
S49=selector switch
S50=selector switch
A6=Agrodata unit

Equipment

The Agrodata unit consists of a monitor in the cab, wheel sensor (engine RPM sensor not fitted), socket for connecting sensors on implement, leads connecting monitor and sensors and supply voltage leads.

The Agrodata unit fuse (F17, 10 A) is placed in the fuse box. The connectors are placed in the lever console in the cab. The connectors are accessible by removing the side panel of the console.

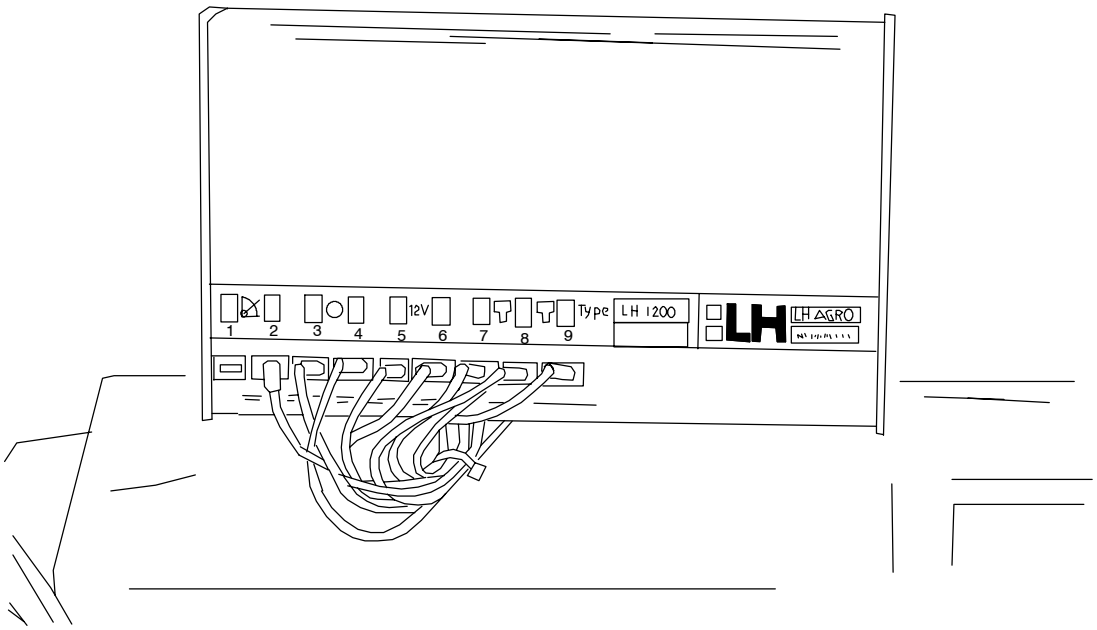
On the rear cover of the Agrodata unit there are terminals for sensor leads and supply voltage leads. The terminals are numbered from one to nine. The leads have corresponding numbers (to terminal 9 is connected lead no 19)

The Agrodata system uses magnetic sensors. When the magnet and the sensor are in close proximity the sensor is activated and an electrical signal is transmitted to the monitor display.

The wheel sensor is fitted on the LH rear wheel mounting flange. Several magnets can be fitted on the wheel, evenly spaced for more accurate measurement of driving speed. Correct speed measurement is not possible if too few magnets are used with a big wheel.

Agrodata is connected to the hydraulic power lift. When implement is raised with the lift/lower switch, the area meter is stopped.

Sensors on implement (Eg. flow meter, piece counter etc) can be connected to the Agrodata via the socket at the rear of the tractor (implement sensors must be ordered separately from the factory).



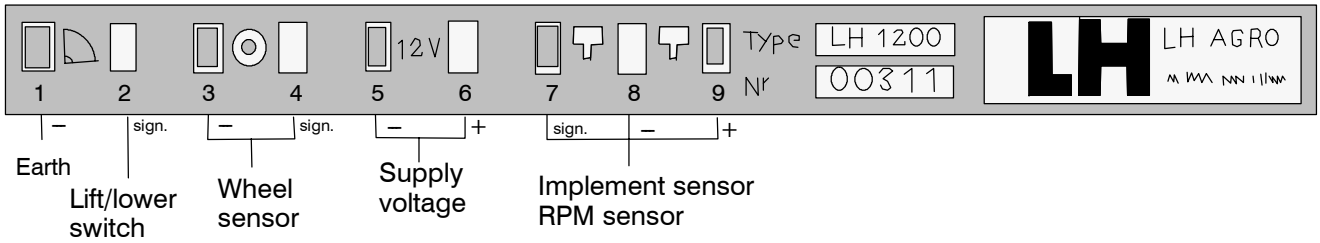


Figure 3. Cable terminal panel (monitor unit rear panel)

Terminal 1; earth (no lead)
Terminal 2; Signal from lift/lower switch of power lift
Terminal 3 and 4; Wheel sensor leads
Terminal 5 and 6; Supply leads (battery voltage)
Terminals 7, 8 and 9; Leads for sensors on implement (or engine RPM sensor leads)

Note! Sensors on implement can be e.g. flow meter, piece counter, RPM sensor etc.

1. Trouble shooting

A. Checking display operation

The Agrodata unit receives its power supply from connector X55 (in the lever console).

1. Turn on the ignition. Check that:
– the monitor display is lit
– the display flashes the word ”AGRO”.

2. If this does not happen:
– check fuse F17 (10 A) in the fuse box
– disconnect the monitor (not the leads) and make sure that the unit is receiving power (measure voltage between terminals 5 and 6.

3. If the power supply is in order, but the monitor fails to operate, the defect is in the unit itself. In this case the monitor must be replaced (the condition of the other leads and sensors is irrelevant if the monitor is defective).

4. If the monitor responds to commands (e.g. working width, wheel circumference), it is in working order.

5. If the monitor displays or flashes the word ”FEJL”, this indicates that the supply voltage to the unit is not adequate (12 V). Check the condition of the battery and the battery connections.

B. Checking the sensors and signal from lift/lower switch

1. Turn on the ignition and:

– input the working width by pressing the  and followed by 8888.

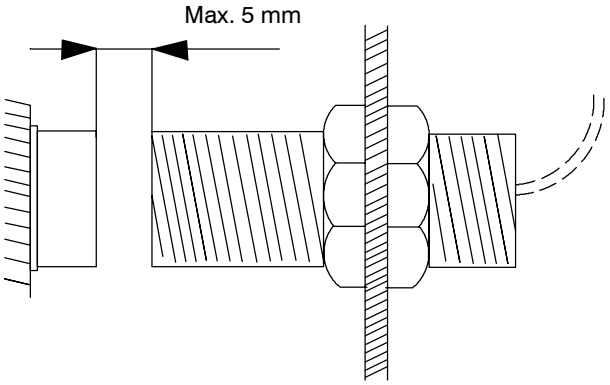
– press the time function key  . Following this the display should be clear (this indicates that the unit is in order.

– set switches 5 and 6 for the unit to measure tractor operations (front side pressed)

2. Now the unit will display the following letters:

– "**h**" (only flashes), when the wheel sensor is activated
– "**r**" (is lit), when the lift/lower switch is in the lifting position
– "**F**" (is lit), when the flow meter blade wheel is revolving (rocker switches in the implement position)) or if the RPM sensor is activated.

3. If the letter "**h**" does not flash, check that the wheel sensor and magnets are properly located.



4. The distance between the magnet and sensor is max. 5 mm (magnet must be fitted so that yellow dot points towards the sensor)

5. If the sensors and magnets are correctly fitted then:

– disconnect the monitor (not the leads)
– switch on the ignition
– measure the voltage between terminal 1 (–) and the following; – terminal 9 (+), supply voltage (about battery voltage)
– terminal 4 (+), wheel sensor (voltage **0 V** when sensor is activated, otherwise the voltage should be **11 – 13,5 V**

6. Wheel sensor resistance (is measured between cable shoes 3 and 4) must be about **33 ohms** when the sensor is activated, otherwise **10 kilo – ohms** or greater.

7. Check the earth connection by measuring the voltage between terminals 8 (–) and 6 (+); this should equal battery voltage.

8. Set the lift/lower switch to the lifting position and measure the voltage between terminals 1 (–) and 2 (+); this voltage should be close to zero.

9. Press the lift/lower switch to the lowering position. Now the voltage should be **11 – 13,5 V.**

10.The defects may be either in the sensors or in the leads. or the connectors have poor contacts

11. The sensors on the implement are checked in the same manner. When this is being done, the rocker switches (5 and 6) must be in implement position (the rear side pressed)

C. Connecting the leads from the implement sensor to the plug poles

Flow meter leads

Blue	to pole 5	(–)
Black	to pole 6	(+)
Brown	to pole 2	(signal)

Piece counter leads

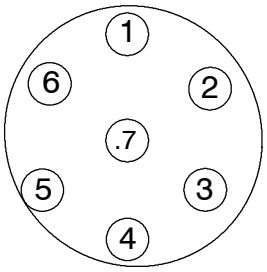
Brown	to pole 5	(–)
Blue	to pole 6	(+)
Black	to pole 2	(signal)

Wheel sensor leads

Blue	to pole 3	(signal)
Brown	to pole 1	(–)

Sensor for detecting movement of part of implement

Blue	to pole 7	(signal)
Brown	to pole 5	(–)



The numbering of poles can be found in the plug by the corresponding pole

Note! Figure shows the plug from the lead side.

Note! The line from the Agrodata unit to the socket can be checked as follows:
– input working depth of 8888 and press the time key
– shunt between the socket terminals no 5 (–) and 2 (signal) and the display should show "**F**" (flow meter, piece counter)
– shunt between terminals no 1 (–) and 3 (signal). The display should show letter "**h**" (only flashes) (wheel sensor).
– then shunt between terminals no 5 (–) and 7 (signal). The display should show letter "**r**".

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Spare part numbers for sensors and plug

Wheel sensor/sensor for detecting movement of part of implement: 31703200 (2 – pole sensor)
Piece counter/flow meter: 31703000 (3 – pole sensor)
Plug: 31702900

C. Further information on Agrodata operation

– Any short – circuit device may be use as a sensor (Eg. mechanical relays)

– Only original magnets should be used. If the magnet is not strong enough malfunctions will occur.

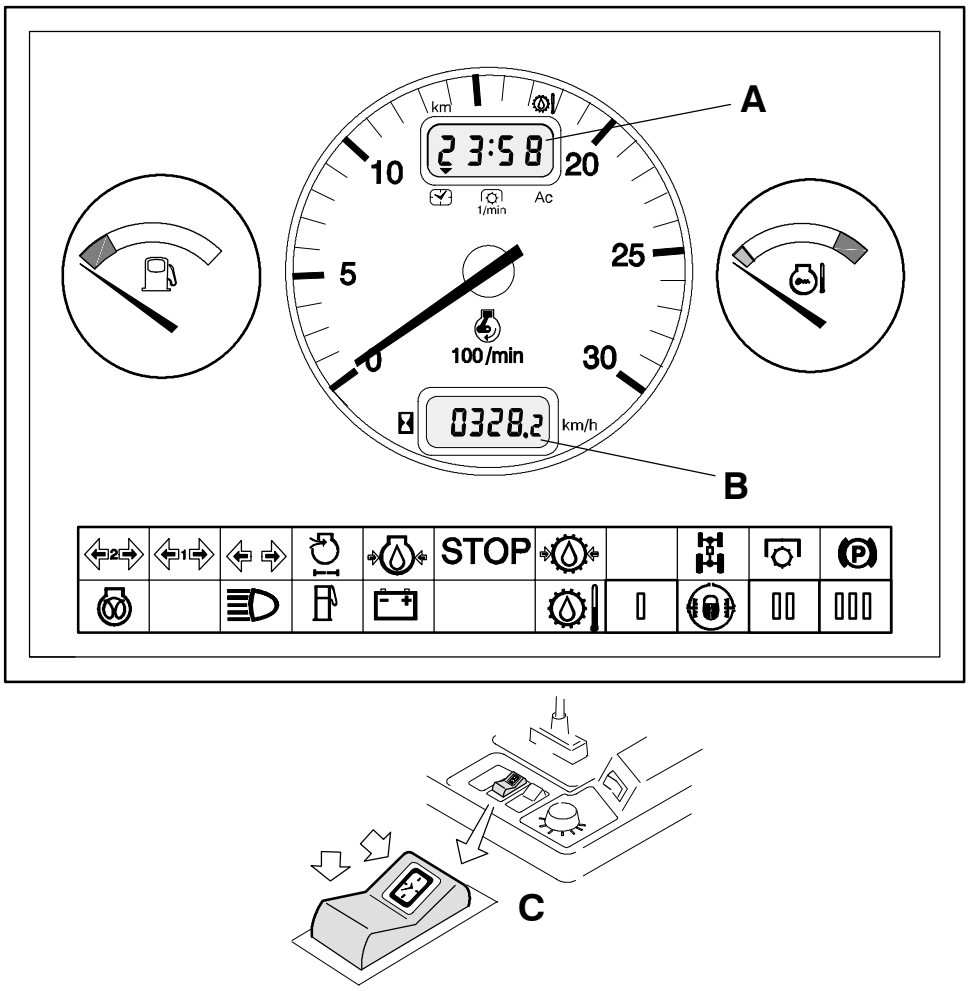
– The full supply voltage should not be connected to the sensor, because this may cause damage to the sensors.

– The unit will not be damaged if the power supply wires are connected in reverse.

– The monitor bulbs cannot be changed in the present models. They are 10000 hour bulbs, and they not only illuminate the display but also dry out internal moisture.

Agrodata – instrument

Note! This is a different device as Agrodata performance monitor shown under code 330. Agrodata is a **factory – mounted** option. Standard equipment in HiTech tractors.



Agrodata has two digital number displays, which is fitted in place of the standard instrument.

Agrodata has a rev. counter, a temperature gauge and a fuel gauge as the standard instrument.

In addition, the lower digital display **B** shows:
1. Running hours, when the tractor is stationary (also when the current is switched of).
2. Driving speed, when the tractor is moving (from 0,3 km/h. There is letter L in front of the value, when the driving speed is slower than 7 km/h).

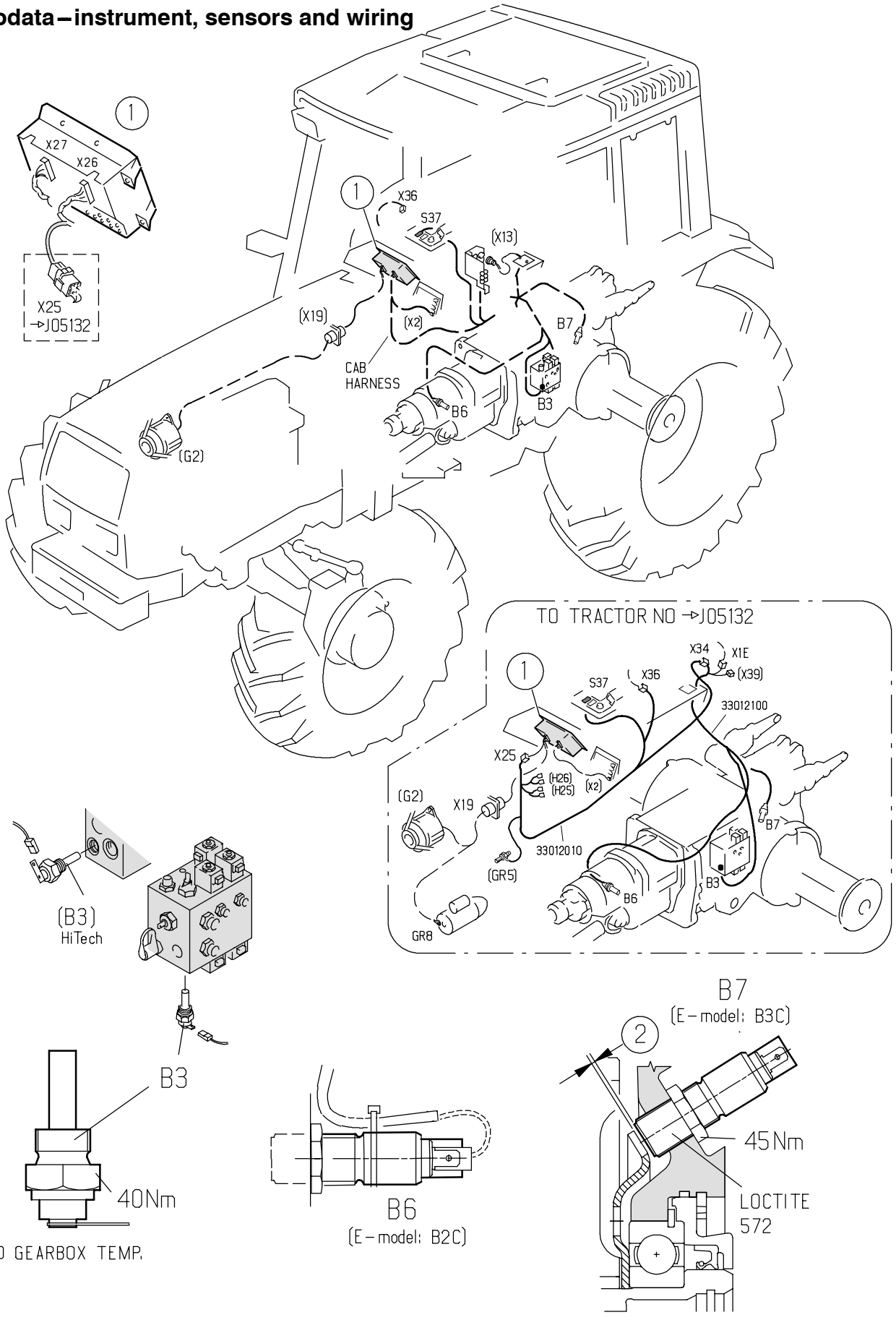
The upper digital display **A** shows:
1. Time (allways when ignition is switched off)
2. PTO shaft rotation speed (r/min)
3. Position of lower links (0 – 99)
4. Distance travelled (up to1000 km, after which is zeroed)
5. Gearbox temperature (from +40˚C. LO is shown at lower temperatures).

The different functions of the upper display can be changed by pressing the rear edge (spring returned) of the switch **C** on the LH side of the position control potentiometer. The black arrow indicates which function is selected.

Tractors, which have Agrodata, have two rotation speed sensors. One on the RH side of the reverse shuttle housing (driving speed, distance travelled) and another at the rear of the tractor for measuring the PTO shaft rotation speed. The sensors are the same as on AC IV system or in HiTech tractors.

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Agrodata – instrument, sensors and wiring



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Agrodata – instrument, sensors and wiring

(See picture on previous page)

1. Agrodata – instrument P5 (upper display)
1. Agrodata – instrument P4 (lower display)
2. Clearance 1/4 of a turn

B3: Gearbox temperature sensor
B6: Gearbox speed sensor
B7: PTO shaft speed sensor
S37: Selector switch for Agrodata upper display
G2: Alternator (engine speed and running hours)

Position of connectors:

X2: In fuse box (not illustrated)
X3: In fuse box (not illustrated)
X13: on fastening plate in lever console (J05133 –)
X19: Plug on the cab front wall on the RH side
X25: Connector for Agrodata under the instrument panel (– J05132)
X26: Connector on the rear side of the instrument (white)
X27: Connector on the rear side of the instrument (blue)
X34: Sensor connector in the rear part of the lever console (– J05132)
X1E: ACD power lift sensors (e.g. radar) on fastening plate in lever console (J05133 –).
GR1: Earth point in the lever console rear part
GR5: Earth point on the cab front wall.
GR8: Earth point on the starter motor

Current from the ignition switch (12 V) comes to the Agrodata – unit as on the standard instrument via fuse F18. Agrodata – unit is supplied with permanent current (12 V) for the clock via fuse F2. If the unit does not work at all, check the fuses. The supply voltage wire to the clock is via plug X19/18 and via connector X2/5. The voltage can be measured between pins 23 (earth) and 24 (supply) of connector X26. Voltage via ignition switch can be measured on pin 26 of connector X27.

If the Agrodata – unit has an internal fault (e.g. in electronics), it cannot be repaired separately, but the damaged instrument section must be replaced as a complete unit.
The rev counter and fuel and temperaure gauges can be replaced separately and also the smaller circuit card (or bigger basis circuit card) which includes the digital displays. Warning light bulbs and instrument light bulbs can be changed separately without opening the instrument unit.

Switch S37 earths pin X26/12, when the rear edge is depressed. When depressing the front edge, pin X26/13 gets earthed.

Zeroing the travelling distance

– select travelling distance into the display by pressing the switch rear edge.
– press the switch front edge until the display is zeroed.

Time setting

– select time into the display by pressing the switch rear edge.
– press the switch front edge, until the hours are flashing.
– set the hours by pressing the switch rear edge
– press the switch front edge, until the minutes are flashing.
– set the minutes by pressing the switch rear edge
– when the time has been set, press the front edge, until the correct time appears into the display (flashing stops).

Calibrating the instrument for different tyres, see page 331/5.

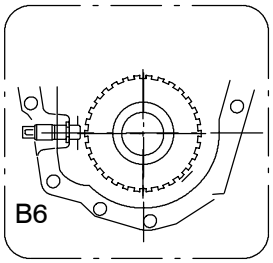
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1. Sensors

A. Gearbox speed sensor B6

Note! The sensor resistance should be **1,0 – 1,10 kΩ.** The resistance can be measured on the pins shown below. If the resistance is infinite, it should be measured on the sensor pins in order to clear up possible breaks:

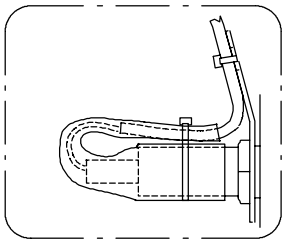
Pins:
Sensor pins
X34: pins 1 and 2 (– J05132)
X25: pins 1 and 2 (– J05132)
X26: pins 9 and 10 (white connector)
X13: pins 6 and 15 (J05133 –)
X1E: pins 1 and 2 (if in use)



Changing the sensor:

Note! Before the gearbox speed sensor can be removed, the tractor frame must be split between gearbox – fuel tank.

- Remove the faulty sensor and clean the threads where the sensor fits.
- Apply Loctite 572 onto the sensor threads and turn it against the gear wheel and then unscrew it **1**/**4** of a turn.
- Lock the sensor with the nut and connect wires
- Carry out a test drive and ensure that Agrodata – unit functions.
- Fit the plastic tube onto the sensor wire. Connect the wires to the sensor and protect with grease UC1913 (vaseline spray HHS 2000 (Wyrth)). Move the tube onto the sensor and warm it until
  it is pressed tightly round the sensor.

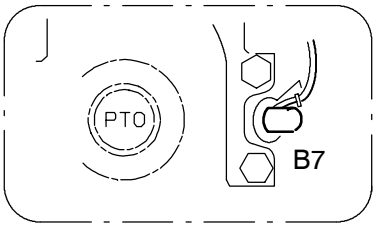


- Fold the wire on the sensor and fasten it with a plastic cable tie.

  N.B.: In 50 km/h transmission the sensor locking nut must be removed and the sensor is locked with Loctite 572. This must be done since in this transmission, the measuring gear wheel is smaller and the sensor thread length is insufficient to fit the lock nut.

  Note! If the driving speed display or travelling distance is clearly faulty, the fault can lie also in the wrong calibration of the instrument, see page **331**/**5**.

B. PTO speed sensor B7



Engage the PTO and measure the PTO shaft rotation speed with a separate RPM meter and compare the reading with the display on the Agrodata – unit. Rudely said the diplay can be checked so that you adjust the engine speed until the rev. counter indicator is at 540 mark, at which time the display should show the same value (±100 rpm).

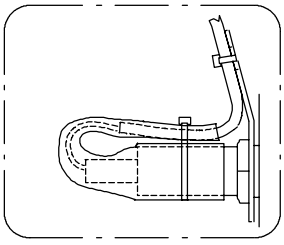
If there is no PTO speed display or it is incorrect, check the sensor and its wiring (ensure that the emergency plug is placed in the rear socket):

Note! The sensor resistance should be **1,0 – 1,10 kΩ.** The resistance can be measured on the pins shown below. If the resistance is infinite, it should be measured on the sensor pins in order to clear up possible breaks in the loom:

Pins:
Sensor pins
X34: pins 5 and 6 (– J05132)
X25: pins 5 and 6 (– J05132)
X26: pins 21 and 22 (white connector)
X13: pins 19 and 27 (J05133 –)
X1E: pins 5 and 6 (if in use)

Changing the sensor:

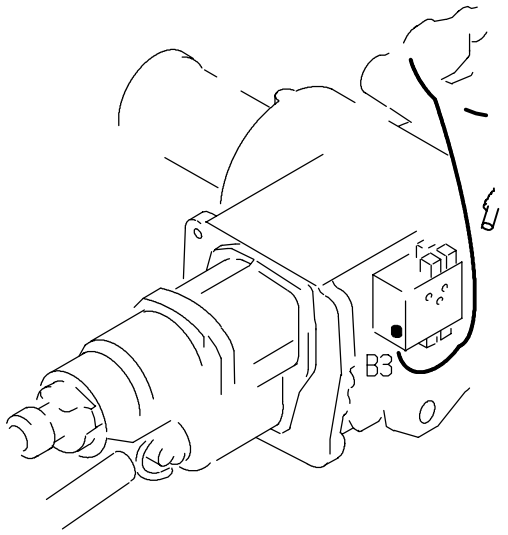
- Remove the faulty sensor and clean the threads where the sensor fits.
- Find with a dial gauge the shortest distance between the sensor and the impulse disc through the sensor hole.
- Apply Loctite 572 onto the threads and screw the sensor by hand until the sensor touches the impulse disc (do not screw too hard because the disc can spring). Unscrew the sensor then **1**/**4** of a turn.
- Lock the sensor with a locking nut and connect wires
- Ensure that the display shows the PTO speed.
- Fit a plastic tube onto the sensor leads. Connect the wires to the sensor and protect with grease UC1913 (vaseline spray HHS 2000 (Wyrth)). Move the tube onto the sensor and warm it until it is pressed tightly round the sensor.



- Fold the wire on the sensor and fasten it with a plastic cable tie.

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C. Gearbox temperature sensor B3



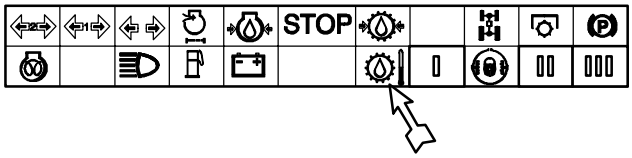
Note! The gearbox oil temperature must be higher than +40˚C, before the display shows the temperature. At the lower temperatures the display shows LO.

If the Agrodata – unit does not show the gearbox temperature, check the sensor and its wiring.

Pins:
Sensor pin
X34 pin 9 (in the rear part of the lever console) (– J05132)
X25 pin 9 (under the instrument panel) (– J05132)
X26 pin 26 (white connector behind the Agrodata – instr.)
X13 pin 20 (on fastening plate in lever console) (J05133 –)

If you doubt that the sensor wiring is faulty, switch on the ignition. Select the gearbox temperaure into the Agrodata display (follow the black arrow).
Detach the wire from the sensor (under the servo valve block) and connect it to the tractor frame. When the wire is earthed, some temperature values must flash in the display and three lines must be visible in the display, if the display and the wiring is OK.

Some sensor resistances:
– **75 – 90 Ω** (~ +90˚ C)
– **200 – 250 Ω** (~ +60˚ C)
(resistance value increases when temperature lowers).

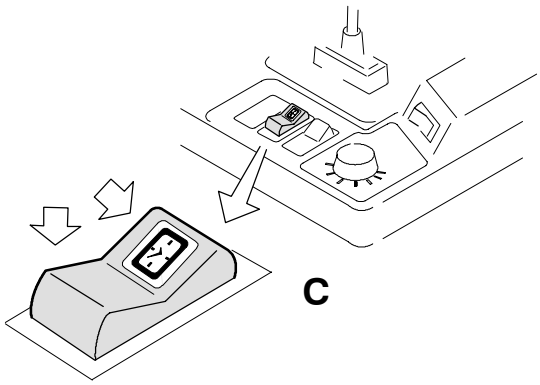


Note! There is an other temperature sensor on the front face of the servo valve block, which lights up the warning light, if the gearbox oil temperature rises too much. Also the Stop – light starts to flash.

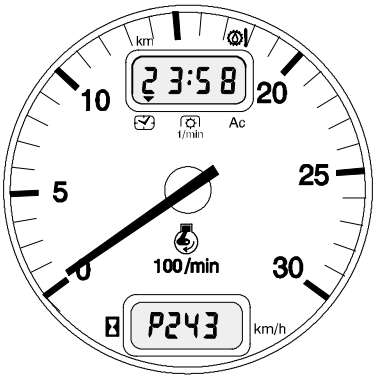
2. Calibrating the instrument for different tyres

1. Remove the switch **C** by prying it carefully. Do not disconnect the wires.

2. Switch on current with the ignition switch.



3. Connect the switch pins 1 and 7 with an auxiliary wire and press at the same time the switch front edge for over 3 seconds. ”P” appears in the lower display and the valid code number (e.g. P243). The first digit is flashing. Remove the wire.



4. Adjust the hundreds by pressing the switch rear edge.

5. When the hundreds are correctly adjusted, press the switch front edge and tens start to flash.

6. Adjust the tens by pressing the rear edge and then press the front edge, at which time single units start to flash.

7. Adjust the ones by pressing the rear edge.

8. Finally press the front edge for over 2 seconds. Calibrating has been carried out and running hours appear in the lower display (read the note below). Fit the switch.

Note! In the beginning of the production (the first 20 tractors), the switch pins 1 and 7 must be once again connected with auxiliary wire and after that the switch front edge is pressed over 2 seconds.

Note! The code number value can vary between P100 – P299. When pressing the switch rear edge, the code value changes from a smaller value to greater one. The code numbers and corresponding tyres are listed in the table on the next page.

Code numbers with different tyre sizes and transmission types

			DPS300	DPS300			DPS460, 550, 650	
Rear wheel	**r dyn**	**T300/40**	**T300/40**	**T450/30**	**T450/40**	**T450/50**	**T450/40**	**T450/50**
13.6 – 38/8N	740	190	180	227	197	181	216	197
13.6R – 38/8M	740	190	180	227	197	181	216	197
14.9R – 38/8M	765	184	174	219	191	175	209	191
14.9R – 38/8N	765	184	174	219	191	175	209	191
16.9 – 34/8N	745	189	179	225	196	180	214	196
16.9R – 34/8M	745	189	179	225	196	180	214	196
16.9R – 34/8N	745	189	179	225	196	180	214	196
16.9R – 38/8M	795	177	168	211	184	168	201	184
16.9R – 38/8N	795	177	168	211	184	168	201	184
18.4 – 34/8N	770	183	173	218	190	174	207	190
18.4 – 34/8N	770	183	173	218	190	174	207	190
18.4R – 34/8N	770	183	173	218	190	174	207	190
18.4R – 34/8M	770	183	173	218	190	174	207	190
16.9R – 38/8M	795	177	168	211	184	168	201	184
18.4 – 34/14FOR	770	183	173	218	190	174	207	190
18.4R – 38/8M	820	172	163	204	178	163	195	178
620/75R – 30/M	800	176	167	210	182	167	199	182
620/75R – 30/M	800	176	167	210	182	167	199	182
16.9 – 34/14IND	745	189	179	225	196	180	214	196
18.4 – 34/14IND	770	183	173	218	190	174	207	190
18.4 – 34/14FOR	770	183	173	218	190	174	207	190
18.4R – 34/8M	770	183	173	218	190	174	207	190
18.4R – 34/8GY	770	183	173	218	190	174	207	190
13.6R – 38/8M	740	190	180	227	197	181	216	197
14.9R – 38/8M	765	184	174	219	191	175	209	191
16.9R – 38/8M	795	177	168	211	184	168	201	184
16.9R – 34/8M	745	189	179	225	196	180	214	196
540/65R – 38/M	791	178	169	212	185	169	202	185
18.4R – 34/8M	770	183	173	218	190	174	207	190
600/65R – 38/M	830	170	161	202	176	161	192	176
600/65R – 34/M	768	183	174	218	190	174	208	190
16.9R – 38/8N	795	177	168	211	184	168	201	184
16.9R – 38/8GY	795	177	168	211	184	168	201	184
18.4R – 38/8GY	820	172	163	204	178	163	195	178
18.4R – 38/14M	820	172	163	204	178	163	195	178
18.4 – 38/14FOR	820	172	163	204	178	163	195	178
20.8R – 38/M	855	165	156	196	171	157	187	171
18.4 – 38/14IND	820	172	163	204	178	163	195	178
18.4R – 38/M	820	172	163	204	178	163	195	178
18.4 – 34/14FOR	770	183	173	218	190	174	207	190
18.4 – 34/IND	770	183	173	218	190	174	207	190
18.4 – 38/FI	820	172	163	204	178	163	195	178
20.8R – 38/8M	855	165	156	196	171	157	187	171
20.8R – 38/8M	855	165	156	196	171	157	187	171
650/65R38M	867	163	154	193	168	154	184	168
520/70R – 34	784	180	170	214	186	171	203	186
540/65R – 38/M	791	178	169	212	185	169	202	185
480/70R – 38	805	175	166	208	181	166	198	181
520/70R – 38	837	168	159	200	174	160	191	174
520/70R – 38	837	168	159	200	174	160	191	174

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Note! If a tractor has tyres which are not listed on the previous page, the code number can passably be calculated as follows:

$$X = \frac{Y \times V}{V_{max}}$$ in which

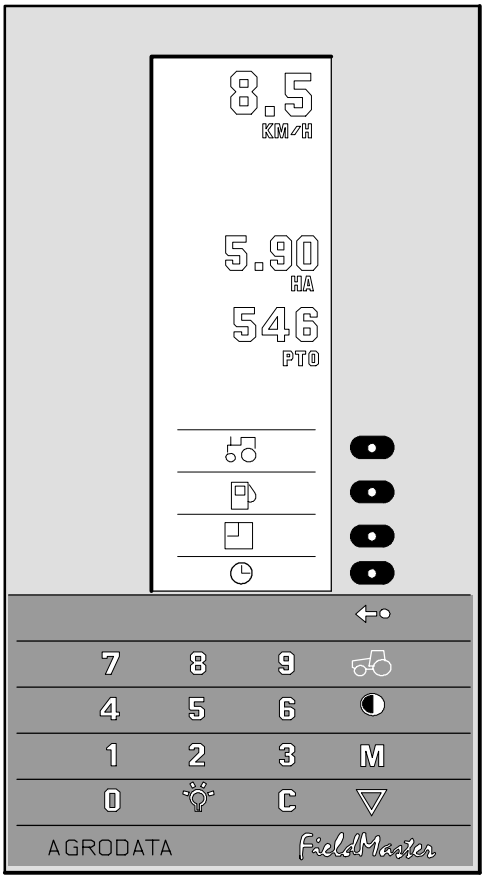
X= correct code number
Y=actual code number in AD – instrument
V= tractor's constructional speed (30, 40 or 50 km/h)
$\mathbf{V_{max}}$=tractor's max driving speed which is shown by AD – instrument

Example:

In AD – instrument there is an actual code number 170
Tractor's constructional speed is 40 km/h
AD – instrument shows the tractor max. driving speed of 38 km/h

$$X = \frac{170 \times 40}{38} = 179$$

1. Description



Picture 1. *FieldMaster display unit in the cab on the RH side. The display shows three different functions at a time.*

Note! The function of the four keys on the RH side of the display changes according to which one of the menus is open. The buttons have always the function which is shown in the display beside the button.

Function keys

Bushing this key returnes to the previous menu.

This button shows the tractor functions.

Display contrast button. In very hot or cold conditions the display can be fully dark or light. With this button the display can be tried to return to normal. The display becomes normal itself, when the operating temperature becomes normal.

With this button can be added a bookmark on a certain page. When the display shows another page, an operator can, by pushing this button, return to the page where the bookmark is situating. This button functions only for one implement at a time.

This button has different functions depending on the selected implement.

This button is used when coding together with the number keys. Remove a selected character. This button also zeroes impulse counters in the TEST FUNCTION mode. This button returns the display contrast to the normal value.

This button switches on/off the display background light.

0 – 9 The number keys are used when inputting code values.

FieldMaster is a combined performance monitor which can monitor both tractor and implement functions.

FieldMaster monitors the following tractor functions:

– driving speed, km/h,
– wheel slip (radar is required))
– PTO shaft rotating speed, rpm
– distance travelled, km
– area, ha
– time functions (clock, elapsed time, remaining time etc).

FieldMaster can monitor the following implement functions:

– sprayers (l/hour, l/ha, litres, alarm functions, automatic proportioning aso)
– fertilizers (kg, kg/ha, kg/hour, rpm, alarm functions etc)
– drills (kg/ha, seed amount in kilos, driving paths etc)
– balers (pcs, kg, rpm, alarm functions etc)
– slurry spreaders (ton/ha, tons, rpm etc)
– other implements (e.g. cultivated area)

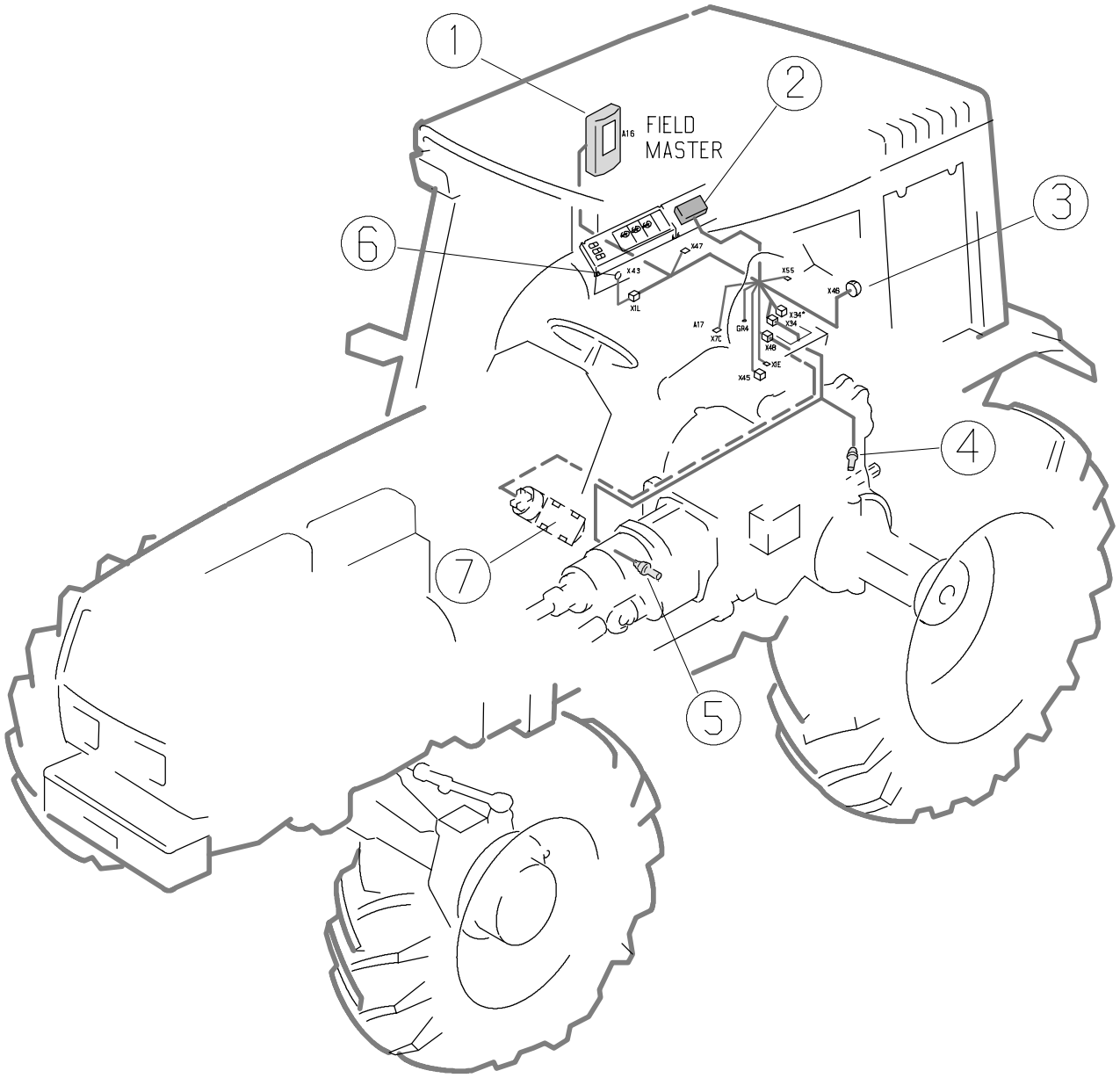
Options:

– radar (slip, ground speed etc.)
– writer (output of work etc.). The writer is connected with a cable to the display unit.
– readiness for the global location system with the aid of a satellite (GPS)

The follow–up of different functions on an implement requires, that the implement has sensors which have been connected to the FM via a socket in the rear of the tractor.

On an implement there can be e.g. rpm sensors, position sensors, wheel sensors, flow meters, weight cells, manometers, actuators/position potentiometers, level sensors etc.

Note! This instruction does not handle operating instructions but it clears up the function of FieldMaster and a fault tracing.



Picture 2. *FieldMaster components on the tractor*

1. Display unit (A16). It has in–built electronics for all functions of FieldMaster.
2. Adapter (A17), which is fitted under the AC/ACD power lift control panel. The adapter converts signals from the tractor speed sensors (4, 5) so that the diplay unit can use them.
3. Rear socket for connecting sensors on implement (X46)
4. PTO shaft rotation speed sensor (same as for AD–instrument)
5. Gearbox speed sensor (same as for AD–instrument)
6. Connector to connect auxiliary devices (e.g. PC) (serial port RS–232) (X43)
7. Radar (option)

Connectors

X7C: connector for the lift/lower switch of the AC/ACD power lift. The function includes stopping the area counters, when the three point linkage is lifted. The connector is placed in the lever console.

X34: connector for the speed sensors on the tractor (4, 5). The conncetor is situating in the lever console.

X48: connector of the radar in the lever console. There is also another connector near the radar.

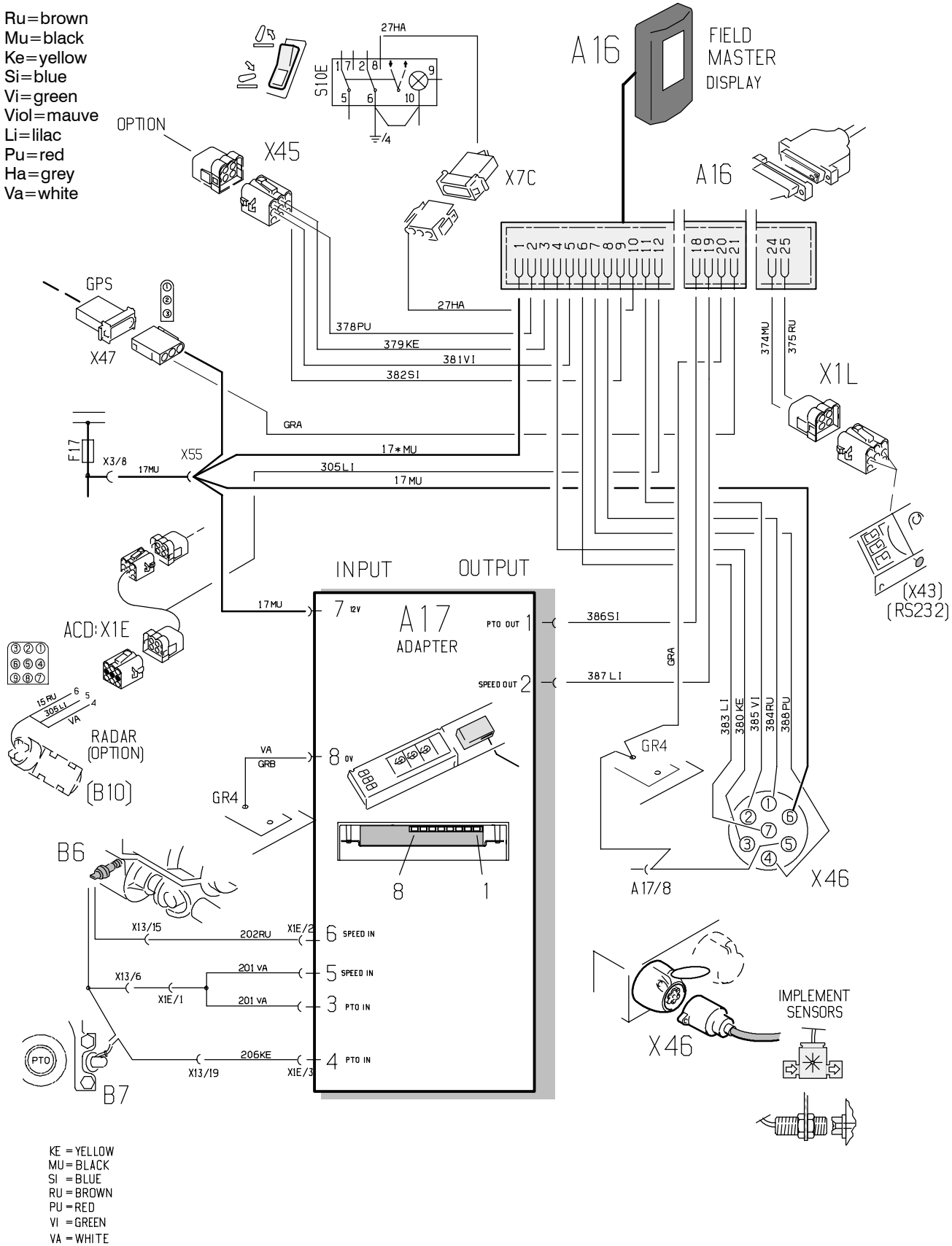
GR4: FieldMaster earth point in the rear part of the lever console.

X55: Supply voltage connector in the lever console (same as for the Agrodata performance monitor).

X1L: via this connector are drawn wires of connector X43. The connector is situating under the switch panel of the power lift.

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FieldMaster wiring diagram



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2. General functions

A. Calibrating gearbox speed sensor and radar (radar is an optional equipment)

Note! If the tractor wheels or FieldMaster display unit are changed, the calibration must be done.

1. Switch on current to the tractor and wait until the main menu appears in the display. In the main menu there are shown different symbols for tractor, implement, area and time functions.

IMPORTANT! If the language in the display is e.g Danish or other language, it can be changed by going either with arrow buttons or with NÆSTE SIDE button to another page, on which there can be found selection SYSTEM. By pressing button VÆLG can be moved to page, on which there is TEST INPUT, TEST OUTPUT, SPROG etc. By moving the highlighted are onto the text SPROG (=language) and by pushing VÆLG button can be moved to the language menu, in which can be selected english by moving the highlighted area onto the ENGLISH and by pushing VÆLG button. Now the language has been changed and it is in power until it is changed.

2. Press the yellow arrow button until you see a menu in which there are alternative implements such as SPRAYER , FERTILIZER DISTRIBUTOR, DRILL, BALER, SLURRY SPREADER and OTHER IMPLEMENTS. If there is SYSTEM in the menu, the unit shows page 2 and the implements are situating in page 1, change page with NEXT PAGE–command.

3. Choose one implement (e.g. sprayer) with SELECT–command. The unit shows one sprayer type, which must be accepted with ACCEPT–command. After this the sprayer symbol appears in the display. In addition, in the display there are the following commands: OPERATION, ENCODE and DATA/DELETE.

4. Choose ENCODE and a new menu appears, in which you can move from one row to another by using the arrow buttons. The small arrows in the upper or lower edge of the display indicate that more menus can be found in the next page, to which you can get either with NEXT PAGE–command or by scanning with the arrow buttons.

5. When you find selection SPEED SENSOR, press it and immediately after that press CALIB/CALC alternative.

6. A new menu appears in the display, in which there is a heading WHEEL TRACTOR and as a subheading text NO OF PULSES and DRIVE 100 M (i.e, number of pulses and an instruction to drive with the tractor 100 meters) and a subselection CALIB./CALC.

7. Drive the tractor to a place, where are ready–made markings of startpoint and endpoint of a distance of 100 meters. Drive the tractor onto the startpoint and press the CALIB–button, at which time the counter of the gearbox speed sensor is zeroed.

8. Drive straight ahead 100 meters on the marked course. During driving the display starts to show flashing text CALC. WHEEL, which indicates that the FieldMaster has received enough impulses on the distance of 100 meters.

9. Stop driving at the endpoint marking and press CALC.WHEEL–button, at which time the impulse counter is stopped and a new number of the impulses (calibrating value) is input.

Note! If the tractor is equipped with a radar, it is calibrated in the same way as the speed sensor. The calibration of the radar is started from ENCODE–selection under which there is command RADAR. After this the calibrating procedure is the same as for the gearbox speed sensor.

B. Changing display language

Note! In this instruction it is understood, that the valid language is english.

1. When the display shows the main menu, press NEXT PAGE–button, until you find selection SYSTEM.

2. Press the SELECT–button, and you will see a page, which has selections TEST INPUT, TEST OUTPUT, LANGUAGE etc.

3. Move the highlighted area onto the LANGUAGE and press SELECT–button, after which the display shows the language menu. Move the highlighted area onto the desired language and press the SELECT–button.

4. A new display language is valid.

C. Others

Before the FieldMaster is able to show for example flow amount or area, the flow meter must be calibrated and working width of an implement must be input. In the same way must be calibrated extreme positions of possible position potentiometer. When necessary, possible weight measuring cell or manometer must also be calibrated. In addition, an amount of magnets for a measuring sensor affects the measurement.

3. Fault tracing

A. General

FieldMaster is supplied via fuse F17 (10 A). Supply voltage connector X55 is placed in the lever console.

When the current is switched on to the tractor, the main menu must appear in the display unit. If nothing appears in the display, check the fuse and supply connector X55 and earthing point GR4. If these are OK, check the display unit connector and adapter connector. If these are OK but the display does not function, the fault may lie in the display unit electronics, and the unit must be changed.

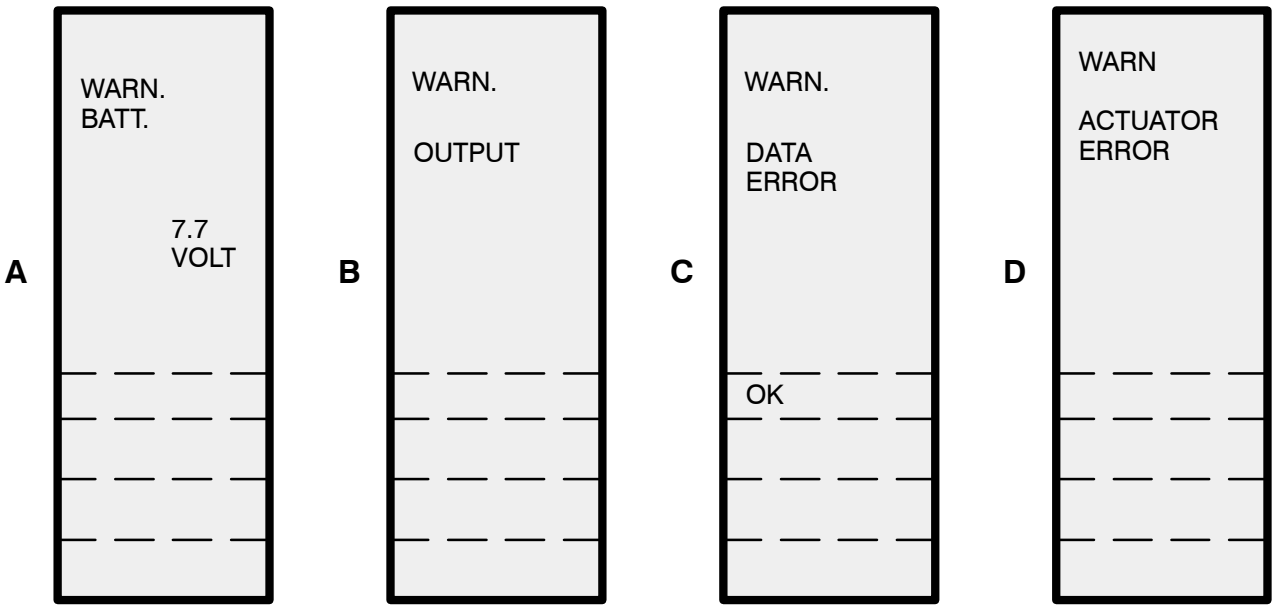
If the display unit does not show a certain implement function, check the sensor mounting on an implement and check the wires between the sensor and the rear socket. Check also the wire connections inside the socket. If these are OK, check also wires between socket – adapter – display.

Note! For the magnetic sensor the distance between the magnet and the sensor end should be max 5 mm. The yellow dot on the magnet should be turned towards the sensor. If the measuring wheel is big (rolling circumference over 2,5 m) more magnets must be fitted (180˚(two magnets), 120˚(three magnets), 90˚(four magnets) etc.

Note! The gearbox speed sensor and the PTO speed sensor on the tractor are the same and in the same place as for the AD – instrument, see page **331**/**4**. The optional radar is the same as on AC III and AC IV or on the ACD – power lift, which has the slip control. If the display does not show the tractor driving speed or the PTO shaft speed, the adapter can be damaged. Check the adapter connectors and the sensors.

Note! The FieldMaster adapter or the display unit cannot be repaired but they must be changed as a complete unit.

B. Error messages



A. Supply voltage to the FM below 10 V. This message disappears, when the supply voltage exceeds 10 V.

B. If there is a short circuit in the wires from the display unit, this message is shown. The message disappears, when the short circuit has been repaired.

C. This message appears, if the display unit memory has malfunctions. When ”RETURN” – button is pressed, the message disappears. After this check all coded values. If the message appears many times, the fault lies in the display unit and it must be changed.

D. Error message for example from an actuator on the slurry spreader. The actuator has been connected wrongly or it is faulty. Check the actuator mounting and wires. If the message appears repeatedly, the fault may lie in the FM display unit or in its wiring.

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C. Test mode

A test mode can be selected in the diplay. In this mode there are shown signals from various sensors when they are activated. The test mode can be selected in the display in the same way as the language (see Page 3), but in place of selection LANGUAGE must be selected TEST INPUT (or test output). The test mode is individual for different implements, and it depends on sensors which have been fitted on an implement in question.

The five first test points are the same for all implements, and they indicate the function of the tractor sensors as follows:
RADAR: In this point are shown signals from the radar, when driving slowly forwards.
PTO: Signals from the PTO sensor when the PTO shaft is rotating.
WHEEL TRACTOR: Signals from the gearbox speed sensor, when driving slowly forwards.
DIESEL: Not in use
IMPLEM: Signal when the lift/lower switch of the AC/ ACD–power lift is turned to the transport position.

Note! TRAIL.1–TRAIL.7 in this mode mean correcponding poles in the rear socket. TRAIL.8 is not in use.

1. Sprayer:

TEST INPUT

RADAR	
0	HI
PTO	
0	HI
WHEEL TRACTOR	
0	HI
DIESEL	
0	HI
IMPLEM.	
0	HI
TRAIL.	1
0	HI
TRAIL.	2
	HI
TRAIL.	4
0	LO
TRAIL.	7
0	LO
TRAIL.	8
0	LO
BOMTEST	
	OK

TRAIL. 1: Signal from the pressure sensor. Low pressure gives only few signals per second, higher pressure more.
TRAIL. 2: Signal from the flow meter. On turn of an impeller gives two impulses.
TRAIL. 4: Signal from the wheel sensor of the sprayer always when the magnet is at the sensor when driving slowly forwards.
TRAIL. 7: Signal from the switch of the sprayer main valve or from the sensor of the manual valve.
TRAIL. 8: not in use.
BOOM TEST: OK or ERROR.

2. Fertilizer

TEST INPUT

RADAR	
0	HI
PTO	
0	HI
WHEEL TRACTOR	
0	HI
DIESEL	
0	HI
IMPLEM.	
0	HI
TRAIL.	1
0	HI
TRAIL.	2
	HI
TRAIL.	4
0	LO
TRAIL.	7
0	LO
TRAIL.	8
0	LO
BOMTEST	
	OK

TEST OUTPUT

OUT	1
	HI
OUT	2
	HI
OUT	3
	HI
OUT	4
0	HI
POT 1:	
48	
POT 2:	
49	
OUT 1	
OUT 2	
OUT 3	
OUT 4	

TRAIL. 1: Signal from a rpm sensor (RPM 1), when the shaft equipped with the magnets is rotating.
TRAIL. 2: Not in use
TRAIL. 4: Signal from the implement wheel sensor, when driving slowly forwards.
TRAIL. 7: not in use.
TRAIL. 8: not in use.
BOOM TEST: not in use.
OUT 1: Signal from FM into an actuator to close a hatch.
OUT 2: Signal from FM into an actuator to open the hatch
OUT 3: Not in use
OUT 4: Not in use
POT 1: Signal from an actuator (potentiometer), which adjusts the position of the hatch. Lower number, when the hatch is closed and upper number when the hatch is open.
POT 2: Not in use.

3. Drill

TEST INPUT

RADAR	
0	HI
PTO	
0	HI
WHEEL TRACTOR	
0	HI
DIESEL	
0	HI
IMPLEM.	
0	HI
TRAIL.	1
0	HI
TRAIL.	2
	HI
TRAIL.	4
0	LO
TRAIL.	7
0	LO
TRAIL.	8
0	LO
BOMTEST	
	OK

IMPLEM: Signal from the switch or sensor of the lifting arm, when the arm is raised.
TRAIL 1: Signal from the rpm sensor on the sowing shaft, when it is rotating.
TRAIL 2: Signal from the switches for the sowing shaft speed control. When the sowing shaft is rotating, HI is visible. When the shaft does not rotate, LO is visible. Can also show signals from the rpm sensor, when the shaft equipped with magnets is rotating.
TRAIL 4: Signal from the level sensor in the tank, when the tank is empty.
TRAIL 7: Signal from a switch for remote control of the hatch or from an implement sensor when the implement is raised.
TRAIL 8: Not in use
BOOM TEST: Not in use.

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4. Baler

TEST INPUT

RADAR	
0	HI
PTO	
0	HI
WHEEL TRACTOR	
0	HI
DIESEL	
0	HI
IMPLEM.	
0	HI
TRAIL.	1
0	HI
TRAIL.	2
0	HI
TRAIL.	4
	LO
TRAIL.	7
0	LO
TRAIL.	8
0	LO
BOMTEST	
	OK

TRAIL 1: Signal from a piece counter, when the sensor is activated.
TRAIL 2: Signal from the rpm sensor (RPM 3), when the shaft equipped with magnets is rotating or signal from the weight cell. A light load gives little and heavy load many impulses per second.
TRAIL 4: Signal from the rpm sensor (RPM 2), when the shaft equipped with magnets is rotating.
TRAIL 7: Signal from the rpm sensor (RPM 1), when the shaft equipped with magnets is rotating.
TRAIL 8: Not in use
BOOM TEST: Not in use.

5. Slurry spreader

TEST INPUT

RADAR	
0	HI
PTO	
0	HI
WHEEL TRACTOR	
0	HI
DIESEL	
0	HI
IMPLEM.	
0	HI
TRAIL.	1
0	HI
TRAIL.	2
0	HI
TRAIL.	4
	LO
TRAIL.	7
0	LO
TRAIL.	8
0	LO
BOMTEST	
	OK

TRAIL 1: Signal from the weight measuring cell, when activated.
TRAIL 2: Signal from the rpm sensor (RPM 3), when the shaft equipped with magnets is rotating, or from weight cells: A light load gives little and heavy load many impulses per second.
TRAIL 4: Signal from the rpm sensor (RPM 2), when the shaft with magnets is rotating.
TRAIL 7: Signal from the rpm sensor (RPM 1), when the shaft with magnets is rotating.
TRAIL 8: Not in use.
BOOM TEST: Not in use.

D. Checking wire connections between rear socket and display unit

TESTING INPUTS:

1. Switch off current with the ignition switch.

2. Connect a test lamp to poles 5 (–) and 6 (+, battery voltage) of the rear socket. The lamp is glowing, if the supply circuit is OK. This can also be made by means of a voltage meter.

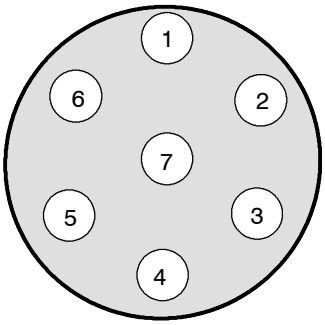
3. Switch on current to the tractor. Return in the FieldMaster menu to the beginning, where are the implement selections by pressing the yellow arrow button twice to the point SYSTEM (can be found in the second page).

4. Select TEST INPUT function (use next page–button once) and make sure that all rear socket information in points TRAIL 1...TRAIL 7 shows HI mode (TRAIL. 8 is not in use).

5. By means of an auxiliary wire (or by test lamp) connect by turns with an auxiliary cable the poles given of the socket and make sure that HI markings (in points TRAIL.1...TRAIL 7) change to LO:
– connect poles **1 and 5** (TRAIL.1)
– connect poles **2 and 5** (TRAIL.2)
– connect poles **4 and 5** (TRAIL.4)
– connect poles **7 and 5** (TRAIL.7)

WARNING! Do not connect poles 6 and 5 (makes short circuit).

6. If one of the HI markings did not change, check whether the wires are connected inside the socket. Always when the poles were connected, the impulse number in the LH side of the display increased.



Order of socket poles seen from the rear.

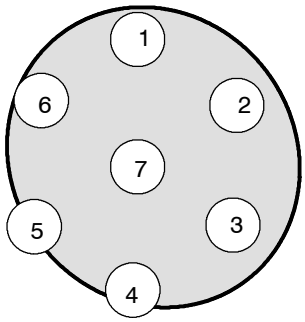
Function of pole :	**Wire colors**:
1=RPM sensor, pressure sensor etc.	1=brown no 384
2=Flow meter	2=green no 385
3=Actuator 1, switch (OUTPUT)	3=yellow no 380
4=Wheel sensor, implement sensor	4=red no 388
5=Earthing	5=white GR
6=Supply (battery voltage)	6=black no 17
7=Implement sensor	7=lilac no 383

TESTING OUTPUT:

7. Select test output function (next after test input). Connect a voltage meter or a test lamp between poles 3 and 6. When you press button “OUT1” the voltage must be up as long as you press the button.

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E. Connecting sensor wires to plug



Plug poles seen from wire side (from sensor side). The pins have been numbered on the plug casing. The tables below show connections of the sensor wires to the plug. Plug ordering number is 31702900 (also Agrodata).

Sprayer		
Sensor	Wire color	Plug pin
Flow meter	blue	5
	brown	2
	black	6
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5
Pressure sensor	blue	6
	brown	5
	black	1

Fertilizer distributor		
Sensor	Wire color	Plug pin
RPM sensor 1	blue	6
	brown	5
	black	1
RPM sensor 2 or weight module	blue	6
	brown	5
	black	2
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5

Drill		
Sensor	Wire color	Plug pin
RPM sensor on drill shaft (2 wires)	blue	1
	brown	5
RPM sensor on drill shaft (3 wires)	blue	6
	brown	5
	black	1
RPM sensor on switch	blue	2
	brown	5
Drill boot sensor	blue	6
	brown	5
	black	4
Implement sensor	blue	7
	brown	5

Baler		
Sensor	Wire color	Plug pin
Piece counter	blue	1
	brown	5
RPM sensor 3 or weight module	blue	6
	brown	5
	black	2
RPM sensor 2	blue	6
	brown	5
	black	4
RPM sensor 1	blue	6
	brown	5
	black	7

Slurry spreader		
Sensor	Wire color	Plug pin
RPM sensor 1	blue	6
	brown	5
	black	1
Flow meter	+12 V	6
	0 V	5
	Signal	2
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5



AGROLINE–INSTR. PANEL

General

Mezzo/Mega/HiTech 6200 – 8950Hi tractors will be fitted with **Agroline** – instrument (Mezzo/Mega: **L17307 –**. Hi-Tech: **L18105 –**).
Before this a new Agroline – instrument has been fitted to the following **HiTech** tractors: L04111, L11112, L11138, L11237, L17119, L17217, L17238, L17310, L17411, L17418, L17528, L17537 ja L17539.

With regard to the instrument change, modifications have been done in the dashboard. Some rocker switches have been positioned on the RHS side pillar of the cab.

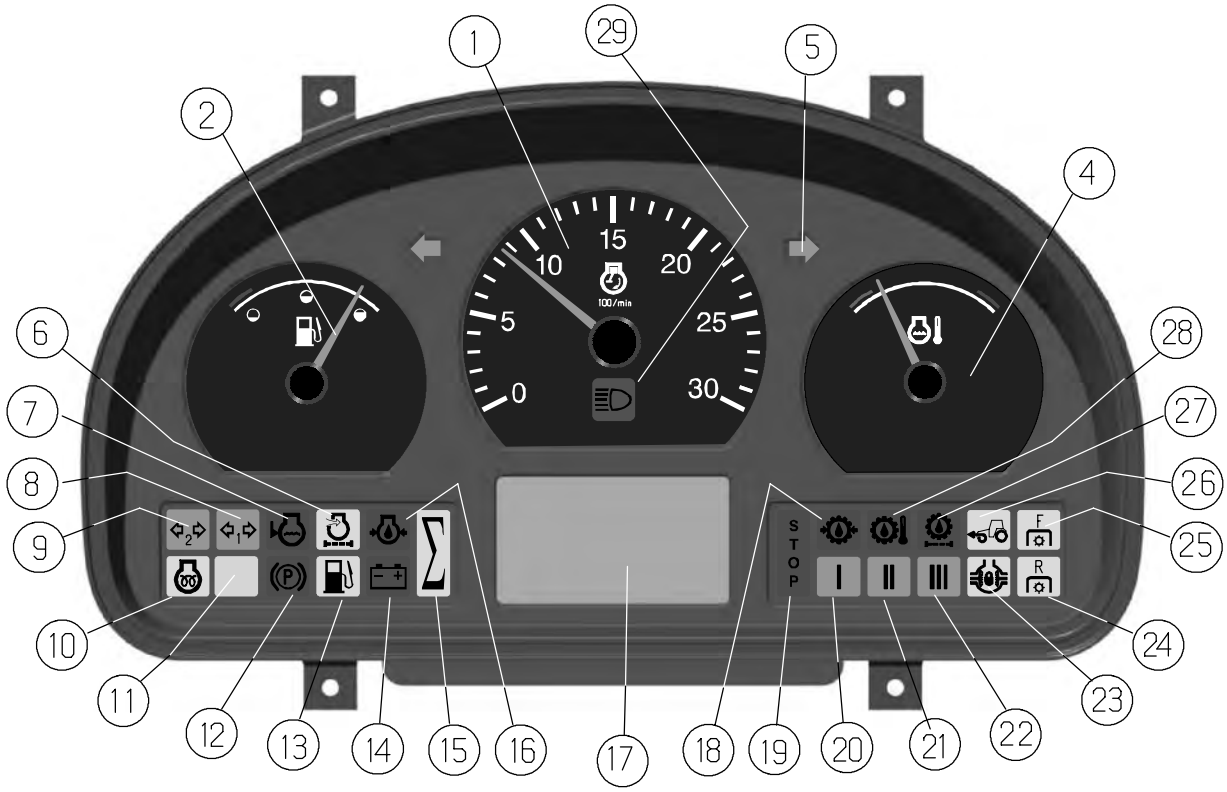
The calibration of the instrument must be done if a new instrument or the rear tyre sizes have been changed. With the help of the calibration the Agroline – instrument can show the correct driving speed and driving distance (page **333/4**).

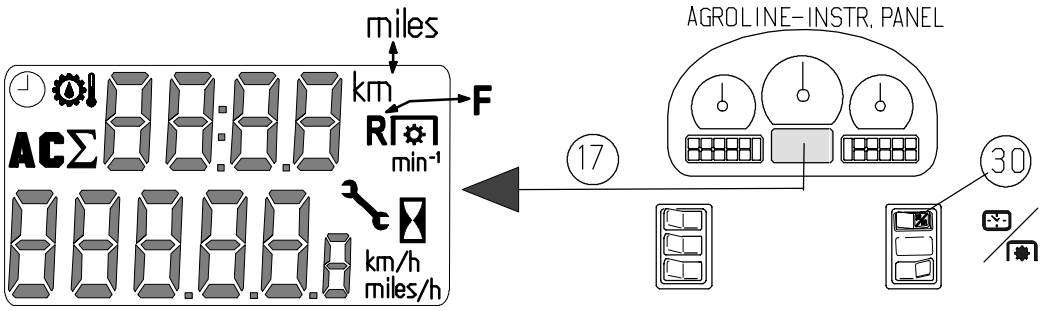
The Agroline – instrument cannot be repaired but a spare part instrument is fitted in place. However, internal light bulbs and cover glass can be changed. Warning lights are LED – diodes and they cannot be changed. There are two connectors on the instrument rear face to connect the wire looms.

The instrument is controlled by a microprocessor and it is programmed according to the tractor type. Regarding service or repairs the instrument program cannot be changed.
A spare part instrument is deliver ready – programmed with the actual running hours of the customer‘s tractor.
The tractor model, chassis number and the actual running hours must be given when ordering.

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Agroline – instrument





1. Revolution counter
2. Fuel gauge
4. Engine temperature gauge
5. Direction indicator flasher
6. Engine air filter warning light
7. Engine coolant level (not in use).
8. First trailer dir. ind. flasher (if one flasher bulb is blown, this light does not flash)
9. Second trailer dir. ind. flasher (if one flasher bulb is blown, this light does not flash)
10. Glowing
11. Not in use
12. Parking brake applied
13. Low fuel level (< 15 l, without extra reservoir)
14. Charging
15. Sigma – Power ind. light (8950Hi only)
16. Engine oil pressure
17. LCD – display
18. Gearbox oil pressure
19. Stop – central warning light
20. DPS – speed I (not HiTech)
21. DPS – speed II (not Hitech)
22. DPS – speed III (not HiTech)
23. Differential lock
24. Rear PTO
25. Front PTO
26. 4WD
27. Hydraulic pressure filter blocked
28. Gearbox oil temperature
29. High beams
30. Switch (**S80**) to select functions in LCD – display (**17**) upper row

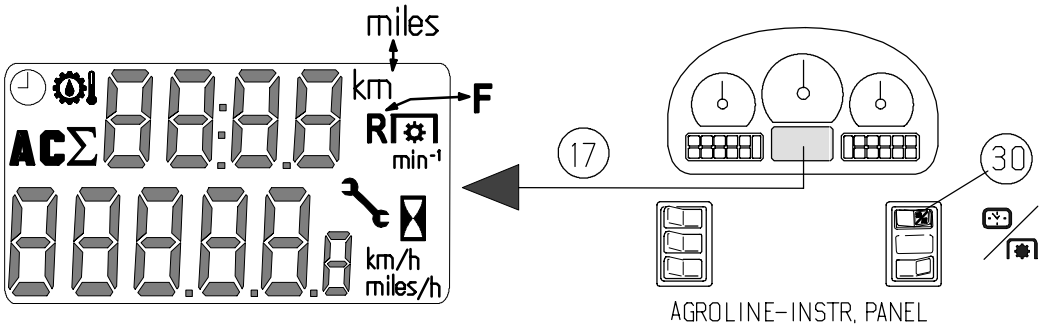
Stop – central warning light (19) The Stop – light is controlled by the following functions, i.e. if one of the following warning lights come on, the STOP – light starts to flash:
– engine oil pressure too low
– engine temperature too high (not ind. light)
– gearbox oil pressure too low
– gearbox oil temperature too high
– parking brake cable broken or faulty adjustment (HiTech only)

If the STOP – light only is flashing, the engine temperature is too high. If in the HiTech models the STOP – light comes on when the parking brake is engaged, the parking brake cable is broken or its adjustment is faulty. It is essential that this fault must be repaired before driving.

When the ignition is switched on, the following warning lights must come on:
– engine oil pressure
– stop – light is flashing
– gearbox oil pressure
– 4WD
– parking brake (HiTech models)l
– charging

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1. Agroline – instrument LCD – display



The display (17) can monitor the following functionst:

Upper row shows:
(the function can be changed by pressing the RH side edge of the switch **30**):
– distance travelled (m, km or miles) (max. 999 km)
– rear PTO revs (R) (r/min)
– front PTO revs, option (F) (r/min)
– time
– gearbox oil temp. (in display LO, when temperature below +40˚C).
– position of lower links (0 – 100) AC.
– SigmaPower % (8950Hi only). Shows in percent how much power is transmitted via rear PTO.
– fault codes
– Service interval indication

Lower row shows:
(the lower row has two functions and cannot be affected with switch (**30**)):
– running hours (visible, when the ignition is on and the engine is not running)
– driving speed (km/h or miles/h) (visible when the ignition is on and the tractor is moving). When the speed is below **3 km/h**, symbol **L** is visible.

When the ignition is switched on, the lower row shows first the running hours and in the upper row there is the function which was selected before the ignition was switched off.

Zeroing distance travelled:
– select the “distance travelled” to the upper row by pressing the right edge of the switch (**30**).
– press the switch (**30**) left edge as long as the distance value is zeroed**.**

Setting time:

Do not pause for over **10 sec**. while setting, because the display is then switched into the normal mode.
– Switch on ignition. Select the time in the upper row by pressing the right edge of switch (**30**) .
– press the right edge for about **3 sec**., then the minutes start to flash.
– set minutes by pressing the switch (**30**) left edge
– select hours in the display by pressing the switch (**30**) right edge
– set hours by pressing the switch (**30**) left edge.
– time is now set and the display is switched to the normal mode after **10 seconds** or by pressing the right edge of switch (**30**) for over **3 seconds**.

2. Calibrating Agroline for different tyres

The calibration of the instrument must be done if a new instrument or the rear tyre sizes have been changed. With the help of the calibration the Agroline – instrument can show the correct driving speed and driving distance.

Do not pause more than **10 seconds** during calibration, because the display will be switched into the normal mode.
– switch on current. Choose the driving distance in the upper row by pressing the right edge of the switch (**30**).
– press the right edge of the switch (**30**) for about **3 sec**. until the display is switched into the setting mode (minutes start to flas).
– press the switch (**30**) right edge quickly, at which time **m** starts to flash in the display.
– select the correct code value in the display by pressing the switch (**30**) left edge. When the left edge is kept down, numbers are changed continually.
– when the code is correct, the display is switched to the normal mode after **10 seconds**. or by pressing the right edge of the switch (**30**) for over **3 seconds**.
– if a correct code value you passed, scan forwards up to code **400**, after which the code starts from **100**.

Note! The code number could be between **100 – 400**. By pressing switch (**30**) the code value is changed from a smaller value to a greater one. The code numbers with various tyres are shown in the table below (same as for Agrodata – instrument).

Note! If tractor tyres cannot be found in the table below, the code number can be calculate as follows:

Example:
– Agroline – instrument present code number is **170**.
– Tractor max. driving speed is **40 km/h**.
Agroline – instrument shows max. driving speed of **39 km/h** when driving the tractor.

The code value **X=174** can be calculated as follows:

$$X = \frac{170 \times 40}{39} = 174$$

Code numbers with different tyre sizes and transmission types (Mezzo ja Mega**):**

Rear wheel	6200 – 6400	6800 – 8550	
	40 km/h	40 km/h	50 km/h traffic model
13.6 – 38	216	216	197
13.6R38	215	215	197
14.9R38	209	209	191
16.9 – 34	214	214	196
16.9R34	212	212	194
16.9R38	201	201	184
18.4 – 34	207	207	190
18.4 – 38	195	195	178
18.4R38	195	195	178
20.8R38	183	183	167
20.8R42	173	173	159
230/95R48	200	200	183
270/95R48	194	194	178
340/85R38	215	215	197
420/85R38	199	199	182
460/85R38	190	190	174
480/70R38	198	198	181

Takapyörä	6200 – 6400	6800 – 8550	
	40 km/h	40 km/h	50 km/h traffic model
480/80R42	181	181	166
520/70R34	203	203	186
520/70R38	193	193	177
520/70R38	191	191	174
520/85R38	181	181	166
520/85R42	169	169	155
540/65R38	200	200	183
580/70R38	182	182	167
600/65R34	203	203	186
600/65R38	193	193	177
600/65R38	192	192	176
620/75R30	199	199	182
650/65R38	184	184	168
650/65R42	175	175	160
650/75R38	173	173	159
680/75R32	183	183	168

Code numbers with different tyre sizes and transmission types (HiTech)**:**

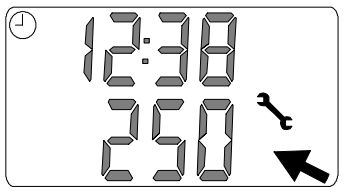
Rear wheel	6250Hi – 6550Hi	6850Hi – 8150Hi		8350Hi – 8950Hi	
	40 km/h	40 km/h	50 km/h traffic model	40 km/h	50 km/h traffic model
13.6 – 38	216	216	197	217	196
13.6R38	215	215	197	216	196
14.9R38	209	209	191	210	190
16.9 – 34	214	214	196	215	195
16.9R34	212	212	194	214	194
16.9R38	201	201	184	202	183
18.4 – 34	207	207	190	208	189
18.4 – 38	195	195	178	196	177
18.4R38	195	195	178	196	177
20.8R38	183	183	167	184	167
20.8R42	173	173	159	174	158
230/95R48	200	200	183	201	182
270/95R48	194	194	178	195	177
340/85R38	215	215	197	216	196
420/85R38	199	199	182	200	181
460/85R38	190	190	174	191	173
480/70R38	198	198	181	199	181
480/80R42	181	181	166	182	165
520/70R34	203	203	186	204	185
520/70R38	193	193	177	194	176
520/70R38	191	191	174	192	174
520/85R38	181	181	166	182	165
520/85R42	169	169	155	170	154
540/65R38	200	200	183	201	182
580/70R38	182	182	167	183	166
600/65R34	203	203	186	204	185
600/65R38	193	193	177	195	176
600/65R38	192	192	176	193	175
620/75R30	199	199	182	200	182
650/65R38	184	184	168	185	167
650/65R42	175	175	160	175	159
650/75R38	173	173	159	174	158
680/75R32	183	183	168	184	167

3. Others

Changing speed and distance units
(km/h – miles/h)

The units have been set in the factory for various market areas. In Service the units cannot be changed.

Indication of periodical maintenance:



Note! When the tractor running hours reach a service interval, a spanner symbol and the running hours of the service interval in question come on into the diplay.

If the service is not done, the spanner and the service interval are visible for **10 seconds** every time the ignition is switched on.

The Service man (or customer) can confirm that the maintenance has been done by pressing switch (**30**) left edge and at the same time switching on the ignition. After this the spanner symbol is not visible until the next Service is approaching.

4. Fault codes

Agroline – instrument can show fault codes for a damaged sensor, at which time the spanner symbol is visible in the display.
The fault code can be seen by scanning with switch (**30**). The fault code is shown in the upper row of the display (**17**), if one of the following sensors have a malfunction or wires have problems:

– fuel level sensor **B2**. **First digit** of three – number code.
– engine temperature sensor **B1**. **Middle digit** of fault code.
– gearbox temperature sensor **B3**. **Last digit** of fault code.

0 = OK
1 = poor contacts or too high resistance
2 = short circuit or too low resistance

E.g: **200**: fuel sensor short circuit
E.g: **010**: engine temperature sensor resistance too high (wire broken, sensor damage etc.).
E.g: **001:** gearbox temperature sensor resistance too high (wire broken, sensor damage etc.).

Fault tracing:

– If the Agroline – instruments have malfunctions, check that the instrument rear face connectors **X26** and **X27** are correctly connected. If the instrument is totally black although the current is switched on, check the fuses **F14** (ignition switch) and **F18** (instrument), supply wires and earth points. (See wiring diagrams on pages **310**/**105,** Mezzo/Mega and **310**/**93,** HiTech). The position of different components and connectors can be found on page **310**/**6C,** (Mezzo/Mega) and **310**/**6E,** (HiTech).

– When necessary, check various sensors and switches according to instructions **5** and **6**. If wires, switches and sensors are OK, but the problem still exist, change the instrument.

– Switch (**30**) earths in the instrument rear face pins no **24** and **25** of the connector **X26**, when different edges of switch are pressed.
If the instrument does not respond to the use of these switches, check wire joints in the switches and instrument connectors behind the instrument. If these are OK, the fault can lie inside the instrument.

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5. Sensors and switches

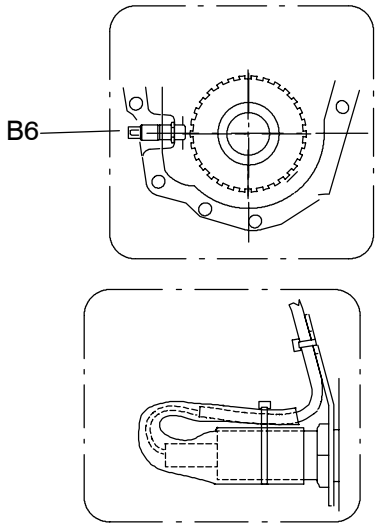
A. Gearbox speed sensor B6

(For monitoring the speed and distance)

Note! The sensor is placed in the lower part of the shuttle housing on the RH side of the gearbox. The sensor is the same as in the Agrodata – instrument.

Note! If the driving speed and travelling distance values are incorrect in the diplay, the reason can also be faulty calibration of the tyres, see page **333/4**.

Note! The sensor resistance should be between **1,0 – 1,10 kΩ.** It can be measured from pins **X26/5** and **X26/22**.
If the resistance was infinite, it must be measured from sensor poles, so that possible continuity problems can be identified.

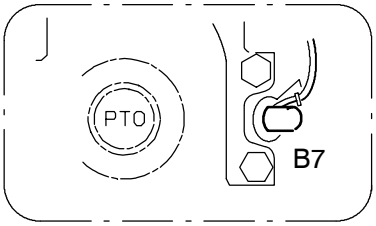


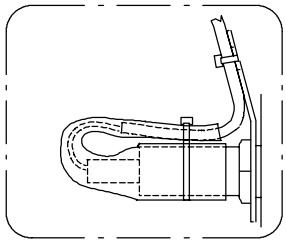
Changing the speed sensor, see page 331/4.

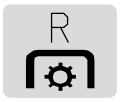
Note! The instruction are as for Agrodata – instrument but connectors have differences, see wiring diagrams.

B. Rear PTO speed sensor B7

(for monitoring PTO revs.).







The sensor is the same as in Agrodata – instrument. The sensor resistance should be **1,0 – 1,10 kΩ.** The resistance can be measured from pins **X26/9** and **X26/22**.
If the resistance was infinite, it must be measured from sensor poles, so that possible continuity problems can be identified.

Changing the sensor, see page 331/4

Note! The instruction are as for Agrodata – instrument but connectors have differences, see wiring diagrams.

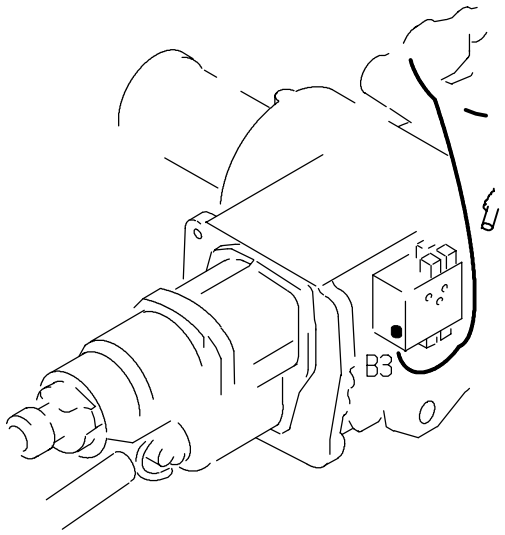


IMPORTANT! If the tractor has front PTO, the speed signals comes from alternator or separate speed sensor.
The Agroline – instrument has front PTO pilot light and its rotation speed can be selected in the instrument LCD – display.

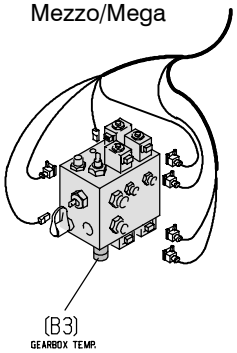
C. Gearbox oil temperature B3

(for monitoring gearbox oil temperature)

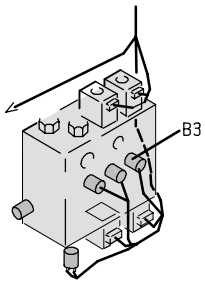
IMPORTANT! Agroline – instrument shows a fault code, if this sensor is faulty, see page **333**/**6**.



Mezzo/Mega



HiTech



Position of the sensor:
– In Mezzo/Mega: on the lower face of the servo valve block
– In HiTech: on the outer face of the servo valve block

Note! The gearbox oil temperature must be higher than +40˚C, before the instrument shows the temperature value. In lower temperatures LO (=LOW) is visible in the display.

If the display does not show the temperature value, check the sensor wires and the sensor.

Sensor resistance values:

+60 ˚C = **221.2 Ω** ±26 Ω (±4 ˚C)
+90 ˚C = **83 Ω** ±8 Ω (±3.5 ˚C)
+120 ˚C = **36.5 Ω** ±2.7 Ω (±3.5 ˚C)

The resistance can be measured between pin **X26**/**6** and frame contact. If the value is infinite, the resistance must be measured on the sensor pins.

Due to manufacturing tolerances of the sensor **B3** for instrument display, the display value can deviate a bit before the warning light of the sensor **S16** comes on.

If the gearbox oil temperature is continuously very high (e.g. +90˚...+99˚C), check the cleanliness of the oil cooler and the transmission oil level. If the gearbox oil level is at ”extra max” line, the oil overheats easily in high loads and at high driving speeds. In some cases it can be useful to reduce the oil level down to ”min” or ”max” line of the dipstick. If there is too little oil in the gearbox, it must be topped up to the dipstick lines.

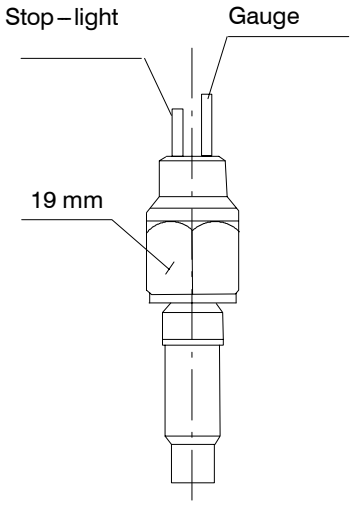
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D. Engine temperature sensor B1

(for monotoring the engine temp. and to control the STOP – light)

Note! The sensor is placed on the engine beside the thermostat housing.

IMPORTANT! Agroline – instrument shows a fault code, if this sensor malfunctions, see page **333**/**5**.



Gauge pin resistance values:
60˚C = **134 ± 13,5 Ω**
90˚C = **51,2 ± 4,3 Ω**
100˚C = **38,5 ± 3,0 Ω**

The resistance can also be measured between pin **X27**/**12** and frame contact (**GR3**).

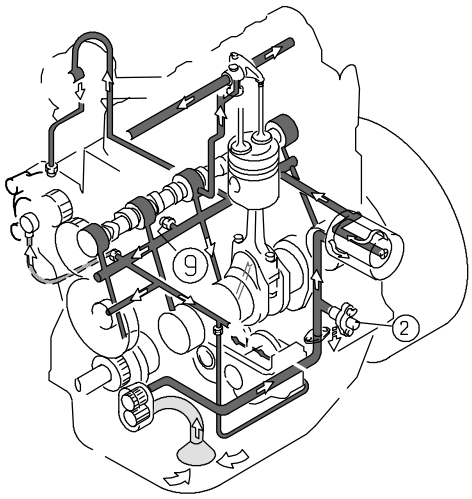
STOP – warning light flashes, if the engine temperature is too high (can also be seen in the gauge):

Part no	Alarm temperature
8366 40772	106 ± 3˚C

E. Engine oil pressure sensor S13 (for warning lights)

STOP – warning light flashes, if the engine oil pressure is too low. Also warning light illuminates (at the same time also air filter warning ligh comes on). In this case the engine must be stopped immediately and possible reason must be found and repaired.

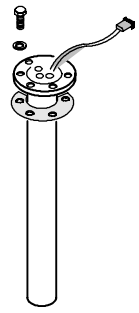
The warning light must be on, when the ignition is switched on (without starting the engine). The warning light must go out, when the engine has started (oil pressure rises in the engine).



The oil pressure sensor (**9**) is placed on the RH side of the engine. The pressure relief valve (**2**) is placed on the LH side.

F. Fuel level sensor B2 (for fuel gauge and warning light)

IMPORTANT! Agroline – instrument shows a fault code, if this sensor has a fault, see page **333**/**5**. Possible fault can also be seen in the fuel gauge. The warning light comes on, when the fuel amount is less than 15 litres (without extra tank).
Warning light switch function can be checked by measuring between pin W and earth (switch function)



The sensor resistance can be measured direct from the sensor or between pole G and earth or between pin **X27**/**7** and earth point (**GR3**). Resistance is about **70 ohms**, when the tank is empty and about **3 ohms**, when it is full.

In case of failure, the sensor is changed. The connector contact problems can be removed by disconnecting and reconnecting the connector.

G. sensor S12 for engine air filter warning light (for warning ligh)

The warning light comes on, when the air filter is blocked. The sensor is placed in the induction pipe of the filter. If the filter is blocked, a vacuum is created in the pipe. Clean or change the filter.

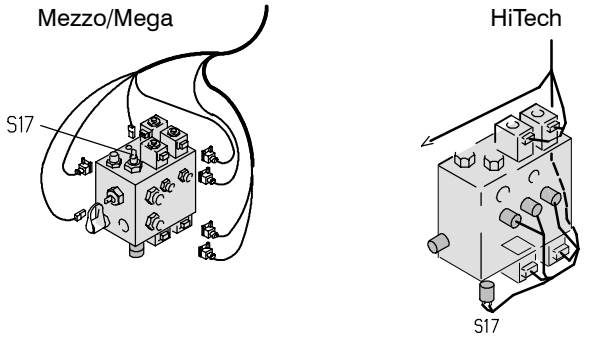
Note! The air filter warning light comes on, if the engine oil pressure warning light comes on while driving, although the filter is OK. The filter warning light is on when the current is on but the engine has not been started.

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H. Gearbox oil pressure S17 (for warning light)

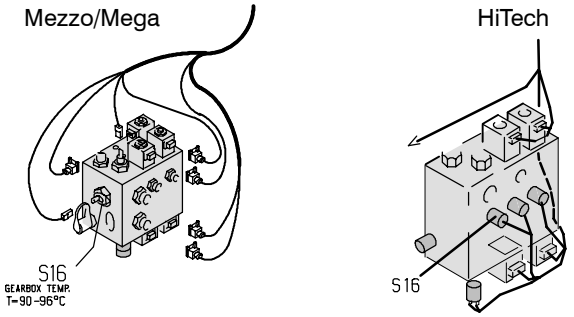
The warning light comes on, when the pressure is too low (**20 – 50 kPa**).

The sensor is placed on the servo valve block on the LH side of the gearbox:



– Mezzo/Mega: the sensor **S17** is located on the upper face of the valve block.
– HiTech: the sensor **S17** is located on the lower face eof the valve block.

I. Gearbox oil temperatute switch S16 (for warning light)



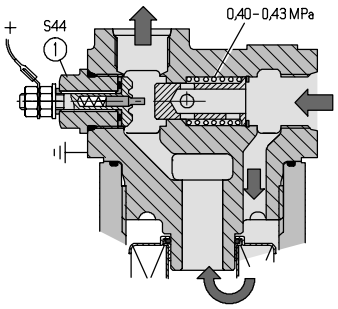
Position of switches:
– Mezzo/Mega: on the front face of the valve block
– HiTech: on the outer face of the valve block

Note! The switch illuminates the warning light in the dashboard, when the gearbox oil temperature rises too much e.g. 90 – 96 °C. Also the STOP – light starts to flash. Then stop the tractor and try to find out the fault.

The engaging temperature tolerance of the warning light sensor **S16** is 93 °C ±4 °C.
Due to manufacturing tolerances of the sensor **B3** for instrument display, the display value can deviate a bit from this before the warning light of the sensor **S16** comes on

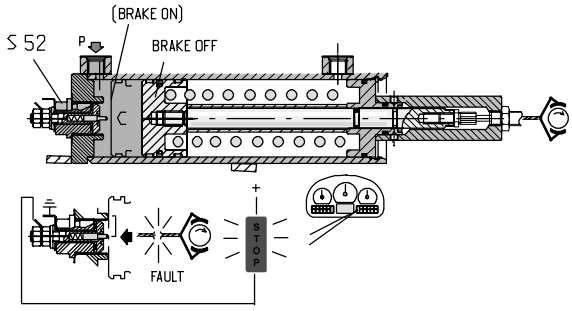
If the temperature is continuously over 90 °C, clean the radiator and check the gearbox oil level.
Note! Too high oil level in the gearbox can cause overheating at high driving speeds.

J. Switch S44 for blocked pressure filter (for warning light)



The switch (**1**) is placed in the pressure filter bracket. If the tractor has many pressure filters/return filters (on HiTech – models three), all filters have switch **S44**, see page **910/9B**. If only one filter is blocked the warning light comes on.

K. Parking brake warning light switch S52 (for STOP – light and warning light)



HiTech – models:
There is a switch **S52** placed in the front end of the parking brake hydraulic cylinder. The switch activates the STOP – light, if e.g. the parking brake cable is damaged or its adjustment is incorrect, see page **521/3**.
In addition, there is a warning light in the dashboard, which comes on when the shuttle lever is in P – position.

Mezzo/Mega – models:
There is a switch **S15** in the rear end of the parking brake lever on the LH side of the seat. The switch activates the warning light, when the lever is pulled up.

6. Others

A. Direction indicator flashers



There are three indicator lights in the instrument:
– tractor flashers
– first trailer flashers
– second trailer flashers

The indicator lights flash simultaneously with the flasher lamps. If e.g. one of the trailer lamps is blown, the indication light in question does not flash in the dashboard.

The flasher relay **K10** is placed separately in front of the fuse box.

B. Indication light for glowing



This light is lit when the ignition switch is turned to the glowing position (THERM), at which time the glow plug in the engine intake manifold is energised and warms up engine intake air.

C. Charging light



This light is on, when the ignition is switched on, but the engine is not running. After the engine has started the light must go out.

If this light comes on while driving, check the alternator wires and the alternator.

D. DPS indication lights (not HiTech)



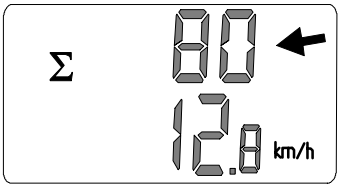
These lights are in Mezzo/Mega – tractors, which have the AC 2.3 system. In HiTech – models the DPS speed is shown in the AC 5 – display on the RH side front pillar of the cab, see page **370**/**4**.

Concerning function of these indication lights, see AC 2.3 pages **314**/**4 – 5**.

E. Σ – light in 8950Hi.

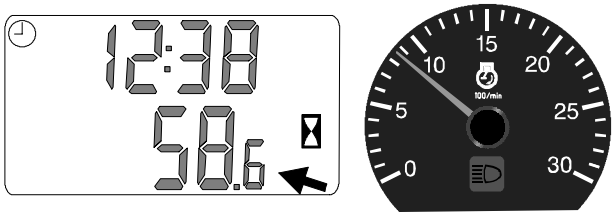


When the higher output range of the engine is engaged, there is a light Σ in the warning light panel.
This light also works as a fault diagnostic light informing by flashing (with different frequencies) of a possible fault (sensor is out of order/cable is broken). Warning light gets the signals from the Σ – *Power* unit.
SigmaPower – basic functions in Agroline are the same as in Agrodata – instrument (see page 313/1).



Agroline – instrument can show in 8950Hi – model, how many percent of the max PTO power is transmitted via the rear PTO, when the PTO is engaged.

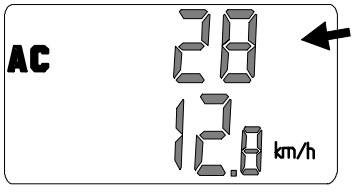
F. Hour recorder and rev counter



The analog engine revs counter (equipped with a hand) receives signals fron the alternator pin **W**. The Agroline – instrument digital hour recorder gets the signals from the alternator pole **W**.

In case of problems, check the alternator wires and alternator.

G. Position of lower links



Agroline – instrument can monitor the position of the lower links (**AC**) between digits **0 – 100**. This function is both in **ACB** and **ACD** power lifts. The function is the same as earlier in the Agrodata – instrument.
The display shows symbol **AC** and the position of the lower links as a percentage scale **0 – 100**. **0** = the lower links are in the lowest position and **100** = the lower links are in the top position. When the lower links are in the middle position, the display shows the number **50**.

34. Autocontrol – III	~~8. 11. 1990~~ 15. 6. 1992	Model 6600E, 8100E	Code 340	Page 1

Valmet Autocontrol – III Tractor control system is a standard equipment on tractors 6600E, 6600E Hi – Trol and 8100E

AC – III controls automatically the following functions:

- front wheel drive
- power take – off
- differential lock
- quick – shift gear
- cold starting
- slip control

Additionally AC – III measures:

- rotation speeds
- battery voltage
- temperatures
- driving speed and distance travelled
- trip area/total area
- number of items
- Application rate/liquid consumption
- position of linkage
- wheel slip
- time and costs

Autocontrol – III controls tractor transmission as follows:

1. Front wheel drive

(Also manual control can be selected with a switch)

4WD engages

- when the rear wheel slip is 15 %
- when braking with latched together brake pedals (also in manual (M) position)
- when the engine is stopped

4WD disengages

- when the engine is started (in automatic (A) position)
- when the wheel slip is less than 8 % during a period over 8 seconds.

2. Power take – off

(Always automatic functions on)

PTO engages

- PTO is engaged manually with the control lever

PTO disengages

- If the PTO has been engaged before starting the engine, the PTO shaft does not start to rotate. Warning light flashes. PTO engages after the control lever is moved to neutral and back to the engaged position
- If the PTO clutch slips more then 4 %. Warning light flashes. PTO is engaged again, when current is switched off and on.
- when the safety switch is opened. Warning light flashes. PTO engages when the engine is stopped and current is switched off and on and the control lever is moved to the neutral position and back to the engaged position

3. Differential lock

(Also manual control can be selected with a switch)

Diff. lock engages

– when one rear wheel rotates 25 % faster than the other

Diff. lock disengages

– when the rear wheel slip is less than 10 % during a period of one second.

– when the brake pedal/pedals is/are pressed (also in the manual (M) position)

– when the clutch pedal is depressed

– when the front wheel steering angle is more than ±10°

– when the tractor driving speed is over 12 km/h

– when the tractor is stopped

4. Quick – shift gear

(Also manual control can be selected with a switch)

Automatic changing A1

– Gear changing according to the max. torque. Economical, changes later and allows the engine revs to fall.

Automatic changing A2

– Gear changing according to the max. effect. Changes earlier and does not allow the engine revs to fall.

– Automatic gear changing, which changes to the lower gear when accelerating and to the higher gear when decelerating (in both ranges A1 and A2)

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AC – III controls also the following functions:

5. Cold starting

(Ignition switch has also a normal glowing position)

Notify readiness for start

– indicator lamp is lit = glowing
– indicator lamp flashes = ready for starting

Programmed according to the engine coolant temperature

Automatic afterglowing if needed

– indicator lamp is lit continuously = afterglowing

– glowing time has been programmed according to the engine coolant temperature

6. Slip control

Slip control is switched on with a switch that have 6 different positions

0 = switched off
1 – 5 = switched on

Slip percent is adjustable

– desired slip limit percent can be programmed

Draft control selector in position P

– buzzer signal is heard when the set slip percent is exceeded.

Draft control selector in position 1 – 5

– if the set slip percent is exceeded, the lift order is sent to the power lift

– lift movement greatness is determined by the position of the slip switch
1 – small lift
5 – big lift

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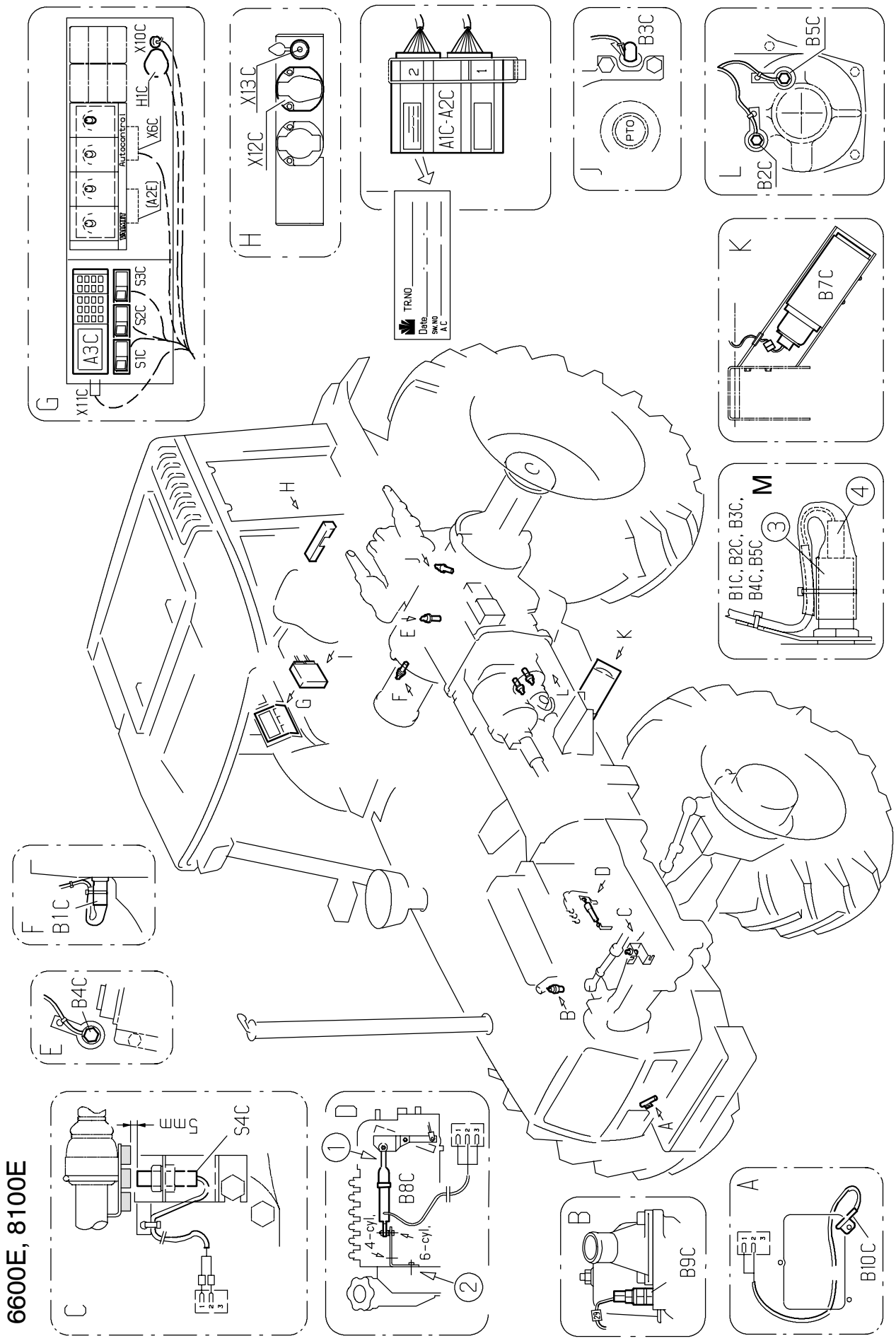


Figure 1. Components for AC – III system

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Components for AC – III system

(see figure 1 on previous page)

A. Sensor for outdoor temperature

Sensor (B10C) is fitted under the fixing screw for the headlight. AC – III display shows the outdoor temperature.

B. Sensor for engine coolant temperature

Sensor (B9C) controls the cold starting automatics. An indicator light on the instrument panel shows when the engine can be started. The system controls automatically the afterglowing in cold conditions. AC – III display shows also the engine coolant temperature.

C. Sensor for front wheel steering angle

Sensor (S4C) notifies the AC – III system when the font wheel steering angle is over ±10°. Then the automatics disengage the differential lock. The lock is re – engaged automatically when the front wheels are turned less than ±10°

D. Potentiometer on fuel injection pump

Potentiometer (B8C) notifies the system the position of the governor control lever on the fuel injection pump. AC – III compares the governor control lever position and the engine revs. Eg. the system changes automatically to the lower gear when the engine revs drop during a hard load (and vice versa)

1) Grease
2) Locking fluid Loctite 242

E. Sensor for engine revs

Sensor (B4C) is fitted on the gearbox under the cab. The sensor measures the engine rotation speed from the gear for the hydraulic pump drive mechanism. The display shows also the engine revs. The sensor controls the engagement of the quick – shift gears and indicates if the PTO clutch is slipping.

F. Sensor for rear axle rotation speed

Sensor (B1C) measures the rotation speed of the RH side rear axle from the impulse disc fitted on the final drive planetary gear. Engages the differential lock when the rotation speed difference between the rear axles exceeds 25 %.

G. Display unit

Function keys on the display unit (A3C) have been presented on pages 340/6 – 7. Below the display unit there are switches for selecting between the manual or automatic control of the tractor transmission.

H. Sockets at the rear of the tractor

Socket X12C (for connecting implement sensors to the AC – III system)
PTO emergency stop socket X13 C (terminator)

I. Central processing unit ECS (Electrical Control System)

The central unit ECS (A1C, A2C) is fitted in the lever console in the cab. On the ECS is fitted a sticker with the tractor manufacturing number etc.

J. Sensor for PTO revs

Sensor (B3C) measures the rotation speed of the PTO shaft from the impulse disc fitted on the shaft. Display shows the PTO rotation speed.

K. Radar

Radar (B7C) notifies the ECS the actual tractor travelling speed. The radar is used e.g. for detecting the wheel slip. The radar has been connected to the hydraulic power lift so that when the set slip percent is exceeded the lift order is sent to the power lift. The radar controls also the engagement of the front wheel drive and the differential lock.

Radar – You are not allowed to go under the tractor which has radar (slip control models) before the current switch has been turned off. – **dangerous for eyes.**

L. Rotation speed sensors for front axle and gearbox

Sensors (B2C and B5C) are fitted on the front face of the reverse shuttle. The gearbox speed sensor measures the bevel pinion shaft rotation speed from the impulse disc at the front end of the shaft. The front axle rotation speed is measured from the impulse disc which is fitted on the output shaft to the front axle.

M. Fitting speed sensors

See figure M and instruction on page **341/1**)

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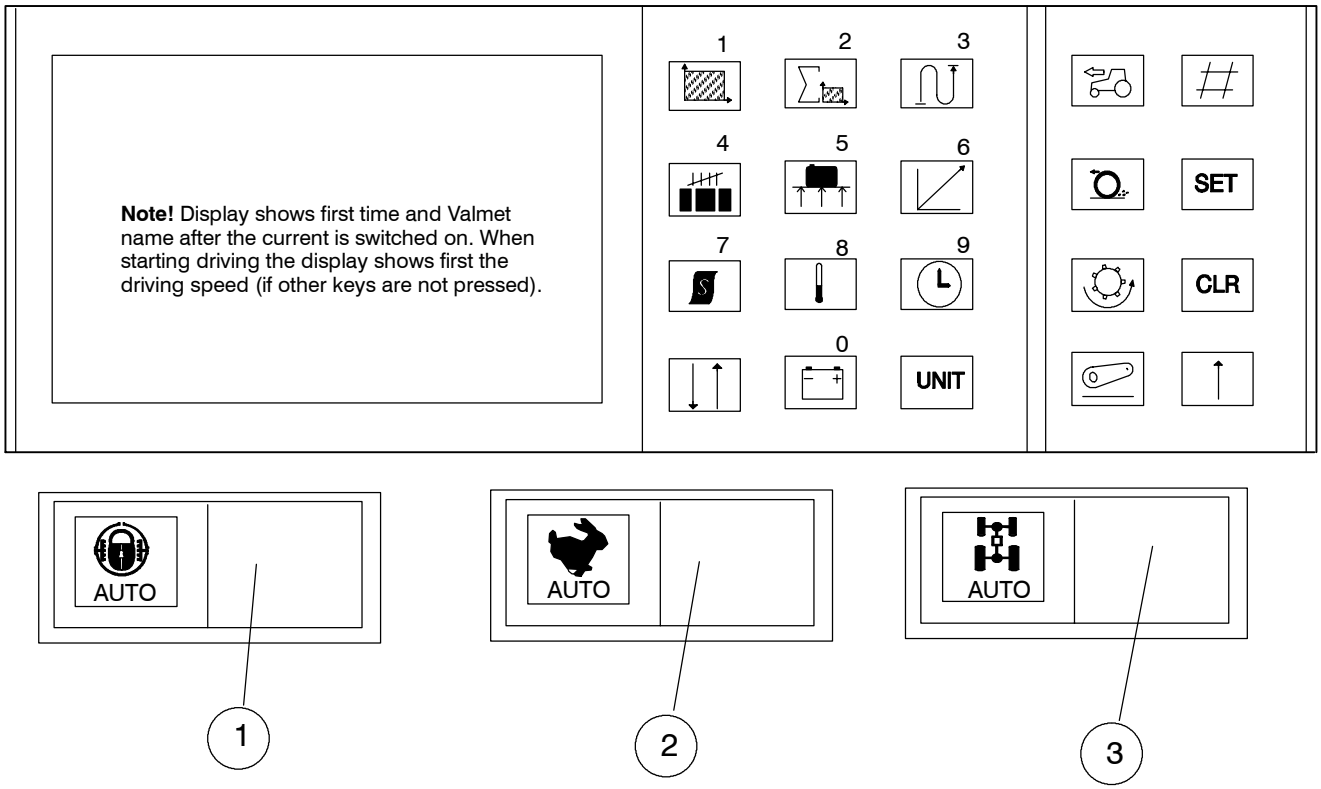


Figure 2. *AC – III display unit, function keys and rocker switches*
1. Switch for differential lock: – rear edge down = manual
– front edge down = automatic

2. Switch for quick – shift gear: – rear edge down = manual
(PS Algorithm) – middle position (A2) = automatic change according to the max. effect
– front edge down (A1) = automatic change according to the max. torque

3. Switch for 4WD: – rear edge down = manual
– front edge down = automatic

The function keys have been presented in the figures on the next page. Hidden functions of the keys have been marked with the double boxes. These hidden functions can be activated with a special function code

The function keys act as number keys when the SET – key is pressed.

Calibrating mode for the hidden functions

(this mode is needed when calibrating the quick – shift gear or when checking the speed sensors)

Some functions have been hidden from the Operator by a special code. The calibrating mode is activated as follows:
– switch on the current and start the engine
– press the function keys in the following order; **9 – 1 – 0 – 4 – 0 – 9** (do not use the SET – key, display changes every time the key is pressed).

Note! Now the quick – shift gear is ready for calibrating and the speed sensors can be checked. If the current is switched off the code must be input again.

– escaping from this mode is done by switching off the current.

Parameters

In the factory a parameter file is input with a micro computer into every AC – III system . The parameter file includes: transmission type, engine type, engaging limits for the diff. lock and the 4WD and the display language. These functions are different on different tractors.

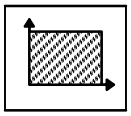
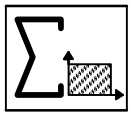
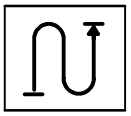
PC is connected to the AC – III socket X10C with a middle wire. In PC there must be a Service Program which sends the parameter file into the ECS. See **Code 343.**

If a fault occurs in the actual parameter file , the ECS replaces the damaged file automatically with a default parameter file. The display shows this with text DEFAULT PARA every time the current is switched on.

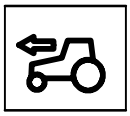
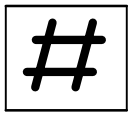
The tractor functions properly with the default parameter file, but as soon as possible the actual parameter file must be input with a PC into the system.

Micro computer can also be used for detailed fault tracing for the AC – III system (see **Code 342**)

Function keys

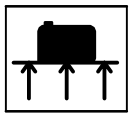
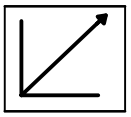




Area	Area	Distance
Trip area	Total area	Distance travelled
Working width input		Calibrating distance

Speed	
Radar speed	Starting/stopping counter
Average speed	
Gearbox speed	
Rear wheel speed	
Front wheel speed	

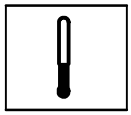
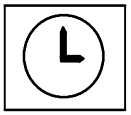
Note! One key can have several functions. E.g. when pressing RPM – key 1 – 4 times, different rotation speeds can be obtained.

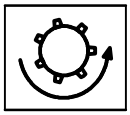
Item number	Liquid	Position
Piece counter	Liquid consumption (litres/hectare)	Position of part of implement
# Program pcs limit	Liquid amount (litres)	Calibrating pos. potentiometer
	Calibrating flow meter	# program pos actuator 1
		# automatic controlling



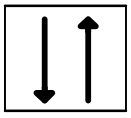
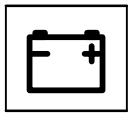
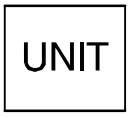

Slip	Set
Wheel slip	Programming SET value
Average slip	
Program wheel slip	

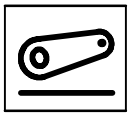
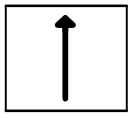
Economy	Temperature	Time
Value since start point	Coolant temperature	Time since start point
Programming the price	Outdoor temperature	Time and date
Printer		time left area or distance




RPM	Clear
Power take – off	
Engine	
Implement	
Quick – shift gear calibration	

	Voltage	Unit
Quick selection	Battery voltage	Changing unit (l, l/ha)

Linkage	
Positon of lower links	Scanning menus
Calibrating linkage pos.	

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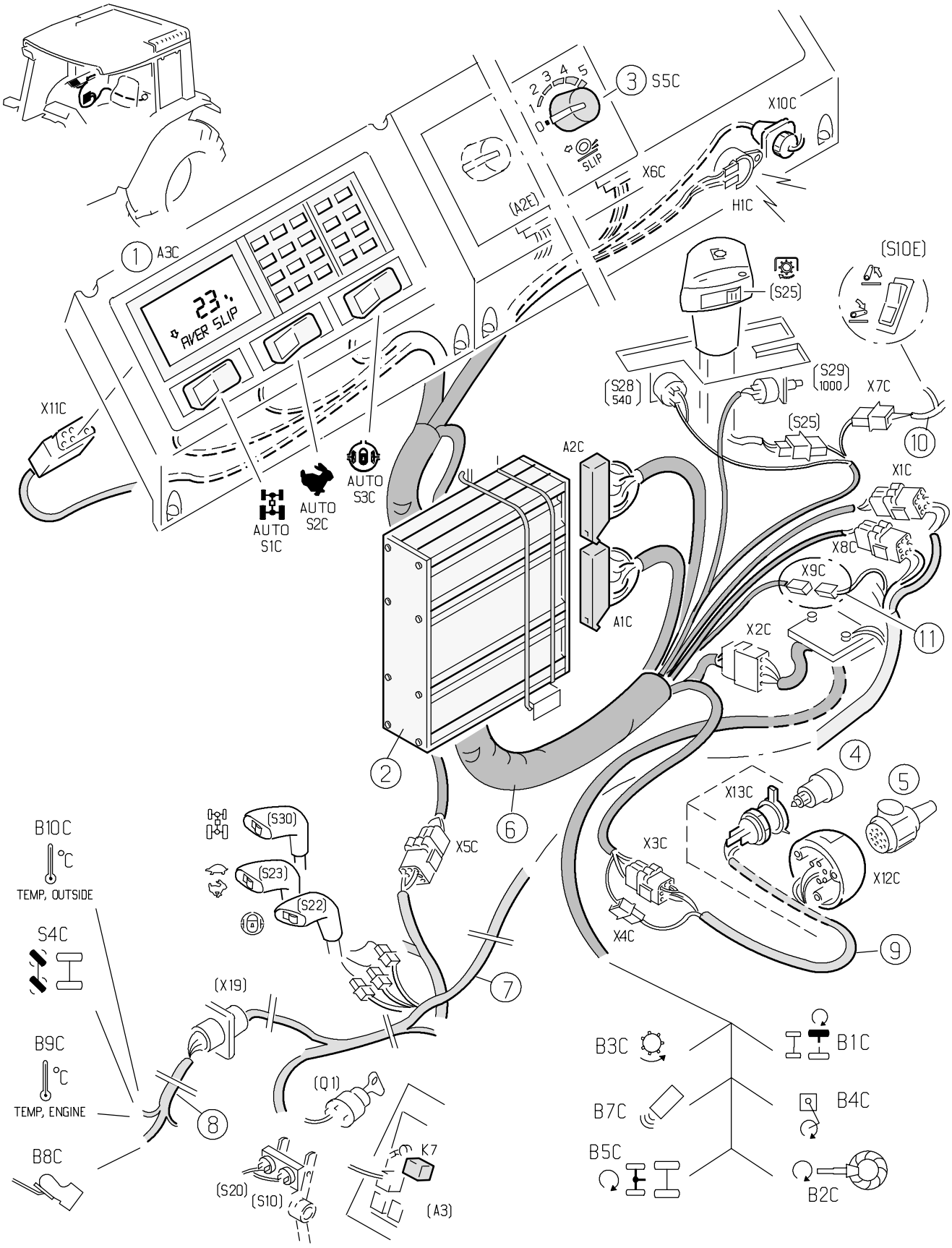


Figure 3. *Autocontrol – III harness looms and connectors*

(concerning component symbols, see component list on pages 340/10 – 12).

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Harness looms and connectors

(see figure 3 on previous page)

1. Display unit (A3C). To the display unit rear side is connected connector X11C.

2. Central processing unit (ECS) is fitted in the lever console in the cab and is accessible after removing the lever console side panel.

3. Slip Control selector (S5C).

4. PTO emergency stop socket (terminator).

5. Socket for connecting implement sensors to the AC – III system.

6. ECS harness loom.

7. Harness loom for cab.

8. Harness loom for engine.

9. Harness loom for rear sockets.

10. Harness loom for electro – hydraulic power lift.

11. If you want to use the PTO unit manually , i.e. override the ECS controls, connect connectors X9C.

Position of connectors

The following connectors are placed in the cab lever console and are accessible after removing the console side panel:
- A1C and A2C (central processing unit (2) connectors)
- X1C (connector for wires from engine harness loom (8))
- X2C (speed sensor wire connector)
- X3C and X4C (connectors for rear sockets)
- X8C (output signals from ECS)
- X9C (PTO manual control connector)

Connector X5C (switches from gear lever knobs) is on the RH side mudguard in the front part of the lever console

Electro – hydraulic power lift connectors which are in the lever console, are accessible after removing the ECS box (2).

Connector B8C (fuel injection pump potentiometer) is placed under the instrument panel

Connector X19 (sensors in front part of the tractor) is placed on the cab front wall on the RH side.

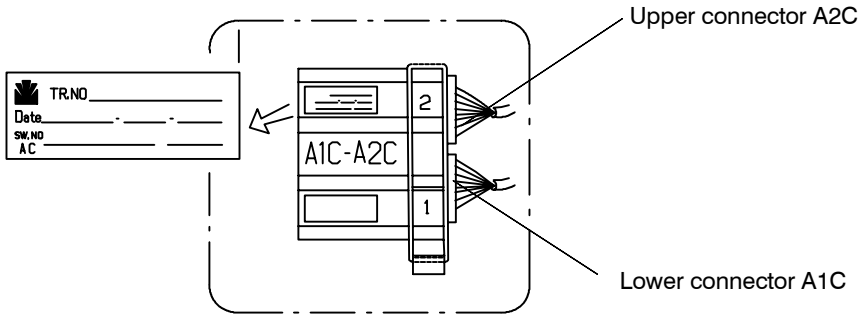


Figure 4. *Central processing unit (ECS) is placed in the lever console in the cab. Central unit is accessible when the console side panel is removed.*

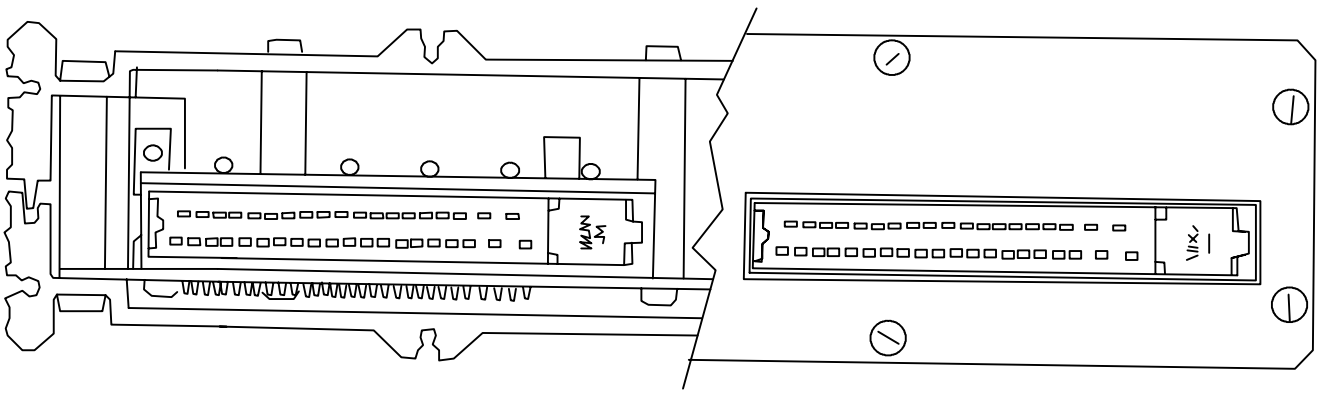


Figure 5. *Rear side of the ECS*
Voltage measurements can be done from the pins of connectors A1C and A2C. The pins have been numbered. When measuring output signals the pins must have a load.

Supply voltage can be measured from connector A2C (earth A2C:1. Supply voltage A2C:2, A2C:21 and A2C:25 (current must be switched on).

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Component list for wiring diagram

(E-models). Diagram no. 325 499 00 32B.

Sym-bol	Component	Code no
(A2)	Radio	2
A3	Distribution box	
(A4)	Velocity meter	
(A5)	Seat with air springs	67
(A7)	Electric air filter	68
(A8)	Buzzer control	
B 1	Sender unit, engine temperature	13
B 2	Sender unit, fuel gauge	16
E 1	Headlights, right	24
E 2	Headlights, left	23
E 3	Front direction indicator, right	28
E 4	Front direction indicator, left	26
E 5	Rear light, right	31
E 6	Rear light, left	30
E 7	Cabin light	43
E 9	Rear working light, right outer	38
E10	Rear working light, right inner	37
E11	Rear working light, left outer	39
E12	Rear working light, left inner	38
E13	Front working light, right	41
E14	Front working light, left	41
E15	Instrument light	14,16
E16	Roof console light	51
(E17)	Seat heating	67
(E18)	Foot step light	42
(E20)	Parking light, right Norway	27
(E21)	Parking light, left Norway	27
(E22)	Number plate light	
F 1	15 A Hazard warning flasher, reserve	29
F 2	5 A Radio (clock),	2
F 3	10 A Main beams, –ind. light	23
F 4	10 A Dipped beams	23
F 5	5 A Parking light, left	26
F 6	5 A Parking light, right	28
F 7	10 A Front working lights	40
F 8	20 A Light switch	27
F 9	15 A Trailer socket	31
F10	15 A Starter switch, thermostart	4
F11	5 A Autocontrol (+30)	69
F12	10 A Rot. warning light, cabin and door light	44
F13	10 A Brake lights	54
F14	10 A Reserve	66
F15	20 A Fan III-speed	49
F16	10 A Rear working lights, inner	38
F17	10 A Direction indicators	29
F18	5 A Instruments, warning lights, Autocontr.	14
F19	10 A Combination lever, wiper return	20
F20	10 A Rear window wiper/washer	45
F21	15 A Fan I, II, Air conditioner, Floor fan	48
F22	10 A Solenoid valves, ECS	57
F23	10 A Rear working lights, outer	38
F24	10 A ECS	85
F25	10 A Seat with air springs, seat heating	67
F26	10 A Reserve/electric air filter	68
F27	10 A Reserve	68
F28	10 A Reserve (telephone)	66
F29	10 A Cigarette lighter, Power socket	35
F30	10 A Reserve	56

Sym-bol	Component	Code no
G 1	Battery	1
G 2	Alternator	4
H 1	Ind. light, direction indicator III	34
H 2	Ind. light, direction indicator II	33
H 3	Ind. light, direction indicator I	32
H 4	Warning light, engine air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, STOP, engine temp.	13
H 7	Warning light, gearbox oil pressure	9
(H8)	Gearbox oil filter	
H 9	Ind. light, 4WD	58
H10	Ind. light, PTO 540	61
H11	Ind. light, parking brake	11
H12	Ind. light, thermostart	5
H14	Ind. light, main beams	22
H15	Warning light, low fuel level	12
H16	Ind. light, charging	6
H18	Warning light, gearbox oil temperature	12
H20	Warning light, differential lock	57
H21	Ind. light, PTO 1000	61
H22	Reserve/Ind. light, quick-shift gear (ECS)	
H23	Horn	18
(H24)	Rotating warning light	44
K1	Relay, front working lights	40
K 2	Relay, rear working lights	38
K 3	Relay, thermostart	55
K 4	Starter switch relay	7
K 5	Starter switch relay	9
K 6	Relay, fan III speed	49
K 7	Brake lights (ECS)	56
K 9	Relay, interval wiper	20
K10	Direction indicator relay	31–32
K14	Starter motor relay	4
M 1	Starter motor	3
M 2	Fan	48
M 3	Windscreen wiper	21
M 4	Windscreen washer	19
(M 5)	Rear window wiper	46
(M 6)	Rear window washer	45
M 7	Floor fan	50
P 1	Engine coolant thermometer	14
P 2	Fuel gauge	16
P 3	Revolution counter	16
P 4	Hour recorder/working height	17
Q 1	Starter switch	4
(Q 2)	Main circuit breaker	2
R 1	Thermostart	6
(R 4)	Cigarette lighter	35
S 1	Switch, headlights	25–26
S 2	Switch, rear working lights	37
S 3	Switch, fan	48
S 4	Combination control	19
S 5	Switch, front working lights	40
(S 6)	Switch, rot. warning light	44
S 7	Switch, hazard warning flashers	30
(S 8)	Switch, air conditioner	47

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Sym–bol	Component	Code no
S 9	Safety circuit breaker	4
S10	Brake light contact, right	54
S11	Fuel gauge sender unit	16
S12	Pressure drop indicator, air filter	7
S13	Engine oil pressure sender unit	8
S15	Sender unit to hand brake ind. light	11
S16	Gearbox temperature sender unit	12
S17	Gearbox oil pressure sender unit	9
S18	Engine temperature sender unit (STOP)	13
(S19)	Air cond. compressor pressure switch	47
S20	Brake light contact, left	54
S22	Switch, differential lock	89
S23	Switch, quick–shift gear (engaging)	95
S24	Switch, quick–shift gear (disengaging)	58
S25	Switch, power take–off	63
S28	Switch, PTO 540	62
S29	Switch, PTO 1000	65
S30	Switch, 4WD	88
S31	Switch, floor fan	50
(S32)	Switch, rear window washer and wiper	45
(S52)	Switch, floor	42
V 1...4	Diode	
X 1	Connector, 9 pins, distribution box	
X 2	Connector, 9 pins, distribution box	
X 3	Connector, 9 pins, distribution box	
X 4	Connector, 9 pins, distribution box	
X 5	Connector, 9 pins, distribution box	
X 6	Connector, 9 pins, distribution box	
X 7	Connector, 9 pins, distribution box	
(X 8)	Connector, 2 pins, power socket	36
X 9	Connector, 9 pins, combination control	
X10	Connector, 9 pins, combination control	
X11	Connector, 9 pins, upwards	
X12	Connector, 9 pins, rearwards, right	
X13	Connector, 4 pins, solenoid valves	
X14	Connector, 9 pins, rearwards, left	
X15	Connector, 3 pins, air cond., diodes	
X16	Connector, 3 pin., cigarette lighter, current socket	
X17	Trailer socket 7 pins	30
X18	Connector, 2 pins, rear window washer	
X19	Connector, 37–pins. ECS , front wall	10
X20	Connector, 9 pins, front direction ind.	
X21	Connector, 3–pins, buzzer	
X22	Connector, 1 pin, rot. warning light	
X24	Connector, 9 pins., upwards	
X26	Connector, 26 pins, instr. left white	
X27	Connector, 26 pins, instr. right blue	
X28	Connector, 6 pins, diodes	
X49	Connector, 2 pins, seat	
Y 1	Solenoid valve, diff. lock	56
Y 2	Solenoid valve, PTO	63
Y 3	Solenoid valve, 4WD	60
(Y 4)	Solenoid valve, quick–shift gear	65
(Y 5)	Solenoid valve, compressor	47

/1	Earth lead, rear lights
/2	Earth lead, roof
/4	Earth lead, Autocontrol
/5	Earth lead, cable harness instr. panel
/7	Earth lead, battery
/8	Earth lead, headlights
/9	Earth lead, cab

Optional equipment listed in brackets.

ECS

Sym–bol	Component	Code no
A1C	Central processing unit (ECS), red	80
A2C	Central processing unit (ECS)	91
B1C	Speed sensor, rear wheel	78
B2C	Speed sensor, gearbox	78
B3C	Speed sensor, PTO	79
B4C	Speed sensor, engine	79
B5C	Speed sensor, front axle	78
B7C	Radar	77
B8C	Potentiometer, fuel injection pump	87
B9C	Temperature sensor, thermostart	93
B10C	Outdoor temperature sensor	92
H1C	Buzzer	94
H2C	Led, slip control	
S1C	A/M–switch, diff. lock	88
S2C	A/M–switch, quick–shift gear	91
S3C	A/M–switch, 4WD	88
S4C	Switch, steering angle	90
S5C	Switch, slip control	
X1C	Connector, 9 pins, front (yellow)	
X2C	Connector, 15 pins, speed sensors	
X3C	Connector, 9 pins, rear sockets (black)	
X4C	Connector, 3 pins, rear sockets (black)	
X5C	Connector, 9 pins, switches on lever knobs	
X6C	Connector, 12 pins., Autocontrol switch panel	74
X7C	Connector, 3 pins, Autocontrol cable harness	
X8C	Connector, 9 pins, outputs (red)	
X9C	Connector, 1 pin, PTO manual control	
X10C	Connector, 8 pins, RS232/RS485	
X11C	Connector, 9 pins, display unit	77
X12C	ECS–socket 13 pins	
X13C	PTO emergency switch, socket, 2 pins.	62

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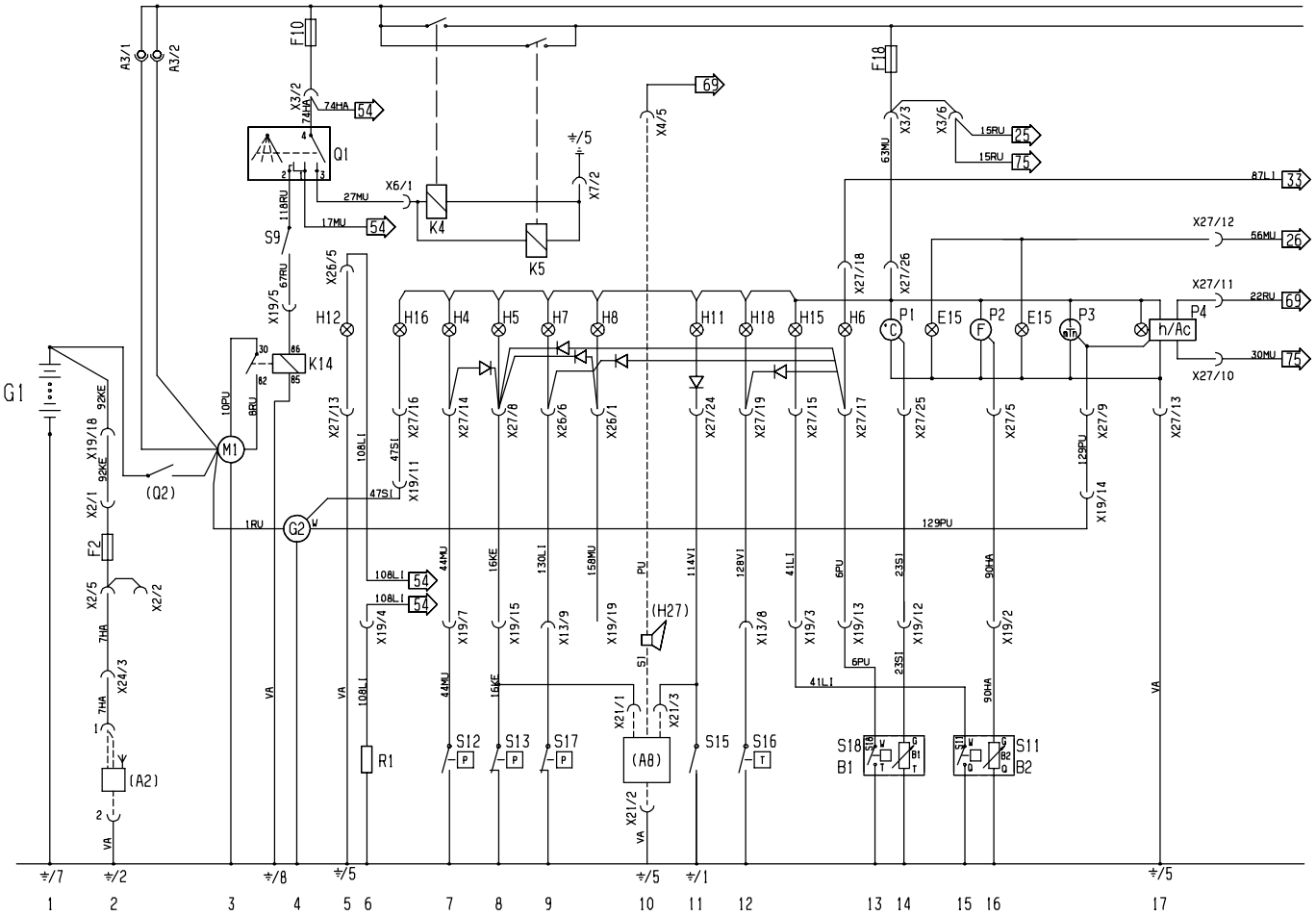
Autocontrol

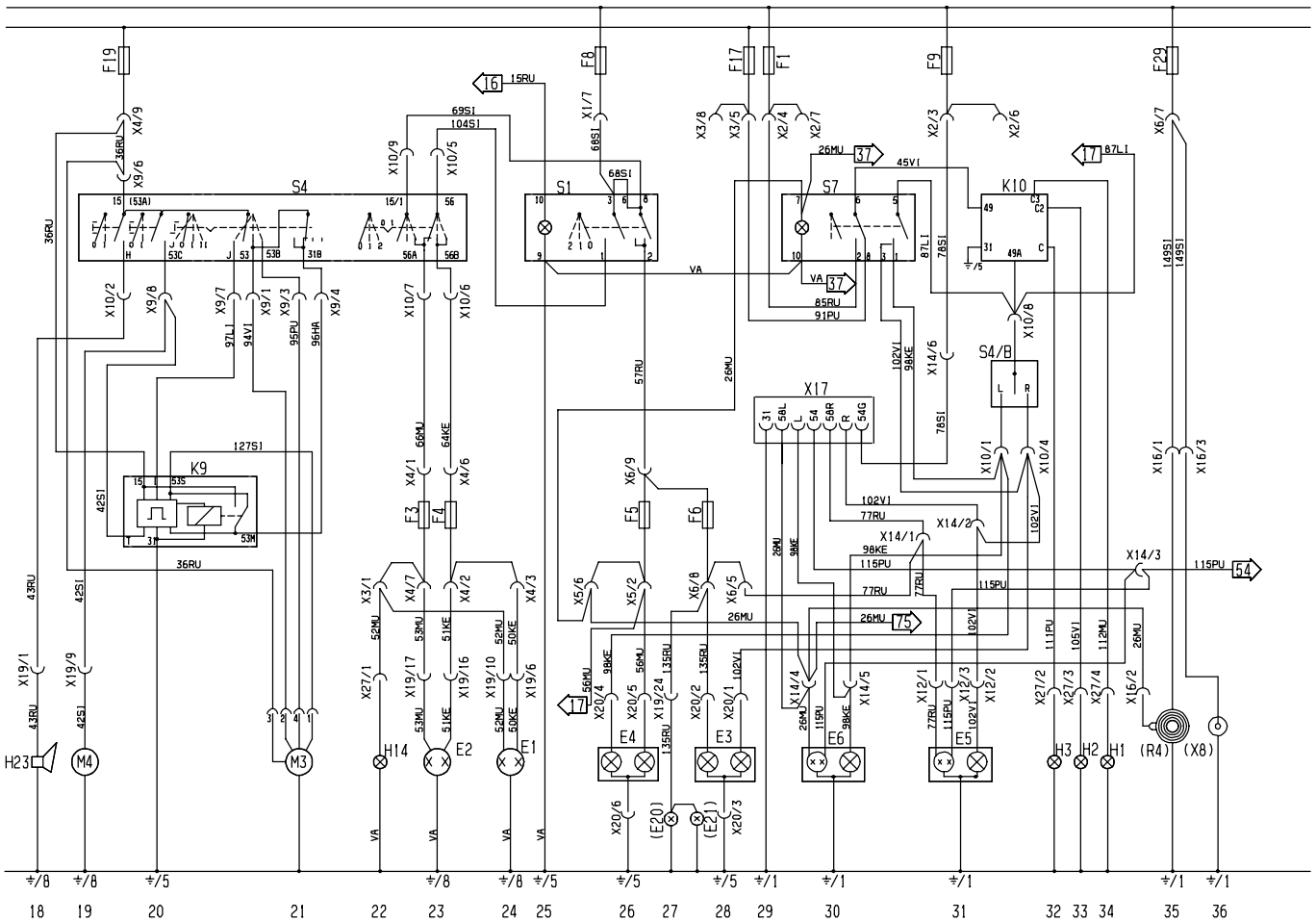
Sym-bol	Component	Code no
A1E	Autocontrol central unit	71
A2E	Autocontrol switch panel	74
A3E	Compensator	70
B1E	Position sensor	69
B2E	Draft sensor, right	69
B3E	Draft sensor, left	69
E1E	Illumination, switch panel	74
E2E	Illumination, position control knob	75
R1E	Potentiometer, position control	74
S1E	Push button, right mudguard, lifting,	71
S2E	Push button, right mudguard, lowering	71
S3E	Push button, left mudguard, lifting	70
S4E	Push button, left mudguard, lowering	70
S5E	Push button, cabin, lifting	73
S6E	Push button, cabin, lowering	73
S7E	Switch, lowering speed	74
S8E	Switch, transport height	74
S9E	Switch, draft control/position control	74
S10E	Switch, lift/lower switch	74
X2E	Connector, 9 pins, supply, push buttons	
Y1E	Solenoid valve, lowering	69
Y2E	Solenoid valve, lifting	69

Wire colours

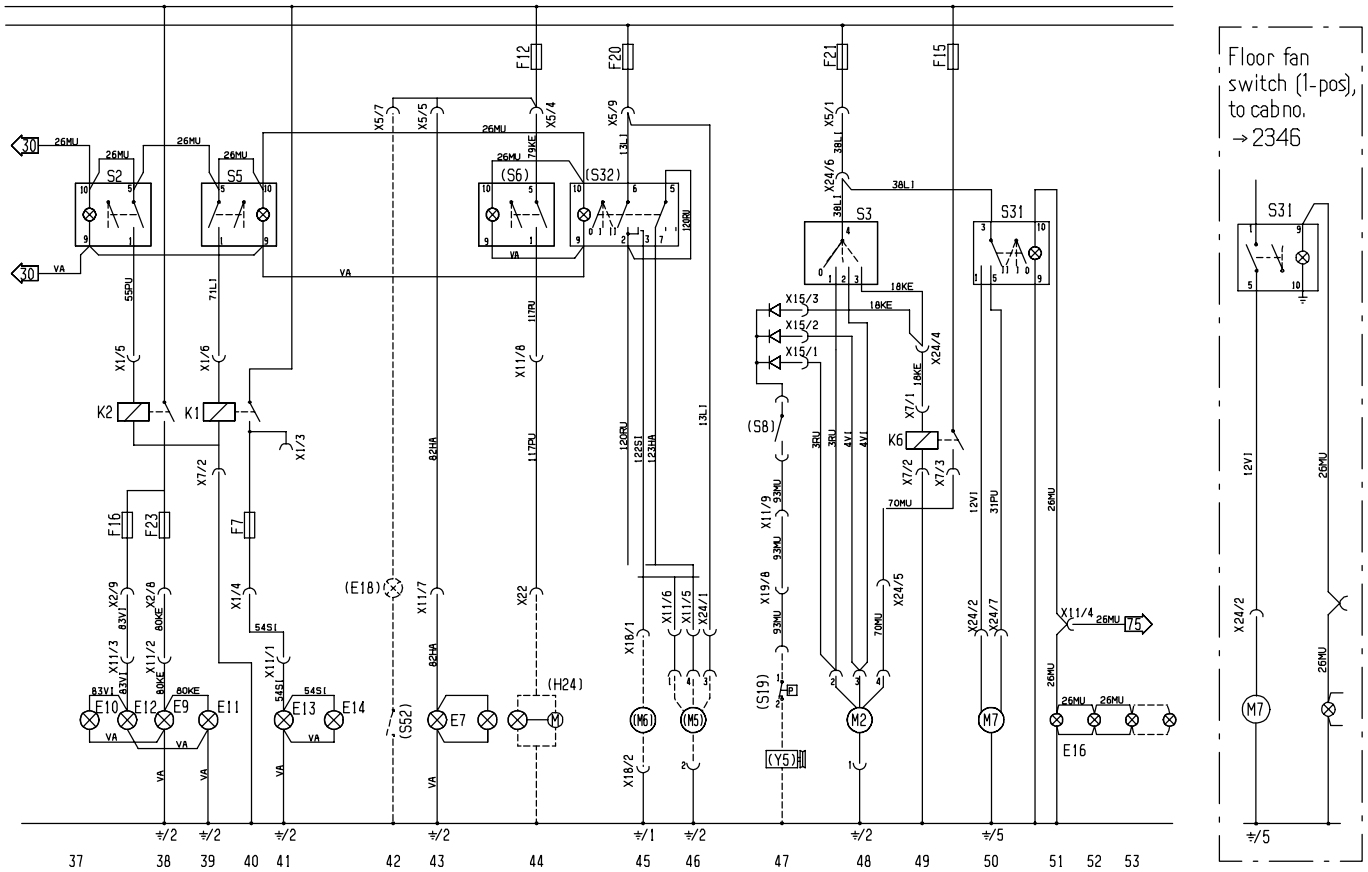
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

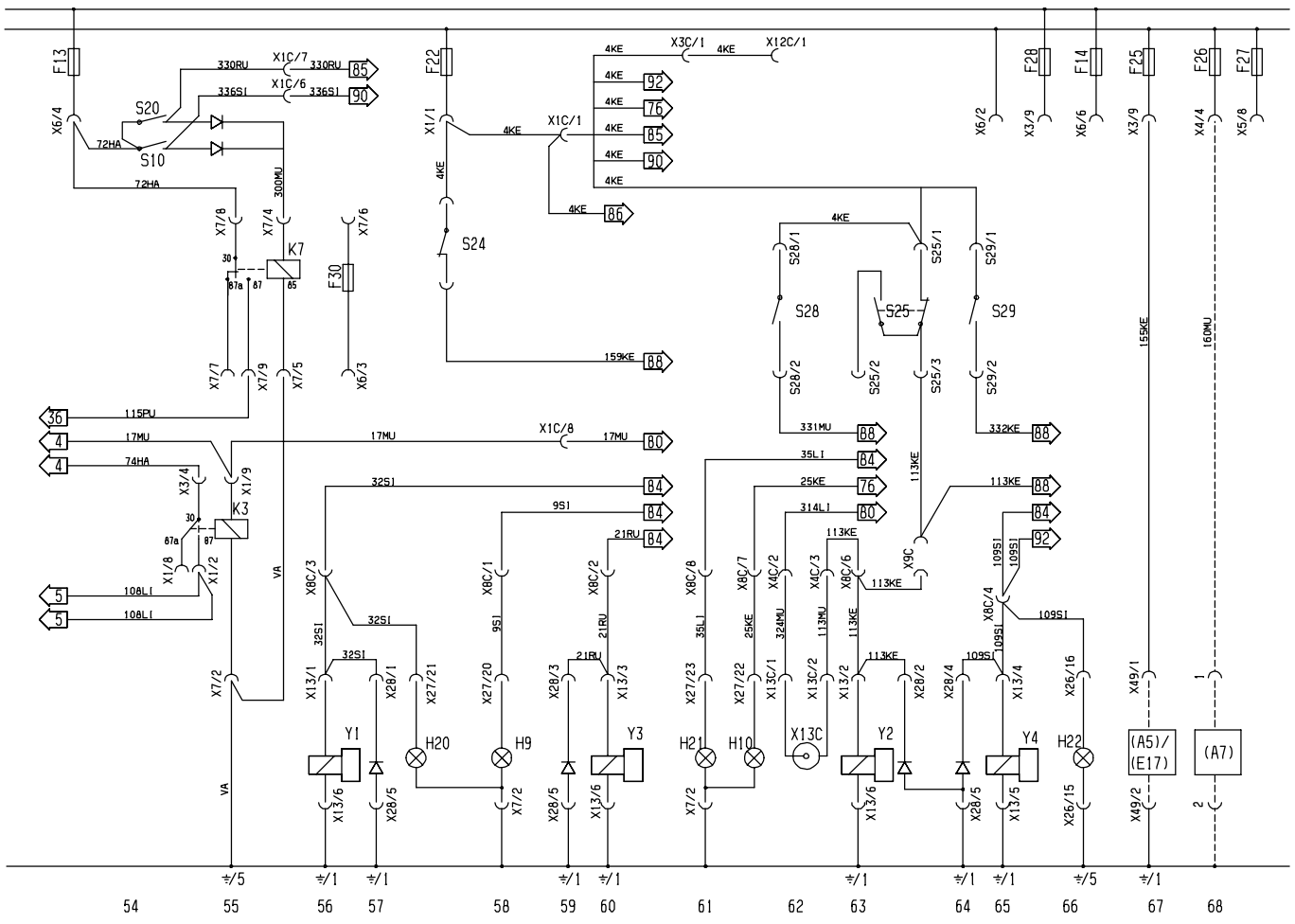
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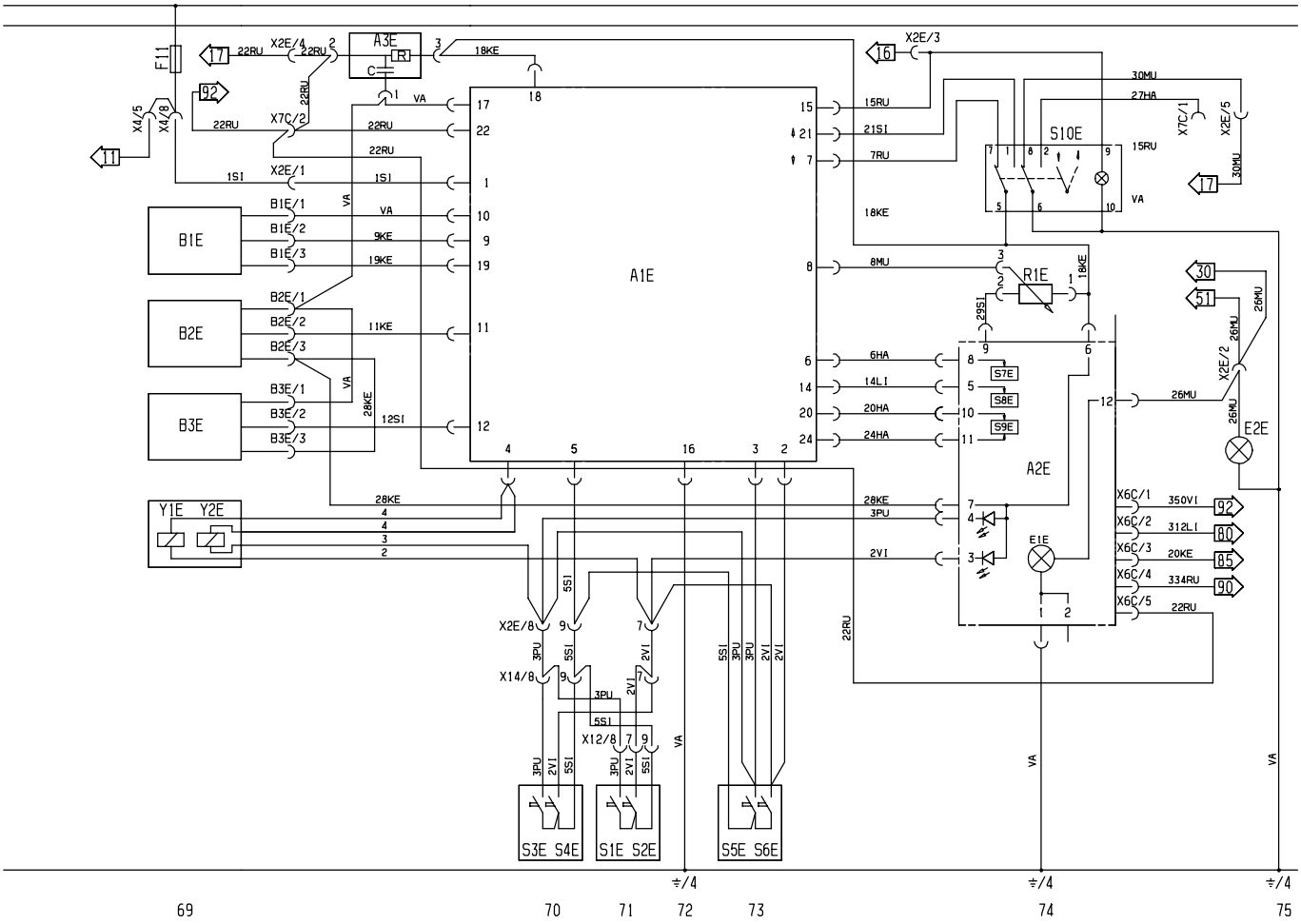
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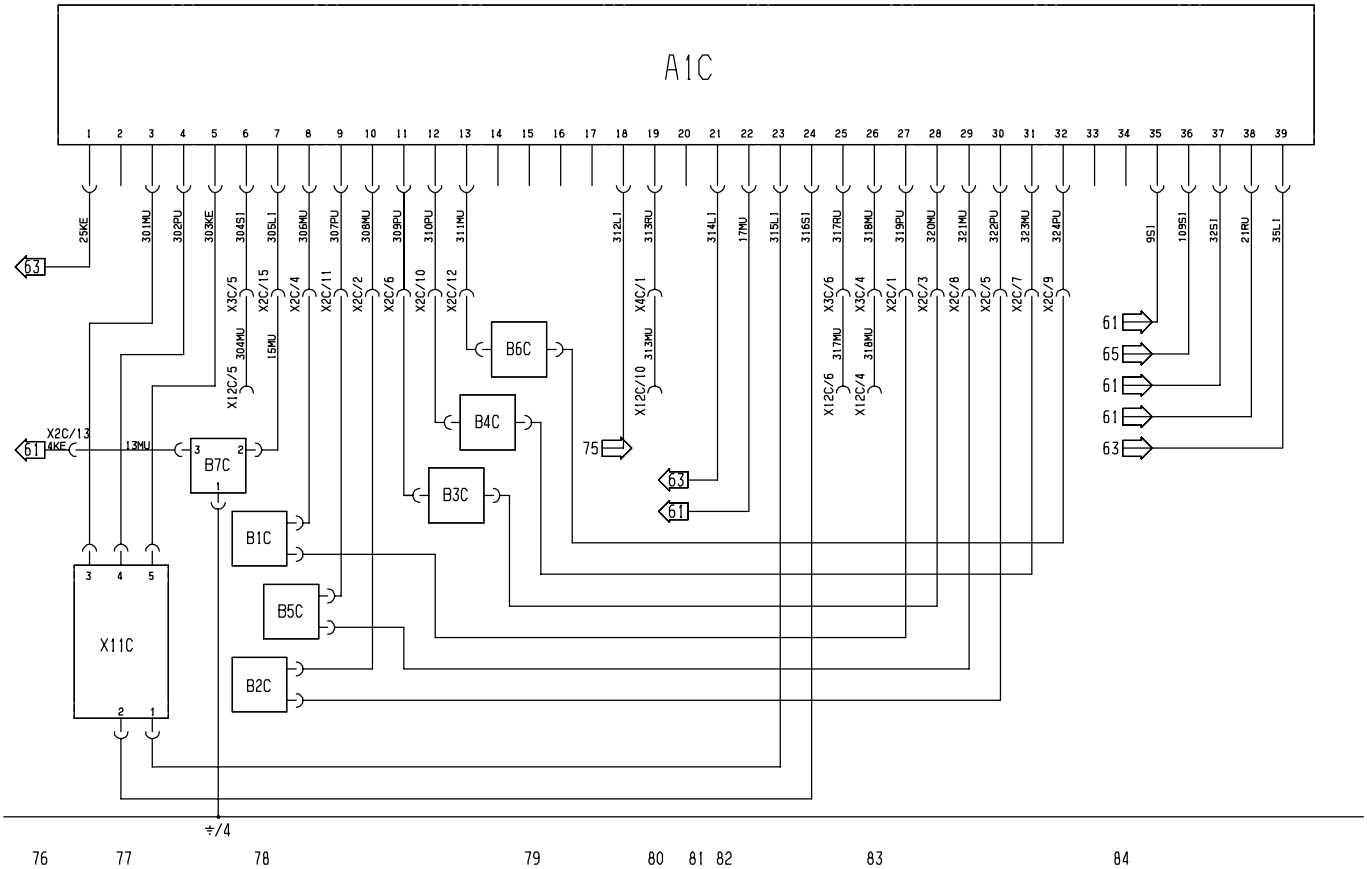


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Autocontrol

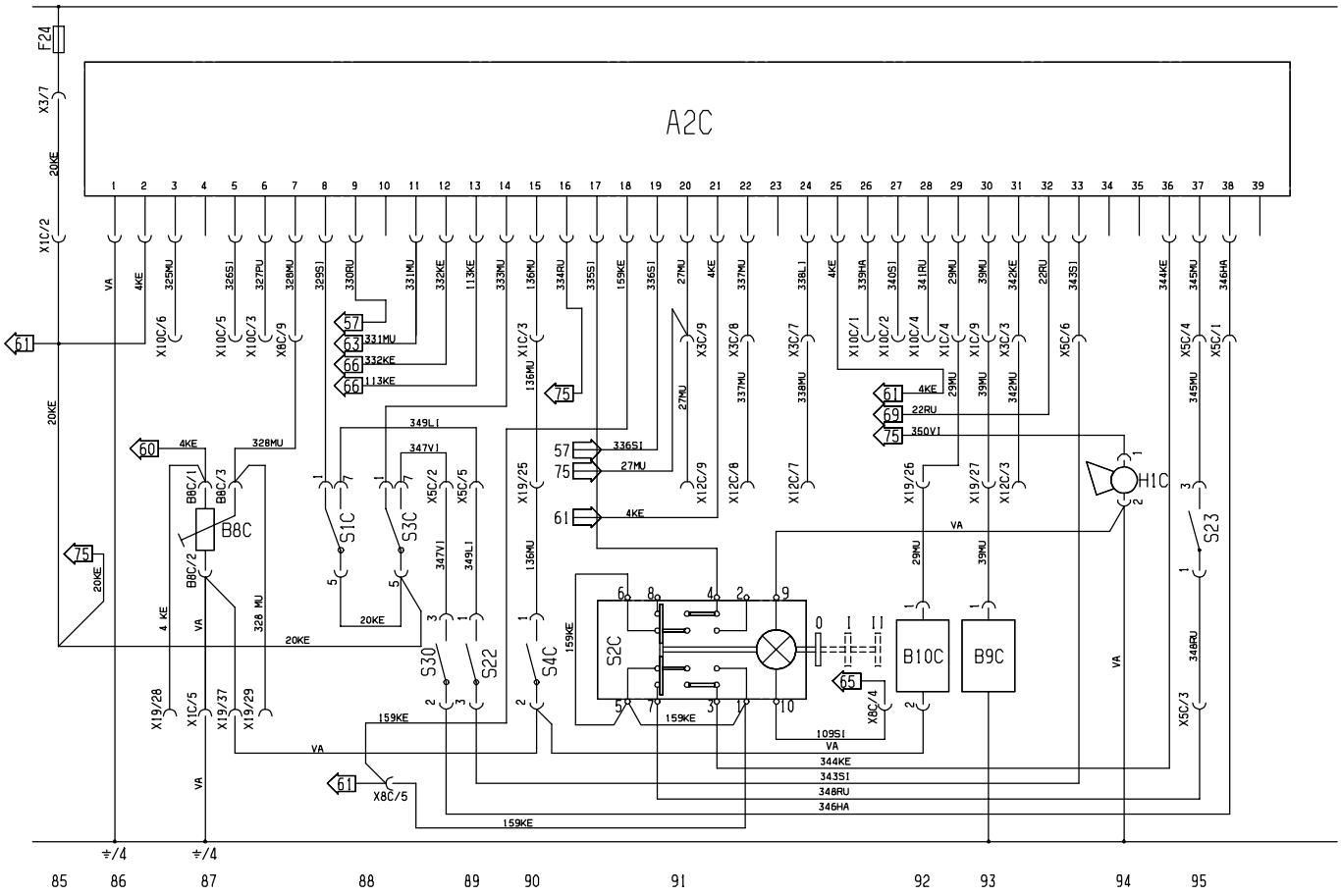


ECS



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ECS



Trouble shooting and repairs

(Computer – aided trouble shooting, see **Code 342**)

1. Checking and fitting sensors

A. Fitting speed sensors

– Clean the sensor threads on the tractor.
– Seek with a dial gauge the shortest distance between the sensor and the impulse disc through the sensor hole (not necessary for engine speed sensor. Pull the 4WD output shaft outwards before measurement).
– Apply Loctite 572 onto the threads and screw the sensor by hand until the sensor touches the impulse disc or gear (do not screw too hard because the impulse disc can be springy).
– Then unscrew the sensors as follows:

Gengine speed sensor 1/3 of a turn
Grear axle sensor 1/4 of a turn
GPTO speed sensor 1/3 of a turn
Ggearbox speed sensor 1/10 of a turn
Gfront axle sensor 1/10 of a turn

– Lock the sensor with a locking nut and connect wires.
– Calibrate and check the speed sensors (see **instr. B).** Check the engine rotation speed sensor (see **instr. C**) and check the PTO speed sensor (see **instr. D**)

N.B. The sensors should be checked with an oscilloscope if necessary. The resistance of every speed sensors (not a radar) is **1,0 – 1,10 kΩ**

– When the sensor functions, fit a plastic tube onto the sensor leads. Connect cable shoes to the sensors and protect shoes with grease. Put the plastic tube onto the sensor and warm it up until it is pressed tightly round the sensor. See figure M on page 340/4.

B. Calibrating the speed sensors

1. Drive the tractor onto the hard ground (free driving distance about 50 m)

2. Select gear **M2**, disengage diff. lock and 4WD (in M – position). Select HARE – range for the quick shift gear and adjust the engine revs to **1800 RPM** with a hand throttle lever.

3. Press the distance – key two times and the display shows text **CAL DIST**.

4. Drive the tractor straight ahead with the hand throttle lever.

5. Press **SET** – key (display shows text **DRIVE**). Continue driving until the display is switched off and then started again (=successful calibration).

6. If the display shows text **NO CALIB** (=signal from the radar too weak), carry out a new test – driving. If the calibration fails again, check the radar and its wiring.

7. If the display shows:
– **ERROR GB**=gearbox speed sensor damaged
– **ERROR FA** = front axle speed sensor damaged
– **ERROR RW** = rear wheel speed sensor damaged
In this case, check the sensor in question and also its mounting and wiring.

8. After successful calibration, change display to the **calibrating mode for the hidden functions** (see page **340/6**) and continue driving straight ahead.

9. Press once the SPEED – key, and the display shows the **radar speed**.

10. Press then twice the SPEED – key and the display will show the **gearbox speed** which should be the same as the radar speed (±0,1 km/h).

11. Press once again the SPEED – key and the display will show the **rear axle speed** which should be the same as the previous speeds (±0,1 km/h).

12. Press once again the SPEED – key and the **front axle speed** can be seen. It must be the same as the previous speeds (±0,1 km/h).

13. Press the menu scanning key four times = radar speed.

Note! The calibrating mode can be left by switching off the current.

C. Sensor for engine revs

The engine RPM sensor can be checked by pressing the RPM – key until the display shows the engine revs. The display reading must be about the same as the rev counter reading (± 50 RPM) in the instrument panel.

Checking can be carried out more accurately by adjusting the engine revs in the display to 1874 r/min at which time the PTO shaft rotating speed must be 540 r/min which can be seen in the display by pressing the RPM – key.

If the display does not show the engine RPM, check the sensor and its wiring. The resistance of the sensor must be between **1,0 – 1,10 kΩ** (pins A1C/31, 12). If the sensor is OK, the possible fault can be a faulty ECS or the display unit is defective. Also the impulse disc can be damaged.

D. PTO speed sensor

Engage the 540 r/min PTO. Press the RPM – key until the display shows the PTO shaft speed. Adjust the engine revs so that the rev counter indicator in the instrument panel is at the 540 mark. Now the AC – III display should also show 540 RPM (± 50 RPM). In the same way, check the 1000 r/min PTO.

More accurately the display reading for the PTO speed can be checked by measuring the PTO shaft speed with a separate tachometer. Then compare the tachometer reading with the reading in the the AC – III display.

If the display does not show the PTO RPM, check the sensor and its wiring. The resistance of the sensor must be between **1,0 – 1,10 kΩ** (pins A1C/28, 11). If the sensor is OK, the possible fault can be a faulty ECS or the display unit is defective. Also the impulse disc can be damaged. **N.B.** Check that the emergency plug is fitted in the rear socket.

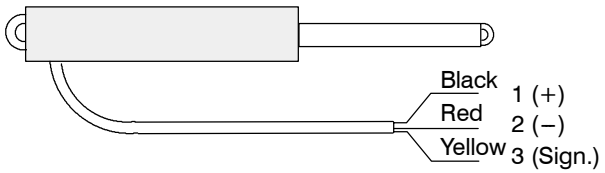
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E. Potentiometer on the fuel injection pump

The potentiometer must be adjusted so that when the accelerator pedal (governor control lever) is in its extreme positions, the pedal (or governor control lever) movement is not limited by the potentiometer because it does not resist that kind of load.

Measure the potentiometer voltage between pins 2 and 3 in connector B8C (under instrument panel). The voltage reading must be **below 3 V** when the accelerator pedal is in its upper position and **over 9 V** when the pedal is in lowest position. (difference between max and min reading at least 6 V).

Resistance measurements of the potentiometer:



1 – 2:
resistance about **1,01 k**Ω

3 – 2
– spindle in, resistance about **0,62 k**Ω
– spindle out, resistance about **1,89 k**Ω

If the resistance values deviate, the potentiometer is faulty.

F. Sensor for engine coolant temperature

Press once the temperature – key and the engine coolant temperature can be seen in the display. Measure the coolant temperature with a separate thermometer and compare the readings. If the display reading is faulty or there is no coolant temperature reading, check the sensor and its wiring. If these are OK the ECS or the display unit can be faulty.

Resistance values at certain temperatures:

–20˚C	6480± 1000 Ω
±0˚C	2450±320 Ω
+20˚C	1450±118 Ω
+40˚C	496±44 Ω
+60˚C	245±22 Ω
Pins:	Sensor poles
	Plug X19/27
	Connector X1C/9
	ECS connector A2C/30

G. Sensor for outdoor temperature

Press the temperature – key twice and the display will show the outdoor temperature. Compare the display reading with a reading measured with a separate thermometer. If the reading is faulty or there is no outdoor temperature reading on AC III display, check the sensor and its wiring. If these are OK the ECS or the display unit can be faulty.

Resistance values at certain temperatures:

±0˚C	10,00±1,0 kΩ
+22˚C	3100±50 Ω
Pins:	Sensor poles
	Plug X19/26
	Connector X1C/4
	ECS connector A2C/29

H. Sensor for steering angle

A steering angle sensor magnet must be fitted so that yellow dots point towards the sensor. Distance between the magnets and sensor must be adjusted to 5 mm. When the front wheels are straight ahead, the middle magnet should be opposite the center line of the sensor.

– sensor resistance is **33** Ω, when the sensor is at the magnet.
– otherwise **10 k**Ω or greater.

Pins:	Sensor poles
	Plug X19/25
	Connector X1C/3
	ECS connector A2C/15

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2. Fault tracing without microcomputer

A. Manual fault tracing

(Computer – aided traouble shooting, see Code **342**)

Manual fault tracing is based on the functional checks and possible malfunctions which are found in these checks (see pages **341/4 – 7** later in this section).

A possible malfunction can then be localised by measuring with a voltmeter voltages or resistances from the pins of the ECS connectors A1C (lower) and A2C (upper). Connector pins have been numbered on the connectors.

Inputs

Input signals for controlling the transmission can be measured from the connector A2C. The measurements are carried out according to the fault tracing tables in instruction under code **342** (computer – aided trouble shooting). Switches and pedals must be in the positions given in the tables. If no input signal comes, check the switch in question and its wiring.

Input signals from various sensors can be checked by means of resistance measurements according to the instruction **1 A – H** above.

Outputs

Output signals for controlling the transmission can be measured from the pins of connector A1C. The pins must have loading when measuring (e.g. test pen). Here must also be used the tables under code **342**. If a correct output signal comes, but the tractor does not function, check a solenoid valve and an indication light in question and their wirings. If output signal fails to come, the ECS is faulty. Output signals into the implement socket, see page **342/9**.

A. Supply voltages

– Switch on current to the tractor
– If Valmet – name and time appears on the AC III display, the unit is in order.
– If nothing appears on the display, check the AC III unit fuses in the fusebox: **F22** (10 A) and **F24** (10 A).
– If the fuses are OK, disconnect the ECS upper connector A2C and measure supply voltages: **pin 1** (earth), **pin 2** (supply), **pin 21** (supply) and **pin 25** (supply).
– If there are not supply voltages, check supply voltage wirings and connectors.
– If there are supply voltages, the central unit ECS is faulty or the display unit is defective.

B. ECS (central processing unit)

If the AC III display unit only flashes and then switches off when the current is switched on, the ECS is faulty and should be changed.

If the ECS uses always the default parameter file although a correct file is input with a microcomputer, the ECS is faulty and should be changed.

When You are programming the AC III unit with a microcomputer and message ERROR IN EPROM appears in the message window, switch off current and start from the beginning. If the same message appears, the ECS should be changed.

When You measure output signals from the ECS, the lacking signal indicates that the ECS is faulty and must be changed.

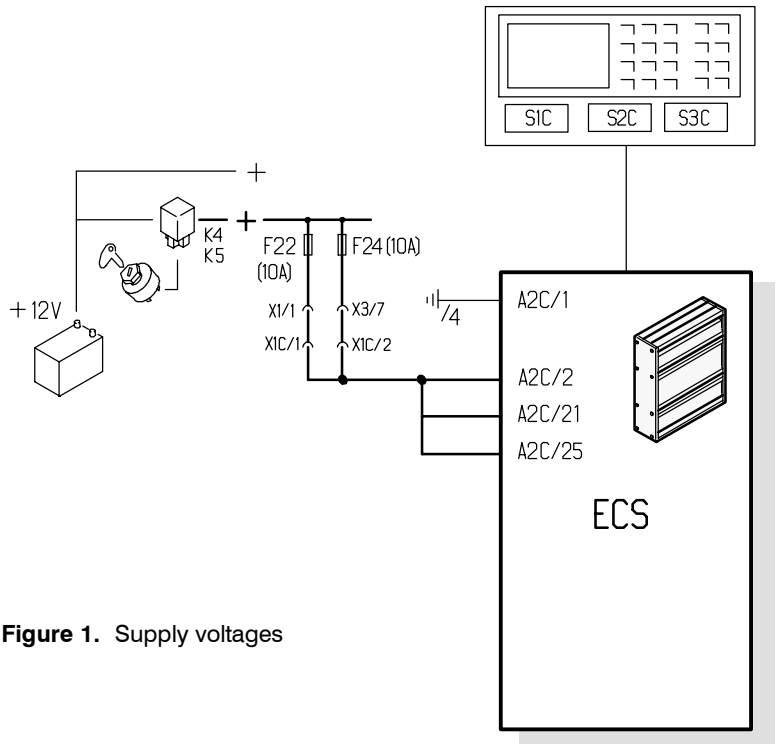


Figure 1. Supply voltages

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3. Functional check

(Fault tracing with a microcomputer, see under code no **342**)

A. Front wheel drive

– start the engine (tractor stationary and the brake pedals are not pressed).
– set the 4WD rocker switch to M – position
– engage and disengage the 4WD with a switch on the range gear lever knob. Indicator light comes on in the engaged position.
– disengage the 4WD
– press brake pedals (latched together) at which time the indicator light should be lit
– release the brake pedals and the indicator light goes out.
– press one brake pedal. Ind. light must not come on.
– engage the 4WD with the switch on the lever knob and the ind. light comes on.
– turn the 4WD rocker switch to the A – position and the ind. light should go out.
– the 4WD engages (A/M – switch in A – position) when the clutch pedal is released rapidly. Declutch (wheels stop) and after 8 seconds the 4WD must be disengaged.

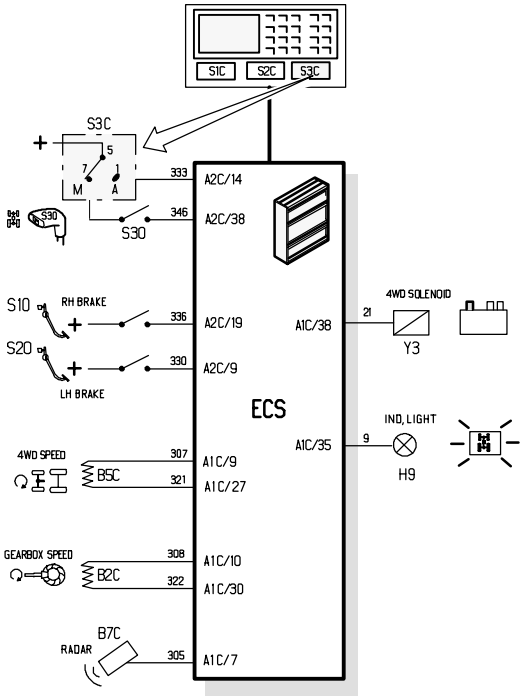


Figure 2. Inputs and outputs to/from the ECS for controlling the 4WD

B. Differential lock

– start the engine (tractor stationary and the brake pedals are not pressed).
– set the diff. lock rocker switch to M – position
– engage and disengage the lock with a switch on the reverse shuttle lever knob. Indicator light comes on in the engaged position.
– engage the diff. lock with the lever knob switch
– press the brake pedal/pedals (both separately and latched together) and the ind. light goes out
– release the pedal/pedals and the ind. light comes on.
– turn the diff. lock rocker switch to A – position and the ind. light goes out
– remove fuse F13 (brake lights). Unlatch the brake pedals.
– drive the tractor (front wheels straight ahead) and brake one rear wheel at which time the diff. lock indicator light comes on
– while the ind. light is on, turn the front wheels over ±10°, and the diff. lock ind. light should go out.
– Turn the front wheels straighter (further pressing one brake pedal) and the diff. lock ind. light comes on
– stop the tractor and the diff. lock disengages

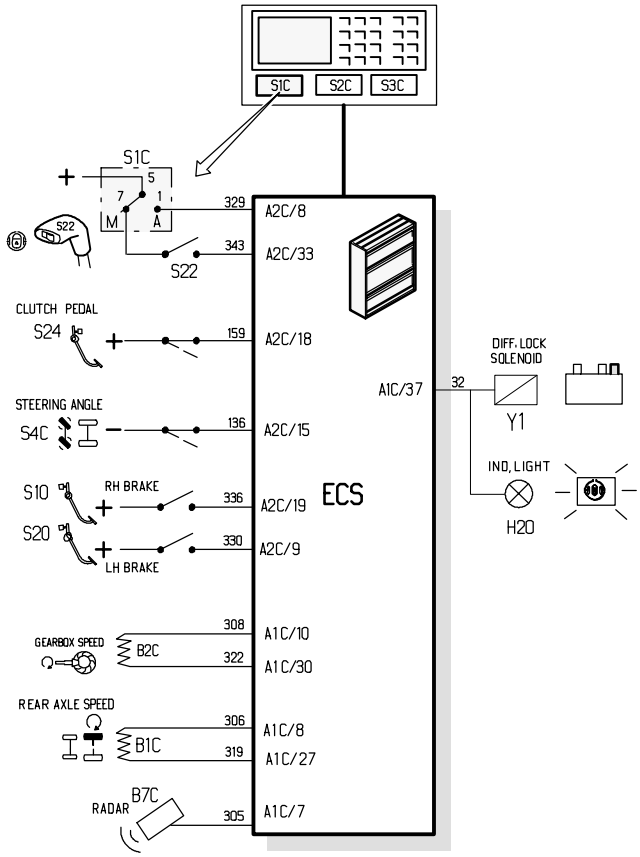


Figure 3. Inputs and outputs to/from the ECS for controlling the differential lock

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C. Quick – shift gear

– set the quick – shift gear rocker switch to M – position
– drive the tractor and engage and disengage the quick – shift gear with a switch on the speed gear lever knob
– in HARE – position, a light comes on in the A/M – switch
– set the lever knob switch to the HARE – position
– set the A/M – switch to the middle position (A_2, max. effect)
– set the display to show the engine revs.
– select gear H1 and drive at engine revs of 2000 r/min
– quick – shift gear changes automatically to the TORTOISE – range
– continue driving and press the brake pedals (latched together).
– the quick – shift gear changes automatically to the HARE – range at engine revs of about 1700 RPM
– A/M – switch light comes on
– release the brakes and the quick – shift gear changes to the TORTOISE – range when engine revs increases
– A/M – switch light goes out
– set the A/M – switch to the position A_1 (max. torque) (switch front edge down)
– make the same test as above; quick – shift gear changes to the HARE – range at engine revs of about1400 RPM.
– A/M – switch light comes on
– release the brake pedals and the quick – shift gear changes to the TORTOISE – range when the engine revs increases
– A/M – switch light goes out

Calibrating the quick – shift gear

– set the display to the **calibrating mode** (see page 340/6)
– press the RPM – key four times and the display shows text CAL PS
– press the SET – key
– display shows text CAL 700 and the actual engine revs
– adjust the engine revs to 700±20 RPM (or min revs) with a hand throttle lever and press SET
– display shows text CAL 1100 and the actual engine revs
– adjust the engine revs to 1100 r/min and press SET
– in the same way go through speeds 1500, 1900 and 2200 (or max. revs)
– when the last time SET is pressed, the calibration is completed
– escape from the calibrating mode by switching off the current

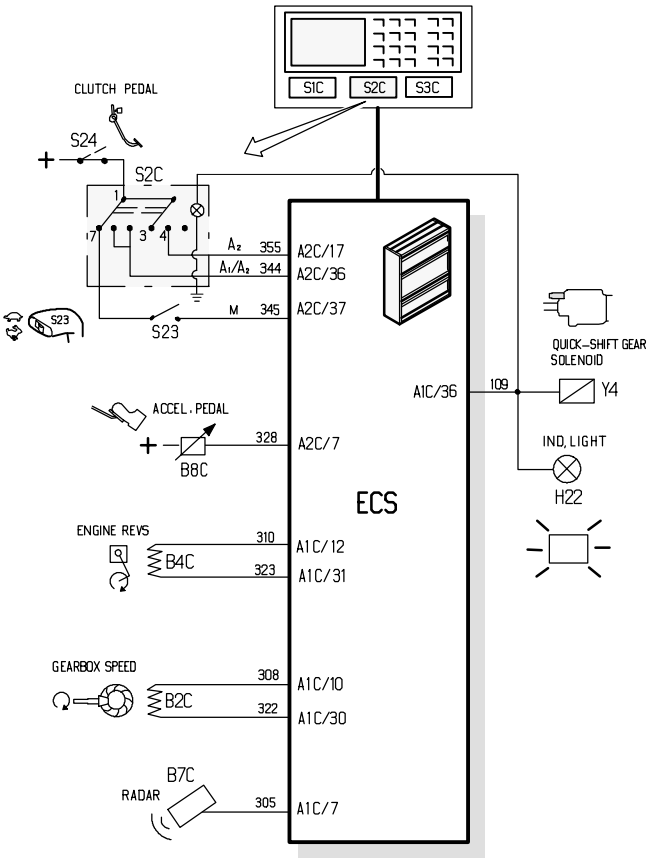


Figure 4. Inputs and outputs to/from the ECS for controlling the quick – shift gear

D. Power take – off

– set the display to show the PTO revs
– engage PTO 540 and the ind. light comes on
– switch current off and then on and the ind. light starts to flash
– PTO shaft must not rotate
– move the control lever to neutral and back to engaged position
– 540 ind. light comes on and the PTO shaft starts to rotate
– disengage the 540 PTO and the ind. light goes out
– in the same way test the 1000 RPM PTO

– engage the 540 PTO and remove the emergency switch (terminator) from the rear socket
– the PTO shaft stops and the 540 ind. light starts to flash
– fit the emergency switch back. PTO shaft must not start to rotate
– move the control lever off and then on. The PTO shaft must not start to rotate
– stop the engine and switch off the current. Then start the engine and move the control lever off and on. Now the PTO is in function.

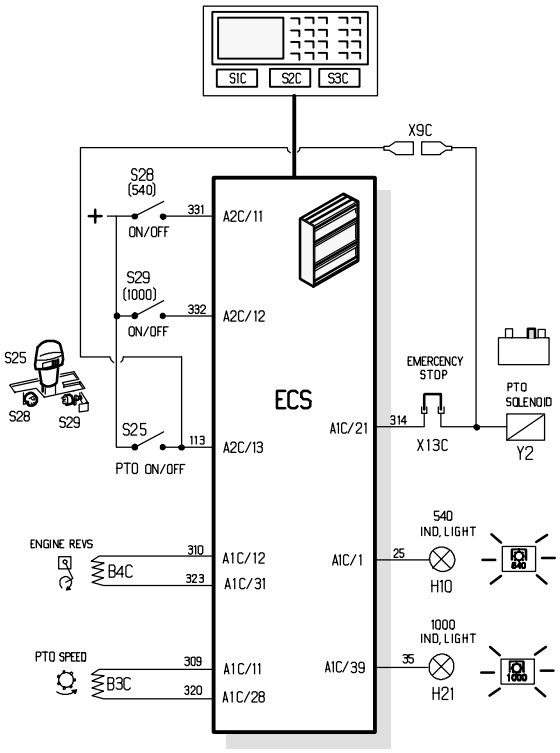


Figure 5. Inputs and outputs to/from the ECS for controlling the PTO.

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E. Slip control

Slip percent can be programmed. Slip control system is controlled with a selector which has six different positions. In the first position (0), the slip control is not in function. Other positions (1 – 5) determine the lift movement. In addition, the system has a buzzer which gives a signal if the set slip percent is exceeded in position control mode (draft control selector in position P).

– disengage the diff. lock and 4WD (switch in M – position)
– raise the RH rear wheel
– adjust lower links to working position
– start carefully driving with a low gear (e.g. M1)
– set the draft control selector to position P
– switch on the slip control (SLIP selector to one of the positions 1 – 5), buzzer gives a sound
– turn the draft control selector to position 1, buzzer sound stops. Set the SLIP selector to position 0
– make sure that the lift/lower switch is in the lower position
– adjust the lower links (with the position control knob) to the lowest position, where they follow accurately the position control
– start driving
– turn the SLIP selector in turns to positions 1 – 5. The lower links must rise stepwise (1 = small lift, 5 = big lift)
– finally turn the SLIP selector to position 0 and the lower links will lower almost to the starting position.

Setting slip percent (%)

– press the SLIP – key three times and the display will show text SLIP LIM and the valid slip percent
– press SET – key, and the display shows SLIP LIM?
– input a new slip percent e.g. 18 and press SET
– slip percent is now 18 %

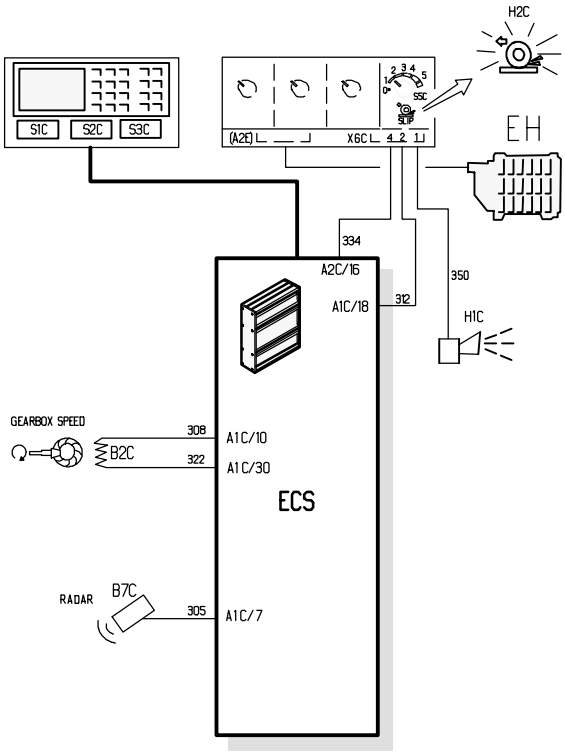


Figure 6. Inputs and outputs to/from ECS for slip control system

F. Cold starting device

Cold starting automatics can be checked by observing the indicator light and its lighting time

Ind. light flashes = ready for starting
Ind. light lights continuously = glowing (afterglowing)

The cold starting automatic has been programmed as follows:
> +5˚C = immediately ready for starting
+5˚C...–10˚C = 15 sec glowing + 5 sec afterglowing
< –10˚C = 20 sec glowing + 15 sec afterglowing

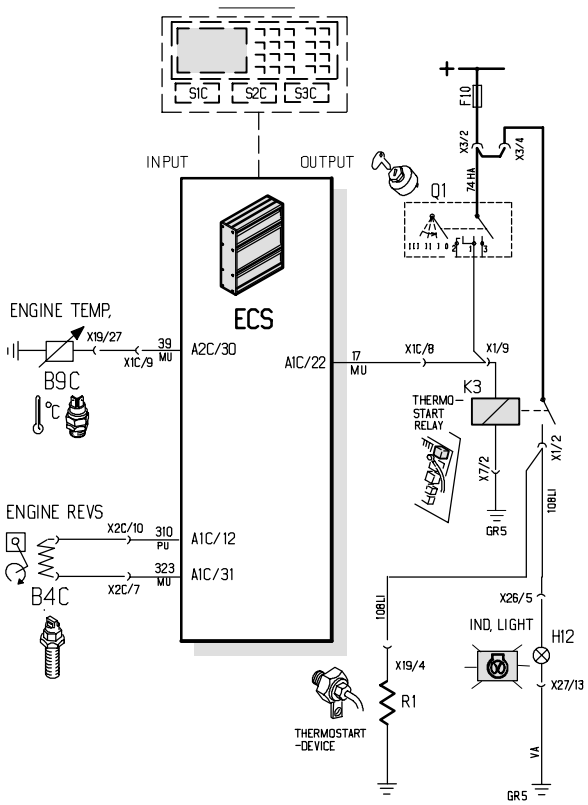


Figure 7. Inputs and outputs to/from ECS for cold start automatic

3. Counter functions

Setting working width:
– Press the AREA – key twice, and the display shows the text WIDTH?
– press the SET – key and input number 1000 (cm) (=10 m)
– press again the SET – key after which the working width has been input.

Setting time and date:
– press the TIME – key twice and the display shows current date and time
– press the SET – key, and the display shows the text TIME?. Input right time (h, min e.g. 14 09) and press SET
– now the display shows the text DATE?. Input current month and day (e.g. 05 28) and press the SET – key. Now there is text YEAR? in the display
– input current year (e.g. 91) and press the SET – key. Now the system has correct time and date and the display shows again the date – function.

Zeroing the counters:
– press the AREA – key once and then the CLR – key twice=zeroing
– press the TOTAL AREA – key once and then the CLR – key twice=zeroing
– press the working time key. Working time should be zero (working time is zeroed when the area is zeroed)
– press the distance – key. The distance should be zero (distance is zeroed when the area is zeroed)

Starting and stopping counters:
– Set one of the counter functions in the display (otherwise the counters do not start).
– press the # – key, until the arrow in the display starts to flash=counters in function. Press the key again and the arrow stops to flash=counters stopped. Start the counters.

Note! The distance counter show the travelled distance, although the arrow does not flash.

Checking function of the lift/lower switch:
(switches off the area counter when the implement is raised to the transport position)
– activate the hydraulic power lift with the switch
– set the lift/lower switch to the lowering position. Now the arrow in the display must point downwards
– set the switch to the transport position and the arrow points upwards
– set the lift/lower switch to the lowering position

Test – run:
Drive the tractor and check that the counters show the correct values (area, total area, time, distance).

Checking battery voltage:
Check that the display shows the correct voltage:
– engine stopped: battery voltage about 12,5 V
– engine started: voltage about 13 – 14 V

Calibrating display for three – point linkage position

– press the position – key twice and the text CAL LIFT appears in the display
– press the SET – key and the display shows text LOW
– adjust the lower links to the lowest position and press the SET – key
– now the display shows text HIGH.
– lift the lower links to the max. upper position and press the SET – key.
– now the calibration has been completed (escape from the calibrating mode by pressing e.g. the SPEED – key)
– check that the display shows zero when the lower links are in the lowest position and 100 when the links are in the upper position

Implement functions

The following sensors can be fitted on an implement:
– flow meter
– rotation speed sensor
– pieces counter
– sensor for working position
– position potentiometer
– possible linear actuator

The implement sensors send signals to the AC – III display which shows various functions of implement.

Line from the ECS to the implement socket can be checked according to the instruction on page **342**/**9** even though You do not have a microcomputer. In this case, shunt between different socket terminals and observe the AC III display readings in different functions.

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Computer – aided fault tracing

A computer program has been made for Autocontrol III (Service Program) which can be used when trouble shooting is carried out with a microcomputer (PC).

In this instruction is used a portable PC which is IBM compatible and uses MS – DOS 3.3 operating system or later version. Additionally PC must have a serial port RS – 232C (9 pins) when the PC is connected to the AC – III unit with cable 326 682 00.

Service Program floppy disk can be ordered from Valmet if needed. It is useful to copy the Program into the hard disk of the PC.

Note! Service Program error messages, see page **343/3**.

Starting fault tracing

In this instruction the Program is in the hard disk (**C:**). If it is in the floppy disk drive, use a correct prompt (e.g. **A:**)

H Connect the PC with the cable to the socket X10C.

H Switch on current to a tractor and to the PC.

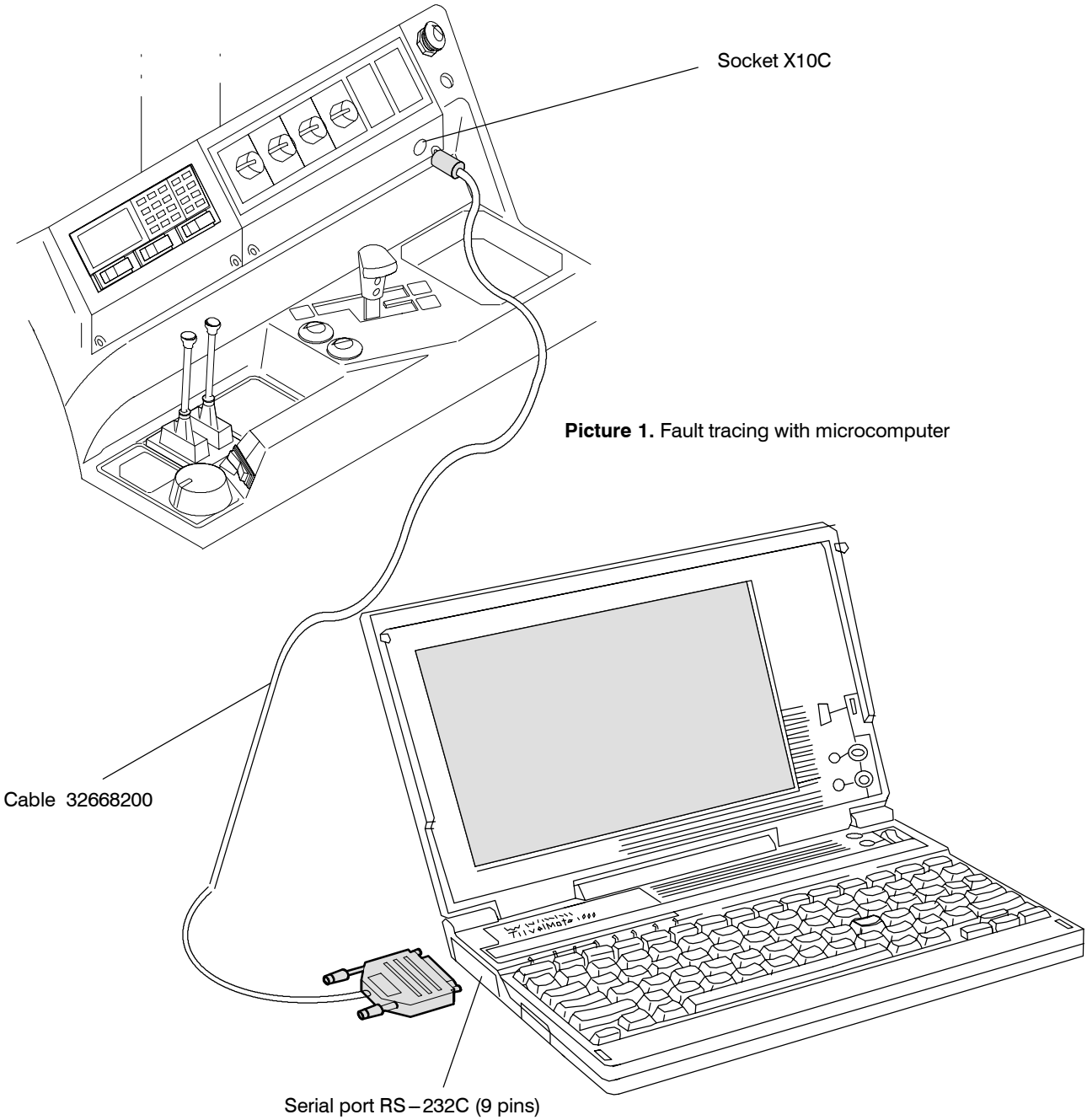
H When prompt **C:\>** appears, type **AC** (ACC if colour monitor) and press **ENTER.**

H A trouble shooting chart appears on the PC display. In the LH side lower corner of the chart there is the following menu:

1PARAMETERS 5SENSOR LOG.

H Press **F5**, and the computer starts to update the trouble shooting chart (i.e. PC changes X marks). Wait for a while before starting the trouble shooting.

H Return to the disk operating system by pressing the function key **F10** (EXIT).



Picture 1. Fault tracing with microcomputer

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Fault tracing chart on PC monitor

AC Communication link ver 1.0 hh:mm:ss

DIGITAL INPUTS		
Steering angle	J2:15	X
Main clutch	J2:18	X
PS algorithm	J2:17	X
Implement pos	J2:20	X
Forward/Rev	J2:10	X
Brake left	J2:9	X
Brake right	J2:19	X
Slip cntr 1/0	J2:16	X
Extra 3	J2:39	X
PS manual 1/0	J2:37	X
4WD A/M	J2:14	X
4WD manual 1/0	J2:38	X
DL A/M	J2:8	X
DL manual 1/0	J2:33	X
Extra 1	J2:34	X
PTO 1/0	J2:13	X
Extra 2	J2:35	X
PTO 540 1/0	J2:11	X
PTO 1000 1/0	J2:12	X
PS A/M	J2:36	X

DIGITAL OUTPUTS		
Slip control	J1:18	X
4WD solenoid	J1:38	X
4WD lamp	J1:35	X
DL sol & lamp	J1:37	X
Pto solenoid	J1:21	X
Pto 540 lamp	J1:1	X
Pto 1000 lamp	J1:39	X
PS sol & lamp	J1:36	X
Forward/Reverse	J1:2	X
Extra 1	J1:23	X
Extra 2	J2:23	X
Implement dir	J2:22	X
Implement act	J2:24	X
Fuel preheater	J1:22	X
Pieces counter	J1:19	X
Parameter table no	XX	
Date of production	XXXX	
PROM Checksum	XXXX	
EPLD Version	XX	

FREQUENCY INPUTS		
Flow	J1:26	XXXX
Radar	J1:7	XXXX
Gearbox	J1: 30, 10	XXXX
Front axle	J1: 29, 9	XXXX
Rear wheel	J1: 27, 8	XXXX
Front wheel	J1: 32, 13	XXXX
RPM impl	J1:6	XXXX
RPM Engine	J1: 31, 12	XXXX
RPM Pto	J1: 28, 11	XXXX
PCS	J1:25	XXXX

ANALOG INPUTS		
Power lift	J2:32	XXX
Outside temp	J2:29	XXX
Acc pedal pos	J2:7	XXX
Coolant temp	J2:30	XXX
Implement pot	J2:31	XXX
System volt	J2:25	XXX

Message Window

Berifors 1990

1PARAMETERS 5SENSOR LOG

10EXIT

Service Program indicates the AC – III unit input and output signals with the following marks:
- X = nothing (see chart above)
- E = error, short circuit or open circuit
- 1 = current on
- 0 = current off

Markings after the names are ECS connector pins:
E.g. J2:15 = A2C pin 15
J1:18 = A1C pin 18

In the tables below the marks above the thick line and the corresponding marks on the PC display should be similar with the given switch and pedal positions under the thick line.

For these checks it is supposed that the tractor hydraulics and mechanics are in perfect condition. During the test current is switched on to the tractor but the engine is stopped (if not otherwise informed)

Important! If the tables below and the computer display chart do not agree, check first that the cable between the PC and the AC – III unit is correctly connected to the PC serial port and to the socket X10C.

The symbols after the names above the thick lines are connector pins from which possible voltage measurements can be done. Thus the tables below can be used for trouble shooting even though You don't have a PC.

A. Fault tracing, front wheel drive control

Input signals to ECS for controlling 4WD (DIGITAL INPUTS).

4WD A/M (A2C/14)	**0**	**0**	**1**	**1**
4WD MANUAL 1/0 (A2C/38)	**0**	**1**	**0**	**0**
A/M – SWITCH	**M**	**M**	**A**	**A**
ON/OFF – SWITCH	**OFF**	**ON**	**OFF**	**ON**

BRAKE LEFT (A2C/9)	**0**	**1**	**0**
BRAKE RIGHT (A2C/19)	**0**	**0**	**1**
LH SIDE BRAKE PEDAL	**OFF**	**ON**	**OFF**
RH SIDE BRAKE PEDAL	**OFF**	**OFF**	**ON**

– If the marks above the thick lines agree with the corresponding marks on the computer display, the input signals are OK.

– If the marks on the PC display do not agree with the marks above the thick lines, the fault lies in the switch in question or its wiring is faulty.

– Input signals from the radar, front axle sensor and gearbox sensor are checked with a calibrating test, see page **341/1** or according to the instruction **F** on page **342/7**.

Output signals from ECS for controlling 4WD (DIGITAL OUTPUTS).

4WD SOLENOID (A1C/38)	**1**	**0**
4WD LAMP (A1C/35)	**0**	**1**
4WD A/M	**M**	**M**
4WD MANUAL 1/0	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the possible fault lies in the solenoid valve, indicating light or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the central processing unit (ECS) is faulty and should be changed.

B. Fault tracing, quick – shift gear control

Input signals to ECS for controlling quick – shift gear power shift (DIGITAL INPUTS).

PS algorithm (A2C/17)	**0/0**	**0/0**	**1/0**	**1/0**	**0/0**	**0/0**
PS A/M (A2C/36)	**0/0**	**0/0**	**1/0**	**1/0**	**1/0**	**1/0**
PS MANUAL 1/0 (A2C/37)	**1/0**	**0/0**	**0/0**	**0/0**	**0/0**	**0/0**
PS algorithm – switch ($M/A_1/A_2$)	**M**	**M**	**A1**	**A1**	**A2**	**A2**
PS MANUAL 1/0 (T=TORTOISE, H=HARE)	**T**	**H**	**T**	**H**	**T**	**H**
CLUTCH PEDAL (U=UP, D=DOWN)	**U/D**	**U/D**	**U/D**	**U/D**	**U/D**	**U/D**

MAIN CLUTCH (A2C/18)	**1**	**0**
CLUTCH PEDAL (U=UP, D=DOWN)	**U**	**D**

– If the marks above the thick lines agree with the corresponding marks on the computer display, the input signals are OK.

– If the marks on the computer do not agree with the marks above the thick lines with given switch and pedal positions, the fault lies in the switch in question or its wiring is faulty.

– Input signals from the radar and gearbox speed sensor are checked with the calibrating test, see page **341/1** or according to the instruction **F** on page **342/7**. The engine speed sensor, see page **341/1** and the injection pump potentiometer, see pages **341/2** or **342/8**.

Output signals from ECS for controlling quick – shift gear (DIGITAL OUTPUTS).

PS SOLENOID AND LAMP (A1C/36)	**1/0**	**0/0**
PS algorithm – switch ($M/A_1/A_2$)	**M**	**M**
PS MANUAL 1/0 (T=TORTOISE, H=HARE)	**T**	**H**
CLUTCH PEDAL (U=UP , D=DOWN)	**U/D**	**U/D**

– If the marks above the thick line agree with the corresponding marks on the computer display, the possible fault lies in the solenoid valve, indicating light or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the central processing unit (ECS) is faulty and should be changed.

C. Fault tracing, differential lock control

Input signals to ECS for controlling differential lock (DIGITAL INPUTS).

DL A/M (A2C/8)	**0**	**0**	**1**	**1**
DL MANUAL 1/0 (A2C/33)	**0**	**1**	**0**	**0**
A/M – SWITCH	**M**	**M**	**A**	**A**
ON/OFF – SWITCH	**OFF**	**ON**	**OFF**	**ON**

BRAKE LEFT (A2C/9)	**0**	**1**	**0**
BRAKE RIGHT (A2C/19)	**0**	**0**	**1**
LH SIDE BRAKE PEDAL	**OFF**	**ON**	**OFF**
RH SIDE BRAKE PEDAL	**OFF**	**OFF**	**ON**

MAIN CLUTCH (A2C/18)	**1**	**0**
CLUTCH PEDAL (U=UP, D=DOWN)	**U**	**D**

STEERING ANGLE (A2C/15)	**0**	**1**	**1**
FRONT WHEELS	**STRAIGHT**	**TO RIGHT □ 10°**	**TO LEFT □10°**

– If the marks above the thick lines agree with the corresponding marks on the computer display, the input signals are OK.

– If the marks on the computer do not agree with the marks above the thick lines with given switch, pedal and steering wheel positions, the fault lies in the switch or sensor in question or their wirings are faulty.

– Input signals from the radar, front axle sensor and rear wheel sensor are checked with the calibrating test, see page **341**/**1** or according to the instruction **F** on page **342**/**7**.

Output signals from ECS for controlling differential lock (DIGITAL OUTPUTS)

DL SOLENOID AND LAMP (A1C/37)	**0**	**1**
DL A/M	**M**	**M**
DL MANUAL 1/0	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the possible fault lies in the solenoid valve or indicating light or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the central processing unit (ECS) is faulty and should be changed.

D. Fault tracing, power take–off control

Input signals to ECS for controlling power take–off (DIGITAL INPUTS)

PTO 540 1/0 (A2C/11)	**0**	**1**	**1**	**0**	**0**
PTO 1000 1/0 (A2C/12)	**0**	**0**	**0**	**1**	**1**
PTO 1/0 (A2C/13)	**0**	**0**	**1**	**0**	**1**
PTO 540 ON/OFF	**OFF**	**ON**	**ON**	**OFF**	**OFF**
PTO 1000 ON/OFF	**OFF**	**OFF**	**OFF**	**ON**	**ON**
PTO ON/OFF	**OFF**	**OFF**	**ON**	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the input signals are OK.

– If the marks on the computer do not agree with the marks above the thick line with given switch positions, the fault lies in the switch in question or its wiring is faulty.

– The engine speed sensor and the PTO speed sensor are checked according to the instructions on page **341**/**1** or according to instruction **F** on page **342**/**7**.

Output signals from ECS for controlling power take–off (DIGITAL OUTPUTS)

PTO 540 LAMP (A1C/1)	**0**	**0**	**1** [1])	**0**	**0**
PTO 1000 LAMP (A1C/39)	**0**	**0**	**0**	**0**	**1** [1])
PTO SOLENOID (A1C/21)	**0**	**0**	**1** [1])	**0**	**1** [1])
PTO 540 ON/OFF	**OFF**	**ON**	**ON**	**OFF**	**OFF**
PTO 1000 ON/OFF	**OFF**	**OFF**	**OFF**	**ON**	**ON**
PTO ON/OFF	**OFF**	**OFF**	**ON**	**OFF**	**ON**

[1]) 1 is seen only momentarily when the ON/OFF switch is moved to the ON position and then it changes to 0. However, if the engine is running during the test the 1 remains on.

a) Engine is stationary and the 540 RPM PTO is engaged; when the emergency plug is pulled out, the PC display shows E at the PTO SOLENOID. E changes to 0 when the plug is refitted. This same function concerns also the 1000 RPM PTO

b) Engine is running and the 540 RPM PTO is engaged; when the emergency plug is pulled out, the PC display shows E at the PTO SOLENOID and the PTO 540 LAMP starts to flash. When the plug is refitted, the E changes to 0 but the PTO 540 LAMP remains flashing. This same function concerns also the 1000 RPM PTO.

– If the table marks above and the PC display marks agree with the given switch positions, the possible fault must lie in the emergency plug, in the solenoid valve or in the indicating lamp or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the central processing unit (ECS) is faulty and should be changed.

E. Fault tracing, slip control

Input signals to ECS for slip control (DIGITAL INPUTS)

SLIP CNTR 1/0 (A2C/16)	**0**	**1**
SLIP CONTROL ON/OFF	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the input signals are OK.

– If the marks on the computer do not agree with the marks above the thick line with given switch positions, the fault lies in the switch or its wiring is faulty.

– The radar and the gearbox speed sensor are checked according to the calibrating instruction on page **341/1** or according to the instruction **F** on the next page.

Output signals from ECS for slip control (DIGITAL OUTPUTS)

SLIP CNTR (A1C/18)	**0**	**1**
SLIP CONTROL ON/OFF	**OFF**	**ON** [1])

[1]) When the switch is in the ON position, disconnect the radar connector and drive the tractor at a speed of 3 km/h (power lift activated in the position control mode). Alternatively one rear wheel can be raised and then started carefully to drive with a low gear (4WD must be disengaged and the A/M switch must be in M position).

– If the table marks above and the PC display marks agree, the signal is sent from ECS to the hydraulic lift. If the lower links do not make a lifting correction the possible fault lies in wiring or the power lift electronics do not function.

– If the marks on the PC do not agree with the marks above, the fault lies in the ECS which must be changed.

F. Fault tracing, speed sensors (FREQUENCY INPUTS)

The following speed sensors are fitted on E – models:
– Radar (**Radar**) (A1C/7)
– Gearbox speed sensor (**Gearbox**) (A1C/30, 10)
– Front axle speed sensor (**Front axle**) (A1C/29, 9)
– Rear wheel rotation speed sensor (**Rear wheel**) (A1C/27, 8)
– Engine rotation speed sensor (**RPM engine)** (A1C/31, 12)
– PTO rotation speed sensor (**RPM Pto**) (A1C/28, 11)

N.B.! The speed sensor resistance (not radar) should be **1,0 – 1,10 kΩ** which can be measured from connector X2C (pins, see wiring diagrams) or from the lower ECS connector A1C (pins, see above). If the resistance value is infinite a new measurement should be done from the sensor poles so that possible faults on wiring can be localised. A faulty sensor should be changed, see page **341/1**.

a) Checking radar

Drive the tractor at different speeds and write down impulses from the radar. The following values were measured from a radar which was in a perfect condition:

D ~ 38 (1 km/h) (inaccuracy increases at low driving speeds)
D ~ 157 (4,3 km/h)
D ~ 327 (8,8 km/h)
D ~ 416 (11,4 km/h)
D ~ 757 (20,6 km/h)
D ~ 1026 (28,2 km/h)

$$\frac{\text{Number of impulses}}{\text{Driving speed}} \square \text{ Constant}$$

– If number of impulses from the radar correspond to values above, the radar is in perfect condition.
– If no impulses come from the radar or if they deviate much from the values above, the radar is faulty or its wiring is damage.

b) Checking speed sensors for front axle, rear axle and gearbox

a) Drive the tractor on a road at a speed of 1 – 2 km/h and write down impulses from the radar (T1) and from one of the speed sensors (A1).
b) Drive then with a faster speed (~ 20 km/h) and write down impulses from the radar (T2) and from the speed sensor (A2).
c) Equation **A1/T1□A2/T2** must come true (deviation can be ≤ 0,16).

– If the equation comes true, the speed sensor is OK.
– If the equation does not come true, the speed sensor in question, its adjustment, wiring or impulse disc is faulty.

c) Checking rotation speed sensors for engine and PTO

a) **RPM engine;** impulse value is about 0616 at engine revs 1000 r/min.
b) **RPM Pto**, impulse value is about 0364 at the PTO speed of 540 r/min.

– If impulses from the sensor correspond to values above, the sensor is functioning properly.
– If no impulses can be observe or number of impulses deviates much from values above, the sensor is faulty. Check then the wiring and the sensor.

d) Calibrating and fitting speed sensors, see page 341/1.

G. ANALOG INPUTS

Here are given some base values for certain analog inputs. These values were measured from the AC – III unit, which functioned perfectly:

Power lift (A2C/32)**:**
a) signal is about 194 when the lower links are in the lowest position
b) lower links in max transport height, signal is about 014.

– if the signal values are correct everything is OK**.**
– if no signal comes or its deviates much from values above, check then connectors and wiring. Fault can also lie in the hydraulic power lift electronics.

Outside temp (A2C/29):
a) signal is about 130 at outside temperature of −3˚C
b) signal is about 120 at outside temperature of +1˚C
N.B. Signal value decreases when temperature rises.

– if the signal values are correct everything is OK**.**
– if no signal comes or its deviates much from values above, the sensor is faulty or its wiring and connectors.

Coolant temp (A2C/30)**:**
a) signal at coolant temperature −2˚C is about 183.
b) signal at coolant temperature 15˚C is about 130.
c) signal at coolant temperature 20˚C is about 116.
d) signal at coolant temperature 25˚C is about 108.
e) signal at coolant temperature 40˚C is about 084.
f) signal at coolant temperature 50˚C is about 064.

– if the signal values are correct everything is OK**.**
– if no signal comes or its deviates much from values above, the sensor is faulty or its wiring and connectors.

System volt (A2C/25)**:**
a) signal value is about 167, when the engine is running at 1000 r/min (correspond voltage ~ 13,5 V).
b) signal value is about 140, when the engine is stopped (correspond voltage ~ 12 V).

– If the signal values are correct, everything is OK (values depend also on condition of battery)
– If no signal comes or it is faulty, check connectors and wiring.

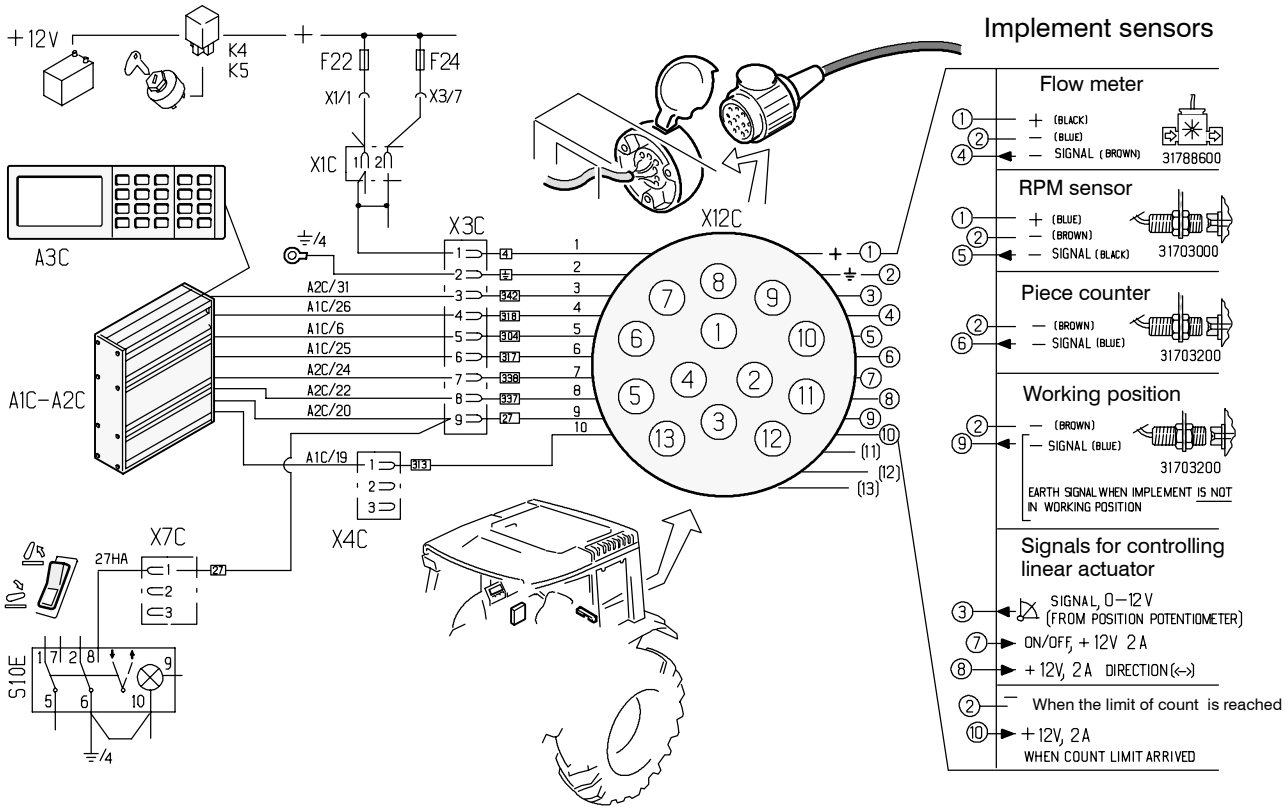
Acc pedal pos (A2C/7):
a) signal is about 020 when the acc. pedal is in the upper position.
b) signal is about 230 when the acc. pedal is in the lower position.

– if the signal values are correct, everything is OK
– if no signal comes or it is faulty, check the potentiometer on the injection pump and its wiring.

Checking injection pump potentiometer, see page **341/2**.
Checking temperature sensors, see page **341/2.**

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AC – III, implement socket



Checking line from implement socket to AC – III unit

– Switch on current to the tractor

– Measure the supply voltage between socket terminals **1** and **2** (= battery voltage, about 12 V DC).
– Connect a microcomputer to the AC – III unit and activate the trouble shooting chart (see page **341**/**1**).

FREQUENCY INPUTS

1. Shunt between socket terminals **2** and **4** (break connection). A number signal must appear on the PC at point **Flow**. This function is the same as the flow meter paddle wheel would revolve. Also AC – III display shows some value in the liquid amount mode (litres).

2. Shunt between socket terminals **2** and **5** (break connection). A number signal must appear on the PC at point **RPM impl**. Also AC – III display shows some value in the implement RPM mode. This function is the same as a magnet would pass by the sensor.

3. Shunt between socket terminals **2** and **6**. A number signal must appear on the PC at point **PCS** every time the connection is broken off and on (summing counter). Also AC – III display shows in the piece counter mode the same value. Note possible limiting program, which limits the max number of items. When the limit value is achieved a signal (0 changes to 1) appears at the point **Pieces counter** (DIGITAL OUTPUTS). This signal can also be measured with a voltmeter between socket terminals **2** and **10**. This function is the same as a magnet would pass by the sensor.

DIGITAL INPUTS

4. Activate the hydraulic power lift and turn the lift/lower switch to the lowering position. Shunt between socket terminals **2**and **9.** A signal (1 changes to 0) appears on the PC at point **Implement pos**. When the socket terminals are connected the arrow on the AC – III display turns to point upwards. The function is the same as a magnet would be opposite the sensor. The lift/lower switch has the same function.

ANALOG INPUTS

5. Signal from possible position potentiometer: Shunt between socket terminals **1** and **3**, after which a number signal appears on the PC at the point **Implement pot**. Here with battery voltage the signal is about 250. Also AC – III display shows some value (e.g. 100) in the implement position mode.

Signals to linear actuator

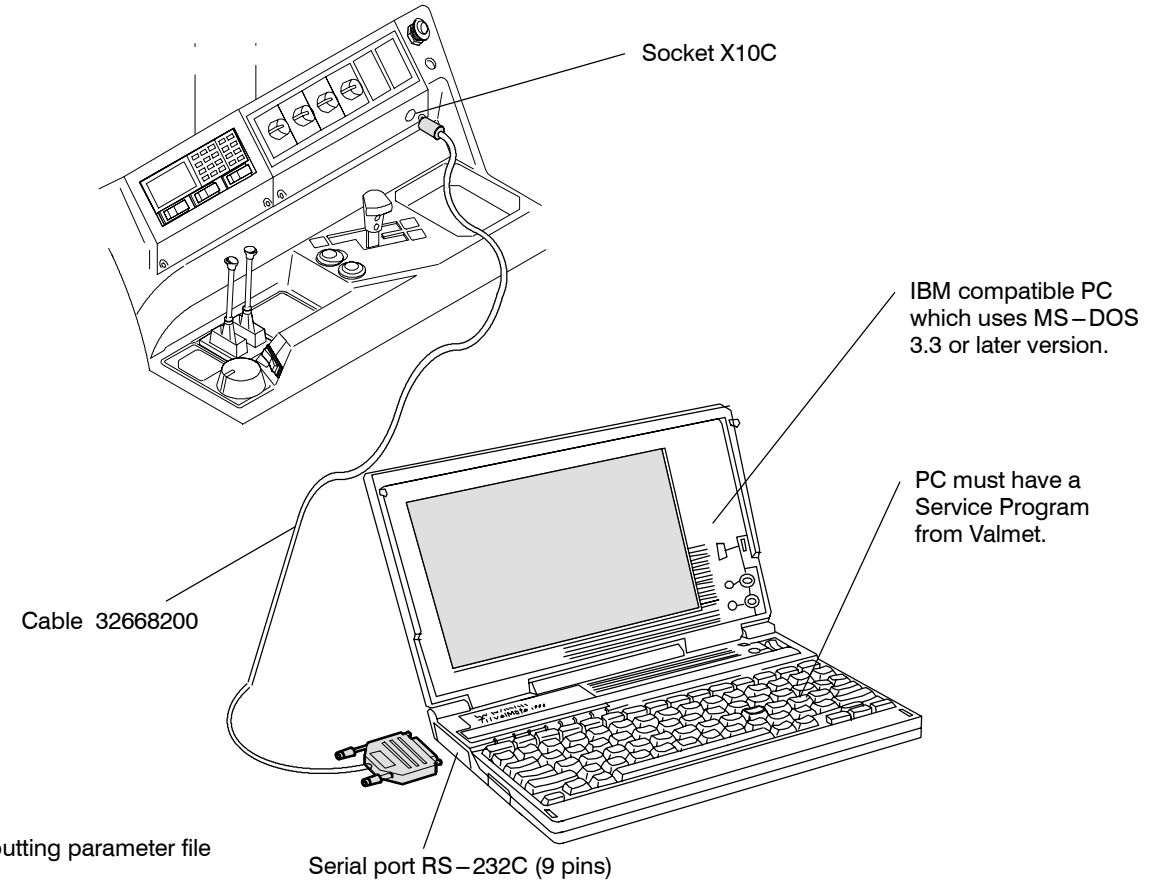
– connect an adjustable resistor to the socket poles **1** (+: black), **2** (–: Red) and **3** (sign: Yellow).
– calibrate the resistor's extreme positions (e.g. 0 (P1) and 100 (P2)).
– input 5 pcs pre – programmed resistor positions (e.g. 10, 30, 50, 70 and 90)
– move the resistor spindle inwards and outwards in the middle range and check that the output signals appear on the PC with e.g. the pre – set position 50. **Implement dir** (current to a relay for controlling actuator rotation direction; 0 or 1) and **Implement act** (current to a relay for controlling actuator; 0 or 1) (both DIGITAL OUTPUTS)
By connecting a test lamp to the socket poles **7** or **8** (earth from any frame contact) it can be checked if the current actually comes to the socket.

N.B. If the line from the socket does not function, check connectors X3C and X4C (in the lever console). Check also wire connections in the socket. If the output signals do not come the ECS is faulty.

Copying parameter file into AC – III unit

One qualification for the correct function of the AC – III:n unit is that the central processing unit (ECS) knows the tractor which it is fitted on. For that reason certain data must be input into the ECS. A parameter file includes this data.

Already in the factory a parameter file has been input into the AC – III unit. If this file gets out of order, the unit takes automatically into use a default parameter file. The unit indicates this with text DEFAULT PARA every time current is switched on to the tractor. The default file must be replaced as soon as possible with a correct file. If tractor's technical values are changed so must also be checked if the parameter file should be changed. If the central processing unit (ECS) has been changed, a correct parameter file must be input.



Picture 1. Inputting parameter file

Parameter files have been named according to the code system. **A parameter file name** includes eleven marks as follows:

E.g. AC 45 02 5M . 6 4 E

AC = Autocontrol (common in all file names)

45 = Program version name. Here V 4.5. This changes only if the program version needs a new parameter file.

02 = Parameter file order number (0 – 99). The order number changes always with exception that different language versions have a same order number.

5 = Engine revs which give the max torque. The first an two last figures have been leaved out. Here 5=1500 RPM.

M = Clutch type, M=mechanical, H= Hi – Trol

6 = Number of cylinders in engine (6 or 4)

4 = Transmission type (40 or 30 km/h)

E = Language (E=English, R=Swedish, S= Finnish

A parameter file is input into the AC – III unit with aid of a microcomputer. Service Program floppy disk can be ordered from Valmet. This same program is used also when trouble shooting is done.

Alternative parameter files

Model	Transmission	Language	Parameter file name
6600E	420GL 40 km/h	Finnish	AC01086M.44S
		Swedish	AC01086M.44R
		English	AC01086M.44E
6600EH	420GL 40 km/h	Finnish	AC01046H.44S
		Swedish	AC01046H.44R
		English	AC01046H.44E
8100E	420GL 40 km/h	Finnish	AC01095M.64S
		Swedish	AC01095M.64R
		English	AC01095M.64E
8100E	420GL 30 km/h	Finnish	AC01105M.63S
		Swedish	AC01105M.63R
		English	AC01105M.63E

Copying parameter file into AC – III unit

In this instruction the Program is in the hard disk (**C:**). If it is in the floppy disk drive, use a correct prompt (e.g. **A:**)

J Connect the PC with the cable to the socket X10C.
J Switch on current to a tractor and to the PC.
J When prompt **C:\>** appears, type **AC** (ACC if colour monitor) and press **ENTER.**
J A trouble shooting chart appears onto the PC display. In the LH side lower corner of the chart there is the following menu:

1PARAMETERS 5SENSOR LOG.

J Press **F1** and the following text appears:

TRACTOR MODEL PARAMETERS

File name:_____

J Type after colon a correct parameter file name.
J Press **ENTER**
J Message **PROGRAMMING AC – III** appears onto the PC display. Programming in action.

J When the programming is successfully completed, text **AC III PROGRAMMED** appears in the message window in the RH side lower corner. During successful programming the AC – III display switch off and on.

Note! Service Program error messages, see next page.

J To the disk operating system is returned by pressing the function key **F10** (EXIT).

The Service Program chart (on PC display) has the following information:

Parameter table no = parameter file order no
Date of production = manufacturing date of ECS
PROM Checksum = program version
EPLD Version = program version of logic circuit

If the central processing unit (ECS) or the parameter file is changed, write on the ECS sticker no 32666800 tractor serial number, date and parameter file name after text SW.NO. Fix the sticker onto the ECS.

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Error messages in Service Program

Service Program has the following error messages which appear in the MESSAGE WINDOW in the RH side lower corner of the fault tracing chart. If other error messages appear, switch off current and start from the beginning.

ERROR IN CHECKSUM If this message appears on the PC display when you are programming the AC – III unit, You must start from the beginning after switching off and on current.

PARAMETER REV MISMATCH. Parameter file and EPROM have different version numbers.

ERROR IN EPROM If You have found an error in EPROM, switch off the AC – III unit for a while and start the Service Program and try again programming. If this is not enough, change the central processing unit (ECS). (EPROM = eraseable and programmable read only memory)

AC – III DOES NOT RESPOND Connection between the PC and the AC – III unit does not function. Check the middle cable and check that the AC – III unit is switched on. Check AC – III fuses.

ERROR IN COMMUNICATION Switch off the AC – III unit for a while and start the Service program again.

WRONG NUMBER OF CHAR This message appears if You try to copy into the AC – III unit a parameter file which has not correct number of characters. Program error.

ILLEGAL CHAR FOUND A parameter file includes an illegal character/characters. Only figures 0 – 9 are allowed. Program error.

FILE ERROR If the file does not exist, appears this message on the PC display. Check the parameter file name. Start from the beginning after turning current off and on.

35. Autocontrol IV	~~1. 1. 1994~~ 1. 1. 1995	Model 6600E 8100E – 8750E	Code 350	Page 1

Valmet Autocontrol IV Tractor Control System is standard equipment on tractors 6600E – 8750E from the beginning of the year 1994 (662343 –). Autocontrol IV replaces Autocontrol III which is shown in section 34.
Autocontrol IV is in many points the same as Autocontrol III. The main difference is that Autocontrol IV controls the 3 – step Delta Powershift gear (Autocontrol III controlled the 2 – step quick – shift gear).

4WD control AC IV

Manual or automatic control with aid of the 3 – position rocking switch.
Rear edge depressed: 4WD disengaged except when latched together brake pedals are depressed.
Middle position:4WD is engaged manually
Front edge depressed: AC IV controls automatically the 4WD as follows:

4WD engages	4WD disengages
– when the rotation speed difference of the front and rear axle exceeds 9% – when braking with latched together brake pedals (also in manual position). – when the engine is stopped	– when the engine is started (in automatic (A) position) – when the wheel slip is less than 2% for more than 6 seconds.

Differential lock control AC IV

Manual or automatic control with aid of the 3 – position rocking switch.
Rear edge depressed:differential lock is disengaged.
Middle position: lock is engaged manually but disengages when brake pedal/pedals are depressed
Front edge depressed: AC IV controls automatically the lock as follows:

Diff. lock engages	Diff. lock disengages
– when one rear wheel rotates 20% faster than the other and the driving speed is less than 12 km/h	– when the rear wheel slip is less than 10 % during a period of one second (speed <12 km/h). – when the brake pedal/pedals are depressed (also in the manual position) – when the clutch pedal is depressed – when the steering angle is more than ± 15 ° – when the tractor driving speed is over 12 km/h – when the tractor is stopped

Delta Powershift control AC IV

Manual or automatic control with aid of the 2 – position rocking switch.
Rear edge depressed: the gear is controlled with the push buttons in the gear lever knob
Front edge depressed: AC IV controls the gear automatically as follows:

Change down	Change up
– changes automatically down when the loading increases – changes to the lowest ratio when the tractor speed is below 1,5 km/h and the clutch pedal is depressed.	AC IV selects automatically the best possible higher ratio – highest ratio reduces noice and fuel consumption.

Note! In the automatic position the gear ratio can temporarily be changed with the push buttons. There is a buzzer in the instrument panel which alarms when the engine is stopped and the parking brake is not applied.

PTO control AC IV

(Always automatic functions on)

PTO engages	PTO disengages
1. PTO is engaged manually with the control lever – electric engagement with the switch in the lever knob	– if the PTO has been engaged before starting the engine, the PTO shaft does not start to rotate. Warning light flashes. PTO engages after the control lever is moved to neutral and back to the engaged position. – If the PTO clutch slips more than 4 %. Warning light flashes. PTO is engaged again, when current is switched off and on. – when the safety switch is opened over 3 seconds. Warning light flashes. PTO engages when the engine is stopped and current is switched off and on and the control lever is moved to the neutral position and back to the engaged position. **Note!** If the safety plug is replaced into the socket within 2 seconds the PTO begins to rotate. This must be observed when using a remote emergency switch connected to the plug.

Slip control AC IV

Slip control is switched on with a switch that has 6 different positions
0 = switched off
1 – 5 = switched on

Slip percent is adjustable

– desired slip limit can be programmed

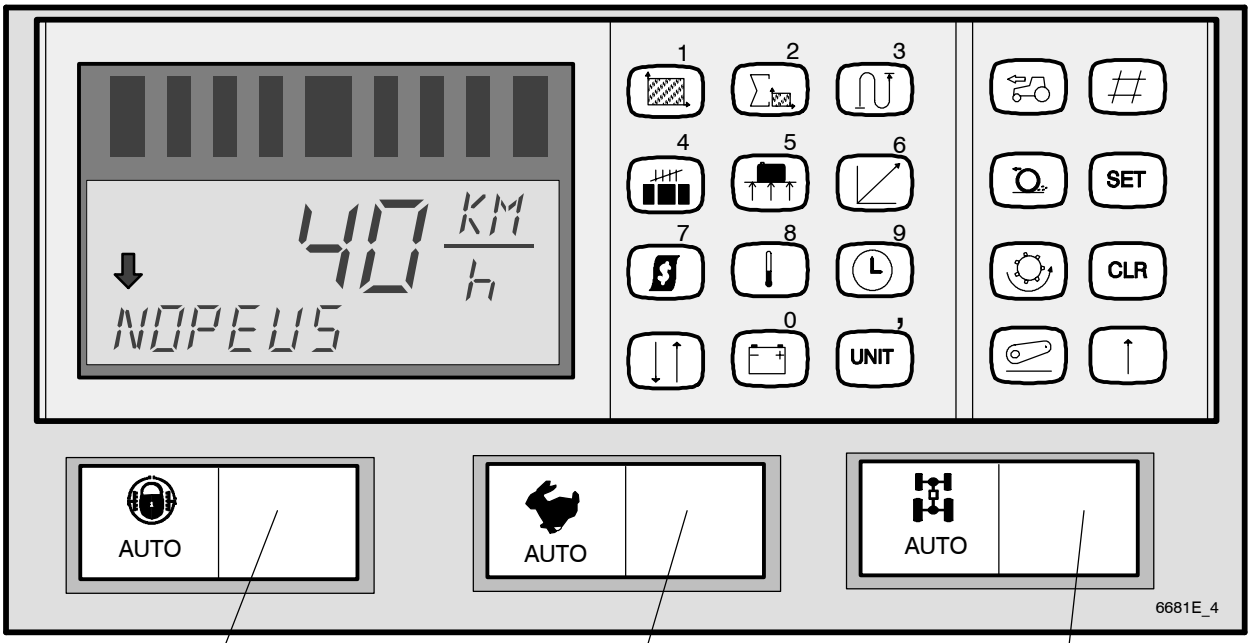
Draft control selector in position P.	Draft control selector in position 1–5
– buzzer signal is heard when the set slip percent is exceeded.	– if the set slip percent is exceeded, the lift order is sent to the power lift. – lift movement is determined by the position of the slip switch: 1-small lift 5–big lift

Cold starting AC IV

(Ignition switch has also a normal glowing position)

Notify readiness for start	Automatic afterglowing if needed
– indicator lamp is lit=glowing – indicator lamp flashes=ready for starting Programmed according to the engine coolant temperature.	– indicator lamp is lit continuously=afterglowing – glowing time has been programmed according to the engine coolant temperature.

Autocontrol IV display unit and function keys



Diff. lock switch *Delta Powershift switch* *4WD switch*

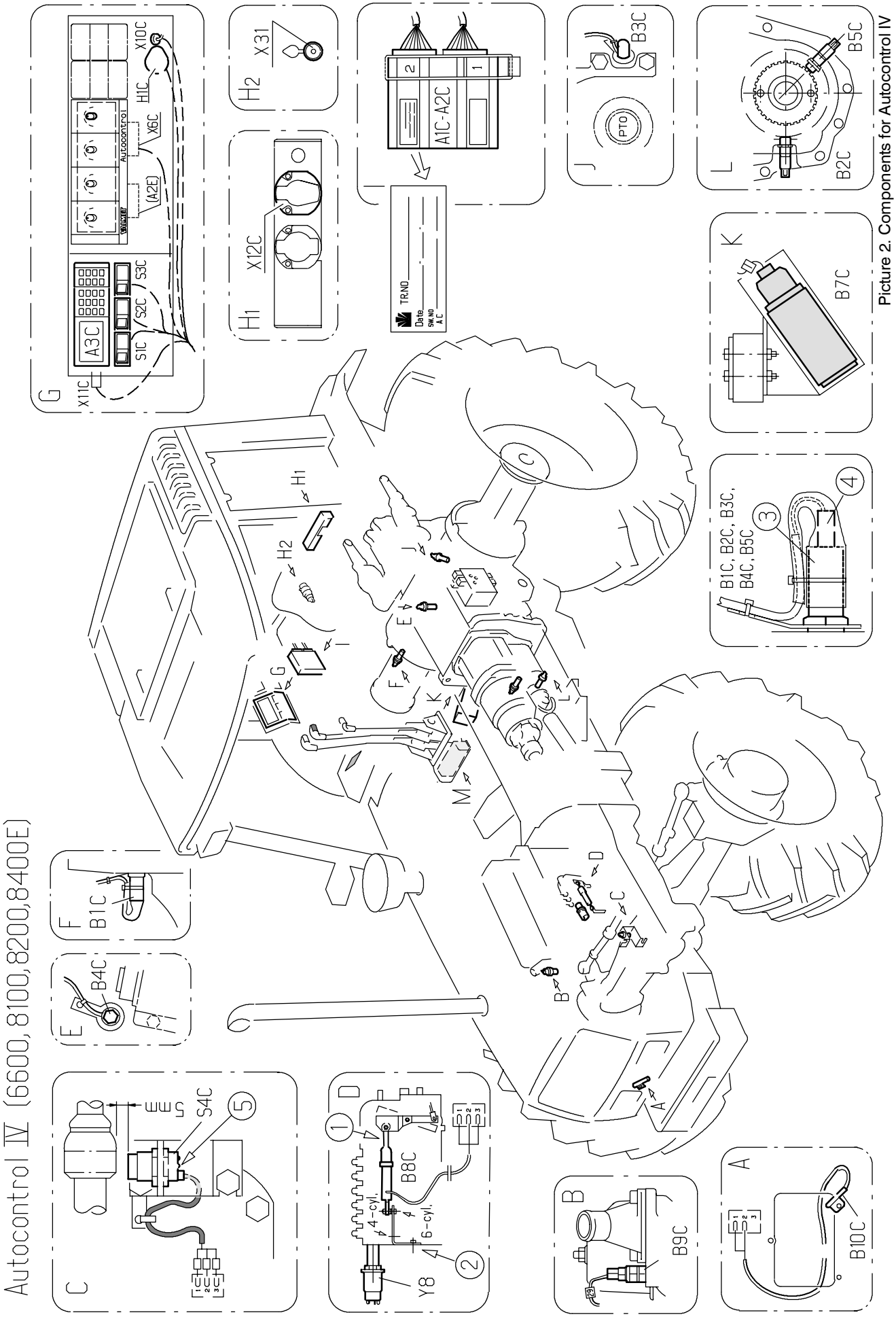
Picture 1. *Display unit and function keys*
Diff. lock switch:
Rear edge depressed: differential lock is engaged.
Middle position: lock is engaged manually but disengages when brake pedal/pedals are depressed
Front edge depressed: AC IV automatically controls the lock
Delta Powershift switch:
Rear edge depressed: the gear is controlled with the push buttons in the gear lever knob.
Front edge depressed: AC IV controls the gear automatically.
4WD switch:
Rear edge depressed: 4WD disengaged except when latched together brake pedals are depressed
Middle position: 4WD is engaged manually
Front edge depressed: AC IV automatically controls the 4WD

The display unit and keys are the same as on Autocontrol III, see pages **340/6 and 7**. The key functions differ a little when calibrating the flow meter.

The switches below the display unit differ from the switches on Autocontrol III, see page **340/6** (AC III) and page **350/1** (AC IV)**.**

Calibrating mode for the hidden functions, see AC III on page **340/6**.

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Picture 2. Components for Autocontrol IV

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Components for AC IV system

See picture 2 on previous page.

A. Outdoor temperature sensor

Sensor B10C is fitted under the fixing screw for the headlight. AC IV display shows the outdoor temperature.

B. Sensor for engine coolant temperature

Sensor (B9C) controls the cold starting automatics. An indicator light on the instrument panel shows when the engine can be started. The system controls automatically the afterglowing in cold conditions. AC IV display shows also the engine coolant temperature.

C. Sensor for front wheel steering angle

Sensor (S4C) notifies the AC IV system when the font wheel steering angle is over ±15°. Then the automatics disengage the differential lock. The lock is re–engaged automatically when the front wheels are turned less than ±15°

5. Sensor signal lights.

D. Potentiometer on fuel injection pump

Potentiometer (B8C) notifies the system the position of the governor control lever on the fuel injection pump. AC IV compares the governor control lever position and the engine revs. Eg. the system changes automatically to the lower gear when the engine revs drop during a hard load (and vice versa)
1. Universal grease.
2. Loctite 242.

E–models have a starting solenoid Y8 in the front face of the fuel injection pump, see page **350/7.**

E. Sensor for engine revs

Sensor (B4C) is fitted on the gearbox under the cab. The sensor measures the engine rotation speed from the gear for the hydraulic pump drive mechanism. The display shows also the engine revs. The sensor controls the engagement of the Delta Powershift and indicates if the PTO clutch is slipping.

F. Sensor for rear axle rotation speed

Sensor (B1C) measures the rotation speed of the RH side rear axle from the impulse disc fitted on the final drive planetary gear. Engages the differential lock when the rotation speed difference between the rear axles exceeds 20 %.

G. Display unit

Display unit A3C and the function keys are the same as on AC III. Below the display unit there are switches for selecting between the manual or automatic control of the tractor transmission.

H_1 and H_2. Sockets at the rear of the tractor

Socket X12C for connecting implement sensors to the AC IV system.
PTO emergency stop socket X31 (terminator)

I. Central processing unit ECS (Electrical Control System)

The central unit ECS (connectors A1C, A2C) is fitted in the lever console in the cab. On the ECS is fitted a sticker with the tractor manufacturing number etc.

J. Sensor for PTO revs

Sensor (B3C) measures the rotation speed of the PTO shaft from the impulse disc fitted on the shaft. Display shows the PTO rotation speed.

Note! With effect from ser. no. F17107 the PTO control system has been modified. In this new system the PTO has a relay control (compare AC II and AC 2.1).

K. Radar

Radar (B7C) notifies the ECS the actual tractor travelling speed. The radar is used e.g. for detecting the wheel slip. The radar has been connected to the hydraulic power lift so that when the set slip percent is exceeded the lift order is sent to the power lift. The radar controls also the engagement of the front wheel drive and the differential lock.

Radar – You are not allowed to go under the tractor which has radar (slip control models) before the current switch has been turned off. – **dangerous for eyes.**

L. Gearbox rotation speed sensor B2C and front axle speed sensor B5C

The reverse shuttle housing has been changed. That is why the above mentioned sensors are fitted in different positions as on Autocontrol III.

M. Delta Powershift control unit A10

The control unit is the same on all Mezzo–tractors which have the Delta Powershift control with two push buttons in the gear lever knob (not rocking switch). Control unit A10, ind. light panel A9 and the buzzer B1 are shown on pages **311/3–6** (Autocontrol II).

Important! IN AC.2.1 system there are changes for DPS control, see code 312.

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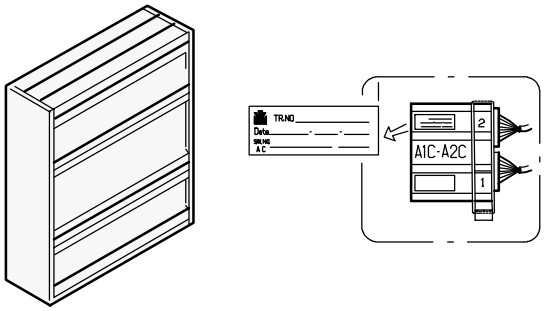
Differences between Autocontrol III and IV

– The front wheel steering angle sensor is different to Autocontrol III.

– The gearbox speed sensor is fitted on the RH side of the reverse shuttle and it measures gearbox rotation speed from the gearwheel of the 4WD clutch drum (not an impulse disc as on AC III).

– The front axle speed sensor measures the rotation speed of the 4WD output shaft. There is an impulse plate fitted between the two output shaft nuts. On the side of the impulse plate there are holes for possible running recorder (tachograph) which must be ordered separately.

Central processing unit ECS



The ECS is fitted in the same place as on AC III. The central unit of the AC IV is different as on AC III but its appearance and size is the same. The AC IV ECS has a sticker with marking ”Autocontrol 4 Control Unit”, order no 32884200. Other markings, see page **353**/**2**.

Parameter files:

Autocontrol IV parameter files are different compared with AC III, see page **343**/**2** (AC III) and **353**/**2** (AC IV). AC III parameter files must not be used. The parameter file is input into the ECS in the same way as on AC III (see under code **353**) but the Service Program is different.

Delta Powershift control

The greatest difference is the automatic control of the Delta powershift. AC IV has a 2–position rocker switch with which can be selected either manual or automatic control of the gear. In the manual mode the gear ratio is changed with the push buttons in the speed gear lever knob.

On AC IV the Delta Powershift control unit A10, indicator light panel A9 and buzzer B1 are the same as on Autocontrol II, see pages **311**/**3–6**.

In the automatic mode, AC IV engages the best possible gear ratio according to the loading conditions. When changing the gear, ECS sends a current signal to the control unit A10 to the same pins as the push buttons in the manual mode. The control unit A10 then sends output signals to the gear solenoids and indicator lights for gear changing.

On AC III, the automatic gear change happened according to the max output or max torque. On AC IV there is only one automatic position and the gear change happens between these two possibilities and the rocking switch has only one automatic position.

Slip control and the power lift

The slip control is the same as on AC III. The hydraulic power lift is the same as on AC III but the lift/lower switch has three positions from the beginning of the year 1994. The middle position stops the movement of the lower links.

Display unit and switches

The function keys are the same as on AC III but the possible flow meter calibration has been changed a little. The functions of the switches below the display unit are different. The 4WD and diff. lock switches have been removed from the gear lever knobs.

Counting functions (same as on AC II)

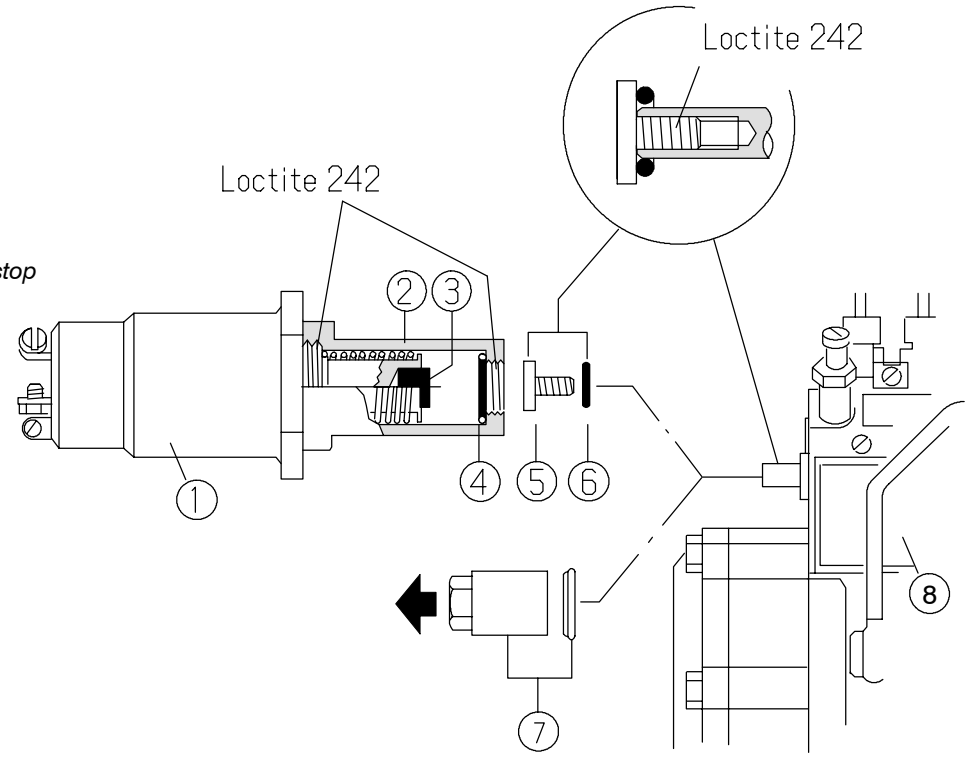
The counting functions are checked in the same way as on AC III, see page **341**/**7**.

Implement functions (same as on AC III)

The implement functions and the rear socket are the same as on AC III. Possible functional checking is carried out in the same way as on AC III, see page **352**/**9** (AC IV).

Electric stop of the engine

E–models have not a stop control knob but the engine stops when the ignition switch is turned to the 0–position. The fuel injection pump is moved to the stop position by a solenoid spring when the current to the solenoid is cut–off.



Picture 3. *Fitting of electrical stop*
1. Solenoid
2. Threaded sleeve
3. Rubber
4. O–ring
5. Screw
6. O–ring
7. Removed standard parts
8. Fuel injection pump

When the ignition switch is in the ON–position, the solenoid is energised and the magnet keeps the pump in the running position.

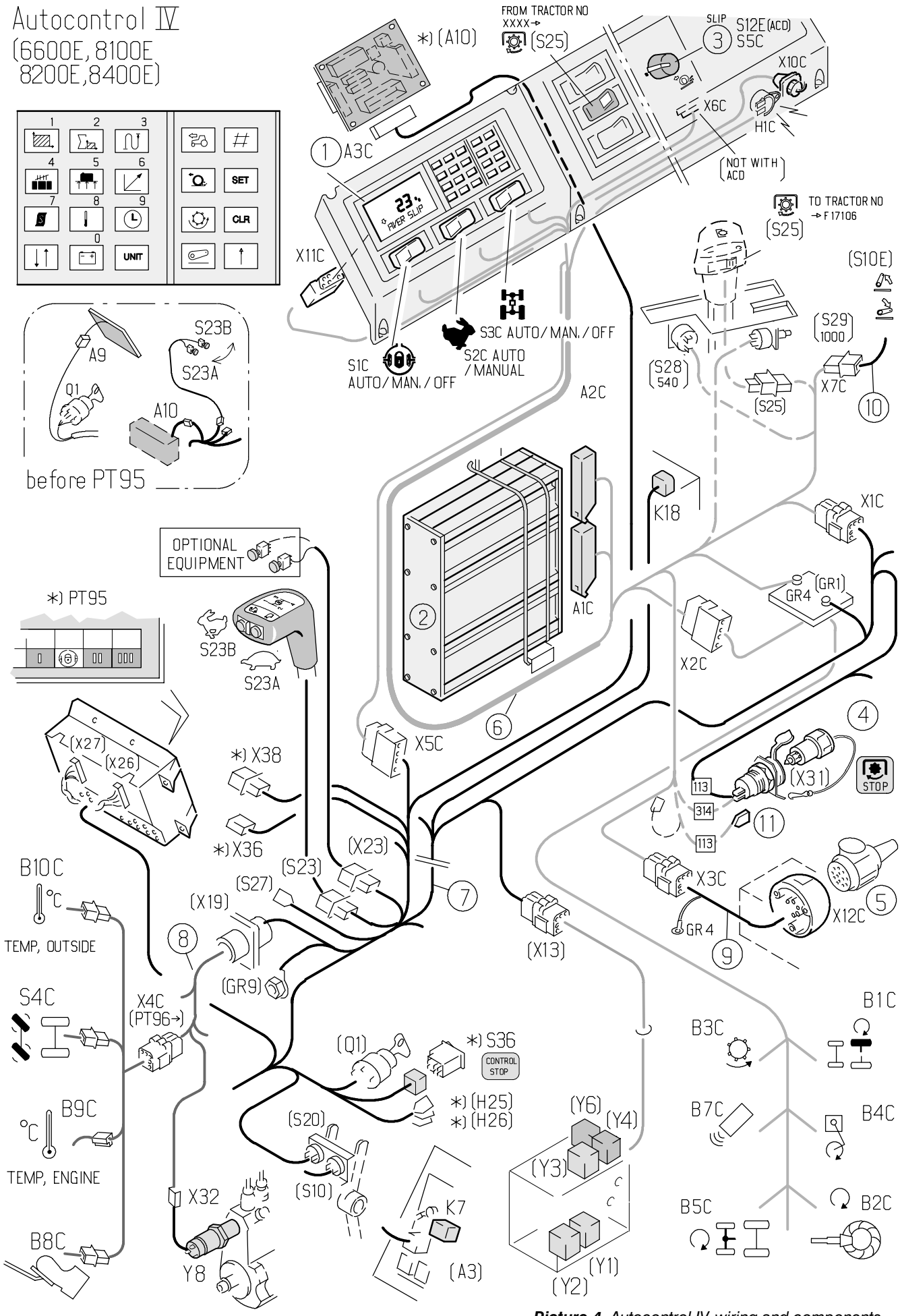
The solenoid earth wire (white) has been fastened under the bolt of the injection pump potentiometer fixing plate. The solenoid supply wire (171/Black) has connector X32 and the wire goes via the socket X19 on the front wall of the cab. The electric stop requires a different ignition switch compared with the normal stop system. From date 9403 all Mezzo–tractors have an ignition switch no 325 53200 which can control the electric stop.

If the engine stops during driving, the solenoid magnet can be damaged or there can be poor wire contacts. When current is switched on to the solenoid, a click sound can be heard.

Note! On later E–Models, the automatic stop control is a standard equipment, see pages **312/1** and **312/4** and wiring diagrams on pages **350/12–17.**

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Connectors and wiring



Picture 4. *Autocontrol IV, wiring and components*

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Wiring and connectors

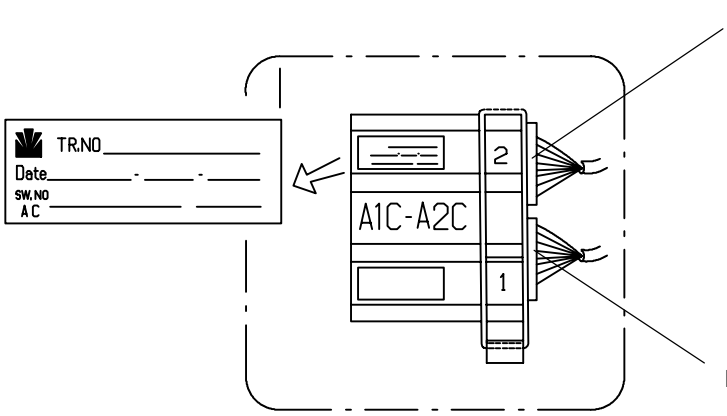
See picture 4 on previous page.

1. Display unit with connector X11C.
2. Central unit (ECS, in the lever console).
3. Slip control (+buzzer)
4. PTO emergency stop socket
5. Implement socket
6. ECS wiring loom
7. Cab wiring loom
8. Engine wiring loom
9. Rear socket wiring loom
10. Power lift wiring loom

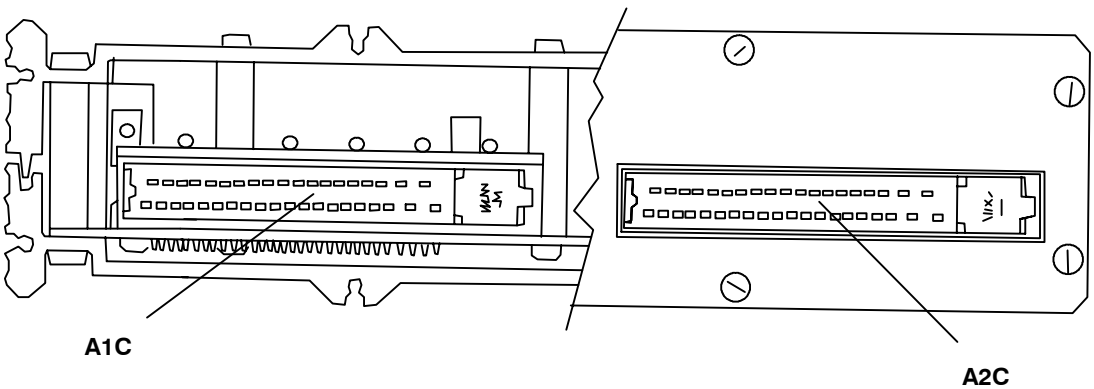
11. If the ECS is damaged, the PTO automatics can be overridden by disconnecting wire nr 314 (lilac) from the emergency stop socket (in the lever console) and then by connecting free wire nr 113 (yellow) inplace of the lilac wire. The PTO can now be controlled manually with the switch S25 in the PTO lever knob. The emergency stop functions also with this connection but not the slip control.

Note! With effect from spring –96 a new connector X4C has been fitted for the sensors in the front part of the tractor. This connector is in the engine compartment on the RH side.

Note! With effect from ser. no. F17107 the PTO control system has been modified. In this new system the PTO has a relay control (compare AC II and AC 2.1).



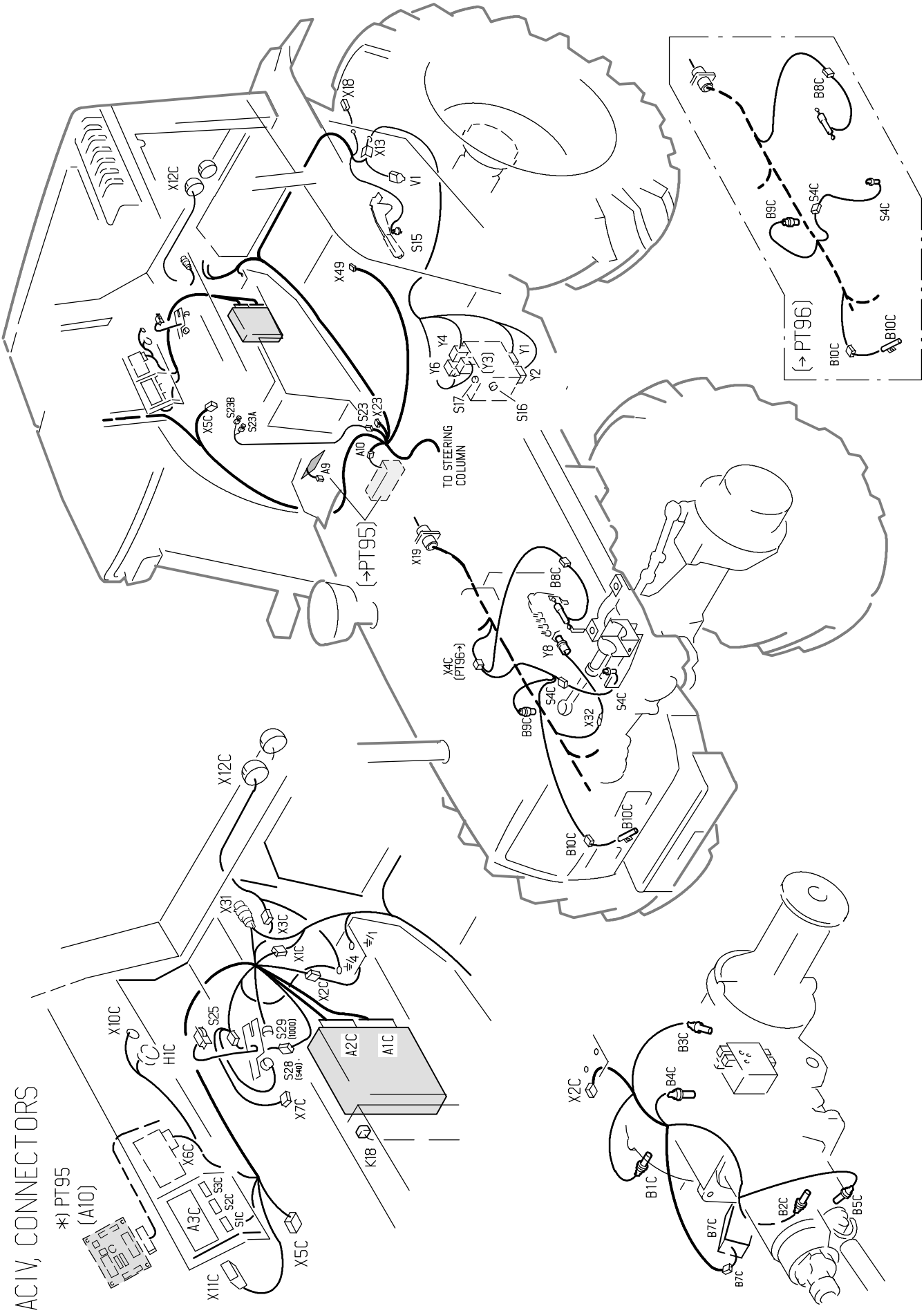
Picture 5. *The ECS is placed in the lever console and is accessible after removing the console side panel.*



Picture 6*. Rear side of the ECS*
Voltage and resistance measurements can be done from the pins of connectors A1C and A2C. The pins have been numbered.
Supply voltage can be measured from connector A2C: Earth A2C/1. Supply voltage A2C/2, A2C/21 and A2C/25 (current must be switched on)

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Position of connectors



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Position of connectors

See picture **7** on previous page.

The ECS connectors A1C (red) and A2C (see also page **350**/**9**) are placed in the cab lever console on the driver's right.

In the lever console, there are also the following connectors:
– X1C: ECS supply and solenoid valve wires
– X2C: speed sensors and radar wires
– X3C: implement socket wires
– X5C: switch and sensor wires
– X6C: power lift control panel wires
– X7C: power lift wiring loom connector

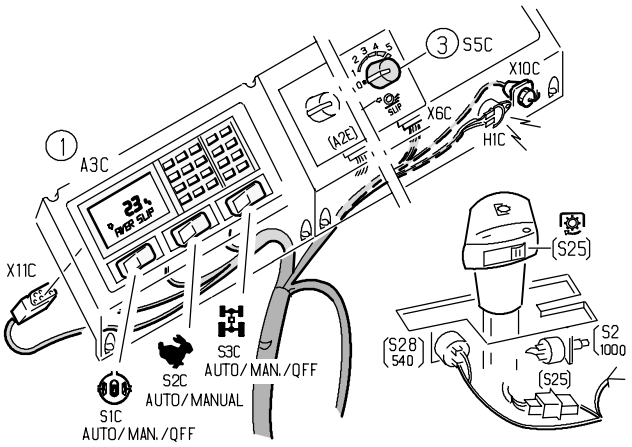
In front of the lever console under the panel:
– A10: Delta Power Shift control unit A10 connector
– S23: Power Shift push button connector
– X23: connector for extra push buttons

All speed sensor pins are equipped with connectors. The radar connector B7C is located near the radar.

Sensors in the engine compartment:
– the outdoor temperature sensor connector is fitted in the front part of the tractor.
– the engine temperature sensor pin has a connector.
– the front wheel steering angle sensor connector S4C is located on the right hand side of the engine
– X4C: connector for sensors in the front part of the tractor
– fuel injection pump potentiometer connector B8C.
– Y8 is a starting solenoid on the fuel injection pump
Note! All wires from the sensors in the engine compartment are drawn via socket X19 in the cab front wall on the RH side.

The solenoid valve connector X13 is placed under the hand brake lever console on the driver's left. In addition, the solenoid pins have connectors:

Y1=Diff. lock solenoid
Y2=PTO solenoid
Y3=4WD solenoid (energised when 4WD is disengaged)
Y4=Delta Power Shift, reduction ratio
Y6=Delta Power Shift, overdrive
In the direct ratio, both solenoid valves are energised.



Display unit (1), A/M–switches, power lift controls and slip control selector (3) and slip control buzzer (H1C) are accessible after unscrewing the panel cross–head screws. The panel has two sections.

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Wiring diagram, E–models, –F17106

Diagram no 32549920A on pages 350/14–16.

Sym–bol	Component	Cod-no
(A 2)	Radio	2
A 3	Electric centre	
(A 5)	Air suspension seat	93
(A6)	Agrodata	
(A7)	Elektric air filter	
A10	Control unit, Delta Power Shift	102
(A11)	Telephone	99
(A14)	Tachograph	1
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B 3)	Sensor, gearbox temperature	95
(B 9)	Sensor, tachograph	1
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front indicator, R.H	31
E 4	Front indicator, L.H	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, R, outer	42
E10	Rear working right, R, inner	42
E11	Rear working light, L, outer	41
E12	Rear working light, L, inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	94
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Registration plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard light, reserve	31
F 2	5 A Radio, clock, tachograph	2
F 3	10 A High beam, indicator light	25
F 4	10 A Low beam	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket/rear fog light	35
F10	15 A Heat/starter switch, thermostart	4
F11	5 A Autocontrol (+bat), buzzer	83
F12	10 A Rotating warning light, cabin light	47
F13	10 A Reserve	93
F14	15 A Water pump	97
F15	20 A Fan III– speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators, Agrodata	32
F18	5 A Instruments, warning lightsAutocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/ washer	48
F21	15 A Fan I, II, air conditioner, floor fan	55
F22	10 A Delta Power Shift	101
F23	10 A Rear w. lights, outer	41
F24	10 A AC–4 control unit	62
F25	10 A Seat with air suspension,seat heating, rear steering prevention	93
F26	10 A Back buzzer, trailer brakes	96
F27	10 A Braking lights	65
F28	10 A Reserve (Telephone)	99
F29	10 A Cigarette lighter, power socket	91
F30	10 A ACIV sensors	66
(F31)	15 A Electric air filter	97
G 1	Battery	1
G 2	Alternator	4

Sym–bol	Component	Cod-no
H 1	Warning light, direction indicator III	34
H 2	Warning light, direction indicator II	34
H 3	Warning light, direction indicator I	34
H 4	Warning light, air filter	7
H 5	Warning light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Warning light, gearbox oil pressure	9
(H8)	Light, oil filter, gearbox	10
H 9	Light, 4WD	65
H10	Light, PTO	67
H11	Light, parking brake	12
H12	Light, Thermostart	6
H14	Light, main beams	27
H15	Warning light, low fuel level	14
H16	Warning light, charging	6
H18	Warning light, gearb. oil temp.	13
H19	Light, DPS I	102
H20	Light, diff. lock	62
H21	Light, DPS II	102
H22	Light, DPS III	102
H23	Horn	50
(H24)	Rotating roof beacon	
(H27)	Back buzzer	96
K 1	Relay, front working lights	43
K 2	Relay, rear working lights	41
K 3	Relay, thermostart	6
K 4	Starter switch relay	8
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Break lights	65
K 9	Relay , interval wiper	53
K10	Direction indicator relay	34
K14	Starter motor relay	4
(K17)	Relay, rear fog light	35
K18	Relay, Control stop	12
M 1	Starter motor	3
M 2	Heating fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M 5)	Rear window wiper	49
(M 6)	Rear window washer	48
(M 7)	Floor fan	57
(M 8)	Water pump	98
P 1	Engine coolant gauge	16
P 2	Fuel gauge	17
P 3	Rev. counter	18
P 4	Hour meter/working height	19
(P 4)	Agrodata–instrument	
(P 5)	Agrodata–instrument	94
Q 1	Starter switch	4
(Q2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S 3	Switch, fan	55
S 4	Combination control	25,34,52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioner	54
S 9	Starter safety switch	4
S10	Brake light contact, right	65
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9

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Sym–bol	Component	Cod-no
S18	Engine temperature sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	65
S23	Switch, Delta Power Shift, selector	102
(S23)	Extra sw., Delta Power Shift, selector	102
S24	Switch, Delta Power Shift release	100
(S26)	Switch, rear fog light	35
(S27)	Switch, back buzzer	
S28	Switch, PTO 540	66
S29	Switch, PTO 1000/ 540E	66
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	97
(S35)	Rear steering prevention	94
S36	Switch, Control stop	4
(S37)	Switch, Agrodata–unit	94
(S38)	Switch, Front PTO	
S42	Door switch, right, cab light	46
S43	Door switch, left, cab light	46
V 1...4	Diodes (Y1, Y2, Y3, Y4, Y6)	
V 3	Diod, Control stop	
X 1	Connector, 9–pole, distribution box	
X 2	Connector, 9–pole, distribution box	
X 3	Connector, 9–pole, distribution box	
X 4	Connector, 9–pole, distribution box	
X 5	Connector, 9–pole, distribution box	
X 6	Connector, 9–pole, distribution box	
X 7	Connector, 9–pole, distribution box	
(X 8)	Conn., 2–pole, power socket	92
X 9	Connector, 9–pole, combination control	
X10	Connector, 9–pole, combination control	
X11	Connector, 9–pole, upwards	
X12	Connector, 9–pole, rearwards, right	
X13	Connector, 9–pole, solenoid valves.	
X14	Connector, 9–pole, rearwards, left	
(X15)	Connector, 3–pole, air cond., diodes	
(X16)	Connector, 3–pole, cigarette lighter, current socket	
X17	Trailer socket, 7–pole	32
(X18)	Connector, 2–pole, rear window washer	
X19	Connector, 24–pole, front wall	
X20	Connector, 9–pole, front direction indicator	
(X22)	Connector, 2 pole, rot. roof light	
X23	Connector, 3–pole,Delta Power Shift, extra switches	
X24	Connector, 9 pole, upwards	
(X25)	Connector, 9 pole, Agrodata–instr.	
X26	Connector, 26 pole, instr. left, white.	
X27	Connector, 26 pole, instr. right, blue	
(X29)	Connector, 2–pole,stop– alarm	
X31	Socket, 2–pole, PTO–emerg. stop	68
X32	Connector, 1 pole, electric stop	
(X33)	Connector, 3–pole,fog light, rear	
(X34)	Connector, 9–pole, Agrodata sensor	
(X35)	Connector, 9–pole, ETB supply	
(X49)	Connector, 2–pole, seat	
Y 1	Solenoid valve, diff. lock	63
Y 2	Solenoid valve PTO	68
Y 3	Solenoid valve 4WD	66
Y 4	Solenoid valve, Delta Power Shift	100
(Y 5)	Solenoid valve compressor (air.cond.)	54
Y 6	Solenoid valve, Delta Power Shift	102
(Y7)	Solenoid valve, rear steering prevention	94
Y8	Solenoid, engine stop	4
(Y9)	Solenoid, front PTO	
GR1	Earth lead, rear lights, solenoids	
GR2	Earth lead, roof	
GR4	Earth lead, autocontrol	
GR5	Earth lead, cable harness, instr. panel	
GR7	Earth lead, battery	
GR8	Earth lead, headlights	
GR9	Earth lead, cabin	
GR10	Earth lead, electrical stop	
AUTOCONTROL POWER LIFT:		
A1E	Autocontrol	84
A2E	Autocontrol, switch panel	87
A3E	Compensator	82
B1E	Position sensor	81
B2E	Draft sensor, R.H	81
B3E	Draft sensor, L.H	81
E1E	Lighting, switch panel	87
E2E	Lighting, position potentiometer	88
R1E	Potentiometer, pos .control	87
S1E	Switch, rear operation, r.h., lifting	84
S2E	Switch, rear operation, r.h., lowering	84
S3E	Switch, rear operation, l.h., lifting	83
S4E	Switch, rear drive, l.h., lowering	83
S5E	Switch, inside, lifting	85
S6E	Switch, inside, lowering	85
S7E	Switch, lowering speed	87
S8E	Switch, top limit	87
S9E	Switch, sensitivity /mixing	87
S10E	Switch, lifting /lowering	88
S11E	Switch, forced lowering	86
X2E	Connector housing, 9 pole., EH– supply, rear push buttons	
Y1E	Solenoid valve, lowering	81
Y2E	Solenoid valve, lifting	81
AC IV UNIT:		
A1C	ACIV– control unit (red connector)	61,66
A2C	ACIV– control unit	61,66
B1C	Speed sensor, rear wheel	61
B2C	Speed sensor, gearbox	61
B3C	Speed sensor, PTO	61
B4C	Speed sensor, engine	61
B5C	Velocity sensor, front axle	68
B7C	Radar	65
B8C	Potentiometer, accelerator	63
B9C	Temperature sensor, thermostart	19
B10C	Outside temperature sensor	18
H1C	Buzzer, slip	89
H2C	Led, slip control	
S1C	Switch, diff. lock, autom./ manual	68
S2C	Switch, Delta Power Shift autom./man.	102
S3C	Switch, 4WD, autom./manual	67
S4C	Switch, steering angle	69
S5C	Switch, slip control	
X1C	Connector housing, 9–pole, sources/solenoids	
X2C	Connector housing, 15–pole, wheel sensors	
X3C	Connector housing, 9–pole, rear socket	
X5C	Connector housing, 15–pole, sensors switches	
X6C	Conn. housing,12–pole,EH–card	87
X7C	Connector housing, EH wiring assy	
X10C	Connector housing, 8–pole, RS232/RS485	61
X11C	Conn. housing, 9–pole, display	61
X12C	Rear socket, 13–pole	71

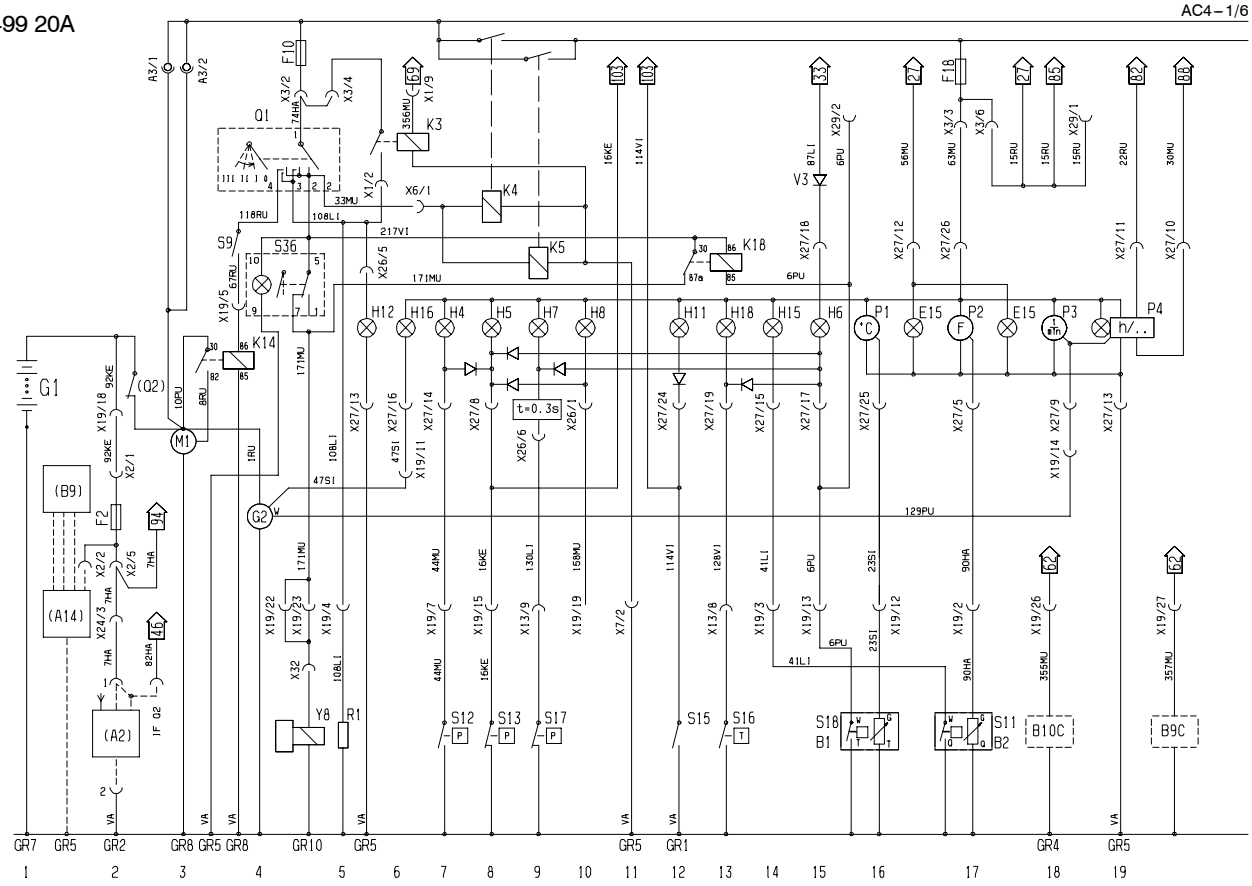
Wire colours

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

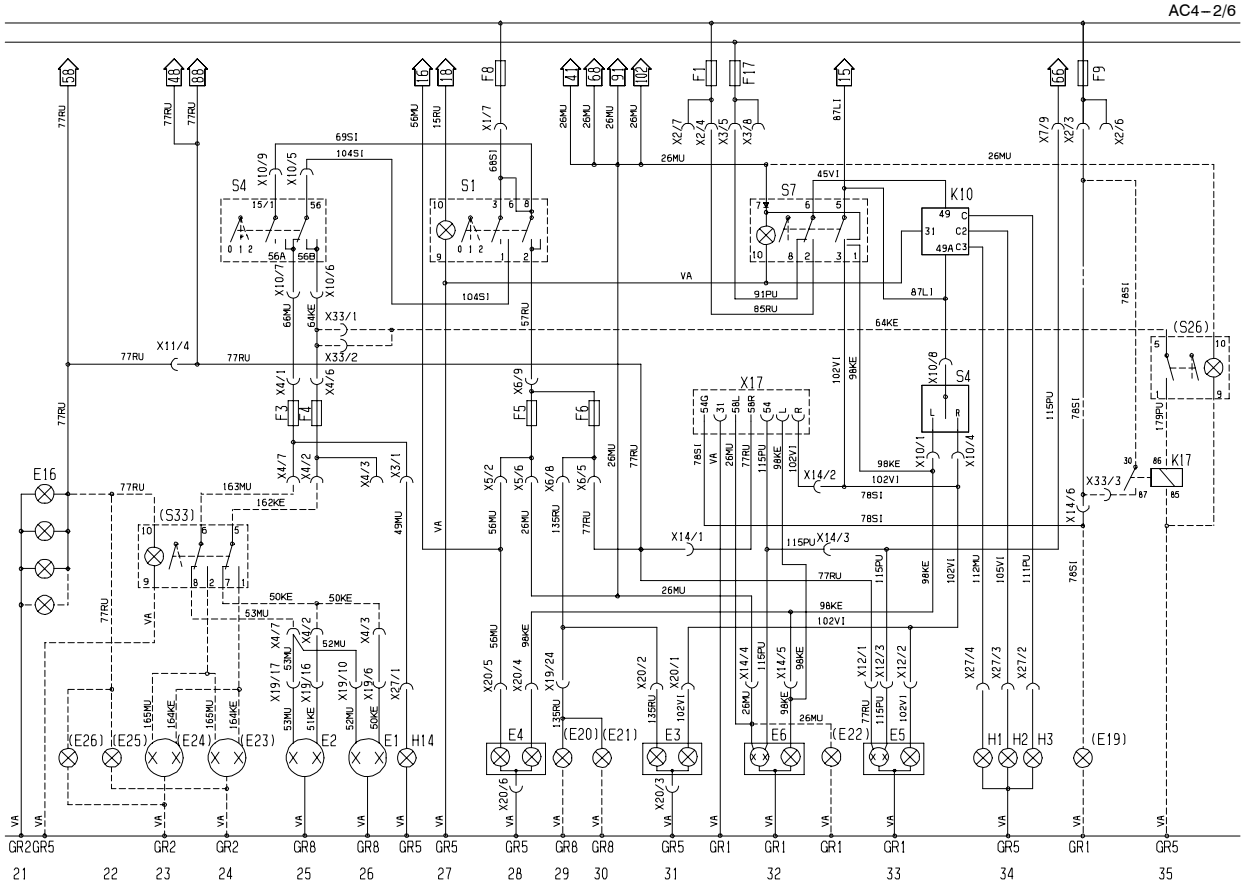
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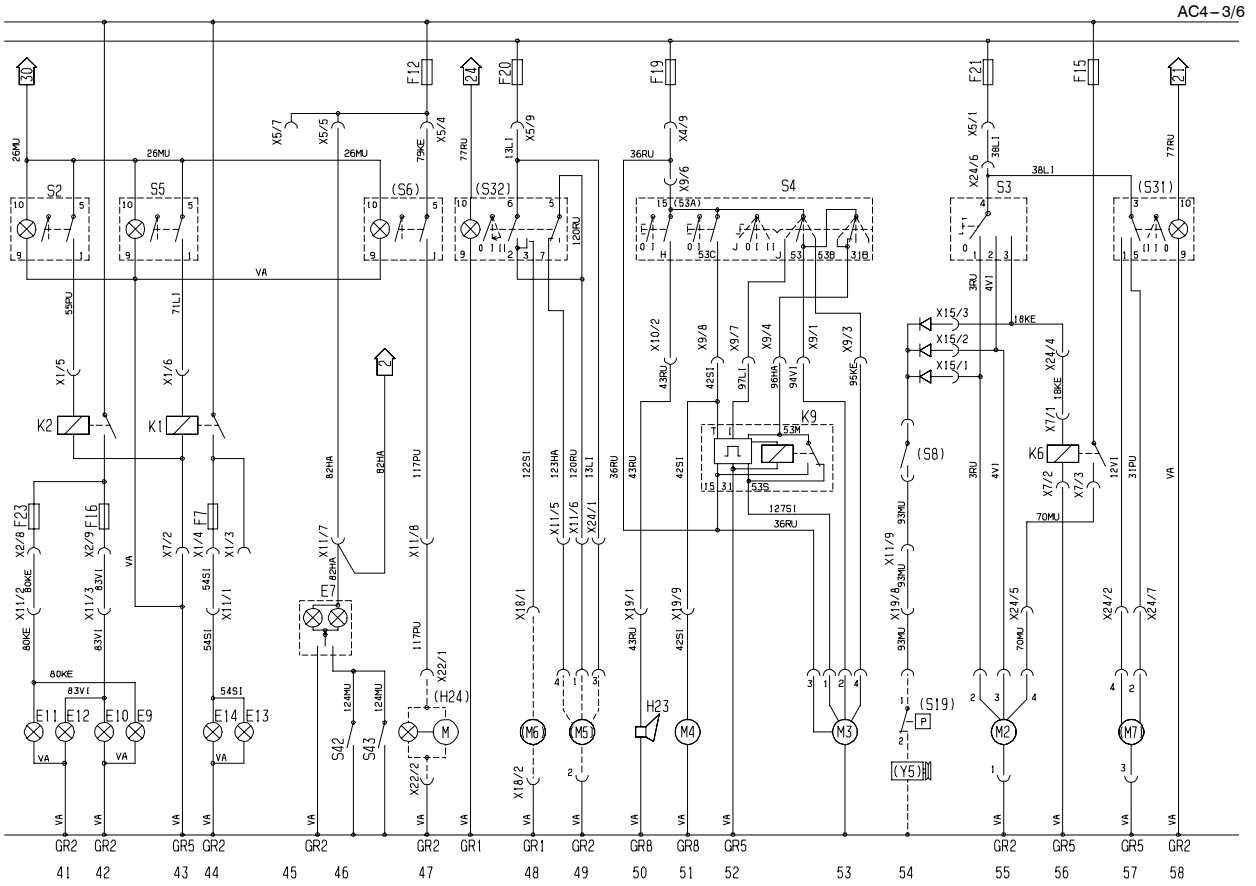
AC4–1/6

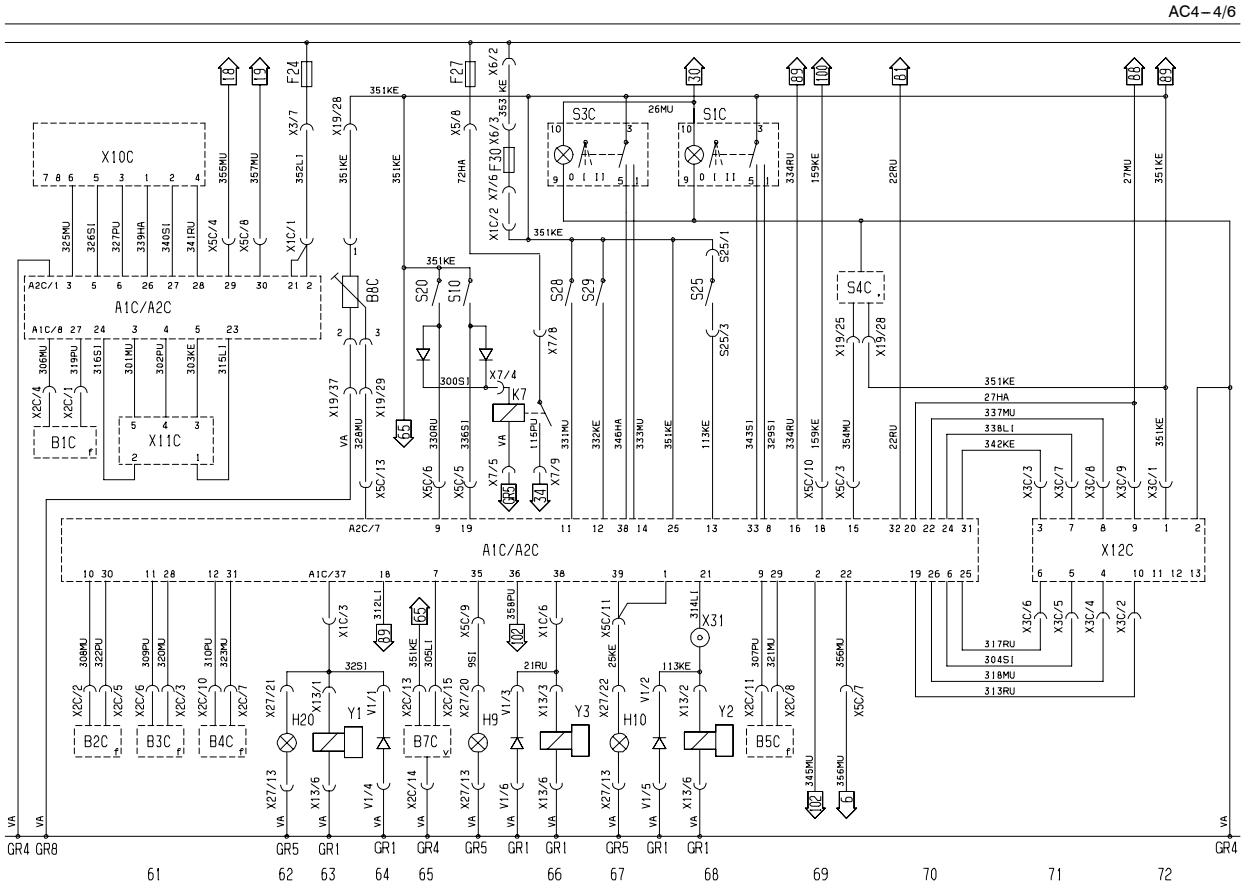


AC4–2/6



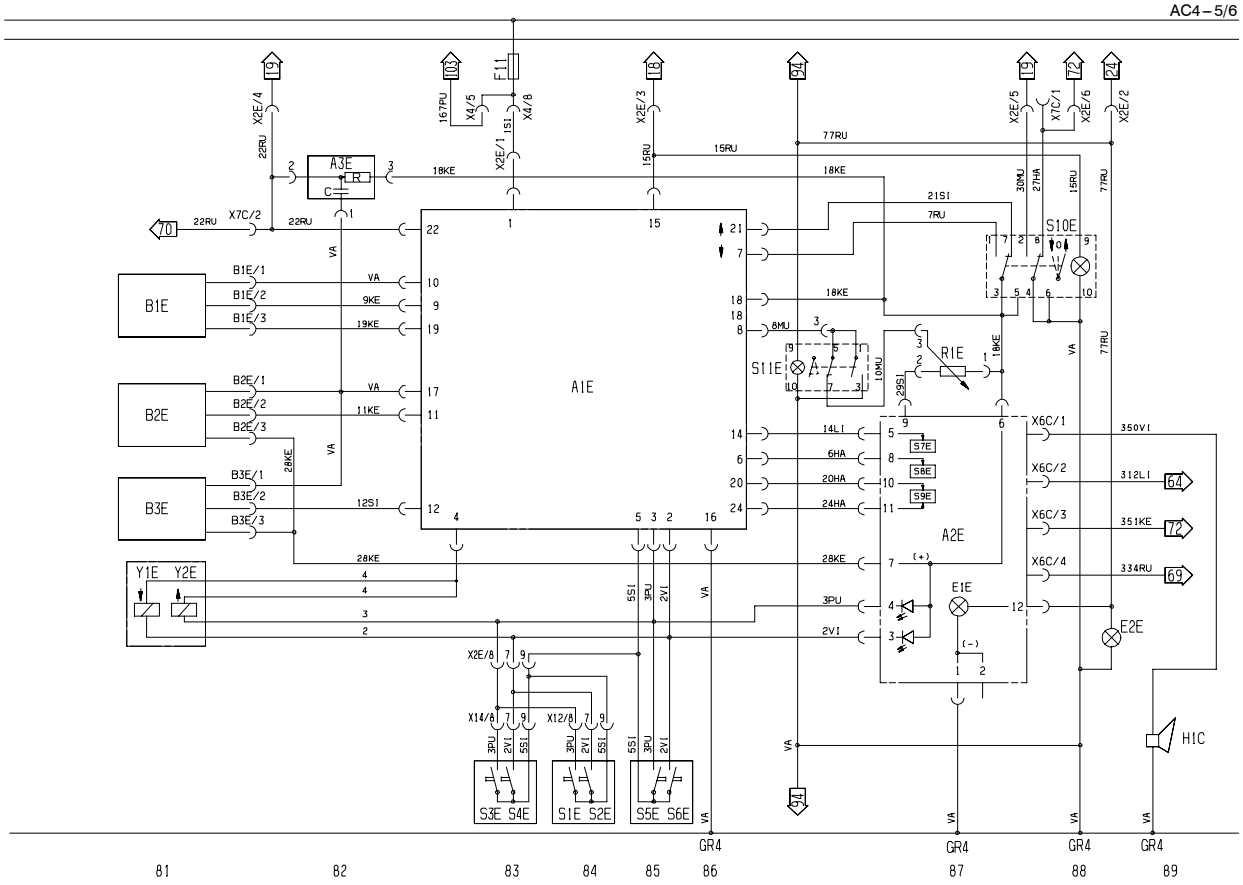
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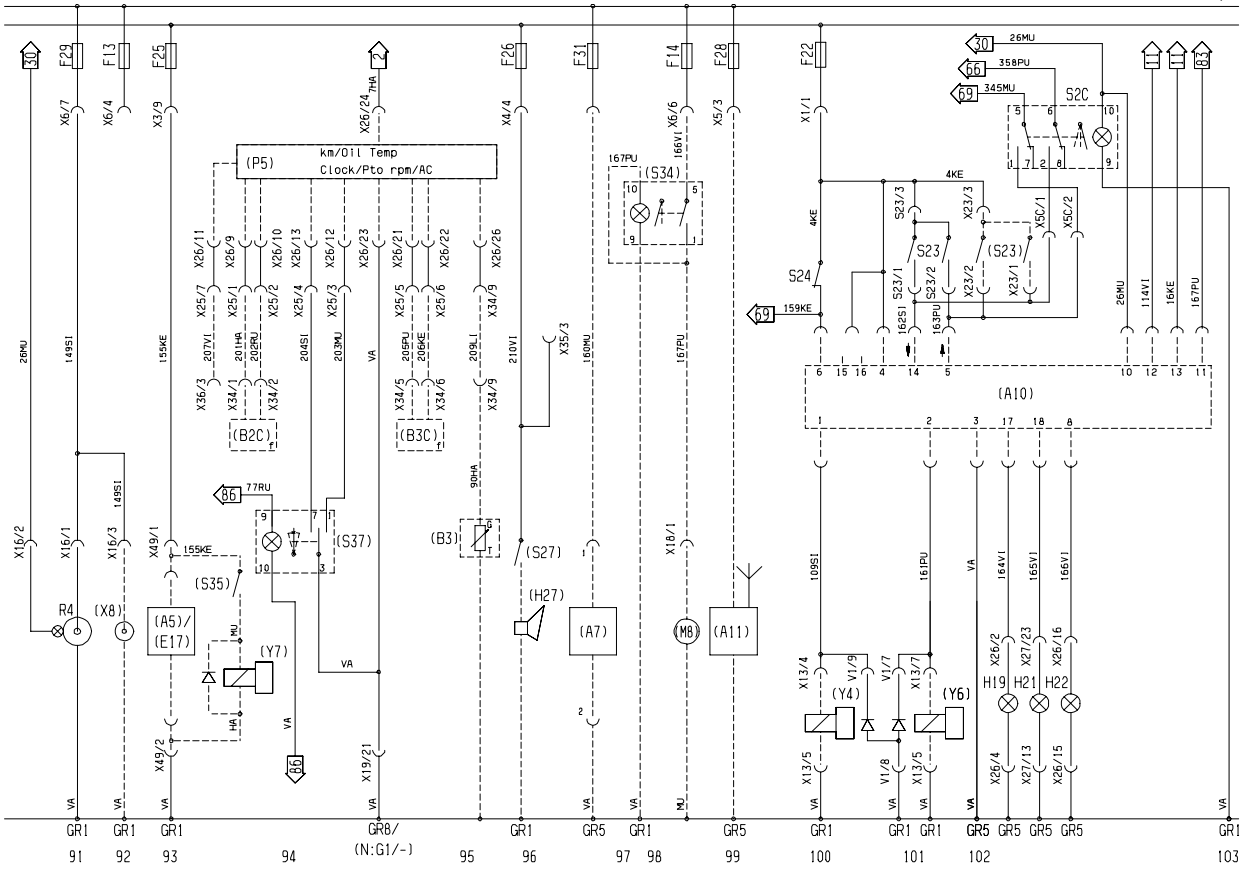


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AC4–5/6



AC4–6/6



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Wiring diagram, E–models, F17107– F50111

Diagrams on pages **350/23–25**. Incl. new cab wire loom and a new relay control for PTO.

Sym–bol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	93
(A7)	Electric air filter	97
A10	Control unit, Delta Power Shift	101
(A11)	Telephone	97
(A13)	Control unit, Sigma	
(A14)	Tachograph	1
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B4)	Sensor, Sigma, crankshaft	
(B5)	Sensor, Sigma, PTO	
(B9)	Sensor, tachograph	1
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front indicator, R.H	31
E 4	Front indicator, L.H	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, R, outer	42
E10	Rear working right, R, inner	42
E11	Rear working light, L, outer	41
E12	Rear working light, L, inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	93
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Registration plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard light, reserve	31
F 2	5 A Radio, clock, **tachograph**	2
F 3	**15 A** High beams, indicator light	25
F 4	**15 A** Low beams	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket/rear fog light	35
F10	15 A Heat/starter switch, thermostart	4
F11	5 A Autocontrol (+bat), buzzer 82,103	
F12	10 A Rot. warning light, cabin light	47
F13	10 A Reserve	92
F14	15 A Water pump 94,96	
F15	20 A Fan III– speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators	32
F18	5 A Instruments, warning lights Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/ washer	48
F21	15 A Fan I,II, air conditioner, floor fan	55
F22	10 A Delta Power Shift	100
F23	10 A Rear w. lights, outer	41
F24	10 A AC–4 control unit	68
F25	**15A** Seat with air suspension, seat heating, rear steering prevention	93
F26	10 A **Back buzzer, trailer brakes, Sigma**	
F27	10 A Braking lights	61
F28	10 A Reserve (Telephone)	97
F29	10 A Cigarette lighter, power socket	91
F30	10 A ACIV sensors, **PTO**	64
(F31)	15 A Electric air filter	97
G 1	Battery	1
G 2	Alternator	4
H 1	Indicator light, direction indicator III	34
H 2	Indicator light, direction indicator II	34
H 3	Indicator light, direction indicator I	34
H 4	Indicator light, air filter	7
H 5	Indicator light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Indicator light, gearbox oil pressure	9
(H8)	Indicator light, gearbox oil filter	10
H 9	Indicator light, 4WD	69
H10	Indicator light, PTO	98
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator, low fuel level	14
H16	Indicator light, charging	6
H18	Indicator light, gearb. oil temp.	13
H19	Indicator light, DPS I	102
H20	Indicator light, diff. lock	68
H21	Indicator light, DPS II	102
H22	Indicator light, DPS III	102
H23	Horn	50
(H24)	Rotating roof beacon	47
(H27)	Back buzzer	94
K 1	Relay, front working lights	43
K 2	Relay, rear working lights	41
K 3	Relay, thermostart	6
K 4	Starter switch relay	8
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Brake lights	61
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K14	Starter motor relay	4
K16	Relay, PTO–emergency stop	99
(K17)	Relay, rear fog light	35
K18	Relay, Control stop	13
K19	Relay, display control, Sigma	
M 1	Starter motor	3
M 2	Heating fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M 5)	Rear window wiper	49
(M 6)	Rear window washer	48
(M 7)	Floor fan	57
(M 8)	Water pump	96
P 1	Engine coolant gauge	16
P 2	Fuel gauge	17
P 3	Rev. counter	18
P 4	Hour meter/working height	19
Q 1	Starter switch	4
(Q2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S 3	Switch, fan	55
S 4	Combination control	25,34,52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47

Sym-bol	Component	Code no
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioner	54
S 9	Starter safety switch	4
S10	Brake light contact, right	62
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temp. sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	62
S23	Switch, Delta Power Shift, selector	102
(S23)	Extra sw., Delta Power Shift, selector	102
S24	Switch, Delta Power Shift release	100
S25	Switch, PTO	99
(S26)	Switch, rear fog light	35
(S27)	Switch, back buzzer	94
S28	Switch, PTO 540	99
S29	Switch, PTO 1000/ 540E	98
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	96
(S35)	Rear steering prevention	93
S36	Switch, Control stop	4
(S38)	Switch, Front PTO	
S42	Door switch, right, cab light	46
S43	Door switch, left, cab light	46
(S44)	Indicator light switch, gearbox filter	10
(S49)	Change over switch, rpm – /flow sensor	
(S50)	Change over switch, speed sensor tractor / implement	
V 1...4	Diodes (Y1, Y2, Y3, Y4, Y6)	
V3	Diod, Control stop	
X 1	Connector, 9 – pole, distribution box	
X 2	Connector, 9 – pole, distribution box	
X 3	Connector, 9 – pole, distribution box	
X 4	Connector, 9 – pole, distribution box	
X 5	Connector, 9 – pole, distribution box	
X 6	Connector, 9 – pole, distribution box	
X 7	Connector, 9 – pole, distribution box	
(X 8)	Conn., 2 – pole, power socket	92
X 9	Connector, 9 – pole, combination control	
X10	Connector, 9 – pole, combination control	
X11	Connector, 9 – pole, up	
X12	Connector, 9 – pole, rearwards, right	
X13	Connector, 9 – pole, solenoid valves.	
X14	Connector, 9 – pole, rearwards, left	
(X15)	Connector, 3 – pole, air cond., diodes	54
(X16)	Connector, 3 – pole, cigarette lighter, current socket	91
X17	Trailer socket, 7 – pole	32
(X18)	Connector, 2 – pole, rear window washer	
X19	Connector, 32 – pole, front wall	
X20	Connector, 9 – pole, front direction indicator	
(X22)	Connector, 2 pole, rot. roof light	
X23	Connector, 3 – pole,Delta Power Shift, extra switches	
X24	Connector, 9 pole, upwards	
X26	Connector, 26 pole, instr. left, white.	
X27	Connector, 26 pole, instr. right, blue	
(X29)	Connector, 2 – pole,stop – alarm	
X31	Socket, 2 – pole, PTO – emerg. stop	99
X32	Connector, 1 pole, electric stop	
(X33)	Connector, 3 – pole,fog light, rear	
(X35)	Connector, 9 – pole, Sigma supply	
(X36)	Reserve	
(X38)	Reserve	
(X39)	Reserve	
(X40)	Reserve	
(X49)	Connector, 2 – pole, seat	

Y 1	Solenoid valve, diff. lock	68
Y 2	Solenoid valve PTO	99
Y 3	Solenoid valve 4WD	69
Y 4	Solenoid valve, Delta Power Shift,	100
(Y 5)	Solenoid valve compressor (air.cond.)	54
Y 6	Solenoid valve, Delta Power Shift,	101
(Y7)	Solenoid valve, rear steering prevention	94
Y8	Solenoid, engine stop	4
(Y9)	Solenoid, front PTO	
(Y13)	Solenoid valve, Sigma	
(Y16)	Solenoid, Cold cranking	
GR1	Earth lead, rear lights, solenoids	
GR2	Earth lead, roof	
GR4	Earth lead, autocontrol	
GR5	Earth lead, cable harness, instr. panel	
GR7	Earth lead, battery	
GR8	Earth lead, headlights	
GR9	Earth lead, cabin	
GR10	Earth lead, electrical stop	

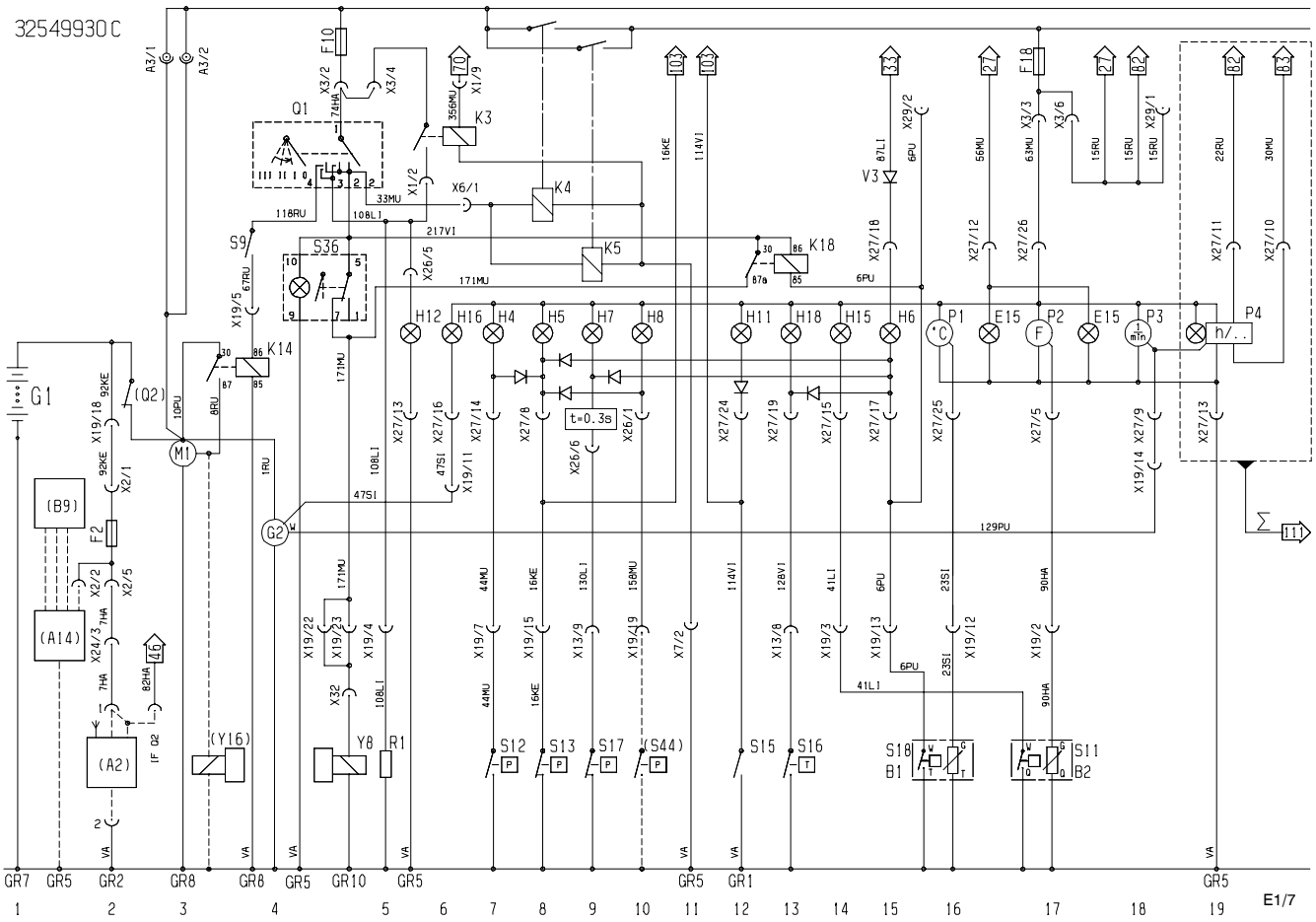
ACD POWER LIFT:

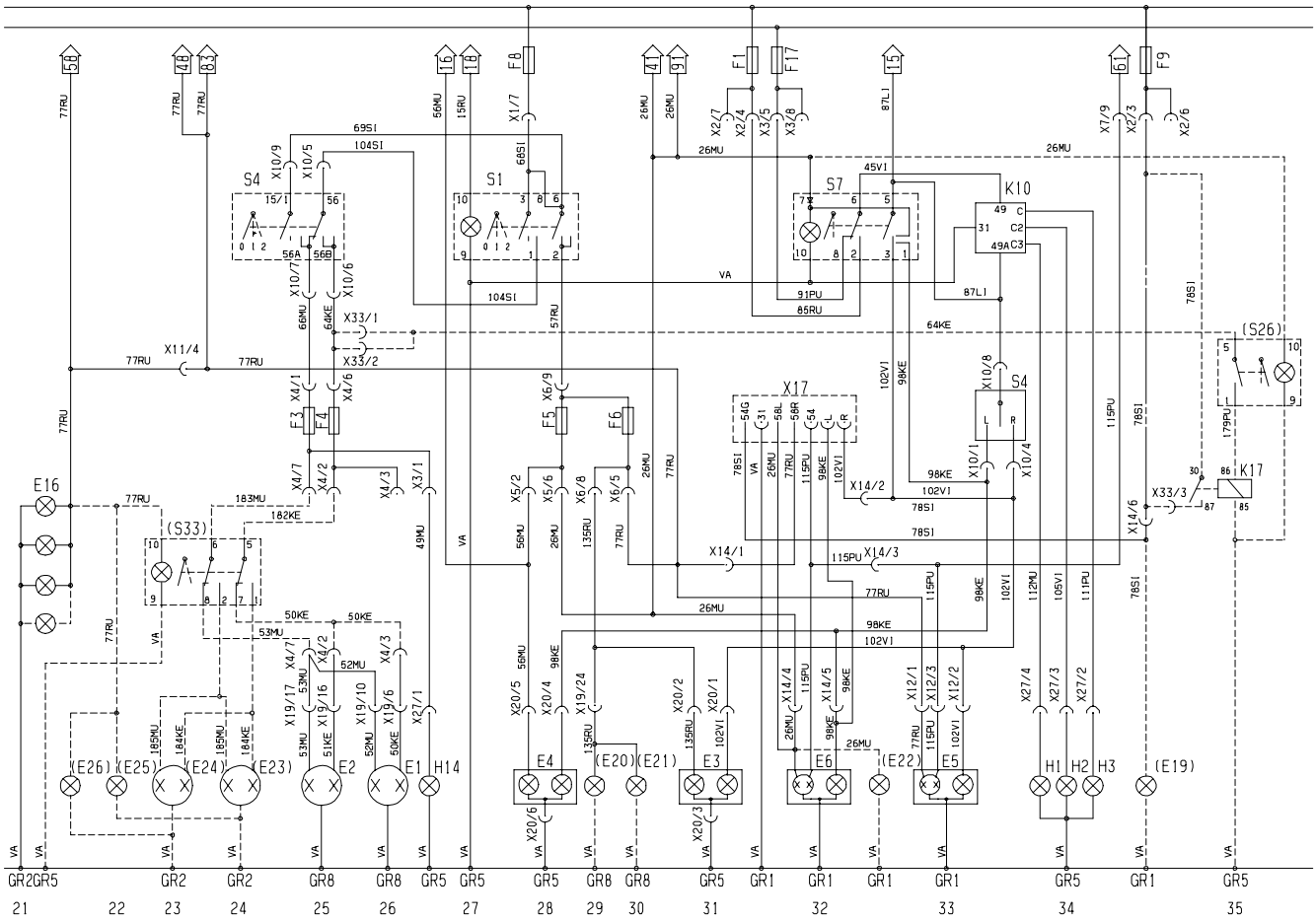
A1E	Autocontrol	82
A2E	Autocontrol, switch panel	83
A3E	Compensator	82
B1E	Position sensor	81
B2E	Draft sensor, R.H	81
B3E	Draft sensor, L.H	81
(B4E)	Position sensor, implement	81
E1E	Lighting, switch panel	83
E2E	Lighting, position potentiometer	83
R1E	Potentiometer, pos .control	83
S1E	Switch, rear operation, r.h., lifting	82
S2E	Switch, rear operation, r.h., lowering	82
S3E	Switch, rear operation, l.h., lifting	82
S4E	Switch, rear drive, l.h., lowering	82
S5E	Switch, inside, lifting / lowering	82
S7E	Switch, lowering speed	83
S8E	Switch, top limit	83
S9E	Switch, sensitivity /mixing	83
S10E	Switch, lifting /lowering	83
S11E	Switch, forced lowering	83
S12E	Switch, drive balance system / slip	83
X1E	Connector housing, 9 pole, speed sensors	
X2E	Connector housing, 9 pole, EH – supply, rear push buttons	
Y1E	Solenoid valve, lowering	82
Y2E	Solenoid valve, lifting	82

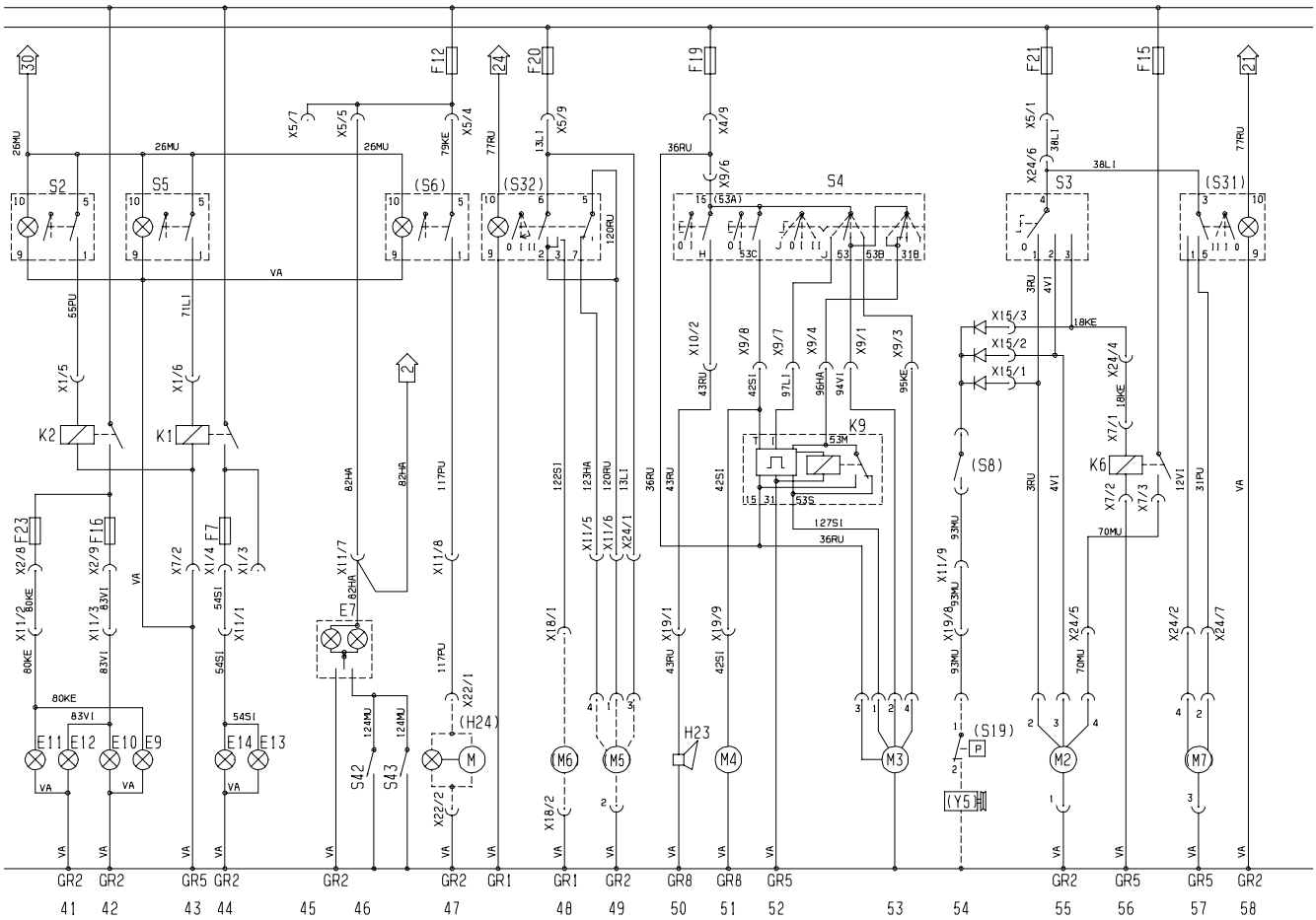
(OPTIONAL EQUIPMENT IN PARENTHESES)

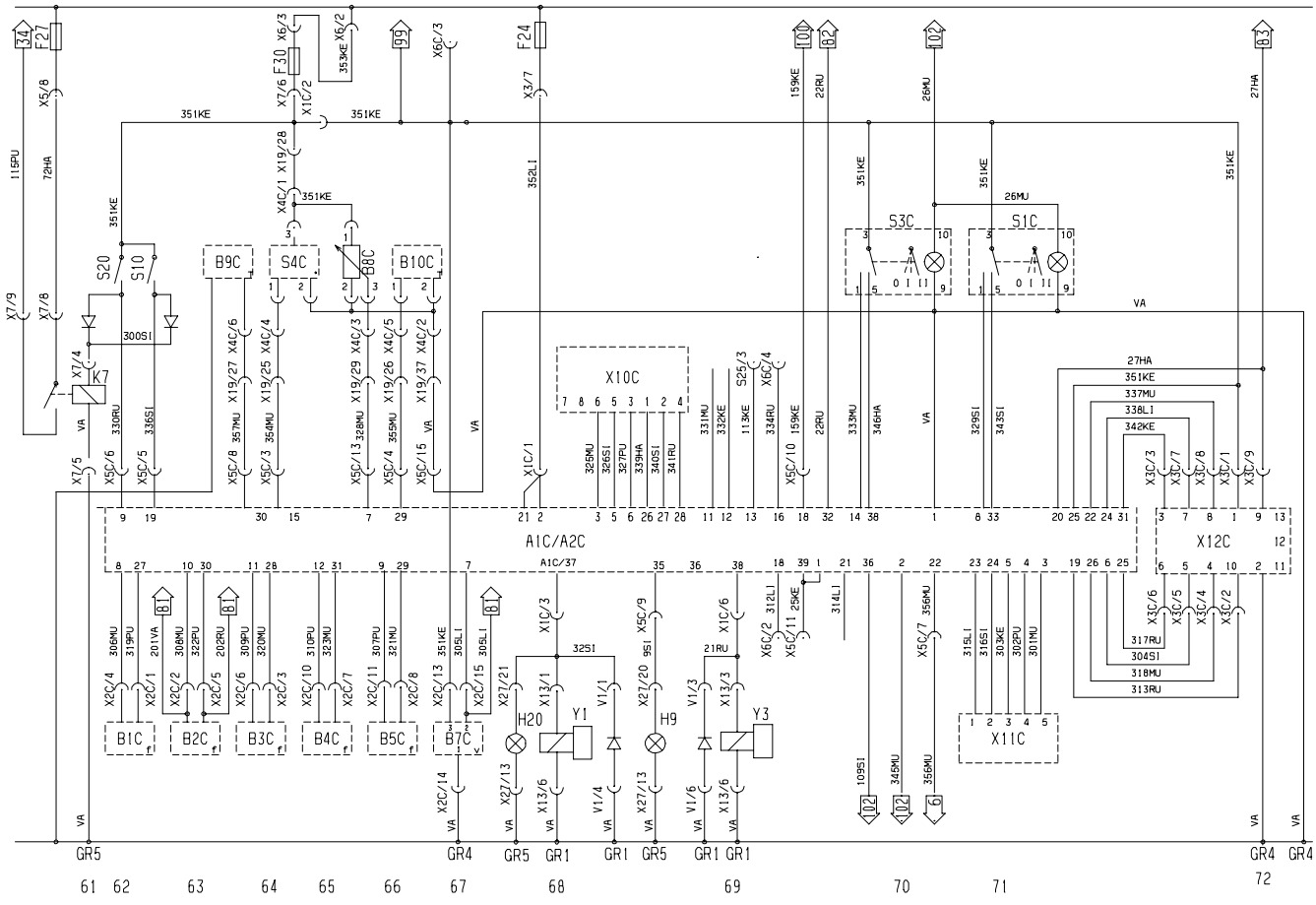
Sym–bol	Component	Code no
AC IV UNIT:		
A1C	ACIV– control unit (red connector)	62–71
A2C	ACIV– control unit	62–71
B1C	Speed sensor, rear wheel	62
B2C	Speed sensor, gearbox	63
B3C	Speed sensor, PTO	64
B4C	Speed sensor, engine	65
B5C	Velocity sensor, front axle	66
B7C	Radar	67
B8C	Potentiometer, accelerator	65
B9C	Temperature sensor, thermostart	63
B10C	Outside temperature sensor	66
S1C	Switch, diff. lock, autom./ manual	71
S2C	Switch, Delta Power Shift autom./man.	102
S3C	Switch, 4WD, autom./manual	70
S4C	Switch, steering angle	64
X1C	Connector housing, 9–pole, sources/solenoids	
X2C	Connector housing, 15–pole, wheel sensors	
X3C	Connector housing, 9–pole, rear socket	72
X4C	Connector, 9–pole, sensors, tractor's front part	
X5C	Connector housing, 15–pole, sensors, switches	
X6C	Not in use	
X7C	Connector housing, 3–pole, EH wiring assy	
X10C	Connector housing, 8–pole, RS232/RS485	68
X11C	Conn. housing, 9–pole, display	71
X12C	Rear socket, 13–pole	72

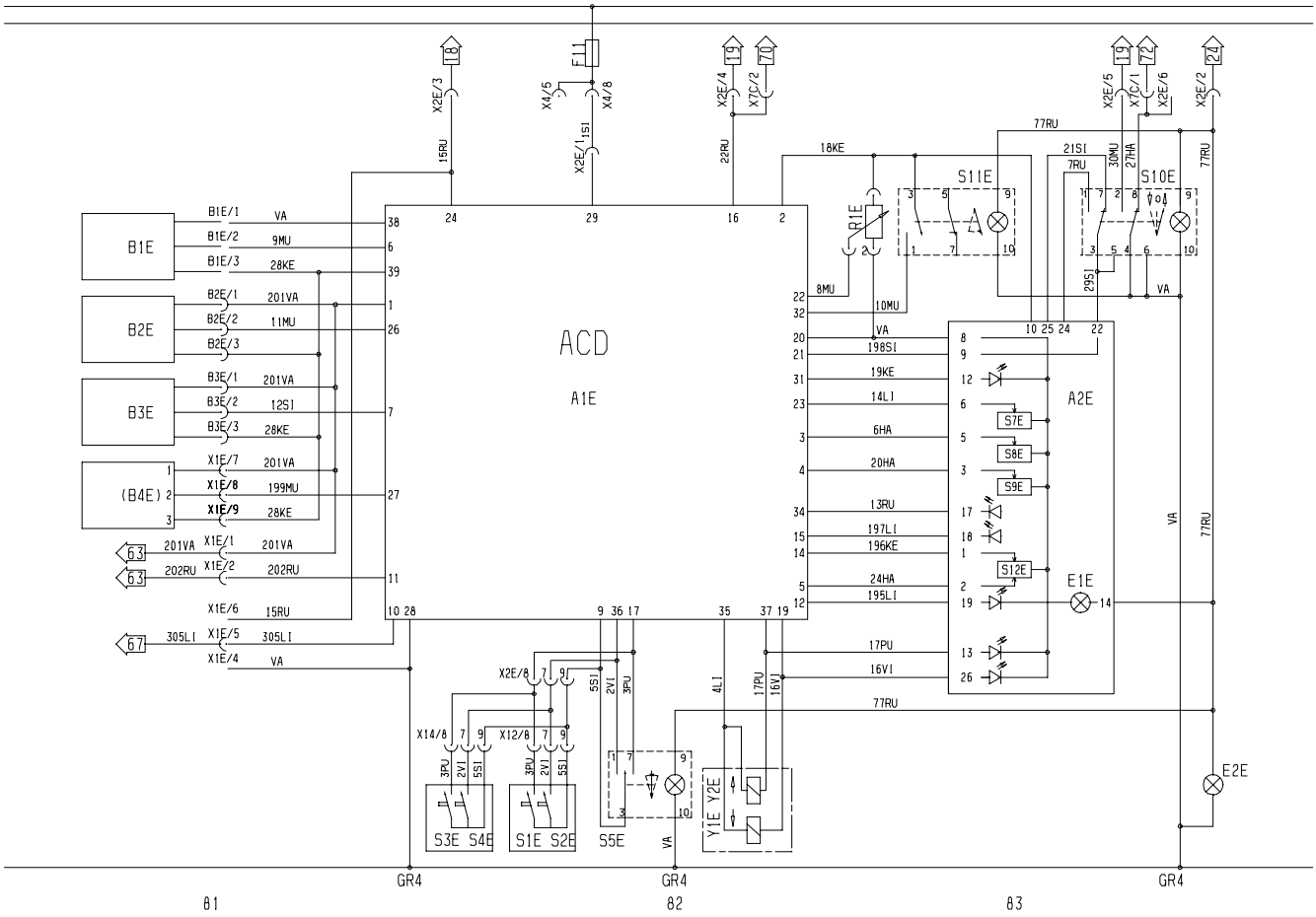
Wire colours
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

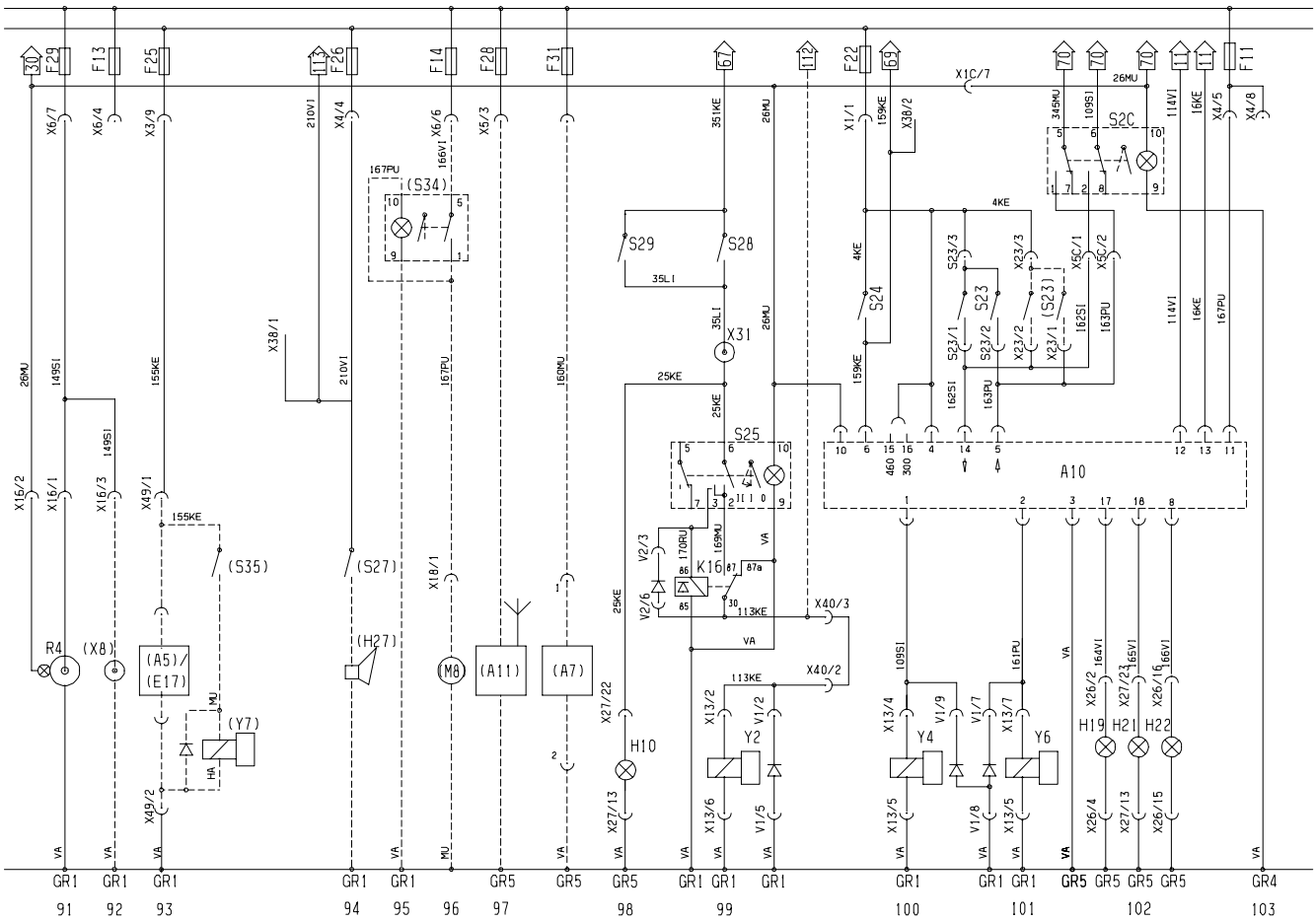

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E1/7








ACD
A1E
B1E
B2E
B3E
(B4E)
A2E
E1E
S10E
S11E
S7E
S8E
S9E
S12E
S1E S2E
S3E S4E
S5E
Y1E Y2E
E2E
R1E
81
82
83
GR4


S2C
S23/1 (S23)
S24
S25
S28
S29
A10
K16
Y2
Y4
Y6
H10
H19 H21 H22
(S27)
(S34)
(S35)
(A5)/ (E17)
(A7)
(A11)
(H27)
(M8)
(X8)
(Y7)
R4
X31
91
92
93
94
95
96
97
98
99
100
101
102
103
GR1
GR4
GR5

Wiring diagram, E–models, F50112–

Diagrams on pages **350**/**31–34**. Incl. modifications of distribution box.

Sym–bol	Component	Code no
(A2)	Radio	2
A3	Electric centre	
(A5)	Air suspension seat	93
(A7)	Electric air filter	97
A10	Control unit, Delta Power Shift	101
(A11)	Telephone	97
(A13)	Control unit, Sigma	113
(A14)	Tachograph	1
B 1	Sensor, engine temperature	16
B 2	Sensor, fuel gauge	17
(B4)	Sensor, Sigma, crankshaft	114
(B5)	Sensor, Sigma, PTO	114
(B9)	Sensor, tachograph	1
E 1	Headlights, right	26
E 2	Headlights, left	25
E 3	Front indicator, R.H	31
E 4	Front indicator, L.H	28
E 5	Rear light, right	33
E 6	Rear light, left	32
E 7	Cabin light	46
E 9	Rear working light, R, outer	42
E10	Rear working right, R, inner	42
E11	Rear working light, L, outer	41
E12	Rear working light, L, inner	41
E13	Front working light, right	44
E14	Front working light, left	44
E15	instrument lights	17
E16	Roof console lights	21
(E17)	Seat heater	93
(E19)	Fog light, rear	35
(E20)	Parking light, right, Norway	29
(E21)	Parking light, left, Norway	30
(E22)	Registration plate light	32
(E23)	Upper head light, right	24
(E24)	Upper head light, left	23
(E25)	Parking light, upper, right	22
(E26)	Parking light, upper, left	22
F 1	15 A Hazard light, reserve	31
F 2	5 A Radio, clock, **tachograph**	2
F 3	**15 A** High beams, indicator light	25
F 4	**15 A** Low beams	25
F 5	5 A Parking lights, left	28
F 6	5 A Parking lights, right	30
F 7	10 A Front working lights	44
F 8	20 A Light switch	28
F 9	15 A Trailer socket/rear fog light	35
F10	15 A Heat/starter switch, thermostart	4
F11	5 A Autocontrol (+bat), buzzer	82,103
F12	10 A Rot. warning light, cabin light	47
F13	10 A Reserve	92
F14	15 A Water pump	94,96
F15	20 A Fan III– speed	56
F16	10 A Rear working lights, inner	42
F17	10 A Direction indicators	32
F18	5 A Instruments, warning lights Autocontrol	17
F19	10 A Combination switch, wiper return	51
F20	10 A Rear window wiper/ washer	48
F21	15 A Fan I,II, air conditioner, floor fan	55
F22	10 A Delta Power Shift	100
F23	10 A Rear w. lights, outer	41
F24	10 A AC–4 control unit	68
F25	**15A** Seat with air suspension, seat heating, rear steering prevention	93
F26	10 A **Back buzzer, trailer brakes, Sigma**	
F27	10 A Braking lights	61
F28	10 A Reserve (Telephone)	97
F29	10 A Cigarette lighter, power socket	91
F30	10 A ACIV sensors, **PTO**	64
(F31)	15 A Electric air filter	97
G 1	Battery	1
G 2	Alternator	4
H 1	Indicator light, direction indicator III	34
H 2	Indicator light, direction indicator II	34
H 3	Indicator light, direction indicator I	34
H 4	Indicator light, air filter	7
H 5	Indicator light, engine oil pressure	8
H 6	Warning light, stop, engine temp.	15
H 7	Indicator light, gearbox oil pressure	9
(H8)	Indicator light, gearbox oil filter	10
H 9	Indicator light, 4WD	69
H10	Indicator light, PTO	98
H11	Indicator light, parking brake	12
H12	Indicator light, Thermostart	6
H14	Indicator light, main beams	27
H15	Indicator, low fuel level	14
H16	Indicator light, charging	6
H18	Indicator light, gearb. oil temp.	13
H19	Indicator light, DPS I	102
H20	Indicator light, diff. lock	68
H21	Indicator light, DPS II	102
H22	Indicator light, DPS III	102
H23	Horn	50
(H24)	Rotating roof beacon	47
(H27)	Back buzzer	94
K 1	Relay, front working lights	43
K 2	Relay, rear working lights	41
K 3	Relay, thermostart	6
K 4	Starter switch relay	8
K 5	Starter switch relay	9
K 6	Relay, fan III	56
K 7	Brake lights	61
K 9	Relay, interval wiper	53
K10	Direction indicator relay	34
K14	Starter motor relay	4
K16	Relay, PTO–emergency stop	99
(K17)	Relay, rear fog light	35
K18	Relay, Control stop	13
K19	Relay, display control, Sigma	112
M 1	Starter motor	3
M 2	Heating fan	55
M 3	Windscreen wiper	53
M 4	Windscreen washer	51
(M 5)	Rear window wiper	49
(M 6)	Rear window washer	48
(M 7)	Floor fan	57
(M 8)	Water pump	96
P 1	Engine coolant gauge	16
P 2	Fuel gauge	17
P 3	Rev. counter	18
P 4	Hour meter/working height	19
Q 1	Starter switch	4
(Q2)	Main switch	3
R 1	Thermostart	5
R 4	Cigarette lighter	91
S 1	Switch, head lights	28
S 2	Switch, rear working lights	41
S 3	Switch, fan	55
S 4	Combination control	25,34,52
S 5	Switch, front working lights	43
(S 6)	Switch, rot. warning light	47

Sym-bol	Component	Code no
S 7	Switch, hazard warning flashers	32
(S 8)	Switch, air conditioner	54
S 9	Starter safety switch	4
S10	Brake light contact, right	62
S11	Fuel gauge sender unit	17
S12	Pressure drop indicator, air filter	7
S13	Engine oil press. sender unit	8
S15	Sender unit to hand brake ind. light	12
S16	Gearbox temperature sender unit	13
S17	Gearbox oil pressure sender unit	9
S18	Engine temp. sender unit (stop)	16
(S19)	Air cond. compressor press. switch	54
S20	Brake light contact, left	62
S23	Switch, Delta Power Shift, selector	102
(S23)	Extra sw., Delta Power Shift, selector	102
S24	Switch, Delta Power Shift release	100
S25	Switch, PTO	99
(S26)	Switch, rear fog light	35
(S27)	Switch, back buzzer	94
S28	Switch, PTO 540	99
S29	Switch, PTO 1000/ 540E	98
(S31)	Switch, floor fan	57
(S32)	Switch, rear window washer and wiper	48
(S33)	Change over sw., head lights up	23
(S34)	Switch, water pump	96
(S35)	Rear steering prevention	93
S36	Switch, Control stop	4
(S38)	Switch, Front PTO	
S42	Door switch, right, cab light	46
S43	Door switch, left, cab light	46
(S44)	Indicator light switch, gearbox filter	10
(S49)	Change over switch, rpm – /flow sensor	
(S50)	Change over switch, speed sensor tractor / implement	
V 1...4	Diodes (Y1, Y2, Y3, Y4, Y6)	
V3	Diod, Control stop	
X 1	Connector, 9 – pole, distribution box	
X 2	Connector, 9 – pole, distribution box	
X 3	Connector, 9 – pole, distribution box	
X 4	Connector, 9 – pole, distribution box	
X 5	Connector, 9 – pole, distribution box	
X 6	Connector, 9 – pole, distribution box	
X 7	Connector, 9 – pole, distribution box	
(X 8)	Conn., 2 – pole, power socket	92
X 9	Connector, 9 – pole, combination control	
X10	Connector, 9 – pole, combination control	
X11	Connector, 9 – pole, up	
X12	Connector, 9 – pole, rearwards, right	
X13	Connector, 9 – pole, solenoid valves.	
X14	Connector, 9 – pole, rearwards, left	
(X15)	Connector, 3 – pole, air cond., diodes	54
(X16)	Connector, 3 – pole, cigarette lighter, current socket	91
X17	Trailer socket, 7 – pole	32
(X18)	Connector, 2 – pole, rear window washer	
X19	Connector, 32 – pole, front wall	
X20	Connector, 9 – pole, front direction indicator	
(X22)	Connector, 2 pole, rot. roof light	
X23	Connector, 3 – pole,Delta Power Shift, extra switches	
X24	Connector, 9 pole, upwards	
X26	Connector, 26 pole, instr. left, white.	
X27	Connector, 26 pole, instr. right, blue	
(X29)	Connector, 2 – pole,stop – alarm	
X31	Socket, 2 – pole, PTO – emerg. stop	99
X32	Connector, 1 pole, electric stop	
(X33)	Connector, 3 – pole,fog light, rear	
(X35)	Connector, 9 – pole, Sigma supply	
(X36)	Reserve	
(X38)	Reserve	
(X39)	Reserve	
(X40)	Reserve	
(X49)	Connector, 2 – pole, seat	

Y 1	Solenoid valve, diff. lock	68
Y 2	Solenoid valve PTO	99
Y 3	Solenoid valve 4WD	69
Y 4	Solenoid valve, Delta Power Shift,	100
(Y 5)	Solenoid valve compressor (air.cond.)	54
Y 6	Solenoid valve, Delta Power Shift,	101
(Y7)	Solenoid valve, rear steering prevention	94
Y8	Solenoid, engine stop	4
(Y9)	Solenoid, front PTO	
(Y13)	Solenoid valve, Sigma	113
(Y16)	Solenoid, Cold cranking	3
GR1	Earth lead, rear lights, solenoids	
GR2	Earth lead, roof	
GR4	Earth lead, autocontrol	
GR5	Earth lead, cable harness, instr. panel	
GR7	Earth lead, battery	
GR8	Earth lead, headlights	
GR9	Earth lead, cabin	
GR10	Earth lead, electrical stop	

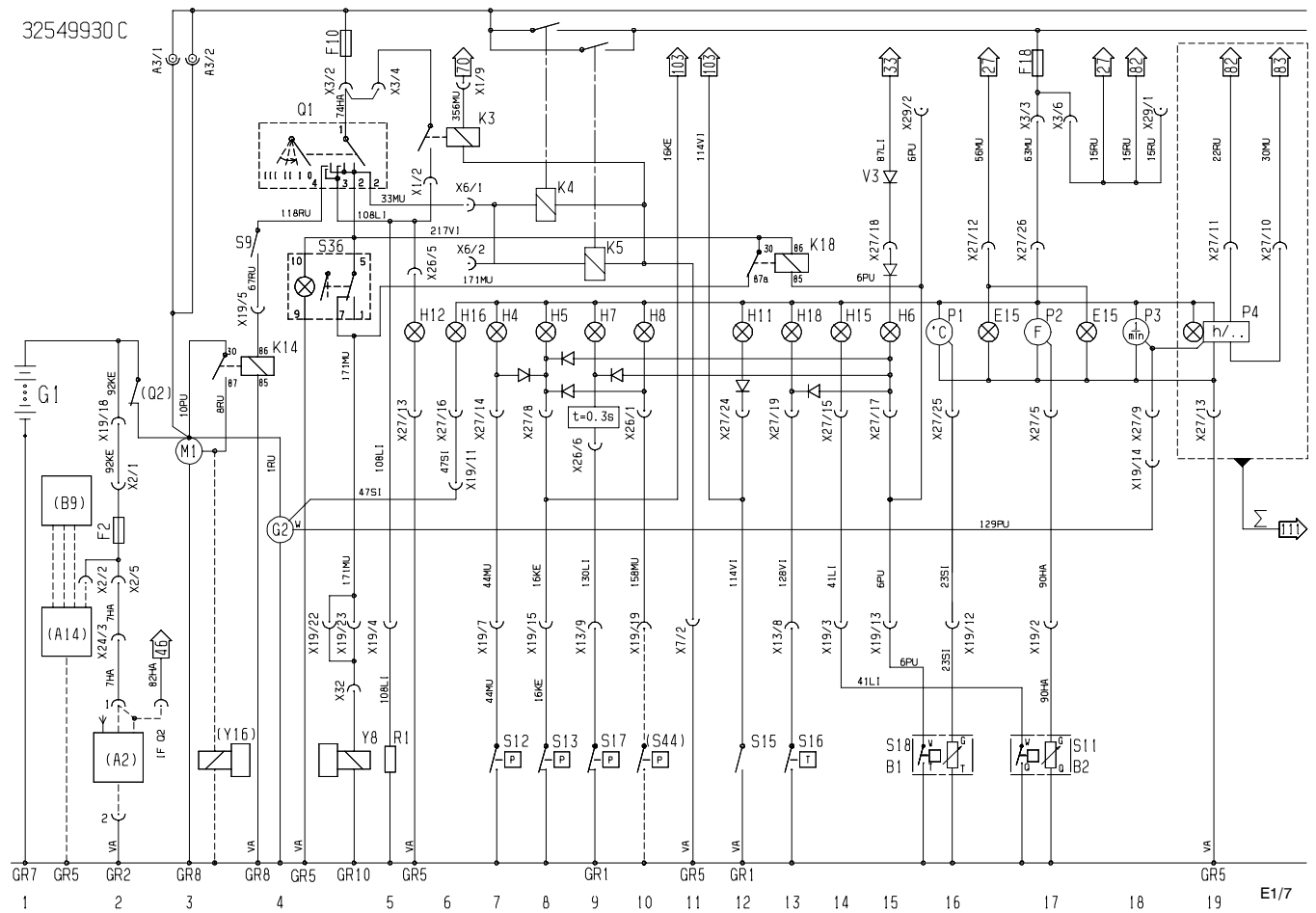
ACD POWER LIFT:

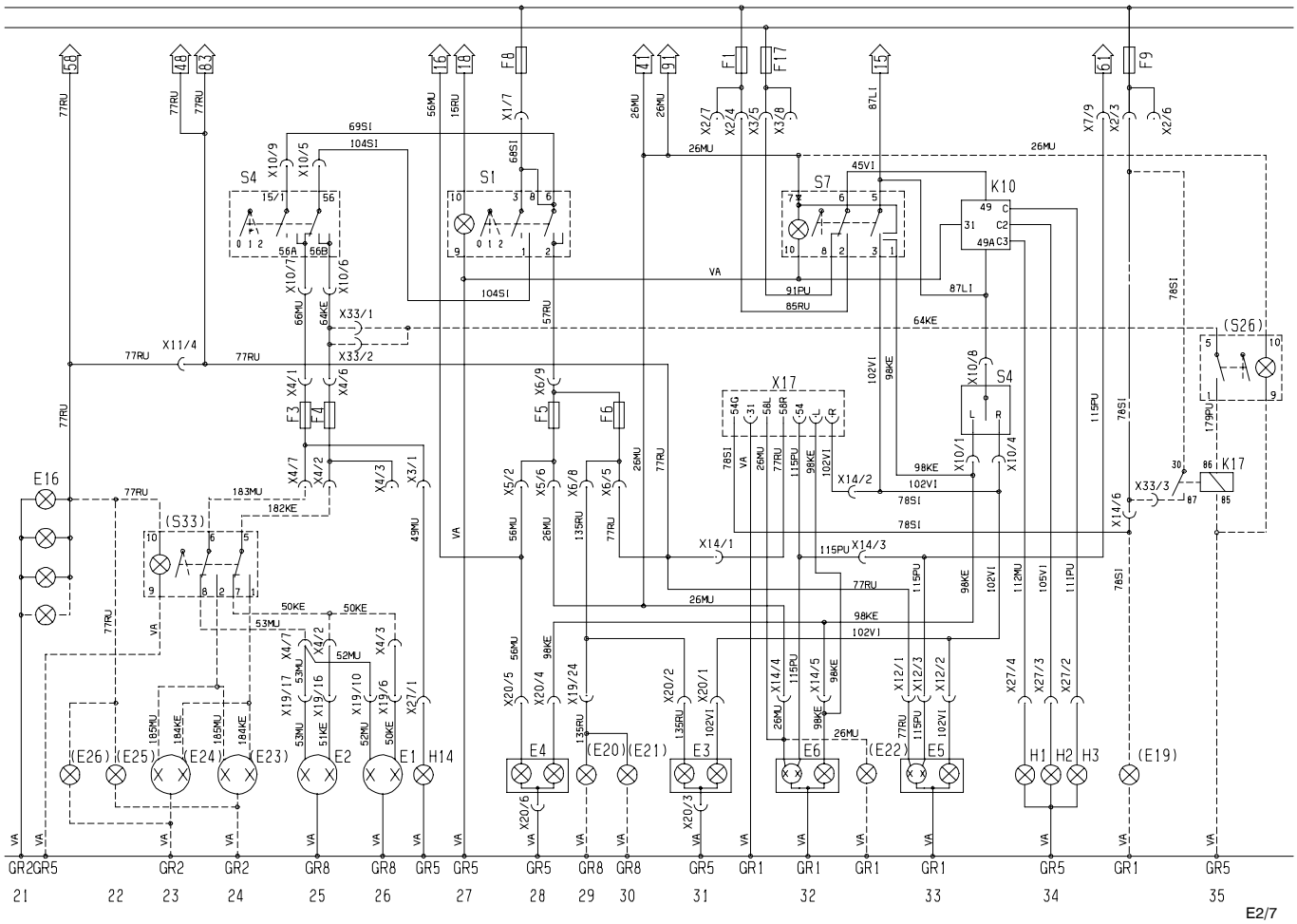
A1E	Autocontrol	82
A2E	Autocontrol, switch panel	83
A3E	Compensator	82
B1E	Position sensor	81
B2E	Draft sensor, R.H	81
B3E	Draft sensor, L.H	81
(B4E)	Position sensor, implement	81
E1E	Lighting, switch panel	83
E2E	Lighting, position potentiometer	83
R1E	Potentiometer, pos .control	83
S1E	Switch, rear operation, r.h., lifting	82
S2E	Switch, rear operation, r.h., lowering	82
S3E	Switch, rear operation, l.h., lifting	82
S4E	Switch, rear drive, l.h., lowering	82
S5E	Switch, inside, lifting / lowering	82
S7E	Switch, lowering speed	83
S8E	Switch, top limit	83
S9E	Switch, sensitivity /mixing	83
S10E	Switch, lifting /lowering	83
S11E	Switch, forced lowering	83
S12E	Switch, drive balance system / slip	83
X1E	Connector housing, 9 pole, speed sensors	
X2E	Connector housing, 9 pole, EH – supply, rear push buttons	
Y1E	Solenoid valve, lowering	82
Y2E	Solenoid valve, lifting	82

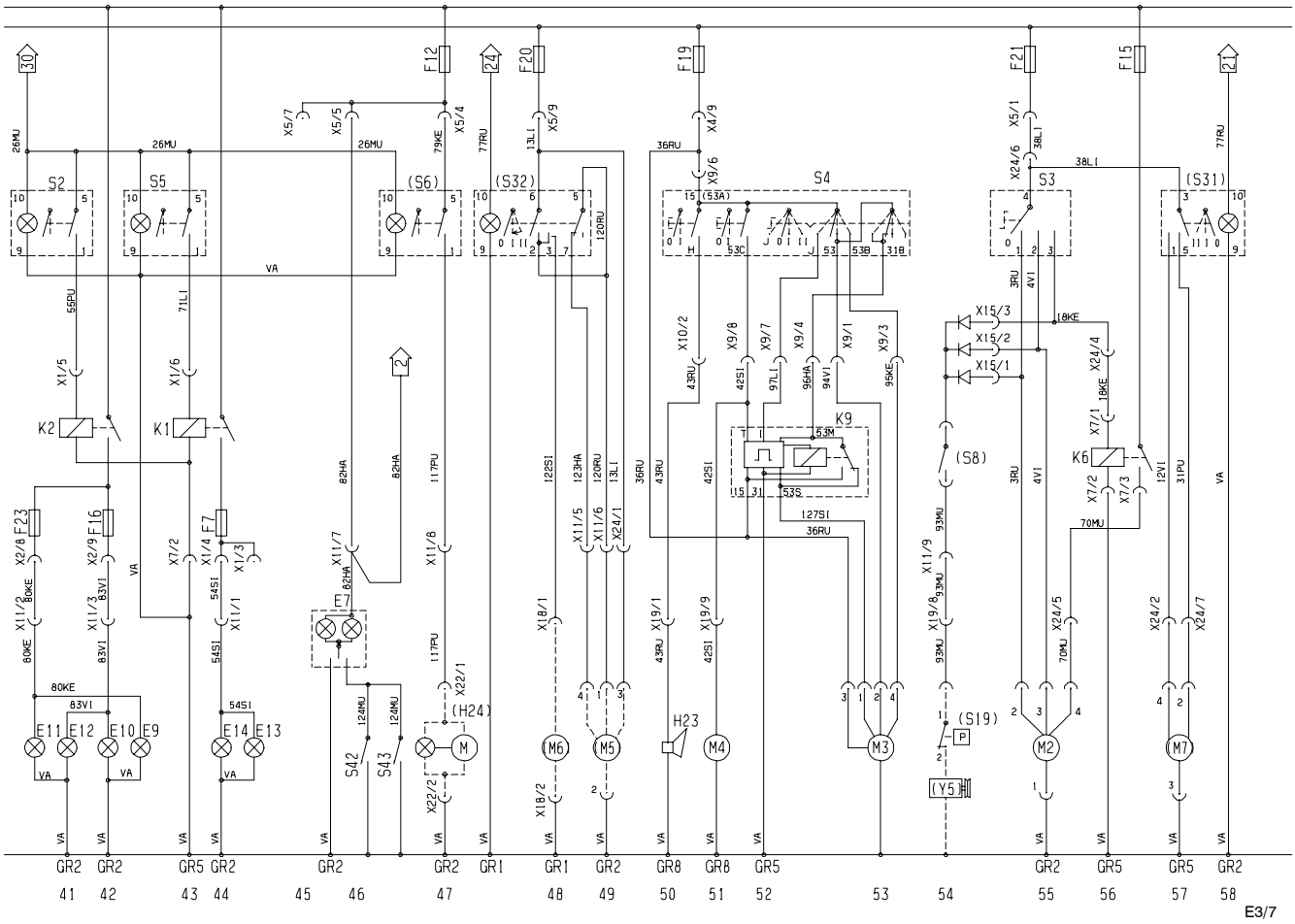
(OPTIONAL EQUIPMENT IN PARENTHESES)

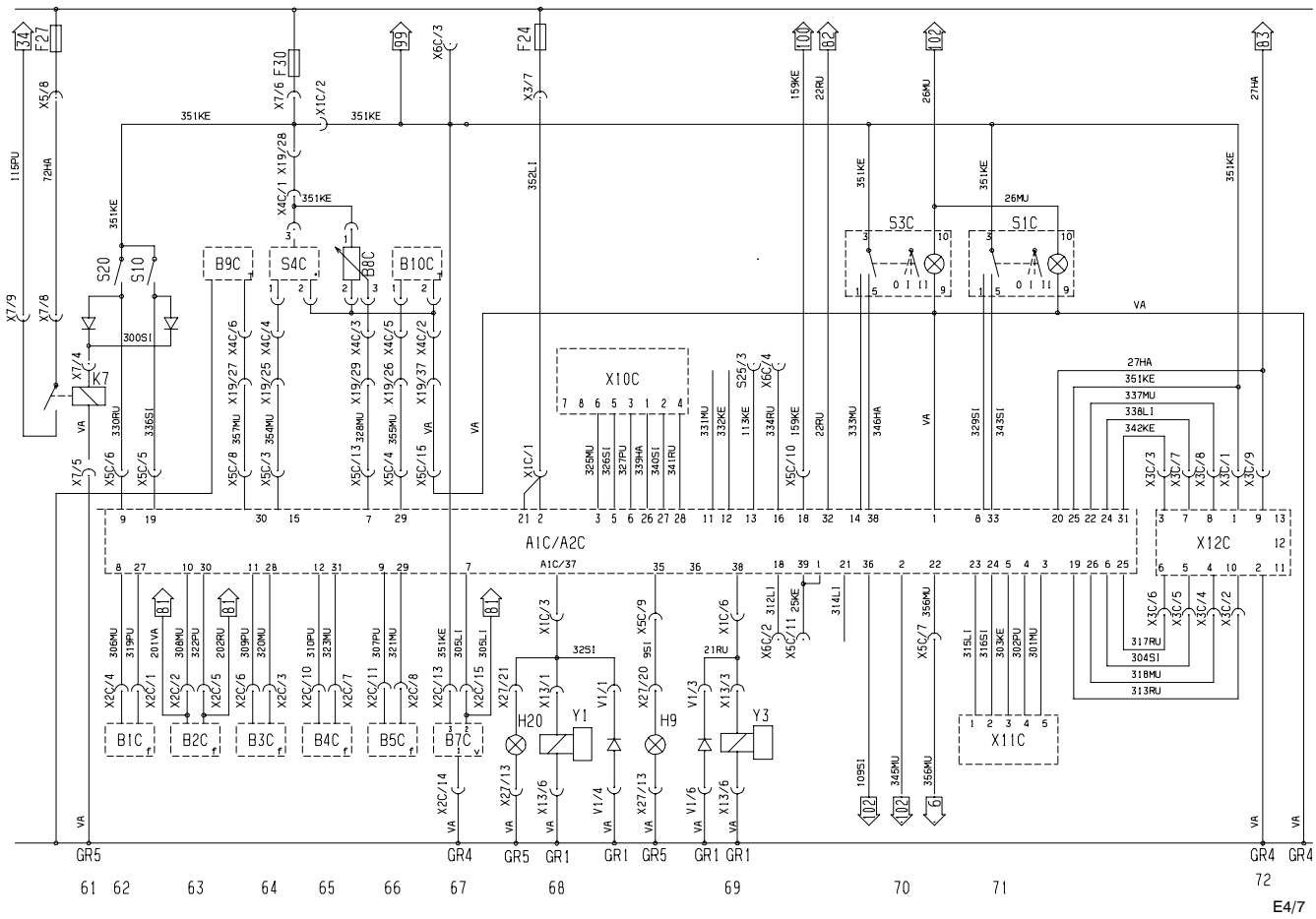
Sym–bol	Component	Code no
AC IV UNIT:		
A1C	ACIV– control unit (red connector)	62–71
A2C	ACIV– control unit	62–71
B1C	Speed sensor, rear wheel	62
B2C	Speed sensor, gearbox	63
B3C	Speed sensor, PTO	64
B4C	Speed sensor, engine	65
B5C	Velocity sensor, front axle	66
B7C	Radar	67
B8C	Potentiometer, accelerator	65
B9C	Temperature sensor, thermostart	63
B10C	Outside temperature sensor	66
S1C	Switch, diff. lock, autom./ manual	71
S2C	Switch, Delta Power Shift autom./man.	102
S3C	Switch, 4WD, autom./manual	70
S4C	Switch, steering angle	64
X1C	Connector housing, 9–pole, sources/solenoids	
X2C	Connector housing, 15–pole, wheel sensors	
X3C	Connector housing, 9–pole, rear socket	72
X4C	Connector, 9–pole, sensors, tractor's front part	
X5C	Connector housing, 15–pole, sensors, switches	
X6C	Not in use	
X7C	Connector housing, 3–pole, EH wiring assy	
X10C	Connector housing, 8–pole, RS232/RS485	68
X11C	Conn. housing, 9–pole, display	71
X12C	Rear socket, 13–pole	72

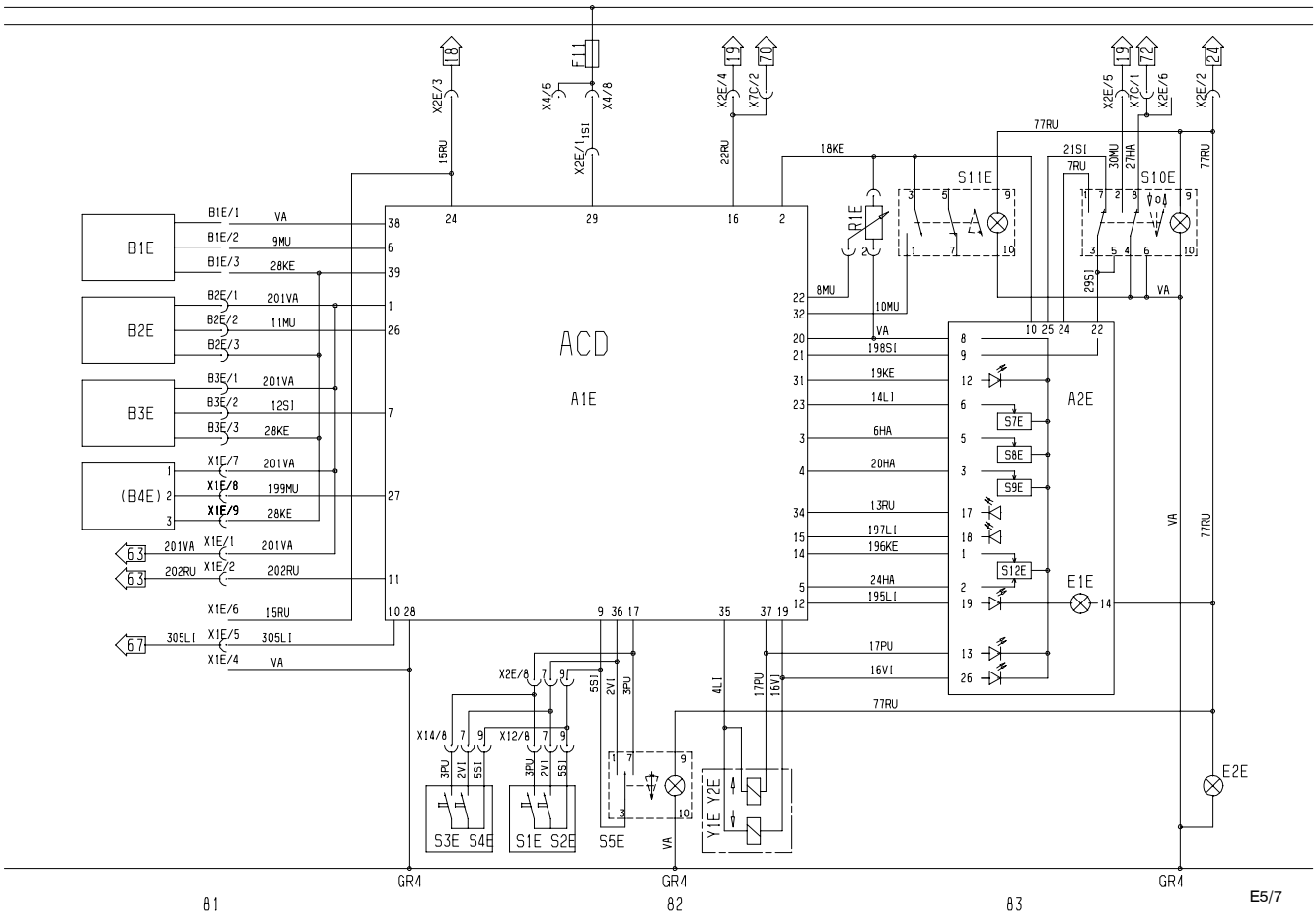
Wire colours
Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

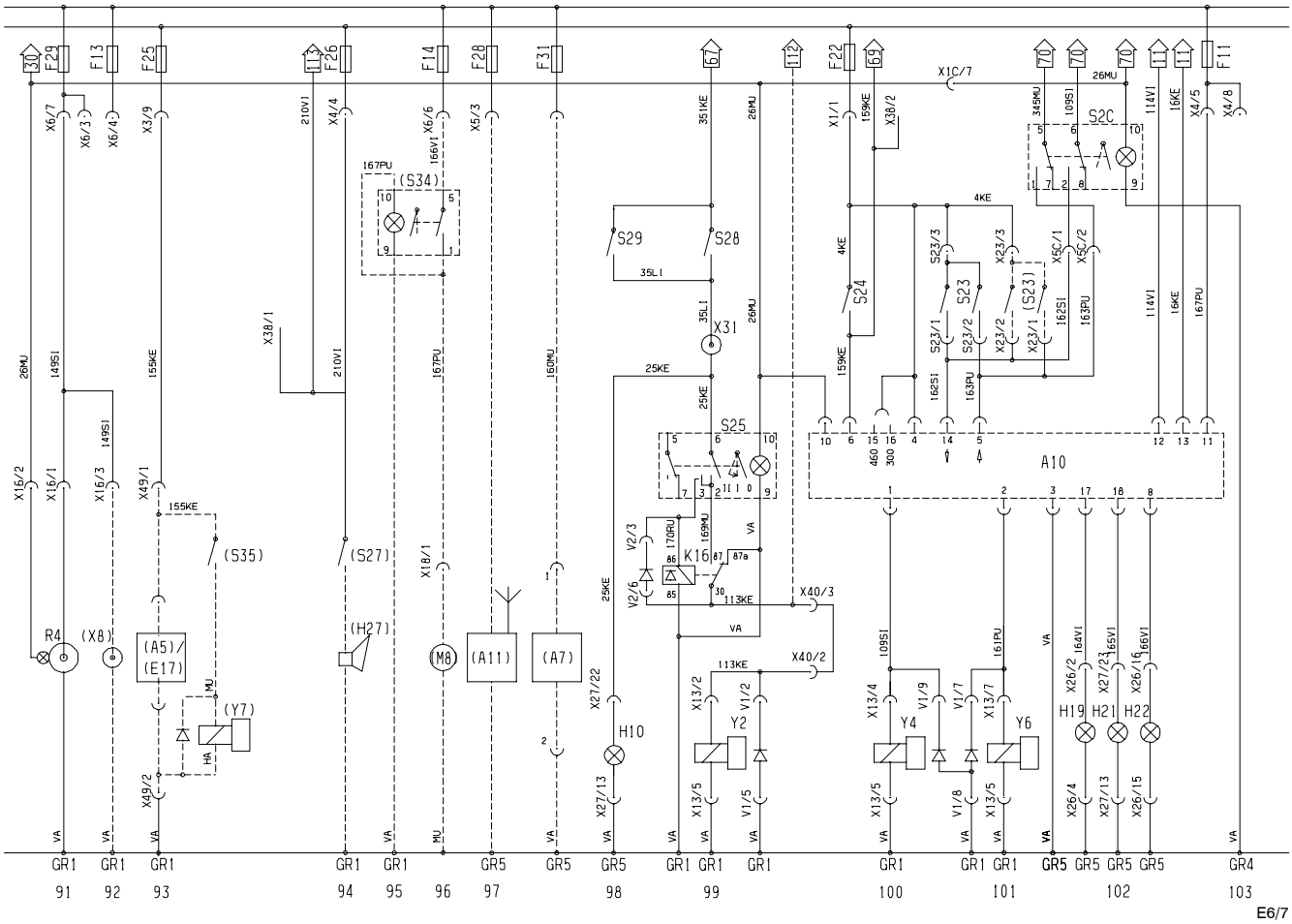

32549930 C
E1/7

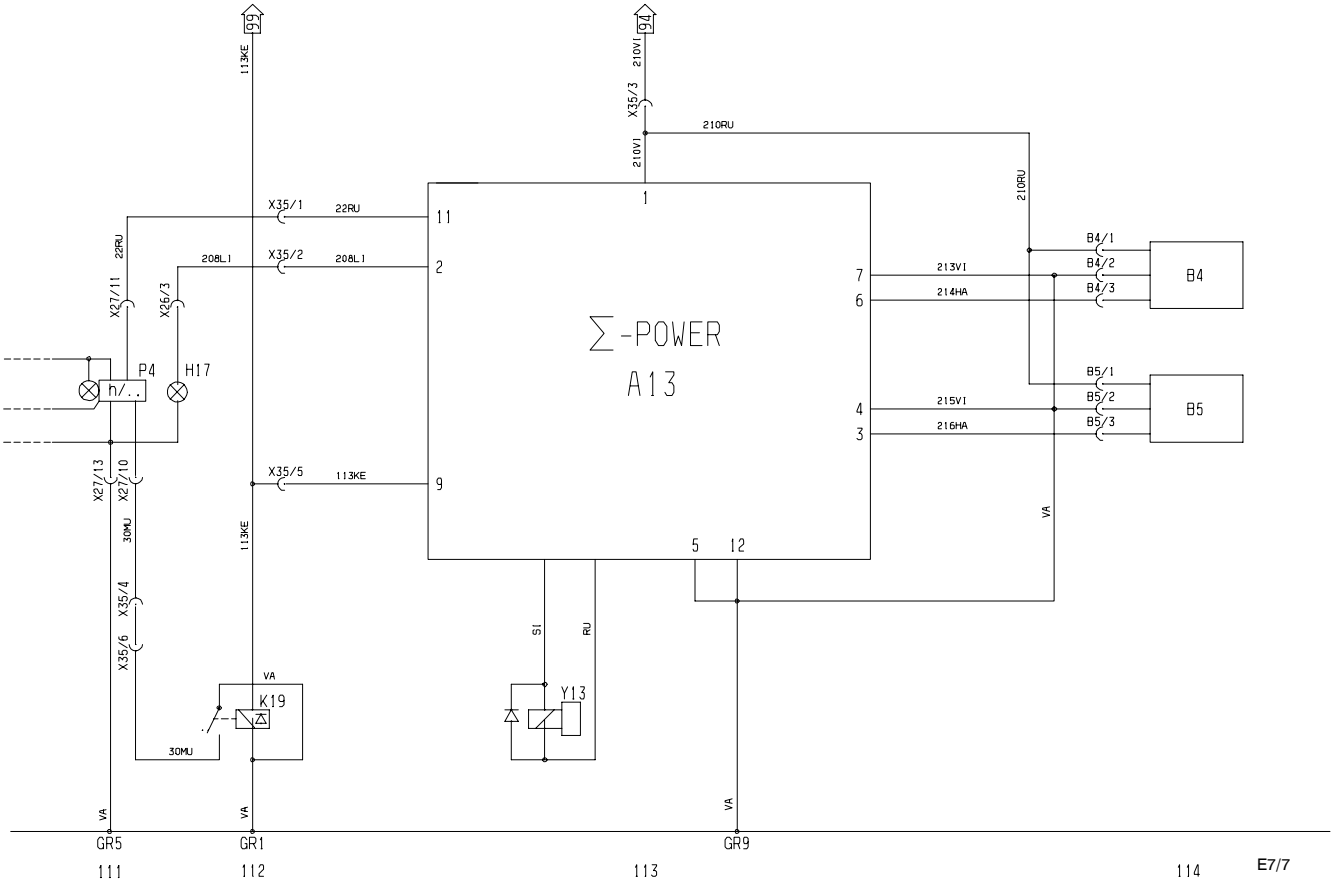

E2/7


E3/7


E4/7


ACD
A1E
B1E
B2E
B3E
(B4E)
A2E
E1E
S11E
S10E
S7E
S8E
S9E
S12E
S3E S4E
S1E S2E
S5E
Y1E Y2E
E2E
R1E
GR4
81
82
83
E5/7


S2C
S25
A10
S29
S28
S24
S23
X31
K16
(S34)
(S35)
(S27)
(H27)
(A5)/
(E17)
(A11)
(A7)
(M8)
(X8)
R4
(Y7)
H10
Y2
Y4
Y6
H19 H21 H22
GR1
GR4
GR5
91
92
93
94
95
96
97
98
99
100
101
102
103
E6/7


G9
113KE
G4
210VI
X35/3
210RU
X35/1
22RU
X35/2
208LI
X35/5
113KE
1
11
2
9
5
12
Σ-POWER
A13
7
6
4
3
213VI
214HA
215VI
216HA
210RU
B4/1
B4/2
B4/3
B4
B5/1
B5/2
B5/3
B5
X27/11
X26/3
P4
H17
h/..
X27/13
X27/10
30MU
X35/4
X35/6
K19
Y13
SI
RU
VA
GR5
GR1
GR9
111
112
113
114
E7/7

VALTRA VALMET https://truckmanualshub.com/

1. Fault tracing without microcomputer

(Computer aided trouble shooting, see code **352**)

The usual malfunctions are caused by poor contacts in various connectors (moisture, impurities etc). The connectors and their locations are shown on pages **350/8–11**. External wires can also damage when the tractor is in use.

Fault tracing of the radar and various sensors, see pages **351/2–4.** Impurities on the sensors can cause malfunctions.

Fault tracing of the transmission controls, slip control and cold starting are carried out according to the functional checks on pages **351/5–7**.
A possible malfunction can then be localised by measuring with a multimeter voltages or resistances from the pins of the ECS connectors A1C (lower) and A2C (upper). Connector pins have been numbered on the connectors.

Inputs

Input signals for controlling the transmission can be measured from the connector A2C pins. The connector must be attached to the ECS. The measurements are carried out according to the fault tracing tables in instructions under code **352** (computer–aided trouble shooting) (1=current signal, 0=no signal). Switches and pedals must be in the positions given in the tables. If no input signal shows, check the switch in question and its wiring.

Outputs

Output signals for controlling the transmission can be measured from the pins of connector A1C. Here must also be used the tables under code **352**. If a correct output signal comes, but the tractor does not function, check a solenoid valve and an indication light in question and their wirings. If output signal fails to show, the ECS is faulty. Output signals into the implement socket, see page **352/9**.

ECS (central processing unit)

If some control function functions in the manual control but not in the automatic control, the ECS can be damaged.

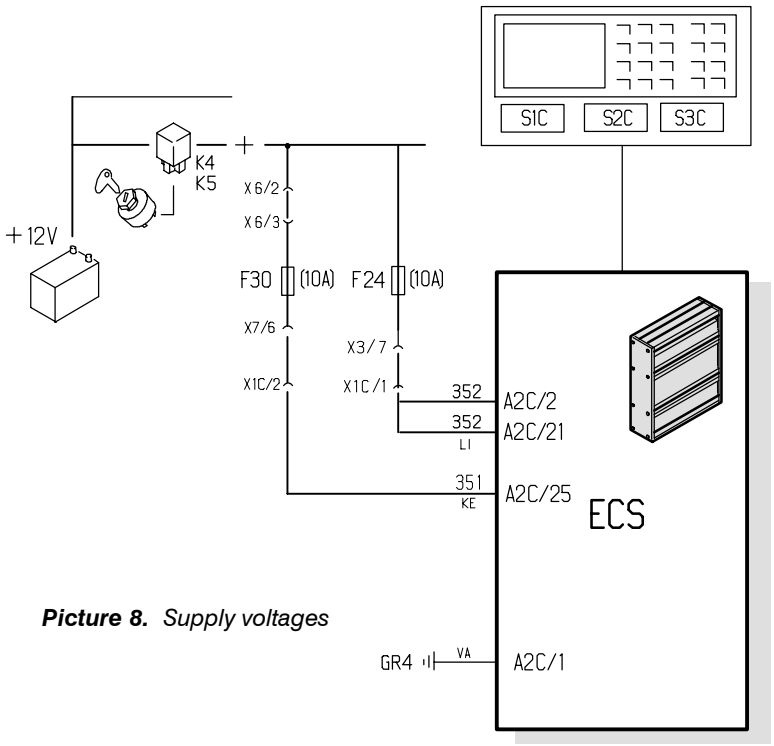
If the AC IV display unit only flashes and then switches off when the current is switched on, the ECS is faulty and should be changed.

If the ECS always uses the default parameter file although a correct file is input with a microcomputer, the ECS is faulty and should be changed.

When you measure output signals from the ECS, the lack of a signal indicates that the ECS is faulty and must be changed.

Supply voltages

– Switch on current to the tractor
– If Valmet–name and time appears on the AC IV display, the unit is in order.
– If nothing appears on the display, check the AC IV unit fuses in the fusebox: **F30** (10 A) and **F24** (10 A).
– If the fuses are OK, disconnect the ECS upper connector A2C and measure supply voltages: **pin 1** (earth), **pin 2** (supply), **pin 21** (supply) and **pin 25** (supply).
– If there are not supply voltages, check supply voltage wirings and connectors.
– If there are supply voltages, the central unit ECS is faulty or the display unit is defective.



Picture 8. *Supply voltages*

https://truckmanualshub.com/

2. Checking and changing sensors

A. Checking radar, gearbox, rear axle and front axle speed sensors

1. Drive the tractor onto the hard ground (free driving distance about 50 m).

2. Select gear **M2**, disengage the diff. lock and 4WD (in M–position). Select the Delta PS highest ratio (in M–position) and adjust the engine revs to **1800 RPM** with the hand throttle lever.

3. Press the distance–key two times and the display shows text **CAL DIST**.

4. Drive the tractor straight ahead with the hand throttle lever.

5. Press **SET** –key (display shows text **DRIVE**). Continue driving until the display is switched off and then started again (=successful calibration).

6. If the display shows text **NO CALIB** (=signal from the radar too weak), carry out a new test–driving. If the calibration fails again, check the radar and its wiring.

7. If the display shows:
– **ERROR GB**=gearbox speed sensor damaged
– **ERROR FA** = front axle speed sensor damaged
– **ERROR RW** = rear wheel speed sensor damaged
In this case, check the sensor in question and also its mounting and wiring according to instruction **B**.

8. After successful calibration, change display to the **calibrating mode for the hidden functions** (see page **340**/**6**) and continue driving straight ahead. Adjust the driving speed to about 8–10 km/h.

9. Press once the SPEED–key, and the display shows the **radar speed**.

10. Press then twice the SPEED–key and the display will show the **gearbox speed** which should be the same as the radar speed (±0,1 km/h).

11. Press once again the SPEED –key and the display will show the **rear axle speed** which should be the same as the previous speeds (±0,1 km/h).

12. Press once again the SPEED–key and the **front axle speed** can be seen. It must be the same as the previous speeds (±0,1 km/h).

13. Press the menu scanning key four times=radar speed.

Note! Do the same test according to paragraphs 9–13 but drive this time at a speed of about 3 km/h. This method shows if the impulse discs/measuring gear wheels are in perfect condition.

Note! The calibrating mode can be left by switching off the current.

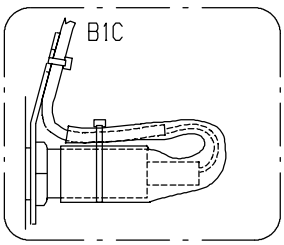
B. Changing gearbox, front axle and rear axle speed sensors

Note! The resistance of the speed sensors (not a radar) is **1,0–1,10 kΩ.** The resistance can be measured from connector pins shown below. If the resistance is infinitive, measure the resistance on the sensor pins to clear up possible breaks:

Pins of the rear axle speed sensor
A1C: 27 and 8.
X2C: 4 and 1
Sensor pins
Pins of the gearbox speed sensor:
A1C: 30 and 10.
X2C: 2 and 5
Sensor pins
Pins of the front axle speed sensor:
A1C: 29 and 9.
X2C: 11 and 8
Sensor pins

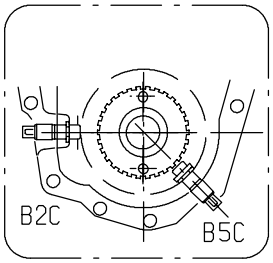
Changing rear axle speed sensor B1C:

– Remove the faulty sensor and clean the threads on the tractor.
– Seek with a dial gauge the shortest distance between the sensor and the impulse disc through the sensor hole.
– Apply Loctite 572 onto the threads and screw the sensor by hand until the sensor touches the impulse disc (do not screw too hard because the disc can be springy). Unscrew the sensor then **1**/**4** of a turn.
– Lock the sensor with a locking nut and connect wires
– Calibrate and check the speed sensors according to instruction **A**.
– When the sensor functions, fit a plastic tube onto the sensor leads. Connect the wires to the sensor and protect shoes with grease UC1913 (vaseline spray HHS 2000 (Wyrth)). Move the tube onto the sensor and warm it until it is pressed tightly round the sensor.



– Fold the wire on the sensor and fasten it with a plastic binder. Fasten the wire also to the lock washer under the sensor locking nut, see picture above.

Changing gearbox speed sensor B2C:

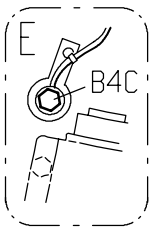


– Remove the faulty sensor and clean the threads on the tractor.
– Apply Loctite 572 onto the sensor threads and turn it against the gear wheel and then unscrew it **1**/**4** of a turn.
– Lock the sensor with the nut and connect wires
– Carry out the calibrating drive and check the speed sensors, see instruction **A**.
– When the sensor functions, fit a plastic tube onto the sensor wire. Connect the wires to the sensor and protect shoes with grease UC1913 (vaseline spray HHS 2000 (Wyrth)). Move the tube onto the sensor and warm it until it is pressed tightly round the sensor.
– Fold the wire on the sensor and fasten it with a plastic binder. Fasten the wire also to the lock washer under the sensor locking nut

N.B.: In transmission 50 km/h the sensor locking nut must be removed and the sensor is locked with Loctite 572. This must be done since in this transmission type the measuring gear wheel is smaller and the sensor thread length is insufficient.

Changing front axle speed sensor B5C:
– Remove the faulty sensor
– Screw a new sensor against the impulse plate and then unscrew it **1**/**4** of a turn.
– Lock the sensor with a locking nut and connect wires.
– Carry out the calibrating drive and check the speed sensors, see instruction **A**.
– When the sensor functions, fit a plastic tube onto the sensor wire. Connect the wires to the sensor and protect shoes with grease UC1913 (vaseline spray HHS 2000 (Wyrth)). Move the tube onto the sensor and warm it until it is pressed tightly round the sensor.
– Fold the wire on the sensor and fasten it with a plastic binder. Fasten the wire also to the lock washer under the sensor locking nut

C. Checking/changing engine speed sensor



The display unit shows the engine speed. Press the rotation speed key until the display shows the engine speed. It should be the same as the rotation speed shown by the instrument panel tachometer (±50 r/min).

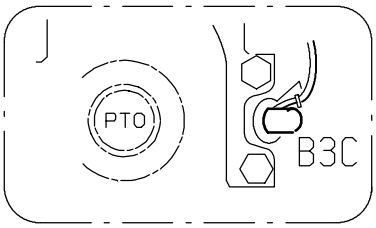
If there is not the engine speed display or it is incorrect, check the sensor and its wiring:

The sensor resistance should be **1,0–1,10 kΩ.** The resistance can be measured on the pins shown below. If the resistance is infinite, it should be measured on the sensor pins in order to clear up possible breaks:

Connector pins to measure the engine speed sensor resistance:
A1C: 31 and 12.
X2C: 10 and 7
Sensor pins

Changing engine speed sensor, see change of the gearbox speed sensor.

D. PTO speed sensor



Engage PTO 540 r/min. Press the rotation speed key until the display shows the PTO speed. Adjust the engine speed so that the tachometer indicator in the instrument panel is at the 540 mark. The display should also show the same PTO speed (±50 r/min). The PTO shaft speed can also be measured with a separate tachometer.

If there is not the PTO speed display or it is incorrect, check the sensor and its wiring (ensure that the emergency plug is placed in the rear socket):

The sensor resistance should be **1,0–1,10 kΩ.** The resistance can be measured on pins shown below. If the resistance is infinite, it should be measured on the sensor pins in order to clear up possible breaks:

Connector pins to measure the engine speed sensor resistance:
A1C: 28 and 11.
X2C: 6 and 3
Sensor pins

Changing PTO speed sensor, see change of the rear axle sensor on page **351**/**2**.

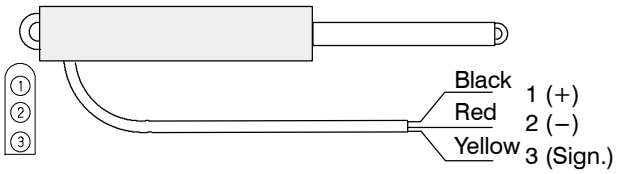
https://truckmanualshub.com/

E. Potentiometer on the injection pump

The potentiometer must be adjusted so that when the accelelator pedal is in its extreme positions, the pedal movement is not limited by the potentiometer because it does not resist that kind of load.

Measure the potentiometer voltage between pins 2 and 3 in connector B8C. The voltage reading must be below **3 V** when the accelerator pedal is the upper position and **over 9 V** when the pedal is in the lowest position (difference between max. and min reading at least 6 V). The voltage value should be change without steps.

Resistance measurements of the potentiometer:

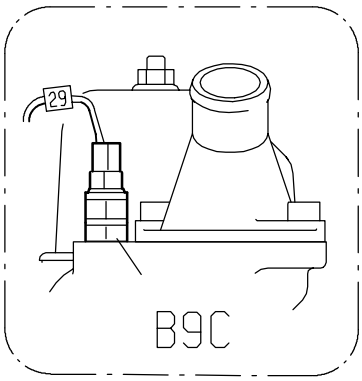


1–2:
about **1,01 kΩ**

3–2
– spindle in, resistance about **0,62 kΩ**
– spindle out, resistance about **1,89 kΩ**

Pins: Connector B8C
Socket X19/29
X5C/13
A2C/7

F. Sensor for engine coolant temperature



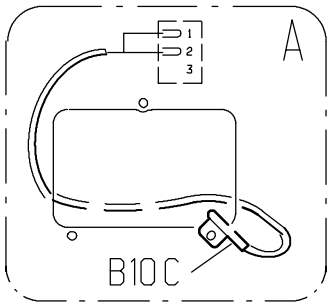
Press once the temperature key and the engine coolant temperature can be seen in the display. Measure the coolant temperature with a separate thermometer and compare the readings. If the display reading is incorrect or there is no coolant temperature reading, check the sensor and its wiring. Check the connectors. Change if necessary the faulty sensor.

Resistance values of the sensor:

– 20˚C	6480±1000 Ω
± 0˚C	2450±320 Ω
+20˚C	1450±118 Ω
+40˚C	496±44 Ω
+60˚C	245±22 Ω

Pins: Connector B9C
Socket X19/27
Connector X5C/8
ECS connector A2C/30

G. Sensor for outdoor temperature



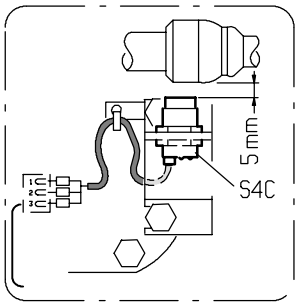
Press the temperature key twice and the display will show the outdoor temperature. Compare the display reading with a separate thermometer reading. If the display reading is incorrect or there is no outdoor temperature reading on AC IV display, check the sensor and its wiring. If these are OK the ECS or the display unit can be faulty

Resistance values at certain temperatures:

± 0˚C	10,00±1,00 kΩ
+ 22˚C	3100±50 Ω

Pins: Connectort B10C
Socket X19/26
Connector X5C/4
ECS connector A2C/29

H. Sensor for steering angle



1=black (sign)
2=blue (ground)
3=brown (+12 V)



Adjust the distance between the sensor and the front axle tie rod joint to 5 mm .

Pins: Sensor connector S4C
Socket X19/25
Connector X5C/3
ECS connector A2C/15

Note! After fitting the sensor, check the function of the sensor by following the signal lights on the lower face of the sensor. When the wheels are straight ahead or turned less that ±15˚, the green and yellow lights should light. When the wheels are turned ±15˚or more the yellow light must go out and it must not light between the steering angle ± 15˚and the max. steering lock. The function of the signal lights indicates that the sensor supply is OK and that the sensor is functioning.

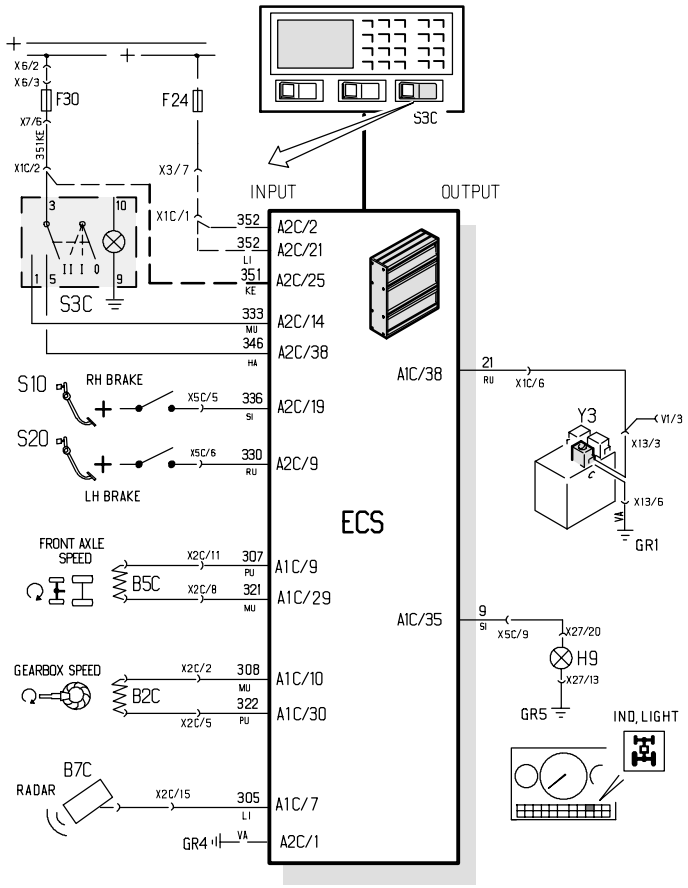
https://truckmanualshub.com/

3. Functional check

A. 4WD

- Start the engine (tractor stationary and brake pedals are nor depressed)
- Depress the rear edge of the 4WD rocking switch
- The 4WD should be disengaged and the ind. light does not light.
- Depress the latched together brake pedals at which time the 4WD engages and the ind. light comes on.
- Release the brake pedals and the ind. light goes out.
- Turn the rocking switch to the middle position and the 4WD engages and the ind. light comes on. Depressing the brake pedals must not affect the 4WD.
- Depress the front edge of the 4WD rocking switch and the ind. light must go out.
- Depress the latched together brake pedals and the ind. light should come on. Release the brakes and the ind light must go out.
- Engage a gear and release clutch pedal rapidly, at which time the 4WD ind light should come on.
- Depress the clutch pedal (wheels stop). After 6 seconds the 4WD must be disengaged (ind. light goes out).

Note! When the 4WD is disengaged, the 4WD solenoid is energised and is magnetic which can be verified e.g. with a screwdriver. Check the engagement of the 4WD by driving at a speed of 4 kph and by turning the front wheels to max steering lock. When the 4WD is engaged, you can see that the front wheels slip (brake) and you feel a jerk when the 4WD engages.

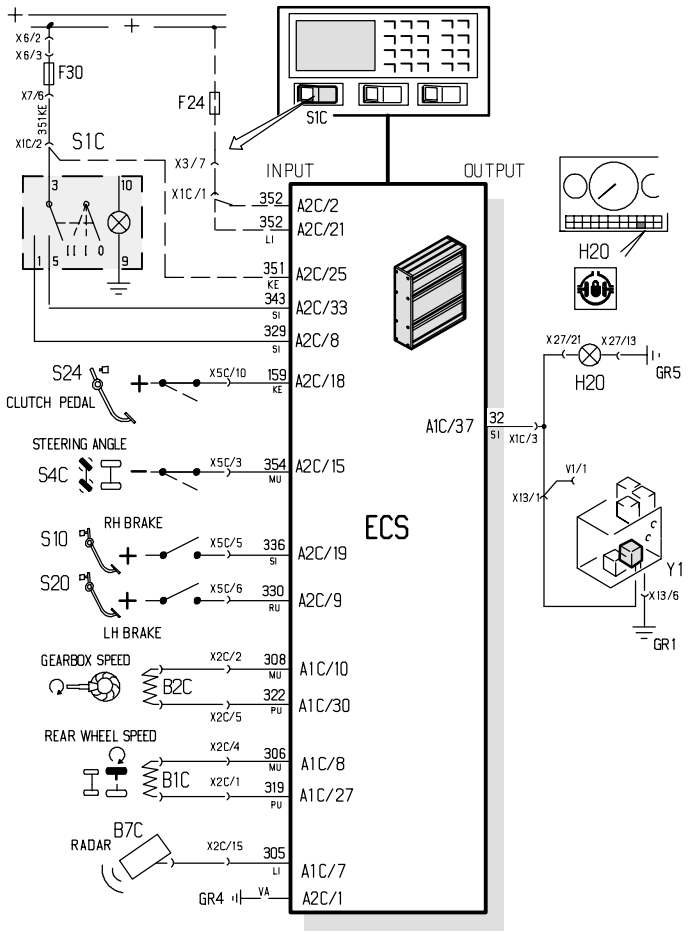


Picture 9. *4WD control*

B. Differential lock

- Start the engine (tractor stationary and brake pedals are nor depressed). Disengage the 4WD.
- Depress the diff. lock rocking switch rear edge at which time the lock must be disengaged and the ind. light must not light. Depressing the brake pedals must not engage the lock.
- Turn the rocking switch to the middle position and the lock should be engaged and the ind. light comes on.
- Depress the brake pedal/pedals and the lock disengages during braking and the ind. light goes out.
- Release the brake pedal/pedals and the lock must engage and the ind. light comes on.
- Depress the rocking switch front edge at which time the lock ind. light must go out.
- Remove fuse F27 (brake switches). Unlatch the brake pedals.
- Drive the tractor and brake one rear wheel at which time the lock engages and the ind. light comes on.
- While the ind light lights, turn the front wheels more than ±15° at which time the lock disengages and the ind light goes out.
- Turn the wheels straight ahead and the lock must engage.
- Stop the tractor at which time the lock disengages.

Note! When the lock is engaged, the solenoid valve is energised and it is magnetic. Drive the tractor at a speed of about 4 kph. Turn the front wheels to the full steering lock. Engage and disengage the lock. You can see that the rear wheels slip (brakes) when the lock is engaged and you also feel a jerk when the lock engages. In the same way functions the possible front axle lock (4WD must be disengaged)



Picture 10. *Differential lock control.*

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C. Delta Powershift

(the gear has three ratios)

– Depress the Delta PS rocking switch rear edge: Manual mode.
– Start the engine. The lowest ratio should be on, at which time one ind. light lights in the dashboard.
– Drive the tractor and press the push buttons in the gear lever knob. The front button changes one step downwards and the rear one step upwards.
– The lowest ratio: one ind. light, direct ratio: two ind. lights, highest ratio: three ind. lights.
– Engage the highest ratio, stop the engine and switch off current. A buzzer alarms if the parking brake is not applied. Start the engine and the lowest ratio should be on = one ind. light.

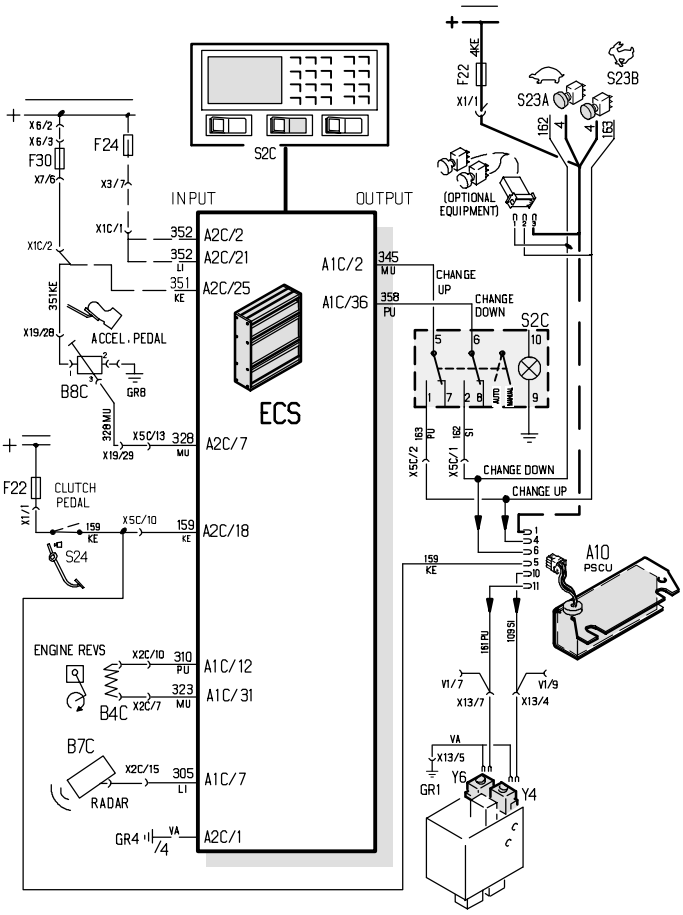
Note! The continuous pressing of the buttons changes only one step up or down. In the highest or lowest ratio, the pressing of the button of direction in question does not change ratio any more.

– Depress the Delta PS rocking switch front edge (Automatic mode).
– Select gear H1 and start driving and raise engine revs with the hand throttle lever
– The Delta PS ratio changes automatically upwards when the accelerator pedal position is over 1900 rpm. The change happens at 50–200 rpm lower than the accelerator pedal position. Follow the ind. lights.
– When the highest ratio is on, depress the together latched brake pedals. The AC IV starts to change down when the loading increases and the engine revs lower. The change down occurs when the engine revs fall 250–400 rpm (at higher revs a larger drop in revs is allowed) lower that the accelerator pedal position supposes (increased loading).
– Release the brake pedals and when the engine revs start to rise, the system changes automatically up.
– Press the push buttons at which time the ratio is changed temporarily but the AC IV changes the ratio as soon as the loading conditions require it.
– Depress the clutch pedal and stop the tractor. The AC IV will change automatically to the lowest ratio.
– Stop the engine. The buzzer alarms. Apply the hand brake and the buzzer sound extinguishes

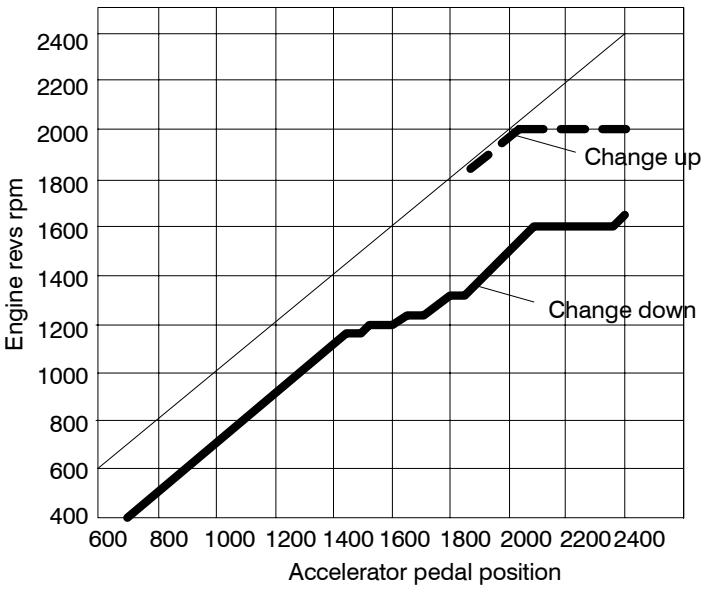
Note! If the gear change functions in the manual mode but not in the automatic mode, this indicates that the ECS is faulty or automatic mode components (e.g. fuel injection pump potentiometer, engine speed sensor) are faulty or wiring has poor contact. To check the DPS solenoids, see page **440**/**13**.

Calibrating the Delta Powershift

The calibration is carried out in the same way as on AC III, see page **341**/**5**. However, the lowest engine calibrating revs are 800 r/min (or min. revs) and the highest engine calibrating revs are 2200 (or max. revs).



Picture 11. *Delta Powershift control*



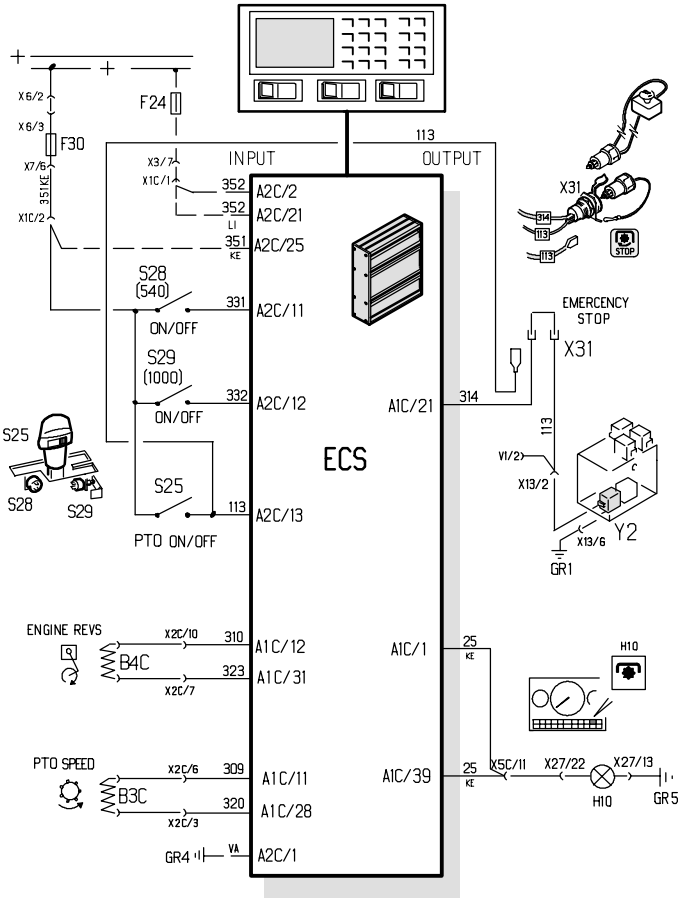
https://truckmanualshub.com/

D. PTO (–F17106)

- Ensure that the PTO emergency plug is placed in the rear socket.
- Start the engine.
- Set the display to show the PTO shaft revs.
- Move the PTO lever to the front position (540 r/min), at which time the ind. light starts to flash.
- Move the lever knob switch to the front position and the PTO shaft starts to rotate and the ind. light lights continually. Move the switch to the rear position and the PTO shaft must stop and. ind. light goes out.
- Move the lever to the middle position.
- Engage PTO 540 r/min (shaft rotates). Switch off current with the ignition switch. Restart the engine
- PTO ind light must flash and the PTO shaft must not rotate. Move the lever to the middle position and back to the front position at which time the PTO shaft starts to rotate and the ind. light lights continuously.
- Remove the emergency plug and the shaft stops rotating and the ind. light starts to flash. Refit the plug. The PTO shaft must not rotate. Ind. light flashes.
- Move the lever to the middle position and back to the front position. The shaft must not rotate.
- Stop the engine and switch off the current. Restart the engine. The ind. light still flashes. Move the lever to the middle position and back to the front position and the shaft starts to rotate and the ind. light lights up.

Note! If the PTO clutch slips too much, the AC IV disengages the PTO. The PTO restarts after the current is switched off and then on with the ignition switch. This PTO automatics can be overridden by making a connection in the lever console, see page **350/9**.

When the PTO solenoid is energised, the nut at the end of the solenoid is magnetic. This can be verified with e.g. a screwdriver. The solenoid is energised when the PTO is on.



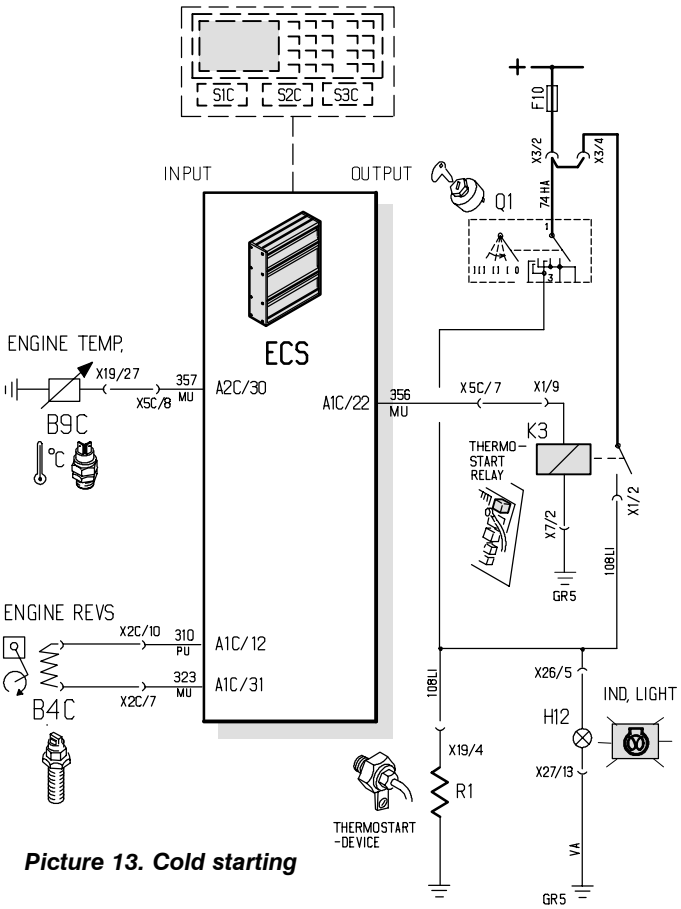
Picture 12. *PTO control*

E. Slip control

Same as on Autocontrol III, see page **341/6** instr. **E**.
Setting the slip limit percent, see Autocontrol III on page **341/6**.

F. Cold starting automatics

The same as on Autocontrol III, see page **341/6** instr. **F.**



Picture 13. Cold starting

Computer–aided fault tracing

A computer program has been made for Autocontrol IV (Service Program) which can be used when trouble shooting is carried out with a microcomputer (PC).

In this instruction is used a portable PC which is IBM compatible and uses MS–DOS 3.3 operating system or later version. Additionally PC must have a serial port RS–232C (9 pins) when the PC is connected to the AC–IV unit with cable 326 682 00.

Service Program floppy disk can be ordered from Valmet if needed. It is useful to copy the Program into the hard disk of the PC.

Note! Service Program error messages, see page **353**/**3**.

Starting fault tracing

In this instruction the Program is in the hard disk (**C:**). If it is in the floppy disk drive, use a correct prompt (e.g. **A:**)

H Connect the PC with the cable to the socket X10C.

H Switch on current to a tractor and to the PC.

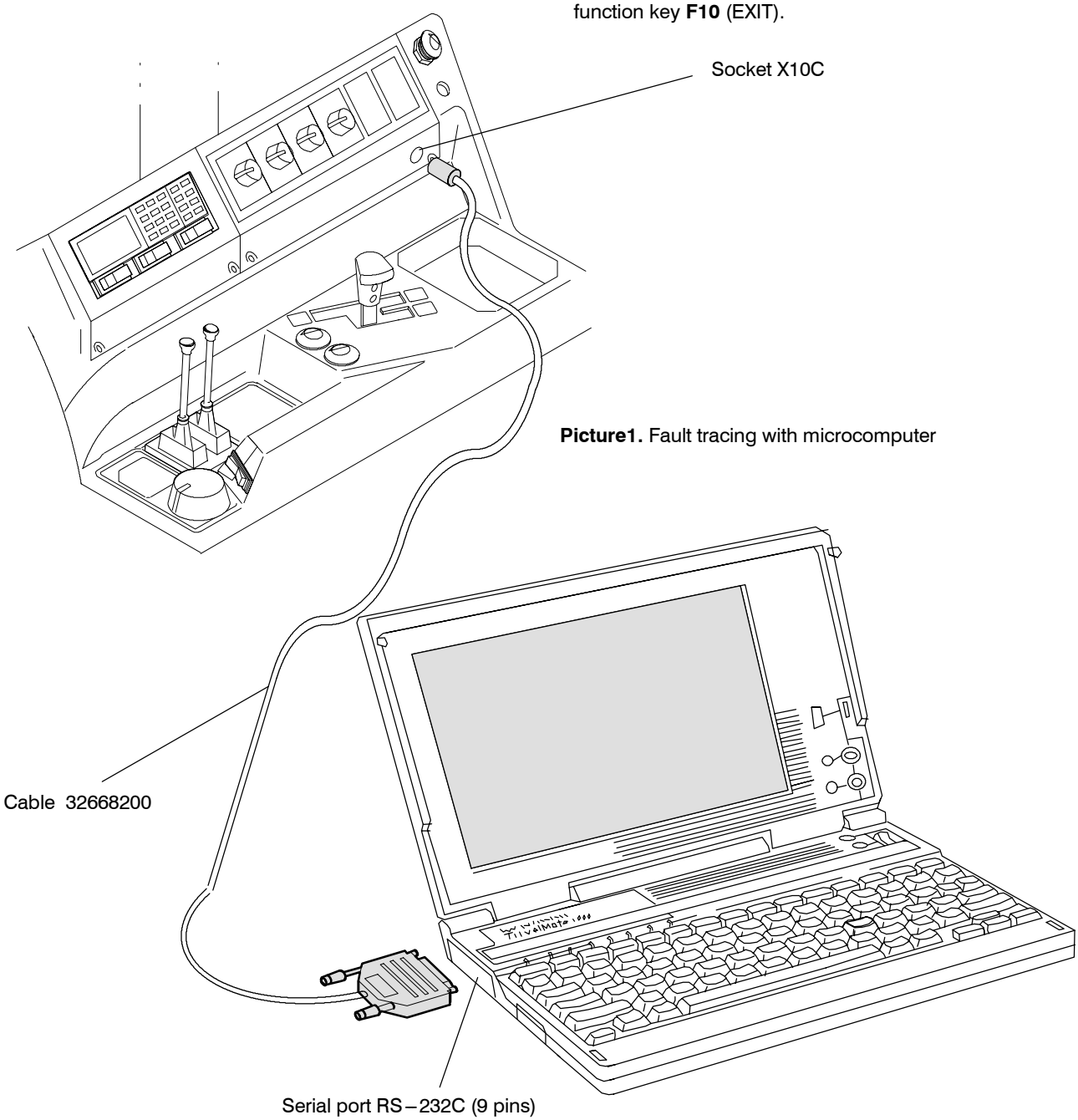
H When prompt **C:\>** appears**,** type **AC** (ACC if colour monitor) and press **ENTER.**

H A trouble shooting chart appears on the PC display. In the LH side lower corner of the chart there is the following menu:

1PARAMETERS 5SENSOR LOG.

H Press **F5**, and the computer starts to update the trouble shooting chart (i.e. PC changes X marks). Wait for a while before starting the trouble shooting.

H Return to the disk operating system by pressing the function key **F10** (EXIT).



Picture1. Fault tracing with microcomputer

Fault tracing chart on PC monitor

AC Communication link ver 2.1 hh:mm:ss

DIGITAL INPUTS		
Steering angle	J2:15	X
Main clutch	J2:18	X
PS algorithm	J2:17	X
Implement pos	J2:20	X
Extra 4	J2:10	X
Brake left	J2:9	X
Brake right	J2:19	X
Slip cntr 1/0	J2:16	X
Extra 3	J2:39	X
Extra 5	J2:37	X
4WD A/M	J2:14	X
4WD manual 1/0	J2:38	X
DL A/M	J2:8	X
DL manual 1/0	J2:33	X
Extra 1	J2:34	X
PTO 1/0	J2:13	X
Extra 2	J2:35	X
PTO 540 1/0	J2:11	X
PTO 1000 1/0	J2:12	X
Extra 6	J2:36	X

DIGITAL OUTPUTS		
Slip control	J1:18	X
4WD solenoid	J1:38	X
4WD lamp	J1:35	X
DL sol & lamp	J1:37	X
Pto solenoid	J1:21	X
Pto 540 lamp	J1:1	X
Pto 1000 lamp	J1:39	X
PS Downwards	J1:36	X
PS Upwards	J1:2	X
Extra 1	J1:23	X
Forward/Reverse	J2:23	X
Implement dir	J2:22	X
Implement act	J2:24	X
Fuel preheater	J1:22	X
Pieces counter	J1:19	X
Parameter table no	XX	
Date of production	XXXX	
PROM Checksum	XXXX	
EPLD Version	XX	

FREQUENCY INPUTS		
Flow	J1:26	XXXX
Radar	J1:7	XXXX
Gearbox	J1: 30, 10	XXXX
Front axle	J1: 29, 9	XXXX
Rear wheel	J1: 27, 8	XXXX
Extra 1	J1: 32, 13	XXXX
RPM impl	J1:6	XXXX
RPM Engine	J1: 31, 12	XXXX
RPM Pto	J1: 28, 11	XXXX
PCS	J1:25	XXXX

ANALOG INPUTS		
Power lift	J2:32	XXX
Outside temp	J2:29	XXX
Acc pedal pos	J2:7	XXX
Coolant temp	J2:30	XXX
Implement pot	J2:31	XXX
System volt	J2:25	XXX

Message Window

Berifors 1994

1PARAMETERS 5SENSOR LOG

10EXIT

Service Program indicates the AC IV unit input and output signals with the following marks:
- X=nothing (see chart above)
- E=error, short circuit or open circuit
- 1=current on
- 0=current off

Markings after the names are ECS connector pins:
E.g. J2:15 = A2C pin 15
J1:18 = A1C pin 18

In the tables below the marks above the thick line and the corresponding marks on the PC display should be similar with the given switch and pedal positions under the thick line.

For these checks it is presumed that the tractor hydraulics and mechanics are in perfect condition. During the test current is switched on to the tractor but the engine is stopped (if not otherwise informed)

Important! If the tables below and the computer display chart do not agree, check first that the cable between the PC and the AC–IV unit is correctly connected to the PC serial port and to the socket X10C.

The symbols after the names above the thick lines are connector pins from which possible voltage measurements can be done. Thus the tables below can be used for trouble shooting even though You don't have a PC.

A. Fault tracing, front wheel drive control

Input signals to ECS for controlling 4WD (DIGITAL INPUTS).

4WD A/M (A2C/14)	**0**	**0**	**1**
4WD MANUAL 1/0 (A2C/38)	**0**	**1**	**0**
A/M–SWITCH (M_1= rear edge down, **M_2**=middle pos. **A**=front edge down)	**M_1**	**M_2**	**A**

BRAKE LEFT (A2C/9)	**0**	**1**	**0**
BRAKE RIGHT (A2C/19)	**0**	**0**	**1**
LEFT BRAKE PEDAL U=Up **D**=Down	**U**	**D**	**U**
RIGHT BRAKE PEDAL U=Up**. D**=Down.	**U**	**U**	**D**

– If the marks above the thick lines agree with the corresponding marks on the computer display, the input signals are OK. If not, the fault lies in the switch in question or its wiring is faulty.

– Input signals from the radar, front axle speed sensor and gearbox sensor are checked with a calibrating test, see page **351/2** or according to the instruction **F** on page **352/7**.

Output signals from ECS for controlling 4WD (DIGITAL OUTPUTS)

4WD SOLENOID (A1C/38)	**1**	**0**	**1**
4WD LAMP (A1C/35)	**0**	**1**	**0**
A/M–SWITCH (M_1= rear edge down, **M_2**=middle position, **A**=front edge down.	**M_1**	**M_2**	**A**

– If the marks above the thick line agree with the corresponding marks on the computer display, but the system does not function, the possible fault lies in the solenoid valve, indicator light or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the ECS is faulty and should be changed.

B. Delta Powershift control

Input signals (DIGITAL INPUTS).

– The Service program does not show the input signals from the A/M–switch or push buttons to the Powershift control unit A10 (concerning control unit A10, see Autocontrol II under code 311). The push buttons and the ind. lights should be checked by driving the tractor and by engaging the different ratios of the Delta Powershift, see page **351/6**.

– The AC IV automatics change the Delta Powershift lowest ratio (one ind. light), when the clutch pedal is depressed and the tractor driving speed is below 1,5 km/h. The input signals from the clutch pedal to the ECS should be as follows:

MAIN CLUTCH (A2C/18)	**1**	**0**
Clutch pedal (U=Up, D=Down)	**U**	**D**

– Input signals from the radar and the gearbox speed sensor to the ECS can be checked with the calibrating drive, see page **351/2** or see instruction **F** on page **352/7**. Checking the engine speed sensor and the fuel injection pump potentiometer, see pages **351/3–4** or pages **352/7–8**.

Output signals from the ECS (DIGITAL OUTPUTS).

Note! Before test, ensure that it is **0** in points PS Downwards and PS Upwards. If it is E in these points, stop the engine and switch off current to the PC and restart then engine and the PC. Ensure that the Powershift A/M–switch is in A position (front edge down).

PS DOWNWARDS (A1C/36)	**1** only flashes when the gear ratio is changing automatically down, but is **0** after that.
PS UPWARDS (A1C/2)	**1** only flashes when the gear ratio is changing automatically up, but is **0** after that.

– the automatic change up happens when the tractor is driven and the engine revs are increased with the hand throttle lever. When the highest ratio is on (three ind. lights), depress both brake pedals and the AC IV starts to change down.

– If the marks above agree with the PC display, but the gear ratio change does not happen, the fault lies in the Powershift solenoid valves or in their wiring or PS control unit A10 is faulty. In this case the ratio doesn't change in the manual control either.

– If the output signals from the ECS lack, the ECS is faulty (inputs should be correct).

C. Differential lock control

Input signals to the ECS (DIGITAL INPUTS)

DL A/M (A2C/8)	**0**	**0**	**1**
DL MANUAL 1/0 (A2C/33)	**0**	**1**	**0**
A/M–SWITCH (M_1 =rear edge down, M_2=middle position, **A**=front edge down	M_1	M_2	**A**

BRAKE LEFT (A2C/9)	**0**	**1**	**0**
BRAKE RIGHT (A2C/19)	**0**	**0**	**1**
LEFT BRAKE PEDAL (**U**=up, **D**=down)	**U**	**D**	**U**
RIGHT BRALE PEDAL (**U**=up, **D**=down)	**U**	**U**	**D**

MAIN CLUTCH (A2C/18)	**1**	**0**
CLUTCH PEDAL (U=UP, D=DOWN)	**U**	**D**

STEERING ANGLE (A2C/15)	**0**	**1**	**1**
FRONT WHEELS	**STRAIGHT**	**RIGHT. □ 15°**	**LEFT □15°**

– If the marks above the thick lines agree with the corresponding marks on the PC, the input signals are OK. If not, the fault lies in the switch or sensor in question or their wirings are faulty.

– Input signals from the radar, front axle sensor and rear axle sensor are checked with the calibrating drive, see page **351**/**2** or see instruction **F** on page **352**/**7**.

Output signals from ECS (DIGITAL OUTPUTS)

DL SOLENOID AND LAMP (A1C/37)	**0**	**1**	**0**
A/M–SWITCH (**M_1**=rear edge down, **M_2**=middle pos., **A**=front edge down.	**M_1**	**M_2**	**A**

– If the marks above agree with the corresponding marks on the computer display, but there is malfunctions, the possible fault lies in the solenoid valve or ind. light or their wiring is incorrect.

– If the output signals lack, the ECS is faulty and should be replaced.

D. Power take–off control (–F17106)

Note! From tractor ser. no. F17107 incl. the PTO system has a relay control, see AC II under code 311.

Input signals to ECS (DIGITAL INPUTS)

PTO 540 1/0 (A2C/11)	**0**	**1**	**1**	**0**	**0**
PTO 1000 1/0 (A2C/12)	**0**	**0**	**0**	**1**	**1**
PTO 1/0 (A2C/13)	**0**	**0**	**1**	**0**	**1**
PTO 540 ON/OFF (**ON**=lever in front position, **OFF**=lever in middle position)	**OFF**	**ON**	**ON**	**OFF**	**OFF**
PTO 1000 ON/OFF (**ON**=lever in rear position, **OFF**=lever in middle position)	**OFF**	**OFF**	**OFF**	**ON**	**ON**
PTO ON/OFF (**ON**=lever knob switch in front position, **OFF**=rear position)	**OFF**	**OFF**	**ON**	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the input signals are OK. If not, the fault lies in the switch in question or its wiring is incorrect.

– The engine speed sensor and the PTO speed sensor are checked according to the instructions on page **351**/**3** or according to instruction **F** on page **352**/**7**.

Output signals from ECS (DIGITAL OUTPUTS)

PTO 540 LAMP (A1C/1)	**0**	**0**	**1** [1])	**0**	**0**
PTO 1000 LAMP (A1C/39)	**0**	**0**	**0**	**0**	**1** [1])
PTO SOLENOID (A1C/21)	**0**	**0**	**1** [1])	**0**	**1** [1])
PTO 540 ON/OFF (ON=lever in front pos., OFF=middle pos.)	**OFF**	**ON**	**ON**	**OFF**	**OFF**
PTO 1000 ON/OFF (ON=lever in rear pos., OFF=middle pos.)	**OFF**	**OFF**	**OFF**	**ON**	**ON**
PTO ON/OFF (ON=lever knob switch in front pos., OFF=switch in rear pos.)	**OFF**	**OFF**	**ON**	**OFF**	**ON**

[1]) 1 is seen only momentarily when the ON/OFF switch is moved to the ON position and then it changes to 0. However, if the engine is running during the test the 1 remains on.

a) Engine is stationary and the 540 RPM PTO is engaged; when the emergency plug is pulled out, the PC display shows E at the PTO SOLENOID. E changes to 0 when the plug is refitted. This same function concerns also the 1000 RPM PTO

– If the table marks above and the PC display marks agree with the given switch positions, but the PTO does not function, the possible fault must lie in the emergency plug, in the solenoid valve or in the indicating lamp or their wirings are faulty.

– If the output signals on the PC display differ from the marks in the table above, the central processing unit (ECS) is faulty and should be changed.

E. Slip control

Input signals to ECS (DIGITAL INPUTS)

SLIP CNTR 1/0 (A2C/16)	**0**	**1**
Slip Control ON/OFF (**OFF**=switch in pos. 0, **ON**=switch in pos 1–5)	**OFF**	**ON**

– If the marks above the thick line agree with the corresponding marks on the computer display, the input signals are OK. If not, the fault lies in the switch or its wiring is faulty.

– The radar and the gearbox speed sensor are checked according to the calibrating instruction on page **351/2** or according to the instruction **F** on the next page.

Output signals from ECS (DIGITAL OUTPUTS)

SLIP CNTR (A1C/18)	**0**	**1**
SLIP CONTROL ON/OFF (**OFF**=Switch in pos 0, **ON**=switch in pos. 1–5)	**OFF**	**ON** [1])

[1]) When the switch is in the ON position, disconnect the radar connector and drive the tractor at a speed of 3 km/h (power lift activated in the position control mode). Alternatively one rear wheel can be raised and then start carefully to drive with a low gear (4WD must be disengaged and the A/M switch must be in M position).

– If the table marks above and the PC display marks agree, the signal is sent from ECS to the hydraulic lift. If the lower links do not make a lifting correction the possible fault lies in wiring or the power lift electronics do not function.

– If the marks on the PC do not agree with the marks above, the fault lies in the ECS which must be changed.

Others

Lift/lower switch (DIGITAL INPUT)

When the lift/lower switch is in the lowering position or in the middle position, there is **1** in point IMPLEMENT POS (A2C/20). When the switch is in the transport position the **1** changes to **0**.

Thermostart (DIGITAL OUTPUTS)

In point FUEL PREHEATER (A1C/22), there is **1** when the glowing is on, otherwise **0**.

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F. Fault tracing, speed sensors (FREQUENCY INPUTS)

The following speed sensors are fitted on E–models:
– Radar (**Radar**) (A1C/7)
– Gearbox speed sensor (**Gearbox**) (A1C/30, 10)
– Front axle speed sensor (**Front axle**) (A1C/29, 9)
– Rear wheel rotation speed sensor (**Rear wheel**) (A1C/27, 8)
– Engine rotation speed sensor (**RPM engine)** (A1C/31, 12)
– PTO rotation speed sensor (**RPM Pto**) (A1C/28, 11)

N.B.! The speed sensor resistance (not radar) should be **1,0–1,10 kΩ** which can be measured from connector X2C or from the lower ECS connector A1C (pins, see above). If the resistance value is infinite a new measurement should be done from the sensor poles so that possible faults on wiring can be localised. A faulty sensor should be changed, see page **351/2.**

a) Checking radar

Drive the tractor at different speeds and write down impulses from the radar. The following values were measured from a radar which was in a perfect condition:

D ~ 38 (1 km/h) (inaccuracy increases at low driving speeds)
D ~ 157 (4,3 km/h)
D ~ 327 (8,8 km/h)
D ~ 416 (11,4 km/h)
D ~ 757 (20,6 km/h)
D ~ 1026 (28,2 km/h)

$$\frac{\text{Number of impulses}}{\text{Driving speed}} \square \text{ Constant}$$

– If number of impulses from the radar correspond to values above, the radar is in perfect condition.
– If no impulses come from the radar or if they deviate much from the values above, the radar is faulty or its wiring is damage.

b) Checking speed sensors for front axle, rear axle and gearbox

a) Drive the tractor on a road at a speed of 1–2 km/h and write down impulses from the radar (T1) and from one of the speed sensors (A1).
b) Drive then with a faster speed (~ 20 km/h) and write down impulses from the radar (T2) and from the speed sensor (A2).
c) Equation **A1/T1□A2/T2** must come true (deviation can be ≤ 0,16).

– If the equation comes true, the speed sensor is OK.
– If the equation does not come true, the speed sensor in question, its adjustment, wiring or impulse disc is faulty.

c) Checking rotation speed sensors for engine and PTO

a) **RPM engine;** impulse value is about 0616 at engine revs 1000 r/min.
b) **RPM Pto**, impulse value is about 0364 at the PTO speed of 540 r/min.

– If impulses from the sensor correspond to the values above, the sensor is functioning properly.
– If no impulses can be observe or number of impulses deviates much from the values above, the sensor is faulty. Check then the wiring and the sensor.

d) Calibrating and fitting speed sensors, see page 351/2.

G. ANALOG INPUTS

Here are given some base values for certain analog inputs. These values were measured from the AC–IV unit, which functioned perfectly:

Power lift (A2C/32)**:**
a) signal is about 194 when the lower links are in the lowest position
b) lower links in max transport height, signal is about 014.

– if the signal values are correct everything is OK**.**
– if no signal comes or deviates much from the values above, check the connectors and wiring. The fault can also lie in the hydraulic power lift electronics.

Outside temp (A2C/29):
a) signal is about 130 at outside temperature of −3˚C
b) signal is about 120 at outside temperature of +1˚C
N.B. Signal value decreases when temperature rises.

– if the signal values are correct everything is OK**.**
– if no signal comes or deviates much from the values above, the sensor is faulty or its wiring and connectors.

Coolant temp (A2C/30)**:**
a) signal at coolant temperature −2˚C is about 183.
b) signal at coolant temperature 15˚C is about 130.
c) signal at coolant temperature 20˚C is about 116.
d) signal at coolant temperature 25˚C is about 108.
e) signal at coolant temperature 40˚C is about 084.
f) signal at coolant temperature 50˚C is about 064.

– if the signal values are correct everything is OK**.**
– if no signal comes or deviates much from the values above, the sensor is faulty or its wiring and connectors.

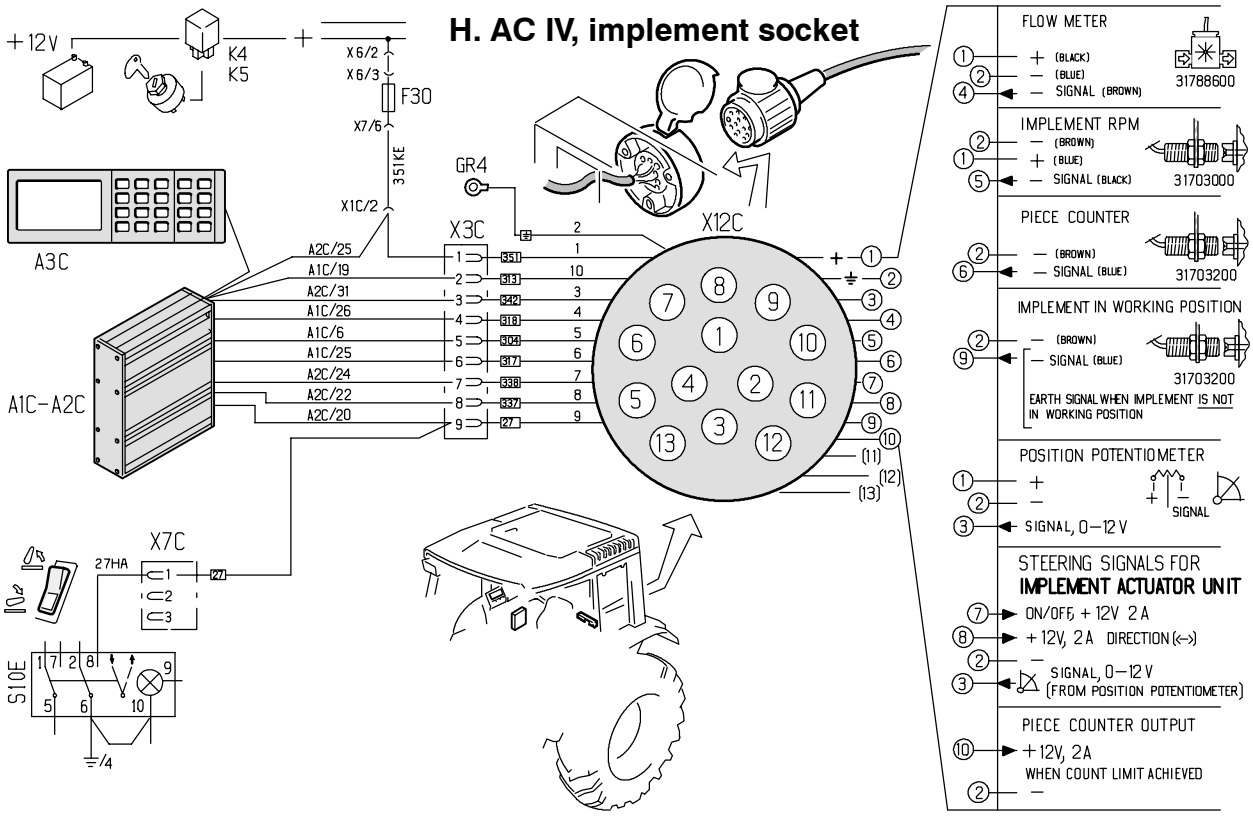
System volt (A2C/25)**:**
a) signal value is about 167, when the engine is running at 1000 r/min (correspond voltage ~ 13,5 V).
b) signal value is about 140, when the engine is stopped (correspond voltage ~ 12 V).

– If the signal values are correct, everything is OK (values depend also on condition of battery)
– If no signal comes or it is faulty, check connectors and wiring.

Acc pedal pos (A2C/7):
a) signal is about 020 when the acc. pedal is in the upper position (can vary even 20 units up or down).
b) signal is about 230 when the acc. pedal is in the lower position (can vary even 20 unit up or down).

– if the signal values are correct, everything is OK
– if no signal comes or it is faulty, check the potentiometer on the injection pump and its wiring.

Checking injection pump potentiometer, see page **351**/**4**.
Checking temperature sensors, see page **351**/**4.**



Checking line from implement socket to AC–IV unit

– Switch on current to the tractor

– Measure the supply voltage between socket terminals **1** and **2** (= battery voltage, about 12 V DC).
– Connect a microcomputer to the AC–IV unit and activate the trouble shooting chart (see page **352**/**1**).

FREQUENCY INPUTS

1. Shunt between socket terminals **2** and **4** (break connection). A number signal must appear on the PC at point **Flow**. This function is the same as the flow meter paddle wheel would revolve. Also AC–IV display shows some value in the liquid amount mode (litres).

2. Shunt between socket terminals **2** and **5** (break connection). A number signal must appear on the PC at point **RPM impl**. Also AC–IV display shows some value in the implement RPM mode. This function is the same as if a magnet would pass by the sensor.

3. Shunt between socket terminals **2** and **6**. A number signal must appear on the PC at point **PCS** every time the connection is broken off and on (summing counter). Also AC–IV display shows in the piece counter mode the same value. Note possible limiting program, which limits the max number of items. When the limit value is achieved a signal (0 changes to 1) appears at the point **Pieces counter** (DIGITAL OUTPUTS). This signal can also be measured with a voltmeter between socket terminals **2** and **10**. This function is the same as a magnet would pass by the sensor.

DIGITAL INPUTS

4. Activate the hydraulic power lift and turn the lift/lower switch to the lowering position. Shunt between socket terminals **2** and **9.** A signal (1 changes to 0) appears on the PC at point **Implement pos**. When the socket terminals are connected the arrow on the AC–IV display turns to point upwards. The function is the same as a magnet would be opposite the sensor. The lift/lower switch has the same function.

ANALOG INPUTS

5. Signal from possible position potentiometer: Shunt between socket terminals **1** and **3**, after which a number signal appears on the PC at the point **Implement pot**. Here with battery voltage the signal is about 250. Also AC–IV display shows some value (e.g. 100) in the implement position mode.

Signals to linear actuator

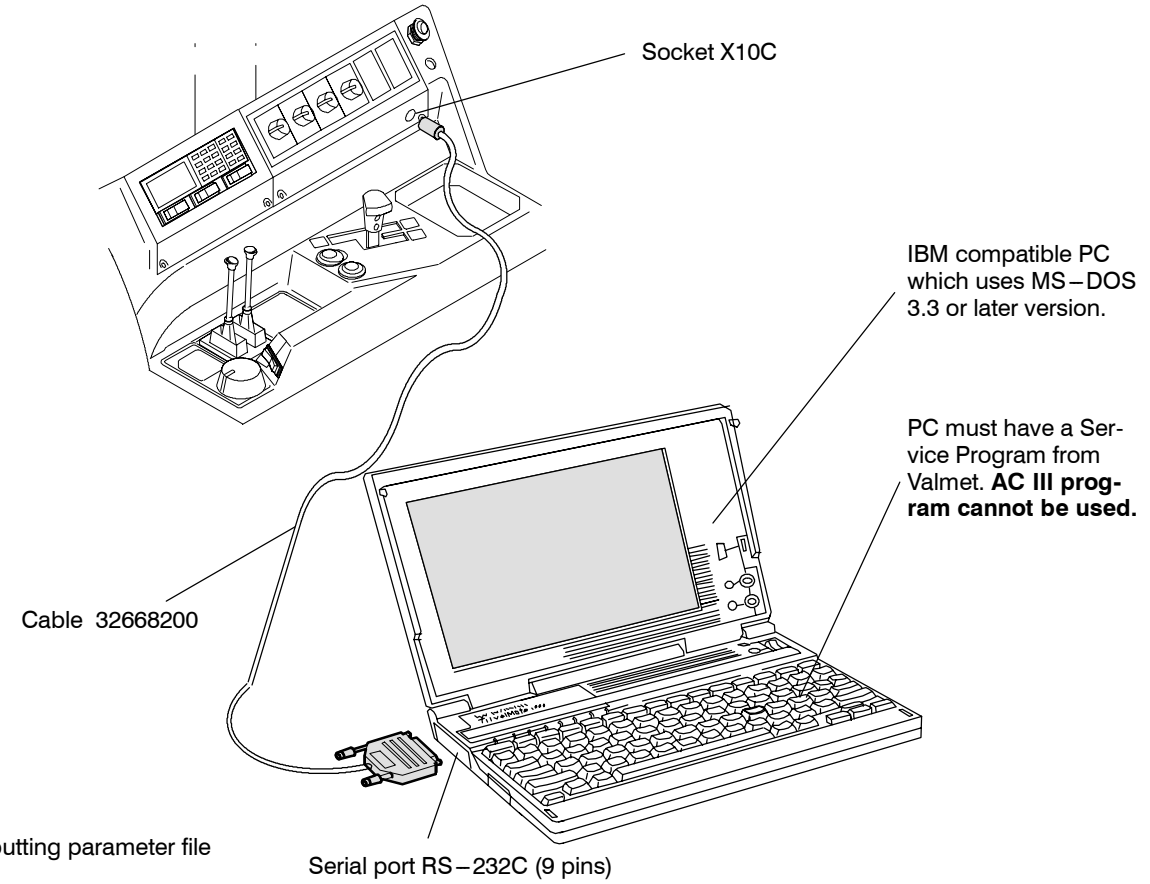
– connect an adjustable resistor to the socket poles **1** (+: black), **2** (–: Red) and **3** (sign: Yellow).
– calibrate the resistor's extreme positions (e.g. 0 (P1) and 100 (P2)).
– input 5 pcs pre–programmed resistor positions (e.g. 10, 30, 50, 70 and 90)
– move the resistor spindle inwards and outwards in the middle range and check that the output signals appear on the PC with e.g. the pre–set position 50. **Implement dir** (current to a relay for controlling actuator rotation direction; 0 or 1) and **Implement act** (current to a relay for controlling actuator; 0 or 1) (both DIGITAL OUTPUTS)
By connecting a test lamp to the socket poles **7** or **8** (earth from any frame contact) it can be checked if the current actually comes to the socket.

N.B. If the line from the socket does not function, check connector X3C (in the lever console). Check also wire connections in the socket. If the output signals do not come the ECS is faulty.

Copying parameter file into AC IV unit

One qualification for the correct function of the AC–IV unit is that the central processing unit (ECS) knows the tractor which it is fitted on. For that reason certain data must be input into the ECS. A parameter file includes this data.

In the factory a parameter file has been input into the AC–IV unit. If this file gets out of order, the unit automatically uses a default parameter file. The unit indicates this with text DEFAULT PARA every time current is switched on to the tractor. The default file must be replaced as soon as possible with a correct file. If the tractor's technical values are changed so it must also be checked if the parameter file should be changed. If the central processing unit (ECS) has been changed, a correct parameter file must be input.



Picture 1. Inputting parameter file

Parameter files have been named according to the code system. **A parameter file name** includes eleven characters as follows:

E.g. AC 4 0 12 XX . N X E

AC = Autocontrol

4 =AC system number in use. AC IV=4. 4.5.

0 =Program version name. This changes only if the program version needs a parameter file.

12 =Parameter file order number (0–99). The order number changes always with exception that different language versions have a same order number. AC IV numbers start from nr 11.

X = Not in use on AC IV.

X = Not in use on AC IV.

N = PTO type. **N**=540/1000 (normal), **E** =540/750 (=540E) (economy).

X = Not in use on AC IV.

E = Language (E=english, R=swedish, S= finnish)

A parameter file is input into the AC–IV unit with aid of a microcomputer. Service Program floppy disk can be ordered from Valmet. This same program is used also when trouble shooting is done. **AC–III program cannot be used**.

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Alternative parameter files

Tractors 6600E, 8100E, 8200E and 8400E have files which are selected according to the PTO type and display language:

Tractor	Gearbox	PTO	Language	Parameter file name
6600E–8400E	30/40/50 km/h	540/1000	Finnish	AC4011XX.NXS
			Swedish	AC4011XX.NXR
			English	AC4011XX.NXE
6600E–8400E	30/40/50 km/h	540/540E (750)	Finnish	AC4012XX.EXS
			Swedish	AC4012XX.EXR
			English	AC4012XX.EXE
Parameter files on E–models which are equipped with HiShift				
6600E–8750E	30/40/50 km/h	540/1000	Finnish	AC4013XX.NXS
			Swedish	AC4013XX.NXR
			English	AC4013XX.NXE
6600E–8750E	30/40/50 km/h	540/540E (750)	Finnish	AC4014XX.EXS
			Swedish	AC4014XX.EXR
			English	AC4014XX.EXE

Copying parameter file into AC IV

In this instruction the Program is in the hard disk (**C:**). If it is in the floppy disk drive, use a correct prompt (e.g. **A:**)

J Connect the PC with the cable to the socket X10C.
J Switch on the current to the tractor and to the PC.
J When prompt **C:\>** appears, type **AC** (ACC if colour monitor) and press **ENTER.**
J A trouble shooting chart appears onto the PC display. In the LH side lower corner of the chart there is the following menu:

1PARAMETERS 5SENSOR LOG.

J Press **F1** and the following text appears:

TRACTOR MODEL PARAMETERS

File name:_____

J Type after colon a correct parameter file name.
J Press **ENTER**
J Message **PROGRAMMING AC–IV** appears onto the PC display. Programming in action.

J When the programming is successfully completed, text **AC IV PROGRAMMED** appears in the message window in the RH side lower corner. During successful programming the AC–IV display is switched off and on.

Note! Service Program error messages, see next page.

J To return to the disk operating system press function key **F10** (EXIT).

The Service Program chart (on PC display) has the following information:

Parameter table no = parameter file order no
Date of production = manufacturing date of ECS
PROM Checksum = program version
EPLD Version = program version of logic circuit

If the central processing unit (ECS) or the parameter file is changed, write on the ECS sticker no 32666800 tractor serial number, date and parameter file name after text SW.NO. Fix the sticker onto the ECS.

Note! If HiShift is retrofitted on an E–model, a new parameter file must be copied into the AC IV unit. The program diskette can be ordered from the Service Department of Tractor Works.

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Error messages in Service Program

Service Program has the following error messages which appear in the MESSAGE WINDOW in the RH side lower corner of the fault tracing chart. If other error messages appear, switch off current and start from the beginning.

ERROR IN CHECKSUM If this message appears on the PC display when you are programming the AC–IV unit, You must start from the beginning after switching off and on current.

PARAMETER REV MISMATCH. Parameter file and EPROM have different version numbers.

ERROR IN EPROM If You have found an error in EPROM, switch off the AC–IV unit for a while and start the Service Program and try again programming. If this is not enough, change the central processing unit (ECS). (EPROM=eraseable and programmable read only memory)

AC–IV DOES NOT RESPOND Connection between the PC and the AC–IV unit does not function. Check the middle cable and check that the AC–IV unit is switched on. Check AC–IV fuses.

ERROR IN COMMUNICATION Switch off the AC–IV unit for a while and start the Service program again.

WRONG NUMBER OF CHAR This message appears if you try to copy into the AC–IV unit a parameter file which has not the correct number of characters. Program error.

ILLEGAL CHAR FOUND A parameter file includes an illegal character/characters. Only figures 0–9 are allowed. Program error.

FILE ERROR If the file does not exist, this message appears on the PC display. Check the parameter file name. Start from the beginning after turning current off and on.

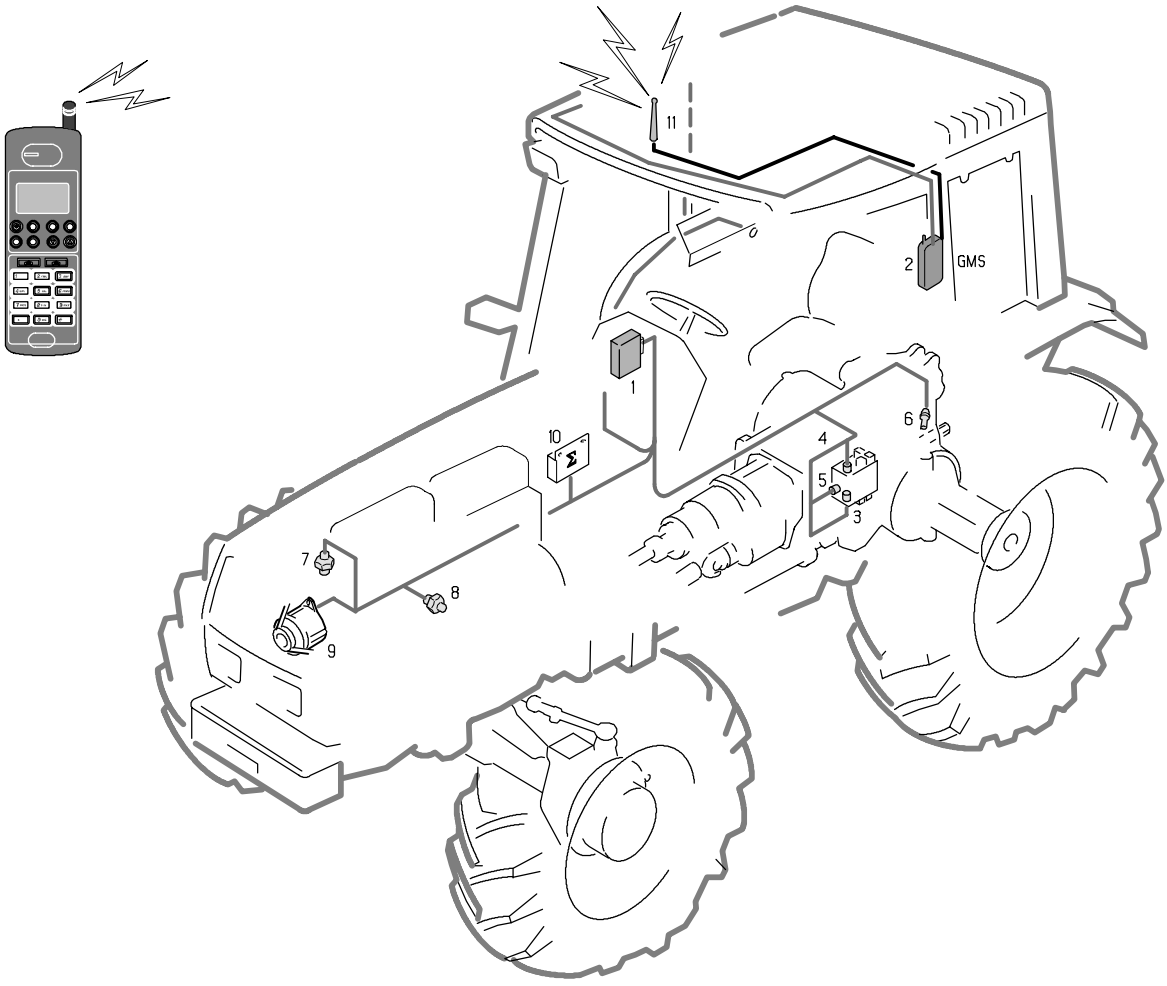
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CareTel (option) can receive questions from a remote GSM phone and send answers to the GSM phone about different tractor functions. One condition is that the GSM phone is in the phone service area and another that the GSM phone has a short message (SMS) function. The messages can also be received with a computer which is connected to the phone. In addition, CareTel has been programmed to send an alarm message automatically to a selected phone number/numbers, if information from one sensor is in the critical point and the tractor can fail. CareTel data logger includes specified information about the tractor. This information has been fed into the data logger in the factory.

CareTel measures, gathers and sends information about the following tractor functions:

– Engine coolant temperature (C˚)
– Transmission oil temperature (C˚)
– Engine torque, 8750 Σ–power only (as percent of the total torque)
– Engine revs (RPM)
– PTO shaft revs (RPM)
– Pressure in low pressure circuit (BAR)
– Lubricating oil pressure in transmission (OK/LOW)
– Engine oil pressure (OK/LOW)
– Σ–power (ETB light) (ON/OFF)

In addition, CareTel shows the tractor serial number and running hours at the measuring time. CareTel shows also if the tractor engine is running or not (*).

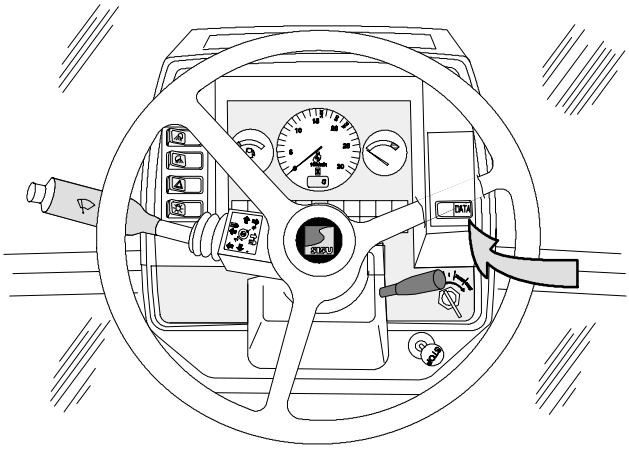


Picture 1. CareTel system.

1. Data logger
2. GSM phone (Nokia GSM 880, 2110 or 5000)
3. Transmission oil temperature sensor
4. Transmission oil pressure sensor
5. Low pressure circuit pressure sensor
6. Rotation speed sensor of PTO shaft
7. Engine coolant temperature sensor
8. Engine oil pressure sensor
9. Alternator (engine revs, running hours)
10 Sigma–Power control unit, 8750
11. GSM phone antenna

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Data logger



Note! In the dashboard there is an indicator light (DATA), which shows the status of the data logger (A1L) as follows when current is switched on:

– lights continually = normal status
– flashes with frequency of 1 Hz = alarm messages in queue, switch on the GSM phone
– flashes with frequency of 10 Hz = faulty or wrong settings in data logger
– light does not light = data logger damaged.

Note! If the data logger must be changed, the specified set values must be fed into the spare part logger in the factory. Although supply to the logger is cut off (e.g. battery is disconnected), the set values remain in the logger's memory. The data logger is placed under the dash board on the RH side. It gets supply voltage direct from the battery via fuse F2. The logger gets supply also via the ignition switch (F30). The logger is connected to the tractor electric system with aid of a 26–pin connector (earth points GR4 and GR5).

CareTel GSM phone



The data logger (A1L) functions alone, but a GSM phone is needed for receiving/sending the SMS–messages. The system phone must be placed in the bracket in the cab, current switched on and activated and its connector must be connected. Tractor works do not dispatch this system phone. The phone bracket is the same as brackets used in cars and the phone is also charged in the bracket.

Care Tel uses Nokia mobile phone technology, and for that reason only Nokia GSM 2110, 5000 or 880 can be uses as a system phone. However, messages from/to CareTel system can be sent with all GSM phone which have the text message function. CareTel messages, however, have been formed so that they are most suitable in the Nokia phone displays.

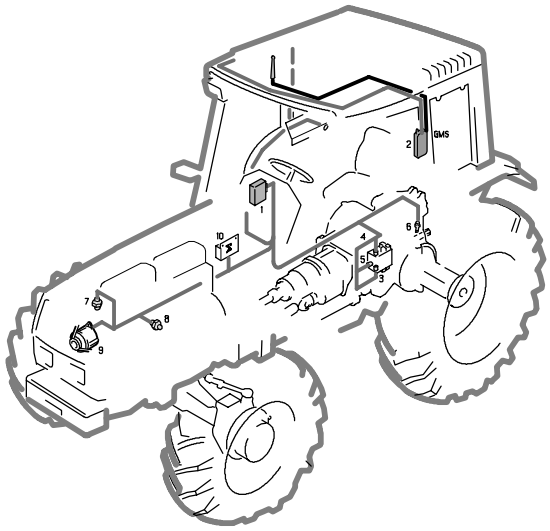
Sensors

Standard sensors for CareTel use:
– engine oil pressure sensor (S13) on the RH side of the engine (warning light in the dashboard)
– transmission oil pressure sensor (S17) on the upper surface of the servo valve block (warning light)
– transmission oil temperature sensor (B3) on the lower face of the servo valve block (warning light). Same as used in Agrodata–instrument.

The low pressure circuit sensor (B1L), which is fitted on the front face of the servo valve block, is a special sensor for CareTel use.

CareTel engine temperature sensor (B9C) is the same and in the same place as on E–models, but it has been connected differently. PTO shaft revs sensor (B7) is the same as on E–models and AD–instrument.

Engine revs and running hours CareTel takes from the alternator. In the dashboard, there are corresponding instruments. Engine torque CareTel takes from the Sigma–Power control unit A13 (8750 only) as well as Sigma–power ON/OFF information (ETB light).



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1. Remote use of CareTel with GSM phone

To/from CareTel can be sent/received SMS–messages with a GSM phone. All GSM phones with the SMS–function can be used. In the CareTel design has been used Nokia 2110 GSM phone. In the display of this phone can be seen 10 characters in three lines.

Note! Normally from the GSM phone menu is selected the SMS message typing mode and after typing the message it is sent to the CareTel system phone. See Instruction Manual of the phone.

Care Tel uses five different message types:
– Questions
– Answers
– Settings (have been fed in the factory)
– Confirmations
– Alarm messages (the receiver phone numbers have been fed into the data logger in the factory)

Important! It is possible that with the Care Tel set values have been determined different rights of usage for different GSM phones. If a question has been sent from a phone, which has not adequate rights, the CareTel does not send an answer message.

Note! Concerning different measuring logs in the data logger, see page **360**/**8**.

A. Query of one measuring value

Query

ZZ[–H|L|n][–A|PH|PL]

ZZ=name of measuring value. In the CareTel settings there are determined two–letter names for all different measuring values as follows.:
TE=Temperature Engine, ˚C
TT=Temperature Transmission ,˚C
ME=Moment Engine, %, Sigma–Power 8750 only
RE=Revs Engine, RPM
RP=Revs PTO, RPM
PH=Pressure Hydraulics (low pressure circuit), BAR
PT=Pressure Transmission, OK/LOW
PE=Pressure Engine, OK/LOW
SP=Sigma–Power (ETB light), ON/OFF
–H=maximum value
–L=minimum value
–n=which value in order from the last value backwards (in memory 1–195 values)
–A=query is directed to the alarm log (in this log there is stored maximum and minimum values of the critical limit values)
–PH=query from maximum log
–PL=query from minimum log

Note! if –A, –PH or –PL parameters are not given, the query is directed to the standard log. If the query is directed to the max. or min. log, parameters –H, –L or –n have no signification.
Care Tel gives value to the asked measurement and, in addition, values to the four previous measurements, if the query is not directed to the min or max logs.

Exsamples:

TE

Query of five last measurements of engine temperature.

TT –A

Query of transmission temperature from the alarm log, five last measurements.

PT –100

Query of transmission oil pressure from standard log, five values from value nr 100 backwards.

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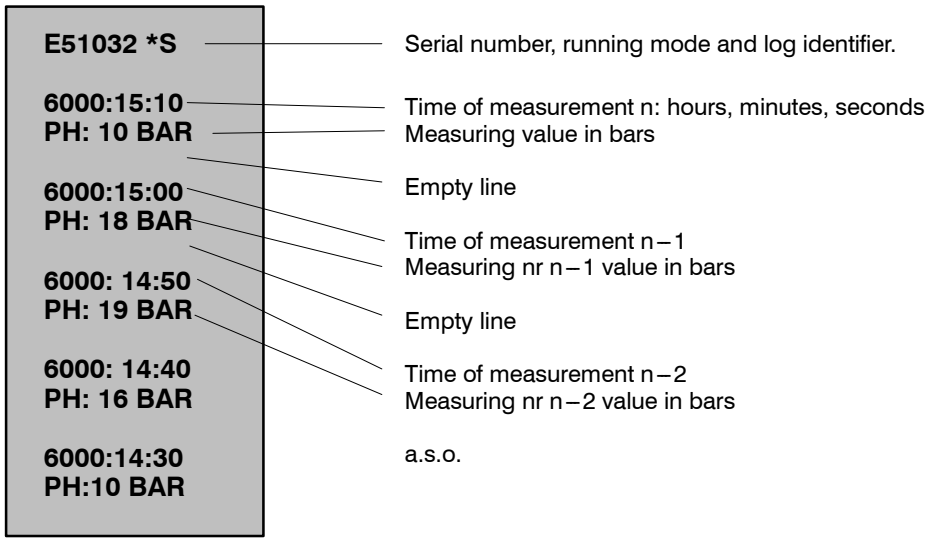
Answers

In the answer of one value there is always the tractor serial number in the beginning (fed into the data logger in the factory). In the same line, there is an asterisk, if the engine is running and a log identifier, in which **S**=standard log, **A**=alarm log and **E**=special tracking log.

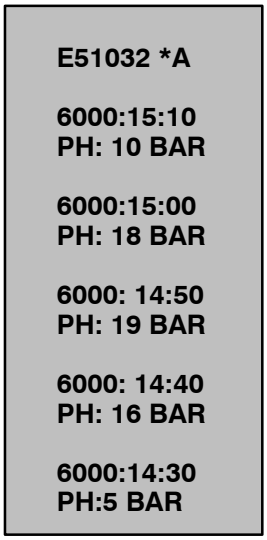
The measuring frequency has been set in the factory. The frequency below is 10 seconds.

Exsamples:

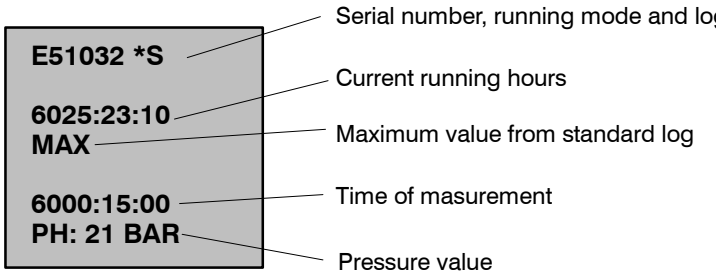
Answer to question **PH –n:**



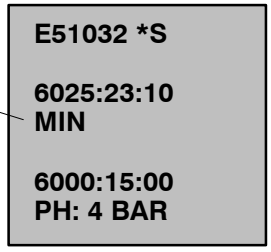
Answer to question **PH –n –A:**



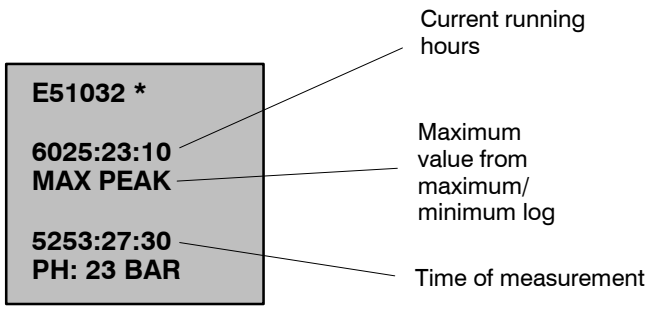
Answer to question **PH –H:**



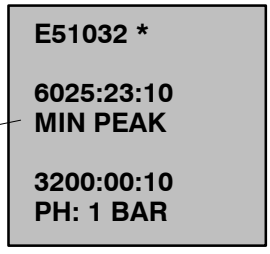
Answer to question **PH –L:**



Answer to question **PH –PH:**



Answer to question **PH –PL:**



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B. Query of all measurements

TO[–n][–A]

–n=which value in order from the last value backwards (1–195 values in memory)
–A=query is directed to the alarm log. If –A is not given, the query is directed to the standard log.

Answers

Exsamples

Answer to question **TO –n**

```
E51032 *S
6025:23:10
6000:15:10
TE: 92 C
TT: 80 C
ME:80
RE:2000 RPM
RP: 1000 RPM
PH: 18 BAR
PT: OK
PE: OK
SP:OFF
```

- E51032 *S — Serial number, running mode, log identifier
- 6025:23:10 — Current running hours
- 6000:15:10 — Time of measurement n
- TE: 92 C — Engine temperature
- TT: 80 C — Transmission temperature
- ME:80 — Moment engine (8750 only)
- RE:2000 RPM — Engine revs
- RP: 1000 RPM — PTO shaft revs
- PH: 18 BAR — Low pressure circuit pressure
- PT: OK — Transmission oil pressure
- PE: OK — Engine oil pressure
- SP:OFF — Sigma–Power (8750 only)

Answer to question **TO –n –A**

```
E51032 *A
6025:23:10
5600:14:20
TE: 92 C
TT: 80 C
ME:80
RE:2000 RPM
RP: 1000 RPM
PH: 10 BAR
PT: OK
PE: OK
SP:OFF
```

C. Query of number of exceeding times of warning limits

WA [–H|–L]

–H=exceeding of upper limits
–L=undershoot of lower limits
If these parameters are not given, CareTel shows the exceeding of the upper limits.

Answers

Exsamples

Answer to question **WA**

```
E51032 *
6025:23:10
WARNINGS
CHHOUR PCS
TE 5600:120
TT 2100:5
ME 0000:0
RE 5600:120
RP 2020:1
PH 1800:212
PT 0120:1
PE 0111:1
SP 2100:1
```

- WARNINGS — Exceedings of warning limits
- CHHOUR PCS — Channel, hours, pcs, heading line
- TE 5600:120 — Engine temperature, the last exceeding time and number of exceedings
- a.s.o.

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D. Query of number of exceeding times of alarm limits

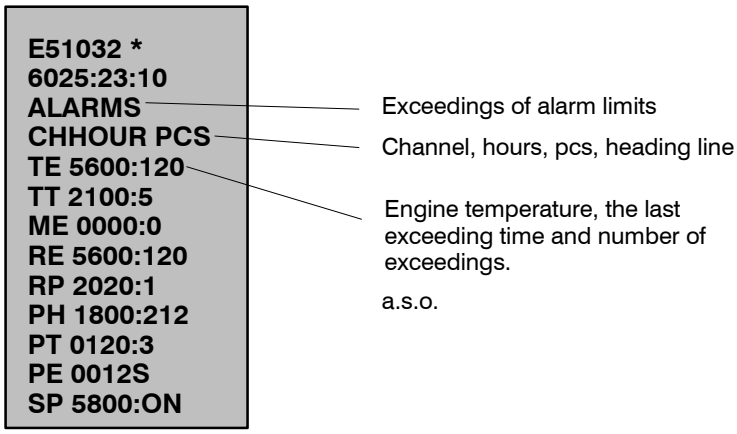
AL [–H|–L]

–H=exceedings of upper limits
–L=undershoots of lower limits
If these parameters are not given, CareTel shows the exceedings of the upper limits.

Answers

Example

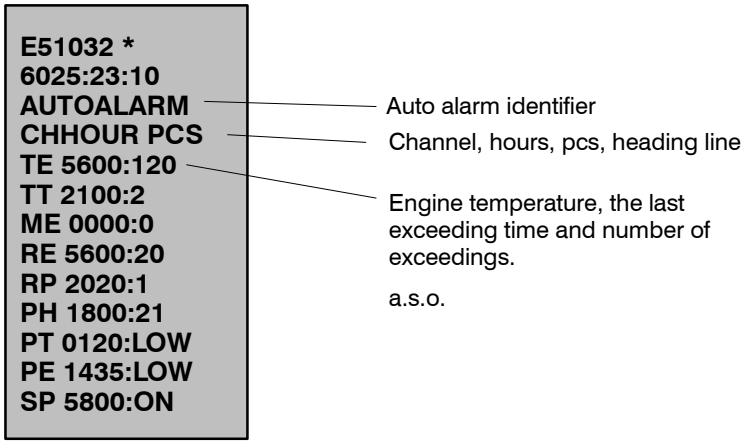
Answer to question **AL**



E. Automatic alarm message

CareTel sends automatically an alarm message, if the alarm limits are exceeded, at the most to three GSM phones determined in the set values.The alarm message includes tractor serial number, running mode, running hours and values of all measurements from the alarm log.

Exsample:



Note! The alarm message is sent only once from every limit exceedings during driving. After engine stop and restarting the alarm messages are sent anew, if the limits are exceeded.

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F. Query from special tracking log

The measuring values, which are gathered in the special tracking log, are initiated with **ST** message.

Note! In the special tracking is gathered 2000 different measuring values from certain sensor in frequency of normal standard log. The measuring frequency has been set in the factory. Default value is 10 seconds.

ST [–n]

This question above shows five measuring values from the special tracking log from beginning of measurement no –n and backwards. In this log parameter –n can vary between 1–2000.

Control of special tracking log

One measuring point is switched on to the special tracking mode with **ST** command.

ST ZZ

In the command above, ZZ is a two–letter name of the measuring point in question.

The STOP command below stops the gathering of data into the special tracking log.

ST STOP

Zeroing of this log is with the CLEAR command below.

ST CLEAR

G. Control of automatic alarm messages

CALL *ID* OFF

CALL *ID* ON

ID=tractor serial number
OFF=automatic alarm messages are not sent.
ON=automatic alarm messages are sent

When the above shown command has been sent, CareTel sends a confirm (ACK CALL=positive confirm, NACK CALL=negative confirm. The confirms show also the tractor serial number and running hours.).

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2. Measuring logs

Standard log

Measuring data from all sensors is gathered in the standard log with frequency determined in the set values. The measuring frequency can vary between 1–255 seconds. In the standard log, there are stored 195 last measuring values.

Exceeding log

In this log there are stored exceedings (pcs) of the warning and alarm limits of all sensors, and the last exceeding time of the alarm limits.

Alarm logs

When an alarm limit of a sensor is exceeded or undershooted, 195 previous measuring values from all sensors are copied from the alarm buffers to the alarm logs in frequency determined in the settings (1–255 seconds).
There are two alarm logs and in them there are stored data from the two last exceedings of the alarm limits. In order to interpret an alarm limit exceeding as a new one, the value must be over five seconds below the alarm limit.
When asking data from the alarm logs with a GSM phone, the question is always directed to the newer alarm log.

Alarm buffer

Measuring values (alarm limit exceeding values), which are copied into the alarm log in turn, are gathered in frequency determined in the setting values into the alarm buffer. The alarm buffer is an internal value table in the data logger, and it is not visible outwards .

Maximum and minimum logs

Maximum and minimum values from all sensors and their measuring time during the total running time of the tractor are gathered and stored in these logs.

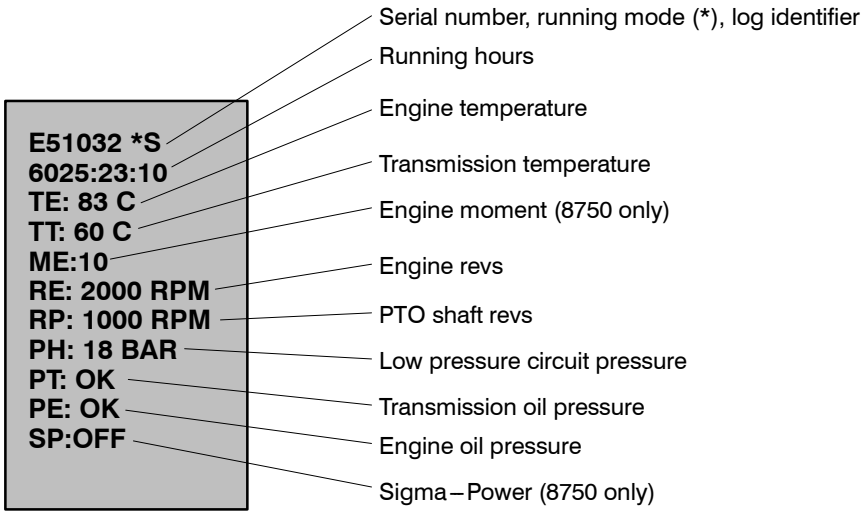
Special tracking log, see previous page.

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1. Checking function of CareTel

If the system does not function:
– check fuse F2 and F30 in the fuse box
– switch on current to the tractor and check the status of the data logger with aid of the ind. light, see page **360**/**2**.
– ensure that the system phone is switched on, field strength is adequate and that the phone is connected to the bracket connector.
– check wires to/from the bracket (antenna, data logger)
– ring to the system phone with an auxiliary GSM phone and assure, that it receives alarm/message. Ring/send a message with the system phone to the auxiliary phone and ensure that it is functioning.

If the answers from the CareTel are faulty, so:
– start the engine and ask with the auxiliary GSM phone with **TO** command current values from all sensors:



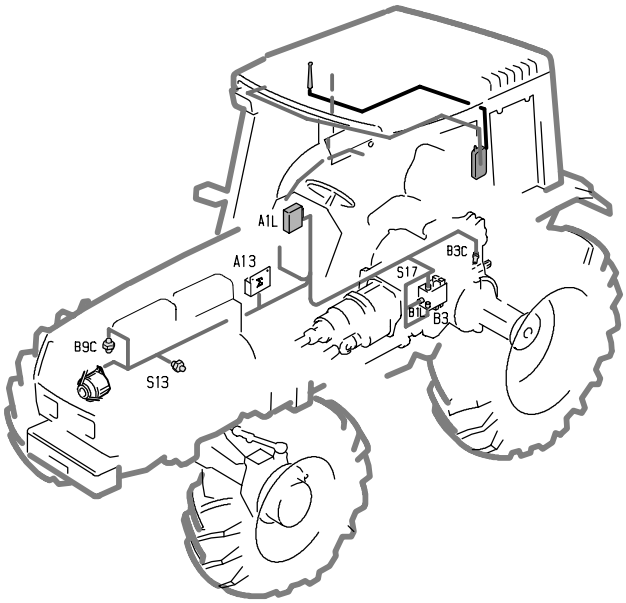
– investigate the message, and ensure whether one or more of the values are clearly faulty or fail.
– raise engine revs and warm the transmission and load it and engage servo functions of the low pressure circuit and carry out a new TO query, and compare values
– if one or more measuring values can easily be verified faulty or it fails, check the sensor in question and its wires, see the following page.
– if the fault cannot be found, change the data logger into a new one.

Note! There are specified GSM numbers and rights of usage and the setting values in the data logger. When ordering a new logger, the tractor in question must be specified.

WARNING! Electric signals from the GSM phone may affect the tractor electric system (e.g. AC/ACD–power lift). Do not keep the GSM phone on the lever console near the AC/ACD power lift electronics.

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2. Sensors



a) Engine oil pressure sensor S13
Transmission oil pressure sensor S17

When the lubricating oil pressures drop under a certain level, the sensors ground the electric circuit and a warning light in question comes on in the dashboard (LOW). When the pressure rises up to a certain level, the sensor cuts off the circuit and the warning light goes out (OK).

Start the engine and ensure that the warning lights do not light. Disconnect the sensor wire and connect it to tractor frame at which time the warning light in question comes on. Connect the wire to the sensor pin and the warning light should go out.

Stop the engine, at which time the warning lights come on and light if the current is switched on. If the warning lights function as shown above, the sensors and wires are probably in order.

b) Engine temperature sensor B9C

Resistance values of the sensor:
– 120–148 Ω (+60˚C)
– 47–56 Ω (+90˚C)
– 35–42 Ω (+100˚C)
(the resistance increases when temperature lowers).

CareTel temperature value can be compared with the reading of the dashboard temperature gauge at which time can be estimated the size class of the value. The working temperature of the engine varies between +75...+95˚C according to loading. Engine coolant temperature can be measured with an auxiliary thermometer, at which time is obtained a more accurate value of comparison.

c) Transmission oil temperature sensor B3

Resistance values of the sensor:
– 200–250 Ω (+60˚ C)
– 75–90 Ω (+90˚ C)
(the resistance increases when temperature lowers).

If the tractor is equipped with Agrodata–instrument, the function of this sensor can be checked by ensuring that the AD–instrument shows a correct temperature value, see code 331.

In the dashboard there is a warning light for too high temperature in the transmission. Transmission oil working temperature varies between +60...+85 ˚C according to the loading.

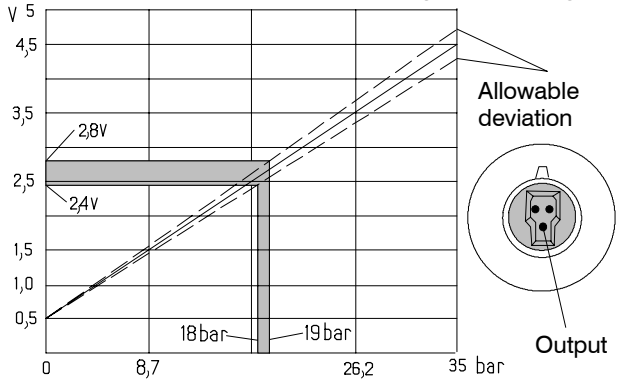
d) PTO shaft rotation speed sensor B7

Resistance of the sensor should be **1,0–1,10 k**Ω.

If the tractor has AD–instrument, check whether it shows the PTO revs. If it shows the revs and the reading reacts to the alterations of the revs, the sensor is in order.

e) Pressure sensor B1L for low pressure circuit

The basic pressure of this circuit is **18–19 bar**. The circuit maintains clutch pressures in various transmission multi–disc clutches, such as DPS, lock, 4WD, PTO, see pages **911/1–2**. Sensor output voltage (DC) depends on the pressure linearly, see diagram below. The connector must be connected to the sensor when measuring output voltages.



Others

Engine revs and running hours

CareTel takes engine revs and running hours from the alternator. In the dashboard there is a rev counter. If it seems to function and reacts to the revs alterations, the measuring circuit is in order.

CareTel running hour reading can be checked by comparing it with the reading in the dashboard.

CareTel takes the engine running mode (*) from the ignition switch position and engine revs (charging light), so that when the engine revs are over 400 r/min, CareTel assumes that the engine is running, if the ignition switch is in the running position.

Engine moment and Σ–power

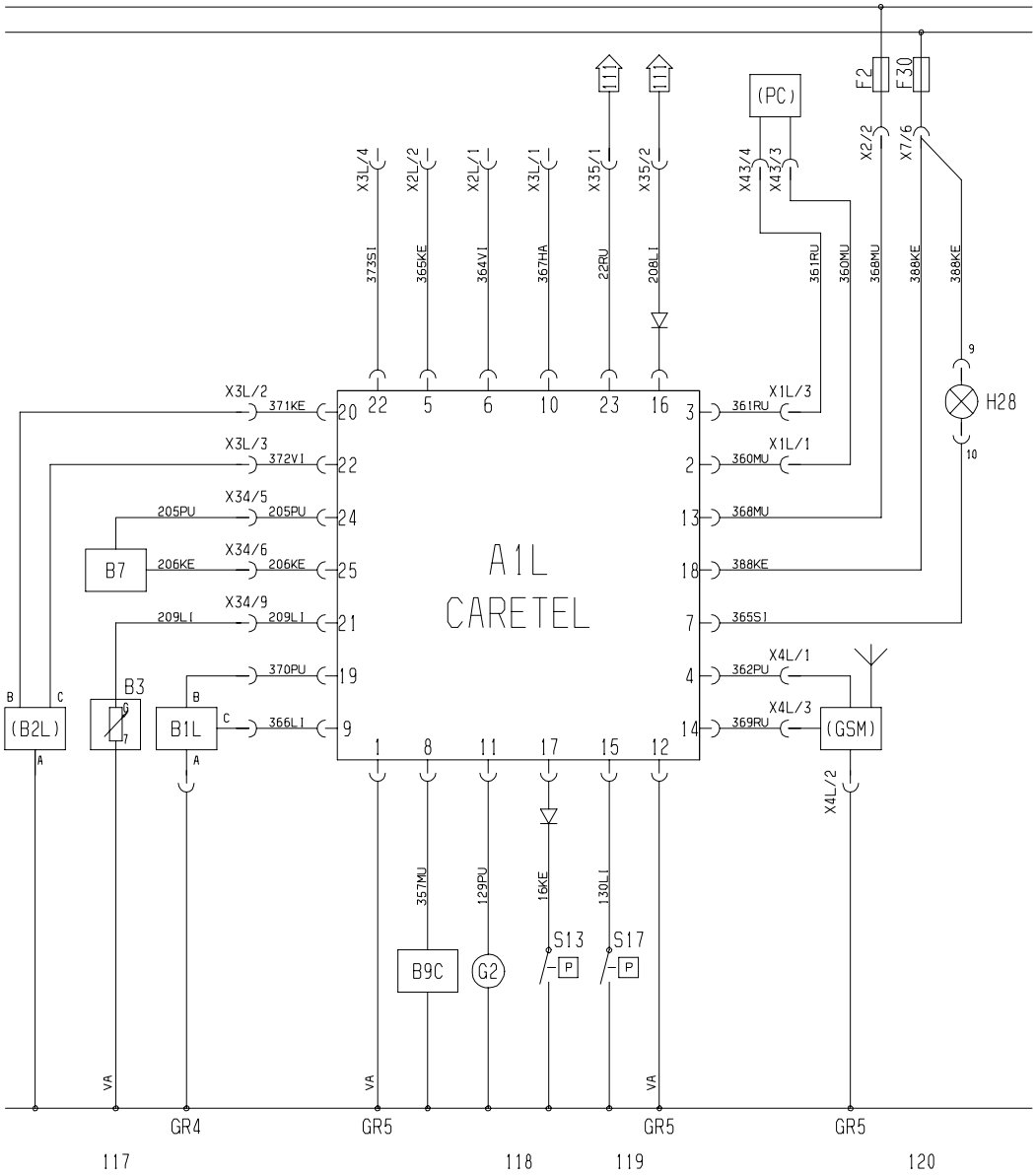
These functions only on 8750 tractor, which has Σ–power, see under code 313.

In point SP there is ON, when the engine is working in the higher output range, at which time also the dashboard ETB–light lights, otherwise OFF.

CareTel shows the engine torque as percents of the total torque.

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Wiring diagram (see also diagrams on pages 310/33–38)



Position of connectors:

X34: Connector in the rear part of the lever console (9 pins)
X35: Connector in the lever console (9 pins)
X43: Socket on the lever console on the driver's right (8 pins)
X2: Connector in the fuse box (9 pins)
X7: Connector in the fuse box (9 pins)
X1L: Under the AC/ACD switch panel in the lever console on the driver's right (8 pins)
X2L: In the steering wheel console under the dashboard (3 pins)
X3L: In the steering wheel console under the dashboard (9 pins)
X4L: In the cab roof on the LH side (3 pins)

GR4: Earth point in the rear part of the lever console
GR5: Earth point on the cab front wall under the dashboard

Ru = brown
Pu = red
Ke = yellow
Si = blue
Mu = black
Vi = green
Va = white
Ha = grey
Li = lilac

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Code 371:

Note! Under code 371 are shown AC 5.2 system's properties, which differ from AC 5 and which cannot be shown under code 370 due to lack of space. Under code 370 are given necessary references to code 371.

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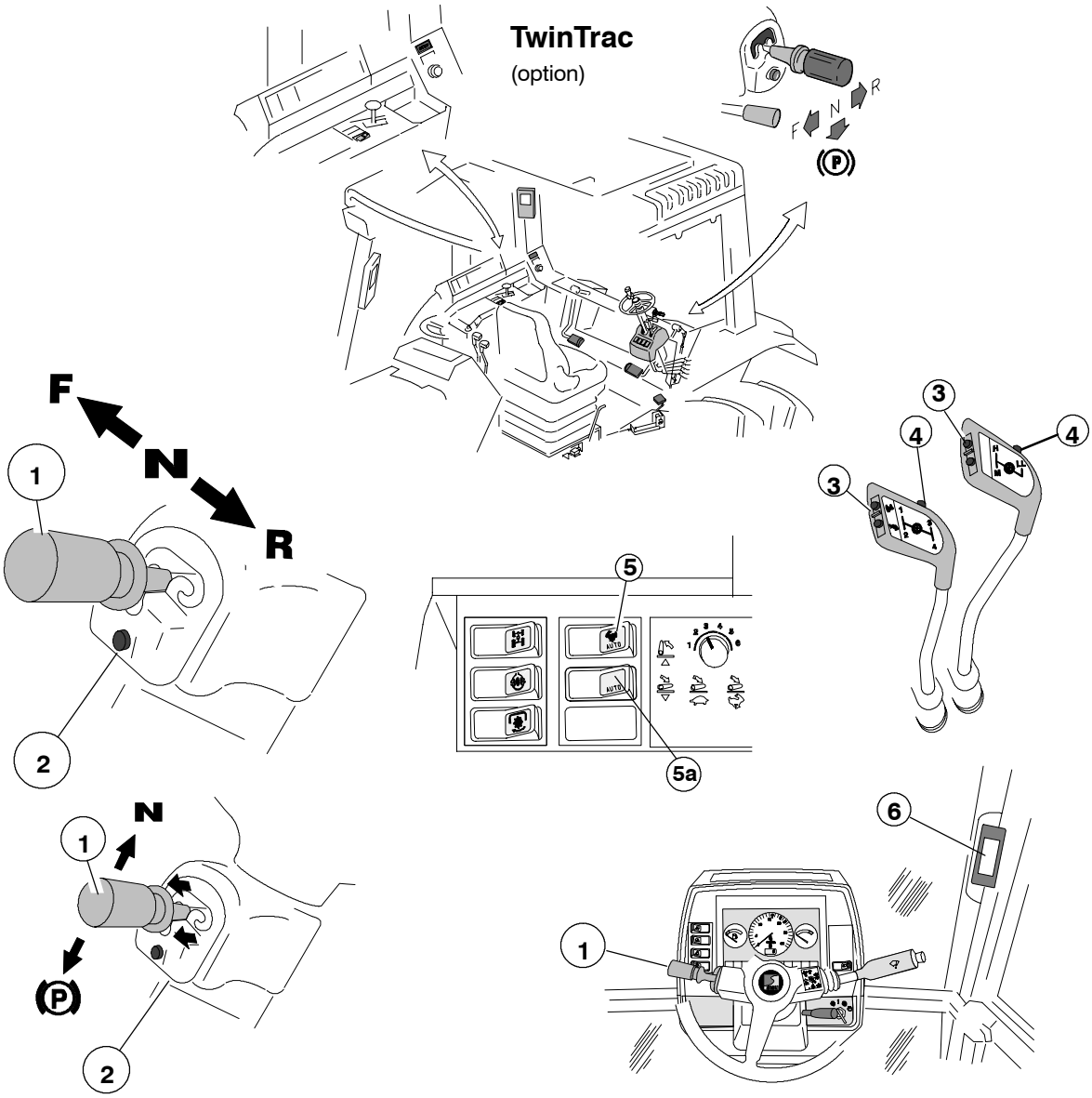
1. AC 5 and 5.2, description

Autocontrol 5 (–K41106) or 5.2 (K41107–) includes:
– Electric engagement control of HiTech shuttle
– Engagement control of DPS and PTO with electro–proportional valves
– Automatic speed change of DPS. AC 5.2: Additionally AutoTraction and Speed Matching functions of DPS.
– Autocontrol 5/5.2 display unit
– AC 5/5.2 control unit (in the lever console) and required sensors and wires.
– Fault diagnostic functions and setting procedures.

Autocontrol 5/5.2 can be fitted on 6250–8950 HiTech tractors. In these tractors the separate circuit card A10 for the DPS is removed (see Autocontrol 2.1 and 2.2).

Autocontrol 5/5.2 system includes a display unit which shows functions of transmission, helps with manual gear change and shows a fault code if the system has malfunctions. The display is also used, when testings and settings are carried out.

A. AC 5 / 5.2 control buttons and levers

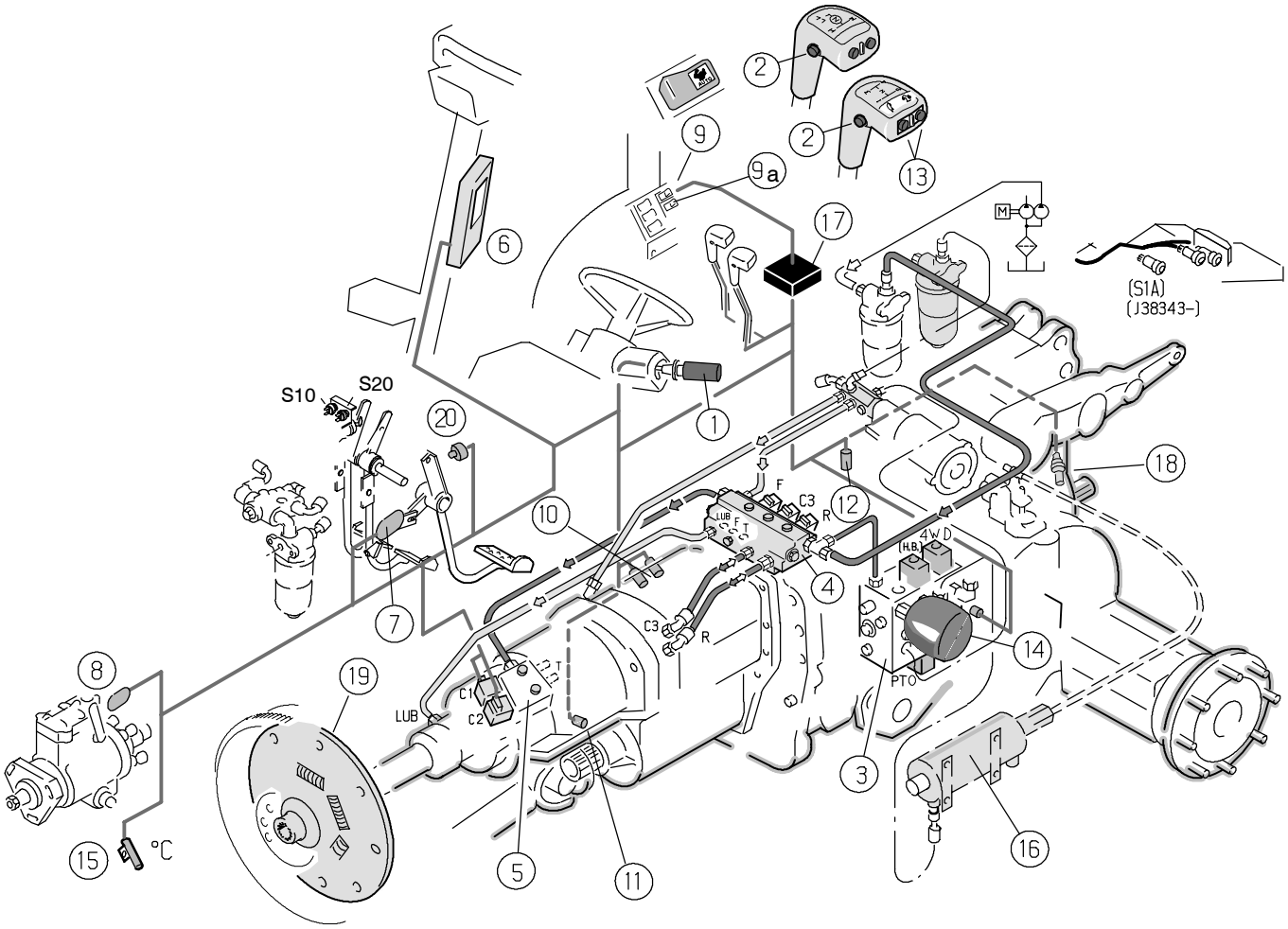


1. Reverse shuttle lever/hand brake lever on the LH side of the steering wheel (or alternatively on the RH side). The parking brake must always be engaged, when the tractor is parked.
2. The button for pre–programming the DPS speed when the tractor driving direction is changed (this button is also used when testing AC 5 or when carrying out settings).
3. Push buttons for the manual control of DPS (as earlier) (these buttons are also used in the test mode and setting mode).
4. Push buttons for disengaging the reverse shuttle (function as in HiShift, but the clutch pedal is not depressed). The tractor has also the clutch pedal for the electrical disengagement of the HiTech shuttle and for normal driving with the pedal.
5. Three–position rocker switch for selecting manual or automatical speed change of the DPS (man/auto1/auto2) (as on AC III).

5a. Switch for AutoTraction function, AC 5.2 only.

6. AC 5/5.2 display unit, see page 4.

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Picture 1. *Autocontrol 5 / 5.2 components*

1. Reverse shuttle lever/parking brake lever
2. Push buttons in the gear lever knobs for disengaging the Shuttle electrically (like HiShift. When the buttons are pressed, the clutch pedal does not move down)
*3. Servo valve block of the low pressure circuit. On the block there are gearbox oil temperature sensor, pressure accumulator, electro–proportional valve for the PTO, solenoid valves for the hand brake, 4WD and the diff. lock. The block is presented on pages **420**/**20C** and on page **440**/**24.***
*4. Valve block on which there are electro–proportional valves for the forward drive (F), reverse drive (R) and for the DPS rearmost clutch C3. The valve block is presented on page **440**/**25**.*
*5. Valve block on which there are electro–proportional valves for foremost (C1) and middle (C2) clutches of the DPS, see also page **440**/**25**.*
6. Display unit
7. Position sensor on the clutch pedal
8. Position sensor on the fuel injection pump
9. Auto1/Auto2/Man–switch for the DPS
9a. Switch for AutoTraction function (AC 5.2 only)
10. Two rpm sensors on the Shuttle
11. Gearbox speed sensor (driving speed)
12. Engine speed sensor
13. Push button for the manual control of the DPS (as AC 2.1)
14. Pressure accumulator
15. Outdoor temperature sensor
16. Hydraulic ram of the parking brake
17. Control unit of AC 5 / 5.2.
18. PTO shaft speed sensor
*19. Drive disc on the flywheel (see page **410**/**4A**)*
20. Limit switch

IMPORTANT! In the reverse drive controls (TwinTrac) there is a shuttle/parking brake lever, clutch and gas pedal (and steering wheel). In AC 5.2 the rear switches have own digital inputs in the control unit and also clutch pedal sensor inputs (the rear gas pedal has been connected to the front pedal with a cable).

Note! On AC 5 / 5.2 there is a position sensor (8) on the fuel injection pump throttle lever and an engine speed sensor (12) on the gearbox, at which time the automatic speed change according to the engine loading is possible. The clutch pedal has a position sensor (7) and a limit switch (20) to disengage the multi–disc clutches in the shuttle.

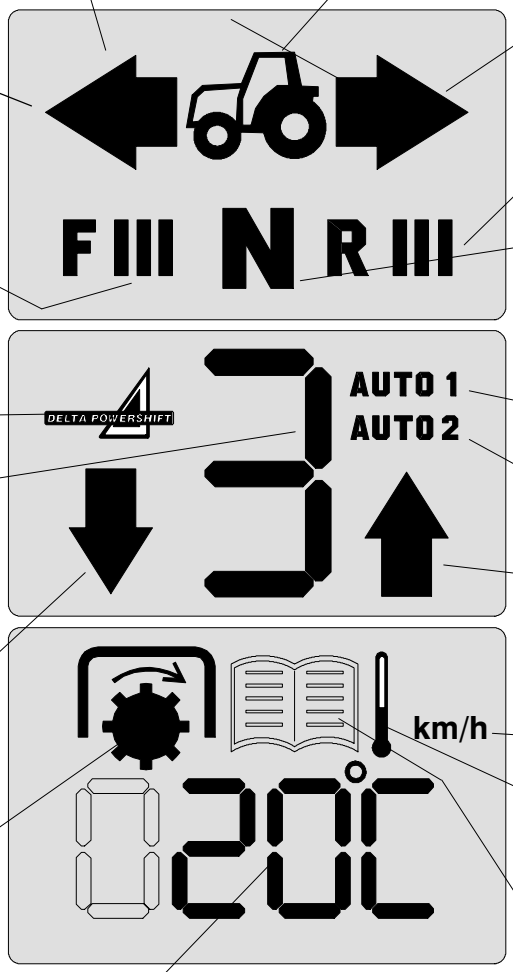
There are two speed sensors (10), which indicate the rotation speed and direction of the shuttle output shaft. The shuttle rotation speed is compared with the engine rpm so that the AC 5/5.2 can change the driving direction safety and progressively. The AC 5 / 5.2 prevents the direction change, if the driving speed is over 10 km/h. The gearbox speed sensor (11) indicates the tractor driving speed. When the driving direction change is happening, the AC 5/5.2 pressurises the shuttle clutches progressively.

On the servo valve block (3) there is a temperature sensor, which steers the shuttle automatics so that the shuttle functions progressively regardless of the transmission oil temperature.

There is an outdoor temperature sensor (15) in the front part of the tractor. The display unit (6) is shown on the next page.

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B. AC 5 / 5.2 display unit



One arrow is blinking, if a driver does not sit on the seat and driving direction (F or R) has been selected.

Tractor image is visible always, when the current is switched on

Arrow is visible when driving forwards

Arrow is visible when driving rearwards.

DRIVING MODE:
Pre–selected [1]) DPS speed in forward driving (I, II or III). If not pre–selected speeds, this symbol is invisible. Shows also main modes.
SERVICE MODE:
– FI fault code memory (AC 5.2 only)
– FII test mode
– FIII setting mode

Pre–selected [1]) DPS speed in reverse drive (I, II or III). If not pre–programmed speeds, this symbol is invisible.

N is visible when the shuttle lever is in the neutral position or in P–position. Is blinking, when automatic traction disengagement is on (AC 5.2).

DPS logo

Field driving automatics [2])
General automatics (AC 5.2)

Engaged DPS speed (1, 2 or 3). Shows also a selected module in test mode. Flashes, when automatics make speed change [3]).

Road driving automatics [2])
Adjustable automatics (AC 5.2)

Arrow upwards is blinking, if the automatics ask driver to change up [4]).

Arrow downwards is blinking, if the automatics ask driver to change down [4]).

Driving speed, when the tractor is in motion

Outdoor temperature gauge symbol is visible always, when the tractor is stationary and the current is switched on

Visible, when PTO shaft is rotating. Can be visible, altought the PTO is disengaged.

Service book is visible, when the system has found malfunctions and shows a fault code. See fault codes on page **370**/**6** (AC 5) or **371**/**5** and **6** (AC 5.2)

Outdoor temperature when the tractor is stationary. Driving speed when the tractor is in motion (accuracy one decimal □ 15 km/h. No decimal at greater speeds). Numbers show also fault codes. In the test mode is shown a point, which is tested or reset.

I = Shuttle, II = DPS, III = Diagnosis

[1]) Pre–selection means the DPS speed, which is automatically switched on when the driving direction is changed and which is pre–programmed with the button beside the shuttle lever. The pre–programming is carried out so that when one of the driving directions is engaged, driver engages the desired DPS speed and then presses the button at least 2 seconds. During the pre–programming the clutch pedal must be depressed. Thus the selected DPS speed remains in the memory of AC 5 and engages always when the driving direction in question is selected. If only one direction is pre–programmed, the pre–programming is valid only for this direction. The DPS speed remains the same in the other direction.
The pre–programmin is cancelled by pushing the button at least 2 seconds, when the shuttle is in the neutral.

[2]) The two DPS automatic modes (Auto1 and Auto2) are selected with the three–position rocker switch on the lever console. The function is the same as on AC III. The switch has also a manual position.

[3]) If a driver changes quickly from DPS speed 1 to 3, the speed 3 flashes immediately in the display (although the automatics changes the speeds also via speed 2) and speed 3 stops to flash just when the gear change is completed.

[4]) When the DPS is in the automatic mode (AUTO 1 or AUTO 2), it changes automatically down or up and informs with the flashing arrow, if the automatics cannot do more and a driver must change up or down manually.

Note! The display has a background light when the current is switched on. Tractor image, DPS–logo and outdoor temperature (stationary) or driving speed (in motion) are visible always when the current is switched on. There is a connector (RS–232) in the lever console for connecting e.g. a micro–computer for re–programming the control unit A1.

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2. Fault tracing

A. General

AC 5 / 5.2 unit has an in–built function for **self–diagnosis**. If fault/faults appear in the AC 5 when working with a tractor, the fault code of the fault in question is shown in the diplay. In this instruction is shown a table in which there are listed all fault codes and corresponding faults. In this way can be localised the fault and possible repair works can be carried out.
In addition, AC 5 / 5.2 unit has an additional diagnostic mode. By pressing certain tractor switches and buttons in a correct order (instructions later), the display can be activated into the **test mode**, in which the diplay shows technical values of various electrical components when components in question are activated. Later in this instruction are shown tables which show the correct technical values of the components. These values are compared with the actual signals in the display so that possible incorrect functions can be verified.
In the same way the diplay unit can be activated into the **setting mode**, in which can be done various settings of the AC 5 components. The setting instructions are shown later in this instruction. In section 4 (components) are given instructions to measure with a multimeter. With the aid of these instructions the components can be checked and verified a faulty component.

NOTE! On page **370**/**7** there are shown working orders för the fault tracing.

B. Self–diagnosis

The self–diagnosis of AC 5 / 5.2 follow up possible faults in the system (when the current is switched on) and show a fault code, which appears in the lower display block (also a book image and the symbol of the module in the middle display block are blinking, when the fault code is shown).

FAULT GROUPS:
A: analog input (position and temp. sensors)
P: proportional output (proportional valves)
d: digital input (switches)
F: frequency input (rpm sensors)
L: logical fault (slipping clutch)

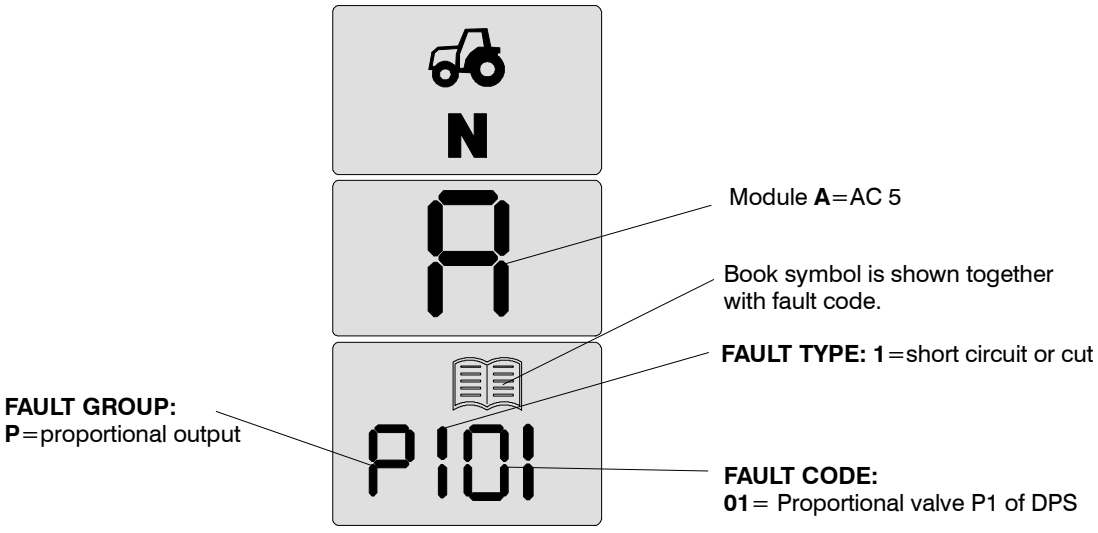
FAULT TYPES:
1=short circuit or cut
2=cut
3=value not in permissible limits
4=multi–disc clutch is slipping

All fauts are numbered with running numbers (01–99). In addition, fault type is shown with numbers (1–4).

FAULT CODES: (e.g. P101)
The fault code is shown in the display diagnosis block (lower) in four display segments as follows:
– The first segment from the left shows the fault group (**A, P, d, F or L**).
– The second segment from the left shows the fault type (**1–4**)
– The two RH side segments show the order number of the fault (**01–99**).

Note! When the fault code is shown, the symbol of the module is shown in the middle block (A=AC 5 / 5.2)**,** which the fault has been found.

When the self–diagnosis shows the fault code, the book image is flashing in frequency of **2 Hz**. If two or more faults are found simultaneously, the codes of different faults are shown three seconds by turns. When the current is switched off, the fault code memory is erased. If a fault code has been found, the driving speed or outdoor temperature cannot be seen in the lower display block. Also number of the quick–shift gear cannot be seen.



IMPORTANT! Escaping from the fault code mode is done by switching off current with the starter switch, when the fault codes exit from the display block.
AC 5.2 has a fault code memory, in which there are stored 3 latest fault codes with running hours, see page **371**/**6**.

Fault codes in AC 5.

Note! Fault codes in AC 5.2, see pages **371/5** and **6**.

Fault code	Pins	Fault identification	Fault funktion level	Tests	Repairs, settings
P101	A1A2/12	Proportional valve P1 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C1).	3	See table **d)** on page **370/13**	See instr. **C** on page **370/21.**
P103	A1A2/10	Proportional valve P2 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C2).	3		
P105	A1A2/8	Proportional valve P3 of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C3).	3		
P107	A1A2/6	Forward drive proportional valve P4 takes current which exceeds or goes below the given limits. Short circuit or wire damage (F).	3		
P109	A1A2/4	Reverse drive proportional valve P5 takes current which exceeds or goes below the given limits. Short circuit or wire damage (R).	3		
A311	A1A3/2	Gearbox oil temperature value (sensor B14) impossible (over +150˚C). Faulty sensor or its wiring	3	See table **b)** on page **370/11**	See instr. **E** on page **370/23**.
A312	A1A3/2	Gearbox oil temperature value (sensor B14) impossible (below −50˚C). Faulty sensor or its wiring	3		
A313	A1A3/4	Signal from gas pedal position sensor B15 below 1 V (DC) or over 7 V (DC). Sensor wrongly fitted or sensor/wires damaged. If fault code A313 is visible together with fault code A314, there can be a short circuit or earth leak in sensors B15 or B16 (same supply voltage).	3	See table **b)** on page **370/11**	See instr. **G** on page **370/24**.
A314	A1A3/7	Signal from clutch pedal position sensor B16 below 1 V (DC) or over 7 V (DC). Sensor wrongly fitted or sensor/wires damaged.	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
A315	A1A3/7 A1A4/4	When the clutch pedal is down (digital input d06 is active), the signal from the clutch pedal position sensor B16 is 0,5 V (DC) greater or smaller than it was in the calibrating point (voltage value must be beyond allowable limit over one second). Check the adjustment of the pedal limit switch S9 with the aid of the test mode, adjust if necessary. Measure and calibrate the position sensor B16. If the fault code appears in connection with the engine start, ensure the correct starting: depress first the clutch pedal and after that start the engine. Check the battery condition and charge (Voltage can be fall too low).	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
d116	A1A3/9, 10	DPS up–down push buttons (S23) are active simultaneously. Push buttons in the lever knobs may be in short circuit.	1	See table **a)** on page **370/10**	See instr. **B** on page **370/20**.
d117	A1A4/7, 8	Forward (S40) and reverse drive direction (S41) are active simultaneously. Shuttle lever switches may be in short circuit.	4		
d118	A1A4/10, 11	Both PTO speeds are engaged simultaneously. PTO lever switches (S28/S29) may be in short circuit.	2		
d123	A1A4/14, 7, 8	Hand brake and one or both shuttle directions engaged simultaneously. Shuttle lever switches may be in short circuit.	4	See table **a)** on page **370/10.**	See instr. **B** on page **370/20**.
d225	A1A3/7 A1A4/4	Clutch pedal position is below 2 % (0...1 %) and d06 is not active (d06=clutch pedal limit switch). Check the adjustment of the clutch pedal limit switch S9. Check the function of the parking brake pilot light H11 (program versions 42-).	3	See table **b)** on page **370/11**	See instr. **F** on page **370/23**.
F320	A1A1/5, 7	Shuttle speed sensors (B12/B13) give different frequency. Difference over 30 %. One of the sensor possible faulty.	3	See table **c)** on page **370/12**.	See instr **D** on page **370/22**.
F321	A1A1/13	Engine rpm lower than what the shuttle sensors (B12/B13) indicate, when one solenoid is fully active. Engine rpm sensor B11 may be faulty.	3		
F324	A1A1/5, 7	Driving speed over 10 km/h and direction information in the control unit is changing. Shuttle sensors B12 or B13 may be faulti or wire problems.	3	See table **c)** on page **370/12**.	See instr **D** on page **370/22**
L419	A1A1/3	Full pressure has been connected to the PTO clutch over 3 seconds, but the PTO shaft rotation speed is lower than it should be. PTO-clutch may slip. It is possible that the PTO rpm sensor B7 is faulty. Check in the test mode PTO lever switches S28 and S29 (check in the test mode that not connected the wrong way round). Check that there is a correct parameter file in the control unit. Ensure that the PTO speed parameters P and L are correctly set (in program version 42-).	2	See table **c)** on page **370/12**	See instr **D** on page **370/22** and pages **370/19** and **370/24B.**
L422	A1A1/13, 8, 6	One shuttle direction is engaged and full control has been active over 3 seconds. Shuttle rotation speed is lower than engine speed in relation to the DPS ratio. One multi-disc clutch in the DPS or in the Shuttle can slip or one proportional valve (Y4,Y6,Y17,Y11,Y12) can be trapped. This fault code also appears, if both shuttle sensors (B12,B13) do not give a signal, when engine revs are over 1600 rpm (1700 rpm in versions 50, 52. 60, 62). Check fuse F22.	4		

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C. Working orders, AC 5 and 5.2

– If the display unit shows a fault code:

Measures:
1. Decode the fault code according to instr. **370**/**5–6** (self–diagnosis)
2. Check the function of the component in the test modet (instr. **370**/**8**).
3. Repair the fault.
4. If the control unit A1A or programs have been changed, make necessary settings according to instr. **370**/**24A**.
5. Carry out all points in the test mode (instr. **370**/**8**). This ensures, that the tractor is OK before delivery. From ser. no. **K41107–** incl**:** Check in the fault code memory F1.
6. Test–run the tractor according to instr. **370**/**24E**.

– If the display does not show the fault code:

In the table below, there are faults which have not the fault codes:

Component:	**Possible reason:**	**Measures:**
1. AC 5 display unit does not function (on the LH side pillar)	– control unit A1 supply voltage or earth has malfunctions or the display supply. – display unit P6 faulty – control unit connector A1A1 loose	– check fuse **F24** – voltage measures from control unit A1 connectors A1A1/1 – A1A1/2 (=battery voltage) – new display unit, if the system does not function – check connections
2. In the dashboard there is lit “P” , although the driving direction has been selected	– shuttle lever switch S15 (P) faulty or wrongly fitted.	– testing in the test mode, point **d16** / **d22** – 1) – check the fitting of switch S15 (page **370–20**)
3. Black arrow is blinking, although the driving direction has been selected	– driver has left the seat over 4 (6) seconds. AC 5.2: over 30 sec., when the clutch pedal is depressed. – detector switch S60 (in the seat) does not function or wire damage	– on the seat, shuttle lever to position P, shuttle lever to the driving position – testing in the test mode, point **d05,** 2)
4. Black arrow does not change, when using the shuttle lever	– shuttle lever switch S40 (F) or S41 (R) faulty or loosed in the frame.	– testing in the test mode, points **d09**, **d10** / **d18, d19**
5. Shuttle, DPS or PTO have malfunctons (e.g. function is slow)	– fault, that the control unit A1 has not identified – pressure in the low pressure circuit too low – clutch pre–fillling or initial pressure indexes are wrongly set	– carry out all procedures in the test mode (instr. **370/8**) – low hydraulics pressure measuring, see instr no. **911–1** – check indexes / in the setting mode, (instr. **370/24D**, AC5.2: instr. **371/11**.)
6. Engine does not start (starter motor does not rotate) Tractors **J38343–**.	– no supply to control unit A1. – Parking brake switch S15 or input signal A1A4/14 (AC 5) or A1A8/8 (AC 5.2) faulty – Control unit output signal A1A2/3 (AC 5) (to relay K28) or A1A3/5 (AC 5.2) faulty.	– check fuse F24 – testing in test mode, point **d16**/**d22** (if necessary, change switch or control unit) – Check whether the voltage from control unit A1 is in relay K28 (when necessary, change the control unit).

Note! If the fault cannot be found, try to find it by carrying out all tests in the test mode FII.

1) The parking brake can be released with a tool which incl. in the tractor tool set (after this the tractor can be towed).

2) If detector switch S60 does not function, it can temporarily be by-passed by connecting switch wires with an auxiliary wire (connector beside the seat holder). The switch must be changed and the auxiliary wire removed as soon as possible (safety).

Fault function levels, AC 5 and 5.2

In the fault function leves the different faults cause different protective functions to the tractor. For instance in the function level 2 the tractor driving is possible but the use of the PTO is prohibited. In the fault function level 4 the tractor driving is prevented until the fault has been repaired.

The number of the fault function levels is 4 pcs. Greater digit means a great priority and vice versa. The fault function level is active, until the current is switched off. If two faults with the priority of 3 have been found simultaneously, the fault function level is always 4 (for instance if two DPS proportional valves are in short circuit simultaneously).

Fault function level 1 (”fault code”)

Only a fault code in question in the display. With the tractor can be driven, but DPS can have malfunctions.

Fault function level 2 (”PTO protection”)

The fault code in the display. The PTO is disengaged immediately and a driver can activate it after the current is switched off and on. The tractor can still be driven.

Fault function level 3 (”home driving”)

The fault code in question in the display. Shuttle automatics are not in function and the PTO stops. Driving direction can be engaged only with clutch pedal depressed.
The control unit reads shuttle parameters from the table for greatest temperatures. Control unit connects all faulty solenoid outputs unenergised. DPS is locked. Before driving the tractor, the control unit clears up which one of the DPS speeds can be engaged so that the faulty solenoid output is unenergised. If the speed in question is not the speed which is now engaged, the speed is changed automatically.

Fault function level 4 (”immediate downdrive”)

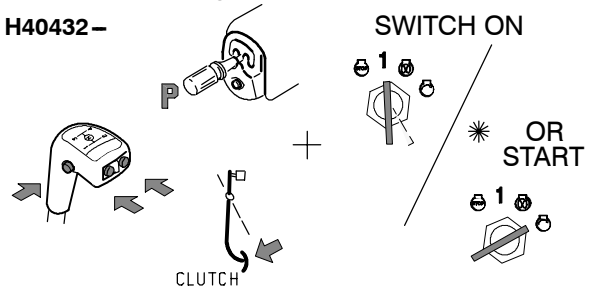
The control unit connects all proportional valves unenergised. Only a fault code in the display, not other information. The tractor cannot be driven, before the fault has been repaired. This is for protecting slipping clutches and engine overloading.

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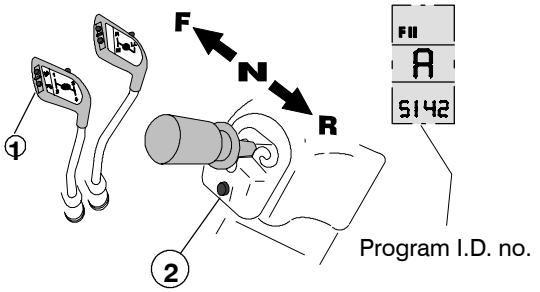
D. Fault tracing in test mode

1. Activating test mode, AC 5 and 5.2

Note! Before activating the test mode, possible pre–programming of the DPS speeds must be removed. The test mode is activated by pushing certain tractor switches in a correct order according to picture below:



Number	Funktion mode	Symbol of mode
1	Fault code memory	**F I** (AC 5.2 only)
2	Test mode	**F II**
3	Setting mode	**F III**



– step with the DPS push buttons (1) up or down and select the main mode symbol FII (test mode).
– after this confirm the selection by pushing the DPS pre–programming button (2)
– now symbol A starts to blink (2 Hz) in the middle display block.
– select module A (7 pcs modules. Only A is in use) by stepping again with the push buttons (1).
– confirm the selection by pushing the button (2) after which A remains without blinking in the display.
– the display is now in the test mode and the trouble shooting can be done

Note! When the desired module is confirmed, the parameter file identification number and the program version number start to blink in the lower block of the display (START LEVEL of **test mode F II**). The identification number can be seen in the two LH side segments and the version number in the two RH side segments.

With aid of the program identifying no. (see picture above) can be checked, which program versio or which parameter file is fitted on the tractor.

Note! In the test mode the DPS speed is always DPS1. The shuttle and PTO function normally, but the display functions are not shown. The DPS pre–programming cannot be done in the test mode. Also the DPS automatic functions are not in use.

IMPORTANT! Escaping from the test mode is done by switching off the current.

2. Fault tracing in the test mode F II.

It is possible in the test mode to check the electric function of various components (control unit input and output signals) by comparing actual values from the different components with the correct values in the tables which are shown in this instruction. Diagram below shows the test mode menu of AC 5 , in which can be stepped up or down with the DPS push buttons (1):

TEST MODE MENU IN AC 5 (AC 5.2, see page **371**/**7**):
*) Engine running

Symbol in display	Test point
F7	Direction information (rpm) *)
F6	PTO speed (rpm) *)
F5	Shuttle output speed (rpm) *)
F4	Shuttle output speed (rpm) *)
F3	Reserve
F2	Driving speed *)
F1	Engine speed *)
A4	Clutch pedal position %
A3	Gas pedal position *) %
A2	Gearbox temperature
A1	Outdoor temperature
d16	Parking brake
d15	PTO standby button
d14	Seat direction (only TwinTrac)
d13	PTO–speed 2 (lever in rear position)
d12	PTO–speed 1 (lever in front position)
d11	DPS pre–programming button (under shuttle lever)
d10	Direction R (rearwards)
d09	Direction F (forwards)
d08	DPS auto/man
d07	DPS auto1/auto 2
d06	Clutch pedal limit switch
d05	Driver detection (in seat) 1)
d04	PTO start
d03	HiShift buttons
d02	DPS push button, down
d01	DPS push button, up
e.g. 5142	**START LEVEL** **Program version nummer**
P1	DPS solenoid 1 (clutch C1) *)
P2	DPS solenoid 2 (clutch C2) *)
P3	DPS solenoid 3 (clutch C3) *)
P4	F clutch solenoidi (forwards) *)
P5	R clutch solenoid (rearwards) *)
b	Counter functions

1) See the next page.
Note! From ser. no. **J38343** incl. there are 12 pcs counter symbols in the test mode menu below symbol P5, see page **370**/**13A**.

1) If detector switch S60 does not function, it can temporarily be by–passed by connecting switch wires with an auxiliary wire (connector beside the seat holder). The switch must be changed and the auxiliary wire removed as soon as possible (safety).

Example:

If e.g. one step up is stepped from the start level by using the push buttons (1) , in the three LH side segments of the lower display symbol **d01** starts to blink with frequency of two hertz. This symbol indicates which digital input is being tested (**d01**=DPS push button up, see table **a** on the next page).

When the button in question has been selected, it can be confirmed for testing by pushing the DPS pre–programming button (2), at which time the symbol stops blinking. In the RH side segment can be seen the mode of the switch (0 or 1) depending whether the button is depressed or not.

When the button in question has been tested, move to the other point in the menu by pressing the DPS pre–programming button (2), after which the symbol starts to blink and the menu can be moved with the DPS push buttons (1). The selection is confirmed again with the pre–programming button (2) (symbol does not blink) and the switch in question can be tested.

Symbols in instruction

– **d01**...**d16**, **A1**...**A4**, **F1**...**F7** are symbols for the AC 5 control unit input signals (from switches, position sensors, temperature sensors and rotation speed sensors).

– **P1**...**P5** are symbols for the AC 5 control unit output signals (control of the proportional valves).

– **A1A1**...**A1A5** are names of the control unit connectors (on the AC 5 control unit).
For example: A1A3/2 means pin no 2 in the control unit connector A1A3 (gearbox oil temperature)

– **S28, S29**..., **B6, B**7... are symbols of the switches and sensors in the wiring diagram.

– **Y2, Y4**... are symbols of the proportional valves in the wiring diagram.

E. Checking I.D. number of AC5 programs

Programs of AC5

Note! Programming instruction of AC5 control unit, see page **370–24B**.
In the tractor production the **AC5** control unit **A1** is equipped with a program, which consists of a main program and a parameter file.
Since in the control unit A1 have been used many different main programs and parameter files, these different programs and files have I.D. numbers for identifying.
The I.D. number, which can be seen in the **AC5**–display (in test mode **FII**), shows the main program version and parameter file I.D. number. The two first digits show the parameter file I.D. number and two last digits the main program version number.

E.g. I.D nummer **5142**:
51 =parameter file I.D. number, **42** =main program version number**.**

Main program version numbers:

Version	Fitted in production, ser. nos.
38	-H40431 (pre-series)
40	H40432- pre-series, (in series H49112-)
41	J01401- (about)
43	J38343-
42	J39116-
42 or 60	J45136- *
50, 52	Used in service and in spare part units (up to tractors –J38342)
53	Is used now in Service and in Spare Parts to tractors ser. no. **H49112–J38342.**
60	J47542-
62	K02116- (used also in service and in spare parts from J38343 incl.
63, 66	Is not fitted in production.
64	Is not fitted in production (fitted in Spare Parts units).
65	Is used now in Service and in Spare Parts to tractors ser. no. **J38343–K41106.**

***** The tractor has either version **42** or **60**, must be checked in tractor display in the test mode.

Parameter file I.D. numbers:

I.D.numbers	PTO speeds
10	1000
17	1000 / 540E
51	540 / 1000
57	540 / 540E
71	540E / 1000E (8350Hi)

Additionally, in service and in spare parts units the following I.D. numbers have been used with effect from program versions 42 (43) incl.. In these versions all PTO types have not an own parameter file but the PTO ratios must be installed into the control unit (see page **370–19A**). The I.D. number increases, when the parameter file is further developed.

E.g. with main program versions **53** and **65** is used a parameter file, which has I.D. numbers 23 and 33.

I.D. number	Tractor model
21...29	models 6250Hi-8150Hi, 8450Hi-8950Hi
31...39	model 8350Hi (low revs)

I.D. numbers of programs used in Production, in Spare Parts and in Service (AC 5 only):

Note! Sorted according to the main program version. Beside the I.D. numbers there is information, with which can be concluded whether the tractor has a correct program.
Tractor chassis numbers in brackets show how old tractor the program is and which program can be fitted. I.D. numbers can be seen in the tractor display. In the PC monitor the numbers change places, e.g. **5162** –> **6251**.

IMPORTANT! Only the newest programs can be used in Service and Spare Parts (versions **53** and **65**).

Note! If an I.D number of a tractor cannot be found in this list, ask Tractor Service.

Main program no. 38 (these must not be on field).
These must be replaced with program version **53.**
These must not be used in Service.

10 38	1)	PTO 1000
17 38	1)	PTO 1000/540E
51 38	1)	PTO 540/1000
57 38	1)	PTO 540/540E
71 38	1)	PTO 540E/1000E (8350Hi)

Main program no. 40 (these must not be on field).
These must be replaced with program version **53**.
These must no more be used in Service.

10 40	1)	PTO 1000
17 40	1)	PTO 1000/540E
51 40	1)	PTO 540/1000
57 40	1)	PTO 540/540E
71 40	1)	PTO 540E/1000E (8350Hi)

Main program no. 41 (H49112–J38342).
These can be replaced with program version **53**.
These must no more be used in Service.

10 41	PTO 1000
17 41	PTO 1000/540E
51 41	PTO 540/1000
57 41	PTO 540/540E
71 41	PTO 540E/1000E (8350Hi)

Main program no. 42 (J38343–J47541).
These can be replaced with program version **65**.
These must no more be used in Service.

10 42	2)	PTO 1000
17 42	2)	PTO 1000/540E
51 42	2)	PTO 540/1000
57 42	2)	PTO 540/540E
71 42	2)	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts:

21 42	2)	6250Hi–8950Hi (Ei 8350Hi)
31 42	2)	8350Hi

Main program no. 43 (J38343–J47541).
These can be replaced with program version **65**.
Thes must no more be used in Service.

10 43	2)	PTO 1000
17 43	2)	PTO 1000/540E
51 43	2)	PTO 540/1000
57 43	2)	PTO 540/540E
71 43	2)	PTO 540E/1000E (8350Hi)

Main program no. 50.
Numbers used only by Service and Spare Parts.
These can be replaced with program version **53**.
These must no more be used in Service.

22 50	1)	6250Hi–8950Hi (Ei 8350Hi)
32 50	1)	8350Hi

Main program no. 52 (–J38342).
Numbers used only by Service and Spare Parts.
Fits to tractors, if the end of the control unit ser. no. is at least 00400 or greater.
These can be replaced with program version **53**.
These must no more be used in Service

20 52	1)	6250Hi–8950Hi (Ei 8350Hi)
23 52		6250Hi–8950Hi (Ei 8350Hi)
30 52	1)	8350Hi
33 52		8350Hi

Main program no. 53 (H49112–J38342).
Numbers used only by Service and Spare Parts.
Fits to tractors, if the end of the control unit ser. no. is at least **00400** or greater.
These must be used in service
These programs are in disk 340 422 60.

23 53	6250Hi–8950Hi (Ei 8350Hi)
33 53	8350Hi

1) A new program must be input into the control unit in connection with service (main program version **53**).
2) If a tractor has the reverse drive controls, a new program must be input (main program version **65**). Affects function of the clutch pedal and AutoDPS when the seat is turned rearwards.

Note! If in the test mode **FII** the I.D. number is **9953** or **9965** after programming or after control unit change, the parameter file has not been input. Input correct parameter file according to instr. on page **370–24B**.

Note! If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes P101...P109), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **53** or **65** and parameter file). Programming instructions on page **370–24B**.

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Main program no. 60 (J38343–K02115).
These can be replaced with program version **65**.
These must no more be used in Service.

10 60	PTO 1000
17 60	PTO 1000/540E
51 60	PTO 540/1000
57 60	PTO 540/540E
71 60	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts.

22 60 3)	6250Hi–8950Hi (Ei 8350Hi)
32 60 3)	8350Hi

Main program no. 62 (J38343–K41106).
These can be replaced with program version **65**.
These must no more be used in Service.

10 62	PTO 1000
17 62	PTO 1000/540E
51 62	PTO 540/1000
57 62	PTO 540/540E
71 62	PTO 540E/1000E (8350Hi)

Numbers used only by Service and Spare Parts.

20 62 3)	6250Hi–8950Hi (Ei 8350Hi)
23 62	6250Hi–8950Hi (Ei 8350Hi)
30 62 3)	8350Hi
33 62	8350Hi

Main program no. 63 (J38343–K41106).
Used only in service in some tractors.
These must be replaced with program version **65**.
These must not be used in Service .

23 63 3)	6250Hi–8950Hi (Ei 8350Hi)
33 63 3)	8350Hi

Main program no. 64 (J38343–K41106).
Numbers used only by Service and Spare Parts.
These can be replaced with program version **65**.
These must no more be used in Service.

23 64	6250Hi–8950Hi (Ei 8350Hi)
33 64	8350Hi

Main program no. 65 (J38343–K41106).
Numbers used only by Service and Spare Parts.
These must be used in service
These programs are in disk 340 422 60.

23 65	6250Hi–8950Hi (Ei 8350Hi)
33 65	8350Hi

Main program no. 66 (J38343–K41106).
Used only in service in some tractors.
These must be replaced with program version **65**.
These must not be used in Service .

23 66 3)	6250Hi–8950Hi (Ei 8350Hi)
33 66 3)	8350Hi

1) A new program must be input into the control unit in connection with service (main program version **53**).
2) If a tractor has the reverse drive controls, a new program must be input (main program version **65**). Affects function of the clutch pedal and AutoDPS when the seat is turned rearwards.
3) A new program must be input (main program version **65**).

Note! If in the test mode **FII** the I.D. number is **9953** or **9965** after programming or after control unit change, the parameter file has not been input. Input correct parameter file according to instr. on page **370–24B**.

Note! If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes P101...P109), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **53** or **65** and parameter file). Programming instructions on page **370–24B**.

F. Functional differences of program versions, comparison, AC 5 only

HiTech – PROGRAMS

DIFFERENCES BETWEEN MAIN PROGRAM VERSIONS:

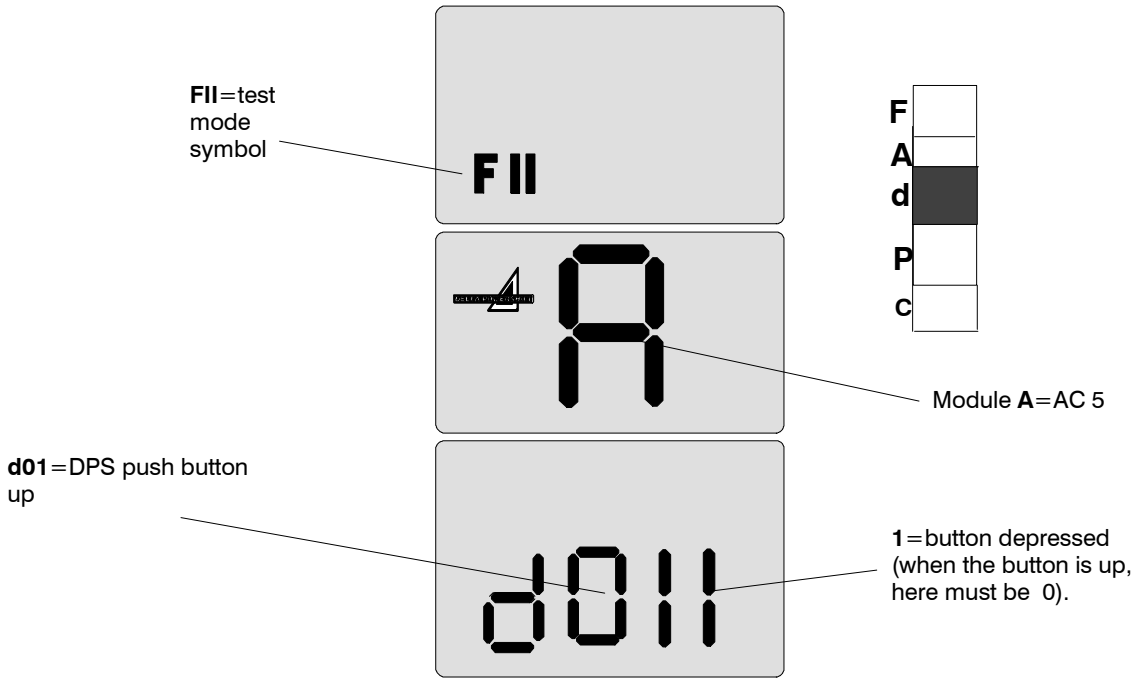
VERSION 41	VERSIONS 42, 43, 50, 52, 60, 62
** GENERAL **	
	Reverse drive controls can be fitted as an option.
	PTO start – /stop push buttons can be fitted in rear mudguards (option).
Parking brake is not connected to AC5 – control unit.	AC5 – unit controls the parking brake.
** AC5 – PROGRAMS **	
Five different parameter files for all PTO types (in production and in service).	**Five** different parameter files in tractor production. Only **two** different parameter files are needed in service (PTO ratios can be set with indexes).
** FUNCTIONS **	
PTO rocker switch in the cab.	PTO rocker switch in cab **and push button in rear mudguards** (option). Operating instructions, see Operator's Manual.
Seat indicator delay is **4 seconds**.	Seat indicator delay is **6 seconds**.
Parking brake can be applied under speed of **4 km/h** .	Parking brake can be applied under speed of **2 km/h** (4 km/h in versions 50 and 52).
VERSION 41	**VERSIONS 42, 43, 50, 52, 60, 62**
Pre – programmed DPS – speeds engages: – when driver moves shuttle lever to F – or R – position (**without** clutch pedal) – or when driver presses the HiShift – button (with or without shuttle lever)	Pre – programmed DPS – speeds engages: – when driver moves the shuttle lever to F – or R – position (**with or without the clutch pedal**) – or when driver moves the shuttle lever to F – or R – position and simultaneously presses the HiShift – button (the gear is engaged after the button is released)
The DPS – pre – programming and AutoDPS can be engaged simultaneously => unnecessary gear shifts in the driving direction change.	When AutoDPS is in function, **the DPS – pre – programmed speeds are by – passed temporarily**. The pre – programmed speeds are activated, when AutoDPS is disengaged.
When AutoDPS is in function, the use of the DPS push buttons can disturb the gear change when stopping driving.	When the tractor is stopped, AutoDPS engages **always gear no. 1** although the DPS push buttons are pressed simultaneously.
	AutoDPS gear shift delay has been shortened. Also some points in gear shift diagrams have been modified.
PTO symbol is visible in AC5 – display, when the PTO shaft rotates over **45 r/min.**	PTO symbol is visible in AC5 – display, when the PTO shaft rotates over **150 r/min.**

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VERSION 41	VERSIONS 42, 43, 50, 52, 60, 62
**** TEST– AND SETTING MODE ****	
In the service mode there are **two** modes: – test mode FII (for service man) – setting mode FIII (for srvice man)	In the service mode there are **three** modes: – test mode FII (for serviceman **and driver**) – setting mode FIII (for serviceman) – **driver** setting mode FIII > three settings (A: tyre dimension, F: °C/°F, S: km/h / miles/h)
Setting of DPS initial pressures cannot be seen as a pressure change in the setting mode. However, affects the function of the DPS.	Setting of DPS initial pressures can be seen as a pressure change in the setting mode.
In the test mode the temperature sensors (A1, A2) show **"L9"** (= low), when the temperature is below –9°C.	In the test mode the temperature sensors (A1, A2) show **"LO"** (= low), when the temperature is below –9°C.
Counters are nor in use.	**12 counters**, which gather information, how many times and how many minutes certain functions have been in use:
**** FAULT CODES ****	
Fault code P101 causes fault code F321 => fault function level 4 => tractor stops.	Program has been developed. **Fault code P101** does not cause other fault codes.
	Fault code d225 appears, if the clutch pedal position is **below 2%** (0–1%) and pedal limit switch S9 is not yet switched on.
VERSION 41	**VERSIONS 42, 43, 50, 52, 60, 62**
**** INTERNAL FUNCTIONS****	
When the PTO is started, pressure rises always according to a certain curve (program).	When the PTO is started, pressure rises always according to a certain curve (program), but the PTO acceleration (sensor B7) is followed at certain intervals and when necessary pressure is raised.
	Versions 50 and 60: –Clutch pedal function precised –Function of DPS automatic gear change (AutoDPS) has been ensured when using reverse drive controls (TwinTrac)
	Versions 52 and 62: –Clutch pedal function precised

G. Testing various switches and buttons (d01–d16) in the test mode in AC 5

NOTE! In AC 5.2 there are more test points, see page **371**/**8**.



INPUT	DESCRIPTION	1 in display	0 in display
d01 (S23), (S1W) 1)	DPS–push button up	button down	button up
d02 (S23), (SiW) 1)	DPS–push button down	button down	button up
d03 (S45)	HiShift buttons (2 pcs, try both buttons)	button down	button up
d04 (S25) (S1A, S2A) 2)	PTO start switch	Start position	switch up
d05 (S60)	Detection of driver (in driver's seat)	Driver on seat	not seat signal
d06 (S9) (S2W) 1)	Clutch pedal limit switch	pedal down	pedal up
d07 (S47)	DPS automatic speed change switch	Auto–pos. 1	Auto–pos. 2
d08 (S47)	DPS auto/manual	Auto 1 or auto 2	Manual
d09 (S40) (S40) 1)	Direction F	Selected	not selected
d10 (S41), (S41) 1)	Direction R	Selected	Not selected
d11 (S51) (S51) 1)	DPS–pre–programming button (under shuttle lever)	button down	button up
d12 (S28)	PTO–lever in front position	selected	not selected
d13 (S29)	PTO–lever in rear position	selected	Not selected
d14 (–) (S3W) 1)	Driver's seat direction (TwinTrac only)	backwards	forwards
d15 (S25)	PTO rocking switch	Start position	Switch up
d16 (S15) (S15) 1)	Hand brake	applied	not applied

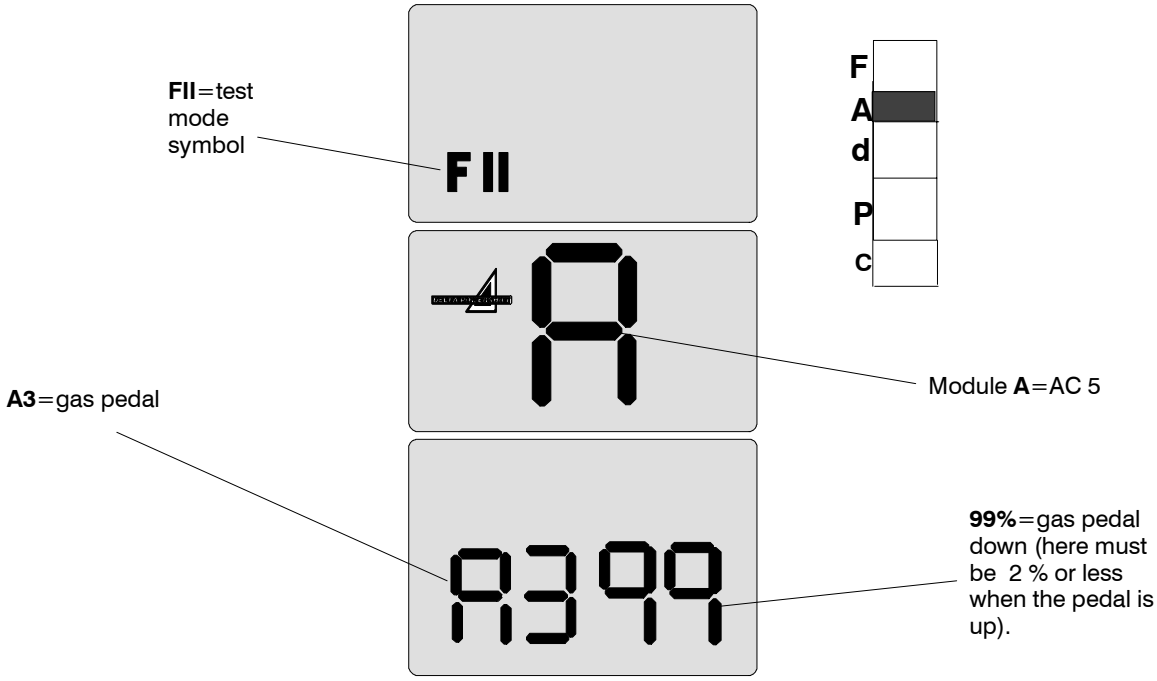
– If the value in the display is not 0, althought it should be according to the table above, the switch can be damaged or in short circuit. Check, change the switch. Check the switch wires.
– If the value in the display is not 1, althought it should be according to the table above, the switch can be damaged/wires broken/ poor contacts in connectors. Change the damaged switch. Check the switch wirings.

NOTE! If a switch (e.g. DPS push button) is damaged, it can be difficult to move into the test mode. AC 5 display shows, however, fault codes, if certain switches are out of order.

1) The latter switch is for the reverse drive controls (option) (TwinTrac). When checking these switches the seat must be turned rearwards.
2) The PTO rear push buttons S1A and S2A (option) are placed on the rear mudguards.

H. Testing temperature sensors and position sensors (A1–A4) in the test mode in AC 5

NOTE! Corresponding tests in AC 5.2, see page **371**/**9**.



SYMBOL	NAME	DESCRIPTION
A1 (B17)	Outdoor temperature (xx °C or F)	Compare the value with the ambient outdoor temperature. If the values are different or not visible, check the sensor wires and sensor itself, see instr **E** on page **370**/**23**. If the temperature is below –9° C, shows the display in place of temperature "L9" (Program versions 38, 40, 41) or "LO" (Versions 42, 43, 50..., 60...)
A2 (B14)	Gearbox oil temperaturte (xx °C)	Compare the reading with the actual gearbox temperature. If the values are different or not visible, check the wires and the sensor, see instr. **E** on page **370**/**23**. If the temperature is below –9° C, shows the display in place of temperature "L9" (Program versions 38, 40, 41) or "LO" (Versions 42, 43, 50..., 60...)
A3 (B15) 1)	Accelerator pedal position (xx %)	When the pedal is fully up, the value should be smaller than **2**. When the pedal is down, the value should be greater than **95**. Check also that the value changes evenly when the pedal is moved (in the middle of the pedal stroke, the value should be about 50). If the values deviate from corret values, see instr. **G** on page **370**/**24**.
A4 (B16), (B1W) 2)	Clutch pedal position (xx %)	When the pedal is fully up, the value should be greater than **97**. With the pedal at the bottom, the value should be smaller than **2**. Also check, that the value changes evenly when the pedal is moved (in the middle of the pedal travel, the value should be about 50). If the values deviate from the above given values, see instr. **F** on page **370**/**23**. Check that the display reading is 3...8 in point, where the pedal limit switch switches on (click).

1)The gas pedal of the reverse drive controls (TwinTrac, option) controls the same position sensor as the front gas pedal. If the rear gas pedal value is not within the given limits, the rear gas pedal cable must be adjusted so that the fuel injection pump adjusting lever can move the whole stroke.

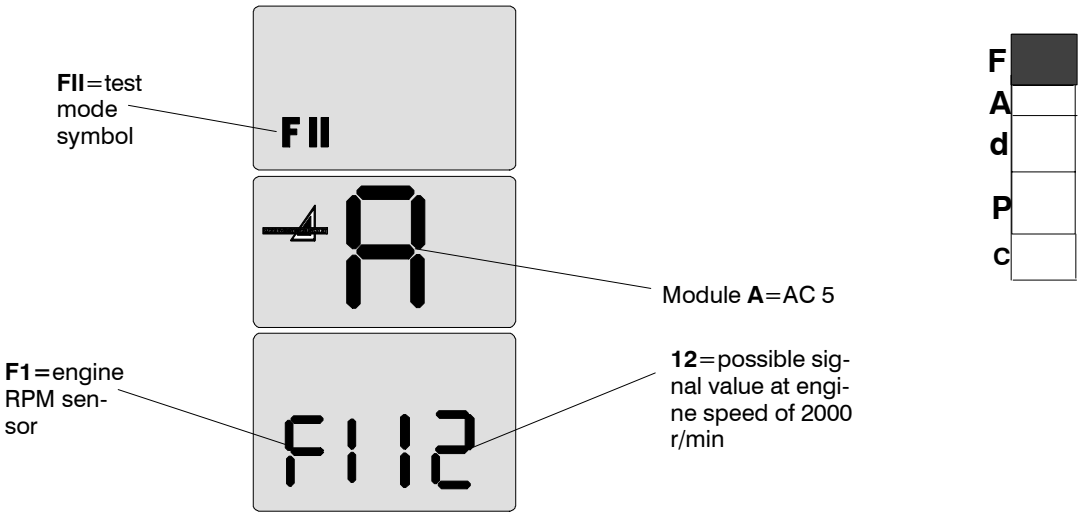
2) The latter switch is for the reverse drive controls (option) (TwinTrac). When checking these switches the seat must be turned rearwards.

I. Testing RPM–sensors (F1–F7) in the test mode in AC 5

NOTE! Corresponding tests in AC 5.2, see page **371/9A.**

Note! If the display shows e.g. **F1 51**, it means the engine rpm sensor frequency of 5100 Hz (value x100=Hertz number).

Example:



INPUT	NAME	VALUES	DESCRIPTION
F1 (B11)	Engine rpm sensor	1000 r/min=5,7–6,3 1500 r/min=8–10 2000 r/min=11–13	Set the engine revs to 1000 r/min and compare the value with the given values in the LH side column. Raise the revs to 1500 and 2000 r/min and compare the reading. If one of the values is not within the given limits, check the sensor, see instr. **D** on page **370/22**.
F2 (B6)	Gearbox speed sensor	1000 r/min=0,6–0,8 (50 km/h) 1500 r/min=1,1–1,3 (50 km/h) 2000 r/min=1,4–1,8 (50 km/h) 1000 r/min=0,5–0,7 (40 km/h) 1500 r/min=0,8–1,1 (40 km/h) 2000 r/min=1,1–1,5 (40 km/h)	Set the engine revs to 1000 r/min, engage gear M1 and drive the tractor forwards. Compare the reading with the given value. Test also at 1500 and 2000 rpm engine revs. If the values differ, see instr. **D** sivulla **370/22**.
F3	Reserve		
F4 (B12)	Shuttle output speed (upper sensor)	1000 r/min=1,8–2,1 (F) 1500 r/min=2,9–3,1 (F) 2000 r/min=3,8–4,2 (F)	Set the gears in neutral. Set the engine revs to 1000 r/min. Engage forward direction (F) and compare the value with the given value. Make the same check also in the reverse direction (R). Raise the engine revs to 1500 and 2000 r/min and measure again in both directions. Compare the reading with the given values. If one of the values deviates, carry out a comparing measurement, check the sensor according to instr. **D** on page **370/22**.
F5 (B13)	Shuttle output speed (lower sensor)	1000 r/min=1,9–2,2 (R) 1500 r/min=3,0–3,2 (R) 2000 r/min=3,9–4,3 (R)	
F6 (B7)	PTO speed sensor	540=1,7–2,0 540E=2,2–2,5 1000=3,0–3,3 540E=2,2–2,5 (8350Hi) 1000E=3,7–3,9 (8350Hi)	Engage PTO. Set the engine revs to 1000 r/min. Compare the values with the given values. If the values deviate, check the sensor acording to instr. **D** on page **370/22**.
F7 (B12, B13)	Direction information	F=1 R=2	Set the gears in neutral. Set the engine revs to 800 r/min. Engage the forward direction (F) and raise slowly the engine revs up to max. The reading must be 1 and must remain the same during the whole test. Engage reverse direction (R) and repeat the same measurement. The reading must be 2 during the whole measurement. If one of the direction readings does not function (value is faulty or it changes when engine revs varie), but F4 and F5 values are correct, the AC 5/5.2 control unit A1 may be damaged and should be changed.

NOTE! If the measured values deviate from the above given values, check first the driver detection switch and its wiring in the seat.

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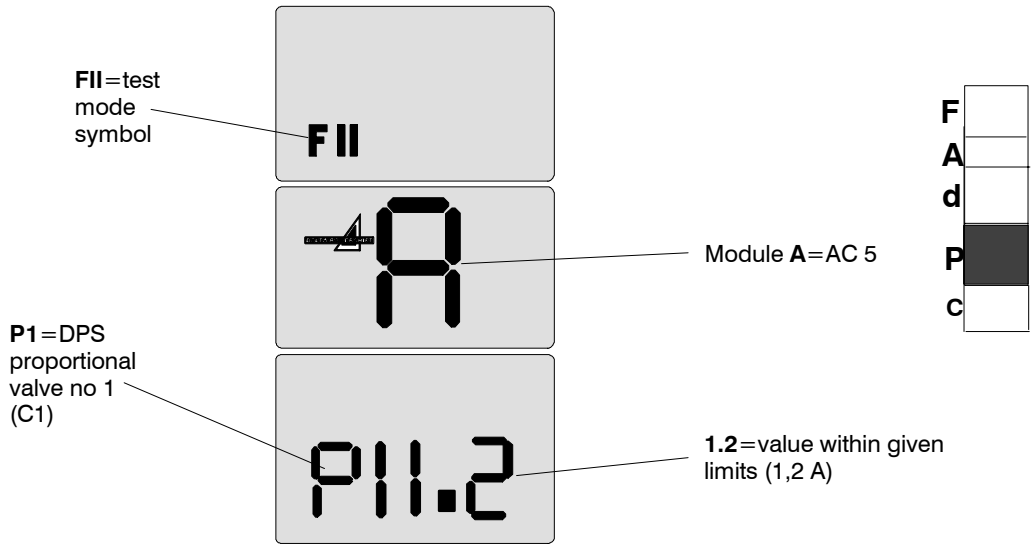
J. Testing proportional valves (P1–P6) in the test mode in AC 5

NOTE! Corresponding tests in AC 5.2, see page **371/9B.**

Note! When the proportional valves are tested, all solenoid outputs are connected automatically unenergised. **Note!** The PTO proportional valve cannot be tested in the test mode in AC 5, but the solenoid is checked by measuring the resistance value.

Hint! E.g. value **P4 1.8** means, that the forward direction proportional valve takes max. current of 1,8 A (in the test mode).

Example:



OUTPUT	NAME	VALUE (activated)	DESCRIPTION
P1 (Y4)	DPS–solenoid Y4 (C1).	1,1–1,9 *	Activate the test mode and start the engine. Set the engine speed to about 1000 rpm.
P2 (Y6)	DPS–solenoid Y6 (C2).		
P3 (Y17)	DPS–solenoid Y17 (C3).	1,1–2,2 (program versions 53, 65)	Proportional valve is activated by stepping the desired solenoid and by pushing the pre–programming button. The display reading should be between the limiting values.
P4 (Y11)	Forwards solenoid Y11.		– If HI=short circuit or valve takes too high current. – If LO=wire damage
P5 (Y12)	Rearwards solenoid Y12.		
P6 (Y2)	PTO solenoid Y2		In AC 5: Cannot be tested in test mode. Measure resistance, see page **370/21**.

***** Although the current value is between the limiting values, can fault codes **P101...P109** appear. In that case the AC5 –control unit must be re–programmed with a new main program file (versions **53** or **65**) and the suitable parameter file (see page **370/24G**). Newest program versions allow a little higher current values, because the higher current taken by a cold solenoid could cause a fault code.
– If one of the values in the diplay deviates from the given values, measure the solenoid resistance on the connector X13 pins or direct on the valve pins. Measure so that the pins do not slacken (see instr. **C** on page **370/21**). If the resistance is correct, but the display reading is faulty, the fault lies in the wires.
Measure also the supply voltage of the control unit while the engine is running (1500 rpm). Correct value is 12 V–14,8 V.
– If the solenoid resistance was faulty, the solenoid is damaged and should be changed. When the proportional valve or the solenoid is changed, the valve indexes must be checked (see page 370–24D).

If above mentioned points are OK, faulty current value can be caused by a defect AC5 / 5.2 control unit A1.

Note! Resistance measures and diode checks, **see instr. 4C on page 370/21**.

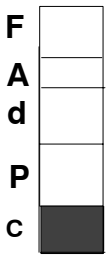
Important! Be careful not to mix up the proportional valves and normal solenoid valves during repair work.

WARNING! The proportional valves have a pin for a manual use, which **MUST NOT** be manipulated: the tractor may suddenly start to move, or the pin can become trapped and can cause later damage to e.g. multi–disc clutches. That is why it must always be checked after the repair work (before engine start), that the proportional valve spools are in the outer positions i.e. almost flush with the valve body (if not, remove the valve and press the spool so that the “manual pins” rises).

K. Counter functions, J38343–, (program versions 42–), AC 5

NOTE! Corresponding tests in AC 5.2, see page **371**/**9C.**

With effect from ser. no. **J38343** there are 12 pcs counters in the test mode menu (see page **370**/**8**). The counter symbols are placed below the symbols for the proportional valves, see table below:



Note! The counters has not been connected in all control units, since the function has been under testing. Due to this the counters do not increase in all tractors. This is not a fault, and does not cause a change of the control unit if the control unit does not have another fault.

Symbole in display	Test point
b	Number of engagements of F–clutch
F	Time in minutes how long time the F–clutch has been engaged (pressurised)
(**r**) ⌐	Number of engagements of R–clutch
A	Time in minutes how long time the R–clutch has been engaged (pressurised)
C	Number of engagements of DPS1 ratio
U	Time in minutes how long time the DPS 1 clutch has been engaged (pressurised)
J	Number of engagements of DPS2 ratio
P	Time in minutes how long time the DPS 2 clutch has been engaged (pressurised)
E	Number of engagements of DPS3 ratio
d	Time in minutes how long time the DPS 3 clutch has been engaged (pressurised)
H	Number of engine starts
L	Time **in hours** how long time the ACV control unit has been active.

The counters are accessible after activating the test mode and by stepping in the menu with the aid of the DPS push buttons.

Note! When the current is switced on with the ignition switch, the default ratio is DPS1. The value in counter H increases with one digit every time the engine revs rise over 400 r/min. Counter L shows the total running hours of the control unit. If the counter reading is smaller than tractor running hours, a new control unit has been fitted later on the tractor.

Note! Reading counters is happened without a separate confirmation. The counters cannot be zeroed in service. If the control unit is reprogrammed, the counter values remain in the control unit memory. In the spare part control unit the counters have been zeroed.

The greatest value of the hour recorders is 9999 after which the counters are zeroed. Counters are switched on always when current is switched on in the control unit.

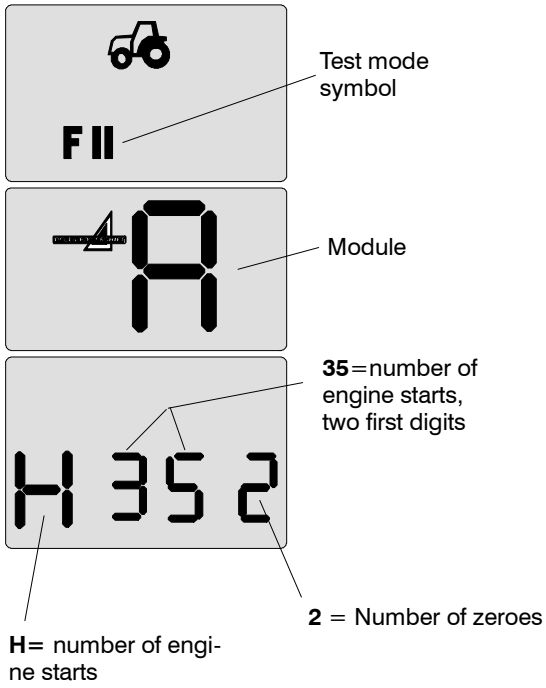
The readings of the counters are shown shortened as follows:
– the LH side display segment shows the counter symbol
– the two intermediate segments show the two first significant digits of the reading
– the RH side segment shows the number of zeroes.

E.g. b 23 3 means that driving direction forwards has been engaged 23000 times.

Last digit	Number of zeroes
0	–
1	0
2	00
3	000 (thousands)
4	0000
5	00000
6	000000 (millions)

Time recorder readings (F, A, U, P, d, L) are also shown in the same way.

Example:



i.e. **H = 3500 times.**

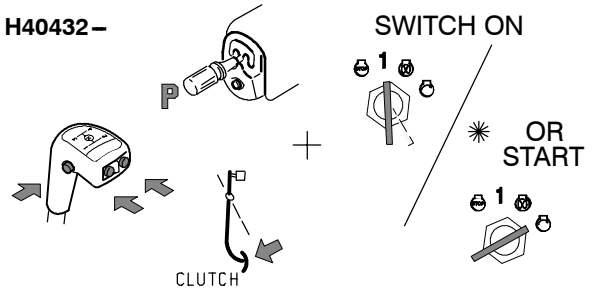
Note! The counters can be used in connection with maintenance or repair works, when e.g. estimating life time of various components or clutch wear etc.

3. Settings

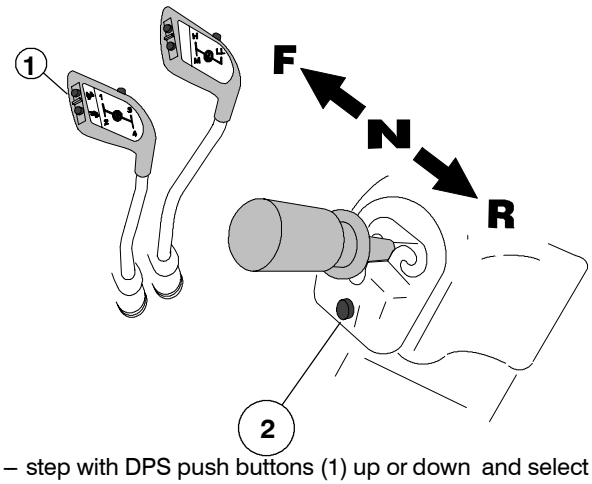
IMPORTANT! Always before settings, the AC 5 / 5.2 must be tested in the test mode and it must be sure that the tractor electrical system (battery, fuses etc) and low pressure circuit of the hydraulic system are in order. When carrying out settings the gearbox oil must be in the normal operating temperature (+30...+60 ˚C) and the engine in the normal operating temperature. Otherwice the calibrations do not succeed. Remove possible DPS pre–programmed speeds. Before changing the setting values, note down the original values).

A. Activating setting mode, AC 5 and AC 5.2

Note! The setting mode is activated by using certain tractor buttons in a correct order as follows:



Number	Main mode	Symbol of main mode
1	Fault code memory	**F I** (AC 5.2 only)
2	Test mode	**F II**
3	Setting mode	**F III**



– step with DPS push buttons (1) up or down and select the main mode symbol FIII (setting mode).
– after this confirm the selection by pushing the DPS pre–programming button (2)
– now symbol A starts to blink (2 Hz) in the middle display block.
– select module A (7 pcs modules. A only in use) by stepping again with push buttons (1).
– confirm the selection by pushing button (2) after which A stops blinking in the display.
– the diplay is now in the setting mode and various settings can be done

NOTE! When the module A was confirmed, number 1 (calibrating of gas pedal) started to blink in the LH side of the lower display block in AC5. 1 is the first point in the setting mode menu. In AC 5.2 text CAL starts to blink.

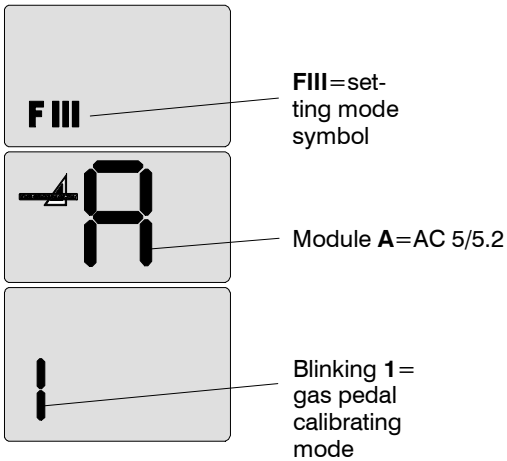
Menu of setting mode F III in AC 5 (AC 5.2: see page 371/10):

Symbol	Description
L	PTO ratio 2 (lever in rear position) (in program version 42–)
P	PTO ratio 1 (lever in front position), (in program version 42–).
S	Driving speed unit selection: **km**/**h** or **miles**/**h**
F	Outdoor temp. unit selection: ˚**C** or ˚**F**.
A	Setting driving speed parameters 3)
9	DPS3 (clutch C3) initial pressure setting. 1) *)
8	DPS2 (clutch C2) initial pressure setting. 1) *)
7	DPS1 (clutch C1) initial pressure setting. 1) *)
6	Initial pressure setting mode of R clutch. 2) *)
5	Initial pressure setting mode of F clutch. 2) *)
4	Resetting of the prefilling time of R clutch.
3	Resetting of the prefilling time of F clutch.
2	Clutch pedal calibrating mode.
1	Gas pedal calibrating mode. *)

1) Change of initial pressure is not visible in pressure value (but it affects the function of the DPS) (in program version 42–).
2) Before the initial pressure settings the resetting of the prefilling times must be done.
3) Same as for AD–instrument, see page **331**/**6**.
*) Engine must be in running.

Note! In the setting mode menu stepping can be done with the DPS push buttons (1) up and down (symbol is blinking) and the selection is confirmed with the DPS pre–programming button (2) (symbole stops to blink or index numbers are visible and blinking). After that the setting/calibrating procedure can be done. Moving to the other point is done by pushing the DPS pre–programming button (2), after which the symbols start again to blink and a new point can be stepped in the setting mode menu. The confirmation is then carried out again with the pre–programming button etc.

Note! Escaping from the setting mode is done by switching off the current.
Note! After the setting mode has been activated, all solenoid outputs are unenergised.



If you think that the gas and clutch pedal calibrations are not OK, correct them first.

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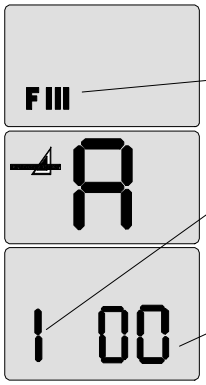
B. Gas pedal calibration in AC 5 and 5.2

Gas pedal is calibrated, if:
– DPS has malfunctions
– Test mode indicated (table **b** on page **370**/**10**), that the gas pedal function is not within the given limits
– Fault code **A313** appeared in the display.
– Fuel injection pump position sensor has been changed
– According to the maintenance program (also check that change in links between pump and sensor does not affect the function of the system).
– fuel injection pump has been changed or adjusted

Important! Before calibration, check the pedal sensor voltages in AC 5, see page **370**/**24**. Before activating the gas pedal calibration, the engine revs must be at the low idling speed and in the normal operating temperature (over +30 °C). Also the transmission must be in the normal operating temperature.

1. Activate the setting mode according to instr. A on page 370/14.

2. Select in the setting mode menu number 1 with the DPS push buttons (in the speed gear lever knob) and confirm it with the DPS pre–programming button (see page 370/14)



FIII=setting mode symbol

1=gas pedal calibrating mode

Blinking **00**=calibration can be done

3. When the gas pedal calibration has been selected and confirmed (**1** is visible in the LH side segment), digits **00** start to blink in the two RH side segments (2 Hz). This indicates that the calibrating can be done.

4. Set the mechanical gears in neutral (engine at low idling). Raise the engine revs evenly and gently with the throttle lever up to max. revs during about 10 seconds, however all the time the revs must go up. When the max. revs have been reached, **wait about 3 seconds** and press the HiShift button. At which time the control unit reads values in the calibrating points and saves them in a memory. Lower to the low idling speed. After the successful calibration digits **01** appear in the two RH side segments. If the calibration is not successful, began the calibration again and raise once again the revs slower during 12–15 seconds with the hand gas lever. When you approach max. revs can the depressing of the pedal be slowed a bit

Note! If the calibration failed (**00** without blinking in the two RH side segments), the values are not saved and the earlier values remain in power. In this case the calibration must be repated. The calibrating mode is left by switching off current.
If the calibration is not successful after several attempts or DPS has malfunctions, (specially low rews models **6750** and **8350**). Do the calibration with the computer, instr. on page **370**/**19B**.
If the calibration failed, so:
– check the pump position sensor, see instr. **G** on page **370**/**24** (AC 5) or on page **371**/**14** (AC 5.2).
– check the position sensor wires
– check function of the engine speed sensor **B11**. See page **370**/**12.**
– If the sensor and its wires are OK, the fault may lie in the control unit and it must be changed.
– check engine speeds: low idling speed must be under 1000 rpm and max speed over 1800 rpm.

IMPORTANT! Escape from this mode by switching off current.

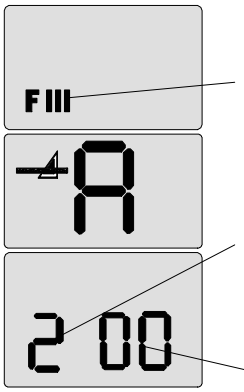
C. Calibrating clutch pedal, AC 5 and 5.2

The clutch pedal is calibrated if:
– test mode indicated that the pedal function is not within the given limits
– Fault code **A314, A315** or **d225** (front controls) or **A351**, **A128** or **d254** (reverse drive controls) appeared in the display.
– pedal position sensor has been changed**.**

IMPORTANT! Before calibration, check the pedal sensor voltages in AC 5, see page **370**/**23**. When selecting the clutch pedal calibration, the pedal must be in the upper position.

1. Activate the setting mode according to instr. A on page 370/14.

2. Select in the setting mode menu number 2 with the DPS push buttons (in the speed gear lever knob) and confirm it with the DPS pre–programming button (see page 370/14)



FIII=setting mode symbol

2=clutch pedal calibrating mode

Blinking **00**= calibration can be done.

3. After the clutch pedal calibration has been selected and confirmed (**2** is visible in the LH side segment), two digits **00** start to blink in the two RH side segments (2 Hz). This indicates that the calibration can be done.

4. Depress the clutch pedal **gently** and **evenly** to the bottom and keep the pedal in bottom for a while, at which time the control unit reads values in the calibrating points and saves them in memory. After the successfully calibration digits **01** appear in the two RH side digits.

Note! If the calibration failed (01 did not appear), the values are not saved. Old values remain in the memory and the calibration must be repeated.

If the calibration failed, so:
– check the clutch pedal potentiometer, see instr. **F** on page **370**/**23**.
– check the pedal limit switch function and adjustment.
– Check the wires of these components
– If these are OK, the fault may lie in the control unit.

IMPORTANT! Escape from this mode by switching off current.

NOTE! Calibrate in the same way the rear clutch pedal of the optional reverse drive control (TwinTrac).

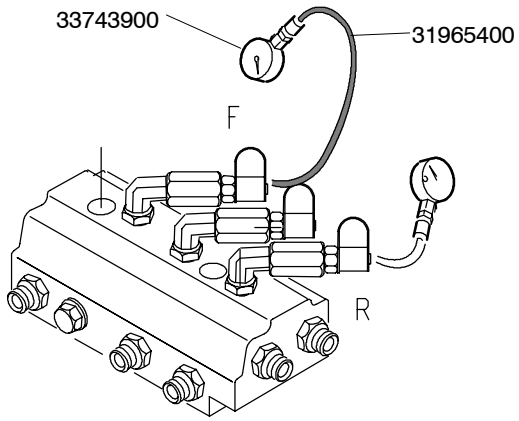
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D. Checking pressures in shuttle clutches in AC 5 and 5.2

See also the setting orders in instr. 370–24D.

Note! If the shuttle has malfunctions or if the shuttle has been repaired or the proportional valves have been changed, the function of the control system must be checked. These tests ensure, that the pressure in the tractor low pressure circuit is high enough and that the F/R proportional valves are functioning.

Note! Ensure that the transmission oil temperature is between **+30˚C...+60˚C** before work.

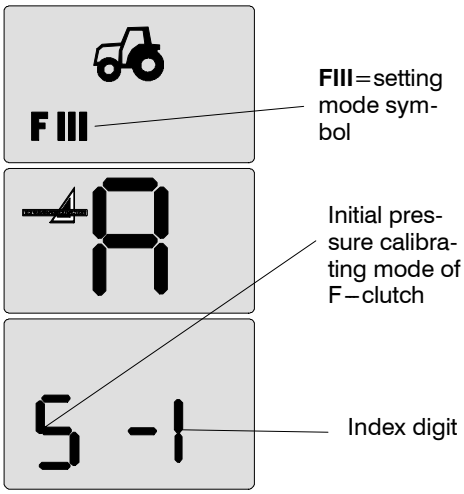


1. Measure pressure in the tractor low pressure circuit according to instr. 911.

2. Connect a pressure gauge of **25 bar** onto the **F–direction** pressure–test point (second point from the right, see also picture on page **440**/**25**).

3. Activate the setting mode according to instr. **A** on page **370**/**14**.

4. Step with the DPS push buttons (in the speed gear lever knob) and select point **5** in the setting mode menu (see page 370/14 (AC 5) or page 371/10 (AC 5.2)) (F–clutch initial pressure calibration) (blinking).



5. Press the DPS pre–programming button, at which time certain **initial pressure index** (between –9...+9) starts to blink in the three RH side segments.

Note! The factory setting of the index is normally **–3...+3**.

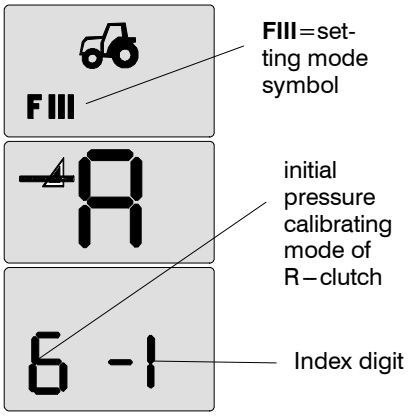
6. Press again the pre–programming button, at which time the index digit stops blinking and read off the pressure gauge reading, which should be **1,8–2,8 bar** (AC 5) or about **3,5 bar** (AC 5.2).

Note! The pressure value can be read after about ten seconds, during which the pressure becomes even (in the beginning possible pressure peak is not observed).

7. If the measured pressure value is different, change the index. This is carried out so that after the pressure measurement the blinking (5) is activated again with the DPS pre–selection button, and the blinking index digit is changed by stepping with the DPS push buttons.

8. After the index has been changed, press again the DPS pre–selection button and read off again the pressure gauge reading.

Note! If the pressure is too low, increase the index one step at a time and vice versa and check the pressure again. If the index is smaller than **–4** or greater than **+4**, the following points must be checked:
– Low pressure circuit of the tractor (instr. 911–1)
– Condition of the valve coil, see page 370/13.
– Cleanliness of the valve
– Valve seals. Change the valve if necessary.



9. Repeate the same also with the R–direction pressure–test point (the LH side test–point on the valve block). In this case the function number **6** of the setting mode menu must be activated (R–clutch initial pressure calibration).

10. Escape from the setting mode by switching off current.

11. Engage a mechanical gear and range gear lever in the neutral. Start the engine and engage the forward–driving direction (F). See the pressure rise of the F–clutch in the pressure gauge. The pressure must stay in level, which is max. 0,05 MPa (0,5 bar) below the pressure in the low pressure circuit. e.g. 18,0 bar –> 17,5 bar (measured in point 1). If the pressure is lower, it is possible that there is a leakage in the system (e.g. o–ring damaged).

12. Measure the reverse–drive direction (R) in the same way.

13. Check the DPS–pressures in the same way (instr. 3E).

14. Set the indexes according to instr. 370/24D.

15. Test–run the tractor according to instr. on page 370/24E.

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E. Checking DPS clutch pressures in AC 5 and 5.2

See also the setting orders on page 370/24D.

Note! If the DPS has malfunctions or if the DPS has been repaired or the proportional valves have been changed, the function of the control system must be checked. These tests ensure, that the pressure in the tractor low pressure circuit is high enough and that the DPS proportional valves C1/C2/C3 are functioning.

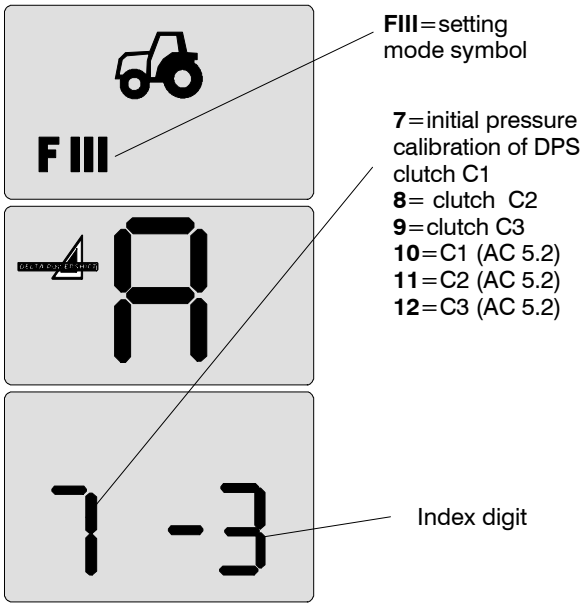
Note! Ensure that the transmission oil temperature is between **+30˚C...+60˚C** before work.

Note! The change of initial pressure index is not visible in the pressure value (but affect the function of the DPS) (in program versions 38, 40, 41). (Can be seen in other versions)

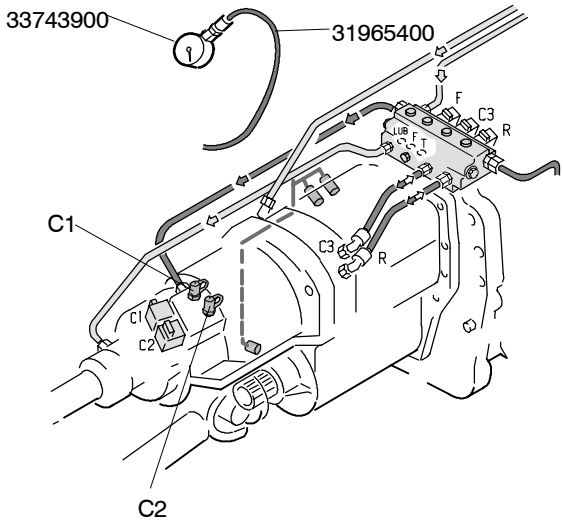
1. Measure pressure in the tractor low pressure circuit according to instr. 911.

2. Activate the setting mode (see page 340/14).

3. Step with the DPS push buttons (in the speed gear lever knob) and select no **7** (DPS1, clutch C1) (AC 5.2: no **10**) in the setting mode menu and confirm this selection with the DPS pre–programming button.



4. When the initial pressure calibrating mode has been selected and confirmed, number **7** (AC 5.2: **10**) can be seen in the left and index digit is blinking in the right.



5. Connect a pressure gauge of **25 bar** onto the C1 clutch pressure–test point (in the right), press again the DPS pre–programming button (index stops to blink) and read off the pressure gauge reading, which should be **1,8–2,8 bar**.

Note! The pressure value can be read after ten seconds, during which the pressure becomes even (in the beginning possible pressure peak is not observed).

6. When the C1 clutch pressure has been checked, repeat the same procedures also with the C2 and C3 clutches. At this time the blinking 7 is changed with the DPS push buttons to 8 (and 9) and confirmed with the preprogramming button.

– **8** (AC 5.2: **11**) (DPS2, clutch C2). Initial pressure value **1,8–2,8 bar**.
– **9** (AC 5.2: **12**) (DPS3, clutch C3). Initial pressure value **1,8–2,8 bar** (AC 5) and little higher in AC 5.2.

Note! It is important that all DPS three proportional valves are checked.

7. Escape from this mode by switching off current.

8. Move the speed gear and range gear levers to the neutral. Start the engine and change the DPS–speed with the push buttons. See the pressure rise in the pressure gauge. The pressure must remain in the level, which is max. 0,05 MPa (0,5 bar) below the pressure in the low pressure circuit, e.g. 18,0 bar –>17,5 bar (measured in point 1). If the presure is lower, there can be a leakage in the system (e.g. o–ring damaged).

9. Check the DPS–pressures in the same way (instr. 370/3D).

10. Set the indexes according to instructions on page 370/24D.

11. Test–run the tractor according to instruction on page 370/24E.

G. Resetting prefilling time of shuttle clutches, AC 5 and 5.2

See also working orders in instr. 370/24D)

Note! This resetting must always be done **before** the calibration of the initial pressures**.** Adjust the initial pressure index of the F– and R–clutches to smaller than **–3** (see instr. **D**) before resetting the prefilling times.

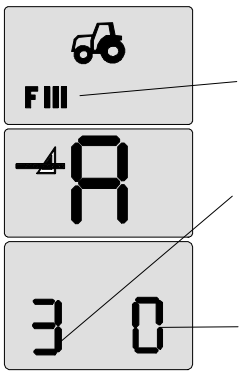
Note! The resetting is done by changing the prefilling index. As a procedure this is done like the initial pressure calibration by stepping with DPS push buttons and by confirming with the DPS pre–selection button.

NOTE! If the shuttle engagement causes so called ”double jerk” in the beginning of the engagement and the function has a great delay, so:
– decreasing the index reduces the jerk and increases the delay
– increasing the index increases the jerk and reduces the delay.

Testdrive the tractor and carry out, if needed, the resetting procedure (note down the original index value). Test–run the tractor after resetting.

1. Check that the transmission oil temperature is +30˚C...+60˚C. Activate the setting mode (see page 340/14).

2. Step with the DPS push buttons (in the speed gear lever knob) and select no 3 in the setting mode menu and confirm this selection with the DPS pre–programming button.



FIII=setting mode symbol

3=Resetting prefilling time of F clutch
4= R–clutch.

Index digit

3. When this mode has been selected and confirmed , number 3 is shown (not blinking) in the left and the index digit is blinking in the right. The factory setting is 0.

4. Change the prefilling index (when it is blinking) one step at a time with the DPS push buttons and confirm it with the preprogramming button (blinking stops). After this, test the engagement of the shuttle many times. Change the index when necessary.

5. Carry out this same also for the R–clutch. Now number 4 is selected in the setting mode menu.

Note! If the index for the F– or R–clutches must be over **+4** or smaller than **–4**, it is possible, that the clutch in question is worn–out or the clutch piston or valve is stuck.

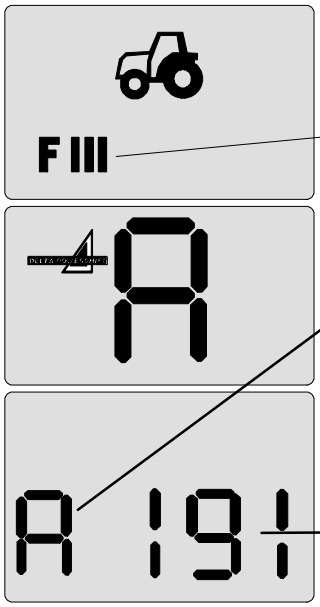
H. Resetting driving speed parameters, AC 5 and 5.2

Note! Driving speed parameter means the pulse parameter (pulses/m) of sensor **F2** (gearbox speed sensor).

By changing this parameter value the driving speed display can be adjusted so that it shows the correct value according to the tractor tyres and transmission type. This procedure is made in the factory for all new tractors. If tyres of different dimensions are fitted later on the tractor, the parameters can be reset according to this instruction.

1. Activate the test mode according to instr. **A** on page **370/14** (if not activated eralier).

2. Select symbol **A** (blinking) in the test mode menu by stepping with DPS push buttons (in the speed gear lever knob), and confirm the selection by pushing the DPS preprogramming button, at which time symbol A stops blinking and the present parameter value is visible (blinking) in the three RH side segments.



FIII=setting mode symbol

A= symbol for driving speed parameter setting.

Value of driving speed parameter.

3. The blinking parameter value can be changed by using the DPS push buttons in the speed gear lever knob.

Note! The parameters according to the tyres and transmission types are the same as for AD–instrument, see table on page **331**/**6**.

4. When the desired parameter value is in the display, it is confirmed by pushing the DPS preprogramming button.

5. If the confirmation succeeds, the parameter value in question remains in the display without blinking.

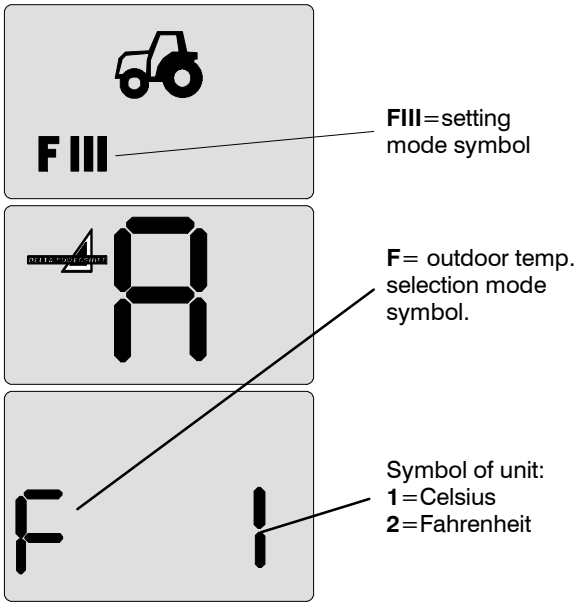
Note! Escape from the setting mode by switching off the current with the ignition switch.

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I. Changing temperature unit of outdoor temperature display, AC 5 and 5.2

The outdoor temperature unit can be changed between **F°** or **°C.**

1. Activate the setting mode according to instr. **A** on page **370**/**14**).



2. Step with the DPS push buttons (in the speed gear lever knob) in the setting mode menu and select symbol **F**, which is blinking (choosing temperature unit), and confirm the selection by pushing the DPS preprogramming button, at which time the symbol F stops to blink and present unit symbol (1 or 2) can be seen in the diplay:

1=°C.
2=°F.

The factory setting is Celsius units.

3. Select the desired temperature unit by pushing the DPS push buttons and confirm the selection by pushing the DPS preprogramming button. After this the outdoor temperature is shown either in Celsius or Fahrenheit units.

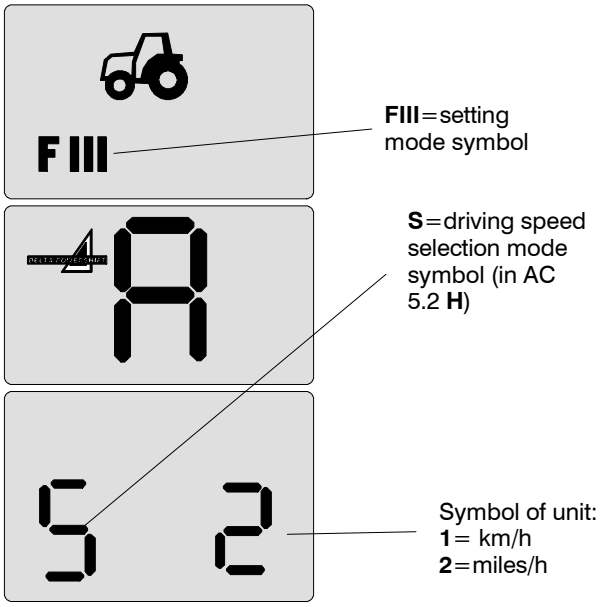
Note! With the formula below the Celsius–units can be changed into Fahrenheit–units.

$$t_F = \frac{9}{5} \times t_C + 32$$

J. Changing driving speed unit, AC 5 and 5.2

The driving speed unit can be either **km**/**h** or **miles**/**h**.

1. Activate the setting mode according to instr. **A** on page **370**/**14**).



2. Step with the DPS push buttons (in the speed gear lever knob) in the setting mode menu and select symbol **S**, which is blinking (choosing driving speed unit), and confirm the selection by pushing the DPS preprogramming button, at which time the symbol S stops to blink and present unit symbol (1 or 2) can be seen in the diplay:

1=km/h.
2=miles/h.

The factory setting is km/h units.

3. Select the desired speed unit by pushing the DPS push buttons and confirm the selection by pushing the DPS preprogramming button. After this the driving speed is shown either in km/h or miles/h.

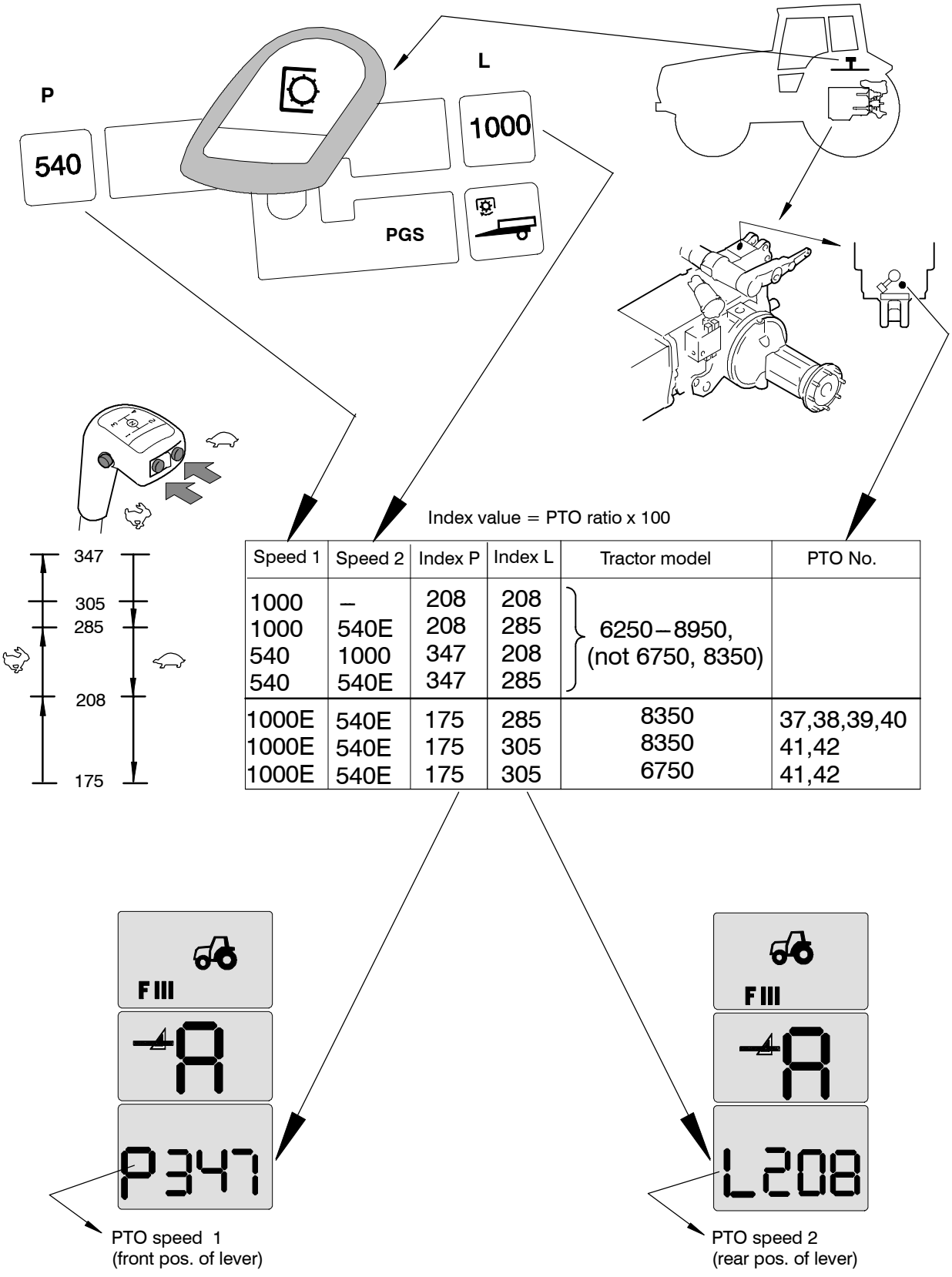
Note! 1 km/h=0,6214 miles/h

Note! If the selected driving speed unit is miles/h, symbol km/h is not shown at all in the diplay.

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K. Setting PTO parameters (ratios), in program versions 42–, AC 5 and 5.2

PTO index values shall always be checked and set after programming or assembling the control unit.

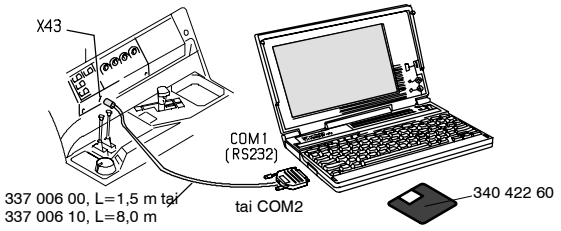


Speed 1	Speed 2	Index P	Index L	Tractor model	PTO No.
1000	–	208	208	6250–8950, (not 6750, 8350)	
1000	540E	208	285		
540	1000	347	208		
540	540E	347	285		
1000E	540E	175	285	8350	37,38,39,40
1000E	540E	175	305	8350	41,42
1000E	540E	175	305	6750	41,42

L. Check of the gas pedal sensor calibration with the computer, AC 5 and 5.2

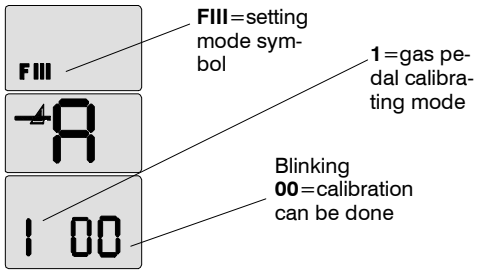
The check with the computer, if:
– Calibration has not succeeded.
– Calibration is correct but DPS has malfunctions (specially low revs models **6750** and **8350**).

1. Switch the power of the tractor off. Connect a programming cable to the PC and to the connector **X43.**



2. Turn the PC's power on and start Windows. Insert an **AC5** programming diskette to the PC's disk drive A:> and choose **" VALT_TRM95_COM1 "** and start the program according to instr. **B.2** on page **370/24B**).
3. Switch the power of the tractor on. Text **" RESET "** or "**Loader 0.4**" appears if the communication is OK. In case of malfunction try once more.

4. The computer is now ready to receive information about the calibration. Do the calibration normally according the following instructions.
5. Activate the setting mode **FIII** according to instr. A on page **370/14**.
6. Select in the setting mode symbol **1** (gas pedal calibration) with the DPS push buttons (in the speed gear lever knob) and confirm it with the DPS pre–programming button (see page **370/14**)



7. When the gas pedal calibration has been selected and confirmed (**1** is visible in the LH side segment),
digits **00** start to blink in the two RH side segments (2 Hz). This indicates that the calibrating can be done.

8. Set the mechanical gears in neutral (engine at low idling). Raise the engine revs evenly and gently with the throttle lever up to max. revs taking about 10 seconds, however all the time the revs must increase. When the max. revs have been reached, **wait about 3 seconds** and press the HiShift button. At which time the control unit reads values in the calibrating points and saves them in to memory. Lower the low idling speed. After the successful calibration digits **01** appear in the two RH side segments. If the calibration is not successful, start the calibration again and raise the revs slower once again during 12–15 seconds with the hand throttle lever.

NOTE! If the calibration has failed (**00** without blinking in the two RH side segments), the values are not saved but the earlier values remain valid. In this case the calibration must be repeated.
IMPORTANT! The calibrating mode is left by switching the current off.
9. After calibration is finished the calibration values will appear on the laptop's screen automatically, see **Table 1**. Scroll the text on the screen if all values are not shown from the top. On the top of table is the text, **" pedal motor "**

10. From the values can be seen all the pedal position values for the control unit and the motor values in rpm. Selected values of the calibration are below all values. Both all values and selected values must be correct. If they are correct, an information **" Error0 "** appears, then the calibration is done correctly, see **Table 1**.

11. If the calibration has not been done correctly information **" Error "** appears and amount of the errors, see **Table 2.** This can happen if all or **selected** pedal values do not increase evenly. This means that if the value is decreasing or there are the same value twice, the calibration has failed.

12. In table 3 is an example in which calibration appears to be correct, because of the information " **Error 0** ". But in the last row, the value of the engine's revs is lower than the earlier value. This can cause DPS malfunctions. Do the calibration again.

NOTE! Check always that pedal and engine values increase evenly, although the information " **Error 0** " appears. It is possible, that the computer does not find faults.

13. Do the gas pedal calibration again and make sure that revs are rising evenly (without stop) during calibration.
Other possible faults listed in stage **G** and in page **370/24.**

TABLE 1
Loader v0.4 4Mb-Samples

Pedal	Motor
311	878 rpm
341	960 rpm
356	1045 rpm
368	1125 rpm
377	1208 rpm
389	1290 rpm
414	1378 rpm
434	1465 rpm
451	1558 rpm
464	1641 rpm
473	1728 rpm
488	1817 rpm
530	1916 rpm
551	1996 rpm
563	2078 rpm
572	2161 rpm
580	2245 rpm
609	2335 rpm

Selected

pedal	motor
311	878 rpm
368	1125 rpm
389	1290 rpm
434	1465 rpm
464	1641 rpm
488	1817 rpm
551	1996 rpm
572	2161 rpm
609	2335 rpm

Error 0

TABLE 2
Loader v0.4 4Mb-Samples

Pedal	Motor
312	869 rpm
327	950 rpm
344	1031 rpm
354	1115 rpm
371	1196 rpm
385	1279 rpm
401	1363 rpm
416	1444 rpm
433	1525 rpm
447	1605 rpm
465	1691 rpm
480	1777 rpm
499	1863 rpm
512	1944 rpm
497	**1863 rpm**
514	1952 rpm
534	2046 rpm
551	2127 rpm
567	2208 rpm

Selected

Pedal	Motor
312	869 rpm
354	1115 rpm
385	1279 rpm
416	1444 rpm
447	1605 rpm
499	1863 rpm
497	**1863 rpm**
534	2046 rpm
567	2208 rpm

Error 1

TABLE 3
Loader v0.4 4Mb-Samples

pedal	motor
233	851 rpm
249	934 rpm
267	1016 rpm
291	1104 rpm
335	1271 rpm
358	1360 rpm
383	1448 rpm
405	1529 rpm
431	1610 rpm
455	1697 rpm
477	1785 rpm
502	1868 rpm
527	1954 rpm
528	2035 rpm
530	2001 rpm

Selected

pedal	motor
233	851 rpm
267	1016 rpm
313	1187 rpm
358	1360 rpm
405	1529 rpm
455	1697 rpm
502	1868 rpm
528	**2035 rpm**
530	**2001 rpm**

Error 0

pedal: gas pedal position motor: engine speed

If " PEDAL " –values do not increase evenly.
– Check the sensor function in all measuring areas (e.g. with oscilloscope FLUKE 123)
– Check, that the gas pedal is pressed evenly during the whole calibration in the same direction.
If " MOTOR " –values do not increase evenly.
– Check, that the gas pedal is pressed evenly during the whole calibration in the same direction. (the pressing can be slowed a little towards the end).
– Check the function of the engine speed sensor **B11** in all measuring areas.

4. Checking AC 5 / 5.2 components

A. Control unit and display:

If the control unit is damaged, the conditions of other components do not affect the function of AC 5. In case of fault check that the unit connectors have not poor contacts by disconnecting them and reconnecting.

Note! If the control unit must be changed, the tractor model and ser. no. must be told to the factory. Also must be told, if the tractor has a turbine clutch (HiTrol). Fitting the control unit to tractor, see page **370**/**24A**.

The control unit has not a battery, but its memory is so designed that the programs remain in it, although should the tractor battery be removed. If necessary, voltage measurements can be done on the sides of the unit connectors (without detaching the connectors). Three different units have been used (33373000 and 33373010 in AC 5 and 33373020 in AC 5.2.

The diplay unit cannot be repaired but it is changed as a complete unit. If the diplay does not function, check first that the connector is correctly connected to the diplay unit. If the display has malfunctions, check that connector A1A2 of the control unit is correctly in place and that there is nothing extra between the connector parts. Check also the display unit supply voltage, fuse 24 (tractors J38343–)

B. Switches:

Note! The switches and their wires can be checked in the test mode FII, see table **a** on page **370**/**10** (AC 5) or page **371**/**8** (AC 5.2). Then the switch in question is activated and in the diplay can be seen the mode (0/1) of the switch, at which time the condition of the switch and its wires can be verified.
If needed, the faulty switch is changed and wires are checked/repaired.

The fault codes can show faults in different switches. Fault codes, see page **370**/**6** (AC 5) or page **371**/**5** and **6** (AC 5.2).

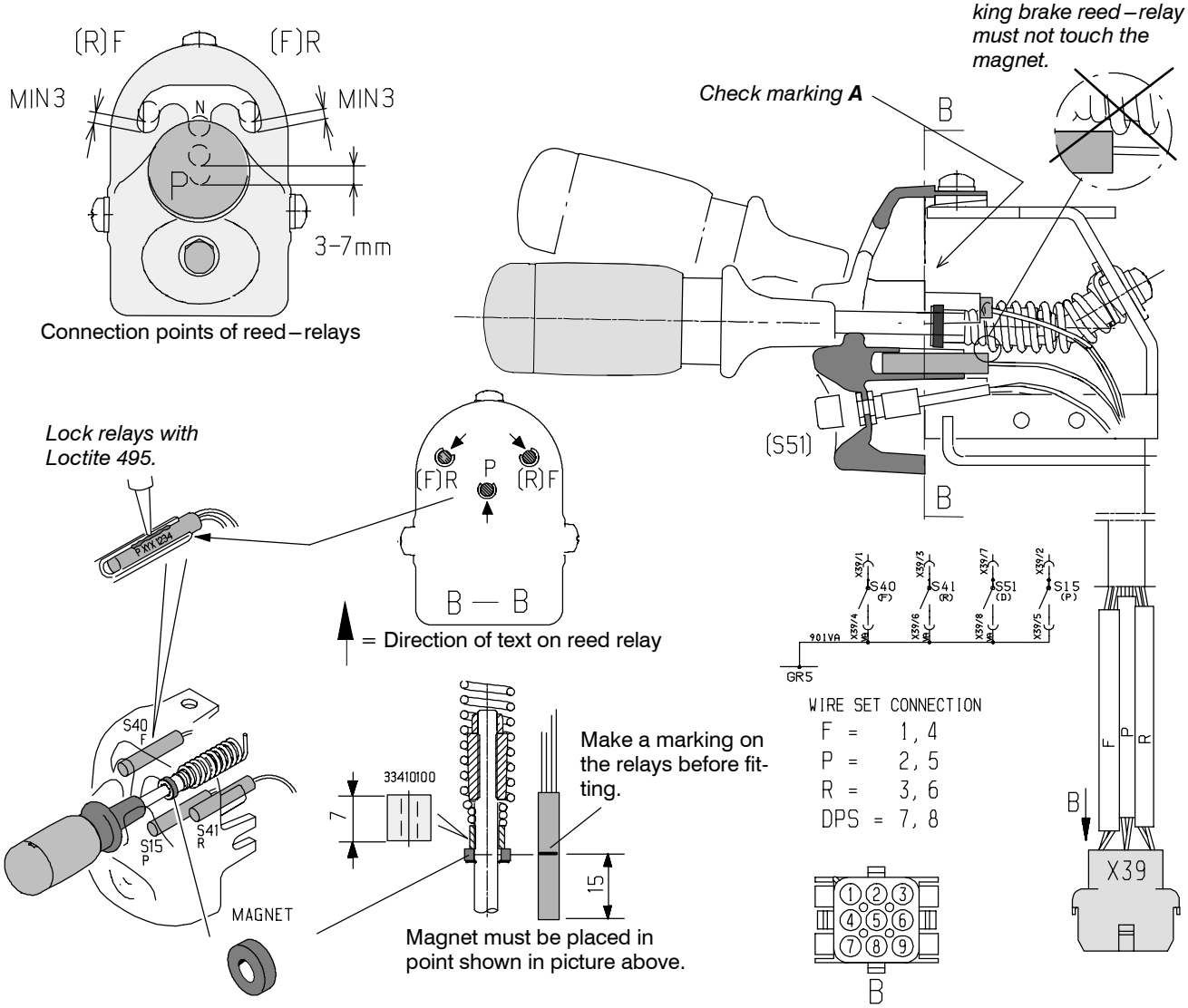
Note! If the switches and wires seem to be OK, but a malfunction exists, the fault may lie in the control unit.

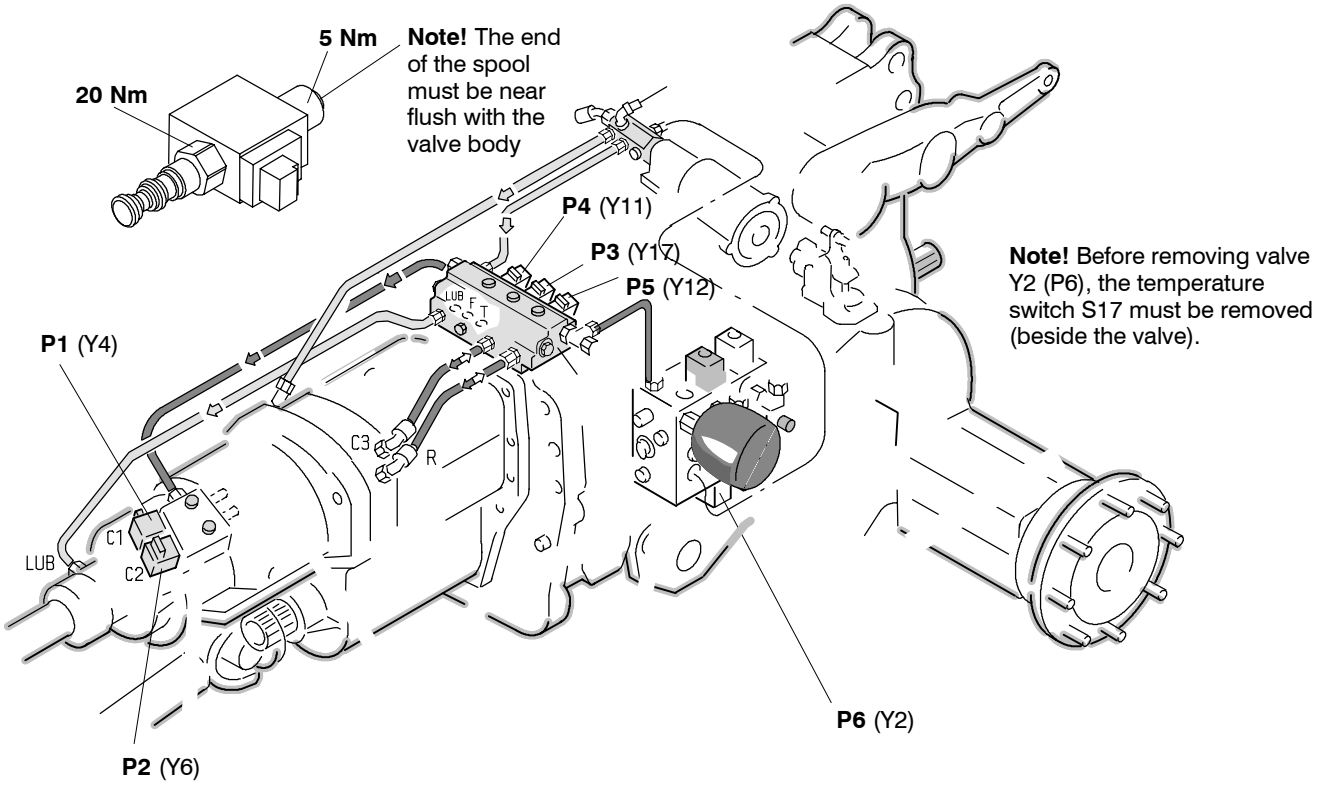
Note! The shuttle lever/hand brake lever is a special switch. When the lever is moved, the magnet in the inner end of the lever moves onto the corresponding reed relay and the desired function is engaged. The DPS pre–programming button is similar to the DPS and HiShift push buttons. The reverse drive controls (TwinTrac) have the corresponding switches).

Note! Check the function of the lever with a multi–meter or in the test–mode **FII** in connection with repairs.

CHECK OF SHUTTLE LEVER

Note! *Spring must not touch the relays. Parking brake reed–relay must not touch the magnet.*





C. Proportional valves, AC 5 and 5.2

Note! The unit self–diagnostics show a fault code, if one of the proportional valves is faulty, see table on page **370/6** (AC 5) or page **371/5** (AC 5.2) (PTO proportional valve is not diagnosed in AC 5). After this the valve can be tested in the test mode. FII, see table **d** on page **370/13.**

1. All six proportional valves are similar:
– **P1**=DPS foremost clutch C1 prop. valve Y4
– **P2**=DPS middle clutch C2 prop. valve Y6
– **P3**=DPS rearmost clutch C3 prop. valve Y17
– **P4**=forward drive (F) proportional valve Y11
– **P5**=reverse dirve (R) proportional valve Y12
– **P6**=PTO proportional valve (not diagnosted in AC 5) Y2

2. When the proportional valve is energised, it is magnetic and clutch in question is pressurised.
– **P1** is energised,when DPS speeds I or II are selected
– **P2** is energised, when DPS speeds I or III are selected
– **P3** is energised, when DPS speeds II or III are selected
– **P4** is energised when forward drive is engaged
– **P5** is energised when reverse drive is engaged
– **P6** is energised when the PTO is engaged.

3. The resistance of the proportional valves is measured from connector X13 pins. Correct value is **7–9 ohms** (+10˚C...+30˚C).

4. If the resistance is incorrect, the valve solenoid is changed. After this the valve indexes must be set, see instr. on page **370/24D**.

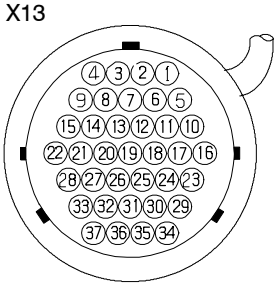
5. If the resistance is correct, but in the circuit there are malfunctions, check the valve wires and connectos. If these are OK, perform the calibration of the initial pressure. Also the diodes must be checked in AC 5 according to table below (in AC 5.2 the diodes are placed in the control unit A1).

Note! One possible and common fault is impurities in the valves. This can cause faults which are very difficult to find. If you doubt this fault, change the proportional valve or try to clean it.

6. If the valve and its wires seem to be OK, but malfunctions exist, the fault can lie in the control unit.
Note! During repair check (before engine start) that the valve spool end is nearly flush with the valve body.

PINS (**X13**)	SOLENOID	RESISTANCE (+10...+30 ˚C)
2<>5 4<>5 7<>5 11<>5 12<>5 13<>5	Y2 (PTO) Y4 (C1) Y6 (C2) Y17 (C3) Y11 (F) Y12 (R)	**7–9 ohms**

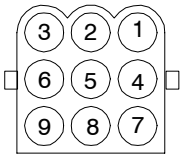
X13



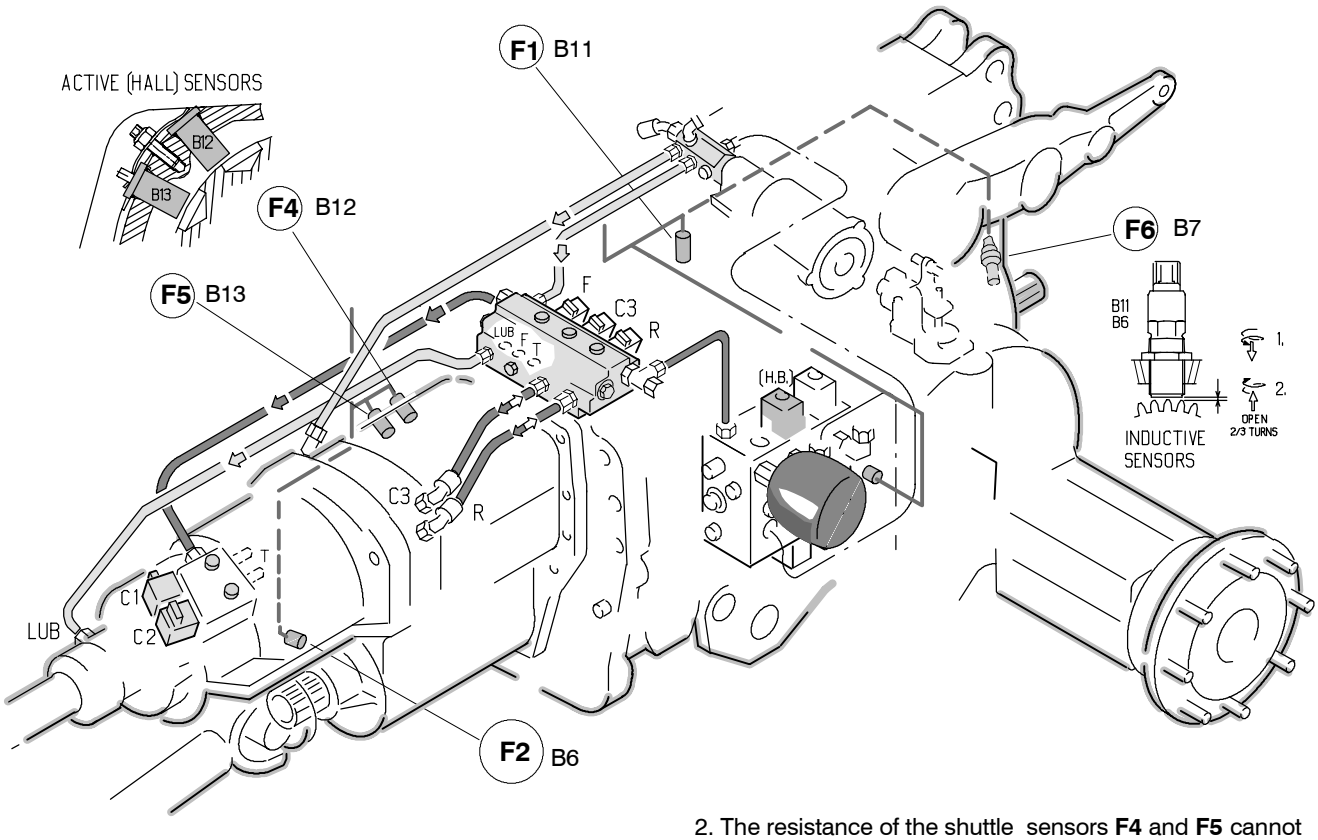
Diode test with multimeter, AC 5 only.

SOLENOID	DIODE HOUSING (V1, V4)	PINS (**V1, V4**)
Y2 Y4 Y6 Y17 Y11 Y12	V1 V1 V1 V4 V4 V4	2<>5 9<>8 7<>8 9<>8 7<>8 3<>6

V1, V4



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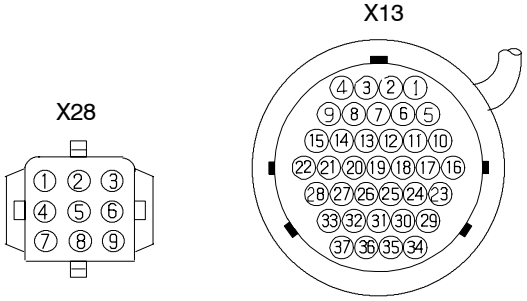
D. Rotation speed sensors, AC 5 and 5.2

Note! If you doubt that one speed sensor is faulty, carry out the checking of frequency outputs, see table **c** on page **370/12**.

The fault codes can show possible faults in the rotation speed sensors. Fault code list, see page **370/6** (AC 5) or pages **371/5** and **6** (AC 5.2).

F1=engine speed sensor B11
F2=gearbox speed sensor B6
F4=shuttle speed sensor B12 (upper), order no on wire.
F5=shuttle speed sensor B13 (lower), not order no.
F6=PTO speed sensor B7

1. If in the test mode one sensor functioned faulty, measure the resistance of the sensor. The resistance can be measured from the wire loom connector X13. If the resistance is infinitive, it should be measured from the sensor pins so that possible breaks can be verified.



2. The resistance of the shuttle sensors **F4** and **F5** cannot be measured. These sensors are tested in the test mode FII. Check first sensor fuse (F22, AC 5 only) and measure sensor supply voltage (=battery voltage) in connector X28 (see table below)

Note! The gearbox speed sensor is accessible after splitting the tractor frame. The other sensors are accessible without splitting the tractor. The engine speed sensor is situating under the cab on the gearbox. The shuttle speed sensors are accessible from under the cab on the RH side of the tractor when a cover is removed.

3. If the sensor resistance is correct, check the sensor wires and connectors. If the resistance was incorrect, the sensor is changed.

4. Fitting and adjustment of sensors **F1**, **F2** and **F6** is done in the same way as for corresponding sensors on the AC IV unit, see pages **351/2–3**.

5. The shuttle sensors **F4** and **F5** cannot be adjusted, but they are pushed into place and locked with a locking plate. **Note!** The sensors must be fitted correctly: F4 up (marked), and F5 down. Check the sensors in the test mode, point F7.

6. If the wires and sensors are OK, but malfunctions exist, it is possible that the control unit is faulty.

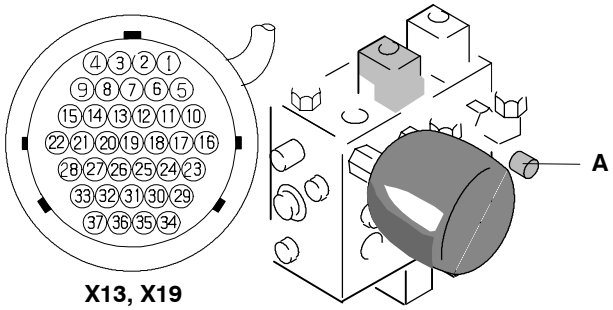
RESISTANCE MEASUREMENTS

PINS (X13)	SENSOR	RESISTANCE +10–+30°C
14<>6 15<>6 19<>6	B11 B6 B7	**1000–1100 ohms**
Supply voltage measurements (B12, B13)		
Pins (X28)	Sensor	Voltage
3<>1 9><7	B12 B13	Battery voltage –"–

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E. Temperature sensors in AC 5 (AC 5.2, see page 371/13).

1. Gearbox oil temperature sensor B14



Note! The sensor is situating on the servo valve block on the LH side of the gearbox.

1. If this sensor or its wires have malfunctions, the self–diagnostics show the following codes:
– **A311** (value over+150˚C, unpossible).
– **A312** (value below – 50˚C, unpossible).

2. Check the sensor in the test mode FII, see table **b** on page **370**/**11**. Compare the reading with the actual oil temperature.

3. If the tempearture reading is incorrect or it is lacking, then check the sensor and its wires. Measure the resistance of the sensor from connector X13 pins 10 and 6:

Resistance values (±1 %)**:**
– 1600 Ω (± 0˚C)
– 2000 Ω (+25˚C)
– 3300 Ω (+100˚C)

4. Change the faulty sensor.

Note! If this sensor is faulty, malfunctions can occur in the transmission multi–disc clutches (delays or jerks).

Note! If the temperature sensor seems to be OK, but malfunctions occur, the control unit can be faulty.

2. Outdoor temperature sensor B17.

This sensor is similar as the gearbox oil temperature sensor and it is placed in the front part of the tractor on the bracket for signal horn.

1. If the outdoor temperature reading is faulty or is lacking, check the sensor in the test mode FII, see table **b** on page **370**/**11**.

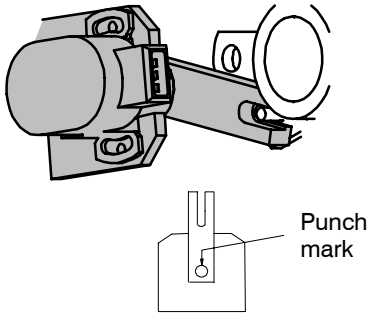
2. Compare the test reading with the ambient outdoor temperature. If no outdoor temperature value is visible, check the sensor and its wires .

3. If the reading is incorrect, check the sensor fitting and measure its resistancefrom connector X19 pins 26 and 37. Replace the faulty sensor.

Resistance values:
– 1600 Ω (± 0˚C)
– 2000 Ω (+25˚C)
– 3300 Ω (+100˚C)

Note! The function of this temperaure sensor does not affect the technical function of AC 5.

F. Clutch pedal position sensor B16 in AC 5 (AC 5.2, see page 371/13).



Note! The position sensor informs the control unit the position of the clutch pedal, so that the control unit can control the clutches.
If the position sensor has malfunctions, the self–diagnosis shows the following fault codes:
– fault code **A314** (signal not within given limits)**.**
– fault code **A315** (pedal calibration faulty or pedal limit switch S9 wrongly adjusted) (switch S2W in the reverse drive controls (option)).

1. Check the function of the position sensor in the test mode (table **b** on page **370**/**11**). If the function is not within the given limits, check the sensor mounting and wires. Check also the fitting of the lever on the sensor spindle.

2. Check the adjustment of the limit switch S9 in the test mode: in the switch–on point the display must show 03...08 (when lifting the pedal). When needed, adjust the position of the limit switch so that it switches on (click) just a little before the pedal extreme position. Recheck in the test mode.

3. Measure, if necessary, the position sensor voltages. Check the voltages always before calibrating the pedal. Connect ETV 894 100 between the sensor and its connector (see picture on the next page). If ETV is not available, measure the supply voltage in the wire loom connector (see picture on the next page). Signal voltage can be measured from control unit A1 connector A1A3/7–A1A3/8 (see page 370/25).

– measure the supply voltage (+7,7...8,3 V) between pins 1 and 3.
– measure signal voltage between pins 1 (ground) and 2 (signal). Ensure that the voltage value changes evenly when moving the position sensor lever. Adjust the sensor position if needed. If the position sensor is faulty, fit a new one and carry out the pedal calibration. Adjust the position of the sensor.

Clutch pedal	Pedal up	Pedal in bottom
Signal voltage	1,5 –3,0 V	5,3–6,0 V

Note! When necessary, the gas pedal sensor B15 can be temporarily used as a spare part (similar sensor, remove the lever). After that the DPS automatic gear change does not function. Try to adjust the pedal “bottom” value to 5,7–5,8 V and then check that the “upper” position value is within given limits.

4. Carry out the pedal calibration according to instruction **C** on page **370**/**15**.

Note! If the sensor and its wires seem to be OK, but malfunctions occur, the fault may lie in the control unit A1. Secure the screw, which fasten the arm to the sensor spindle with Loctite 222.

G. Gas pedal (fuel injection pump) position sensor B15 in AC 5 (AC 5.2, see page 371/14).

Note! If this sensor is faulty, there occur malfunctions in the DPS automatic speed change (auto1, auto2). Also a faulty engine speed sensor can cause this kind of malfunctions.

If the position sensor has malfunctions, the self–diagnosis shows the fault code **A313**.

1. Check in the test mode FII (table **b** on page **370**/**11**), whether the pedal values are between the given limits. If the function is incorrect, check the position sensor bearings (no clearance) fitting and wires and wear of the pump pin. Also check the sensor. Also check the connector X1A (in engine compartment).

2. Measure, if needed, the position sensor voltages. Check the voltages always before calibrating the pedal. Connect ETV 894 100 between the sensor and its connector (see picture below). If ETV is not available, measure the supply voltage in the wire loom connector (see picture on the next page). Signal voltage can be measured from control unit A1 connector A1A3/4–A1A3/5 (see page 370/25). The voltages can also be measured in connector X1A.

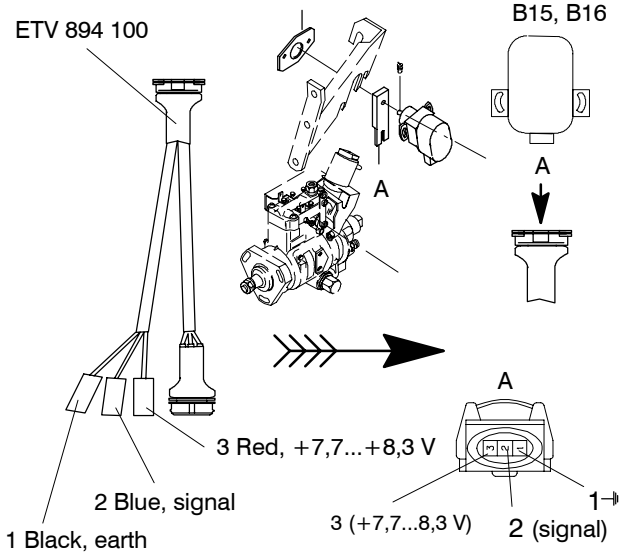
– measure the supply voltage (7,7...8,3 V) between pins 1 and 3.
– measure signal voltage between pins 1 (ground) and 2 (signal). Ensure that the voltage value changes evenly when moving the position sensor lever. Adjust the sensor position if necessary. If the position sensor is faulty, fit a new one in the correct way (punch mark on shaft towards lever) and perform the calibration of the pedal. Adjust the position of the sensor. Fasten the sensor in point, in which the sensor shaft is in the same line with the pump lever shaft (see point A in picture below).

Gas pedal	Pedal up	Pedal in bottom
Signal voltage	5,7–5,8 V	1,5–4,0 V

Adjust the pedal “upper” value and check then that the pedal “bottom” position value is within the given limits. Secure the screw, which fasten the arm to the sensor spindle with Loctite 222.

3. Perform the pedal calibration according to instr. **B** on page **370**/**15**. If the calibration failed, turn the sensor into a little different position and try again the calibration. When needed, try the test with a new sensor.
Only on model **8950** can the sensor be fitted in different way with fitning set no. **345 60 300** (see fitting instruction **39.25**)

Note! The calibration of the gas pedal must be done according to the periodical maintenance program.



H. Detection of driver in AC 5 and 5.2

Purpose of the switch S60

In AC 5 / 5.2 is used for safety reasons so called driver detection system. The detection switch prevents unintentional engagement of the PowerShuttle in the situations, in which the driver does not sit on the seat.

Function

The switch in question has been connected to AC 5/5.2 control unit pin d05. When the driver is sitting on the seat (weight must be over 30 kg), the switch contacts are closed and d05 is activated (GND control). The function of the switch can be seen in table **a** on page **370**/**10** (AC 5) or on page **371**/**8** (AC 5.2). When the driver leaves the seat, the switch contacts open (delay 6 seconds. 4 sec. in program versions 38, 40, 41 and in AC 5.2 30 sec. if the clutch pedal is depressed).

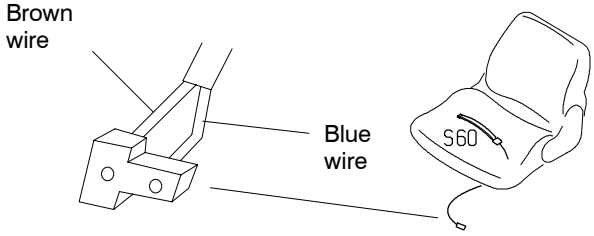
Function in different situations

When the driver engages the PowerShuttle direction, the AC 5 control unit checks the signal from the seat. If there is not a signal (driver does not sit on the seat) , the direction arrow in the AC 5 display starts to blink and the direction is not engaged. After this the direction can be engaged just when the shuttle lever is moved to the parking brake position, the seat signal is activated (driver sits on the seat) and the direction is re–engaged.

If the direction has been engaged (or is being engaged) and the seat signal disapperas (e.g. driver stands up from the seat), a counter is started. The counter damps possible disturbing information, which can appear e.g. when driving on an uneven ground. If the seat signal remains floating (driver does not sit on the seat) over 6 seconds (4 sec. in program versions 38, 40, 41 and in AC 5.2 30 sec. if the clutch pedal is depressed), the Shuttle is disengaged and the direction arrow starts to blink. After this the direction can be engaged just when the shuttle lever is moved into the parking brake position, the seat signal is activated and the Shuttle direction is engaged again.

Checking function of the sensor
– in the test mode FII (digital input d05)
– with ohmmeter in the wire loom connector (beside the seat base). The switch is normally open, but closes, when driver sits on the seat

Changing the sensor
– remove the seat upholstery
– detach the sensor from its holder by pulling it
– remove the sensor together with wire
– pass a new sensor wire and press the sensor into its holder.
– refit the upholstery. Connect the connector. Check the function.



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5. Working orders, AC 5 and 5.2

A. Fitting AC 5 / 5.2 control unit on the tractor

	A	B
1.1	READY–PROGRAMMED AC 5 CONTROL UNIT	UNPROGRAMMED UNIT
1.2	FIT THE UNIT ON THE TRACTOR	FIT THE UNIT ON THE TRACTOR
1.3		INPUT MAIN PROGRAM INPUT PARAMETER FILE After loading the main program file to a control unit, the corresponding parameter file must be loaded as well. When needed, a parameter file can be changed separately (if the control unit has already the correct main program). — see instruction on page 370/24B (HYPERTERMINAL) see instruction on page 370/24D (LOADER 1.5)

2	SETTING MODE FIII	CALIBRATE CLUTCH PEDAL SENSOR CALIBRATE REAR CLUTCH PEDAL SENSOR (in reverse drive controls only),turn the seat at rear position before calibration	INDEX 2	page 370/15
		SET DRIVING SPEED PARAMETER (tyres & transmission) SET OUTDOOR TEMPERATURE UNIT (˚C / ˚F) SET DRIVING SPEED UNIT (km/h / miles/h)	INDEX A INDEX F INDEX S/H	page.370/18 ja 331/6 page. 370/19 page. 370/19
		SET PTO RATIO 1 (LEVER IN FRONT POSITION), in program version 42– SET PTO RATIO 2 (LEVER IN REAR POSITION), in program version 42–	INDEX P INDEX L	page.370/19A
3	WARM THE TRACTOR +30˚...60˚C (transmission oil temperature)			
4	SETTING MODE FIII	CALIBRATE GAS PEDAL SENSOR	INDEX 1	see instruction 370/15
5	TEST MODE FII	CHECK THROUGH THE WHOLE TEST MODE FII. ALL MUST BE OK		page. 370/8 (AC 5) page. 371/7 (AC 5.2)
6	SETTING MODE FIII	SET THE SHUTTLE, DPS AND PTO INITIAL PRESSURES AND PRE–FILLING INDEXES (see page **370**/**24H** (manual setting) or automatic setting in AC 5.2 on page **371**/**11**. Manual setting of PTO clutch, see page **371**/**12A** (AC 5.2).		page. 370/24H (AC 5/5.2) page.371/11 (AC 5.2) page. 371/12A (PTO AC 5.2)
7	TEST–RUN			see instruction 370/24I

B. Programming of AC5 and AC5.2 control unit by means of HYPERTERMINAL –loading program.

The PC used must have "HYPERTERMINAL" –terminal program. Installing can be done with the MS–WINDOWS–program disk. Please note the PC must have Adobe Acrobat 4.0 or later version to view these files. If needed contact your program supplier.

Programming quick instruction (perfect instructions below).

Used main program and parameter files are in tables on page **370/24G.**

B.1 Connect the computer to the unit according to the pictures 1 or 2 (in points 1–3).
B.2 Start the HyperTerminal– program and switch power on (in points 4–5).
B.3 Delete the old main program by typing command REM_MEM and load a new main program (in points 6–9).
B.4 Disconnect and connect communication once more (in points 10).
B.5 Delete old parameter file by typing command LOAD_PAR and load new parameter file (in points 11–15).
B.6 See the check code by typing command PROC_VER? and compare check code on page 370/24G with the table (in points 16–19).
B.7 Carry out settings and test–drive (see page **370/24A** diagram).

NOTE: After loading the main program file to a control unit, the corresponding parameter file must be loaded as well. When needed, a parameter file can be changed separately (if the control unit has already the correct main program).
After programming the check code 1 must be same as in the table.

B.1 Connections

Removed control unit (see picture **1**):
1. Connect the cable of the programming unit (part no. **340 425 00**) to the PC's serial communication port COM 1 (or to COM 2).

2. Connect an AC5.2 control unit A1 to the connections of the programming unit.

3. Connect the power supply. Switch power off (on/off switch). Go to point **4.**

Control unit that has been assembled to tractor (see picture **2**):
1. Switch power of the tractor off.

2. Connect a programming cable (part no. **337 006 00** or **337 006 10**) to the PC's serial communication port COM 1 (or to COM2).

3. Connect the cable to the connector **X43** (at the right side panel).Go to point **4.**

B.2 Starting of the program

4. Turn the PC's power on and start Windows 95 or 98. Insert an AC5 programming diskette (diskettes part. no. page **370/24G**) to the PC's disk drive A: > choose " **My computer** " > choose " **3½ floppy (A:)** " > choose file " **VALT_TRM95_COM1** " or " **VALT_RM95_COM 2** " depending on which COM–port of the computer the cable is connected to (double click) > program " **Hyper Terminal** " starts > wait until the program has started.

5. Switch the programming unit power on (or tractor power on) => text (AC5: **RESET**) or (AC5.2: **Loader v0.4 4Mb**) appears, it means that communication is OK. In case of malfuntion try once more (switch off > switch on).

NOTE! If the transmission between the computer and the control unit fails text **RESET** begins to appear continuously. Press the **button s** (lower case) many times until a text " **Software download, Enter password ?** " appears > press the **backspace button** (<–) ten times > write the password **5533710** > press **Enter** > the control unit start to wait loading a file " **Send download file** " > send the program file (see position **8**).

B.3 Deleting main program and loading the new one

NOTE! If the control unit has not been programmed earlier it is not necessary to perform stage no. **6** (the control unit performs it by itself and goes to stage no.**7**).

6. Write **REM_MEM** ("Caps Lock" off, use "shift" key) > **enter**

7. Appears: **FLASH ERASE. * * * * * *** (the memory of control unit is cleared) > after a few seconds appears: *** * OK * * SEND DOWNLOAD FILE.**

7a From ser. no **J38343** incl. Switch off the tractor current with the ignition switch and switch on again >tractors display is emptied.

8. Choose " **Transfer** " > " **Send text file** "

9. Go to point " **Files of type** " > choose " **All files (*.*)** " > go to point " **Look in** " > choose directory " **Programs** " > choose with double click a suitable program version (with help of the page **370/24G**) > transferring data begins (the process can't be seen in PC's display) wait 3...5 minutes. Windows 2000: wait 15...25 minutes. > when the process is ready text (AC5: **RESET**) or (AC5.2: **Loader v0.4 4Mb**) appears (and display in tractor begins to work) (=OK)

B.4 Reconnect the communication

10. Choose "**Call**" > " **Disconnect** " > " **Call** " > " **connect** ". Go to point **B.5 Deleting and loading of the parameter file**.

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B.5 Deleting and loading of the parameter file (If necessary a parameter file can be deleted and copied separately without deleting the program file).

11. Switch programming unit power off (or switch the tractor power off) > switch power on > appears text (AC5: **RESET**) or (AC5.2: **Loader v0.4 4Mb**) (=OK)

12. Write **LOAD_PAR** ("Caps Lock" off, use " Shift " key) > **enter** > **OK** (old parameters are cleared in memory)

13. Choose " **Transfer** " > " **Send text file** "

14. Go to point " **Files of type** " > choose " **All files (*.*)** " > go to point " **Look in** " > choose directory " **3½–levyke A**: " > choose directory " **Parameters** ".

15. Choose a parameter file by means of table (page **370**/**24G**). double click > appears text (AC5: **RESET**) or (AC5.2: **OK Loader v0.4 4Mb**) (=OK)).

NOTE! If in connection with inputting parameter file the following information appears " **parameters are cleared!!!! card will not work until set!!!** ", carry out again points 12...15 (type **LOAD_PAR>enter**...).

NOTE! If loading of the parameter file has not succeeded, turn the power off for 30 seconds and carry out points 12...15 once more.

B.6 Programming inspection

16. Write **PROC_VER?** > **enter** > a number with four marks appears in PC's display, this clarifies what files are situated in the control unit program file and parameter file (see page **370**/**24G**). Check that the number with four marks correspond to the right control unit part no. and tractor type. If necessary copy parameters once more (stages 11...16).

NOTE! The two last numbers of the check code 1 cannot be **99** (e.g. 53**99**). Then the control unit is missing parameter file.

17. Choose " **Call** " > " **disconnect** "

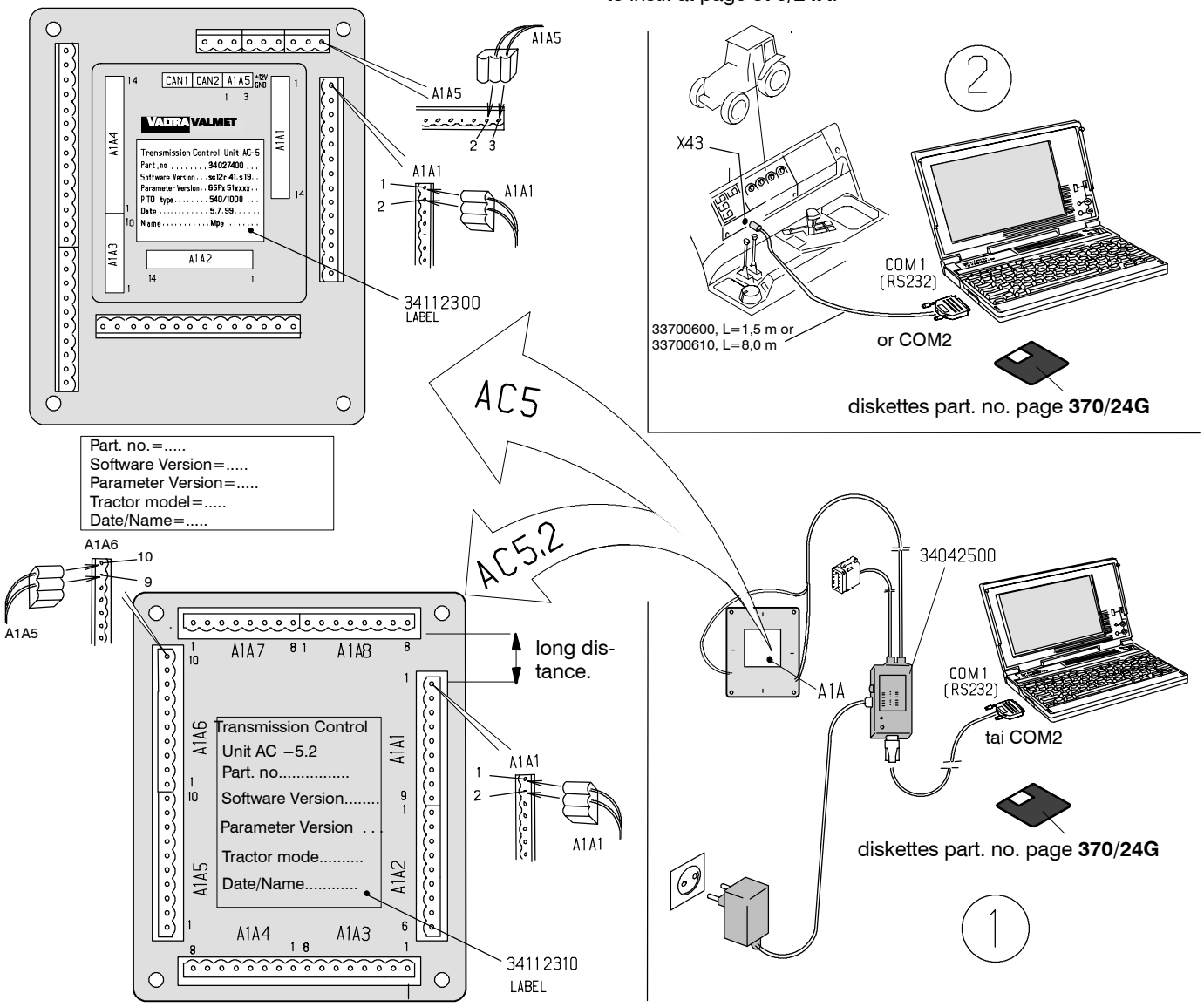
18. Switch programming unit power off (or switch tractor power off).
New control unit: Fill in an adhesive label (part no and file names and tractor model, see table 1) > fasten it on the control unit in the right position (see picture **1**).

19. Disconnect the programming cable from the control unit (or from tractor).

NOTE! Exit from the " Hyper Terminal " program, if the control units you are not going to be programmed.

B.7 Settings and test–drive

20. Carry out settings and test–run the tractor according to instr. at page **370**/**24A**.



C. Programming of AC5 and AC5.2 control unit by means of LOADER 1.5 loading program.

Programming can also be done as before (by means of HyperTerminal in MS Windows, see the service manual page no. **371**/**24B**). Instructions are also included in the disk (Service Manual pages), Please note the PC must have Adobe Acrobat 4.0 or later version to view these files. If needed contact your program supplier.

Programming quick instruction (perfect instructions below).

Used main program and parameter files are in tables on page **370**/**24G.**

C.1 Connect the computer to the unit according to the pictures 1 or 2 (in points 1–3).
C.2 Start the Loader 1.5– program (in point 4).
C.3 Load main program to the unit by clicking ”SOFTWARE” (in points 5–6).
C.4 Load parameter file to the unit by clicking ”PARAMETERS” (in point 7).
C.5 See the check code by clicking “Version” and compare check code on page 370/24G with the table (in points 8–10).
C.6 Carry out settings and test–drive (see page **370**/**24A** diagram).

NOTE: After loading the main program file to a control unit, the corresponding parameter file must be loaded as well. When needed, a parameter file can be changed separately (if the control unit has already the correct main program).
After programming the check code 1 must be same as in the table.

C.1 Connections

Removed control unit (see picture **1**)
1. Connect the cable of the programming unit (part no. **340 425 00**) to the PC’s serial communication port COM 1 (or to COM 2).
2. Connect an AC5 control unit or AC5.2 control unit to the connections of the programming unit. Please see the drawings on pages **370–24E**.

3. Connect the power supply. Switch power off (on/off switch). Go to point **4.**

The control unit is situated in the tractor (see picture **2**).
1. Switch the power of the tractor off.

2. Connect a programming cable (part no. **337 006 00** or **337 006 10**) to PC’s serial communication port COM 1 (or to COM 2).

3. Connect the cable to the connector **X43** (at the right side panel). Go to point **4.**

C.2 Starting the Loader 1.5 program

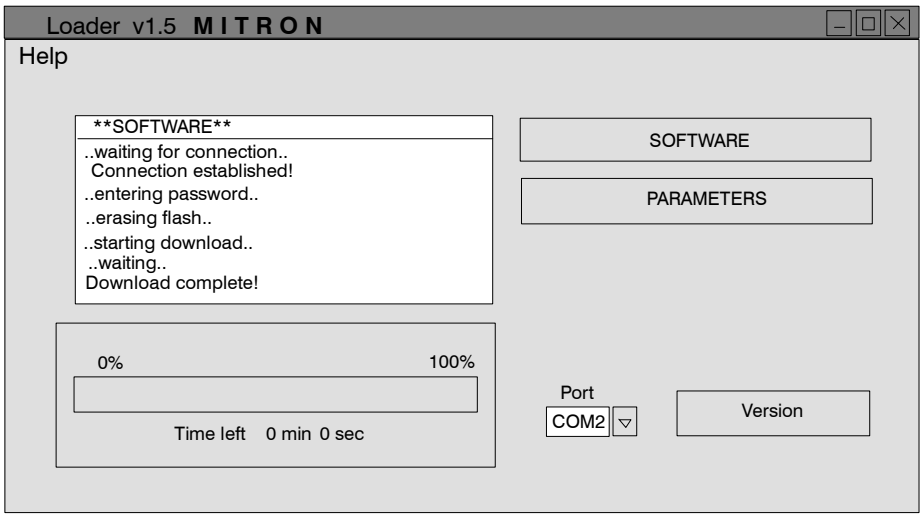
4. Turn PC’s power on and start Windows. Insert a program diskette (diskettes part. no. page **370**/**24G**) to PC’s drive A: > choose ” **My computer**” > choose **“ 3½ floppy (A:) ”** > choose file ” **Loader 1.5** ” (double–click) > program Loader 1.5 starts.

C.3 Loading the main program

5. Go to point ”**Port**” and choose the port where the cable is connected (COM 1/COM 2).

6. Click the button **SOFTWARE** > click the button ” **Browse** ” > choose directory ” **Programs** ” (double–click) > choose a suitable program file (double–click) > the chosen file appears in the window ” **File** ” > click the button ” **Begin Download** ” > turn the power on (programming unit or the ignition switch) > there appears text in the white window explaining what the status is > after a while a blue bar at the lower part of the window begins to grow: it shows how much of the program has been loaded (the point ” **Time left** ” shows estimated time left) > when the loading process is successful the text ” **Download complete!** ” appears in the white window.
Go to point: **C.4 Loading the parameter file**.

NOTE! On page **370**/**24F** there are tips for error situations, if the main program loading has not succeeded.



C.4 Loading the parameter file (Do this always after loading a program file !)

7. Click the button **PARAMETERS** > click the button "**Browse**" > choose directory " **Parameters** " (click the yellow button where there is an arrow up and choose directory Parameters by double–clicking) > choose a parameter file (double–click) > the chosen file appears in the window " **File** " > click the button " **Begin download** " > a loading process begins and a blue bar at the lower part of the window begins to grow > when the loading process is successful the text " **Parameter download successful!** " appears in the white window.

NOTE! On page **370/24F** there are tips for error situations, if the parameter file loading has not succeeded.

C.5 Checking and markings

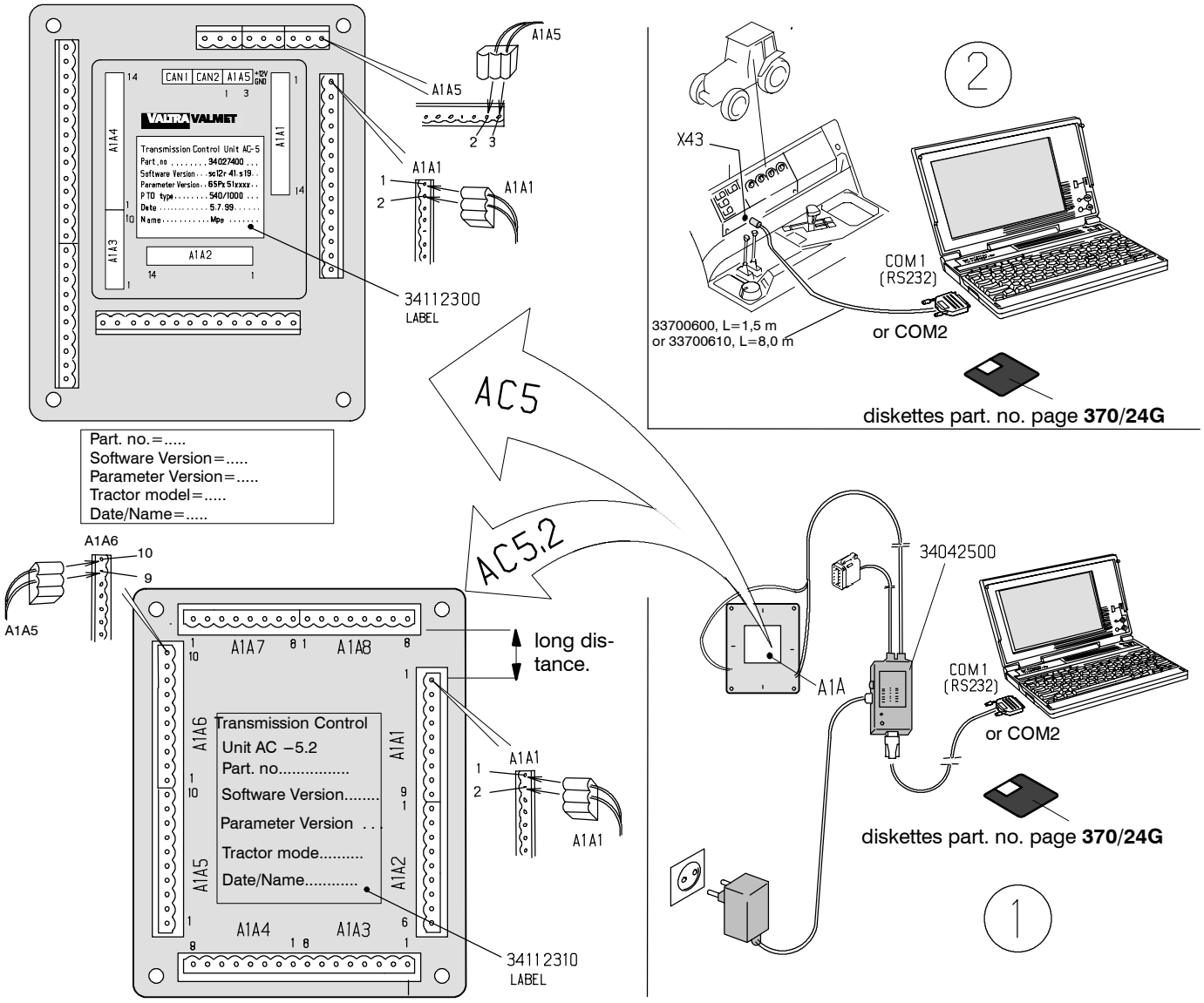
8. Click the button " **Version** " > after a few seconds the program identification number e.g. 86 17 can be seen in the white window (check **code 1**) > confirm that the check code corresponds to the tractor model (see page **370/24G**).

9. Turn the power off (switch off program unit or ignition switch) > if the more control units are not going to be programmed, exit from the Loader program by clicking **X button** (at the upper right corner of the window). Disconnect the programming cable from the connector **X43**.
If an unfixed control unit is being programmed, let the connectors of the programming unit be connected in the control unit (fastening of the label in right position is easier).

10. New control unit: Fill out an adhesive label (part no and file names and tractor model) > fasten it on the control unit in right position (see picture **1**) > disconnect the cables from the control unit.

C.6 Settings after programming (after fixing the control unit in the tractor)

11. Carry out settings and test–drive according to the instructions at page **370/24A**.



Tips for error situations

When loading the main program

1. The loading process does not start or program execution stops (there is no more text after text " **waiting for connection..** "**:**
Click the button " **Cancel** " > the loading process stops (text " **Download cancelled** " appears) > check that the right communication port at point " **Port** " has been chosen (it must be the same port where the cable to the PC has been connected) > check that the power has been turned on (at programming unit or by ignition switch) > check that the cables to the right connectors of the control unit have been connected (connector positions are different on **AC5** control unit **333 730 10** and on **AC5.2** control unit **333 730 20** and **333 730 30**).

2. The loading process of a main program is almost ready but the process does not become complete, text " **waiting**" stays at the window for a long time. (however the main program is usually already loaded)**:**
Press the button " **PARAMETERS** " > load the parameter files. If the parameter file can be loaded successfully, press the "**Version**" button > If the software check code is right the control unit has been programmed completely.

3. Error message " **Download failed** "**:**
Loading a file to the control unit has failed. This can appear if the power supply for the control unit is not OK all the time, or the communication between the PC and the control unit does not work properly > check that the programming cable/unit is OK > check also that the control unit has power supply (a fuse in the programming unit). > Try to load a program once more.

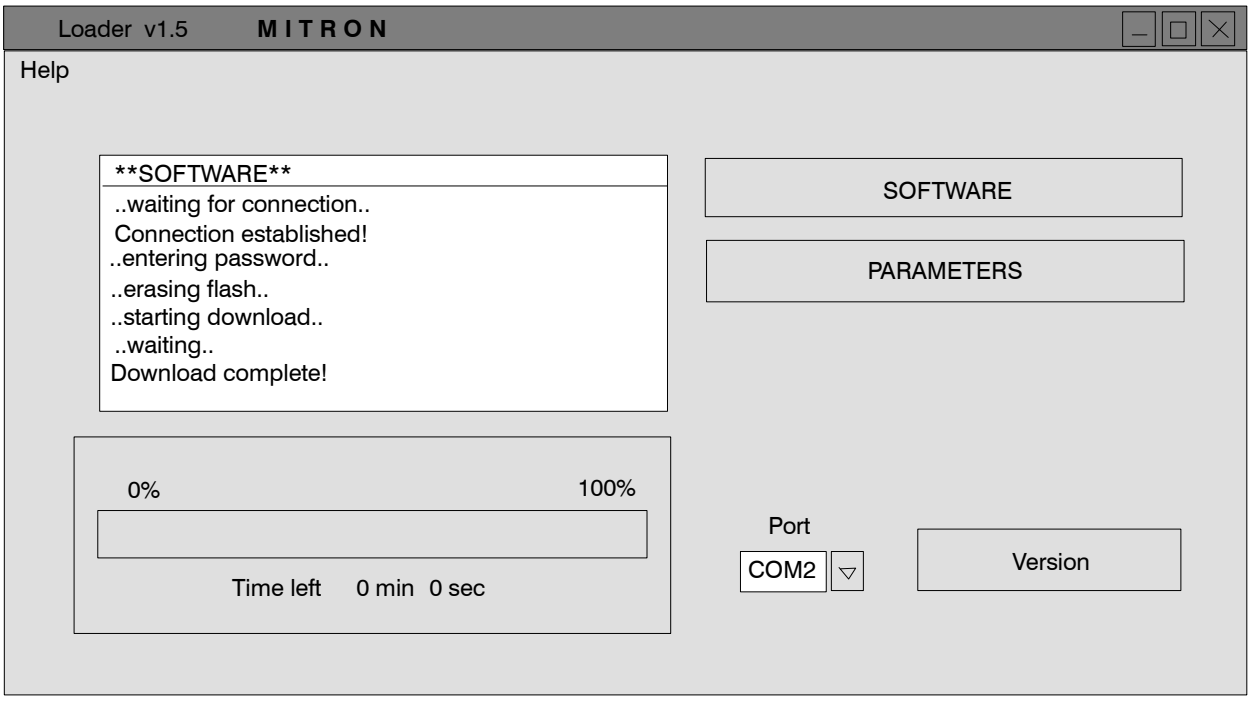
4. Message " **Download end** "**:**
Loading a file to the control unit has failed > Try to load once more > If the same message " **Download end** " appears every time, try to load a parameter file > Check the software check code by pressing the button " **Version** " > If the check code is OK the control unit has been programmed properly

5. It is not possible to program a control unit or to check the version number**:**
Exit from the Loader 1.5 program > try to program the control unit by means of the HyperTerminal program, see the instructions at page **370/24B**.

When loading a parameter file

1. Error message **" !Error! Cannot start download** " when loading a parameter file**:**
Downloading of a parameter file did not start > turn the power off for 10 seconds and turn the power on again > Try to send the parameter file again.
(Repeat turning of the power off if needed and hold the power off for a minimum of 30 seconds.)
If the problems persists, load the main program file and the parameter file once more.

2. The software check code does not appear by pressing the " **Version button** "**:**
Wait for a while > press the " **Version** " button again. If the check code does not appear turn the power off for 3–5 seconds > Press the " **Version** " button again > If the check code does not appear load the program file once more.



D. Main program and parameter files tables of AC5 and AC5.2 –control units

AC5: 340 42 260

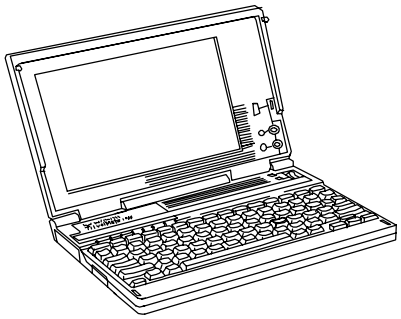
Autocontrol 5

TABLE 1: Control unit part numbers and file names, versions **53** and **65**. These parameter files and check codes are used in Service and in Spare Parts. The program disk part no is 340 422 60.

For tractors no.	Suitability tractor models	Control unit part no.	Program file-name [3])	Parameter file name [3])	Check **code 1** [1])	Check **code 2** [2])
– –	– –	333 730 10	Not programmed	Not programmed	– –	– –
–J38342	6250, 6350, 6550, 6650, 6850, 8050, 8150, 8450,8550, 8950	340 272 30	AC5V**53**.s19	6250_8950_5365.txt	53 23	23 53
–J38342	8350	340 276 30	AC5V**53**.s19	8350_5365.txt	53 33	33 53
J38343 –K41106	6250, 6350, 6550, 6650, 6850, 8050, 8150, 8450, 8550, 8950	341 573 30	AC5V**65**.s19	6250_8950_5365.txt	65 23	23 65
J38343 –K41106	8350	341 574 30	AC5V**65**.s19	8350_5365.txt	65 33	33 65

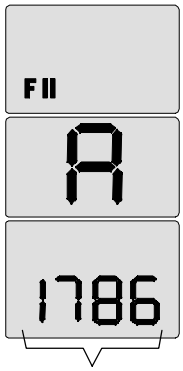
[3]) The files can be copied into the control units which have number **333 73 010** and the ser. no. end is **00400** or greater.

CODE 1



[1]) Check code 1 is visible in the PC display by typing command **PROC_VER?** (HYPERTERMINAL) or by clicking "**Version**" (LOADER 1.5)

CODE 2



[2]) Check code 2 is visible in the tractor display (in the test mode **FII**)

AC5.2: 344 04 620

Autocontrol 5.2

TABLE 1: Control unit part numbers and file names, version **86.** In Service, these parameter files and check codes are used in Spare Parts and in production. The program disk part no is 344 046 20.

For tractors no.	Suitability tractor models	Control unit part no.	Program file-name [3])	Parameter file name [3])	Check **code 1** [1])	Check **code 2** [2])
-		333 730 20 333 730 30	Not programmed	Not programmed	–	–
K41107–	6250, 6350, 6550, 6650, 6850	344 038 20	AC5V**86**.s19	6250_6850_86.txt	86 17	17 86
K41107–	6250, 6350, 6550, 6650, 6850 **+ HiTrol**	344 039 20	AC5V**86**.s19	6250_6850_HT_86.txt	86 27	27 86
K41107–	6750	347 884 20	AC5V**86**.s19	6750_86.txt	86 67	67 86
K41107–	8050, 8150	344 041 20	AC5V**86**.s19	8050_8150_86.txt	86 37	37 86
K41107–	8350	344 043 20	AC5V**86**.s19	8350_86.txt	86 47	47 86
K41107–	8450, 8550, 8950	344 044 20	AC5V**86**.s19	8450_8950_86.txt	86 57	57 86
K41107–	X100, X110, X120	344 038 20	AC5V**86**.s19	X100_X120_86.txt	86 17	17 86

[3]) The files can be copied into the control units which have number **333 73 020** or **333 73 030**.

E. Manual setting of indexes for DPS and shuttle in AC 5 and 5.2

NOTE! When needed, manual setting can be done in the **AC5.2**, if automatic calibrating cannot give a correct value.

1. Drive the tractor warm, transmission temperature +30˚C...+65˚C.

2. Shuttle in P−position, gear H1, with accelerator lever 1200−1500 r/min.

Note! It is unnecessary to stop the engine after the index setting. Enough is that the tractor current is switched off and then immediately on, so that the tractor can be driven. In the same way not to stop the engine it can be moved to the setting mode FIII. In this case must simultanious be pressed switches, which activate the test mode.

3. Shuttle pre−filling time indexes		
Setting mode FIII H1 1200−1500 r/min	Set the F−clutch initial pressure index to: −6 Set the R−clutch initial pressure index to: −6	Index 5 Index 6
	Set the F−clutch pre−filling time index to: −3 Set the R−clutch pre−filling time index to: −3	Index 3 Index 4
	Make starting drivings forwards with the shuttle lever. Increase pre−filling index one step by turns (−3, −2, −1, 0, +1, +2, +3, +4...) until the jerk is disturbing. Diminish the index 1−2 steps. Check that in the starting driving there is a clear but small jerk.	Index 3
	Set the R−clutch pre−filling index in the same way	Index 4



4. Shuttle initial pressure indexes		
Setting mode FIII H1 1200−1500 r/min	Increase F−direction initial pressure index one step by turns (−4, −3, −2, −1, 0, +1, +2, +3, +4...) and make starting drivings with the shuttle lever. Index is suitable, when the tractor accelerates evenly and there is not delay or break in the traction.	Index 5
	Set the R−direction initial pressure index in the same way	Index 6
Test mode FII H1 1200−1500 1/min	Start the engine and activate the test mode FII and find point A4. Depress the clutch pedal and switch on the forward driving (F). Raise the pedal slowly and watch the display and observe in which pedal position the tractor starts to move (%−value).	
	Switch on the R−direction. When starting driving rearwards the %−value must be about 10 %−units greater that when starting driving forwards. E.g. in forward driving 20/rearward driving 30. If the forward driving value is the same or greater that the rearward driving value, recheck the initial pressure indexes. NOTE! In the AC 5.2 can the pedal engaging point be adjusted with a separate index (see page **371**/**10**).	



5. DPS initial pressure indexes				
Setting mode FIII H1 1200−1500 r/min	Check the function of the DPS in different situations: different driving speeds, in traction, without traction, in engine braking. − If the traction breaks when engaging the speed, increase the index. − If the engagement is too sharp, decrease the index			
	The function of DPS and indexes			
	switching the quick−shift gear	Closing clutch (during shifting).	Pressurized clutches (after shifting).	Index no:
	1 − > 2 2 −> 3 3 −> 2 2 −> 1	C3 C2 C1 C2	C1 + C3 C2 + C3 C1 + C3 C1 + C2	Index 9 Index 8 Index 7 Index 8

6. Carry out a test−run (see instruction 370−24E)

D. Test–run, AC 5 and 5.2

HiTech –tractors shall be test–run always after repair works and, when necessary, also in connection with fault tracing:

Before the test–run:

- If the tractor has been repaired, carry out all points in the test mode; all functions must be OK before the test–run.
- If the fuel injection pump or its linkage has been repaired or adjusted, calibrate the gas pedal position sensor B15
- If one of the DPS or shuttle proportional valves has been changed, the resetting of the shuttle and the DPS pre–filling time and initial pressure indexes must be done.
- If a new AC 5 / 5.2 control unit (A1) has been fitted or it is reprogrammed, carry out the following settings in the setting mode FIII:
– driving speed parameter, temperature and driving speed units
– calibration of the clutch pedal and gas pedal sensors
– resetting of the pre–filling times and initial pressure indexes of shuttle, DPS and PTO.

Test–run, general:

– test–run the tractor on a safe place, not IN TRAFFIC
– observe the display unit during the test–run; if a fault code appears, repair the fault and carry out a new test–run
– if a minor fault appears during the test–run, the control unit shows a fault code in the display; often driving can be continued but clutch pedal must be used when starting driving and when the driving direction is changed.
– If a serious fault appears during the test–run, the control unit prevents driving or using PTO to protect the transmission against break–downs
– Check, that the HiTech display shows near the same driving speed as the AD–instrumentFunction of the safety systems:

Safety system

– Start prevention: try to start the engine with shuttle lever in positions F–R–N–P (clutch pedal depressed); the engine is allowed to start only in P–position (parking brake applied), and the engine is not allowed to start, if the clutch pedal is in the upper position
– Driver detection (in the seat): stand up from the seat, after 7…10 seconds engage direction F (speed gear engaged, clutch pedal up); The tractor is not allowed to move, and the direction arrow in the display starts to blink, (to continue driving: sit on the seat, move the shuttle lever to pos. P and engage after that the driving direction). AC 5.2: the delay of the seat switch is 30 sec, if the clutch pedal has been depressed.
– Emergency brake system: switch off current with the ignition switch (driving speed max. 2 km/h for the safety); the parking brake must engage after a while.

Function of the parking brake (HiBrake):

– Drive below 4 km/h (below 2 km/h in program versions 42, 43, 60, 62), apply parking brake: parking brake must engage after a while
– Drive at a speed of 5…6 km/h, apply parking brake; the parking brake must engage just when the driving speed has dropped below 4 km/h (below 2 km/h in program versions 42, 43, 60 and 62).
– The parking brake must disengage (engine running) in the shuttle lever positions N–F–R Function of HiShift function:

Function of HiShift

–Start driving (several times) by using the HiShift button, the tractor must start to move with even acceleration (not jerks or long delay)
– Drive ahead over 10 km/h, change gears 1–2–3–4 by using HiShift buttons (without clutch pedal); traction must again continue when the HiShift button is released.

Function of the clutch pedal:

– Start driving slowly with the clutch pedal: traction must engage evenly without a sharp jerk
– Start driving faster with the clutch pedal : the tractor must start to move without delay.
– Start to move by allowing the pedal rise fast to the top position (slip foot to one side on the pedal). In this case the automatics take care of a smooth start.

Function of the reverse shuttle:

– When the engine is running (shuttle lever in pos. P) engage gear H1
– Move the lever to pos. N ; the shuttle must further be in neutral
– Start driving forwards by moving lever to pos. F (without clutch pedal); repeat many times
– Start driving rearwards by moving lever to pos. R, repeat many times
– Compare starts with the shuttle lever and the HiShift–button. They must function with the same speed.
– Drive below 10 km/h forwards, move then the lever to R–position (hand gas lever 1200…1500 rpm); the driving direction change must start immediately (shuttle brakes) and the R–direction must engage smoothly but fast, when the tractor is almost stopped
– Drive over 10 km/h forwards, move then the lever to R–position (hand gas lever 1200…1500 rpm); the driving direction change must start at a speed of about 10 km/h.

Function of DPS, manual mode:

– Turn the DPS –rocker switch to ”man” –position (front edge depressed), change during driving DPS speeds with buttons in the gear lever knobs, use also engine revs between 1700…2000 rpm; the speeds should engage without sharp jerks and without any long delay
– Change quickly with double–click 1=>3 and 3=>1; although the display does not show the speed 2 , the DPS speed must change via speed 2.
– Turn the DPS rocker switch to pos. ”Auto1” (AUTO 1 in display); test by driving in M–range that the DPS changes speed when the loading varies (use an implement if necessary), Auto1 –program tries to keep the engine revs high
– Turn the DPS–switch to pos. ”Auto2” (AUTO 2 in display); drive with range gear H and ensure that the DPS changes speed when the driving speed varies, Auto 2 allows larger engine rev variations than Auto1. In AC 5.2 the AUTO 2 functions with fixed revs and is adjustable, see page 371/4.
– Turn the DPS–switch to pos. ”man”, pre–program the DPS speeds F II / R III, carry out driving direction changes (without the clutch pedal); the correct, pre–programmed DPS speed should engage in both driving directions.

Function of PTO (use implement, if needed, as a load):

– Select with the lever PTO speed 1 (front position of the lever), start the PTO, PTO symbol must light up in the display, keep engine revs at about 1800 rpm for about 30 seconds.
Note the changed PTO starting custom in program version 42– (starting at least 3 seconds). Also check possible rear push buttons for PTO (option)
– Try the same with PTO speed 2 (lever in the rear position)
NOTE! In AC 5.2 there are as option the PTO start/stop buttons on the rear mudguards, which have 3 sec. engaging delay.

4WD automatics (AC 5.2 only)

The automatics are activated, if the value of index **U** (in the setting mode menu) is 1 (=factory value).

– turn the 4WD rocker switch into OFF position (left side down). When starting driving and when changing driving direction the 4WD must be engaged for a while. The 4WD must be engaged also when using HiShift buttons, if the driving speed is below 10 km/h. The 4WD must be disengaged at least when the driving speed exceeds 10 km/h.

Automatic traction control (AC 5.2 only)

– let the engine idle and switch on the AutoTraction control with the “Nauto” switch (right edge down).
Symbol N starts to flash in the display. Engage gear H1 and switch on the driving direction.
Raise the engine revs with the gas pedal over 1020 r/min, at which time the tractor must start to move softly (do not use the clutch pedal). The traction must be disengaged, when the brakes are depressed while the driving speed is below 10 km/h, the traction must also be disengaged, if the gas pedal is released and the engine speed lowers under 970 r/min.
The traction control is switched off by stopping the tractor and by moving the shuttle lever into position P.

Checking fault code memory (AC 5.2only)

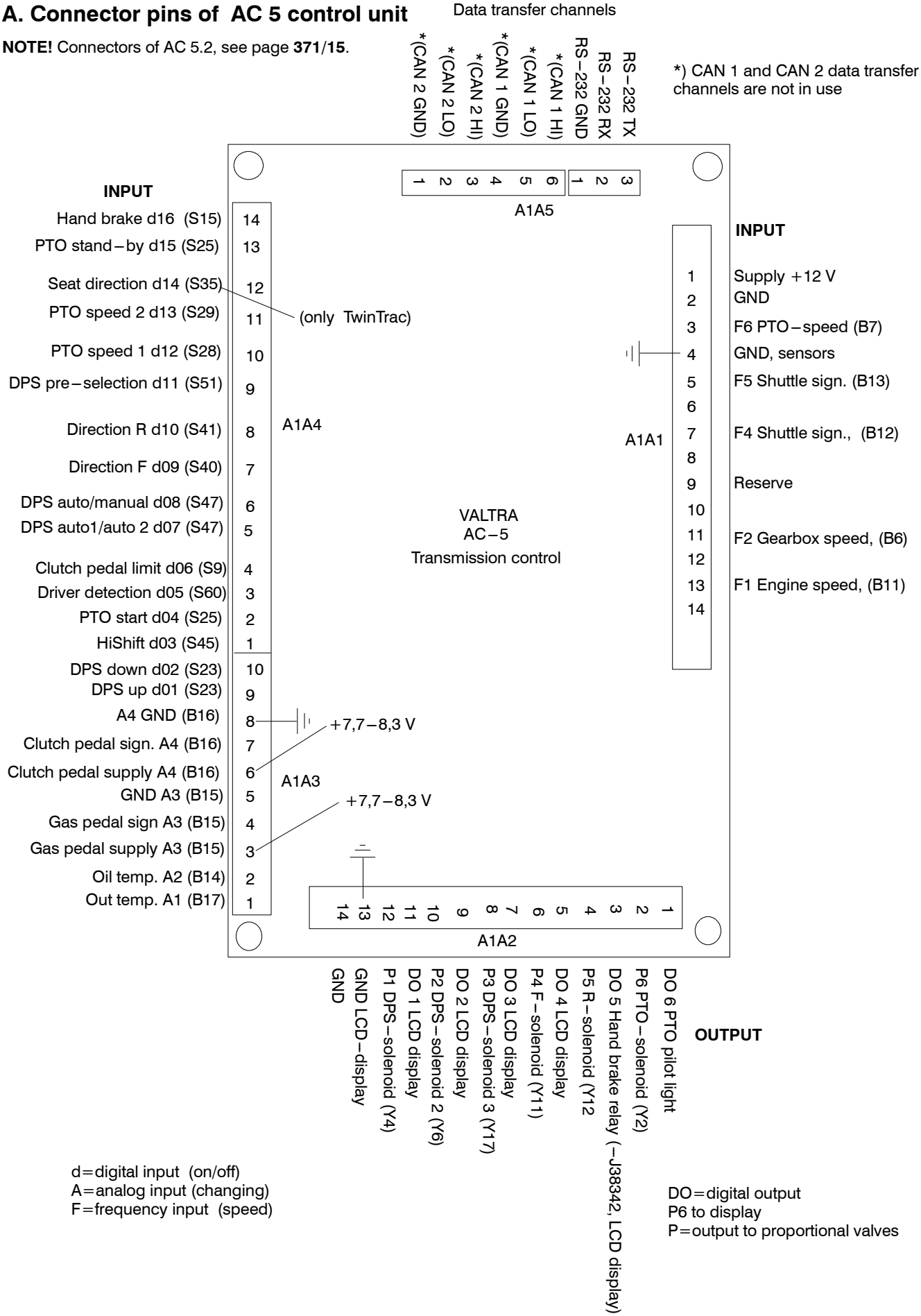
Check after the test–run if there are fault codes in the memory . If so, repair the faults and empty the fault code memory by pushing the DPS pre–programming button over 4 seconds (see page 371/6)

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6. Others

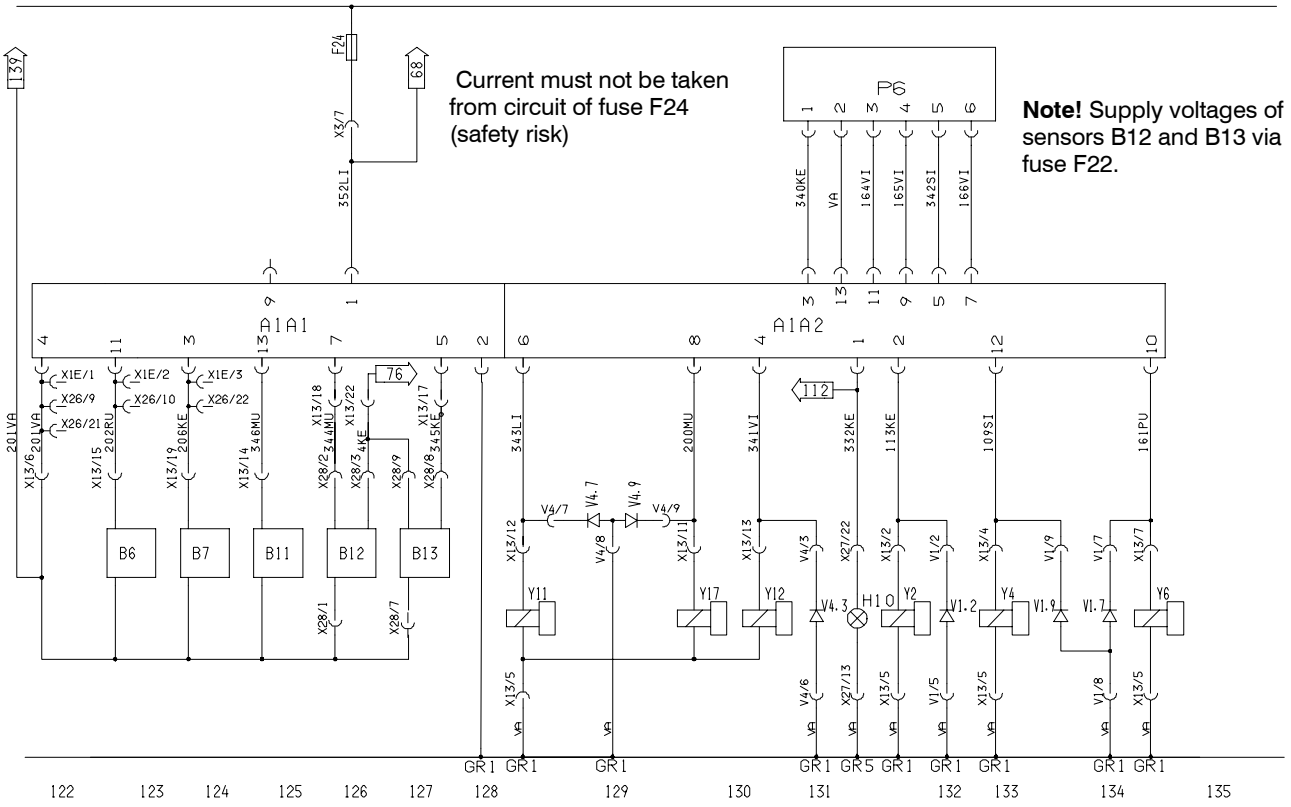
A. Connector pins of AC 5 control unit

NOTE! Connectors of AC 5.2, see page **371/15**.

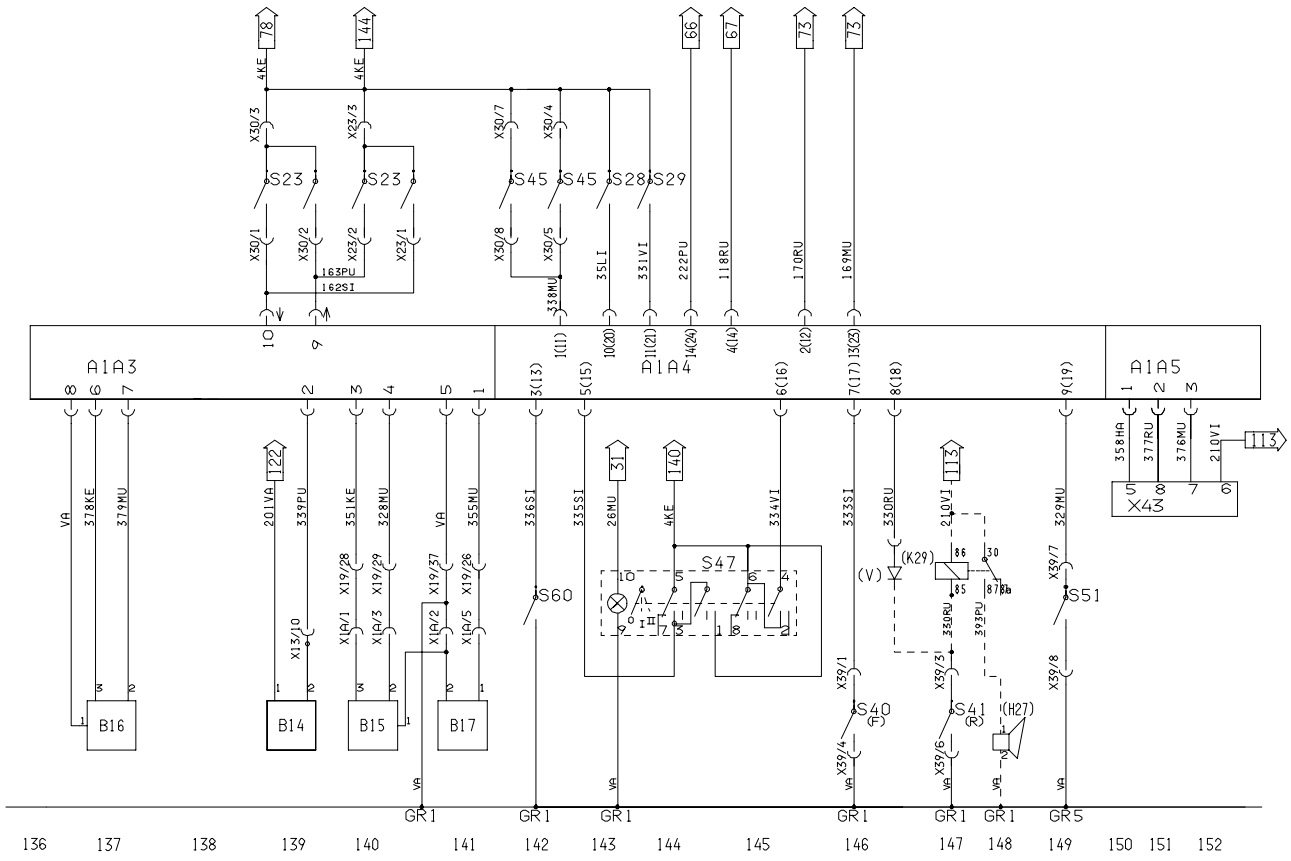


Wiring diagram AC5 1

– J38342 (AC 5).



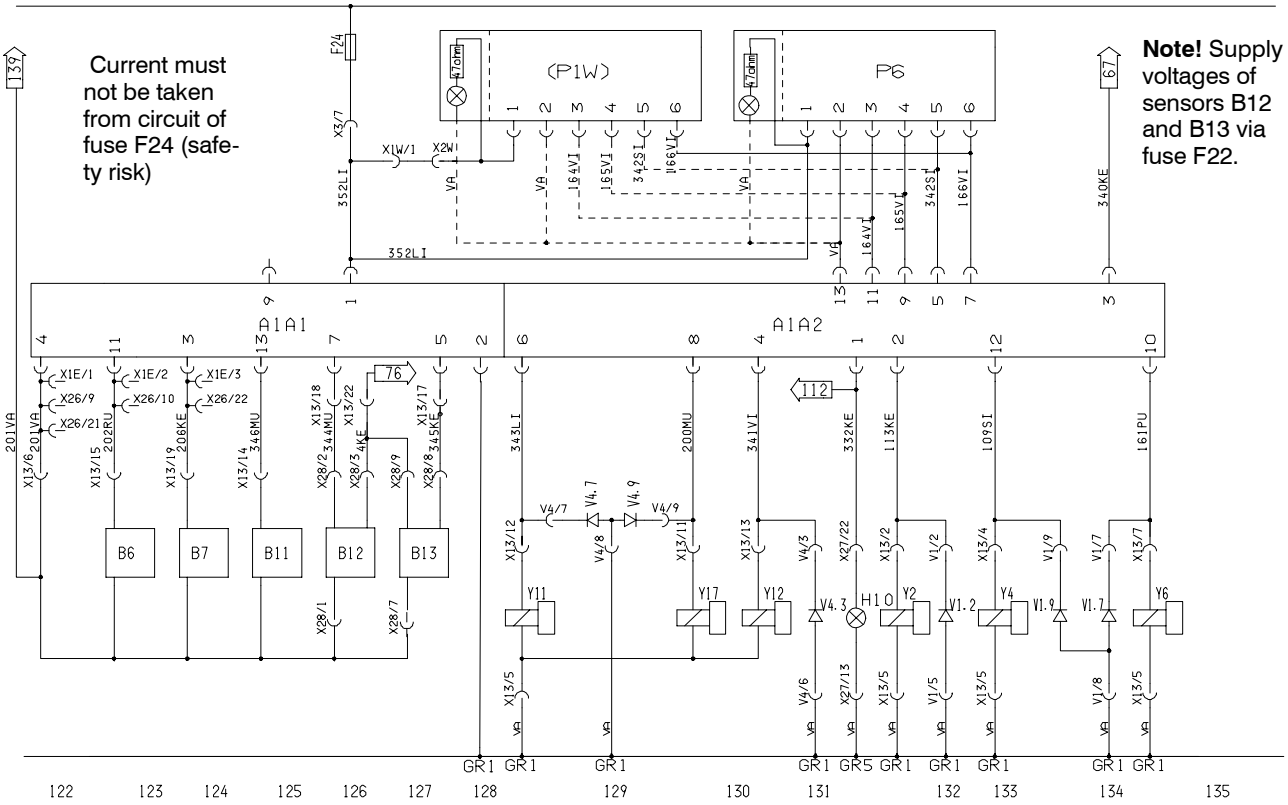
Wiring diagram AC5 2



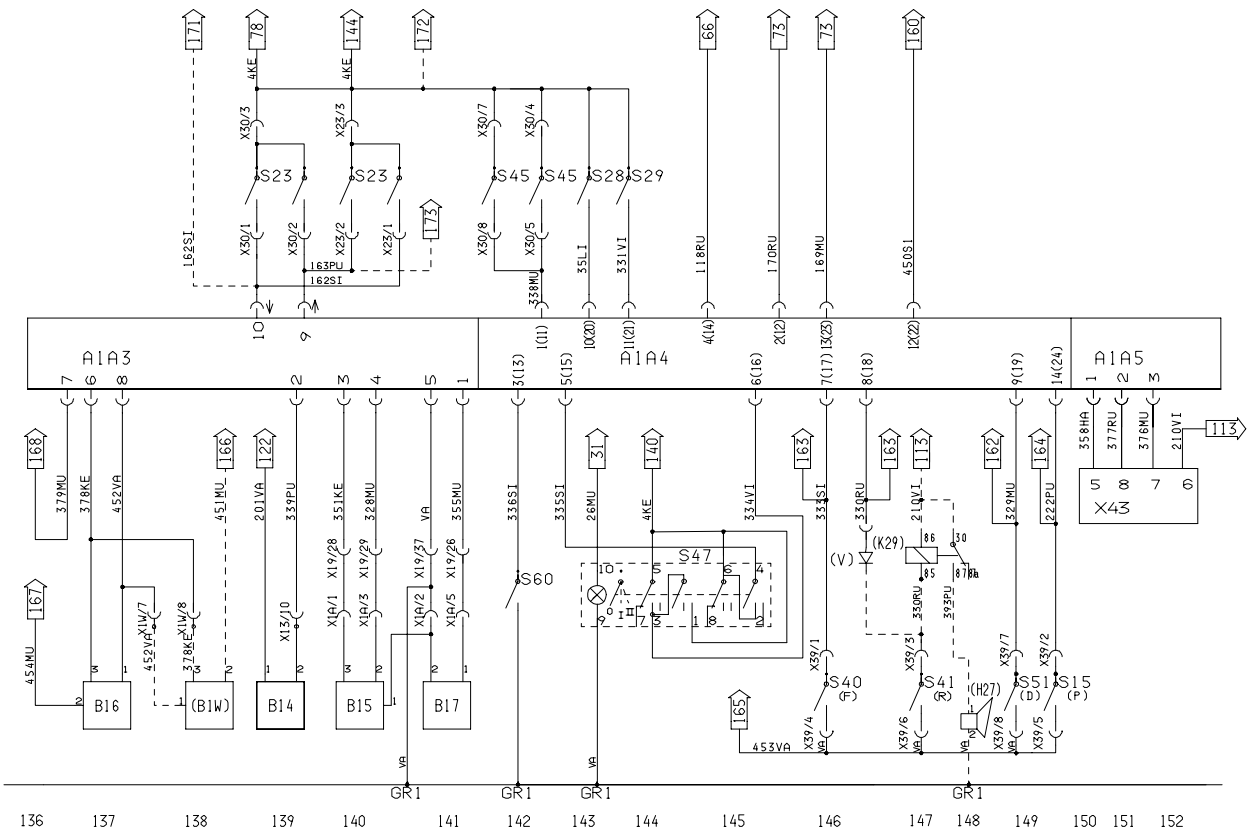
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Wiring diagram AC5 1

J38343–K41106 (AC 5)



Wiring diagram AC5 2



B. Wiring diagrams AC5

(The diagrams also under code 310). Position of connectors, see pages **310**/**6C** och **6D**.

A. Control unit A1 connector A1A1

F24: AC5 fuse in the fuse box

B6: Gearbox speed sensor
B7: PTO speed sensor
B11: Engine speed sensor
B12: Shuttle speed sensor
B13: Shuttle speed sensor

Position of connectors:

X13: Connector for transmission (37 pins) on the support plate in the lever console.
X28: Connector for shuttle sensors (9 pins) in the lever console
X26: White connector (26 pins) in the rear face of the combination instrument.
X1E: Connector (9 pins) for ACD power lift speed sensors on the support plate in the lever console (also connector X2E).

GR1: earth point in the rear part of the lever console

B. Control unit connector A1A2

P6: AC5 display unit
H10: PTO ind. light

Y11: Proportional valve, forward driving (F)
Y17: DPS proportional valve (C3)
Y12: Proportional valve, rearward driving (R)
Y2: PTO proportional valve (PTO)
Y4: DPS proportional valve (C1)
Y6: DPS proportional valve (C2)

Position of connectors:

X13: Connector for transmission (37 pins) on the support plate in the lever console.
X27: Blue connector (26 pins) in the rear face of the combination instrument.
V1: diode box for solenoid valves Y1, Y2, Y3, Y4 and Y6 on the support plate in the lever console.
V4: diode box for solenoid valves Y11, Y12 and Y17 on the support plate in the lever console.

GR1: earth point in the rear part of the lever console
GR5: earth poin in the cab front wall

C. Control unit connector A1A3

B16: Clutch pedal position sensor
B14: Gearbox temperature sensor
B15: Gas pedal pisition sensor
B17: Outdoor temperature sensor

S23: DPS push buttons up/down

Position of connectors:

X13: Connector for transmission (37 pins) on the support plate in the lever console.
X19: Connector (37 pins) on the cab front wall on the RH side.
X1A: Connector (9 pins) for the engine sensors in the front part of the engine compartment near the thermostat housing.
X23: Connector for DPS push buttons in the lower part of the gear levers
X30: Connector (9 pins) for gear lever push buttons in the lower end of the levers.

GR1: earth point in the rear part of the lever console

D. Control unit connnectors A1A4 and A1A5

S45: HiShift push buttons in the gear lever knobs
S28: PTO switch at the PTO lever (540)
S29: PTO switch at the PTO lever (1000, 540E)
S47: Auto1/Auto2//Man switch for the DPS
S40: Reed relay, forward driving (F) (in the shuttle lever)
S41: Reed relay, rearward driving (R) (in the shuttle lever)
S51: DPS pre–programming button
S60: Seat safety switch (detection of driver)
H27: Back buzzer
K29: Relay for the back buzzer

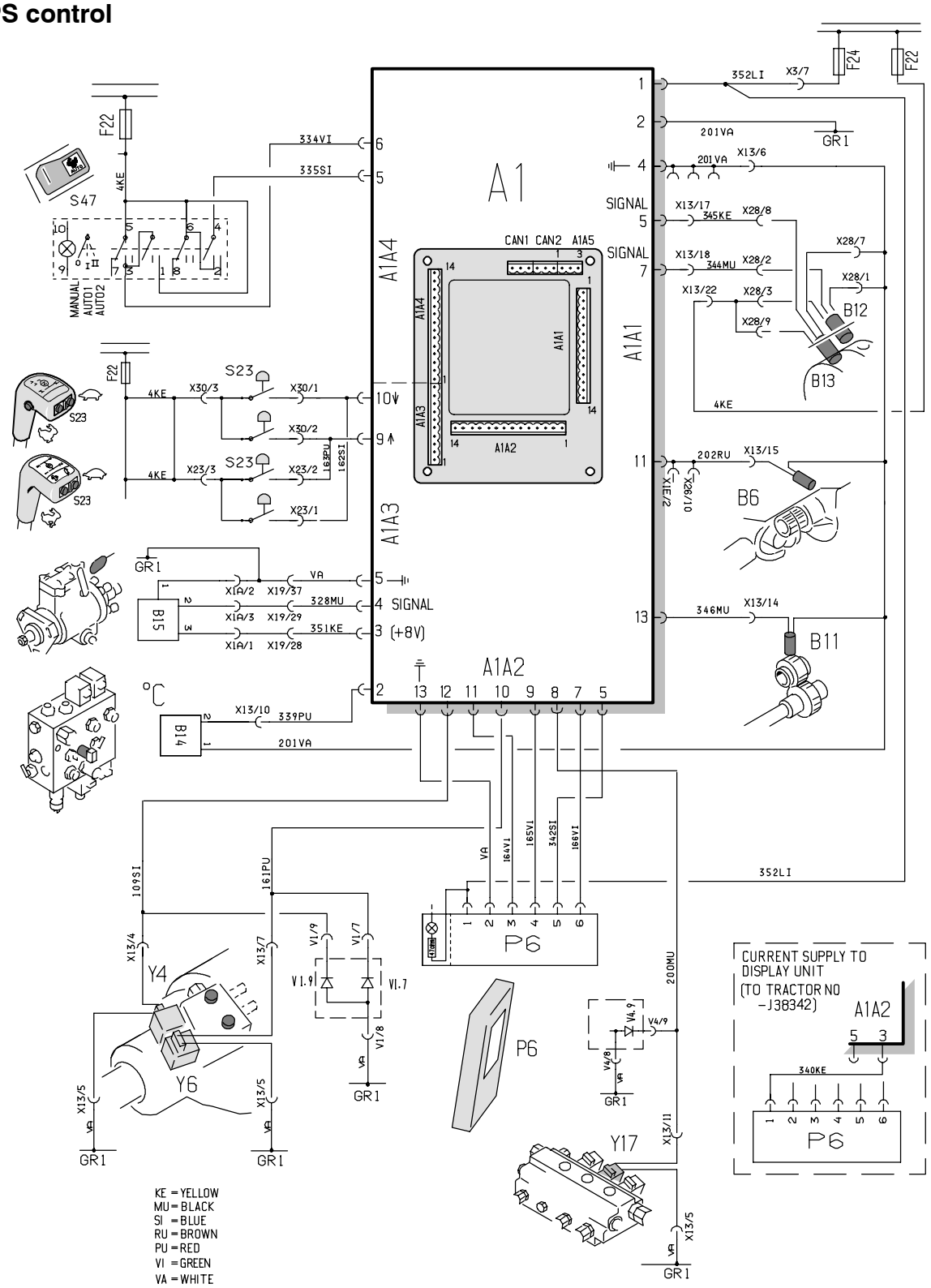
Position of connectors:

X30: Connector (9 pins) for the gear lever push buttons in the lower end of the levers.
X39: Connector (9 pins) for the shuttle lever at the steering wheel under the dashboard.
X43: RS–232 connector on the lever console

GR1: earth point in the rear part of the lever console
GR5: earth point in the cab front wall

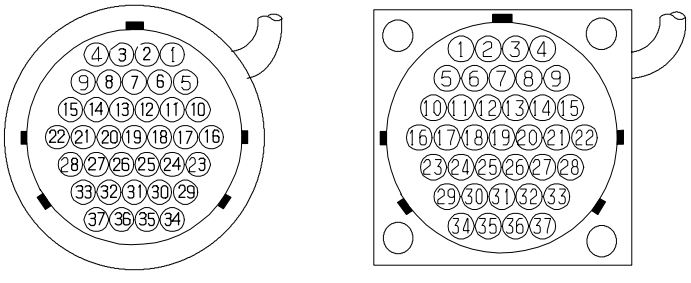
C. Control diagrams, AC 5. **Note!** Control diagrams of AC 5.2, see page **371/18–22.**

DPS control

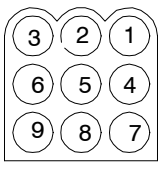


KE = YELLOW
MU = BLACK
SI = BLUE
RU = BROWN
PU = RED
VI = GREEN
VA = WHITE

X13

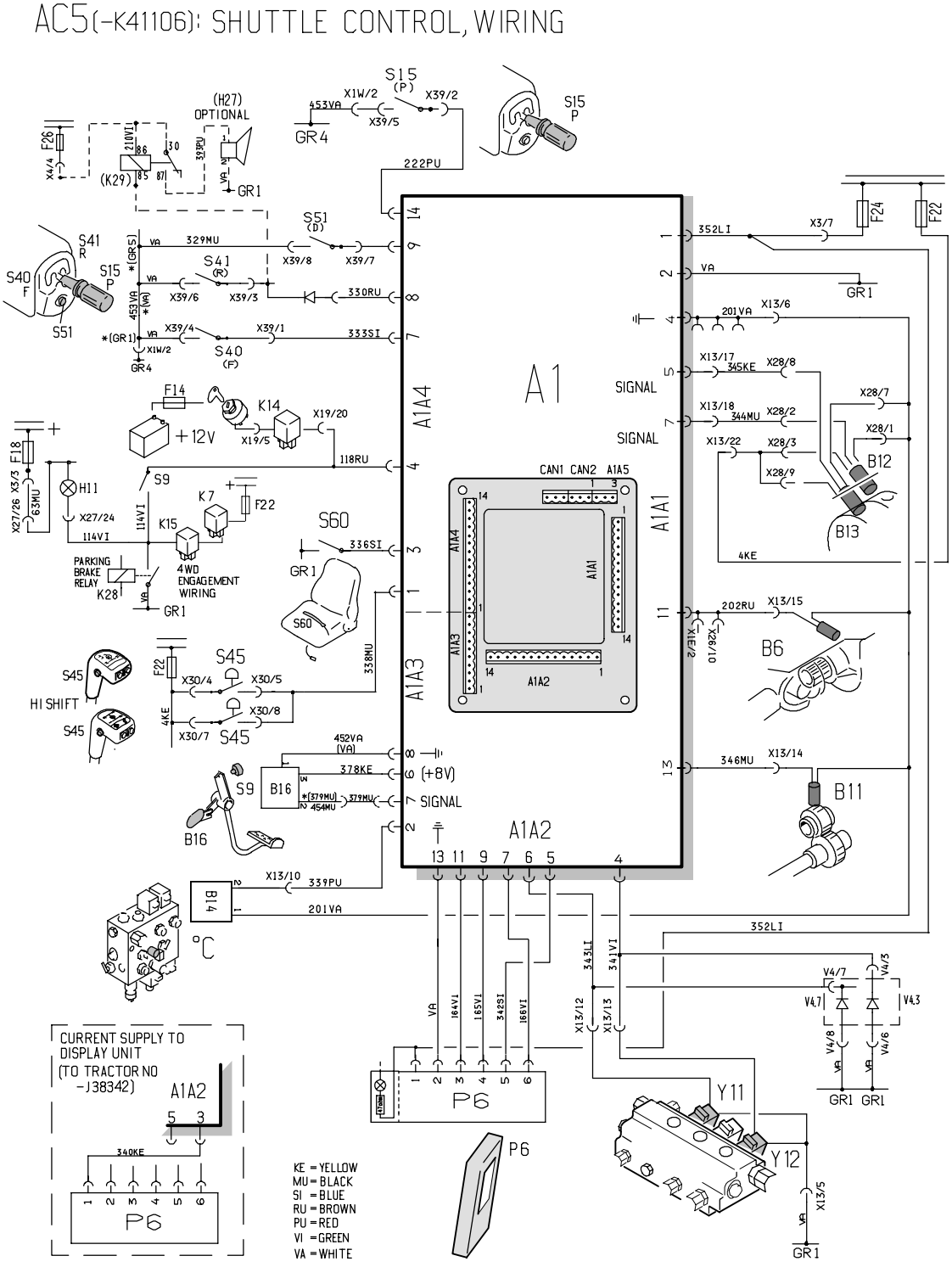


V1, V4



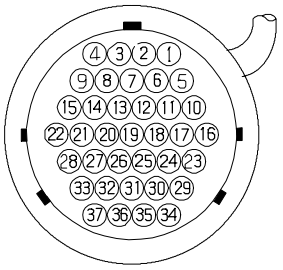
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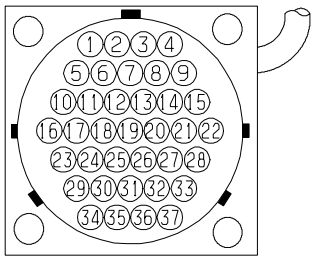
Control of shuttle, AC 5



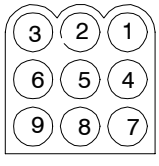
*(-J38342)

X13



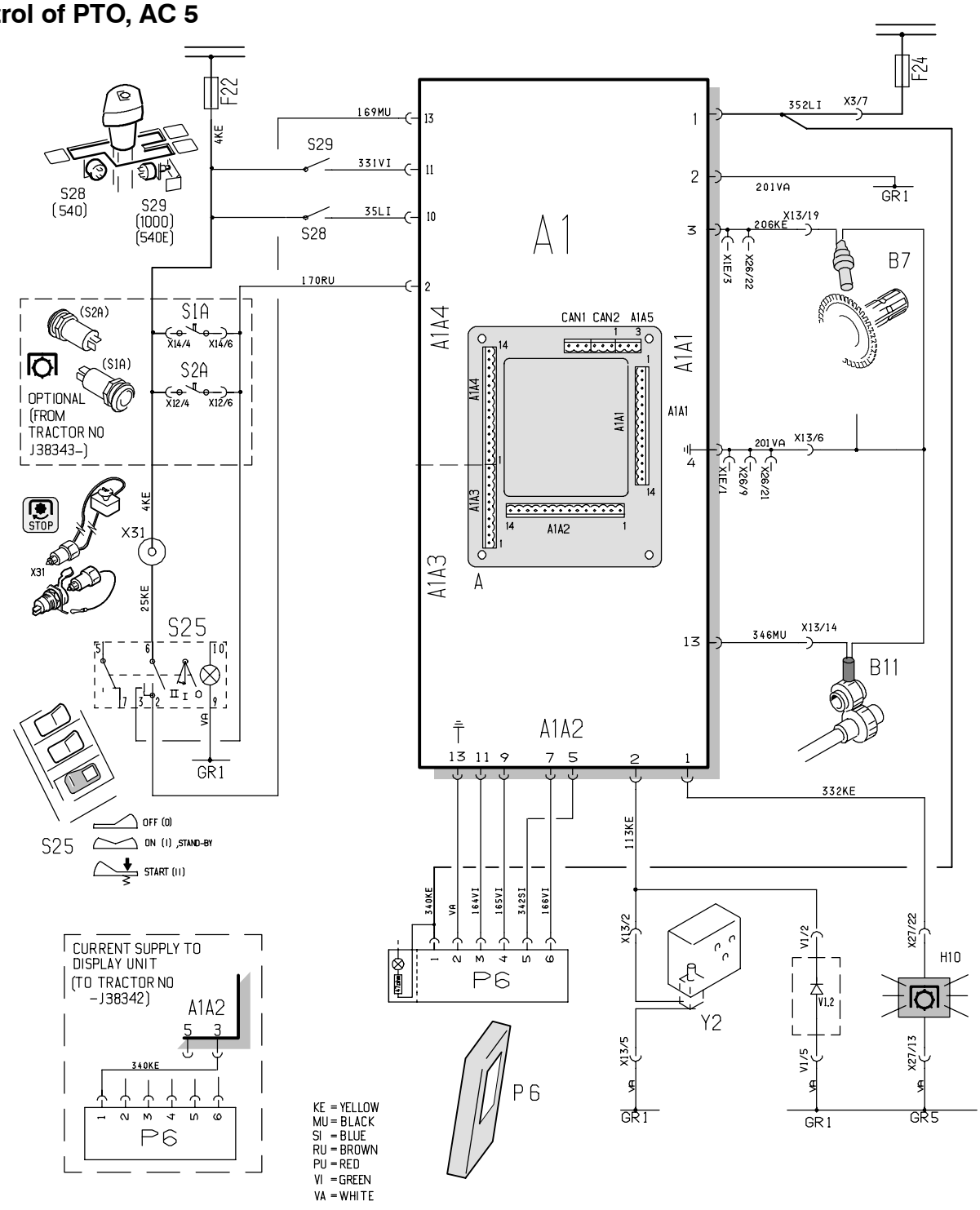


V1, V4

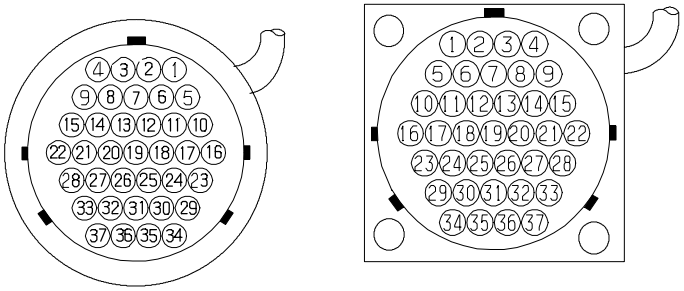


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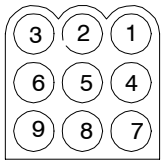
Control of PTO, AC 5



X13

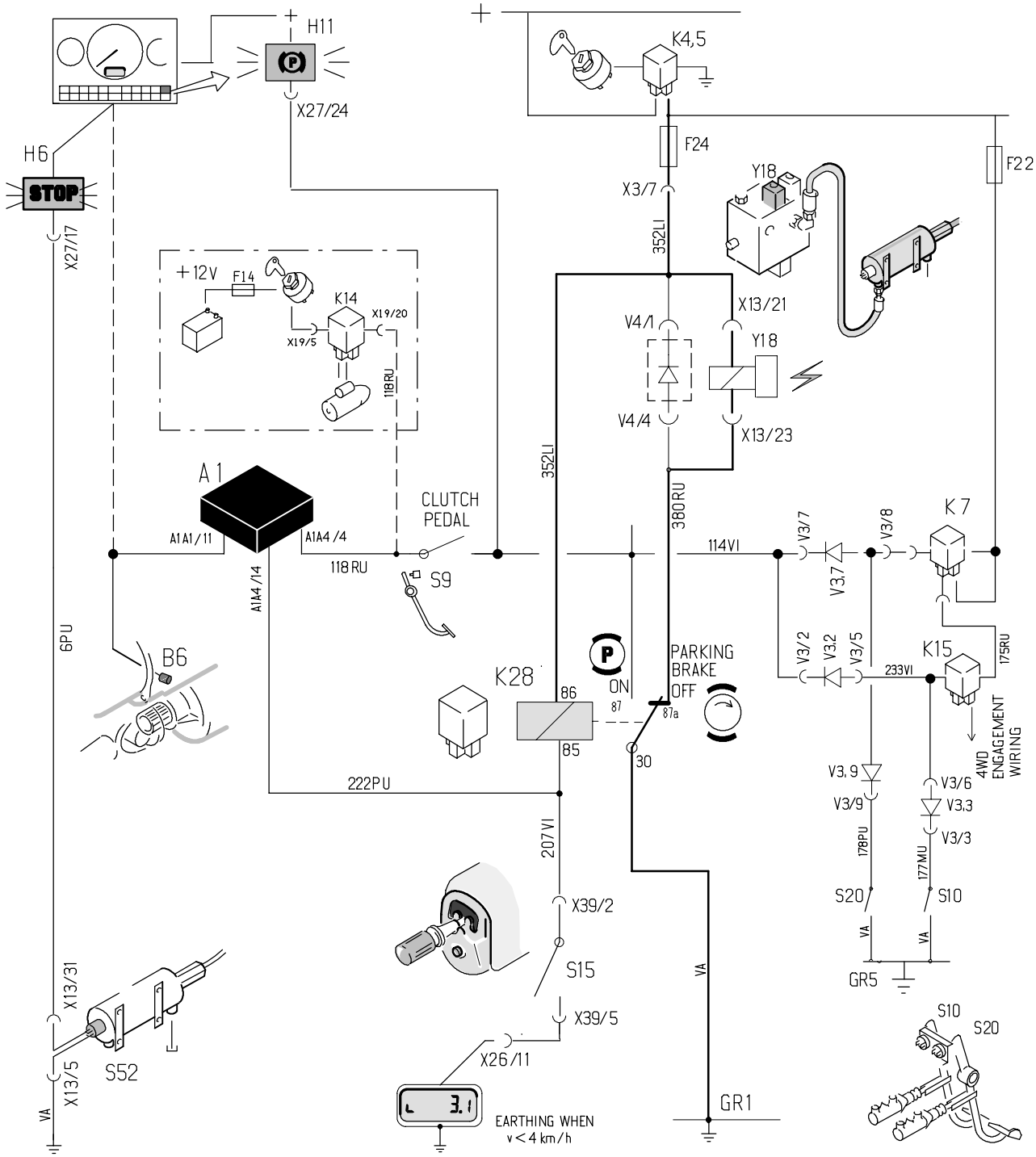


V1, V4



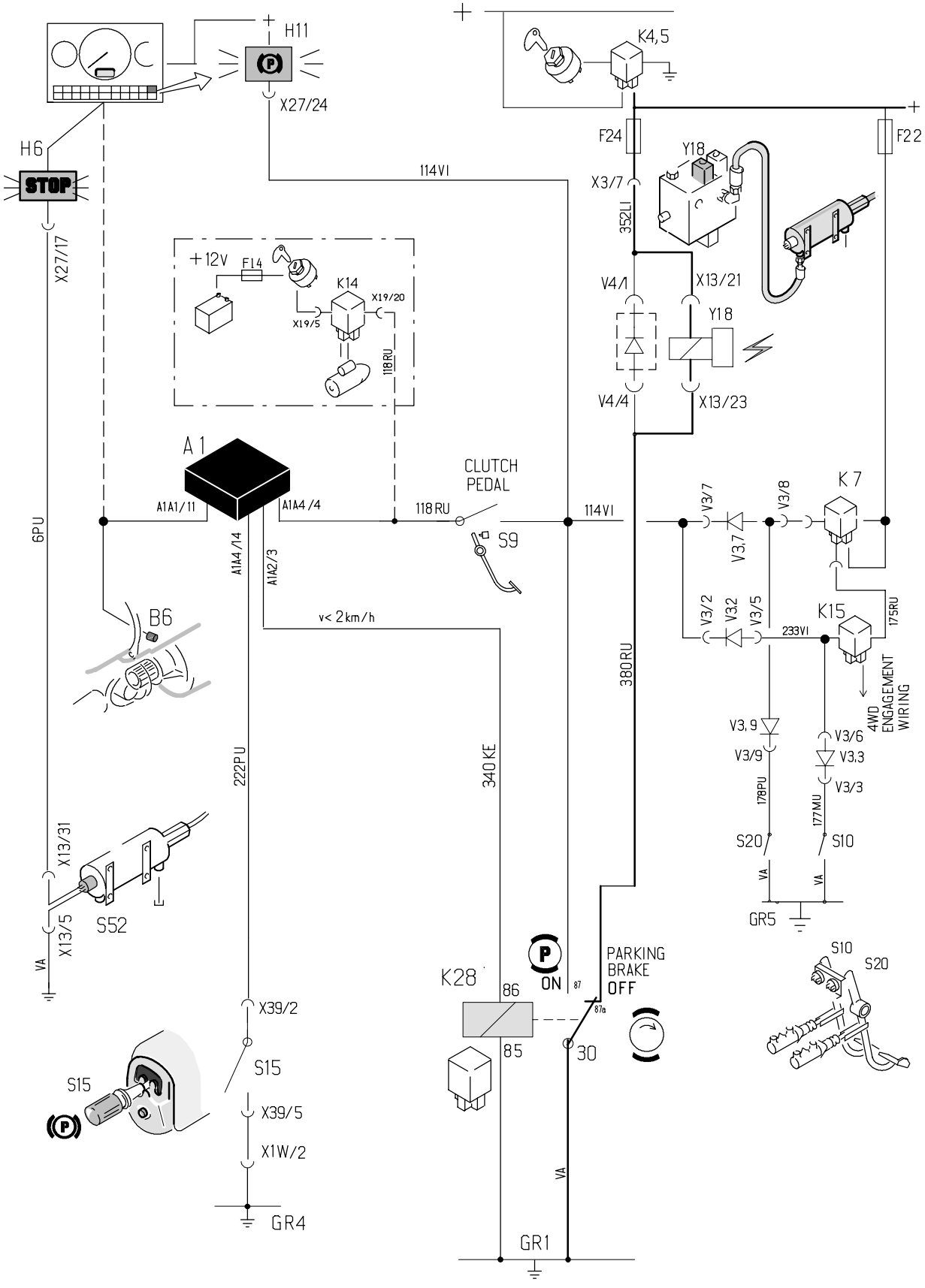
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Control of parking brake and engine starting, –J38342, AC 5



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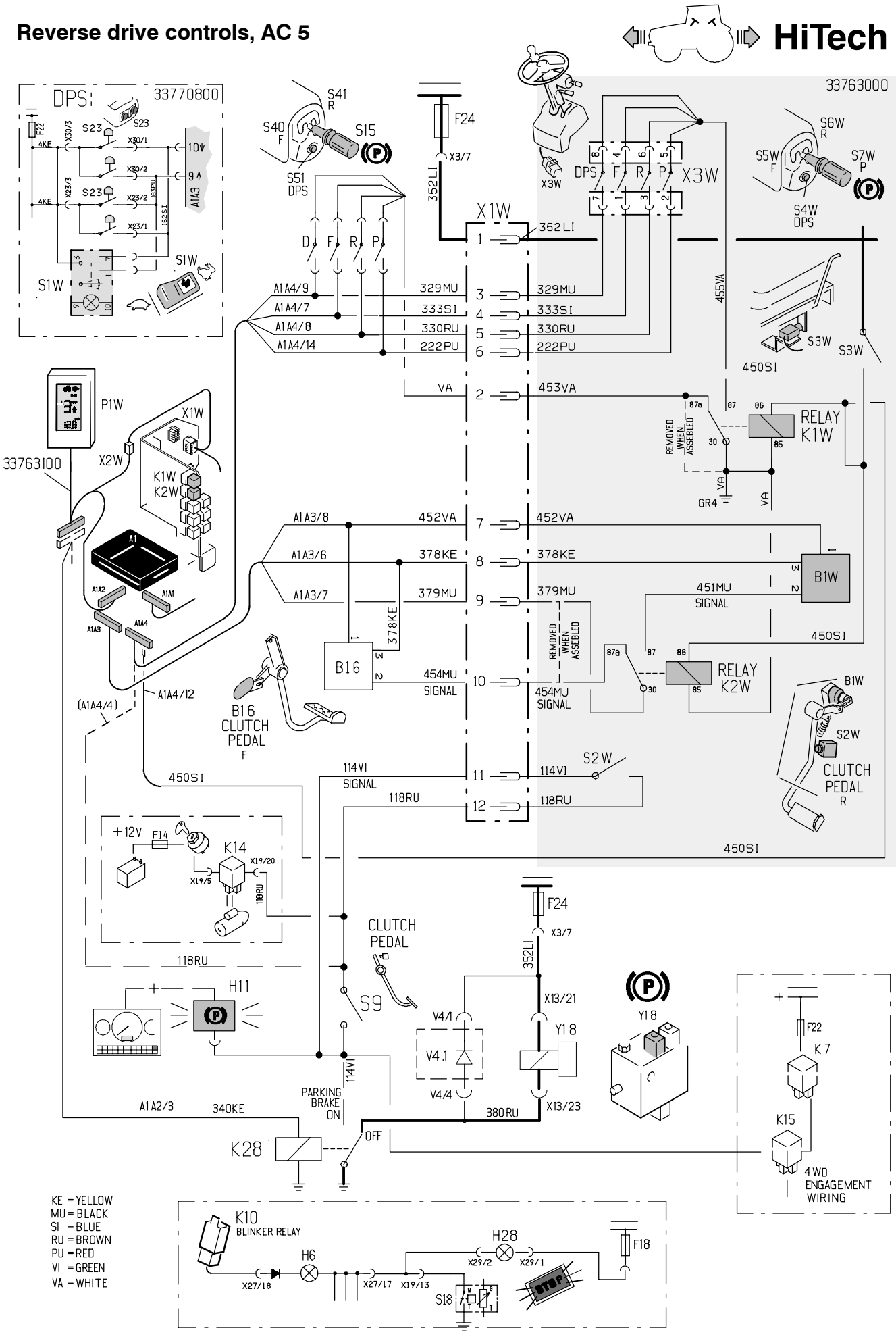
Control of parking brake and engine starting, J38343–K41106, AC 5



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Reverse drive controls, AC 5

HiTech



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1. Autocontrol 5.2, general

Note! AC 5.2 replaces the AC 5 system in 6250Hi–8950Hi tractors from ser. no. **K41107** incl.

A. Additional functions in AC 5.2

a) Automatic traction control (Autotraction ON/ OFF)

See page **371**/**3**.

b) Fault codes

Fault codes have a fault code memory (in fault code mode FI), in which can be checked and deleted from display. The memory stores three latest fault codes and running hours of the codes (control unit running hours).

New fault codes have been added in the system, see pages **371**/**5** and **6**.

c) Automatic speed change of DPS

AutoDPS Auto2 function has been changes so that it functions in fixed speed change revs and driver can set easily the revs, see page **371**/**4**.

d) Speed Matching

When using the HiShift button the control unit adapts the DPS speed so that it is suitable for driving situation when the mechanical gear has been changed, see page **371**/**4** or when traction is disengaged and re–engaged with clutch pedal, with HiShift or with the shuttle lever.

e) Automatic calibrations

The automatic calibration is activated in setting mode FIII, and it calibrates the initial pressures and pre–filling times of the shuttle clutches, for DPS and PTO clutches only the initial pressures, see page **371**/**11**. The calibrations can also be done manually, see page **370**/**24D**. Manual calibration of PTO clutch, see page **371**/**12**.

f. Calibrations of clutch and gas pedals and pedal position sensors

The activating point of the clutch pedal limit switch has been changed to zero point of the pedal position. Now the activating point of the switch is not necessary to adjust so excatly as earlier.

The pedal calibrations have been changed so that the control unit accepts more unaccurate signal voltages for the position sensors. Calibrations, see page **370**/**15**.

The position sensors are different and they have been fastened so that no adjustment is needed, see pages **371**/**13** and **14**.

With the aid of the clutch pedal ratio index the pedal engaging point can be adjusted separately in F– and R–directions in the setting mode FIII, see page **371**/**10**.

g) Reverse drive controls (TwinTrac)

The reverse drive controls have separate digital inputs in the control unit A1. The position of the seat (d14) determines which one of digital inputs the control unit uses.

h) Seat switch

The activating delay is normally 6 seconds, but 30 seconds, if the clutch pedal has been depressed, see page **370**/**24**.

i) PTO start

The PTO start push buttons in the mudguards (option) have separate digital inputs in the control unit. The PTO rocker switch in the cab functions without delay and the push button in the mudguard has delay of 3 sec.

j) Zero–point offset of the shuttle outputs

(program versions 80...85)

Into the shuttle clutch, which is unpressurised, is fed an oil pressure of 0,1...0,5 bar, so that no air can enter into the oil passages. This happens if either of the driving directions is engaged.

Note! The pistons in the shuttle have been made smaller and the spring force has been increased. The emptying valve has been removed from the piston for reverse driving, see page **440**/**19A**. In connection with this shuttle the AC 5.2 programs must always be used.

NOTE! Initial pressures of the shuttle clutches have been raised up to about 3,5 bar (earlier about 2 bar).

k) Other modifications

With the aid of output P7 the control unit switches on and off the auxiliary relay K52 of the starter.

Control unit output P8 controls the 4WD automatics (relay K27).
The control unit changes no more DPS speed in driving speed of 65 km/h but gives only a fault code.

NOTE! AC 5.2 has a new control unit, which can be used also in the earlier manufactured tractors with AC 5, but a different programs must be used.
AC 5.2 has only one main program there are several parameter files according to the tractor model and engine power.

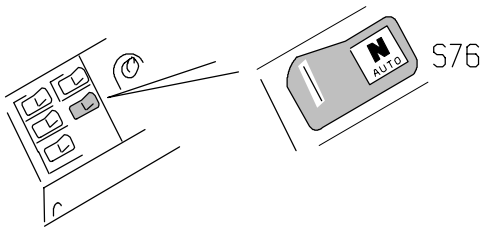
In the DPS–gear the spring force of clutch C3 has been increased. Also oil way modifications have been done, see page **440**/**15C**.

Parking brake! A non–return valve from ser. no. **K50440** incl. has been fitted in the low pressure circuit, which together with program modification retards the pressure drop in cases, in which engine stops during running (e.g. fuel runs out). A modification has been made in AC 5.2 program, which disengages all multi–disc clutches if tractor's engine stops when the driving speed is over 5 km/h. In this case the parking brake cylinder starts to brake after 15–30 seconds when the tractor has been already stopped.

The function of output DO5 has been changed inverse. Earlier this output was parking brake on. Now parking brake off. The control unit controls direct the valve and no more via an auxiliary relay.

B. Automatic traction control

An extra rocker switch (Autotraction ON/OFF) has been fitted in the cab. This switch switches on/off an automatic function, in which either driving directions (traction) (F, R) can be engaged and disengaged automatically by using the gas pedal or the brake pedals depending on the engine revs and driving speed.



1. The function can be switched on, when:

– tractor is stationary (i.e. gerabox speed is zero)
– engine revs lower than 1000 rpm.
– rocker switch is turned into position ON
– gas pedal calibration has been done correctly

Note! After engine stop the function must be restarted with the rocker switch.

When the function has been switched on and the shuttle lever is in the neutral position, the system is in the stand–by mode and symbol N is blinking in the display. The seat switch functions normally during the autotraction control.

2. Automatic traction disengagement happens, when:

A. the function is switched on, driving direction F or R is engaged and the tractor is driven with. Now the automatics observe signal from brake switches (S10, S20). When the brake pedal/pedals are depressed and the driving speed is below 10 km/h, the traction is disengaged automaticallly,

or

B. the function is switched on, driving direction F or R is engaged and when the engine revs drop below 970 rpm. If the gas pedal is almost in the upper position, the selected driving direction is disengaged automatically.

If the above given terms (A or B) come true, the selected driving direction is disengaged automatically and symbol N is blinking in the display.

3. Automatic traction engagement happens, when:

– function is activated and either driving directions (F or R) is engaged
– brake pedals are not depressed
– engine revs greater than 1020 r/min
– the gas pedal is depressed sufficiently.

The following items affect the autotraction control :

– position of rocker switch (Autotraction on/off), **d23**
– engine revs, **F1**.
– gearbox speed (driving speed), **F2**
– brake pedal switches, S10, S20, **d24**
– gas pedal position, **A3**.
– clutch pedal position (front/rear), **A5**/**A7.**
– position of shuttle lever (front/rear), **d9, d10**/**d18, d19.**
– direction (F, R), **F4** and **F5.**
– parking brake (front/rear), **d16**/**d22**

Note! If the traction control is switced off with the rocker switch during driving, the selected driving direction is disengaged into the neutral position and symbol N in the display is blinking. After this the control unit does engage neither direction until the parking brake is activated (driving speed below 2 km/h) and the driving direction is reselected.

FAULT TRACING:

– If the AutoTraction has malfunctions, check in the test mode FII the sensors and switches and wires which affect the function of the system. Also check the calibration of the gas pedal.

– check the gas pedal signal voltage in the test mode FII, specially when the pedal is up (page 371/9).
Calibrate the gas pedal and check in the test mode, that the position % is zero when the pedal is up.
– check the gas pedal position sensor lever and its fastening on the spindle.
– check, that the engine revs drop clearly below 950 rpm, when the gas cable is released.

NOTE! When driving with the reverse drive controls (Twin/Trac), the use of the brake pedal does not disengage the traction but the traction must be disengaged otherwise (the rear brake pedal has not a brake light switch, so the control unit cannot get information, when the pedal is depressed.

C. Automatic speed change of DPS (AutoDPS)

1. Auto2 – function

AutoDPS Auto2 function has been changed so that the automatic gear change occurs at adjusted engine revs. The limit revs can be adjusted as follows:

– ensure that the shuttle lever is in the neutral position
– switch on Auto2 with the rocker switch
– press for one second DPS–preprogramming button

After this the present change–down limit revs are blinking in the display and the black arrow downwards is blinking.

The blinking revs can be stepped with DPS push buttons at intervals of 50 rpm in both directions. The limit revs for the change–down can be altered between 900–2300 rpm.

After the change–down limit revs are correctly set, press the DPS–preprogramming button after which the limit revs for change–up starts to blink in the display and the black arrow upwards is flashing. Also these revs can be stepped at intervals of 50 rpm.

The limit revs for change–up can be adjusted between 1000–2400 rpm and it must be at least 100 rpm bigger than the change–down revs.

When the change–up limit revs are correctly set, press the DPS–preprogramming button after which the set revs function as limit revs in the Auto2 function.

The adjusted limit revs remain in the memory although the current is switched off. Factory values of the limit revs are 1400 and 2100 in normal tractors and 1100 and 1700 in low rev tractors.

Note! While the limit revs setting mode is activated, the control unit does engage neither driving direction (R or F). If the driving direction is tried to engage during setting, the indication arrow of the direction in question is flashing, but the direction is not engaged. After this the direction can not be engaged until the setting is completed and the parking brake is engaged. After the parking brake has been engaged, the control unit is in the normal function.

The following digital inputs affect the function:
d01=DPS–push button up
d02=DPS–push button down
d07=AutoDPS rocker switch Auto1 and Auto 2
d08=DPS auto/manual
d09=Direction F (forward driving selected)
d10=Direction R (rearwards driving selected)
d11=DPS–preprogramming button
d16=parking brake

The following frequency input:
F1=engine rotation speed sensor

The switches and sensors can be checked in the test mode **FII**.

If the input signals are OK, but malfunctions appear, the fault can lie in the control unit of AC 5.2.

2. Speed Matching of DPS

The Speed Matching is one part of the AutoDPS function. With the aid of the speed matching the DPS speed is changed automatically to a best suitable speed in connection with the mechanical gear change.

The function is active, when:
– AutoDPS is switched on (auto1 or auto2) and
– tractor is in motion and
– either driving directions is on.

When these terms come true, the speed matching is activated and it remains on until one of the following terms comes thrue:

– AutoDPS is switched off (Man position) or
– tractor is stopped

When the speed matching is activated, the control unit observes whether one of the following terms comes thrue:

– HiShift–button is pressed or
– clutch pedal is depressed or
– selected driving direction (F or R) is switched off

If one of the above given terms comes thrue, the control unit measures immediately the input frenquency from sensors F4/F5 (F4 in the beginning), and with the aid of these inputs the control unit calculates the comparison values.

When the driving direction is switched on again (HIShift button is released, clutch pedal is released or driving direction is reselected), the control unit measures the frequency from sensors F4/F5 at this moment (F4 in the end).
This measured frequency is compared with the comparison values and the control unit is carried out an automatic DPS speed change (the automatic speed change can be one or two step up or down), if the measured frequency is above or below the calculated limit values.

The control unit changes first the DPS speed and after this engages the traction (shuttle). If there is no need to change the DPS speed, the traction engages immediately.

Note! During the automatic speed change can happen that it is not possible to change two steps up or down (e.g DPS speed II is selected and the speed matching should be two steps upwards). In this case the speed matching is one step up.

The following digital inputs affect the function:
d03=HiShift–button
d06=Clutch pedal limit switch
d07=AutoDPS rocker switch Auto1 and Auto 2
d08=DPS auto/manual
d09=Direction F (forward driving selected)
d10=Direction R (rearward driving selected)

The following frequency inputs:
F2=gearbox speed (driving speed)
F4=reverse shuttle speed (upper sensor)
F5=reverse shuttle speed (lower sensor)

The switches and sensors can be checked in the test mode **FII**.

If the input signals are OK, but malfunctions appear, the fault could be in the control unit of AC 5.2.

D. Fault codes in AC 5.2

Note! Concerning AC 5.2 fault code structure, see page **370/5** (AC 5).
Note! Concerning AC 5.2 fault function levels, see page **370/7** (AC 5).

Fault code	Control unit pin	Fault identification	Fault function level	Tests	Repairs, settings
P101	A1A4/6	Proportional valve P1 (Y4) of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C1).	3	See table E on page **371/9B**.	See instr. **C** on page **370/21**.
P103	A1A4/4	Proportional valve P2 (Y6) of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C2).	3		
P105	A1A4/2	Proportional valve P3 (Y17) of DPS takes current which exceeds or goes below the given limits. Short circuit or wire damage (C3).	3		
P107	A1A3/8	Forward drive proportional valve P4 (Y11) takes current which exceeds or goes below the given limits. Short circuit or wire damage (F).	3		
P109	A1A3/6	Reverse drive proportional valve P5 (Y12) takes current which exceeds or goes below the given limits. Short circuit or wire damage (R).	3		
P125	A1A3/4	PTO proportional valve P6 (Y2) takes current which exceeds or goes below the given limits. Short circuit or wire damage	2		
P131	A1A3/2	Proportional output P7, which controls the starter interlock relay K52, takes current which exceeds or goes below the given limits. Short circuit or wire damage. Check the alternator.	1		
P132	A1A3/1	Proportional output P8, which controls the 4WD relay K27, takes current which exceeds or goes below the given limits. Short circuit or wire damage (FET status error).	1		
A128	A1A5/3 A1A5/6	Supply voltage of clutch and gas pedal position sensors is not within given limits (4,5…5,5 VDC). Probably wires in short citrcuit.	3	See table **C** on page **371/9**.	See instr. **A** and **B** on page **371/13** and instr. **D** on page **371/14**
A311	A1A5/2	Gearbox oil temperature value (sensor B14) impossible (over +150˚C). Faulty sensor or its wiring	3		
A312	A1A5/2	Gearbox oil temperature value (sensor B14) impossible (below −50˚C). Faulty sensor or its wiring.	3		
A313	A1A5/4	Signal from gas pedal position sensor B15 below 0,4 VDC or over 4,4 VDC. Sensor wrongly fitted or wire damages.	3		
A314	A1A5/7	Signal from front clutch pedal position sensor B16 below 0,3 VDC or over 4,7 VDC. Sensor wrongly fitted or wire damages.	3		
A326	A1A1/1 A1A1/2	Control unit supply voltage not within limits 10,5…17,0 VDC. Battery damaged or poor contacts or short circuit in wires. Check the alternator. Low battery voltage causes the oil pressure drop and damages the multi–disc clutches of the tractor shuttle and DPS.	3		
A351	A1A7/1	Signal from rear clutch pedal position sensor B1W below 0,3 VDC or over 4,7 VDC. Sensor wrongly fitted or sensor/wire damages. This fault code appears only when the seat is turned backwards.	3	See table **C** on page **371/9**.	See instr. **B** on page **371/13.**
d116	A1A5/9 A1A5/10	DPS up-down push buttons (S23) are active simultaneously. Push buttons in the lever knobs may be in short circuit. The fault code can also appear, when the service modes (FI-FIII) are activated.	1	See table **B** on page **371/8**.	See table **B** on page **370/20**.
d117	A1A8/1 A1A8/2	Forward (S40) and reverse drive direction (S41) are active simultaneously. Shuttle lever switches may be in short circuit.	4		
d118	A1A8/4 A1A8/5	Both PTO speeds are engaged simultaneously. PTO lever switches (S28/S29) may be in short circuit.	2		
d123	A1A8/8 A1A8/1 A1A8/2	Front parking brake and one or both shuttle directions engaged simultaneously. Shuttle lever switches may be in short circuit. No function, if the seat has been turned rearwards.	4		
d127	A1A8/8	Digital output, which controls the parking brake solenoid (Y18), is not within given limits. Probably solenoid in short circuit or wire damages.	3		
d129	A1A8/3 A1A2/5	DPS–pre–programming buttons S51 and S4W in front and reverse drive controls active simultaneously. Front and rear push buttons in short circuit or buttons have been stuck.	1		
d130	A1A7/4 A1A2/9	PTO start switches (S25, S1A, S2A) in the cab and in the rear mudguard are simultaneously active. Probably short circuit or switches have been stuck.	2		
d152	A1A2/8 A1A2/7	In the reverse drive controls F and R directions active simultaniously. Shuttle lever switches probably in short circuit. This fault code appears only when the seat is turned backwards.	4		
d133	A1A7/6 A1A2/6	Front and rear clutch pedal limit switches S9 and S2W active simultaneously . Probably short circuit in the switches or switches have been stuck.	3		

Fault code	Control unit pin	Fault identification	Fault function level	Tests	Repairs, settings
d153	A1A2/3 A1A2/8 A1A2/7	In the reverse drive controls parking brake and one direction (F or R) active simultaniously. Rear shuttle lever switches probably in short circuit. This fault code appears only when the seat is turned backwards.	4	See table **B** on page **371/8**.	See instr. **B** on page **370/20**.
d215	A1A7/6 A1A5/7	Front clutch pedal position > 50 % and d06 is active (d06=pedal limit switch S9). Check the limit switch and its adjustment.	4		
d254	A1A2/6 A1A7/1	Rear clutch pedal position > 50 % and d20 is active (d20=pedal limit switch S2W). Check the limit switch and its adjustment. This fault code appears only when the seat is turned backwards.	4		
F320	A1A1/7 A1A1/5	Shuttle speed sensors (B12/B13) give different frequency. Difference over 30 %. One of the sensor possible faulty.	3	See table D on page **371/9A**	See instr. **D** on page **370/22**
F321	A1A2/4	Engine rpm lower than what the shuttle sensors (B12/B13) indicate, when one solenoid is fully active. Engine rpm sensor B11 may be faulty.	3		
F324	A1A1/7 A1A1/5	Driving speed over 10 km/h and direction information in the control unit is changing. Shuttle sensors B12 or B13 may be faulti or wire problems.	1		
L419	A1A1/3	Full pressure has been connected to the PTO clutch over 3 seconds, but the PTO shaft rotation speed is lower than it should be. PTO-clutch may slip. It is possible that the PTO rpm sensor B7 is faulty. Check in the test mode PTO lever switches S28 and S29. Check that the switches have not been faulty connected (can be seen in the test mode). Ensure that the PTO speed parameters P and L are correctly set.	2	See table D on page **371/9A**. See table **B** on page **371/8**.	See instr. **D** on page **370/22.** See instr. **B** on page **370/20**.
L422	A1A1/7 A1A1/5 A1A2/4	One shuttle direction is engaged and full control has been active over 3 seconds. Shuttle rotation speed is lower than engine speed in relation to the DPS ratio. One multi-disc clutch in the DPS or in the Shuttle can slip or one proportional valve (Y4,Y6,Y17,Y11,Y12) can be trapped. This fault code also appears, if both shuttle sensors (B12,B13) do not give a signal, when engine revs are over 1600 rpm (check the fuse **F22**). This fault code is activated at engine speeds over 1000 rpm and in HiTrol tractors at engine speeds over 1800 rpm. This fault code can also appear, if the turbine clutch has too much slip (e.g. too little oil in the turbine clutch).	4	See table E on page **371/9B**.	See instr. **C** on page **370/21**. See instr. **D** on page **370/22**
L334	A1A2/2	Driving speed over 65 km/h measured by gearbox speed sensor B6 frequency input. 4WD propeller shaft can be damaged.	1		
L335	A1A2/4	Engine revs over 2800 rpm, measured by sensor B11 frequency input.	1		

E. Fault code memory (AC 5.2 only)

The fault code memory functions in all tractors, which have main program version 81 or later. In version 80 the fault code memory has malfunctions.

For fault codes have been made a memory where can be checked and removed appeared fault codes. The memory stores three latest fault codes and their running hours (according to the control unit hour counter “L”, not an exact value).

The fault code memory **FI** can be activated in the same way as the test mode **FII**, see page 370/8.

Number	Mode	Mode symbol
1	Fault code memory (AC 5.2)	**F I**
2	Test mode	**F II**
3	Setting mode	**F III**

When the fault code memory has been activated, the display shows in the lower part of the display the fault codes stored in the memory. The fault codes are visible in a correct order so that after the activation there is an oldest code in the display.

This fault code is visible two seconds and after this is shown the running hours of the code. The running hours are shown also two seconds.

If there are many codes in the memory, a line is shown one second between each codes. Then the next code and the running hours are shown. When all codes and running hours have been shown, the first code appears again in the display. The codes are shown until the current is switched off or the DPS pre–programming button is pressed over 4 seconds.

– if there is no codes in the memory, the line is blinking in the lower part of the display.
– the fault code memory can be emptied by pressing the DPS pre–programming button over 4 seconds, after which the codes disappear and the line starts to blink.

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F. Working order

Setting indexes of transmission (AC 5.2)

1. Warm the transmission up to +30°C...+60°C

Note! If the tractor has HiTrol turbine clutch, carry out stall–test before automatic calibrations (see pagr 411–7).

2. AutoCalibration of shuttle clutches and PTO clutch:		
Setting mode FIII M4 (40 kph) M3 (50 kph, 8350Hi) 1700–1800 rpm	–Calibrate the forward clutch F –Calibrate the reverse clutch R –Calibrate the PTO clutch	CAL 1 CAL 2 CAL 6
	(Autocalibration sets the initial pressure and pre–filling time indexes for the shuttle, initial pressure index for the PTO)	

3. Make a test–drive

4. If the shuttle does not function properly make the AutoCalibration once more		
Setting mode FIII M4 (40 kph) M3 (50 kph, 8350Hi) 1700–1800 rpm	–Calibrate the clutch that does not function properly –Check that you have the right main gear selected –Check that the tractor stays at a flat surface	
	– Make a test drive (the shuttle) – If the function is not good enough set the indexes manually (you can start from the indexes that the AutoCalibration has saved into memory)	

5. Make a test–drive
–Test the function of DPS (shift DPS speeds 1–2–3–2–1 at different situations like accelerating and motor braking)

6. If the DPS does not function properly make the AutoCalibration of DPS clutches:		
	Set the indexes no. 7, 8, 9 and 12 to zero, since the AutoCalibration does not set the DPS pre–filling time indexes 7, 8 and 9 and the DPS clutch C3 initial pressure index 12.	
Setting mode FIII M4 (40 kph) M3 (50 kph, 8350Hi) 1700–1800 rpm	– calibrate DPS clutch C1 – calibrate DPS clutch C2 –The clutch C3 can't be calibrated automatically	CAL 3 CAL 4
	– Make a test drive (the DPS) – If the DPS does not function properly set the indexes manually Problems when shifting 1 > 2, Set indexes of the clutch C3 1) Problems when shifting 2 > 3, Set indexes of the clutch C2 1) Problems in shifting 3 > 2, Set indexes of the clutch C1 1) Problems in shifting 2 > 1, Set indexes of the clutch C2 1)	 Indexes 9, 12 Indexes 8, 11 Indexes 7, 10 Indexes 8, 11

7. Test the start of PTO (with an implement if possible).

– If the PTO start is not good enough set the PTO indexes manually

1) Set first the pre–filling index to zero, since the correct index value is normally near zero. In addition, the effect of the pre–filling index is not very big, since the piston free movement is short. After that is changed clutch initial pressure index upwards or downwards:
– if traction disengages for a while during speed change, increase initial pressure index.
– if there is a "double jerk" in the beginning of engagement, reduce the initial pressure index.

NOTE! The effect of the index change can be verified, when the speed change upwards is done in heavy loading.

G. Checking ID number of program, AC 5.2:

PROGRAMS OF AC 5.2

Note! Programming instruction for AC5.2, see page **370–24**.
In tractor production a program has input in the control unit **A1**, which consists of a main program and a parameter file. Both the main programs and the parameter files are of different types, and that is why they have ID numbers.
In the tractor display (in the test mode **FII**) can be seen the program ID number, which shows the main program version and the parameter file ID number. The two first digits mean the parameter file ID number and the two last digits the main program version number.

E.g. ID number **3181**:
31 = parameter file number, **81** = main program version number.

Main program version number:

Version	Used in production
80 1)	K41107 – K42439
81 2)	K42440 –K45217
82	K45218–K50336
83	K50337–L27205
83	L27206–L36305 (parameter files changed)
84	L36306–L44126
85	Is not fitted in production.
86	L44127–

1) Version 80 has also be used in the pre–series, tractors K25332, K25414, K26316, K26440, K34507, K35307.
2) Version 81 has been input in factory in some tractors before no. K42440.

Parameter file ID numbers:

The parameter files have not been divided according to the PTO type as in **AC 5**, but according to the tractor model. The PTO ratios must be set in the setting mode **FIII**, see page 370–19A.
For all main program versions have been done own parameter files. If the parameter files are developed, the ID number increases one digit, e.g. 11 => 12. In this way different generations can be distinguished.

ID number	Used in tractor models:
11, 16, 17	6250Hi – 6850Hi, X100 – X120
21, 26, 27	6250Hi – 6850Hi HiTrol
31, 36, 37	8050Hi – 8150Hi
41, 46, 47	8350Hi
51, 56, 57	8450Hi – 8950Hi

ID NUMBERS USED IN PRODUCTION, IN SPARE PARTS AND IN SERVICE

Divided according to the main program version.
Beside the ID number there is information, which shows whether the tractor has a correct program.

Note. If the ID number in the tractor display cannot be found in this list, contact Valtra Tractor Service. In some tractors there can be special programs.

Main program version 80.
These must be replaced with main program version **86.**
These must no more be used in Service

11 80 3)	6250Hi–6850Hi, X100–X120
21 80 3)	6250Hi–6850Hi HiTrol
31 80 3)	8050Hi–8150Hi
41 80 3)	8350Hi
51 80 3)	8450Hi–8950Hi

Main program version 81
These must be replaced with main program version **86.**
These must no more be used in Service

11 81 3)	6250Hi–6850Hi, X100–X120
21 81 3)	6250Hi–6850Hi HiTrol
31 81 3)	8050Hi–8150Hi
41 81 3)	8350Hi
51 81 3)	8450Hi–8950Hi

Main program version 82:
These must be replaced with main program version **86.**
These must no more be used in Service

11 82 3)	6250Hi–6850Hi, X100–X120
21 82 3)	6250Hi–6850Hi HiTrol
31 82 3)	8050Hi–8150Hi
41 82 3)	8350Hi
51 82 3)	8450Hi–8950Hi

3) If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes **P101...P109**), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **86** and parameter file). Programming instructions on page **370–24B**. A new program must be input in the control unit (main program version **86**). In version **86.** the faults which are found in versions **80–85**, have been corrected and the function has been improved.

Main program version 83.
Can be fitted from **K41107 –>**
These can be replaced with program version **86**.
These must no more be used in Service.

11 83	4)	6250Hi–6850Hi, X100–X120
21 83	4)	6250Hi–6850Hi HiTrol
31 83	4)	8050Hi–8150Hi
41 83	4)	8350Hi
51 83	4)	8450Hi–8950Hi

Main program version 83 (parameter files changed).
Can be fitted from **K41107 –>**
These can be replaced with program version **86**.
These must no more be used in Service.

16 83	4)	6250Hi–6850Hi, X100–X120
26 83	4)	6250Hi–6850Hi HiTrol
36 83	4)	8050Hi–8150Hi
46 83	4)	8350Hi
56 83	4)	8450Hi–8950Hi

Main program version 84.
Can be fitted from **K41107 –>**
These can be replaced with program version **86**.
These must no more be used in Service.

16 84	4)	6250Hi–6850Hi, X100–X120
26 84	4)	6250Hi–6850Hi HiTrol
66 84	4)	6750Hi
36 84	4)	8050Hi–8150Hi
46 84	4)	8350Hi
56 84	4)	8450Hi–8950Hi

Main program version 85 (Is not fitted in production).
Can be fitted from **K41107 –>**
These can be replaced with program version **86**.
These must no more be used in Service.

16 85	4)	6250Hi–6850Hi, X100–X120
26 85	4)	6250Hi–6850Hi HiTrol
66 85	4)	6750Hi
36 85	4)	8050Hi–8150Hi
46 85	4)	8350Hi
56 85	4)	8450Hi–8950Hi

4) If the clutch pedal has malfunctions or the tractor has malfunctions (e. g. fault codes **P101...P109**), the transmission has jammed or if tractors transmission has not disengaged complety with clutch pedal, with HiShift button or with shuttle lever, then must a new program be input (main program version **86** and parameter file). Programming instructions on page **370–24B**.
A new program must be input in the control unit (main program version **86**). In version **86.** the faults which are found in versions **80–85**, have been corrected and the function has been improved.

Main program version 86.
Can be fitted from **K41107 –>**
These must be used in service**.**
These programs are in disk 344 046 20.

17 86	6250Hi–6850Hi, X100–X120
27 86	6250Hi–6850Hi HiTrol
67 86	6750Hi
37 86	8050Hi–8150Hi
47 86	8350Hi
57 86	8450Hi–8950Hi

In Service and In Spare Parts can be used only the newest programs (version 86).

NOTE! After loading the main program file to a control unit, the corresponding parameter file must be loaded from the same diskette as the main program file and it must correspond with the tractor model.

Note! If in the test mode **FII** the I.D. number is **9986** after programming or after control unit change, the parameter file has not been input. Input correct parameter file according to instr. on page **370–24B**.

2. Tests

Note! The correct electric signals from sensors and switches have been shown in the tables on pages **371/8–9C.**

A. Test mode FII menu in AC 5.2

Note! Activating the test mode, see page **370/8**.

F7	Shuttle rotation direction *)
F6	PTO revs *)
F5	Shuttle rotation speed (lower sensor) *)
F4	Shuttle rotation speed (upper sensor) *)
F3	Reserve
F2	Driving speed *)
F1	Engine revs *)
A8	Rear clutch pedal pos. sensor signal, V
A7	Rear clutch pedal position %
A6	Front clutch pedal pos. sensor signal, V
A5	Front clutch pedal position %
A4	Gas pedal pos. sensor signal, V *)
A3	Gas pedal positon % *)
A2	Gearbox oil temperature
A1	Outdoor temperature
d24	Brake pedal position (brake light switches)
d23	AutoTraction switch (N–Auto)
d22	Parking brake, reverse drive controls
d21	DPS pre–programmming button, reverse drive controls
d20	Clutch pedal limit switch, reverse drive controls
d19	Direction R, lever , reverse drive controls
d18	Direction F , lever, reverse drive controls
d17	PTO–start, button on rear mudguard
d16	Parking brake, front controls
d15	PTO stand–by switch
d14	Seat direction (TwinTrac only)
d13	PTO–speed 2 (lever in rear position)
d12	PTO–speed 1 (lever in front position)
d11	DPS pre–programming button, front controls
d10	Direction R, lever, front controls
d09	Direction F, lever, front controls
d08	DPS auto/man
d07	DPS auto1/auto2
d06	Clutch pedal limit switch, front controls
d05	Seat switch 1)

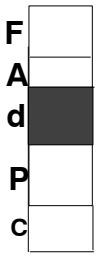
d04	PTO–start switch in cab
d03	HiShift–buttons
d02	DPS–button, down
d01	DPS–button, up
99 99	**Parameter number and program number. Start level.**
P1	DPS–prop. valve 1 (clutch C1) current *)
P2	DPS–prop. valve 2 (C2) ottama virta *)
P3	DPS–propo 3 (kytkin C3) ottama virta*)
P4	Shuttle prop. valve (forwards) current *)
P5	Shuttle prop. valve (rearwards) current*)
P6	PTO prop. valve current *)
b	Counter: informs how many times F–direction has been engaged.
F	Counter: informs how many hours F–direction has been engaged.
r	Counter: informs how many times R–direction has been engaged.
A	Counter: informs how many hours R–direction has been engaged.
C	Counter: informs how many times DPS1 (C1) has been engaged.
U	Counter: informs how many hours DPS1 (C1) has been engaged.
J	Counter: informs how many times DPS2 (C2) has been engaged.
P	Counter: informs how many hours DPS2 (C2) has been engaged.
E	Counter: informs how many times DPS3 (C3) has been engaged.
d	Counter: informs how many hours DPS3 (C3) has been engaged.
H	Counter: informs how many times the engine has been started.
L	Counter: informs how many hours AC 5.2 control unit has been energised.

*) Engine must be run

1) If detector switch S60 does not function, it can temporarily be by–passed by connecting switch wires with an auxiliary wire (connector beside the seat holder). The switch must be changed and the auxiliary wire removed as soon as possible (safety).

B. Table to check various switches (d01–d24) in the test mode in AC 5.2

Activate the test mode **FII** (see page 370/8) and select with the DPS bush buttons the correct test point and confirm the selection with the DPS push button, after which the selected point can be checked. When the checking has been done, press again the DPS pre–programming button, after which a new test point can be selected with DPS push buttons etc.



DIGITAL INPUT	NAME	IN DISPLAY 1	IN DISPLAY 0
d01 (S23)	DPS push buttons, up	Button depressed	Button up
d02 (S23)	DPS push buttons, down	Button depressed	Button up
d03 (S45)	HiShift button (test both buttons)	Button depressed	Button up
d04 (S25)	PTO–start, in cab	PTO switch in START–position	Disengaged
d05 (S60)	Seat switch	Driver sits on the seat	No signal
d06 (S9)	Front clutch pedal limit switch	Pedal in bottom	Pedal up
d07 (S47)	DPS automatic gear change switch	Auto–position 1	Auto–position 2
d08 (S47)	DPS auto/manual	Auto 1 or 2 on	DPS manual mode (man)
d09 (S40)	Direction F, front controls	F–direction selected	Direction disengaged
d10 (S41)	Direction R, front controls	R–direction selected	Direction disengaged
d11 (S51)	DPS pre–programming button (under shuttle lever), front controls	Button depressed. Visible only for a while.	Button up
d12 (S28)	PTO–speed 1 (lever in front position)	Speed selected	Speed disengaged
d13 (S29)	PTO–speed 2 (lever in rear position)	Speed selected	Speed disengaged
d14 (S3W)	Seat direction (TwinTrac only)	Seat rearwards	Seat forwards
d15 (S25)	PTO rocker switch	On, PTO–start	Disengaged
d16 (S15)	Parking brake, front controls	Parking brake applied	Parking brake disengaged
d17 (S1A, S2A)	PTO–start button on rear mudguard	Button depressed	Button up
d18 (S40)	Direction F, reverse drive controls (TwinTrac only) *)	F–direction selected	Direction disengaged
d19 (S41)	Direction R, reverse drive controls (TwinTrac only) *)	R–direction selected	Direction disengaged
d20 (S2W)	Rear clutch pedal limit switch (TwinTrac) *)	Pedal in bottom	Pedal up
d21 (S51)	DPS pre–programming button (TwinTrac) *)	Button depressed. Visibly only for a while.	Button up
d22 (S15)	Parking brake, rear (TwinTrac) *)	Parking brake applied	Parking brake disengaged
d23 (S76)	AutoTraction switch	AutoTraction on	AutoTraction off
d24 (S10, S20)	Brake pedal position (brake light switches). Check both front pedals separately. Possible rear brake pedal has not the switch.	Pedal in bottom	Pedal up

*) Seat must be turned rearwards.

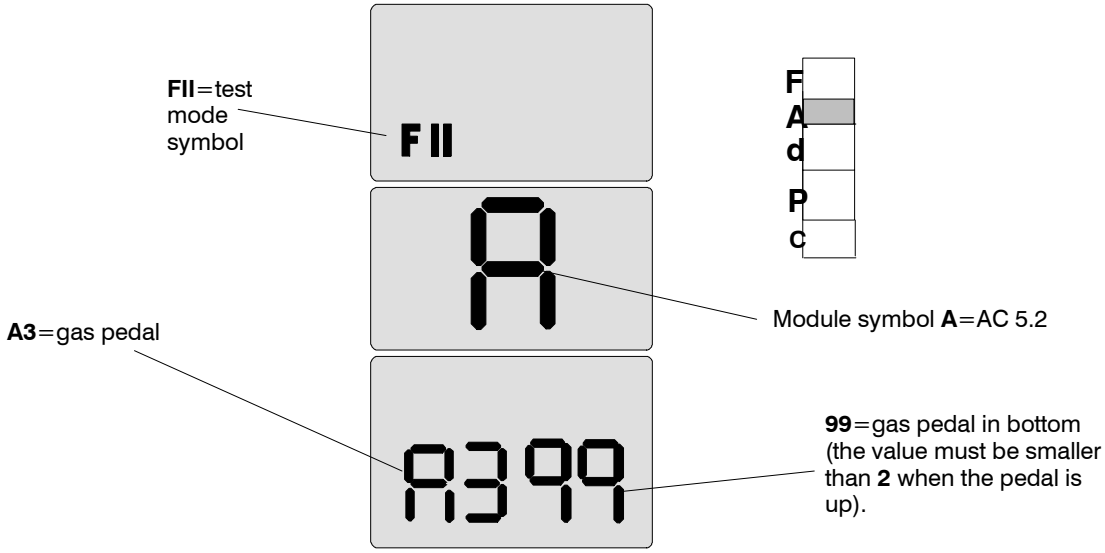
– If the value in the display is not 0, althought it should be according to the table above, the switch can be damaged or in short circuit. Check, change the switch. Check the switch wires.

– If the value in the display is not 1, althought it should be according to the table above, the switch can be damaged/wires broken/ poor contacts in connectors. Change the damaged switch. Check the switch wirings.

C. Table to check the temperature sensors and position sensors (A1–A8) in the test mode in AC 5.2

Activate the test mode **FII** (see page 370/8) and select with the DPS push buttons a wanted test point and confirm the selection with the DPS pre–programming button, after which the required point can be checked. When the test has been done, press again the DPS pre–programming button, after which can be selected an other test point with DPS push buttons etc.

Example:



DIGITAL INPUT	NAME	DESCRIPTION
A1 (B17)	Outdoor temperature (xx ˚C or xx˚F)	Compare the value with the ambient outdoor temperature. If the values are different or not visible, check the sensor wires and sensor itself, see instr **A** on page **371/13**. If the temperature is below –9˚ C, the display shows “LO”.
A2 (B14)	Gearbox oil temperature (xx ˚C)	Compare the reading with the actual gearbox temperature. If the values are different or not visible, check the wires and the sensor, see instr. **A** on page **371/13**. If the temperature is below –9˚ C, the display shows “LO”.
A3 (B15) 1)	Gas pedal position (xx %) *)	When the pedal is fully up, the value should be smaller than **2**. When the pedal is in bottom, the value should be greater than **99**. Check also that the value changes evenly when the pedal is moved (in the middle of the pedal stroke, the value should be about 50). If the values deviate from corret values, see instr. **D** on page **371/14**.
A4 (B15) 1)	Gas pedal pos. sensor signal, Volts.	Gas pedal fully up, signal between 2,0...4,7 V. Pedal in bottom, signal between 0,3...3,0 V.
A5 (B16)	Front clutch pedal position (xx %) *)	When the pedal is fully up, the value should be greater than **97**. With the pedal at the bottom, the value should be smaller than **2**. Also check, that the value changes evenly when the pedal is moved (in the middle of the pedal travel, the value should be about 50). If the values deviate from the above given values, see instr. **B** on page **371/13**.
A6 (B16)	Front clutch pedal pos. sensor signal, Volts.	Clutch pedal in bottom, signal between 2,5–4,7 V. Front clutch pedal fully up, signal between 0,3–2,4 V.
A7 (B1W)	Rear clutch pedal position (xx %) *)	When the pedal is fully up, the value should be greater than **97**. With the pedal at the bottom, the value should be smaller than **2**. Also check, that the value changes evenly when the pedal is moved (in the middle of the pedal travel, the value should be about 50). If the values deviate from the above given values, see instr. **B** on page **371/13**.
A8 (B1W)	Rear clutch pedal pos. sensor signal, Volts.	Clutch pedal in bottom, signal between 2,5–4,7 V. Rear clutch pedal fully up, signal between 0,3–2,4 V.

Note! Compare signals from the temperature sensors and position sensors with values in the table above. If the signal from one sensor is not correct, carry out the required repairs, see e.g. pages 371/13 and 14.

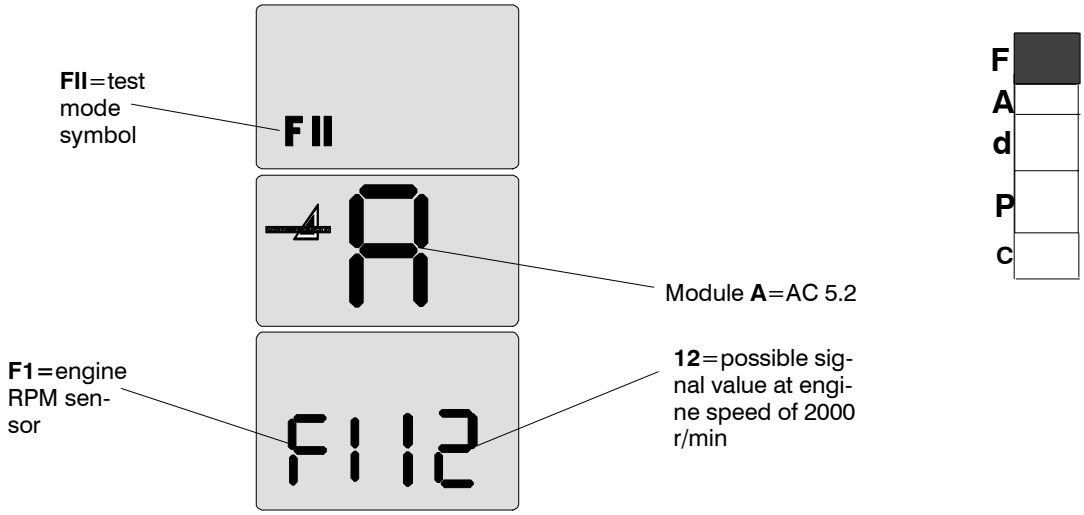
1) The gas pedal of reverse drive controls (TwinTrac, option) affect the same sensor as the front pedal. If the rear pedal signal value is not within given limits, the rear pedal wire must be adjusted so that the fuel injection adjusting lever moves the hole stroke.

*) The pedal position sensor must be calibrated before checking %–values.

D. Testing RPM–sensors (F1–F7) in the test mode in AC 5.2

Note! If the display shows e.g. **F1 51**, it means the engine rpm sensor frequency of 5100 Hz (value x100=Hertz number).

Example:



INPUT	NAME	VALUES	DESCRIPTION
F1 (B11)	Engine rpm sensor	1000 r/min=5,7–6,3 1500 r/min=8–10 2000 r/min=11–13	Set the engine revs to 1000 r/min and compare the value with the given values in the LH side column. Raise the revs to 1500 and 2000 r/min and compare the reading. If one of the values is not within the given limits, check the sensor, see instr. **D** on page **370/22**.
F2 (B6)	Gearbox speed sensor	1000 r/min=0,6–0,8 (50 km/h) 1500 r/min=1,1–1,3 (50 km/h) 2000 r/min=1,4–1,8 (50 km/h) 1000 r/min=0,5–0,7 (40 km/h) 1500 r/min=0,8–1,1 (40 km/h) 2000 r/min=1,1–1,5 (40 km/h)	Set the engine revs to 1000 r/min, engage gear M1 and drive the tractor forwards. Compare the reading with the given value. Test also at 1500 and 2000 rpm engine revs. If the values differ, see instr. **D** sivulla **370/22**.
F3	Reserve		
F4 (B12)	Shuttle output speed (upper sensor)	1000 r/min=1,8–2,1 (F) 1500 r/min=2,9–3,1 (F) 2000 r/min=3,8–4,2 (F)	Set the gears in neutral. Set the engine revs to 1000 r/min. Engage forward direction (F) and compare the value with the given value. Make the same check also in the reverse direction (R). Raise the engine revs to 1500 and 2000 r/min and measure again in both directions. Compare the reading with the given values. If one of the values deviates, carry out a comparing measurement, check the sensor according to instr. **D** on page **370/22**.
F5 (B13)	Shuttle output speed (lower sensor)	1000 r/min=1,9–2,2 (R) 1500 r/min=3,0–3,2 (R) 2000 r/min=3,9–4,3 (R)	
F6 (B7)	PTO speed sensor	540=1,7–2,0 540E=2,2–2,5 1000=3,0–3,3 540E=2,2–2,5 (8350Hi) 1000E=3,7–3,9 (8350Hi)	Engage PTO. Set the engine revs to 1000 r/min. Compare the values with the given values. If the values deviate, check the sensor acording to instr. **D** on page **370/22**.
F7 (B12, B13)	Direction information	F=1 R=2	Set the gears in neutral. Set the engine revs to 800 r/min. Engage the forward direction (F) and raise slowly the engine revs up to max. The reading must be 1 and must remain the same during the whole test. Engage reverse direction (R) and repeat the same measurement. The reading must be 2 during the whole measurement. If one of the direction readings does not function (value is faulty or it changes when engine revs varie), but F4 and F5 values are correct, the AC 5/5.2 control unit A1 may be damaged and should be changed.

NOTE! If the measured values deviate from the above given values, check first the driver detection switch and its wiring in the seat.

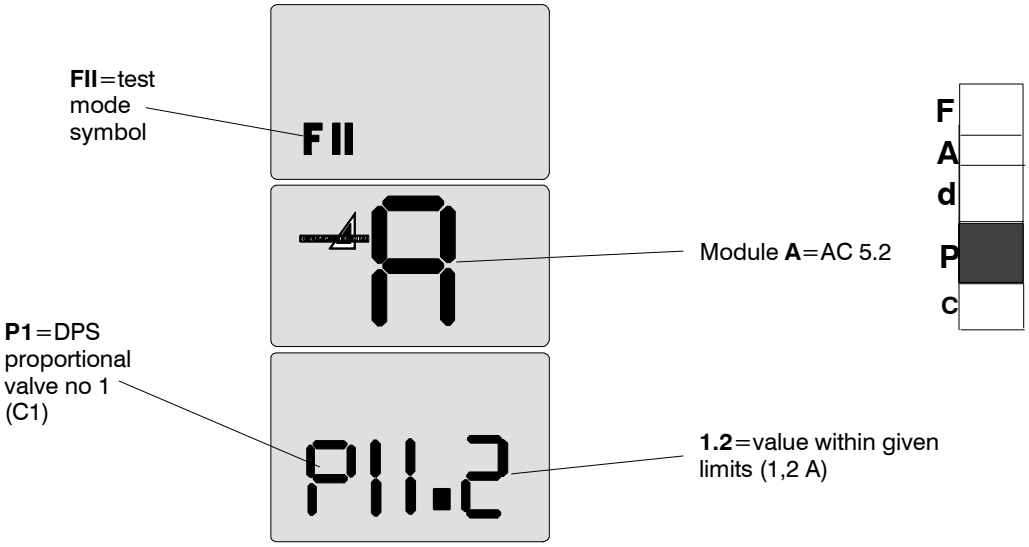
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E. Testing proportional valves (P1–P5) in the test mode in AC 5.2

Note! When the proportional valves are tested, all solenoid outputs are connected automatically unenergised.

Hint! E.g. value **P4 1.8** means, that the forward direction proportional valve takes max. current of 1,8 A (in the test mode).

Example:



OUTPUT	NAME	VALUE (activated)	DESCRIPTION
P1 (Y4)	DPS–solenoid Y4 (C1).	1,1–1,9 * (program versions 80, 81, 82) 1,1–2,2 (program versions 83, 84, 85, 86)	Activate the test mode and start the engine. Set the engine speed to about 1000 rpm. Proportional valve is activated by stepping the desired solenoid and by pushing the pre–programming button. The display reading should be between the limiting values. – If HI=short circuit or valve takes too high current. – If LO=wire damage
P2 (Y6)	DPS–solenoid Y6 (C2).		
P3 (Y17)	DPS–solenoid Y17 (C3).		
P4 (Y11)	Forwards solenoid Y11.		
P5 (Y12)	Rearwards solenoid Y12.		
P6 (Y2)	PTO solenoid Y2		

* Although the current value is between the limiting values, can fault codes **P101...P109** appear. In that case the AC5 –control unit must be re–programmed with a new main program file (versions **86**) and the suitable parameter file (see page **370**/**24G**). Newest program versions **83...86** allow a little higher current values, because the higher current taken by a cold solenoid could cause a fault code.
– If one of the values in the diplay deviates from the given values, measure the solenoid resistance on the connector X13 pins or direct on the valve pins. Check that the pins are not loose (see instr. **C** on page **370**/**21**). If the resistance is correct, but the display reading is faulty, the fault lies in the wires.
Measure also the supply voltage of the control unit while the engine is running (1500 rpm). Correct value is 12 V–14,8 V.
– If the solenoid resistance was faulty, the solenoid is damaged and should be changed. When the proportional valve or the solenoid is changed, the valve indexes must be checked (see page 370–24D).

If above mentioned points are OK, faulty current value can be caused by a defect AC5.2 control unit A1.

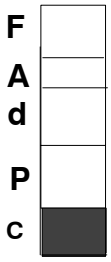
Note! Resistance measures and diode checks, **see instr. 4C on page 370/21**.

Important! Be careful not to mix up the proportional valves and normal solenoid valves during repair work.

WARNING! The proportional valves have a pin for a manual use, which **MUST NOT** be manipulated: the tractor may suddenly start to move, or the pin can become trapped and can cause later damage to e.g. multi–disc clutches. That is why it must always be checked after the repair work (before engine start), that the proportional valve spools are in the outer positions i.e. almost flush with the valve body (if not, remove the valve and press the spool so that the “manual pins” rises).

F. Counter functions in AC 5.2

There are 12 pcs counters in the test mode menu (see page **371/7**). The counter symbols are placed below the symbols for the proportional valves, see table below:



NOTE! The counters does not function in all units. This is not a fault, which could cause the replacement of the unit.

Symbole in display	Test point
b	Number of engagements of F–clutch
F	Time in hours how long time the F–clutch has been engaged (pressurised)
(**r**) ⌐	Number of engagements of R–clutch
A	Time in hours how long time the R–clutch has been engaged (pressurised)
C	Number of engagements of DPS1 ratio
U	Time in hours how long time the DPS 1 clutch has been engaged (pressurised)
J	Number of engagements of DPS2 ratio
P	Time in hours how long time the DPS 2 clutch has been engaged (pressurised)
E	Number of engagements of DPS3 ratio
d	Time in hours how long time the DPS 3 clutch has been engaged (pressurised)
H	Number of engine starts
L	Time **in hours** how long time the ACV control unit has been active.

The counters are accessible after activating the test mode and by stepping in the menu with the aid of the DPS push buttons.

Note! When the current is switced on with the ignition switch, the default ratio is DPS1. The value in counter H increases with one digit every time the engine revs rise over 400 r/min. Counter L shows the total running hours of the control unit. If the counter reading is smaller than tractor running hours, a new control unit has been fitted later on the tractor.

Note! Reading counters is happened without a separate confirmation. The counters cannot be zeroed in service. If the control unit is reprogrammed, the counter values remain in the control unit memory. In the spare part control unit the counters have been zeroed.

The greatest value of the hour recorders is 9999 after which the counters are zeroed. Counters are switched on always when current is switched on in the control unit.

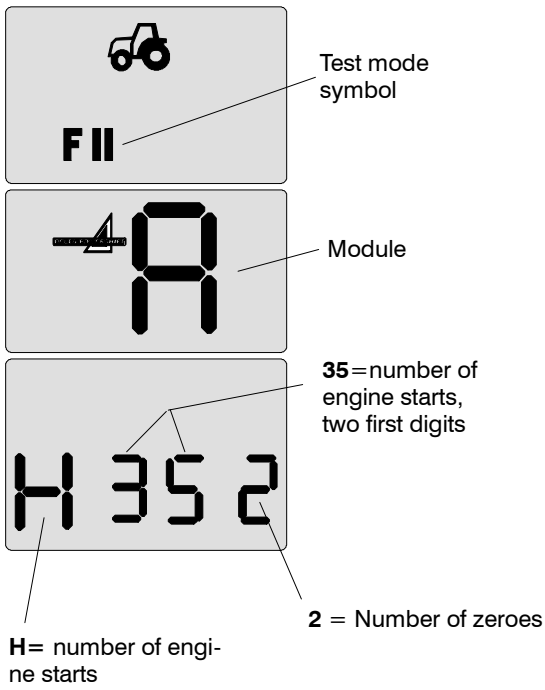
The readings of the counters are shown shortened as follows:
– the LH side display segment shows the counter symbol
– the two intermediate segments show the two first significant digits of the reading
– the RH side segment shows the number of zeroes.

E.g. b 23 3 means that driving direction forwards has been engaged 23000 times.

Last digit	**Number of zeroes**
0	–
1	0
2	00
3	000 (thousands)
4	0000
5	00000
6	000000 (millions)

Time recorder readings (F, A, U, P, d, L) are also shown in the same way.

Example:



i.e. **H = 3500 times.**

Note! The counters can be used in connection with maintenance or repair works, when e.g. estimating life time of various components or clutch wear etc.

3. Settings

Note! Different setting procedures have been shown on pages **370**/**15–19A.** If the settings of AC 5 and 5.2 differ from each others, the settings of AC 5.2 have been shown under code 371.

A. Setting mode FIII menu in AC 5.2

Note! Activating the setting mode menu, see page **370**/**14**.

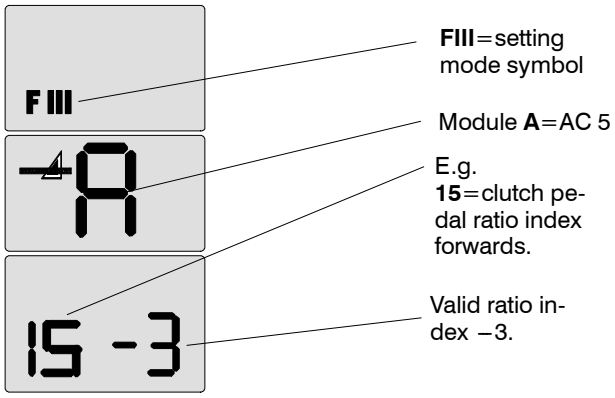
L	PTO ratio 2 (lever in rear position)
P	PTO ratio 1 (lever in front position)
H	Choocing speed unit, **km**/**h** or **miles**/**h**
F	Choocing temperature unit **˚C** or **˚F**
A	Setting driving speed parameters 2)
U	4WD automatics (on/off), on=1, off=0
16	Clutch pedal ratio index, rearards
15	Clutch pedal ratio index, forwards
14	Manual setting of PTO clutch initial pressure 1)
13	Manual setting of PTO clutch pre–filling time
12	Manual setting of DPS3 (clutch C3) initial pressure 1)
11	Manual setting of DPS2 (clutch C2) initial pressure 1)
10	Manual setting of DPS1 (clutch C1) initial pressure 1)
9	(Manual setting of DPS3 (clutch C3) pre–filling time) 3)
8	(Manual setting of DPS2 (clutch C2) pre–filling time) 3)
7	(Manual setting of DPS1 (clutch C1) pre–filling time) 3)
6	Manual setting of R–clutch initial pressure 1).
5	Manual setting of F–clutch initial pressure 1).
4	Manual setting of R–clutch pre–filling time.
3	Manual setting of F–clutch pre–filling time.
2	Clutch pedal calibration.
1	Gas pedal calibration.
CAL	**START LEVEL**
CAL 1	Automatic calibration of F–direction (Y11).
CAL 2	Automatic calibration of R–direction (Y12).
CAL 3	Automatic calibration of DPS clutch C1 (Y4).
CAL 4	Automatic calibration of DPS clutch C2 (Y6).
CAL 5	Automatic calibration of DPS clutch C3 (Y17) (**not in use**).
CAL 6	PTO automatic calibration

1) Before setting the initial pressures, the pre–filling times must be set.
2) Parameters are the same as codes for AD–instrument, see page **331**/**6**.
3) Normally the pre–filling indexes 7, 8 and 9 can be zero, since their effect is minor due to the piston short free movement.

B. Setting clutch pedal ratio index

Note! This setting procedure is only in AC 5.2. With this setting the clutch pedal can be adjusted so that it engages exact in the same point in forward and rearward direction. Increasing the index one step increases all clutch pedal control values one percent and vice versa. I.e. when increasing the index the clutch pedal engages deeper and vice versa. The factory sets the indexes to 0. When both indexes are 0, the clutch slips and engages little earlier when driving rearwards.

1. Activate the setting mode, see page **370**/**14**. Step in the menu with DPS push buttons and select either point **15** (ratio index forwards) or **16** (rearwards).



2. When the selection has been done, press the DPS pre–programming button, after which the selected point is shown without blinking and the valid and blinking ratio index can be seen in the right.

3. The blinking index can be increased or decreased with the DPS push buttons in the speed gear lever knob.

4. The index can be between –5....+5. When there is a correct index value in the display, press the DPS pre–programming button. After a successful setting the correct index value (without blinking) is shown in the display.

5. The setting mode can be left by switching off current.

6. Check the function of the clutch pedal by making startings forwards and rearwards with slipping. Change the index when necessary.

C. Automatic calibrations of shuttle, DPS and PTO clutches (Shuttle: setting pre–filling and initial pressure indexes.
DPS and PTO: – only setting of initial pressure indexes)

Note! The automatic calibrations only in AC 5.2. These clutches can also be calibrated manually:
– manual calibration of shuttle and DPS clutches, see page **370/24H**
– manual calibration of PTO clutch, see page **371/12A**.

In the automatic calibration the whole control line is calibrated:
– Multi–disc clutch
– Proportional valve
– Control unit output

Note! An implement or trailer must not be connected to the tractor during the automatic calibration.

Before calibration the following points must be observed:

1. The clutch pedal must be calibrated first.

2. Warm the engine up to a normal running temperature and warm the gearbox oil to an operating temperature (+30...+60° C). Check the temperature in the test mode FII, point A2 (Agrodata– instrumentation panel shows only temperature over +40°C).

Note! If the tractor has a turbine clutch (HiTrol) , check the Stall revs before the calibrations (page 411/7).

3. Drive the tractor on **a level** ground, preferably on asphalt, on tarmac or on hard gravel, where there is space forwards and backwards for some meters (during calibration the tractor moves some centimeters forwards and backwards and stops itself). The calibration fails if done on a field. The calibration must not be done indoors or on slanting ground.

4. Disengage the differential lock, 4WD and PTO.

5. Check that the working hydraulics are in the free circulation phase (levers to the neutral position N). Turn the front wheel straight ahead.

6. If the PTO clutch is to be calibrated, move the PTO lever to the front position. The PTO calibration is done without a load on the PTO shaft.

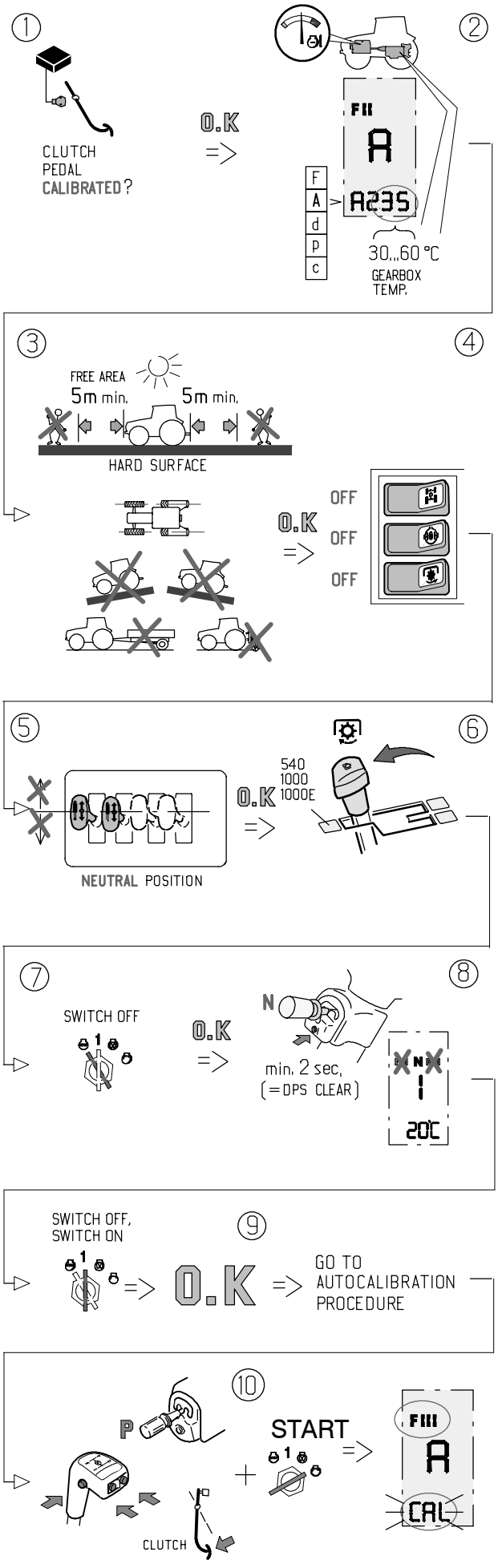
Caution! If the PTO clutch is calibrated, the PTO shaft starts to run automatically during the calibration procedure and also stops by itself.

7. Turn the current off and on in order to obtain the test mode.

8. Move the shuttle lever to the neutral position N. Remove possible pre–programming of the DPS speeds by pressing the pre–programming button more than 2 seconds when the shuttle lever is in the neutral position N.

9. Turn the current off for the starting of the automatic calibration.

10. Activate the setting mode **FIII**, see page **370/14**.
Confirm FIII, confirm A, then " **CAL** " begins to blink and the start phase of the setting mode appears.



11. Move the shuttle lever to the neutral position N. Engage a mechanical gear: In 40 km/h models gear **M4** and in 50 km/h– models (also 6750 and 8350Hi models) gear **M3**.
12. Adjust the engine revs with the hand throttle to 1700–1800 r/min.
13. If the clutch pedal is depressed, lift it up.
14. Step with the DPS push buttons in the menu from starting level (CAL, blinking) downwards and select desired function:
CAL 1 = Calibration of F–clutch (Y11).
CAL 2 = Calibration of R–clutch (Y12)
CAL 3 = Calibration of DPS–clutch (Y4)
CAL 4 = Calibration of DPS–clutch C2 (Y6)
CAL 5 = Calibration of DPS–clutch (Y17), **NOT IN USE**
CAL 6 = Calibration of PTO clutch (Y2).

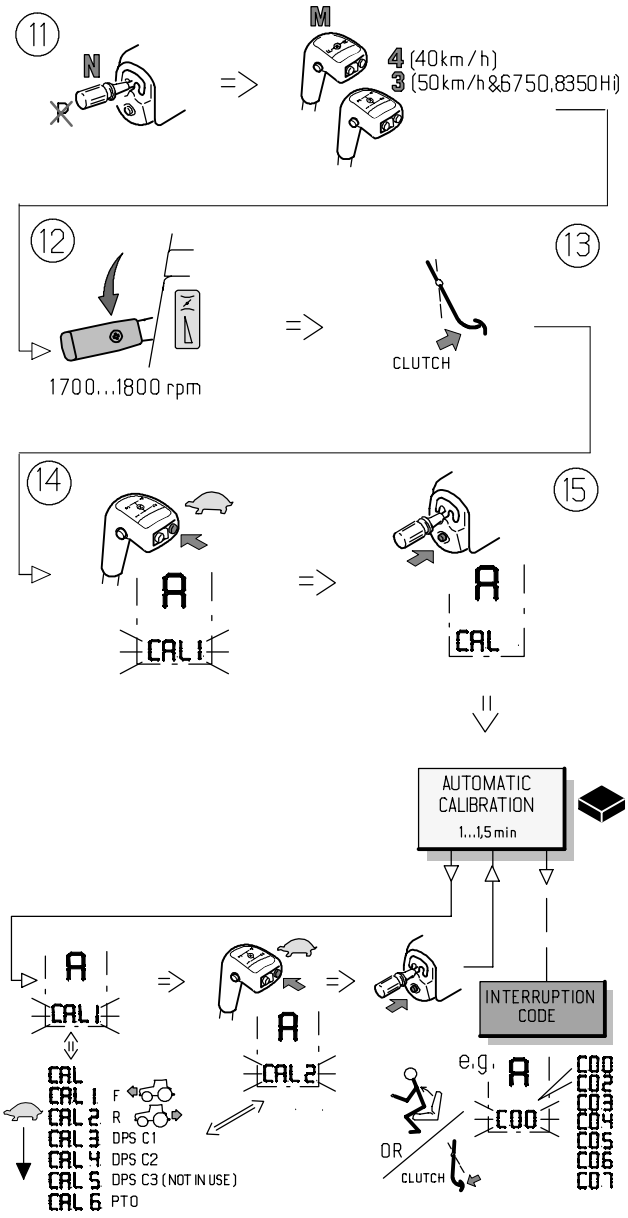
15. Confirm desired blinking calibration point (e.g. CAL 1) with DPS pre–programming button, after which there is text CAL without blinking in the display lower row (during the whole calibration). After this the calibration proceeds automatically and stops either to an **interruption code** or to a successful calibration. When the calibration has been successfully completed, e.g. text CAL1 starts to blink in the display (the calibration symbol of the clutch, which has been calibrated is blinking). After this can be stepped to another calibration point etc. A calibration of a clutch takes about 1...1,5 minutes.
NOTE!
– Wait during the whole calibration procedure and do not touch the controls. During the automatic calibration DPS speed 1 is engaged automatically.
– The calibration can be interrupted by depressing the clutch pedal (or by getting up from the seat). The calibrating mode can be left by switching off the current.
– With an aid of the interruption code the control unit informs that the calibration has failed and the reason.

Interruption codes:

C 00	The seat switch does not recognize a driver or clutch pedal has been depressed during calibration.
C 02	Parking brake applied, engine revs wrong, gearbox temperature wrong, mechanical gear is not engaged or tractor on a slanting ground.
C 03	Initial pressure calibration does not find a correct value in spite of many attempts. The tractor starts to move too sharply. Ensure, that the tractor is on the level ground and that the correct mechanical gear has been engaged.
C 04	Clutch which is calibrated does not transmit enough high torque. E.g. piston or valve trapped, pressure of low pressure circuit is too low, leaks etc.
C 05	Calculated initial pressure index is not within given limits (limits –9...+9).
C 06	Calculated pre–filling index is not within given limits (e.g. clutch piston does not move freely or clutch worn out) (limits –9...+9)..
C 07	The pre–filling time calibration does not find a correct value in spite of many attempts.

Note! If the automatic calibration does not succeed, try to calibrate the clutch manually(see page **370**/**24H**). If a very small or large index must be used (below –6 or over +6), the fault can lie in the mechanical parts or in the hydraulics.

The calibration can also fail, if the fault lies in:
– Control unit
– Wiring looms
– Battery (voltage too low)
– Proportional valves
– Low pressure circuit of hydraulics (18 bar)
– Mechanical parts (clutch pack etc)
– Clutch return springs faulty or wrong number of springs.



D. Manual calibration of PTO clutch

(=index settings)

The PTO clutch indexes can be changed if you want to affect the PTO engagement phase e.g. due to excessive delay.

Note! In the setting mode menu point **13**=manual setting of PTO clutch pre–filling time and point **14**= manual setting of PTO initial pressure. The indexes can be altered between –9...+9.

Important! The PTO indexes are set in the same way as the shuttle indexes (e.g. 3 and 5 for F–clutch) and they affect similar:
– setting pre–filling times of the shuttle, see page **370**/**24D** and **370**/**18**.
– setting initial pressures of the shuttle, see page **370**/**24D** and **370**/**16**.

First is set index **13** and then **14**. The effect of the indexes cannot be seen, if an implement is not connected to the PTO. In addition, rotational torque of an implement affects the PTO engagement.

Big implement (e.g. a big baler):
– index values can be altered much, affects slowly when observing visually.
Small implement (e.g. hay turner):
– index change small, affects quickly when observing visually.

1. Connect an implement to the PTO.

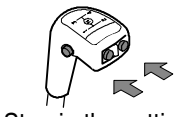
2. Warm the engine to a normal running temperature and gearbox oil to an operating temperature (+30˚...+60˚ C). Apply parking brake.

3. Adjust engine revs to about **1200 r**/**min**.

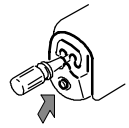
4. Move the PTO lever to the engaging position.

5. Check how the PTO engagement happens with the present index values. Start/stop of the PTO can be done with the rocker switch in the cab. Change the enagement procedure as follows:

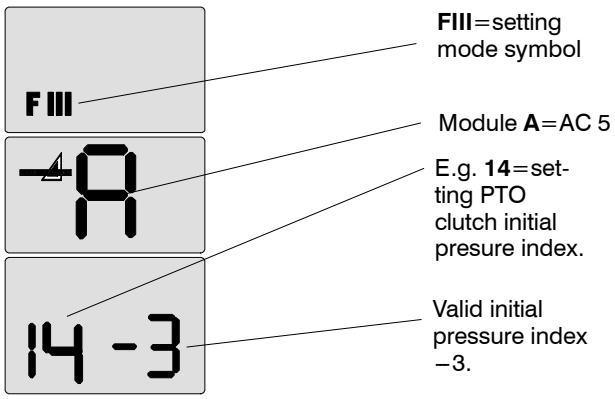
6. Activate the setting mode (see page **330**/**14**).



Step in the setting mode menu with DPS push buttons.



Confirm the selection with DPS pre–programming button.



7. First set the PTO initial pressure index to –3 (point 14) and then the pre–filling index to –6 (point 13). Increase the pre–filling index **13** on step at a time (–6, –5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5, 6), and test the PTO engagement after every index change until a clear jerk can be seen in the beginning of the engagement. Decrease then the index two steps.

8. Again check that the jerk disappeared in the beginning of the engagement.

Note! If the pre–filling index must be set below –6 or over +6, the PTO clutch is worn out or the piston does not move freely.

9. Increase then the initial pressure index **14** one step at a time (–3, –2, –1, 0, 1, 2, 3) and test the engagement after every index change until the implement acceleration occurs in the correct way during engagement.

10. The setting mode can be left by switching off current with the ignition switch.

E. Setting 4WD automatics (AC 5.2 only)

In the setting mode there is point **U**, in which can be selected either automatic function on or off (on=1, off=0).

When the 4WD automatics is on (on=1), the 4WD is engaged for a moment in the drive direction change/start, which reduces wheel slip on a slippery ground. After the drive direction change/start the 4WD is disengaged automatically.

This function can be switched off by selecting **0** in the setting mode menu in point **U** (0=off). Selection is made normally with the DPS push buttons and the selection is confirmed with the DPS pre–programming button.

F. Resetting pre–filling indexes for DPS clutches

If in connection with DPS gear change there occurs a “double jerk” or traction disengages for a while, check/set the DPS clutch pre–filling indexes.

However, first must be set automatically initial pressure indexes for DPS clutches C1 and C2 (see page **371**/**11**).

Set all DPS pre–filling indexes first to 0 (index nos 7, 8 and 9). Also set clutch C3 initial pressure index to 0 (index no. 12), since the automatic calibration does not do this.

Check the function of the DPS.

– If in the beginning of the gear change there is the “double jerk”, decrease the pre–filling index of the clutch in question to –2 and check the function after that. Decrease the index value more, if needed. Particularly in the gear change between speeds 1 > 2 there can easily be a double jerk, if the indexes are incorrectly set.

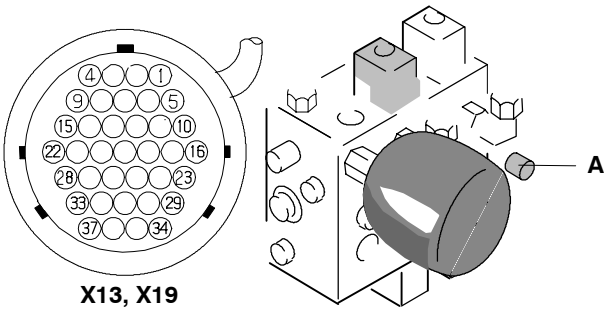
– If the traction disengages for a while during speed change, increase the pre–filling index of the clutch in question to e.g. +2 and check the function. Increase more, if necessary. Sometimes the initial pressure indexes must be adjusted.

– If speed change between 1 > 2 is bad, set clutch C3 indexes.
– If speed change between 2 > 3 is bad, set clutch C2 indexes.
– If speed change between 3 > 2 is bad, set clutch C1 indexes.
– If speed change between 2 > 1 is bad, set clutch C2 indexes.

4. Components

A. Reconditioning temperature sensors

1. Gearbox oil temperature sensor B14



X13, X19

Note! Sensor B14 (A) is placed on the servo valve block on the LH side of the gearbox (see also page **440**/**24**).

1. If this sensor has problems, the self diagnosis shows the following fault codes:
– **A311** (temperature over +150˚C, impossible).
– **A312** (temperature below – 50˚C, impossible).

2. Check then the sensor in the test mode, see table **C** on page **371**/**9**. Compare the temperature in display to the actual temperature in the gearbox.

3. If the temperature reading in the display is clearly wrong or it missis, check the sensor and its wiring. When needed, measure the sensor resistance in connector **X13** pins **10** and **6.** If the resistance was infinite, check the resistance in the sensor pins:

Resistance values of the sensor (±1 %)**:**
– 1600 Ω (± 0˚C)
– 2000 Ω (+25˚C)
– 3300 Ω (+100˚C)

4. Change a faulty sensor. Fix wirings.

Note! If this sensor is defective, it can cause engaging problems in various multi–disc clutches (delays and jerks).

Note! If the sensor and its wires seem to be OK, but malfunctions exist, the fault can lie in the control unit of the A 5.2.

2. Outdoor temperature B17

This sensor is placed in the front part of the tractor behind the front grille on the signal horn bracket.

1. If you doubt, that the sensor is damaged, test it in the test mode, see table **C** on page **371**/**9**.

2. Compare the diplay reading to the ambient temperature. If the outdoor temperature does not appear at all or it is clearly wrong, check the sensor and its wires.

3. Check the sensor mounting. Check the sensor resistance by measuring it in connector **X19** pins **26** and **37.** If the resistance was infinite, check connector **X1A** pins **2 and 5**. Change faulty temperature sensor.

Resistance values of the sensor (±1 %)**:**
– 1600 Ω (± 0˚C)
– 2000 Ω (+25˚C)
– 3300 Ω (+100˚C)

Note! The outdoor temperature sensor does not affect the function of the AC 5.2 unit.

B. Clutch pedal position sensor B16 and B1W (TwinTrac), reconditioning

Note! In the AC 5.2 the clutch pedal position sensor has been fastened so that its position cannot be adjusted.

Note! In the reverse drive controls (TwinTrac, option) there is similar clutch pedal position sensor B1W, which should be tested and calibrated separately.

1. If the position sensors have problems, the self diagnosis can show the following fault codes:

– fault code **A128:** Reference voltage of clutch pedal (and gas pedal) sensor is not within given limits (4,5–5,5 VDC). Eventually short circuit in wires
– fault code **A314:** Signal from the front clutch pedal sensor B16 is not within given limits**.** Sensor faulty fastened or sensor/wires defective. Battery voltage too low.
– fault code **A351:** Signal from rear clutch pedal sensor B1W faulty. Sensor faulty fastened or sensor/wires defective. This fault code appears only when the seat is turned rearwards. Battery voltage too low.

2. Check the function of the sensors in the test mode (see table **C** on page **371**/**9**). If the function is not within given limit values, check the mounting of the position sensor and its wires. Also check the sensor lever fitting on the sensor spindle. If the signal voltage is missing or it is not in limits check the supply voltage (4,75–5,25 V) and signal voltage by means of measuring cable ETV 894510 (see picture on page 371–14).

Clutch pedal, front / rear	**Up**	**In bottom**
Signal voltage	0,3–2,4 V	2,5–4,7 V

3. If You doubt poor contacts in wires/connectors, disconnect and then reconnect the front sensor B16 connector and make the same to the control unit connector A1A5.

4. In the same way, check the rear pedal sensor B1W connector and connector S1W pins 7 and 9 and connector A1A5 on the control unit.

Note! If the wires are be OK, but malfunctions occur, the sensor can be damaged or the fault can lie in the control unit A1 of AC 5.2. Defective sensor or control unit must be changed.

4. When the fault has been repaired, calibrate the clutch pedal sensors, see page **370**/**15** instr. **C**. The both pedals are calibrated in the same way but when calibrating the rear pedal, the drive's seat must be turned rearwards.

C. Front clutch pedal limit switch S9 and rear pedal switch S2W, reconditioning

Note! The limit switches' activating point has been changed into zero point of the clutch pedal posiiton in AC 5.2. That is why the switch activating point is not necessary to adjust accurately. The limit switch must be adjusted so that it functions near the pedal lower position, but the functioning is never the less surely (e.g. 1cm pedal movement).

1. If the limit switches have malfunctions, the self diagnosis shows the following fault codes:

– **d133:** The front and rear pedal limit switches active simultaneouly. Switches possible damaged or short circuit in wires.
– **d215**: The front pedal position greater than 50 % and kimit switch S9 active simultaneously. Switch damaged or short circuit in wires.
– **d254**: Rear pedal position greater than 50 % and limit switch S2W active simultaneously. Switch damaged or short circuit in wires (this fault code appears only when the seat is turned rearwards).

2. Then check the limit switch position and wires. The limit switch function can be checked in the test mode, see table **B** on page **371**/**8**.

3. If You doubt poor contacts, check the wire connections on the switch S9. Also check the control unit connector A1A7 and earth point GR5.

4. Check the rear pedal switch S2W wires on it. Check earth point GR1 and connector A1A2 of the control unit.

Note! If the wires seem to be OK, and the switch functions when testing it with finger, but still malfunctions occur, the switch can be defective or control unit of AC 5.2 can be damaged. Then change the components in question.

D. Gas pedal (fuel injection pump) position sensor B15, reconditioning

Note! In AC 5.2 system the gas pedal position sensor is fastened so that its position cannot be adjusted.

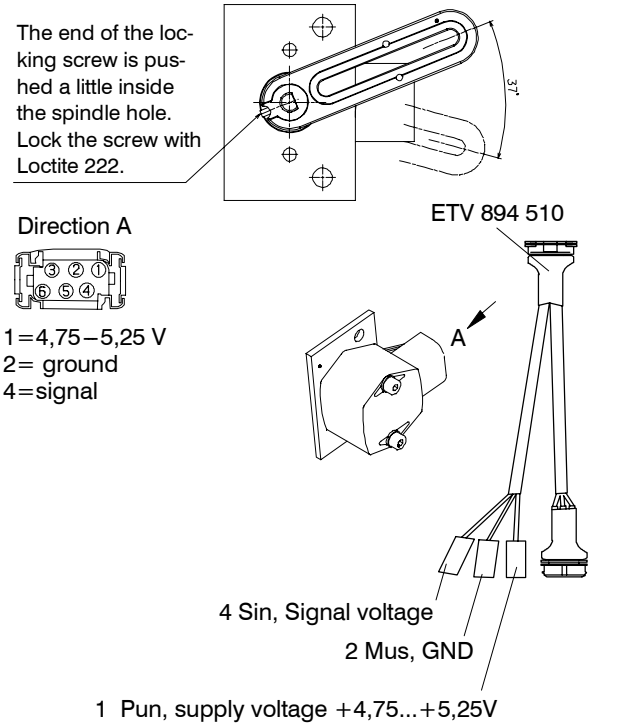
Note! If the gas pedal position sensor has malfunctions, it affects the automatic or manual functions of DPS (auto1, auto2, Speed Matching, AutoTraction etc). Defective engine rotation speed sensor can also cause these malfunctions in DPS.

Note! The rear gas pedal (TwinTrac) has been connected with a cable to the front gas pedal. When necessary, the cable must be adjusted.

The self diagnosis shows the following fault codes, when the gas pedal position sensor has malfunctions:

– **A128:** Reference voltage of the gas pedal (and clutch pedal) position sensor is not within given limits (4,5–5,5 VDC)). Eventually wires in short circuit.
– **A313:** Signal from the gas pedal sensor under 0,4 or over 4,4 VDC. Sensor wrongly fastened or wire damages. Battery voltage can be too low.

1. Check in the test mode (table **C** on page **371**/**9**), whether the sensor values are within the given limits (point A4 in the table). If the function is defective, check the sensor fitting and wires. Also check the sensor pin bearings (no clearance) and pin wear (and fuel injection pump pin wear).
If the signal voltage is missing or it is not in limits, check the supply voltage (4,75–5,25 V) and signal voltage by means of measuring cable ETV 894510.



Accelerator pedal	Up	In bottom
Signal voltage	2,0–4,7 V	0,3–3,0 V

2. If You think poor contacts, check the sensor connector and wires. Check connector X1A pins 1, 2 and 3 and connector X19 pins 28, 29 and 37. Also check the control unit connector A1A5.

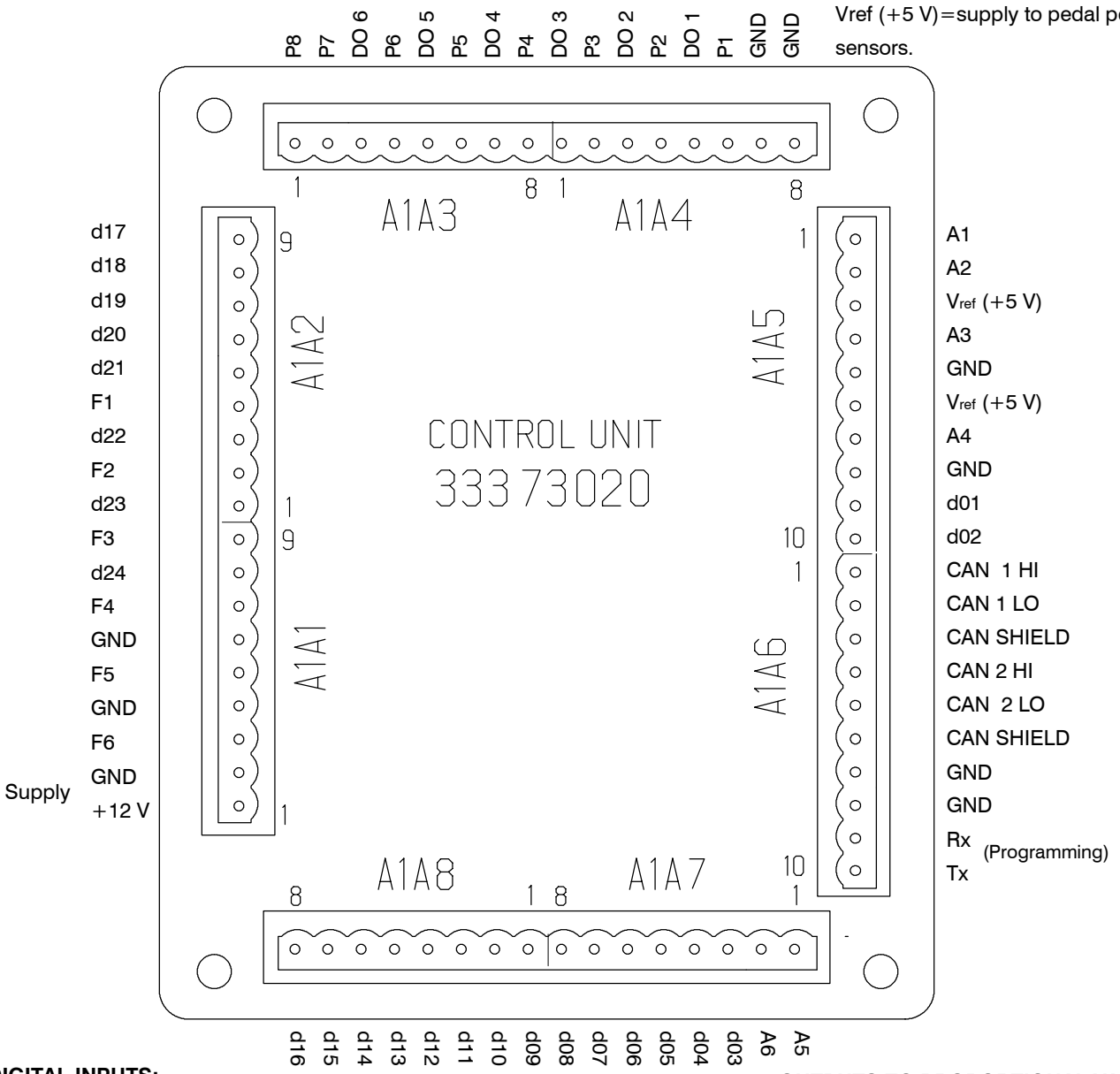
3. If the sensor fitting and its wires seem to be OK, but still malfunctions appear, the sensor itself can be damaged or the control unit A1. Change a damaged part.

4. After the fault has been repaired, carry out gas pedal calibration according to instr. **B** on page **370**/**15.** If the rear clutch pedal has malfunctions, adjust the pedal cable.

Note! The gas pedal position sensor must be calibrated after the first **500 running hours** and later at intervals of **1000** running hours.

5. Others

A. AC 5.2 control unit, connectors:



DIGITAL INPUTS:
d01=DPS up (S23)
d02=DPS down (S23)
d03=HiShift (S45)
d04=PTO start in cab (S25)
d05=seat switch (S60)
d06=clutch pedal, front (S9)
d07= DPS Auto1/Auto2 (S47)
d08= DPS auto/manual (S47)
d09 = Forwards F, front (S40)
d10=Rearwards R, rear (S41)
d11=DPS pre–progr., front (S51)
d12=PTO speed 1 (S28)
d13=PTO speed 2 (S29)
d14=direction of seat (S3W)
d15=PTO standby (S25)
d16=hand brake, front (S15)
d17= PTO start, mudguard (S1A, S2A)
d18= Forwards F, rear
d19= Rearwards R, rear
d20=Clutch pedal, rear (S2W)
d21=DPS pre–progr., rear
d22=handbrake, rear
d23=traction control (S76)
d24=Brake pedal switches

ANALOG INPUTS:
A1=outdoor temp (B17)
A2=oil temp (B14)
A3=Gas pedal, signal (B15)
A4=front clutch pedal, signal (B16)
A5=rear clutch pedal, signal (B1W)
A6=reserve

FREQUENCY INPUTS:
F1=engine speed (B11)
F2=gearbox speed (B6)
F3=reserve
F4=shuttle speed 1 (B12)
F5=shuttle speed 2 (B13)
F6=PTO speed (B7)

DIGITAL OUTPUTS:
DO 1=LCD display
DO 2=LCD display
DO 3=LCD display
DO 4=LCD display
DO 5=parking brake
DO 6=PTO pilot light (H10)

OUTPUTS TO PROPORTIONAL VALVES:
P1=DPS solenoid 1 (Y4)
P2=DPS solenoid 2 (Y6)
P3=DPS solenoid 3 (Y17)
P4=F–solenoid (Y11)
P5=R–solenoid (Y12)
P6=PTO–solenoid (Y2)
P7=starter interlock (K52)
P8=4WD automatics

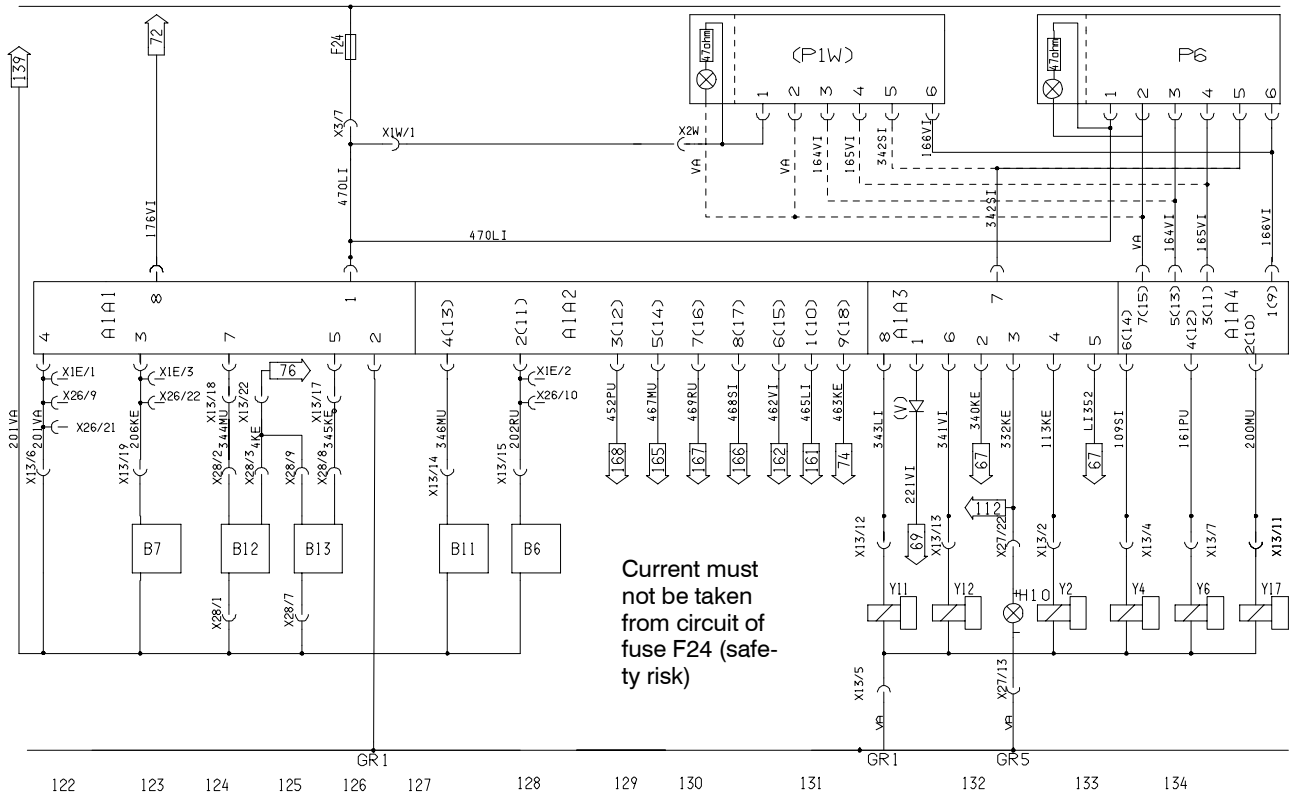
DATA TRANSFERRING CHANNELS:
CAN 1 HI *)
CAN 1 LO *)
CAN SHIELD *)
CAN 2 HI *)
CAN 2 LO *)
CAN SHIELD *)
GND
Rx
Tx
RS–232

*) CAN transferring channels are not in use for the present.

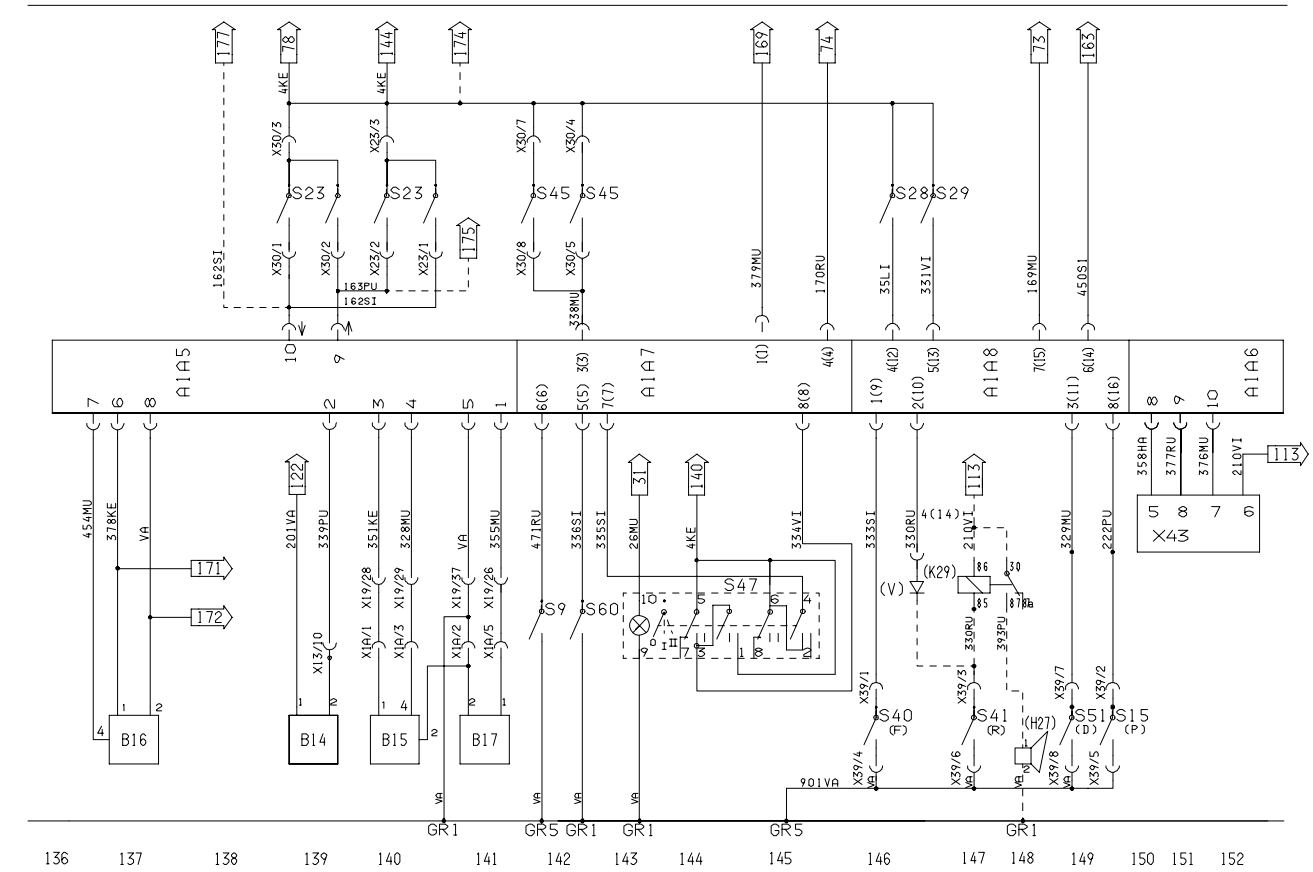
https://truckmanualshub.com/

B. AC 5.2, Wiring diagram

AC 5.2 1



AC 5.2 2



Wiring diagram AC 5.2

(The diagrams also under code 310). Position of connectors, see pages **310**/**6C** och **6D**.

A. Control unit connector A1A1

F24: AC5.2 fuse in the fuse box
GR1: earth point in the rear part of the lever console
B7: PTO speed sensor
B12: Shuttle speed sensor, upper
B13: Shuttle speed sensor, lower

Position of connectors:
X13: Connector for transmission (37 pins) on the support plate in the lever console.
X28: Connector for shuttle sensors (9 pins) in the lever console
X26: White connector (26 pins) in the rear face of the combination instrument.
X1E: Connector (9 pins) for ACD power lift speed sensors on the support plate in the lever console (also connector X2E).
X3: Connector in fuse box

B. Control unit connector A1A2

B6: Gearbox speed sensor
B11: Engine speed sensor

Position of connectors:
X13: Connector for transmission (37 pins) on the support plate in the lever console.
X26: White connector (26 pins) in the rear face of the combination instrument.
X1E: Connector (9 pins) for ACD power lift speed sensors on the support plate in the lever console (also connector X2E).

C. Control unit connector A1A3

Y11: Proportional valve, forward driving (F)
Y12: Proportional valve, rearward driving (R)
Y2: PTO proportional valve (PTO)
H10: PTO ind. light
GR1: earth point in the rear part of the lever console
GR5: earth poin in the cab front wall
P6: AC 5.2 diplay, front controls
(P1W): AC 5.2 display, reverse drive controls (TwinTrac)

Position of connectors:
X13: Connector for transmission (37 pins) on the support plate in the lever console.
X27: Blue connector (26 pins) in the rear face of the combination instrument.

D. Control unit connector A1A4

Y4: DPS proportional valve (C1)
Y6: DPS proportional valve (C2)
Y17: DPS proportional valve (C3)
P6: AC 5.2 display, front controls
(P1W): AC 5.2 display, reverse drive controls (TwinTrac)

Position of connectors:
X13: Connector for transmission (37 pins) on the support plate in the lever console.

E. Control unit connector A1A5

B14: Gearbox temperature sensor
B15: Gas pedal pisition sensor
B16: Clutch pedal position sensor
B17: Outdoor temperature sensor
S23: DPS push buttons up/down
GR1: earth point in the rear part of the lever console

Position of connectors:
X13: Connector for transmission (37 pins) on the support plate in the lever console.
X19: Connector (37 pins) on the cab front wall on the RH side.
X1A: Connector (9 pins) for the engine sensors in the front part of the engine compartment near the thermostat housing.
X23: Connector for DPS push buttons in the lower part of the gear levers
X30: Connector (9 pins) for gear lever push buttons in the lower end of the levers.

F. Control unit connector A1A6

X43: RS–232 connector on the lever console

G. Control unit connector A1A7

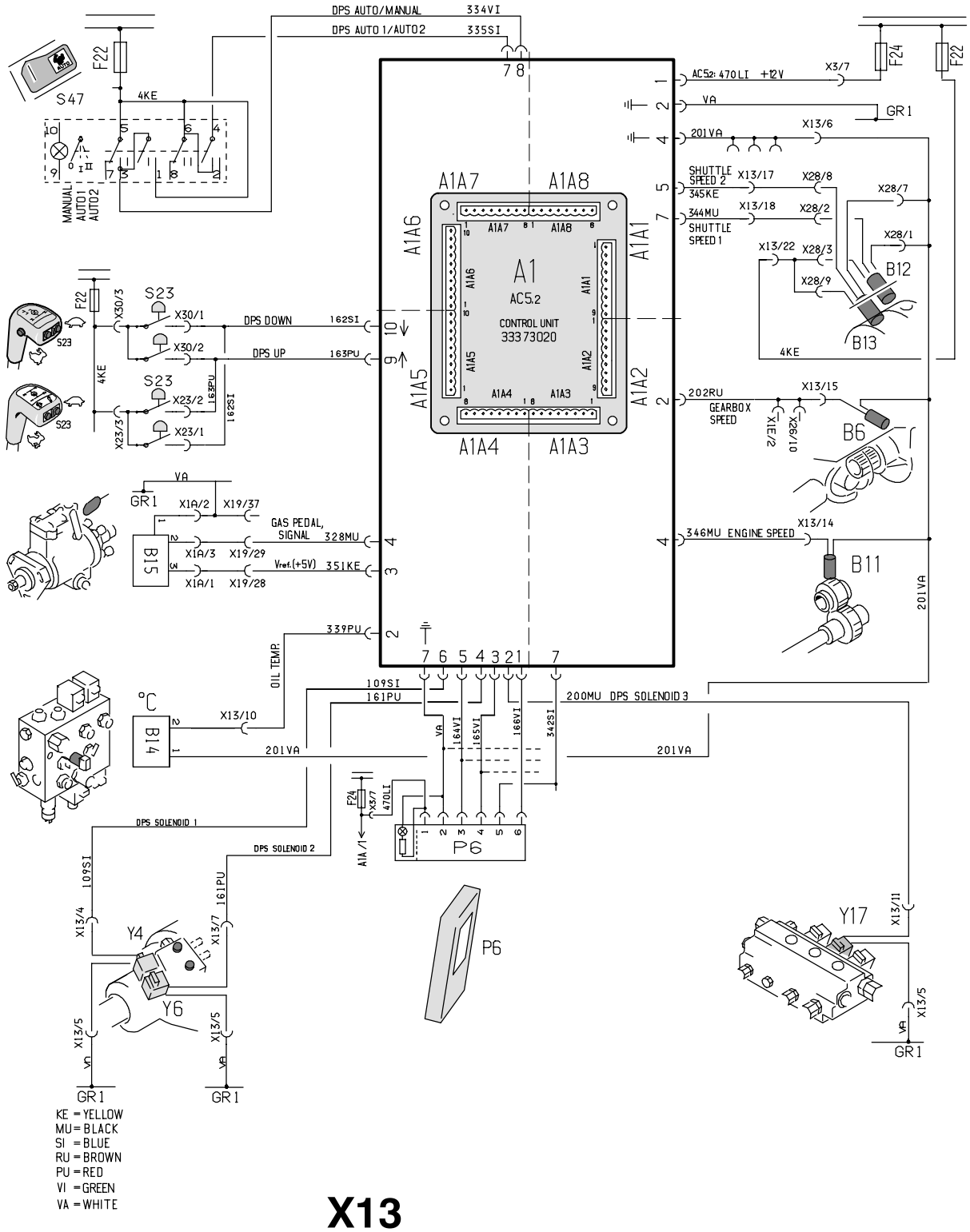
S9: Starter interlock switch at clutch pedal
S60: Safety switch in driver's seat
S47: Switch, DPS, man/auto
S45: Switches for HiShift
GR1: earth point in the rear part of the lever console
GR5: earth poin in the cab front wall
Position of connectors:
X30: Connector (9 pins) for the gear lever push buttons in the lower end of the levers.

H. Control unit connector A1A8

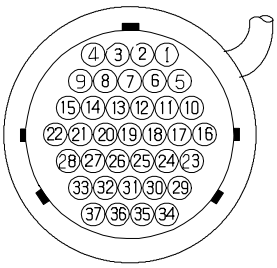
S40: Reed relay, forward driving (F).
S41: Reed relay, reverse driving (R).
S51: Push button, DPS, pre–programming
S15: Reed relay, parking brake (P)
S28: Switch, PTO 540.
S29: Switch, PTO 1000/540E
H27: Back buzzer
K29: Relay, back buzzer
GR5: earth poin in the cab front wall
Position of connectors:
X39: Connector (9 pins) for the shuttle lever at the steering wheel under the dashboard.

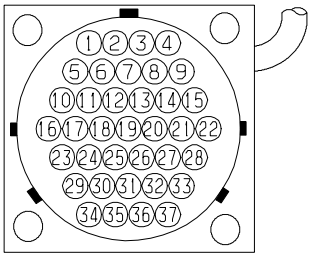
C. Control diagrams

Control of DPS, AC 5.2

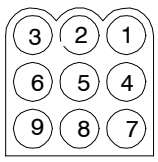


X13



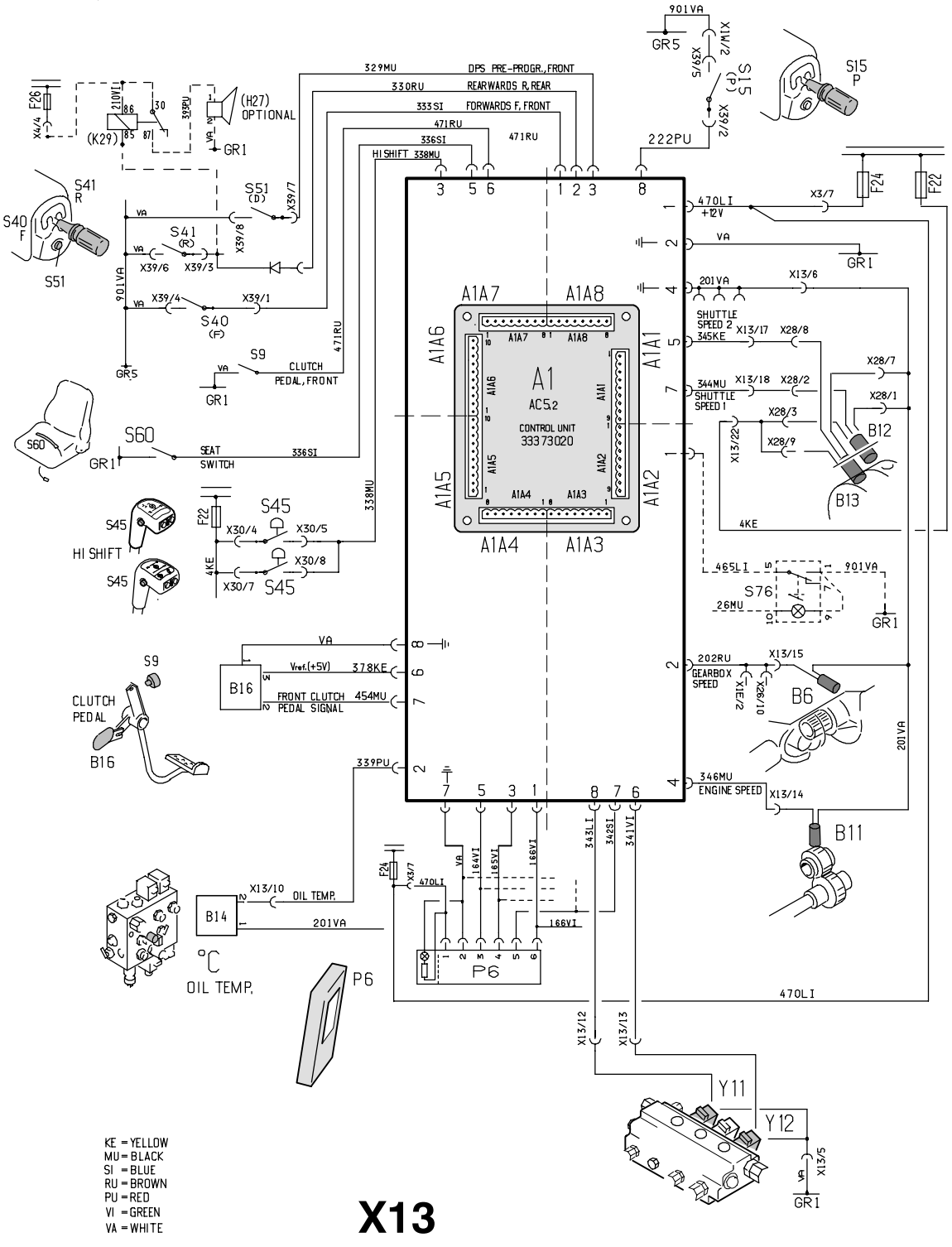


V1, V4



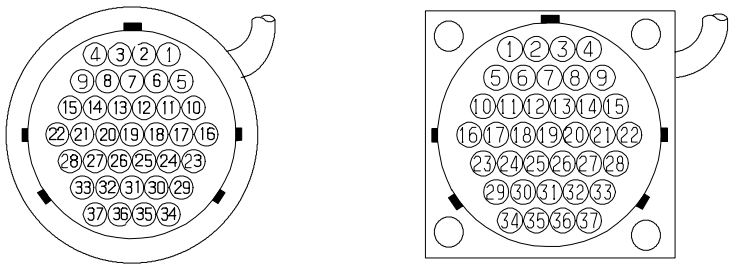
Control of HiTech shuttle, AC 5.2

AC5.2 (K41107–): SHUTTLE CONTROL, WIRING

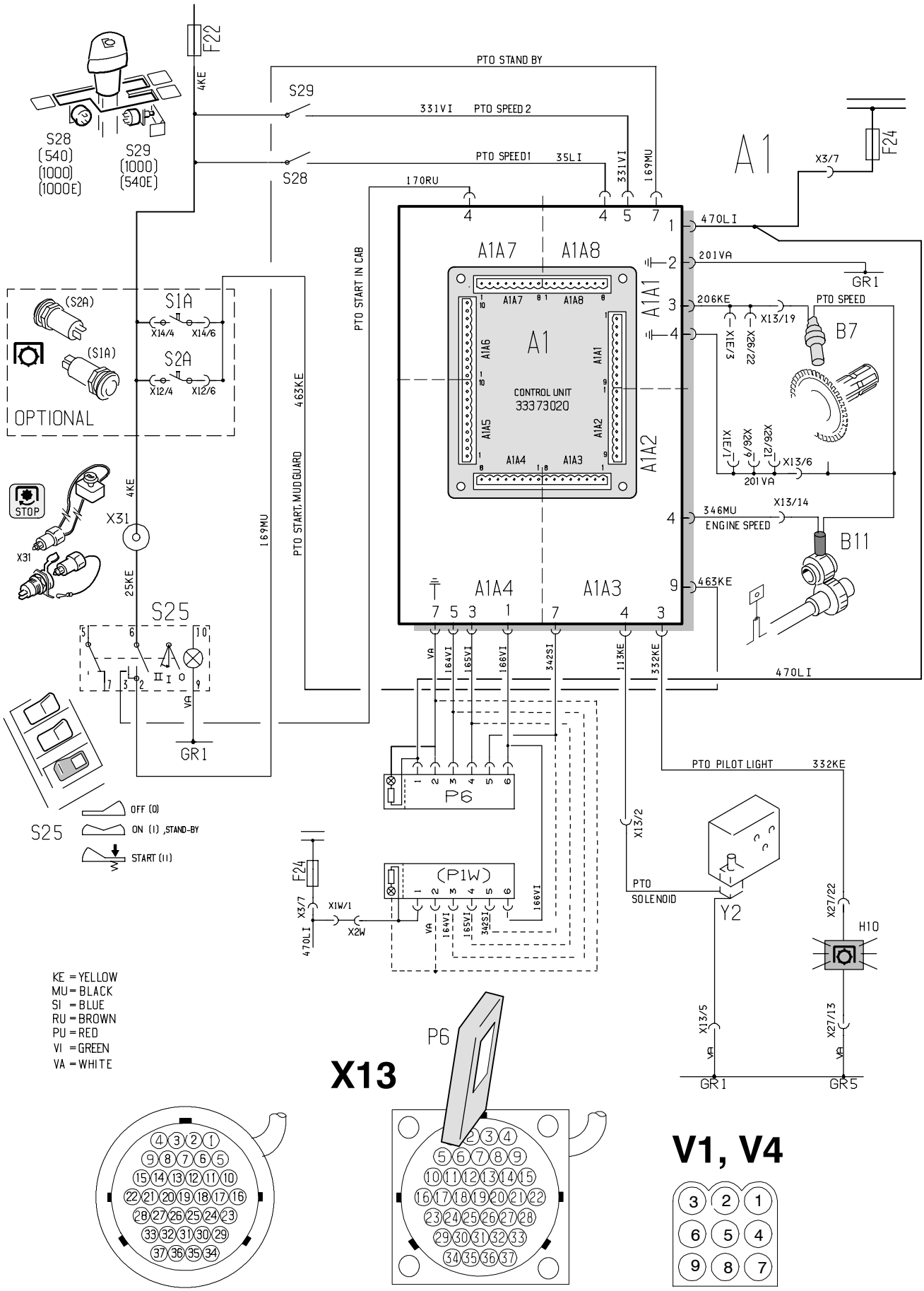


KE = YELLOW
MU = BLACK
SI = BLUE
RU = BROWN
PU = RED
VI = GREEN
VA = WHITE

X13

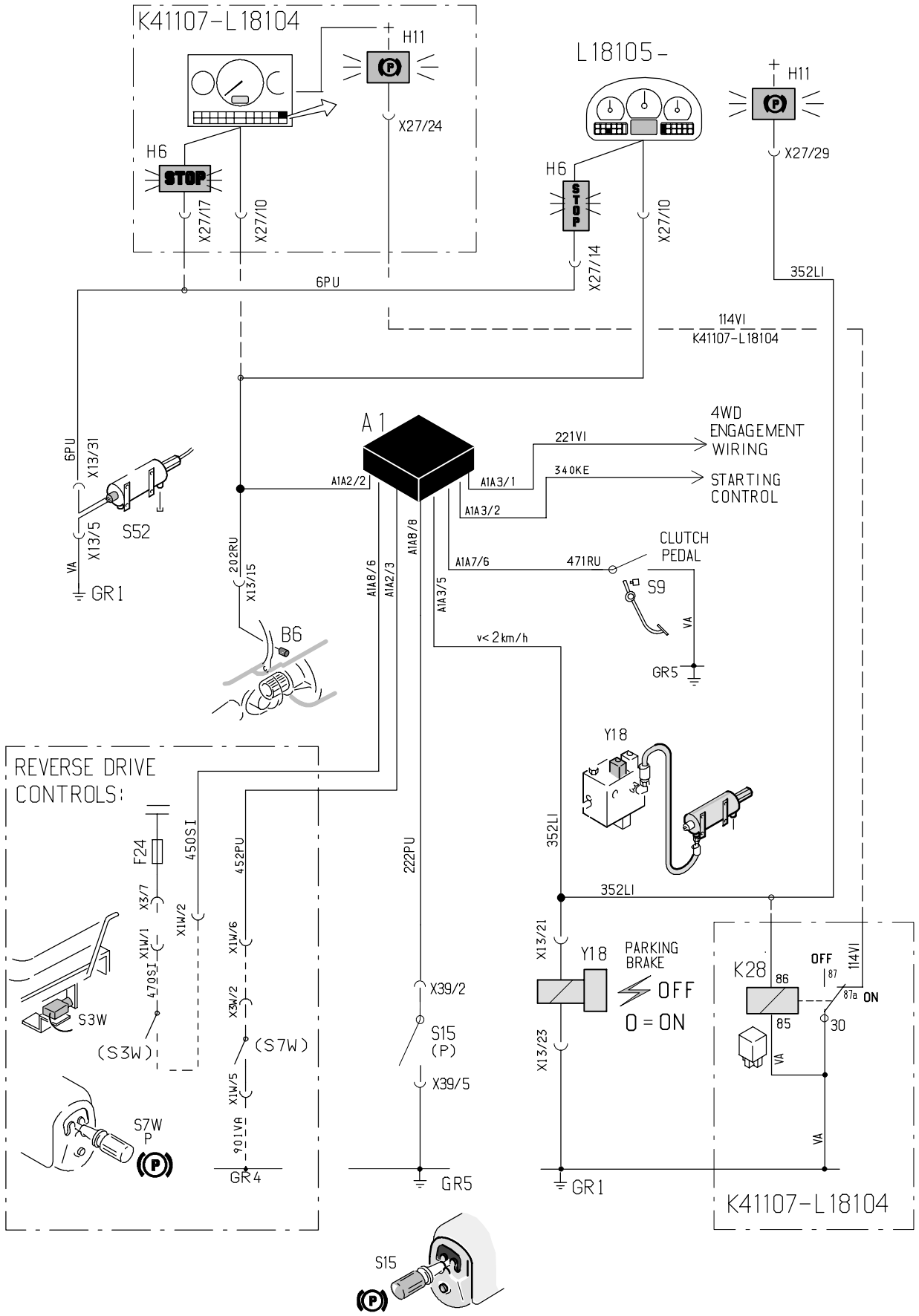


Control of PTO, AC 5.2

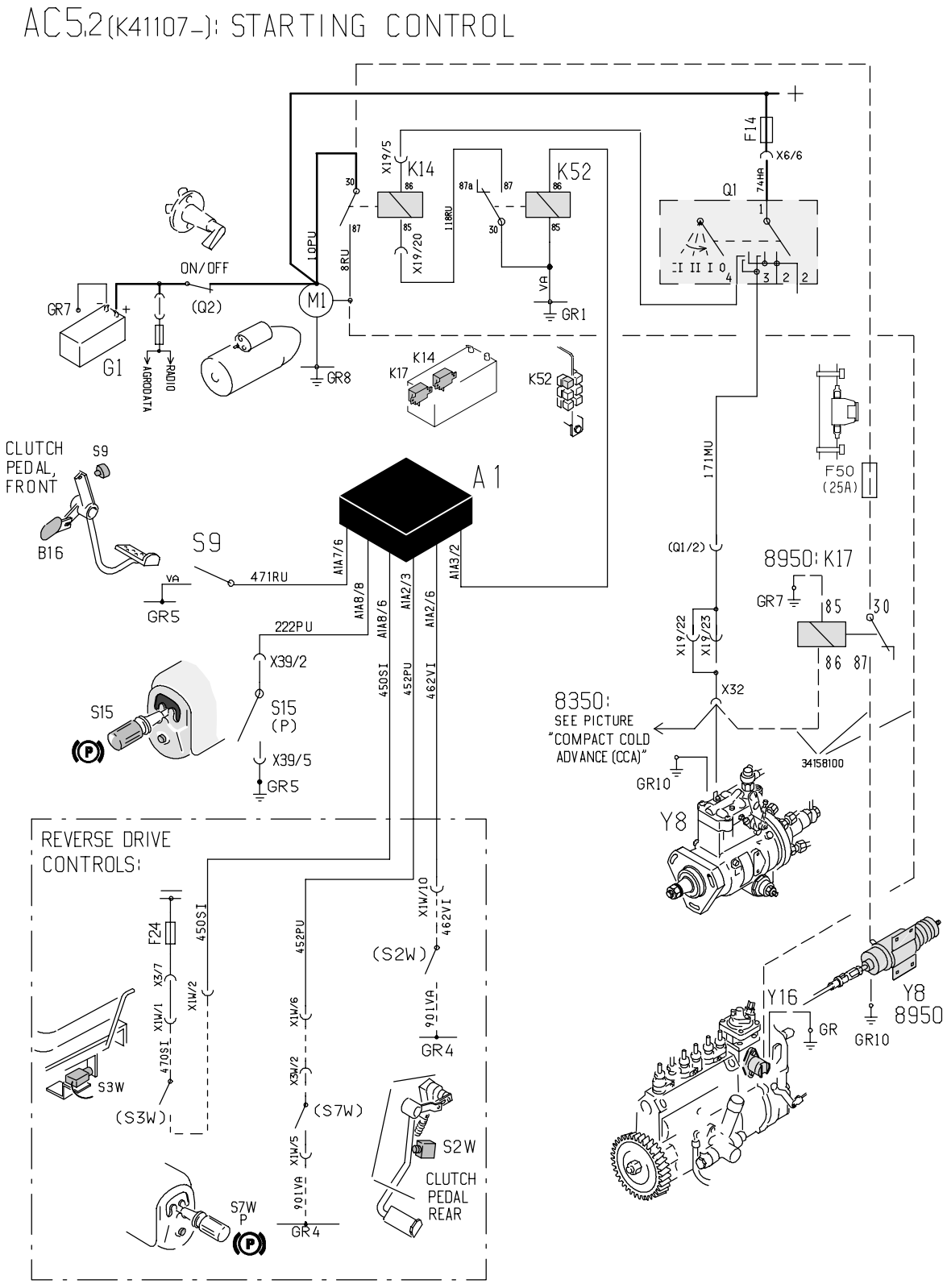


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Control of parking brake, AC 5.2



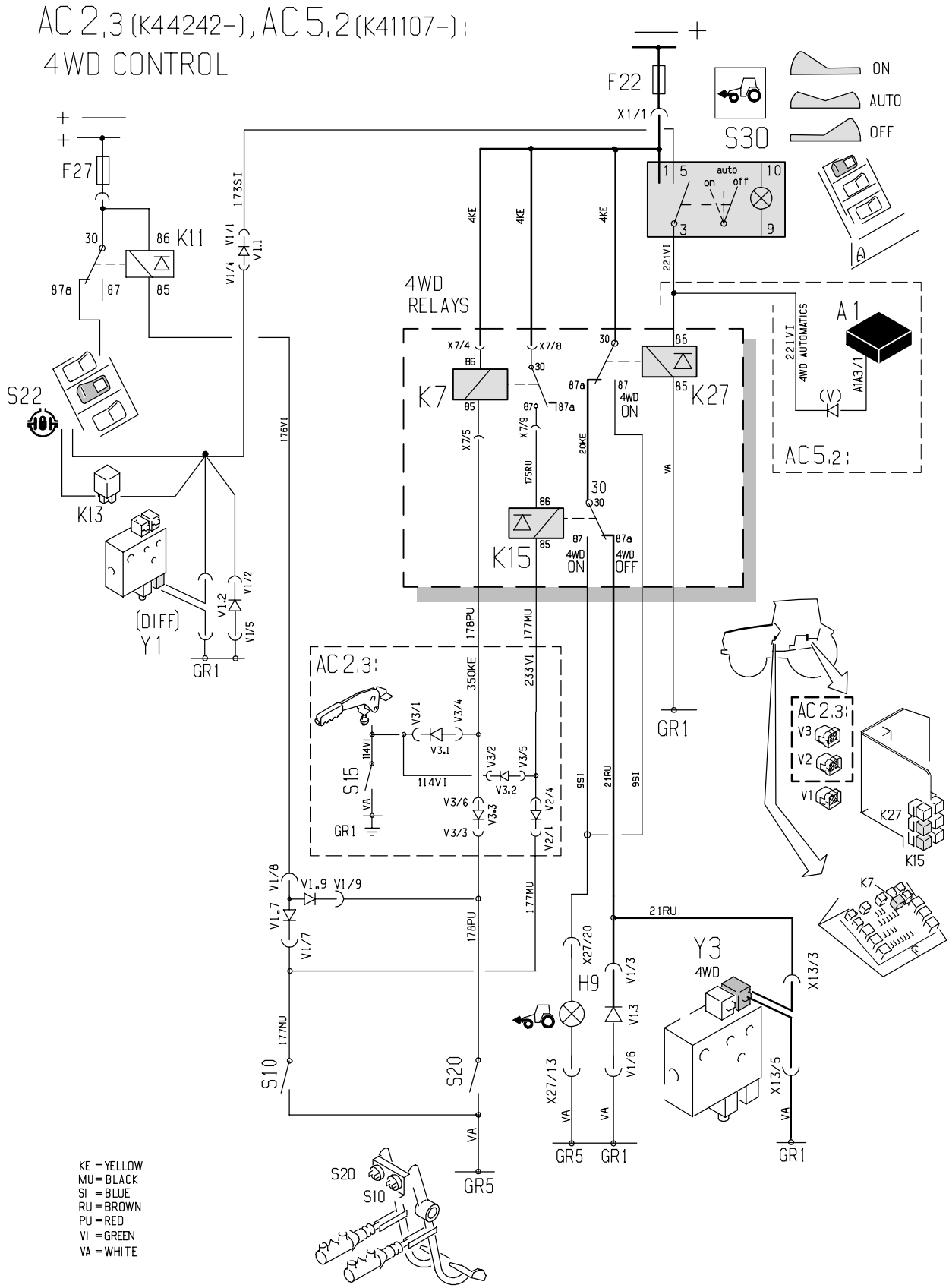
Starting control, AC 5.2



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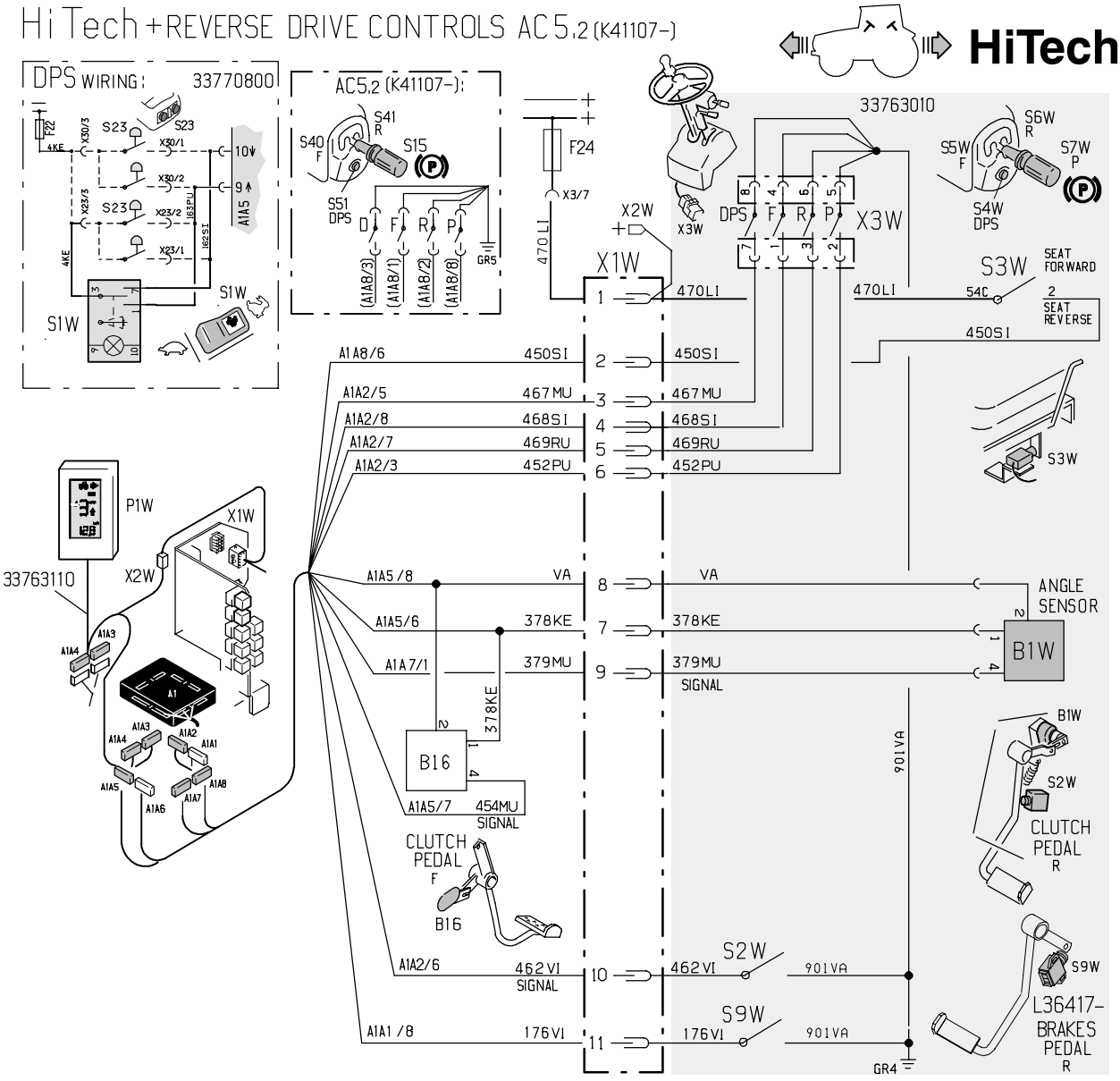
Control of 4WD, AC 5.2

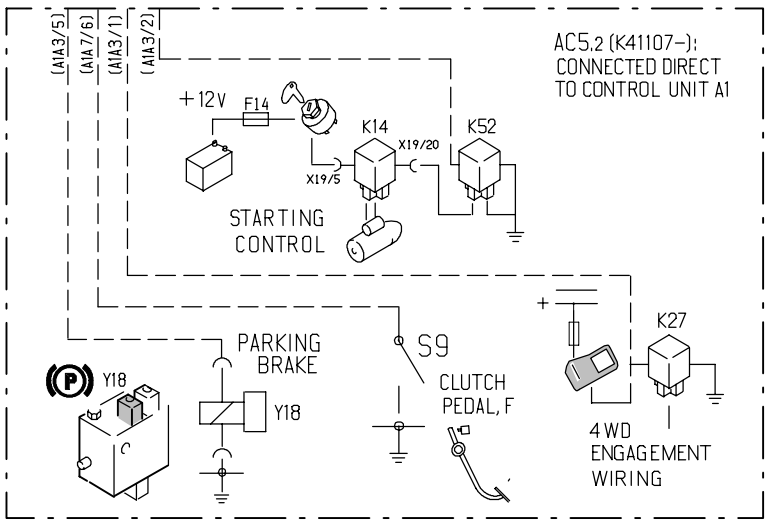
HiTech

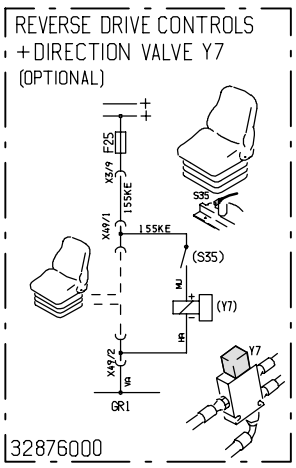


https://truckmanualshub.com/

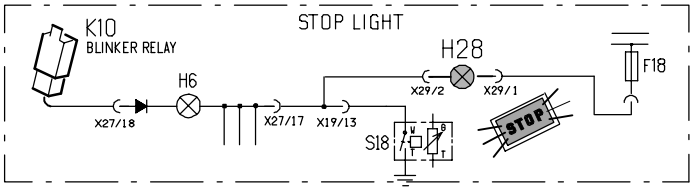
TwinTrac, AC 5.2





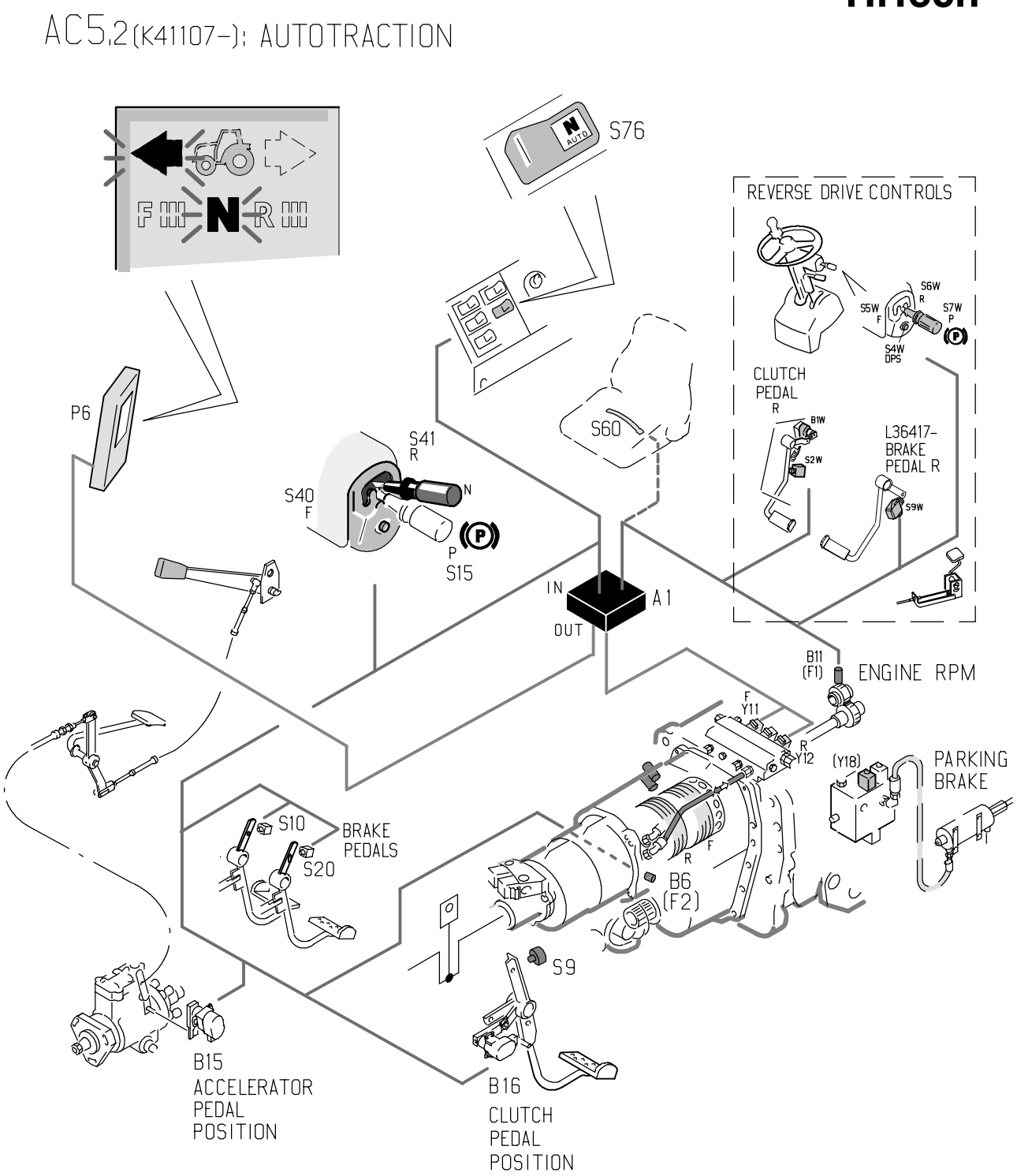


KE = YELLOW
MU = BLACK
SI = BLUE
RU = BROWN
PU = RED
VI = GREEN
VA = WHITE



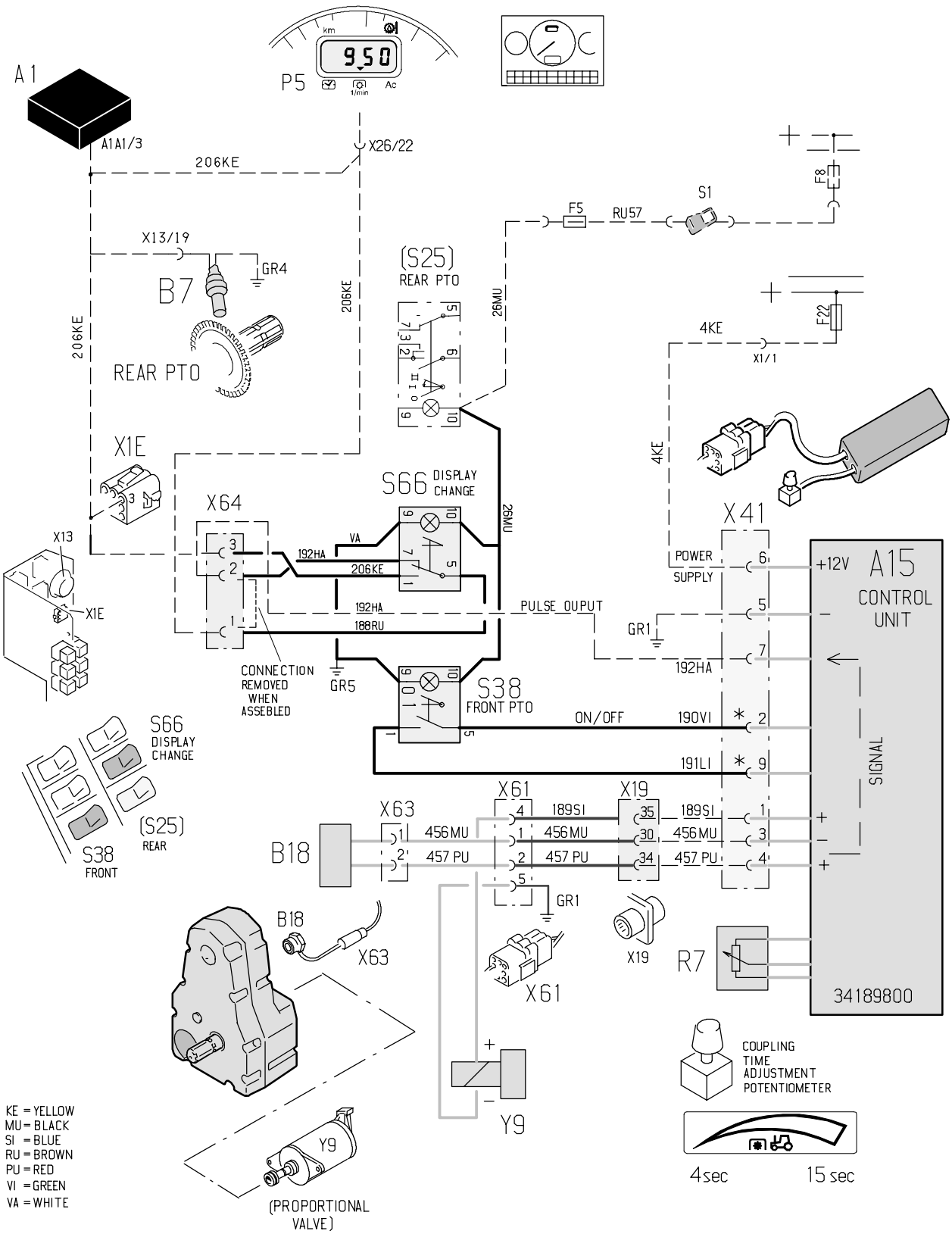
AutoTraction

HiTech



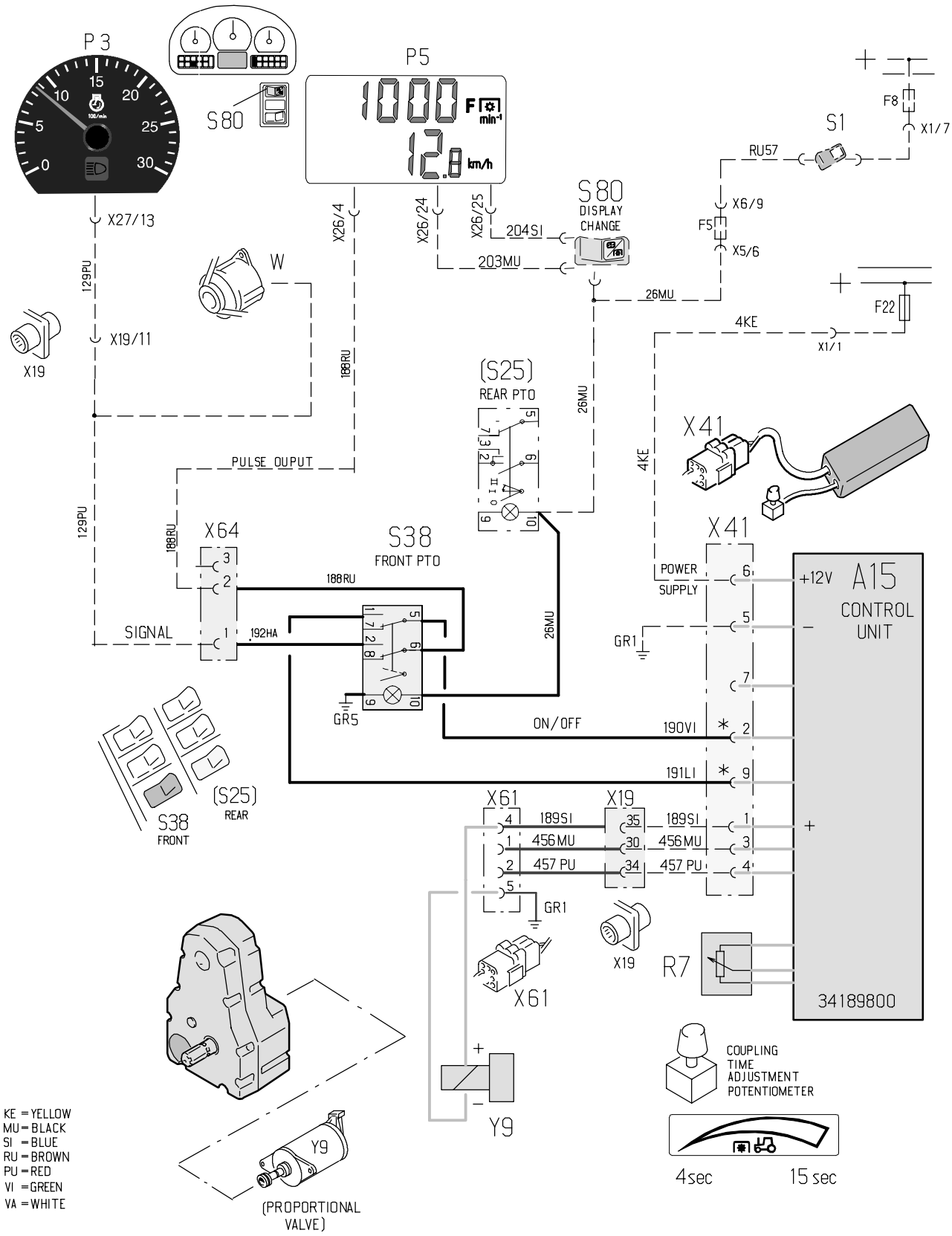
AC 5.2 FRONT PTO, WIRING
(4-cyl, models, K41107 – L18104)

HiTech



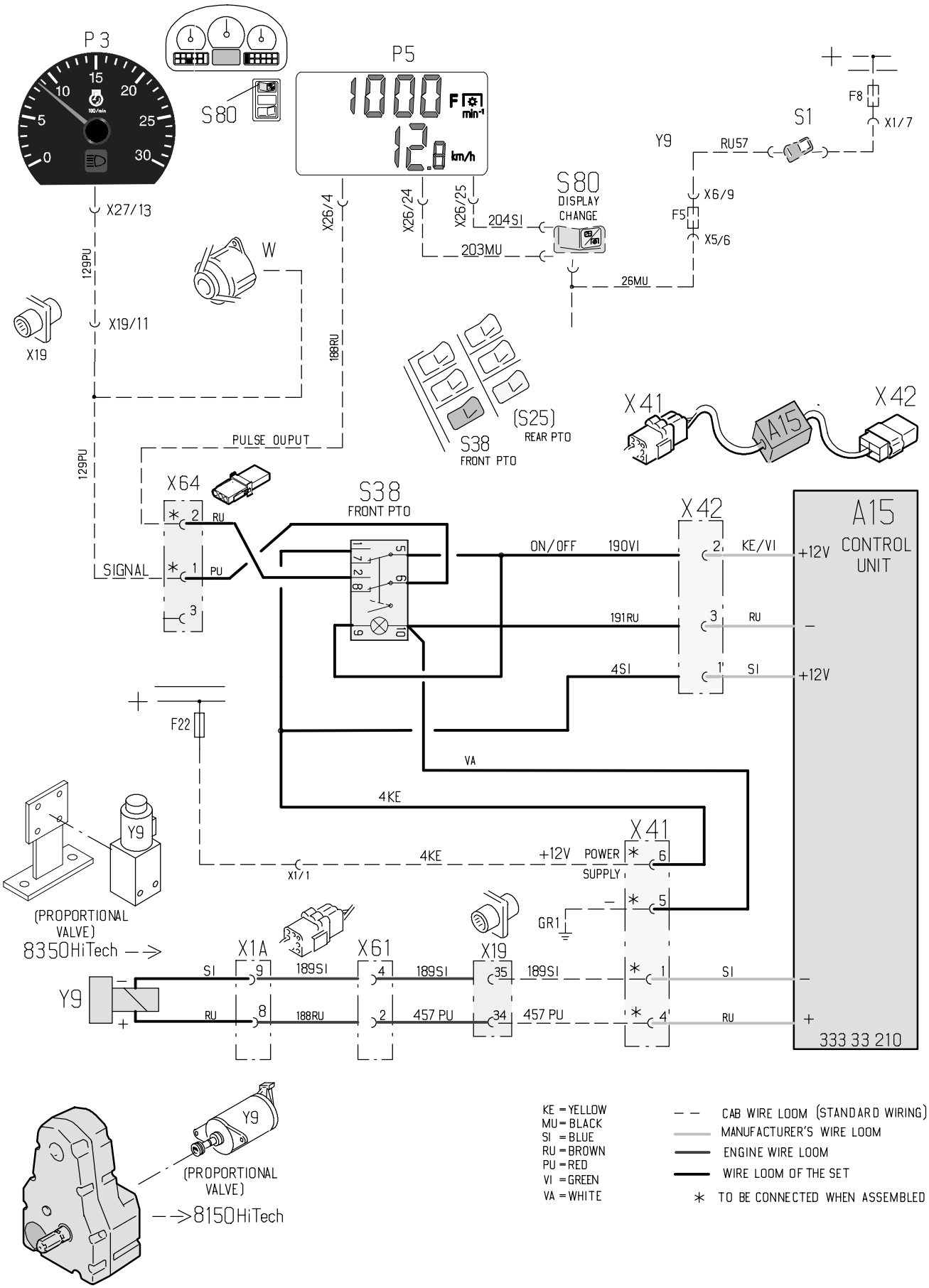
AC 5.2 FRONT PTO, WIRING
(4-cyl. models, (L18105-)

HiTech



AC 5.2 FRONT PTO, WIRING
(6-cyl. models, (L18105-)

HiTech



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Rear window wiper and washer 31611700.

Fitting wiper motor:

– There are ready–made holes for the wiper motor in the rear window (point A).

– Remove the protective plugs, clean the window and glue sticker 32534400 on the fastening point on the inner side.

– Fasten the wiper motor according to picture A.

– Connect the motor to connector M5 which is placed in the wire loom for the cab. The connector can be found by opening a little the roof rear linings.

To tractor no 660794:

– Remove the instrument panel cover by unscrewing four cross-head screws and the starter switch nut. Remove the cover and fit rocker switch 30943900.

– Connect existing connector " S32" (wire no 13, 120, 122 and 123) to the rocker switch and wires no 26 and earth lead (white) to the indicating lamp holder (picture C).

From tractor no 660795:

– Remove the lever console longer switch panel. Cut a hole on the panel (marked) for the switch frame (picture D).
Fasten the switch S32 in the upper hole (covers on the lower holes).
Seek connector "S32" under the panel. If necessary, remove the lever console side panel. Connect connector to the switch (picture C) and fit the frame.

– Switch on the wiper for a while and observe the extreme stopping points of the wiper.

– Fasten the wiper arm and the blade.

Fitting washer:

– The washer reservoir bracket is attached under the fixing screws of the LH side rear mudguard (picture B).

– Take supply voltage for the pump from existing connector X18 in the wire loom 32275900.

– Connect the wire loom and a water hose to the reservoir pump and fit the reservoir.

– Drill a hole ø 12 mm for the lead–in rubber of the water hose (see picture B).

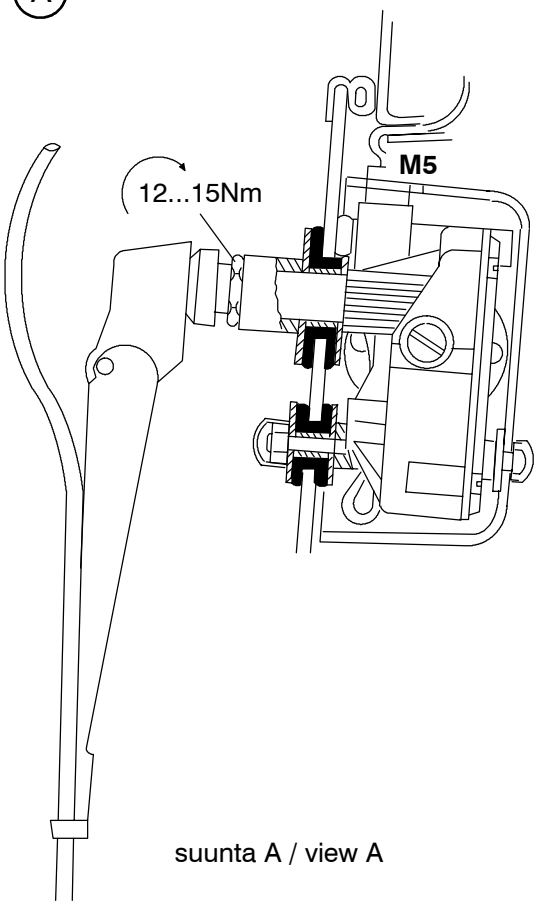
– Pass the hose according to the picture, glue hose fasteners (2 pcs) to the edge of the corner box and fasten the hose to the blade with fastener 30637400. Fit and direct the nozzle.

Function:

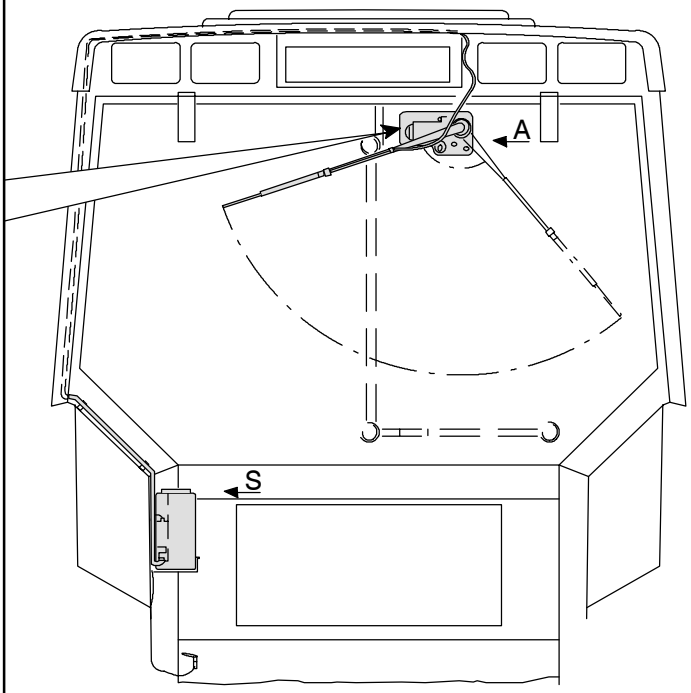
– The wiper functions by pushing the rocker switch to position I and washer by pushing continually the switch.

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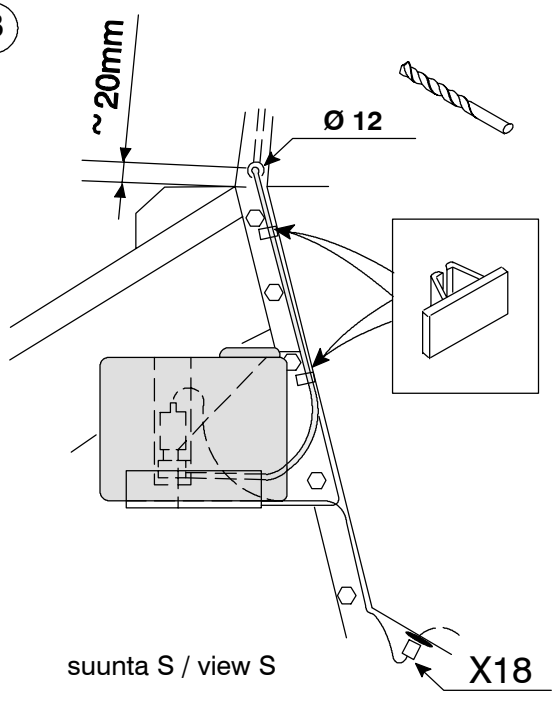
A



suunta A / view A

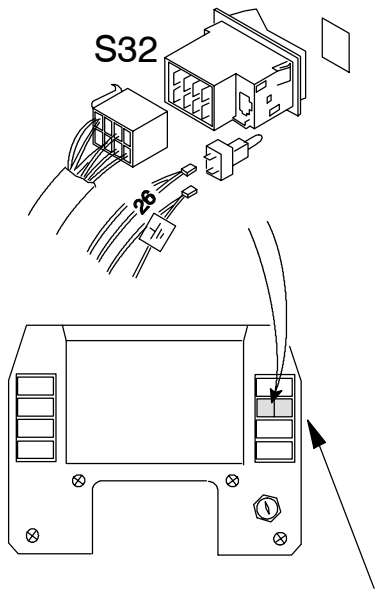


B



suunta S / view S

C

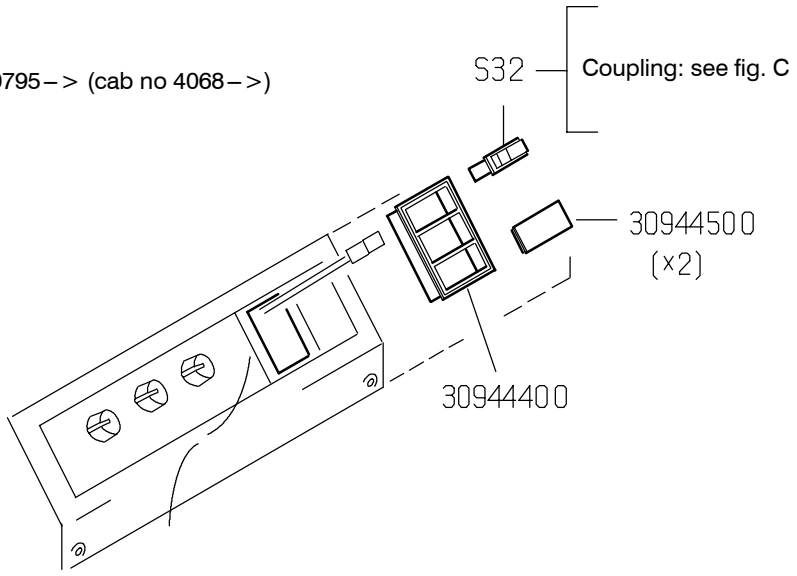


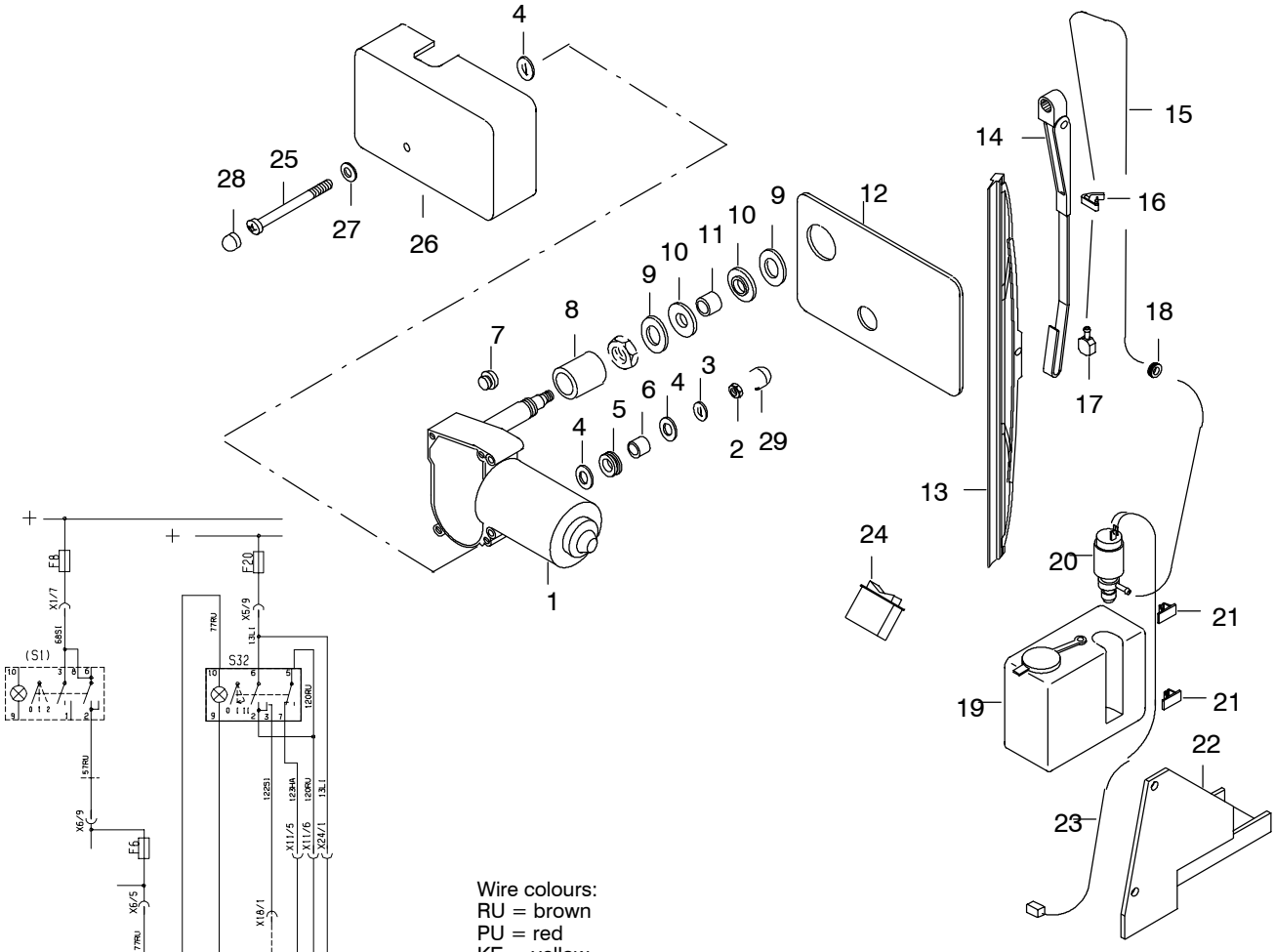
Traktorin nr. –>660794 asti
Traktorer till tillv. nr –>660794
Tractors to no –> 660794

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D

Tractors from no. 660795–> (cab no 4068–>)





Wire colours:
RU = brown
PU = red
KE = yellow
SI = blue
MU = black
VI = green
VA = white
HA = grey
LI = lilac

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	1	31611700	Takalasin pyyhin	Brakrutetorkare	Rear window wiper	Rückscheibewascher	
1	1	32275700	.Moottori	Motor	Engine	Motor	
2	1	JB8903	.Mutteri	Mutter	Nut	Mutter	
3	1	JD0406	.Aluslevy	Bricka	Washer	Scheibe	
4	3	32241000	.Aluslevy	Bricka	Washer	Scheibe	
5	1	30314000	.Läpivientikumi	Gummigenomföring	Rubber inlet	Durchführ.gummi	
6	1	32060900	.Holkki	Hylsa	Sleeve	Hülse	
7	1	32249100	.Kumi	Gummi	Rubber	Gummi	
8	1	32237100	.Holkki	Hylsa	Sleeve	Hülse	
9	2	32240900	.Aluslevy	Bricka	Washer	Scheibe	
10	2	32275600	.Kumi	Gummi	Rubber	Gummi	
11	1	32237200	.Holkki	Hylsa	Sleeve	Hülse	
12	1	32534400	.Tarra	Dekal	Sticker	Aufkleber	
13	1	30302100	.Sulka	Blad	Blade	Feder	
14	1	32275500	.Varsi	Arm	Arm	Arm	
15	1	32546800	.Letku	Slang	Hose	Schlauch	
16		30637400	.Kiinnitin	Fästdon	Fastener	Halter	
17	1	30240800	.Suutin	Munstycke	Nozzle	Düse	
18	1	30145500	.Läpivientikumi	Gummigenomföring	Rubber inlet	Durchführ.gummi	
19	1	30184500	.Säiliö	Behållare	Container	Behälter	
	1	31960600	..Korkki	Lock	Cap	Deckel	
20	1	30240700	.Moottori	Motor	Engine	Motor	
21	2	30324000	.Kiinnitin	Fästdon	Fastener	Halter	
22	1	32276000	.Teline	Konsol	Bracket	Gestell	
23	1	32275900	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
24	1	30943900	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
25	1	HD9168	.Ruuvi	Skruv	Screw	Schraube	
	1	30944800	.Linssi	Lins	Lens	Linse	
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
26	1	32773000	.Suoja	Skydd	Cover	Schutz	
27	1	32667000	.Aluslevy	Bricka	Washer	Scheibe	
28	1	32604400	.Suoja	Skydd	Cover	Schutz	
29	1	31631800	.Suoja	Skydd	Cover	Schutz	
–	1	30944400	.Paneeli	Panel	Panel	Panel	:
–	2	30944500	. Peitelevy	Täckplatta	Covering plate	Deckplatte	:

: Traktorin numerosta 660795– >
Fr.o.m. traktor nr. 660795– >
From tractor no 660795– >

https://truckmanualshub.com/

PTO emergency stop 32916400

– With this mounting kit the PTO emergency stop can be fitted also on earlier Mezzo tractors (standard on ACII, IV Mezzo tractors). At the same time, the PTO switch is changed to the 3–position switch and the new switch is fitted on the side panel.

The PTO does not start any more when the engine is started.

PTO stops when the plug is removed from the socket. Also an electric stop switch can be connected to the plug (switch is not delivered with the mounting kit).

FITTING:

– Disconnect the battery earth cable. Remove the cab lever console side panel. Detach the longer switch panel section on the console.

– Disconnect connector S25 (3 pins) in the console in front of the PTO lever and connect inplace connector "S25" in the wiring loom **12**.
Detach the switch in the PTO lever knob and remove it together with its wires. Place plug **11** inplace of the switch.

– Drill a ø 5,5 mm through the vertical gutter under the panel. Fasten to the hole wiring loom **12** relay holder with screw **1,2** and fit relay **10**.

– Rocking switch **3** is fitted on the AUTOCONTROL –panel (see picture). If there is already extra switches on the panel (e.g. rear window wiper). fit the new switch onto a free reserve place. Otherwise, make on the panel 49x78 mm opening for a switch frame **4** (place for opening has been marked on the rear face of the panel). Place cover plates **5** onto the other openings.

– Make a ø 19 mm hole on the RH side of the lower rear window above the PTO cable. Fit into the hole emergency socket **6** (wire no 35 (lilac) to the middle pin and wire no 25 (yellow) to the outer pin) and fit the emergency plug fixing plate **7**.

Fasten sticker **8** beside the hole. Fit the plug **9** into the socket, plug fastener is fitted to the hole on the plate.

– Connect the battery earth cable.
Check the function of the emergency stop. How to use the emergency stop, see the following page.

https://truckmanualshub.com/

The power take off switch has 3 positions:

The **front side** pressed down = **off** position.
The switch in the **middle** = **on** position.

Rear side pressed down, spring return is the starting position.
By pressing the rear side down the PTO is engaged. By pressing the front side of the switch down the PTO is disengaged.
The PTO is only disengaged temporarily with this switch. The indicator light on the instrument panel is still illuminated showing that the lever is engaged. **Always disengage the PTO by moving the PTO lever to the middle position e.g. when leaving the tractor cab by moving the lever to the middle position**.

– The PTO can be temporarily disengaged by pushing the PTO lever outwards (not when using ground speed PTO).The PTO should be started with switch.

– The emergency stop outside the tractor can be connected to operate in two different ways:

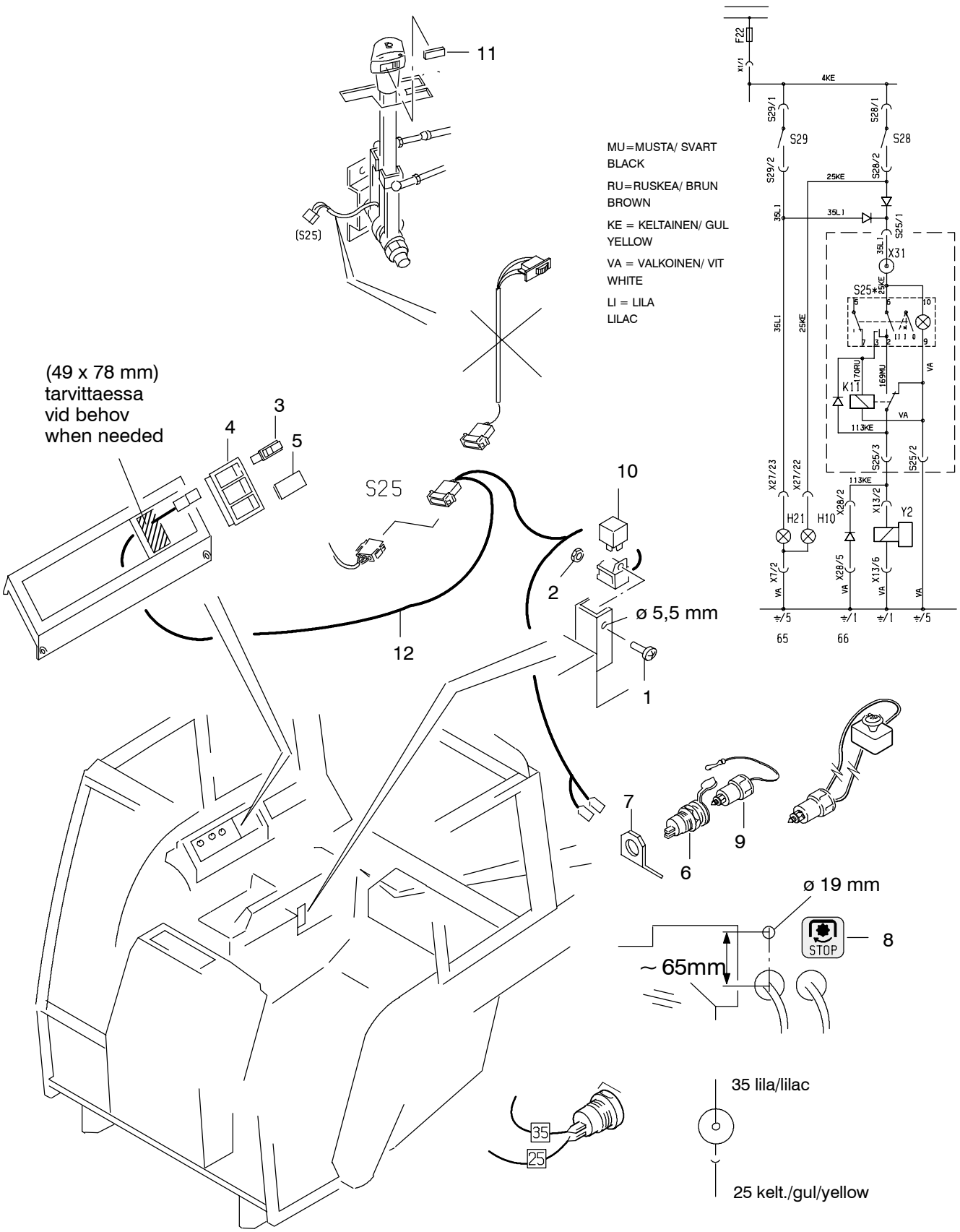
Method 1. Connect a rope from the operating position on the implement to the stop plug.

Method 2. Connect a longer loop of cable to the plug and have an emergency switch fitted in the loop close to the operator.

– After an emergency stop or stopping the tractor engine the PTO will only start by pressing the switch in the starting position.

	1	32916400	PTO–hätäpysäytys	Nödstopp, PTO	Emerg. stop,PTO	Notstop, Zapfwelle	
1	1	HD8005	.Ruuvi	Skruv	Screw	Schraube	M05X12
2	1	JB8902	.Mutteri	Mutter	Nut	Mutter	N M5
3	1	30943900	.Keinukytkin	Vippströmbrytare	Rocker switch	Schalter	3– Pos.
	1	32887200	.Symbolilinssi	Symbollins	Lens	Linse	PTO
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
4	1	30944400	.Asennuspaneeli	Panel	Panel	Panel	
5	2	30944500	.Peitelevy	Täckplatta	Covering plate	Deckplatte	
6	1	32207200	.Pistorasia	Stickdosa	Plug socket	Steckdose	
7	1	32891500	.Levy	Platta	Plate	Platte	
8	1	32893700	.Tarra	Dekal	Sticker	Aufkleber	
9	1	32893900	.Oikosulkupistoke	Stickkontakt	Contact plug	Steckkontakt	
	1	32893800	..Haka	Hake	Hook	Haken	
10	1	32906800	.Vaihtorele	Relä	Relay	Relais	With diode
11	1	32908100	.Tulppa	Täckplatta	Covering plate	Deckplatte	
12	1	32916300	.Johdinsarja	Ledningsats	Wiring set	Verkabelung	

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Electric stop + control stop (A+B) . 33036300
A) Electric stop of engine 32914200
B) Control stop 33005600
33005610

D Note! Tractors with starter switch **816450** (not current supply to the other devices during starting): the electric stop requires a new starter switch (**32553200,** as standard from March –94), **SHOULD BE ORDERED SEPARATELY**
The starter switches can be recognized in switch connectors.

D **Note! 3– and 4–cyl. motors with in–line injection pump:** some models with air conditioner must have an extra belt pulley (**32889100**) for air conditioning compressor belt. **SHOULD BE ORDERED SEPARATELY.** (see picture **A5**)

– The fuel injection pump is moved into the starting position when the starter switch is switched to position 1. The engine stops when the starter switch is turned to position 0.

A) FITTING (pages 1–3):

– Remove the engine hood side plates. Disconnect the battery earth cable.

– Remove the earlier stop control cable and fit the cover plate, picture **A1**.
Change the cable lead–in rubber on the cab front wall into the plug **14** (picture **A2**).
Up to ser. no **662342**: The lead–in rubber is not necessary to change (an extra wire is drawn through the rubber hole).

– Tractors with starter switch **816450**:
Remove an earlier starter switch. Connect the cab wiring loom to the new starter switch (32553200) according to picture **A3**.

Tractors up to ser. no. **662342** (not AC II): Make a wire (cross section 2,5 mm^2, length 4 m, fit suitable connectors to the wire ends). Connect the one end of the wire to the starter switch pole 2 and pass the other end through the lead–in rubber hole into the engine compartment (see picture **A4**)

– Tractors with starter switch **32553200** (current supply also during glowing and starting):
It is unnecessary to change the starter switch.

– **Tractors equipped with air conditioner (3– and 4–cyl.)**:
Fasten the extra belt pulley together with parts **95–105**, see picture **A5**.

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– Remove the control rod protective cap and the seal in the front part of the injection pump.
Apply locking fluid (Loctite 242) onto the screw **4** and fit the screw and an o–ring onto the end of the control rod.
Apply locking fluid also onto the solenoid **5** threads and screw in the solenoid.

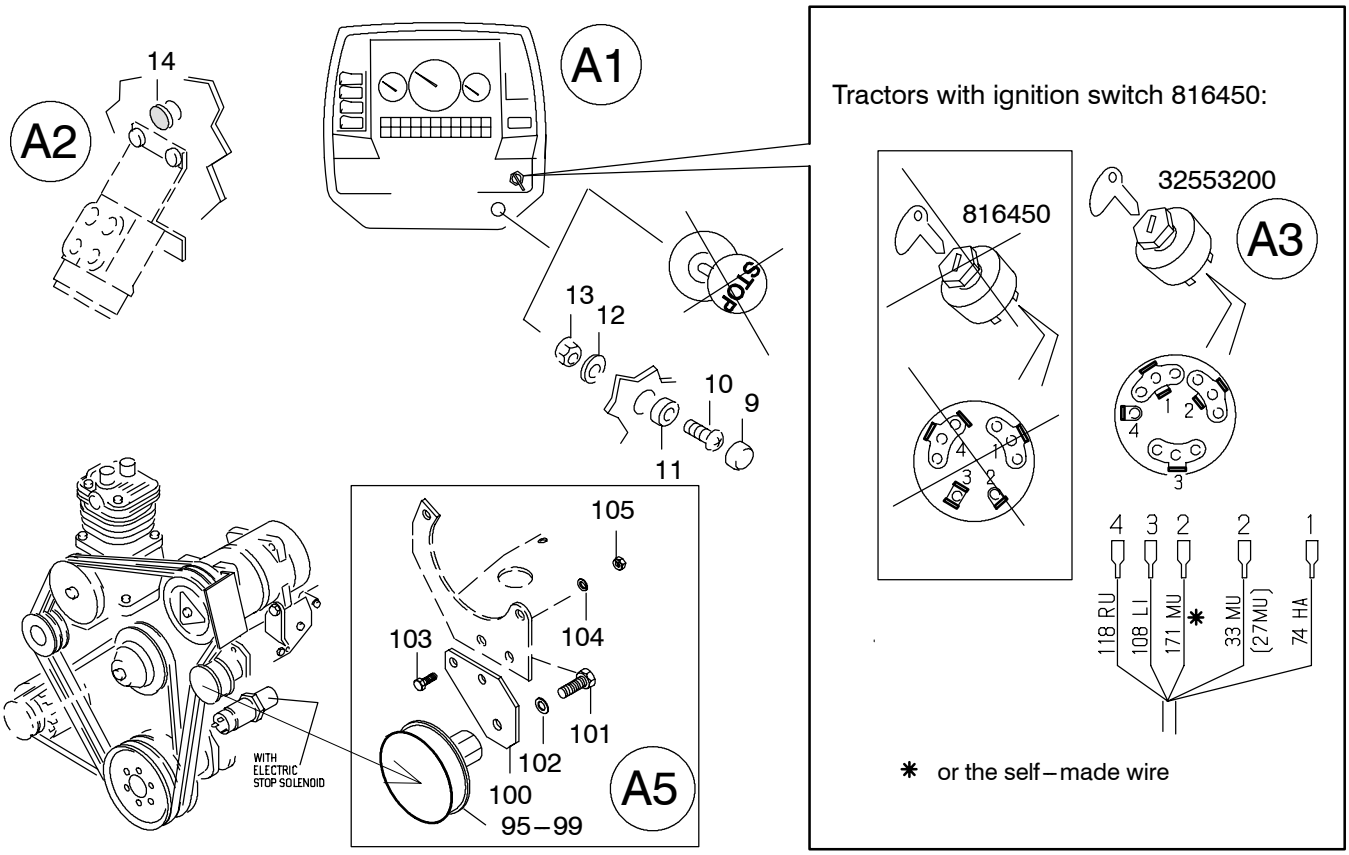
– Connect the wiring loom **1** wire no 171 (black) to the solenoid connector "–".
Bind the wire loom onto the solenoid using a plastic slip.
Fasten the wire loom earth shoe (white wire) under the injection pump fixing bolt.

– Find the wiring loom to the engine temperature sensor (beside the thermostat). In the wiring loom protective tube there is wire no 171 (black), connect it to wiring loom **1** corresponding wire.
Up to ser. no. **662342**: connect the earlier made wire end to the wire no 171 (Black) in the wiring loom **1**.

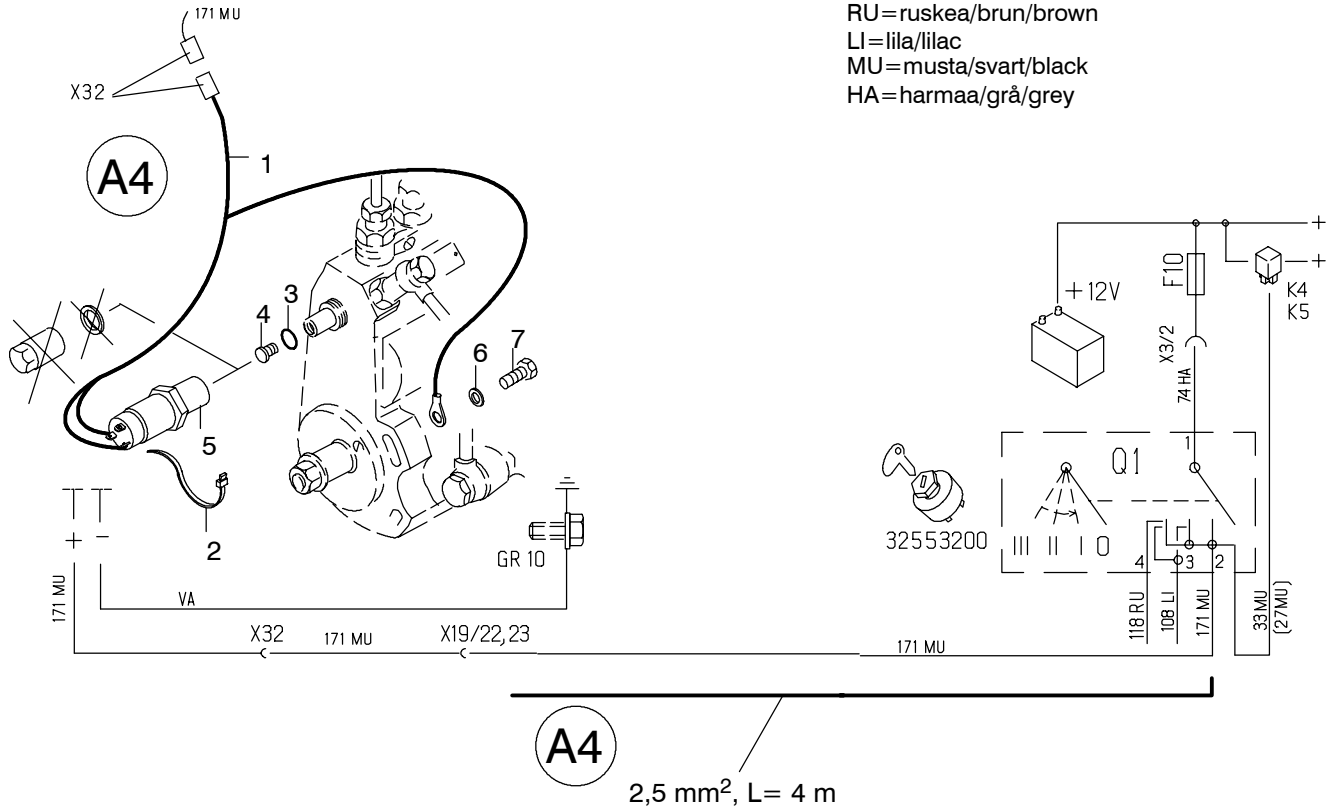
– Connect the battery. Check the function.

	1	**32914200**	Sähköpysäytin	Elstopp	Elecric stop	Elektrische stop	
1	1	32914300	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
2	3	SA1900	.Johdinside	Buntband	Wiring band	Leitungsklemme	
3	1	KH4934	.O-rengas	O-ring	O-ring	O-ring	
4	1	32914500	.Ruuvi	Skruv	Screw	Schraube	
5	1	32914400	.Solenoidi	Solenoid	Solenoid	Magnetspule	
6	1	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	
7	1	HA9229	.Ruuvi	Skruv	Screw	Schraube	
9	1	32604400	.Kupu	Kopp	Cup	Kuppel	
10	1	HD9024	.Ruuvi	Skruv	Screw	Schraube	
11	1	32667000	.Pohja	Botten	Bottom	Boden	
12	1	625515	.Aluslaatta	Bricka	Washer	Scheibe	
13	1	JB8903	.Mutteri	Mutter	Nut	Mutter	
(14)	1	597660	.Tulppa	Plugg	Plug	Stopfen	
TRACTORS WITH IGNITION SWITCH 816450 (see the text):							
–	1	**32553200**	Virtalukko	Tändlås	Ignition switch	Zündschloß	
WITH AIR CONDITIONER:							
	1	**32889100**	Välipyörä koott.	Mellanhjul kmpl.	Intermed. wheel assy	Zw.rad kompl.	**6000–6600**
95	1	32889210	.Välipyörä	Mellanhjul	Intermediate wheel	Zwischenrad	
	1	KG1020	.Varmistinrengas	Låsring	Circlip	Sicherungring	
	1	LA1803	.Laakeri	Lager	Bearing	Lager	
	1	KG3052	.Varmistinrengas	Låsring	Circlip	Sicherungring	
	1	32889620	.Akseli	Axel	Shaft	Achse	
100	1	32884600	.Levy	Platta	Plate	Platte	
101	1	HA6344	.Ruuvi	Skruv	Screw	Schraube	
102	1	JD9105	.Aluslaatta	Bricka	Washer	Scheibe	
103	1	HA6325	.Ruuvi	Skruv	Screw	Schraube	
104	1	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	
105	1	JB9927	.Mutteri	Mutter	Nut	Mutter	

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RU=ruskea/brun/brown
LI=lila/lilac
MU=musta/svart/black
HA=harmaa/grå/grey



2,5 mm^2, L= 4 m
To the tractor no 662342: make the wire

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B) Control stop 33005600
33005610

This instruction concerns tractors with effect from ser. no. **662343–>** (ACII).
Note! The system requires the new starter switch no. 32553200 (as standard from March –94) and the electric stop of the engine.

– When a tractor drives an implement (e.g. compressor, pump etc.) without driver's control, the control stop stops the engine when:

– engine oil pressure lowers
– gearbox oil pressure lowers
– gearbox oil temperature rises
– engine coolant temperature rises

(warning light comes on normally).
If the control stop is not needed, it can be switched off with a "Control Stop" switch (S36) in the instrument panel).

NOTE! The engine starts only when the Control Stop is switched off with the switch.

B) FITTING (pages 4–6):

– Disconnect the battery earth wire. Open the lever console side panel.

– Find connector X29 in the rear part of the lever console
Connect to this connector the corresponding connector in wire loom **4**.
– Only **HiTech–models with reverse drive controls:** Fitting as above mentioned, furthermore connect the branched connector (X29, wire no 6 red) and connector wire no 15 (brown) to the stop–warning light (see picture **B1**).

– Fit the relay holder **7** onto the lever console relay bracket (to the left side and down). Fasten the holder with the same securing screw as the opposite relay has been fastened. Fit the relay **9**.

– Pass the wire loom together with other wires under the floor mat towards the instrument panel.Refit the lever console side panel.

– Tractors with old model instrumentation **to no L17306 (–L18104 HiTech):** Fit the cable which goes to the switch (S36) together with the cable to the ignition switch with cable ties.

– Pass the wire loom **4** to run up along the cab front wall into the steering wheel console. Fasten the wire loom with tape onto the other wires.

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– Tractors with new instrumentation **to no L17307 (L18105–HiTech):** Remove the front panel of the wheel box. Thead the cable for switch (S36) to run up along the cab wall of wheel box right side into switch panel (see picture **B2**).

– Detach the starter switch and the dash board cover. Disconnect wire no 171 (black) from the starter switch pin 2, and connect it to the corresponding connector in the wire loom **4**. Connect the wire loom **4** wire no 217 (green) to the starter switch pin 2 (see picture **B3**).

– Tractors with old model instrumentation **to no L17306** (**–18104 HiTech**): Remove the lower switch plastic cover on the RH side of the dash board.

– Tractors with new model instrumentation **to no L17307** (**L18105**–HiTech): Remove the uppermost switch plastic cover on the right side of the cab side beam.

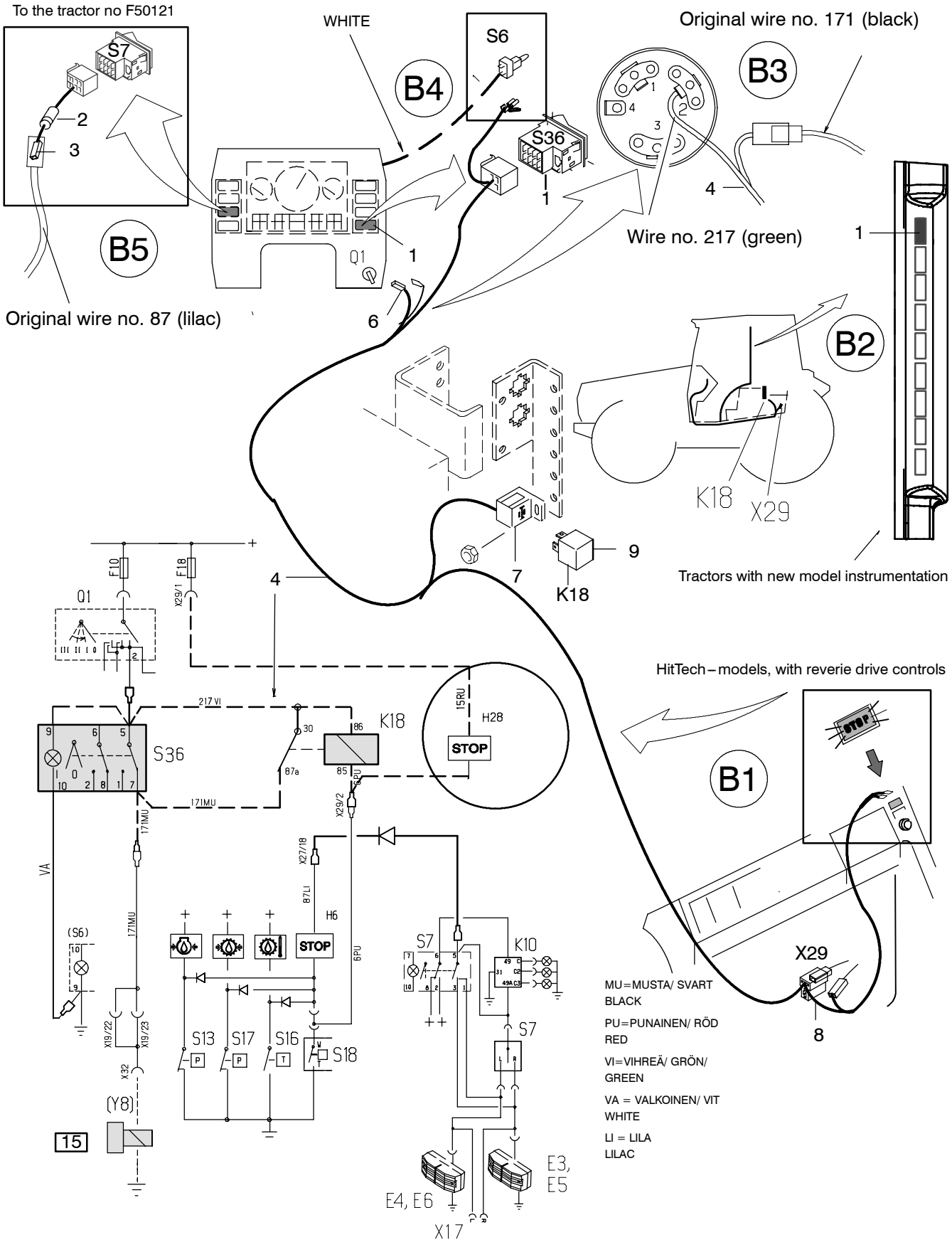
– Fit the switch **1** and connect the wire loom **4** wires to the switch (see picture).
Connect the white earth wire of the wire loom with a connector to the white earth wire which can be found in the wire loom. The wire is in connector S6 (see picture **B4**).

–Tractors **to no F50121:** Disconnect from the hazard warning flasher switch (S7) wire no 87 (lilac) which has been connected to switch pin no 5 and connect it to the connector side end of wire **2** equipped with a diode.
Connect the wire no **2** other end to the switch pin no 5 (see picture **B5**).

– Refit all detached parts. Check the function by earthing the oil pressure sensor connector to the engine block (switch S36 in ON position). The connector is placed on the RH side of the engine.

	1	**33005600**	Valvonta pysäytysl.	Kontrollstopp	Control stop	Kontrollestop	–L17306(–L18104 HiTech)
	1	**33005610**	Valvonta pysäytysl.	Kontrollstopp	Control stop	Kontrollestop	L17307–(L18105– HiTech)
1	1	31877500	Keinukytkin	Vippströmbrytare	Switch	Kippschalter	2–act.
	1	31712100	Linssi	Lins	Lens	Linse	–L17306(–L18104 HiTech)
	1	34397400	Linssi	Lins	Lens	Linse	L17307–(L18105– HiTech)
2	1	33005900	Diodi	Diod	Diode	Diode	–F50121
3	1	SA1527	Liitinkotelo	Skarvhus	Connector	Steckdose	
4	1	33005700	Johdinsarja	Ledningssats	Wiring set	Verkabelung	–L17306(–L18104 HiTech)
4A	1	34610300	Johdinsarja	Ledningssats	Wiring set	Verkabelung	L17307–(L18105– HiTech)
5	1	SA1530	Liitinkotelo	Skarvhus	Connector	Steckdose	8 pole
6	1	SA1527	Liitinkotelo	Skarvhus	Connector	Steckdose	1 pole
7	1	SA1793	Releenkanta	Reläfäste	Relaymounting	Relaissockel	
8	1	SA1550	Liitinkotelo	Skarvhus	Connector	Steckdose	2 pole
9	1	32906800	Rele	Relä	Relay	Relais	
10	1	SA1520	Liitin	Anslutning	Connection	Anschluß	
11	1	HD8005	Ruuvi	Skruv	Screw	Schraube	
12	1	JD0405	Aluslevy	Bricka	Washer	Scheibe	
13	1	JB8902	Mutteri	Mutter	Nut	Mutter	

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– **Delta Power Shift–control unit . . 32949000**
(the unit is a standard equipment on DPS tractors from ser. no **662343**–> (AC II).

– Delta Powershift– control unit facilitates the use of the extra buttons to control the DPS.
(control of the DPS solenoid valves happens via the control unit and not direct.

The mounting kit incl. also the DPS signal light panel+buzzer (gives a sound if the engine is stopped without applying the hand brake).

FITTING:

– Disconnect the battery earth lead.
Bend the floor mat at the control levers and remove the linings in the lower part of the levers.
Disconnect the connectors of wires into the speed gear lever and remove the earlier wire+rocker switch from the lever knob.
Remove the speed gear lever knob.

– Place the lens **20** onto the knob **19**. Fit the wire loom **15** push buttons **17** into the frame **18.** (order: the red wire rearmost, the connectors one on the other) and fit them into the knob **19**. Pass the wire loom through the lever. Fit the knob, be careful not to damage the wires.

Connect the wire loom lower end connectors to the connector ”S23” half **16** (is delivered with wiring loom **8**, order: see figure).

– Fasten the control unit **13** under the bolts of the gear lever bracket.

– Connect the control unit connector ”A10” to the corresponding connector in the wiring loom **8**.
Connect the connector X30 to the corresponding connector in the wiring loom **8** (wire no 4, yellow).
Connect connector ”X23” to the corresponding connector in the wiring loom **8**.
Connect the push button connector ”S23” to the corresponding connector in the wiring loom **8**.
(Possible extra push buttons are connected to the connector ”S23: ”).

– Detach the dashboard upper panel. Cut off the neck between two holes for extra switches in the RH side upper corner of the panel.
Remove the protective cover behind the fuse box.

– Pass the wire loom **8** connectors A9, X21, and wire no 167 along the floor cable flute into the steering wheel console. Fix the wire loom with tape in suitable points.

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– Fasten the circuit card **4** with its parts (**1**–**7**) into place.
Connect the wiring loom **8** connector ”A9” to the circuit card
Fasten the cover

– Find the fuse box connector X4. Connect the wire loom **8** supply wire no167 (red) to the connector pin no 5. Fasten the wire with tape onto the wiring loom.

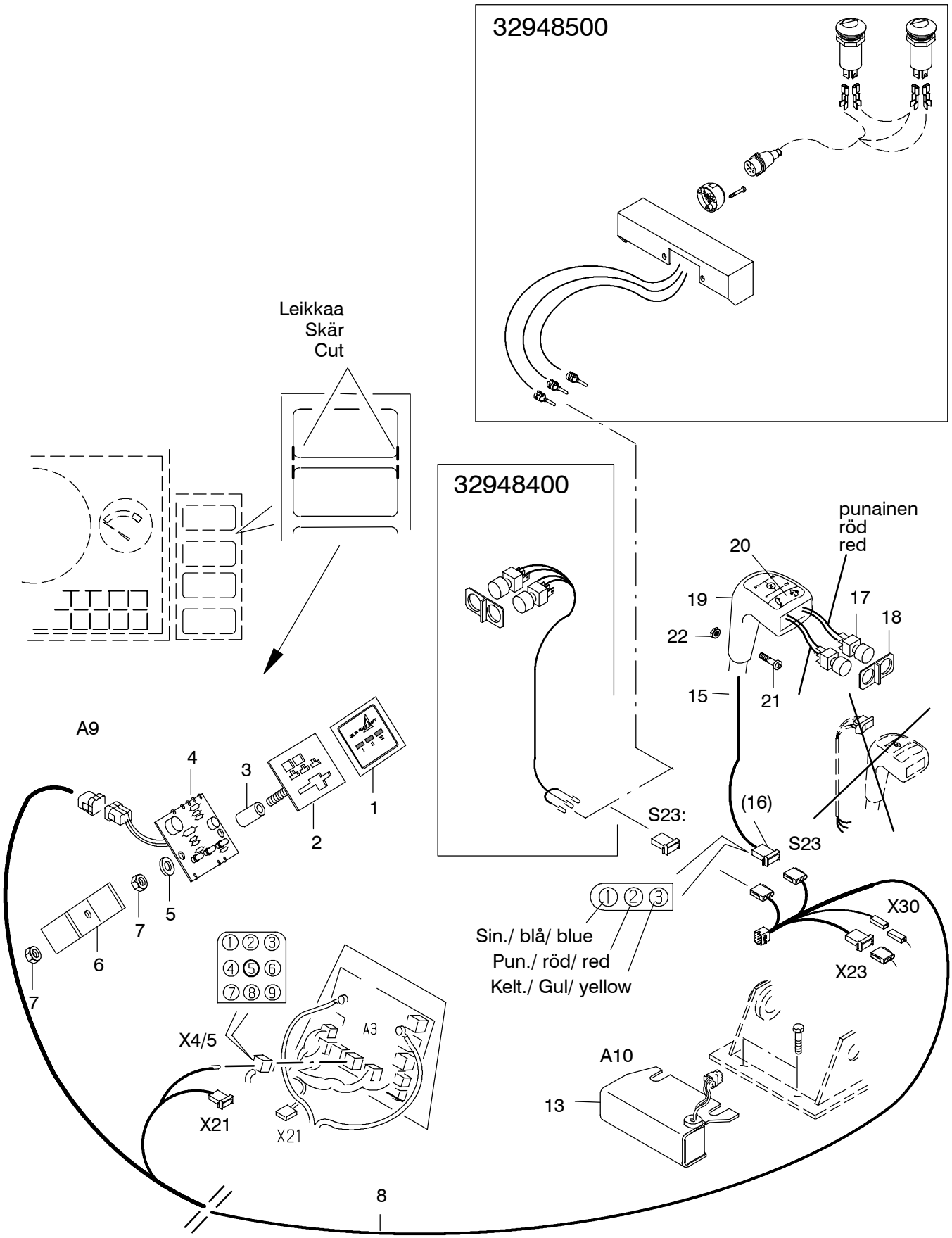
– Connect connector ”X21” to the corresponding connector beside the fuse box.

– Connect the battery and check the function of the buttons, signal lights and the buzzer.
(When the current is switched on, the DPS control unit engages the lowest ratio and one signal lights is on. When the rear button is pressed, the ratio changes up and 2. and 3. signal lights come on etc.).

The buzzer gives a sound (sounds about 2– 2,5 min also after the ignition switch off), when the engine is stopped but the hand brake is not applied.

	1	**32949000**	DPS ohjain ja valot	DPS kontrollenhet och ind.ljus	DPS controller and ind.lights	DPS Steuerung und Lichte
1	1	32845200	.Tarra	Dekal	Sticker	Aufkleber
2	1	32845100	.Levy	Platta	Plate	Platte
3	2	32848800	.Holkki	Hylsa	Sleeve	Hülse
4	1	32845300	.Piirilevy, pieni	Kretskort, litet	Circuit card, small	Kreiskarte, klein
5	2	JD0404	.Aluslaatta	Bricka	Washer	Scheibe
6	1	32848300	.Tuki	Stöd	Support	Stütze
7	2	JB1104	.Mutteri	Mutter	Nut	Mutter
8	1	32861300	.Johdin	Ledning	Wire	Leitung
(16)	2	SA1786	..Liitinkotelo	Skarvhus	Connector	Steckdose
13	1	32861200	.Ohjain	Styrning	Guide	Führung
15	1	32862600	.Johdin	Ledning	Wire	Leitung
17	2	32908300	.Painokytkin	Tryckknapp	Push button	Druckschalter
18	1	32908200	.Kehys	Ram	Frame	Rahmen
19	1	32471310	.Nuppi	Knopp	Knob	Knopf
20	1	32522400	.Linssi	Lins	Lens	Linse
21	2	HE6984	.Ruuvi	Skruv	Screw	Schraube
22	2	JB1105	.Mutteri	Mutter	Nut	Mutter

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– **Delta Powershift–extra buttons . . . 32948400**
(Suit only on tractors which have bush buttons for DPS control).

– These extra buttons can be fitted e.g. in the reverse shuttle lever. This improves tractor control specially when doing loading work.

– **Delta Powershift–extra buttons on implement 32948500**
(Suit only on tractors which have bush buttons for DPS control).

– With these control buttons the DPS ratio can be changed on the implement.

– FITTING (extra buttons, 32948400, e.g. into the reverse shuttle lever):

– Remove the reverse shuttle lever knob. Bend the floor mar aside at the levers and detach the linings in the lever lower part.

– Fit the wiring loom **15** push buttons **17** onto the frame **18** (order: the red wire is rearmost, the connectors one on the other) and fit them into the knob **19**. Pass the wiring loom through the reverse shuttle lever. Fasten the knob, be careful not to damage the wires).

– Find the connector ”X23” in the lower part of the levers and pull off the connector one half.
Connect the wiring loom **15** lower end connectors to the connector half (order: see picture) and connect the connector.

– FITTING (extra buttons on implement), 32948500):

– If the socket bracket in the rear of the tractor has only one part, it should be changed to bracket **23**. The trailer socket is moved to the middle part of a new bracket (do not disconnect the wires).

– Make three wires (1,5 mm^2, lengths 2 m), colour of which should be blue, red and yellow).

Connect connectors **27** to one end of the wires and connect them to the cab wiring loom connector ”X23” in the lower part of the levers (or to extra wiring loom connector ”S23: ”, if this fitting is done at the same time with the control unit), connections, see picture.

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– Draw the wires along the cab RH side corner (together with the other wires) to the rear part of the lever console and inside the rear horizontal beam to the socket bracket **23**. Fasten the wires with tape.
Connect the wires to socket **24** according to the figure. Fasten the socket.

– Make a wire between the socket and push buttons on the implement.
For this you need a rubber cable, cross section 3 x1,5 mm^2, measure a suitable length.

– To the push button ends of the wires is fitted connectors **28**, and a contact plug **26** to the other end.

Check that the positions of the wires in the plug **26** correspond the positions of the wires in the socket **24**.

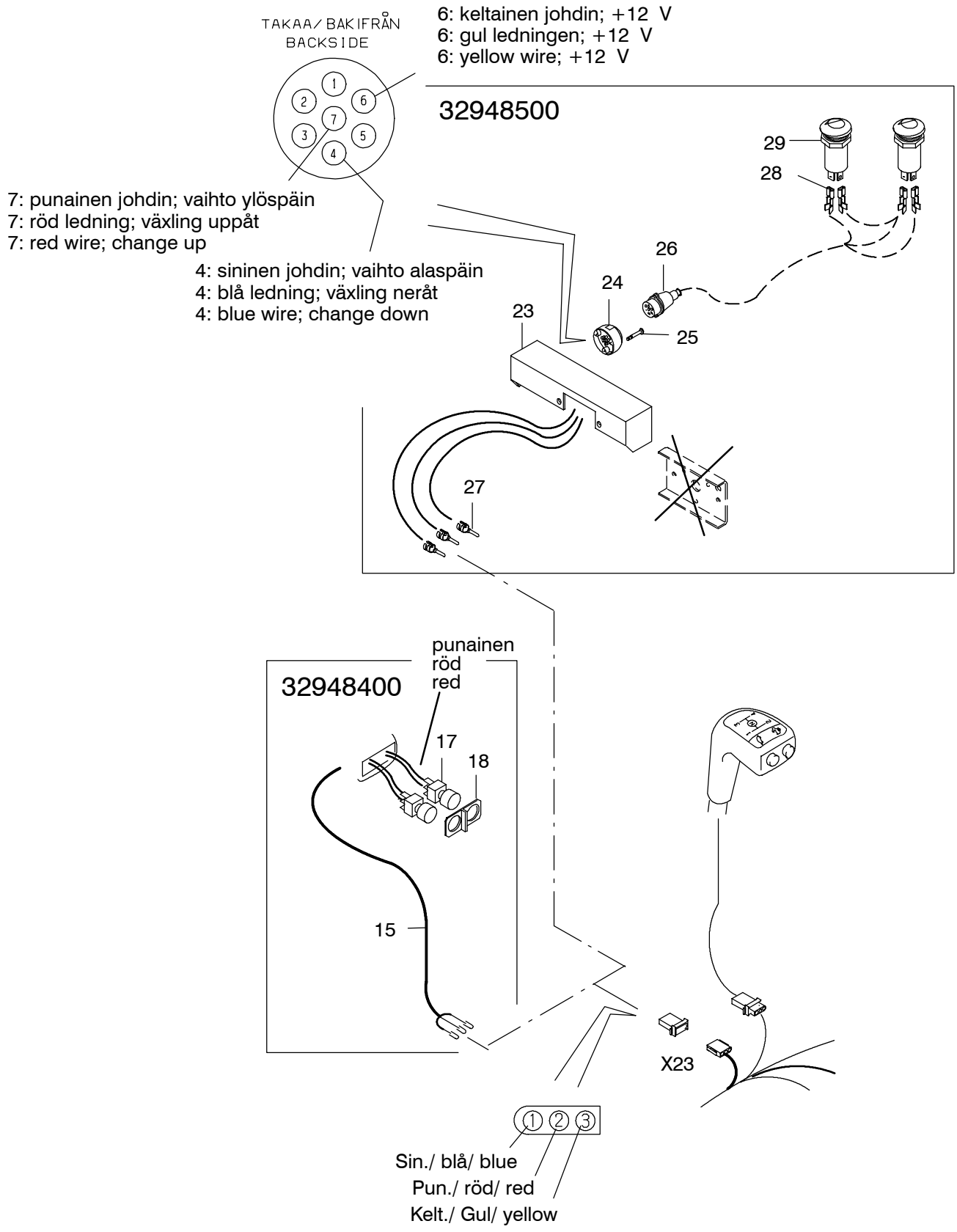
– pin 4, to buttonb ,change down (blue)
– pin 6, supply to both buttons.
(green or brown)
– pin 7 to button y , change up (black)

Fit the push buttons **29** on the implement (Note! The lower parts of the buttons must be protected from water, e.g. in a suitable box), and connect the wires.

	1	**32948400**	Lisäkytkimet, DPS	Extra strömbr.,DPS	Extra switches, DPS	Zusätzliche Schalter, DPS
15	1	32862600	.Johdin	Ledning	Wire	Leitung
17	2	32908300	.Painokytkin	Tryckknapp	Push button	Druckschalter
18	1	32908200	.Kehys	Ram	Frame	Rahmen

	1	**32948500**	Lisäkytkytk., DPS työkone	Extra strömbr.,DPS redskap	Extra switches, DPS implement	Zusätzliche Schalter, DPS Anbaugerät
23	1	32236700	.Kannatin	Hållare	Support	Halter
24	1	31720300	.Pistorasia	Stickdosa	Plug socket	Steckdose
25	3	HD9042	.Ruuvi	Skruv	Screw	Schraube
26	1	31702900	.Pistoke	Stickkontakt	Contact plug	Steckkontakt
27	3	SA1776	.Liitin	Anslutning	Connector	Anschluß
28	4	SA1757	.Liitin	Anslutning	Connector	Anschluß
29	2	30572200	.Painokytkin	Tryckknapp	Push button	Druckschalter

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Rear fog light 32914100

– Mounting kit includes a switch, signal light, fog light and a wire loom with necessary fitting parts. This instruction concerns tractors with effect from ser. no **662343–** (AC II).

FITTING:

– Disconnect the battery earth lead.

– Fit relay K3 into the fuse box. Fasten switch **1** onto the instrument panel. Connect the wire loom connector+fog light wires to the switch **1** (S26)

– Connect the wire loom **2** wire equipped with a cable shoe under the earth screw in the front wall.

– Disconnect wire no 78 (blue) from fuse box connector X2 pin 3. Use a suitable tool of tube type. Connect the wire to the connector X1 pin 2.

– Connect the wire loom **2** wire no 78 (blue) to the connector X2 pin 3 and the other end of the wire to the connector X3 pin no 4.

– Disconnect wire no 64 (yellow) from connector X4 pin 6 and connect the wire to the wire loom **2** connector X33 pin 1 (female).

– Connect the wire loom **2** wire nr 64 (yellow) from connector X33 to the connector X4 pin 6..

– Disconnect wires (2 pcs) nos 26 (black) from connector X5 pin 6 and connect them to connector X33 pin 3 (female).

– Connect wire loom **2** wire no 26 (black) to the connector X5 pin 6 and wire no 176 (red) to the connector X1 pin 9.

– Fasten the fog light onto the new bracket **6**. Detach the implement socket and remove the earlier bracket.

– Connect the fog light wires to the socket so that a black–white wire comes to the socket pin 31 (earth) together with an existing white wire. The blue–yellow wire is connected to the socket pin 54g (earlier permanent current) together with an existing blue wire no 78.

– Fasten the implement socket onto the bracket **6** and the bracket onto the tractor.

– Connect the battery earth lead and check the function of the system. The rear fog light lights simultaneously with the dipped beams.

Hinternebellicht 32914100

– Dieser Satz enthalten Wippenchalter, Zeichenlicht, Lampe und Verkabelung mit Montageartikeln. Diesen Instruktion ist passend für Traktor ab Nummer **662343–** (ACII).

MONTAGE:

– Klemmen Sie das Minuskabel der Batterie ab.

– Montieren Sie das Relais K3 in die Elektrozentrale. Befestigen Sie den Wippenschalter **1** am Armaturenbrett. Verbinden Sie den Stecker des Kabelbaums + Nebellichtverkabelung mit dem Wippenschalter **1** (S26).

– Befestigen Sie den Kabel des Kabelbaums **2**, der mit Kabelschuh ausgerüstet ist, unter dem Masseanschluss an der Frontwand.

– Machen Sie den Kabel Nummer 78 (blau) los von dem Stecker X2 der Eletrozentrale, Anschluß Nr. 3. Wenden Sie ein passendes Rohrwerkzeug an. Versetzen Sie den Kabel zum Stecker X1, Anschluß Nr. 2.

– Verbinden Sie der Kabel Nr. 78 (blau) des Kabelbaums **2** mit der Steckdose X2, Anschluß Nr 3, und verbinden Sie das andere Ende der Leitung mit der Stecker X3, Anschluß Nr 4.

– Lösen Sie den Kabel Nr. 64 (gelb) von dem Stecker X4, Anschluß Nr. 6 und versetzen Sie den Kabel zum Stecker X33 des Kabelbaums **2,** Anschluß (Weibchen) Nr. 1.

– Verbinden Sie den Kabel Nr. 64 (gelb) von der Steckdose X33 des Kabelbaums **2** mit dem Anschluß Nr 6 des Steckers X4.

– Machen Sie den Kabel (2St) Nr. 26 (schwarz) an dem Stecker X5 Anschluß Nr. 6 los, und verbinden Sie diese Kabel mit dem Stecker X33 (Weibchen) Anschluß Nr 3.

– Verbinden Sie den Kabel Nr. 26 (schwarz) des Kabelbaums **2** mit dem Stecker X5, Anschluß Nr. 6 und den Kabel Nr.179 (rot) mit dem Stecker X1, Anschluß Nr 9.

– Befestigen Sie das Hinternebellicht an den neuen Halter **6**. Lösen Sie die Hintersteckdose und nehmen Sie den alten Halter weg.

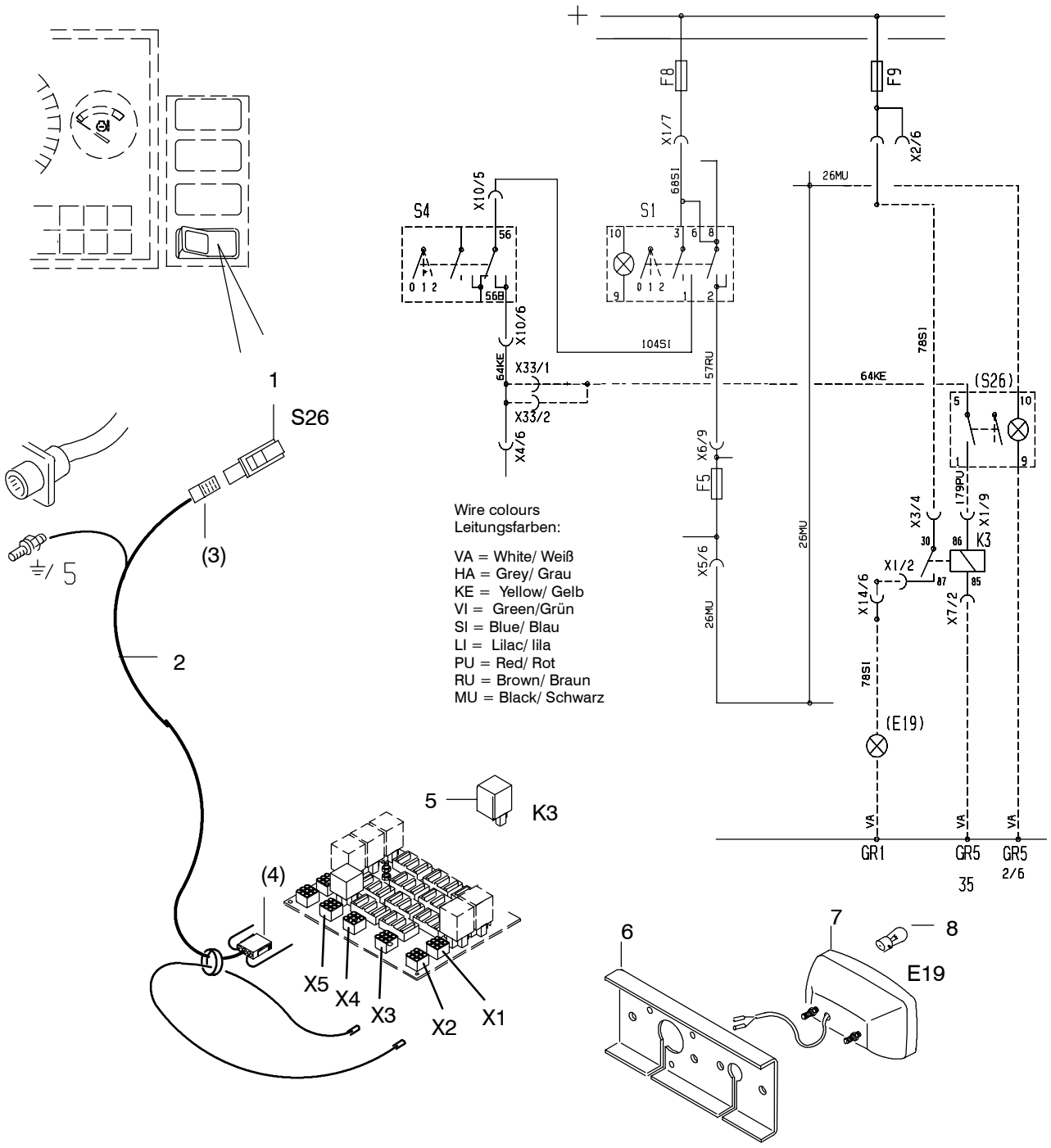
– Verbinden Sie die Kabel des Hinternebellichts mit der Anhängersteckdose so, daß schwarz/weißer Kabel (Erdung) in den Steckdose–Anschluß Nr. 31 kommt, zusammen mit dem da schon befindlichen weissen Kabel. Verbinden Sie den blau/gelben Kabel des Hinternebellichts mit dem Anschluß Nr 54g der Anhängersteckdose (früherer kontinuierlicher Strom), zusammen mit dem da schon befindlichen blauen Kabel Nr.78.

– Befestigen Sie die Anhängersteckdose an dem Halter **6,** und den Halter am Traktor.

– Klemmen Sie die Batterie an und überprüfen Sie die Funktion (das Hinternebellicht leuchtet, wenn das Abblendlicht eingeschaltet ist).

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	1	32914100	Sumuvalo	Dimljus	Fog light	Nebellicht
1	1	30944200	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß
	1	32862400	.Linssi	Lins	Lens	Linse
2	1	32914900	.Johdinsarja	Ledningssats	Wiring set	Verkabelung
(3	1	SA1530	..Liitinkotelo	Skarvhus	Connector housing	Steckdose)
(4	1	SA1786	..Liitinkotelo	Skarvhus	Connector housing	Steckdose)
(	1	SA1787	..Liitinkotelo	Skarvhus	Connector housing	Steckdose)
5	1	32906800	.Rele	Relä	Relay	Relais
6	1	32904000	.Kannatin	Hållare	Support	Halter
7	1	75017200	.Sumuvalaisin	Dimstrålkastare	Fog lamp	Nebelscheinwerfer
(8	1	SH2647	..Lamppu	Lampa	Bulb	Lampe)



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Cab heater socket 32634800
(Note! requires an engine heater). The mounting kit includes the socket, wires and a branch connector (to engine heater supply wire) with necessary fitting details.

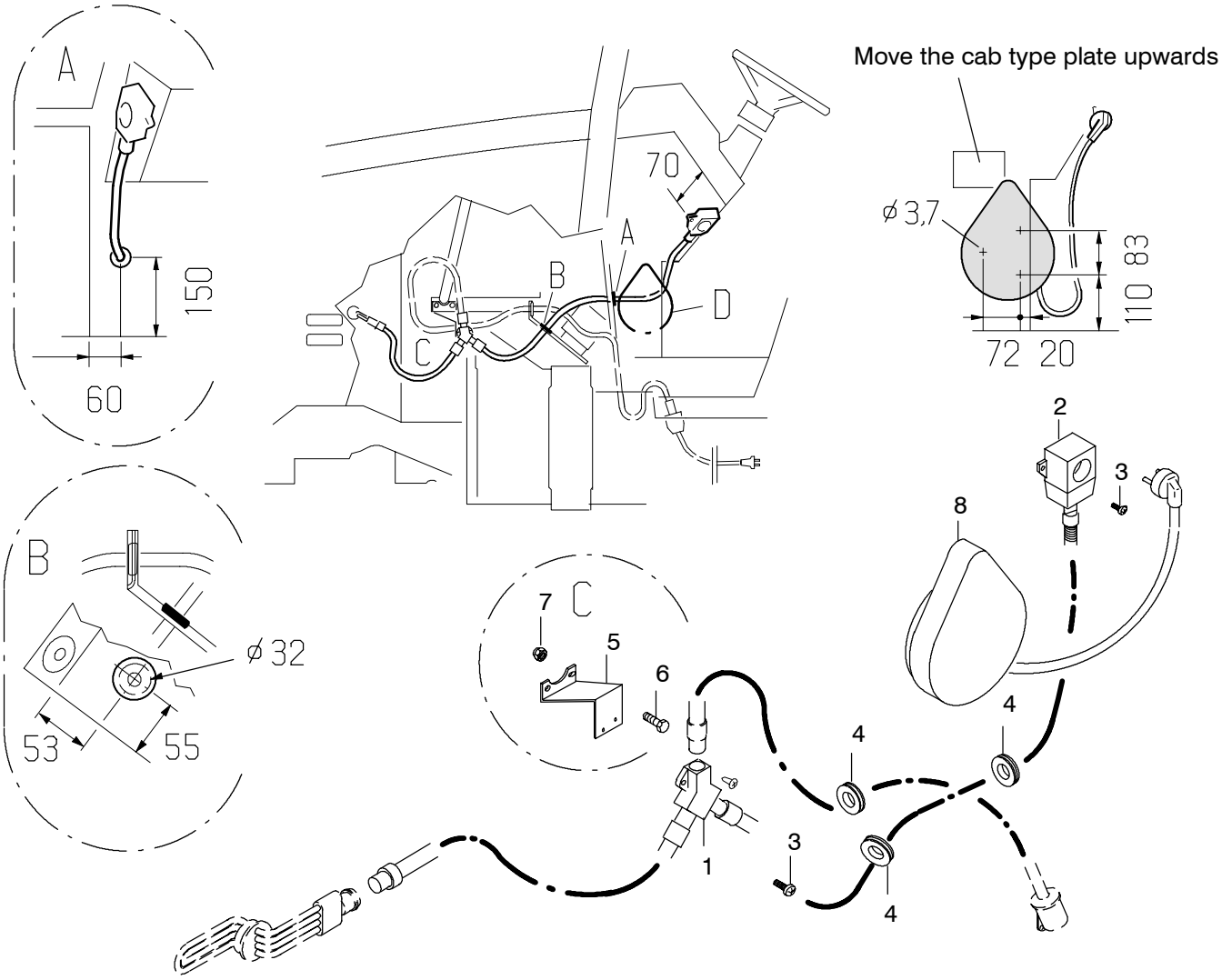
Cab heater 32630300
The heater has two output levels, 1100W / 550W

FITTING:

– Remove the LH side engine side plate.

– Make lead–in holes according to the picture through the intermediate frame protective shield and through the cab front wall.
Fit bracket **5** into position in holes on the battery shelf and fasten the branch connector **1** onto the bracket. Fasten socket **2** under the instrument panel and pass the wire to the branch connector. Disconnect the supply wire from the engine heater, and connect it to the branch connector. Connect the wire from the connector to the engine heater.

– Drill for the cab heater **8** fastening holes and fit the heater.



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	1	**32634800**	Sisät. lämm. pistor. Asennussarja	Kontaktdosa för hyttv. Monteringssats	Socket for cab heater, fitting set	Stecker f. Innenheizung Einbausatz
	1	32630200	.Asennussarja	Monteringssats	Fitting set	Einbausatz
	1		..Johdin	Ledning	Wire	Leitung
	1		..Johdin	Ledning	Wire	Leitung
1	1	32635000	..Haarakappale	Grenstycke	Branching	Zweigstück
2	1	32634900	..Pistorasia	Stickdosa	Plug socket	Steckdose
3	4	HN6735	.Ruuvi	Skruv	Screw	Schraube
4	3	30145900	.Läpivientirengas	Genomföringsring	Inlet ring	Durchführungsring
5	1	32630400	.Kannatin	Hållare	Support	Halter
6	2	HA6322	.Ruuvi	Skruv	Screw	Schraube
7	2	JB8904	.Mutteri	Mutter	Nut	Mutter
8	1	**32630300**	Sisätilan lämmitin	Hyttvärmare	Cabin heater	Innenheizung

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Back buzzer (not HiTech**) 33039300**

– The buzzer alarms always when the reverse gear is engaged (current switched on). The warning sound is discontinuous.

FITTING:

– Remove the lever console side panel in the cab.

– Fasten the buzzer **1** under the rear mudguard fixing bolt. Open the lead–in cover in the bottom of the lever console so much that the buzzer wire can be pushed into the console. Connect the wire loom **2** connector (H17) to the buzzer connector (1a+1b).

– Fasten wire loom **2** cable shoe under the nut of the lead–in cover. Pass the wire loom together with other wires along the lever console lower edge to the lower part of the gear levers.

– Fasten switch **6** onto support **5** (washers **7** on both sides of the support).
Unscrew a screw lever bracket screw on the driver's seat side of the bracket and fasten the support under the screw.
Adjust the switch so that it functions when the reverse gear is engaged (if the support cannot be adjusted enough, change places of the washers between the switch and the support).

– Connect the wire **2** loom to the switch pin.

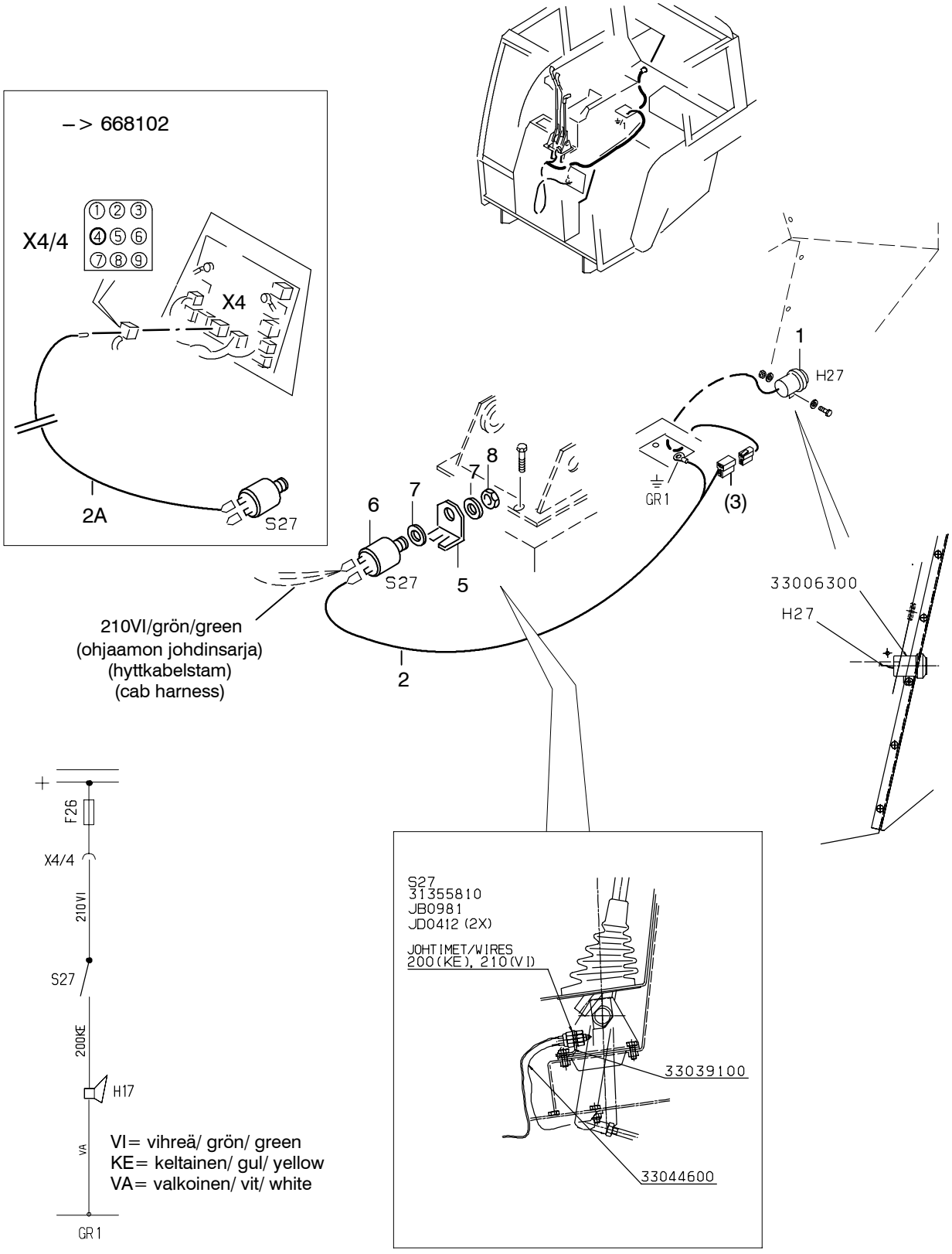
Tractors –>668102: Connect the wire **2A** to the another switch pin and pass wire no 210 (green) with other wires under the floor mat into the steering wheel console. Fasten the wire on the tractor wire loom e.g. with tape.
Disconnect the fuse box connector X4. Connect the wire loom connector to pin no 4 of the connector X4.

– Tractors 668103–>: Connect the connector S27 (green wires no 210) in the cab harness to the another pin of the switch.

– Rebuild the tractor. Check the function of the buzzer.

	1	**33039300**	Per.summeri.	Backsummer	Back buzzer	R.fahrsummer	Avertisseur arrière
1	1	33006300	.Per.summeri	Backsummer	Back buzzer	R.fahrsummer	Avertisseur arrière
2	1	33044600	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	Jeu de câbles
3	1	SA1509	.Liitinkotelo	Skarvhus	Connector	Steckdose	Raccord
4	1	SA1518	.Liitin	Anslutning	Connection	Anschluß	Raccord
5	1	33039100	.Kannatin	Hållare	Support	Halter	Support
6	1	31355810	.Rajakytkin	Gränsbrytare	Limit switch	Grenzschalter	Interrupteur limitation
7	2	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle
8	1	JB0981	.Mutteri	Mutter	Nut	Mutter	Ecrou

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Forced lowering switch 33009700

– When this switch is depressed, the working depth adjustment is overridden and an implement lowerst quickly into ground (according to the lowering speed switch position). When the switch is released, the lower links find the position determined by the position control potentiometer.

FITTING INSTRUCTION:

– Remove the lever console side panel.
Remove the upper panels (2 pcs) and unscrew the lever console cover panel securing screws.

– Remove auxiliary valve lever knob symbol lenses and unscrew the knob securing screws. Remove the knobs and remove the lever protective rubbers.
Remove the knob of the PTO control lever.
Disconnect the connectors and remove the cover panel.

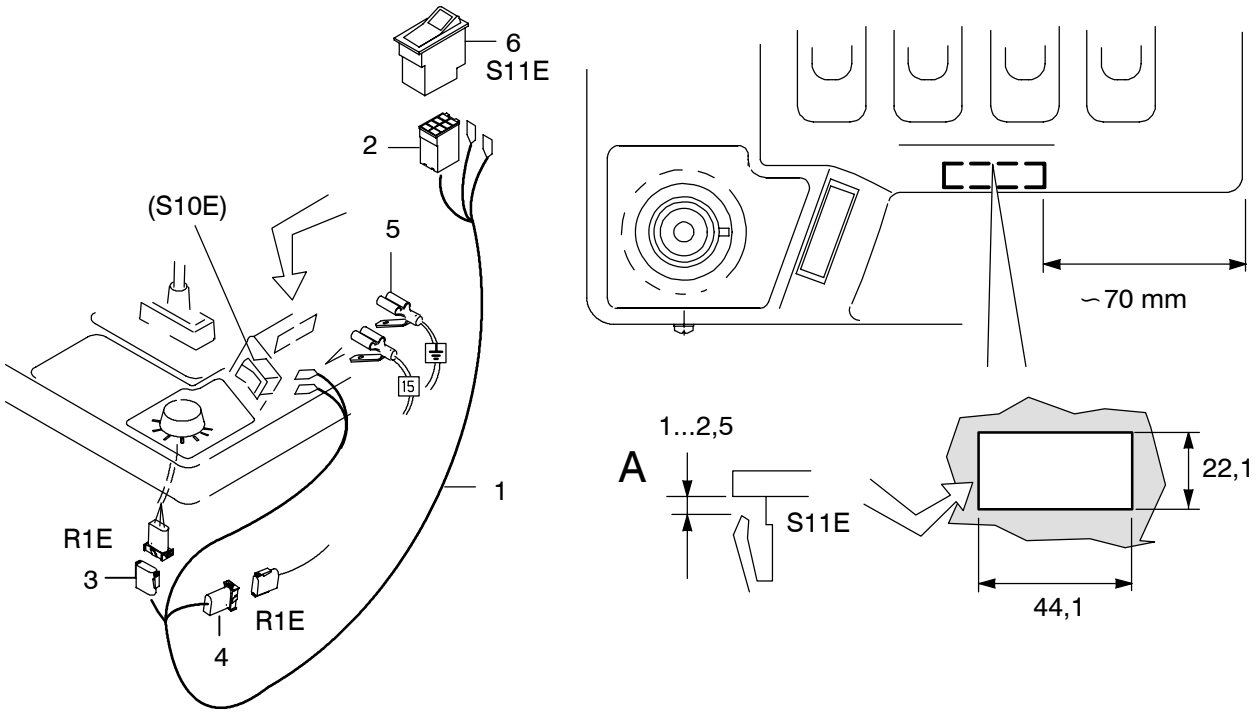
– Make a hole through the cover panel for switch **6**, according to the picture so that the forced lowering switch and the lift/lower switch (S10E) are as near each other as possible.
File the end edges of the switch opening a little thinner so that the switch is kept in position. (point A). Fit the switch.

– Connect the wire loom connector **3** to the position control potentiometer. Connect connector **2** to switch **6**
Connect the wire loom wires no **5** (no 15 and earth) to the bulp of the lift/lower switch.

– Fit the upper panel and the cover panels into position. Connect connectors. Connect connector **4** to the cab wire loom connector "R1E".
Connect the lift/lower switch wires (no 15 and earth) back to the connectors of the lift/lower switch illumination wires.

– Test the function of the switch. The forced lowering switch functions only when the lift/lower switch is in the lowering position.

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	1	33009700	Pakkolasku, nostov.	Tvångssänkning,lyftarm.	Forced lowering,liftarm	Zwangsenkung,Hebearm	EH
1	1	33009600	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
(2	1	SA1530	..Liitinkotelo	Skarvhus	Connector	Steckdose	)
(3	1	SA1786	..Liitinkotelo	Skarvhus	Connector	Steckdose	)
(4	1	SA1787	..Liitinkotelo	Skarvhus	Connector	Steckdose	)
(5	1	SA1520	..Liitin	Anslutning	Connection	Anschluß	)
6	1	33009500	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
	1	33009800	.Linssi	Lins	Lens	Linse	
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	

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Fieldmaster **33378000**

FieldMaster is a combined performance monitor which can monitor both tractor and implement functions.

FieldMaster monitors the following tractor functions:

– driving speed, km/h,
– wheel slip (radar is required))
– PTO shaft rotating speed, rpm
– distance travelled, km
– area, ha
– time functions (clock, elapsed time, remaining time aso).

FieldMaster can monitor the following implement functions:

– sprayers (l/hour, l/ha, litres, alarm functions, automatic proportioning aso)
– fertilizers (kg, kg/ha, kg/hour, rpm, alarm functions aso)
– drills (kg/ha, seed amount in kilos, driving paths aso)
– balers (pcs, kg, rpm, alarm functions aso)
– slurry spreaders (ton/ha, tons, rpm aso)
– other implements (e.g. cultivated area)

Options:

– radar (slip, ground speed etc.)
– writer (output of work etc.). The writer is connected with a cable to the display unit.
– readiness for the global location system with an aid of a satellite (GPS)

The follow–up of different functions on an implement requires, that the implement has sensors which have been connected to the FM via a socket in the rear of the tractor.

On an implement there can be e.g. rpm sensors, position sensors, wheel sensors, flow meters, weight cells, manometers, actuators/position potentiometers, level sensors etc.

FITTING (sensor):

– Disconnect the battery earth cable.

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– Tractors without **Agrodata–equipment** (both sensors are lacking) or **ACD–power lift** (PTO sensor is lacking):

Fasten the gearbox and/or PTO speed sensors.

Gearbox speed sensor **B6** is placed at the front end of the propeller shaft (gearbox):

(If the gearbox sensor is wanted to fit to its original place on the housing of the 4WD clutch, the tractot must be split between gearbox–fuel tanl).

Remove the propeller shaft.
Unscrew the foremost shaft nut (let the rearmost nut be in place), and fasten the bracket under the drive flange of the 4WD.

– PTO sensor **B7**: Remove the plug and clean the sensor threads on the tractor. Find with a dial gauge through the sensor hole a shortest distance between the sensor and the impulse disc.

– **B6, B7**: Apply Loctite 572 on the threads of a new sensor and screw it in by hand, until it touches the gearwheel/impulse disc and open it then **1/4 of a turn** (B7: do not use force, since the impulse disc is springy).

– **B6, B7**: Lock the sensor with the locking nut and connect wire loom **7** to the sensor
Connect connectors to the sensor and protect pins with grease UC1913 (vaseline spray HHS 2000, Würth).

– **B6, B7**: Bend the wire on the sensor and fasten it to the sensor with a binder (prevents disconnecting of the wires in draft). Fasten the wire also with the securing plate under the nut.

– Connect the sensor wire loom *(ready–made on tractors with AD–insatrument*).
Tractors with ACD power lift: the wire loom is connected only to the PTO sensor.

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FITTING (other parts):

– Remove the lever console side panel. Detach in the upper part the AC power lift control panels (2 pcs).
Slacken the whole lever console fixing screws.

– Make threaded holes M5 (2 pcs, drill ø 4,2) on the rear face of the side pillar, and see picture A.

– Open the side pillar linings in the front part of the pillar and pass the display unit wire under the linimgs into the lever console. Fasten the diplay unit.

– Pass the wire loom **8** adapter **1** wires to the lower part of the smaller control panel.
Connect the connectors to the adapter, see picture B.
Fasten the adapter to the rear side of the control panel, and fit the panel.

– Place the wire loom **8** into the lever console.
Connect to the wire loom to the diplay unit connector (“A16”)

– Connect the wire loom supply wire X55 to the corresponding wire in the lever console (nr 17, black).

– Pass wires to the rear socket **7** along the cab rear beam and push them out of the beam to the rear of the tractor.
Fit a new socket bracket **6** in place of the earlier one.
Connect the wires to the socket, see picture C.
Fasten the rear socket..

– *Tractors with Agrodata–instrument:*
Open the connector “X34” in the lever console and connect the wire loom **8** correnspondent connectors “X34” and “X34***** “ between the detached connectors. Wire loom connectors “X39” and “X1E” are not used.

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– *Tractors without earlier sensors (B7 ja B6):*
Slacken the lead–in hole cover in the bottom of the lever console and pass the sensor connectors into the cab.
Connect the sensor wire loom **9** connector "X1E" with the corr. connector of the wire loom. Wire loom connectors "X34" and "X39" are not connected.

– *Tractors with ACD power lift (without PTO sensor B7):*
Connect the wire loom **9** connector "X34 * " with the connector "X34" in the lever console. Other connectors are not connected.

– Fasten the earth wire with the cable shoe under eart point GR4 in the bottom of the lever console (tyre side point).

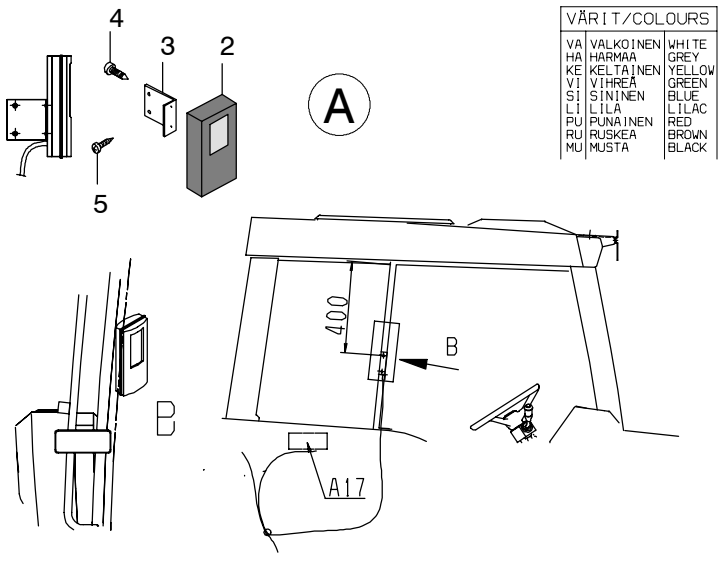
– *If the tractor has a radar,* the radar wires are connected to the free half of connector X48, see picture D:

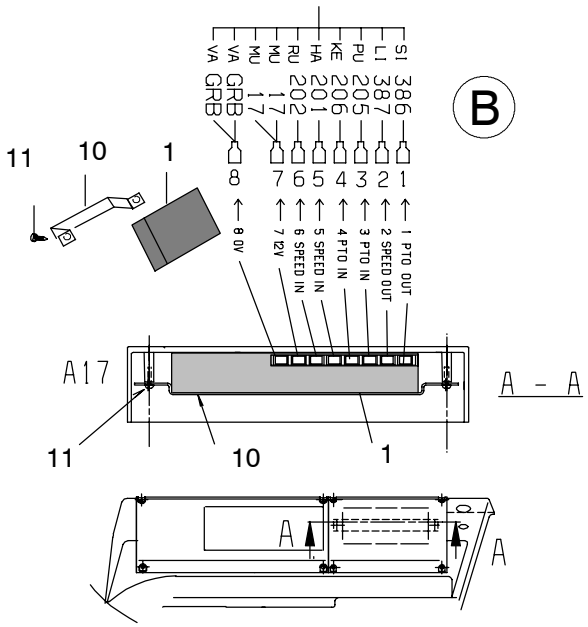
– wire 1 (white) to pin 1
– wire 305 (lilac) to pin 2
– wire 15 (brown) to pin 3

– In addition, wire loom **8** wire no. 305 (lilac) must be connected to the pin 5 of connector "X1E"

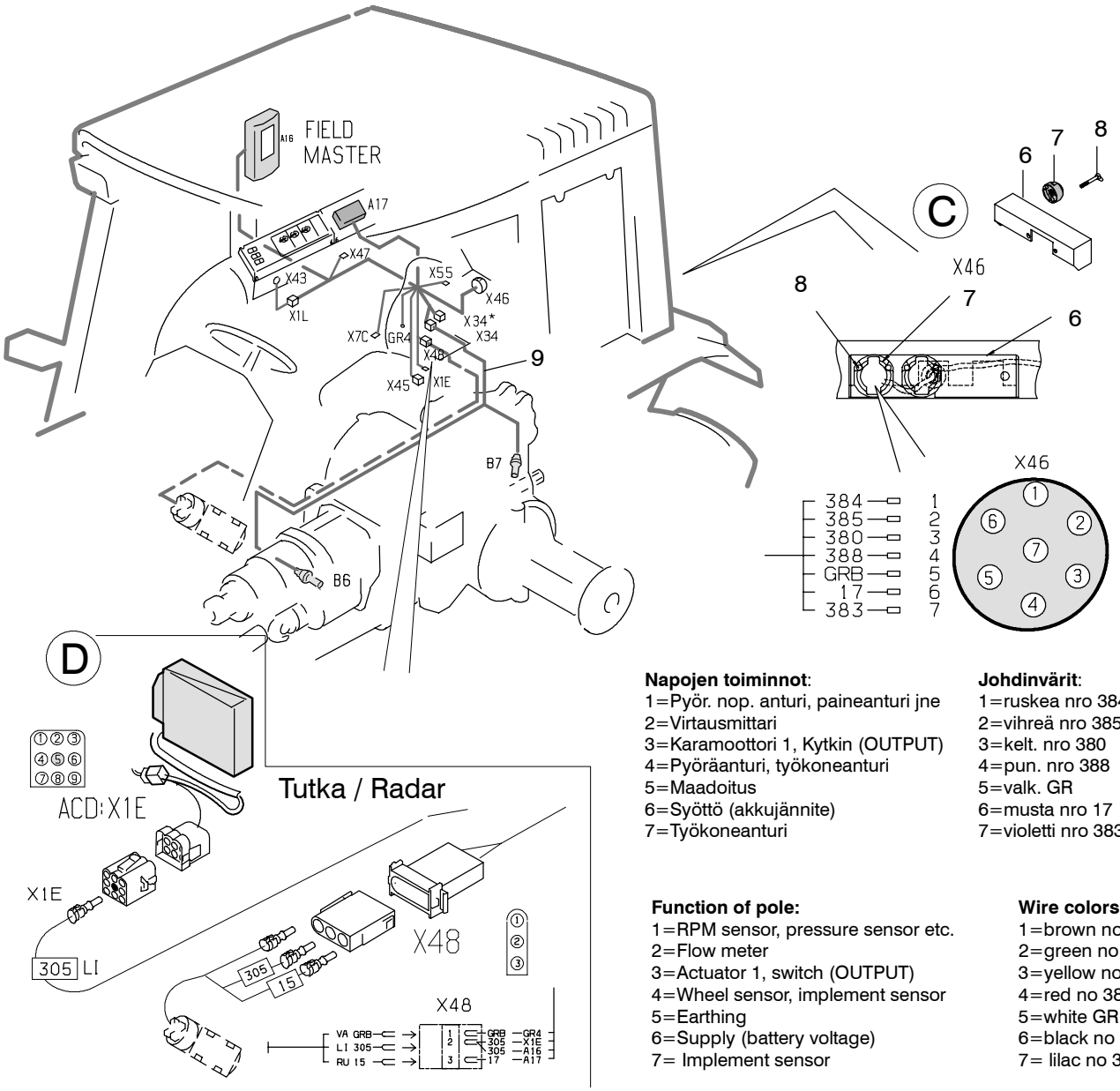
– Connect connector "X7C" to the corr. connector in the lever console.

– Wire loom **8** connectors X1L and X45 are not connected.
Connector X47 is intended to use for the optional GPS system (LH–AGRO).





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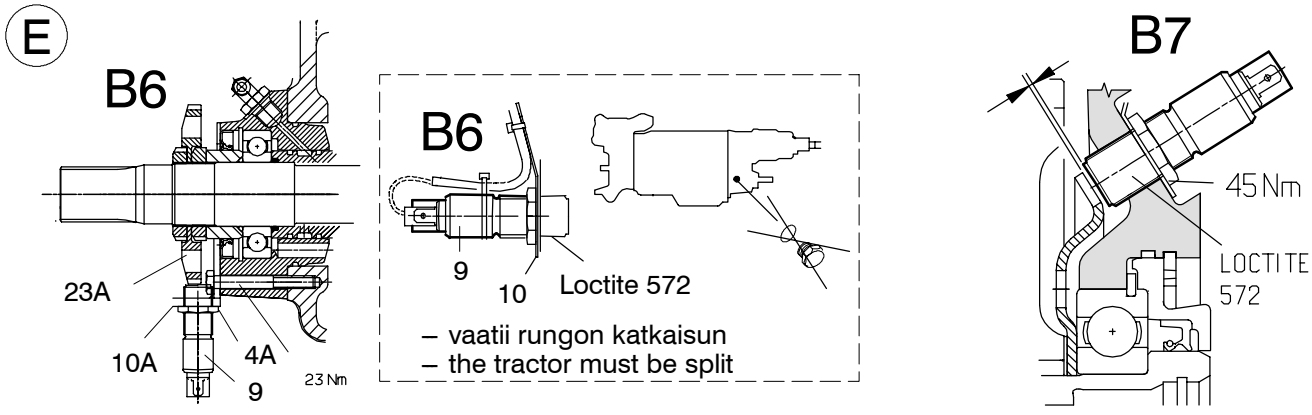


Napojen toiminnot:
1=Pyör. nop. anturi, paineanturi jne
2=Virtausmittari
3=Karamoottori 1, Kytkin (OUTPUT)
4=Pyöräanturi, työkoneanturi
5=Maadoitus
6=Syöttö (akkujännite)
7=Työkoneanturi

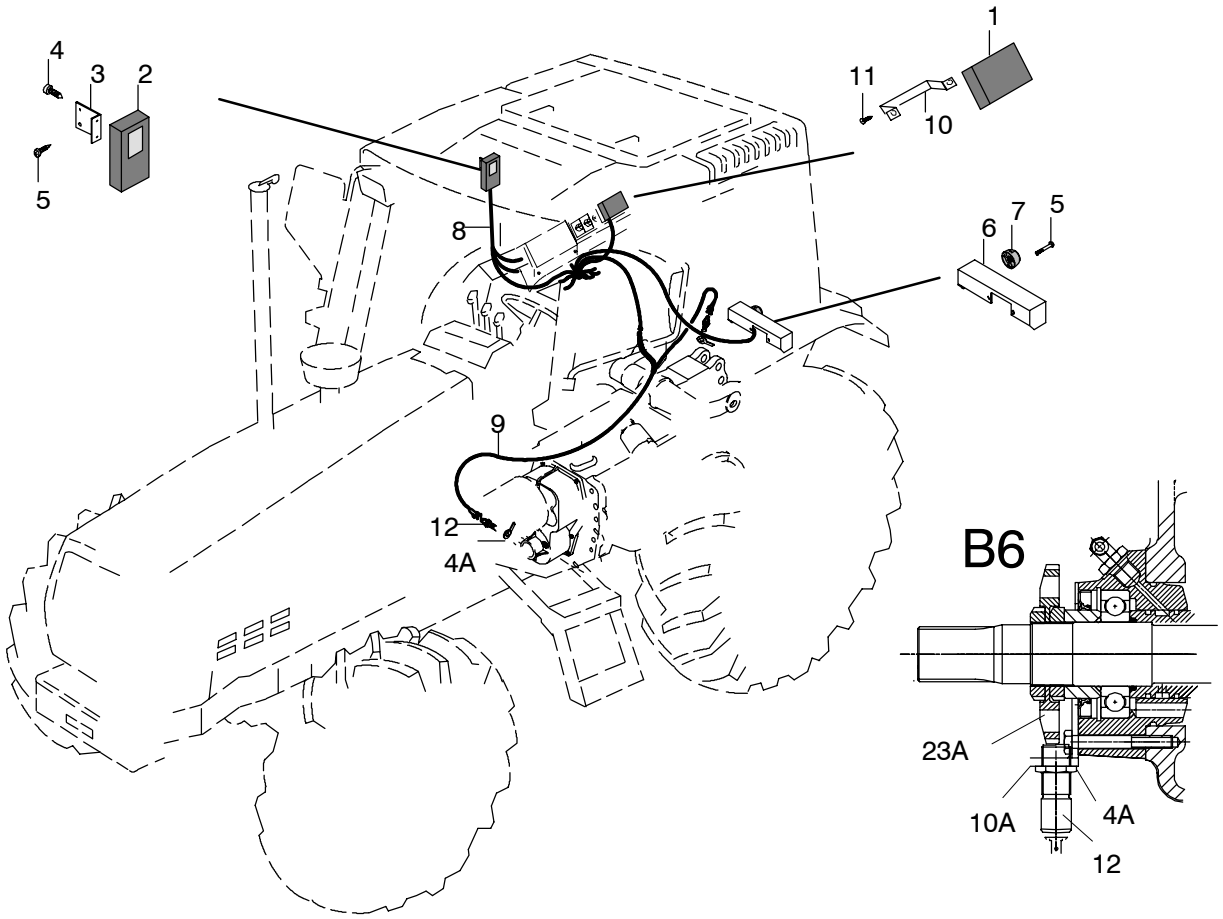
Johdinvärit:
1=ruskea nro 384
2=vihreä nro 385
3=kelt. nro 380
4=pun. nro 388
5=valk. GR
6=musta nro 17
7=violetti nro 383

Function of pole:
1=RPM sensor, pressure sensor etc.
2=Flow meter
3=Actuator 1, switch (OUTPUT)
4=Wheel sensor, implement sensor
5=Earthing
6=Supply (battery voltage)
7= Implement sensor

Wire colors:
1=brown no 384
2=green no 385
3=yellow no 380
4=red no 388
5=white GR
6=black no 17
7= lilac no 383



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	1	**33378000**	Fieldmaster	Fieldmaster	Fieldmaster	Fieldmaster	Assy
1	1	33359600	.Adapteri	Adapter	Adapter	Adapter	
2	1	33378100	.Näyttölaite	Teckenförster	Display unit	Bildschirm	
3	1	33378200	.Teline	Konsol	Bracket	Gestell	
4	2	HD9025	.Ruuvi	Skruv	Screw	Schraube	
5	5	HD9042	.Ruuvi	Skruv	Screw	Schraube	
6	1	32236700	.Kannatin	Hållare	Support	Halter	
7	1	31720300	.Pistorasia	Stickdosa	Plug socket	Steckdose	
8	1	33369500	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
9	1	33012100	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
10	1	33483900	.Kiinnityslevy	Fästplåt	Mounting plate	Befestigungsplatte	
11	2	HN6612	.Ruuvi	Skruv	Screw	Schraube	
12	2	31702400	. Anturi	Givare	Sensor	Sensor	
4A	1	32844920	Levy	Platta	Plate	Platte	
23A	1	32844810	Hammaspyörä	Kugghjul	Gear	Zahnrad	
10A	2	32619100	Kiinnitin	Fästdon	Fastener	Halter	

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A. Calibrating gearbox speed sensor and radar

(radar is an optional equipment)

Note! If the tractor wheels or FieldMaster display unit are changed, the calibration must be done.

1. Switch on current to the tractor and wait until the main menu appears in the display. In the main menu there are shown different symbols for tractor, implement, area and time functions.

IMPORTANT! If the language in the display is e.g danish or other difficult language, it can be changed by going either with arrow buttons or with NÆSTE SIDE button to another page, on which there can be found selection SYSTEM. By pressing button VÆLG can be moved to page, on which there is TEST INPUT, TEST OUTPUT, SPROG etc. By moving the highlighted are onto the text SPROG (=language) and by pushing VÆLG button can be moved to the language menu, in which can be selceted english by moving the highlighted area onto the ENGLISH and by pushing VÆLG button. Now the language has been changed and it is in power until it is rechanged.

2. Press the yellow arrow button until you see a menu in which there are alternative implements such as SPRAYER , FERTILIZER DISTRIBUTOR, DRILL, BALER, SLURRY SPREADER and OTHER IMPLEMENTS. If there is SYSTEM in the menu, the unit shows page 2 and the implements are situating in page 1, change page with NEXT PAGE–command.

3. Choice one implement (e.g. sprayer) with SELECT–command. The unit shows one sprayer type, which must be accepted with ACCEPT–command. After this the sprayer symbol appears in the display. In addition, in the display there are the following commands: OPERATION, ENCODE and DATA/DELETE.

4. Choice ENCODE and a new menu appears, in which you can move from one row to another by using the arrow buttons. The small arrows in the upper or lower edge of the display indicate that more menus can be found in the next page, to which you can get either with NEXT PAGE–command or by scanning with the arrow buttons.

5. When you find selection SPEED SENSOR, press it and immediately after that press CALIB/CALC alternative.

6. A new menu appears in the display, in which there is a heading WHEEL TRACTOR and as a subheading text NO OF PULSES and DRIVE 100 M (i.e, number of pulses and an instruction to drive with the tractor 100 meters) and a subselection CALIB./CALC.

7. Drive the tractor to a place, where is ready–made markings of startpoint and endpoint of a distance of 100 meters. Drive the tractor onto the startpoint and press the CALIB–button, at which time the counter of the gearbox speed sensor is zeroed.

8. Drive straight ahead 100 meters on the marked course. During driving the display starts to show flashing text CALC. WHEEL, which indicates that the FieldMaster has received enough impulses on the distance of 100 meters.

9. Stop driving at the endpoint marking and press CALC.WHEEL–button, at which time the impulse counter is stopped and a new number of the impulses (calibrating value) is input.

Note! If the tractor is equipped with a radar, it is calibrated in the same way as the speed sensor. The calibration of the radar is started from ENCODE–selection under which there is command RADAR. After this the calibrating procedure is the same as for the gearbox speed sensor.

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B. Changing display language

Note! In this instruction is supposed, that the valid language is english.

1. When the display shows the main menu, press NEXT PAGE–button, until you find selection SYSTEM.

2. Press the SELECT–button, and you will see a page, which has selections TEST INPUT, TEST OUTPUT, LANGUAGE etc..

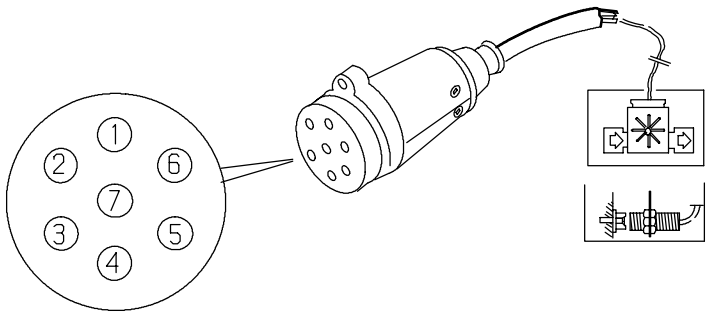
3. Move the highlighted area onto the LANGUAGE and press SELECT–button, after which the display shows the language menu. Move the highlighted area onto the desired language and press the SELECT–button.

4. A new display language is valid.

C. Others

Before the FieldMaster is able to show for example flow amount or area, the flow meter must be calibrated and working width of an implement must be input. In the same way must be calibrated extreme positions of possible position potentiometer. When necessary, possible weight measuring cell or manometer must also be calibrated. In addition, an amount of magnets for a measuring sensor affects the measurement.

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Poles have been numbered on the plug casing. The tables below show how the implement sensors are connected to the plug.

Sprayer		
Sensor	Wire color	Plug pin
Flow meter	blue	5
	brown	2
	black	6
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5
Pressure sensor	blue	6
	brown	5
	black	1

Fertilizer distributor		
Sensor	Wire color	Plug pin
RPM sensor 1	blue	6
	brown	5
	black	1
RPM sensor 2 or weight module	blue	6
	brown	5
	black	2
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5

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Drill		
Sensor	Wire color	Plug pin
RPM sensor on drill shaft (2 wires)	blue	1
	brown	5
RPM sensor on drill shaft (3 wires)	blue	6
	brown	5
	black	1
RPM semsor on switch	blue	2
	brown	5
Drill boot sensor	sininen	6
	ruskea	5
	musta	4
Implement sensor	sininen	7
	ruskea	5

Baler		
Sensor	Wire color	Plug pin
Piece counter	blue	1
	brown	5
RPM semsor 3 or weight module	blue	6
	brown	5
	black	2
RPM sensor 2	blue	6
	brown	5
	black	4
RPM sensor 1	blue	6
	brown	5
	black	7

Slurry spreader		
Sensor	Wire color	Plug pin
RPM sensor 1	blue	6
	brown	5
	black	1
Flow meter	+12 V	6
	0 V	5
	Signal	2
Wheel sensor	blue	4
	brown	5
Implement sensor	blue	7
	brown	5

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The earlier connectors can be changed into new ones, which have rubber seals.

FITTING:

– Disconnect the battery earth cable.

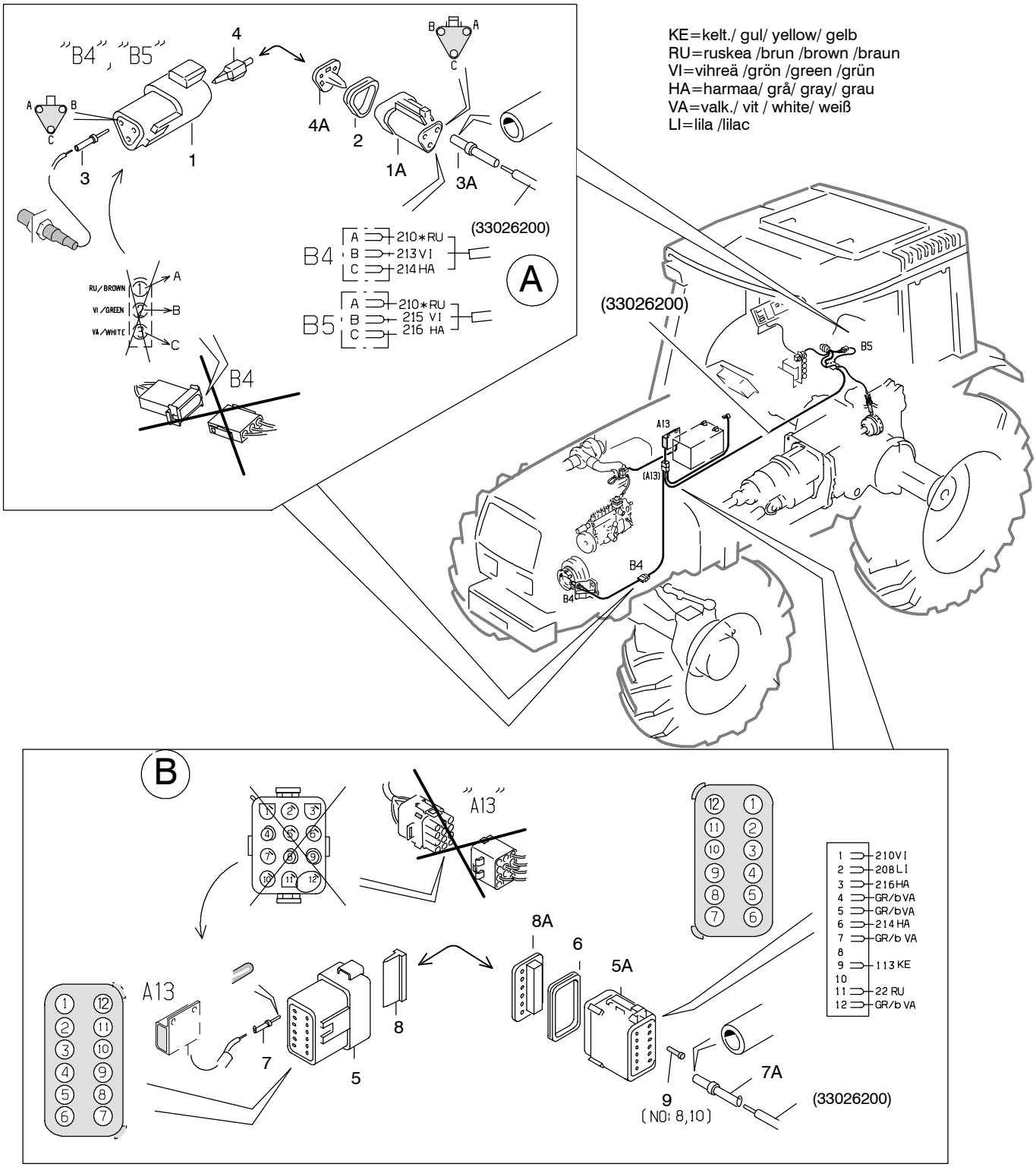
– Find connector ”B4” (in engine compartment on the LH side).
Change the connector and pins according to picture A (the wires are connected to the pins by pressing with pliers).
The earlier connector pin ”1” (rounded edge) corresponds to the new connector letter ”A” a.s.o. Numbers/letters have been marked on the connectors.

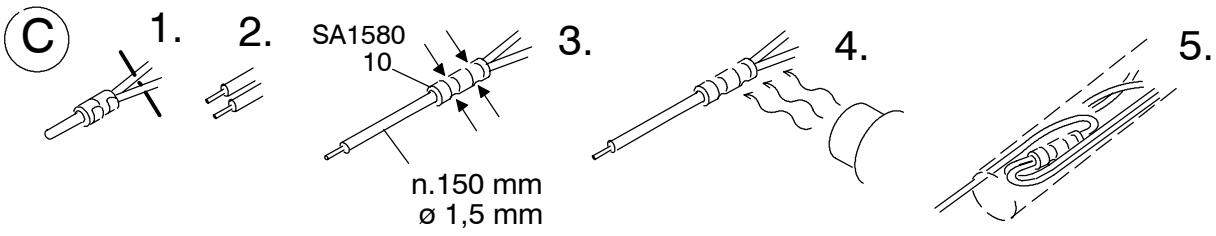
– Find connector ”A13” behind the engine.
Change the connector and pins according to picture B.
Fit the control unit side connector half wires into the new connector so that the numberings correcponds to each orhers (numbers are visible in the rear end of the connector; on the earlier connector pin no 1 is at the notch on the connector housing).
NOTE! the earlier connector pins no 1,4,7 and 12 (2 wires): cut the wires to the connector and peel their ends.
Make an auxiliary wire with length of 150 mm (ø 1,5 mm). Connect with an extension sleeve SA1580 the above mentioned two wires and the auxiliary wire together, and press with pliers the wires . Warm the shrink plastic round the sleeve so that the connection becomes tight.
Push the connection inside the wire loom protective tube.
The empty holes no 8 and 10 on the wire loom (33026200) side connector half are plugged with plugs **9**.

– Check the function of the system.

1,1A	1	33434000	Liitinkotelopari	Skarvhuspar	Connector, pair	3–nap/ pole
1	1	SA1583	Liitinkotelo	Skarvhuspar	Connector, pair	3–nap/ pole, naaras/female
1A	1	SA1584	Liitinkotelo	Skarvhuspar	Connector, pair	3–nap/ pole, uros/male
2	1	–	.Tiivistekumi	Tätning	Seal	Dichtung
3	3	SA1587	.Liitin, uros	Anslutning	Connector pin	male
3A	3	SA1588	.Liitin, naaras	Anslutning	Connector pin	female
4	1	–	.Lukituskappale	Låsstycke	Locking piece	for female connector
4A	1	–	.Lukituskappale	Låsstycke	Locking piece	for male connector
5,5A	1	33433900	Liitinkotelopari	Skarvhuspar	Connector, pair	12–nap/ pole
5	1	SA1585	Liitinkotelo	Skarvhuspar	Connector, pair	12–nap/ pole, naaras/female
5A	1	SA1586	Liitinkotelo	Skarvhuspar	Connector, pair	12–nap/ pole, uros/male
6	1	–	.Tiivistekumi	Tätning	Seal	Dichtung
7	10	SA1587	.Liitin, uros	Anslutning	Connector pin	male
7A	10	SA1588	.Liitin, naaras	Anslutning	Connector pin	female
8	1		.Lukituskappale	Låsstycke	Locking piece	for female connector
8A	1		.Lukituskappale	Låsstycke	Locking piece	for male connector
9	2		.Tulppa	Plugg	Plug	
10	4	SA1580	Jatkoholkki	Hylsa	Sleeve	

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Upraised headlights 32817000
Upraised headlights (left–hand traffic) 33423000

– The raised headlights are needed when the tractor has a front mounted implement (e.g. front loader) which hampers visibility of the standard headlights. The upper headlights are attached to the cab roof front edge (in addition, the standard headlights are fitted on the tractor). Driver can choose with a switch which one of lights he wants to use. When the parking lights are switched on, also in–built parking lights light in the upper headlights.

– Fitting instruction:

– Detach the working lights from their attachments in the front edge of the roof. Remove the covering (1) and the roof.

– Open a little the inner roof so that the wiring loom (24) can be passed into the roof side through the hole in the side pillar and push the wire connector ends (E25, E23 and E24, E26) out of the roof front corners.

– Connect the wiring loom wires nos 77 (2 pcs brown) between the roof panel light (E16) supply wire (earlier tractors: no 26 black wire) and the lamp base.

– Connect the earth connector to the earth point /2.

– Disconnect the working light connectors and change places for working lights (the LH side light to the right and the RH side light to the left).

– Check all connections and fit the roof.

– Fasten the support (2) to the fastening lugs.

– Carefully clean the upper corners of the windscreen. The stickers' (15) round corners should be turned downwards towards the driver's seat. Mark the places for the stickers: The visible edges of the stickers should be about 10 mm outer than the corresponding edges of the covering (1). Fasten the stickers onto the windscreen.

– Mark places for new fixing holes (6 pcs) on the roof and use the covering (1) as a pattern. Drill ø4 mm holes. Seal the earlier holes with e.g. silicone based sealant.

– Fasten the number plate back plate to the covering (1) in the reverse direction so that it does not stand in the working light way.

– Fasten the covering (1) into place. There are rubber washers (28) between the covering and the outer roof.

– Assemble the headlights (parts 18, 20, 21 and 22, 26) and fasten them onto the frames (11), see picture. Connect the wiring loom to the bulbs and fasten the assembled frames onto the covering

– Fasten the working lights (TOP–marking upwards).

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– Draw the wiring loom in cab inside the side pillar linings and under the mudquard linings and further in the cable channel under the floor mat into the steering wheel console.

– Seek the connector X3 of the fuse box. If one wire (black, no 52) is fitted in the connector pole 1, modifications are unnecessary (the modifications have been done from the cab no 3645–>). If two wires are fitted in the pole 1, the following procedures must be done:
Cut off the thicker wire (1,5 mm^2) beside the connector. Procure about 0,5 m wire of the same thickness and connect it to the other end of the cut wire with connector SA 1553. Squeeze the plastic covering round the connector by warming it.
Tape the wire onto the side of the wiring loom behind the steering wheel column and draw it to the RH side of the fusebox.
Disconnect wire no 53 black from the fusebox connector X7 pole no 7. Use a small screwdriver to release the connector locking claws. Remove the earlier connector from the wire and connect this wire + the wire which was done to the new connector SA 1776. Connect the connector back to the connector X4 pole no 7.

– Connect the wiring loom (24) between the connector X4 (see picture).

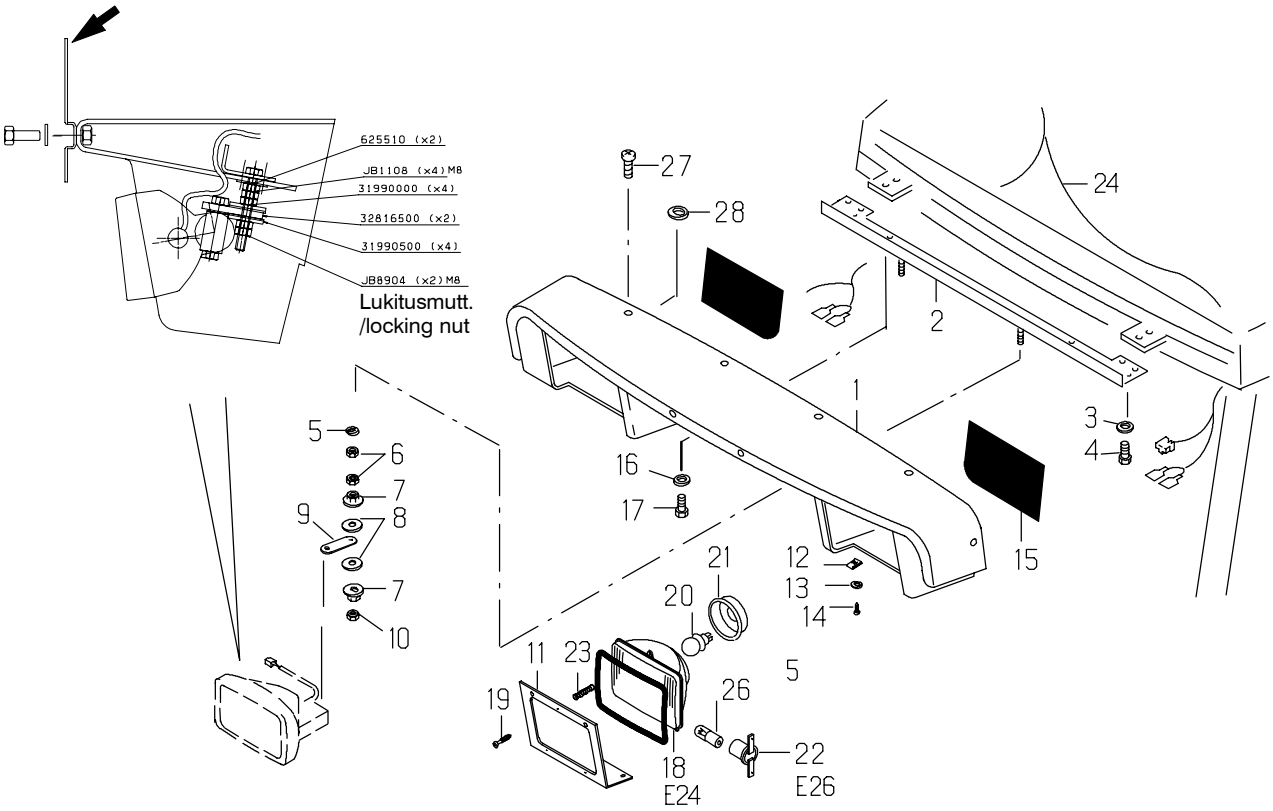
– Fit the switch (25) and connect it to the wiring loom (”S33”).

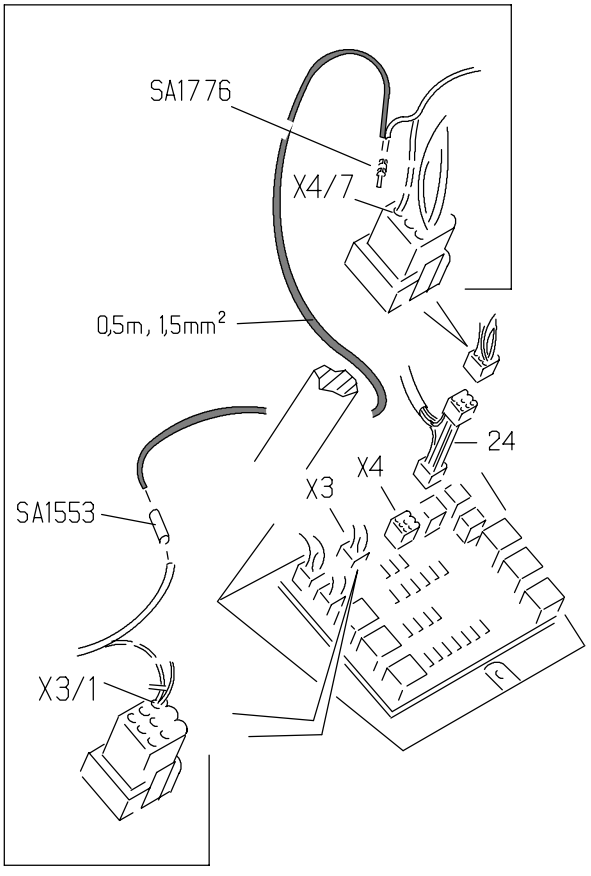
– Check the function of the raised headlights. Adjust the lights (see picture).

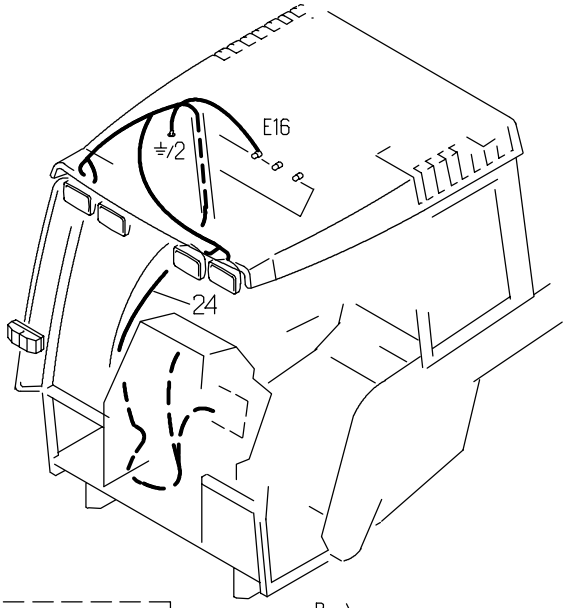
	1	32817000	Yläajovalot	Över färdljus	Upper head lights	Obere Scheinwerfer	
	1	33423000	Yläajovalot	Över färdljus	Upper head lights	Obere Scheinwerfer	For Left– hand traffic
1	1	32814200	.Suojus	Skydd	Shield	Schutz	
2	1	32816400	.Tuki	Stöd	Support	Stütze	
3	6	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	
4	4	HA6323	.Ruuvi	Skruv	Screw	Schraube	
5	2	625510	.Aluslaatta	Bricka	Washer	Scheibe	
6	4	JB1108	.Mutteri	Mutter	Nut	Mutter	
7	4	31990000	.Lukituslevy	Låsbricka	Lock washer	Sicherungsscheibe	
8	4	31990500	.Kitkalevy	Friktionplatta	Friction plate	Reibungsplatte	
9	2	32816500	.Kiinnitin	Fästdon	Fastener	Halter	
10	4	JB8904	.Mutteri	Mutter	Nut	Mutter	
11	2	32816300	.Kehys	Ram	Frame	Rahmen	
12	8	JC9002	.Mutteri	Mutter	Nut	Mutter	
13	8	JD0405	.Aluslaatta	Bricka	Washer	Scheibe	
14	8	HN6804	.Ruuvi	Skruv	Screw	Schraube	
15	1	32817100	.Tarra	Dekal	Sticker	Aufkleber	assy
16	2	625510	.Aluslaatta	Bricka	Washer	Scheibe	
17	2	HA6323	.Ruuvi	Skruv	Screw	Schraube	
18	2	31547310	.Ajovalaisin	Strålkastare	Head light	Scheinwerfer	For Right–hand traffic
	2	31590100	.Ajovalaisin	Strålkastare	Head light	Scheinwerfer	For Left–hand traffic
18A	2	32745300	..Tiiviste	Tätning	Gasket	Dichtung	
19	6	32547600	..Ruuvi	Skruv	Screw	Schraube	
20	2	SH2663	..Lamppu	Lampa	Bulb	Lampe	
21	2	601610	..Suojus	Skydd	Shield	Schutz	
22	2	32571100	..Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
23	6	601640	.Jousi	Fjäder	Spring	Feder	
24	1	32816800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
25	1	31877500	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
	1	32816900	.Linssi	Lins	Lens	Linse	
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	+ lamppu /+ bulb

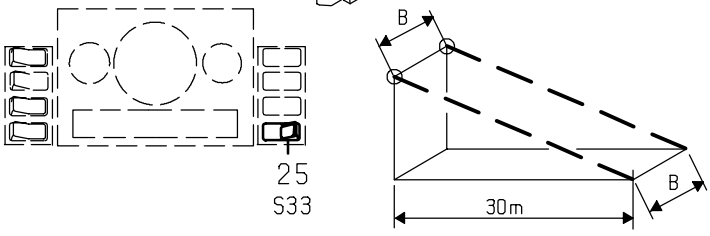
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26	2	SH2664	.Lamppu	Lampa	Bulb	Lampe	
27	6	HN6804	.Ruuvi	Skruv	Screw	Schraube	
28	6	32643900	.Kumilaatta	Gummibricka	Rubber washer	Gummischeibe	
	1	SA1776	.Liitin	Anslutning	Connection	Anschluß	
	1	SA1553	.Liitin	Anslutning	Connection	Anschluß	
–	1	–	Johdin 0,5 m	Ledning, 0,5 m	Wire, 0,5 m	Kabel	1,5 mm^2

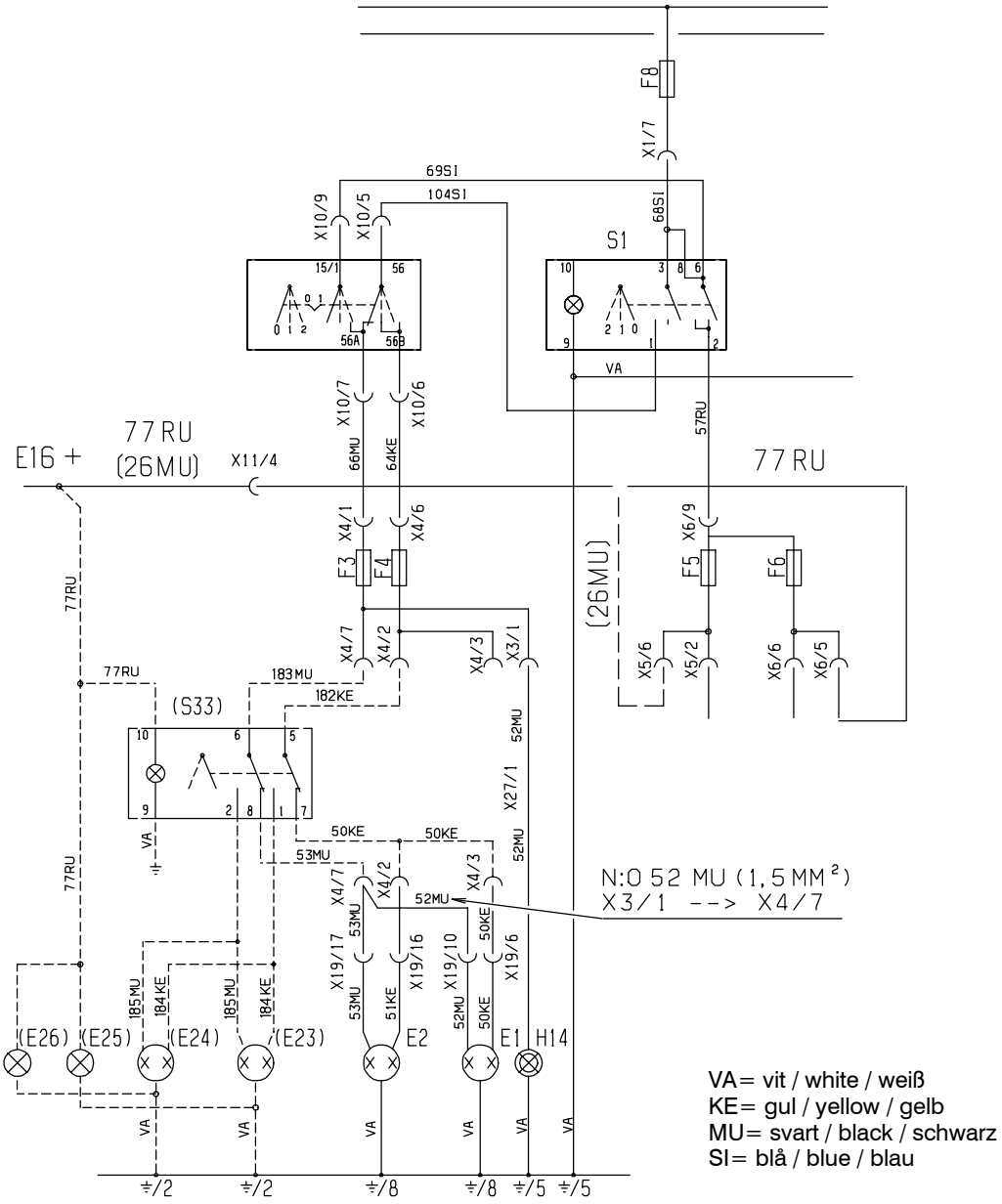








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Agrodata instrument panel . . . . . A 33039000

FITTING THE SENSORS:

– Models 6000–8400 (these tractors don't have ACD– electrohydraulic lift as standard): Gearbox speed sensor B6 is fitted to the 4WD drive shaft front end (gearbox). If the sensor location on the 4WD clutch housing is desired, the tractor has to be splitted at the gearbox.

  Tractors 8450–8750: the sensor B6 (location on the 4WD housing) and the harness **7** are installed.

– Sensor B6: remove the propeller shaft. Remove the front shaft nut (do not touch the other one), and fasten the support under the 4WD flange screws.

– Sensor B7: Remove the plug and clean the threads. Find with a dial gauge the shortest distance between the sensor and the impulse disc through the sensor hole.

– B6, B7: Apply Loctite 572 onto the sensor threads and turn it against the gear wheel / impulse disc and then unscrew it **1**/**4** of a turn (B7: do not screw too hard because the disc can spring).

– B6, B7: Lock the sensor with the nut and connect wire harness **7**.

– B6, B7: Connect the wires to the sensor and protect with grease UC1913 (vaseline spray HHS 2000, Würth).

– B6, B7: Fold the wire on the sensor and fasten it with a plastic cable tie. Fasten the wire to the lock washer .

– Temperature sensor B3: remove the plug and fit the sensor (+ o–ring) instead. Connect the wires to the sensor and protect with grease UC1913.

– Fasten removed parts.

FITTING THE PARTS IN THE CAB:

– Disconnect the battery earth lead. Remove the instrument panel. Remove the lever console side panel.

– Connect the wires to the new instrument panel. Connect the connector "X25" to the wiring harness **2**. Fit the new instrument panel.

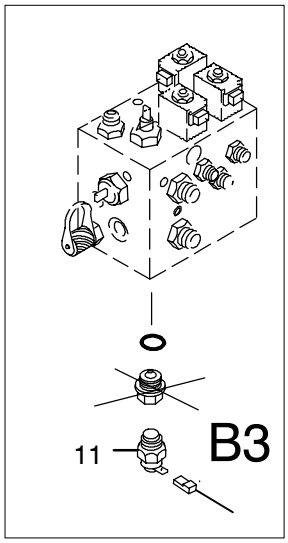
– Draw the wire loom **2** together with other cables along the floor into the lower end of the lever housing and furthermore at the rear part of the cab into the side console Bind the cable together with the other cables.

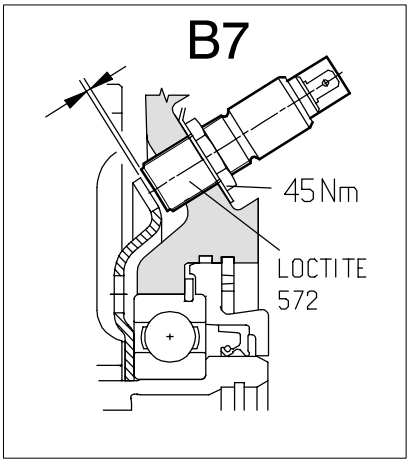
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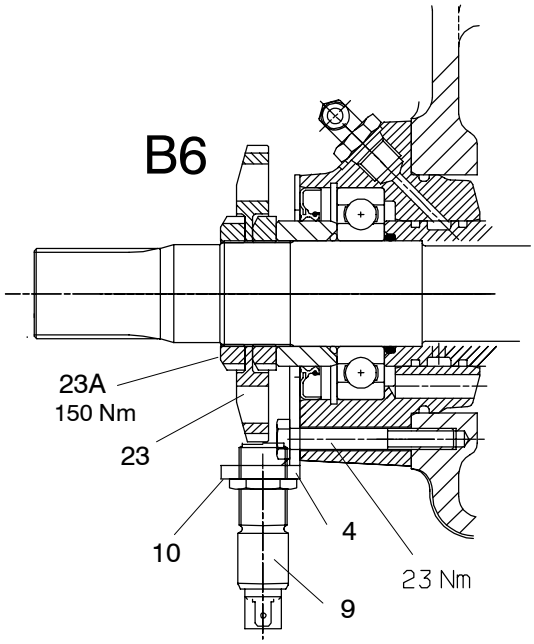
– Draw the connector ”X34” of the sensor wiring loom through the opening at the bottom of the side panel. Connect the connector to the wiring loom **2.** Connect also the connector ”X1E” to the wiring harness **2**.
(The connector ”X39” of the wiring loom **7** remains unconnected).

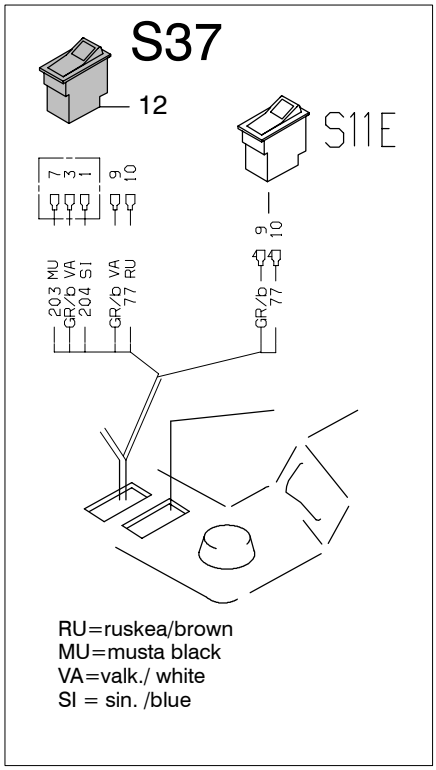
– Take the switch S11E (forced lowering switch) apart from the panel and connect the auxiliary wires of the wiring loom **2** to the switch S37, and fit the switch again (see picture).
(The connectors of the wiring loom **2** ”H25”, ”H26”, ”GR5” and ”X36” remain unconnected).

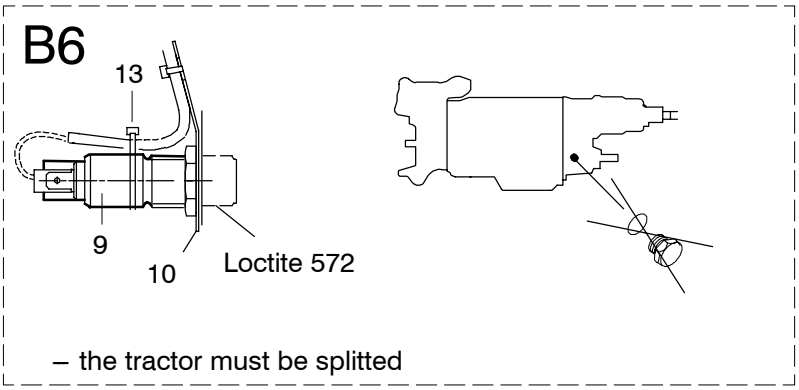
– Carry out a calibrating (see pages 6–7/7) and a test drive and ensure that Agrodata–unit functions.



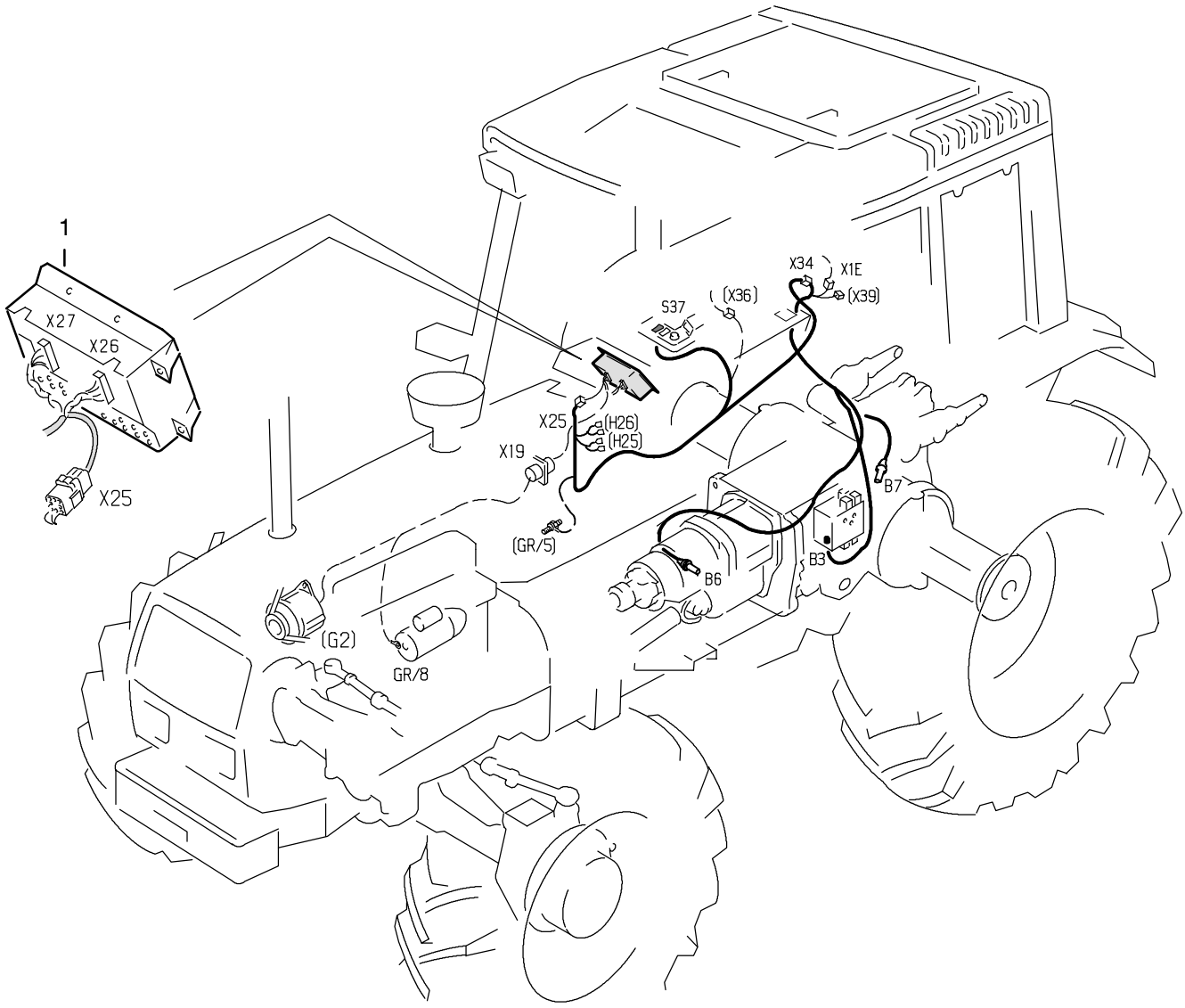






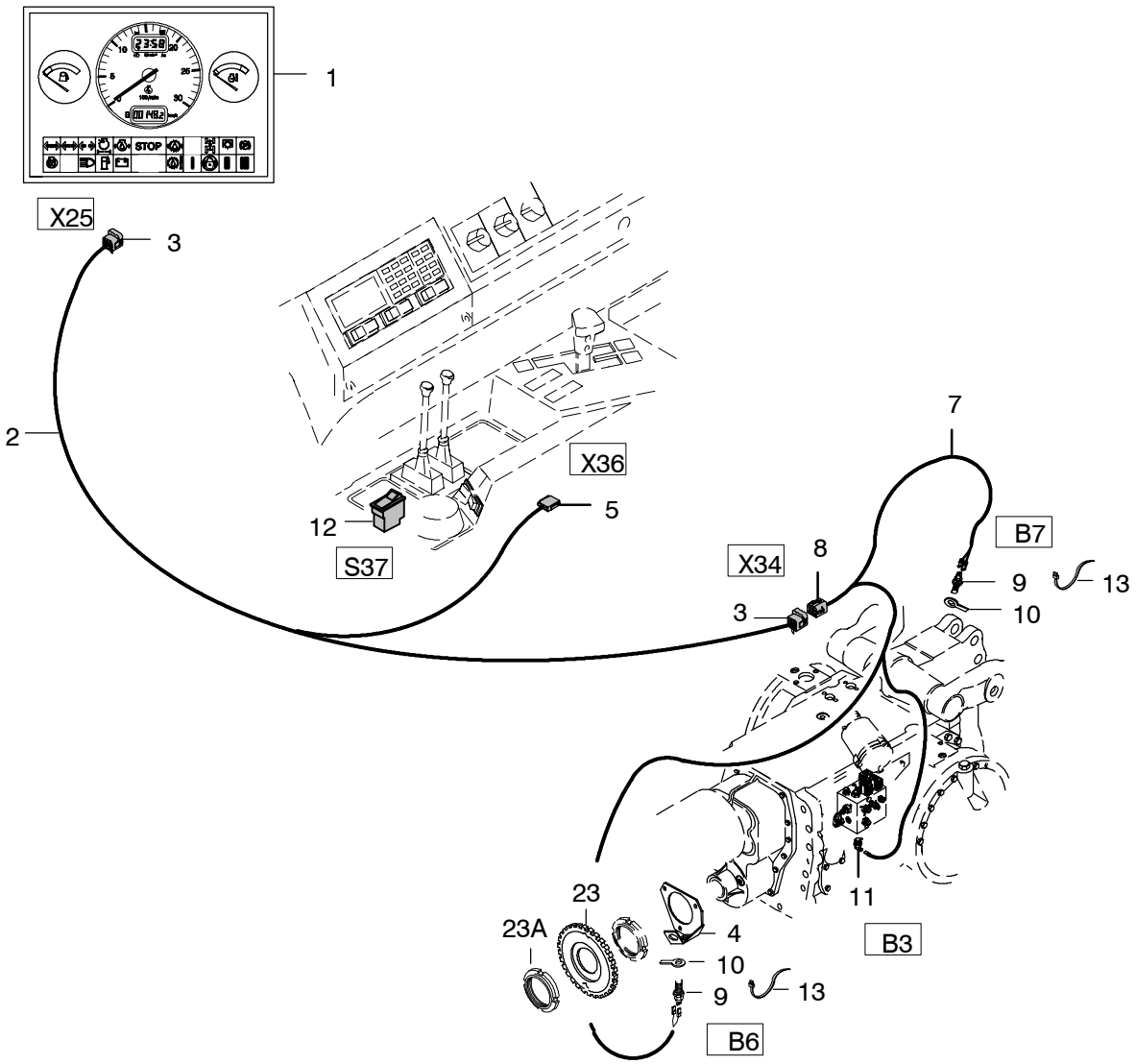


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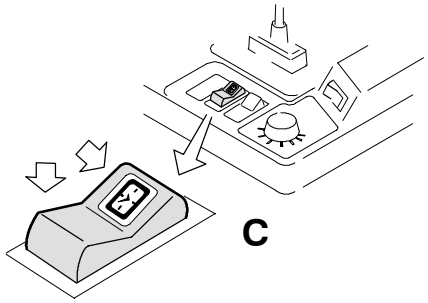
		A 33039000	Agrodata–mittaristo	Agrodata–Instrument	Agrodata–Instrument	Agrodata–Instrument	
1	1	33011810	.Mittaristo	Instrument	Instrument	Instrument	
2	1	33012010	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
3	2	SA1774	..Liitinkotelo	Skarvhus	Connector	Steckdose	9–pole
5	1	SA1786	..Liitinkotelo	Skarvhus	Connector	Steckdose	3–pole
4	1	32844920	.Levy	Platta	Plate	Platte	
7	1	33012100	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	EI/ NO 8450–8750
8	1	SA1775	..Liitinkotelo	Skarvhus	Connector	Steckdose	9–pole
9	2	31702400	.Anturi	Givare	Sensor	Geber	
10	2	32619100	.Kiinnitin	Fästdon	Fastener	Halter	
11	1	33047100	.Lämpötila-anturi	Temperatursgivare	Temperature sensor	Temperaturfühler	
12	1	32276400	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	3–act
	1	33384600	.Linssi	Lins	Lens	Linse	
	1	30944600	.Lampunpidin +Lamppu	Lampfattning Lampa	Bulb socket Bulb	Lampenfuß Lampe	
13	2	SA1900	.Johdinside	Buntband	Wiring band	Leitungsklemme	
23	1	32844810	.Hammaspyörä	Kugghjul	Gear	Zahnrad	
23A	1	LB3013	. Mutteri	Mutter	Nut	Mutter	



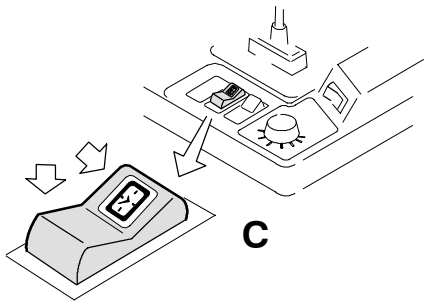
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Calibrating the instrument for different tyres:

1. Remove the switch **C** by prying it carefully. Do not disconnect the wires.
2. Switch on current with the ignition switch.



–3. Connect the switch pins 1 and 7 with an auxiliary wire and press at the same time the switch front edge for over 3 seconds. ”P” appears in the lower display and the valid code number (e.g. P243). The first digit is flashing. Remove the wire.



4. Adjust the hundreds by pressing the switch rear edge.
5. When the hundreds are correctly adjusted, press the switch front edge and tens start to flash.
6. Adjust the tens by pressing the rear edge and then press the front edge, at which time single units start to flash.
7. Adjust the ones by pressing the rear edge.
8. Finally press the front edge for over 2 seconds. Calibrating has been carried out and running hours appear in the lower display (read the note below). Fit the switch.

Note! In the beginning of the production (the first 20 tractors), the switch pins 1 and 7 must be once again connected with auxiliary wire and after that the switch front edge is pressed over 2 seconds.

Note! The code number value can vary between P100–P299. When pressing the switch rear edge, the code value changes from a smaller value to greater one. The code numbers and corresponding tyres are listed in the table on the next page.

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– Code numbers with different tyre sizes and transmission types (**sensor located on the front end of the 4WD drive shaft**):

Mezzo			DPS300	DPS300			DPS460 & DPS 650	
Rengas	r dyn	T300/40	T300/40	T450/30	T450/40	T450/50	T450/40	T450/50
13.6-38/8N	740	146	146	145	144	147	144	144
13.6R-38/8M	740	146	146	145	144	147	144	144
13.6R-38/8M	740	146	146	145	144	147	144	144
16.9-34/8N	745	145	145	144	143	146	143	143
16.9R-34/8M	745	145	145	144	143	146	143	143
16.9R-34/8N	745	145	145	144	143	146	143	143
16.9-34/14IND	745	145	145	144	143	146	143	143
16.9R-34/8M	745	145	145	144	143	146	143	143
14.9R-38/8M	765	142	141	140	140	142	139	140
14.9R-38/8N	765	142	141	140	140	142	139	140
14.9R-38/8M	765	142	141	140	140	142	139	140
600/65R-34/M	768	141	141	139	139	141	138	139
18.4-34/8N	770	141	141	139	139	141	138	139
18.4-34/8N	770	141	141	139	139	141	138	139
18.4R-34/8N	770	141	141	139	139	141	138	139
18.4R-34/8M	770	141	141	139	139	141	138	139
18.4-34/14FOR	770	141	141	139	139	141	138	139
18.4-34/14IND	770	141	141	139	139	141	138	139
18.4-34/14FOR	770	141	141	139	139	141	138	139
18.4R-34/8M	770	141	141	139	139	141	138	139
18.4R-34/8GY	770	141	141	139	139	141	138	139
18.4R-34/8M	770	141	141	139	139	141	138	139
18.4-34/14FOR	770	141	141	139	139	141	138	139
18.4-34/IND	770	141	141	139	139	141	138	139
520/70R-34	784	138	138	136	136	138	136	136
540/65R-38/M	791	137	137	135	135	137	134	135
16.9R-38/8M	795	136	136	135	134	137	134	134
16.9R-38/8N	795	136	136	135	134	137	134	134
16.9R-38/8M	795	136	136	135	134	137	134	134
16.9R-38/8M	795	136	136	135	134	137	134	134
16.9R-38/8N	795	136	136	135	134	137	134	134
16.9R-38/8GY	795	136	136	135	134	137	134	134
620/75R-30/M	800	135	135	134	134	136	133	134
620/75R-30/M	800	135	135	134	134	136	133	134
480/70R-38	805	135	134	133	133	135	132	133
18.4R-38/8M	820	132	132	130	130	132	130	130
18.4R-38/8GY	820	132	132	130	130	132	130	130
18.4R-38/14M	820	132	132	130	130	132	130	130
18.4-38/14FOR	820	132	132	130	130	132	130	130
18.4-38/14IND	820	132	132	130	130	132	130	130
18.4R-38/M	820	132	132	130	130	132	130	130
18.4-38/FI	820	132	132	130	130	132	130	130
600/65R-38/M	830	131	130	129	129	131	128	129
520/70R-38	837	129	129	128	128	130	127	128
20.8R-38/M	855	127	127	125	125	127	124	125
20.8R-38/8M	855	127	127	125	125	127	124	125
20.8R-38/8M	855	127	127	125	125	127	124	125
650/65R38M	867	125	125	123	123	125	123	123
580/70R-38	875	124	124	122	122	124	122	122

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– Code numbers with different tyre sizes and transmission types (**sensor located on the gearbox housing**):

			DPS300	DPS300			DPS460,650	
Rear wheel	**r dyn**	**T300/40**	**T300/40**	**T450/30**	**T450/40**	**T450/50**	**T450/40**	**T450/50**
13.6–38/8N	740	190	180	227	197	181	216	197
13.6R–38/8M	740	190	180	227	197	181	216	197
14.9R–38/8M	765	184	174	219	191	175	209	191
14.9R–38/8N	765	184	174	219	191	175	209	191
16.9–34/8N	745	189	179	225	196	180	214	196
16.9R–34/8M	745	189	179	225	196	180	214	196
16.9R–34/8N	745	189	179	225	196	180	214	196
16.9R–38/8M	795	177	168	211	184	168	201	184
16.9R–38/8N	795	177	168	211	184	168	201	184
18.4–34/8N	770	183	173	218	190	174	207	190
18.4–34/8N	770	183	173	218	190	174	207	190
18.4R–34/8N	770	183	173	218	190	174	207	190
18.4R–34/8M	770	183	173	218	190	174	207	190
16.9R–38/8M	795	177	168	211	184	168	201	184
18.4–34/14FOR	770	183	173	218	190	174	207	190
18.4R–38/8M	820	172	163	204	178	163	195	178
620/75R–30/M	800	176	167	210	182	167	199	182
620/75R–30/M	800	176	167	210	182	167	199	182
16.9–34/14IND	745	189	179	225	196	180	214	196
18.4–34/14IND	770	183	173	218	190	174	207	190
18.4–34/14FOR	770	183	173	218	190	174	207	190
18.4R–34/8M	770	183	173	218	190	174	207	190
18.4R–34/8GY	770	183	173	218	190	174	207	190
13.6R–38/8M	740	190	180	227	197	181	216	197
14.9R–38/8M	765	184	174	219	191	175	209	191
16.9R–38/8M	795	177	168	211	184	168	201	184
16.9R–34/8M	745	189	179	225	196	180	214	196
540/65R–38/M	791	178	169	212	185	169	202	185
18.4R–34/8M	770	183	173	218	190	174	207	190
600/65R–38/M	830	170	161	202	176	161	192	176
600/65R–34/M	768	183	174	218	190	174	208	190
16.9R–38/8N	795	177	168	211	184	168	201	184
16.9R–38/8GY	795	177	168	211	184	168	201	184
18.4R–38/8GY	820	172	163	204	178	163	195	178
18.4R–38/14M	820	172	163	204	178	163	195	178
18.4–38/14FOR	820	172	163	204	178	163	195	178
20.8R–38/M	855	165	156	196	171	157	187	171
18.4–38/14IND	820	172	163	204	178	163	195	178
18.4R–38/M	820	172	163	204	178	163	195	178
18.4–34/14FOR	770	183	173	218	190	174	207	190
18.4–34/IND	770	183	173	218	190	174	207	190
18.4–38/FI	820	172	163	204	178	163	195	178
20.8R–38/8M	855	165	156	196	171	157	187	171
20.8R–38/8M	855	165	156	196	171	157	187	171
650/65R38M	867	163	154	193	168	154	184	168
					0			

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520/70R–34	784	180	170	214	186	171	203	186
540/65R–38/M	791	178	169	212	185	169	202	185
480/70R–38	805	175	166	208	181	166	198	181
520/70R–38	837	168	159	200	174	160	191	174
520/70R–38	837	168	159	200	174	160	191	174

– **Note!** If a tractor has tyres which are not listed on the previous table, the code number can passably be calculated as follows:

$$X = \frac{Y \times V}{V_{max}}$$ in which

X= correct code number
Y=actual code number in AD–instrument
V= tractor's constructional speed (30, 40 or 50 km/h)
$\mathbf{V_{max}}$=tractor's max driving speed which is shown by AD–instrument.

Example:

In AD–instrument there is an actual code number 170
Tractor's constructional speed is 40 km/h
AD–instrument shows the tractor max. driving speed of 38 km/h

$$X = \frac{170 \times 40}{38} = 179$$

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Mounting kit 33464200

– The earlier type control unit no 32861200 (tractors up to no 668102), will be replaced with a new unit no 33027100 and with an extra wire loom. The kit incl. also new fastening parts.

In connection with the unit change, the following functions are added:

– sound signal for applied hand brake

– sound signal for head lights

FITTING:

– Disconnect the battery earth lead.

– Remove the dash board plate round the instruments.
Push the connector end ”A9” of the wire loom 33031100 into the steering wheel console from lower part upwards.

– Part the connector ”A9” halves of the display unit and connect the wire loom 33031100 corresponding connector between the connector halves.

– Release the floor mat in the cab RH side front part and the lower end protection of the gear levers.
Remove the earlier control unit (32861200).
Remove the power lift switch panel.
Unscrew the panel housing bottom nut.
Loosen the door seal at the rear mudguard.

– Draw the wire loom 33031100 together with other cables along the floor into the lower end of the lever housing. Bind the cable together with the other cables.

– Connect the connector ”A10” (in the cab wire loom to the loosened control unit) onto the new wire loom.

– Draw the new wire loom under the mudguard upholstery into the power lift switch panel housing (a hole for wires is ready–made).

– Fasten parts **29**–**36** onto the switch panel. Connect connector ”(A10)” to the control unit circuit card and refit the cover. Fasten other removed parts.

– Check the function of the DPS and the sound signals of the hand brake and head lights:

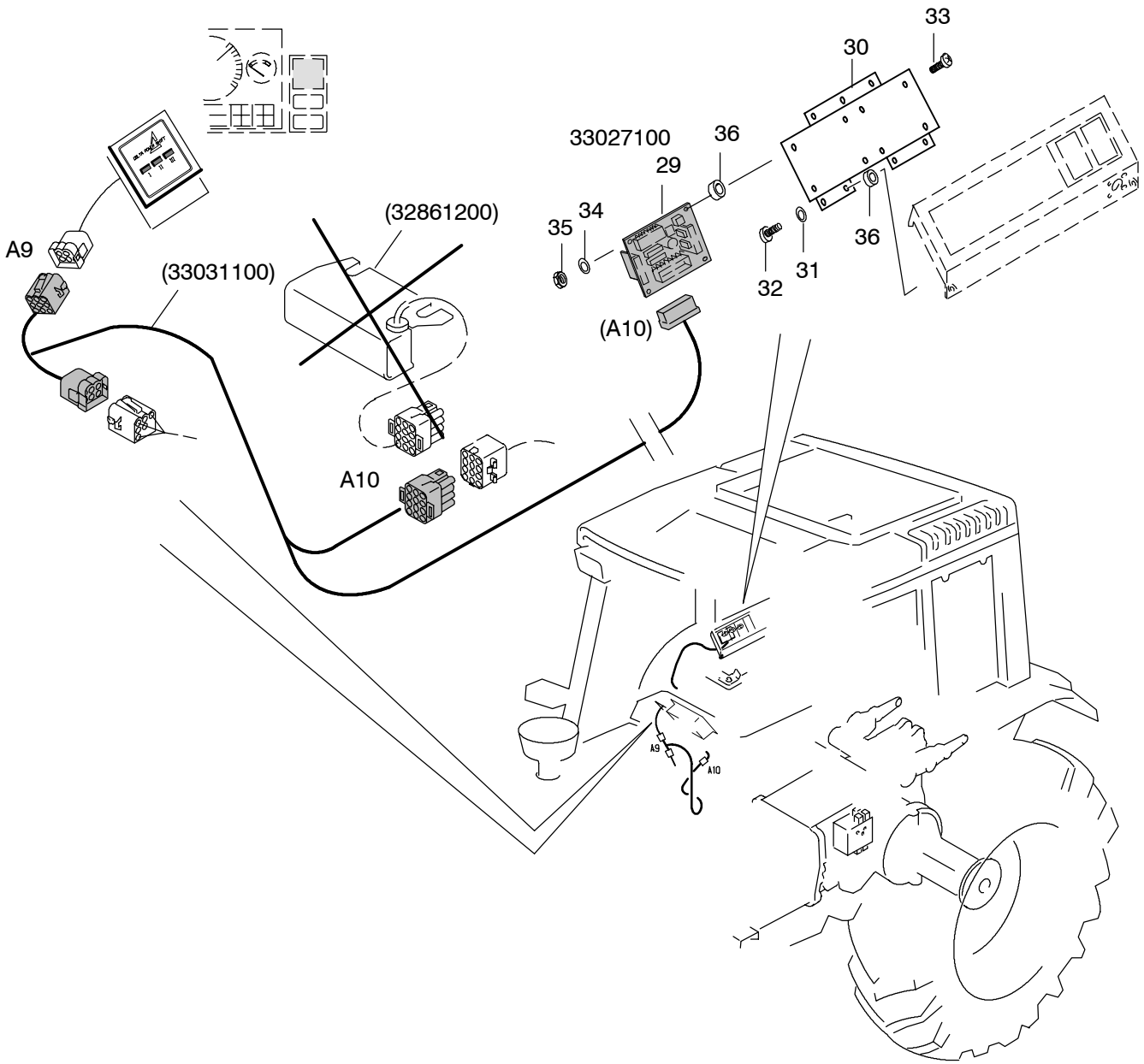
* Alarm buzzer starts to alarm continuously, if the engine is stopped and the parking brake is not applied.

* If the engine is started without releasing the hand brake, the buzzer alarms brokenly.

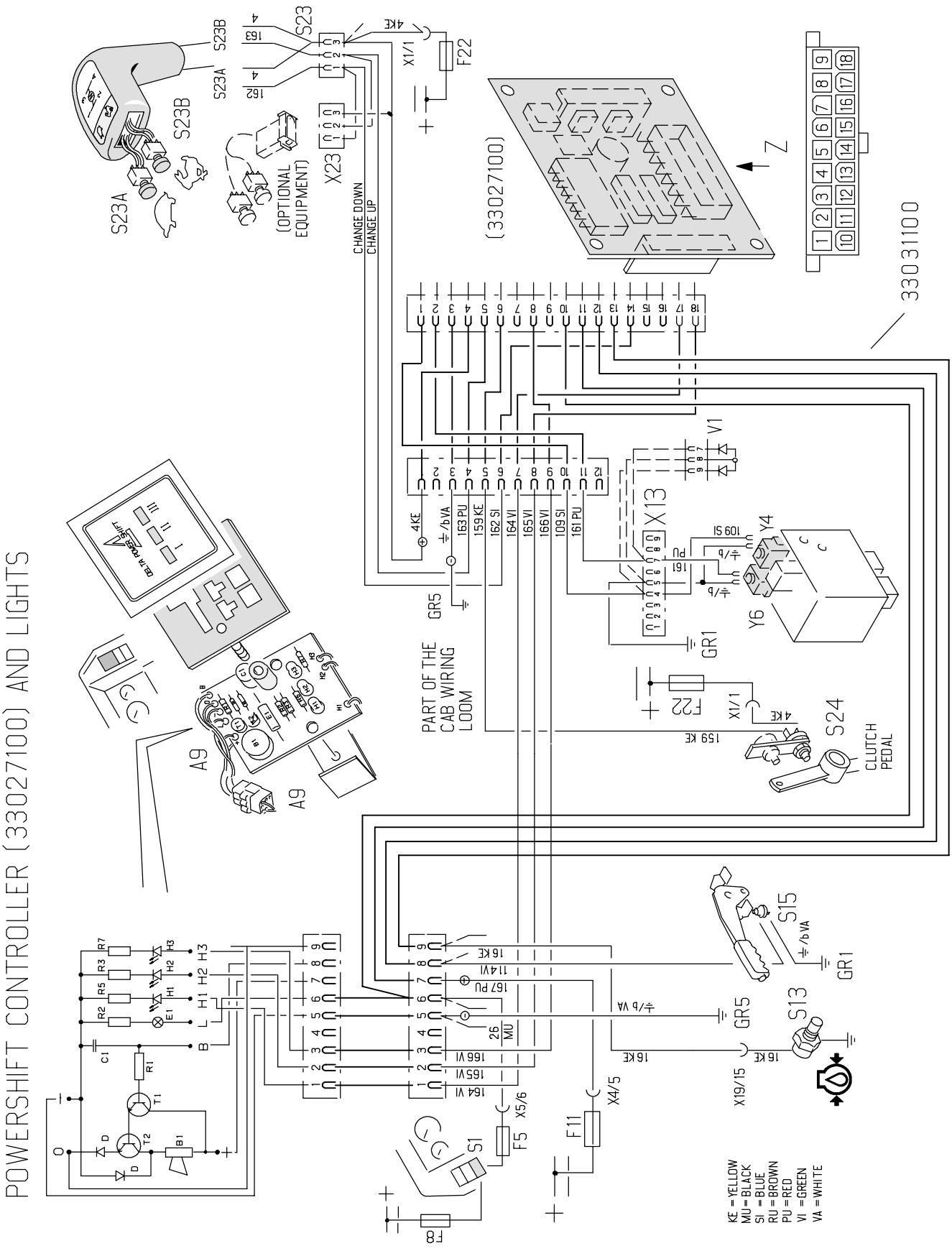
* If the head lights are on after the current is switched off , the buzzer alarms brokenly.

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	1	33464200	Asennussarja	Ditsättn. sats	Fitting kit	Einbausatz
29	1	33027100	.Ohjain	Styrning	Guide	Führung
	1	33031100	.Johdinsarja	Ledningssats	Wiring set	Verkabelung
30	1	33030500	.Kannatin	Hållare	Support	Halter
31	4	JD0405	.Aluslaatta	Bricka	Washer	Scheibe
32	4	HN6807	.Ruuvi	Skruv	Screw	Schraube
33	4	HD8002	.Ruuvi	Skruv	Screw	Schraube
34	4	JD0404	.Aluslaatta	Bricka	Washer	Scheibe
35	4	JB8901	.Mutteri	Mutter	Nut	Mutter
36	8	32518100	.Rengas	Ring	Ring	Ring



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Speedometer and clock 32635700

Fitting:

– Speedometer and clock are fitted in their casing on the instrument panel.
– Detach the instrument panel, fit the casing and mark places for holes and lead–in points for wires.
– Drill holes (ø 5mm, 2 pcs) for fixing screws and a hole ø 32mm for wires (connector, 9 pins).

– Fasten the casing with screws **3** (2 pcs) and fasten the display unit into the casing.

– Detach the RH side threshold moulding and the side panel. Draw the wire loom **4** backwards under the floor mat.

– Carry out wire connections according to the picture:
– wire no 1 (red) to connector X2 pin 2. Connector is placed in the fuse box.
– wire no 2 (yellow) to connector X3 pin 7. Connector is placed in the fuse box.
– earth wire under the earth screw 5.

– Fit the wheel sensor bracket **6** under the nut of the LH side check link. Nut is fitted under the rear axle housing. Fit the sensor and connect wires to the 3–pin connector. Blue wire to pin 1 and brown to pin 3.

– Change two rear wheel attaching bolts with bolts fitted with magnet (bolts which fitted 180˚ opposite each other). Yellow dot on magnets against the sensor. Secure screws with Loctite 242.

– Adjust distance between sensor and magnet to 1–5mm.

	1	**32635700**	Nop.mitt. ja kello	Hastig.m.+klocka	S.meter+clock	Tachometer+Uhr	
1	1	32663710	.Näyttölaite	Teckenförster	Display unit	Bildschirm	
2	1	32663500	.Kotelo	Hus	Housing	Gehäuse	
3	2	HD4313	.Ruuvi	Skruv	Screw	SchraubeVis	(M6x12)
4	1	32663600	.Johdin	Ledning	Wire	Leitung	
5	1	31703200	.Anturi	Givare	Sensor	Geber	
6	1	31703300	.Kannatin	Hållare	Support	Halter	
7	2	HE6958	.Ruuvi	Skruv	Screw	SchraubeVis	
8	2	31720500	.Magneetti	Magnet	Magnet	Magnet	
9	2	31720600	.Aluslaatta	Bricka	Washer	Scheibe	
10	2	32249200	.Ruuvi	Skruv	Screw	SchraubeVis	

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INSTALLING AND CHECKING:

I Setting speedometer

1. Push the function key beside the display until the display shows the driving speed.

2. The driving speed should be zero (0).
3. Push the key about 6 seconds, then release it.

4. To make the display smaller:
   –Push the key once. By pushing the key **immediatel**y, the display shows the wheel circumference adjusting value which reduces at every push.
   To make the display greater:
   –Push the key once and wait about 6 seconds. By pushing after, the adjusting value increases at every push.
   Adjust the circumference value according to the tyre size shown in table below by pushing the key.

5. After the adjustment, the display shows automatically the driving speed and the adjusting value is in the memory. Note that the driving speed must be in the display, when the adjustment is started. The value direction can neither be changed during the adjustment.

   Setting speedometer has also to be done when changing different size tyres or if it is wanted to adjust the speedometer more exact for worn tyres.

Tyre size	Value
13.6–38/8	211
13.6R–38/8	211
14.9R–38/8	218
16.9–34/8	213
16.9R–34/8	213
16.9–34/10	212
16.9R–34/14	213
16.9R–38/8	227
18.4–34/8	220
18.4R–34/8	220
18.4–34/10	220
18.4–34/14	220
18.4R–38/8	234
18.4–38/14	234
18.4R–38/14	234
20.8R–38/8	244
23.1R30	225
540/65R–38/M	226
600/65R–34/M	219
600/65R–38/M	237
620/75R–30/M	228
650/65R–38/M	248

Table 1. The wheel circumference value which is input into the speedometer can be calculated as follows:

$$\frac{\text{Rolling circumference}}{\text{number of magnets (2)}} \times 0{,}91$$

If tyre specifications are not available, you can measure the wheel circumference as follows:
– Mark a mark on the tyre and on the ground.
– Drive the tractor forward until the wheel has made 5 revolutions.
– Make a second mark on the ground.
– Measure the distance between the two marks and divide this distance by 5. The result is the effective circumference of the wheel.

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II Setting time

1. Push the function key beside the display until the time is shown.
2. The time is shown from 1 to 12.

3. Push the key about 6 seconds, release it.

4. To make the display time less:
   –Push shortly the key once. By pushing the key **immediately** the display shows the time which reduces at every push.

   To make the display time greater:
   –Push shortly the key once and wait about 6 seconds. By pushing after, the time increases at every push. Adjust correct time by pushing the key.

5. After adjustment the colon starts to flash and the correct value is in the memory. Note that the time must be in the display before starting the setting. Neither the direction can be changed during the adjustment.

III Functional check

1. Push the time into the display.

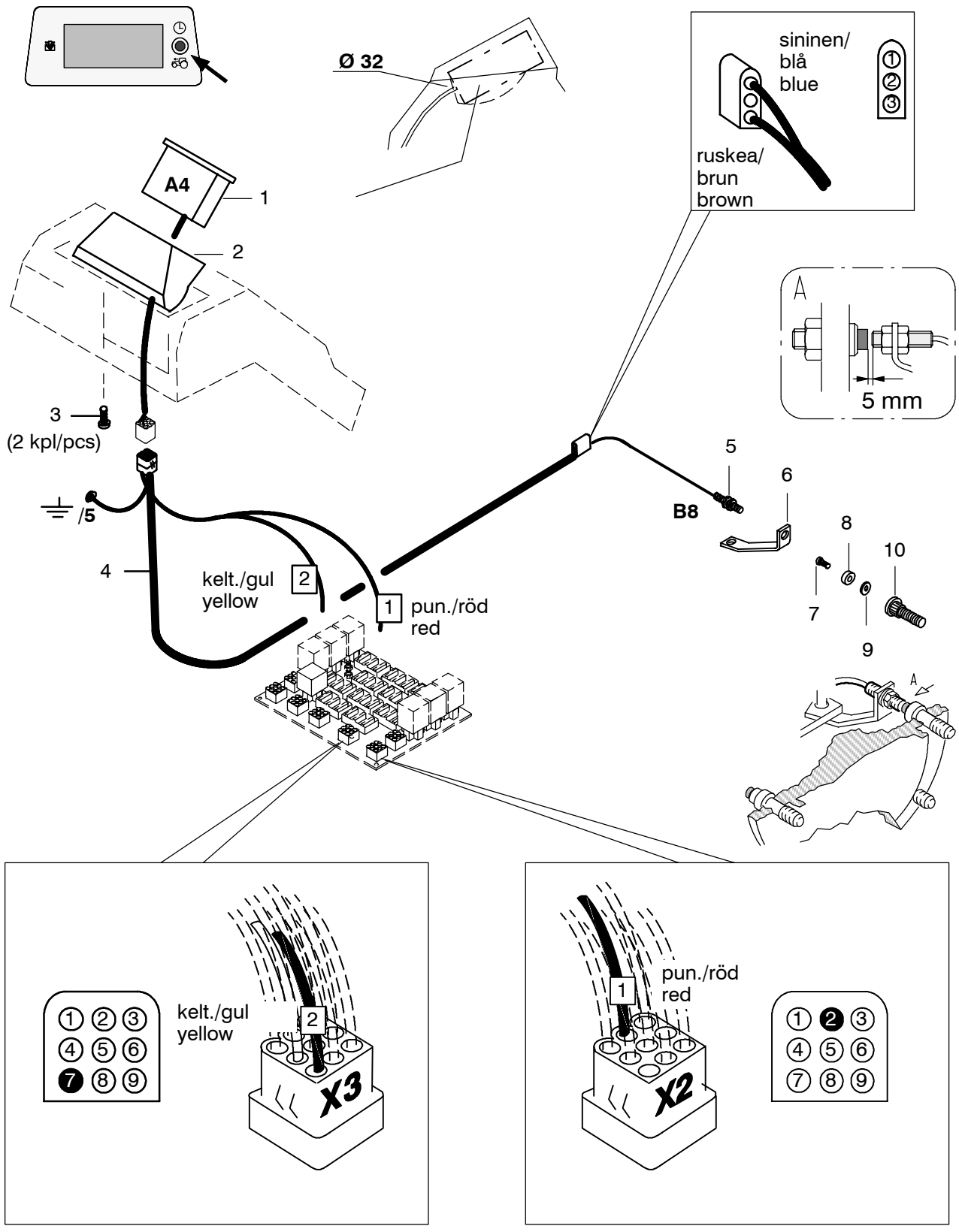
2. Start driving with gear M1 and at engine revs 1500 RPM.

3. The speed value must appear in the display. Check that the speed reading correspond to the theoretic driving speed.

4. Push the speedometer key while driving after which the time must appear in the display. Press once again the same key after which the speed reading returns to the display.

5. Stop the tractor and after 8 seconds the speed reading must be zero.

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Rotating warning light (on LH side) . **31687000.**
(mounting on RH side) **31983500**
for model LS **32952400**
Rotating warning light (blue) **33361200**

The light is fitted on the handle on the cab LH side front corner according to the picture.

Fitting :

– Fasten the light bracket using fasteners **6** (4pcs) and screws **7** (see picture).

– Connect the supply and earth wire no **9** to the light (picture A). Push the plastic shield of the wire through the hole on the tube **4**.
Connect the other end of the wire to connector X22 in the cab wire loom. Connector is placed in the LH side front corner under the visor (picture B).

– Up to the cab no 470 the supply wire (no 117 red) can be found by opening a little the rear roof edge in the middle. The wire is connected with an existing lead to the direction indicator. Place the wire under the LH side edge seal of the roof.

– Fit the rotating warning light into the socket **3** and tighten the wing nut.

Instrument panel:

– Open the panel cover by unscrewing 4 st cross–head screws and the ignition switch nut.

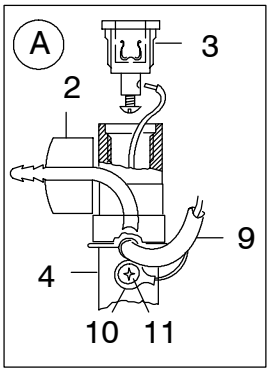
– Remove the covering and fit the rocker switch **12**.

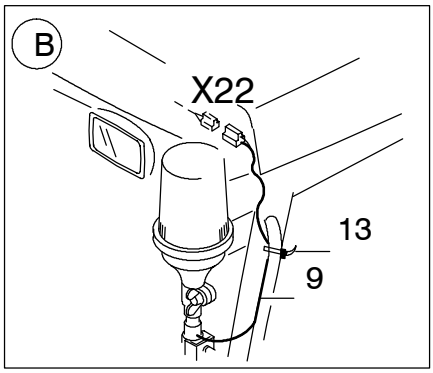
– Connect existing connector S6 in the wire loom (wires no 117 and 79) to the rocker switch and wires no 26 and the earth wire (white) to the indicating lamp holder (picture C).

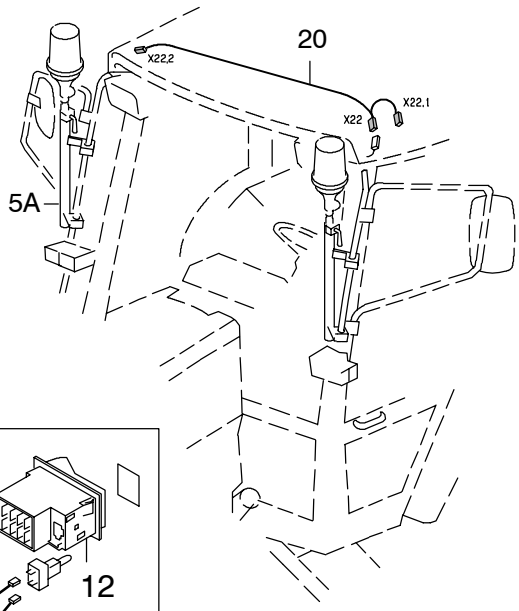
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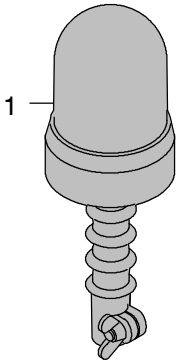
	1	**31687000**	Kattovilkku	Roterande varn.ljus	Rotating warn. light	Drehwarnblinker	Left
	1	**31983500**	Kattovilkku	Roterande varn.ljus	Rotating warn. light	Drehwarnblinker	Right GB
	1	**32952400**	Kattovilkku	Roterande varn.ljus	Rotating warn. light	Drehwarnblinker	LS
	1	**33361200**	Kattovilkku	Roterande varn.ljus	Rotating warn. light	Drehwarnblinker	CAD(blue)
1	1	32641800	.Vilkkuvalo	Blinkljus	Flash light	Blinkerlicht	flexible arm(orange)
	1	SH2662	..Lamppu	Lampa	Bulb	Lampe	(orange)
	1	33361100	.Vilkkuvalo	Blinkljus	Flash light	Blinkerlicht	flexible arm CAD (blue)
	1	SH2662	..Lamppu	Lampa	Bulb	Lampe	
2	1	31085100	.Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	
3	1	31085200	.Pistorasia	Stickdosa	Plug socket	Steckdose	
4	1	30354510	.Putki	Rör	Pipe	Rohr	
5	1	31686920	.Tuki	Stöd	Support	Stütze	Left
	1	32955800	.Tuki	Stöd	Support	Stütze	Right GB
6	4	32635910	.Kiinnitin	Fästdon	Fastener	Halter	
7	4	HC9605	.Ruuvi	Skruv	Screw	Schraube	
8	1	30354800	.Ruuvi	Skruv	Screw	Schraube	
9	1	31690700	.Johdin	Ledning	Wire	Leitung	
9A	1	SA1550	..Liitinkotelo	Skarvhus	Connector	Steckdose	
	1	32949600	.Johdin	Ledning	Wire	LeitungLS	
9A	1	SA1550	..Liitinkotelo	Skarvhus	Connector	Steckdose	
10	1	JD9201	.Aluslaatta	Bricka	Washer	Scheibe	
11	1	HD9025	.Ruuvi	Skruv	Screw	Schraube	
12	1	30944200	.Kytkin	Strömställare	Switch	Schalter	
	1	31690810	.Linssi	Lins	Lens	Linse	
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
			+Lamppu	Lampa	Bulb	Lampe	
13	1	SA9102	.Side	Band	Band	Binde	
16	2	32949900	.Levy	Platta	Plate	Platte	LS
17	2	JB8903	.Mutteri	Mutter	Nut	Mutter	LS
18	2	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	LS
19	2	HA9224	.Ruuvi	Skruv	Screw	Schraube	LS
20	1	32998000	Johdin	Ledning	Wire	Leitung	
			(Kattovilkku	Roterande varn.ljus	Rotating warn. light	Drehwarnblinker	Left+Right)

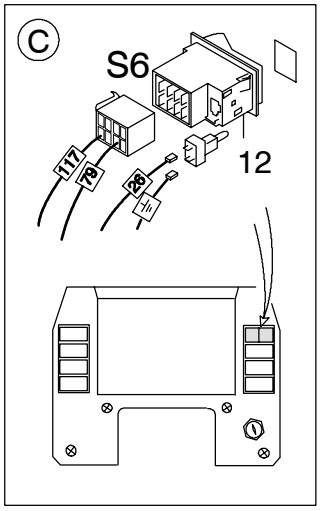
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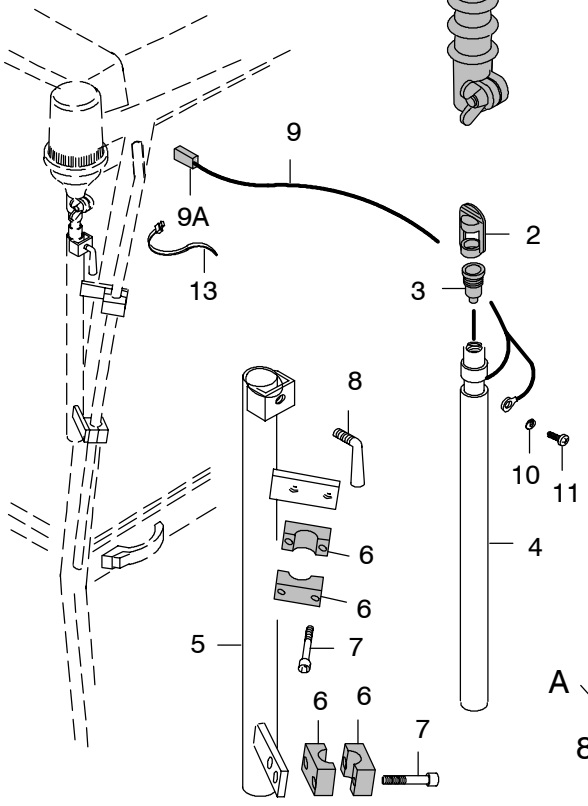




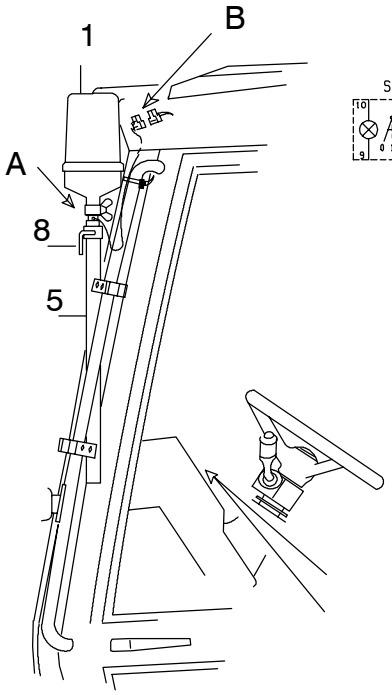


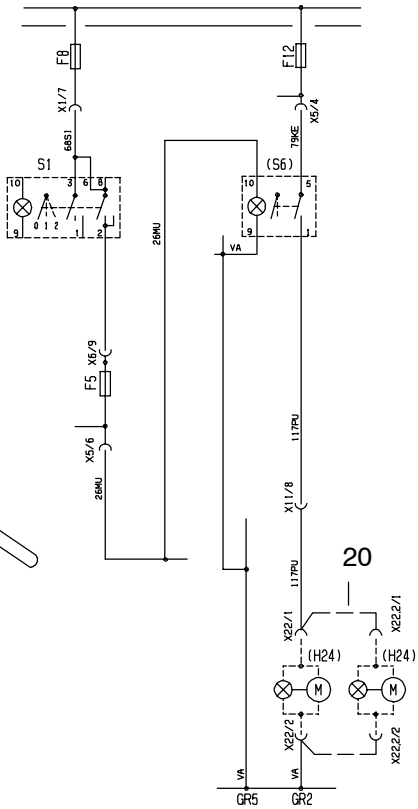




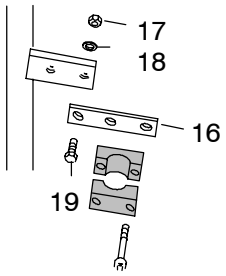


VA = Vit /White /Weiß
HA =Grå/Grey /Grau
KE = Gul/Yellow /Gelb
PU = Röd/Red /Rot
RU = Brun/Brown /Braun
MU = Svart/ Black /Schwarz





Malli / Model LS:





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Radio/cassette
(CLARION ARB–1370E) 32830540

Radio is fitted into the console in the roof (PT94–cabs: on the right side of the roof) and loudspeakers into the rear part of the cab roof (see pictures).

Fitting:

– The loudspeakers and the antenna and their wires must be fitted before fitting the radio.
Cabs to the end of the year 1993:
Remove knobs and switches from the roof panel and remove the panel (8 pcs cross–head screws).
PT94– cabs: remove with e.g a hack saw the shield for opening.

Loudspeakers (picture A, B, C):

– **Cabs to the end of the year 1993**: Cut holes in the roof lining in points for loudspeakers. Hole diameter is about 104 mm.
PT94– cabs: Remove the protective net.

– Draw loudspeaker wires between the roof lining and the outer roof plate using a suitable wire.

– Connect wires in a correct way, **–** and **+** wires to the correct pins and fasten the loudspeakers using screws and spring washers **8**.

Antenna (picture B):

– Unscrew two fixing screws of the front hinge of the RH side side window. Fit two washers **6** (If not fitted) and the antenna bracket **5** under the screws and retighten the screws.

– Fasten the antenna and pass the wire between the roof and the edge seal, cut the seal if needed (on later tractors there is a ready–made hole for the antenna wire). Slacken, if needed, the roof fixing screws.

Radio (picture C):

– **Cabs to the end of the year 1993**: Open the radio space on the panel plate and fasten the plate **2**.

– **PT94– cabs**: The mounting plate for the radio has been mounted in the factory.

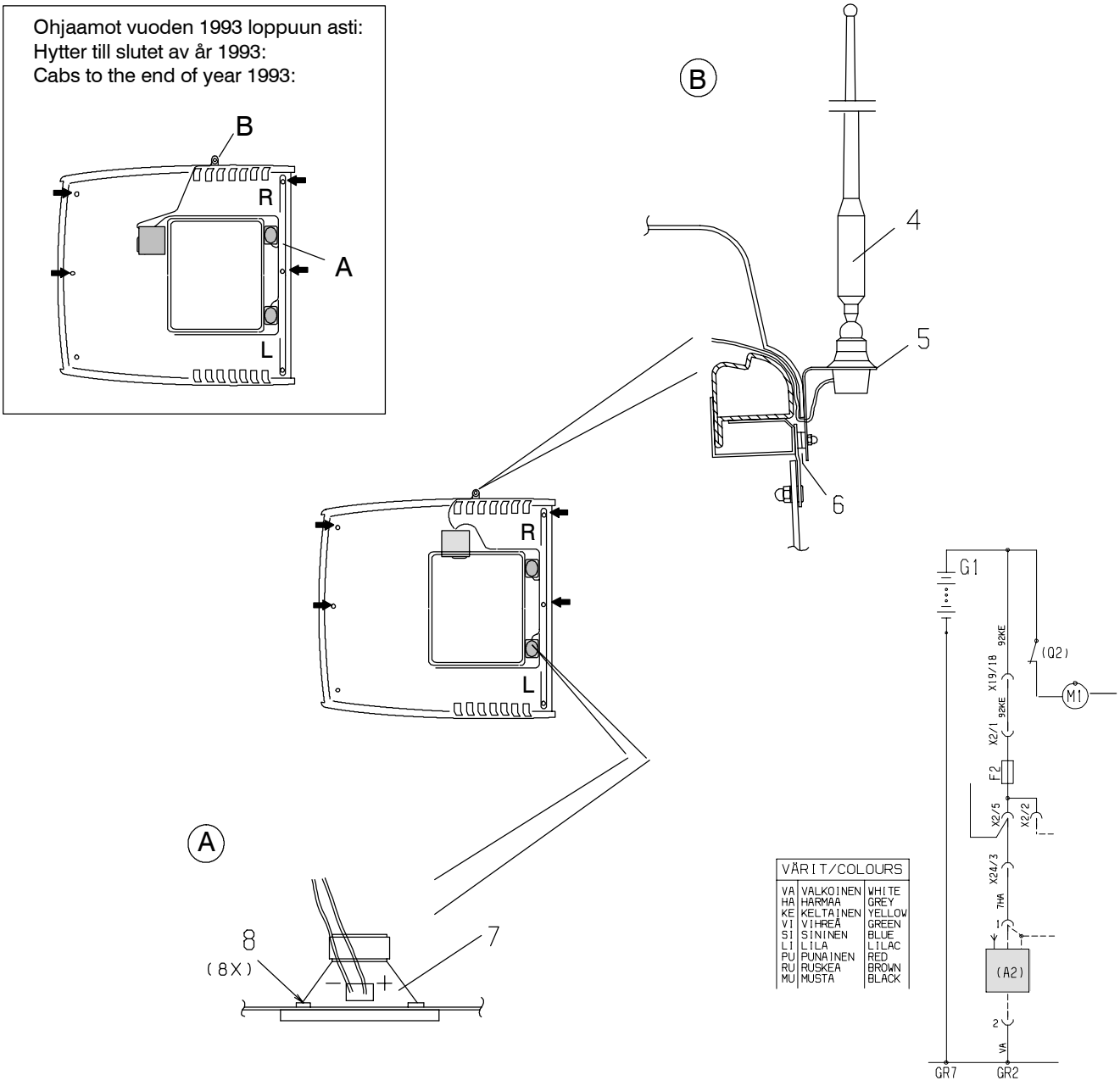
– Fit the bracket +radio into the housing according to the radio instruction book (note locking forks of the radio bracket).

– Connect radio supply and earth wires to the connector A2 in the RH side upper corner of the cab (connector exists in the cab wire loom).
Connect the loadspeaker and antenna wires and fasten the radio.

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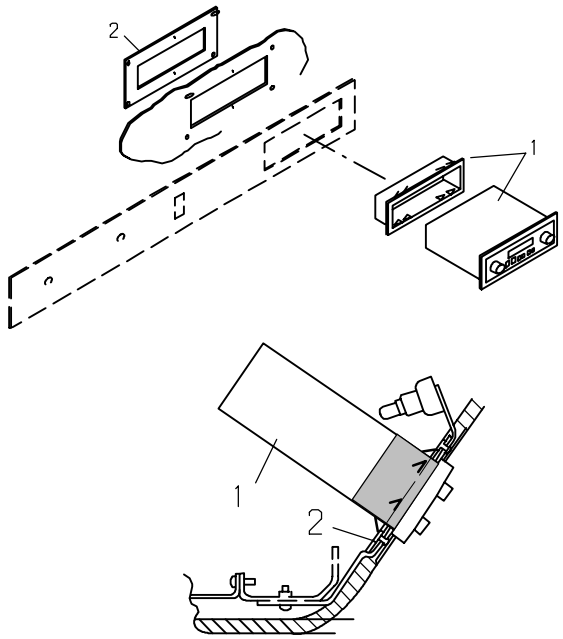
	1	**32830540**	**Radio**	**Radio**	**Radio**	**Radio**	**Radio/Cassette**
1	1	31955040	.Radio	Radio	Radio	Radio	CLARION ARB1370E
2	1	32603100	.Kiinnityslevy	Fästplatta	Mounting plate	Befestigungsplatte	:
4	1	30368100	.Antenni	Antenn	Antenna	Antenne	
5	1	32477800	.Jalusta	Stativ	Stand	Sockel	
6	2	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	
7	2	31680600	.Kaiutin	Högtalare	Loud speaker	Lautsprecher	
8	8	JC9003	.Mutteri	Mutter	Nut	Mutter	
15	1	32803100	.Adapteri	Adapter	Adapter	Adapter	
16	1	32803000	.Johdinsarja	ledningssats	Wiring set	Kabel	

: Ohjaamot vuoden 1993 loppuun asti
Hytter ända till slutet av år 1993
Cabs to the end of year 1993

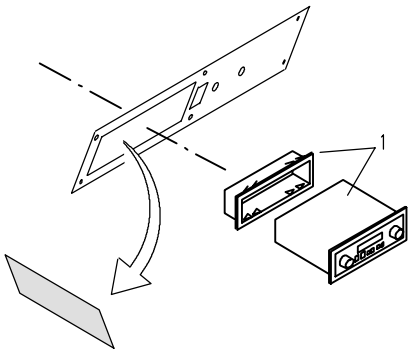


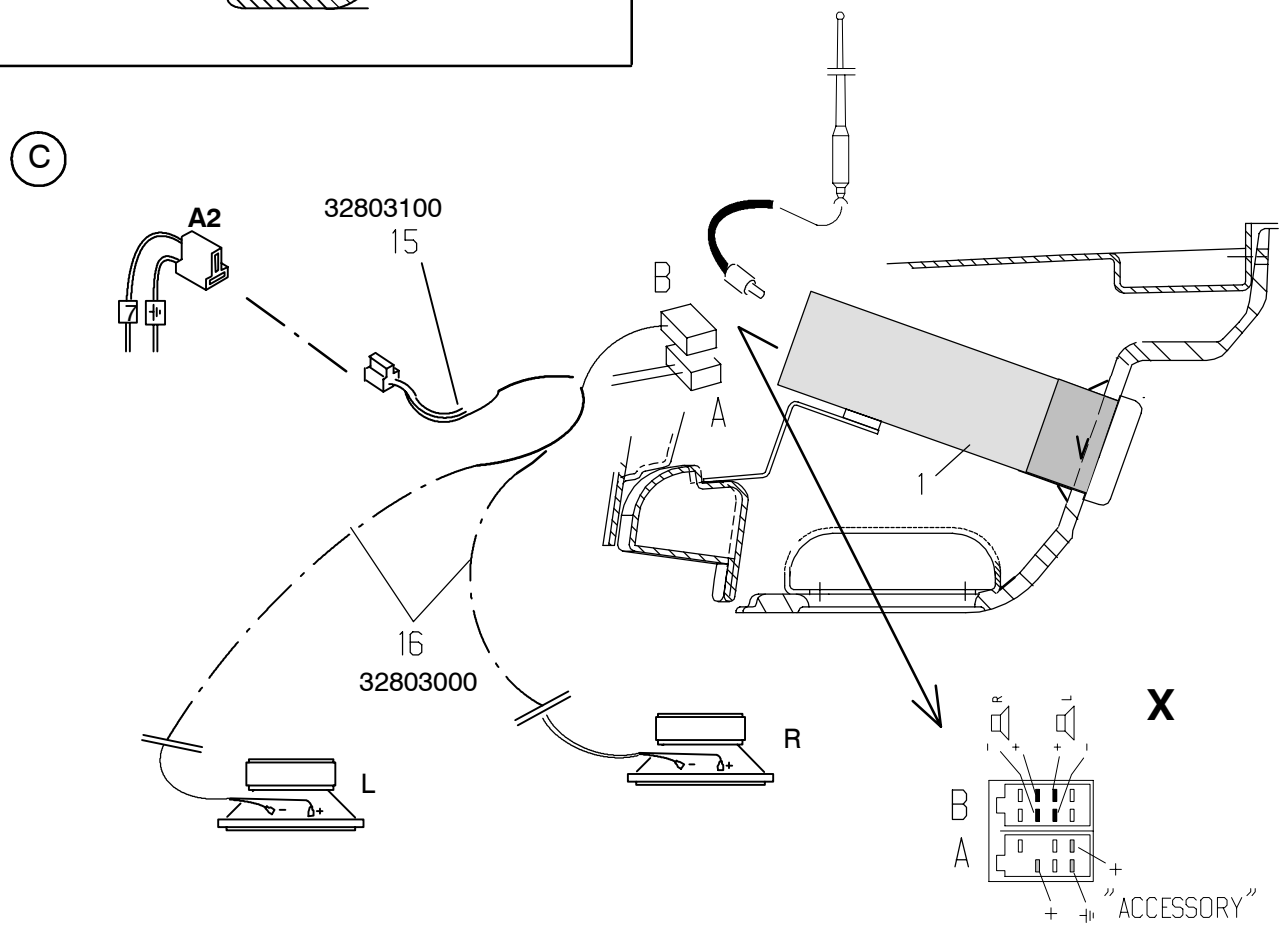
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Ohjaamot vuoden 1993 loppuun asti:
Hytter till slutet av år 1993:
Cabs to the end of the year 1993:



Asennus ja kytkentä valmistajan ohjeiden mukaan.
Ditsättning och koppling: se tillverkarens instruktioner.
Mounting and connection according to instructions of the manufacturer.





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Valmet Agrodata **31774600.**
Sensor for PTO revs **32775300**

Agrodata gives useful information when working on a field. Agrodata consists of an electronic unit and a sensor on the LH side rear wheel (picture A). There is a socket at the rear of the tractor to which can be connected sensors on an implement, e.g. flow meter or piece counter.

Agrodata measures the following units:

1.	Working time	**5**.	Liquid amount
2.	Area	**6**.	(Revs, PTO)*
3.	Speed	**7**.	Number of items
4.	Flow	**8**.	Distance travelled

*optional, see page 4/4.

Agrodata has been connected to the fuse F17 (permanent current).
Note! If arch welding is carried out on the tractor, disconnect the battery earth cable.

FITTING AGRODATA:

– Disconnect the battery earth lead. Open the lever console side panel and the switch panels at the upper part of the console.

– Cut a marked hole in the shorter switch panel for electronic unit **1**, and fasten the unit to the panel with screws **3** and a support plate **2**.

– Cut an opening in the longer panel for switch frame **16**. Fit the frame. Fasten rocker switches **5** and **4** to the upper holes. Fasten lens "RPM" on the upper switch and "Km/h" on the lower switch.

– Note that the panels change places, the short panel + eletronic unit comes foremost.
Connect wires **2**–**8** and **19** of the wire loom **18** to the electronic unit rear side according to picture B
Connect the wire loom connector S46 to the upper switch and S50 to the lower switch.

– Pass the wire loom other parts down to the lever console. Fasten the panels.

Valmet Agrodata **31774600.**
Zapfwellensensor **32775300**

Die Agrodata besteht aus einer elektronischen Einheit, einem Sensor am Hinterrad (Bild A) und, je nach Ausrüstung, einem Zapfwellendrehzahlgeber. Am Traktor befindet sich hinten eine Steckdose, an die am Gerät befingliche Geber, wie Durchflußmesser oder Zähler angeschlossen werden können.

Die Agrodata zeigt die folgenden Werte an:

1. Arbeitszeit		**5**. Flüssigkeitsmenge	
2. Fläche		**6**. Zapfwellendrehzahl*	
3. Geschwindigkeit		**7**. Stückzahl	
4. Durchfluß		**8**. Zurückgelegte Strecke	

*Zusatzausrüstung, siehe Seite 4/4.

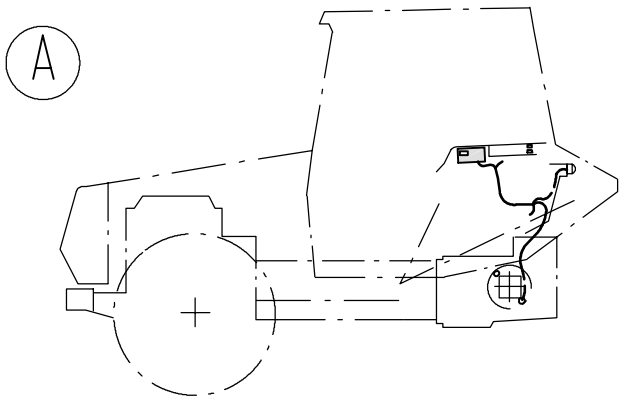
Die Agrodata wird an die Sicherung F17 (Dauerversorgung) angeschlossen.
Achtung! Bei Schweißarbeiten am Traktor das Minuskabel der Batterie abklemmen.

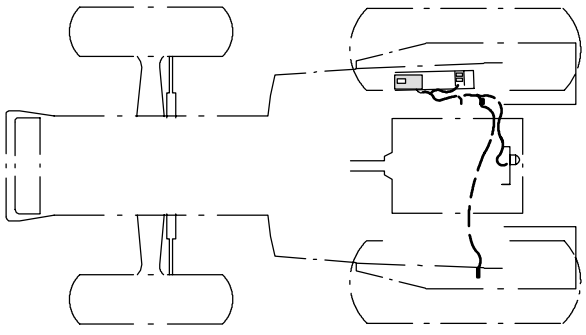
EINBAU DER AGRODATA:

– Minuskabel der Batterie abklemmen. Seitliche Abdeckung des Gangschaltunggehäuses und oberen Instrumentenbretter entfernen.

– Vorbereitete Öffnung für die Anzeigeeinheit **1** im kürzeren Instrumentenbrett ausschneiden und Einheit mit Schrauben **3** und Stützblech **2** befestigen.
– Vorbereitete Öffnung für die Halterung **16** der Schalter im längeren Instrumentenbrett ausschneiden. Halterung befestigen. Kippschalter 4 und 5 in die obersten Öffnungen links nach Abbildung einbauen. Schildchen "RPM" im oberen und " km/h" im unteren Schalter befestigen.

– Die Instrumentenbretter tauschen beim Wiedereinbau ihren Platz: das kürzere mit der Agrodataeinheit kommt nach vorn. Die Leitungen **2**–**8** und **19** des Kabelsatzes **18** der Agrodata nach Bild B anschließen. Kabelschuh S49 an den oberen und Kabelschuh S50 an den unteren Schalter anschließen.
– Übrige Kabel nach unten in das Ganghebelgehäuse ziehen und Abdeckungen befestigen.





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– Fasten the support iron **11** under the nut of the check link attachment (240 Nm) and change two opposite LH side rear wheel bolts into measuring bolts (**12**–**15**). Adjust distance between the magnet and the bolts to about **5** mm.
Note! The yellow dot on the magnet should be turned against the bolt. Use locking fluid Loctite 242 on the threads.

– Pass the sensor wire along the cab rear side structure. Slacken the cover in the lever console bottom and draw the sensor wire into the lever console.

– Connect in the console the sensor wire connector to the connector X54 of the wire loom **18** (see picture B).
Connect the wire loom earth cable shoe /4 under the earth nut (/4) in the lever console bottom.
Connect the wire loom connector X55 to the cab wire loom (rear floor) corresponding connector (wire nr 17, black).

– Draw the wire loom wires for the rear socket (7, X53) from the lever console (in the upper rear part of the consol there is a fastener for the wire loom) along the beam under the rear window. Remove the rubber plug on the beam and push the wires out through the hole.

– Change the trailer socket bracket into bracket **6**. Fasten the tractor's own socket into the middle hole of the bracket (do not disconnect the wires).

– Connect wires to the Agrodata socket **7** (X53, see page 3 (rear view of socket)). Fasten the socket onto the bracket **6**. Connect the battery cable.

– Read the Operator's Manual of Agrodata and input certain start values into the Agrodata. Check the function of the Agrodata (concerning possible malfunctions, see Service Manual). The wiring of implements has been shown in picture C.

–Befestigungsteil **11** an der Konsole des linken Seitenbegrenzers unter den Muttern der Befestigungsschelle befestigen und zwei gegenüberliegende Radbolzen gegen Meßbolzen (**12**–**15**) auswechseln Luftspalt auf ca. **5** mm einstellen.
Magnete so einbauen, daß die gelbe Kennzeichnung sichtbar ist. Sicherung der Schrauben mit Loctite 242.

– Kabel des Gebers im hinteren Teil der Kabine verlegen. Deckel auf dem Boden des Schaltgestängegehäuses entfernen und Kabel in das Gehäuse einziehen.

– Geberleitung an Kabelschuh X54 des Kabelsatzes **18** anschließen (Abb. B).
Erdungschuh /4 des Kabelsatzes an Erdungsschraube /4 am Boden des Schaltgestängegehäuse befestigen. Kabelschuh X55 an Anschluß des Kabelsatzes der Kabine (Kabel 17, schwartz) ansließen.

– Die zur Steckdose führenden (7, X53) Leitungen des Kabelsatzes aus dem Schaltgestängegehäuse herausführen (Kabelbefestigung im Gehäuse hinten–oben). Kabel entlang dem Balken unter der Heckscheibe führen, Gummidekkel im Balken entfernen und Kabel durchführen.

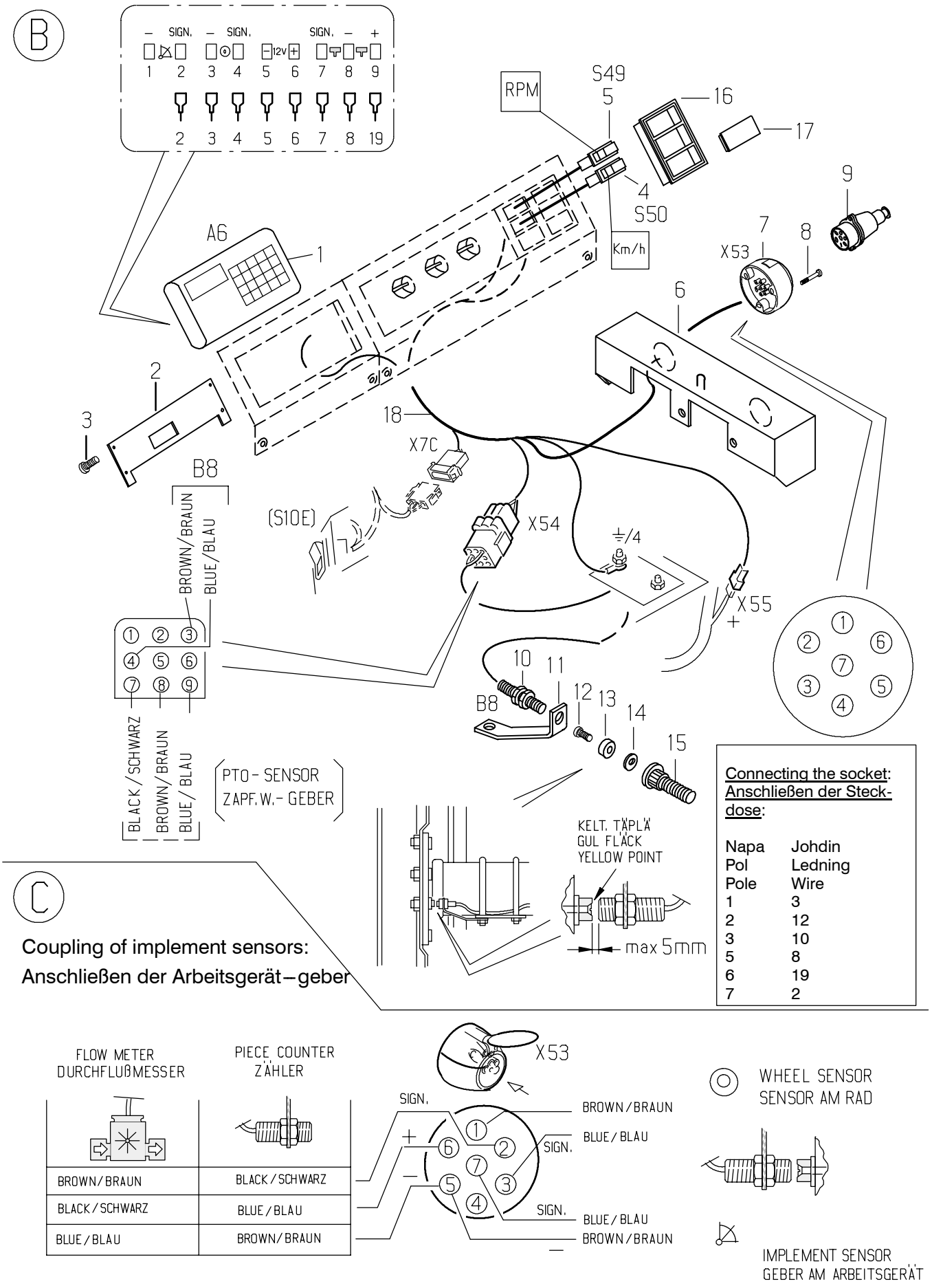
– Halter der Anhängersteckdose gegen Halter **6** austauschen. Anhängersteckdose in der mittleren Öffnung ohne Abklemmen der Kabel befestigen.

– Zur Agrodata– Steckdose **7** (X53) kommende Kabel an die betreffenden Anschlüsse nach Abbildung anschließen (Ansicht der Steckdose von hinten). Steckdose an Halter **6** befestigen. Batterie anschließen.

– Bedienungsanleitung des Traktors durchsehen, Grunddaten eingeben und Funktion prüfen (bei Störungen Werkstattshandbuch hinzusiehen). Verkabelung der Geber der Arbeitsgeräte nach Abbildung C.

	1	31774600	Agrodata	Agrodata	Agrodata	Agrodata	
1	1	31702600	.Näyttölaite	Teckenförster	Display unit	Bildschirm	
2	1	32552100	.Tukilevy	Stödskiva	Support plate	Stützplatte	
3	6	HN9031	.Ruuvi	Skruv	Screw	Schraube	
4	1	31682100	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
	1	31707900	.Linssi	Lins	Lens	Linse	Km/h
5	1	31682100	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
	1	31707800	.Linssi	Lins	Lens	Linse	RPM
6	1	32236700	.Kannatin	Hållare	Support	Halter	
7	1	31720300	.Pistorasia	Stickdosa	Plug socket	Steckdose	
8	3	HD9042	.Ruuvi	Skruv	Screw	Schraube	
9	1	31702900	.Pistoke	Stickkontakt	Contact plug	Steckkontakt	
10	1	31703200	.Anturi	Givare	Sensor	Geber	
11	1	31703300	.Kannatin	Hållare	Support	Halter	
12	2	HE6958	.Ruuvi	Skruv	Screw	Schraube	
13	2	31720500	.Magneetti	Magnet	Magnet	Magnet	
14	2	31720600	.Aluslaatta	Bricka	Washer	Scheibe	
15	2	32249200	.Ruuvi	Skruv	Screw	Schraube	
16	1	30944400	.Paneeli	Panel	Panel	Paneel	
17	1	30944500	.Peitelevy	Täckplatta	Covering plate	Deckplatte	
18	1	32213500	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	

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Connecting the socket:
Anschließen der Steckdose:

Napa Pol Pole	Johdin Ledning Wire
1	3
2	12
3	10
5	8
6	19
7	2

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Sensor for PTO revs 32775300

– This sensor is used as an optional equipment for Agrodata. Then the switch S49 (see picture B) selects PTO revs display or revs on an implement (if the implement has a revolution speed sensor).

– After fitting the sensor it must remain a free radial space of 62 mm measured from the end of the PTO shaft. (SFS–4572 standard: R 83 mm). That is why all transmission shafts cannot be used together with the PTO speed sensor.

FITTING:

– Fasten the magnet **6** at the base of the PTO shaft (ø 35mm type) (fixing screw on magnet).

– Fasten the wire loom to the fastener with plastic tie **5**.
Fasten the fastener **4** to the threaded hole at the rear side of the PTO housing (remove the protective plug). Fit between the fastener and housing two washers. Direct the fastener towards the shaft center point and tighten the screw.

– Fit the sensor **3** so that the distance between the sensor and the magnet becomes 3–4 mm. Pass the wire through the cab rear side lead–in point and connect wires to connector X54 poles 7, 8 and 9, see picture B.

Zapfwellendrehzahlgeber . . . 32775300

– Dieser Geber ist eine Zusatzausrüstung der Agrodata. Man kann dabei durch Betätigung des Schalters S49 (Abb. B) entweder die Zapfwellendrehzahl oder die Drehzahl des Arbeitsgerätes anzeigen (wenn dieses mit einem Drehzahlgeber ausgestattet ist)

– Nach Montage des Drehzahlgebers hat der Freiraum um das Ende der Zapfwelle einen Radius von 62 mm (SFS–4572 Standard: 83 mm).
Aus diesem Grunde können bei eingebautem Drehlzahlgeber nicht alle Gelenkwellentypen verwendet werden.

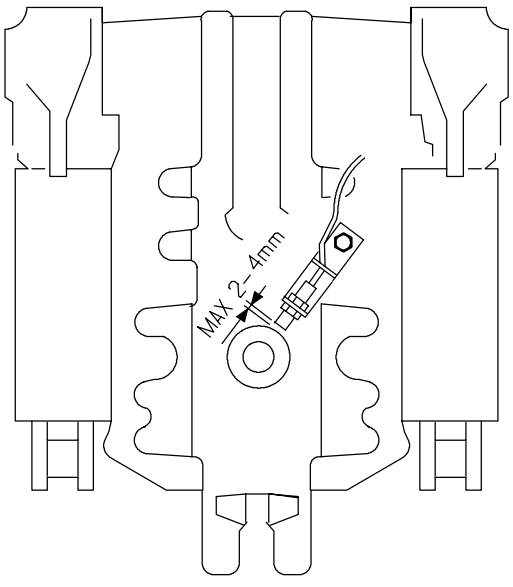
– EINBAU:

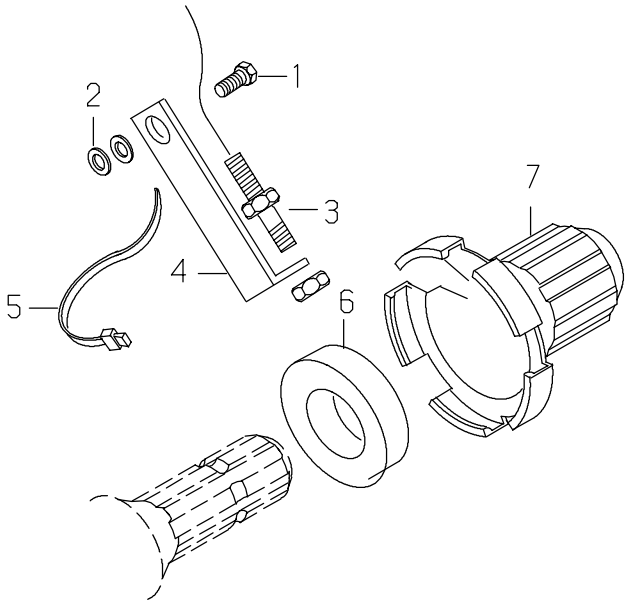
– Magnet 6 auf Zapfwelle montieren (paßt nur für 35 mm– Zapfwelle). Befestigungsschraube im Magneten.

– Kabel 5 am Geberhalter 4 befestigen. Halter 4 mit Schraube 1 und zwei untergelegten Scheiben 2 am Zapfwellengehäuse befestigen. Halter zur Wellenmitte ausrichten und Schraube anziehen.

– Geber 3 einbauen und Luftspalt auf 3–4 mm einstellen. Kabel durch Durchführung im hinteren Teil der Kabine ziehen und an Naben 7,8 und 9 der Verbindung X54 (Abb. B) anschlißen.

1	1	HA6356	Ruuvi	Skruv	Screw	Schraube
2	1	JD0416	Aluslaatta	Bricka	Washer	Scheibe
3	1	31703000	.Anturi	Givare	Sensor	Geber
4	1	32775200	Kannatin	Hållare	Support	Halter
5	2	SA1900	Side	Band	Band	Band
6	1	32775100	Magneetti	Magnet	Magnet	Magnet
7	1	32775400	Suojakuppi	Skyddskopp	Shield cup	Schutz





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Main current switch (battery crosswise[x]) **. 32599000**
M. current sw., LH (battery lengthwise[xx]) **. 32599010**
M. current switch, RH (4–cyl, 6200–6800, 6250Hi–6850Hi) **..... 32599020**
M. current switch RH (G24514–>,6–cyl) **33348700**

[x]) 6800: –F03311, 50–series:–F10105, 6000–8400: –F17108, xx) : –G24513

With aid of the main switch, current to all tractor can be switched off (except the fuse F2–> radio, speedometer) e.g. when you leave the tractor. This prevents possible fire risk caused by short circuits in the electic system.
The switch lever can be removed, if needed.

FITTING:

– Remove the engine hood side plates. Disconnect the battery earth lead.

– **32599000**: Fit the fastener **2** to the holes on the battery holder (drill holes if needed). Fasten the main current switch **6** (note the nut caps **8**).

– Disconnect the starter motor +lead and push protective tube **1** onto the cable. Connect the lead to the main switch. Connect the lead **5** to the starter motor and to the main switch. Check that the leads do not rub the other tractor parts. Connect the battery earth lead.

– Drill a ø 37 mm hole through the side plate (see fig.), if not made earlier. Paint the hole edges. Fasten the switch lever strap **9** under the nut of the side plate attachment. Fasten the sticker **7** (see fig.).

– **32599010**: Fit the fastener **2A** to the holes on the battery holder. Fasten the main current switch **6**.

– Disconnect the starter motor +lead and connect the lead to the main switch. Connect the lead **5** to the starter motor and to the main switch. Check that the leads do not rub the other tractor parts. Connect the battery earth lead.

– Drill a ø 37 mm hole through the side plate (see fig.), if not made earlier. Paint the hole edges. Fasten the switch lever strap **9** under the nut of the side plate attachment (6–cyl. + visco: drill a hole ∅ 7mm) Fasten the sticker **7** (see fig.).

– **32599020**: Fit the fastener **2** under the engine fastening screws (tightening torque 90Nm, M10). Fasten the main current switch **7** (+ strap **9**).

– Disconnect the starter motor +lead and connect the lead to the main switch. Connect the lead **6** to the starter motor and to the main switch. Check that the leads do not rub the other tractor parts. Connect the battery earth lead.

– Fasten the sticker **5** (see fig.).

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– **33348700**: Fit the fastener **2C** to the holes on the side plate holder. Fasten the main current switch **7** (+ strap **9**).

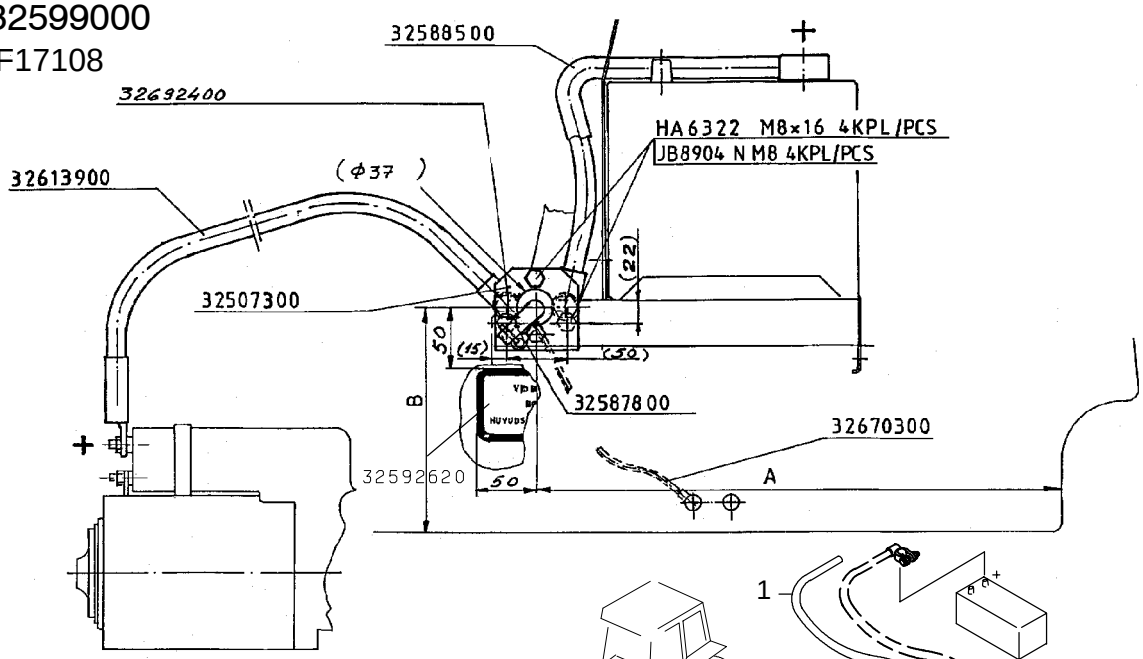
– Disconnect the starter motor +lead and connect the lead to the main switch.
Connect the lead **6** to the starter motor and to the main switch. Check that the leads do not rub the other tractor parts. Connect the battery earth lead.

– Fasten the sticker **5** to the lower side plate (see fig.).

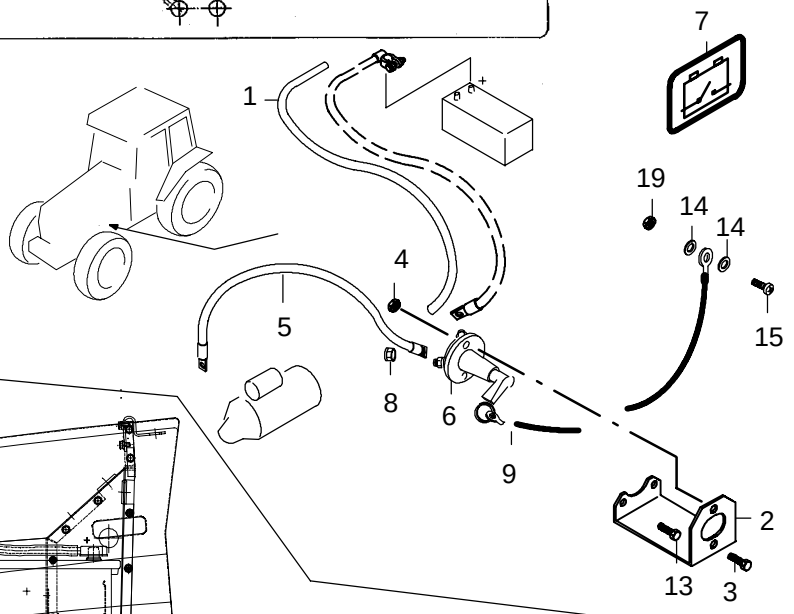
	1	**32599000**	Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	– F17108 6000–8750
1	1	32588500	.Suojus	Skydd	Shield	Schutz	Protection	
2	1	32507300	.Teline	Konsol	Bracket	Gestell	Support	–F17108
3	4	HA6322	.Ruuvi	Skruv	Screw	Schraube	Vis	
4	4	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
5	1	32613900	.Johdin	Ledning	Wire	Leitung	Fil électrique	L=850
6	1	32587800	.Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	
7	1	32592620	.Tarra	Dekal	Sticker	Aufkleber	Autocollant	
8	2	32692400	.Suoja	Skydd	Cover	Schutz	Couvercle	
9	1	32670300	.Hihna	Rem	Belt	Riemen	Courroie	
15	1	HD9030	.Ruuvi	Skruv	Screw	Schraube	Vis	
	1	**32599010**	Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	F17109–G24513
2A	1	33165700	.Teline	Konsol	Bracket	Gestell	Support	F17109–
3	2	HA6323	.Ruuvi	Skruv	Screw	Schraube	Vis	
3A	2	HA6322	.Ruuvi	Skruv	Screw	Schraube	Vis	
5	1	32613900	.Johdin	Ledning	Wire	Leitung	Fil électrique	L=850
6	1	32587800	.Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	
7	1	32592620	.Tarra	Dekal	Sticker	Aufkleber	Autocollant	
8	2	32692400	.Suoja	Skydd	Cover	Schutz	Couvercle	
9	1	32670300	.Hihna	Rem	Belt	Riemen	Courroie	
11	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
12	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
14	2	JD0406	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	Visco
15	1	HD9030	.Ruuvi	Skruv	Screw	Schraube	Vis	Visco
16	1	30234000	.Läpiv.rengas	Genomf.ring	Inlet ring	Durchf.sring	Anneau d'entrée	
19	1	JB8903	.Mutteri	Mutter	Nut	Mutter	Ecrou	Visco
	1	**32599020**	Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	6000-6800, 4-cyl. 6250Hi–6850Hi
2B	1	33337100	.Teline	Konsol	Bracket	Gestell	Support	6200–6800
5	1	32592620	.Tarra	Dekal	Sticker	Aufkleber	Autocollant	
6	1	33337600	.Kaapeli	Kabel	Cable	Kabel	Câble	L=310
7	1	32587800	.Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	
9	1	32670300	.Hihna	Rem	Belt	Riemen	Courroie	
10	2	JD0406	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
12	2	HA6313	.Ruuvi	Skruv	Screw	Schraube	Vis	
	1	**33348700**	Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	6900-8750, G24514– 8050Hi–8950Hi
2C	1	33346400	.Pidin	Klämma	Clamp	Klammer	Agrafe	6900–8750
3	4	HA6322	.Ruuvi	Skruv	Screw	Schraube	Vis	
4	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
5	1	32592620	.Tarra	Dekal	Sticker	Aufkleber	Autocollant	
6	1	33337600	.Kaapeli	Kabel	Cable	Kabel	Câble	L=310
7	1	32587800	.Päävirtakytkin	H.strömbrytare	Main switch	H.stromschalter	Interr. principal	
9	1	32670300	.Hihna	Rem	Belt	Riemen	Courroie	
10	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
12	2	HA6313	.Ruuvi	Skruv	Screw	Schraube	Vis	

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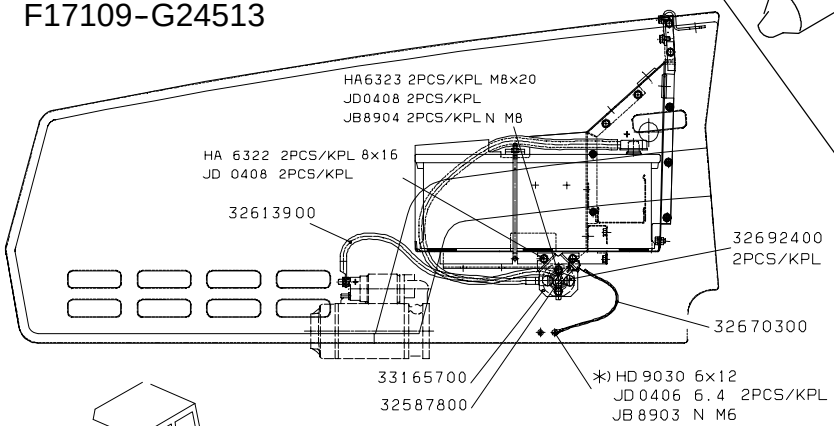
32599000
-F17108

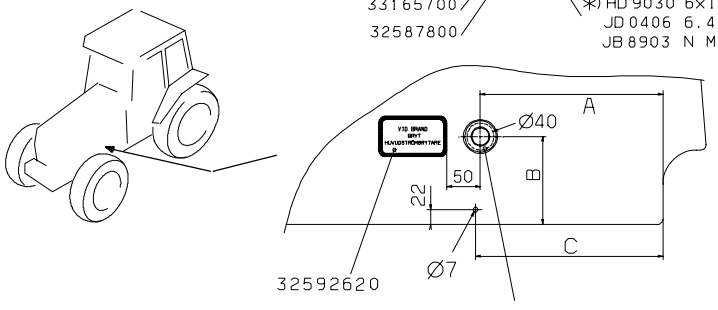


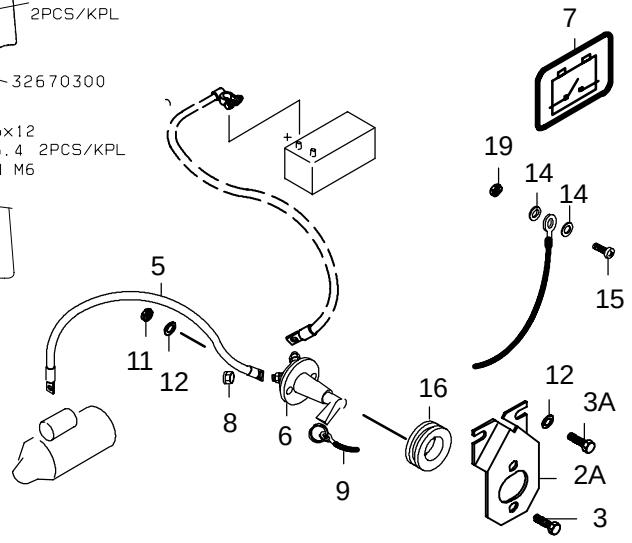
	A	B
6100	442	190
6400	442	190
8100	442	170



32599010
F17109-G24513

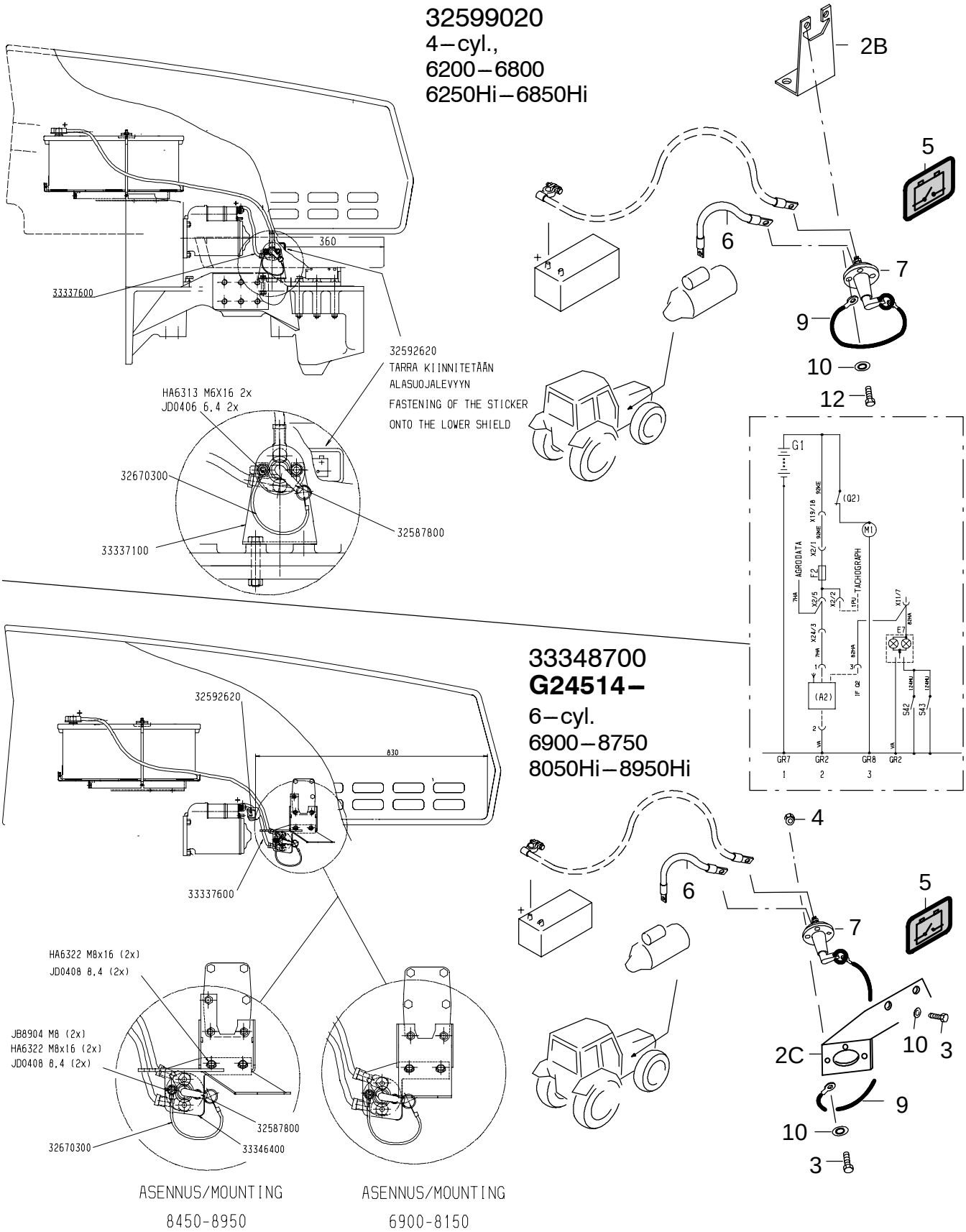






ARTICLE TUOTE	A	B	C
4-CYL.	268	130	-
6-CYL.	268	110	-
6-CYL. *)-VISCO	268	95	275

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Cigarette lighter and ash tray 32569000

The cigarette lighter is supplied with permanent current via fuse F29. When the parking lights are switched on, also the cigarette lighter has an illumination.

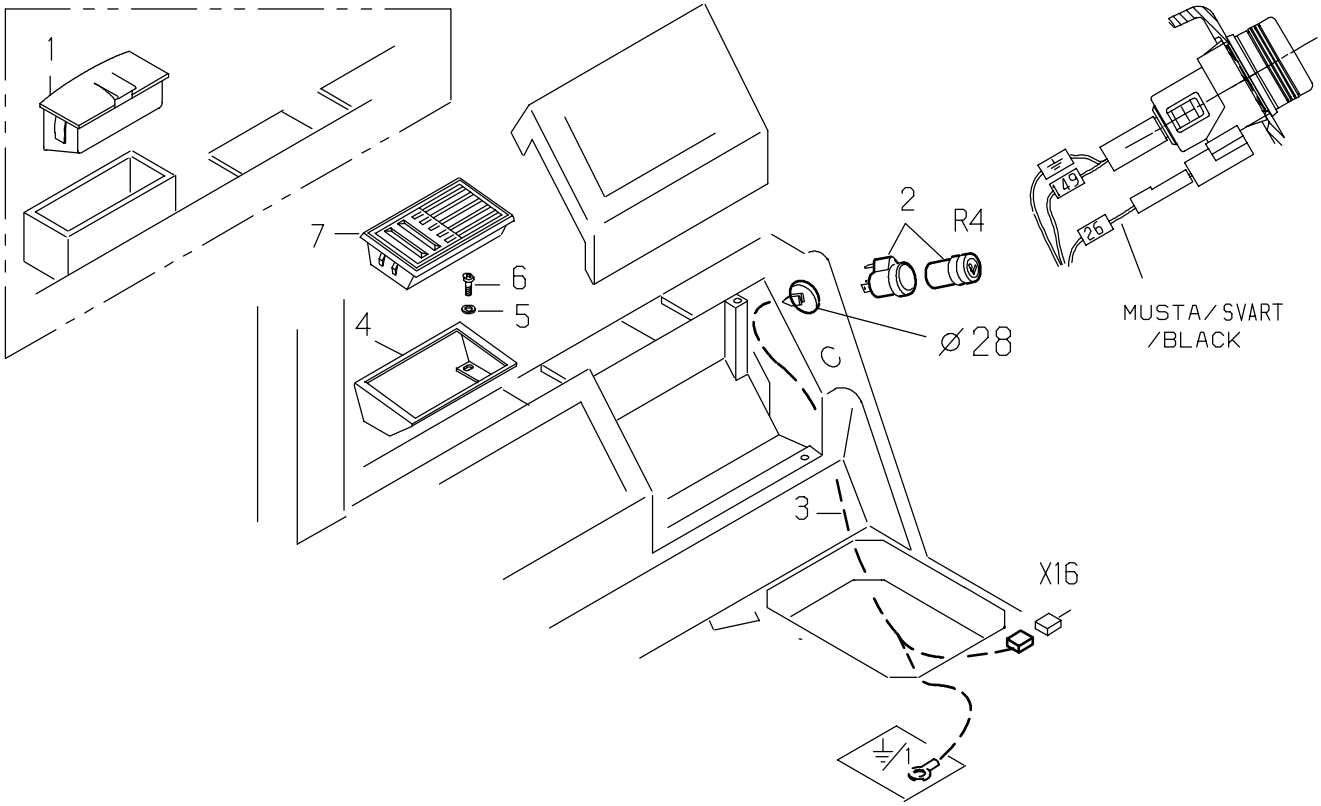
FITTING:

Ash tray **1** is fitted either on the sump on the side panel (if any) or ash tray **7** is fastened with screws on the side panel (see picture).

Fit the cigarette lighter **2** onto the upper hole in the side panel rear part:

– Disconnect the battery earth cable. Remove the lever console side wall and the rearmost cover plate on the side panel. Drill a ø 28 hole at the upper marking ring.

– Pass the wiring loom connector R4 out of the drilled hole and push rest of wires into the lever console. Connect the connector to the lighter (see picture) and fasten the lighter (fit first the lighter outer ring and after that the lighter).
Connect the earth cable shoe under the screw for the wire lead – in hole in the lever console bottom.
Connect connector X16 to the corresponding connector in the cab wiring loom.
Reassemble the tractor and check the function of the cigarette lighter.



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	1	32569000	Tup.syt+tuhkak.	Tändare + askkopp	Lighter + ash tray	Zünder+ asher
2	1	32595300	.Tupakansytytin	Tändare	Lighter	Zünder
3	1	32615700	.Johdin	Ledning	Wire	Leitung
4	1	32746300	.Teline	Konsol	Bracket	Gestell
5	2	JD0406	.Aluslevy	Bricka	Washer	Scheibe
6	2	HD9030	.Ruuvi	Skruv	Screw	Schraube
7	1	32746600	.Tuhkakuppi	Askkopp	Ashtray	Ascher
(1	1	32595400	Tuhkakuppi	Askkopp	Ashtray	Ascher)

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Implement control system . . . . . 32669500.

– With this system it is possible to use the electric operational devices of the implements directly from the tractor cab (Standard SFS 5673).

The operational devices that are controlled by the system are most often spindle motors or magnetic valves. The system can be adapted to different chop forage harvesters, plant protection sprayers, snow slings, fertilizer spreaders, balers etc.

The system consists of (fig. 2):

A) Control unit in the tractor cab.

B) Wiring set for the control currents, 9–pole contact box inside the cab, and 7–pole implement contact box on the cab rear wall.

– The control unit is individual for each implement, and when connecting a new implement to the rear contact box it is most often also necessary to take a new control unit. The control functions transmitted over the poles 1 to 7 of the implement control box depend on the control unit (the figure 2 shows the outputs of the currents of control unit 32264000 for various control knob positions).
The control unit 32264000 contains 2 pieces of 3–position rocker switches (32276400) and one 2–position (on/off) switch (30944200).

In the place of the last–mentioned, also a 3–position switch can easily be mounted (when mounting the switch, the connection X3T is disconnected and wires 3 and 2 are connected to the pole of the switch, fig. 2).
The control unit has also place reservations for two additional switches.

– The cab contact box (AMP 1–480672–0): The current comes to pole 1 of the contact box through relay K1T controlled by the ignition switch (a 15 A fuse in connection of the relay). Pole No. 3 is grounded.

– Implement contact box X3T (ISO 3732) is similar to trailer light contact box, except that its centre pole is different, to avoid contacting errors.

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FITTING:

– Disconnect the battery earth cable. Remove the lever console side panel.

– Drill holes ø 9 mm (2 pcs) in the RH side side pillar, see picture. Fasten support **2**, housing **13** and control unit **1**.

– Holder **5** is fitted on the driver's right in the rear wall of the cavity on the lever console.
Fit the holder into place and mark places for the fixing holes (2 pcs). Drill holes ø 3 mm.
Make a 35 x 35 m hole in the middle of the holes for lead–in of the wires.

– Push the wiring loom **11** connector "X1T" under the lever console and further through the holder **5** so that the connector is locked in place. Fasten the holder **5** onto the panel.
Connect the cable from the control unit to the connector.

– Detach the socket support in the rear of the tractor. Move the socket to a new support **7** (do not disconnect the wires).

– Pass wires to the implement socket **8** ("X3T") inside the beam below the rear window. Pass the wires out of the LH side lead–in hole.

– Fasten the socket **8** onto the bracket **7** at the LH side fastening point.
Connect wires to the socket, see picture. Fasten the bracket into place.

– Connect the wiring loom **11** connector equipped with an earth shoe under the earth screw in lever console bottom (driver' seat side) (lead–in hole cover fixing screw).

– Draw the wiring loom **11** front end together with other wires along the lever console edge and further along the cable channel under the floor mat into the steering wheel console.
Fasten the wire with a clip to the main wiring loom.

– Remove the interval wiper K9 holder fixing screw and fasten inplace a holder of relay **12** ("K1T") in the wiring loom.
Connect the interval wiper holder to the relay **12** holder. Push the relays into the holders.

On the latest models the relay "K1T" is fastened in the LH side lower edge of the electric centre protective plastic. There is a fixing screw fitted.

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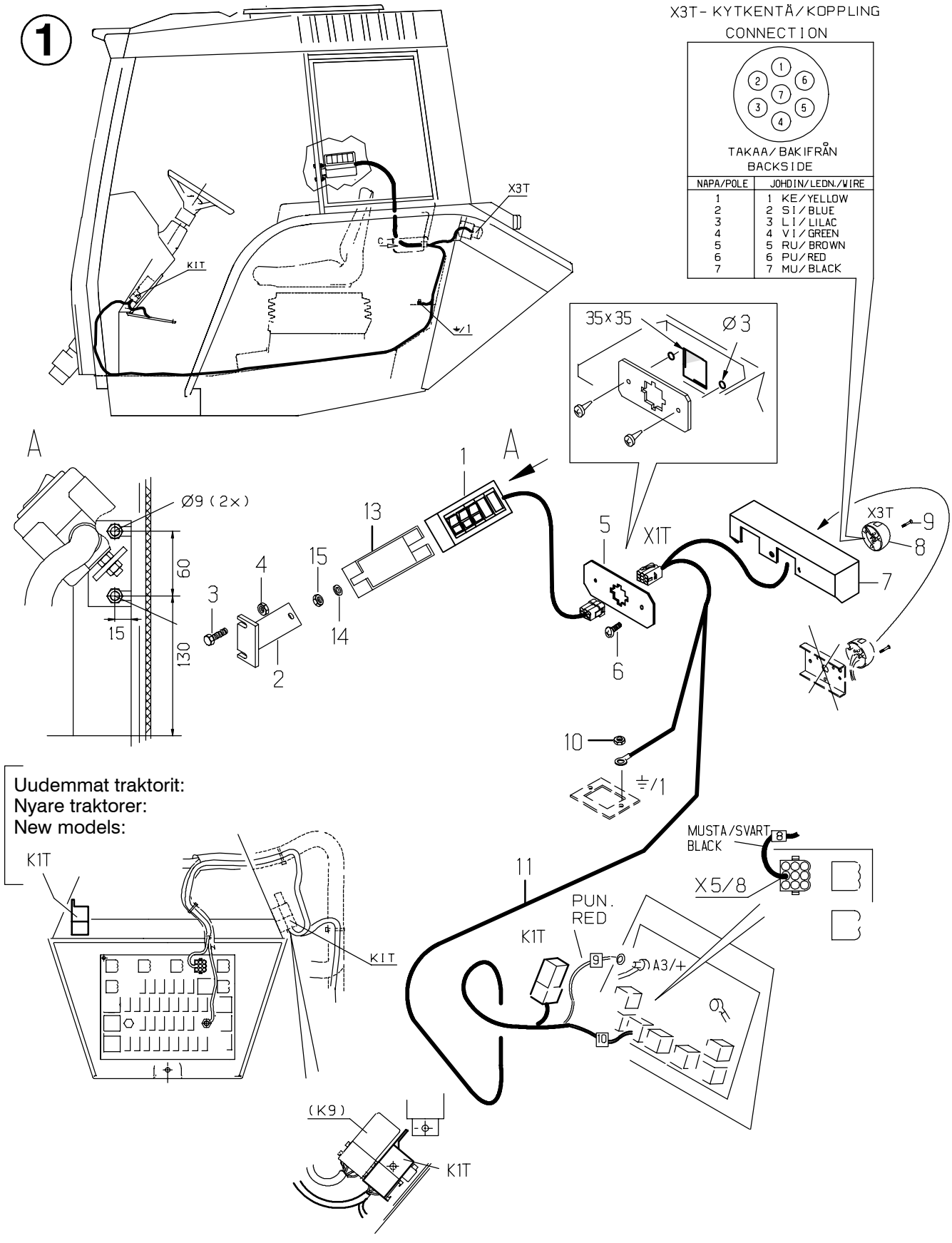
– Connect the wire no 10 (black) to the electric centre connector X5 pin 8.

Connect the wire no 9 which has a cable shoe under the nut of the electric centre supply wire.

– Connect the battery earth cable and check the function of the unit.

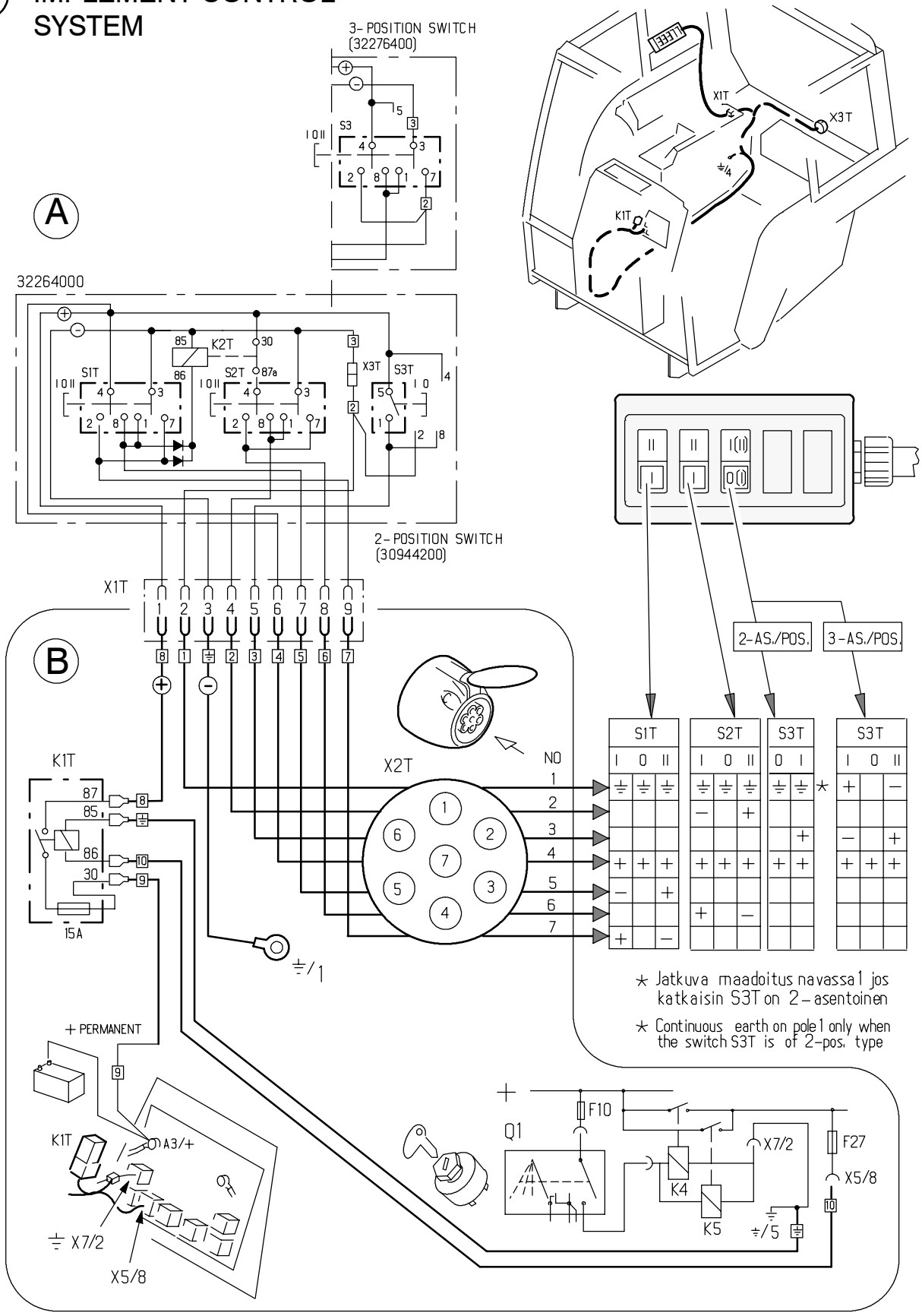
	1	**32669500**	Työkoneohjaus	Kontrollenh. redskap	Implement control	Arbeitg.steuerung
1	1	32264000	.Ohjausyksikkö	Kontrollenhet	Control unit	Steuereinheit
2	1	32669400	.Kannatin	Hållare	Support	Halter
3	2	HA8326	.Ruuvi	Skruv	Screw	Schraube
4	2	JB8904	.Mutteri	Mutter	Nut	Mutter
5	1	32213400	.Pidin	Klämma	Clamp	Klammer
6	2	HN6612	.Ruuvi	Skruv	Screw	Schraube
7	1	32236700	.Kannatin	Hållare	Support	Halter
8	1	31720300	.Pistorasia	Stickdosa	Plug socket	Steckdose
9	3	HD9042	.Ruuvi	Skruv	Screw	Schraube
10	1	JB8904	.Mutteri	Mutter	Nut	Mutter
11	1	32669600	.Johdin	Ledning	Wire	Leitung
12	1	32249300	.Rele	Relä	Relay	Relais
13	1	32080200	.Kotelo	Hus	Housing	Gehäuse
14	1	JD0408	.Aluslaatta	Bricka	Washer	Scheibe
15	1	JB8904	.Mutteri	Mutter	Nut	Mutter

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2 IMPLEMENT CONTROL SYSTEM



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Implement control system . . . . . 32669500.

– With this system it is possible to use the electric operational devices of the implements directly from the tractor cab (Standard SFS 5673).

The operational devices that are controlled by the system are most often spindle motors or magnetic valves. The system can be adapted to different chop forage harvesters, plant protection sprayers, snow slings, fertilizer spreaders, balers etc.

The system consists of (fig. 2):

A) Control unit in the tractor cab.

B) Wiring set for the control currents, 9–pole contact box inside the cab, and 7–pole implement contact box on the cab rear wall.

– The control unit is individual for each implement, and when connecting a new implement to the rear contact box it is most often also necessary to take a new control unit. The control functions transmitted over the poles 1 to 7 of the implement control box depend on the control unit (the figure 2 shows the outputs of the currents of control unit 32264000 for various control knob positions).
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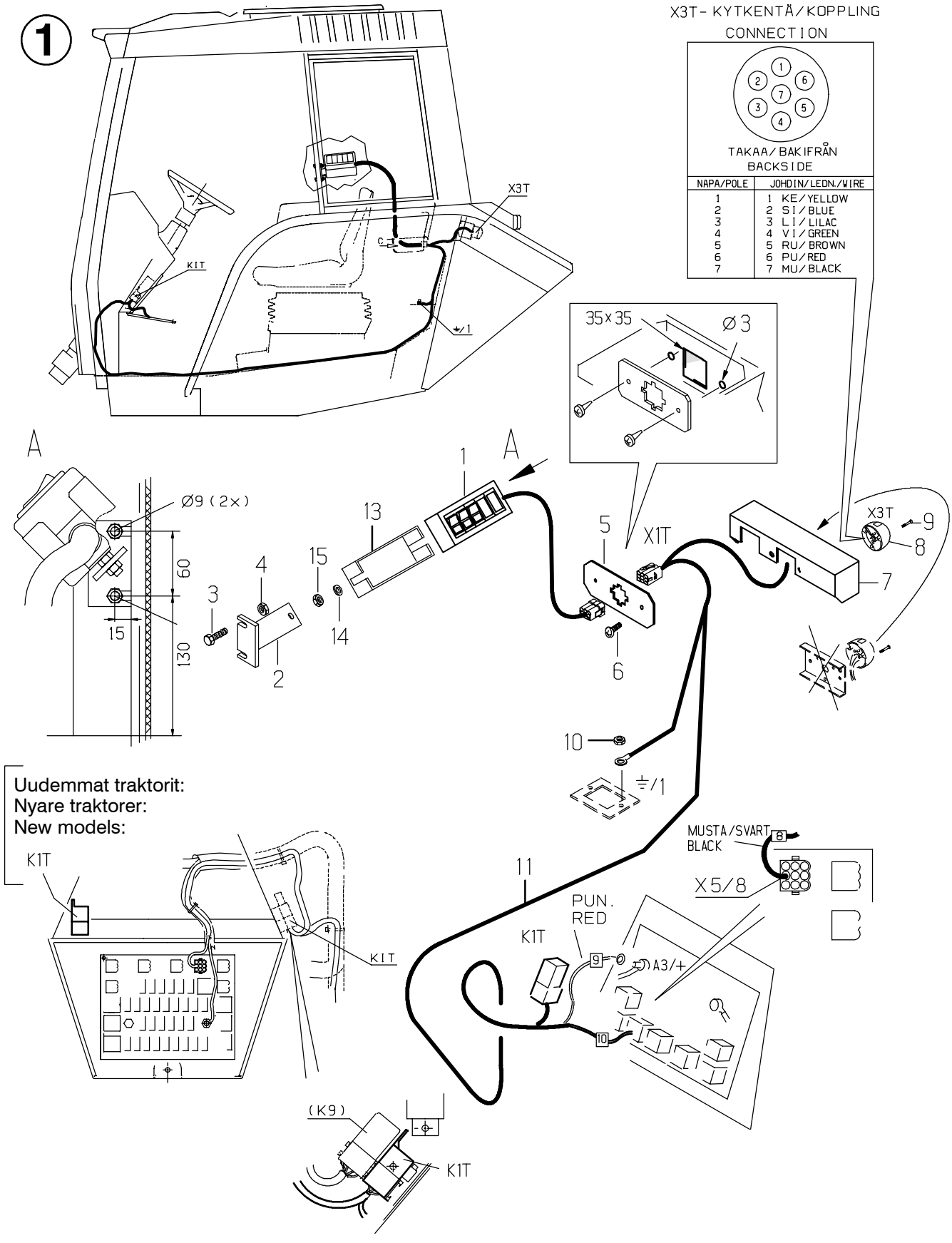
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Connect the wire no 9 which has a cable shoe under the nut of the electric centre supply wire.

– Connect the battery earth cable and check the function of the unit.

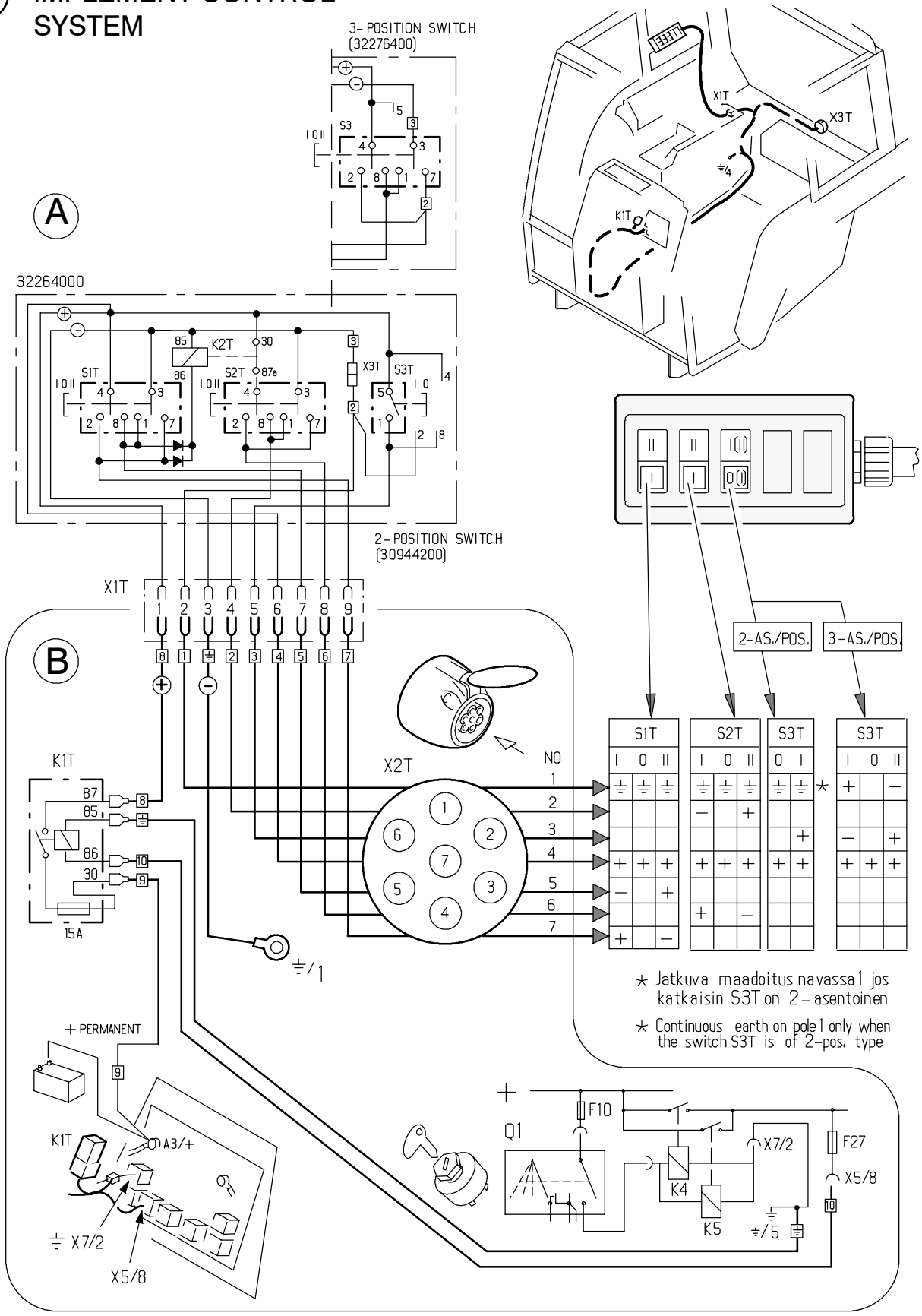
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2 IMPLEMENT CONTROL SYSTEM



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40. Power transmission

41. Clutch
Turbine clutch
HiShift

42. Gearbox

44. Quick−shift gear, DPS
Reverse shuttle
4WD clutch

45. Final drives

46. Power take−off

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6. HiShift 12

Technical data

Single dry–disc clutch of cup spring type, mechanically operated. The clutch assembly is the same on all 6000–8400 tractors. On the tractors with Hi–Trol, the clutch disc has no vibration damping springs.

Manufacturer	F&S
Clutch disc diameter	330 mm
Clutch disc diameter, latest 8200–8400 (transmission 460) and 8050–8750	350 mm
Linings on 6000–8100	organic (asbestos–free)
Linings on earlier 8400	ceramic (asbestos–free)
Linings on latest 8200–8400 (transmission 460) and 8050–8750 (ø 350)	organic (asbestos–free)
Releasing force	max. 2950 N
Clutch pressure against flywheel	about 11200 N

Tightening torques

Clutch–flywheel	23 Nm
Pump shaft drive flange–flywheel	46 Nm
Release bearing tube guide sleeve–fuel tank, –659477	46 Nm
Engine–fuel tank	80 Nm
Flange joint, propeller shaft	35 Nm

Adjustments

Clutch pedal free travel, –659477	20–25 mm
Clutch pedal free travel with cable type release mechanism, 659478–	15–20 mm
Clutch lever travel (at wing nut), –659477	10–15 mm
Distance, wing nut–adjuster stop (new disc), –659477	50–55 mm
Distance between cable nut and cab front wall with pedal travel 15–20 mm, 659478–	3 mm

With cable type release mechanism, the release lever bolt is tightened first fully home and then it is unscrewed:
– 3/4 a turn, –662263
– 1/4 a turn, 662264–.

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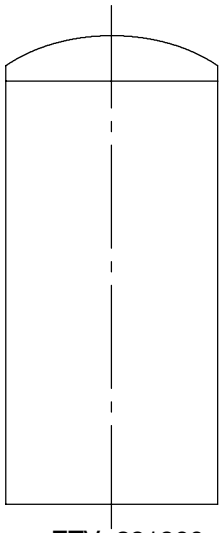
Special tools

A

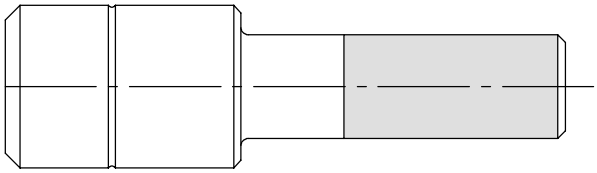
Part no	Description
ETV 891900	Sleeve for fitting clutch release bearing (Clutch 505–905)
ETV 892380	Sleeve for removing clutch release bearing (Clutch 505–905)
ETV 893790	Centring tool for clutch disc (Clutch 505–905)

Locally prepared tools

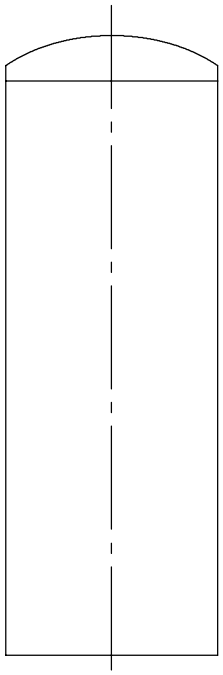
ET 893470	Support roller for splitting tractor (Frame and Wheels 505–905)
ET 893480	Support plate (2 pcs) (Frame and Wheels 505–905)



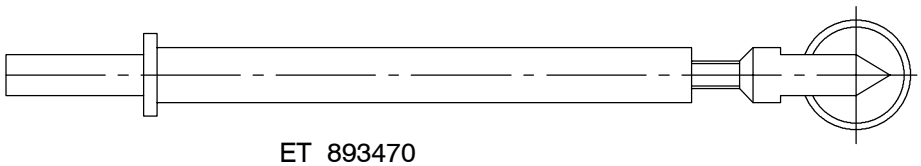
ETV 891900



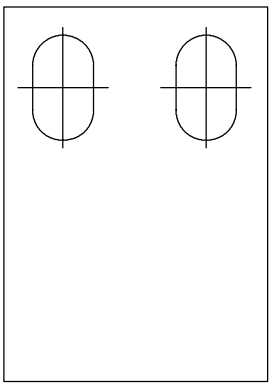
ETV 893790



ETV 892380



ET 893470



ET 893480

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Clutch, description

Important! Construction of clutch release mechansim from ser. no. **659478**, see page **410/8**.

Models 6100–8100 are provided with a single dry–disc clutch of the cup spring type. The clutch is operated mechanically. The disc is provided with damping springs (not on Hi–Trol models). Clutch disc diameter is 330 mm and it has organic linings (asbestos–free) (8400 has ceramic linings).

The clutch transmits power from the flywheel through a tubular shaft (clutch shaft) to the input shaft of the quick–shift gear (or reverse shuttle), and further to the gearbox. The clutch shaft front end is supported with a bearing. The clutch shaft front end splines are engaged with the disc hub splines. The clutch shaft rear end is connected to the gearbox input shaft with a coupling sleeve.

The release bearing is fitted at the end of a tube, the rear end of which is controlled by the clutch lever. At the front end the tube is supported in a guide sleeve

Pedal travel is adjusted by means of the wing nut on the link rod. Disc wear is indicated by the distance between the wing nut and the adjuster stop.

The pump drive shaft, which is driven by the drive flange on the flywheel, runs inside the clutch shaft.

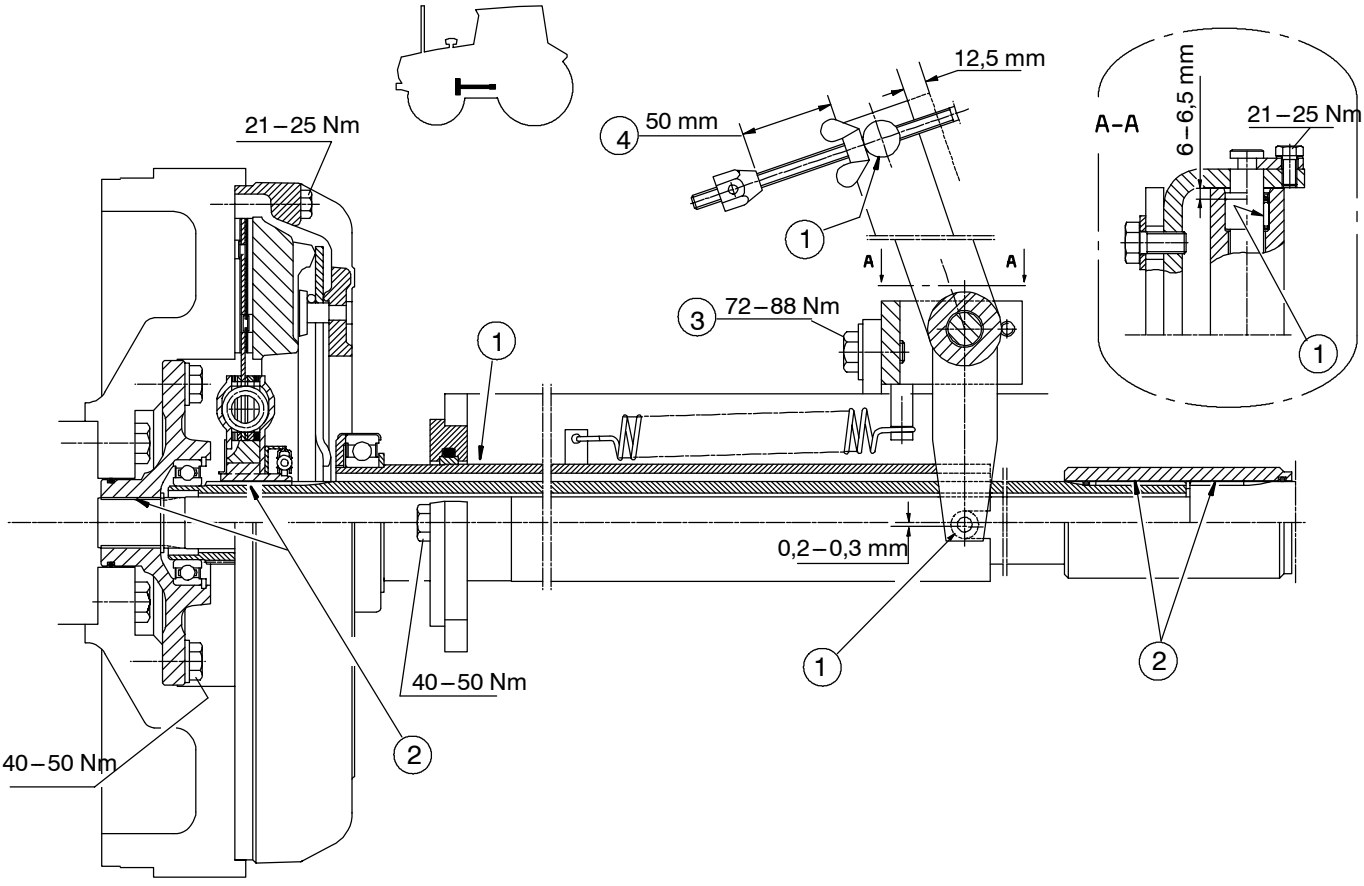


Figure 1. *Clutch with release mechanism* ***up to ser. no. 659477****.*

1. Universal grease
2. Pressure–resistant grease
3. Screw for adjusting position of release fork: 0,2–0,3 mm below the centre line.
Thus the position of the release bearing is correct when the tube is in the front position
4. When changing the clutch disc the distance between the wing nut and adjuster stop is set to 50 mm.

NOTE! On HiTech tractors, which have a Powershift Shuttle , there is not a clutch assembly on the flywheel, but only a drive disc, see page **410/4A**.

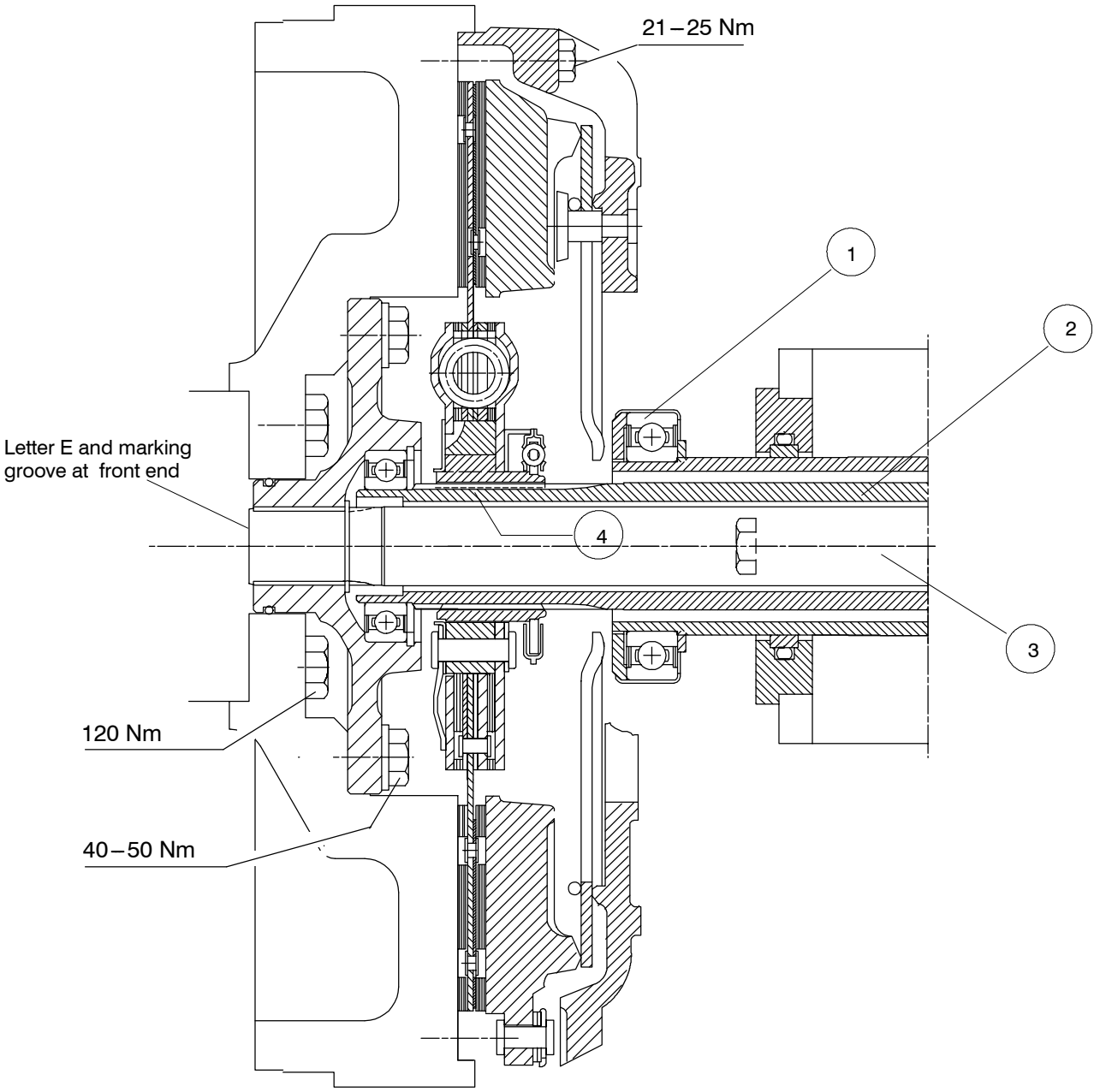


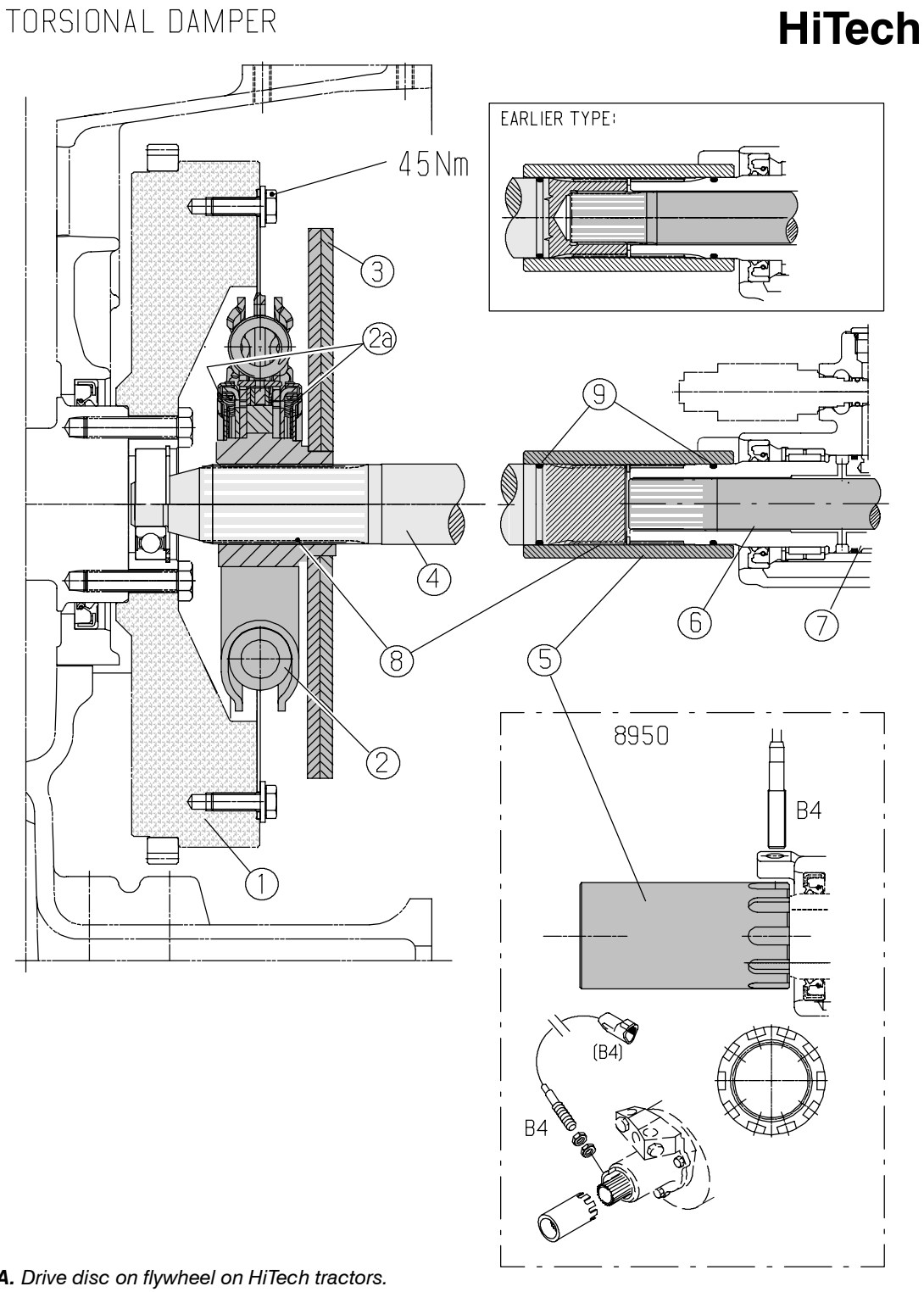
Figure 2. *Clutch assembly*

1. Clutch release bearing
2. Clutch shaft
3. Pump drive shaft
4. Pressure–resistant grease on splines

Note! *The circlip at the pump drive shaft front end has been removed. The new drive shaft is fitted so that the end which has a groove must be turned to the engine side. Pump drive shafts for tractors 8200–8400 have also letter E at the front end of the shaft. Spare part shafts have both the groove and the letter. If you fit a new pump drive shaft onto the earlier tractors, check if there is a cavity (reliever) at the rear end of the crankshaft. If it is there, use a metal plate to prevent the pump drive shaft from moving too much forwards.*

Note! *On transmission 650 the pump drive shaft diameter is 30 mm. On other transmissions (300, 460) 28 mm. On transmission 650 the hollow clutch shaft is shorter on machines, which have a reinforced DPS–gear.*

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Picture 2A. *Drive disc on flywheel on HiTech tractors.*

1. Flywheel (different on HiTech tractors)
2. Disc damping springs
3. Plates which increase mass
4. Closed drive shaft (earlier a hollow clutch shafti)
5. Coupling sleeve between drive shaft–DPS input shaft. Sealed with o–rings.
6. Pump/PTO drive shaft
7. DPS input shaft
8. EP grease on splines
9. O–rings
B4: SigmaPower sensor.

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Clutch servo

The clutch servo reduces pedal force by about 40 percent. The clutch servo is standard equipment on 6100–8100 tractors.

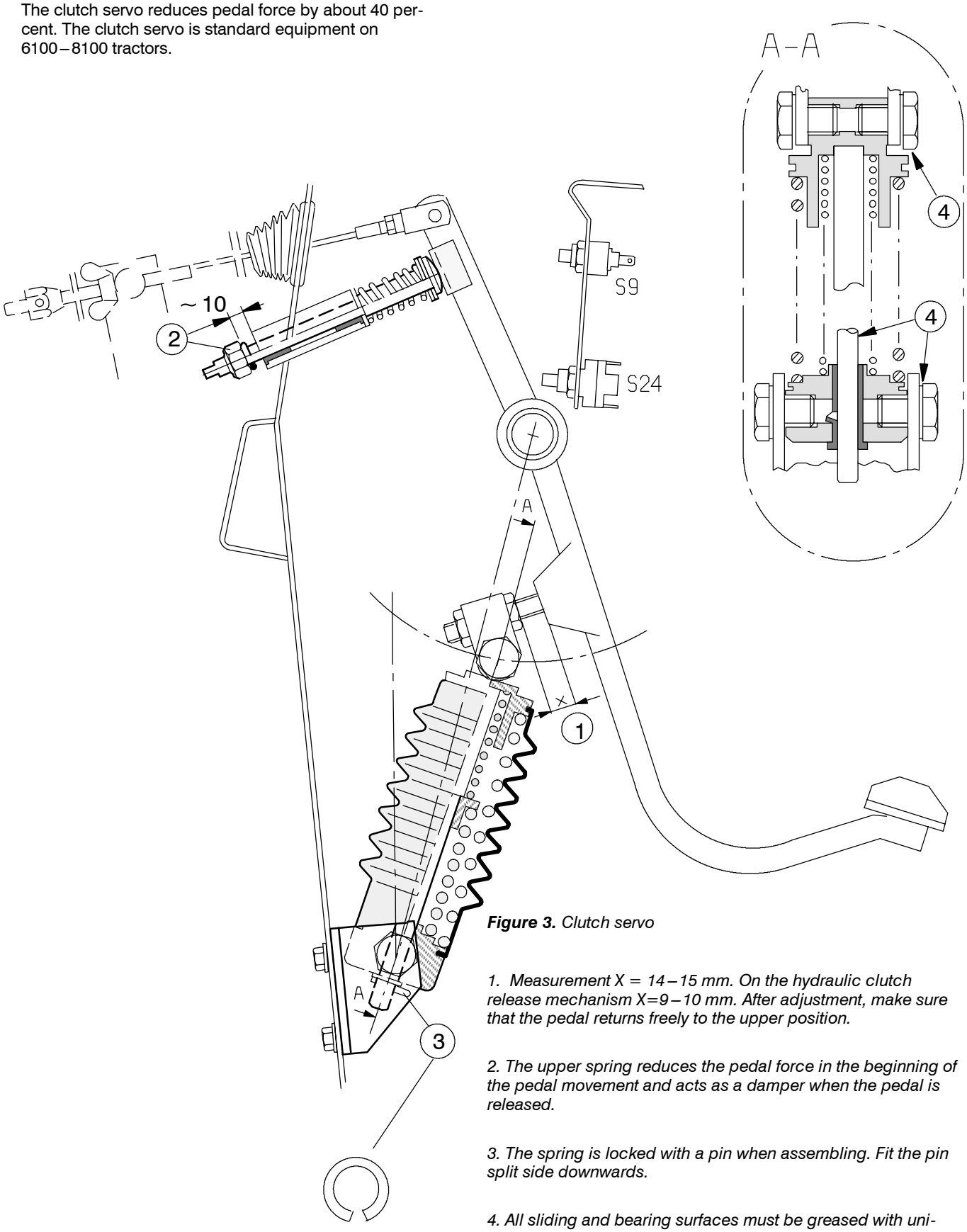


Figure 3. *Clutch servo*

1. Measurement X = 14–15 mm. On the hydraulic clutch release mechanism X=9–10 mm. After adjustment, make sure that the pedal returns freely to the upper position.

2. The upper spring reduces the pedal force in the beginning of the pedal movement and acts as a damper when the pedal is released.

3. The spring is locked with a pin when assembling. Fit the pin split side downwards.

4. All sliding and bearing surfaces must be greased with universal grease when fitting the clutch servo.

S9 = Safety circuit breaker (when starting)
S24 = Switch for disengaging the quick–shift gear

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Hydraulic coupling Voith (–658205 and 666066–)

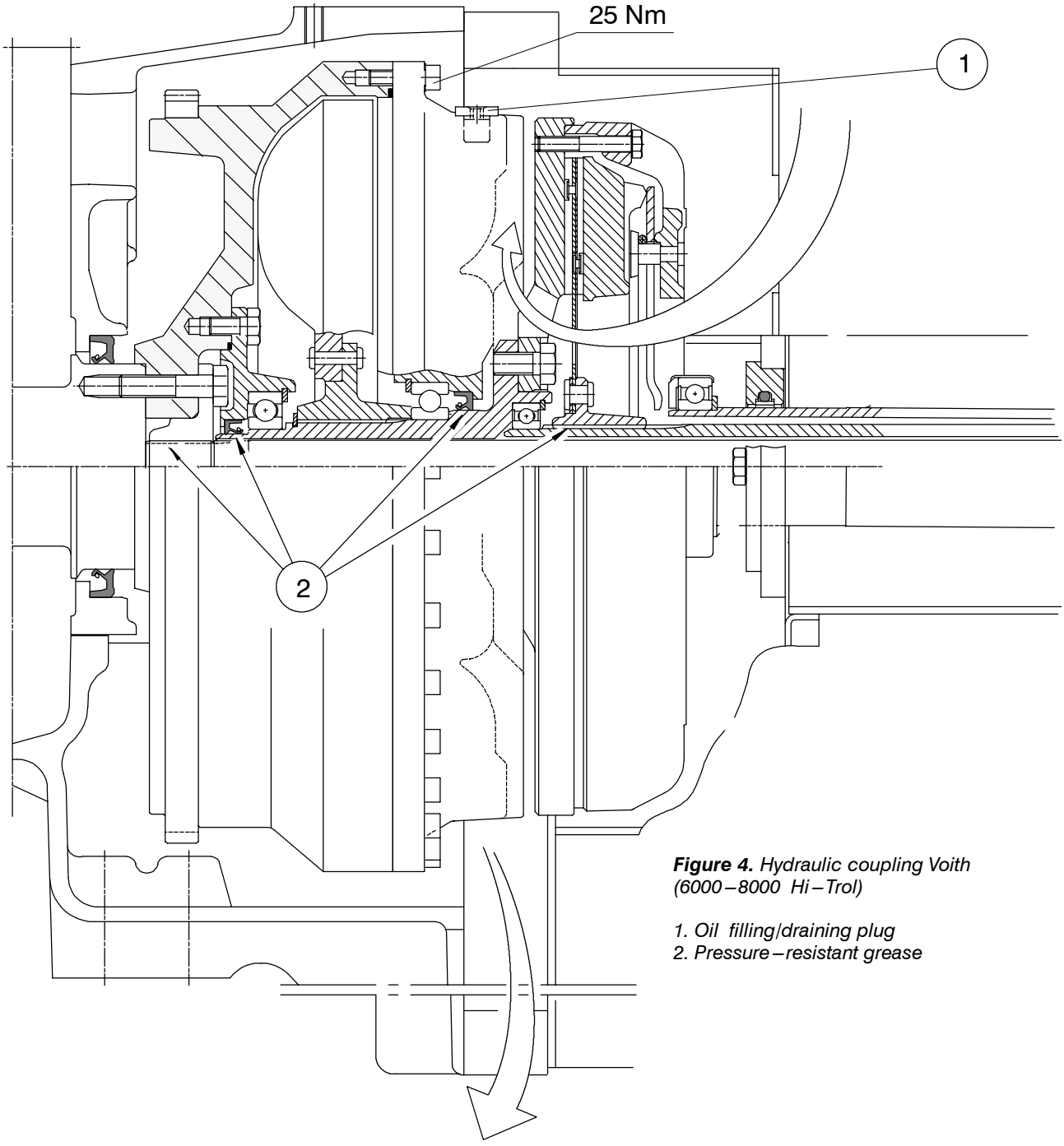


Figure 4. *Hydraulic coupling Voith (6000–8000 Hi–Trol)*

1. Oil filling/draining plug
2. Pressure–resistant grease

Valmet 6000–8000 Hi–Trol –models are equipped with a hydraulic coupling between the flywheel and the clutch. The mechanical clutch (except the disc) and its adjusting values are the same as on models without the hydraulic coupling (see figure 1).

The hydraulic coupling is maintenance–free. It is not even necessary to check the oil level.

Oil quality in hydraulic coupling, see page **130**/**4**.
Oil volume in hydraulic coupling, see page **130**/**4**.

Hydraulic coupling type: Voith 390 TD–VA (–658205) or Voith TD–FVA1 (666066–)
Diameter: 433 mm
Slip at max. power: 2 %

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Hydraulic coupling Transfluid (658206–666065)

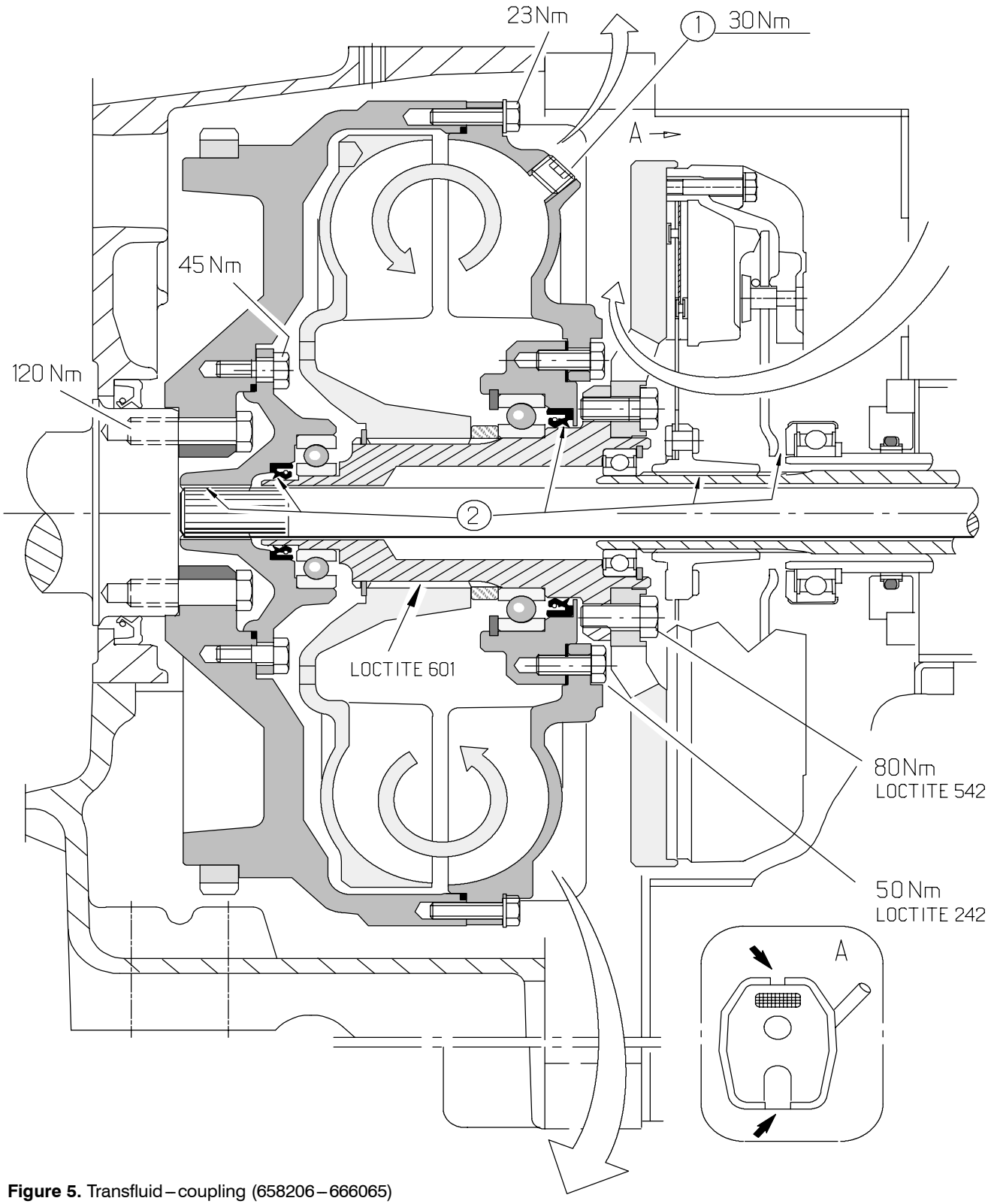


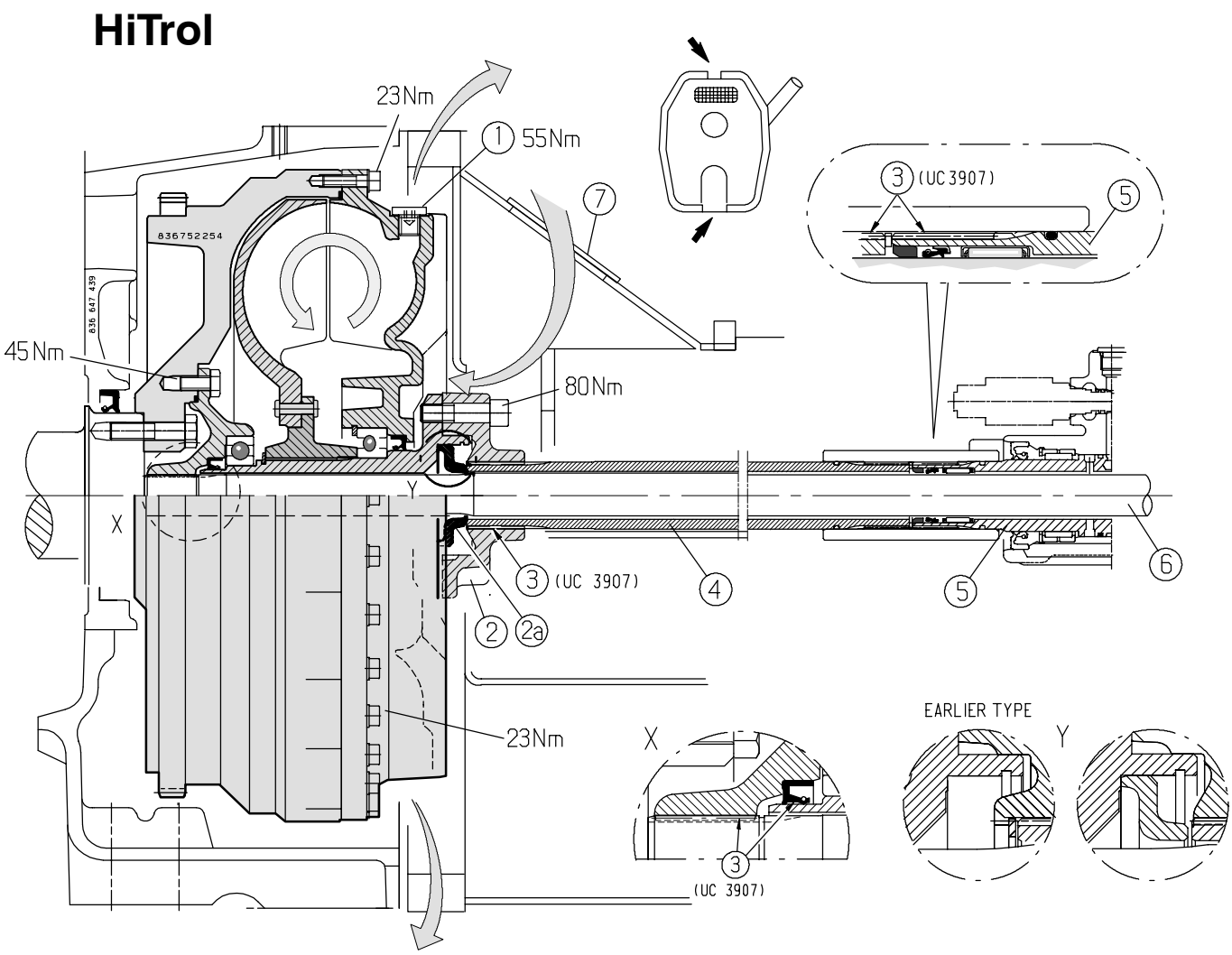
Figure 5. Transfluid–coupling (658206–666065)
1. Oil filling/draining plug. Chesterton no. 908 (UK 0181) on threads.
2. EP grease

With effect from tractor ser. no 658206 up to ser. no 666065 tractors 6000–8000 have a hydraulic coupling of Transfluid make.

Oil quality and volumes in the hydraulic coupling, see page **130/4**.

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Hydraulic coupling on 6250Hi–6650Hi



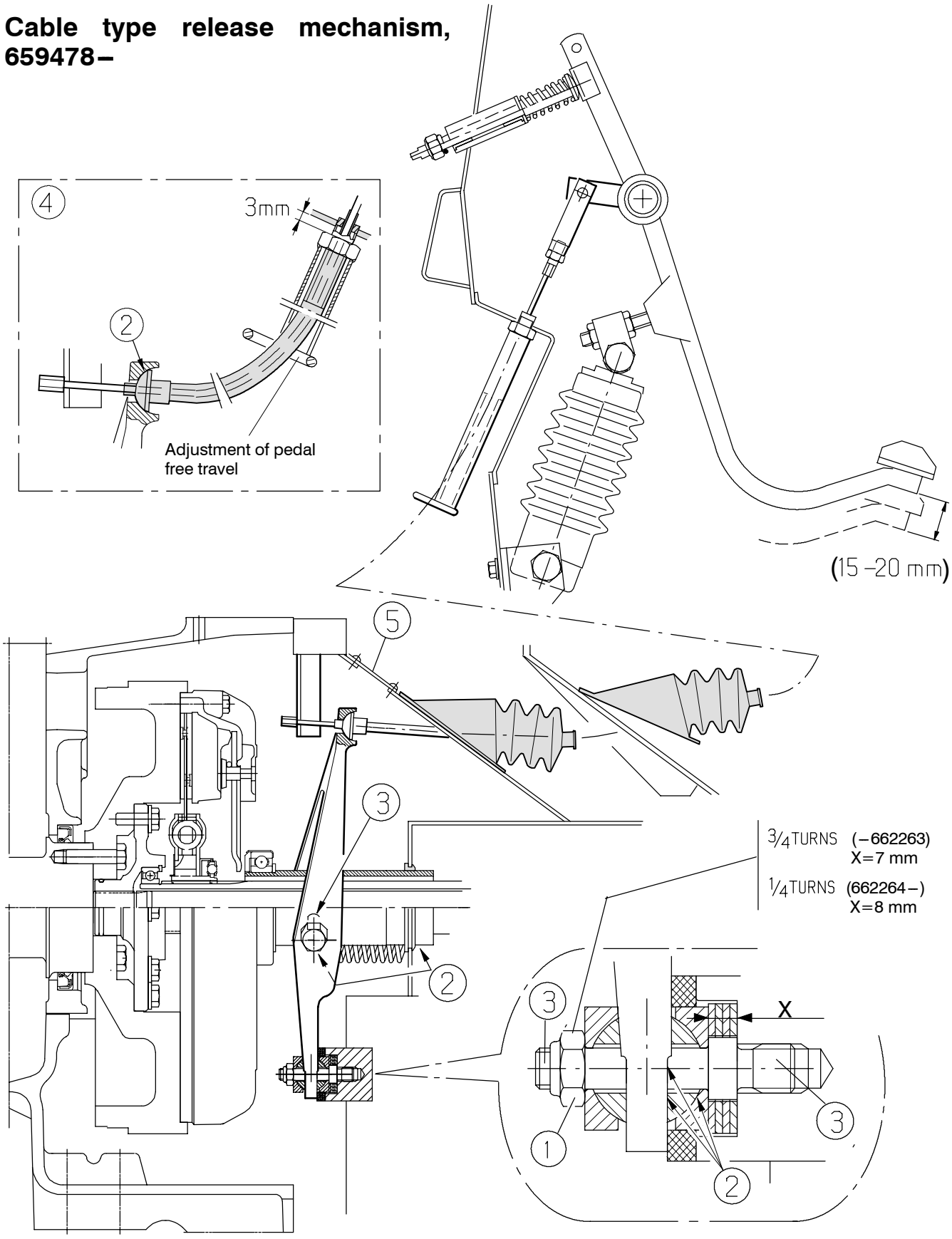
Picture 5a. Hydraulic coupling fitting (Voith TD–FVA1) in 6250Hi–6650Hi tractors
(this fluid coupling is the same Voith as used earlier, see page **410**/**6**).

Oil volumes in the fluid couplings, see page **130**/**4**. Test values and repairs, see page **411**/**7.**

1. Oil filling/checking plug. Emptying and filling can be done without removing the coupling from the tractor.
NOTE! When emptying the coupling, 0,2 litres oil remain in the coupling, which must be observed during filling.
2. New hub flange on HiTech models
3. EP–grease
4. The clutch shaft is modified (different length, front bearing point removed)
5. In the DPS input shaft (new part) there is a space for guide ring (protects seal when the long PTO shaft is fitted), seal and needle bearing (as in DPS 650).
6. The long PTO shaft is modified (hardened at the needle bearing and the seal)
7. Metal net. In place of the net there is a plate on tractors which do not have the fluid coupling).

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Cable type release mechanism, 659478–



1. Tighten the nut first fully home and unscrew it then **3**/**4** a turn (–662263) or **1**/**4** a turn (662264–).

2. Universal grease

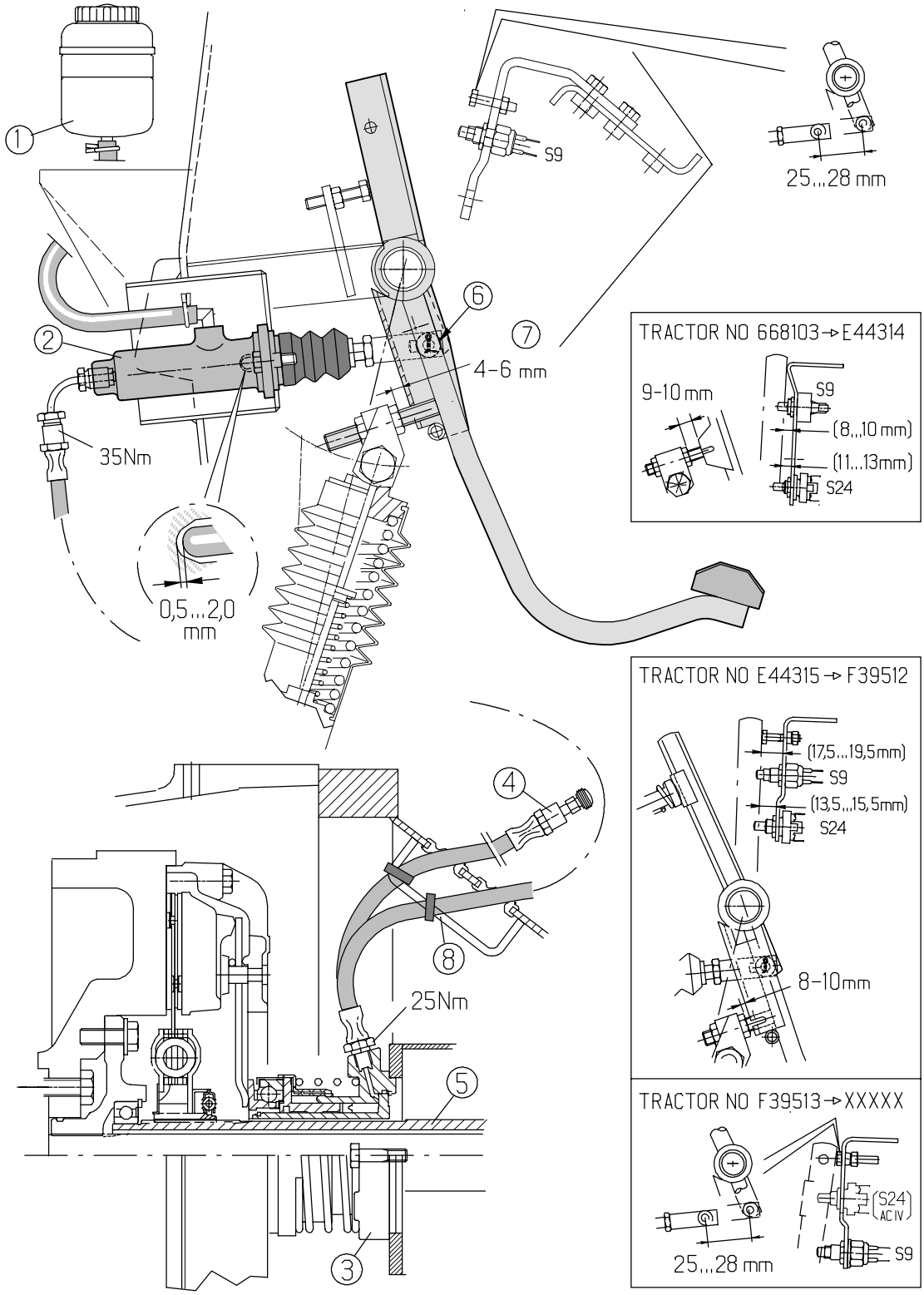
3. Loctite 242

4. Pedal free travel is adjusted by adjusting the distance between the cab wall and the nut to **3 mm.**

5. There is an opening through which the cable clutch side end can be detached and the cable can be changed, if needed, without splitting the tractor.

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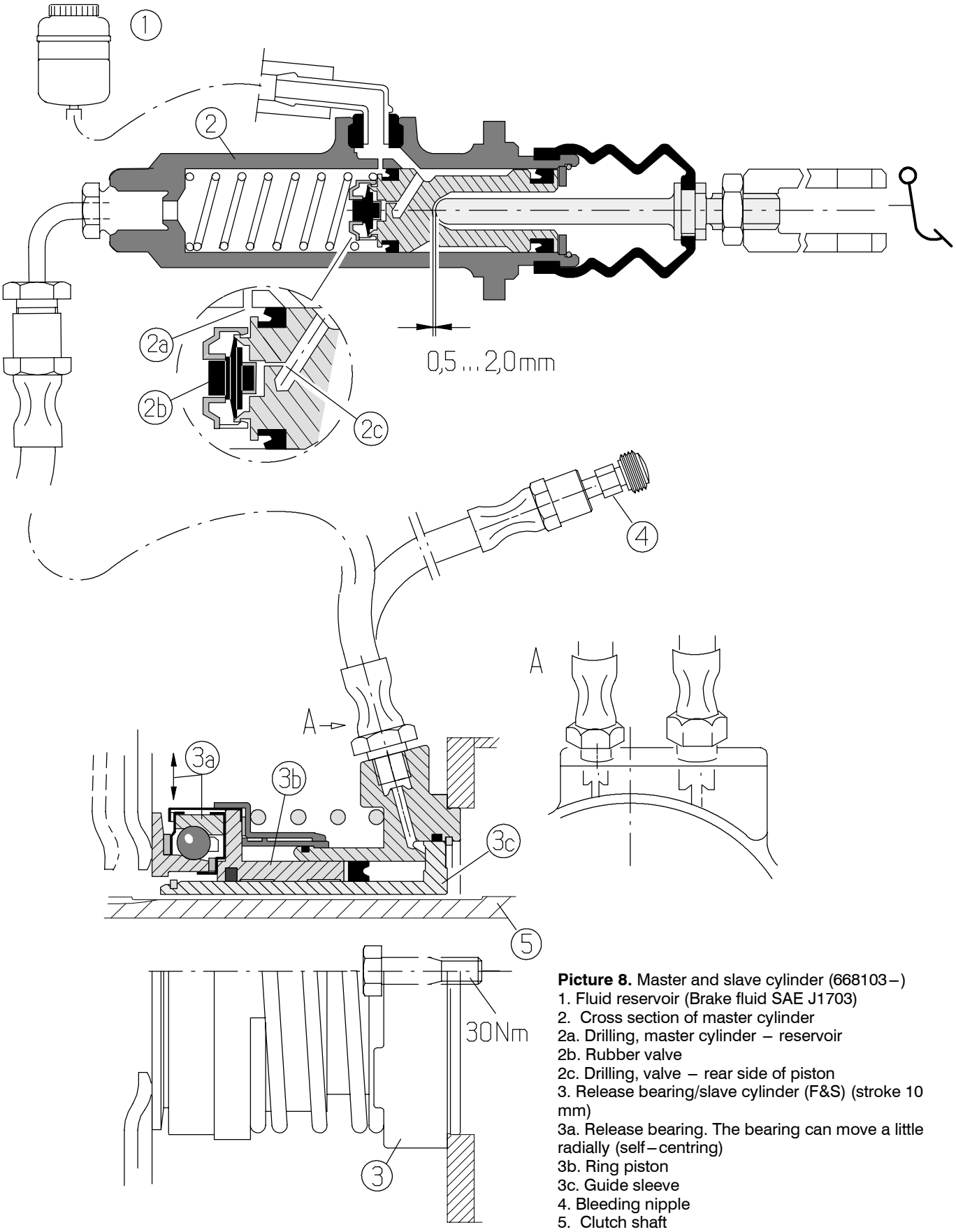
Hydraulic type clutch release mechanism, E44315–



Picture 7. Clutch release mechanism

1. Reservoir (volume 2 dm^3). Brake fluid SAE J1703.
2. Master cylinder.
3. Release bearing–slave cylinder (F&S).
4. Bleeding nipple. The system can also be filled through this hose
5. Clutch shaft. The shaft is thinner at the slave cylinder
6. Universal grease
7. Adjusting value of clutch pedal power assistance

Note! From tractor ser. no. F39513
incl. the switch S24 has been removed and the safety switch S9 has been moved to the support lower hole. On E–models there is further switch S24 and it is fitted to the support upper hole.



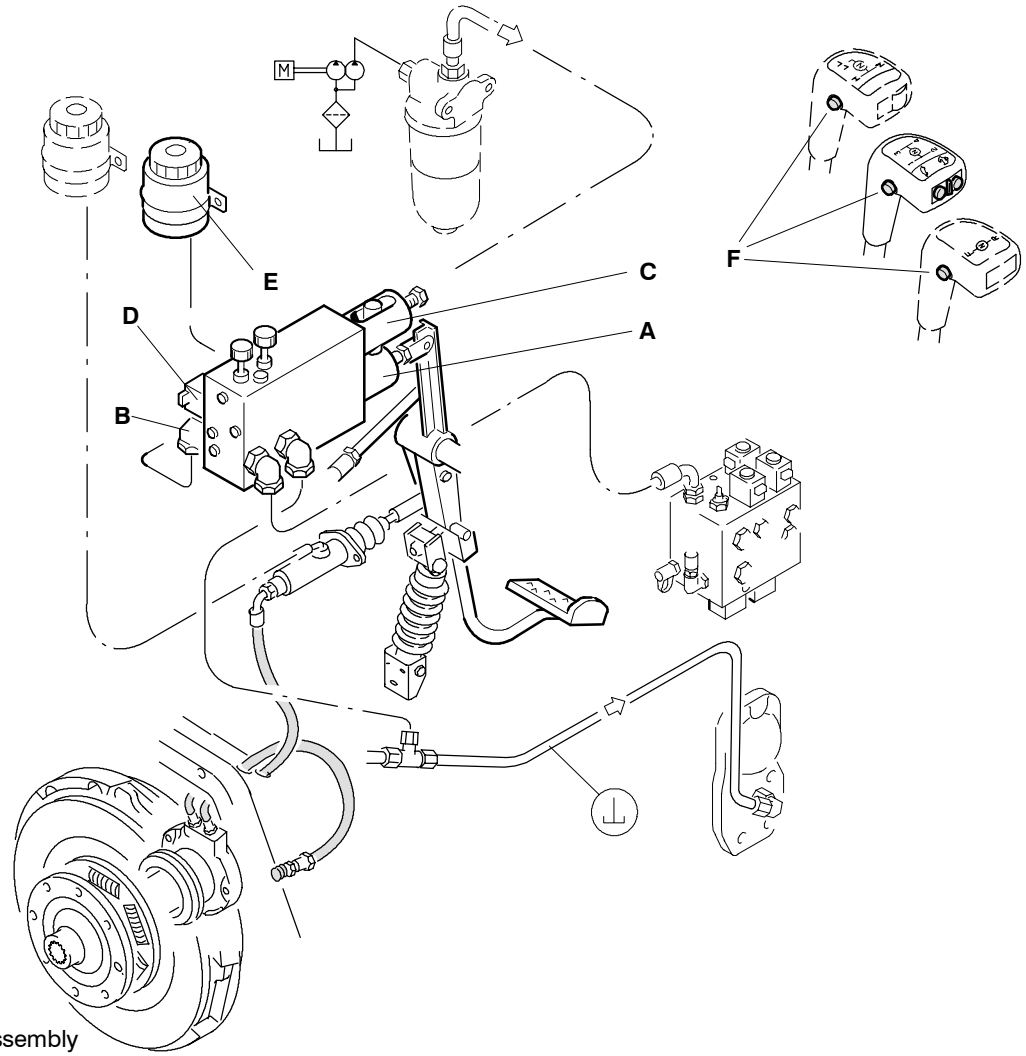
Picture 8. Master and slave cylinder (668103–)
1. Fluid reservoir (Brake fluid SAE J1703)
2. Cross section of master cylinder
2a. Drilling, master cylinder – reservoir
2b. Rubber valve
2c. Drilling, valve – rear side of piston
3. Release bearing/slave cylinder (F&S) (stroke 10 mm)
3a. Release bearing. The bearing can move a little radially (self–centring)
3b. Ring piston
3c. Guide sleeve
4. Bleeding nipple
5. Clutch shaft

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HiShift, description

Repair instructions, see pages **411/12–14**.

HiShift (option) controls the clutch pedal electro–hydraulically and it is unnecessary to depress the clutch pedal with the foot. HiShift includes a hydraulic block attached to the cab front wall with aid of the bracket, a new clutch pedal, a new clutch fluid reservoir and electric parts.



Picture 9. HiShift assembly

Function of the hydraulic part

The working cylinder piston (A) pushes the clutch pedal down (working pressure from the low pressure circuit). The working pressure is controlled with the solenoid valve (B, Y14), which in turn is controlled with aid of the push buttons (F) in the gear lever knobs.

When the solenoid valve (B) is energised (one of the buttons is depressed), the hydraulic pressure pushes the pedal down. When the button is released (solenoid unenergised), the permanent hydraulic pressure on the piston rod side forces the piston to move inwards and the clutch pedal returns to the upper position.

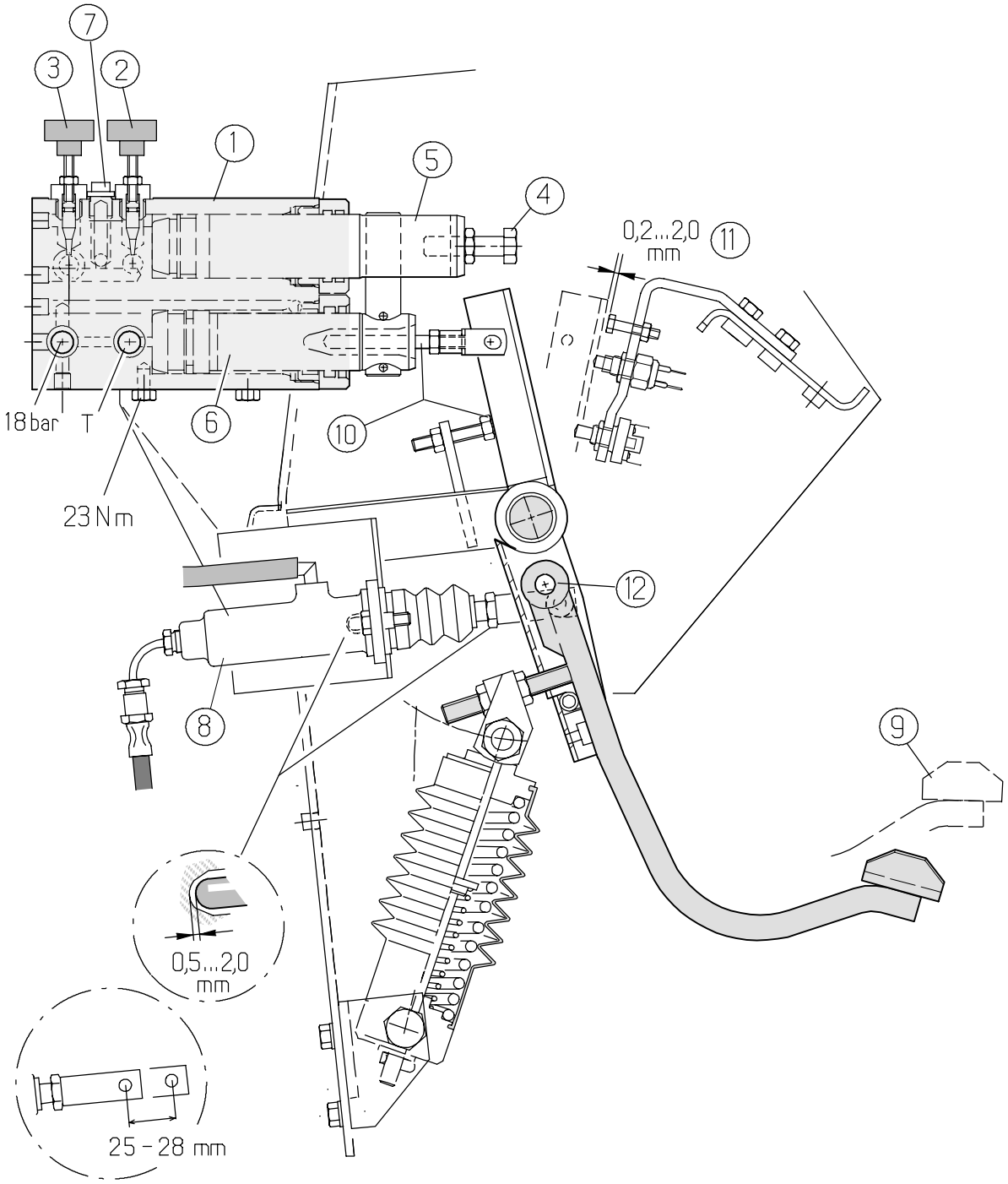
Function of the damping part

The damping cylinder has been connected to the clutch fluid reservoir (E) by a hose.

When the working cylinder piston (A) releases the clutch, it pulls the damping cylinder piston (C) mechanically out by the pin and the damping cylinder is filled with clutch fluid via the filling valve.

When the working cylinder solenoid valve is unenergised (push button is released), the working cylinder piston (pedal) rises first quickly the extent of the oblong hole in the damping piston and then slower, because the return flow of the clutch fluid into the reservoir is restricted.

The damping cylinder restriction can be changed by the solenoid valve (D, Y15) so that when the driving speed is less than 4 km/h, the solenoid is energised and the clutch pedal rises up slower. With speeds over 4 km/h the solenoid is unenergised and the pedal rises faster. When the shuttle lever button is used, the pedal always rises slower regardless of the tractor driving speed.



Picture 10. HiShift hydraulic block and clutch pedal

1. HiShift hydraulic block
2. Adjustable restriction for clutch pedal rising speed
3. Adjustable restriction for clutch pedal rising speed
4. Adjusting screw for adjusting position of knee point (knee point is a point, where clutch starts to slip and engage when it rises from lowest position upwards)
5. Damping piston
6. Main hydraulic piston
7. Damping cylinder filling valve
8. Clutch master cylinder
9. Clutch pedal
10. In the upper position the pedal should rest against the stop and working cylinder piston (6) push rod must be free. Push rod clearance to the piston hole edges should be at least 1 mm in the whole pedal travel.
11. When piston (6) is fully pushed out, clearance to the stopper should be **0,2–2 mm**.
12. All sliding and bearing surfaces should be greased with universal grease in connection with repair works.

Others

Normal foot control of the pedal is always possible, also simultaneously. The clutch pedal has a hinge for safety.

The clutch master cylinder and the clutch release mechanism are the same as earlier.

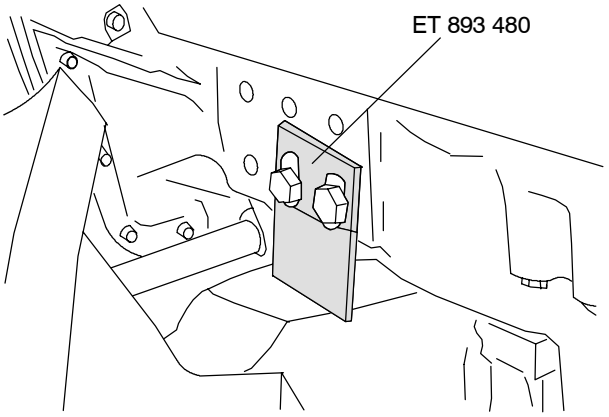
Note! HiShift can be retrofitted also on earlier manufactured tractors, although they do not have the Agrodata–instrument.

HiShift hydraulic block fixing bolts are tightened to 23 Nm. The bolts must not be tightened too hard.

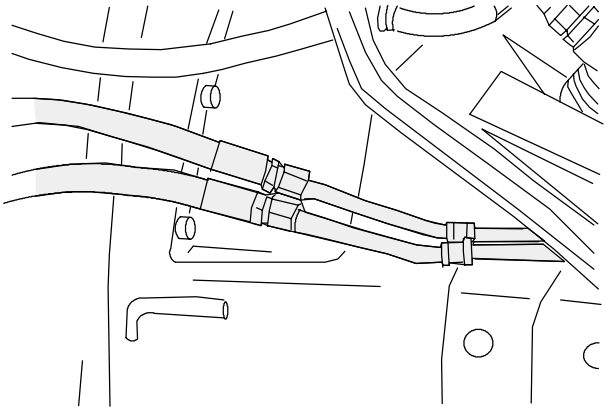
1. Changing disc/release bearing (Op. no. 411)

Note! Instructions below are for a tractor with a hydraulic coupling (Hi–Trol). For tractors without hydraulic coupling the same instructions applies. On E–models it is necessary to disconnect the sensor wires when splitting the tractor.

A. Splitting tractor at clutch



1. Fit support plates ET 893 480 on both sides to prevent pivoting. Remove all engine casing plates.

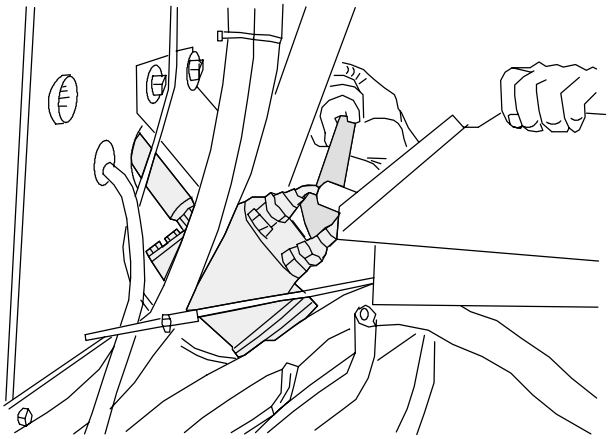


2. Remove the stop control cable wire from the injection pump. Disconnect the oil cooler hoses on the left hand side of the tractor.

3. Disconnect the fuel hoses from the tank (on right hand side). Disconnect the fuel gauge wires (fold sound insulation plate to one side when disconnecting the wires).

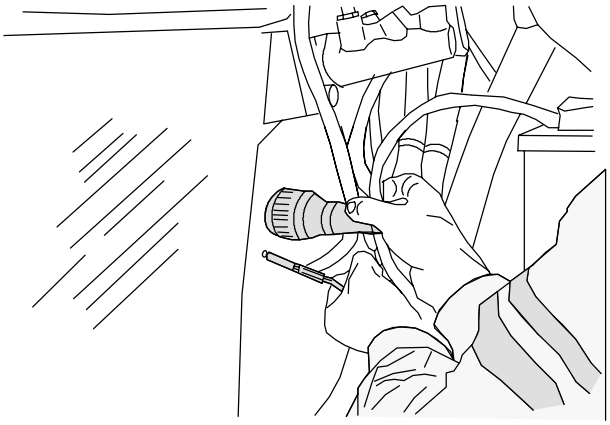
Important! With effect from tractor ser. no. **659478** the clutch release mechanism has been changed to a cable type. Then disconnect the cable front end from the release lever through the access hole on the frame.

Note! On some tractors, there is a linkage type clutch release mechanism inplace of the cable type mechanism. This linkage has been fittind in the field by using a replacement kit. From tractor serial number **668103** the tractors have a hydraulic type release mechanism.

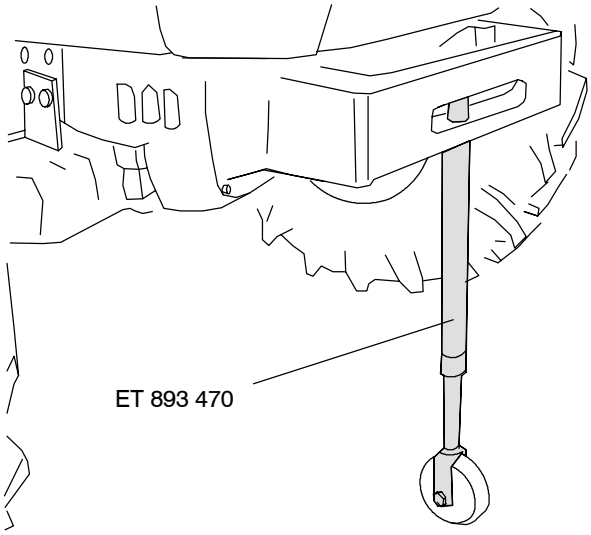


4. Disconnect the steering cylinder oil hoses from the steering valve (mark hoses for easier refitting).

5. Disconnect the heater hoses from the cab front wall and from the pipe to the coolant pump.



6. Disconnect the throttle control cable and the socket from the cab front wall on the right hand side. Disconnect the cab earth lead from the front wall and disconnect the cable to the starter motor.



7. Fit support ET 893 470 under the front ballast weight bracket. Fit a support (with rollers) under the front frame rear edge.

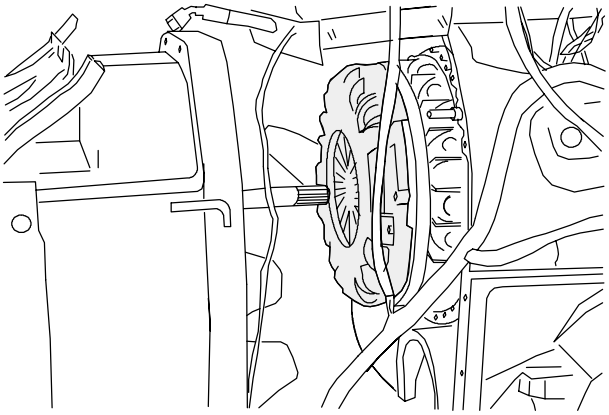
Note! Six–cylinder engine (8000 and 8100) is rear–heavy. Other engines are almost balanced and must be supported at both ends.

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8. Remove the propeller shaft guard under the tractor and disconnect the front flange joint of the propeller shaft.

Important! On tractors with Delta Powershift, the front flange joint is unnecessary to disconnect, since the rear end of the propeller shaft has a splined sleeve joint.

9. Unscrew the bolted frame joint at the clutch. Disconnect the windscreen washer hose and the cable connector.



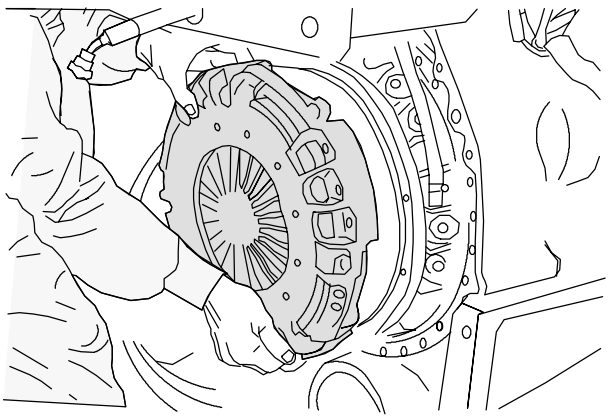
10. Carefully push the front frame apart from the middle frame about 40 cm.

11. Tap the clutch shaft backwards until its front end loosens from the bearing. Push the pump drive shaft backwards until its rear end splines engage.

Note! This is done to prevent damage to the seal inside the hollow input shaft.

B. Changing clutch/disc

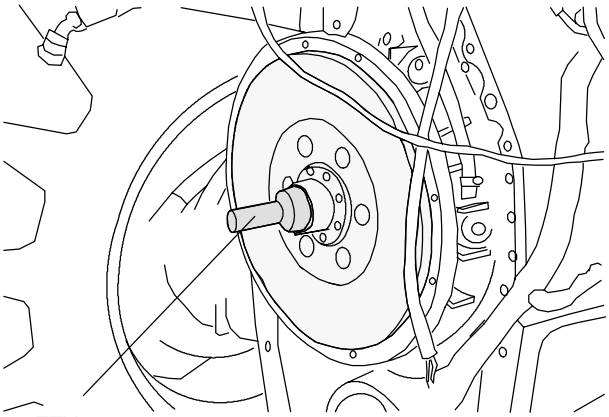
1. Split the tractor at the clutch (**see instr. A**).



2. Unscrew the clutch fixing bolts evenly and remove the clutch assembly/disc.

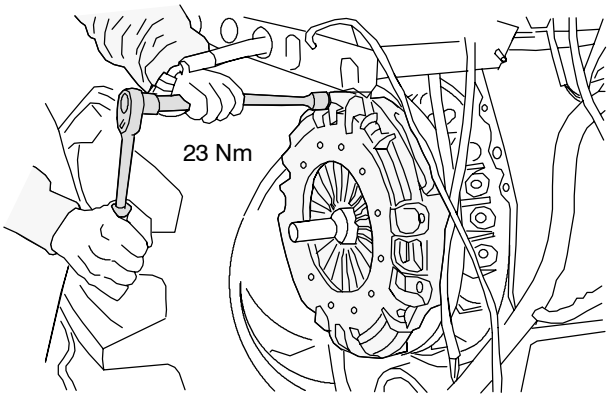
3. Check the condition of the clutch shaft front end bearing. Check also splines on the pump drive flange on the flywheel.

Note! On the hydraulic coupling models the coupling must be detached before checking the pump drive flange.



ETV 893790

4. Fit centring tool ETV 893 790 and place the disc onto the centring tool (disc hub longer side rearwards).

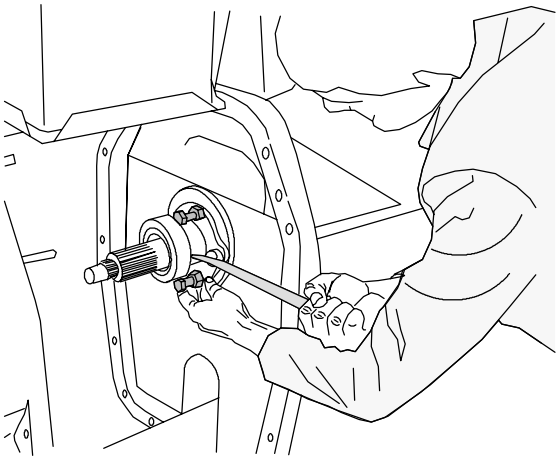


5. Fit the clutch assembly and tighten it evenly to a torque of 23 Nm. Remove the centring tool.

6. Assemble the tractor (**see instr D).** Adjust the pedal free travel (**see instr 2A**).

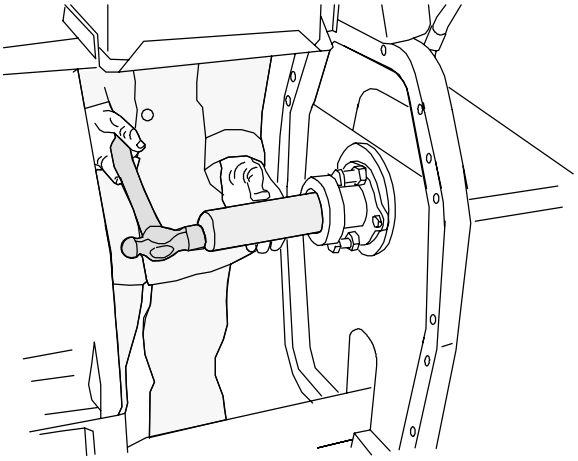
C. Changing release bearing

1. Split the tractor at clutch (**see instr A**).



2. Prise out the bearing/tube and place 40 mm long bolts between the bearing and guide sleeve.

Important! Changing the release bearing with effect from tractor ser. no. 659478, see page **411/10**.



3. Knock in the tube with ETV 892 380 and remove the bearing. Fit a new bearing with ETV 891 900

Note! Check that the bearing comes up against the spacer ring.

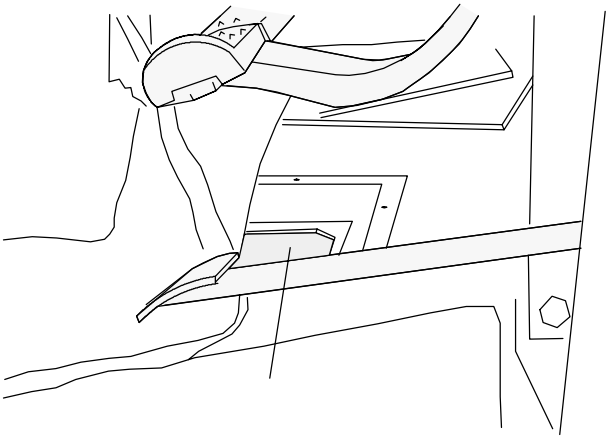
Note! Check also the sliding ring inside the tube guide sleeve.

4. Assemble the tractor frame at the clutch (**see instr. D**).

D. Assembling tractor at clutch

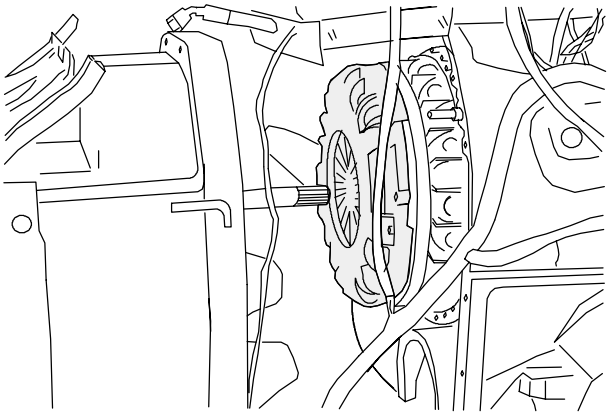
1. Push the pump drive shaft backwards fully home. Push the clutch shaft backwards until it engages into the coupling sleeve. **Important!** The pump drive shaft should be fitted in the correct way. The end which has a marking groove (and letter E) should be turned to the engine side.

Important! Guide the rear end of the propeller shaft onto the 4WD output shaft front end splines (659478 –).



Floor hatch

Note! If necessary, guide the coupling sleeve through the floor hatch. Grease splines with pressure – resistant grease.



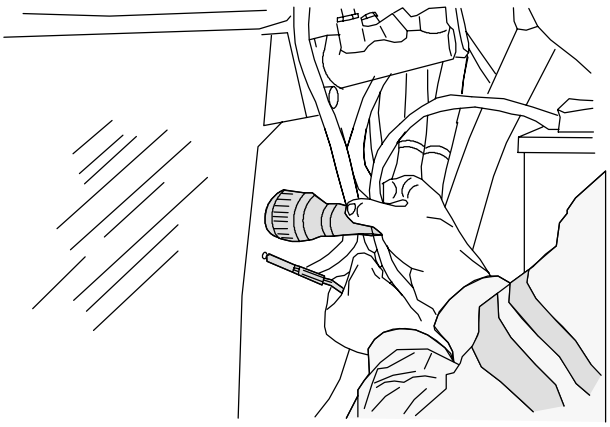
1. Push the units together so that the shafts engage. If necessary, rotate the flywheel so that the splines engage.

2. Tighten the bolts to correct torque.

3. Connect the oil cooler hoses on the left hand side. Connect the fuel hoses and the fuel gauge wires (on the right hand side).

4. Connect the cab earth lead to the cab front wall. Connect the hoses to the steering valve according to the marks. Connect the starter motor cable.

Important! With effect from tractor ser. no. 659478, connect the release cable front end to the lever upper end, work through the access hole on the frame.



5. Fit the throttle cable and the socket to the front wall on the right hand side.

6. Connect the windscreen washer hose and cable connector. Connect the heater hoses.

7. Connect the stop control to the injection pump.

8. Adjust the clutch (**see instr 2A**). Remove all supports. Fit the engine hood plates.

9. Connect the propeller shaft front flange joint. Fit the guard under the tractor.

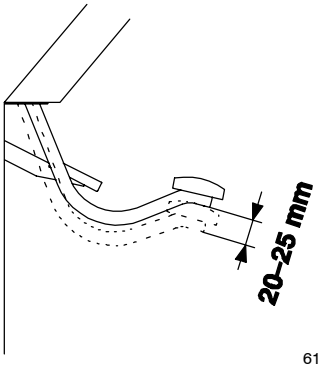
Note! Fit the floor hatch if opened.

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2. Checks and adjustments

A. Adjusting clutch pedal free travel up to tractor ser. no. 659477

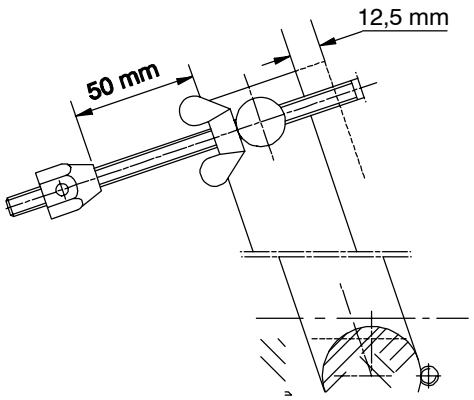
Important! Adjusting the free travel with effect from tractor ser. no. **659478**, see page **411/10**.



6181–87

1. Pedal free travel should be 20–25 mm, when the clutch is correctly adjusted.

2. Remove the left hand side plate of the engine compartment.

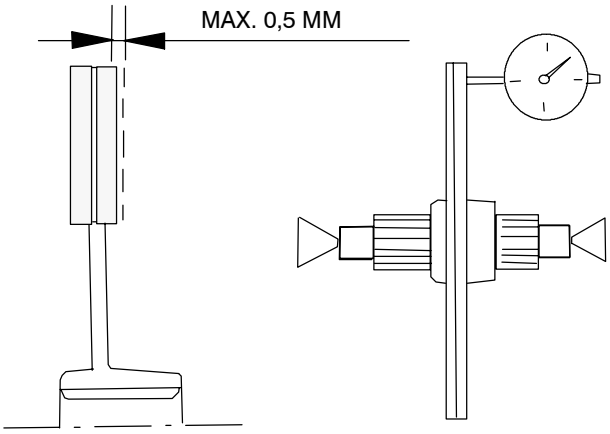


3. Adjust the free travel of 10–15 mm to the upper end of the clutch lever by screwing the wing nut. Now the pedal free travel should be 20–25 mm.

4. If a new disc is fitted, adjust the distance between the adjuster stop and the wing nut to 50–55 mm.

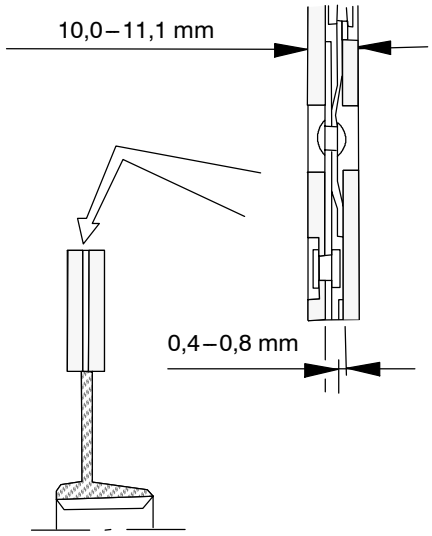
Note! If the free travel can no longer be adjusted (the adjuster stop touches the nut), the clutch disc must be changed.

B. Checking clutch disc and clutch assembly



Checking axial throw of clutch disc

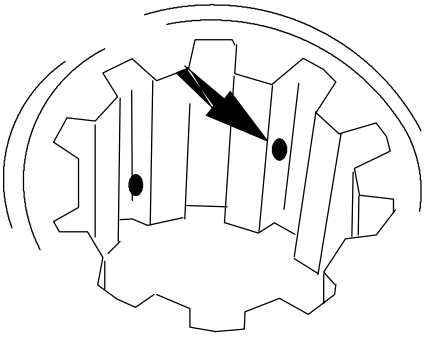
Mount the disc between the chuck and tailstock on a lathe. Rotate the disc and measure the axial throw at its outer edge. Also measure the taper (”dishing”) of the disc. If the throw or taper is greater than 0,5 mm, change the disc.



Checking thickness of clutch disc

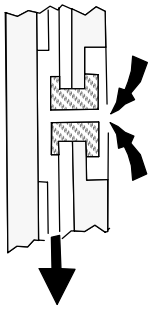
Thickness, new disc (unloaded) 10,0–11,1 mm.
Axial resilience 0,4–0,8 mm

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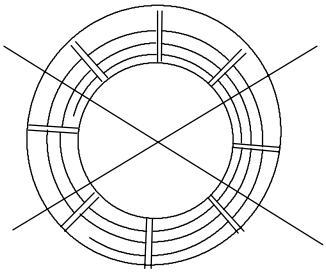
Clutch disc splines

Coat the splines in the centre of the clutch disc with pressure–resistant grease to safeguard the axial movement of the disc on the clutch shaft.



Clutch disc rivets

Rivets have a small hole for free air flow. If these holes become clogged (e.g. dust), it can cause sticking of the disc.

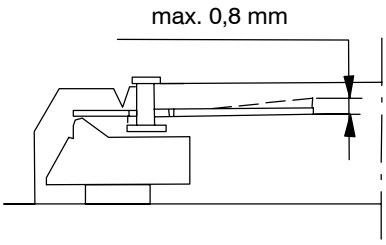


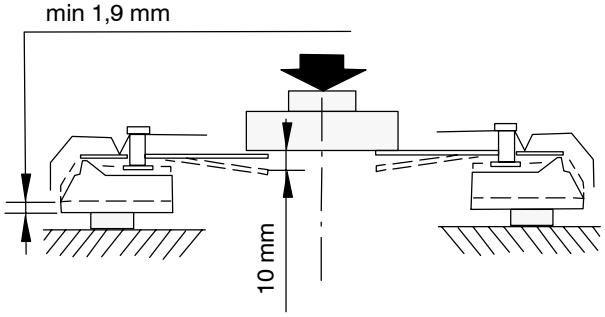
Organic linings are made by winding asbestos–free band. For that reason radial grooves must not be made on the linings because thus bands can cut off. This can cause the linings to loosen.

Friction surfaces must be clean. A small amount of grease on the linings can cause vibrations and the disc can stick.

Checking movement of pressure plate

1. Place the clutch in fixture ETV 892 570 with 10 mm spacers. Secure with at least four bolts.



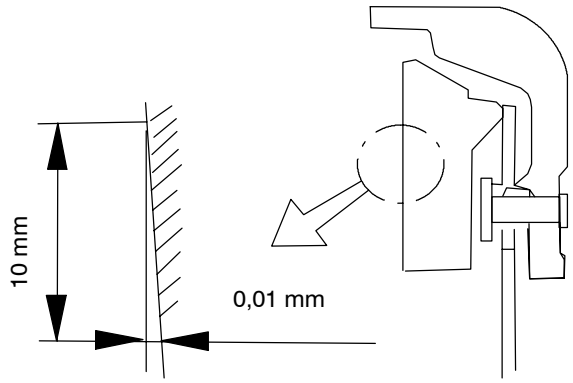


2. Apply the clutch 3–4 times so that the cup spring ”beds down”.

3. Check the height difference between the fingers of the cup spring: this must not exceed 0,8 mm. If it is greater, the clutch must be changed.

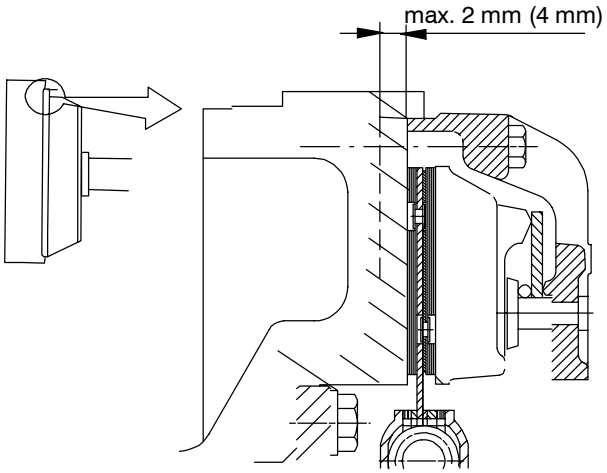
4. Press the cup spring fingers down by 10 mm and measure the distance between the spacers and pressure plate. The clearance must be at least 1, 90 mm. Check at several points. If the clearance is lower the clutch must be changed.

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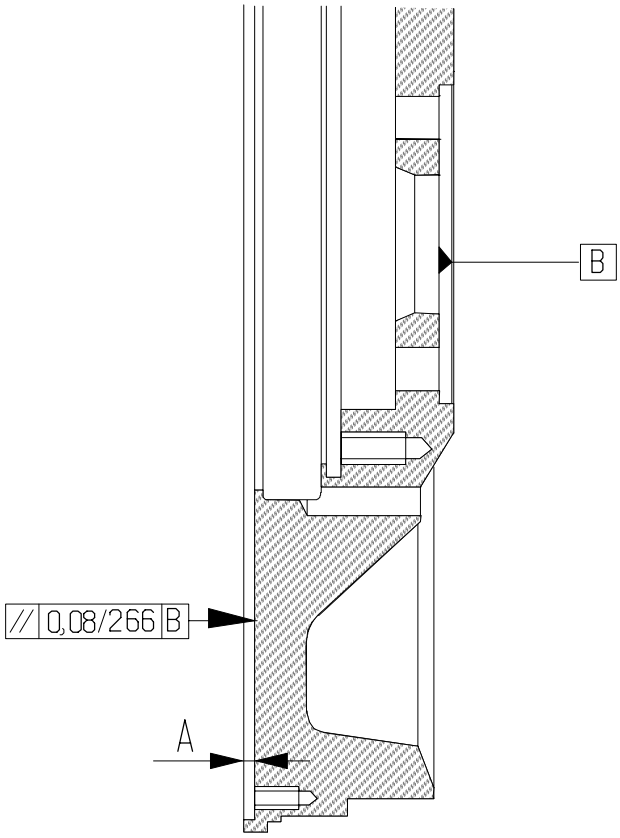
Checking concavity of pressure plate

A new pressure plate is flat to slightly concave, max. 0,01/10 mm: convexity, i.e. the reverse state, must not occur. The reason for the concave surface is to allow engagement to start at the outer edge of the lining where the disc is least sensitive to slipping. A grooved or otherwise deformed clutch must be changed.



Machining flywheel

The flywheel can be machined 2 mm without any further action. For additional machining the holes for the clutch attaching bolts must also be deepened. The maximum machining of the flywheel is 4 mm.



Important! When machining the flywheel, it is important to observe that the clutch surface and the flywheel fixing surface are parallel.

Measurement A on a new flywheel is 6±0,3 mm, and max allowable value is 10±0,3 mm.

3. Hydraulic coupling (Hi–Trol)

Note! See figure 4 on page 410/6 (Voith) or figure 5 on page 410/7 (Transfluid).

Hi–Trol–models have a hydraulic coupling between the flywheel and the mechanical clutch.

Removing hydraulic coupling Voith (–658205, 666066–):

– split the tractor at the clutch (**see instr 411 1A**)
– remove the mechanical clutch and its fixing plate
– drain the oil from the hydraulic coupling through the draining plug.
– unscrew the bolts on the outer sphere of the coupling. If necessary, use extractor screws (there are threaded holes for this purpose).

When fitting the hydraulic coupling the screws must be tightened evenly to **25 Nm**.

Note! 0,2 litre oil remain in the later Voith coupling (666066–) when the coupling is emptied through the draining hole while the coupling is attached to the flywheel. The draining plug can be removed and fitted via the hole in the tractor frame when the plug is in the upper position. For instance oil checking and topping up is possible without splitting the tractor frame.

Reconditioning hydraulic coupling Transfluid (658206–666065), see pages 411/8 and 9.

Oil quality and oil volume in hydraulic couplings, see page **130/4**.

A. Checking function of hydraulic coupling

Normally the hydraulic coupling does not need any maintenance or adjustments. If there is doubt that the coupling does not function properly, it can be checked as follows:

1.Warm up the engine to normal working temperature by driving the tractor about 15–30 min (not any stall–test)

2. Check the pulling power (crawling) of the coupling at engine idling speed (750 r/min). The pulling power of the coupling is determined so that when gear H1 is engaged the tractor is stationary when brake pedals are pressed lightly.

B. Stall–test

– apply the parking brake
– engage the highest gear H4
– declutch and move the hand throttle lever to max revs (front position) and check the resultant R.P. M. Max stall–test period is 10 seconds. The right value is **1100–1250 r/min** (Voith) or **950–1250 r/min (6800: over 1200 r/min)** (Transfluid).

Note! Do not repeat a new stall–test immediately after the previous test because this will cause overheating on the hydraulic coupling and also the stall value becomes faulty

The hydraulic coupling characteristics can be changed by changing oil level in the coupling. The coupling becomes softer when oil is reduced and vice versa. Too high stall value indicates that there is not enough oil in the hydraulic coupling.

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Hydraulic coupling (Transfluid)

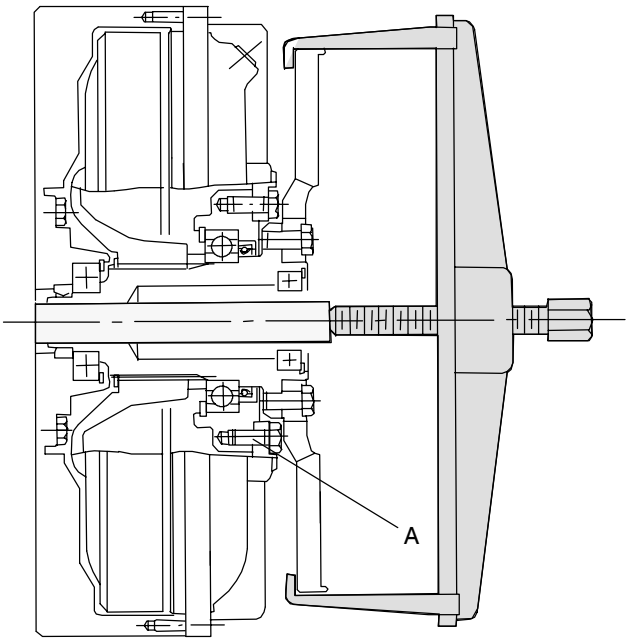
(fitted on Valmet tractors from serial number **658206** up to serial number **666065**)

A. Disassembling hydraulic coupling

1. Split the tractor at clutch (**see instr. 411 1A**). Remove the mechanical clutch. Do not detach yet the clutch attaching plate.

2. Unscrew the oil draining plug and drain the oil from the coupling into a suitable vessel.

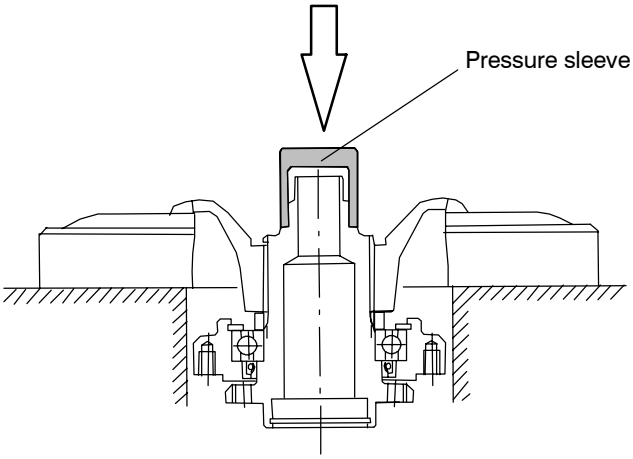
3. Unscrew the bolted joint between flywheel–coupling on the coupling outer edge.



4. Detach the hydraulic coupling with an extractor according to the figure above. Position extractor legs behind the clutch attaching plate and place a suitable support bar inside the coupling.

5. Remove the large o–ring. Remove the attaching plate of the mechanical clutch. Unscrew the pump wheel bolts A (12 off).

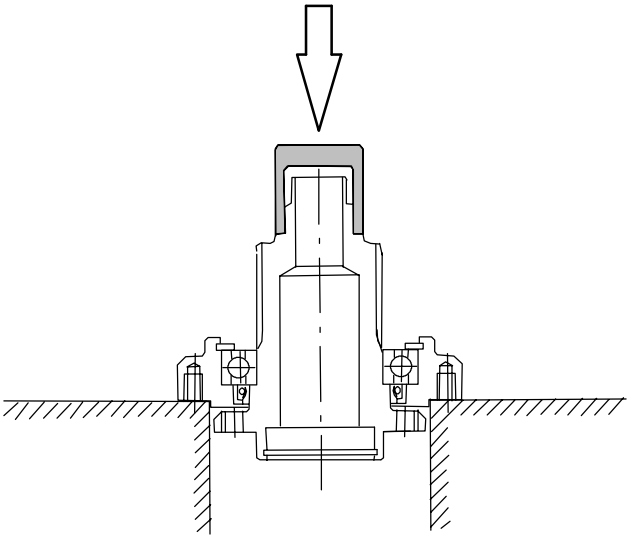
6. Remove the pump wheel and the gasket from its flange. Release the turbine wheel circlip at the front end of the coupling hub.



7. Place the turbine wheel on a support and press the hub out from the splines.

Note! On the splines there is locking fluid Loctite 601.

8. Remove the spacer ring in front of the bearing.



9. Place the hub on a support and press the hub out from the bearing housing.

10. Remove the bearing circlip, bearing and the seal behind it.

11. Check the smaller bearing in the flywheel and change the oil seal in the flywheel. Change all rubber seals. Check also the ball bearing inside the hub rear end.

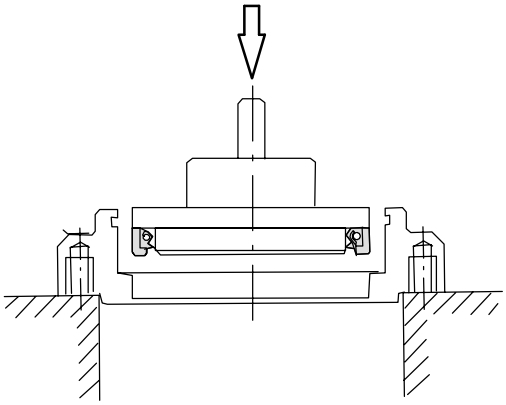
12. Clean all seal and bearing locations. Remove remaining locking fluid from the turbine wheel and hub splines.

13. Clean every parts thoroughly and change worn parts. Apply EP grease onto the rubber seals.

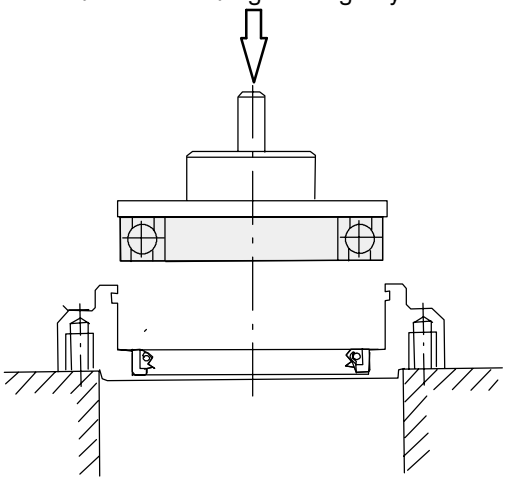
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B. Assembling hydraulic coupling

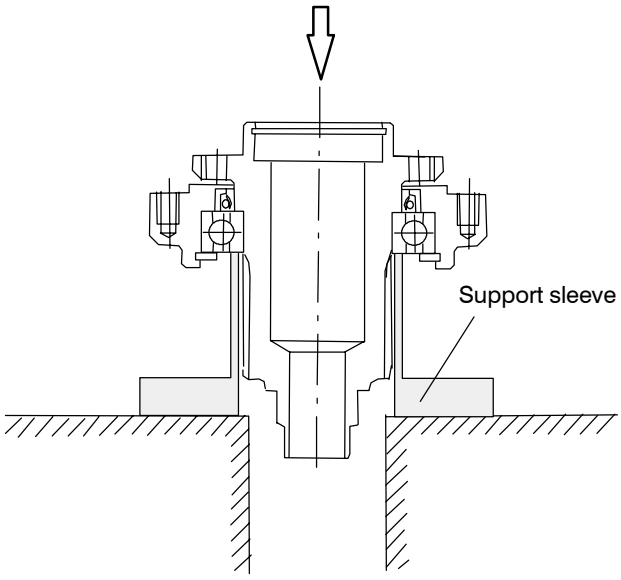
1. Grease lips and outer face of the seal with EP–grease.



2. Fit the seal into the bearing housing fully home.



3. Fit the bearing and fit the bearing circlip.



4. Support against the bearing inner race and press the hub into place fully home.

5. Fit the spacer ring in front of the bearing. Apply Loctite 601 to the hub splines. Fit the turbine wheel onto the hub splines fully home.

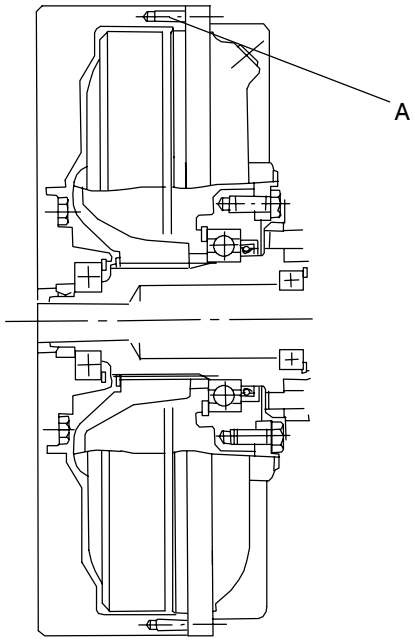
6. Remove possible excess Loctite. Fit the circplip in front of the turbine wheel.

Note! Wait about 15 minutes before continuing assembling.

7. Fit the gasket onto the hub flange and fit the pump wheel so that the holes align.

8. Apply Loctite 242 to the pump wheel bolts (12 off) and tighten them to **50 Nm**.

9. Grease and fit a new o–ring onto the pump wheel outer circle. Place the hydraulic coupling carefully onto the flywheel so that the coupling hub front end fits into the seal and bearing on the flywheel.



10. Tighten the hydraulic coupling fixing bolts (A) evenly to **23 Nm**.

11. Fill the coupling with correct amount of correct oil (engine oil SAE 10W/30). Unscrew the filling plug. Make sure there is a seal ring on the plug.

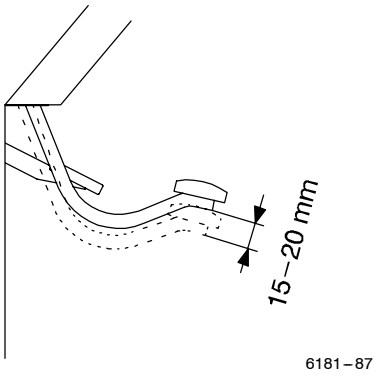
12. Fit the attaching plate of the mechanical clutch (**80 Nm**, Loctite 542). Fit the clutch and assemble the tractor frame at clutch. (see instr. **411 1D**).

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4. Adjusting and repair instruction for clutch release mechanism of cable type, 659478–

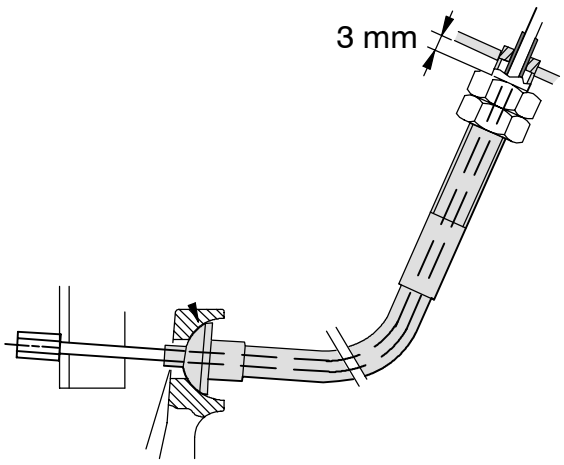
Note! This new mechanism is fitted on all 6000–8400 tractors with effect from tractor ser. no. **659478**.

A. Adjusting clutch pedal free travel.



2. The free travel at the pedal should be **10–15 mm**. The free travel is difficult to verified by depresseing the pedal.

3. If the free travel is not correct, adjust it with an adjusting sleeve at the cable lead–in point in the cab front wall.



4. When the pedal is in the upper position, the distance between the cab wall and the adjusting sleeve should be 3 mm, which corresponds to the correct free movement.

Note! The distance is adjusted by turning the sleeve and by moving the cable until the free travel between the sleeve and the cab front wall is correct. If the pedal does not return to the upper position, it may be necessary to adjust the clutch servo, see page **410**/**5**.

B. Clutch repairs

The tractor frame is split and assembled according to instructions **411 1A** and **D**. The clutch assembly is the same as earlier.

The release bearing cannot be removed as described in instr. **C** on page **411**/**3**. The easiest way to remove the bearing is to place a suitable drift against the bearing support tube and by pulling out the bearing with an extractor.

C. Changing release cable

The cable can be changed without splitting the tractor. There is an access hole on the tractor frame through which the clutch end of the cable can be disconnected from the upper end of the release lever. After changing the cable, the clutch pedal free travel should be adjusted.

Note! The clutch cable has been strengthened with effect from tractor ser. no. **665081.** The new cable is exchangeable with the earlier cable after renewing the adjusting nut. On Hi–Trol models the cable upper end fork should also be changed. The Spare Part Centre dispatches only the new cables. All earlier type cables should be returned to the tractor factory.

Check the function of the cable via the access hole.

If the cable does not function correctly, split the tractor at the clutch and check the position and alignment of the clutch lever and the cable support. The support groove must must be in line with the clutch lever, clutch shaft centre and clutch lever attachment centre line.

If necessary, remove the support and reweld it into place. Check the function of the clutch lever lower end ball joint. Assure that the cup springs are fitted correctly. Nut tightening: first fully home and upscrew it 3/4 or 1/4 turn (depending on the tractor ser no). Reassemble the tractor.

Check again the function of the cable. Test–drive the tractor and check the adjustment of the cable and readjust, if necessary

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5. Hydraulic clutch release mechanism, 668103–.

A. Bleeding the clutch circuit

Note! The bleeding hose/nipple is placed on the LH side of the tractor frame.

This release mechansim does not normally require any adjustments. The clutch pedal free travel cannot be felt, since the release bearing is in the continuous contact with the clutch. If the clutch does not release, the system must be bled.

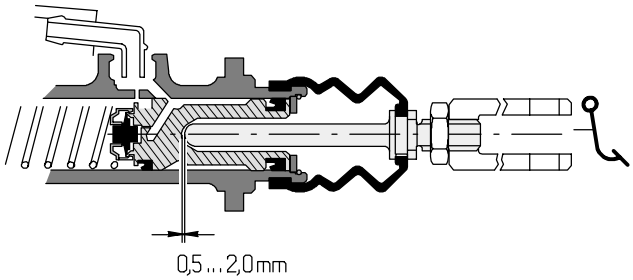
Note! Check that the reservoir is full of brake fluid before bleeding. Pump with the clutch pedal a few times, so that the system is under pressure.

– Depress the clutch pedal and at the same time open the bleeding nipple.
– When the pedal is down, close the nipple and allow the pedal to rise up.
– Continue in this way until no air bubbles come out of the nipple
– Check again liquid level in the reservoir and top up if necessary

Note! Do not allow the liquid to contact the tractor frame, since the brake fluid can damage the paint.

B. Adjusting the pedal free travel

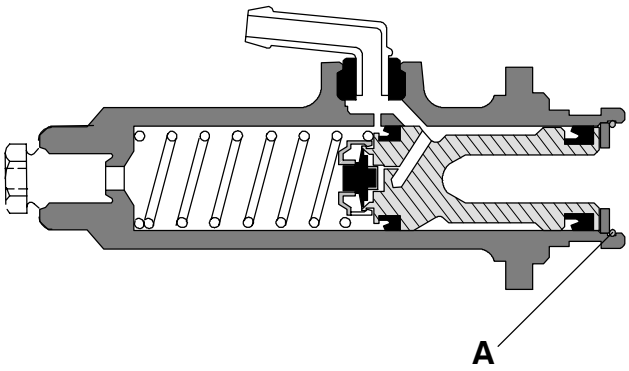
The free travel cannot be felt, since the release bearing touches the clutch release fingers all the time. Normally the pedal does not need any adjustment.



Adjust the distance between the master cylinder piston and the pedal push rod to **0,5–2,0 mm**, when the pedal is in the upper position.

This clearance can be adjusted by slackening the clevis lock nut and by rotating the clevis.

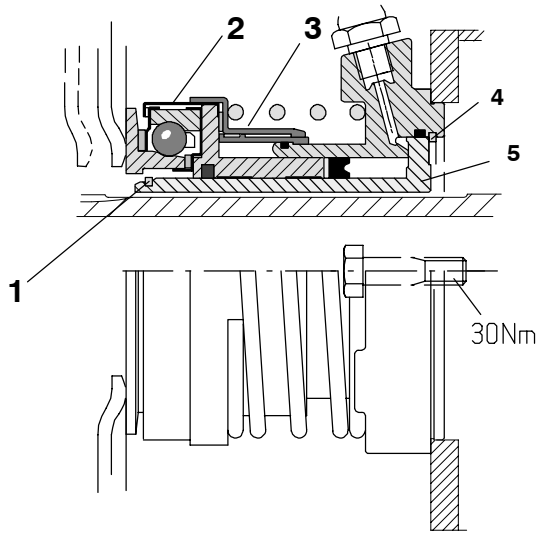
C. Master cylinder



The master cylinder is attached with two bolts onto the cab front wall.
A seal kit is available for the cylinder. The seals, piston and the spring can be removed from the cylinder by removing the circlip A and the intermediate ring behind the circlip. Lubricate new seals with brake fluid. The seals must not be lubricated with oil, because oil damages them.

D. Slave cylinder/release bearing

Note! The tractor frame is split at the clutch as before according to instruction **A** on page **411/1**. Assemble the tractor frame according to instr. **D** on page **411/3**.



1. The slave cylinder unit is attached with three bolts onto the tractor frame. The pressure hose and the bleeding hose have different threads.

2. The release bearing can be removed by releasing circlip 1. Before removing the bearing, the locking sleeve 2 claws should be released from the flange.

3. The plastic covering 3 cannot be removed separately. The guide sleeve 5 loosens, when you remove the circlip 4.

Important! The slave cylinder seals must not be lubricated with mineral oil. The seals are lubricated with brake fluid.
Note! When the clutch disc linings are worn, the slave cylinder shrinks correspondingly and the stroke of the cylinder remains the same (about 10 mm).

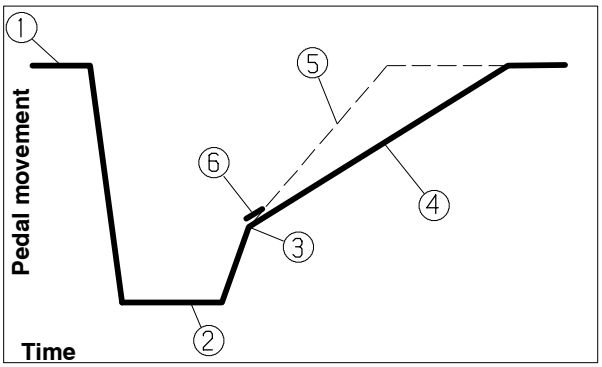
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6. HiShift

A. Adjustment

Note! Adjustment has been done in the factory and HiShift does not normally require any adjustment. In connection with repair works the adjustment can be done according to this instruction.

Note! There is an access hole on the side of the steering wheel console, through which the adjusting screw can be turned.



1. Pedal up
2. Pedal down
3. Knee point
4. Driving speed < 4 km/h
5. Driving speed > 4 km/h
6. Clutch slips and engages

1. Check the clutch fluid level. Raise the tractor on axle stands. Start the engine and use the HiShift several times so that air is removed from the system.

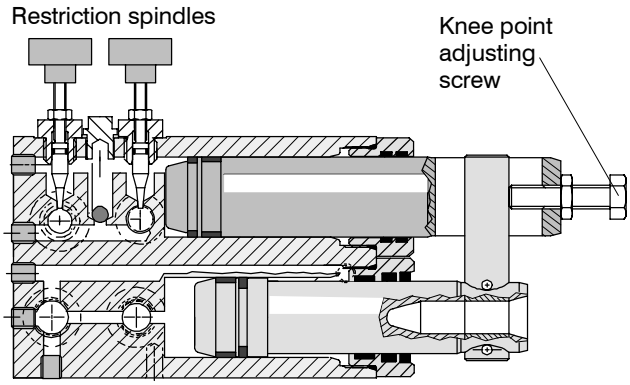
2. Close the cab side restriction spindle. The foremost restriction spindle should be open 2 turns.

3. Depress the clutch pedal by using the push button. Select e.g. gear F/M/1. Adjust engine revs to 800–1000 r/min (greater than 1500 r/min if the tractor has a fluid coupling, i.e. Hi–Trol models).

4. Release the button at which time the pedal rises up to the knee point (3), in which the working cylinder piston rests against the damping piston. Tractor wheels must not rotate.

5. Open the cab side restriction a little, at which time the pedal starts to rise slowly. The wheels must start to rotate before the pedal has risen **10 mm** (ideal value 5 mm) from the knee point.

Note! On account of possible small leakage of the restriction spindle the pedal can start to rise slowly before the restriction spindle is opened. The knee point (3) can, however, be observed from change of rising speed of the pedal.



6. If necessary, adjust the position of the knee point (adjusting screw at the end of the damping piston). Screw outwards=point rises and vice versa.

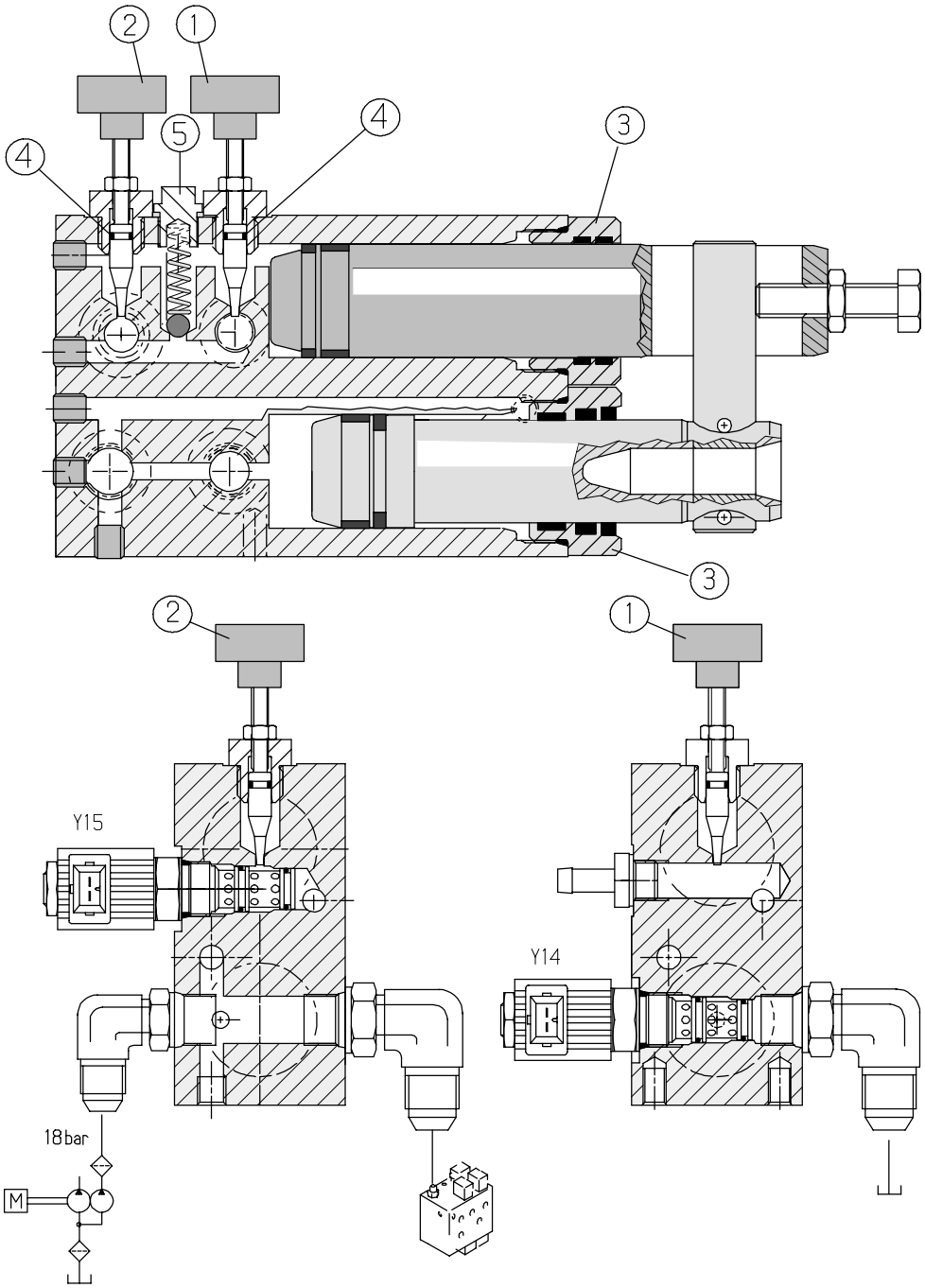
7. When the knee point has been adjusted, close the cab side restriction and then open it **1+1/4** turns. The foremost restriction should be open **2** turns (factory setting). Lock the restriction spindles.

8. In a test–drive with driving speeds under 4 km/h the pedal rises up slower (4) (restriction 1+1/4). With speeds over 4 km/h the pedal rises up faster (restriction (1+1/4)+(2)). When the shuttle lever button is used , the pedal always rises slower regardless of the driving speed.

Note! Tractor driver can adjust the Hi Shift between certain limits according to his own choice. However, the cab side restriction must always be open at least 1 turn, to prevent excess wear of the clutch disc.

9. Check the function of the clutch. Drive under and over 4 km/h and check that the engagement occurs softly. Ensure, that the pedal hinge functions. Check for leaks.

Fault tracing.
If the clutch pedal in paragraph 4 rises direct to the upper position:
– the cab side restriction spindle leaks.
– solenoid valve Y15 does not function or leaks.
– damping cylinder filling valve leaks.



B. HiShift hydraulic block

Oil continuously circulates in the HiShift block from the tractor low pressure circuit and its pressure releases and engages the clutch. If the low pressure circuit has malfunctions, it affects the Hi Shift.

The damping part is not connected to the tractor hydraulic system, but its own circuit uses clutch fluid (=brake fluid). In connection with malfunctions, check the clutch fluid level in the reservoir, when the pedal is in the upper position.

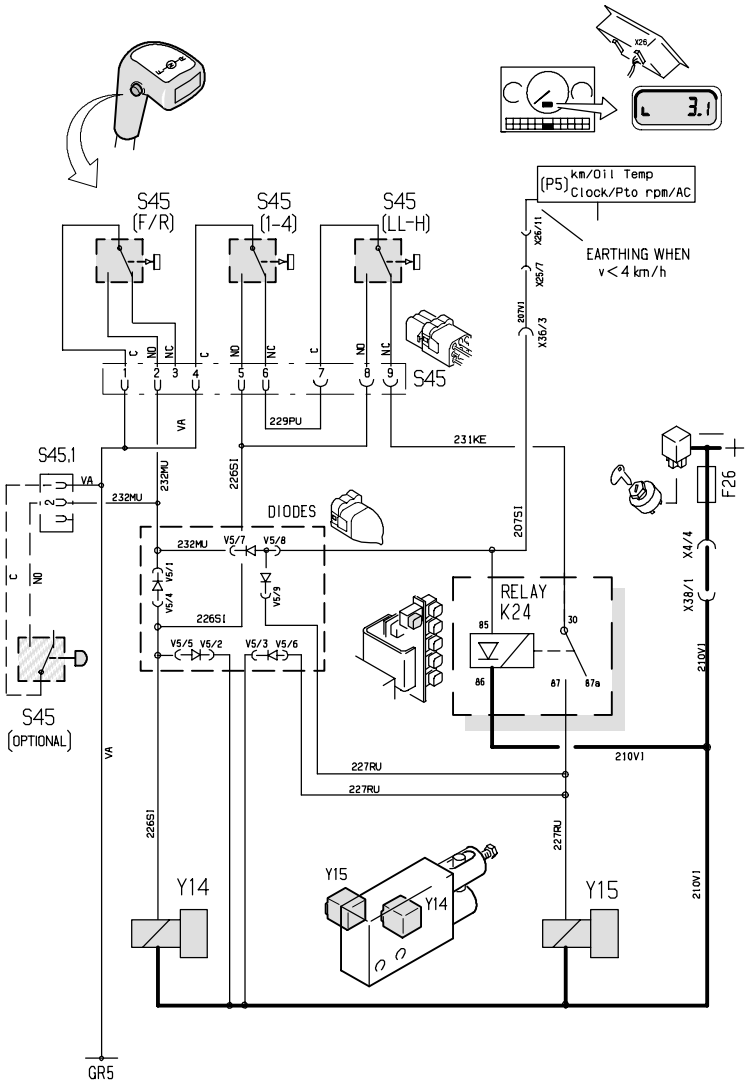
Leaking piston seals can be changed after unscrewing seal flanges (3). The filling valve spring and ball can be removed by unscrewing plug (5) between the restrictions (1 and 2).

The restriction spindles have o–rings (4), which can be changed. Do not screw in the spindles too hard, otherwise the spindle tapered surfaces can damage. The restriction spindles have securing nuts.

Important! The seal rings of the damping cylinder solenoid valve Y15 are of different material to the seal rings of the solenoid valve Y14, and they must not be interchanged.
Note! Before fitting the solenoid, make sure that the circuit in question is brake fluid circuit. Remove o–rings on the new solenoid valve, wipe off oil on the new solenoid and lubricate new o–rings, which are delivered with the repair kit, with brake fluid and fit them (do not lubricate the o–rings with oil).
In connection with repair works the solenoid valve Y15 seal rings must not lubricate with oil but, if needed, with clutch fluid.

In connection with repairs, tighten the joint between the hydraulic block and the cab front wall to make watertight (e.g.Silicone 2650 black).

C. HiShift electric system



Note! When the buttons are pushed, the solenoid valve Y14 is grounded and it becomes energised and the clutch pedal is depressed. AD–instrument grounds via relay K24 the solenoid valve Y15, when driving speed is under 4 km/h, and the pedal rises up slower. When the shuttle lever button is used, the valve Y15 is always grounded regardless of the driving speed.

–If the HiShift does not function:
– check fuse F26. If the fuse blows repeatedly, the fault can lie in diodes.
– check the resistance of the solenoid valves which should be **11–12 ohms**.
– when 12 V is fed to the valve pins, the valves must become magnetic and the spindle must move (click).

If the fuse and the solenoid valves are OK, but the Hi Shift has malfunctions:
– measure whether there is a voltage of 12 V in the connector pins of Y14 when the buttons are depressed. If not, the fault can lie in the valve wires or in the push buttons. Check/ /correct.
If the pedal rising speed has malfunctions:
– measure whether there is a voltage of 12 V in the connector pins of valve Y15 when the driving speed is under 4 km/h or the tractor is stationary. If not, the fault lies in relay K24 or in valve wires.
– when driving speed is over 4 km/h, the valve Y15 should be unenergised and the pedal rises up faster.
– If the pedal rises never slower when using all three buttons, the relay K24 is faulty.

If the pedal does not always rise slower when using the shuttle lever button
– check function of other buttons. If with the other buttons the Hi Shift functions correct, but not with the reverse shuttle lever button, the fault lies in the diodes.

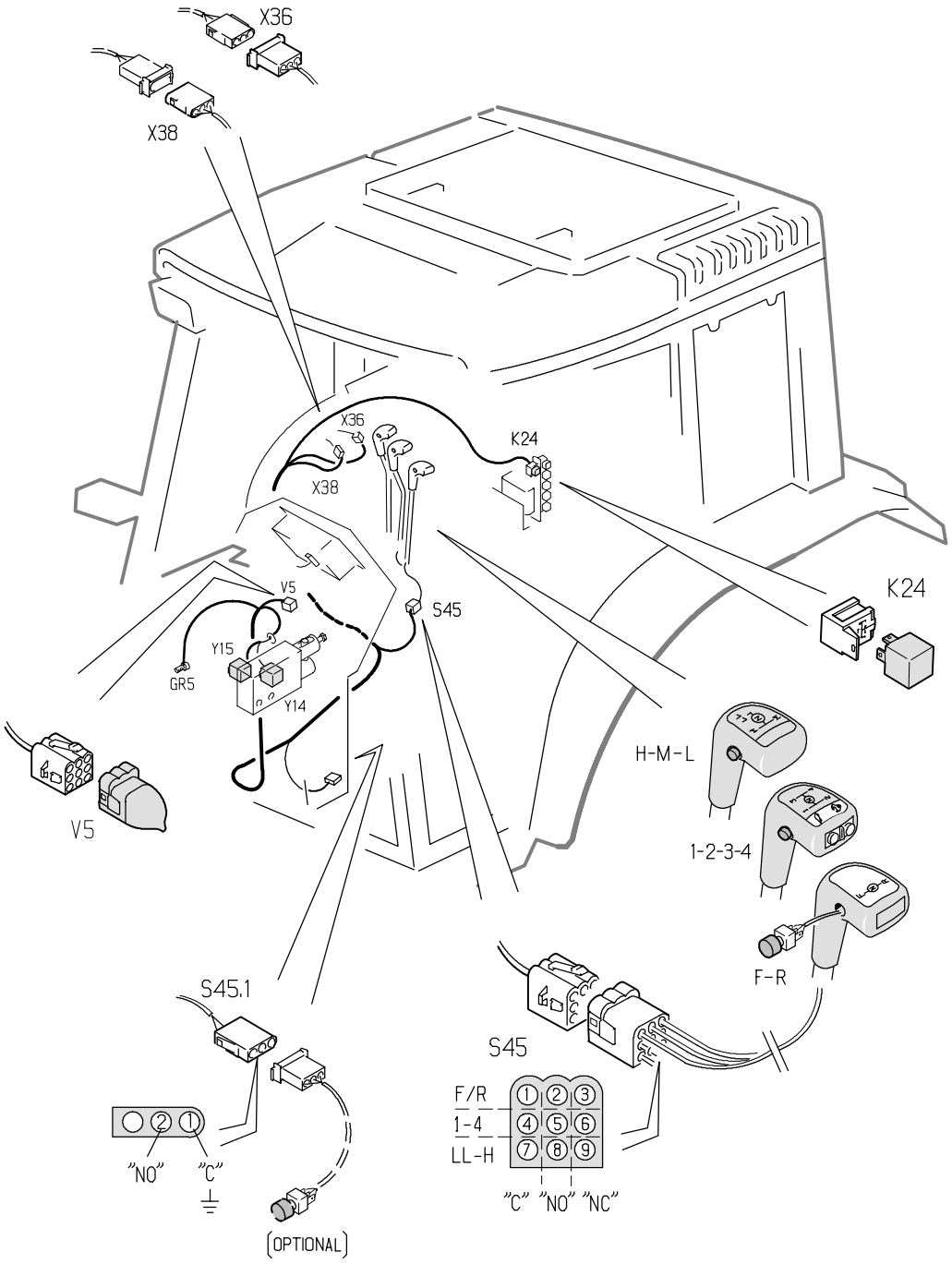
Valve Y15 has been connected to the speed sensor B6 of the AD–instrument. If the instrument shows correct speed and travelling distance, the sensor B6 is in order. Otherwise the sensor should be checked/changed, see page 331/4.

Diode housing V5 is placed in the steering wheel console. In case of diode damages the whole housing should be changed.

Earthing point GR5 is under the dash board (cab wire loom).

Relay K24 is situated in the lever console beside the relays for the AC II.

Note! The push button wires have been soldered to the buttons. As a spare part is dispatched wires together with the buttons. The wire lower ends have connectors



Positions of electrical components for HiShift.

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Differential 11
Gear shift lever system 12
Power transmission, servo and lubricating system 17
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C. Fitting gearbox side cover 2

2. Changing selector forks 2

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1. Changing/reconditioning differential:
A. Changing differential gears/diff. lock friction discs 1

Technical data

Number of gears (numbers in brackets refer to tractors with quick–shift gear) ((Delta Powershift)):
– forwards . . . . . 12 (24) ((36))
– reverse . . . . . 12 (24) ((36))

Oil

(common to transmission and hydraulics)
Viscosity and quality grade: see page 130/4.
Oil volume: see page 130/4.

Warning lights for gearbox oil pressure and temperature. Oil cooler as standard.
Pressure lubrication for input shaft and bevel pinion shaft.
Lubricating oil pressure–relief valve, opening pressure . . . . . 0,2 MPa
Suction strainer, degree of separation . . . . . 125 μm
Pressure filter, filtration capacity . . . . . β10=75

Differences between gearboxes on 6100–8400 tractors, which have a 2–speed quick–shift gear

	Transmission 30 km/h		Transmission 40 km/h	
Number of teeth	**6100–6400 8000**	**6600, 8100 8400**	**6100–6400 8000**	**6600, 8100 8400**
– bevel pinion shaft/crown wheel	Z7/Z40	Z7/Z40	Z9/Z38	Z9/Z38
Gears for 4WD:				
– in front end of bevel pinion shaft	Z34	Z28	Z39	Z33
– in front end of transmission shaft	Z41	Z47	Z35	Z41
Differential				
– number of differential pinions	2 pcs	4 pcs	2 pcs	4 pcs

Tractors with ground speed PTO; there is a coupling, selector fork and shaft for PTO in the gearbox. Transmission 50 km/h, see pictures on pages 420/8 and 9. **Tractors with Delta Powershift, see the next page 420/2A.**

Tightening torques

Gearbox
Bevel pinion shaft ring nuts (+transmission shaft ring nut) . . . . . 270 Nm
Input shaft front end cover . . . . . 21–25 Nm
Layshaft front end cover . . . . . 21–25 Nm
Gearbox side cover screws . . . . . 50 Nm
Differential
Crown wheel fixing bolts . . . . . 110 Nm
Differential bearing cover screws . . . . . 40–50 Nm
Frame joints
Gearbox–fuel tank:
– upper studs . . . . . 270–330 Nm
– lower hexagonal socket–head screws . . . . . 125 Nm
Gearbox–reverse shuttle . . . . . 21–25 Nm
Gearbox–power take–off:
– upper studs (8 pcs) . . . . . 270–330 Nm
– lower studs (6 pcs) . . . . . 72–88 Nm
Gearbox–brake housings . . . . . 270–330 Nm
Propeller shaft flange joints . . . . . 35 Nm

Settings

Gearbox
Pinion shaft rolling resistance measured with torsion meter at front end of shaft
(without differential) . . . . . 1,7–2,3 Nm
Input shaft end float . . . . . 0,025–0,075 mm
Layshaft end float . . . . . 0,025–0,075 mm
Differential
Differential bearing preload measured with torsion meter at front end of bevel pinion shaft
=pinion shaft rolling resistance+ . . . . . +0,6–1,7 Nm (Z7/40, Z8/42)
+0,8–2,2 Nm (Z9/38)
+1,0–2,8 Nm (Z11/37)
Tooth backlash, pinion/crown wheel . . . . . 0,175–0,325 mm

Sealing compounds and locking fluids used

Reverse shuttle–gearbox, sealing Hylosil RTV Grade 102 Black
Power take–off–gearbox, sealing Hylosil RTV Grade 102 Black
Brake housings–gearbox, sealing Hylosil RTV Grade 102 Black
Side cover–gearbox, sealing Hylosil RTV Grade 102 Black
Threads on selector fork rails (+transmission shaft ring nut), Loctite 242
Crown wheel fixing bolts, Loctite 273

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Markings of gearboxes

With effect from tractor ser. no **662134** the gearboxes have been marked with letter codes. The purpose is to make recognizing of the gearboxes easier in connection with tyre changing, repair works and when fitting parts for the ground speed PTO. Concerning PTO unit markings, see page 460/2A. The gearboxes listed below are fitted on tractors which have a Delta Power Shift or the DPS can be retrofitted.

Transmission 300: 6000--6400 (--K41105), **8000** (--H12332) (DPS 300, gearbox 300, rear axles 300, PTO 300 (--G18213), PTO 450 (G18214--)). **Transmission 550** replaces **transmission 300** from ser. no. **K41106** incl.

Letter	Type		Number of gears	Ratio front/rear	Part no	Z	Z 4WD
A	40 km/h	DPS	36	1,332	32825210	Z8/42	Z32/37
	30 km/h	DPS	33	1,332	32825210	Z8/42	Z32/37
B	40 km/h	DPS, AVO	36	1,332	32825310	Z8/42	Z32/37
	30 km/h	DPS, AVO	33	1,332	32825310	Z8/42	Z32/37
C	40 km/h		12	1,334	32825410	Z9/38	Z42/39
	30 km/h		11	1,334	32825410	Z9/38	Z42/39
D	40 km/h	AVO	12	1,334	32825510	Z9/38	Z42/39
	30 km/h	AVO	11	1,334	32825510	Z9/38	Z42/39
J	40 km/h	DPS	36	1,391	32825200	Z7/40	Z34/41
	30 km/h	DPS	33	1,391	32825200	Z7/40	Z34/41
K	40 km/h	DPS, AVO	36	1,391	32825300	Z7/40	Z34/41
	30 km/h	DPS, AVO	33	1,391	32825300	Z7/40	Z34/41
L	40 km/h		12	1,381	32825400	Z9/38	Z39/35
	30 km/h		11	1,381	32825400	Z9/38	Z39/35
M	40 km/h	AVO	12	1,381	32825500	Z9/38	Z39/35
	30 km/h	AVO	11	1,381	32825500	Z9/38	Z39/35

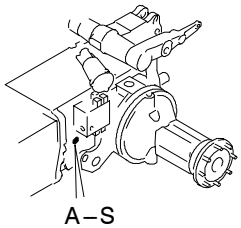
Transmission 390: 6900 (--K36111), **8000** (H12333--K36111) (DPS 300, gearbox 390 (As transmission 300, but four diff. pinions in differential), rear axles 300, PTO 450).

AA	40 km/h	DPS	36	1,332	33394600	Z8/42	Z32/37
BA	40 km/h	DPS, AVO	36	1,332	33394700	Z8/42	Z32/37
CA	40 km/h		12	1,334	33394800	Z9/38	Z42/39
DA	40 km/h	AVO	12	1,334	33394900	Z9/38	Z42/39

Transmission 450: 6600--6800 (--G01400)**, 8100--8400** (--668102) (DPS 300, gearbox 450, rear axles 450, PTO 450)

E	40 km/h	DPS, AVO	36	1,315	32779900	Z9/38	Z33/41
	30 km/h	DPS, AVO	33	1,315	32779900	Z9/38	Z33/41
F	40 km/h	DPS	36	1,315	32824700	Z9/38	Z33/41
	30 km/h	DPS	33	1,315	32824700	Z9/38	Z33/41
G	30 km/h	DPS, AVO	36	1,317	32824800	Z7/40	Z28/47
H	30 km/h	DPS	36	1,317	32824900	Z7/40	Z28/47
I	50 km/h	DPS, AVO	24	1,337	32825000	Z11/37	Z38/37
N	50 km/h	DPS	24	1,337	33094700	Z11/37	Z38/37

DPS=Delta Power Shift
AVO=Ground speed PTO
Ratio front/rear=ratio between the front and rear axle. E.g. Front wheels rotate 1,332 turns/1 rear wheel turn.
Z=number of teeth on pinion/crown wheel.
Z 4WD=number of teeth on the 4WD gear wheels in the gearbox.
Part no=spare part number of the complete gearbox.


A--S

Note! Earlier the max. speeds of the transmissions (30 km/h and 40 km/h) were created by changing a number of teeth on the pinion/crown wheel. On the latest transmissions the max. speed is limited with a mechanical blocking device in the gearbox. The blocking device prevents engagement of the highest gear H4 in transmission 30 km/h.

The letter has been stamped on the LH side of the gearbox.

Transmission 460: 8200, 8400 (668103–), **8050 and 8150** (–F32103) (DPS 460, gearbox 450, rear axles 450, PTO 450.

Letter	Type		Number of gears	Ratio front/rear	Spare part number	Z	Z 4WD
P	40 km/h	DPS	36	1,309	33094900	Z8/42	Z29/45
	30 km/h	DPS	33	1,309	33094900	Z8/42	Z29/45
O	40 km/h	DPS, AVO	36	1,309	33094800	Z8/42	Z29/45
	30 km/h	DPS, AVO	33	1,309	33094800	Z8/42	Z29/45
S	50 km/h	DPS	36	1,315	33095100	Z9/38	Z33/41
R	50 km/h	DPS, AVO	36	1,315	33095000	Z9/38	Z33/41

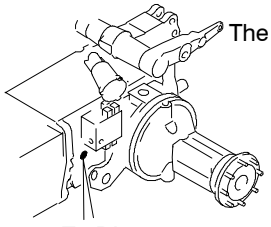
Transmission 650: 8450–8750, 8050 and 8150 (F32104–)**, 6600 and 6800** (G01401–)
6250Hi–8950Hi (K36108–), **8350Hi–8950Hi** (**–**L32105)

Transmission 550: 6200–6550Hi (J12242–), **6200–6400** (K41106–)
(DPS 650, gearbox 650/550, rear axles 450/650, PTO 650).

Note! Transmission 550 is the same as 650, but 550 has only two differential pinions, 650 has four. The 4WD ratio is different.

Letter	Type		Number of gears	Ratio front/rear (SIGE)	Ratio front/rear (CARRARO)	Spare part number	Z	Z 4WD
T (650)	40 km/h	DPS, AVO	36	1,309		33086100	Z8/42	Z29/45
U (650)	40 km/h	DPS	36	1,309		33086200	Z8/42	Z29/45
V (650)	50 km/h	DPS, AVO	36	1,315		33086300	Z9/38	Z33/41
Y (650)	50 km/h	DPS	36	1,315		33086400	Z9/38	Z33/41
EA (650 Hi)	40 km/h	DPS, AVO	36	1,309	1,320	33511900	Z8/42	Z29/45
FA (650 Hi)	40 km/h	DPS	36	1,309	1,320	33512000	Z8/42	Z29/45
GA (650 Hi)	50 km/h	DPS, AVO	36	1,315	1,326	33512100	Z9/38	Z33/41
HA (650 Hi)	50 km/h	DPS	36	1,315	1,326	33512200	Z9/38	Z33/41
IA (650 Hi)	40 km/h ***)**	DPS, AVO	36	1,315	1,326	33673200	Z9/38	Z33/41
JA (650 Hi)	40 km/h ***)**	DPS	36	1,315	1,326	33673300	Z9/38	Z33/41
KA (550 Hi)	40 km/h	DPS, AVO	36	1,339		33757600	Z8/42	Z29/44
LA (550 Hi)	40 km/h	DPS	36	1,339		33757700	Z8/42	Z29/4
MA (550)	40 km/h	DPS, AVO	36	1,339		34257500	Z8/42	Z29/44
NA (550)	40 km/h	DPS	36	1,339		34257600	Z8/42	Z29/44
OA (550)	40 km/h	AVO	12	1,337		34257700	Z11/37	Z38/37
PA (550)	40 km/h		12	1,337		34257800	Z11/37	Z38/37

DPS=Delta Power Shift
AVO=Ground speed PTO
Ratio front/rear=ratio between the front and rear axle. E.g. Front wheels rotate 1,332 turns/1 rear wheel turn.
Z=number of teeth on pinion/crown wheel.
Z 4WD=number of teeth on the 4WD gear wheels in the gearbox.
Part no=spare part number of the complete gearbox.
***)** Low revs tractor



The letter has been stamped on the LH side of the gearbox.

T–PA

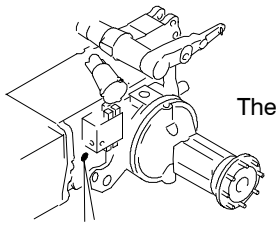
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Transmission 700: 8350Hi–8950Hi (L32106–)

(DPS 650, gearbox 700, rear axle 700)

Letter	Type		No. of gears	Gear ratio front/rear	Part no.	Z	Z 4WD
RA (700 Hi)	40 km/h	DPS, AVO	36	1,327	34469700	Z9/38	Z29/45
SA (700 Hi)	40 km/h	DPS	36	1,327	34469800	Z9/38	Z29/45
TA (700 Hi)	50 km/h	DPS, AVO	36	1,321	34469900	Z11/37	Z33/41
UA (700 Hi)	50 km/h	DPS	36	1,321	34470000	Z11/37	Z33/41
VA (700 Hi)	40 km/h ***)**	DPS, AVO	36	1,321	34470100	Z11/37	Z33/41
YA (700 Hi)	40 km/h ***)**	DPS	36	1,321	34470200	Z11/37	Z33/41

DPS=Delta Power Shift
AVO=Ground speed PTO
Gear ratio front/rear=ratio between the front and rear axle. E.g. Front wheels rotate 1,327 turns/1 rear wheel turn.
Z=number of teeth on pinion/crown wheel.
Z 4WD=number of teeth on the 4WD gear wheels in the gearbox.
Part no=spare part number of the complete gearbox.
***)** Low revs tractor



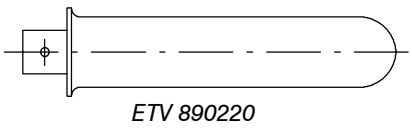
RA–YA

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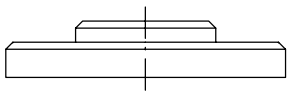
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Special tools

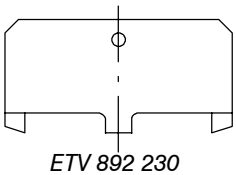
Order no	Description
ETV 890 220	Universal handle
ETV 891 870	Plate for fitting thrust bearing for differential side of gear (Gearbox 505–905)
ETV 892 230	Socket spanner for bevel pinion shaft ring nut (Gearbox 305–555)
ETV 894 190	Socket spanner for 4WD clutch drum nut
ETV 892 370	Sleeve for fitting input shaft front end bearing (Front axle 505–905) Sleeve for fitting bevel pinion shaft front end bearing
ETV 892 380	Sleeve for fitting input shaft rear end bearing (Gearbox 505–905)
ETV 893 300	Puller for differential bearings (Gearbox 505–905)
ETV 893 340	Plate for fitting bearing race, pinion shaft rear bearing (Gearbox 505–905)
ETV 893 400	Plate for fitting differential bearings (Gearbox 505–905)
ETV 894 050	Drift for fitting locking pins for selector forks
ETV 894 080	Drift for fitting selector fork rail for LL–range
ETV 894 120	Counter hold for puller ETV 893300.
Locally prepared tools	
ET 894 060	Press tool for adjusting selector forks



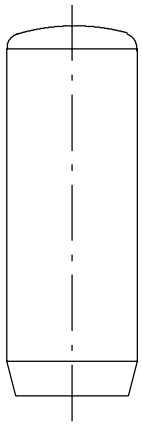
ETV 890220



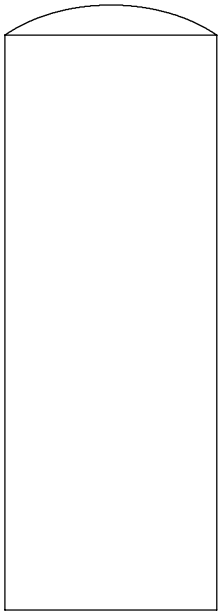
ETV 891870



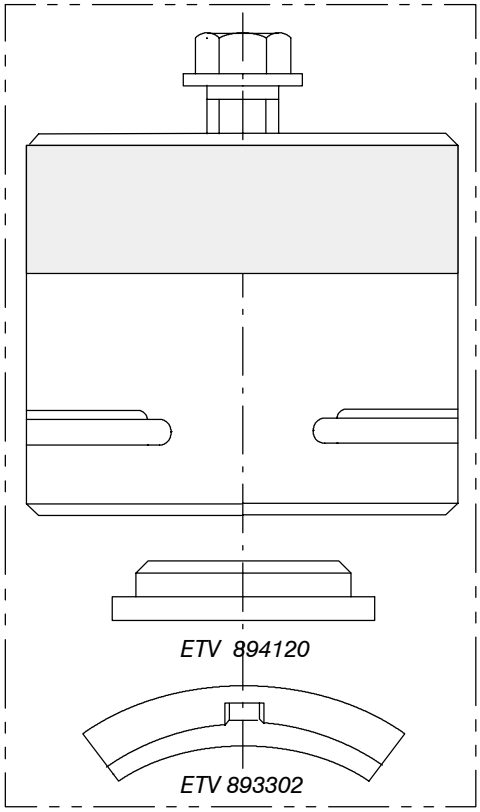
ETV 892 230



ETV 892 370



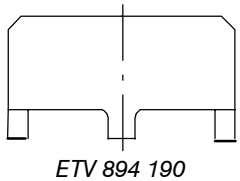
ETV 892380



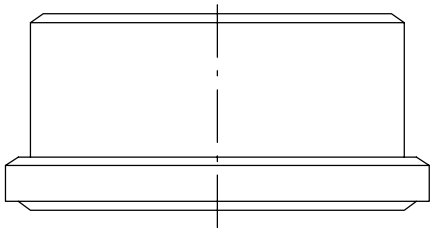
ETV 894120

ETV 893302

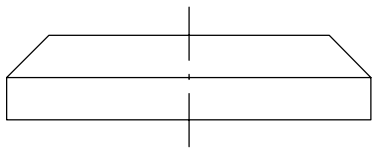
ETV 893 300



ETV 894 190

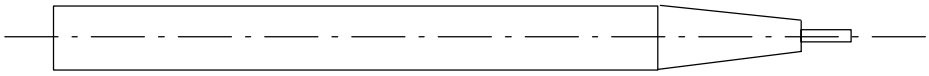


ETV 893340

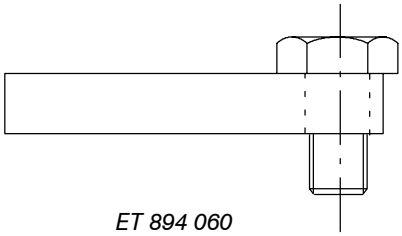


ETV 893400

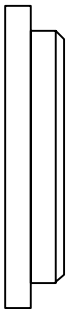
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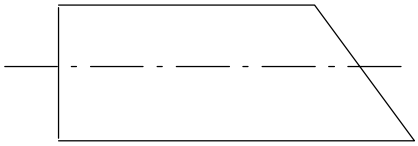


ETV 894 050



ET 894 060





ETV 894 080

ETV 894 120

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Gearbox, description

Position of the gearbox is shown in the figure below. Reverse shuttle and quick–shift gear are attached to the front of the gearbox. Power take–off is attached to the rear end. Rear axles are attached to the both sides of the gearbox. Differential is fitted in the rear part of the gearbox housing.

The gearbox is operated mechanically with a speed gear lever and range gear lever on the right hand side of the driver's seat. Gearbox has three ranges (LL–M–H) and four speed gears. The reverse shuttle is operated with a separate lever.

The quick–shift gear doubles the number of speeds. The Delta Powershift gear triplicates the number of speeds.

The gearbox is fully synchronized (except LL–range). Gear wheels have helically cut teeth. Pressure lubrication. Separate reverse shuttle.

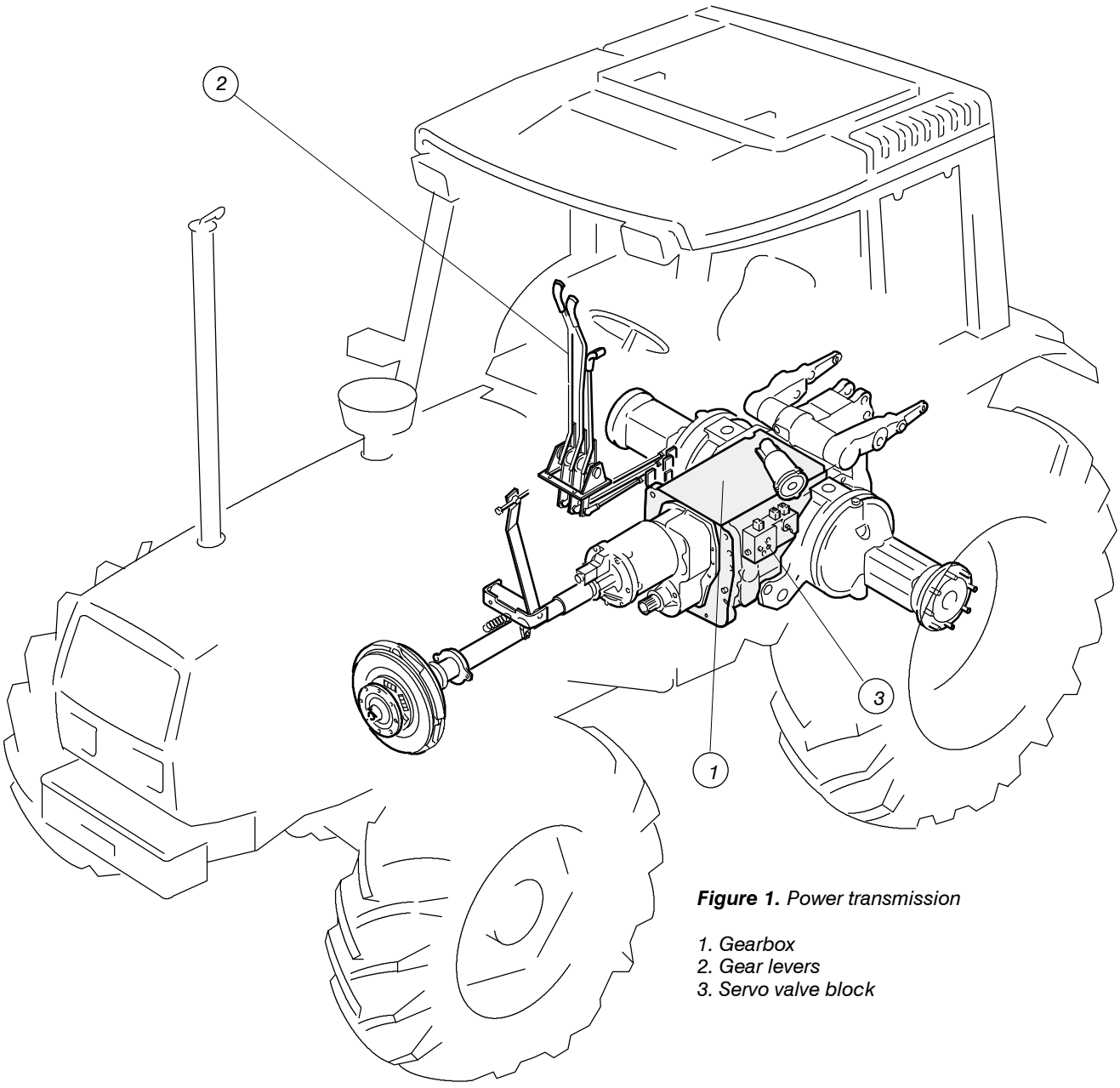


Figure 1. *Power transmission*

1. Gearbox
2. Gear levers
3. Servo valve block

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Gearbox has four shafts (or five if ground speed PTO)
– input shaft (P)
– layshaft (S)
– bevel pinion shaft (M)
– transmission shaft (U)
– ground speed PTO shaft (AVO), optional

In the lower part of the gearbox there is fitted a transmission shaft (U), which transmits LL–range to the pinion shaft and power to the ground speed PTO shaft (optional). There is a 4WD gear and 4WD clutch drum fitted in the front end of the transmission shaft. Power to the 4WD clutch drum is transmitted from the gear at the front end of the pinion shaft.

Selector fork for the ground speed PTO is fitted on the pinion shaft (M). The ground speed PTO fork is operated with the PTO control lever.

Input shaft (P), layshaft (S) and pinion shaft (M) are supported in taper roller bearings, ground speed PTO shaft (AVO) and transmission shaft (U) in ball bearings.

Input shaft and pinion shaft have pressure lubrication. Other shafts are lubricated through splash lubrication.

In the rear end of the input shaft there is a pump driving mechanism which is powered by a long drive shaft from the flywheel. Input shaft front end splines engage to the reverse shuttle gear splines.

End float for the input shaft and layshaft is adjusted with shims in the front end of the shafts. Pinion shaft bearing preload is adjusted with spacer rings (2 pcs) at the front end of the shaft. Position of the pinion shaft is adjusted with shims under the shaft rear bearing outer race.

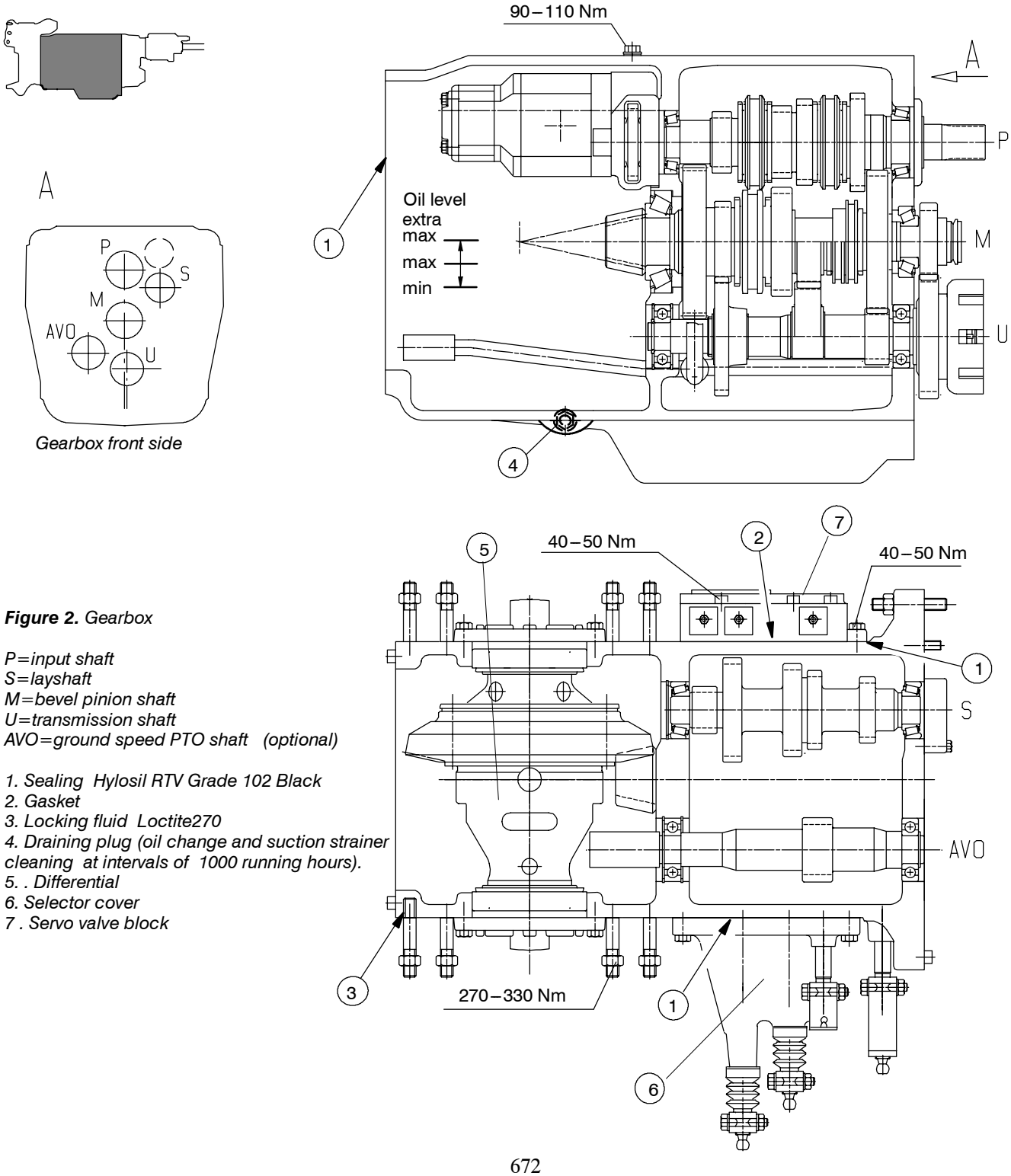


Figure 2. *Gearbox*

P=input shaft
S=layshaft
M=bevel pinion shaft
U=transmission shaft
AVO=ground speed PTO shaft (optional)

1. Sealing Hylosil RTV Grade 102 Black
2. Gasket
3. Locking fluid Loctite270
4. Draining plug (oil change and suction strainer cleaning at intervals of 1000 running hours).
5. . Differential
6. Selector cover
7 . Servo valve block

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Power routes in gearbox

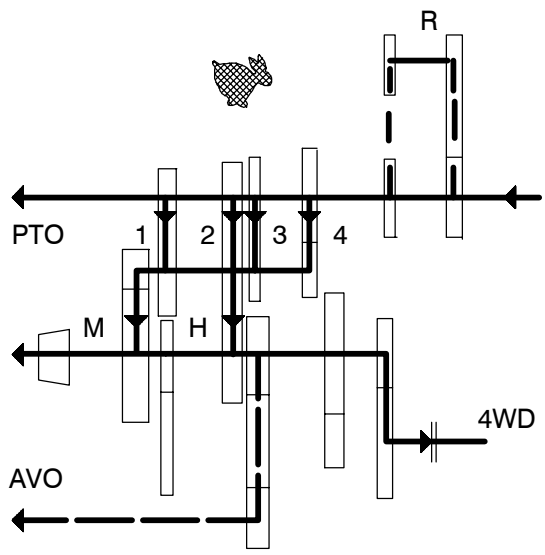


Figure 3. *Power route in ranges H and M*

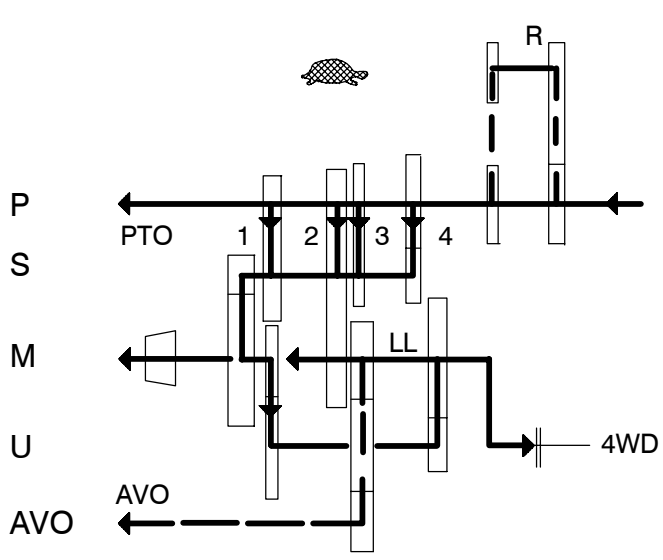


Figure 4. *Power route in range LL*

Gearbox shafts

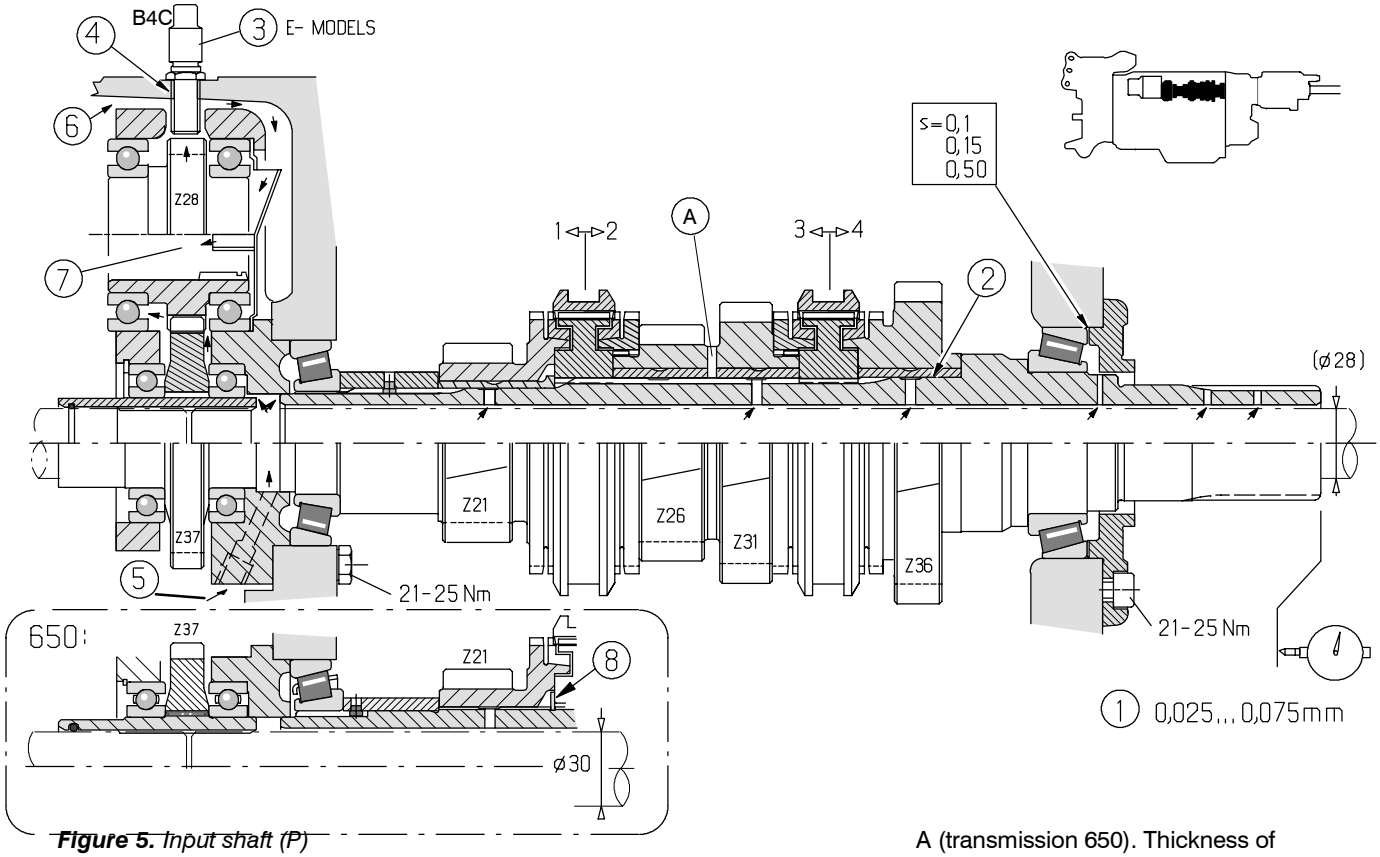


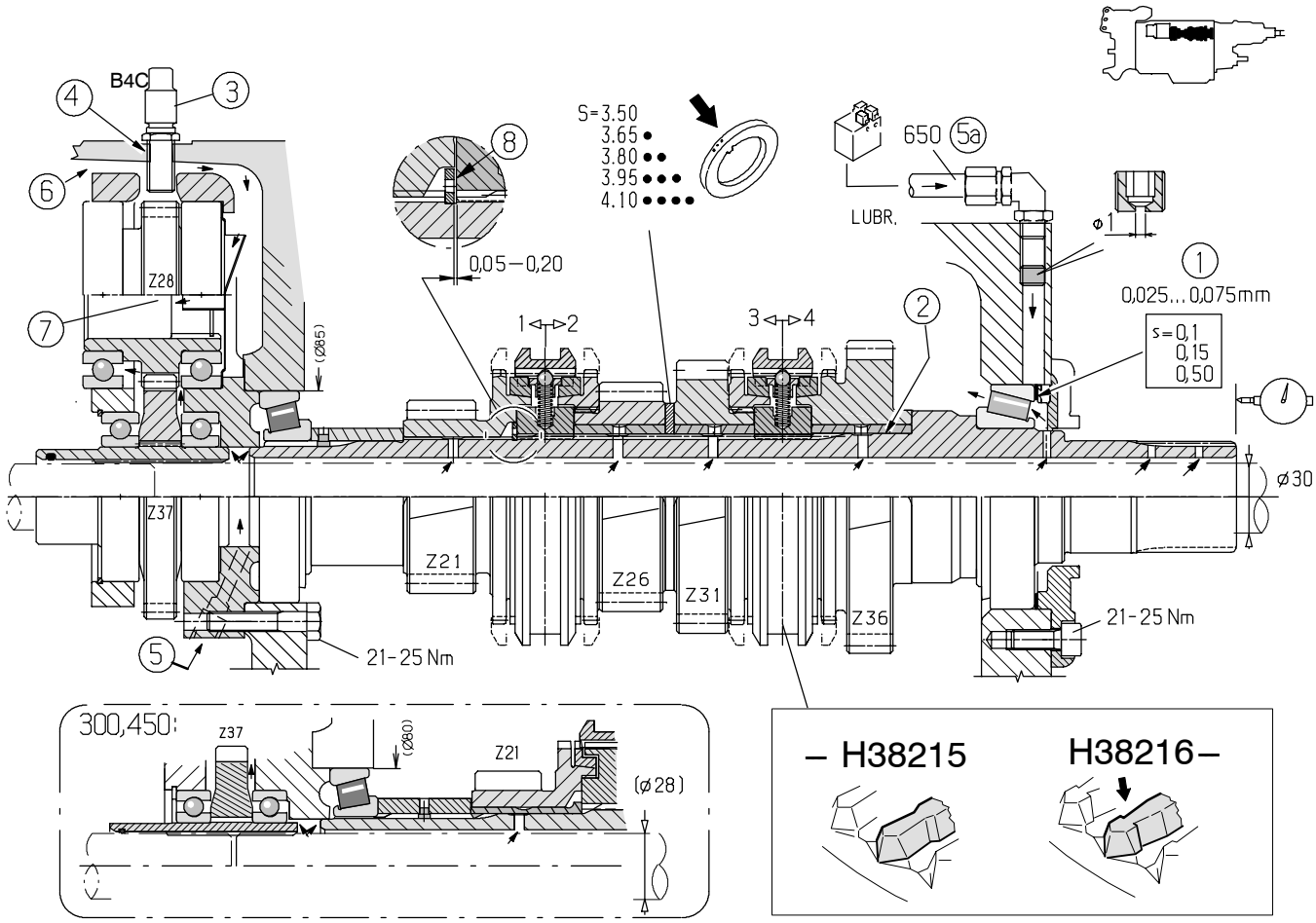
Figure 5. *Input shaft (P)*

1. Bearing end float is adjusted with shims
2. Bushing is locked with Loctite 601
3. Engine speed sensor (only 6600E and 8100E)
4. Sensor threads are locked with Loctite 542 (only 6600E and 8100E)
5. Lubricating oil to the input shaft
6. Splash oiling from crown wheel
7.Lubricating oil to pump drive shaft splines

A (transmission 650). Thickness of spacer:
3,50 mm (without dot)
3,65 mm (1 dot)
3,80 mm (2 dots)
3,95 mm (3 dots)
4,10 mm (4 dots)

Note! *In the 650 transmission the input shaft rearmost bearing is larger. Also the input shaft is different in the transmissions 300 and 460 due to the thicker pump drive shaft of the 650. In addition, gearwheel Z21 has been made broader. Spacer ring A has been added between gears Z26–Z31. Adjust the clearance beween circlip (8) and synchro hub to zero or as small as possible.*

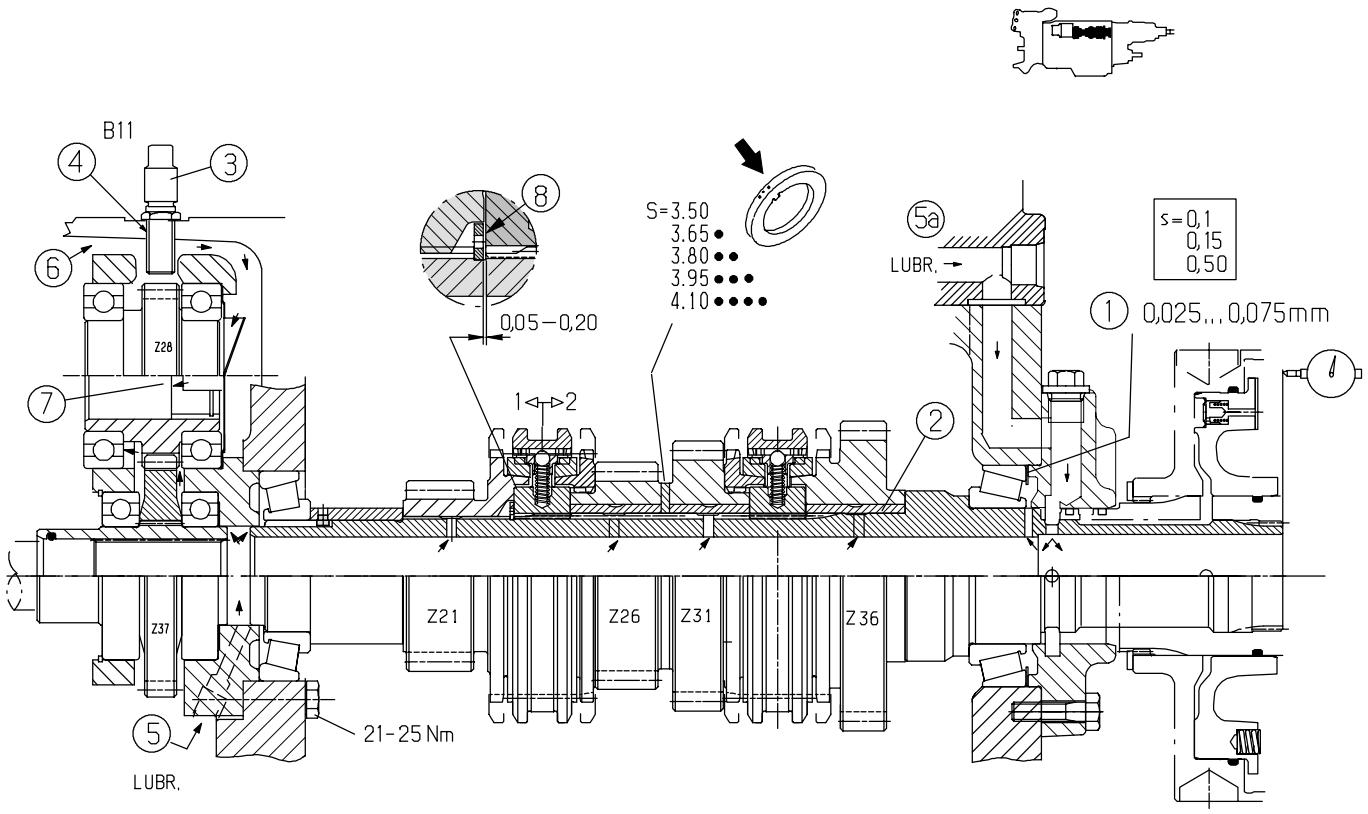
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Picture 5A. *Input shaft in transmission 650 from ser. no. H42416 incl. (not HiTech).*

1. Bearing end float is adjusted with shims
2. Bushing is locked with Loctite 601
3. Engine speed sensor (CareTel, AC V)
4. Sensor threads are locked with Loctite 542
5. Lubricating oil to the input shaft
5a. Lubricating oil onto the input shaft front bearing
6. Splash oiling from crown wheel
7. Lubricating oil to pump drive shaft splines
8. Circlip. Play between circlip and synchronizing unit hub is adjusted to 0,05–0,20 mm with a spacer between gears Z26 and Z31.

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Kuva 5B. *Input shaft in HiTech models (transmission 650).*

1. Bearing end float is adjusted with shims
2. Bushing is locked with Loctite 601
3. Engine speed sensor (CareTel, AC V)
4. Sensor threads are locked with Loctite 542
5. Lubricating oil to the input shaft
5a. Lubricating oil onto the input shaft front bearing
6. Splash oiling from crown wheel
7. Lubricating oil to pump drive shaft splines
8. Circlip. Play between circlip and synchronizing unit hub is adjusted to 0,05–0,20 mm with a spacer between gears Z26 and Z31.

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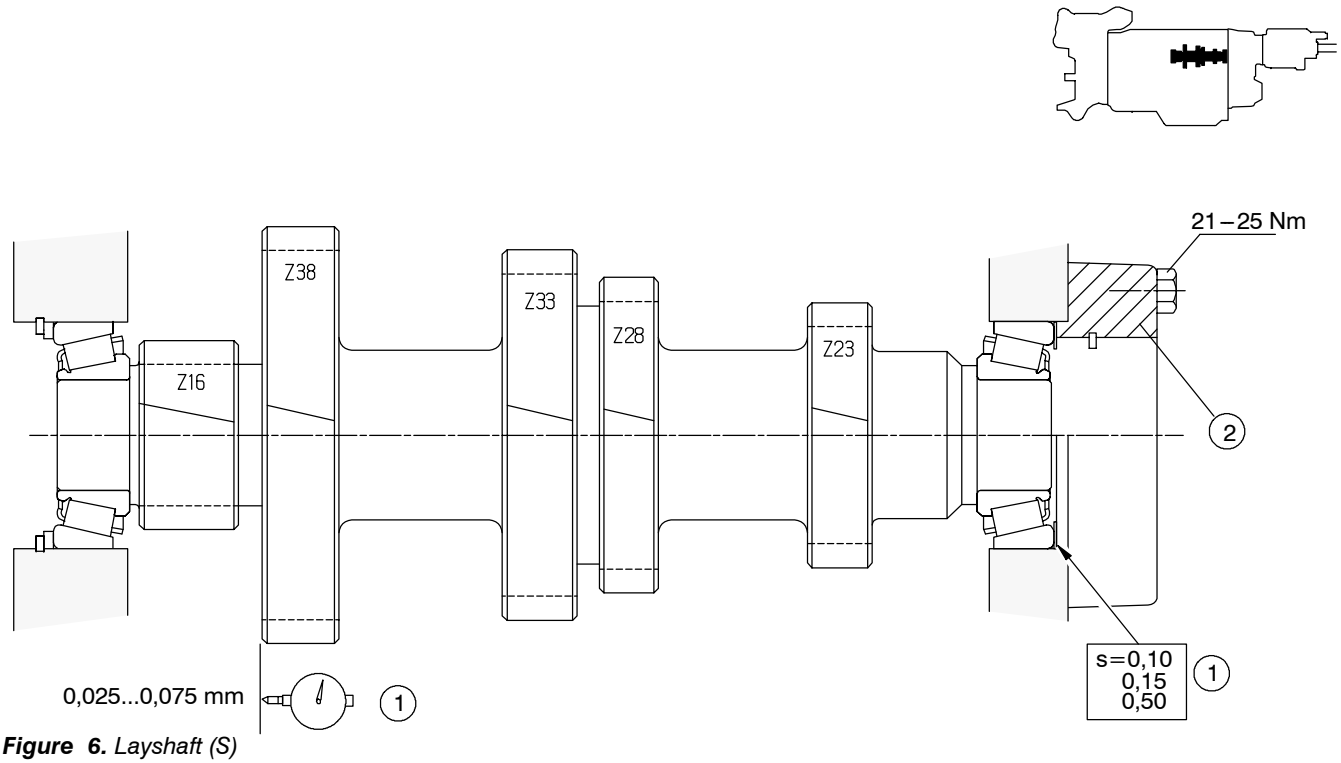


Figure 6. *Layshaft (S)*

1. Bearing end float is adjusted with shims
2. Note the position of the bearing cover
Layshaft gearwheels Z16 and Z38 have been made broader

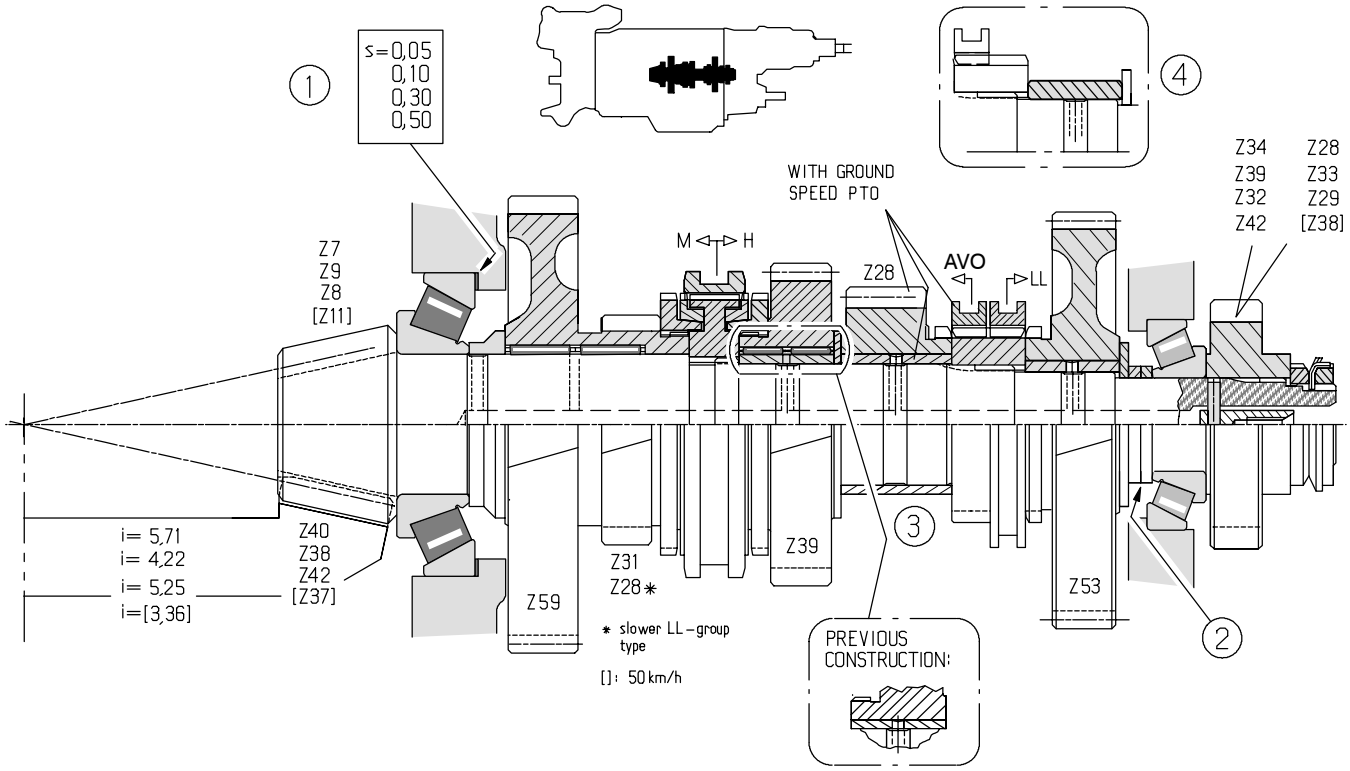


Figure 7. *Bevel pinion shaft (M)*

1. Shims for adjusting position of the bevel pinion shaft
2. Bearing preload is adjusted with spacer rings
3. Gear Z28 and AVO coupling only on tractors with ground speed PTO
4. If coupling sleeve LL and gear Z53 removed, there is a sleeve in place.
Note! *Figures in brackets = transmission 50 km/h.*

Note! On latest shafts there is a needle bearing fitted inside gear Z39 (for range H). This must be observed during possible repair works.

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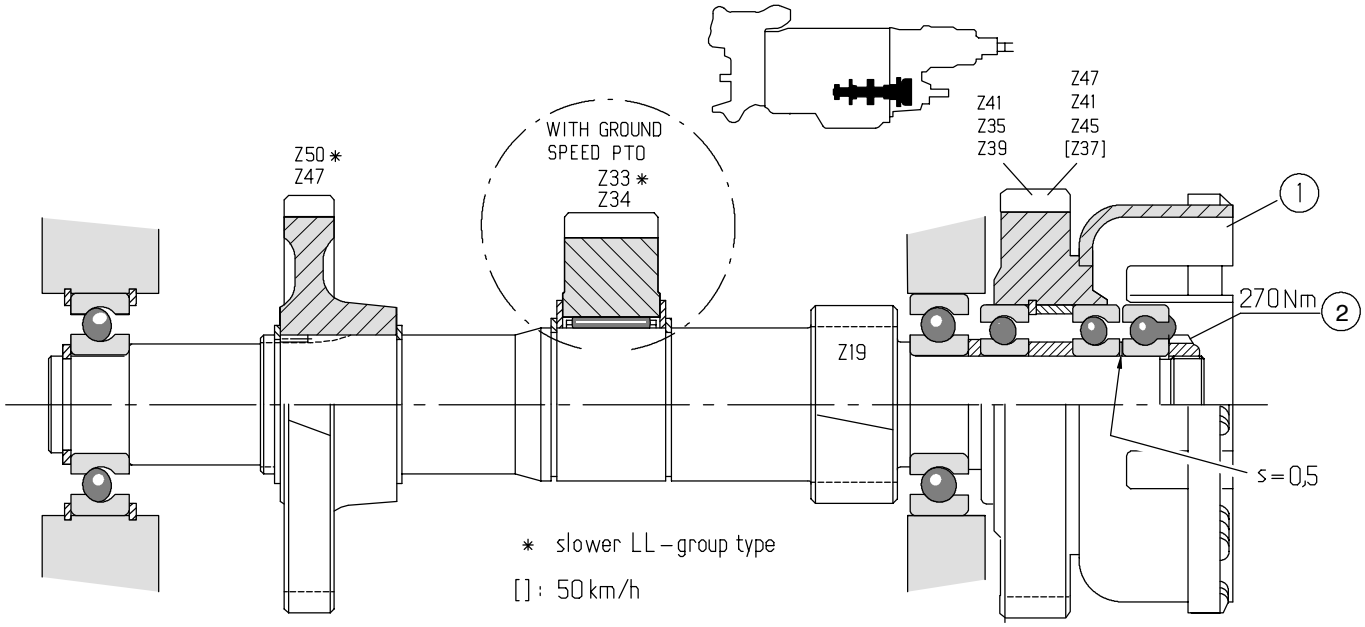


Figure 8. *Transmission shaft (U)*

1. 4WD clutch drum
2, Shaft nut (270 Nm)
Note! *Gear Z34 only on tractors with ground speed PTO.*
Figures in brackets = transmission 50 km/h.

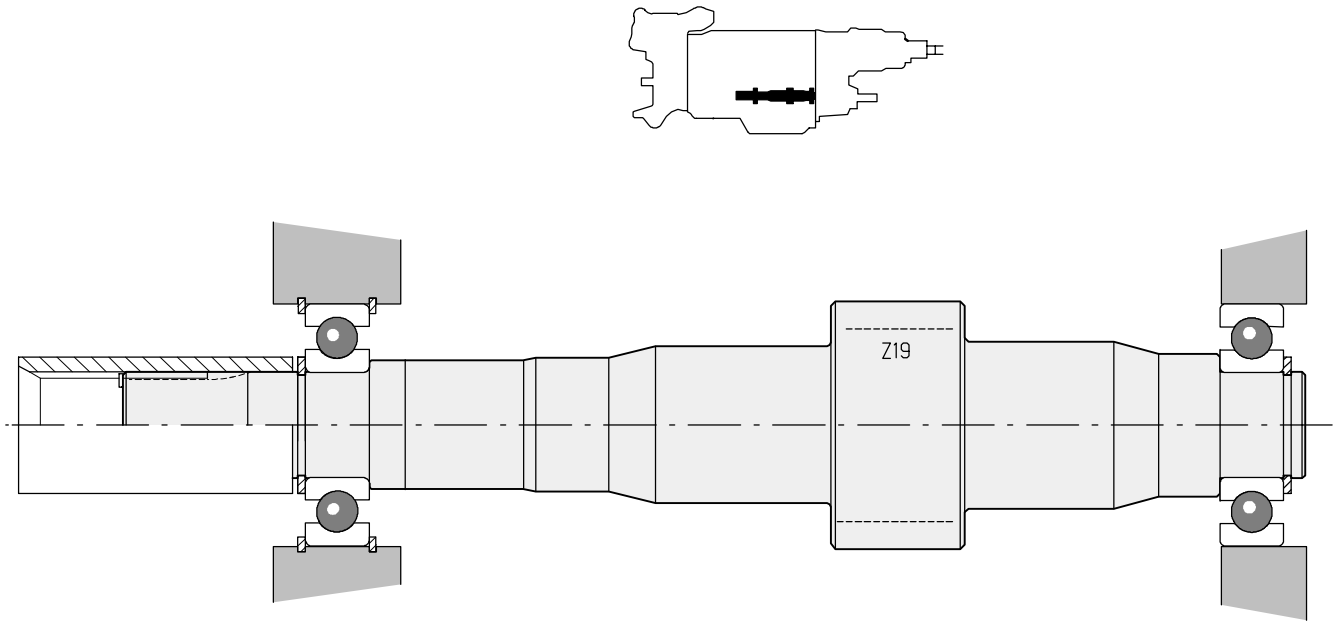


Figure 9. *Ground speed PTO shaft (AVO) (optional)*
Note! *Gear wheel Z19 has been made wider on the latest shafts.*

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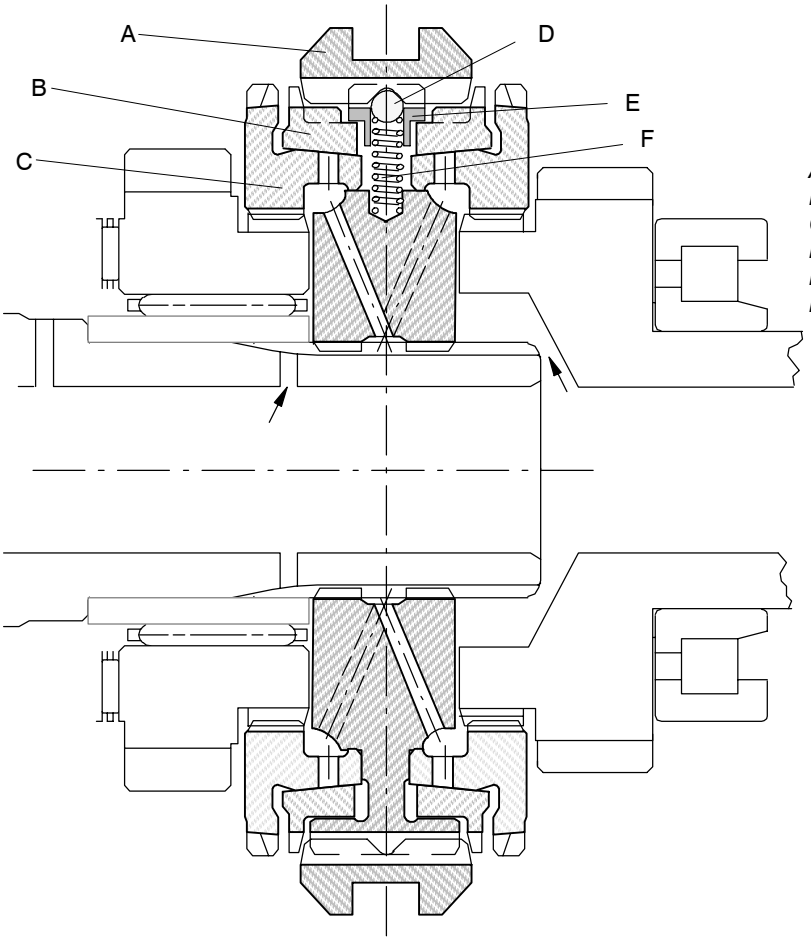
Synchronization

Synchronizing cones

On input shaft (couplers for gears 1–2 and 3–4): ø82 mm, steel

On bevel pinion shaft (coupler for ranges M and H): ø90 mm, steel

The synchromesh units can be fitted either way. The synchromesh units on the input shaft are interchangeable and can be fitted either way. Measuring synchronizing cone wear and assembling the unit, see page **423/7**.



A. Sliding coupler
B. Synchronizing cone (2 pcs)
C. Coupler (2 pcs)
D. Ball (3 pcs)
E. Shoe (3 pcs)
F. Spring (3 pcs)

Figure 10. *Synchromesh unit*

Engagement

The axial movement of the sliding coupler (A) presses the synchronizing cone (B) against the male taper on the coupler (C) by means of the balls (D) and shoes (E). The different speeds of the components to be coupled together produces staggering of their relative positions, limited by stops, which in turn causes the chamfered teeth on the synchronizing cone (B) to press against the sliding coupler (A), thereby preventing any relative movement of this coupler. The pressure exerted by the sliding coupler (A) and the staggered position of the synchronizing cone (B) creates axial pressure between the tapered friction surfaces on the synchronizing cone (B) and the coupler (C) by means of the chamfers on the teeth. This axial pressure gradually reduces the difference in speeds in order to achieve synchronization.

Once, the speeds have been synchronized, the sliding coupler (A) continues to exert pressure against the synchronizing cone (B) and pushes it backwards until the teeth in coupler (A) are opposite gaps between the teeth on the synchronizing cone (B). At this point the resistance, which had so far prevented the sliding coupler (A) from moving, is overcome and the sliding coupler (A) engages silently with the teeth in the coupler (C)

Neutral position

The sliding coupler (A) is in the middle position. Balls (D) are pushed into the V shaped groove in the sliding coupler (A) by springs (F). The gears can turn freely on the shaft. The sliding coupler (A) is locked in this position by three balls (D) held by springs (F).

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Differential

Note! The differential is the same as on Valmet 505–905 tractors.

The crown wheel and differential case are mounted in the gearbox housing on taper roller bearings. Bearing preload and tooth backlash between the pinion and the crown wheel are adjusted with threaded flanges.

On 6000–6400 and 8000 tractors, the differential has two differential pinions. Tractors 6600–6900 and 8050–8750 have four differential pinions in the differential. The side bevel gears and pinions in the differential case have plain bearings.

Differential lock

The differential lock is an electro–hydraulically controlled multi–disc clutch. The solenoid valve for the lock is placed on the servo valve block on the left hand side of the gearbox.

The low pressure pump supplies oil to the servo valve block via an external oil hose. A pressure–limiting valve on the servo valve block limits the diff. lock oil pressure to 1,8 MPa. Pressurised oil from the servo valve block to the diff. lock is conducted through a pipe inside the gearbox housing.

In the differential case cover there is a piston which presses the clutch discs together, thus connecting the differential bevel side gear to the differential casing.

The diff. lock can be engaged while driving. The differential lock disengages automatically, if the brake pedals (or one pedal) are pressed.

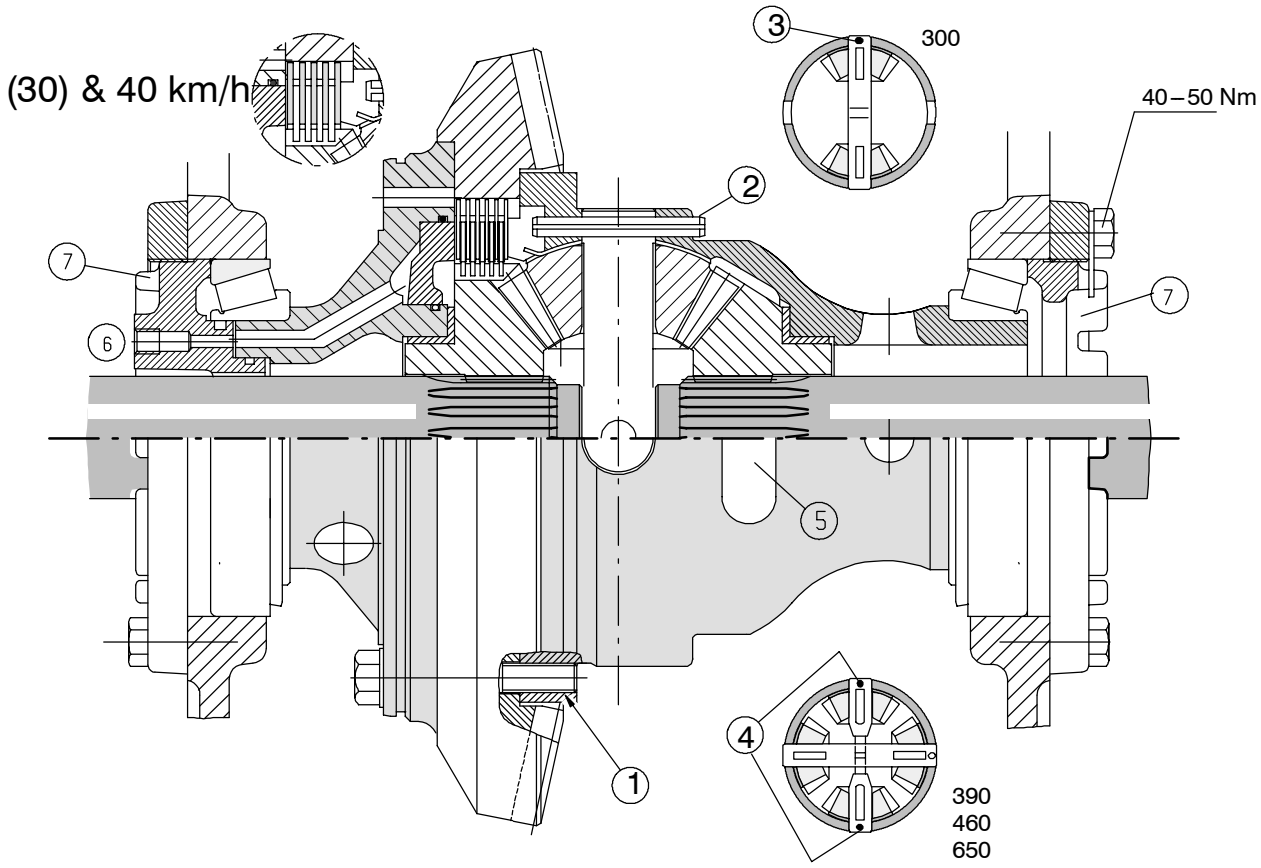


Figure 11. *Cross–section of differential*

1. Loctite 270 on the crown wheel bolt threads
2. Note the position of the tension pin
3. On models 6000–6400 and 8000, the differential pinion shaft is locked with a tension pin (2) (1 pc).
4. On models 6600–6900, 8050–8750, the shorter diff. pinion shafts are locked with tension pins (two pins are needed).
5. Oil hole for lubricating oil from the PTO unit lubricating oil pipe hole.
6. Pressurised oil to the differential lock
7. Threaded flanges for adjusting differential bearing preload and tooth backlash between pinion / crown wheel

Note! On the earlier tractors the differential lock has 5 friction discs and 4 steel discs. On the latest tractors there are 5 friction discs and 6 steel discs, which are thinner, since the disc location is the same. The new discs pack can be fitted into the earlier tractors without modifications. Max. thickness of the disc pack is 21,5 mm.

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Gear levers

The range gear lever (2) selects ranges LL, M or H. When selecting e.g. LL, the lever is moved first outwards and then forwards. The lever lower end first moves inwards and pushes via a cable the selector lever on the side cover outwards and it engages with a groove on the LL–range selector fork. When the range gear lever is then moved forwards, the lower part moves backwards and via shifter rods it turns the selector lever so that the LL–range engages.

In the same way the other ranges are engaged. The range gear lever is first moved towards the driver' seat whereat the selector lever on the side cover is pushed inwards and the lever inner end engages with a groove on the selector fork for ranges M and H (fork in foremost position=M. Fork in rearmost position=H).

The speed gear lever (1) engages gears 1–4. When selecting e.g. gear 1, the gear lever first is moved towards the driver's seat and then forwards. When moving towards the seat the selector lever on the side cover is moved inwards (by the cable) and it engages with a groove on the fork for gears 1–2. When the gear lever is then moved forwards, the selector lever is turned (by the shifter rod) so that gear 1 engages.

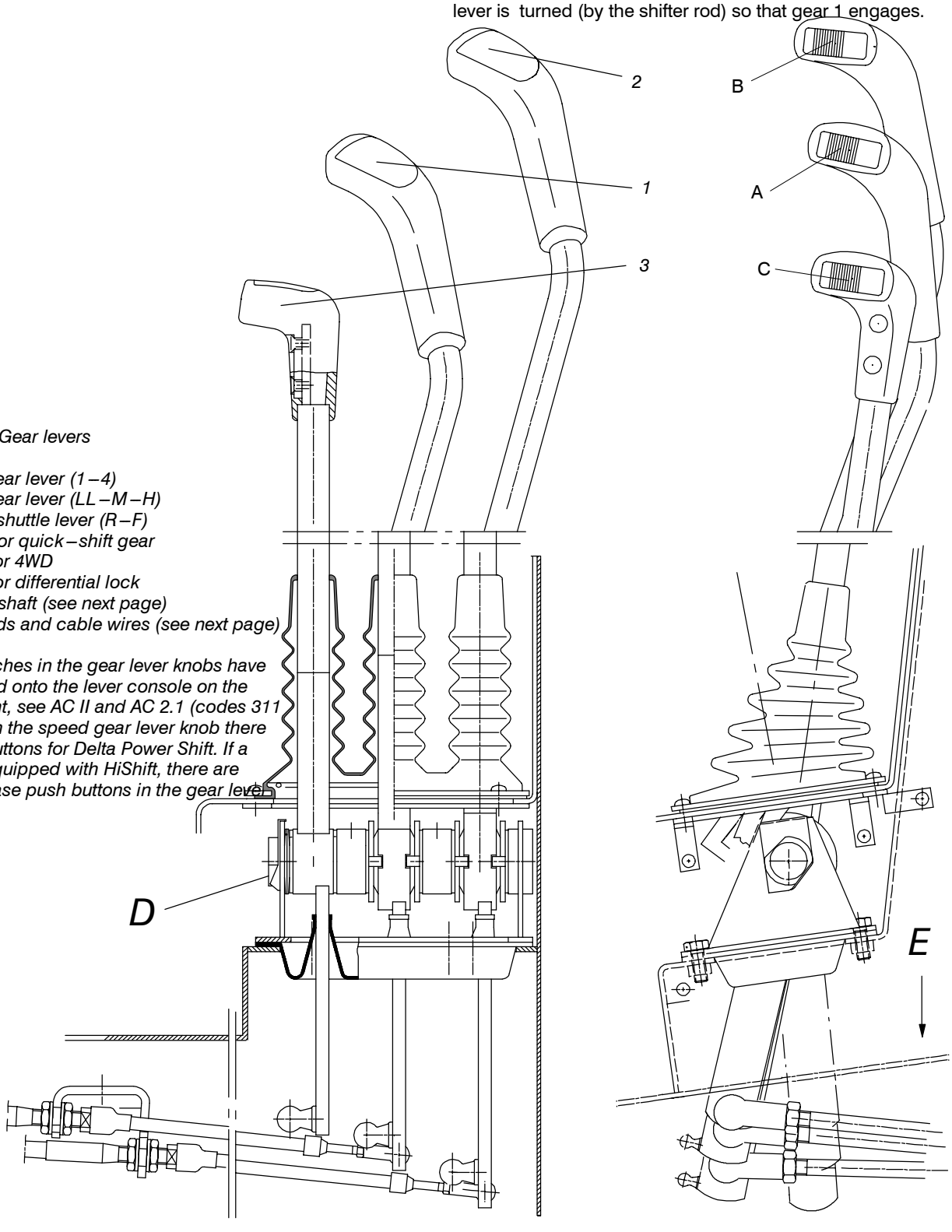


Figure 12. *Gear levers*

1. Speed gear lever (1–4)
2. Range gear lever (LL–M–H)
3. Reverse shuttle lever (R–F)
A. Switch for quick–shift gear
B. Switch for 4WD
C. Switch for differential lock
D. Support shaft (see next page)
E.Shifter rods and cable wires (see next page)

Note! *Switches in the gear lever knobs have been moved onto the lever console on the driver's right, see AC II and AC 2.1 (codes 311 and 312). In the speed gear lever knob there are push buttons for Delta Power Shift. If a tractor is equipped with HiShift, there are clutch release push buttons in the gear lever knobs.*

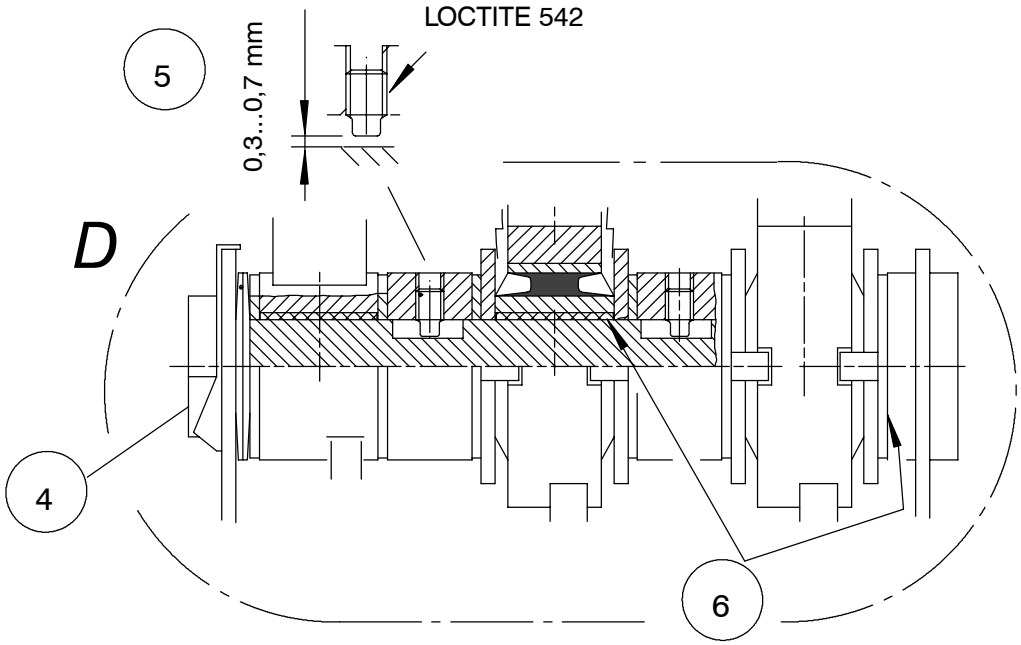
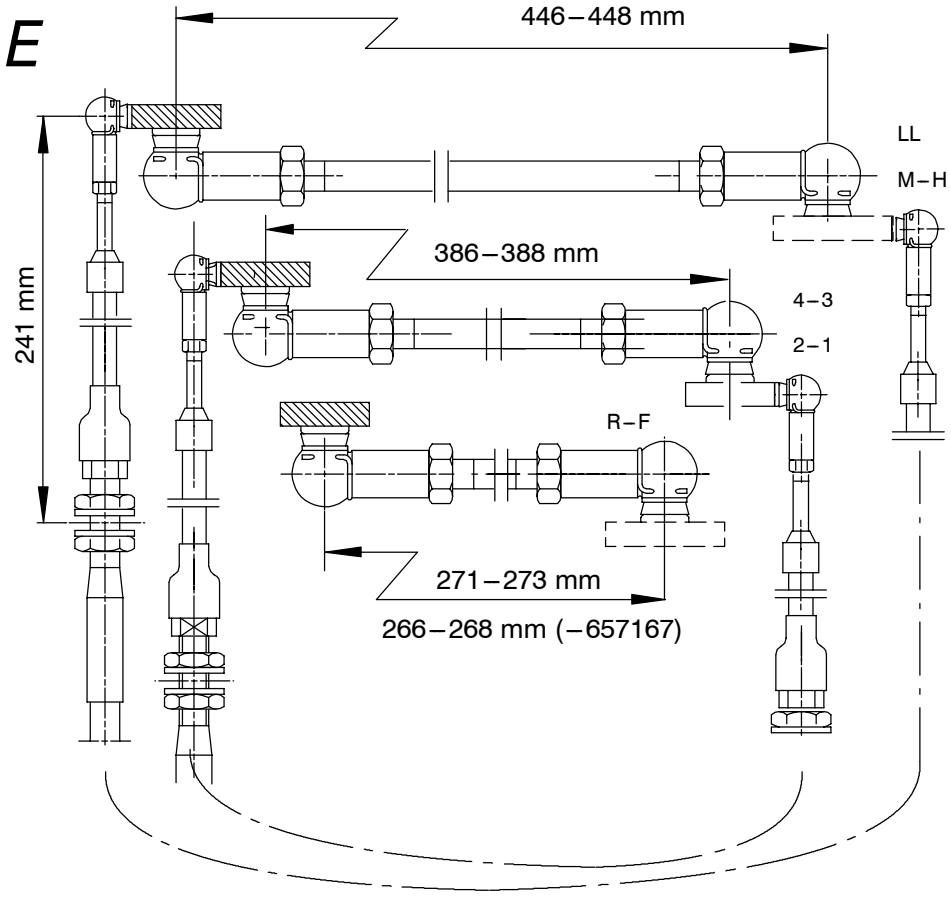


Figure 13. *Gear lever support shaft (point D in figure 12)*
Note! *Rubber joints allow side movement for the speed and range gear levers*

4. Force at the end of the reverse shuttle lever is adjusted to 10–20 Nm by tightening the shaft
5. Adjust distance to 0,3–0,7 mm by turning the pin
6. Universal grease



Adjust shifter rods and cable wires to dimensions shown in figure.Adjustment can be done through a access hole on the RH side mudguard.

Figure 14. *Shifter rods and cable wires for inwards/outwards movement of the selector levers (point E in figure 12). The gear lever must stand in the neutral position when adjusting measurement 241.*

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Selector levers and side cover

Selector levers, which move the selector forks, are led into the gearbox through the side cover on the right side of the gearbox. Selector levers for speed and range gears can move also in– and outwards on the cover.

On the side cover there are fitted blocking pieces which prevent simultaneous engagement of two gears. At the outer end of the selector levers there are fitted shifter levers. Shifter rods and cable are attached to the shifter levers.

Also the selector lever for the ground speed PTO (optional) is led into the gearbox through the side cover (see section 46 Power take–off). Note! Reverse shuttle selector lever is placed in front of the side cover (see section 44).

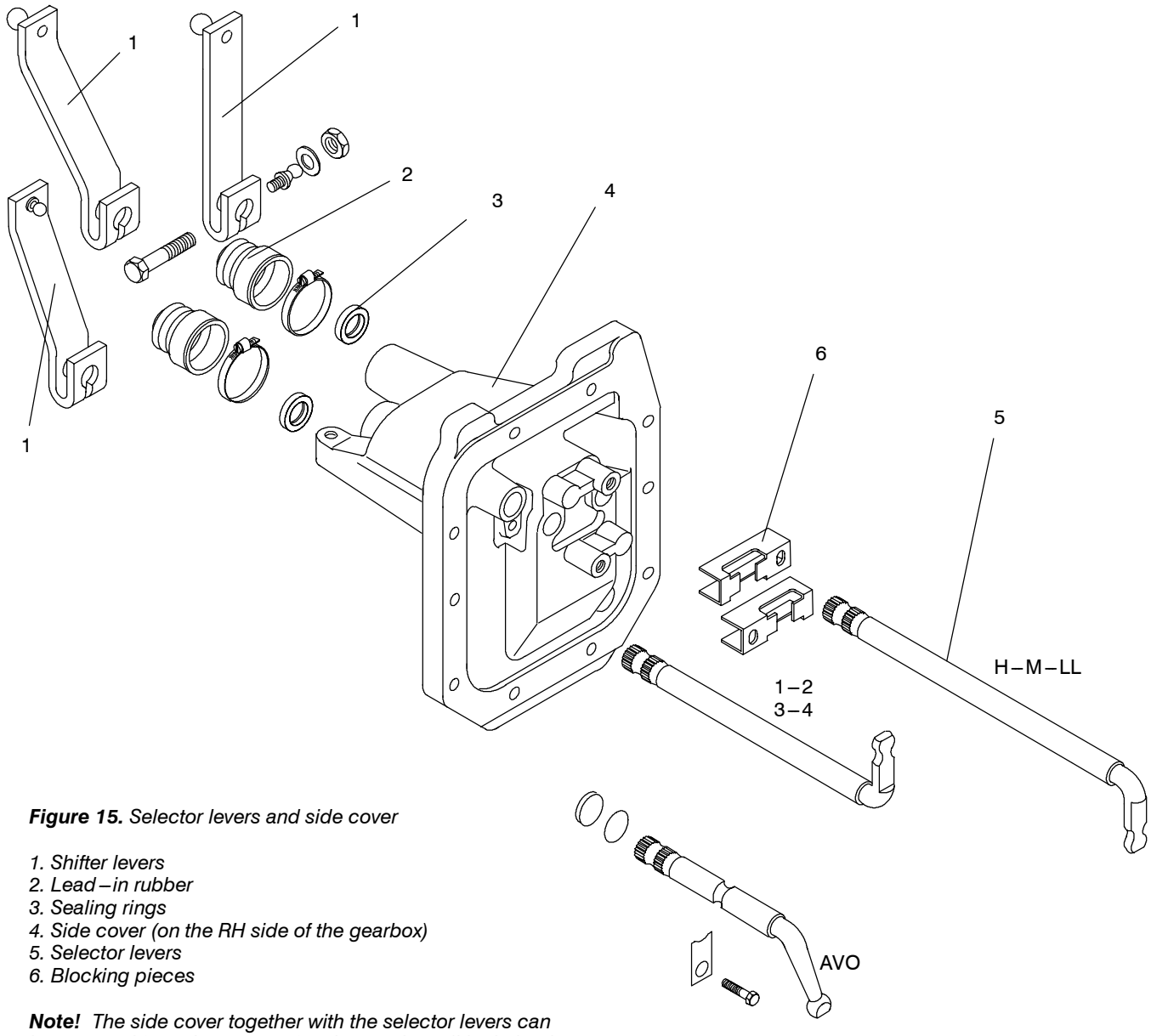


Figure 15. *Selector levers and side cover*

1. Shifter levers
2. Lead–in rubber
3. Sealing rings
4. Side cover (on the RH side of the gearbox)
5. Selector levers
6. Blocking pieces

Note! *The side cover together with the selector levers can be removed from the tractor after the gearbox oil is drained.*

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Selector forks and selector fork rails

Each selector fork for gears M–H, 1–2 and 3–4 are fitted on their own rail. The forks are attached to the rails with a locking pin. The selector lever round–shaped end engages with the groove on the selector fork.

There is an adjusting piece at the rear end of the rails. There are also locking balls and springs which engage with the adjusting piece grooves (3 pcs).

When the gears are in neutral, the grooves on forks M–H and LL should be opposite each other. In the same way in neutral position, the grooves on forks 1–2 and 3–4 should be opposite each other. This must be noted when adjusting the forks.

The rail for fork LL (and for the ground speed PTO fork) is attached to the gearbox housing with threads.

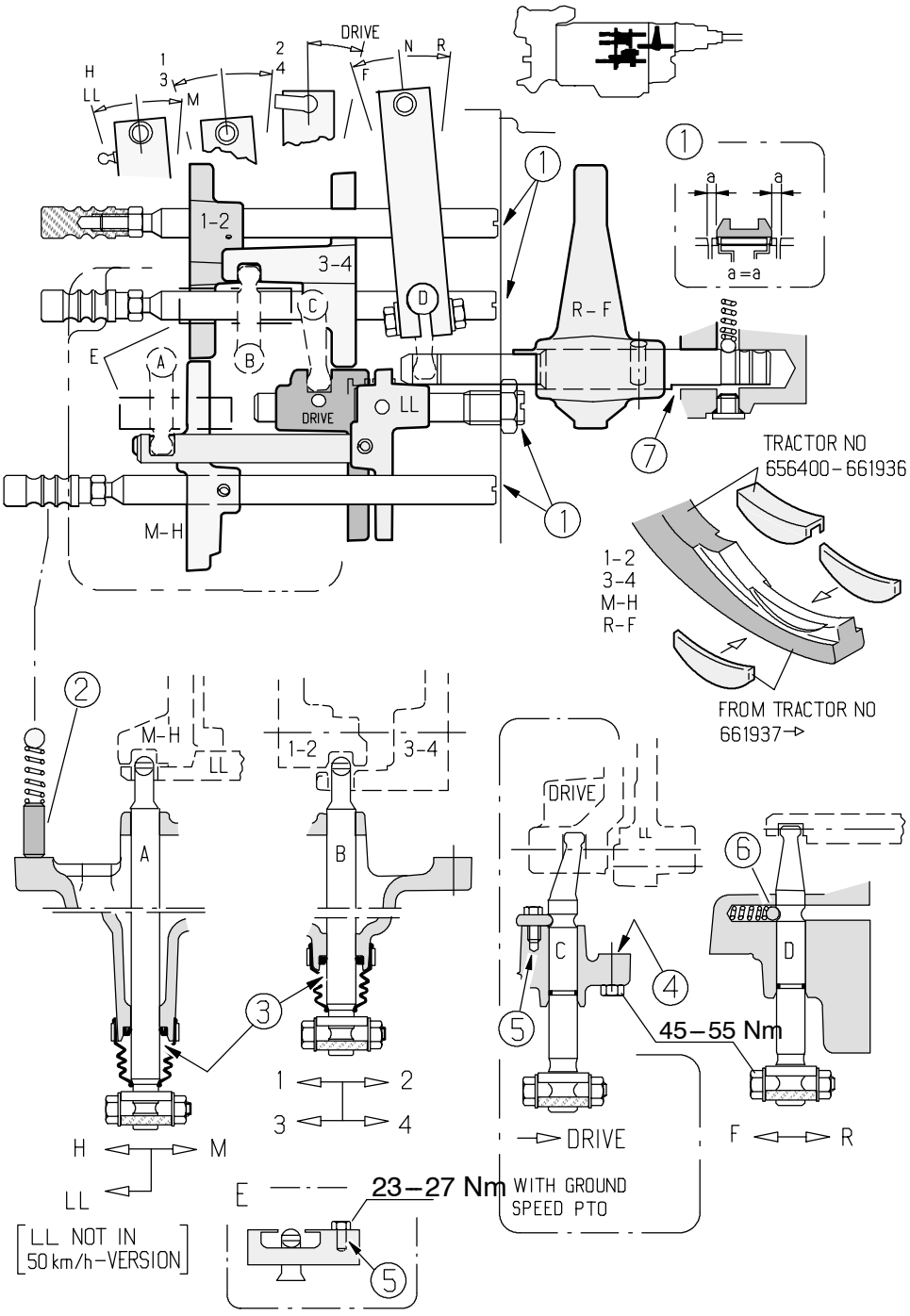


Figure 16. *Selector forks and rails*

2. Long pins into the two upper hole and short pin into the lowest hole

3. Universal grease

4. Hylosil sealing compound (UK 0067) between cover and gearbox

5. Loctite 242 (UK 0126).

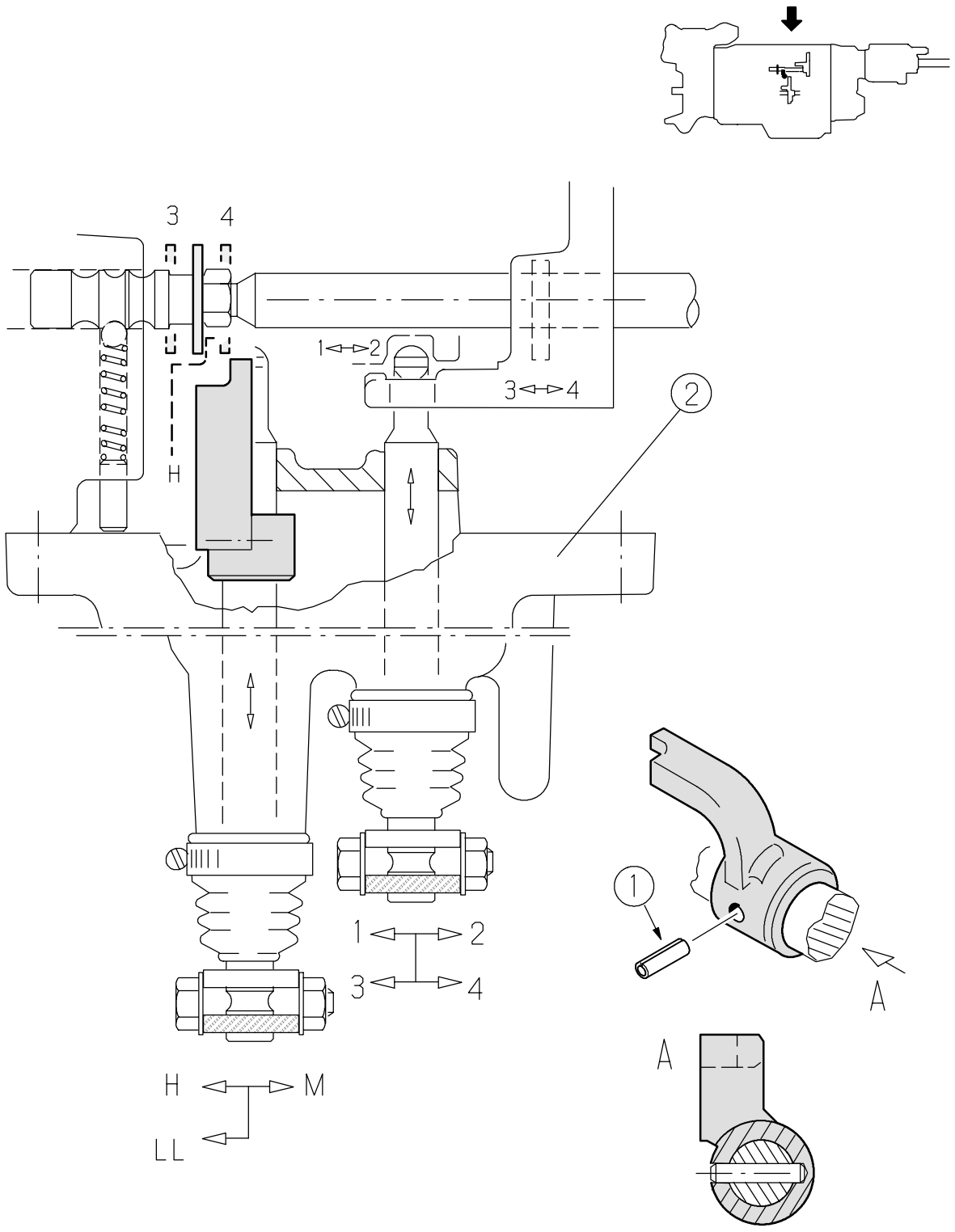


Figure 17. *Blocking device for gear H4*

1. The tension pin must be fitted with the split side either upwards or downwards.
(N.B. The bore does not reach through the blocking device).
2. Gearbox RH side cover

On tractors intended for certain markets, the gearbox (type 40 km/h) is equipped with a blocking device for gear H4. The maximum speed is then about 30 km/h.

Function:

If the speed gear 4 has been engaged, and then the range gear lever is moved to the H position, the blocking device pushes (by means of a washer on the selector fork rail) the speed gear 4 out of mesh.
If, in turn, the range gear lever is in H– position, and the speed gear lever is moved to position 4, the device disengages the range H.

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Servo hydraulics and lubrication

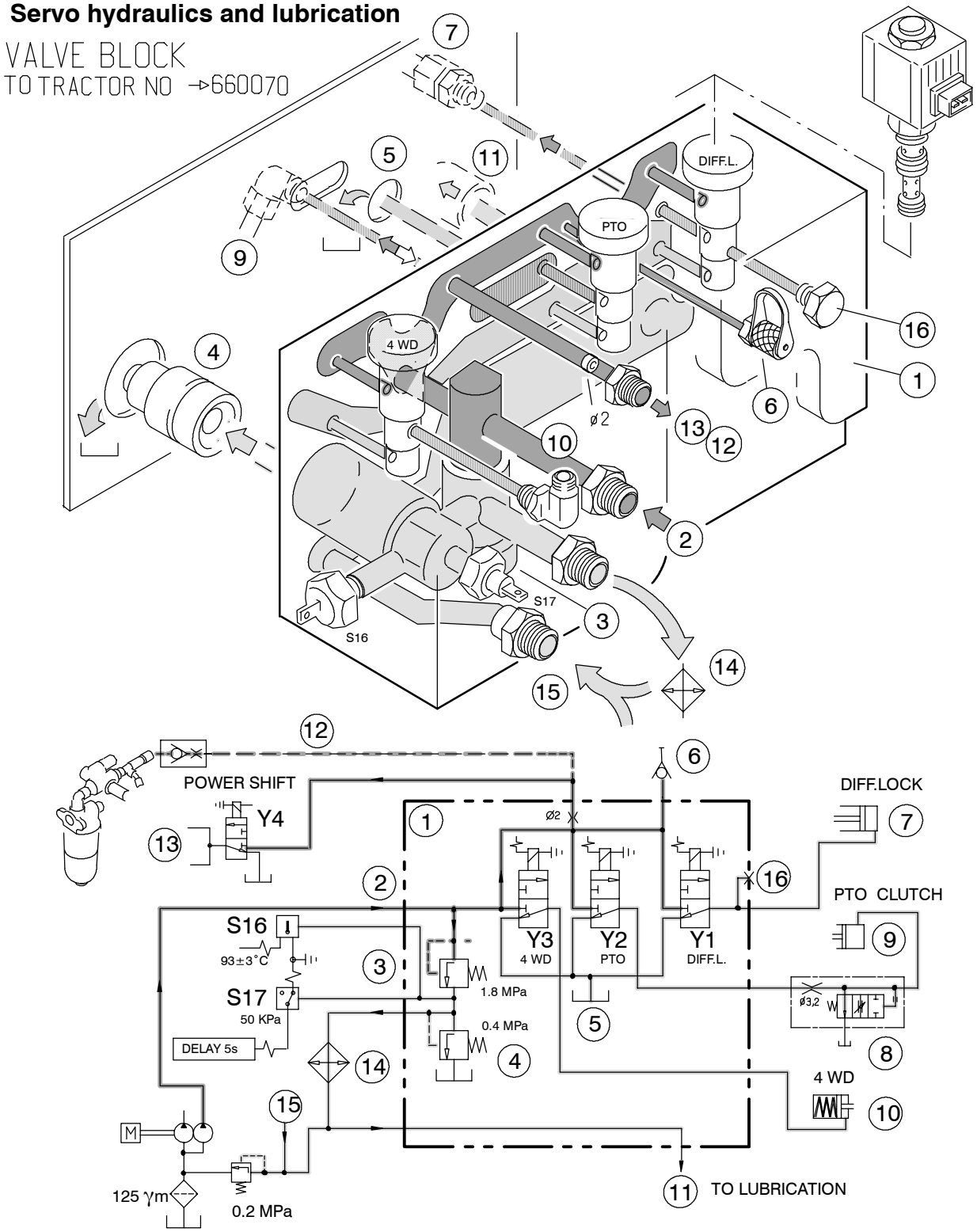


Figure 18. *Servo valve block and hydraulics, earlier valve block,* ***–660070.***

1. Servo valve block
2. Oil supply from low pressure pump
3. Oil pressure and temperature sensors (S16, S17)
4. Safety valve for oil cooler (0,4 MPa)
5. Return oil to gearbox housing
6. Pressure test point (1,8 MPa)
7. Pressurised oil to diff. lock
8. Cushioning valve, PTO engagement
9. Pressurised oil to PTO clutch
10. Pressurised oil to 4WD clutch (external pipe)
11. To lubrication of transmission
12. Priority valve for steering (external pipe)
13.Power shift, quick–shift gear (external pipe)
14. Oil cooler
15. Return oil connection, working hydraulics
16. Diff. lock engaging pressure
Y1) Solenoid valve, diff. lock
Y2) Solenoid valve, PTO
Y3) Solenoid valve, 4WD
S16) Temperature sensor, gearbox temperature (90–96 °C)
S17) Oil pressure sensor, gearbox lubrication (20–50 kPa)

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Servo hydraulics and lubrication

The servo valve block is fitted on the LH side of the gearbox (see figures **17** and **19**). The low pressure pump supplies oil to the servo valve block, which has a pressure–relief valve (1,8 MPa) and pressure–test point.

There are solenoid valves for 4WD, PTO and diff. lock on the servo valve block (solenoid valve for the quick–shift gear is fitted on the gear).

On the valve block there is a transmission oil temperature sensor (warning lights comes on at +93˚±3˚C) and oil pressure sensor (warning light comes on at 20–50 kPa).

Connections to/from the valve block:
– inlet connection from pump (on front side)
– outlet connection to diff. lock (on rear side)
– outlet connection to 4WD clutch (on front side, external pipe)
– outlet connection to PTO clutch (on rear side)
– outlet connection to quick–shift gear (on front side, external pipe). From this connection has also been drawn a hose to the priority valve
– outlet/inlet connections to/from oil cooler (on front side). From the inlet connection has also been drawn a hose via pressure–limiting valve (0,2 MPa) to the pump suction side.
– outlet connection to lubrication of transmission (on rear side)

In addition, on the valve block there is a safety valve (0,4 MPa), which protects the oil cooler. The lubricating oil pressure–limiting valve (0,2 MPa) is fitted at the rear end of the suction strainer housing on the gearbox.

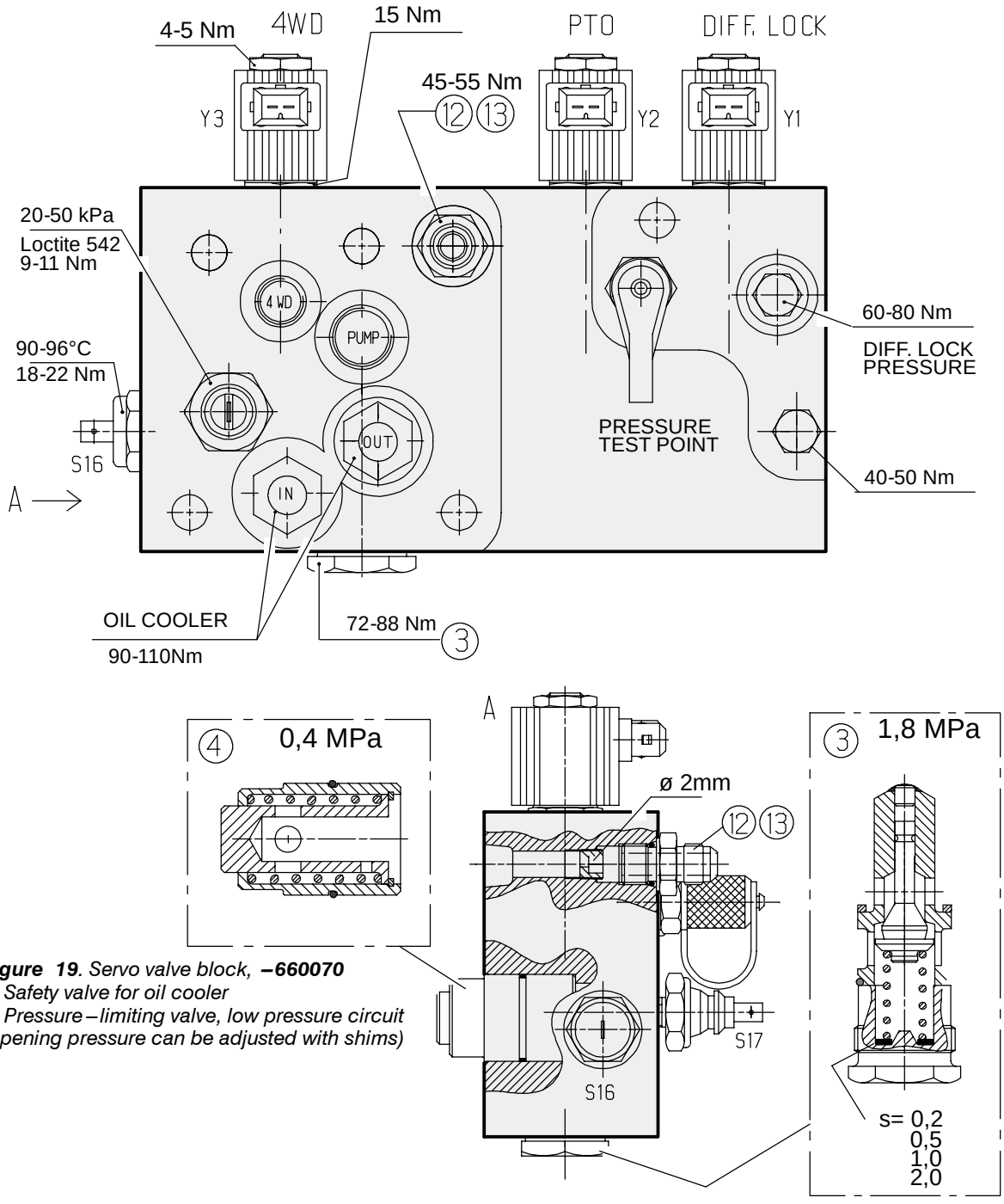
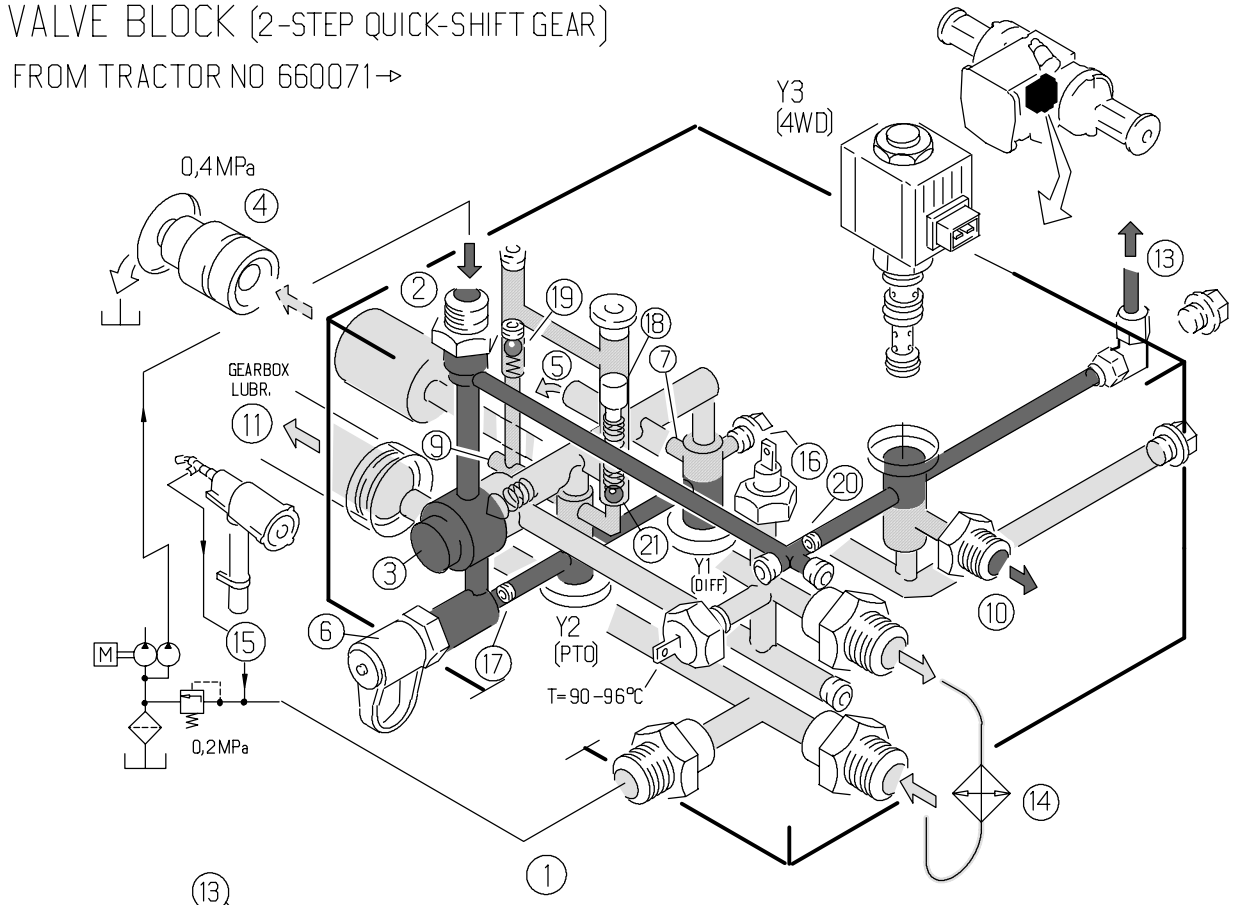
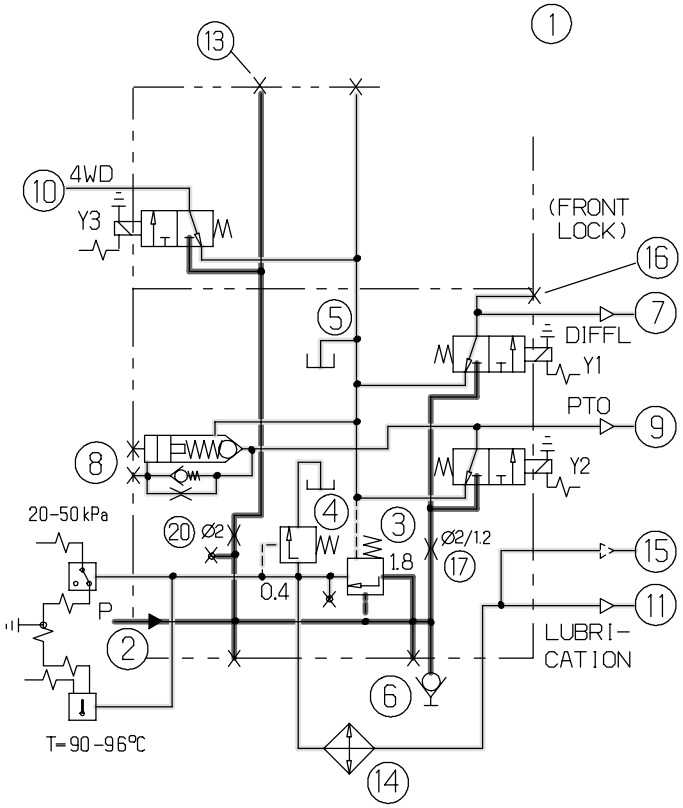


Figure 19. *Servo valve block,* ***–660070***
4. Safety valve for oil cooler
3. Pressure–limiting valve, low pressure circuit (opening pressure can be adjusted with shims)

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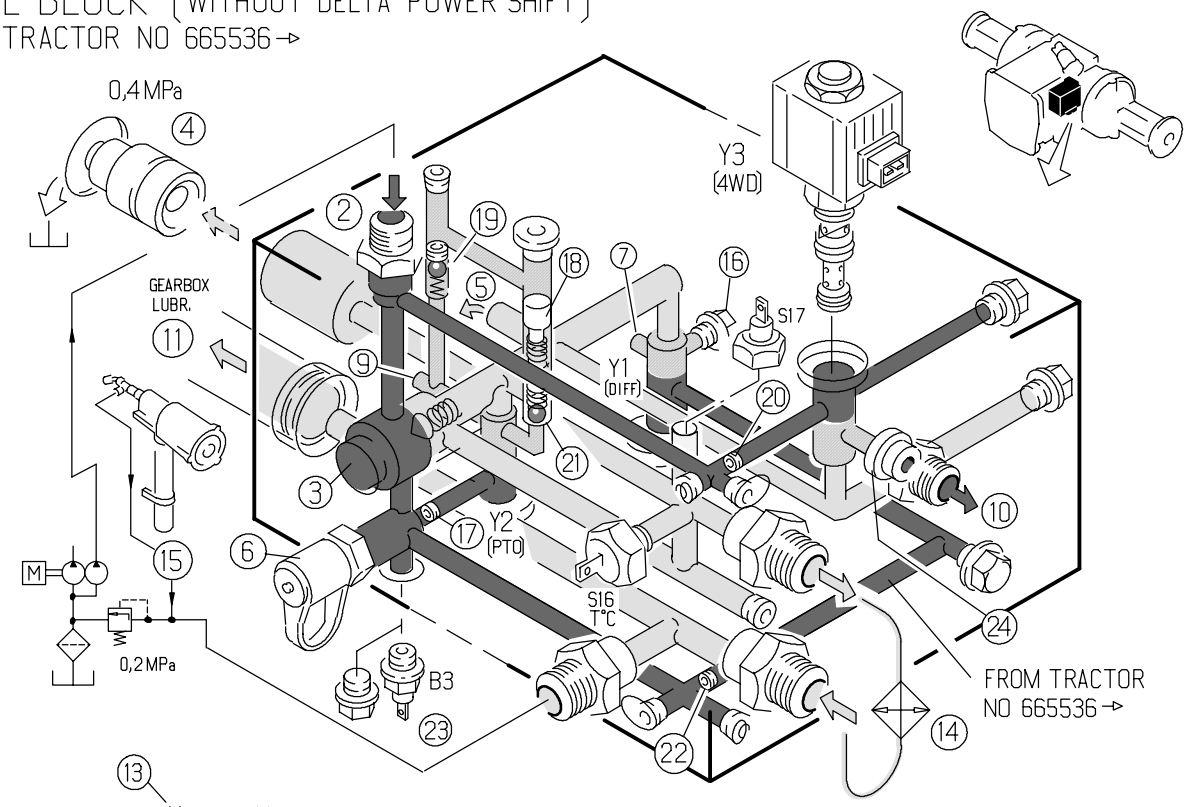


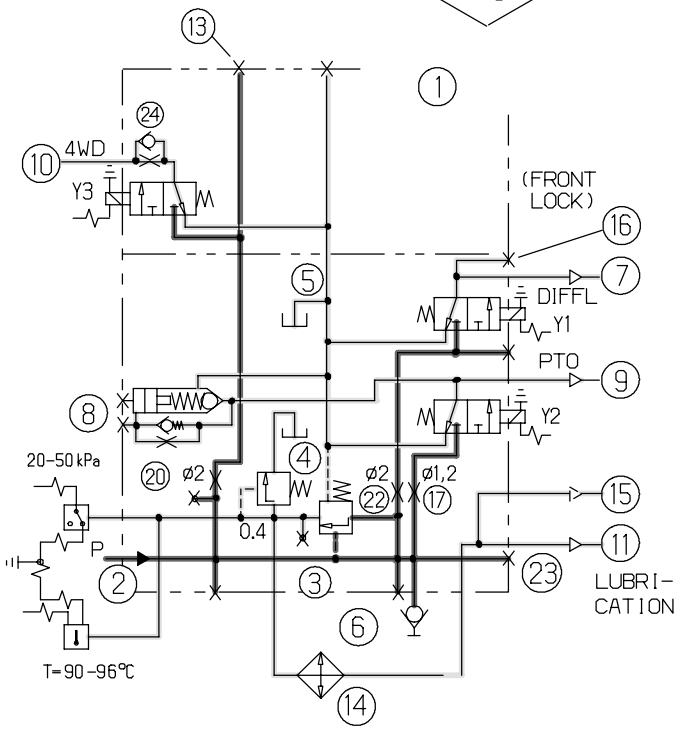
Picture 20. *New servo valve block with effect from ser. no.* ***660071*** *on tractors which have 2–step quick–shift gear or are without quick–shift gear.*

1. Servo valve block
2. Oil supply from low pressure pump
3. Pressure–limiting valve, 1,8–1,9 MPa (18–19 bar)
4. Safety valve 0,4 MPa (4 bar) for oil cooler. Protects hydraulic system e.g. when oil is cold and thick.
5. Tank passage from solenoid valves
6. Pressure–test point (Valmet HPR, thread M16)
7. Pressure oil to differential lock.
8. Cushioning valve for PTO clutch, incl. parts 18, 19, 21.
9. Pressure oil to PTO clutch
10. Pressure oil to 4WD clutch
11. Oil to gearbox lubricating system, see picture on page 420/22.
13. Pressure oil to quick–shift gear. If not guick–shift gear, the passage is plugged.
14. Oil cooler
15. Connection to return side of working hydraulics.
16. Plug (readiness för front axle diff. lock)
17. Restriction ø 2 mm ***(–661797)*** *or ø 1,2 mm* ***(661798–)*** *eliminates pressure drop when engaging PTO clutch or diff. lock. On the later valve blocks* ***(665536–)*** *there is a separate passage from the pump pressure side to the diff. lock solenoid valve. There is restriction ø2 mm on this passage. In this way are separated functions of the diff. lock and the PTO.*
18. Piston, PTO clutch cushioning valve
19. Valve ball, PTO clutch cushioning valve
20. Restriction Ø 2mm eliminates pressure drop when engaging 4WD or quick–shift gear clutch.
21. Valve ball, PTO clutch cushioning valve

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VALVE BLOCK (WITHOUT DELTA POWER SHIFT)
FROM TRACTOR NO 665536→





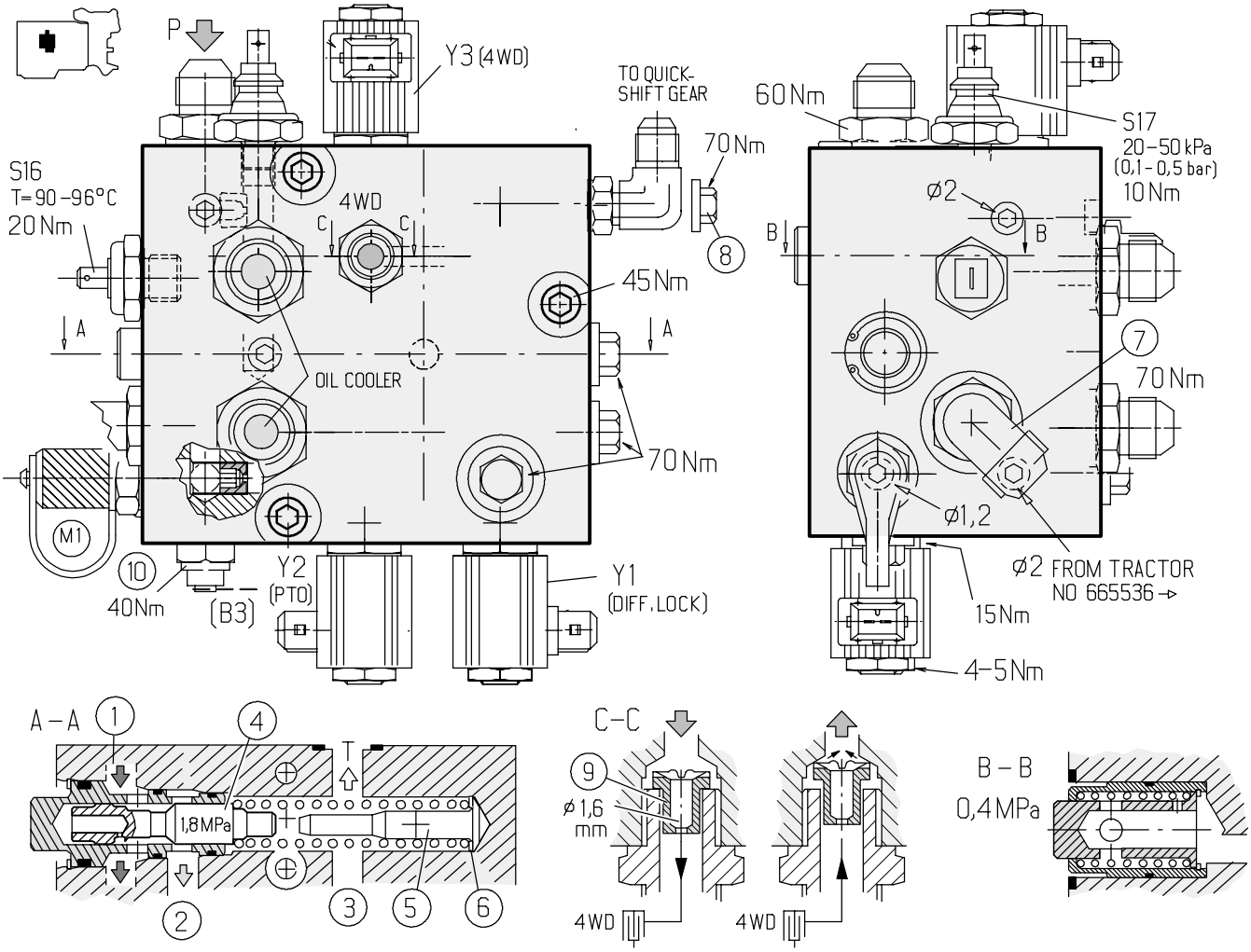
Picture 20A. *For oil to the differential lock solenoid (**Y1**) has been drilled an own passage with effect from tractor serial number **665536–>** (at the same time the passage between the PTO solenoid (Y2) and solenoid (Y1) has been removed).*
In this way is prevented the pressure drop of the PTO clutch when engaging simultaneously the differential lock.

1) Valve block
2) Oil from the pump.
3) Pressure relief valve, 1,8–1,9 MPa (18–19 bar).
4) Safety valve 0,4 MPa (4 bar). Protects the system e.g. in wintertime, when oil is is stiff in the oil cooler.
5) Tank passage for the solenoid valves.
6) Measurement point (Valmet HPR, connecting thread M16).
7) Pressure oil to the differential lock.
8) Damping valve for the PTO, includes parts 18, 19, 21.
9) Pressure oil to PTO multi–disc clutch.
10) Pressure oil to 4WD multi–disc clutch.
11) To the gearbox lubrication.
***13)** –*
14) Oil cooler (Note! In case the oil cooler is damaged, do not plug the hoses, but use a by–pass hose).
15) Connection to the return line from the working hydraulics.
16) Plug (for the front axle differential lock.
17) Restriction hole (ø 1,2 mm) in the screw eliminates the pressure drop, when engaging PTO solenoid.
18) Piston, damping valve for PTO.
19) Ball, damping valve for PTO.
20) Ø 2mm throttle eliminates the pressure drop, when engaging 4WD solenoid valve.
21) Ball valve, PTO damping system.

***22)** Ø 2mm restriction hole eliminates the press. drop, when engaging the differential lock.*
***23)** Temperature sender unit for Agrodata– display (optional equipment).*
***24)** Restriction/counter valve (Ø 1,6 mm restriction hole) prevents the pressure drop in the system, when the 4WD has been disengaged, e.g. when braking. From tractor no **668118–>**.*

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Later valve block 660071– (on tractors without quick–shift gear or with 2–step quick–shift gear)



Picture 20B. *Later servo valve block on tractors without quick–shift gear or with 2–step quick–shift gear,* ***660071–****.*

Y1=Solenoid valve for diff. lock
Y2=Solenoid valve for PTO
Y3=Solenoid valve for 4WD
S16=transmission oil temperature sensor (warning light)
S17=transmission oil pressure sensor (warning light)
P=Pressure oil supply from low pressure pump
M1. Pressure–test point (clutch pressures)
1) Pressure oil to the valve block (flows further to solenoid valves).
2) To gearbox lubrication
3) Tank channel
4) Slide
5) Limiter
6) Fit shims, if needed
7) Connection with return line of the working hydraulics
8) Plugged when the quick–shift gear has not been mounted.
9) *Restriction/counter valve (Ø 1,6 mm restriction hole) prevents the pressure drop in the DPS multi–disc clutches, when the 4WD has been disengaged (the multi–disc clutch is then pressurised), e.g. when braking. The valve has been mounted from tractor no* ***668118–>****. The valve can be mounted afterwards.*
Left picture *(4WD disengaged):*
Oil flows through the restriction Ø 1,6 mm to the 4WD multi–disc clutch.
Right picture *(4WD engaged):*
Oil returns from the 4WD multi–disc clutch without restriction (opening corresponds to a total hole of Ø 3,7 mm) to the tank.
10) *Temperature sender unit for Agrodata– display (optional equipment).*

Note! When the current is switched on to the solenoid valves, the nut at the end of the valves becomes magnetic which can be checked e.g. with a screwdriver. The 4WD clutch solenoid valve is energized when the 4WD is disengaged.

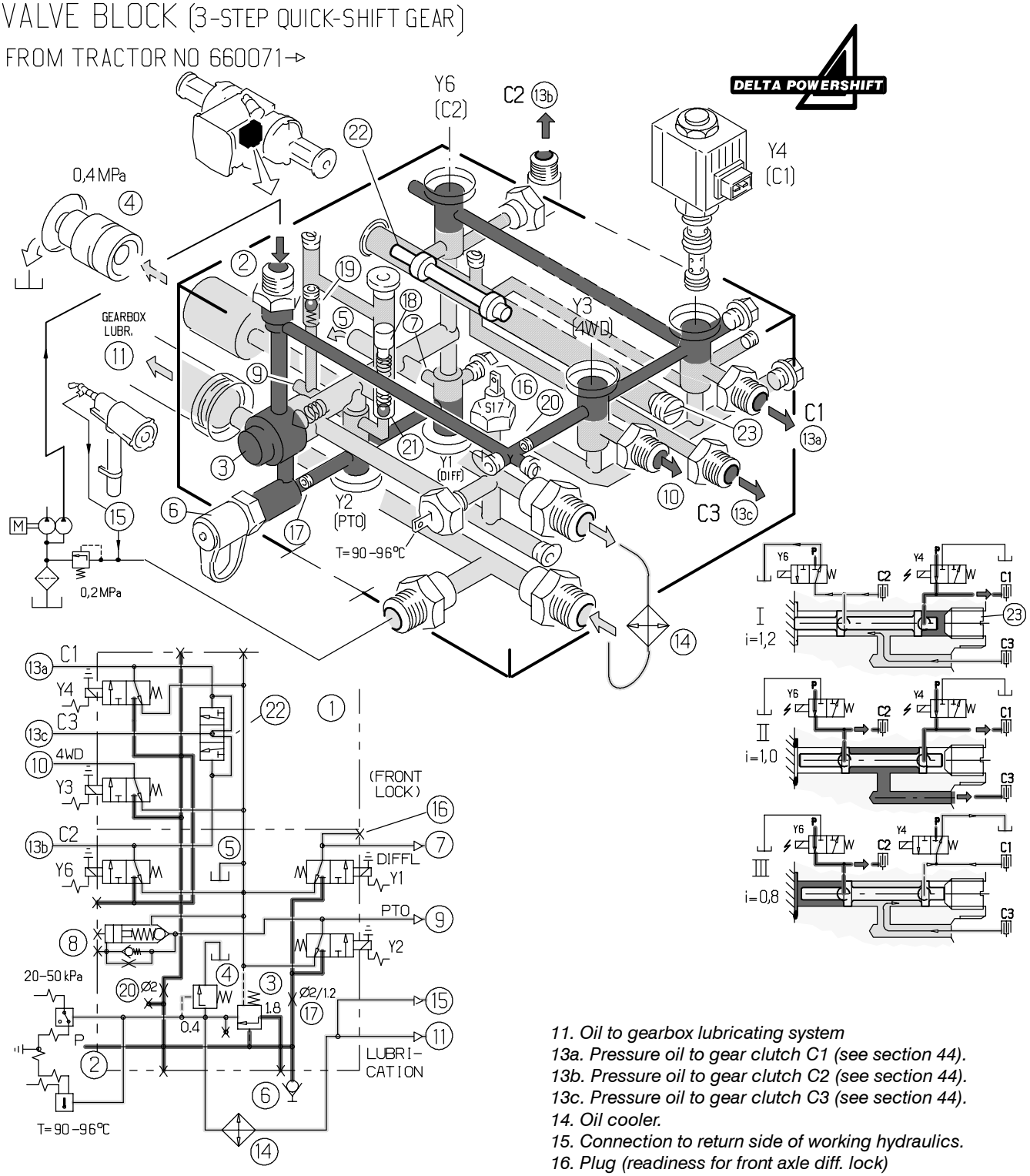
This new servo valve block has the same functions as the earlier valve block in figure **19**. The build–up of the pressure–limiting valve is, however, different as well as the positions of various components. In addition, this new valve has an in–build cushioning valve for the PTO clutch (see section **46**).

If the tractor has 3–step quick–shift gear (Delta Powershift), the tractor has this same valve block, but it has additionally two extra solenoid valves and one valve spool and necessary pipe connectors (see picture **20C** on next page).

Note! With effect from tractor ser. no. **665536** the valve block has been changed. The modified valve block can be fitted in place of the earlier block. When fitting the latest valve block, thicker "O"–rings (**KH 4070**) must be fitted between the gearbox and the valve block.

Important! If the valve block should be removed, push with a large screwdriver the lubricating oil pipe (see picture **23** point **2** on page **420/22**) towards the gearbox. Push the screwdriver through the oil cooler lower pipe connector. Otherwise the lubricating oil pipe lower end can loosen from the distribution pipe.

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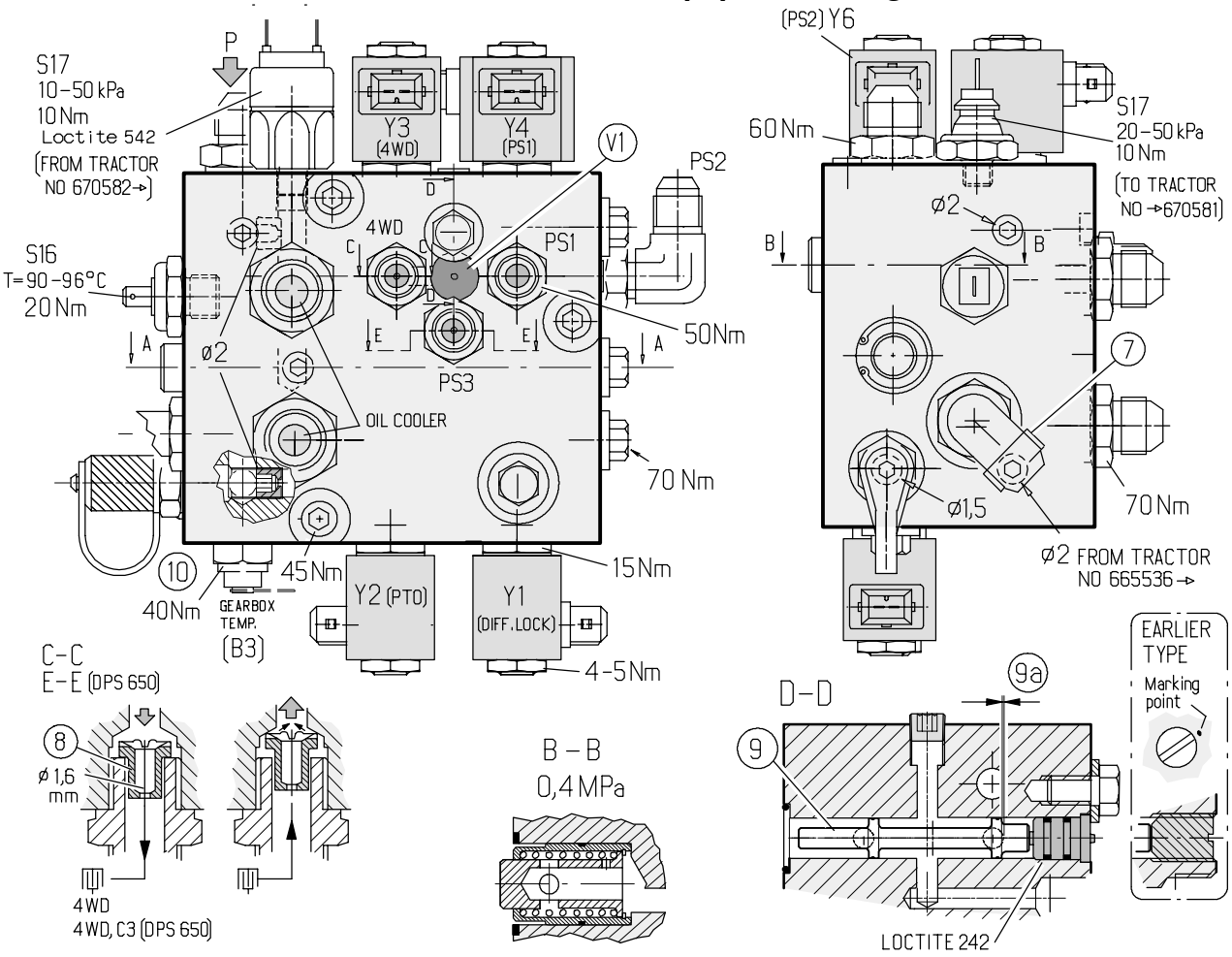


Picture 20C. *Servo valve block with effect from ser. no.* ***660071–*** *on tractors which have Delta Powershift (3–step quick–shift gear).*

1 . Servo valve block
2. Oil supply from pump
3. Pressure–limiting valve, 1,8–1,9 MPa (18–19 bar)
4. Safety valve 0,4 MPa (4 bar). Protects oil cooler when hydraulic oil is cold and thick.
5. Tank passage from solenoid valves
6. Pressure–test point (Valmet HPR, thread M16)
7. Pressure oil to differential lock.
8. PTO cushioning valve, incl. parts 18, 19, 21.
9. Pressure oil to PTO clutch
10. Pressure oil to 4WD clutch
11. Oil to gearbox lubricating system
13a. Pressure oil to gear clutch C1 (see section 44).
13b. Pressure oil to gear clutch C2 (see section 44).
13c. Pressure oil to gear clutch C3 (see section 44).
14. Oil cooler.
15. Connection to return side of working hydraulics.
16. Plug (readiness for front axle diff. lock)
17. Restriction ø 2 mm ***(–661797)*** *or ø 1,2 mm* ***(661798–)*** *eliminates pressure drop when engaging PTO clutch or diff. lock. On the later valve blocks* ***(665536–)*** *there is a separate passage from the pump pressure side to the diff. lock solenoid valve. There is restriction ø2 mm in this passage. In this way are separated functions of the diff. lock and the PTO.*
18. Piston, PTO cushioning valve
19. Valve ball, PTO cushioning valve
20. Restriction Ø 2mm eliminates pressure drop when engaging 4WD or quick–shift gear (Delta Powershift)
21. Valve ball, PTO cushioning valve
22.Valve spool for engaging gear clutch C3.
23. End plug of valve spool (position marked with a punch mark).

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Servo valve block on tractors which have 3–step quick–shift gear 660071–, (Delta Powershift)



Picture 21. *Servo valve block on tractors which have Delta Powershift,* ***660071–*** *(compare with picture 20 on previous page).*

Y1=Solenoid valve for diff. lock
Y2=Solenoid valve for PTO
Y3=solenoid valve for 4WD
Y4=Solenoid valve for reduction gear
Y6=Solenoid valve for overdrive
S16=Transmission oil temperature sensor (warning light)
S17=Transmission oil pressure sensor (warning light)
Note! *Sensor S17 in the picture above is fitted on the valve block up to ser. no.* ***670581****. From ser. no.* ***670582 incl.*** *there is a new sensor , which has two wires (earth and supply) and the pressure values are 10–50 kPa. Apply Loctite 542 to the threads of the sensor.*
P=Oil supply from low pressure pump
V1=Valve spool for direct ratio of Delta Powershift
7= Pipe connector for connecting return oil side of working hydraulics
8) *Restriction/counter valve (Ø 1,6 mm restriction hole). This valve is located in the 4WD pressure outlet, and in connection with 650 DPS, also in C3 multi–disc clutch pressure outlet.*
9) *Valve slide*
9a*) The adjustment of the valve slide has been done in the factory (grinding it so, that the clearance 9a and the corresponding clearance at the left boring comes true).*
Normally there is no need of adjustment. The slide is available as spare part, when needed, adjustment by grinding.
Earlier model: The position of the adjusting screw is marked with a punch point.
New model: The adjusting screw has been replaced with a plug. in this way the possible faulty adjustments can be avoided.
10*) Temperature sender unit for Agrodata – display (option).*

In this servo valve block the pressure–limiting valve (section A–A) is the same as shown in figure **20B** on previous page. Also the oil cooler safety valve (section B–B) and *the 4WD restriction/counter valve* (section C–C) are the same.
The servo valve block above has parts which are needed for 3–step quick–shift gear (Delta Powershift). Otherwise the construction of this servo valve block corresponds to the valve block presented in picture **20B** on previous page.

Important! If repair work concerns the 3–step quick–shift gear (Delta Powershift), see section **44** page **440**/**13**.

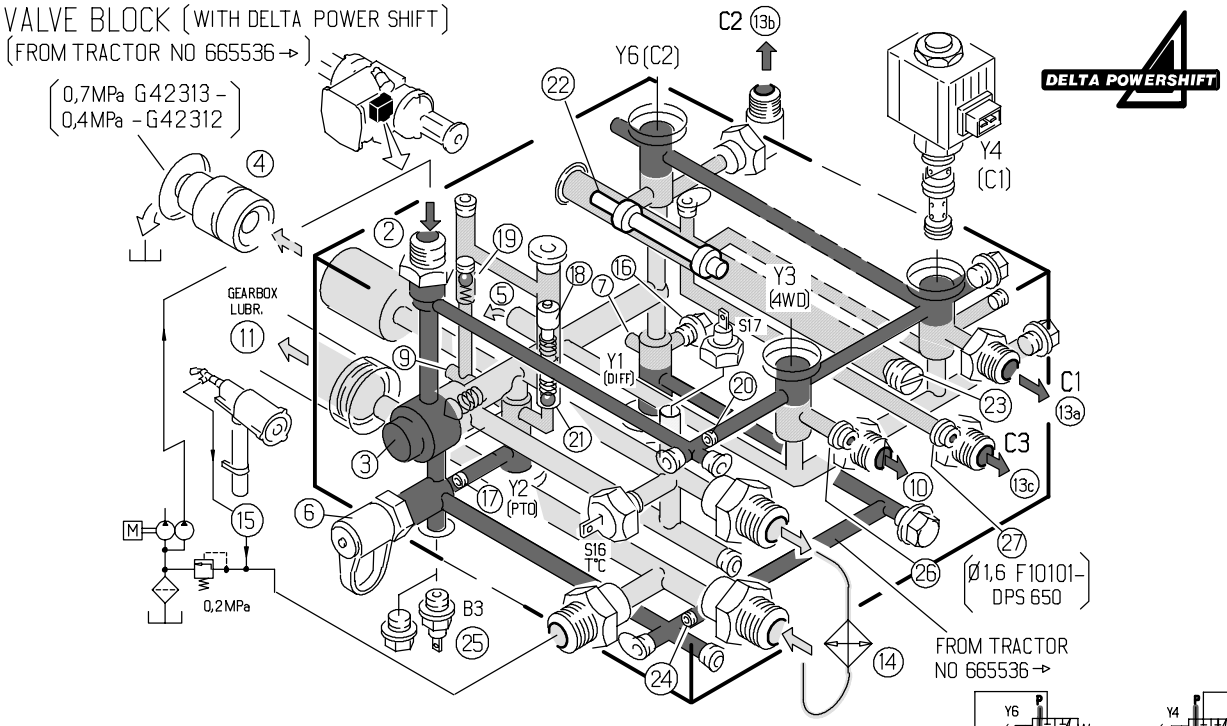
Also this valve has the cushioning valve for the PTO clutch, see also section **46**.

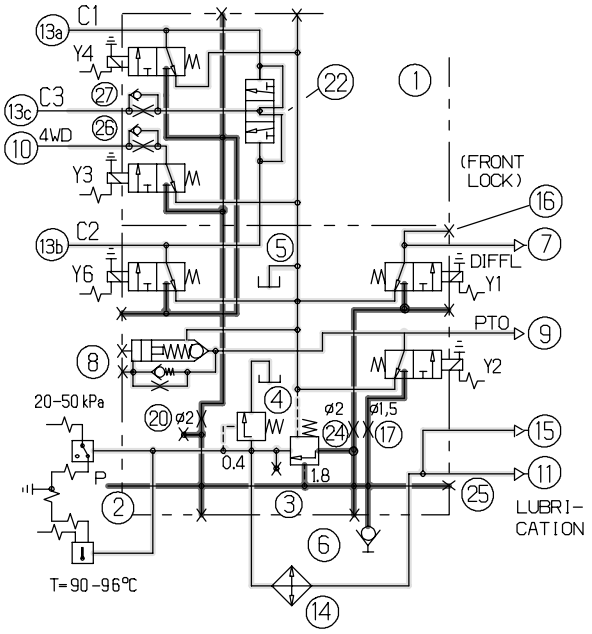
Important! If the valve block should be removed, push with a large screwdriver the lubricating oil pipe (see picture **23** point **2** on page **420**/**22**) towards the gearbox. Push the screwdriver through the oil cooler lower pipe connector. Otherwise the lubricating oil pipe lower end can loosen from the distribution pipe.

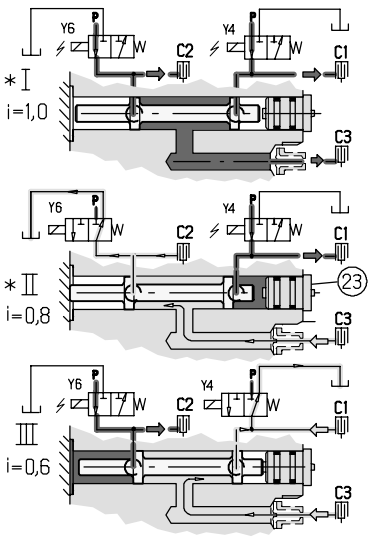
Note! With effect from tractor ser. no. **665536** the valve block has been changed. The modified valve block can be fitted in place of the earlier block. When fitting the latest valve block, thicker "O"–rings (**KH 4070**) must be fitted between the gearbox and the valve block.

Note! The threaded plug (1) has been removed and has been replaced with a lockin plate which is fastened on the valve block with a screw. In this case the valve spool does not need any adjustment, but it is in the correct position when the locking plate is fitted.

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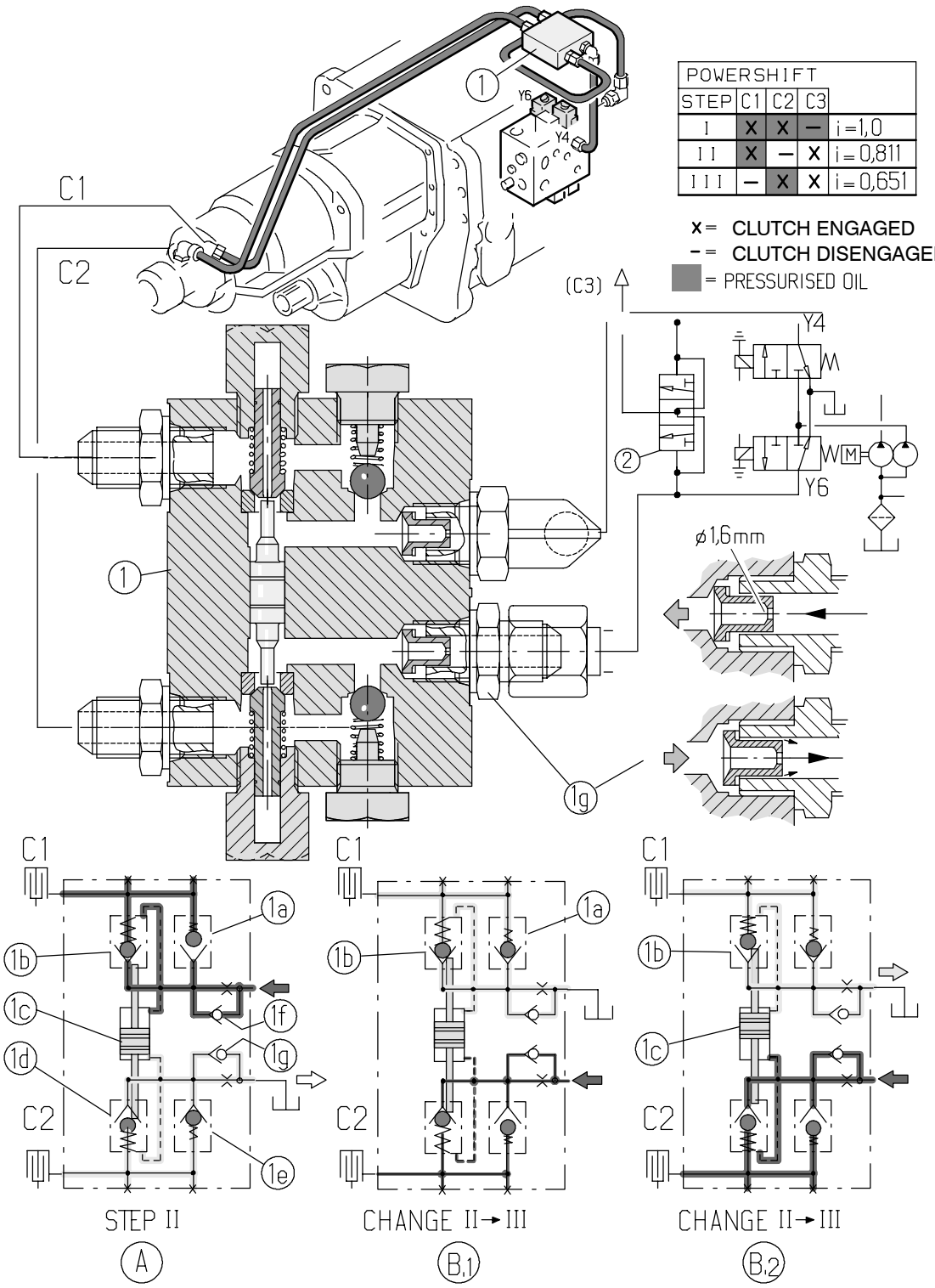


*) AC2.1, PT95

Picture 21A. Servo valve block from ser. no **668103** incl on tractors which have a **mechanical** shuttle.

1 . Servo valve block
2. Oil supply from pump
3. Pressure–limiting valve, 1,8–1,9 MPa (18–19 bar)
4. Safety valve 0,4 MPa (4 bar). Protects oil cooler when hydraulic oil is cold.
5. Tank passage from solenoid valves
6. Pressure–test point (Valmet HPR, thread M16)
7. Pressure oil to differential lock.
8. PTO cushioning valve, incl. parts 18, 19, 21.
9. Pressure oil to PTO clutch
10. Pressure oil to 4WD clutch
11. Oil to gearbox lubricating system
13a. Pressure oil to gear clutch C1 (see section 44).
13b. Pressure oil to gear clutch C2 (see section 44).
13c. Pressure oil to gear clutch C3 (see section 44).
14. Oil cooler (oil cooler must not be plugged. In possible malfunctions, the cooler must be passed with hose)
15. Connection to return side of working hydraulics.
16. Plug (readiness for front axle diff. lock)
17. Restriction ø1,2 mm ***(661798–)*** *and ø1,5 mm* ***(G412131–)****. eliminates pressure drop when engaging PTO clutch.*
18. Piston, PTO cushioning valve
19. Valve ball, PTO cushioning valve
20. Restriction Ø 2mm eliminates pressure drop when engaging 4WD or quick–shift gear (Delta Powershift)
21. Valve ball, PTO cushioning valve
22.Valve spool for engaging gear clutch C3.
23. End plug of valve spool (position marked with a punch mark).
24. Ø 2 mm restriction eliminates pressure drop when using differential lock.
25. Temperature sensor for Agrodata–instrument (option)
26. Change–over restriction ø2 mm. Prevents pressure drop in DPS clutches, when 4WD is disengaged (4WD clutch becomes pressurised) e.g. when braking.
27. DPS 650 ***(F10101–):*** *Restriction/counter valve (Ø 1,6 mm restriction hole) makes the pressure increasing slower in the multi–disc clutch C3 (in other words, the opening of the planetary carrier) , and in this way prevents the momentary neutral position of the Delta Powershift.*

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Picture 21B. *Lock valve of Delta Powershift on tractors which have a mechanical shuttle.*

1. Lock valve
1a,e) Non–return valve, 0,7 bar
1b,d) Non–return valve
1f,g) Change–over restriction (ø1,6 mm)
1c) Lock valve piston

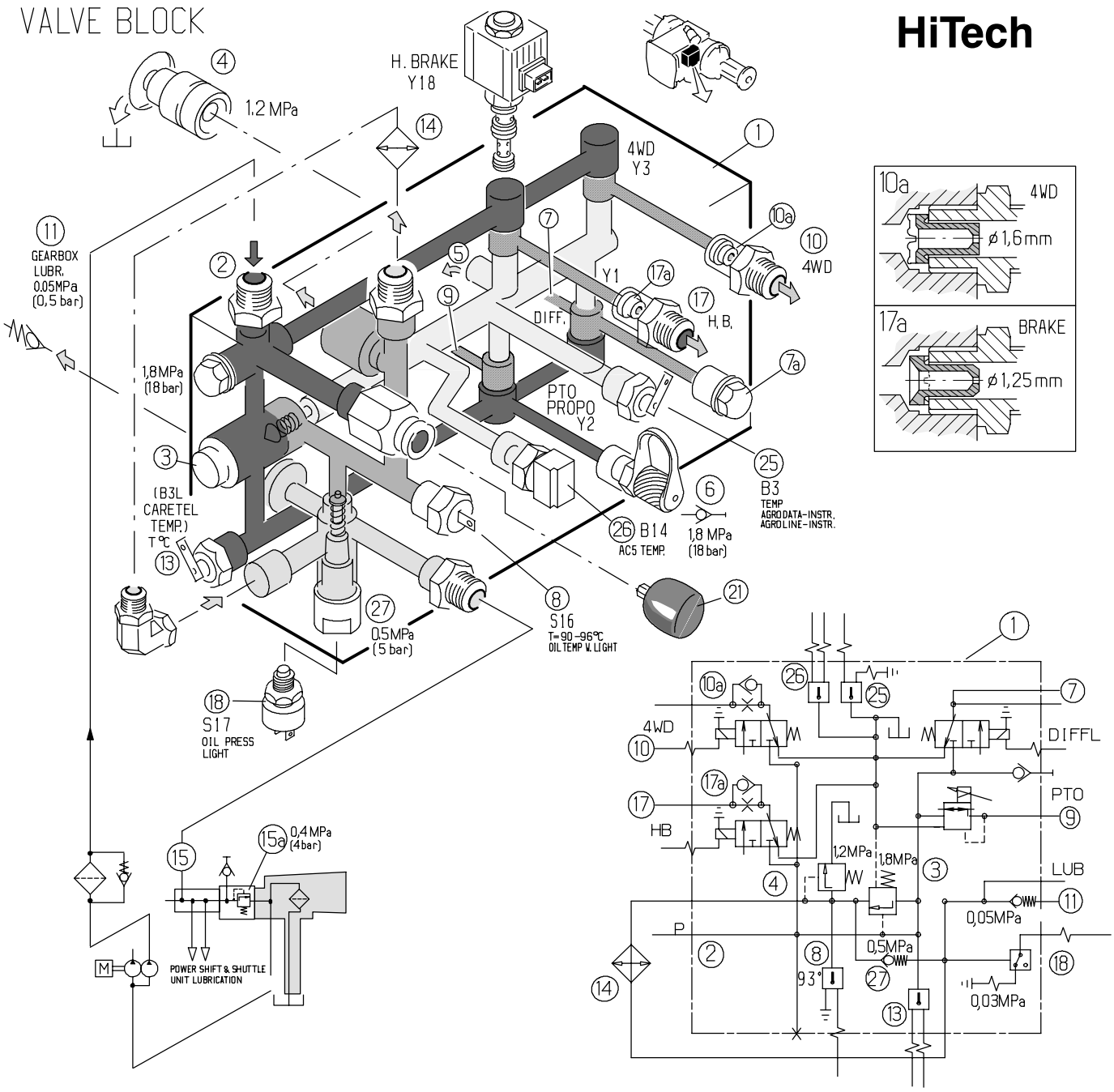
In transmissions 460 and 650 the tractors have the above shown valve (not HiTech tractors). The valve is fitted between the DPS clutches C1 and C2 and the servo valve block.

The valve synchronises the engagement of clutches C1 and C2 so that pressure in one clutch drops just, when the other clutch is fully pressurised. The valve functions, when the DPS ratio is changed from the intermediate ratio (II) to the highest ratio III and vice versa.

Testing the valve

Select H–range gear and start to drive with revs of over 2000 rpm. Drive and depress brake pedals until the engine revs lower to about 1700–1800 rpm. Change DPS ratio from II to III and vice versa and follow the rev. counter reading. If engine revs rises much during gear change, the lock valve must be changed as a complete unit.

If engine overloads strongly during gear ratio change (from II to III or vice versa), the lock valve is faulty and should be changed. This overloading damages the DPS clutches.



Picture 21C. *Servo valve block on HiTech tractors (on the LH side of the gearbox)*
Note! *See also picture on page* ***440/24***.

HiTech Shuttle has caused the following modifications in the servo valve block:

- PTO cushioning valve has been removed (PTO solenoid valve **Y2** is proportional).
- The valve spindle of the DPS clutch C3 has been removed and C3 has its own proportional valve **Y17** (is placed on a separate valve block on the gearbox).
- Valve **Y4** (DPS clutch C1) and valve **Y6** (DPS clutch C2) have been changed to proportional valves, and they are placed on the DPS housing. Hand brake solenoid valve **Y18** (+valve **17a**) has been added.
- DPS restrictions have been removed. A pressure accumulator has been fitted on the valve block (not in picture), which eliminates pressure drops during engaging/disengaging the multi–disc clutches.
- Valves Y2 and Y1 have been connected with an oil channel. Oil cooler by–pass valve has been added. Safety valve limits max. pressure before the oil cooler to 0,7 MPa (was 0.4 MPa).

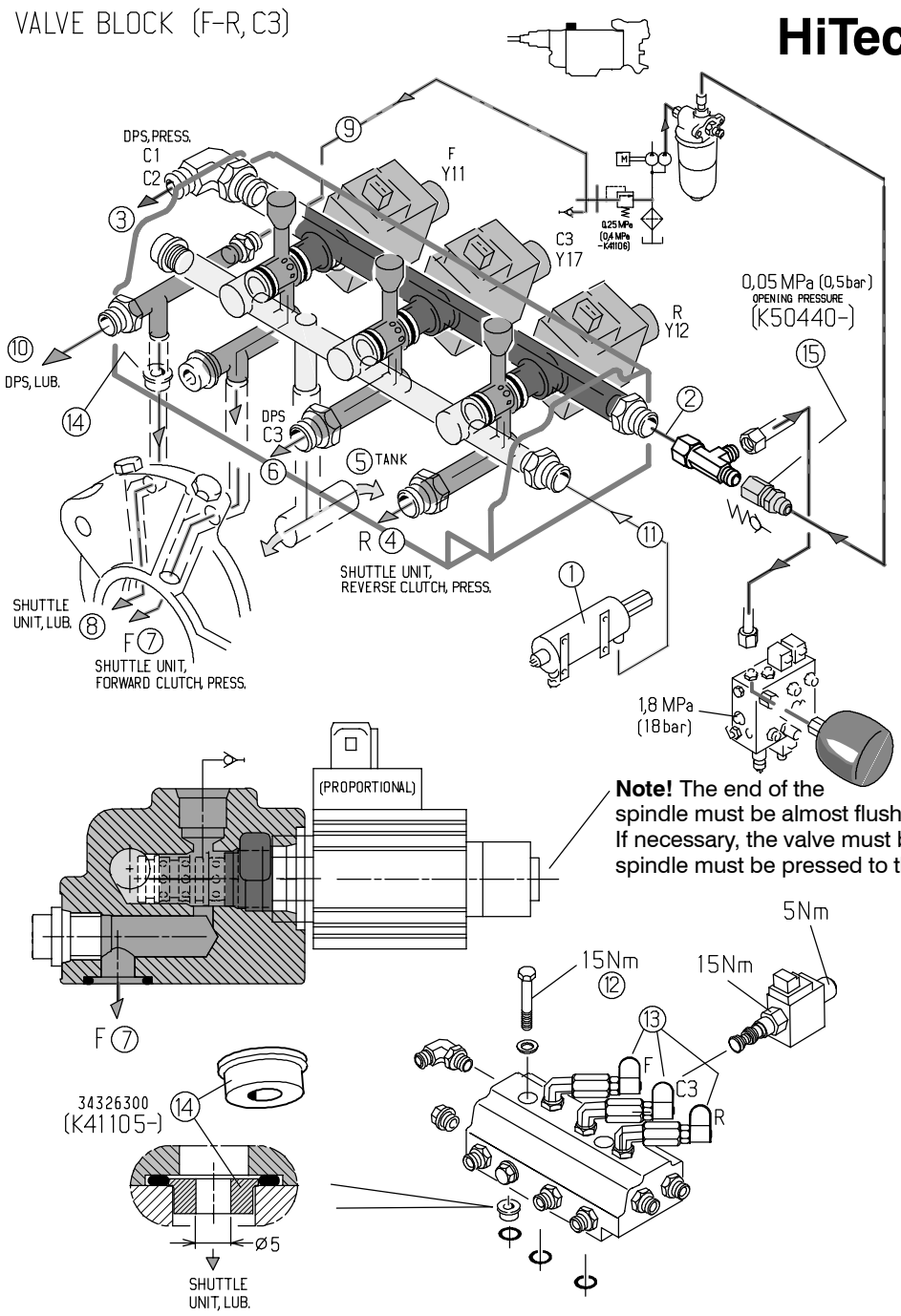
Pressure–limiting valve in the suction strainer housing is of 0,4 MPa (was 0,2 MPa).

By increasing the lubricating oil pressure and with a new by–pass of the oil cooler the oil amount, which flows direct into the tank, has been tried to minimized.

Pressure sensor **S17** has been placed under the block and it measures actual pressure after the oil cooler.

Behind plug **7a** there is diff. lock clutch pressure.

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Picture 21D. *Valve block of HiTech – shuttle on the gearbox housing*

1. Valve block
2. Pressure oil, 1,8 MPa (18 bar), into the valve
3. Pressure oil into DPS clutches C1 and C2.
4. Pressure oil into the HiTech shuttle (rearward driving)
5. Tank passage (into the gearbox and shuttle housings).
6. Pressure oil into DPS clutch C3.
7. Pressure oil into the shuttle (forward driving)
8. Lubricating oil into the shuttle housing
9. Lubricating oil from filter distribution block
10. Lubricating oil into DPS
11. Tank passage from hand brake ram (leaks)
12. Tightening torque 15 Nm.
– Permatex Super 300 No 83 onto the threads
13. Proportional valve
14. Lubricating oil flow into the shuttle has been reduced with a restriction (diam. 5 mm, **K41105–**). This modification balances lubr. oil flow into the F – and R – clutches. In connection with this modification the DPS and shuttle lubr. oil flow has been improved.
15. A non – return valve From ser. no. **K50440** incl. has been fitted to prevent oil pressure escape from pressure accumulator into the hydraulic pump and the brake valve.
This ensures that the parking brake is not engaged too fast after engine stop. **Note!** This happens only in case that the engine stops itself (e.g. fuel runs out) when the driving speed is over 5 km/h. Does not affect the normal function of the parking brake.

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Lubricating system

Gearbox input shaft and bevel pinion shaft have pressure lubrication. The low pressure circuit supplies oil for lubrication. In addition, return oil from the hydraulic power lift is also delivered to the lubrication system (see hydraulic diagram in figure 17).

Lubricating oil pressure–limiting valve (0,2 MPa) is fitted at the rear end of the suction strainer housing on the gearbox.

Lubricating oil is delivered from the servo valve block via an s–shaped pipe to the distributor pipe on the bottom of the gearbox.

From the rear end of the distributor pipe has been drawn a lubricating pipe to the rear end of the input shaft (and to the hydraulic pump drive mechanism). Lubricating oil to the input shaft lubricating points is channelled in the space between the input shaft and the pump drive shaft.

From the front end of the distributor pipe has been drawn a pipe to the distributor piece in the front face of the reverse shuttle housing. From the distributor piece lubricating oil is conducted to the front end of the pinion shaft and via drillings to the different lubricating points.

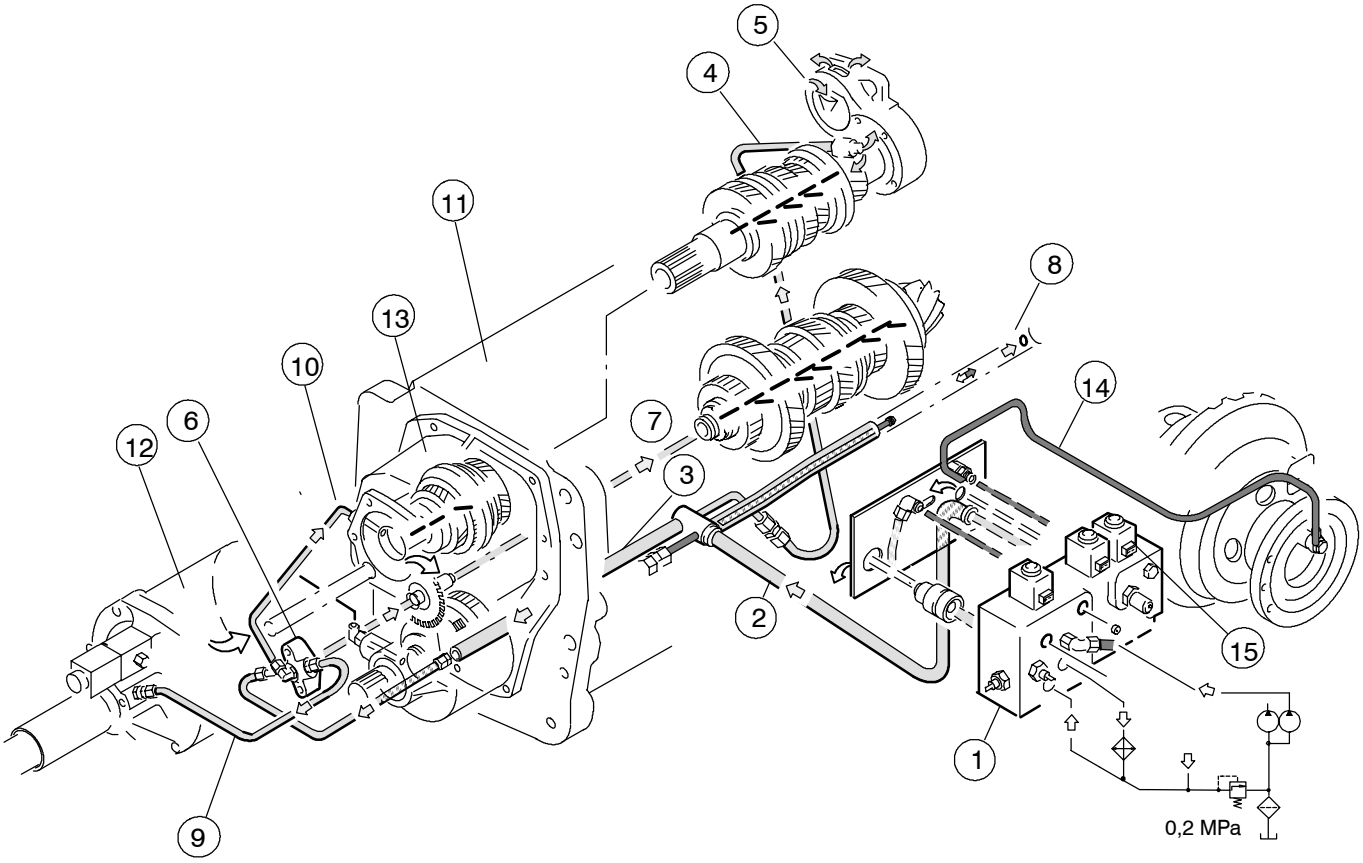
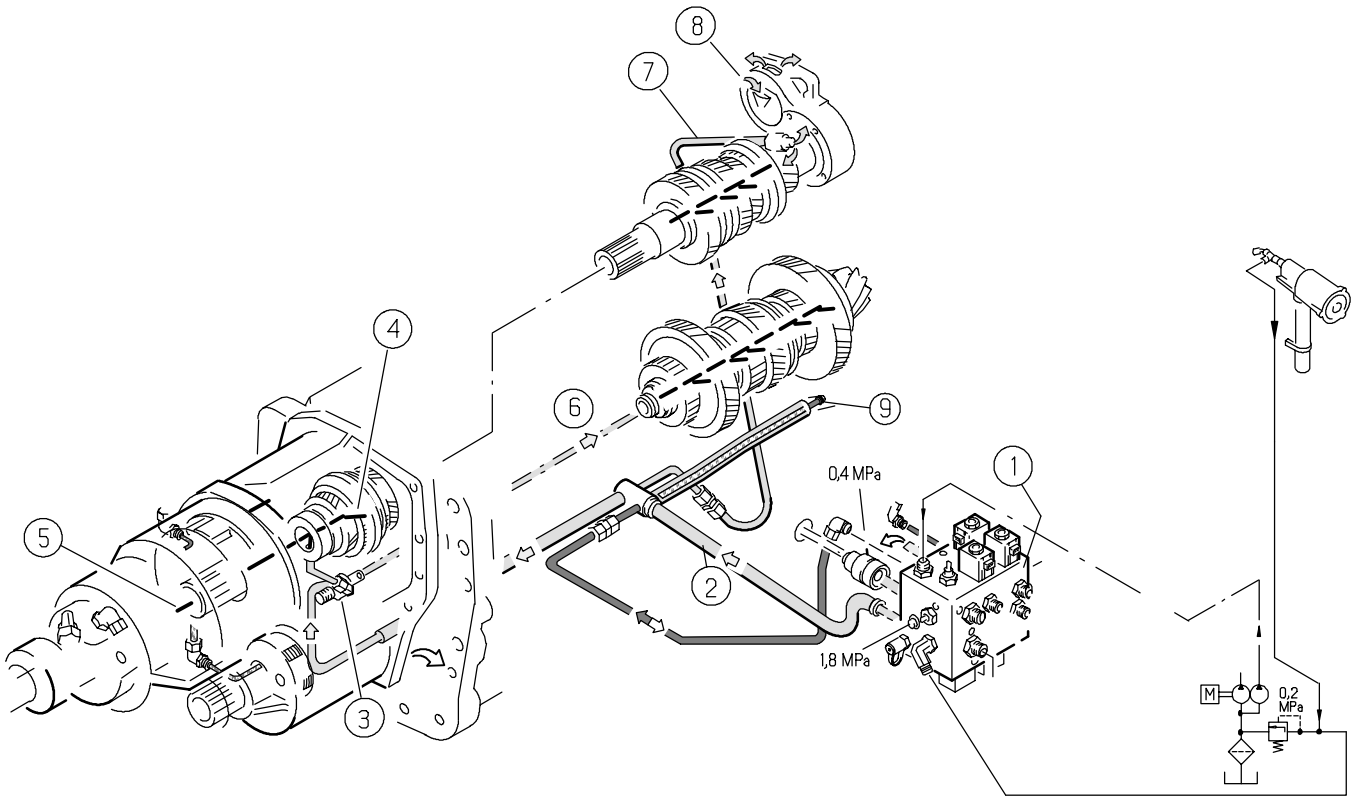


Figure 20. *Lubricating system for power transmission on tractors without quick–shift gear or with 2–step quick–shift gear,* ***–660070****.*
1. Servo valve block (–660070)
2. Lubricating oil feed pipe
3. Distributor pipe
4. Lubricating oil to input shaft
5. Hydraulic pump drive mechanism
6. Distributor piece in the front face of the reverse shuttle
7. Lubricating oil to bevel pinion shaft
8. Lubricating oil to PTO unit
9. Lubricating oil to quick–shift gear
10. Lubricating oil to reverse shuttle
11. Gearbox housing
12. Quick–shift gear
13. Reverse shuttle
14. Pressurised oil to diff. lock
15. Solenoid valve for diff. lock



Picture 23. *Lubricating system of power transmission on tractors which have 3–step quick–shift gear (Delta Powershift),* ***660071–****.*

1. Servo valve block, ***660071–***
2. Lubricating oil supply pipe
3. Distribution piece inside the reverse shuttle housing
4. Lubricatin oil of reverse shuttle
5. Lubricating oil of Delta Powershift
6. Lubricating oil to bevel pinion shaft
7. Lubricating oil to gearbox input shaft
8. Lubricating oil of pump drive mechanism
9. Lubricating oil to power take–off

Working order

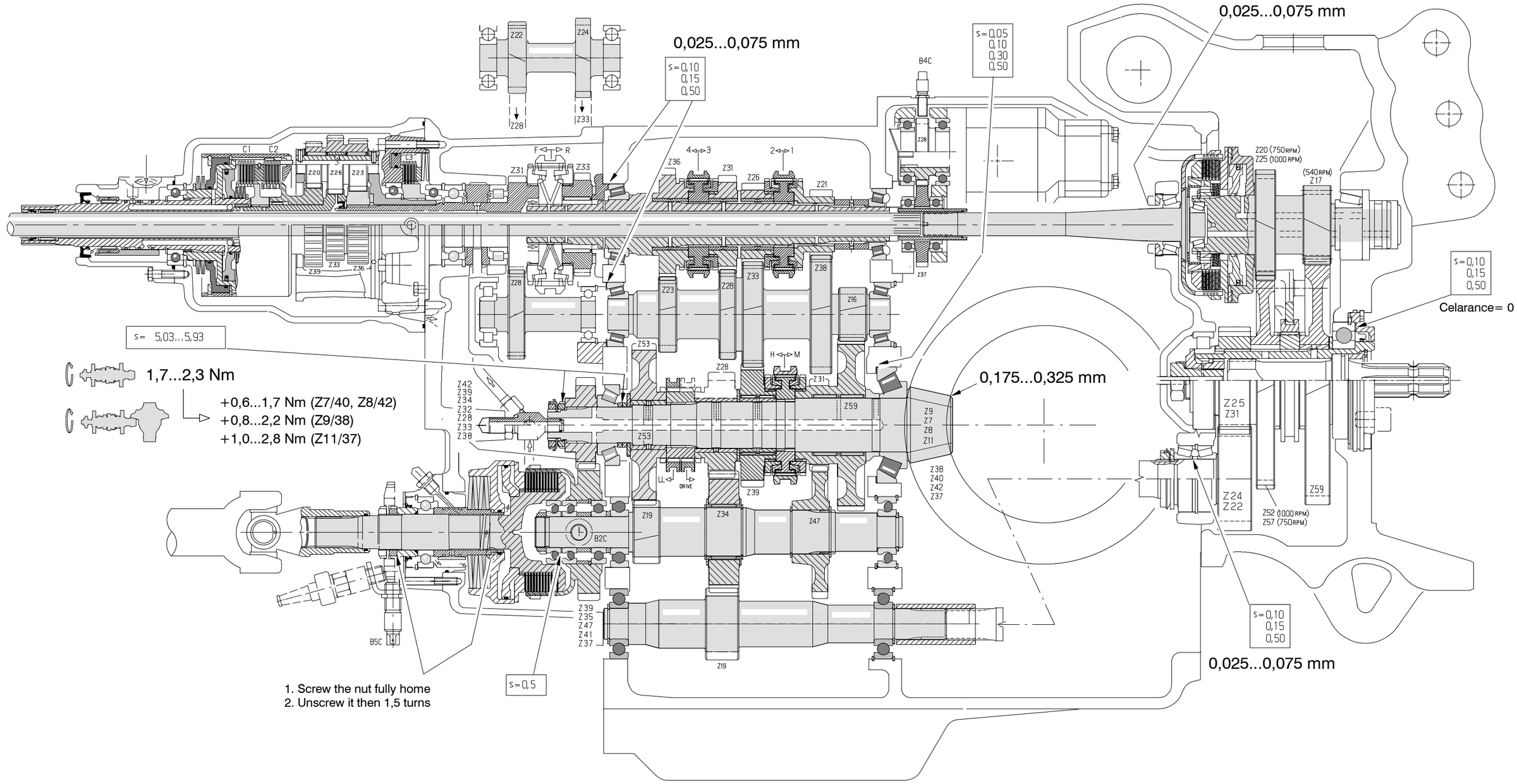
In the table below is shown the working orders for certain gearbox repair work. Reconditioning selector forks, see code 421.
Removing, reconditioning and fitting gearbox, see code 423.

	Drain transmission oil	Remove side cover	Raise cab front side and split tractor between gearbox–fuel tank	Remove PTO unit	Raise cab rear side and split tractor between gearbox–fuel tank	Remove quick–shift gear and reverse shuttle	Remove final drives/ brake housings	Remove differential	Remove selector forks	Remove ground speed PTO shaft (optional)	Remove bevel pinion shaft and transmission shaft
Adjusting selector forks for gears 1–2, 3–4 and M–H	1	2									
Adjusting selector forks for range LL and PTO (optional)	1	2	3			4					
Changing selector forks	1	2	3			4					
Changing selector levers	1	2									
Reconditioning differential	1			2	3 (or raise the cab rear end, and splitting becomes unnecessary)		4	5			
Changing bevel pinion shaft/ crown wheel	1	7		2	3	4	5	6	8	9	
Changing synchronizing rings on input shaft	1	7		2	3	4	5	6	8	9	10

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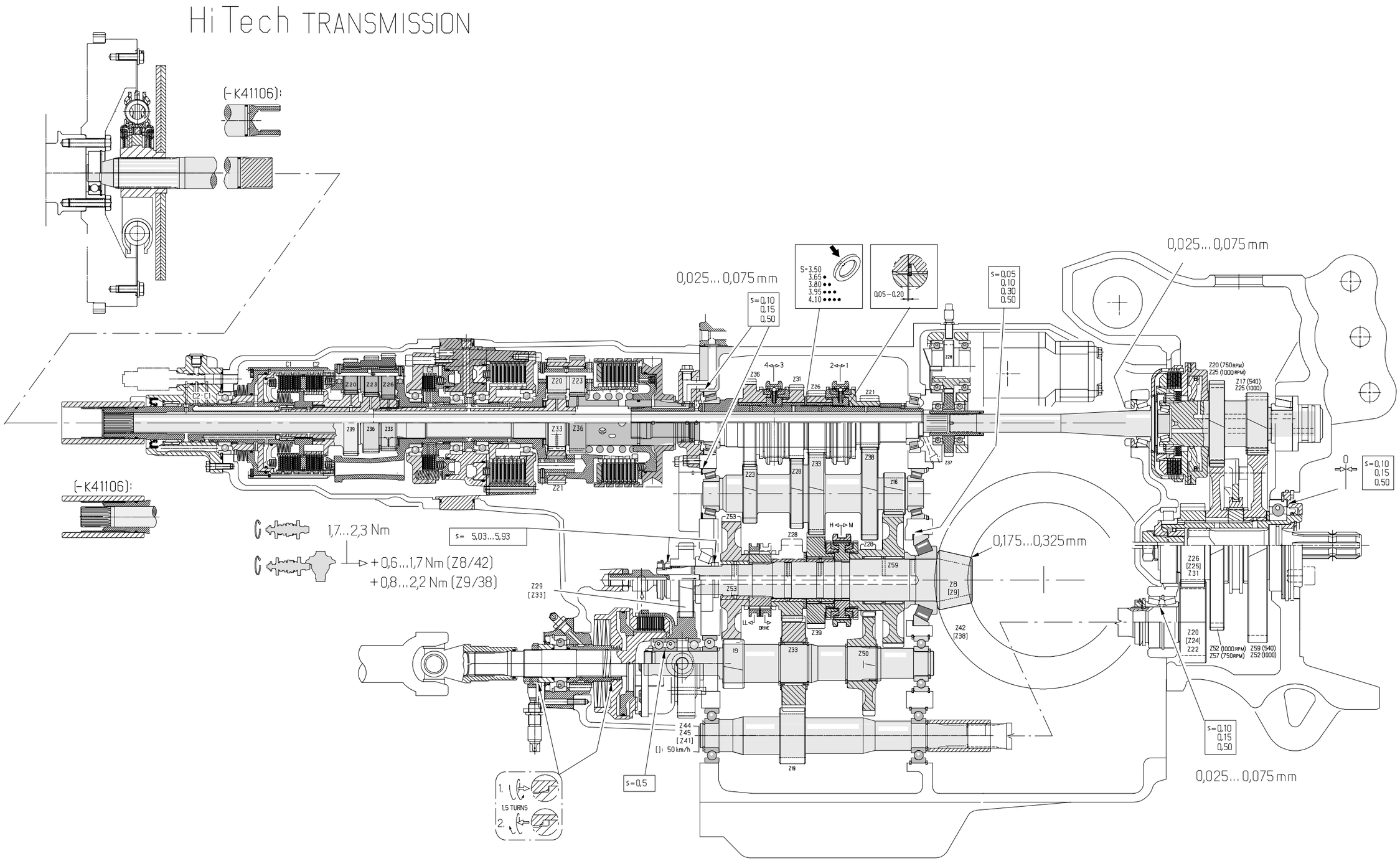
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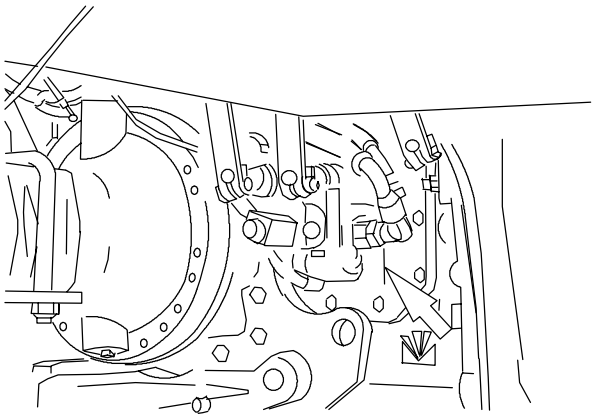
Selector forks (Op. no. 421)

1. Adjusting selector forks

Note! If the gear change mechanism does not function properly (e.g. if selected gear does not stay in the engaged position), the selector forks can be adjusted as follows:

A. Removing side cover

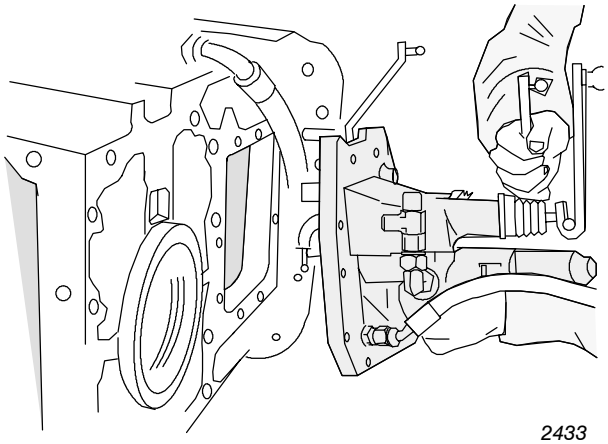
1. Drain the oil from the gearbox. Remove the RH side rear wheel. Move the gear levers to the neutral position.



2. Disconnect oil hoses from the hydraulic power lift control valve. Disconnect the return oil hose from the side cover.

3. Disconnect the shifter rod rear ends and the cable wires from the shifter levers on the side cover.

Note! There is an access hole on the RH side mudguard.



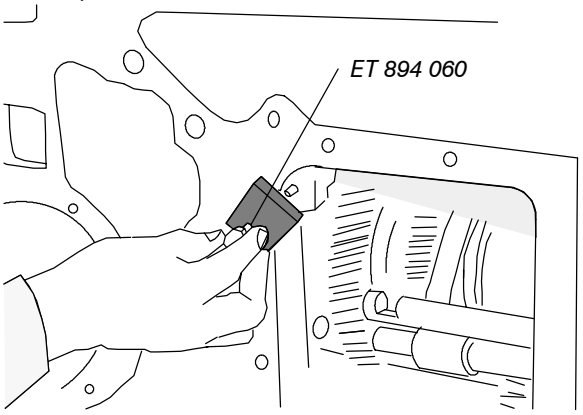
2433

4. Unscrew the side cover bolts and remove the cover. At the same time the selector fork rail locking pins (3 pcs) are released.

B. Adjusting selector forks

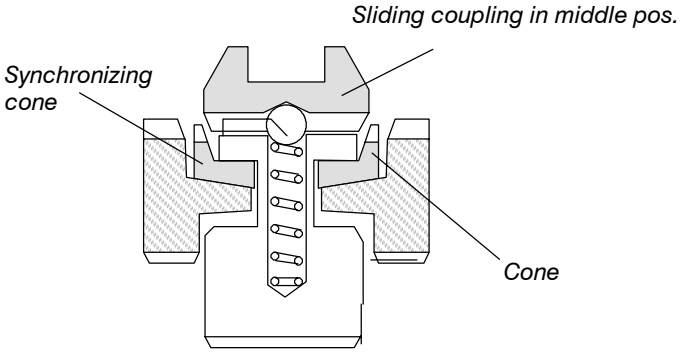
5. Fit the locking balls, springs and pins into their holes.

Note! The longer pins into the two upper holes and the shortest pin into the lowest hole.

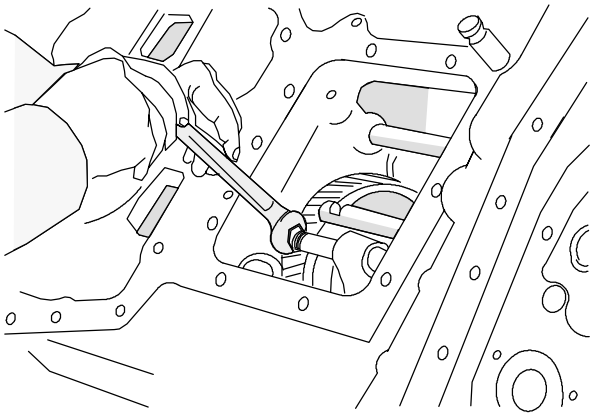


2464

5. Press the upper pin (for gears 1–2) into its drilling with tool ET 894 060.



6. Move the selector fork (and rail) for gears 1–2 to the middle position. Adjust the fork to the middle position by screwing the adjusting piece at the rear end of the selector fork rail.



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7. When the fork (and the sliding coupling) is in the middle position, push the selector rail/fork to the rear position (it is locked by the ball) and tighten the adjusting piece nut (prevent rotation of the adjusting piece while tightening).

8. Take the hold of the rail and move it. It must move loosely.

9. Then push the rail (together with the fork) to the front position. Move the rail again. It must move loosely.

10. Adjust if necessary and finally tighten the adjusting piece nut.

11. In the same way adjust the selector fork for gears 3–4.

Note! Selector fork for gears 3–4 is easiest to adjust by moving the fork so that the groove on it is opposite the groove on the fork for gears 1–2 when the gears are in neutral position.

12. Check the adjustment in the extreme positions, so that the rail/fork for gears 3–4 moves loosely in these positions.

13. Adjust the selector fork for range gears (H–M) in the middle position and check the adjustment in the extreme positions as above.

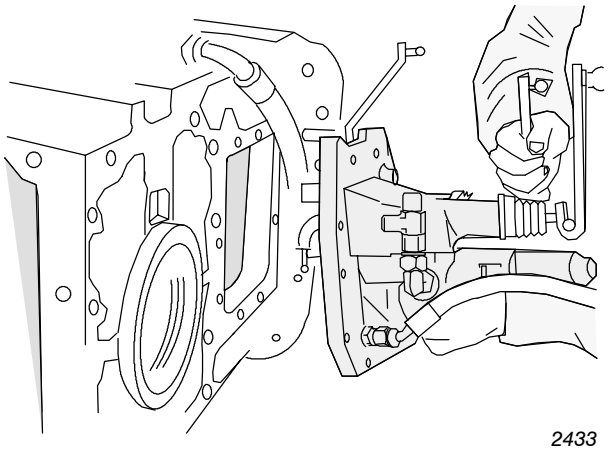
14. Move the fork for range LL (and fork for ground speed PTO, if fitted) to the neutral position and make sure that the groove on the M–H fork is exactly opposite the groove on the fork for range LL (gears in neutral).

Note! If the LL–fork has to be adjusted, the tractor frame must be split between the gearbox and fuel tank and the reverse shuttle housing must be detached. Thus the nut at the front end of the LL–fork rail can be opened and the rail can be turned.

C. Fitting the side cover

15. Make sure that the selector fork rail locking pins are in their holes.

16. Move all selector forks to the neutral position. Apply sealing compound (e.g. Silastic) to the contact surface between the cover and the gearbox. Clean mating surfaces if necessary.



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17. Fit the side cover (upper end first).

18 Tighten the bolts to **50 Nm**.

19. Connect the oil hoses to the cover and to the control valve.

20. Connect the cables and the shifter rods to the shifter levers on the cover

21. Pour the oil into the gearbox.Test–drive the tractor and check that the gear change mechanism functions properly.

2. Changing selector forks

Note! See also the following instructions:
– instr. **423 2D** (removing the selector forks)
– instr. **423 4B** (fitting and adjusting the selector forks)

1. Drain the oil from the gearbox.

2. Split the tractor between the gearbox and the fuel tank; see instr. **441 1A** (cab attached to the rear frame) or instr. **423 1A** (cab attached to the front frame).

3. Remove the quick–shift gear (**see instr. 441 1B**) and the reverse shuttle (**see instr. 442 1A**) from the gearbox front side.

4. Remove the gearbox side cover.

5. Remove the selector fork locking pins. Pull out the rails forwards and remove the forks through the side opening in the following order:

– fork for ranges M–H (remove first the LL/PTO–rail)
– fork for ground speed PTO (if fitted)
– fork for gears 3–4
– fork for range LL
– fork for gears 1–2

6. Fit the forks in the reverse order.

Note! The rail, fork and the locking pin for gears 1–2 must be fitted before other parts are fitted into the gearbox. In addition, the fork for ranges M–H must be fitted onto the sliding coupling before fitting the rail for range LL (and ground speed PTO (if fitted))

Sliding pieces on the selector forks

(see picture 16 on page 420/15).

With effect from tractor ser. no. **661937,** the selector forks and the plastic sliding pieces have been changed. In connection with possible repair works, new forks and sliding pieces must be fitted.
Note! In connection with repairs the earlier forks and sliding pieces must be changed into new ones in spite of the condition of the earlier parts.

Forks 1–2, 3–4, M–H and F–R have each 4 pcs sliding pieces and they are all similar (spare part number 32888200, 16 pcs).
Fasten the sliding pieces on the forks with a little grease during fitting.

Also the later AVO and LL forks have sliding pieces.

Note! The reverse shuttle fork F–R is different on tractors which have a 2–speed quick–shift gear or the Delta Powershift. Changing the shuttle fork, see under code **442**.

Reconditioning gearbox (Op. no. 423)

1. Removing gearbox

Note! The gearbox is easiest to remove if it is possible to remove the cabin (removing and fitting cabin, see Op. 811 1A). In the instruction below the cabin, however is in place. In addition, on E – models the sensor wires must be disconnected.

A. Splitting tractor between gearbox and fuel tank (cab attached to front frame)

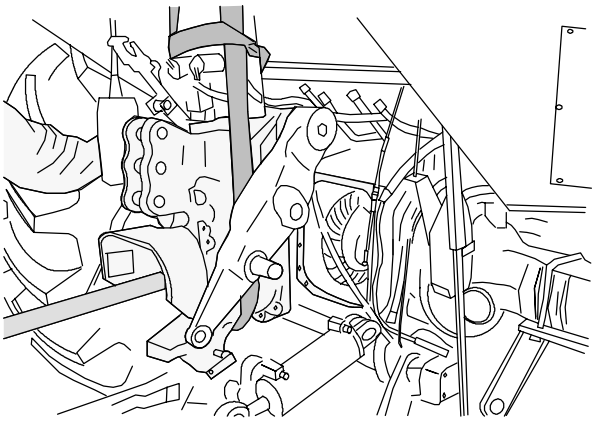
1. Remove all engine hood plates.



2. Remove the propeller shaft guard and disconnect the propeller shaft rear end flange joint (on tractors with Delta Powershift, there is not a flange joint at the rear end of the propeller shaft).

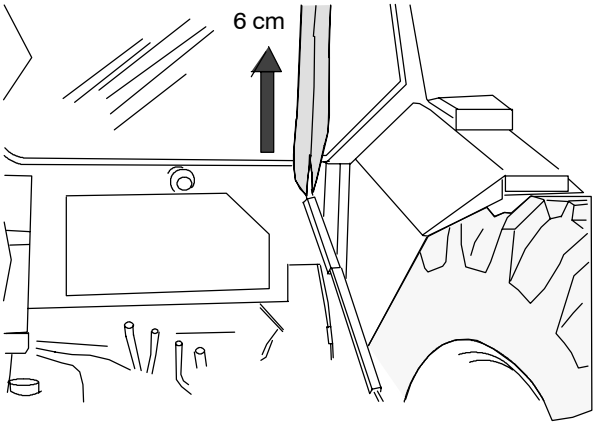
3. Drain the oil in the transmission.

4. Release the lower end of the PTO control cable, lower end of the pick – up hitch release control and the joint at the lower end of the lewelling screw control rod (these att at the rear of the tractor).



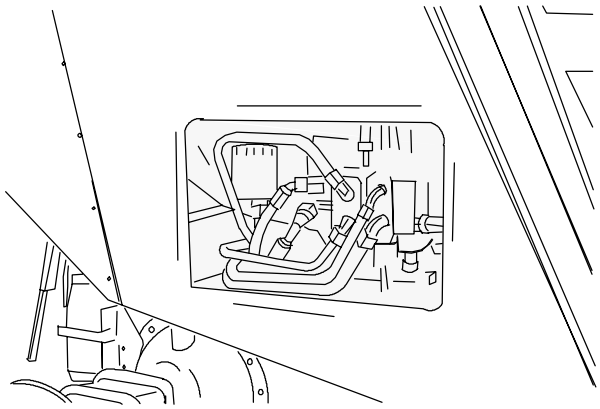
5. Remove the power take – off unit (**see Op. 462 1A**).

6. Unscrew the cab rear fastening bolts and raise the cab rear part about 6 cm.



Note! Lifting rope can be fastened to the levelling screw control rod support according to the figure above.

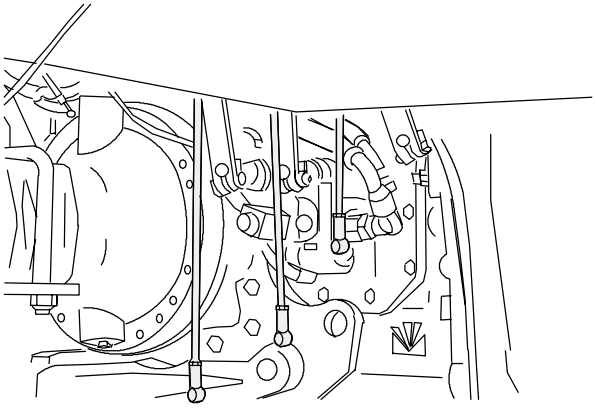
7. Remove the RH side rear wheel and open the hatch on the RH side rear mudguard.



8. Disconnect the oil pipes from the rear and front sides of the valve blocks for the auxiliary hydraulics.

9. Unscrew the fixing bolts for the valve block bracket on the gearbox and lift the valve blocks upwards.

Note! The valve blocks can be fastened to the cab with wire. If necessary, extra valve blocks must be detached for easier opening of the bracket bolts.



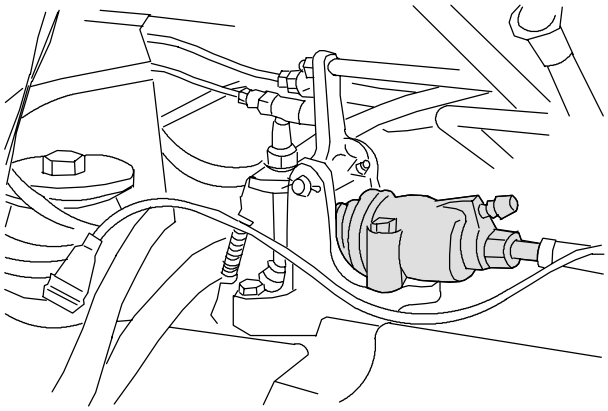
10. Disconnect the shifter rods from the lower ends of the gear levers. Disconnect the cable from the shifter levers and from the gear lever lower ends. Remove the gearbox housing breather filter by disconnecting its pipe through the mudguard opening.

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11. Disconnect the control valve solenoid wires on the gearbox side cover. Disconnect oil hoses from the pressure filter.

Note! It is easier to disconnect and connect the hoses if the pressure filter is removed. Pressure filter is fitted under the cab floor on the RH side front corner.

12. Remove the hose clip (on RH side), which binds two hoses (one hose is connected to the pump side of the valve block set and another to the pump pressure connection).



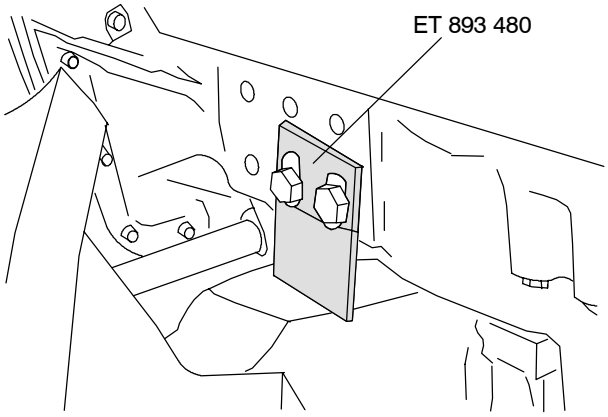
13. Remove the brake cylinder fixing bolts (at the rear of the tractor) and free the cylinders and support them to the cab floor. Release the parking brake cable from its mechanism.

14. Disconnect the hydraulic power lift sensor connectors in the lever console in the cab (remove console side panel). Remove also the lead – in plate for the wires.

15. Disconnect the sensor wires from the servo valve block on the LH side of the gearbox. Disconnect hoses and pipes (on the LH side) which prevent splitting.

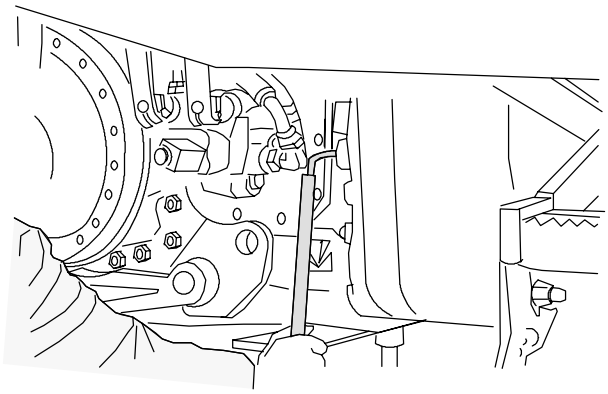
16. Disconnect the wires from the solenoid valves on the servo valve block (on LH side).

17. Fit the RH side rear wheel.

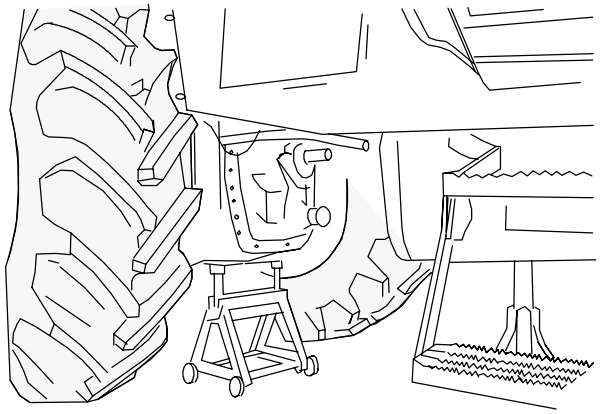


18. Fit supports ET 893480 on the front axle (on both sides) to prevent front axle oscillation.

19. Fit a steady trestle under the fuel tank. Fit a trestle fitted with castors under the gearbox front edge and under the towing hook.

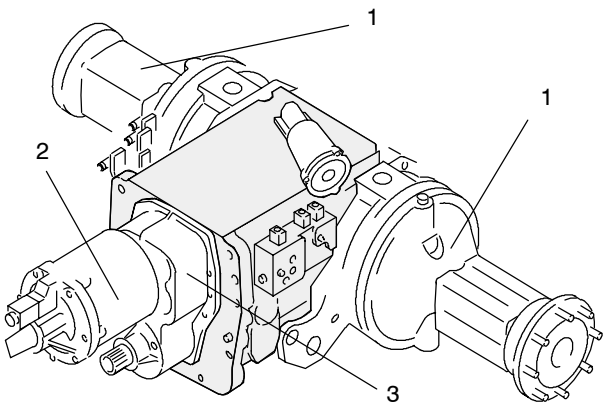


20. Open the bolted joint between gearbox – fuel tank (on RH side, disconnect the control valve hoses for easier work).



21. Part the tractor by pushing at the rear wheels. If the tractor has big rear wheels the rear mudguards should be removed.

Note! Make sure that every hydraulic pipes have been released. Disconnect the front end of the hose to the priority valve and remove the hose between the valve block set and the control valve of the hydraulic lift.



22. Remove the rear wheels, rear axles (1), quick shift gear (2) and reverse shuttle (3) from the transmission unit. Place the gearbox in the fitting stand.

N.B. Label all detached parts and pipes from the transmission unit for easier assembling.

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2. Disassembling gearbox

In this instruction the gearbox has been removed from the tractor (**see previous instr. 1A**) and external pipes have been removed and also the following components:

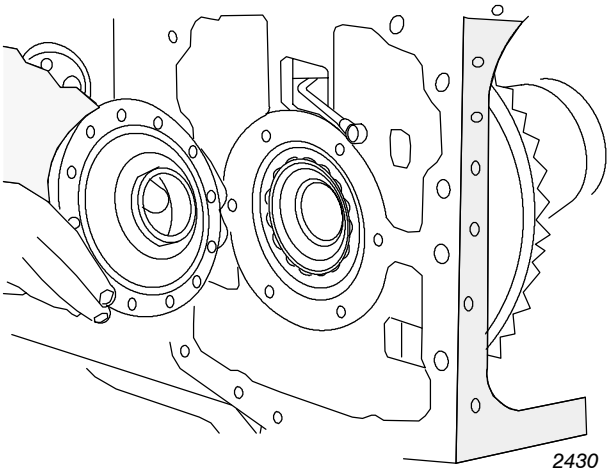
– final drives together with brake housings
– 2–speed quick–shift gear or 3–speed DPS
– reverse shuttle

1. Place the gearbox in the fitting stand. Instruction below is shown in the correct working order. In addition, the gearbox below has been equipped with parts for optional ground speed PTO.

A. Removing differential

Note! Before removing, mark the position of the differential bearing flanges for easier assembling, See also instr. **424 1A**.

1. Detach the diff. lock pressure oil pipe from the LH side bearing flange and bend the pipe to one side.

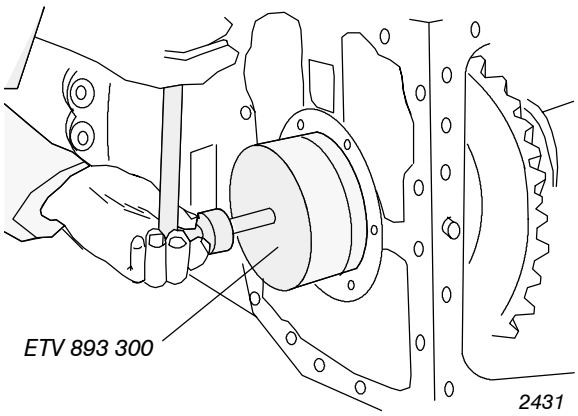


2430

2. Remove the LH side bearing flange.

3. Press the differential to the left until the LH side bearing is pushed out from its location.

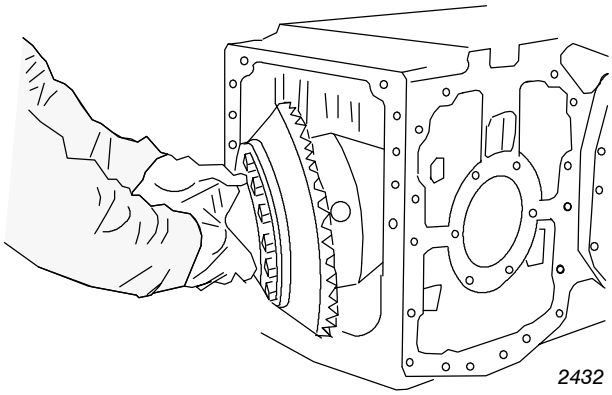
4. Fit a wooden wedge under the differential and place an other wedge between the gearbox housing and the differential so that it presses the differential to the right against the RH side bearing.



2431

5. Remove the LH side bearing by using puller ETV 893300 with a counter hold ETV 894120 and claws ETV 893302.

Note! Make sure that the claws grip around the bearing race at diametrically opposed points.



2432

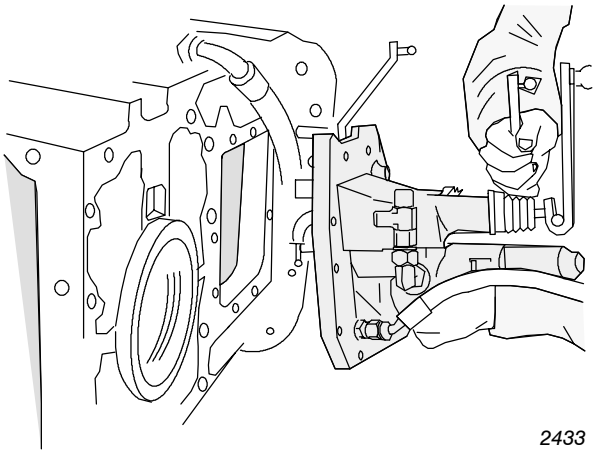
6. Remove the RH side bearing flange and the bearing outer race. Move the differential to the right and remove the differential from the gearbox housing (left side first).

7. Reconditioning differential, see Op. **424 1A**.

B. Removing side cover.

Note! The side cover can also be detached from the tractor without removing the gearbox. Only the oil need to be drained from the gearbox.

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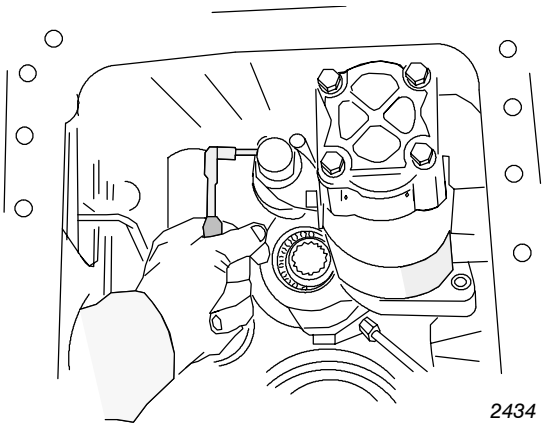


2433

1. Set all gears to neutral position. Unscrew the side cover bolts and remove. At the same time selector fork rail locking pins are released.

C. Removing hydraulic pump

Note! The pump can also be detached from the tractor after removing the PTO unit (see section 90. Hydraulics).

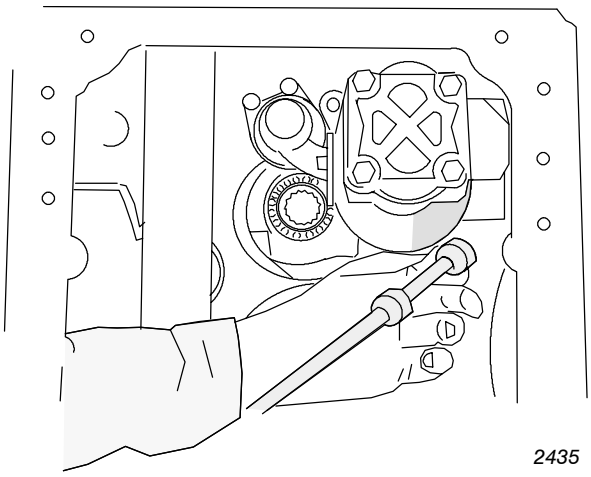


2434

1. Loosen the suction pipe clip (hexagonal socket head screw, 5 mm).

2. Detach the suction strainer housing on the gearbox and remove the long suction pipe and the curve pipe.

3. Remove also the pressure pipe connections on the gearbox (pipes have threads).



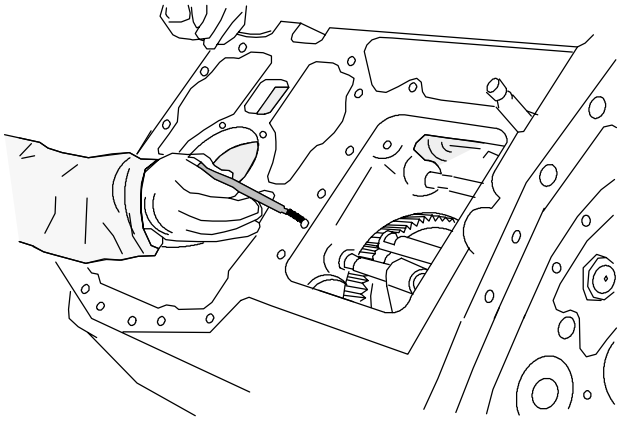
2435

4. Unscrew pump fixing bolts and remove the pump.

D. Removing selector forks

Note! If only selector forks have to be removed, then split the tractor between the gearbox and fuel tank and remove the reverse shuttle housing. Now the selector fork rails can be removed forwards and the forks can be removed through the side opening (see instr. on page **421**/**2**).

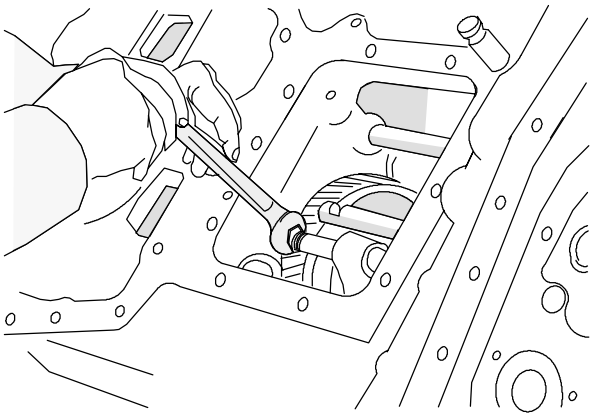
1. Remove the selector fork rails as follows:



2438

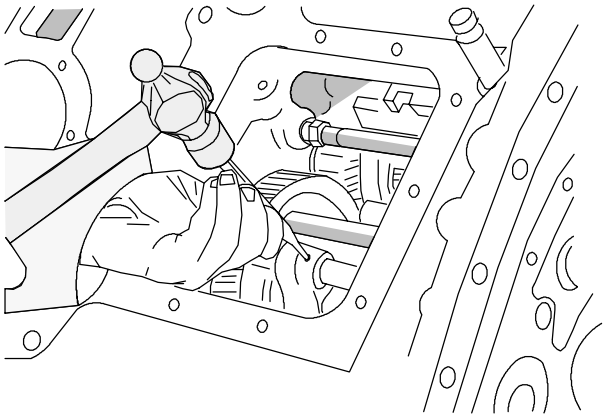
– remove pins, springs and balls (3 pcs) from their locations.

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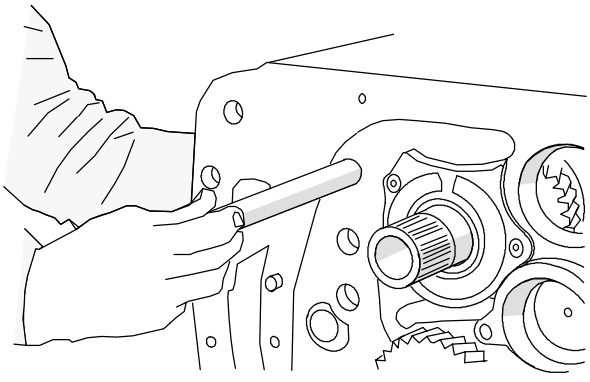
2439

– loosen the rail locking nuts



2440

– engage gear 1. Tap out the locking pins for the forks for gears 1–2, 3–4 and M–H.

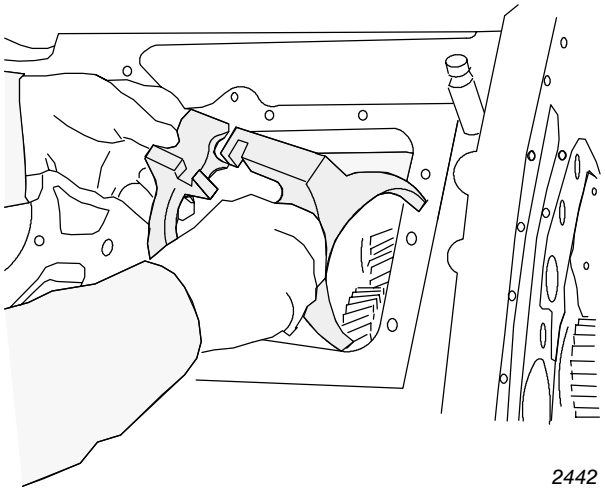


2441

– unscrew the rails from their adjusting pieces at the rear ends and pull out the rails forwards.

2. Remove the circlip on the rail for gears AVO/LL (ground speed PTO/LL–range). Open the nut at the front end of the rail and remove the rail by turning it.

Note! Take care of the released balls and springs.



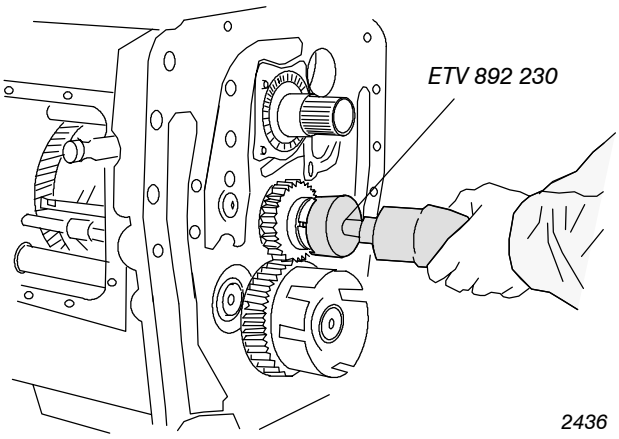
2442

3. Remove the forks for gears 1–2 and 3–4 on the input shaft and remove also the sliding pieces.

4. Remove the forks for gears M–H, AVO and LL on the bevel pinion shaft. Remove also the sliding pieces on the M–H fork. Also the latest AVO and LL forks have sliding pieces.

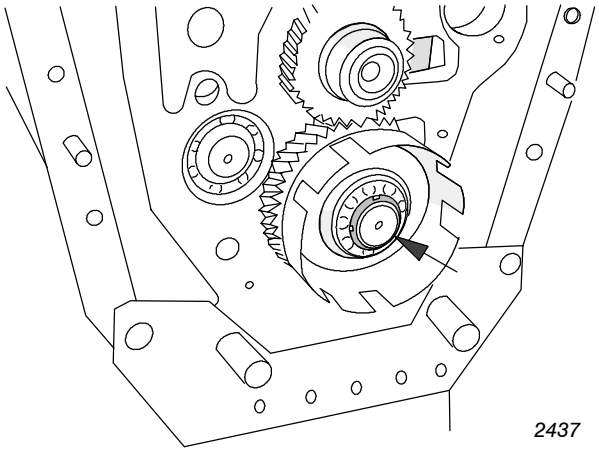
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E. Removing AVO–shaft, bevel pinion shaft, transmission shaft and input shaft



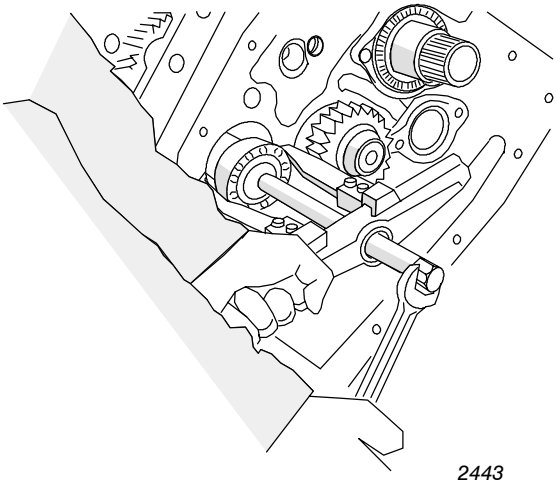
2436

1. Bend aside the tab washer and unscrew the bevel pinion shaft nuts with ETV 892230. Remove the 4WD output gear at the front end of the bevel pinion shaft.

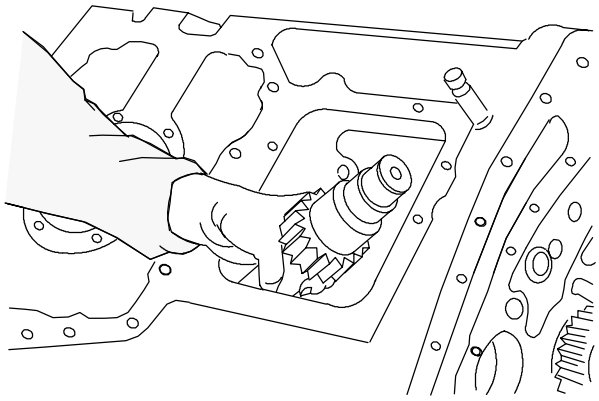

2437

2. Unscrew the 4WD clutch drum nut with ETV 894190 and remove the drum.

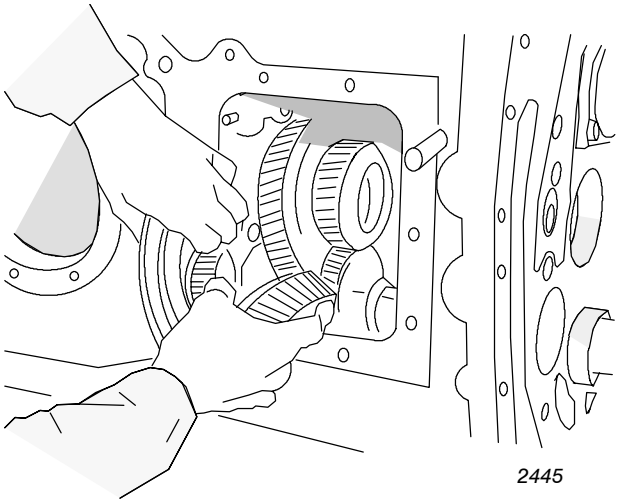
3. Remove the circlip on the AVO–shaft (ground speed PTO shaft, option).


2443

4. Tap the AVO–shaft forwards and remove the front bearing with a puller. Remove the rear bearing with a suitable drift.


2444

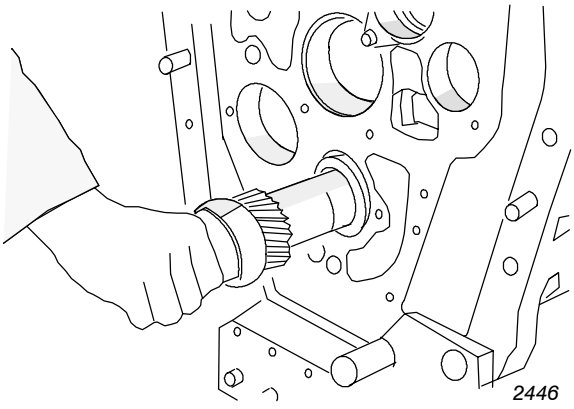
5. Remove the AVO–shaft through the side opening.


2445

6. Remove the bevel pinion shaft rearwards. Remove the gears and synchronizing units through the side opening. Remove the bearings.

7. Remove the rear circlip on the transmission shaft and tap at the shaft rear end until the shaft loosens from its bearings.

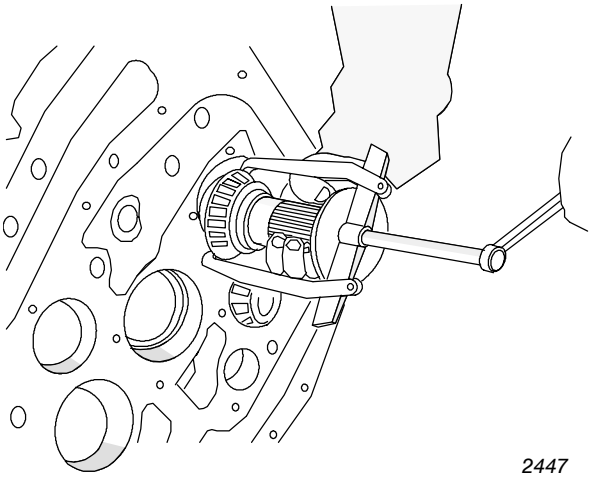
8. Release the gear wheel circlip through the side opening.


2446

– pull out the transmission shaft forwards.
– remove gears, circlips, spacer rings and needle bearings through the side opening.

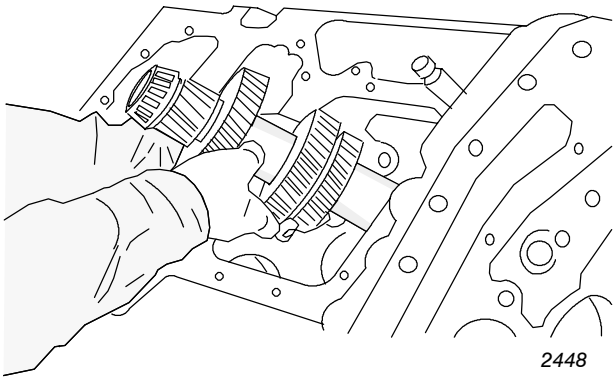
9. Remove front bearing covers at the front end of the layshaft and the input shaft. Pull the input shaft forwards until the front bearing outer race is detached.

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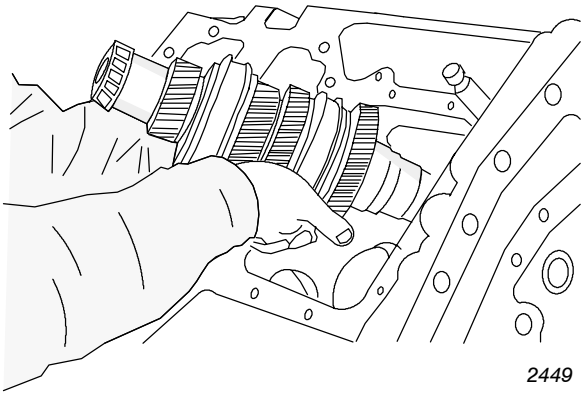
2447

10. Remove the input shaft front end bearing. Support the shaft so that it is kept horizontal.



2448

11. Remove first the layshaft from the housing.



2449

12. Then remove the input shaft.

Important! Before removing the layshaft and the input shaft, unscrew the lowest screw for the pump drive mechanism inside the gearbox housing. Also remove the servo valve block on the LH side of the gearbox, so that the S – shaped lubricating oil pipe is released.

13. Remove the pump drive mechanism, if needed. Fixing screws are inside the gearbox housing.

Note! Before detaching the pump drive mechanism, the suction strainer housing and the suction pipes have to be removed. Also the input shaft lubricating pipe must be removed.

14. Remove bearing outer races from their locations.

3. Checking disassembled gearbox

1. Check the condition of all gear wheels and bearings. Replace damaged parts with new ones. Lubricate all parts with oil.

2. Clean the gearbox housing and the lubricating pipes if necessary. Check the bearing locations.

3. Check the condition of the synchronizing units. The input shaft synchronizing units can be detached by removing the rear bearing with a puller.

Input shaft in transmission 650:

In transmission 650 there is a circlip behind the input shaft rearmost synchronizer. This circlip must be removed before removing the input shaft foremost parts (see picture 5 on page 420/7).
Also a spacer has been added between the input shaft gears Z31 and Z26, with which is adjusted the clearance between the circlip and the synchronizer hub to zero or as small as possible. The spacer has marking dots, which indicate the thickness of the spacer, see picture 5 on page 420/7.

Checking synchronizing ring wear:
– Place the coupler gear on a flat surface (tapered part upwards).
– Place the synchronizing ring correctly on the tapered part of the coupler and measure the clearance between the ring and the gear (i.e. how deep the ring is pressed).

Correct clearances:
Input shaft (1 – 2, 3 – 4) synchronizing rings (ø 82)
– new 1,750 – 1,850 mm (min allowable clearance 0,7 mm)
Pinion shaft synchronizing rings (M – H) (ø90 mm)
– new 1,700 – 2,250 mm (min allowable clearance 1,0 mm).

Assembling synchronizing units
– place the sliding coupler on a flat surface.
– put the springs and shoes onto the hub, press them inwards and place the hub into the sliding coupler so that the springs and shoes are kept in place.
– fit three balls (separately) onto the springs and press the ball inwards and push the parts inside the sliding coupler so that they are kept in place.
– when all three balls are in place, push the hub into the sliding coupler.

Note! The bevel pinion shaft and the crown wheel are replaced in pairs because they have been matched together.

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4. Assembling gearbox

Note! In this instruction, assembling work is done in the correct working order. Before assembling, the lubricating oil pipes must be fitted.

A. Fitting layshaft, input shaft, transmission shaft, bevel pinion shaft and AVO–shaft

Note! Lubricate all parts with oil before fitting.

1. If the layshaft bearings are changed, warm up new bearings before fitting them onto the shaft or use a suitable fitting sleeve.

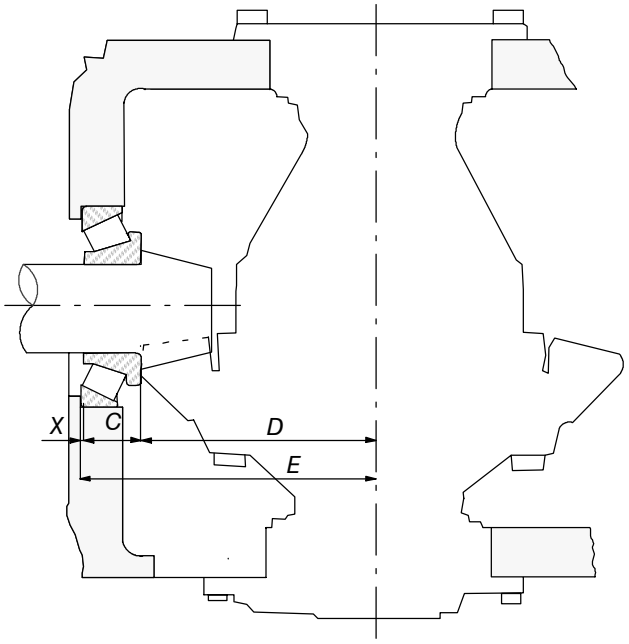
2. Fit the pump drive mechanism, if detached. Do not fit the lowest fixing screw. Fit the input shaft lubricating oil pipe.

3. Fit the layshaft rear bearing outer race into the location. Then fit the spacer ring (3 mm) and the circlip behind the race.

4. Fit the reverse shuttle selector lever (if removed) so that the round–shaped end points downwards. Grease the lever o–ring and fit it.

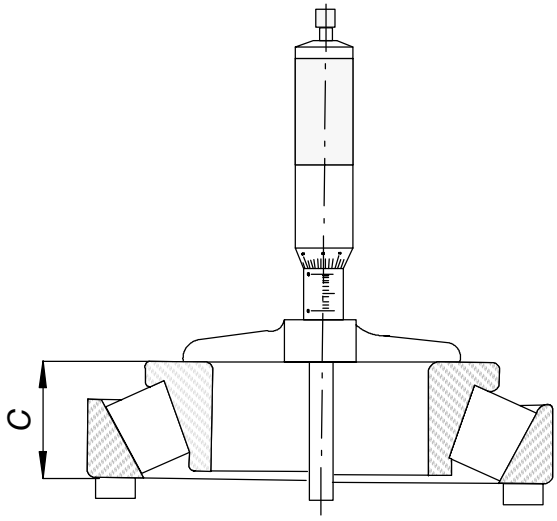
Adjusting position of bevel pinion shaft

The purpose of this adjustment is to determine the number of shims under the rear bearing outer race

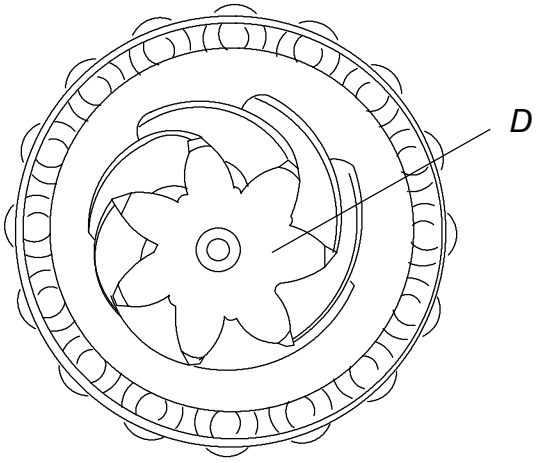


X = required shim thickness
C = thickness of rear bearing
D = measurement stamped into the end surface of the pinion shaft (the distance from the rear surface of the bearing to the centre of the differential bearing locations)
E = the distance from the bottom of the rear pinion bearing location to the centre of the differential bearing locations.

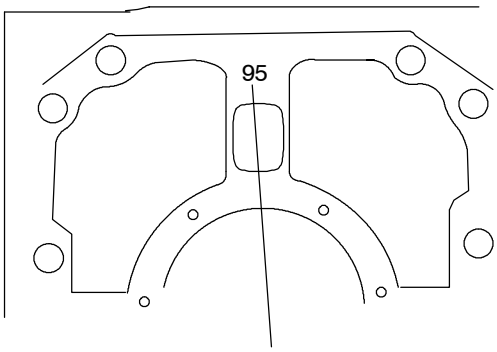
Note! E = 193 mm + decimals stamped on the RH side of the gearbox housing (e.g. 95). However, if this decimals is between 0,00–0,20, then E=194 mm.



– Measure the thickness **C** of the rear bearing (e.g. 33,75) (rotate the bearing at least 20 times before measuring).



– Read value **D** stamped into the rear end of the pinion shaft (e.g. 159,70)



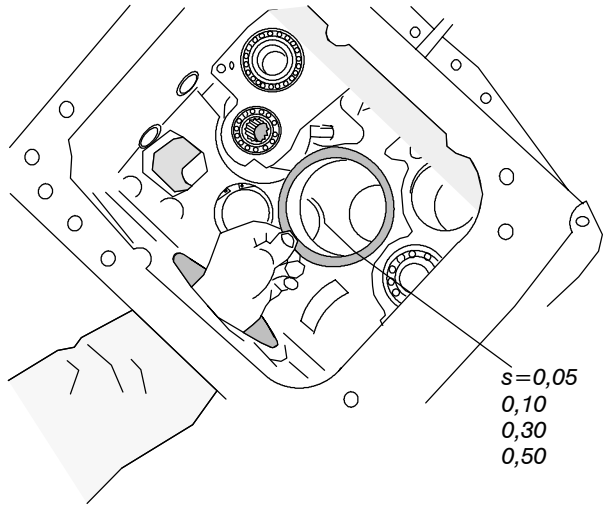
Decimal for value E

– Read decimals stamped on the RH side of the gearbox. The shims thickness can be determined by using the following formula:

X=E–(C+D)

E.G. X=193,95–(33,75+159,70)=0,5 mm.

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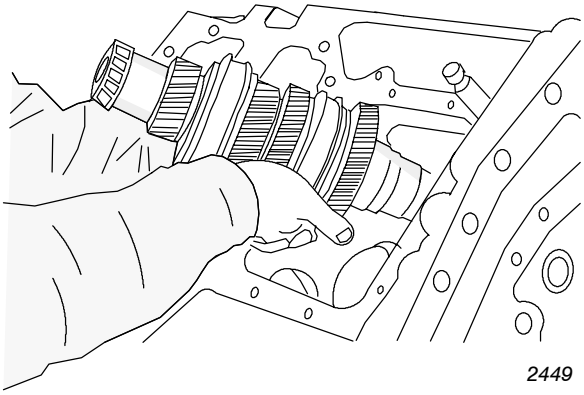


– Set the required thickness (X) of shims into the bearing location.

Note! First fit the shims with three lugs (0,30 mm, order no 30486400).

– drive in the outer bearing race against the shims using ETV 893340.

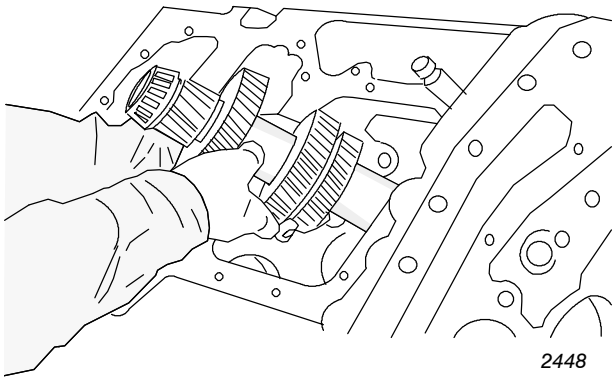
5. Fit the transmisson shaft rear ball bearing with its circlip into its location.



6. Place the assembled input shaft into the gearbox through the side opening.

Note! The input shaft front bearing is fitted after the input shaft and the layshaft are in place.

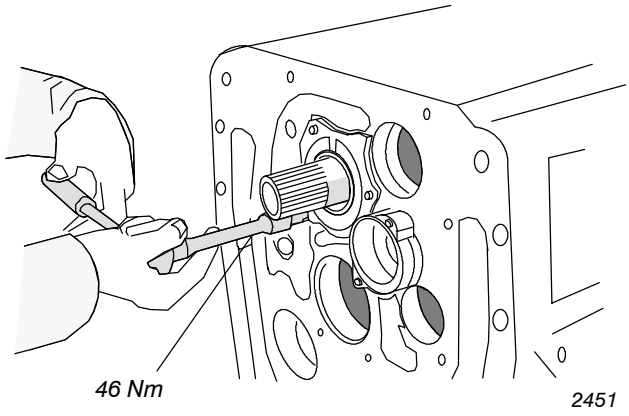
7. Fit the pump drive mechanism lowest bolt and tighten it to a correct torque. Fit the S – shaped lubricating oil pipe.



8. Fit the layshaft (the bearings are fitted on the shaft). Raise the input shaft for more space for layshaft.

9. Connect the S – shaped lubricating oil feed pipe to the distributor pipe on the bottom of the gearbox and connect the other end to the hole on the gearbox wall (note o – ring). Fit the servo valve block.

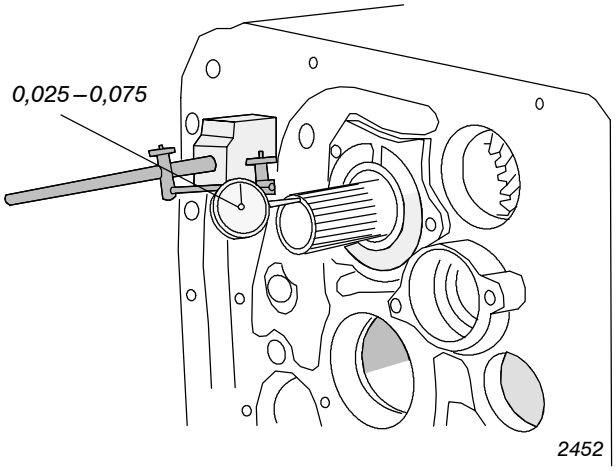
10. Fit the input shaft front bearing with ETV 892370. Fit the bearing outer race.



11. Fit shims in front of the input shaft front bearing (select shims so that the bearings have a definite clearance). Tighten the bearing cover.

Note! Try shims which were there before disassembling. Turn the input shaft 20 – 30 revolutions, in order to bed in the bearings.

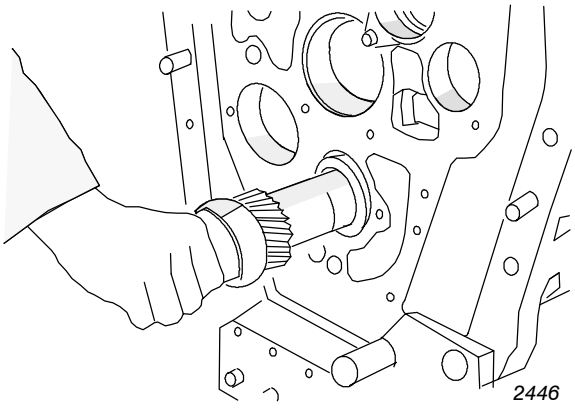
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12. Measure the input shaft end float. It should be **0,025–0,075 mm**. Increase or decrease the shim thickness as necessary.

13. In the same way adjust the end float of the layshaft. End float should be **0,025–0,075 mm**.

Note! Turn the layshaft 20–30 revolutions in order to bed in the bearings before measuring. Fit the layshaft front end cover in the right way (the thin side up).



14. Fit the transmission shaft into the gearbox through the front bearing hole. **Note!** There must be the wide gear circlip, the spacer and needle bearings on the shaft.

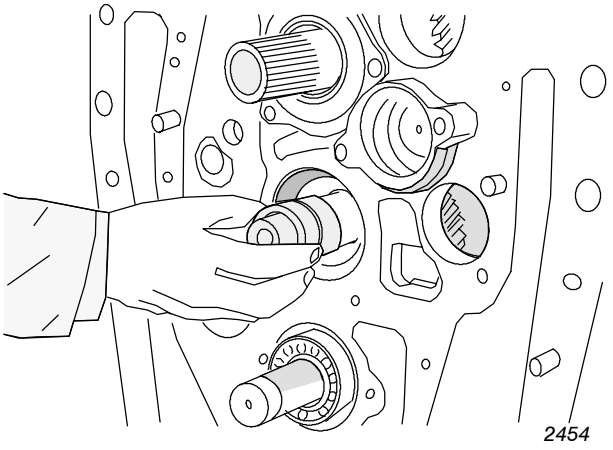
15. Fit onto the shaft first the broad gear wheel, spacer ring, circlip and the narrow gear wheel.

16. Fit the circlips into their places. Tap at the shaft front end until the shaft is in place.

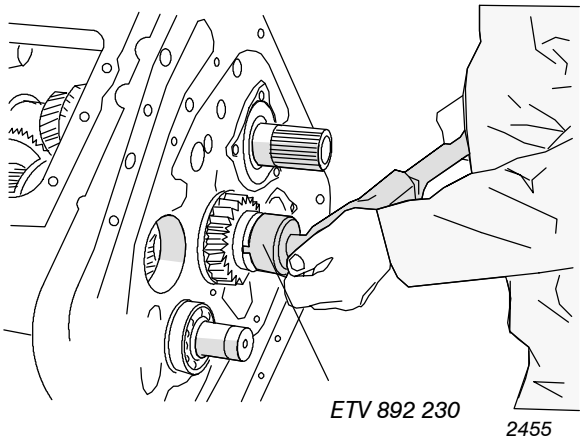
Note! It may be easier (lack of space) to fit first the bevel pinion shaft and after that the transmission shaft.

17. Fit the bevel pinion shaft rear bearing onto the shaft if removed (warm up the bearing before fitting).

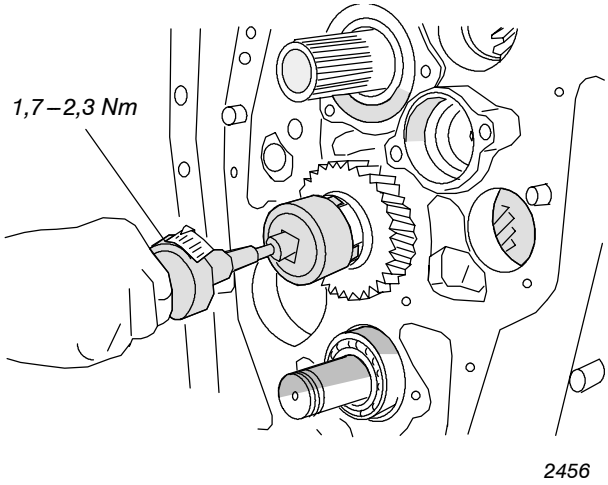
18. Fit the pinion shaft gears and synchronizing units into the gearbox as follows:
– fit first the foremost gear and the rearmost gear
– then fit other parts using the pinion shaft as a support. Couplers for AVO and LL are kept in place by hand and the shaft is pushed through them.



– Through the front bearing hole are fitted the bushing for the foremost gear, end plate and the earlier spacer rings (2 pcs).



19. Fit the front bearing outer race into its location. Fit the front bearing with sleeve ETV 892370, fit the 4WD output gear and tighten the nut to a torque of **270 Nm** (ETV 892230).

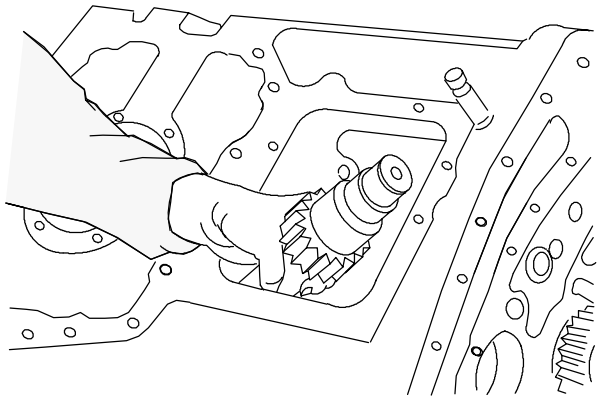


20. Measure the rolling resistance of the pinion shaft bearings with a torsion meter. Correct value is **1,7–2,3 Nm**. Increase or decrease the spacer ring thickness as necessary.

Note! 13 different thickness of spacer rings are available (thickness between 5,03–5,93 mm). Make sure that the shaft can rotate freely. Rotate the shaft 20–30 revolutions before measurement.

21. After adjustment, tighten the shaft nut to a correct torque and lock it with locking washer tabs.

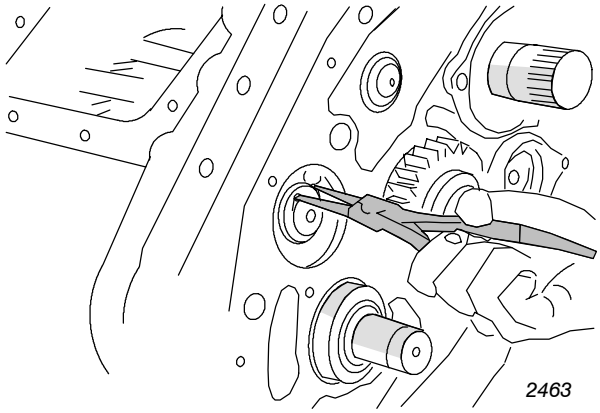
https://truckmanualshub.com/



2444

22. Fit the AVO – shaft into the gearbox through the side opening and carry out the following steps:

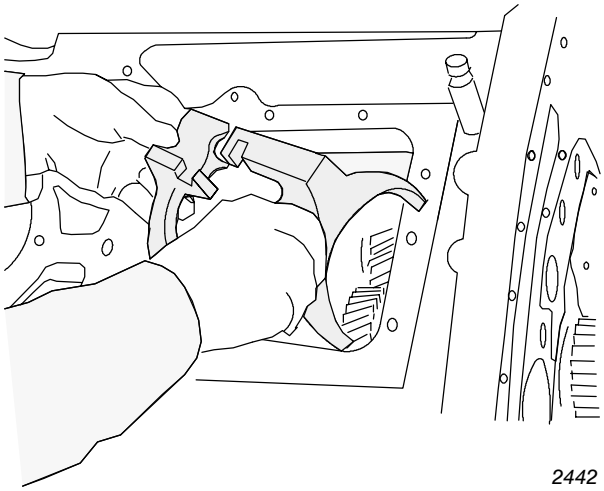
– Fit the front circlip of the rear bearing into its groove.
– Fit the rear bearing into place against the circlip.
– Fit the rear circlip of the rear bearing.
– Tap at the shaft front end until the shaft is fully home.
– Fit the front bearing.



2463

– Fit the front and rear bearing circlip into the grooves on the shaft.

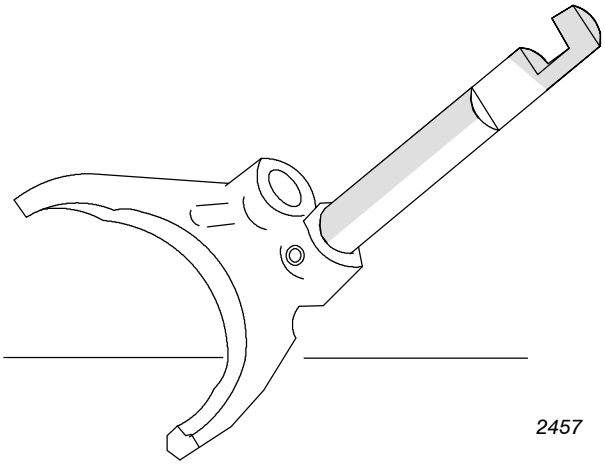
B. Fitting selector forks



2442

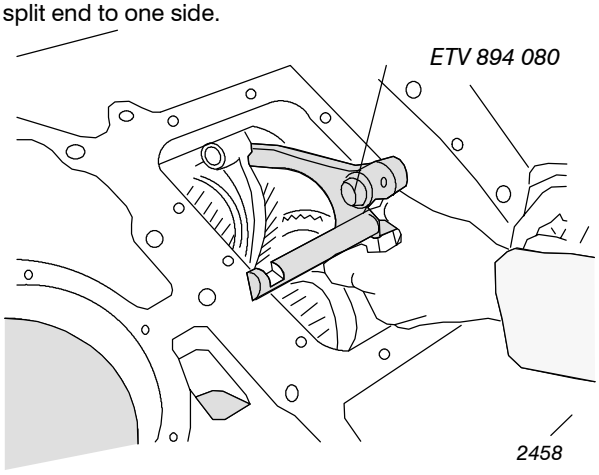
1. Fasten the sliding pieces on the forks with a little grease. Fit the forks for gears 1 – 2 and 3 – 4 onto the input shaft and support the forks in the upper position with a selector fork rail.

2. Fit the sliding pieces on the M – H fork and fit the fork onto the bevel pinion shaft.
Note! From tractor ser. no. **661937** the forks and the sliding pieces have been changed. In connection with repair works, the latest forks and sliding pieces must be fitted on the tractor in place of the earlier parts despite of the condition of the earlier parts. This concerns also the F – R fork.



2457

3. Fasten the rail to the LL – range fork if detached. **Note!** The groove on the shaft upwards. The locking pin is fitted with the split end to one side.

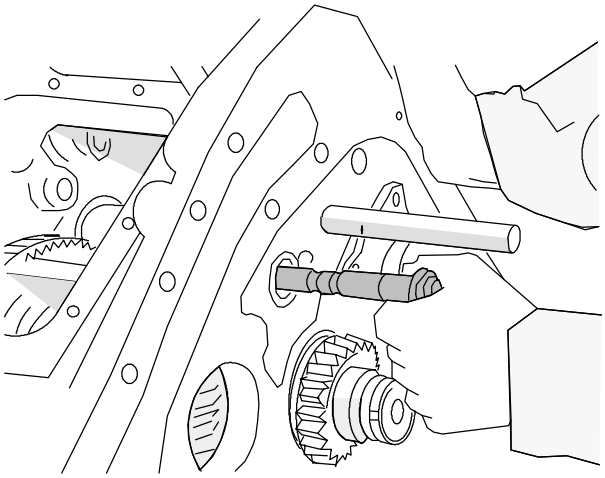


2458

4. Fit the spring, ball and tool ETV 894080 into the LL – range fork. The tool holds the ball and spring in place. Fit the LL – range fork with its rail into the gearbox (latest LL forks have also the sliding pieces).

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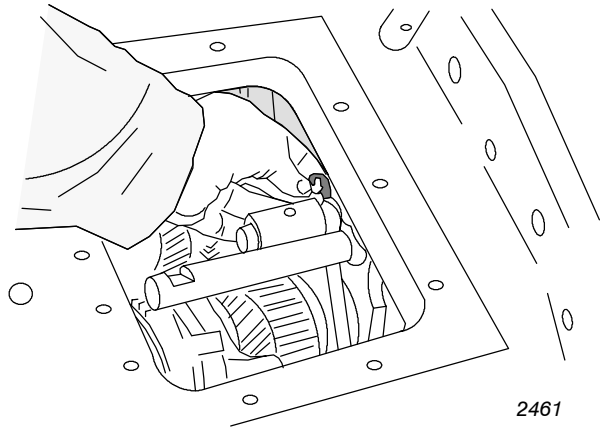
5. Move the sliding coupling for the ground speed PTO to the rear position and the LL – range sliding coupler together with the fork to the front position. Fit the PTO – fork with the sliding pieces onto the sliding coupling beside the LL – fork.



2460

6. Push the PTO/LL – rail into the gearbox. Push the rail first through the LL – fork while the tool is pushed out.

7. Then fit the spring and ball into the PTO – fork and the tool will press them into place. When the rail has pushed through both forks, remove the tool.



2461

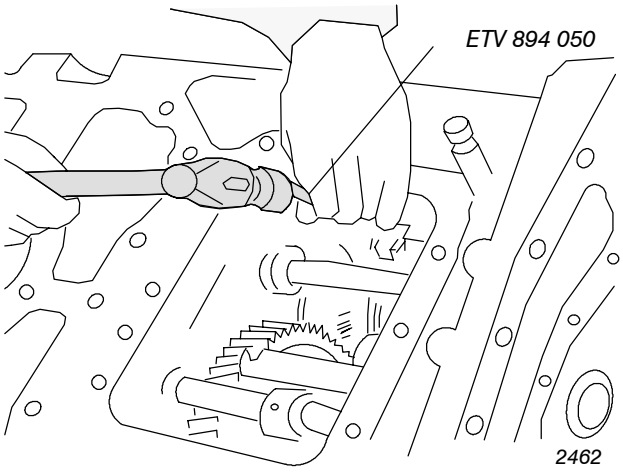
8. Turn the PTO/LL – rail until it is in place and fit the circlip onto the rail. Tighten the rail front end nut. Adjusting position of the rail, see instruction later.

Note! Loctite 242 onto the selector fork rail threads.

9. Put the adjusting pieces for rails (1 – 2), (3 – 4) and (M – H) into their places in the gearbox rear wall (all three adjusting pieces are similar).

10. Push the rails through the forks and turn the rails so that their rear ends engage with the threads on the adjusting pieces (the longest rail is for M – H fork. The two upper rails are similar).

Note! Fit locking nuts onto the rails before turning their rear ends into the adjusting pieces.



2462

11. Engage gear 1 and fit the locking pin for fork for gears 1 – 2 (use tool ETV 894 050 when fitting the pins).

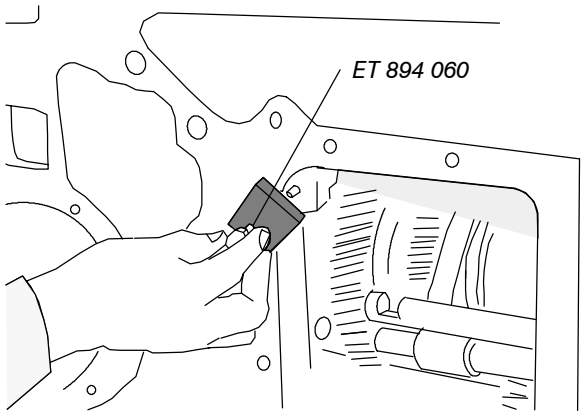
12. Similarly fit the locking pins for forks for gears 3 – 4 and M – H.

Note! The split side of the pins to one side.

Adjusting selector forks

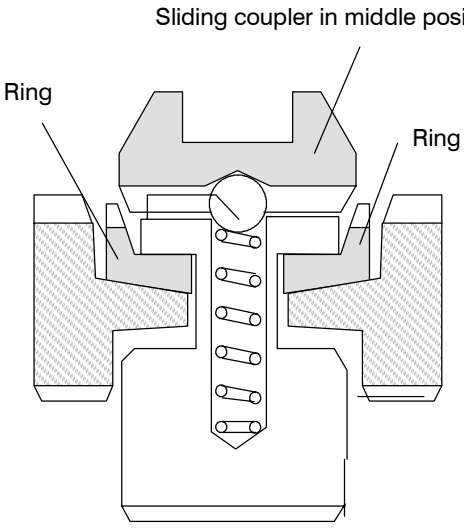
13. Fit the balls, springs and the pins into their holes at the rail adjusting pieces.

Note! The shortest pin into the lowest hole.

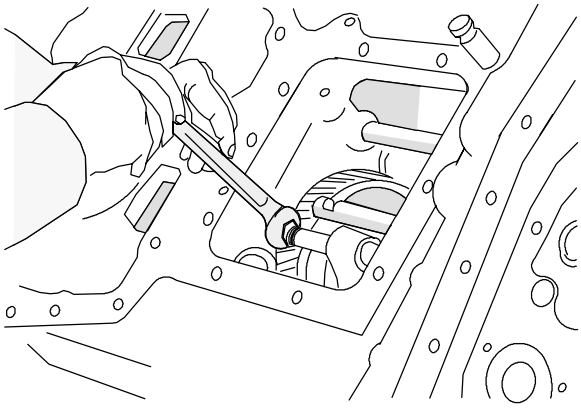


2464

14. Use tool ET 894060 to press the pins separately into their borings when adjusting the forks.



15. Move the sliding coupling for gears 1 – 2 to the neutral (middle position). Turn the rail rear end into or out of the adjusting piece until the sliding coupling is in the middle position.



2439

16. When the fork is in the middle position, move the rail to the rear position (the ball locks the rail) and tighten the adjusting nut (prevent rotating of the rail or the adjusting piece).

17. Take hold of the rail and move it. It must move loosely. Then move the rail to the front position and again move the rail. It must move loosely. Now the adjustment is correct.

18. In the same way adjust the fork for gears 3 – 4.

Note! Adjustment is easier to carry out when the fork for gears 3 – 4 is adjusted so that the groove on it is opposite the groove on the fork 1 – 2 (adjusted earlier) when the gears are in neutral.

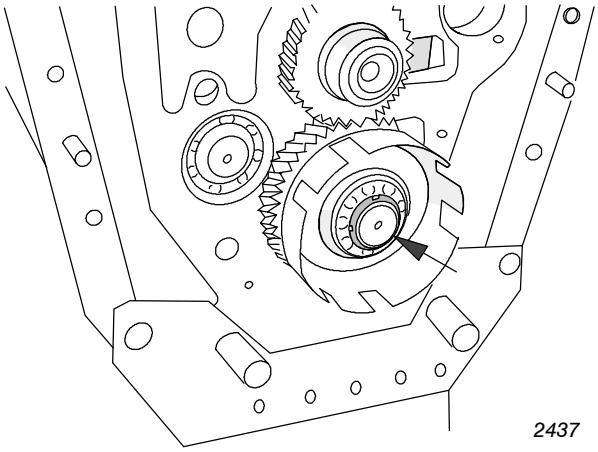
19. In the same way, adjust the fork for ranges H – M, first in the middle position and then check the adjustment in both extreme positions.

20. Move the forks for PTO and range LL to the neutral position. Turn the rail so that the groove on the LL – fork shaft is opposite the groove on the fork for ranges M – H (M – H fork in the middle position).

21. Check then that the forks for PRO and range LL move loosely when they are in the engaged position.

22. Make sure that the rail locking balls, springs and pins are in their borings.

C. Fitting 4WD clutch drum



2437

1. Fit the clutch drum and its bearings onto the front end of the transmission shaft according to the figure 8 on page 420/9.

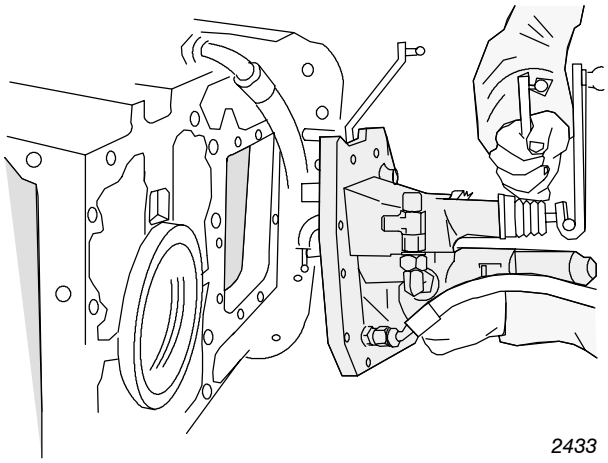
2. Apply Loctite 242 to the shaft nut threads.

3. Tighten the nut with ETV 894190 to a torque of **270 Nm**.

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D. Fitting side cover

1. Move first all the gears (forks) to the neutral position. Apply sealing compound (e.g. Silastic) to the contact surface between the cover and the gearbox. Clean contact surfaces if needed.



2433

2. Turn a guide pin into one lower fixing bolt hole. Fit the cover with the upper side first.

3. Tighten the fixing bolts to a torque of **50 Nm**.

4. Check the engagement of different gears while rotating the input shaft.

Note! Fit the splined sleeve onto the input shaft front end splines and attach a crank to the sleeve for easier rotating.

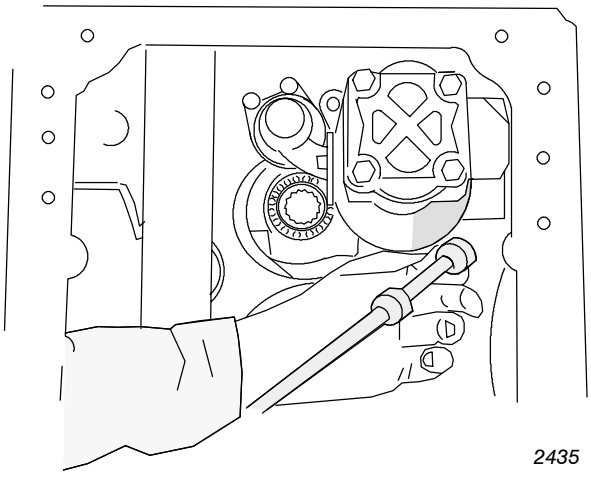
E. Fitting pump, suction pipes and suction strainer housing

Note! Oil pump and suction pipes can be fitted although the differential is in place.

Note! The input shaft lubricating pipe must be fitted before fitting the differential.

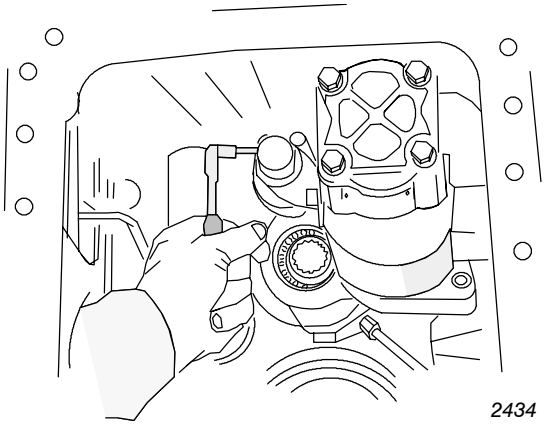
1. Fit the long suction pipe and the curved suction pipe through the holes on the gearbox housing and fasten the suction strainer housing onto the gearbox.

2. Place the hose clip onto the curved suction pipe (screw upwards.



2435

3. Fit the pump and turn it clockwise and tighten the fixing bolts to a correct torque (**40–50 Nm**).



2434

4. Tighten the hose clip to the correct torque (~ 6 Nm).

5. After the pump has been fitted, place the pressure pipes into their holes on the gearbox and screw them into the threads on the pump. Note also the sealing pieces, which have sealing rings.

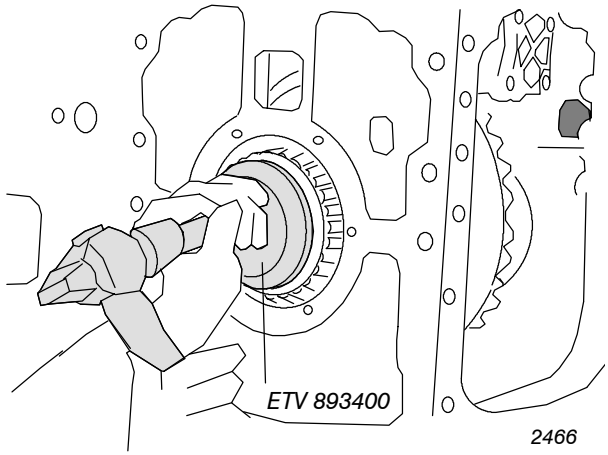
Note! Apply Hylosil sealing compound between the gearbox and pressure pipe sealing pieces. Apply Loctite 542 to the sealing piece fixing bolts.

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F. Fitting differential

1. Fit the differential RH side bearing onto the differential housing (if removed) (use tool ETV 893400). Place the differential case into the gearbox housing right side first.

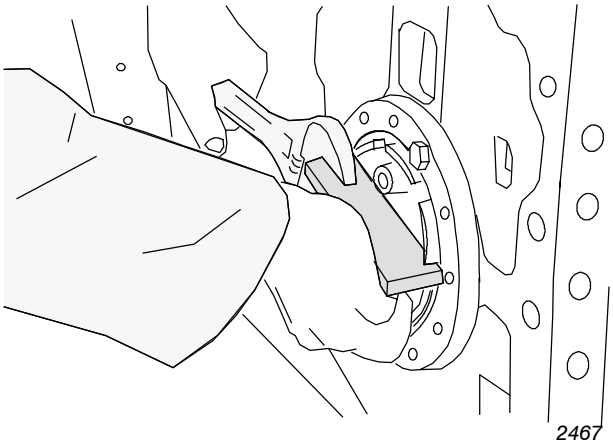
2. Support the differential to the height of the bearing holes and fit the RH side bearing outer race and the bearing flange together with the threaded adjusting flange according to the marks. Fit then a wooden wedge so that it presses the differential to the right against the RH side bearing.



3. Fit the LH side bearing with tool ETV 893400.

4. Fit the bearing outer race.

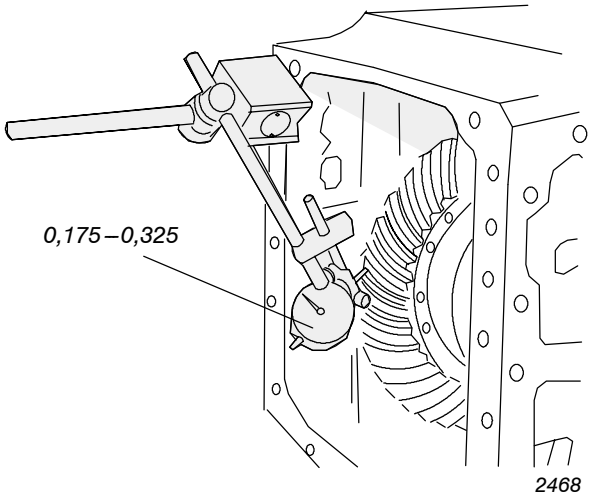
Note! Tap the outer race as deep as possible for good centring.



5. Fit the LH side bearing flange/adjusting flange according to the marks.

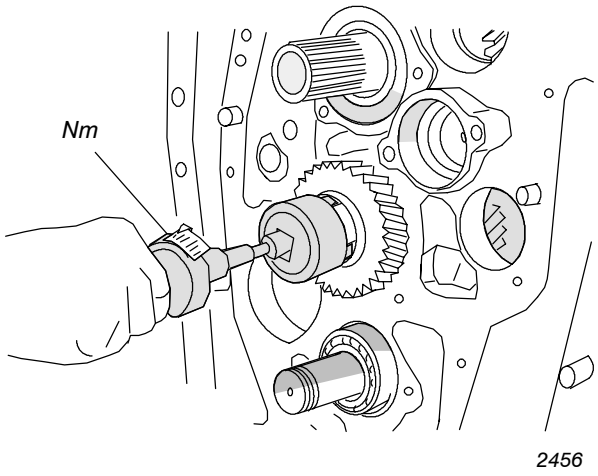
Note! The adjusting flange can be tightened with a piece of flat iron and with an adjustable spanner as shown in figure above.

6. Adjust the backlash between the crown wheel and the pinion by moving the differential sideways by means of the adjusting flanges. Ensure that there is no play in the bearings during the adjustment by turning both nuts equally in the same direction.



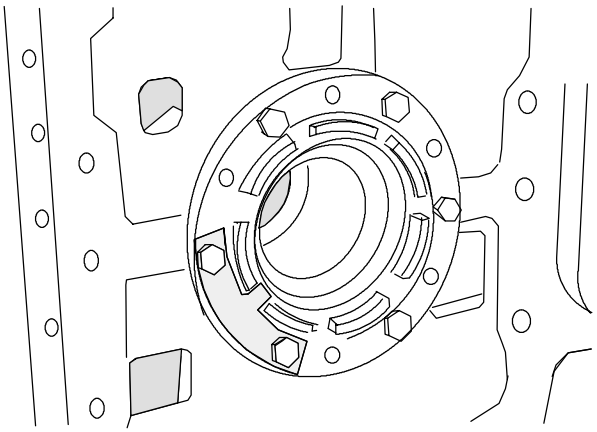
7. Measure the tooth backlash with a dial gauge with the stylus at right angles to the side of the tooth. The backlash should be **0,175–0,325 mm**.

Note! Try to adjust the backlash to the middle of the tolerance range or preferably near the min. value.



8. When the backlash is correct, tighten carefully the RH side adjusting flange until the differential bearing rolling resistance is correct. The rolling resistance is measured at the front end of the bevel pinion shaft. Thus the correct value is the bevel pinion shaft rolling resistance +:
+0,6–1,7 Nm (Z7/40, Z8/42) or
+0,8–2,2 Nm (Z9/38) or
+1,0–2,8 Nm (Z11/37)

In parentheses there is given the number of teeth of the pinion/crown wheel. Concerning different gearboxes, see pages 420/2 and 420/2A.



2470

9. When the bearing preload is correct, lock the adjusting flanges with locking plates. Tighten the bearing flange screws.

10. Bend and connect the differential lock pipe on the LH side.

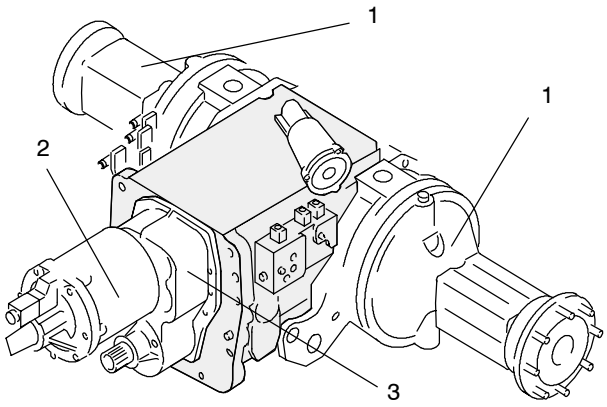
Note! The LH side adjusting flange can be in such a position that the diff. lock pipe connection is not at the pressure pipe. Then remove the bearing flange screws and turn the bearing and adjusting flanges together, until the connection is opposite the pressure pipe and can be connected. Then the bearing preload does not change.

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5. Fitting gearbox

Note! If You have removed the cab, attach all transmission components and hoses to the tractor frame and after this fit the cab (fitting the cab, see section 80). In instruction below the cab, however, is in place.

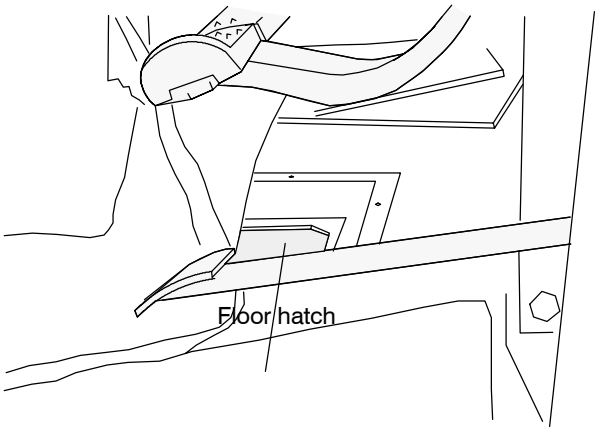
A. Fitting gearbox



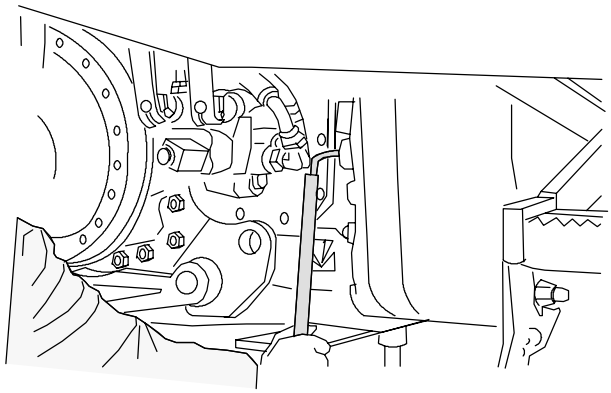
Note! Assemble the transmission unit as shown in the above figure. Attach every part, hoses and pipes, which were removed after splitting (**see Op. 1A**). Fit the rear wheels and support the transmission unit with trestles equipped with castors.

Note! Push the pump drive shaft into the gearbox input shaft and place the connecting sleeve onto the quick – shift gear/ DPS input shaft splines (or reverse shuttle splines).
Important! The pump drive shaft should be fitted in the correct way. The end with a marking groove (and letter E) should be turned to the engine side)

1. Push at the rear wheels and connect the gearbox to the fuel tank so that the guide pins and studs engage with their holes.



Note! Guide the connecting sleeve onto the clutch shaft through the floor hatch. Rotate the flywheel through the hole on the flywheel housing so that the pump drive shaft splines engage. Guide the propeller shaft rear end splines onto the gearbox 4WD output shaft on the tractors which have the Delta Powershift.



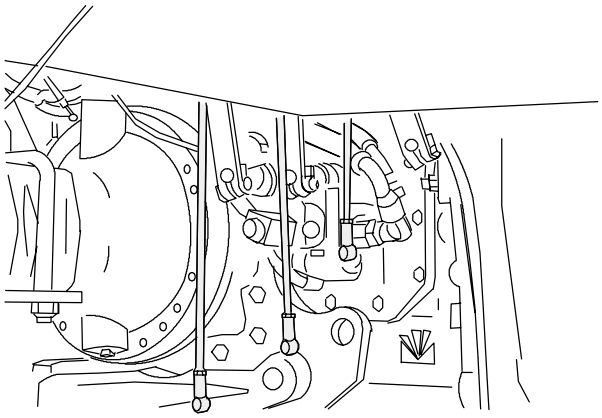
2. Tighten the bolted frame joint to the correct torque.

3. Remove the RH side rear wheel. Fasten the auxiliary hydraulic valve bracket onto the gearbox (work through the hole on the mudguard). Connect oil hoses to the end plate of the valve chest.

4. Connect the cables to the shifter levers and to the lower ends of the gear levers.

5. Connect the hoses of the hydraulic power lift control valve.

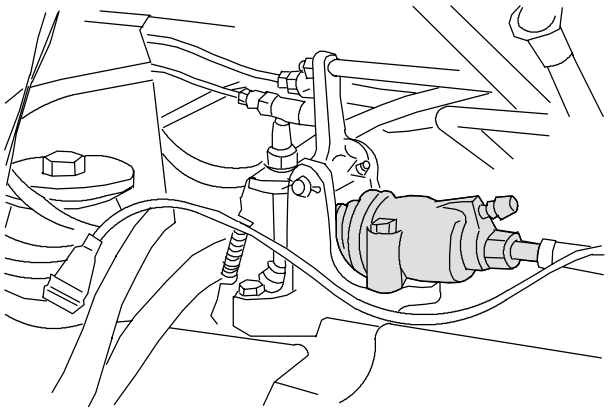
6. Connect the hoses to the pressure filter and attach the filter housing.

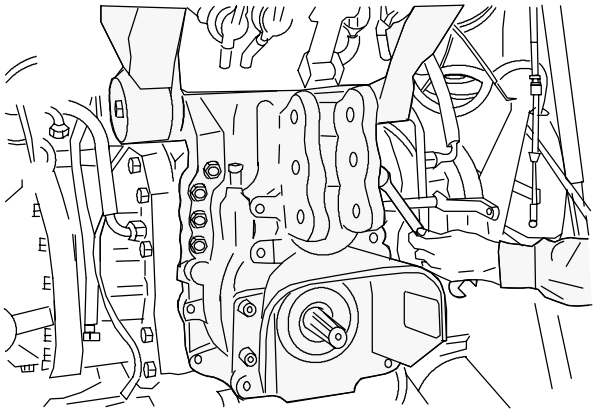


7. Connect the shifter rods to the lower ends of the gear levers. Connect electric wires to the control valve solenoids.

8. Connect the reverse shuttle lever lower end to the shifter lever.

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9. Fasten the brake cylinders. Connect the hand brake cable wire. Fit the breather filter (work through the mudguard opening).

10. Connect the hydraulic power lift sensor connectors in the lever console in the cab. Fit also the wire lead – in plate.

11. Connect the solenoid valve connector on the rear LH side. Connect the sensor wires to the servo valve block on the LH side of the gearbox. Connect the oil pipes on the LH side of the gearbox.



12. Connect the propeller shaft rear flange joint. Fit the guard. Fit the floor hatch and mat, if removed.

13. Lower the cab rear end and fasten the cab rear attachments.

14. Fit the PTO unit (**see instr. 462 1G**).

15. Check that all hydraulic pipes have been fitted. Fit the hatch plate onto the mudguard opening and fit the rear wheel. Remove the support plates on the front axle. Remove trestles under the tractor.

16. Fit the engine hood plates. Fill the transmission with oil. Connect the pick – up hitch release control, levelling screw joint and the PTO control cable (at the rear of the tractor).

17. Test – drive the tractor and check for oil leaks.

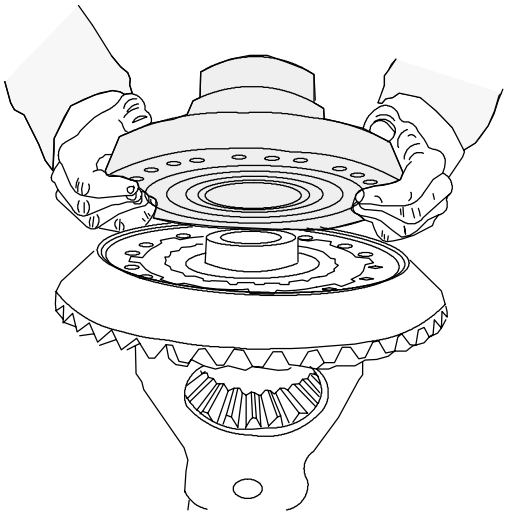
Note! On E – models, ensure that the AC – III/IV unit sensor wires have been connected and check the function of the AC – III/IV unit.

1. Reconditioning differential (Op. no. 424)

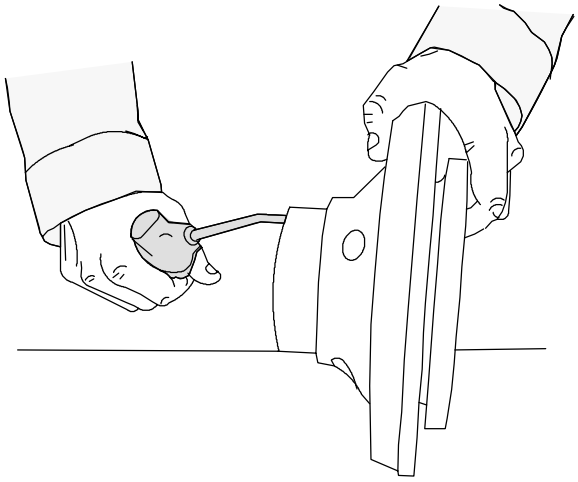
Note! If reconditioning the differential only, then remove:
– PTO unit (**see Op. no. 462 1A**)
– final drives/brake housings
– differential (**see Op. no. 423 2A**)

Note! For detaching the brake housings, raise the cab or split the tractor between the gearbox and fuel tank according to Op. **423 1A**.

A. Changing the differential side bevel gear bearings and the differential lock discs



1. Remove the crown wheel attaching screws and remove the differential cover.

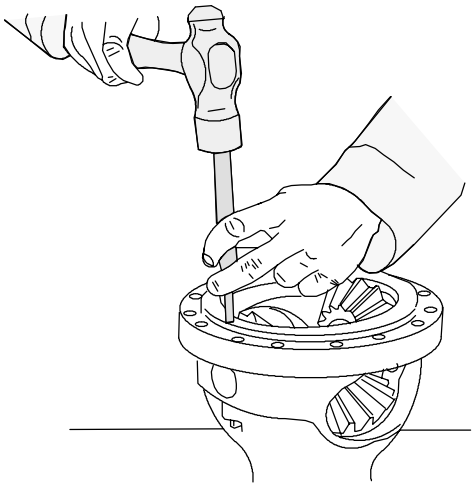


2. Press the piston for the differential lock out of the casing half using compressed air **but be careful**. Change the o–rings on the piston.

3. Change the bearing for the differential side gear. Remove the bearing using a drift and fit the new bearing using ETV 891870.

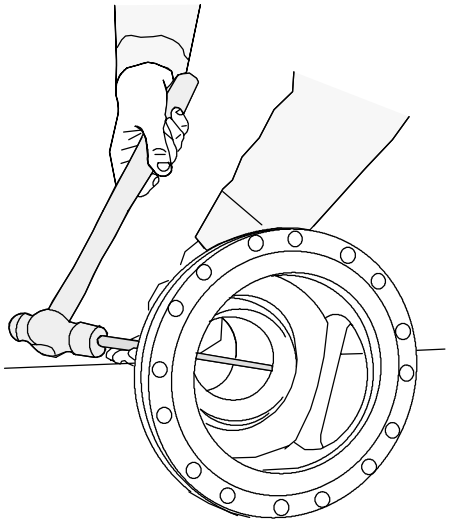
4. Lubricate the o–rings on the piston and push the piston into place.

5. Lift off the crown wheel. Remove the friction and steel discs and lift out the differential side gear.



6. Drive out the tubular pin (8 mm) locking the differential pinion shaft and tap out the shaft. Lift out the differential pinion and the right differential side gear.

Note! In the tractors which have higher engine outputs there are four differential pinions in the differential, at which time the short pinion shafts have been secured with tension pins.



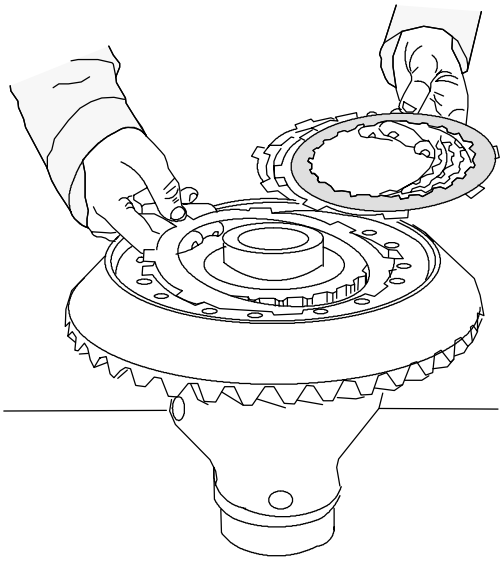
7. Remove the right side differential side gear using a hammer and a drift. Fit a new bearing using ETV 891870.

8. Lubricate the bearing and fit the right–hand side differential side gear in position. Lubricate the differential pinions and place them in the differential casing. Drive the shaft for the differential pinions into place.

9. Fix the shaft in position with the tubular pin.

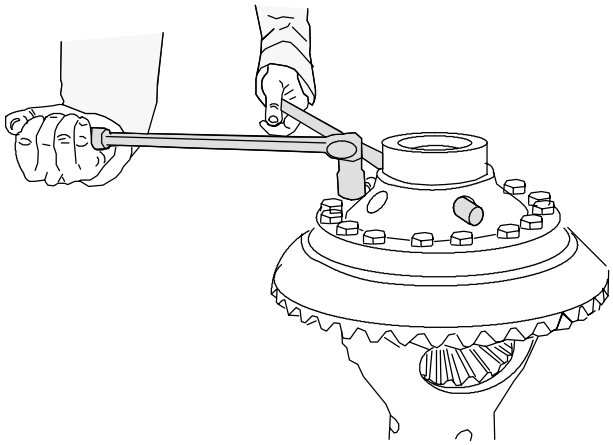
Note! On models 6600–6900 and 8050–8750 the shorter pinion shafts are locked with two tension pins.

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10. Position the crown wheel and the left hand side differential side gear. Position the friction and steel discs (An earlier disc pack: the first and the last disc of the disc pack is friction disc. Latest disc pack: the first and the last disc of the disc pack is a steel disc).

Note! Earlier there were five friction discs and four steel discs in the differential lock. In the latest differential lock there are five friction discs (internal splines) and six steel discs (lugs on outer circumference). New, thinner discs can be fitted into the older tractors without modifications. When changing the discs, change simultaneously the whole disc pack.



11. Position the left differential casing half. Apply locking fluid to the threads of the crown wheel attaching bolts and tighten the screws to a torque of **110 Nm**.

12. Fit the differential (**see Op. 423 4F**).

13. Fit final drives/brake housings.

14. Fit the PTO unit (**see Op. 462 1G**).

44. Quick–shift gear, reverse shuttle and 4WD clutch	~~15. 5. 1993~~ 1. 11. 1998	Model 6000–8750	Code 440	Side 1

Contents

General (Op. no 440)
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Working order 24

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B. Detaching quick–shift gear from reverse shuttle 2
2. Fitting quick–shift gear:
A. Attaching quick–shift gear to reverse shuttle 3
B. Assembling tractor frame between gearbox–fuel tank 3
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D. Fitting input shaft and disc assembly 8
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1. Mechanical reverse shuttle:
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B. Changing reverse shuttle synchronizing unit/bearings 2
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B. Changing 4WD clutch friction discs/seals, 3–step quick–shift gear (Delta Powershift) 3
C. Changing 4WD output shaft oil seal, 2–step quick–shift gear 4
D. Changing 4WD output shaft oil seal, 3–step quick–shift gear (Delta Powershift) 4

Reconditioning 3–step quick–shift gear (Delta Powershift) (Op. no. 444)

1. Reconditioning Delta Powershift:
A. Reconditioning planetary gear and its multi–disc clutch 1
B. Reconditioning multi–disc clutches for reduction ratio and overdrive 4

2. Needle bearings 8

3. Changing seals in Delta Powershift:
A. Changing oil rings of piston ring type 8
B. Changing front oil seal of Delta Powershift 8
C. Changing oil seal and needle bearing inside the input shaft front end 8

4. DPS in transmission 650 9

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Technical data

2–step quick–shift gear

Reduction ratio:
–Trac–Trol (reduction gear), 6100–6400 and 8000 ..... i=1,256
– Overdrive, 6600 and 8100 ..... i=0,796

Multi–disc clutch:
– number of friction discs ..... 2+3 pcs
– number of steel discs ..... 2+3 pcs
– number of pressure plates ..... 2 pcs
– clutch pressure (from low pressure circuit) ..... 1,8 MPa
Cup spring, small, convexity ..... 6,90–7,02 mm
Cup spring, large, convexity ..... 13,90–14,30 mm

Tightening torques:
Quick–shift gear – reverse shuttle ..... 45 Nm
Bolted joint between gearbox–fuel tank:
– hexagonal socket–head screws ..... 125 Nm
– nuts on studs ..... 270–330 Nm
Flange joint on propeller shaft ..... 35 Nm
Cab attaching bolts ..... 200 Nm
Seal retainer on quick–shift gear input shaft ..... 23 Nm
Quick–shift gear cover bolts ..... 23 Nm
Planet carrier screws ..... 23 Nm
Solenoid valve fixing screws ..... 2,5–3,5 Nm
Oil hoses to the steering valve ..... 50 Nm
Front axle attaching bolts ..... 380 Nm

3–step quick–shift gear Delta Powershift

Gear ratios, transmission 300 (450):
– reduction ratio ..... i=1,233
– direct ratio ..... i=1,0
– overdrive ..... i=0,803
Gear ratios, transmissions 460 and 650:
– direct ratio ..... i=1
– overdrive ..... i=0,811
– overdrive ..... i=0,651
Powershift clutch pressures (from low pressure pump) ..... 1,8 MPa
Multi–disc clutches:
Foremost clutc C1:
– number of friction discs, transmission 300/460/650 ..... 5/7/9 pcs
– number of steel discs, transmission 300/460/650 ..... 6/7/9 pcs
Intermediate clutch C2:
– number of friction discs, transmission 300/460/650 ..... 5/5/7 pcs
– number of steel discs, transmission 300/460/650 ..... 6/5/7 pcs
Clutch C3 for planetary gear when mechanical shuttle:
– number of friction discs ..... 4 pcs
– number of steel discs ..... 5 pcs
Clutch C3 for planetary gear when HiTech Shuttle:
– number of friction discs/steel discs ..... 6/6 pcs
Cup springs (2 pcs) in planetary gear clutch, convexity ..... 7±0,15 mm
Cup springs (6 pcs) in clutch for reduction ratio, convexity ..... 3 mm
Cup springs (4 pcs) in clutch for overdrive, convexity ..... 3,5 mm

Tightening torques

Gear housing–reverse shuttle, 4 pcs ..... 23 Nm
Planetary gear fastening flange–reverse shuttle, 6 pcs ..... 23 Nm
Oil seal housing–gear housing, 3 pcs ..... 23 Nm
For other tightening torques, see values for 2–step quick–shift gear.

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Mechanical reverse shuttle

Gear ratio:
– forwards 1:1
– backwards 2,5 % faster
Synchronizing ring diam. ø 114 mm

Tightening torques
Reverse shuttle–gearbox . . . . . 23 Nm

Sealing compound used:

On contact surface between reverse shuttle–gearbox, Hylosil RTV Silicone Grade 102 black

HiTech shuttle

Number of friction discs/steel discs/ring springs in both clutches . . . . . 9/9/9 pcs
Axial play of input shaft . . . . . 0,2–0,6 mm
Tightening torque of all shuttle bolts . . . . . 23 Nm

4WD clutch on tractors without or with 2–step quick–shift gear

Number of friction discs . . . . . 10 pcs
Number of steel discs . . . . . 9 pcs
Cup springs (3 pcs), convexity . . . . . 6,30 mm
Clutch pressure (from low pressure circuit) . . . . . 1,8 MPa

Settings
Clutch pack clearance is adjusted by first tightening the output shaft nut and then unscrewing it **one a turn**.

4WD clutch on tractors with 3–step quick–shift gear Delta Powershift or without DPS

Number of friction discs . . . . . 12 pcs
Number of steel discs . . . . . 11 pcs
Cup springs (4 pcs), convexity . . . . . 8,5 mm
Clutch pressure (from low pressure circuit) . . . . . 1,8 MPa

Settings
Clutch pack clearance is adjusted by first tightening the output shaft nut and then unscrewing it **one and a half turn**.

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Special tools

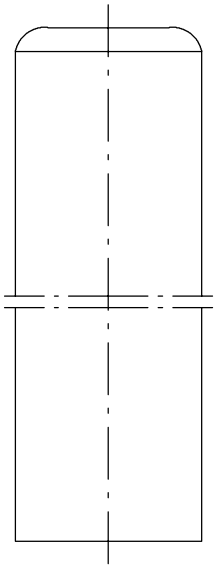
44.1 2–step quick–shift gear

A

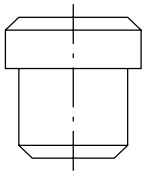
Part no.	Description
ETV 891 840	Sleeve for fitting seal on input shaft (Gearbox 505–905)
ETV 892 180	Drift for fitting needle bearing/sealing ring on input shaft (Gearbox 505–905)
ET 893 480	Support plate for front end frame, 2 pcs (Frame and Wheels 505–905)

B

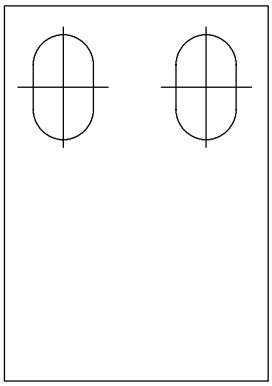
ETV 890 220	General handle
ETV 893 303	Plate for removing bearings for planet carrier (Quick–shift gear 505–905)
ET 893 420	Sleeve for fitting bearings on planet carrier (Final drives 505–905)
	Fitting bearings on front end of cylinder



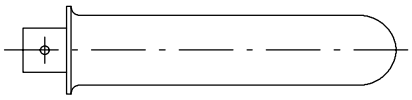
ETV 891 840



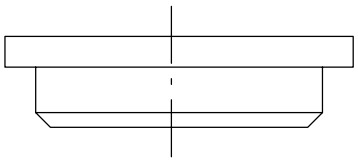
ETV 892 180



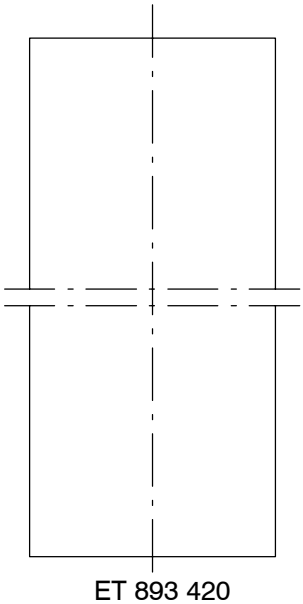
ET 893 480



ETV 890220



ETV 893 303

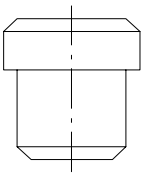


ET 893 420

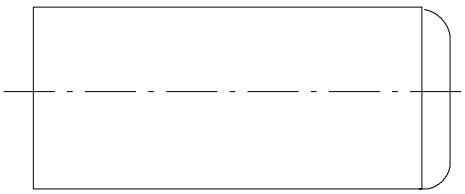
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44.2 3–step quick–shift gear Delta Powershift

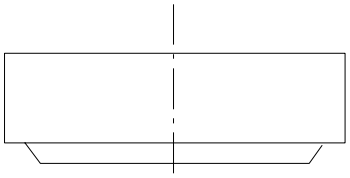
Part no	Description
A	
ETV 892 180	Drift for fitting oil seal and needle bearing inside input shaft front end (see 2–step quick–shift gear)
ETV 893720	Plate for fitting quick–shift gear front oil seal (front axle ZF on 305–665)
ET 893 480	Support plate for front end frame, 2 pcs (see 2–step quick–shift gear)
ETV 894 200	Drift for fitting oil seal and needle bearing inside DPS input shaft front end (transmission 650)
B	
ETV 893700	Sleeve for fitting oil seal inside the middle sun gear (PTO 205–665)
ETV 894030	Sleeve for fitting planetary carrier ball bearing (Hydraulic power lift 205–665)



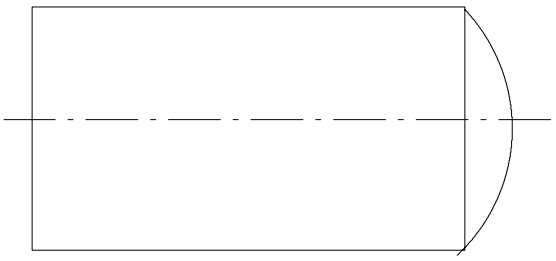
ETV 892 180



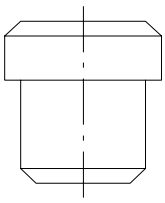
ETV 893 700



ETV 893 720



ETV 894 030

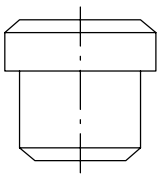


ETV 894 200

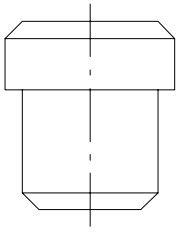
44.3 Mechanical reverse shuttle

A

ETV 892 180	Drift for fitting needle bearing/sealing ring on input shaft (Gearbox 505–905). Only on tractors without quick–shift gear.
ETV 894 200	Drift for fitting needle bearing/sealing ring inside reverse shuttle input shaft front end (transmission 650) Only on tractors without DPS gear.



ETV 892 180



ETV 894 200

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44.4 4WD clutch/4WD output shaft

A

ETV 893 260 [1]) Socket spanner for 4WD output shaft nut (Gearbox 505–905)

ETV 894 170 [2]) Socket spanner for 4WD output shaft nut (new tool)

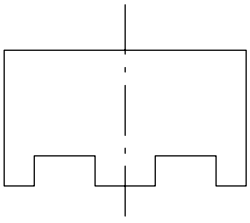
ETV 891 900 [1]) Sleeve for fitting 4WD output shaft sealing ring/bearing (Gearbox 505–905)

B

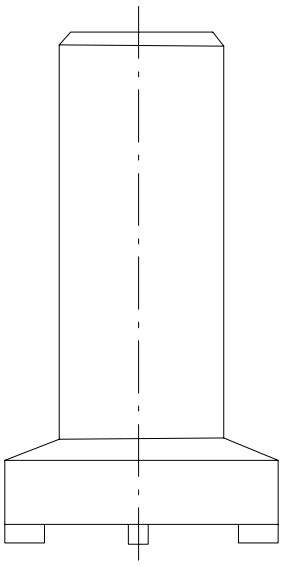
ETV 890 830 [1]) Sleeve for fitting 4WD clutch piston onto the output shaft (PTO 505–905)

[1]) Tractors without quick–shift gear or with 2–step quick–shift gear

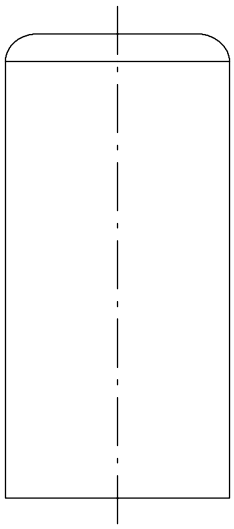
[2]) Tractors with 3–step quick–shift gear Delta Powershift. The nut is the same as the nut at the front end of the bevel pinon shaft on 505–905 tractors. For this nut spanner ETV 893 440 is used. Spanner ETV 894 170 can be replaced by welding a sleeve onto the tool ETV 893 440.



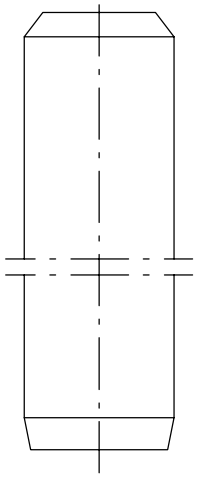
ETV 893 260



ETV 894 170



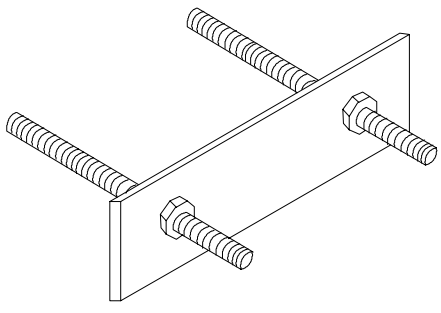
ETV 891900



ETV 890 830

44.5. HiTech Shuttle

ETV 894 350 Compressing tool for F–clutch large coil spring



ETV 894 350

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2–step quick–shift gear, description

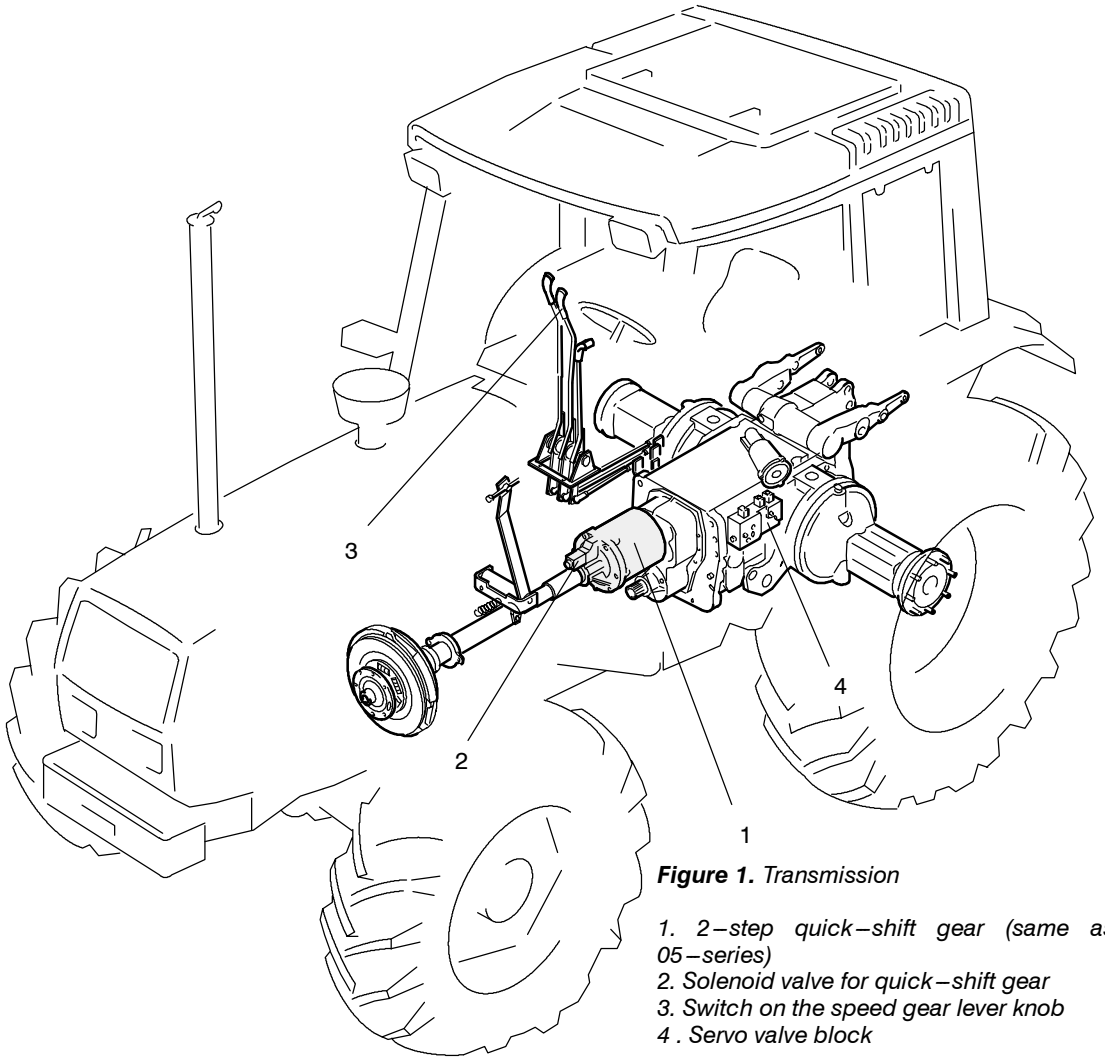


Figure 1. *Transmission*

1. 2–step quick–shift gear (same as on 05–series)
2. Solenoid valve for quick–shift gear
3. Switch on the speed gear lever knob
4 . Servo valve block

The quick–shift gear is fitted in front of the reverse shuttle. The quick–shift gear is connected to the clutch shaft by means of a coupling sleeve. The quick–shift gear can be either a reduction gear or an overdrive according to the tractor model.

Quick–shift gear is engaged and disengaged electro–hydraulically with a switch on the gear lever knob. The quick–shift gear can be engaged while driving without using the clutch pedal. The solenoid valve for quick–shift gear is fitted on the quick–shift gear cover.

Clutch pressure is directed to the quick–shift gear from the servo valve block on the LH side of the gearbox. The low pressure pump supplies oil to the valve block. Clutch pressure is 1,8 MPa which is limited by a pressure–relief valve on the servo valve block.

Quick–shift gear has pressure lubrication (see figure **3** on page **440**/**10**).

To facilitate gear changing (reduction of the rotating mass), the quick–shift gear always moves to shifting position when the clutch pedal is pressed down.

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2–step quick–shift gear

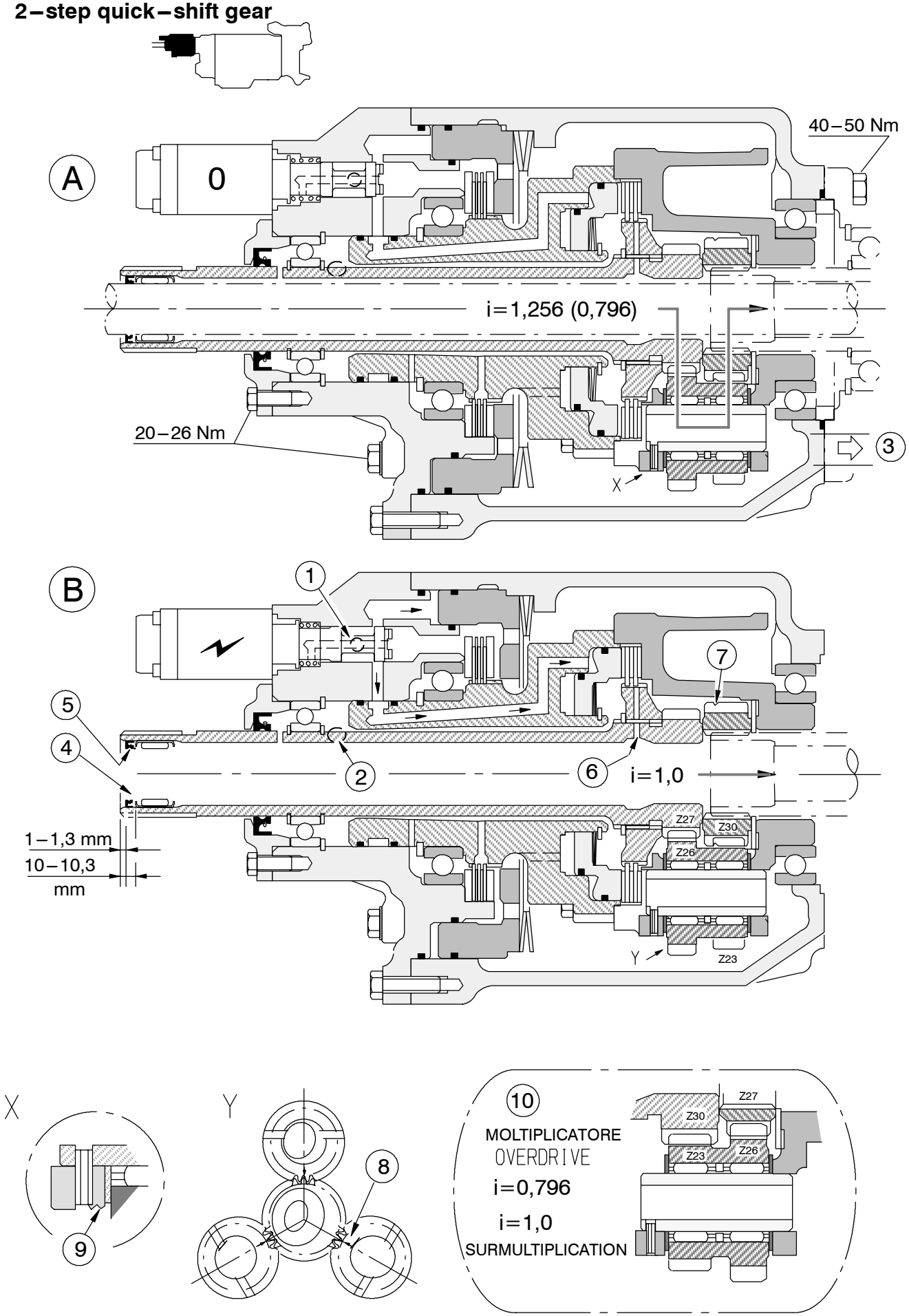


Figure 2

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2–step quick–shift gear

Figure 2 A on previous page:

The pressure oil channel is closed (solenoid valve dead). The oil pressure does not act on the quick–shift gear. The lock–up clutch (rear) is disengaged and the clutch for shifting position (front) is applied.
The power is transmitted from the sun wheel on the end of the input shaft to the planet pinions and onwards to the output shaft, causing an alteration in the reduction ratio. The planet pinions rotate around their shafts. Ratio: i=1,256 (Overdrive i=0,796).

Figure 2 B on previous page:

Current is connected to the solenoid valve so that it opens pressure channel (1) to the quick–shift gear. The oil pressure applies the lock–up clutch so that the planet carrier and input shaft are connected together. At the same time the oil pressure releases the clutch for shifting position so that the planet carrier and gear rotate at the same speed as the input shaft. There is no alterations in the reduction ratio. The planet pinions do not rotate around their shafts. Ratio i=1,0.

1) Pressure oil (1,8 MPa)

2) Lubricating oil

3) Lubricating and leak–off oil return to gearbox housing

4) Marking on bearing to face outwards.

5) To be packed with universal grease when fitting.

6) Holes to come in line with each other when fitting.

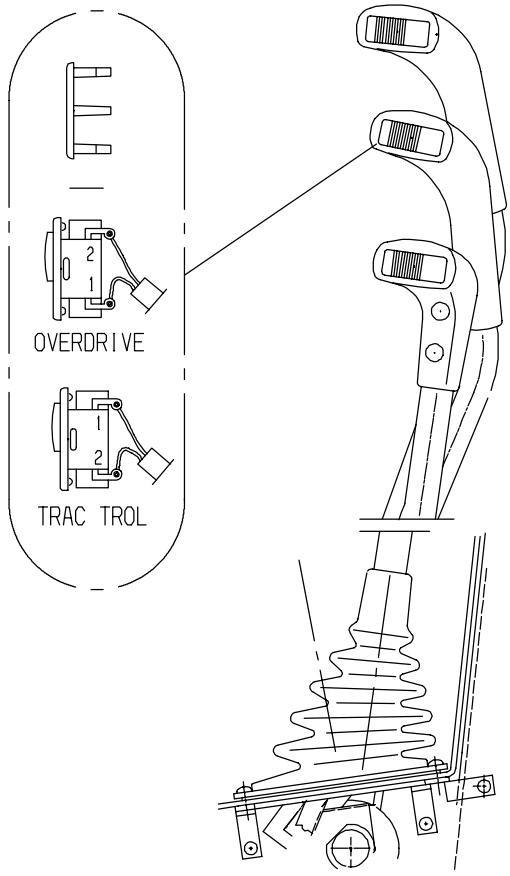
7) **Note!** Groove for fitting sun wheel.

8) **Note!** Arrows to point to centre of sun wheel when fitting.

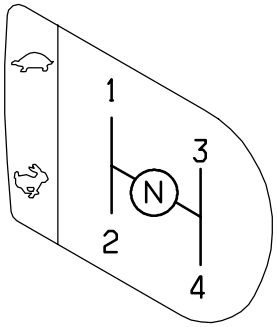
9) Locating pin (fixed with centre punch pops).

10) At overdrive the planet pinions are turned in the other direction (number of teeth on sun wheel altered in a similar manner).

Note! If the reduction gear (Trac–Trol) is altered into overdrive version, the planet pinions must be turned and the input shaft with sun gear (front) must be changed. Also the other loose sun gear (rear) must be changed (number of teeth, see figure 2).



2–step quick–shift gear switch is placed on the speed gear lever knob. Figure above shows electric connection of the switch for Overdrive and for Trac–Trol. The switch must function so that the "tortoise" symbol has slower speed than the "hare" symbol.



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Lubricating system of 2–step quick–shift gear and mechanical shuttle

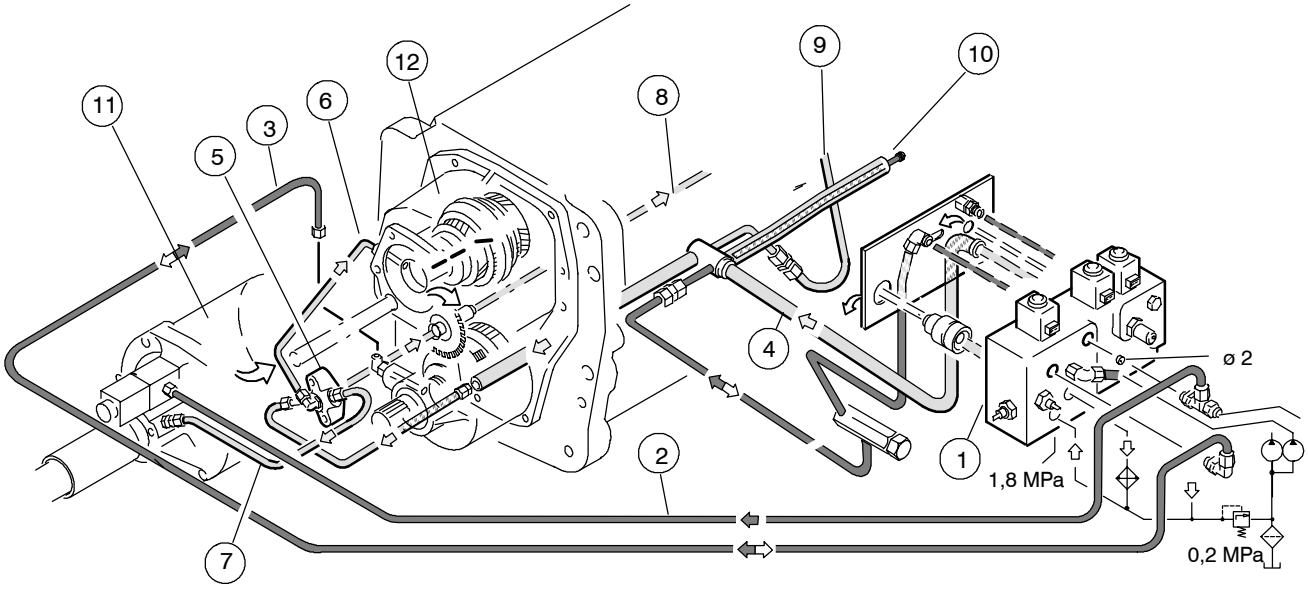


Figure 3. *Lubricating and clutch pressures*

1 . Servo valve block
2. Clutch pressure to quick–shift gear
3. Clutch pressure to 4WD clutch
4. Lubricating oil feed pipe
5. Lubricating oil distributor piece on the reverse shuttle front side
6. Lubricating oil pipe to reverse shuttle
7. Lubricating oil pipe to quick–shift gear
8. Lubricating oil to bevel pinion shaft
9. Lubricating oil to gearbox input shaft
10. Lubricating oil and clutch pressure to PTO
11. Quick–shift gear
12. Reverse shuttle

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3–step quick–shift gear (Delta Powershift), description

Note! The 3–step quick–shift gear Delta Powershift can be fitted on 6000–8400 tractors with effect from ser. no. **660071**.

The 3–step quick–shift gear (1) is fitted in front of the reverse shuttle and it is connected to the clutch shaft by means of a connecting sleeve.

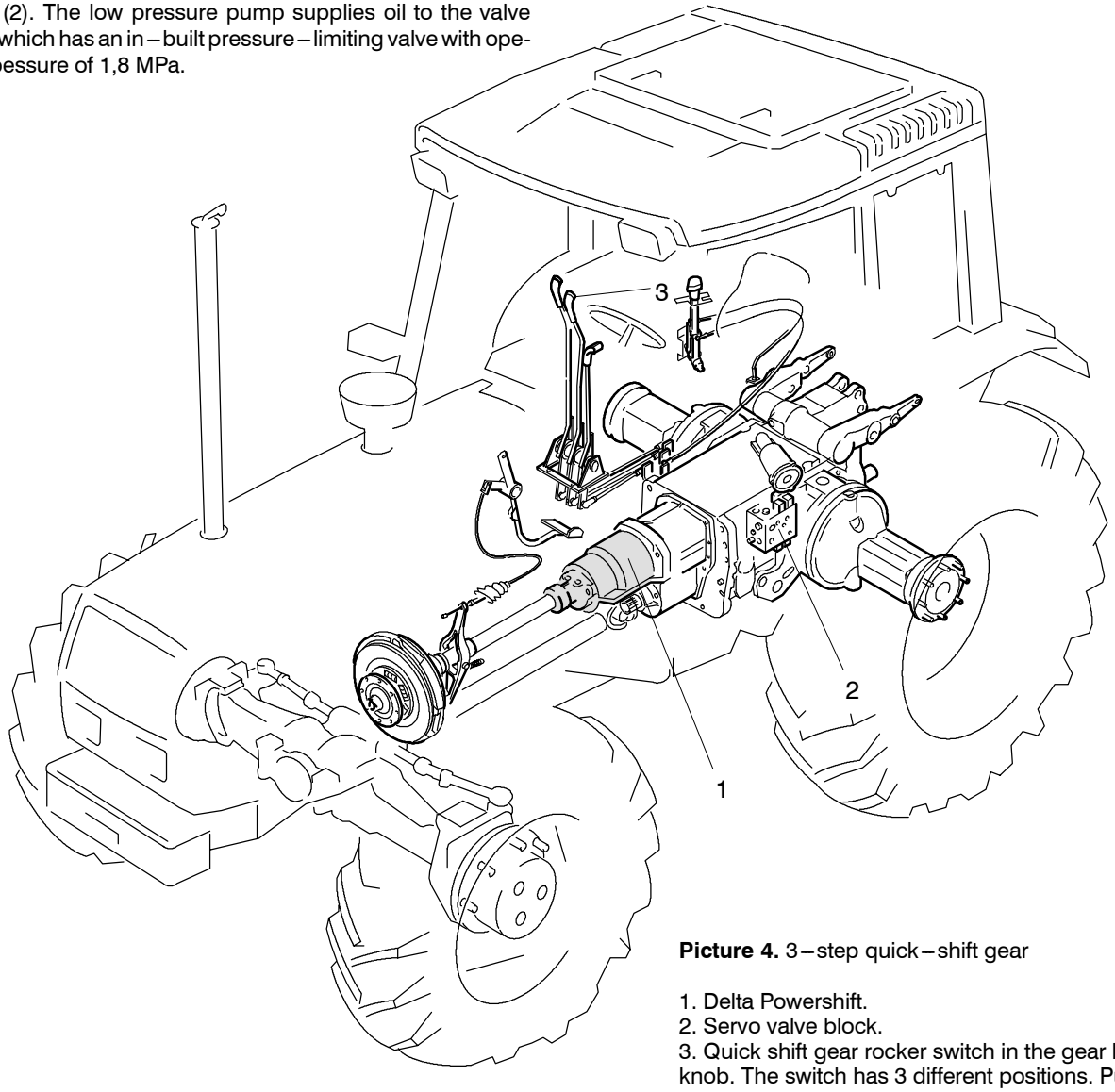
The different speeds are engaged/disengaged electro–hydraulically with the rocker switch (3) (or with push buttons) in the speed gear lever knob. All speeds can be engaged/disengaged during driving without using the clutch pedal. The solenoid valves (2 pcs) are fitted on the servo valve block (2).

Clutch pressures are directed to the gear from the servo valve block (2). The low pressure pump supplies oil to the valve block which has an in–built pressure–limiting valve with opening pessure of 1,8 MPa.

When the rocker switch (3) is operated the solenoid valves open or close and send pressure to the multi disc clutches.

The clutch pressure pipes are external pipes and they run from the valve block to the gear housing connectors.

When the clutch pedal is depressed (switch on the pedal), the current to the solenoids is switched off and then the gear is in the neutral position when the rotating masses are in minimum to facilitate an easier gear changing. This is the same when the current is switched off with the starter switch. When parking the tractor and the current is switched off, the parking brake must always be applied, since the engaged speed gear does not keep the tractor stationary.

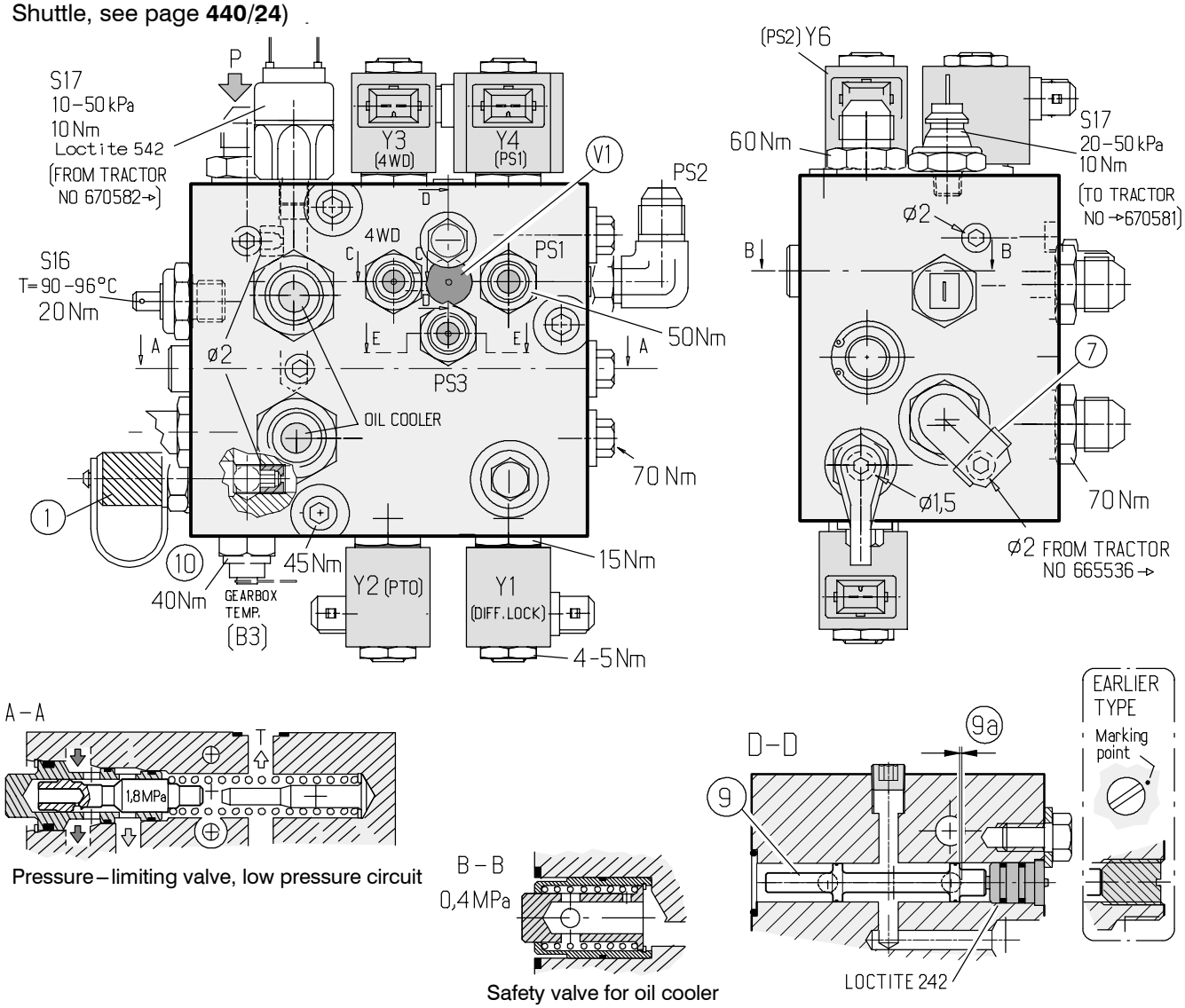


Picture 4. 3–step quick–shift gear

1. Delta Powershift.
2. Servo valve block.
3. Quick shift gear rocker switch in the gear lever knob. The switch has 3 different positions. Push buttons, see Autocontrol II under code 311.

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Servo valve block with Delta Powershift and with mechanical shuttle (valve block with HiTech Shuttle, see page **440**/**24**)



Pressure–limiting valve, low pressure circuit

Safety valve for oil cooler

Picture 5. *Valve block (on the LH side of the gearbox)*
Y1=Solenoid valve of diff. lock.
Y2=Solenoid valve for PTO
Y3=Solenoid valve of front wheel drive
Y4=Solenoid valve for quick–shift gear foremost clutch (lowest ratio)
Y6=Solenoid valve for quick–shift gear middle clutch (intermediate ratio)
S16=Transmission oil temperature sensor (warning light)
S17=Transmission oil pressure sensor (warning light). Modified, 670582–, see page 420/20.

P=Pressure oil inlet from the low pressure pump
1. Pressure–test point (Valmet HPR)
2. Oil inlet from the working hydraulic return oil
3. If plug 3 is to be removed, note its position by counting opening turns or measure the plug depth from the valve surface before removing the plug. Ensure that the punch mark is at the plug groove. A valve spool behing the plug (3) directs pressure oil to the planetary gear multi–disc clutch when both solenoid valves Y4 and Y6 are energized. Apply Loctite 242 onto the plug (3) threads. ***The plug (3) has been removed on the latest models and a locking plate has been fitted in place, see page 420/20.***

The different ratios are engaged with push buttons in the speed gear lever knob:
I = lowest ratio
II = intermediate ratio
III= highest ratio

When the solenoid valve Y4 is energized, pressure oil affects the quick–shift gear foremost clutch C1.

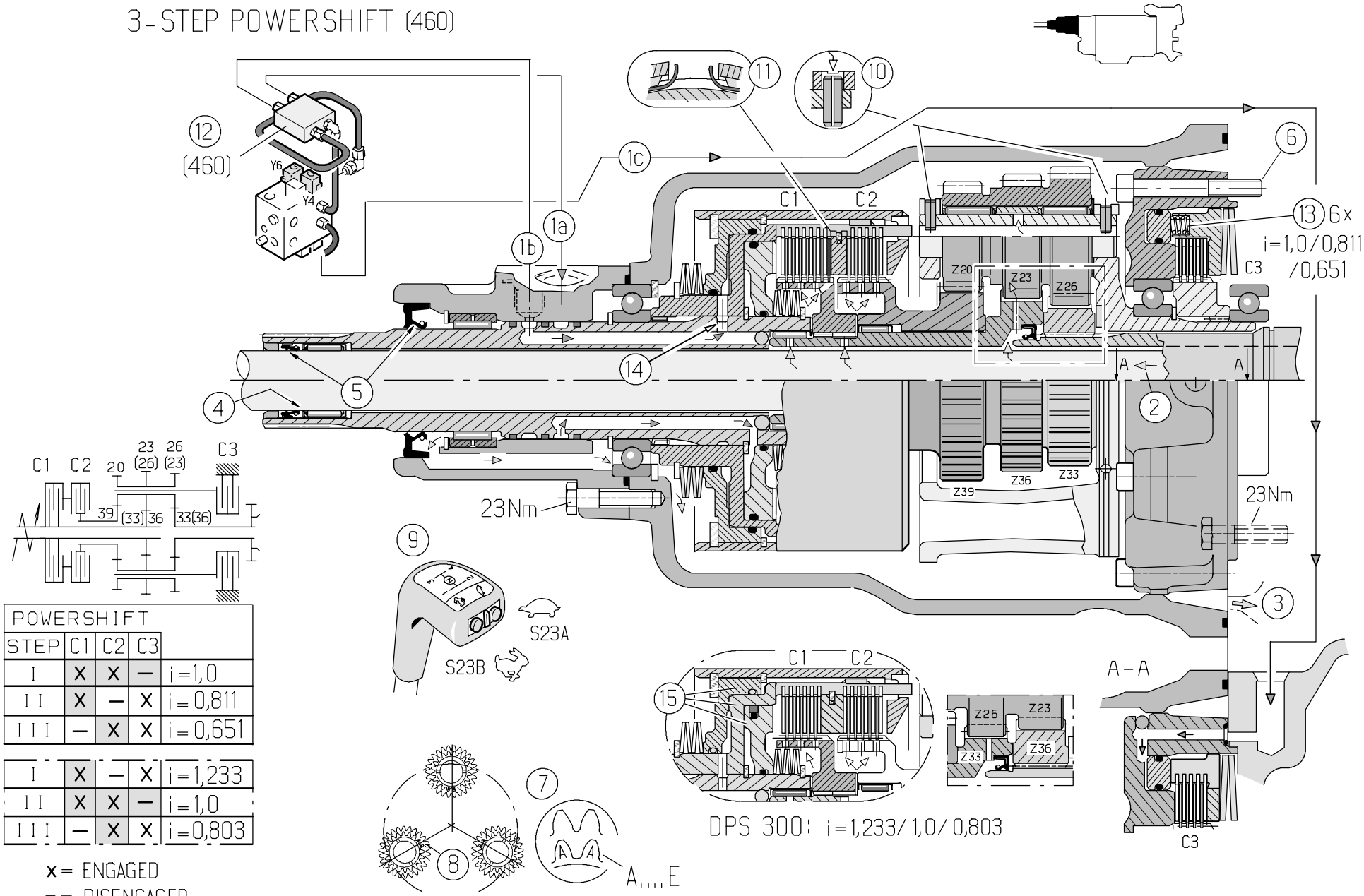
When both solenoid valves Y4 and Y6 are energized. Pressure oil affects in all three multi disc clutches. When pressure oil does not affect the planetary carrier multi disc clutch, the planetary gear is locked by the clutch Belleville springs.

When the solenoid Y6 is energized, pressure oil affects the quick–shift gear clutch C2

Note! When the solenoid valve is energized, the nut at the end of the valve becomes magnetic which can be verified with e.g. a screwdriver. Concerning electric system of DPS, see section 31 code 310 (wiring diagrams), 311 (AC II) and 312 (AC 2.1)

Important! Concerning removal of the valve block, see page **420**/**20**. With effect from ser. no. 668103, on 8200 and 8400 tractors (transmission 460) the DPS gear ratios have been changed, see pages **440**/**14–15.** Transmission 650, see pages **440**/**15A** and **B**.

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POWERSHIFT				
STEP	C1	C2	C3	
I	X	X	–	i=1,0
II	X	–	X	i=0,811
III	–	X	X	i=0,651

I	X	–	X	i=1,233
II	X	X	–	i=1,0
III	–	X	X	i=0,803

X = ENGAGED
– = DISENGAGED
= PRESSURISED OIL

Picture 6. 3–step quick–shift gear Delta Powershift in transmissions 300 and 460.

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3–step quick–shift gear (Delta Powershift), transmissions 300, 460

Note! See picture 6 on previous page.

Delta Powershift is a 3–step quick–shift gear and it is of a planetary gear type. It has three multi–disc clutches, one for reduction ratio, one for overdrive ratio and one for the planetary gear carrier for a direct ratio. All clutches are controlled with aid of pressure oil from the low pressure pump. Solenoid valves are fitted on the servo valve block on the LH side of the gewarbox.

Gear ratios, transmission 300 (450):
– reduction ratio 1:1,233
– overdrive 1:0,803
– direct ratio 1:1

Gear ratios, transmissions 460 and 650
– direct ratio 1:1
– overdrive 1:0,811
– overdrive 1:0,651

When all three clutches are unpressurised (e.g. if current is switched off with the starter switch or if the clutch pedal is depressed), the unit is in the neutral position.

1a) Pressure oil to multi–disc clutch C1.
1b) Pressure oil to multi–disc clutch C2.
1c) Pressure oil to multi–disc clutch C3.

2. Lubricating oil.

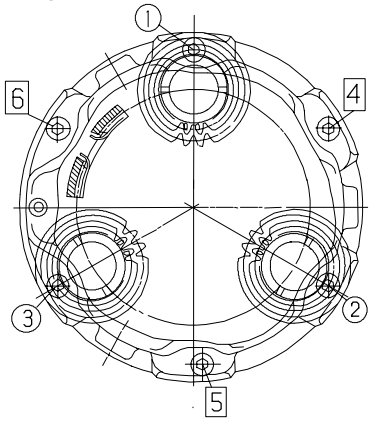
3. Return of lubricating oil and leak oil into the gearbox housing.

4. Needle bearing number side (hardened side) outwards.

5. To be filled with universal grease when assembling.

6. When unscrewing planetary gear carrier attaching bolts, the planet gears can be in such a position that they prevent unbolting. In this case, pump up pressure with a hand pump into the clutch C3 after which the planetary gear carrier can be rotated to the other position.

Important! Apply locking fluid Loctite 243 to the threads of the planetary gear carrier bolts (6) in connection with repair works.
Tightening torque of the bolts (6):
– 8.8, 23 Nm (earlier)
– 10.9, 35 Nm (latest)
Tighten the bolts progressively. Picture below shows the correct tightening order.



7. Planet gears are divided into classes (A–E). The letter marking is stamped on the side of each planet gear. The all three planet gears should have the same letter. Spare part planet gears are delivered as a ready–made kit which includes three planet gears with same letter markings.

8. The planet gear letter markings must point towards the sun gear midpoint when assembling the planetary gear.

9. The two push buttons of the 3–step quick–shift gear are fitted in the speed gear lever knob.

10. When the planetary carrier is locked, lubricating oil is allowed to flow through the tension pins into the planet gear shafts and further into the planet gears.

Note! The tension pins must be knocked a little deeper than the planetary carrier surface to facilitate free flow of lubricating oil.

11. There is a piano wire under the intermediate ring locking ring. See repair instructions for more detail.

12. Lock valve, see page **420**/**20B**.

13 Springs (6 off), 8200–8400; 668103– (transmission 460).

14. Holes must align**.**

Modifications of Delta Powershift

At the beginning of the manufacture, the DPS was controlled with the 3–position rocker switch in the speed gear lever knob and there were no pilot lights at all.

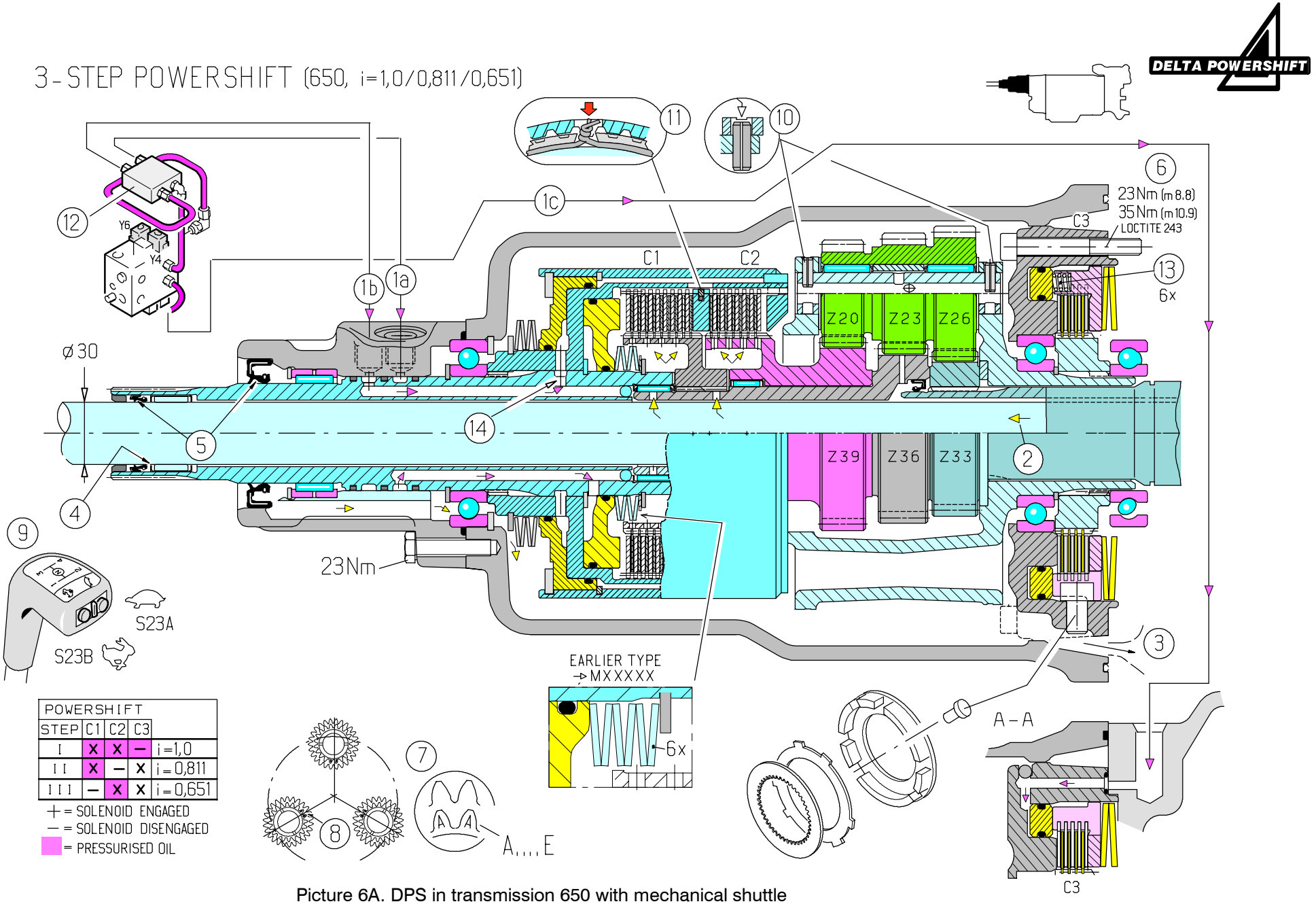
From the beginning of 1994 (662343–) the DPS was controlled with two push buttons in the speed gear lever knob. In addition, there was a separate pilot light panel on the RH side of the instrument panel (see under code 311, AC II).

From the beginning of March 95 (668103–), the pilot lights were moved into the dash board in connection with the other pilot and warning lights. At the same time, the DPS control unit was changed, see under code 312 (AC 2.1). In connection with ratio altering (transmission 460), a lock valve has been added onto the DPS piping, see page **420**/**20B**. In addition, on 8200–8400 tractors (668103–, transmission 460) the planetary carrier clutch has six springs against the clutch piston (see picture on previous page and see also repair instructions under code 444).

From spring –96 the DPS gear has been reinforced in transmission 650, see pages **440**/**15A** and **15B**. Tractors 8450–8750 and 8050–8150 with effect from ser. no. F32104 have transmission 650. 6600–6800 have transmission 650 from tractor number G01401 incl.

In connection with HiTech Shuttle, the DPS gear was changed a little, see pages **15C** and **15D**.

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Picture 6A. DPS in transmission 650 with mechanical shuttle

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DPS in transmission 650 when mechanical shuttle

Note! Tractors 8450–8750 and 8050–8150 with effect from ser. no. F32104 have transmission 650. 6600–6800 have transmission 650 from tractor number G01401 incl.

In the 650 transmission the DPS has been reinforced and some dimensions have been changed. Basic construction and function is similar to the DPS in transmissions 300 and 460. The number of friction discs in the clutches have been increased in transmission 650, see page 440/2.

In the 650 transmission the pump drive shaft diameter (inside the gearbox input shaft and the hollow clutch shaft) has been increased due to the greater transmitted torque. This means that the needle bearing and the seal ring inside the shafts are also larger. In the 650 transmission these parts can be fitted with a new tool ETV 894 200.

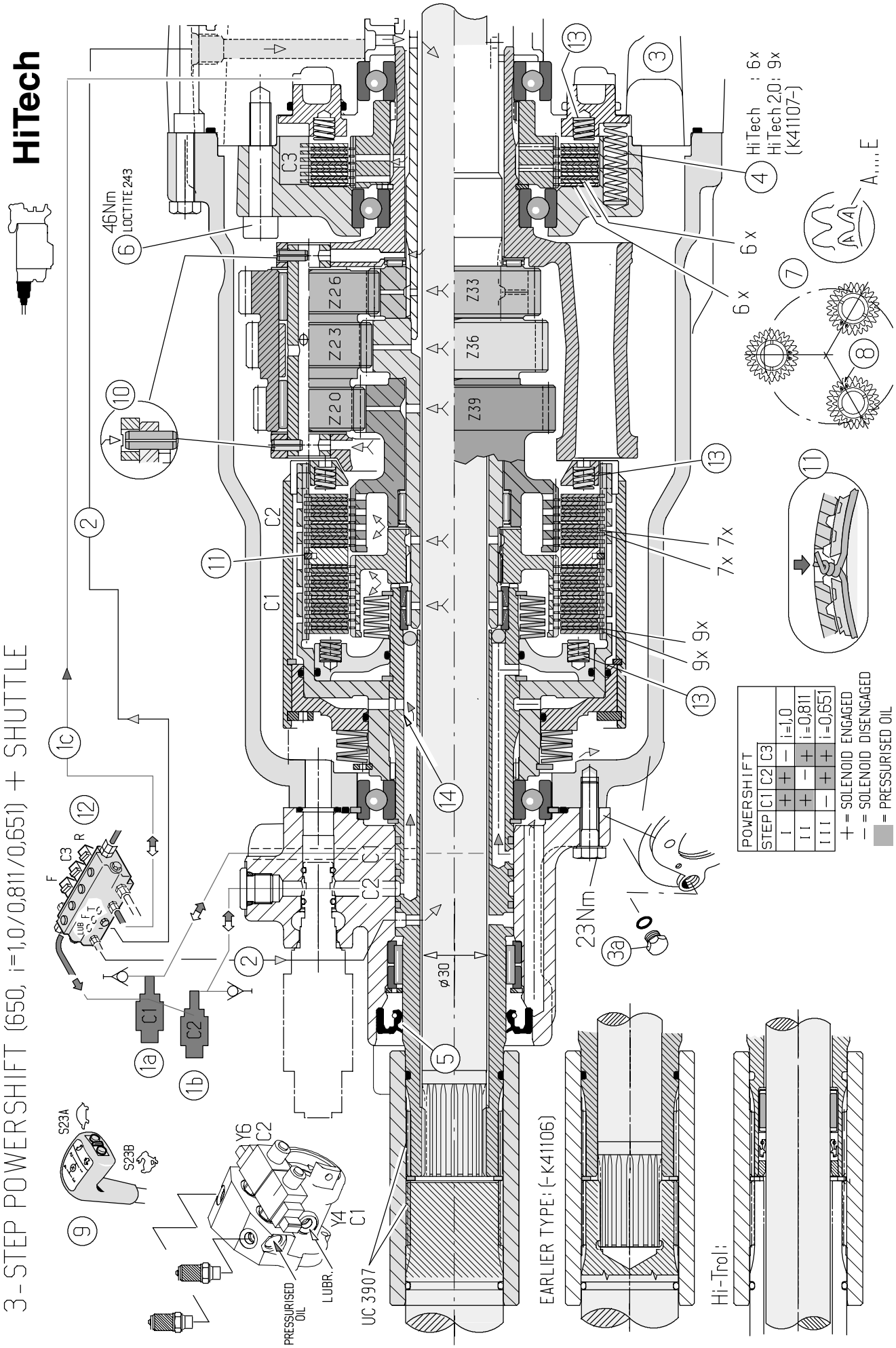
Repair instructions, see pages **444/9–10**.

11. There is a piano wire under the securing ring between clutches C1 and C 2 with effect from ser. no. F32509. The securing ring can be squeezed via holes in the clutch drum.

Note! Other reference numbers (in the picture on the previous page) are the same as in transmissions 300 and 460 on page 440/15.

Important! Apply locking fluid Loctite 243 to the threads of the planetary gear carrier bolts (6) in connection with repair works. Tightening torque of the bolts:
– 8.8, 23 Nm (earlier)
– 10.9, 35 Nm (latest)
Tighten the bolts progressively. Tightening order, see picture on page 440/15.

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DPS on tractors with HiTech Shuttle

See picture **6C**.

(HiTech: –K41106. HiTech 2.0: K41107–).

1. The rearmost planetary gear clutch (C3) of DPS has been modified in HiTech models so that pressure engages the clutch and it has an own solenoid valve. In connection with the mechanical shuttle clutch C3 has cup springs and pressure releases the disc pack. In addition, the number of the discs in the rearmost clutch is 6+6 pcs (HiTech Shuttle), or 4+5 pcs (mechanical shuttle).

2. In connection with HiTech Shuttle all three DPS clutches have their own solenoid valve and they are proportionally controlled for a progressive engagement. The proportional solenoid valves have been placed on two valve blocks on the tractor frame, see page **440**/**25**.

3. The number of the cup springs in clutches C1 and C2 has been increased. Also coil springs have been fitted on the pistons of these two clutches of DPS.

Note! The electrical control of the DPS clutches and the calibration of clutch pressures have been described under code **370** (Autocontrol 5/5.2).

Modifications, HiTech 2.0 (K41107–):

The number of springs (**4**) has been increased from 6 to 9. The lubrication drillings at the clutch C3 have been reduced and drillings (3 off) to the planet gears have been added. Planet carrier front end (in front of gear wheel Z20) has been shaped so that it gathers oil and it is connected with aid of lubrication drillings to the planet gear axles. The clutches are delivered as a complete unit with correct thickness. Due to the manufacturing reasons the splines of the long PTO shaft has been moved into the DPS input shaft (NOTE! Different lengths of the shafts).

Note! The long PTO shaft cannot be removed forwards when the DPS is in place due to modifications in the front end of the shaft.

1a) Pressure oil (0–1,8 MPa) to multi–disc clutch C1.

1b) Pressure oil (0–1,8 MPa) to multi–disc clutch C2.

1c) Pressure oil (0–1,8 MPa) to multi–disc clutch C3.

2. Lubricating oil.

3. Return of lubricating oil and leak oil into the gearbox housing.

3a. Plug for manufacturing of DPS.

4. Clutch C3 return springs (6 pcs / 9 pcs) for piston.

5. To be filled with universal grease when assembling.

6. Clutch housing fixing bolts (46 Nm). Loctite 243 on the threads.

7. Planet gears are divided into classes (A–E). The letter marking is stamped on the side of each planet gear. All three planet gears should have the same letter. Spare part planet gears are delivered as a ready–made kit which includes three planet gears with same letter markings.

8. The planet gear letter markings must point towards the sun gear midpoint when assembling the planetary gear.

9. The two push buttons of the 3–step quick–shift gear are fitted in the speed gear lever knob.

10. When the planetary carrier is locked, lubricating oil is allowed to flow through the tension pins into the planet gear shafts and further into the planet gears.
Note! The tension pins must be knocked a little deeper than the planetary carrier surface to facilitate free flow of lubricating oil.

11. There is a piano wire under the intermediate ring locking ring. See repair instructions for more details.

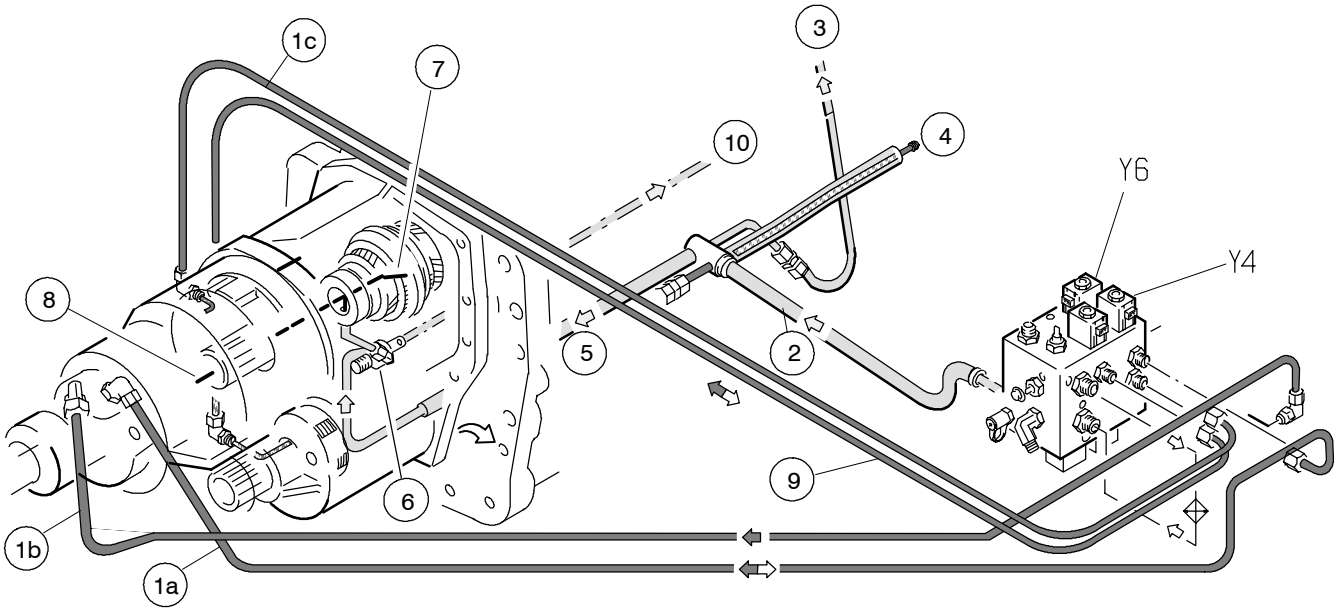
12. Distribution piece.

13 Springs (à 18 pcs) in the piston bores. The springs cushion the function of the clutches.

14. Holes must align (pressure line of clutch C2).

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Lubricating system of DPS and mechanical shuttle

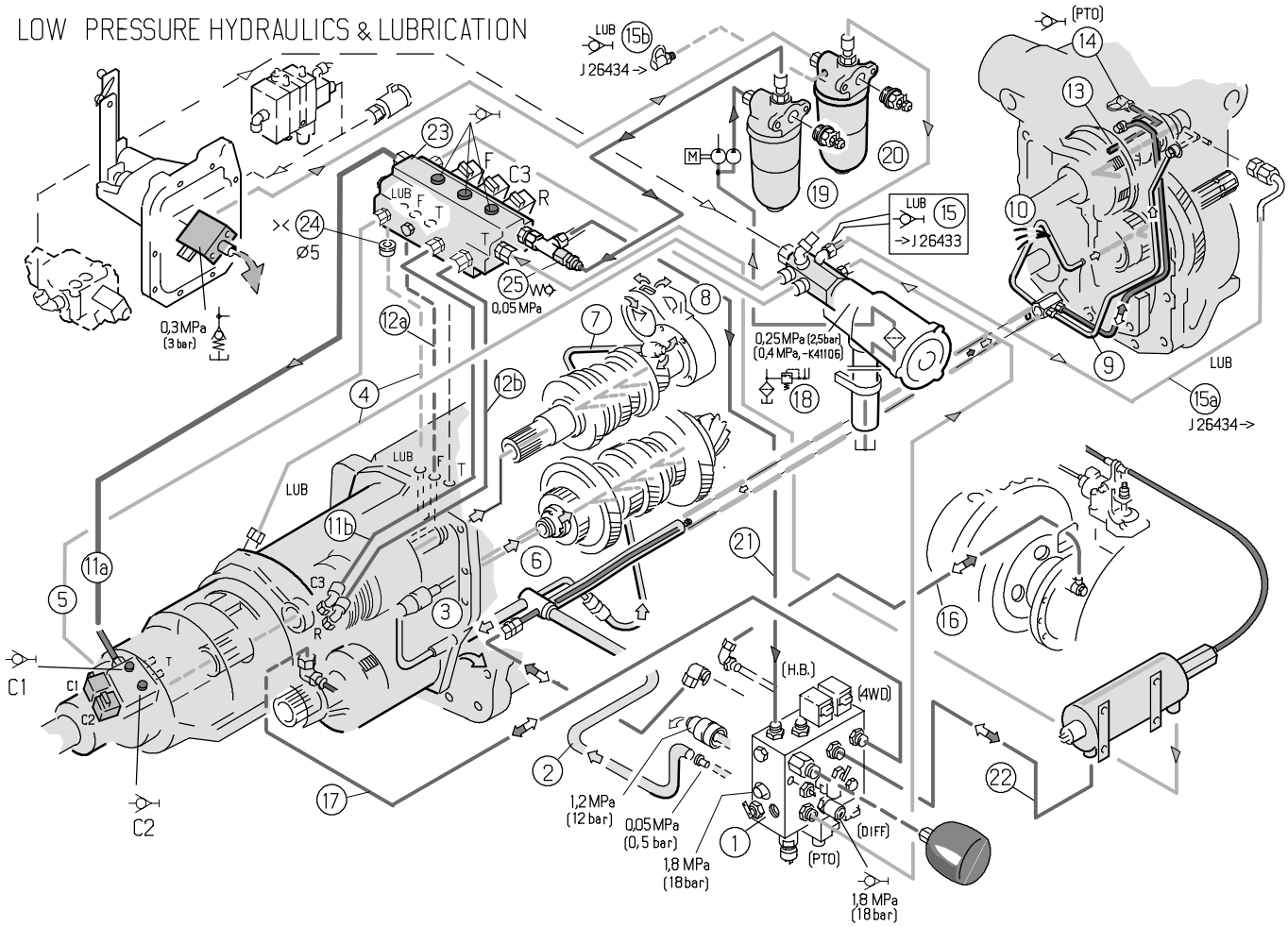


Picture 7. Lubricating and pressure oil pipes on tractors with Delta Powershift and with mechanical shuttle.

1a. Pressure oil pipe to multi–disc clutch for reduction ratio
1b. Pressure oil pipe to multi–disc clutch for overdrive ratio.
1c. Pressure oil pipe to multi–disc clutch for planetary carrier.
2. Feed pipe for lubricating oil
3. Lubricating oil to gearbox input shaft
4. Lubricating oil to PTO unit
5. Lubricating oil to the distribution piece inside the reverse shuttle housing
6. Distribution piece
7. Lubricating oil from distribution piece to reverse shuttle and quick–shift gear.
8. Lubricating oil to quick–shift gear
9. Pressure oil to 4WD clutch in the lower part of the reverse shuttle housing.
10. Lubricating oil to bevel pinion shaft
Y4 = Solenoid valve for reduction ratio
Y6 = Solenoid valve for overdrive ratio

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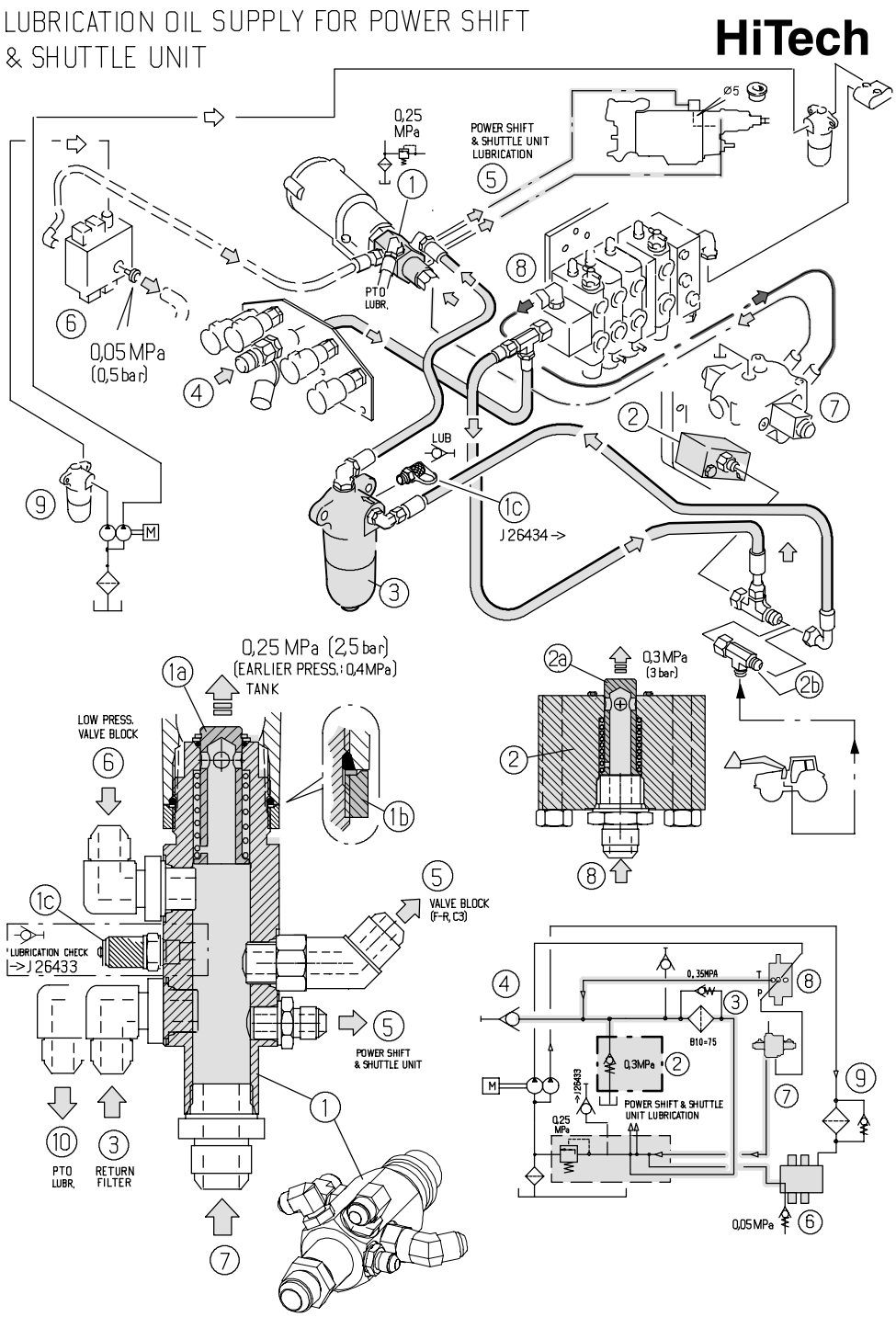
Lubricating and low pressure piping on HiTech tractors



Picture 7A. *Low pressure pipes on HiTech tractors.*

1. Servo valve block (see pages **420**/**20C** and **440**/**24**):
– on the valve block there are solenoid valves for diff. lock, 4WD, PTO (proportional) and hand brake.
– oil cooler by–pass valve (0,05 MPa) and oil cooler safety valve (1,2 MPa)
– pressure limiting valve of 1,8 MPa (clutch pressures).
2. Lubricating oil to gearbox.
3. Distribution piece (in which there is ø 2mm restriction for the bevel pinion shaft lubrication).
4. Lubricating oil to shuttle
5. Lubricating oil to DPS
6. Lubricating oil to bevel pinion shaft
7. Lubricating oil to input shaft
8. Lubricating oil to pump drive mechanism
9. Lubricating oil to PTO clutch (+PTO)
10. Lubricating oil to PTO shaft (in the pipe there is ø 1,5 mm hole for differential lubrication)
11a. Pressure oil to DPS solenoid valves P1/P2.
11b. Pressure oil to DPS clutch C3.
12a. Pressure oil to shuttle F–clutch
12b. Pressure oil to shuttle R–clutch
13. Pressure oil to PTO clutch
14. Test point, PTO clutch pressure (threads M14x1,5)
15. Test point (HPR), lubr. pressure.
16. Pressure oil to diff. lock
17. Pressure oil to 4WD clutch
18. Pressure–limiting valve (**0,4 MPa**) determines the lubrication pressure (0,25 MPa, K41107–).
19. Pressure filter of low pressure hydraulics
20. Return oil filter
21. Pressure oil from pump via filter into the valve block **1**.
22. Pressure oil to hand brake ram
23. Valve block
24. Restriction, diam 5 mm
25. Non–return valve, 0,05 MPa (K50440–)

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Picture 7B. *Lubricating system in HiTech tractors*

1. Distribution piece

1a. Valve 0,25 MPa (2,5 bar), ealier 0,4 MPa, determines the lubr. oil pressure. The pressure was earlier 0,4 MPa (–K41106). This modification improves the lubr. oil pressure. This pressure drop has been made so that the valve spool (1a) has been lenghtened about 4 mm. Valve spring is the same as in valve **2a**

1b. Fixing nut of the distribution piece.
Observe, that the o–ring must remain in the thinned part of the distribution piece (not between threads).
1c) Test point, lubr. oil pressure. Fittend on the rearmost pressure filter, J26434–.
2. Valve body
2a. Pressure limiting valve 0,3 MPa (3 bar) determines the max. pressure in return oil circuit.

2b. Return oil connection for front loader.

3. Return oil filter.

4. Return oil connection for auxiliary hydraulics.

5. Lubr. oil to DPS and shuttle. Oil flow into the shuttle has been reduced with a restriction (diam. 5 mm) (K41107–)

6. In the servo valve block, in the gearbox lubr. oil pipe, there is a valve of 0,05 MPa, which ensures lubr. oil to DPS and shuttle, if pressure drops below 0,05 MPa:n.

7. Oil from control valve (Bosch)
8. Oil from valve blocks
9. Pressure filtre in low pressure circuit
10. Lubr. oil pipe to the PTO clutch (J26434–).

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Mechanical reverse shuttle, description

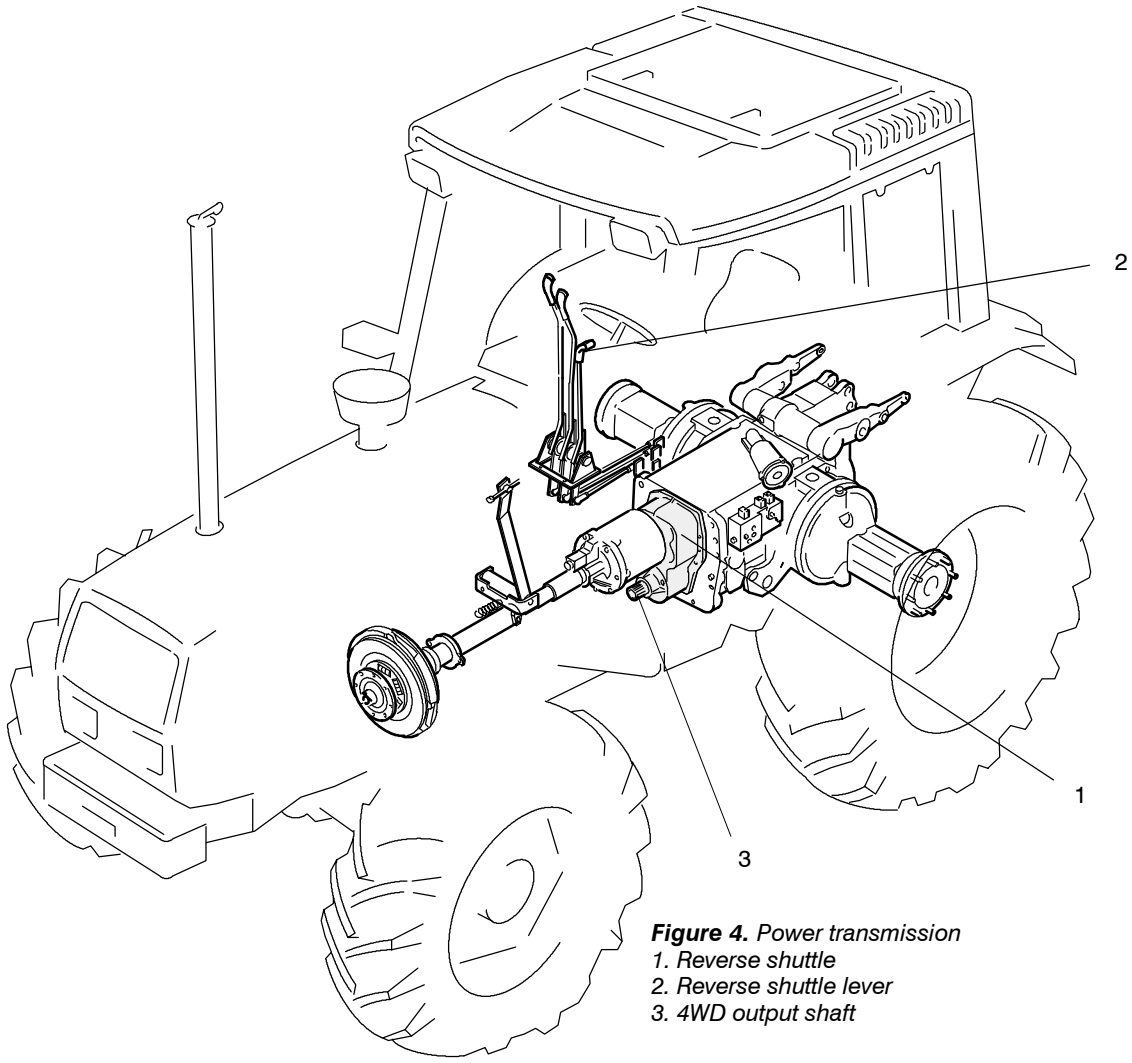


Figure 4. *Power transmission*
1. Reverse shuttle
2. Reverse shuttle lever
3. 4WD output shaft

The reverse shuttle housing is attached to the gearbox front end. The reverse shuttle is controlled mechanically with a lever. In the reverse shuttle there is fitted a synchromesh unit.

When changing driving direction, the tractor must be stationary and the clutch pedal must be pressed.

The selector fork rail rear end is led into the gearbox through the gearbox front wall. The reverse shuttle lever lower end has been connected to the shifter lever, which turns the selector lever and the selector fork on the synchromesh unit moves.

The reverse shuttle has pressure lubrication (see figures on pages 440/10 and 440/16).

In the reverse shuttle housing lower part there is the 4WD clutch and 4WD output shaft. On E–models, there are two speed sensors on the reverse shuttle front end.

Important!
The picture above shows a transmission which has a 2–step quick–shift gear. If the tractor has a 3–step quick–shift gear (Delta Powershift), the reverse shuttle housing has a little different casting and additionally the input shaft length is different (see picture on page 440/19). In addition, in the reverse shuttle housing there is no impulse disc for E–models. The 4WD clutch and the 4WD output shaft have been reinforced in connection with the Delta Powershift (see picture on page 440/21). Also the selector fork rail has been reinforced. Otherwise the reverse shuttle is the same as earlier.

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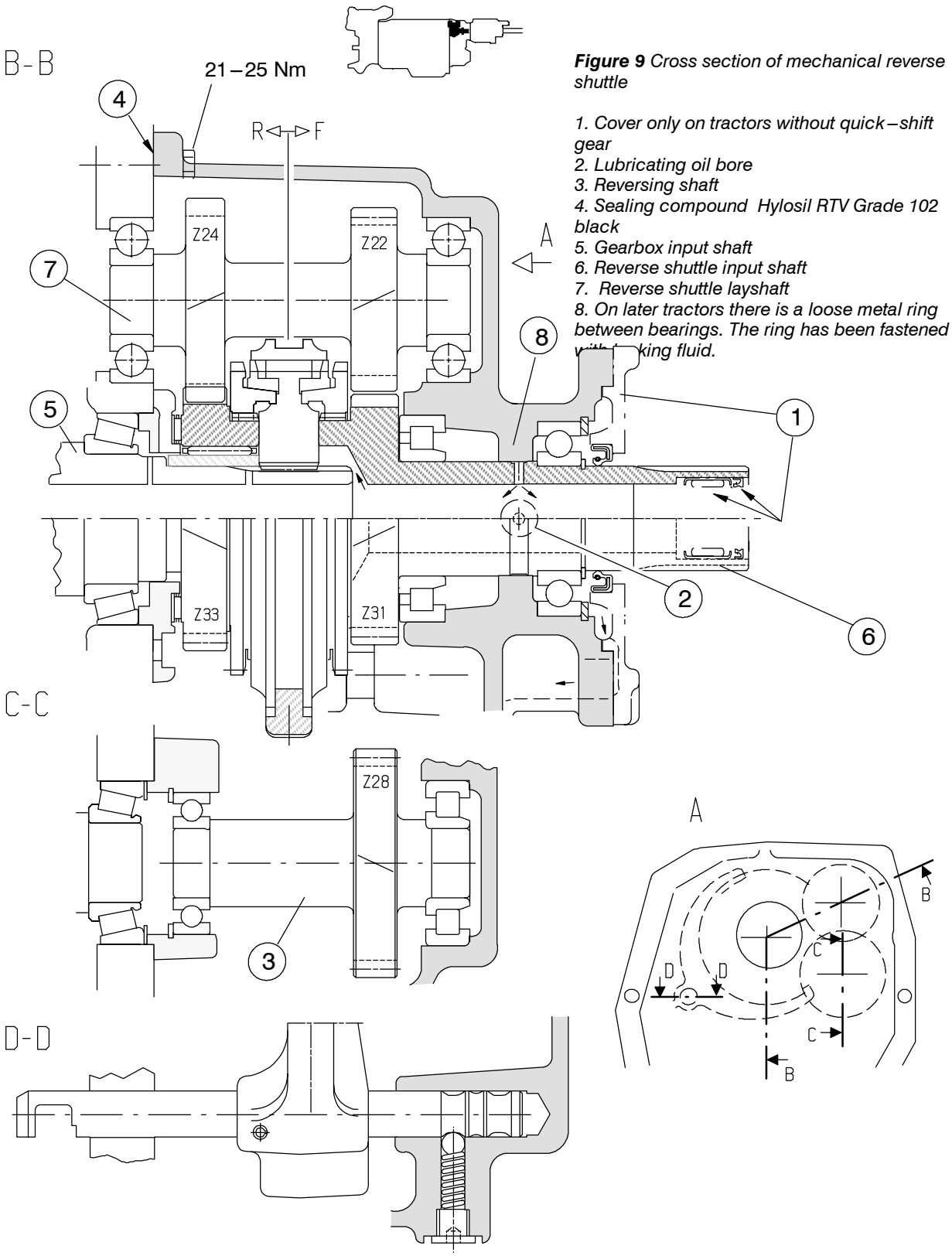


Figure 9 *Cross section of mechanical reverse shuttle*

1. Cover only on tractors without quick–shift gear
2. Lubricating oil bore
3. Reversing shaft
4. Sealing compound Hylosil RTV Grade 102 black
5. Gearbox input shaft
6. Reverse shuttle input shaft
7. Reverse shuttle layshaft
8. On later tractors there is a loose metal ring between bearings. The ring has been fastened with locking fluid.

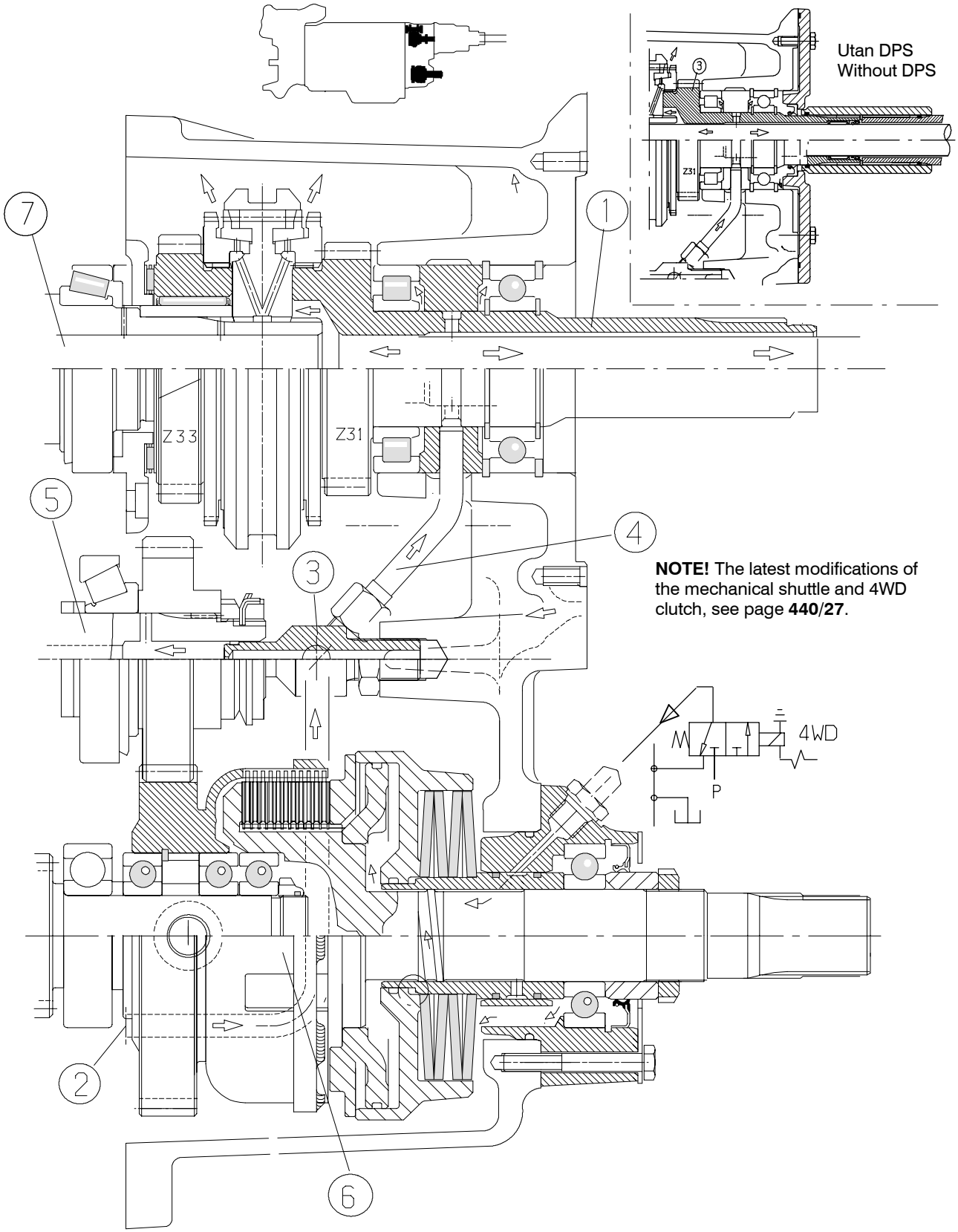
Forward driving

The synchromesh unit is in the front position (F). Gear Z31 has been engaged to the gearbox input shaft (5), and power is transmitted direct to the gearbox (transmission ratio 1:1).

Reversing

The synchromesh unit is in the rear position (R). Power is transmitted from the input shaft (6) via reversing shaft (3) to the layshaft (7). The layshaft rear gear (Z24) rotates the gear Z33 which has been engaged to the gearbox input shaft (5). (transmission ratio 2,5 % faster than in driving forward).

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NOTE! The latest modifications of the mechanical shuttle and 4WD clutch, see page **440**/**27**.

Picture 10. Mechanical reverse shuttle and 4WD clutch on tractors which have a 3–step quick–shift gear (Delta Powershift).

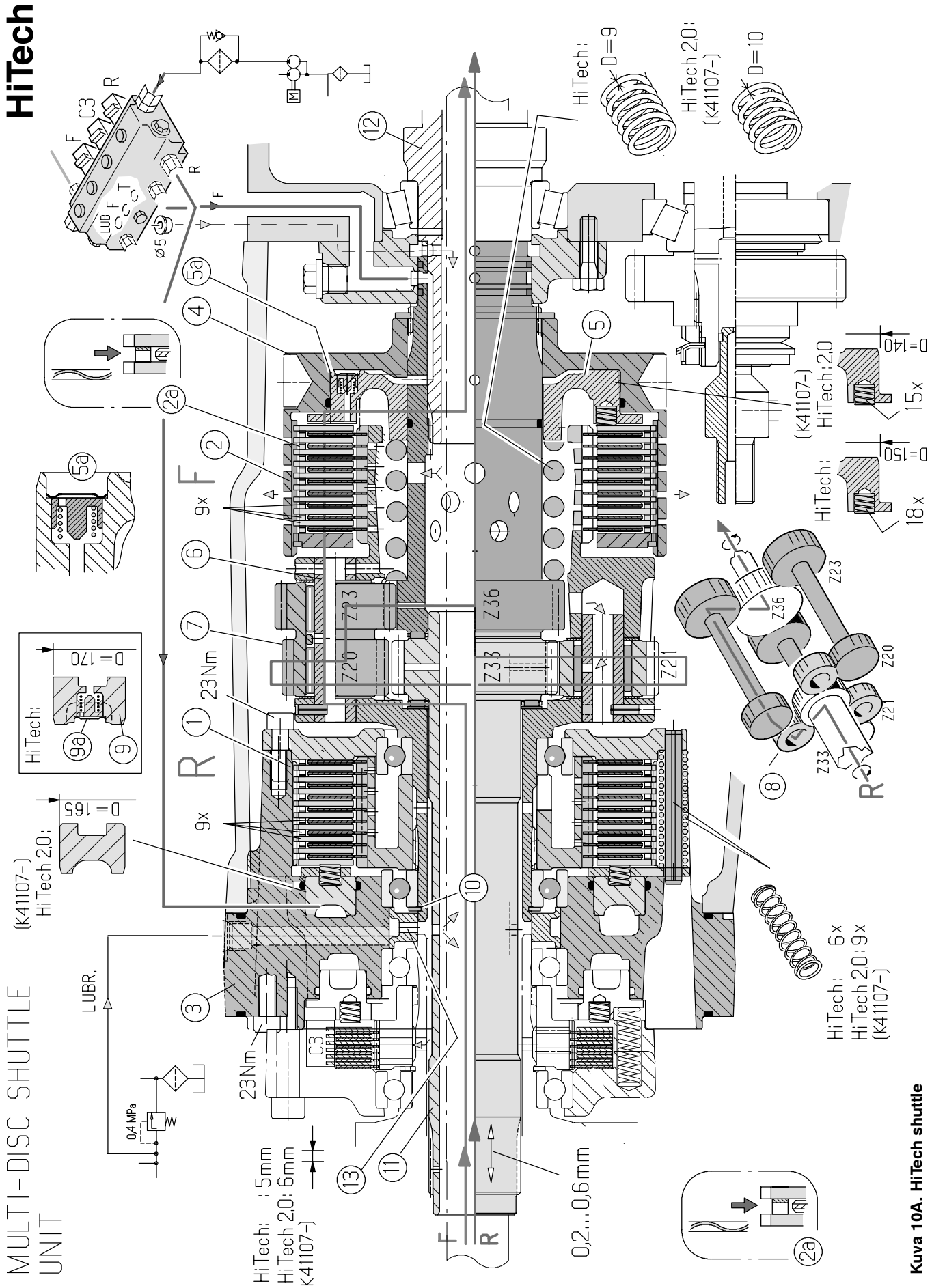
1. Reverse shuttle input shaft
2. Lubricating oil inlet
3. Lubricating oil distribution piece
4. Lubricating oil to reverse shuttle and quick–shift gear
5. Bevel pinion shaft front end
6. 4WD multi–disc clutch (see also page 440/21)
7. Gearbox input shaft

Note! On tractors with Delta Powershift, the revese shuttle layshaft and reversing shaft are the same as earlier, see previous page. Between the reverse shuttle input shaft bearings there is a loose metal ring and the ball bearing of the input shaft has circlips on both sides of the bearing.

Note! This shuttle and 4WD clutch is also on latest tractors which have not the Delta Power Shift. In this case, the shuttle input shaft is tightened with a flange which has an oil seal. Also inside the input shaft, there is a needle bearing and a seal for the pump (PTO) drive shaft.

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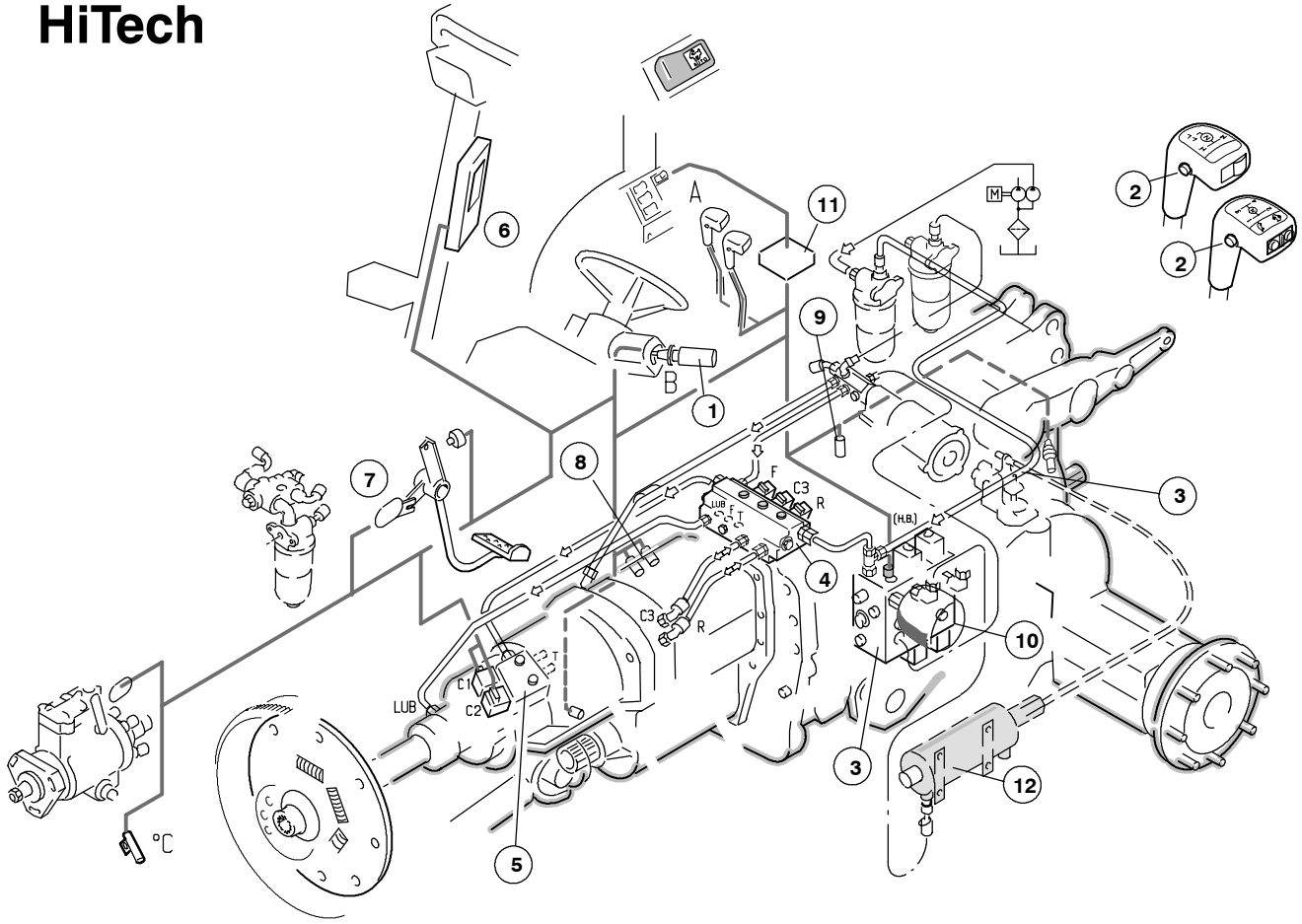
HiTech shuttle (HiTech: –K41106. HiTech 2.0: K41107–).



Kuva 10A. HiTech shuttle

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HiTech



Picture 10B. *HiTech Shuttle components*

1. Shuttle lever / hand brake
2. In the gear lever knobs, there are push buttons for electrical disengagement of the Shuttle (comprare HiShift).
*3. Pressure oil (1,8 MPa) from tractor low pressure circuit to the valve block on the LH side of the gearbox (see pages **420**/**20C** and **440**/**24**)*
*4. Valve block on which there are proportional solenoid valves for F– and R–clutches of the shuttle, see page **440**/**25**.*
*5. DPS valve block, see page **440**/**25**.*
*6. Display unit, see code **370** (Autoconrol V) page 370/4.*
7. The shuttle can also be disengaged electrically with the clutch pedal. The pedal has a position sensor.
8. Shuttle rpm sensors (+rotation direction information)
9. Gearbox speed sensor (driving speed)
10. Pressure accumulator
11. Control unit
12. Hand brake ram

The construction of the HiTech shuttle is of a planetary type. Both F– and R–clutch disc packs are similar. When one of the clutches is under pressure (proportional valve in question energised), the direction in question is engaged. Power routes in the Shuttle, see picture **10A** (R=reverse drive, F=forward drive).

The change of the driving direction can be done without using the clutch pedal or push buttons and the tractor has not the conventional propulsion clutch on the flywheel. Automatics control the driving direction change and it is prevented if the driving speed exceeds 10 km/h.

The following modifications have been done on the tractors which are equipped with the HiTech Shuttle:
– casting modifications on the housings of the DPS and Shuttle.
– since the DPS is fastened to the shuttle, modifications have been done in the rear part of the DPS, see pages **15C** and **D**.
– Main gearbox input shaft front end has modifications
– The shaft between flywheel–DPS modified.
– The pressure and lubricating oil pipes and the various valve blocks have been arranged in the new way, see page **440**/**16A** and **B**.
– New electrical control of the DPS and Shuttle, see code **370** (Autocontrol V).
– Drive plate in place of the propulsion clutch, see page **410**/**4A.**

Note! Repair instruction of the HiTech Shuttle, see pages **442**/**4–11**. The electric control of the DPS and Shuttle is described under code **370** (Autocontrol V). Various valve blocks in connection with the HiTech Shuttle, see pages **440**/**24** and **25**.

In connection with the HiTech Shuttle, the hand brake control has been combined with the Shuttle lever (see page **521**/**2**).

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4WD clutch

The 4WD clutch is fitted in the lower part of the reverse shuttle housing. Power from the gearbox to the clutch is transmitted via a gear wheel at the bevel pinion shaft front end.

4WD is always engaged by cup springs, when the engine is stopped (pressurised oil does not act in the clutch).

When pressure oil is directed to the 4WD clutch, the multi–disc clutch is released and power is not transmitted to the front wheels.

Front wheel drive is engaged and disengaged electro–hydraulically by means of a switch on the range gear lever knob. 4WD solenoid valve is placed on the servo valve block on the gearbox LH side.

Clutch pressure is directed to the 4WD clutch via an external pipe from the servo valve block. Low pressure pump supplies oil to the servo valve block. Clutch pressure is 1,8 MPa and is limited by a pressure–limiting valve on the servo valve block.

4WD output shaft has been connected to the propeller shaft with a flange joint or with a sleeve joint on tractors which have Delta Powershift

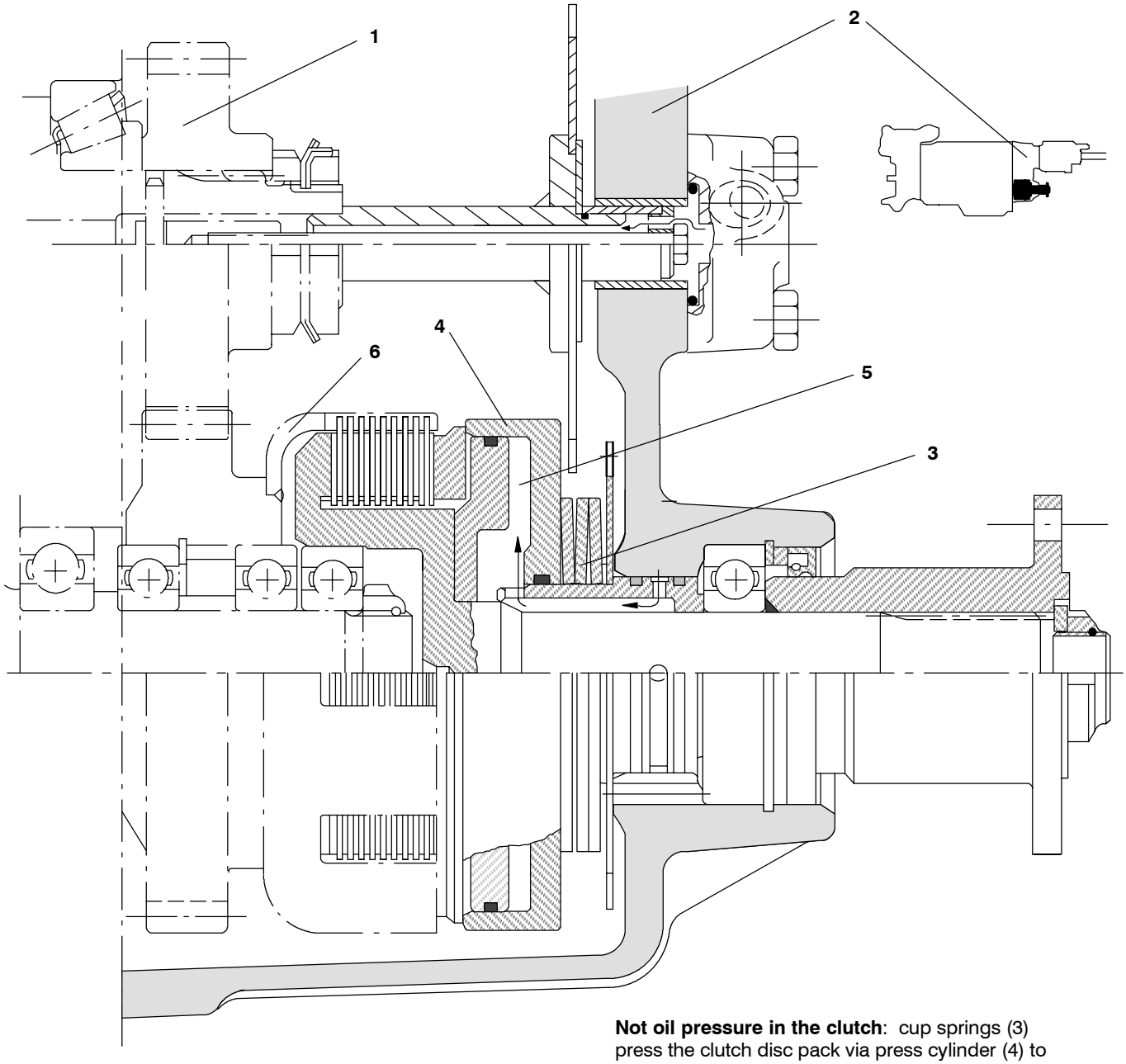


Figure 11. *4WD clutch on tractors equipped with a 2–step quick–shift gear or are without a quick–shift gear*

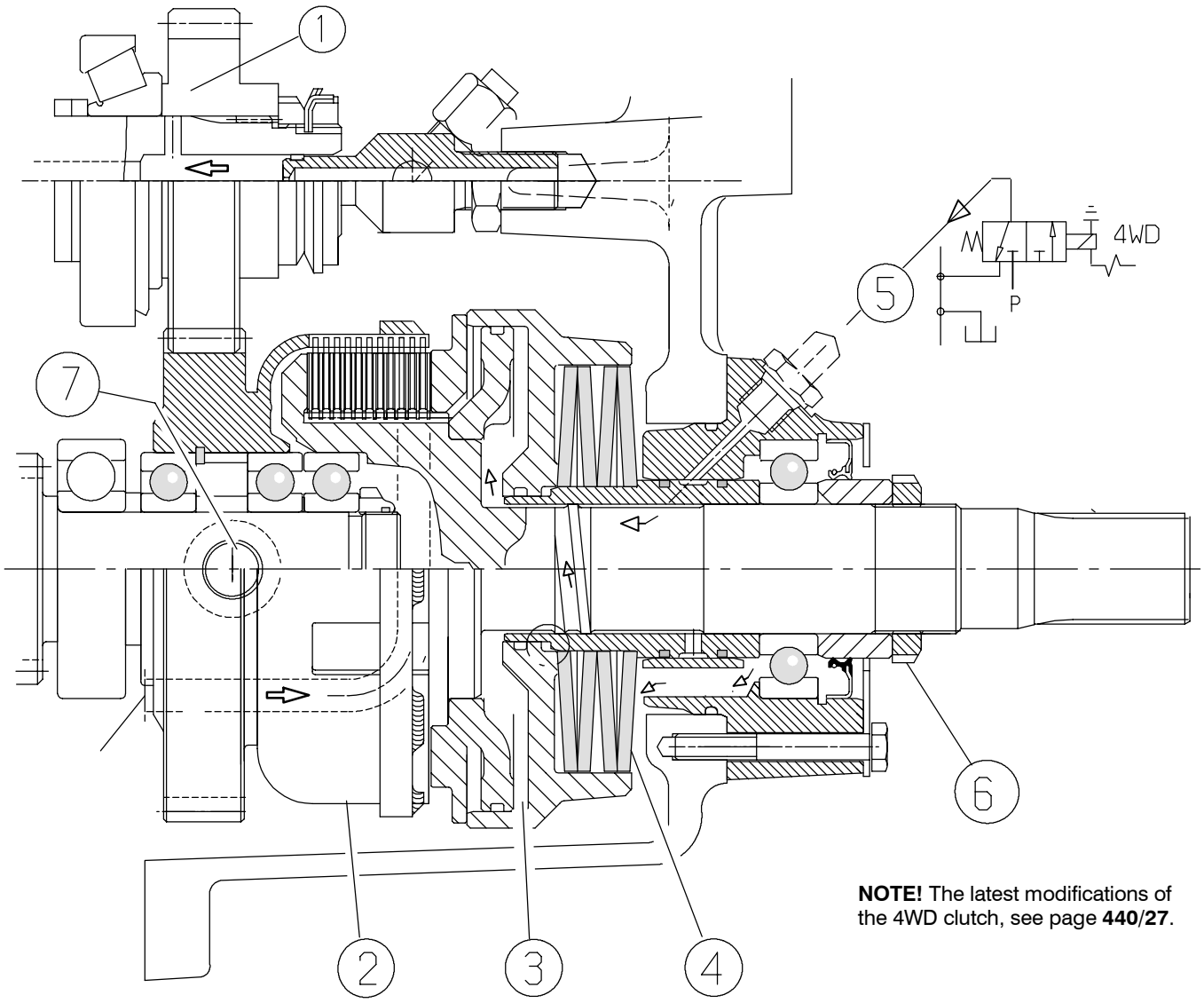
1. Output gear at the front end of the bevel pinion shaft
2. Reverse shuttle housing
3. Cup springs
4. Press cylinder
5. Oil space
6. Clutch drum, which always rotates when the tractor moves.Clutch pack steel disc lugs are engaged with the grooves on the drum.

Not oil pressure in the clutch: cup springs (3) press the clutch disc pack via press cylinder (4) to the engaged position and power is transmitted to the front wheels.

Oil pressure in the clutch: Pressure oil acts in the oil space (5) and cylinder (4) moves against the cup springs (3) and the multi–disc pack is released. Power is not transmitted to the front wheels

Note! 4WD engages always when the brake pedals are pressed.

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NOTE! The latest modifications of the 4WD clutch, see page **440/27**.

Picture 12. *4WD clutch on tractors which have Delta Powershift (reinforced clutch* ***660071–).***

1. Gear wheel for 4WD at the front end of the bevel pinion shaft. Number of teeth on 4WD gear wheels depends on the transmission type (30 km/h, 40 km/h or 50 km/h).

2. 4WD clutch drum.

3. Pressure oil space for disengaging the 4WD.

4.Cup springs which keep the clutch in engaged position when pressure oil does not act in space 3.

5. Pressure oil inlet from the servo valve block (valve block, see page 440/13).

6. The multi–disc clutch is adjusted by tightening the shaft nut first fully home and then unscrewing the nut one and a half turn.

7. Place for rotation speed sensor on E–models (AC IV). The sensor must be removed before the reverse shuttle housing is detached.

The function of the clutch above is the same as earlier (see previous page).

In this clutch the propeller shaft rear end is connected to the 4WD output shaft with a sleeve joint. Additionally, in the clutch there are more clutch discs and also the cup springs are reinforced.

The 4WD clutch above is equipped with a separate seal/bearing housing which is bolted to the lower part of the reverse shuttle.

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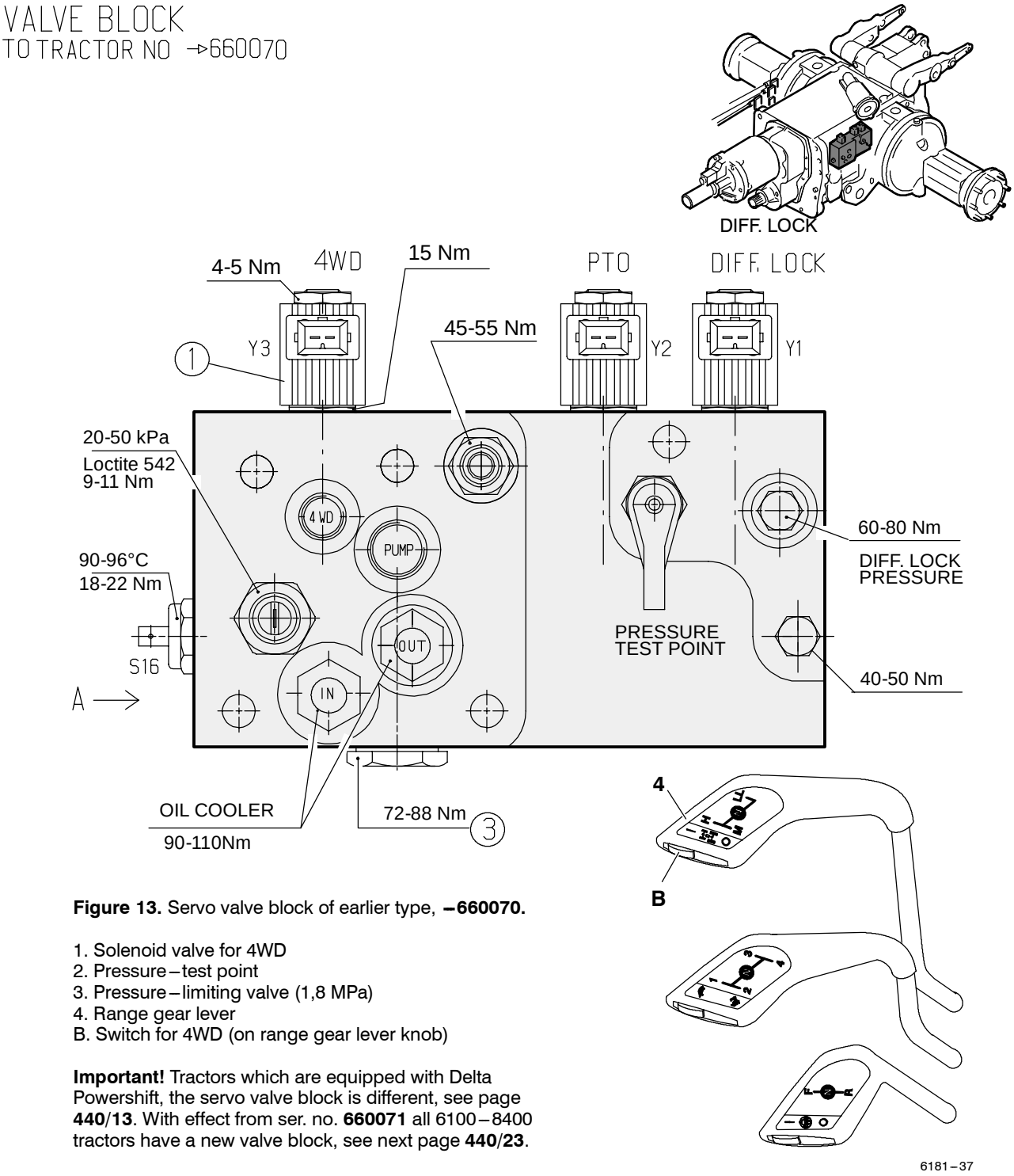


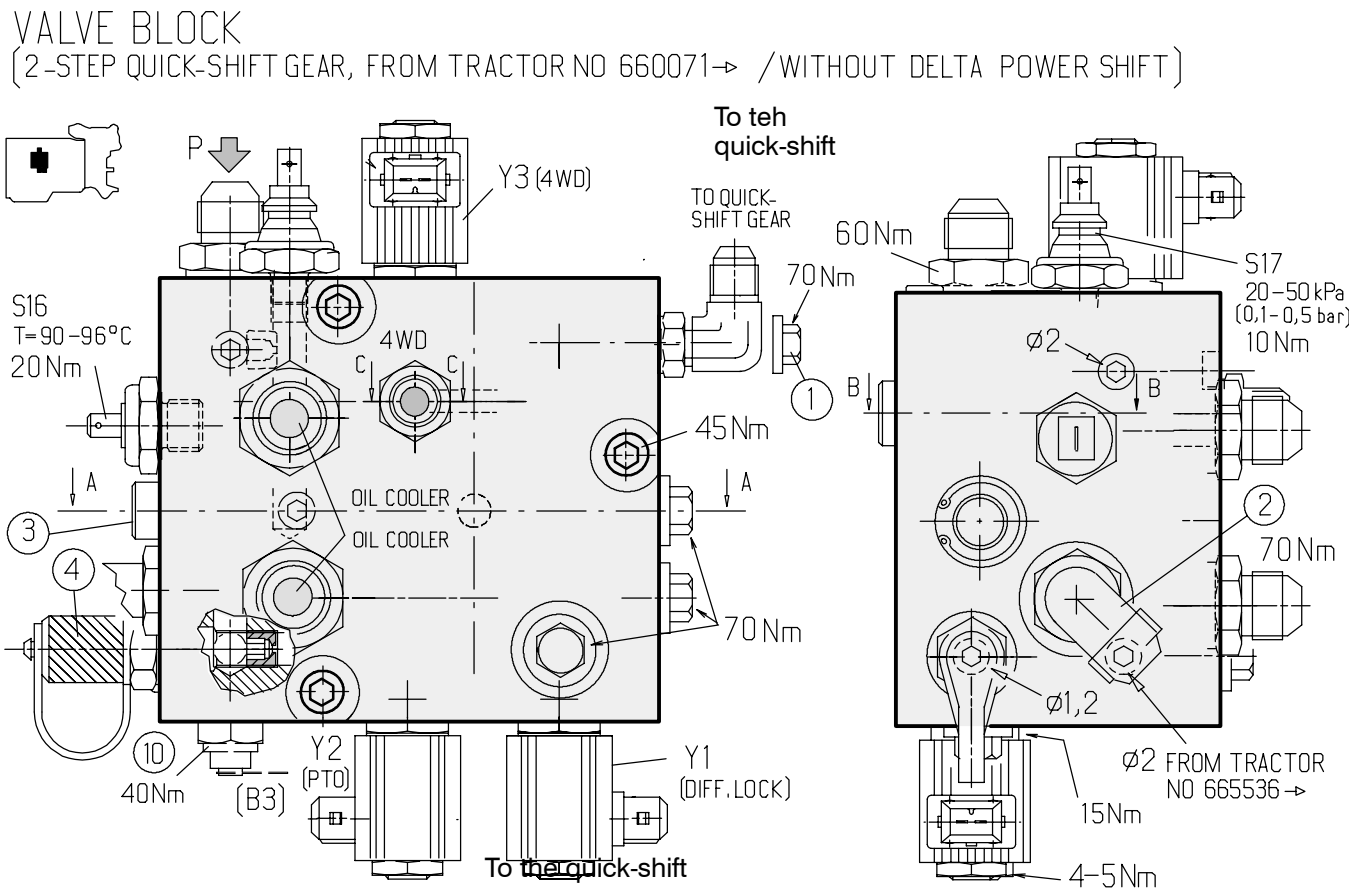
Figure 13. Servo valve block of earlier type, **–660070.**

1. Solenoid valve for 4WD
2. Pressure–test point
3. Pressure–limiting valve (1,8 MPa)
4. Range gear lever

B. Switch for 4WD (on range gear lever knob)

Important! Tractors which are equipped with Delta Powershift, the servo valve block is different, see page **440**/**13**. With effect from ser. no. **660071** all 6100–8400 tractors have a new valve block, see next page **440**/**23**.

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Picture 14. *Later servo valve block,* ***660071 –****, which is fitted on tractors with 2–step quick–shift gear or without quick–shift gear (and DPS), and with mechanical shuttle.*

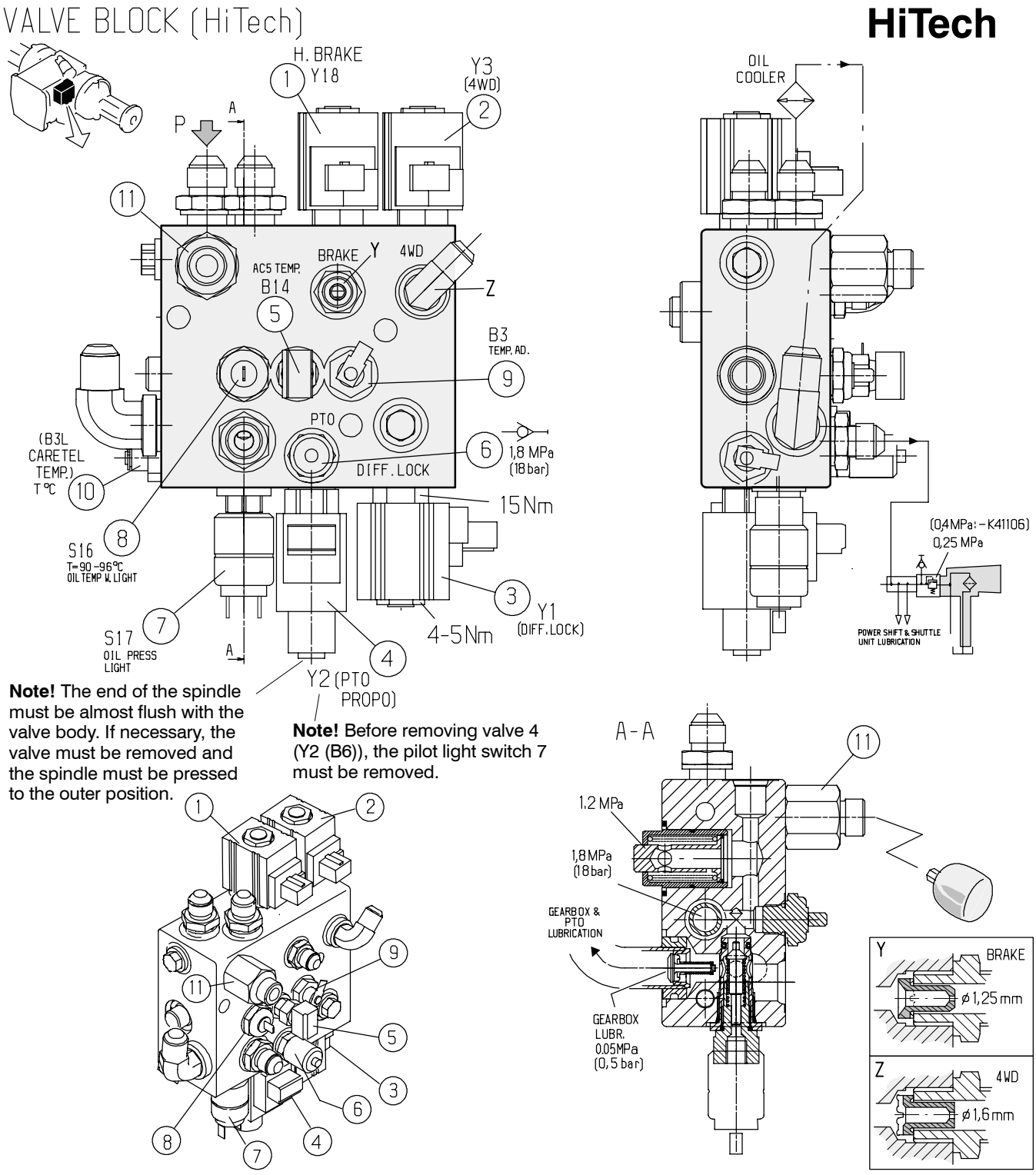
The valve block is placed on the LH side of the gearbox.

Y3 = Solenoid valve for 4WD
S16 = Transmission oi temperature sensor (warning light)
S17 = Transmission oil pressure sensor (warning light)
1. Connector is plugged on tractors without quick–shift gear
2. Oil inlet from the working hydraulic return oil side.
3. Pressure–limiting valve
4. Pressure–test point, low pressure circuit.
P = Pressure oil inlet from the low pressure pump.

The pressure–limiting valve (1,8 MPa) in the valve above is of different construction compared with the pressure–limiting valve in the previous valve block. The cross–section of the new pressure–limiting valve is shown on page **440**/**13**.

The valve block above has the same components as the valve block which is fitted on tractors with Delta Powershift, see page 440/13. However, the valve above has not solenoid valves for Delta Powershift and not even the valve spool for a direct ratio of Delta Powershift.

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Note! The end of the spindle must be almost flush with the valve body. If necessary, the valve must be removed and the spindle must be pressed to the outer position.

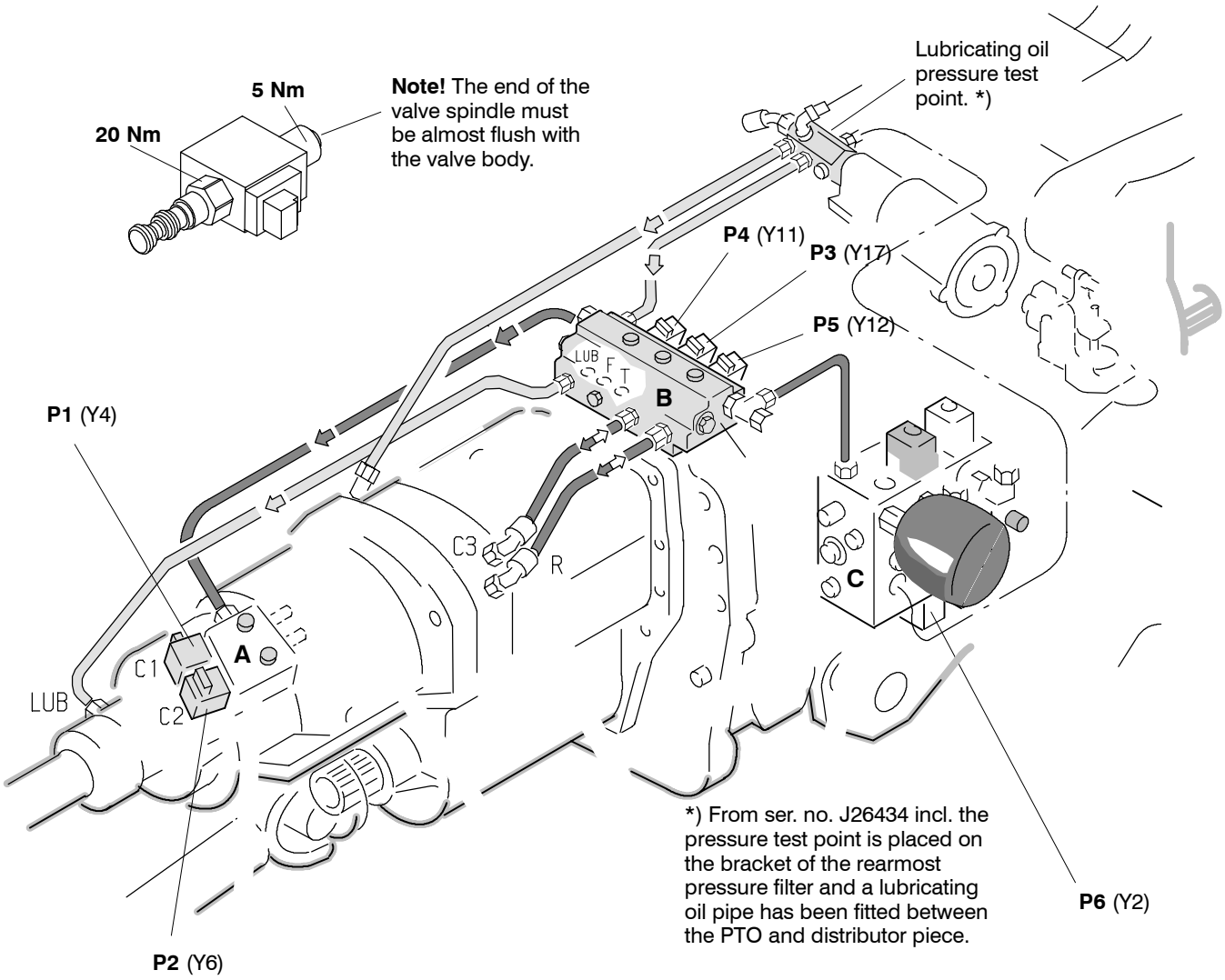
Note! Before removing valve 4 (Y2 (B6)), the pilot light switch 7 must be removed.

Picture 15. *Servo valve block on HiTech tractors (on the LH side of the gearbox)*

NOTE! *Cross section of the valve, see page* ***420***/***20C****.*

1. Solenoid valve of hand brake (energised, when the hand brake is disengaged, see code ***521****).*
2. 4WD solenoid valve (engaging logic, see code ***314*** *(AC 2.3).*
3. Solenoid valve of differential lock (engaging logic, see code ***314*** *(AC 2.3).*
4. Proportional valve Y2 (P6) of PTO (engaging logic, see code ***314*** *(AC 2.3).*
5. Temperature sensor of Autocontrol 5/5.2/6 (see code ***370***/***371)****.*
6. Pressure test point, low pressure circuit (1,8–1,9 MPa)
7. Indicator light sensor (S17), gearbox oil pressure
8. Indicator light sensor (S16), gearbox oil temperature
9. Oil temperature sensor (B3), AD–instrument
10. CareTel oil temperature sensor B3L.
11. Connection for pressure accumulator (not ill.).

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Picture 16. *Valve blocks in connection with HiTech Shuttle*

A. DPS valve block
B. Shuttle valve block
C. Renewed servo valve block, see pages **440**/**24** and **420**/**20C**.

Valve block A:

P1=Proportional solenoid valve of DPS foremost clutch C1 This valve is energised, when DPS ratios I or II have been connected (transmission 650). The pressure test point of this clutch is the LH side point on the block.

P2=Proportional solenoid valve of DPS middle clutch C2 This valve is energised, when DPS ratios I or III have been connected (transmission 650). The pressure test point of this clutch is the RH side point on the block.

Valve block B

P3=Proportional solenoid valve of DPS rearmost clutch C3 This valve is energised, when DPS ratios II or III have been connected (transmission 650). The middle pressure test point is for this clutch.

P4=proportional solenoid valve for forward clutch (F). Energised when the forward driving has been connected. The pressure test point is the RH side test point on the block.

P5=proportional solenoid valve for reverse clutch (R). Energised when the reverse driving has been connected. The pressure test point is the LH side point on the block.

P6=proportional solenoid valve for PTO.

Note! Concerning pressure tests and pressure calibrations, see under code **370** (Autocontrol V).

Note! The lubricating oil pressure can be measured in test point (HPR) on the rear part of the suction strainer housing. Valve block **B** is also shown on page **420**/**20D**.

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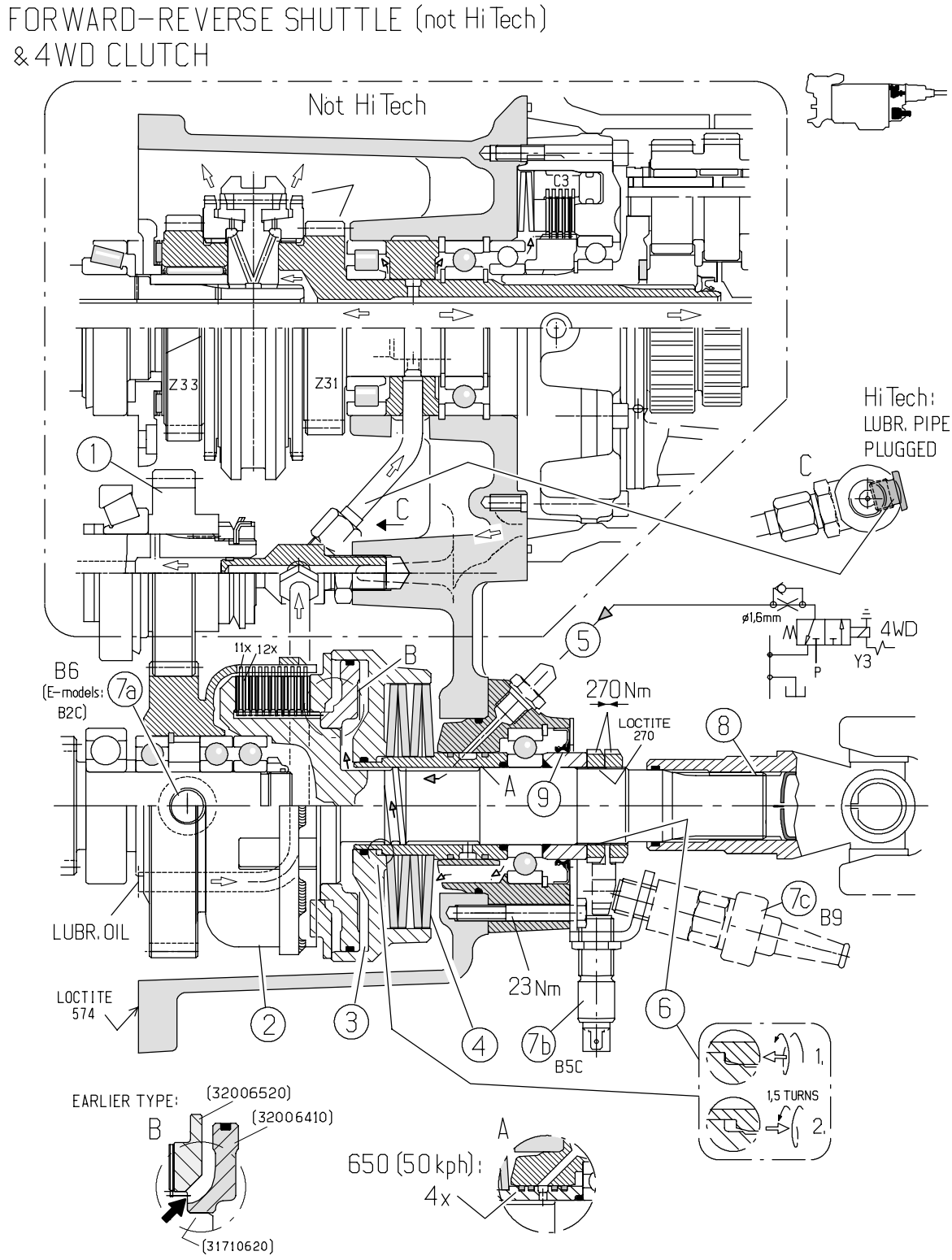
Working order

Table below shows working orders for certain repair work. Detailed repair instructions can be found in instructions which start on next page.

	Drain transmission oil	Remove floor hatch	Split tractor between fuel tank–gearbox	Remove quick–shift gear	Remove reverse shuttle	Disassemble gearbox
Changing 2–step quick–shift gear solenoid valve.		1				
Changing solenoid valves/proportional valves for 3–step quick–shift gear.	Solenoid valves are placed on the separate valve blocks and oil draining is not necessary					
Changing 2–step and 3–step quick–shift gear front oil seals	1		2			
Changing oil seal inside the quick–shift gear input shaft front end	1		2			
Changing piston ring type oil seals in 3–step quick–shift gear	1		2 (in addition, disconnect oil pipes from gear housing and remove the seal housing in the front part of the gear housing.			
Reconditioning quick–shift gear	1		2	3		
Repairing mechanical reverse shuttle synchromesh unit	1		2	3	4	
Changing mechanical reverse shuttle selector fork	1		2	3	4	
Changing mechanical reverse shuttle selector lever	1		2	3	4	5
Reconditioning Hi-Tech Shuttle multi–disc clutches	1		2	3	4	
Reconditioning 4WD clutch	1		2	3	4	
Changing 4WD output shaft oil seal	1					

Note! The quick–shift gear/reverse shuttle can be removed in two different ways:
– split the tractor between gearbox–fuel tank and roll the front frame away from the gearbox (cab is attached to the rear frame): see **instruction 441 1A**
– split the tractor between gearbox–fuel tank and roll the rear frame away from the fuel tank (cab attached to the front frame): see **instruction 423 1A.**

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Picture 14. *Mechanical shuttle (not HiTech) and 4WD clutch (also HiTech), latest modifications.*

1.Gear wheel in the front end of the bevel pinion shaft
2. Clutch drum
3. Pressure cylinder
4. Cup springs
5. Pressure oil inlet port
6.Tighten the inner nut fully home and open it then ***1,5 turn****. Outer nut is tightened to 270 Nm against the inner nut. Loctite 270 on the threads.* ***Note!*** *Prevent inner nut from rotating when tightening the outer nut.*

7a, b. Speed sensors of gearbox anf front axle
7c.Tachograph (option)
8. EP grease on splines..
9. Universal grease

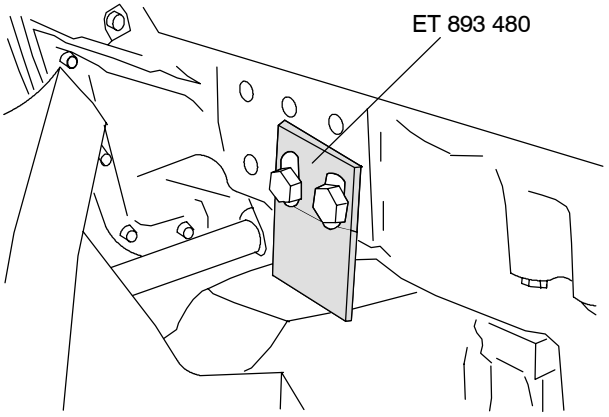
Detail B: The shape of the flanges have been changed. With earlier shape the pressure flange could drop between the shaft and the flange due to the casting faults.

Reconditioning quick–shift gear (Op. no. 441)

1. Removing quick–shift gear

A. Splitting tractor between gearbox–fuel tank (cab attached to the rear frame)

Note! Splitting can be done also according to instruction **423 1A**. In addition, on E–models the sensor wires must be disconnected.



1. Fit support plates ET 893 480 (2 pcs) for preventing front axle oscillation (fixing bolts M20x35). Drain transmission oil.



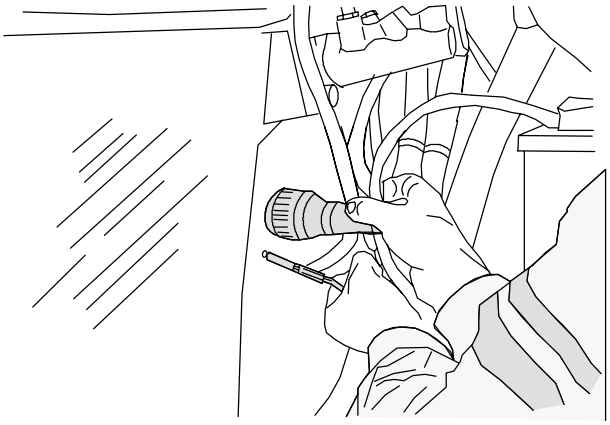
2. Remove all engine hood plates. Disconnect the battery earth cable. Remove the propeller shaft guard and disconnect the propeller shaft rear flange joint.

Note! On tractors with Delta Powershift the propeller shaft rear end has a sleeve joint and it disconnects when tractor is split

3. Disconnect the heater hoses from the cab front wall.

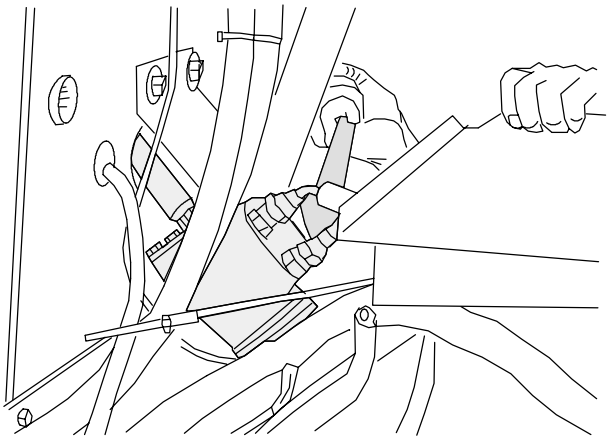
4. Disconnect the stop control from the injection pump. Detach clutch lever from the clutch adjusting rod or cable (**–659477)** or disconnect the release cable front end by working through the access hole on the frame (**659478–**)

Note! Measure the distance between the clutch adjuster stop and the wing nut for easier fitting (**–659477**).



5. Disconnect the socket and the accelerator pedal cable wire from the cab front wall (on the RH side).

6. Disconnect the electric cable to the starter motor and disconnect the cab earth lead from the cab front wall.



7. Mark the steering valve hoses for easier fitting and disconnect the hoses from the valve. Disconnect the windscreen washer hose and the cable connector.

8. Detach the plastic covers from the cab lower front edge. Unscrew the cab front fixing bolts and raise the cab front end about 5 cm.

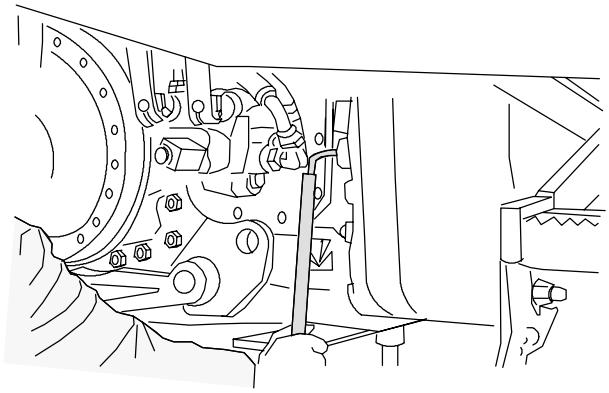
Note! The lifting rope can be attached to the brake fluid reservoir bracket. Support the cab front end with trestles.

9. Disconnect the oil cooler pipes from the servo valve block on the gearbox LH side.

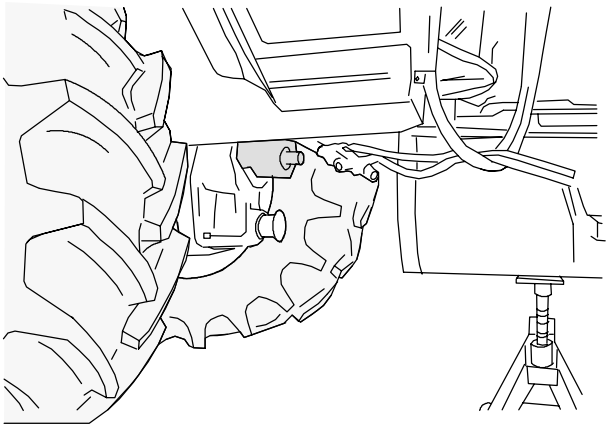
10. Disconnect the hoses and hose connections from the hydraulic lift control valve (on the RH side of the gearbox) for easier work. Disconnect the hoses from the pressure filter.

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11. Place trestles equipped with castors under the fuel tank. Support the gearbox under the front edge and also place support under the towing hook (rear frame is rear–heavy).



12. Unscrew the bolted joint between the gearbox and fuel tank.



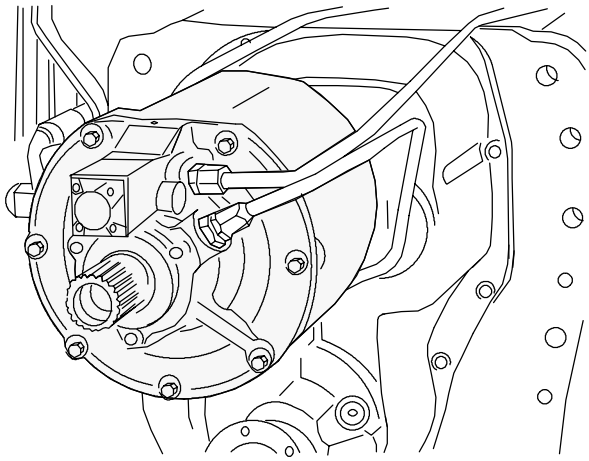
13. Roll the front frame apart from the gearbox.

Note! Pass the 2–step quick–shift gear solenoid wire so that it does not damage when the frame is split.

B. Detaching 2–step quick–shift gear from the reverse shuttle

Important! 3–step quick shift gear (Delta Powershift), see page **444/1**.

1. Disconnect the quick–shift gear solenoid wire connector. Carefully pull out the long pump drive shaft. Do not damage the seals.



2. Disconnect the oil pipes from the quick–shift gear.

3. Unscrew the quick–shift gear fixing bolts and remove the quick–shift gear.

4. Remove the centring ring and o–rings between the quick–shift gear and the reverse shuttle.

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2. Fitting quick–shift gear

A. Attaching 2–step quick–shift gear to reverse shuttle

Important! 3–step quick shift gear (Delta Powershift), see under code **444**.

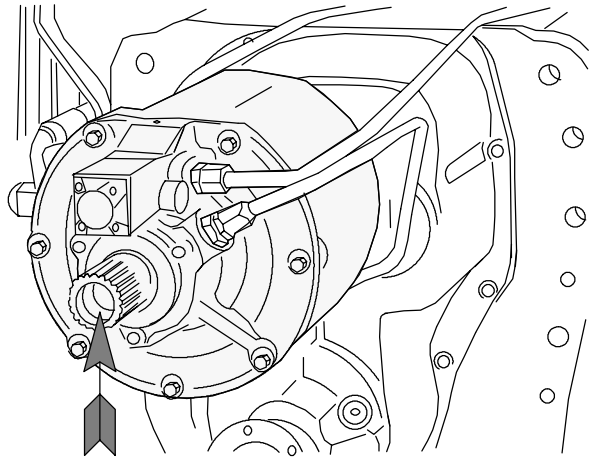
1. Fit the centring ring, large o–ring and small o–ring round the oil bore between the quick–shift gear and the reverse shuttle.

Note! If necessary, o–rings can be fixed with a little grease.

2. Place the quick–shift gear onto the reverse shuttle input shaft.

3. Tighten the quick–shift gear fixing bolts to a torque of **45 Nm**.

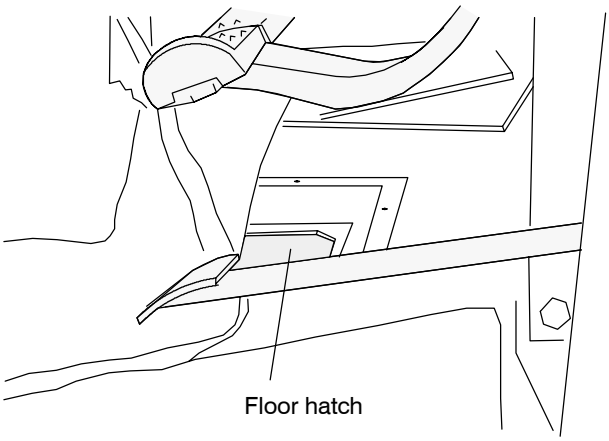
4. Connect the oil pipes and the solenoid valve lead to the quick–shift gear.



Note! Check and change, if necessary, the needle bearing and oil seal inside the input shaft front end. The seal can be fitted with drift ETV 892 180.

5. Carefully push the pump drive shaft through the input shaft fully home. Place the connecting sleeve onto the quick–shift gear input shaft.

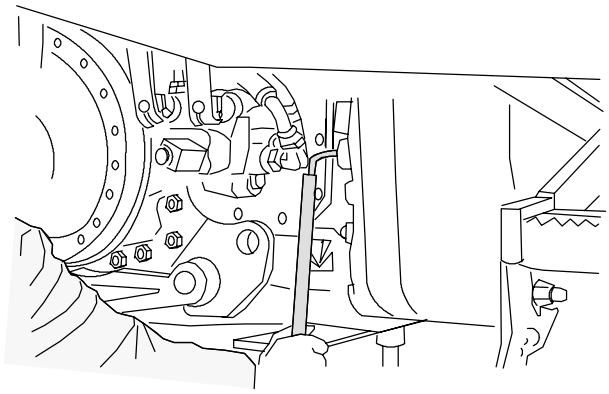
B. Assembling tractor frame between gearbox–fuel tank.



1. Open the floor hatch

2. Push the front frame against the gearbox and guide the connecting sleeve through the floor hatch.

Note! Rotate, if necessary, the flywheel for easier engagement of the pump drive shaft front end splines. Also guide the 2–step quick–shift gear solenoid valve wire into place.



3. Push the frame parts against each other so that the guide pins and studs engage with their holes. Tighten the frame joint bolts (nuts onto studs **300 Nm**, hexagonal socket–head screws **125 Nm**). Remove the supports under the tractor.

Important! If the tractor has Delta Powershift, guide the propeller shaft rear end onto the 4WD output shaft splines.

4. Connect the hoses to the hydraulic lift control valve and also the hoses to the pressure filter (on the RH side).

5. Connect the oil cooler pipes to the servo valve block (on the LH side of the gearbox).

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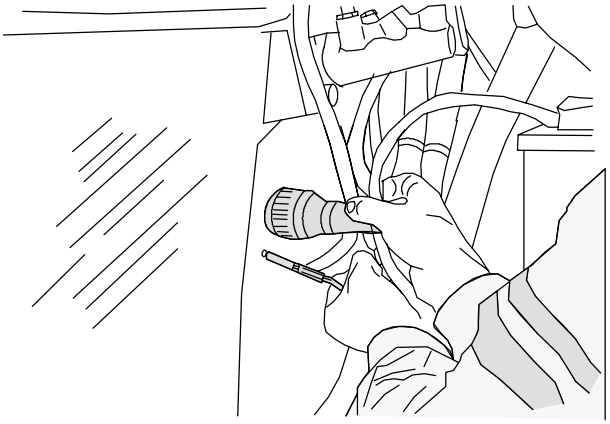


6. Connect the rear flange joint of the propeller shaft (**35 Nm**) (not Delta Powershift) and fit the guard plate.

Note! Tightening torque of the front axle attaching bolts is **380 Nm**.

7. Lower the cab front end and tighten the cab fixing bolts to **200 Nm**. Fit the plastic covers to the cab lower front edge on both sides.

8. Connect the hoses to the steering valve according to the marks. Fit the windscreen washer hose and cable connector.



9. Connect the cable to the starter motor. Connect the socket and the accelerator pedal cable wire (on the RH side). Connect the cab earth lead to the cab front wall.

10. Fit the clutch lever/adjusting rod or cable according to the measurements (**–659477**) or connect the release cable front end through the access hole on the frame (**659478–**). Connect the stop control to the injection pump. Connect the cab heater hoses.

11. Remove the support plates on the front axle. Connect the battery earth cable. Fill the transmission with oil.

12. Fit the engine hood plates and test–drive the tractor. Adjust the clutch and make sure that the throttle control and stop control function properly. Check for leaks.

13. Make sure that the quick–shift gear functions properly.

Note! E–models: check that the sensor wires have been connected and that the AC–III unit functions.

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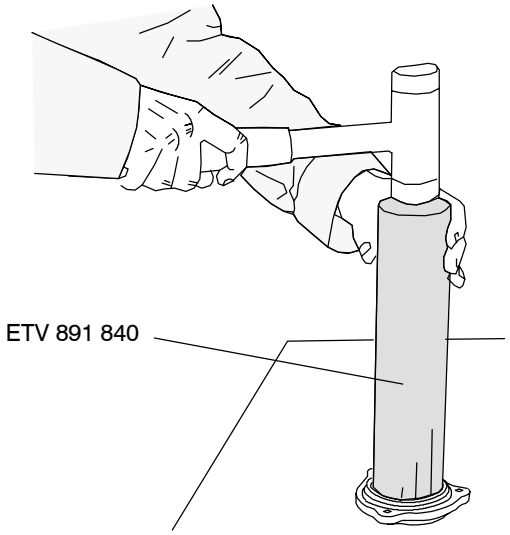
3. Reconditioning 2–step quick–shift gear

Note! The 2–step quick–shift gear is the same as on Valmet 505–905 tractors. Tractors equipped with 3–step quick–shift gear Delta Powershift, see under code **444**.

A. Changing seals for input shaft

Note! Before changing the seals, split the tractor frame between the gearbox and fuel tank (**see instr. 441 1 A or 423 1A**).

1. Remove the seal retainer/bearing cover.



2. Remove the old seal from the retainer and drive in a new seal with ETV 891 840. Fit a new o–ring in the cover.

Note! Fit the support ring under the seal.

3. Wrap plastic foil round the splined joint on the quick–shift gear shaft and press on the cover with seals. Tighten the bolts to **23 Nm**.

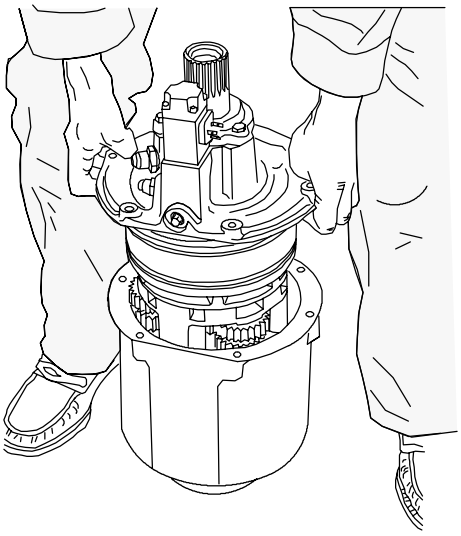
4. Assemble the tractor frame between the gearbox and fuel tank (**see instr. 441 2 B**).

B. Changing input shaft/disc assembly

Note! The quick–shift gear has been detached from the tractor (**see instr. 441 1 A and B**).

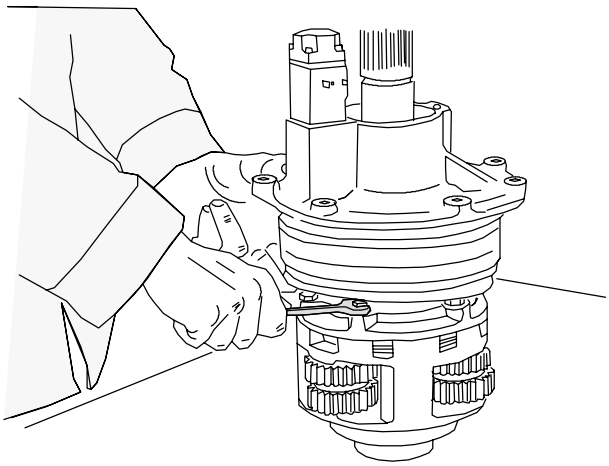
1. Remove the seal cover.

2. Unscrew the quick–shift gear cover bolts. It lifts about 5 mm out of the housing under pressure from the cup springs.



3. Lift off the cover so that the input shaft complete with epicyclic gear and multi–disc clutch comes out with it.

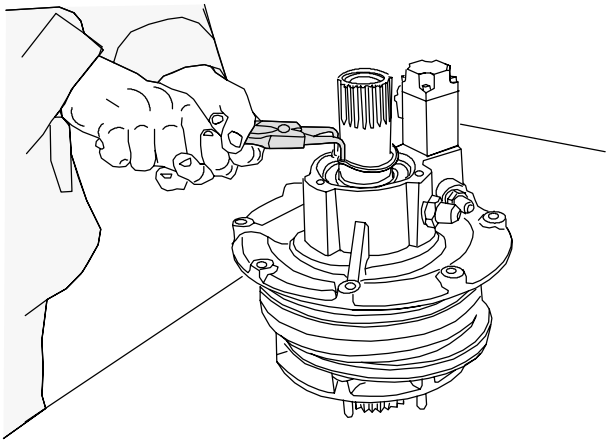
Note! If the planet carrier does not loosen, turn the cover slightly so that the planet pinions enter the grooves in the walls of the housing.



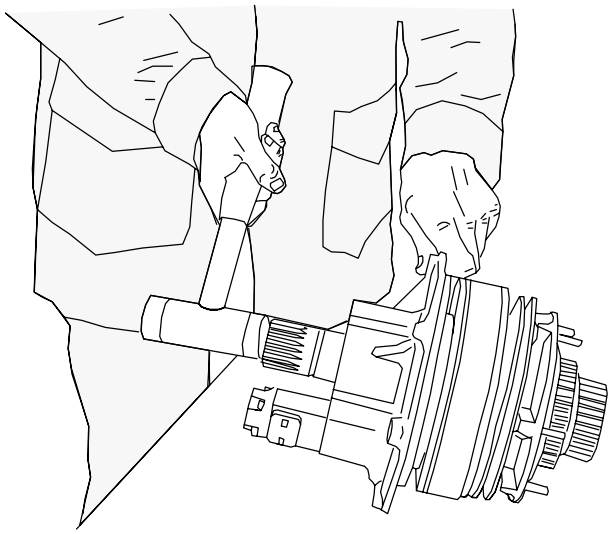
4. Place the quick–shift gear on end so that the cover comes upwards. Separate the planet carrier and lift off the upper part.

5. Remove the discs.

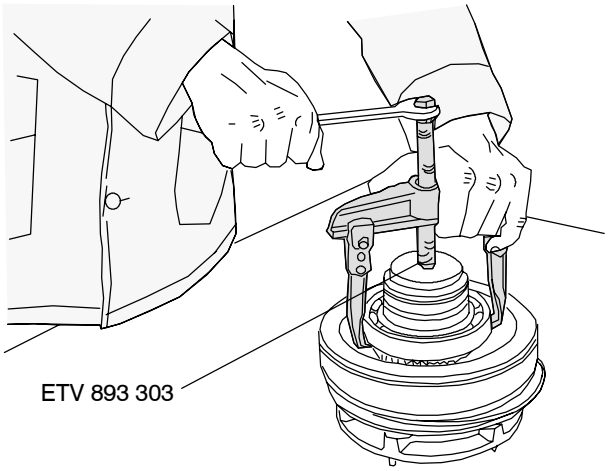
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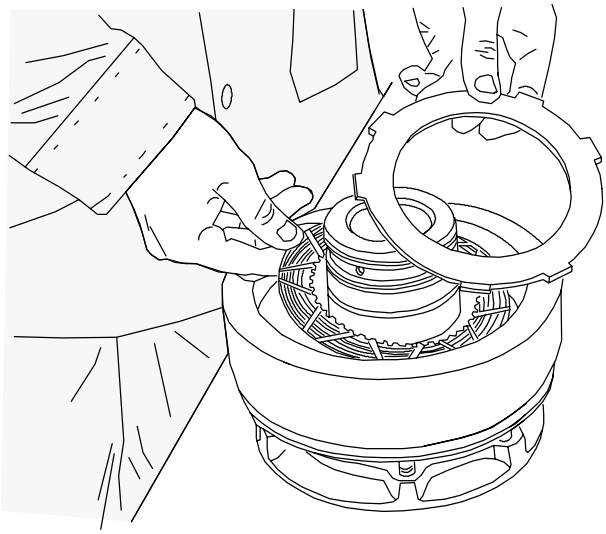
6. Remove the circlip for the front bearing. Take care not to damage the sealing surface on the shaft.



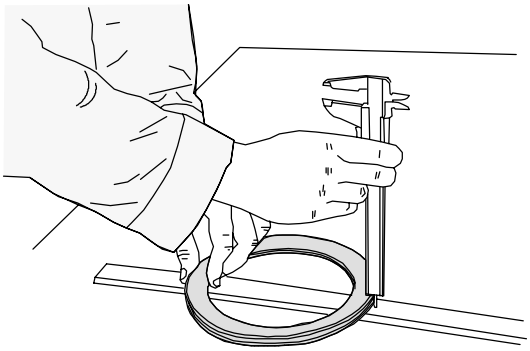
7. Knock the end of the shaft with a recoilless hammer so that the shaft comes out of the cover together with piston and front part of the planet carrier.



8. Remove the piston ring type seals and circlip which are fitted in front of the ball bearing. Pull off the bearing (Kukko 20–10).

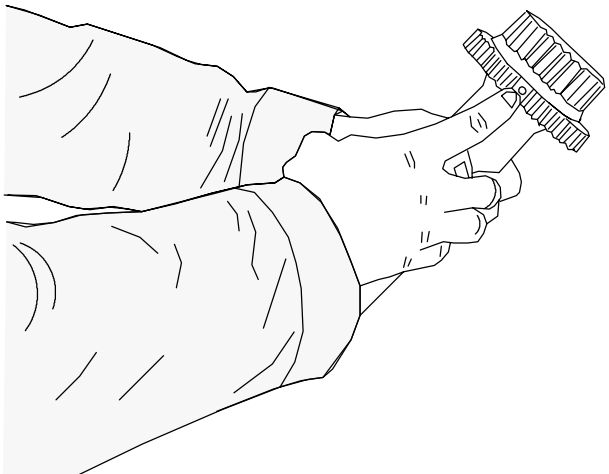


9. Remove the discs and pressure plates. Take out the piston.



10. Check the convexity of the cup springs. The measurement should be **13,7–14,3 mm.** If the springs are outside these limits they must be changed.

11. The discs must be changed when the oil deflector grooves on the surface are worn down. The wear can be assessed by looking at the oil deflector grooves on the side of the planet carrier. If no grooves are visible it can be assumed that the discs are worn out and should be changed.

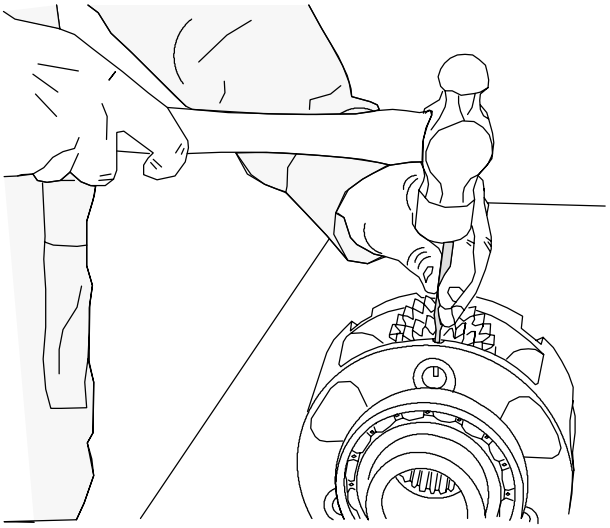


12. When changing the disc hub on the input shaft, check that the hole in the ring gear comes in line with the hole in the shaft. The hub is fitted on the shaft with the chamfered surface facing the gear wheel.

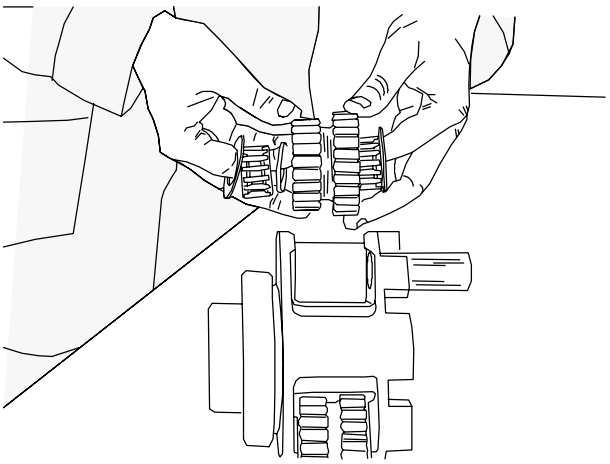
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C. Changing needle bearings in planet pinions and planet carrier

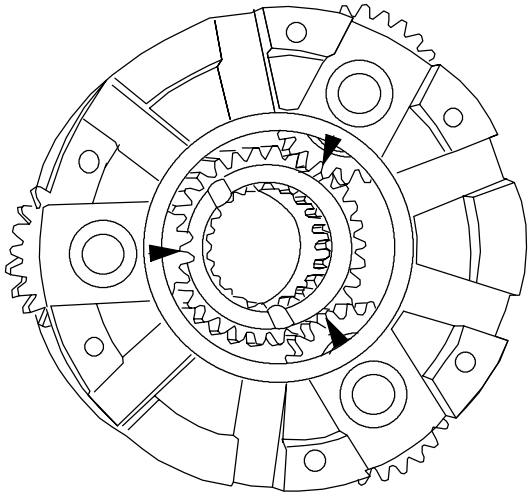
Note! In this instruction, the planet carrier has been detached (**see previous instr. B points 1–5**).



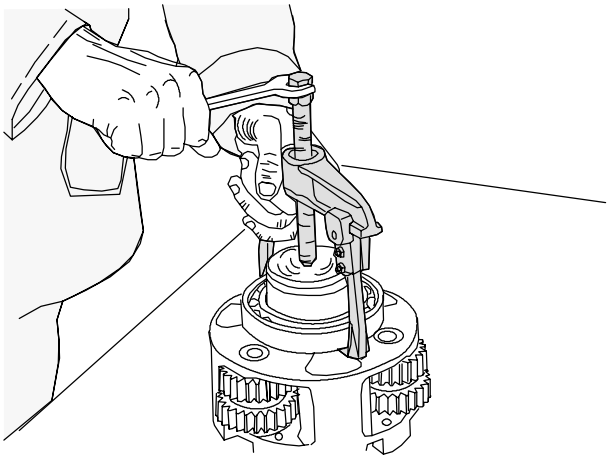
1. Knock in the locating pin for the planet pinion shafts. Push out the shaft and take off the pinion and spacer ring.



2. Oil the new bearings before fitting. Fit the bearing and spacer ring in each planet pinion.



3. Check when fitting that the arrows on the planet pinions point towards the centre of the sun wheel. Push the shaft in the pinion and fix it with a locating pin. Fix the pin with a centre punch pop.



3. Pull off the rear bearing of the planet carrier (Kukko 20–100.

4. Fit a new bearing (ET 893 420).

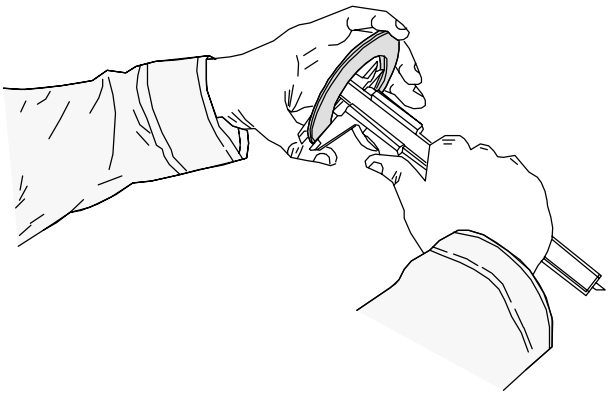
Note! If the bearing in the end plate is to be changed, this is most easily done by pressing it out from inside. The new bearing is only fitted after the shaft has been fitted in the quick–shift gear.

5. Assemble the quick–shift gear (**see next instr. D**) and fit the quick–shift gear (**see instr. 441 2 A and B**).

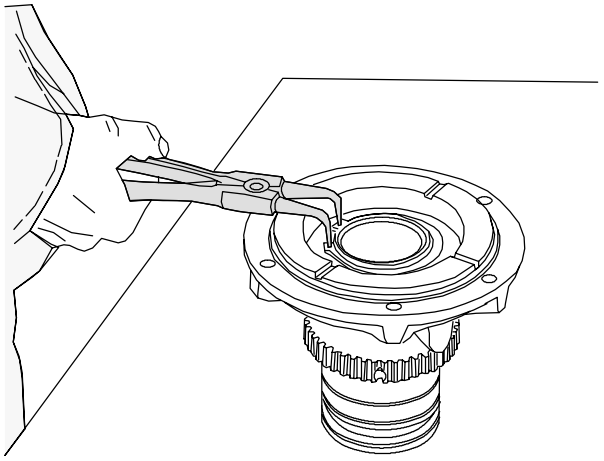
https://truckmanualshub.com/

D. Fitting input shaft and disc assembly

Note! Before fitting check the piston seal rings and change them if necessary..



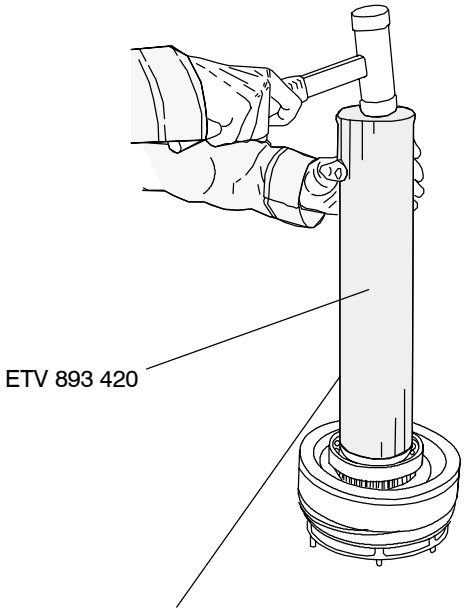
1. Fit the lock–up piston. Check the convexity of the cup springs, which should be **6,90–7,02 mm**



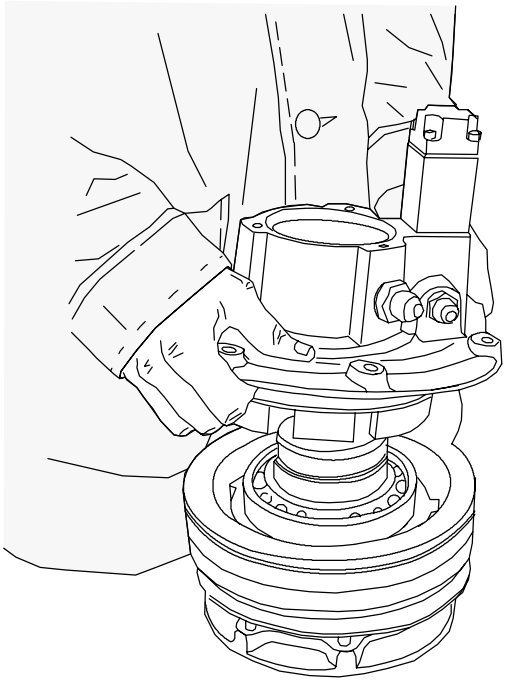
2. Fit the cup springs so that the outer peripheries come in line with each other. Lock the springs with the circlip.

3. Turn the planet carrier so that the newly fitted lock–up piston comes downwards and place the six bolts in their holes in the flange. Fit the two cup springs so that their inner peripheries come in line with each other. Fit the piston.

4. Fit the pressure plates and discs..

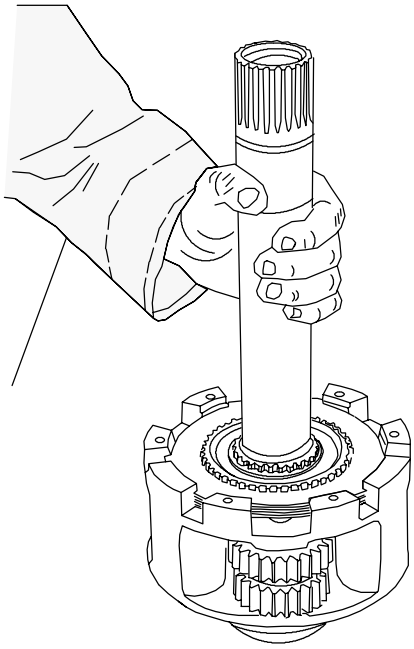


5. Drive on the front ball bearing with ET 893420. Lock the bearing with the circlip. Fit the piston rings.



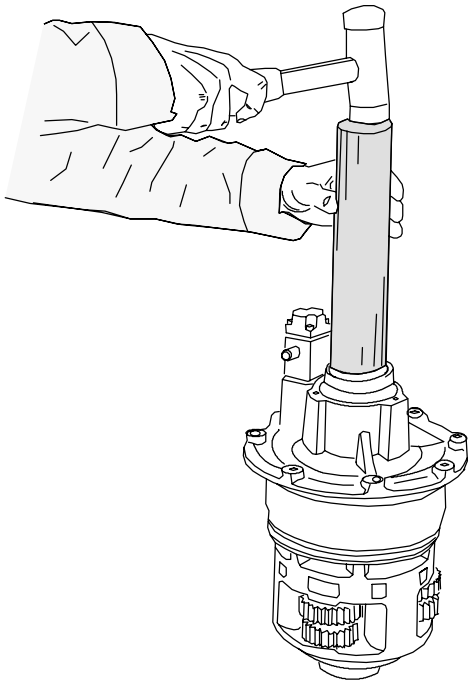
6. Guide the external teeth on the pressure plates and steel disc so that they come in line with each other. Fit the end plate and press on. Check that the teeth engage with the gaps in the end plate.

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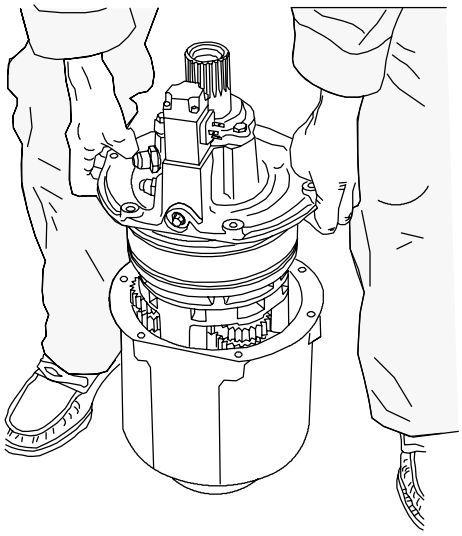
7. Place the lock–up discs on the planet carrier. Fit the input shaft together with the disc hub. Check that the hub on the shaft engages with the splined joint on the discs.

8. Lift the cover complete with front part of the planet carrier in place on the input shaft/planet carrier. Tighten the bolts to **23 Nm.**



9. Fit the circlip behind the bearing on the input shaft. Drive in the bearing with ET 893 362. Fit the circlip in front of the bearing..

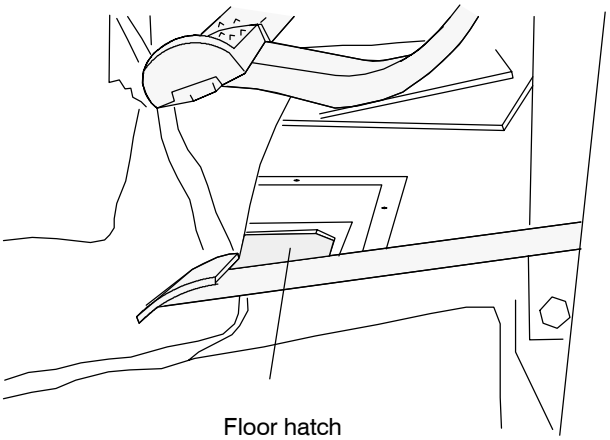
10. Fit the new shaft seal. Wrap plastic foil over the splines on the shaft, oil the seal and fit the seal retainer. Tighten the bolts to **23 Nm**.



11. Lift the gear into the housing. Make sure that the cup springs come fully home (distance between the cover and housing contact surfaces should be 5 mm when the gear rests on the cup springs). If this distance is greater, check the position of the cup springs. Screw the cover bolts to **23 Nm**. Do not use force.

12. Attach the quick–shift gear to the reverse shuttle (**see instr. 441 2A**) and assemble the tractor frame (**see instr. 441 2 B or 423 5A**).

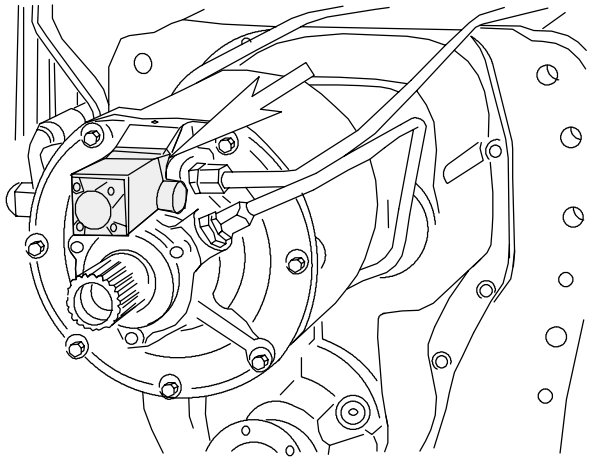
E. Changing quick–shift gear solenoid valve



Floor hatch

1. Remove the floor mat and the cover plates on the floor opening.

2. Detach the connector from the solenoid valve.



3. Unscrew the solenoid fixing screws and fit a new solenoid.

Note! Do not tighten the solenoid screws too hard. Correct torque is **2,5–3,5 Nm**.

4. Connect the connector to the solenoid. Check the function of the quick–shift gear solenoid.

5. Fit the floor hatch and the floor mat.

Reconditioning reverse shuttle (Op. no. 442).

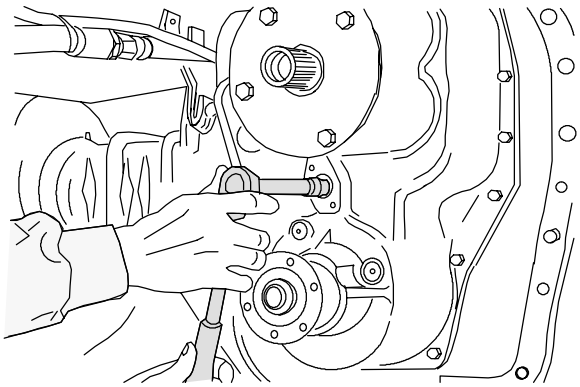
Note! In the instruction below a tractor is used which has no quick–shift gear. On these models, the reverse shuttle has a flange which is shown in the figures. In addition, on E–models there are two speed sensors on the front face of the reverse shuttle housing. Also impulse discs are only on reverse shuttle units which are fitted on E–models. Casting of the reverse shuttle housing is a little different on tractors with Delta Powershift.

A. Removing reverse shuttle

1. Split the tractor frame between the gearbox and fuel tank (see instr. **441 1 A** or instr. **423 1A**).

2. Detach the quick–shift gear, if fitted: 2–step quick–shift gear, see instr. **441 1B**. 3–step quick–shift gear, see instr. **444 1A** points **1–4**.

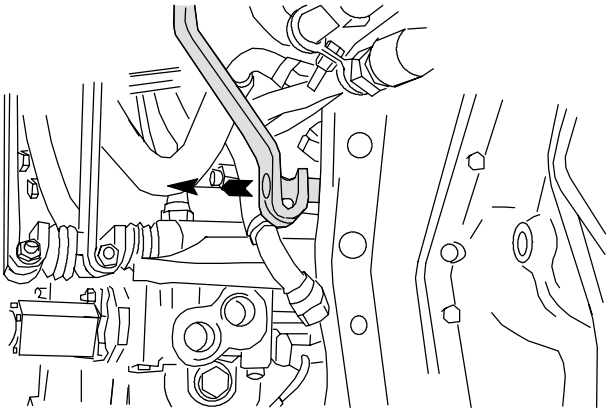
1. Disconnect the oil pipes from the reverse shuttle.



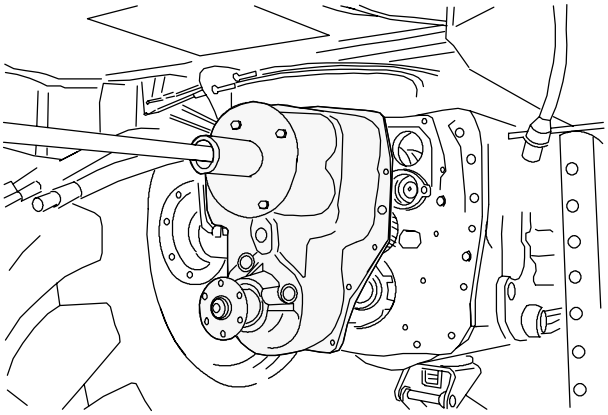
2. **2–step quick–shift gear**: Detach the oil distributor piece from the front side of the housing and unscrew the bolt behind the piece (otherwise the bolt prevents detaching of the housing)

Important! If the tractor has Delta Powershift, the oil distributor piece is fitted inside the reverse shuttle housing and it is unnecessary to remove it.

3. **On AC IV models:** Remove the gearbox speed sensor on the RH side of the reverse shuttle housing.



3. Pull out the reverse shuttle selector lever (on the RH side of the gearbox) until the lever inner end releases from the selector fork rail groove.

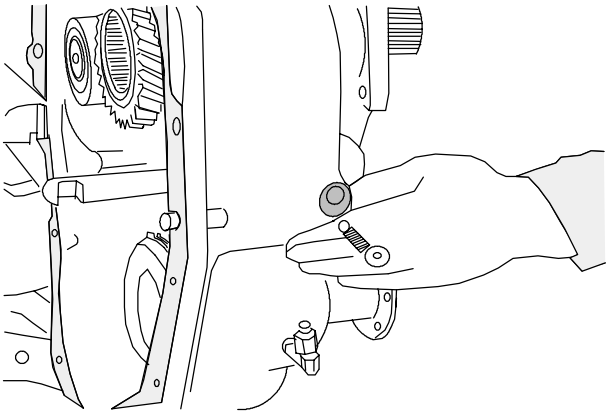


4. Support the reverse shuttle with a suitable lifting device and unscrew the reverse shuttle fixing bolts. Pull the housing straight out.

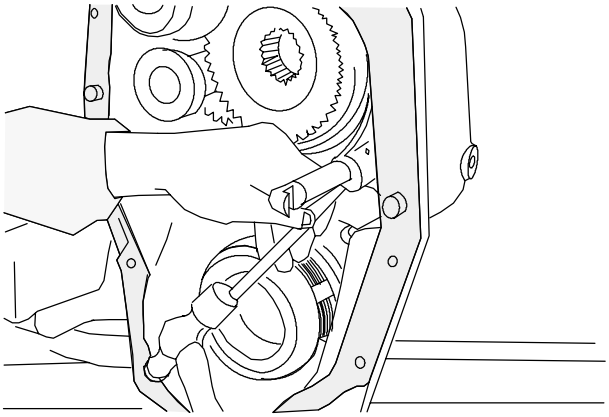
Note! Easiest way to remove the reverse shuttle is to use a lifting device which has a support bar that can be pushed through the reverse shuttle input shaft as in figure above.

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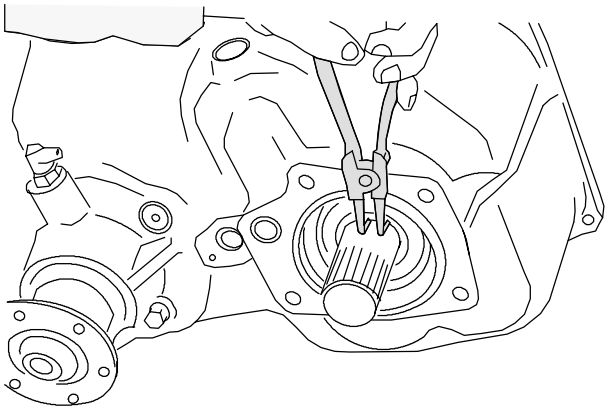
B. Changing synchromesh unit/reverse shuttle bearings



1. Unscrew the plug for the selector fork rail locking ball and spring and remove the spring and ball.

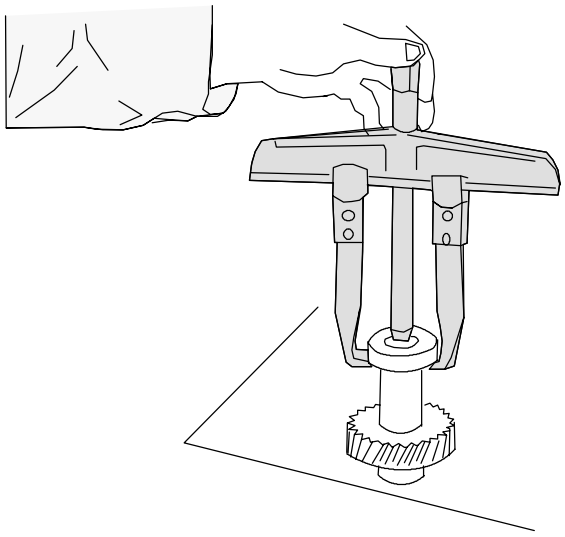


3. Tap out the selector fork locking pin. Pull out the selector fork rail (selector fork remains in place).



4. Remove the smaller circlip at the input shaft front end.

5. Knock at the input shaft front end and remove all three shafts from the housing. Remove also the selector fork sliding pieces.



6. Change, if necessary, the layshaft and reversing shaft ball bearings.

7. If you change the reversing shaft roller bearing, its inner race can be removed from the shaft by warming it up.

8. Check the condition of the synchromesh unit and change worn parts.

Note! The synchromesh unit is assembled as follows:

– place the sliding coupler on a flat surface.
– fit springs and shoes onto the hub, press them inwards and place the hub into the sliding coupler, so deep that the parts are held in place.
– Fit separately three balls on the springs. Press the ball inwards and push the parts inside the sliding coupler so that the ball is held in place.
–when all balls are in place, finally push the hub into the sliding coupler.

Note! Measure the synchronizing ring wear by putting the ring onto the tapered part of the coupling gear. Then measure, how deep the ring is pressed. Clearance between the ring and the gear on the new synchromesh unit is **1,65–2,20 mm**. Min. allowable clearance **is 1 mm.**

9. Remove the circlip of the input shaft front ball bearing and remove the bearing.

Note! Fit a new bearing after the reverse shuttle housing has been attached to the gearbox.

Note! The reverse shuttle shafts can be fitted back into the housing, but the reverse shuttle is easier to fit if the shafts are fitted first onto the gearbox front side and after that the housing.

10. If you change the input shaft roller bearing, the inner race can be removed from the shaft by warming it up. Fit a new bearing fully home into its location on the housing .

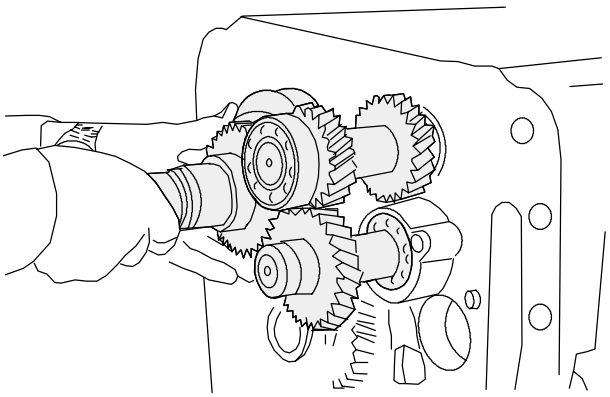
Note! On the latest reverse shuttles, there is a loose metal ring between the input shaft bearings, see picture on page **440**/**18** point 8. See also picture on page **440**/**19**.

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C. Fitting the reverse shuttle

1. Fasten the thrust bearing with universal grease to its place on the gearbox input shaft front bearing cover. In connection with the 2–step quick–shift gear, fasten the impulse disc (on E–models only) and its support tube into the reverse shuttle housing (o–ring fix the impulse disc but universal grease can be used if necessary).

Note! Before fitting the reverse shuttle, ensure that the gearbox layshaft front end cover has been fitted in the correct way (otherwise it prevents the reverse shuttle layshaft from entering fully home).



2. Fit the reverse shuttle shafts and the synchromesh unit onto the gearbox front side (see figure above).

3. Place the selector fork together with sliding pieces (sliding pieces can be fixed with universal grease on the fork during mounting) onto the sliding coupler and guide the selector fork rail through the hole on the gearbox front face. Fasten the fork to the rail with a locking pin. With effect from tractor ser. no. **661937** the selector fork and the sliding pieces have been modified. Fit the latest parts onto the reverse shuttle despite the condition of the earlier part. See also page **421/2**.

Note! Fit the reverse shuttle input shaft roller bearing into its location on the housing. The foremost ball bearing is fitted after the housing is in place against the gearbox front side.

4. Make sure that the 4WD output shaft nut has been fully tightened and then unscrewed **one turn** (2–step quick–shift gear) or **one and a half turn** (Delta Powershift) . Check that the lugs on the 4WD multi–disc clutch pack are accurately in line with each other.

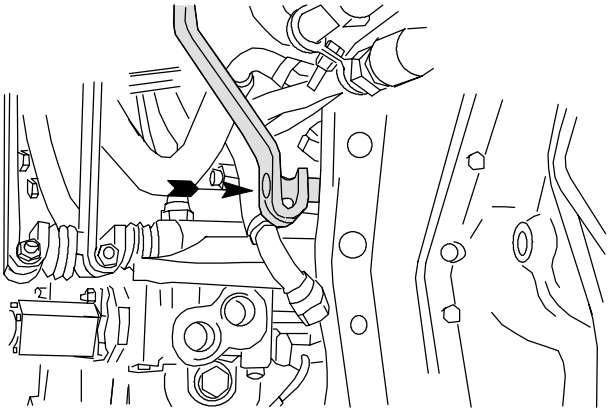
5. Apply sealing compound to the contact surface between the gearbox and the reverse shuttle housing.

6. Push the housing into place and turn the 4WD clutch so that the lugs on the discs engage with the grooves on the clutch drum.

6. Push the housing against the gearbox front side and screw four guide pins (M8, l= 100 mm) into the holes for housing bolts.

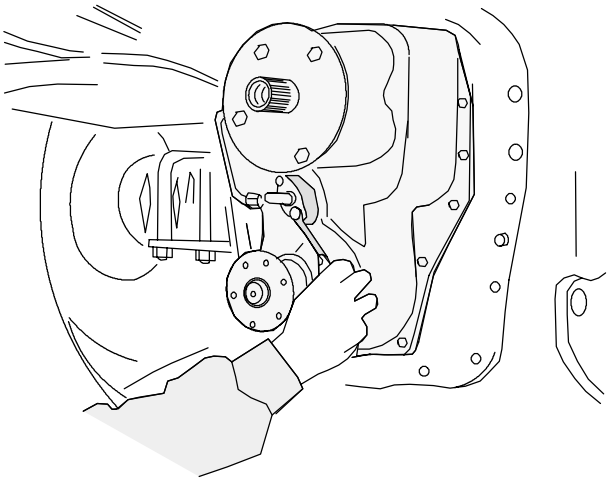
7. Push the housing fully home (tap carefully with a copper bar, but do not use too much force). Remove the guide pins and tighten the reverse shuttle fixing bolts to **23 Nm**.

Note! Ensure that the impulse disc is correctly in place (E–models).



8. Fit the selector fork rail locking ball, spring and the plug. Push the selector lever inwards and check that it has engaged with the groove on the rail rear end.

9. Fit the input shaft ball bearing and its circlip. Fit the smaller circlip onto the shaft.



10. **Tractors with 2–step quick–shift gear or without quick–shift gear**: Screw the long bolt into place under the lubricating oil distributor piece and fit the distributor piece.

11. Connect the external pipes.

12. Attach the quick–shift gear to the reverse shuttle: 2–step quick–shift gear, see instr. **441 2 A**. 3–step quick–shift gear, see instr. **444 1A** points **19–26**.

13. Assemble the tractor frame (see instr. **441 2 B** or **423 5A**).

Note! On **AC IV** models, fit the gearbox speed sensor B2C onto the RH side of the shuttle housing, see page 351/3.

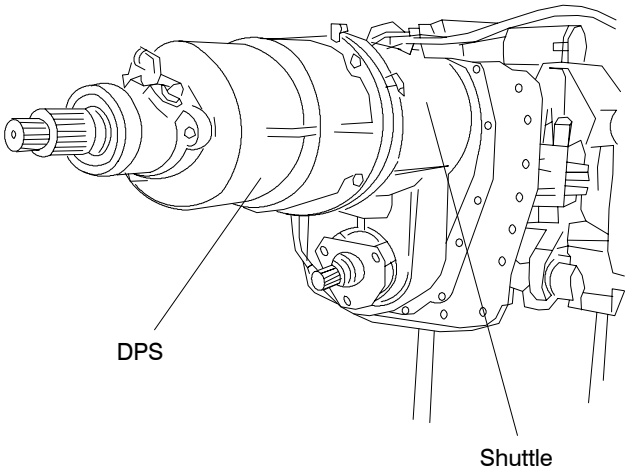
https://truckmanualshub.com/

2. HiTech shuttle

A. Removing shuttle

1. Split the tractor frame between the gearbox and the fuel tank according to instr. **423 1A** (the rear part of the frame is pushed rearwards and cab is attached to the front frame).

2. Disconnect oil pipes from the DPS housing and the Shuttle front flange. Disconnet other parts, which prevent removing.

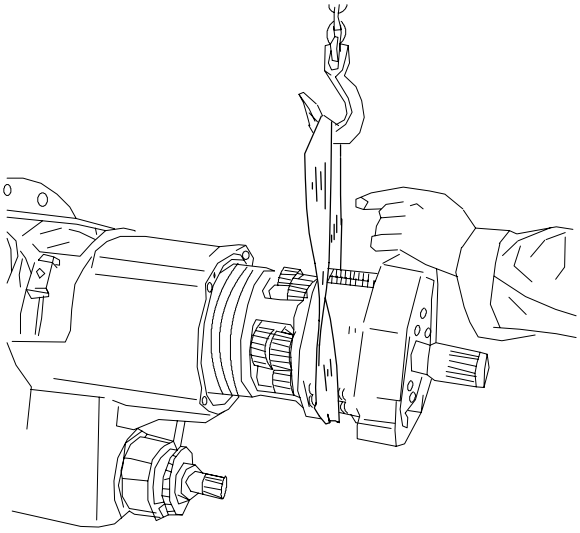


3. Unscrew the four DPS housing fixing bolts and pull out the housing. Take care of the housing large o–ring.

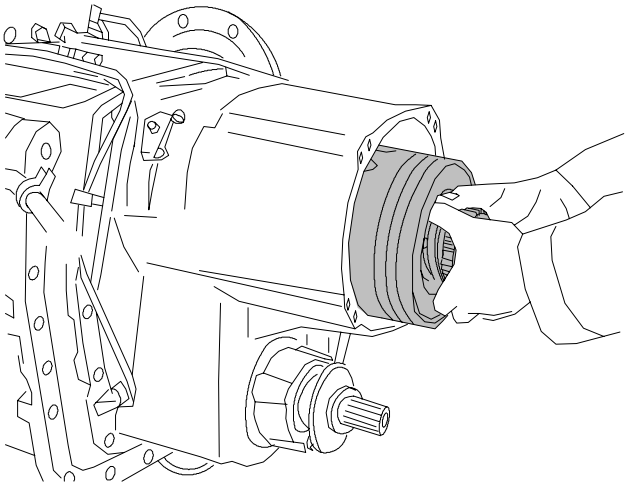
Note! The planetary carrier+rearmost clutch of the DPS remain on the Shuttle front face. Remove them now or just when the Shuttle has been removed.

Note! If the reparation work concerns only the frorward clutch of the shuttle, it is unnecessary to remove the DPS parts on the shuttle front face.

4. Unscrew two shuttle fixing bolts (M8, socket head). Bolts are placed in the recesses.



5. Wind a lifting rope round the shuttle flange, hold the shuttle in the horizontal position and pull it straight out of the housing along the shaft. Take care of the flange large o–ring.



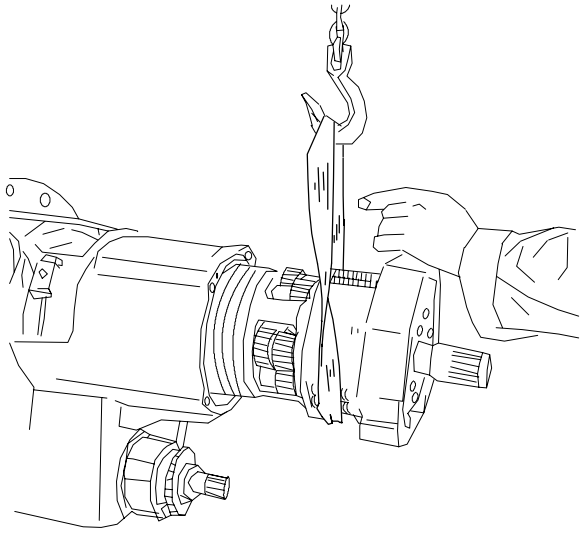
6. Take the shuttle rearmost clutch (F direction) out of the housing (it remains on the front end of the gearbox input shaft).

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B. Fitting shuttle

Note! Before fitting the shuttle the DPS planetary carrier+rearmost clutch can be fastened onto the shuttle, or they can be fastened after the shuttle has been placed in the shuttle housing.

1. Fit the shuttle large o–ring into its groove. It can be fastened temporarily with a little gearse. Fit the pump/PTO drive shaft.



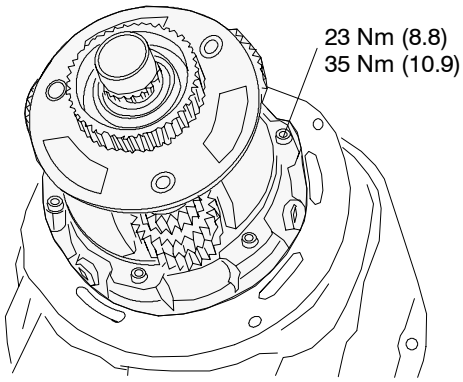
2. Wind a lifting rope round the shuttle flange. Position the shuttle horizontal on the shaft and push it straight into the housing so that the rearmost sun gear shaft is guided onto the gearbox input shaft.

Note! Blow, if needed, compressed air through the pressure pipe union into the shuttle foremost clutch so that the planetary carrier is locked and the rearmost sun gear shaft can be rotated with the shuttle input shaft, at which time the splines connect with the gearbox input shaft splines.

3. The final stage of the mounting must be done carefully so that the metallic sealing rings in the rear end of the shuttle are guided into the oil flange. Fit is accurate.

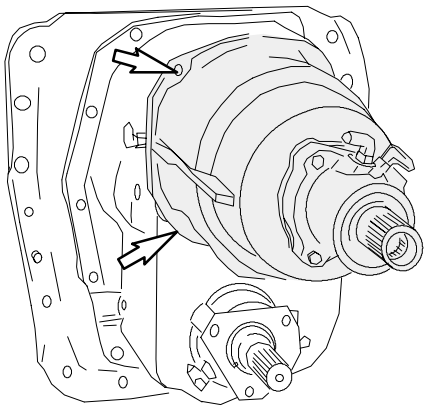
4. When the shuttle is in place, fasten it to the housing with two bolts (M8, socket head). Tightening torque is **23 Nm**.

5. Check, that the shuttle input shaft has an axial play of **0,2–0,6**.



6. Fit the DPS ball bearing into the shuttle front face and fit the small spiral springs into the holes on the piston of the DPS rearmost clutch . Fasten the DPS planetary carrier+clutch pack onto the front face of the shuttle. Use locking fluid Loctite 243 on the bolt threads.

Note! Tightening order of the planetary carrier fixing bolts, see page **440**/**15**.



7. Place the DPS housing large o–ring into its groove. Fit the DPS housing. Tighten the bolts to **23 Nm**.

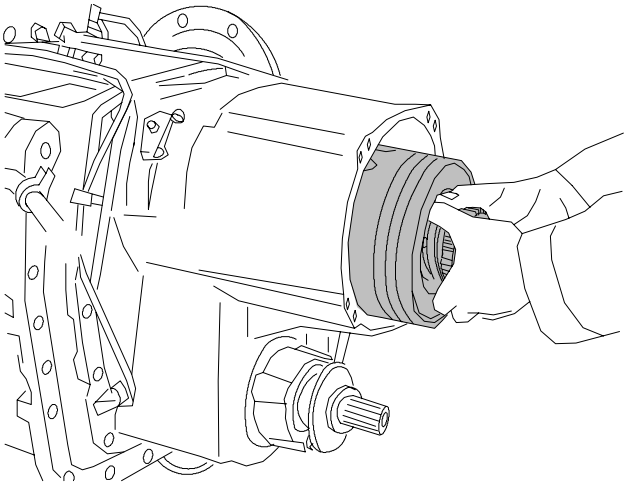
Note! Before fitting the DPS housing, push the foremost and middle sun gear shafts of the DPS into the clutch drum in the DPS housing. Concerning detailed instructions, see page **444**/**3**.

8. Reconnect all oil pipes to the shuttle and the DPS housing. Refit other removed parts.

9. Assemble the tractor frame according to instr. **423 5A** on page 423/17. Check the function of the shuttle and DPS. Check for leaks.

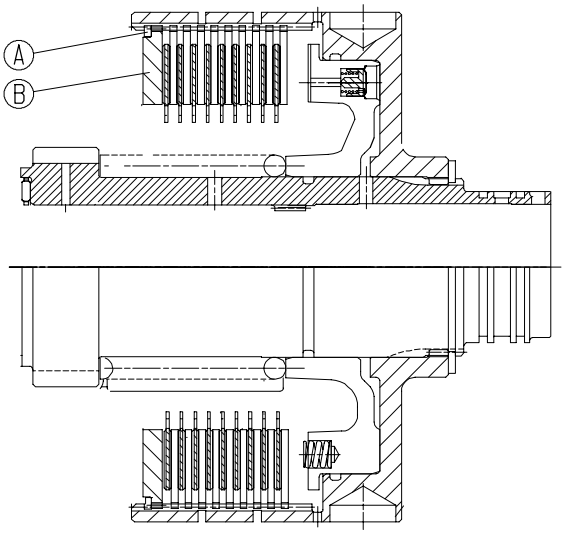
C. Reconditioning clutch for forward driving (rearmost clutch)

1. Split the tractor frame and remove the shuttle according to instr. **A**.



2. Take the rearmost clutch out of the housing.

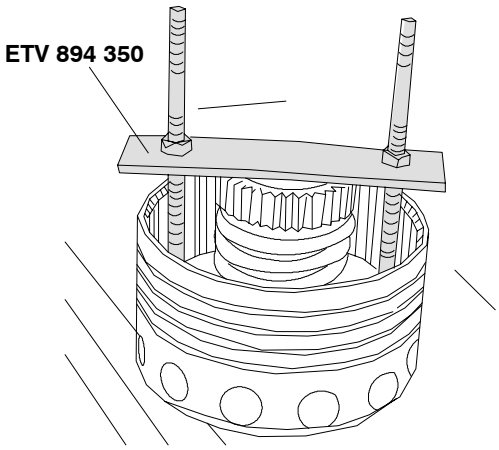
3. Take care of the thrust bearing between the sun gears.



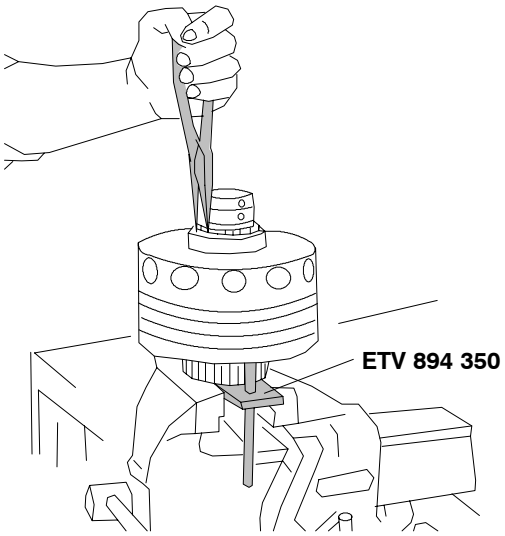
4. Compress the clutch disc pack and release the snap ring A and remove the support ring B.

5. Take the friction and steel discs and the spring rings out of the drum. Remove the small spiral springs in the piston housing.

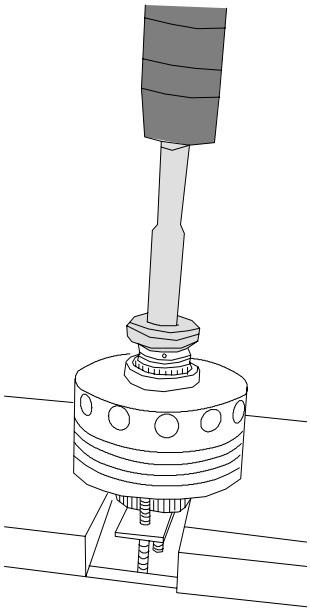
Note! Dip the friction discs in oil before fitting and keep them in oil for a while. Change all small coil springs of the piston in connection with reparations.



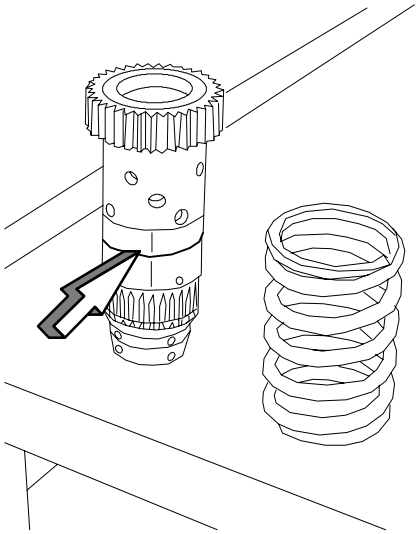
6. If you change the piston seals or the large spiral spring, screw ETV 894 350 into the threaded holes in the piston. Tighten the nuts of the ETV at which time the spring is shrunk (and the piston is pulled out of its location).



7. Remove the clutch drum snap ring.

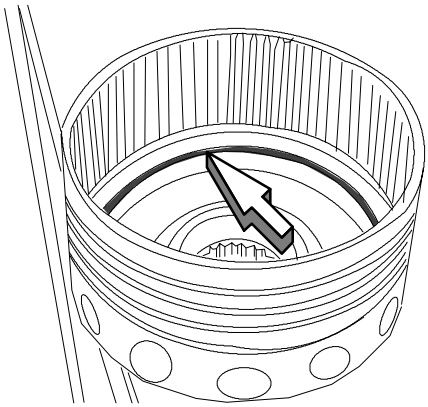


8. Remove the drum (press fit) by pressing it carefully with a hydraulic press.



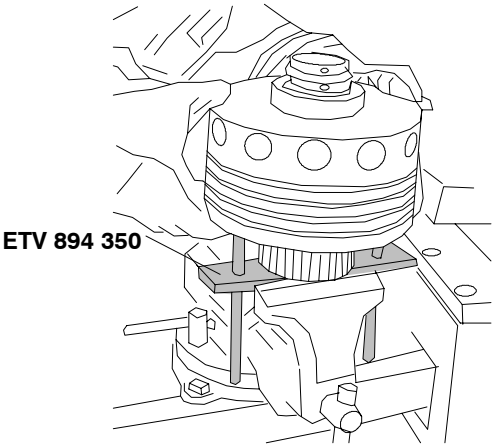
9. Unscrew ETV 894 350, at which time the piston loosens. Check/change the piston small o–ring round the sun gear shaft (arrow) and lubricate the o–ring with oil or grease.

10. Check that the large spring is OK. Ensure, that its length is within permissible dimensions.



11. Change, if necessary, the piston large o–ring (arrow) and lubricate it with oil or grease.

Note! Check the function of the emptying valve. If the valve is disassembled, the valve circlip damages.



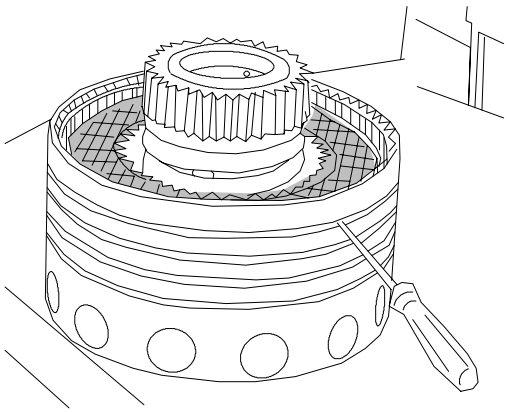
12. Place the large spring onto the sun gear shaft. Fit the piston and fasten ETV 894 350 and tighten it until the spring shrinks. Warm the drum a little (+80˚C) and press it into place and fit the snap ring of the drum.

13. Remove ETV 894 350.

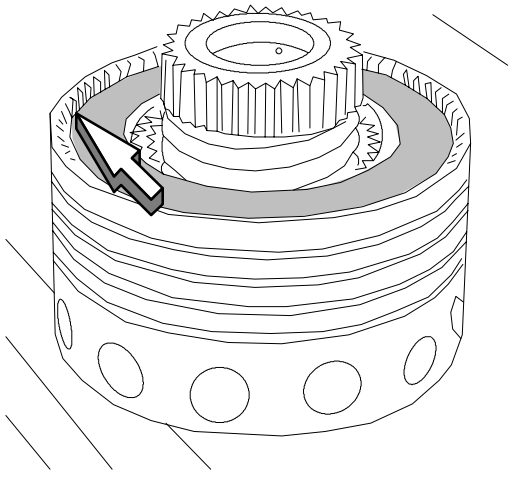
14. Position the small spiral springs into the borings in the piston.

Note! Change all small coil springs in connection with repair work. Dip all friction discs in oil a little while before fitting.

15. Fit by turns new friction and steel discs and the spring rings. A steel disc first against the piston springs and uppermost a friction disc (9 pcs steel discs and 9 pcs friction discs and 9 pcs spring rings). The spring rings are placed onto the outer circumference of the friction discs.

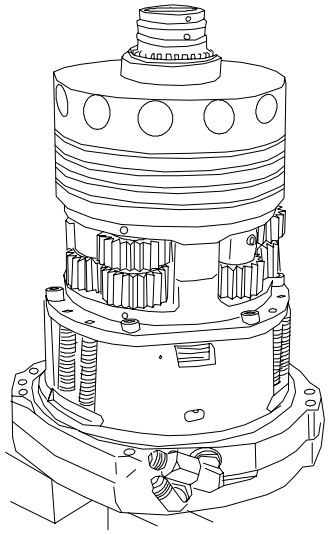


Note! Before fitting the two last friction discs and a steel disc, push for instance small screw drivers through holes on the side of the drum. Compress the disc pack and push the screw drivers so that they hold the discs pack compressed. Fit then the last three discs.



16. Place the support ring on the disc pack, press down the disc pack and fit the snap ring (arrow). Remove the screw drivers.

17. Check/change the metallic seal rings in the rear end of the sun gear shaft. Ensure, that the ring ends are locked together.



18. Place the F–direction clutch drum on the planetary carrier so that the sun gear is guided between the planetary gears.

Note! Ensure, that there is a thrust bearing between the sun gears.

19. Fit the shuttle into its housing and assemble the tractor according to instr. **B**.

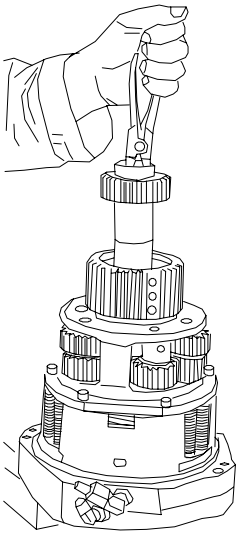
D. Reconditionig reverse drive clutch

(foremost clutch)

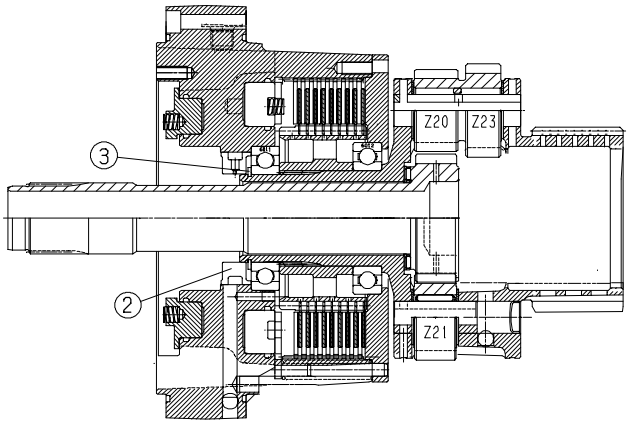
Disassembling:

1. Split the tractor frame and remove the shuttle according to instr. **A**.

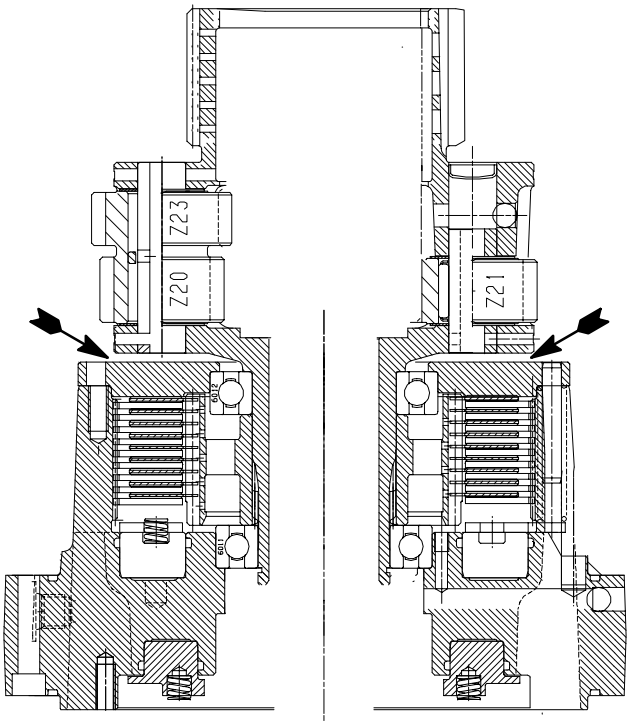
2. Remove the DPS planetary carrier+clutch pack on the front face of the shuttle. Take away small spiral springs in the borings of the DPS rearmost clutch piston.



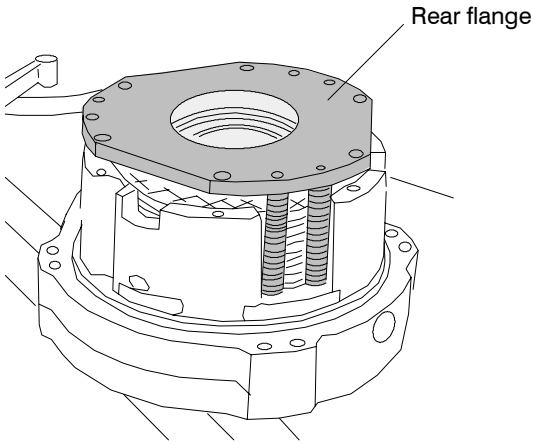
3. Remove the shuttle input shaft (foremost sun gear shaft). Take care of the shaft thrust bearing.



4. Remove the DPS planetary carrier rearmost ball bearing in front of the oil ring (2) (if not released earlier). Remove the oil ring (2) and the shuttle planetary carrier snap ring (3).



5. Lever with two fitting levers (arrows) and remove the planetary carrier of the shuttle.

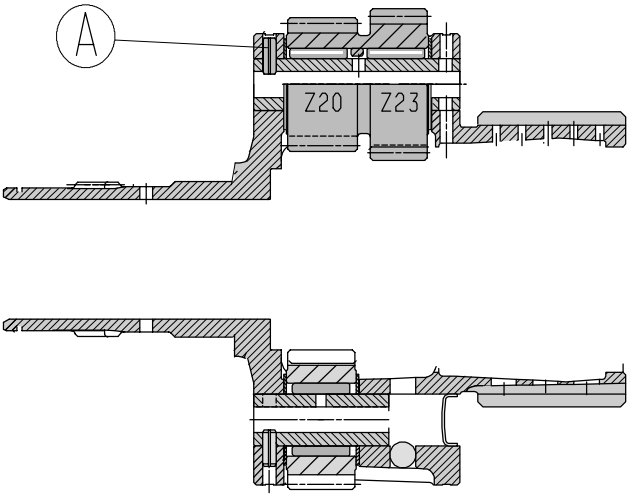


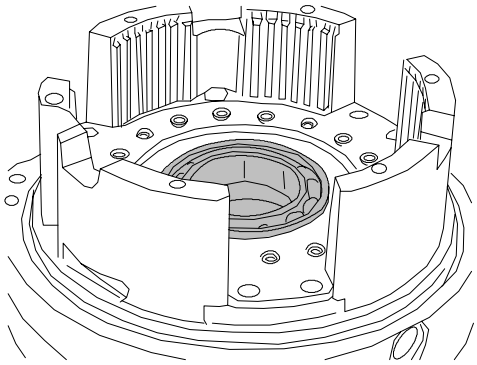
6. Unscrew the disc pack rear flange bolts after which the flange rises upwards with the aid of the springs. Remove the flange+springs+ball bearing.

7. Take the friction and steel discs and the spring rings out of the drum. Remove the disc pack hub.

8. Remove the support ring for the piston small spiral springs. Remove the springs. Remove the ball bearing.

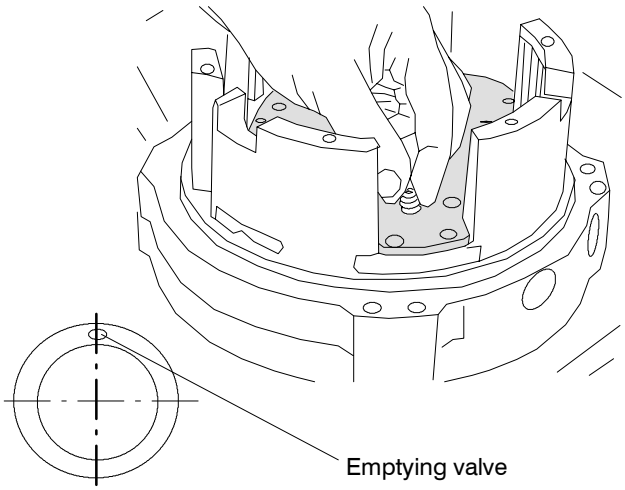
9. If you change the piston seals, the piston can be forced out by blowing carefully compressed air through the pressure pipe union.





10. The planetary gears can be detached by tapping out the tension pin (A) and by pushing the gear axles to the left in the picture above. If you must change the planetary gears, change all three gears. New gears must be the same series according to the markings (e.g. A) on the gear teeth.

Assembling



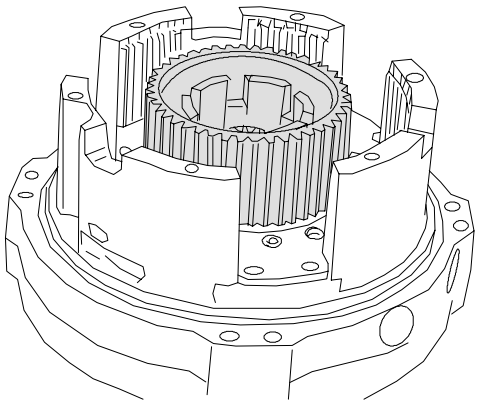
11. If you have removed the piston, push it down into its location. Place the spiral spring support plate onto the piston and fit the small spiral springs into their borings (picture).

Important! Position the piston into its location so that the emptying valve comes upwards (when the shuttle is fitted in tractor).

Note! Ensure, that a spring is not at the emptying valve (a spring can partly block a hole)**.** Change all springs in connection with repair work.

The emptying valve of the R–clutch has been removed with effect from ser. no. **K41107** (AC 5.2, HiTech 2.0)**.**

12. Fit the ball bearing (picture).

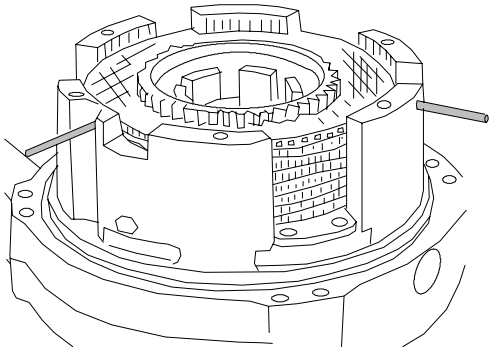


13. Fit the hub (picture). Dip the friction discs in oil a littlewhile before fitting.

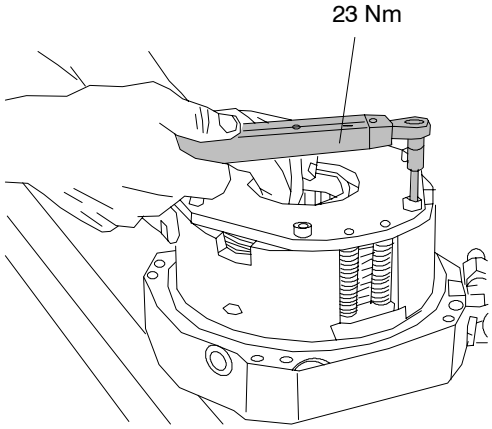
14. Fit by turns new friction and steel discs and spring rings. A steel disc first against the piston springs and uppermost a friction disc (9 pcs steel discs, 9 pcs friction discs and 9 pcs spring rings). The spring rings are placed into the outer circumference of the friction discs.

Note! The discs and the spring rings are the same as in the clutch for the forward driving and a number of the discs is also the same.

Note! Dip all friction discs in oil before fitting.

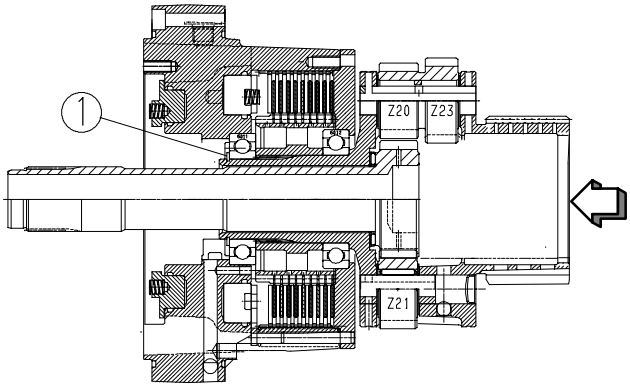


15. Before fitting the last steel disc, compress the disc pack and push ø 3 mm pins (e.g. drills) through the holes on the sides of the drum so that they hold the disc pack compressed.

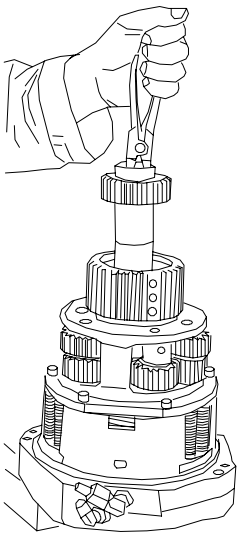


16. Fit the last discs and the spring rings. Place the rear flange together with the spiral springs and the ball bearing on the disc pack. Screw down the flange a little with two auxiliary bolts (M8x35) until the flange shoulder is a little below the edge of the drum. Remove the ø 3 pins and tighten the flange bolts (M8x25) to a torque of **23 Nm**.

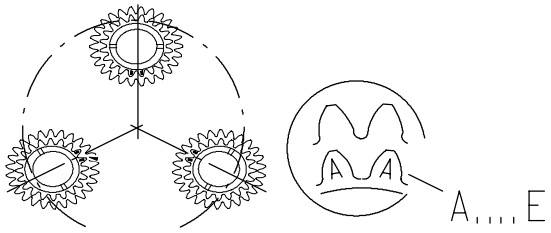
Note! When necessary, blow compressed air through the pressure pipe union into the clutch and check that the clutch is functioning correct. If everything is OK, the piston moves and presses the discs against the rear flange.

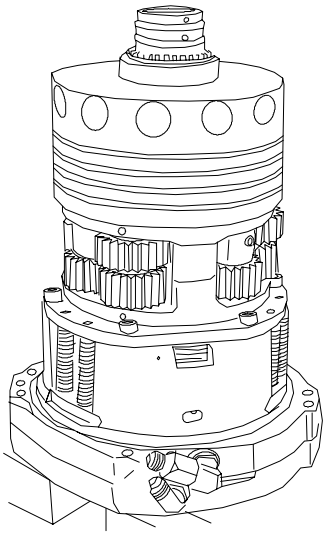


17. Press the planetary carrier into place and fit the snap ring (1). Fit the oil sleeve and the DPS ball bearing.



18. Turn the planet gears so that the markings on the teeth (e.g. A) point towards the centre of the sun gears. Fit then the shuttle input shaft together with its thrust bearing.





19. Place the rearmost clutch drum (F direction) on the planetary carrier so that the friction disc teeth engage with the splines on the hub. Ensure, that there is a thrust bearing between the sun gears.

20. Fit the shuttle into the housing and reassemble the tractor according to instr. **B**.

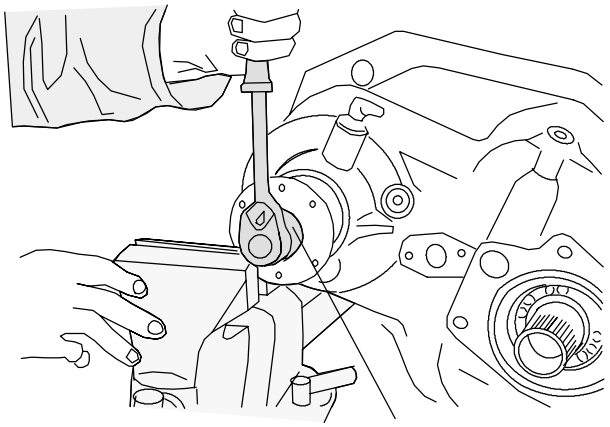
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Reconditioning 4WD clutch (Op. no. 443)

Note! In figures below an impulse disc can be seen which is only on E–models. Concerning tractors which have Delta Powershift, see page **443/3**.

A. Changing 4WD clutch discs/seals on tractors which have 2–step quick–shift gear

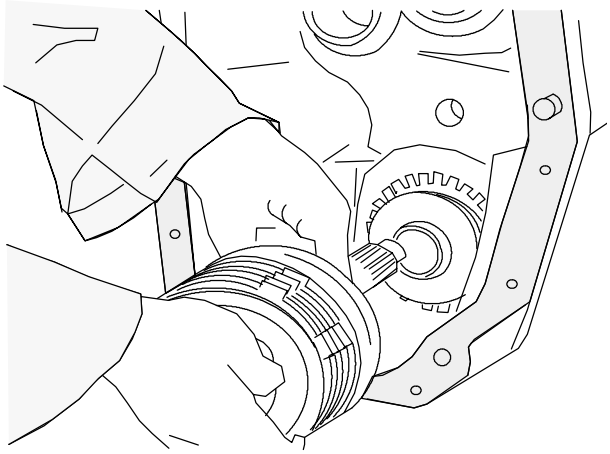
– Split the tractor between the gearbox–fuel tank (**see instr. 441 1 A** or **instr. 423 1A)**.
– remove the quick–shift gear (**see instr. 441 1 B**)
– remove the reverse shuttle (**see instr. 442 A**)



ETV 893 260

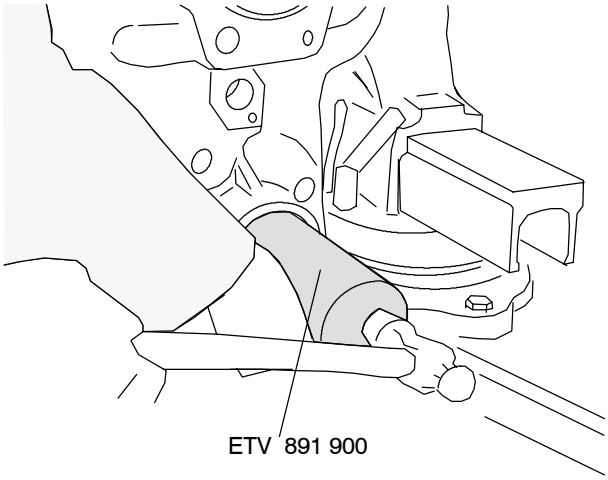
1. Fasten the 4WD output shaft flange to the vice. Unscrew the shaft nut with socket spanner ETV 893 260.

Note! It is hard to open the nut because the cup springs press the nut.



2. Remove the spacer ring, drive flange and o–ring. Tap at the shaft front end until it releases.

3. Remove the shaft front ball bearing from its location (remove first the oil seal, spacer ring and the circlip).



ETV 891 900

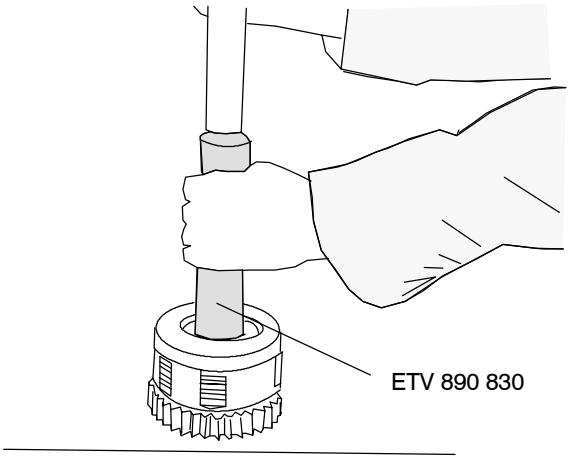
4. Fit a new bearing, circlip, spacer ring and oil seal into their locations (sleeve ETV 891 900 can be used). Grease the seal lips.

5. Detach the clutch cylinder and piston from the shaft by knocking the shaft front end against the table.

Note! The piston is a press fit.

6. Remove the pressure plate on the disc pack. Remove the friction and steel discs and fit new discs so that the steel disc lugs are in line with each other.

Note! The clutch discs are changed as a complete set. The friction disc has worn out, if the grooves on it have disappeared.



ETV 890 830

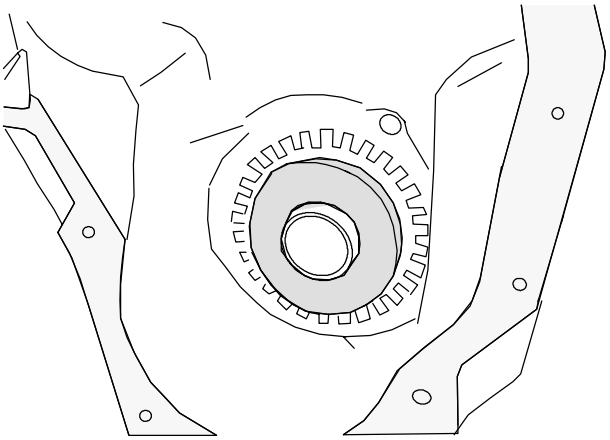
7. Fit the pressure plate onto the disc pack. Drive the piston onto the shaft with sleeve ETV 890 830.

8. Fit the cylinder onto the shaft. Before fitting it, check the piston and cylinder seals, and change them if necessary.

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9. Remove the cup springs and the impulse disc from the housing and pull out the oil sleeve.

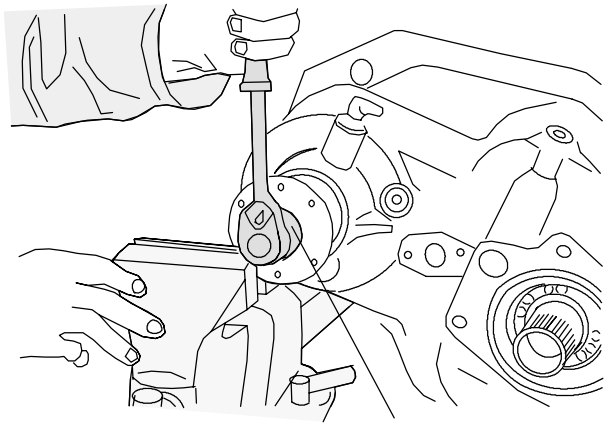
10. Check the sealing rings on the oil sleeve and change them if necessary. Then fit the sleeve and the impulse disc.



11. Fit the cup springs against the impulse disc.

Note! Fit the two foremost spring concave sides against each other and the rearmost spring concave side rearwards.

12. Knock the shaft/clutch assembly into the housing. Fit the o–ring, drive flange and the washer onto the shaft front end.



ETV 893 260

13. Tighten first the shaft nut with socket spanner ETV 893 260 fully home and umscrew the nut **one turn**. This sets the clutch clearance.

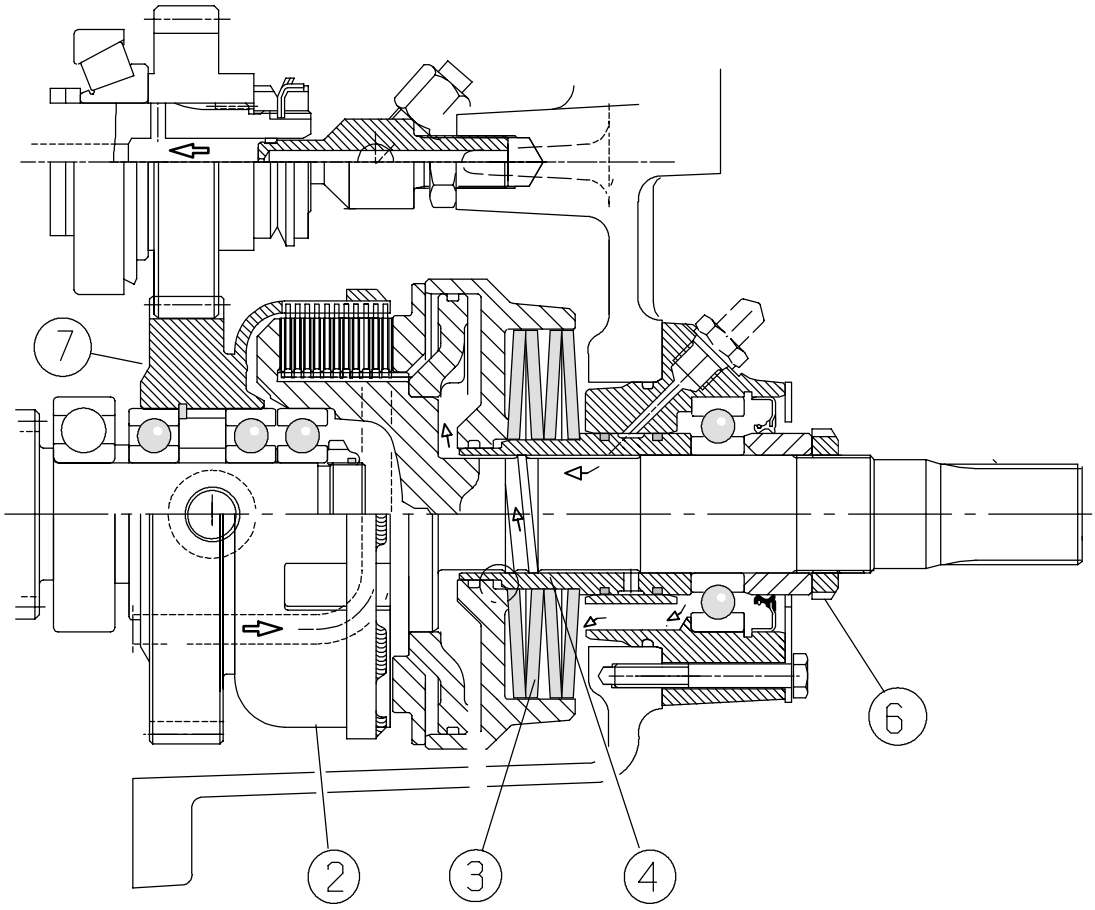
Note! Before tightening the nut, ensure that the clutch disc pack lugs are accurately in line with each other. It is useful to fit the clutch drum onto the disc pack when the nut is tightened.

– Fit the reverse shuttle (**see instr. 442 C**)
– Fit the 2–step quick–shift gear (**see instr. 441 2 A**)
– Assemble the tractor frame (**see instr. 441 2 B** or **instr. 423 5 A**)

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B. Reconditioning 4WD clutch on tractors with 3–step quick–shift gear (Delta Powershift)

Changing seals, see Op. **D** on the next page.



1. Split the tractor frame between gearbox–fuel tank, see Op. **441 1A** or **423 1A.**

2. Remove the 3–step quick–shift gear from the reverse shuttle front face, see Op. **444 1A** points **1–4**.

3. Slacken the 4WD output shaft nut (6) using spanner ETV 894 170 before removing the reverse shuttle.

4. Detach the reverse shuttle from the gearbox front side according to instruction **442 A**.

5. Unscrew the 4WD output shaft nut and tap at the shaft front end until the clutch/shaft loosen.

6. Remove the oil sleeve (4) from the shaft. Remove the cup springs (3) and the cylinder, piston and the pressure plate.

7. Change the clutch discs as a complete unit: 11 steel discs and 12 friction discs.

8. Assemble the clutch and change the piston seal if necessary. Push the oil sleeve into its place in the reverse shuttle housing and fit the cup springs according to the picture above.

9. Push the shaft/clutch into the housing through the ball bearing.

10. Remove the clutch drum/gear wheel on the front face of the gearbox and place the drum onto the clutch disc pack so that the steel disc lugs engage with the grooves on the drum.

11. Prevent the 4WD output shaft from rotating by placing a suitable block between the drum gear (7) and the wall of the reverse shuttle housing.

12. Tighten the shaft nut first fully home and then slacken it **one and a half turn**. The clutch pack has then a correct clearance.

13. Fit the clutch drum back to the gearbox front end.

13. Attach the reverse shuttle onto the gearbox front face, see Op. **442 C.**

14. Attach the 3–step quick–shift gear (Delta Powershift) onto the front face of the reverse shuttle, see Op. **444 1A** points **19–26**.

15. Assemble the tractor frame between gearbox–fueltank, see Op. **441 2B** or **423 5A**.

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C. Changing 4WD output shaft seal on tractors which have 2–step quick–shift gear

1. Drain the oil from the gearbox.



2. Remove the propeller shaft guard and disconnect the propeller shaft rear flange joint.

3. Open the output shaft nut (ETV893 260) and remove the spacer ring and the drive flange. Remove the old seal and fit a new one with sleeve ETV 891 900.

4. Fit the o–ring, drive flange, spacer ring and tighten the nut fully home and then unscrew one a turn.

4. Connect the propeller shaft flange joint (**35 Nm**), fit the guard plate and fill the gearbox with oil.

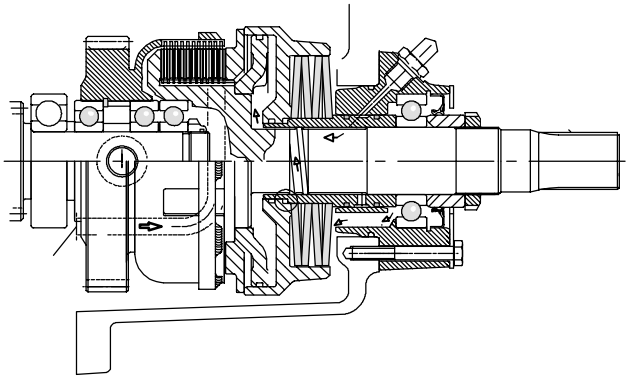
Note! The front end of the propelles shaft guard has been attached with the front axle attaching bolts. Tightening torque for these bolts is **380 Nm.**

D. Changing 4WD output shaft seals on tractors which have 3–step quick–shift gear (Delta Powershift)

The oil seal and seals of piston ring type can be changed as follows:

1. Remove the propeller shaft undershield. Disconnect the propeller shaft front end flange joint and pull the shaft forwards until its rear end releases from the splines on the 4WD output shaft.

2. Drain the oil in the gearbox (max. 50 litres).



3. Unscrew the 4WD output shaft nut using spanner ETV 894 170. Remove the oil seal wear ring and its o–ring on the shaft. Disconnect the pressure oil pipe from the output shaft seal housing.

4. Unscrew the seal housing bolts and pull off the housing. Remove the oil sleeve on the shaft. On the sleeve there are fitted the seals of piston ring type.

5. Change damaged parts. Apply universal grease to the oil seal lips. Carefully push the oil sleeve into the sealing housing fully home against the ball bearing.

6. Carefully fit the sealing housing. Ensure that the o–ring is in place. Fit the protective plate and tighten the housing bolts.

7. Place the o–ring onto the shaft and then the wear ring. Tighten the shaft nut using ETV 894 170 first fully home and slacken it then **one and a half turn**.

8. Connect the 4WD clutch pressure oil pipe. Fit the propeller shaft and its undershield. Fill the transmission with oil.

Note! The propeller shaft undershield front end is fixed with the front axle attaching bolts. Tighten the bolts to **380 Nm.**

9. Test–run the tractor and make sure that the 4WD clutch functions and that there are no leaks.

3–step quick–shift gear, transmissions 300 and 460 (Op. no. 444)

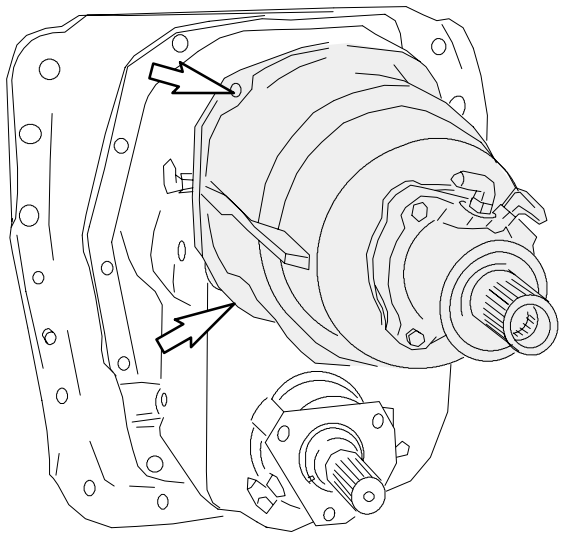
1. Reconditioning Delta Powershift

A. Reconditioning planetary gear and its multi–disc clutch

Dismantling:

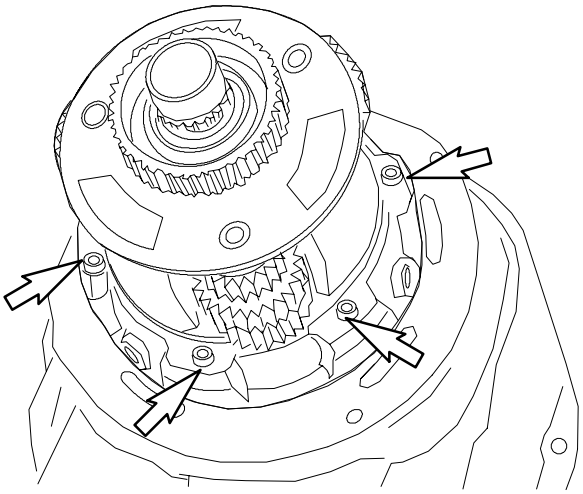
1. Split the tractor between gearbox–fuel tank (see Op. **441 1A**)

2. Disconnect the oil pipes from the gear housing.



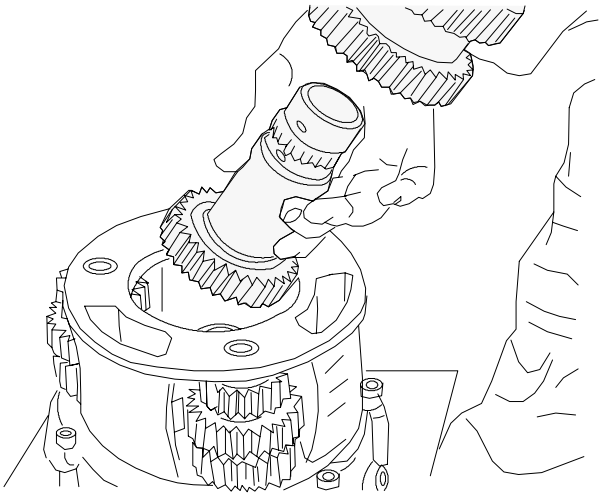
3. Unscrew four attaching bolts of the housing (see arrows) and carefully pull off the housing.

Note! The planetary gear and its multi–disc clutch remain on the front face of the reverse shuttle. Also the foremost and middle sun gear may remain inside the planet gears.



4. Unscrew the planetary carrier fixing bolts (see arrows) and remove the planetary gear. At the same time it is releasing the multi–disc clutch cup springs (2 pcs)

Note! If one of the planet gears prevents unscrewing of the carrier bolts, the planetary gear cannot be rotated but in this case, connect a hydraulic hand pump to the pipe connector on the reverse shuttle housing and pump up pressure into the clutch until the planetary gear can be rotated.

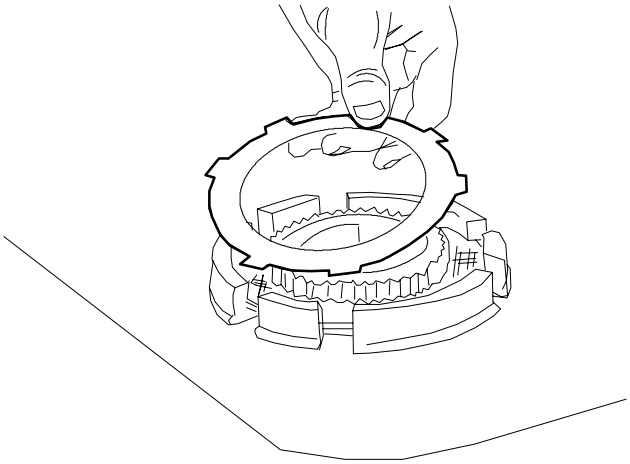


5. Remove the foremost and middle sun gears from the planetary gear, if they remained inside the planet gears.

6. Remove the planetary carrier rearmost ball bearing using two pinch bars. Remove the pressure plate on the clutch disc pack. Remove the discs and the hub.

Note! 8200–8400: From serial no 668103 incl, there are six springs between the ring piston and the pressure plate. Remove the springs as well, when you remove the pressure plate.

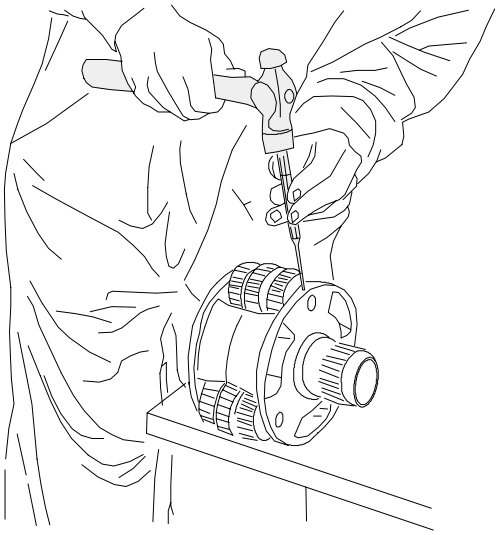
7. Remove the foremost ball bearing circlip. Pull out the planetary gear attaching flange together with the bearing.



8. If the clutch discs are worn so much that the grooves on the friction discs have disappeared, change the complete disc pack at the same time.

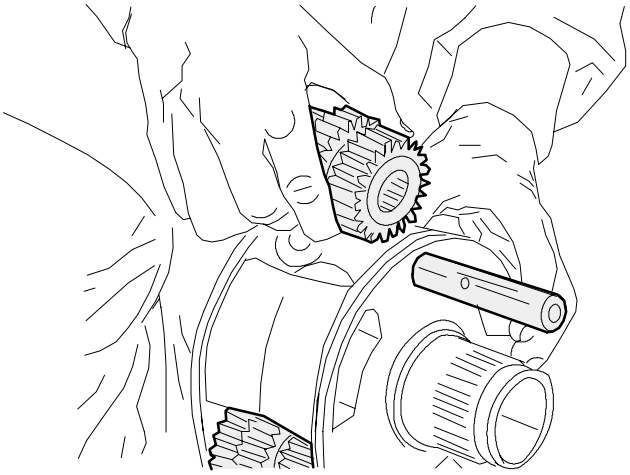
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9. If the ring piston seals need to be changed, the piston can be forced out by using compressed air, but be very carefull.



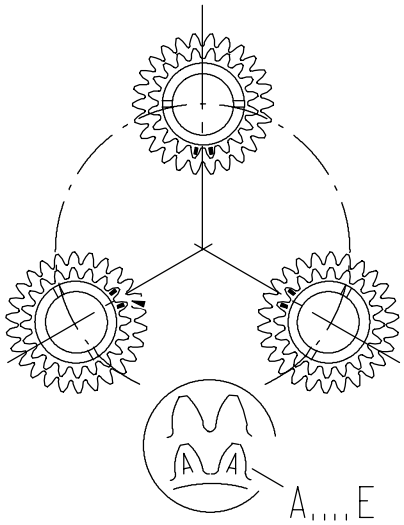
10. Knock the planet gear shaft tension pins into the shafts and remove the shafts at which time the planet gears and their needle bearings are releasing. Change damaged parts.

Assembling:



11. Fit the rearmost sun gear into its place (there is a spacer ring behind the sun gear). Fit first two planet gears together with the needle bearings and push their shafts into place.

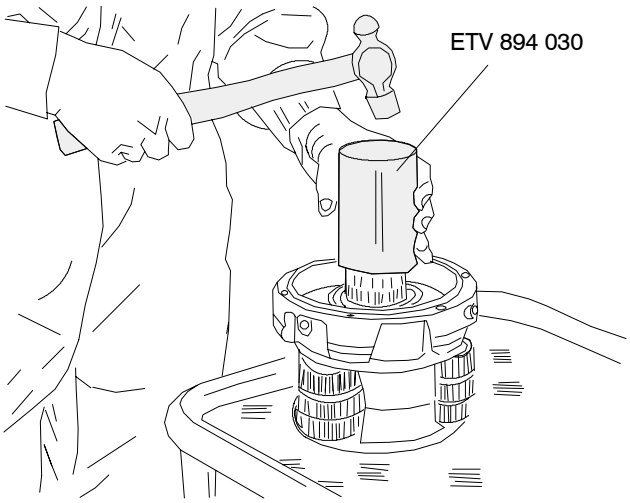
12. Fit the tension pins so that the split sides come at the carrier groove and tap the pins a little deeper that the planetary carrier surface to facilitate free flow of lubricating oil.



13. When the two planet gears have been fitted, place the rearmost sun gear so that the letter markings (A – E) on the planet gears point towards the sun gear midpoint. Then fit the third planet gear with the letter marking turned towards the sun gear midpoint.

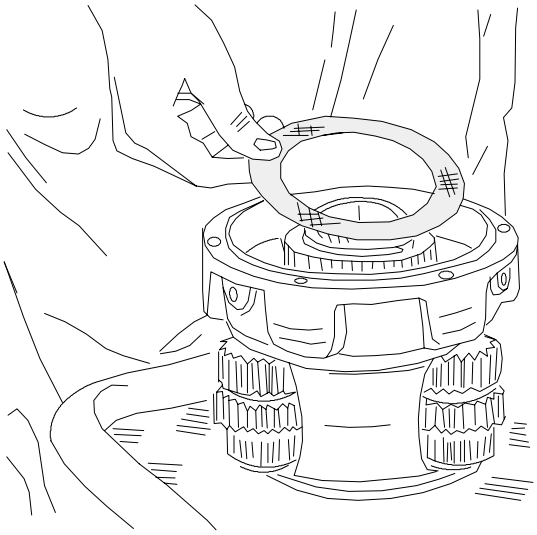
Note! All three planet gears should have the same letter marking (either A, B,C, D or E).

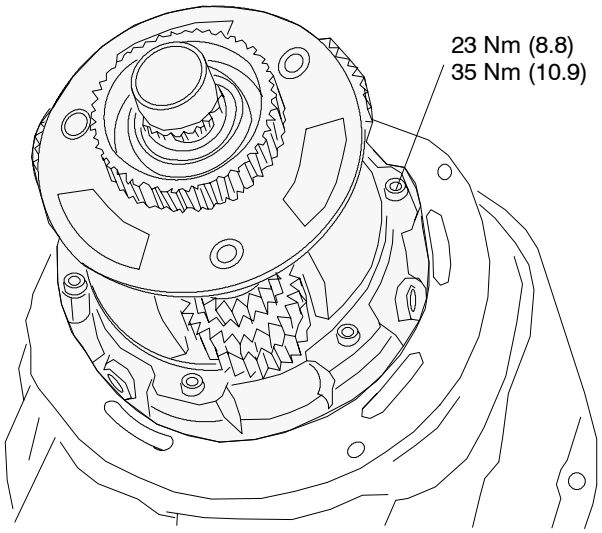
14. Grease the piston seals and press the piston into its location, if removed.



15. Fit the planetary gear foremost ball bearing into the attaching flange against the shoulder (use e.g. ETV 894 030). Place the attaching flange onto the planetary carrier and fit the ball bearing circlip.

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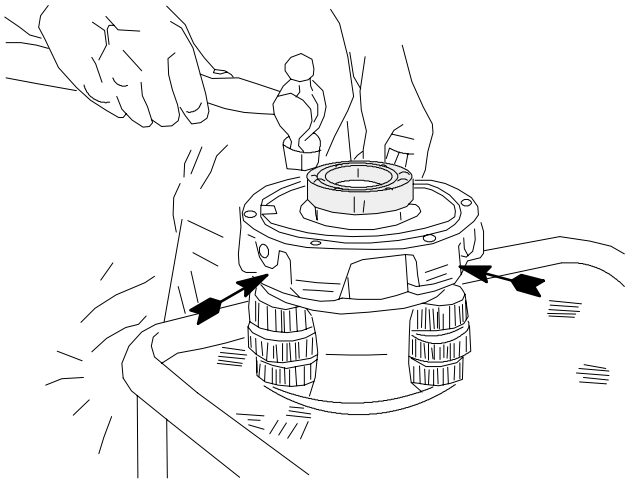




16. Place the clutch hub into the attaching flange and then fit alternately 5 steel discs and 4 friction discs in.

17. Position the pressure ring onto the disc pack so that the steel disc lugs fit inside the grooves on the ring. Also the loose locking pieces must engage with grooves on the pressure ring.

Important! 8200–8750: From ser. no. 668103 incl, the pressure plate has six drillings for the springs. Before fitting the pressure plate, fasten the spring in their drillings with a little grease, so that they are kept in place during fitting the pressure plate.



18. Fit the rearmost ball bearing against the hub (use ETV 894 030, if needed). Support e.g with two screwdrivers (at arrows) the planetary gear front clutch disc (uppermost disc in picture above), so that it does not drop.

19. Place the cup springs with concave sides against each other between the planetary gear and the reverse shuttle.

20. Lift the planetary gear into place and turn it so that the pressure oil bore together with its small o–ring comes at the pipe connector on the reverse shuttle housing.

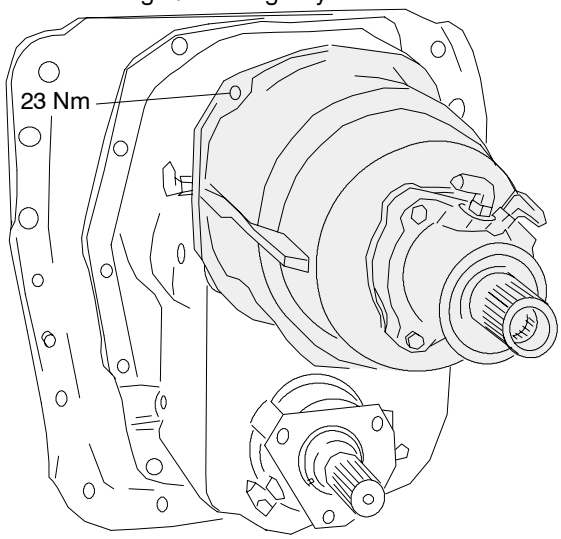
NOTE! Rotate the planetary gear so that the planets do not prevent tightening of the planetary gear attaching bolts.

21. Raise the cup springs into place using a screwdriver and tighten the planetary gear attaching bolts progressively to a torque of **23 Nm** (8.8), **35 Nm** (10.9). Apply Loctite 243 to the threads of the bolts. Tightening order, see pages 440/15.

Note! Tighten the bolts in order so that when one bolt becomes stiff to turn, move to the adjacent bolt until the planetary gear attaching flange is tightly against its location on the reverse shuttle front face. Never use force.

22. After fitting, pump up pressure of **1,7–2,0 MPa** into the clutch through the pipe connector. If the clutch does not disengage, the clutch foremost steel disc can be wrongly positioned. In this case the clutch should be assembled anew. The connector has thread 9/16 JIC 37°. The reverse shuttle housing has thread 14 x 1,5 mm.

23. Place the foremost and middle sun gear into the clutch drum inside the gear housing fully home.



24. Grease the large o–ring of the housing and place the o–ring into its groove. Push the housing into place and tighten its four attaching bolts to **23 Nm**.

25. Connect the pressure oil pipes to the gear housing. Assemble the tractor frame according to instr. **441 2B**.

26. Let the engine run for a while with the clutch pedal depressed for proper lubrication. Test–run the tractor and ensure that the quick–shift gear functions correctly.

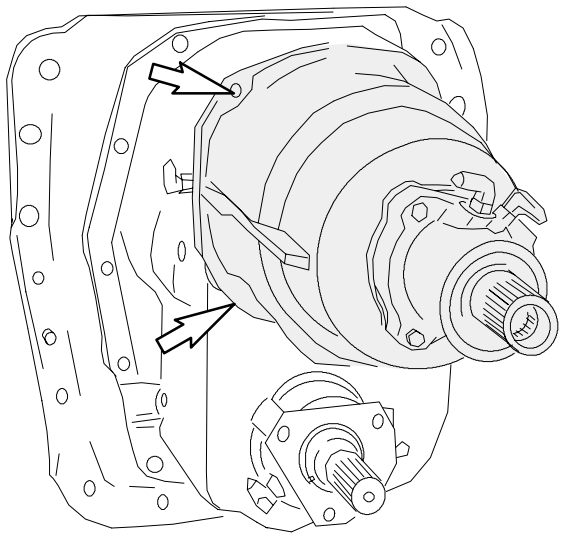
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B. Reconditioning multi – disc clutches for reduction ratio and overdrive

Dismantling:

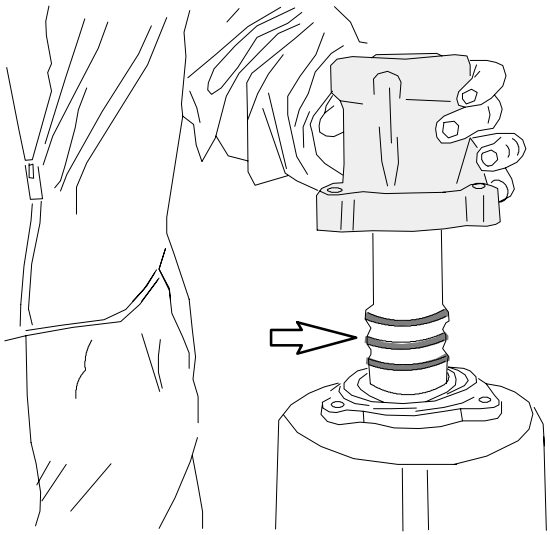
1. Split the tractor between gearbox – fuel tank (see Op. **441 1A**)

2. Disconnect the oil pipes from the gear housing.

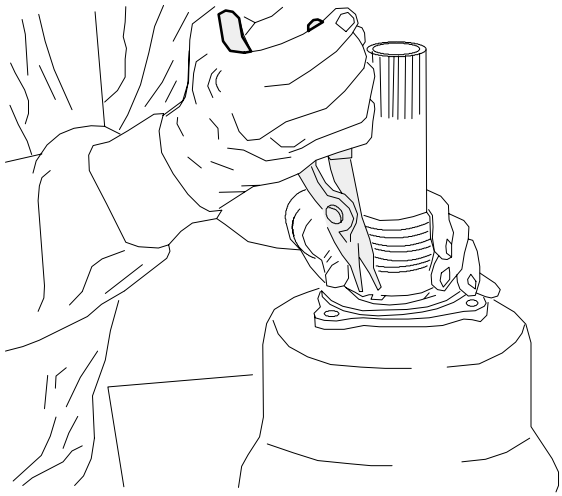


3. Unscrew four attaching bolts of the housing (see arrows) and carefully pull off the housing.

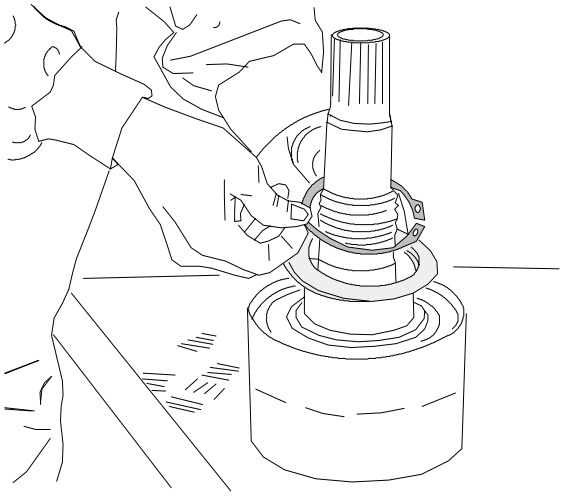
Note! The planetary gear and its multi – disc clutch remain on the front face of the reverse shuttle. Also the foremost and middle sun gear may remain inside the planet gears.



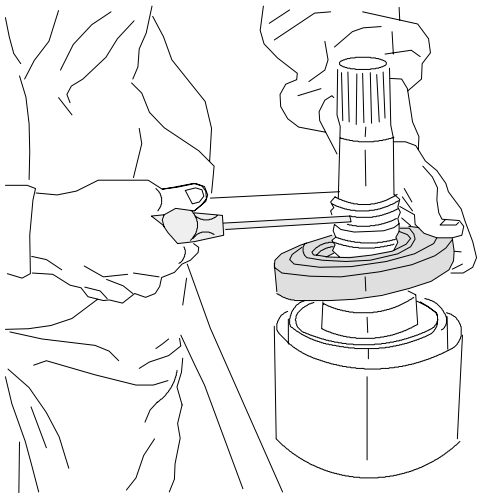
4. Unscrew three fixing bolts of the seal housing and remove the housing. Remove the oil seals of piston ring type on the shaft (3 pcs, see arrow).



5. Remove the front ball bearing circlip. Tap at the shaft front end until the shaft/clutch drum releases.

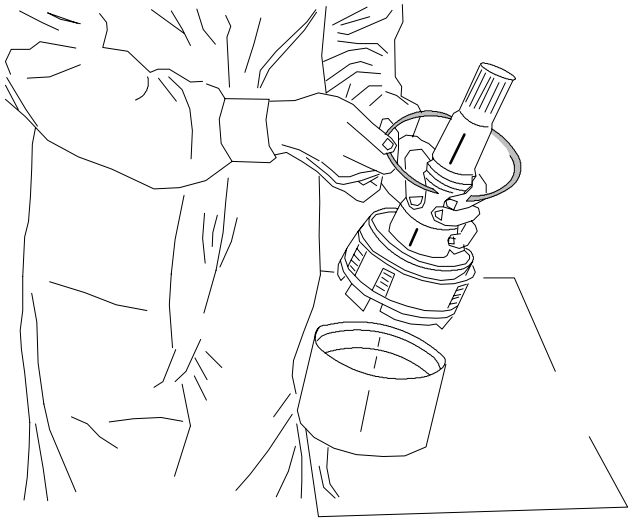


6. Remove the circlip and cup springs of the piston for the rearmost multi – disc clutch.

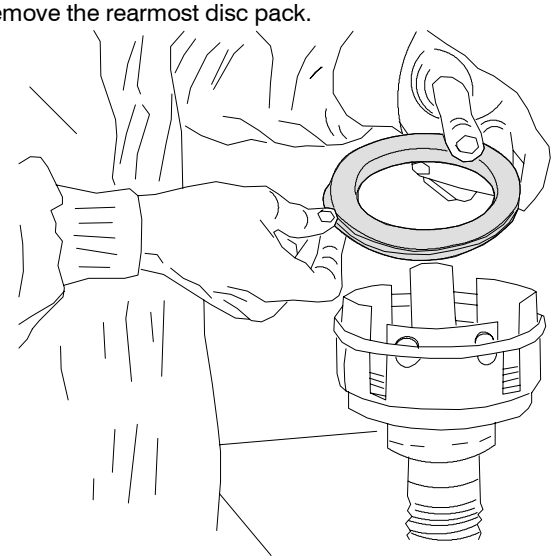


7. Remove the large circlip of the piston. Remove the piston carefully using compressed air through the pressure oil hole. Check and change, if necessary, the piston sealing rings.

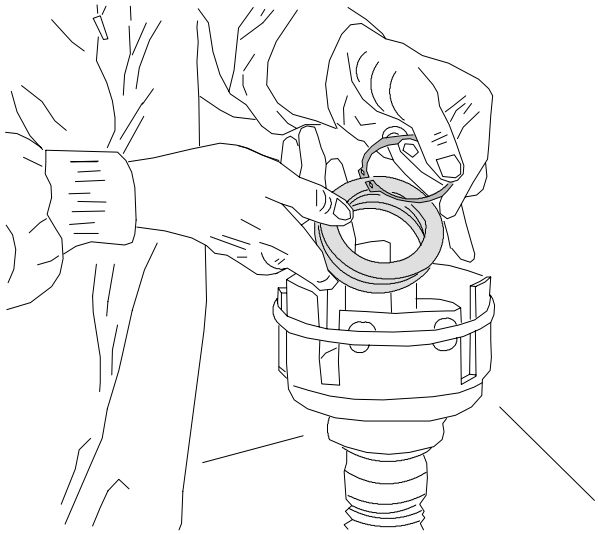
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8. Push the clutch drum inside the casing and remove the circlip which has bevelled ends. Take the drum out of the casing. Remove the rearmost disc pack.



9. Remove the piano wire under the locking ring of the intermediate ring between the disc packs. Then squeeze the locking ring and remove the intermediate ring.
Remove the foremost clutch discs and its hub.

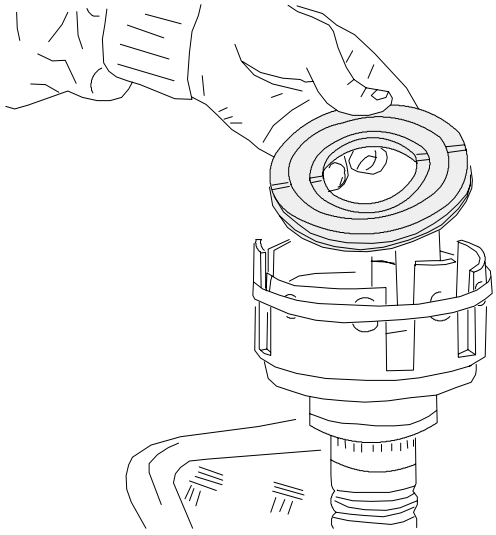


10. Remove the circlip of the foremost clutch piston at which time the cup springs release. Remove the piston carefully e.g. with compressed air through the oil port.

Note! If You must change the clutch drum (press fit), remove it from the shaft e.g. with a hydraulic press and a sleeve. When fitting the drum, warm it and press it onto the shaft against the circlip.

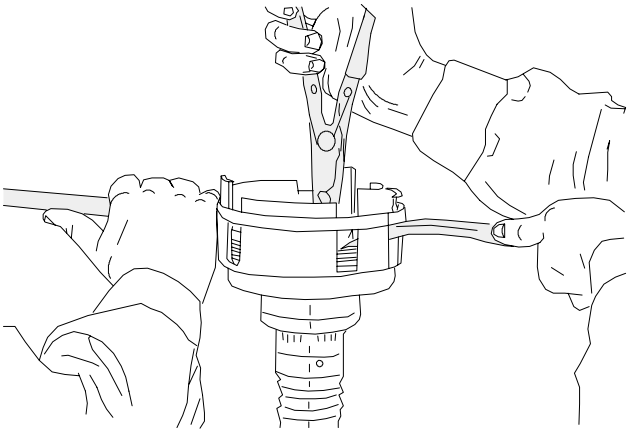
Assembling:

11. Ensure that the clutch drum is fully home against the circlip. Tap or press the drum into place, if needed.



12. Grease the sealing rings of the foremost clutch piston and press the piston into its location so that the grooves on the piston come upwards.

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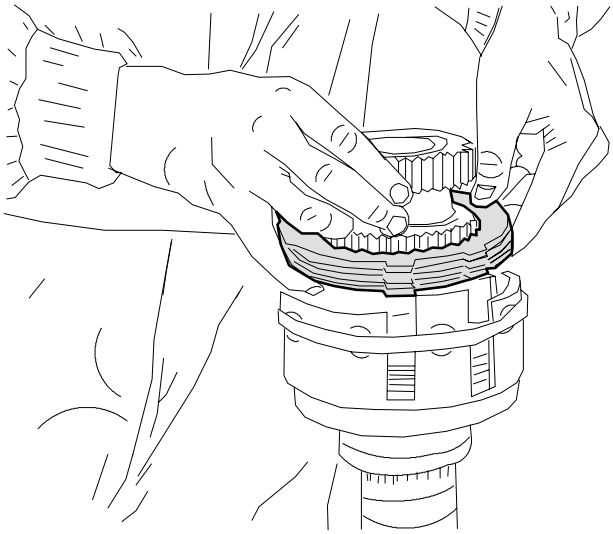
13. Fit six cup springs with concave sides against each other on the piston. Open the circlip with pliers and press with two pinch bars the circlip into its groove according to picture above.

14. Place the foremost clutch hub on the cup springs so that the internal splines on the hub come upwards.

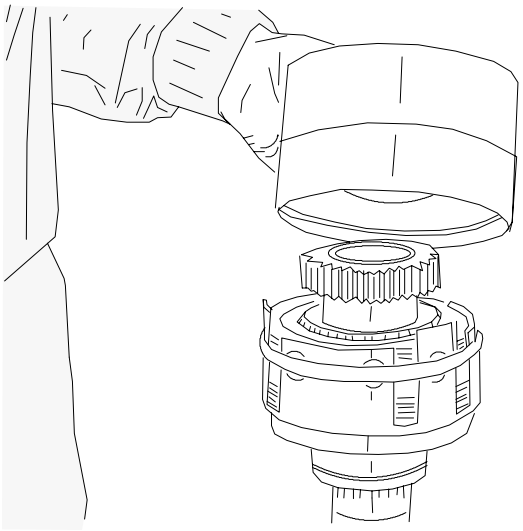
15. Fit the foremost clutch steel and friction discs (6 steel discs and 5 friction disc). If the friction discs are worn out, change the complete disc pack at the same time.

16. Fit the intermediate ring between the two multi – disc clutches. Make sure that the locking ring is located in its groove on the drum.

17. Push piano wire (thickness ø1 mm and length about 450 mm) under the intermediate ring locking ring. Bend the wire ends outwards about 5 mm so that the wire cannot rotate.



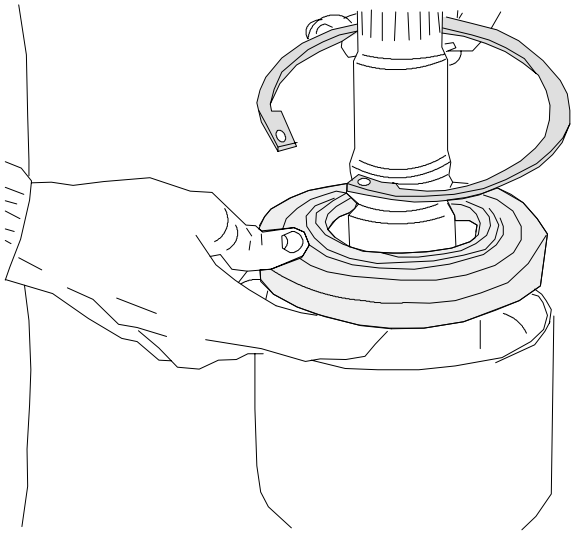
18. Fit the rearmost clutch pack (6 steel discs and 5 friction discs). Position the clutch hub together with the sun gear inside the discs.



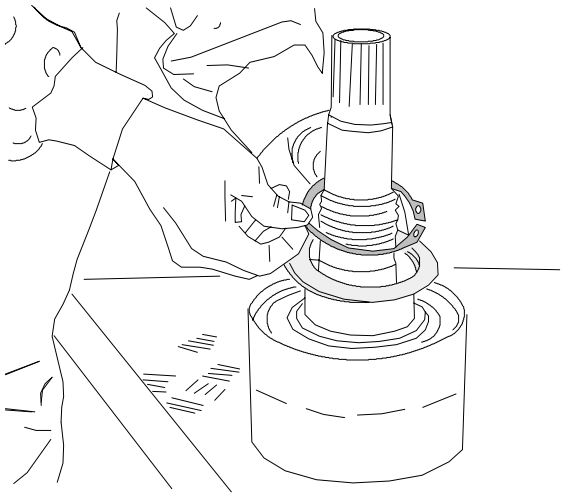
19. Place the clutch casing on the drum and fit the circlip which has bevelled ends.

Note! When You turn the drum upside down, support the rearmost clutch hub so that it does not disengage from the disc pack.

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20. Grease the sealing rings of the rearmost clutch piston and press the piston into the casing. Fit the large circlip of the piston.



21. Fit four cup springs with concave sides against each other upon the piston. Fit the piston circlip with a sleeve and a heavy drift. The circlip can also be pressed into its groove between jaws of a vice.

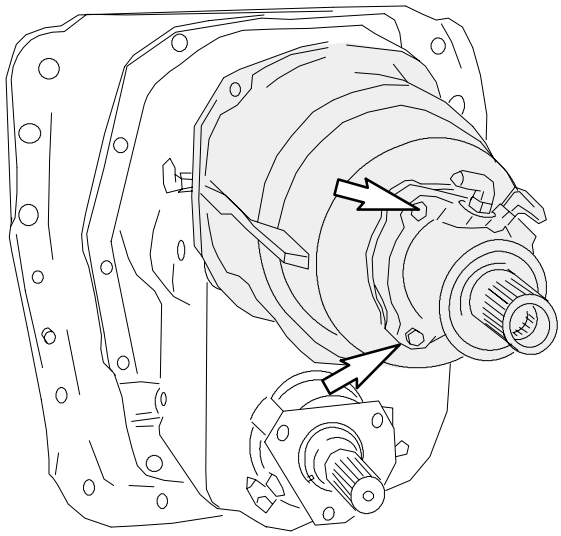
Note! Do not damage the seal ring grooves on the shaft when fitting the piston. The function of the multi–disc clutches can be tested e.g. with compressed air.

22. Fit the shaft together with the clutch drum onto the planetary gear so that the foremost and middle sun gears are inside the planet gears and the sun gear front ends are engaged in the clutch discs. Remove the foremost ball bearing at the gear housing front end.

23. Fit and grease the gear housing large o–ring. Push the housing into place until it touches the reverse shuttle front face. Tighten the four fixing bolts to a torque of **23 Nm** .

24. Fit the housing foremost ball bearing. Fit the bearing circlip. Place the seal rings of piston ring type into their grooves on the shaft. Ensure that the seal ring ends have been correctly engaged.

25. If you change the oil seal in the sealing housing, remove the damaged oil seal. Grease the lips of the new seal and fit the seal using plate ETV 893 720.



26. Fit the sealing housing at the front end of the gear casing. Grease its o–ring and tighten three attaching bolts (see arrows) to a torque of **23 Nm**.

27. Connect the oil pipes to the gear housing. Assemble the tractor frame according to instruction **441 2B**.

28. Let the engine run for a while with the clutch pedal depressed for proper lubrication. Test–run the tractor and ensure that the Delta Powershift functions correctly.

2. Needle bearings

The mounting depth of both needle bearings inside the gear housing is **0,5 mm** measured from the end face. This ensures free flow of lubricating oil. The needle bearing in the sealing housing is fitted against the bottom of its location.

3. Changing oil seals of Delta Powershift

A. Changing oil seals of piston ring type

1. Split the tractor between gearbox – fuel tank, see Op. **441 1A**.

2. Diconnect the pressure oil pipes from the gear casing.

3. Unscrew the three fixing bolts of the sealing housing at the front end of the gear casing and pull out the housing.

Note! Check that sealing ring grooves on the shaft and the hole in the sealing housing are in perfect condition. Do not damage the seal ring grooves during repair work since it can cause seal ring damages.

4. Change three seal rings of piston ring type. When fitting new rings, make sure that the ring end lockings engage correctly.

5. Grease and fit the seal housing o – ring. Fit the seal housing and tighten the three bolts to a torque of **23 Nm**.

6. Connect the oil pipes to the gear housing. Assemble the tractor frame according to instruction **441 2B**.

B. Changing front oil seal of gear housing

1. Split the tractor frame between gearbox – fuel tank, see Op. **441 1A**.

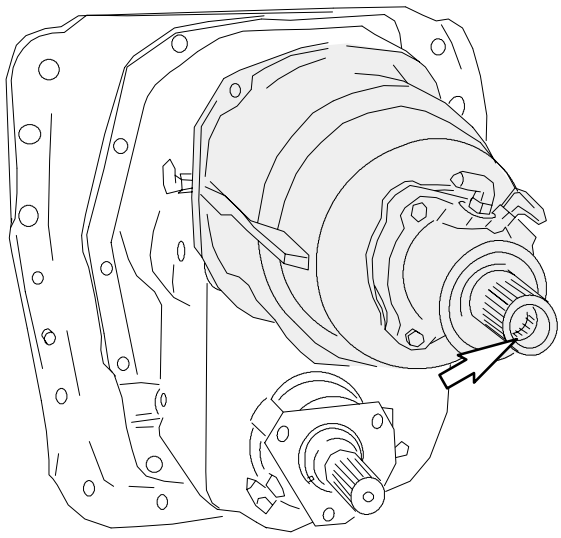
2. Remove the damaged oil seal and fit a new seal with a suitable sleeve. If you detach the seal housing, the oil seal can be fitted with plate ETV 893 720.

Note! Do not damage the seal on the input shaft splines. Apply grease to the lips of the new seal.

3. Assemble the tractor frame according to instr. **441 2B**.

C. Changing oil seal and needle bearing inside the input shaft front end

1. Split the tractor frame between gearbox – fuel tank, see Op. **441 1A**.



2. Remove the guide ring in front of the seal. Use e.g. an impact puller.

3. Remove the damaged oil seal inside the input shaft front end. Check/grease the needle bearing behind the oil seal.

4. Fit a new oil seal (and needle bearing if changed). The parts can be fitted with tool ETV 892 180.

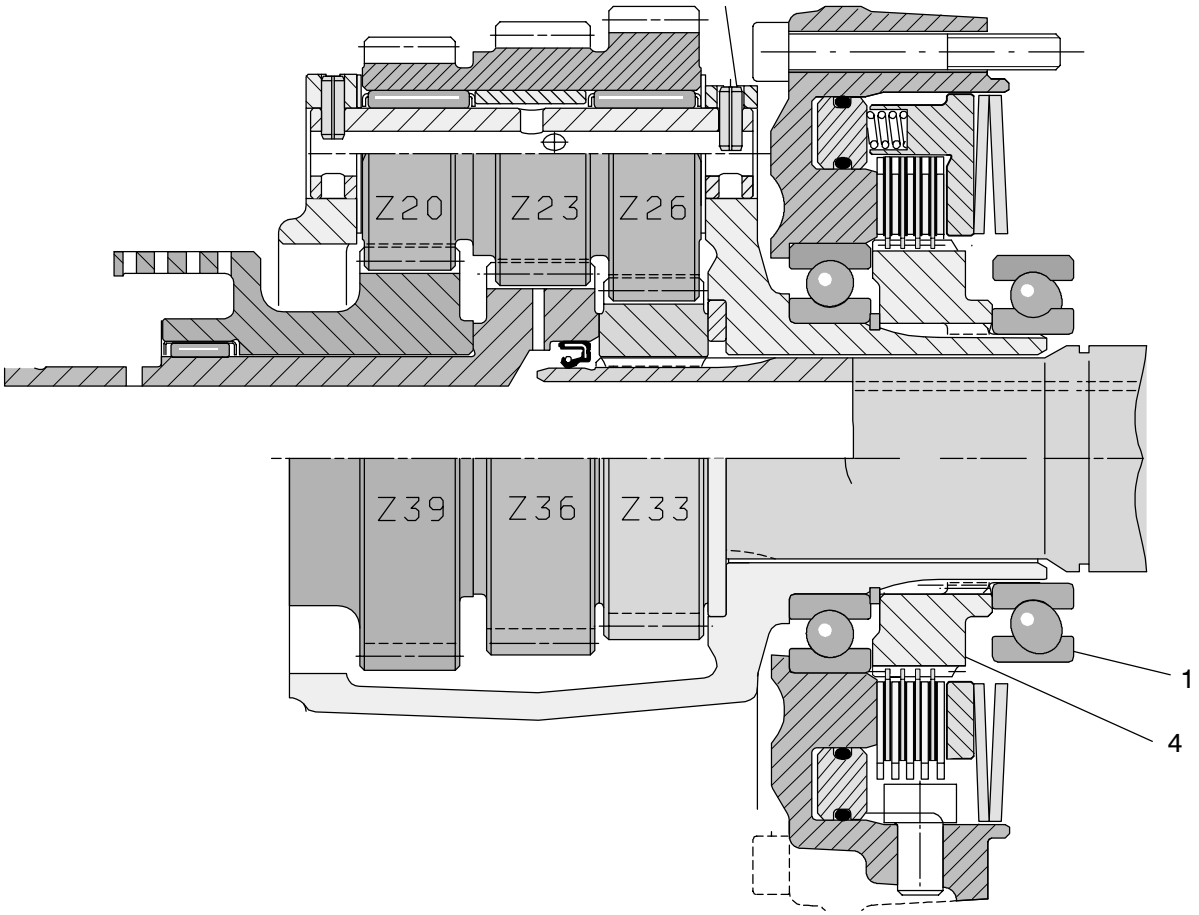
Note! Fit the needle bearing and the seal deep enough so that the guide ring can be fitted with its front face level with the input shaft front face.

5. Grease the seal lips. Apply Loctite 601 to the guide ring surface and fit the ring in front of the seal.

8. Assemble the tractor frame according to instr. **441 2B**.

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4. DPS in transmission 650



A. Changing the planet gears and reconditioning planetary gear multi–disc clutch C3

1. Remove the DPS housing and the planetary gear on the front surface of the reverse shuttle and remove bearing (1), hub (4) and the cup springs and remove the disc pack, see instr. A paragraphs 1–6 on page 444/1.

Note! The steel discs in this clutch (C3) are different compared with the steel discs in clutches C1 and C2. The friction discs, however, are the same as in other clutches.

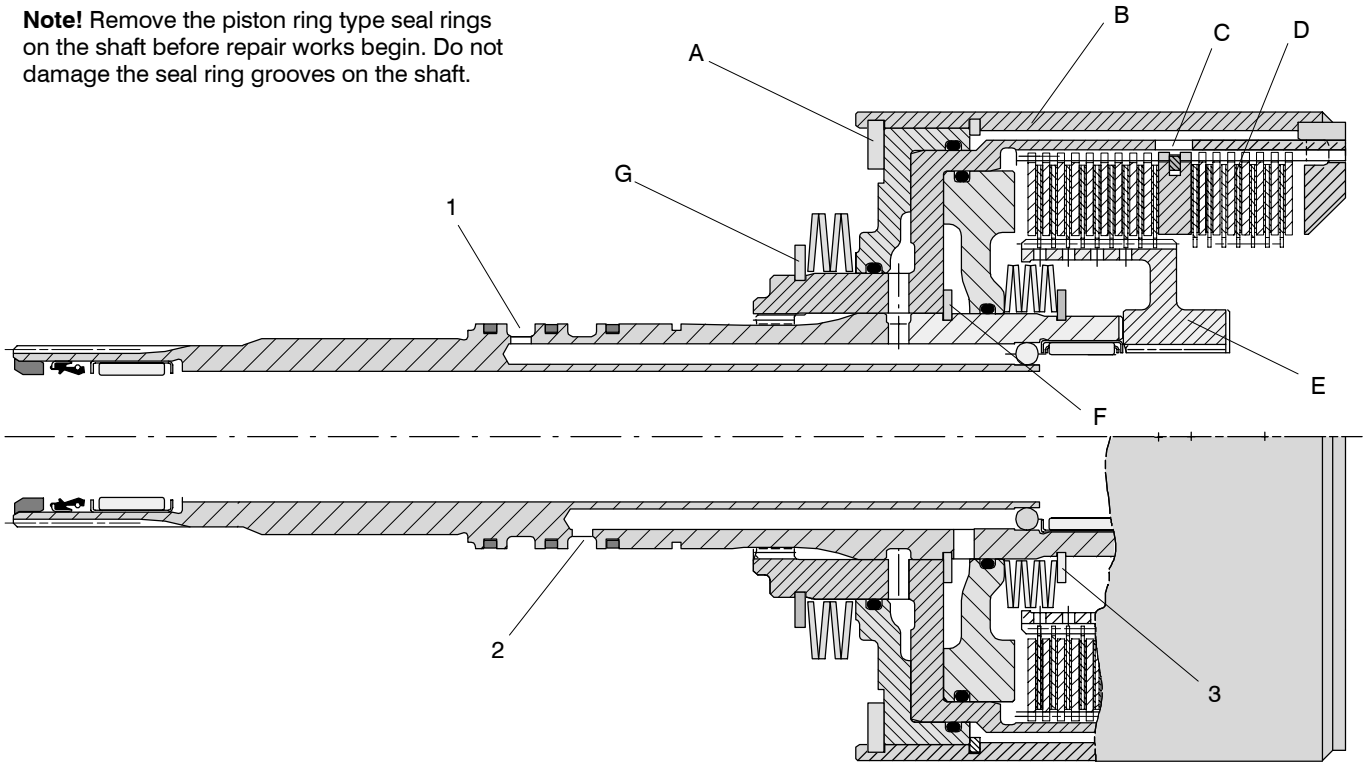
2. Reconditioning the multi–disc clutch C3 is done in the same way as on transmissions 300 and 460.

3. Changing planet gears, see instr. A points 10–13 on page 444/2.

3. Assembling the planetary gear and fitting the gear and the DPS housing onto the shuttle front face, see instr. 444 1A points 19–26 on page 444/3.

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Note! Remove the piston ring type seal rings on the shaft before repair works begin. Do not damage the seal ring grooves on the shaft.



B. Changing friction discs in the clutch drum

1. Remove the DPS housing/clutch drum from the reverse shuttle front face, see instr. B paragraphs 1–3 on page 444/4.

2. Remove the sealing housing at the front end of the DPS housing. Remove the front bearing circlip and tap out the shaft/clutch drum of the housing, see instr. B paragraphs 4–5 on page 444/4.

3. Remove the large circlip (A), and remove the outer housing B by pulling it to the right (in picture above).

4. Remove the intermediate disc pack D (7 pcs friction discs and 7 intermediate discs). Squeeze the securing ring between the clutches through holes in the clutch drum C and remove the securing ring and the support ring.

Note! On the latest DPS gears (F32509–), there is a piano wire under the securing ring.

5. Remove the front disc pack (9 pcs friction discs and 9 intermediate discs). Ensure that the clutch drum is fully home against the circlip F. Knock or press the drum if necessary.

6. When assembling the front disc pack, place first against the piston an intermediate disc and then by turns friction and intermediate disc. Fit the support ring and its securing ring and place the hub E into place.

7. Assemble the intermediate disc pack (fit against the support ring a friction disc and then by turns intermediate disc and friction disc). Fit the outer jacket B and secure it with circlip A. Fit the disc pack D hub (+front sun gear) and the middle sun gear shaft.

8. Assemble the DPS together with its housing to the reverse shuttle front face and assemble the tractor frame, see paragraphs 21–27 on page 444/7.

C. Changing piston seals of the clutches

Intermediate clutch:

1. Carry out procedures according to paragraphs 1–3 in previous instr. B.

2. Remove circlip G and cup springs and blow carefully compressed air into hole 1, until the piston of clutch D comes out. Change piston seals.

3. Carry out procedures according to paragraphs 20–27 on page 444/7.

Front clutch

1. Remove both disc packs according to paragraphs 1–5 in previous instruction B.

2. Release circlip 3, and remove cup springs. Remove the piston by carefully blowing compressed air through hole 2.

3. Change the piston seals.

4. Assemble the disc packs and the clutch drum and fit the DPS gear onto the tractor, see instr. B paragraphs 6–8.

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B. Changing needle bearings in planetary gears 1
C. Changing bearings and seals for outer drive shafts 2
D. Adjusting outer drive shaft bearing clearance 3
E. Fitting final drives 4

Technical data

Gear ratio, planetary gears:
– final drives 300 . . . . . i=5,20
– final drives 450/650 . . . . . i=6,86
– final drives 700 . . . . . i=8,57
Rear axle flange distance . . . . . 1750 mm

Tightening torque

Drive axle housing–brake housing:
– M12, 8.8 (6000–6400, 6900–8000) (final gears 300) . . . . . 80 Nm
– M12, 10.9 (6200–8950) (final gears 450/650/700) . . . . . 125 Nm
Rear wheel nuts . . . . . 550 Nm
Cab rear attaching bolts . . . . . 200 Nm

Settings

Drive shaft bearing clearance is adjusted by tightening the centre screw to . . . . . 10–20 Nm
Distance between brake housing surface–inner drive shaft end:
– final gears 300 . . . . . 157,50–159,15 mm
– final gears 450 . . . . . 157,40–159,30 mm

Oil

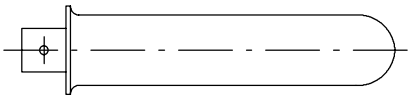
(The transmission and hydraulic systems use the same oil and same oil reservoir)
– oil quality and volume . . . . . see page 130/4

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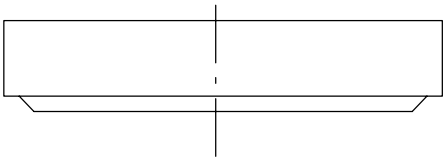
Special tools

B

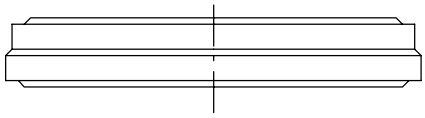
Part. no.	Description
ETV 890 220	Universal handle
ETV 892 260	6600–8950; Plate for fitting outer drive shaft inner bearing race
ETV 893 690	6600–8950; Plate for fitting outer drive shaft inner oil seal
ETV 893 310	6000–6400 y 8000; Plate for fitting outer drive shaft inner oil seal
ETV 893 320	6000–6400 y 8000; Plate for fitting outer drive shaft bearing race
ETV 894 470	6200–8950: Tool to fit the cassette seal (rear axle housing with greater oil volume)
ETV 894 480	6200–8950: Quide sleeve to assemble the final gears (rear axle housing with greater oil volume)
ETV 894 490	6200–8950: Quide pipe to assemble the final gears (rear axle housing with greater oil volume)
ETV 894 550	8350–8950Hi: Tool to fit the cassette seal in final drives 700
ETV 894 560	8350–8950Hi: Quide sleeve to assemble the final drives 700
Locally prepared tools	
ET 893 410	Support for removing outer drive shaft bearing race



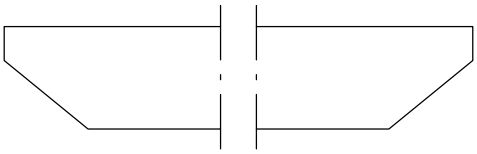
ETV 890220



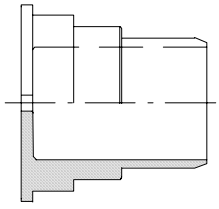
ETV 893 690 (6600, 8100–8400)



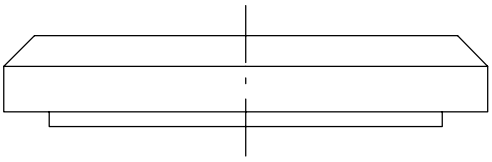
ETV 893 320 (6100–6400, 8000)



ET 893 410



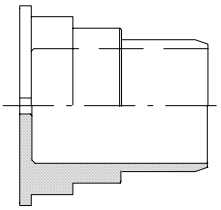
ETV 894 550



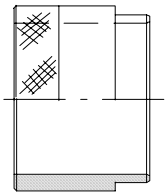
ETV 892 260 (6600, 8100–8400)



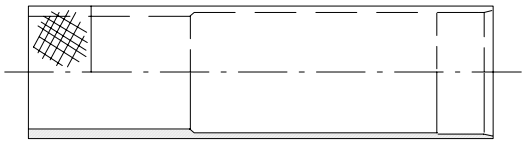
ETV 893 310 (6100–6400, 8000)



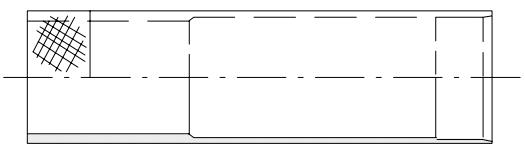
ETV 894 470



ETV 894 480



ETV 894 490



ETV 894 560

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Final drives, description

The final drives are of the planetary gear type working in conjunction with hydraulically controlled multi–disc brakes which run in oil. Final drives have been attached to the brake housings with 14 bolts. Construction is the same on models 6100–6400, 8000 (transmission 300). On models 6600, 8100–8400 the planetary gears are of a sturdier construction and a slightly gear ratio, and the brakes have a greater number of discs. Wheel attaching flanges are identical on all models.

The power is transmitted from the differential, via the inner drive shaft, to the planetary gears, and then though the outer drive shafts to the rear wheels. Planetary gear ratio; 1=5,2 (models 6100–6400, 8000) or i=6,86 (models 6600, 8100–8400).

In the final drives on tractors 6100–6400 the external splines of the ring gear has a tight press fit in the rear axle housing. On tractors 6600–8400 (not 8000) the ring gear is fitted between the rear axle housing and the brake housing and is easy to remove.

The planetary sun gear is machined integral with the inner drive shaft. When the inner shaft rotates, it drives the planetary gears and the planetary gear retainer, which is connected to the outer drive shaft, through splines.

The outer drive shaft is journalled in the drive axle housing in taper roller bearings. The planetary gears are carried in needle bearings on the shaft studs which are fixed to the planetary retainer. On top of the rear axle housing there is a grease nipple for greasing the outer bearing of the outer drive shaft.

The final drives have not a separate oil space but they have common oil with transmission and hydraulic system.

On models 6600E and 8100E there is an impulse disc on the RH side planetary retainer and the rear wheel rotation speed sensor is fitted on the RH side rear axle housing.

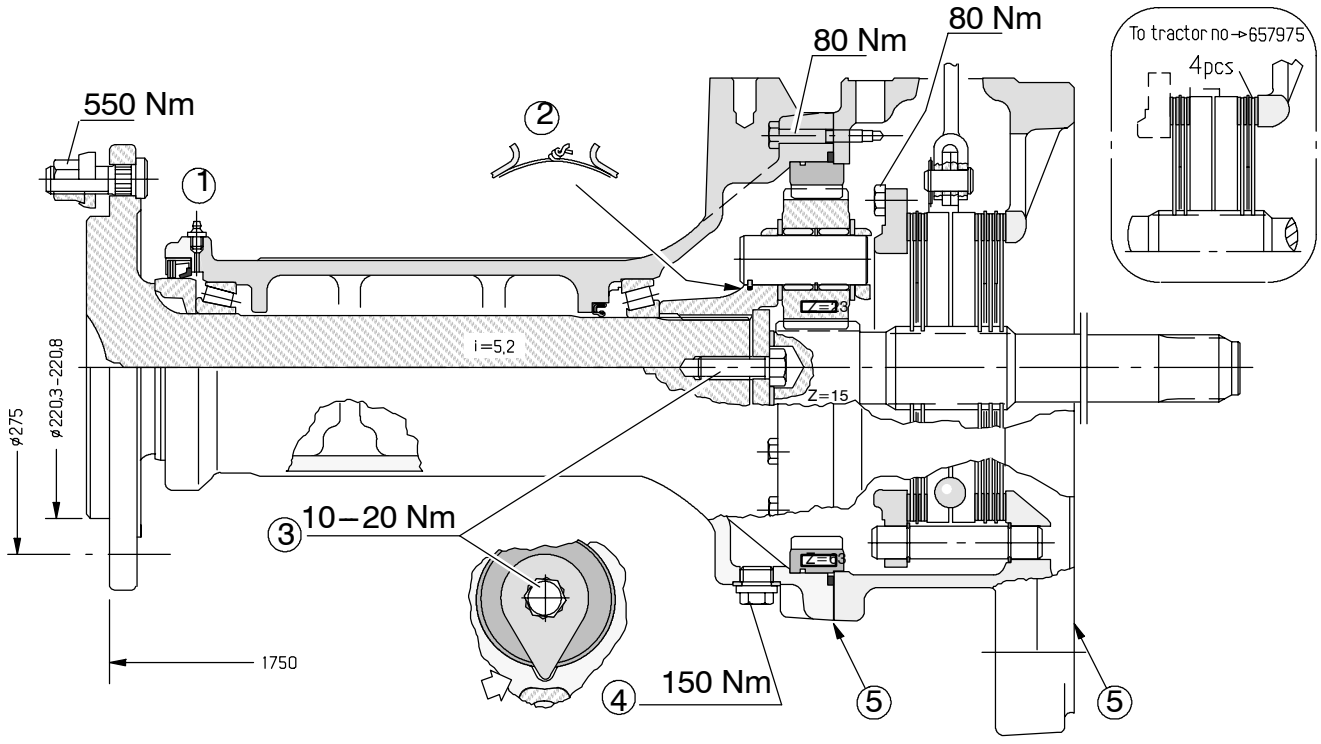


Figure 1. *Final drives 300, tractors 6000–6400 and 8000 (–K41105)*

1. Grease nipple (grease bearing at intervals of 1000 running hours)
2. Wind the wire ends one to one and a half turns and bend them
3. Bearing clearance is adjusted by tightening the centre bolt to 10–20 Nm. Apply Loctite 270 onto bolt threads.
4. Draining plug
5. Sealing compound Hylosil

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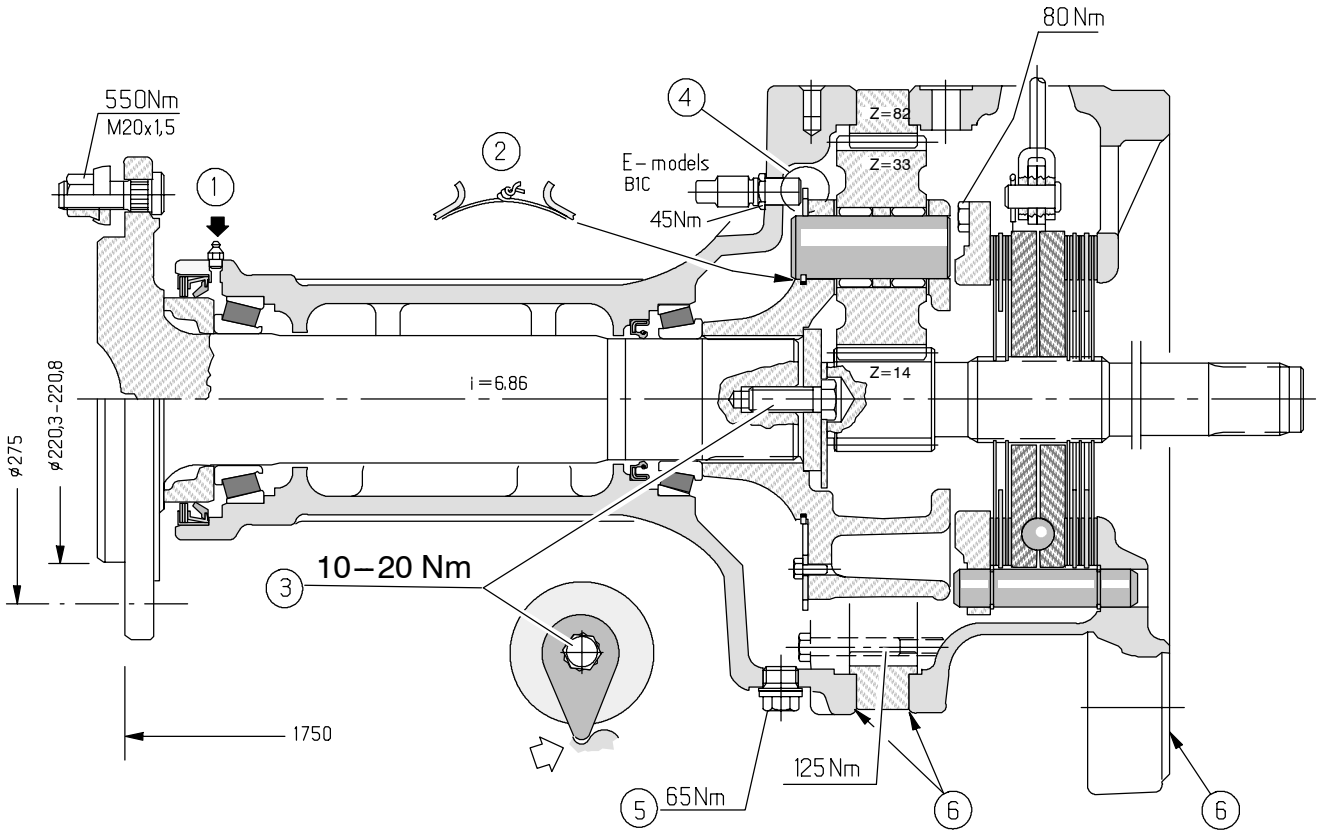


Figure 2. *Final drives 450, tractors 6600–8750 (–J02315)*

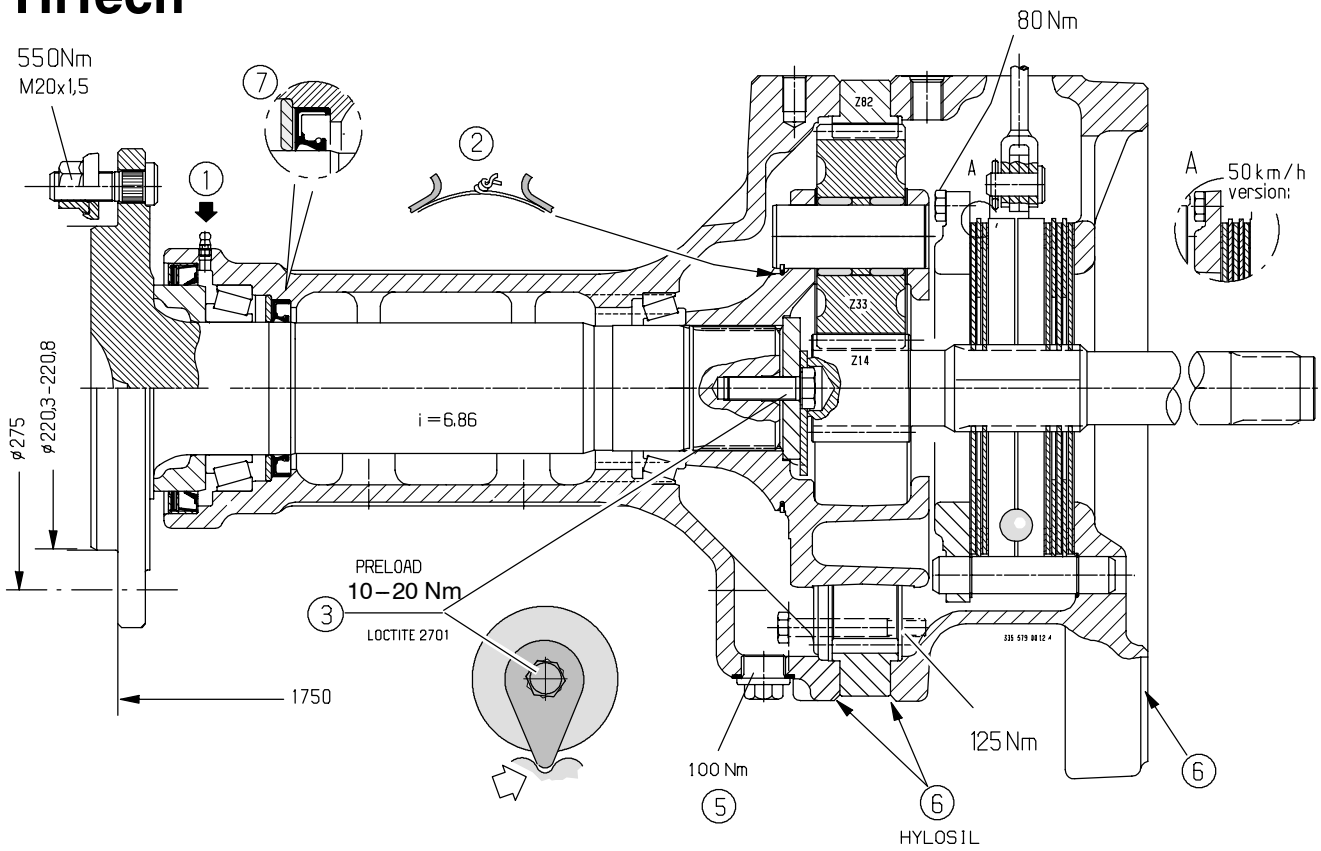
1. Grease nipple (grease bearing at intervals of 1000 running hours)
2. Wind the wire ends one to one and a half turns and bend them
3. Bearing clearance is adjusted by tightening the centre bolt to 10–20 Nm. Apply Loctite 270 onto bolt threads.
4. Speed sensor and impulse disc (only E–models)
5. Draining plug
6. Sealing compound Hylosil

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HiTech

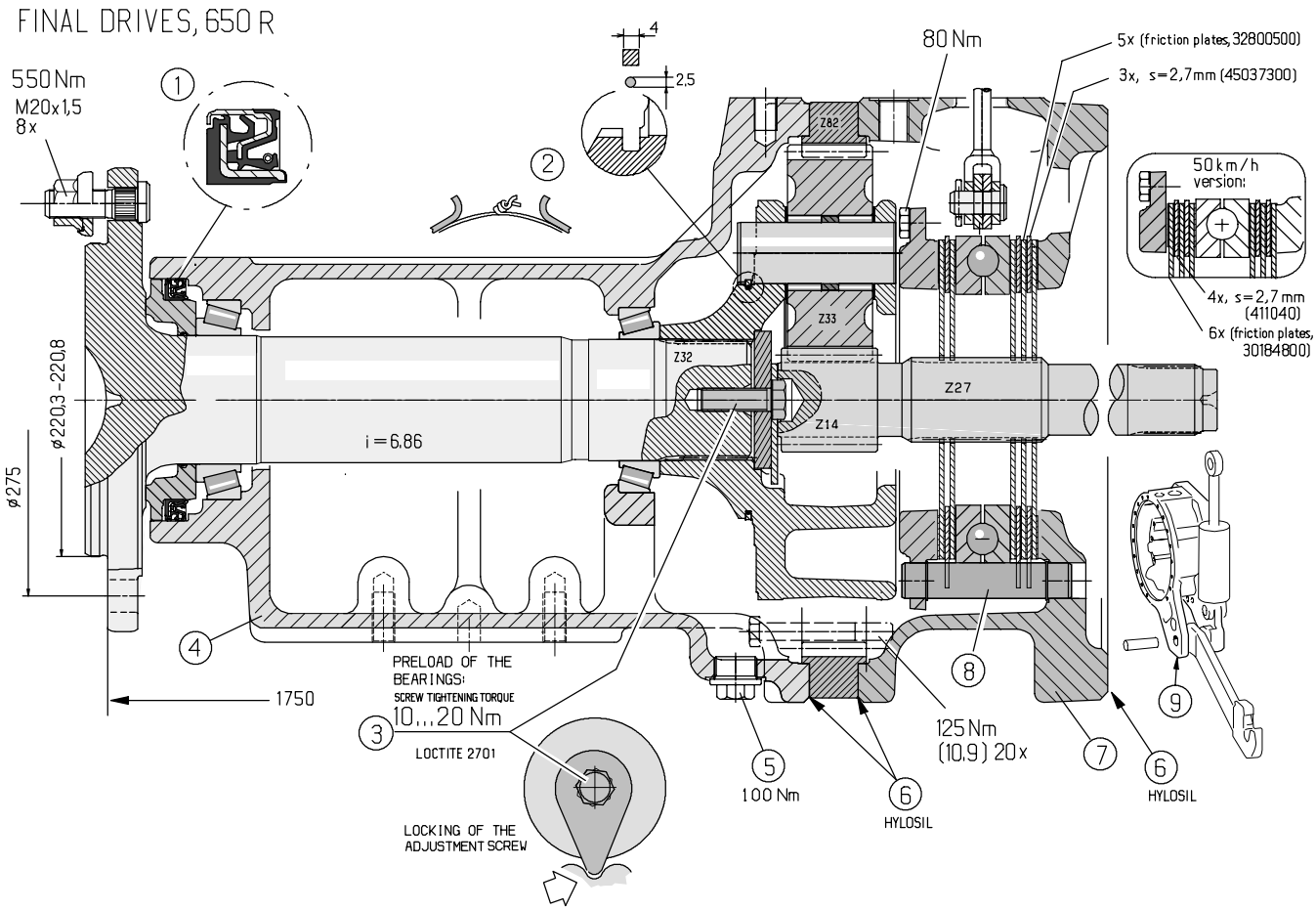


Picture 4. *Final drives 650 on 6250Hi–8950Hi (–K36111) and 6600–8750 (J02316–K36111).*

1. Grease nipple (greasing at every 1000 running hours)
2. Wind the wire ends one to one and a half turns and bend them
3. Bearing clearance is adjusted by tightening the centre bolt to 10–30 Nm. Apply Loctite 270 onto bolt threads.
5. Draining plug
6. Sealing compound Hylosil
*7. Plastic ring in front of outer oil seal *)*

*) In order to increase the oil volume (cooling advantage), the inner seal has been moved outwards. Axle housing, hub shaft and the oil seal have different spare part numbers. The plastic ring is a new part.

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Picture 5. *Final drives 650 with greater oil volume in transmission 550/650 (6200–8950).*

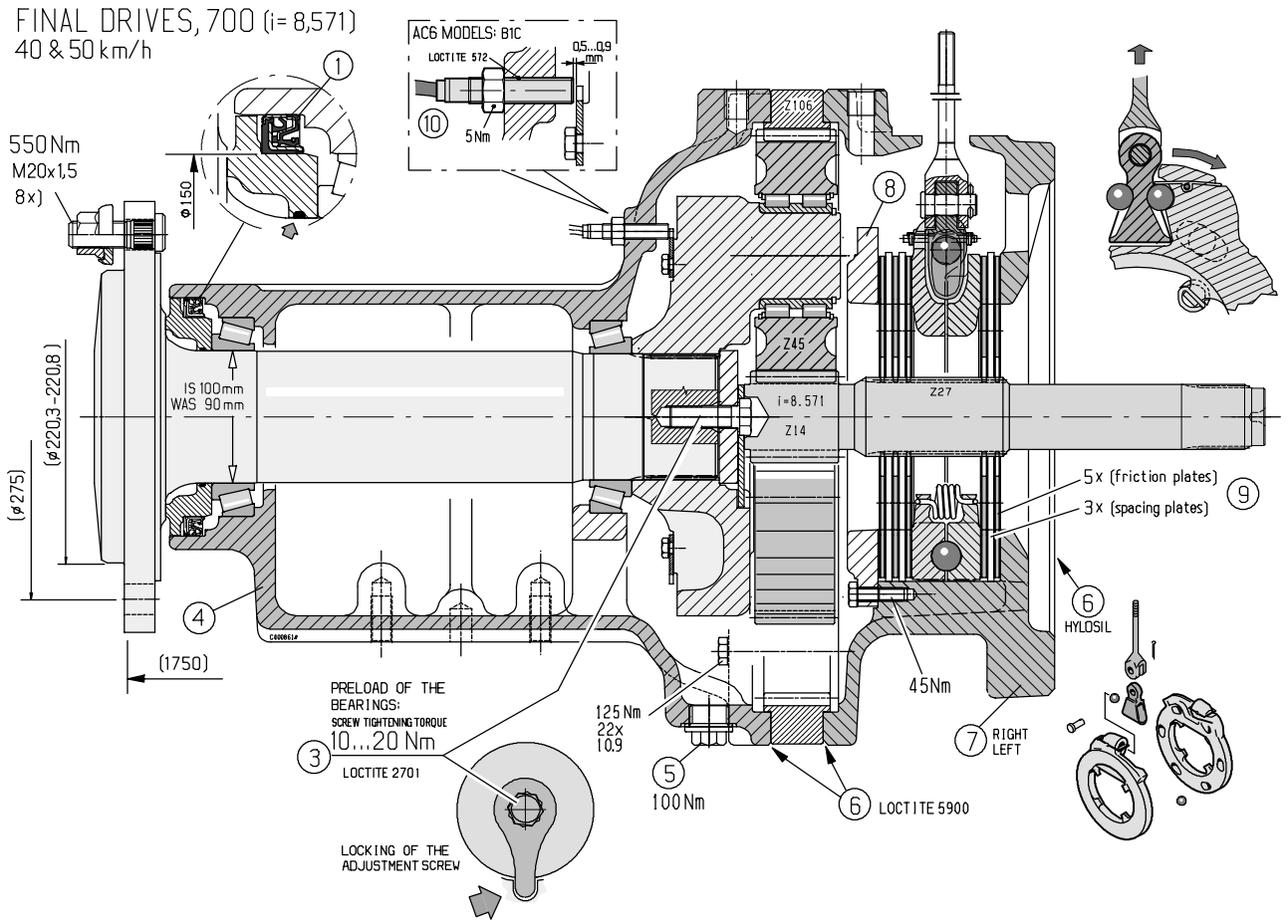
These final drives in 6200–8950 tractors:
– 6200–6400, ***K41106–****.*
– 6250Hi–8950Hi and 6800–8550, ***K36108–, ****).*

1. Hub axle outer oil seal has been changed into a cassette seal (inner oil seal and grease nipple removed)
2. Wind the wire ends one to one and a half turns and bend them
3. Bearing clearance is adjusted by tightening the centre bolt to 10–20 Nm. Apply Loctite 270 onto bolt threads.
4. Axle housing oil volume has been increased.
5. Oil draining plug
6. Sealing compound Hylosil RTV Grade A (UK 0067) onto the ring gear sides
7. Brake housing
8. Support bolt
9. Lower link attachment

Larger oil volume in transmission:
Dipstick min. mark ***45 l***
Max. mark ***55 l***
Extra max. mark ***65 l***

*) Also K26616, K26440, K25332, K25414, K23241, K23423, K23538, K34139, K34211, K34311, K34443, K34511, K35307.

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Picture 6. Final drives 700.

*This final drive is fitted on 8350–8950Hi from chassis number **L32106** incl.*

– Flange distance . . . . . 1750 mm

This final drive is totally new (gear ratio has been changed). The drive shaft diameter has been increased 10 mm.
Planet gears (2) are supported with taper roller bearings.

1. Cassette seal is 10 mm greater than in final gears 650. Between wear ring and drive shaft there is an o–ring.

2. Planet gear

3. Adjusting drive shaft bearing pre–load:
Place the drive shaft with the wheel flange on the floor. Bed in the bearings by rotating the axle housing 20–30 turn. Tighten the centre screw to a torque of **10–20 Nm**. Again rotate the axle housing and check the torque.
Note! After some time of operation the correct bearing clearance will be established.
Turn the lock washer for the centre screw so that the notch on the washer locates in the recess in the planetary retainer. Apply Loctite 2701 onto the threads of locking bolt.

4. Axle housing.

5. Oil draining plug.

Change of transmission oil and cleaning of suction strainer at every 1000 running hours.

6. Apply sealing compound Hylosil RTV Grade A (UK 0067).

7. Brake housing (left and right housings are different).

8. Support brake.
Brake pin has been removed (lugs on the intermediate discs keep the brake parts in place).

9. Brake discs pack is new.
– friction discs 9,5" (243 mm) x 7" (178 mm), 5 pcs.
– intermediate discs (s= 5mm), 3 pcs.

10. Rotation speed sensor for rear axle.

1. Reconditioning final drives (Op no 451)

Note! Both final gear types appear in the illustrations.

A. Removing final drives

Note! The brake housing is not removed from the tractor. E–models have a rotation speed sensor on the RH side final drive.

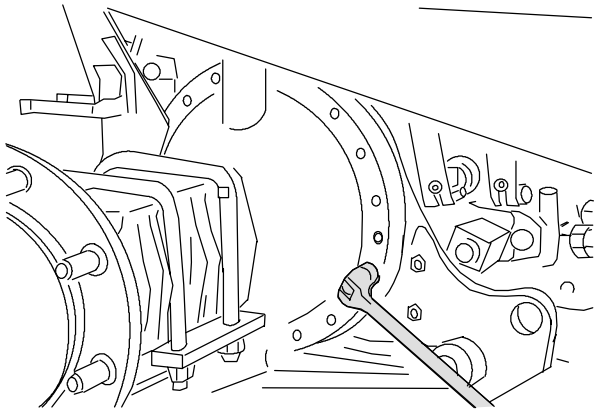
1. Drain the transmission oil (22 mm, 3 plugs). Disconnect the check links from the rear axle housings.

2. Slacken the rear wheel nuts. Raise the rear wheel and remove it. Block up the tractor with an axle stand placed under the front edge of the brake housing.

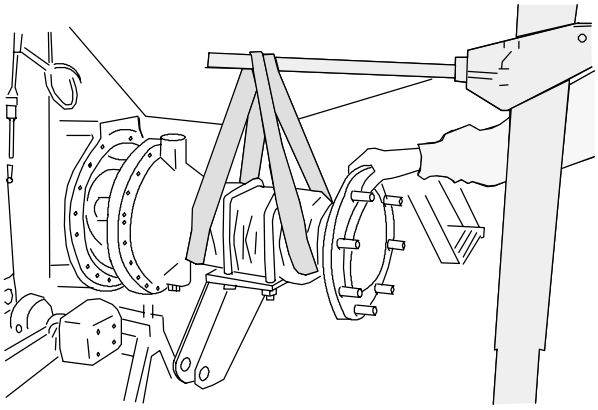
3. Unscrew the cab rear attaching bolts. Disconnect the PTO control cable, pick–up hitch release control and the joint at the lower end of the lewelling screw control rod. Remove all engine hood plates.

4. Raise the cab rear end about 6 cm and support it.

Note! The lifting rope can be attached to the lewelling screw control rod support on the cab rear wall. Do not damage the rear window.



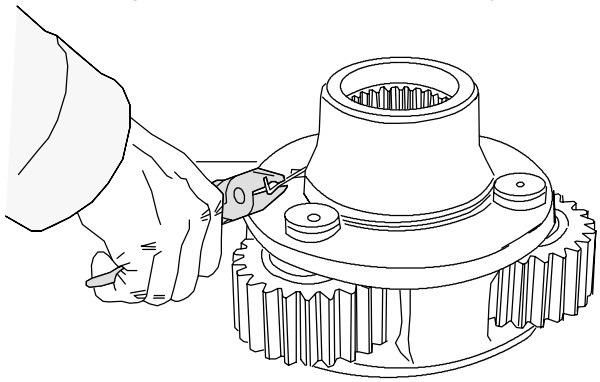
5. Connect a suitable hoist to the rear axle housing. Unscrew the final drive attaching bolts.



6. Pull the housing straight outwards so that it clears the brake housing.

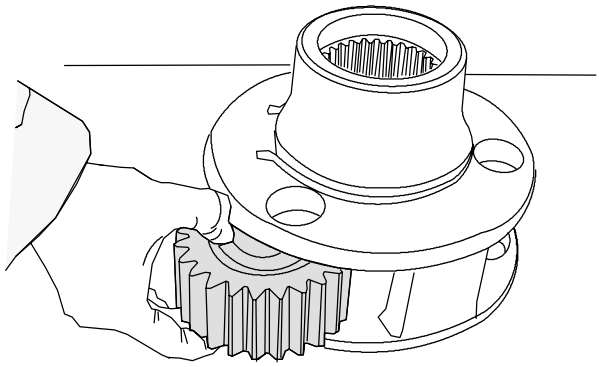
B. Changing needle bearings in planetary gears

1. Remove the lock washer from the centre screw securing the outer drive shaft to the planetary gear and unscrew the screw. The attaching plate remains inside the planetary retainer.



2. Pull the planetary gear off the drive shaft. Cut the locking wire under the locking spring for the planetary gear shaft studs. Remove the locking wire.

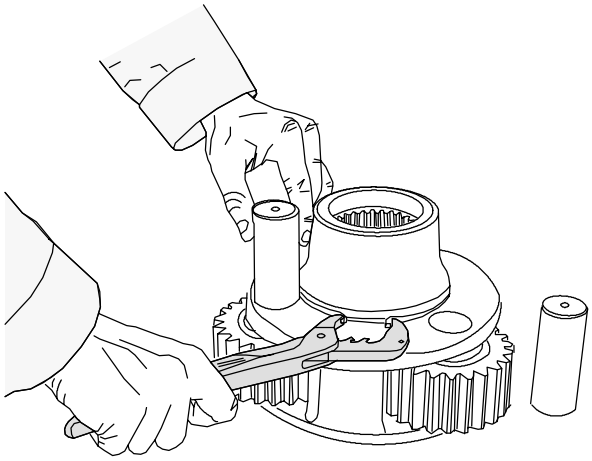
3. Compress the locking spring with a pair of pliers and pull the shaft studs out of the planetary retainer.



4. Remove the planetary gears from the retainer. Push at the wear washers in order to prevent the 2x25 needles in each bearing from falling out. Change the needles. When assembling, fix the needles in position with a little grease.

Note! Note the spacers between the two rows of needles.

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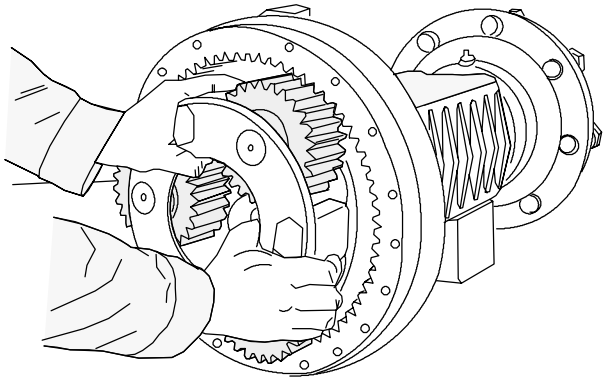
5. Press the bearing wear washers against the sides of the planetary gears and press them into the retainer. Compress the locking spring and push the shaft studs into position and make sure the locking spring engages the groove in the studs.

Note! Fit the attaching plate for the planetary gears retainer before fitting the third planetary gear.

6. Push in 1,5 mm wire under the locking spring when the planetary shaft studs have been fitted and wind the wire ends one to one and a half turns and bend them.

7. a) Models 6100–6400 and 8000: the ring gear is fitted with a tight press fit in the rear axle housing. Remove or fitting the gear should be done using sturdy hydraulic pressing tools.

7. b) Models 6600, 8100 and 8400: the ring gear can be loosened with a drift. Before fitting the ring gear apply sealing compound on the sides of the ring gear.

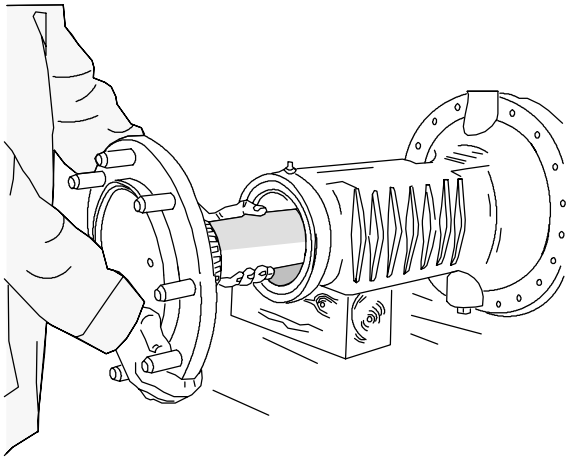


8. Push the planetary gear onto the splines on the outer drive shaft. Secure the planetary gear by tightening the centre screw (24 mm).

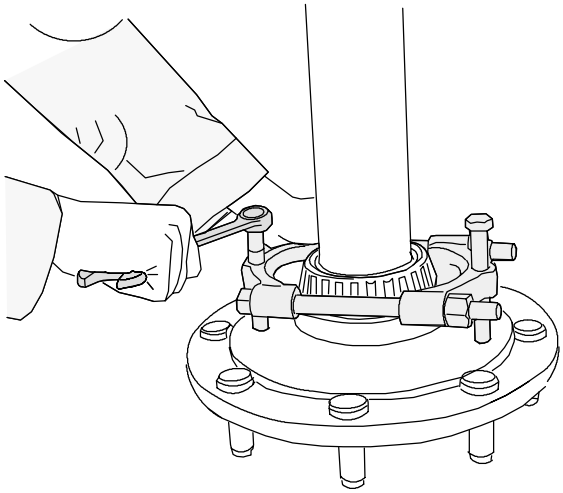
9. Adjust the bearing clearance of the outer drive shaft (paragraph D) and fit the assembly to the tractor (paragraph E).

C. Changing bearings and seals for outer drive shaft

1. Remove the final drives (**instr. A**) and detach the planetary gear (**instr. B: 1–2**).

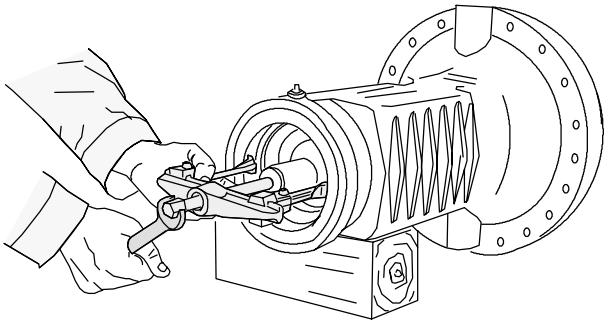


2. Tap at the end of the drive shaft so that it slides out of the bearings. Pull the shaft out of the axle housing.



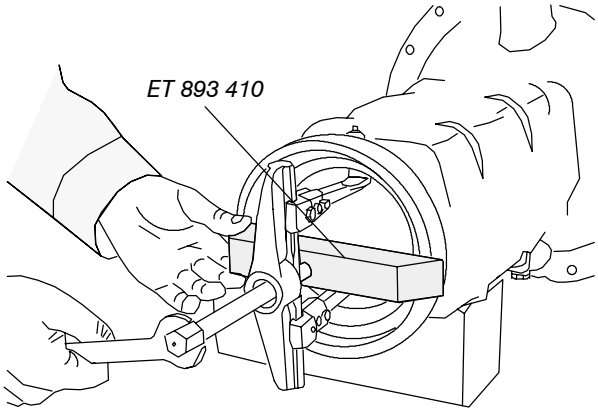
3. Remove the outer drive shaft bearing using a puller. Warm up a new bearing and fit it onto the shaft fully home.

Note! If the wear ring on the shaft has damaged, change it before fitting the bearing.



4. Remove the outer seal for the shaft using a puller (fit a suitable counter hold inside the rear axle housing).

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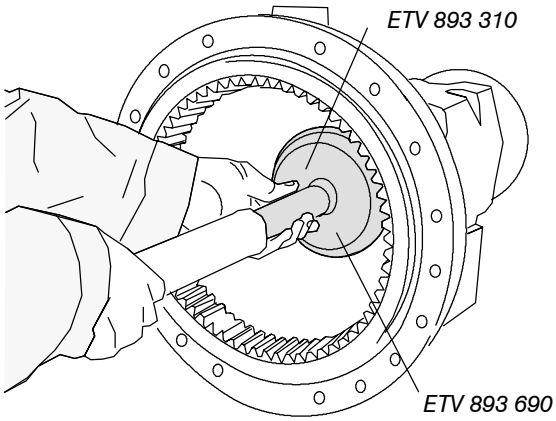
5. Position counter hold ET 893 410 against the rear axle housing and pull out the outer bearing race.

6. **Final gears 650, 6250Hi–8950Hi** (–K36111) and **6600–8750** (J02316–K36111): Remove the plastic ring in front of the inner seal. Lever out the seal, if damaged. Grease lips of a new seal and fit it. Fit the plastic ring in front of the seal.

7. Fit the race of the outer bearing (6000–6400, 6900–8000: ETV 893 320 and universal handle ETV 890 220). Tap it fully home

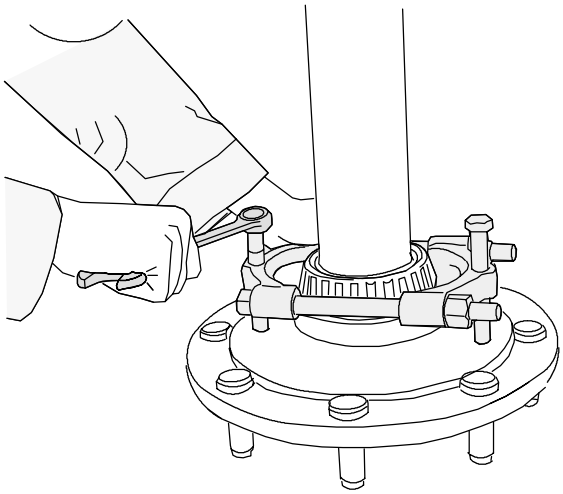
8. **Final gears 300 and 650:** Lubricate the outer oil seal and fit it. Use a sturdy plate for fitting. **Final gears 650 R and 700:** Fit the outer cassette seal of the drive shaft to the axle housing using plate: 650 R, ETV 894 470 and 700, ETV 894 550).
.

9. Remove the inner bearing race using a puller and support ET 893 410. Fit a new bearing race using plate ETV 893 320 **6000–6400, 6900–8000** or ETV 892 260 (**6600–8750**).



10. **Final gears 300 and 450:** Change the inner oil seal of the outer drive shaft. Fit a new seal with plate ETV 893 310 **6000–6400, 6900–8000** (–K41105) or ETV 893 690 **6600–8750** (–J02315)**.**

NOTE! Recommend use the followings ETV–tools to assemble the final drives



11. Put the drive shaft upright with the wheel flange on the floor. Grease the bearings and seals before fitting them.

Final gears 650 and 700: Place the guide pipe on the drive shaft. (650: ETV 894 490) ja (700: 894 560).

Only 650: Put the guide sleeve ETV 894 480 on the inner bearing race of the axle housing
Carefully lift the axle housing into the drive shaft *). Make sure that the seals are not damaged.
Remove the ETV–tools from the drive shaft.

*) HiTech (–K36111) and **6600–8750**, (J02316–K36111) tractors, the inner seal has been moved outwards.
Protect the plastic ring seal using the ETV–tools and grease.

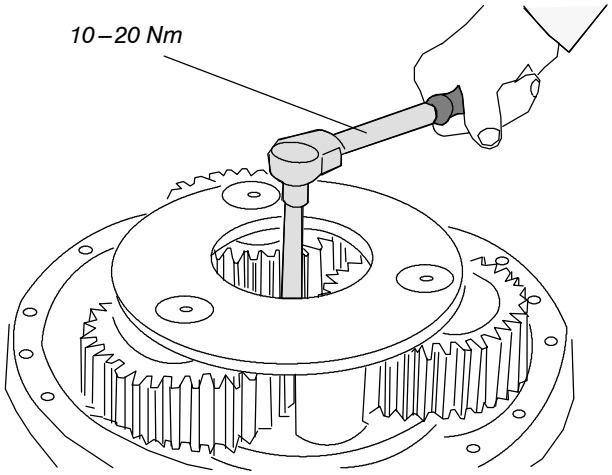
12. Fit the inner bearing on the drive shaft. Fit the planetary gear on the splines on the drive shaft and press the planetary gear home. Fix the planetary gear to the end of the drive shaft with the attaching plate and the screw.

13. Adjust the drive shaft bearing clearance **(instr. D)** and fit the final drives **(instr. E)**.

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D. Adjusting outer drive shaft bearing clearance

1. Place the drive shaft with the wheel flange on the floor. Bed in the bearings by rotating the axle housing 20–30 turn.



2. Tighten the centre screw to a torque of **3–5 Nm**. Again rotate the axle housing and check the torque.

Note! After some time of operation the correct bearing clearance will be established.

3. Turn the lock washer for the centre screw so that the notch on the washer locates in the recess in the planetary retainer.

Note! The lock washer can be fixed with a small amount of grease before fitting the final drives.

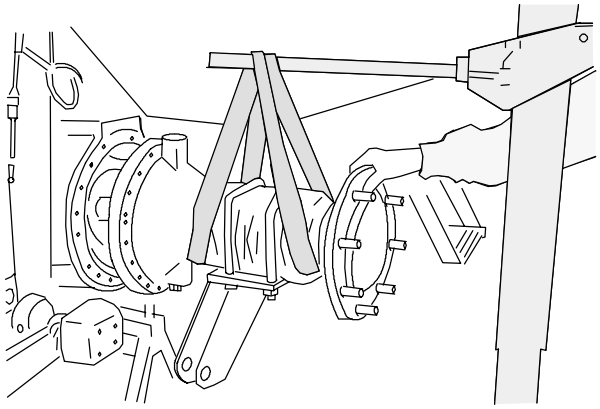
E. Fitting final drive

Note! Push the inner drive shaft fully home into the brake housing so that it is pushed through brake discs and its splines engage the differential.

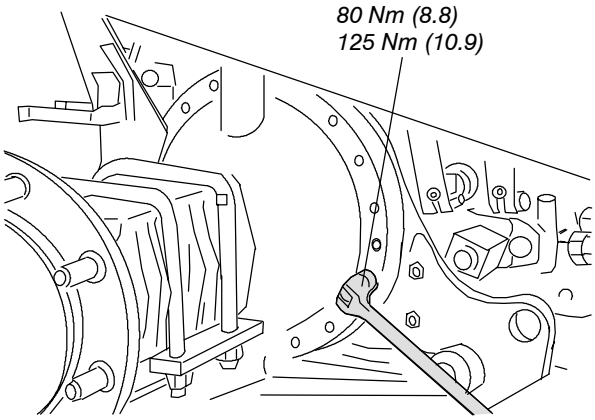
1. a) 300: Place a new o–ring between the rear axle housing and the brake housing. Fix the o–ring in position with a little grease. Apply sealing compound Hylosil RTV silicone Grade 102 (UK 0067) to the contact surfaces.

b) 450/650: Apply sealing compound Hylosil RTV silicone Grade 102 Black (UK 0067) to the ring gear sides and place the ring gear against the rear axle housing.

Note! Make sure that the bolt holes align.



2. Lift up the rear axle housing and move it inwards at right angles so that the inner drive shaft locates between the planetary gears.



3. Tighten the bolts to **80 Nm** (final gears 300) or **125 Nm** (450/650).

4. Press grease through the nipple to the drive shaft outer bearing.

5. Connect the check link to its bracket on the rear axle housing. Fit the rear wheel and tighten the nuts to **550 Nm**. Fill the transmission with oil.

6. Lower the cab rear end and tighten the attaching bolts to **200 Nm**.

7. Connect the PTO control cable, pick–up hitch release control and the joint at the lower end of the lewelling screw control rod. Fit the engine hood plates.

8. Test–drive the tractor and check for leaks.

Note! On E–models, ensure that the speed sensor and its wiring have been connected and check the function of the AC–III/IV units.

46. Power take–off	~~15. 5. 1993~~ 1. 4. 1997	Model 6000–8750	Code 460	Page 1

Contents

General (Op. no. 460)

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Repair instructions (Op. no. 462)

1. Reconditioning power take–off:

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Front PTO (Op. no. 463):

Front PTO on 6000–8400 1
Front PTO on 8450–8750 6

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Technical data

PTO is controlled with a control lever:
– engine PTO is engaged at low engine revs.
– ground speed PTO is engaged while the tractor is stationary
PTO shafts (changeable):
– ø 35 mm (1 3/8") ISO 500, as standard 6–splines
– ø 35 mm (1 3/8") ISO 500, option 21–splines
– ø 45 mm (1 3/4") ISO 500, option 20–splines
– ø 45 mm (1 3/4") ASAE, option 6–splines
– ø 38 mm GOST 3480–58, option 8–splines

At outputs over 50 kW, use 21–splines shaft. In heavy ground speed PTO use is recommended the 20–splines shaft.
Use, if necessary, a torque limiting clutch (1000 Nm)

Engine PTO, ratios:
– PTO speed 540 r/min at engine speed . . . . . 1874 r/min
– PTO speed 540E r/min at engine speed . . . . . 1539 r/min
– PTO speed 1000 r/min at engine speed . . . . . 2080 r/min
– PTO speed 1000E r/min at engine speed (8350Hi) . . . . . 1750 r/min
Ground speed PTO, ratios on tractors with a 2–step quick–shift gear (concerning DPS models, see the next page).
– 1 rear wheel revolution corresponds (6100–6400, 8000; 30 km/h) . . . . . 31,0764 PTO shaft revolutions
– 1 rear wheel revolution corresponds (6100–6400, 8000; 40 km/h) . . . . . 31,0613 PTO shaft revolutions
– 1 rear wheel revolution corresponds (6600, 8100, 8400; 30 km/h) . . . . . 40,9799 PTO shaft revolutions
– 1 rear wheel revolution corresponds (6600, 8100, 8400; 40 km/h V) . . . . . 40,9600 PTO shaft revolutions
– 1 rear wheel revolution corresponds (6600, 8100, 8400; 40 km/h F) . . . . . 30,2796 PTO shaft revolutions
– 1 rear wheel revolution corresponds (6600, 8100, 8400; 50 km/h) . . . . . 32,6308 PTO shaft revolutions

PTO multi–disc clutch:
– clutch pressure 1,8 MPa (from low pressure circuit of hydraulic system).
– PTO clutch solenoid valve is fitted on the servo valve block. In the PTO clutch there is fitted a PTO brake. In addition, the system has a cushioning valve for engagement.
– friction discs 7 pcs (–660476). 6000–6400 6 pcs (660477–) and 6600–8400 8 pcs (660477–)
– steel discs 6 pcs (–660476). 6000–6400 5 pcs (660477–) and 6600–8400 7 pcs (660477–)
Note! On the latest 6000–8750 tractors there are 8 friction discs and 7 steel discs in the PTO clutch.

PTO unit differences on different transmission types on tractors with 2–step quick–shift gear:

(Markings on the later PTO units, see the next page 460/2A).

	Transmission 30 km/h	**Transmission 40 km/h**
Upper shaft 540/1000 r/min	gears Z25/17	Z25/17
Upper shaft 540/540E r/min	gears Z20/17	Z20/17
PTO shaft gears for 540/540E/1000 r/min	Z59/57/52	Z59/57/52
PTO shaft foremost gearwheel for ground speed PTO	Z31	Z25
Gearwheel on the ground speed PTO shaft	Z22	Z24

Note! On E–models, there is an impulse disc on the PTO shaft for measuring PTO shaft speed. On power take–off units without ground speed PTO, there is not a ground speed PTO shaft (lowest) and a ground speed PTO gearwheel at the front end of the PTO shaft. Instead of this gearwheel, there is fitted a spacer ring and spacer sleeve. In addition, the front bearing of the PTO shaft is a ball bearing.

Settings

Clearance of the ground speed PTO shaft bearings . . . . . 0,025–0,075 mm
Clearance of the PTO clutch shaft bearings . . . . . 0,025–0,075 mm
Clearance between PTO shaft rear bearing and PTO shaft oil seal is adjusted to zero with shims.

Tightening torques

Frame joint between gearbox–PTO housing:
– upper stud nuts (8 pcs) . . . . . 270–330 Nm
– lower stud nuts (6 pcs) . . . . . 72–88 Nm
Front cover of the PTO unit . . . . . 72–88 Nm
Shaft nut on the ground speed PTO shaft . . . . . 260–280 Nm
Locking plate for the clutch shaft adjusting nut . . . . . 21–25 Nm
Locking flange at the front end of the PTO shaft (earlier version) 190–210 Nm
Locking bolt at the front end of the PTO shaft (later version) . . . 225 Nm

Locking fluids and sealing compounds used

Sealing compound Hylosil RTV Grade 102 black between gearbox–PTO unit
Sealing compound Loctite 542 on PTO speed sensor threads (only 6600E and 8100E–models).
Activator Loctite747 + locking fluid Loctite 270 onto the locking flange at the front end of the PTO shaft (earlier version).

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Markings on the PTO units, 662134–.

With effect from tractor ser. no. **662134** the PTO units have been marked with number codes. The purpose is to make it easier to recognize different PTO units when changing tyres, when modifying and repairing the PTO units and in connection with possible repair works. The PTO ratios were modified when the Delta Powershift unit was introduced.

Transmission 300 (PTO 300) **and 390** (PTO 450) **: 6000–6400** (–K41105)**, 6900, 8000** (–K36111)**.** Transmission 550 replaces transmissions 300 and 390. In transmission 550, the long PTO shaft diam. is 30 mm.

Code	Type	Z	Ratio of AVO
1	540+1000		
2	540+1000+AVO	Z25/24	A, B/38,62 C, D, L, K/31,06 J,M/42,04
3	540+1000+AVO	Z31/22	A, B/28,55 C, D, L, K/22,96 J, M/31,08
4	540+540E		
11	540+540E +AVO	Z25/24	A, B/38,62 C, D, L, K/31,06 J, M/42,04
12	540+540E+AVO	Z31/22	A, B/28,55 C, D, L, K/22,96 J, M/31,08
15	540+1000+AVO	Z26/20	A, B/30,95 C, D, L, K/24,89 J, M/33,68
16	540+540E+AVO	Z26/20	A, B/30,95 C, D, L, K/24,89 J, M/33,68

Transmission 450 (PTO 450) **: 6600–6800** (–G01400)**, 8100–8400** (–668102) (DPS reduction–direct–overdrive)

5	540+1000		
6	540+1000+AVO	Z25/24	E, F/40,96 G, H/55,43 I, N/32,63
7	540+1000+AVO	Z31/22	E, F/30,28 G, H/40,98 I, N/24,12
8	540+540E		
9	HD 1000+AVO	Z25/24	E, F/40,96 G, H/55,43 I, N/32,63
10	HD 1000+AVO	Z31/22	E, F/30,28 G, H/40,98 I, N/24,12
13	540+540E+AVO	Z25/24	E, F/40,96 G, H/55,43 I, N/32,63
14	540+540E+AVO	Z31/22	E, F/30,28 G, H/40,98 I, N/24,12
17	540+1000+AVO	Z26/20	E, F/32,82 G, H/44,42 I, N/26,15
18	540+540E+AVO	Z26/20	E, F/32,82 G, H/44,42 I, N/26,15
19	HD 1000+AVO	Z26/20	E, F/32,82 G, H/44,42 I, N/26,15
20	HD 1000		

Transmission 460 (PTO 450) **: 8200, 8400** (668103–), **8050 and 8150** (–F32103) (DPS direct–overdrive–overdrive)

5	540+1000		
6	540+1000+AVO	Z25/24	R, S/40,96 O, P/50,93
7	540+1000+AVO	Z31/22	R, S/30,28 O, P/37,65
8	540+540E		
9	HD 1000+AVO	Z25/24	R, S/40,96 O, P/50,93

AVO=ground speed PTO.
HD=Heavy Duty PTO, see page 460/6.
Z=number of teeth of the gears for the ground speed PTO (in the PTO unit).
Ratio of AVO=E.g. PTO shaft end rotates 38,62 turns/1 turn of the rear wheels.
Letters in front of ratio means different gearbox types, see page **420**/**2A** and **2B**.

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Transmission 460 (PTO 450) **: 8200, 8400** (668103–), **8050 and 8150** (–F32103)

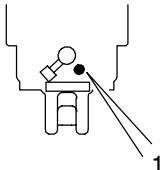
Code	Type	Z	Ratio of AVO
10	HD 1000+AVO	Z31/22	R, S/30,28 O, P/37,65
13	540+540E+AVO	Z25/24	R, S/40,96 O, P/50,93
14	540+540E+AVO	Z31/22	R, S/30,28 O, P/37,65
17	540+1000+AVO	Z26/20	R, S/32,82 O, P/40,81
18	540+540E+AVO	Z26/20	R, S/32,82 O, P/40,81
19	HD 1000+AVO	Z26/20	R, S/32,82 O, P/40,81
20	HD 1000		

Transmission 650 (PTO 650) **: 8350–8750, 8050 and 8150** (F32104–), **6600–6800** (G01401–), **6650Hi–8950Hi, Transmission 550** (PTO 650) **: 6250Hi–6550Hi** (K36112–), **6200–6400** (K41106–).

Note! If on HiTech tractors the PTO speeds are changed, the AC V control unit A1 must be reprogrammed, i.e. the new parameter file must be input**, –J38342** or PTO parameters (ratios) must be set in the setting mode, **J38343–**, see code 370.

Code	Type	Z	Ratio of AVO
21	540+1000		
22	540+540E		
23	540+1000+AVO	Z26/20	T/40,81 U/40,81 V/32,82 Y/32,82
24	540+540E+AVO	Z26/20	T/40,81 U/40,81 V/32,82 Y/32,82
25	HD 1000		
26	HD 1000+AVO	Z26/20	T/40,81 U/40,81 V/32,82 Y/32,82
27	540+1000+AVO	Z31/22	T/37,65 U/37,65 V/30,28 Y/30,28
28	540+540E+AVO	Z31/22	T/37,65 U/37,65 V/30,28 Y/30,28
29	HD 1000+AVO	Z31/22	T/37,65 U/37,65 V/30,28 Y/30,28
30	540+1000+AVO	Z25/24	T/50,93 U/50,93 V/40,96 Y/40,96
31	540+540E+AVO	Z25/24	T/50,93 U/50,93 V/40,96 Y/40,96
32	HD 1000+AVO	Z25/24	T/50,93 U/50,93 V/40,96 Y/40,96
33	1000+540E		
34	1000+540E+AVO	Z25/24	T/50,93 U/50,93 V/40,96 Y/40,96
35	1000+540E+AVO	Z31/22	T/37,65 U/37,65 V/30,28 Y/30,28
36	1000+540E+AVO	Z26/20	T/40,81 U/40,81 V/32,82 Y/32,82
37	540E+1000E		
38	540E+1000E+AVO	Z25/24	T/50,93 U/50,93 V/40,96 Y/40,96
39	540E+1000E+AVO	Z31/22	T/37,65 U/37,65 V/30,28 Y/30,28
40	540E+1000E+AVO	Z26/20	T/40,81 U/40,81 V/32,82 Y/32,82

AVO=ground speed PTO.
HD=Heavy Duty PTO, see page 460/6.
Z=number of teeth of the gears for the ground speed PTO (in the PTO unit).
Ratio of AVO=E.g. PTO shaft end rotates 38,62 turns/1 turn of the rear wheels.
Letters in front of ratio means different gearbox types, see page **420**/**2A** and **2B**.



The number code has been stamped on the PTO unit.

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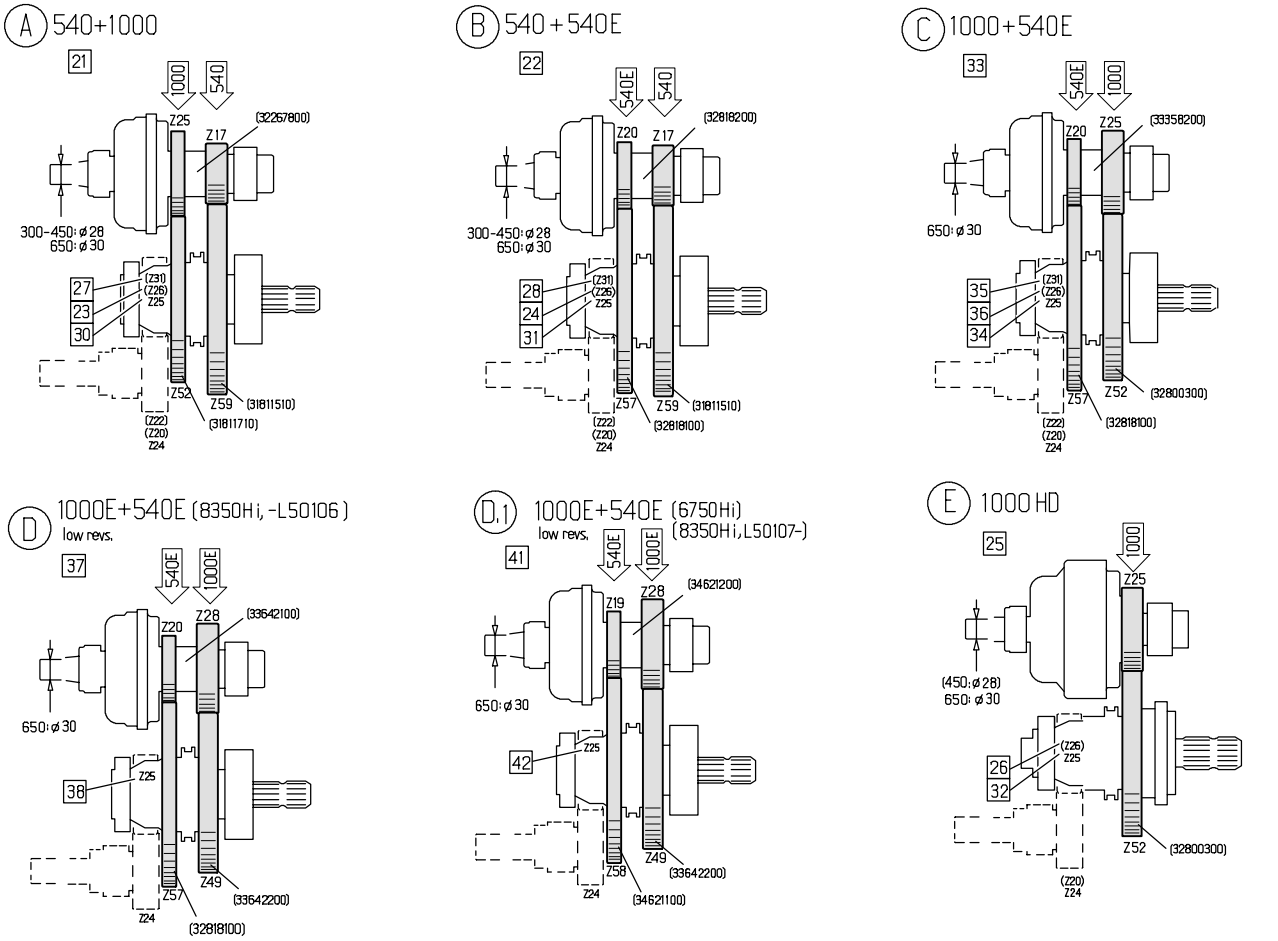
Transmission 650: (PTO 650)**: 8350–8750, 8050 ja 8150** (F32104–)**, 6600 ja 6800** (G01401–)**, 6250Hi–8950Hi** (K36108–), **8350Hi–8950Hi** (–L32105)

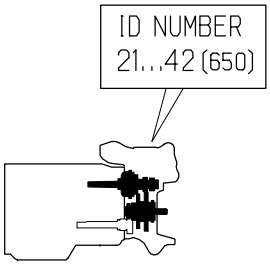
Transmission 550: (PTO 650)**: 6200–6550Hi** (J12242–), **6200–6400** (K41106–).
Transmission 700: (L32106–), **8350Hi–8950Hi**

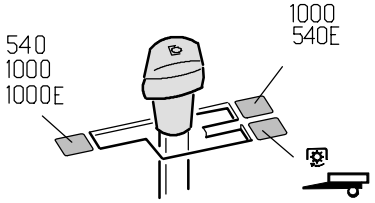
Note! If on HiTech tractors the PTO speeds are changed, the AC V control unit A1 must be reprogrammed, i.e. the new parameter file must be input**, –J38342** or PTO parameters (ratios) must be set in the setting mode, **J38343–**, see code 370.

Code	Type	Z	Ground speed PTO ratio
37	540E+1000E		
38	540E+1000E+AVO	Z25/24	JA/40,96
39	540E+1000E+AVO	Z31/22	JA/30,28
40	540E+1000E+AVO	Z26/20	JA/32,82
41	540E+1000 E		
42	540E+1000E+AVO	Z25/24	JA/40,96

PTO VARIATIONS







1000 r/min at engine speed 2080 r/min (Z52/25)
1000 r/min at engine speed 1750 r/min, 1000E (Z49/28)
540 r/min at engine speed 1874 r/min (Z59/17)
540 r/min at engine speed 1539 r/min, 540E (Z57/20)
540 r/min at engine speed 1648 r/min, 540E (Z58/19)

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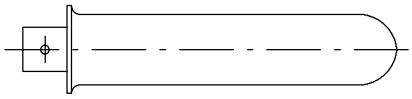
Special tools

A

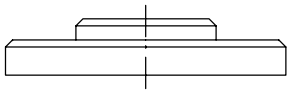
ETV 890 220	Universal handle
ETV 891 870	Plate for fitting PTO shaft seal (Gearbox 505–905)
ETV 894 080	Drift for fitting selector fork rail locking ball (Gearbox 6100–8100)
ETV 894 420	Ring for fitting PTO shaft new cassette seal (to be used with below listed sleeves)
ETV 894 430	Sleeve (ø 35) for fitting PTO shaft new cassette seal (to be used with above mentioned ring)
ETV 894 440	Sleeve (ø 44,6) for fitting PTO shaft new cassette seal (to be used with above mentioned ring)

B

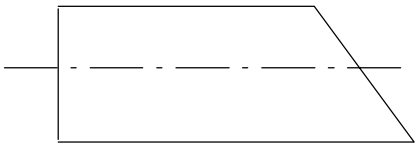
ET 894 000	Tool for unscrewing locking flange (earlier version) at front end of PTO shaft (Steering system 505–905)
ET 894 090	Sleeve for fitting PTO clutch circlip



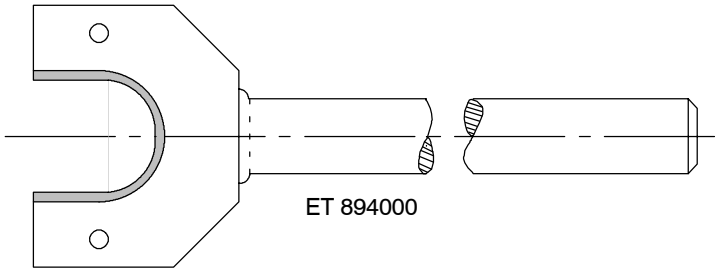
ETV 890220



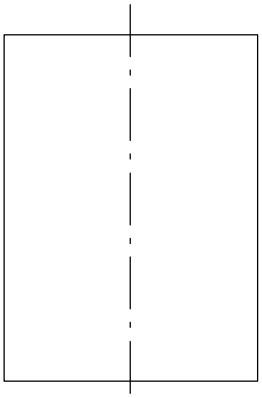
ETV 891870



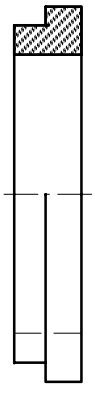
ETV 894 080



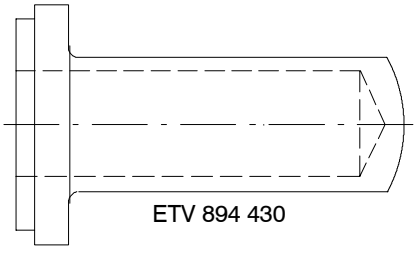
ET 894000



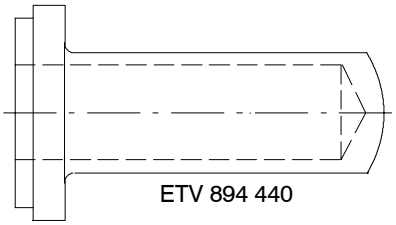
ET 894 090



ETV 894 420



ETV 894 430



ETV 894 440

Max. PTO output at 1000 r/min (at engine revs 2080 r/min kW (hv))														
6000	**6100**	**6300**	**6400**	**6600**	**6800**	**8000**	**8050**	**8100**	**8150**	**8200**	**8400**	**8450**	**8550**	**8750**
45 (61)	49 (67)	53 (72)	60 (81,5)	66 (90)	73 99)	63,5 (86)	69 (94)	76 (103)	79,5 (108)	81,5 (111)	92 (125)	92 (125)	104 (141)	124 (169)

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Power take–off, description

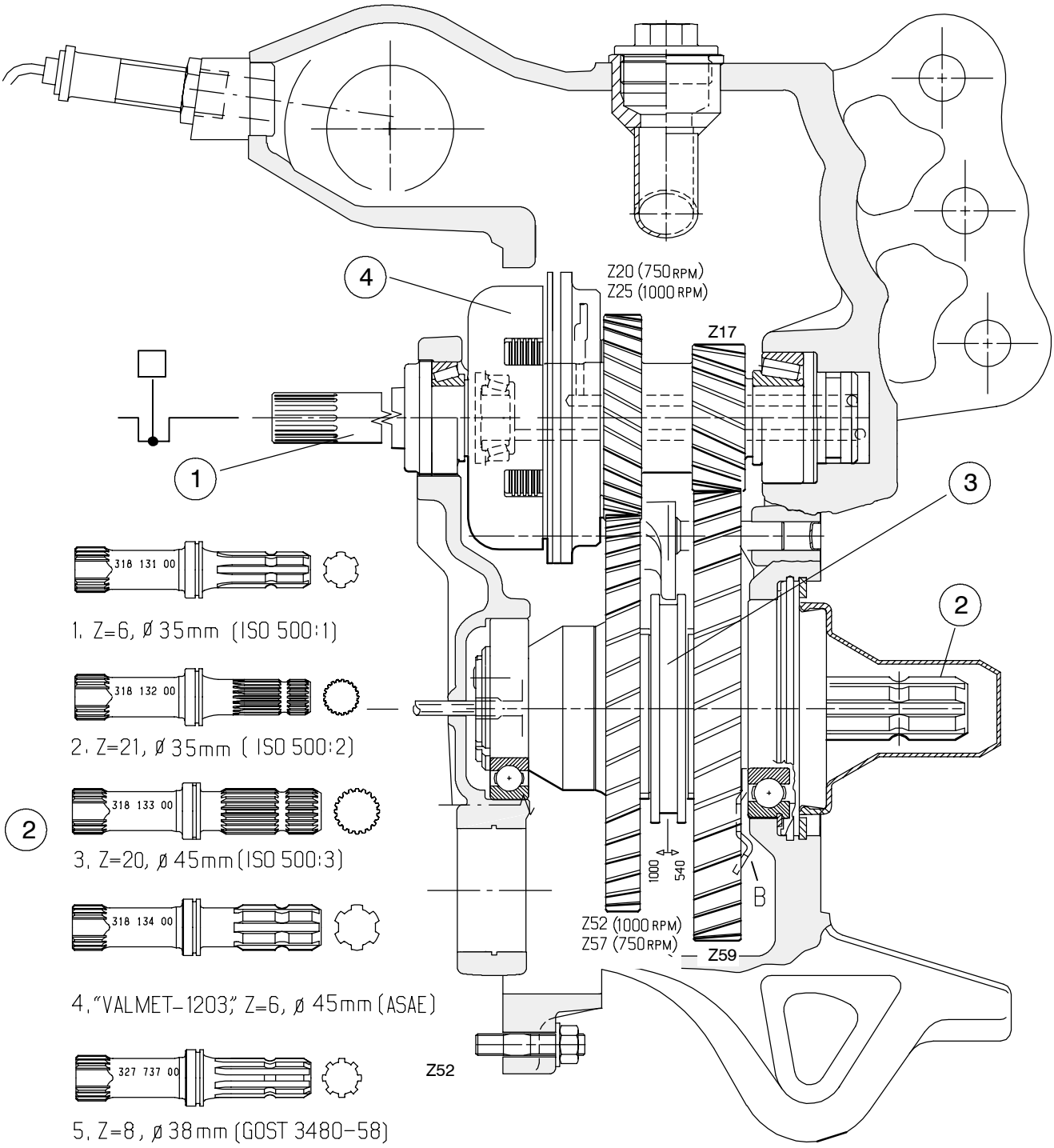


Figure 1. *PTO 540/1000 r/min* and *PTO 540/750 r/min.*

Front end of shaft (1) is connected to the coupling sleeve in the pump drive mechanism at the rear end of the gearbox input shaft. Shaft (1) is rotated by the pump drive shaft from the engine flywheel. Shaft (1) front end together with the PTO clutch drum (4) always rotate when the engine is running.

When there is no oil pressure in the PTO clutch, power is not transmitted to the PTO shaft (2). Now the PTO brake cup springs engage the brake which prevents upper shaft gearwheels from rotating

When pressurised oil acts in the PTO clutch, the clutch is engaged (and the brake is released) and power is transmitted to the PTO shaft gearwheels. When sliding coupler (3) is in the front position, 1000 r/min PTO or 750 PTO has been engaged. When the coupler is in the rear position, 540 r/min PTO has been engaged.

Note! In the picture above the locking flange at the front end of the PTO shaft (2) is the earlier version. Later version is illustrated on page **460/7**. Additionally, the clutch housing has been reinforced with a metal ring, see page **460/9**.

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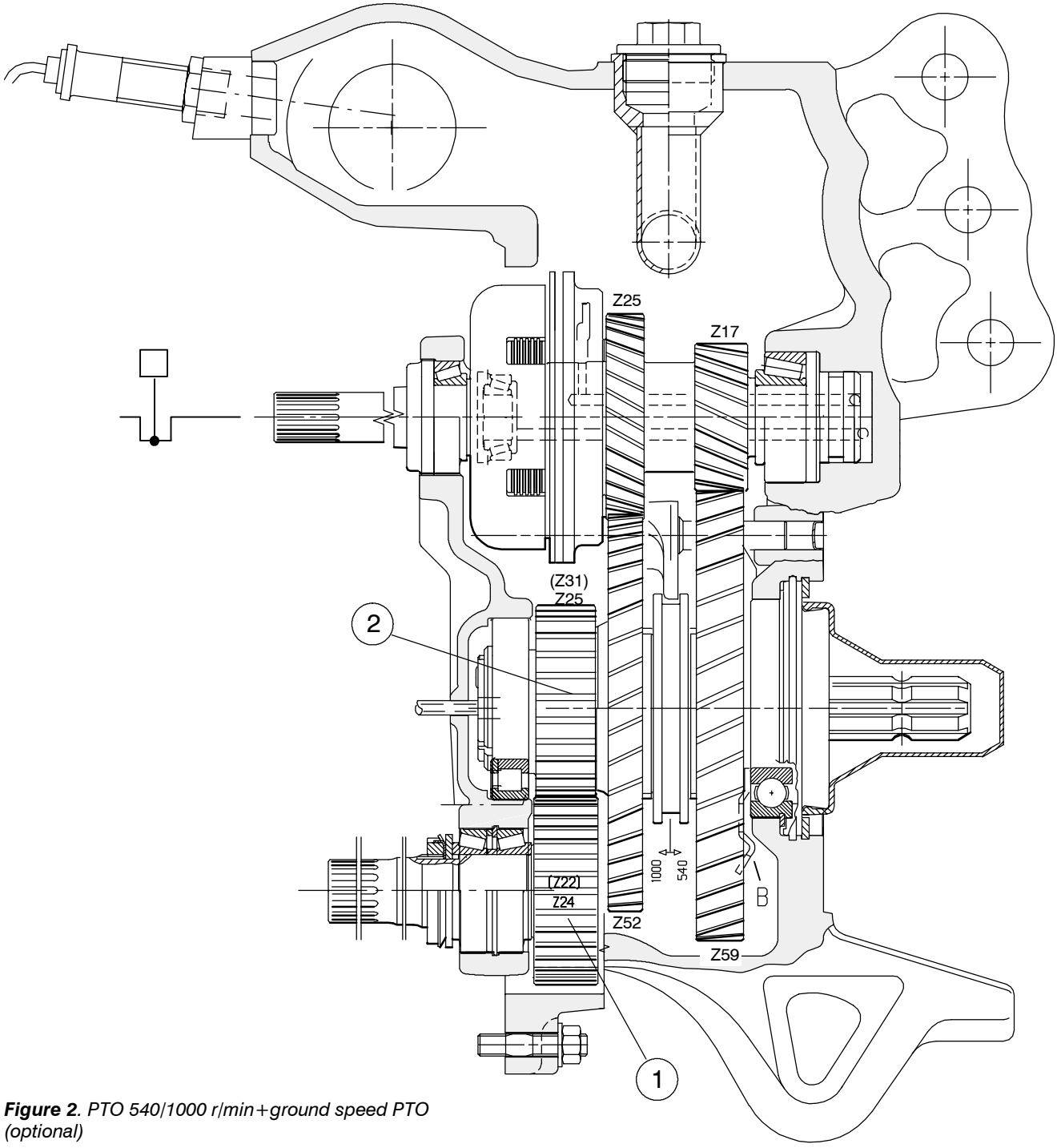


***Figure 2**. PTO 540/1000 r/min+ground speed PTO (optional)*

On this PTO unit, nominal speeds 540 and 1000 r/min are obtained in the same way as on a PTO unit without ground speed PTO (see figure 1)

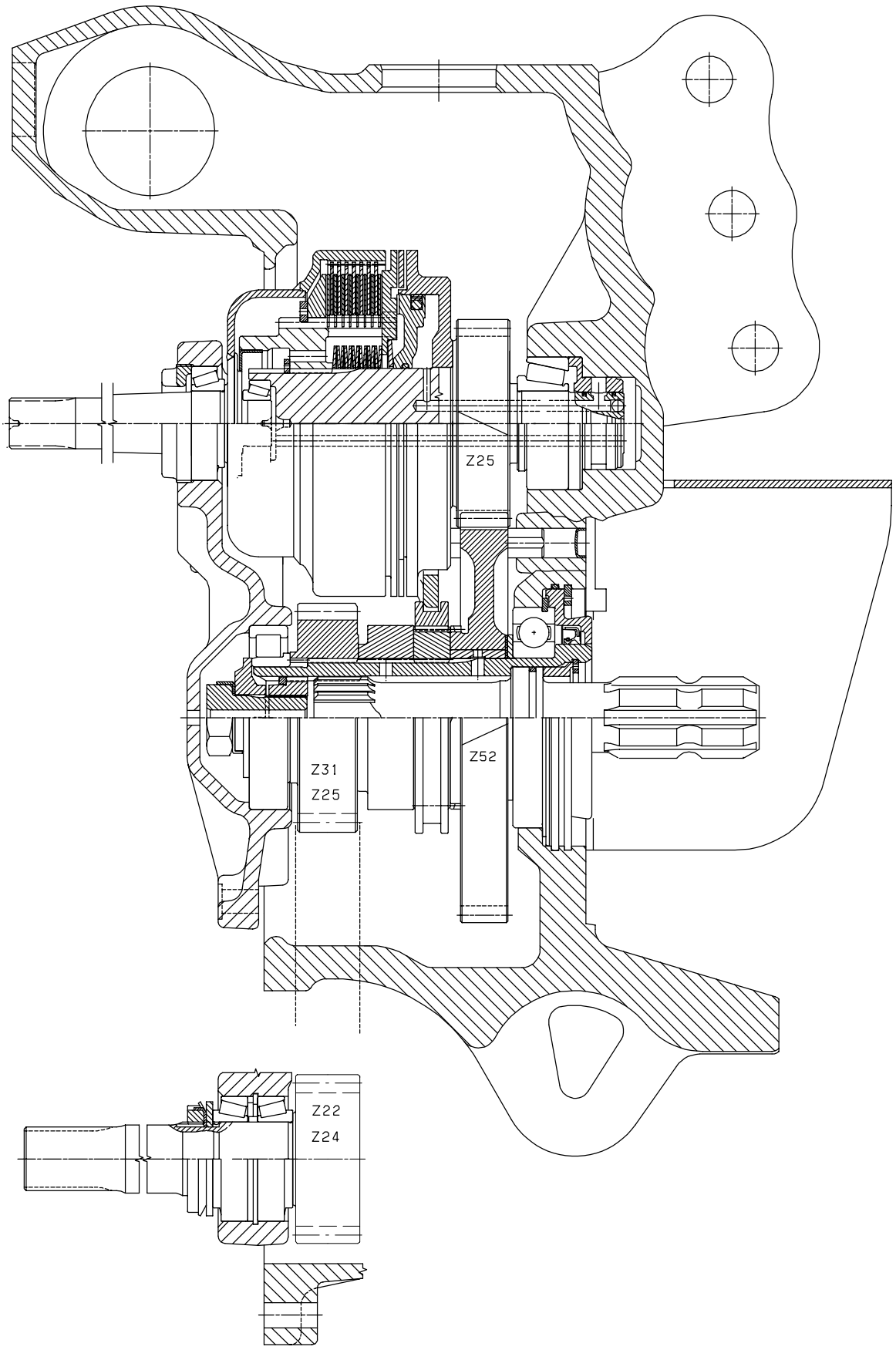
In the figure above shaft (1) is for ground speed PTO. Its front end has been connected with a coupling sleeve to the rear end of the ground speed PTO output shaft in the gearbox. There is a sliding coupler for the ground speed PTO at the front end of the gearbox bevel pinion shaft.

The ground speed PTO is engaged with the same control lever as the engine PTO speeds 540 and 1000 r/min.

When the ground speed PTO has been engaged, the PTO shaft rotates proportional to the rear wheel rotation speed and power is transmitted from gear (1) to gear (2) on the PTO shaft.

Note! In the picture above the locking flange at the front end of the PTO shaft is the earlier version. Later version is illustrated on page **460**/**7**. Additionally, the clutch housing has been reinforced with a metal ring, see page **460**/**9**.

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Picture 3. *Heavy Duty PTO (6600–8400, not 8000)*

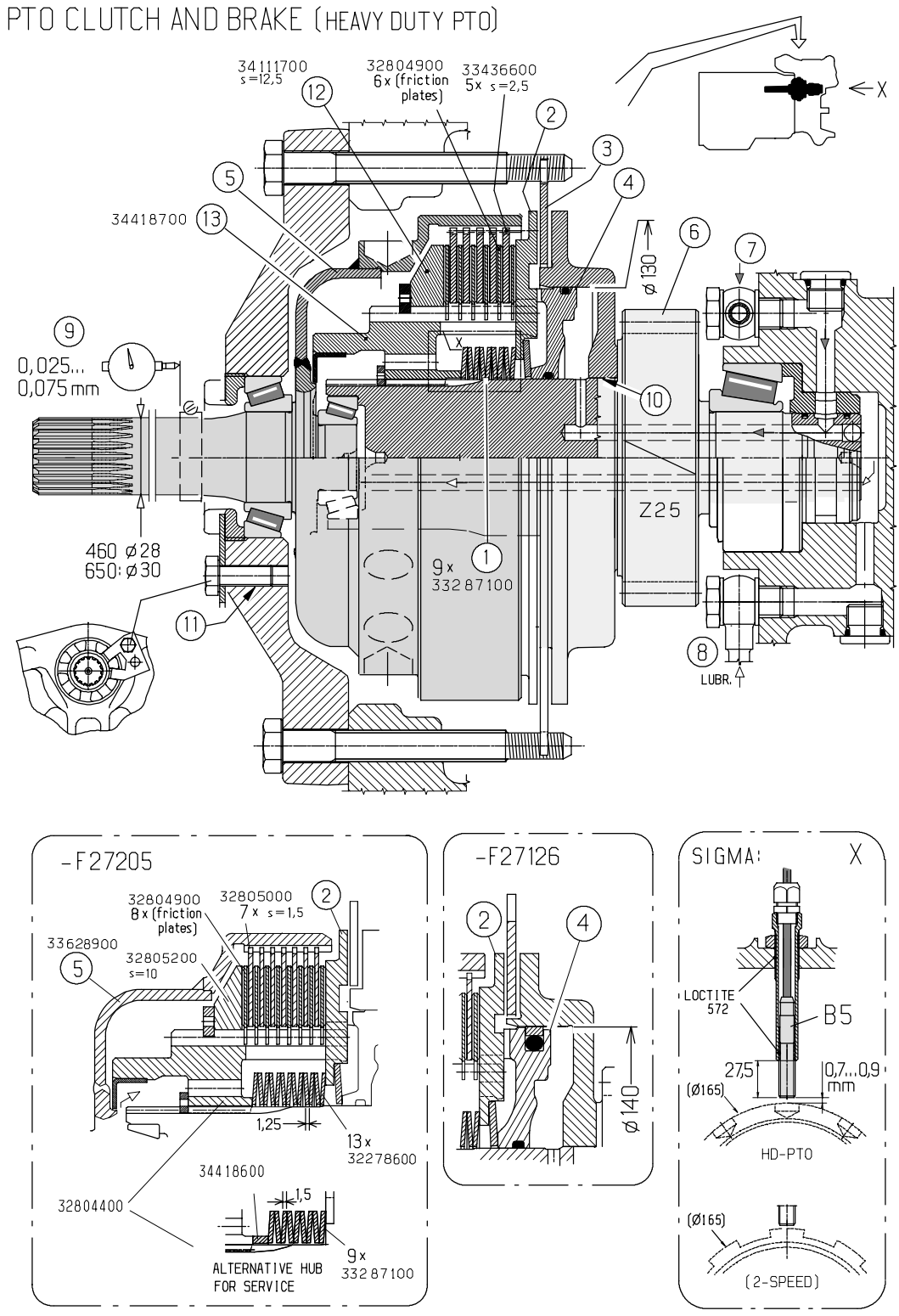
This PTO unit is optional equipment which can be used in very heavy work.

The heavy duty PTO has an engine PTO 1000 r/min and ground speed PTO which is available in two different ratios (V and F, see Technical Data).

Note! The hardening depth of the clutch shaft has been increased. On these shaft E is marked on the rear side of the shaft. These shafts should always be fitted as a spare part.

Note! This PTO is standard on 8750 tractor. On this tractor for Σ–power system, there is an impulse wheel on the PTO clutch outer circumference and a speed sensor, see under code 313. The drive shaft diameter is then 30 mm.

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Picture 3A. *Heavy Duty PTO clutch*

1. Cup springs (13 pcs)
2. Pressure plate
3. Brake plate
4. Piston
5. Shaft + drum
6. Gear weheel
7. Pressure oil
8. Lubricating oil
9. Adjustment of bearing clearance
10. Press–fit
11. Apply Loctite 242 to the threads
12. Counter hold
13. Hub

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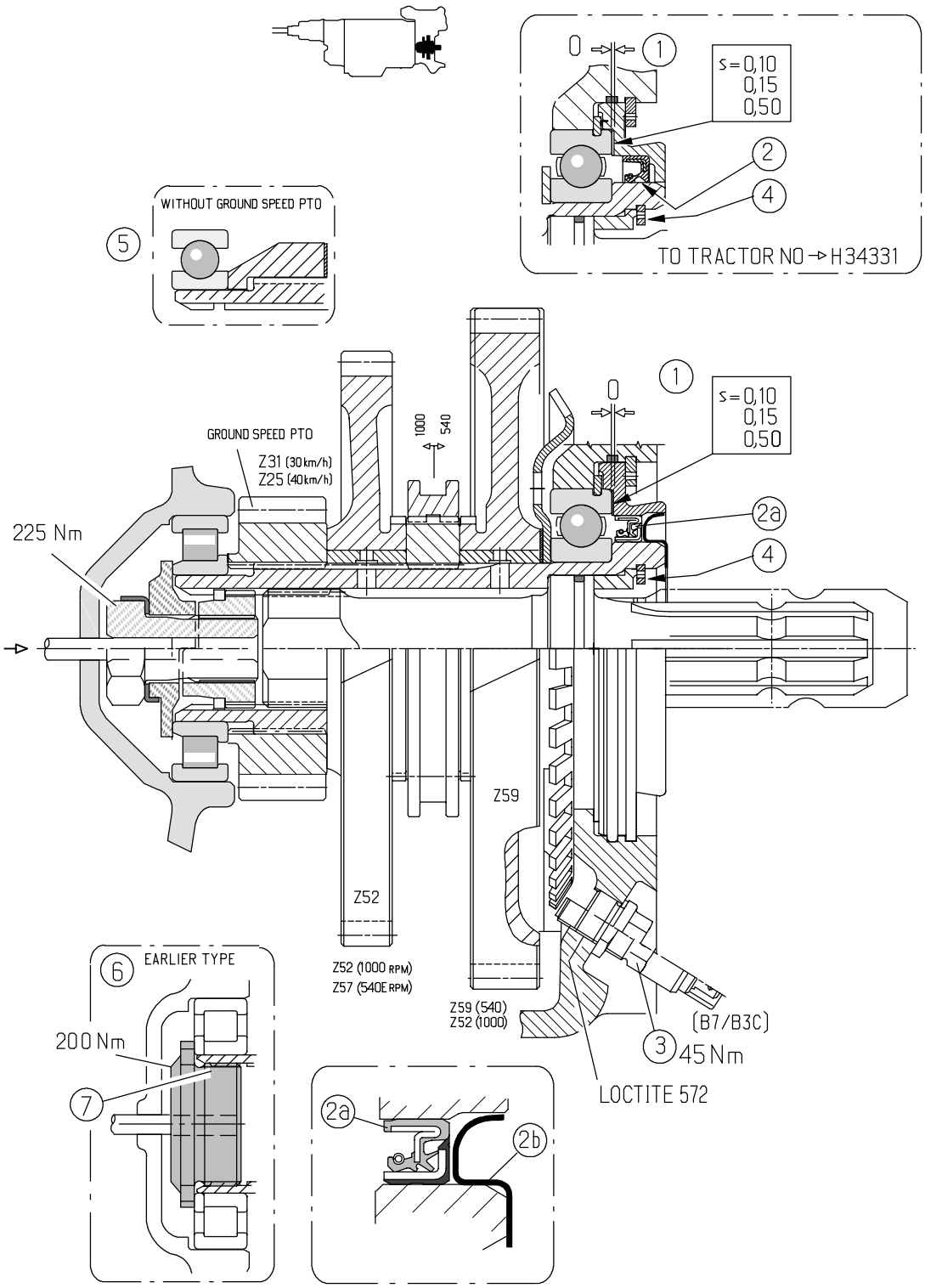


Figure 4. *PTO shaft*

1. Clearance is adjusted to zero with shims
2. Universal grease
2a. Cassette seal (H34332–). Fitting instruction, see page 462/8A.
2b. Protective cup for cassette seal
3. PTO rotation speed sensor (only E–models)
4. Circlip
5. Unit without ground speed PTO
6. Earlier type locking flange at the PTO shaft front end
7. First activator Loctite 747 (reaction time 15–20 seconds) onto the shaft and flange threads. Then locking fluid Loctite 270 and tighten the flange to 200 Nm with special wrench ET 894 000.

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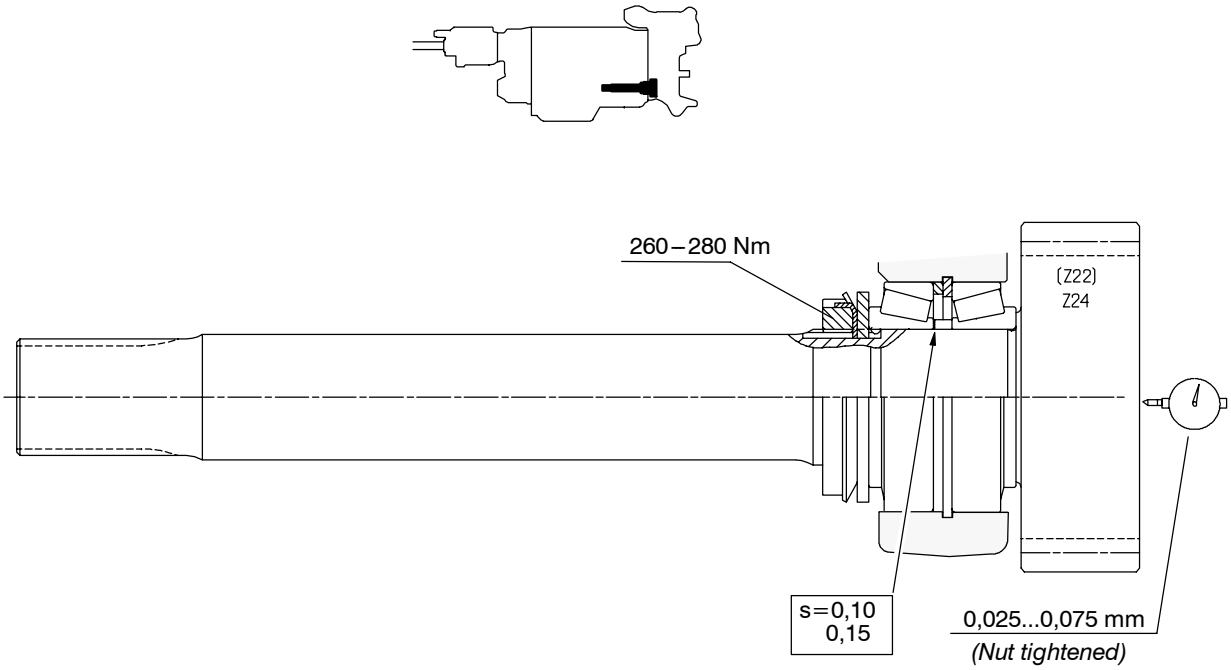
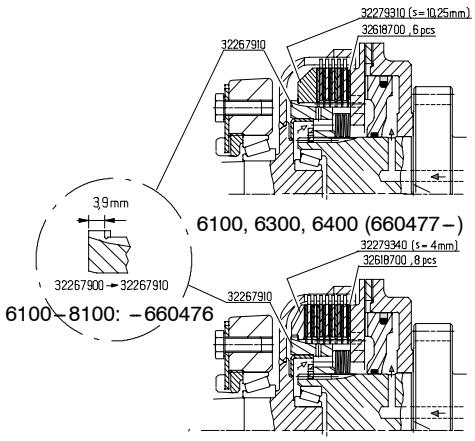


Figure 5. *Proportional ground speed PTO shaft (optional)*

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PTO multi–disc clutch

Pressurised oil to the clutch is conducted from the servo valve block (on gearbox LH side) via internal piping to the rear end of the PTO clutch shaft (6) and onwards via drilling to the oil space behind the piston (4)



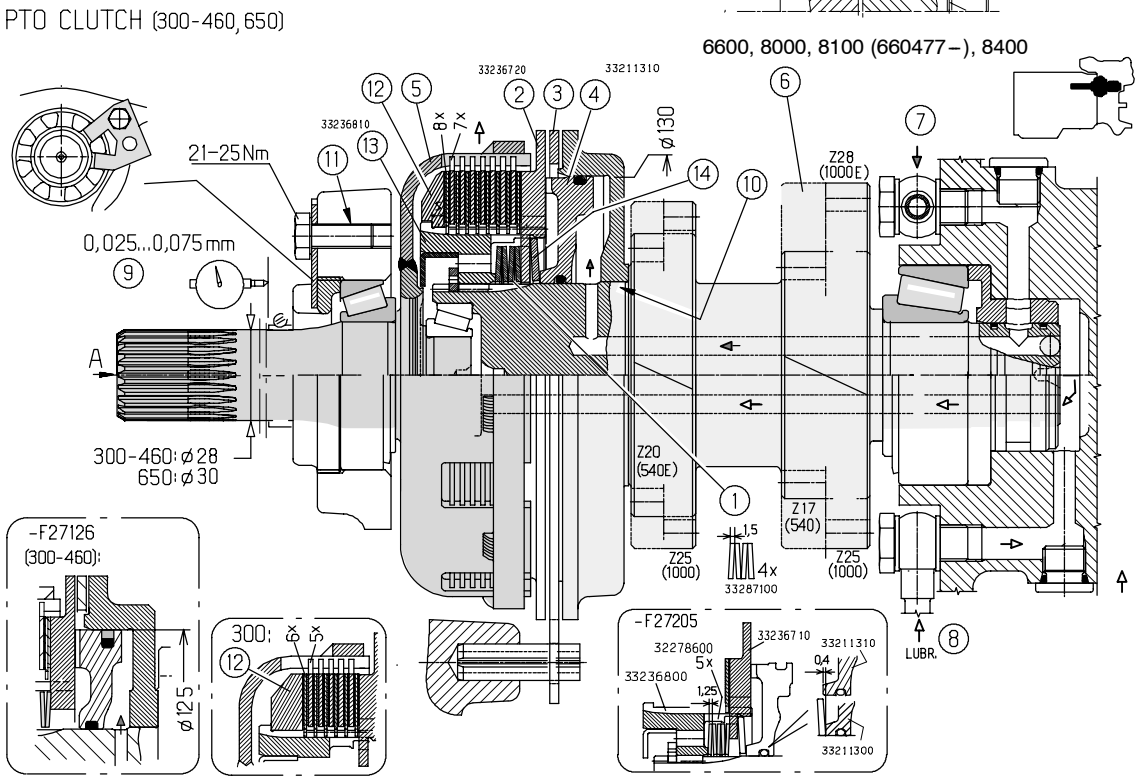


***Figure 6**. PTO clutch*
1. Cup springs (5 pcs)
2. Pressure plate (modified for spring 14)
3. PTO brake disc
4. Piston
5. Shaft / clutch drum
6. Shaft
7. Pressure oil to clutch
8. Lubricating oil
9. Adjustment of PTO clutch shaft bearing cleareance
10. Fastening with Loctite 601
11. Loctite 242 on the threads
12. Support ring (6 friction discs: s=10,25, 7 pcs: s=7,4 mm, 8 pcs: s=4 mm
13. Hub
14. Cup spring (on latest models)

When there is no oil pressure in the clutch (solenoid valve unenergized), cup springs (1) press plate (2) against brake disc (3) causing brake action.

When pressure is connected behind the piston (4), it moves forwards releasing the brake and engaging via disc pack the clutch drum (5) to shaft (6) and power is transmitted to the PTO shaft.

Note!On the latest clutches, the clutch housing (5) has been reinforced with a metal ring.
A number of the clutch discs and disc material have been changed.

Number of the discs, see technical data on page **460**/**2**. Concerning repairs of the earlier clutches, see page **462**/**3** and pictures above.

Heavy Duty PTO clutch, see page **460**/**6A.**

Note! In transmission 650 the clutch drive shaft diameter is 30 mm. In other transmissions (300, 460) the diameter is 28 mm

Note! From ser. no. **F27127** incl. the piston of the HD clutch and the standard clutch is the same (ø 130 mm). At the same time the piston seal was changed into an o–ring. From ser. no. **H11438** incl. the dimensions and shape of the piston have been changed. This modification helps to ensure that the PTO shaft stops when the PTO is disengaging.

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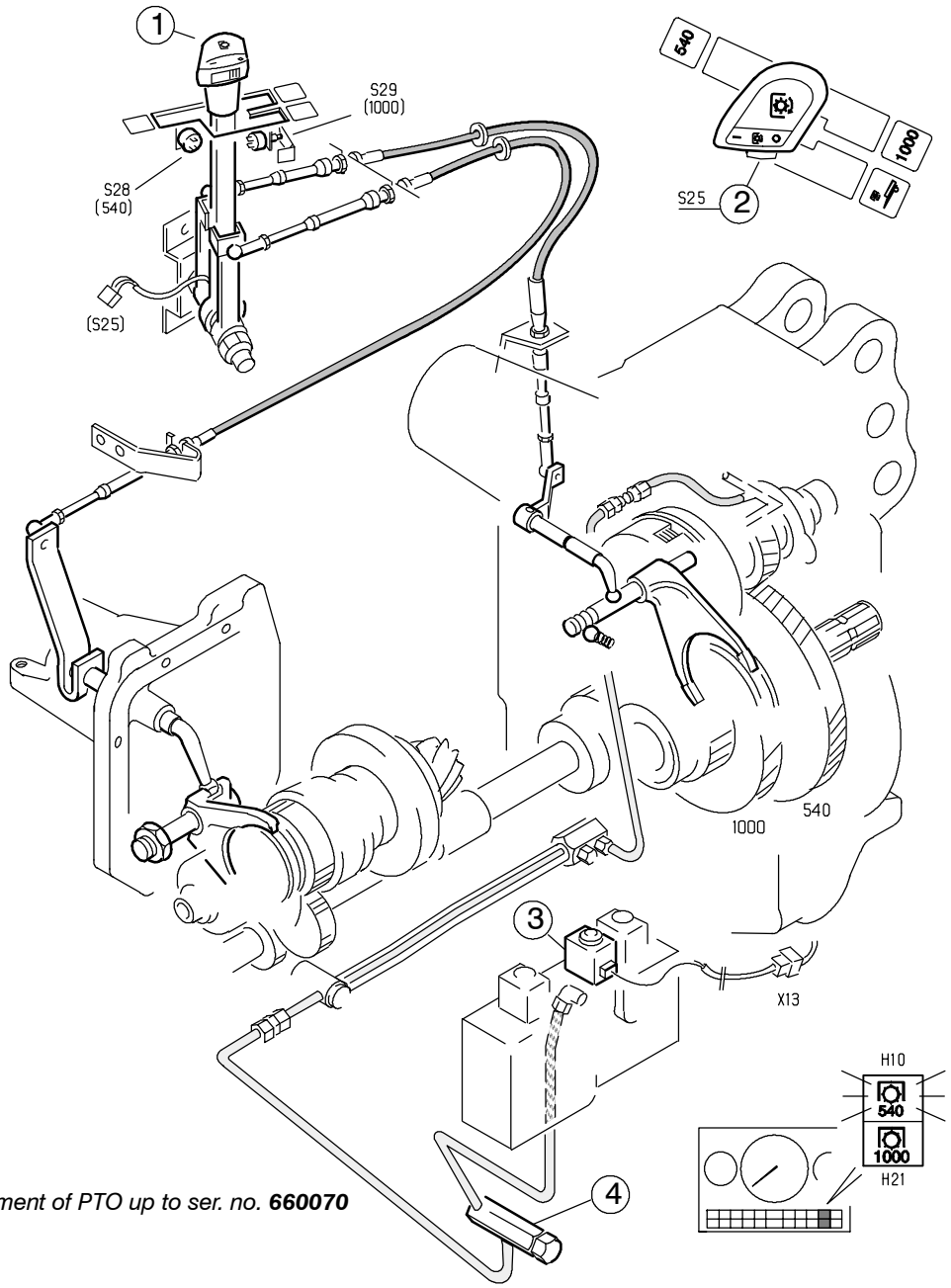


Figure 7**. Engagement of PTO up to ser. no. **660070

1. Control lever
2. Switch
3. Solenoid valve
4 . Cushioning valve

Lever (1) movement is transmitted via a cable to the selector fork on the PTO unit sliding coupler and also via another cable to the selector fork on the sliding coupler (in gearbox) for ground speed PTO (optional).

When the control lever is in the middle position, the PTO unit sliding coupler is in the middle position, PTO clutch is unpressurised and the PTO brake is engaged.

When the lever (1) is moved to the front position (engine PTO 540 r/min), the sliding coupler in the PTO unit is moved to the rear position and when the lever is released, the lever presses the microswitch, which in turn connects current to the PTO solenoid valve and the PTO clutch is engaged and the PTO shaft starts to rotate (indicator light comes on).

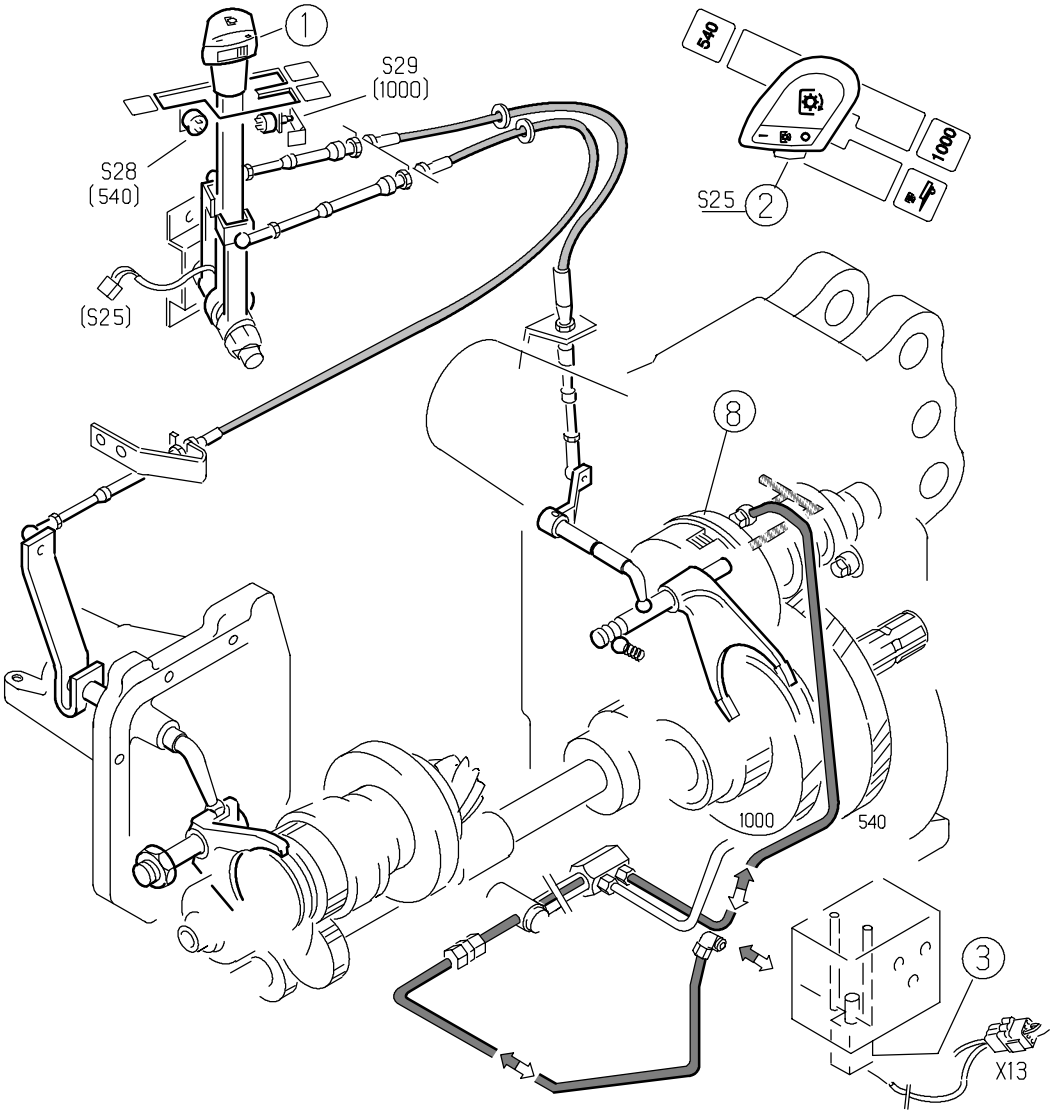
When the engine speed PTO is disengaged, first the microswitch disconnects the solenoid valve and the PTO clutch disengages (and the brake engages). When the lever is moved to the middle position, the sliding coupler is moved to the middle position. (indicator light goes out)

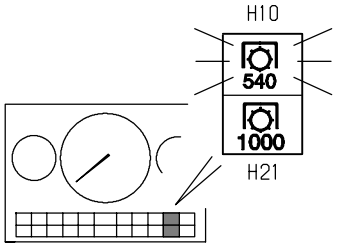
In the same way is engaged engine PTO 1000 r/min. Now the lever is moved to the rear position. Indicator light in the instrument panel is lit.

Ground speed PTO is engaged by moving first the lever to the left from the middle position and then backwards. Now the sliding coupler in the gearbox engages the ground speed PTO mechanically. Now the PTO clutch is in the disengaged position (unpressurised).

There is a switch on the PTO control lever knob. With this switch the PTO clutch can be disengaged temporarily. The sliding coupler, however, does not move to the middle position. Long–periods of disengagement should always be done with the control lever

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Picture 8. *Engagement of PTO with effect from tractor ser. no.* ***660071****.*

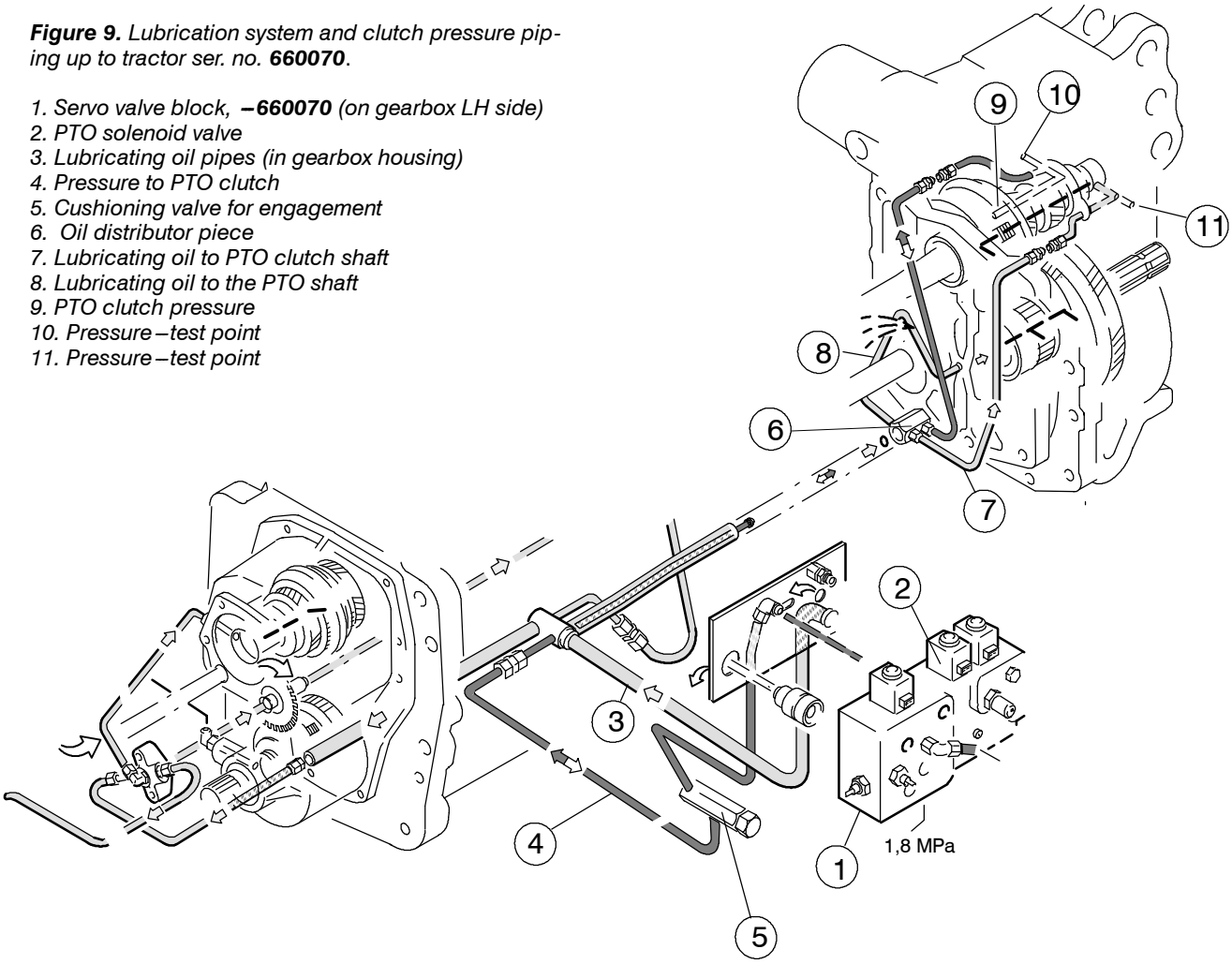
1. Control lever
2. Switch
3. New servo valve block, see also pages ***420****/****17–20****.*
8. Multi–disc clutch of PTO

From tractor serial number **660071** there is a new servo valve block on the gearbox LH side. The cushioning valve for the PTO clutch is fitted inside the valve block. For function of the cushioning valve, see page **462**/**9**. The PTO solenoid valve is fitted on the lower side of the valve block.

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Figure 9. *Lubrication system and clutch pressure piping up to tractor ser. no.* ***660070****.*

1. Servo valve block, ***–660070*** *(on gearbox LH side)*
2. PTO solenoid valve
3. Lubricating oil pipes (in gearbox housing)
4. Pressure to PTO clutch
5. Cushioning valve for engagement
6. Oil distributor piece
7. Lubricating oil to PTO clutch shaft
8. Lubricating oil to the PTO shaft
9. PTO clutch pressure
10. Pressure–test point
11. Pressure–test point



Lubricating system

The PTO unit uses the same oil as the whole transmission/hydraulic system. In addition, pressure lubrication is directed from the servo valve block via pipe (3) to the oil distributor piece (6). From the distributor piece oil is directed to the PTO clutch shaft bearings via pipe (7) and to the PTO shaft gearwheel sliding surfaces via pipe (8).

Note! Inside the lubricating oil pipe (12) is fitted the PTO clutch pressure pipe (4).

PTO clutch pressure

Pressure oil to the PTO clutch is conducted from the servo valve block (1) via cushioning valve (5) and pipe (4) inside the gearbox housing.

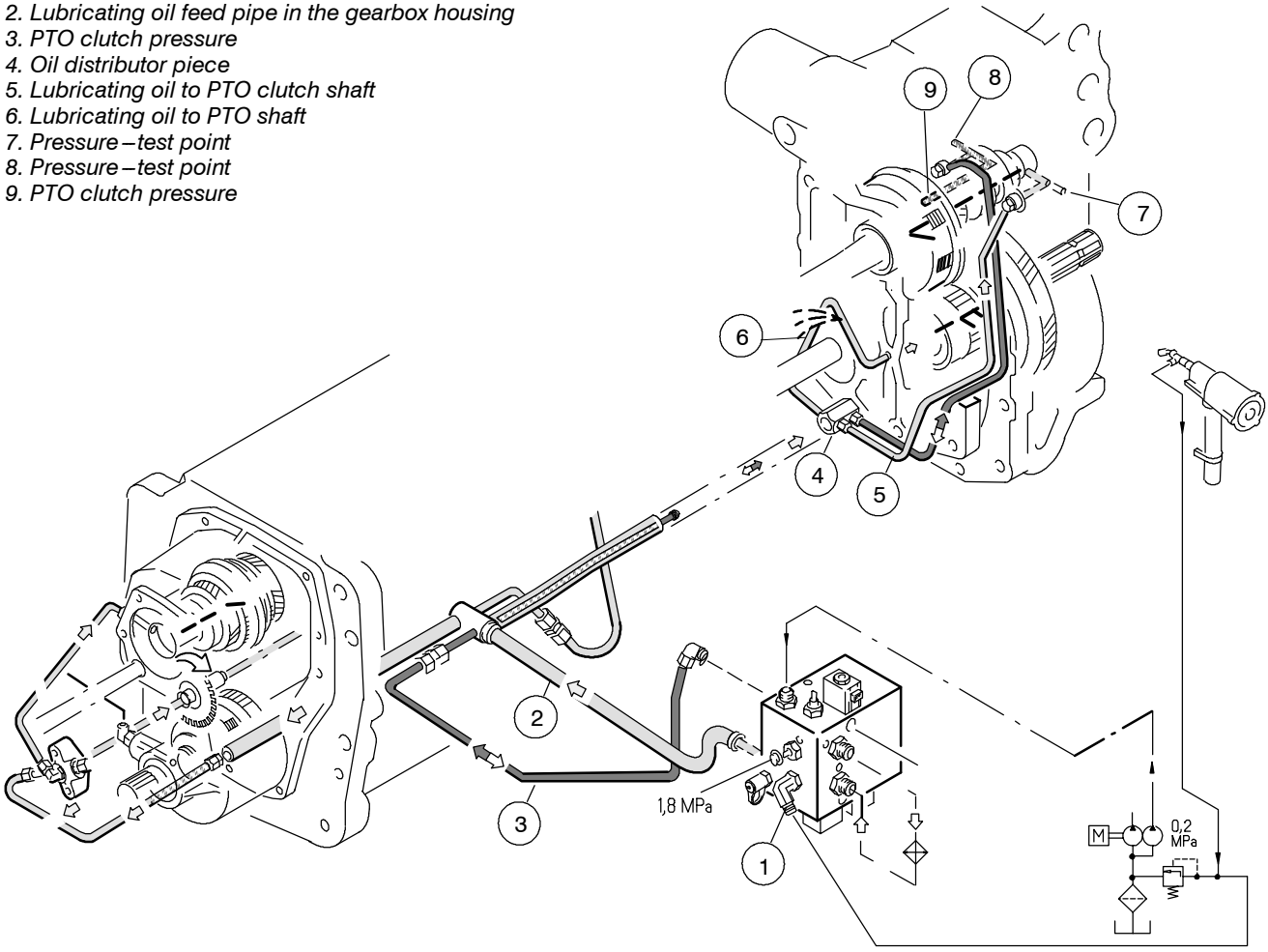
Note! Lubricating oil pipe (3) and clutch pressure pipe (4) rear ends have been sealed with o–rings against the oil distributor piece (6).

Important! The piping has been changed with effect from tractor serial number **659787**. The new servo valve block is fitted on tractors from ser. no. **660071** (see picture on the next page).

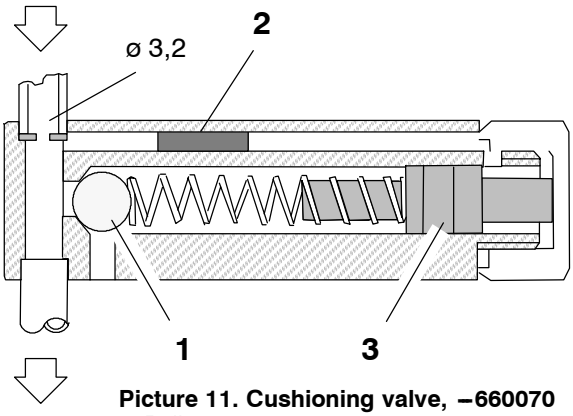
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Picture 10. *Lubricating system and clutch pressure piping,* ***659787–****.*

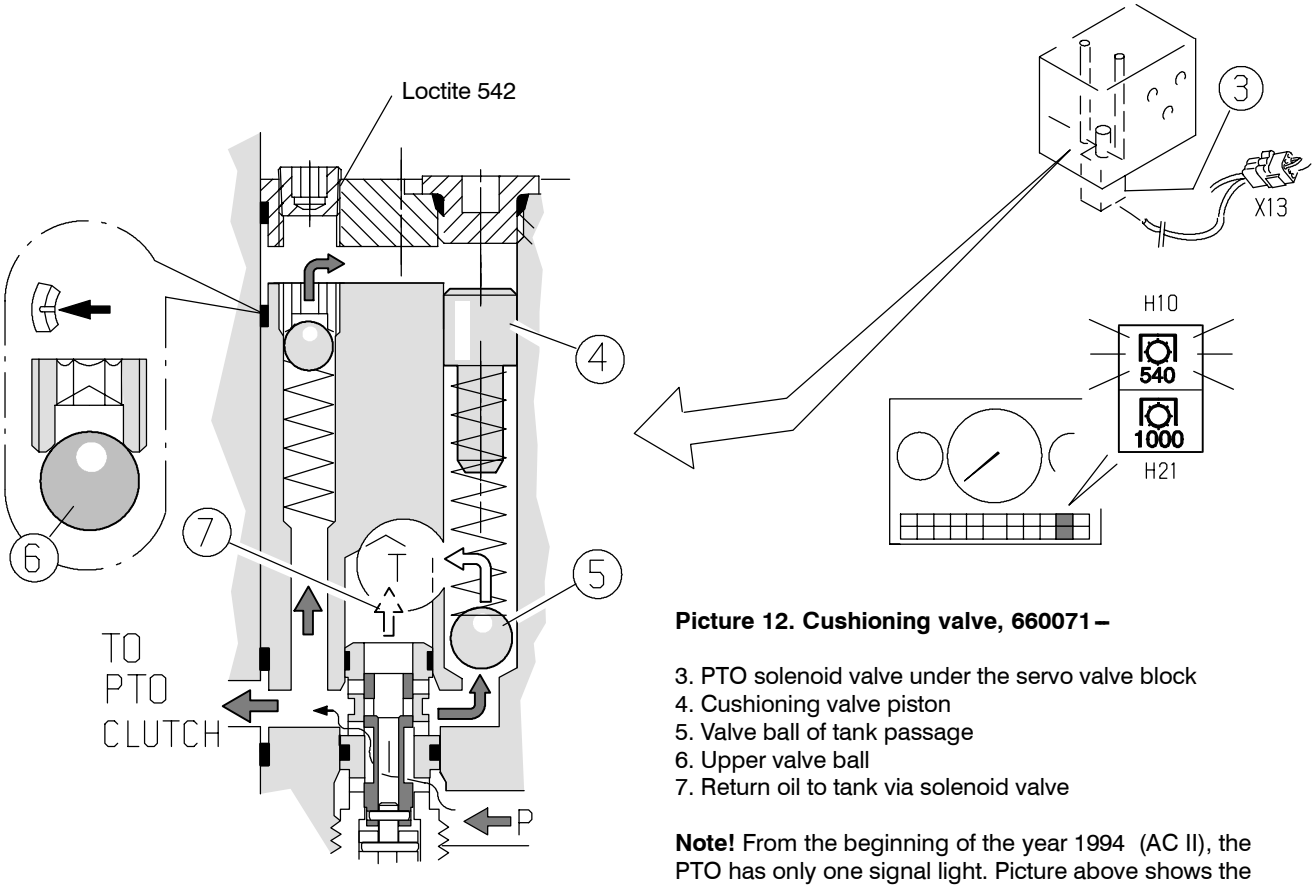
*1. Servo valve block (**660071–**), which has in–built cushioning valve for the PTO clutch (see page **462**/**9**). The PTO solenoid valve is fitted on the valve block lower side.*
2. Lubricating oil feed pipe in the gearbox housing
3. PTO clutch pressure
4. Oil distributor piece
5. Lubricating oil to PTO clutch shaft
6. Lubricating oil to PTO shaft
7. Pressure–test point
8. Pressure–test point
9. PTO clutch pressure



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Picture 11. Cushioning valve, –660070
1. Ball
2. Needle
3. Piston



Picture 12. Cushioning valve, 660071–

3. PTO solenoid valve under the servo valve block
4. Cushioning valve piston
5. Valve ball of tank passage
6. Upper valve ball
7. Return oil to tank via solenoid valve

Note! From the beginning of the year 1994 (AC II), the PTO has only one signal light. Picture above shows the earlier fitting.

Note! On the tractors with the HiTech Shuttle, the PTO clutch engagement is controlled by a proportional valve and these tractors do not have the above shown cushioning valve.

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PTO clutch cushioning valve, –660070 (picture 11).

The cushioning valve is fitted in the gearbox housing and it is accessible when a small cover on the gearbox LH side is removed. Before removing the cover, the gearbox oil must be drained.

When PTO solenoid valve opens oil flows under pressure to the PTO clutch. When the pressure has reached 0,5–0,6 MPa, valve ball (1) opens. At the same time oil flows past needle (2) to piston (3). After 0,7–1 second the pressure is equalized and ball (1) closes. The engaging pressure then rises to a normal value of about 1,8 MPa.

Note! The PTO engagement can further be made slower by fitting a ø 2 mm restriction into the gearbox housing, see page 462/8.

PTO clutch cushioning valve, 660071– (picture 12).

From tractor ser. no. 660071 the cushioning valve is in–built in the servo valve block on the LH side of the gearbox. The cushioning valve end plugs are fitted on the top side of the valve block, see pictures on pages **420**/**17A** and **17B** point **8**.

When the PTO is engaged, the solenoid valve directs oil to the PTO clutch and to the cushioning valve. The cushioning valve spring (below piston 4) has its maximum length and raising pressure in the lower passage opens valve ball 5 and oil can flow to the tank. At the same time oil flows by valve ball 6 into the upper passage.

Pressure oil moves piston 4 downwards and spring force which affects the ball 5 increases. Oil flow to tank decreases and clutch pressure rises slowly to its max. value (1,8 MPa).

When the PTO is disengaged, oil returns via solenoid valve to the tank passage 7. Pressure in the lower passage decreases and oil can flow from the upper passage by ball 6. Piston 4 returns quickly to the original position.

This construction facilitates the function of the valve when the PTO is engaged quickly again.

From tractor ser. no **661798** incl. the cushioning valve has been modified so that the engagement of the PTO is ”softer”.

The spring on ball (5) has been changed so that the spring wire diameter is now 1,0 mm (earlier 1,1 mm). In addition, the restriction on ball (6) has been changed. The new restriction has a groove of 0,4 mm (earlier 0,5 mm).

These modifications can also be done for the earlier manufactured tractors.
The spare part number of the new spring is 30626810.
The spare part number of the new restriction is 32720410.

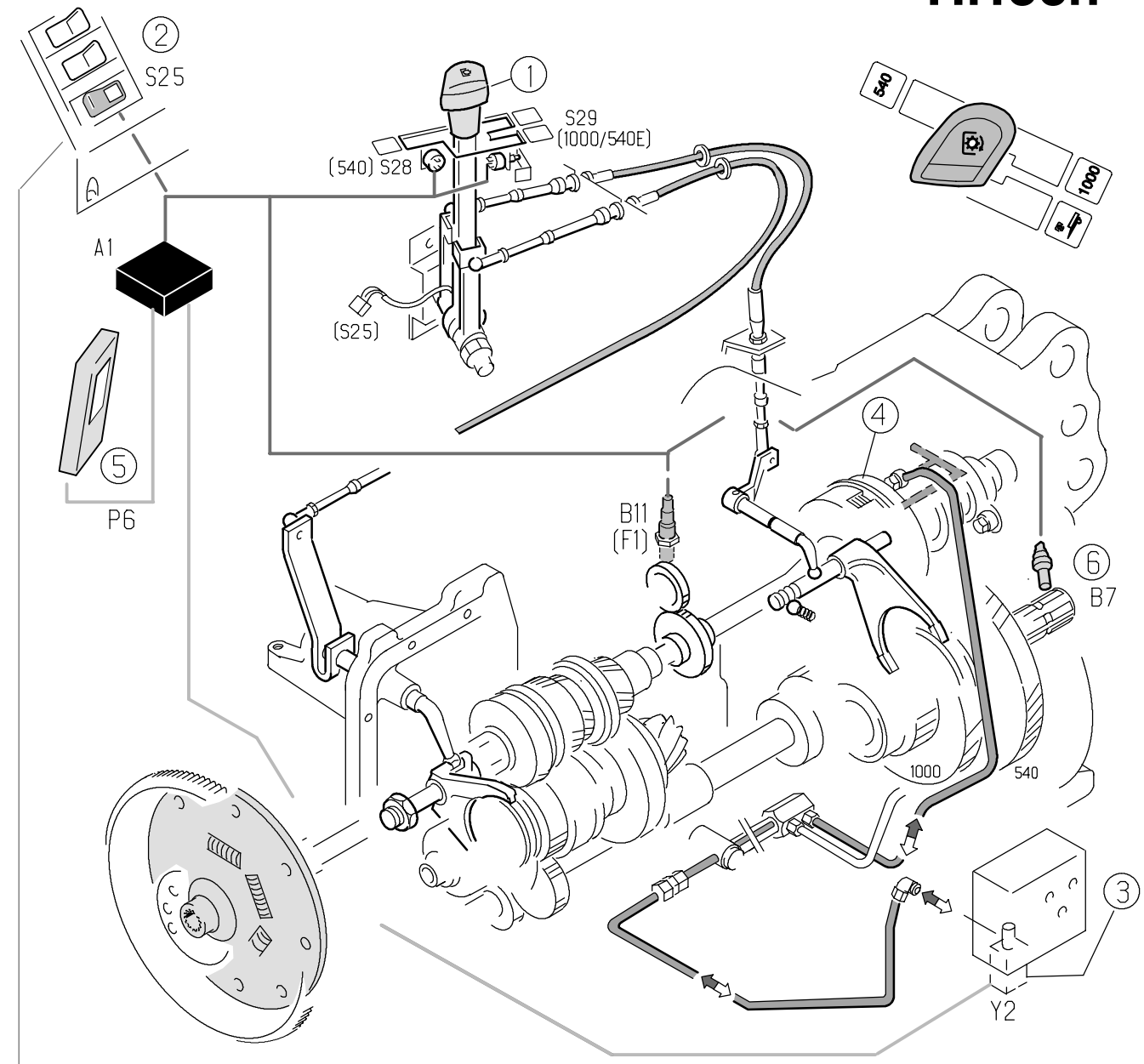
Note! In order to improve further the engagement of the PTO, a new restrictor has been fitted into the servo valve block and an extra passage has been drilled, see page **420**/**17A** point 17 and page **420**/**17B** point 17. The restrictor can be fitted also on the earlier manufactured tractors. The spare part number of the restrictor is 31742320 (ø1,2 mm).

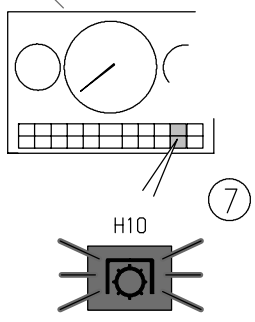
Note! HiTech tractors have not the cushioning valve, but the PTO engagement is controlled by a proportional solenoid valve which in turn is controlled by the Autocontrol V control unit (see code 370).

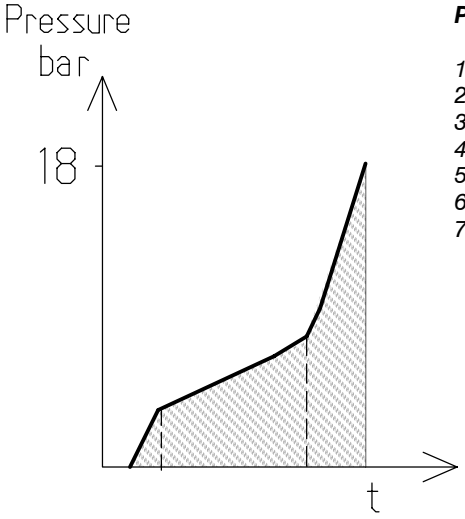
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PTO, ENGAGEMENT

HiTech







Picture 13. *PTO on HiTech tractors*

1. Control lever
2. Switch
3. Proportional valve
4. Multi–disc clutch
5. AC V display
6. Rotation speed sensor
7. Pilot light

1. Reconditioning PTO (Op. no. 462)

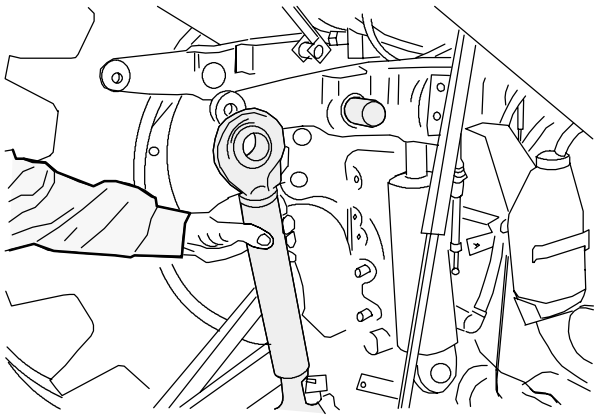
Note! In the instructions below has been used a PTO unit which is equipped with parts for ground speed PTO. The instructions are good also for PTO units without the ground speed PTO.

A. Removing PTO unit

1. Drain the oil from the transmission. On E–models, disconnect the PTO speed sensor wire. Remove the position sensor of the hydraulic power lift.

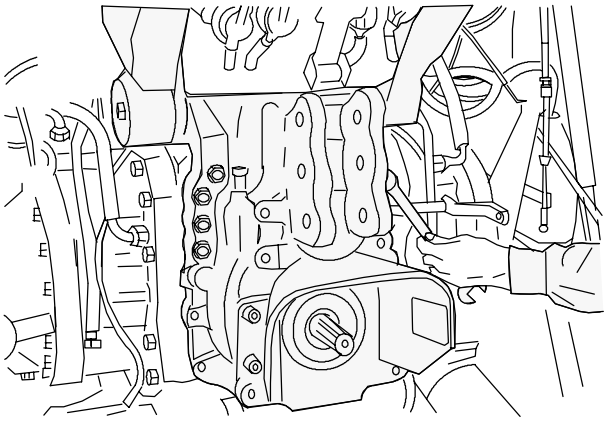
2. Disconnect the auxiliary hydraulic pipes from the quick–action couplings (in front of the bracket for couplings).

3. Disconnect the PTO control cable, pick–up hitch release control and the locking pin for the levelling screw control rod joint.



4. Lower the towing hook. Disconnect the lifting links from the lifting arms.

5. Disconnect the lifting cylinder upper ends from the lifting arms. Disconnect the oil hoses from the lifting cylinder and lower them.

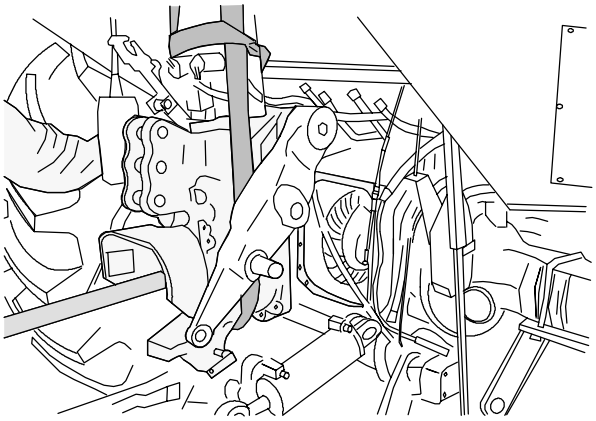


Note! Support the lifting arms by pushing an iron bar through the hole for lifting cylinder pin and further under the return oil connection for auxiliary hydraulic (the cam on the lifting shaft can damage if the lifting arms can rotate freely).

6. Unscrew the PTO housing fixing bolts. Disconnect the draft sensor connectors. Open the leak oil reservoir cap and release its hoses.

7. Wrap a lifting rope round the PTO housing. Push a tube onto the PTO shaft end. The unit can be kept in balance with the tube.

Note! As a suitable tube can be used tool ET 893 550 (tool for Carraro front axle on Valmet 05–series).

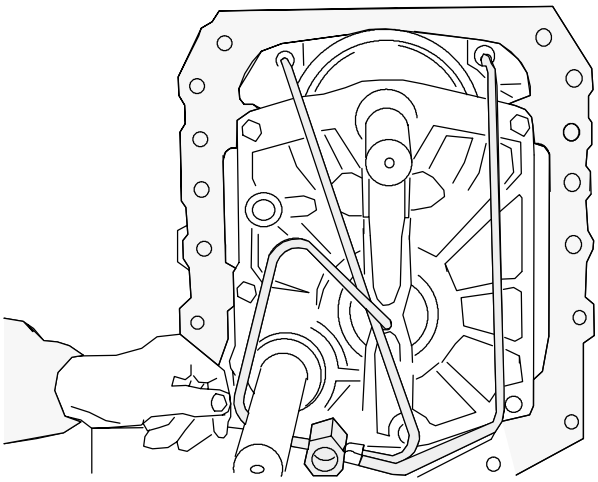


8. Raise the towing hook with a garage jack about 40 cm and pull the PTO unit straight out from place.

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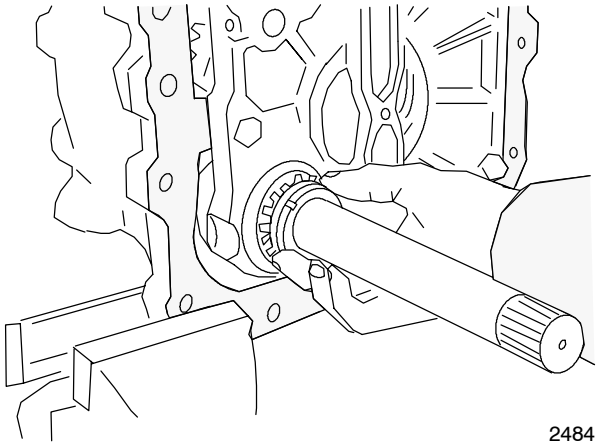
B. Removing PTO clutch

1. Remove the PTO unit (**see instr. 1 A**).



2. Remove the external lubricating oil pipes and the oil distributor piece.

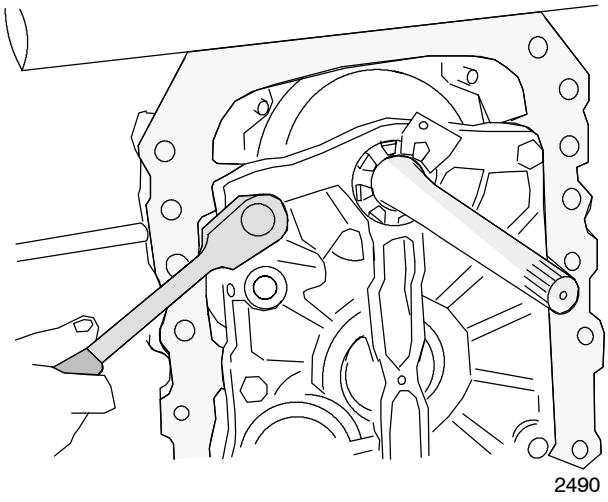
Important! With effect from tractor searial no. **659787** the oil pipes have been drawn in the different way, see picture**10** on page **460**/**13**.



3. Set the PTO selector lever to the neutral position (middle position). Slacken the ground speed PTO shaft nut for easier removing of the front cover.

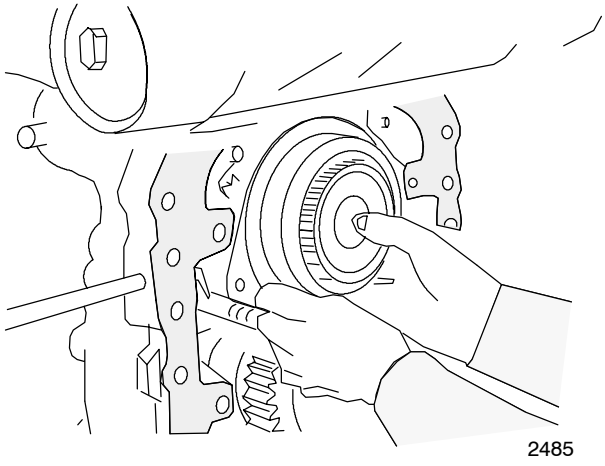
Note! On the latest tractors it is unnecessary to slacken the nut before removing the front cover.

Note! Prevent the ground speed PTO shaft from rotating e.g. with pipe tongs. Open the nut with a standard spanner wrench.



4. Unscrew the front cover bolts. Pry out the cover with a fitting lever and prevent the selector fork locking ball and spring from springing from their place.

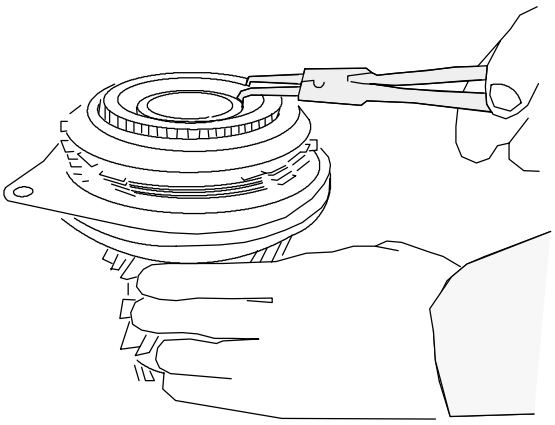
Note! Easiest way to remove the cover is to pry at the PTO shaft front end. There is a guide sleeve on two fixing bolts on upper and lower corner of the cover.



5. Remove the PTO clutch and shaft from the housing.

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C. Reconditioning PTO clutch



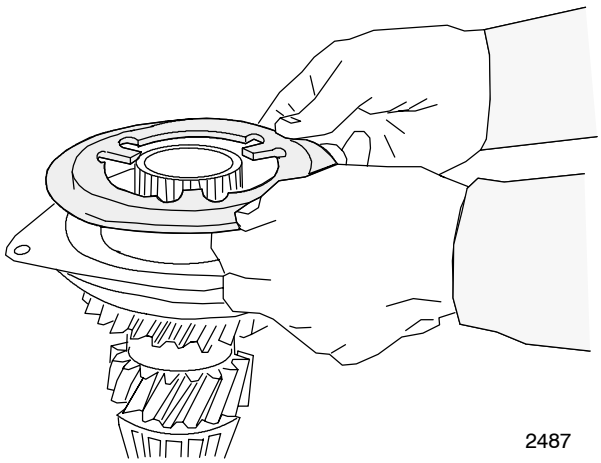
2486

1. Remove the oil deflector plate from the PTO clutch hub and remove the circlip under the plate and the clutch cup springs release.

2. Remove the clutch discs. Check the condition of the friction and steel discs and the PTO brake plate. Replace damaged parts.

Note! The friction discs and steel discs must be renewed as a complete set. The friction disc must be changed if the grooves on it have disappeared.

3. Remove the piston, if necessary, with compressed air or knock the shaft end against the table. Change the piston seals. Push in the piston

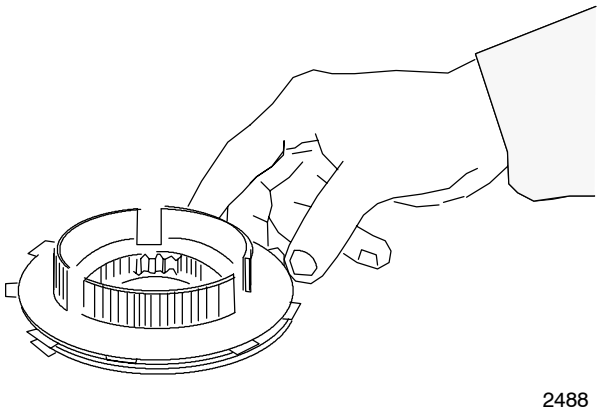


2487

4. Assemble the clutch by fitting the brake plate on the piston. Then place on the brake plate a plate which has internal lugs.

5. Place the cup springs (5 pcs) on the internal lugs. The first spring concave side against the lugs and then other springs in pairs the concave sides against each other.

Note! The cup spring convexity is 3 mm.



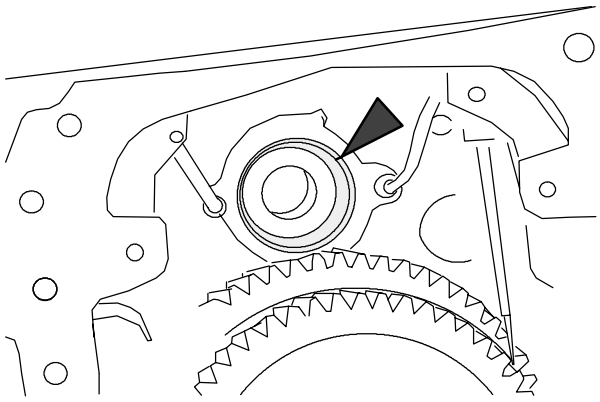
2488

6. Place the friction and steel discs by turns onto the hub (first friction disc). Number of discs, see page **460**/**2**.

Important! From ser. no. 660477 the disc linings were changed from ceramic to organic type. At the same time number of the discs were changed as follows: 6100–6400 6 pcs and 6600–8400 8 pcs. It is recommended that in repair works organic discs are used. The organic linings are thicker and if you fit these onto the earlier tractors, the hub 32267900 should be machined to 3,9 mm (see page 460/9) or a new hub 32267910 should be used. Number of the discs is the same as earlier. On the latest 6000–8750 tractors, there are 8 friction discs and 7 steel discs in the PTO clutch.

7. Fit then the hub/disc pack onto the plate which has internal lugs (and on the cup springs) so that the grooves on the hub engages with the lugs on the plate.

8. Fit the circlip into the hub and force the circlip into its groove by striking with sleeve ET 894 090. Fit the oil deflector plate onto the hub.
Note! Place the clutch shaft on a table and assure that the clutch drum grooves are enough deep. The discs (steel disc) must not be against the groove bottoms when the shaft is in the working position.



2489

9. Check the clutch shaft rear taper roller bearing and its race in its location on the housing. Change the parts if necessary.

10. Check also condition of the piston ring type seals at the rear end of the clutch shaft.

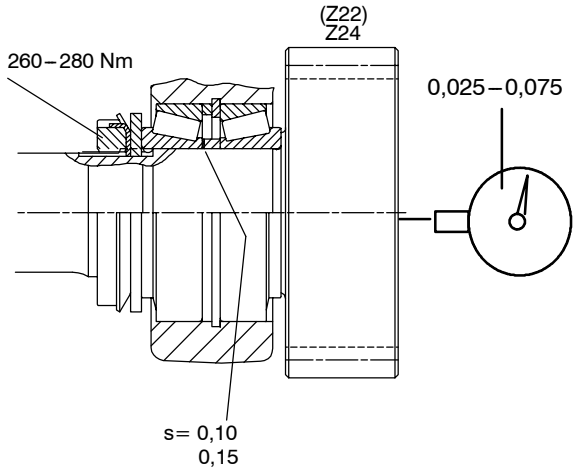
11. Check and change, if necessary, the taper roller bearings at the front end of the shaft. Fit all bearings fully home.

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D. Fitting PTO clutch shaft and adjusting bearing clearances

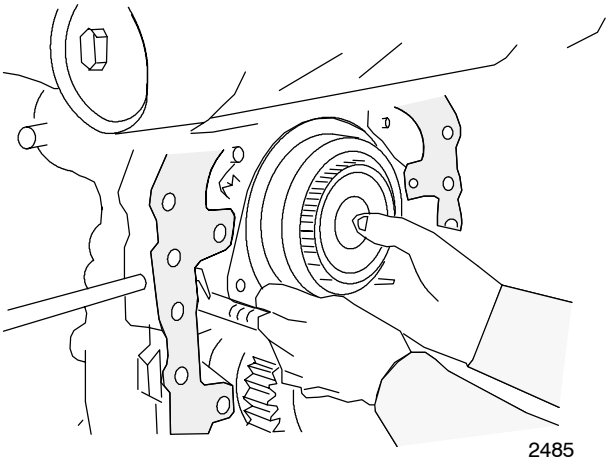
Adjusting bearing clearance of ground speed PTO shaft (adjustment is done before fitting the front cover)

1. If you have changed the bearings of the ground speed PTO shaft (shaft is attached to the front cover), adjust the taper roller bearing clearance as follows:
– fasten the front cover to a vice
– fit the old shims between the bearings
– Fit the spacer ring and tighten the shaft nut to **260–280 Nm**.
– Place a dial gauge stylus against the shaft rear end (middle of the gear)



– Measure the clearance which should be **0,025–0,075.** Rotate the shaft and press it to its extreme positions.
– Increase or decrease shims thickness between bearings.

Note! Shim thickness of 0,10 and 0,15 mm are available. Tighten the shaft nut after the front cover has been fitted.

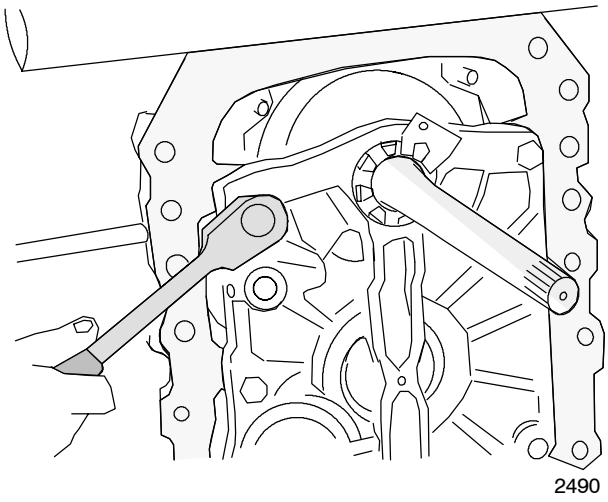


2. Fit the PTO clutch shaft into the housing. Do not damage the piston ring type seals at the rear end of the shaft.

3. Place the clutch drum/shaft onto the clutch disc pack.

4. Fit drift ETV 894 080 into the hole for selector fork rail for holding the locking spring and ball in place.

5. Fit the front cover and make sure that:
– the selector fork rail is pushed through the hole on the cover and that the rail pushes out the drift
– the PTO shaft front end bearing is pushed into its location on the cover
– the brake plate holes engage with the pins on the cover.



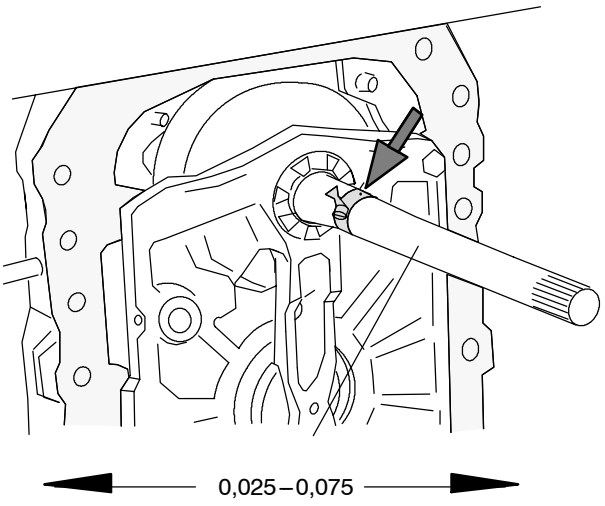
6. Tighten the cover bolts to a correct torque. Ensure that the selector fork rail locking ball and spring are in place.

Note! Two bolts on the upper and lower corner of the cover have a guide sleeve.

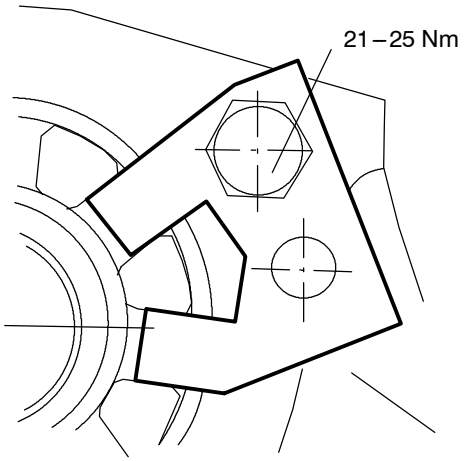
7. When the cover is in place, tighten the ground speed PTO shaft nut to **260–280 Nm** and lock it with a locking washer.

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Adjusting clutch shaft bearing clearance



– Remove the locking plate and turn the adjusting nut on the shaft until there is no clearance in the clutch shaft taper roller bearings
– Place a dial gauge stylus against a hose clip pressed on the clutch shaft
– Unscrew the adjusting nut so that the clearance of **0,025–0,075 mm** is obtained for the bearings. Rotate the shaft and press it to its extreme positions when measuring the clearance.



– Lock the adjusting nut with a locking plate and tighten its fixing screw to **21–25 Nm**. Apply Loctite 242 to threads.

Note! One step of the adjusting nut corresponds to about 0,09 mm alteration on the clearance value. Note that the locking plate can be fitted in two different way which doubles the number of steps.

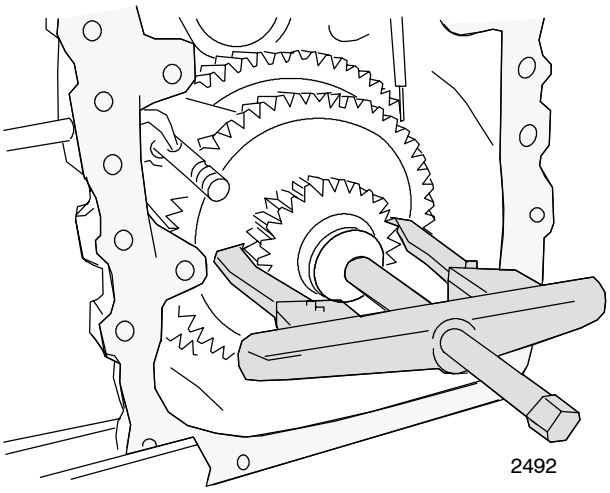
9. Fit the oil pipes and the oil distributor piece.

10. Fit the PTO unit (**see instr. 1 G**).

E. Removing selector fork and PTO shaft gears

1. Remove the PTO unit (**see instr. 1 A**).

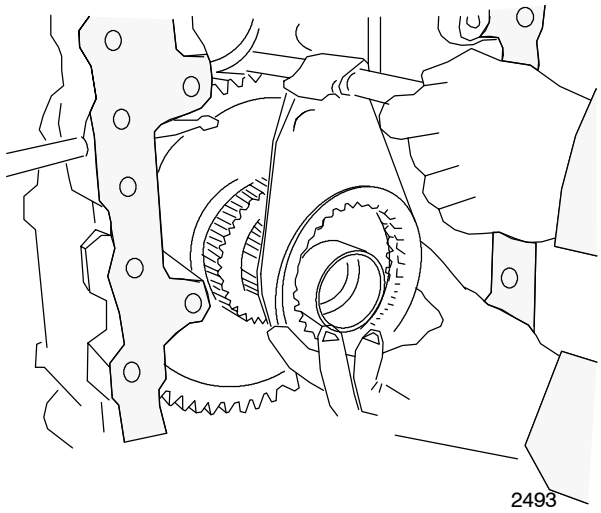
2. Carry out measures shown in instruction **1B; 2–5**.



3. a) **Earlier version:** Unscrew the locking flange at the front end of the PTO shaft using ET 894000. Remove a spacer ring and roller bearing and pull out the roller bearing inner race with an extractor (see figure above).
b) **Later version:** Release the locking washer and unscrew the locking bolt. Remove the flange and pull out the roller bearing inner race as above.

Note! Tractors without ground speed PTO: Pull out the ball bearing and remove the spacer sleeve and ring in front of the gearwheel.

4. Remove the small ground speed PTO gearwheel (if fitted) and the middle gearwheel for engine PTO 1000 r/min.



5. Pull the selector fork and its rail out from the housing. Change, if necessary, the inner selector lever which has a round–shaped end. Fit a new fork onto the rail and secure it with a locking pin.

Note! Fit the locking pin of the outer selector lever so that its split side points forwards.

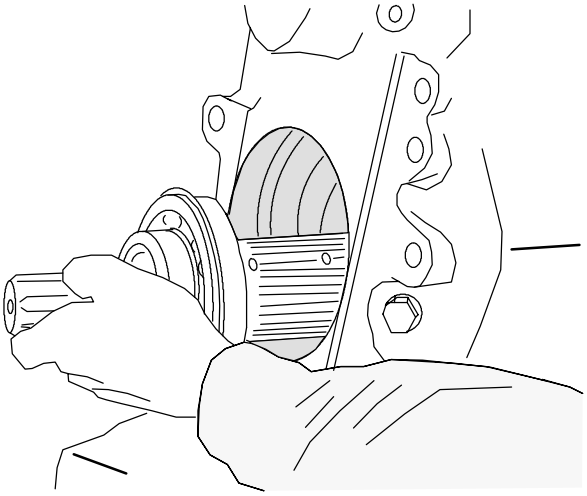
6. Remove the larger circlip for the oil seal retainer at the PTO shaft rear end. Knock at the front end of the hollow shaft round

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the PTO shaft and remove the PTO shaft/hollow shaft. Remove the big gearwheel from the PTO housing.

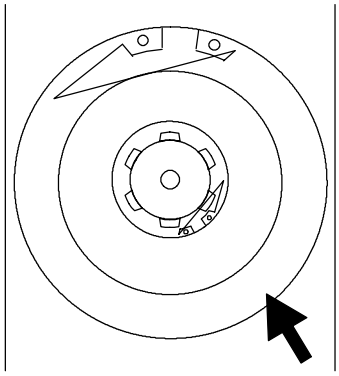
7. Check the PTO shaft seal and o–rings and change them if necessary. Check also the PTO shaft rear ball bearing.

F. Fitting gears and selector fork



1. Push the PTO shaft/hollow shaft/ball bearing as a complete unit into the housing. Place the impulse disc onto the hollow shaft splines and fit the spacer ring in front of the disc.

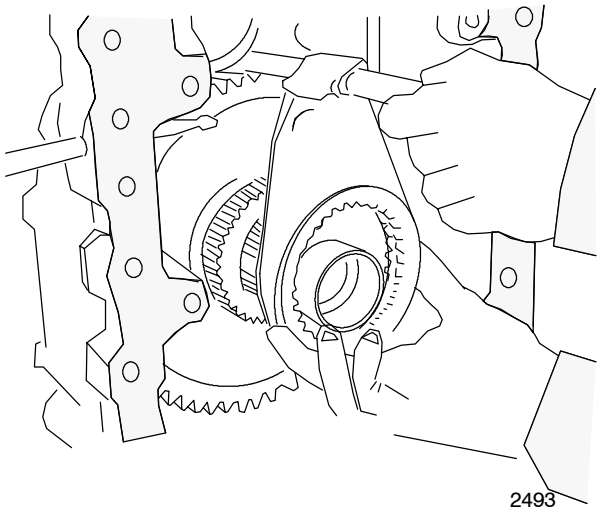
Note! The impulse disc is fitted only on E–models. On other models, there are two spacer rings.



2. Fit the big gearwheel onto the shaft before the shaft is fully home. Tap at the PTO shaft rear end until the rear ball bearing is in its location fully home. Fit the seal retainer and the larger circlip.

IMPORTANT! On the latest tractors (**H34332–**) there is fitted a new cassette seal for the PTO shaft, see picture on page **460**/**7** and fitting instruction of the cassette seal on page **462**/**8A**.

Note! There are shims between the seal retainer and the ball bearing. The clearance between these parts is adjusted to zero. Use old shims. If necessary, the clearance can be measured by placing a dial gauge stylus against the seal retainer. Available thickness of shims; 0,10 0,15 and 0,50 mm.



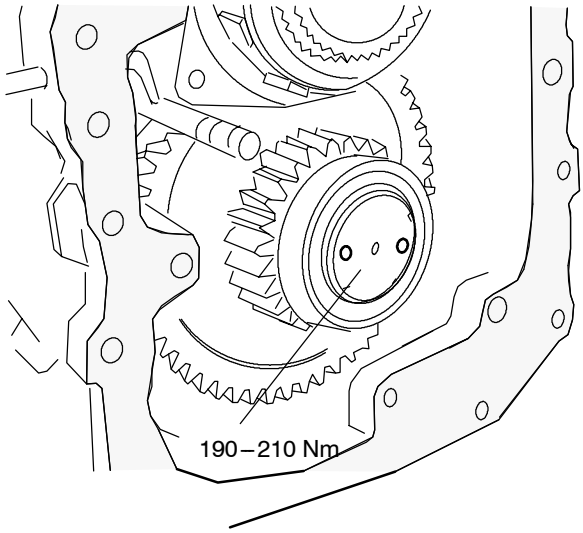
3. Fit the sliding coupler onto the fork and place the fork/rail into the housing so that the sliding coupler engages onto the teeth on the big gearwheel.

Note! Fit the selector lever round–shaped end into the hole on the rail.

4. Fit the middle gearwheel and then the small gearwheel.

Note! Tractors without the ground speed PTO: fit the spacer ring and the sleeve in front of the small gearwheel.

5. Fit the roller bearing inner race onto the shaft in front of the small gearwheel and fit the roller bearing onto the race.



6. a) **Earlier version:** Fit the spacer ring in front of the bearing and tighten the locking flange to **190–210 Nm** (ET 894000). **Important:** Instructions on how to lock the locking flange, see figure 4 on page 460/7.

6. b) **Later version:** Fit the flange and tighten the locking bolt to **225 Nm** and lock it with the locking washer.

Note! Tractors without the ground speed PTO: Fit the ball bearing and then the locking flange or locking bolt.

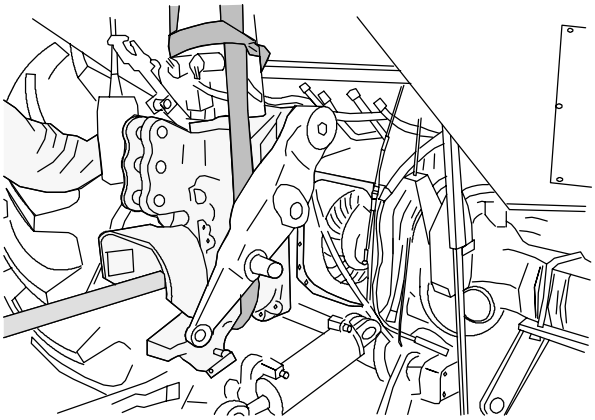
6. Carry out measures shown in instruction **1D.**

7. Fit the PTO unit (**see instr. 1 G**).

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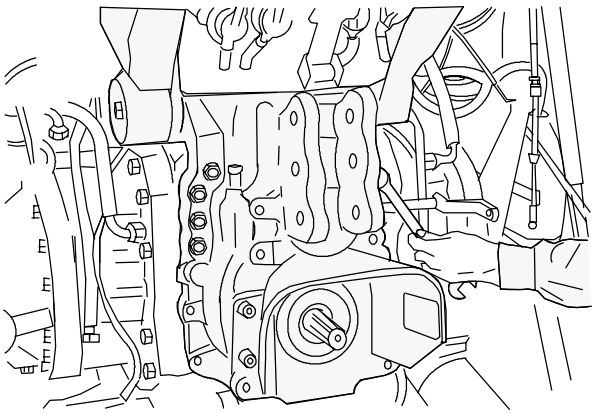
G. Fitting PTO unit

1. Clean contact surfaces between the PTO housing and the gearbox and apply sealing compound to the surfaces.



2. Push the PTO unit straight into place so that the PTO clutch shaft front end (and ground speed PTO shaft front end) engages with their splines.

Note! Before fitting the PTO unit, put the ground speed PTO shaft coupling sleeve onto the rear end of the ground speed PTO output shaft in the gearbox.

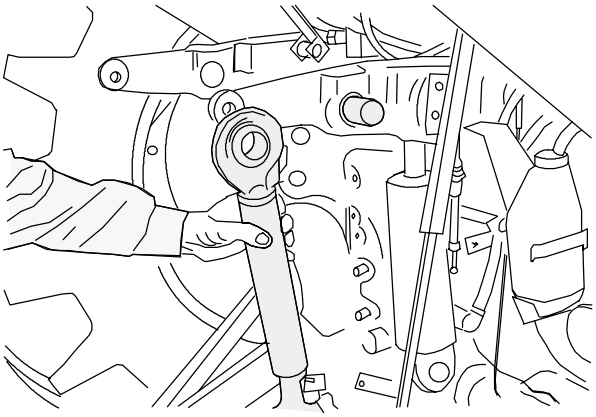


3. Tighten the PTO housing bolts to a correct torque. Connect the hoses to the lifting cylinders. Connect the lifting cylinder upper ends with pins to the lifting arms.

4. Connect the draft sensor connectors. Fit the leak oil reservoir hoses and the reservoir cap.

5. Connect the pipes to the quick–action couplings. Slacken, if necessary, the quick–action couplings in their bracket for easier work.

6. Fit the PTO control cable. Connect the pick–up hitch release control. Connect the lower joint of the levelling screw control rod.



7. Connect the lifting link upper ends to the lifting arms. Fit the top link. Connect the pick–up hitch lifting links.

8. Fill the transmission with oil.

9. Fit the position sensor and adjust it, see page **320**/**6** (AC Power lift) or page **321**/**9** (ACB/ACD Power lifts).

Note! On E–models, connect the PTO speed sensor wires and check that the AC–III/IV unit functions properly.

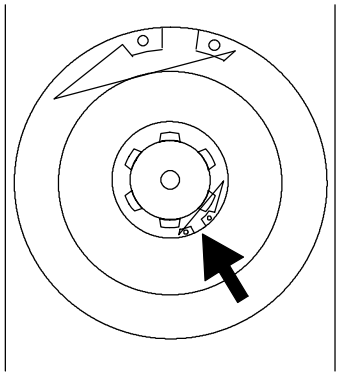
Note! On HiTech models, connect the wire of the speed sensor B7. If the PTO speeds have been changed, AC V control unit must be reprogrammed (parameter files), **–J38342**, or PTO parameters (ratios) must be set in the setting mode, **J38343–**, see under code 370.

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2. PTO shaft seal and cushioning valve

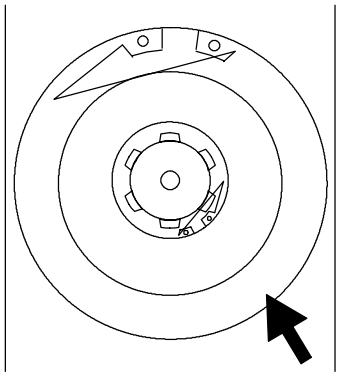
A. Changing PTO shaft/seal

1. Drain the oil from the transmission. Remove the PTO shaft safety cap.



2. Remove the smaller circlip round the shaft and pull out the PTO shaft. Also a spacer ring releases.

3. Fit a new PTO shaft and check and grease the o–ring on it. Push the shaft fully home and fit the spacer ring and the circlip.



4. Remove the larger circlip behind the seal retainer and pry out the retainer by using two screwdrivers.

5. Check/change the seal retainer o–ring in the PTO housing bore.

IMPORTANT! Concerning tractors which have a new cassette seal for the PTO shaft (H34332–), see picture on page **460**/**7** and the cassette seal fitting instruction on page **462**/**8A**.

6. Pry out the old oil seal fit a new one with plate ETV 891 870.

7. Grease the seal lips and fit the seal retainer into its location. Secure the retainer with the circlip behind it.

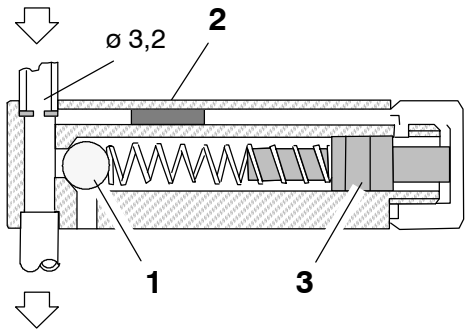
Note! There are shims between the seal retainer and the ball bearing. Fit the same shims and fix them, if necessary, with a little grease.

8. Fill the transmission with oil and check for leaks.

B. Cushioning valve for PTO engagement

1. The cushioning valve is fitted in the gearbox housing and it is accessible when the small cover on the gearbox LH side is removed.

Note! Before removing the cover, the gearbox oil must be drained.



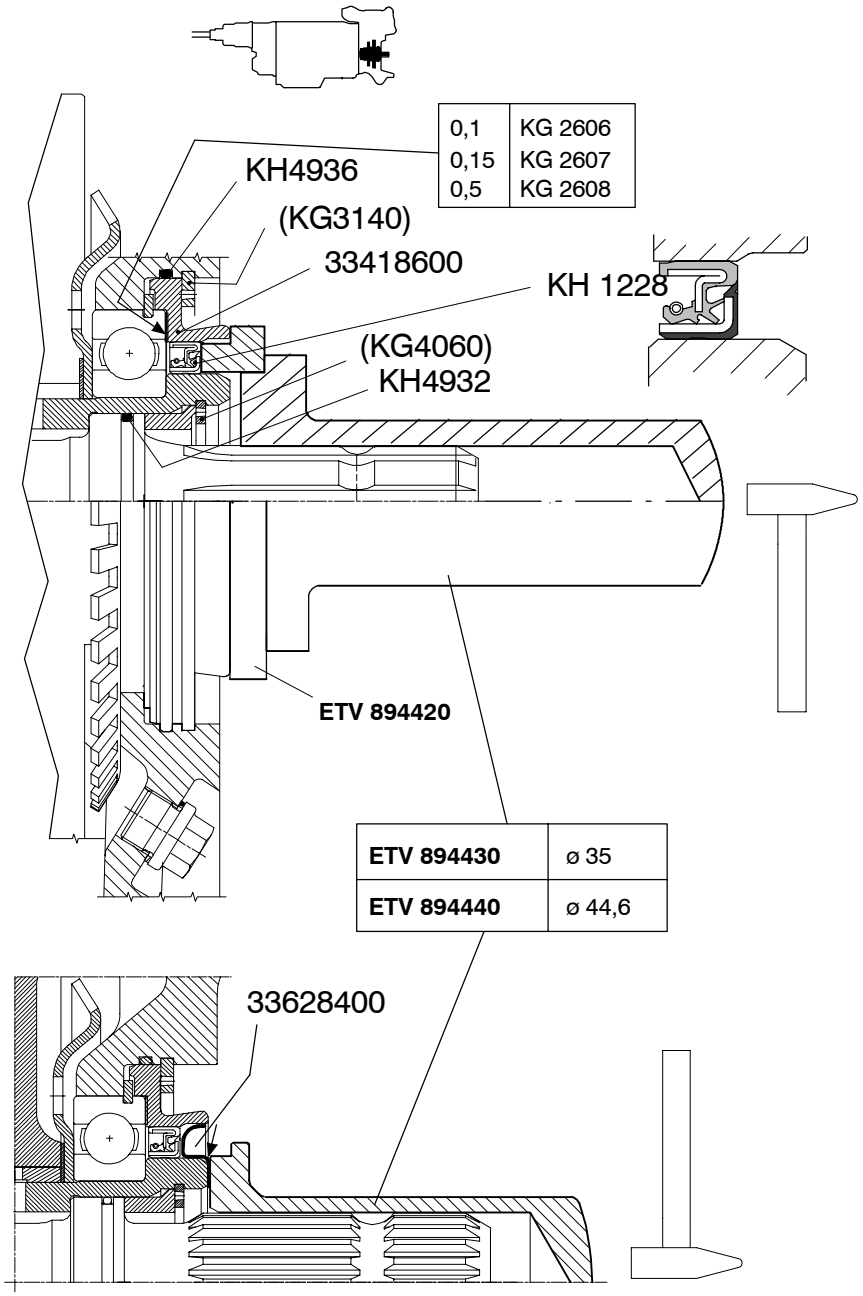
On tractors that have this cushioning valve (and the earlier servo valve block), the PTO engagement can further be made slower by fitting a ø 2 mm restriction into the gearbox housing as follows:
– remove the servo valve block and fit the ø 2 mm restriction into the PTO clutch pressure passage in the gearbox housing. The restriction remains a little above the gearbox housing surface.
– fit the valve block and check that it does not touch the restriction, machine if needed.

Required parts:
– Restriction, ø 2 mm 31742300
– Gasket 32212400

Important! With effect from tractor serial number **660071** the cushioning valve is fitted in the new servo valve block on the LH side of the gearbox, see the next page.

C. Changing cassette seal (H34332–) of PTO shaft

Note! On the tractors, that have the ground speed PTO, the PTO shaft seal is of the earlier type. The new cassette seal can also be fitted on the earlier manufactured tractors, when the seal retainer is changed.



1. Drain the oil from the transmission. Remove the PTO shaft protective tube. Remove the PTO shaft seal retainer large circlip and pry out the retainer with two large screwdrivers. Also the protective cup and the cassette seal are removed.

2. Clean the parts and the housing bore. Change, if necessary, the seal retainer o–ring and oil it.

3. Fit the seal retainer (use same shims between the retainer and the bearing. When necessary, the play can be measured with a dial gauge and new shims can be fitted). Fit the seal retainer large circlip.

4. When the seal retainer is in place, fit the cassette seal as follows:
– lubricate the seal inner and outer surfaces with oil
– tap the seal into place by using ring ETV 894420 and sleeve ETV 894430 (PTO shaft ø 35 mm) or sleeve ETV 894 440 (PTO shaft ø 44,6 mm)
– fit the seal protective cup by using one of the above mentioned sleeves

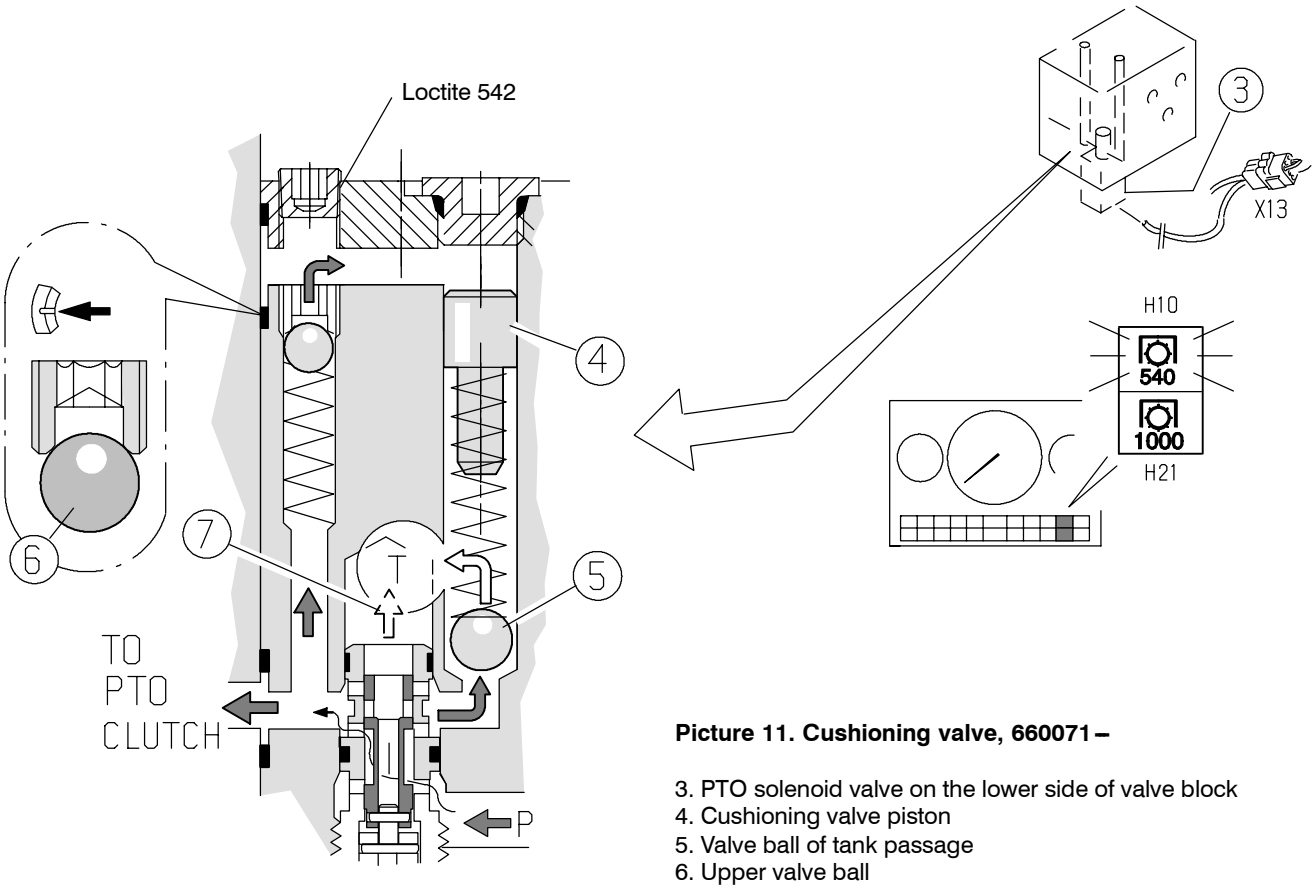
Note! It is very important, that the seal is pushed straight into its location. That is why the fitting sleeves and the ring must be used.

5. Fill the transmission housing with oil. Start the PTO and check for leaks.

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PTO clutch cushioning valve with effect from tractor ser. no. 660071.

From tractor ser. no. 660071 the cushioning valve is in–built in the servo valve block on the LH side of the gearbox. The cushioning valve end plugs are fitted on the top side of the valve block, see pictures on pages **420/17A and 17B point 8**.



Picture 11. Cushioning valve, 660071–

3. PTO solenoid valve on the lower side of valve block
4. Cushioning valve piston
5. Valve ball of tank passage
6. Upper valve ball
7. Return oil to tank via solenoid valve

Note! On later tractors, there is only one signal light for the PTO. Picture above shows the earlier fitting.

Function and modifications of this valve, see page 460/15. The valve can be dismantled by removing the plugs on the servo valve block.

Note! On HiTech tractors (6250–8950) the PTO engagement is controlled by a proportional valve (AC V), and they have not the cushioning valve.

46. Front PTO	~~1. 4. 1997~~ 1. 8. 2000	Model 6000–8950	Code 463	Page 1

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Technical data, 6000–8150

NOTE! Front PTO on models 6250Hi–6850Hi, see page 463/13A.

PTO shaft . . . . . 6–splines, ø 1 3/8" (35 mm)
Nominal revs 1000 r/min are achieved at an engine speed of . . . . . 1860 r/min.
Direction of rotation of the PTO shaft (seen from the front) . . . . . anti-clockwise
Max. permissible continuous loading on the crankshaft . . . . . 400 Nm
Corresponding max. front PTO output at 1000 RPM . . . . . 78 kW (106 hp)
Control:
– electro–hydraulically with aid of a rocker switch in the cab.
– wet multi–disc clutch inside the PTO housing.
– friction discs 9 pcs, intermediate discs 10 pcs . . . . . ø 135 mm.
– clutch pressure (separate hydraulic circuit with a pump and filter) . . . . . 1,8 MPa
– pump output . . . . . 4,5 l/min
Oil cooler fitted in the hydraulic circuit.
Lubricating oil:
– oil volume . . . . . 4,0 litres
– oil quality (same oil as in the tractor transmission) 10W30 GL4

Tightening torques

Front PTO attaching bolts (4 pcs) . . . . . 240 Nm
Fixing bolts of the elastic joint (3+3 pcs (4–cyl.), 4+4 pcs (6–cyl.)) . . . . . 140 Nm
Flange joint bolts on the drive shaft (m12.9) . . . . . 85 Nm
Belt pulley fixing bolts at the crankshaft front end (m12.9) . . . . . 45 Nm
Front power lift attaching bolts, see page 910/26.

Technical data, 8350–8950

PTO shaft . . . . . 6–splines, ø 1 3/8" (35 mm)
Nominal revs 1000 RPM are achieved at an engine speed of . . . . . 2040 r/min (8350Hi: 1767 r/min).
Direction of rotation of the PTO shaft (seen from the front) . . . . . anti–clockwise *)
Max. permissible continuous loading on the crankshaft . . . . . 400 Nm
Corresponding max. front PTO output at 1000 RPM . . . . . 85 kW (116 hp)
Control:
– electro–hydraulically with an aid of a rocker switch in the cab.
– dry cone clutch on the rear face of the PTO housing . . . . . ø 168 mm.
– friction pieces . . . . . 6 pcs
Hydraulics:
– clutch pressure from the tractor low hydraulic circuit . . . . . 1,8 MPa
– pressure from the solenoid valve into the cone clutch . . . . . 1,1 MPa
– the system has a separate hydraulic pump for the cooling circuit
– system is equipped with an oil cooler
Lubricating oil:
– oil amount . . . . . 2,5 litres
– oil quality, Shell Tivela WB. SAE90

Tightening torques

Attaching bolts (4 pcs) of the front PTO bracket on the front face of the engine oil sump . . . . 400 Nm
Front PTO attaching bolts (4 pcs) to the bracket front face . . . . . 140 Nm
Fixing bolts of the elastic joint (4+4 pcs) . . . . . 140 Nm
Flange joint bolts at the rear end of the drive shaft (m12.9) . . . . . 40 Nm
Front power lift attaching bolts, see page 910/26.

*) Change of rotation direction is possible (8450–8950) by removing one intermediate gear and by fitting another gear "in the middle" between the upper and lower shaft.

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1. Description

A. Front PTO on 6000–8150 tractors

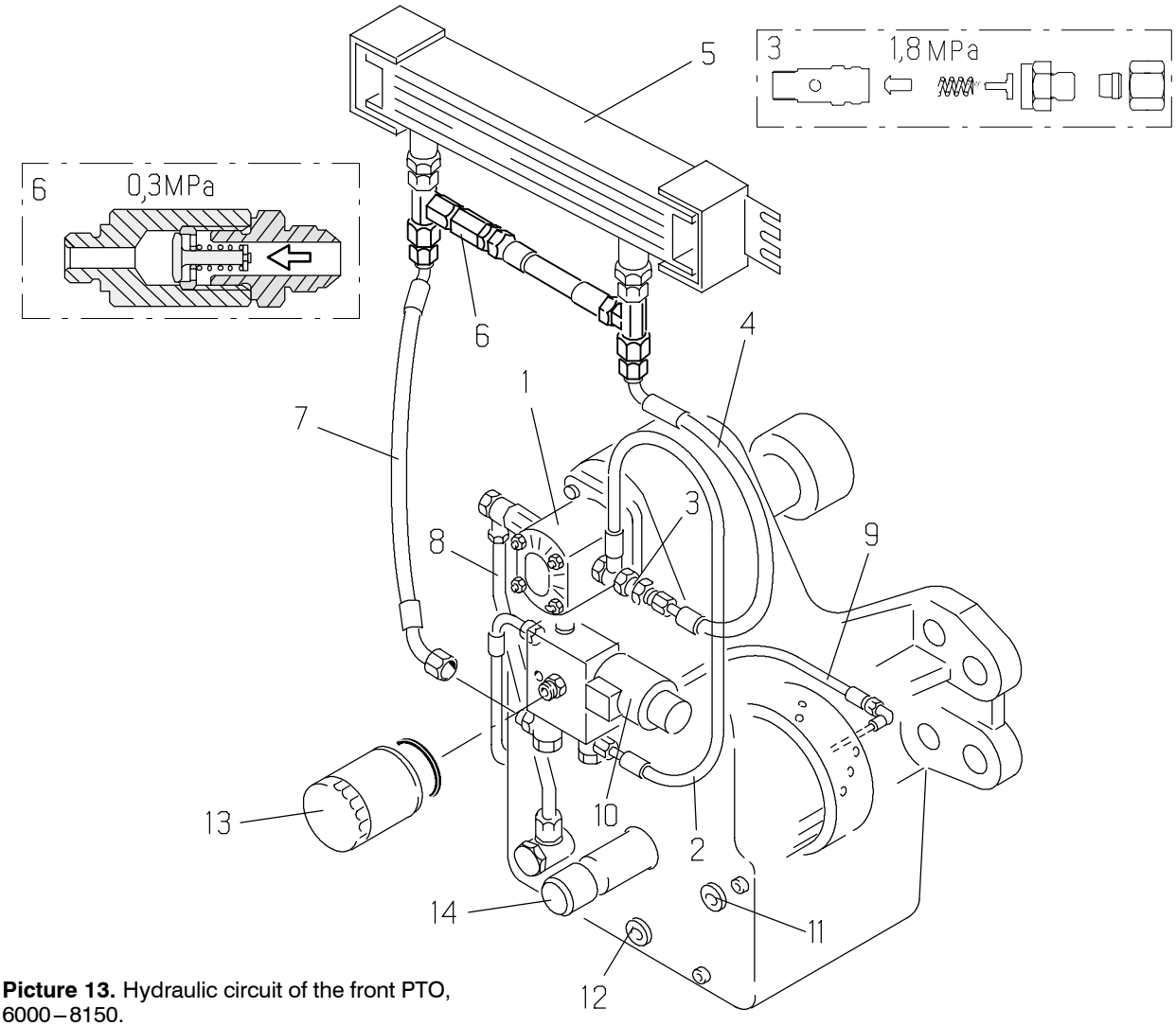
The front PTO is an alternative equipment. The front power lift linkage is also fitted together with the front PTO.

The front PTO unit is attached in place of the tractor front piece. The front PTO unit is powered via a drive shaft in the front end of the engine crank shaft. The PTO unit has its own hydraulic circuit with a pump, and is not connected to the tractor hydraulic system.

On tractors with the front PTO, the engine radiator with its cowl and the fan have been modified as well as, the fan belt pulleys of the crankshaft (the fan ratio has been changed on 8150 tractor, and also the belt pulleys and v–belts).

The front PTO is engaged and disengaged with the aid of a rocker switch in the cab. In the cab lever console, on the PTO wire loom, there is an electric box, which creates a progressive engagement of the front PTO.

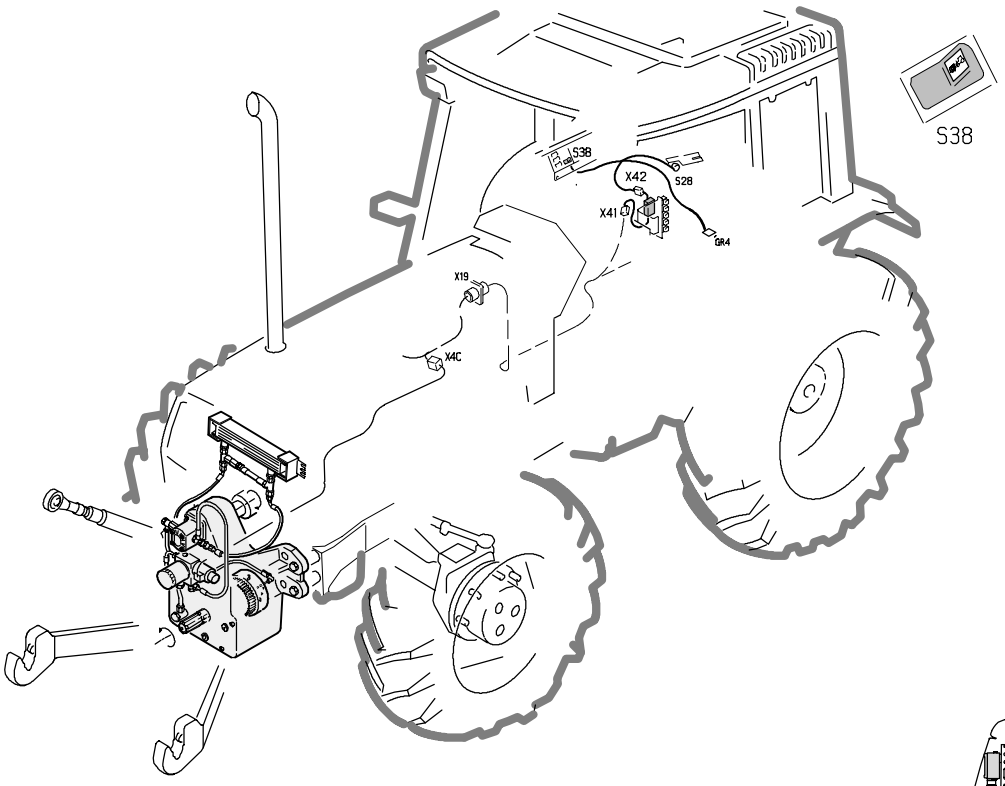
In the PTO housing, there is a hydraulic multi–disc clutch, into which pressure oil is conducted via a solenoid valve (proportional valve) on the front side of the PTO unit.



Picture 13. Hydraulic circuit of the front PTO, 6000–8150.

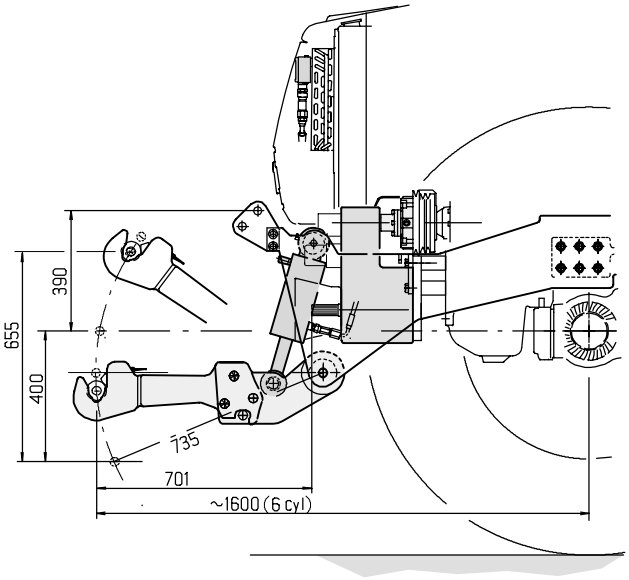
1. Gear wheel pump (output 4,5 l/min)
2. Pressure oil (1,8 MPa) to the solenoid valve
3. Pressure valve, 1,8 MPa.
4. Oil into cooler
5. Oil cooler
6. Cooler by–pass valve, 0,3 MPa
7. Oil from cooler
8. Suction pipe
9. Oil pressure into multi–disc clutch (1,8 MPa)
10. Solenoid valve
11. Oil filling plug/oil level (oil amount 4 l)
12. Oil draining plug
13. Replaceable oil filter
14. PTO shaft

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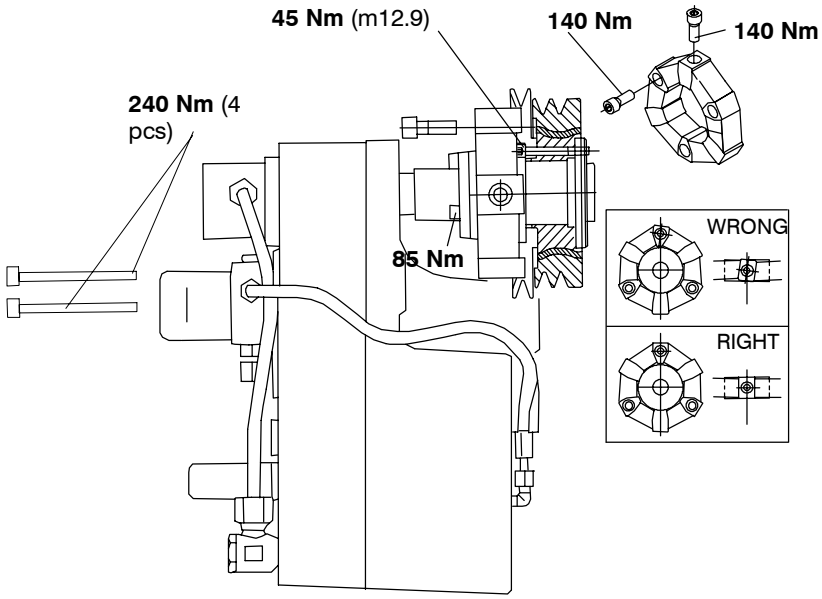


Picture 14. Front PTO on 6000–8150

Note! The max allowed (continuous) loading in the engine crankshaft is 400 Nm, which corresponds to an output of 78 kW (106 hp) in the PTO shaft at an engine speed of 1860 r/min. This must be observed, when large implements are attached to the front PTO. Use a torque limiting clutch, if necessary. With the torque limiting clutch the max. torque can reach up to 750 Nm.



Picture 15. Front PTO and front lift, dimensional drawing



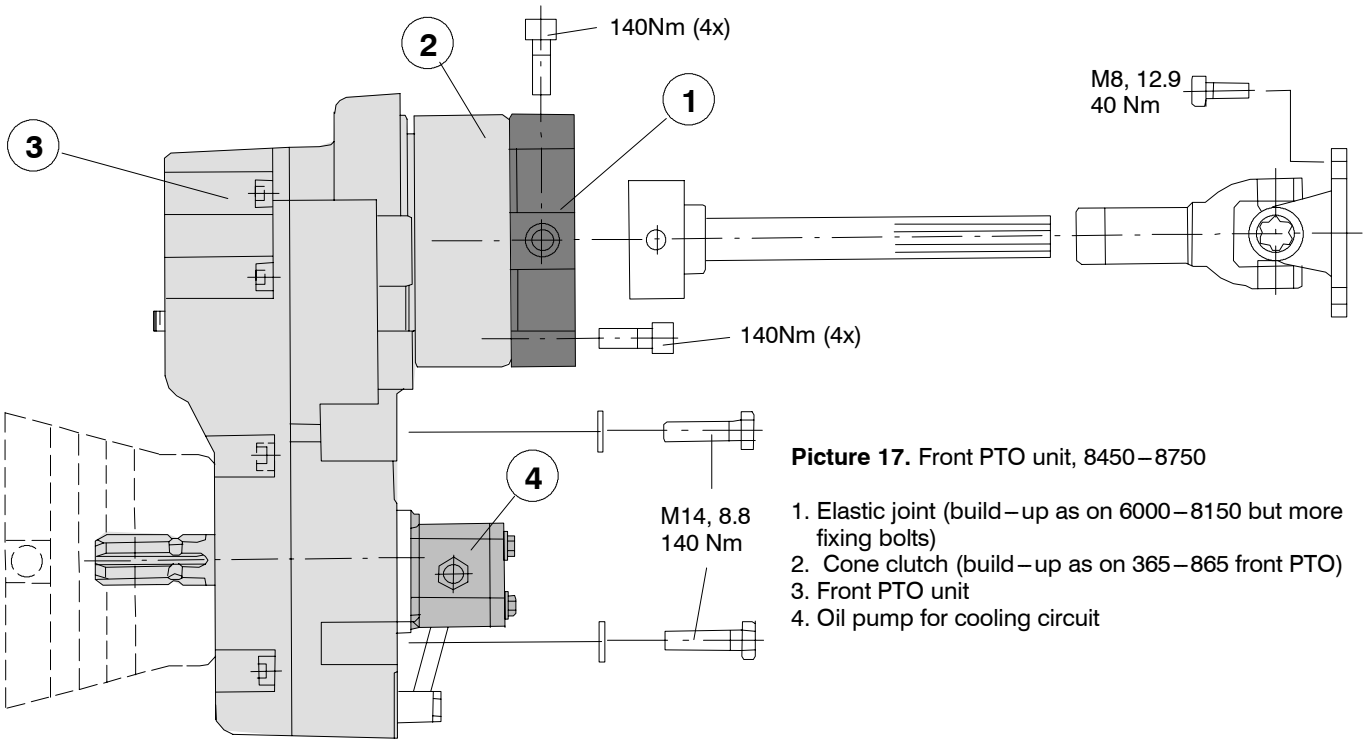
Kuva 16. Etukoneisto 6000–8150

The PTO unit has been fastened to the engine oil sump front surface with four bolts. There are spacer sleeves of 80 mm (6–cyl. engines) between the oil sump and the PTO unit.

There is an elastic rubber joint between the crankshaft front end and the front PTO. On the 4–cylinder engines (6000–6800), the elastic joint is placed inside the belt pulley.

Note! Before removing the front PTO unit, the engine coolant should be drained and the engine radiator and its cowl must be removed.

B. Front PTO on 8450–8750 tractors

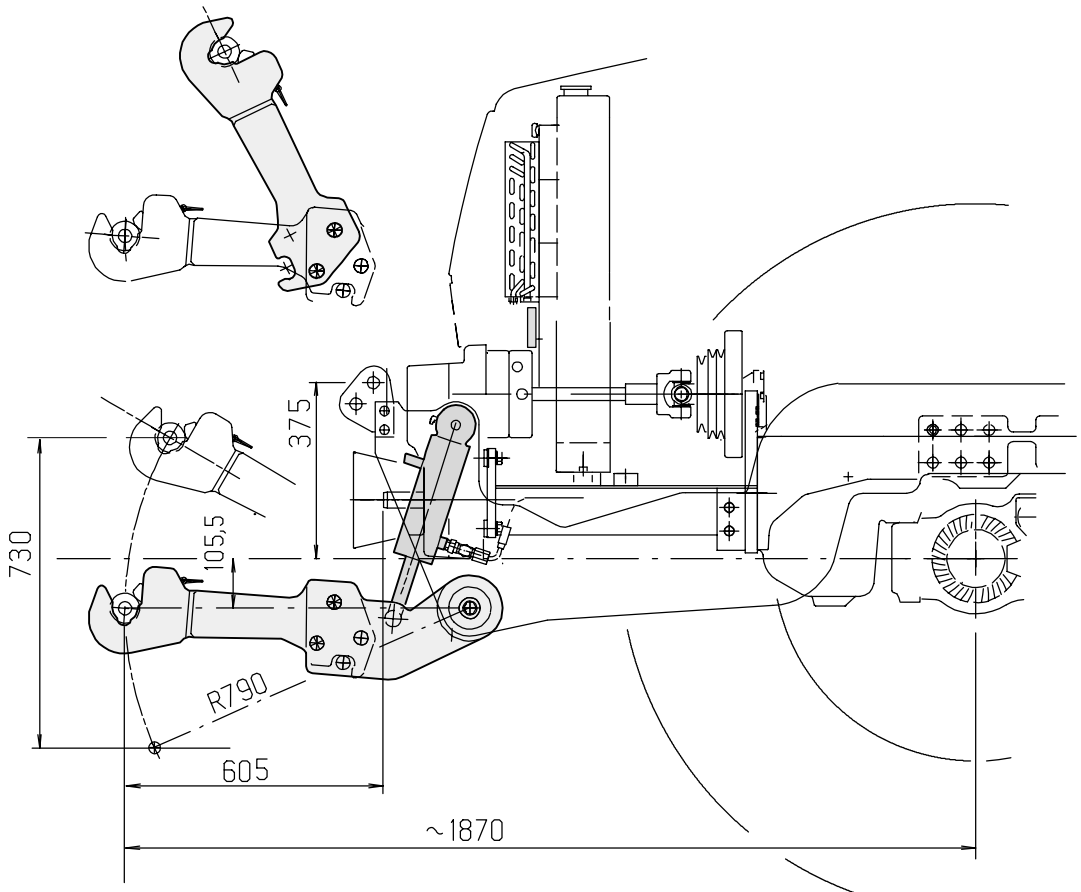


Picture 17. Front PTO unit, 8450–8750

1. Elastic joint (build–up as on 6000–8150 but more fixing bolts)
2. Cone clutch (build–up as on 365–865 front PTO)
3. Front PTO unit
4. Oil pump for cooling circuit

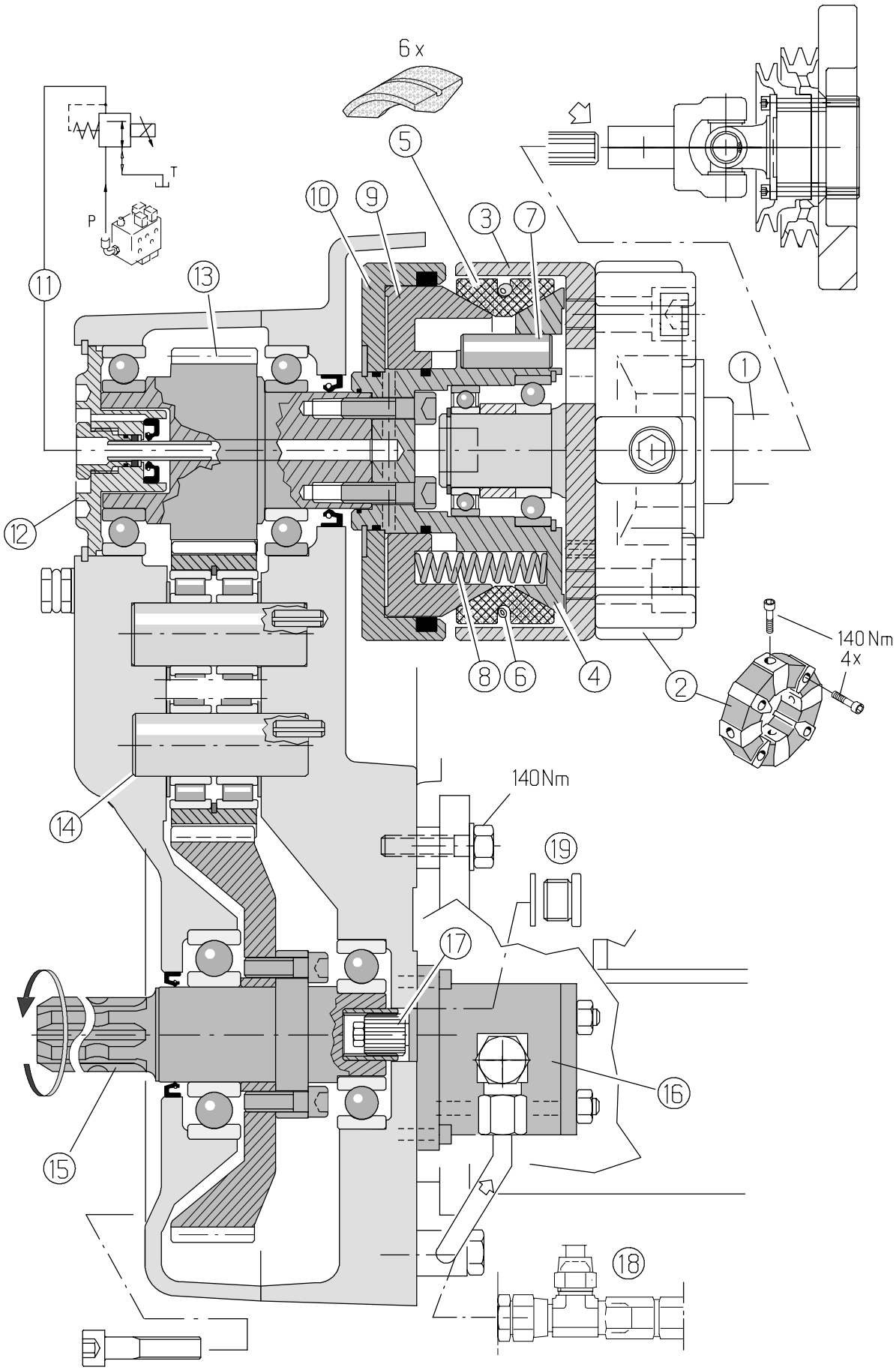
The attaching bracket of the front PTO has been fastened to the oil sump front face in place of the standard front piece. The front PTO is attached to the front part of the bracket with aid of four bolts.

Note! The max allowed (continuous) loading in the engine crankshaft is 400 Nm, which corresponds to an output of 85 kW (116 hp) in the PTO shaft at an engine speed of 2040 r/min. This must be observed, when large implements are attached to the front PTO. Use a torque limiting clutch, if necessary. With the torque limiting clutch the max. torque can reach up to 820 Nm on 8450–8750 tractors.



Picture 18. Front PTO, front power lift 8450–8750, dimensional drawing

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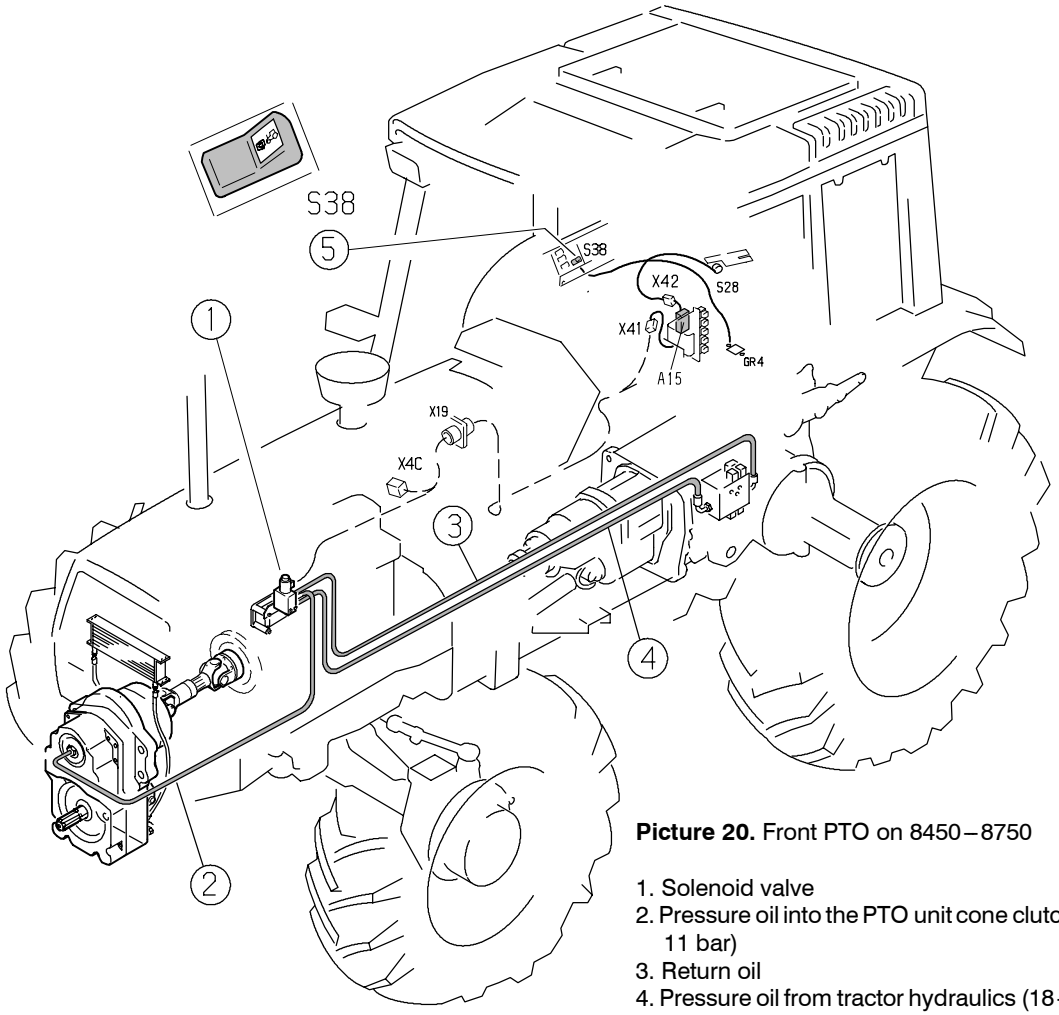


Picture 19. Front PTO unit cross section, 8450–8750

Picture 19. Cross section

1. Drive shaft
2. Elastic joint
3. Clutch drum
4. Hub
5. Friction piece (6 pcs)
6. Spring
7. Clutch guide pin (3 pcs)
8. Return spring (6 pcs)
9. Piston
10. Clutch cylinder
11. Pressure oil into clutch (from tractor low pressure circuit)
12. Oil inlet cover
13. Shaft
14. Intermediate gear wheel
15. PTO shaft
16. Pump (for cooling circuit)
17. Pump drive sleeve
18. Oil draining
19. Oil level

.



Picture 20. Front PTO on 8450–8750

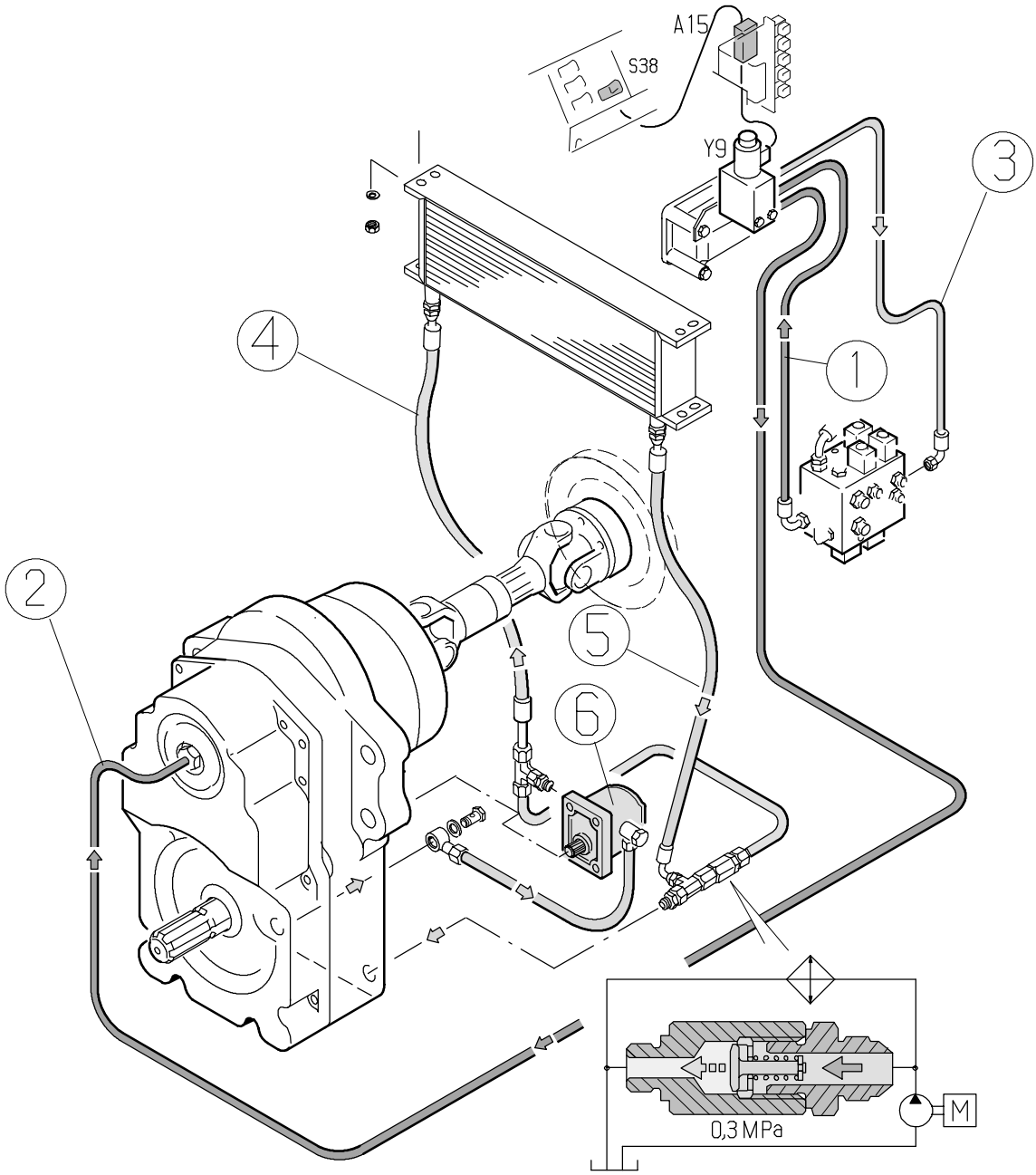
1. Solenoid valve
2. Pressure oil into the PTO unit cone clutch (about 11 bar)
3. Return oil
4. Pressure oil from tractor hydraulics (18–19 bar)
5. Rocker switch of front PTO

On 8450–8750 tractors the front PTO clutch pressure is maintained by the low pressure circuit of the tractor hydraulic system.

Solenoid valve (1), which is located in the engine compartment, directs the oil pressure to the front PTO clutch when the switch (5) is turned. The electronic box (A15) is the same and in the same place as on 6000–8150 tractors.

Note! The electric systems of the front PTO on 6000–8750 tractors are similar, but the wire lengths are different, since the solenoid valves are fitted in the different places on 6000–8150 and 8450–8750 tractors.

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Picture 21. Hydraulic system of the front PTO, 8450–8750.

1. Pressure oil from the tractor hydraulics (1,8–1,9 MPa)
2. Clutch pressure into the PTO unit cone clutch (about 1,1 MPa)
3. Return oil into the tractor hydraulic system
4. Lubricating oil into the oil cooler
5. Return oil from the oil cooler
6. Oil pump for the cooling circuit (pump is different as on 6000–8150 tractors)

Note! The oil cooler by–pass valve, 0,3 MPa, is the same as on front PTO 6000–8150. The oil cooler is different as on 6000–8150 tractors.

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2. Repair instructions, front PTO on 6000–8150

A. Maintenance (also 8350–8950)

1. All front PTO fixing bolts should be retightened after the first 100 running hours.

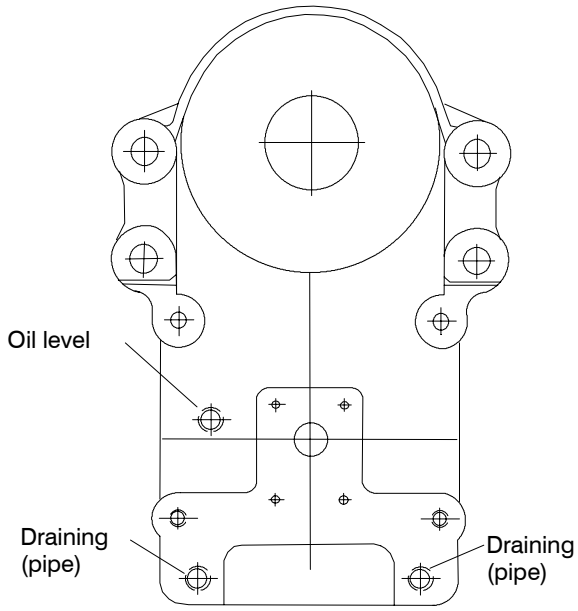
2. Check occasionally for leaks, change leaking parts.

3. 8350–8950: grease the drive shaft universal joints nipples at intervals of 500 running hours.

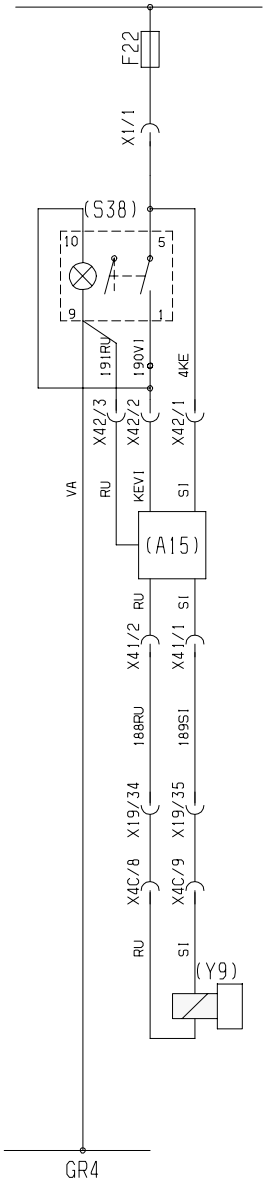
4. 6000–8150: Change oil and filter at intervals of 500 running hours (clean the filter on 6250–6850, Kxxxxx–).
8350–8950: Check oil level at intervals of 500 running hours, top up if needed.
Oil amount and oil quality:
– 6000–8150: 4 litres SAE 10W/30 GL4 oil.
– 6250Hi–6850Hi: 2,6 litres, Shell Donax TX.
– 8350–8950: 2,5 litres SAE90 oil, Shell Tivela WB.
Draining/level plugs:
– 6000–8150, see picture 13 on page 463/3
– 8350–8950, see the next picture
– 6250Hi–6850Hi, see page 463/13B.

5. When necessary, clean the oil cooler to prevent overheating of the front PTO.

6. At every 500 running hours, check the rubber coupling for breakage or tears and replace if necessary.



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Wire colours
Ru=brown
Si=blue
Va=white
Ke=yellow
Kevi=Yellowgreen

B. Fault tracing, 6000–8150 (also 8450–8750)

If the PTO shaft does not start to rotate, although the switch S38 is turned to the starting position, the fault can lie in:
- fuse F22 in the fuse box. Check/change.
- solenoid valve (resistance should be **5,5–7,5 ohms**) or in its wires at which time the solenoid valve does not get voltage in the running position (check, if voltage (12 V) comes to the valve connector pins. If not, check the switch S38 and its wiring).
- pump. Remove the pump and check the splined drive sleeve. 6000–8150: Open the pressure valve and clean it and check the spring and the valve spindle sealing surface). 8450–8750: assure that the pressure of 1,8 MPa is feed into the solenoid valve and that a pressure of 1,1 MPa is fed into the cone clutch.
- worn clutch discs or in leaking piston or solenoid valve seals (the clutch can slip).
- too little oil in the PTO housing. Check/add.

Note! If the front PTO does not start progressively, the fault can lie in the electric box A15 in the cab lever console.

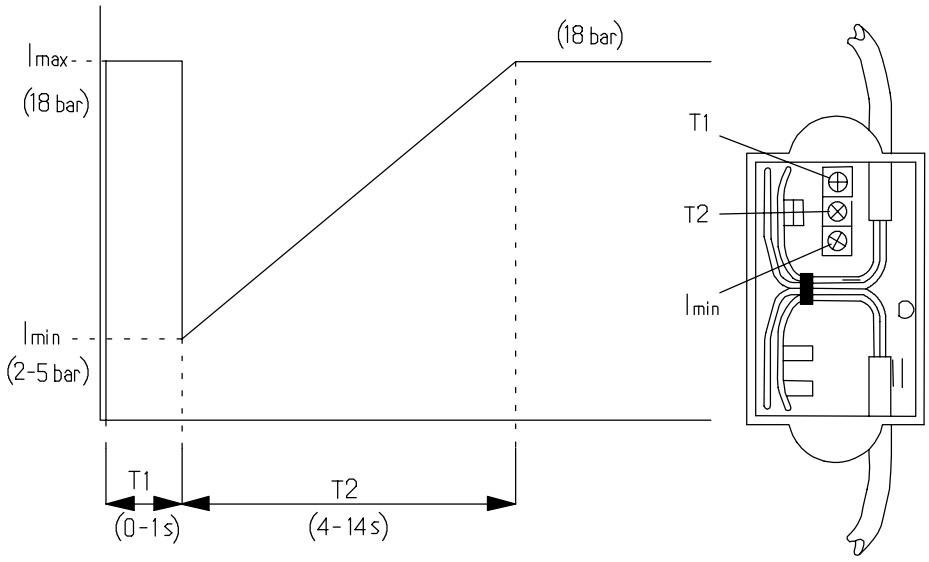
Note! If the front PTO overheats, check the cleanliness of the oil cooler, condition of the pump, oil amount and condition of the by–pass valve and the pressure maintaining valve on 6000–8150

F22 = fuse in the fuse box
S38 = rocker switch on the lever console front part (FRONT PTO)
A15 = electric box (fastened on the relay bracket) in the lever console
Y9 = solenoid valve on the PTO unit front surface (6000–8150) or in the engine compartment (8450–8750)

Connectors:
X1/1 in the fuse box
X42/1, 2, 3 in the cab lever console
X41/1, 2 in the lever console
X19/34, 35 socket in the cab front wall on the RH side
X4C/8,9 in the engine compartment front part
GR 4 earthing point in the lever console rear part
Solenoid valve Y9 pins have connector.

C. Adjusting engagement, 6000–8150

(also 8450–8750)



T1 = Clutch filling time
T2 = Engaging time
I min = Start pressure

The values above can be adjusted by turning the adjusting screws in the electric box A15.

Note! The adjustment has been done in the factory and readjustment is normally unnecessary. Long engaging time causes excessive clutch wear.

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D. Removing the front PTO/changing v–belts/changing elastic joint, 6000–8150

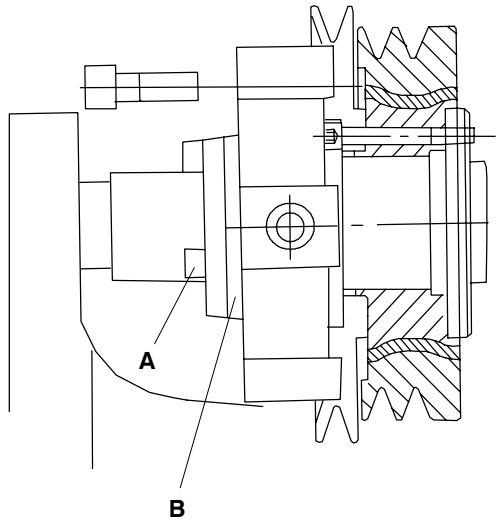
Removing the front PTO unit:

1. Before removing the front PTO unit, the engine coolant should be drained and the engine radiator and its cowl must be removed. At the same time must be released the oil cooler and the air conditioner condenser and the drier reservoir, if fitted (do not disconnect the hoses).

2. Unscrew the bolts of the drive shaft flange joint in front of the elastic joint (bolts A in the picture below). Unscrew the PTO unit four fixing bolts, after which the unit can be removed.

Note! If necessary, remove the front lift top link bracket. It is possible to remove the front housing half while the rest of the unit is attached to the tractor.

Changing v–belts:



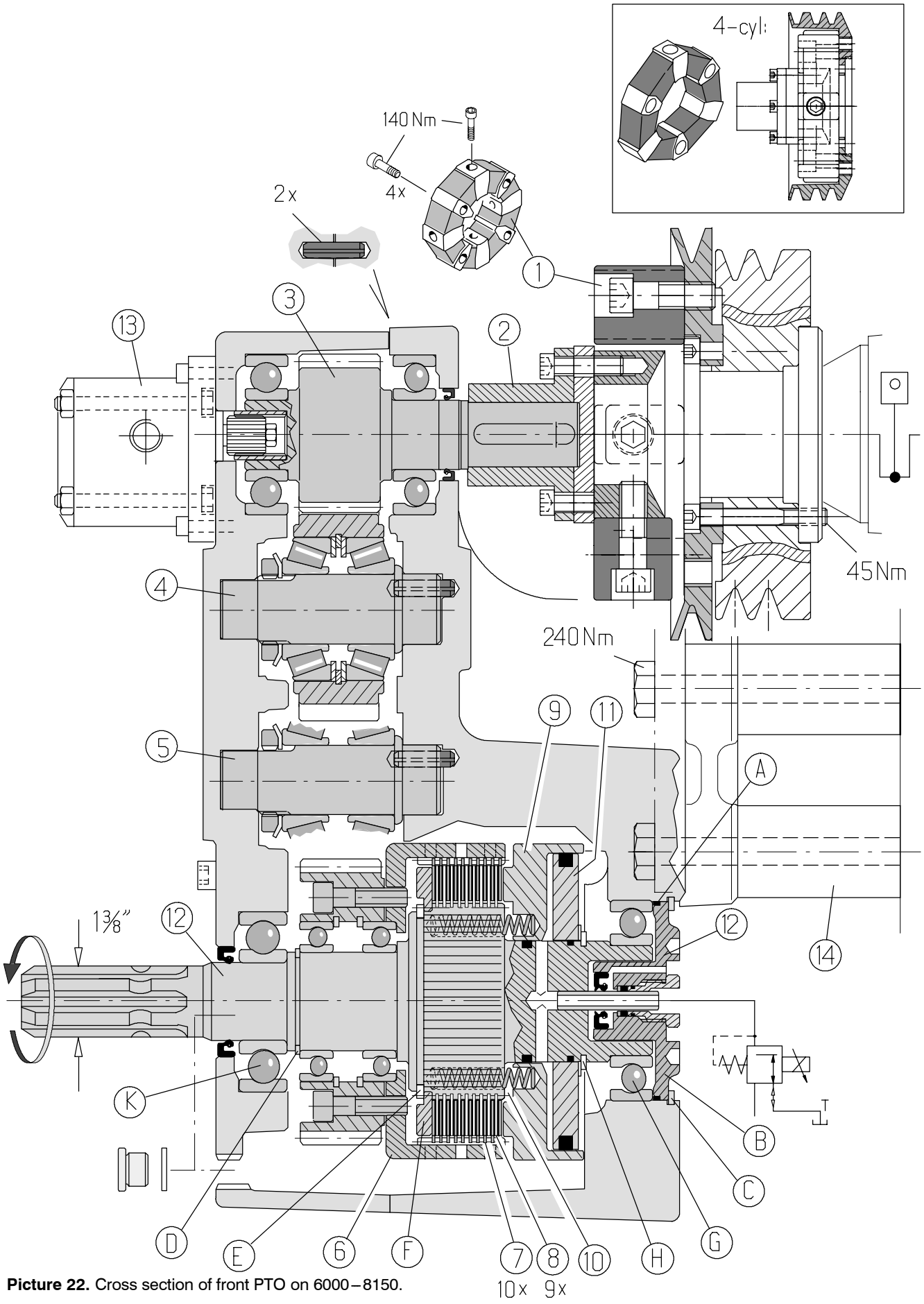
If the engine V–belts have to be changed on 6000–8150 tractors, which are equipped with the front PTO, unscrew the flange joint (A) in front of the elastic joint and then remove the intermediate ring (B), after which there is enough space to remove/fit the belts.

Note! On 6000–6800 tractors (4–cyl.) the front PTO unit must be inclined a little, if the tractors have three belt pulleys.

Changing elastic joint:

Before work the front PTO unit must be removed.
When fitting the elastic joint (140 Nm, 3+3 pcs (4–cyl), 4+4 pcs (6–cyl.)) apply a little grease onto the lower surfaces of the bolt heads (see also picture 16 on page 463/4).

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Picture 22. Cross section of front PTO on 6000–8150.

Picture 22. Cross section.

1. Elastic joint.
2. Clutch inner part
3. Input shaft
4. 1. intermediate shaft
5. 2. intermediate shaft
6. Outer casing of the clutch
7. Intermediate discs (10 pcs)
8. Friction discs (9 pcs)
9. Clutch piston
10. Pressure springs (12 pcs)
11. Cylinder end
12. PTO shaft
13. Pump (Casappa)
14. Spacer sleeves (4 pcs). Not 4–cyl. engines

E. Reconditioning multi–disc clutch/ changing PTO shaft (detached unit)

Disassembly

1. Drain PTO unit oil. Disconnect the oil hoses and pipes. Remove the oil pump (hexagonal socket head 5 mm, 4 pcs) and the solenoid valve.

2. Unscrew the fixing bolts of the housing halves.

3. Tap with a plastic mallet at the PTO shaft rear end flange (B) and at the upper drive shaft rear end, until an opening appears between the housing halves.

4. Place the housing horizontally with the PTO shaft end upwards and pry with two fitting levers the foremost housing half loose from the rearmost half.

Note! This work requires a little force because of the tension pins and bearing tolerances.

5. Tap out the PTO shaft/multi–disc clutch.

6. Remove bearing (G). Compress with a hydraulic press the piston springs and release circlip (H) and remove the support ring under it.

Note! When using the hydraulic press, the pressure sleeve should have a hole on one side, through which the circlip (H) can be released.

7. Remove the piston, springs and the clutch discs.

8. If the PTO shaft has to be changed, remove the gear wheel/clutch drum by removing bearing (K) and circlip (D) and by pulling the drum off with an extractor. Place the support ring (F) and the circlip (E) onto a new shaft. When refitting the drum, tap it onto to the new shaft with a suitable sleeve. Refit the circlip (D) and the bearing (K) and mount the seal rings onto the new shaft.

9. Fit new clutch discs (friction discs, 9 off, and steel discs 10 off outermost) and change, if necessary, the piston seals.

10. During reassembly, compress the piston springs and refit the support ring and the circlip (H). Refit the bearing (G).

Assembly

11. Check/change, if needed, the seal rings of flange (B). Fit o–ring (A) onto the flange (B) and tap the flange into place. Fit the flange circlip (C). Ensure that the o–ring (A) is situated correctly in place.

12. Position the rearmost housing half horizontally on a table and tap the PTO shaft/multi–disc clutch into the housing so that the rear bearing (G) is pushed into the bearing location against the flange (B).

13. Place the intermediate shafts and the drive shaft together with their bearings into the rearmost housing half (if loosened).

14. Clean the mating surfaces of both housing halves and fit a new paper gasket (thickness 0,4 mm).

15. Position the foremost housing half on the other half and tap the foremost housing half until the bearings are pushed into their locations and the mating surfaces touch each others.

16. Tighten the housing half bolts evenly to the correct torque.

17. Refit the oil pump, the solenoid valve and reconnect all oil pipes.

18. Fill the unit with 4 litres transmission oil (oil level must be at the level of the filling hole lower edge).

F. Intermediate shafts

If these shafts or their bearings are to be changed, tighten the shaft nuts so that the bearings have not clearance and secure the nuts with lock washers.

G. Oil seals

The PTO shaft oil seal can be changed without removing the PTO housing. Fit a new seal by using a suitable sleeve. Fit the protective ring and the PTO shaft guard, if removed.

If the upper drive shaft oil seal has to be changed, the PTO unit must be removed.

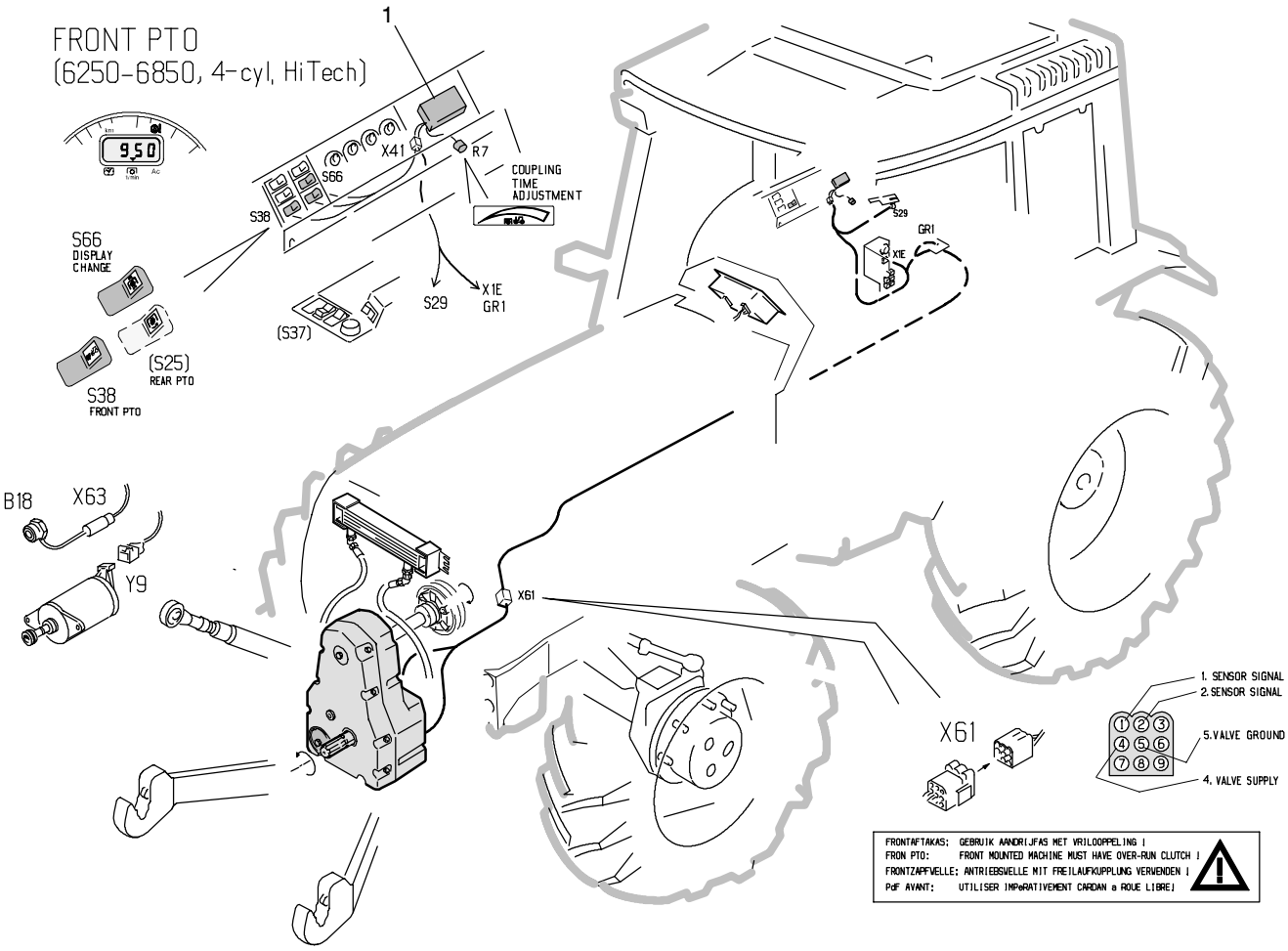
Note! If the front PTO is disassembled and repaired, it is recommended that the oil seals are changed.

H. Others

The pump drive sleeve in the front end of the upper shaft has a press–fit. In addition, locking fluid has been used.

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I. Front PTO on 6250Hi–6850Hi



Picture 23. Front PTO on 6250Hi–6850Hi.

The front PTO control unit (1) is placed in the switch console and there is a separate adjusting knob to adjust the PTO engaging time.

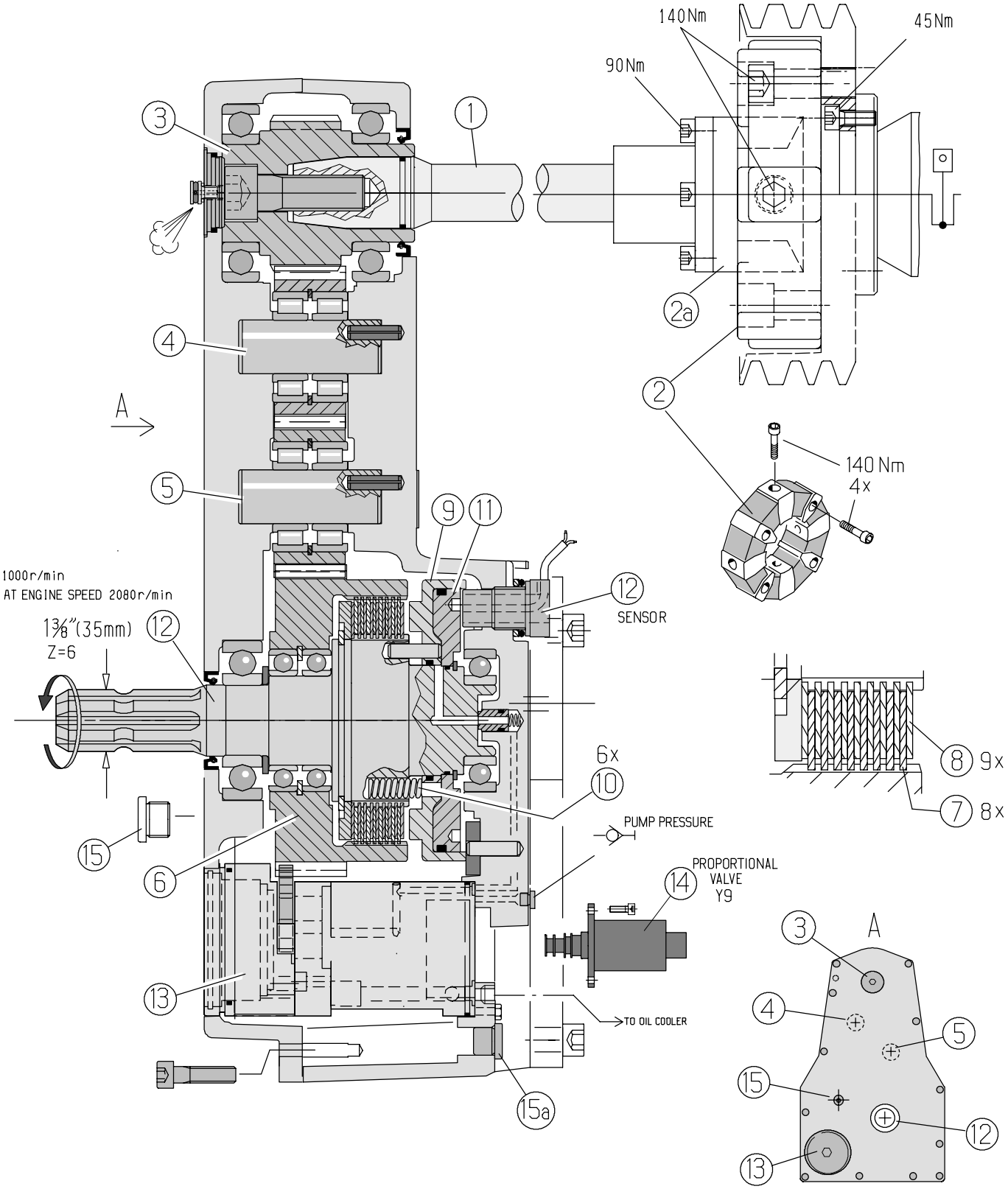
The PTO is engaged/disengaged with switch S38. In the front PTO unit there is a proportional valve Y9.

Note! The max allowed (continuous) loading in the engine crankshaft is 400 Nm, which corresponds to an output of 87 kW (116 hp) in the PTO shaft at an engine speed of 2080 r/min (PTO speed 1000 r/min. This must be observed, when large implements are attached to the front PTO. Use a torque limiting clutch, if necessary. With the torque limiting clutch the max. torque can reach up to 830 Nm.

Maintenance

– Oil quantity in the front PTO is **2,6 litres**
– Oil quality Shell Donax TX
– Change oil and clean suction filter at every 500 running hours.

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Picture 24. Cross–section of 6250Hi–6850Hi front PTO.

1. Drive shaft
2. Rubber coupling
2a. Intermediate ring
3. Drive gear
4. 1. intermediate shaft
5. 2. intermediate shaft
6. Clutch drum
7. Steel disc (8 pcs)
8. Friction disc (9 pcs)
9. Piston
10. Return springs (**6** pcs)
11. Cylinder end flange
12. PTO unit
13. Pump unit
14. 3/2 – proportional valve
15. Filling/checking plug
15a. Draining plug

Repair instructions:

Ref. numbers in the instructions refer to picture 24.

A. Changing v–belts:

– unscrew drive flange bolts (90 Nm) in front of the rubber coupling **2**
– remove spacer ring **2a**
– remove v–belts through the gab

B. Removing / fitting the PTO unit:

Removal:

– unscrew drive flange bolts (90 Nm) in front of the rubber coupling **2**
– disconnect oil cooler hoses
– disconnect proportional valve wires.
– drain oil (if necessary)
– unscrew PTO unit fixing bolts.

Fitting:

– fit the unit into place and guide the drive shaft and hoses into places.
– tighten four fixing bolts to **150 Nm**
– connect drive flange (90 Nm)
– connect oil hoses.
– connect eletric wires
– fill the unit with oil (if drained)

C. Changing clutch discs / PTO shaft

– detach the PTO unit. Drain oil.
– disconnect the drive shaft tapered joint as follows:
Remove the breather flange on upper front face. Prevent shaft from rotating and unscrew the joint bolt. Screw in a longer bolt M22x1,5 and hit against the end of the bolt until the joint releases.
– place the PTO unit , PTO shaft upwards, on a suitable ground, unscrew housing halves bolts and split the housing.
– take the PTO shaft/clutch out of the houisng.
– compress the piston return springs with e.g. three small glue clamps and remove the piston snap ring. Remove the piston and the clutch disc pack
– if the PTO shaft is changed, remove parts on the shaft (see picture 24), change the shaft and refit the parts on the new shaft.
– change clutch discs and oil them. Fit the piston, compress the springs and fit the snap ring.
– position all parts into the housing

To be observed during assembling:

– before connecting the housing halves, check that the intermediate shafts are in bottom and the tension pins in their borings
– use new 0,4 mm paper gasket between housing halves
– do not damage the PTO shaft oil seal when fitting the upper housinhg half
– tap the upper housing half until the contact surfaces are against each others.
– tighten progressively the housing halves bolts
– Connect the drive shaft tapered joint as follows:
Clean well the tapered surfaces. Apply suitable Loctite locking fluid on the tapered surface. Prevent the drive shaft from rotating and tighten the M22 bolt to **550 Nm**. Fit the breather flange in front of the bolt.
– Fill the PTO with oil.

D. Changing outer oil seals

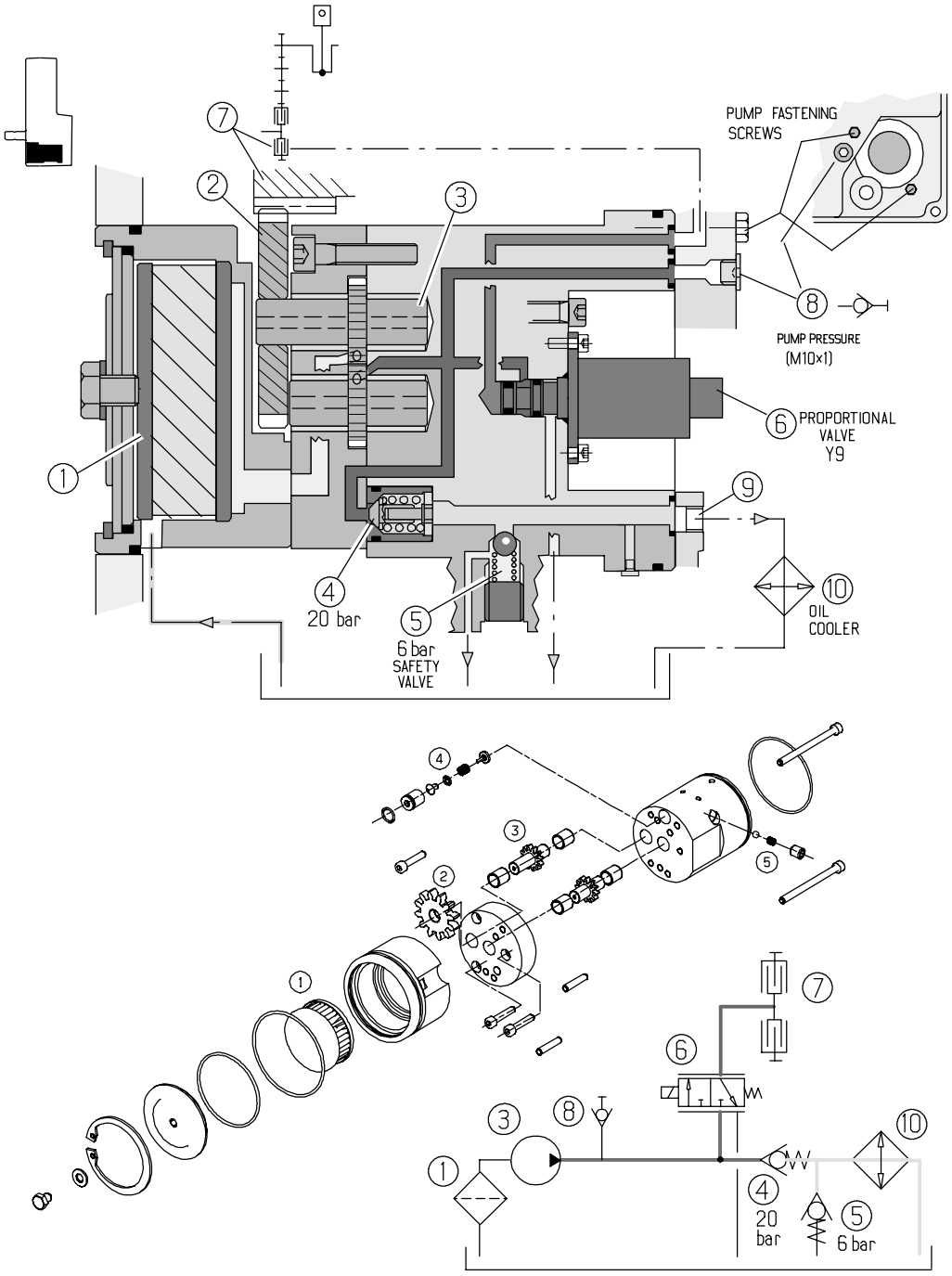
PTO shaft seal:

– the seal can be changed from front without removing the PTO unit. Pry out the damaged seal in a suitable way. Do not damage the shaft sealing surface.
– oil the lips of as new seal and fit it by using a suitable sleeve or the old seal. Do not damage the new seal on the shaft splines

Drive shaft seal:

– remove the front PTO unit.
– remove the drive flange on the drive shaft front end and pry out the seal. Do not damage the sealing surface
– oil the lips of a new seal and fit it
– refit the PTO unit

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Picture 25. 6250Hi–6850Hi tractors' oil pump in the front PTO.

1. Suction filter
2. Drive gear
3. Gear wheel pump
4. Pressure–limiting valve (20 bar), clutch pressure
5. Safety valve (6 bar)
6. 3/2 – proportional valve
7. PTO multi–disc clutch
8. Pressure–test point
9. Into oil cooler
10. Oil cooler

The pump produces the clutch engaging pressure (20 bar) and circulates oil through the oil cooler.

Removing pump:
– drain oil in PTO unit
– remove the suction filter flange snap ring (slacken first the centre bolt).
– remove the flange and filter
– disconnect prop. valve wires
– unscrew two pump fixing screws (see picture above)
– remove the pump from front

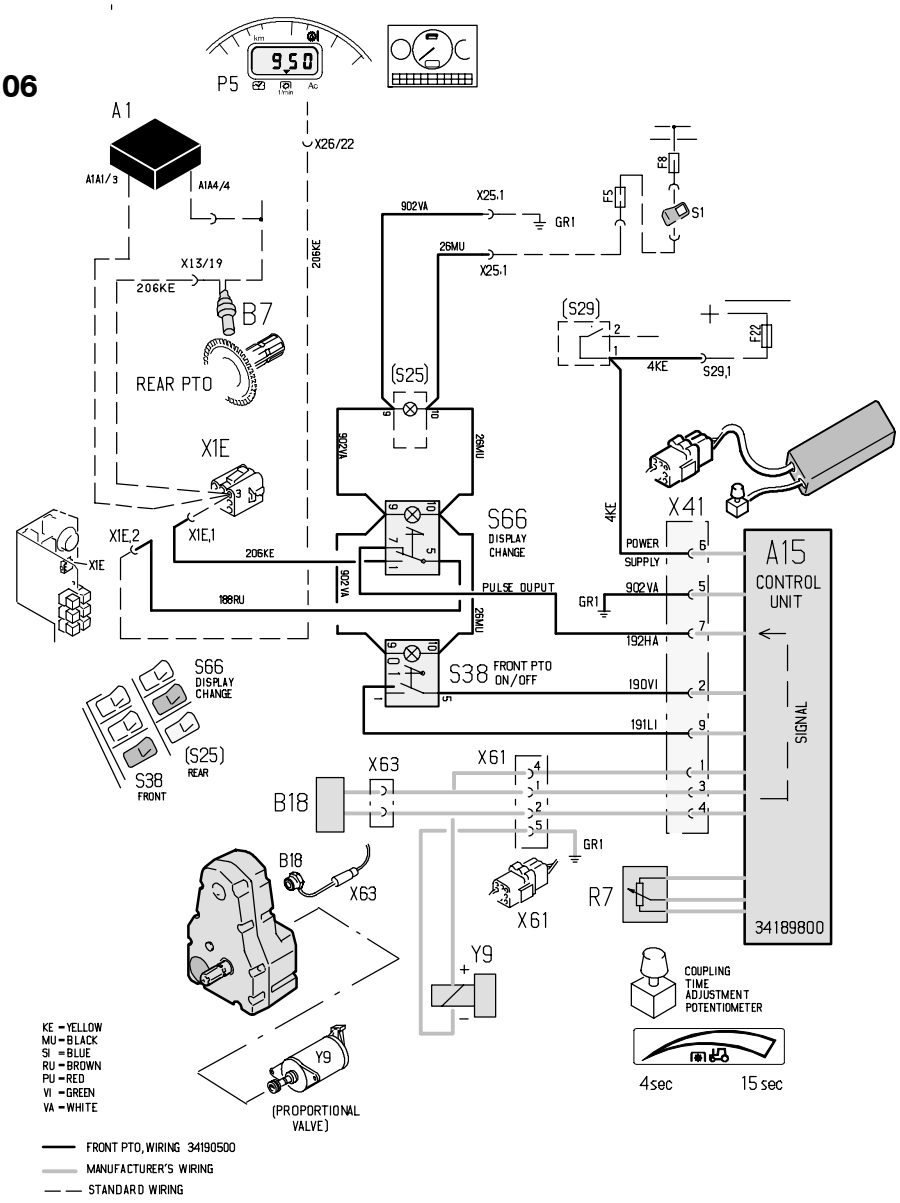
Note! The pump can be dismantled by opening the assembling screws. The prop. valve, pressure–limiting valve (20 bar) and safety valve (6 bar) can be removed

To be observed when fitting the pump:

– ensure that there are small o–rings round the pump pressure drillings. Fix them with a little grease.
– check all sealing rings.

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–K41106



Picture 26. Wiring diagram of front PTO, **–K41106**, 6250Hi–6850Hi

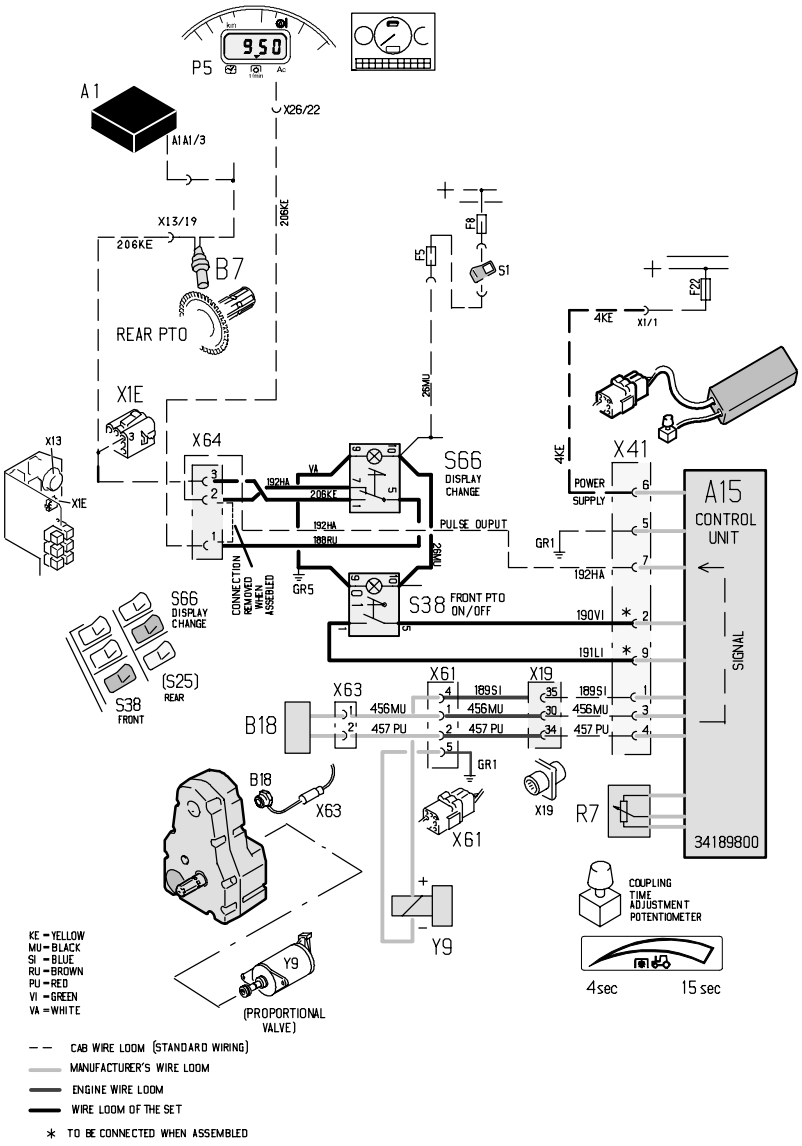
When the PTO speed has been selected in the upper displ-lay of Agrodata–instrument (arrow at PTO symbole), the display shows either front PTO or rear PTO rotation speed depending on use of rocker switch **S66**:

With potentiometer **R7** can be adjusted stepplessly the engaging time of the front PTO (between 4–15 seconds). The engagging time is independet of loading.

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K41107–

AC5.2 FRONT PTO, WIRING
(4-cyl HiTech, K41107–)



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3. Front PTO 8450–8750, repair instructions

A. Maintenance

See page 463/9.

B. Fault tracing

See page 463/10.

C. Adjusting engaging time

See page 463/10.

D. Removing front PTO unit

– Release the clutch pressure hose on the unit front face
– Release the oil cooler hoses (oil draining) and remove the oil cooler
– Unscrew the elastic joint bolts, which are fitted radially
– Remove the top link bracket of the front lift
– unscrew the front unit fixing bolts (4 pcs)

Note! It is possible to remove separately the PTO housing front half while the unit is attached to the tractor, at which time the PTO shaft, gear wheels and bearings are accessible. There is a paper gasket with thickness of 0,4 mm between the housing halves.

E. Changing V–belts / elastic joint

V–belts:

– Remove the top link bracket of the front lift.
– Remove the oil cooler and its return hose
– Unscrew the elastic joint bolts, which are fitted radially
– Unscrew the PTO unit two lower fixing bolts and fit in place screws with length of 100mm (M14)
– Unscrew the two upper fixing bolts
– Pull the unit forwards along the lower bolts
– Pull the drive shaft front end out of its spline joint
– Pass the V–belts onto the shaft through the hole on the cowl

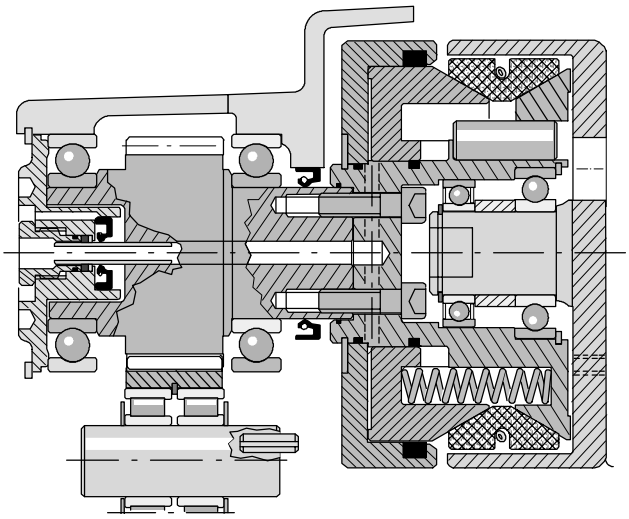
Note! Refitting is done in the reverse order. In order to make the refitting easier, push the drive shaft front end into the rear end splined joint before fitting the unit

Note! In addition the viscous fan must be detached on the coolant pump side and possible air compressor V–belt should be slackened.

Elastic joint:

Before changing work, the front PTO unit must be removed. When refitting the rubber coupling, tighten the 4 radial and 4 axial bolts to a torque of 140 Nm. Apply a little grease onto the bolt head lower surfaces. (also see picture 16 on page 463/4).

F. Cone clutch



Before the cone clutch can be dismantled the PTO unit must be removed.

The cone clutch is dismantled as follows:
– remove the elastic joint
– release the clutch bearing circlip through the holes in the clutch drum end
– pull out the drum with aid of puller screws (M10) after which the friction pieces are accessible. The bearings loosen when the clutch drum is pulled out.
– If the clutch piston seals or the upper shaft oil seal have to be changed, unscrew the clutch hub six bolts, after which the seals can be changed.

G. Others

The PTO shaft oil seal as well as the upper shaft flange seals can be changed without removing the front PTO or the PTO shaft. The pump drive sleeve in the front end of the PTO shaft has a press–fit. In addition, locking fluid has been used.

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HiShift A33277000

HiShift reduces the use of the clutch pedal to minimum.
HiShift can be fitted on the tractors, which have an hydraulically controlled clutch release mechanism. With effect from tractor ser. no. G10101 all cabs have readiness for HiShif (the valve bracket and a prepared hole for the valve, the support of the clutch pedal axle and the limiters have already been fitted).

FITTING:

– Remove the engine hood plates. Remove the battery.
If the battery is fitted lengthwise, remove also the protective plate behind the battery.

– Remove the instruments. Remove the clutch pedal power assistance and the pedal and the clutch master cylinder.

*) Up to tractor number G10100:
Remove the spindle of the limiter for the clutch pedal upper position and the spring (see picture C).
Detach switches S9 and S24 (if fitted).

*) Disconnect the wire of the LH side side light (can be damaged during welding).

*) Mark places for holes for the valve and the wire loom onto the cab front wall, see picture A.

*) Mark also a place for the adjusting hole onto the LH side of the steering wheel console, see picture B.

*) Cut the marked holes. Cut the lower part of the valve hole so that the pipe for the limiter of the pedal upper position is removed.

*) Mark a place for the valve bracket and weld it into place. Weld the pedal axle support into place according to picture C (the hole of the upper position limiter screw must be in the middle of the opening).
Protect other parts against welding splashes and fire risk. Paint the welded points and the edges of the holes.

– Fit the valve onto the bracket, seal joints with silicone mass. Fit a new clutch pedal and a limiter screw for the upper position.
Fasten the pusher to the pedal (parts **11–16**, picture G) and adjust its clearance with aid of the upper position limiter screw so that the pusher is free (ref. 6 in picture C) and the clearance to the piston hole edges is min. 1 mm.

*) Up to tractor number G10100: Fit a new lower position limiter of the pedal (parts **25–29**, picture G) into place. Remove the earlier lower position limiter by sawing it.

– Open the cab floor mat on the RH side.
Detach the plastic console of the mudguard and the gear levers, the side panel and the switch panel.

HiShift A33277000

HiShift verringert den Gebrauch des Kupplungspedals auf ein Minimum.
Mit HiShift können alle Traktoren ausgerüstet werden, die über einen hydraulisch gesteuerten Kupplungsausrückmechanismus verfügen. Ab der Traktor-Serien-Nr. G10101 sind alle Traktoren für den HiShift-Einbau vorbereitet (die Ventilhalterung und eine entsprechende Öffnung für das Ventil sowie der Träger für die Kupplungspedalachse und die Begrenzer sind bereits angebracht).

EINBAU:

– Entfernen der seitlichen Motorraumabdeckungen. Ausbauen der Batterie. Wenn die Batterie längs eingebaut ist, muß auch die Schutzplatte hinter der Batterie ausgebaut werden.

– Ausbauen der Instrumente. Entfernen der mech. Servo-Kupplungsunterstützung, des Pedals und des Kupplungshauptzylinders.

*) Ab der Traktor-Nr. G10101:
Entfernen der Spindel und der Feder des Begrenzers für die obere Kuppllungsposition (siehe Bild C). Abklemmen der Schalter S9 und S24 (falls montiert).

*) Abklemmen des Kabels der Beleuchtungseinheit auf der linken Seite (kann während des Schweißens beschädigt werden).

*) Kennzeichen der Öffnungen für das Ventil und den Kabelstrang an der Frontwand der Kabine, siehe Bild A.

*) Ebenso die Position der Einstellöffnung auf der linken Seite der Lenkradkonsole kennzeichnen, siehe Bild 3.

*) Ausschneiden der markierten Öffnungen. Den unteren Teil der Ventilöffnung so auschneiden, daß das bisherige Rohr für den Begrenzer der oberen Pedalposition entfernt wird.

*) Markieren der Position für die Ventilhalterung und diese dann an die entsprechende Stelle anschweißen. Anschweißen des Trägers für die Pedalachse gemäß Bild C (das Loch für die Einstellschraube der oberen Pedalposition muß mittig zur Öffnung für das Ventil liegen).

– Das Ventil an der Halterung befestigen und die Fugen mit Silikon abdichten. Ein neues Kupplungspedal und eine Begrenzungsschraube für die obere Pedalposition montieren.
Den Ventilschieber am Pedal befestigen (Teile **11-16**, Bild G) und mit Hilfe der Begrenzungsschraube für die obere Pedalposition so einstellen, daß der Schieber frei beweglich ist (Punkt 6 in Bild C) und das Spiel zu den Kanten der Kolbenbohrungen mindestens 1 mm beträgt.

*) Ab der Traktor-Nr. G10101: Anbringen eines neuen Begrenzers für die untere Pedalposition (Teile **25-29**, Bild G) an die entsprechende Stelle. Den alten Begrenzer durch Absägen entfernen.

– Die Fußbodenmatte auf der rechten Seite lösen. Entfernen der Plastikkonsole des Kotflügels sowie der seitlichen Armaturentafel und der Schalterleiste.

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– Remove the gear level knobs and fit new ones (picture E). Fit the control buttons onto the knobs, connect the wires to connector S45, see picture E.

– Fit and connect the wire loom into place and fasten it with binds to the cab wire loom (picture E).
Fit diodes V5 onto the wire loom.

– HiShift wire loom connectors X38 (supply) and X36 (earthing of the slower engagement) must be connected (depending on the tractor number) accordning to pictures D.1 and D.2.

Note! If the tractor is not equipped with Agrodata–instrument, a rocker switch for the earthing of the slower engagement (relay K24) must be fitted on the RH side of the instrument.
Current to the rocker switch lamp is drawn from connector nr 10 of the light switch S1 (to this connector comes brown wire no. 15).

On the ACIV–tractors, this earthing must be done according to picture D.3.
Note (ACIV)**!** – parts of the earth signal do not belong to HiSHift series, but they must be ordered separately, see parts catalogue.
The speed limit must be programmed again (10 kmph –> 4 kmph) see Workshop Manual.

– Make a ø 38 mm hole through the gearbox sound insulation at the hose union of the steering system return oil pipe (picture F).

– Remove the pressure hose to the valve block. (Note! Tractors with the brake valve: remove the pressure hose from the brake valve, picture F.2). Remove the hose connector from the valve block and fit a new connector. Pass the hydraulic hoses into place according to picture between the sound insulation plate and the cab, bind with binders, if necessary.

– If the battery is fitted lengthwise:
Fasten the clutch and damping cylinder fluid reservoirs onto the protective plate behind the battery.
On the latest tractors, there are ready–made holes (3 pcs, ø 8 mm).

– If the battery is fitted crosswise:
Fasten the clutch fluid reservoirs onto the mounting plate (33432300, picture C).
Remove the brake fluid reservoir. Mark and drill ø 6,5 mm holes through the mounting plate so that the reservoirs are in the correct level. Fasten the plate and brake fluid reservoir.

– Connect the fluid hoses to the cylinders (a new hose also for the clutch master cylinder). Shorten the hoses, if needed. The hose to the master cylinder must be fitted before fastening the master cylinder.

– Fill the reservoirs with brake fluid. Bleed the clutch. The hoses must be fitted so that no air pocket appear.

– Die Schalthebelköpfe entfernen und durch die neuen ersetzen (Bild E). Die Druckknöpfe an die Schaltköpfe montieren und die Leitungen mit Stecker S45 verbinden, siehe Bild E.

– Den Kabelstrang anschließen und mit Bindern am Kabinenkabelstrang befestigen (s. Bild E). Die Dioden V5 am Kabelstrang anbringen.

– Der Stecker des HiShift-Kabelstrangs X38 (Versorgung) und X36 (Erdung für den langsamen Einrückvorgang) müssen gemäß Bildern D.1 und D.2 angeschlossen werden.

Hinweis! Wenn der Traktor nicht mit einem Agrodata-Instrument ausgerüstet ist, muß ein Kippschalter für die Erdung des langsameren Einrückvorgangs (Relais K24) an der rechten Seite des Armaturenbretts angebracht werden. Strom für die Kippschalterbeleuchtung wird vom Stecker Nr. 10 des Lichtschalters S1 entnommen (zu diesem Stecker führt das braune Kabel Nr. 15). Bei Traktoren mit ACIV-Instrument muß die Erdung gemäß Bild D.3 angeschlossen werden.
Hinweis (ACIV)**!** Einige Teile zur Erdung gehören nicht zum HiShift-Bausatz und müssen separat bestellt werden, siehe Ersatzteilkatalog.
Die Geschwindigkeitsgrenze muß erneut programmiert werden (10 km/h –> 4 km/h), siehe Werkstatthandbuch.

– Bohren eines Loches (ø 38 mm) durch die Schalldämmungsplatte des Getriebegehäuses an der Rückflußleitung der Lenksystemhydraulik (Bild F).

– Entfernen des Druckschlauchs zum Ventilblock (Hinweis! Bei Traktoren mit Anhängerbremsventil: entfernen des Druckschlauchs vom Bremsventil, Bild F.2). Den Schlauchanschluß vom Ventilblock entfernen und durch einen neuen ersetzen. Anbringen der Hydraulikschläuche, gemäß der Abbildung, zwischen die Schalldämmungsplatte und die Kabine. Falls notwendig, die Schläuche mit Bindern zusammenbinden.

– Bei längs eingebauter Batterie: Befestigen der Flüssigkeitsbehälter für die Kupplung und den Dämpfungszylinder an der Schutzplatte hinter der Batterie.
An den neueren Traktoren sind die Bohrungen bereits angebracht (3 Stück, ø 8 mm).

– Bei quer eingebauter Batterie:
Anbringen des Kupplungsflüssigkeitsbehälters an der Befestigungsplatte (33432300, Bild C). Entfernen des Bremsflüssigkeitsbehälters. Kennzeichnen und Bohren der Löcher (ø 6.5 mm), so daß alle Behälter auf der Platte angebracht werden können. Befestigen der Platte und des Bremsflüssigkeitsbehälters.

– Verbinden der Schläuche mit dem Zylinder (auch für den Hauptzylinder sollte ein neuer Schlauch verwendet werden). Falls notwendig, die Schläuche kürzen. Der Schlauch zum Hauptzylinder muß vor der Montage des Zylinders angebracht werden.

– Die Behälter mit Bremsflüssigkeit füllen. Die Kupplung entlüften. Die Schläuche so montieren, daß keine Lufteinschlüsse auftreten.

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– Start the engine and operate the clutch pedal with the buttons many times. Check the function and possible leakages. Fit the limiter screw of the lower position (clearance 0,2..2,0 mm). Fit the switch S9 (on AC IV also S24). Fit the instruments.

– Fit the HiShift sticker (picture E).

– Carry out adjustment and test–run, see page 11.

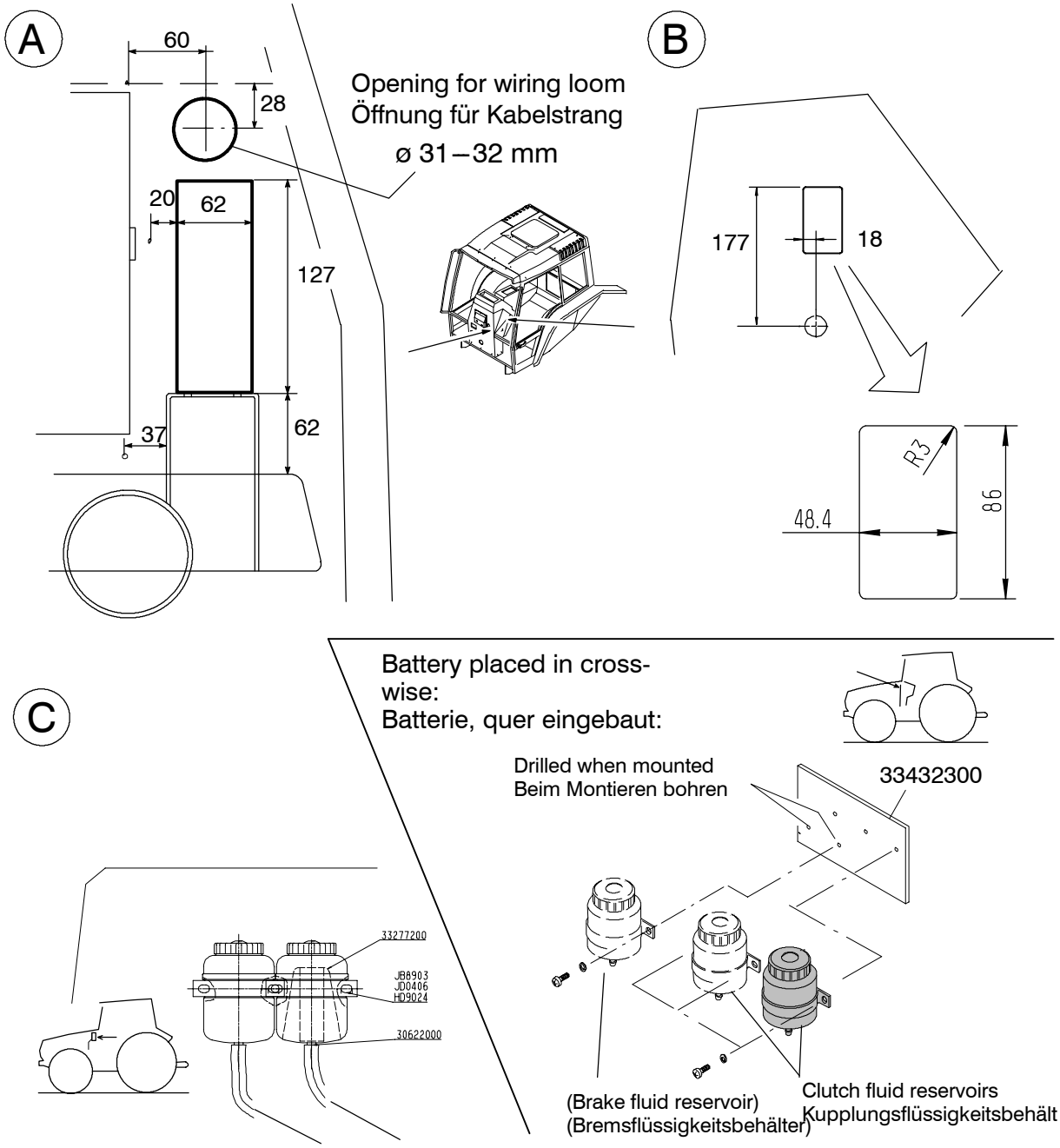
– Fit other detached parts.

–Den Motor Starten und das Kupplungspedal mit Hilfe der Druckknöpfe mehrmals betätigen. Hierbei ist die Funktion zu überprüfen und auf mögliche Leckagen zu achten. Anbringen der Begrenzungsschraube für die untere Pedalstellung (Pedalspiel 0.2...2.0 mm). Montieren des Schalters S9 (mit ACIV auch S24). Die Instrumente wieder anbringen.

– Anbringen des HiShift-Aufklebers (Bild E).

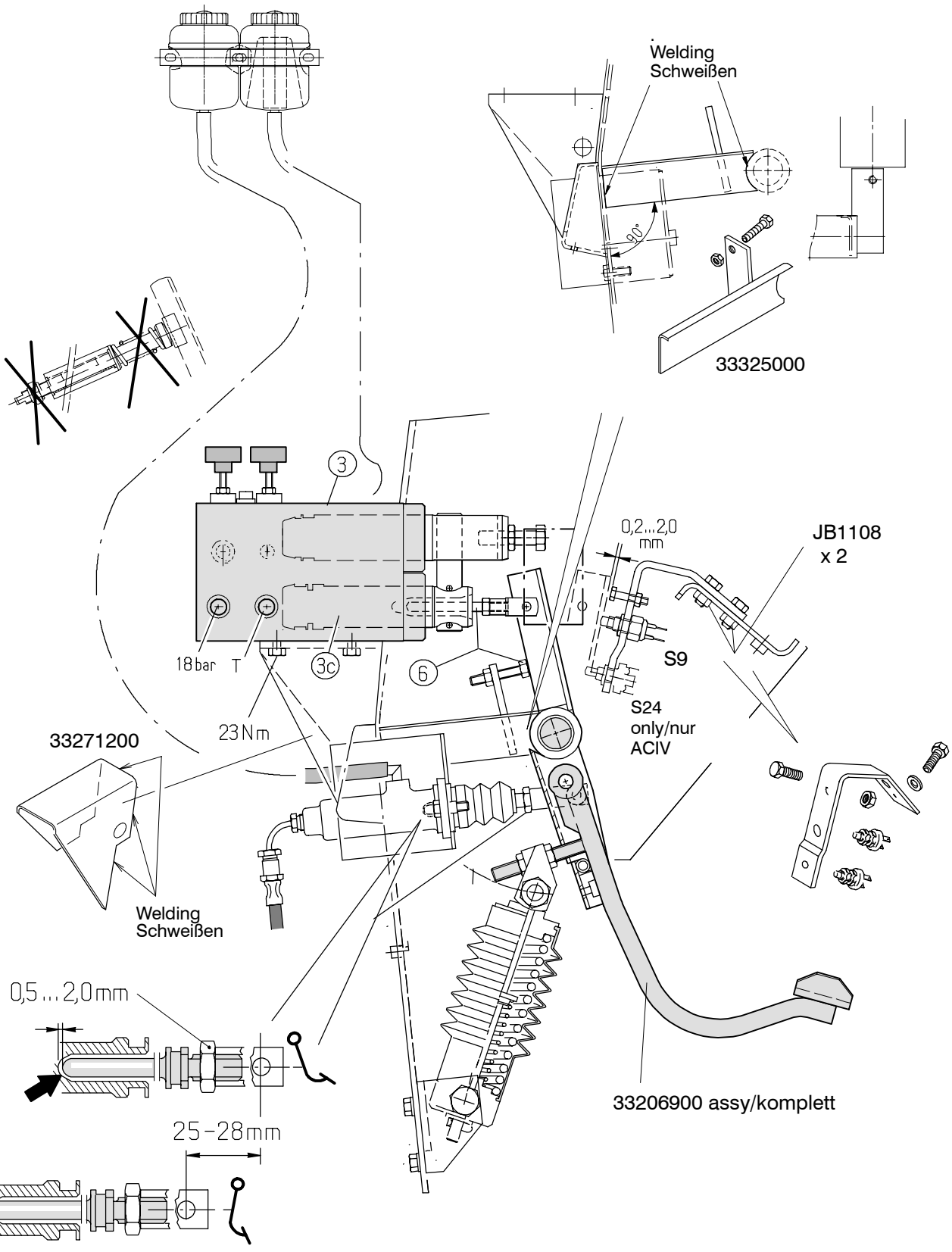
– Durchführen der Einstellung und eines Testlaufs, siehe Seite 11.

– Anbringen der restlichen abmontierten Teile.



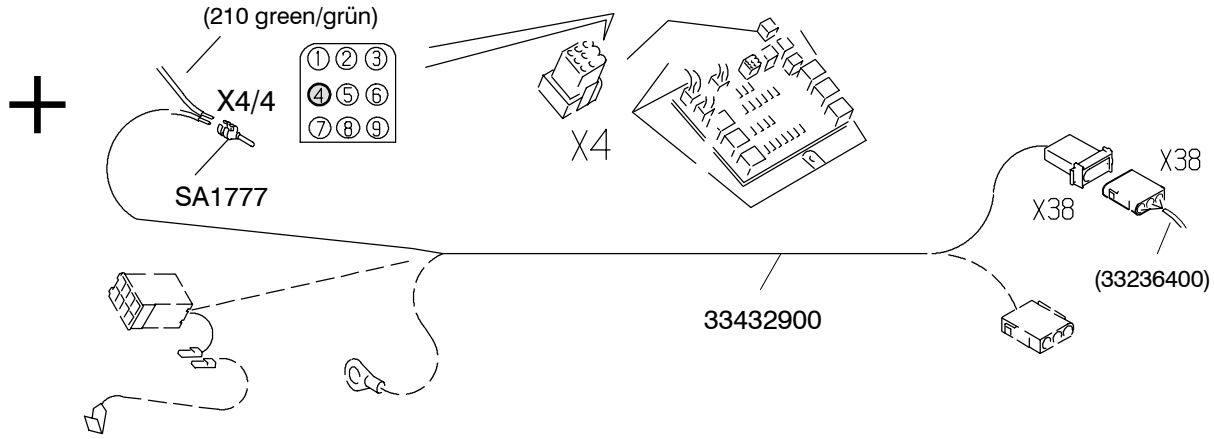
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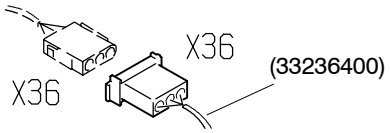


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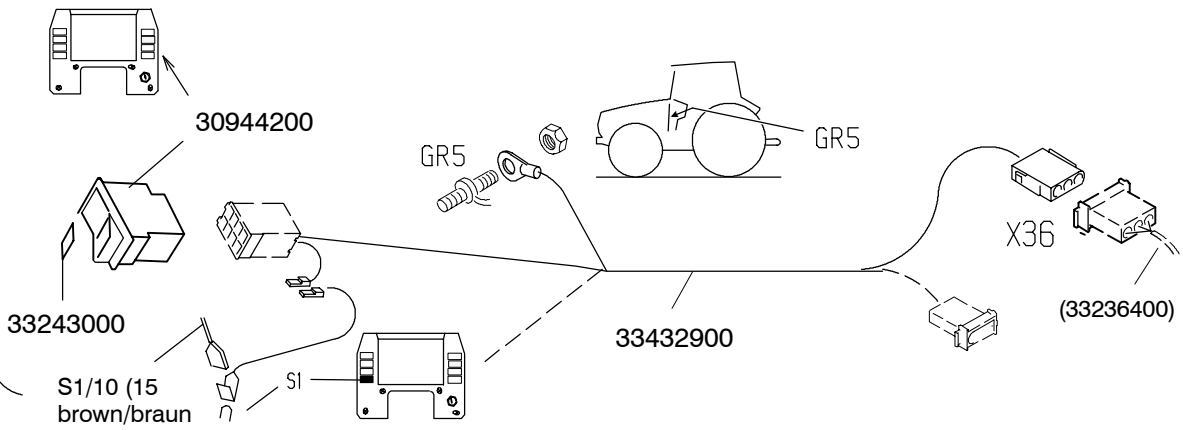
D.1 –>F17106 (AC2)



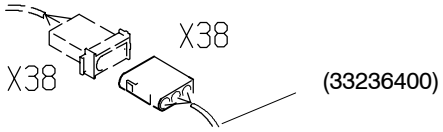
When there is AGRODATA-instrument panel:
Wenn ein AGRODATA-Instrument eingebaut ist:



If there is not AGRODATA-instrument panel:
Wenn kein AGRODATA-Instrument eingebaut ist:



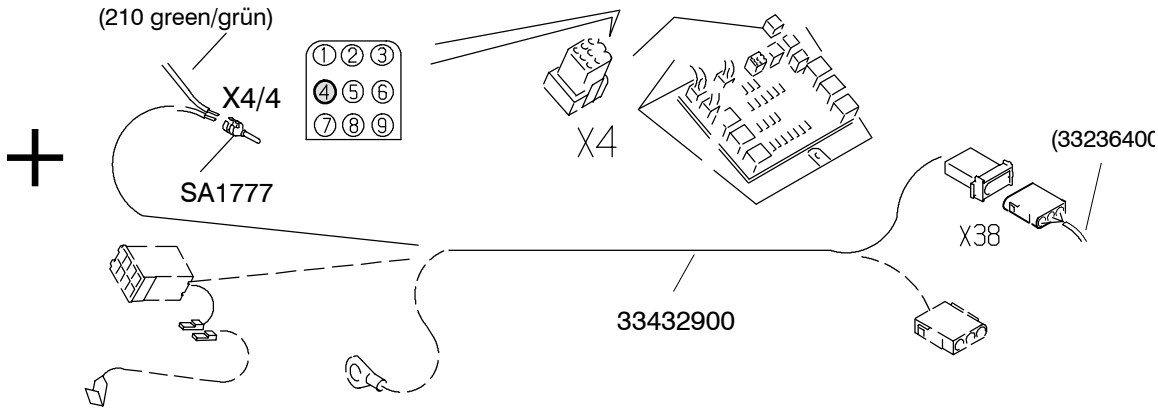
D.2 F17107–> (AC2)



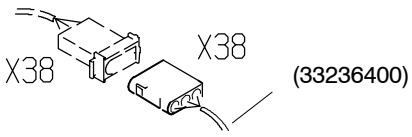
same as on tractors –> F17106
gleich wie in Traktoren ab Fahrgestellnr.: –> F17106

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D.3 ACIV –>F17106



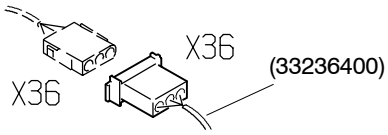
F17107–>



ACIV K24 Earthing signal / Erdungssignal:

–>F17106

When there is AGRODATA-instrument panel:
Wenn ein AGRODATA-Instrument eingebaut ist:

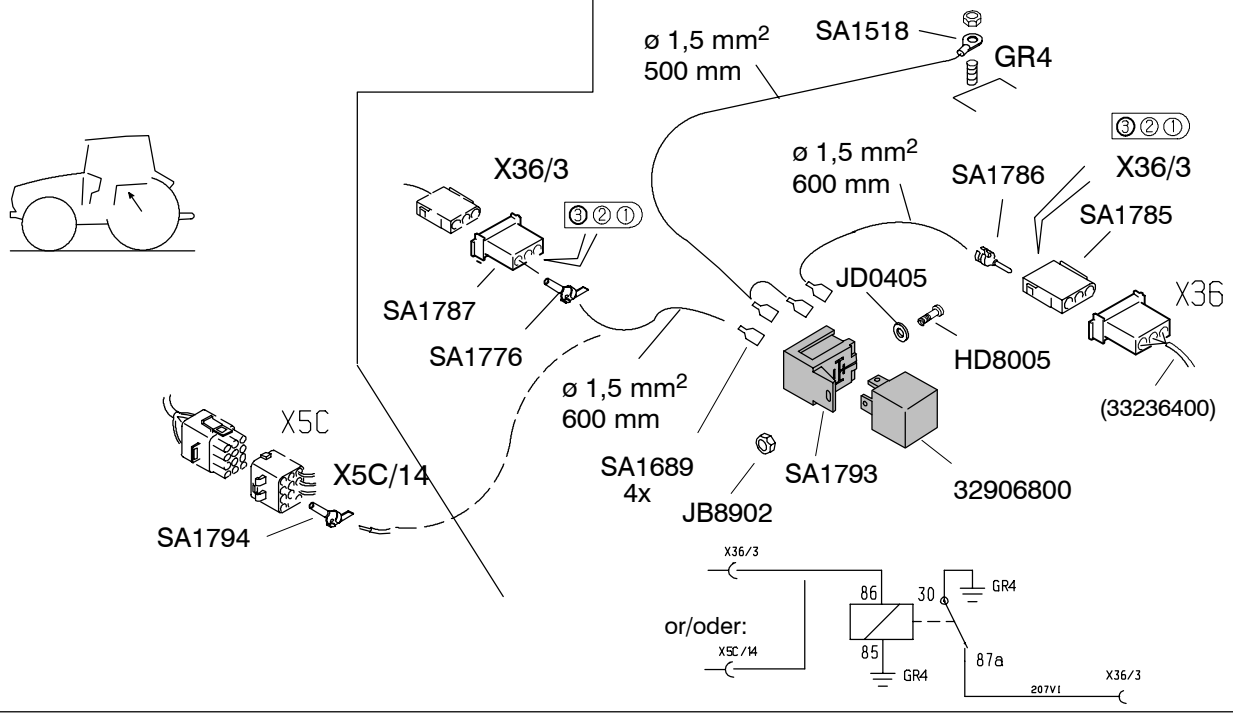


–>F17106

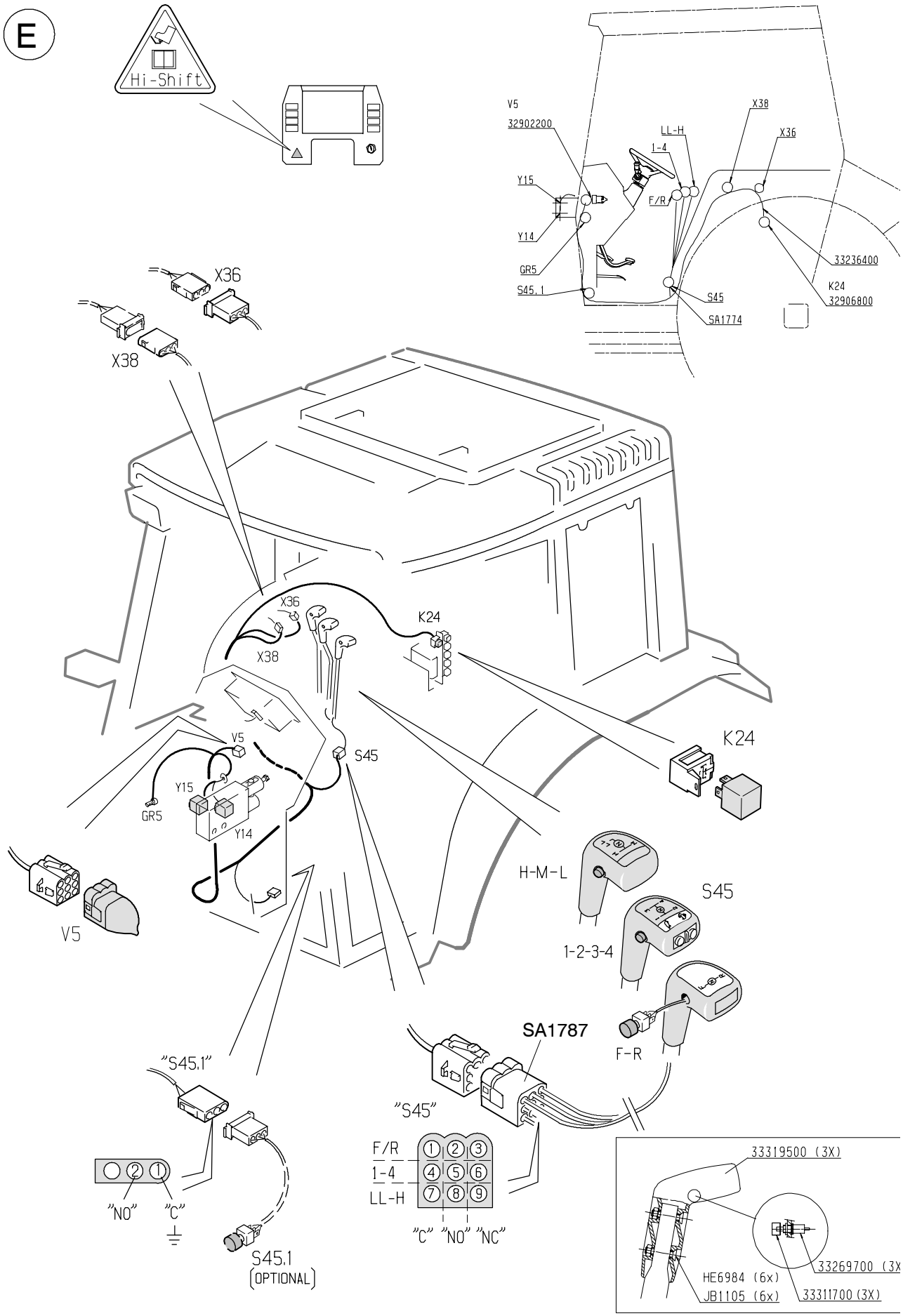
If there is not AGRODATA-instrument panel:
Wenn kein AGRODATA-Instrument eingebaut ist:

F17107–>

Never with AGRODATA-instrument panel:
Nie mit AGRODATA-Istrument:

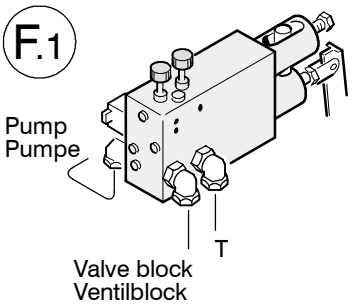


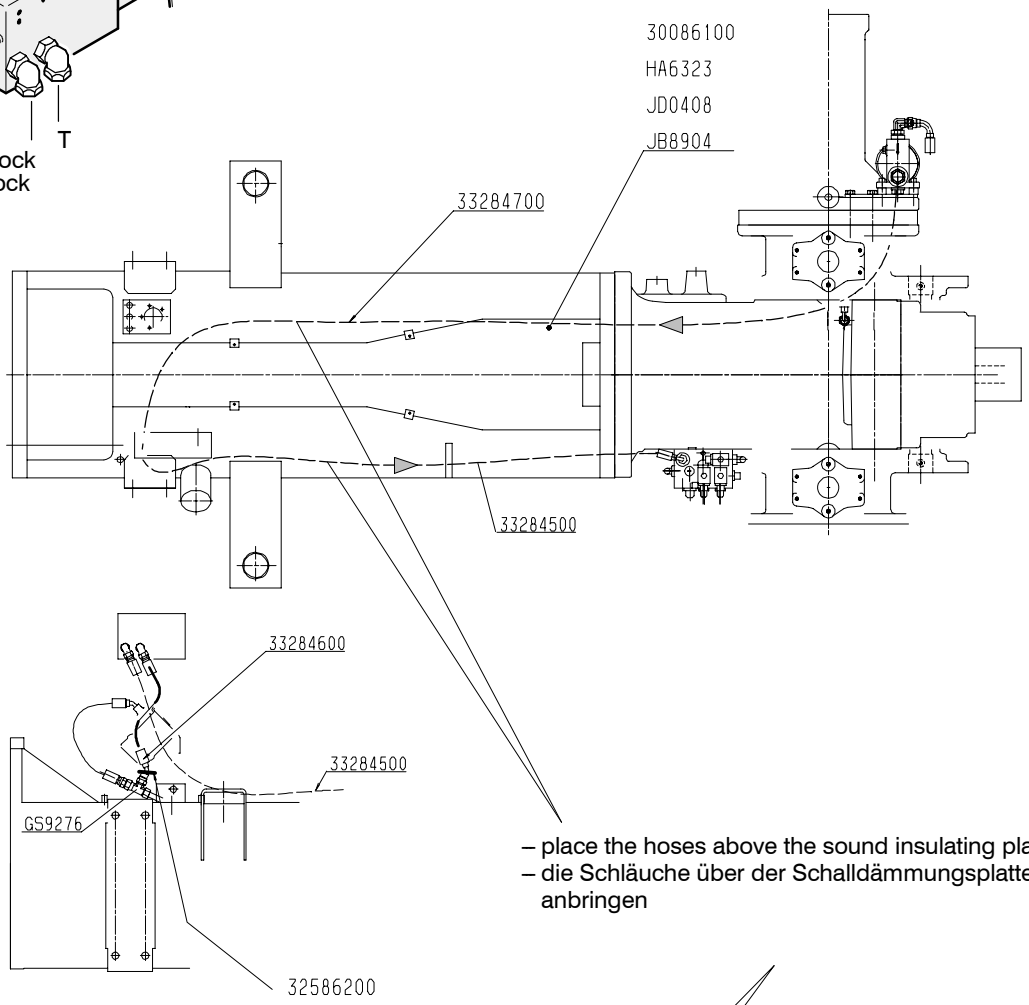
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F.1



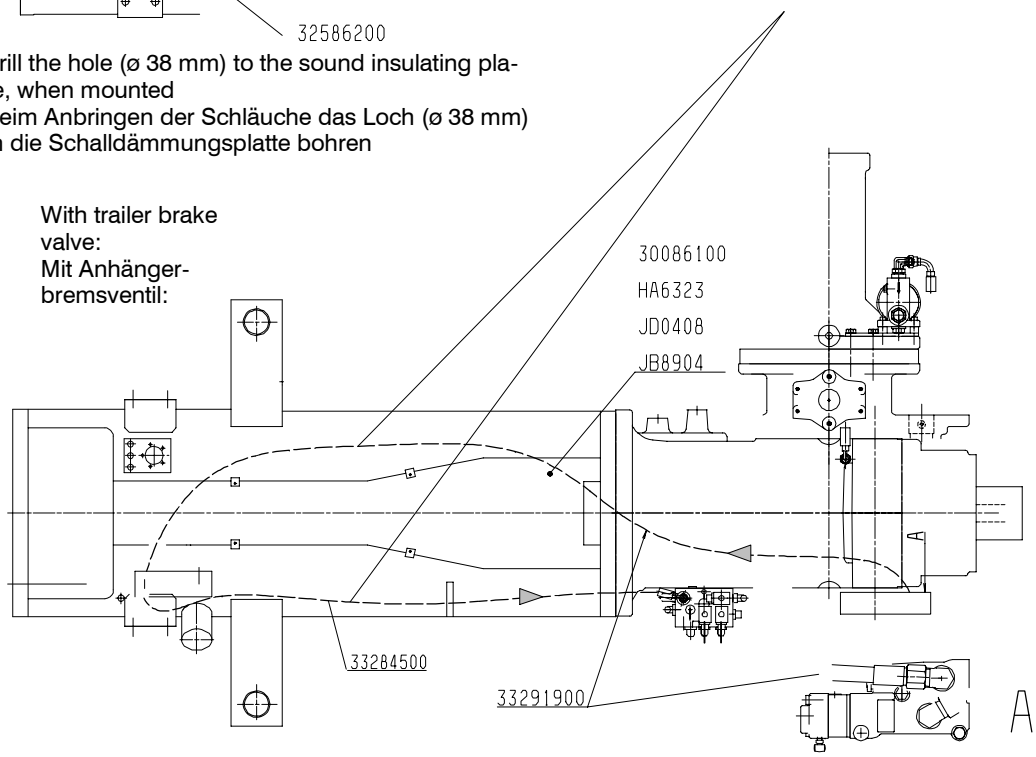


– place the hoses above the sound insulating plate
– die Schläuche über der Schalldämmungsplatte anbringen

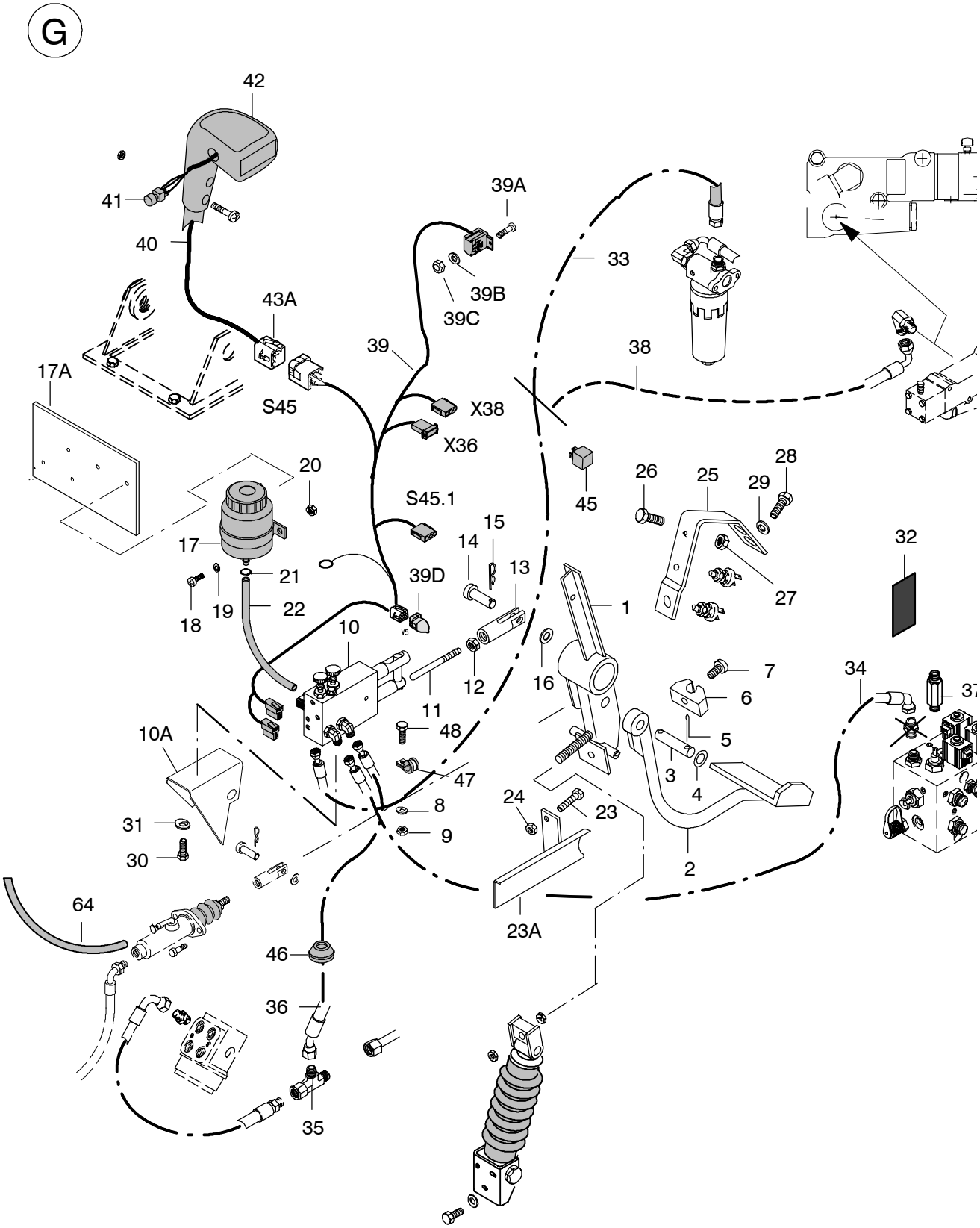
– drill the hole (ø 38 mm) to the sound insulating plate, when mounted
– beim Anbringen der Schläuche das Loch (ø 38 mm) in die Schalldämmungsplatte bohren

F.2

With trailer brake valve:
Mit Anhänger-bremsventil:



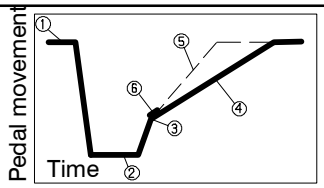
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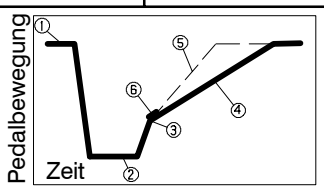


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	1	**A33277000**	**Hi Shift**	**Hi Shift**	**Hi Shift**	**Hi Shift**	
	1	33206900	.Poljin	Pedal	Pedal	Pedal	
1	1	33206600	..Napa	Nav	Hub	Nabe	
2	1	33206500	..Varsi	Arm	Arm	Arm	
3	1	33327200	..Tappi	Tapp	Pin	Stift	
4	2	JD0412	..Aluslaatta	Bricka	Washer	Scheibe	ø 13
5	2	JE3079	..Sokka	Sprint	Pin	Splint	ø 3,2 x 20
6	1	33293000	..Pidätin	Spärr	Retainer	Halter	
7	1	HD9051	..Ruuvi	Skruv	Screw	Schraube	M06X16
8	1	JD0406	..Aluslaatta	Bricka	Washer	Scheibe	ø 6,4
9	1	JB8903	..Mutteri	Mutter	Nut	Mutter	M6
10	1	33188500	.Venttiili	Ventil	Valve	Ventil	
10A	1	33271200	.Kannatin	Hållare	Support	Halter	
11	1	33188600	.Tappi	Tapp	Pin	Stift	
12	1	JB1108	.Mutteri	Mutter	Nut	Mutter	M8
13	1	30337000	.Haarukka	Gaffel	Fork	Gabel	
14	1	33052000	.Tappi	Tapp	Pin	Stift	
15	1	JE3047	.Sokka	Sprint	Pin	Splint	ø 2X16
16	1	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	ø 8,4
17	1	33044900	.Säiliö	Behållare	Container	Behälter	
	1	33277200	.Suojus	Skydd	Shield	Schutz	
17A	1	33432300	.Kiinnityslevy	Fastsättn. platta	Fastening plate	Halterplatte	
18	3	HD9024	.Ruuvi	Skruv	Screw	Schraube	M6X16
19	3	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	ø 6,4
20	3	JB8903	.Mutteri	Mutter	Nut	Mutter	M6
21	2	30622000	.Letkunpidin	Slangfäste	Hose holder	Schlauchhalter	
22	2	33324900	.Letku	Slang	Hose	Schlauch	
23	1	45160500	.Rajoitin	Begränsare	Limiter	Anschlag	
23A	1	33325000	.Tuki	Stöd	Support	Halter	
24	1	JB1108	.Mutteri	Mutter	Nut	Mutter	M8
25	1	33271500	.Latta	Platt	Flat	Platt	
26	1	HA6325	.Ruuvi	Skruv	Screw	Schraube	M08X30
27	3	JB1108	.Mutteri	Mutter	Nut	Mutter	M8
28	2	HA6324	.Ruuvi	Skruv	Screw	Schraube	M08X25
29	2	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	ø 8,4
30	4	HA6322	.Ruuvi	Skruv	Screw	Schraube	M08X16
31	4	JD9103	.Aluslaatta	Bricka	Washer	Scheibe	ø 8
32	1	33306500	.Kansi	Lock	Cover	Deckel	
33	1	33284700	.Letku	Slang	Hose	Schlauch	L=2600
34	1	33284500	.Letku	Slang	Hose	Schlauch	L=1800
35	1	GS9276	.Liitin	Anslutning	Connection	Anschluß	
36	1	33284600	.Letku	Slang	Hose	Schlauch	L=515
37	1	30917100	.Liitin	Anslutning	Connection	Anschluß	
38	1	33291900	.Letku	Slang	Hose	Schlauch	L=2750
39	1	33236400	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
39A	1	JB8902	.Mutteri	Mutter	Nut	Mutter	M5
39B	1	JD0405	.Aluslaatta	Bricka	Washer	Scheibe	ø 5,3
39C	1	HD8005	.Ruuvi	Skruv	Screw	Schraube	M5x12
39D	1	32902200	.Diodit	Dioder	Diodes	Dioden	5kpl /pcs
40	3	33269700	.Johdin	Ledning	Wire	Leitung	
41	3	33311700	.Nuppi	Knopp	Knob	Knopf	pun./red
42	3	33319500	.Nuppi	Knopp	Knob	Knopf	
43A	1	SA1774	.Liitinkotelo	Skarvhus	Connector	Steckergehäuse	
45	1	32906800	.Rele	Relä	Relay	Relais	
46	1	32586200	.Läpivientikumi	Gummigenomföring	Rubber inlet	Durchführ.gummi	
47	1	30086100	.Letkunpidin	Slangfäste	Hose holder	Schlauchhalter	
48	1	HA6323	.Ruuvi	Skruv	Screw	Schraube	M08X20
64	1		.Letku	Slang	Hose	Schlauch	Kts/ see 22
–	1	33379700	.Tarra	Dekal	Sticker	Aufkleber	HiShift
–	1	33432900	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
–	1	30944200	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter	
–	1	33243000	.Linssi	Lins	Lens	Linse	
–	10	SA9102	.Side	Band	Band	Binde	
ACIV:						Kts. kuva D.3 / See picture D.3	
	1	SA1518	Kaapelikenkä	Kabelsko	Cable lug	Kabelklemme	
	1	SA1786	Liitin	Anslutning	Connection	Stift	
	1	SA1785	Liitinkotelo	Skarvhus	Connector	Steckergehäuse	
	1	SA1787	Liitinkotelo	Skarvhus	Connector	Steckergehäuse	
	1	SA1776	Liitin	Anslutning	Connection	Stift	
	1	SA1793	Releenkanta	Reläfäste	Relay mounting	Relaisfaßung	
	1	32906800	Rele	Relä	Relay	Relais	
	1	SA1794	Liitin	Anslutning	Connection	Stift	
	1	JB8902	Mutteri	Mutter	Nut	Mutter	M5
	1	JD0405	Aluslaatta	Bricka	Washer	Scheibe	ø 5,3
	1	HD8005	Ruuvi	Skruv	Screw	Schraube	M5x12
	1	SA1777	Liitin	Anslutning	Connection	Stift	
	4	SA1689	Liitin	Anslutning	Connection	Stift	
	1	–	Johto	Ledning	Wire	Leitung	1700mm, 1,5 mm^2

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1. Pedal up
2. Pedal down
3. Knee point
4. Driving speed < 4 km/h
5. Driving speed > 4 km/h
6. Clutch slips and engages

1. Check the clutch fluid level. Raise the tractor on axle stands. Start the engine and use the HiShift several times so that air is removed from the system.
2. Close the cab side restriction spindle.
3. Depress the clutch pedal by using the push button. Select e.g. gear F/M/1. Adjust engine revs to 800–1000 r/min (greater than 1500 r/min if the tractor has a fluid coupling, i.e. Hi–Trol models).
4. Release the button at which time the pedal rises up to the knee point (3), in which the working cylinder piston rests against the damping piston. Tractor wheels must not rotate.
5. Open the cab side restriction a little, at which time the pedal starts to rise slowly.

   Note! On account of possible small leakage of the restriction spindle the pedal can start to rise slowly before the restriction spindle is opened. The knee point (3) can, however, be observed from change of rising speed of the pedal. The wheels must start to rotate before the pedal has risen **10 mm** (ideal value 5 mm) from the knee point.
6. If necessary, adjust the position of the knee point (adjusting screw at the end of the damping piston). Screw outwards=point rises and vice versa.
7. When the knee point has been adjusted, close the cab side restriction and then open it **1+1/4** turns. The foremost restriction should be open **2** turns (factory setting). Lock the restriction spindles.
8. In a test–drive with driving speeds under 4 km/h*) the pedal rises up slower (4) (restriction 1+1/4). With speeds over 4 km/h the pedal rises up faster (restriction (1+1/4)+(2)). When the shuttle lever button is used , the pedal always rises slower regardless of the driving speed.

1. Pedal up
2. Pedal down
3. Schleifpunktt
4. Fahrgeschwindigkeit < 4 km/h
5. Fahrgeschwindigkeit > 4 km/h
6. Kupplung rutscht und greift ein

1. Den Kupplungsflüssigkeitsstand überprüfen. Anschließend den Traktor aufbocken. Den Motor starten und HiShift mehrmals betätigen, so daß die Luft aus dem System entweicht.
2. Die kabinenseitige Drossel schließen. Die Einstellung der vordersten Drossel hat nun keinen Einfluß mehr.
3. Das Kupplungspedal durch Betätigen des Druckknopfes nach unten drücken. Wählen eines Ganges (z.B. F/M/1). Die Motordrehzahl auf 800 – 1000 U/min bringen. Falls der Traktor mit einer Turbokupplung ausgerüstet ist, sollte die Motordrehzahl auf über 1500 U/min erhöht werden.
4. Den Druckknopf loslassen, wodurch das Kupplungspedal bis zum Schleifpunkt (3) angehoben wird.
   In diesem Punkt liegt der Arbeitskolben durch die mechanische Verbindung am Dämpfungskolben an. Die Traktorräder dürfen sich nicht drehen**.**
5. Die kabinenseitige Drossel ein wenig öffnen, wodurch das Pedal beginnt sich langsam nach oben zu bewegen.
   Hinweis: In Anbetracht möglicher kleiner Leckagen der Drossel kann das Pedal vor dem Öffnen der Drossel schon langsam ansteigen. Der Schleifpunkt läßt sich jedoch aufgrund der Änderung der Anhebegeschwindigkeit des Pedals erkennen. Die Räder müssen sich zu drehen beginnen, bevor sich das Pedal um **10 mm** nach oben bewegt hat (Idealwert: 5 mm).
6. Falls notwendig, muß die Position des Schleifpunktes eingestellt werden (die Einstellschraube befindet sich am Ende des Dämpfungskolbens).
   Herausdrehen der Schraube –> der Schleifpunkt steigt an und umgekehrt.
7. Wurde der Schleifpunkt eingestellt, muß die kabinenseitige Drossel geschlossen und dann wieder um **1¼** Umdrehungen geöffnet werden. Die vorderste Drossel sollte um **2** Umdrehungen geöffnet sein (werkseitige Einstellung). Die Einstellungen der Drosseln müssen dann mit den Feststell-muttern gesichert werden.
8. Bei einer Probefahrt mit Fahrgeschwindigkeiten unter 4 km/h *****) sollte das Kupplungspedal langsamer ansteigen (4) (Drossel 1¼). Bei Geschwindigkeiten über 4 km/h sollte das Pedal schneller ansteigen (5) (Drosseln (1¼) +(2)). Wird der Druckknopf am Schalthebel für die Richtungsänderung betätigt, steigt das Pedal immer langsamer an, unabhängig von der Fahrgeschwindigkeit.

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Note! Tractor driver can adjust the Hi Shift between certain limits according to his own choice. However, the cab side restriction must always be open at least 1 turn, to prevent excess wear of the clutch disc.

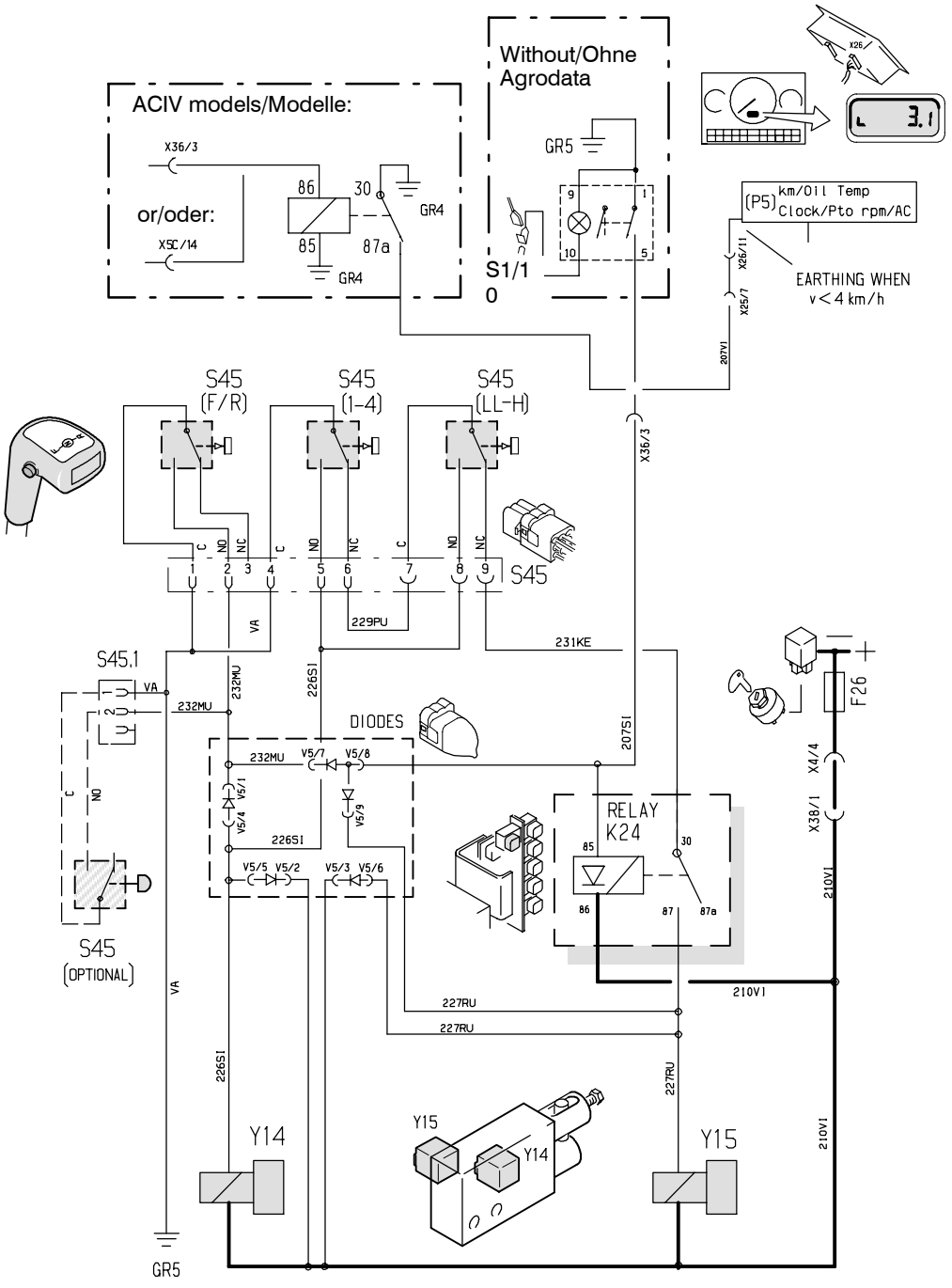
9. Check the function of the clutch. Drive under and over 4 km/h and check that the engagement occurs softly. Ensure, that the pedal hinge functions. Check for leaks.

x) or on tractors without Agrodata – instrument: if the rocker switch is in the earthing position (i.e. switch lamp lights).

Hinweis! Der Traktorfahrer kann die HiShift-Funktion zwischen best. Grenzen nach seinen eigenen Bedürfnissen einstellen. Die kabinenseitige Drossel muß aber immer mindestens eine Umdrehung geöffnet sein, um eine übermäßige Abnutzung der Kupplung zu verhindern.

9. Kontrollieren der Kupplungsfunktion. Fahren unter und über 4 km/h und prüfen, ob ein weicher Eingriff erfolgt. Sicherstellen, daß das Pedalgelenk funktioniert. Überprüfen auf Leckage.

x) oder bei Traktoren ohne AGRODATA-Instrument: wenn sich der Kippschalter in der Erdungsposition befindet (d.h.die Kontrollampe am Schalter leuchtet).



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50. Brake system

51. Service brakes

52. Parking brake

Contents

General (Op. no. 510)
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Pressure air brakes (option) 6

Reconditioning brakes (Op. no. 511)

1. Reconditioning service brakes:
A. Changing brake discs 1
B. Adjusting brakes 2
C. Bleeding brake system 2
D. Changing brake housing 3
E. Adjusting master cylinder pushrod clearance 3
F. Adjusting brakes on tractors which have reverse drive controls (TwinTrac) 3
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Reconditioning parking brake (Op. no. 521):
A. Adjusting parking brake 1
B. Parking brake on tractors equipped with HiTech Shuttle 2

Technical data

Service brakes hydraulically controlled disc brakes running in oil.
Parking brake mechanically controlled, acting on the foot brakes. In HiTech–models the parking brake is controlled electro–hydraulically.

Tractors 6000–6400 and 8000 (–657975):
– number of brake discs per brake (ceramic linings) . . . . . 4 pcs
– number of brake balls per brake . . . . . 6 pcs
– friction surface per brake . . . . . 880 cm^2
– brake disc, diameter . . . . . ø 222 mm

Tractors 6600, 6800, 8100–8400, 8050–8750, 6250Hi–8950Hi (also on 6000–6400 and 8000 from ser. no. 657976):
– number of brake discs per brake (organic linings, 665437–) . . . . . 5 pcs
– number of balls per brake . . . . . 6 pcs
– friction surface per brake . . . . . 3690 cm^2/org (2650 cm^2/sint)
– brake disc, diameter . . . . . ø 224 mm/org (ø 222 mm/sint)

Tractors 6600–8750, 6650Hi–8950Hi: 50 km/h:
On traffic tractors (50 km/h) the splines of the inner drive shaft have been lenghtened, after which the brake dics number can be increased to 6 pcs per brake (3+3). The disc linings are then of sinter type.

Tractors 8350–8950Hi (L32106–):
– brake discs, 9,5" (243 mm)x7" (178 mm) . . . . . 5 pcs
– intermediate discs (s=5 mm) . . . . . 3 pcs
– friction surface/brake . . . . . 2150 cm^2/org

Tightening torques
Brake disc attaching flange:
– 6000–8950Hi . . . . . 80 Nm
– 8350–8950Hi, L32106– . . . . . 45 Nm
Brake housing–final gear housing:
– 6100–6400 and 8000 (8.8) . . . . . 80 Nm
– 6600, 6800, 8100–8400 and 8050–8750 (10.9) . . . . . 125 Nm
Brake housing–gearbox . . . . . 270–330 Nm
Rear wheel nuts . . . . . 550 Nm
Cab attaching bolts . . . . . 200 Nm
Brake pipe–master cylinder . . . . . 20 Nm

Settings
Brake pedal free travel (latched together) . . . . . 70–80 mm
Parking brake free travel (at lever end) . . . . . about 50 mm
Parking brake cable adjusting value, Power Shuttle tractors . . . . . 1–2 mm

Brake fluid . . . . . SAE J1703
Brake fluid reservoir . . . . . 0,3 litres

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Brakes, description

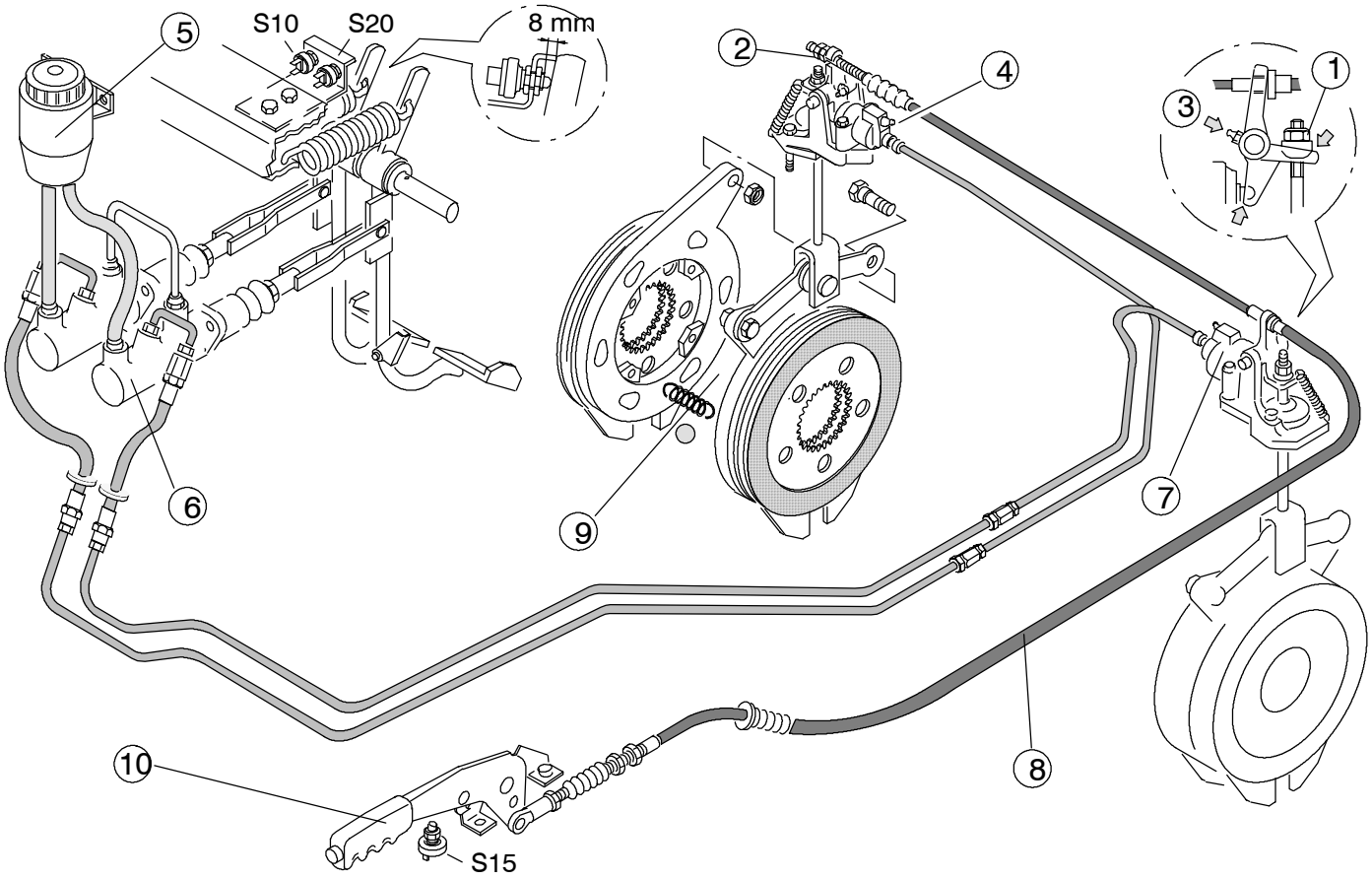


***Figure 1**. Brake mechanism.*

1. Service brakes adjusting nut.
2. Parking brake adjusting nut.
3. Grease nipple.
4. Bleeding nipple.
5. Brake fluid reservoir.
6. Master cylinders (2 pcs).
7. Brake cylinder (2 pcs).
8. Parking brake cable.
*9. Brake mechanism (in rear axle housing). In 8350–8950Hi from chassis no. **L32106–** the mechanism is different.*
10. Parking brake lever. In HiTech–models the parking brake mechanism is different, see pages 521/2–3.
S10 = switch for RH side brake light.
S20 = switch for LH side brake light.
S15 = switch for parking brake warning light (different in HiTech–models).

Service brakes are wet multi–disc brakes fitted in the rear axle housing. Service brakes are controlled hydraulically by means of the brake pedals. When the brake pedals are pressed, the 4WD engages causing brake action also on the front wheels.

Brake pedals can be used separately as steering brakes or they can be latched together.

Parking brake hand lever acts mechanically on the foot brakes (not HiTech–models). The brakes can be adjusted by means of the adjusting nuts. In HiTech–models the parking brake is controlled electro–hydraulically (see pages **521/2–3**).

As an optional equipment, the brake valve for a trailer is available. Also pressure–air brakes for trailer is available as an option.

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The brake master cylinders and the brake fluid reservoir are positioned to the right on the cab front wall. The brake system has two brake cylinder with in – built equalising valves, which ensure even braking action when the brake pedals are latched together.

The brake discs are fitted on splines on the inner drive shaft in the brake housing. The brake system and the gearbox use the same oil.

The bleeder nipples are positioned on top of the brake cylinders

During brake application the force from the brake cylinders is transferred, via levers, to the brake discs. The thrust plates turn in opposite direction and the balls between the plates force them against the brake discs and brake action is obtained.

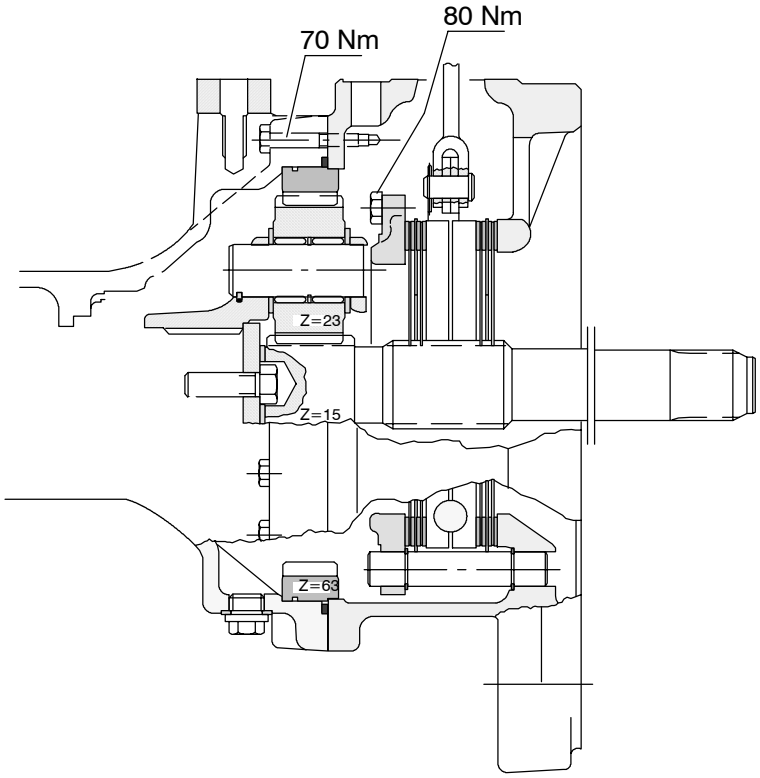
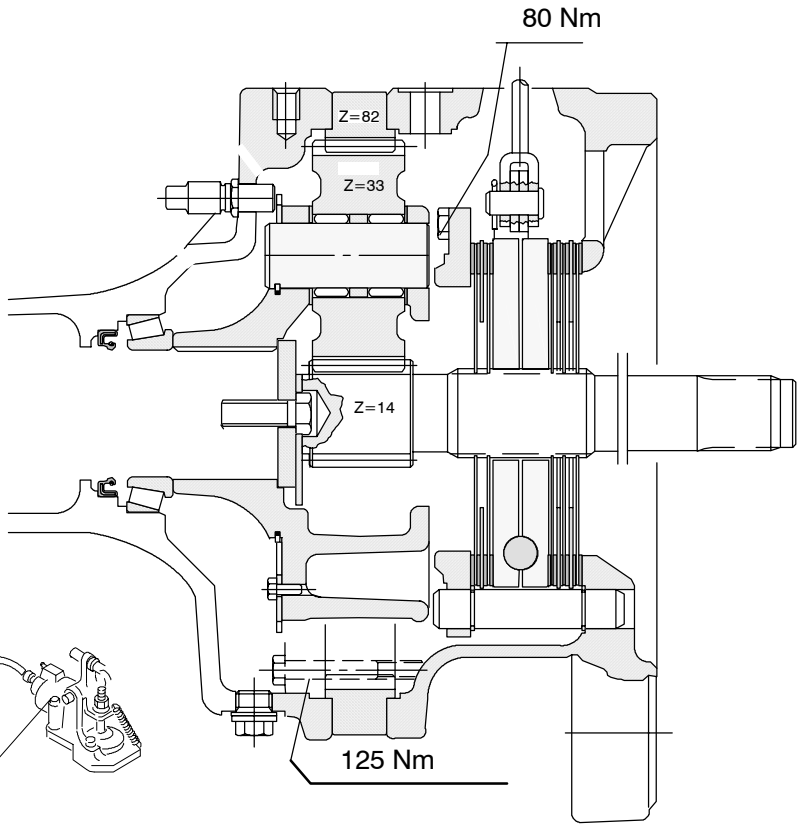
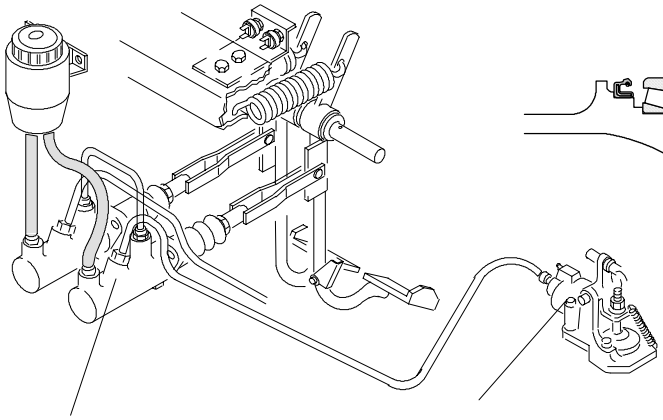


Figure 2. *Brake housing with final drives 300*





Master cylinder

Brake cylinder

Figure 3. *Brake housing with final drives 450 and 650.*

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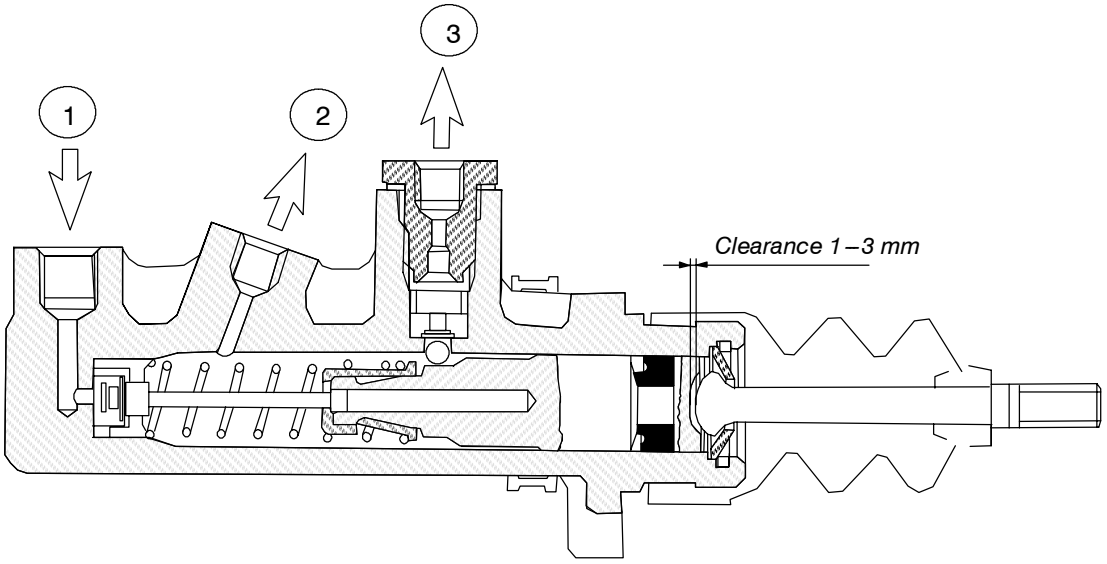


Figure 4. *Master cylinder*

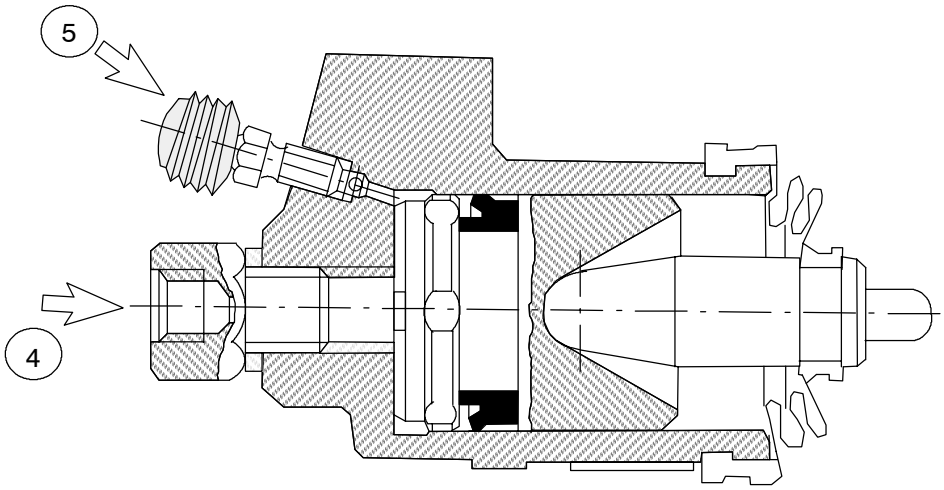


Figure 5*. Brake cylinder*

The brake fluid flows from the reservoir through pipe (1) into the master cylinder. When the pedals are depressed, the non–return valve at the front end of the master cylinder closes preventing oil from returning to the reservoir. The fluid, now under pressure in the cylinder, flows through pipe (2) to hole (4) at the front end of the brake cylinder behind the piston and forces out the thrust rod.

The valves and the intermediate pipe (3) in the master cylinders serve as an equalising mechanism, if the mechanical setting of the two brakes differs. When the pedals are depressed, the pistons actuate the valves so that they open and any pressure differences in the brake circuits are equalised through the intermediate pipe (3).

If only one of the brakes is applied, the valve is opened by the piston, thus pressurising the intermediate pipe (3). This causes the valve in the other (not actuated) master cylinder to close. Oil under pressure now flows from the master cylinder which is being applied to the corresponding brake cylinder.

The brake system bleeder nipples (5) are placed on top of the respective brake cylinders.

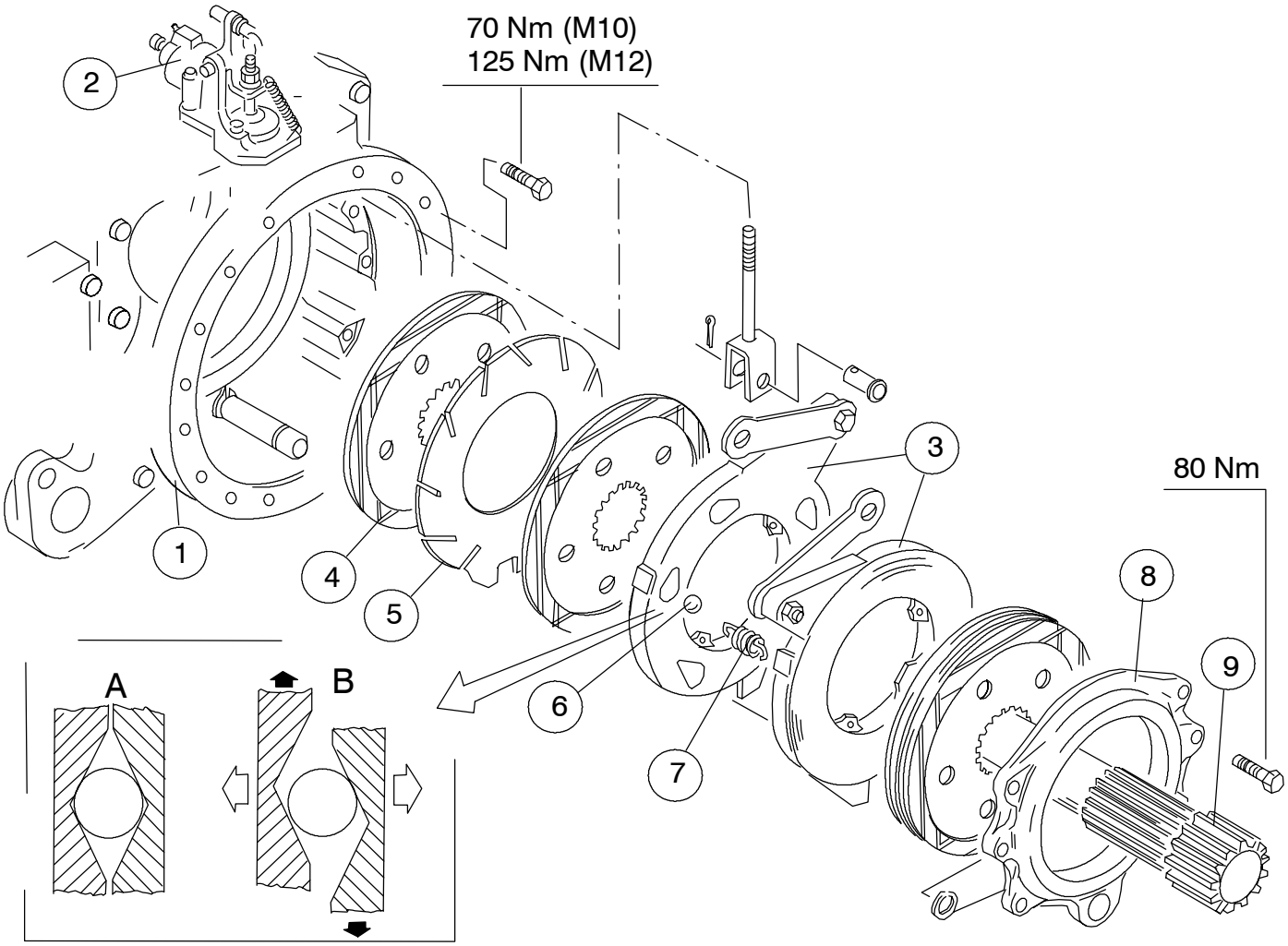
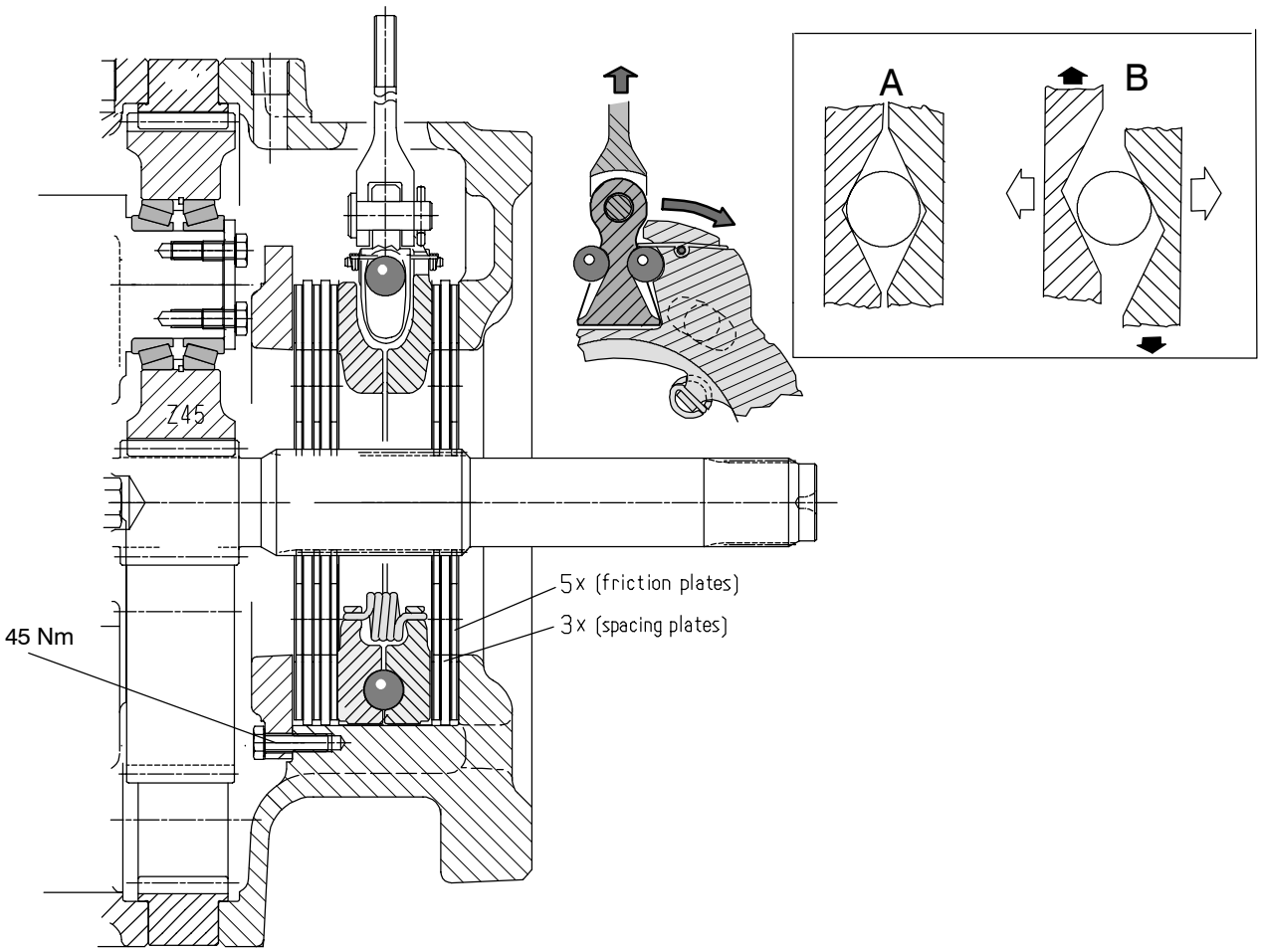


Figure 6. *Brake mechanism when final drives 300, 450 and 650 (not 8350– 8950Hi, L32106–).*

1. Brake housing
2. Brake cylinder
3. Application plates
4. Brake discs
5. Intermediate discs
6. Brake balls
7. Return spring (4 pcs per brake)
8. Support brake
9. Inner drive shaft
A) Application plates and balls in neutral position
B) Movement of application plates when braking

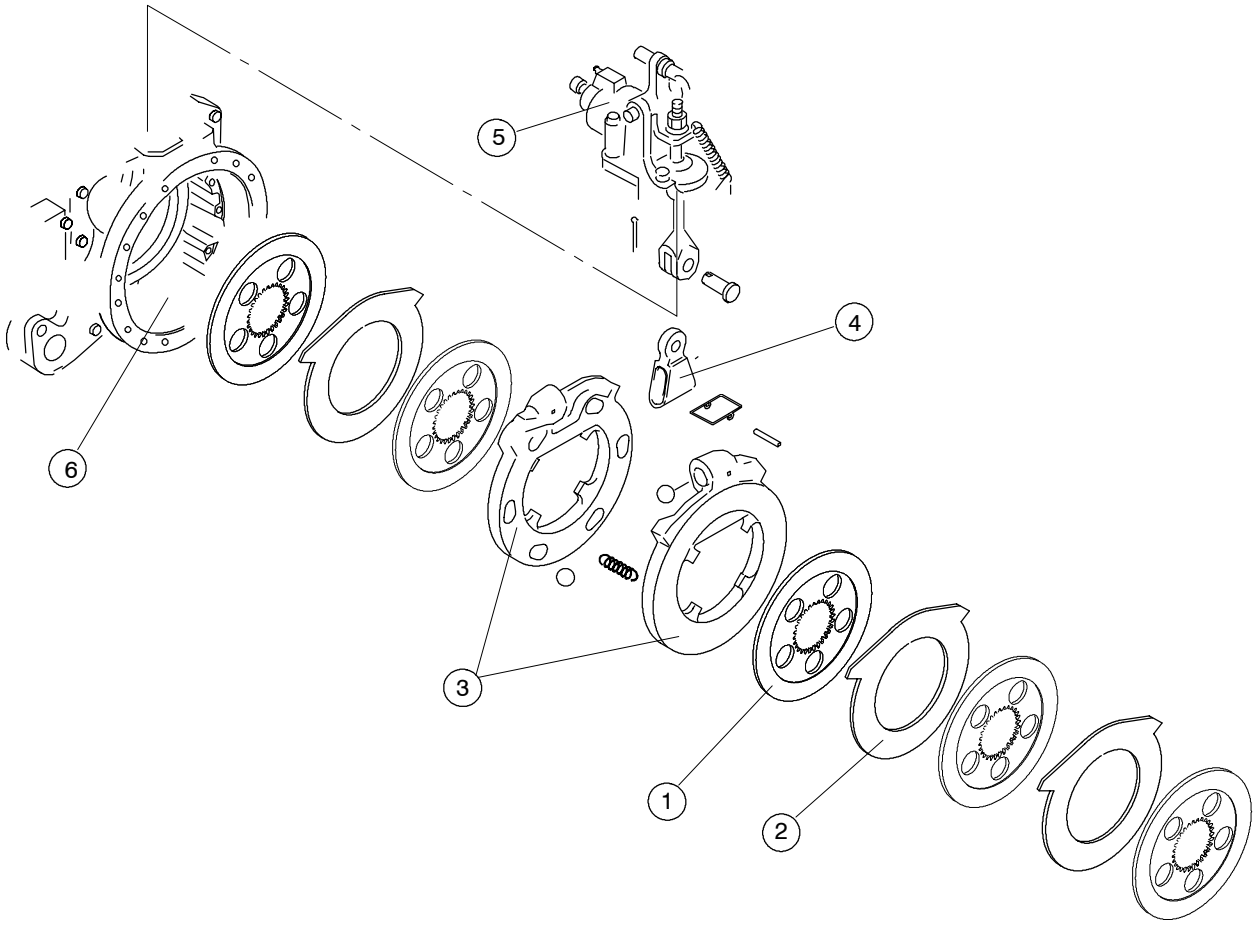


Picture 6A. Brake mechanism in 8350–8950Hi tractors, which has final drives 700 (**L32106–**).

In connection with final drives 700 the brake mechanism is different. In this system the application plate pressing force agains the brake discs is obtained by the tapered part, sides of which press the steel balls which turns the application plates causing the brake force.

There is not an anchor bolt in the lower part of the brakes, as in connection with final drives 300–650. In final drives 700 there are sholders in the intermediate discs and in the application plates which engage in the notches casted in the rear axle housing.

The brake discs are fitted on the drive shaft splines so that the holes in the discs are tried to place almost in the same line in order to facilitate free oil flow.



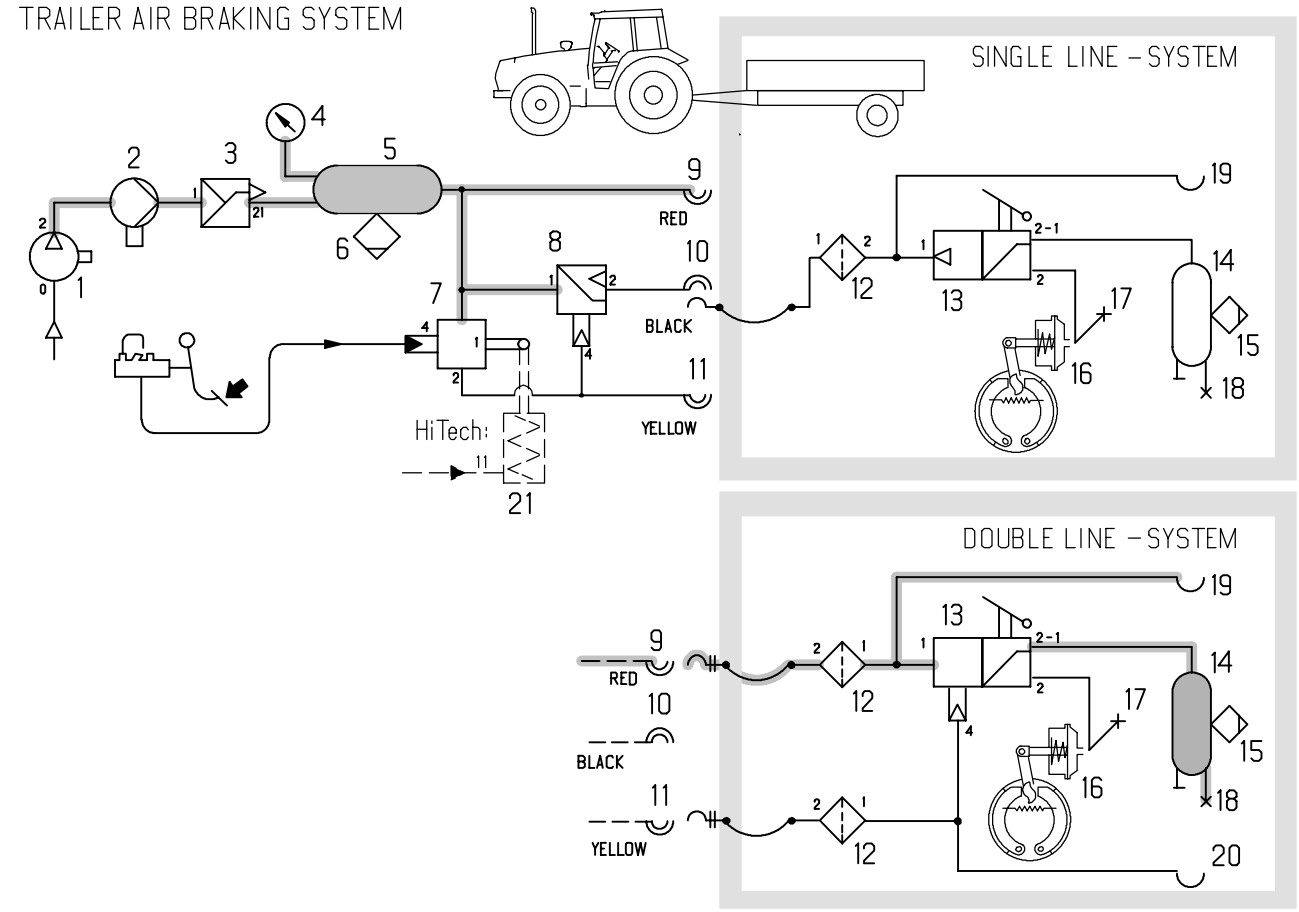
Picture 6B. Brake mechanism in 8350–8950Hi tractors with final drives 700 (L32106–).

1. Brake discs (5 pcs). Holes almost in the same line.
2. Intermediate discs (3 pcs).
3. Application plates (6 pcs balls between the plates).
4. Taperd part to expand the application plates.
5. Brake working cylinder.
6. Brake housing.

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Pressure air brakes for trailer

Note! Pressure air brakes are available as an optional equipment for 6200–8950 tractors.



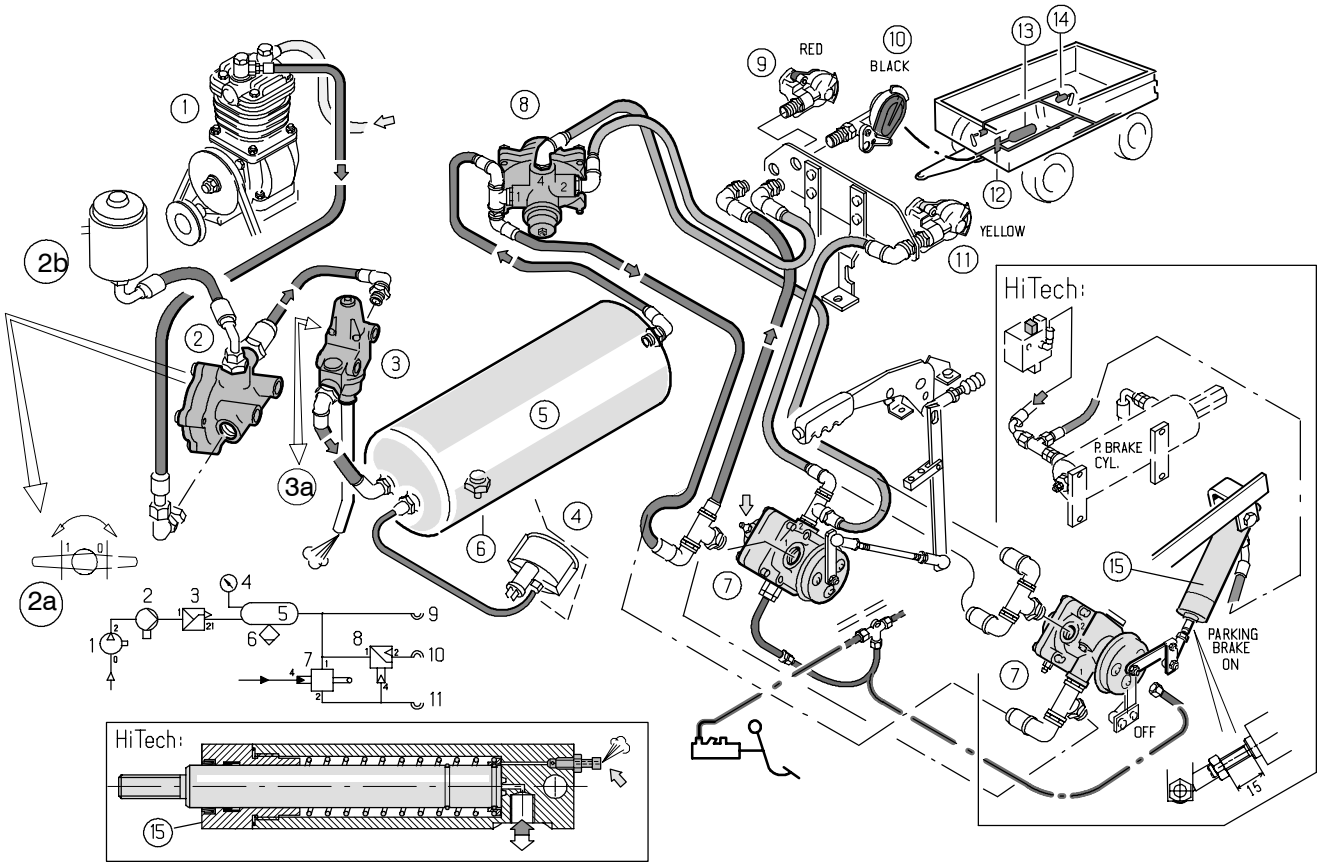
Picture 7. *Components of pressure air brakes*

1. Compressor
2. Deicer
3. Pressure regulator (incl. filter and relief valve).
4. Pressure gauge
5. Pressure air reservoir
6. Drain cock
7. Trailer brake control valve
8. Trailer brake control valve
9. Two–line system; reservoir line (red)
10. One–line coupling (black)
11. Two–line system; brake line (yellow)
12. Filter
13. Trailer brake valve+brake power regulator
14. Pressure air reservoir
15. Water draining tap
16. Cylinder
17. Pressure–test point
18. Pressure–test point
19. Coupling for second trailer, reservoir line (red)
20. Coupling for second trailer, brake line (yellow)

Note! Valve (7) controls combined two–line and one–line trailer brake system according to the pilot pressure from the tractor brake pedal.
The valve has additionally a lever, which has been connected to the hand brake mechanism. When the hand brake lever is pulled up, the valve lever turns and causes braking effect in the trailer brakes.

Note! Valve (8) is intended to control the one–line system. The valve is controlled by pilot pressure from valve 7.
Valve (8) also limits pressure to the trailer brakes to 5,2 bar. During braking the valve (8) lowers (in one–line system) the trailer brake pressure. When the braking is stopped air can flow via valve (8) to refill the air reservoir of the trailer brake.

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Picture 8. *Pressure air brakes for trailer on 6000–8950*

1. Compressor
2. Deicer
2a. Flow valve lever
2b. Deicer reservoir
3. Pressure regulator
4. Pressure gauge
5. Pressure reservoir
6. Water draining plug
7. Control valve (one– and two–line systens)
8. Control valve (one–line system)

General

The trailer is connected in the two–line system to two couplings. The couplings (9 and 11) have been marked as follows:
– Reservoir line – **red** protecting cover
– Brake line – **yellow** protecting cover
– In the one–line system the trailer is connected to the **black** (brake line) coupling (in certain marketing areas).

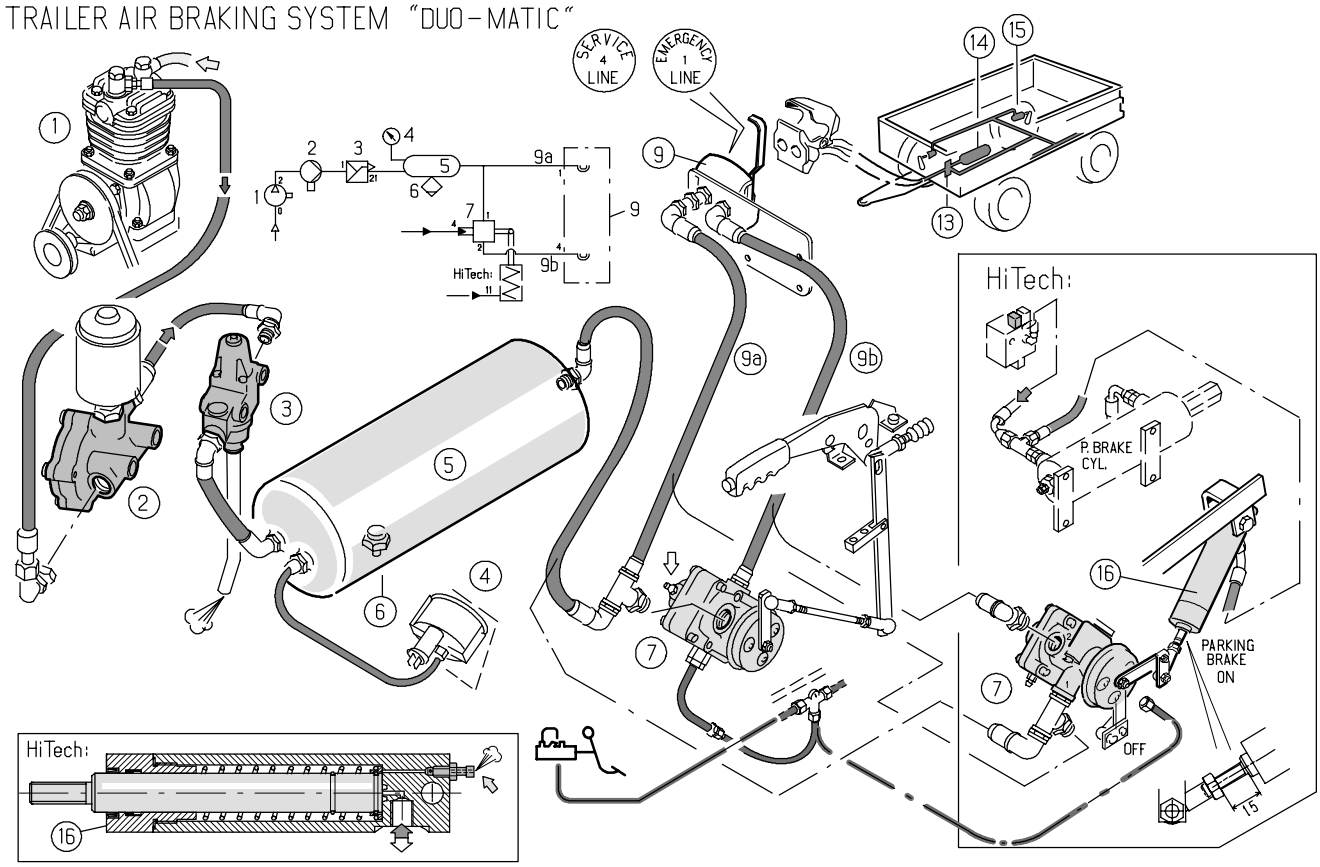
By turning connection (3a) on the pressure regulator to the bottom, compressed air can be taken off for auxiliary purposes (pressure about 8 bar, e.g. for tyre inflation). Through this connection the system can also be filled with auxiliary compressed air, e.g. if the tractor compressor does not function. In this case the connection need not be screwed fully into the bottom.

If the outdoor temperature is **below +5°C**, eythol alcohol or methanol must be used in the deicer (2b) . Antifreeze agent flow valve lever (2a) must then be open (position 1). Reservoir and lever are placed under the cab RH side front edge. When filling the reservoir it must be removed from its holder.

NOTE! In the system there must be full pressure, about 7–8 bar, before driving the tractor. Pressure gauge (**4**) is placed in the cab beside the dashboard.

When connecting in the two–line system trailer to tractor, connect first the trailer yellow coupling (without pressure). When disconnecting the trailer, disconnect first the red coupling (reservoir line).

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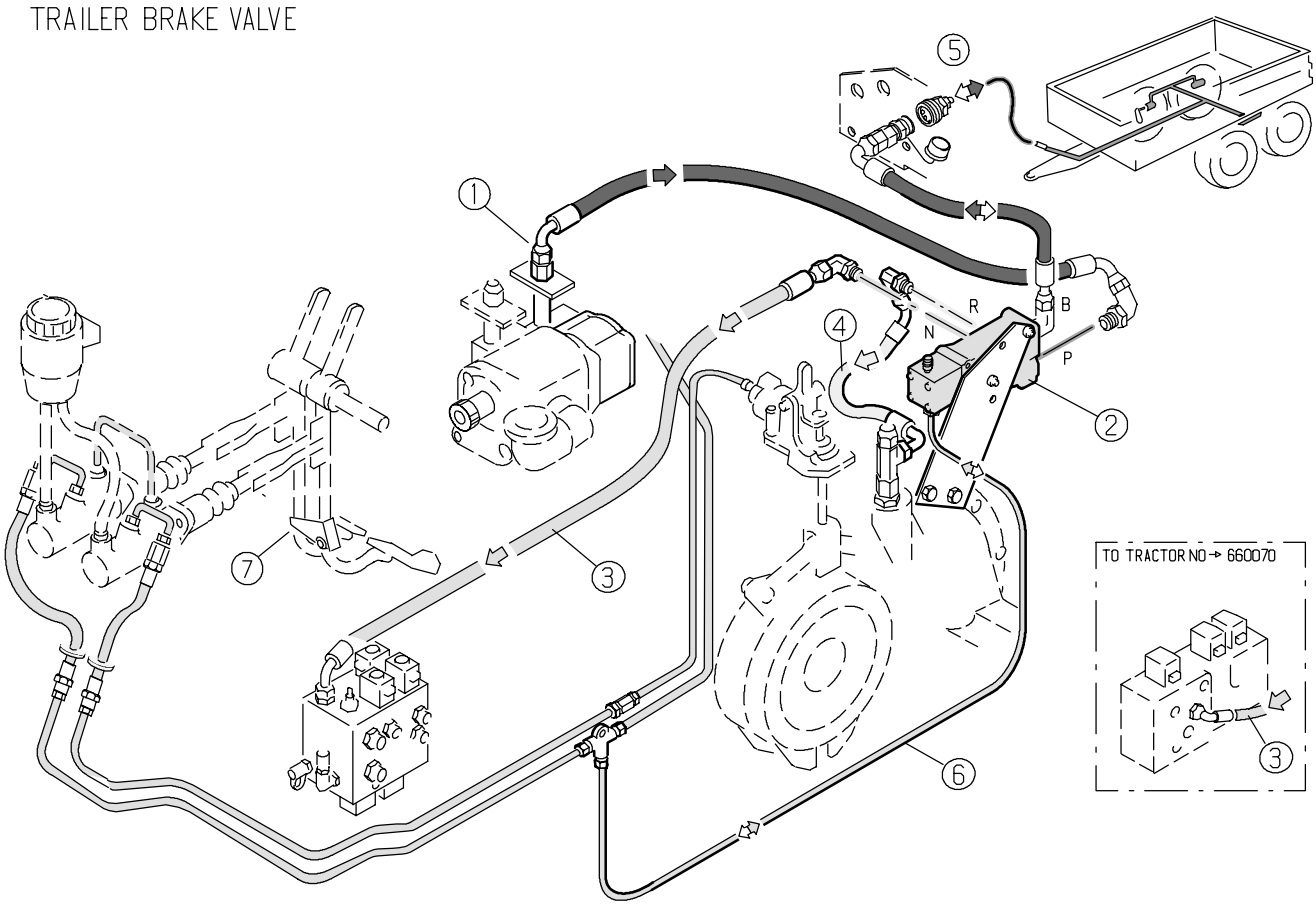


Picture 9. *Duo–Matic pressure air brakes.*

– Brake system with "Duo–Matic" –couplings is an alternative equipment for customers who have trailers equipped with these couplings (e.g. trailers like in lorries).

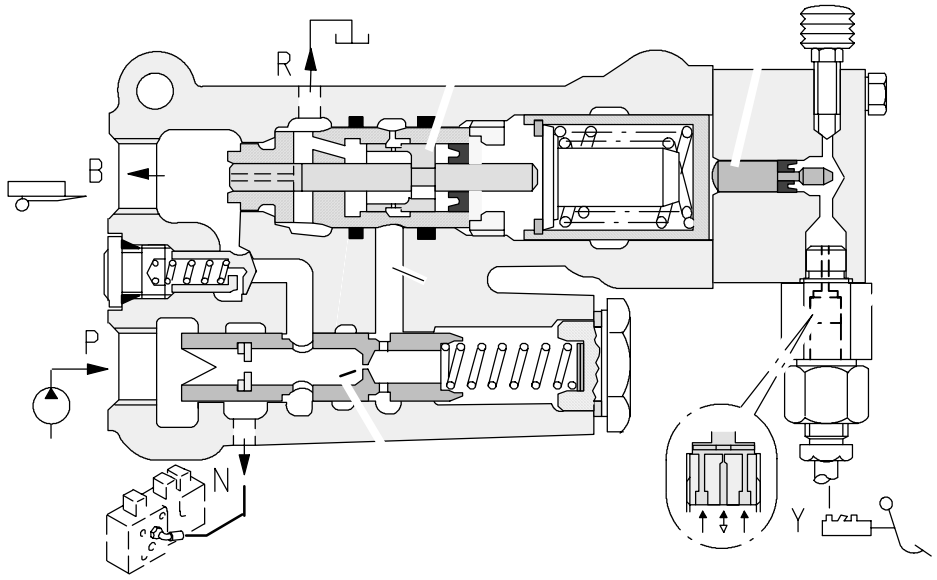
– "Duo–Matic" –has only two–line system. Function (pressures etc.) corresponds the two–line system shown on page 510/6.
"Duo–Matic"– couplings have not colour codes, because faulty connection is not possible.

1) Compressor
2) Deicer
3) Pressure regulator
4) Pressure gauge
5) Pressure reservoir
6) Water draining tap
7) Trailer brake control valve
9) Trailer coupling ,"Duo–Matic"
9a) Two–line system; reservoir line
9b) Two–line system; brake line
13) Trailer brake valve + brake power regulator
14) Trailer pressure air reservoir
15) Trailer brake cylinder
16) Servo cylinder (HiTech). Greasing the cylinder lever joint at every 250 running hours



Picture 9. Brake valve for trailer

1. Pressure line from pump
2. Brake valve
3. Pipe from low pressure citcuit
4. Pipe
5. Coupling for trailer
6. Pilot pressure from brake circuit
7. Brake pedals



Kuva 10. Perävaunun jarruventtiilin halkileikkauskuva

Reconditioning brakes (Op. no. 511)

1. Service brakes

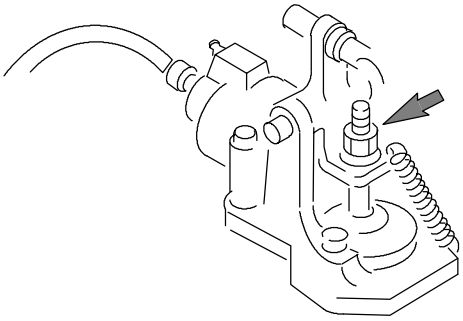
A. Changing brake discs

Note! There are oil grooves on the friction surface of the brake discs. On new discs the grooves are 0,3 mm deep. If the grooves are worn away, the braking efficiency will be impaired and the discs should be replaced.

1. Remove the final drives (**see Op. 451 1A**).

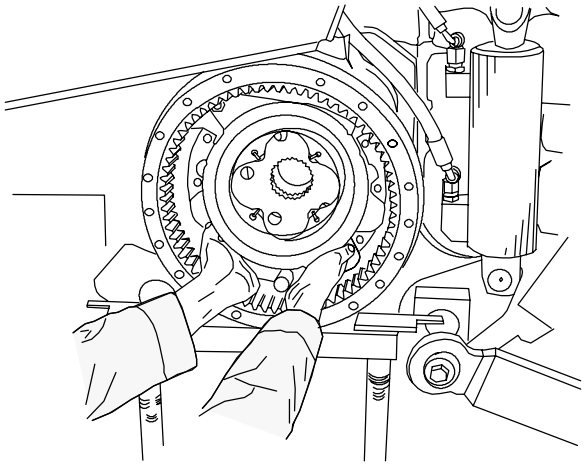
2. Pull out the inner drive shaft. Remove the outer support plate in front of the discs.

3. Remove the outer brake discs.



4. Slacken the adjusting nut (see arrow) until the brake mechanism is loose.

5. Take out the cotter pin and the link pin at the lower end of the stay. Pull the stay up until it is free from the application plate.



5a. Final drives 300, 450, 650: Remove the application plates by simultaneously pulling out the anchor bolt, fitted under the plate, and loosening the lower end of the plate from its position.

Note! The removal of the application plates is easier if the outermost circlip is removed from the anchor bolt.

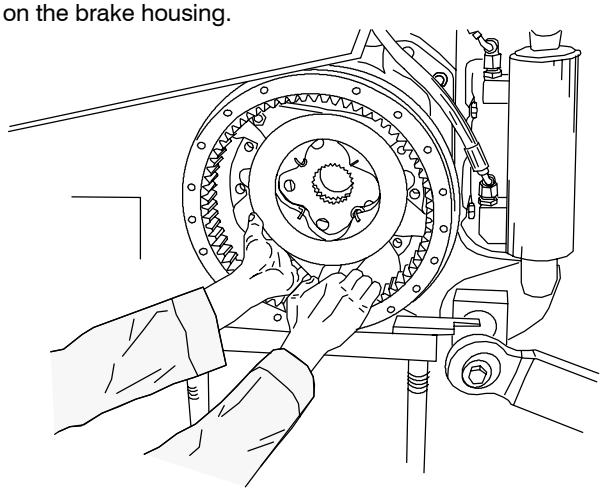
5b. 8350–8950Hi with final drives 700 has not an anchor bolt. Pull the application rings out of the housing.

6. Remove the inner brake discs.

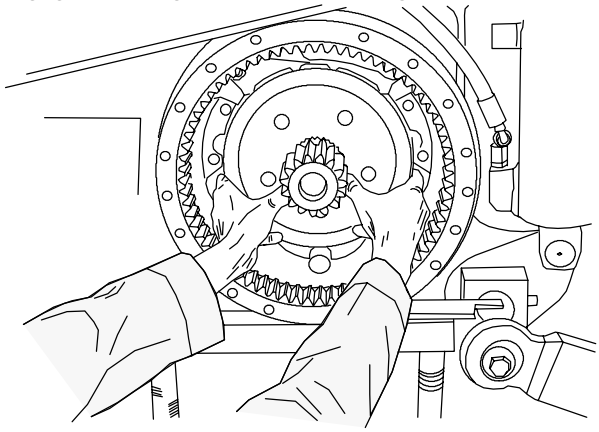
7. Check the friction surfaces in the brake housing and polish with an emery cloth.

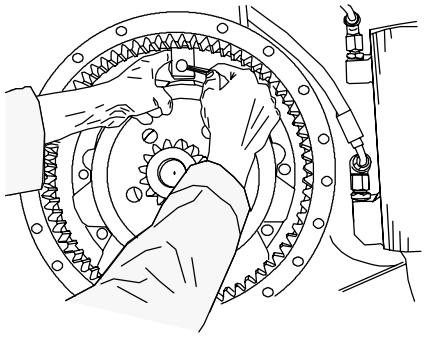
8a. Final drives 300, 450, 650: Push the anchor bolt in through the hole in the brake housing, but do not press it right home. Fit the inner brake discs on the anchor bolt. Check that the discs remain located in front of the inner circlip.

8b. In connection with final drives 700 there is not the anchor bolt. Place the inner brake discs and the intermediate discs in position so that the lugs engage into the grooves on the brake housing.



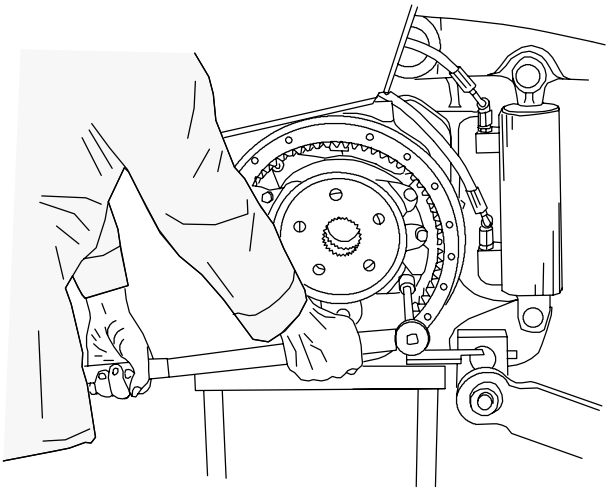
9. Final drives 300, 450, 650: Insert the application plate into the housing with the upper edge first locating the lower edge of the plate on the pulled–out anchor bolt. Press the bolt and the application plate into position. Fit the outer circlip on the anchor bolt. In connection with final drives 700, pass the application plate into place so that lugs on it engage into the grooves in the housing.





11. Using the link pin connect the brake stay to the link arms of the application plate and secure with the cotter pin. Tighten the adjusting nut at the upper end of the stay.

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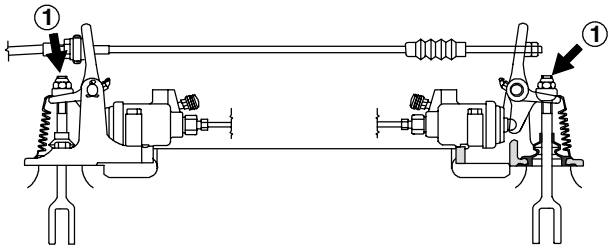
12. Fit the support and tighten it to **80 Nm** (8350–8950Hi, L32106–: **45 Nm**).

11. Fit the final drives (**see Op. 451 1E**) and adjust brakes (**see next instr. B**).

B. Adjusting foot brakes

Note! The pedal free travel should be **70–80 mm** with the pedals latched together. Adjust as follows:

1. Fit blocks in front of the front wheels to prevent the tractor from moving. When adjusting the service brakes, the parking brake must not be engaged. In HiTech–models the engine must be in running and the shuttle lever must **not** be in the P–position.



Final drives 300, 450 and 650:

2a. Raise the rear wheels off the ground and adjust both brakes separately with adjusting nuts (1) until the wheels cannot be turned by hand any further.
Slacken the adjusting nuts two turns and check that the wheels can rotate freely.

Final drives 700 (8350–8950Hi, L32106–):

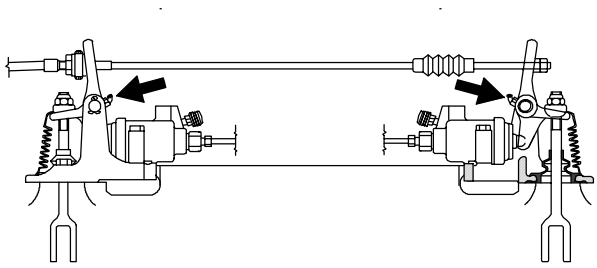
2b. Tighten the adjusting nuts (1) to **15 Nm** and unscrew them **one and a half turn**.

3. Check that the brake action is the same on both wheels while driving with the pedals latched together. Adjust if necessary.

5. Check the pedal free travel.

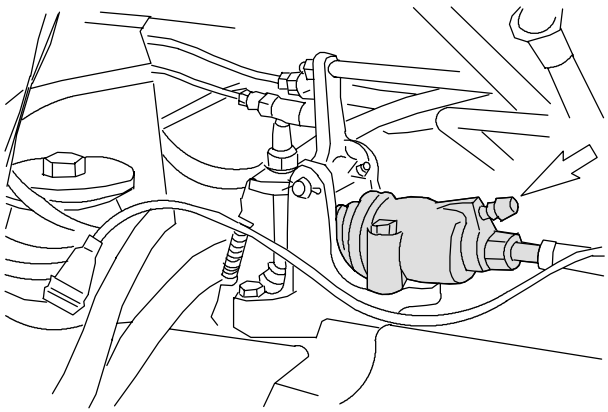
Note! Tractors equipped with the reverse drive controls: Adjust first the front pedals according to the instruction above. After this is adjusted the rear brake pedal by adjusting the lenght of the cable so that the rear brake pedal free travel becomes **20 mm**, see instruction on page 511/3.

Maintenance



Note! Grease brake lever nipples (see arrows) weekly (or every 50 running hours). It is recommended, that the brake fluid is changed every other year.

C. Bleeding brake system



Note! Both brake cylinders have a bleeding nipple (see arrow). Bleed both brakes individually (pedals not latched together).

1. Check thet the brake fluid reservoir is full.

2. Pump several times with the pedal in order to built up the pressure in the system.

3. Depress one of the brake pedals and at the same time open the bleed nipple on the brake which is being actuated by the pedal. Close the nipple and slowly let the brake pedal up again.

4. Repeat the pumping action with the brake pedal until the brake fluid which runs out at the bleeding nipple is completely free of air.

5. The procedure for bleeding the brakes is the same on both sides.

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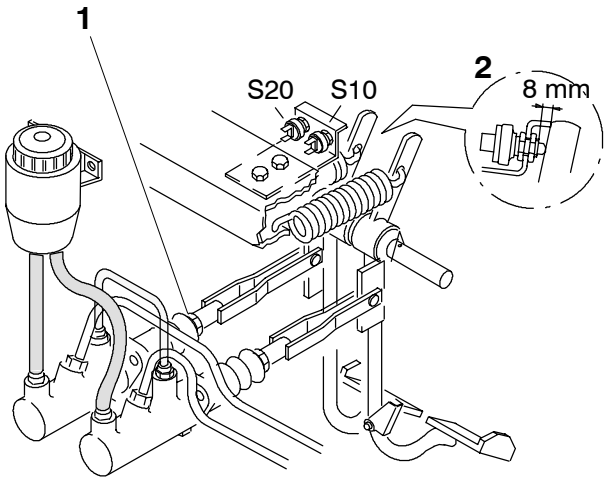
D. Changing brake housing

The brake housing fixing bolts are difficult to open if the cabin is fitted in place. For that reason, the cabin must be lifted up before removing the brake housings (**removing the cab, see section 80**) or the tractor frame must be split (**see Op. 423 1A**).

When fitting the brake housing, apply sealing compound Hylosil RTV Grade 102 black or Loctite 5900 to the contact surfaces between gearbox–brake housing.

Brake housing fixing bolts are tightened to **270–330 Nm**.

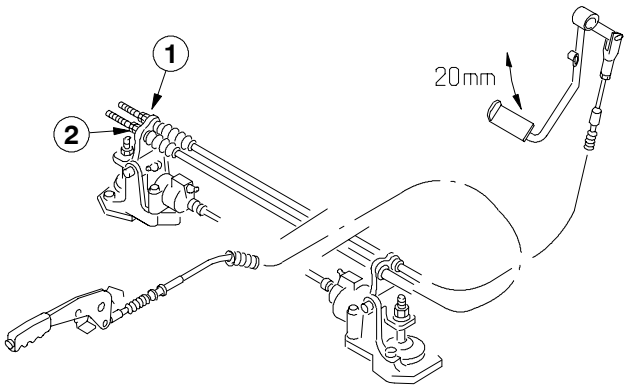
E. Adjusting master cylinder pushrod clearance



The clearance should be **1–3 mm**. This adjustment is done by slackening screw (1) and removing the cotter pin and the pivot pin and turning the clevis.

Note! Point 2 shows the brake light switch adjusting measurement.

F. Tractors with reverse drive controls (TwinTrac)

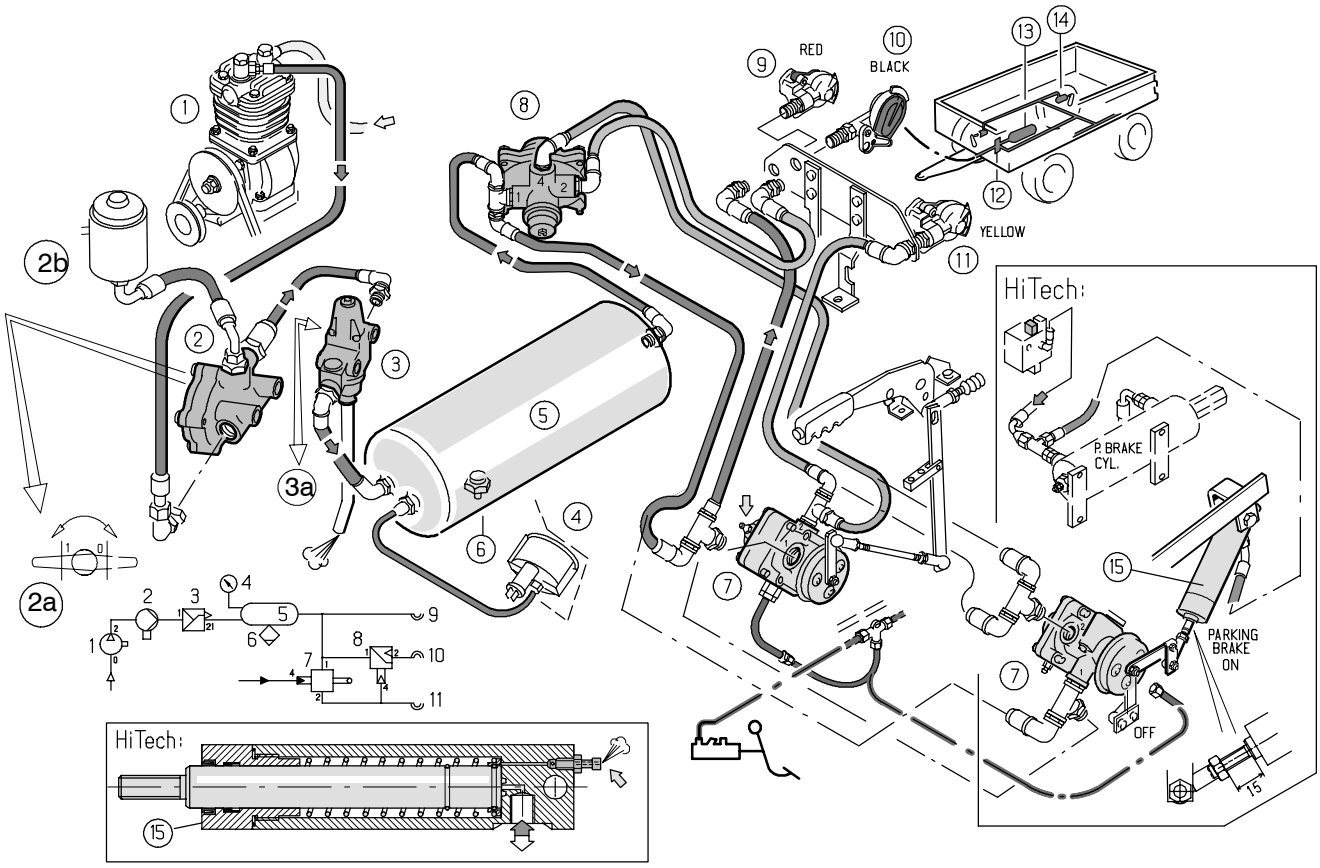


Adjusting rear brake pedal free travel:

– adjust first the free travel of the front pedals according to instruction **B**.
– adjust the free travel of the rear brake pedal to **20 mm** by turning the adjusting nut **1**.
– nut **2** is for adjusting the parking brake cable. Adjustment of the parking brake is shown on page **521/1–3**.

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2. Pressure air brakes for trailer (option)



A. Maintenance

General

In the system there is a filter, which is placed in the pressure regulator (3). The filter must be cleaned/changed periodically (depending on use). The filter can be removed by removing the tyre filling connection (3a) on the pressure regulator.

Daily maintenance

Condensed water must be drained from the system daily by pressing or pulling the pin of the draining tap (6) under the air reservoir.

Weekly maintenance

Check the mounting of the compressor. Check/adjust the compressor belt tightness by adjusting the tension pulley (1).

Maintenance at intervals of 250 running hours

Grease the quick coupling rubber surfaces with silicone grease. Grease the hand brake lever joints.

B. Others

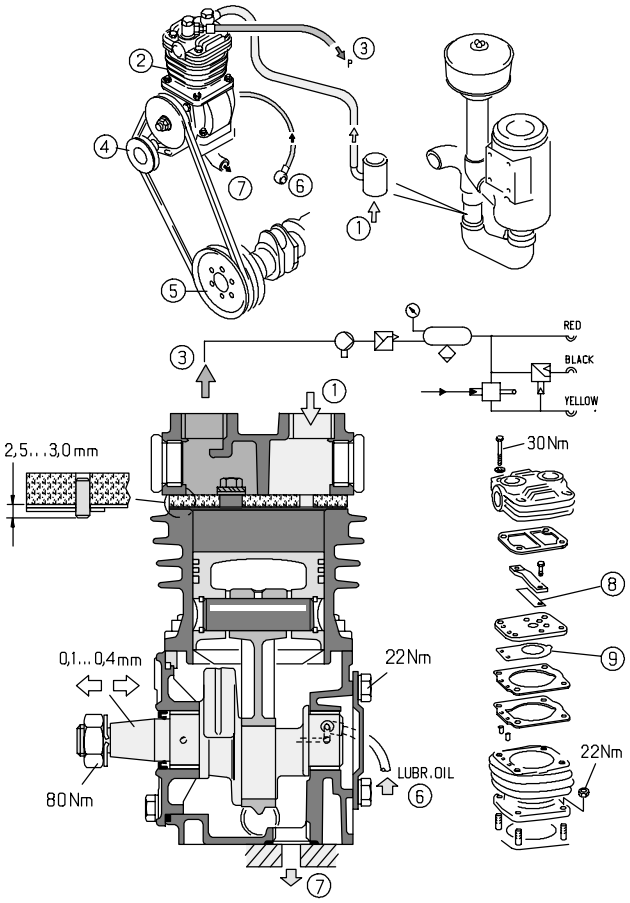
The pressure regulator has an in–built relief valve, which blows off, when the pressure in the reservoir exceeds 12–14 bar. This can be caused by e.g. faulty relief valve, icing or blocking filter.

Check the tightness of the system. The system must be so tight that the pressure drop after the engine stop is max. **0,15 bar during 10 minutes** (2%).

If the hoses or hose unions have leakages, new parts are available as a spare part. Other components of the pressure air system must be changed as a complete unit since no separate spare parts are available.

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C. Compressor



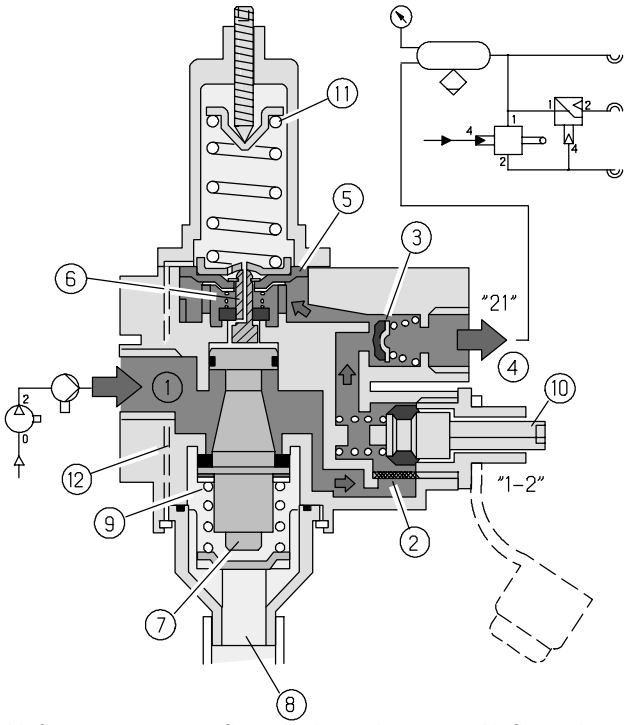
Picture 1 *Compressor of pressure air brakes*

1. Compressor draws air from the engine air intake system
2. Compressor
3. Pressure air into pressure regulator
4. Tension pulley
5. Compressor requires extra belt pulley (+hub piece)
6. Lubricating oil from engine
7. Return oil into engine
8. Preessure plates
9. Suction plate

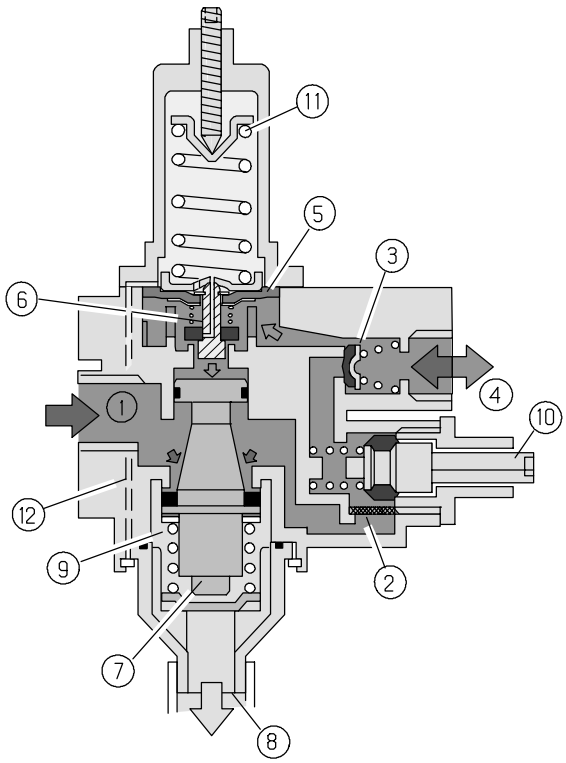
Compressor . . . . . Knorr LK13
Displacement . . . . . 110 cm^3
Output (2300 r/min, with 7 bar
counter pressure) . . . . . 220 l/min
Power consumption (2300 r/min, 7 bar). . . 1,8 kW
Lubrication . . . . . Engine lub. circuit
Cooling . . . . . air cooling

Note! On the six–cylinder engines the compressor is fitted on the RH side of the engine. On 3– and 4–cylinder engines (without air conditioning/electric stop) the compressor is fitted on the LH side of the engine.
If the tractor is retrofitted with the air conditioning/electric stop, the compressor is fitted on the RH side of the engine. In fitted with pressure air+air conditioning the compressor is driven by two belts.

D. Pressure regulator



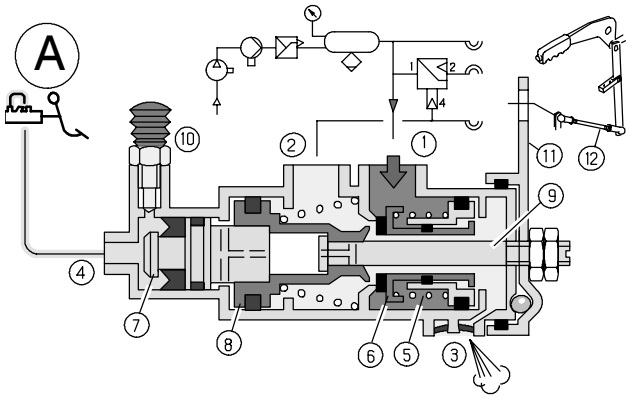
Air from compressor flows in through port **1**. Air flows then via strainer **2**, opens one–way valve **3**, and flows through port **4** into reservoir..



As soon as pressure in the reservoir is greater than spring force **11** (ca. 8 bar), memphrane **5** distorts and piston **6** moves upwards. At the same time rubber collar round the piston closes port in the piston and opens a passage to the upper part of piston **7**.
Pressure moves piston **7** downwards against spring **9**, and air from compressor to port **1** blows off via port **8** to atmosphere.

Note! It is possible to adjust the working pressure with the adjusting screw of spring **11**. When the screw is turned outwards, working pressure lowers and vice versa.

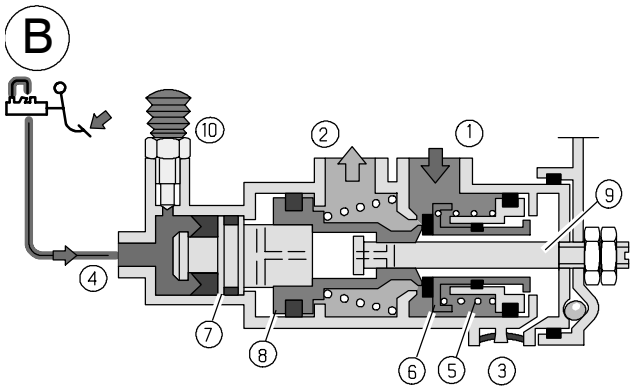
E. Control valve for trailer brakes



Function, fig. A (not braking):
In the neutral position spring **5** presses sleeve **6** against the valve body, passage from inlet port **1** forwards is closed. Passage **2** to the trailer coupling (and to the one–line system control valve) is connected to outlet port **3**.

Adjusting hand brake

Hand brake adjustment is made with the aid of rod **12**.
Adjustment: Adjust the rod (12) length so that the trailer brake coupling (yellow) gives check pressure of **6,2 – 7,5 bar** when the hand brake lever is in the second notch of the ratchet plate.



Function, fig. B (when braking):

Brake pedal hydraulic pressure via port **4** and piston **7** pushes it and the adjusting piston **8** to the right.
Connection from port **2** to outlet hole is closed, and passage from port **1** to **2** is opened. Compressed–air is directed via port **2** the trailer brake valve.

Pressure which acts against adjusting piston **8** pushes the piston (+piston **7**) against the brake hydraulic pressure to the left and connection between ports **1** –> **2** is closed.
Balance situation is achieved.

F. Control valve of one–line system

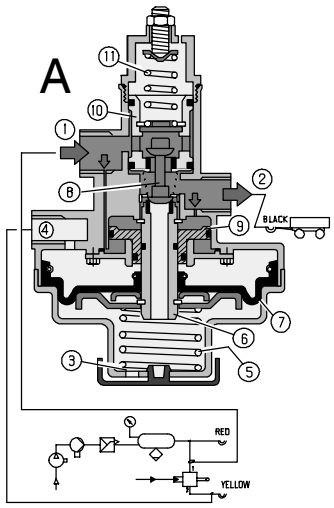
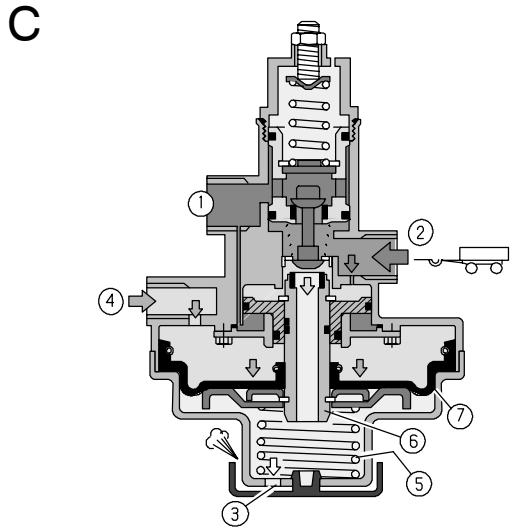


Fig. A (not braking)
Spring **5** holds membrane+sleeve **6** up. Upper end of valve spindle **8** has opened passage from inlet port **1** to trailer brake port **2**. Pressure air flows from tractor reservoir via ports 1 and 2 to the trailer brakes.
Simultaneously in port **2** pressure acts on the underside of piston **1**.



Function, fig. C (when braking):
When depressing the brake pedal pilot pressure from the trailer control valve port **4**. Pressure affect the upper part of memphrane **7**, and moves the memphrane and sleeve **6** downwards against spring **5**. Passage from port **2** to sleeve **6** internal hole opens.
Pressure flows from port **2** via sleeve **6** and cover hole **3** to outdoors to give quick pressure drop for trailer pre–braking. The pressure drop causes an action of trailer brake valve in one–line system.
NOTE! During braking replacing air does not flow into the trailer brake system.

– The one–line system working pressure (5,2 bar) is lower than that in the two–line system. Control valve lowers the system pressure from 7 bar to 5 bar. Contrary to the two–line system coupling (yellow), the black coupling of the one–line system is under pressure when not braking.
The control valve does not require maintenance.

Checking the pressure air brake system:

	Not braking with pedals or hand brake lever	Full braking with pedals or hand brake lever
Reservoir line (red)	**6,0 – 8,0 bar**	**6,0 – 8,0** bar
Brake line (black)	**4,8 – 5,6 bar**	0
Brake line (yellow)	0	**6,2 – 7,5** bar

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2. Parking brake

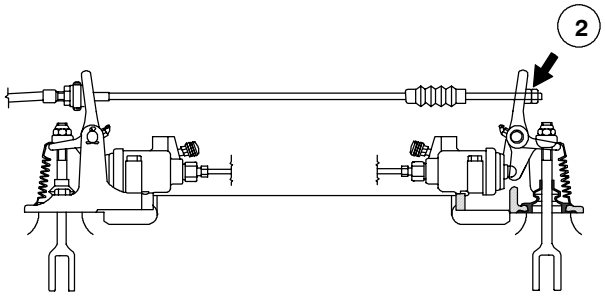
Note! Adjusting parking brake on tractors with pressure air system for trailer brakes, see instr. **E** on page **511/6**.

Note! Parking brake on tractors with HiTech Shuttle, see instruction **B** on pages **521/2 – 3**.

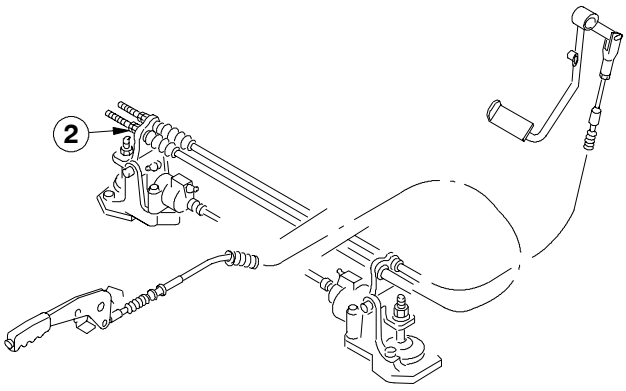
A. Adjusting parking brake (not HiTech tractors)

Note! The parking brake is controlled mechanically and it is connected to the foot brake mechanism by a cable. The parking brake is adjusted in the factory and re – adjustment is not necessary unless parts of brake mechanism have been changed. The parking brake is affected when the foot brakes are adjusted (**see instr. 1B**).

1. Before adjusting the parking brake, adjust foot brakes (see instr. **1B** on page **511/2**).



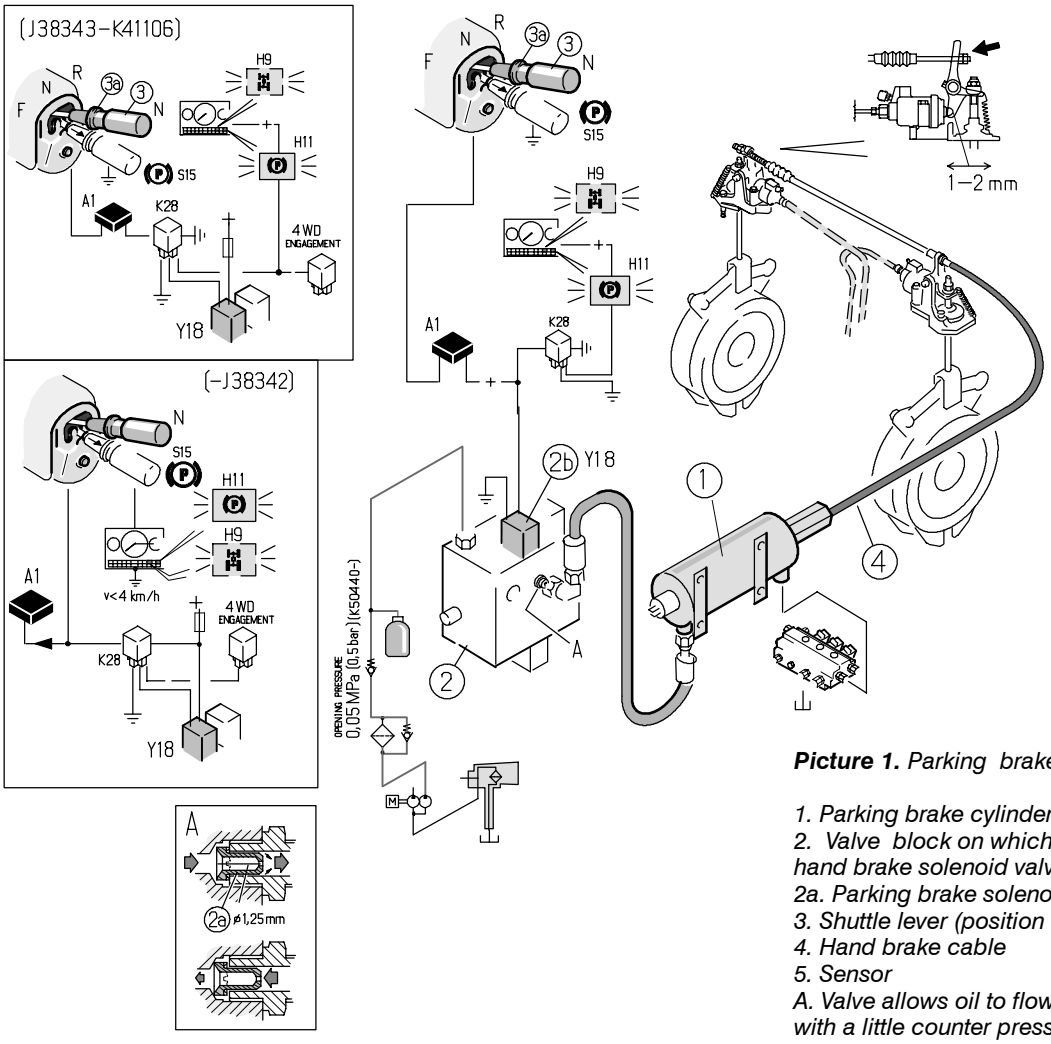
2. Adjust the parking brake lever free travel to about **50 mm** (at the lever end) by turning the adjusting nut (2) at the rear end of the cable.



Note! If the tractor has reverse drive controls (TwinTrac), the parking brake adjustment is done with nut (2), but there are two cables connected to brake mechanism. The other cable is for the rear brake pedal.

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B. Parking brake on tractors with HiTech Shuttle



Picture 1. *Parking brake mechanism*

1. Parking brake cylinder
2. Valve block on which there is a hand brake solenoid valve
2a. Parking brake solenoid valve Y18
3. Shuttle lever (position P)
4. Hand brake cable
5. Sensor
A. Valve allows oil to flow out of ram with a little counter pressure

In connection with HiTech Shuttle the hand brake is controlled electro–hydraulically. When the engine is running and the shuttle lever (3) is moved to position P, hydraulic oil pressure from the low pressure circuit is cut off in the ram (1) (solenoid valve (2a) becomes unenergised) and the ram spring pulls the hand brake on.

When pressure again is connected to the ram (solenoid valve energised), pressure compresses the spring and hand brake is released.

When the engine is stopped (pump stops), the hand brake comes on automatically with an aid of the spring force.

If the hand brake does not disengage (engine running) although the shuttle lever is moved to the N, R or F position so:

– check whether the solenoid valve (2a) is energised (magnetic), when the hand brake is disengaged. If not, measure the solenoid resistance, which should be **11–12 ohms**.

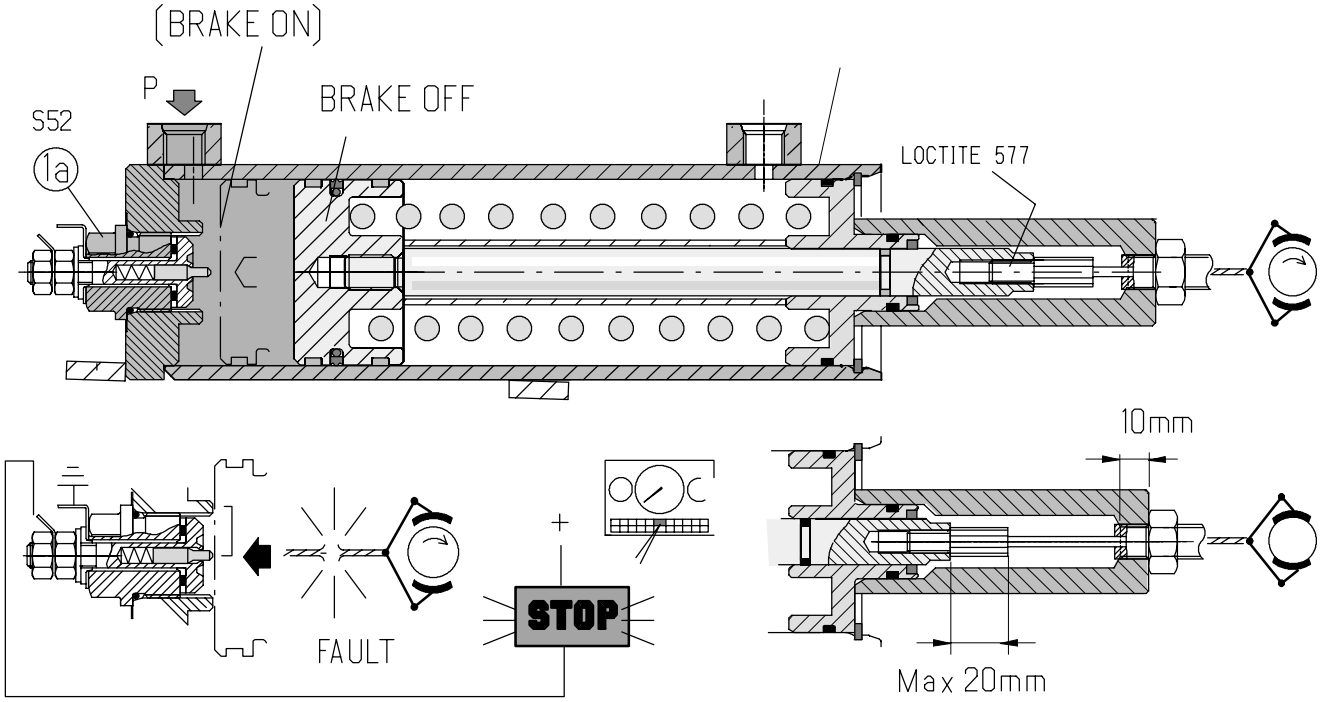
– If the solenoid is faulty, it should be replaced.
– If the solenoid is OK, measure whether current comes up to the solenoid connector. If not, check the solenoid wires and connectors.
– The condition of the shuttle lever switch can be tested in the AC 5/5.2 test mode, see pages 370/10 or 371/8.
– If the solenoid and its wiring and the hand brake switch are OK, the fault can lie in the hand brake relay or in the AC 5/5.2 control unit.
– If these are Ok, the fault can lie in the hydraulic system.

Note! If the hand brake engages itself during driving, the solenoid valve (2a) has become unenergised or low pressure circuit has malfunctions.

Note! If the driving speed exceeds 2 km/h (in the beginning of the production 4 km/h), the hand brake engagement is prevented by relay K28 (in the lever console).

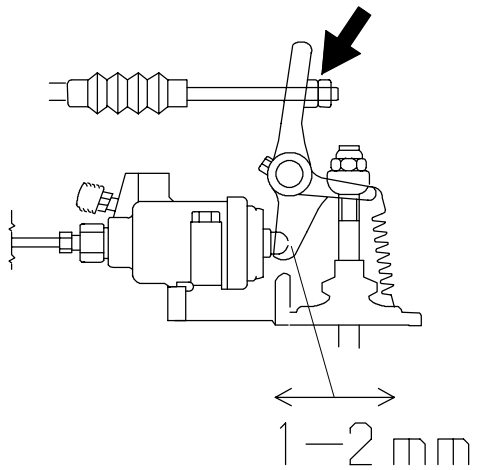
– a non–return valve from ser. no. **K50440** incl. has been fitted in the system which together with the AC 5.2 program modification, retards the pressure drop in the low pressure circuit in cases that e.g. engine stops during driving (e.g. fuel runs out). Program disengages all transmission multi–disc clutches, if the engine stops and the driving speed exceeds 5 km/h. In this case the parking brake cylinder starts to brake after 15...30 seconds.

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Picture 2. Hand brake ram on HiTech tractors.
1a) Safety switch lights up the STOP light in the dasboard, if e.g. the hand brake cable breaks.
Note! Adjusting dimensions MAX 20 and 10 mm must come true when fitting a new cable.

Adjusting hand brake on HiTech tractors



The length of the hand brake cable is adjusted, when necessary, so that when the hand brake is disengaged (=ram pressurised), the clearance between the RH side brake cylinder push rod and the brake mechanism lever is **1–2 mm**. The clearance can be adjusted with nuts at the end of the cable (arrow).

Note! Before adjustment ensure, that the foot brake is correctly adjusted, see instr. **B** on page **511/2**.

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6000–6400, 6900 8000, 8000R:

Br.valve, pressure ratio	**1:5,44**	**32556110**
,	**1:7,11**	**33646300**
	1:11,1	**32530210**
6600, 6800, 8050–8750:		
Br.valve, pressure ratio	**1:5,44**	**33640900**
	1:7,11	**33646400**
	1:11,1	**33641300**
6250Hi–8950Hi:		
Br.valve, pressure ratio	**1:5,44**	**33619300**
	1:7,11	**33670200**
	1:11,1	**33619400**

– The brake valve is used with trailers which have hydraulic brakes. The brake valve steers the tractor hydraulic pressure into the trailer brake cylinders when braking.

CHOOSING CORRECT BRAKE VALVE:

– The max operating pressure of the brake valve is 15 MPa and valve pilot part pressure ratios are 1:5,44 or 1:11,1
NOTE! Check that the trailer max. allowable pressure is not lower that 15 MPa (see trailer type plate).

Pressure ratio 1:5 is intended to be a universal valve for so called ”normal” trailers.

Pressure ratio 1:11 is intended to be fitted on heavy trailers or on trailers whose brake cylinders require a high pressure e.g. small cylinders. (The brake pressure does not even in this case rise over 15 MPa, but full braking power is obtained faster).

Fitting instruction:

– Lower the lower links to the lowest position. Remove the LH side rear wheel.

– Connect T–connector **11** to the final drives return pipe and then connect the hose **12** end (fig. 1) to the T–connector.

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– Fit the brake valve bracket **9** under two screws of the rear axle housing according to the fig. 1.
Rear axle housing fitting bolts:
70 Nm (M10 property class is 10.9)
125 Nm (M12 property class is 10.9)

– Attach the brake valve (2 pcs screws **8** + nut **15**).

– Fit instead of the LH side brake pipe connector piece a T–connector **14** and connect the brake pipe **13** to the pilot part of the valve. Shape the pipe if necessary.

– Detach the hose end (pump/pressure filter – valve plate) from the LH side gearbox valve block.
Hi Shift: detach the hose end (pressure filter–hydraulic block), from the clutch hydr. block (see picture 3b).
HiTech: detach the hose end (pressure filter–hydraulic block) from hydr. block (F–R, C3).

– Easiest way to connect the hoses is the following order (fig. 2):
1. N
2. R
3. P or B

– Connect hose **10** to the brake valve port ”N” using an angle connector **5** and connect the hose other end to the gearbox (standard models) valve block
Hi Shift: to the clutch hydraulic block (see picture 3b).
HiTech: to the hydr. block (F–R, C3).

– Connect the end of the hose **12** to the brake valve port ”R”.

– Connect the detached pressure hose end to the port “P” with an angle connector **5**.

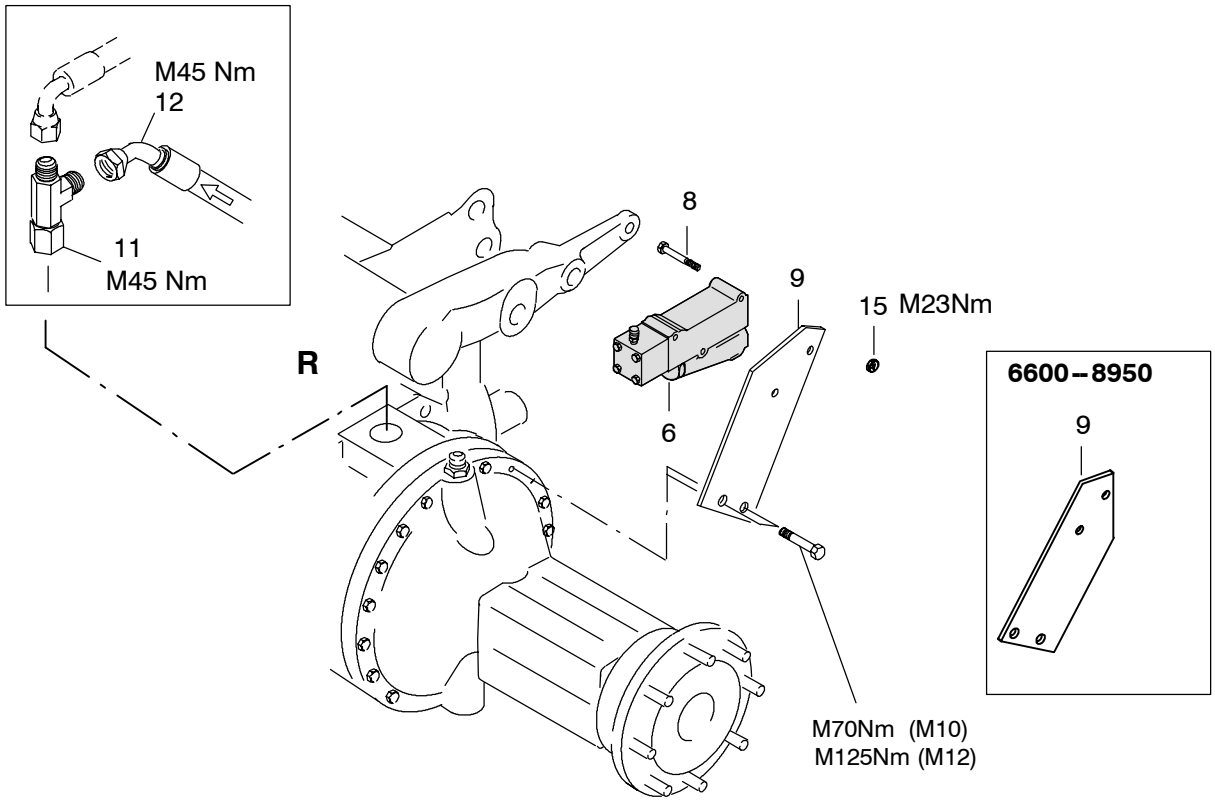
– Connect hose **4** to the brake valve port ”B” and fasten the pipe other end to the quick–action coupling bracket using intermediate nipple **3** and male connector **1**.

– Bleed brake system.

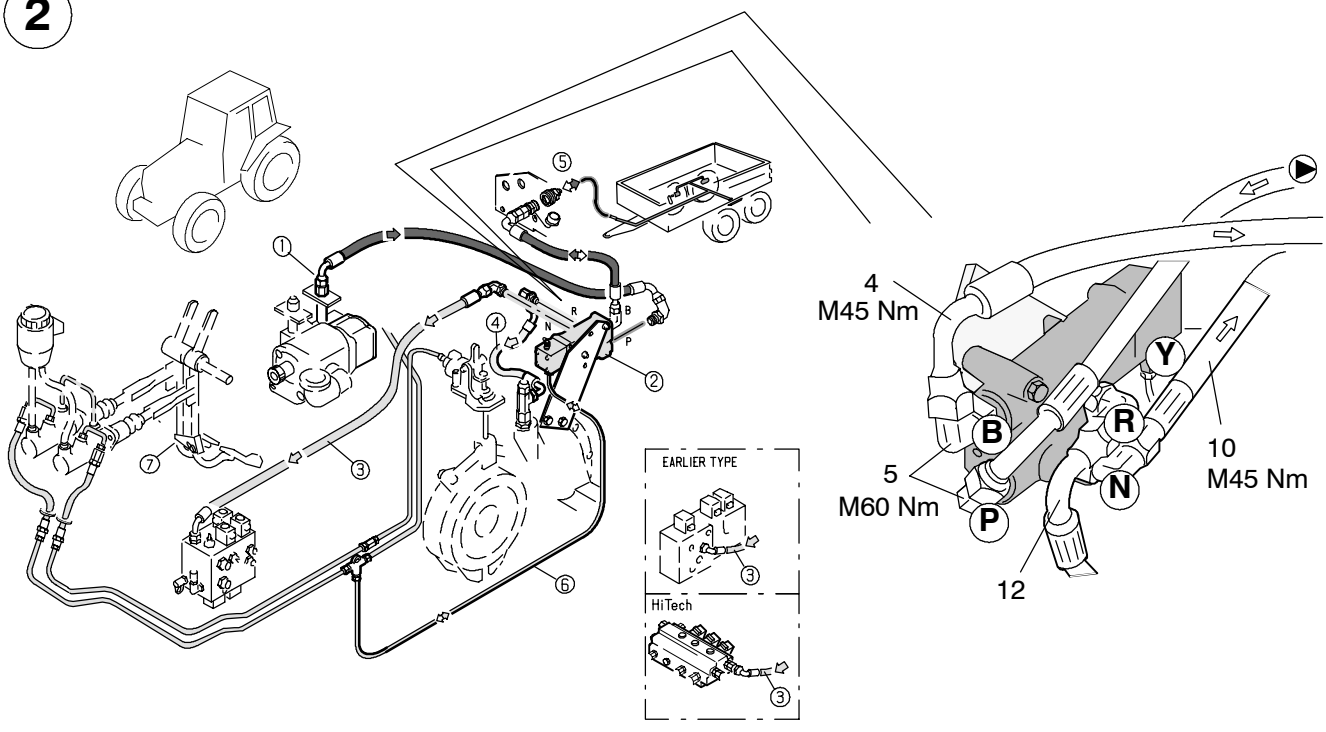
– Check for leaks in brake system. Measure the brake valve pressure from the quick–action coupling. Start the engine (hydraulic oil temperature 50–65˚C, engine revs1500 r/min). Latch the brake pedals together and increase gradually brake pedal force. The pressure should rise up to 15 MPa.

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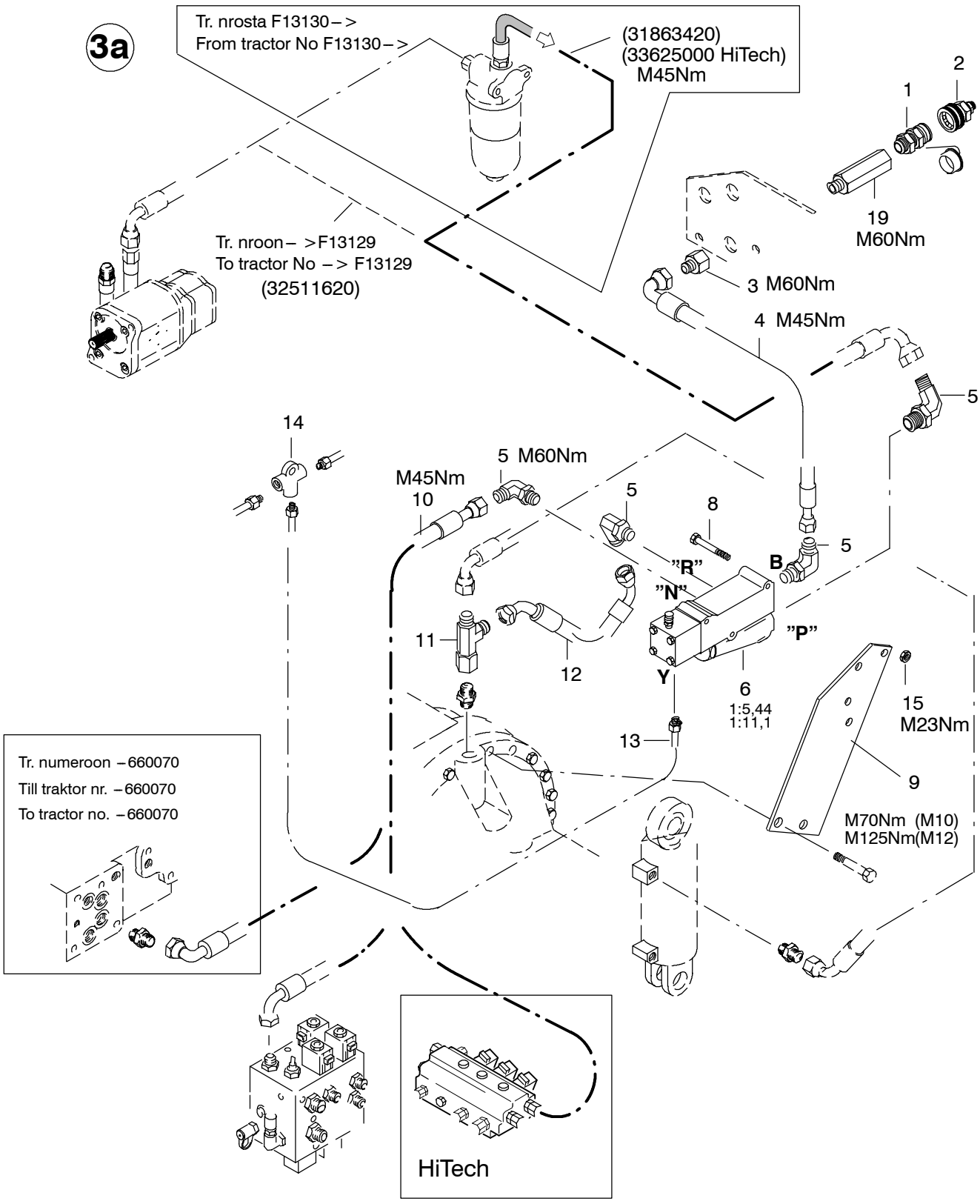
1



2

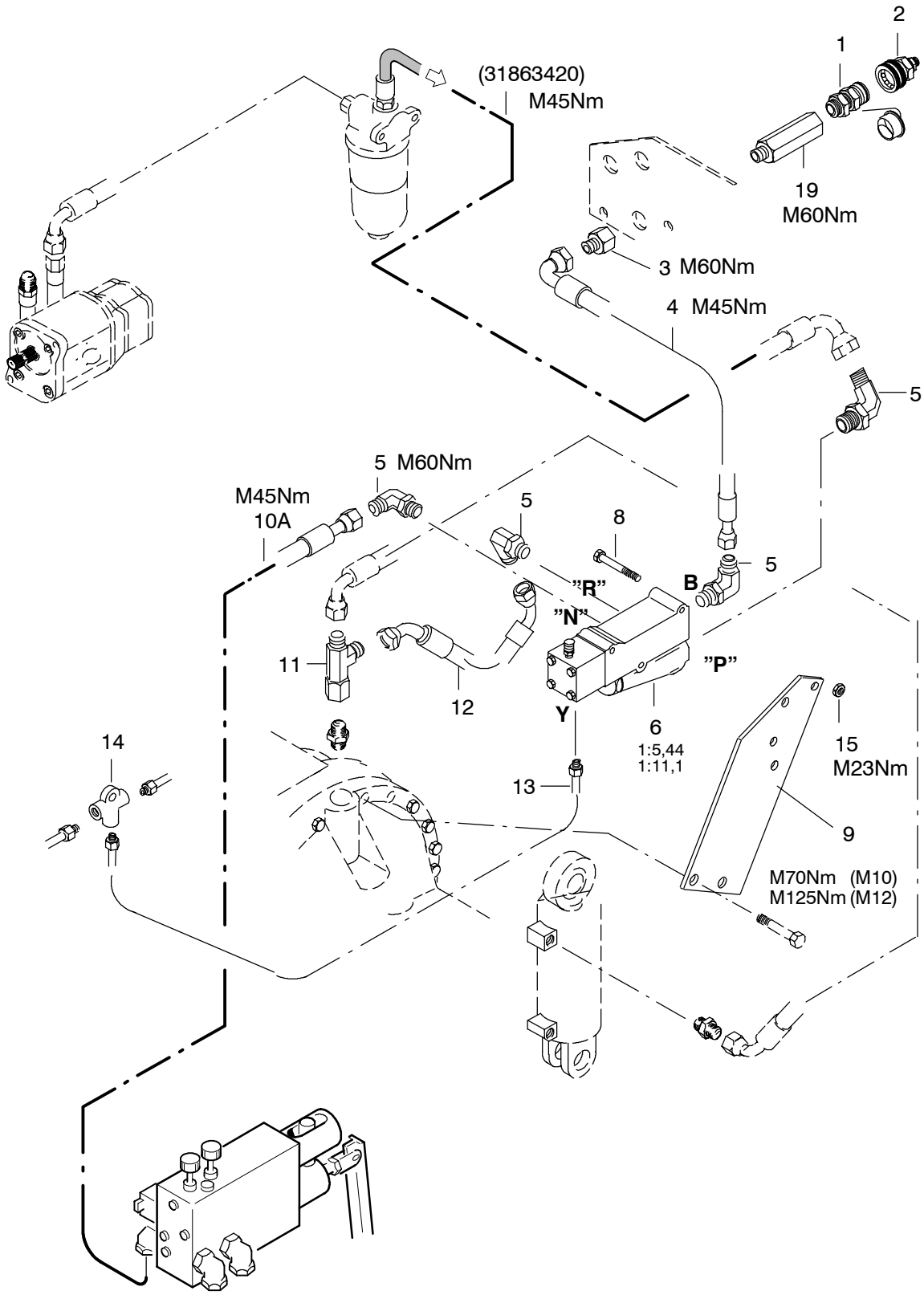


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3b Jos traktorissa on Hi Shift:
Om traktorn har Hi Shift:
If the tractor has Hi Shift:



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PARTS LIST:

	1	32556110	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:5,44 :
	1	33646300	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:7,11 :
	1	32530210	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:11,1 :
	1	33640900	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:5,44 : :
	1	33646400	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:7,11 : :
	1	33641300	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:11,1 : :
	1	33619300	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:5,44 : : :
	1	33670200	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:7,11 : : :
	1	33619400	Jarruventtiili	Bromsventil	Brake valve	Bremsventil	1:11,1 : : :
1	1	32609800	.Pikaliitin koiras	Snabbkoppling hane	Quick coupler /	Schnellkupplung /	
2	1	31628700	.Pikaliitin naaras	Snabbkoppling hona	Quick coupler ?	Schnellkupplung ?	
3	1	GS9304	.Liitin	Nippel	Union	Verbindung	
4	1	32599600	.Letku	Slang	Hose	Schlauch	
5	4	GS9452	.Liitin	Nippel	Union	Verbindung	
	4	KH9032	.O-rengas	O-ring	O-ring	O-ring	
6	1	32434020	.Jarruventtiili	Broms sventil	Brake valve	Bremsventil	1:11,1
	1	32436120	.Jarruventtiili	Broms sventil	Brake valve	Bremsventil	1:5,44
	1	33651500	.Jarruventtiili	Broms sventil	Brake valve	Bremsventil	1:7,11
8	2	HA8328	.Ruuvi	Skruv	Screw	Schraube	
9	1	33629500	.Kannatin	Hållare	Support	Halter	:
	1	33629600	.Kannatin	Hållare	Support	Halter	: : , : : :
10	1	32599500	.Letku	Slang	Hose	Schlauch	: , : :
	1	33538200	.Letku	Slang	Hose	Schlauch	: : :
10A	1	33291900	Letku	Slang	Hose	Schlauch	HiShift
11	1	GS9276	.Liitin	Nippel	Union	Verbindung	
12	1	32599700	.Letku	Slang	Hose	Schlauch	
13	1	33629700	.Putki	Rör	Pipe	Rohr	:
	1	33629800	.Putki	Rör	Pipe	Rohr	: :
	1	33590200	.Putki	Rör	Pipe	Rohr	: : :
14	1	30458200	.Liitin	Nippel	Union	Verbindung	
15	2	JB8904	.Mutteri	Mutter	Nut	Mutter	
19	1	32773100	.Liitin	Nippel	Union	Verbindung	

: = 6000–6400, 6900 8000, 8000R
: : = 6600, 6800, 8050–8750
: : : = 6250Hi–8950Hi

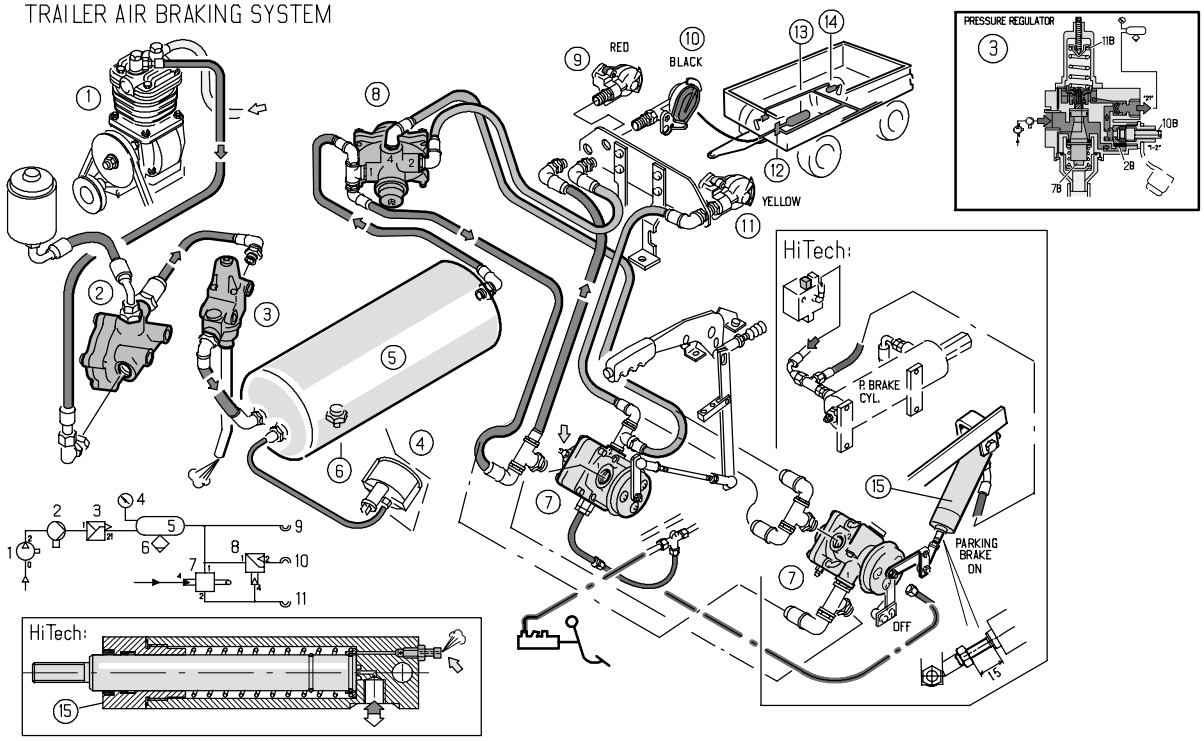
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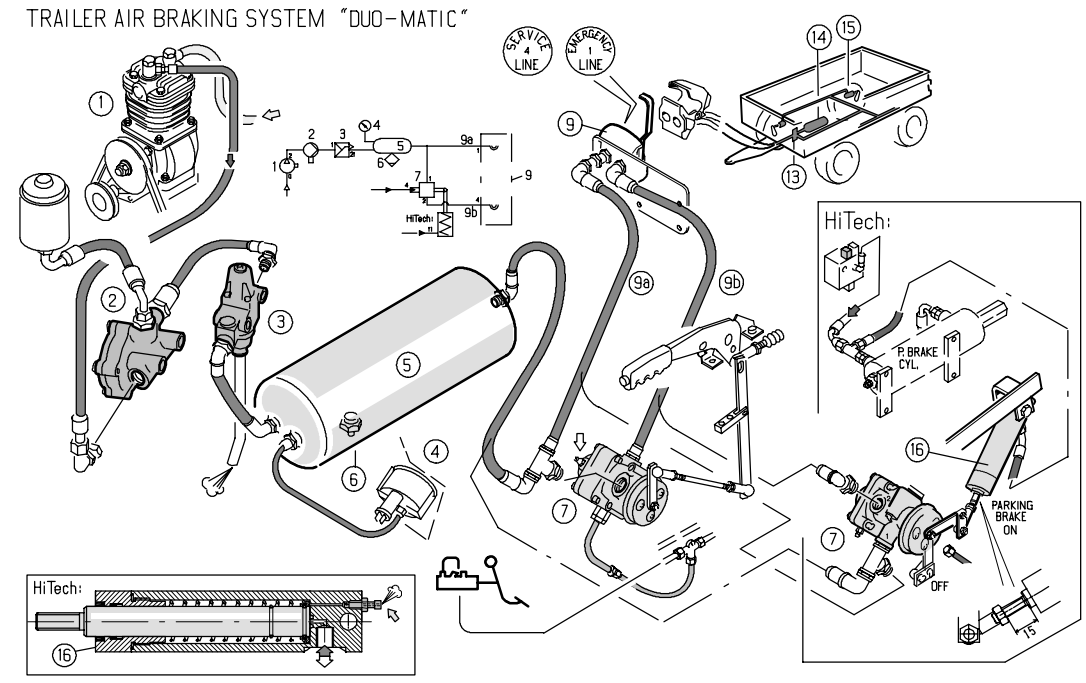
Trailer air braking system 32910800
Trailer air braking system *) 34327000
Trailer air braking system, HiTech 33692600
Trailer air br. system, HiTech*) . . . 34186200
Trailer air br. system (Duo–Matic) 33019000
T. air br. system (Duo–Matic) *) . . . 34327100
T. air br. system (Duo-Matic), HiTech . 33690100
T. air br. system (Duo-Matic), HiTech *) 34078600

***)** only brake system parts, see fig. A,B,C,D

– NB! if the compressor has not been mounted, see **separate instruction**.

1





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FITTING:

– Fasten support **59** under two gearbox–to– fuel tank bolts (M16: 270–330Nm, M12: 125 Nm), see picture **A**.
Holder **107** is fastened between foot step bracket and intermediate frame support (fig. A.1).

– Fasten bracket **120** under the nuts of the foot step front support.

– Use the reservoir bracket **17** as a pattern and drill holes (2 pcs, 6,2 mm) through the wall on the foot step frame side (picture **I**).

– Mount the deicer **83** according to picture **A, A.1**. Pour into reservoir **12A** methanol or ethylic alcohol (0,5 l, e.g. AEROL 100). By opening the wing screw the holder + pump can be inclined for easy filling. With lever **B** can the flow of antifreeze agent cut into the system (if outdoor temperature is over 5_C. In summer the reservoir can be empty, then the lever position is unimportant).

– Fasten the air reservoir **65,** the pressure regulator **106** and the control valve **58** (one–line system) according to the picture **A, A.1**.

– Make a 52 mm hole in the instrument panel for the pressure gauge **78** (dimensions in picture **A.1**., *HiTech– models,* picture **B, B.1**: the gauge needs a back plate **116**). Make the hole accurate, since the gauge fixing flange is small. Pass the gauge pipe (reservoir–gauge) through the hole in the cab front wall (beside the 37 pin connector).
Take current and ground for the gauge from the ind. light for the rear working light switch (S2) (wire no 26 black).
Connect the white earth wire. Fasten the pressure gauge.

– Pass hose **85** along the tractor left side under the battery and behind the filter and fuel injection pump to the compressor.

– Fasten the coupler bracket (parts **7**, **13**, **14**) on the PTO housing, and fit the couplers **1**, **2**, **3** (picture **A.2**).

– *Not HiTech –models:*
Take away the shield of the parking brake and the holder. Drill holes 10 mm (2 pcs) and a longer opening (12x35) according the picture **A.3**.

– Drill three holes ∅12 mm) in the lower side plate of the cab for the bracket **33**.
Fasten the control valve **43**.

– *Not HiTech –models:*
Fit the parking brake lever mechanism. Take the control pressure from the brake system (lower brake tube) with help of a T– connector **50** (placed instead of a straight connector). Bleed finally the brake system

(NB! the control valve has also a bleeding nipple).

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– *Hitech– models* (pictures B, B.1, D, D.1): Drill two holes (∅11 mm) in the lower side plate of the cab according to the picture **B.1**.
Fasten the control valve **30** and cylinder **23** to the holder **14**. Adjust the distance between the nut and the shoulder of the piston rod to **15 mm** (picture **B.2**)
NB! put two washers between the joint piece and the lever (picture **B.2**). Fit the pre–assembled holder.

Take the control pressure from the brake system (lower brake tube) with help of a T– connector (**37**, picture **B**), placed instead of a straight connector). Take the working pressure from the parking brake cylinder with help of a T– connector (**50**, picture **B**).

– Fit the hoses and the shield tubes (around the tubes). The hoses can be connected with the connectors by pushing.

– **Duo–Matic** (pictures C, D):
The Duo–Matic trailer air pressure system has only a two–line system. The control valve (one–line system) lacks, and the trailer coupling is different.
The mounting can be carried out as previously described according to the pictures C and D.
NB! If the tractor has rederse drive controls: move with help of the sleeves **84** the plate **35** (fig. C) backwards. Do not fit the connector **2**.

ADJUSTMENTS:

– Hand brake adjustment is made with the aid of rod **32** (fig. A).
Adjustment: Adjust the rod length so that the trailer brake coupling (yellow) gives check pressure of **6,2 – 7,5 bar** when the hand brake lever is in the second notch of the ratchet plate.

– Check the tightness of the system. The system must be so tight that the pressure drop after the engine stop is max. **0,15 bar during 10 minutes** (2%).

– Checking the pressure air brake system:

	Not braking with pedals or hand brake lever	Full braking with pedals or hand brake lever
Reservoir line (red)	**6,0** – **8,0 bar**	**6,0** – **8,0** bar
Brake line (black)	**4,8** – **5,6 bar**	0
Brake line (yellow)	0	**6,2** – **7,5** bar

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GENERAL (fig. **1**):

Instructions for operating:

– On the two hose system the trailer is connected to two different couplings (**9–11**), which have been marked as follows:
  – Container line – **red** cover
  – Brake line – **yellow** cover

  On one hose system the trailer is connected to the coupling with **black** cover (brake line) (is used on some marketing areas).

  The couplings of the Duo–Matic system have no colour code, because these couplings cannot be confused.

– From air pressure system it is also possible to get press for external purpose (8 bar), e.g. for tyre/tire filling, from the coupling (fig. **1,** ref 3) which is situated on the right side under the cab. Through this coupling the system can be filled, when needed, by outside compressed air e.g. when the compressor of the tractor is broken. By doing this the coupling can not be turned to bottom.

– When the couplings (**1**) of the trailer are not in use, keep the shields on them.

– When the ambient temperature is **colder than +5°C**, in the antifreeze container (**3**) must be filled with ethyl alcohol or methanol. The liquid streaming valve lever (**4**) has to be open (position 1). The container and streaming valve lever are situated under the right cab corner in front of the cab. The valve with the container can be inclined when filling by loosening the wing screw of the holder.

CAUTION: There must be full pressure in the air pressure system, about 7–8 bar (pressure gauge 8 of the system is beside the instrument panel), before you start driving a tractor which has a trailer with air pressure brakes.

– The pressure regulator (fig **1**, ref 3) adjusts the system pressure. The system pressure can, if necessary, be adjusted with spring 11 adjusting screw.

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Service

– The system includes also a filter 2, which is situated in the pressure regulator (fig **1**, ref 3). It has to be cleaned/changed occasionally (depending on use). The filter can be taken away by first loosening the tyre/tire filler coupling.

The pressure regulator is provided with inbuilt pressure regulator, which is operated, if the pressure rises to 12–14 bar. This can be caused e.g. by the broken pressure regulator valve, frozen or blocked filter.

Service daily:

The water has to be drained **daily** from the press air system by pressing and pulling the spindle (fig. **1**, ref. 6) of the water draining valve at the bottom of the container.

Service weekly or after every 50 operating hours:

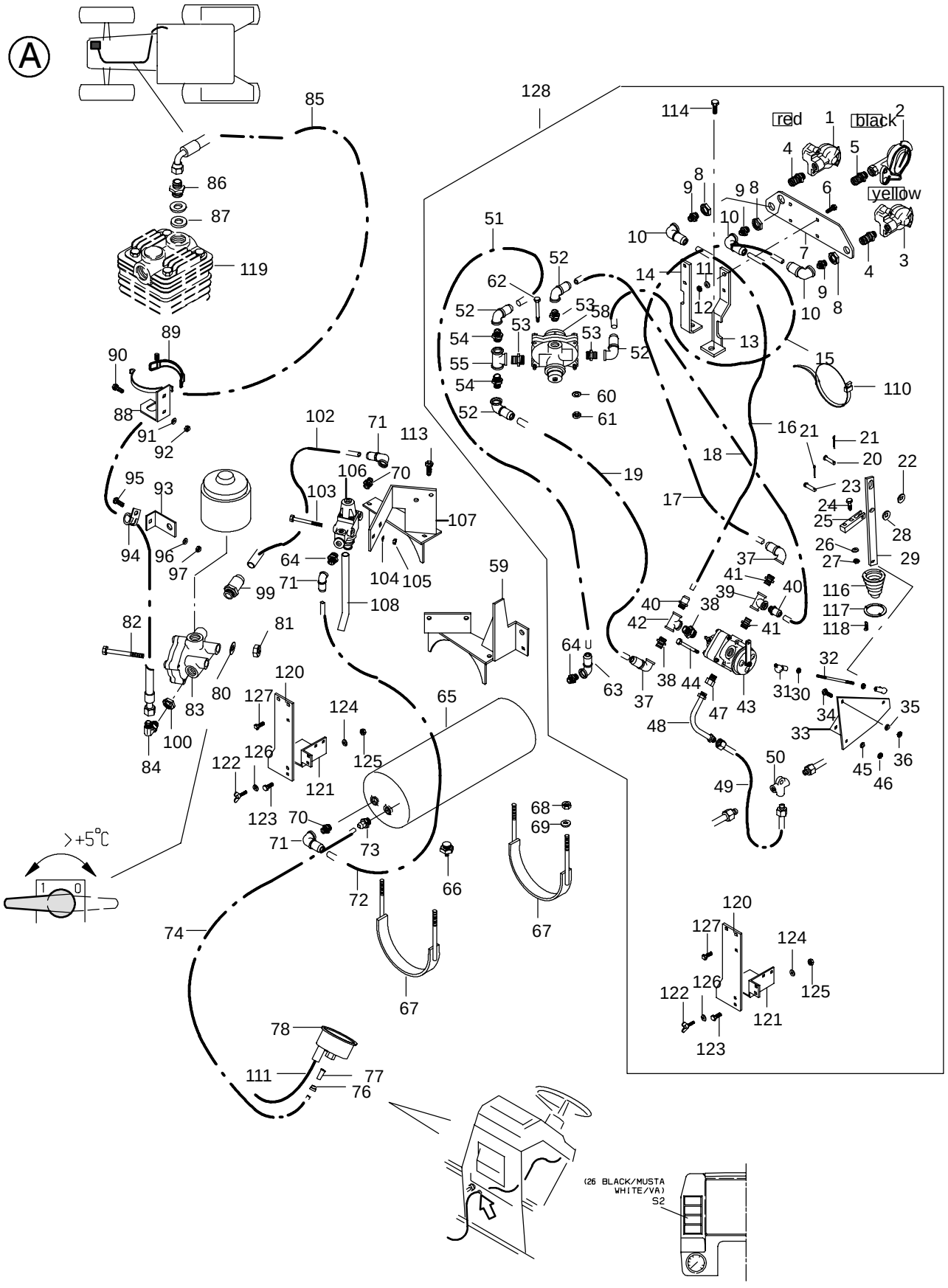
– Check the fixing bolts of the compressor. Check and adjust the compressor belt tension by adjusting the adjusting wheel.

Service after every 250 operating hours

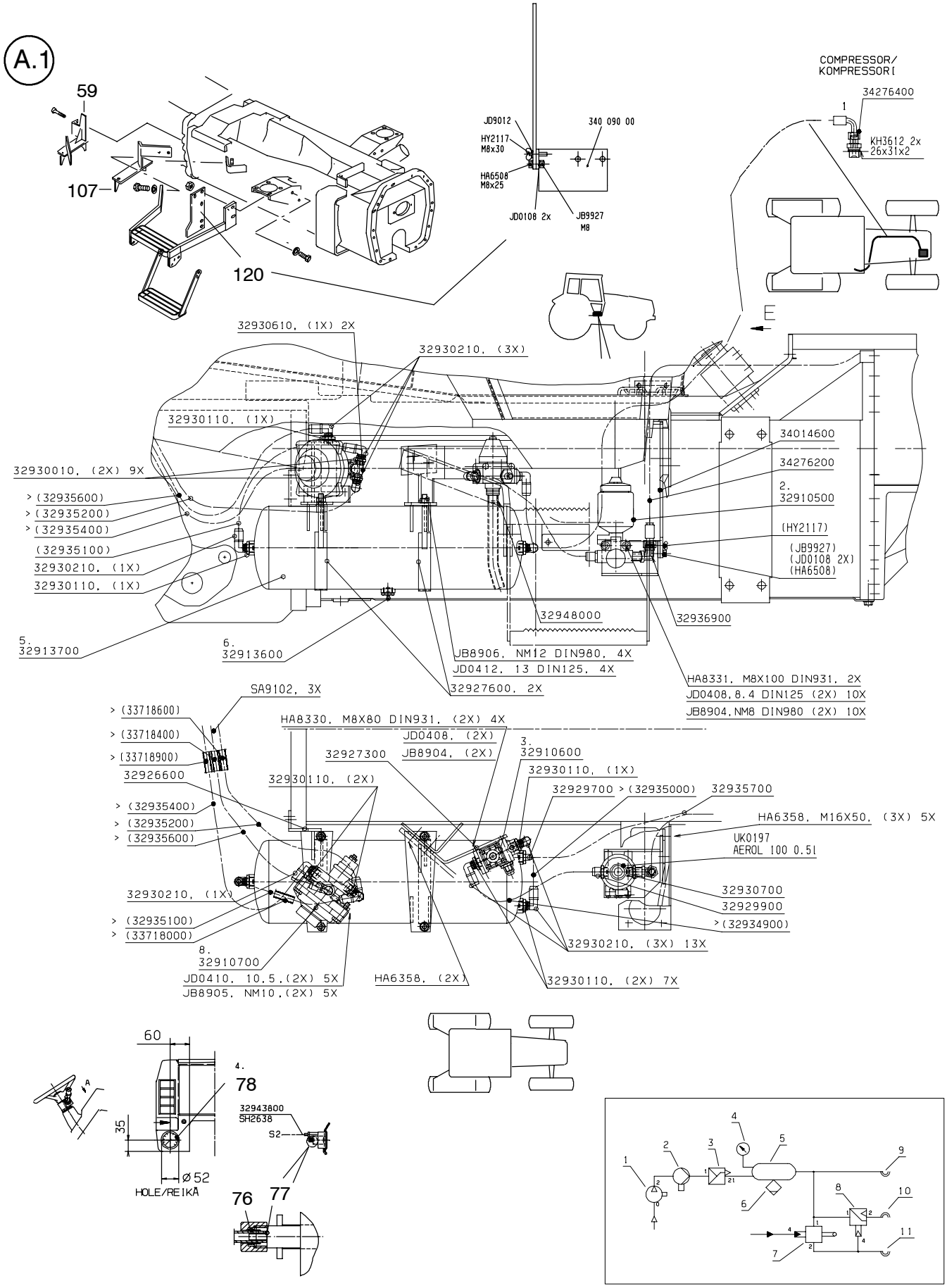
– Grease the rubber surfaces of the trailer quick couplings (**1**) with silicone–bottomed grease. Grease the joint of the lever for handbrake cylinder (**7**).

– Check the tightness of the system. The system has to be so tight, that after stopping the engine the pressure does not decrease more than **0,15 bar during 10 minutes** (2%). When needed repair the leakages.

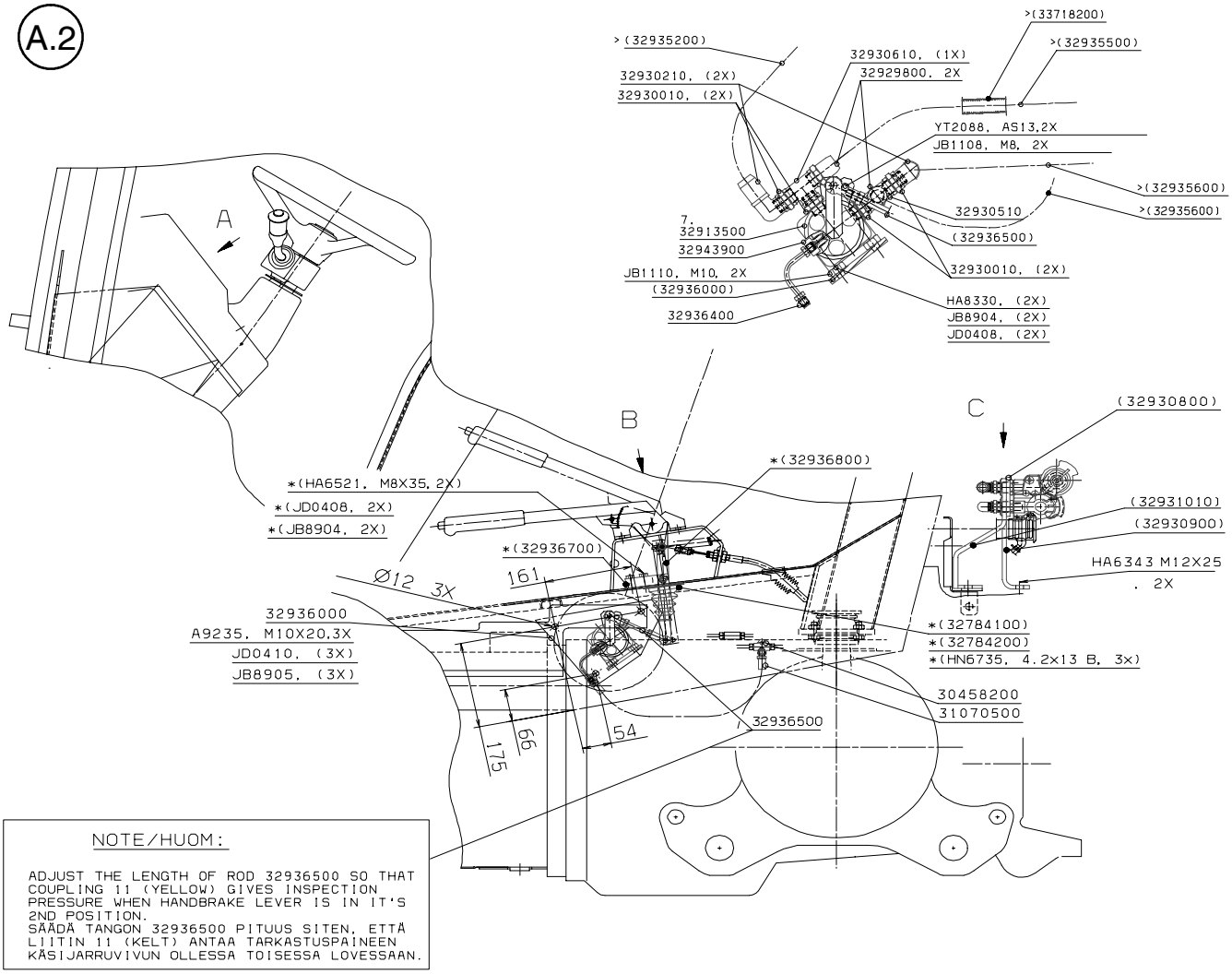
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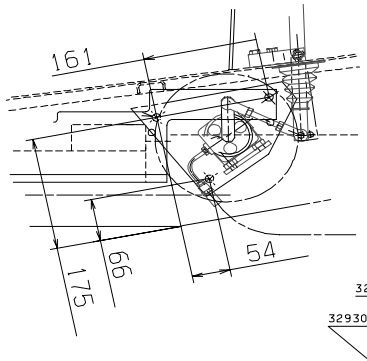


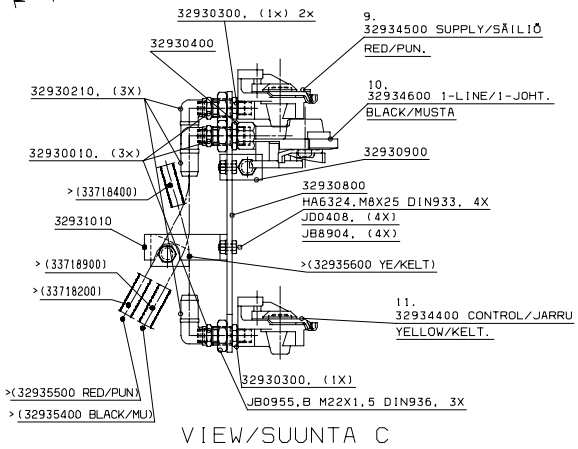
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NOTE/HUOM:

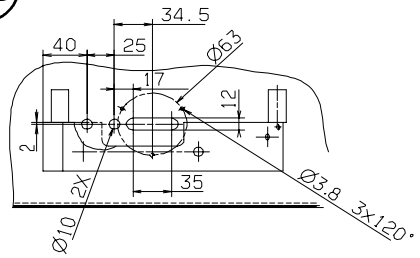
ADJUST THE LENGTH OF ROD 32936500 SO THAT COUPLING 11 (YELLOW) GIVES INSPECTION PRESSURE WHEN HANDBRAKE LEVER IS IN IT'S 2ND POSITION.
SÄÄDÄ TANGON 32936500 PITUUS SITEN, ETTÄ LIITIN 11 (KELT) ANTAA TARKASTUSPAINEEN KÄSIJARRUVIVUN OLLESSA TOISESSA LOVESSAAN.



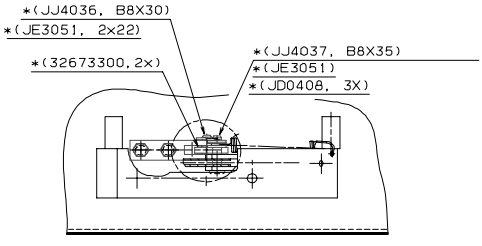


VIEW/SUUNTA C

A.3 VIEW/SUUNTA B



HOLE PATTERN: SEE ALSO 33288600
REIKÄKUVIO: KTS. MYÖS 33288600



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	1	**32910800**	Paineilmajarrut	Tryckluftsbroms	Air press. brake	L.druckbremse	Frein à air comprimé	
1	1	32934500	.Liitin	Nippel	Union	Verbindung	Raccord	
2	1	32934600	.Liitin	Nippel	Union	Verbindung	Raccord	
3	1	32934400	.Liitin	Nippel	Union	Verbindung	Raccord	
4	2	32930300	.Liitin	Nippel	Union	Verbindung	Raccord	
5	1	32930400	.Liitin	Nippel	Union	Verbindung	Raccord	
6	4	HA6324	.Ruuvi	Skruv	Screw	Schraube	Vis	
7	1	32930800	.Levy	Platta	Plate	Platte	Plaque	
8	3	JB0955	.Mutteri	Mutter	Nut	Mutter	Ecrou	
9	3	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	R. rapide	
10	3	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
11	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
12	4	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
13	1	32931010	.Kannatin	Hållare	Support	Halter	Support	
14	1	32930900	.Kannatin	Hållare	Support	Halter	Support	
15	1	32935400	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
	2	33718900	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=2060
16	1	32935500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
	2	33718200	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=940
17	1	32935600	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
	1	33718400	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1340
18	1	32935300	.Putki	Rör	Pipe	Rohr	Tuyau	
	1	33018300	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1000
19	1	32935200	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
	1	33718600	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1470
20	1	JJ4037	.Tappi	Tapp	Pin	Stift	Cheville	
21	2	JE3051	.Sokka	Sprint	Pin	Splint	Goupille	
22	3	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
23	1	JJ4036	.Tappi	Tapp	Pin	Stift	Cheville	
24	2	HA9230	.Ruuvi	Skruv	Screw	Schraube	Vis	
25	1	32936700	.Kannatin	Hållare	Support	Halter	Support	
26	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
27	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
28	2	32673300	.Kiinnityslaatta	Fästplåt	Mounting plate	Bef.platte	Plaque de support	
29	1	32936800	.Vipu	Spak	Lever	Hebel	Levier	
30	2	JB1108	.Mutteri	Mutter	Nut	Mutter	Ecrou	
31	2	YT2088	.Nivel	Led	Joint	Gelenk	Joint	
32	1	32936500	.Tanko	Stång	Rod	Stange	Barre	
33	1	32936000	.Teline	Konsol	Bracket	Gestell	Support	
34	3	HA9235	.Ruuvi	Skruv	Screw	Schraube	Vis	
35	3	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
36	3	JB8905	.Mutteri	Mutter	Nut	Mutter	Ecrou	
37	2	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
38	2	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
39	1	32930510	.Liitin	Nippel	Union	Verbindung	Raccord	
40	2	32929800	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
41	2	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
42	1	32930610	.Liitin	Nippel	Union	Verbindung	Raccord	
43	1	32913500	.Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	

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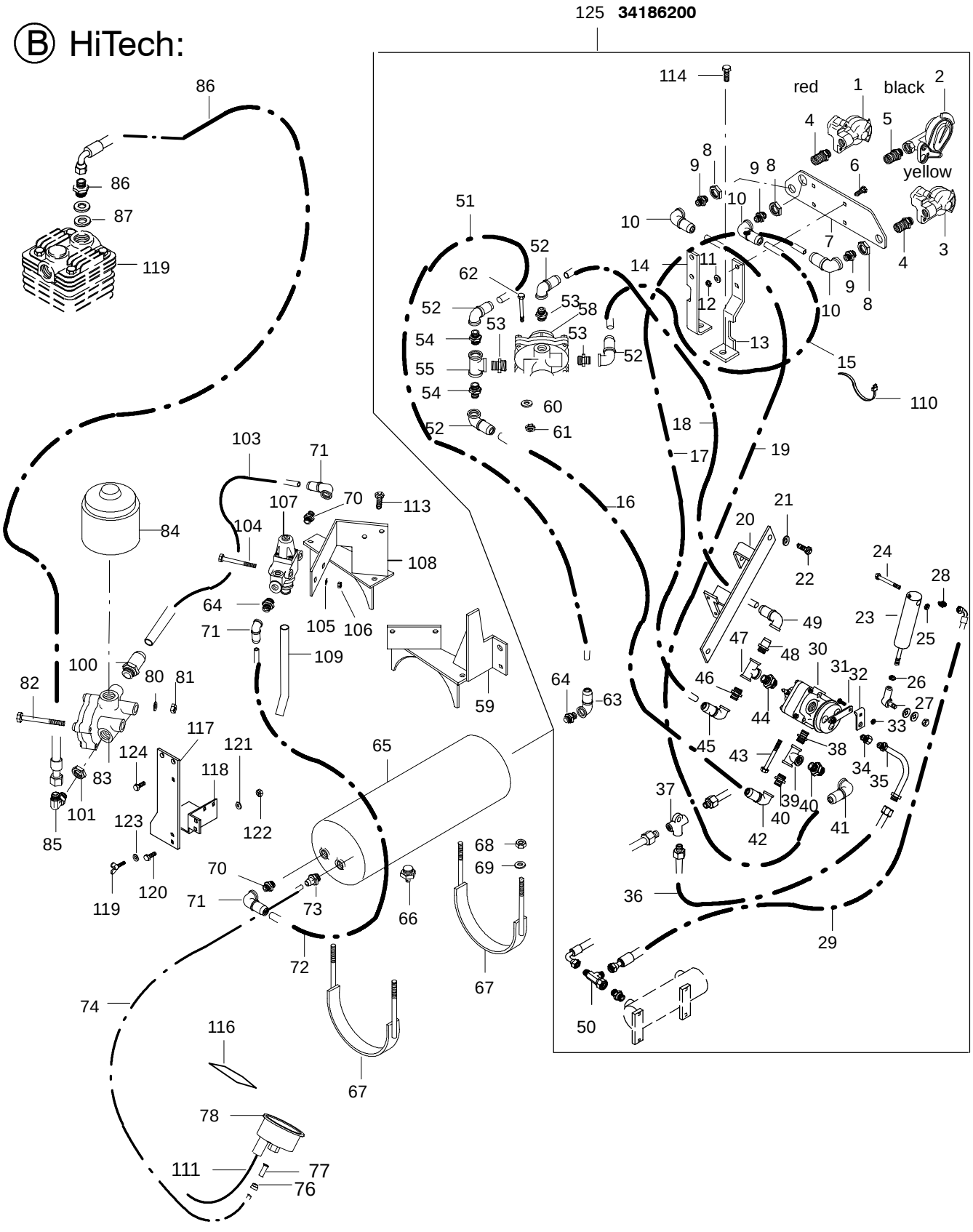
44	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis	
45	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
46	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
47	1	32943900	.Liitin	Nippel	Union	Verbindung	Raccord	
48	1	32936400	.Putki	Rör	Pipe	Rohr	Tuyau	
49	1	31070500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
50	1	30458200	.Liitin	Nippel	Union	Verbindung	Raccord	
51	1	32935100	.Putki	Rör	Pipe	Rohr	Tuyau	
	1	33718000	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=390
52	4	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
53	3	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
54	2	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
55	1	32930610	.Liitin	Nippel	Union	Verbindung	Raccord	
58	1	32910700	.Venttiili	Ventil	Valve	Ventil	Soupape	
59	1	32926600	.Teline	Konsol	Bracket	Gestell	Support	
60	2	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
61	2	JB8905	.Mutteri	Mutter	Nut	Mutter	Ecrou	
62	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis	
63	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
64	1	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
65	1	32913700	.Säiliö	Behållare	Container	Behälter	Réservoir	
66	1	32913600	.Tulppa	Plugg	Plug	Stopfen	Bouchon	
67	2	32927600	.Sanka	Bygel	Bow	Bügel	Support	
68	4	JB8906	.Mutteri	Mutter	Nut	Mutter	Ecrou	
69	4	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
70	2	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
71	3	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
72	1	32935000	.Putki	Rör	Pipe	Rohr	Tuyau	
73	1	32929700	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
74	1	32935700	.Putki	Rör	Pipe	Rohr	Tuyau	
76	1	32944100	.Rengas	Ring	Ring	Ring	Anneau	
77	1	32944000	.Holkki	Hylsa	Sleeve	Hülse	Manchon	
78	1	32934800	.Painemittari	Tryck mätare	Press. instr.	Druckinstrument	Manomètre	
	1	SH2638	.Lamppu	Lampa	Bulb	Lampe	Lampe	
80	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
81	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
82	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	Vis	
83	1	32910500	.Pumppu	Pump	Pump	Pumpe	Pompe	
84	1	32936900	.Liitin	Nippel	Union	Verbindung	Raccord	
85	1	34276200	.Putki	Rör	Pipe	Rohr	Tuyau	
86	1	34276400	.Liitin	Nippel	Union	Verbindung	Raccord	
87	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
88	1	32927900	.Teline	Konsol	Bracket	Gestell	Support	
89	1	33133400	.Side	Band	Band	Binde	Bande	

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90	2	HA9219	.Ruuvi	Skruv	Screw	Schraube	Vis	
91	2	JD0405	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
92	2	JB1105	.Mutteri	Mutter	Nut	Mutter	Ecrou	
93	1	32935900	.Levy	Platta	Plate	Platte	Plaque	
94	1	30086100	.Pidin	Klämma	Clamp	Klammer	Agrafe	
95	1	HA6322	.Ruuvi	Skruv	Screw	Schraube	Vis	
96	1	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
97	1	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
99	1	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung		Raccord rapide
100	1	32930700	.Mutteri	Mutter	Nut	Mutter	Ecrou	
102	1	32934900	.Putki	Rör	Pipe	Rohr	Tuyau	
103	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis	
104	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
105	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
106	1	32910600	.Paineensäätöv.	Tryckregleringsv.	Press. control.v.	Drucksteuerv.	Valve contrôle pression	
107	1	32927300	.Teline	Konsol	Bracket	Gestell	Support	
108	1	32948000	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
110	3	SA9102	.Johdinside	Buntband	Wiring band	Leitungsklemme	Bande pour câbles	
111	1	32943800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	Jeu de câbles	
113	5	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis	
114	2	HA6343	.Ruuvi	Skruv	Screw	Schraube	Vis	
116	1	32784100	.Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	Protection caoutchouc	
117	1	32784200	.Levy	Platta	Plate	Platte	Plaque	
118	3	HN6735	.Ruuvi	Skruv	Screw	Schraube	Vis	
119	1		Kompressori	Kompressor	Compressor	Kompreßor	Compresseur	Katso erilinen as.ohje / see separate instr.
120	1	34007500	.Kannatin	Hållare	Support	Halter	Support	
121	1	34009000	.Teline	Konsol	Bracket	Gestell	Support	
122	1	HY2117	.Ruuvi	Skruv	Screw	Schraube	Vis	
123	1	HA6508	.Ruuvi	Skruv	Screw	Schraube	Vis	
124	1	JD0108	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
125	1	JB9927	.Mutteri	Mutter	Nut	Mutter	Ecrou	
126	2	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
127	1	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis	
128	1	**34327000**	Osasarja	Delsats	Sundry parts kit	Teilsatz	Jeu de pièces	

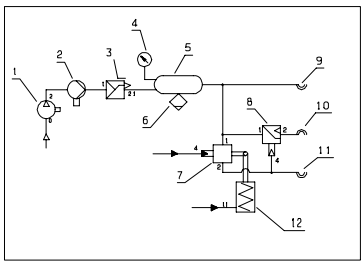
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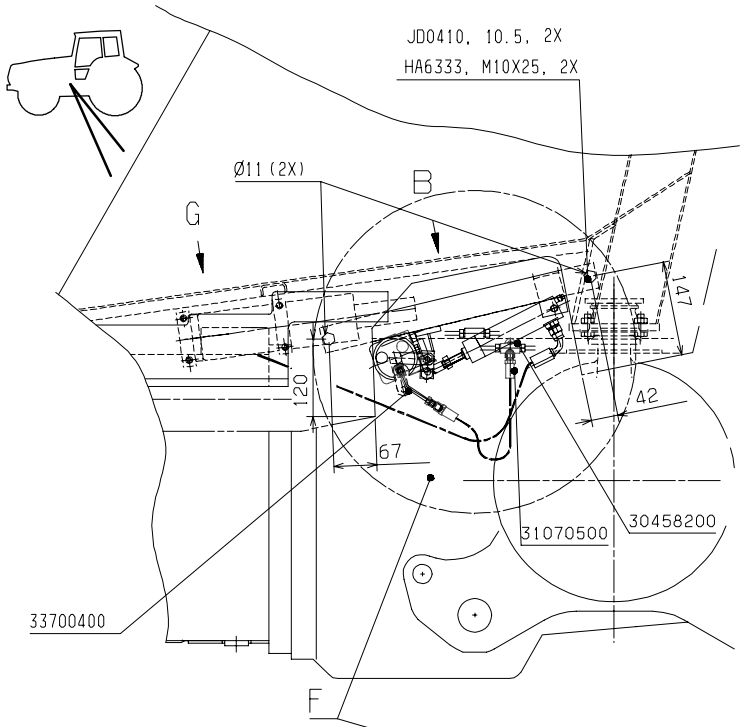
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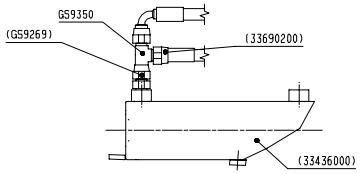


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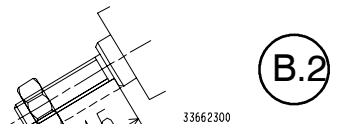


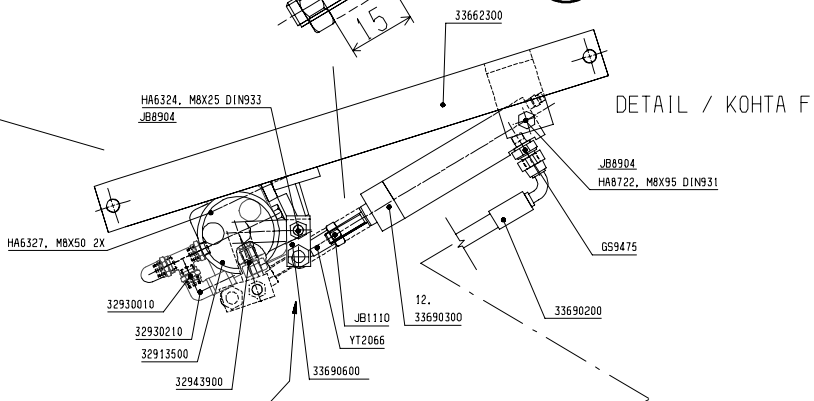


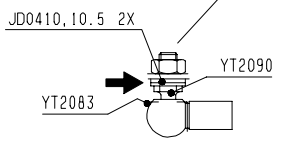


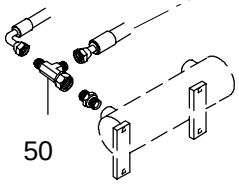
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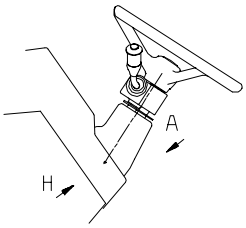
B.2

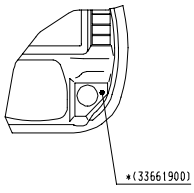




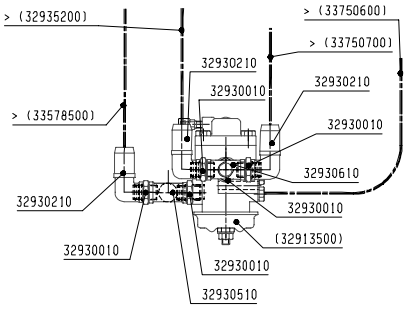




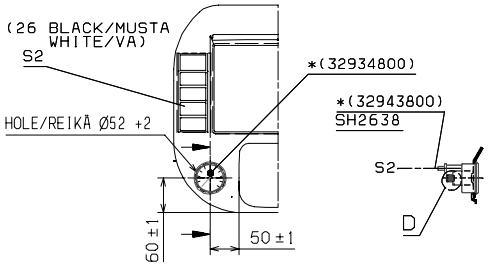




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HiTech

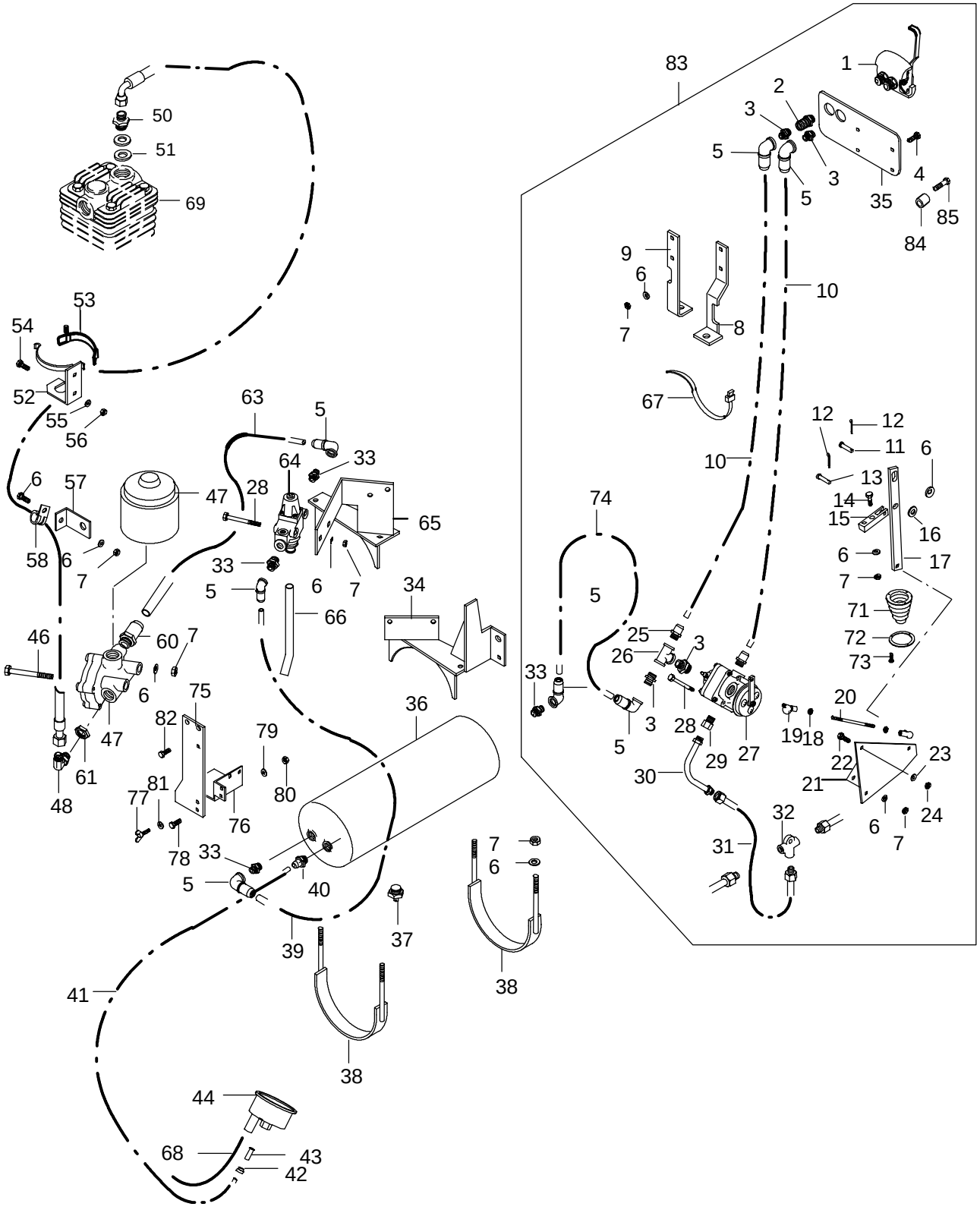
	1	**33692600**	Paineilmajarrut	Tryckluftsbroms	Air press. brake	L.druckbremse	Frein à air comprimé	
1	1	32934500	.Liitin	Nippel	Union	Verbindung	Raccord	
2	1	32934600	.Liitin	Nippel	Union	Verbindung	Raccord	
3	1	32934400	.Liitin	Nippel	Union	Verbindung	Raccord	
4	2	32930300	.Liitin	Nippel	Union	Verbindung	Raccord	
5	1	32930400	.Liitin	Nippel	Union	Verbindung	Raccord	
6	4	HA6324	.Ruuvi	Skruv	Screw	Schraube	Vis	
7	1	32930800	.Levy	Platta	Plate	Platte	Plaque	
8	3	JB0955	.Mutteri	Mutter	Nut	Mutter	Ecrou	
9	3	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
10	3	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
11	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
12	4	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
13	1	32931010	.Kannatin	Hållare	Support	Halter	Support	
14	1	32930900	.Kannatin	Hållare	Support	Halter	Support	
15	1	32935400	.Putki	Rör	Pipe	Rohr	Tuyau	
	2	33718900	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=2060
16	1	33578500	.Putki	Rör	Pipe	Rohr	Tuyau	
	2	33718700	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1540
17	1	33750700	.Putki	Rör	Pipe	Rohr	Tuyau	
	2	33718600	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1340
18	1	32935200	.Putki	Rör	Pipe	Rohr	Tuyau	
	2	33718400	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1470
19	1	33750600	.Putki	Rör	Pipe	Rohr	Tuyau	
	2	33718200	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=940
20	1	33662300	.Kannatin	Hållare	Support	Halter	Support	
21	1	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
22	1	HA6333	.Ruuvi	Skruv	Screw	Schraube	Vis	
23	1	33690300	.Sylinteri	Cylinder	Cylinder	Zylinder	Cylindre	
24	1	HA8722	.Ruuvi	Skruv	Screw	Schraube	Vis	
25	1	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
26	1	JB1110	.Mutteri	Mutter	Nut	Mutter	Ecrou	
27	1	YT2066	.Nivel	Led	Joint	Gelenk	Joint	
	1	YT2083	.Lukitusjousi	Låsfjäder	Locking spring	Sicherungsfeder	Ressort de verrouillage	
	1	YT2090	..Kuulatappi	Kulatapp	Ballpin	Kugelstift	Bille de cheville	
	2	JD0410	..Aluslevy	Bricka	Washer	Scheibe	Rondelle	
28	1	GS9475	.Liitin	Nippel	Union	Verbindung	Raccord	
29	1	33690200	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
30	1	32913500	.Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
31	1	HA6324	.Ruuvi	Skruv	Screw	Schraube	Vis	
32	1	33690600	.Vipu	Spak	Lever	Hebel	Levier	
33	1	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
34	1	32943900	.Liitin	Nippel	Union	Verbindung	Raccord	
35	1	33700400	.Putki	Rör	Pipe	Rohr	Tuyau	
36	1	31070500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
37	1	30458200	.Liitin	Nippel	Union	Verbindung	Raccord	
38	1	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
39	1	32930510	.Liitin	Nippel	Union	Verbindung	Raccord	
40	2	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
41	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
42	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
43	2	HA6327	.Ruuvi	Skruv	Screw	Schraube	Vis	
44	1	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
45	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
46	1	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
47	1	32930610	.Liitin	Nippel	Union	Verbindung	Raccord	

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48	1	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
49	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord		
50	1	GS9350	.Liitin	Nippel	Union	Verbindung	Raccord		
51	1	32935100	.Putki	Rör	Pipe	Rohr	Tuyau		
	1	33718000	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=390	
52	3	32930210	.Liitin	Nippel	Union	Verbindung	Raccord		
53	3	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
54	2	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
55	1	32930610	.Liitin	Nippel	Union	Verbindung	Raccord		
58	1	32910700	.Venttiili	Ventil	Valve	Ventil	Soupape		
59	1	32926600	.Teline	Konsol	Bracket	Gestell	Support		
60	2	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
61	2	JB8905	.Mutteri	Mutter	Nut	Mutter	Ecrou		
62	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis		
63	1	32930210	.Liitin	Nippel	Union	Verbindung	Raccord		
64	1	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
65	1	32913700	.Säiliö	Behållare	Container	Behälter	Réservoir		
66	1	32913600	.Tulppa	Plugg	Plug	Stopfen	Bouchon		
67	2	32927600	.Sanka	Bygel	Bow	Bügel	Support		
68	4	JB8906	.Mutteri	Mutter	Nut	Mutter	Ecrou		
69	4	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
70	2	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
71	3	32930210	.Liitin	Nippel	Union	Verbindung	Raccord		
72	1	32935000	.Putki	Rör	Pipe	Rohr	Tuyau		
73	1	32929700	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
74	1	32935700	.Putki	Rör	Pipe	Rohr	Tuyau		
76	1	32944100	.Rengas	Ring	Ring	Ring	Anneau		
77	1	32944000	.Holkki	Hylsa	Sleeve	Hülse	Manchon		
78	1	32934800	.Painemittari	Tryck mätare	Press. instr.	Dr.instrument	Manomètre		
	1	SH2638	.Lamppu	Lampa	Bulb	Lampe	Lampe		
80	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
81	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou		
82	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	Vis		
83	1	32910500	.Pumppu	Pump	Pump	Pumpe	Pompe		
84	1	33495200	..Säiliö	Behållare	Container	Behälter	Réservoir		
85	1	32936900	.Liitin	Nippel	Union	Verbindung	Raccord		
86	1	32943700	.Putki	Rör	Pipe	Rohr	Tuyau		
87	1	32944200	.Liitin	Nippel	Union	Verbindung	Raccord		
88	1	32948300	.Liitin	Nippel	Union	Verbindung	Raccord		
	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	Joint		
100	1	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide		
101	1	32930700	.Mutteri	Mutter	Nut	Mutter	Ecrou		
103	1	32934900	.Putki	Rör	Pipe	Rohr	Tuyau		
104	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis		
105	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
106	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou		
107	1	32910600	..Paineensäätöv.	Tryckregleringsv.	Press. control.v.	Drucksteuerv.	Valve contrôle pression		
108	1	32927300	.Teline	Konsol	Bracket	Gestell	Support		
109	1	32948000	.Letku	Slang	Hose	Schlauch	Tuyau flexible		
110	3	SA9102	.Johdinside	Buntband	Wiring band	Leitungsklemme	Bande pour câbles		
111	1	32943800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	Jeu de câbles		
112	1	32944300	Kompressori	Kompressor	Compressor	Kompreßor	Compresseur		
113	5	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis		
114	2	HA6343	.Ruuvi	Skruv	Screw	Schraube	Vis		
116	1	33661900	.Levy	Platta	Plate	Platte	Plaque		
117	1	34007500	.Kannatin	Hållare	Support	Halter	Support		
118	1	34009000	.Teline	Konsol	Bracket	Gestell	Support		
119	1	HY2117	.Ruuvi	Skruv	Screw	Schraube	Vis		
120	1	HA6508	.Ruuvi	Skruv	Screw	Schraube	Vis		
121	1	JD0108	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
122	1	JB9927	.Mutteri	Mutter	Nut	Mutter	Ecrou		
123	2	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle		
124	1	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis		
125	1	**34186200**	Osasarja	Delsats	Sundry parts kit	Teilsatz	Jeu de pièces	Air pressure brake	

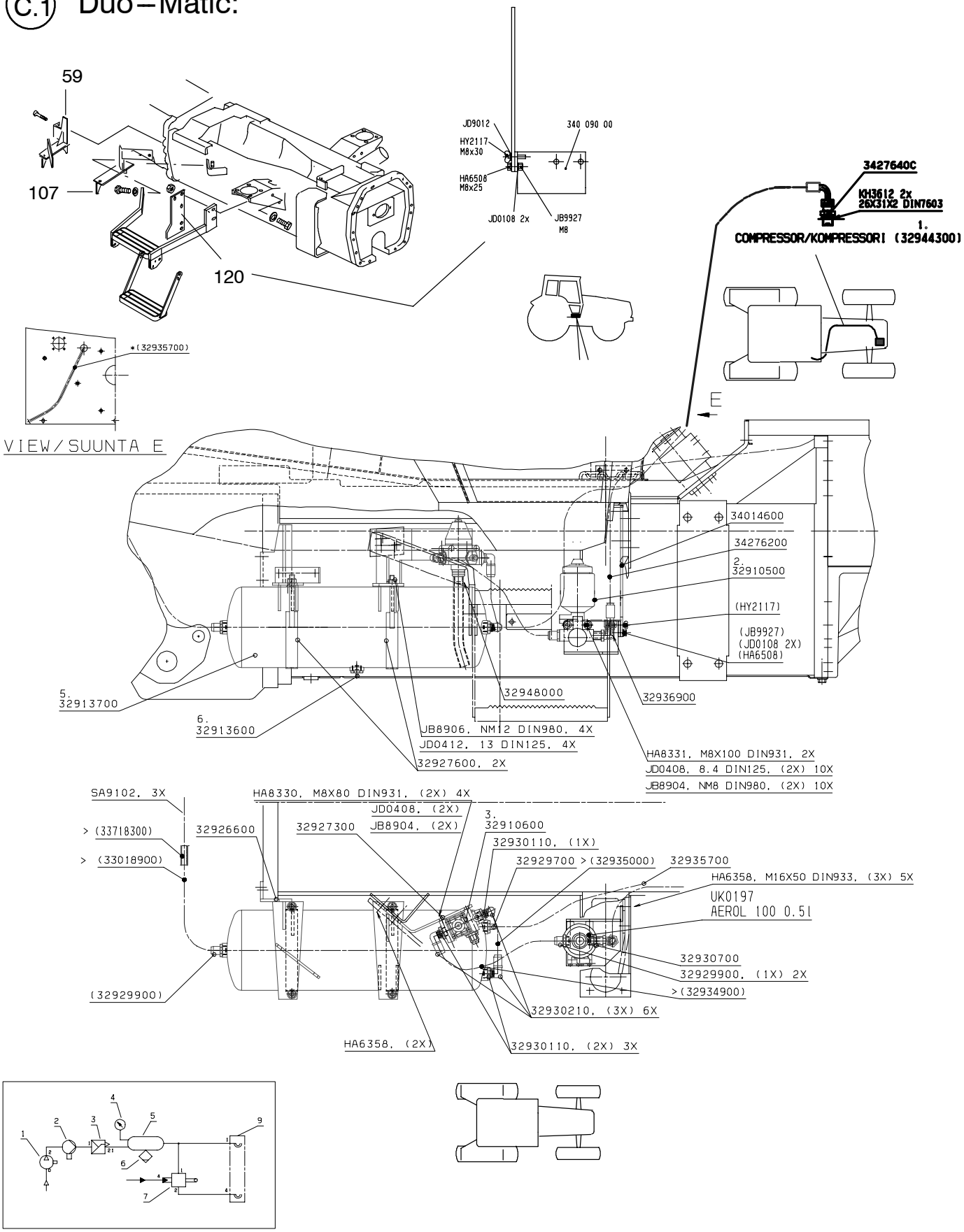
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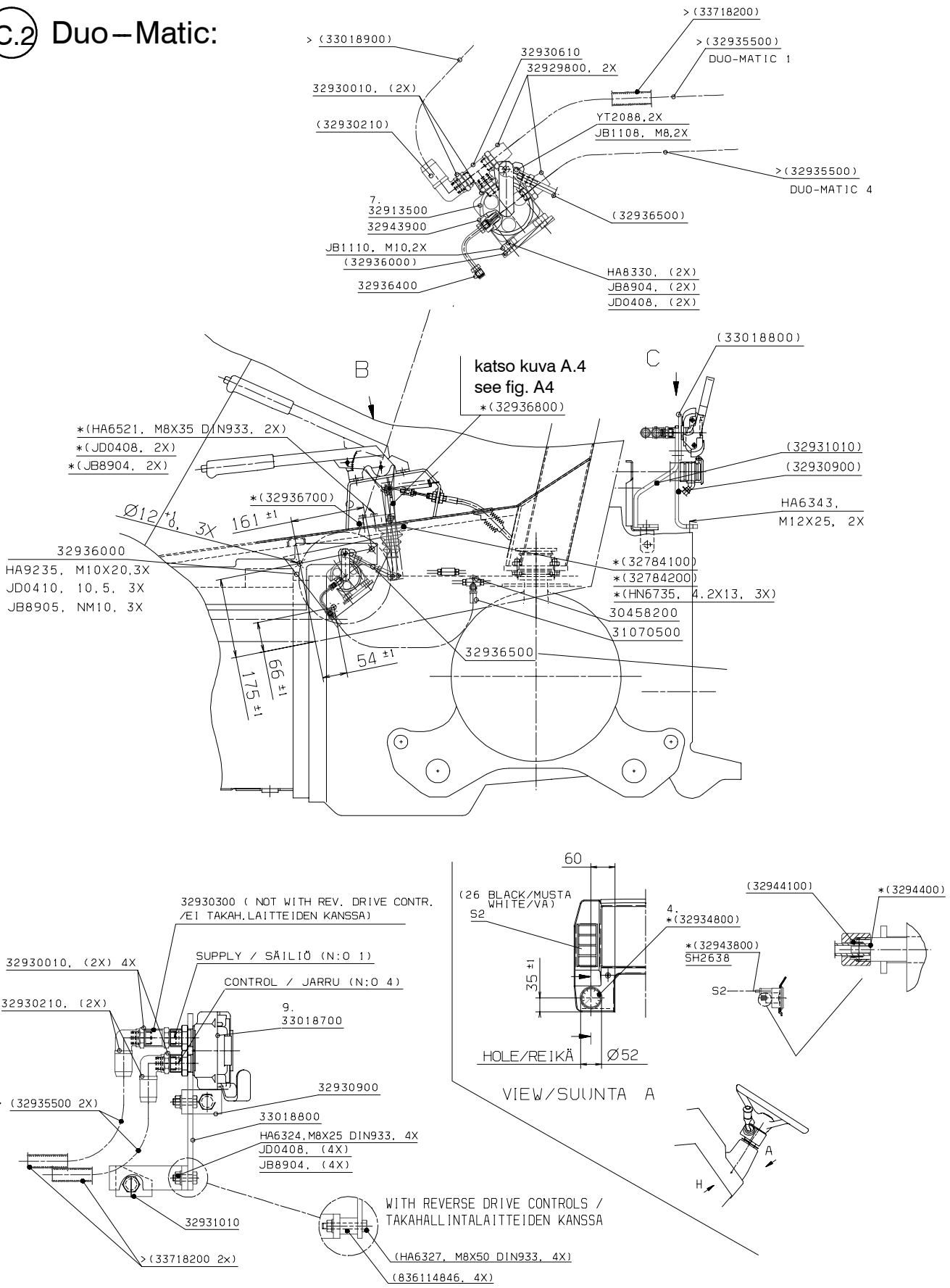
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C.1 Duo–Matic:



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C.2 Duo–Matic:



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Duo–Matic:

	1	**33019000**	Paineilmajarrut	Tryckluftsbroms	Air press. brake	L.druckbremse	Frein à air comprimé	
1	1	33018700	.Liitin	Nippel	Union	Verbindung	Raccord	
2	1	32930300	.Liitin	Nippel	Union	Verbindung	Raccord	Ei takahall.laitt. Not with rev. drive controls
3	4	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
4	3	HA6322	.Ruuvi	Skruv	Screw	Schraube	Vis	
5	6	32930200	.Liitin	Nippel	Union	Verbindung	Raccord	
	6	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
6	16	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
7	13	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
8	1	32931010	.Kannatin	Hållare	Support	Halter	Support	
9	1	32930900	.Kannatin	Hållare	Support	Halter	Support	
10	2	32935500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
	2	33718200	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=940
11	1	JJ4037	.Tappi	Tapp	Pin	Stift	Cheville	
12	1	JE3051	.Sokka	Sprint	Pin	Splint	Goupille	
13	1	JJ4036	.Tappi	Tapp	Pin	Stift	Cheville	
14	2	HA9230	.Ruuvi	Skruv	Screw	Schraube	Vis	
15	1	32936700	.Kannatin	Hållare	Support	Halter	Support	
16	2	32673300	.Kiinnityslaatta	Fästplåt	Mounting plate	Bef.platte	Plaque de support	
17	1	32936800	.Vipu	Spak	Lever	Hebel	Levier	
18	2	JB1108	.Mutteri	Mutter	Nut	Mutter	Ecrou	
19	2	YT2088	.Nivel	Led	Joint	Gelenk	Joint	
20	1	32936500	.Tanko	Stång	Rod	Stange	Barre	
21	1	32936000	.Teline	Konsol	Bracket	Gestell	Support	
22	3	HA9235	.Ruuvi	Skruv	Screw	Schraube	Vis	
23	3	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
24	3	JB8905	.Mutteri	Mutter	Nut	Mutter	Ecrou	
25	2	32929800	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
26	1	32930610	.Liitin	Nippel	Union	Verbindung	Raccord	
27	1	32913500	.Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
28	4	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis	
29	1	32943900	.Liitin	Nippel	Union	Verbindung	Raccord	
30	1	32936400	.Putki	Rör	Pipe	Rohr	Tuyau	
31	1	31070500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
32	1	30458200	.Liitin	Nippel	Union	Verbindung	Raccord	
33	3	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
34	1	32926600	.Teline	Konsol	Bracket	Gestell	Support	
35	1	33018800	.Levy	Platta	Plate	Platte	Plaque	
36	1	32913700	.Säiliö	Behållare	Container	Behälter	Réservoir	
37	1	32913600	.Tulppa	Plugg	Plug	Stopfen	Bouchon	
38	2	32927600	.Sanka	Bygel	Bow	Bügel	Support	
39	1	32935000	.Putki	Rör	Pipe	Rohr	Tuyau	
40	1	32929700	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
41	1	32935700	.Putki	Rör	Pipe	Rohr	Tuyau	
42	1	32944100	.Rengas	Ring	Ring	Ring	Anneau	
43	1	32944000	.Holkki	Hylsa	Sleeve	Hülse	Manchon	
44	1	32934800	.Painemittari	Tryck mätare	Press. instr.	Dr.instrument	Manomètre	
	1	HS2638	.Lamppu	Lampa	Bulb	Lampe	Lampe	
46	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	Vis	
47	1	32910500	.Pumppu	Pump	Pump	Pumpe	Pompe	Incl. Container
48	1	32936900	.Liitin	Nippel	Union	Verbindung	Raccord	
49	1	34276200	.Putki	Rör	Pipe	Rohr	Tuyau	
50	1	34276400	.Liitin	Nippel	Union	Verbindung	Raccord	
51	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	Joint	

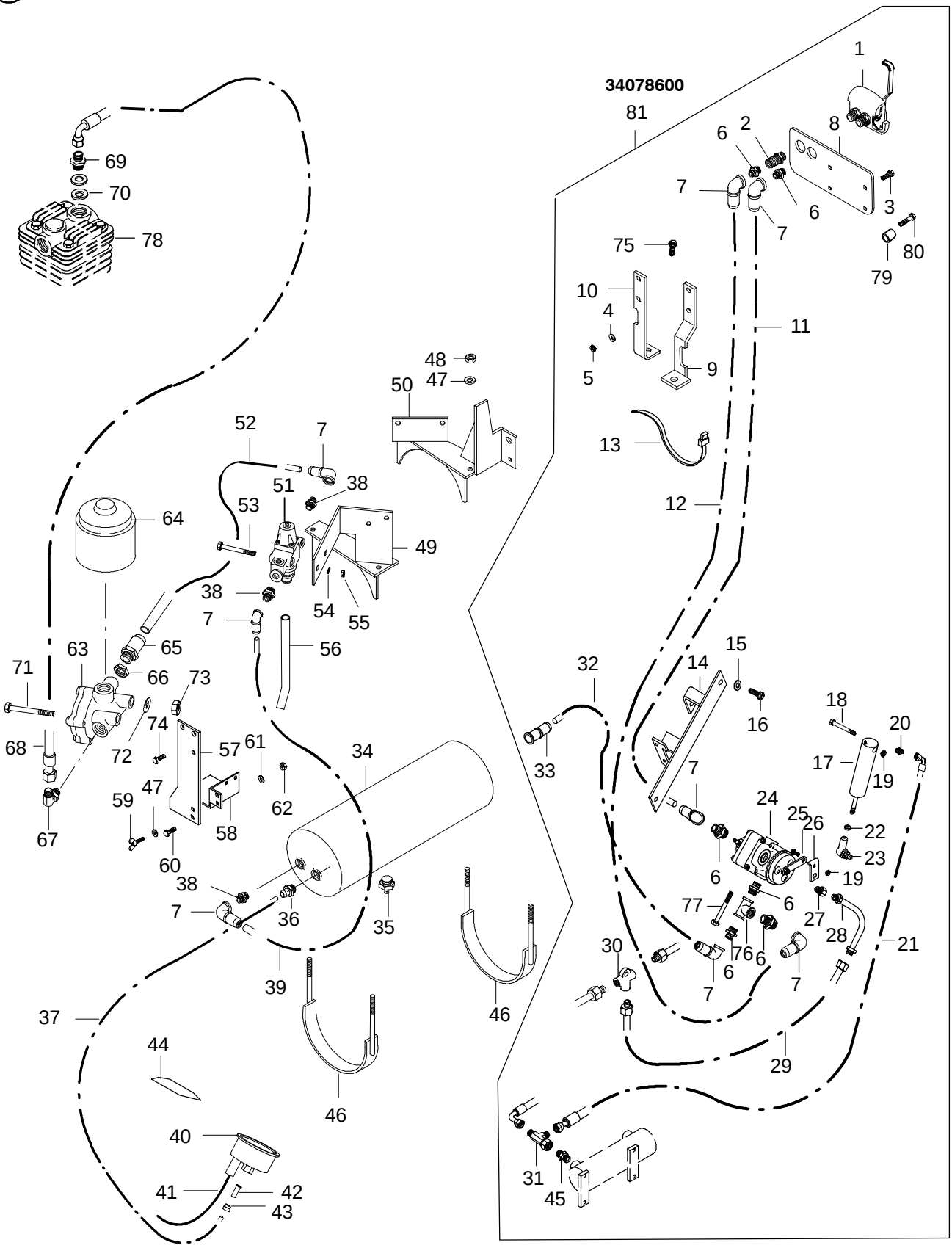
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Duo–Matic:

52	1	32927900	.Teline	Konsol	Bracket	Gestell	Support	
53	1	33133400	.Side	Band	Band	Binde	Bande	
54	2	HA9219	.Ruuvi	Skruv	Screw	Schraube	Vis	
55	2	JD0405	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
56	2	JB1105	.Mutteri	Mutter	Nut	Mutter	Ecrou	
57	1	32935900	.Levy	Platta	Plate	Platte	Plaque	
58	1	30086100	.Pidin	Klämma	Clamp	Klammer	Agrafe	
60	2	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
61	1	32930700	.Mutteri	Mutter	Nut	Mutter	Ecrou	
63	1	32934900	.Putki	Rör	Pipe	Rohr	Tuyau	
64	1	32910600	.Paineensäätöv.	Tryckregleringsv.	Press. control.v.	Drucksteuerv.	V. contrôle pression	
65	1	32927300	.Teline	Konsol	Bracket	Gestell	Support	
66	1	32948000	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
67	3	SA9102	.Johdinside	Buntband	Wiring band	Leitungsklemme	Bande pour câbles	
68	1	32943800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	Jeu de câbles	
69	1		Kompressori	Kompressor	Compressor	Kompreßor	Compresseur	Katso erilinen as.ohje / see separate instr.
71	1	32784100	.Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	Protection caoutchouc	
72	1	32784200	.Levy	Platta	Plate	Platte	Plaque	
73	3	HN6735	.Ruuvi	Skruv	Screw	Schraube	Vis	
74	1	32935100	.Putki	Rör	Pipe	Rohr	Tuyau	
75	1	34007500	.Kannatin	Hållare	Support	Halter	Support	
76	1	34009000	.Teline	Konsol	Bracket	Gestell	Support	
77	1	HY2117	.Ruuvi	Skruv	Screw	Schraube	Vis	
78	1	HA6508	.Ruuvi	Skruv	Screw	Schraube	Vis	
79	1	JD0108	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
80	1	JB9927	.Mutteri	Mutter	Nut	Mutter	Ecrou	
81	2	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
82	1	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis	
83	1	**34327100**	Osasarja	Delsats	Sundry parts kit	Teilsatz	Jeu de pièces	
84	2	836114846	Holkki	Hylsa	Sleeve	Hülse	Manchon	*
85	2	HA6327	Ruuvi	Skruv	Screw	Schraube	Vis	*
*			Takah.laitteet	U.vändb. f.plats	Back dr. system	R.wärtssteuers..	Système conduite ar.	

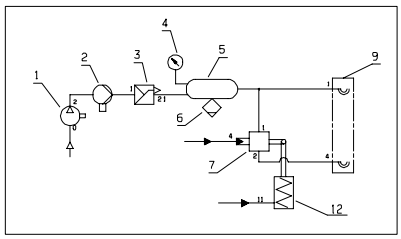
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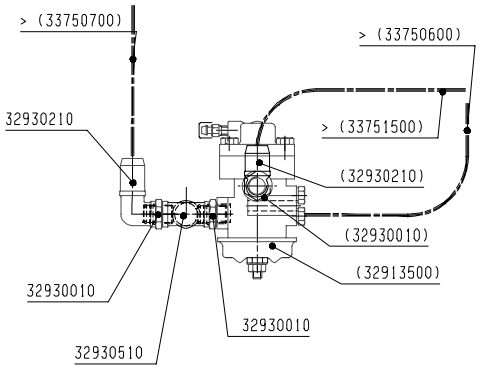
Ⓓ Duo–Matic, HiTech:



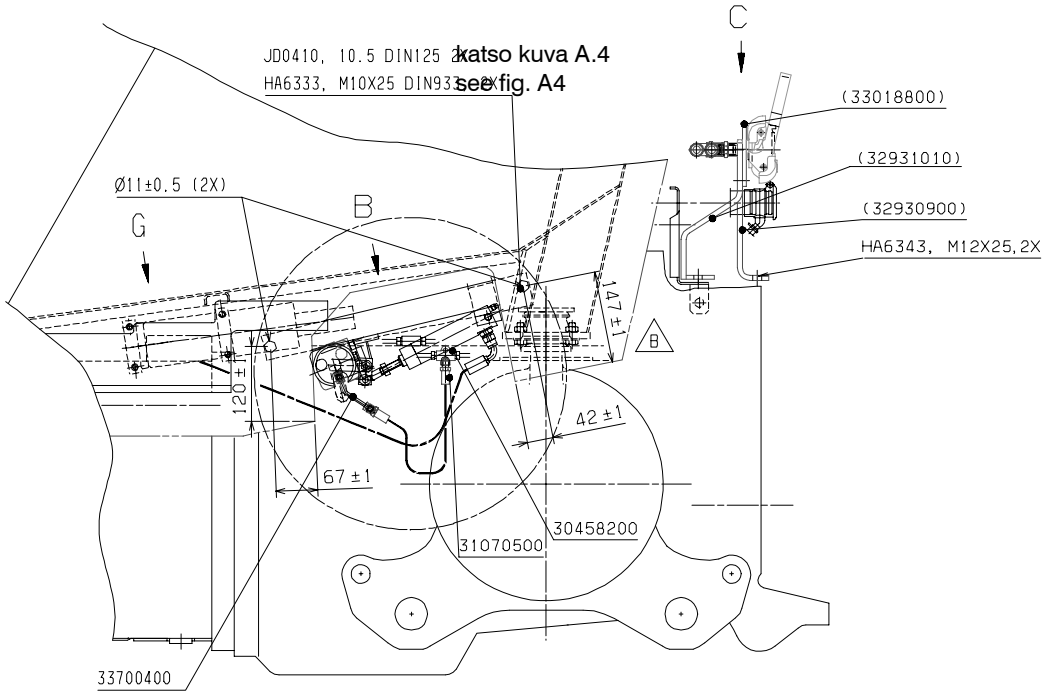
https://truckmanualshub.com/

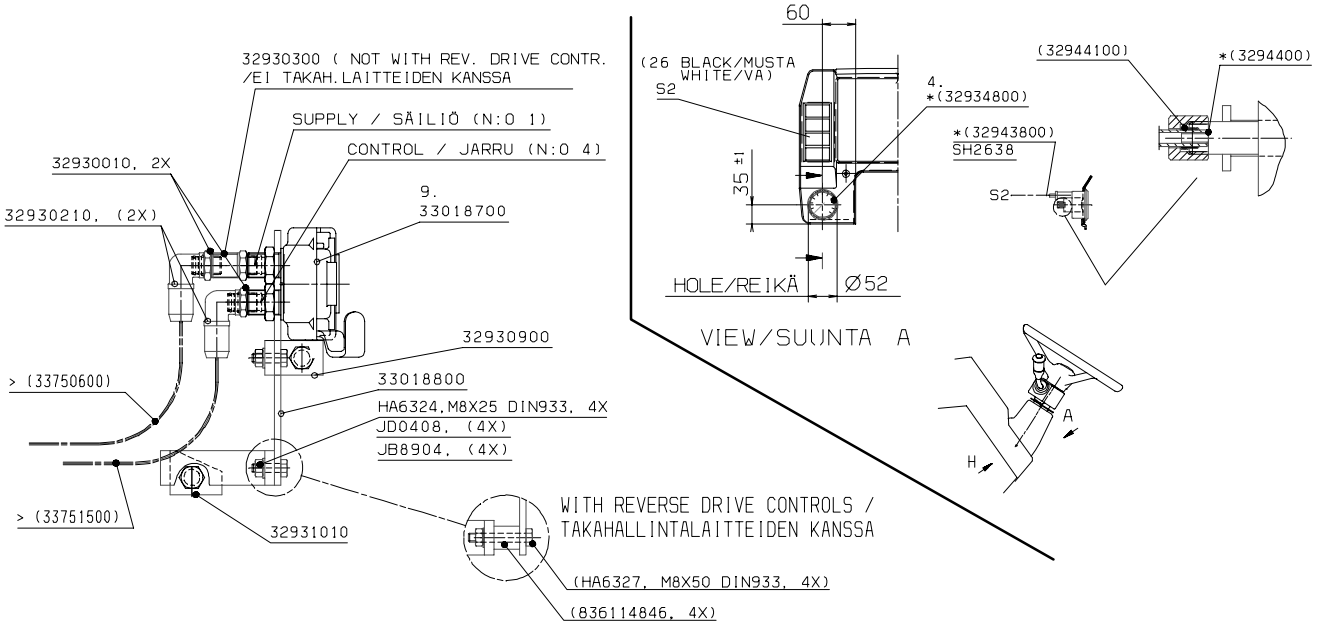
(D.1) Duo–Matic, HiTech:



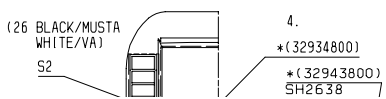


VIEW / SUUNTA B





VIEW/SUUNTA C 1:2,5



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Duo – Matic, HiTech:

	1	**33690100**	Paineilmajarrut	Tryckluftsbroms	Air press. brake	L.druckbremse	Frein à air comprimé	
1	1	33018700	.Liitin	Nippel	Union	Verbindung	Raccord	
2	1	32930300	.Liitin	Nippel	Union	Verbindung	Raccord	Ei takahall.laitt. Not with rev. drive controls
3	4	HA6324	.Ruuvi	Skruv	Screw	Schraube	Vis	
4	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
5	4	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
6	6	32930010	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
7	8	32930210	.Liitin	Nippel	Union	Verbindung	Raccord	
8	1	33018800	.Levy	Platta	Plate	Platte	Plaque	
9	1	32931010	.Kannatin	Hållare	Support	Halter	Support	
10	1	32930900	.Kannatin	Hållare	Support	Halter	Support	
11	1	33751500	.Putki	Rör	Pipe	Rohr	Tuyau	
	1	33752000	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	Tuyau de protection	
12	1	33750600	.Putki	Rör	Pipe	Rohr	Tuyau	
	1	33718200	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	Tuyau de protection	
13	3	SA9102	.Johdinside	Buntband	Wiring band	Leitungsklemme	Bande pour câbles	
14	1	33662300	.Kannatin	Hållare	Support	Halter	Support	
15	1	JD0410	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
16	1	HA6333	.Ruuvi	Skruv	Screw	Schraube	Vis	
17	1	33690300	.Sylinteri	Cylinder	Cylinder	Zylinder	Cylindre	
18	1	HA8722	.Ruuvi	Skruv	Screw	Schraube	Vis	
19	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
20	1	GS9475	.Liitin	Nippel	Union	Verbindung	Raccord	
21	1	33690200	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
22	1	JB1110	.Mutteri	Mutter	Nut	Mutter	Ecrou	
23	1	YT2066	.Nivel	Led	Joint	Gelenk	Joint	
	1	YT2083	..Lukitusjousi	Låsfjäder	Locking spring	Sicherungsfeder	Ressort de verrouillage	
	1	YT2090	..Kuulatappi	Kulatapp	Ballpin	Kugelstift	Bille de cheville	
	1	JD0410	..Aluslevy	Bricka	Washer	Scheibe	Rondelle	
24	1	32913500	.Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
25	1	HA6324	.Ruuvi	Skruv	Screw	Schraube	Vis	
26	1	33690600	.Vipu	Spak	Lever	Hebel	Levier	
27	1	32943900	.Liitin	Nippel	Union	Verbindung	Raccord	
28	1	33700400	.Putki	Rör	Pipe	Rohr	Tuyau	
29	1	31070500	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
30	1	30458200	.Liitin	Nippel	Union	Verbindung	Raccord	
31		GS9350	.Liitin	Nippel	Union	Verbindung	Raccord	
32	1	33750700	.Putki	Rör	Pipe	Rohr	Tuyau	
	1	33718400	.Suojaputki	Skyddsrör	Shield pipe	Schutzrohr	T. de protection	L=1340
33	1	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
34	1	32913700	.Säiliö	Behållare	Container	Behälter	Réservoir	
35	1	32913600	.Tulppa	Plugg	Plug	Stopfen	Bouchon	
36	1	32929700	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
37	1	32935700	.Putki	Rör	Pipe	Rohr	Tuyau	
38	3	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
39	1	32935000	.Putki	Rör	Pipe	Rohr	Tuyau	
40	1	32934800	.Painemittari	Tryck mätare	Press. instrum.	Druckinstr.	Manomètre	
	1	HS2638	.Lamppu	Lampa	Bulb	Lampe	Lampe	
41	1	32943800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	Jeu de câbles	
42	1	32944000	.Holkki	Hylsa	Sleeve	Hülse	Manchon	
43	1	32944100	.Rengas	Ring	Ring	Ring	Anneau	
44	1	33661900	.Levy	Platta	Plate	Platte	Plaque	
45	1	GS9269	.Liitin	Nippel	Union	Verbindung	Raccord	
46	2	32927600	.Sanka	Bygel	Bow	Bügel	Support	

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47	5	JD0412	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
48	4	JB8906	.Mutteri	Mutter	Nut	Mutter	Ecrou	
49	1	32927300	.Teline	Konsol	Bracket	Gestell	Support	
50	1	32926600	.Teline	Konsol	Bracket	Gestell	Support	
51	1	32910600	..Paineensäätöv.	T.regleringsv.	Press. control.v.	Drucksteuerv.	V. contr. pression	
52	1	32934900	.Putki	Rör	Pipe	Rohr	Tuyau	
53	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	Vis	
54	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
55	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
56	1	32948000	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
57	1	34007500	.Kannatin	Hållare	Support	Halter	Support	
58	1	34009000	.Teline	Konsol	Bracket	Gestell	Support	
59	1	HY2117	.Ruuvi	Skruv	Screw	Schraube	Vis	
60	1	HA6508	.Ruuvi	Skruv	Screw	Schraube	Vis	
61	1	JD0108	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
62	1	JB9927	.Mutteri	Mutter	Nut	Mutter	Ecrou	
63	1	32910500	.Pumppu	Pump	Pump	Pumpe	Pompe	
64	1	33495200	.Säiliö	Behållare	Container	Behälter	Réservoir	
65	1	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkuppl.	Raccord rapide	
66	1	32930700	.Mutteri	Mutter	Nut	Mutter	Ecrou	
67	1	32936900	.Liitin	Nippel	Union	Verbindung	Raccord	
68	1	34276200	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
69	1	34276400	.Liitin	Nippel	Union	Verbindung	Raccord	
70	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
71	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	Vis	
72	2	JD0408	.Liitin	Nippel	Union	Verbindung	Raccord	
73	2	JB8904	.Mutteri	Mutter	Nut	Mutter	Ecrou	
74	1	HA6358	.Ruuvi	Skruv	Screw	Schraube	Vis	
75	2	HA6343	.Ruuvi	Skruv	Screw	Schraube	Vis	
76	1	32930510	.Liitin	Nippel	Union	Verbindung	Raccord	
77	2	HA6327	.Ruuvi	Skruv	Screw	Schraube	Vis	
78	1	32944300	.Kompressori	Kompressor	Compressor	Kompreßor	Compresseur	
79	2	836114846	Holkki	Hylsa	Sleeve	Hülse	Manchon	*
80	2	HA6327	Ruuvi	Skruv	Screw	Schraube	Vis	*
*			Takah.laitteet	U.vändb. f.plats	Back dr. system	R.wärtssteuers..	Système conduite ar.	
81	1	**34078600**	Osasarja	Delsats	Sundry parts kit	Teilsatz	Jeu de pièces	Air pressure brake

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60. Steering system and front axle

61. Steering system

64. Powered front axle

65. Industrial front axle

66. Air suspension

67. Carracro 20.29 front axle

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General (Op. no. 610)
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Priority valve 8
Steering cylinder 11
Fault tracing 12
Reverse drive controls 14

Reconditioning steering system

Steering valve (Op. no. 611):
A. Measuring working pressure of steering system 1
B. Measuring shock valve opening pressure 1
C. Steering circuit leakage check 2
D. Removing steering valve 2
E. Reconditioning shock valves and pressure–limiting valve 3
F. Changing seals in steering valve 4
G. Fitting steering valve 6
Priority valve (Op. no. 612):
1. Cleaning priority valve:
A. Disassembling priority valve 1
B. Assembling priority valve 1
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1. Changing steering cylinder seals:
A. Removing steering cylinder 1
B. Changing oil seals on RH side end piece 1
C. Changing oil seals on LH side end piece 2
D. Fitting steering cylinder 3
Adjustments:
A. Adjusting toe–in 3
B. Adjusting steering lock 4

Technical data

Hydrostatic steering system. Oil is supplied to the steering system from the high–pressure pump via the priority valve. Adjustable telescopic steering wheel column. One double–action steering cylinder in the middle of the front axle.

Steering valve . . . . . Orbitrol OSPC 125 LS
Pump capacity per revolution . . . . . 0,125 l
Working pressure (at pressure–test point, 1500 r/min / 50–65°C) . . . . . 14–15,5 MPa
Pressure–limiting valve opening pressure . . . . . 14 MPa
Shock valve opening pressure . . . . . 19,5–21,5 MPa
Priority valve:
– 6000–8400 . . . . . OLS 80
– 8050–8750 . . . . . OLS 120
Steering speed . . . . . over 2 rounds/sec. at idling speed
Steering wheel rotates . . . . . 5,2 turn
Steering capacity ±30° with front axle load of 5000 kg on dry asphalt

Turning radius (m) with standard track width:

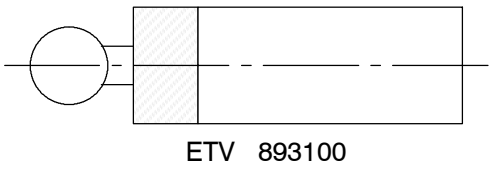
Tractor	**6100**	**6300–6400**	**6600**	**8000**	**8100**	**8400**
Tyres	12.4–24	13.6–24	14.9R24	14.9R24	13.6R28	16.9R28
Turning circle	4,0 m	4,2 m	4,7 m	5,1 m	5,1 m	5,5 m

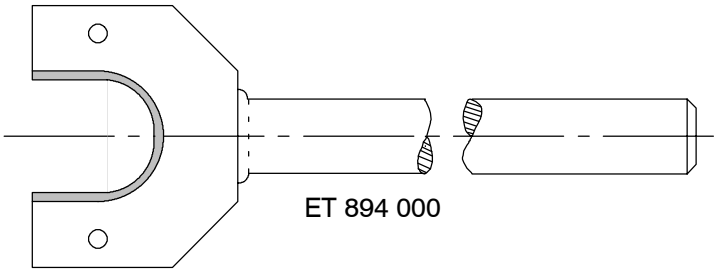
Toe–in . . . . . 0–5 mm
Suction strainer filtering properties . . . . . 125 µm
Pressure filter, degree of separation . . . . . β10=75

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Special tools

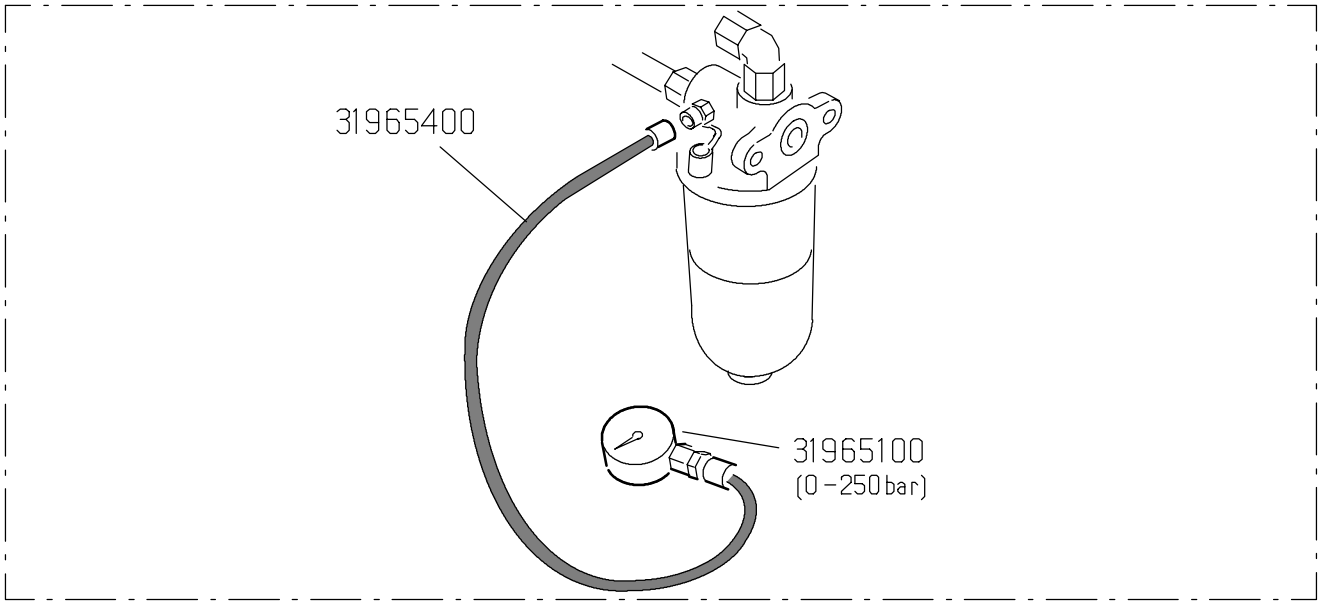
ETV 893 100	Fitting tool for steering valve seal (Steering valve 505–905)
ET 894 000	Tool for rotating steering cylinder head up to axle no **129**/**92** (Front axle Sige 505–905)



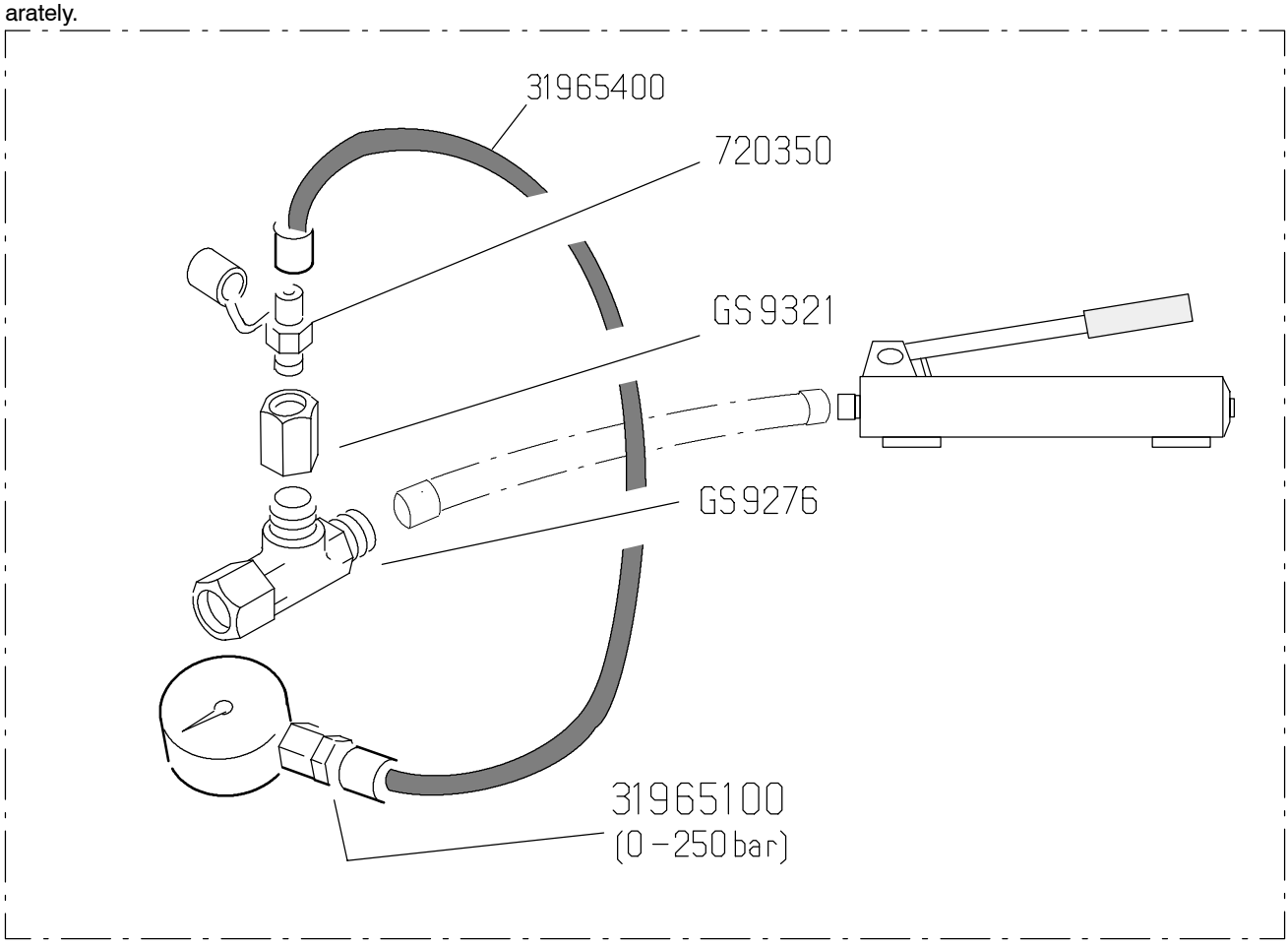


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Special tools



1. Equipment for measuring steering system working pressure (**pressure at test point 14,0–15,5 MPa**)
Pressure measuring kit 31965000 includes the above shown hose and pressure gauge. These parts can also be ordered separately.



2. Equipment for measuring shock valve opening pressure **(opening pressure 19,0–21,5 MPa)**.
Note! T–connector GS9276 has thread 3/4–16 for connecting hand pump hose. The pressure measuring kit 31965000 does not include the hand pump

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Steering system, description

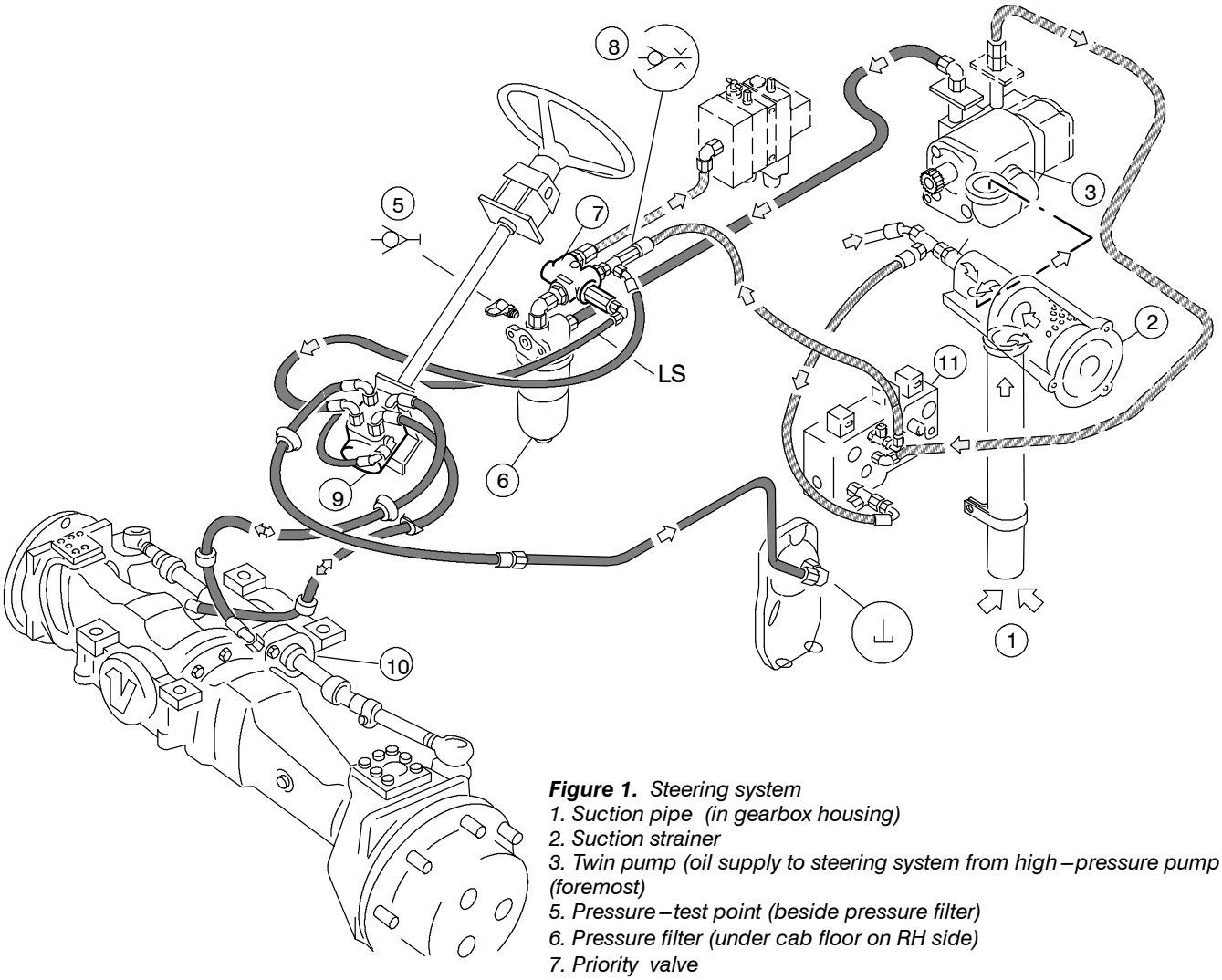


Figure 1. *Steering system*
1. Suction pipe (in gearbox housing)
2. Suction strainer
3. Twin pump (oil supply to steering system from high – pressure pump (foremost)
5. Pressure – test point (beside pressure filter)
6. Pressure filter (under cab floor on RH side)
7. Priority valve
8. Non – return valve
9. Steering valve
10. Steering cylinder
11. Servo valve block, ***– 660070*** *(low – pressure circuit)*

Pressurized oil to the steering system (and to the working hydraulics) is supplied by the high – pressure pump. The system has a priority valve, which ensures that there is always enough hydraulic oil for steering.

Pressure – limiting valve (14 MPa) and shock valves (19,5 MPa) are fitted in the steering cylinder.

The steering valve on the 6100 – 8100 tractors is a load sensing type of valve. Compared with the conventional unit, the LS steering valve has a 5th additional LS port. One port on the steering valve is for pressure oil feed, one for return oil, two to/ from the steering cylinder and one for the load sensing. The load sensing pipe is fitted between the priority valve and the steering valve.

The LS port is either open to the return line when the steering is in neutral, or open to the pressure feed line as soon as the steering wheel is turned.

Important! With effect from tractor serial number **660071,** 6100 – 8400 tractors have a new servo valve block. In picture above is shown an earlier valve block. There is not an oil hose between the new valve block and the priority valve

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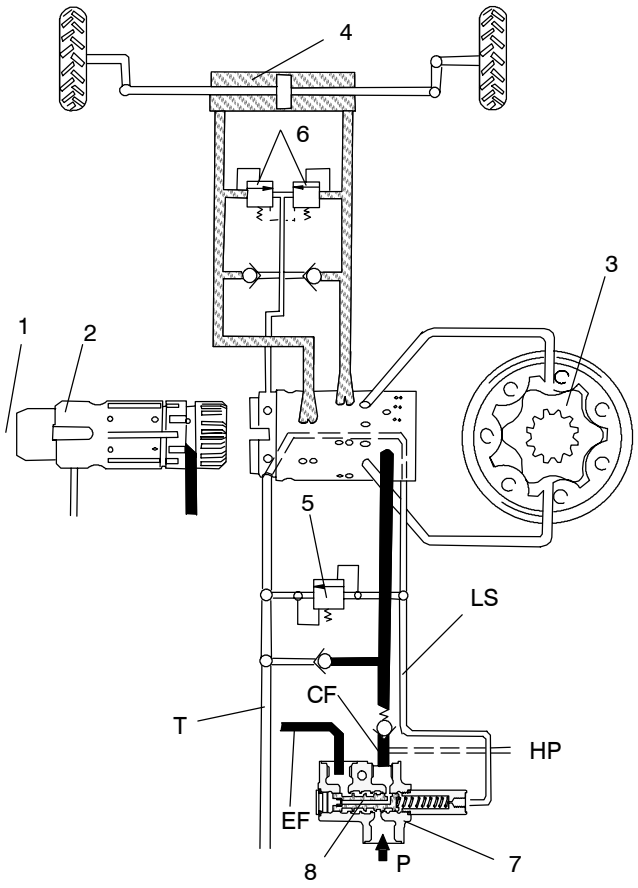


Figure 2. *Steering wheel is not turned*

1. Steering wheel
2. Spool valve
3. Rotor
4. Steering cylinder
5. Pressure–limiting valve (14 MPa)
6. Shock valves (19,5 MPa)
7. Priority valve
8. Priority valve slide
P=From pump
T=To tank
CF=Pressure oil to steering valve
EF=Pressure oil to working hydraulics
HP=Low–pressure oil from servo valve block, ***–660070***
LS=Load sensing line

In this figure the steering wheel is not turned. LS line is unpressurized and the slide (8) in the priority valve directs oil pressure to the line EF (to the working hydraulics)

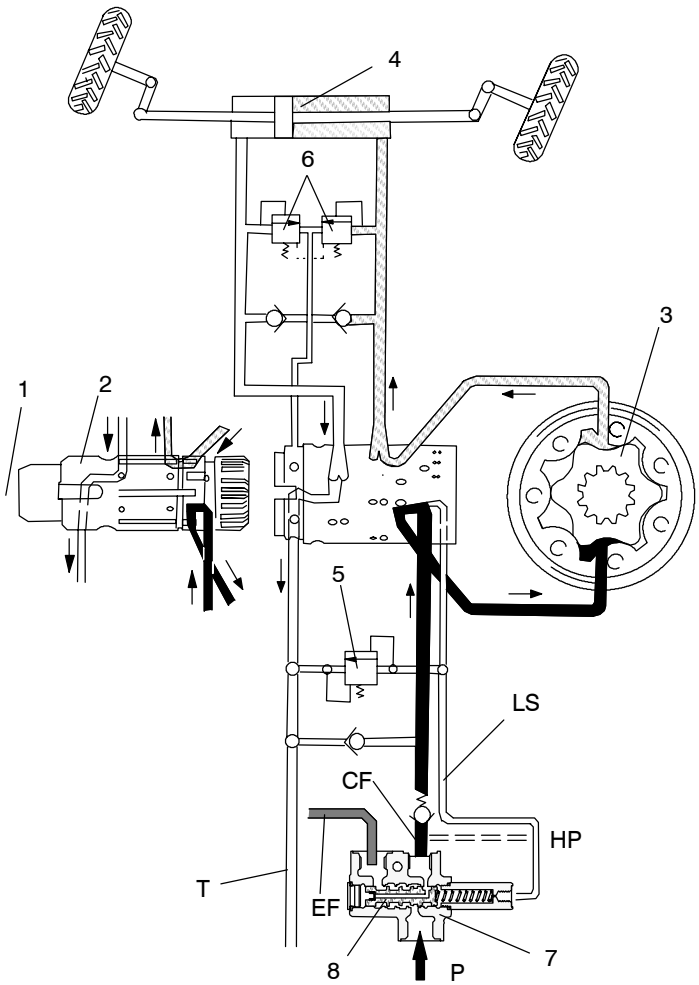


Figure 3. *Steering wheel is turned to the right*

1. Steering wheel
2. Spool valve
3. Rotor
4. Steering cylinder
5. Pressure–limiting valve (14 MPa)
6. Shock valves (19,5 MPa)
7. Priority valve
8. Priority valve slide
P=From pump
T=To tank
CF=Pressure oil to steering valve
EF=Pressure oil to working hydraulics
HP=Low–pressure oil from servo valve block, ***–660070***
LS=Load sensing line

In this figure the steering wheel is turned and the pipe LS is pressurized and pushes the slide (8) so that pressure from pump P is directed to the steering valve (pipe CF) and further to the steering cylinder. The pressure limiting valve (5) regulates the steering system pressure at 14 MPa.

Steering valve

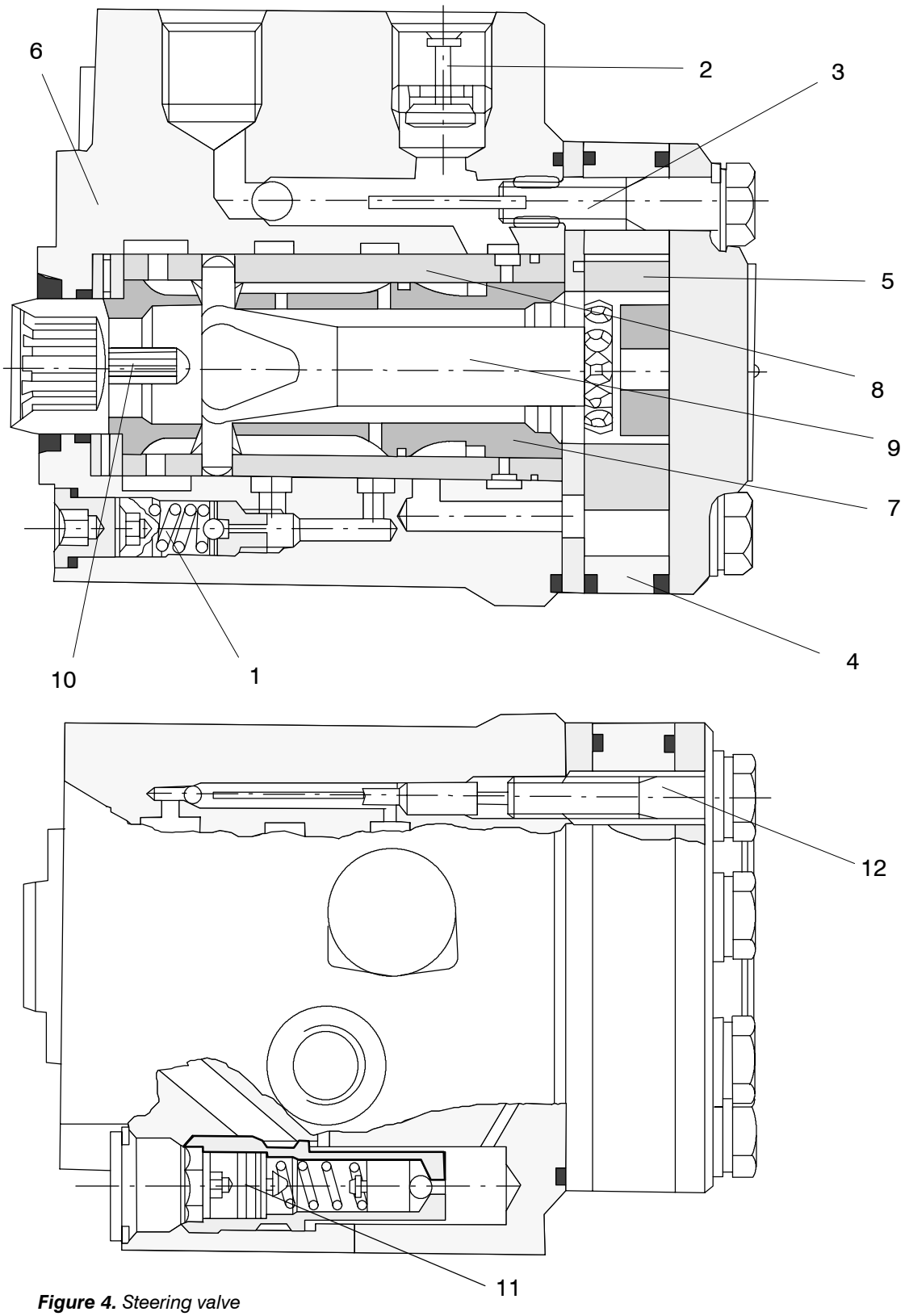


Figure 4. *Steering valve*

1. Shock valve (2 pcs, 19,5 MPa)
2. Non–return valve
3. Non–return valve for emergency steering
4. Rotor ring
5. Rotor
6. Valve housing
7. Inner valve spool
8. Outer valve spool
9. Rotor shaft
10. Centring springs
11. Pressure–limiting valve (14 MPa)
12. Anti–cavitation valves (2 pcs)

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Steering valve, description

See figure 4 on previous page.

The steering valve consists of a metering unit (rotor set) and a valve unit. The rotor set consists of a rotor ring (4) with seven internal teeth and a rotor (5) with six external teeth. The valve unit consists of a valve housing (6), outer valve slide (8) and inner valve slide (7).

The inner slide (7) is directly actuated by the steering wheel. The outer valve slide (8) is mechanically connected to the rotor (5) by a cross pin and rotor shaft (9). The cross pin which runs through both valve slides permits the inner valve slide to move 8° in both directions independent of the outer valve slide.

When the steering wheel is in the rest position, centring springs keep the inner and the outer valve slides in neutral (in relation to each other) and the oil flows freely through the steering valve. The passages to the steering cylinder are kept closed and the steering cylinder cannot move.

When the steering wheel is turned, the inner valve slide is turned in relation to the outer valve slide. The neutral–position passages become restricted at the same time the passages down to the measuring unit and on to the steering cylinder gradually open. Simultaneously the return oil from the other side of the steering cylinder flows back via the steering valve. The oil flow from the pump through the valve makes the rotor and the outer valve slide turn in the same direction as the steering wheel and the inner valve slide.

When the steering wheel is not turned any further and kept still, the centring springs bring the outer and the inner valve slide back into the neutral position The passages to the steering cylinder close and the oil flows freely again through the steering valve.

When the hydraulic pump does not supply any oil, the metering unit of the steering valve acts as a manually powered pump. The oil which is drawn from the steering cylinder and the return line via the non–return valve (3) is delivered to the other side of the steering cylinder when the steering wheel (and inner valve slide 7) is turned 8°. The cross pin then also makes the following parts turn: the outer valve slide (8), rotor shaft (9) and rotor (5). Shocks and knocks against the steering wheel are dampened by the two shock valves (1) which are fitted in the steering valve.

The shock valves are combined with anti–cavitation valves (point A in figure 5) in order to keep the cylinder fully supplied with oil at all times.

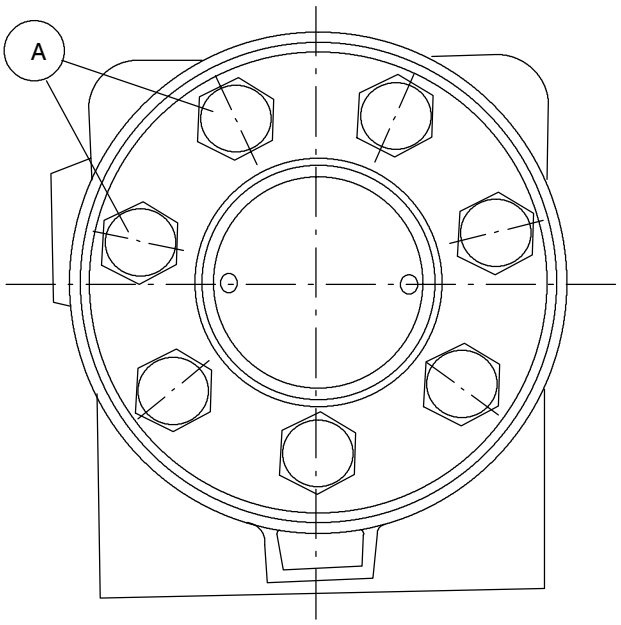


Figure 5. *Steering valve lower face*
A. Anti–cavitation valves

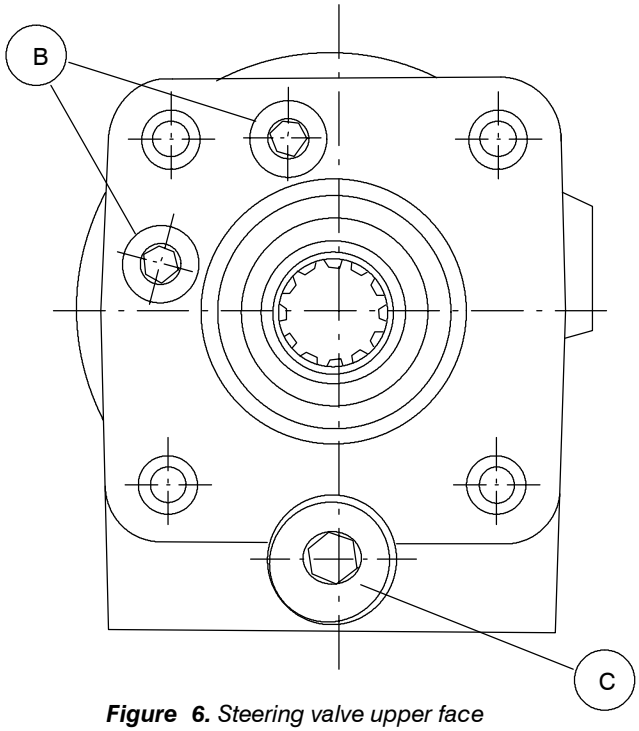


Figure 6. *Steering valve upper face*
B. Shock valves
C. Pressure–limiting valve

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Priority valve

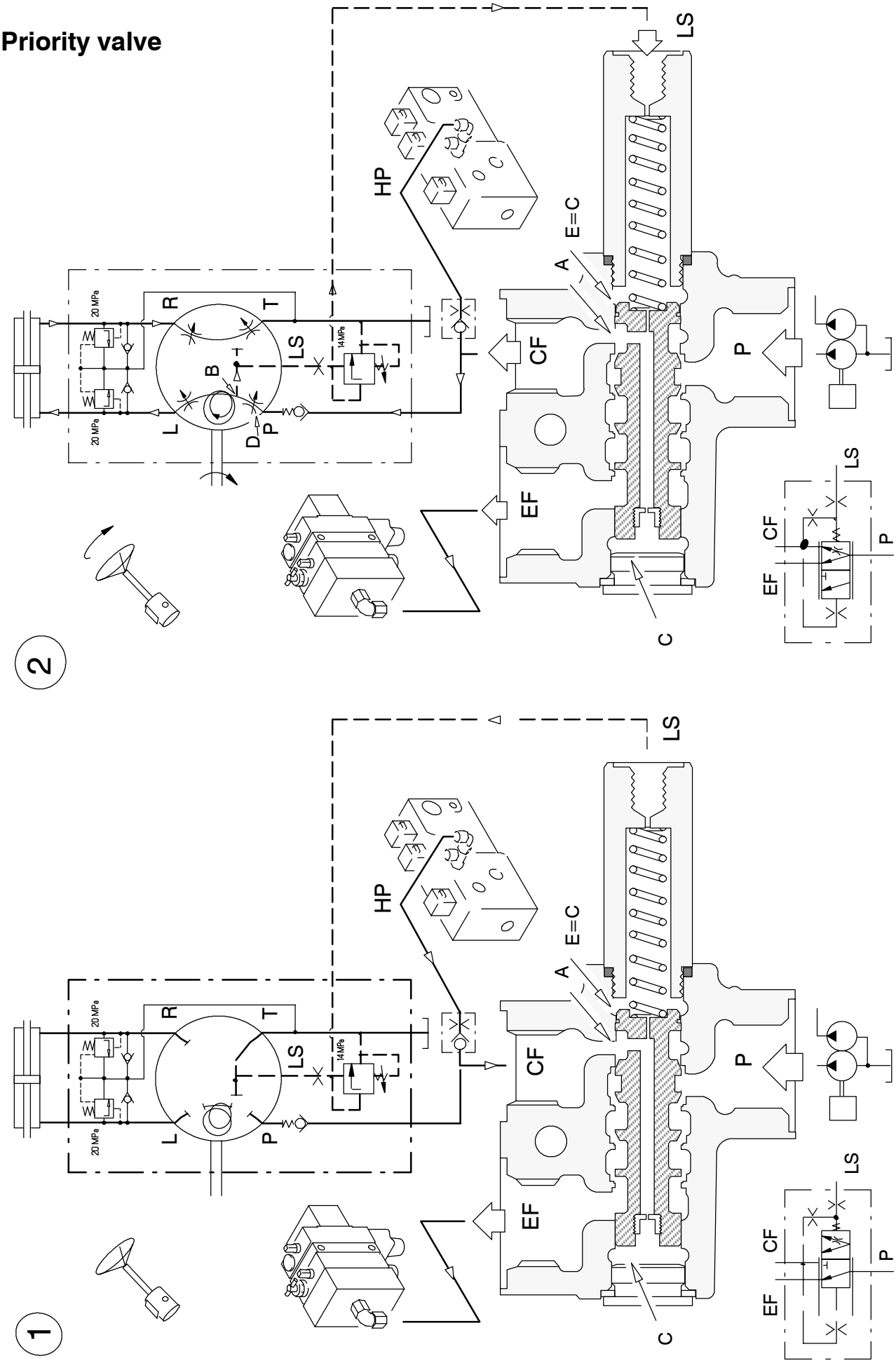


Figure 7. Priority valve

Priority valve (figure 7)

– The priority valve is placed beside the pressure filter on the RH side of the tractor.

The priority valve directs the oil flow both to the working hydraulics EF and to the steering hydraulics CF.

Steering hydraulics have priority. This means that in every situation there is sufficient oil flow for the steering of the tractor, independently of the load of steering hydraulics and working hydraulics. The rest of the oil flow is available for the working hydraulics

Function of the priority valve:

1) The pump delivers oil–steering is not used:

The **P** connection of the steering valve is closed. The **LS** (Load Sensing) line is connected to the **T** connection. All the pump delivery is driven over the three–stepped throttling to the **EF** connection (to the working hydraulics) with a pressure loss determined by the LS spring, which is about 7 bar (area C x pressure in point A=spring force LS).

Auxiliary pressure **HP** (from the low–pressure circuit, 1,8 MPa) presses the slide to the right and reduces the free–circulation pressure **P** of the pump.

Important! From tractor ser. no. **660071** the **HP** pressure does not affect the priority valve. The hose betveen the servo valve block and the priority valve removed.

2) The steering wheel is turned:

– The throttle **D** of the steering valve opens up. The pressure upon the steering cylinder L/R is conducted from point **B** along the **LS** line to the spring side of the priority valve. The pressure which acts at the left end of the slide is area **Cx** pressure **B** on the steering valve (this pressure is conducted via port CF and through the drilling on the slide). At the right end of the slide acts pressure **B** + spring pressure. Now the slide moves to the left and oil flow between ports **P–EF** is throttled and oil starts to flow between ports **P–CF**.

The state of balance is achieved when the pressure loss **A–B** = 7 bar, which corresponds to the value of the LS spring.

D is the throttling that varies according to the steering speed in the space **A–B:**

Steering at maximum speed:

– When the steering speed is the maximum, the flow area **D** of the throttle is maximum.

The priority valve increases the oil flow from the **CF** connection to the steering valve so much, that the pressure loss **A–B**=7 bar. This situation corresponds the maximum steering speed

When the steering movement is finished, port D on the steering valve is closed and the pressure in line LS discharges to the tank. Now pressure HP presses the priority valve slide to the right against the spring, and the oil flows from pump (port **P**) to the working hydraulics (port **EF**). **Important!** From tractor ser. no. **660071** the **HP** pressure does not affect the priority valve. The hose betveen the servo valve block and the priority valve removed.

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Hydraulic diagram

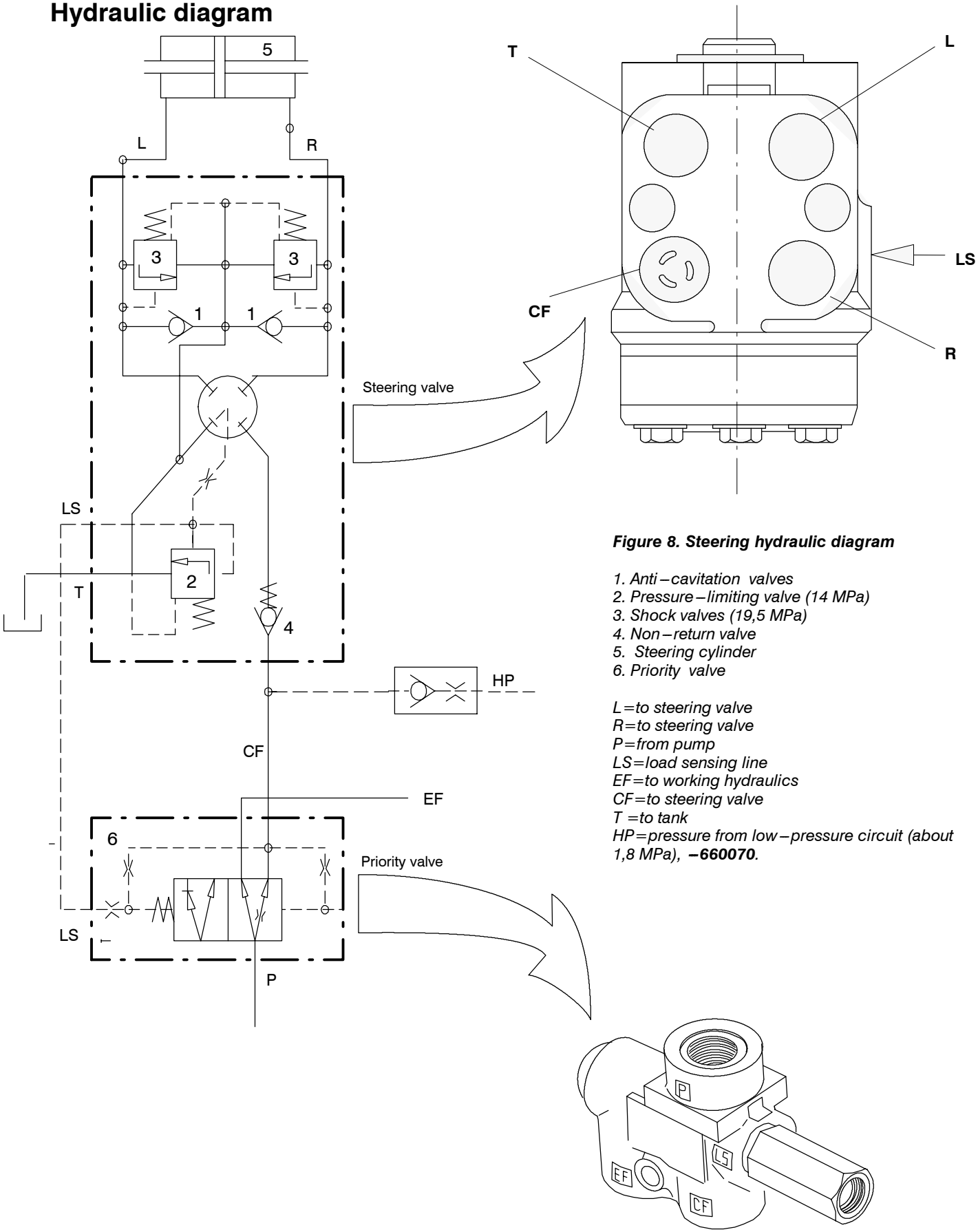


Figure 8. Steering hydraulic diagram

1. Anti–cavitation valves
2. Pressure–limiting valve (14 MPa)
3. Shock valves (19,5 MPa)
4. Non–return valve
5. Steering cylinder
6. Priority valve

L=to steering valve
R=to steering valve
P=from pump
LS=load sensing line
EF=to working hydraulics
CF=to steering valve
T =to tank
HP=pressure from low–pressure circuit (about 1,8 MPa), ***–660070****.*

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Steering cylinder

The steering cylinder is fitted at the back of the front axle member where it is protected from damage.

The piston is fitted at the centre of the piston rod which runs through both ends of the cylinder. There are seals on the piston against the cylinder barrel and also in both end pieces against the piston rod and cylinder liner.

The tie–rods are connected directly to the piston rod ends. Steering movements are transmitted symmetrically via the tie–rods to the steering arms; there is ample steering power even close to the full–lock positions.

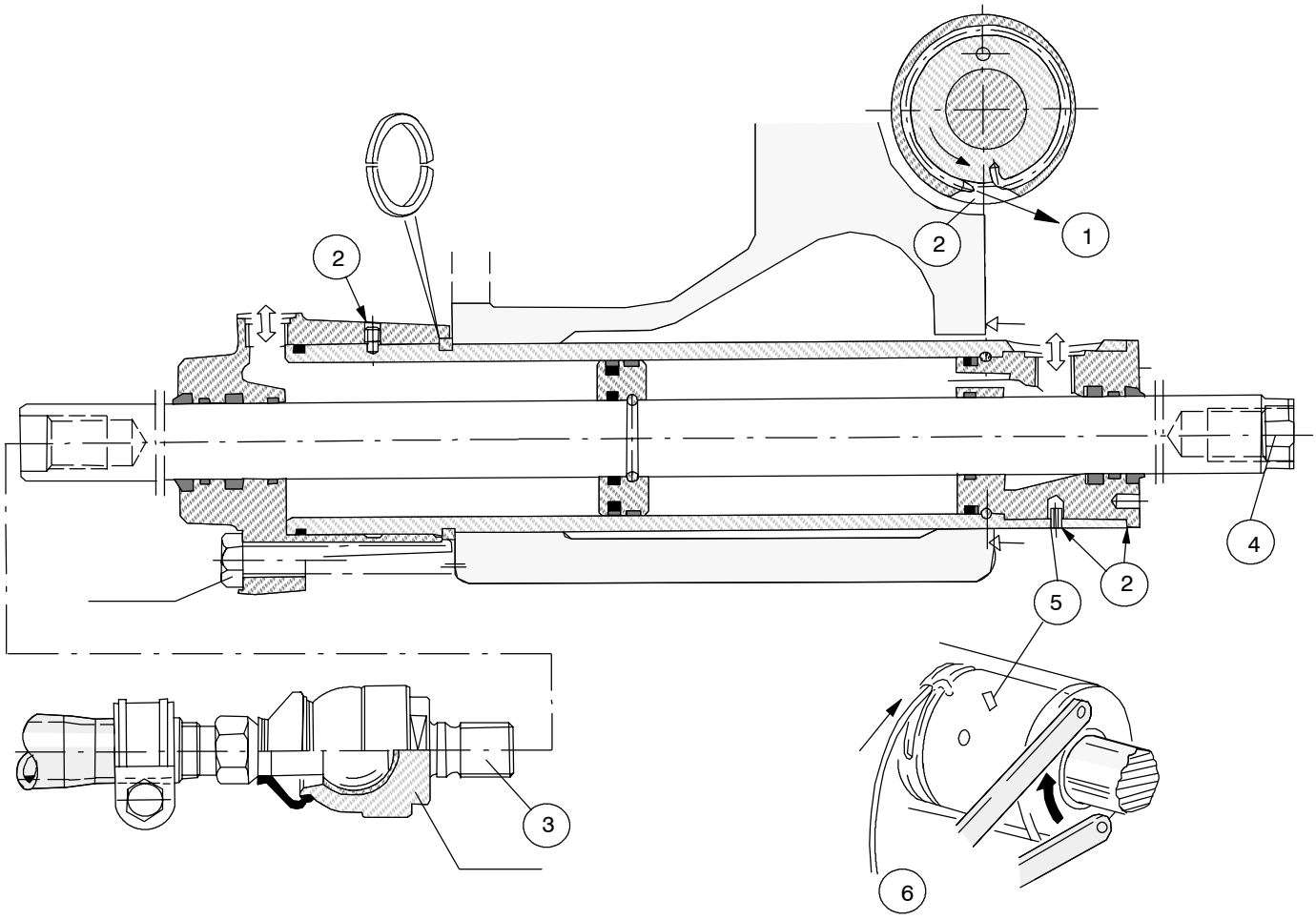
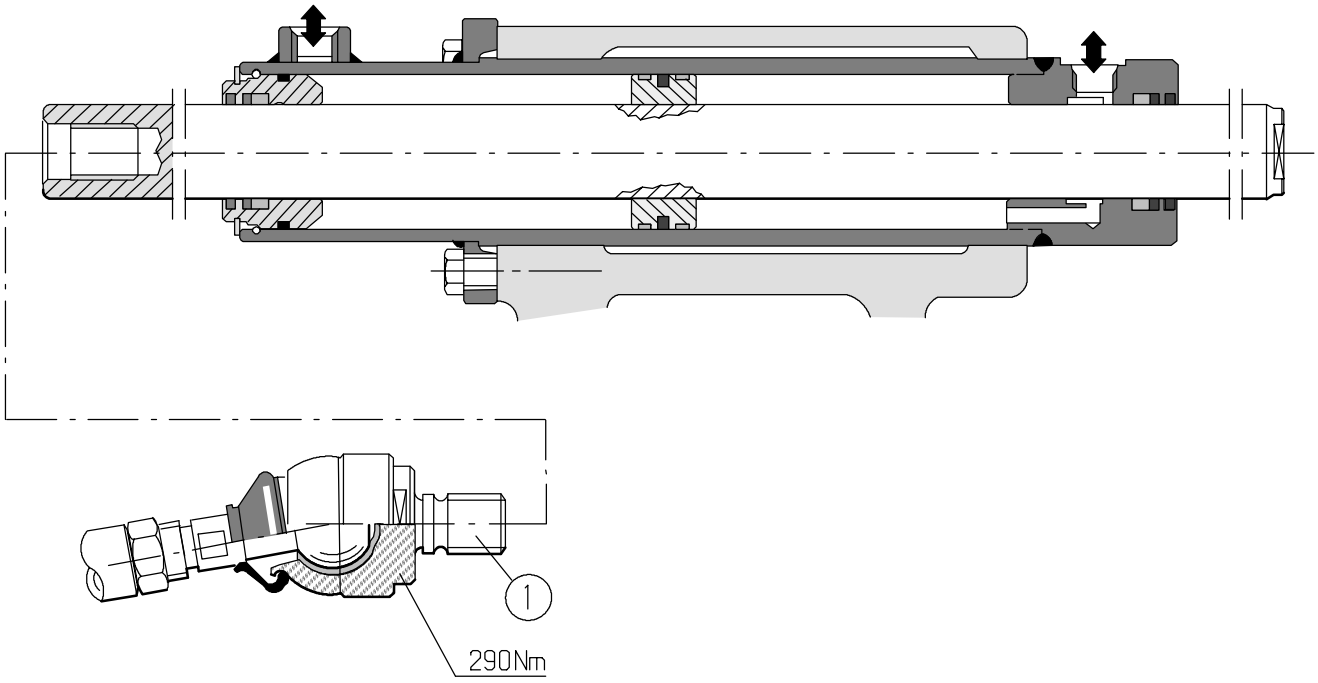


Figure 9. *Sige steering cylinder up to front axle no.* ***1672/94*** *(On Hi–Lock axles up to front axle number* ***0305/94.*** *On ind. front axles up to axle number* ***085/94****).*

1. Removal of locking wire
2. Fill with silicon mass when fitting
3. Locking fluid Loctite 586 on the threads
4. Loctite 586
5. Pin to prevent rotation of end piece
6. Fitting of locking wire



Picture 10. Steering cylinder with effect from front axle number **1673**/**94** (on Hi–Lock axles from axle number **0306**/**94.** On ind. front axles from axle no **086**/**94**).
1. Locking fluid Loctite 586 to threads.

The parts of the latest steering cylinder are not separately exchangeable with the earlier cylinder parts. The complete steering cylinder is exchangeable with the earlier cylinder. The inner diameter of the cylinder is 65 mm. The piston rod diameter is 32 mm.

NOTE! Steering cylinder on Carraro 20.29 front axle, see code 675.

Fault tracing chart

Before disconnecting the pipes, hoses and hydraulic components it is most important that the units, as well as the adjacent parts, should be carefully cleaned. Use white spirit or a similar solvent. Also remove paint from the pipe fittings, couplings etc.

Open ports, hose and pipe ends must be plugged immediately after they are exposed, in order to prevent dirt from getting into the system.

Never use teflon when assembling the system. Traces of teflon can get into the system and cause problems.

Before examining the steering system for particular malfunctions, the fluid level should be checked and the whole system bled if necessary. Where applicable, check that the fluid system is not blocked. It is also important to make sure that the correct type of hydraulic fluid is used, see the oil recommendations.

Fault	Probable cause	Remedy
The steering wheel is hard to turn, but the steering is otherwise normal	1. No hydraulic pressure. The pump or the pump drive faulty	Repair the fault
	2. Non–return valve (3 fig. 5) leaking or ball in wrong position.	Replace the ball or check its position
	3. Pressure–limiting valve jammed in open position	Repair the pressure–limiting valve (or clean it)
	4. Considerable friction in the mechanical parts of the steering system.	Lubricate the steering system bearings and joints, repair if necessary. Check the steering column clearance
Continual correction of the steering wheel is necessary. The steering wheel will not assume a neutral position.	1. Leaf springs have no force or are broken	Change the leaf springs
	2. Steering column and steering valve are not in line.	Line up the steering column with the centre line of the steering valve
	3. Too little play or no play at all between the steering column and the connecting piece.	Adjust the clearance
The steering wheel will not assume the neutral position, tends to turn itself=motor effect)	1. Dirt, burrs or swarf between the inner and outer slides.	If possible clean the slides, otherwise change the complete housing or the whole steering valve
	2. Jamming between the inner and outer slides caused by too high fluid pressure	Clean the whole steering system
		Adjust the pressure–limiting valve to the prescribed pressure
	3. Leaf springs broken or have no spring pressure.	Change the leaf springs
Road wheels turn in the wrong direction	1. Hoses to steering cylinder are reversed	Change the hoses round
	2. Wrong setting of rotor shaft or rotor set, see figure	Correct the setting
Steering force too low (or only to one side)	1. Steering pressure too low	Correct the pump pressure of the pressure–limiting valve
	2. Worn seal on steering cylinder piston	Change the piston seal
	3. Too large internal leakage in steering valve	Change or recondition the steering valve
	4. Shock valve faulty	Recondition shock valve
	5. Abnormal superstructure for use of machine	Compare with machine of standard version
Abnormally large ”play” in steering wheel	1. Groove for cross pin worn or broken	Change rotor shaft
	2. Play in universal joint on steering column	Change the universal joint
	3. Leaf springs broken or have no spring force	Change the leaf spring

Road wheels vibrate	1. Air in the steering cylinder 2. Wear in the mechanical connections or wheel bearings	Bleed the steering system Change worn parts
The steering wheel is subject to severe shocks when steering wheel is turned or the steering wheel tries to move the opposite way (=tends to twist out of the hands)	1. Faulty setting of rotor shaft and rotor set	
Shocks from road wheels while driving	1. Non–return valve (2 fig. 5) faulty	Change steering valve
Steering too slow	1. Too little oil in the system 2. Pipe lines partly clogged 3. worn steering valve 4. Abnormal superstructure or use of machine	Check oil level and oil pressure flow from the pump Clean or repair Change or recondition the steering valve Compare with machine of standard version

Reverse drive controls (optional equipment)

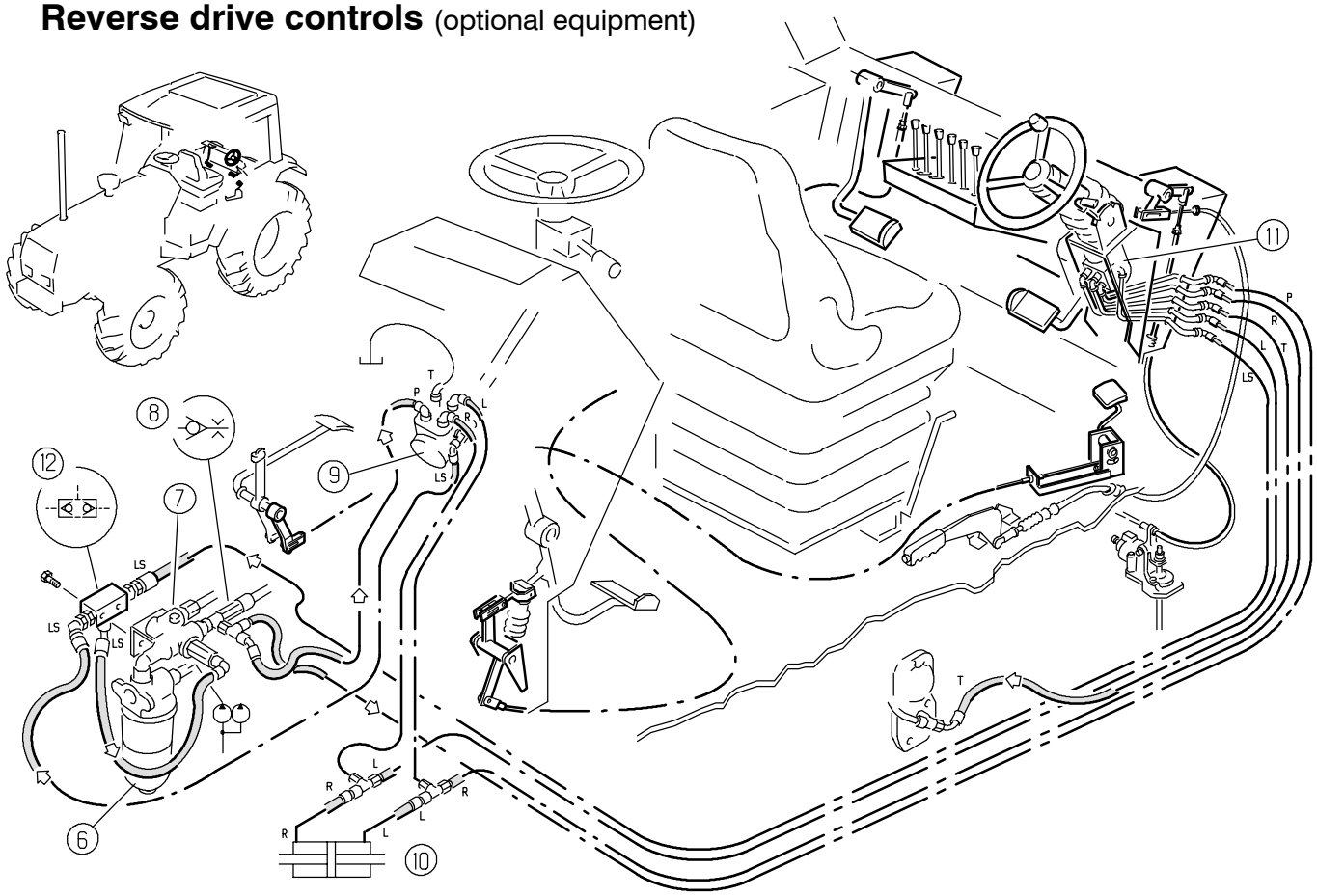
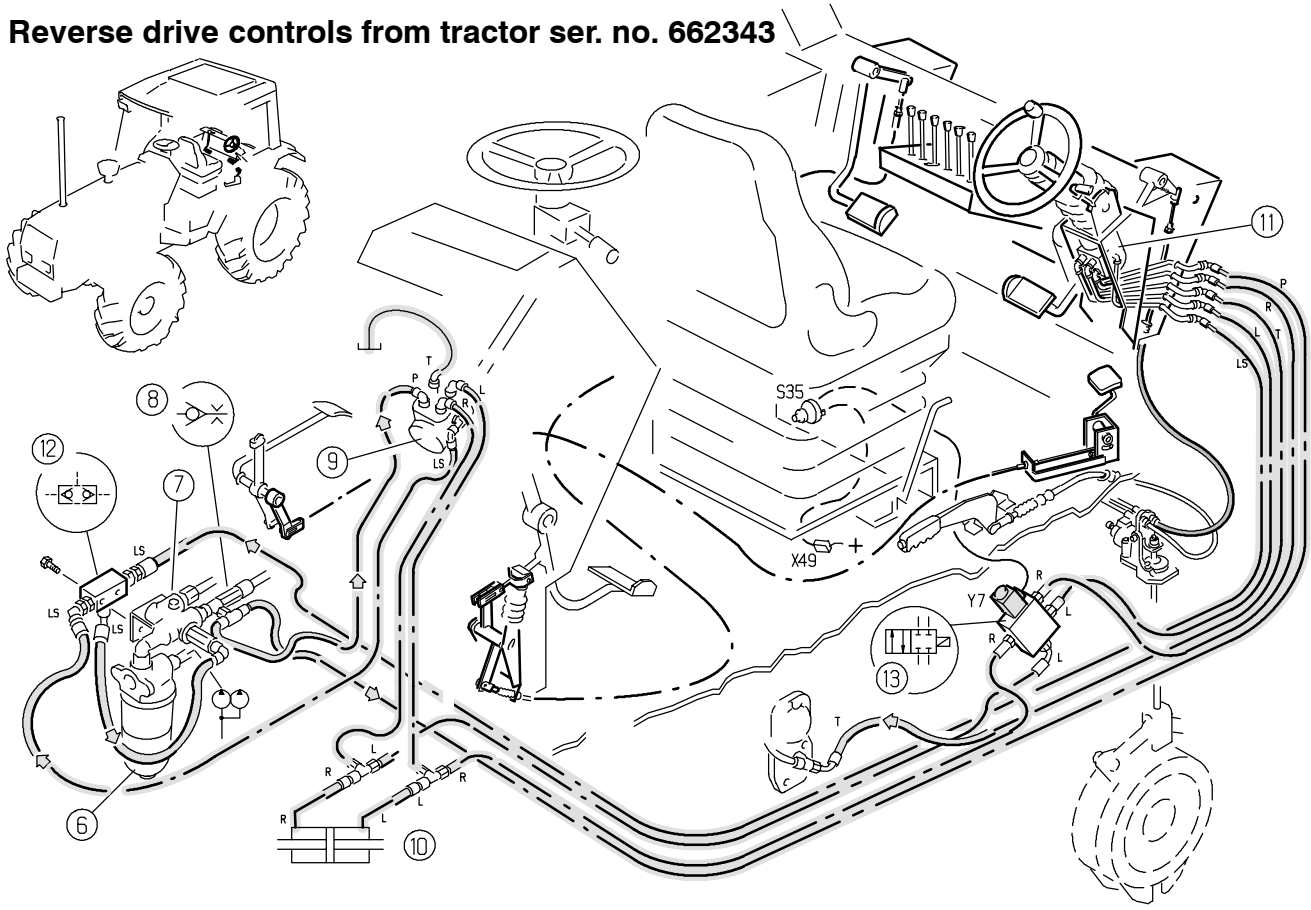


Figure 10. *Reverse drive controls*

6. Pressure filter
7. Priority valve
8. Non–return valve
9. Steering valve (forward driving)
10. Steering cylinder
11. Steering valve, reverse drive controls
– pressure relief valve 14 MPa
– shock valve pressure 19,5 MPa
– steering valve revolution volume 100 cm^3/r
12. Shuttle valve, reverse drive controls

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Reverse drive controls from tractor ser. no. 662343



With effect from tractor serial no. **662343** the parking brake does not operate the rear brakes via the reverse drive brake pedal but the cable operates the brake mechanism direct (as on std models).

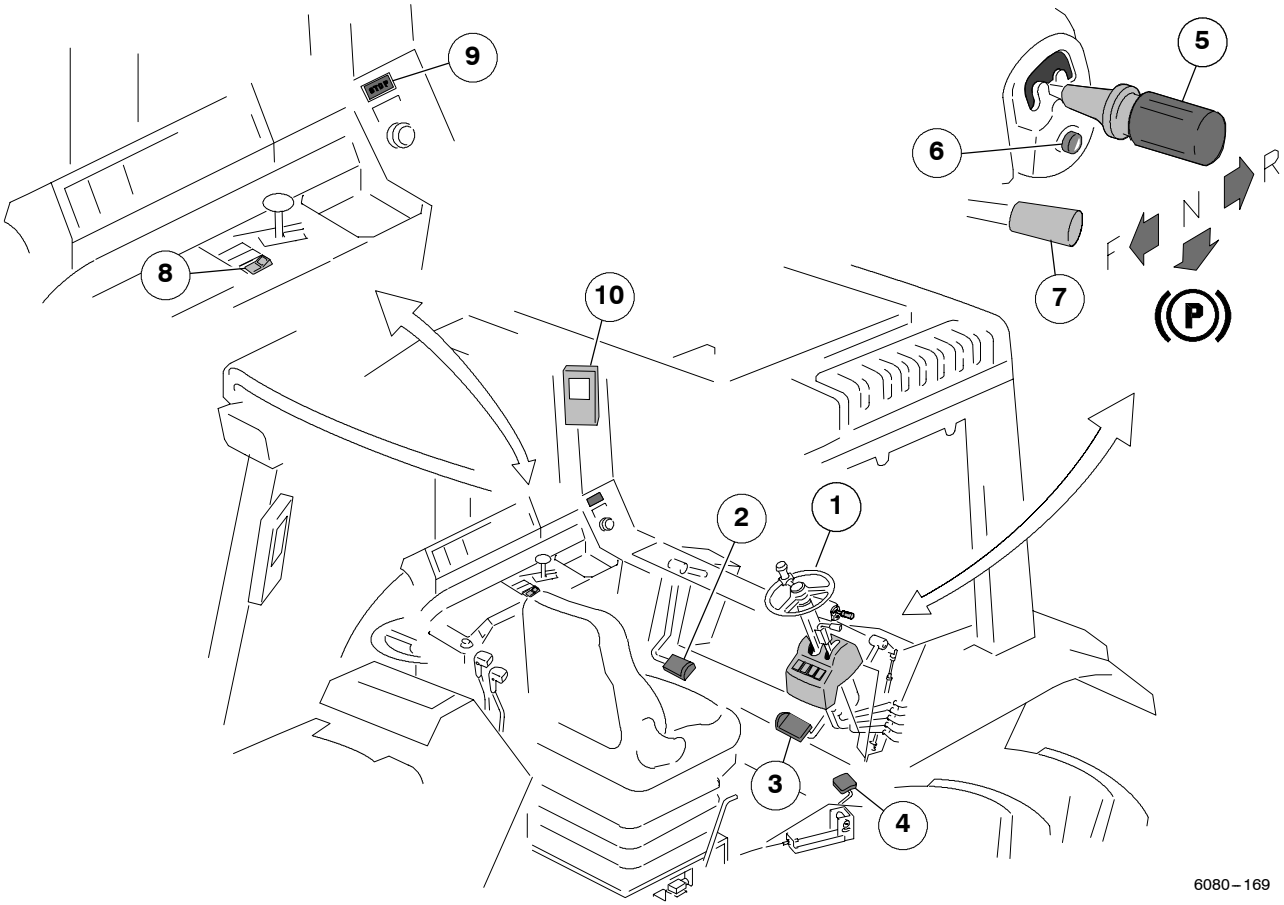
On certain markets the reverse drive controls are equipped with a directional control valve **13**, which disengages the rear steering system when driving forwards.
When the seat is turned forwards, the switch **S35** under the seat switches on current to solenoid **Y7**, and the directional control valve 13 prevents oil from flowing from the rear steering valve to the steering cylinder.

Note! Check every now and then fuse F25 (if the fuse is blown, the valve 13 remains in the open position and the rear drive controls function despite of the position of the seat).
– The use of the reverse drive control in the road driving (transport driving) is prohibited.
– Valve table + levers (six or eight levers) are available as optional equipment.

7. Priority valve
8. Non–return valve
9. Steering valve
11. Rear steering valve
– pressure limiting valve **9** MPa
– shock valve **16** MPa
– revolution volume **100** cm^3/r
12. Shuttle valve
13. Directional control valve

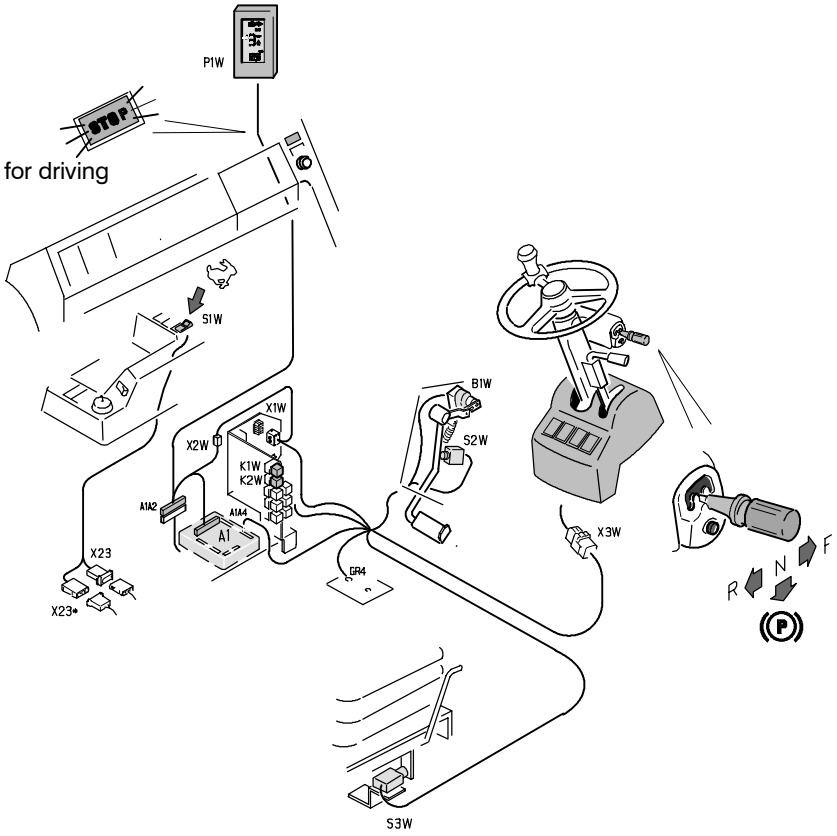
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Reverse drive controls (TwinTrac) on HiTech models



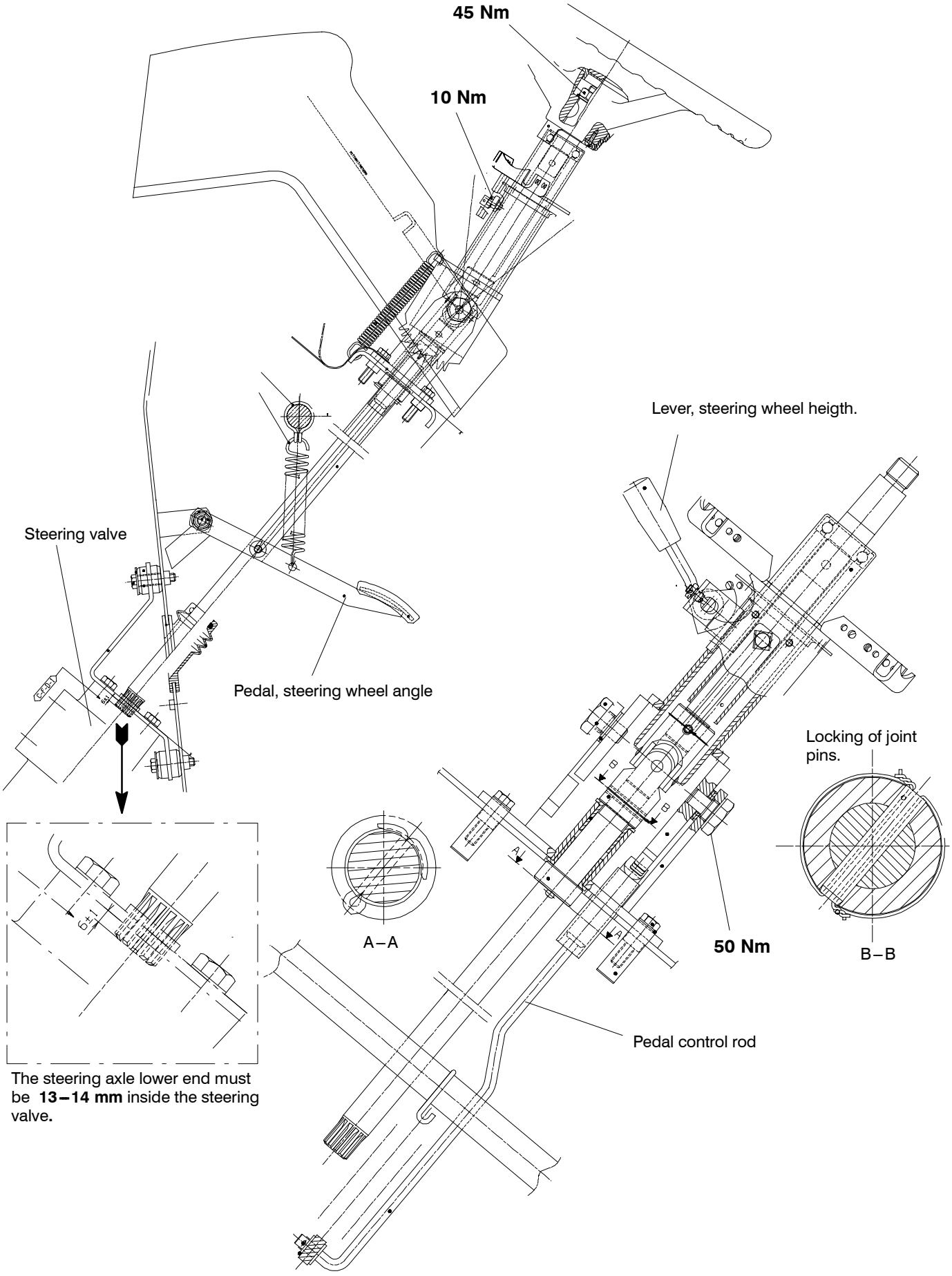
6080–169

1. Rear steering wheel
2. Clutch pedal
3. Brake pedal
4. Gas pedal
5. Shuttle lever/parking brake lever
6. Delta Power Shift pre–programming button for driving direction change
7. Lever to adjust steering wheel distance
8. Delta Power Shift switch, three positions
9. **Stop** (red pilot light, does not flash)
   If the stop lamp comes on, the tractor and the engine must be stopped immediately. Only in emergency the driving can be continued little while.
10. Display unit for driving direction change, for DPS etc.



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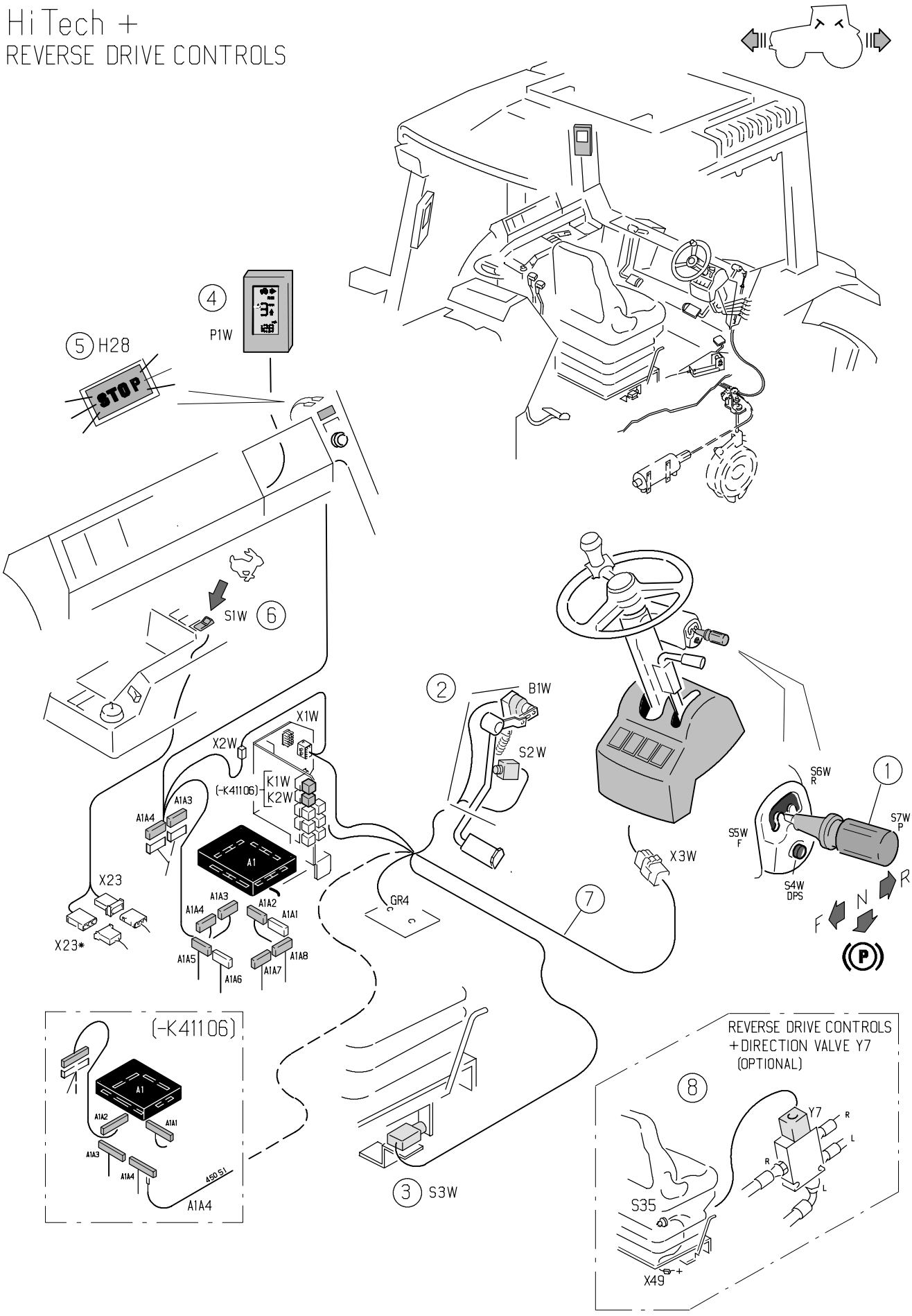
Steering wheel column



The steering axle lower end must be **13–14 mm** inside the steering valve.

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TwinTrac, AC 5.2



Reconditioning steering system

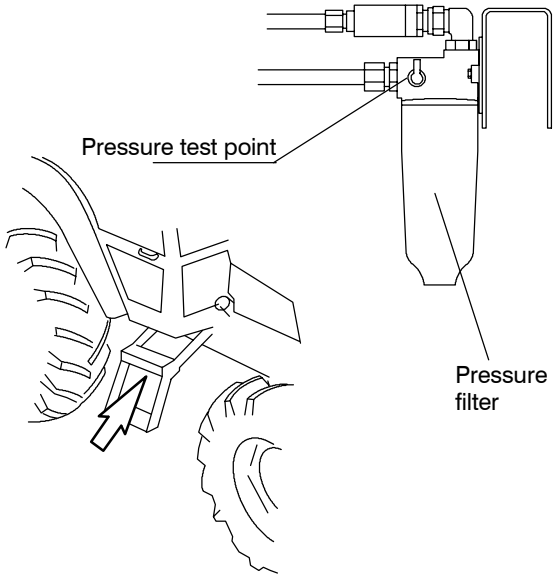
Steering valve (Op. no. 611)

A. Measuring steering system pressure

(pressure–limiting valve opening pressure)

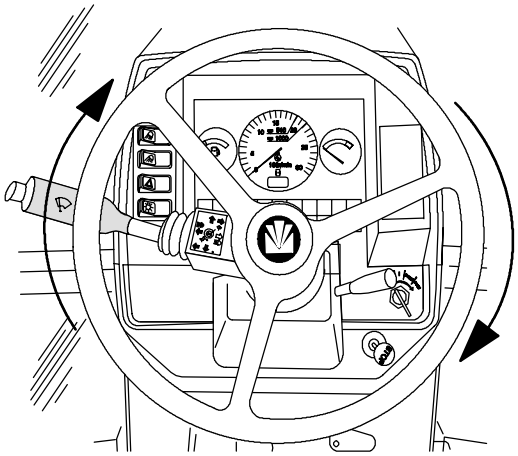
1. Start the engine and allow it run until the oil temperature in the transmission is **50–65 °C**.

Note! Oil warms up faster if the steering wheel is held against lock.



2. Connect a pressure gauge (measuring equipment, see page **610/3**) to the pressure test point (Valmet HPR) on the pressure filter bracket.

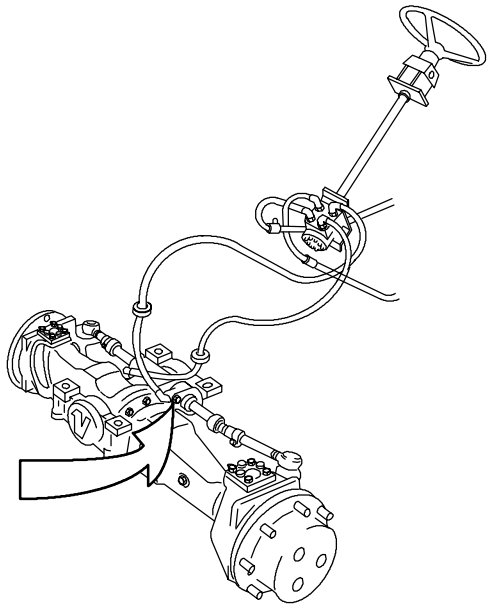
3. Run engine at **1500 r/min**.



4. Turn the steering wheel to full lock and hold. The correct pressure gauge reading is **14,0–15,5 MPa** (140–155 bar).

Note! If the pressure value is not correct, remove the steering valve (**see instr. D**) and inspect the pressure limiting valve (**see instr. E**).

B. Checking shock valve opening pressure



1. Disconnect one of the oil lines to the steering cylinder and connect a hand pump and a pressure gauge to the disconnected hose (measuring equipment **610/3**).

Note! It is easier to disconnect the hose if the tractor is driven so that one front wheel is upper that the other (axle oscillation).

2. Pump up pressure and read off the shock valve opening pressure. The correct value is **19,5–21,5 MPa** (195–215 bar).

3. Completely re–assemble the system and check the opening pressure in the other line to the steering cylinder.

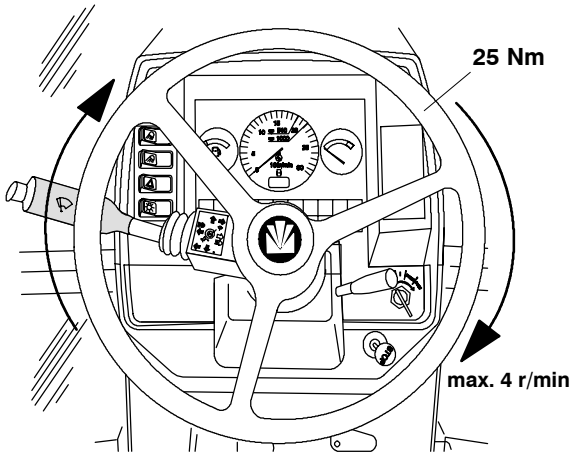
Note! If opening pressure is not correct, remove the steering valve (**see instr D**) and check and clean the shock valves and adjust them (**see instr. E**).

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C. Steering circuit leakage check

1. Start the engine and allow it run until the oil temperature in transmission is **55–65 °C**.

2. Run the engine at **1500 r/min**.



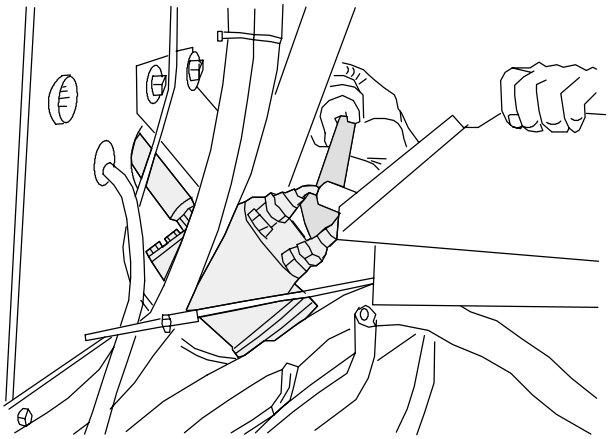
3. Turn the steering wheel to full lock and apply **25 Nm** torque to the steering wheel.

4. If the steering wheel turns more that **4 rev/min**, there is too much internal leakage in the steering valve and it must be changed.

5. Check the internal leakage also with a new steering valve. If the steering wheel still turns too much, the steering cylinder seals must be checked.

D. Removing steering valve

1. Remove the engine side shields.



2. Disconnect the oil hoses from the steering valve.

Note! Mark the hoses for easier fitting.

3. Unscrew the steering valve bracket screws from the cab front wall.

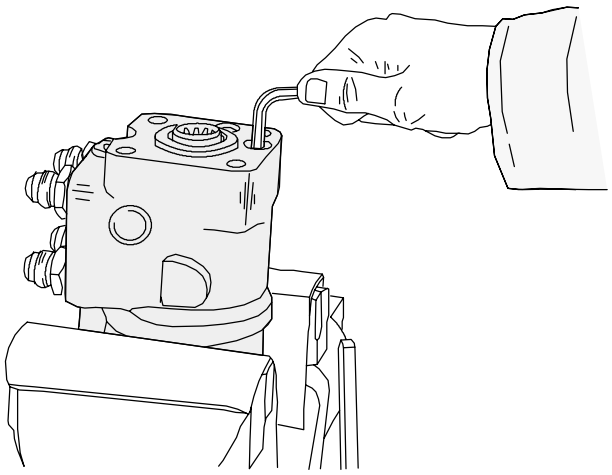
4. Attach the steering valve to a vice and remove the bracket.

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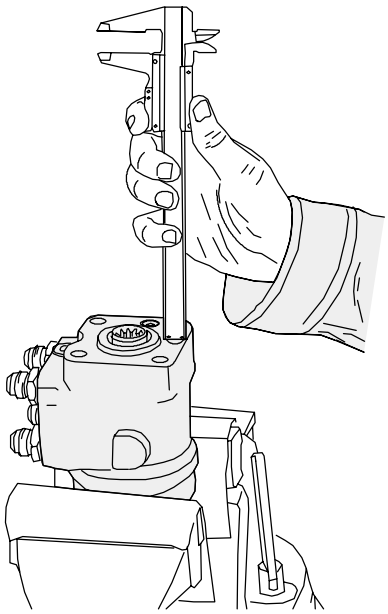
E. Cleaning shock valves and pressure–limiting valve

1. Remove the steering valve (**see instr D**). Secure the valve in a vice with soft jaws.

Note! There are two shock valves in the steering unit. Both valves are similar.



2. Remove the plug on the shock valve (6 mm socket head) and remove the sealing ring of the plug.



3. Measure and make a note of the distance between the adjusting screw and the upper face of the steering valve to facilitate the setting of the opening pressure of the shock valve.

4. Remove the adjusting screw (6 mm socket head). Shake out a spring, washer and a ball.

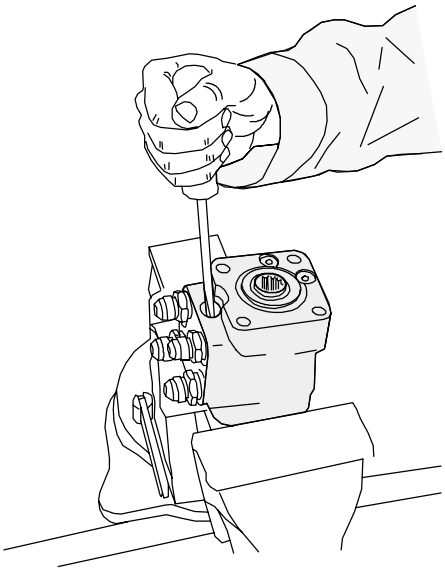
5. Clean and check the parts and change faulty ones. Lubricate all parts with oil before assembling. Minor damage to the seat can be polished with a ball and fine grinding paste.

6. Fit the valve ball, washer and the spring.

7. Apply a little locking fluid to the threads on the adjusting screw. Screw in the screw to the depth as measured in paragraph 3.

8. Fit the sealing ring and the valve plug and tighten to a torque of **40–60 Nm**.

9. Unscrew the pressure–limiting valve plug (8 mm socket head).



10. Remove the pressure–limiting valve insert by unscrewing it with a 12 mm Allen key.

11. The pressure–limiting valve insert can be disassembled by unscrewing the plug with a 4 mm Allen key. After that the valve spring, seat and the ball can be removed.

Note! When assembling the valve, screw the plug to the same depth as it was before disassembling.

12. Clean all parts and the valve bore and lubricate the parts with oil.

13. Make sure that there is a sealing ring on the pressure–limiting valve insert. Fit the valve insert and tighten it to **40–60 Nm**.

14. Fit the plug sealing ring and tighten the plug to **40–60 Nm**.

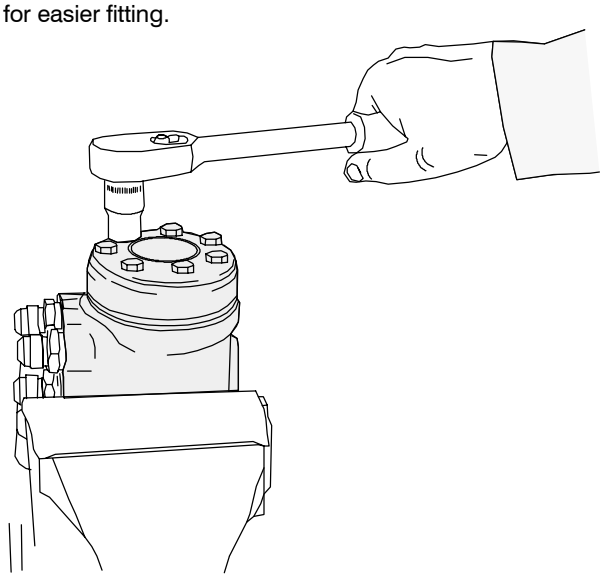
15. Fit the steering valve (**see instr. G**) and check the steering system pressures (**see instr. A and B**).

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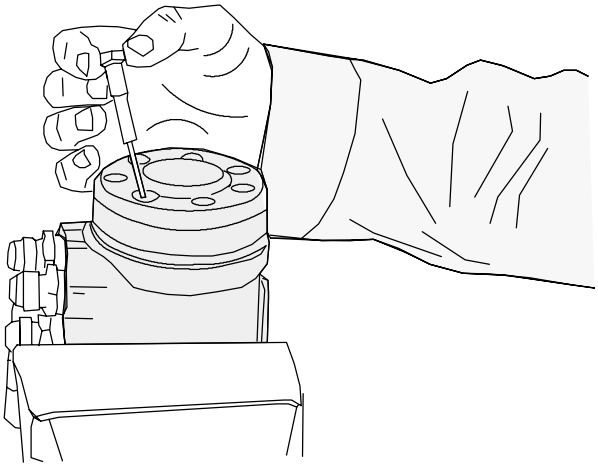
F. Changing seals in steering valve

1. Remove the steering valve (**see instr. D**).

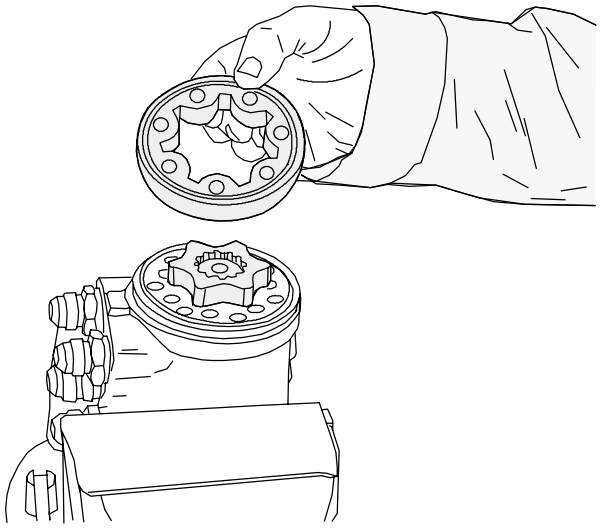
2. Secure the steering valve in a vice with the cover upwards. Mark the position of the cover, distributor plate and rotor ring for easier fitting.



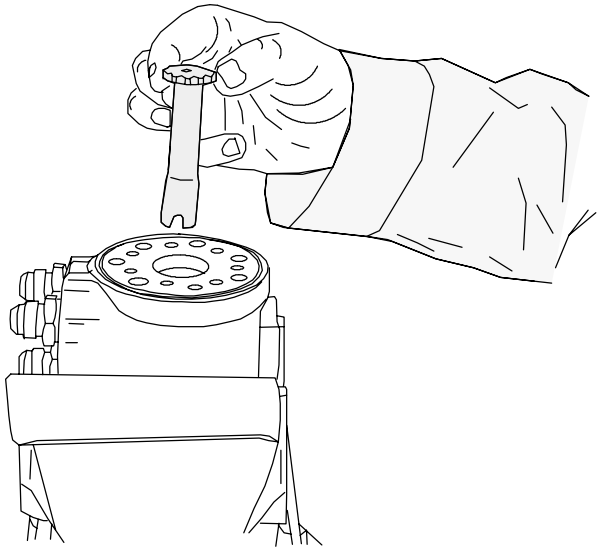
3. Unscrew the cover fixing bolts.



Note! Remember where the bolt with the locating pin was fitted. If the valve is turned upside down, three valve balls and two pins will fall out.



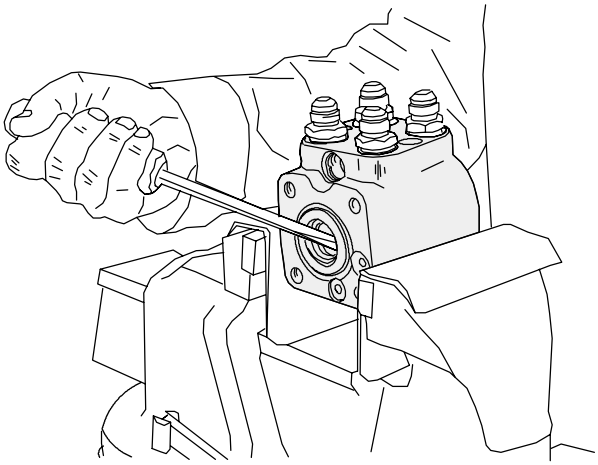
4. Remove the cover, rotor ring and the rotor and the washer inside the rotor.



5. Remove the rotor shaft and the distributor plate. Check/ change o–rings between the parts.

6. Push up the valve slide and pull them out of the valve housing. Remove the thrust bearing from the slide bore.

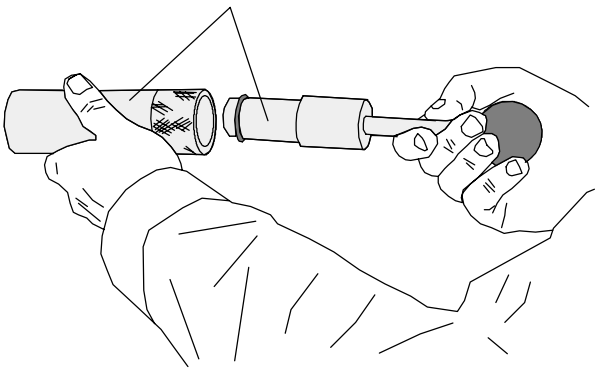
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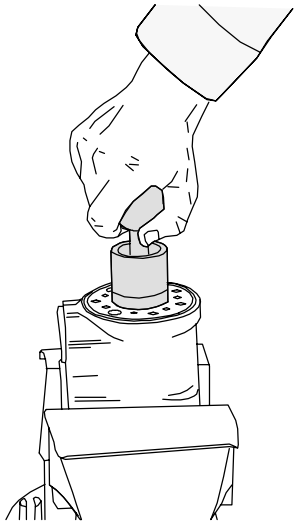
7. Turn the steering valve to a horizontal position and prize out the seal from the valve housing. Remove the inner oil seal. Fit a new outer seal. Apply some grease to the seal and turn the valve back to the vertical position.

8. Fit the inner seal (and the support ring) using tool ETV 892 100 *) as follows:

ETV 893 100

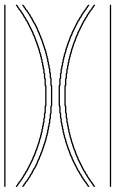


– lubricate the o–ring. Fit the support ring on the stud of the tool and fit the o–ring on the support ring. Push the stud into the guide sleeve.



–push the guide sleeve into the valve housing and push the seal together with the support ring in place using the stud on the tool. Remove the tool and check that the seal is property positioned.

*) Seal has been changed during autumn 96. A new seal can be fitted with tool ETV 894 330.

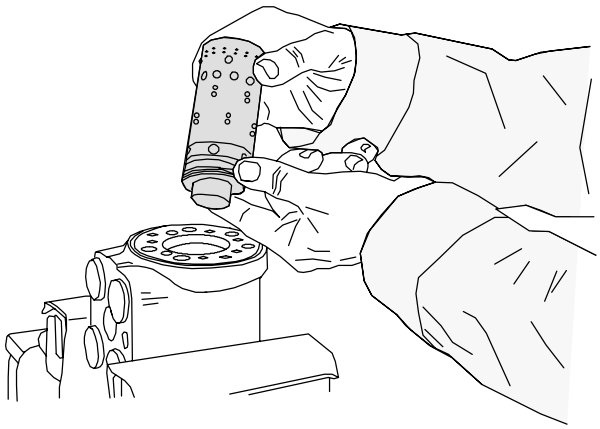


Note! If the centring springs are changed, they must be fitted as shown in figure above.

Note! Before removing the springs, mark position of the valve spindles in ralation to each others e.g. with tusche. Rinse the spindles with gas oil (also lubricating properties) so that they can move easily and the centring springs can center them.

9. Fit the ring over the centring springs. Place the thrust bearing assembly onto the valve slide.

Note! Thick thrust washer first, then bearing and then the thin thrust washer. Chamfered side of the thick washer towards the slide.

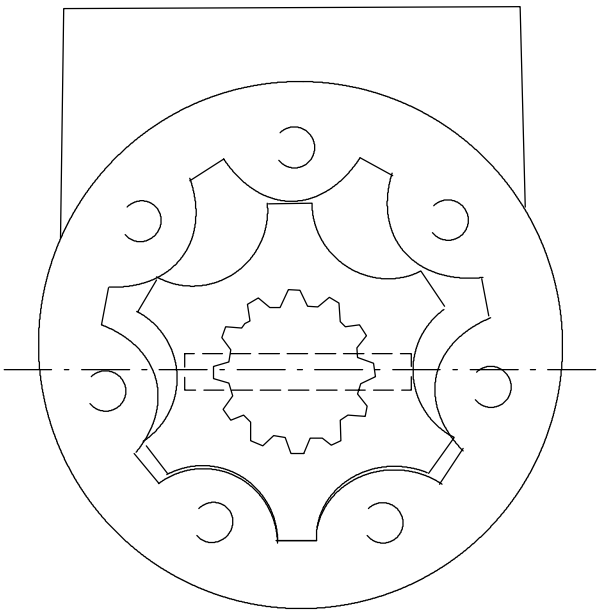


10. Push the valve slide into the housing fully home

Note! The valve slide together with the thrust bearing is easier to fit into the housing when the steering valve is horizontally. Turn the slides until the cross pin is parallel to the flat side of the valve housing.

11. Fit a new o–ring and the distributor plate onto the housing according to the mark. Fit the rotor shaft so that grooves on it engage the cross pin.

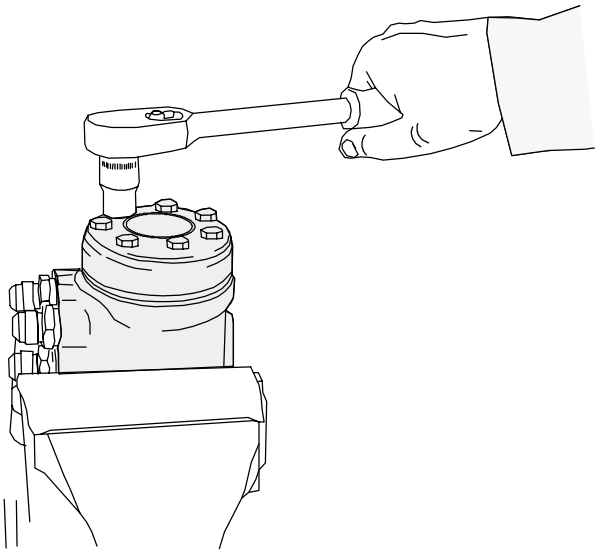
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13. Then fit a new o–ring and the rotor ring according to the marks. Fit the rotor according to the figure above.

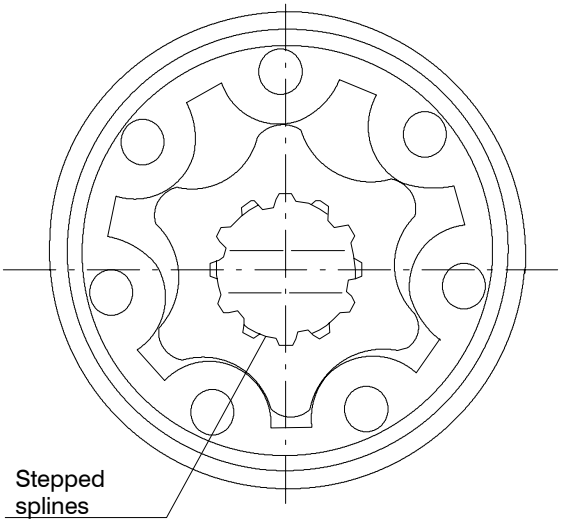
14. Fit the washer inside the rotor.

Note! See also the notes on the next column.



15. Fit the cover according to the marks and tighten the bolts to a torque of **30–35 Nm**.

16. Fit the steering valve (**see next instruction).**



Note! In the latest steering valves the rotor shaft and the rotor have stepped splines at which time the mutual position of the parts is determined automatically.

Note! The stepped splines also prevent the rotor shaft from releasing from the cross pin inside the valve. With regard to possible repair works it is recommended, that a spacer is fitted at the end of the rotor shaft to ensure the position of the shaft. The spacers are still available as spare parts.

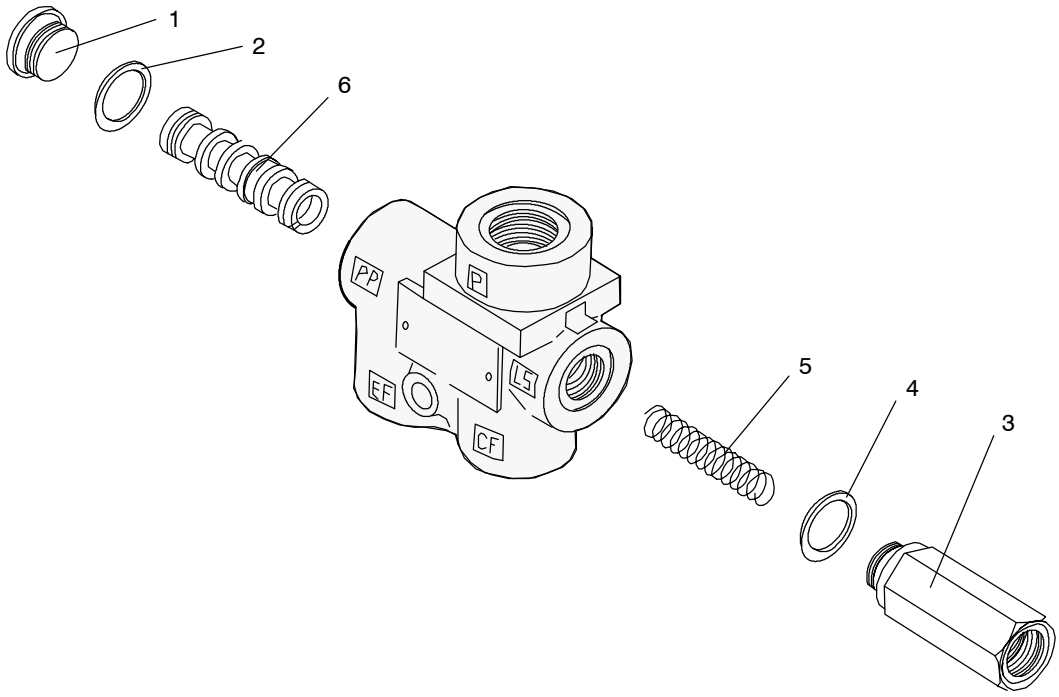
G. Fitting steering valve

1. Attach the bracket to the steering valve (17 mm) and secure the screws with locking washers.

2. Place the valve into its place and guide the steering wheel column lower end into the valve splines.

3. Fasten the bracket to the cab front wall. Connect the oil hoses according to the marks.

4. Test–run the tractor and check for leaks.



Priority valve (Op. no. 612)

1. Cleaning priority valve OLS 80

A. Disassembling

1. Detach the priority valve which is fitted beside the pressure filter under the cab floor on the RH side.

2. Open the plug (1) and remove the sealing ring (2).

3. Unscrew the connection (3) and remove the sealing ring (4) and the spring (5).

4. Push out the valve slide (6) by using e.g. a pencil. Do not damage contact surfaces on the slide and the housing.

5. Check and clean the parts. Replace the sealing rings with new ones. Lubricate the parts with oil before fitting.

B. Assembling

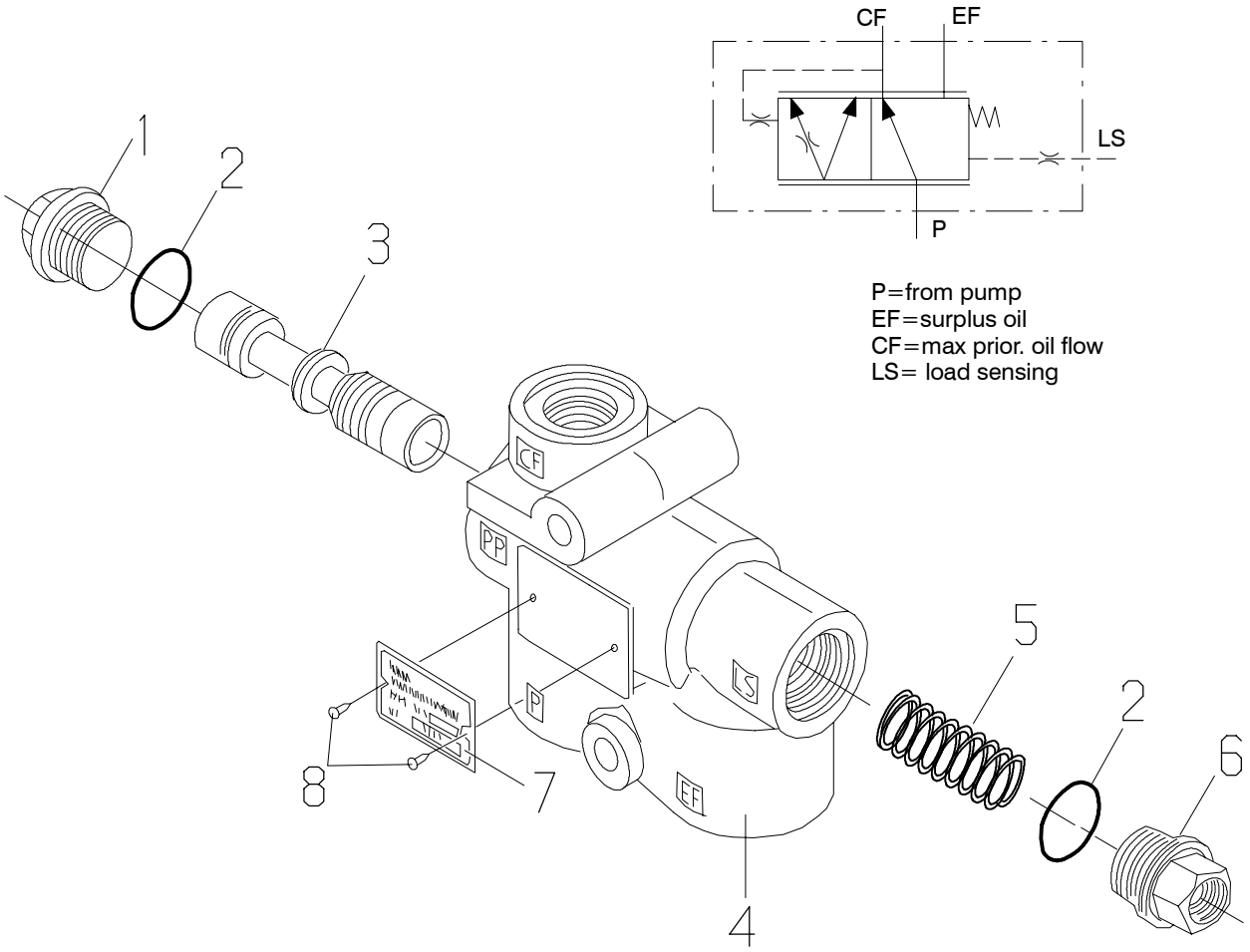
1. Push the slide (6) into the housing. Fit a new sealing ring on the plug (1).

2. Place the spring (5) into the housing. Fit a new sealing ring and the connection (3). Tighten the connection to **40–60 Nm**.

3. Tighten the plug (1) to **40–60 Nm**.

4. Fit the priority valve.

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Priority valve OLS 120

Note! Priority valve OLS 120 is fitted on 8050–8750 tractors and on 6000–8400 from F13208–. The construction differs a little from OLS 80 valve. OLS 120 valve is bigger than OLS 80.

1. Cleaning priority valve

A. Disassembling

1. Detach the priority valve which is fitted beside the pressure filter under the cab floor on the RH side.

2. Open plug (1) and remove the sealing ring (2).

3. Unscrew the connection (6) and remove the sealing ring (2) and the spring (5).

4. Push out the valve slide (3) by using e.g. a pencil. Do not damage contact surfaces on the slide and the housing.

5. Check and clean the parts. Replace the sealing rings with new ones. Lubricate the parts with oil before fitting.

B. Assembling

1. Push the slide (3) into the housing. Fit a new sealing ring on the plug (1).

2. Place the spring (5) into the housing. Fit a new sealing ring and the connection (6). Tighten the connection to **40–60 Nm**.

3. Tighten the plug (1) to **40–60 Nm**.

4. Fit the priority valve.

Steering cylinder (Op. no. 613)

1. Changing seals in steering cylinder

Note! This instruction concerns earlier steering cylinder, –1672/93, –0305/93 (Hi–Lock). Later cylinder, see page 613/3.

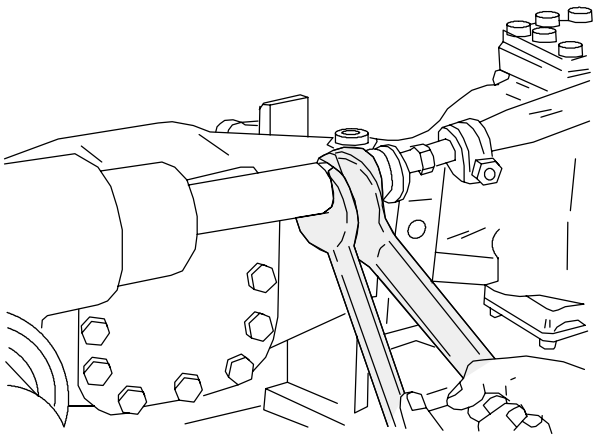
A. Removal of steering cylinder

N.B. It is not necessary to detach the front axle from tractor when repairing the steering cylinder. In the figures below the front axle is detached.

1. Raise the front end of the tractor and place axle stands behind the front axle. Turn the front wheels to the left against the limiter screw.

2. Heat up the RH side piston rod end at the joint between the piston rod and tie rod until the locking fluid in the threads melts (apply heat carefully about 30 mm from end, max 200° C).

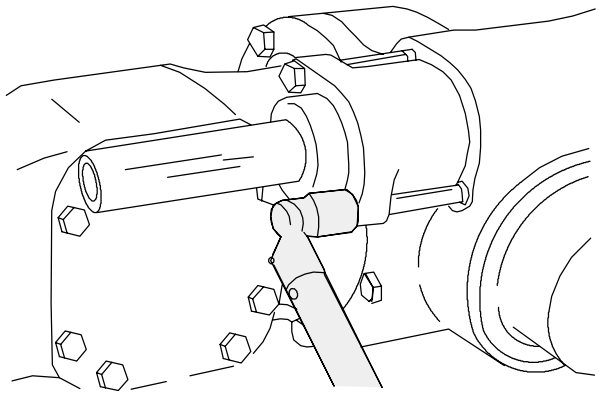
Important!. the metal must not be allowed to become blue during the heating operation. Do not heat up the ball joint because this can damage the rubber cover on the joint.



3. Disconnect the tie rod from the piston rod end.

4. Turn the LH wheel to the right against the limiter screw and disconnect the threaded joint between the LH side piston rod and tie rod in the same way as described above.

5. Disconnect oil hoses from the steering cylinder. Remove the connecting nipple from the RH side end piece. Cover all holes with suitable plugs.



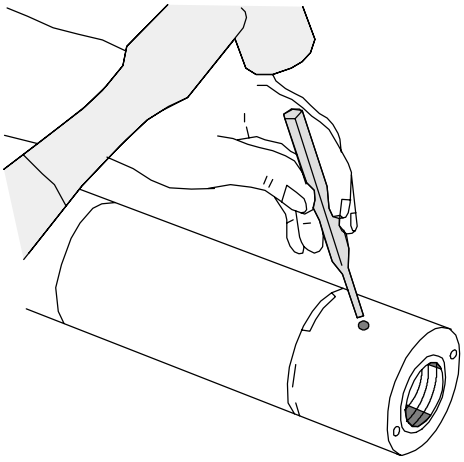
6. Remove steering cylinder attaching bolts (on LH side).

7. Pull out the cylinder to the left from the axle housing.

Note! On E–models, there is a sensor on the front axle for detecting steering angle.

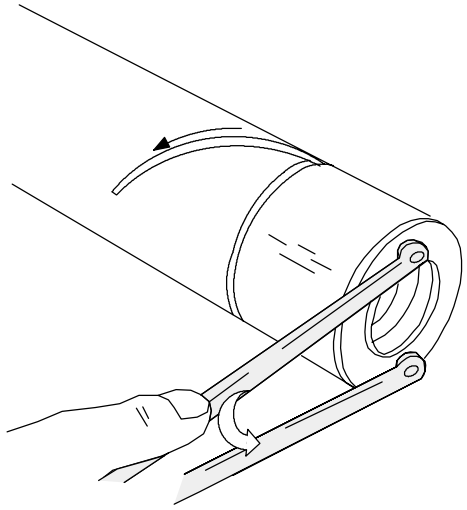
B. Changing seals in RH side end piece

1. Remove steering cylinder **(instr. A).**



2. Secure the cylinder in a vice. Tap in the pin (ø 4 mm) on the RH side end piece. Push the pin as far as possible.

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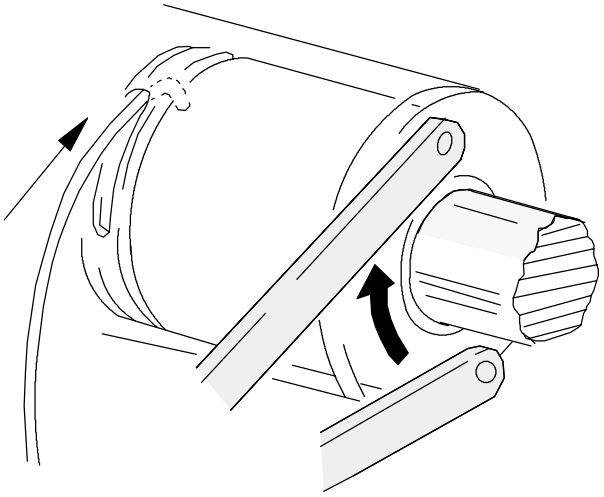


3. Turn the end piece with tool ET 894000 until the locking wire emerges. Remove the end piece from cylinder. Remove the pin from the end piece.

4. Change the o–ring and support ring which packs against the cylinder liner. Grease the o–ring with universal grease (support ring is fitted outermost).

5. Change scraper seal, support ring and seal which packs against the piston rod. Grease parts with universal grease. Change the innermost support ring when necessary.

Note! Scraper seal lip outwards, seal lip inwards.



6. Push the end piece carefully into the cylinder, hook the safety wire into the hole and rotate the end piece until the whole wire has been correctly positioned in the groove (note direction of rotation).

7. Drive the pin into the hole until it is level with the surface of the end piece.

N.B. Never use a pin that is too long (max ø4x8 mm), because it will prevent removal of the end piece in the future..

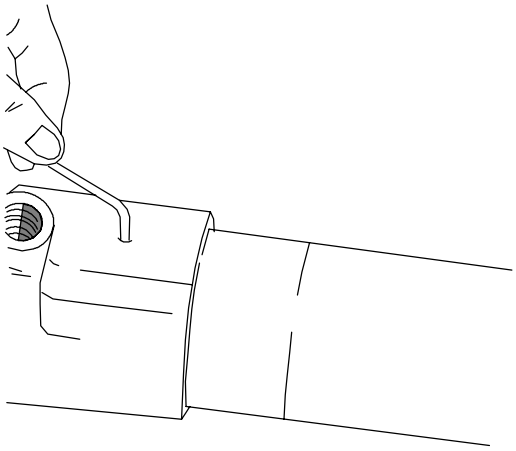
8. Apply silicon mass to the pin, to the locking wire groove and to the joint between cylinder liner and end piece.

9. Fit the steering cylinder into the front axle housing (**Op. D)**.

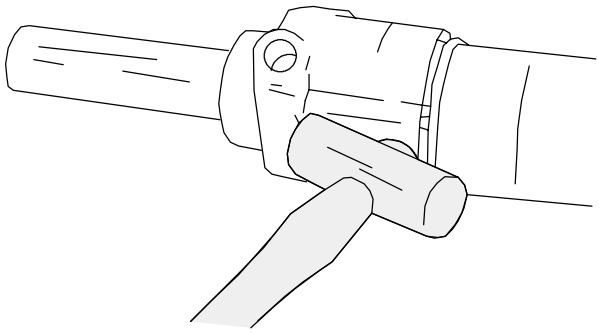
C. Changing seals in LH side end piece

1. Remove steering cylinder (**instr. A)**.

2. Secure steering cylinder in a vice.



3. Unscrew the locking screw on the LH side end piece.



4. Knock out the end piece using a hammer. Remove the now loose locking ring segments.

5. Change the o–ring on the cylinder liner outer side. Change the scraper seal, sealing ring and two support rings which are fitted on the end piece. Grease parts with universal grease.

Important: The lip of the scraper seal should be turned inwards.

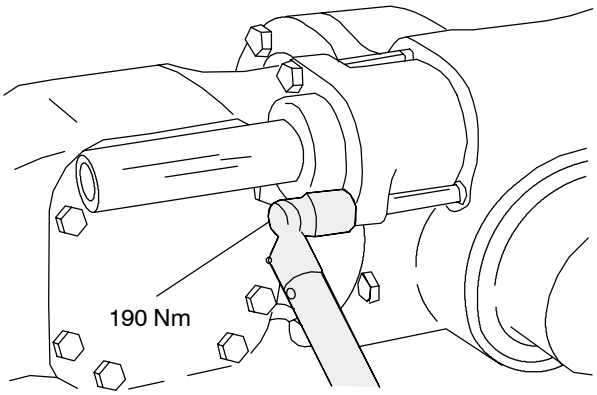
6. Fit the end piece onto the cylinder liner until it lies against the segments of the locking ring. Turn the end piece until the locking screw can be fitted.

N.B.! Apply silicon mass to the locking screw.

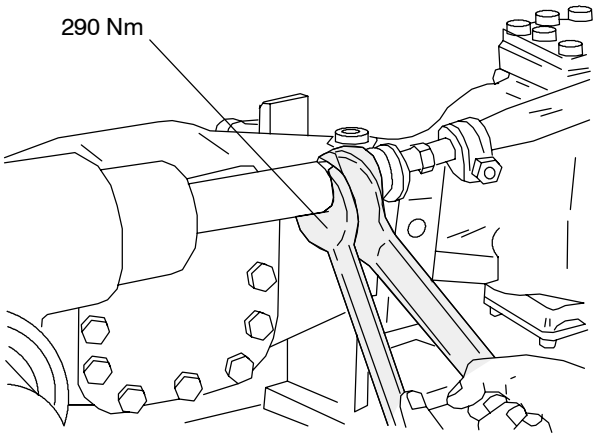
7. Fit the steering cylinder into the axle housing (**Op. D)**.

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D. Fitting steering cylinder



1. Push the steering cylinder into the axle housing. Tighten cylinder attaching screws to **190 Nm**.



2. Connect the piston rod to the tie rods. Tighten the joint to **290 Nm.** Apply locking fluid Loctite 586 to the threads.

3. Connect the oil hoses to the steering cylinder.

4. Start the engine and check that the steering system functions properly. Check for possible leakage. Check oil level in hydraulic oil tank.

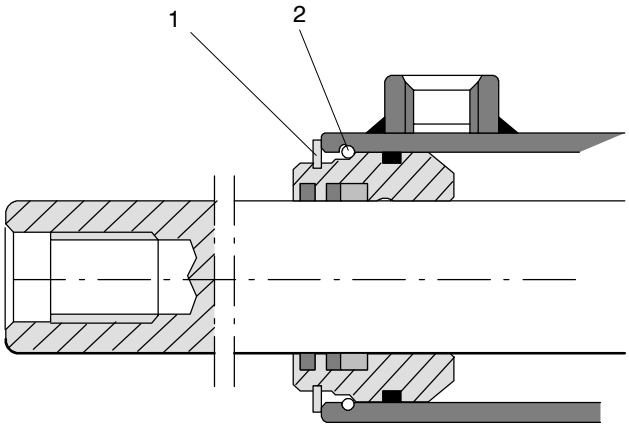
2. Later steering cylinder

The steering cylinder on Sige front axles has been changed from axle number **1673**/**94** incl. and **0306**/**94 –** incl. (Hi – Lock) or **086**/**94 –** incl. (ind. front axle)

The new cylinder is as a complete unit exchangeable with the earlier one. Order number of the new steering cylinder is 31797410.

A. Changing seals

1. Removing the cylinder, see instr. **1A** on page **613**/**1**.



2. Remove the locking ring (1). Push the end piece a little inwards and remove the securing ring (2).

3. Pull the piston rod/piston out of the cylinder with a rapid movement at which time also the end piece releases.

4. Remove all damaged seals and fit new ones.

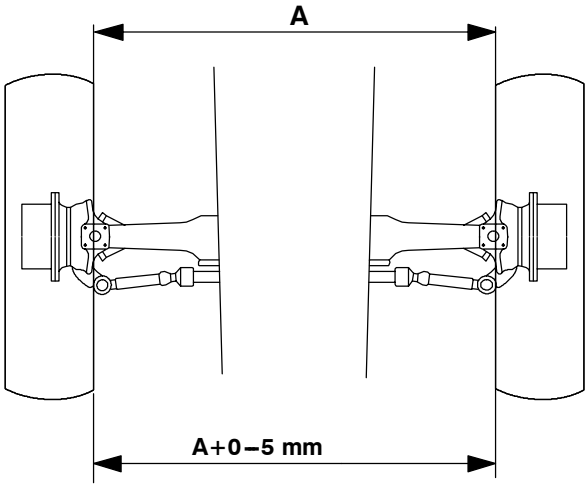
Note! A seal ring kit no 31797510 is available.
Lubricate all seals with oil before assembling the cylinder.

5. Assemble the cylinder in the reverse order. Fitting the cylinder into the front axle, see instr. **D** on this page **613**/**3**.

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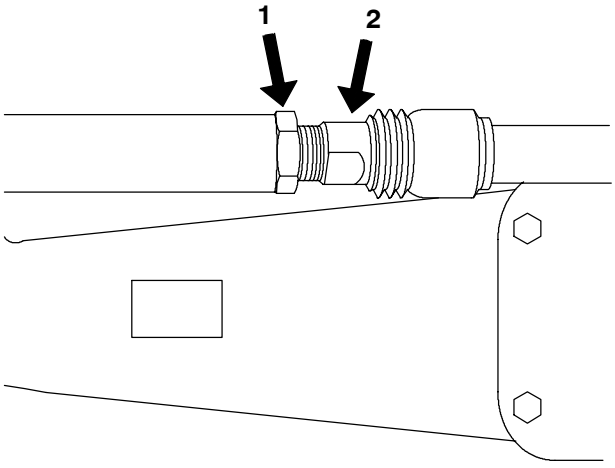
Adjustments

A. Adjusting front wheel toe–in



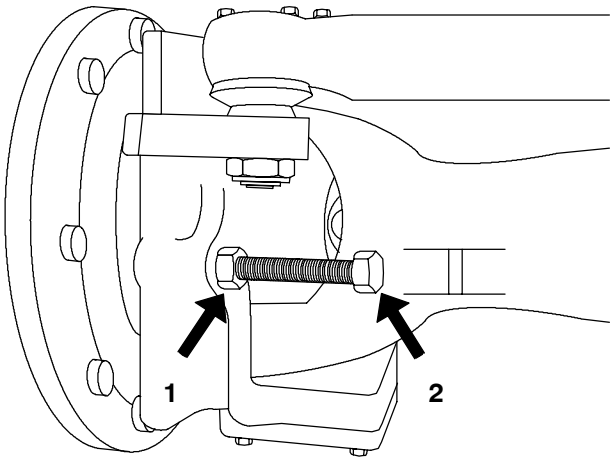
First check that there is no play on the ball joints of the steering arms and tie rods. Set the wheels for running straight ahead.

Checking
Make a vertical mark on the front tyres on the middle of the tread level with hubs. Measure the distance between the marks. Roll the tractor forwards so that the marks again come level with hubs, this time at the rear edge. Measure the distance between the marks again. The distance of the marks should be **0–5 mm** larger at the rear edge.



Adjustment
Slacken the locking screws (1) of the tie rod and turn the adjusting screw (2) in the desired direction.
Check the measurements again as above and tighten the locking screws when the correct measurement has been obtained. Both tie rods must be adjusted so that there is no limitation of the steering lock.

B. Adjusting steering lock



Adjustment of steering angle may be necessary when changing tyres or if the track width of the front wheels has been adjusted.

The front axle is fitted with limiter screws which limit the steering lock. Carry out adjustment by slackening the locking nuts (1) and adjust the adjusting screws (2). After adjusting tighten the nuts.
Adjust the adjusting screws of both sides to the same length, so that the turning angle would be same on both sides.

Contents

General (Op. no. **640**)
Technical data 2
Special tools 3
Powered front axle, description 4
4WD clutch, see section 44
Steering cylinder, see section 61
Adjusting toe–in and steering angle, see section 61

Repair instruction

Axle housing and central pivot bearing brackets (Op. no. **641**)
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B. Changing front axle central pivot bearing bracket sleeves 1
C. Fitting front axle 1

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1. Reconditioning drive shafts:
A. Changing outer ball bearing and oil seal 1
B. Changing inner bearing bushing and oil seal 3
C. Reconditioning double universal joint 3
.
Hub reduction gear (Op. no. **643**)
1. Reconditioning planetary hub gear:
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C. Changing steering knuckle bearings 3

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2. Changing pinion shaft/crown wheel:
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C. Fitting pinion shaft and adjusting position of pinion shaft 3
D. Adjusting differential bearing preload and tooth backlash pinion/crown wheel 5
E. Assembling front axle 7

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Technical data

4WD is engaged electro–hydraulically by means of a multi–disc clutch.

Axle type designation:	
– 6000–8400	Sige CS17VSD
Gear ratios:	
– differential	3,20
– hub reduction gears	5,538
– total gear ratio	17,72
Gear ratios front axle–rear axle, tractors with 2–step quick–shift gear:	
– transmission 300/30 km/h (tractors 6100–6400 and 8000)	1,391
– transmission 300/40 km/h (tractors 6100–6400 and 8000)	1,381
– transmission 420/30 km/h (tractors 6600 and 8100)	1,317
– transmission 420/40 km/h (tractors 6600 and 8100)	1,315

Note! Tractors with Delta Powershift, see page 420/2A.

Camber	1
KPI	5°
Caster	0
Toe–in	0–5 mm
Front axle oscillation	±12°
Front axle oscillation, 662538–, 8100–8400	±8°
Steering lock (adjustable)	30°–55°
Flange distance	1700 mm
Automatic differential brake:	
– number of friction discs	3+3 pcs
– number of intermediate discs	4+4 pcs
– thrust plates	1+1 pcs
Oils:	80W/90 GL–5 EP or 10W30 GL–4 STOU
Oil capacities:	
– differential	8 litres
– hub	2x1 litres

Tightening torque

Front axle attaching bolts	380 Nm
Front wheel nuts	550 Nm
Propeller shaft flange joint	35 Nm
Tie rod–steering arm	160 Nm
King pin attaching bolts	120 Nm
Ring gear attaching bolts	75 Nm
Crown wheel attaching bolts	70 Nm
Pinion shaft nut	250 Nm
Axle housing bolts	190 Nm
Planetary gear housing attaching bolts	70 Nm

Setting values

Thickness of diff. brake disc set	14,51–14,69 mm
Steering knuckle bearing preload	0,6 mm
Differential bearing preload	0,05 mm
Tooth backlash, crown wheel/pinion shaft	0,2–0,25 mm (measured at pinion shaft drive flange)
Rolling resistance, pinion shaft bearings (measured using spring balance (without seals)	3–5 kg ø 60 mm (0,9–1,5 Nm)
Axial clearance (between axle housing–pivot bearing brackets)	0,1–1,1 mm

Sealing compounds and locking fluids used:

Sealing compound Loctite 290
– on outer sides of oil seals
– on wear ring inner surfaces
– on hub seal dust cover
Medium strength locking fluid Loctite 242
– ring gear attaching bolts
Heavy strength locking fluid Loctite 586
– tie rod–piston rod

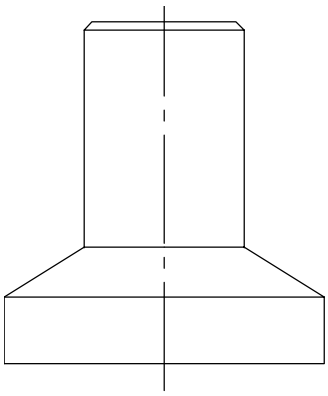
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Special tools

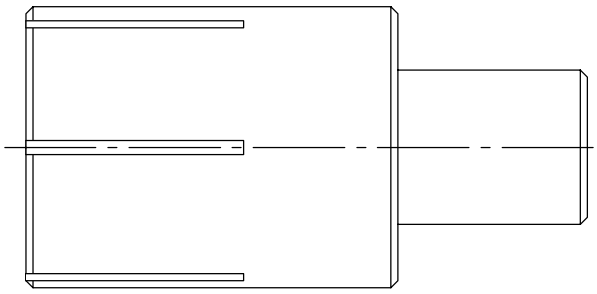
ETV 892 290 Sleeve for fitting drive shaft outer oil seal (powered front axle 505–905)
ETV 893 600 Sleeve for fitting pinion shaft oil seals (powered front axle 505–905)
ETV 893 730 Plate for fitting drive shaft inner oil seal (powered front axle 505–905))
ETV 894 020 Plate for fitting hub oil seal (powered front axle 505–905)
ETV 894 150 Flate for fitting hub oil seal of cassette type (1701/94–)

Locally prepared tools

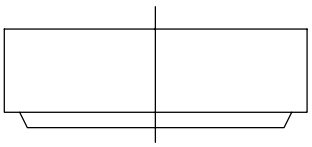
ET 894 010 Drift for fitting/removing drive shaft bushing (powered front axle 505–905)
Extractor for removing king pins



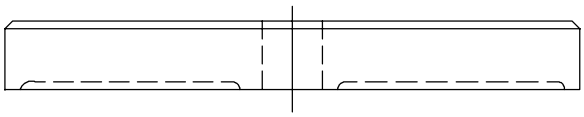
ETV 892290



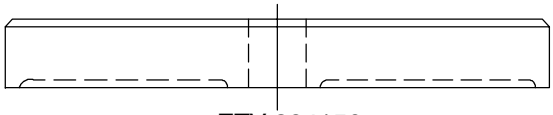
ETV 893600



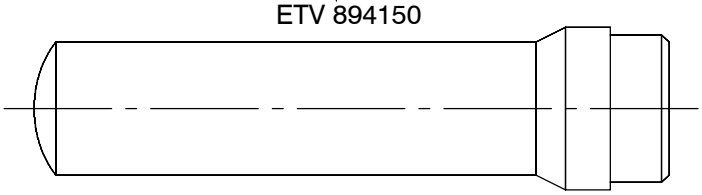
ETV 893730



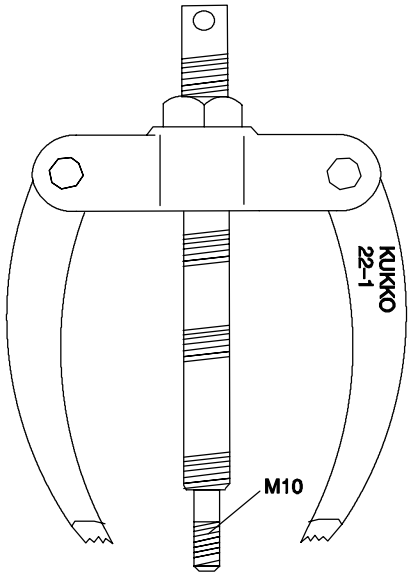
ETV 894020



ETV 894150



ET894010



Extractor for removing king pins

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Powered front axle

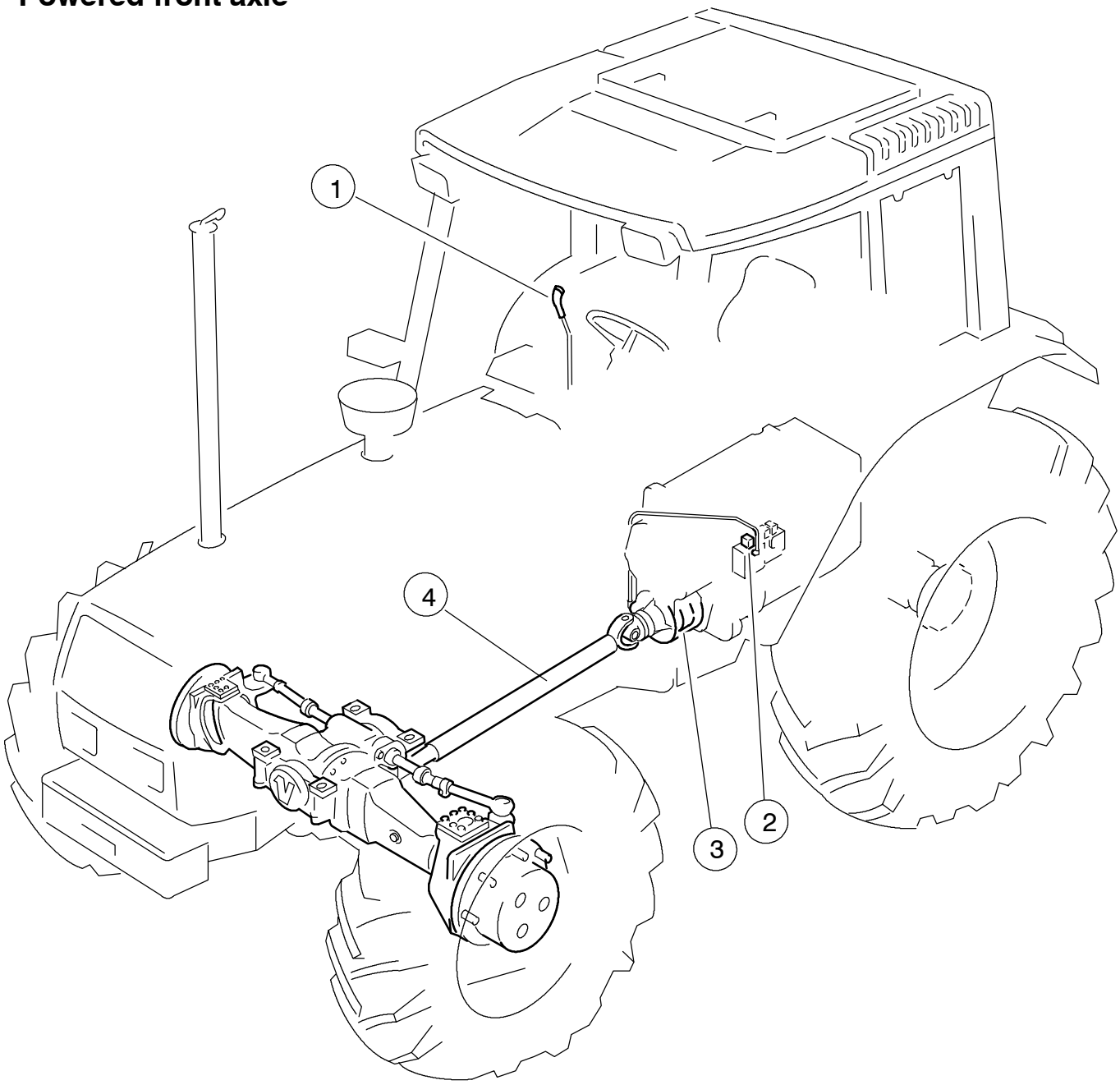


Figure 1. *Powered front axle*

1. 4WD switch is placed on the range gear lever knob
2. Solenoid valve for 4WD on the servo valve block
3. 4WD clutch/output shaft is fitted in the lower part of the reverse shuttle housing
4. Propeller shaft

Note! *Reconditioning 4WD clutch, see section 44*

Note*! 4WD engages automatically when the brake pedal/pedals are depressed*

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Powered front axle, description

Powered front axle on 6100–8100 tractors is the same Sige–axle as on Valmet –05 series.

The powered front axle is attached to the front end of the tractor by two bearing brackets. There is a small clearance between the axle housing and central pivot bearing brackets. This clearance can be adjusted with shims.

The power is transmitted from the gearbox to the pinion shaft by the propeller shaft. From the pinion shaft, power is transmitted through the differential to the drive shafts and through the double universal joints to the hub reduction gears and the front wheels

The drive shafts are carried in bearing bushings in the axle housing and in ball bearing in the swivel housings.

In each hub gear the planetary pinions (3 off) are carried in roller bearings in the retainer. The ring gear is bolted to the steering knuckle.

The steering knuckle is attached to the front axle housing by the king pins which are carried in taper roller bearings. The bearing preload of the king pins is adjusted with shims at the upper pin.

The differential is provided with an automatic differential brake. The friction discs are fitted between the differential side gears and the differential casing.

Position of pinion shaft, tooth backlash and differential and pinion bearing preload are adjusted with shims.

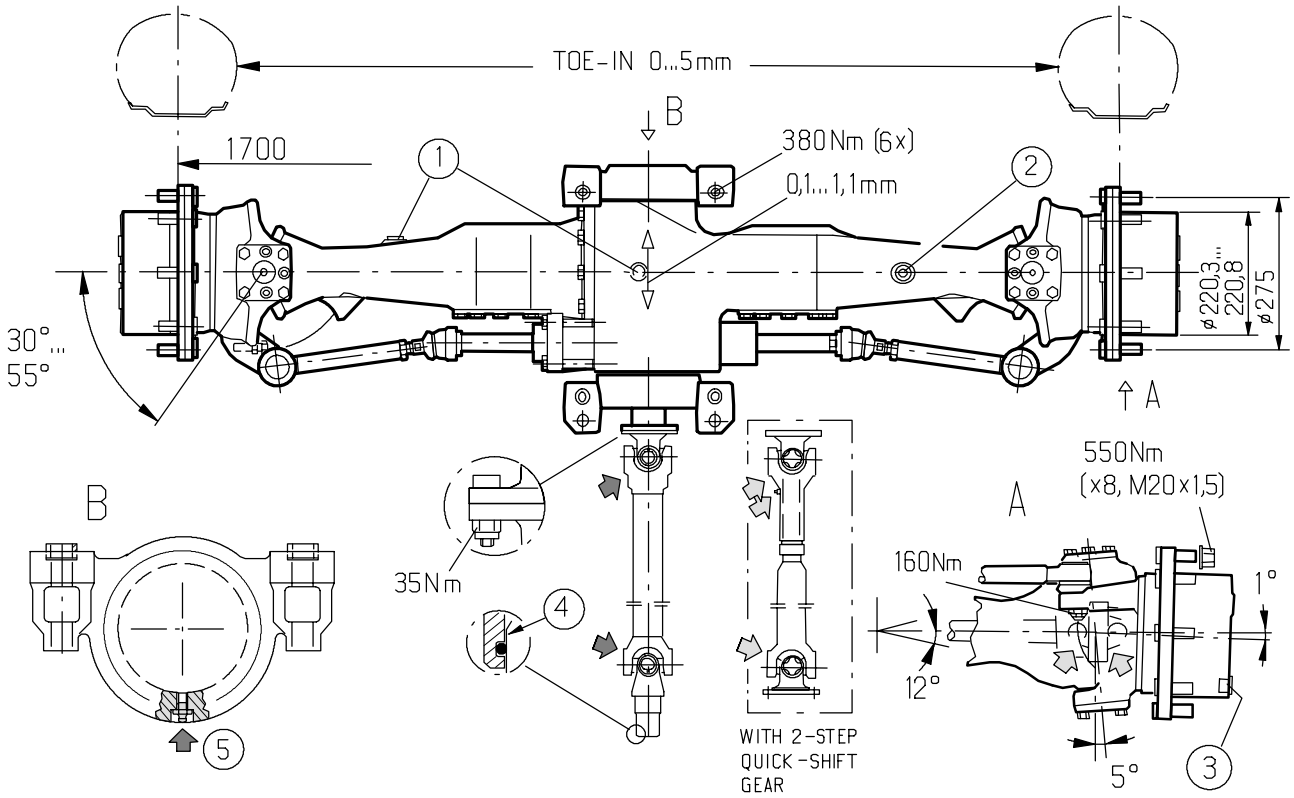


Figure 2. *Sige front axle*

1. Plug for checking and raining oil in differential housing
2. Oil filling plug for differential housing
3. Oil filling and draining plug for hub
Note! *Oil levels in the axle should be checked every 500 running hours. Oil should be changed yearly/every 1000 running hours. Central pivot bearing bracket nipples (B) must be greased at every 50 running hours, other nipples at every 250 running hours.*
4. Pressure resistat grease on splines in connection with repairs
5. Earlier two grease nipples, later one grease nipple.

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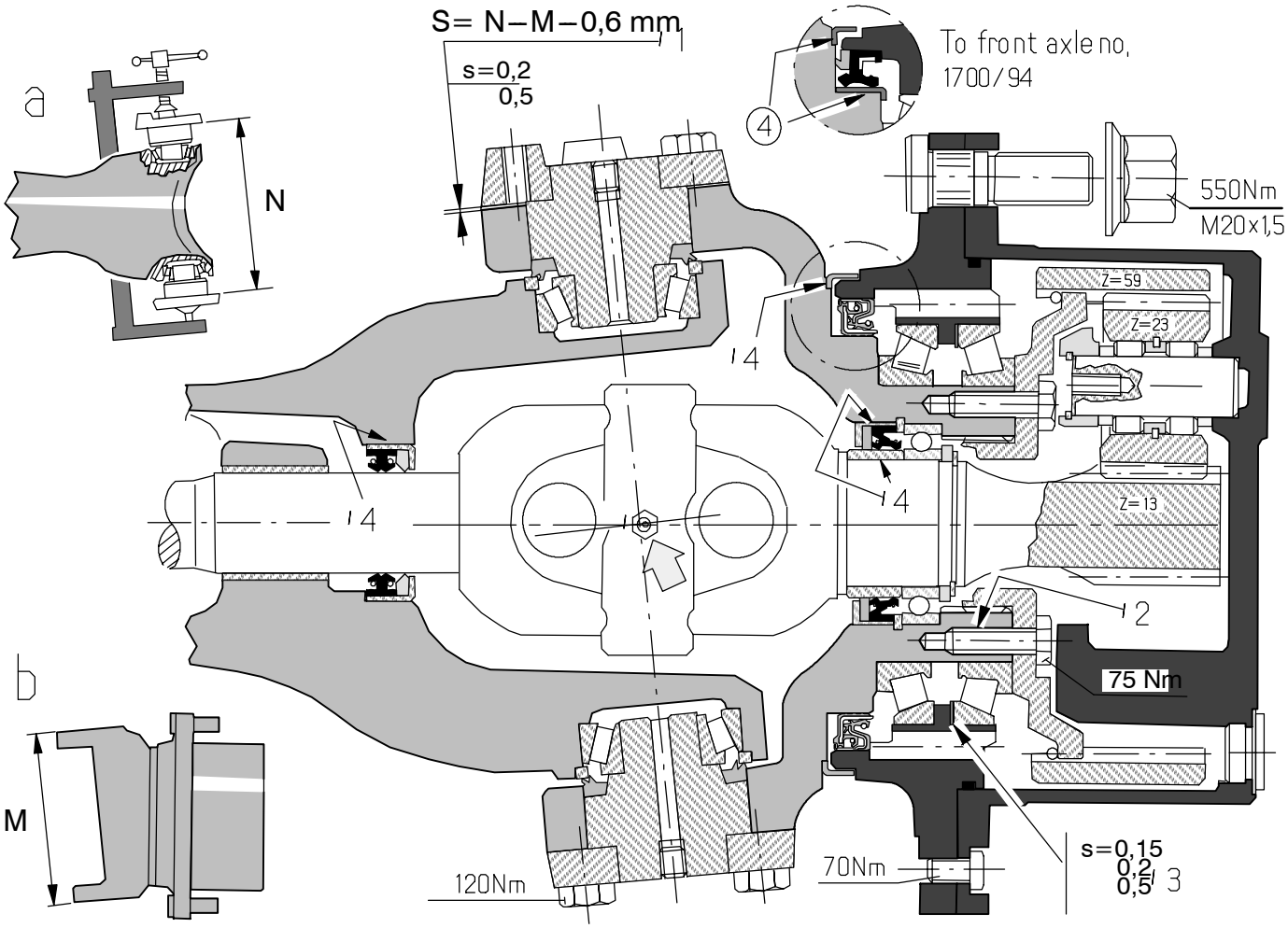


Figure 3. *Planetary gear, Sige front axle*

1. Shims for adjusting steering knuckle bearing preload
2. Locking fluid Loctite 242 on threads
3. Shims for adjusting wheel bearing preload
4.Sealing compound Loctite 290
a) Adjustment of steering knuckle bearings preload
b) Adjustment of steering knuckle bearings preload

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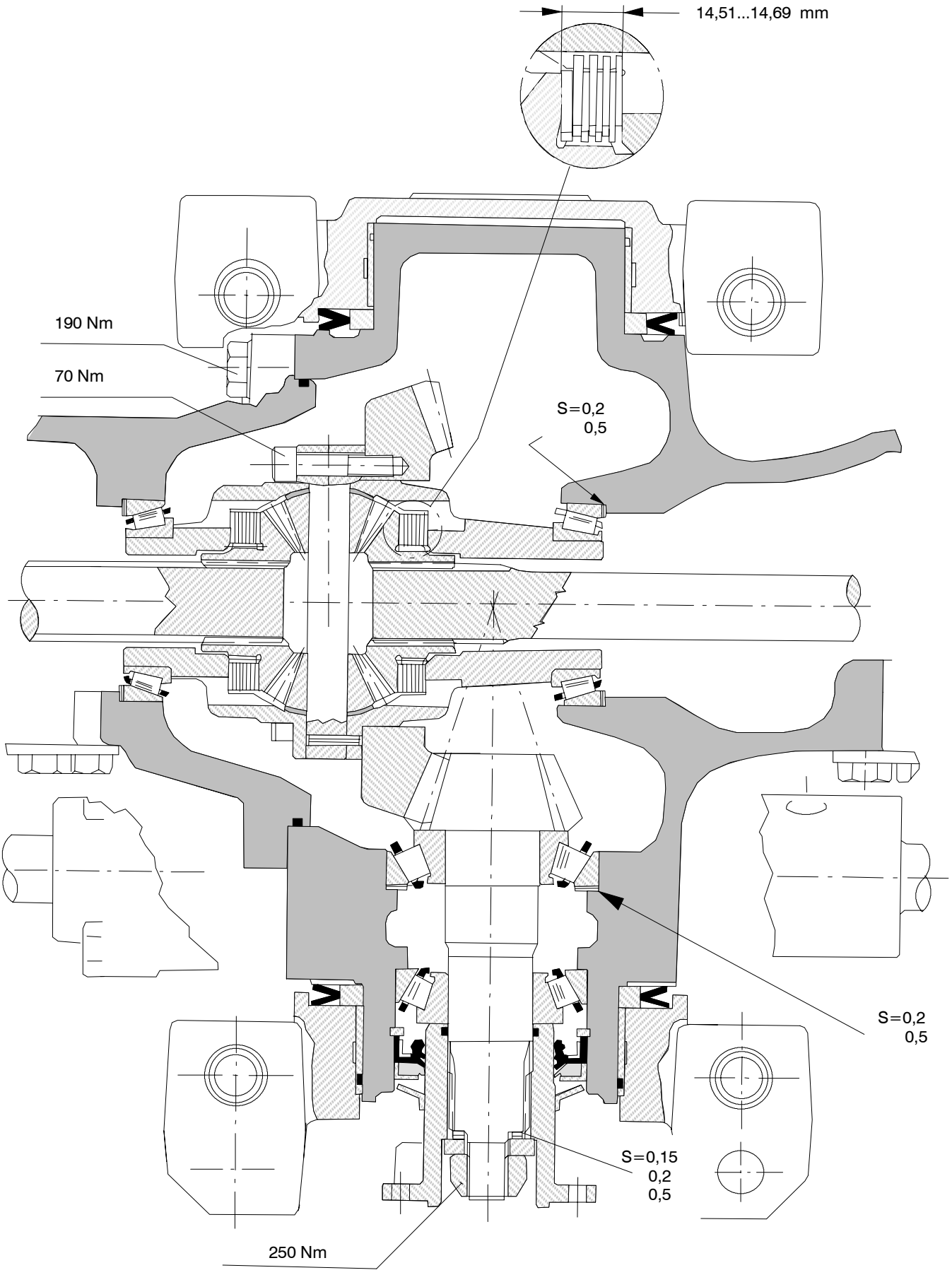
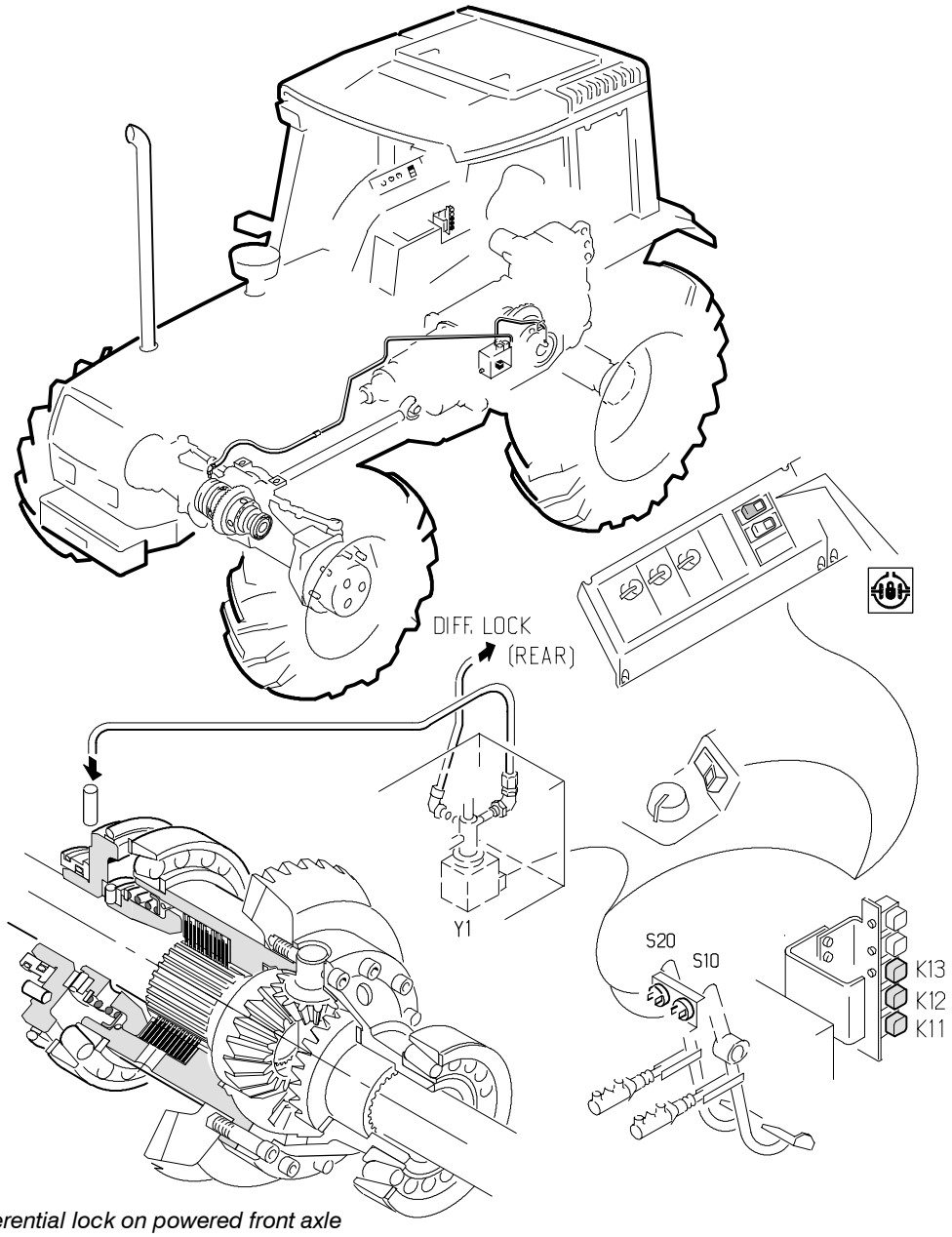


Figure 4. *Differential, powered front axle*

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Differential lock



Picture 5. *Differential lock on powered front axle*

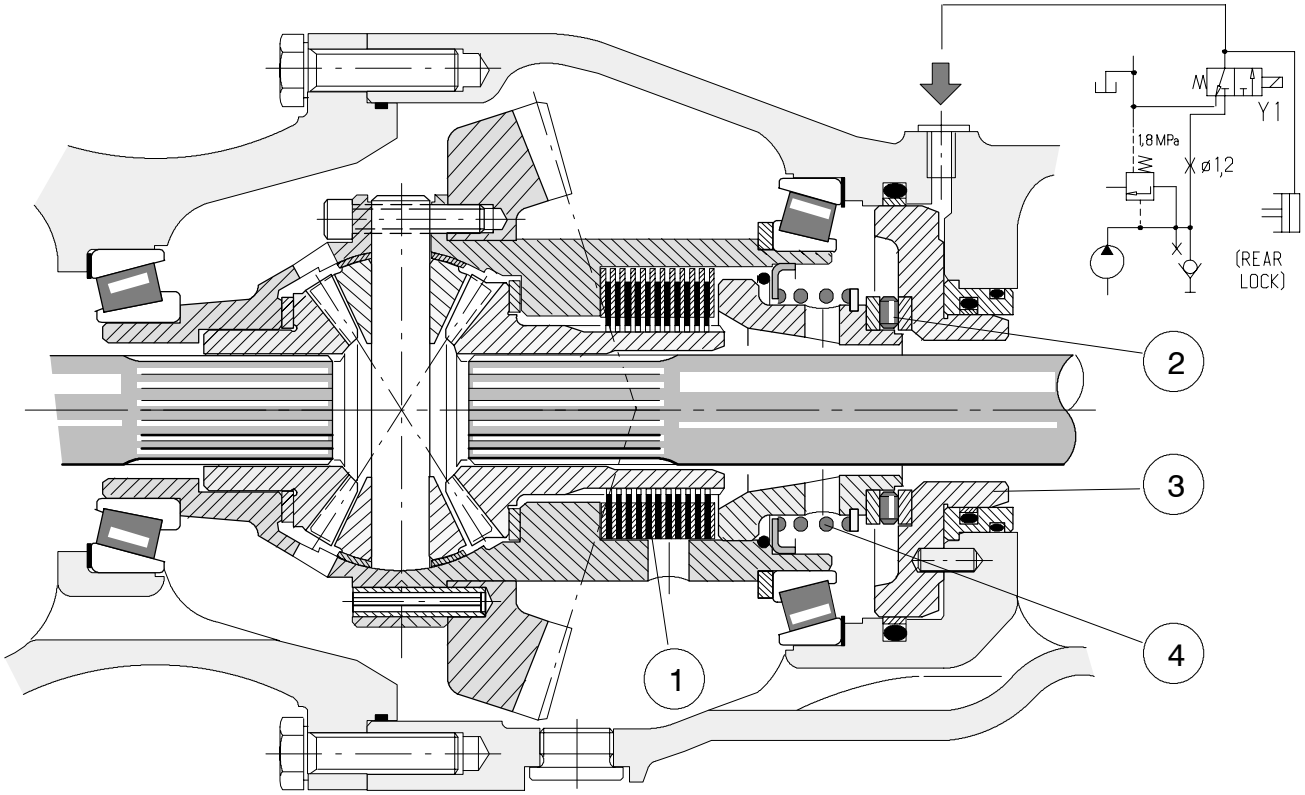
The front axle differential lock is an optional equipment for all Mezzo–tractors from the beginning of the year 1994.

The front and rear locks are supplied via the same solenoid valve (Y1) and both locks are controlled with the same rocking switch on the driver's right. Clutch pressure (1,8 MPa) from the low pressure circuit.

Differential lock control, see **Autocontrol II** under code **311**, **Autocontrol IV** under code **350**.

Repair instructions of the differential lock, see page **644**/**8**.

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Picture 6. *Cross section of differential lock*

1. Disc pack: 11 friction discs ja 12 steel discs
2. Thrust bearing
3. Piston
4. Return spring of piston

The differential equepped with the lock cannot be fitted into the standard axle since the differential with the lock requires a new axle housing.

Axle housing and central pivot bearing brackets (Op. no. 641)

A. Removing front axle

1. Drain the oil from the hub gears and from the differential (if necessitated by the repair job in hand).

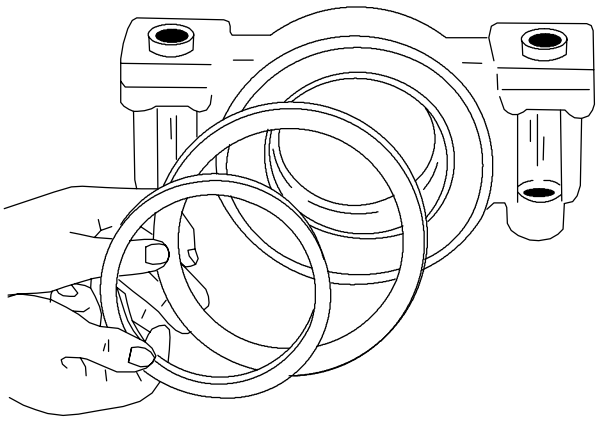
2. Remove the propeller shaft guard. Disconnect the propeller shaft front flange joint from the pinion shaft.

3. Disconnect oil hoses from the steering cylinder. Raise the tractor front end and place axle stands under the front frame. Remove front wheels if needed.

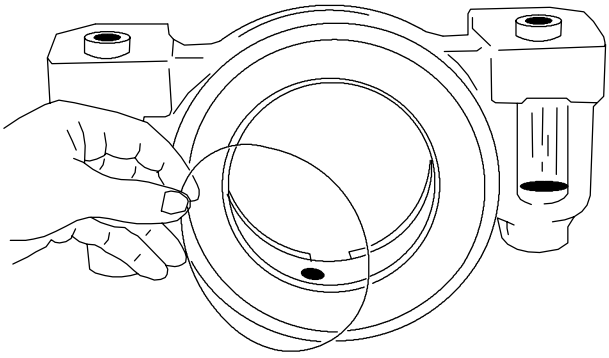
4. Connect the hoist to the front axle and remove axle bearing brackets from tractor frame. Remove the axle from the tractor.

B. Changing central pivot bearing brackets sleeves

1. Remove front axle (**see Op. A 2 – 4)**



2. Remove bearing brackets from axle. Check condition of bearing sleeves.



3. Check condition of v – ring and intermediate ring. Grease all parts with universal grease. Also grease the o – rings for the sleeves.

4. Fit bearing brackets onto the axle and fit the axle (**Op C).**

N.B. Central pivot bearing brackets should have a small axial clearance (0,1 – 1,1 mm). Adjust this if necessary using shims.

C. Fitting front axle

1. Check that bearing brackets are in right position on the axle.

2. Lift up the front axle and tighten the bearing bracket attaching bolts to **380 Nm**. **Note!** Propeller shaft guard front end must be fitted under the rear attaching bolts.

3. Connect the steering cylinder oil hoses. Connect the propeller shaft flange joint (**35 Nm**).

4. Fit the front wheels if removed (**550 Nm**). Remove supports from under the tractor.

5. If the oil was drained refill the differential (**8 l**) and both hubs (**2x1 l**).

6. Grease the front axle central pivot bearings.

7. Test run the tractor and check that the steering system function properly.

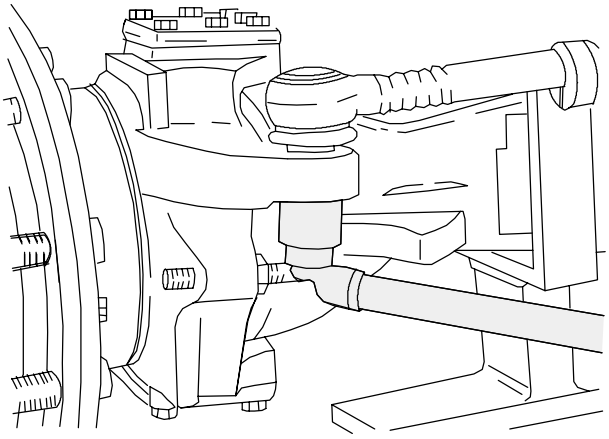
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Drive shafts (Op. no. 642)

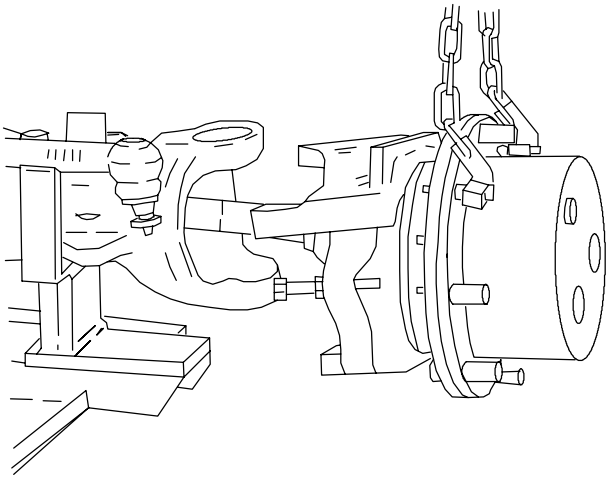
1. Reconditioning drive shafts

A. Changing outer oil seal and ball bearing.

1. Raise the tractor front end and place axle stands under the tractor. Drain the oil from the hub.

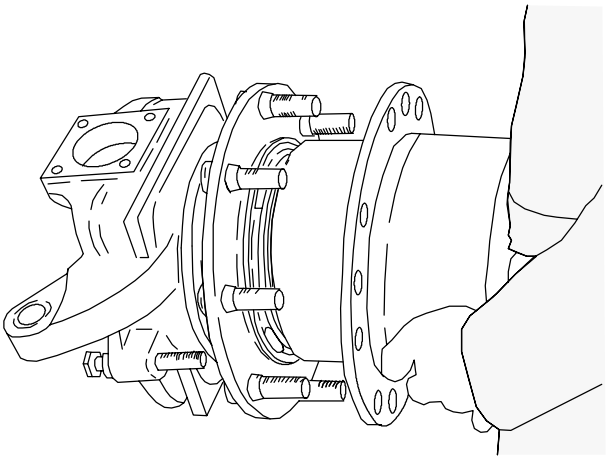


2. Disconnect the tie rod from the steering arm.

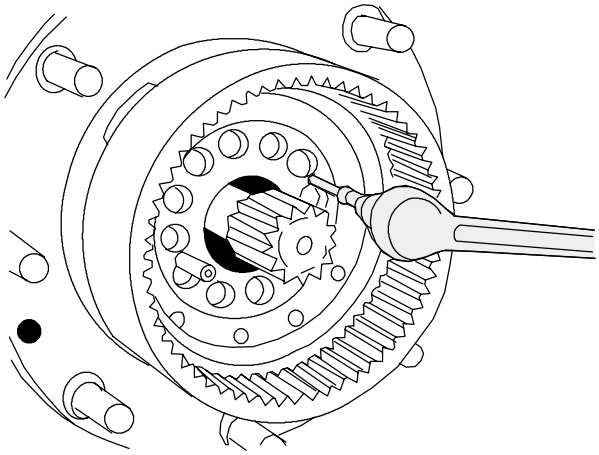


3. Support the hub with a suitable hoist and remove the king pins. Carefully pull out the hub from the axle housing; the drive shaft will also be loosened.

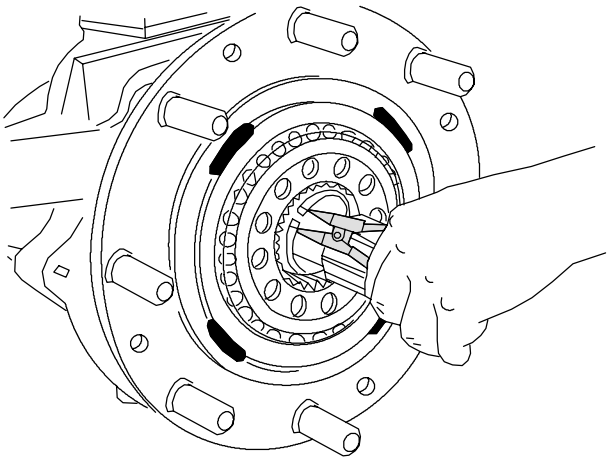
Note! Do not damage the drive shaft inner oil seal. King pins can be removed by using a standard extractor e.g. Kukko 22–1 (see page **640**/**3**)



4. Unscrew the planetary gear housing screws and pull the planetary gear unit out from the hub.



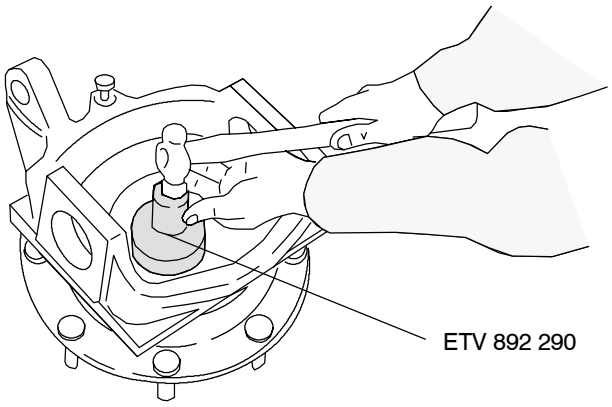
5. Unscrew the ring gear attaching bolts and pull out the ring gear using puller screws (M8).

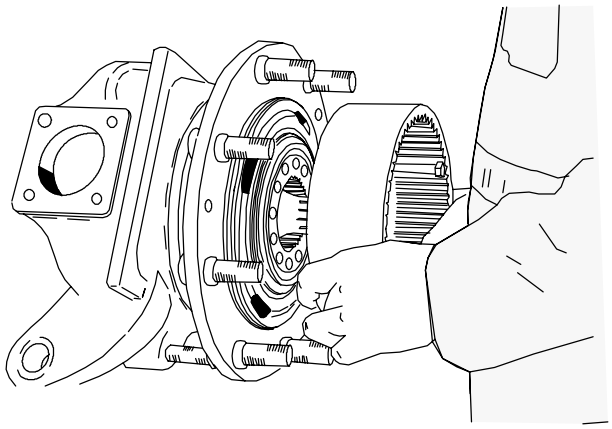


6. Remove the drive shaft circlip and spacer ring and knock out the drive shaft from the hub.

7. Pry out the drive shaft outer seal from the hub. Remove the ball bearing circlip and the bearing. Fit a new bearing; push it right home against the bottom of the housing and fit the circlip.

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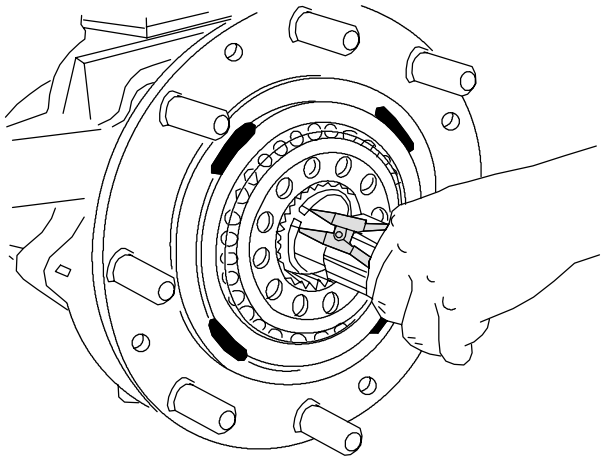


8. Oil the new seal and fit it into the place against the circlip.

N.B. Tool ETV 892290 can be used when fitting the seal. Apply sealing compound Loctite 290 to the outer side of the seal.

9. Fill the space between the seal lips with universal grease. If necessary change the oil seal wear ring on the drive shaft. Apply sealing compound Loctite 290 to the inner side of the wear ring.

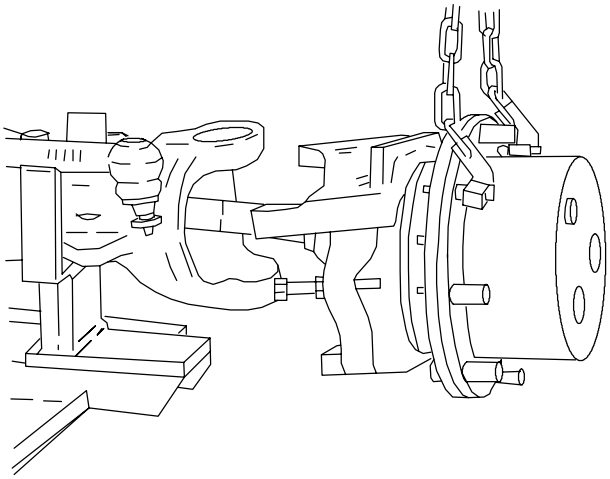
N.B. Heat the wear ring to 80˚C before fitting; heating makes it easier to fit onto the shaft.



10. Wrap thin plastic film round the drive shaft splines (sun gear) and push carefully into the hub. Fit the drive shaft spacer ring and circlip..

11. Fit the ring gear and tighten bolts evenly to **75 Nm.** Apply locking fluid Loctite 242 to threads.

12. Check the planetary gear housing o–ring and change if necessary. Apply universal grease to the o–ring. Attach the housing to the hub. Tighten the screws to a torque of **70 Nm**.



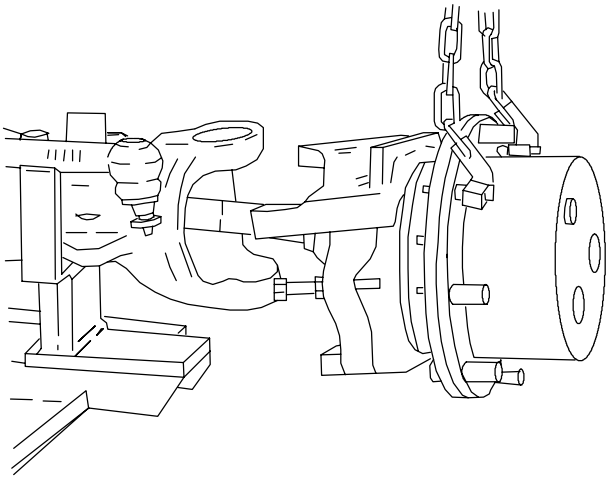
13. Fit the hub on the axle housing and push the drive shaft carefully into the housing, avoiding damage to the drive shaft inner oil seal. Push the drive shaft until its splines slide into the splines in the differential.

14. When the drive shaft is fully home the hub is attached to the axle by means of the king pins. Replace the same shims under the upper king pin, which were removed. Tighten the king pins to **120 Nm.**

15. Connect the tie rod to the steering arm (**160 Nm**). Fill the hub with oil and fit the front wheel (**550 Nm**). Test run the tractor and check for possible leakages

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B. Changing inner bearing bushing and oil seal

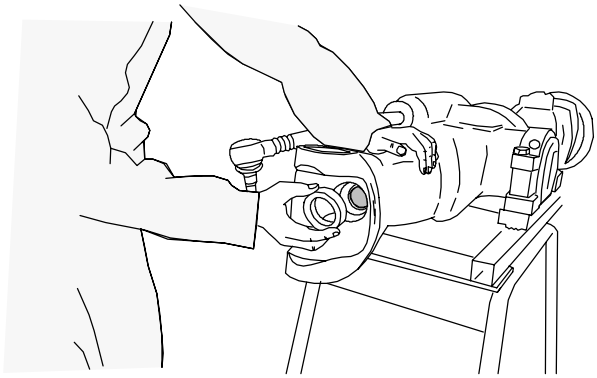


1. Remove the hub and the drive shaft **(see Op A; 1–3**).

2. Remove the old oil seal from axle housing.

3. Check the bearing bushing behind the seal. If the bush has to be changed tap it into the axle housing by using the drift ET 894010. Fit the new bush into its place with the same drift. Grease the bushing with universal grease.

N.B. The old bushing can be removed from the axle housing through the cover which is fitted on the front side of the housing.

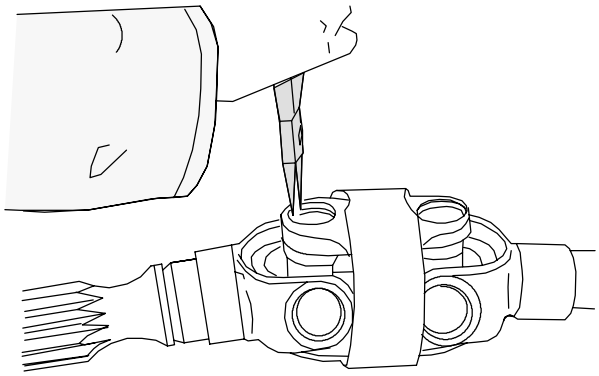


4. Apply sealing compound Loctite 290 to the outer side of the new oil seal. Oil the seal and fit it carefully in place using tool ETV 893730 with the all–purpose handle. Fill the space between the seal lips with universal grease.

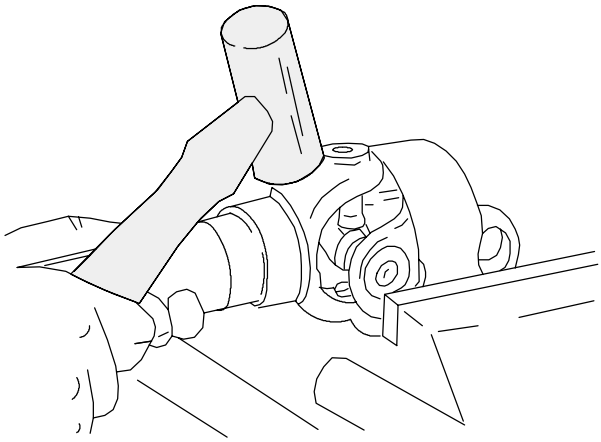
5. Fit the drive shaft and the hub onto the axle housing (**see Op. A; 13–15**).

C. Reconditioning double universal joint

1. Remove the drive shaft (**see Op. 642 1A; 1–6**).

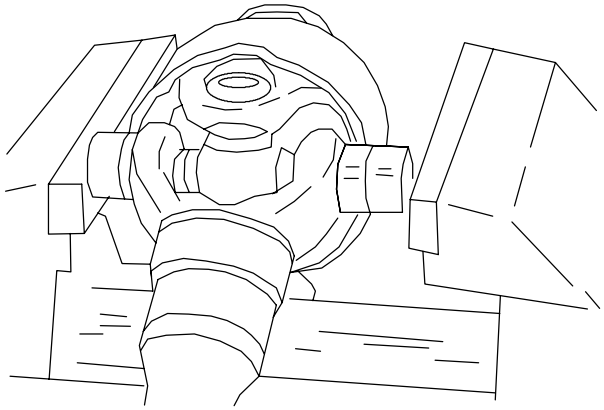


2. Remove the cross journal snap–rings (8 pcs).



3. Secure the joint in a vice and tap either side of the fork shank to remove the bushings. Remove all the bushings in the same way; this will also free both cross journals.

N.B. There are bearing needles in the bushing. The needles can be kept in position with grease.



4. Fit the bushings as shown in the figure above. When the bushings are in place the snap–rings can be fitted.

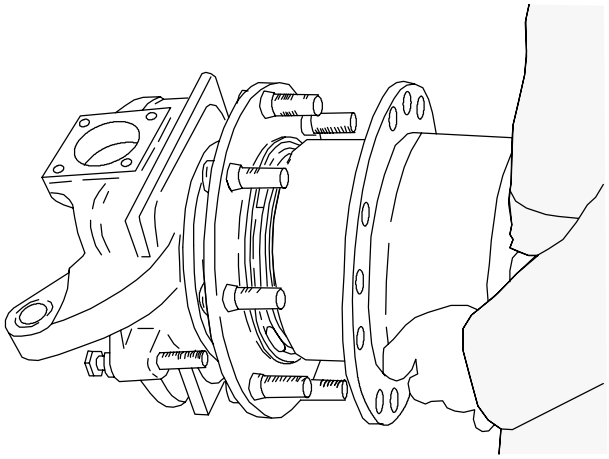
5. Fit the drive shaft (see **Op. 642 1A; 10–15**).

Hub reduction gear (Op. no. 643)

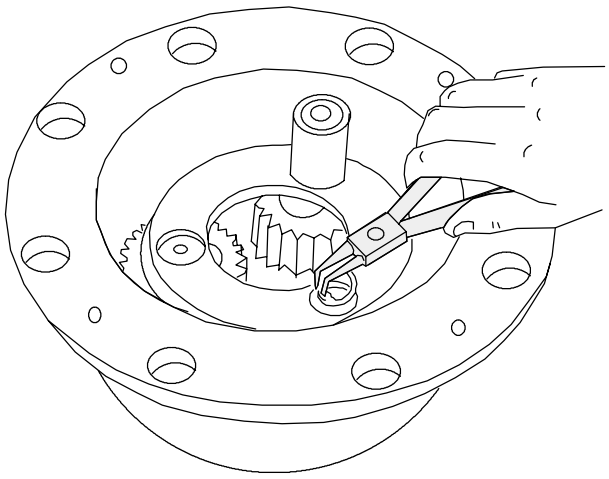
1. Repairing planetary gear

A. Changing planetary pinion roller bearings

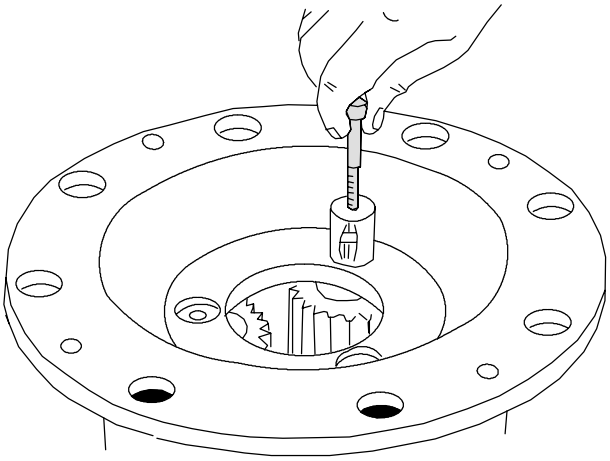
1. Raise the front end of the tractor and support the tractor frame. Remove the front wheel on the side requiring repair. Drain the oil from the hub.



2. Unscrew the planetary gear housing screws and pull the housing off the axle.



3. Remove the planetary pinion shaft circlips.



4. Pull off the shafts using a screw (M8). The fit is not particularly tight.
5. To remove the gears, first move two from the outside, after which the third one can be removed through the middle. Remove all the gears in the same way.

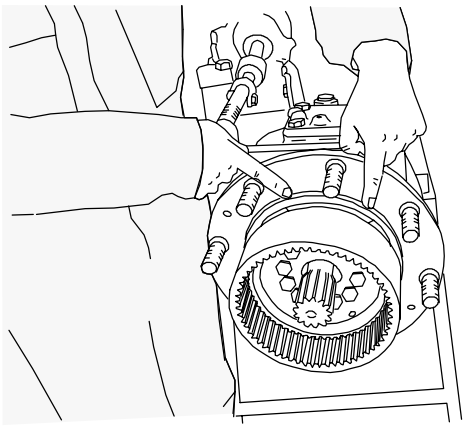
6. Remove the old bearing rollers from the gears.

7. Fit new bearing rollers (rollers are changed as a complete set) and apply grease to the rollers so that they are held in place on the gears. Fit the outer spacer rings against the rollers.

8. First fit the two gears carefully through the middle hole of the retainer and position them against the housing. Then fit the third gear into place through the middle hole.

N.B. Check that the rollers and spacer rings are correctly positioned before fitting the pins.

9. Push the pins into place and fix them with circlips.



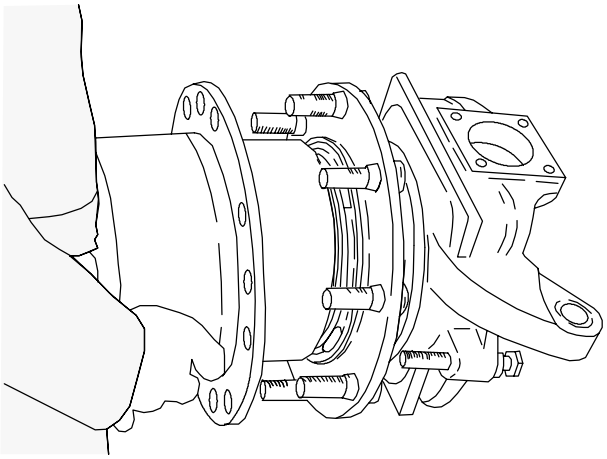
10. Check the o–ring on the planetary gear housing and change if necessary. Fit the planetary gear onto the steering knuckle and tighten the bolts to **70 Nm.**

11. Fit the front wheel **(550 Nm**). Fill the hub with oil and testrun the tractor.

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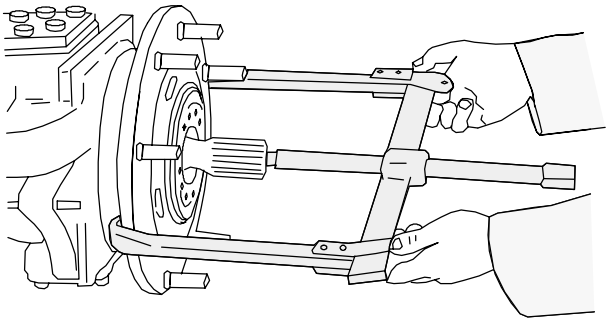
B. Changing wheel bearing and hub oil seal

1. Raise the front end of the tractor and support it with sturdy trestles. Remove the front wheel from the side to be repaired. Drain the oil from the hub.



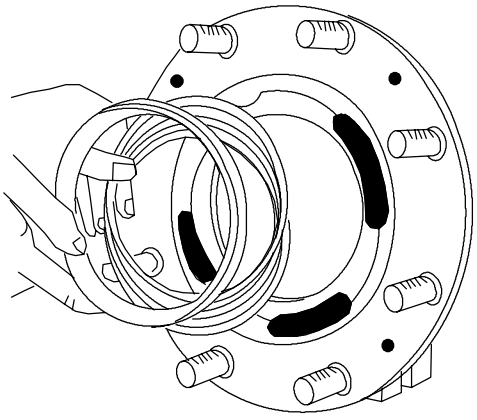
2. Unscrew the planetary gear housing screws and remove the housing from the axle.

3. Unscrew the ring gear attaching screws; pull off the ring gear with aid of two screws (M8).

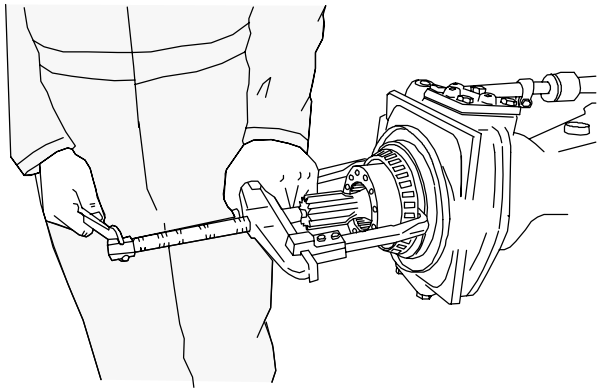


4. Pull off the wheel attaching flange using a puller; this action releases the outer bearing of the wheel.

5. Use a drift to tap out the wheel bearing outer races. Fit new outer races.

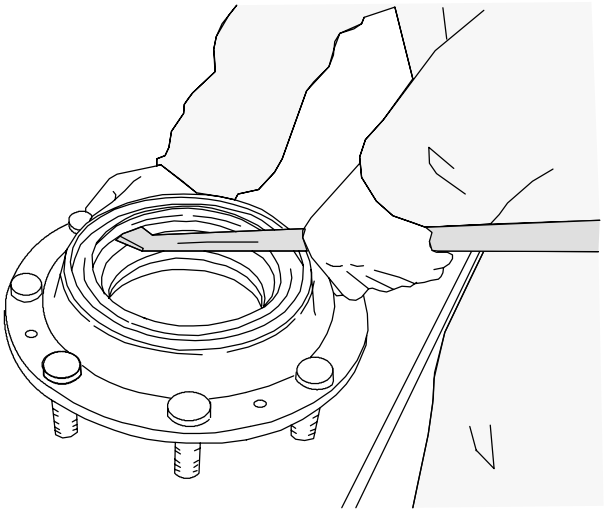


Important: to ensure that the wheel bearing has the correct preload replace the same shims under the outer race of the outer wheel bearing.



6. Remove the inner bearing from the steering knuckle using an extractor. When the bearing is changed it can be removed by attaching a puller behind the rollers.

7. Heat the new inner bearing (80˚C) and push it fully home onto the knuckle. Oil the bearing rollers.



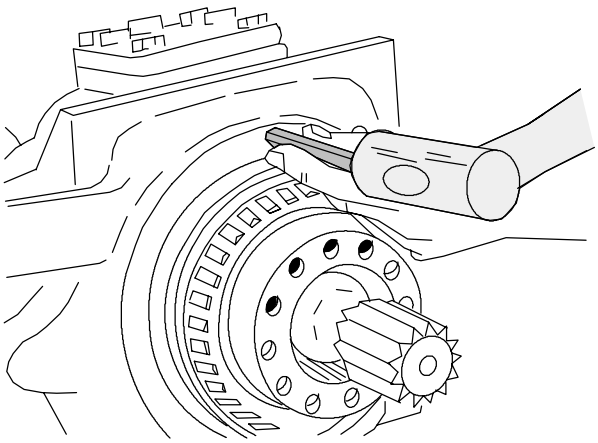
8. Change hub oil seal if necessary (ETV 894 020). It can be removed by tapping it through the holes in the opposite side. Fit the dust seal ring. Fill the space between the lips of the seal with universal grease.

Note! On the latest axles there is a cassette type hub oil seal, which can be fitted with plate ETV 894 150. The casette seal is fitted on standard axles from axle no. **1701**/**94** incl. and on the Hi–Lock axles from axle no. **0036**/**94** incl. In connection with the cassette seal the wear ring is not used. The wear ring should be removed from the earlier axles before fitting the cassette seal. The spare part steering knuckles have a wear ring which should be removed before the cassette seal is fitted.

9. Check the wear ring of the hub oil seal and change it if necessary. The wear ring is easier to remove if it is warmed up.

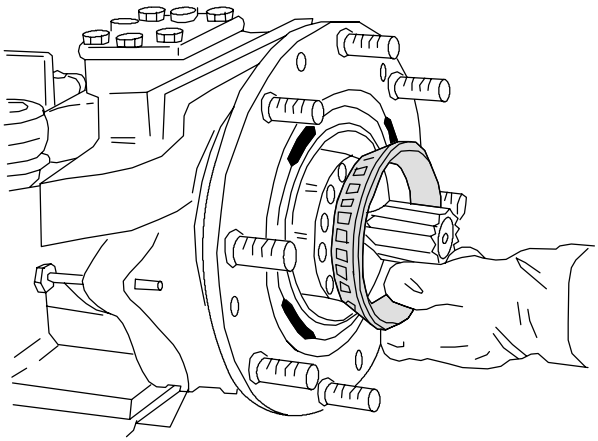
N.B. Heat the wear ring to 80˚C when fitting. Apply sealing compound Loctite 290 to the inner surface of the wear ring.

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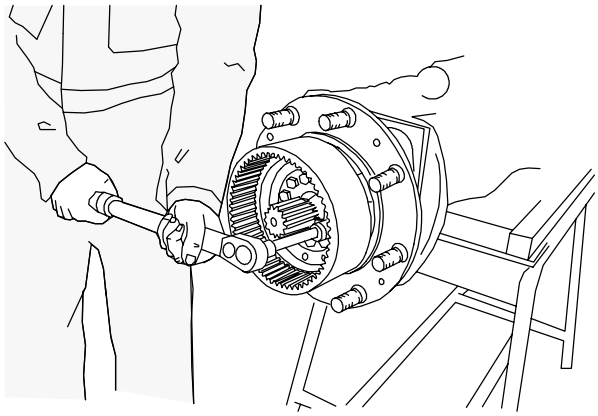


10. If you change the dust–cover apply sealing compound Loctite 290 to the rear side. Fix the dust–cover with sex equidistant clips of the drift punch.

11. Fit the wheel attaching flange onto the knuckle. It should be pushed fully home so that the outer race of the bearing is against the bearing rollers.



12. Heat up the outer bearing (80˚C) and push it fully home against the outer race. Oil the bearing.



13. Fit the ring gear and tighten the screws to **75 Nm.** Apply locking fluid Loctite 242 to the threads.

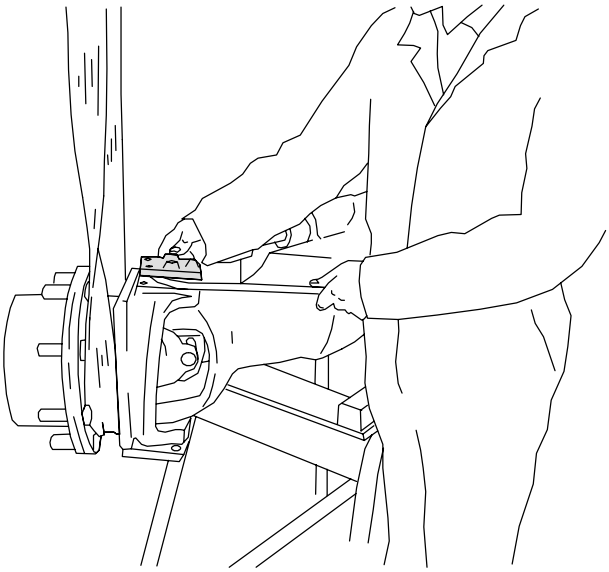
14. Check the condition of the o–ring on the planetary gear housing and change it if necessary. Grease the o–ring. Fit the planetary gear housing and tighten the screws to **70 Nm.**

15. Fit the front wheel, tighten to **550 Nm** and fill the hub with oil. Test–run the tractor.

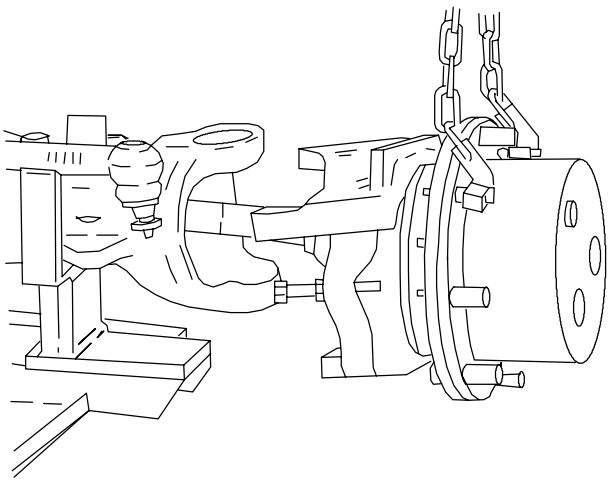
C. Changing steering knuckle bearings

1. Raise the tractor front end and support it with sturdy trestles. Remove the front wheel from the side to be repaired.

2. Disconnect the tie rod from the steering arm.



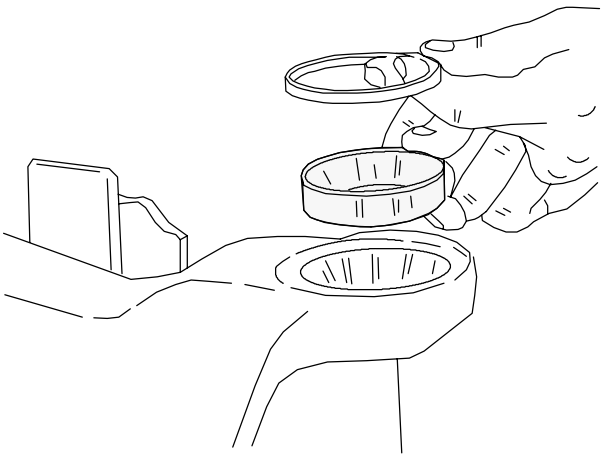
3. Support the hub with a hoist and remove the king pins by using extractor Kukko 22–1 (see page **640/3**)



4. Pull the hub carefully off the axle housing; this releases the drive shaft.

Note! Do not damage the drive shaft inner oil seal if it is not being changed.

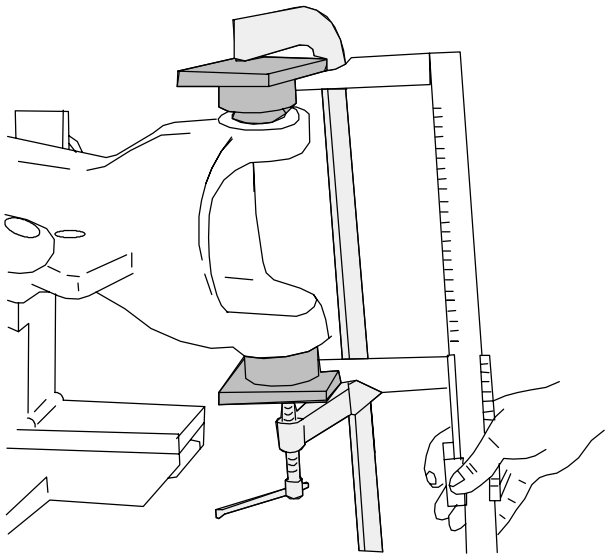
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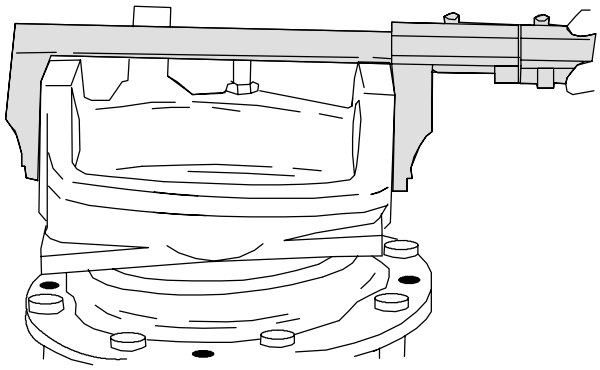
5. Change the outer races of the steering knuckle bearings. Apply compound Loctite 290 to the outer sides of the races. Apply grease to the bearing surface and fill the bearing location with grease. Fit the spacer rings in front of the races. Apply Loctite 290 to the spacer rings.

6. Remove the bearings from the king pins and fit new bearings. Grease bearing rollers. Fit new seals into the king pin holes inside the knuckle.Grease the seals.

7. Adjust the steering knuckle bearing preload as follows:



– Press the king pins into place using a screw clamp and measure the distance between the inner surfaces of the king pin cover **(measurement N e.g. 258,50 mm)**



– On the knuckle housing measure the distance between the surfaces as shown in the figure above **(measurement M e.g. 256,85**)

– Calculate the number of shims required (**measurement S**), taking into account the fact that the bearings are preloaded by **0,6 mm** (**measurement P**).

S=N–M–P (=258,50–256,85–0,6=1,05)

8. Fit the required number of shims under the upper king pin.

9. Fit the steering knuckle onto the axle housing **(see Op 642 1A;13–15)**.

Differential (Op. no. 644)

1. Reconditioning differential

A. Changing pinion shaft seal (without removing the front axle)

1. Drain the oil from the differential. Remove the protective shield and unscrew the propeller shaft front flange joint.

2. Unscrew the pinion shaft nut and remove the spacer ring and shims which are under the nut. Pull the drive flange off the shaft.

3. Pry out the oil seals and fit new seals (tool ETV 893600 can be used to facilitate fitting the seals). Fill the space between the lips of the seal with universal grease).

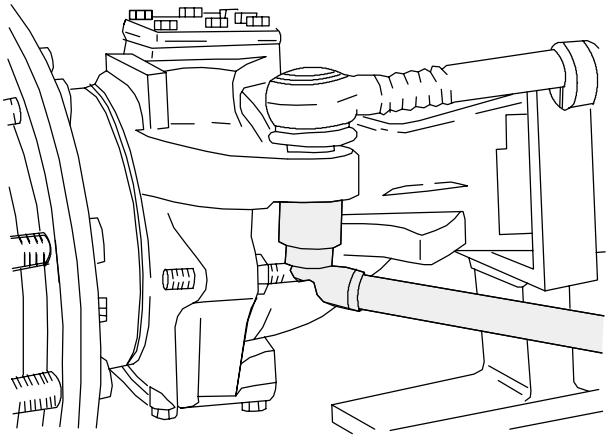
4. Check the drive flange o–ring and change if necessary. Grease the o–ring.

5. Fit the drive flange, shims (use the same shims) and the spacer ring onto the shaft. Tighten the nut to **250 Nm.** Connect the propeller shaft flange joint (**35 Nm**). Fit the protective shield.

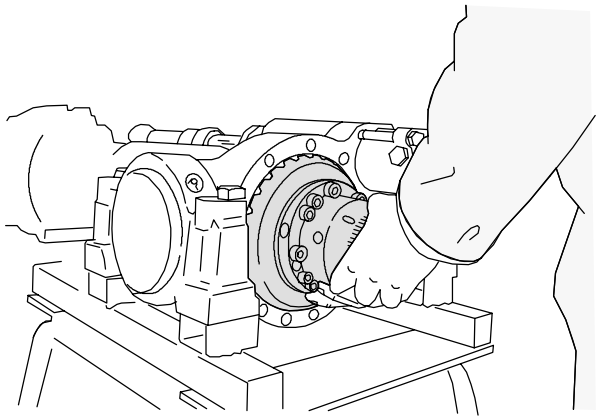
6. Fill the differential with oil and test–run the tractor. Check for possible leakages.

B. Changing differential friction disc

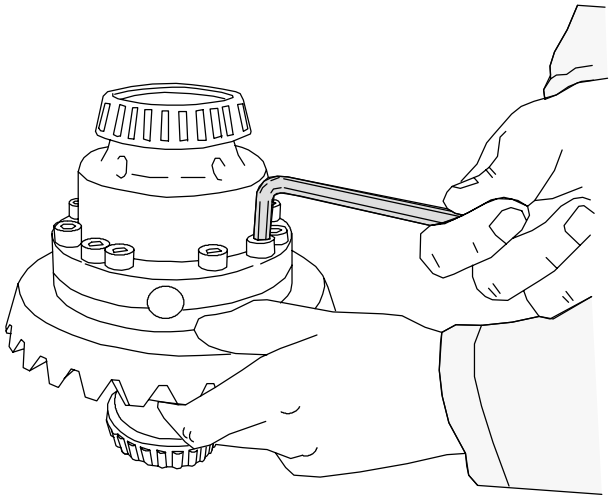
1. Raise the front end of the tractor and support it with sturdy trestles. Drain the oil from the differential housing.



2. Disconnect the tie–rod from the steering arm on the side with the shorter axle section.

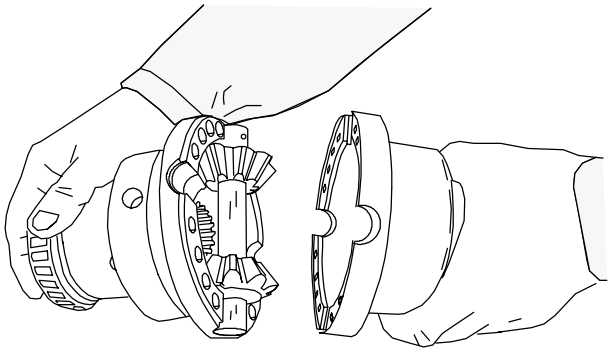


3. Pull the axle housing section apart once the bolts have been unscrewed. Remove the differential unit from the axle housing..



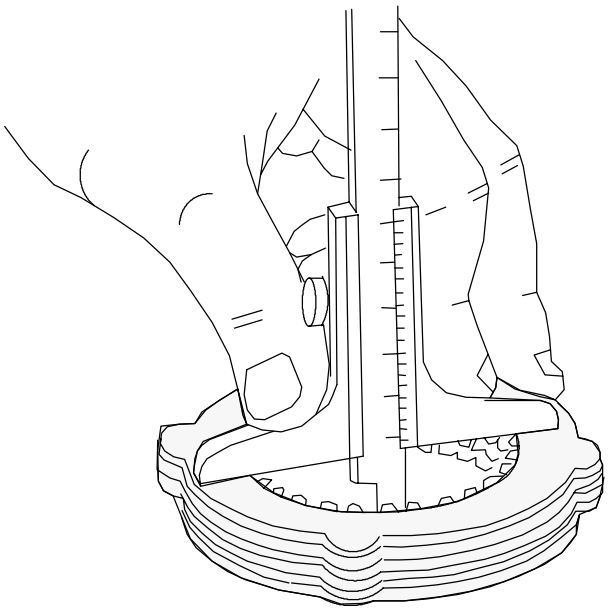
4. Unscrew the bolts holding the differential carrier. Knock off the crown wheel and remove the locking pins.

N.B. Mark the halves of the differential carrier to facilitate reassembling.



5. Open the carrier and remove the various components.

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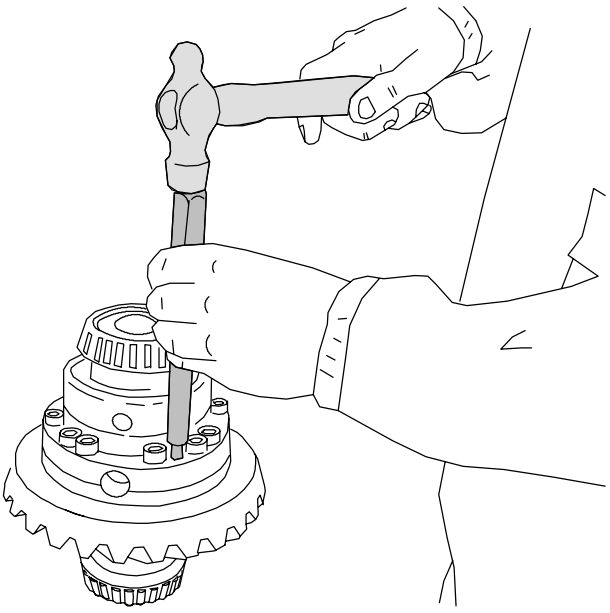
6. Check the friction disc for wear and change if necessary. Measure the total thickness of the set of discs. It should be in the range **14,51–14,69 mm**. Immerse the discs in oil before reassembling.

N.B. In the event of replacement, renew both the RH and LH pack. The thickest disc with internal teeth should be fitted with the smooth side against the differential side gear. Next fit friction disc and intermediate disc alternatively. The last disc should have external teeth.

7. Also check both differential pinions and side gears and change if necessary. Oil all parts.

N.B. The differential pinion shaft is locked by means of the locking pin. The diff. pinion thrust–washers are fitted so that the locking lugs engage in the grooves on the differential carrier.

8. Reassemble the differential and fit the carrier halves so that the marks are in the same places as they were before dismantling. Fit the crown wheel and tighten the screws to **70 Nm.**



9. Fit the locking pins. First fit the bigger pin and then the smaller pin inside with the split pointing towards the heads of the screws

10. Rotate the differential with the splined end of the drive shaft. The drive shaft should turn freely, without resistance.

11. Fit the differential unit into the housing and attach the bolted joint of the axle housing. Check the o–ring on the joint and apply grease to it. Tighten the screws to **190 Nm.**

12. Attach the tie–rod to the steering arm (**160 Nm**). Fill the differential housing with oil. Test–run the tractor.

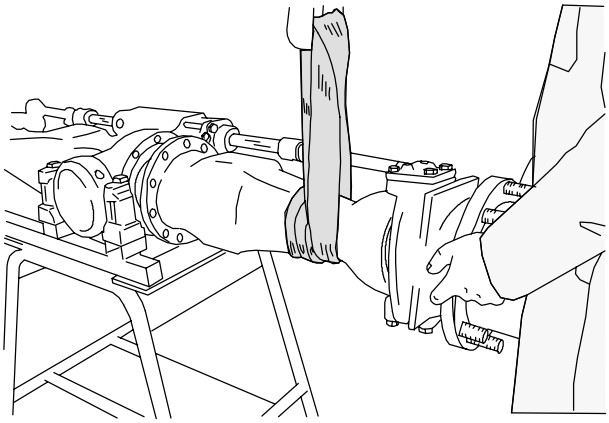
2. Changing crown wheel/pinion shaft

Note! This operation is easier if the front axle is detached from the tractor. However this is not essential.

A. Removing differential

1. Remove the front axle (**Op. no. 641 A)**. Drain the oil from the differential housing.

2. Detach the tie–rod from the steering arm on the side with the shorter axle section.

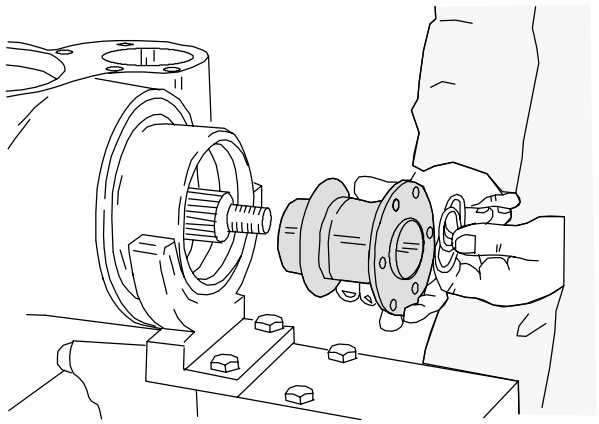


3. Unscrew the bolted joint on the axle housing.

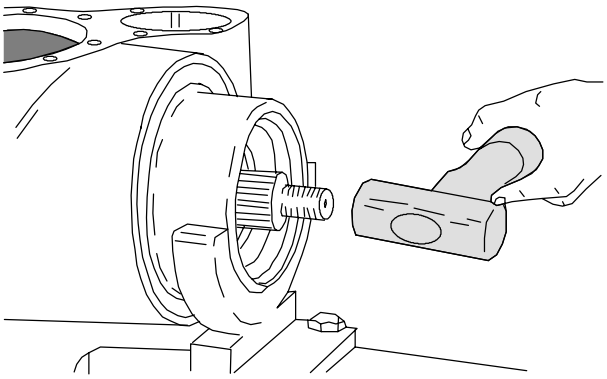
4. Remove the differential unit. Detach the old crown wheel. Fit a new crown wheel and tighten the screws to **70 Nm**.

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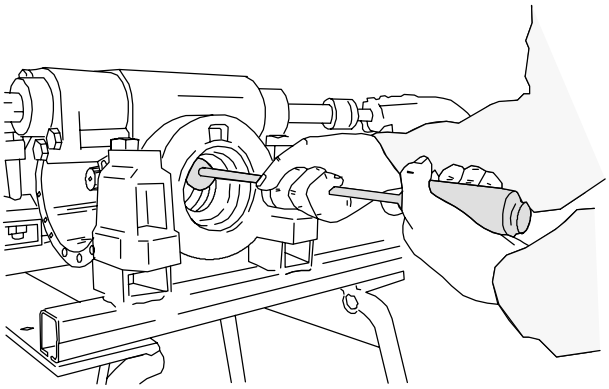
B. Removing pinion shaft



1. Unscrew the pinion shaft nut and remove the spacer ring and shims from under the nut. Remove the drive flange from the shaft.



2. Tap the pinion shaft out from the bearing and remove the outer bearing as it is freed.



3. Remove the oil seals from the shaft housing. Remove the circlip which is placed behind the seals and use a puller to extract the outer bearing race.

4. Tap out the inner bearing race from the housing and remove the shims from under the race. Tap the inner bearing off the shaft.

5. Check the condition of the bearings and change if necessary.

C. Fitting pinion shaft adjusting position

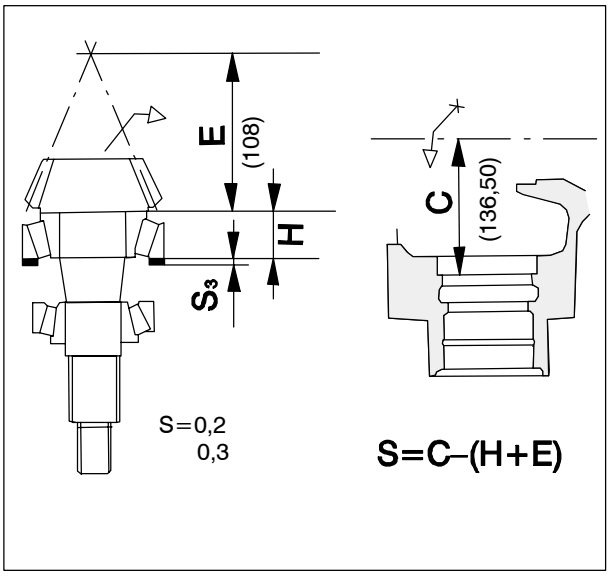
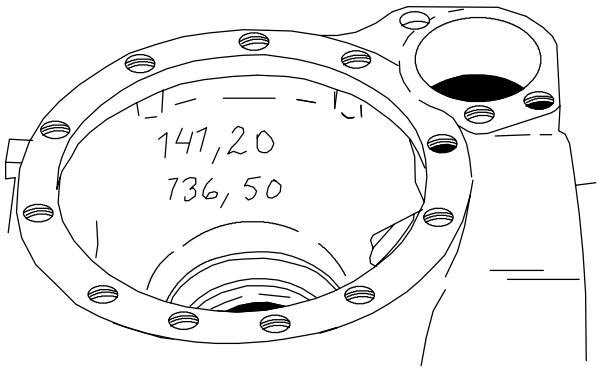


Figure 5. Adjusting pinion shaft position

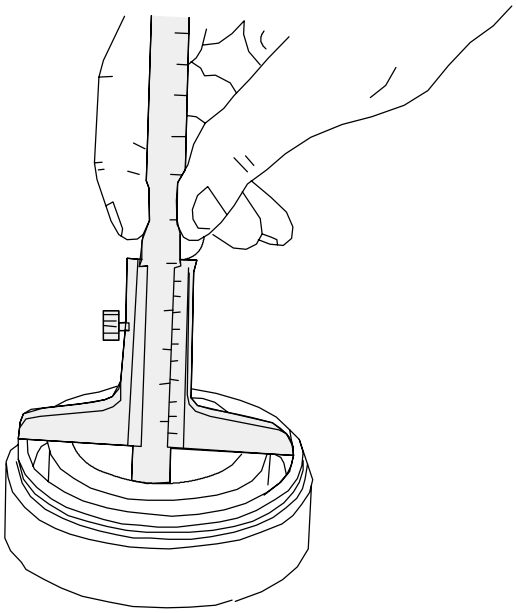
1. Read off the value **E** which is stamped on the end of the pinion shaft (e.g. 108,00 mm).



2. Check the smaller figure marked in the axle housing (in side for the longer axle section), measurement **C** (e.g. 136,50 mm).

Note! If no measurement can be found in the axle housing, see page **644/6A**.

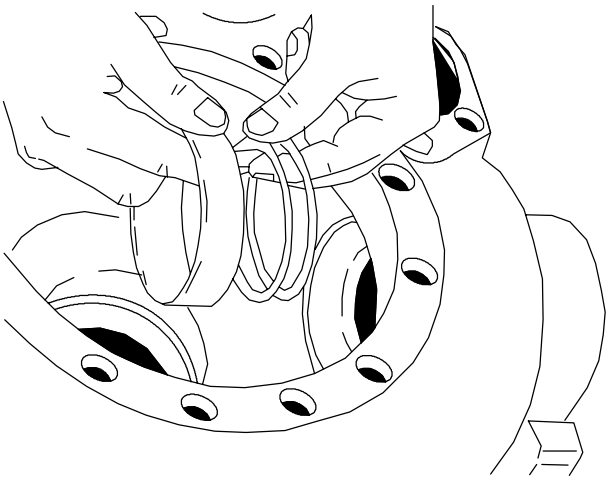
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3. Measure the thickness of the inner bearing (larger bearing), measurement **H** (e.g. 28,00 mm).

4. Calculate the number of shims required for correct pinion shaft position:

S=C–(H+E)=136,50–(108,00+28,00)=0,5 mm



5. Put the shims required under the inner bearing outer race and fit the outer race against the shims. Fit the outer bearing outer race.

6. Heat the inner bearing to 80˚C and fit it onto the pinion shaft. Push fully home.

7. Push the pinion shaft into the housing. Heat the outer bearing to 80˚C and push it onto the shaft against the outer race. Fit the circlip.

8. Fit the drive flange onto the pinion shaft (do not fit the seals yet) and fit the shims, spacer ring and the nut. Tighten the nut to **250 Nm.**

N.B. Turn the shaft 20–30 revolutions before measuring the rolling resistance and lubricate the bearings with oil.

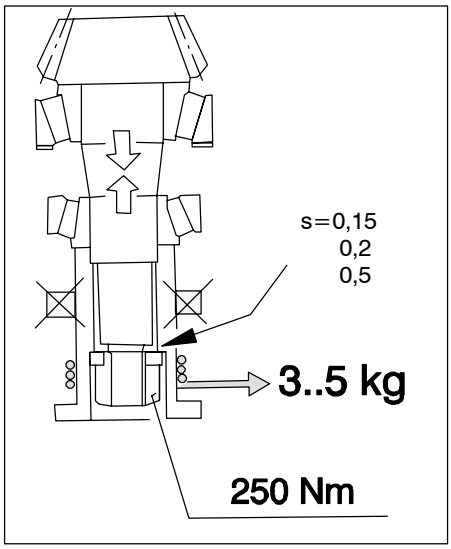
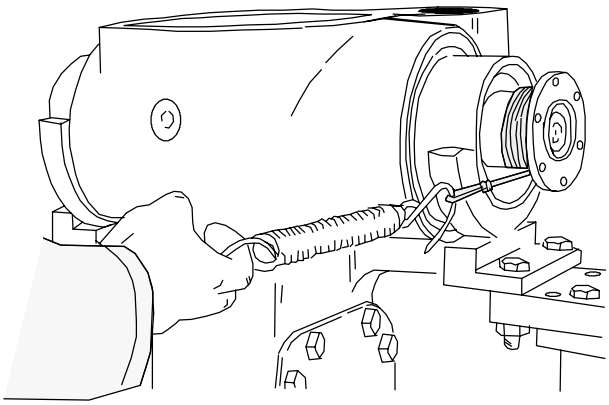


Figure 6. Adjustment of pinion shaft bearing preload.



9. Use a spring balance (see figure above) to measure the force needed to rotate the pinion shaft. The rolling resistance should be **3–5 kg.** If the rolling resistance is not correct the number of shims under the nut must be adjusted.

N.B. If the rolling resistance is too great more shims are required and vice versa.

10. When rolling resistance is correct the seals can be fitted. Grease the lips of the seal with universal grease; fit a dust seal in front of the seal.

N.B. Tool 893600 can be used when fitting the seals.

11. Fit shims, spacer ring and drive flange; tighten the nut to **250 Nm.**

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D. Adjusting differential bearing preload and pinion/crown wheel tooth backlash

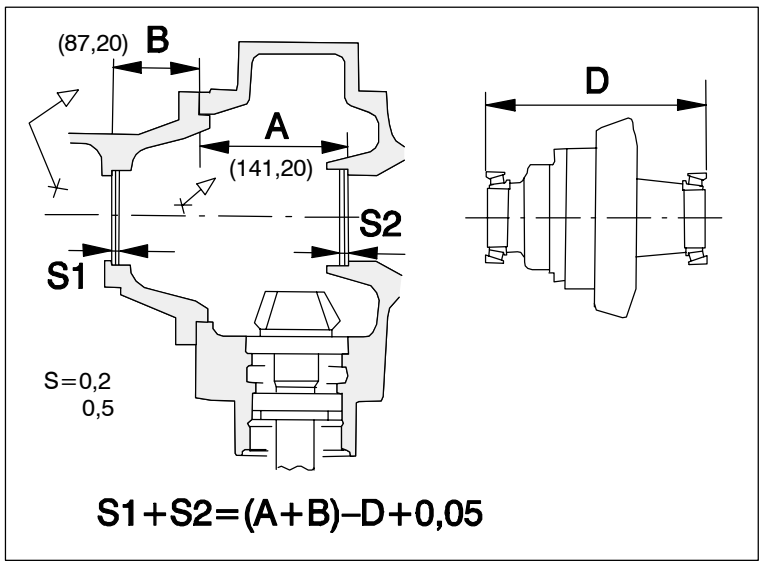
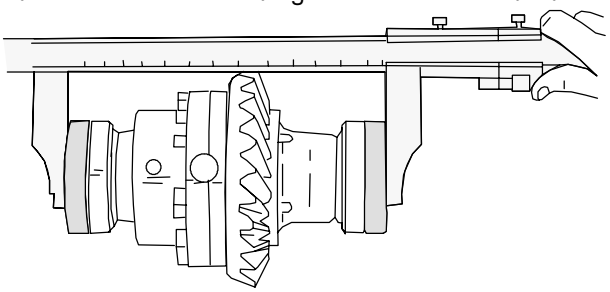
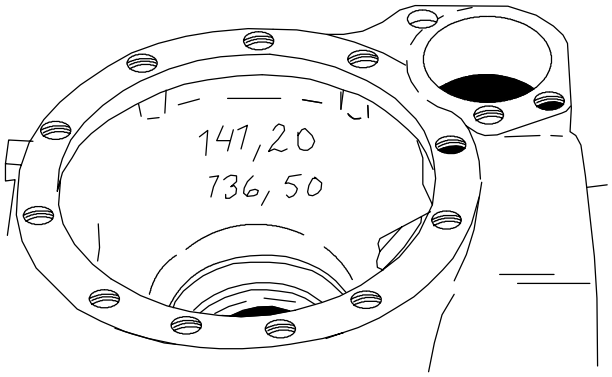


Figure 7. Adjusting differential bearing preload.

1. Remove differential bearing outer races from both axle sections and remove any shims that may be fitted behind the races. Remove roller bearings from the differential carrier.

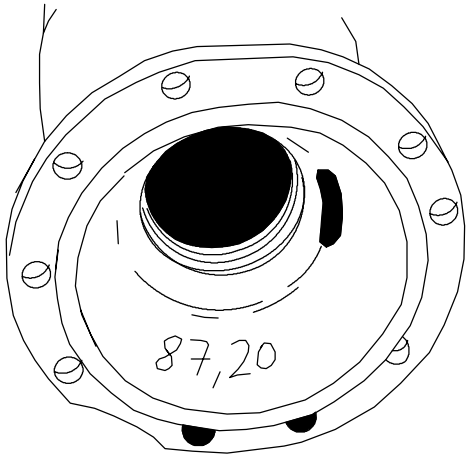


2. Fit new bearings onto the differential carrier. Press outer races against the bearings and use a vernier caliper to measure the distance between them as shown in the figure above, measurement **D** (e.g. 226,50 mm). **N.B.** When measuring the use of measuring pieces is necessary.



3. Read off measurement **A** (larger figure) marked inside the longer axle housing. This is the distance between the bottom of the differential bearing location and the axle housing flange surface (e.g. 141,20 mm).

Note! If no measurement can be found in the axle housing, see page **644/6A**.



4. Read off measurement **B** marked inside the shorter axle housing. This is the distance between the bottom of the bearing housing and the axle housing flange surface (e.g. 87,20 mm).

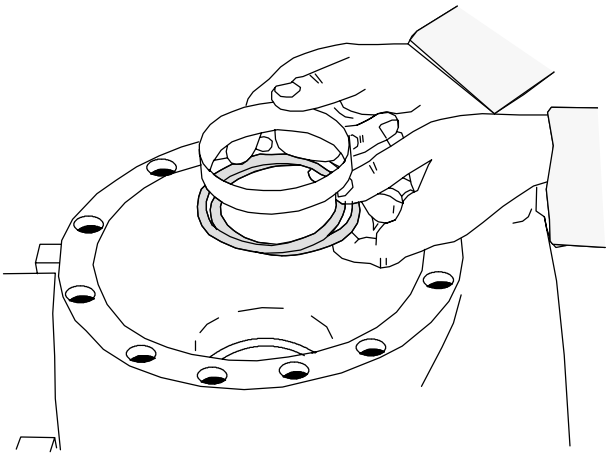
Note! If no measurement can be found in the axle housing, see page **644/6A**.

5. The preload **(P)** of the differential bearings should be **0,05 mm**. Calculate the number of shims required as follows:

S=(A+B)–D+P=(141,20+87,20)–226,50+0,05

S=1,95 mm.

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6. Fit an equal number of shims under each differential bearing. Fit the differential into the axle housing and connect the axle sections with several screws (**190 Nm)**.

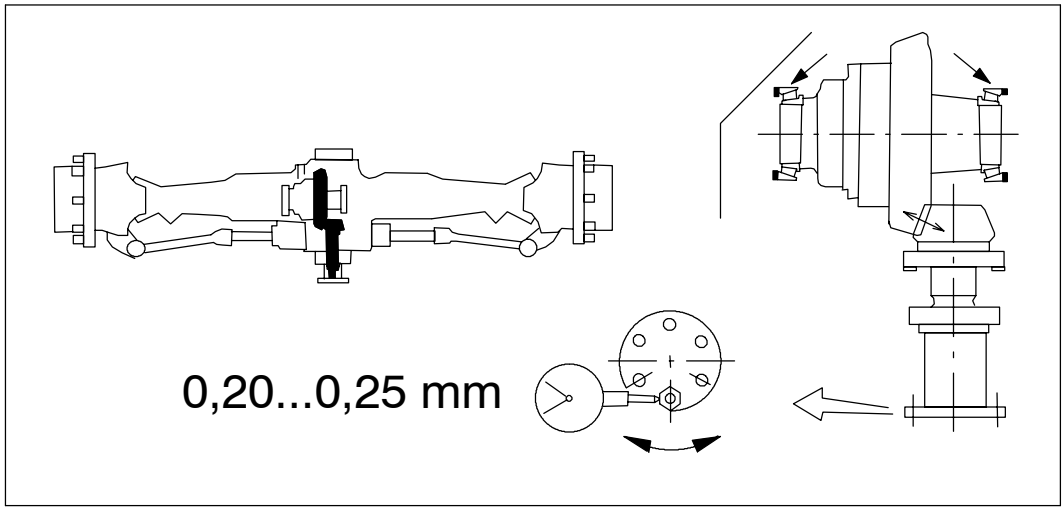
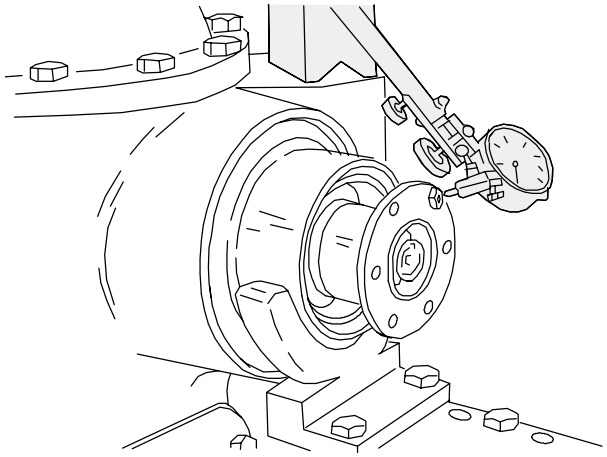
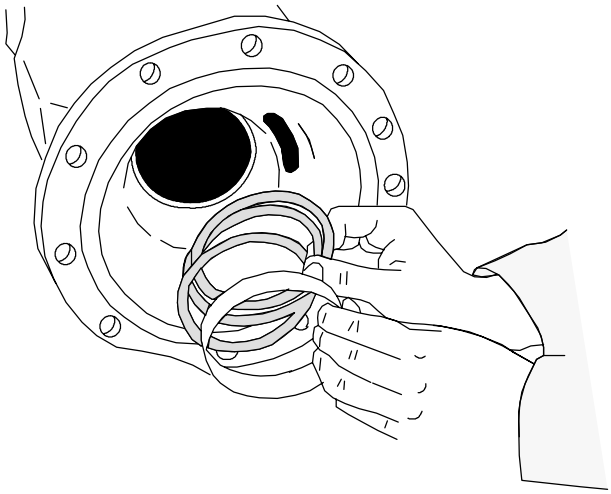


Figure 8. Adjusting tooth backlash between pinion/crown wheel.



7. Measure the pinion/crown wheel tooth backlash using an indicator gauge stylus against a screw on the drive flange. The backlash should be in the range **0,20–0,25 mm.**



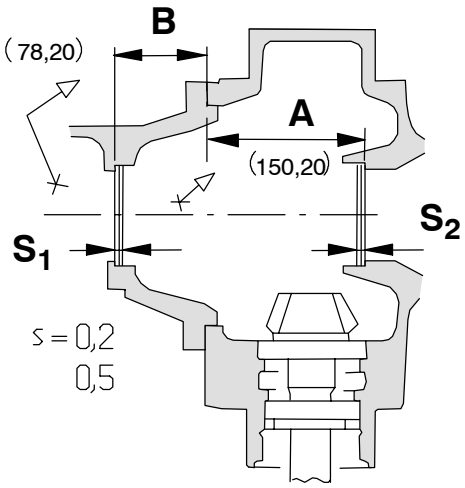
8. If the backlash is not correct transfer shims from one bearing race to the other.

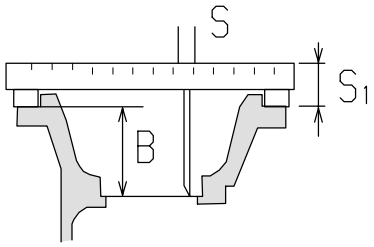
N.B. If the backlash is too small transfer shims from the shorter axle section side to the longer side and vice versa.

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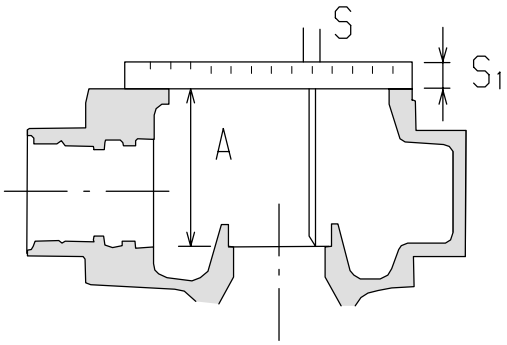
Note! If in the axle production adjusting measurements has not been marked in the axle housing, the measurements can be determined according to the pictures below:





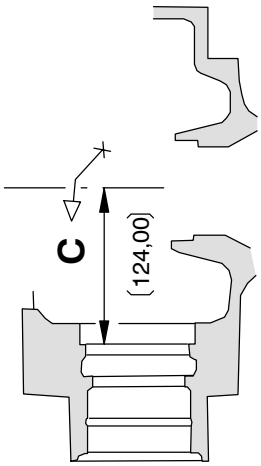
B

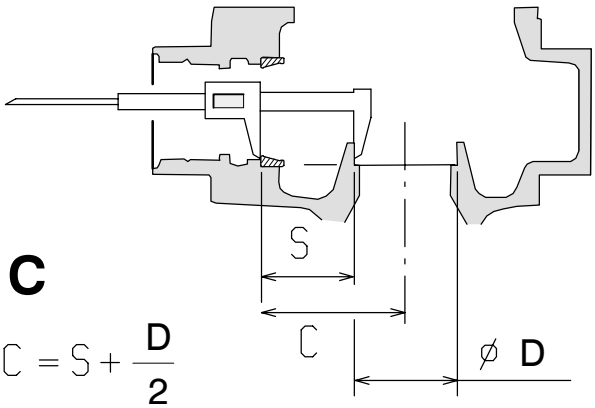
$B = S - S_1$



A

$A = S - S_1$





C

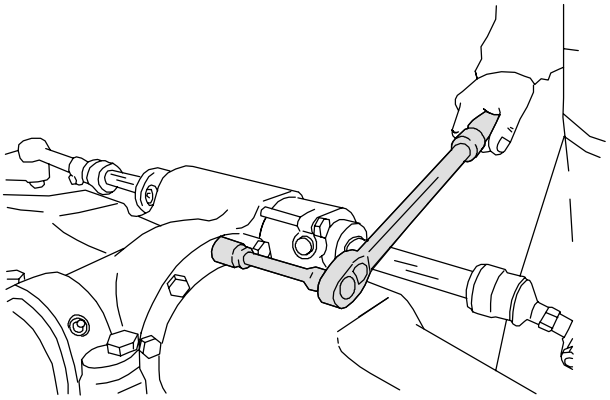
$C = S + \frac{D}{2}$

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E. Fitting front axle

1. When the backlash is correctly adjusted unscrew the axle housing joint and check the condition of the o–ring.

2. Change the o–ring if necessary and apply grease to it.



3. Connect the bolted joint of the axle housing. Tighten the attaching screws to a torque of **190 Nm.**

4. Attach the tie–rod to the steering arm.

5. Fit the front axle (**see Op no 641 C)**. Fill the differential housing with oil.

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3. Differential lock

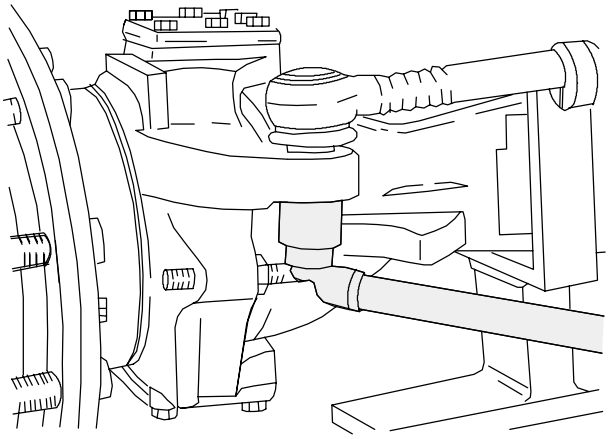
Sige front axle with the differential lock is an optional equipment. This shaft has the same pivot bearings and mounting brackets, hubs, king pins, drive shaft joints, seals and bushings and the same bevel pinion shaft as the standard axle:

– Mounting brackets, see page **641/1.**
– Drive shafts, see page **642/1**
– Hubs, see page **643/1**
– King pins, see page **643/3** instruction **C**
– Bevel pinion shaft, see page **644/3** instructions **B** and **C**.

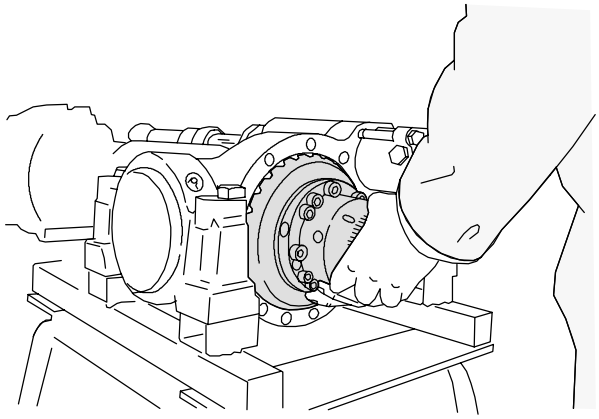
A. Changing differential lock piston seals

Note! If the piston seals leak, the pressure oil can flow into the axle housing causing oil level rise.

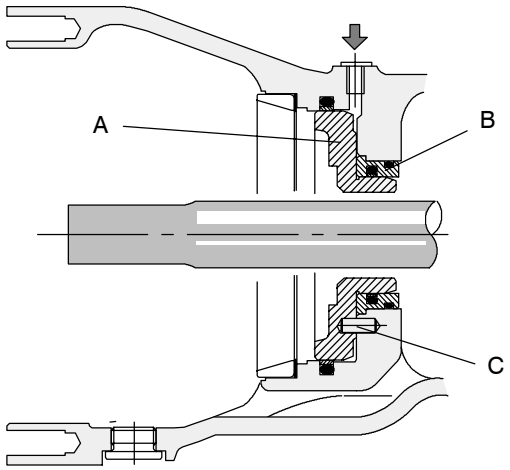
1. Raise the tractor front end and support it. Drain the oil in axle housing. Remove the LH side front wheel.



2. Disconnect the tie rod from the LH side steering arm.



3. Pull the axle housing section apart once the bolts have been unscrewed. Remove the differential unit from the axle housing. Remove the diff. lock thrust bearing.

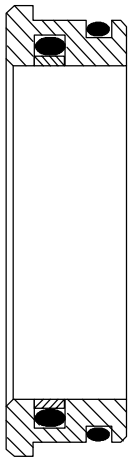


4. Remove the piston (A) by using compressed air through the pressure oil pipe but **be very careful.** Remove, if necessary, the differential bearing race and shims behind it. Remove the piston dowel (C).

5. Remove the metal ring (B) together with its seals.

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6. Change the piston seal and the o–ring in the axle housing groove.



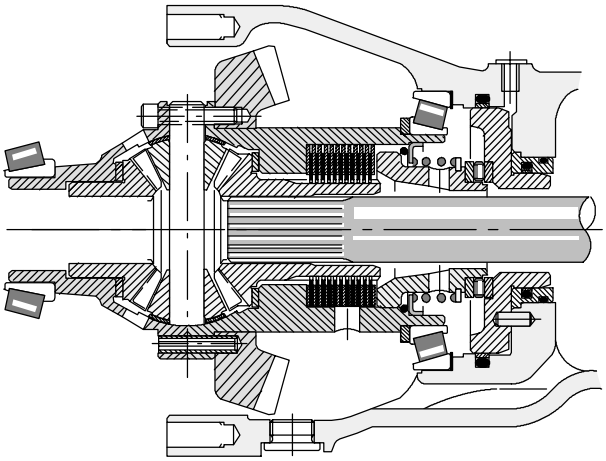
7. Change the metal ring sealing rings.

8. Apply grease to the sealing rings..

9. Push the metal ring with its seals into its location fully home. Fit the piston together with its dowel. Fit the differential bearing race and shims, if removed..

10. Fit the thrust bearing ring into the piston recess. Fix it, if necessary, with a little grease.

11. Fit the other thrust bearing ring and its roller ring onto the differential. Fix with grease, if needed.



12. Fit the differential unit into the axle housing so that the drive shaft splines guide into the differential side gear.

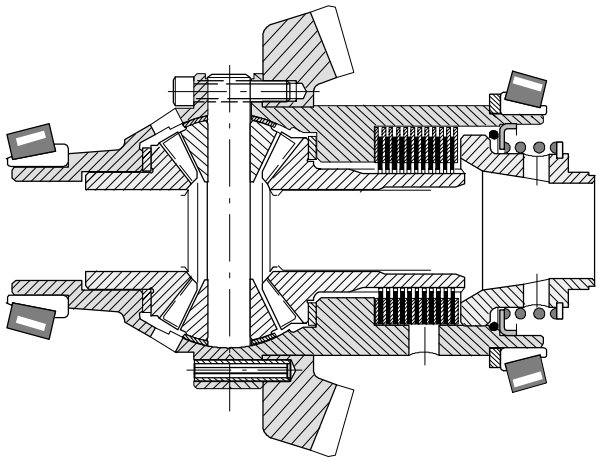
13. Check and grease the axle section o–ring. Place the axle sections to the correct position and tighten the bolts to a torque of **190 Nm**.

14. Rotate the hub by hand. It must rotate quite easily.

15. Connect the tie rod to the steering arm (**160 Nm**). Fit the front wheel (**550 Nm**). Fill the axle housing with oil. Test–run the tractor and assure that the lock functions. Check for leaks.

B. Changing the disc pack

1. Remove the differential, see Op. **A** paragraphs **1–3**.



2. Remove the pressure sleeve snap ring and the spring (not necessary).

3. Pull out the pressure sleeve together with the spring seat and the o–ring behind it.

4. Take away the disc pack.

5. Oil new discs. Fit by turns steel disc and friction disc into the differential housing. First and last the steel disc (11 friction discs and 12 steel discs).

Note! It is better to change the whole disc back than separate discs.

6. Place the pressure sleeve on the disc pack. Fit the o–ring (fit a new o–ring, if the earlier one was damaged).

7. Fit the spring seat, spring and the spring snap ring (if removed).

8. Fit the differential unit, see Op. **A** paragraphs **10–15**.

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C. Changing differential gears/crown wheel

Note! Compare Op. **B** on page **644/1**.

1. Remove the differential unit from the axle housing, see **Op. A** paragraphs **1–3**. Mark the halves of the differential carrier to facilitate reassembling.

2. Unscrew the crown wheel bolts. Knock off the crown wheel.

3. Knock off the locating pins of the crown wheel. Open the carrier and remove the various components.

4. Check the condition of the housing, differential gears and bearing plates. Change all damaged parts. Lubricate all parts with oil.

Note! The differential pinion shaft is locked by means of the locking pin. The diff. pinions thrust–washers are fitted so that the locking lugs engage in the grooves on the differential carrier.

5. Reassemble the differential and fit the carrier halves so that the marks are in the same places as they were before dismantling. Fit the crown wheel and tighten the screws to **70 Nm**.

Important! If you change the crown wheel, also the pinion shaft must be changed. Removing, fitting and adjusting the pinion shaft, see page **644/3** instr. **B** and **C**.

6. Fit the locking pins. First the bigger pin and then the smaller pin inside with the split pointing towards the heads of the screws.

7. Fit the differential, see instr. **A** paragraphs **10–15**.

D. Changing differential bearings

Note! If you change the differential bearings, the bearing pre–load should be adjusted and also the tooth backlash between the crown wheel and the pinion shaft should be adjusted, see instr. **D** on page **644/5**.

1. Remove the differential, see instr. **A** paragraphs **1–3**.

2. Remove differential bearing outer races from both axle sections and remove any shims that may be fitted behind the races.

3. Remove the roller bearings from the differential carrier.

4. Fit new bearings onto the differential carrier.

5. Press outer races against the bearings and use a vernier caliper to measure the distance between them, **measurement D**.

6. Read off **measurement A** (larger upper figure) marked inside the longer axle housing. This is the distance between the bottom of the differential bearing location and the axle housing flange surface.

7. Read off **measurement B** marked inside the shorter axle housing. This is the distance between the bottom of the bearing housing and the axle housing flange surface.

8. The preload **(P)** of the differential bearings should be **0,05 mm**. Calculate the number of shims required as follows:

S=(A+B)–D+P

9. Fit an equal number of shims under each differential bearing.

10. Fit the differential into the axle housing and connect the axle sections with several screws (**190 Nm**).

11. Measure the pinion/crown wheel tooth backlash using an indicator gauge stylus against a screw on the drive flange. The backlash should be in the range **0,20–0,25 mm**.

12. If the backlash is not correct transfer shims from one bearing race to the other.

Note! If the backlash is too small transfer shims from the shorter axle section side to the longer side and vice versa.

13. When the backlash is correctly adjusted, fit the differential unit and reassemble the axle housing, see instr. **A** paragraphs **10–15**.

65. Industrial front axle	~~15. 5. 1996~~ 1. 8. 1998	Model 6000–8750	Code 650	Page 1

Sige industrial front axle is an optional equipment on Valmet 6000–8400 tractors. The industrial front axle has a heavy duty construction. This section shows only differences compared with the standard axle, see section 64.

Technical data

Axle type	Sige DS17 V SD.01
Flange distance	1810 mm
Number of the teeth (crown wheel/pinion)	Z27/8
Differential ratio	3,375
Ratio of the hubs	5,25
Total ratio	17,72
Number of the differential pinions	4 pcs
Oil volume in hubs	2x1,5 litres
Wheel disc attachment: Hub guides (ø 280,3–280,8), M20x1,5 (10 pcs)	
Max. statical carrying capacity	7700 kg
Max. dynamic carrying capacity 0–8 km/h	6200 kg
Carrying capacity at speed of 40 km/h	3900 kg

Hubs and king pins

Ring gear support bolts	120 Nm Loctite 242
Pre–load of king pin bearings	0,5 mm
Rolling resistance of the hub bearings (measured with a spring balance from wheel attaching bolt)	3,6–4,7 kg
King pin covers	190 Nm
Tie rod tapered joint to steering arm (nut)	220 Nm

Important! The industrial front axle is a standard equipment on 8450, 8550 and 8750 tractors. On these tractors the industrial front axle has an electro–hydraulically controlled differential lock of a multi–disc type, see pages **640/8–9**.

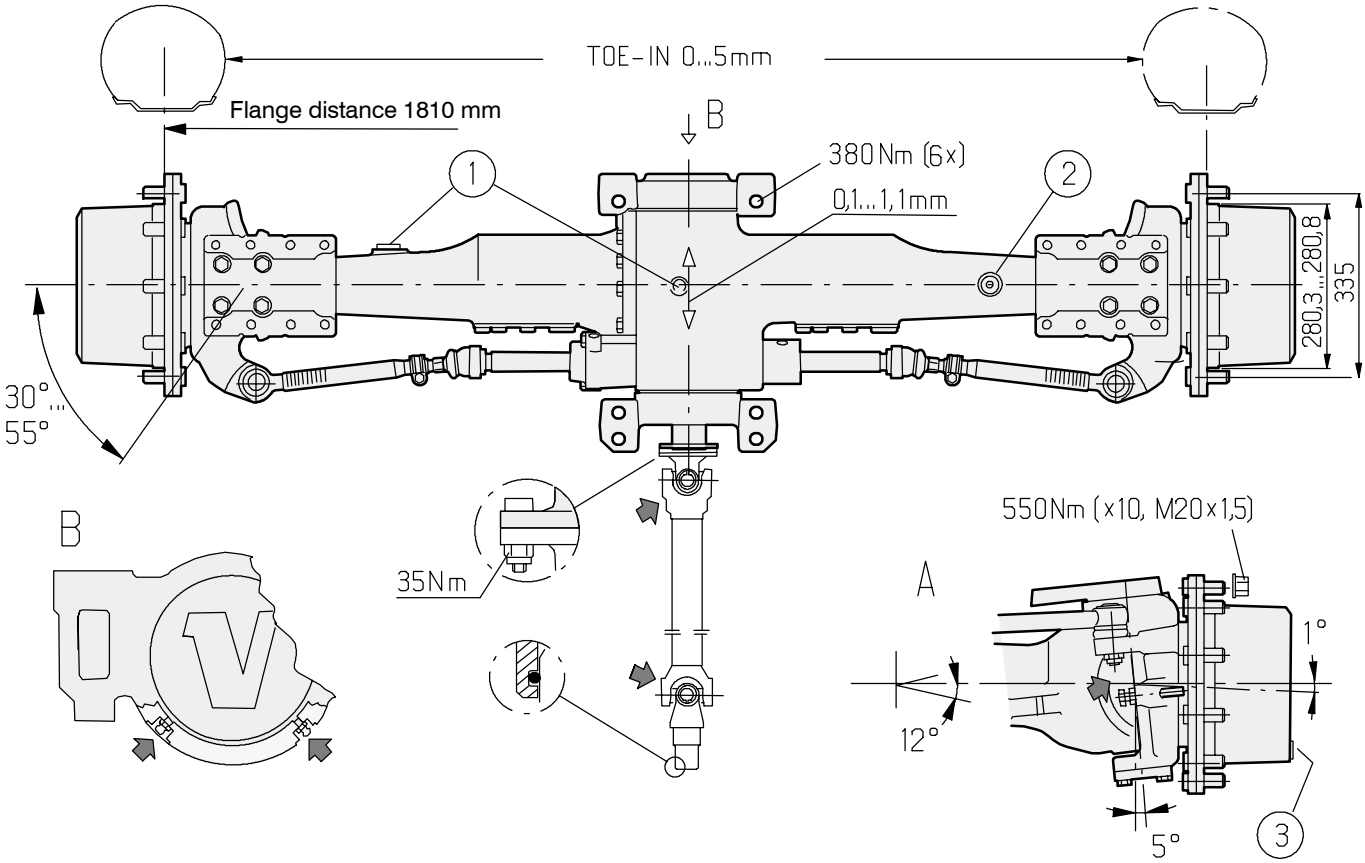


Fig. 1. *Industrial front axle DS17V*

1. Plug for checking and draining oil in differential housing.
2. Oil filling plug for differential housing.
3. Oil filling and draining plug for hub..
Oil volume in differential housing ***8 litres***
Oil volume in hubs ***2x1,5 litres.***
Grease the central pivot bearing nipples weekly / at every 50 running hours.
Grease propeller shaft nipples at every 250 running hours
Check the front axle oil levels at every 500 running hours and change oils at intervals of 1000 running hours.

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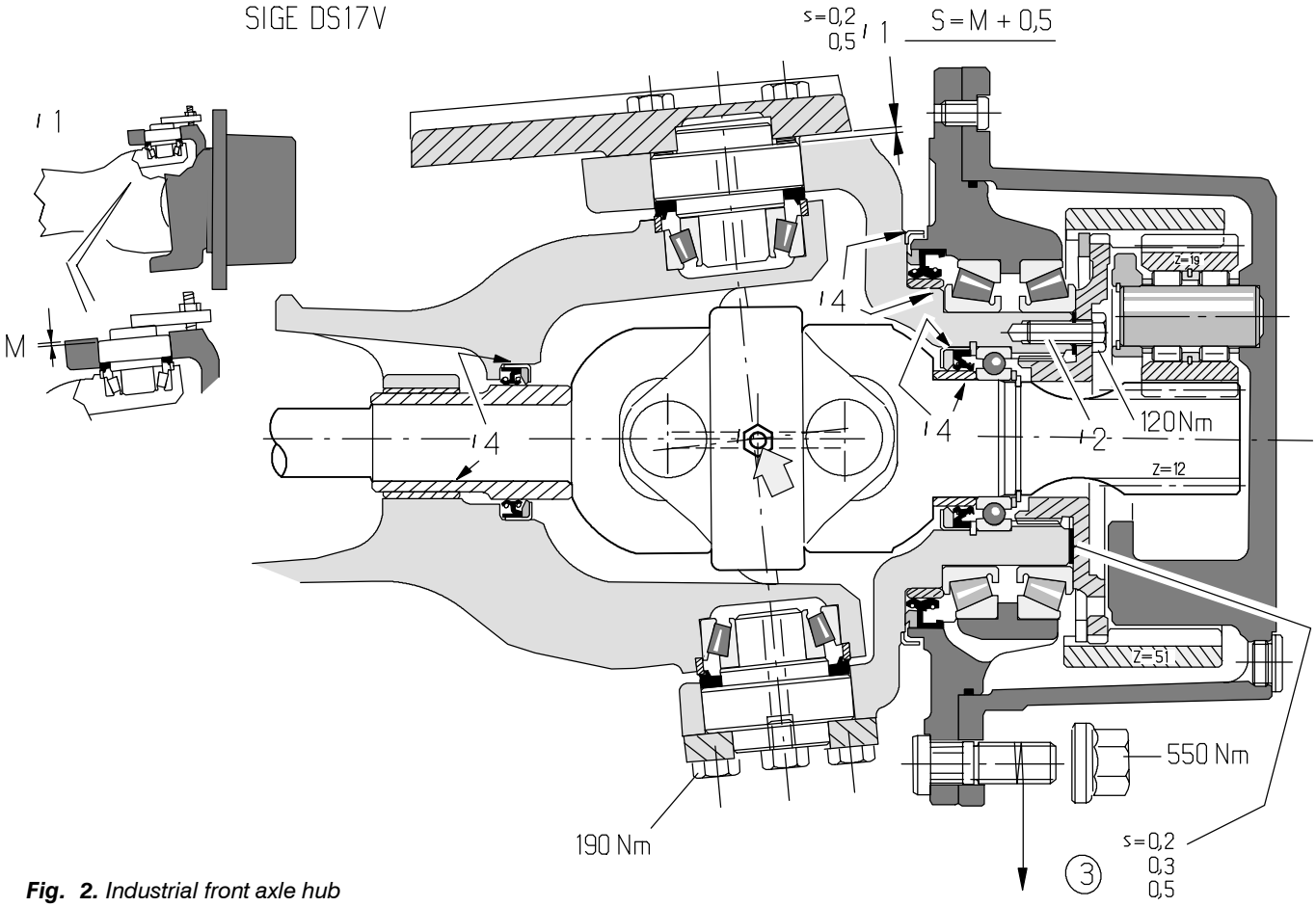


Fig. 2. *Industrial front axle hub*

1. Adjusting king pin bearing pre – load
2. Loctite 242
3. Shims for adjusting hub bearing pre – load
4. Loctite 290
Apply grease between the lips of the seals

Note! Here is presented shortly the repair instructions for the industrial front axle. If the instructions are the same as for the standard axle, necessary refers are given.

1. Hubs, drive shafts and king pins

(see fig. 2 on previous page)

A. Central pivot bearing brackets

See page **641**/**1**.

Oil volume in the hubs is **2x1,5 litres**.

B. Drive shaft seals and double joints

The drive shaft outer seal is changed as shown on page **642**/**1**. The king pins can be removed with extractor shown on page **640**/**3** but the king pins have thread M12**.** The king pin cover bolt tightening torque is **190 Nm**.

The outer diameter of the drive shaft outer seal is 95 mm.

The ring gear support tightening torque is **120 Nm**. When you remove the ring gear support flange, at the same release also shims for adjusting the wheel bearing pre–load. The shims should be fitted back when reassembling the hub.

The drive shaft inner seal is changed as described in instr. **B** on page **642**/**3**. The seal outer diameter is 80 mm. The seal has also a wear ring. Apply Loctite 290 under the wear ring, if removed.

Reconditioning double joints, see page **642**/**3** instr. **C**.

C. Hubs

The planetary gear bearings are changed as shown on page **643**/**1**. The hub big seal can be fitted with locally prepared tool ET 894 020.

Adjusting wheel bearing preload:

– oil new bearings. Fit the wheel attaching flange and the bearings into place. Fit the ring gear support and tighten the bolts (2) so that the bearings have a small play, so that the hub rolling resistance can be measured without bearing preload. Before measurement, rotate the hub many times into both directions.

– attach a spring balance wire to the wheel attaching bolt and measure the hub rolling resistance without preload, e.g. **F=6,5 kg**.
– Then tighten the ring gear support flange bolts to **120 Nm** and measure again the rolling resistance, e. g. **F=11 kg**. Subtract this from the previous value:

11 kg–6,5 kg=4,5 kg

The preload value should be between **3,6–4,7 kg.**

The preload is adjusted with shims which are fitted between the ring gear support and the hub.

Note! The same shims can be used often, because the bearings are precision–machined.

D. Changing king pin bearings

See instr. **C** on page **643**/**3**.

Adjust the king pin bearings as follows:

– Ensure that the lower king pin with its bearing and cover is fitted in place. Tighten the lower pin cover bolts to a correct torque.

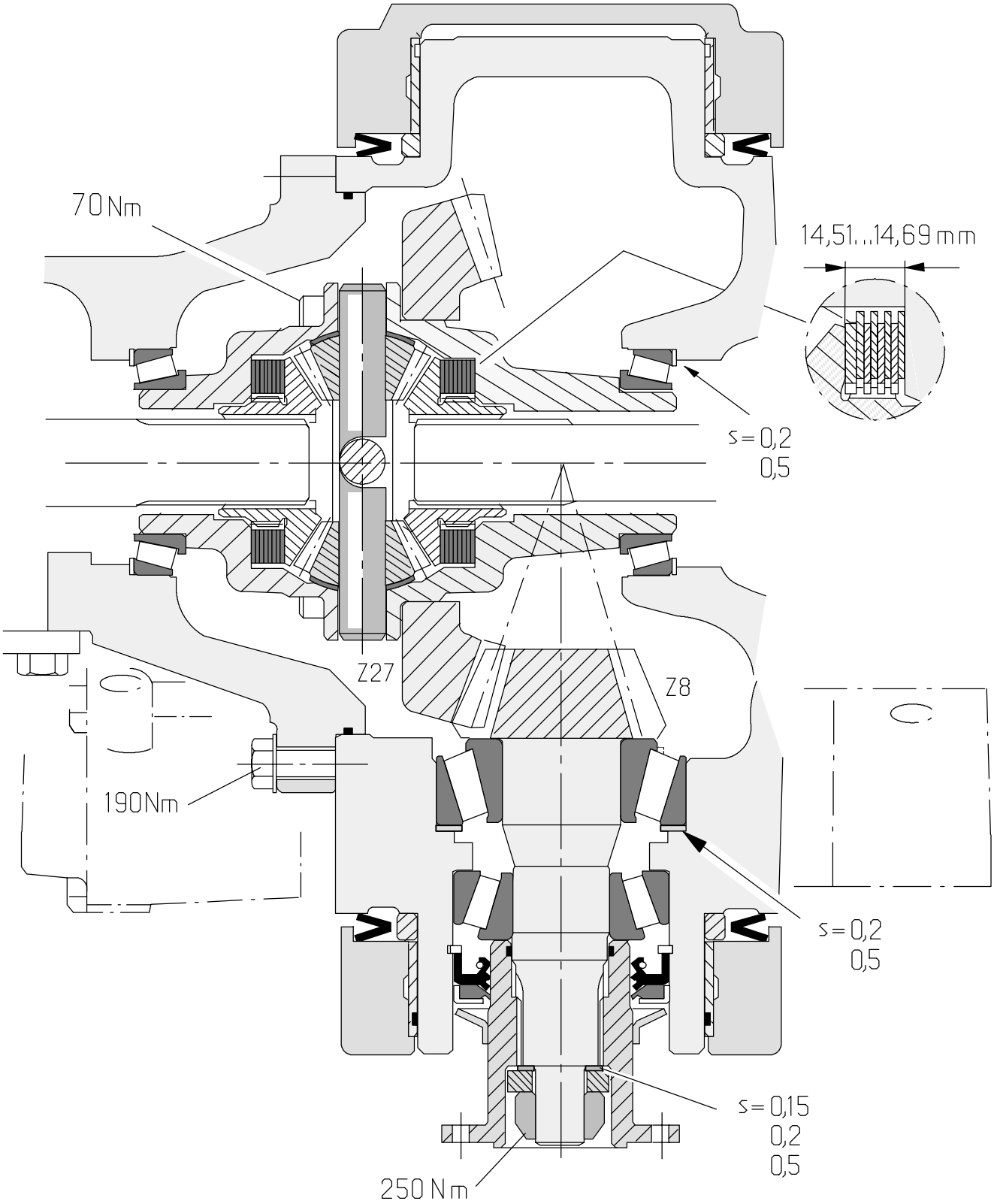
– Fit the upper king pin together with its bearing into place and press with a suitable plate and bolt the upper king pin/ bearing into its location until the bearings have no play.

– Measure with a depth gauge how deep the upper king pin was pressed, measurement **M** e.g. **0,8 mm**

– The king pin bearings need a preload of **0,5 mm**. The shim thickness **S** which must be fitted on the upper pin can be calculated as follows:

S=M+0,5
E.g. 0,8+0,5 mm=**1,3 mm**.

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Picture 3. *Differential and bevel pinion shaft.*
Apply grease between the lip seal lips.
Oil felt gasket before fitting.

2. Bevel pinion shaft and differential

(See picture 3 on the previous page)

A. Bevel pinion shaft seal

The seal can be changed without removing the front axle, see page **644/1** instruction **A**.

B. Changing differential friction discs

See instruction **B** on page **644/1**.

It is best to change both disc packs at the same time. The disc pack thickness should be between **14,51–14,69 mm**. The differential has four pinions.

C. Changing bevel pinion shaft and crown wheel

See instruction 2 on page **644/2**. Various adjustments are shown below.

Adjusting bevel pinion shaft position

Note! Working procedure is the same as on the standard axle, see page **644/3.**

– read off value **E** which is stamped on the end of the pinion shaft (e.g. 114 mm).

– see the bigger value marked in the axle housing (inside the longer axle section), **measurement C** (e.g. 152,00)

– measure the thickness of the inner bearing (larger bearing), **measurement H** (e.g. 36,50)

– calculate the number of shims required for correct pinion shaft position:

S=C–(H+E)
E.g. 152,00–(36,50+114) = **1,5 mm**

– put the shims required under the inner bearing outer race and fit the outer race against the shims.

Adjustment of pinion shaft bearing preload.

Note! Same as for the standard axle, see page **644/4.**

– fit the pinion shaft together with its bearings.

– fit the circlip in front of the outer bearing.

– fit the drive flange onto the shaft but do not fit yet the seal.

– fit the same shims as earlier. Fit a ring in front of the shims and tighten the shaft nut to **250 Nm**.

– use a spring balance to measure the force needed to rotate the pinion shaft (see picture on page 644/4), Ø 60 m

– the rolling resistance should be **3–5 kg**.

– if the rolling resistance is not correct the number of shims under the nut must be adjusted. If the rolling resistance is too great, more shims are required and vice versa.

– when the rolling resistance is correct the seals can be fitted.

Adjusting differential bearing preload and pinion/crown wheel tooth backlash

The working procedure is the same as on the standard axle, see page **644/5.**

– Using a vernier caliper, measure the distance between the differential bearings, see picture on page **644/5**, measurement **D** e.g. 226,50.

– Read off measurement **A** (larger figure) marked inside the longer axle housing. This is the distance between the bottom of the differential bearing location and the axle housing flange surface (e.g. 141,20 mm).

– Read off measurement **B** marked inside the shorter axle housing. This is the distance between the bottom of the bearing housing and the axle housing flange surface (e.g. 87,20 mm).

–The preload **(P)** of the differential bearings should be **0,05 mm**. Calculate the number of shims required as follows:

S=(A+B)–D+P
E.g. (141,20+87,20)–226,50+0,05=**1,95 mm**.

– Fit an equal number of shims under each differential bearing. Fit the differential into the axle housing and connect the axle sections with several screws (**190 Nm)**.

– Measure the pinion/crown wheel tooth backlash using an indicator gauge stylus against a screw on the drive flange, see picture on page **644/6**.

– the correct tooth backlash value is **0,20–0,25 mm**.

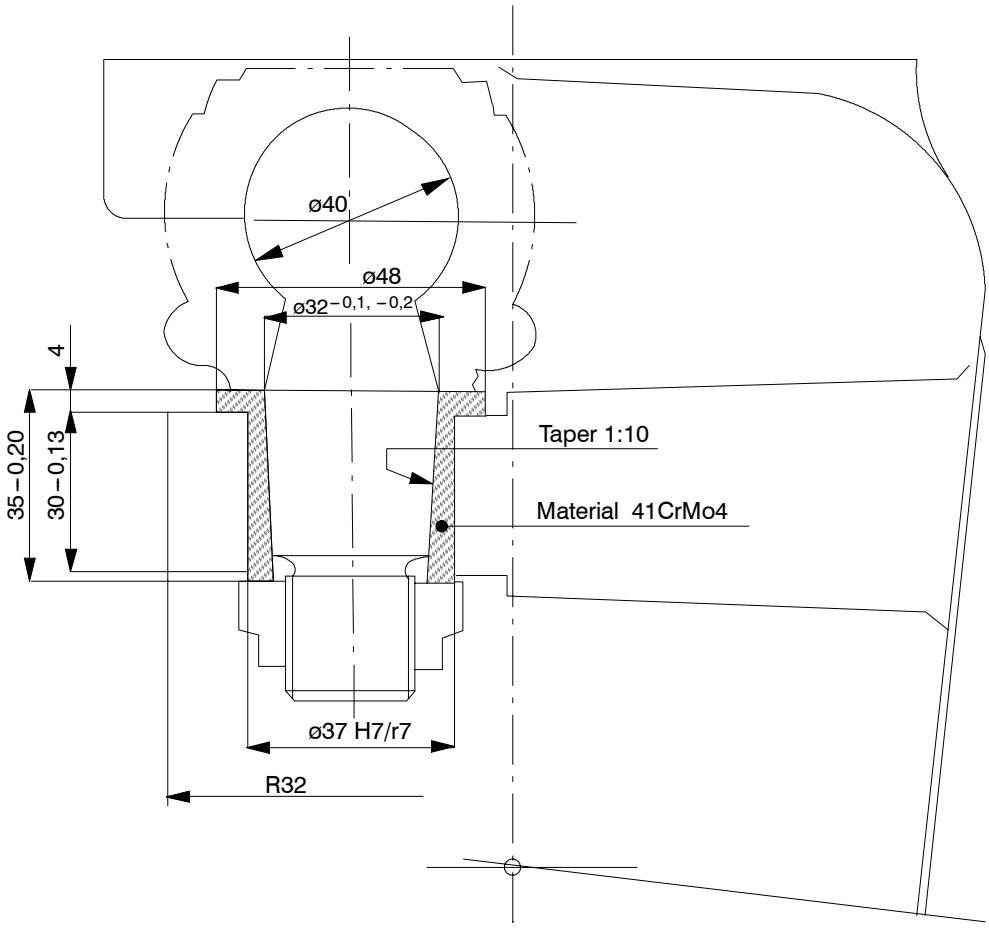
– If the backlash is not correct transfer shims from one bearing race to the other.

N.B. If the backlash is too small transfer shims from the shorter axle section side to the longer side and vice versa.

– when the backlash is correctly adjusted, reassemble the axle, see page **644/7**.

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Tapered joint between tie – rod and steering arm

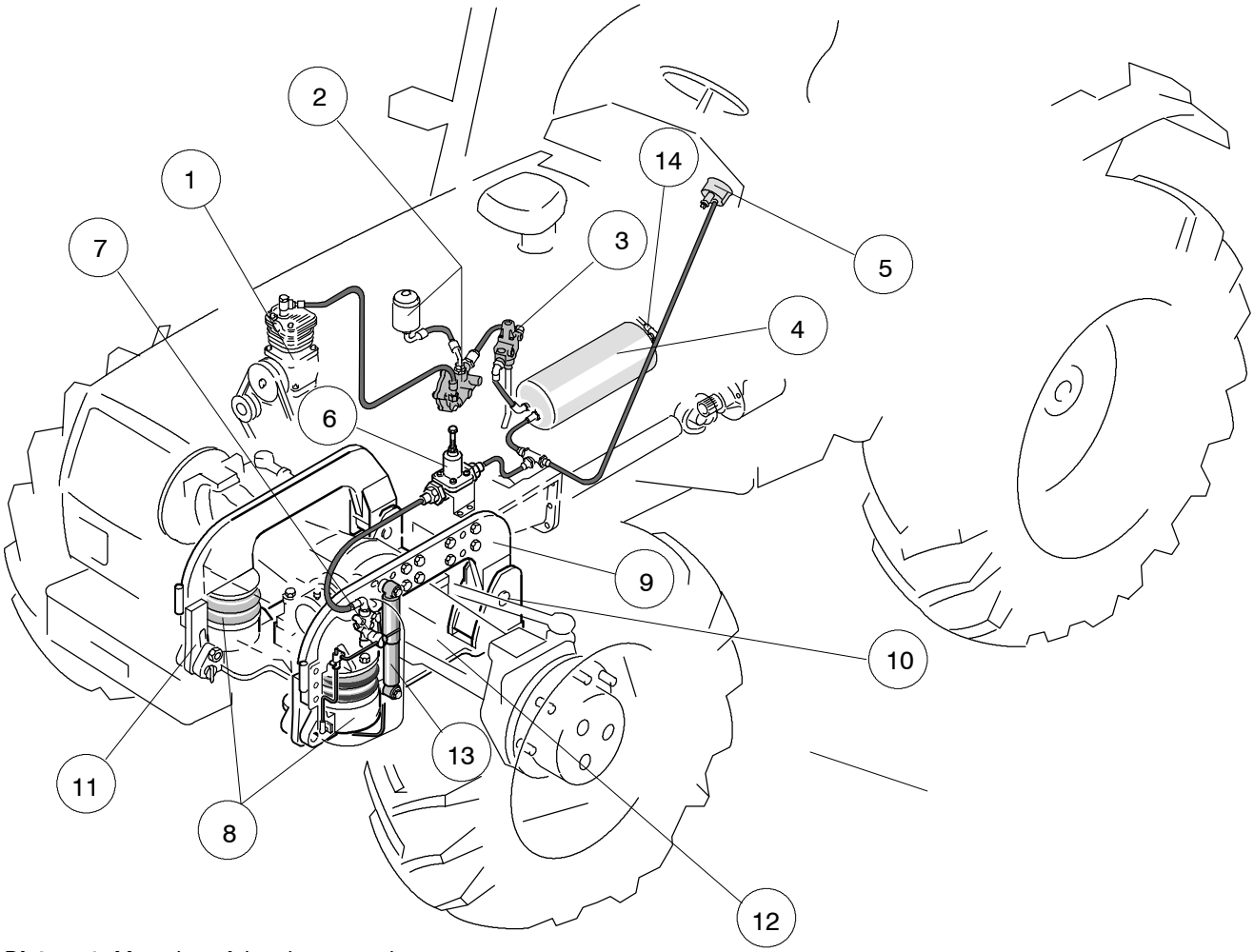


The tie – rod end has been strengthened. Taper ø 32 mm (was ø 26 mm), joint ball ø 40 mm (was ø 35 mm). At the same time the steering arm has been modified in the corresponding way. The modified steering knuckle and the tie – rod are in pairs exchangeable with each others. This modification is in production with effect from axle number 0116/94.

The earlier steering knuckle can be rapaired by machining a space for a body – fit sleeve (see picture above). The repair work can be done in the tractor factory, if necessary.

General

The front axle air suspension (option) is available for 6200–8950 tractors. The foremost components of the system (compressor, deicer with reservoir, pressure regulator, pressure gauge and pressure air reservoir) are the same as for the optional pressure air brakes for the trailer (pressure air brakes, see pages **510/6–7** and **511/4–7**). In addition, the air suspension has an overflow valve and a levelling valve, which keeps the height of the suspension system (rubber bellows height) the same regardless of the loading on the front axle. In addition, the system incl. two shock absorbers, air pipes and necessary frame parts. The upper parts of the frame are bolted onto the side of the tractor frame (front loader mounting is possible, since spacer plates of different thickness can be fitted between the tractor frame and the air suspension system frames. A space of 30 mm has been left on both sides for fitting optional equipments).

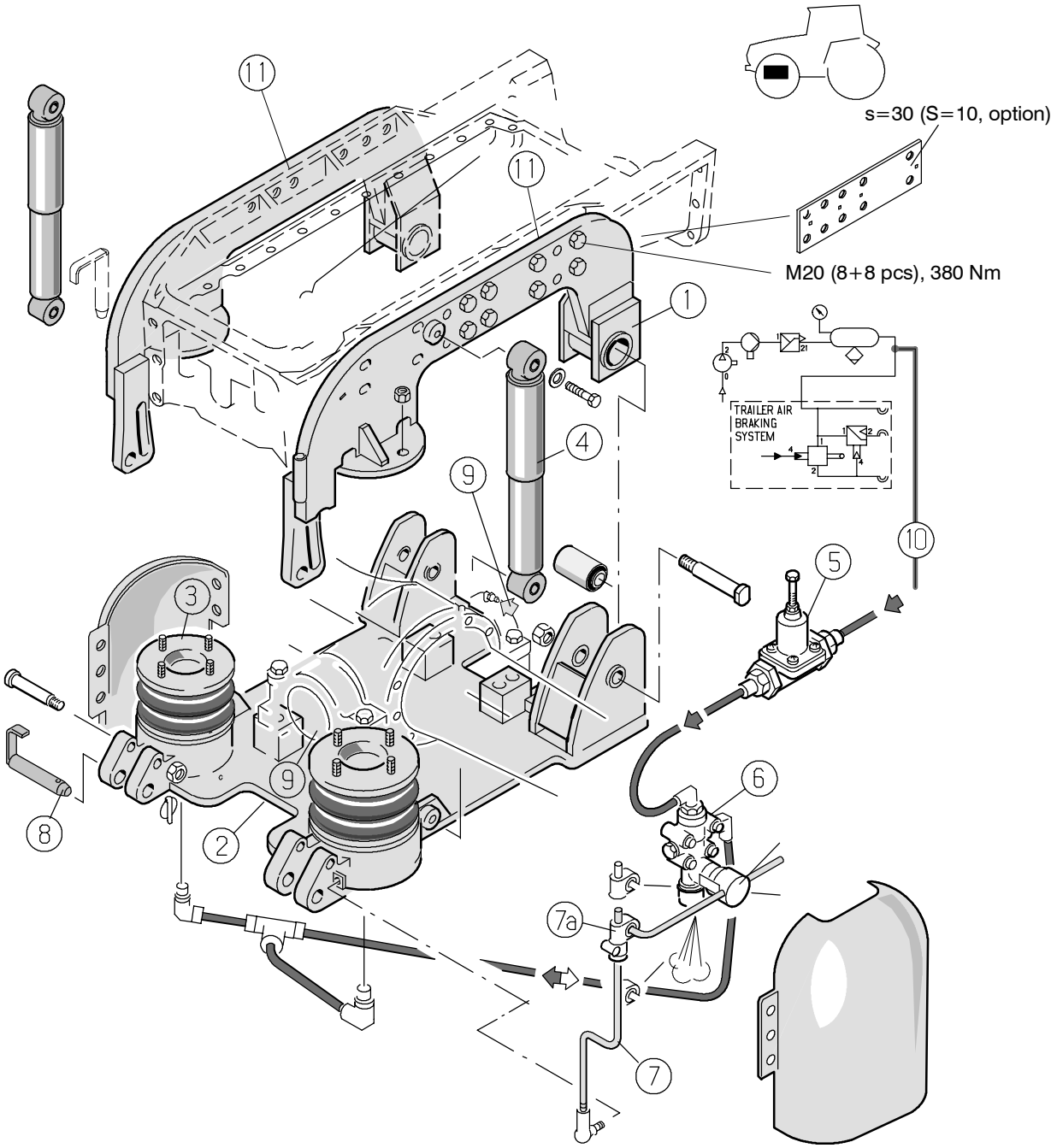


Picture 1. *Mounting of the air suspension system*

1. Compressor (same as for pressure air brakes)
2. Deicer and reservoir (same as for pressure air brakes)
3. Pressure regulator (same as for pressure air brakes)
4. Pressure reservoir (same as for pressure air brakes)
5. Pressure gauge (same as for pressure air brakes)
6. Overflow valve
7. Levelling valve
8. Rubber bellows
9. Fixed support plates (on both sides)
10. Hinge pins in the rear end
11. Oval attaching holes in the front end (suspension can be locked by using round holes)
12. Bottom plate, on which there is attached the front axle
13. Shock absorber (on both sides)
14. Pressure take–off for trailer brakes.

Note! *The same suspension system can be fitted both on the standard front axle and on the industrial front axle.*

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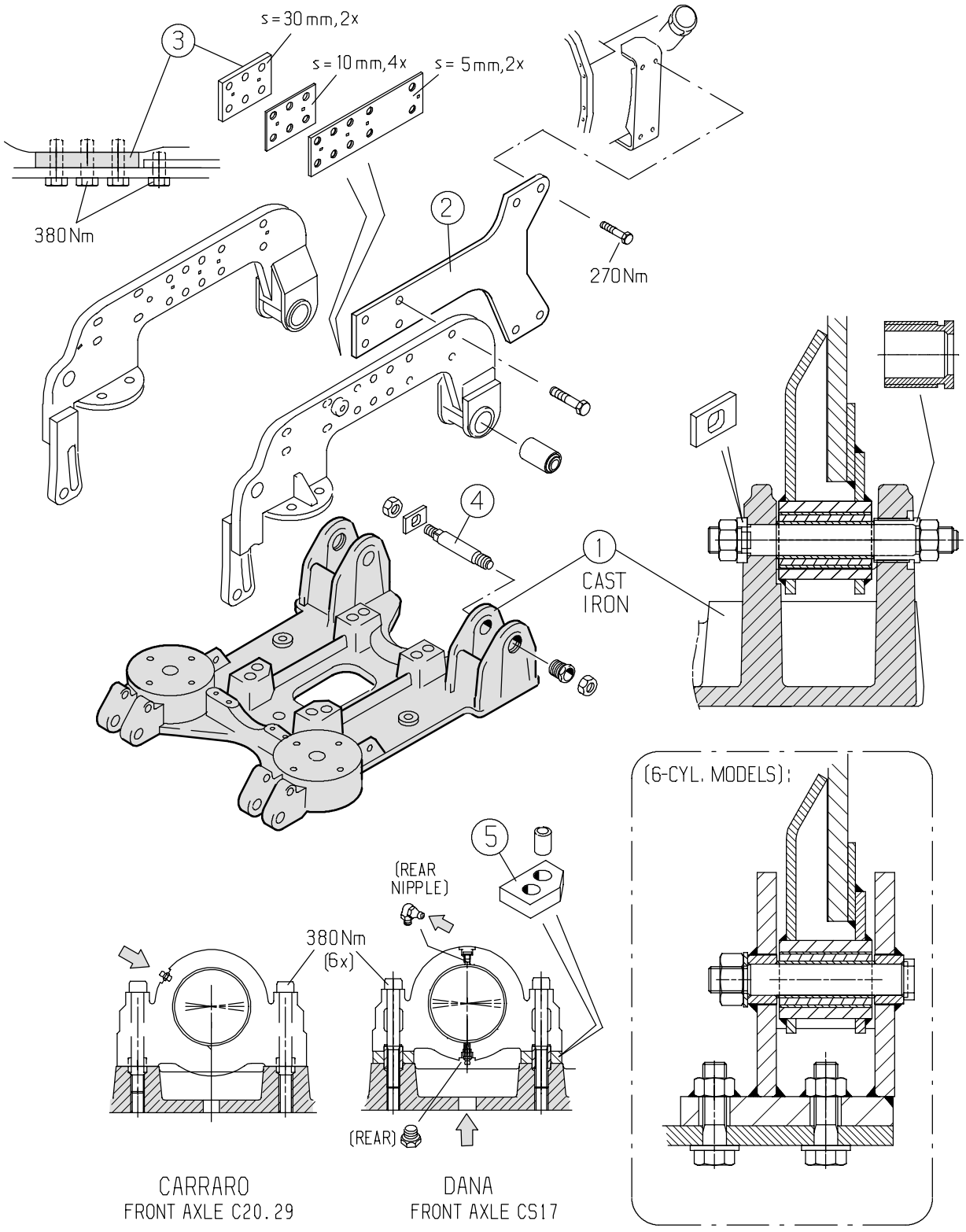


Picture 2. *Air suspension system for front axle*

1. Joint pin bracket
2. Bottom plate
3. Rubber bellows
4. Shock absorber
5. Overflow valve (if the tractor has the trailer air brakes, the overflow valve ensures enough high pressure in the brakes even though there is a leakage in the suspension system).
6. Levelling valve
7. Feeler linkage of the levelling valve
7a. Adjusting piece of linkage
8. Locking pin (the suspension can be locked by fitting the lock pin into the round holes. If the holes do not align, turn the levelling valve linkage to align the holes).
9. Grease nipples of axle brackets. The nipple of the foremost bracket is placed under the bracket (greasing at ***every 250*** *running hours)*
10. Pressure air intake from reservoir (symbols in picture, see picture ***7*** *on page* ***510****/****6****).*
11. Spacer plates between the frames (plate thickness depends on the front mounted implement)

Note! The front axle loading is **350 kg** greater than on the tractor without the air suspension. The max. permissible axle loadings are the same as for the industrial front axle and standard front axle.

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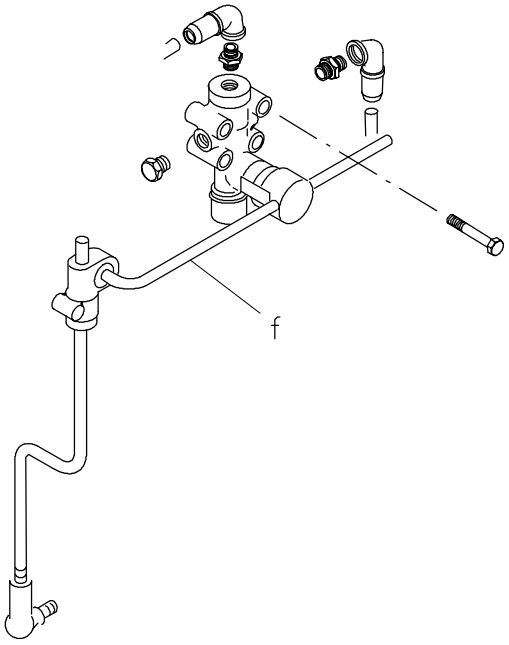


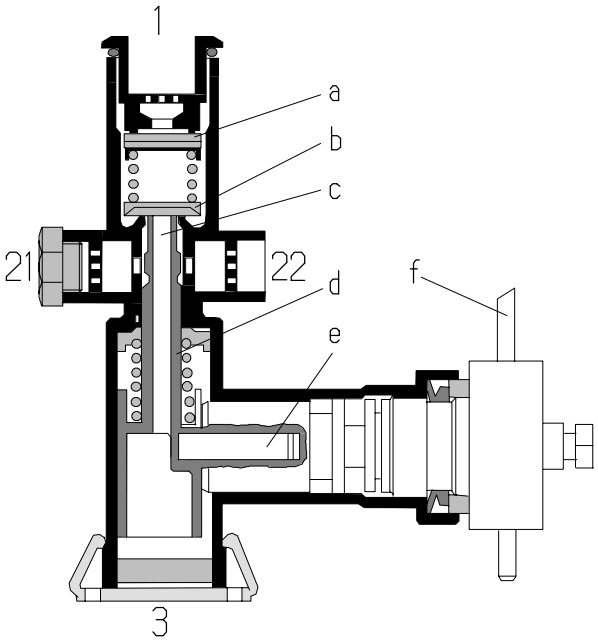
Picture 2A. *Front axle air suspension is also available for tractors with 4–cyl. engines.*

1. Cast iron lower part in connection with 4–cyl. engines.
2. The intermediate attachment requires support plate which is fastened on the intermediate frame.
3. Alternative intermediate plates
4. The pin can be disassembled outwards (the front lift arms need space inside). Clearences are removed with threaded bushing.
5. Intermediate piece for Sige (Dana) front axle. There is a hole for greasing the foremost bearing in the lower piece .

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1. Levelling valve



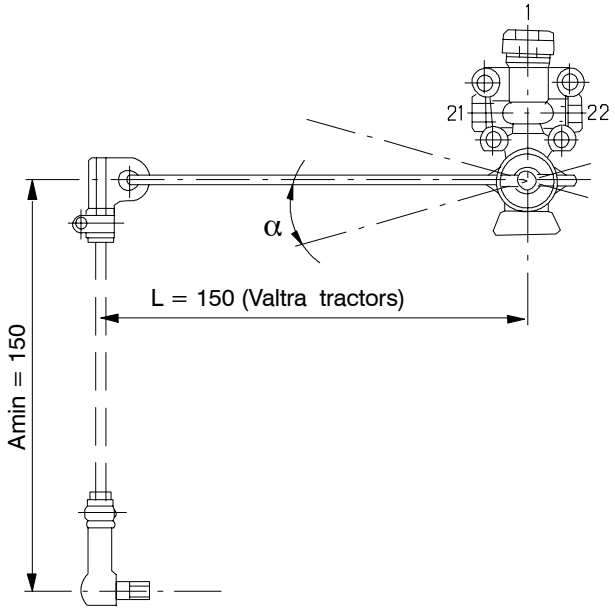


A. Function

When the loading on the front axle increases, the tractor frame/levelling valve moves downwards. Linkage lifts up the link (f) and sleeve (d) with the aid of the cam pin (e). When the sleeve (d) moves upwards, it opens the valve (b), and compressed air flows from the reservoir through port (1) and valve (a) into the suspension rubber bellows, which are connected to port 22 (port 21 is plugged).

When pressure increases in the bellows, the frame moves upwards, and link (f), when moving downwards, closes the valve (b).

When pressure increases in the bellows and link (f) together with the cam pin (e) move downwards, excess air from the bellows can flow through passage (c) and hole (3) to atmosphere. Now the tractor frame moves downwards and link (f) returns into the normal horizontal position. When passage (c) is closed, the levelling valve is again in the balanced position.



B. Adjustment

- lower the tractor frame into the lowest position against the limiter
- fill the bellows slowly. The valve must stop the lifting movement, when the locking pin holes align in the front part of the suspension frame. If the tractor rises more, lower the tractor frame and make the vertical link longer.
- check the adjustment again and change the vertical link length until the lifting height is correct (locking pins holes align).
- if the closing angle (link near horizontal) is reached before the correct height, shorten the vertical link.

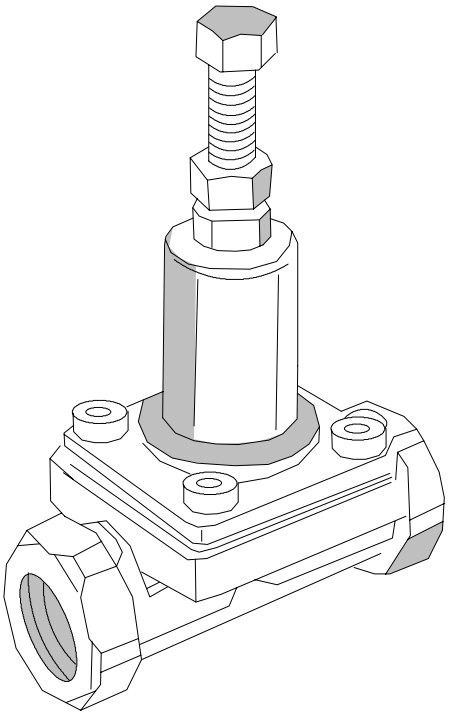
Note! The total stroke of the bellows on Valtra–tractors is ± 72 mm i.e. H= 144 mm (front wheel suspension is then ±40 mm).

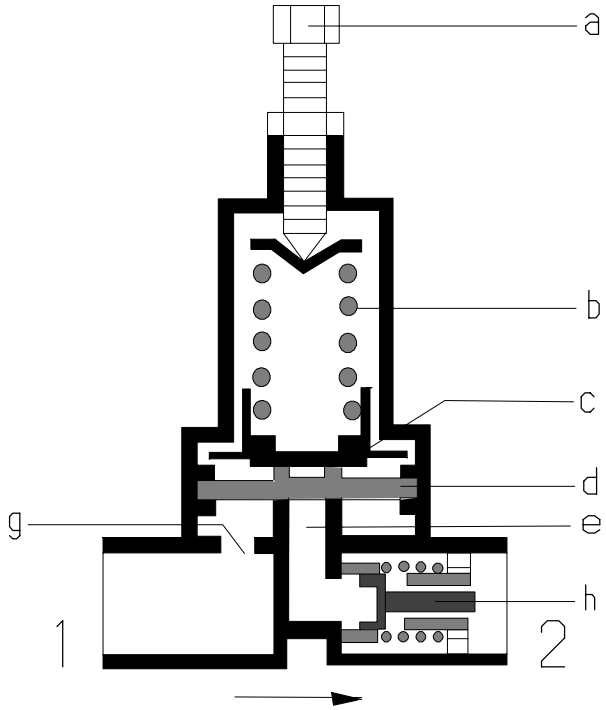
Note! Separate spare parts are not available for the valve. In case of a damage a new valve must be fitted. When fitting a new valve, the adjusting values can be set into the same values as for the old valve (however, the adjustment must be checked).

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2. Overflow valve

(only on tractors equipped with pressure air brakes)





A. Function

This valve ensures that the pressure air flow into the suspension occurs just when the correct pressure affects the air brake system (although the suspension air bellows are leaking). Non–return valve (h) prevents return of the air form port 2 (suspension) to port 1 (reservoir). If the pressure drops in port 1, the pressure in the second side 2 remains the same.

Compressed air flows in the direction of the arrow through valve and through port (g) to the underside of membrane (d). Spring (b) presses the membrane against the seat. When enough high pressure has reached (6,2–6,5 bar), spring force (b) is overcome so that the membrane (d) rises up from its seat and passage (e) opens. Air flows through the non–return valve (h) into the suspension. Return flow is impossible since the non–return valve closes, if the pressure in the suspension is higher.

B. Adjustment

The valve opening pressure can be adjusted by turning screw (a). When turning clockwise the opening pressure increases and vice versa.

The valve does not need any maintenance. Opening pressure (1 –> 2) factory setting is **6,2–6,5 bar** (closing pressure – 10 %).

Note! In case of damage the whole valve is changed.

3. Other components

Compressor, deicer, pressure regulator, pressure reservoir and pressure gauge are the same as for the air brakes of the trailer (option).

Concerning these parts, see pages **510/6–7** and **511/4–7.**

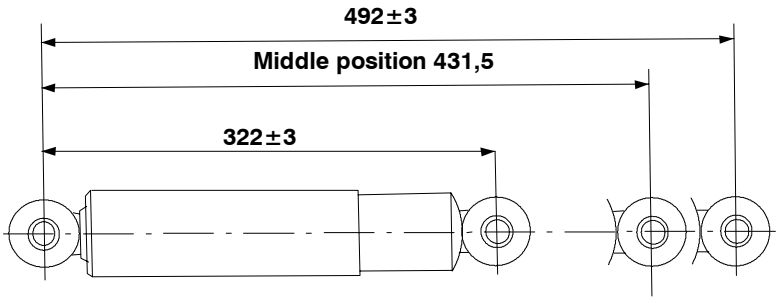
Note! The pressure air pipes of the suspension system have been made of nylon pipes and quick couplings.

IMPORTANT! Although the engine is stopped, the suspension system remains under pressure. Always before maintenance works, make the system unpressurised e.g. by turning the level valve linkage.

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4. Other parts

A. Shock absorbers



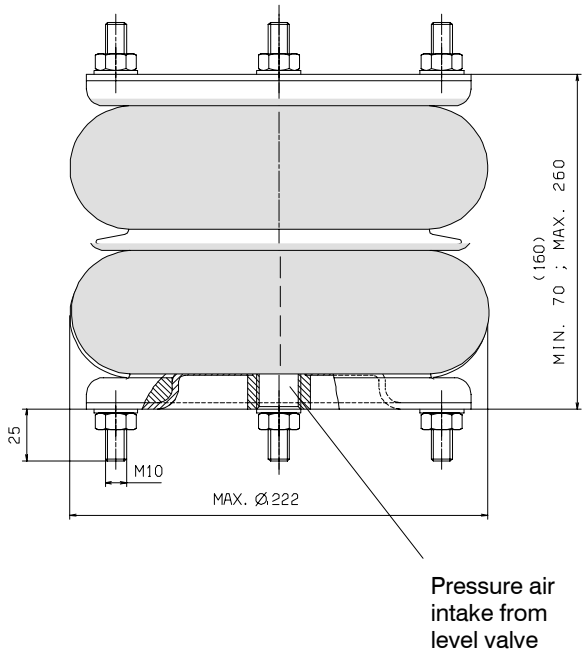
The shock absorbers (2 pcs) are of a liquid type. If the shock absorbers are damaged, the oscillations will take longer to stabilize after driving over pot holes or an rough terrain: giving uncomfortable driving. The shock absorbers are attached with the aid of bushings which have rubber damping.

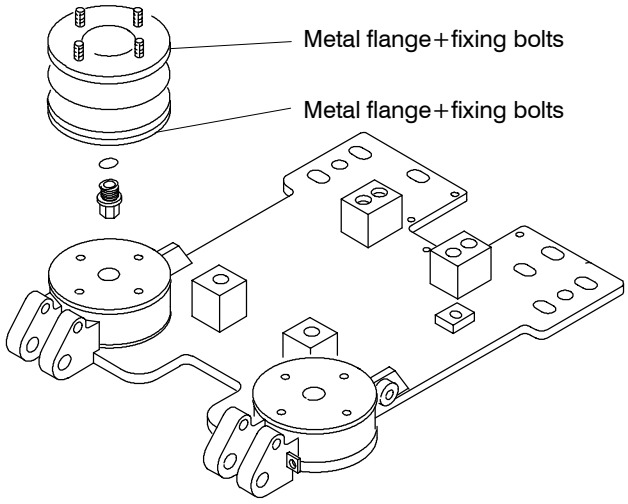
Note! The shock absorbers cannot be repaired, but a new one is fitted in place of the damaged one.

B. Rubber bellows

Type: Dunlop 8”x2.
Pressure values:

	Pressure	Limit value
Max. axle loading, static	3,5 bar	15 bar
Max. axle loading, bottom reaching	14 bar	15 bar
Norm. axle loading, outwards	1,8 bar	not vacuum





Note! In case of damages the rubber bellows are changed as a complete unit.

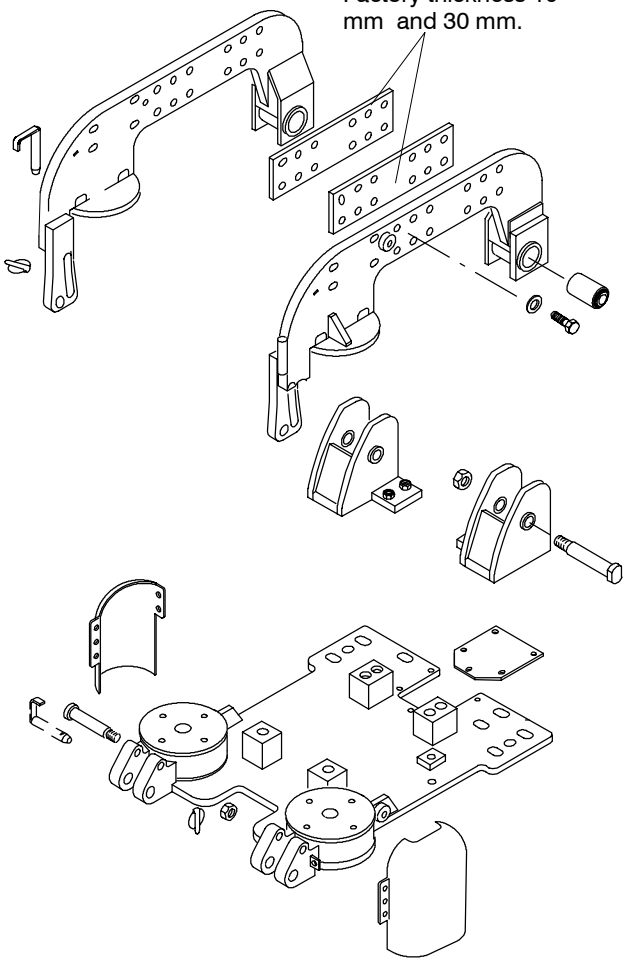
The bellows can be removed as follows:

- stop the engine, exhaust the system
- remove the rubber bellows protective coverings
- unscrew the bellows upper nuts (4 pcs)
- disconnect the pressure pipes under the bellows
- unscrew the lower nuts (4 pcs)
- remove the front end joint pins of the suspension
- raise the tractor front frame, until the bellows can be removed.
- fitting in the reverse order

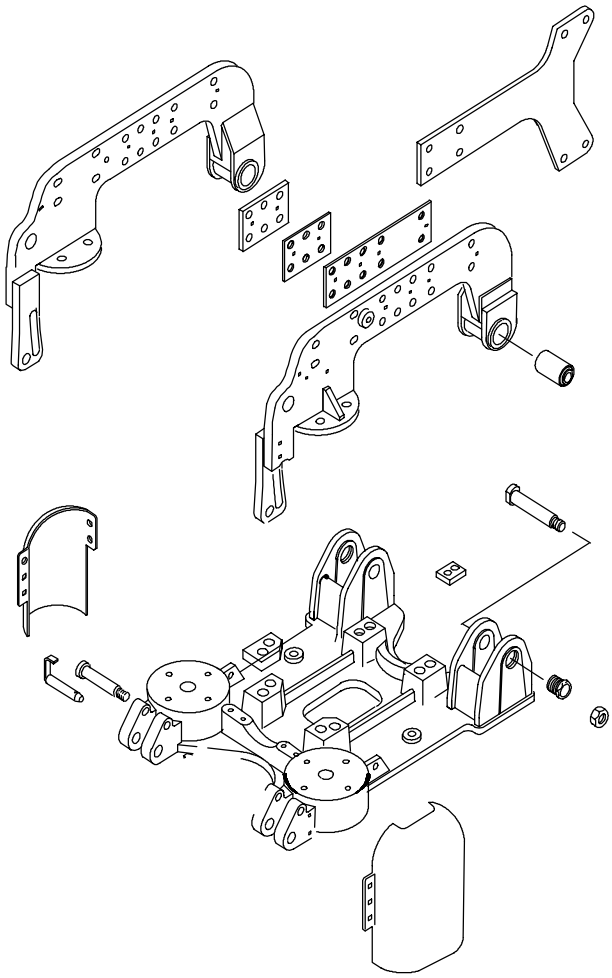
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C. Frame parts

6–cyl.



4–cyl.



The upper frame parts have been fastened onto the sides of the engine oil sump. Between the upper frames and the oil sump there are spacer plates. Thickness of the plates depends on the front mounted implements (the factory thickness of the plates are 10 and 30 mm).

Both upper frame parts are fastened with eight bolts (**M20x75** 8.8, **380 Nm**). In connection with the 6–cylinder engines the joint brackets of the frame parts are fastened with bolts and if the frame parts must be changed, possible dimension deviations can be compensated by adjusting the joint brackets. In connection with 4–cyl. engines the joint bracket have been casted on the lower frame The pins have rubber bushings.

Note! On the side of the rubber bellows there are protective coverings. In addition, at the propeller shaft front joint there is a removable shield.

67. Powered front axle Carraro	1. 10. 1999	Model 8450–8950	Code 670	Page 1

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J. Fitting differential into axle housing 8

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A. Reconditioning steering ram 1

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A. Adjusting toe–in 1
B. Adjusting steering angle 1

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Technical Data

Axle type	Carraro 20. 29
Electro–hydraulic differential lock (HiLock)	standard
Ratio, differential	2,538
Ratio, hub reduction gears	6,923
Total ratio	17,570
Ratio, front axle–rear axle	1,315
Steering angle, adjustable	max. 55˚
Oscillation angle	±7˚
Caster	6˚
KPI	7˚
Camber	1,5˚
Toe –in	0–5 mm
Flange distance	1900
Oils:	
– in differential	6 litres
– in hubs	2x1,5 litres
– oil quality (e.g. Valtra Axle)	80W/90 GL–5 (LS)

Setting values

Bevel pinion shaft:	
– bearing pre–load (measured with a spring balance on the shaft, Ø 34,8 mm)	3–5 kg
– thickness of shims for position adjustment (with increment of 0,1 mm)	2,50–3,40 mm
Differential:	
– bearing pre–load (measured with spring balance on the bevel pinion shaft, Ø 34,8 mm) is bevel pinion shaft bearing preload+	6–9 kg
– tooth backlash, bevel pinion–crown wheel	0,17–0,23 mm
– thickness of thrust washers for differential side gears (with increment of 0,1 mm)	1,45–1,55 mm
– tooth backlash, differential pinions–differential side gears	0,13–0,18 mm
– thickness of steel discs in differential lock (8 pcs)	1,43–1,57 mm
– thickness of friction discs in differential lock (7 pcs)	2,24–2,36 mm
Others:	
– End float of central pivot bearing brackets	0,1–1,1 mm

Tightening torques

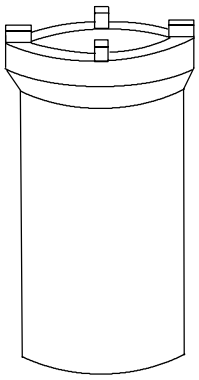
Hubs:	
– Hub cover (planet gear carrier) bolts (2 pcs)	25 Nm
– Planet gear fixing bolts	80 Nm
– Ring gear support fixing bolts	230 Nm
– King pin covers	190 Nm
– Front wheel bolts	550 Nm
– Front wheel stud bolts to hub flange (threads)	70 Nm
– Tie–rod tapered joint to knuckle housing	220 Nm
Bevel pinion shaft:	
– Shaft nut is tightened until the bearing pre–load is correct.	
– Bolts between bevel pinion shaft drive flange–propeller shaft drive flange	70 Nm
– drive flange attaching bolts on bevel pinion shaft (2 pcs)	60 Nm
Differential:	
– Differential bracket bolts to axle housing	170 Nm
– Bearing covers of differential bearings	265 Nm
– Crown wheel fixing bolts	70 Nm
– Locking nuts for differential bearing adjusting nuts	13 Nm
Others:	
– Front axle central pivot bearing bracket to tractor frame	380 Nm
– Tie–rod ball joint	300 Nm
– Tie– rod ball joint locking nut	250 Nm
– Locking nut for steering angle limiting bolts	150 Nm
– Bolts of steering cylinder end flange	120 Nm
– Locking bolts for central pivot bearing brackets	200 Nm
– Steering cylinder hoses	45 Nm

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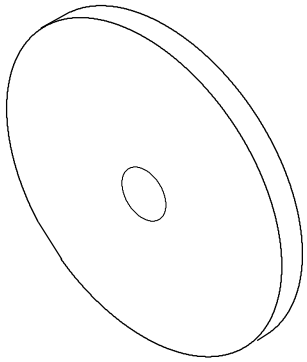
Special tools

Ordering no.	Description
ETV 893 490	Socket spanner for bevel pinion shaft nut (also Carraro 505–905)
ETV 894 460	Plate to fit hub cassette seal (new)
ETV 893 450	Tool to adjust bevel pinion shaft position, which incl.:
	ETV 893 451, Measuring rod (1 pcs) (also Carraro 505–905)
	ETV 893 452, Screw M10x100 (1 pcs) (also Carraro 505–905)
	ETV 893 453, Compression plate (2 pcs) (also Carraro 505–905)
	ETV 893 454, Nut M10 (1 pcs) (also Carraro 505–905)

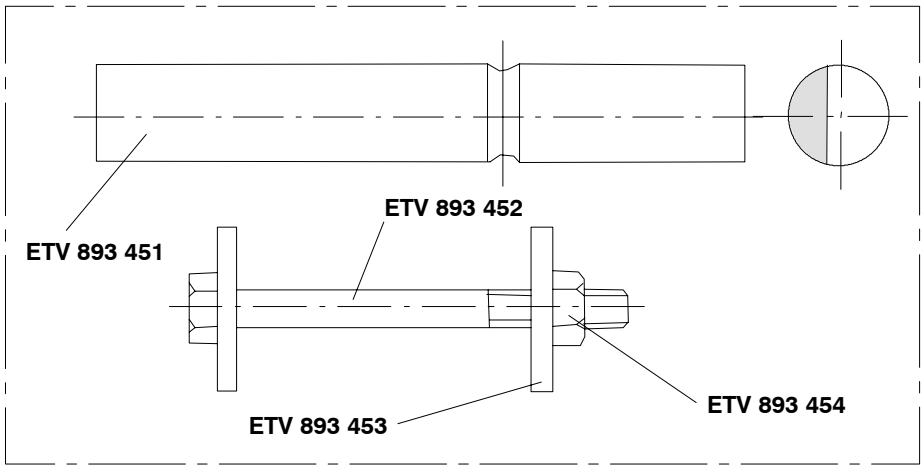
Note! Various bearings and bearing races can be removed by using a drift and a suitable puller. Fitting can be done with sleeves or plates of suitable dimensions. Bearings can be warmed or cooled according to the fitting. Drive shaft seals can be fitted with plates or sleeves of correct dimensions. Some earlier ValtraValmet ETV–sleeves and – plates can be used when repairing this axle.



ETV 893 490



ETV 894 460



ETV 893 450

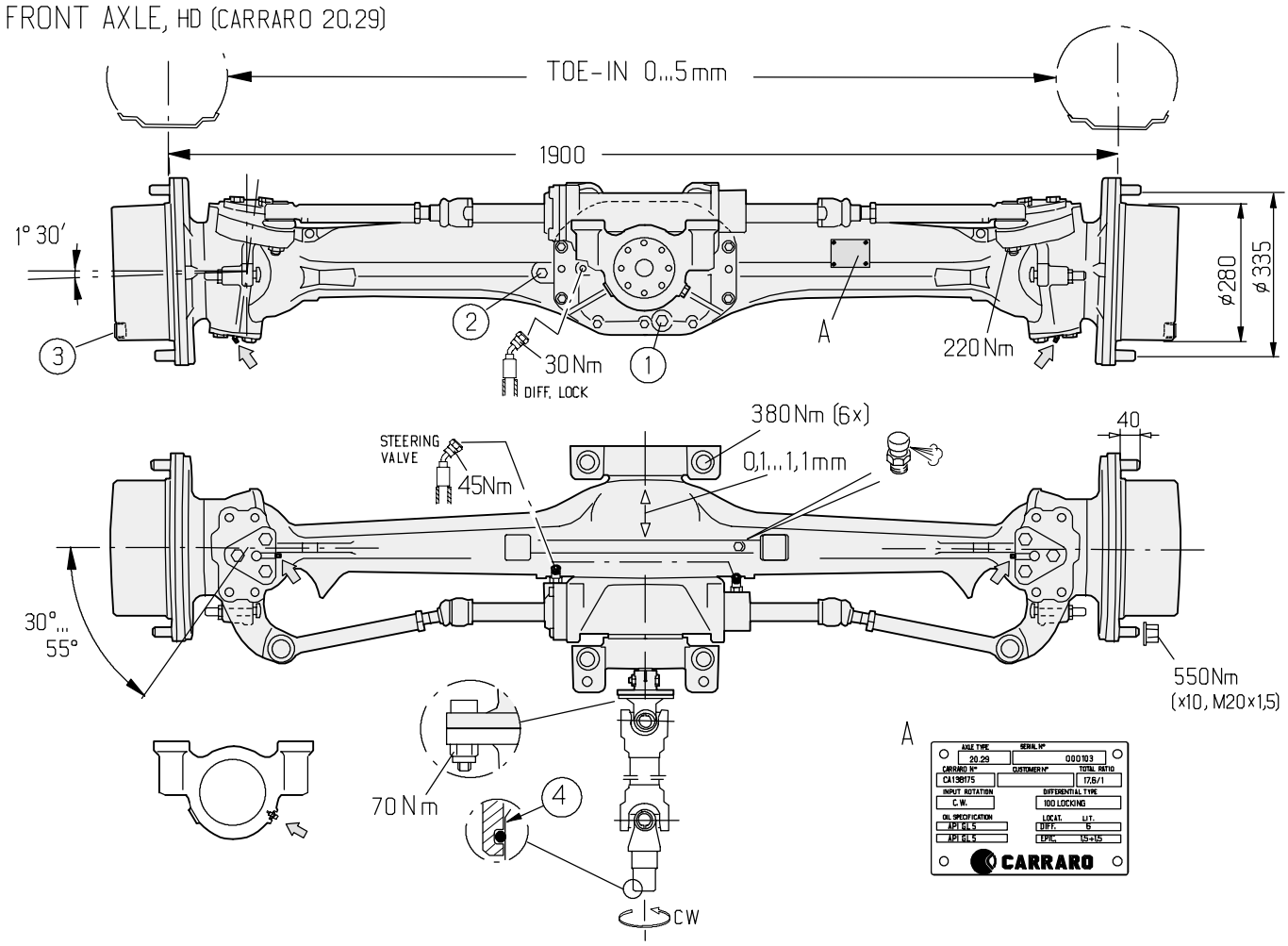
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Description

Carraro 20.29 axle replaces the earlier used Sige industrial front axle from week 32/99. The Carraro axle has as standard an electro–hydraulically controlled differential lock (HiLock), which functions simultaneously with the rear axle lock.

Earlier used front wheel discs cannot be used with this Carraro–axle, since the front wheel fixing studs are different.

Build–up of Carraro axle is shown in pictures on the following pages.
The maintenance intervals and oil qualities are the same as in Sige–axle. However, the grease nipples of the king pins are greased at intervals of 50 running hours/ weekly.

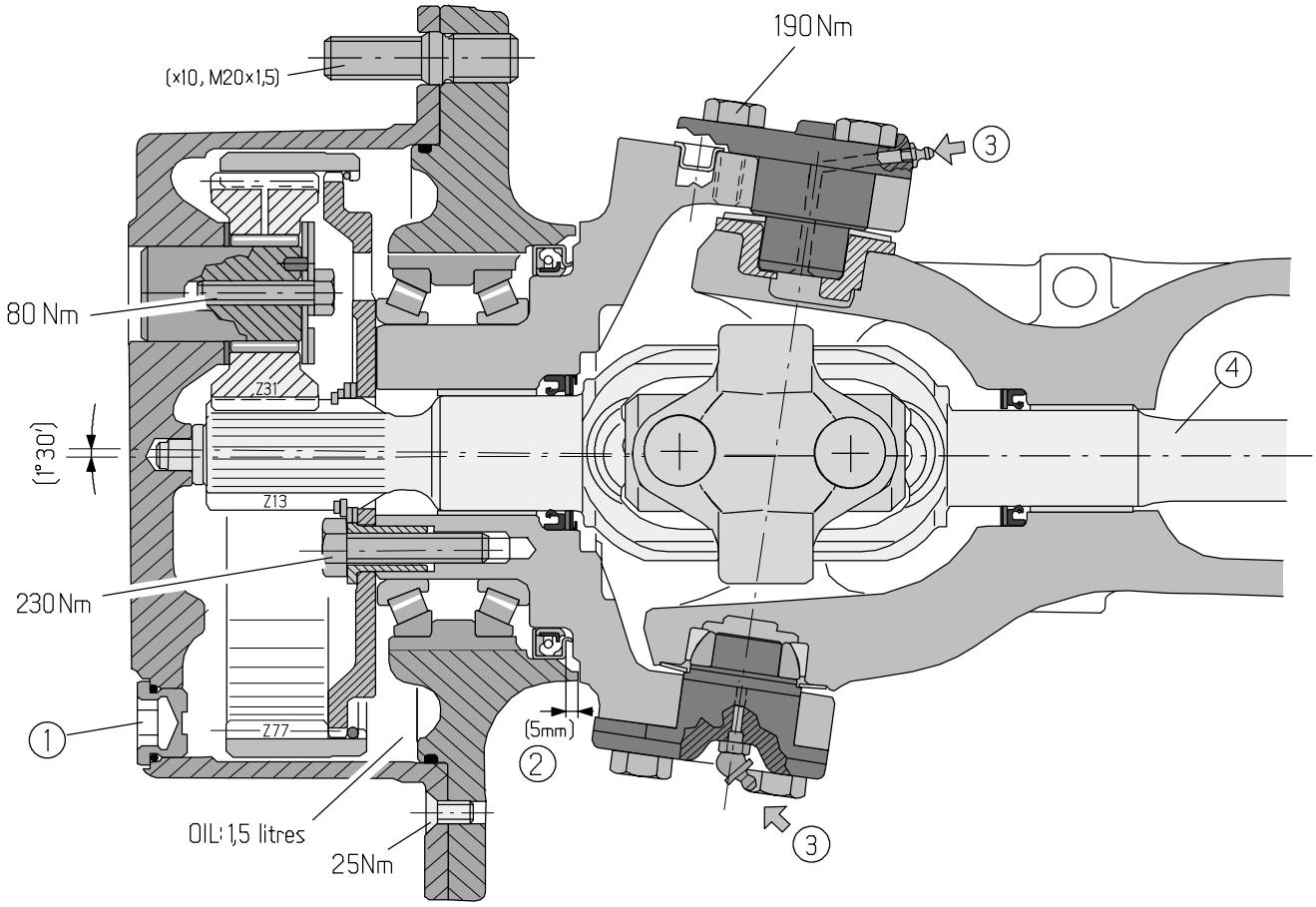


***Picture** 1. Carraro front axle*

1. Axle housing oil draining plug
2. Filling plug
3. Hub oil draining / filling plug
4. EP–grease on splines

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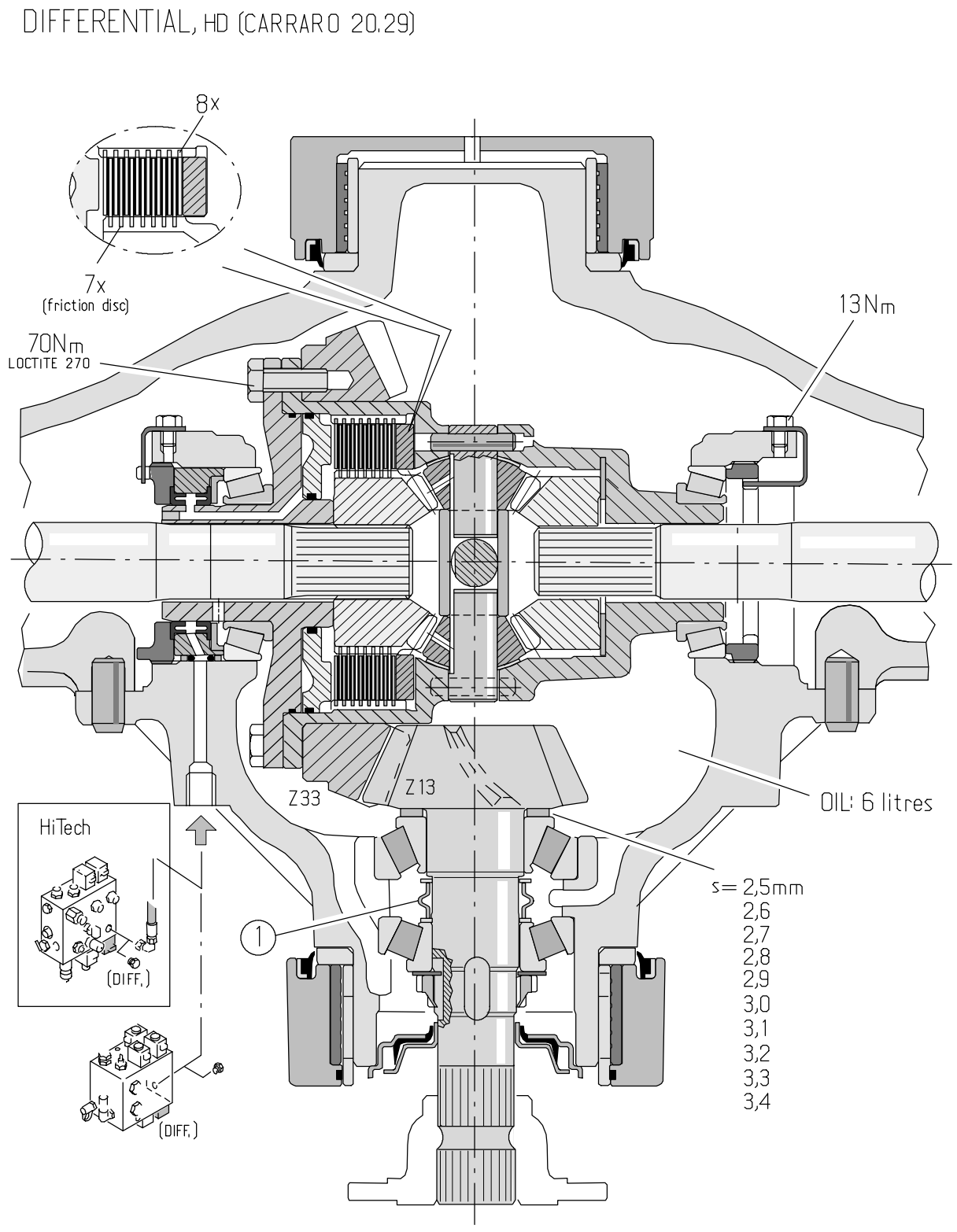
PLANETARY GEAR, HD (CARRARO 20.29)



***Picture** 2. Carraro front axle hub*

1. Oil draining / filling plug
2. Mounting depth of hub cassette seal
3. King pin grease nipples (at intervals of 50 running hours / weekly)
4. Drive shaft

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Picture 3. *Differential, Carraro front axle*

1. Compression bushing

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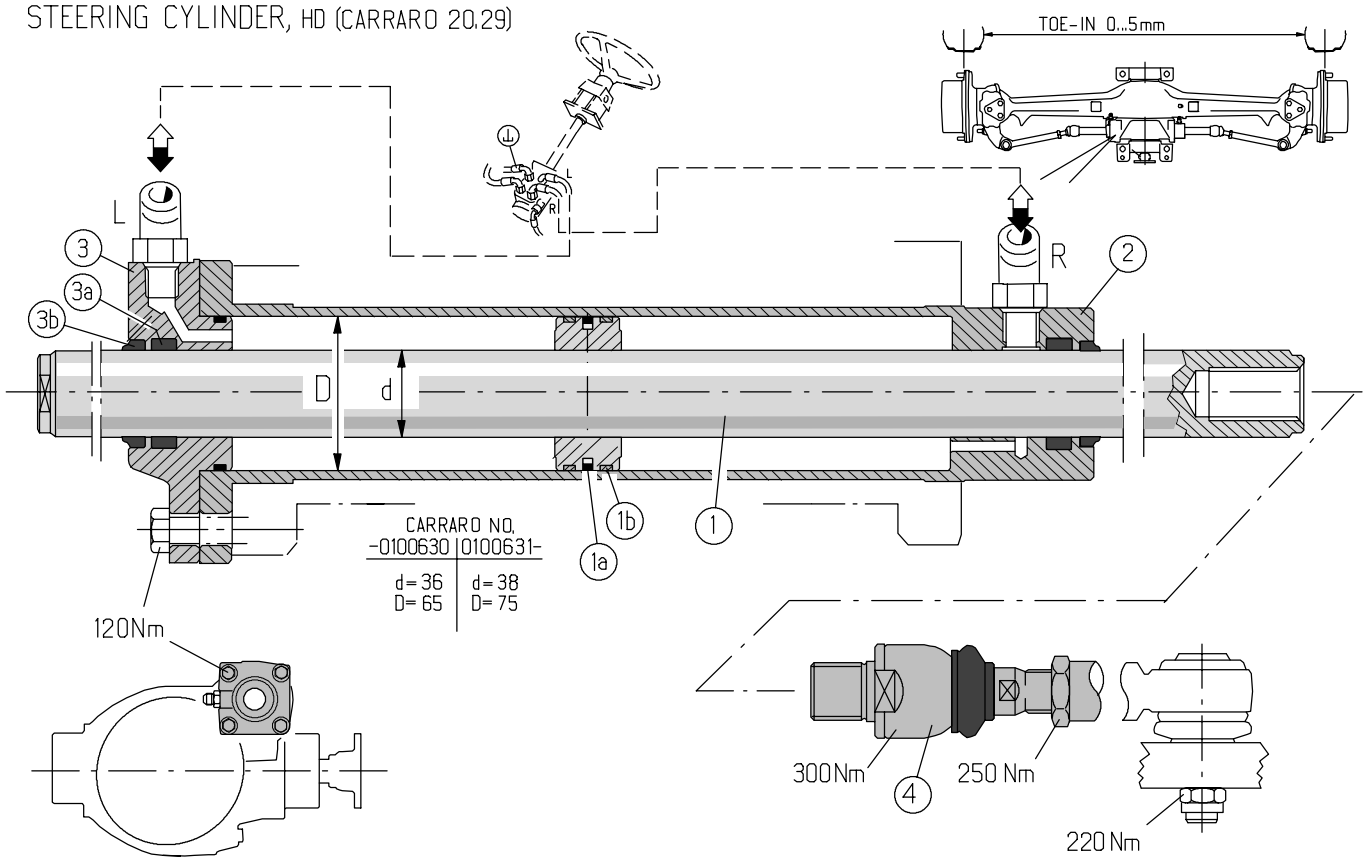


Bild 4. *Steering cylinder*

1. Piston rod and piston
1a. Piston seal + piston seal expander
1b. Wear rings
2. Cylinder liner
3. End flange
3a. Scraper
3b. Oil seal

Axle housing and attaching brackets (Op. no. 671)

A. Removing front axle

1. Apply parking brake. Scotch the rear wheels. Disconnect, if necessary, battery cables.

2. Drain oil in hubs and axle housing (if necessary for repair).

3. Remove the propeller shaft guard under the tractor. Disconnect the propeller shaft front end flange joint.

4. Disconnect oil hoses on the steering cylinder. Disconnect the differential lock pressure oil pipe on the axle housing. Raise the tractor front end and put axle stands under the front frame. Remove front wheels when needed.

5. Fasten lifting ropes to the axle on both sides of the engine.

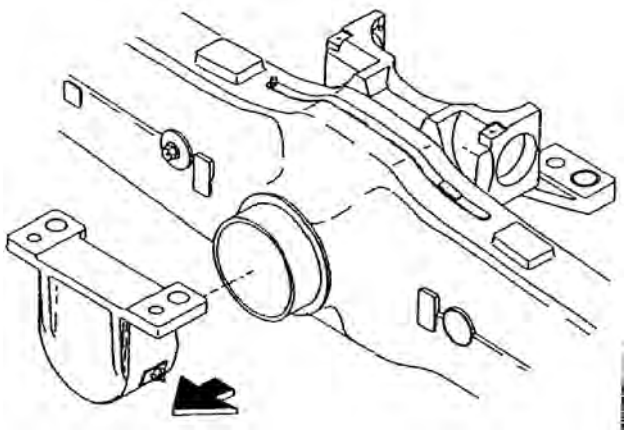
6. Unbolt the central pivot bearing bracket bolts. Lower the axle and remove it.

B. Changing central pivot bearing sleeves.

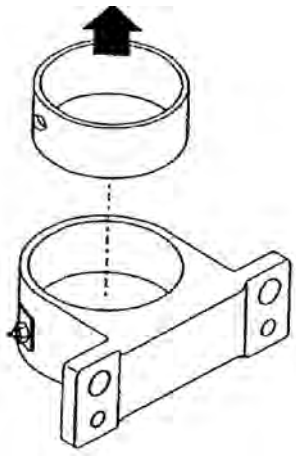
1. Apply parking brake. Scotch the rear wheels. Disconnect the battery cables.

2. Raise the tractor front end and put axle stands under the tractor.

3. Support the axle so that the bearing brackets can be unbolted.

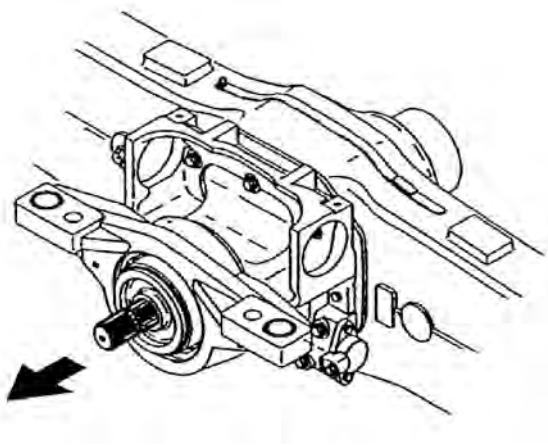


4. Open the bearing bracket bolts. Lower the axle until the guide sleeves release and remove first the foremost bearing bracket.

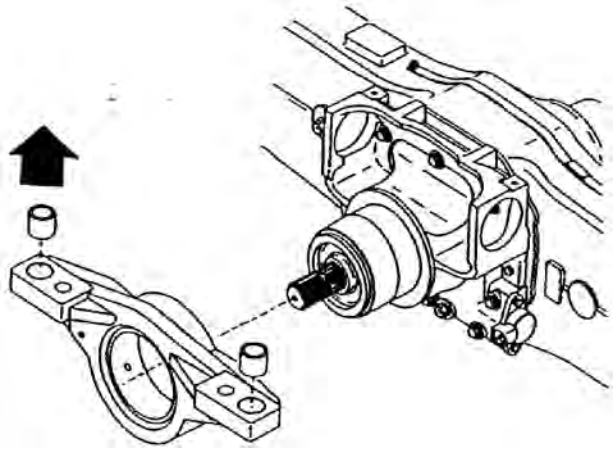


5. Slacken the locking bolt and remove the bearing sleeve. Check sleeve for wear. Change if necessary. Tighten the locking bolt.

6. Check the V–shaped seal ring on the axle. Change if necessary.

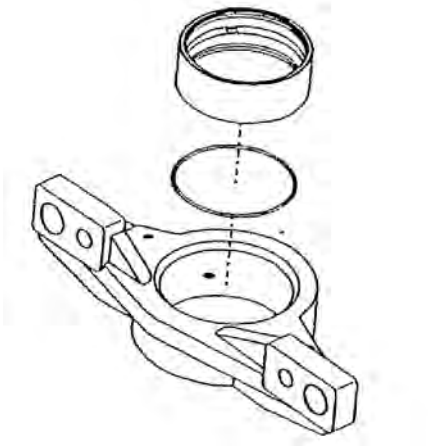


7. Remove the rearmost bearing bracket on the axle.



8. Check the condition of the sleeves. Change when necessary. Check also condition of the V–shaped seal on the axle, change when necessary.

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9. Slacken the bearing sleeve locking bolt and remove the sleeve. Change if needed. Check also condition of the o–ring.

10. Fit the bearing brackets on the axle. Ensure, that the guide sleeves are in their places. Position the axle under the tractor and tighten the bearing bracket bolts to **380 Nm**.

11. Grease the bearings sleeves with universal grease (nipples).

12. Remove the axle stands under the tractor.

13. Test–run the tractor and check that axle functions are OK.

C. Fitting front axle

1. Ensure that the bearing brackets are correctly positioned on the axle and that their guide sleeves are in place.

2. Lift the axle into place and tighten the bearing brackets to a torque of **380 Nm**.

3. Connect the oil hoses to the steering cylinder. Connect the differential lock pressure oil pipe. Connect the propeller shaft front flange joint (**70 Nm**).

4. Fasten the front wheels, if removed (**550 Nm**). Remove the axle stands under the tractor.

5. Fill the differential housing with oil (**6 litres**) and fill hubs (**2x1,5 litres**), if drained (oil quality 80W/90 GL–5 (LS), e.g. Valtra Axle).

6. Grease the bearing bracket nipples with universal grease.

7. Test–run the tractor and check that steering and front axle function properly. Check for leaks.

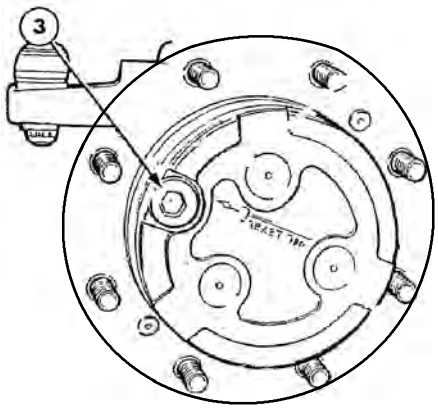
Hubs (Op. no. 672)

1. Reconditioning hubs

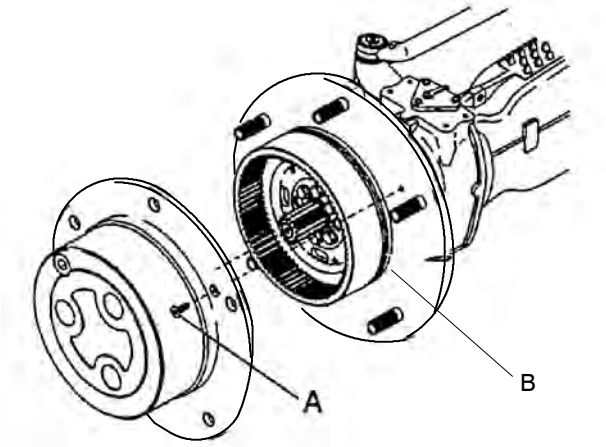
A. Changing planet gears/bearing rollers

1. Apply parking brake. Place wedges on the both sides of the rear wheels. Disconnect the battery cables.

2. Raise the tractor front end and support it with sturdy axle stands. Remove front wheel(s).



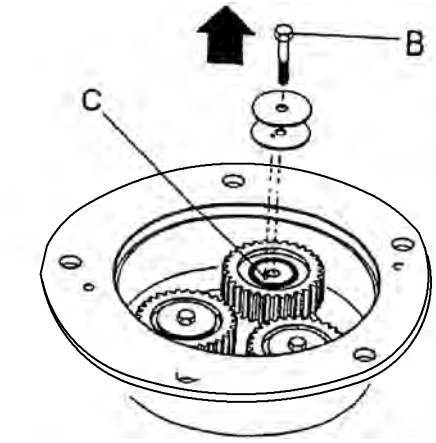
3. Turn the hub so that the oil draining/filling plug (3) is in the rear position. Unscrew the plug and drain the oil into a suitable vessel (1,5 litres oil in both hubs)



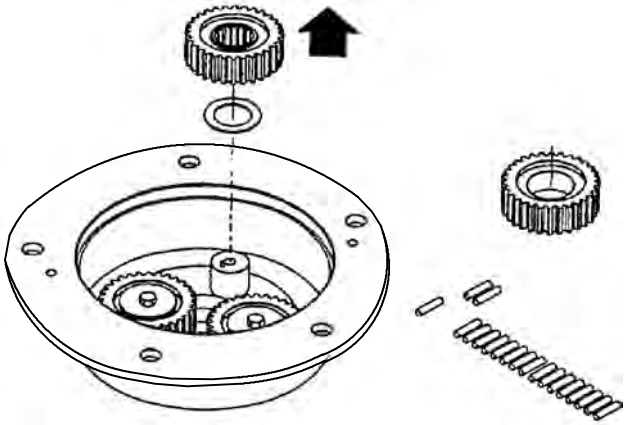
4. Unscrew two hexagonal socket head bolts (A) in recesses. B is the hub large o–ring.

5. Tap with a soft mallet the planetary carrier (hub cover) out and pry it out with two fitting levers.

6. Fasten the planetary carrier e.g. in a vice.



7. If the planet gears/bearing rollers must be changed, unscrew bolts (B) and remove the thrust washers. Take care of the locking pin (C), if it releases.



8. Remove the planet gears and washers under them. Do not mix the planet gear bearing rollers. Change, if necessary, the bearing rollers (28 pcs/gears).

Note! If the stud bolts must be changed, they cannot be separately removed and changed but the whole planetary carrier must be changed. The studs have press fits and they must be pressed into place during fitting.

9. Fit the washer, bearing rollers and planet gears and fit the thrust washers and tighten the bolts to **80 Nm**. Ensure that the locking pins remain in their locations.

Note! The bearing rollers can be fastened with a little grease when assembling them.

10. Check the hub large o–ring, change if necessary. Grease the o–ring.

11. Push the planetary carrier (hub cover) into place and tighten the two socket head bolts to **25 Nm**

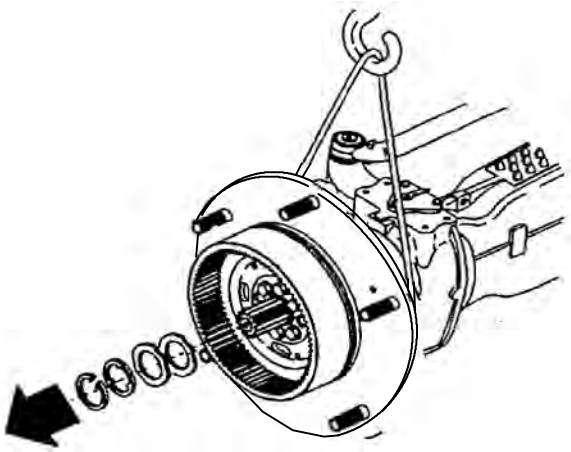
12. Fill the hub with **1,5 litres** oil (80W/90 GL–5 (LS), e.g. Valtra Axle.

13. Fit the front wheel(s), remove the supports and test–run the tractor. Check for leaks.

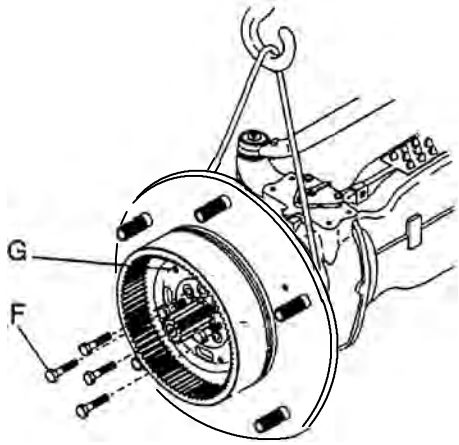
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B. Changing hub cassette seal/wheel bearings

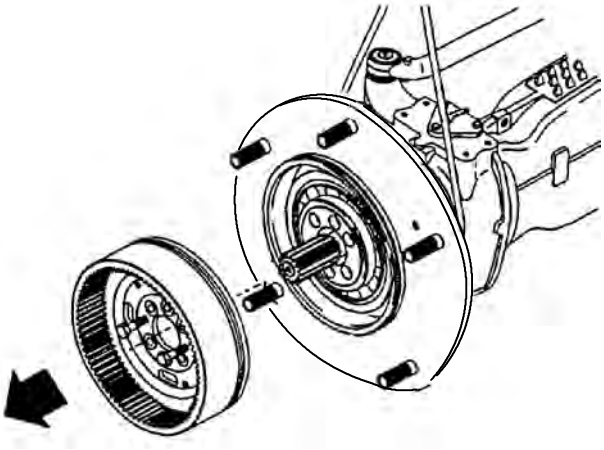
1. Remove the planetary carrier (hub cover) as shown in instr. **1A** stages **1 – 5** on page **672/1**.



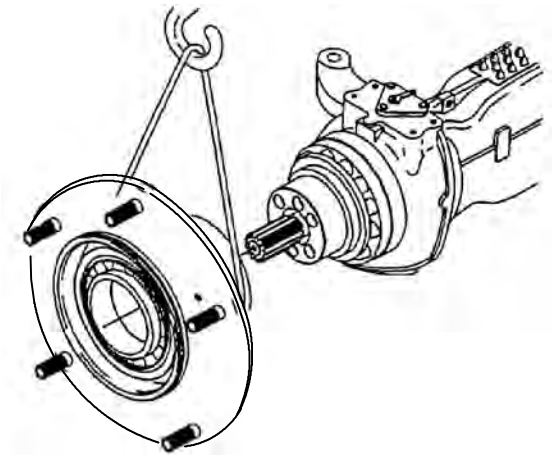
2. Support the hub with a lifting rope. Remove the drive shaft snap ring and thrust washers. Observe the positions of the washers.



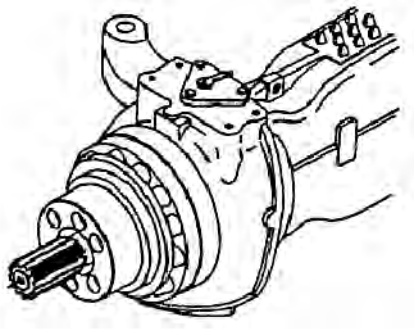
3. Unscrew the ring gear support bolts (F). Screw in two bolts into puller holes (G) and pull out the ring gears.



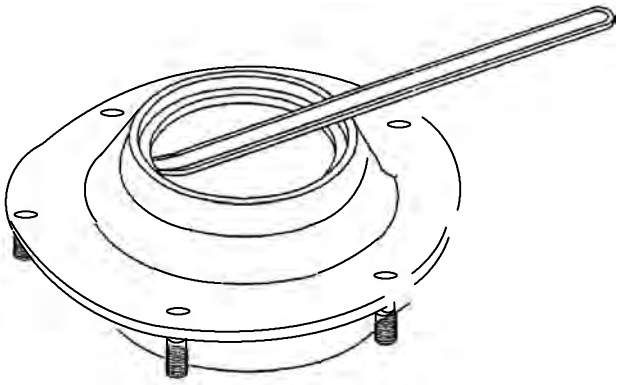
4. Remove the ring gear and its support.



5. Remove the hub flange with wheel bearings and the cassette seal. Remove the outer wheel bearing.

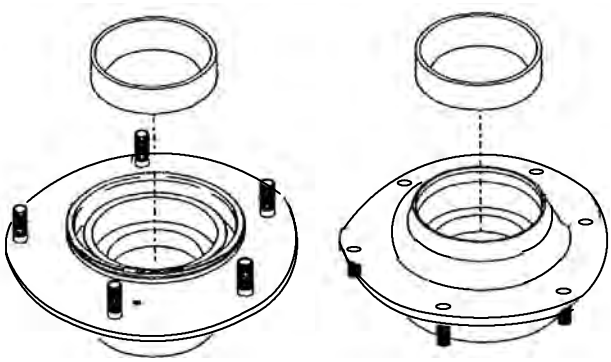


6. Remove the inner wheel bearing on the knuckle housing, if damaged. Removing can be done with a drift and a puller.

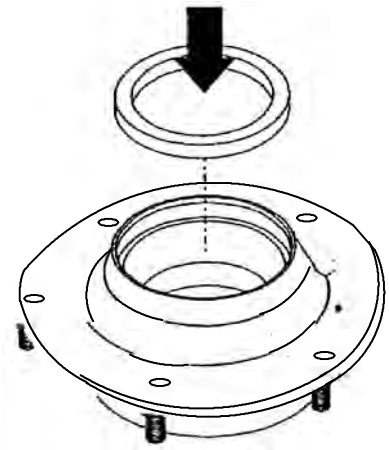


7. Prise out the hub cassette seal.

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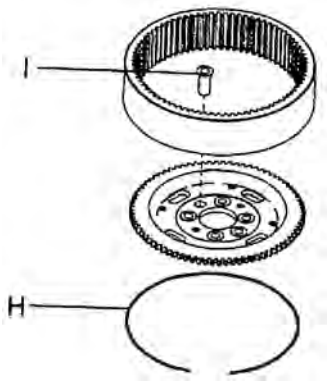


8. Remove the wheel bearing outer races in the hub flange and fit new ones. Removing can be done e.g. with a drift and a hammer. When fitting new races, they can be cooled.

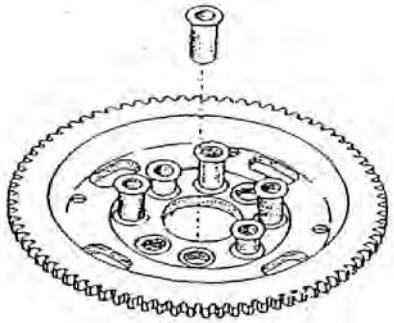


9. Fit a new cassette seal with plate **ETV 894 460**. Grease the seal lips.

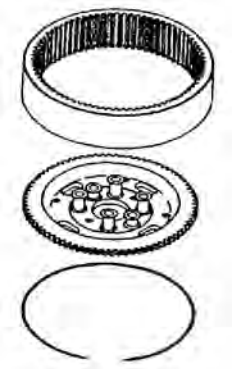
10. Fit a new inner tapered roller bearing on the knuckle housing. The bearing can be warmed up to +80° C.



11. Detach, when necessary, the ring gear by releasing circlip (H) with a suitable pliers. Remove, when necessary, steel sleeves (I) and fit new ones.



12. If you change the steel sleeves, prefit the sleeves into ring gear support so that two sleeves protrude some millimetres to guide the ring gear support when fitting it.

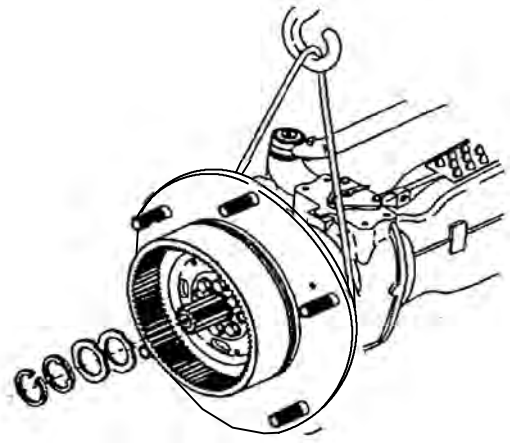


13. Fasten the ring gear onto support and secure it with the snap ring.

14. Press the hub flange into place so that the inner bearing outer race fits onto the roller bearing on the knuckle housing.

15. Push the outer wheel bearing against its outer race in the flange. The bearing can be warmed up to +80° C.

16. Place the ring gear onto the hub. Tap in all steel sleeves to their boring. Fit and tighten the ring gear support bolts to **230 Nm**.



17. Refit the washers in a correct order and secure them with the circlip.

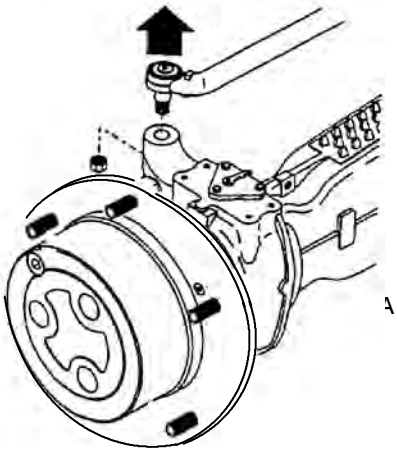
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18. Fit the planetary carrier (hub cover) and add oil into the hub, see instr. **1 A** stages 10–13 on page **672**/**1**.

C. Changing king pin bearings

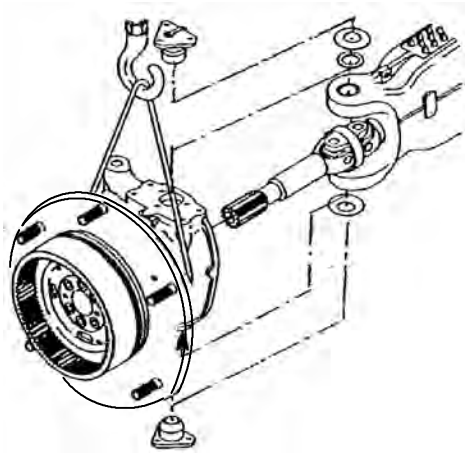
1. Remove the hub cover according to instr. **1A** stages **1–5**. Remove the drive shaft outer end circlip and the washers.

Note! The above shown stage 1 is not necessary, since the hub can be removed as a complete unit when the king pin covers are removed. In this case the drive shaft comes out with the hub. However, the drive shaft outer seal cannot be changed.



2. Disconnect the tie–rod tapered joint from the steering arm.

3. Support the hub/knuckle housing with a lifting rope and unscrew the king pin upper and lower covers. Do not mix the upper and lower tapered rings (different thickness and shape).



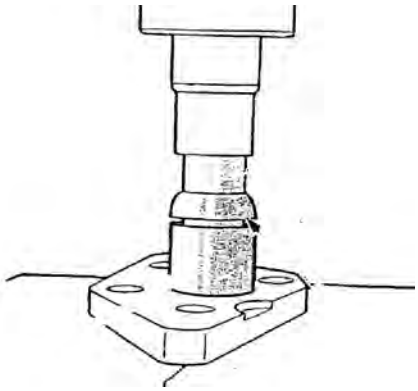
4. Remove the king pins and remove the nub. Take care of the washers.

Note! If the drive shaft remains in the axle housing, do not damage the drive shaft outer seal. If the drive shaft comes out together with the hub, do not damage the drive shaft inner seal.

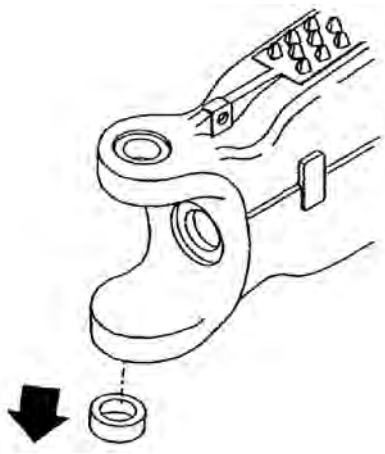


5. Fasten the lower king pin in a vice and drive out the tapered ring according to the picture above.

6. Remove the sleeve from the upper king pin in the same way.

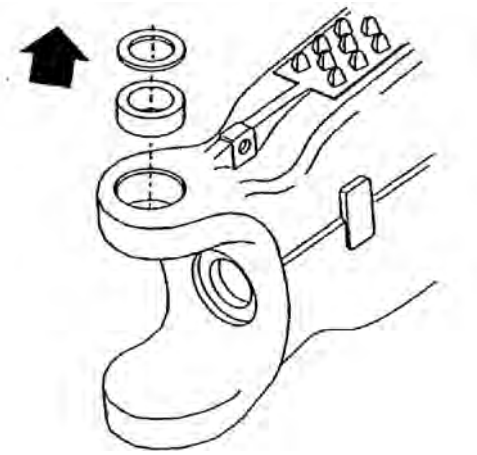


7. Press with a hydraulic press a new tapered ring (lower pin) and a new sleeve (upper pin) into place.

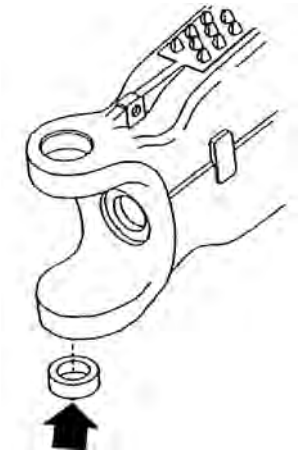


8. Pull out the lower king pin inner tapered ring and fit a new one.

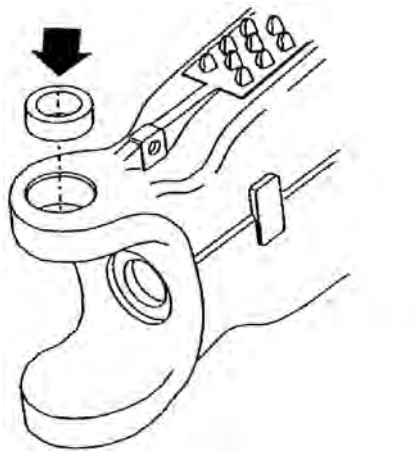
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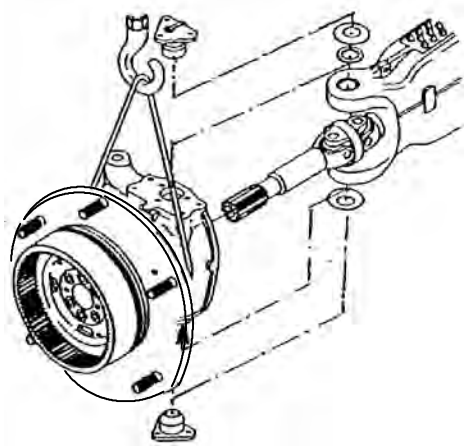
9. Remove the upper pin sleeve after removing the tapered ring.



10. Fit a new lower king pin outer bearing cup.

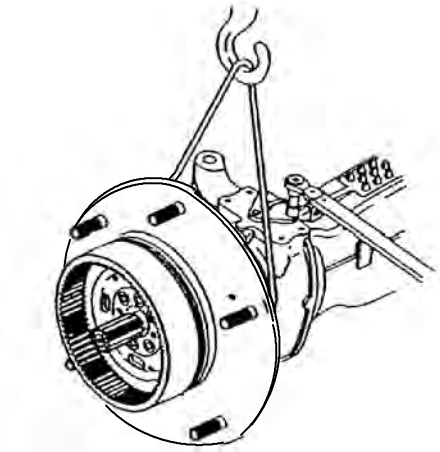


11. Fit the upper pin bearing cup.



12. Support the hub with a lifting rope and push it onto the axle end and fit the washers and the king pins.

Note! Do not mix the upper and lower washers (different thickness and shape). Do not damage the drive shaft outer seal, if the drive shaft remained in the axle housing



13. Tighten the king pin covers (**190 Nm**).

14. If you removed the hub cover and the circlip and the washers at the end of the drive shaft, refit first the washers and circlip (correct order) at the end of the drive shaft and fit the planetary carrier (hub cover) as shown in instr. **1A** stages **10–13** on page **672/1**.

15. Grease the king pin nipples with universal grease.

16. Connect the tie rod tapered joint (**220 Nm**).

Drive shafts (Code no. 673)

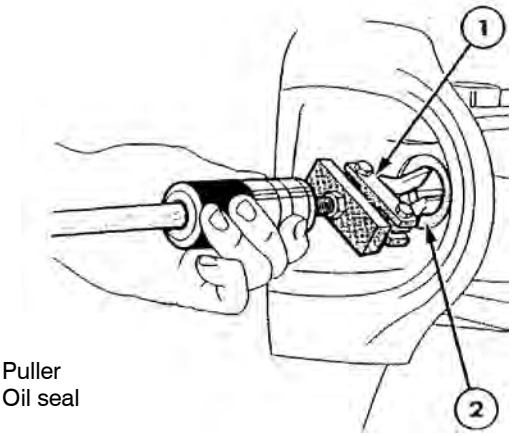
1. Changing drive shaft oil seals / bearing bushings

A. Changing inner seal/bearing bushing

Note! The drive shaft inner oil seal can be changed so that first are removed the king pins and then the hub is pulled out together with the drive shaft. In this case is unnecessary to disassemble the hub.

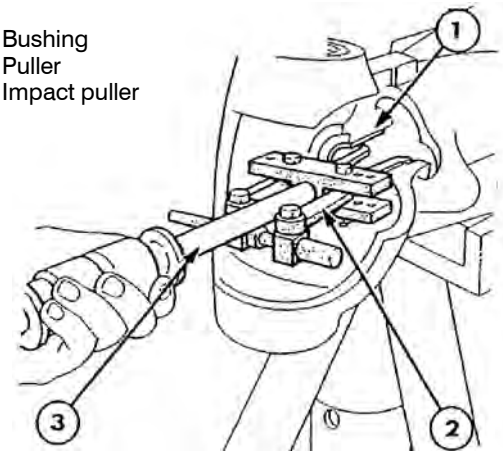
1. Remove the front wheel. Disconnect the tie–rod tapered joint, support the hub with a lifting rope and remove the king pins, see instr. **1 C** stages **2–4** on page **672/4**.

2. Pull out the hub/drive shaft. When necessary, drain the oil in the axle housing.



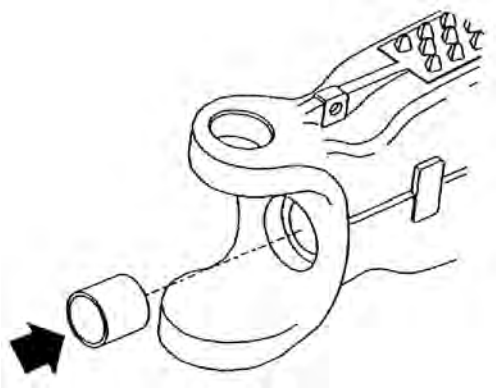
1. Puller
2. Oil seal

3. Prise out or pull out the inner oil seal.

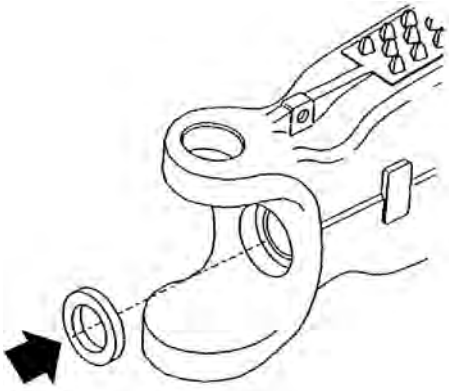


1. Bushing
2. Puller
3. Impact puller

4. Check the condition of the drive shaft bearing bushing in the axle housing bore. Pull it out, if damaged, with a suitable puller.



5. Tap in a new bushing with a suitable fitting tool. Grease the bushing.



6. Fit a new inner oil seal into the housing bore (lips turned to the housing side). Grease the seal lips.

7. Push the hub/drive shaft into the housing. Do not damage the inner oil seal with the drive shaft splines.

8. Fit the king pins/washers and tighten the pins to a torque of **190 Nm.** Connect the tie–rod tapered joint to the steering arm (**220 Nm**).

9. Grease the king pin nipples.

10. Add oil into the axle housing, if drained (**6 litres,** 80W/90 API GL–5 (LS), e.g. Valtra Axle).

11. Refit the front wheel. Test–run the tractor and ensure that no leaks exist.

Drive shafts:

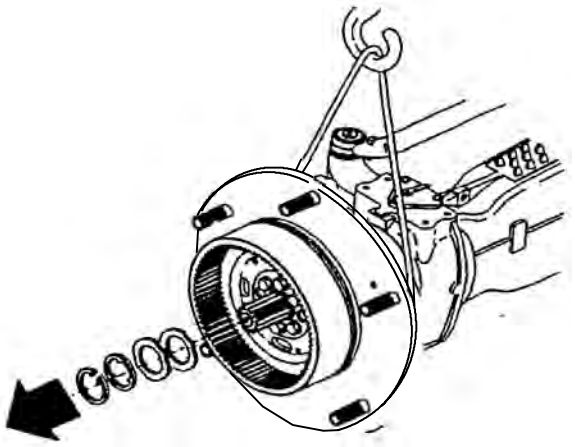
Note! Check the condition of the drive shaft splines and the double joints. The double joints can be disassembled in a normal way concerning these joints, see e.g. instr. **C** on page **642/3**.

If the joints have been damaged, cross pieces, sleeves and washers are available as a spare part.

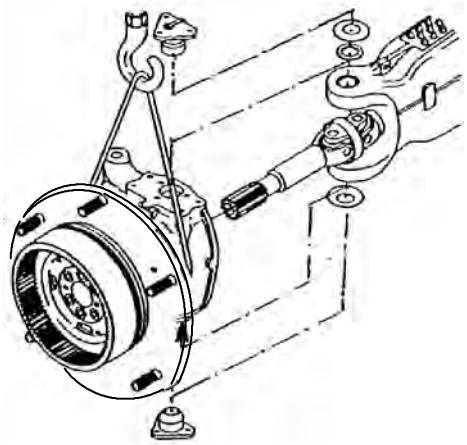
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B. Changing drive shaft outer oil seal / bearing bushing

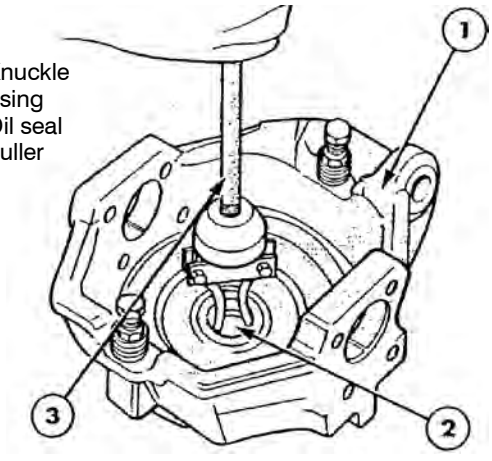
12. Drain oil in the hub, remove the planetary carrier (hub cover), see instr. **1A** stages **1–5** on page **672**/**1**. When necessary, drain oil in the axle housing.



13. Remove the drive shaft snap ring and the washers (note the order of the washers).

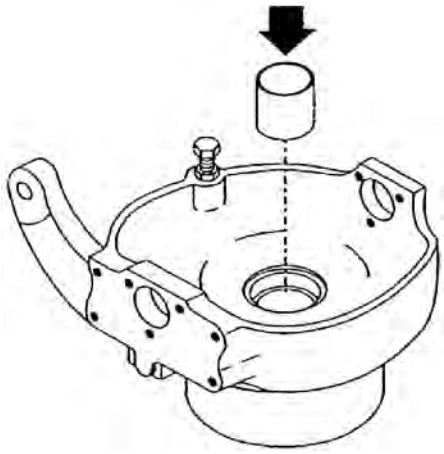


14. Support the hub with a lifting rope. Disconnect the tie–rod from the steering arm. Remove the king pins/washers and pull out the hub.

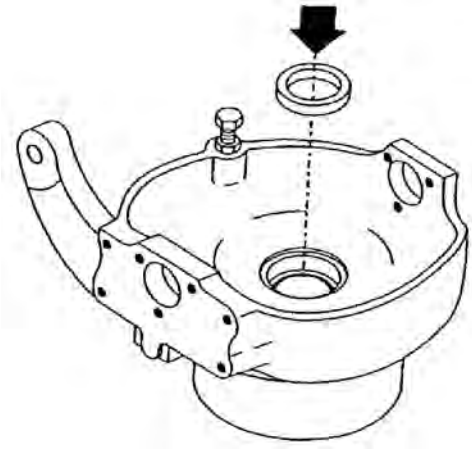


1. Knuckle housing
2. Oil seal
3. Puller

15. Prise out the drive shaft outer oil seal. Check the condition of the bearing bushing. Pull out the damaged bushing with a suitable puller or knock it out with a suitable tool.



16. Drive in a new bushing with a suitable tool.



17. Fit a new outer seal with a suitable tool.

18. Grease the bushing and the seal

19. Wrap a plastic foil round the drive shaft splines (sun gear) and push the drive shaft into the hub. Remove the plastic foil, fit the washers (observe order) and fit the snap ring.

20. Push the hub/knuckle housing together with the drive shaft into the axle housing (do not damage the drive shaft inner oil seal).

21. Fit the washers/king pins and tighten the pins to a torque of **190 Nm.** Reconnect the tie–rod (**220 Nm**).

22. Grease the king pin nipples.

23. Add oil into the axle housing, if drained (**6 litres,** 80W/90 API GL–5 (LS), e.g. Valtra Axle).

24. Fasten the planetary carrier, see instr. **1A** stages **10–13** on page **672**/**1**.

25. Test–run the tractor and ensure that no leaks exist.

Reconditioning differential/bevel pinion shaft (Code no. 674)

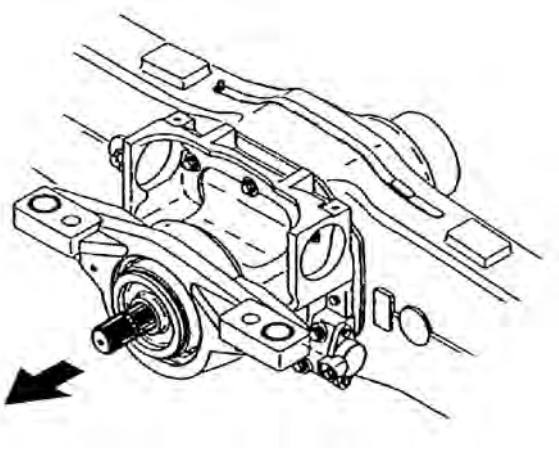
A. Changing bevel pinion shaft cassette seal.

Note! The seal can be changed from under as follows:

1. Drain oil in the axle housing.

2. Remove the propeller shaft guard under the tractor.

3. Disconnect the flange joint at the front end of the propeller shaft and lower the shaft to the ground. Remove the drive flange on the bevel pinion shaft splines.



4. Prise out the damaged seal with a suitable lever. Remove the o–ring, if fitted.

5. Put the o–ring into place and grease it and lips of a new cassette seal. Fit the new cassette seal with a suitable fitting tool. Do not damage the seal on the shaft splines.

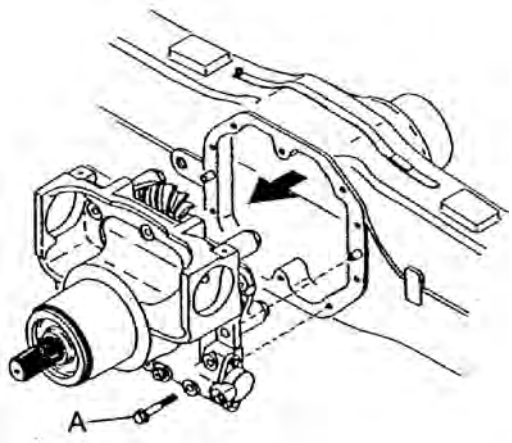
6. Refit the drive flange onto the bevel pinion shaft (60 Nm). Reconnect the flange joint (70 Nm). Refit the propeller shaft guard. Add oil into the axle housing.

7. Test–run the tractor and check for leaks.

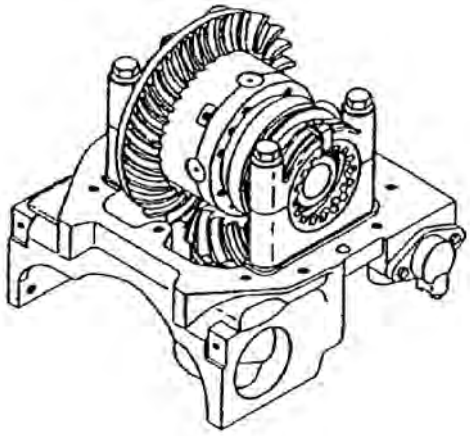
B. Removing differential

1. Drain the oil in the axle housing. Remove the steering ram (see instr. **A** stages **675**/**1**). Disconnect the diff. lock pressure oil hose.

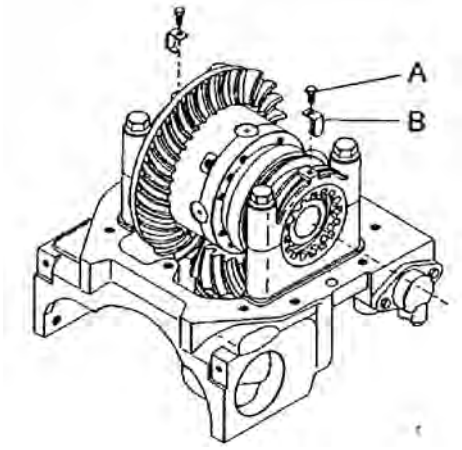
2. Remove both hubs together with the drive shafts (see instr. **1A** stages **1–2** on page **673**/**1**)



3. Unscrew the differential bracket bolts (A) and take out the differential/bevel pinion shaft. In the mating surfaces there are dowels.

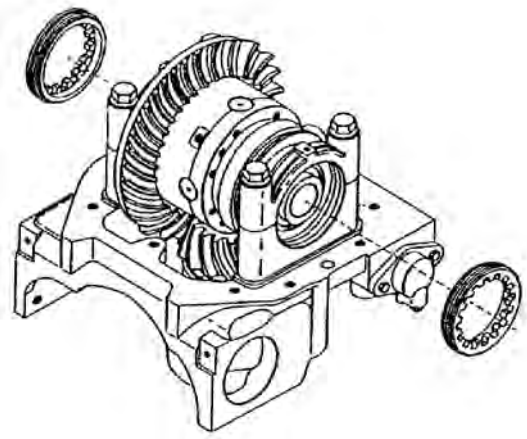


4. Place the differential unit in a suitable fitting base.

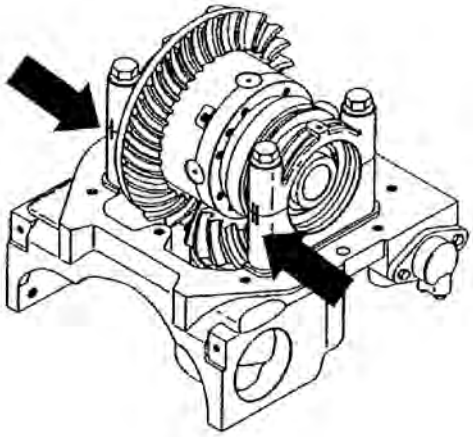


5. Unscrew bolts (A) and remove lock tabs (B).

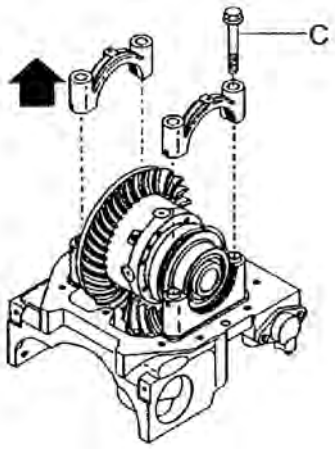
https://truckmanualshub.com/



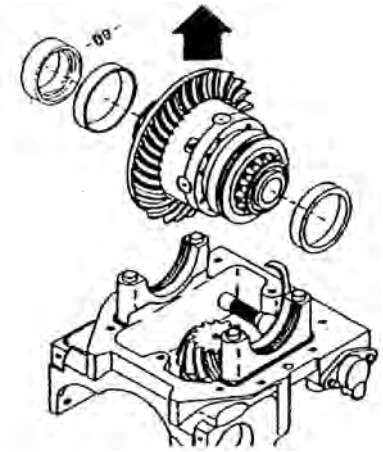
6. Unscrew and remove the adjusting nuts.



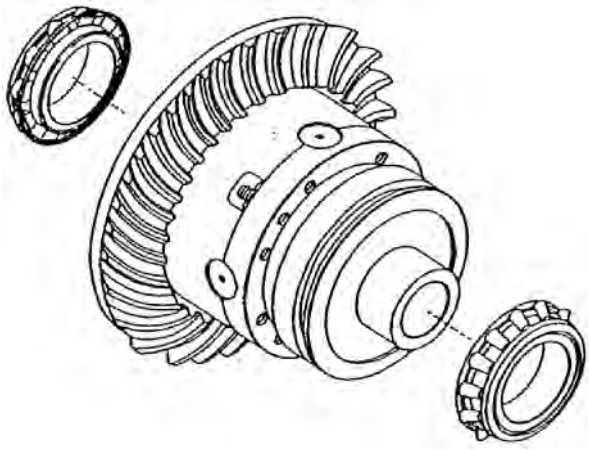
7. Before removing the differential bearing caps, mark their positions to make refitting easier.



8. Unscrew the bearing cap bolts (C) and remove the caps.

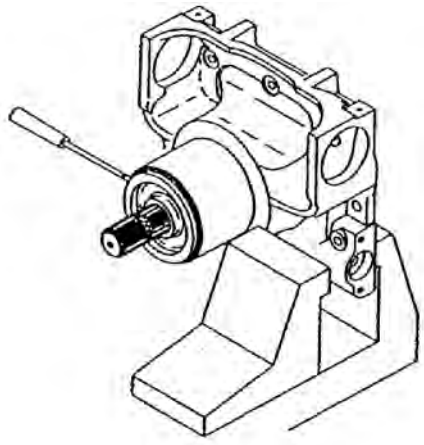


9. Remove the differential unit together with its bearings and remove oil distributor sleeve, o–ring and the intermediate ring.



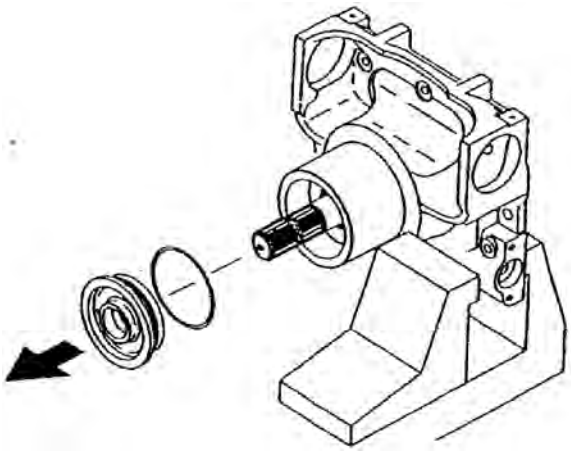
10. Remove the differential bearings, when necessary.

C. Removing bevel pinion shaft:

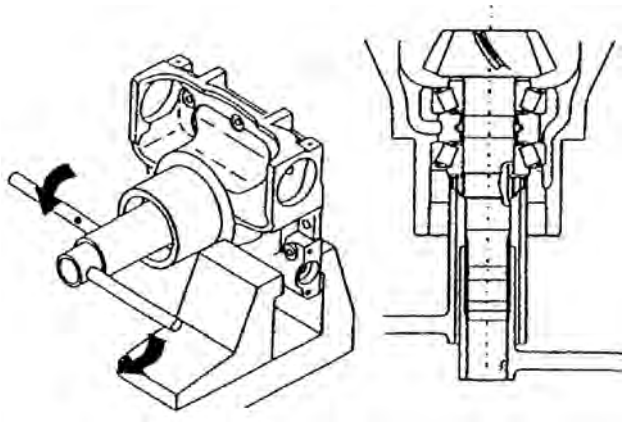


11. Remove the cassette seal by prising it out (note that the seal is damaged when it is removed).

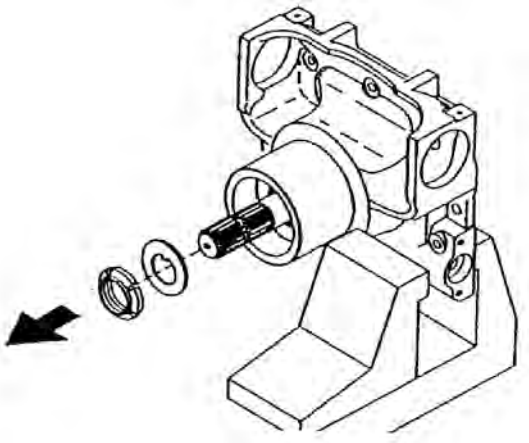
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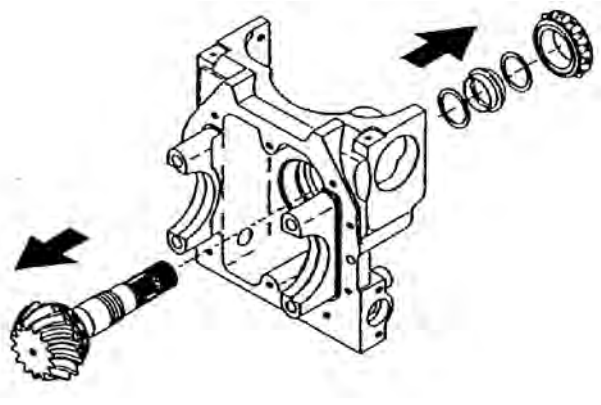
12. Remove the cassette sea and the o–ring (if fitted).



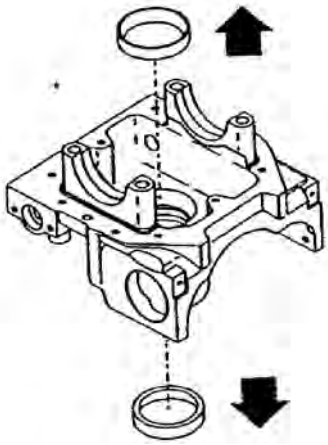
13. Unscrew the bevel pinion shaft nut with spanner **ETV 893 490**. Prevent shaft from rotating in a suitable way.



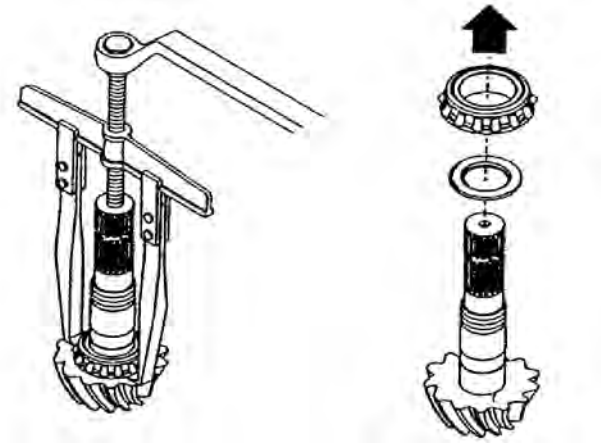
14. Remove the nut and the lock washer on the shaft.



15. Knock out the shaft with a soft mallet. Take care of the intermediate rings, compression bushing and the outer bearing, which are released.



16. When necessary, drive out the shaft bearing outer races in the differential bracket.

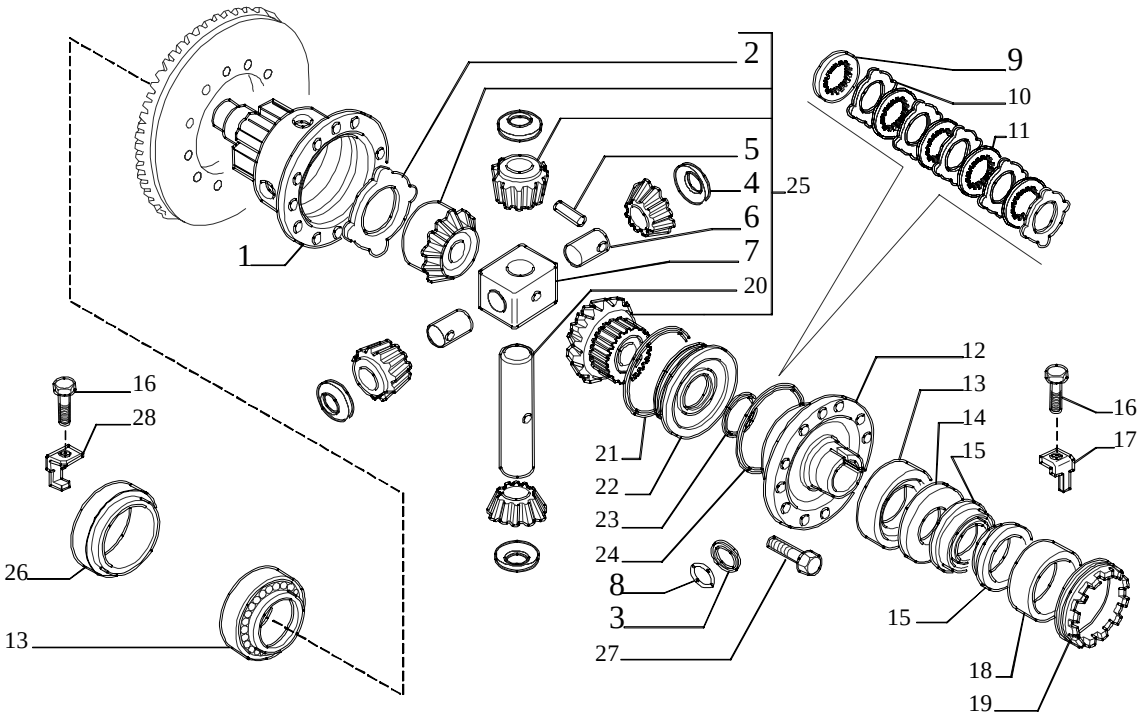


17. Remove the inner tapered roller bearing on the shaft and remove the spacer ring under the bearing.

Note! The chamfered side of the spacer ring must be turned to the bevel pinion side.

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D. Disassembling differential



18. Unscrew bolts (27), at which time the crown wheel is released and the differential housing is split.

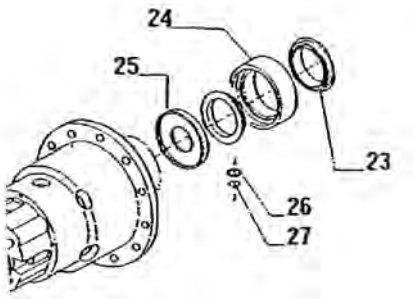
19. Remove cover (12) and change o–ring (24).

20. Remove piston (22) and change o–rings (21) and (23).

21. Remove the disc pack (9, 10, 11) (note the fitting order. Steel discs have teeth on the outer circumference) and check the condition of the discs. If the disc wear can be found, change all discs at the same time. Thickness of the discs, see page **670/2**.

22. Remove and check the condition of the differential pinions. Before removing, remove tension pins (5).

Note! In connection with damages, change all parts under pos. no. 25.



23. Check/change seals (23) and o–ring (27).

24. Check the housing wear. Small damages can be repaired with fine emery cloth.

E. Assembling differential

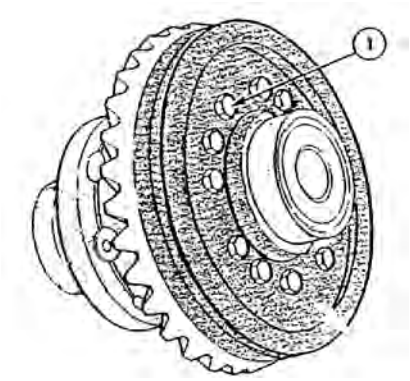
25. Assembling is done in a reverse order.

26. Lock the differential pinions with pins (5). Fit the disc pack and the differential side gears (disc pack contains **1 thrust plate, 8 steel discs and friction discs**. Steel discs have teeth on the outer circumference).

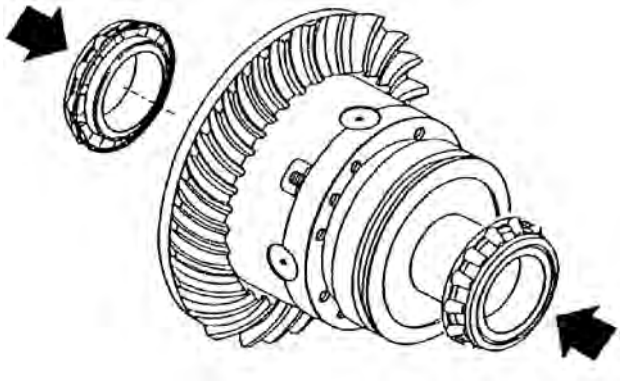
27. Refit piston (22) and its o–rings (23) and (21), cover (12) and o–ring (24).

Note! The differential gears have thrust washers with different thickness, see technical data. In addition, the differential gears have a certain tooth backlash, see technical data. If the thrust washers must be changed, the tooth backlash must be checked with a dial gauge.

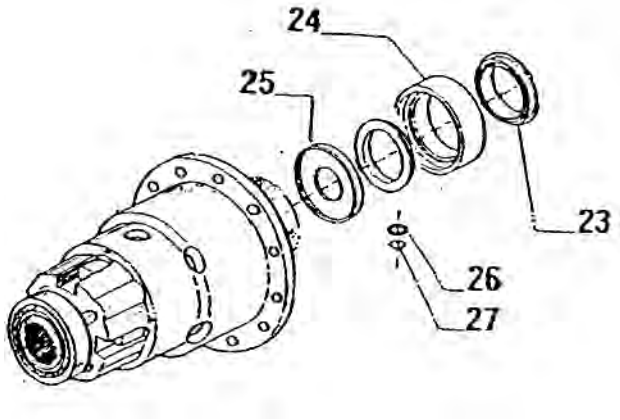
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28. Place the crown wheel into place, apply Loctite 270 on the bolts (1) and tighten them to **70 Nm**.



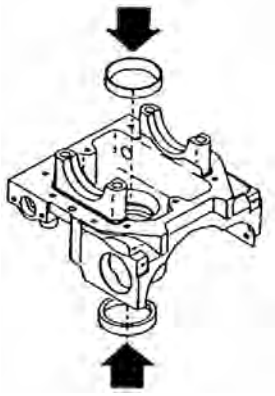
29. Fit the differential bearings onto the housing. When necessary, warm the bearings up to +80°C before fitting.



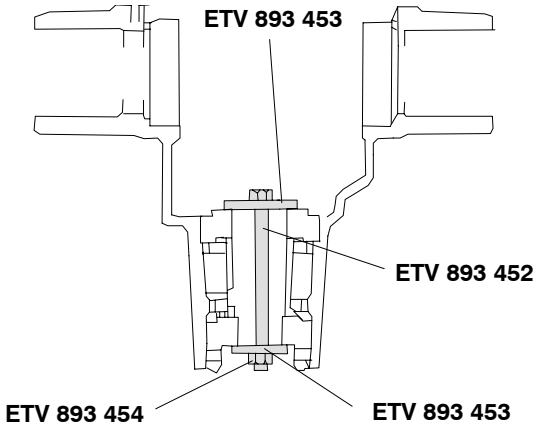
30. Fit the intermediate plate (25), protector (24) and seal (23) (if removed). After this the differential can be fastened onto the support. Observe the o–ring (27) and plate (26).

IMPORTANT! The intermediate plate (25) must be fitted so that the bent side is turned to the bearing side (see picture on page **670/6**).

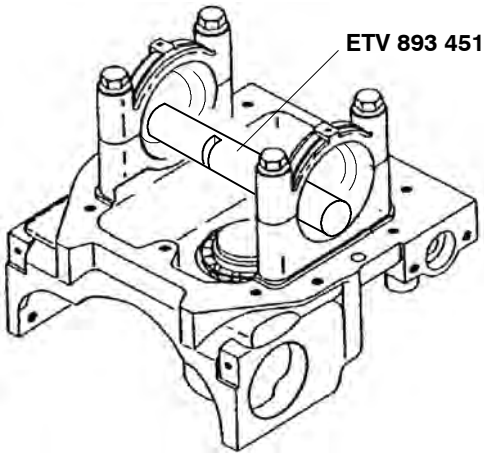
F. Adjusting position of bevel pinion shaft



31. Fit both bearing outer races into their locations in the bracket. Cool, when necessary, the bearing races before fitting.



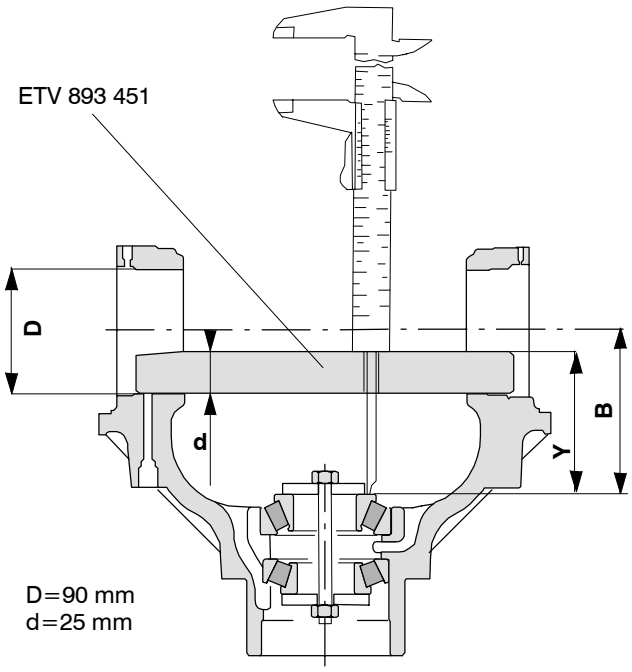
32. Fit the bevel pinion shaft bearings and fasten them with the special tools (plates ETV 893 453 (2 pcs), ETV 893 454 nut M10 and ETV 893 452 screw M10x100) so that the bearings rotate freely but without clearance. Rotate bearings many times.



33. Place the measuring rod ETV 893 451 on the differential bearing bores in the middle of them in the lowest position.

Note! Bearing caps (in picture) can be removed.

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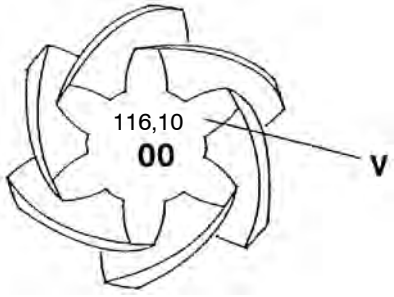


34. Measure distance **Y** according to the picture above. **Y** is the distance from the bevel pinion shaft bearing surface to the upper surface of the rod ETV 893 451 (e.g. 99,10 mm). Place the vernier caliper through the groove in the rod.

34a. The sought measurement **B** (distance between the bevel pinion shaft bearing surface to the middle of the differential bearing locations) can be calculated as follows:

B = Y–d+ D/2, e.g.:

B= 99,10 mm–25 mm + 45 mm = 119,10 mm



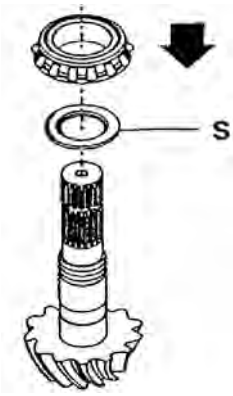
35. Read measurement **V** (e.g. 116,10) at the end of the bevel pinion shaft**.**

Thickness of spacer ring between the bevel pinion and the bearing can be calculated as follows:

S=B–V, e.g.

S=119,10 mm–116,10 mm = 3.00 mm

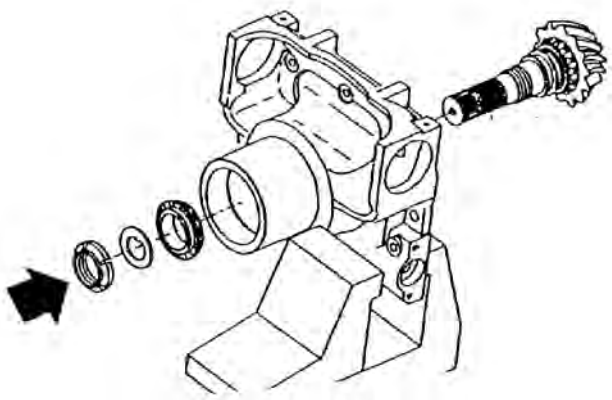
Choice a correct spacer ring S. Available from 2,5 mm to 3,4 mm: (with increments of 0,1 mm).



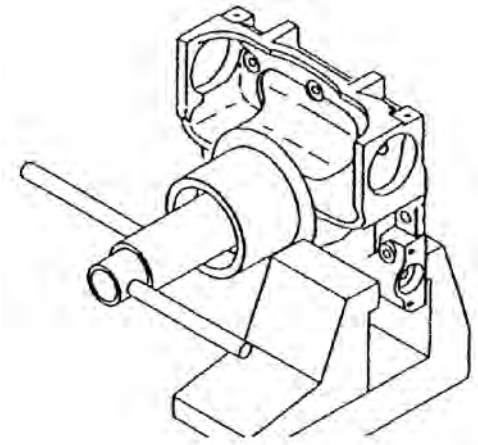
36. Fit the correct spacer ring **S** (chamfered side to the bevel pinion side) and the bearing. When needed, warm the bearing to +80˚C before fitting.

G. Adjusting pre–load of bevel pinion shaft bearings

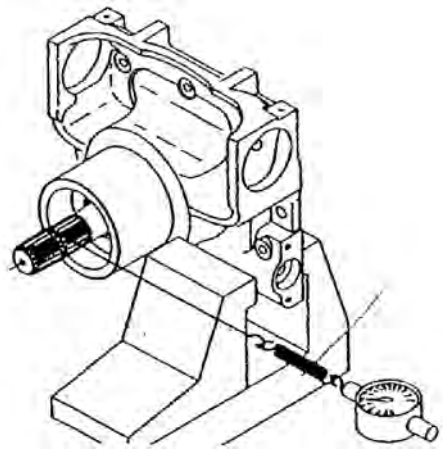
37. Fit the thrust washer on the shaft, new compression bushing and other thrust washer.



38. Push the shaft into place and fit the other bearing onto it, locking ring and screw in the shaft nut.



39. Tighten progressively the nut with tool **ETV 893 490** and measure now and then the bearing rolling resistance with a spring balance. Always after tightening, rotate the shaft many times.



40. Wind a rope round the bevel pinion shaft (Ø 34,8 mm) and connect a spring balance to the rope (shaft without the cassette seal).

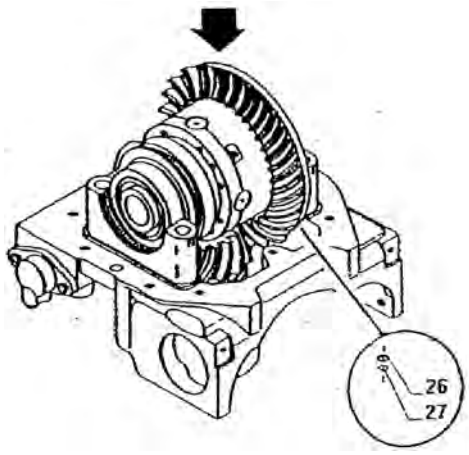
41. Measure the rolling resistance **P** two, three times. Read off the value, while the shaft is rotating. In the beginning more power is needed.

The correct rolling resistance should be **30 N–50 N (3–5 kg)**

42. Tighten the shaft nut, if necessary.

IMPORTANT! Take a note of the rolling resistance value, since it is needed when adjusting the differential bearing rolling resistance.

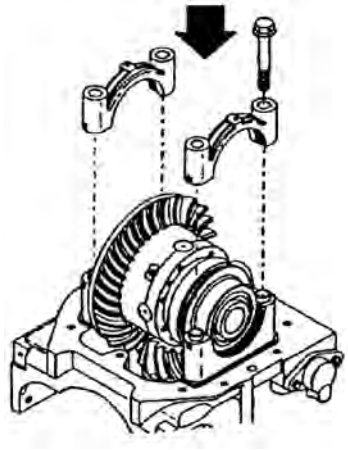
H. Fitting differential onto bracket



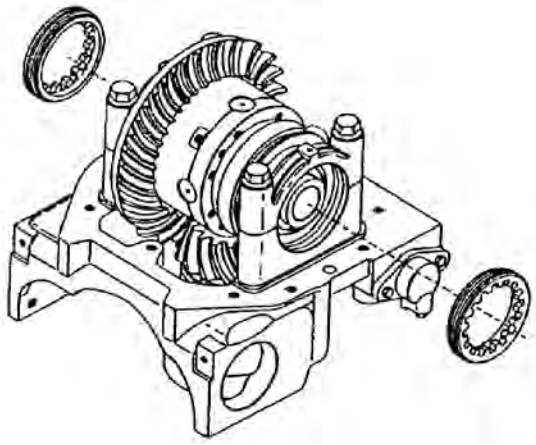
43. Fit the o–ring (27) and the washer (26) into the differential.

Note! Grease the parts to keep them in place during fitting.

44. Position the differential onto the bracket. Do not move parts (26) and (27). Ensure, that the bearing outer races are in places fully home.

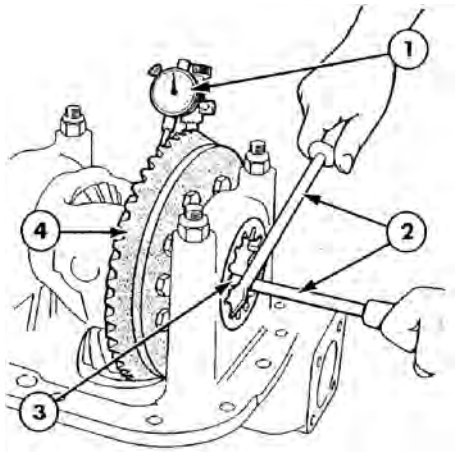


45. Refit the bearing caps according to the marks and screw in the fixing bolts and tighten them but not too hard.



46. Screw the adjusting nuts into place in a suitable way.

I. Adjusting tooth backlash and differential bearing pre–load:

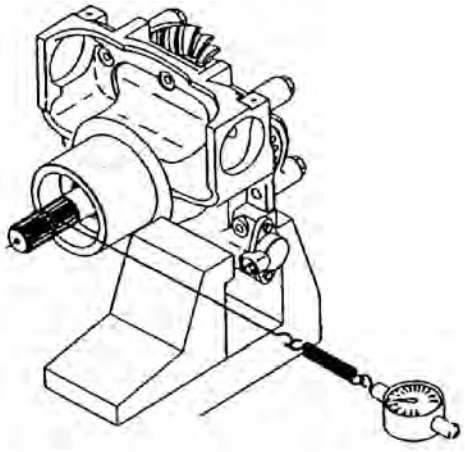


47. Place the dial gauge (1) stylus against the crown wheel tooth (measure at least on three teeth). Adjust the tooth backlash by slackening (if too small backlash) or by tightening (if too big backlash) the adjusting nut (3) (i.e. by moving the differential axially so that the bearing clearance is kept as zero or slightly pre–loaded).

The backlash must be between **0,17–0,23 mm**.

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48. When the tooth backlash is correct, ensure that the adjusting nuts keep the differential bearings without clearance or slightly pre–loaded. If the nuts must further be tightened (when adjusting preload), the differential must not move axially.



49. Wind the spring balance rope round the bevel pinion shaft (Ø 34,8 mm).

50. Measure the common rolling resistance of the differential bearings and the bevel pinion shaft bearings (**T**) two three times. Read off the value when the shaft is rotating. In the beginning more power is required.

The correct value (**T**), is:

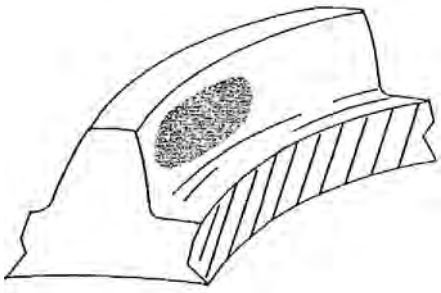
T = (P+60 N)...(P+90 N) i.e. (P+6 kg)... (P+9 kg)

In which:

T= common rolling resistance of the differential bearings and the bevel pinion shaft bearings
P= rolling resistance of the bevel pinion shaft bearings (measured earlier))
6 kg–9 kg (60–90 N) =differential bearing allowable rolling resistance.

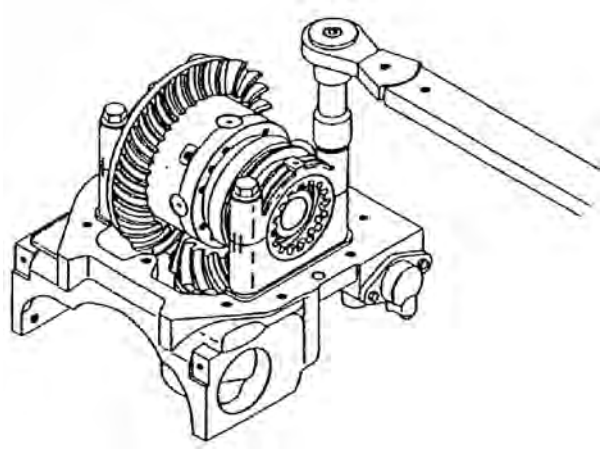
51. If the value is not within the given limits, tighten the differential bearing adjusting nut (if resistance is too small) and vice versa. Always after tightening the nut, rotate the differential many times.

IMPORTANT! Do not affect the tooth backlash when tightening the adjusting nuts. After the rolling resistance adjustment, check once more the tooth backlash.

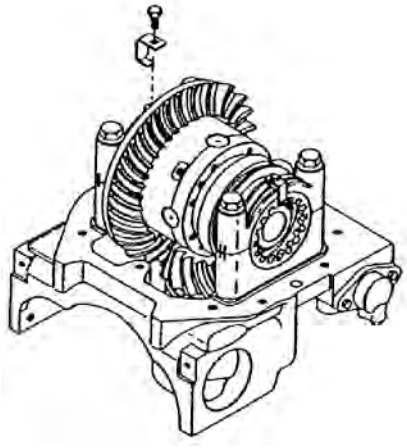


52. The teeth contact surface can be checked (if necessary) by using marking colour. The picture above shows the correct colour spread pattern on the teeth.

J. Fitting differential into axle housing

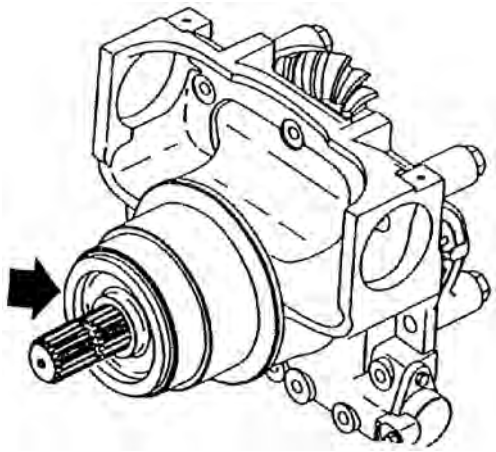


53. Tighten the differential bearing caps to a correct torque (**270 Nm**)

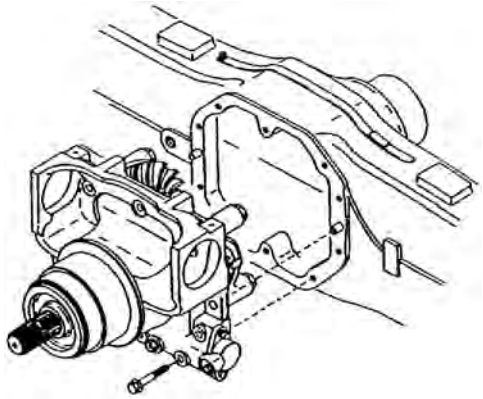


54. Refit the locking tabs. Turn the nuts, if necessary, so that the tabs fit into the notches on the nuts. Tighten the screws to **13 Nm**.

55. Lock the bevel pinion shaft nut with the locking washer.



56. Fit the o–ring (if any), grease and fit the cassette seal with a suitable sleeve. Do not damage the seal on the shaft splines.



57. Clean the mating surfaces on the axle housing and on the differential bracket. Apply Loctite 510 or alt. Loctite 518 and push the differential into the axle housing. There are dowels in the joint.

58. Tighten progressively the bracket fixing bolts to **170 Nm**. Reconnect the diff. lock hose.

59. Fit the bevel pinion shaft drive flange (fixed with two bolts). Connect the propeller shaft front flange joint (**70 Nm**).

60. Fit the steering ram, see instr. **A** on page **675**/**1**.

61. Fit the bottom guard.

62. Fasten the hubs/drive shafts, see instr. **1C** stages **12–16** on page **672**/**5**.

63. Add oil into the axle housing (**6 litres**. 80W/90 GL–5 (LS), e.g. Valtra Axle).

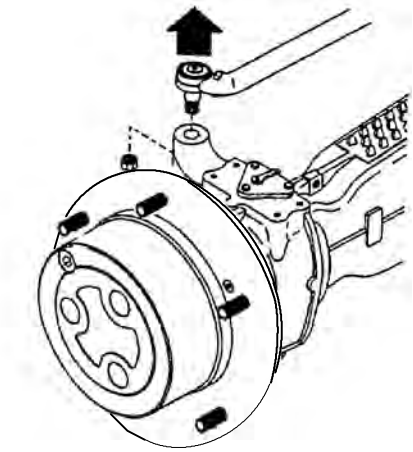
64. Test–run the tractor and check the function of the front axle and differential lock. Check for leaks and test the steering system.

Reconditioning steering ram (Code no. 675)

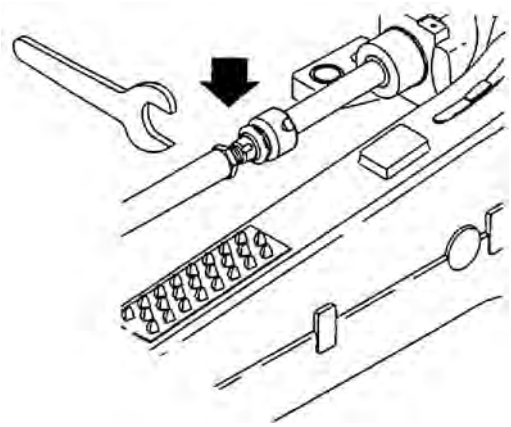
Note! The steering ram must be removed, if the differential is removed from the axle.

Note! From Carraro no. **0100631–** incl. the steering force/power has been added by changing the control valve and the cylinder diameters 75/38x276 (was 65/36x276). Because of this the cylinder outer diameter has also been enlarged, thus it is not exchangeable with the earlier cylinder.

A. Reconditioning steering ram

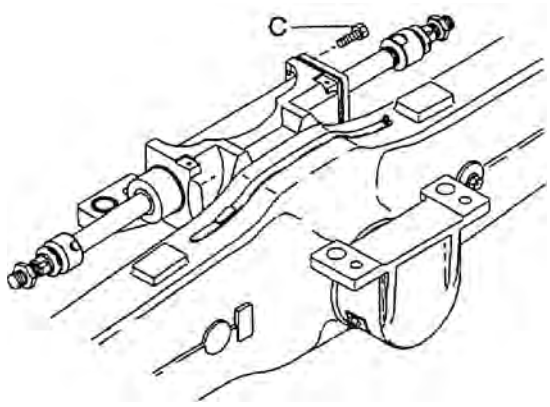


1. Disconnect the tie–rod tapered joint.

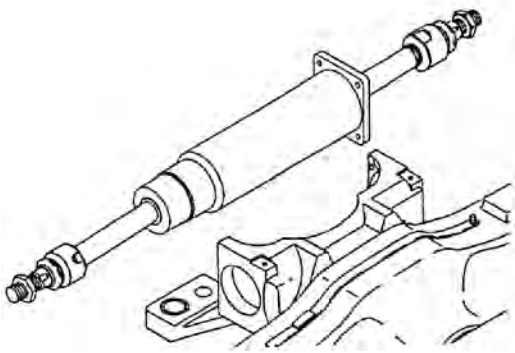


2. Disconnect the tie rod ball joint.

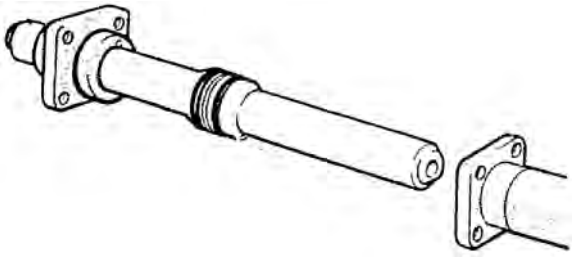
3. Disconnect the oil hoses on the ram.



4. Slacken some turns four bolts (C). Turn the steering wheel to the left at which time the ram end flange is pushed out. Little oil can drain. Remove the bolts (C) and the ram.

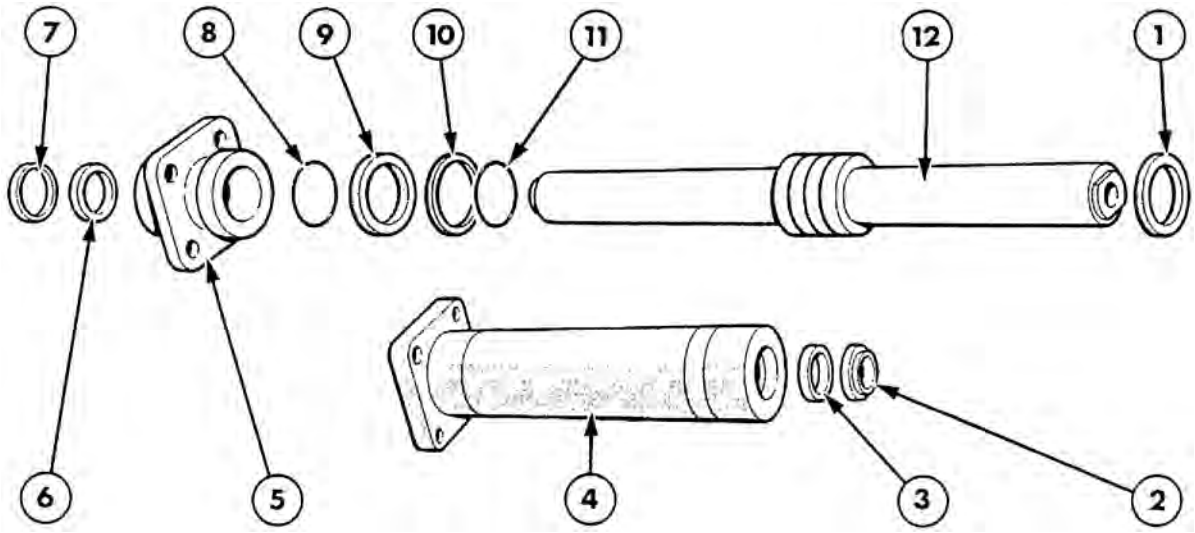


5. The steering ram unit can be changed as a complete unit or it can be repaired. Oil leakages can be repaired by changing seals. A seal kit is available as a spare part.



6. Pull out the piston rod/piston. Slide away the left end flange.

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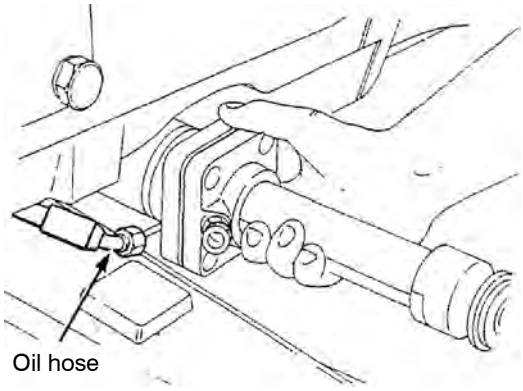


1. Wear ring
2. Scraper ring
3. Oil seal
4. Cylinder liner
5. End flange
6. Oil seal
7. Scraper ring
8. End flange o–ring
9. Wear ring
10. Piston seal
11. Piston seal expansion ring
12. Piston rod and piston

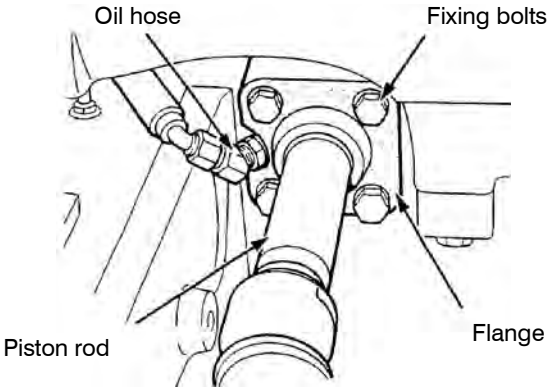
7. Remove the wear rings, the piston seal and o–rings, end flange seals and oil and scraper rings.

8. Wash the parts with suitable solvent and let them dry.

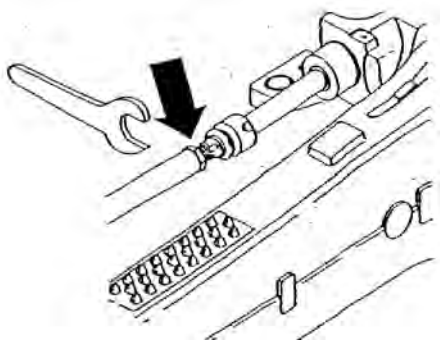
9. Check the piston rod. Small damages can be repaired with fine emery cloth.



10. Refit the assembled steering ram onto the differential bracket.



11. Tighten the fixing bolts to a correct torque (**120 Nm**). Reconnect oil hoses.



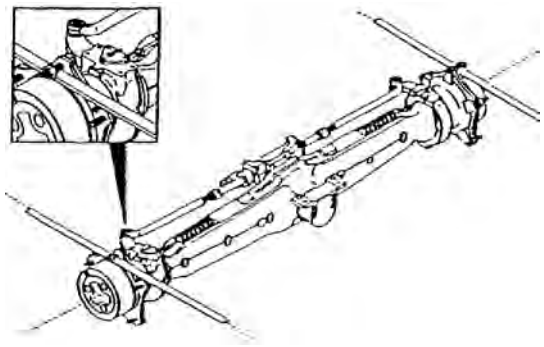
12. Reconnect the tie rod ball joint (**300 Nm**, locking nut **250 Nm).** Reconnect the tie rod to the steering arm (**220 Nm**).

13. Add drained oil into the system. Start the engine and turn the steering wheel from one extreme position to another many times and ensure that the steering system functions properly and that no leaks exist. Check, if necessary toe–in .

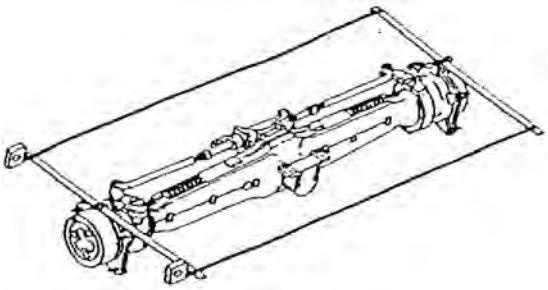
Other checks and adjustments (Code no. 676)

Note! Check that the axle housing breather valve is open. If the front axle diff. lock piston seals have leaks, oil flows into the axle housing in which oil level rises.

A. Adjusting toe–in (one possible method)

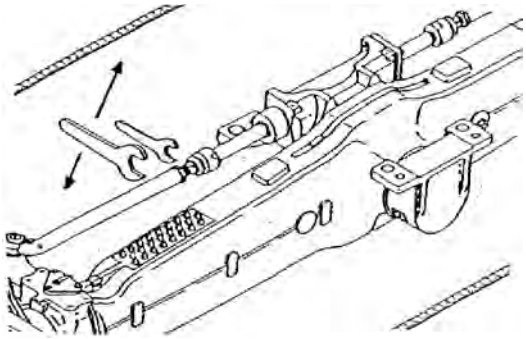


1. Fasten straight rods with length of about one meter onto both hubs according to picture above. Turn the hubs straight ahead.



2. Measure the distance of the rod ends in the rear and in front of the axle.

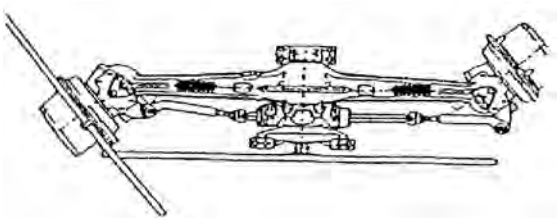
3. The distance in the front must be **0–2 mm** smaller than in the rear.



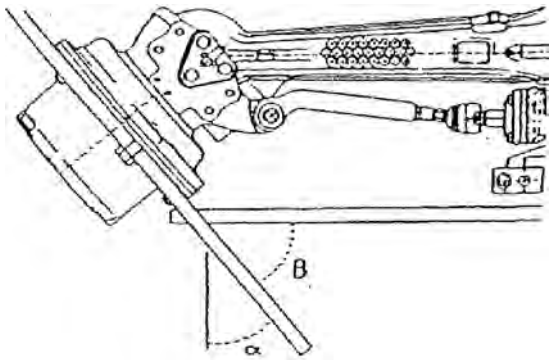
4. The toe–in can be adjusted at the tie rod ball joint. Adjust both tie rods equally (ball joint 300 Nm, locking nut 250 Nm).

B. Adjusting steering angle

Note! Adjustment can be necessary, if wheels are changed etc.

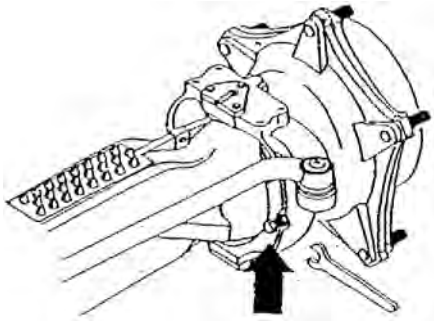


1. Use the same rods as shown in the previous instruction A according to the pictures.



2. Measure the steering angle (α) with a suitable angle rule:

$$\alpha = 90° - \beta$$



3. Limit the steering angle with stop bolts. Tighten the bolt locking nut to a correct torque (**150 Nm**). Limit both hubs equally.

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11.00–16 30429600
12.4R24 32611600
13.6–24, 13.6R24 32611500
14.9–24, 14.9R24, 13.6R28,
14.9–28, 13,6–14.9R28 32600500
16.9R28, 480/65R24, 480/65R28,
440/65R28 32873100
17,5–19.5R24, 540/65R28 32600410

Fixed rims:

14.9–24, 14.9–28, 13,6–14.9R28 ... 32600500
16.9R28, 16.9–24 32873110
13.6–24 32611500

Ind. front axle, fixed rims:
16.9R28, 16.9–24 32873210
14.9R28, 14.9–28, 14.9–24 32873300

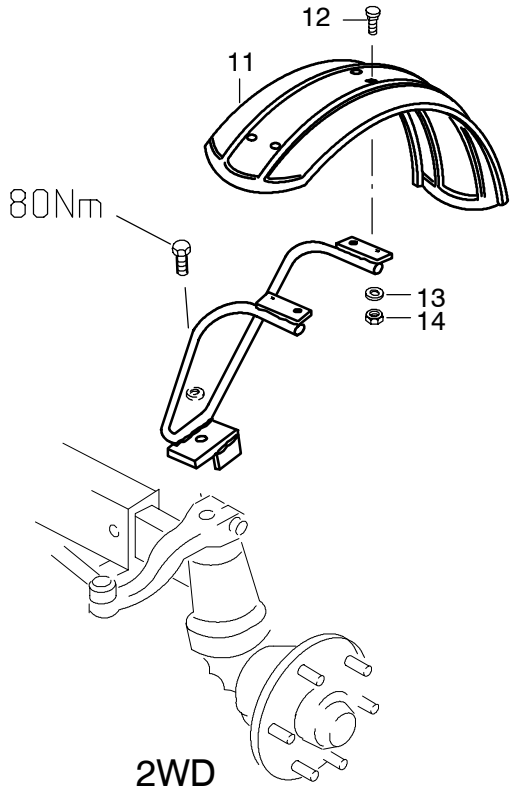
Transferring pieces for the narrow track widths
(ref. 11 in picture) **..... 32258900**

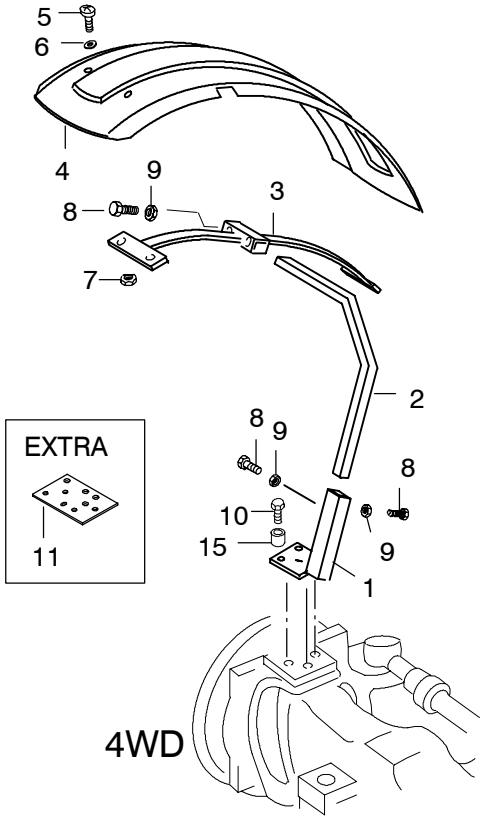
Adjusting front mudguards to track width1500 mm. Suits to 28” or smaller tyres.

FITTING:

– 4WD: the front mudguards are fastened into the threaded holes on the king pin covers (3 off). Remove the plastic plugs in the holes.

– 2WD: the mudguards are fastened under the bolt of the steering arm.





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	1	**32600410**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD
			Rengas	Ring	Ring	Ring	
			17.5R24, 19.5R24	17.5R24, 19.5R24	17.5R24, 19.5R24	17.5R24, 19.5R24	
1	1	33064500	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	330646 00	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612110	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32612310	.Tuki	Stöd	Support	Stütze	
4	1	33047200	.Kaari	Båge	Bow	Bogen	Left
	1	33047300	.Kaari	Båge	Bow	Bogen	Right
8	12	HA9242	.Ruuvi	Skruv	Screw	Schraube	
9	12	JB1112	.Mutteri	Mutter	Nut	Mutter	

	1	**32600500**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD
			Rengas	Ring	Ring	Ring	
			13.6–28, 14.9–24	13.6–28, 14.9–24	13.6–28, 14.9–24	13.6–28, 14.9–24	
1	1	32611800	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	32613000	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612200	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32611700	.Tuki	Stöd	Support	Stütze	
4	1	32612400	.Kaari	Båge	Bow	Bogen	Left
	1	32612500	.Kaari	Båge	Bow	Bogen	Right
8	12	HA6334	.Ruuvi	Skruv	Screw	Schraube	M10x30
9	12	JB1110	.Mutteri	Mutter	Nut	Mutter	M10

	1	**32611500**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD
			Rengas	Ring	Ring	Ring	
			13.6–24	13.6–24	13.6–24	13.6–24	
1	1	32611800	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	32613000	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612200	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32611700	.Tuki	Stöd	Support	Stütze	
4	1	32612600	.Kaari	Båge	Bow	Bogen	Left
	1	32612700	.Kaari	Båge	Bow	Bogen	Right
8	12	HA6334	.Ruuvi	Skruv	Screw	Schraube	M10x30
9	12	JB1110	.Mutteri	Mutter	Nut	Mutter	M10

	1	**32611600**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD
			Rengas	Ring	Ring	Ring	
			12.4–24	12.4–24	12.4–24	12.4–24	
1	1	32611800	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	32613000	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612200	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32611700	.Tuki	Stöd	Support	Stütze	
4	1	32612800	.Kaari	Båge	Bow	Bogen	Left
	1	32612900	.Kaari	Båge	Bow	Bogen	Right
8	12	HA6334	.Ruuvi	Skruv	Screw	Schraube	M10x30
9	12	JB1110	.Mutteri	Mutter	Nut	Mutter	M10

YHTEISET OSAT / GEMENSAMMA DELAR / COMMON PARTS:

5	8	HK0013	.Ruuvi	Skruv	Screw	Schraube	
6	8	32539300	.Aluslaatta	Bricka	Washer	Scheibe	
7	8	JB1106	.Mutteri	Mutter	Nut	Mutter	
10	6	HA8337	.Ruuvi	Skruv	Screw	Schraube	M10x60
15	6	33063400	.Holkki	Hylsa	Sleeve	Hülse	Ø11

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	1	**32873110**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD
			Rengas	Däck	Tire	Reifen	
			16.9R28, 16.9–24	16.9R28, 16.9–24	16.9R28, 16.9–24	16.9R28, 16.9–24	
1	1	33064500	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	33064600	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612210	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32612310	.Tuki	Stöd	Support	Stütze	
4	1	32873400	.Kaari	Båge	Bow	Bogen	Left
	1	32873500	.Kaari	Båge	Bow	Bogen	Right
8	12	HA9242	.Ruuvi	Skruv	Screw	Schraube	M12x35
9	12	JB1112	.Mutteri	Mutter	Nut	Mutter	M12

	1	**32873210**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD IND.
			Rengas	Däck	Tire	Reifen	
			16.9R28, 16.9–24	16.9R28, 16.9–24	16.9R28, 16.9–24	16.9R28, 16.9–24	
1	1	33063600	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	33063700	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612210	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32612310	.Tuki	Stöd	Support	Stütze	
4	1	32873400	.Kaari	Båge	Bow	Bogen	Left
	1	32873500	.Kaari	Båge	Bow	Bogen	Right
8	12	HA9242	.Ruuvi	Skruv	Screw	Schraube	M12x35
9	12	JB1112	.Mutteri	Mutter	Nut	Mutter	M12

	1	**32873300**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	4WD IND.
			Rengas	Däck	Tire	Reifen	
			14.9–24, 14.9–28	14.9–24, 14.9–28	14.9–24, 14.9–28	14.9–24, 14.9–28	:
1	1	32873000	.Kiinnitin	Fästdon	Fastener	Halter	Left
	1	32873600	.Kiinnitin	Fästdon	Fastener	Halter	Right
2	2	32612200	.Kulmaputki	Vinkelrör	Elbow pipe	Winkelrohr	
3	2	32611700	.Tuki	Stöd	Support	Stütze	
4	1	32612400	.Kaari	Båge	Bow	Bogen	Left
	1	32012500	.Kaari	Båge	Bow	Bogen	Right
8	12	HA6334	.Ruuvi	Skruv	Screw	Schraube	M10x30
9	12	JB1110	.Mutteri	Mutter	Nut	Mutter	M10

YHTEISET OSAT / GEMENSAMMA DELAR / COMMON PARTS:

5	8	HK0013	.Ruuvi	Skruv	Screw	Schraube	
6	8	32539300	.Aluslaatta	Bricka	Washer	Scheibe	
7	8	JB1106	.Mutteri	Mutter	Nut	Mutter	
10	6	HA8337	.Ruuvi	Skruv	Screw	Schraube	M10x60
	6	HA8360	.Ruuvi	Skruv	Screw	Schraube	IND.M16x70
15	6	33063400	.Holkki	Hylsa	Sleeve	Hülse	Ø11
	6	33063500	.Holkki	Hylsa	Sleeve	Hülse	Ø17 IND.
11	2	32258900	Levy	Platta	Plate	Platte: (NL)	

	1	**30429600**	Etulokasuojat	Framstänkskärmar	Front mudguards	Vorderkotflügel	2WD
			Rengas	Ring	Ring	Ring	
			10x16 ja	10x16	10x16	10x16	
			11.00x16	11.00x16	11.00x16	11.00x16	
11	2	850095	.Kaari	Båge	Bow	Bogen	
12	8	HK0013	.Ruuvi	Skruv	Screw	Schraube	
13	8	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	
14	8	JB1106	.Mutteri	Mutter	Nut	Mutter	

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Special steering wheel 32482900

– With a leather covered steering wheel the driver has a pleasant and safe hold to driving.

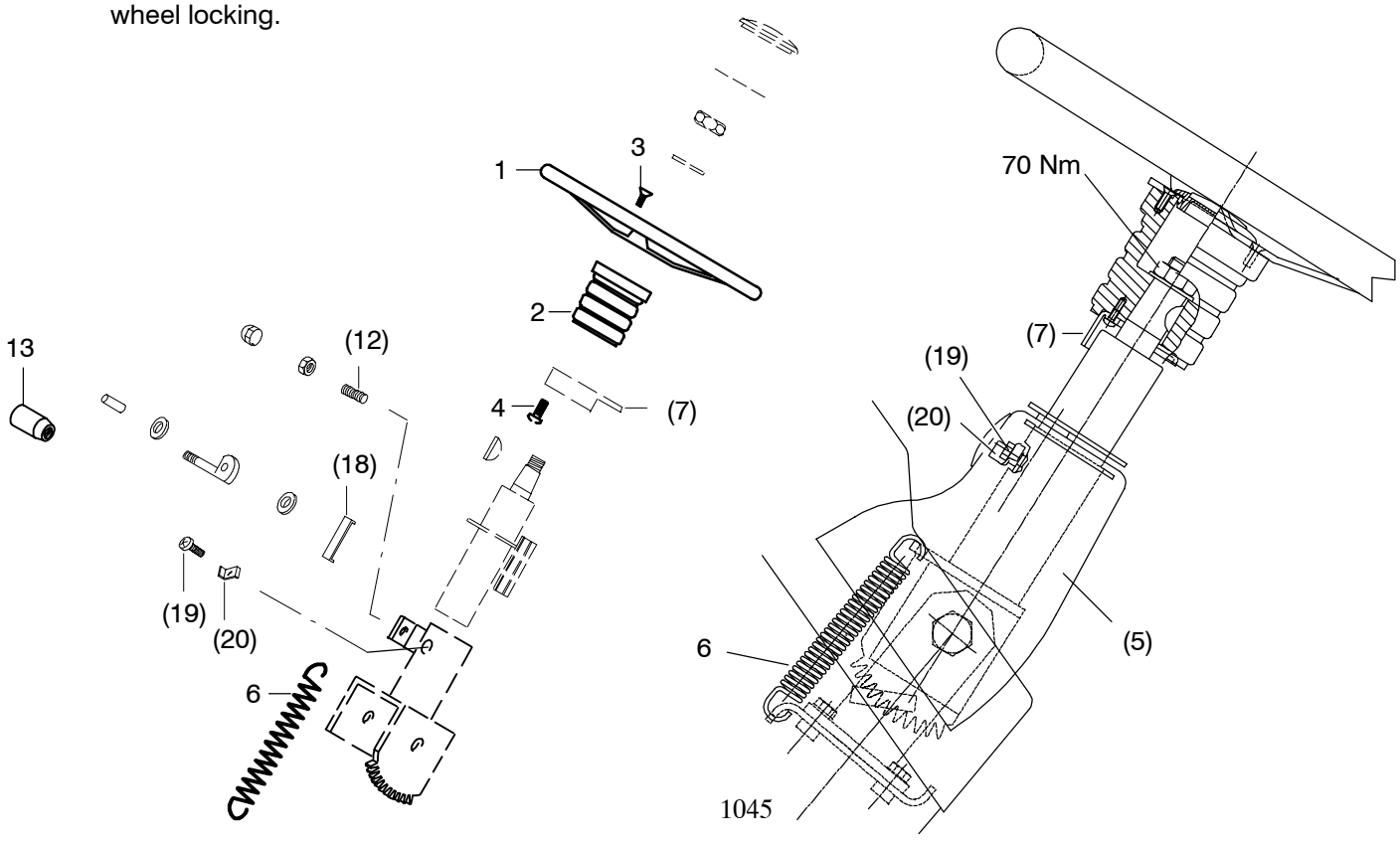
FITTING:

– Unscrew the steering wheel centre nut and remove the standard steering wheel with a suitable puller. Move the return ring **7** of the earlier steering wheel onto the corresponding place on the special steering wheel.
Assemble the special steering wheel, be sure that the screws **3** do not get into wrong threads. Fit the new steering wheel into position (tightening torque 70Nm).

– Change spring **6** into a stronger one:
Open first locking plate **20**, slacken locking screw **19** and pull out the steering wheel column pipe and the steering wheel.
Note! Do not lose the locking piece **18**.
Remove plastic covering **5**. Change the spring **6** with aid of iron wire etc. Refit the covering.

– Fasten the locking piece **18** temporarily with e.g. grease, or slacken adjusting screws **12** (remember number of opening revs), so that the locking piece remains better in the notch.
Push the steering wheel+column pipe into position by rotating the steering wheel so that the teeth engage.
Lock the column pipe with screw **19**.
NB! **Bend the locking plate 20 so that screw 19 cannot get loose!**

– If the adjusting screws **12** have been unscrewed, check after assembling the function of the steering wheel locking.



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	1	32482900	Erikoisohjauspyörä	Specialratt	Spec. steering wheel	Speziallenkrad
1	1	32483000	.Ohjauspyörä	Ratt	Steering wheel	Lenkrad
2	1	32476800	.Keskiö	Centrum	Centre	Zentrum
3	6	HE6973	.Ruuvi	Skruv	Screw	Schraube
4	1	HD9032	.Ruuvi	Skruv	Screw	Schraube
6	1	33011900	Jousi	Fjäder	Spring	Feder

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Reverse drive control, Twin Trac
6000–6800 32279500
8000–8750 32534600

– The mounting kit includes the reverse drive controls with the steering valve, accelerator, clutch and brake pedals and fitting parts.

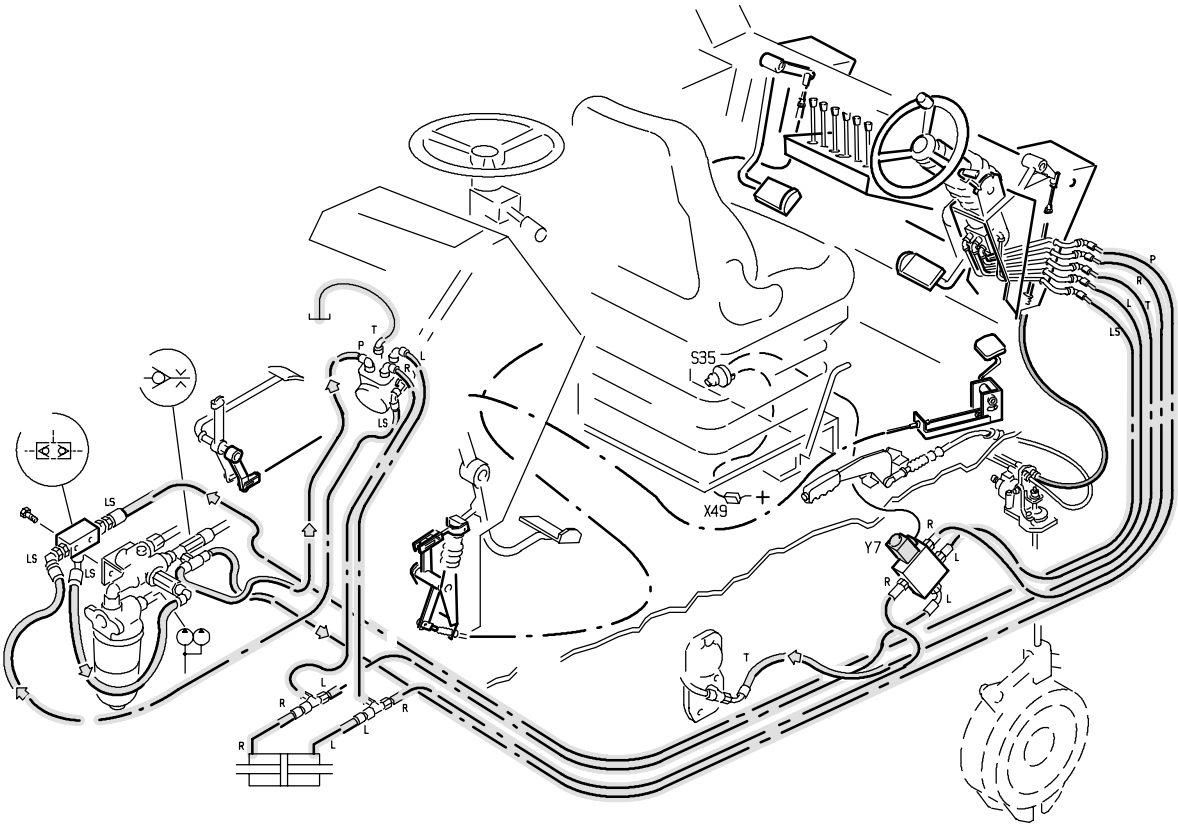
Note! The rear brake pedal affects only the rear axle brakes of the tractor.
Also the brake valve of the trailer does not function when using the rear brake pedal.

Reverse drive control + control valve (lock valve for the reverse drive controls)
6000–6600 32875800
8000–8400 32875900

– The kit includes the reverse drive controls (Twin Trac) and a directional control valve, which switches off the reverse steering wheel, when the driver's seat is turned forwards.

Rear accelerator pedal
6000–8750 33749900

– The kit includes this pedal with necessary fitting parts.
When working with the reverse drive controls in the cab, the rear accelerator pedal makes it easier and more effective to use the timber loader or excavator.



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1. Preliminary works:

– Disconnect the battery earth cable.

– Remove the seat and the floor mat.
Remove the side panel protection, the hand brake console, the passenger's seat and the tool box.

– Remove the wire loom inside the rear beam and tie the loom to the protective arch.

– Remove the lower window at the rear of the tractor.
Remove the electric socket and the PTO safety switch from the loom (these parts must be reconnected).
This ensures that the wire loom does not damage while drilling holes to the beam.

– Mark a ø 9mm starting hole according to the picture.
Fasten the housing to this hole and mark other holes which are to be drilled. Drill ø 9mm holes with a drilling machine.
Mark and drill also holes a and b for the rear steering wheel.

– Remove a bit from the edge of the hole for the brake pedal

– Paint all points where is not the original paint.

– Pass the clutch cable under the cab.

2. Fitting accelerator pedal:

– Fit the pedal bracket and mark places for the holes (3x). The relief on the bracket must become against the protective rubber of the hand brake lever cable. Drill ø 9mm holes.
Drill with a self–tapping screw a fastening point for the return spring in the rear beam (see picture).

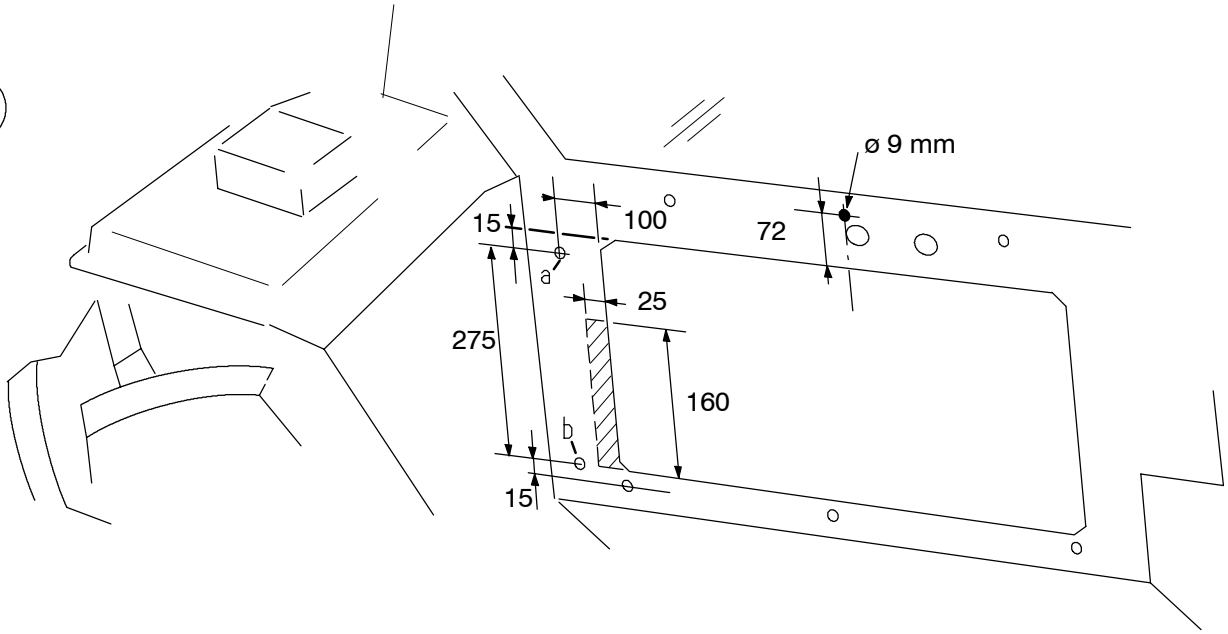
– Fasten the pedal and check function.
Note! Fasten the clutch cable + fastening eye under the rear fixing bolt of the accelerator pedal.

– Remove the accelerator pedal in the front part of the cab.
Fit in place a pre–assembled pedal. Secure it with a tension pin.

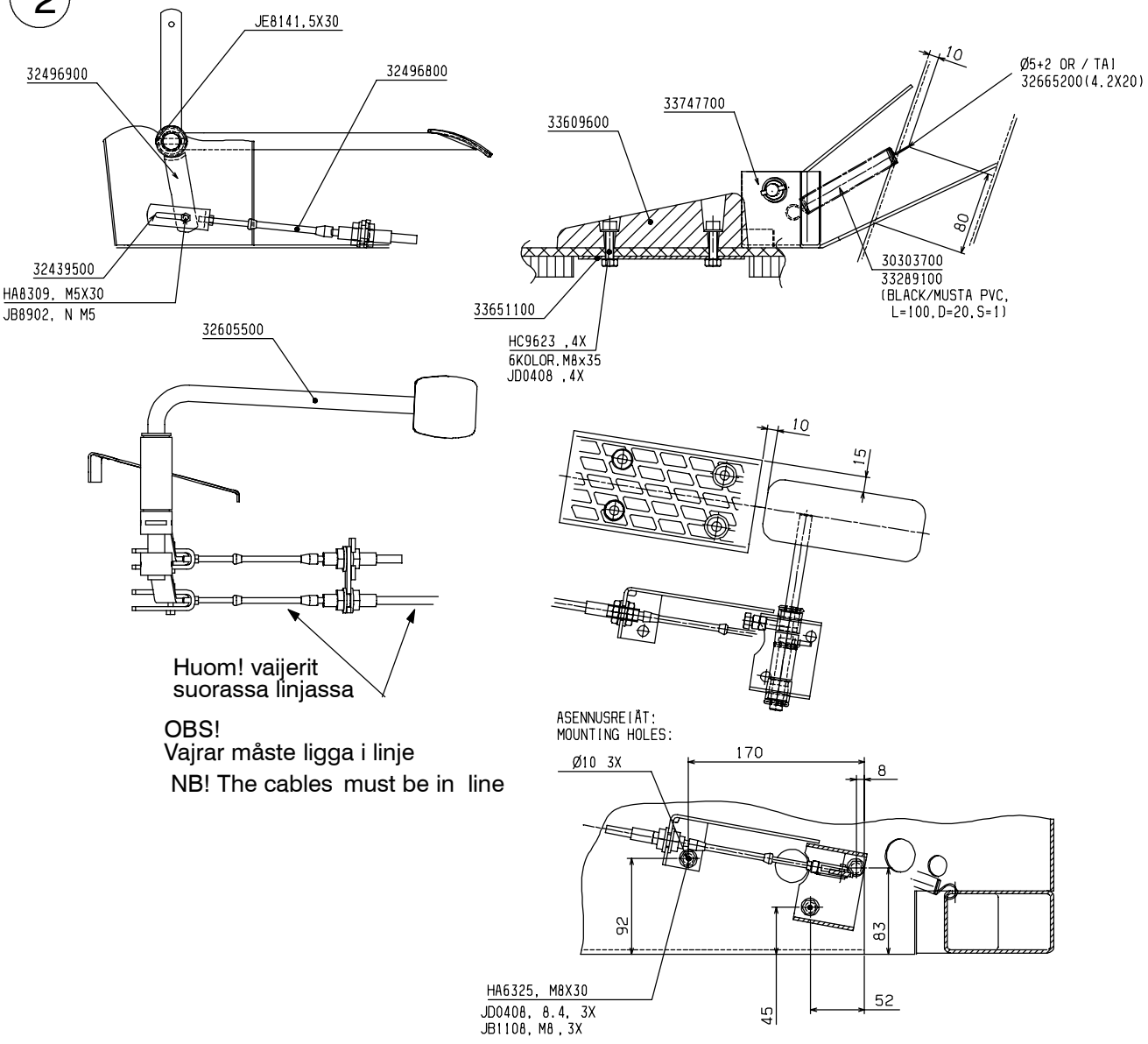
– Fit the cable (32496800) between pedals. Check that the cables to the front pedal are in the straight line, so that there are not curves, which can prevent the function of the pedals. If necessary, bend the cable support on the floor.
(From cab no ca 15575 the piece 32602400 is not needed).

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1

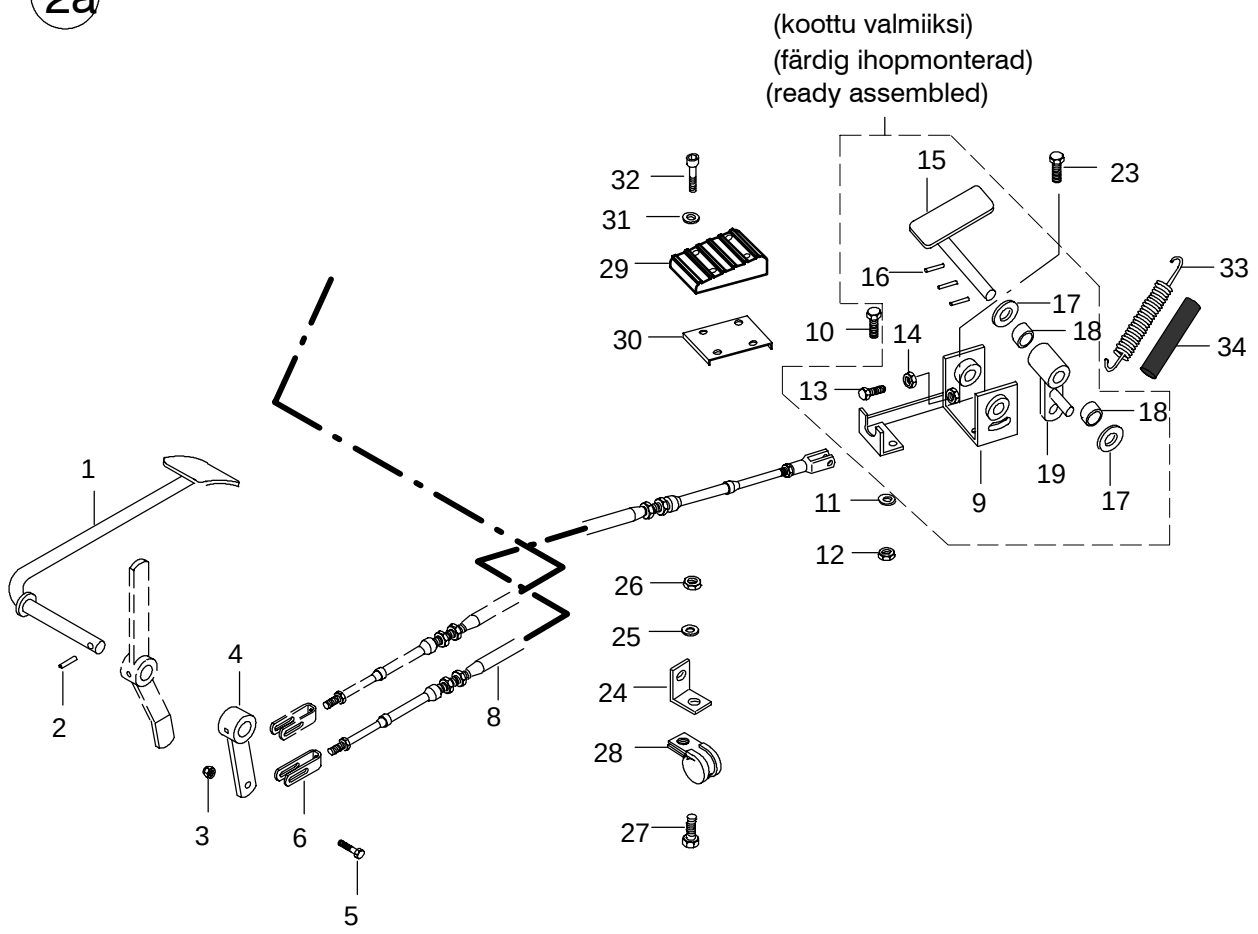


2

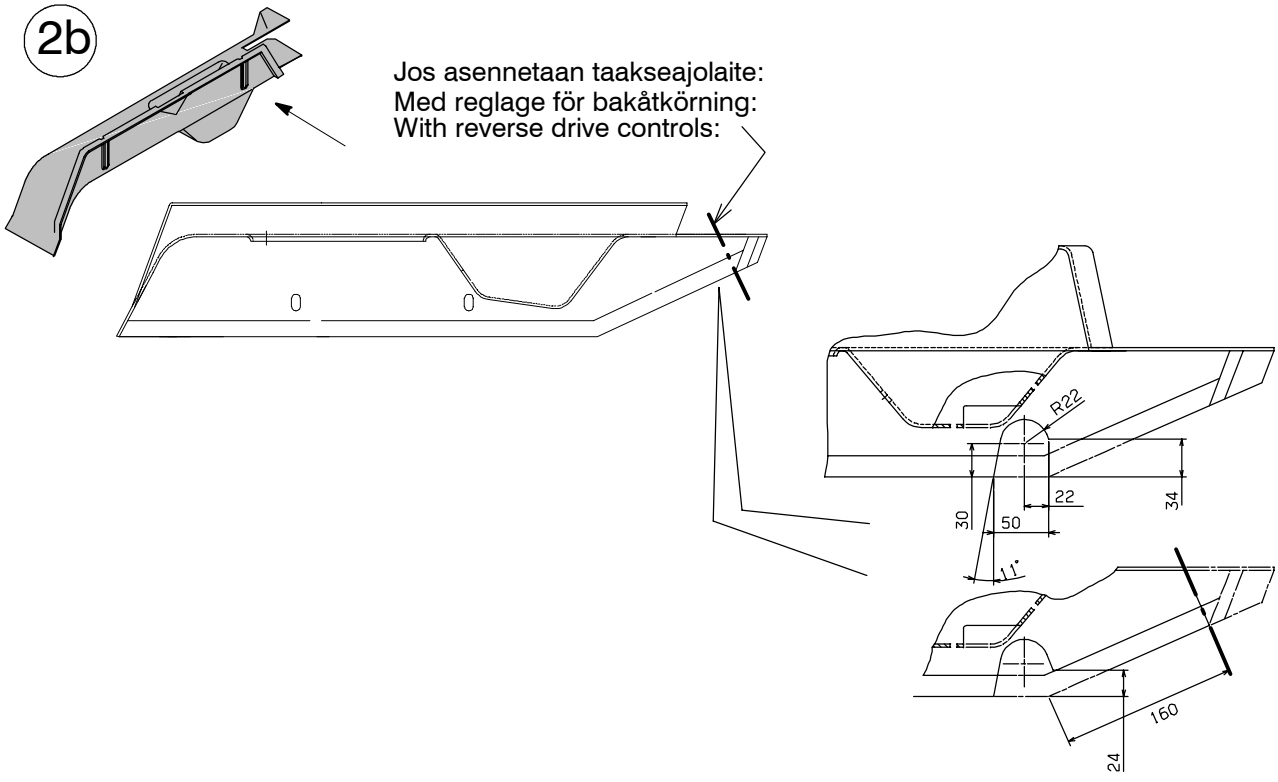


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2a



2b



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– Adjusting the accelerator pedal cable:
Remove play from the rear fixing nuts of the cable.
Adjust the limiter screw of the rear pedal bracket so that the pedal touches the floor mat when it is depressed.
Make the adjustment with the cable front nuts so that both pedals move without play and simultaneously.

– Cut holes to the hand brake protection for the accelerator pedal (see picture 2a). If it is fitted also the reverse drive controls, the protection must also be shortened.
Tighten the sheet metal protection (32600910) with silicone and fit it. Fasten the hand brake protection.

3. Fitting clutch pedal:

– Dimension a starting point to the cab front wall with a ø 4mm drill (see picture).
Cut to the insulation of the front wall an opening of 100 x 250 mm (under the lever support).
Drill with a 45 mm hole drill a hole at the starting point hole.

– Remove the clutch pedal power assistance.
Note! a locking pin into the hole before removing the spring assembly!

– Earlier model: Make M8 hole to the upper fixing point of the power assistance (see picture) for clewis **6** (picture 3a).
Latest models: fork (32633710) fastens to the arm of the pedal.

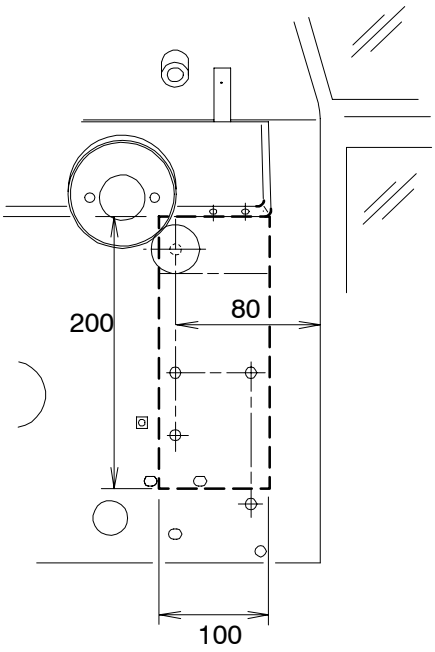
– Fasten the leverage to the clutch pedal (see picture 3a). Check that the lever is in the middle of the hole (otherwise resulting malfunctions), Turn the leverage carefully, if needed.
Mark places for holes of support **22** upper end and make M6 threads.
Fasten the support upper end and mark places for other holes, drill ø10mm hole.

– Apply silicone mass round the fixing holes (for water leaks), and fasten the bracket of the levers.

– Fit the leverage, the levers must not get entangled.
Fit the power assistance.

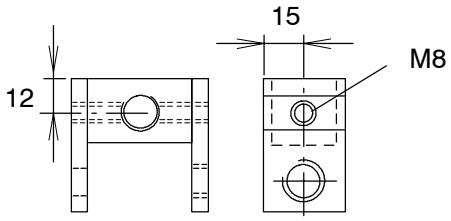
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3



3a

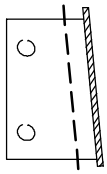
Vanha tyyppi (haarukka 32633700):
Äldre typ (gaffel 32633700):
Earlier type (fork 32633700):



Aikaisemmat mallit: katkaise kuivaajasäiliön teline

Tidigare modeller: skär av torkarbehållarens hållare

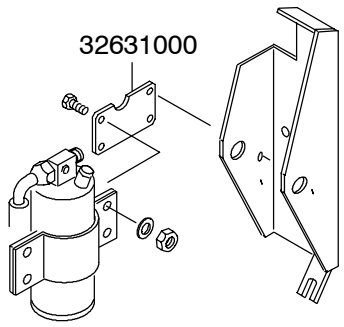
Earlier models: cut off the support for dryer

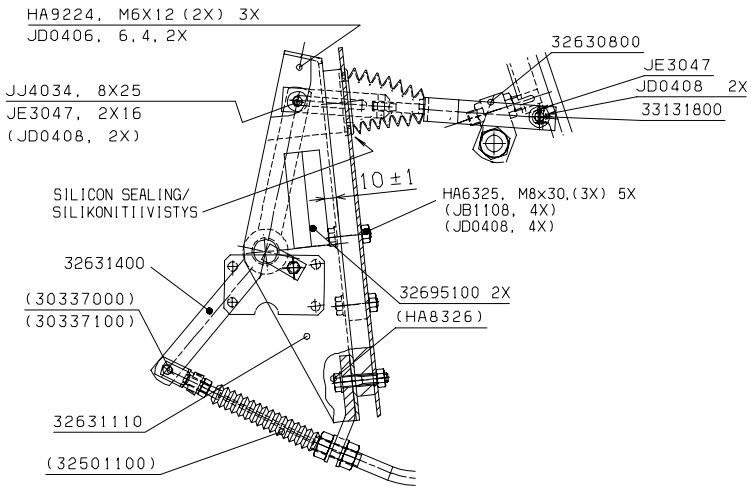


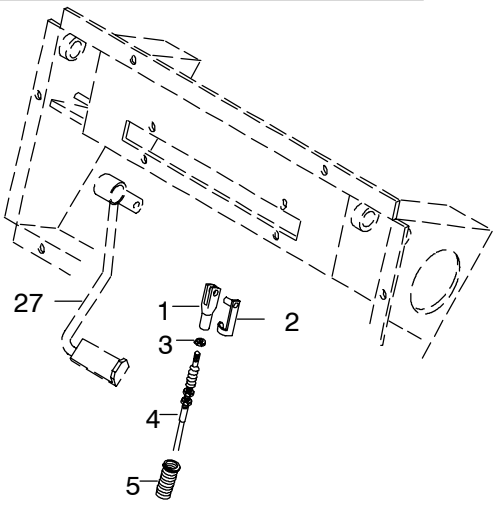
Jos ilmastointilaitteen kuivaajasäiliö on ohjaamon etuseinässä:

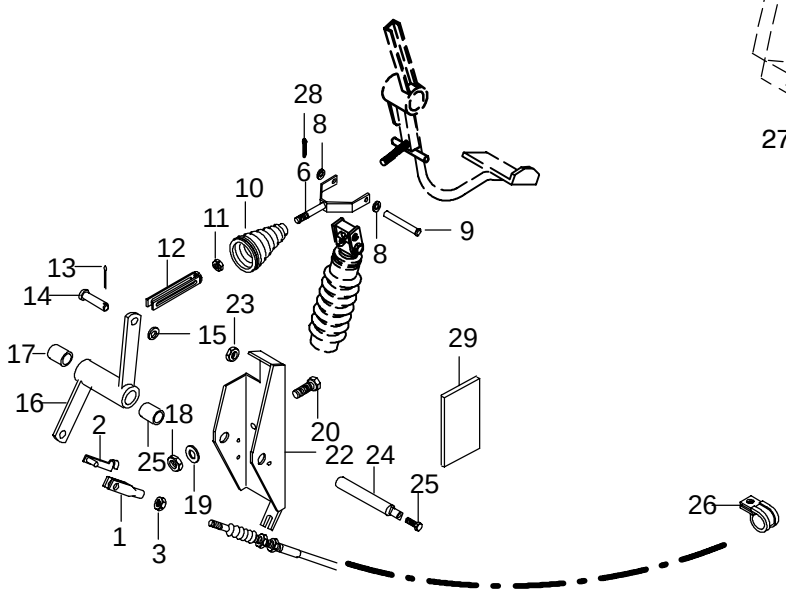
Med luftkonditionering (om torkar–behållaren finns i hyttens framvägg):

With air conditioning (if the dryer has been located in the cab front wall):

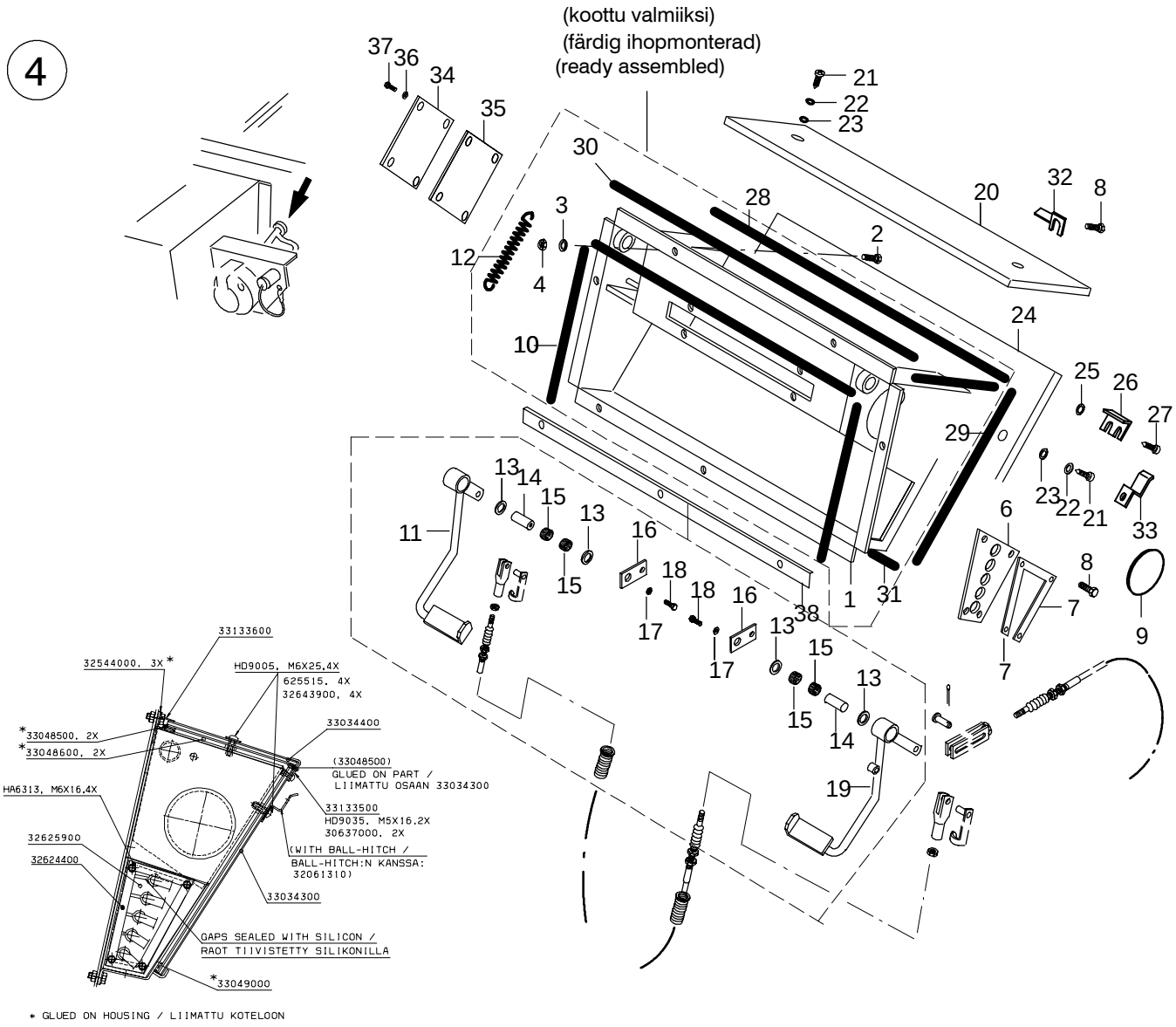








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4. Fastening the rear housing:

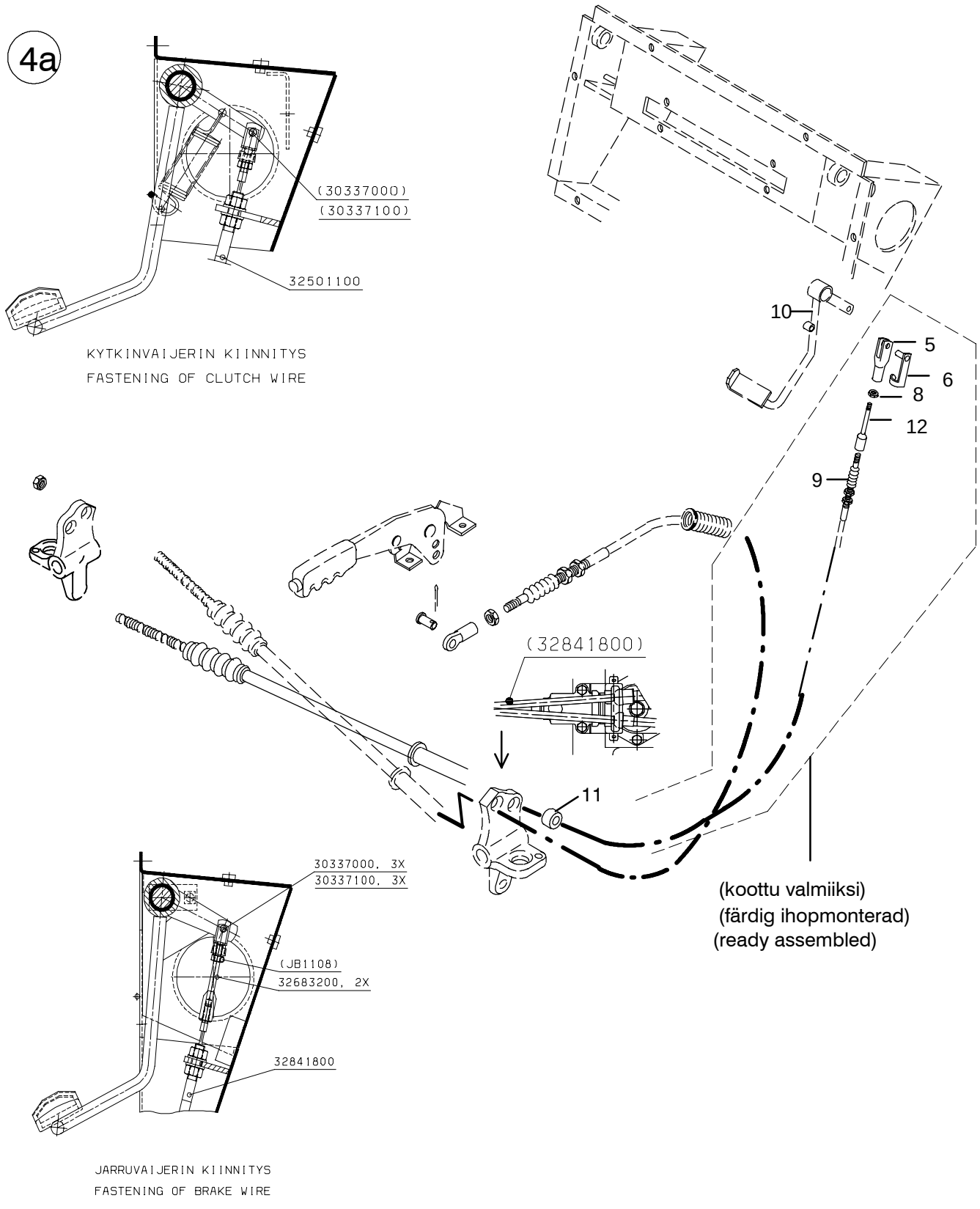
– Glue gaskets to the edge of the rear opening and fasten the housing with M8 screws. Connect the electric socket and the PTO safety switch to the fastener on the rear housing. Wires to the socket are drawn through the earlier hole for the safety socket in the rear wall of the cab.

  Position a shrink plastic to the joint of the wire and the switch frame (water tight).

– Assemble the clutch leverage and the brake leverages (see picture 4a).
  Check function. Fasten the clutch cable, leave all adjusting clearances to the rear lever.

– Fit the brake cable.

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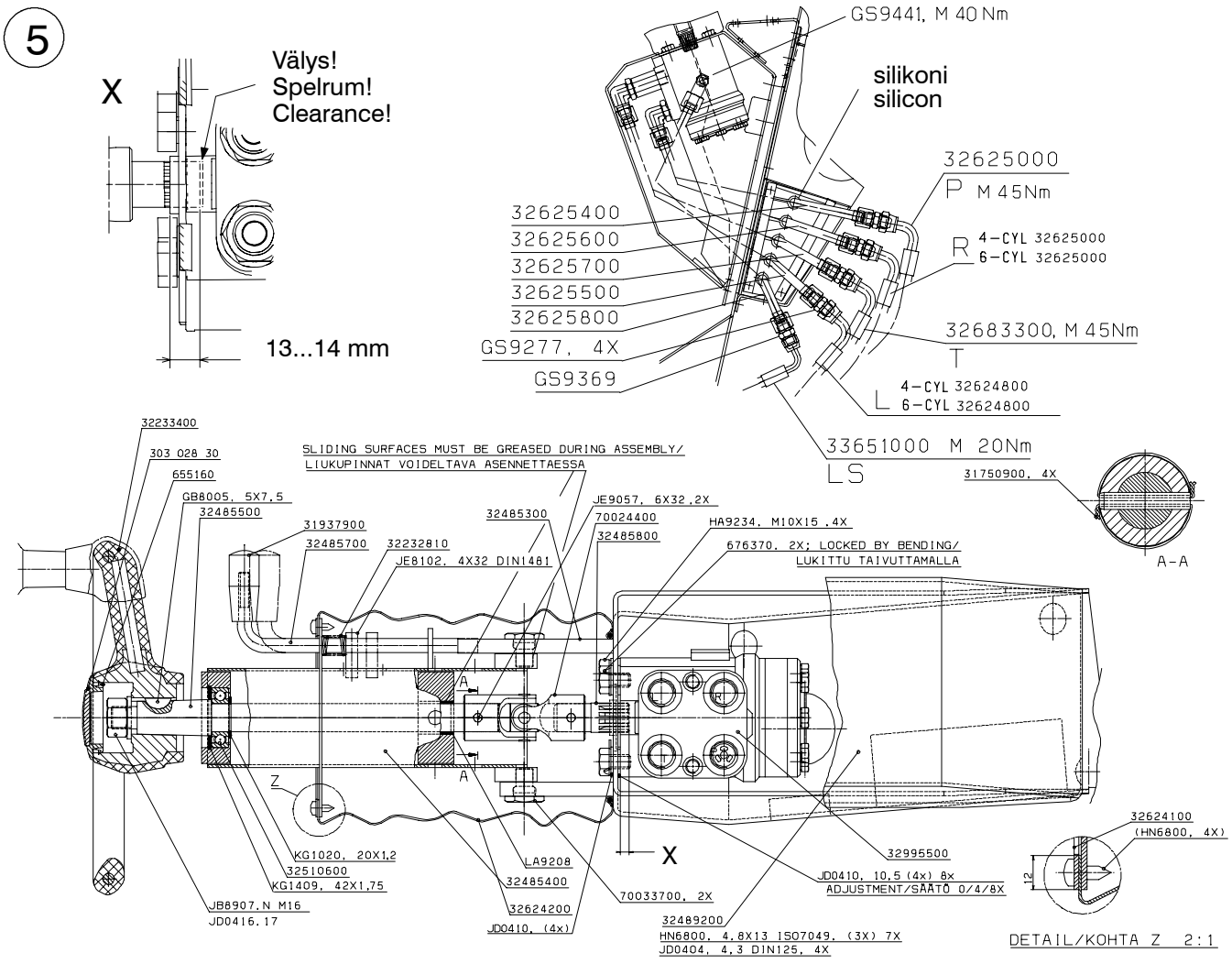
5. Fitting steering wheel column:

– Fasten the column frame (do not tighten the screws too hard).

– Assembly the steering valve (o–rings against the valve, connectors in places).
Place washers (JD0410, fasten with grease) between valve and the frame. make sure that the steering valve is in the middle of the hole and fasten the valve.
Secure the bolts with locking plate.

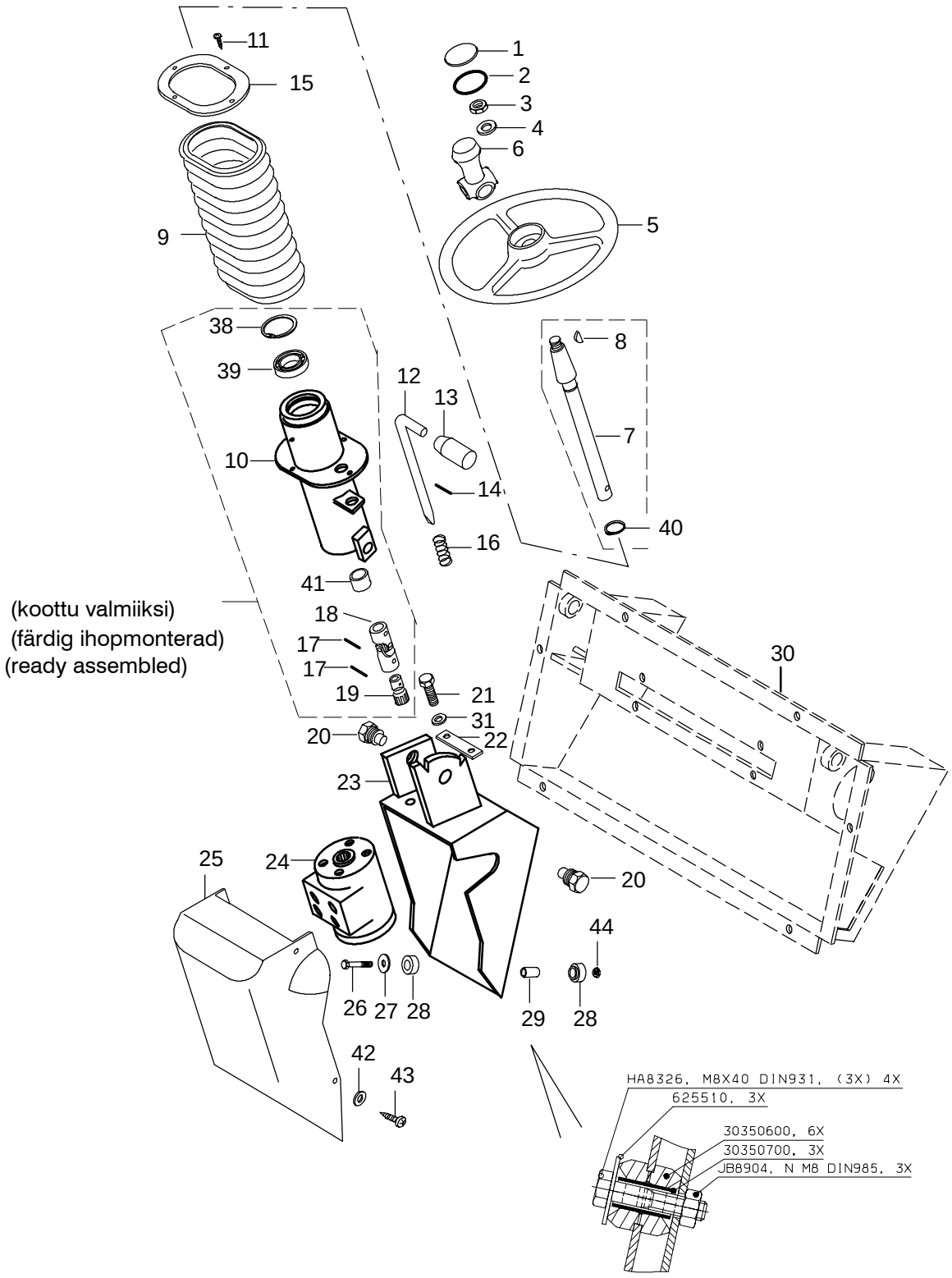
– NOTE! Check by measuring that the steering column end splines are pushed into the shaft of the steering valve **13...14 mm.** Make before assembling a marking with a pen on the steering column shaft (32485800) with a distance of 13...14 from the end of the shaft, see picture 4. (the steering column shaft is not allowed to touch the bottom of the splines in the steering valve shaft). If necessary, adjust with washers between frame and valve.

– Fit the steering hoses (note fitting order, the lengths of the hoses which come out of the housing shorten evenly (P–>LS).
Tighten the hoses with silicone mass to water tight at the lead–in rubbers.



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5a



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6. Fitting steering hydraulics:

– assemble the bracket+change–over valve under the priority valve. Because of the modification of the priority valve (with effect from tractor number F13208–>), the brackets and fastening are different, see pictures 6a and 6b.

– Fasten the hoses (starting from the rear ends) according to pictures 5 and 6. Fasten the hoses together with plastic clips.
The hoses are drawn under the cab floor behind the shuttle lever to the priority valve.

6b. Fitting steering hydraulics (reverse drive control +directional control valve):

– Fasten the directional control valve under the fixing bolt of the LH side rear axle housing. The fixing point depends on the tractor model (see picture 6b).
Fasten the hoses according to the picture.

– Connect wire loom (32876000) connector to the directional control valve.
Pass the loom through the hand brake cable hole into the cab.
Find connector X49 near the seat (red and white wires), and connect to the wire loom.
In the loom, there is a reserved connector for the pneumatic seat.

7. Rest of fittings:

– Fasten gaskets to the edges of the rear housing (see picture 4) and place (plexi)glasses into the housing (screw + washer + rubber plate).

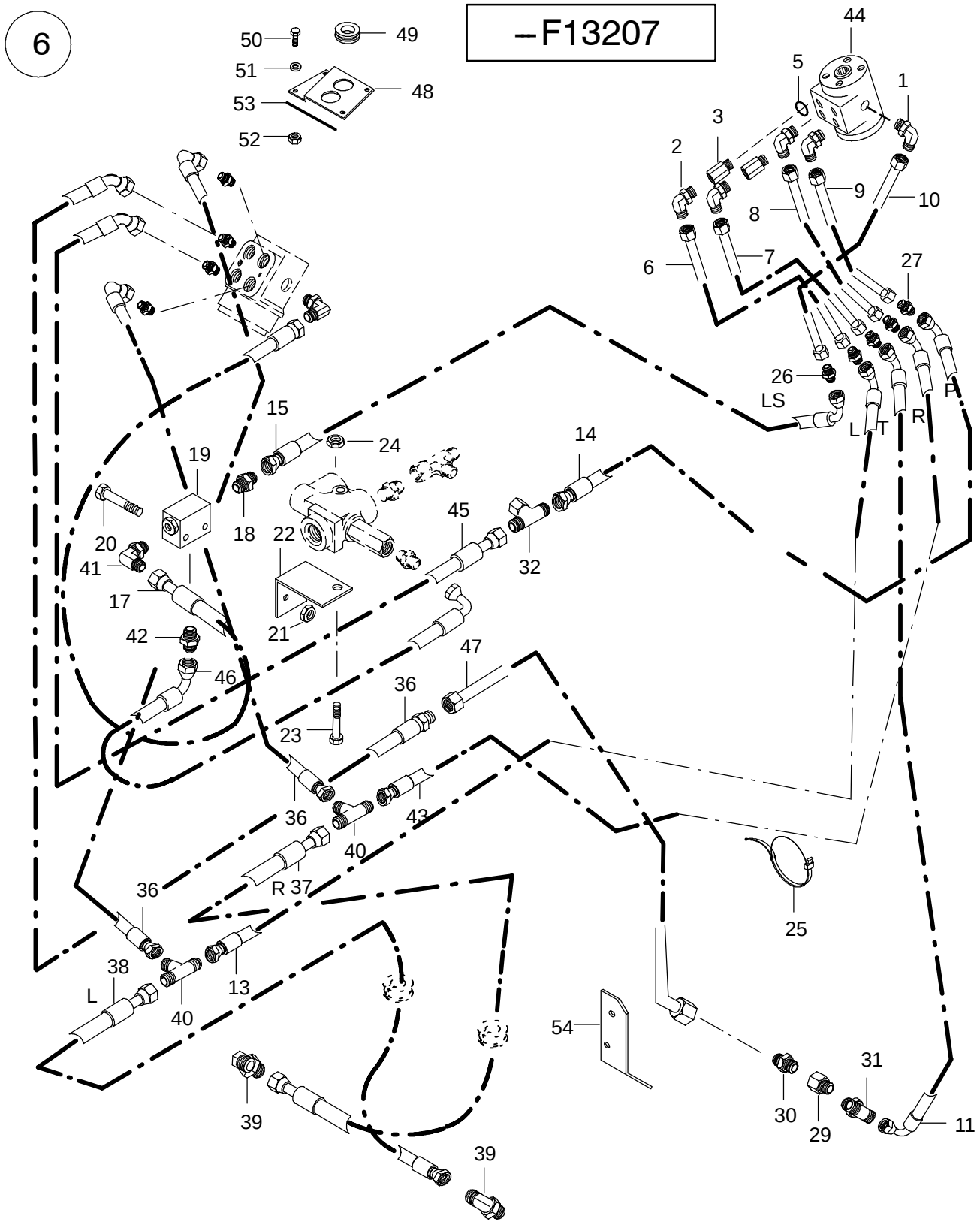
– Fit the rear mirror, see picture 7.

– Refit the cab floor ma. Mount the towing hook releasing control.
Refit the seat.

– Glue warning stickers (32843800 and 33332700) on the beam in the lower edge of the rear window.

– Replace the stickers on the earlier rear window to the new window.

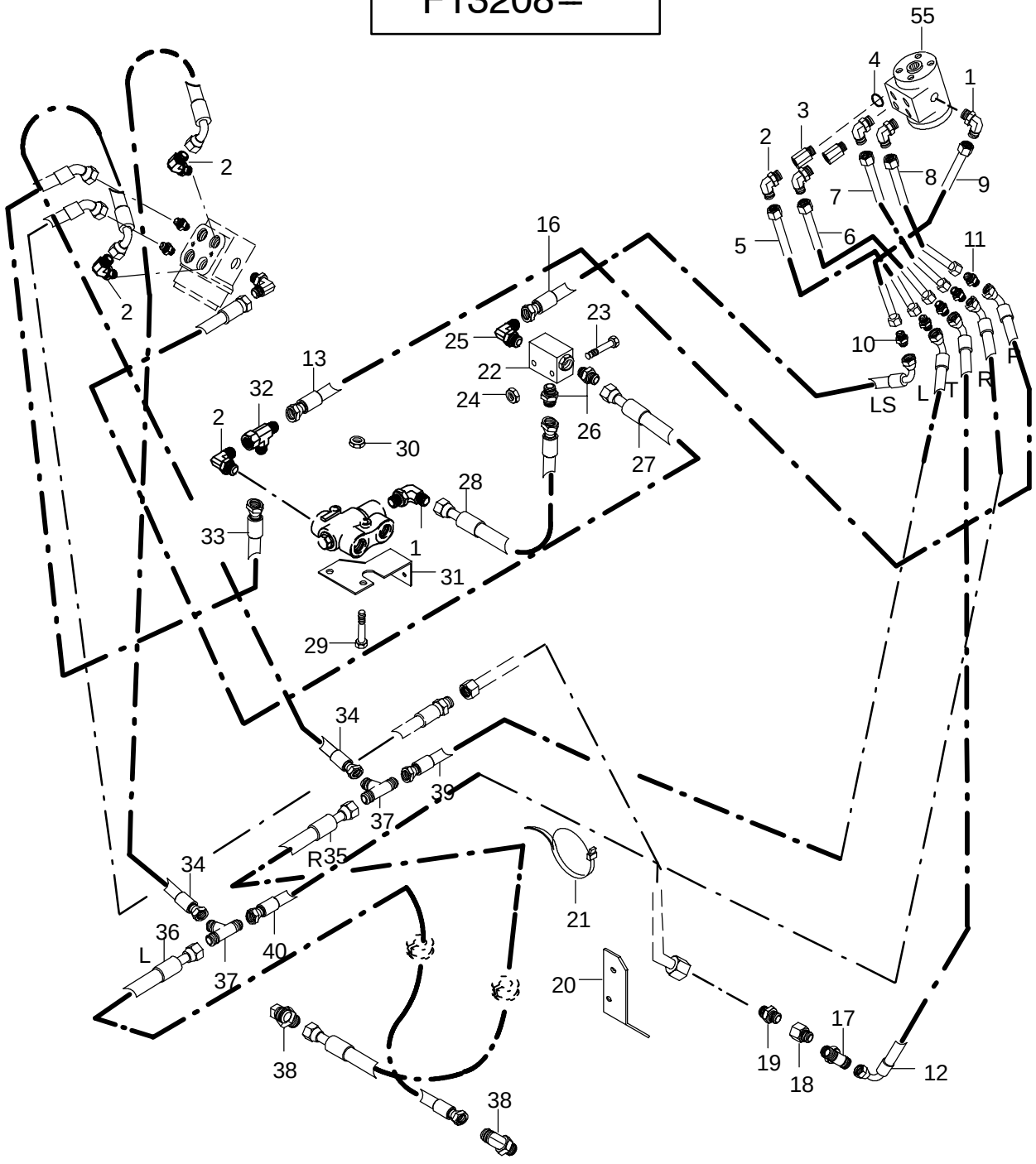
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6a

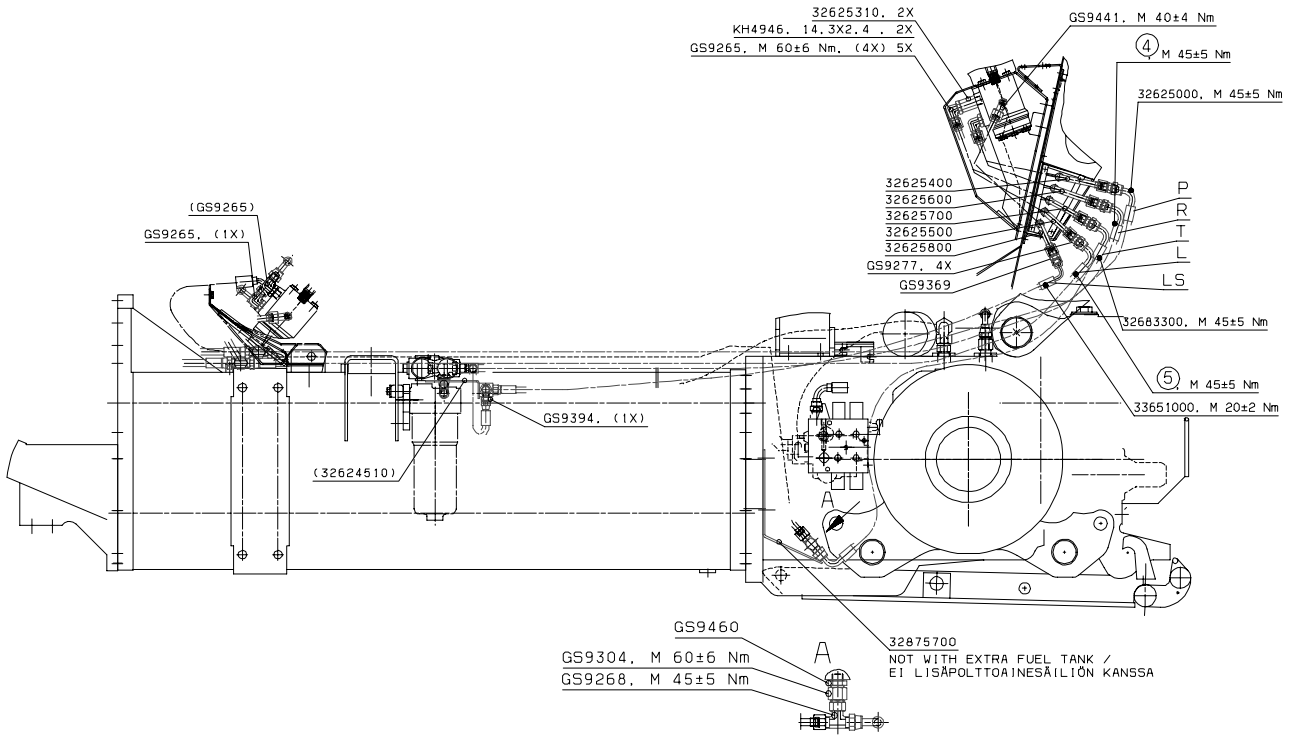
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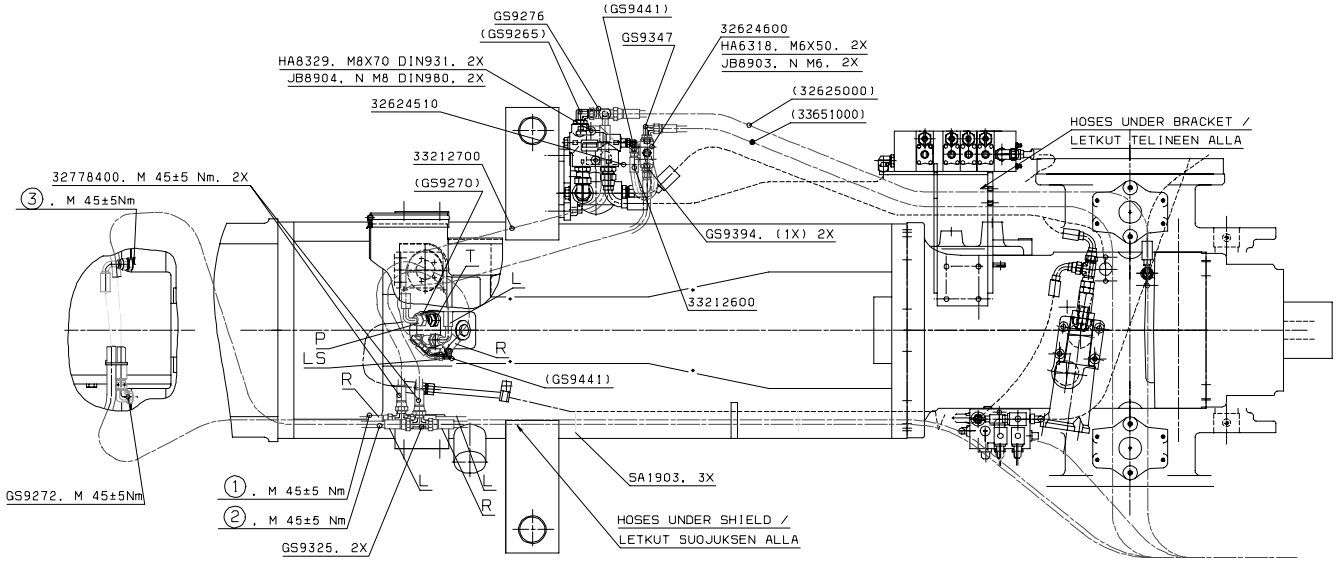
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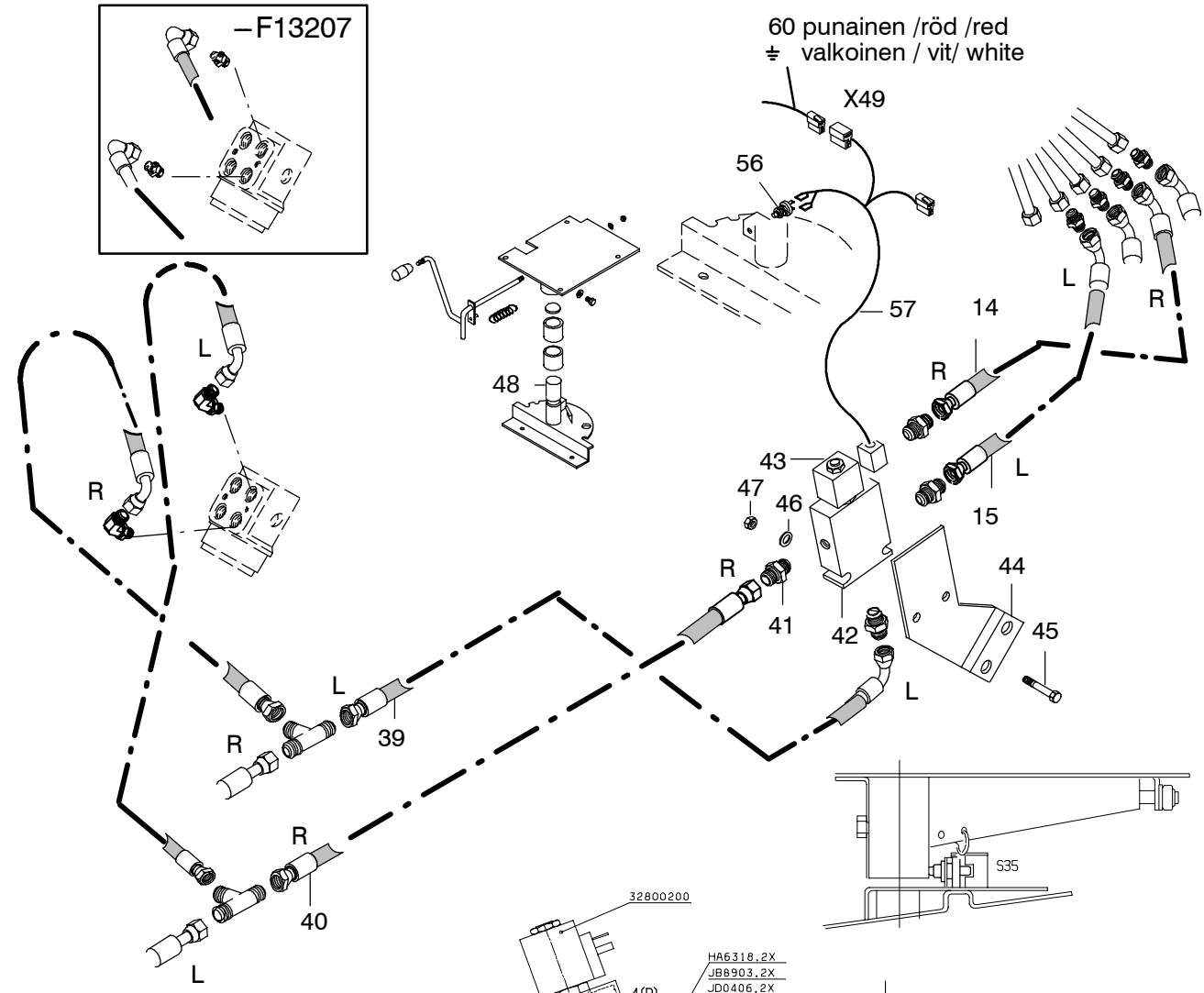
	PART NO/ TAVARAT.	MODEL / MALLI	①	②	③
*	32624300	6100-6600	32732300	30917010	GS9272
**	32720800	8000-8400	32764500	32778600	-
*	32872000	6100-6600	32732300	30917010	GS9272
**	32872100	8000-8400	32764500	32778600	-

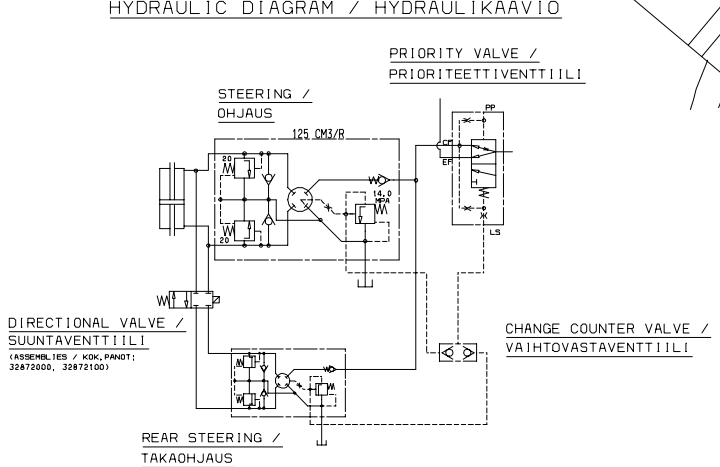
REMOVED PARTS / POISTETUT OSAT:
* GS9270, 32270840, 33202300, 33202400
** 32270840, 34070500, 33203600



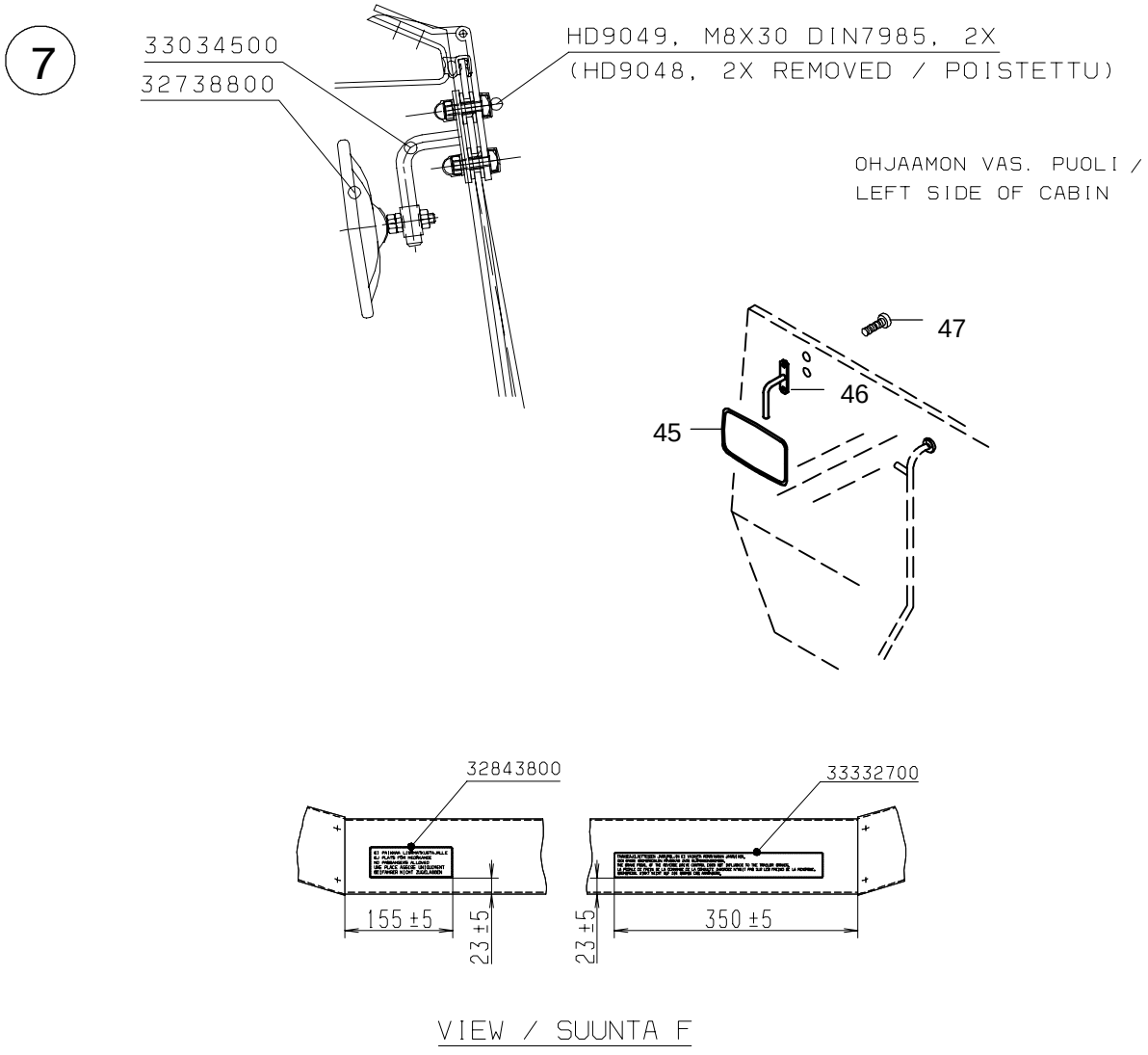
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6b Reverse drive controls + directional control valve





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2a

	1	33749900	Nopeusvivusto	Hastigh.reglage	Speed levers	G.gestänge	Levier de vitesse	
1	1	32605500	.Poljin	Pedal	Pedal	Pedal	Pédale	
2	1	JE8141	.Sokka	Sprint	Pin	Splint	Goupille	
3	1	J8902	.Mutteri	Mutter	Nut	Mutter	Ecrou	
4	1	32496900	.Vipu	Spak	Lever	Hebel	Levier	
5	1	HA8309	.Ruuvi	Skruv	Screw	Schraube	Vis	
6	1	32439500	.Haarukka	Gaffel	Fork	Gabel	Fourchette	
8	1	32496800	.Vaijeri	Vajer	Cable	Kabel	Câble	
9	1	32497110	.Runko	Ram	Frame	Rahmen	Châssis	
10	1	HA6325	.Ruuvi	Skruv	Screw	Schraube	Vis	
11	3	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
12	3	JB1108	.Mutteri	Mutter	Nut	Mutter	Ecrou	
13	1	HA6325	.Ruuvi	Skruv	Screw	Schraube	Vis	
14	1	JB1108	.Mutteri	Mutter	Nut	Mutter	Ecrou	
15	1	33606500	.Poljin	Pedal	Pedal	Pedal	Pédale	
16	3	JE9056	.Sokka	Sprint	Pin	Splint	Goupille	
17	2	32111800	.Laakerilevy	Lagerplatta	Bearing plate	Lagerplatte	Plaque de roulement	
18	2	LA9196	.Laakeri	Lager	Bearing	Lager	Roulement	
19	1	32497200	.Vipu	Spak	Lever	Hebel	Levier	
23	2	HA6323	.Ruuvi	Skruv	Screw	Schraube	Vis	
29	1	33609600	.Pala	Stycke	Piece	Stück	Pièce	
30	1	33651100	.Levy	Platta	Plate	Platte	Plaque	
31	4	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
32	4	HC9623	.Ruuvi	Skruv	Screw	Schraube	Vis	
33	1	30303700	.Jousi	Fjäder	Spring	Feder	Ressort	
34	1	33289100	.Letku	Slang	Hose	Schlauch	Tuyau flexible	Ø20, L=100

3a

1	2	30337000	Haarukka	Gaffel	Fork	Gabel	Fourchette	
2	2	30337100	Pidin	Klämma	Clamp	Klammer	Agrafe	
3	2	JB1108	Mutteri	Mutter	Nut	Mutter	Ecrou	
4	1	32501100	Vaijeri	Vajer	Cable	Kabel	Câble	
5	1	30203010	Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	Protection caoutchouc	
6	1	32633710	Haarukka	Gaffel	Fork	Gabel	Fourchette	
8	1	JD0408	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
9	1	33131800	Tappi	Tapp	Pin	Stift	Cheville	
10	1	70038300	Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	Protection caoutchouc	
11	1	JB1208	Mutteri	Mutter	Nut	Mutter	Ecrou	
12	1	32634000	Luisti	Slid	Slide	Schieber	Coulissement	
13	1	JE3047	Sokka	Sprint	Pin	Splint	Goupille	
14	1	JJ4034	Tappi	Tapp	Pin	Stift	Cheville	
15	1	JD0408	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
16	1	32631400	Vipu	Spak	Lever	Hebel	Levier	
17	2	LA9208	Laakeri	Lager	Bearing	Lager	Roulement	
18	4	JB1108	Mutteri	Mutter	Nut	Mutter	Ecrou	
19	4	JD0408	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
20	4	HA6325	Ruuvi	Skruv	Screw	Schraube	Vis	
22	1	32631110	Korvake	Öra	Lug	Ohr	Support	
23	1	JB1106	Mutteri	Mutter	Nut	Mutter	Ecrou	
24	1	32631700	Akseli	Axel	Shaft	Achse	Arbre	
25	1	HA9224	Ruuvi	Skruv	Screw	Schraube	Vis	
26	1	30555700	Pidin	Klämma	Clamp	Klammer	Agrafe	
27			Poljin	Pedal	Pedal	Pedal	Pédale	see fig. 4
28	1	JE3037	Sokka	Sprint	Pin	Splint	Goupille	
29	2	3269510	Kumi	Gummi	Rubber	Gummi	Caoutchouc	

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4

	1	32498700	Takakotelo	Bakhus	Rearhousing	Rückgehäuse	Châssis arrière	
1	1	32498810	.Runko	Ram	Frame	Rahmen	Châssis	
2	7	HA6325	.Ruuvi	Skruv	Screw	Schraube	Vis	
3	15	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
4	8	JB1108	..Mutteri	Mutter	Nut	Mutter	Ecrou	
6	1	32625900	.Kumi	Gummi	Rubber	Gummi	Caoutchouc	
7	1	32624400	.Levy	Platta	Plate	Platte	Plaque	
8	5	HA6313	.Ruuvi	Skruv	Screw	Schraube	Vis	
9	4	32499400	.Tulppa	Plugg	Plug	Stopfen	Bouchon	
10	3	32544000	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
11	1	32499000	.Poljin	Pedal	Pedal	Pedal	Pédale	
12	1	70018600	.Jousi	Fjäder	Spring	Feder	Ressort	
13	4	32499300	.Laakerilevy	Lagerplatta	Bearing plate	Lagerplatte	Plaque de roulement	
14	2	32499100	.Akseli	Axel	Shaft	Achse	Arbre	
15	4	70038200	.Laakeri	Lager	Bearing	Lager	Roulement	
16	2	32499200	.Latta	Platt	Flat	Platt	Anneau	
17	2	JD0408	.Aluslevy	Bricka	Washer	Scheibe	Rondelle	
18	2	HA6323	.Ruuvi	Skruv	Screw	Schraube	Vis	
19	1	32498910	.Poljin	Pedal	Pedal	Pedal	Pédale	
20	1	33034400	Suojus	Skydd	Shield	Schutz	Protection	
21	4	HD9005	Ruuvi	Skruv	Screw	Schraube	Vis	
22	4	625515	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
23	4	32643900	Kumialuslaatta	Gummibricka	Rubber washer	Gummisheibe	Rond. de caoutch.	
24	1	33034300	Suojus	Skydd	Shield	Schutz	Protection	
25	2	30637000	Vaimennin	Dämpare	Damper	Dämpfer	Amortisseur	
26	1	33133500	Levy	Platta	Plate	Platte	Plaque	
27	2	HD9035	Ruuvi	Skruv	Screw	Schraube	Vis	
28	1	33049100	Kumitiiviste	Gummitätning	Rubber seal	Gummidichtung	Joint de caoutch.	
29	2	33048600	Kumitiiviste	Gummitätning	Rubber seal	Gummidichtung	Joint de caoutch.	L=515
30	1	33048500	Kumitiiviste	Gummitätning	Rubber seal	Gummidichtung	Joint de caoutch.	
31	1	33049000	Kumitiiviste	Gummitätning	Rubber seal	Gummidichtung	Joint de caoutch.	L=640
32	1	33133600	Levy	Platta	Plate	Platte	Plaque	
33	1	32061310	Lukitsin	Låsplatta	Lock plate	Verrieg.platte	Frein	(BALL–HITCH)
34	2	33532900	Kansi	Lock	Cover	Deckel	Couvercle	
35	2	33533000	Tiiviste	Tätning	Gasket	Dichtung	Joint	
36	8	JD04060	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
37	8	HA9223	Ruuvi	Skruv	Screw	Schraube	Vis	
38	1	33532800	Reunalista	Kantlist	Edge strip	Kantenleiste	Bordure	

4a

5	1	30337000	Haarukka	Gaffel	Fork	Gabel	Fourchette	
6	1	30337100	Pidin	Klämma	Clamp	Klammer	Agrafe	
7	1	30203010	Suojakumi	Skyddsgummi	Shield rubber	Schutzgummi	Prot. caoutchouc	
8	1	JB1108	Mutteri	Mutter	Nut	Mutter	Ecrou	
9	1	32841800	Vaijeri	Vajer	Cable	Kabel	Câble	
10			Poljin	Pedal	Pedal	Pedal	Pédale	see fig.4
11	1	32809100	Holkki	Hylsa	Sleeve	Hülse	Manchon	
12	1	32683200	Jatkokappale	Förlängning	Extension	Verl.stück	Extension	

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5a

	1	32279500	Takah.laitteet	Utr.vändb. förarplats	Back driving system	Rückfahr– einrichtung.	Com. du poste de conduite inversée	6000–6800
	1	32875800	Takah.laitteet	Utr.vändb.	Back driving	Rückfahr–	Com. du poste	6000–6800, with direction valve
	1	32534600	Takah.laitteet	Utr.vändb.	Back driving	Rückfahr–	Com. du poste	6900–8750
	1	32875900	Takah.laitteet	Utr.vändb.	Back driving	Rückfahr–	Com. du poste	6900–8750 with direction valve
1	1	30302830	Peitelevy	Täckplatta	Covering plate	Deckplatte	Couverture	VALTRA
2	1	655160	Kiilarengas	Kilring	Key ring	Keilring	Anneau de blocage	
3	1	JB8907	Mutteri	Mutter	Nut	Mutter	Ecrou	
4	1	JD0416	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
	1	32233400	Ohjauspyörä	Ratt	Steering wheel	Lenkrad	Volant	
5	1	32623600	.Ohjauspyörä	Ratt	Steering wheel	Lenkrad	Volant	No stored
6	1	32623700	.Nuppi	Knopp	Knob	Knopf	Pommeau	
7	1	32485500	Akseli	Axel	Shaft	Achse	Arbre	
8	1	GB8005	Kiila	Kil	Key	Keil	Clef	
9	1	32624200	Suojus	Skydd	Shield	Schutz	Protection	
10	1	32485400	Ohjauspylväs	Rattstam	Steering column	Lenksäule	Colonne de direction	
11	4	HN6800	Ruuvi	Skruv	Screw	Schraube	Vis	
12	1	32485700	.Tappi	Tapp	Pin	Stift	Cheville	
13	1	31937900	Nuppi	Knopp	Knob	Knopf	Pommeau	
14	1	JE8102	Sokka	Sprint	Pin	Splint	Goupille	
15	1	32624100	Kehys	Ram	Frame	Rahmen	Cadre	
16	1	32232810	Jousi	Fjäder	Spring	Feder	Ressort	
17	2	JE9057	Sokka	Sprint	Pin	Splint	Goupille	
	4	31750900	Lanka	Tråd	Thread	Draht	Filetage	
18	1	70024400	Nivel	Led	Joint	Gelenk	Joint	
19	1	32485800	Akseli	Axel	Shaft	Achse	Arbre	
20	2	70033700	Ruuvi	Skruv	Screw	Schraube	Vis	
21	4	HA9234	Ruuvi	Skruv	Screw	Schraube	Vis	
22	4	676370	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
23	1	32485300	Runko	Ram	Frame	Rahmen	Châssis	
24	1	32995500	Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
25	1	32489200	Suojus	Skydd	Shield	Schutz	Protection	
26	4	HA8326	Ruuvi	Skruv	Screw	Schraube	Vis	
27	3	625510	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
28	6	30350600	Vär.vaimennin	Vibr.dämpare	Vibr. damper	Vibr.dämpfer	Amortisseur	
29	3	30350700	Holkki	Hylsa	Sleeve	Hülse	Manchon	
30	1		Runko	Ram	Frame	Rahmen	Châssis	see fig. 4
31	4	JD0410	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
38	1	KG1409	Pidätinrengas	Låsring	Circlip	Sicherungsring	Circlip	
39	1	32510600	Laakeri	Lager	Bearing	Lager	Roulement	
40	1	KG1020	Pidätinrengas	Låsring	Circlip	Sicherungsring	Circlip	
41	1	LA9208	Laakeri	Lager	Bearing	Lager	Roulement	
42	1	JD0404	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
43	1	HN6800	Ruuvi	Skruv	Screw	Schraube	Vis	
44	4	JB1108	Mutteri	Mutter	Nut	Mutter	Ecrou	

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6

–F13207

1	1	GS9441	Liitin	Nippel	Union	Verbindung	Raccord	
	1	KH4934	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
2	4	GS9265	Liitin	Nippel	Union	Verbindung	Raccord	
	1	KH9032	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
3	2	32625310	Liitin	Nippel	Union	Verbindung	Raccord	
5	2	KH4946	O–rengas	O–ring	O–ring	O–ring	Joint torique	
6	1	32625500	Putki	Rör	Pipe	Rohr	Tuyau	
7	1	32625700	Putki	Rör	Pipe	Rohr	Tuyau	
8	1	32625600	Putki	Rör	Pipe	Rohr	Tuyau	
9	1	32625400	Putki	Rör	Pipe	Rohr	Tuyau	
10	1	32625800	Putki	Rör	Pipe	Rohr	Tuyau	
11	1	32683300	Letku	Slang	Hose	Schlauch	Tuyau flexible	
13	2	32625000	Letku	Slang	Hose	Schlauch	Tuyau flexible	
14	1	32625000	Letku	Slang	Hose	Schlauch	Tuyau flexible	
15	1	32624700	Letku	Slang	Hose	Schlauch	Tuyau flexible	
17	1	32625210	Letku	Slang	Hose	Schlauch	Tuyau flexible	
18	3	GS9364	Liitin	Nippel	Union	Verbindung	Raccord	
	3	KH9030	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
19	1	32624600	Vaihtovastaventtiili		Skyttelventil	Shuttle valve	Richtungsventil	Valve d’inversion
20	2	HA6318	Ruuvi	Skruv	Screw	Schraube	Vis	
21	2	JB8903	Mutteri	Mutter	Nut	Mutter	Ecrou	
22	1	32624500	Kiinnitin	Fästdon	Fastener	Halter	Fixation	
23	1	HA8328	Ruuvi	Skruv	Screw	Schraube	Vis	
24	1	JB8904	Mutteri	Mutter	Nut	Mutter	Ecrou	
25	3	SA1903	Side	Band	Band	Binde	Bande	
26	1	GS9456	Liitin	Nippel	Union	Verbindung	Raccord	
27	4	GS9277	Liitin	Nippel	Union	Verbindung	Raccord	
29	1	GS9304	Liitin	Nippel	Union	Verbindung	Raccord	
30	1	GS9460	Liitin	Nippel	Union	Verbindung	Raccord	
	1	KH9032	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
31	1	GS9268	Liitin	Nippel	Union	Verbindung	Raccord	
32	2	GS9268	Liitin	Nippel	Union	Verbindung	Raccord	
36	2	32683400	Letku	Slang	Hose	Schlauch	Tuyau flexible	
37	1	32732300	Letku	Slang	Hose	Schlauch	Tuyau flexible	6000–6800
	1	32764500	Letku	Slang	Hose	Schlauch	Tuyau flexible	8000–8400
38	1	30917010	Letku	Slang	Hose	Schlauch	Tuyau flexible	6000–6800
	1	32778600	Letku	Slang	Hose	Schlauch	Tuyau flexible	8000–8400
39	2	GS9272	Liitin	Nippel	Union	Verbindung	Raccord	6000–6800
	1	GS9272	Liitin	Nippel	Union	Verbindung	Raccord	8000–8400
40	2	GS9325	Liitin	Nippel	Union	Verbindung	Raccord	
41	1	GS9347	Liitin	Nippel	Union	Verbindung	Raccord	
	1	KH9030	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
42	1	GS9394	Liitin	Nippel	Union	Verbindung	Raccord	
	1	KH9030	.O–rengas	O–ring	O–ring	O–ring	Joint torique	
43	1	32624800	Letku	Slang	Hose	Schlauch	Tuyau flexible	
44	1	32995500	Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
45	1	32778400	Letku	Slang	Hose	Schlauch	Tuyau flexible	
46	1	32778500	Letku	Slang	Hose	Schlauch	Tuyau flexible	
47	1	32263740	Putki	Rör	Pipe	Rohr	Tuyau	
48	1	30992000	Levy	Platta	Plate	Platte	Plaque	
49	2	30145900	Läpivientirengas	Genomföringsring		Inlet ring	Durchführungsring	Anneau d’entrée
50	4	HA6306	Ruuvi	Skruv	Screw	Schraube	Vis	
51	4	JD0405	Aluslevy	Bricka	Washer	Scheibe	Rondelle	
52	4	JB9926	Mutteri	Mutter	Nut	Mutter	Ecrou	
53	1	32745300	Tiiviste	Tätning	Gasket	Dichtung	Joint	
54	1	32875700	Levy	Platta	Plate	Platte	Plaque	

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6a

1	1	GS9441	Liitin	Nippel	Union	Verbindung	Raccord
2	7	GS9265	Liitin	Nippel	Union	Verbindung	Raccord
	1	KH9032	O–rengas	O–ring	O–ring	O–ring	Joint torique
3	2	32625310	Liitin	Nippel	Union	Verbindung	Raccord
4	2	KH4946	O–rengas	O–ring	O–ring	O–ring	Joint torique
5	1	32625500	Putki	Rör	Pipe	Rohr	Tuyau
6	1	32625700	Putki	Rör	Pipe	Rohr	Tuyau
7	1	32625600	Putki	Rör	Pipe	Rohr	Tuyau
8	1	32625400	Putki	Rör	Pipe	Rohr	Tuyau
9	1	32625800	Putki	Rör	Pipe	Rohr	Tuyau
10	1	GS9456	Liitin	Nippel	Union	Verbindung	Raccord
11	4	GS9277	Liitin	Nippel	Union	Verbindung	Raccord
12	1	32683300	Letku	Slang	Hose	Schlauch	Tuyau flexible
13	2	32625000	Letku	Slang	Hose	Schlauch	Tuyau flexible
14	1	32625000	Letku	Slang	Hose	Schlauch	Tuyau flexible
15	1	32624800	Letku	Slang	Hose	Schlauch	Tuyau flexible
16	1	33651000	Letku	Slang	Hose	Schlauch	Tuyau flexible
17	1	GS9268	Liitin	Nippel	Union	Verbindung	Raccord
18	1	GS9304	Liitin	Nippel	Union	Verbindung	Raccord
19	1	GS9460	Liitin	Nippel	Union	Verbindung	Raccord
	1	KH9032	.O–rengas	O–ring	O–ring	O–ring	Joint torique
20	1	32875700	Levy	Platta	Plate	Platte	Plaque
21	3	SA1903	Side	Band	Band	Binde	Bande
22	1	32624600	Vaihtov.venttiili	Skyttelventil	Shuttle valve	Richtungsventil	Valve d'inversion
23	2	HA6318	Ruuvi	Skruv	Screw	Schraube	Vis
24	2	JB8903	Mutteri	Mutter	Nut	Mutter	Ecrou
25	1	GS9347	Liitin	Nippel	Union	Verbindung	Raccord
	1	KH9030	.O–rengas	O–ring	O–ring	O–ring	Joint torique
26	2	GS9394	Liitin	Nippel	Union	Verbindung	Raccord
	3	KH9030	O–rengas	O–ring	O–ring	O–ring	Joint torique
28	1	33212600	Letku	Slang	Hose	Schlauch	Tuyau flexible
29	1	HA8329	Ruuvi	Skruv	Screw	Schraube	Vis
30	1	JB8904	Mutteri	Mutter	Nut	Mutter	Ecrou
31	1	32624510	Kiinnitin	Fästdon	Fastener	Halter	Fixation
32	1	GS9276	Liitin	Nippel	Union	Verbindung	Raccord
33	1	33212700	Letku	Slang	Hose	Schlauch	Tuyau flexible
34	1	32778400	Letku	Slang	Hose	Schlauch	Tuyau flexible
35	1	32764500	Letku	Slang	Hose	Schlauch	Tuyau flexible
36	1	32778600	Letku	Slang	Hose	Schlauch	Tuyau flexible
37	2	GS9325	Liitin	Nippel	Union	Verbindung	Raccord
38	2	GS9272	Liitin	Nippel	Union	Verbindung	Raccord
39	1	32625000	Letku	Slang	Hose	Schlauch	Tuyau flexible
40	1	32624800	Letku	Slang	Hose	Schlauch	Tuyau flexible

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6b

39	1	32834500	Letku	Slang	Hose	Schlauch	Tuyau flexible	*
40	1	32834200	Letku	Slang	Hose	Schlauch	Tuyau flexible	*
41	4	GS9329	Liitin	Nippel	Union	Verbindung	Raccord	
43	1	32800200	Venttiili	Ventil	Valve	Ventil	Soupape	*
	1	32875200	.Kela	Spole	Coil	Spule	Inducteur	*
	1	32875100	.Kara	Spindel	Spindle	Spindel	Axe	*
	1	32875300	.Pesä	Hus	Housing	Gehäuse	Carter	*
44	1	32841700	Levy	Platta	Plate	Platte	Plaque	*
45	2	HA6318	Ruuvi	Skruv	Screw	Schraube	Vis	*
46	2	JD0406	Aluslevy	Bricka	Washer	Scheibe	Rondelle	*
47	2	JB8903	Mutteri	Mutter	Nut	Mutter	Ecrou	*
48	1	34045300	Runko	Ram	Frame	Rahmen	Carcasse	*
55		32995500	Ohjausventtiili	Styrventil	Steering valve	Steuerventil	Valve de direction	
56	1	684690	Rajakytkin	Gränsbrytare	Limit switch	Grenzschalter	Interrupteur limitation	
*								
57	1	32876000	Johdin	Ledning	Wire	Leitung	Fil électrique	*
	1	30145700	Läpivientirengas	Genomf.ring	Inlet ring	Durchf.ring	Anneau d’entrée	
*			Takaohj.estin	Spärr f. Bakstyringen	Lock for reverse drive control	Sperr f. Rück–fahreinrictung		

7

45	1	32738800	Peili	Spegel	Mirror	Spiegel	Miroir
46	1	33034500	Teline	Konsol	Bracket	Gestell	Support
47	2	HD9049	Ruuvi	Skruv	Screw	Schraube	Vis

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Shuttle lever (Twin Trac) **33494400**

– Remove the RH side rear wheel, mudguard service cover and ventilation filter with its pipe. Disconnect and turn to one side hydraulic hoses. Plug the hoses and nipples. Remove the lever console side panel, upper panel, remove the AC/ ACD control unit rubber band and the relay fastening bracket.

– Measure positions of protective rubber **6** and screw holes, see picture **A.1**.

– Measure and make hole onto the cab panel, see picture **B**.

– Measure fastening holes for fastener **1** onto the cab wall on the RH mudguard side.
Try to make an accurate measurement. Use the fastener as a pattern. Drill four ø 8 holes, see drawing **A**. NOTE! Be careful not to damage the wires when drilling.

– Fit lever **10** onto the fastener **1**, place washer **13** and nut **14** (without play). Turn the lever straight.

– Try the fastener with the lever and an intermediate rubber piece. Check that the lever is in the middle of the hole. If not, loosen and adjust the lever.

– Fit the fastener together with the lever and protective rubber **6** (the intermediate piece **5** is fitted between the cab wall and the fastener) with screw **2**, washer **3** and lock nut **4**.
The protective rubber is fitted from under with screw **8**, washer **7** and lock nut **9**.

– Fit the lever knob **20** together with push buttons (the button with red wire is fitted against the mudguard) onto the lever **10** with screws **21**, and nut **22**. Pull the wires through the lever tube. Fit the protective plastic and the round connector **32**.
The yellow wires (2 pcs) are connected together to the round connector.
Fit the connector housing **30** (the wires are connected to the corr. coloured wires of connector 29, except that the green wire corr. to the connector 29 brown wire).
Fit the cover on the knob.

– Remove the existing shuttle lever.
Weld the lever extension **19** to the removed shuttle lever, see drawing **C**. Refit the lever.

– Fit the joint bar **18** and adjust the gear lever. Lock with the nut.

– Make ø 12,5 hole for lead–in rubber **33** through the front panel, see drawing **D**.
Fit the lead–in rubber and draw wire loom **25** through it.

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– Fit the round connector **32** onto red, yellow and blue wires.
Put the wires with the round connector into the connector housing **33** and connect it to connector housing ”X23”.

– HiShift: Disconnect the black and green wires of the foremost shuttle lever from connector ”S45”. Connect black and brown wires of the wire loom to corr. coloured wires of the foremost shuttle lever to the connector with aid of the round connector **32**.

– Tie the wires.

– Check the electrical functions.

– Adjust the relay bracket according to drawing **E**.

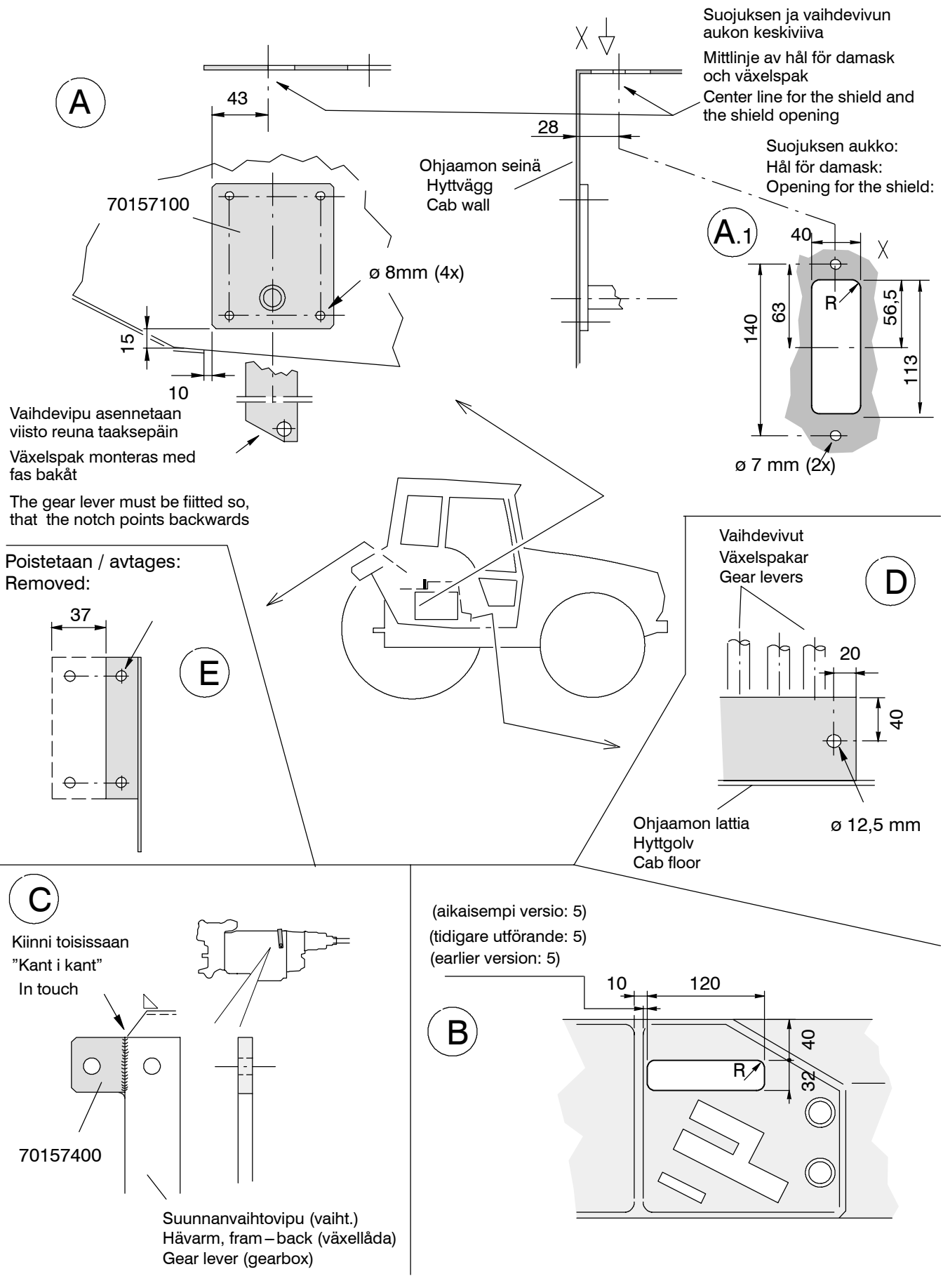
– Turn the ventilation filter backwards (turn the T–union). Clearance must be left on the cab side. Refit the hydraulic hoses.

– Grease the gear lever.
Check that the gear lever and the joint bar can move freely.

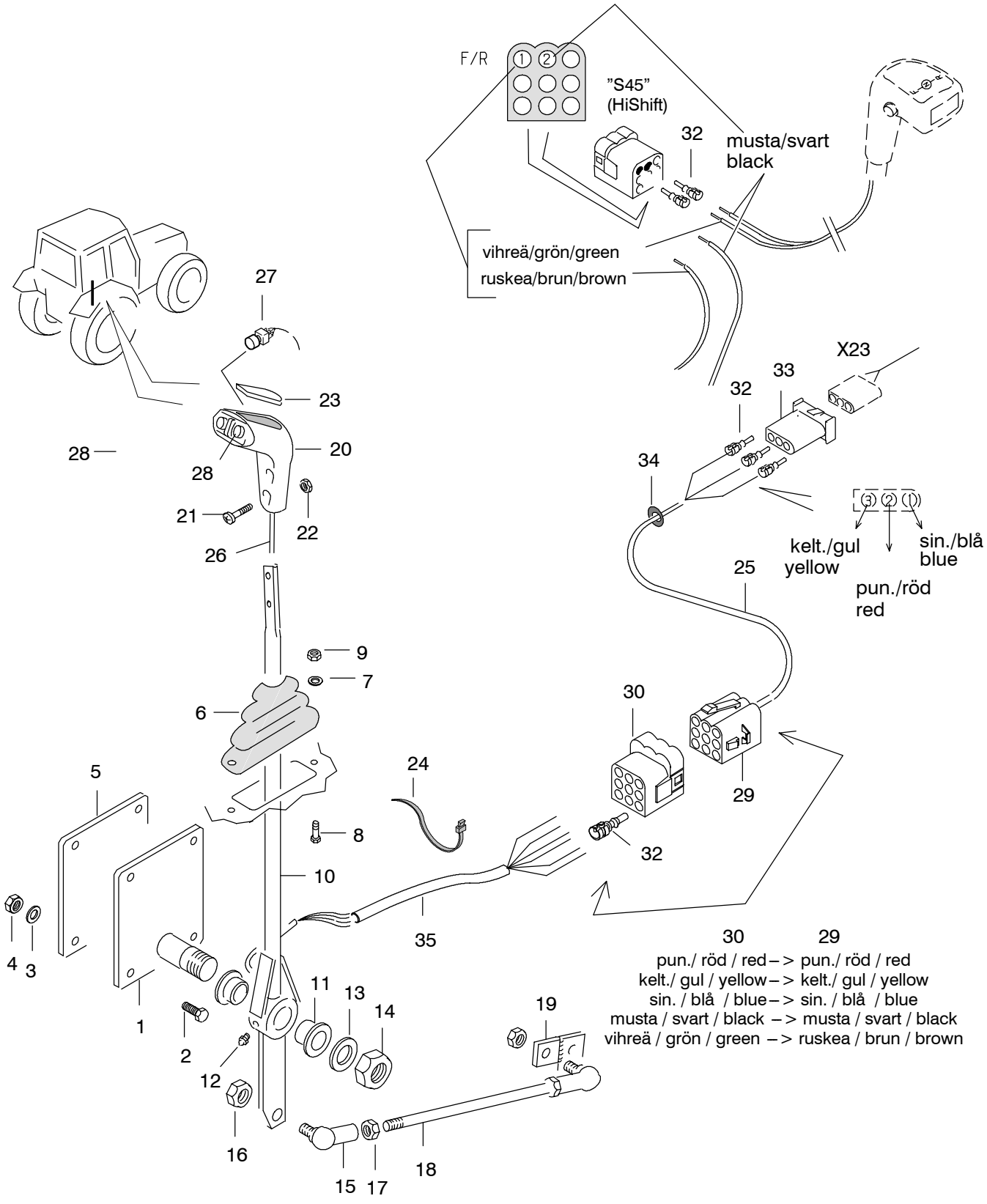
– Refit all removed parts.

	1	**33494400**	Suunnanvaihtovipu	Fram–backspak	Forward–reverse gear lever	Twin–Trac
1	1	70157100	.Kiinnitin	Fäste	Support	
2	4		.Ruuvi	Skruv	Screw	M8x25
3	4		.Aluslaatta	Bricka	Washer	8x19x1,5
4	4		.Lukitusmutteri	Låsmutter	Locking nut	M8
5	1	70157500	.Kumivälipala	Gummimellanlägg	Rubber	
6	1	612880	.Suojakumi	Damask	Rubber shield	
7	2	960139	.Aluslaatta	Bricka	Washer	
8	2	955272	.Ruuvi	Skruv	Screw	M6x19
9	2		.Lukitusmutteri	Låsmutter	Locking nut	M6
10	1	70157200	.Vaihdevipu	Växelspak	Gear lever	
11	2	30208600	.Holkki (musta)	Bussning (svart)	Bushing (black)	
12	1	GG0088	.Voidenippa	Smörjnippel	Greasing nipple	
13	1	29869	.Aluslaatta	Bricka	Washer	16,5x38x6
14	1	963121	.Lukitusmutteri	Låsmutter		M16x1,5
15	2	959081	.Kulmakuulanivel	Vinkelkulled	Angle joint	
16	2	971083	.Lukitusmutteri	Låsmutter	Locking nut	M10
17	2		.Mutteri	Mutter	Nut	M10
18	1	70157300	.Niveltanko	Länkstång	Joint rod	
19	1	70157400	.Pidennyskappale	Hävarmsförlängare	Lengthening piece	
20	1	33319500	.Vivun nuppi	Spakknopp	Knob	
21	2	HE6984	.Ruuvi	Skruv	Screw	M5
22	2	JB1105	.Mutteri	Mutter	Nut	M5
23	1		.Suojakansi	Skyddslock	Lock	
24	2	948210	.Johdinside	Buntband	Band	
25	1		.Johdinsarja	Kabelknippe	Wiring harness	
26	1	33269700	.Johdin	Kabel	Wire	
27	1	32908300	.Nappi	Knopp	Button	
28	1	32948400	.Painonapit	Tryckknappar	Button	
29	1	SA1775	.Liitinkotelo	Skarvhus	Connector housing	
–	5	SA1785	.Liitin	Anslutning	Pin	
30	1	SA1774	.Liitinkotelo	Skarvhus	Connector housing	
32	10	SA1776	.Liitin	Anslutning	Pin	
33	1	SA1787	.Liitinkotelo	Skarvhus	Connector housing	
34	1	32643500	.Läpivientikumi	Skyddsbussning	Rubber	
35	1		.Suojaputki	Skyddshölje	Shield	

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Air suspension of front axle 33135100
The suspension requires also a pressure reservoir kit and the compressor kit (if not fitted).

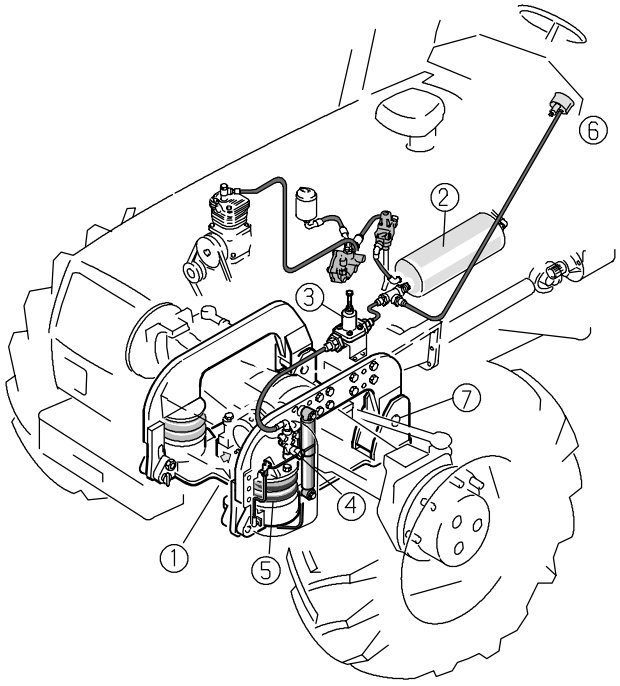
Pressure reservoir kit 33501100
Compressor kit (6900–8400) 32960200
Compressor kit (8450–8750) 33273600
Spacer (s=10, front loader, Ålö) 33145900
Spacer (s=30) 33145800

– Can be fitted on tractors with **6–cylinder** engines, which have a short wheel base (2558 mm), all front axle types.

– **Not** on tractors with the front lift.

– Other options must be observed during fitting.

– The suspension functions with the aid of pressure air. The suspension is adjusted automatically according to the ftont axle loading. With the air suspension is obtained very sturdy and pleasant driving properties when using different implement.



1) Suspension frame parts
2) Pressure reservoir
3) Overflow valve
4) Levelling valve
5) Rubber bellows
6) Pressure gauge
7) Hinge pins

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(Fitting the compressed air equipment (if not fitted): see page 9/17)

Removing the front axle:

– Remove the propeller shaft guard under the tractor. Unbolt the front flange joint of the propeller shaft.

– Disconnect the oil hoses on the steering cylinder. Raise the tractor front end and place sturdy axle stands under the front frame. Remove the front wheel, if needed.

– Fasten the lifting ropes on the axle and unbolt the axle bearing brackets. Lower the axle and remove it.

Modifications:

– Drill on the front bearing bracket a grease hole so that it is a mirror image to the earlier hole and tap a thread for the nipple (picture **A**).

– Plug the earlier grease hole, fit the nipple into the new hole.

– Remove an edge from the front bearing bracket by machining it, picture **A.1** and check the function.

– Make chamfers onto the oil sump frame, see picture **B**.

– Fasten the axle onto a new frame, do not tighten the bolts to the final torque. Tighten them just when the propeller shaft is correctly positioned.
Ensure, that the bearing brackets are correctly positioned on the axle.

Fastening front axle:

– connect the upper and lower frames, and fasten the bellows and the shock absorbers, see picture **E**.

– Fasten the complete frame+front axle onto the tractor frame, fit spacers **3** (30 mm) between the tractor and the new frame.
(Spacers 10 mm are available as an option for front loader).
Fasten the propeller shaft (35e).

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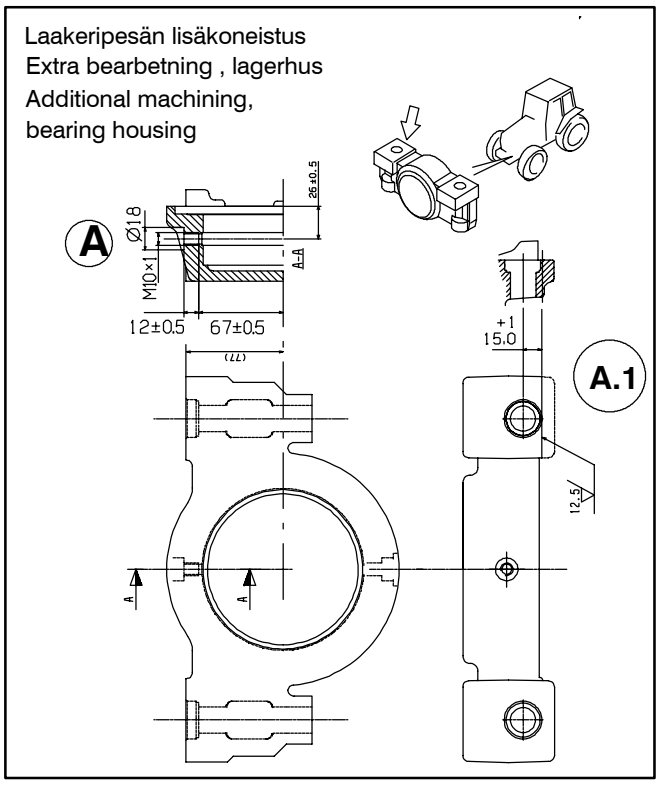
– Adjust the propeller shaft in the middle of the intermediate frame (picture **C**) by turning the front axle, tighten the front axle attaching bolts (380 Nm).

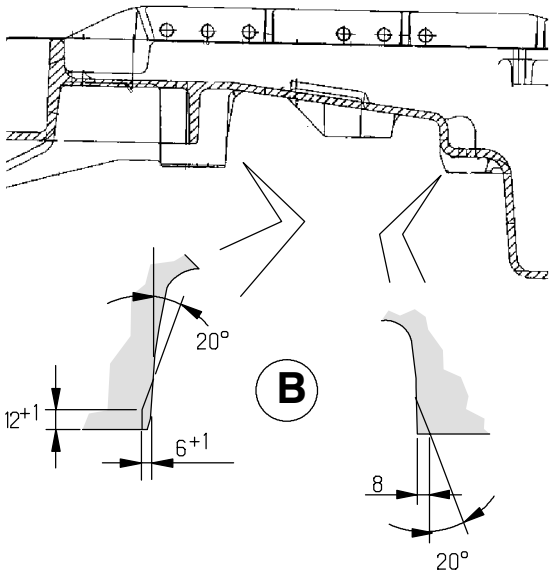
Reconnect the oil hoses on the steering ram.
Fit new shields (**38** and **39**, picture **E**).

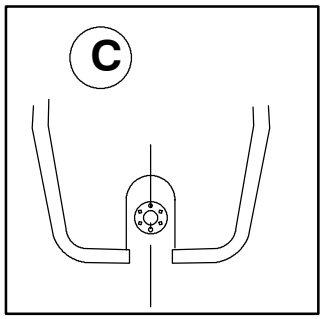
– Fit the compressed air components , picture **F**

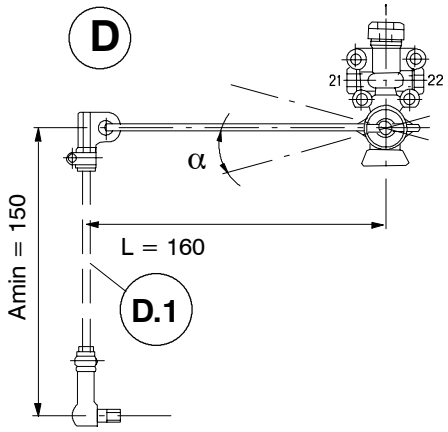
– Assemble the levelling valve linkage. Basic measurements; see picture **D**.

– Fill the system up to the adjusted pressure. Carry out adjustment.









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Adjustment:

– lower the tractor frame into the lowest position against the limiter

– fill the bellows slowly. The valve must stop the lifting movement, when the locking pin holes align in the front part of the suspension frame, picture **F.1**

– If the tractor rises more, lower the tractor frame and make the vertical link longer.

– check the adjustment again and change the vertical link **D.1** length until the lifting height is correct (locking pins holes align).

– if the closing angle (link near horizontal) is reached before the correct height, shorten the vertical link.

Carry out a test–run

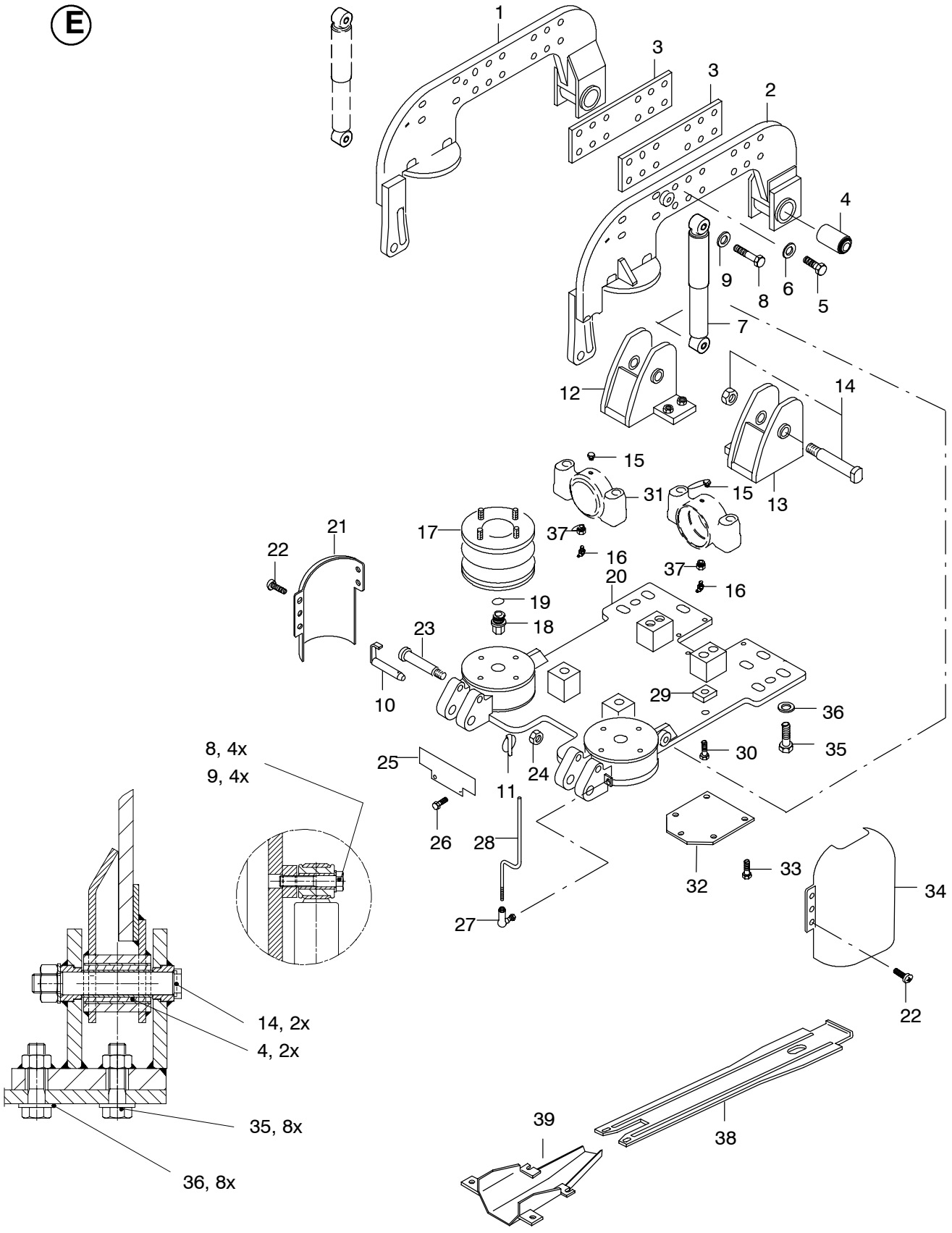
General

Check regularly, that all bolts and nuts are tight.

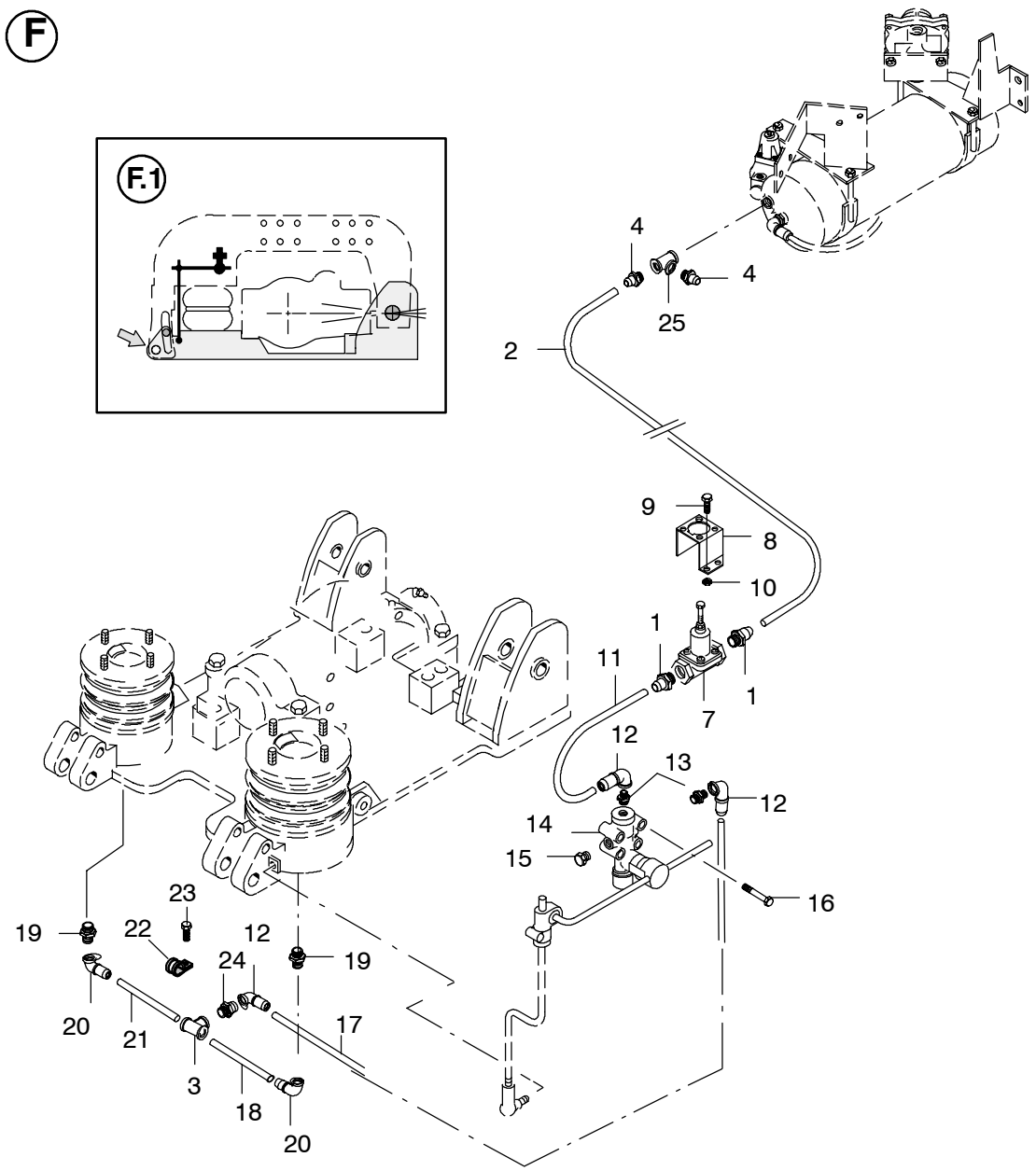
Maintenance at intervals of 250 running hours

Grease the front axle bearing brackets (nipples, 2 pcs).

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Ⓔ

	1	33584300	Etuakselin jousitus	Framaxelns fjädking	Suspens. of front axle	Feder. der Vorderachse	
1		.	Jousituksen painei.	Framaxelns tryckluf.	Air system of susp.	D.luft der V.achse	Page 8/17
	1		.Paineilmasäiliö	Tryckluftsbehållare	Air pressure container	Luftdruckbehälter	Page 17/17
	1	**33135100**	..Etuakselin jousitus	Framaxelns fjädkiwg	Suspens. of front axle	Federung der vordera	
1	1	33138600	..Runko	Ram	Frame	Rahmen	Right
2	1	33138500	..Runko	Ram	Frame	Rahmen	Left
3	2	33145800	..Levy	Platta	Plate	Platte	s=30
	1	33145900	..Levy	Platta	Plate	Platte	s=10, **Ålö**
4	2	33150100	..Holkki	Hylsa	Sleeve	Hülse	
5	16	HA9422	..Ruuvi	Skruv	Screw	Schraube	
6	16	JD0420	..Aluslevy	Bricka	Washer	Scheibe	21
7	2	33139100	..Iskunvaimennin	Stöddämpare	Shock absorber	Stoßdämbfer	
8	4	HA8714	..Ruuvi	Skruv	Screw	Schraube	
9	4	JD0416	..Aluslevy	Bricka	Washer	Scheibe	17
10	2	32532500	..Tappi	Tapp	Pin	Stift	
11	2	JE9301	..Sokka	Sprint	Pin	Splint	
12	1	33137700	..Kannatin	Hållare	Support	Halter	Right
13	1	33137600	..Kannatin	Hållare	Support	Halter	Left
14	2	32746200	..Tappi	Tapp	Pin	Stift	
15	2	GR0261	..Tulppa	Plugg	Plug	Stopfen	
16	2	GG0087	..Voidenippa	Smörjnippel	Grease nipple	Schmiernippel	
17	2	33145500	..Palje	Bälg	Bellows	Balg	
18	2	33149700	..Holkki	Hylsa	Sleeve	Hülse	
19	2	KH4052	..O-rengas	O-ring	O-ring	O-ring	
20	1	33136700	..Runko	Ram	Frame	Rahmen	
21	1	33533700	..Suojus	Skydd	Shield	Schutz	Right
22	12	HD9046	..Ruuvi	Skruv	Screw	Schraube	
23	2	33533400	..Tappi	Tapp	Pin	Stift	
24	2	JB1116	..Mutteri	Mutter	Nut	Mutter	
25	1	33145400	..Levy	Platta	Plate	Platte	
26	2	HA6322	..Ruuvi	Skruv	Screw	Schraube	
27	1	YT2045	..Nivel	Led	Joint	Gelenk	
28	1	33145100	..Tanko	Stång	Rod	Stange	
29	2	33495700	..Rajoitin	Begränsare	Limiter	Anschlag	
30	2	HA6334	..Ruuvi	Skruv	Screw	Schraube	
31	1	33151300	..Laakeripesä	Lagerhus	Bearing housing	Lagerghäuse	
32	1	33526000	..Kansi	Lock	Cover	Deckel	
33	5	HA9248	..Ruuvi	Skruv	Screw	Schraube	
34	1	33533600	..Suojus	Skydd	Shield	Schutz	Left
35	8	HA9211	..Ruuvi	Skruv	Screw	Schraube	
36	8	33533500	..Aluslevy	Bricka	Washer	Scheibe	
37	2	33139700	..Liitin	Nippel	Union	Verbindung	
38	1	33138300	Suojus	Skydd	Shield	Schutz	
39	1	33499800	Suojus	Skydd	Shield	Schutz	

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(F)

	1	33500800	Jousituksen painei.	Framaxelns tryckluf.	Air system of susp.	Druckluft. der vordera	
1	2	32929900	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	
2	1	33650400	.Putki	Rör	Pipe	Rohr	L=1900
	1	33650500	.Putki	Rör	Pipe	Rohr	L=1760
3	1	33501500	.Liitin	Nippel	Union	Verbindung	
4	2	32929800	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	
7	1	33145700	.Venttiili	Ventil	Valve	Ventil	
8	1	33500900	.Tuki	Stöd	Support	Stütze	
9	4	HA6322	.Ruuvi	Skruv	Screw	Schraube	
10	4	JB1108	.Mutteri	Mutter	Nut	Mutter	
11	1	33609700	.Putki	Rör	Pipe	Rohr	L=680
12	3	32930210	.Liitin	Nippel	Union	Verbindung	
13	2	33501000	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	
14	1	33145600	.Venttiili	Ventil	Valve	Ventil	
15	1	33495500	.Tulppa	Plugg	Plug	Stopfen	
16	4	HA9402	.Ruuvi	Skruv	Screw	Schraube	
17	1	33013300	.Putki	Rör	Pipe	Rohr	L=560
	1	33607600	.Putki	Rör	Pipe	Rohr	L=540
18	1	33607500	.Putki	Rör	Pipe	Rohr	L=265
	1	33018400	.Putki	Rör	Pipe	Rohr	L=200
19	2	33014210	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	
20	2	32930210	.Liitin	Nippel	Union	Verbindung	
21	1	33607500	.Putki	Rör	Pipe	Rohr	L=265
	1	33018400	.Putki	Rör	Pipe	Rohr	L=200
22	2	30555700	.Pidin	Klämma	Clamp	Klammer	
23	2	HA6322	.Ruuvi	Skruv	Screw	Schraube	
24	1	32930110	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	
25	1	32930510	.Liitin	Nippel	Union	Verbindung	

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Fitting compressor (6900, 8000, 8000R, 8100, 8400, 8050, 8150): picture **G**

On 6–cyl. engines the compressor is always fitted on the RH side of the engine.

– Remove the engine side plates. Lift up the engine hood plate.

– Fasten an extra belt pulley **35** on the ready–fitted pulley (the same fixing bolts).
Change alternator shield **38**.

– Fit the compressor bracket and the compressor according to the picture at the bolts of the engine timing gear casing.
One return oil hole in the compressor bottom is plugged with plug **11**. In the hole at the return hole must be fitted an o–ring **10**.
Fit the return pipe parts (**13**, **14**, **27**) .
Change the alternator shield **38**.

– Remove the plug screw behind the alternator on the cylinder block and fit in it the compressor lubricating oil hose **25** one end (union **50**). Fasten the other end to the compressor.

– Assemble the tightener (parts **39**–**48**) into place. Fit the belt **37** and tighten it.

NOTE! check:
– alignment of the pulleys
– belt tensioning
– tightness of pipe connections

– Replace the suction pipe intermediate pipe with pipe **5,** and fit the suction pipe **4** with its parts into place. Fasten the suction pipe at suitable points.

Fitting compressor (8450–8750): picture **H**

– Fitting like above shown.
The alternator shield is not changed.

Fitting the air reservoir (pictures **I** and **I.1**):

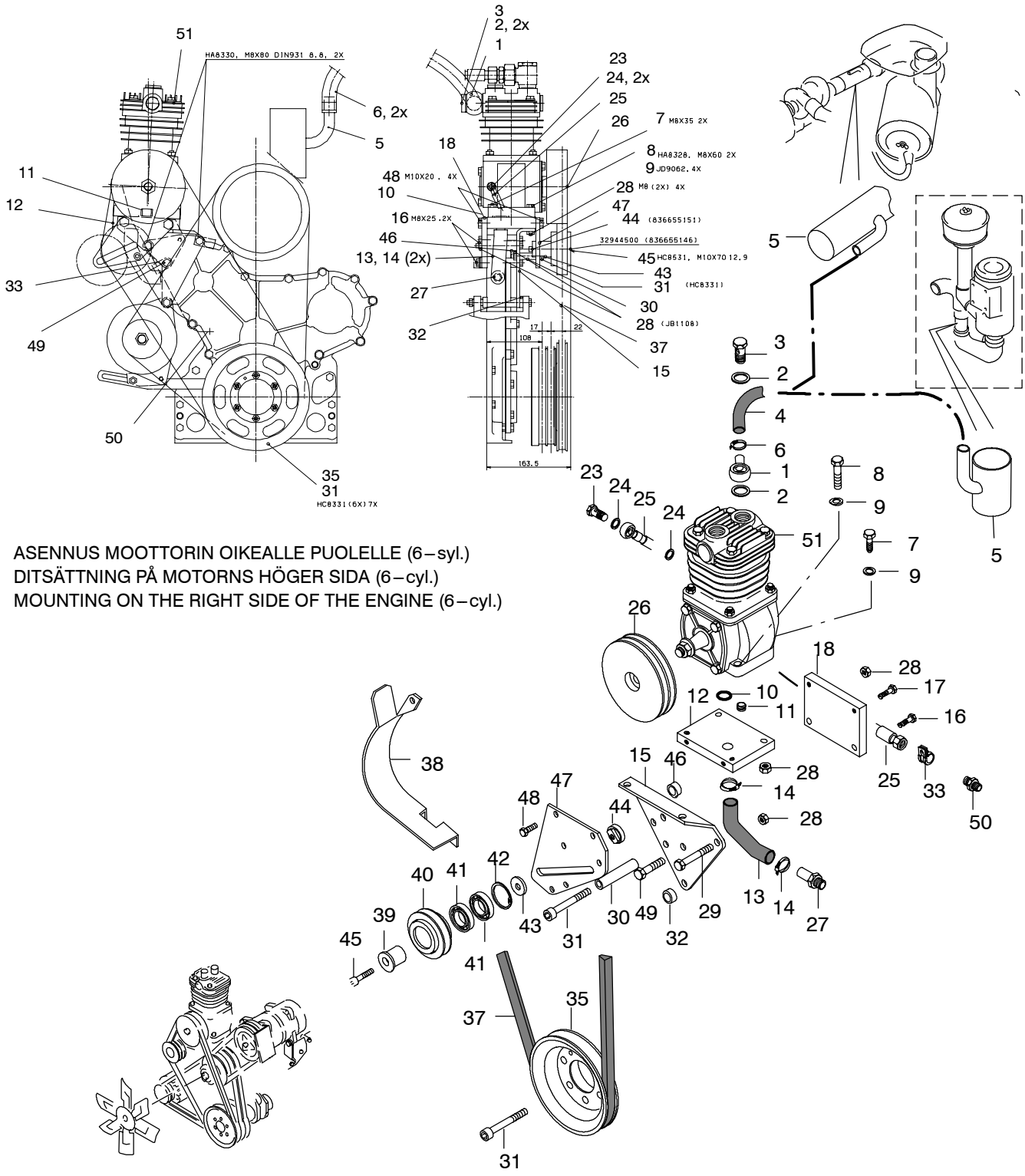
– Fasten support **6** under two gearbox–to– fuel tank bolts (M16: 270–330Nm, M12: 125 Nm), see picture **I**.
Holder **31** is fastened between foot step bracket and intermediate frame support.

– Fasten bracket **34** under the nuts of the foot step front support.

– Use the reservoir bracket **17** as a pattern and drill holes (2 pcs, 6,2 mm) through the wall on the foot step frame side (picture **I**).

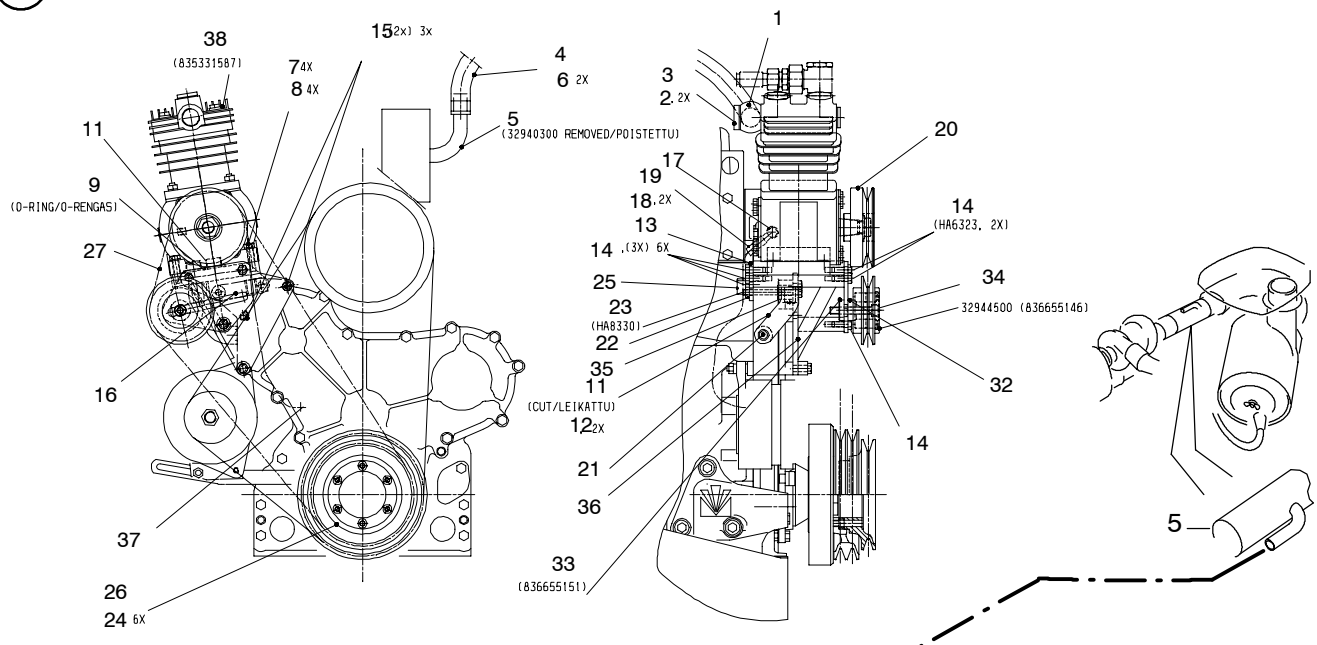
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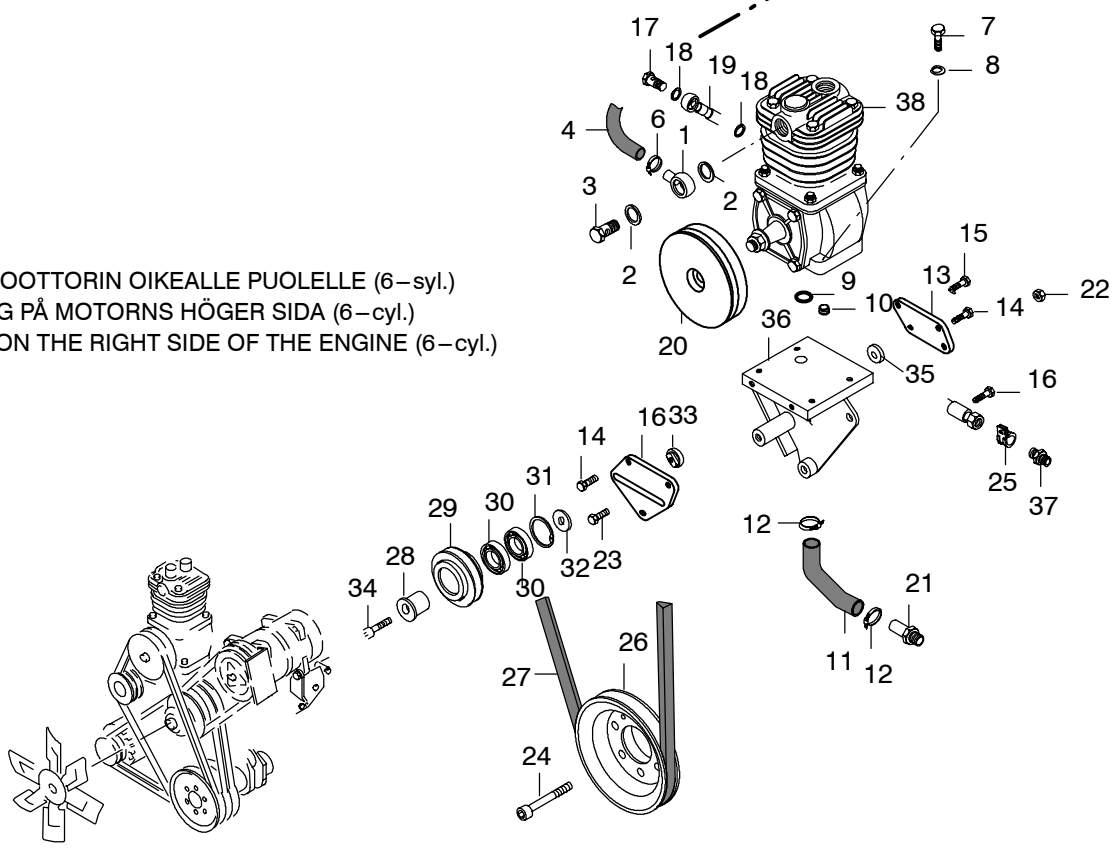
G 6900, 8000, 8000R, 8100, 8400, 8050, 8150



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(H) 8450–8950





ASENNUS MOOTTORIN OIKEALLE PUOLELLE (6–syl.)
DITSÄTTNING PÅ MOTORNS HÖGER SIDA (6–cyl.)
MOUNTING ON THE RIGHT SIDE OF THE ENGINE (6–cyl.)

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– Make a 52 mm hole in the instrument panel for the pressure gauge **37** (dimensions in picture **I.1**. Note! HiTech– models).
Make the hole accurate, since the gauge fixing flange is small.
Pass the gauge pipe (reservoir–gauge) through the hole in the cab front wall (beside the 37 pin connector).
Take current and ground for the gauge from the ind. light for the rear working light switch (S2) (wire no 26 black).
Connect the white earth wire. Fasten the pressure gauge.

– Assemble parts according to picture **I**.
Pour into reservoir **12A** methanol or ethylic alcohol (0,5 l).
With lever **B** can the flow of antifreeze agent cut into the system (if outdoor temperature is over 5_C. In summer the reservoir can be empty, then the lever position is unimportant).

– Pass hose **14** along the tractor left side under the battery and behind the filter and fuel injection pump to the compressor.

– Check the tightness of the system. It must be so tight that pressure does not drop more than **0,15 bar during 10 minutes** (2%), when the engine is stopped. When necessary, the leaks must be repaired.

General (picture **I.1**):

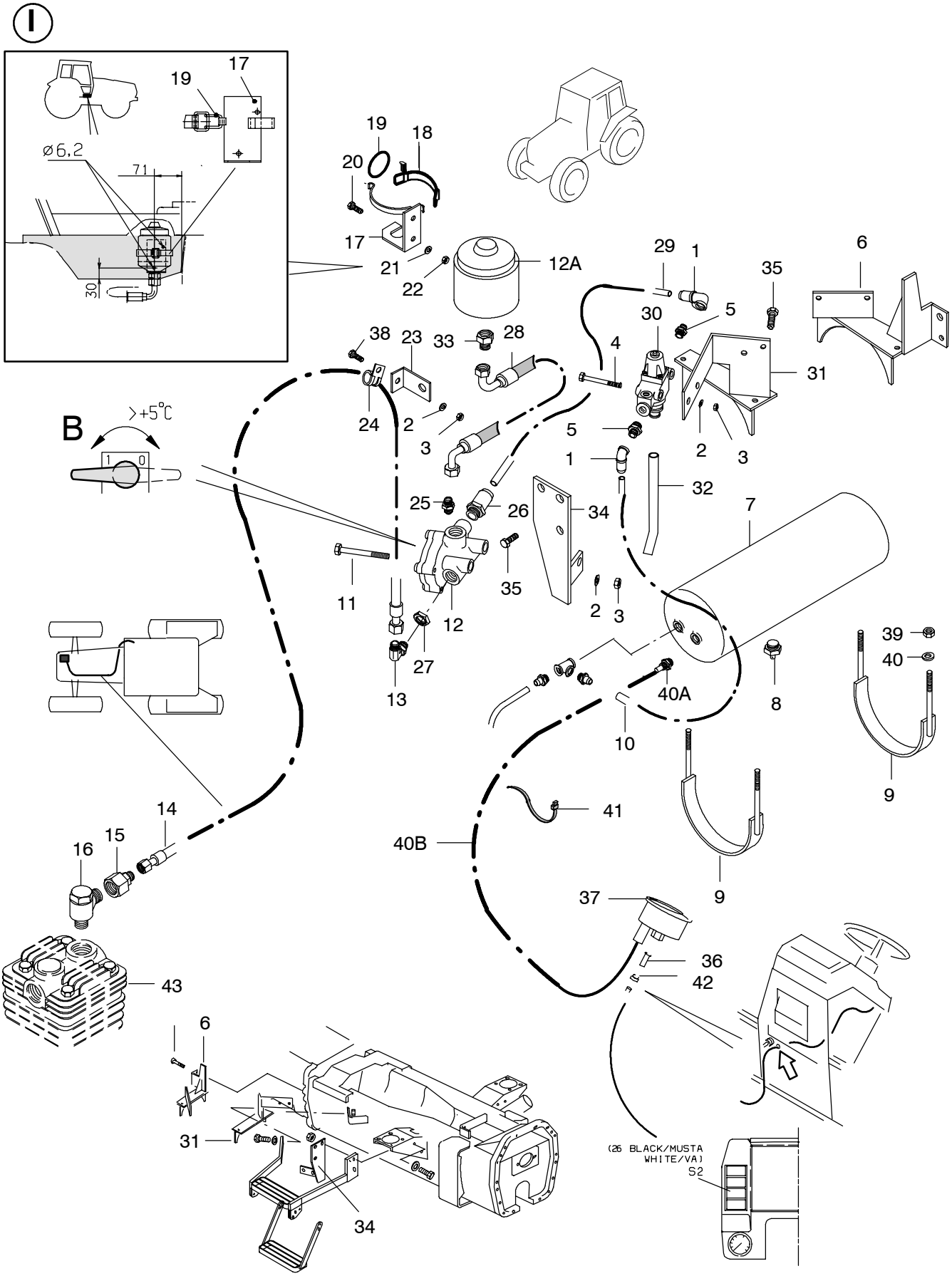
Pressure regulator (picture **A**) adjusts the system pressure to correct. When the pressure rises up to about. 8 bar, allows the regulator air to flow to atmosphere. When the system pressure lowers 0,6 bar, the regulator adjusts the compressed air to flow into the system.
The system pressure can be adjusted by turning the spring **11B** adjusting screw.

Compressed air can also be taken out for auxiliary components (pressure 8 bar) by turning union **10B** into bottom, e.g. to fill tyres. Through this union the system can be filled with auxiliary compressed air, e.g. if the tractor's own compressor is not working. Then the union must not be turned into bottom.

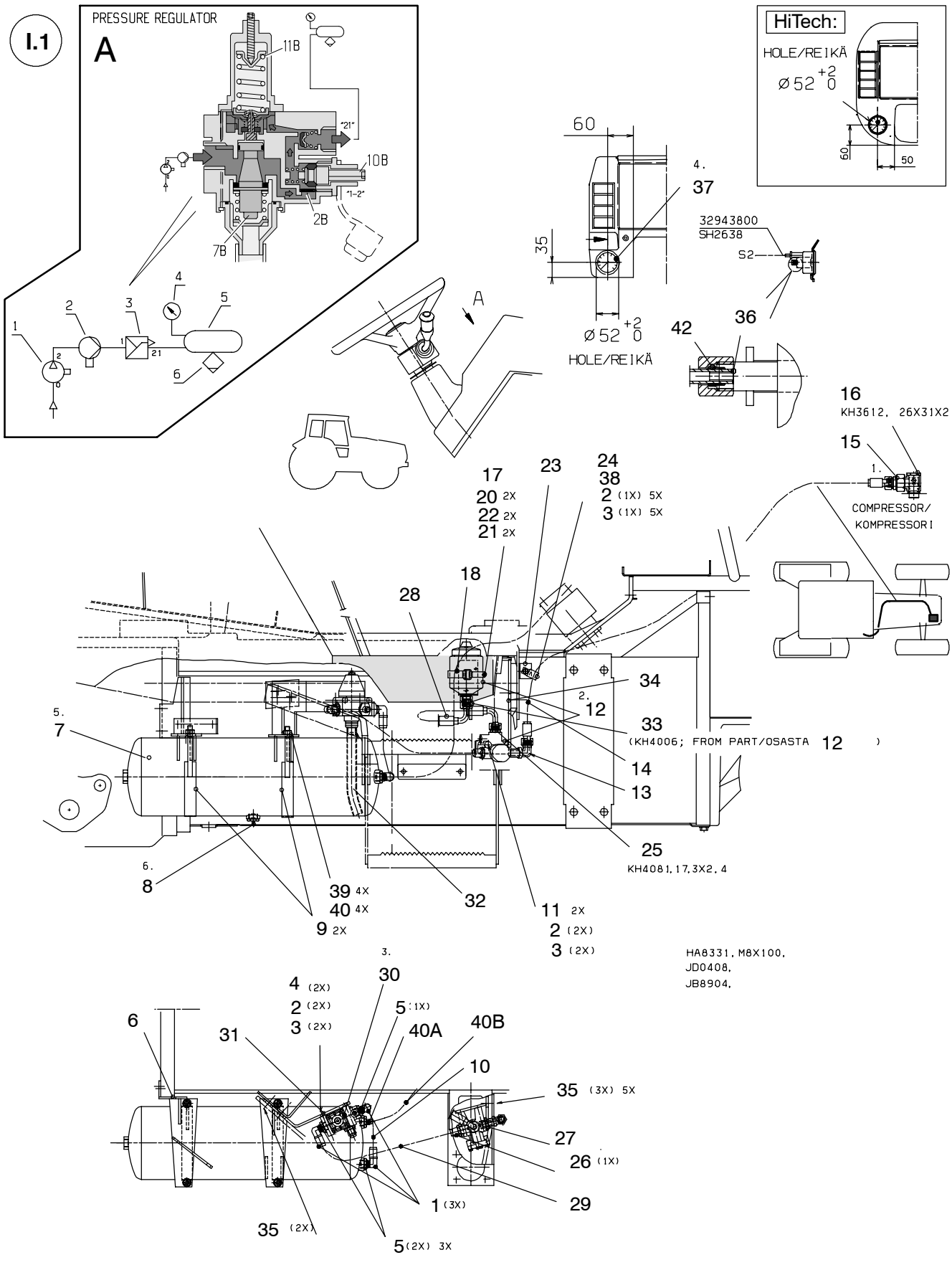
Filter **2B** must be cleaned regularly.
Valve **7B** functions also as a relief valve.

Water must be removed from the system daily by pulling or pushing the tap **10** (picture **I**) under the pressure reservoir.

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G

6900, 8000, 8000R, 8100, 8400, 8050, 8150

	1	**32960200**	**Kompressori**	**Kompressor**	**Compressor**	**Kompreßor**	6900, 8000, 8000R, 8100
(	1	32960300	Kompressori	Kompressor	Compressor	Kompreßor	*)
1	1	640255222	.Nippa	Nippel	Nipple	Nippel	
2	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	
3	1	640435022	.Ruuvi	Skruv	Screw	Schraube	
4	1	836655225	.Letku	Slang	Hose	Schlauch	8000,8100
4	1	836655224	.Letku	Slang	Hose	Schlauch	*
5	1	836855254	.Imuputki	Sugrör	Intake pipe	Saugrohr	8000,8100
5	1	33073800	.Imuputki	Sugrör	Intake pipe	Saugrohr	*
6	2	GP3912	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
7	2	HA9230	.Ruuvi	Skruv	Screw	Schraube	
8	2	HA8328	.Ruuvi	Skruv	Screw	Schraube	
9	4	JD9062	.Aluslaatta	Bricka	Washer	Scheibe	
10	1	614702532	.O-rengas	O-ring	O-ring	O-ring	
11	1	835331738	.Tulppa	Plugg	Plug	Stopfen	
12	1	836136875	.Laatta	Platta	Plate	Platte	
13	1	836136869	.Putki	Rör	Pipe	Rohr	
14	2	GP3918	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
15	1	836136866	.Levy	Platta	Plate	Platte	
16	2	HA6324	.Ruuvi	Skruv	Screw	Schraube	
17	2	HA9235	.Ruuvi	Skruv	Screw	Schraube	
18	1	836136865	.Laatta	Platta	Plate	Platte	
23	1	640435006	.Ruuvi	Skruv	Screw	Schraube	
24	2	KH3641	.Tiiviste	Tätning	Gasket	Dichtung	
25	1	836847771	.Putki	Rör	Pipe	Rohr	
26	1	836652094	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
27	1	836136868	.Putki	Rör	Pipe	Rohr	
28	4	JB1108	.Mutteri	Mutter	Nut	Mutter	
29	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	
30	1	836852171	.Holkki	Hylsa	Sleeve	Hülse	
31	7	HC8331	.Ruuvi	Skruv	Screw	Schraube	
32	1	836019387	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
33	1	602060612	.Kiinnitin	Fästdon	Fastener	Halter	
35	1	836655449	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	*
37	1	684121500	.Kiilahihna	Kilrem	V–belt	Keilriemen	
38	1	836852402	.Suoja	Skydd	Cover	Schutz	
–	1	32944500	Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	Assy
39	1	32510410	..Akseli	Axel	Shaft	Achse	
40	1	32509610	..Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
41	2	LA1800	..Laakeri	Lager	Bearing	Lager	
42	1	KG3052	..Varmistinrengas	Låsring	Circlip	Sicherungring	
43	1	836655155	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
44	1	32969100	.Vastakappale	Motstycke	Counterpiece	Gegenstück	
45	1	HC8531	.Ruuvi	Skruv	Screw	Schraube	
46	1	836114846	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
47	1	836852172	.Levy	Platta	Plate	Platte	
48	2	HA9235	.Ruuvi	Skruv	Screw	Schraube	
49	1	HA9400	.Ruuvi	Skruv	Screw	Schraube	
50	1	641086006	.Liitin	Anslutning	Connection	Anschluß	
51	1	32944300	.Kompressori	Kompressor	Compressor	Kompreßor	

*= 8400, 8050, 8150

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8450–8950

	1	**33273600**	**Kompressori**	**Kompressor**	**Compressor**	**Kompreßor**	Assy
							(8450–8750)
1	1	640255222	.Liitin	Nippel	Union	Verbindung	
2	2	KH3612	.Tiiviste	Tätning	Gasket	Dichtung	
3	1	640435022	.Ruuvi	Skruv	Screw	Schraube	
4	1	33279400	.Letku	Slang	Hose	Schlauch	
5	1	33073800	.Imuputki	Sugrör	Intake pipe	Saugrohr	
6	2	GP3912	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
7	4	HA9230	.Ruuvi	Skruv	Screw	Schraube	
8	4	JD9062	.Aluslaatta	Bricka	Washer	Scheibe	
9	1	614702532	.O-rengas	O-ring	O-ring	O-ring	J
10	1	835331738	.Tulppa	Plugg	Plug	Stopfen	
11	1	836136869	.Putki	Rör	Pipe	Rohr	
12	2	GP3918	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
13	1	836338193	.Levy	Platta	Plate	Platte	
14	6	HA6323	.Ruuvi	Skruv	Screw	Schraube	
15	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	
16	1	836338192	.Kiinnityslevy	Fästplåt	Mounting plate	Befestigungsplatte	
17	1	640435006	.Ruuvi	Skruv	Screw	Schraube	
18	2	KH3641	.Tiiviste	Tätning	Gasket	Dichtung	
19	1	836847771	.Putki	Rör	Pipe	Rohr	T
20	1	836338194	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
21	1	836136868	.Putki	Rör	Pipe	Rohr	
22	1	JB1108	.Mutteri	Mutter	Nut	Mutter	
23	1	HA8330	.Ruuvi	Skruv	Screw	Schraube	
24	6	HC8331	.Ruuvi	Skruv	Screw	Schraube	
25	1	602060612	.Kiinnitin	Fästdon	Fastener	Halter	
26	1	836324762	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
27	1	33279300	.Kiilahihna	Kilrem	V–belt	Keilriemen	
–	1	32944500	Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	Assy
28	1	32510410	..Akseli	Axel	Shaft	Achse	
29	1	32509610	..Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
30	2	LA1800	..Laakeri	Lager	Bearing	Lager	
31	1	KG3052	..Pidätinrengas	Låsring	Circlip	Sicherungsring	
32	1	836655153	.Välipala	Mellanstycke	Intermediate piece	Zwischenstück	
33	1	32969100	.Vastakappale	Motstycke	Counterpiece	Gegenstück	
34	1	HC9765	.Ruuvi	Skruv	Screw	Schraube	
35	1	836114846	.Välipala	Mellanstycke	Intermediate piece	Zwischenstück	
36	1	836338191	.Teline	Konsol	Bracket	Gestell	
37	1	641086006	.Liitin	Anslutning	Connection	Anschluß	
38	1	32944300	.Kompressori	Kompressor	Compressor	Kompreßor	

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	1	**33501100**	Paineilmasäiliö	Tryckluftsbehållare	Air pressure container	Luftdruckbehälter	
1	5	32930210	.Liitin	Nippel	Union	Verbindung	
2	16	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	
3	13	JB8904	.Mutteri	Mutter	Nut	Mutter	
4	4	HA8330	.Ruuvi	Skruv	Screw	Schraube	
5	2	32930110	.Liitin	Nippel	Union	Verbindung	
6	1	32926600	.Teline	Konsol	Bracket	Gestell	
7	1	32913700	.Säiliö	Behållare	Container	Behälter	
8	1	32913600	.Tulppa	Plugg	Plug	Stopfen	
9	2	32927600	.Sanka	Bygel	Bow	Bügel	
10	1	32935000	.Putki	Rör	Pipe	Rohr	
11	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	
12	1	32910500	.Pumppu	Pump	Pump	Pumpe	
12A		33495200	..Säiliö	Behållare	Container	Behälter	
13	1	32936900	.Liitin	Nippel	Union	Verbindung	
14	1	32943700	.Putki	Rör	Pipe	Rohr	
15	1	32944200	.Liitin	Nippel	Union	Verbindung	
16	1	32948300	.Liitin	Nippel	Union	Verbindung	
	1	KH3612	.O-rengas	O-ring	O-ring	O-ring	
17	1	32927900	.Teline	Konsol	Bracket	Gestell	
18	1	33133400	.Side	Band	Band	Binde	
19	1	KH4341	.O-rengas	O-ring	O-ring	O-ring	
20	2	HA9219	.Ruuvi	Skruv	Screw	Schraube	
21	2	JD0405	.Aluslaatta	Bricka	Washer	Scheibe	
22	2	JB1105	.Mutteri	Mutter	Nut	Mutter	
23	1	32935900	.Levy	Platta	Plate	Platte	
24	1	30086100	.Letkunpidin	Slangfäste	Hose holder	Schlauchhalter	
25	1	32976000	.Liitin	Nippel	Union	Verbindung	
	1	KH4081	.Tiiviste	Tätning	Gasket	Dichtung	
26	2	32929900	.Liitin	Nippel	Union	Verbindung	
27	1	32930700	.Mutteri	Mutter	Nut	Mutter	
28	1	32929600	.Letku	Slang	Hose	Schlauch	
29	1	32934900	.Putki	Rör	Pipe	Rohr	
30	1	32910600	.Paineensäätöv.	Tryckregleringsv.	Pressure control.v.	Drucksteuerv.	
31	1	32927300	.Teline	Konsol	Bracket	Gestell	
32	1	32948000	.Letku	Slang	Hose	Schlauch	
33	1	32802300	.Liitin	Nippel	Union	Verbindung	
	1	KH4006	.Tiiviste	Tätning	Gasket	Dichtung	
34	1	32928900	.Teline	Konsol	Bracket	Gestell	
35	5	HA6358	.Ruuvi	Skruv	Screw	Schraube	
36	1	32944000	.Holkki	Hylsa	Sleeve	Hülse	
37	1	32934800	.Painemittari	Tryck mätare	Pressure instrument	Druckinstrument	
	1	32943800	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
	1	SH2638	.Lamppu	Lampa	Bulb	Lampe	
38	1	HA6322	.Ruuvi	Skruv	Screw	Schraube	
39	4	JB8906	.Mutteri	Mutter	Nut	Mutter	
40	4	JD0412	.Aluslaatta	Bricka	Washer	Scheibe	
40A	1	32929700	.Liitin	Nippel	Union	Verbindung	
40B	1	32935700	.Putki	Rör	Pipe	Rohr	L=2320
41	1	33133400	.Side	Band	Band	Binde	
42	1	32944100	.Rengas	Ring	Ring	Ring	
43	1		Kompressori	Kompressor	Compressor	Kompreßor	Page 9/17

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70. Frame and wheels

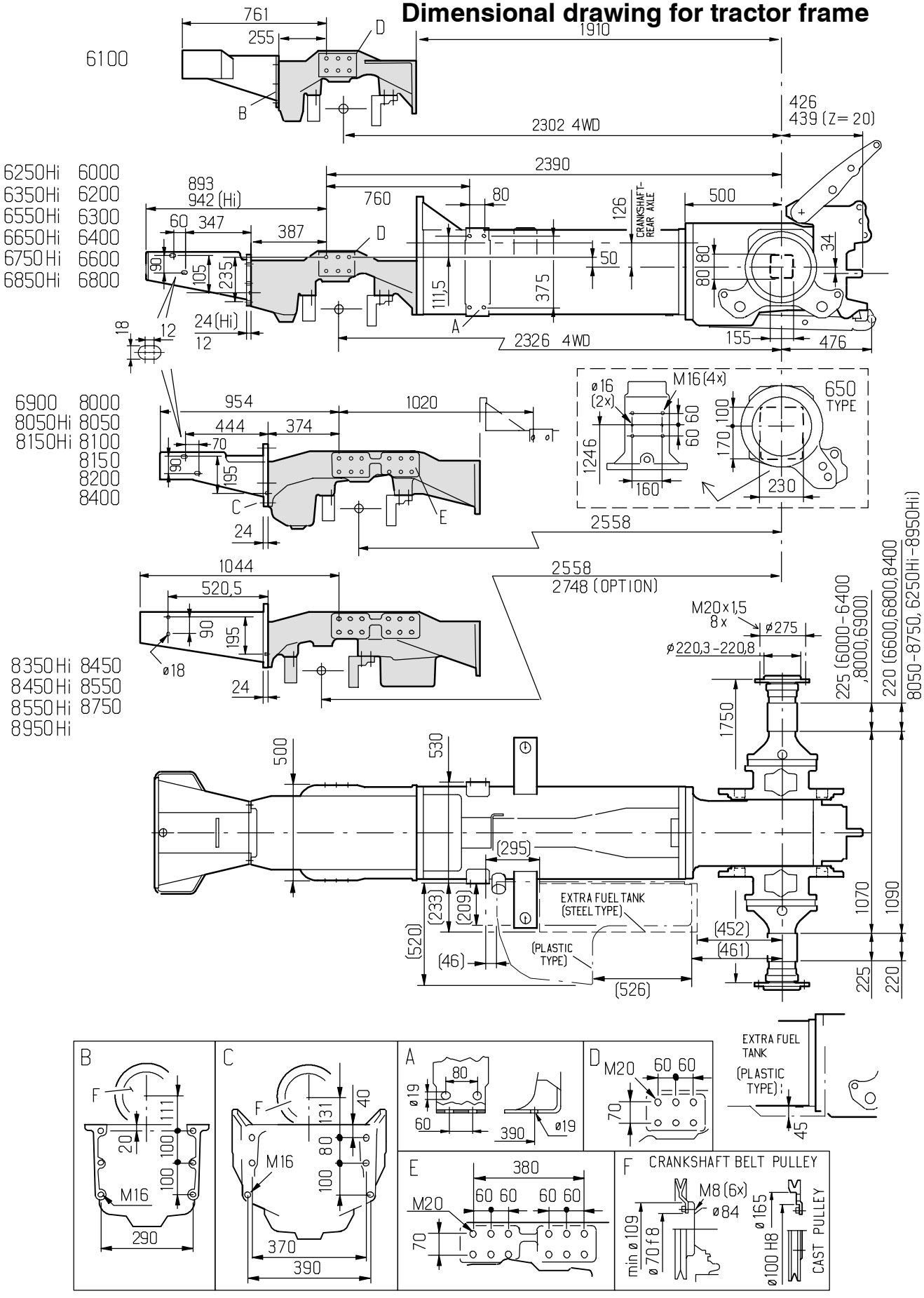
71. Frame

72. Wheels

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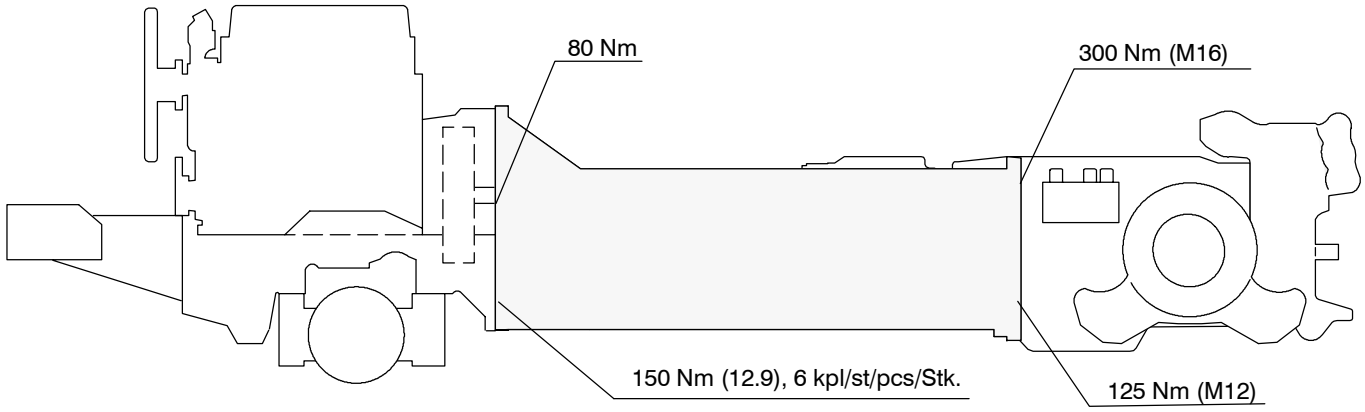
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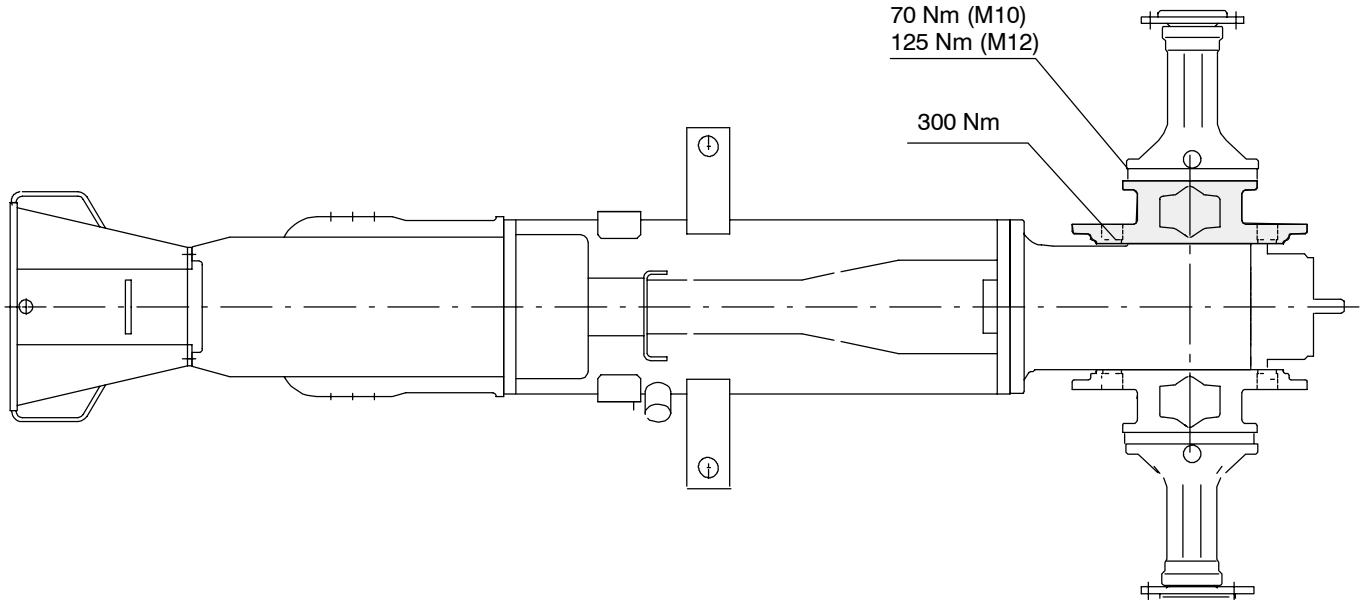
Dimensional drawing for tractor frame

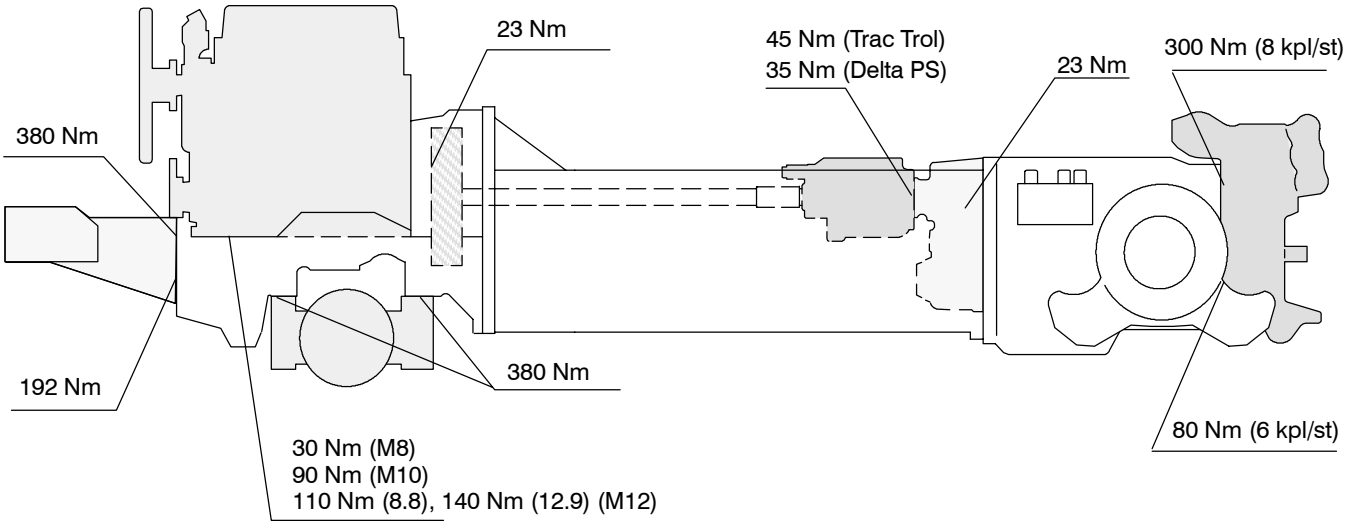


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Tightening torques for frame joints







Tyres and track widths

Tyres (alternative tyre equipment)

When changing tyres, make sure that the ratio between the front and rear axles becomes correct, see also page **640**/**2**. Allways when changing tyres, check that the front wheels do not touch the frame at max steering angle. If necessary, limit the steering angle with limiter screws.

Etu	Taka	6000, 6100[4]	6300, 6400, 8000[4]	6600, 8100, 8200, 8400		
11.00–16/8	13.6R38/8	X	X			
11.00–16/8	14.9R38/8	X	X			
11.00–16/8	16.9R34/8	X	X			
11.00–16/8	16.9R38/8	X	X			
12.4R24/8	13.6R38/8	X	X			
13.6R24/8	14.9R38/8	X	X			
13.6R24/8	16.9R34/8	X	X			
14.9–24/8	16.9–34/8	X	X			
14.9–24/8	18.4–34/8	X	X	X		
14.9R24/8	18.4R34/8	X	X	X[1]		
14.9R28/8	18.4R38/8		X	X		
14.9–28/8	18.4–38/8			X		
16.9R28/8	20.8R38/8			X		
480/65R24	600/65R34		X	X		
480/65R28	600/65R38		X	X		
19.5R24	620/75R30		X	X		
540/65R28	650/65R38			X		
14.9–24/14 IND	18.4–34/14 IND	X	X	X		3)
14.9–24/14 FOR	18.4–34/14 FOR	X	X	X		
14.9–28/14 FOR	18.4–38/14 FOR		X	X		
14.9R28/8	18.4R38/8		X	X		
16.9R28/8	20.8R38/8			X		
13.6–24/12 IND	16.9–34/14 IND	X	X			
16.9R28	20.8R38			X	2)	
16.9–24/14 IND	18.4–38/14 IND			X		
14.9R28	18.4R38			X		
14.9–28/14 FOR	18.4–34/14 FOR			X		
14.9–24/14 IND	18.4–34/14 IND			X		

[1]) Depands on tyre type and manufacturer. [2]) Industrial front axle. [3]) Fixed discs. [4]) on 6000–6400, 8000 with front/rear axle ratio 1,334 (without quick–shift gear, pinion shaft/crown wheel 9/38) and with ratio 1,332 (with Delta Power Shift, pinion shaft/crown wheel 8/42)

Wheem nuts, tightening torques

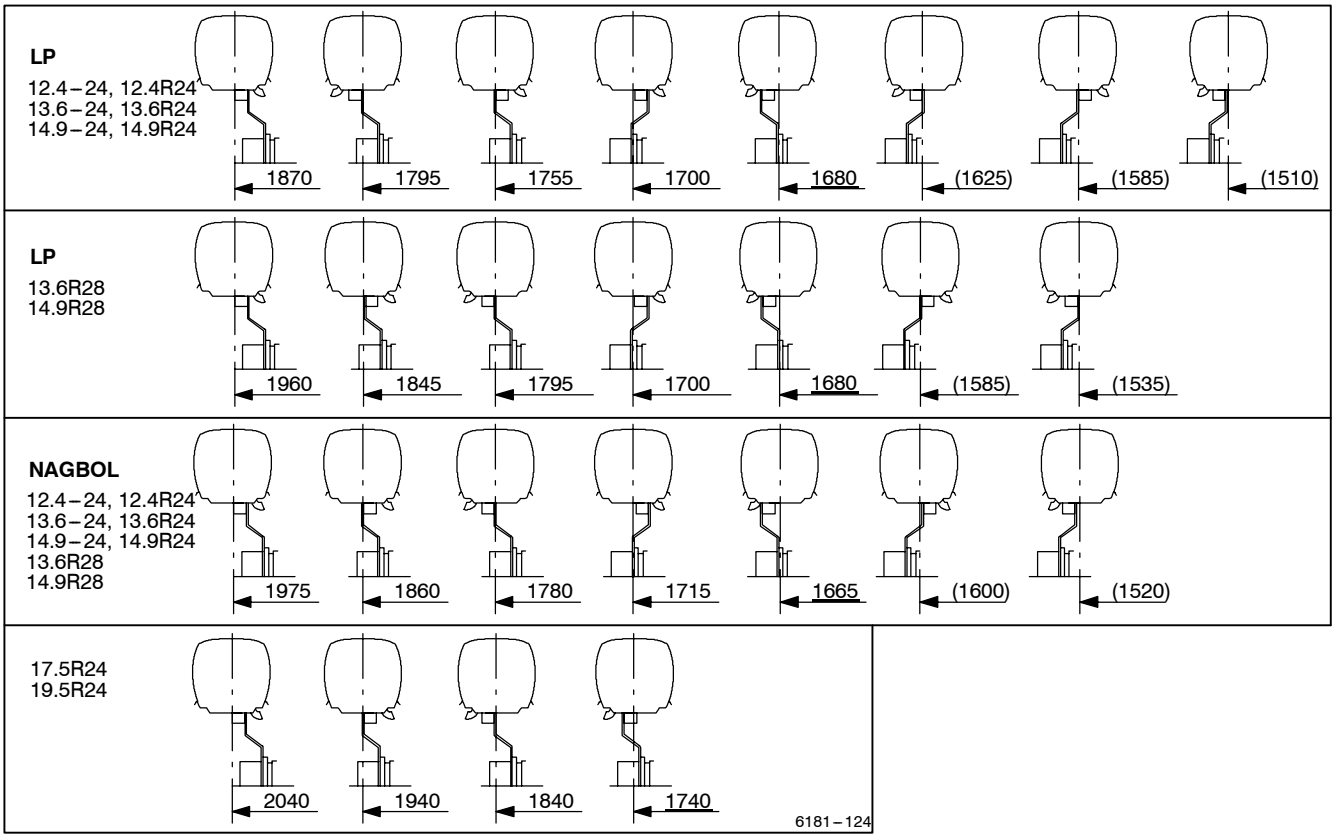
–Wheel nuts, front . . . . . 550 Nm
rear . . . . . 550 Nm
–Rim–wheel disc (front and rear), 8.8 . . . 240 Nm
–Rim–wheel disc (front and rear), 10.9 . . 310 Nm

Note! Retightening of the wheel nuts should be done according to the Service Program.

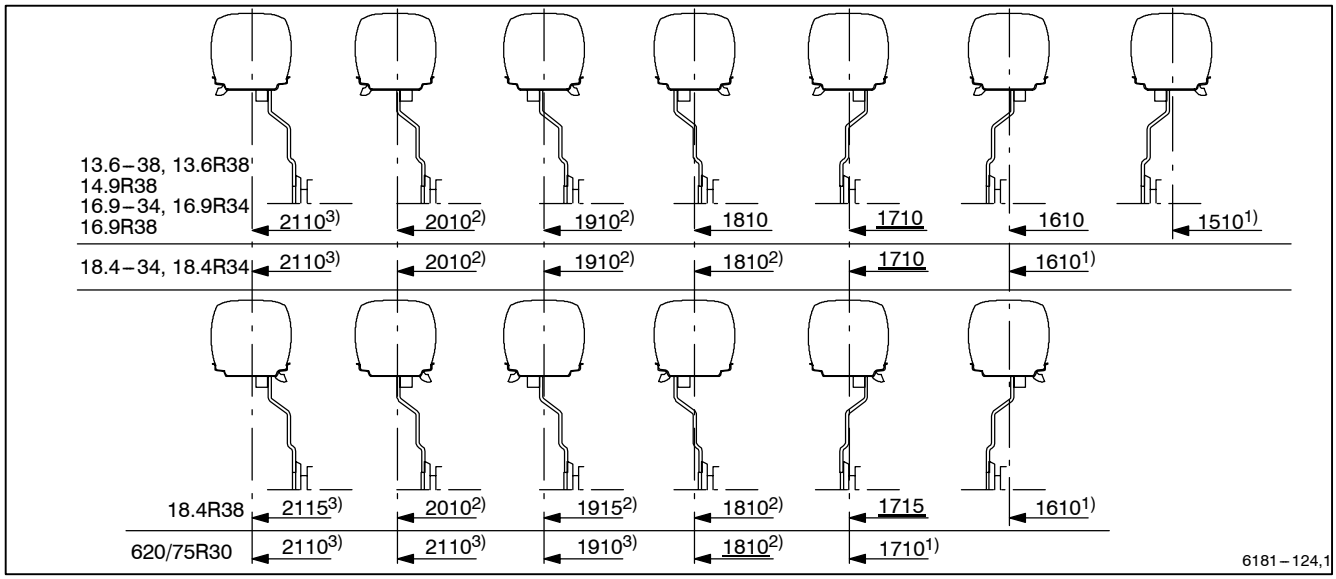
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Track widths, –660070

Front



Rear



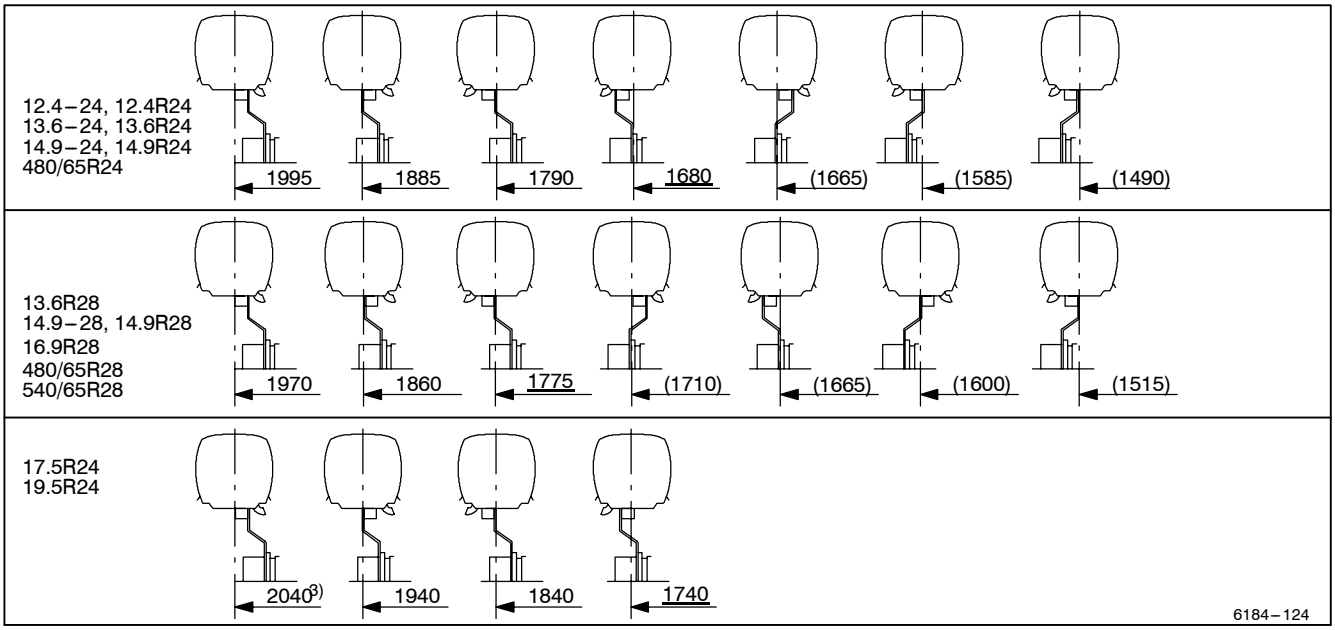
N.B. Standard track width underlined.
LP and NAGBOL are wheel disc manufacturers and are marked on the wheel discs.

1) Space between tyre and mudguard less than 80 mm (note when using snow chains).
2) Do not use on public roads. Distance between tyre outer side and outer side lights more than 400 mm. The side lights must be moved and broader mudguards must be fitted.
3) Do not use on pubtic roads. Distance between tyre outer side and outer side lights more than 400 mm. The side lights must be moved. The broader mudguards are not enough.
Distance between rear mudguards is 1020 mm.

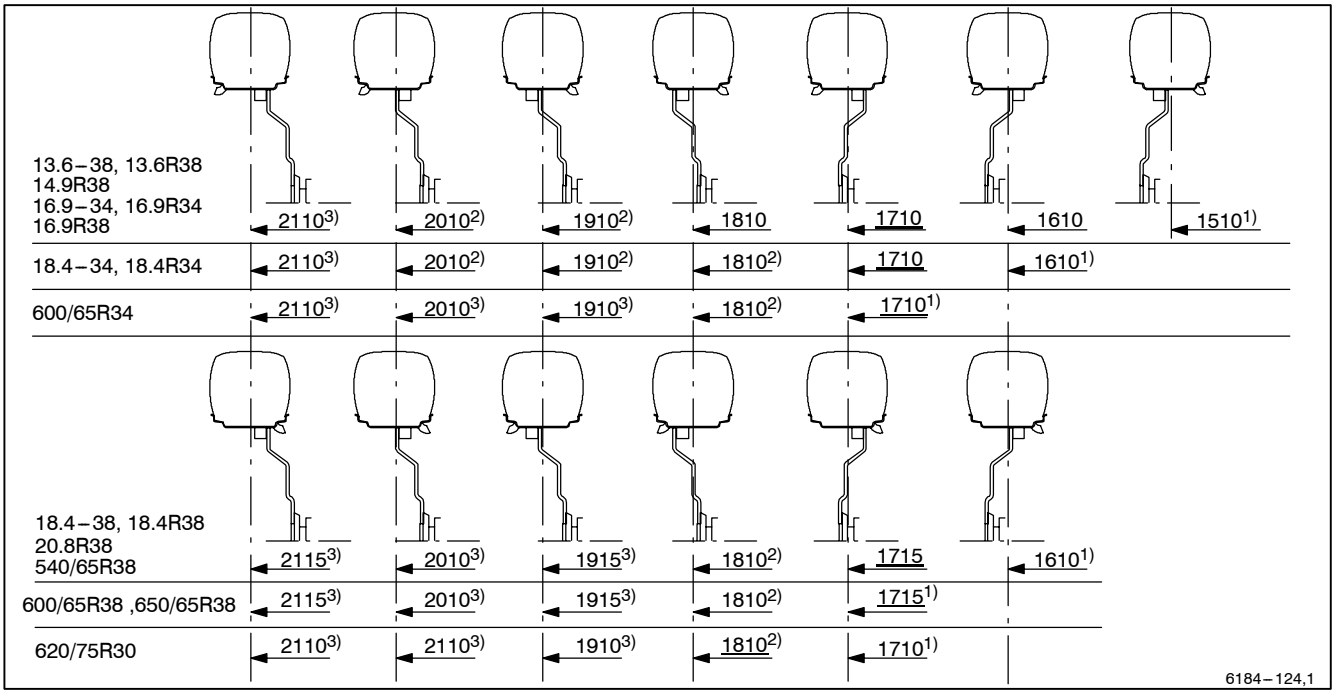
https://truckmanualshub.com/

Track widths, 660071–

Front (not LP or NAGBOL markings)



Rear (not LP or NAGBOL markings)



Note! Standard track width underlined

1) Space between tyre and mudguard less than 80 mm (note when using snow chains).
2) Do not use on public roads. Distance between tyre outer side and outer side lights more than 400 mm. The side lights must be moved and broader mudguards must be fitted.
3) Do not use on pubtic roads. Distance between tyre outer side and outer side lights more than 400 mm. The side lights must be moved. The broader mudguards are not enough.
Distance between rear mudguards is 1020 mm.

Tyre pressures and loadings/tyre (40 km/h)

Front axle			Rear axle		
Tyre	**Max. loading**	**Pressure**	**Tyre**	**Max. loading**	**Pressure**
11.00–16/8	1150 kg	250 kPa	13.6–38/8	1530 kg	200 kPa
12.4–24/8	1415 kg	230 kPa	13.6R38/8	1800 kg	160 kPa
12.4R24/8	1360 kg	160 kPa	14.9R38/8	2060 kg	160 kPa
13.6R24/8	1450 kg	160 kPa	16.9–34/8	1905 kg	170 kPa
13.6–24/8	1235 kg	200 kPa	16.9R34/8	2430 kg	160 kPa
13.6R28/8	1550 kg	160 kPa	16.9R38/8	2575 kg	160 kPa
14.9–24/8	1410 kg	180 kPa	18.4–34/8	2050 kg	140 kPa
14.9R24/8	1700 kg	160 kPa	18.4R34/8	2800 kg	160 kPa
14.9R28/8	1800 kg	160 kPa	18.4R38/8	3000 kg	160 kPa
14.9–28/8	1505 kg	180 kPa	18.4–38/8	2170 kg	140 kPa
16.9R28/8	2240 kg	160 kPa	20.8R38/8	3650 kg	160 kPa
480/65R24	1750 kg	160 kPa	540/65R38	2430 kg	160 kPa
	1240 kg	70 kPa		1900 kg	70 kPa
480/65R28	1850 kg	160 kPa	600/65R34	2900 kg	140 kPa
	1300 kg	70 kPa		2050 kg	70 kPa
540/65R28	2070 kg	120 kPa	600/65R38	3075 kg	160 kPa
	1540 kg	60 kPa		2150 kg	70 kPa
17.5R24	2060 kg	160 kPa	620/75R30	3875 kg	160 kPa
19.5R24	2360 kg	160 kPa	650/65R38	3350 kg	120 kPa
12.4–24/12 IND.	2370 kg	380 kPa		2510 kg	60 kPa
14.9–24/12 IND.	3090 kg	330 kPa	16.9–34/14 IND.	3935 kg	290 kPa
13.6–24/10 FOR	1790 kg	250 kPa	18.4–34/14 IND.	4850 kg	290 kPa
14.9–24/14 FOR	2375 kg	300 kPa	18.4–34/14 FOR	2985 kg	260 kPa
14.9–28/14 FOR	2530 kg	300 kPa	18.4–38/14 FOR	3110 kg	260 kPa
16.9–24/14 IND	3530 kg	300 kPa	18.4–38/14 IND	5055 kg	290 kPa

With R–tyres at speed of 30 km/h the max permissible loading per tyre is 20 % bigger.

Adjusting track widths, front wheels and rear wheels

Adjusting front and rear wheel track widths is done in the same way.

Scotch the front wheels (or rear wheels) to prevent the tractor from moving. Raise the rear wheels off the ground and position sturdy axle stands under the axle housing.

Track width can be adjusted by changing the position of the wheel rim in relation to the central disc or by turning the wheel around (as shown above). **If tyres are turned move them to other side.**

Make sure that the arrows on the upper part of the tyres are pointing forwards.

Lubricate the wheel nuts and tighten them to the recommended values (see technical specifications).

Alternative tyre equipment (in pairs) on HiTech models

2WD		
Rear	**Front**	**6250Hi-2, 6350Hi-2, 6550Hi-2**
13.6R38/8	11.00-16/8	X
14.9R38/8	11.00-16/8	X
16.9R38/8	11.00-16/8	X
16.9R34/8	11.00-16/8	X

	4WD						
	Rear	**Front**	**6250Hi, 6350Hi, 6550Hi**	**6650Hi, 6850Hi**	**8050Hi, 8150Hi**	**8350Hi-8950Hi**	
	16.9R34	13.6R24	X				
	18.4-34	14.9-24	X	X			
	18.4R34	14.9R24	X				
1	520/70R34	420/70R24	X				
1	600/65R34	480/65R24	X	X			
	13.6R38	13.6R24	X				
	14.9R38	12.4R28	X				
	16.9R38	13.6R28	X	X	X		
	18.4R38	14.9R28	X	X(*)	X(*)	X*	
	18.4R38	14.9R28	X	X(*)	X(*)		
	480/70R38	380/70R28	X	X	X		
1	520/70R38	420/70R28	X	X(*)	X(*)	X*	
	20.8R38	16.9R28		X(*)	X(*)	X*	2
	20.8R38	16.9R28		X(*)	X(*)	X*	2
1	540/65R38	440/65R28	X	X	8050		
1	580/70R38	480/70R28		X(*)	X(*)	X*	
1	600/65R38	480/65R28	X	X(*)	X(*)	X*	
1	650/65R38	540/65R28		X(*)	X(*)	X*	
	18.4R34 IND	14.9R24 IND	X				
	18.4-38/14 IND	16.9-24/14 IND		X*	X*	X*	
1	20.8R38 IND	16.9R28IND		X*	X*	X*	
	18.4-34/14 FOR	14.9-24/14 FOR	X	X	X		
	18.4-38/14 FOR	14.9-28/14 FOR	X	X(*)	X(*)	X*	
1	600/65R38 FOR	500/65R28 FOR		X*	X*	X*	
1	20.8-38/14 FOR	16.9-28/14 FOR		X*	X*	X*	

[1] Wide rear mudguards
[2] Not all tyres on traffic tractors (50 km/h)
(*) Agricultural front axle or ind. front axle
* Industrial front axle (on 8350Hi–8950Hi as standard)

Fixed rims

When changing tyres, observe the correct ratio on 4WD models. Check always when changing tyres or when adjusting track widths, that the tyres do not touch the engine side plates, limit the front wheel steering angle when necesssary.

Tyre inflation pressures and max permissible tyre loadings on HiTech models.

Rear axle			Front axle		
Tyre	**Carrying capacity**	**Pressure**	**Tyre**	**Carrying capacity**	**Pressure**
16.9R34/8	2430 kg	160 kPa	11.00–16/8	1320 kg	250 kPa
18.4–34/8	2565 kg	140 kPa	13.6R24	1450 kg	160 kPa
18.4R34/8	2800 kg	160 kPa	14.9–24/8	1760 kg	180 kPa
520/70R34	3150 kg	160 kPa	14.9R24/8	1700 kg	160 kPa
	1775 kg	60 kPa	420/70R24	1900 kg	160kPa
600/65R34	2900 kg	140 kPa		1070	60 kPa
	2050 kg	70 kPa	480/65R24	1750 kg	160 kPa
13.6R38	1800 kg	160 kPa		1240 kg	70 kPa
14.9R38	2060 kg	160 kPa	12.4R28	1450 kg	160 kPa
16.9R38/8	2575 kg	160 kPa	13.6R28/8	1550 kg	160 kPa
18.4R38/8	3000 kg	160 kPa	14.9R28/8	1800 kg	160 kPa
480/70R38	2900 kg	160 kPa	380/70R28	1750 kg	160 kPa
	1635 kg	60 kPa		985 kg	60 kPa
520/70R38	3875 kg	160 kPa	420/70R28	2060 kg	160 kPa
	2185 kg	60 kPa		1160 kg	60 kPa
20.8R38/8	3650 kg	160 kPa	16.9R28/8	2240 kg	160 kPa
540/65R38	2390 kg	120 kPa	440/65R28	1450 kg	120 kPa
	1810 kg	60 kPa		1060 kg	60 kPa
580/70R38	3875 kg	120 kPa	480/65R28	1850 kg	160 kPa
	2185 kg	60 kPa		1300 kg	70 kPa
600/65R38	3075 kg	160 kPa	480/70R28	2500 kg	160 kPa
	2150 kg	70 kPa		1410 kg	60 kPa
650/65R38	3350 kg	120 kPa	540/65R28	2070 kg	120 kPa
	2510 kg	60 kPa		1540 kg	60 kPa
18.4R34 IND	4850 kg	290 kPa	14.9R24 IND	3090 kg	330 kPa
18.4–38/14 IND	5055 kg	290 kPa	16.9–24/14 IND	3530 kg	300 kPa
20.8R38 IND	5460 kg	260 kPa	16.9R28IND	3765 kg	300 kPa
18.4–34/14 FOR	2985 kg	260 kPa	14.9–24/14 FOR	1900 kg	300 kPa
18.4–38/14 FOR	3110 kg	260 kPa	14.9–28/14 FOR	2024 kg	300 kPa
600/65R38 FOR	4375 kg	240 kPa	500/65R28 FOR	2800 kg	240 kPa
20.8–38/14 FOR	4340 kg	230 kPa	16.9–28/14 FOR	3120 kg	270 kPa

In the twin wheel use the carrying capacity of two wheels is 1,76 x carrying capacity of single wheel.

Track widths on HiTech models

(Between middle of wheels on the ground)

	Rear	Track widths
	13.6R38, 14.9R38	1510, 1610, 1710, 1810, 1910, 2010, 2110
	16.9R34, 18.4-34, 18.4R34, 520/70R34, 600/65R34	1610, 1710, 1810, 1910, 2010, 2110
	16.9R38, 18.4R38, 480/70R38, 20.8R38, 520/70R38, 540/65R38, 580/70R38	1610, 1715, 1810, 1915, 2010, 2115
	600/65R38, 650/65R38	1715, 1810, 1915, 2010, 2115
1)	18.4R38, 520/70R38, 20.8R38, 580/70R38, 600/65R38, 650/65R38	1610, 1715, 1810, 1910, 2010, 2115
	18.4R34/14 IND	1740, 1790
	18.4-34/14 FOR	1650, 1880
	18.4-38/14 FOR, 18.4R38, 18.4-38/14 IND, 20.8R38, 20.8R38 IND, 20.8-38/14 FOR, 600/65R38 FOR	1650, 1875

Front	Track widths
11.00-16/8	1465, 1565, 1665, 1765
13.6R24, 14.9-24, 14.9R24, 420/70R24, 480/65R24	1535, 1640, 1735, 1840, 1935
12.4R28, 13.6R28, 14.9R28, 380/70R28, 420/70R28, 440/65R28, 16.9R28, 480/65R28, 480/70R28, 540/65R28	1540, 1635, 1740, 1835, 1940, 2035
14.9R28, 14.9-28/14 FOR, 16.9R28	1555, 1830
14.9-24/14 FOR, 14.9R24 IND	1710
Industrial front axle	**Track widths**
14.9R28, 16.9R28, 420/70R28, 480/65R28, 480/70R28, 540/65R28	1530, 1625, 1730, 1830, 1930, 2025, 2130, 2230
16.9-24/14 IND	1840, 1915
16.9R28 IND	1870, 1890
14.9R28, 16.9R28, 14.9-28/14 FOR, 16.9-28/14 FOR, 500/65R28 FOR	1870, 1890

Standard track widths underlined.
1) Models 8350Hi–8950Hi

Fixed rims

The distance between the rear mudguards is 1020 mm.

NOTE! Always when adjusting track widths or when changing tyres, the front wheel steering angle must be checked/adjusted with max oscillation angles of the front axle in both directions. When adjusting the rear axle track widths, check that the wheels can rotate freely. Also check when using the snow chains, that the distance between the cab and the rear wheels is not under 80 mm. In addition, check that the distance between the parking lights and the rear wheel outer edges does not exceed 400 mm.

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Wheel weights ..... 30608600 (à 80 kg)
813860 (à 80 kg)
31568000 (à 80 kg)
38905200 (à 80 kg)
32480700 (à 70 kg)
32403500 (à 70 kg)
32480710 (à 70 kg)
32403510 (à 70 kg)
33131600 (à 70 kg)
33131700 (à 70 kg)

– Wheel weights are fitted with bolts to the rim. Tightening torque: 190 Nm.

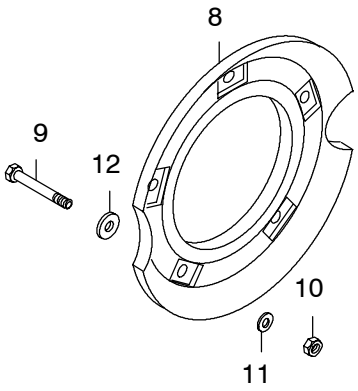
– In the picture (see page 2) there are some fitting examples:

A:	1	**30608600**	Painot	Vikter	Weights	Gewichte	80 kg
8	4	831020	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW12x38)
9	10	HA8366	.Ruuvi	Skruv	Screw	Schraube	M16x180
10	10	JB8907	.Mutteri	Mutter	Nut	Mutter	
11	10	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
12	10	32982500	.Aluslevy	Bricka	Washer	Scheibe	
B:	1	**813860**	Painot	Vikter	Weights	Gewichte	80 kg
8	8	831020	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW15Lx34)
9	10	HA8727	.Ruuvi	Skruv	Screw	Schraube	M16x280
9	10	HA8729	.Ruuvi	Skruv	Screw	Schraube	M16x300
10	10	JB8907	.Mutteri	Mutter	Nut	Mutter	
12	20	32982500	.Aluslevy	Bricka	Washer	Scheibe	
C:	1	**31568000**	Painot	Vikter	Weights	Gewichte	80 kg
8	2	31545700	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW16x34 Fixed)
9	10	HA8367	.Ruuvi	Skruv	Screw	Schraube	M16X200
10	10	JB8907	.Mutteri	Mutter	Nut	Mutter	
11	10	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
12	10	32982500	.Aluslevy	Bricka	Washer	Scheibe	
D:	1	**38905200**	Painot	Vikter	Weights	Gewichte	80 kg
8	2	831020	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW14x30 Fixed)
9	10	HA9419	.Ruuvi	Skruv	Screw	Schraube	M16x130
10	10	JB8907	.Mutteri	Mutter	Nut	Mutter	
11	10	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
12	10	32982500	.Aluslevy	Bricka	Washer	Scheibe	
E:	1	**32480700**	Painot	Vikter	Weights	Gewichte	70kg
13	2	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW14x30)
14	2	33131400	.Holkki	Hylsa	Sleeve	Hülse	L=34,5
15	8	HA8366	.Ruuvi	Skruv	Screw	Schraube	M16x180
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	

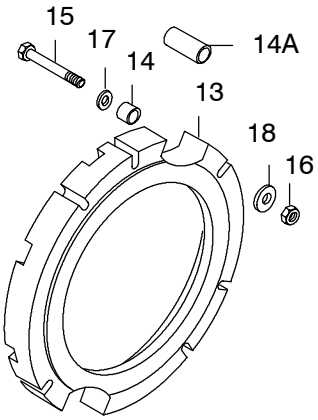
https://truckmanualshub.com/

F:	1	**32403500**	Painot	Vikter	Weights	Gewichte	70kg
13	4	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW14x30)
14	2	33131400	.Holkki	Hylsa	Sleeve	Hülse	L=34,5
15	8	HA8370	.Ruuvi	Skruv	Screw	Schraube	M16x260
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	
G:	1	(32480710)	Painot	Vikter	Weights	Gewichte	70kg
13	**2**	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW15Lx30)
							(DW14Lx30)
14	2	33131400	.Holkki	Hylsa	Sleeve	Hülse	L=34,5
15	8	HA8366	.Ruuvi	Skruv	Screw	Schraube	M16x180
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	
H:	1	**32403510**	Painot	Vikter	Weights	Gewichte	70kg
13	**4**	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW15Lx30)
							(DW14Lx30)
14	2	33131400	.Holkki	Hylsa	Sleeve	Hülse	L=34,5
15	8	HA8726	.Ruuvi	Skruv	Screw	Schraube	M16x240
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	
I:	1	(33131600)	Painot	Vikter	Weights	Gewichte	70kg
13	**2**	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW15Lx30)
							(DW14Lx30)
14A	2	33131500	.Holkki	Hylsa	Sleeve	Hülse	L=75
15	8	HA8367	.Ruuvi	Skruv	Screw	Schraube	M16x200
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	
J:	1	(33131700)	Painot	Vikter	Weights	Gewichte	70kg
13	**4**	75003210	.Paino	Vikt	Weight	Gewichte	
			.Vanteille	För fälgar	For rims	Für Felgen	(DW15Lx30)
							(DW14Lx30)
14A	2	33131500	.Holkki	Hylsa	Sleeve	Hülse	L=75
15	8	HA8727	.Ruuvi	Skruv	Screw	Schraube	M16x280
16	8	JB8907	.Mutteri	Mutter	Nut	Mutter	
17	8	JD0416	.Aluslevy	Bricka	Washer	Scheibe	
18	8	32982500	.Aluslevy	Bricka	Washer	Scheibe	

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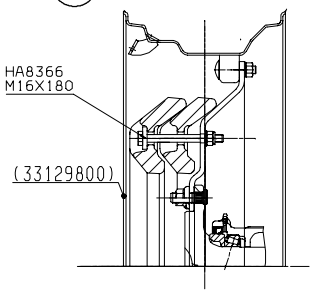


DW12x38" sääd. / justerb. / adjustable



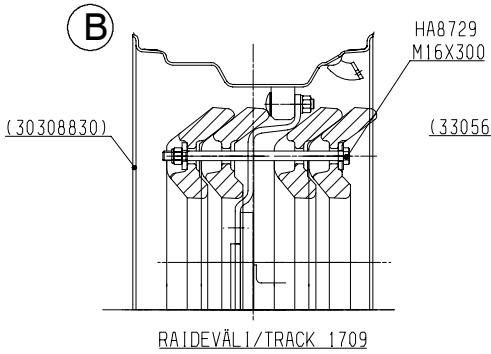
DW15Lx34" sääd./ justerb. / adjustable

A

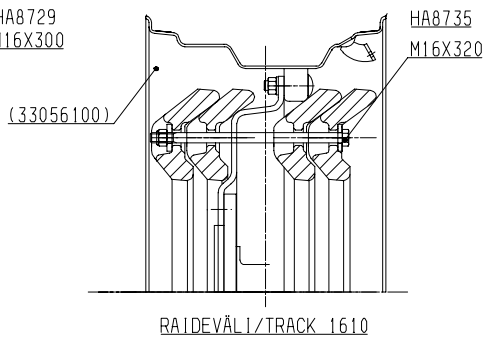


DW16x34" kiinteä / fäst / fixed

B

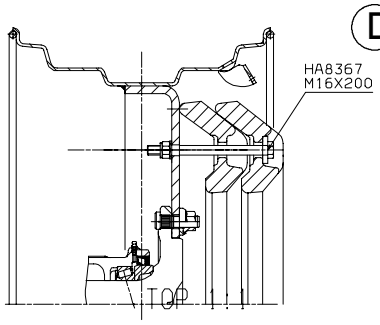


DW14x30" kiinteä/ fäst/ fixed

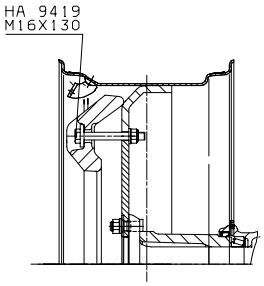


DW14x30" sääd. / justerb./ adjustable
W12x28" sääd. / justerb./ adjustable

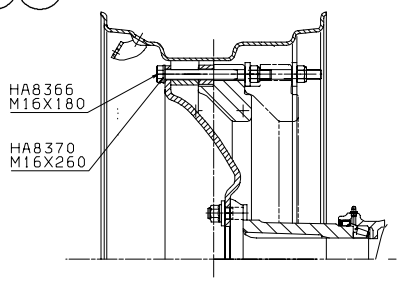
C



D

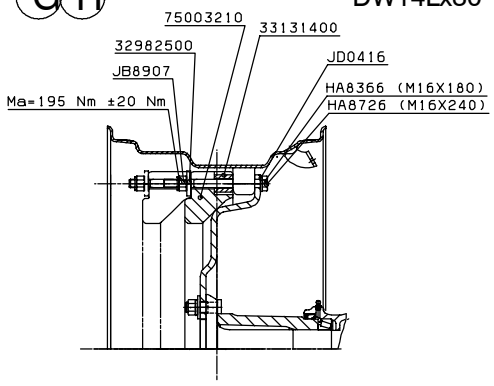


E F

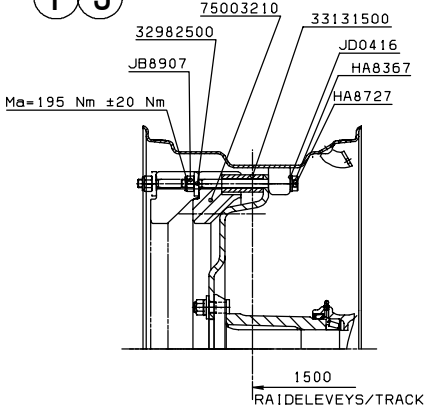


DW15Lx30" (33053100)
DW14Lx30" (33053000)

G H



I J





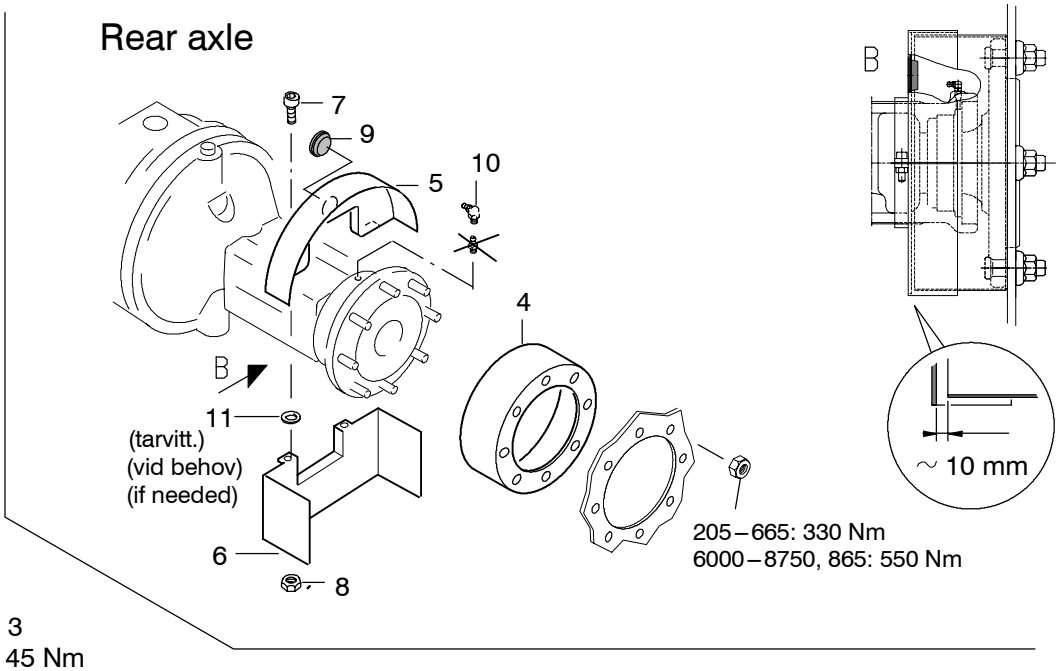
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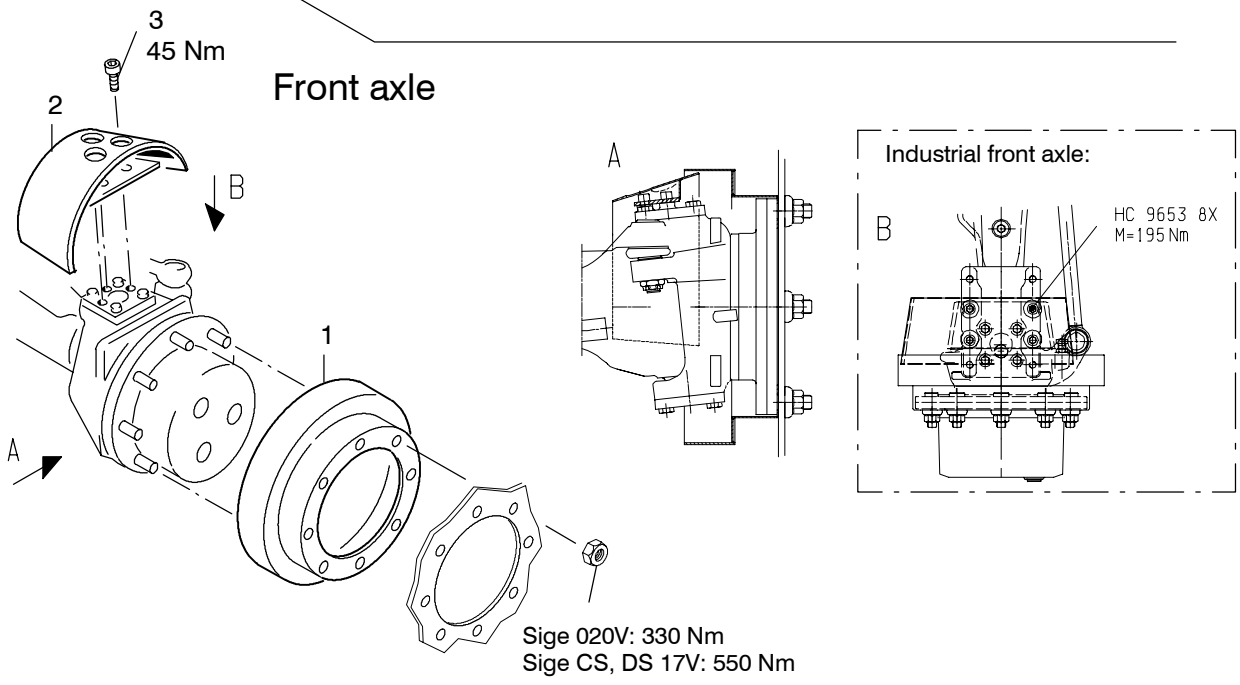
Mud shields, front+rear (365–665) . 33362200

front axle (865, 600–900, 6000–8400) 33561600
industrial front axle 33561700

rear axle (865, 600–900) . . 33561500
rear axle (6000–8750) 33561200

The mud shields protect the shaft seals when working in very difficult conditions (e.g. muddy fields).





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	1	**33362200**	Suojat, etu + taka	Skydd, fram+bak	Shields, front+rear	Schutz, v+h	365–665
1	2	33339200	.Suoja	Skydd	Cover	Schutz	
2	1	33338800	.Suoja	Skydd	Cover	Schutz	Oik. / Right
	1	33338900	.Suoja	Skydd	Cover	Schutz	Vas. / Left
3	6	HC9336	.Ruuvi	Skruv	Screw	Schraube	
4	2	33343100	.Suoja	Skydd	Cover	Schutz	
5	2	33343200	.Suoja	Skydd	Cover	Schutz	
6	2	33343300	.Suoja	Skydd	Cover	Schutz	
7	4	HC8328	.Ruuvi	Skruv	Screw	Schraube	
8	4	JB8904	.Mutteri	Mutter	Nut	Mutter	
9	2	33362100	.Kumitulppa	Gummiplugg	Rubber plug	Gummistopfen	
10	2	GG0094	.Voitelunippa	Smörjnippel	Grease nipple	Schmiernippel	

		33561600	Suojat, etuaks.	Skydd, framaxel	Shield, front axle	Schutz, vorn	4WD, 865, 600–900, 6000–8400
1	2	33339200	.Suoja	Skydd	Cover	Schutz	
2	1	33338800	.Suoja	Skydd	Cover	Schutz	Oikea / Right
	1	33338900	.Suoja	Skydd	Cover	Schutz	Vasen / Left
3	6	HC9336	.Ruuvi	Skruv	Screw	Schraube	

		33561700	Suojat, etuaks.	Skydd, framaxel	Shield, front axle	Schutz, vorn	Teoll. etuakseli / Ind. Front axle, 4WD
1	2	33479900	.Suoja	Skydd	Cover	Schutz	
2	1	33479700	.Suoja	Skydd	Cover	Schutz	Oikea
	1	33479800	.Suoja	Skydd	Cover	Schutz	Vasen
3	8	HC9653	.Ruuvi	Skruv	Screw	Schraube	

		33561500	Suojat, taka–aks.	Skydd, bakaxel	Shield, rear axle	Schutz, hinten	865, 600–900)
4	2	33294300	.Suoja	Skydd	Cover	Schutz	
5	2	33360400	.Suoja	Skydd	Cover	Schutz	
6	2	33360510	.Suoja	Skydd	Cover	Schutz	
7	4	HC8328	.Ruuvi	Skruv	Screw	Schraube	
8	4	JB8904	.Mutteri	Mutter	Nut	Mutter	
9	2	33362100	.Kumitulppa	Gummiplugg	Rubber plug	Gummistopfen	
10	2	GG0094	.Voitelunippa	Smörjnippel	Grease nipple	Schmiernippel	

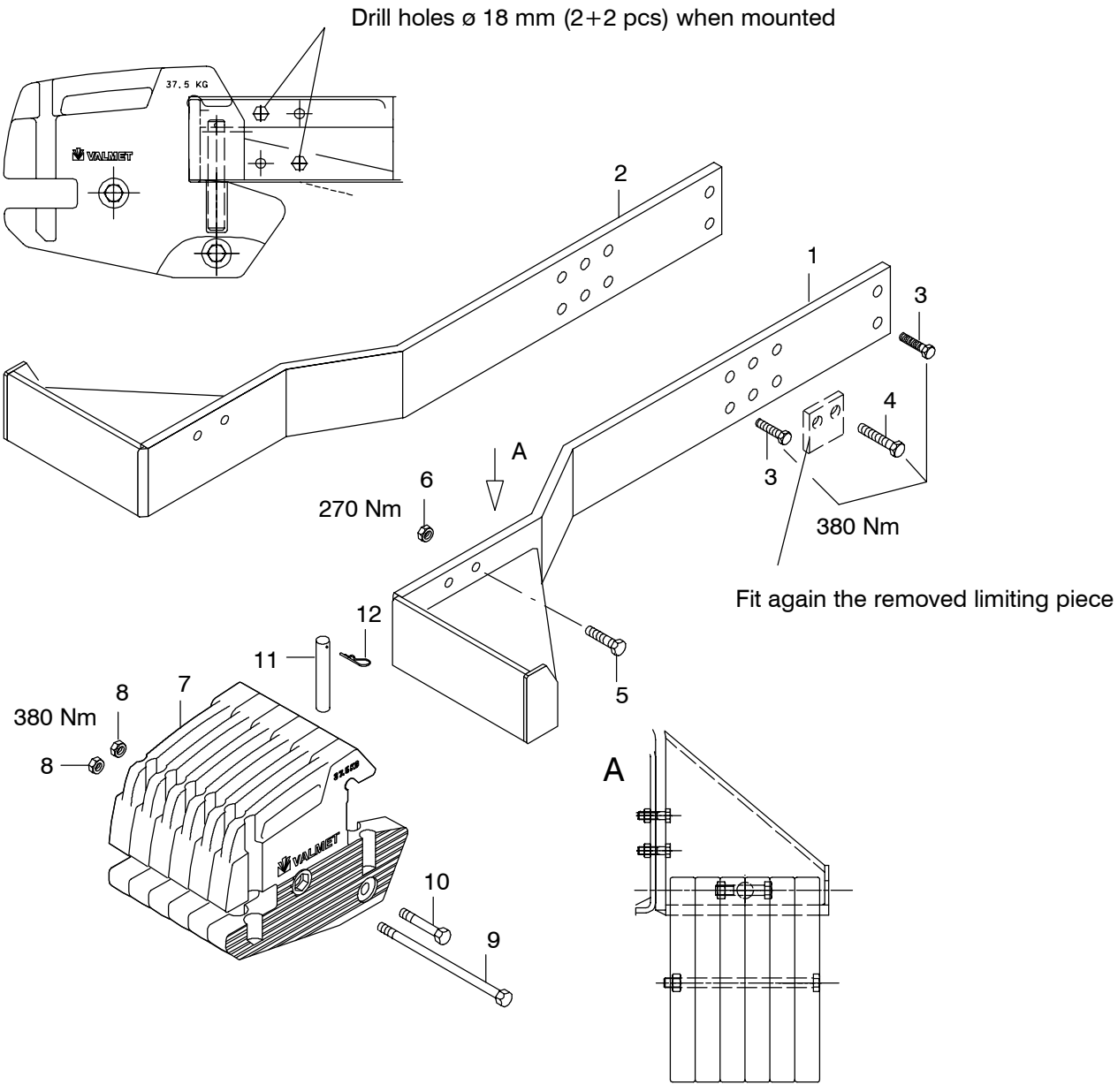
		33561200	Suojat, taka–aks.	Skydd, bakaxel	Shield, rear axle	Schutz, hinten	6000–8750
4	2	.33294300	.Suoja	Skydd	Cover	Schutz	
5	2	33344100	.Suoja	Skydd	Cover	Schutz	
6	2	33344210	.Suoja	Skydd	Cover	Schutz	
7	4	HC8328	.Ruuvi	Skruv	Screw	Schraube	
8	4	JB8904	.Mutteri	Mutter	Nut	Mutter	
9	2	33362100	.Kumitulppa	Gummiplugg	Rubber plug	Gummistopfen	
10	2	GG0094	.Voitelunippa	Smörjnippel	Grease nipple	Schmiernippel	

11	–	JD0408	Aluslaatta	Bricka	Washer	Scheibe	ø 8,4, tarvittaessa, if needed

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Extra front ballast weights, 550 kg . . 32938200
(12x37,5 +100)

	1	33129100	Etupainot	Extra frontvikter	E. front b. weights	Z. V.gewichte	(12 kpl/psc) 4–Cyl.
	1	32938200	Etupainot	Extra frontvikter	E. front b. weights	Z. V.gewichte	(12 kpl/pcs) 6–Cyl.
1	1	33130900	.Teline	Hållare	Support	Halter	Vas./ Left 4–Cyl.
	1	32937400	.Teline	Hållare	Support	Halter	Vas./ Left 6–Cyl.
2	1	33130800	.Teline	Hållare	Support	Halter	Oik./ Right 4–Cyl.
	1	32937900	.Teline	Hållare	Support	Halter	Oik./ Right 6–Cyl.
3	6	HA6368	.Ruuvi	Skruv	Screw	Schraube	4–Cyl. (M20x40)
	8	HA6368	.Ruuvi	Skruv	Screw	Schraube	6–Cyl.
4	4	HA6370	.Ruuvi	Skruv	Screw	Schraube	(M20x60)
5	4	HA6358	.Ruuvi	Skruv	Screw	Schraube	
6	4	JB8907	.Mutteri	Mutter	Nut	Mutter	
7	12	31759200	.Etupainot	Frontvkter	Front ballast	Vorderballast	**37,5** kg
8	4	JB8908	.Mutteri	Mutter	Nut	Mutter	
9	2	32403200	.Ruuvi	Skruv	Screw	Schraube	
10	2	HA8373	.Ruuvi	Skruv	Screw	Schraube	
11	2	30231200	.Tappi	Tapp	Pin	Stift	
12	2	JJ5102	.Sokka	Sprint	Pin	Splint	



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Extra fuel tank 6000–8750 33627000

Note! Fuel tank draining plug thread should be M30x1,5 (from tractor ser. no. 664868 –>).

The extra fuel tank capacity is 85 litres, which can be an addition to the fuel in the standard tank. When filling the tank, observe that in the end the filling happens slower due to resistance of fuel flow.

– Fitting extra tank:

– Drain the fuel tank. Remove the footstep iron. *HiTech–models*: remove the wires which go to the end piece of the parking brake cylinder (S52).

– *Tractors to tractor no. –J10111:* Assemble the fuel filling hole extension piece according to the picture. Check that the o–ring **17** remains in its groove when You tighten the sleeve **5**. Tighten the sleeve as hard as possible using e.g. an oil filter spanner.

– Fasten the damper sticker **10** onto the extra tank and also bands **11** (7 off) onto the frame **12**.

– Unscrew the nut of the lower stud bolt (M16) and the upper hexagonal socket screw M12 on the LH side in the bolted joint between gearbox–fuel tank. Fasten the support **18** with nut and screw. Place the frame **12** temporarily into place. Estimate the position of the cut–off point of the footstep RH side support iron. Mark places for the fixing holes (ø18 mm) on the footstep iron and drill the holes. *HiTech–models*: leave the footstep support (33598300) away.

– If the tractor has an air conditioner and its hoses have been drawn behind the cab front attachment, the hoses should be moved to the front side of the attachment. In this case, unscrew the cab front attaching bolts and slacken the cab rear bolts. Also the PTO control cable should be detached. Raise the cab about 50 mm and move the hoses to the front side of the attachment. (Note! Remove out from way the attaching screws of the engine heater socket). Also detach the drier and push excess hose length into the engine compartment.

– Connect the hose **4** to the extra fuel tank and fasten frame and the tank. The tank front end is attached to the rear face of the cab attachment and the rear end is attached with the support **18**. NOTE! Guide e.g. with a flat iron the edge seal of the intermediate frame protective shield so that it stays between the tank and the intermediate frame.

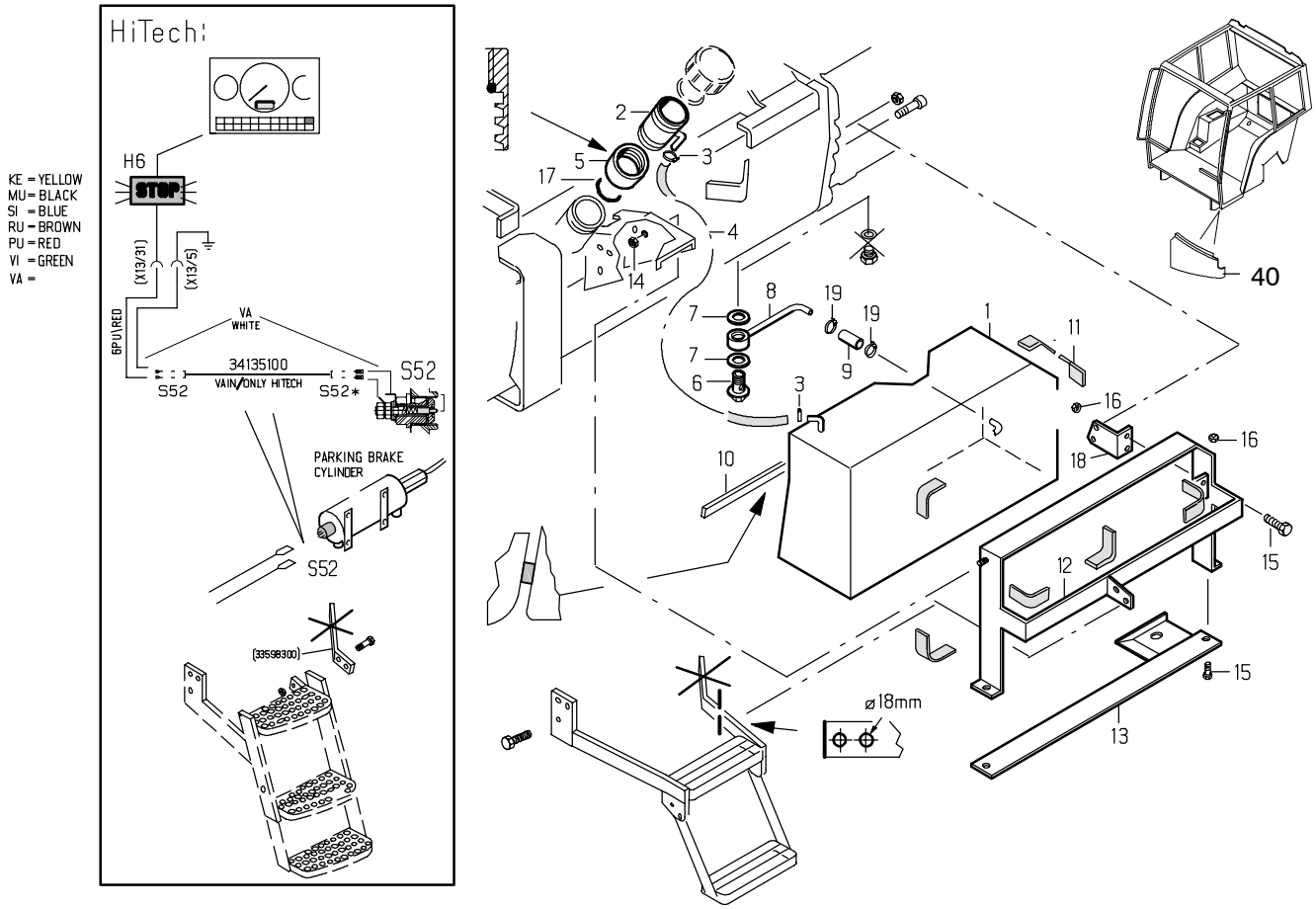
– Change the lower shield **40** on the left side of the cab.

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– Fasten the fuel pipe **8** (it can be assembled while the fastener **13** is in place). Connect the pipe **4** other end to the connector on the fuel filling hole. *HiTech–models*: make the wires of the parking brake cylinder longer by the extension wire 34135100 (HiTech only). Join the connector S52.

– Fill the tank with fuel and check for leaks.

	1	33627000	Polttoainesäiliö	Bränsletank	Fuel tank	Kraftstofftank	Réservoir de carburant	6200–8550 6250Hi–8950Hi
1	1	32755220	.Polttoainesäiliö	Bränsletank	Fuel tank	Kraftstofftank	Réservoir de carburant	
2	1	32829700	.Täyttöputki	Påfyllningsrör	Filling pipe	Einfüllungsrohr	Tuyau de remplissage	–J10111
3	2	GP3927	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	Clip de tuyau	
4	1	32837000	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
5	1	32829800	.Holkki	Hylsa	Sleeve	Hülse	Manchon	–J10111
6	1	32967500	.Ruuvi	Skruv	Screw	Schraube	Vis	M30x1,5
7	2	KH3643	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
8	1	32967710	.Putki	Rör	Pipe	Rohr	Tuyau	
9	1	32967600	.Letku	Slang	Hose	Schlauch	Tuyau flexible	
10	2	32021500	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
11	7	32697500	.Tiiviste	Tätning	Gasket	Dichtung	Joint	
12	1	32816010	.Kehys	Ram	Frame	Rahmen	Cadre	
13	1	32755300	.Laatta	Platta	Plate	Platte	Plaque	
14	1	JB8907	.Mutteri	Mutter	Nut	Mutter	Ecrou	
15	4	HA9242	.Ruuvi	Skruv	Screw	Schraube	Vis	
16	4	JB8906	.Mutteri	Mutter	Nut	Mutter	Ecrou	
17	1	KH4933	.O–rengas	O–ring	O–ring	O–ring	Joint torique	–J10111
18	1	32959900	.Korvake	Öra	Lug	Ohr	Support	
19	2	GP3919	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	Clip de tuyau	
	1	34135100	.Johdin	Ledning	Wire	Leitung	Fil électrique	HiTech
40	1	33678800	.Suojus	Skydd	Shield	Schutz	Protection	Left



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Water reservoir (+pump) 32837200

The water reservoir capacity is **85** litres. The reservoir material is stainless steel. The reservoir has a pump with output of **7,3** l/min at a pressure of **2,5** kp/cm^2. The water hose is fitted on a portable hose drum and the hose length is **20** m.
The water tank can be used as a fire–fighting equipment e.g. when working in the peat industry
NOTE! In a cold season the tank should be drained (or anti–freeze agent should be used). Pour into the empty tank engine coolant and let the pump run for a while so that all water in the pump runs out.
Never use the pump without liquid.
The pump has been connected to the fuse F14 (permanent current).

FITTING:

– Remove the foot step irons.

– Fasten padding band **2** onto the water tank and also band **3** (7 pcs) onto the frame **4**.

– Unscrew the nut of the lower stud bolt M16 and the upper hexagonal socket screw M12 on the LH side in the bolted joint between gearbox–fuel tank.
Fasten the support **31** with these nut and screw.
Place the frame **4** temporarily into place. Estimate the position of the cut–off point of the footstep RH side support iron. Mark places for the fixing holes (ø18 mm) on the footstep iron and drill the holes.

– Fit the stand and the tank. NOTE! Guide e.g. with a flat iron the edge seal of the intermediate frame protective shield so that it stays between the tank and the intermediate frame.
Connect hoses **18** and **9** to the tank.

– Connect the other end of hose **18** to the filling pipe **20**. Use the filling pipe as a pattern (do not bend the hose) and drill holes (2 pcs, ø13 mm) into the inner surface of the LH side mudguard. Fasten the filling pipe.

– Place the hose stand **22** on the RH side mudguard and mark places for holes (2 pcs, ø 9 mm) (if you want that the side window can be opened, the stand should be fitted partly on the console of the rear light).
Drill holes and fasten the stand.

– If the tractor has an air conditioner and its hoses have been drawn behind the cab front attachment, the hoses should be moved to the front side of the attachment.
In this case, unscrew the cab front attaching bolts and slacken the cab rear bolts. Also the PTO control cable should be detached. Raise the cab about 50 mm and move the hoses to the front side of the attachment. (Note! Remove out from way the attaching screws of the engine heater socket). Also detach the drier and push excess hose length into the engine compartment.

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– Open the lever console side panel and detach the longer upper panel. Cut a hole for the switch frame **28**. Fasten the parts **28**, **29** and the switch **27** into place**.**
Draw the wiring loom connector S34 + ind. lamp wire to the switch. Fasten the upper panel. Connect the earh connector under the earth screw in the lever console bottom. Pass the rest of the wires out of the console through its rear corner.

– Draw wire nr 166 (green) together with other wires to the fuse box. Disconnect connector X6 and connect the wire to the connector pole 6. Tape the wire to the side of the other wire looms. Change fuse F14 (10 A) into a fuse of 15 A.

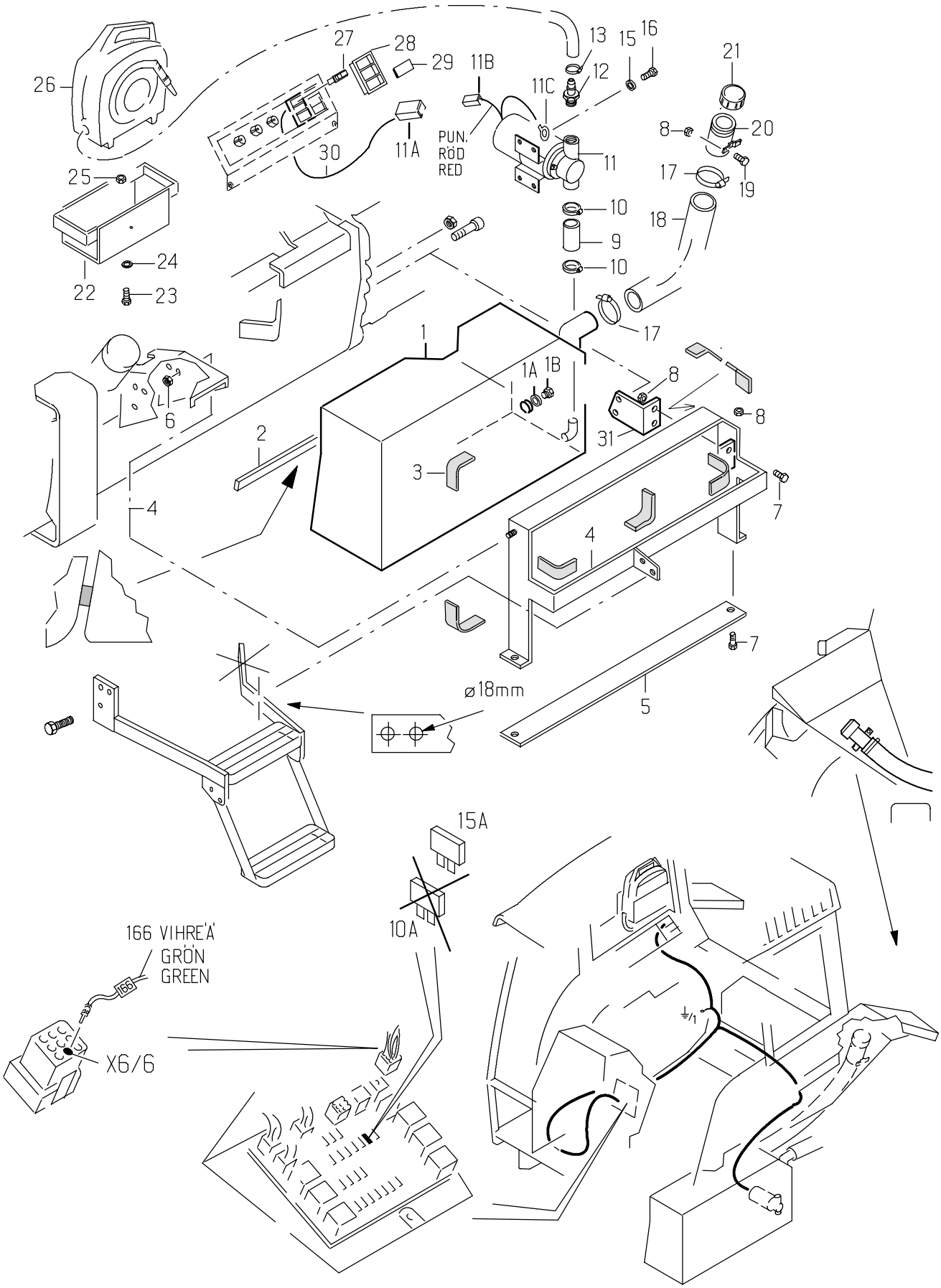
– Draw the wire no 167 (red) to the cab LH side rear corner and further through the lead–in point to the pump. Fit the connector **11A** on the wire. Connect the earth connector **11C** to the pump black wire and connector **11B** to the pump red wire.
Fit the pump (earth cable shoe under one pump fixing screw). Connect the pump suction and presssure hoses.

– Fill the tank (at least up to the pump level). Check the function of the pump and check for leaks.

	1	32837200	Vesisäiliö	Vattentank	Water tank	Waßertank
1	1	32819400	.Säiliö	Behållare	Container	Behälter
1A	1	KH3610	..Tiiviste	Tätning	Gasket	Dichtung
1B	1	GR0225	..Tulppa	Plugg	Plug	Stopfen
2	2	32021500	.Tiiviste	Tätning	Gasket	Dichtung
3	7	32697500	.Tiiviste	Tätning	Gasket	Dichtung
4	1	32816010	.Kehys	Ram	Frame	Rahmen
5	1	32816200	.Laatta	Platta	Plate	Platte
6	1	JB8907	.Mutteri	Mutter	Nut	Mutter
7	4	HA9242	.Ruuvi	Skruv	Screw	Schraube
8	6	JB8906	.Mutteri	Mutter	Nut	Mutter
9	1	32837600	.Putki	Rör	Pipe	Rohr
10	2	GP3927	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder
11	1	32837400	.Pumppu	Pump	Pump	Pumpe
11A	1	SA1527	Liitinkotelo	Skarvhus	Connector housing	Klemmschutz
11B	1	SA1687	Liitin	Anslutning	Connection	Klemme
11C	1	SA1763	Maadoituskenkä	Jordanslutning	Earth connector	Klemme
12	1	GS9112	.Liitin	Nippel	Union	Verbindung
13	1	GP3916	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder
14	1		.Letku	Slang	Hose	Schlauch
15	4	JD0405	.Aluslaatta	Bricka	Washer	Scheibe
16	4	HA6306	.Ruuvi	Skruv	Screw	Schraube
17	2	GP3941	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder
18	1	32837500	.Letku	Slang	Hose	Schlauch
19	2	HA6343	.Ruuvi	Skruv	Screw	Schraube
20	1	32836800	.Täyttöputki	Påfyllningsrör	Filling pipe	Einfüllungsrohr
21	1	32861800	.Korkki	Lock	Cap	Deckel
22	1	32841410	.Kiinnitin	Fästdon	Fastener	Halter
23	2	HA6324	.Ruuvi	Skruv	Screw	Schraube
24	2	625510	.Aluslaatta	Bricka	Washer	Scheibe
25	2	JB8904	.Mutteri	Mutter	Nut	Mutter
26		32837810	.Letkukela	Slangtrum	Hose dram	Schlauch rulle
27	1	30944200	.Keinukytkin	Vippströmbrytare	Switch	Schaukelschalter
	1	30944600	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß
	1	32862300	.Linssi	Lins	Lens	Linse

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28	1	30944400	.Paneeli	Panel	Panel	Paneel	
29	2	30944500	.Peitelevy	Täckplatta	Covering plate	Deckplatte	
30	1	32862200	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
31	1	32959900	.Korvake	Hållare	Support	Halter	
	1	31541100	.Sulake	Säkring	Fuse	Sicherung	15A



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80. Cab and shields

81 Cabin

82. Shields

83. Air conditioning

80. Cab and shields	8. 11. 1990	Model 6000–8750	Code 810	Page 1

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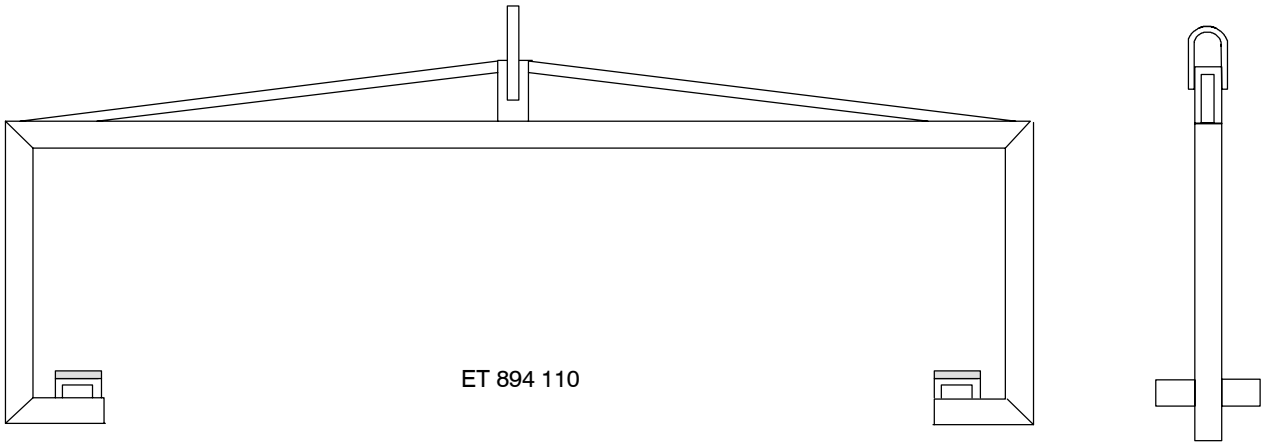
General (Op. no. 810)
Special tools 2
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Instruments and controls 4
Seat 7
Cabin heater 8

Repair instructions (Op. no. 811)
1. Removing and fitting cabin:
A. Removing cab 1
B. Fitting cab 2
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Locally prepared tools

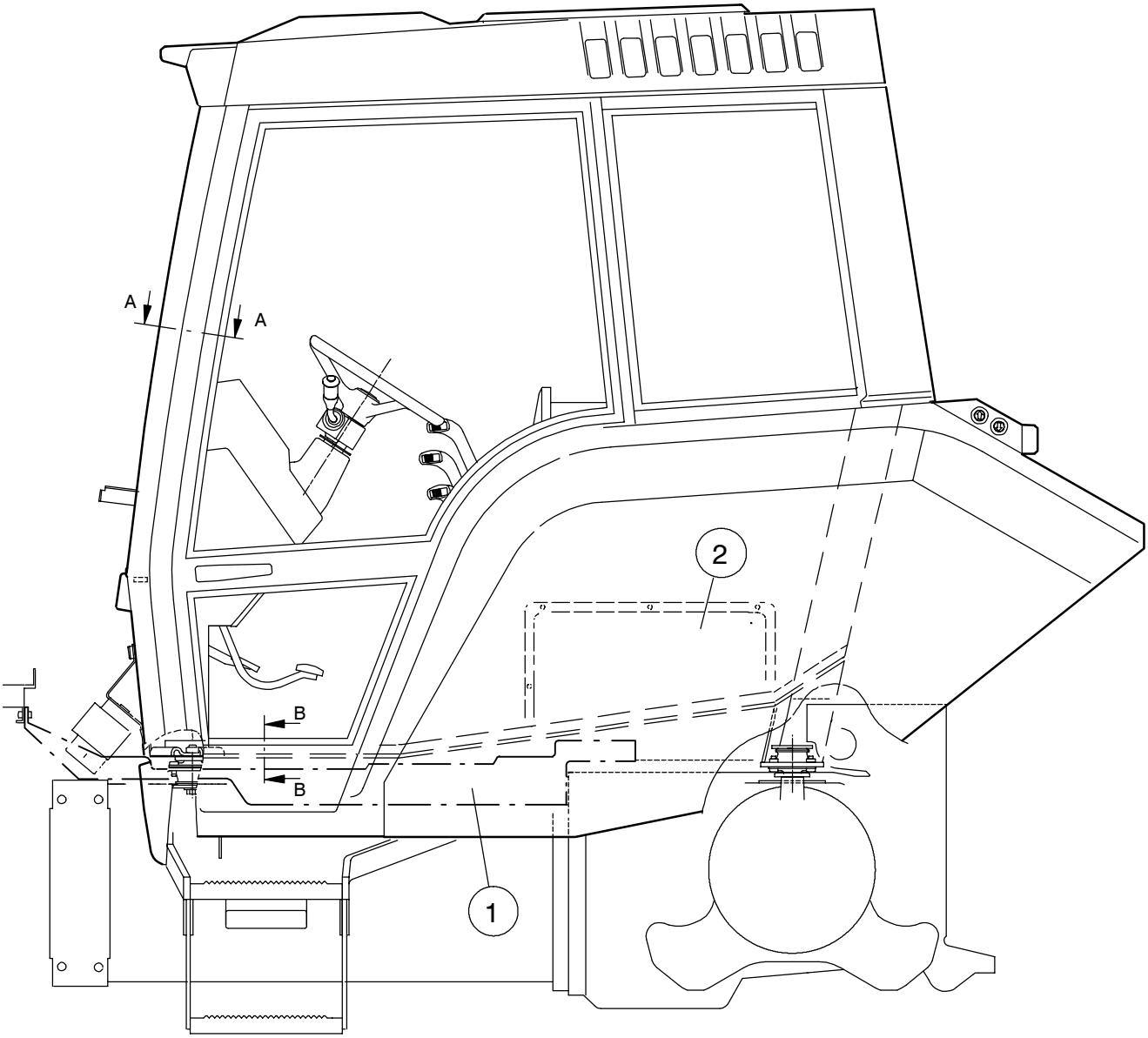
ET 894 110 Tool for lifting the cabin

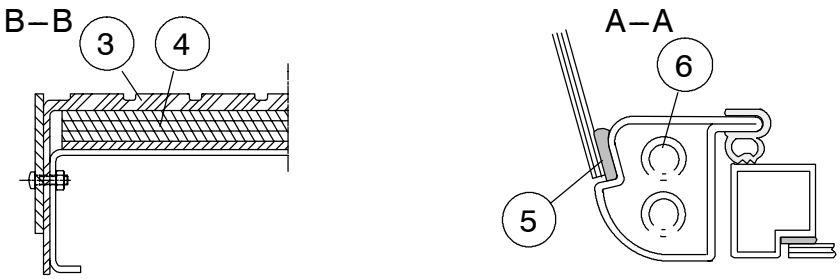


ET 894 110

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Cab, general



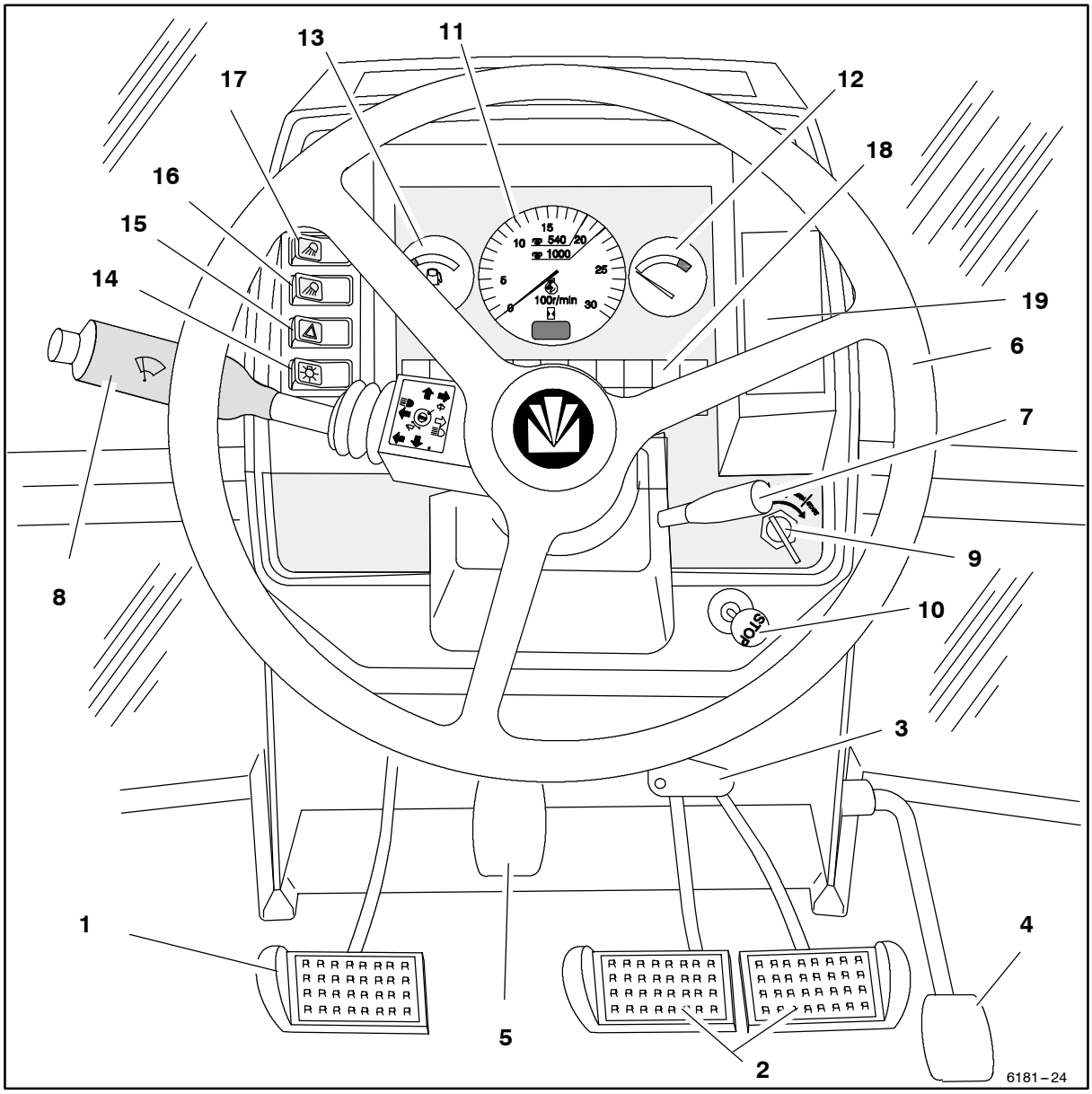


1. Sound–insulating shield.
2. Access hole (on the RH side mudguard). On the cabin floor there is also an access hole for fitting the clutch shaft coupling sleeve.
3. Floor mat: rubber or polyurethane.
4. Insulating material: foam rubber s=15mm (protected with polyurethane film).
5. The windscreen and door windows have been glued onto the cab frame in the beginning of the tractor production. Later the glasses have been fastened with butyl rubber and plastic fasteners.
6. The hoses for the air conditioner (optional equipment) are located in the LH side front corner pillar (in the right side there are the hoses for the cab heater).

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Instruments and controls

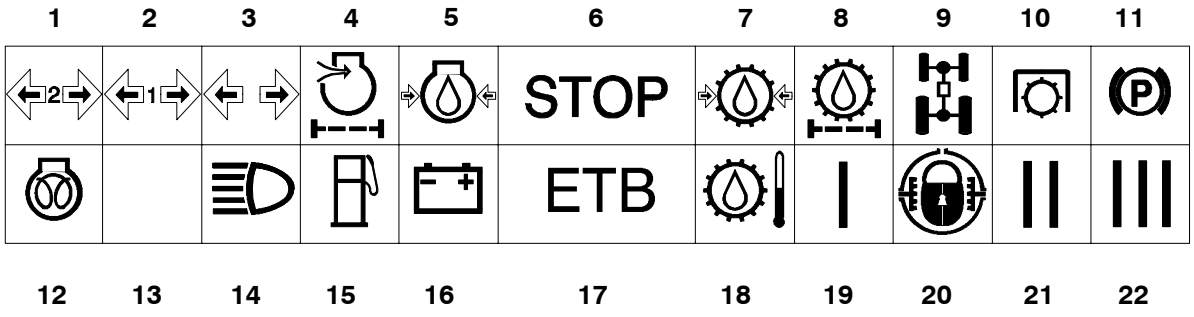
Instrument panel and pedals



1.Clutch pedal
2.Brake pedals
3.Latch for brake pedals
4.Accelerator pedal
5.Lock for steering wheel inclination
6.Steering wheel
7.Lever for adjusting steering wheel height
8.Control for:
– main/dipped headlights
– direction indicators
– horn
– windscreen wiper
– windscreen washer
– headlight flasher
9.Ignition switch
10. Stop control
11.Rev. counter and hour recorder
12.Coolant thermometer
13.Fuel gauge
14.Light switch
15 .Hazard warning flasher switch
16.Switch, rear working lights
17.Switch, front working lights
18.Indicator lights on instrument panel
19. Places for switches for optional equipment
***Note!** On tractors which have Delta Powershift, the DPS indicator light panel is fitted in the instrument panel on the RH side.*

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Indicator and warning lights



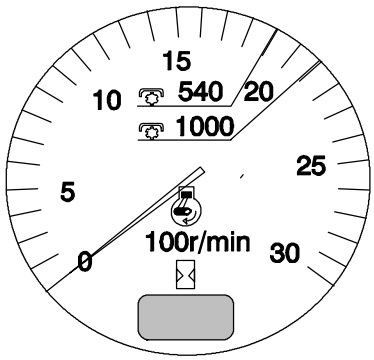
1.Direction indicator warning light for second trailer (green)
2.Direction indicator warning light for first trailer (green)
3.Tractor direction indicator warning light (green)
4.Air cleaner warning light (yellow)
5.Engine oil pressure (red)
6.Engine Stop – (red)
7.Gearbox oil pressure (red)
8.Blocked working hydraulics pressure filter, red (option)
9.Front wheel drive (yellow)
10. Power take–off 540 r/min (yellow). From the beginning of the year 1994 common with 1000 r/min PTO (AC II).
11. Parking brake (red)
12. Thermostart – glow (yellow)
13.Not used (yellow)
14.Main beams (blue)
15. Low fuel level (yellow)
16. Battery charging (red)
17.ETB, Σ–power (yellow), 8750 tractor only
18. Gearbox oil temperature (red)
19. Not used (red). Later DPS indicator light
20. Differential lock (yellow)
21. Power take–off 1000 r/min (yellow). Removed from the beginning of the year 1994 (AC II). See point 10. Later DPS ind. light
22. DPS ind. light.

The central warning (STOP) lamp is actuated by::
– engine oil pressure
– gearbox oil pressure
– gearbox oil temperature
– engine coolant temperature

If the central warning light (stop) comes on when the tractor has been driven the engine must be stopped immediately and the fault must be repaired before continuing again.

Note! If the STOP–light comes on alone, and engine temperature is not too high, the fault lies in the engine temperature sensor, which should be changed (temperature gauge shows, however, a correct value). In this case, the STOP–light goes temporarily out, when you disconnect the sensor wire.

Rev. counter and hour recorder



The rev. counter shows the engine speed in hundreds of revolutions per minute. The revolutions which correspond to the nominal revolutions of PTO are also marked on the rev. counter.

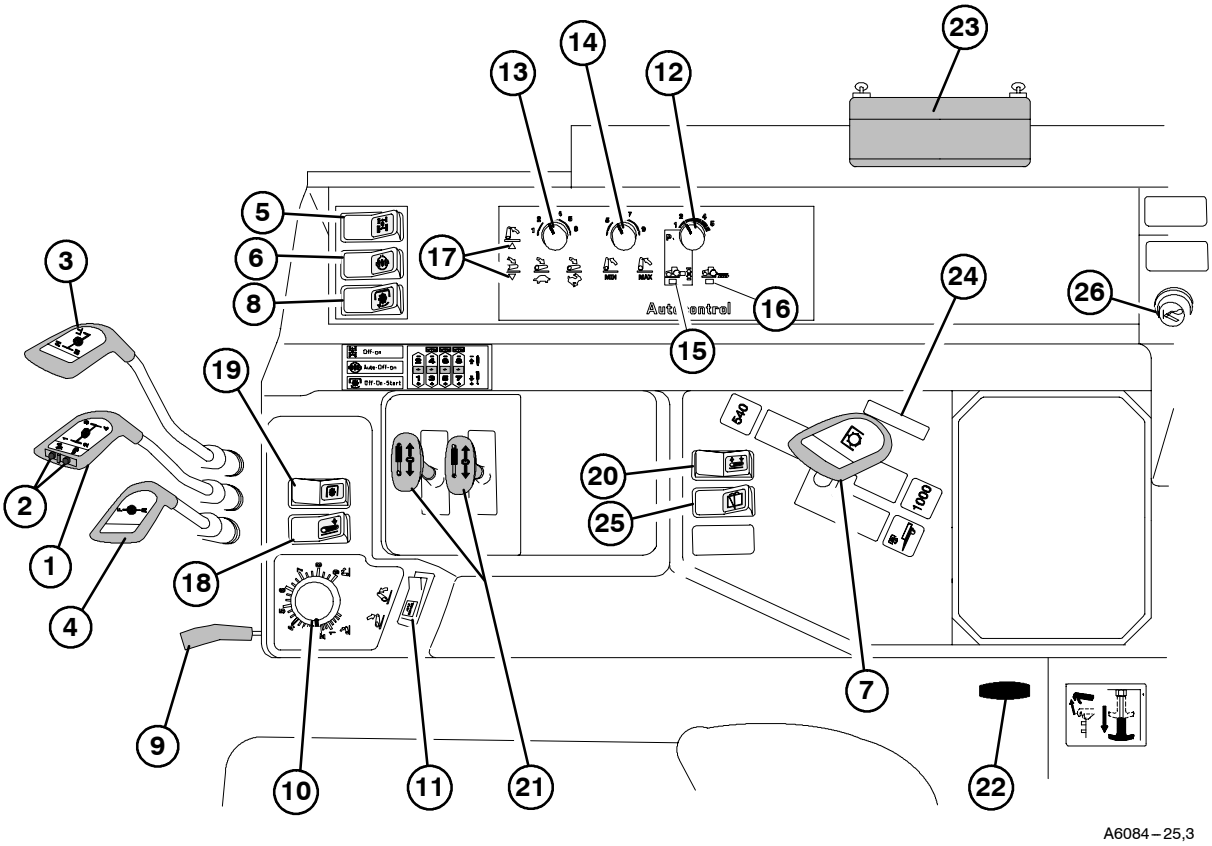
The digital hour recorder shows the total number of hours worked, when the lift/lower switch of the power lift is in the lifting position.

When the lift/lower switch is in the lower position, the display shows the position of the lower links on a scale 0–100 (50=middle position).

Note! The letters Ac after the number mean Autocontrol.

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Controls on RH side

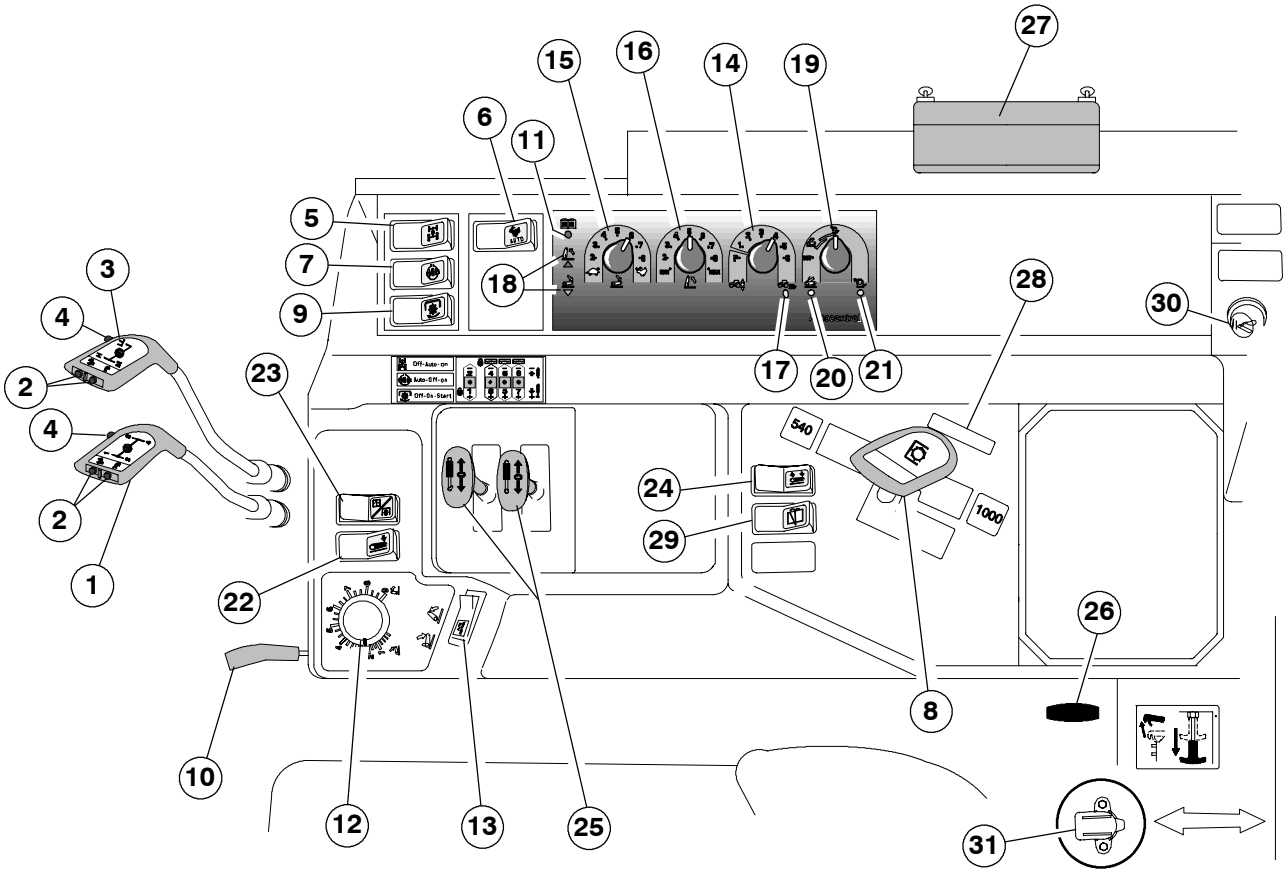


1. Speed gear lever
2. Push buttons for Delta powershift operation (alternative equipment)
3. Range gear lever
4. Forward/reverse gear lever
5. Switch for 4WD
6. Switch for differential lock (3 positions)
7. PTO control lever
8. PTO switch (3 positions)
9. Hand throttle lever
10. Position control knob, hydraulic lift
11. Lift/stop/lower switch, hydraulic lift (3 positions)
12. Draft control selector
13. Lowering speed selector
14. Transport height selector
15. Position control indicator light
16. Draft control indicator light
17. Lift/lower indicator light
18. Forced – lowering switch for hydraulic lift, standard on ACD linkage models, extra equipment on other models.
19. Agrodata – instrument switch (option)
20. Lift/lower switch (corresponding push – buttons are located on both mudguards)
21. Auxiliary hydraulic valve levers
22. Pick – up hitch release control
23. Side window opening handle
24. Place for remote control (cutter etc.)
25. Rear window wiper + washer (optional equipment)
26. Lighter (also for electric output)

Note! Parking brake lever is placed on the LH side of the driver's seat. Cab heater controls are fitted on the roof console (see cabin heater on page 810/8 – 9).

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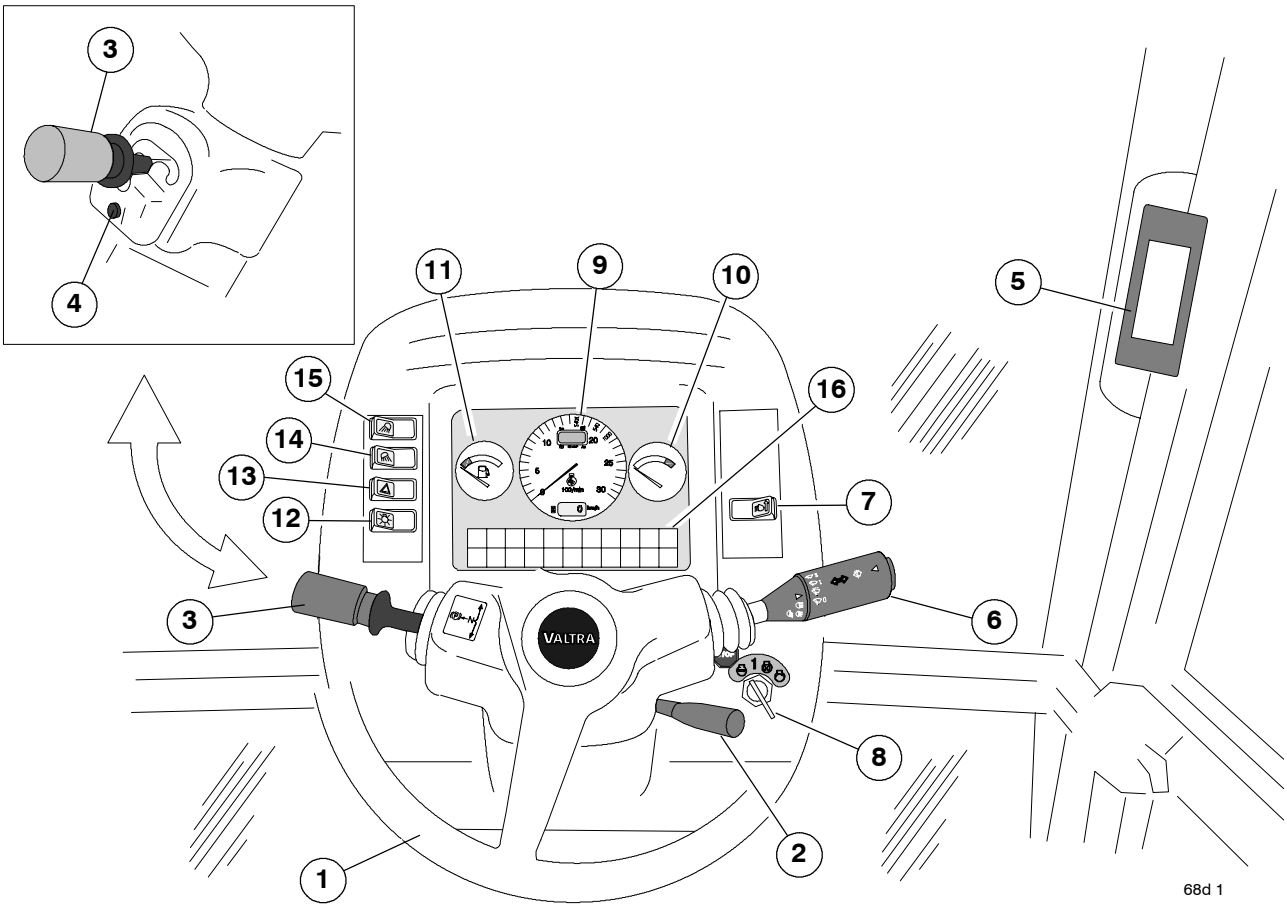
Control on RH side on HiTech models



1. Speed gear lever
2. Delta Power Shift push buttons
3. Range gear lever
4. HiShift button
5. 4WD rocker switch
6. Delta Power Shift Auto/Man switch
7. Diff. lock switch (three positions)
8. PTO control lever
9. PTO rocker switch (3 positions), PTO push buttons on rear mudguard as an option
10. Hand throttle
11. Diagnosis light (indicated possible faults)
12. Position control potentiometer
13. Power lift lift/stop/lower switch
14. Draft control selector
15. Lowering speed selector
16. Transport heigth selector
17. Ind. light, draft control mode, Autocontrol D (ACD)
18. Lift/lower ind. lights
19. Oscillation damper (DBC) switch. On Autocontrol D (ACD) slip control as an option
20. Ind. light, oscillation damper
21. Slip control ind. light, on Autocontrol D (ACD) as an option
22. Forced lowering switch
23. Switch for AD–instrument
24. Power lift lift/lower rocker switch (correcponding yellow push buttons on both rear mudguards.
25. Control levers, auxiliary hydraulics
26. Pick–up hitch release control (option)
27. Side window opening handle
28. Place for remote controller
29. Rear window wiper+washer (option)
30. Cigarette lighter (also current socket)
31. 3–pin current socket

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Dashboard on HiTech models

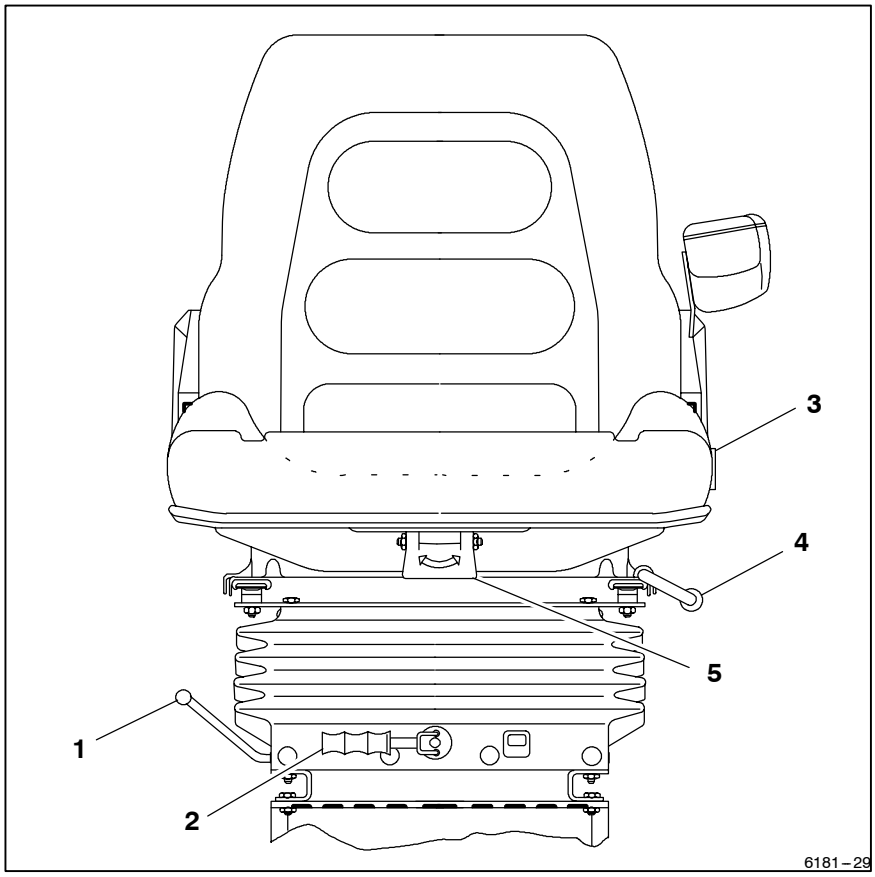


Shuttle/parking brake lever (**3.**) and combination control (**6.**) can be fitted also on the other side of the steering wheel.

1. Steering wheel
2. Locking lever, steering wheel height
3. Shuttle lever/parking brake lever
4. Delta Power Shift pre–programming button for driving direction change
5. Display for transmission functions
6. Combination control:
   – high/dipped beams
   – direction indicator flashers
   – horn
   – windscreen wiper
   – windscreen washer
   – high beam flash
7. Toggle switch, raised headlights (option)
8. Ignition switch
9. Rev counter/hour recorder/lower link position, not on 8950Hi.
10. Engine temperature gauge
11. Fuel gauge
12. Light switch
13. Switch for hazard warning flashers
14. Switch, rear working lights
15. Switch, front working lights
16. Warning ligh panel

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Driver's seat

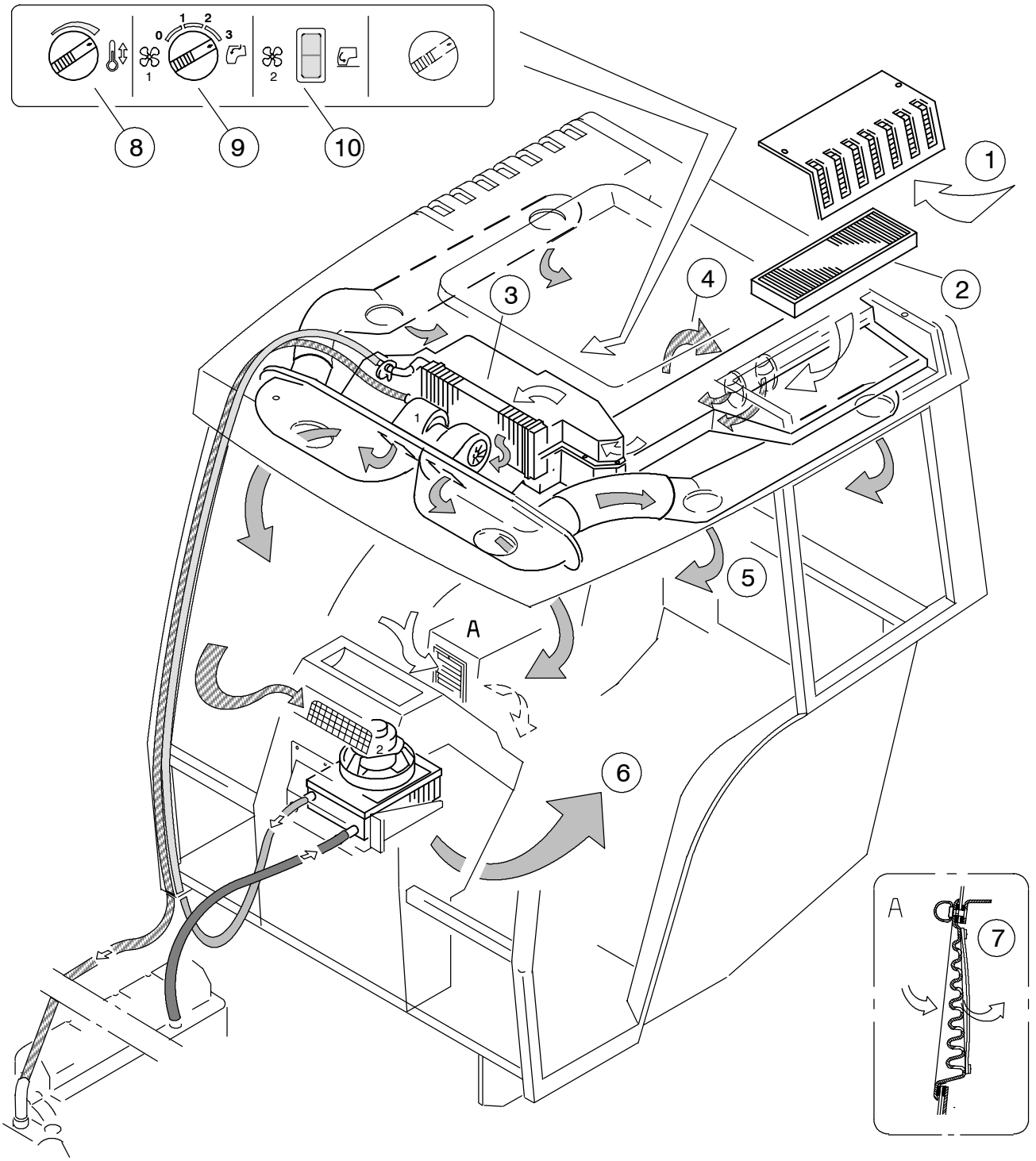


1. Lock for turning seat
2. Suspension
3. Seat back inclination
4. Adjustor forward/rearward
5. Lock for side inclination of the seat

Note! *Height adjustment by lifting the seat*

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Cabin heater



1. Air intake
2. Air filter (clean at intervals of 200 running hours)
3. Heater radiator
4. Re–circulation of air (can be closed when needed)
5. Warm air into the cab (nozzles can be turned 360˚)
6. Warm air for the lower part of the cab
7. Overpressure valve
8. Heating and ventilation control
9. Roof heater fan (3–speeds)
10. Floor heater fan

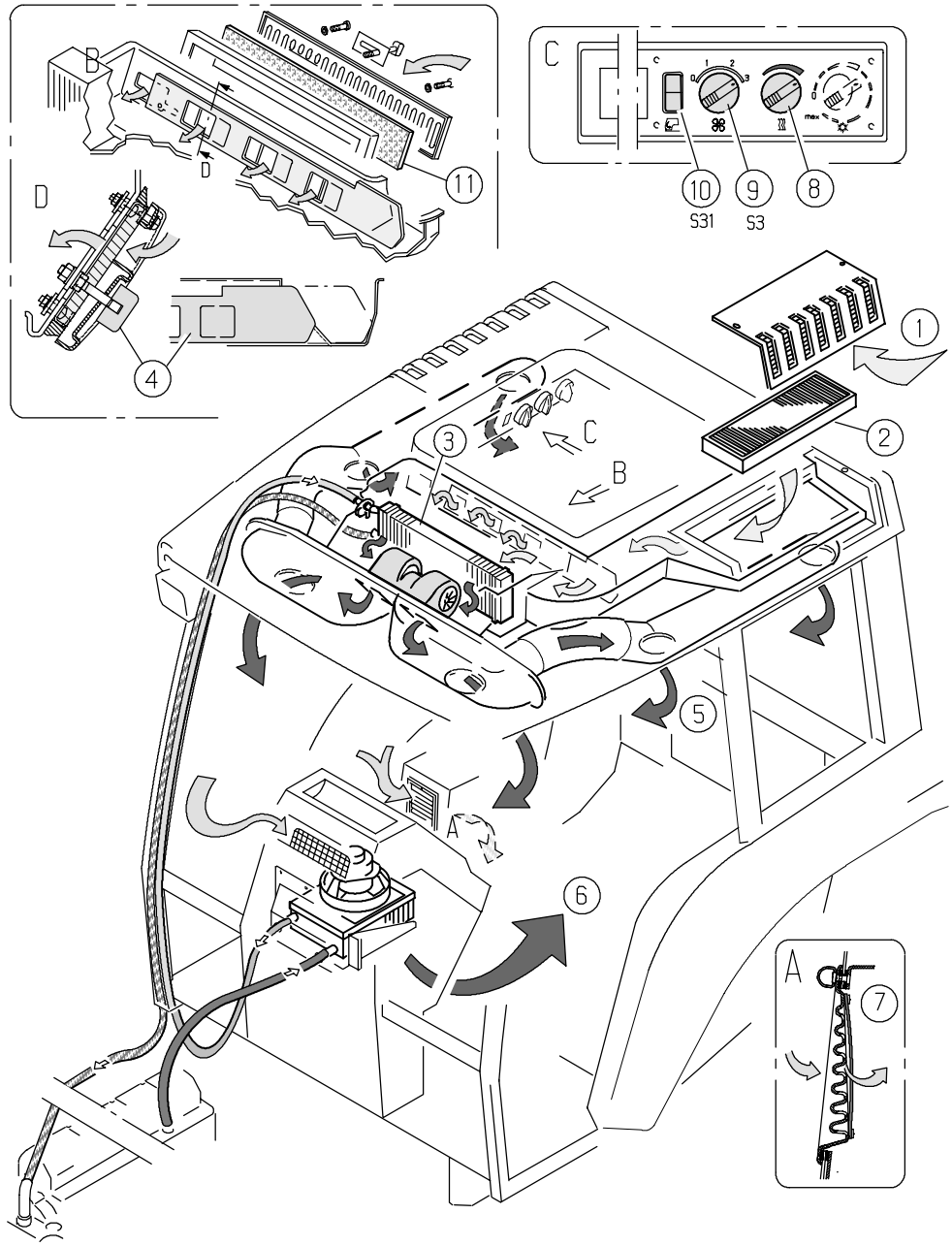
Note! The heater unit components on the roof are accessible after removing the upper roof plate. Detach the roof plate as follows:

– open the roof hatch and unscrew the screws on the edge of the hatch
– unscrew the screws on the rear and front edge of the roof (6 pcs)
– unscrew the front gutter plate screws
– remove the upper roof plate

Note! When fitting the roof plate, do not tighten the screws too hard because the roof plate material (glass fibre) could be damaged.

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Ventilation and heating system, cab PT/94



1. Air intake.
2. Cab air filter (cleaning at every 250 running hours).
3. Heater radiator. The radiator has been made wider in connection with modifications.
4. Recirculation valve

In the front part of the roof panel there is a steplessly adjustable air recirculation grille. When opening the grille, the outdoor air intake passage is closed at the same time (the passage is reduced to about 15 %).
When the grille is open (fully open when the knob is in the extreme position on the LH side) it is achieved:
– Faster cab heating.
– Greater heating capacity.
– Greater cooling effect if the air conditioner is fitted.

When the grille is closed (the knob on the RH side) it is achieved:
– Better removal of moisture and prevention of icing
– Greater pressurisation of the cab (reduced dust ingress)

5. Warm air into cab (nozzles can be turned 360˚)
6. From floor heater fan
7. Overpressure valve
8. Heater control knob
9. Roof fan (3–speed).
10. Floor heater fan switch (2–speed with effect from cab no. 2347).
11. Pre–filter is accessible after removing the grille. Wash the filter when necessary.

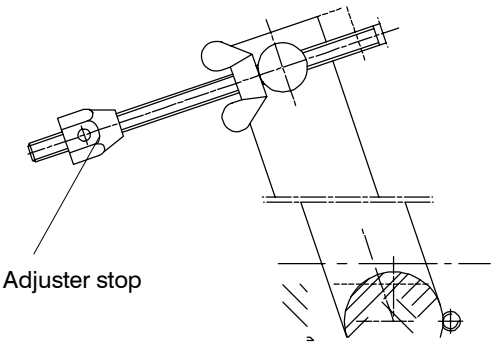
1. Removing and fitting cab

Note! If the garage has not enough lifting space, first remove the rear wheels. Then detach the auxiliary hydraulic valve block bracket on the gearbox (work through access hole on the mudguard). Then detach the quick–action couplings from their bracket and fasten valve blocks and pipes to the cab with wires. Now it is not necessary to lift the cab very much.

A. Removing cab

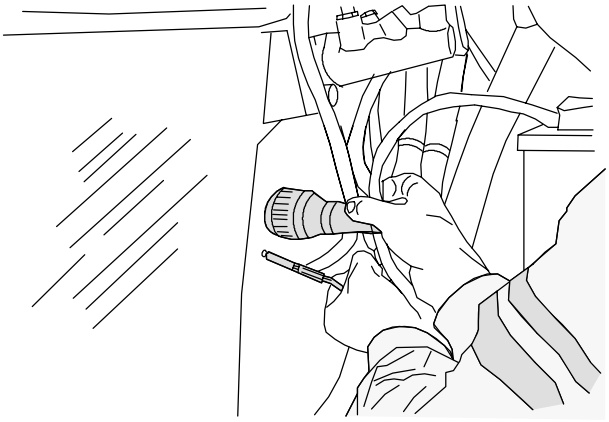
1. Remove the engine hood plates. Disconnect the battery cables.

2. Detach the following in front of the cab on the LH side:



– adjusting rod from the clutch lever (measure the position of the adjuster stop for easier fitting)
– stop control cable from the injection pump

3. Detach the following parts from the cab front wall:

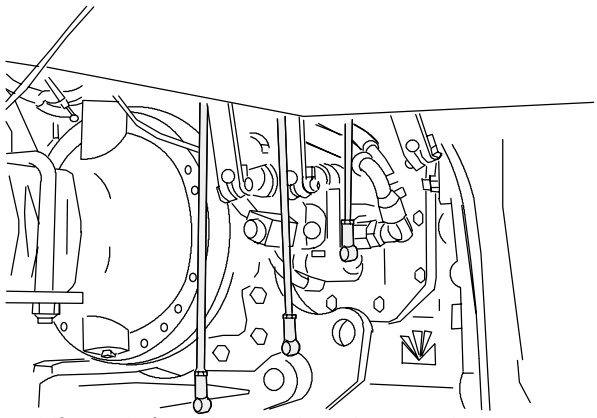


– socket and the accelerator pedal cable
– steering valve bracket screws
– cab earth cable

4. Disconnect the cable from the starter motor. Disconnect the windscreen washer hose and cable shoe.

4. Drain a little engine coolant through the motor block plug and disconnect the heater hose front ends from the engine.

5. Disconnect the following parts on the RH side:



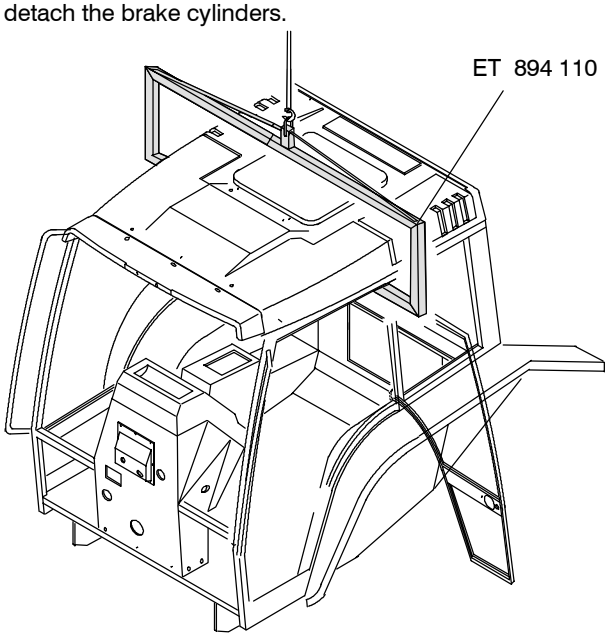
– shifter rods from the gear lever lower ends
– shifter cables from the selector levers and from the lower ends of the gear levers
– ground speed PTO cable from its selector lever (if fitted)
– solenoid valve leads from the control valve for the hydraulic lift

6. Disconnect the following parts at the rear of the tractor on the RH side:
– hydraulic lift sensor connectors
– PTO control cable lower end
– pick–up hitch release control lower end
– lifting link gear control rod lower end

7. Disconnect the following parts at the rear of the tractor on the LH side:
– solenoid valve lead connector
– sensor wires from the servo valve block

8. Unscrew the brake cylinder fixing screws and release the parking brake cable. Support the brake cylinders.

Note! The brake pipes can also be disconnected at the joint under the cab floor on the LH side. Now it is not necessary to detach the brake cylinders.



9. Unscrew the cab front and rear attaching bolts. Fit the tool ET 894 110 on the rear edge of the door opening and lift the cab carefully.

Note! Make sure that the auxiliary hydraulic valve levers do not prevent lifting. Remove, if necessary, the lever knobs.

B. Fitting cab

1. Lift the cab onto the tractor frame and guide all detached parts into places. Make sure that the auxiliary hydraulic valve levers fit through their hole.

2. Tighten the cab attaching bolts.

Connect the following parts in front of the cab on the LH side:

– stop control cable to the injection pump
– clutch adjusting rod to the clutch lever (fit the adjuster stop on the rod according to the measurement)

Connect the following parts to the cab front wall:

– socket and the accelerator pedal cable
– steering valve bracket
– cab earth lead

– connect the cable to the starter motor
– connect the windscreen washer hose and cable connector
– connect the cab heater hoses and fill the cooling system

Connect on the RH side of the tractor:

– shifter rods to the gear lever lower ends
– shifter cables to the selector levers and gear lever lower ends.
– ground speed PTO control cable wire (optional)
– solenoid valve leads to the control valve of the hydraulic lift

Connect at the rear of the tractor on the RH side:

– hydraulic lift sensor connectors
– PTO control cable lower end
– pick–up hitch release control lower end
– lifting link gear control rod lower end

Connect at the rear of the tractor on the LH side:

– connector for the solenoid valve leads
– sensor leads to the servo valve block

Fit at the rear of the tractor:
– brake cylinders (or brake pipe joints)
– parking brake cable

3. Connect the battery cables. Test run the tractor and ensure that the electrical system and the control levers function properly. Bleed, if necessary, the brake system and adjust the brakes.

4. Ensure that the accelerator pedal and stop control cables have been fitted correctly. Fit the engine hood plates.

Note! If you detached the cab in the way which needs less lifting space (see the note in the beginning of instruction A), carry out the following steps:

– attach the auxiliary hydraulic valve set bracket to the gearbox (work through the access hole).
– connect the quick–action couplings to the bracket at the rear of the tractor.
– fit the access hole cover and the rear wheels

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2. Glueing cab windows

The cab front windows and the door windows have been fastened with sealing compound (butyl) and plastic fasteners. In connection with possible repair work the windows are fitted as follows:

1. Clean the window contact surfaces from remaining sealant and glass. Remove possible grease spots with suitable solvent.

2. Before fastening the window, check that it fits into place. Ensure that there are not unevenesses on the contact surface (e.g. welding splashes etc).

3. Place butyl rubber band KH 3708 onto the window contact surface on the door or on the cab frame.

4. Position the window in place and fasten it with the plastic fasteners. Check that the glass is in the middle of the opening.

5. Varnish the butyl band with protective lacquer UF 3274 so that dust does not fasten on the sealant (not necessary if the tractor is not used in dusty conditions immediately after fitting the windows).

Note! Since in very warm conditions the side exhaust pipe can raise windscreen temperature near the max. allowable temperature of the butyl band (+80˚C), the butyl band raw material has been changed. Temperature resistance of the new material is +100˚C. In addition, the side movement of the windscreen has been prevented by filling the space between the windscreen upper part and the frame with silicone mass.

Order numbers:

– Butyl band (Ø 8 mm, 6 m, 80˚C) KH3708
– Butyl band (Ø 10 mm, 6 m, 100˚C) KH6343
– Silicone (300 ml) UK0067
– Silicone (80 ml) UK0068
– Cleaner (250 ml) 32637300

3. Changing rear window

1. Remove the damaged rear window. Remove the middle position locking device by removing the latch, latch pin and the spring (these parts were removed with effect from tractor ser. no. **658670**).

2. Check that the handle fits correctly against the window. Bend the handle, if needed, so that holes on the handle and the window are against each other. Check also that the handle fastening flanges are parallel with the glass surface. Fasten the handle and note the mounting order of the fastening parts.

3. Fit the window seal. Fit the window. Bend the hinges, if necessary, so that the window fits correctly in position.

4. Adjust counter piece 31607100 so that the glass closes with power of 15 kp which corresponds the seal compression of 2–4 mm in the middle of the seal in the lower edge. If there is not enough adjusting space, new M6 holes have to be drilled for counter piece screws HD 9153. Alternatively sheet iron screws HN 6646 can be used.

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– Maintenance 1
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Technical data

Important! These instructions present both the earlier air conditioner (refrigerant R12) and the later air conditioner which has refrigerant R134a (Suva). The compressor and the drier reservoir have markings stating which one of the refrigerants is in the system. If R12 refrigerant is replaced with R134a, see page **831**/**10**. Tractors which have the earlier air conditioner, the heater and air conditioner control panel is fitted on the front side of the cab roof. On the later air conditioner, the control panel is placed on the RH side of the cab roof.

Air conditioner on Valmet 6000–8750 tractors:

Refrigerant	R12 or R134a (SUVA)
– refrigerant filling in system	1,4 kg
Compressor Diesel Kiki DKS 15 CH:	
– Number of cylinders	6 pcs
– Cyl diam x stroke	ø 34 mm x 24 mm
– Max revs	7000 r/min
– Lubricating oil if refrigerant R12	Freol DS–83P or Esso 2980
– Lubricating oil if refrigerant R134a	ZXL 100 PG (DH–PS)
– Lubricating oil volume	200 cm^3 (2,0 dl)
Electro–magnetic clutch:	
– voltage	12 V (DC)
– starting torque	50 Nm
– power consumption	44 W (max)
– clutch clearance	0,3–0,6 mm
Drier	
– heat fuse melts at (not heat fuse if refrigerant R134a)	+107...+118˚C
Pressure switch switches off at max pressure, R12	2,55±0,2 MPa
Pressure switch switches off at max pressure, R134a	3,40±0,2 MPa
– switches on again when pressure drops	0,57±0,2 MPa
Pressure switch switches off at min pressure	190±20 kPa
– switches on again when pressure rises up to	200±30 kPa
Thermostatic switch:	
– switch off when evaporator temperature is below	+2...+3 ˚C
– switch on when evaporator temperature has risen up to (max cooling effect)	+6...+7 ˚C
– switch on when evaporator temperature has risen up to (min cooling effect)	about +19 ˚C
High and low pressures at engine revs 1500 r/min between temperatures +20...+25 ˚C:	
– low pressure	50–300 kPa
– high pressure	700–1400 kPa

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Operating principle

An air conditioner takes heat from the cab air when outdoor temperature is high. Refrigerant in the system is exposed under different pressures and temperatures and this causes a cooling effect. Refrigerant vaporizes in the evaporator and evaporation absorbs heat which is taken from the warm cab air which is blown through the evaporator.

The air conditioner functions so that the refrigerant is continuously circulated in the system at which time it changes from liquid form into gaseous form. This process absorbs heat from the cab when the refrigerant vaporises in the evaporator and emits heat to outdoors when refrigerant becomes condensed in the condenser.

Although the process has four parts, it can be divided into two main parts: high pressure side and low pressure side according to the figure below.

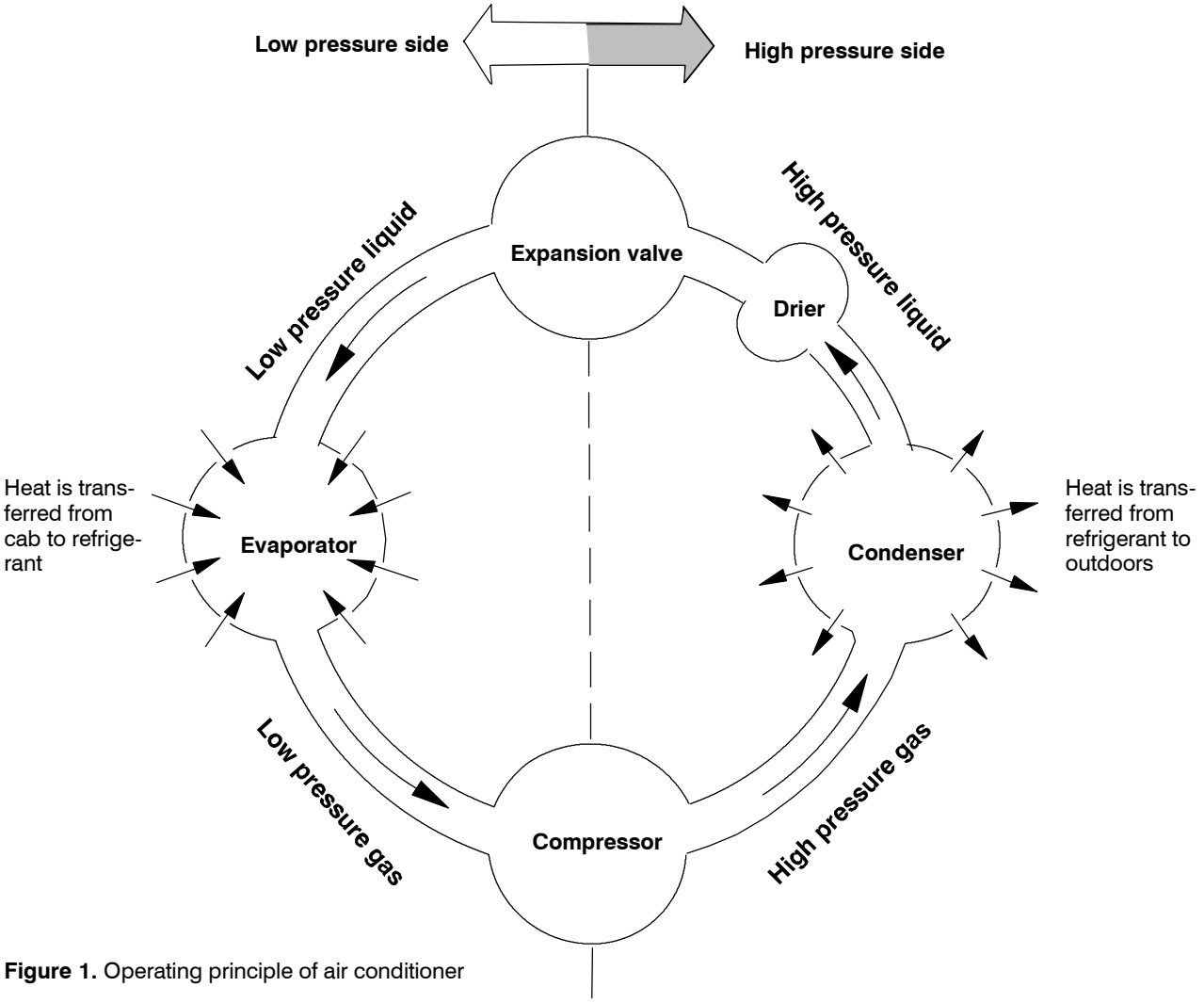
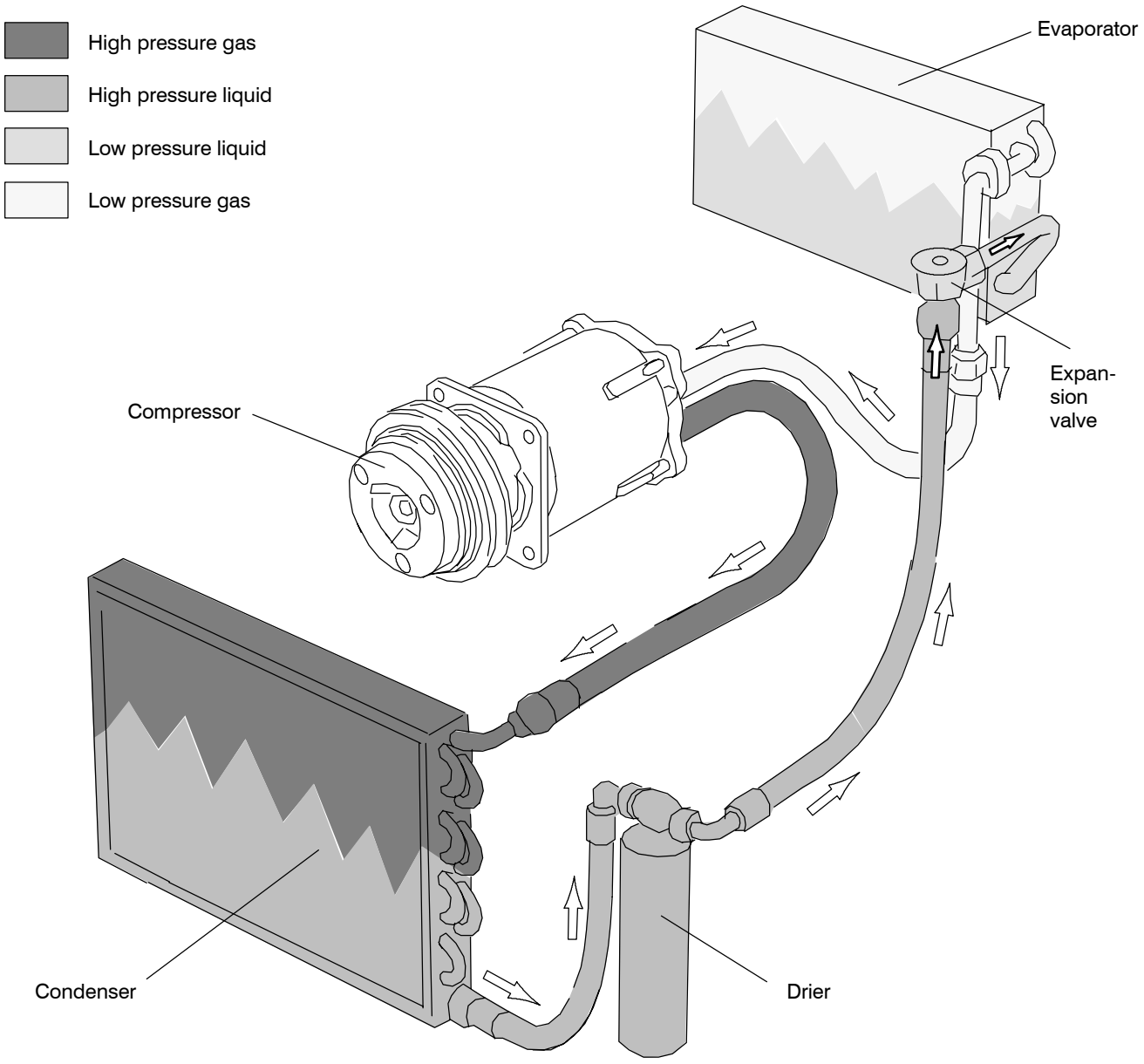


Figure 1. Operating principle of air conditioner

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Circulation of the refrigerant begins from the compressor. The compressor sucks low pressure gas from the evaporator and compresses high pressure gas into the condenser. In the condenser gaseous refrigerant becomes condensed and emits heat to outdoors. From the condenser high pressure liquid flows via a drier to the expansion valve in which a part of the liquid vaporizes and the refrigerant cools and its pressure drops. Liquid flows from the expansion valve into the evaporator where cab heat changes liquid into gas. This low pressure gas then flows into the compressor suction side from where a new circulation begins.

Max. cooling effect corresponds to the situation when the compressor works all the time. In order to achieve a certain cooling effect, the compressor has to keep a certain pressure in the evaporator outlet side.

An evaporation temperature of Freon R12 is −30˚C at normal air pressure. The corresponding value of the R134 is −26˚C. When pressure increases the evaporation temperature rises and vice versa.

When the air conditioner is operating the low pressure hoses are cold and high pressure hoses are warm.

Liquid refrigerant from the condenser is filtered and dried in the drier container. The drier also prevents gaseous freon from entering into the expansion valve. In the drier container there is a pressure switch which switches off current to the compressor if pressure in the high pressure circuit rises too high or becomes too low:

In addition, the drier has a heat fuse (not if refrigerant R134a) which melts at **107–118 ˚C** (corresponds pressure 3,4–3,8 MPa) and refrigerant blows off. The drier has two inspection glasses through which can be checked the refrigerant filling and moisture in the system (see page **831/2**).

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Earlier air conditioner which has the control panel fitted in the front part of the cab roof.

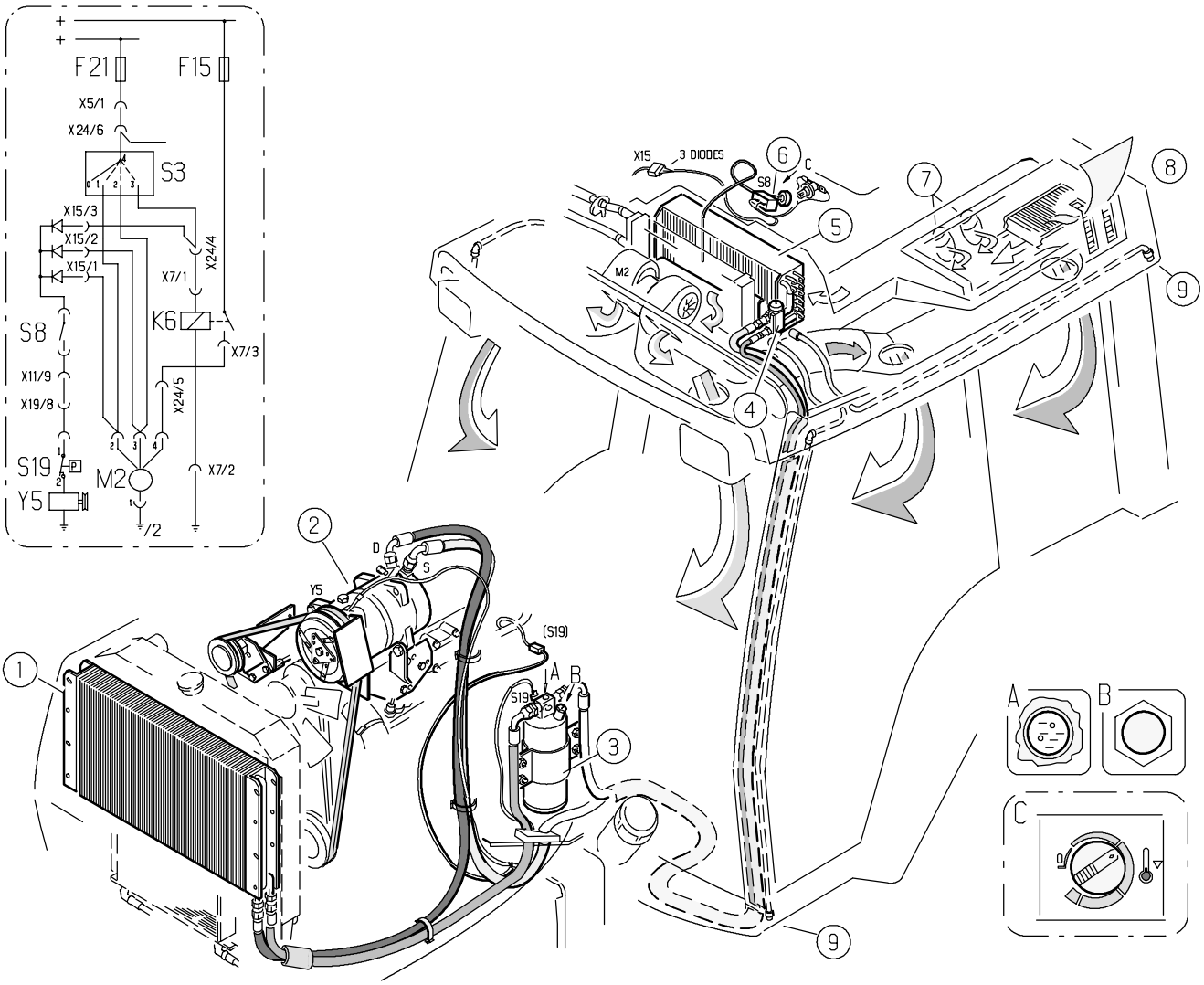


Figure 3. Air conditioner on Valmet 6100–8100 tractors.

1. Condenser
2. Compressor
3. Drier
A=Inspection glass
B=Moisture indicator
4. Expansion valve
5. Evaporator
6. Temperature switch
7. Re–circulation nozzles
8. Air inlet into cab
9. There are valves in the outlet pipes for condensing water. The valves prevent air from entering into the evaporator housing. Water becomes condensed in the housing when the warm cab air flows through the cold evaporator.

Wiring diagram:
F21 = Air conditioner fuse
F15 = Fan fuse
S3 = Fan switch
S8 = Temperature switch
S19 = Pressure switch
Y5 = Electromagnetic clutch
M2 = Fan
K6 = Relay, max speed III of fan

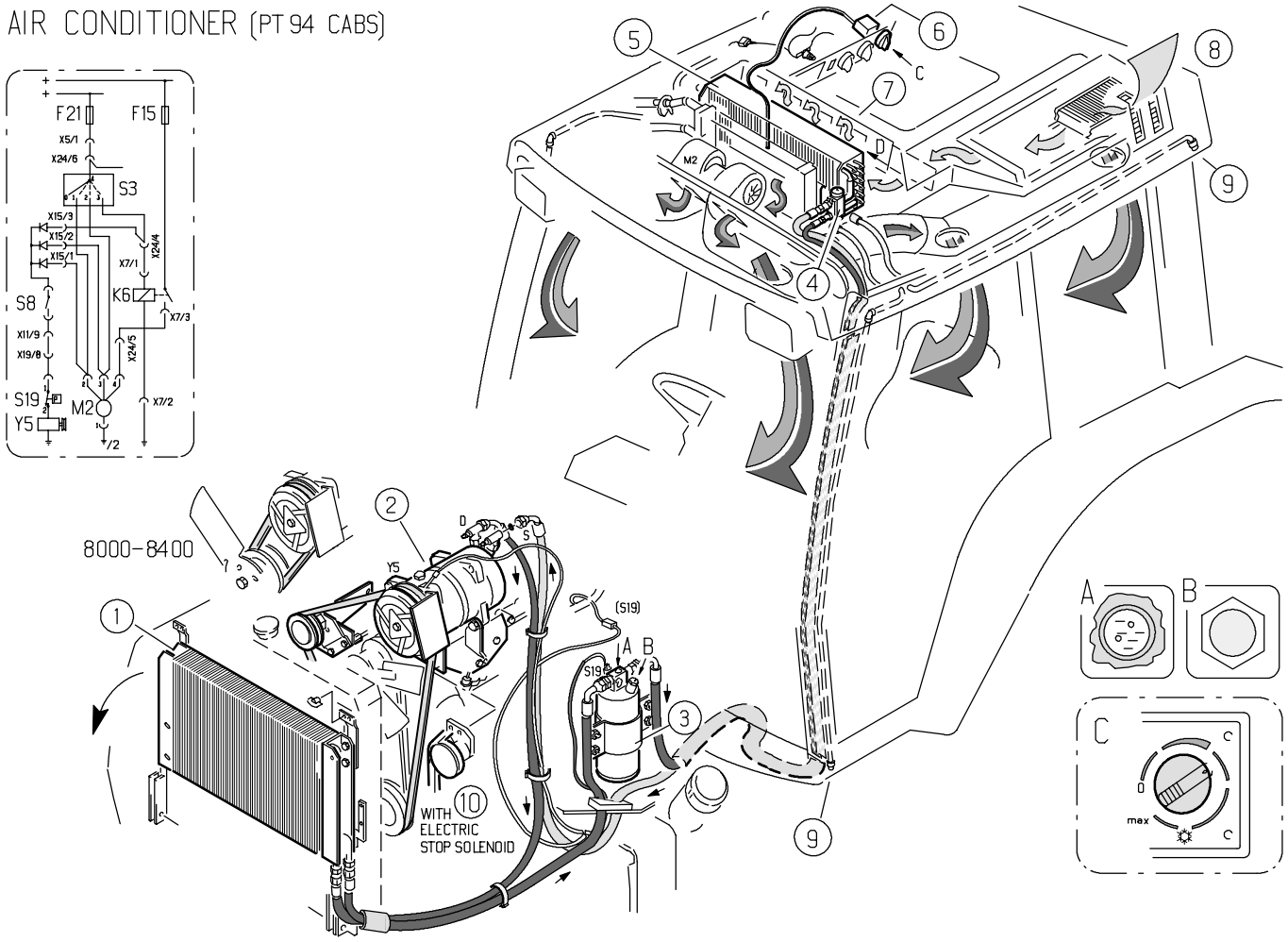
Compressor (2) is driven by an extra belt pulley at the front end of the crankshaft. The compressor belt pulley is fitted with an electromagnetic clutch, which switches the compressor off and on according to the required cooling effect. The compressor is shown on page 831/9.

The expansion valve (4) regulates the amount of refrigerant in the evaporator (5) so that the refrigerant vaporizes in the best possible way. The expansion valve lets only as much refrigerant flow into the evaporator as the evaporator can vaporize. The expansion valve is shown on the next page.

Temperature switch sensor (6) (capillary tube) is pushed between the evaporator fins and it senses evaporator temperature in its coldest place. The sensor switches off the compressor when the evaporator temperature drops below +2...+3°C (prevents icing on the evaporator), and switches on again when the evaporator temperature has risen over +6...+7°C (or up to +19°C when the temperature switch is in min position).

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Later air conditioner (ECOND) which has the control panel fitted on the RH side of the cab roof. Refrigerant R134a.



Picture 4. The following modifications have been made:

1. The condenser has more cooling area. The front covering is openable and the condenser has hinges in the lower edge for easier cleaning.
2. New compressor which has new oil type and new service valves. Compressor seal material is different. The compressor type plate is marked with the new refrigerant R134a.
3. New drier reservoir with new synthetic drying material. The drier has not a heat fuse. The drier reservoir type plate is marked with new refrigerant type. On the latest tractors the drier reservoir is fitted in front of the engine radiator.
4. Expansion valve has different adjusting values
5. Larger evaporator
6. Air conditioner switch is placed on the roof console on the RH side of the roof.
7. Recirculation grille with an adjustable valve.
8. Cab air filter
9. Condension water draining pipes
10. An additional belt pulley, if the tractor has the electric stop solenoid on the fuel injection pump.

All rubber pipes and seals are of different material.

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Expansion valve

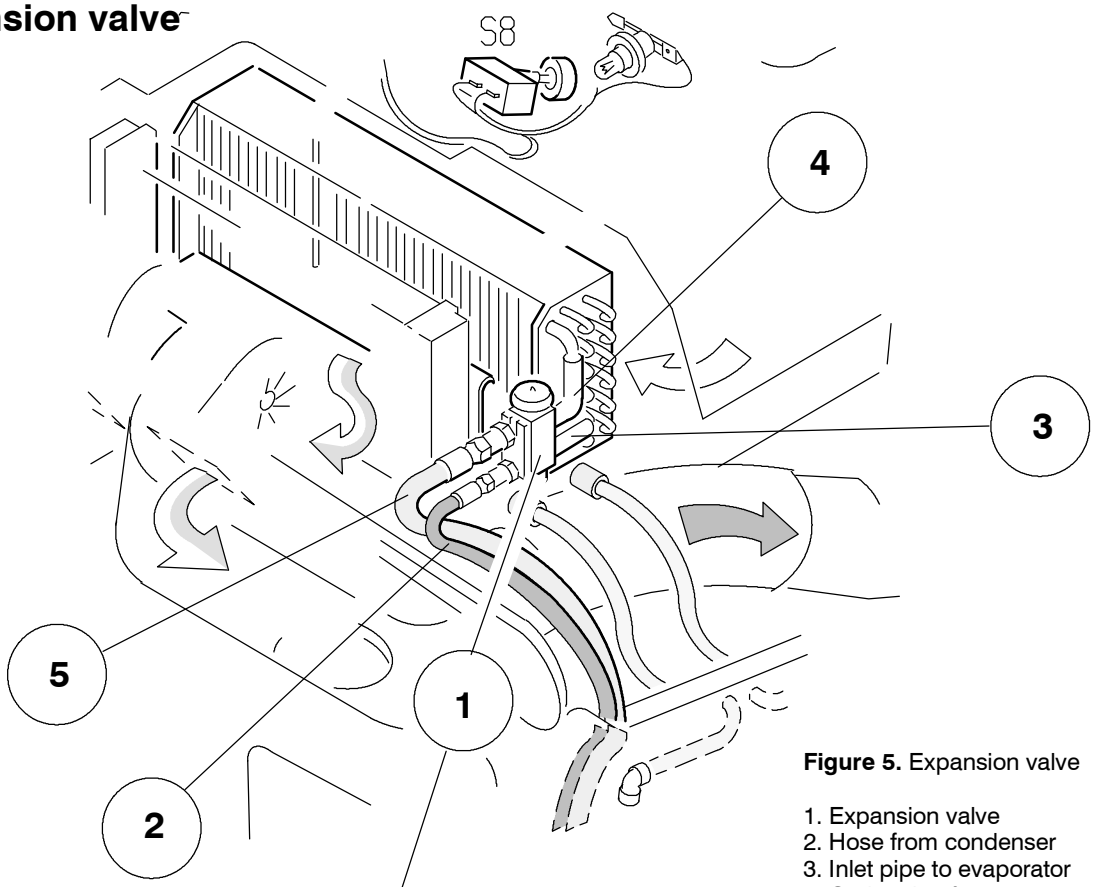
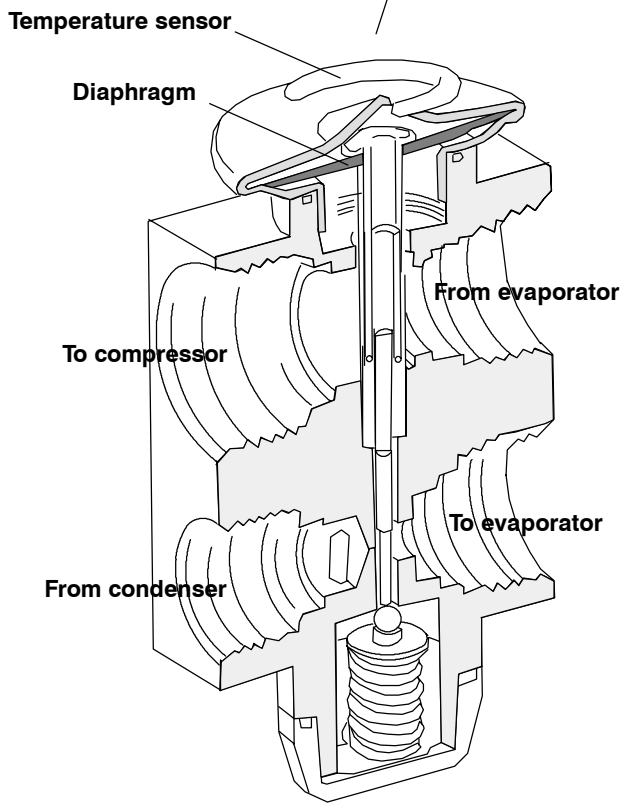


Figure 5. Expansion valve

1. Expansion valve
2. Hose from condenser
3. Inlet pipe to evaporator
4. Outlet pipe from evaporator
5. Hose to compressor suction side



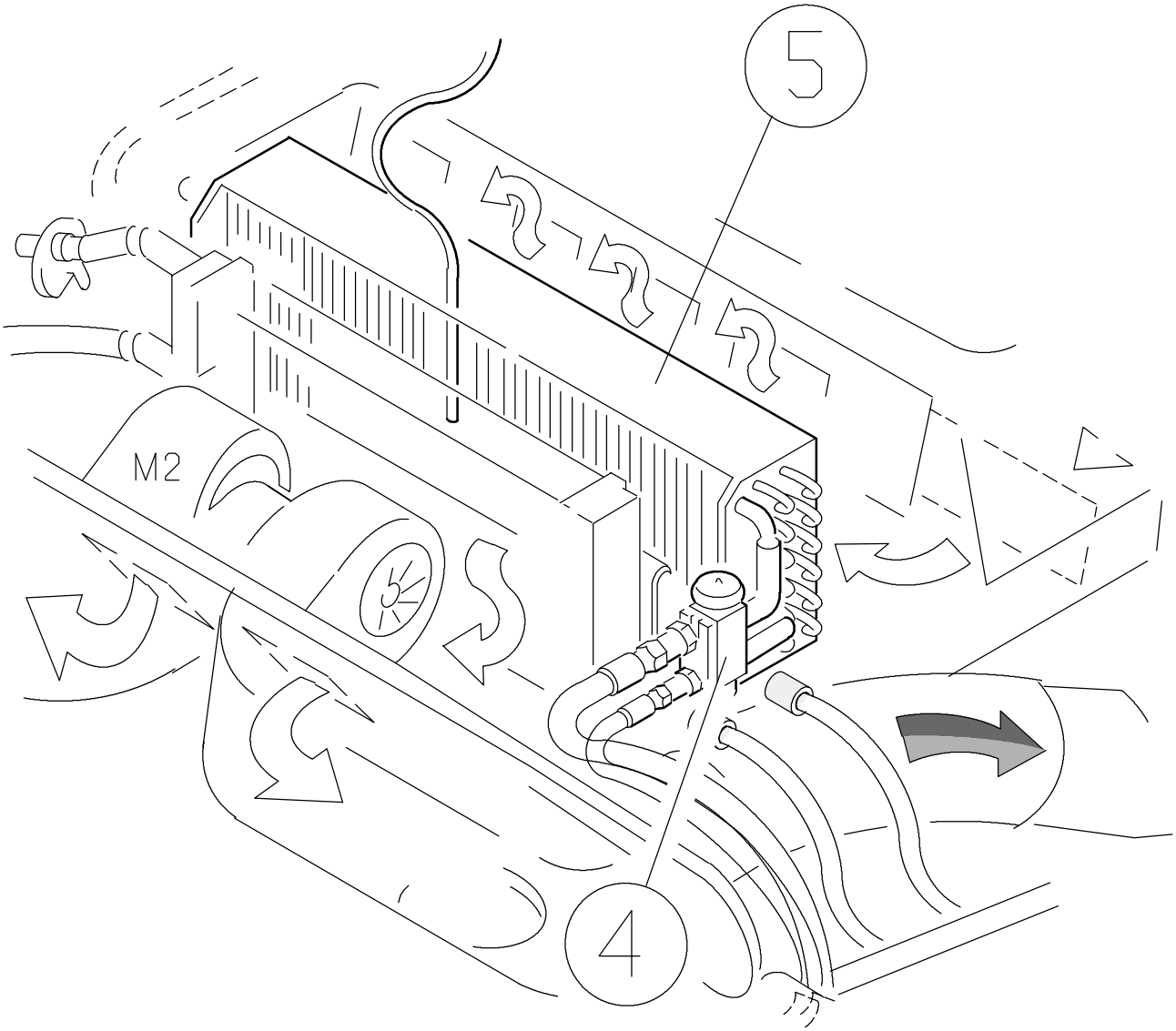
When the compressor starts pressure drops in the evaporator and the diaphragm pushes the pin downwards and the ball opens. Refrigerant can now flow via the spring housing into the evaporator

When the temperature in the evaporator outlet pipe lowers, the temperature sensor pulls the diaphragm upwards and the valve ball closes preventing refrigerant from flowing into the evaporator.

In this way the expansion valve regulates all the time the amount of refrigerant in the evaporator.

On the later air conditioner, the expansion valve functions in a similar way.

Note! The expansion valve and the metal pipes have been covered with insulating mass 30794000.



Picture 6. The new air conditioner

4. Expansion valve
5. Evaporator. At the rear of the evaporator there is the recirculation grille.

Maintenance, fault tracing and repairs

Safety precautions

Important! If the air conditioner system must be opened, this work must be done by an expert who knows refrigerating systems.

– The pressure of the refrigerant is always greater than its normal boiling point. If piping is split, the refrigerant will evaporate or boil very rapidly.

–Uncontrolled escape of refrigerant must be avoided. The refrigerants Freon 12 and R134a are non–flammable, non–toxic (except when in contact with a flame) and non–corrosive (except in contact with water).

– Never attempt to empty the system by loosening a connection. Slow emptying without danger can only be carried out using a manifold gauge set.

– You should be very careful when handling refrigerant. It can freeze the skin or the eyes on direct contact. Never handle refrigerant without wearing safety goggles, as well as gloves.

– Do not empty the system in a room where there is a flame. Decomposition of R12 gives **phosgene gas which is deadly**. The same precautions must be taken if you are looking for leaks. Refrigerant R134a and open flame form poisonous and stimulating compounds (e.g. hydrofluoric acid)

– Never weld or clean with steam near a filled system: excess pressure may be created with possible leakage.

– If it is necessary to retighten a connection, use two spanners for tightening, so as to prevent distortion which may give rise to leakage.

– Do not store refrigerant in the sun or close to a source of heat.

– Avoid subjecting the bottle to impact. Do not carry the bottle in the passenger compartment of a vehicle.

In the event of an accident, proceed as follows:

– If you get refrigerant in your eyes, wash them carefully with a solution of mineral oil, and continue to wash them carefully, with a solution of boric acid and water (1 teaspoonful of acid, diluted in a quarter of a cup of water). Contact a doctor immediately.

Important! Never wash you eyes with pure water because refrigerant+water causes corrosive acid.

– Freezing caused by liquid refrigerant can be treated by progressively thawing the injured area with cold water and then applying a dry skin cream. Contact a doctor immediately.

Maintenance

– Before switching on the air conditioner, ensure that windows and doors are properly closed. If for any reason the cab cannot be completely closed, the air recycling system must be switched off. If these recommendations are not observed, there is a risk of blockage at the evaporator and risk of damage to the compressor.

– Check externally the drier, condenser and hoses (if the evaporator or expansion valve for any reason should be checked, the cab roof and the evaporator housing cover must be removed). All impurities (and ice on evaporator) cause malfunctions. Check also occasionally the tightness of the compressor belts.

– Check regularly through the drier inspection glasses moisture and refrigerant filling in the system (see next page).

– Always when the system has leaked and it has been opened and specially if brown or yellow colour can be seen in the drier inspection glass or if the moisture indicator has changed its colour, the drier should be changed. Also if the heat fuse has melted (not heat fuse if refrigerant R134a), the drier must be changed.

– From the bottom of the evaporator housing there are drawn three drain hoses through which the condensing water flows away from the housing. This prevents icing on the evaporator.

– In order to keep the system in good condition, we recommend to operate the system for several minutes each month in order to lubricate all the components, since the compressor oil can get mixed with the refrigerant.

– When restarting the compressor, specially if it has not operated for some time, proceed in the following manner to ensure lubrication right from the first rotations of the compressor:

. Switch on the electromagnetic clutch by switching the fan on and moving the temperature switch to cold.
. Crank over the tractor engine for a few seconds with the fuel stop button out.
. Then push in the fuel stop button, start the engine and allow to idle slowly for several minutes.

A simple functional check:

a) Start the engine and adjust engine revs to **1500 r/min**. Turn the fan switch to max speed and select the max cooling effect with the temperature switch (compressor starts).

b) Check temperature of different components:

– Low pressure hoses, compressor inlet hose should be cold when touched by hand.

– Compressor outlet hose, condenser, drier and every high pressure hose should be warm when touched by hand

Note! Expansion valve and evaporator are accessible only after removing the cab roof. The thermostatic temperature switch is accessible after removing the roof panel in the cab.

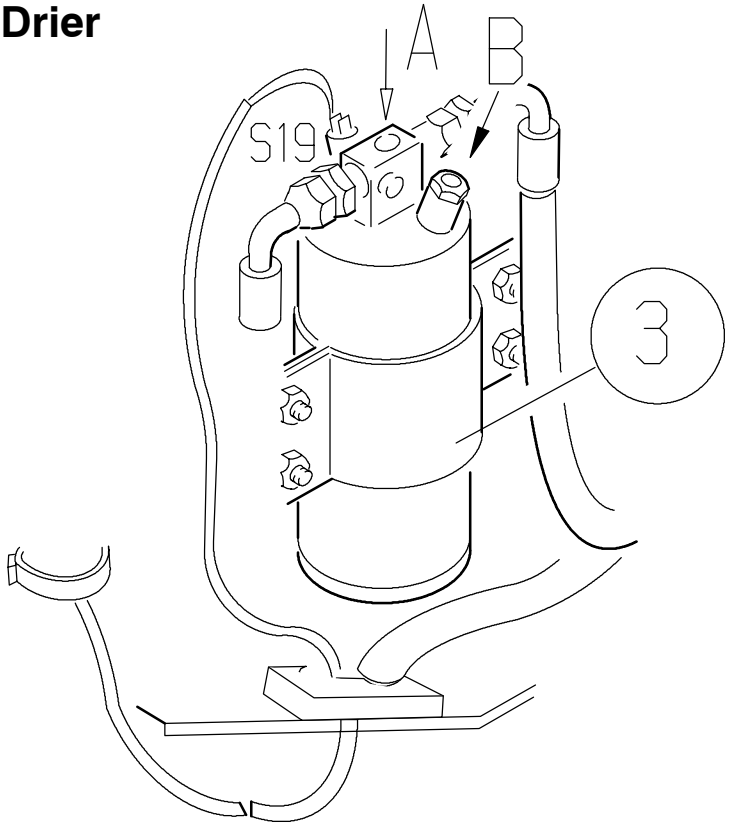
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Possible faults can be localized easily if pressure gauges are connected to the compressor service valves. The low pressure gauge is connected to valve S and the high pressure gauge to valve D. For instruction on how to carry out these pressure measurements, see page **831/5**.

Note! If You have not got enough training for repairing refrigerating systems, it is necessary to call an expert if the system should be opened or if refrigerant must be added. The refrigerating system expert has equipment with which repair work can be done in a correct and safe way.

.

Drier



The drier reservoir (3) is a combined expansion/liquid reservoir and a drying filter for moisture. The drier also includes a filter which filters impurities in the system. There are two inspection glasses on the drier: A=inspection of refrigerant and its filling, B=moisture indicator.

The drier reservoir must not be stored with pipe connections open. **The drier must be changed if the system has been opened for maintenance work**. There is a pressure switch S19 which switches off current to compressor, if the high pressure rises too much or is too low. There is also an in–built heat fuse which melts if refrigerant temperature rises up to 107–118˚C (not heat fuse if refrigerant R134a).

Inspection glass A (1500 r/min and max cooling effect)

Sightglass	Description	Conclusion and remarks
	No bubbles appear at all. (Reduction by bleeding is necessary). (This can also mean that there is no refrigerant at all in the system).	POSSIBLE EXCESSIVE REFRIGERANT The high–pressure side will be abnormally hot. REMEDY: Contact authorized workshop for releasing the excess refrigerant
	The fluid inside is almost transparent. A few bubbles may appear as the engine speeds up and down.	SUFFICIENT REFRIGERANT. The high–pressure side will be hot and the low–pressure side cold.
	A few bubbles appear intermittenly, at intervals of 1 to 2 seconds. (Refilling is necessary)	INSUFFICIENT REFRIGERANT. The high–pressure side will be warm, and the low–pressure side fairly cold. REMEDY: Check for refrigerant leakage. Contact authorized workshop.
	When bubbles flow continuously, or the flow has changed to a ”mist” flow, the refrigerant is almost exhausted . (Refilling is necessary)	VERY LITTLE REFRIGERANT. There will be almost no difference in temperature between the high–pressure side and the low–pressure side. REMEDY: Stop the compressor and inspect the entire system. When necessary, contact authorized workshop.

N.B. The refrigerant in the inspection glass should be clear. If it has brown/yellowish colour, the refrigerant and the drier must be changed.

Inspection glass B

If the moisture indicator colour is blue, the system is in order. If its colour has changed into pink or grey, the drier and the refrigerant should be changed.

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1. Fault tracing without special equipment

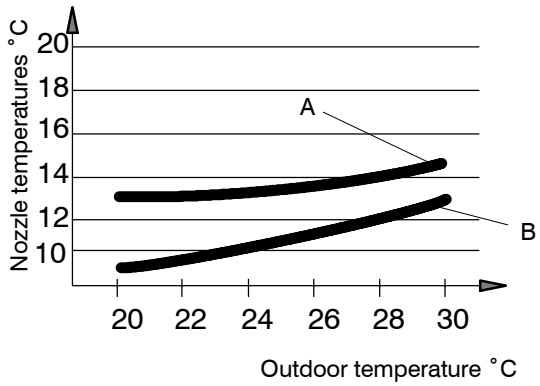
Note! This instruction supposes that the outdoor temperature is high enough so that the temperature switch switches on the compressor.

A. Correct function

When the air conditioner is functioning properly the compressor runs and stops at regular intervals and cool air flows into the cab according to the position of the temperature switch.

To check for malfunction, carry out the following simple test in the shadow by fitting a thermometer sensor into the front ventilation nozzle on the LH side and by following nozzle temperatures during 5–10 minutes. During this test the windows, doors and re–circulation nozzles should be closed. Select the max speed for the fan. Adjust the max cooling effect and set the engine revs to 1500 RPM.

Nozzle temperatures should be according to the curves below (±1,0˚C). Curve A is for the earlier air conditioner and curve B for the later air conditioner which has the roof console on the RH side of the roof:



If measured temperatures agree with the curve above, the air conditioner is in order.

If the nozzle temperatures are higher, make sure that the heater control knob is closed so that the warm engine coolant does not circulate in the heating element which is placed in front of the evaporator. If the knob is closed, see the following instruction B.

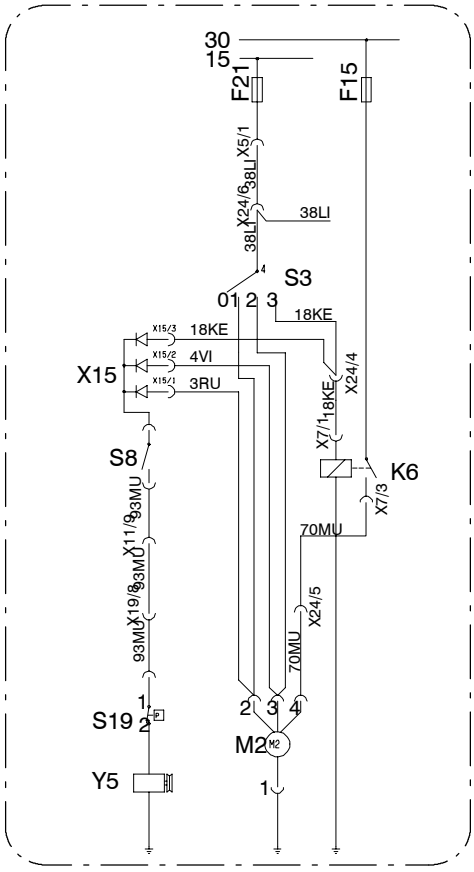
B. Refrigerant filling and moisture

– Check the amount of refrigerant and moisture in the system through the drier inspection glasses (see page **831/2**).

Moisture in the system causes icing in the expansion valve and in the compressor which in turn causes malfunctions. Refrigerant+water causes a corrosive compound.

Possible leakages can be found with an electronic leak detector. If the refrigerant filling is wrong or there is moisture in the system, contact an expert who knows refrigerating systems. If everything is OK, see the following instruction C.

C. Electric system



Switch on current to the tractor and turn on the fan S3. If the fan does not start, check fuse F21. If the fan started, turn the temperature switch S8 to max cooling effect at which time the click–sound must be heard from the compressor magnetic clutch. This indicates that the electric system functions.

If the click–sound was not heard, disconnect the wires to the pressure switch S19 and connect the wire ends (never connect the + wire to the frame). If the click can now be heard in the compressor, the electric system is OK, but the fault lies in the pressure switch or in the system pressures. Call an expert.

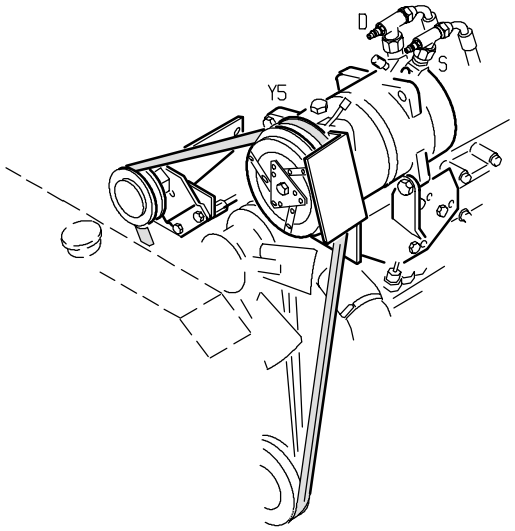
If the click–sound cannot be heard when connecting the pressure switch wires, check the supply wire for current to the pressure switch. If it is there, the fault lies in the compressor magnetic clutch or in its wiring.

Measure the voltage from the pressure switch supply wire with different fan speeds. If there is no current with some fan speed, the fault lies in diodes, which should be changed. The diodes cannot be changed separately but the complete wiring set no 326 107 00 (earlier air conditioner) or no 328 351 00 (later air conditioner) should be changed.

If there is no current to the pressure switch wire, check connector X19/8 in the cab front wall on the RH side and also connector X11/9 which is placed behind the roof panel in the cab (on the RH side).

If there is no current to the pressure switch wire, connect the temperature switch wire ends. If now there is current to the pressure switch supply wire, the fault lies in the temperature switch which should be changed.

D. Compressor



1. Normal function

– When the compressor is functioning properly, it starts and stops regularly. With max cooling effect the compressor runs often but not as long as in min cooling. Unusual sound must not be heard from the compressor. Check the compressor belts regularly.

2. Continuing running, no cooling

– The compressor is faulty and should be changed. Also icing caused by moisture can cause this kind of malfunction (check the moisture indicator colour). In this case also temperature difference between high and low pressure pipes is diminutive.

3. Continuing running, max cooling

– The compressor is in order but a fault lies in the temperature switch which does not switch off current to the compressor when the evaporator temperature is under +2...+3 °C. Make sure that the temperature switch sensor is correctly fitted between the evaporator fins. This malfunction causes icing on the evaporator which lowers the cooling effect.

4. Irregular running

– Check the compressor belt tightness.
– Change for faulty compressor

5. Unusual sound

Compressor engaged:
– Check the compressor attachment.
– Electromagnetic clutch slips, faulty bearings or valves in the compressor can cause an unusual sound.
– Wrong refrigerant filling in the system can cause unusual sound.
– Change faulty compressor

Compressor disengaged:
– electromagnetic clutch clearance is wrongly adjusted.

Note! If the compressor front end is oily and moist, the compressor shaft seal can be leaking. If the compressor does not run at all, the fault is in the electrical system.

E. Expansion valve

Note! The expansion valve is accessible after removing the cab roof and the evaporator housing cover. In addition, the evaporator is covered by insulating mass.

– A faulty expansion valve causes a poor cooling effect.

– If the expansion valve is noisy (continuing whistle), there is too little refrigerant in the system which causes bubbles to appear in the inspection glass of the drier.

– If the expansion valve does not function (stuck fast or frozen in open or closed position) the cooling effect is insufficient.

– If the air conditioner blows first cool air, then warm and then again cool, there is ice in the expansion valve which prevents refrigerant from flowing into the evaporator.

F. Evaporator

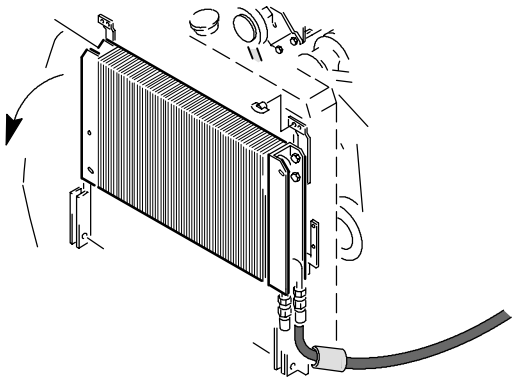
Note! The evaporator is accessible after removing the cab roof and the evaporator housing cover.

– If there is icing on the evaporator, the fault lies in the temperature switch or its sensor is wrongly positioned between the evaporator fins.

Note! Do not use the air conditioner if the outdoor temperature is below **+20 °C.**

– Make sure that the drain pipes for the condensing water are open i.e. water can flow away from the evaporator housing bottom. Otherwise icing can appear on the evaporator. If there is water on the evaporator housing bottom, the drain pipes should be checked e.g. with compressed air.

G. Condenser



– If malfunctions occur, always check and clean externally the condenser from impurities. Cleaning can be carried out with compressed air. In the later air conditioners, the tractor front covering can be raised up and the condenser has hinges for easier cleaning.

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2. Trouble shooting with pressure gauges

System pressures depend directly on air pressure and temperature. At outdoor temperature **20˚–25˚C** and at engine revs **1500 r/min** the low pressure varies between **50–300 kPa** and the high pressure between **700–1400 kPa**. The pressure gauges are connected to the compressor service valves: low pressure gauge to (S) and high pressure gauge to (D). The service valves are different on the air conditioners which have refrigerant R134a thus preventing mischarging with freon R12.

Fault analysis and symptoms

a) Leaks in the system will lead to inadequate cooling and low and high gauge readings will be too low.

b) If the system is under–charged, bubbles will be permanently visible in the dehydrator sight glass and both gauge readings will be low.

c) If the evaporator is dirty or an expansion valve is blocked or frozen up, there will be a partial vacuum on the low pressure side and insufficient pressure on the high pressure side.

d) An over–charged system, an expansion valve stuck open or a clogged condenser will cause excessive pressure on the low pressure side.

e) A clogged condenser and an over–charged system will cause excessive pressure on the high pressure side.

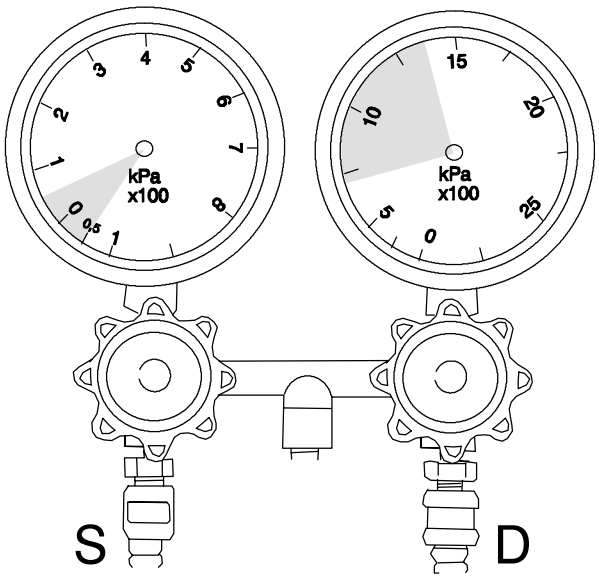
Overcharge

Note! The correct refrigerant filling is **1,4 kg** on Valmet 6000–8750 tractors.

In a correctly charged system, R12 discharged from the compressor in the form of gas looses its excess heat, resulting from compression in the first coil of the condenser and condenses to a liquid in the subsequent coils. Before flowing to the reservoir, this liquid is held in the last condenser coil. If the system is over–charged, the liquid level builds up in the condenser, leaving fewer coils available to condense the gas. Both temperature and pressure then build up, causing hoses to burst in some cases.

Connecting pressure gauges:	Stop the engine. Remove the service valve protective caps. Connect the low pressure gauge to valve S and high pressure gauge to valve D.
Disconnecting gauges:	Stop the engine. Unscrew rapidly the low pressure gauge. Run the air conditioner 5–10 min and stop the engine. Unscrew rapidly the high pressure gauge. **Note!** Refrigerant in the gauge hoses blows off. Use gloves and goggles when connecting and disconnecting gauges. Recap valves.

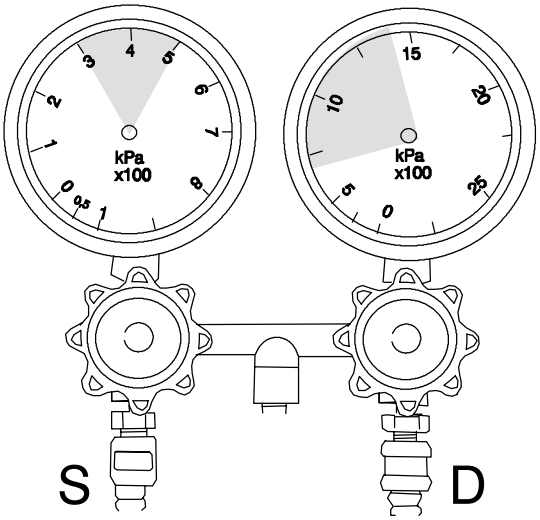
Low pressure too low **High pressure normal**



Possible fault	Remedy
1. Expansion valve faulty.	1. Change expansion valve.
2. Moisture in system causing icing in expansion valve	2. Empty and flush the system. Change the drier and the expansion valve if necessary.
3. Expansion valve is clogged or evaporator dirty, if low pressure gauge shows underpressure.	3. Empty system and change the expansion valve and also the evaporator and drier if necessary.
4. Drier blocked (temperature difference on different sides of blockage causes icing in the drier when air conditioner is functioning).	4. Empty system and change the drier.

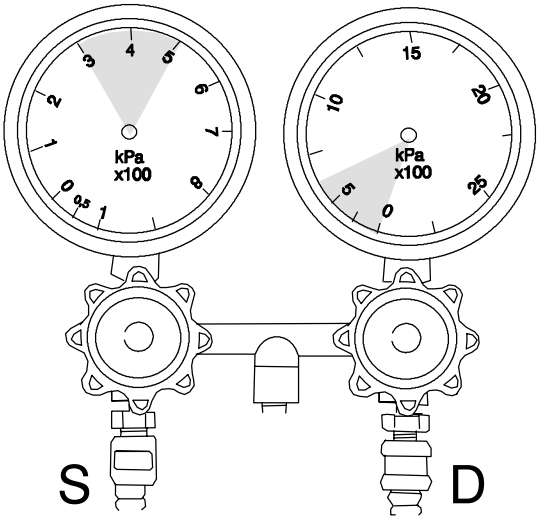
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Low pressure high High pressure normal



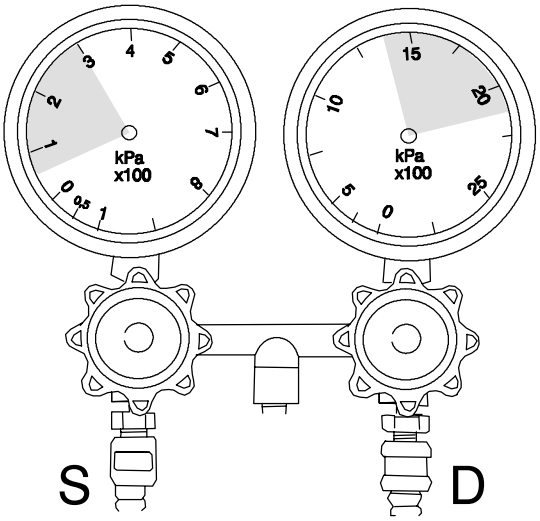
Possible fault	Remedy
1. Expansion valve faulty. Valve stuck fast in open position.	1. Empty system and change expansion valve.
2. Compressor faulty or its belt slackened.	2. Check compressor belt. Change damaged compressor.
3. Too little refrigerant in system.	3. Empty and refill the system with refrigerant (1,4 kg).

Low pressure high High pressure low



Possible fault	Remedy
1. Valves or seals in compressor faulty.	1. Change compressor.
2. Too little refrigerant causes the high pressure reading to be too low.	2. Empty and refill the system with correct amount of refrigerant (1,4 kg).

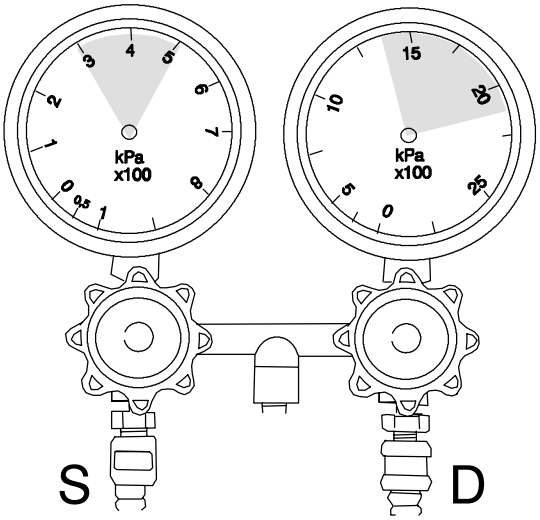
Low pressure normal High pressure high



Possible fault	Remedy
1. Air in system or too much refrigerant in system.	1. Empty system and refill with refrigerant (1,4 kg).
2. Condenser dirty (insects etc)	2. Clean the condenser.
3. If bubbles appear in inspection glass fast filling is OK, the drier hose connections have been connected faulty and refrigerant flows in reverse direction.	3. Empty system and change hose connections. Change the drier. Refill system (1,4 kg).
4. If there is bubbles and icing in the drier, there is restriction in the drier inlet side.	4. Empty system and remove blockage and fit a new drier. Refill system (1,4 kg).

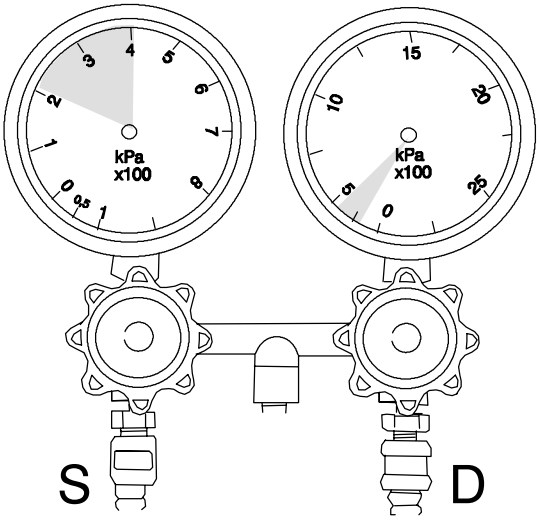
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Low pressure high **High pressure high**



Possible fault	Remedy
1. Condenser is dirty (insects etc.)	1. Clean condenser
2. Too much refrigerant in system.	2. Empty and refill system with refrigerant (1,4 kg).

Both gauges show same pressure



Possible fault	Remedy
1. Compressor magnetic clutch does not function.	1. Change compressor
2. Compressor is faulty	2. Change compressor
3. Electric system faulty (temperature switch, pressure switch, fuse etc.)	3. Check electrical system (see page 831/3 instr. C).

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Important information on air conditioner repairs and spare part storage

Note! Moisture is the worst enemy of any air conditioner.

1. Keep all spare parts sealed and store in a dry place.

2. Immediately make all connections air tight when interrupting the refrigerant circuit.

3. Before installation purge refrigerant hoses with nitrogen or refrigerant.

4. When installing parts, do not remove plugs until shortly before assembly. This is especially important for the drier. A drier, which is not sealed, quickly becomes saturated and cannot be used.

5. Do not pump refrigerant from the air conditioner back into the cylinder.

6. Always keep empty refrigerant cylinders closed.

7. Only buy refrigerant from specialized dealers.

8. Do not carry out repairs outdoors in damp weather.

9. Always replace drier receiver after interrupting the refrigerant circuit.

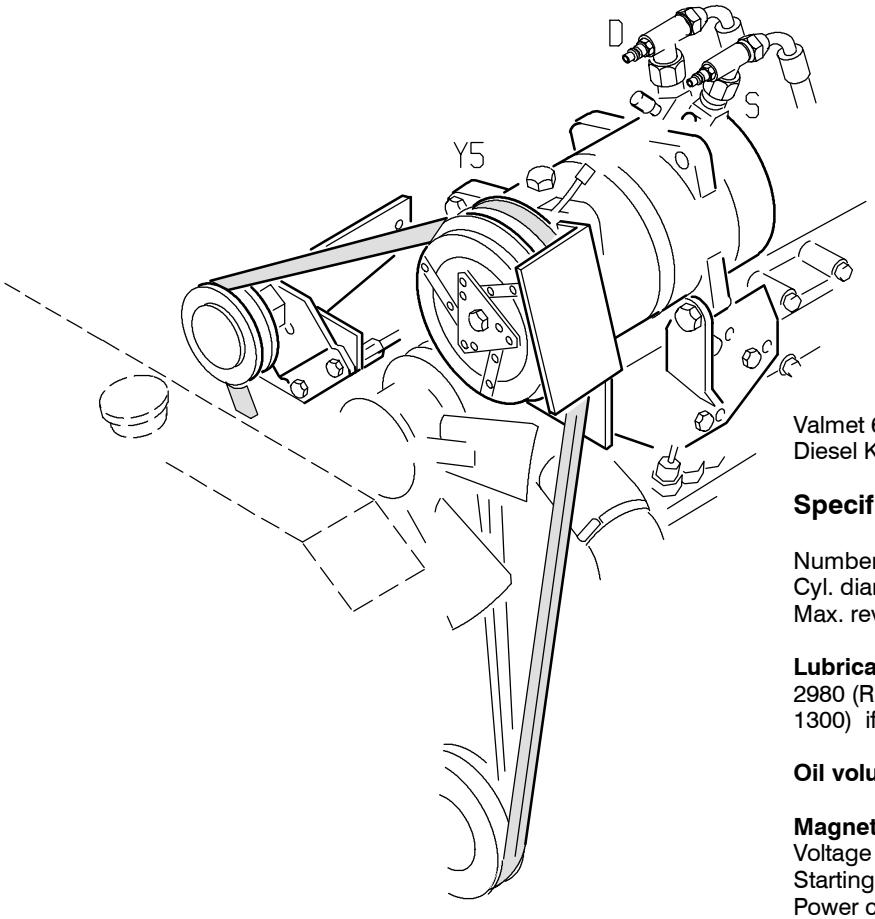
10. The presence of moisture in the refrigerant circuit does not only lead to a poor cooling output but also to the decomposition of the solid – state drier and the decay of the refrigerant lines due to acid formation. Expensive repairs and down – time are the result.

11. Before starting, check oil level of the compressor and evacuate refrigeration circuit according to instructions given. Time of evacuation 1 – 4 hours. Dry refrigeration circuit at least once by breaking the vacuum with liquid refrigerant.

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Compressor

The service valves (D and S) are fitted on the pipe connectors on air conditioners that have refrigerant R134a as in figure below



D = Discharge
S = Suction
Y5 = magnetic clutch

If the compressor should be changed, contact an expert who knows refrigerating systems.

A new compressor is filled with 2,0 dl oil in the factory. Drain the oil in the new compressor. 1,6 dl oil must run out. Pour the oil back to the compressor and fit the plug. If the drained oil amount was not 1,6 dl, add or reduce the oil volume to 1,6 dl (on account of the internal build–in, all oil in the compressor does not run out).

Note! If the system is opened and refrigerant changed, the compressor oil should also be changed. In this case, fill the compressor with 2,0 dl oil.

Detach the new compressor protective caps very carefully so that the threads and connections do not damage.

Tightening torques:
– 3/4" connection on pressure side **24,5–29,5 Nm.**
– 7/8" connection on suction side **29,5–33,5 Nm.**

Valmet 6000–8400 tractors' compressor type: Diesel Kiki model DKS 15 CH.

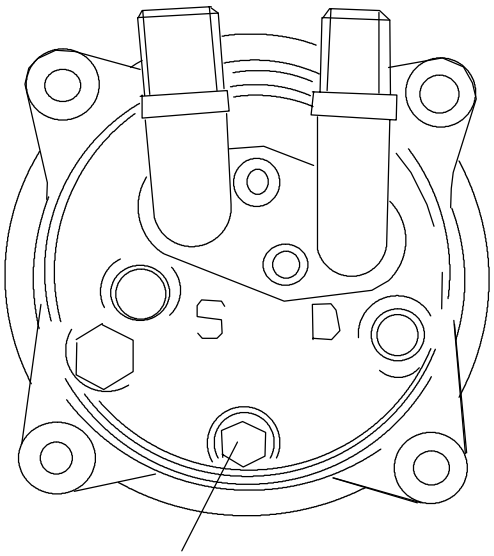
Specifications

Number of cylinders . . . . . 6 pcs
Cyl. diam x stroke . . . . . ø34 mm x 24 mm
Max. revs . . . . . 7000 r/min

Lubricating oil: Freol DS–83P or Exxon (Esso) 2980 (R12) or ZXL 100 PG (DH–PS) (Valtra UC 1300) if refrigerant R134a.

Oil volume: 200 cm^3 (2,0 dl)

Magnetic clutch:
Voltage . . . . . 12 V (DC)
Starting moment . . . . . 50 Nm
Power consumption . . . . . 44 W (max)
Clutch clearance value . . . . . 0,3–0,6 mm



Draining/filling plug for lubricating oil.

Note! Do not open the plug, if the system is filled with refrigerant. Compressor oil should be stored in a closed container. If refrigerant is freon R12, the service valves are fitted on the rear side of the compressor (S and D in picture above).

5. Changing refrigerant R12 to R134a.

If the R134a refrigerant is changed to the air conditioners which have refrigerant R12, the following components should also be changed:
– Dryer reservoir
– Pressure switch
– Compressor
– Compressor service valves
– All O–rings
– All hoses if the tractor has been manufactured before March 92 (–657500)

When the parts have been changed, fill the system with refrigerant R134a and run the air conditioner about one hour. Empty then the system and the compressor and fill the compressor with new oil (2,0 dl oil ZXL 100 PG (DH–PS) (Valtra UC 1300) and fill the system again with the refrigerant 134a.
Two oil changes must still be carried out at intervals of 100 running hours after which the earlier mineral oil has been removed from the system.

Note! If you have a special charging device (AKA force method) the oil changes after filling is unnecessary but the system is evacuated 0,5–1 hours, after which the air conditioner can be charged finally.

Part numbers

	Order no
Dryer reservoir	32814800
Pressure switch	32844300
Pressure switch O–ring	32275210
Dryer reservoir hose O–rings (2 pcs)	30414910
Compressor	32838600
Service valve S (LH side)	32839000
Service valve (S) O–ring against compressor	30415110
Service valve D (RH side)	32838800
Service valve (D) O–ring against compressor	30415010
LH side valve (S) upper end O–ring	30415110
RH side valve (D) upper end O–ring	30415010

Note! When fitting the compressor, adjust the distance between the support and compressor to 0,1 mm with shims.

Condenser hose O–rings:

Front hose O–ring	30415010
Rear hose O–ring	30414910

Expansion valve O–rings:

Upper hose O–ring	30415110
Lower hose O–ring	30414910
O–rings (2 pcs) on the evaporator side tubes	30415010

Note! Before changing the expansion valve O–rings, the insulating mass should be removed. After fitting, cover the valve with mass no 30794000.

Up to ser. no **657500** all the rubber hoses should be changed
(tractors manufactured before March 92):

Hose between compressor and condenser	32849100
Hose between condenser and drier reservoir:	
– 3/4–cylinder engines	32862900
– 6–cylinder engines	32849500
Hose between drier reservoir and expansion valve	32849400
Hose between expansion valve and compressor:	
– 3/4–cylinder engines	32849300
– 6–cylinder engines	32849200

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Active coal filter 505–905, 205–900 **20790500**
(to tr. no –> F51507), 6000–8400 . . . . **20707700**
(from tr no. F51508 –>) 6000–8400, . . **20750400**
8050–8750

Active coal filter, filters both solid and gaseous impurities such as dust and spores and it reduces biocide concentration in the cab to about1/10 of a normal value. The active coal filter, filters all particles in dimensions 2/1000 mm (2 μm) and bigger. It separates visible impurities totally. The active coal filter is fitted instead of the standard filter.

Fitting 205–900 :

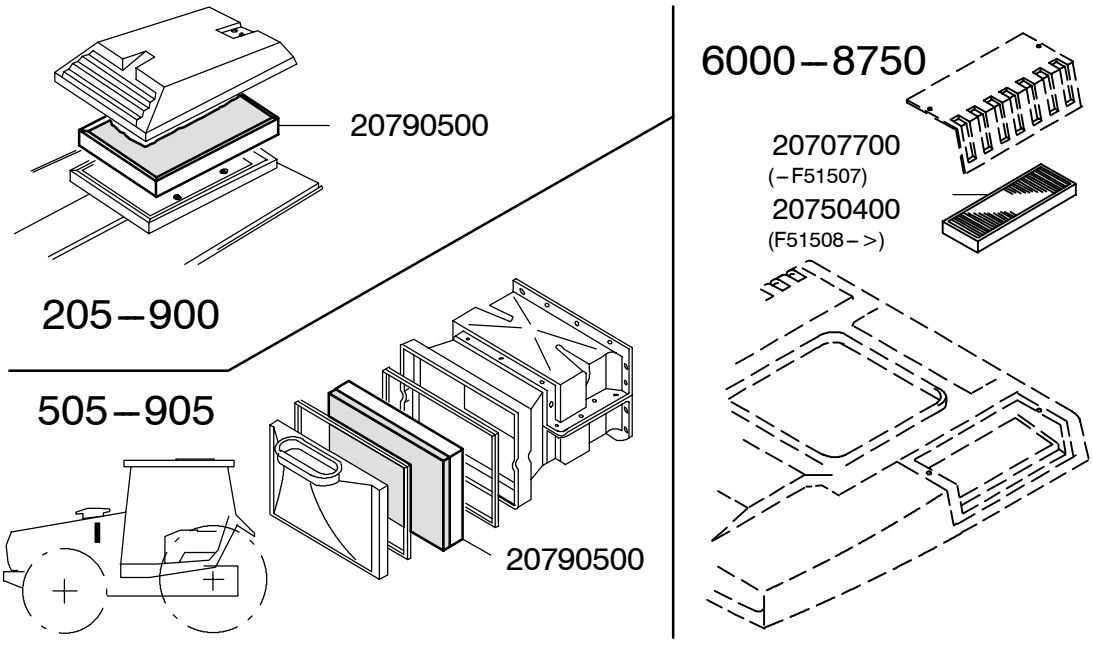
– Remove the filter housing cover and place the active coal filter in place of the standard filter, see figure below.
– Refit the cover.

Fitting 505–905 :

– Remove engine hood side plate on the LH side and raise the upper plate
– Open the filter housing and place the active coal filter in place of the standard filter. Note the position of the filter, see picture 2.
– Refit the engine hood plates

Fitting 6000–8750 :

– Detach the air intake cover on the LH side of the roof and place the active coal filter in place of the standard filter.
– Refit the cover





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Wider rear mudguards (320mm) 32600800
Wider rear mudguards (485mm) 33270200
W. r. mudguards Green Claas (485mm) . 34232000

– Remove the filter cover and the previous filter (when dirty).

– The wider rear mudguards are fitted, if needed, in place of the standard rear mudguards.

FITTING:

– Remove the rear light protective covers and the cover fasteners (it is not necessary to remove the push buttons and the rear lights). Remove the standard rear mudguards.

– Fit the wider mudguards **1** into place.

– The support **2** needs not to be mounted of strength reasons, but mounting can be done. See picture for the position of support.

– Fasten the rear light covers together with the push buttons into place.

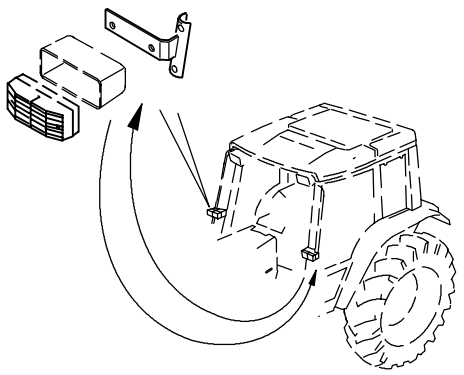
– Earlier tractors: Position the parking lights more outwards by changing over the RH and LH side parking light brackets.
NOTE! In new tractors this has already been done.

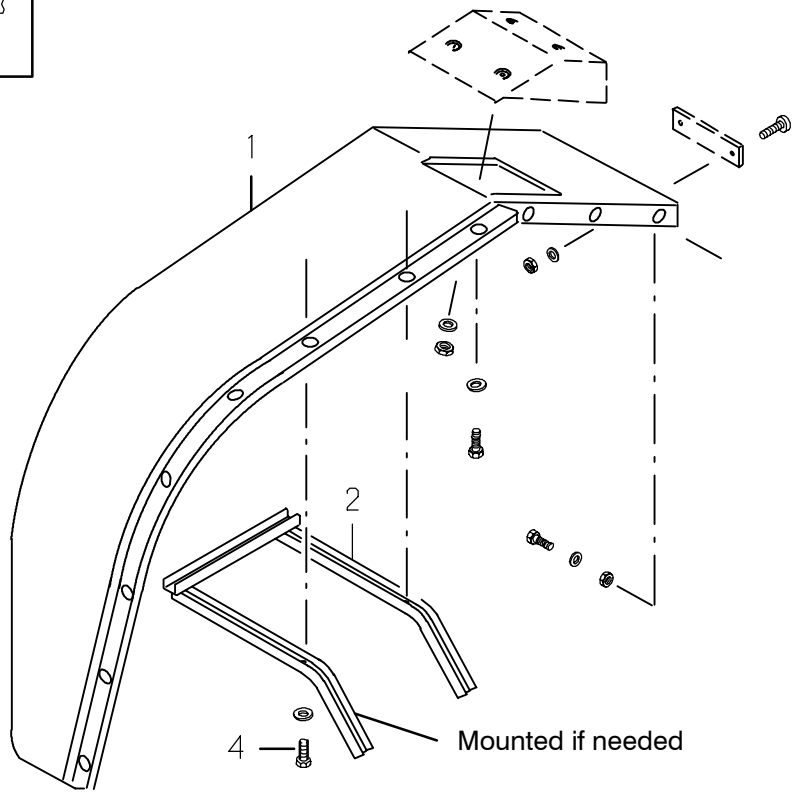
– Order new mudguard side stickers or lathes (not included) according to tractor‘s color, if needed.

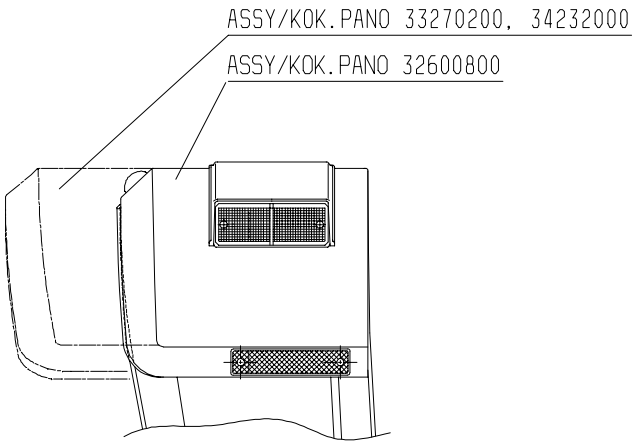
	1	**32600800**	Takalokasuojat	Bakstänkskärmar	Rear mudguar	Hinterkotflügel	320mm, Total
	1	**33270200**	Takalokasuojat	Bakstänkskärmar	Rear mudguar	Hinterkotflügel	485mm, Total
	1	**34232000**	Takalokasuojat	Bakstänkskärmar	Rear mudguar	Hinterkotflügel	485mm, Total, Green Claas
1	1	32286520	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	Left 320mm
1	1	33170410	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	Left 485mm
1	1	34063500	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	L. 485mm, Green Claas
1	1	32286620	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	Right 320mm
1	1	33170510	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	Right 485mm
1	1	34063600	.Lokasuoja	Stänkskärm	Mud guard	Kotflügel	R. 485mm, Green Claas
2	2	32668400	.Kannatin	Hållare	Support	Halter	If needed
4	4	HA6326	.Ruuvi	Skruv	Screw	Schraube	If needed

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If not already changed:







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Air suspended seat 32036900

The air suspended seat makes tractor driving pleasant when driving on an uneven ground and also the seat improves driving comfort.
The seat reduces sways automatically according to the driver's weight. In addition, the seat has a horizontal springiness which can be locked. This springiness improves roadholding
The seat has an in–built compressor.
The seat is fastened with fixing screws of the standard seat.
The air suspended seat power demand is 108W, seat fuse is F25 (10 A).

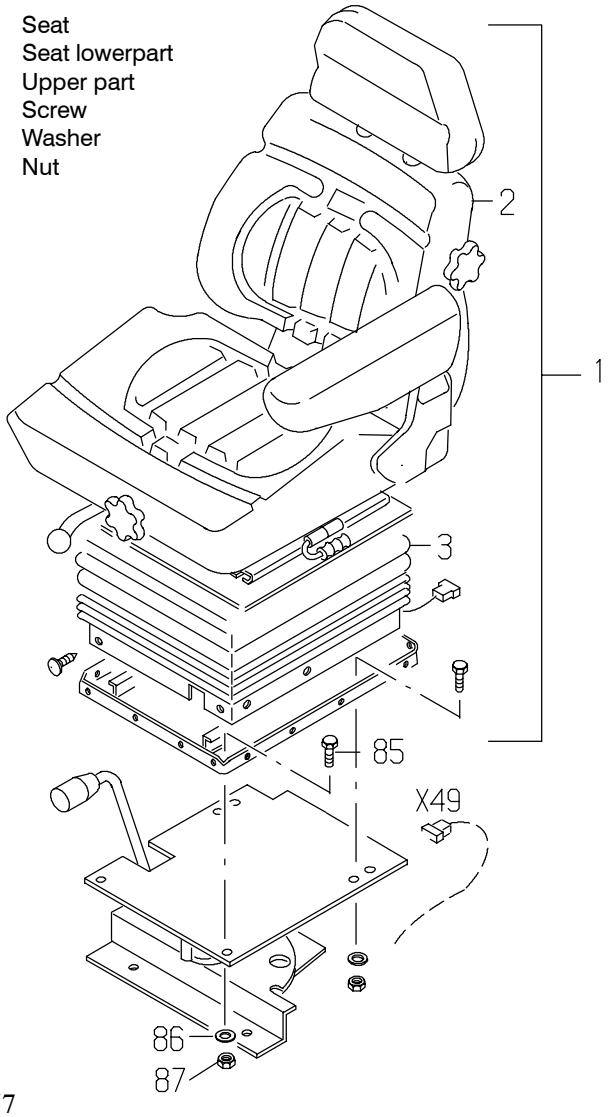
FITTING:

– Remove the standard seat (4 screws) and fasten the air suspended seat inplace.

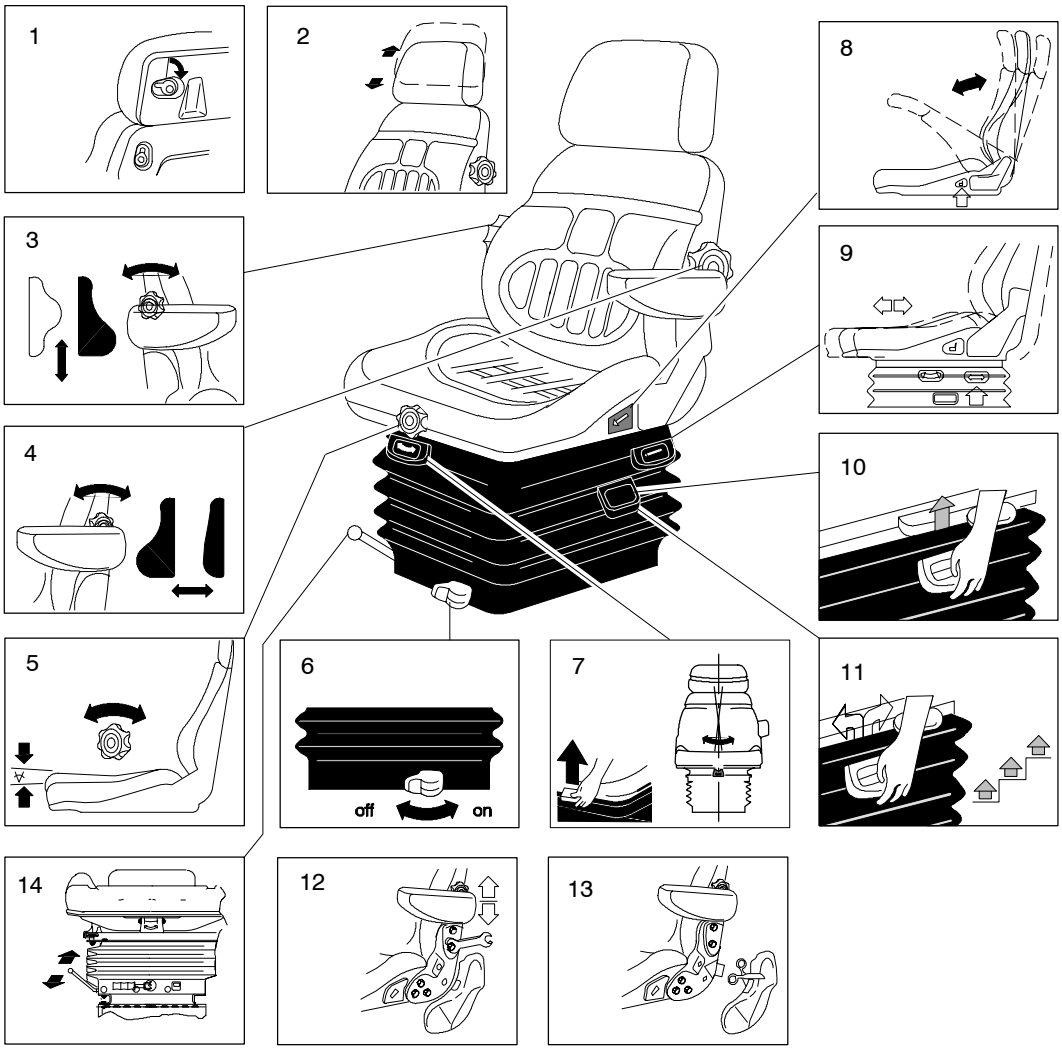
– Connect the seat wires to the connector X49 in the cab wiring loom. The connector is situated at the turning device.

– Become familiar with various adjustments of the seat and adjust it.

1	1	32036900	Istuin	Förarstol	Seat
2	1	32097600	.Istuimen alaosa	Förarstol undre del	Seat lowerpart
3	1	31660200	.Yläosa	Övredel	Upper part
85	4	HA6323	Ruuvi	Skruv	Screw
86	4	JD0408	Aluslaatta	Bricka	Washer
87	4	JB8904	Mutteri	Mutter	Nut



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Ilmajousitettu istuin

1. ja 2. Niskatuen korkeuden säätö
3. Ristiselän tuki korkeuden säätö
4. Ristiselän tuki kohouman säätö
5. Pitkittäiskallistus
6. Pituusjouston lukitus
7. Sivukallistus (7°–0°–7°)
8. Selkänojan kallistus
9. Etäisyys
10. ja 11. Paino ja korkeus
12. Kyynärtuen korkeus
13. Turvavyön kiinnitys
14. Kääntö

Luftfjädradsits

1. och 2. Inställning av nackstödets höjd
3. Höjd inställning av svankstödets höjd
4. Inställning av svankstöd
5. Inställning av sittdynans lutning
6. Spärr plandämpare
7. Inställning av sitsens sidolutning (7°–0°–7°)
8. Ryggstödets lutning
9. Inställning framåt/bakåt
10. och 11. Inställning av förarvikt och höjd
12. Inställning av armstödets höjd
13. Fästpunkter för säkerhetsbältet
14. Inställning av sitsens vridning

Air suspension – driver's seat

1. and 2. Head support height adjustment
3. Lower seat back height adjustment
4. Lumber support adjustment
5. Seat pan adjustment
6. Lock for height suspension
7. Side inclination (7°–0°–7°), tilting
8. Seat back inclination adjustment
9. Adjustment for forwards/rearwards
10. and 11. Weight and height adjustment
12. Arm rest adjustment
13. Seat belt anchor point
14. Seat rotation

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Electric air filter 32675100

– The electric air filter can filter also small particles which cannot be filtered by mechanical filters (the electirc air filter can filters particles with sizes of 0,2 µm).
The cabin air becomes more pleasant and the productivity increases.

The filter consists of the paper filters and a dust collection element of the high voltage type in which the dust particles fasten on the metal plates. The dust collection element is washable.

The air filter is fitted in place of the roof hatch. However, the roof hatch can be used as an emergency exit even if the air filter is fitted on the tractor.

The filter increases the cab total height about 20 cm.
The fan has three different speeds.
The power consumption is max. 210W (The electric air filter : 10 W).
Ionizing voltage: 8000 V.
The filter is connected to fuse F26 (10A).

Fitting:

– Remove the upper roof plate as follows:
Remove the roof hatch (hinges). Unscrew the screws on the edges of the roof hatch opening.
Unscrews the screws on the roof front and rear edges. Uncrew the front gutter plate screws. Remove the upper roof plate.

– Open a little the cab linings at the cab side pillar so that you can pass wire **20** into the connector "A7" and further to the roof side. Draw the wire to the LH side front edge of the roof opening.

– Refit the roof plate and fit the front gutter plate screws and the middle screw of the roof front edge.
NOTE! Do not tighten the screws too hard since the roof material can damage.

– Fit washers **19** (5 pcs) at the fastening holes. Fit gasket **2** onto the bracket **9**.
Fasten the bracket **9** onto the roof with new screws. (front end screws M8 x 40). Detach the roof hatch lock counter piece on the edge of the hatch.

– Fasten the fastener **10** and the counter piece **21** onto the roof.

– Connect connectors SA1687 and connector plug SA 1950 to the air filter current wire. Connections, see picture C.

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– Open the air filter cover and mark positions for the extra holes to be drilled, picture **a**.
Fasten the hole fastening parts **6** (4 pcs).

– Fit the air filter into place on the roof. (the hinge side forwards). Fasten the device with fastening handles **6**.
Mark places for extra holes ø 9 mm, see picture **b**
Fit screws **23** (M8x16) and bushes **22**.

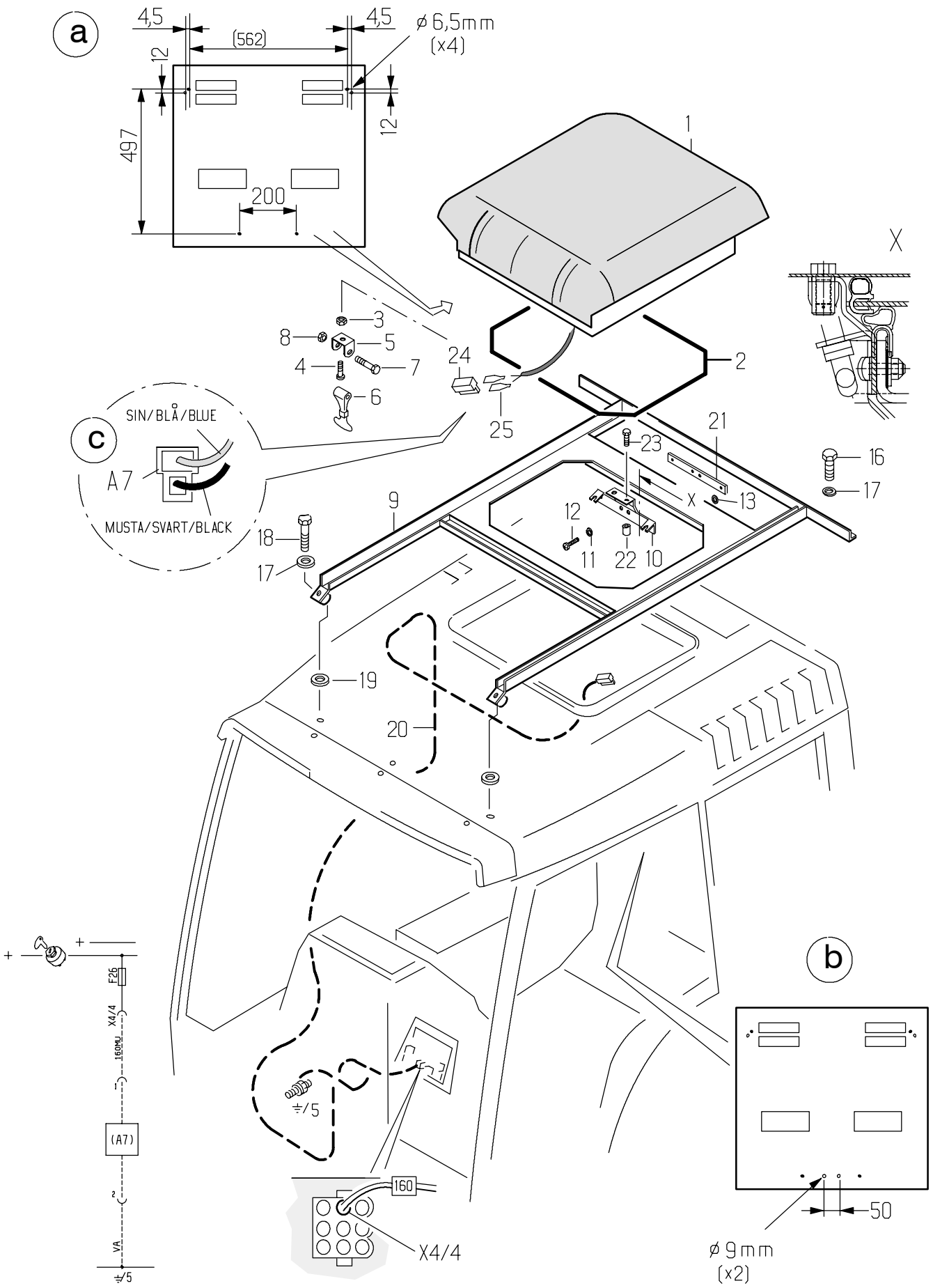
– Open the cab side pillar and mudguars linings and pass the wire together with other wires into the steering wheel console.
Connect wire **20** connector equipped with an earth casble shoe under the earth screw in the cab front wall.
Connect wire no 160 (black) to the connector X4/4 in the electric centre
Tape the wires against the other wiring looms

– Connect connector A7 in the roof opening to the air filter connector and push the connectors into the roof linings.
Check the function of the electric air filter.
The filter has an indication lamp which lights when the current is switched on. If the lamp begins to flash, the filter should be cleaned.

	1	32675100	Sähkösuodin	Elektrofilter	Elecric air filter	
1	1	32729700	.Sähkösuodin	Elektrofilter	Elecric air filter	(32501700)
2	1	32681100	.Tiiviste	Tätning	Gasket	
3	4	JB8903	.Mutteri	Mutter	Nut	
4	4	HE6963	.Ruuvi	Skruv	Screw	
5	4	32431500	.Korvake	Öra	Lug	
6	4	32437600	.Kiinnitin	Fästdon	Fastener	
7	4	HA9221	.Ruuvi	Skruv	Screw	
8	4	JB9926	.Mutteri	Mutter	Nut	
9	1	32673900	.Runko	Ram	Frame	
10	1	32725410	.Pidin	Klämma	Clamp	
11	4	JD0500	.Aluslaatta	Bricka	Washer	
12	4	HD9052	.Ruuvi	Skruv	Screw	
13	4	32643900	.Kumialuslaatta	Gummibricka	Rubber washer	
16	3	HA6508	.Ruuvi	Skruv	Screw	
17	5	JD0501	.Aluslaatta	Bricka	Washer	
18	2	HA8326	.Ruuvi	Skruv	Screw	
19	5	30752500	.Aluslaatta	Bricka	Washer	
20	1	32723600	.Johdin	Ledning	Wire	
21	1	32842900	.Levy	Platta	Plate	
22	2	32842800	.Holkki	Hylsa	Sleeve	
23	2	HA6322	.Ruuvi	Skruv	Screw	
24	1	SA1550	.Liitin	Anslutning	Connector	
25	2	SA1687	.Liitin	Anslutning	Connector	

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ELECTRIC AIR FILTER FITTING INSTRUCTION		Model	Code	Page
	03.08.1993	6000–8400	89	3(3)



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Ventilation latch 32708200

With aid of this latch the cab doors can be locked ajar which improves the cab ventilation.
The doors can be locked normally by turning the latch to one side. The mounting kit includes latches for both doors.

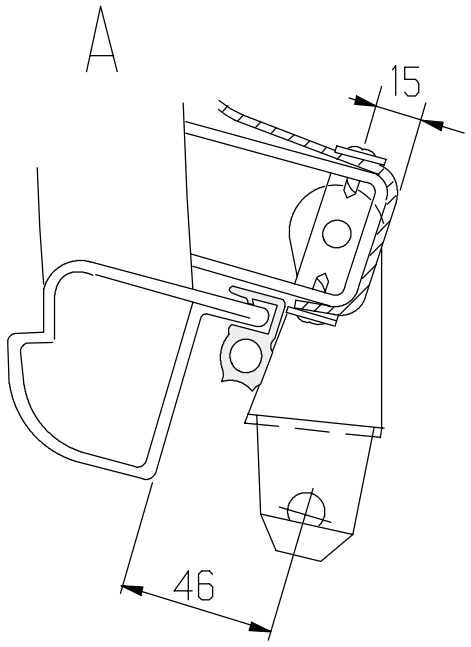
Fitting:

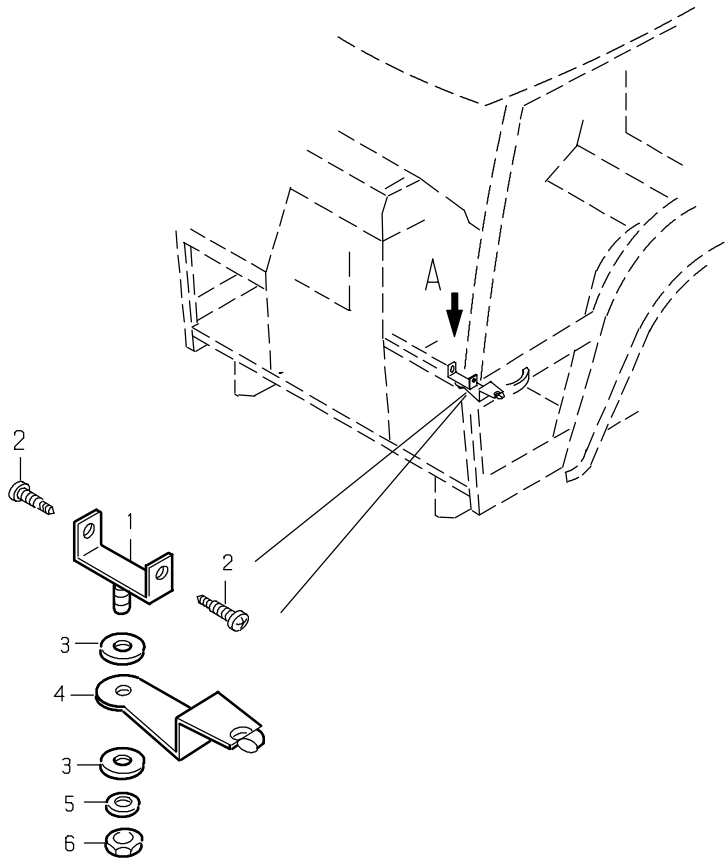
– Press the latch **4** round section against the door lock.

– Lift the attacment **1** against the lock pin lug so much up as possible
Move the attachment towards the windscreen until the ventilation latch touches the door seal.

– Fit the inner screw **2** (the screw does not need a ready–made hole).
The outer screw is fitted when the door is open. Fasten the latch and the friction plates.

	1	32708200	Tuuletussalpa	Ventilationslås	Ventilation latch	Ventilatorriegel
1	1	32707800	.Kiinnitin	Fästdon	Fastener	Halter
2	2	32665100	.Ruuvi	Skruv	Screw	Schraube
3	2	32577400	.Kitkalevy	Friktionplatta	Friction plate	Reibungsplatte
4	1	32707300	.Salpa	Spärr	Catch	Riegel
	1	32708000	.Salpa	Spärr	Catch	Riegel
5	1	JD0408	.Aluslaatta	Bricka	Washer	Scheibe
6	1	JB8904	.Mutteri	Mutter	Nut	Mutter



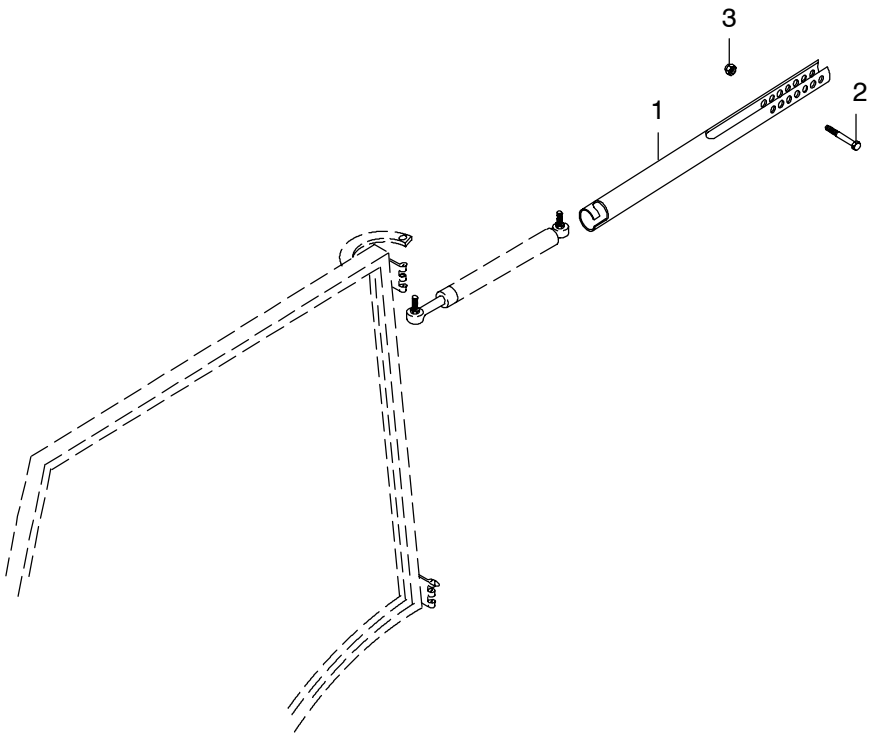


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Door limiter 32843700

– With this limiter can the door opening be limited to many different positions.

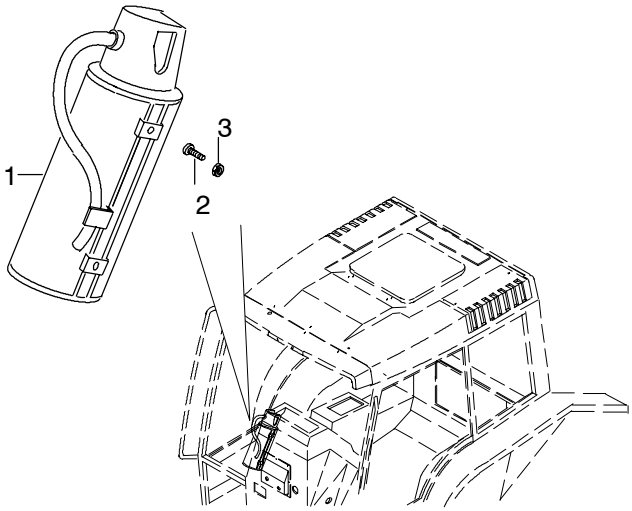
	1	32843700	Oven Rajoitin	Begränsare	Limiter	Anschlag	assy
1	2	32801200	.Rajoitin	Begränsare	Limiter	Anschlag	
2	2	HA6316	.Ruuvi	Skruv	Screw	Schraube	
3	2	JB8903	.Mutteri	Mutter	Nut	Mutter	

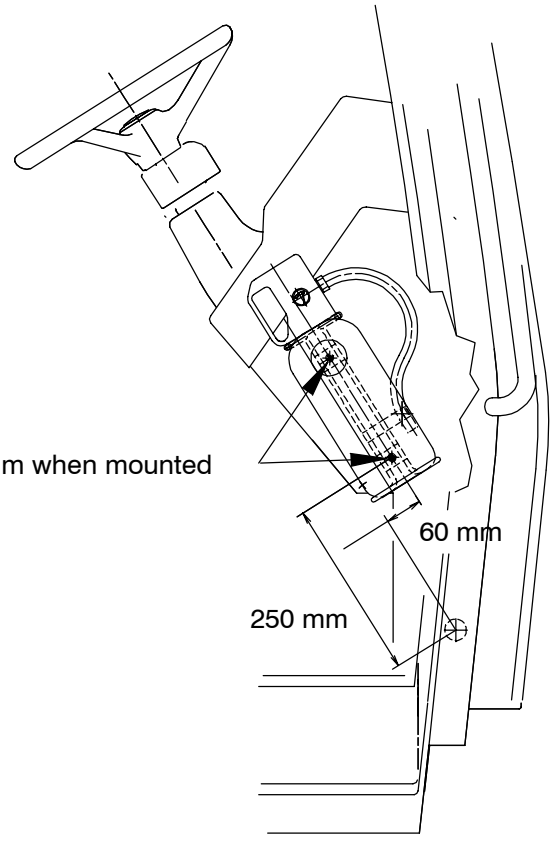


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Powder extinguisher (2kg) **. 32640500**

	1	32640500	Jauhesammutin	Pulversläckare	Powder extinguisher assy
1	1	32548300	.Jauhesammutin	Pulversläckare	Powder extinguisher
2	2	HE6963	.Ruuvi	Skruv	Screw
3	2	JB8903	.Mutteri	Mutter	Nut





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– Extra air filter 32787100

The kit includes a housing with necessary mounting parts
In place of the standard filter is placed a protruding part which has space for two filter elements. These filter elements are the same as the standard filter has and they take air from underside. Thus dust does not collect on the filters and a shock caused by a door shut cleans the filters.
The filters are easily accessed with aid of a holder which has hinges.

– FITTING:

– Remove the filter cover and the previous filter (when dirty).

– Place housing **4** into the filter opening and drill holes ø 3,6 mm (14 off) using the housing as a pattern. Place spring nuts **21** (14 off) on the roof at the holes
Place seal **24** and seal **25** (on the filter side) between the roof and housing **4** (see picture) and fasten the housing.

– Fasten nuts **14** with rivets **15** on frame **12**. Fit the frame with hinge pins **10** and lock pins **9** in position.

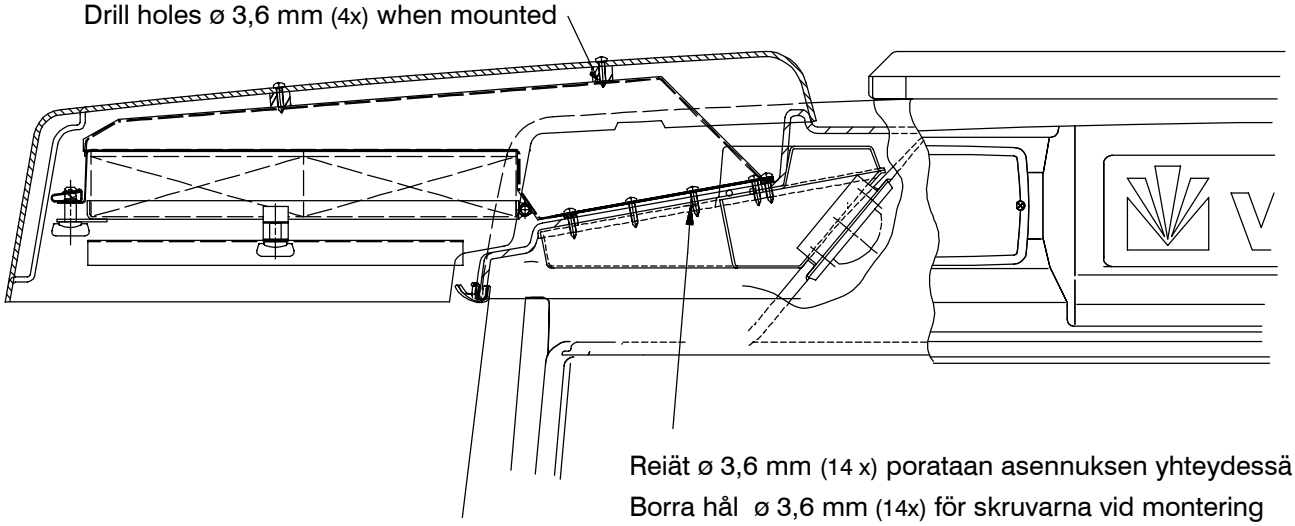
– Using protective covering **2** as a pattern, drill holes ø 3,6 mm (4 off) through housing **4** and fasten the covering.

– Position filters **11** on the frame and fasten it and grille **13** with parts **16, 22** and **23.**

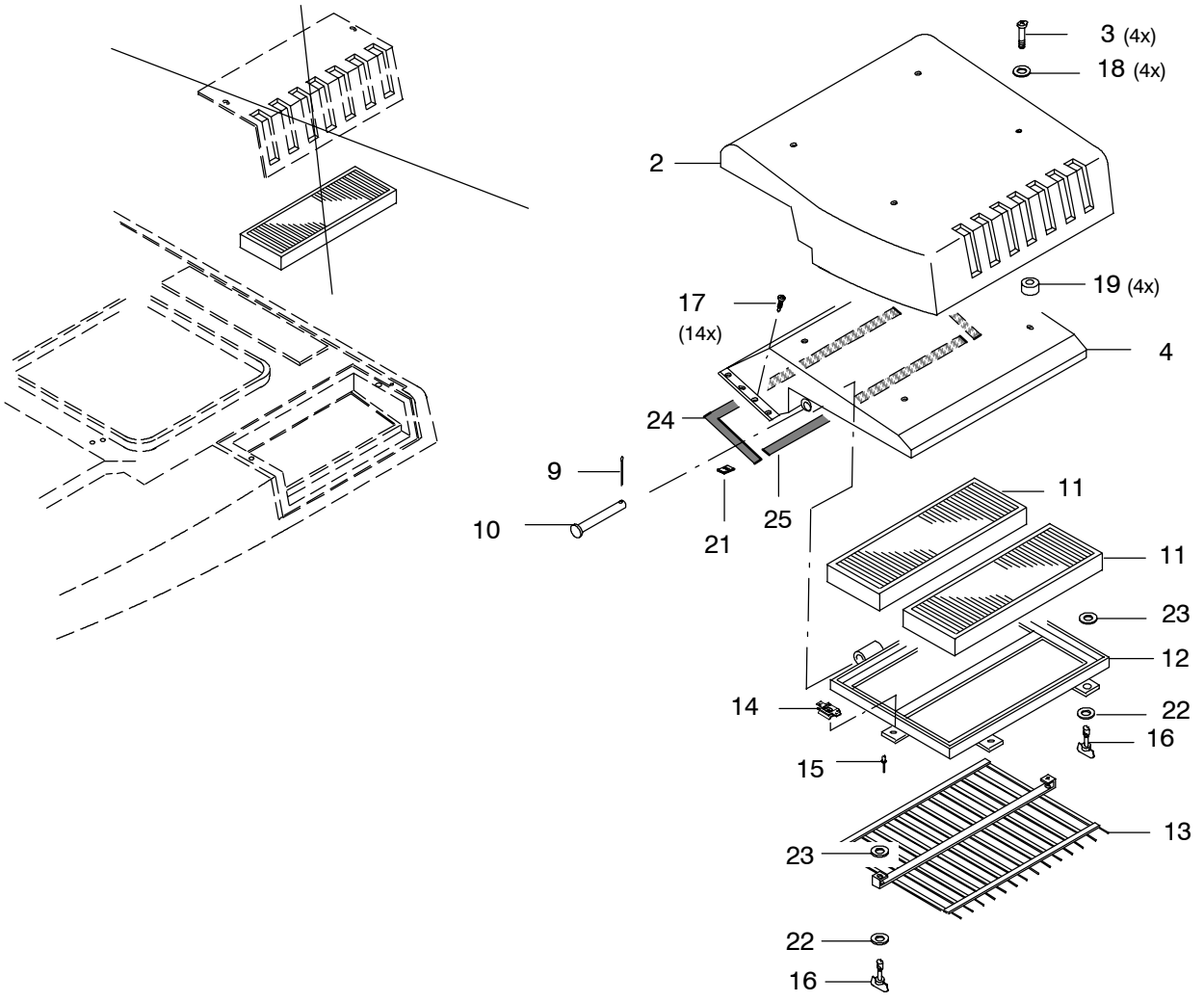
		32787100	Ilmansuodin	Luftfilter	Air filter	Luftfilter
2	1	32787200	.Suojus	Skydd	Shield	Schutz
3	4	HN6805	.Ruuvi	Skruv	Screw	Schraube
4	1	32786500	.Kotelo	Hus	Housing	Gehäuse
9	2	JE3029	.Sokka	Sprint	Pin	Splint
10	2	JJ6033	.Tappi	Tapp	Pin	Stift
11	2	31739500	.Suodin	Filter	Filter	Filter
12	1	32786600	.Kotelo	Hus	Housing	Gehäuse
13	1	32800400	.Säleikkö	Grill	Grid	Grill
14	4	32675200	.Mutteri	Mutter	Nut	Mutter
15	8	JF5002	.Niitti	Nit	Rivet	Niet
16	4	32665500	.Ruuvi	Skruv	Screw	Schraube
17	14	HN6804	.Ruuvi	Skruv	Screw	Schraube
18	4	JD0406	.Aluslaatta	Bricka	Washer	Scheibe
19	4	32720100	.Kiinnitin	Fästdon	Fastener	Halter
21	14	JC9003	.Mutteri	Mutter	Nut	Mutter
22	1	32673300	.Kiinnityslaatta	Fästplåt	Mounting plate	Befestigungsplatte
23	1	32665600	.Kiinnityslaatta	Fästplåt	Mounting plate	Befestigungsplatte
24	1	32544000	.Tiiviste	Tätning	Gasket	Dichtung
25	1	30938000	.Tiiviste	Tätning	Gasket	Dichtung

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Reiät ø 3,6 mm (4 x) porataan asennuksen yhteydessä
Borra hål ø 3,6 mm (4x) för skruvarna vid montering
Drill holes ø 3,6 mm (4x) when mounted



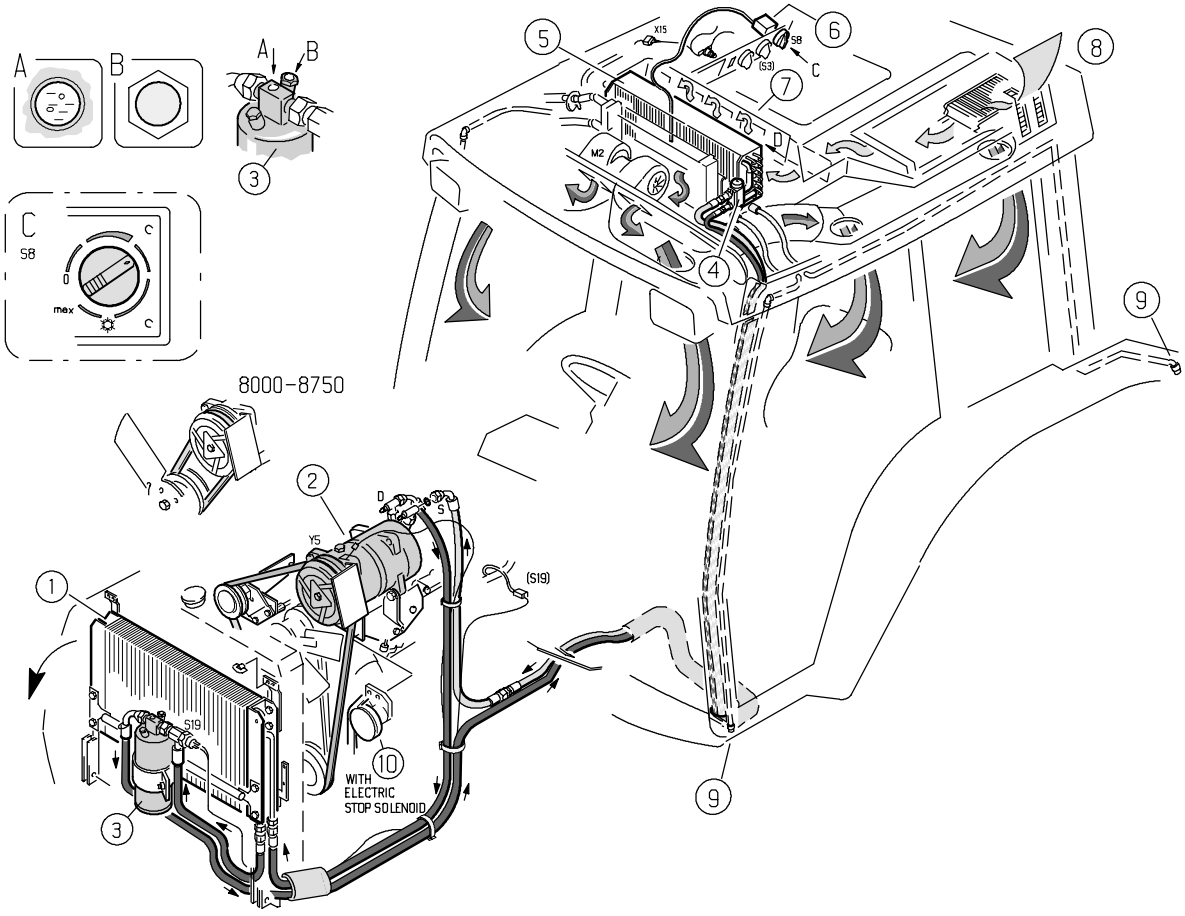
Reiät ø 3,6 mm (14 x) porataan asennuksen yhteydessä
Borra hål ø 3,6 mm (14x) för skruvarna vid montering
Drill holes ø 3,6 mm (14x) when mounted



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Air conditioning 6000–6600 32453210
Air conditioning 6800 33099900
Air conditioning 6900(8000R)–8150 32214310
Air conditioning 8450–8750, 8050Hi–8950Hi 33182400
Air conditioning 6250Hi–6850Hi . . . 33665200

NB! The tractor must have openable front cover.
Model 8000–8400, up to engine no **–D 1229**: the 3–groove coolant pump pulley (836855063) is needed.
NB! If the tractor has other extra equipment, familiarize yourself with fitting instructions and the extra parts before ordening the set.



1. Condenser
2. Compressor
3. Dryer
A=Inspection glass
B=Moisture indicator
4. Expansion valve
5. Evaporator
6. Temperature switch
7. Re–circulation valves
8. Air inlet into cab
9. Condensing water hoses have nozzles which prevent air from entering into the system via hoses.
10) With an electric stop solenoid

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TECHNICAL DATA:

REFRIGERANT..... R134a
– filling quantity (+20˚C)..... approx. 1,4 kg

Compressor ..... DKS15CH DIESEL KIKI

– type.....axial–flow compressor
– number of cylinders..... 6
– max revs..... 7000r/min
– capacity/rev..... 147cm^3
– lubr. oil volume..... 200cm^3
– lubr. oil quality..... ZXL 100 PG (DH–PS)

Compressor clutch:
– voltage..... 12V DC
– starting torque..... 50Nm
– power consumption..... 44W (max)
– clearance value..... 0,3–0,6 mm
– pressure relief valve 37±4 bar

Drier:

Pressure switch, high pressure function:
– switches off..... 3,40±0,2MPa
– switches on..... 0,57±0,2MPa
below switch–off pressure
Pressure switch, low pressure function:
– switches off..... 190±20kPa
– switches on..... 200±30kPa

Thermostat:

– switches off when evaporator temperature is below..... +2...+3 ˚C
– switches on when evaporator temperature has risen up to (max cooling)..... +6...+7 ˚C
– switches on when evaporator temperature is about (min cooling)..... +19 ˚C

Pressures in system with max cooling,1500 r/min, at outdoor temperature of +20...+25 ˚C:
– low pressure..... 50–300 kPa
– high pressure..... 700–1400 kPa

NB!

– The installation place must be clean and dry and provided with a filling device for the refrigerant. Try to carry out fitting as quickly as possible so that moisture does not enter the system (moisture in the refrigerant circuit is one of the commonest reason for malfunction).
The protective plugs on new components must remain in place until **immediately before** the component is connected. Components must not be blown through with compressed air but cleaned out with nitrogen or R134a refrigerant.
Unions for the refrigerant hoses must be sealed with o–rings. When lubricating o–rings before fitting, use the same type of oil as in the compressor. **Note!** The o–rings are made of special rubber and must not be replaced by any other quality.

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FITTING:

Condenser (picture 1a,b).

– Remove both engine side plates. Lift up the openable front plastic covering. Remove protective shield (32839500) in front of the cooling radiator. Clean the radiator fins with compressed air.

– Fit the condenser above the oil cooler (picture 2).
– Fit the condenser upper end securing parts in position, picture **1a,b,c** (numbers in brackets intend parts which are already fitted on the tractor).

– NOTE! The condenser is a very sensitive component and must be handled with care. Support the pipes of the condenser when tightening the hoses (tightening torque, see picture), so that the condenser is not bent.

– 6000–6600 tractors: Part **16** (nut M8) is intended to be an intermediate part
Cut a piece of edge band **89** and fit it onto the net hole edge and other piece to the lower edge.

– **6250Hi–6850Hi tractors:** Fit the condenser with parts 87H–99H.
– 6900–8400 tractors: Place the edge band **89** round the protective net hole.
– **8050–8750, 8050Hi–8950Hi tractors**: Fit the condenser with parts 87S–99S.

– For easier cleaning, leave enough free length for hoses **4** and **120**. Fit the angle unions first for eliminating possible winding faults (after fitting the compressor and drier).

Drier (picture 2).

– Fit the drier according to the figure.

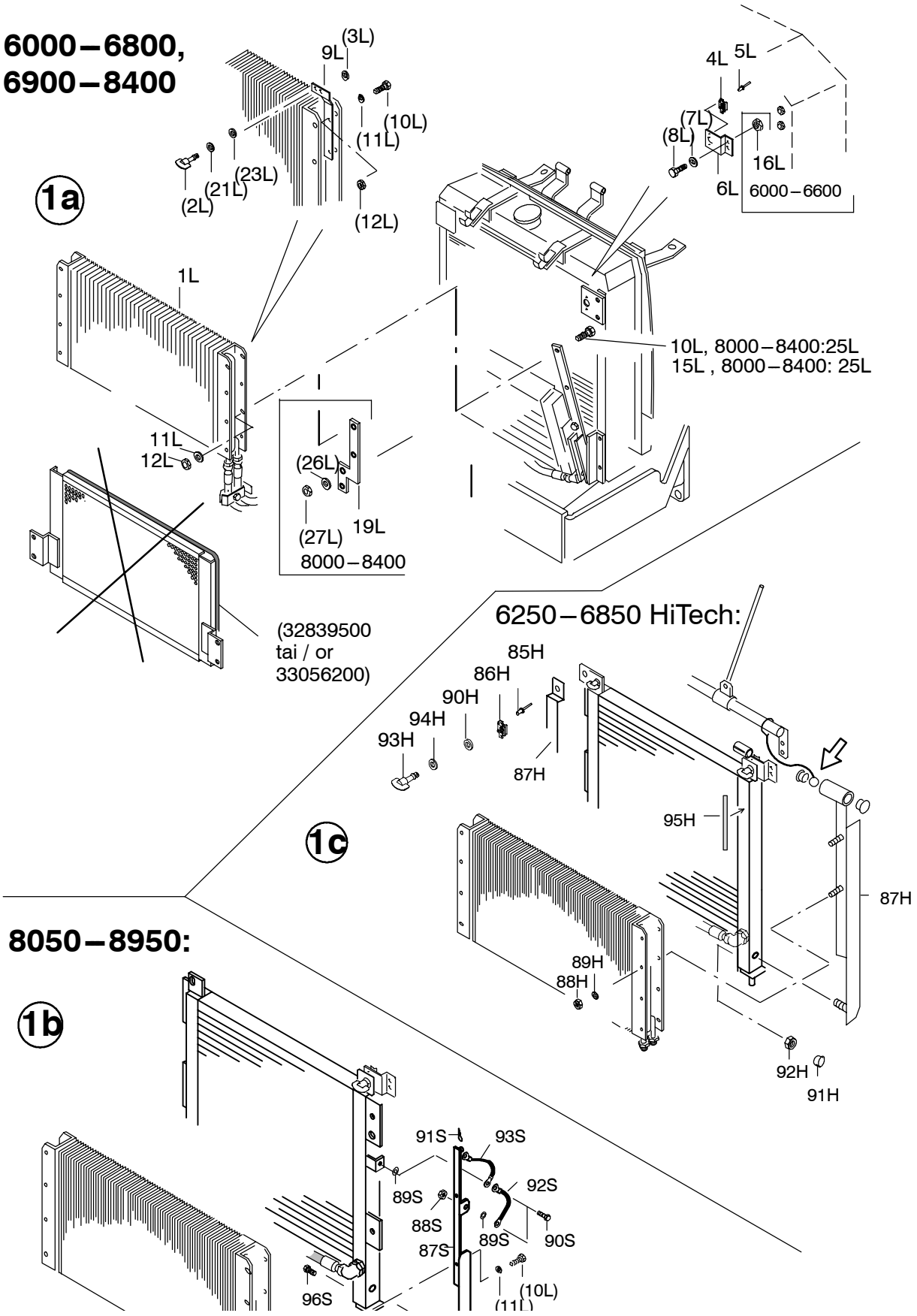
– Connect pressure switch **33** +O–ring **71** to the hose **121** (6000–6600: to the drier **32)**.

– Cut an opening (like a hole on the plate) through the covering for the hoses.

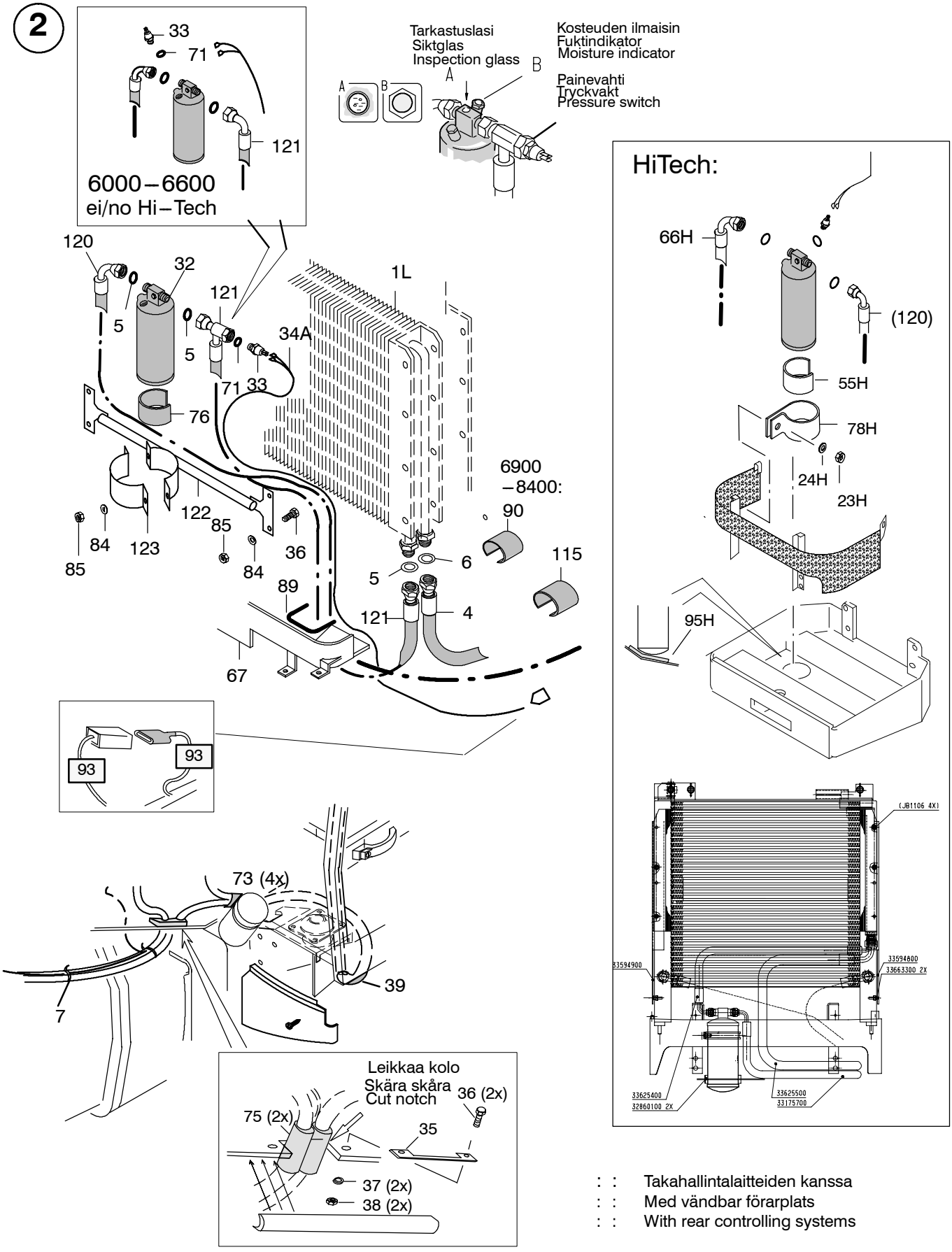
– CONNECT THE HOSES TO THE DRIER JUST WHEN OTHER FITTINGS ARE DONE. (the drier becomes easily saturated by humidity in air).

– Fit the wiring loom **34**. Connect wires no 33 and 93 to the pressure switch poles 1 and 2. Other end of the wire no 33 is connected to the compressor and other end of the wire 93 to the wire which has the same number in the engine wire loom. The wires are situated under the battery shelf on the RH side of the tractor.

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: : Takahallintalaitteiden kanssa
: : Med vändbar förarplats
: : With rear controlling systems

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Compressor (picture 3).

– Carefully turn the radiator cap to the first stop so that possible overpressure releases from the engine cooling system before fitting the extra belt pulley and the compressor.

– Fit the compressor bracket opposite the screws of the intake manifold according to the figure. Change the screws into longer ones (HA8331). Unscrew from the injection pump the fuel injection pipe for the first cylinder for easier work. Models **6800, 6250H–6850Hi**: fit the bracket to the hindmost holes.

– Fasten the compressor onto the bracket.
– Fit hoses **4** and **40A** with o–rings (tightening torque for the hoses: see picture.

Models 6000– 6600: Extra belt pulley (picture 4)

– Fit an extra belt pulley on the existing pulley. Use an intermediate piece **58** and screws **59** (6 pcs).
– Fit the idler wheel on the engine RH side opposite the screws for the thermostat housing and the engine lifting eye. Replace thermostat screws into special screws **10** and **11** one screw at a time for avoiding leaks. Fit support **8** and the idler wheel. Fit the V–belt and tighten it to a suitable tension.

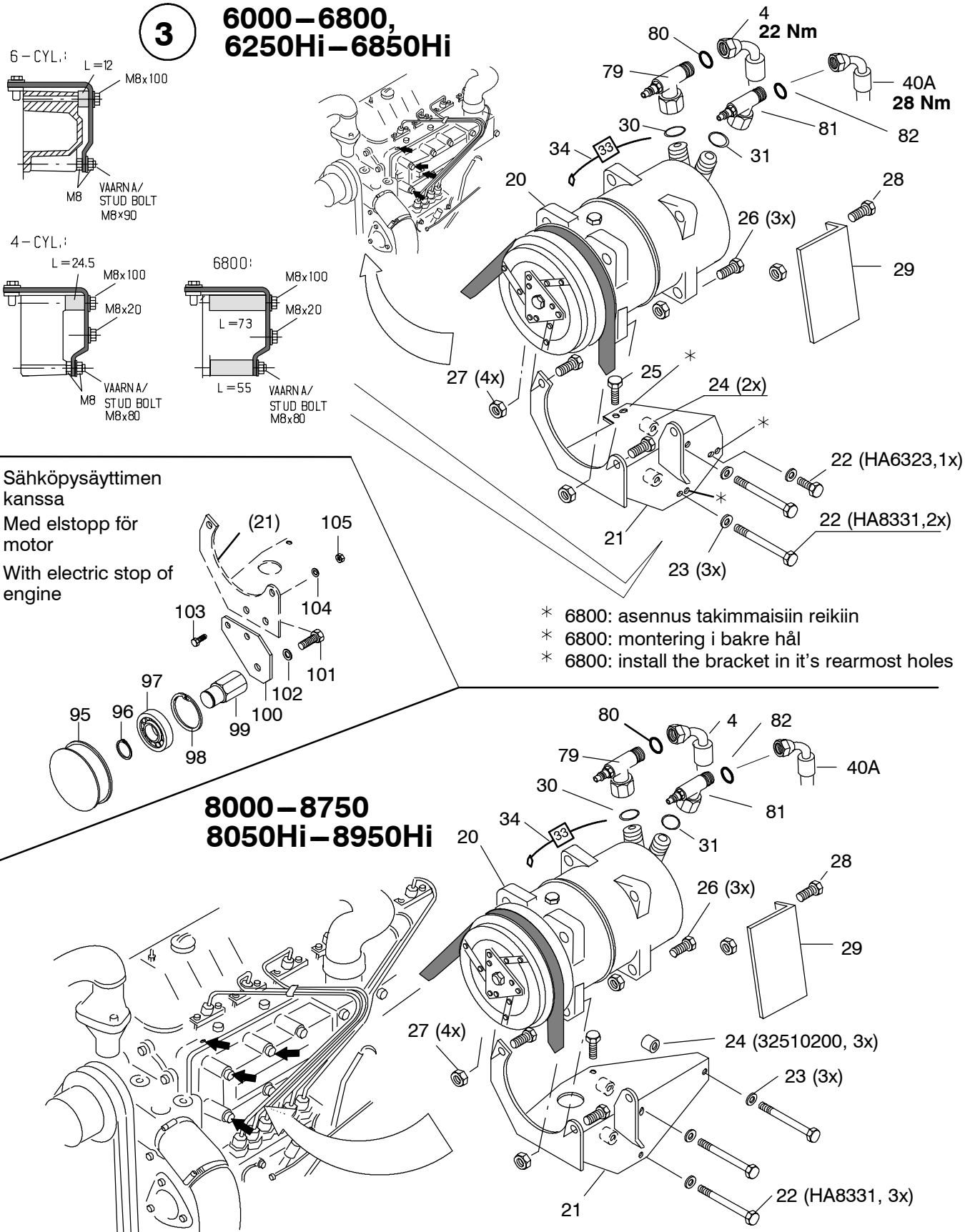
Models 6800– 8750, 6250Hi–6850 Hi, 8050Hi–8950Hi: Compressor drive is taken from the coolant pump v–belt pulley.
Up to engine number **D1229**:
Remove the coolant pump (drain engine coolant). Unscrew the belt pulley securing nut and remove the belt pulley. Use, if needed, puller 9052 48900. Change the belt pulley into 3–groove pulley (836855063). Remove the intermediate piece (836847538).

From engine number **D1230**: The 3–groove belt pulley is ready–mounted on the tractors.

Models 6000– 6800, 6250Hi–6850 Hi: If the tractor has an electric stop solenoid, an extra idler pulley **95** should be fitted on the compressor bracket.

Models 6000– 6800, 6250Hi–6850 Hi: If the tractor is equipped with compressed air system, the air compressor should be moved to the RH side of the engine (see appendix 1, on page 25).

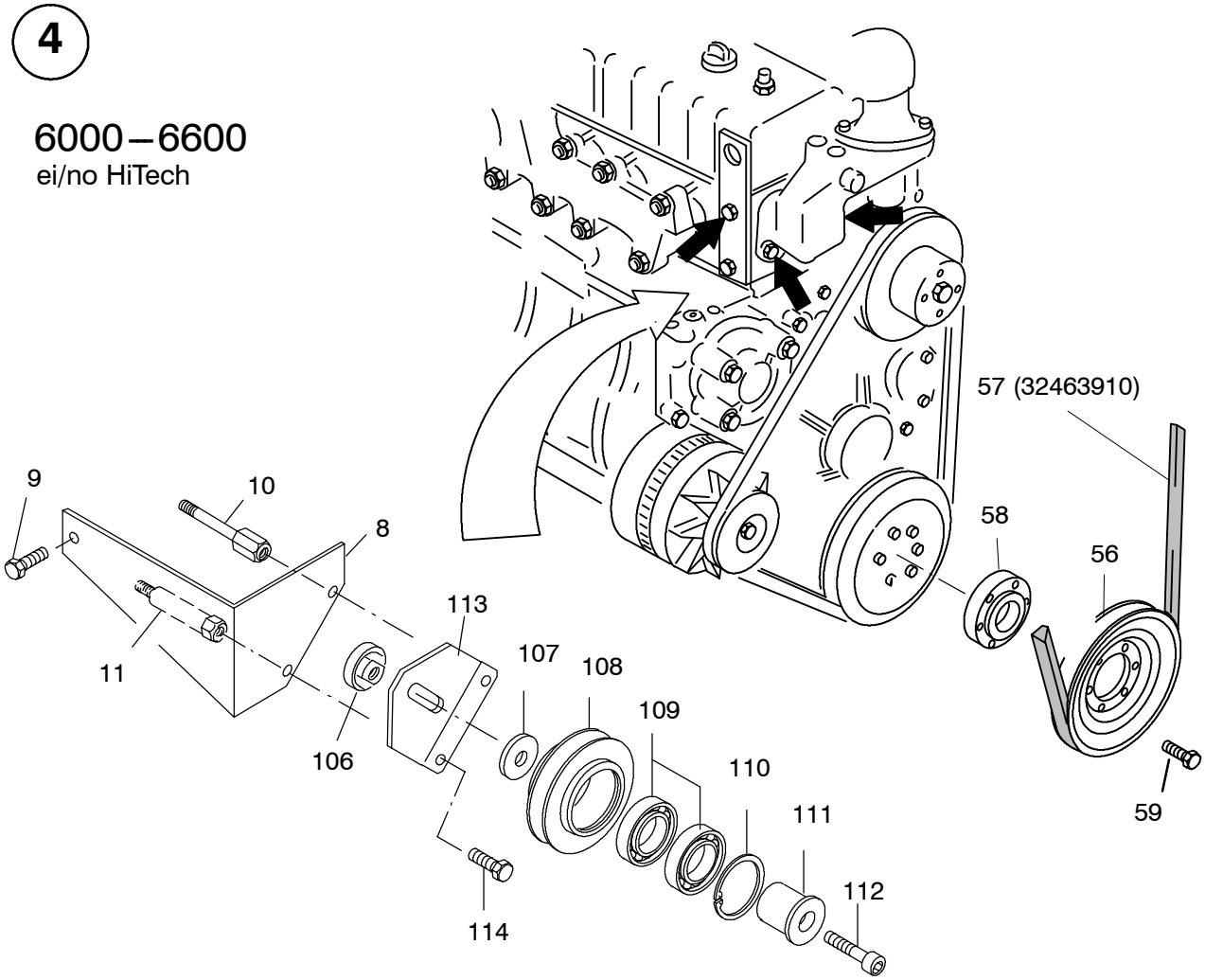
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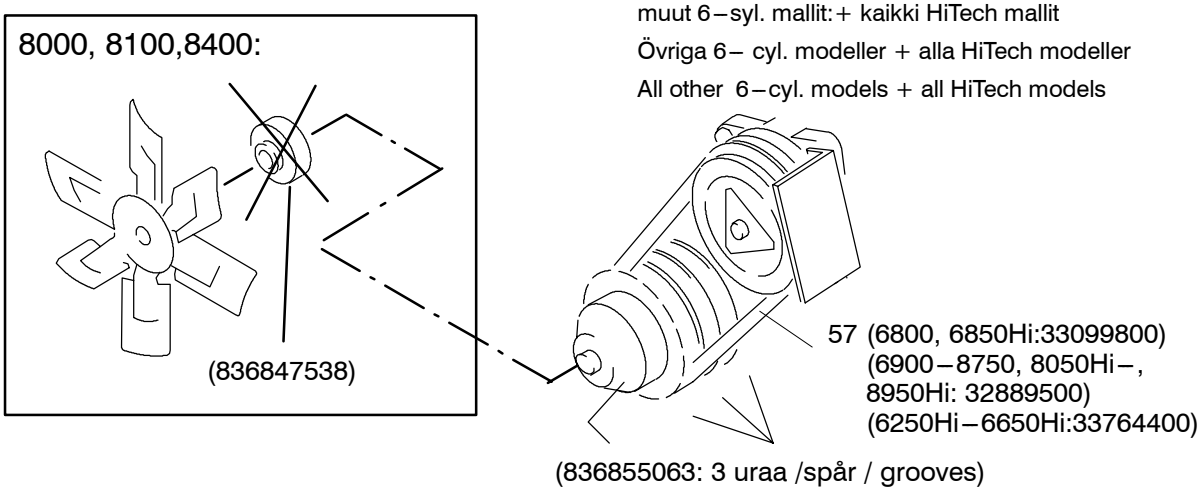
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4

6000–6600
ei/no HiTech



6800, 6900–8750,8050Hi–8950Hi
6250Hi–6850Hi



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Evaporator (fig.6, 7 and 8).

– Remove the cab filter grille on the roof. Remove the roof hatch and the outer roof plate (NOTE! rubber washers between the roof and the front gutter. Disconnect the front ends of the heater air hoses from the cabin

– Remove the cover on the heater radiator housing. Disconnect the lower hose to the heater unit, drain coolant. Drain coolant into a suitable vessel and plug the hose end.

– Lift up the heater radiator and turn it to one side. Detach the heater fan (do not damage the resistance) and the bottom housing

– Drill ø 6 mm holes (in bottom 5 pcs) and ø 6 mm holes (in side walls 4 pcs) through the bottom housing. Use the splash plate **61** as a pattern. Apply Hylosil sealing compound on the housing at points which are in contact with the splash plate (bottom + gables).
Fasten the plate +counter piece **91** in position with nuts. Ensure that the splash plate tights fully against the housing.

– Drill also ø 6 mm holes (4 pcs) through the bottom housing by using part **87** as a pattern. Apply Hylosil mass on part **87** on surfaces which are in contact with the housing shoulder and apply also mass on the housing at points which are in contact with part **87** gables. Fasten the part in position with bolts.

– Cut a hole for expansion valve pipe (see picture 8).
– Fasten the bottom housing in place.

– Remove possible sharp edges from the cab side pillars. Fit valves to the ends of draining hoses **64** and push the hoses into the pillars (picture). If necessary, remove one heater hose from the RH side pillar and push it back after the draining hoses are in place. The hoses can be made slippery with a suitable compound. Ensure tightness of the hose lead–in points with Hylosil mass. Shorten the hoses when necessary and fasten the other ends of the draining hoses into connectors **77** and **54.**
Older tractors: a ø16 mm hole must be drilled to the bottom of the rear cab pillars (mud guard), see fig. 6a.

– Cut the housing lead–in rubber plugs (picture) and push the connectors through the rubbers

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– Glue seal **66** onto the housing bottom at the evaporator rear edge (see picture).
Glue seals **47** and **67** onto the gables of the evaporator.

– Fit the heater radiator and connect the hoses (renew the clips if necessary). Check that the hose lead–in point on the housing are fully tight.

– Pass covering **39** for the hoses to the evaporator. Pass the hoses above the cab attachment and push these hoses up inside the cab LH side front pillar. Bind the hoses together with hose clips **7**.
Make sure, that the hoses for condensing water are not clamped.

– Connect hoses to the expansion valve (o–ring **42** and **41**)

– To avoid water condensing, wrap round evaporator outlet pipe and round the expansion valve insulating mass **48** so that metal parts are entirely covered by the mass.

Seal also hose lead–in points on the housing with the insulating mass.
Leave a small piece of insulating mass left, which can be fitted later when reassembling the housing

– Remove adhesive tape of the temperature switch at the switch fitting point (on rear side) and fit the switch. Pass the capillar tube carefully towards the evaporator.

Push the capillar tube between the evaporator fins to the depth of 90±10 mm according to the picture (the tube must not touch the evaporator pipes). Lock the tube by bending upper edge of the fins against the tube.
Bend carefully the tube to the angle of 90° (do not damage the tube). Coil round the excess length of the tube and place it outside the housing

– Glue seal **46** on the evaporator. The seal is placed partly on the part **67** (see picture 8).
Check that the evaporator is tight against the housing halves.

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– Fasten lamp **53** (1 pcs) and the lamp bracket 32571100 with rubber seal 32570900 onto the support plate (free hole on the plate).

– Fit the wiring loom **52**. Connector X15 (3 pins) should be connected to the corresponding connector in the roof wire loom. Connect wires no 77 (brown) equipped with branch connectors and a white earth wire to the exsisting panel illumination.
Connect wire loom **52** wire no 31 (blue) to the temperature switch S8 (”in”). Find wire no 93 (black) in the roof wire loom and connect it to the other pin (”out”) of the temperature switch

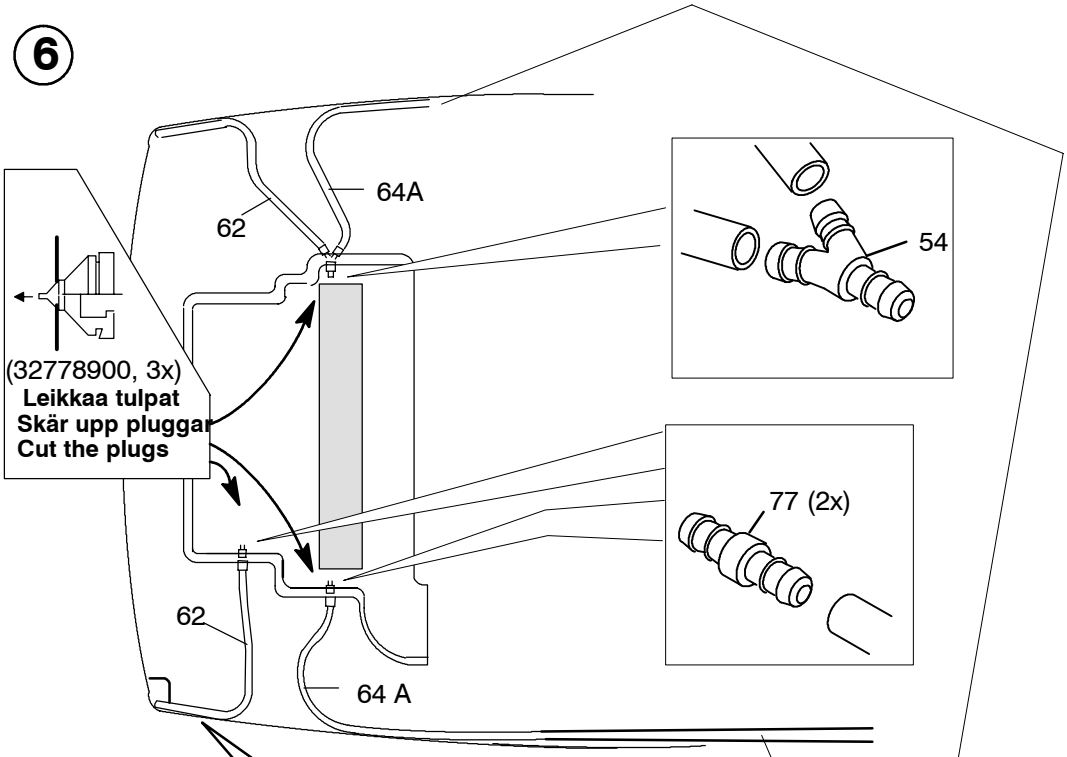
Connect the wire loom wire no 77 (brown) and the white earth wire to the lamp **53**.

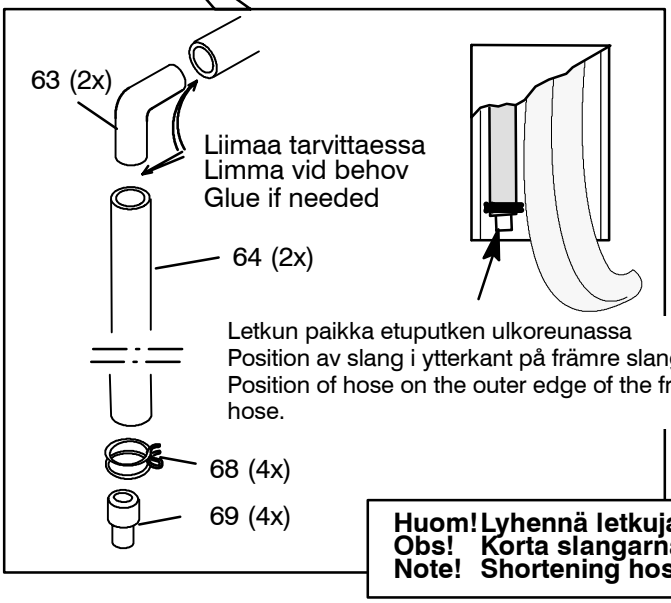
– Before fitting the housing cover, check that the evaporator upper side is flush with the heater radiator upper side.

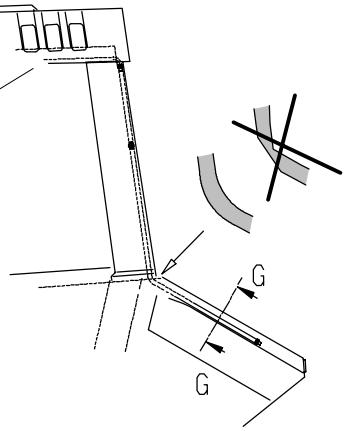
– Reassemle the tractor.

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6

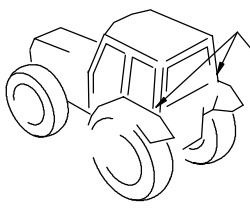






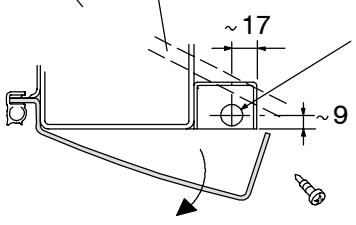
Huom! Lyhennä letkuja tarvittaessa
Obs! Korta slangarna vid behov
Note! Shortening hoses if needed

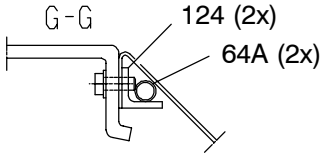
6a



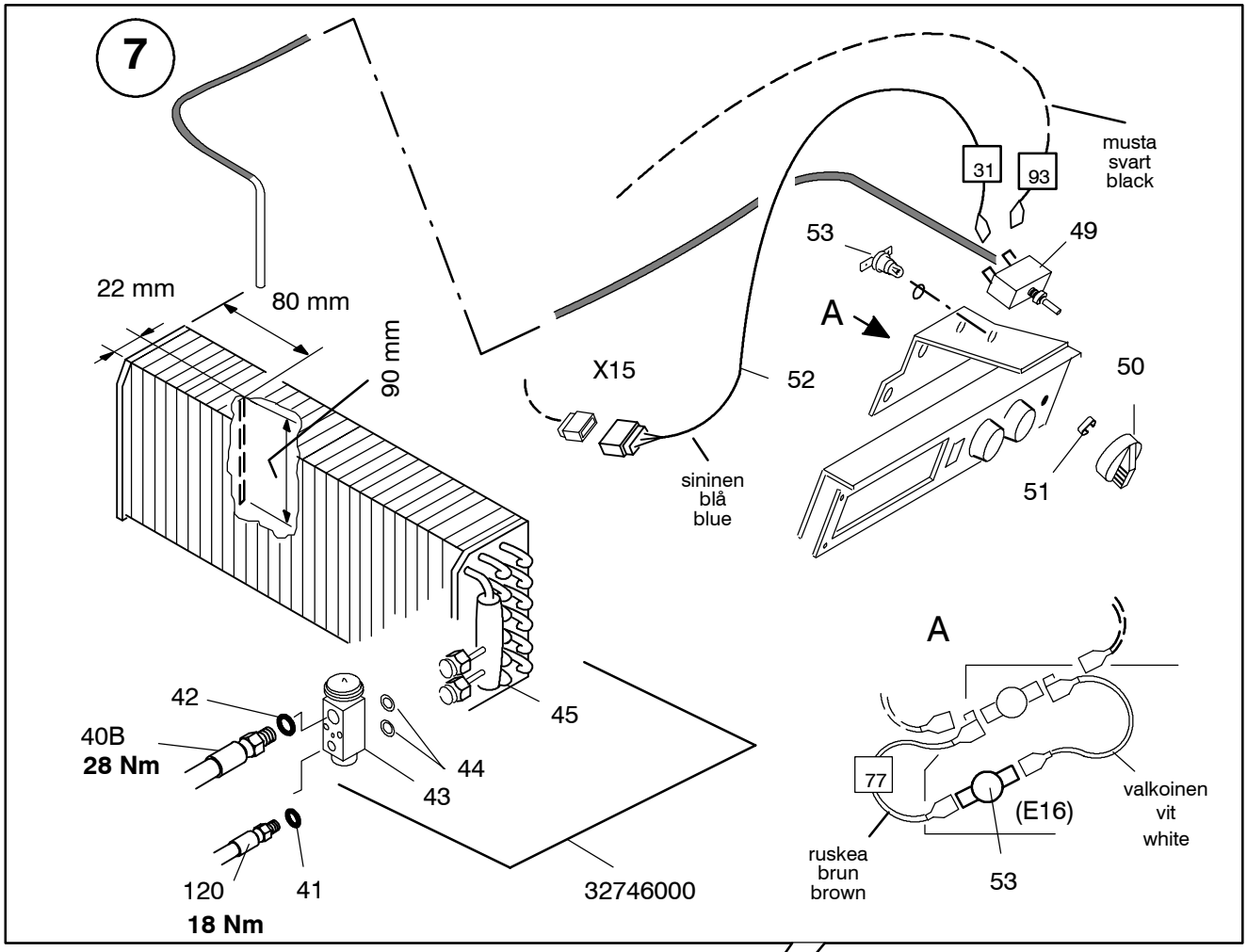
johtosarja
ledningssats
wiring loom

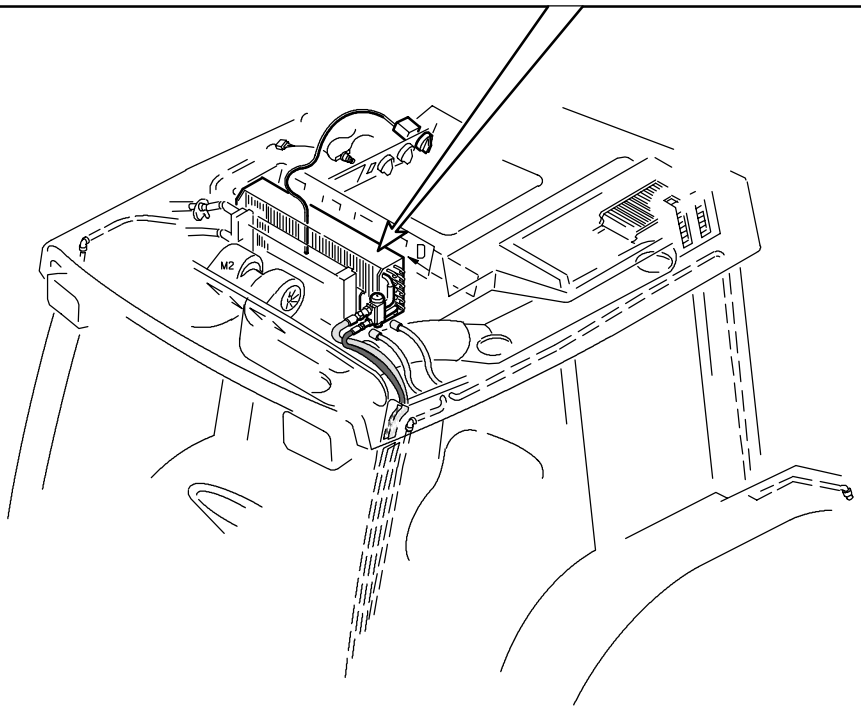
Varo poratessa johtosarjaa
Akta dig för att borra ledningssatsen
Be careful not to drill the wiring loom



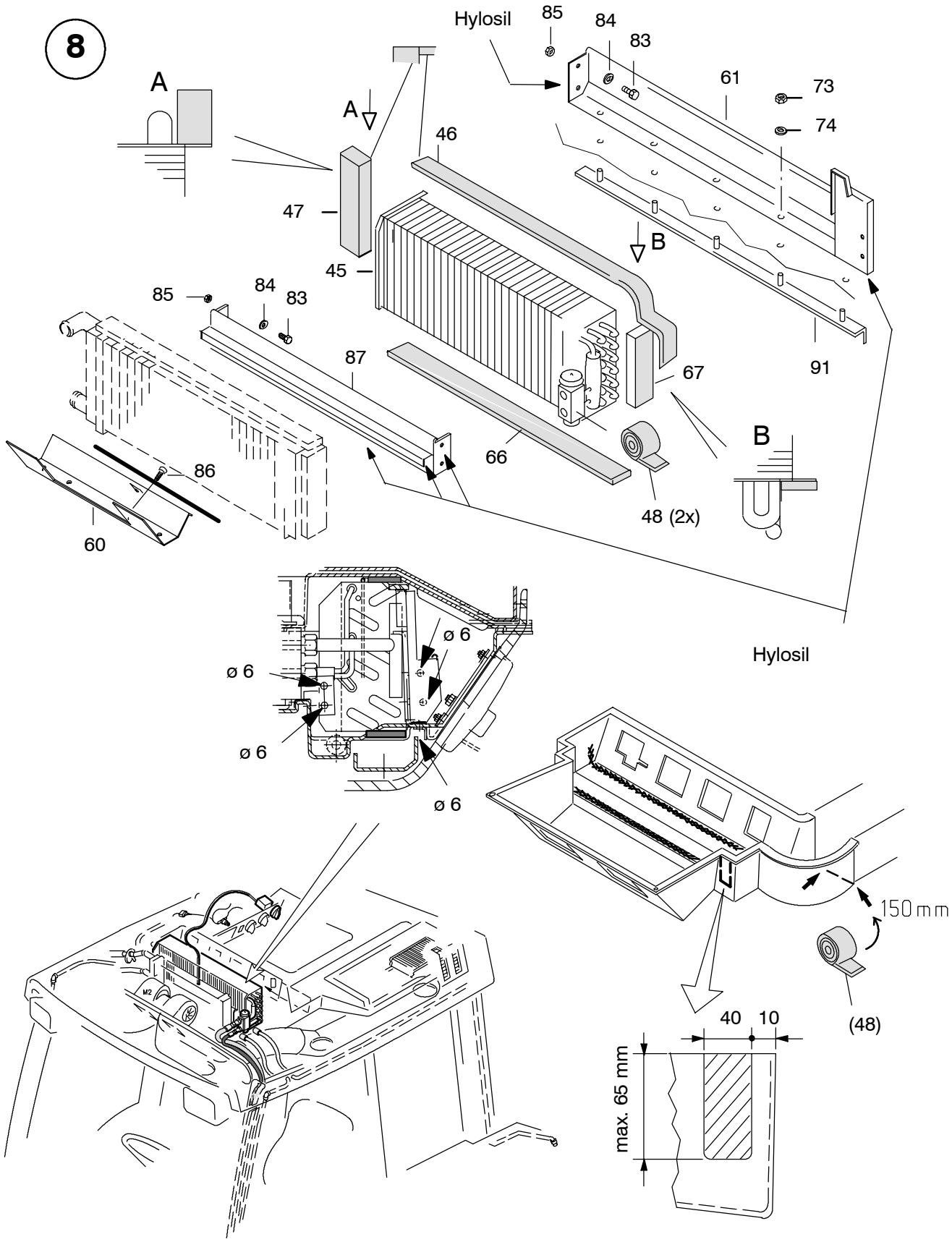


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– Note! Drier hoses are connected **immediately before filling**.

FILLING UP WITH REFRIGERANT: **OBSERVE ALL SAFETY PRECAUTIONS WHEN FILLING!**

– Check that all unions are tightened. NOTE! After filling with refrigerant the compressor oil plug must never be unscrewed, as refrigerant will then spray out.

– Air and moisture can be removed from the system by vacuum pumping. This is carried out from the compressor service valves ”SUC” and ”DIS”. Flush the system with refrigerant while vacuum pumping so that moisture and air are fully removed from the system. (Vacuum–pump for 45 minutes, allowing a small amount of refrigerant to flow into the installation, and then continue pumping for 15 minutes).

– Filling is carried out in gaseous state through service valve SUC on the suction side with compressor running (or in liquid state through service valve DIS on the pressure side, when the engine must not be running).

There is about **1,4 kg** refrigerant in the system

– Drier 32515500: When the system has functioned about 10 min refrigerant in the inspection glass must be almost transparent. Some bubbles can be seen when engine rotation speed is changed.

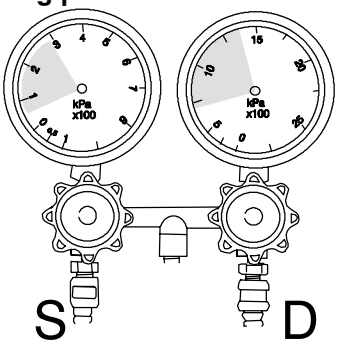
– When the filling hoses are removed from the compressor after filling, the hose union must be pressed against the service valve while turning the nut so that no refrigerant escapes.

CHECKING:

– Carry out pressure measurements after filling. Normal pressure values at outdoor temperature of 20–25˚C and at engine revs1500 r/min: (max cooling, fan speed II).

Low pressure reading: 50–300 kPa
High pressure reading: 700–1400 kPa

Deviating pressures and fault analysis, see Service Manual.

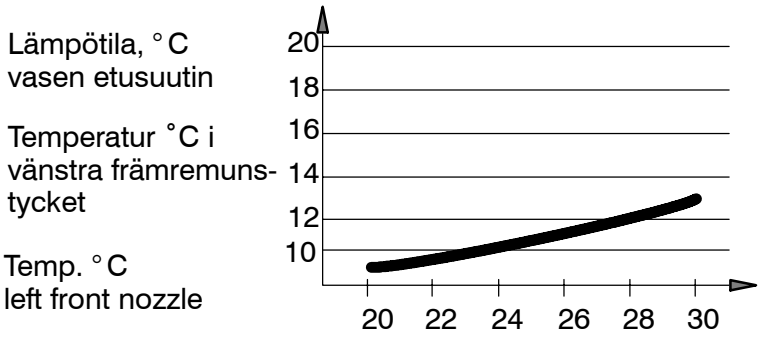


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Temperature:

– Temperature measurement is carried out in shadow, every ventilation nozzles open, doors and windows closed and after the air conditioner has been in function 5–10 minutes. Temperature in the nozzle on the roof console should be about +6...+10 ˚C (at engine revs 1500 r/min, with max cooling effect, with fan speed II and at outdoor temperature of +20–30˚C).

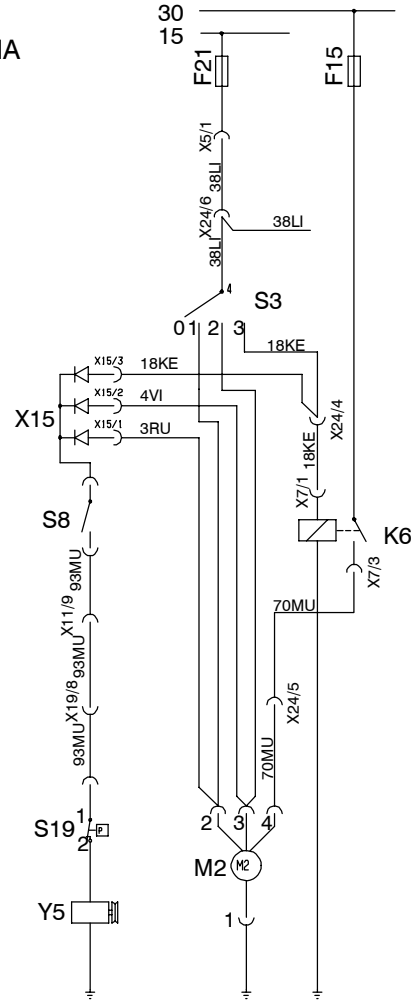
(Check that the cab heater water valve closes the circulation of warm engine coolant).



Lämpötilaero vas./oik. etusuutin max. 3˚C
Temperaturskillnad mellan vänstra och högra ventilationsmunstycken är max 3˚ C.
Temp difference between left and right front nozzles is max 3˚C.

Ulkolämpötila °C
Utetemperatur °C
Outdoor temp.°C

KYTKENTÄKAAVIO
KOPPLINGSSCHEMA
WIRING DIAGRAM



S 3 Kytkin, puhallin
Strömställare, fläkt
Fan switch

S 8 Kytkin, ilmastointilaite
Strömställare, luftkonditionering
Switch, air conditioner

S19 Kytkin, kompressorin paine
Luft kond, tryckvakt
Pressure switch

M 2 Puhallin
Fläkt
Fan

K 6 Rele, puhallin III–nopeus
Relä, fläkt III–hastighet
Relay, fan speed III

X15 Liitinkotelo, 3–os., ilmastointil., diodit
Kopplingsbox, 3 poler, luftkond, dioder
Connector, 3 pins, air cond., diodes

Y 5 Magneettiventtiili, kompressori
Magnetventil, kompressor strömuttag
Compressor magnetic clutch

F21 Ilmastointilaitteen sulake
Säkring för klimatanläggning
Air conditioner fuse

F15 Puhaltimen sulake
Säkring för fläkt
Fuse for fan

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SERVICING AND USE:

* If it is required to reduce quickly temperature to the desired value the engine speed must be set to at least a 1000 RPM with cooling knob in max. position (if air humidity is high the control knob is turned less) and fan in position II. The cooling knob is then turned to the desired value and the fan speed adjusted. Note that a high fan speed does not always produce the coldest result as air passes through the evaporator so quickly that it is not sufficiently cooled down.

* Apart from cab cooling, the installation can also be used from reducing the general air humidity in the cab (e.g. from windows) by setting on the heating valve for a short time. The moisture in the air is then condensed in the evaporator and the air heated to the desired temperature

* On the drier there is an inspection glass. When the air conditioner has been in function for about 10 min, should refrigerant in the glass be almost transparent. Some bubbles cab be seen when engine revs are changed up and down. On this drier there is also a separate moisture indicator. Blue colour indicates that the drier is active. Pink or grey colour means that the drier is inactive and should be changed.

* The most usual cause of faults in a cooling installation is moisture in the system or that gas has leaked out. If there is moisture in the refrigerant, ice plugs will be formed which block the expansion valve (these both faults can be seen in the drier inspection glasses).

* To prevent gas leakage through drying out of the seals on the compressor shaft the air conditioner should be run for about five minutes at every lubrication service of the tractor, or at least once a month, even during winter.

  NOTE! Check that the compressor actually starts (at low temperatures the thermostat cuts out).

*The condenser must be cleaned at regular intervals to remove dust, insects and other foreign matter. Twisted gills must be straightened out.

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FAULT ANALYSIS AND SYMPTOMS

a) Leaks in the system will lead to inadequate cooling and low and high gauge readings will be too low.

b) If the system is under–charged, bubbles will be permanently visible in the dehydrator sight glass and both gauge readings will be low.

c) If the evaporator is dirty or an expansion valve is blocked or frozen up, there will be a partial vacuum on the low pressure side and insufficient pressure on the high pressure side.

d) An over–charged system, an expansion valve stuck open or a clogged condenser will cause excessive pressure on the low pressure side.

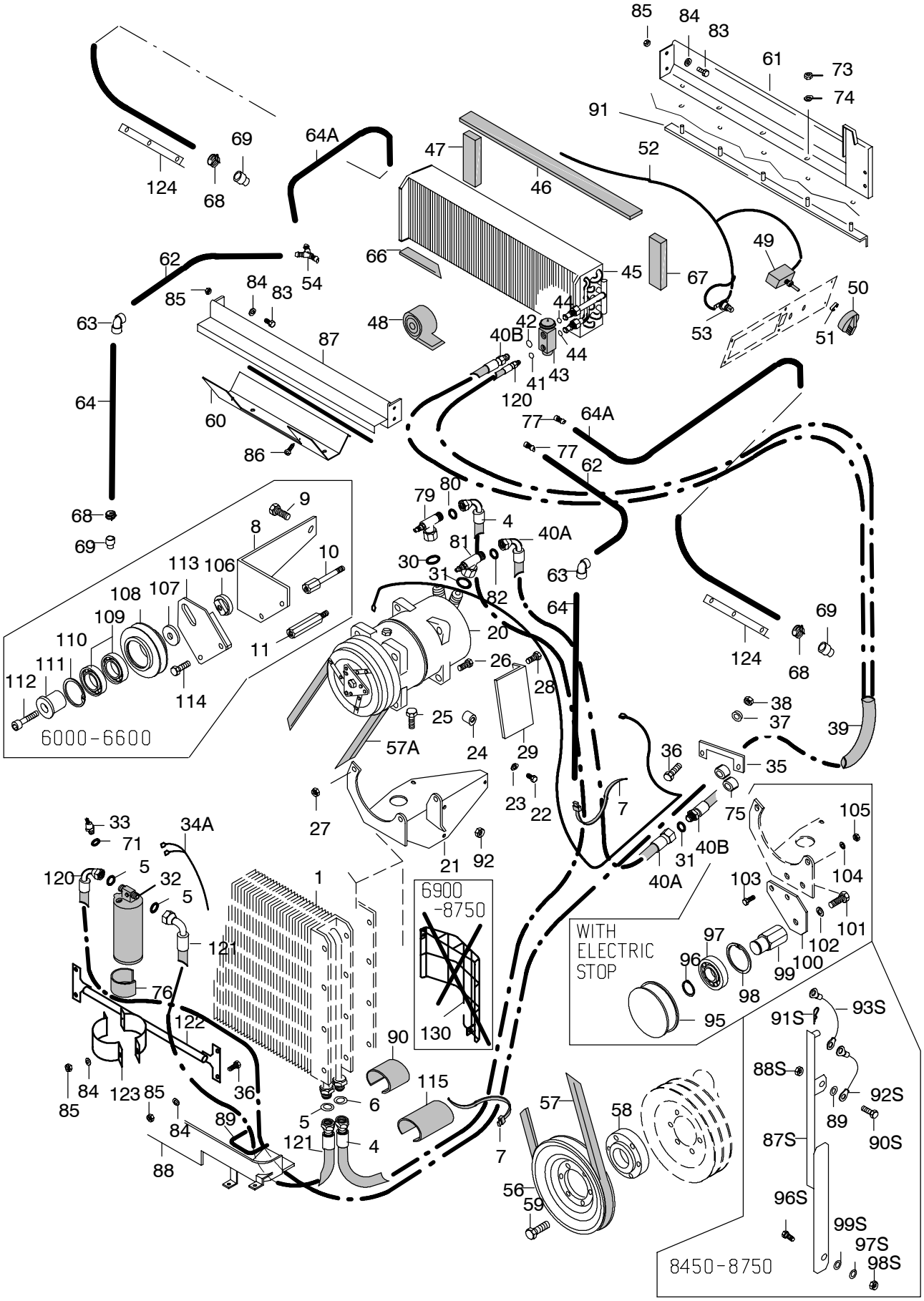
e) A clogged condenser and an over–charged system will cause excessive pressure on the high pressure side.

OVERCHARGE

Note! The correct refrigerant filling is about **1,4 kg** on 6000–8400 tractors.

– In a correctly charged system, R12 discharged from the compressor in the form of gas looses its excess heat, resulting from compression in the first coil of the condenser and condenses to a liquid in the subsequent coils. Before flowing to the reservoir, this liquid is held in the last condenser coil. If the system is over–charged, the liquid level builds up in the condenser, leaving fewer coils available to condense the gas. Both temperature and pressure then build up, causing hoses to burst in some cases.

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OSALUETTELO / STYCKLISTA / PARTS LIST

OSALUETTELO / STYCKLISTA / PARTS LIST **6000, 6100, 6200, 6300, 6400, 6600, 6800, 6900, 8000, 8100, 8200, 8400, 8050, 8150, 8450, 8550, 8750**:

							1994–
	1	**32453210**	Ilmastointilaite	Luftkondit.	Air conditioning	Klimaanlage	6000–6600
			Avattava keula	Öppningsbar framkåpa	Openable front cover	Öffenbar vorderteil	
	1	**32214310**	Ilmastointilaite	Luftkondit.	Air conditioning	Klimaanlage	6900–8400
			Avattava keula	Öppningsbar framkåpa	Openable front cover	Öffenbar vorderteil	
	1	**33099900**	Ilmastointilaite	Luftkondit.	Air conditioning	Klimaanlage	6800
			Avattava keula	Öppningsbar framkåpa	Openable front cover	Öffenbar vorderteil	
	1	**33182400**	Ilmastointilaite	Luftkondit.	Air conditioning	Klimaanlage	8050–8750
	1	**33665200**	Ilmastointilaite	Luftkondit.	Air conditioning	Klimaanlage	HiTech, page 24
1	1		.Lauhdutin	Condensor	Condenser	Kondensator	Page 23
4	1	32849100	.Letku	Slang	Hose	Schlauch	
5	3	30414910	.O-rengas	O-ring	O-ring	O-ring	ø 7.66x1,78
6	1	30415010	.O-rengas	O-ring	O-ring	O-ring	ø 10,82x1,78
7	13	SA9102	.Side	Band	Band	Binde	
8	1	32509800	.Tuki	Stöd	Support	Stütze	
9	1	HA6324	.Ruuvi	Skruv	Screw	Schraube	M08x25
10	1	32509200	.Ruuvi	Skruv	Screw	Schraube	
11	1	32509300	.Ruuvi	Skruv	Screw	Schraube	
20	1	32838600	.Kompressori	Kompressor	Compressor	Kompreßor	
21	1	32213920	.Jalusta	Stativ	Stand	Sockel	6000–6800
	1	32510020	.Jalusta	Stativ	Stand	Sockel	6900–8750
22	1	HA6323	.Ruuvi	Skruv	Screw	Schraube	6000–680 M08x20
	2	HA8331	.Ruuvi	Skruv	Screw	Schraube	6900–8750 M08x100
23	3	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	ø 8,4
24	1	32602700	.Holkki	Hylsa	Sleeve	Hülse	6000–6800 L=24,5
	2	32510200	.Holkki	Hylsa	Sleeve	Hülse	6900–8750 L=12
	2	33412000	.Holkki	Hylsa	Sleeve	Hülse	6800 L=55
	2	33183400	.Holkki	Hylsa	Sleeve	Hülse	6800 L=73
25	1	HA6323	.Ruuvi	Skruv	Screw	Schraube	M08x20
26	3	HA9236	.Ruuvi	Skruv	Screw	Schraube	M10x35
27	4	JB8905	.Mutteri	Mutter	Nut	Mutter	N M10
28	2	HA6333	.Ruuvi	Skruv	Screw	Schraube	M10x25
29	1	30764900	.Suojus	Skydd	Shield	Schutz	
30	1	30415010	.O-rengas	O-ring	O-ring	O-ring	
31	2	30415110	.O-rengas	O-ring	O-ring	O-ring	
32	1	32814800	.Kuivaajasäiliö	Torkn.behållare	Drying container	Trocknenbehälter	
33	1	32844300	.Painevahti	Tryck vakt	Pressure detector	Druckindikator	
34A	1	33175800	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
35	1	32603400	.Tuki	Stöd	Support	Stütze	
36	14	HA6313	.Ruuvi	Skruv	Screw	Schraube	M06x16
37	2	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	ø 6,4
38	2	JB1106	.Mutteri	Mutter	Nut	Mutter	M6
39	1	32550600	.Suojus	Skydd	Shield	Schutz	
40A	1	33201200	.Letku	Slang	Hose	Schlauch	F16408–
40B	1	33201100	.Letku	Slang	Hose	Schlauch	F16408–
41	1	30414910	.O-rengas	O-ring	O-ring	O-ring	
42	1	30415110	.O-rengas	O-ring	O-ring	O-ring	
	1	32746000	.Paisuntaventtiili	Expansionsventil	Expansion valve	Expansionsventil	
			+ Höyrystin	Evaporator	Evaporator	Verdampfer	
43	1	32745700	..Paisuntaventtiili	Expansionsventil	Expansion valve	Expansionsventil	
44	2	30415010	..O-rengas	O-ring	O-ring	O-ring	
45	1	32745600	..Höyrystin	Evaporator	Evaporator	Verdampfer	
46	1	32836300	.Tiiviste	Tätning	Gasket	Dichtung	7x20x690
47	2	32836500	.Tiiviste	Tätning	Gasket	Dichtung	35x20x155
48	2	30794000	.Eristysmassa	Isolatorsmass	Isolating compound	Isoliermaße	1850 mm
49	1	30415200	.Säätökytkin	Reglerbrytare	Control switch	Regelschalter	
50	1	31752000	.Nuppi	Knopp	Knob	Knopf	
51	1	32291100	.Lukitsin	Låsplatta	Lock plate	Verriegelungsplatte	
52	1	32835110	.Johdinsarja	Ledningssats	Wiring set	Verkabelung	
53	1	SH2651	.Lamppu	Lampa	Bulb	Lampe	2W
	1	32571100	.Lampunpidin	Lampfattning	Bulb socket	Lampenfuß	
	1	32570900	.Kumitiiviste	Gummitätning	Rubber seal	Gmmidichtung	

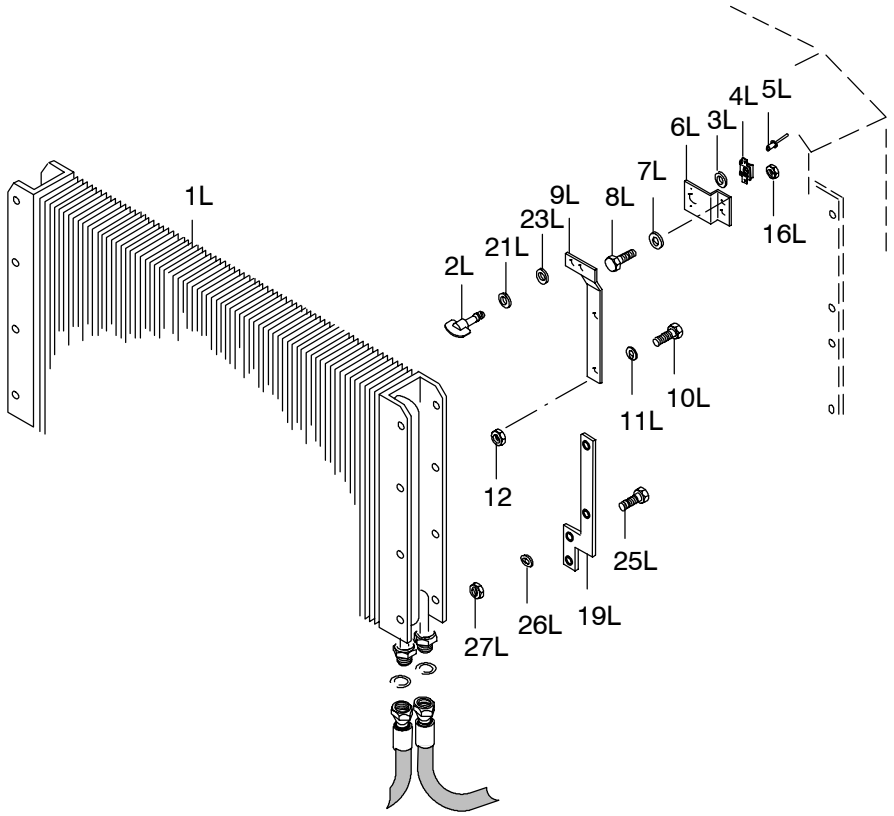
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54	1	32461100	.Y-liitin	Y-koppling	Y-union	Y-verbindung	
56	1	30555000	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
	1	836655451	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
57	1	32463910	.Kiilahihna	Kilrem	V–belt	Keilriemen	6000–6600
57A	1	32889500	.Kiilahihna	Kilrem	V–belt	Keilriemen	6900–8750
	1	33099800	.Kiilahihna	Kilrem	V–belt	Keilriemen	6800
	1	33279600	.Kiilahihna	Kilrem	V–belt	Keilriemen	6800 : : :
58	1	30555100	.Välikappale	Mellanstycke	Intermed. piece	Zwischenstück	6000–6800
59	6	HA6326	.Ruuvi	Skruv	Screw	Schraube	6000–6800
60	1	32840700	.Ohjauslevy	Styrplatta	Guide plate	Steuerplatte	
61	1	32800010	.Levy	Platta	Plate	Platte	
–	1	33761200	..Tiiviste	Tätning	Gasket	Dichtung	62
2		33554200	.Letku	Slang	Hose	Schlauch	
63	2	32688800	.Käyrä	Vinkelrör	Elbow pipe	Vinkelrohr	
64	2	33554300	.Letku	Slang	Hose	Schlauch	L=1600
64A	2	33554400	.Letku	Slang	Hose	Schlauch	L=2500
66	1	32836200	.Tiiviste	Tätning	Gasket	Dichtung	5x40x590
67	1	32836400	.Tiiviste	Tätning	Gasket	Dichtung	5x20x150
68	4	32697000	.Letkunpidin	Slangfäste	Hose holder	Schlauchhalter	
69	4	32696700	.Suutin	Munstycke	Nozzle	Düse	
71	1	32275210	.O-rengas	O-ring	O-ring	O-ring	
73	5	JB1105	.Mutteri	Mutter	Nut	Mutter	M5
74	5	JD0405	.Aluslaatta	Bricka	Washer	Scheibe	ø5,3
75	2	32732600	.Putkieriste	Rörisolering	Pipe insulation	Rohrisolator	
76	2	32569200	.Tiiviste	Tätning	Gasket	Dichtung	3x10x100
77	2	32602800	.Liitin	Nippel	Union	Verbindung	
79	1	32838800	.Liitin	Nippel	Union	Verbindung	D
80	1	30415010	.Tiiviste	Tätning	Gasket	Dichtung	
81	1	32839000	.Liitin	Nippel	Union	Verbindung	S
82	1	30415110	.Tiiviste	Tätning	Gasket	Dichtung	
83	8	HA9224	.Ruuvi	Skruv	Screw	Schraube	M06x12
84	28	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	ø6,4
85	24	JB1106	.Mutteri	Mutter	Nut	Mutter	M6
86	2	HN9051	.Ruuvi	Skruv	Screw	Schraube	B 4,8x32
87	1	32934000	.Levy	Platta	Plate	Platte	
88	1	32883400	.Verkko	Nät	Net	Netz	6000–6800
	1	32844000	.Verkko	Nät	Net	Netz	6900–8400
	1	33127500	.Verkko	Nät	Net	Netz	8450–8750
89	1	32842700	.Reunasuojus	Kantskydd	Edge shield	Kantenschutz	
90	1	32807900	.Tiiviste	Tätning	Gasket	Dichtung	6900–8400
91	1	33135010	.Tuki	Stöd	Support	Stütze	
92	1	JB9927	.Mutteri	Mutter	Nut	Mutter	
	1	32889100	Välipyörä, koott	Mellanhjul, kmpl	Interm. wheel, assy	Zwischenrad	6000–6800:
95	1	32889210	..Välipyörä	Mellanhjul	Intermediate wheel	Zwischenrad	
96	1	KG1020	..Varmistinrengas	Låsring	Circlip	Sicherungring	
97	2	LA1290	..Laakeri	Lager	Bearing	Lager	
98	1	KG3052	..Varmistinrengas	Låsring	Circlip	Sicherungring	
99	1	32889620	..Akseli	Axel	Shaft	Achse	
100	1	32884600	..Levy	Platta	Plate	Platte	
101	1	HA6344	..Ruuvi	Skruv	Screw	Schraube	M12x30
102	1	JD9105	..Aluslaatta	Bricka	Washer	Scheibe	12
103	1	HA6325	..Ruuvi	Skruv	Screw	Schraube	M8x30
104	1	JD0408	..Aluslaatta	Bricka	Washer	Scheibe	
105	1	JB9927	..Mutteri	Mutter	Nut	Mutter	V M8

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	1	32510310	.Kiristin koott.	Klämma, kmpl	Clip, assy	Klammer, kompl	6000–6600
106	1	32969100	..Vastakappale	Motstycke	Counterpiece	Gegenstück	
107	1	32969200	..Välipala	Mellanstycke	Intermediate piece	Zwischenstück	
108	1	32509610	..Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	
109	2	LA1800	..Laakeri	Lager	Bearing	Lager	
110	1	KG3052	..Varmistinrengas	Låsring	Circlip	Sicherungring	
111	1	32510410	..Akseli	Axel	Shaft	Achse	
112	1	HC9769	..Ruuvi	Skruv	Screw	Schraube	M10x40
113	1	32509510	..Välipala	Mellanstycke	Intermediate piece	Zwischenstück	
114	2	HA6325	..Ruuvi	Skruv	Screw	Schraube	M08x30
115	1	30765700	..Suojus	Skydd	Shield	Schutz	8000–8750
120	1	33175700	.Letku	Slang	Hose	Schlauch	L=5700
121	1	33175600	.Letku	Slang	Hose	Schlauch	6000–6600
		33244410	.Letku	Slang	Hose	Schlauch	
122	1	33154900	.Teline	Konsol	Bracket	Gestell	6000–6800
	1	33154800	.Teline	Konsol	Bracket	Gestell	6900–8400
123	1	33154600	.Kannatin	Hållare	Support	Halter	
–	1	32961000	Latta	Platt	Flat	Platt	: : :
–	1	HA6324	Ruuvi	Skruv	Screw	Schraube	M08x25 : : :
–	1	JB1108	Mutteri	Mutter	Nut	Mutter	M8 : : :
–	1	HA8330	Ruuvi	Skruv	Screw	Schraube	M08x80 : : :
–	1	JD9062	Aluslaatta	Bricka	Washer	Scheibe	B8 : : :
124	2	33497900	.Tuki	Hållare	Support	Halter	
(130	1	33027900)	Suojus	Skydd	Shield	Schutz	: : :
	1	33200800	Välipala	Mellanstycke	Intermediate piece	Zwischenstück	8200
			Tuuletin	Fläkt	Fan	Ventilator	
:		Sähköpysäytin	Elstopp	Elecric stop	Elektrische stop	Stop électrique	
: : :		P.imakompr.	Med tryckluftkompr. kanssa	With air compressor	Mit Luftkompressor		
							8050–8750:
87S	1	33267400	.Kannatin	Hållare	Support	Halter	Left
	1	33267500	.Kannatin	Hållare	Support	Halter	Right
88S	4	JB1106	.Mutteri	Mutter	Nut	Mutter	M6
89S	4	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	6,4
90S	4	HA6313	.Ruuvi	Skruv	Screw	Schraube	M06x16
91S	2	33268200	.Sokka	Sprint	Pin	Splint	
92S	2	33268000	.Pidin	Klämma	Clamp	Klammer	
93S	2	33268100	.Pidin	Klämma	Clamp	Klammer	
96S	2	HA8327	.Ruuvi	Skruv	Screw	Schraube	M08x50
97S	2	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	8,4
98S	2	JB9927	.Mutteri	Mutter	Nut	Mutter	V M8
99S	4	625510	.Aluslaatta	Bricka	Washer	Scheibe	

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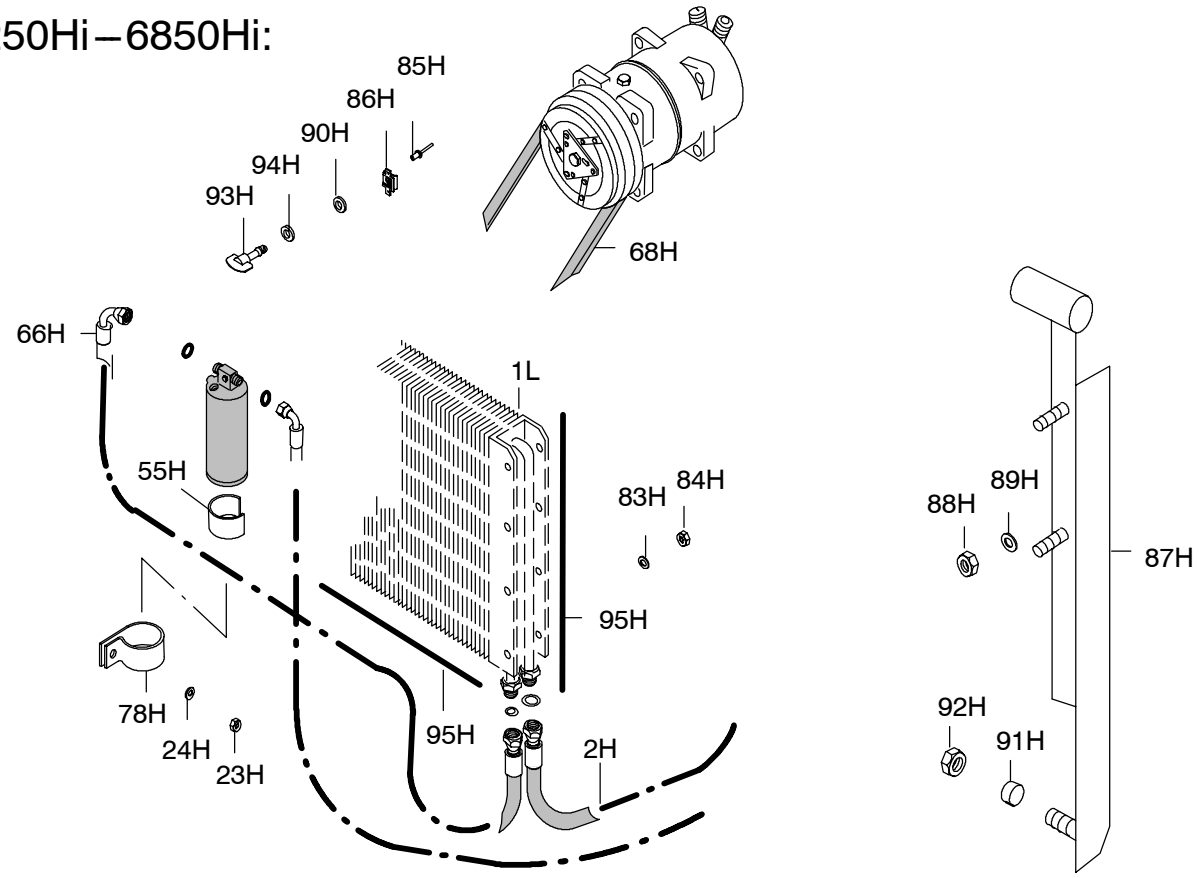


OSALUETTELO / STYCKLISTA / PARTS LIST:

							1994–
1L	1	32814900	.Lauhdutin	Condensor	Condenser	Kondensator	6000–6800
	1	33289400	.Lauhdutin	Condensor	Condenser	Kondensator	6900–8400, 8050–8750
2L	2	32665500	.Vääntötappi	Vridpinne	Torque pin	Drehstift	
3L	2	32665600	.Kiinnityslaatta	Fästplåt	Mounting plate	Befest.platte	
4L	2	32675200	.Kiinnitin	Fästdon	Fastener	Halter	ei/no 6800
5L	4	JF5002	.Niitti	Nit	Rivet	Niet	ei/no 6800
6L	2	32814700	.Kiinnitin	Fästdon	Fastener	Halter	ei/no 6800
7L	4	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	ø6,4
8L	4	HA9224	.Ruuvi	Skruv	Screw	Schraube	M06x12
9L	1	32844400	.Kiinnitin	Fästdon	Fastener	Halter	ei/no 6800
	1	32844500	.Kiinnitin	Fästdon	Fastener	Halter	ei/no 6800
10L	8	HA6313	.Ruuvi	Skruv	Screw	Schraube	M06x16
11L	8	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	
12L	8	JB1106	.Mutteri	Mutter	Nut	Mutter	M6
16L	4	JB1108	.Mutteri	Mutter	Nut	Mutter	M8, 6000–6600
19L	2	32844200	.Levy	Platta	Plate	Platte	6900–8400
21L	2	32673300	.Kiinnityslaatta	Fästplåt	Mounting plate	Befest.platte	
23L	2	JD0410	.Aluslaatta	Bricka	Washer	Scheibe	10,5
25L	2	HA6323	.Ruuvi	Skruv	Screw	Schraube	M8x20
26L	2	JD0408	.Aluslaatta	Bricka	Washer	Scheibe	ø8,4
27L	2	JB8904	Mutteri	Mutter	Nut	Mutter	N M8

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6250Hi–6850Hi:



ERILAISET OSAT / OLIKA DERAL / DIFFERENT PARTS **6250Hi–6850Hi:**

23H	1	JB1108	.Mutteri	Mutter	Nut	Mutter	
24H	1	JD0406	.Aluslaatta	Bricka	Washer	Scheibe	
55H	2	32860100	.Tiiviste	Tätning	Gasket	Dichtung	
66H	1	33625400	.Letku	Slang	Hose	Schlauch	
68H	1	33764400	.Kiilahihna	Kilrem	V–belt	Keilriemen	6250Hi–6650Hi
(	1	33099800	.Kiilahihna	Kilrem	V–belt	Keilriemen	6850Hi)
78H	1	TC7150	.Side	Band	Band	Binde	
85H	4	JF5002	.Niitti	Nit	Rivet	Niet	
86H	2	32675200	.Jousilevy	Fjäderplatta	Spring plate	Federplatte	
87H	1	33594800	.Kannatin	Hållare	Support	Halter	Left
	1	33594900	.Kannatin	Hållare	Support	Halter	Right
90H	2	32665600	.Kiinnityslaatta	Fästplåt	Mounting plate	Befest.platte	
91H	2	33663300	.Holkki	Hylsa	Sleeve	Hülse	
92H	2	JB8904	.Mutteri	Mutter	Nut	Mutter	
93H	2	32665500	.Väätötappi	Vridpinne	Torque pin	Drehstift	
94H	2	32673300	.Kiinnityslaatta	Fästplåt	Mounting plate	Befestigugsplatte	
95H	3	32569200	Tiiviste	Tätning	Gasket	Dichtung	

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APPENDIX 1

If the tractor (3, 4–cyl.) is equipped with compressed air system, the air compressor should be moved to the RH side of the engine:

– In this case a vertical exhaust silencer and a new engine hood plate should be fitted.
A cutting must be done on the wind tunnel (fan comes more forward). At the crankshaft end, there are three belt pulleys. The **two** outer pulleys power the compressed air and air conditioner compressor.

– Remove the engine hood plate and the vertical silencer. Remove the radiator cowl.

– Make holes in the cowl according to picture.

– **Note!** The compressor bracket of the air conditioning must be fitted in the rear holes.
Fasten the compressor extra support **20**.

– Change an extra belt pulley **35** in place of one–groove pulley (without intermediate piece).

– Fit the compressor bracket and compressor according to picture at fixing bolts of the engine gear wheel casing. Fit the return pipe parts (**13**,**14**,**27**) into place
Change the alternator protective covering **38**.

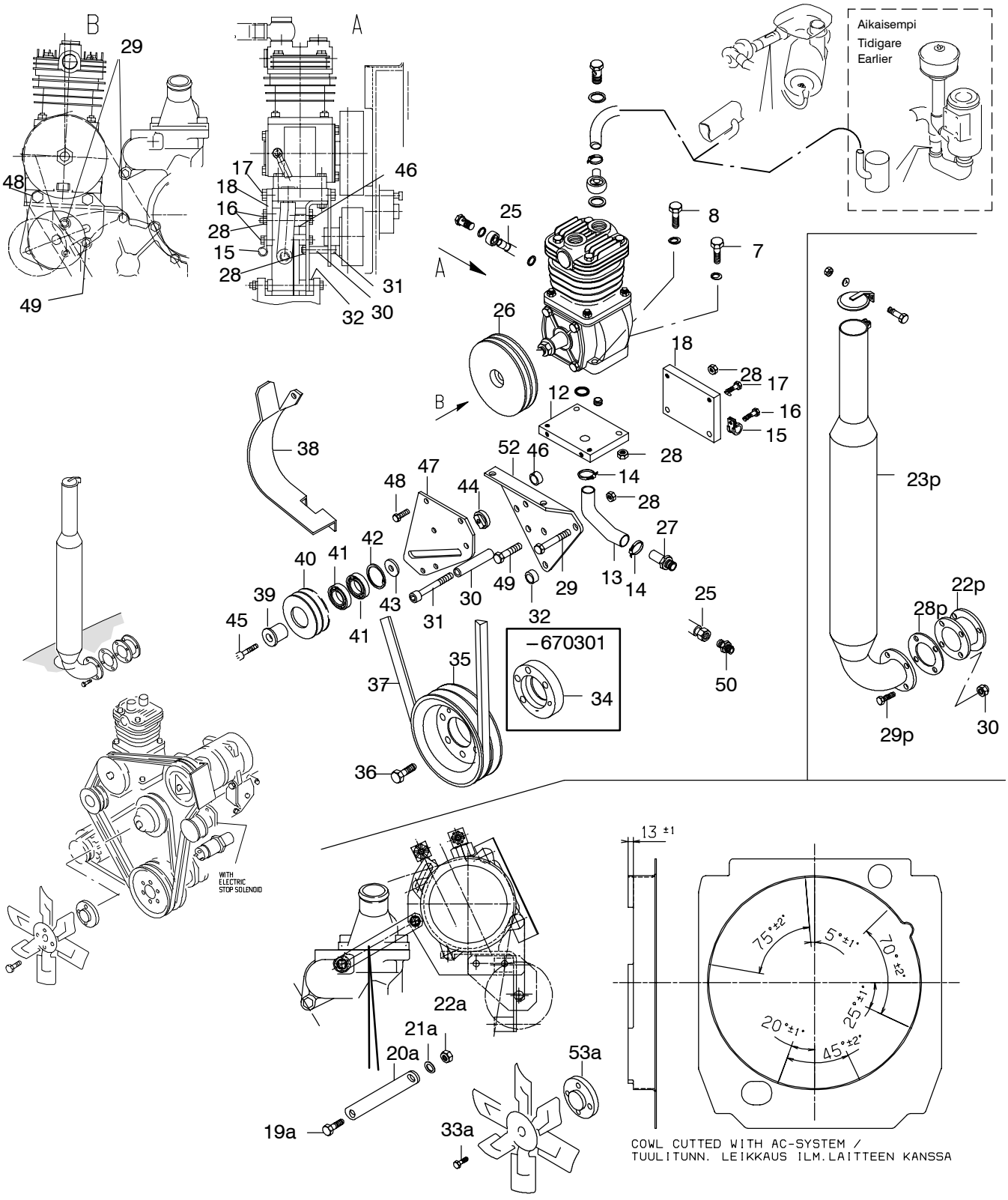
– Remove a plug screw on the cylinder block behind the alternator and connect into hole the compressor lubricating oil hose **25** one end (union **50**). Fasten the other end to the compressor.

– Assembly the tightener (parts **39**–**48**) into place. Fit the belt **37** and tighten it to a suitable tension
NOTE! check:
– belt pulley position in relation to the other pulleys (must be in the same line.)
– belt tension
– Tightness of hose unions

– Fit the vertical silencer **23p** with its parts. Fit a new engine hood plate.

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Liite1 Paineilmalaitteet: paineilmakompressorin siirto moottorin oikealle puolelle (3/4–syl.)
Bilaga 1 Tryckluftanordning: Flyttning av tryckluftkompressorn till motorns högra sida (3/4–cyl.)
Appendix 1 Pneumatic appliances: Moving the air kompressor to the right side of the engine, (3/4–cyl.)



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LIITE 1 / BILAGA 1 / APPENDIX 1

5	1	836652398	.Imuputki	Sugrör	Intake pipe	Saugrohr	
7	2	HA9230	.Ruuvi	Skruv	Screw	Schraube	M8x35
8	2	HA8328	.Ruuvi	Skruv	Screw	Schraube	M8x60
10	1	614702532	.O-rengas	O-ring	O-ring	O-ring	
11	1	835331738	.Tulppa	Plugg	Plug	Stopfen	
12	1	836136875	.Laatta	Platta	Plate	Platte	
13	1	836136869	.Putki	Rör	Pipe	Rohr	
14	2	GP3918	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	
15	1	602060612	.Kiinnitin	Fästdon	Fastener	Halter	
16	2	HA6324	.Ruuvi	Skruv	Screw	Schraube	M8x25
17	2	HA6333	.Ruuvi	Skruv	Screw	Schraube	M10x25
18	1	836136865	.Laatta	Platta	Plate	Platte	
19a	2	HA6324	.Ruuvi	Skruv	Screw	Schraube	M8x25
20a	1	32961000	.Tuki	Stöd	Support	Stütze	
21a	2	JD9062	.Aluslaatta	Bricka	Washer	Scheibe	8
22a	2	JB1108	.Mutteri	Mutter	Nut	Mutter	M8
25	1	836847771	.Putki	Rör	Pipe	Rohr	
26	1	836652094	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	Air conditioning
27	1	836136868	.Putki	Rör	Pipe	Rohr	
28	4	JB1108	.Mutteri	Mutter	Nut	Mutter	M8
29	2	HA8330	.Ruuvi	Skruv	Screw	Schraube	M8x80
30	1	836852171	.Holkki	Hylsa	Sleeve	Hülse	
31	1	HC8331	.Ruuvi	Skruv	Screw	Schraube	M8x60
32	1	836019387	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
33a	4	HA8327	.Ruuvi	Skruv	Screw	Schraube	M8x50
34	1	30555100	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	–670301
35	1	836655452	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	Air conditioning
36	6	HA8326	.Ruuvi	Skruv	Screw	Schraube	M8x40
37	2	32960800	.Kiilahihna	Kilrem	V–belt	Keilriemen	Air conditioning
38	1	836655231	.Suoja	Skydd	Cover	Schutz	
39	1	32510410	.Akseli	Axel	Shaft	Achse	
40	1	835328919	.Kiilahihnapyörä	Kilremskiva	V–belt pulley	Keilriemenrad	Air conditioning
41	2	LA1800	.Laakeri	Lager	Bearing	Lager	
42	1	KG3052	.Varmistinrengas	Låsring	Circlip	Sicherungring	
43	1	836655153	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
44	1	32969100	.Vastakappale	Motstycke	Counterpiece	Gegenstück	
45	1	HC9765	.Ruuvi	Skruv	Screw	Schraube	M10x60
46	1	836114846	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	
47	1	836136873	.Levy	Platta	Plate	Platte	
48	2	HA9235	.Ruuvi	Skruv	Screw	Schraube	M10x20
49	1	HA9400	.Ruuvi	Skruv	Screw	Schraube	M8x45
50	1	641086006	.Liitin	Anslutning	Connection	Anschluß	
51	1	32944300	.Kompressori	Kompressor	Compressor	Kompreßor	
52	1	836136866	.Levy	Platta	Plate	Platte	
53a	1	836652033	.Välipala	Mellanstycke	Intermedeate piece	Zwischenstück	

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LIITE 1 / BILAGA 1 / APPENDIX 1

			Vaihdettavat osat	**Utbytbara delar**	**Changeable parts**	**Wechselbare Teile**	6100
	–1	32059520	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	30294920	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	–1	32107200	Konepeitto	Motorhuv	Engine hood	Motorhaube	
	+1	31810310	Konepeitto	Motorhuv	Engine hood	Motorhaube	
22p	+1	32766300	Väliputki	Mellanrör	Spaser pipe	Zwischenrohr	
29p	+4	HA6325	.Ruuvi	Skruv	Screw	Schraube	M8x30
30p	+4	JB9927	.Mutteri	Mutter	Nut	Mutter	V M8
	–1	32879600	.Putki	Rör	Pipe	Rohr	
28p	+1	586480	.Tiiviste	Tätning	Gasket	Dichtung	

			Vaihdettavat osat	**Utbytbara delar**	**Changeable parts**	**Wechselbare Teile**	6300,6600
	–1	32059420	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	30294920	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	32766600	Konepeitto	Motorhuv	Engine hood	Motorhaube	
	–1	31810410	Konepeitto	Motorhuv	Engine hood	Motorhaube	
22p	+1	32766200	Väliputki	Mellanrör	Spaser pipe	Zwischenrohr	
29p	+4	HA6325	.Ruuvi	Skruv	Screw	Schraube	M8x30
30p	+4	JB9927	.Mutteri	Mutter	Nut	Mutter	V M8
	–1	32879600	.Putki	Rör	Pipe	Rohr	
28p	+1	586480	.Tiiviste	Tätning	Gasket	Dichtung	

			Vaihdettavat osat	**Utbytbara delar**	**Changeable parts**	**Wechselbare Teile**	6400
	–1	32437700	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	30294920	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	32766600	Konepeitto	Motorhuv	Engine hood	Motorhaube	
	–1	31810410	Konepeitto	Motorhuv	Engine hood	Motorhaube	
22p	+1	32961300	Väliputki	Mellanrör	Spaser pipe	Zwischenrohr	
29p	+4	HA6325	.Ruuvi	Skruv	Screw	Schraube	M8x30
30p	+4	JB9927	.Mutteri	Mutter	Nut	Mutter	V M8
	–1	32879600	.Putki	Rör	Pipe	Rohr	
28p	+1	586480	.Tiiviste	Tätning	Gasket	Dichtung	

			Vaihdettavat osat	**Utbytbara delar**	**Changeable parts**	**Wechselbare Teile**	6000
	–1	32059520	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	30294920	Äänenvaimennin	Ljuddämpare	Muffler	Schalldämpfer	
	+1	32766600	Konepeitto	Motorhuv	Engine hood	Motorhaube	
	–1	31810410	Konepeitto	Motorhuv	Engine hood	Motorhaube	
	–1	32868200	Väliputki	Mellanrör	Spaser pipe	Zwischenrohr	
22p	+1	32965900	Väliputki	Mellanrör	Spaser pipe	Zwischenrohr	TURBO
	–1	32589800	Tiiviste	Tätning	Gasket	Dichtung	
29p	+4	HA6325	.Ruuvi	Skruv	Screw	Schraube	M8x30
30p	+4	JB9927	.Mutteri	Mutter	Nut	Mutter	V M8
	–1	32879600	.Putki	Rör	Pipe	Rohr	
28p	+1	586480	.Tiiviste	Tätning	Gasket	Dichtung	

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90. Hydraulics

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Technical data

The hydraulic system has low and high pressure circuits. Oil is supplied by a twin gear pump.

Both circuits have a common suction strainer. In addition, the high pressure circuit has a pressure filter and also the low pressure circuit (F13130–). On HiTech tractors there are two pressure filters in the low pressure circuit, one of which is a return filter.

Low pressure circuit (rearmost pump)
– pump capacity at max. engine revs. **l/min** ..... 19 (–658899), 23 (658900–)
– pump capacity in HiTech tractors (transmission 650) and in 6200–6550Hi tractors (transmission 550) from ser. no. K36112 (6200–6400, K41106–) at max. engine revs. **l/min** 30
8350Hi: 1800r/min, **l/min** 25
– max. pressure (pressure–limiting valve opening pressure) ..... 1,8 MPa (18 bar)
Supplies oil for the following functions:
– quick–shift gear engagement
– HiTech shuttle engagement
– 4WD engagement
– PTO engagement
– diff. lock engagement
– transmission lubrication
– oil for brake valve for trailer (optional)
– oil to oil cooler
– oil to disengage the hand brake on HiTech tractors.

High pressure circuit (foremost pump)
– pump max.capacity at min. pressure and at max. engine revs. (**l/min**) ..... 70 (–658899), 73 (658900–)
– max. pressure ..... 19 MPa (190 bar)
Hydraulic system capability at max. revs, measured at quick–action couplings:
– max. effect (**kW**) ..... 19 (–658899), 20 (658900–)
Pump safety valve opening pressure ..... 23 MPa (230 bar)
Supplies oil for the following functions:
– steering system (priority valve)
– hydraulic power lift
– auxiliary hydraulics

Pressures at test points (1500 r/min, 40–65˚C)
Low pressure circuit, –660070/660071– ..... 2,1–2,3 MPa/1,8–1,9 MPa
High pressure circuit/free circulation pressure ..... 19,0–19,8 MPa/ca. 1,5 MPa
Hydraulic power lift shock valve opening pressure ..... 20–21 MPa
Lubricating oil pressure, mechanical Shuttle/HiTech Shuttle ..... min. 0,03 MPa/min. 0,12 MPa

Oils:
Common oil for transmission and hydraulic system. Oil quality and quantity, see page **130**/**4**.
– min. mark, available for auxiliary hydraulics ..... 20 l
– max. mark, available for auxiliary hydraulics ..... 30 l
– extra max. mark, available for auxiliary hydraulics ..... 40 l

Hydraulic power lift
Electro–hydraulic power lift (Autocontrol)
Hydraulic lift control valve
– type ..... Bosch
– shock valve opening pressure ..... 20 MPa (200 bar)
Two external lifting cylinders:
– Ø 80 mm (6000–6400, 8900, 8000).
Note! Manufacturing of power lift 40 KN (Ø 80 mm cyl.) is finished in autumn 2000.
– Ø 90 mm (6600, 6800, 8100, 6250Hi–6550Hi)
– Ø 100 mm (8200, 8400, 8050–8750, 6650Hi–8950Hi)
– lifting cylinder working pressure ..... max. 18,0 MPa (180 bar)

Valves for auxiliary hydraulics
Two 1/2–action valves, separate levers:
– First valve has a mechanical position locking function.
– Second valve has a floating position.
– As an extra equipment can be fitted two extra valve
– As an option oil flow control valve can be fitted (controls the first valve oil flow)
– At the rear of the tractor there are quick–action couplings for auxiliary hydraulics. Different kind of towing devices are available.
Front power lift is also available, see pages 910/26 and 27.

Three–point linkage, category 2;
– telescopic lower links (6100–6400, 8000)
– linkage has quick–attaching type links (6600–8100).
– lower links with ball type ends, category 3 (8400)
Hydraulically controlled pick–up hitch. Agricultural drawbar (optional)

Special tools

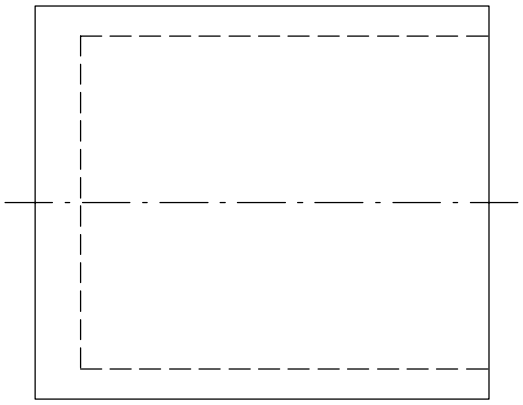
A

Locally prepared tool

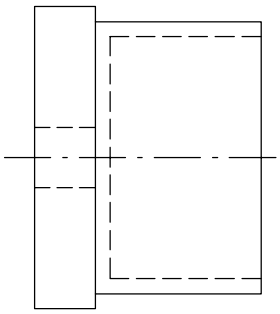
ET 893 530	Sleeve for fitting lifting arm shaft seals (Hydraulic lift 505–905)

B

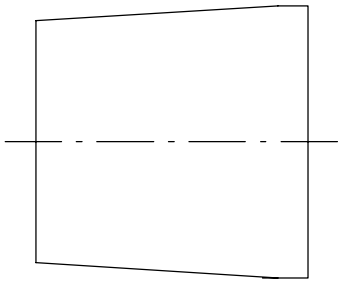
ETV 893 540	Sleeve for removing/fitting lifting arm shaft bushes (Hydraulic lift 505–905)
ETV 893 580	Conic sleeve for fitting lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 893 590	Sleeve for crimping lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 893 600	Drift for fitting lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 894 240	Conic sleeve for fitting lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)
ETV 894 250	Sleeve for crimping lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)
ETV 894 260	Drift for fitting lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)



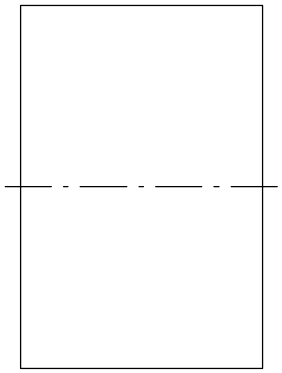
ET 893 530



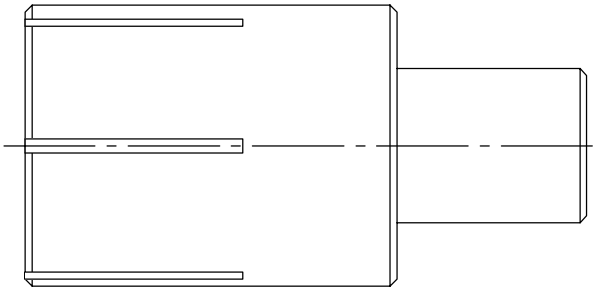
ETV 893 540



ETV 893 580 (ø 80)
ETV 894 280 (Ø 90)
ETV 894 240 (ø 100)



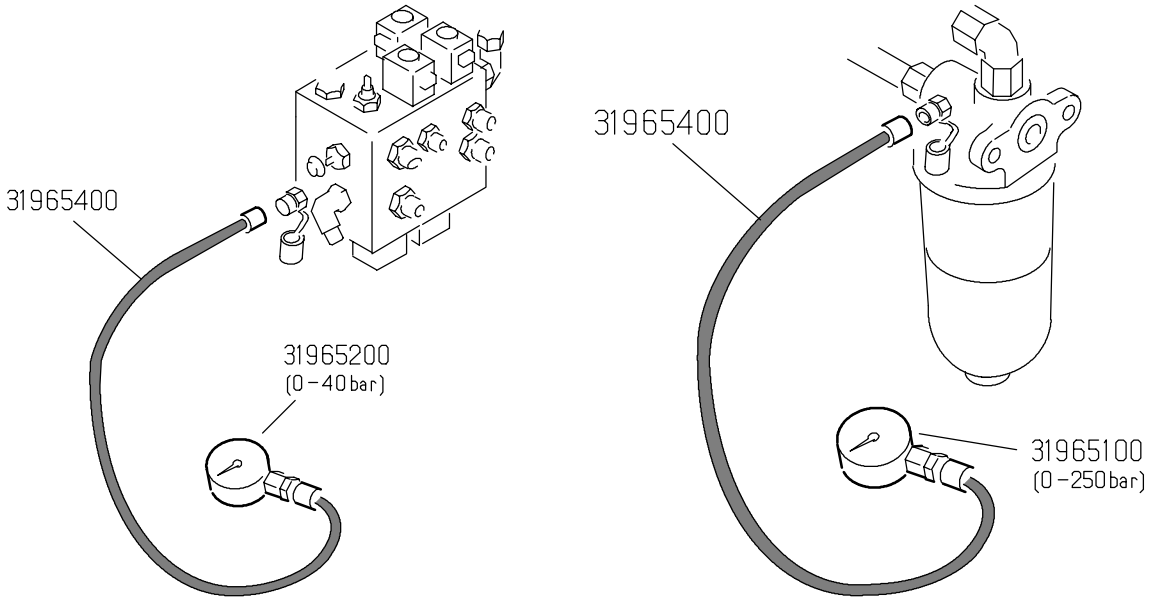
ETV 893 590 (ø 80)
ETV 894 290 (Ø 90)
ETV 894 250 (ø 100)



ETV 893 600 (ø 80)
ETV 894 300 (Ø 90)
ETV 894 260 (ø 100)

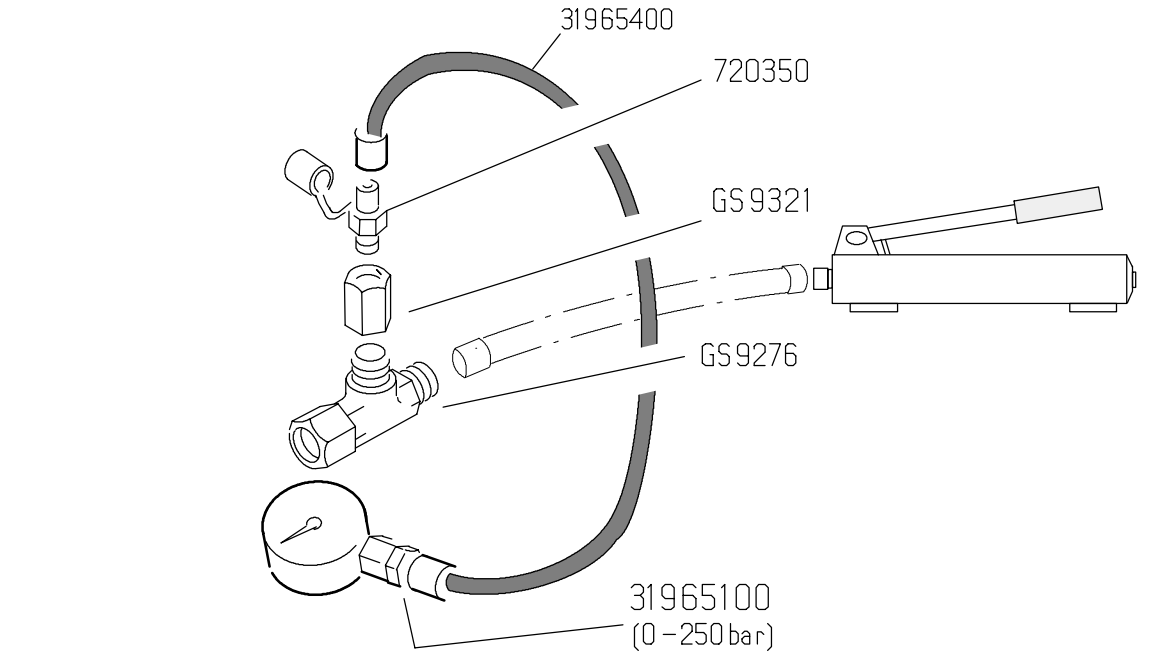
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Pressure measuring equipment



1. Equipment for measuring pressure in low pressure circuit (**2,1–2,3 MPa** (–660070) or **1,8–1,9 MPa** (660071–). On HiTech tractors the pressure test point is placed on the outer face of the block, see picture on page **440/24**.
2. Equipment for measuring pressure in high pressure circuit (**19,0–19,8 MPa**). Pressure measuring kit 31965000 includes the above shown equipment, which can also be ordered separately.

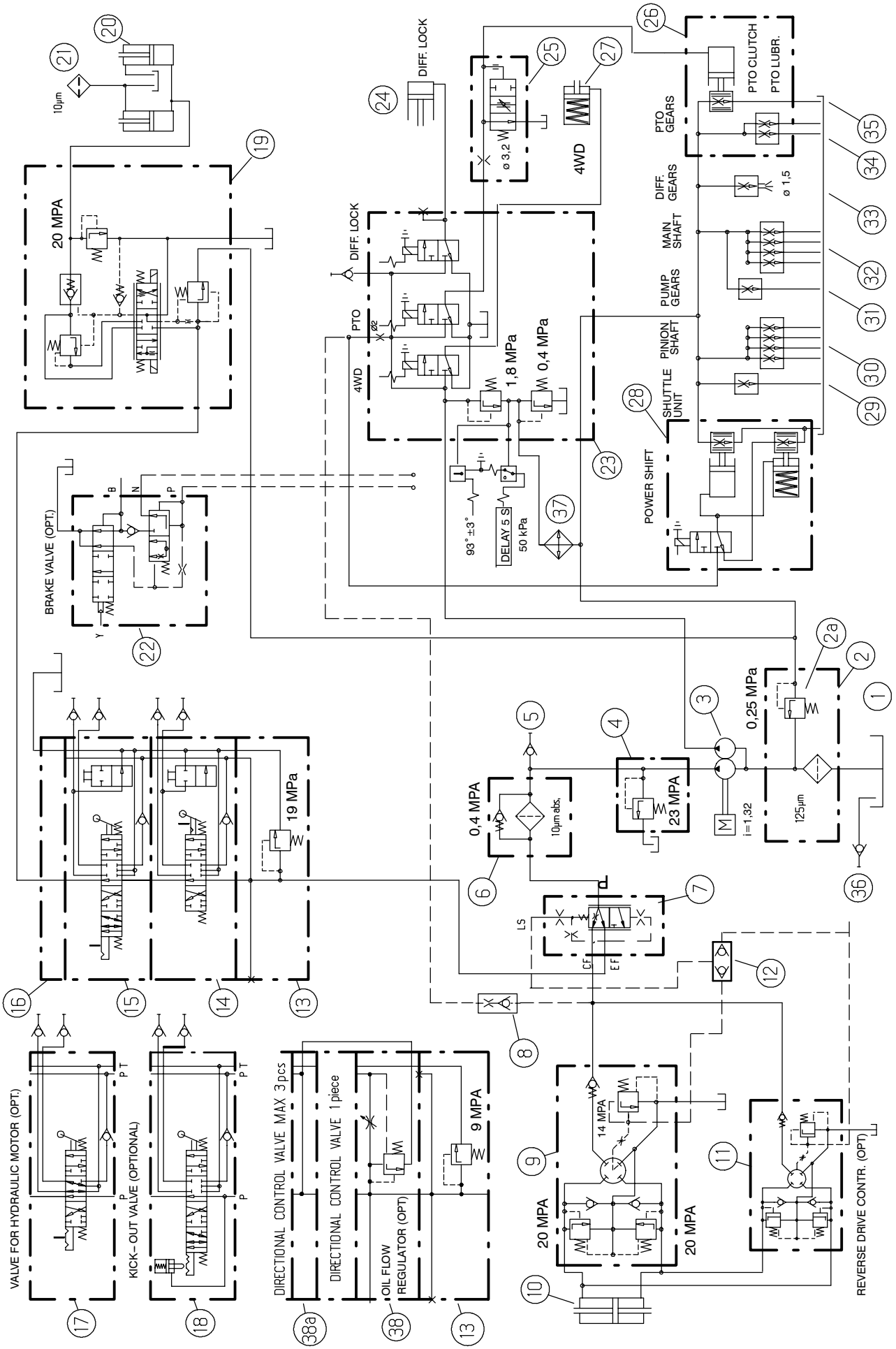
Measuring opening pressure of hydraulic lift shock valve



1. Measuring opening pressure of the hydraulic lift shock valve **(opening pressure 20 MPa).**
Note! T–connector GS9276 has thread 3/4–16 for connecting a hand pump. The kit 31965000 does not include the hand pump.

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Hydraulic diagram, –660070



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Hydraulic diagram, –660070

(see figure 1 on previous page)

1. Oil reservoir
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,2 MPa (lubricating pressure)
3. Twin gear pump (23,5+6,4 cm^3/r, i=1,32)
4. Safety valve 23 MPa. (placed in the high pressure pump).
5. Pressure test point (Valmet HPR)
6. Pressure filter (degree of separation: β10=75).
– by–pass valve 0,35 MPa.
7. Priority valve
8. Non–return valve
9. Steering valve (125 cm^3/r).
– steering system pressure–limiting valve 14 MPa
10. Steering cylinder
11. Steering valve, reverse drive (optional)
12. Shuttle valve, reverse drive
13. End plate (oil inlet)
– pressure–limiting valve 19 MPa (high pressure circuit)
14. Valve for auxiliary hydraulics, 2/1– action (out–hold–in)
15. Valve for auxiliary hydraulics, 2/1– action (float–out–hold–in), float position can be locked)
16. End plate (tank side)
17. Valve for auxiliary hydraulics (optional), 2– action (out–float–in), out and in positions can be locked)
18. Valve for auxiliary hydraulics (optional), 2–action, kick–out function (float–out–hold–in), float, out and in positions can be locked)
19. Hydraulic lift control valve (Bosch)
– lifting cylinder shock valve 20 MPa
20. Lifting cylinder
21. Breather filter for lifting cylinders and transmission housing (degree of separation: β10=75).
22. Brake valve for trailer (optional)
23. Servo valve block
– safety valve for oil cooler 0,4 MPa
– pressure–limiting valve for low pressure circuit 1,8 MPa
24. Differential lock
25. Cushioning valve for PTO engagement
26. PTO
27. 4WD clutch
28. Quick–shift gear
29. Reverse shuttle lubrication
30. Lubrication for bevel pinion shaft
31. Lubrication for pump drive mechanism
32. Lubrication of gearbox input shaft
33. Lubrication of differential gears
34. Lubrication of PTO unit shafts
35. Lubrication of PTO mechanism
36. Return oil connection for auxiliary hydraulics
37. Oil cooler
38). Oil flow regulator valve (Rexroth), (optional)
38a). Intermediate flange for oil flow regulator valve

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Hydraulic diagram, 660071–

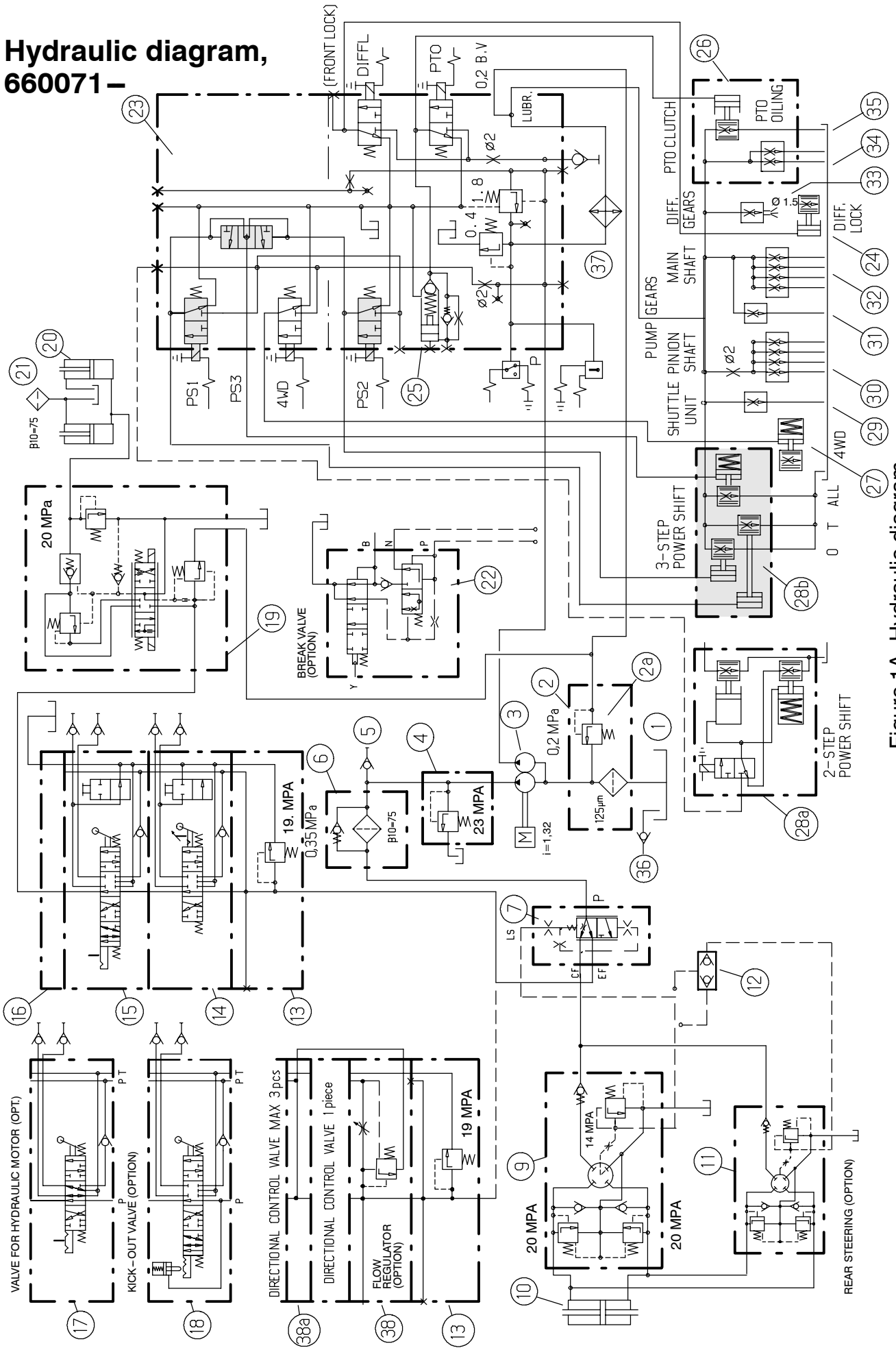


Figure 1A. Hydraulic diagram

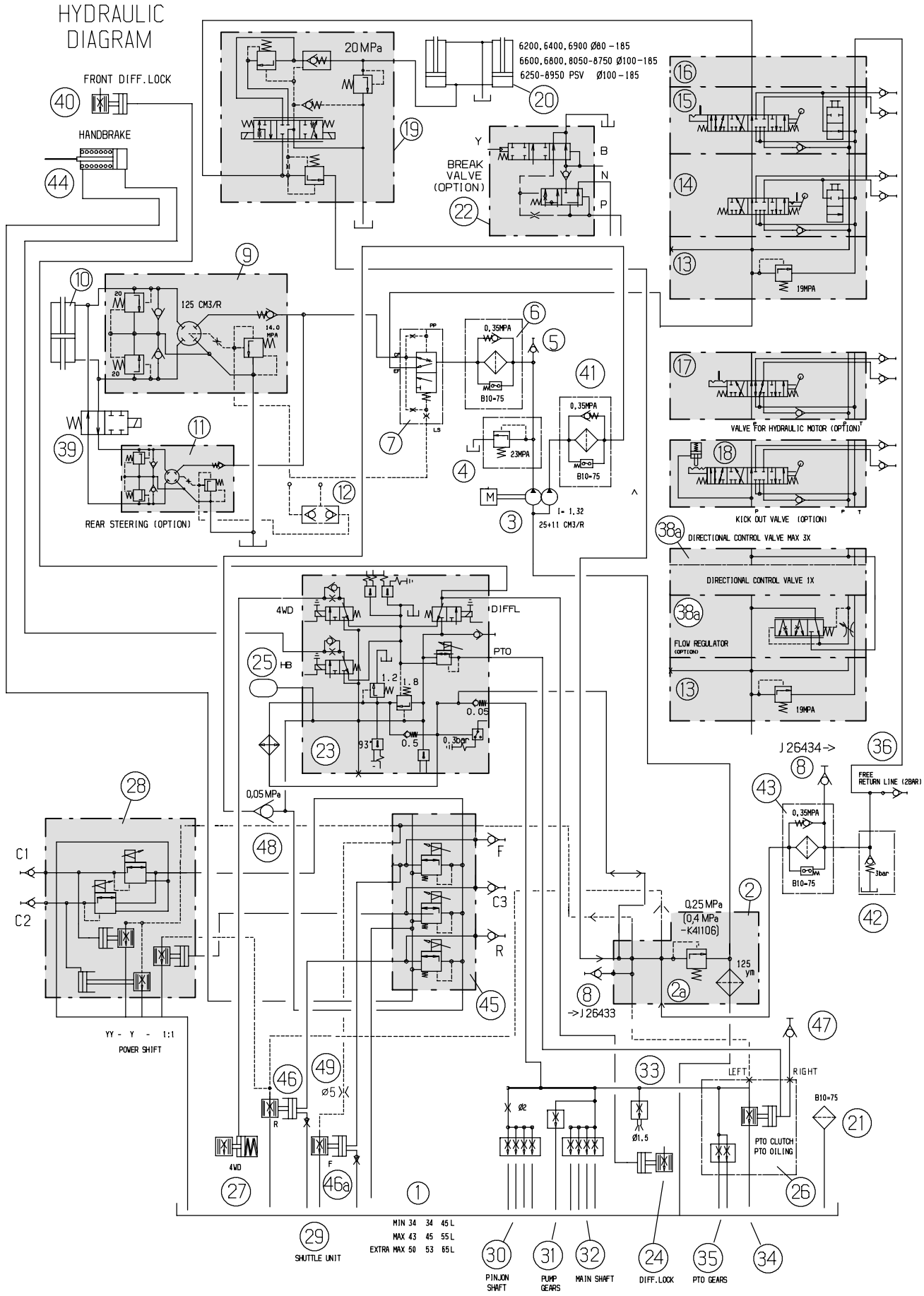
Hydraulic diagram, 660071–

See picture 1A on previous page.

1. Oil reservoir
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,2 MPa (lubricating pressure)
3. Twin gear pump (25+8 cm^3/r, i=1,32)
4. Safety valve 23 MPa. (placed in the high pressure pump).
5. Pressure test point (Valmet HPR)
6. Pressure filter (degree of separation: β10=75).
– by–pass valve 0,35 MPa.
7. Priority valve
8. **N.B.** Hose between valve block and priority valve and non–return valve removed.
9. Steering valve (125 cm^3/r).
– steering system pressure–limiting valve 14 MPa
– shock valve 20 MPa
10. Steering cylinder
11. Steering valve, reverse drive (optional)
12. Shuttle valve, reverse drive
13. End plate (oil inlet)
– pressure–limiting valve 19 MPa (high pressure circuit)
14. Valve for auxiliary hydraulics, 2/1– action (out–hold–in)
15. Valve for auxiliary hydraulics, 2/1– action (float–out–hold–in), float position can be locked)
16. End plate (tank side)
17. Valve for auxiliary hydraulics (optional), 2– action (out–float–in), out and in positions can be locked)
18. Valve for auxiliary hydraulics (optional), 2–action, kick–out function (float–out–hold–in), float, out and in positions can be locked)
19. Hydraulic lift control valve (Bosch)
– lifting cylinder shock valve 20 MPa
20. Lifting cylinder
21. Breather filter for lifting cylinders and transmission housing (degree of separation: β10=75).
22. Brake valve for trailer (optional)
23. Servo valve block
– safety valve for oil cooler 0,4 MPa
– pressure–limiting valve for low pressure circuit 1,8 MPa
24. Differential lock
25. Cushioning valve for PTO engagement
26. PTO
27. 4WD clutch
28. A: 2–step quick–shift gear
B: 3–step quick–shift gear
29. Reverse shuttle lubrication
30. Lubrication for bevel pinion shaft
31. Lubrication for pump drive mechanism
32. Lubrication of gearbox input shaft
33. Lubrication of differential gears
34. Lubrication of PTO unit shafts
35. Lubrication of PTO mechanism
36. Return oil connection for auxiliary hydraulics
37. Oil cooler
38). Oil flow regulator valve (Rexroth), (optional)
38a). Intermediate flange for oil flow regulator valve

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Hydraulic diagram, HiTech tractors



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Hydraulic diagram, HiTech tractors

1. Oil reservoir
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,25 MPa (K41107–)
0,4 MPa (–K41106)
3. Twin gear pump (25+11 cm^3/r, i=1,32)
8350Hi: 32+11 cm^3/r.
4. Safety valve, 23 MPa, beside the pump
5. Pressure–test point (Valmet HPR)
6. Pressure filter (filtration grade: β10=75).
7. Priority valve
8. Pressure–test point (lubrication pressure)
9. Steering valve (OSPC 125LS, 125 cm^3/r).
10. Steering ram
11. Steering valve, TwinTrac
12. Non–return valve, TwinTrac
13. End flange (pump side)
– pressure–limiting valve 19 MPa
14. Valve block, 2/1– action
(out–hold–in)
15. Valve block, 2/1– action
(float–out–hold–in, float pos. locked)
16. End flange (tank side)
17. Valve block, option,
2– action, actuator (out–
float–in, out–in pos. locked)
18. Valve block, option,
2– action, kick–out
(float–out–hold–in, float–out–in
pos. locked)
19. Control valve (BOSCH)
– lifting ram safety valve 20 MPa
20. Lifting rams
21. Lifting ram+ transmission
breather (filtration grade: β10=75).
22. Brake valve (option)
23. Servo valve block
– pressure–limiting valve 1,8 MPa
– safety valve **1,2** MPa
24. Differential lock
25. Pressure accumulator
26. PTO
27. 4WD multi–disc clutch
28. DPS
29. Shuttle lubrication
30. Bevel pinion shaft lubrication
31. Lubr. of pump drive gears
32. Input shaft lubrication
33. Differential lubrication
34. Lubrication of PTO shafts
35. Lubrication of PTO
36. Return oil connection, auxiliary hydraulics
37. Oil cooler
– by–pass valve 0,35 MPa
– switch, blocked filter
38. Oil flow control valve (Rexroth), (option)
38a. Intermediate flange (see above)
39. Control valve (TwnTrac)
40. Diff. lock, front axle
– steering, press.–limiting valve 14 MPa
41. Low pressure circuit filter
42. Valve 0,3 Mpa (3 bar)
43. Return oil filter
44. Hand brake ram
45. Valve block (F, R, C3).
46. R–clutch of shuttle
46a. F–clutch of shuttle
47. Pressure–test point, PTO
48. Non–return valve 0,05 MPa (0,5 bar) (47/00–)
49. Lubricating oil flow into the F–clutch has been reduced with a restriction, diam. 5 mm.

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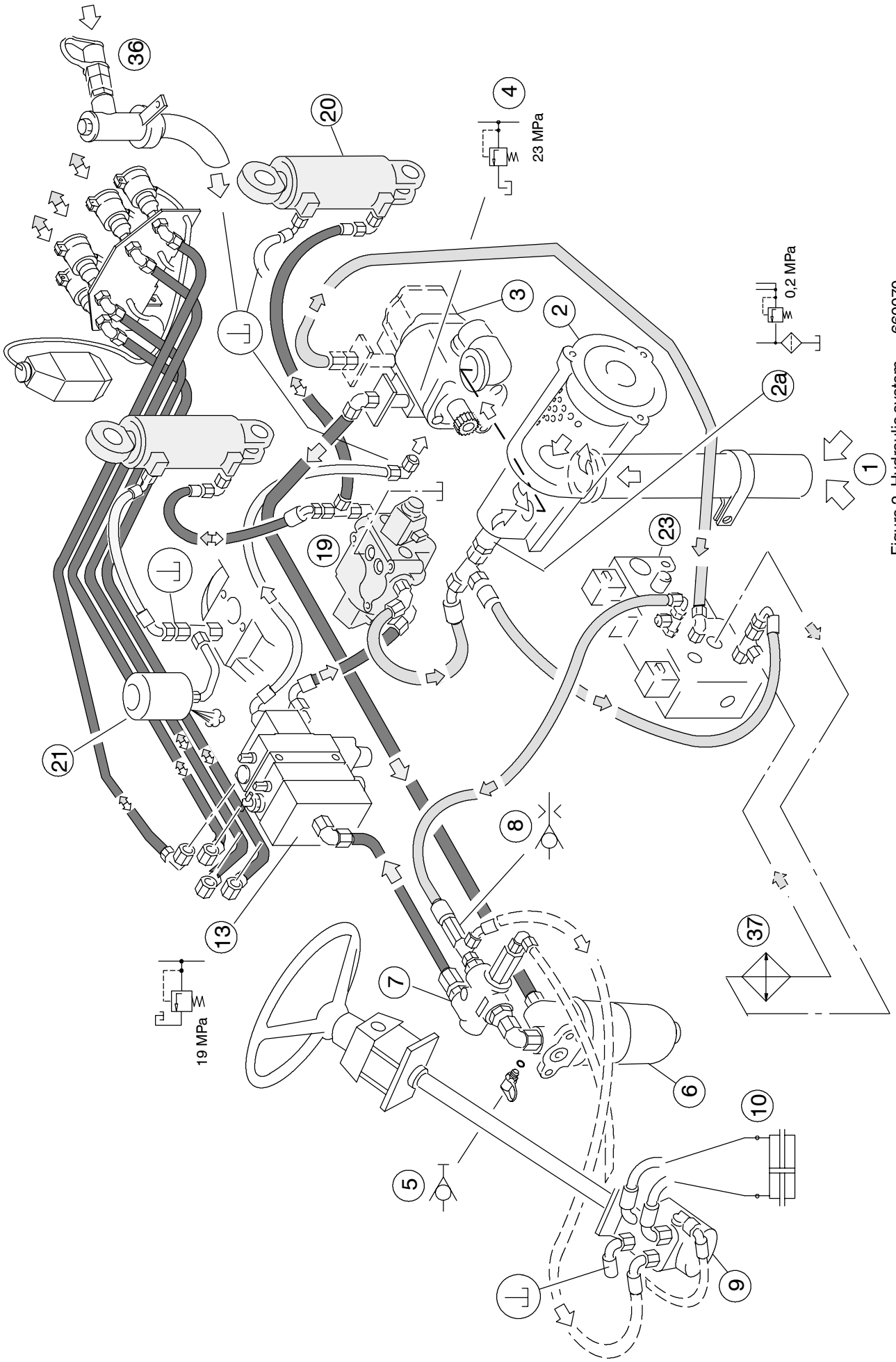


Figure 2. Hydraulic system , –660070

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Hydraulic system, –660070

(see figure 2 on previous page)

1. Oil reservoir
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,2 MPa (lubricating pressure)
3. Twin gear pump
4. Safety valve 23 MPa (high pressure pump).
5. Pressure test point (Valmet HPR)
6. Pressure filter (degree of separation: β10=75).
– by–pass valve 0,35 MPa.
7. Priority valve
8. Non–return valve
9. Steering valve (125 cm^3/r).
– steering system pressure–limiting valve 14 MPa
10. Steering cylinder
13. End plate (oil inlet)
– pressure–limiting valve 19 MPa (high pressure circuit)
19. Control valve for hydraulic lift (Bosch)
– shock valve 20 MPa
20. Lifting cylinders
21. Breather filter for lifting cylinders and transmission housing (degree of separation: β10=75).
23. Servo valve block (safety valve 0,4 MPa + pressure–limiting valve 1,8 MPa)
36. Return oil connection for auxiliary hydraulics
37. Oil cooler

Low pressure circuit

(Numbers in text below refer to figure 2).

Low pressure pump supplies oil for:
– quick–shift gear engagement
– 4WD engagement
– PTO engagement
– diff. lock engagement
– transmission lubrication
– trailer brake valve (optional)
– oil cooler

The low pressure circuit delivery pipe conducts oil from the low pressure pump (3) (rearmost) to the servo valve block (23) on the gearbox LH side. On the servo valve block there are fitted solenoid valves for 4WD, PTO and diff. lock. The quick–shift gear solenoid valve is fitted on the quick–shift gear housing. Clutch pressure to the quick–shift gear is conducted from the servo valve block via an external pipe.

On the servo valve block there is a pressure–limiting valve (1,8 MPa) which limits clutch pressures. A pressure test point for the low pressure circuit is fitted on the servo valve block.

On the servo valve block there are outlet and inlet connections for the oil cooler. The servo valve block has a safety valve (0,45 MPa) which protects the oil cooler.

Return oil from the oil cooler is conducted to the transmission lubricating system. Also free–circulation oil from the hydraulic lift control valve flows to the lubricating system. A pressure–limiting valve (2a, 0,2 MPa) in the suction strainer housing rear end limits the lubricating pressure to 0,2 MPa.

From the servo valve block has been drawn a hose to the priority valve (7). This pressure from the low pressure circuit to the priority valve reduces the high pressure pump free–circulation pressure

Note! An optional brake valve for trailer brakes also uses oil from the low pressure circuit.

Note! See also transmission, servo and lubricating system in section **42** on pages **420/17–420/22**.

High pressure circuit

(Numbers in text below refer to figure 2).

High pressure pump supplies oil for:
– steering system (priority)
– hydraulic power lift
– auxiliary hydraulics

In the high pressure pump there is fitted a safety valve (23 MPa), which protects the pump in cold weather when the hydraulic oil is thick.

High pressure pump (3) (foremost) delivery pipe conducts oil from the pump to the pressure filter (6), and then to the priority valve (7).

Note! Priority valve and steering system, see section **61**.

From the priority valve oil flows to the auxiliary hydraulic valve set end plate (inlet side). The high pressure circuit pressure–limiting valve (19 MPa) is fitted on the underside of the end plate.

Then oil flows through the auxiliary hydraulic valves to the hydraulic lift control valve (19) and then to the lifting cylinders. The control valve free–circulating oil flows to the lubricating system for transmission and oil pressure over 0,2 MPa flows direct to the hydraulic pump suction side.

The hydraulic lift control valve (19) has an in–built shock valve (20 MPa), which protects the system against pressure shocks from the lifting cylinders.

On the pressure filter bracket there is a pressure test point (5) for measuring working hydraulic pressure and also the steering system pressure (see steering system in section **61**).

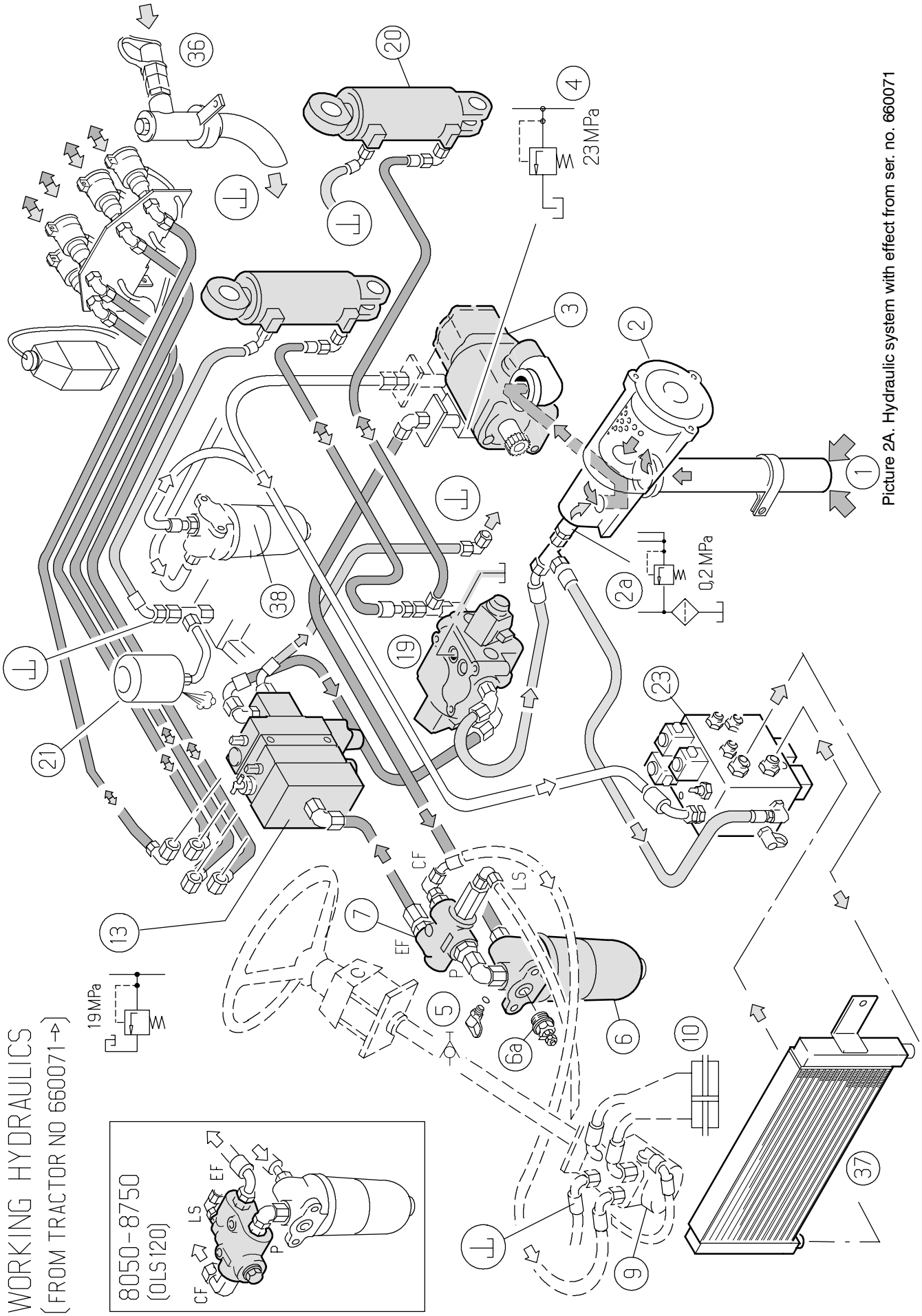
Pump

The pump drive shaft front end is engaged to the engine flywheel by means of the drive flange. The drive shaft goes through the gearbox input shaft to the rear end where it is fitted to the pump drive mechanism.

The twin gear pump is placed in the gearbox housing and is attached to the rear side of the wall between the gearbox and differential housings.

The twin pump capacity per revolution and the drive mechanism gear ratio:
– 23,5+6,4 cm^3/r, i =1,32 (–658899).
– 25+8 cm^3/r, i=1,32 (658900–)

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Picture 2A. Hydraulic system with effect from ser. no. 660071

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Hydraulic system, 660071–

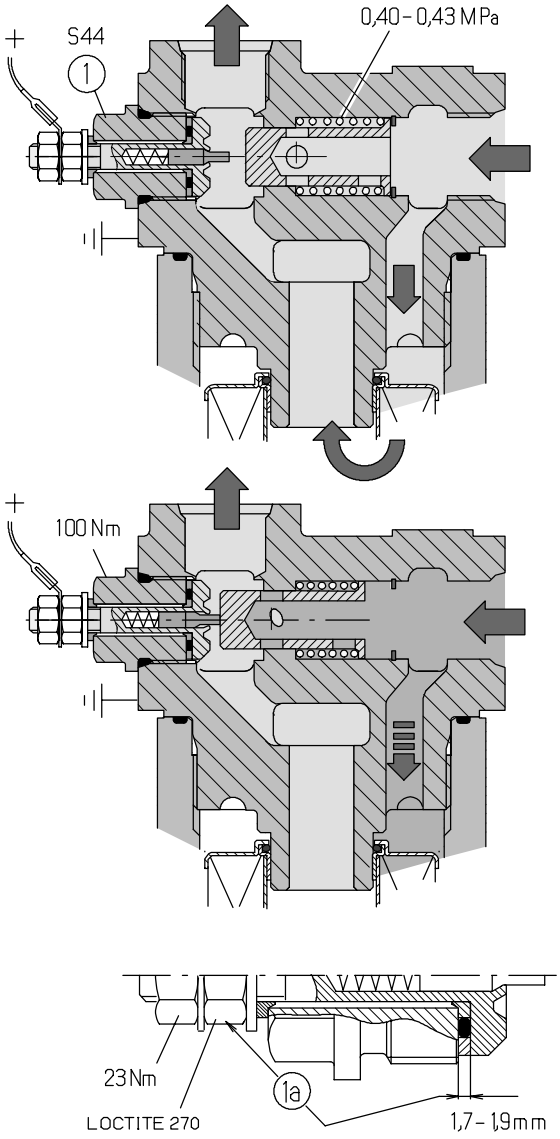
The new system is shown in picture 2A on previous page.

The servo valve block has been changed with effect from tractor ser. no. **660071**. At the same time the hose between the valve block and the priority valve has been removed (and also the non–return valve, see ref. **8** in picture on page **910**/**8**) .

1. Oil tank
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,2 MPa
3. Double pump 23,5+6,4 cm^3/r (–658899) or 25+8 cm^3/r (658900–). i=1,32)
4. Pressure–limiting valve 23 MPa.
5. Pressure–test point (Valmet HPR)
6. Pressure filter (degree of separation: β10=75).
– by–pass valve 0,35 MPa.
6a. Warning light sensor, blocked pressure filter (option)

7. Priority valve
Note! On 8050–8750 tractors the priotity valve is the larger, OLS 120. On other models OLS 80.
8. –
9. Steering valve (125 cm^3/r).
– pressure–limiting valve 14 MPa
10. Steering cylinder
13. End plate (oil inlet side)
– pressure–limiting valve 19 MPa
19. Hydraulic lift control valve (Bosch)
– shock valve 20 MPa
20. Lifting cylinder
21. Lifting cylinder+transmission housing breather filter (degree of separation: β10=75).
23. Servo valve block (safety valve 0,4 MPa + pressure–limiting valve 1,8 MPa)
36. Return oil connectio for auxiliary hydraulics.
37. Oil cooler
38. **Note!** From ser. no. F13130 incl. the tractors have a pressure filter also in the low pressure circuit. The filter maintenance intervals are the same as for the pressure filter in working hydraulics

The function of the hydraulic system is the same as earlier, see page **910**/**9**.

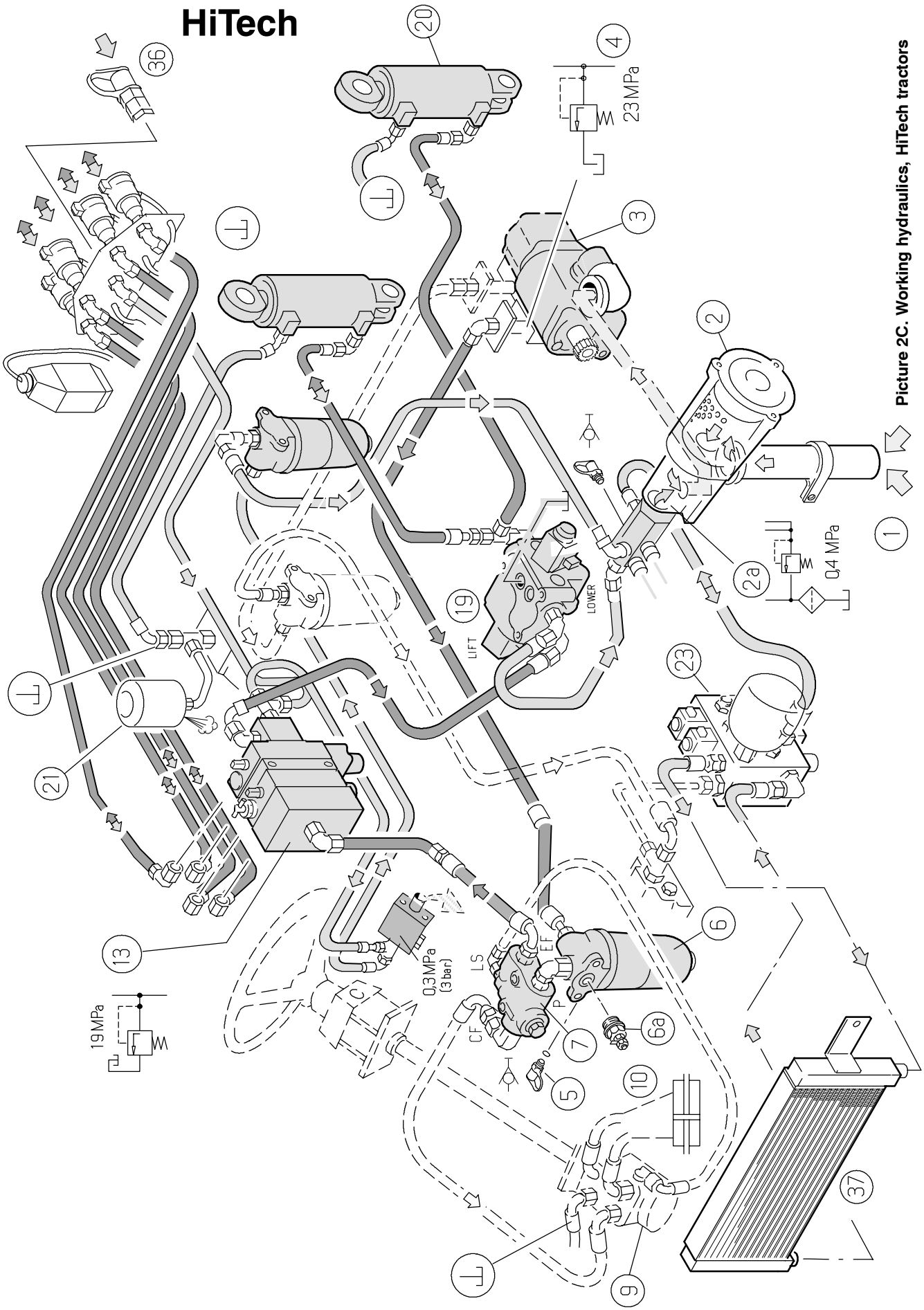


Picture 2B. *Warning light sensor, blocked pressure filter (option).*

Note! The function of the sensor can be tested by pushing the sensor pin with power of 13 kp, at which time a bulb connected to the sensor should light.

Note! On HiTech models there are three pressure filters (one in working hydraulics and two in low pressure side) and all have the indicator lamp switch. By disconnecting the switch wires can be tested, which one of the filters is blocked.

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Picture 2C. Working hydraulics, HiTech tractors

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Working hydraulics on HiTech tractors

See picture **2C**.

1. Oil tank
2. Suction strainer (125 μm)
2a. Pressure–limiting valve 0,2 MPa
3. Twin gear pump, 25+11 cm^3/r
4. Safety valve 23 MPa.
5. Pressure–test point (Valmet HPR)
6. Pressure filter (filtration grade: β25=75).
– by–pass valve, 0,40 MPa.
6a. Indicator lamp switch, blocked filter
7. Priority valve
8. –
9. Steering valve (125 cm^3/r).
– safety valve 14 MPa
10. Steering ram
13. End flange (inlet side)
– pressure–limiting valve 19 MPa
19. Control valve (Bosch)
– shock valve 20 MPa
20. Lifting rams
21. Liftin rams+transmission breather (filtration grade: β10=75).
23. Servo valve block (safety valve 0,4 MPa + pressure–limiting valve 1,8 MPa)
36. Return oil connection, auxiliary hydraulics
37. Oil cooler

The function of the working hydraulics is the same as shown on page **910**/**9**.

Note! The different servo valve blocks on the LH side of the gearbox, see under code **420** pages **420**/**17–20C**. Various valve blocks and low pressure hydraulics are described under code **440**. In addition, HiTech tractors' pressure calibrations are shown under code **370** (Autocontrol V).

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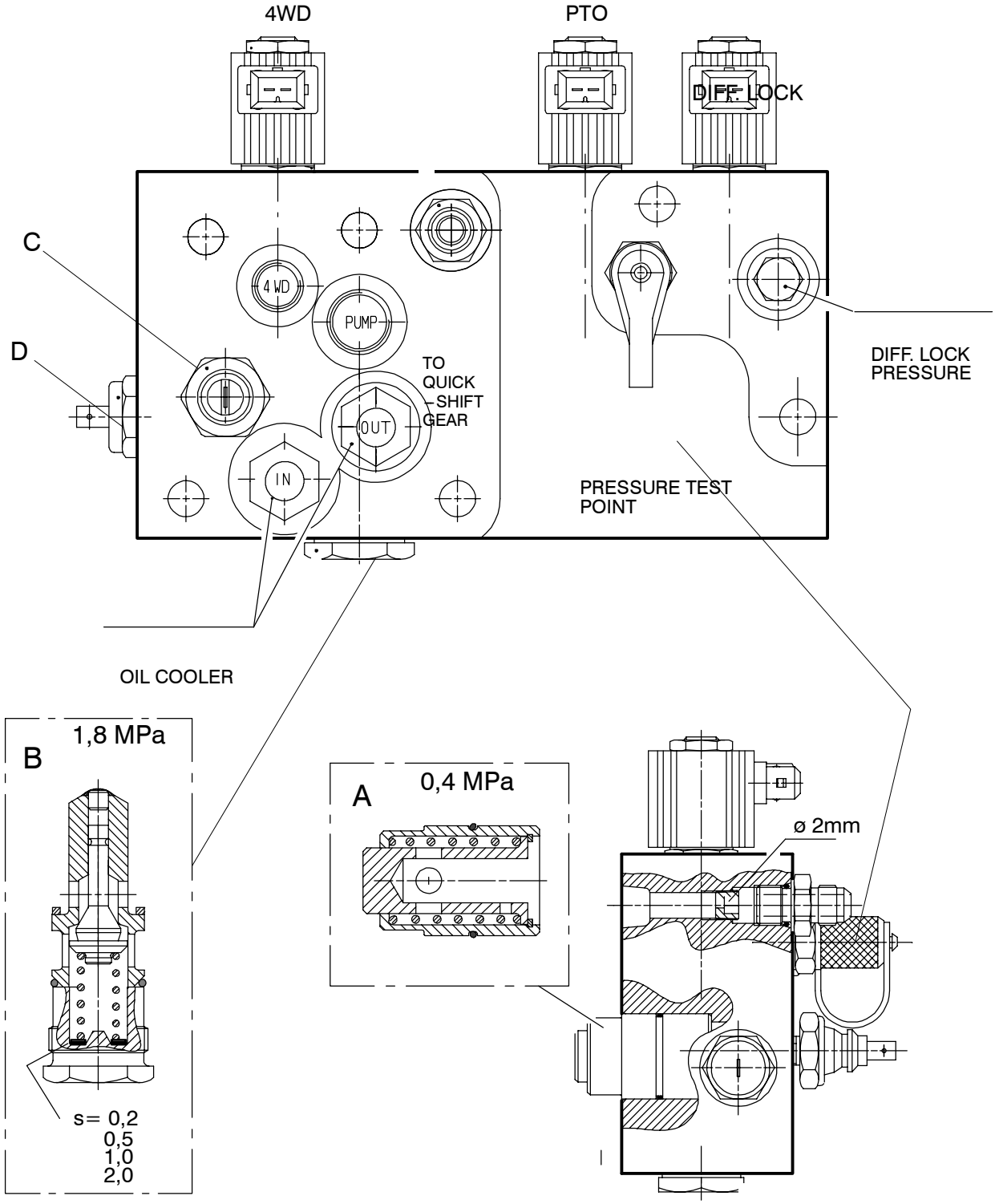


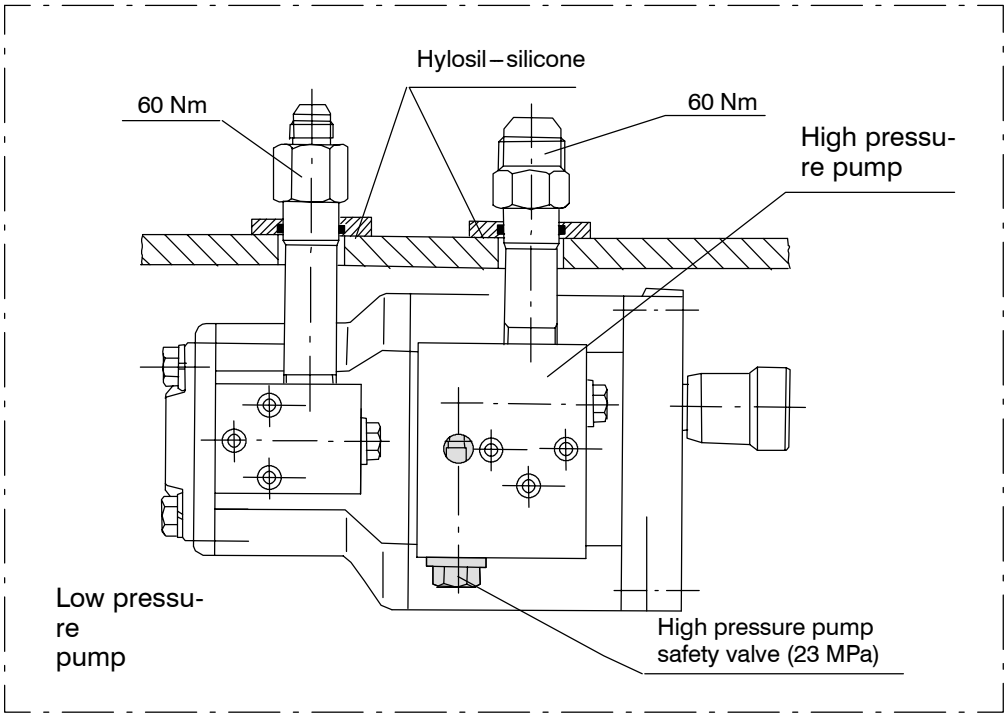
***Figure 3**. Servo valve block (low pressure circuit)*
(the valve block is fitted on the LH side of the gearbox)

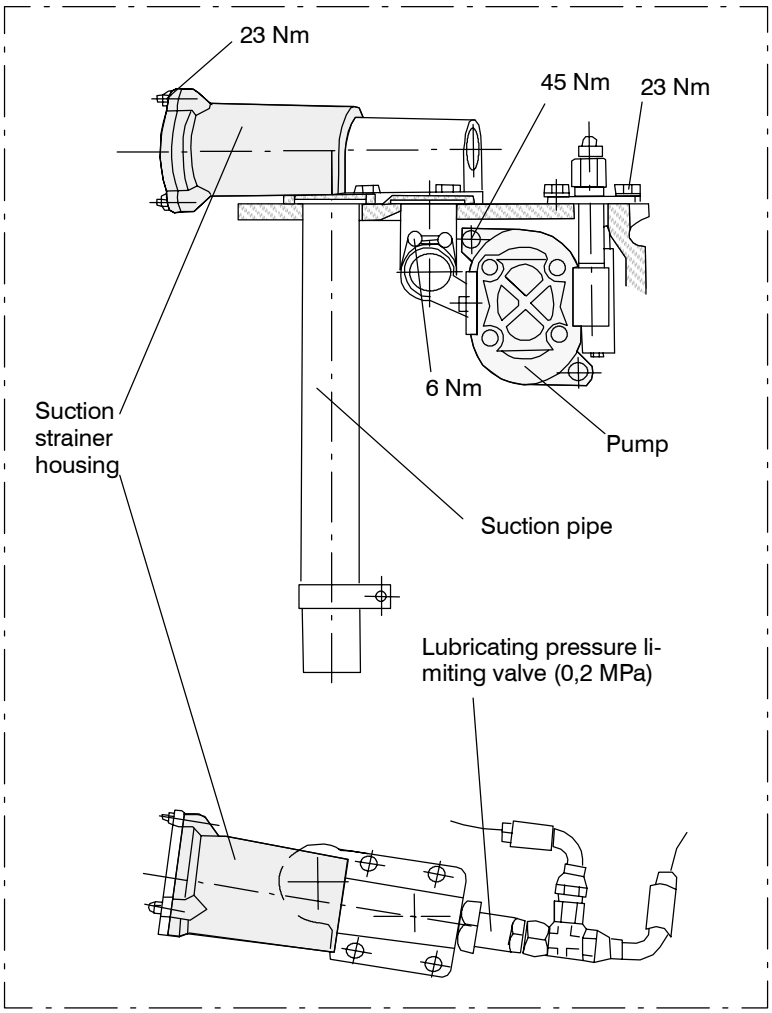
A. Oil cooler safety valve
B. Pressure–limiting valve, low pressure circuit (opening pressure can be adjusted with shims)
***Note!** Opening pressure stamped on end of valve*
C. Lubricating oil pressure sensor (warning light comes on if pressure drops below 20 kPa.
D. Hydraulic oil temperature sensor (warning light comes on at temperature of +93±3˚C)

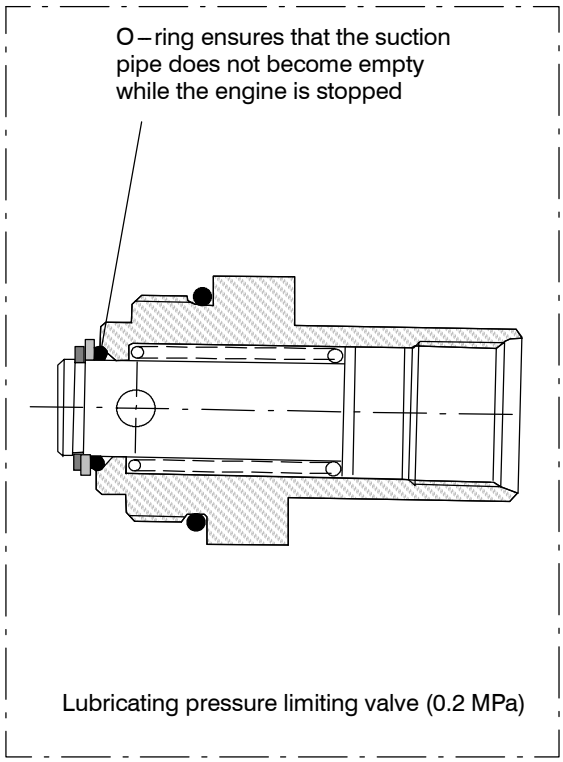
Important! With effect from tractor ser. no. 660071 the tractors have different type of valve block, see pages 420/17–20C. See also under code 440.

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Hydraulic pump and suction pipes, –658899





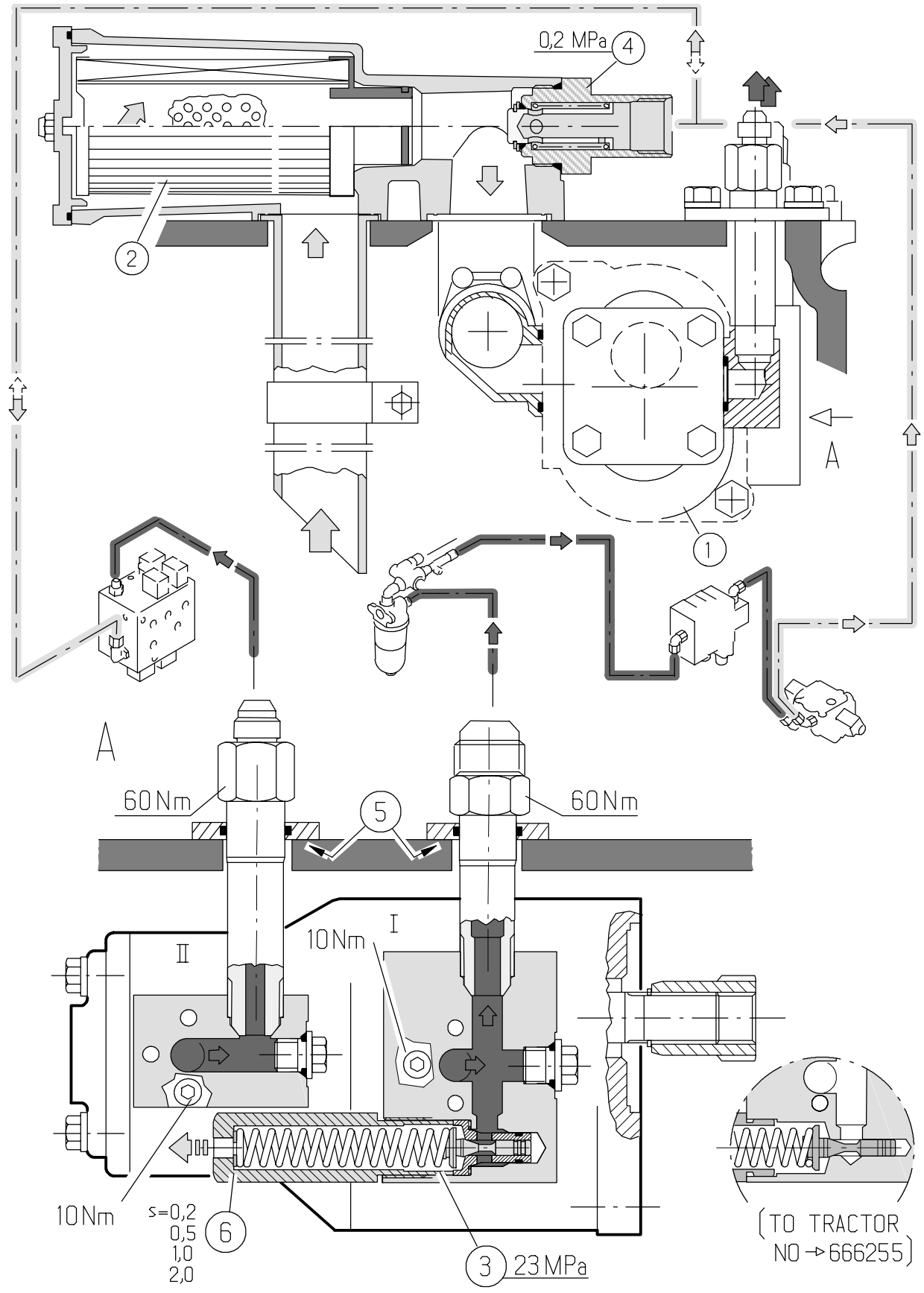


Picture 4. *Twin gear pump, suction pipes and suction strainer housing, –658899*

Suction strainer housing is fitted upon the gearbox and pump is placed in the gearbox housing
Wash the suction strainer every 800 running hours.

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Hydraulic pump and suction pipes, 658900–



Picture 4A. Hydraulic pump and suction pipes (658900–)

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Hydraulic pump and suction pipes, 658900–

See picture 4A on previous page.

With effect from tractor ser. no. **658900** the tractors have a new hydraulic pump. The construction of the pump and the suction pipes is similar compared with the earlier system (see picture **4** on page **910**/**11**). Pump technical values have been changed a little, see Technical Data on page **910**/**3**.

Note! Because the new pump has different outer dimensions, the gearbox housing has also been changed at the same time. The new pump cannot be fitted into the earlier gearbox housing.

1. Twin gear pump
2. Suction strainer housing on the gearbox. The suction straines should be cleaned according to the maintenance program (see Operator' Manual).
3. Safety valve for high pressure pump. Opening pressure is 23 MPa.
4. Pressure limiting valve for lubricating oil. Opening pressure is 0,2 MPa.
5. Sealing plates at pressure pipe lead–in points. Apply Hylosil–silicone to the lower face of the plates.

The pump is removed and fitted in the same way as earlier according to instruction on page **911**/**4**.

Important! From ser. no. **H18329** incl. the pump pressure pipe lead–in plates and their seals have been changed in transmissions 650, 300 and 390.
From ser. no. **H19317** incl. (in transmission 650) there is a Bosch–make pump in the hydraulic system.
The new Bosch pump is replaceable with the earlier pump, when the pump connection parts are changed (suction connection is not necessary to change). A new part is fitted between the pump and the suction connection, and the pressure connection has been changed. The safety valve body has been changed, the other parts as earlier. In connection with possible repair work new lead–in plates and seals must be fitted.

Note! On HiTech tractors, the low pressure pump output is greater than in earlier tractors, which have a mechanical shuttle (25+11 cm^3/r).

Note! From autumn 2000 there is the same hydraulic pump as in HiTech models (25+11 cm^3/r) in transmission 550. Transmission 550 is in 6200–6550Hi tractors from ser. no. K36112 incl. (6200–6400 from K41106–).
Low rev tractor 8350Hi has pump 32+11 cm^3/r.

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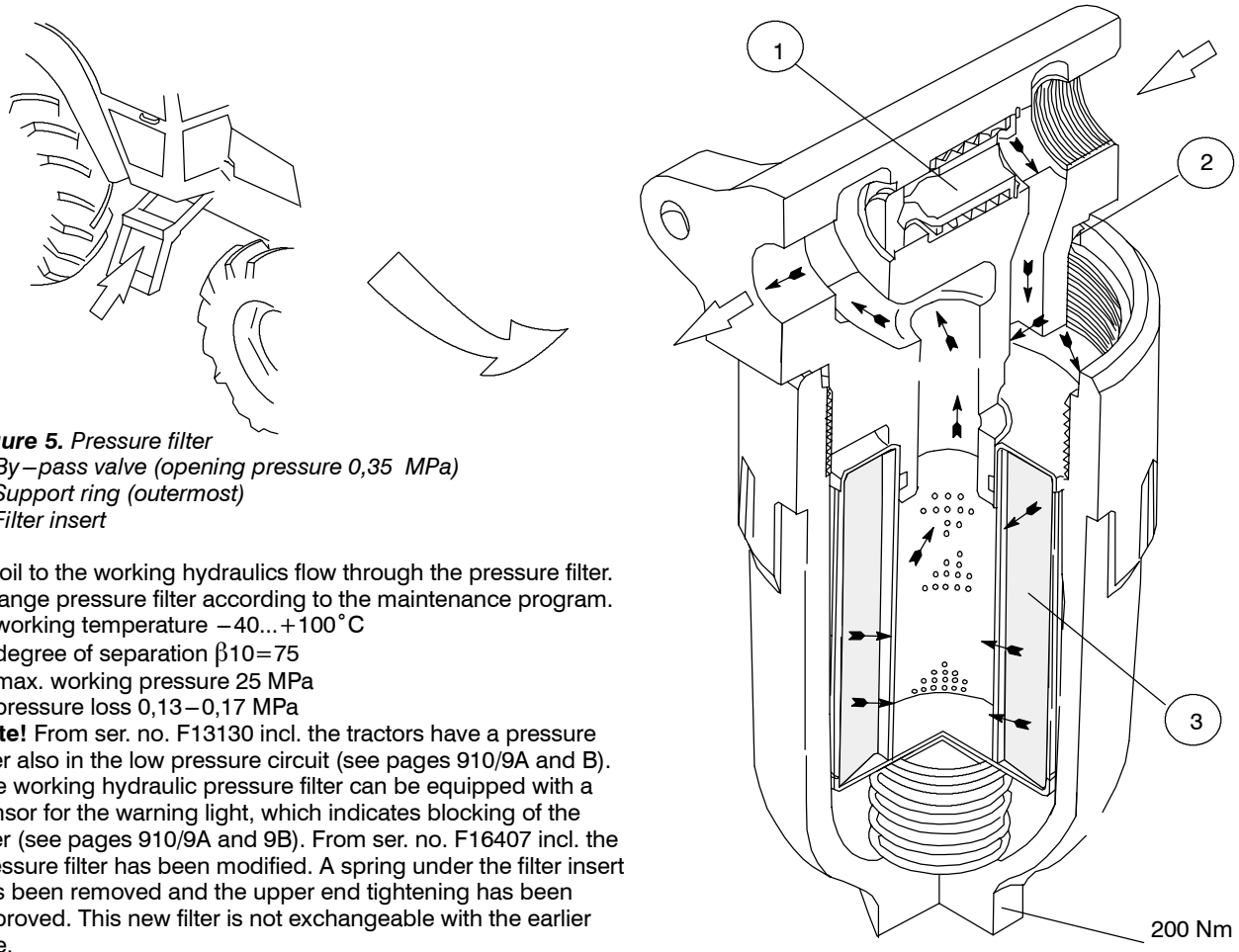


Figure 5. *Pressure filter*
1. By–pass valve (opening pressure 0,35 MPa)
2. Support ring (outermost)
3. Filter insert

All oil to the working hydraulics flow through the pressure filter. Change pressure filter according to the maintenance program.
– working temperature –40...+100˚C
– degree of separation β10=75
– max. working pressure 25 MPa
– pressure loss 0,13–0,17 MPa

Note! From ser. no. F13130 incl. the tractors have a pressure filter also in the low pressure circuit (see pages 910/9A and B). The working hydraulic pressure filter can be equipped with a sensor for the warning light, which indicates blocking of the filter (see pages 910/9A and 9B). From ser. no. F16407 incl. the pressure filter has been modified. A spring under the filter insert has been removed and the upper end tightening has been improved. This new filter is not exchangeable with the earlier one.

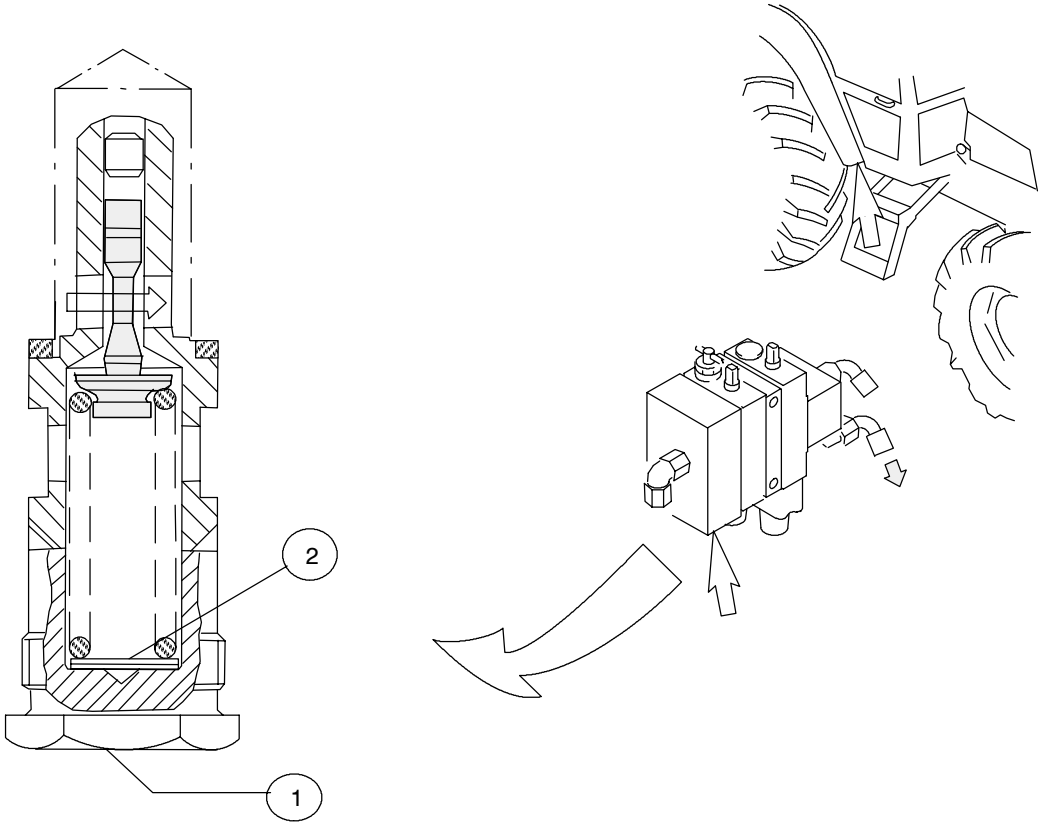


Figure 6. *Pressure–limiting valve, working hydraulics, 18 MPa (8000: 19 MPa)*
1. Opening pressure stamped on end of valve
2. Opening pressure can be adjusted with shims (S=0,2, 0,5, 1,0 and 2,0 mm)

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Hydraulic power lift

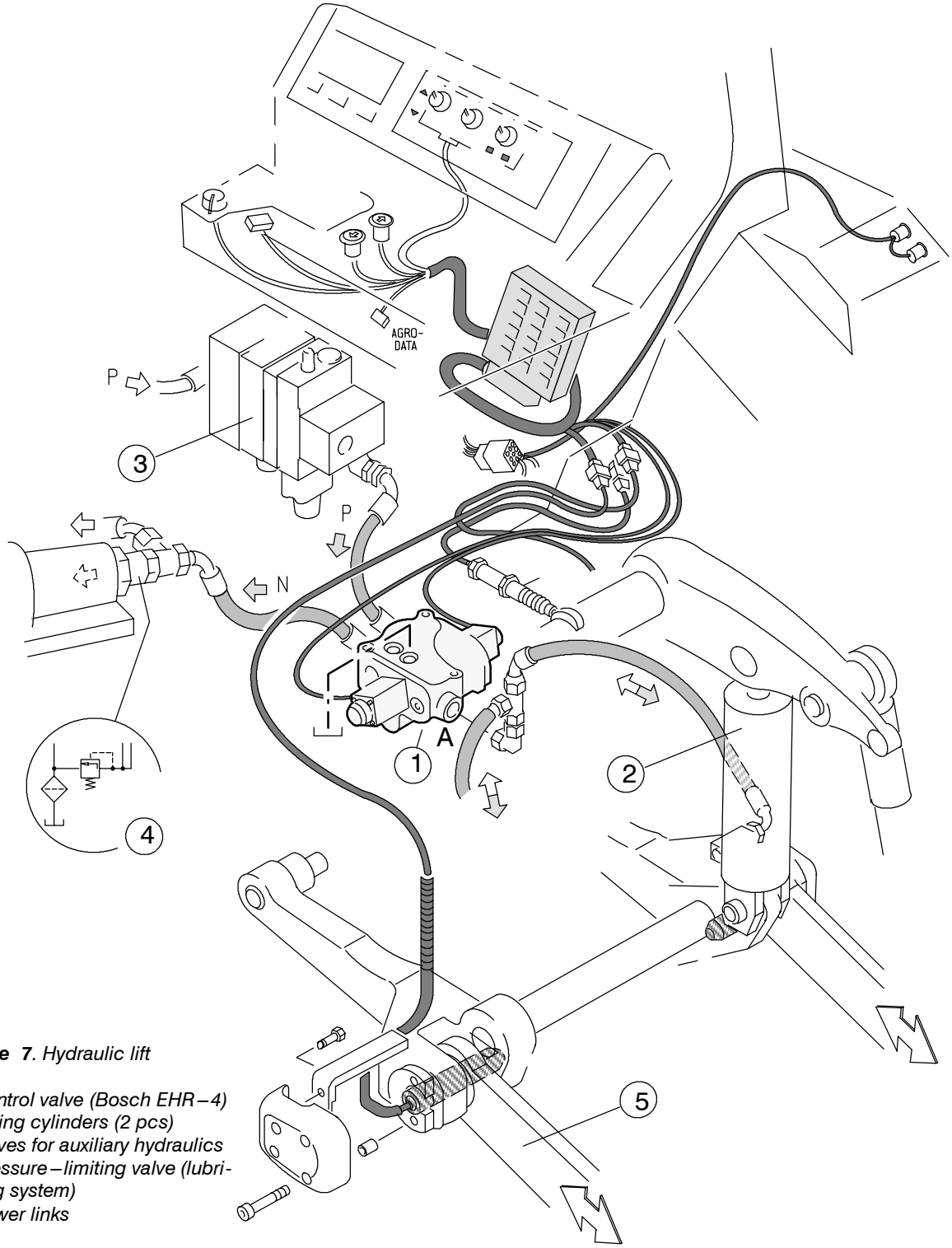


***Figure 7**. Hydraulic lift*

1. Control valve (Bosch EHR–4)
2. Lifting cylinders (2 pcs)
3. Valves for auxiliary hydraulics
4. Pressure–limiting valve (lubricating system)
5. Lower links

The hydraulic lift control valve (1) is fitted on the RH side of the gearbox. Oil flows to the control valve from the high pressure pump via the priority valve and via the valves for the auxiliary hydraulics (3) (hose P).

Electrically controlled valve (1) directs oil to the lifting cylinders (port A) in the lifting position. In the lowering position, the oil returns to the oil reservoir (gearbox housing). In the neutral position, the valve holds pressure in the lifting cylinders and the valve is in the free–circulation position (hose N).
The free–circulating oil (below 0,2 MPa) flows to the transmission lubricating system.

The control valve (1) has an in–built shock valve (20 MPa) which protect the working hydraulics against pressure shocks from the lifting cylinders.

Working hydraulic pressure is limited by a pressure–limiting valve (19 MPa) which is placed on the underside of the end plate (inlet side) of the auxiliary hydraulic valve block (3).

Electrical system of the hydraulic power lift is described in section **32** (Electro–hydraulic power lift).

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Hydraulic lift control valve Bosch EHR–4

The valve is the same as on Valmet 05–tractors. The valve is fitted on the RH side of the gearbox.The valve regulates oil flow regardless of loading in the three–point linkage.

There are push buttons on the ends of the both solenoid valves. Thus it is possible to move the control valve main spool manually if, for instance, there is a malfunction of the control valve or if it is suspected that the hydraulic system is not functioning properly.

Note! Solenoid valves must not be connected direct to the tractor battery terminals (e.g. for testing purposes) for long periods (max 10 seconds) since the solenoids cannot withstand strong current and will be damaged
Solenoids can be changed separately. In addition, the shock valve and lowering valve can be cleaned and checked and valve springs can be changed.

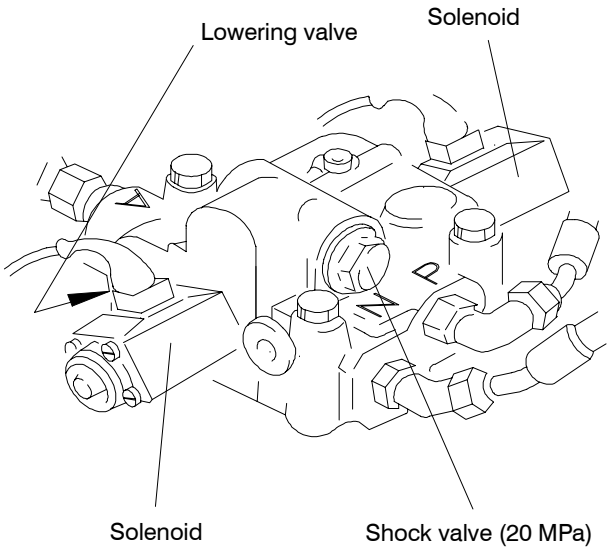


Figure 8. *Hydraulic lift control valve*

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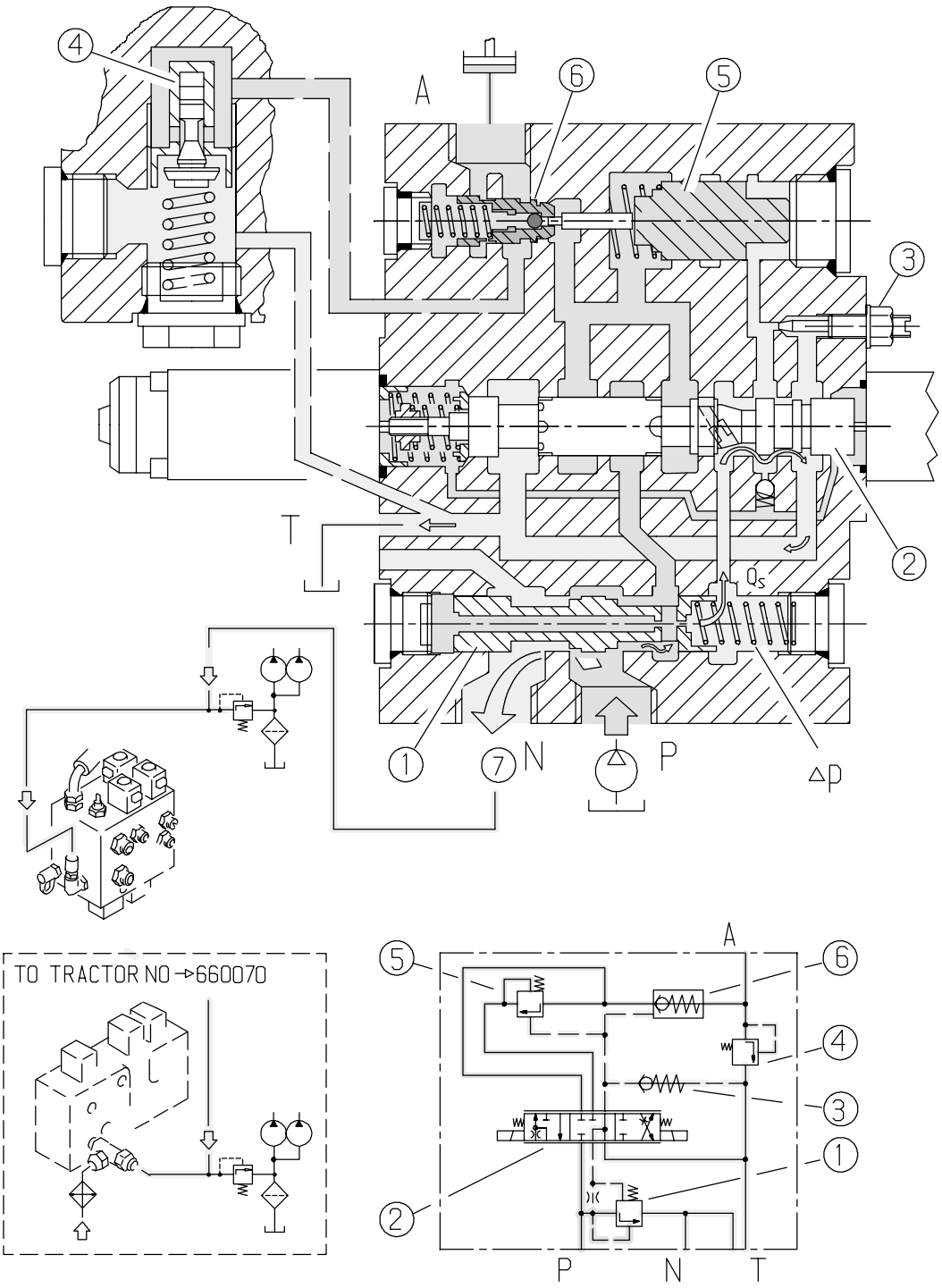


***Figure 9**. Control valve in neutral position*

Function (neutral position)

When the tractor is started oil flows from the pump (port "P") to the left end of the spool (1) through a drilling in the middle. The spool is then pushed to the right against a spring and opens the unloading circuit between ports P and N (pump–tank)

Through the drilling in the spool (1) oil flows through the drilling at the right end of the slide. The constant oil (Qs) flows via the main spool (2) to the tank ("port T").

The main spool (2) is held in the middle position by the action of the centring springs (left end of spool in fig 9) The pressure (+spring) keeps the lowering valve (6) closed.

1) 3–way oil flow regulating slide
2) Main spool
3) Pilot pressure limiting valve for lowering valve
4) Shock valve
5) Lowering valve pilot piston.
6) Lowering valve
7) Free circulation oil to the transmission lubricating system

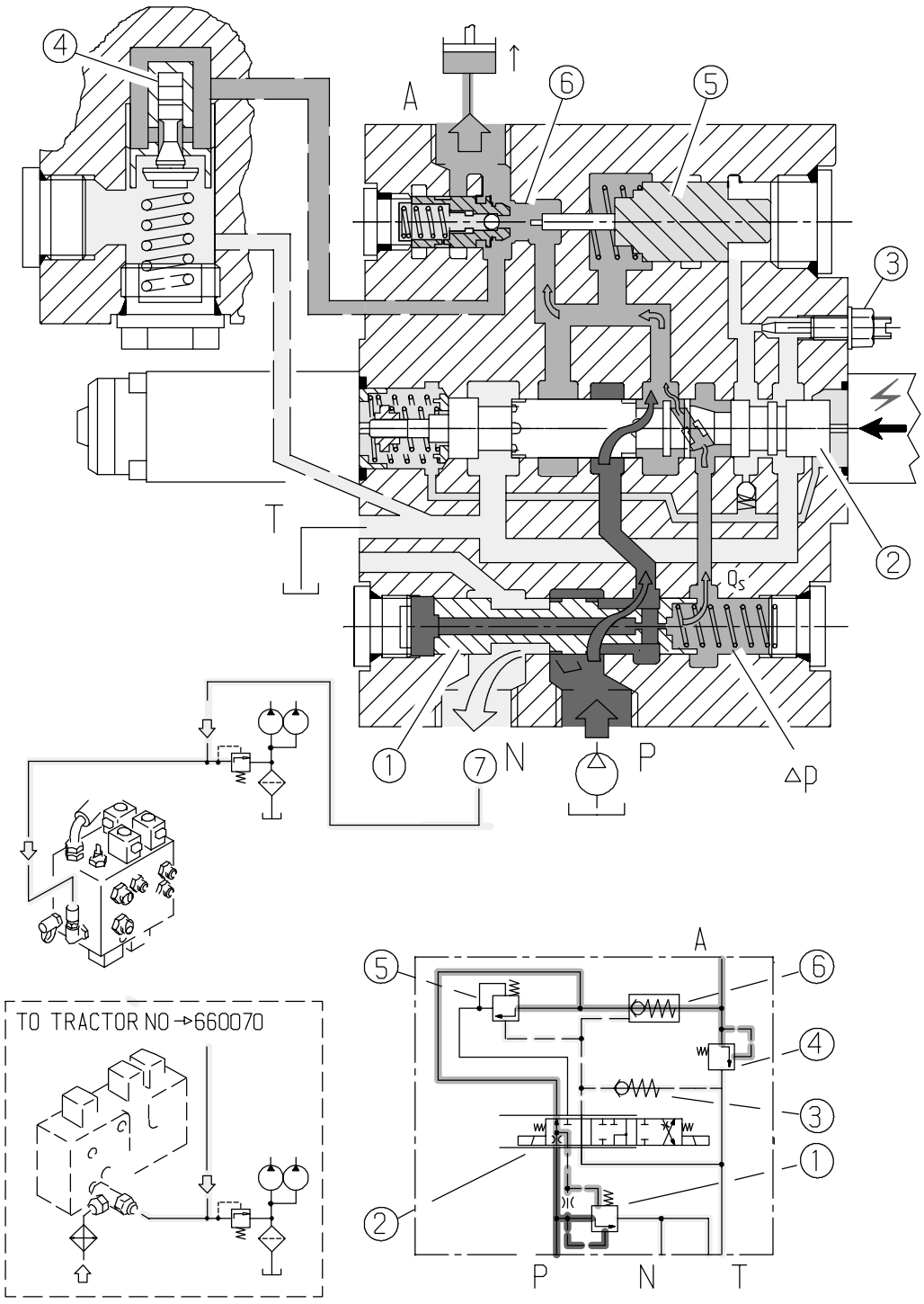


Figure 10. *Control valve in the lifting position*

Function (lifting position):

In the lifting position the RH solenoid is energized. The magnet presses the main spool (2) to the left against the centring spring. Then it opens the passage from the spool (1) to the lifting cylinders by an amount proportional to the strength of the current supplied to the RH solenoid.

The right end of the slide (1) is under lifting cylinder pressure. Pump pressure becomes equal in value to lifting cylinder pressure + pilot pressure (=spring). The pressure difference through the restriction of the main spool (2) is always equal to pilot pressure so the oil flow depends only on the position of the main spool (2) (and oil viscosity).

The lifting solenoid is controlled so that in the beginning and in the end of the lifting movement, the solenoid current is cut a period of some milliseconds, so that the movement becomes smooth. The actual lifting movement is carried out with full current (otherwise as in the lowering position).

1) 3–way oil flow regulating slide.
2) Main spool.
3) Pilot pressure limiting valve.
4) Shock valve.
5) Lowering valve pilot piston.
6) Lowering valve.
7) Free circulation oil to the transmission lubricating system.

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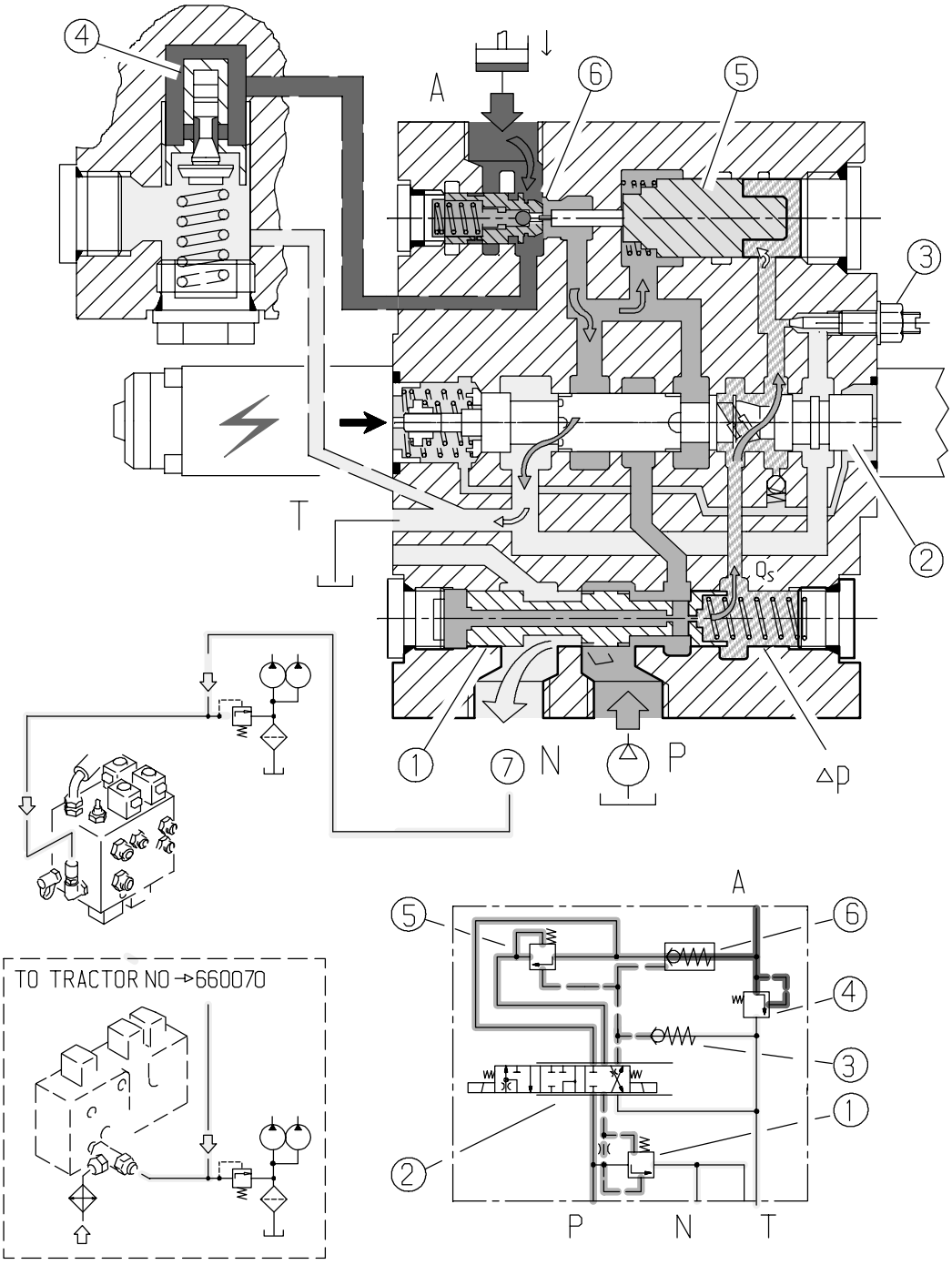


***Figure 11**. Control valve in the lowering position*

Function (lowering position):

In the lowering position the LH side solenoid is energized. The magnet presses the main spool (2) to the right against the inner spring. The spool opens the passage between the lowering valve (6) and tank (T).

At the same time the spool (2) also allows oil (Qs) to flow behind the pilot piston (5). The piston moves to the left and opens the lowering valve pilot ball. The pressure behind the lowering valve decreases (compared with the pressure in the working line) and the lowering valve opens and allows oil to flow from the lifting cylinders to the tank.

The return oil flow pressure also acts on the front of the piston (5). If this pressure reaches a sufficient level (greater than the force of spring+pressure Qs), the holding valve stops the flow.

Therefore the return flow does not depend on the pressure caused by the load on the three point linkage. The rate (lowering speed) of the return flow is proportional to the current supplied to the solenoid for lowering. The pilot pressure limiting valve (3) sets a pressure difference which acts over the main spool (2) when the load is being lowered.

The free circulation circuit from the pump (P) to the tank (N) functions as in the neutral position.

1) 3–way oil flow regulating slide
2) Main spool
3) Pilot pressure limiting valve
4) Shock valve
5) Lowering valve pilot piston
6) Lowering valve
7) Free circulation oil to the transmission lubricating system.

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Lifting cylinders

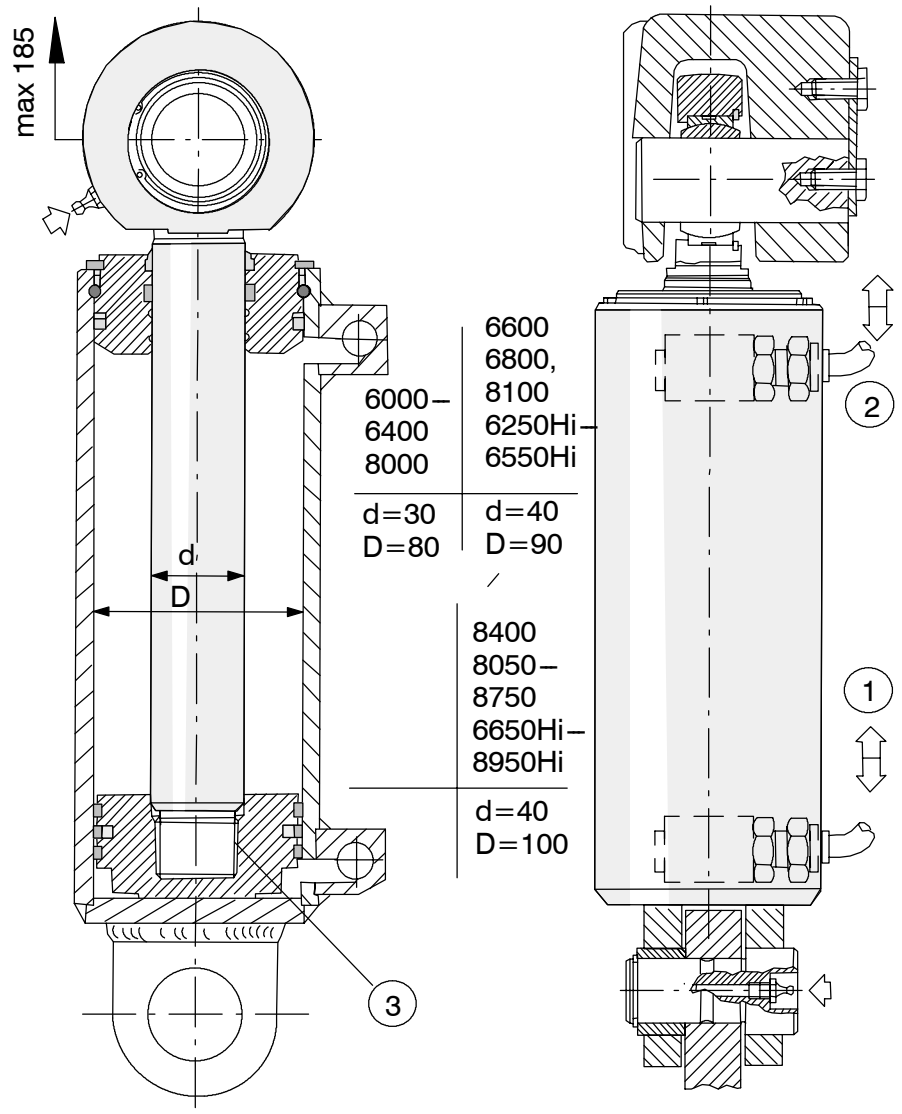


Figure 12. Lifting cylinders

1. Working pressure (max 17,5 MPa)
2. Ventilation
3. Tightening torque 150 Nm. Locking fluid Loctite 270.

Note! The cylinder can be loaded in both direction. Nipples should be greased weekly/every 50 running hours.

Lifting cylinders on HiTech–tractors:
6250–6550: d=40 mm, D=90 mm.
6650–8950: d=40 mm, D=100 mm.

Note! Manufacturing of power lift 40 KN (Ø 80 mm cyl.) is finished in autumn 2000. After this the tractors in question have lifting cylinder with diameter of 90 mm.

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Three–point linkage and towing hook

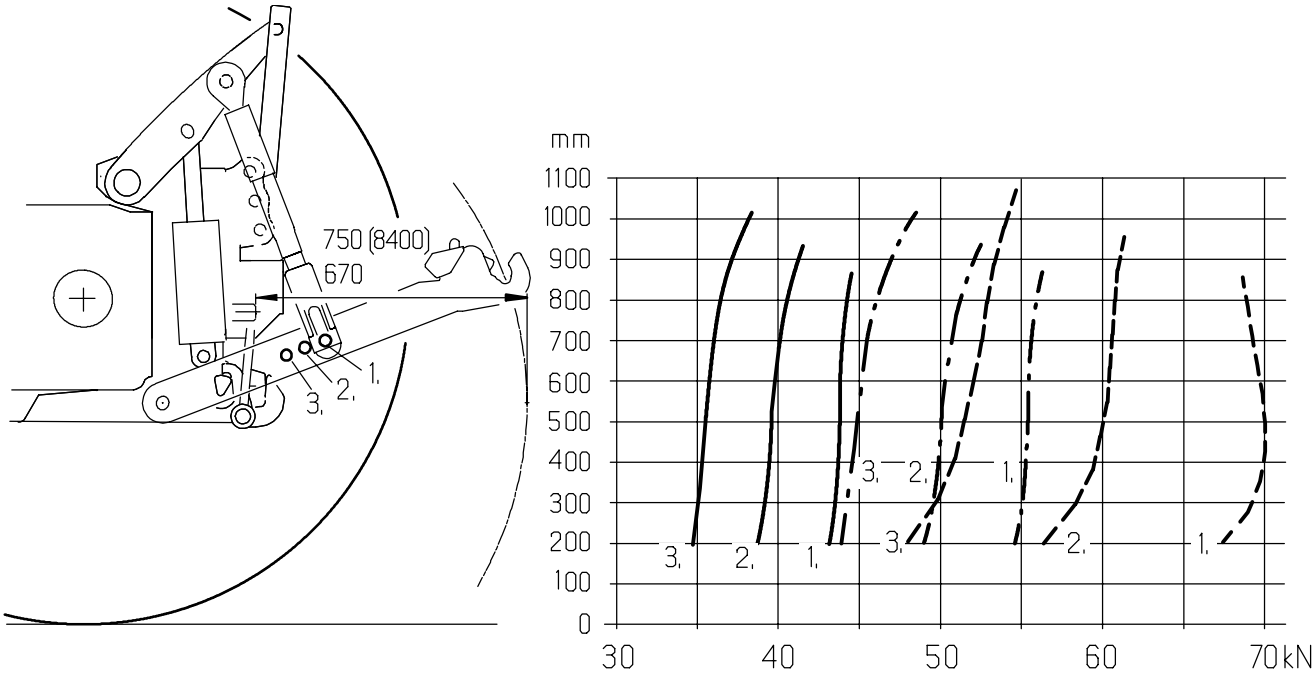


Figure 13. *Lifting force and lifting range*

Note! Hydraulic lifting link gear is available as an optional equipment

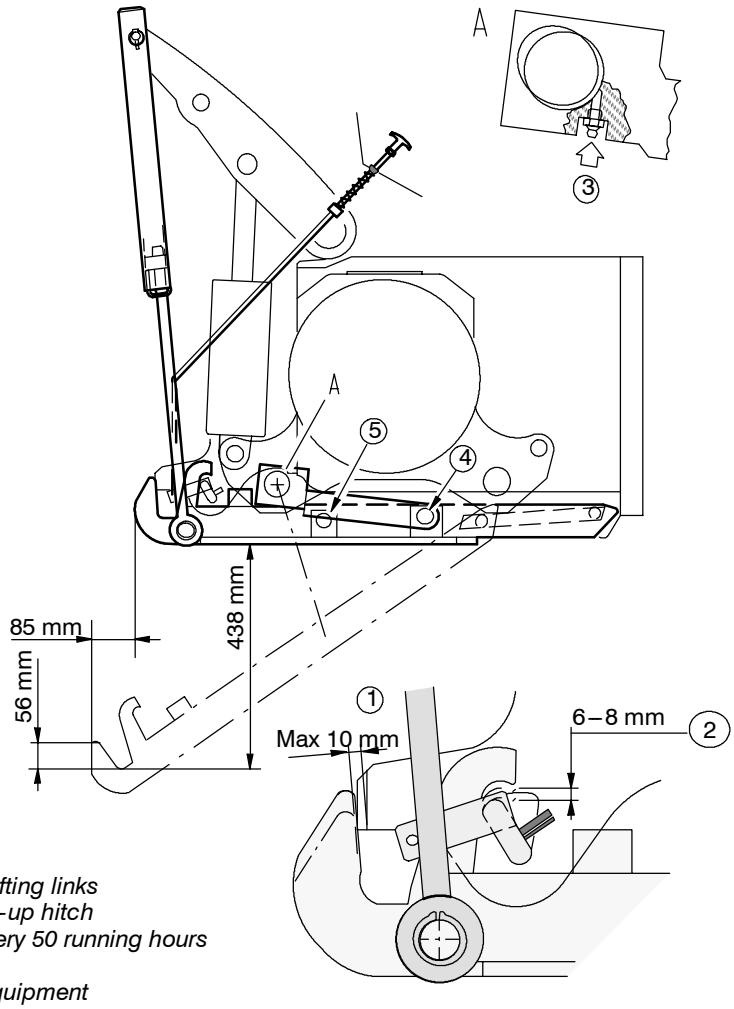


Figure 14. *Pick–up hitch*

1. Adjusting pick–up hitch lifting links
2. Checking locking of pick–up hitch
3. Grease nipples weekly/every 50 running hours
4. Universal grease
5. Attachment for optional equipment

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Valves for auxiliary hydraulics

Valmet 6100–8100 tractors have as standard two valves for auxiliary hydraulics, which are controlled separately with two levers. The valves are fitted on the RH side of the tractor so that the control levers go straight into the cab.

Both of these valves are adjustable for either single–acting or double–acting function. One of these valves can be locked mechanically in different positions and the other valve has a ”floating position”.

Standard quick–action couplings or Push–Pull type couplings are available. A leakage oil reservoir is standard.

As an extra equipment can be fitted;
a) two extra valves+brake valve for trailer
or
b) one extra valve equipped with an oil flow control valve+brake valve for trailer.

For later tractors two extra valves+brake valve for trailer+oil flow control valve can be fitted.

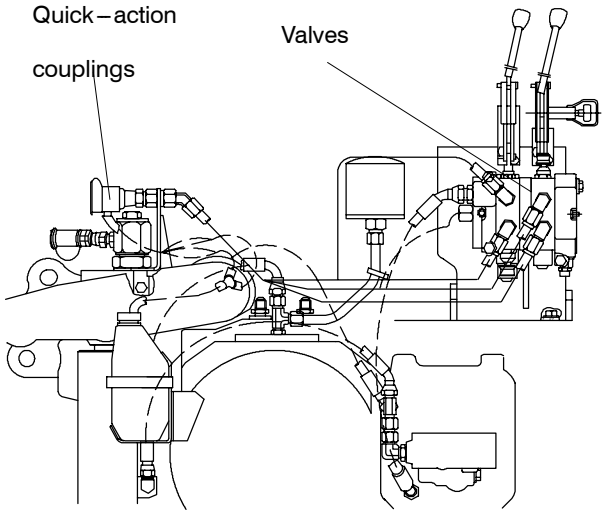


Figure 15. *Valves for auxiliary hydraulics*

When repairing or changing the valves, they are accessible through the hole in the cab RH side mudguard.

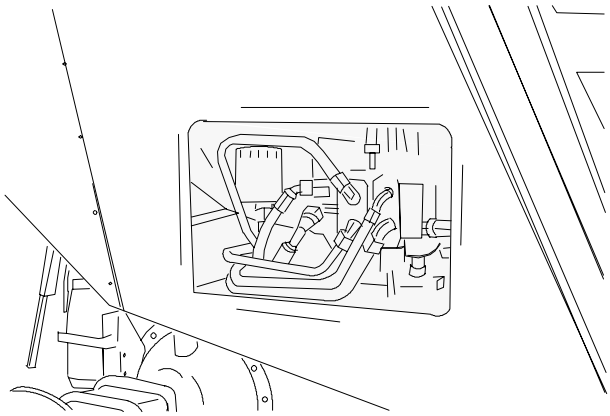


Figure 16. *Access hole*

1. Adjustment between single/double–action
2. Adjustment between single/double–action
3. Position locking

Intermediate plate A and the pump side end plate B have been attached to the valve bracket (3 pcs bolts). Tightening torque for the bolts is **45 Nm.**

Bolts C (4 pcs) through the valve block set must be tightened evenly and crosswise to **23 Nm**. Otherwise the valve spools can get trapped. When fitting extra valves, bolts C should be changed for longer ones.

Note! When fitting valve blocks, ensure that the o–rings between the blocks are correctly positioned in their grooves.

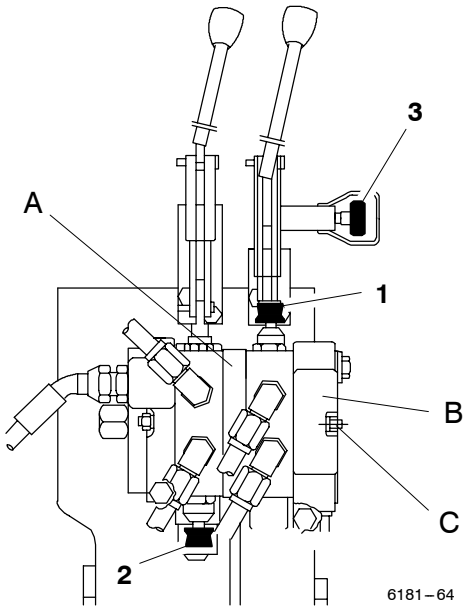


Figure 17. *Control levers for standard valves*

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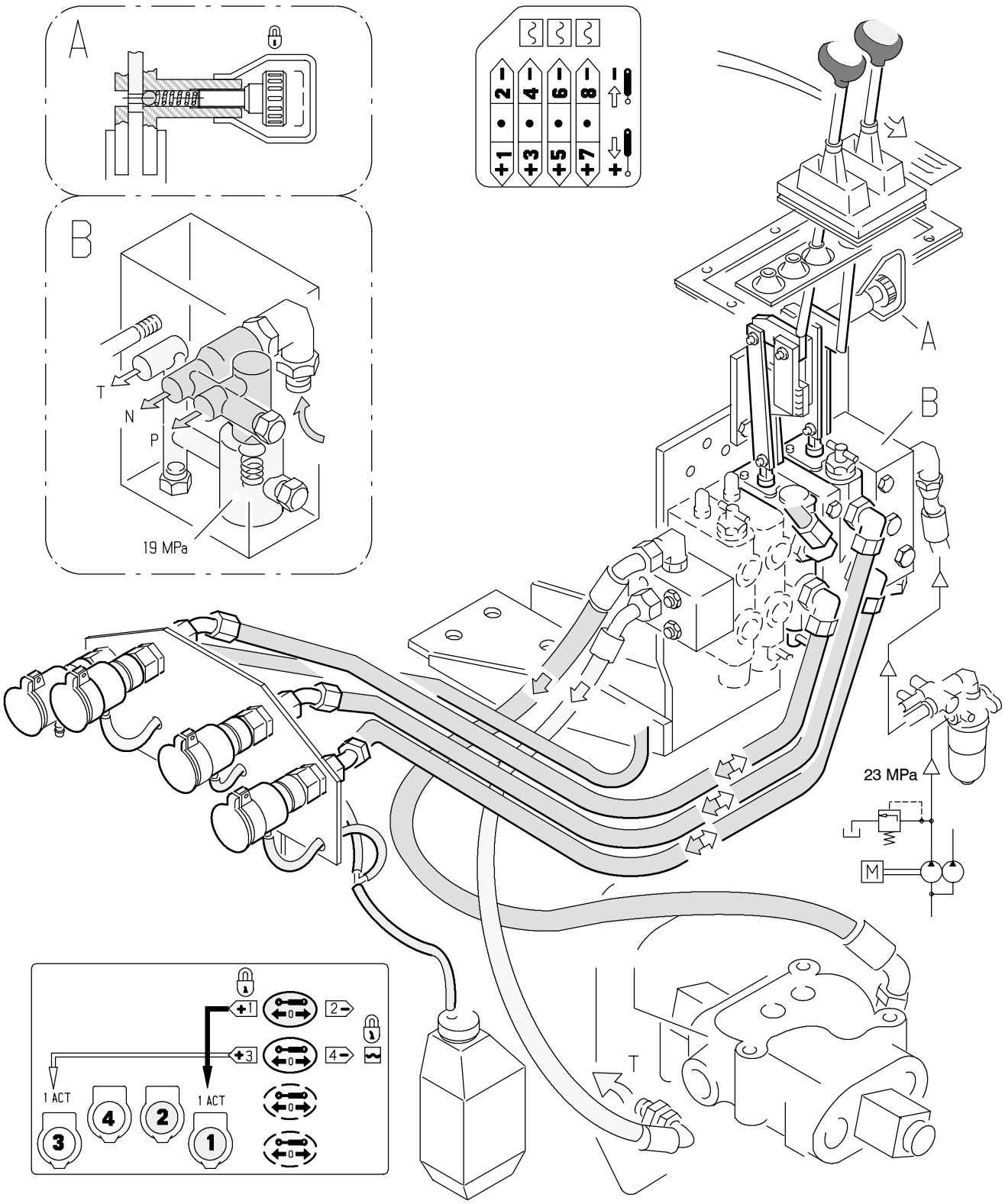


Figure 18. Valves for auxiliary hydraulics
A Position locking for the first valve
B. On the end plate underside there is fitted a pressure–limiting valve for working hydraulics (19 MPa)

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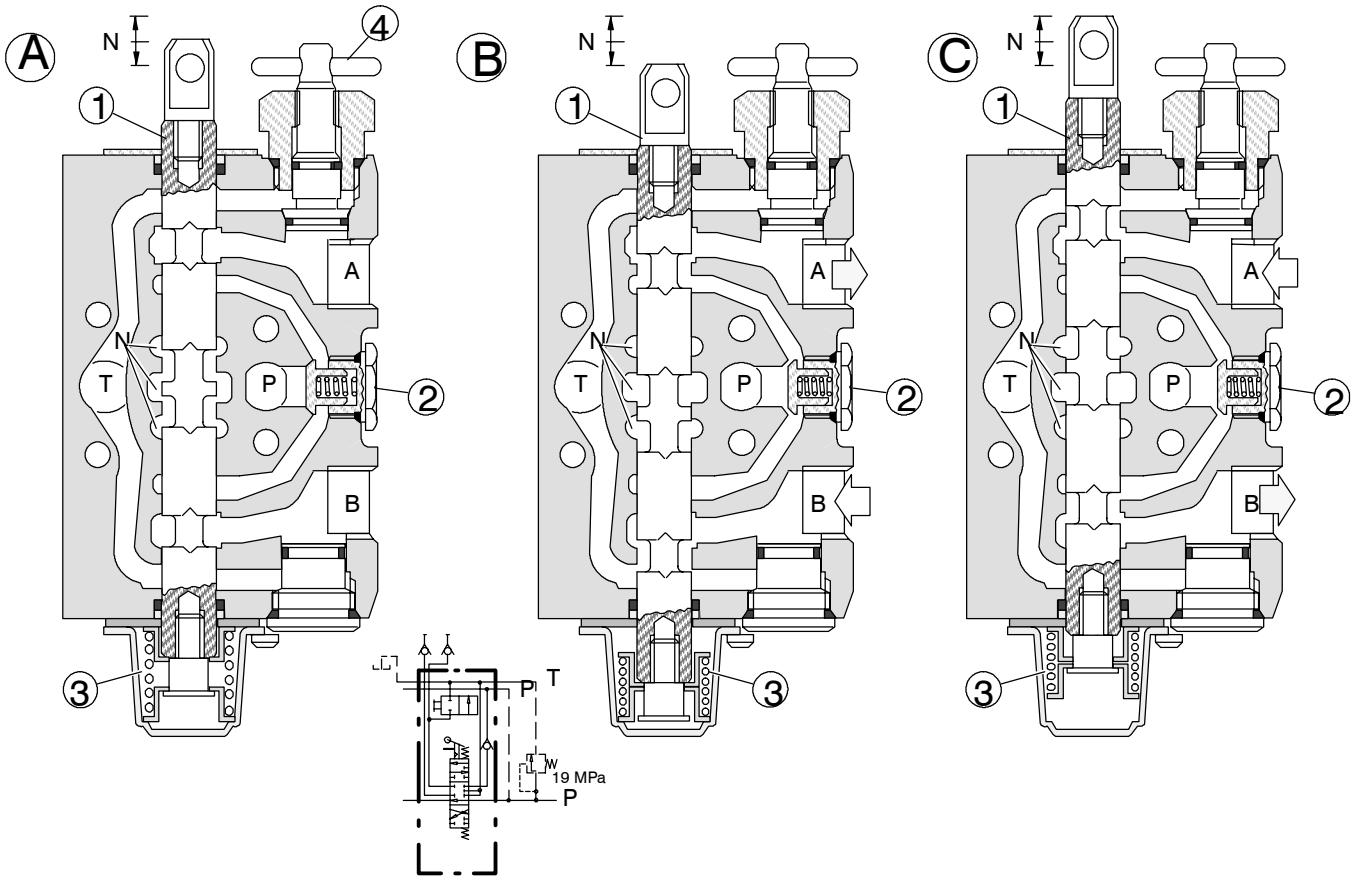


Figure 19. *Foremost standard valve*

– the foremost standard valve (order no 32536400): 1/2 – action, 3 positions (out – hold – in), spring – return. Out – position can be locked mechanically.

Function:

A: Neutral position. Oil flows from the priority valve through the flow – through channels **N** to the control valve of the hydraulic lift.
The channels to the auxiliary hydraulics (**A**, **B**) and the non – return valve **2** are closed.

B: Pressure position: When the slide **1** has been moved downwards, the middle part of the slide closes the channels **N**, and its upper part opens the line to the port **A**. Pressure in the channel **N** and in channel **P** increases (these channels unite in the front end flange).
The non – return valve **2** opens and oil flows to the auxiliary hydraulics via port **A**.
At the same time the slide opens the return line from port **B** to tank channel **T**.

C: Pressure position: Slide **1** has been moved upwards. Flow – through channels **N** are closed and oil flows via port **B** to the auxiliary hydraulics. Return oil flows from port **A** to tank channel **T.**

The change – over valve **4** is used to give a double – acting valve a single – action function. When single – acting, the equipment hose must be connected to the lower connector **B**.

1) Slide

2) Non – return valve

3) Centring springs

4) Change – over valve

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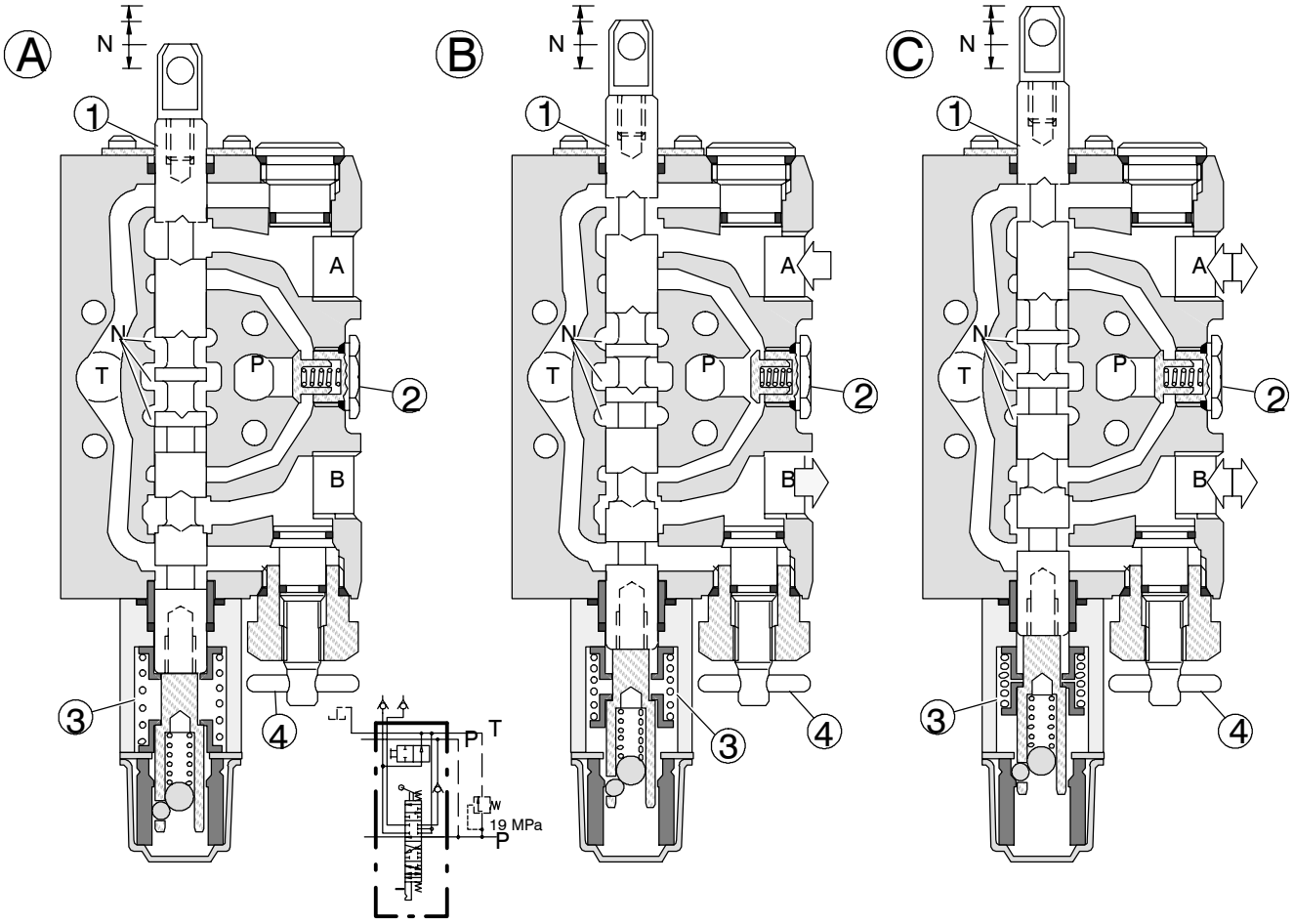


Figure 20. *Rearmost standard valve*

– The rearmost standard valve (order no. 32536500): 1/2 –action, 4 positions (out–hold–in–float), spring–return. Floating position can be locked.

Function:

A: Neutral position. Oil flows from the priority valve (and valve no 1) through the flow–through channels **N** to the control valve of the hydraulic lift. The channels to the auxiliary hydraulics (**A**, **B**) and the non–return valve **2** are closed.

B: Pressure position: When the slide **1** has been moved upwards, the middle part of the slide closes the channels **N**, and its lower part opens the line to the port **B**. Pressure in the channel **N** and in channel **P** increases (these channels unite in the front end flange).
The non–return valve **2** opens and oil flows to the auxiliary hydraulics via port **B**. At the same time the slide opens the return line from port **A** to tank channel **T**.

When the slide has been moved downwards, the port **A** is pressurised and return oil flows via port **B**.

C: Floating position: The slide **1** has been moved further upwards. The detent balls lock the sleeve. The sleeve opens the middle channels **N** and oil flows to the hydraulic lift.
The lines from the pressure channel **P** to ports **A** and **B** are closed. Both ports **A**, **B** are connected to tank channel (and to each other).

– The change–over valve **4** is used to give a double–acting valve a single–action function. When single–acting, the equipment hose must be connected to the upper connector **A**.

1) Slide

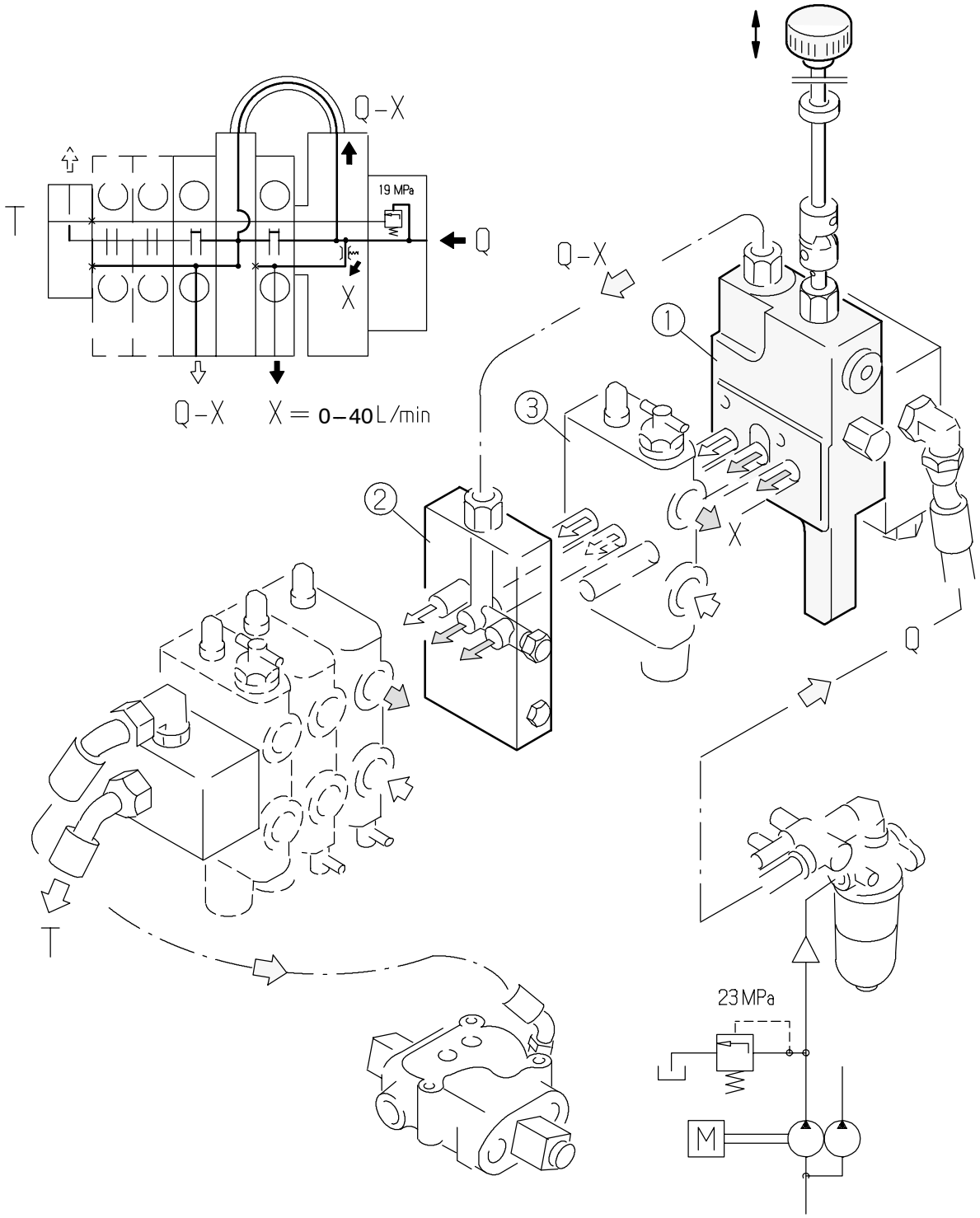
2) Non–return valve

3) Centring springs

4) Change–over valve

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Oil flow control valve



– The oil flow control valve makes it possible to use simultaneously two hydraulic cylinders, or simultaneous use of power lift and one auxiliary cylinder.

With the oil flow control valve the oil flow can be adjusted so that it suits the implement, when maximal flow is not needed for e.g. speed control of hydraulic motors (together with a special valve of the motor).

The oil flow control valve is situated between the pump end plate and the valve block. The oil flow is adjusted with a knob on the side panel in the cab.

Note! Two seal kits are available for repairing the oil flow control valve no. 32599900: kit no. 32449400 (complete) and kit no. 33643500 (internal seals).

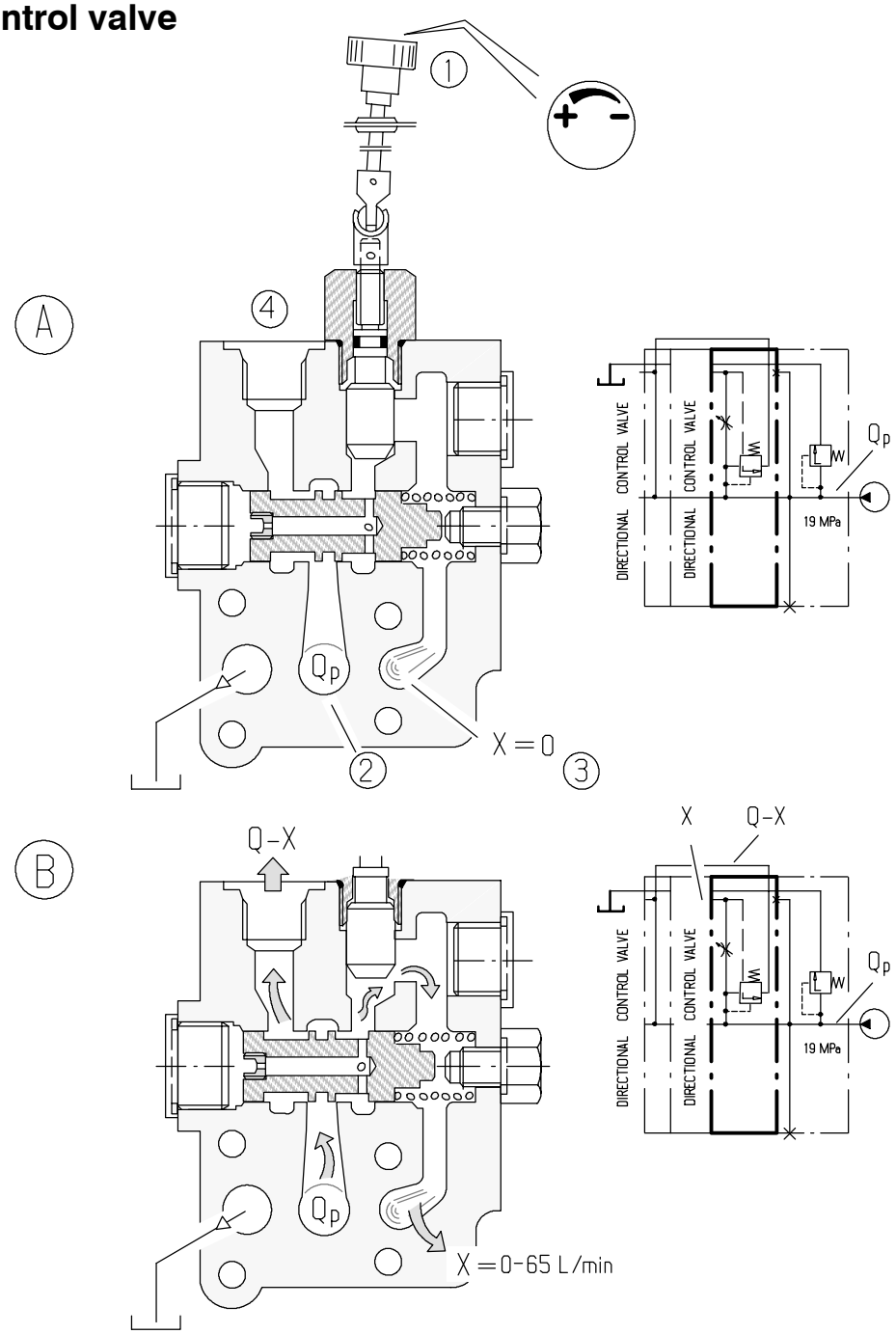
Functions:
The valve directs the required priority flow (that can be steplessly adjusted from 0 to 40 litres per minute) to the spool valve that is mounted between the oil flow control valve and the intermediate plate.

The rest of the flow is directed through an external pipe to the next, downstream spool valves.

X = pressure channel for the regulated oil flow
Q – X = the surplus flow to other spool valves
1) Oil flow control valve
2) Intermediate plate
3) The spool valve supplied by the regulated flow (the valve type is a matter of choice)

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Oil flow control valve



A) The oil flow is not adjusted.

The first spool valve can not be used when the throttle is closed. The pump flow goes through the channel Qp to the spool valves after the intermediate plate, and further through the power lift control valve into the tank.

Direction of the pressure to one spool valve or to the power lift.

B) The oil flow is adjusted (and the manual control valve is in the active position).

The pump flow is divided in proportion to the throttle between 0 and 65 litres per minute among the channels Q – X and X and can simultaneously be used for controlling the spool valve X (between the pump end plate and the intermediate plate) and one of the next spool valves, or the spool valve X and the power lift.

When the throttle spindle 1 is opened, the flow X grows and the flow Q – X decreases.

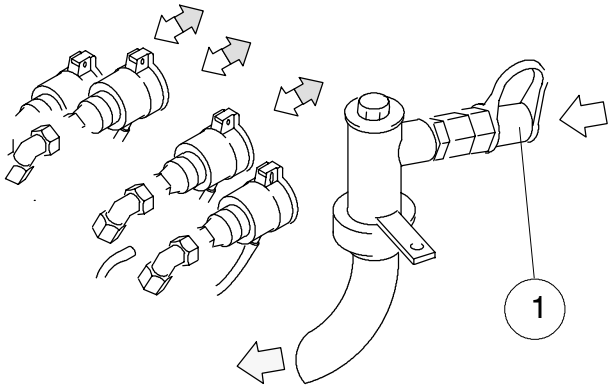
If the pressure in channel X varies, the same pressure change is transmitted through the throttle and the balance piston bore also to the opposite head of the piston, and this means in practice that the spindle keeps its position and the flow does not change.

The throttle in the piston bore prevents vibration.
– When the oil flow is adjusted, the pressure of the flow X is the pump pressure minus the spring load. The pressure of the flow Q – P varies from free flow pressure to maximum pressure, depending on the use of the other manual control valves / of the power lift.

1) Adjusting knob
2) Pressure channel that goes through the valve blocks
3) Adjusted flow to the X spool valve
4) Surplus flow to other spool valves

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Return oil connection for auxiliary hydraulics



Valmet 6100–8100 tractors have as standard a return oil connection (1), which can be used when low return pressure is needed.

Counter pressures:

1/2 inch connection, flow 50 l/min, 10˚C max. 4,0 bar
1/2 insc connection, flow 50 l/min, 50˚C . . max. 1,0 bar
1 inch connection, flow 50 l/min, 10˚C . . . max. 0,6 bar
1 inch connection, flow 50 l/min, 50˚C . . . max. 0,5 bar

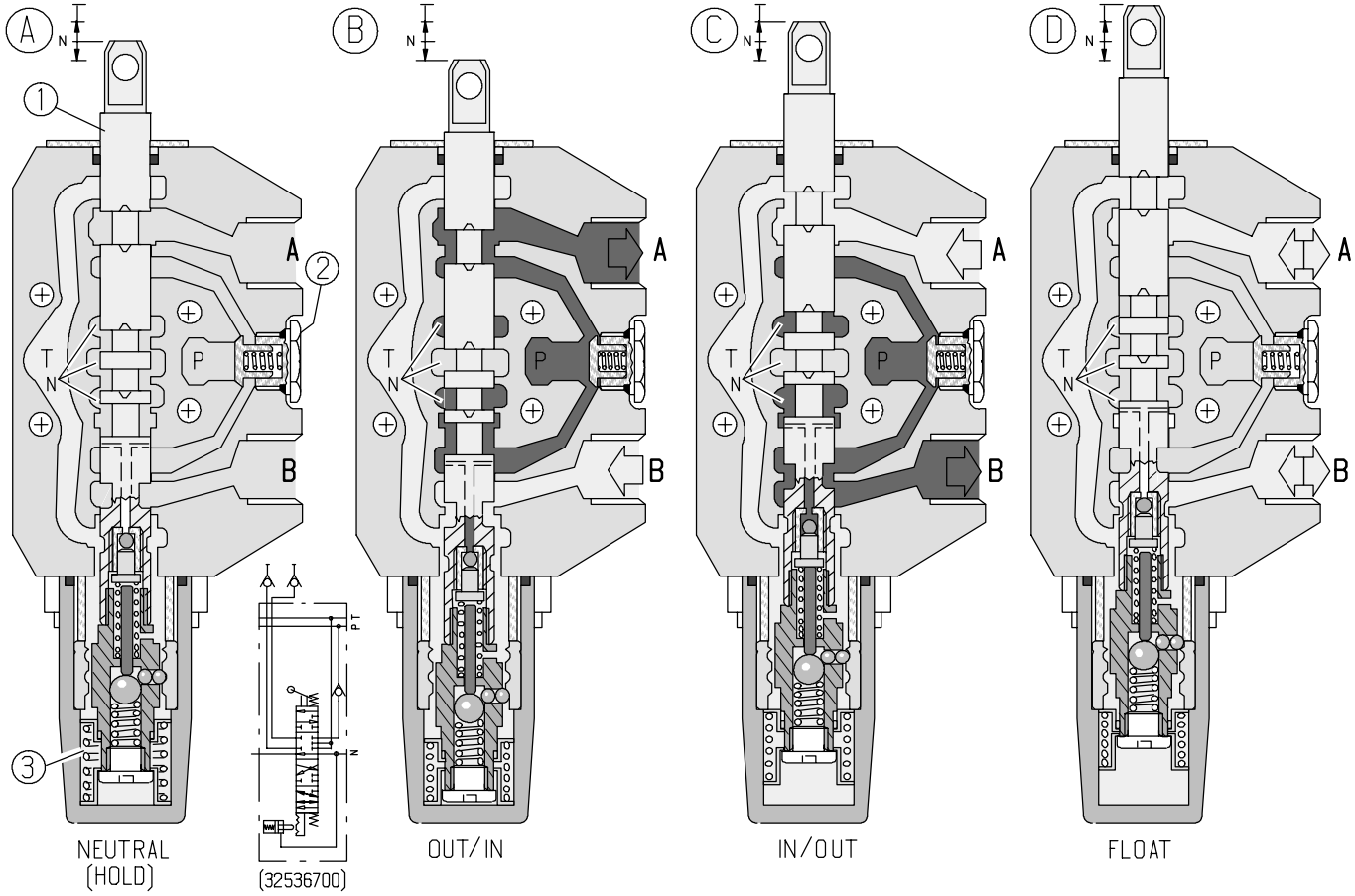
Push–pull quick couplings

There is a breather hole under the rubber seal ring in the Push–Pull quick couplings, which hole should point downwards. From January 2000 oil gathering protectors will be fitted in the quick couplings and the oil gathering hose nipple must also point downwards. The parts must not moved in relation to each others during fitting.

If the breather hole does not point downwards, little oil can leak inside the coupling or water can condens, which make it difficult to connect the couplings.

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Kick–out valve



– Extra equipment (32536700): 2–action, 4 positions (float–out–hold–in) kick out. Float, out and in–positions can be locked.

Function:

A: Neutral position: Oil flows from the priority valve (via valve blocks) through passages **N** and further to the power lift control valve. Passages to auxiliary hydraulics (**A**, **B**) and the non–return valve **2** are closed.

B: Pressure position: When the spool **1** is moved downwards, the spool middle part closes the passages **N** and the spool upper part opens an oil way to port **A**. Pressure in passage **N** increases as in passage **P** (passages joint together in the front end plate).
Non–return valve **2** opens and oil flows via port **A** to the auxiliary hydraulics.
At the same time the spool has opened a return passage from port **B** to tank passage **T**. Locking balls lock the spool.

C: When the spool is moved upwards, port **B** is pressurised and oil returns via port **A**.

Pressure return (kick–out) to the neutral position happens when oil pressure pushes ball+needle at the spool lower end and releases the locking balls (at a pressure of 14–16 MPa).

The spring space is open and allows oil to be returned to passage **T**. Rest of pressure in the oil space (if greater than 0,2 MPa) can cause returning of the spool to the neutral position.

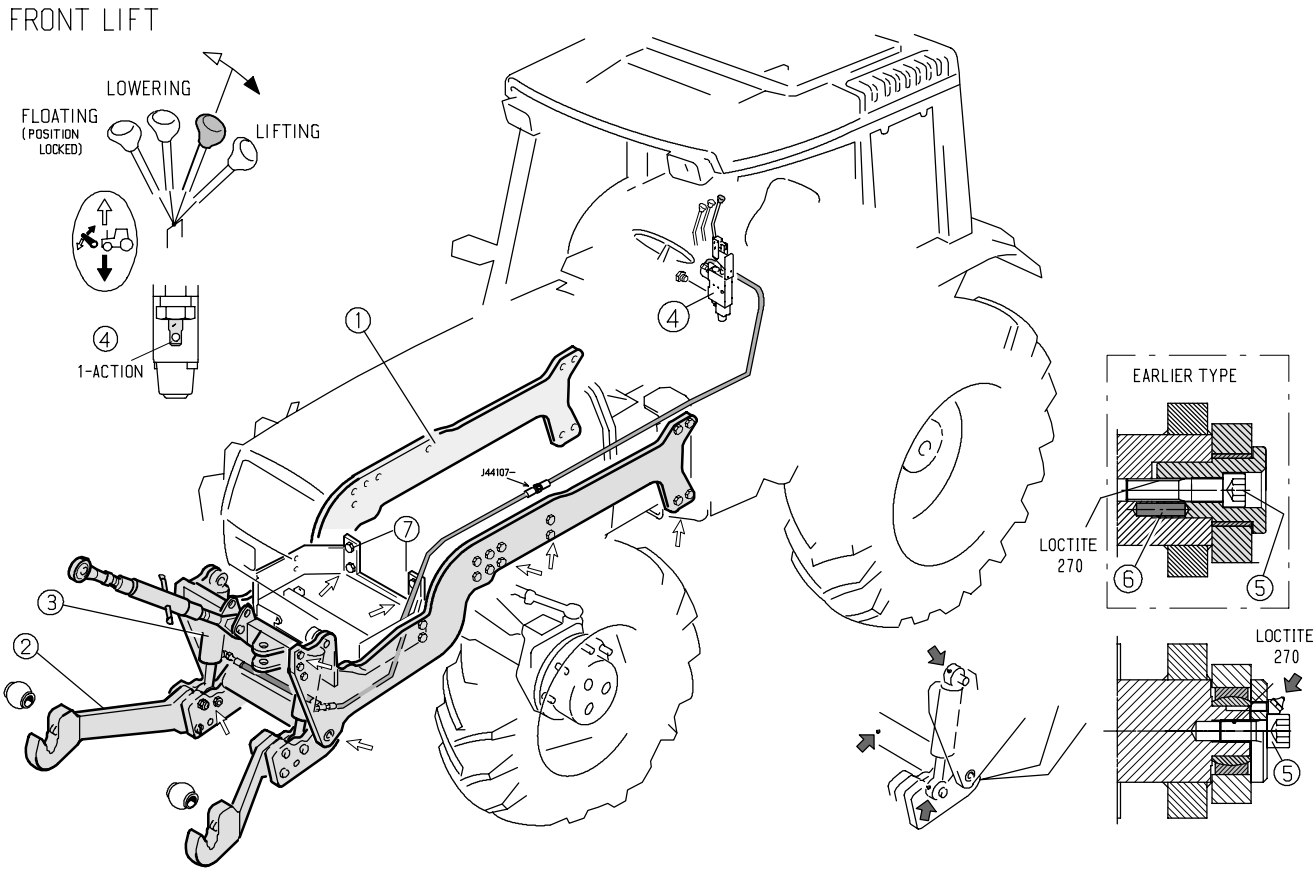
D: Floating position: Spool **1** has been moved further upwards. The locking balls lock the spool in position. The middle passages **N** open and oil flows through them to the power lift control valve. Connection between pressure passage **P** to ports **A** and **B** is closed.
Both ports **A** and **B** are connected with tank passage **T**.

– When the valve is used as a single–acting valve, an implement hose should be connected to the upper coupling **A**. The return oil flow can be created by moving the spool to the floating position (upwards).

1) Spool
2) Non–return valve
3) Centring springs

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Front power lift



Picture 21. Front power lift, 30 kN (6200–8150), 35 kN (8350–8950).

1. Frame
2. Lower links can be turned and removed
3. Lifting cylinder, 2 pcs, ø 80 mm (6200–8150), ø 90 mm (8350–8950).
4. Control valve
5. M14 (8.8), 140 Nm
   M16 (8.8), 220 Nm
   M16 (12.9), 360 Nm
6. Tension pin prevents the shaft from rotating in relation to the lower links
7. Tightening torque of upper bolts is 400 Nm..

Note! The control valve (out–hold–in–float, floating position can be locked) is fitted to the third valve in the valve set. Ordering number of the control valve is 32532700 (with lever), or 32536500 (only valve block).

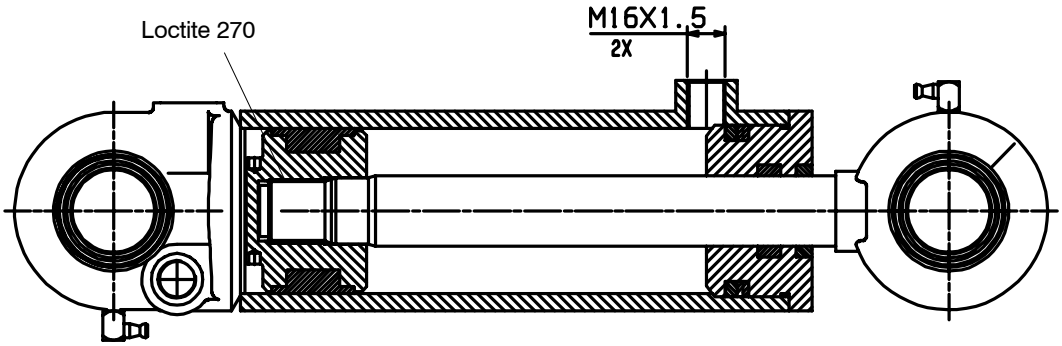
It is possible to order the front lift together with the front PTO. The standard front piece of the tractor is not needed, when the front lift is mounted. All moveable parts of the front lift have bearings.

Maintenance

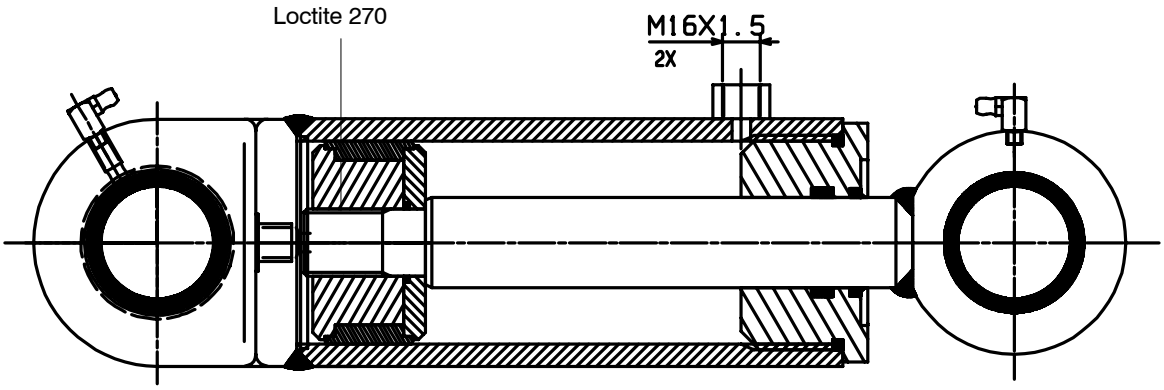
a) Grease the lifting cylinder joint pins and the lift main shaft nipples at intervals of 250 running hours, depending on use.
b) Retighten all front lift bolts after the first 100 running hours.

M14x25 m 8.8	140 Nm
M16x30 m 8.8	220 Nm
M16x50 m 12.9	360 Nm
M18x60 m 8.8	320 Nm
M20x60 m 8.8	430 Nm
M20x50 m 12.9	750 Nm
M20x60 m 10.9	600 Nm
M20x60 m 12.9	750 Nm
M20x70 m 12.9	750 Nm

Lifting rams of front lift



Picture 22. Lifting ram on 6300–8150 (ø 80 mm).



Picture 23. Lifting ram on 8350–8950 (ø 90 mm).

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Repair instructions

1. Low pressure circuit (Op. no. 911)

A. Measuring pressure

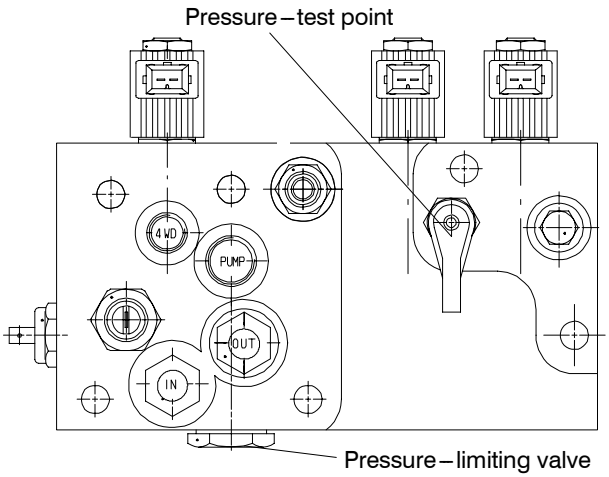
1. Start the engine and run it at **1500 revs/min**.

2. Warm up the transmission/hydraulic oil to **40–65°C**.

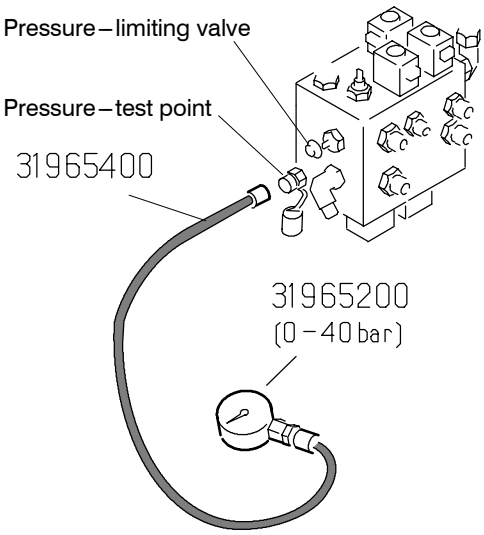
Note! The oil warms up faster if the steering wheel is held against the stop.

3. Disengage as many servo functions as possible (clutches unpressurised in order to eliminate a pressure drop caused by leakages in clutch piston seals).

Note! When the 4WD is engaged, the clutch is unpressurised. On 2–step speedshift should theTORTOISE range be engaged (Trac–Trol) or HARE range engaged (Overdrive). On HiTech models the shuttle must be in the neutral position. Two DPS clutches are always pressurised, when the engine is running.



4a. Earlier valve block (–660070): Connect a pressure gauge to the test point on the servo valve block (on the LH side of the gearbox). Read the pressure. It should be between **2,1–2,3 MPa.** Pressure measuring equipment, see page 910/5.

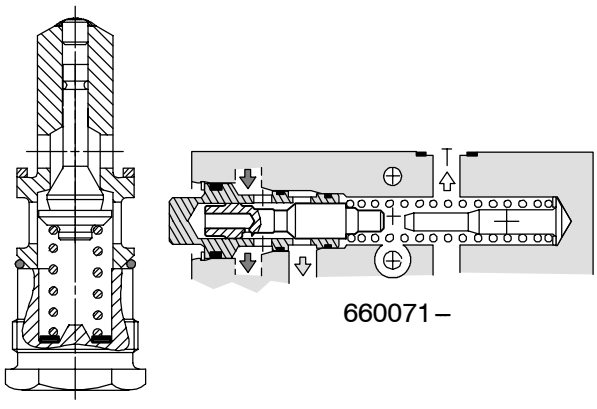


4b. Later valve block (660071–): Connect a pressure gauge to the test point on the servo valve block and read the pressure value. It should be **1,8–1,9 MPa.**

4c. On tractors which have been equipped with HiTech Shuttle, the low pressure circuit test point is placed on the outer face of the valve block, see page **440/24**. The pressure value is **1,8–1,9 MPa**.

Note! These pressures are maintained by the low pressure limiting valve and seals at various solenoid valves (and clutch piston seals in pressurised clutches).

Pressure–limiting valves (1,8 MPa)



5. If the pressure gauge reading deviates much from the correct value, the fault can lie in the pressure–limiting valve or the low–pressure pump is worn out. Also excessive leakage can cause pressure loss.

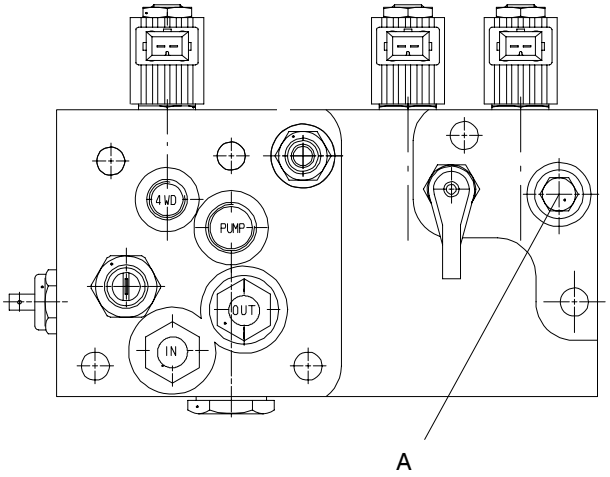
6. Then activate each service in turn. The pressure should momentarily drop but quickly re–stabilise. A constant pressure drop of about 0,1–0,2 MPa indicates excessive leakage and therefore pressure loss in that service.

Note! Pressure measuring equipment, see page 910/5. It is available a pressure–test kit which order no is 31965000. It includes all equipment needed for pressure measurement on Valmet tractors. The parts can also be ordered separately.

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B. Diff. lock clutch pressure

Note! Engine revs **1500 r/min**. Oil temperature **40–65 °C.**

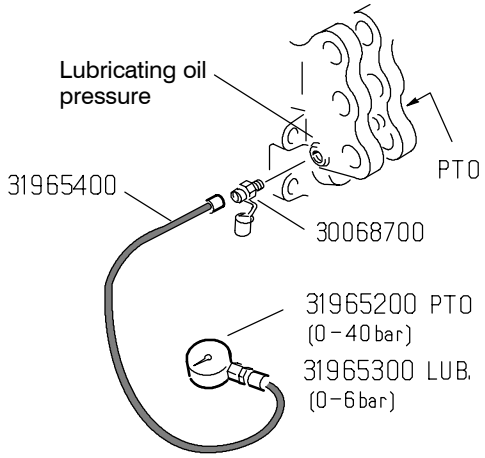


1. The diff. lock clutch pressure can be measured separately by connecting a pressure gauge to the hole A on the servo valve block. The hole has thread M14X1,5 and connector 30068700 fits into the hole.

Important! The picture above shows the earlier valve block (–660070)**.** The plug is situated on the rear face of the later valve block, see pages **420/17A** and **17B** point 16**.** Valve block on HiTech Shuttle tractors, see page **420/20C** point A.

C. Lubricating pressure and PTO clutch pressure

Note! Engine revs **1500 r/min**. Oil temperature **40–65 °C.**



1a. The lubricating oil pressure can be measured by connecting a pressure gauge to the hole on the LH side of the PTO housing. The lubricating oil pressure minimum value is **0,03 MPa**. On HiTech tractors the min. value is **0,12 MPa** measured at test point (HPR) in the rear part of the suction strainer housing on the gearbox, see page **440/25**.

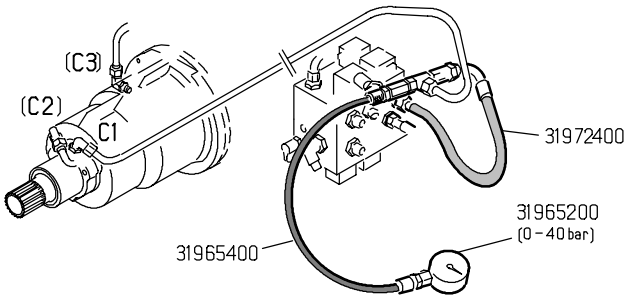
1b. The PTO clutch pressure is measured by connecting a pressure gauge to the hole on the RH side of the PTO housing. The pressure should be **0,05–0,1 MPa** lower than pressure measured at the pressure–test point on the servo valve block. **Note!** In HiTech 2.0 tractors there is a Valmet HPR pressure–test point in the hole.

2. Both holes have thread M14X1,5 and connector 30068700 can be screwed into them.

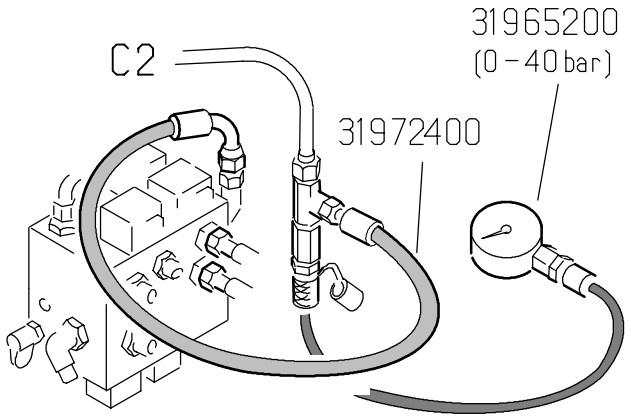
D. DPS clutch pressures

NOTE! Concerning HiTech tractors, see code **370** (Autocontrol V). Position of test–points on these tractors, see picture on page **440/25**.

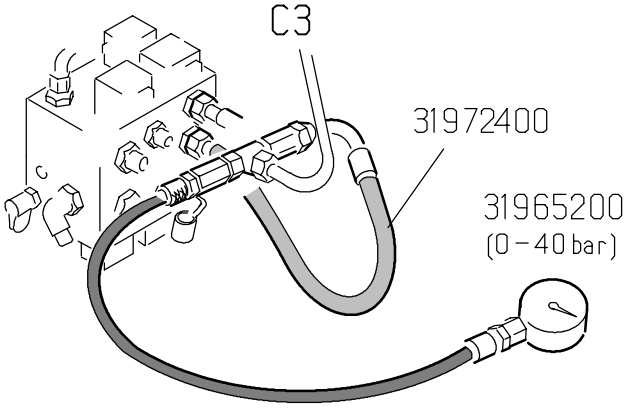
Note! The pressures are measured at engine revs of **1500 rpm** and with an oil temperature of **40–65 °C.**



C1=DPS foremost clutch



C2= DPS middle clutch



C3=Clutch in planetary gear (rearmost)

All three pressures should be between **1,8–1,9 MPa.** Pressure measuring equipment in pictures above are included in pressure–test kit 31965000**.**

NOTE! On tractors which have a lock valve (see page **420/20B**), the piping deviates from the pictures above**.** The lock valve is fitted in transmissions 460 and 650, but the lock valve is not fitted on HiTech tractors.

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IMPORTANT! On the HiTech tractors, there are fitted Valmet HPR test points to measure the DPS clutch pressures (see picture on page **440/25**). Under code **370** (AC V) there are shown calibrations of the DPS clutches.

NOTE! Under code **370** there are also shown calibrations and resettings of HiTech Shuttle clutches **F**– and **R**. Concerning pressure test points, see page **440/25**.

Mechanical shuttle

POWERSHIFT				
STEP	C1	C2	C3	
I	X	X	–	i=1,0
II	X	–	X	i=0,811
III	–	X	X	i=0,651
I	X	–	X	i=1,233
II	X	X	–	i=1,0
III	–	X	X	i=0,803

x = ENGAGED
– = DISENGAGED
= PRESSURISED OIL

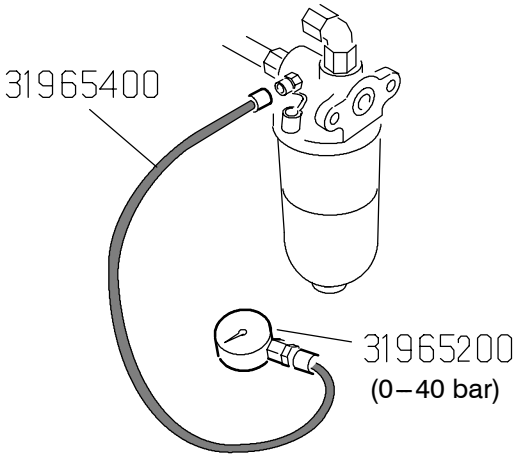
HiTech shuttle

POWERSHIFT				
STEP	C1	C2	C3	
I	+	+	–	i=1,0
II	+	–	+	i=0,811
III	–	+	+	i=0,651

+ = SOLENOID ENGAGED
– = SOLENOID DISENGAGED
= PRESSURISED OIL

2. High pressure circuit

A. Measuring free circulation pressure



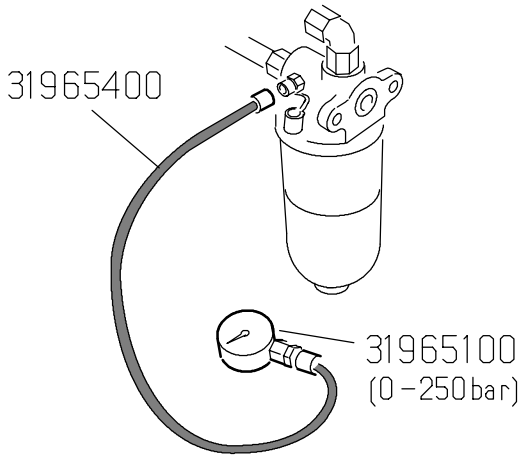
The free circulation pressure can be measured by connecting a pressure gauge to the pressure–test point at the pressure filter bracket. When measuring this pressure, the steering wheel must not be turned. The auxiliary hydraulic valve levers should be in the neutral positions. In addition, the power lift position control potentiometer must not be in the lowest position.

Pressure values at engine revs of 1500 r/min:
– ~ **1,5 MPa** (+50°...+65°C)
– ~ **1,7 MPa** (+30°...+32°C)
– ~ **2,0 MPa** (+20°...+25°C)

Note! Possible extra hydraulic equipment raise the free circulation pressure value. For instance, on tractor that has three valve blocks and a front loader, the pressure value is about **2,1 MPa** (+50...+65° C).

Note! Pressure measuring equipment above are included in the test kit 31965000.

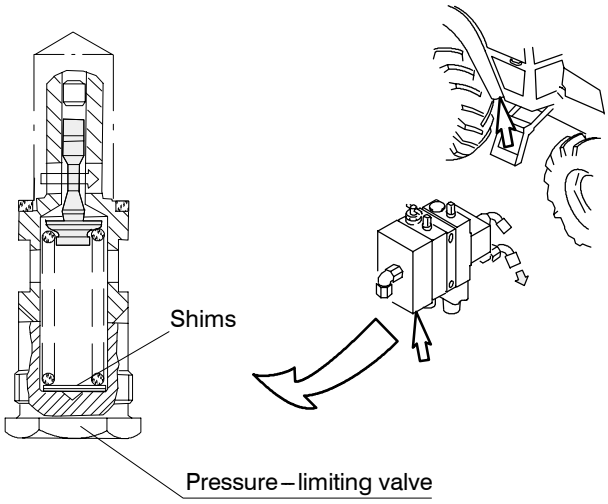
B. Working pressure



1. Connect a pressure gauge (pressure measuring equipment, se page **910/5**) to the pressure–test point at the pressure filter.

2. Adjust engine revs to **1500 r/min**. Warm the hydraulic oil to **50–65°C**.

3. Move an auxiliary hydraulic valve lever to the pressure position and read off the gauge reading which should be **19,0–19,8 MPa.**



Note! The pressure is maintained by the pressure limiting valve on the underside of the front plate of the auxiliary hydraulic valve set.

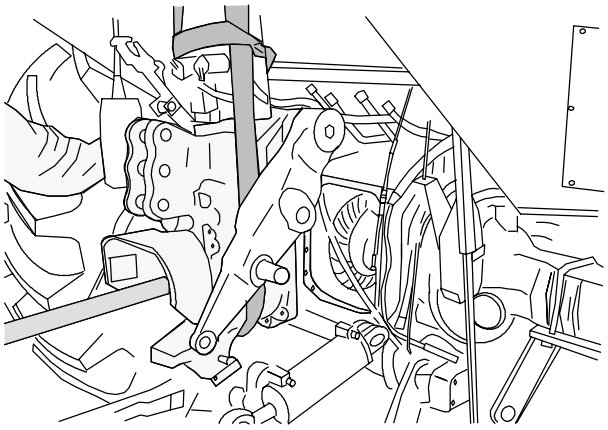
4. If the pressure reading deviates much from the correct value, change pressure limiting valve spring or adjust it with shims. Shims thickness of 0,2 mm raises the pressure value about 0,4 MPa.

Note! Possible deviation can also be caused by a dirty or faulty safety valve (23 MPa) in the hydraulic pump or the pump can be rundown.

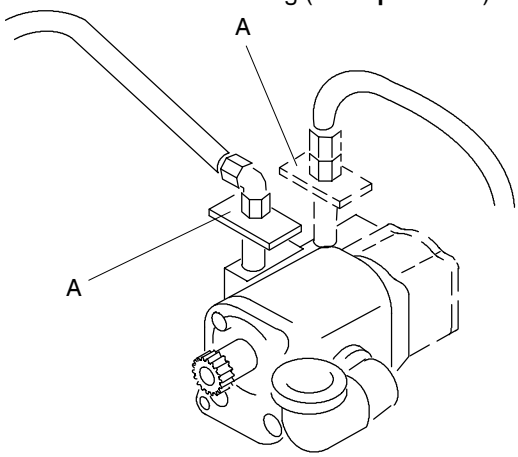
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D. Removing hydraulic pump

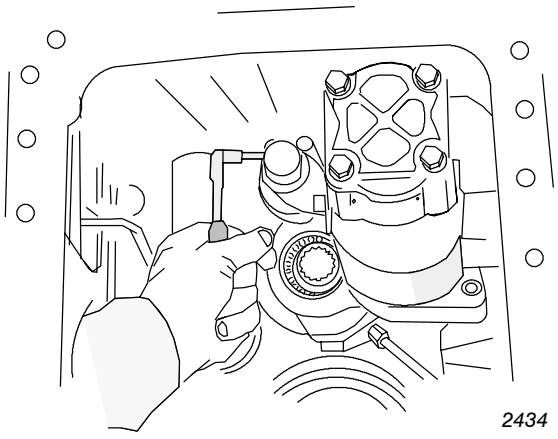
1. Drain the oil from the transmission.



2. Remove the PTO housing (**see Op. 462 1A**).

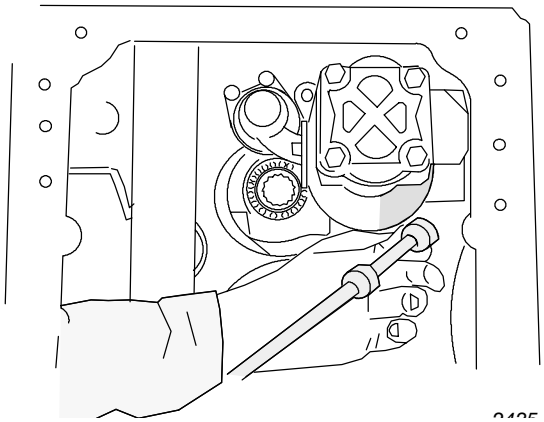


3. Remove the RH side brake cylinder. Disconnect the connectors from the pressure pipes. Slacken the sealing pieces (A) and unscrew the pressure pipes from the pump.



4. Slacken the pump suction pipe clip.

Note! The differential can be in place because it does not prevent removal of the pump.



5. Unscrew the pump fixing bolts and remove the pump from the gearbox housing.

E. Fitting hydraulic pump

1. Fit the pipe clip (screw upwards) onto the suction pipe. Fit the pump coupling sleeve into the pump drive mechanism (if removed).

2. Fit a new pump. Turn the pump clockwise and tighten the fixing bolts to **40–50 Nm**.

Check, that the pump goes fully home by hand and the main axle of the pump is not pressed axially. There should not be gap between flange of the pump and frame of the gearbox.

3. Push the pressure pipes through the sealing pieces and screw the pipes into the pump thread to a torque of **60 Nm**.

4. Apply sealing compound Hylosil RTV Grade 102 Black between the gearbox and sealing pieces. Apply Loctite 542 to the sealing piece screws and tighten them.

5. Connect the pressure hoses to the pressure pipes. Fit the brake cylinder.

6. Tighten the suction pipe clip to a torque of **2 Nm**.

7. Fit the PTO unit (**see Op. 462 1G**).

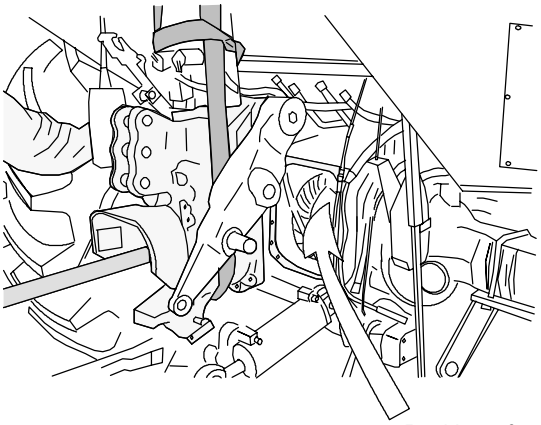
8. Fill the transmission with oil and test–drive the tractor. Make sure that the new pump is functioning by measuring hydraulic pressures.

Note! For the pump is available a seal kit no. 32664100. The high pressure pump safety valve (and separate parts) are available as a spare part. During warranty period the pump is changed as a complete unit.

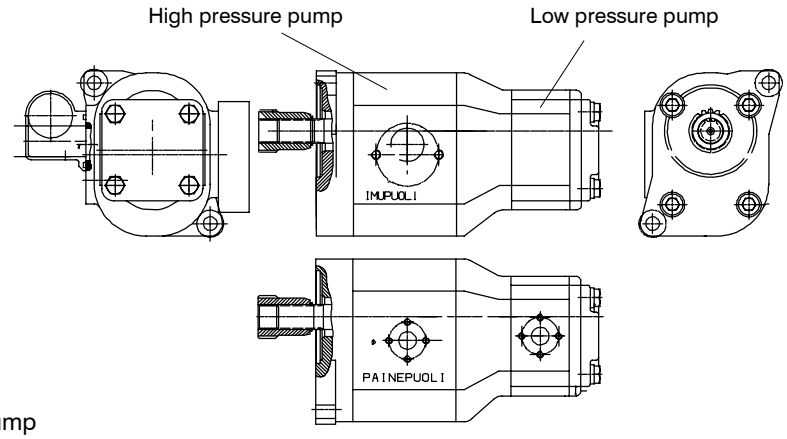
Important! From ser. no. **H19317** incl. (in transmission 650) there is a Bosch–make pump in the hydraulic system. From ser. no. **H18329** incl. the pump pressure pipe lead–in plates and their seals have been changed in transmissions 650, 300 and 390.
The new Bosch pump is replaceable with the earlier pump, when the pump connection parts are changed (suction connection is not necessary to change). A new part is fitted between the pump and the suction connection, and the pressure connection has been changed. The safety valve body has been changed, the other parts as earlier. In connection with possible repair work new lead–in plates and seals must be fitted.

Note! On HiTech tractors, the low pressure pump output is greater than in earlier tractors, which have a mechanical shuttle (25+11 cm^3/r).

2. Pump and pipes, fault tracing



Position of pump



Technical data of pump, see page **910/3**
Removing and fitting pump, see page **911/3**
Pump and pipes, see pages **910/11–11A**

A. General

The condition of the pump can be checked e.g. by measuring pump output at different counter pressures. A worn pump has a lowered output and it cannot maintain enough high pressure. In this case the hydraulic circuit does not function as it should.

The lowered output causes the hydraulic cylinder movements to be slower than normal.
The lowered pressure means that the hydraulic cylinder cannot raise heavy loads. E.g. the lifting cylinder cannot raise the load even thought its weight is below the max permissible load.

A possible reason can also be a faulty pressure–limiting valve or shock valve. In addition, oil leaks in various components and seals can also cause corresponding malfunctions.

The pump can be tested e.g. by measuring the pump output with a flow meter. Use of a separate loading valve makes it possible to measure the output at different pressures. The pump output must not vary much at different counter pressures. The working hydraulic pump output can be measured from the quick–action couplings. The low pressure pump output can be measured by connecting the flow meter on the pressure hose between the pump and the servo valve block.

It is difficult to determine a certain reject limit to the pump. In a light agricultural use even a worn pump can function satistactorily. Just when a tractor has extra hydraulic equipment (front loader, timber loader etc.), a worn pump cannot maintain the hydraulic circuit and it should be changed.

B. Fault tracing by inspecting oil:

1. Air in oil – If there is too much air in oil, the result is that oil foams in the tank. In this case, check all seals and connectors in the suction side. Also the suction strainer cover seal can be faulty. Check the condition of the pump drive shaft oil seal. Change oil if necessary.

2. Water in oil – Water in oil causes the oil to be milky. The system must be emptied and filled with new oil. In addition, prevent water from entering into the hydraulic system. Water causes corrosion to the various parts in the hydraulic circuit.

3. Impurities in oil – Impurities can be verified by taking a sample of oil and by pouring it through a filter paper. The suction strainer and the pressure filter should be serviced according to the maintenance schedule. Impurities can enter into the system from the auxiliary hydraulic cylinders. The hydraulic oil and the pressure filter must be changed according to the instructions.

4. Impaired properties of oil – Mineral oil loses some lubricating properties in prolonged use. This can appear in change of colour, change of smell or change of viscosity. For these reasons, it is necessary to change the oil according to the maintenance program. Also oil level should be checked regularly.

C. Fault tracing without removing pump

If the hydraulic system functions when the oil is cold, but in the operating temperature different functions are slow or powerless, this indicates that the oil pump is worn–out.

The high pressure pump can be tested by connecting a pressure gauge to the circuit and by pulling one auxiliary hydraulic valve lever to the pressure position. Now if the pressure gauge reading follows clearly the engine revs alteration, this indicates that the pump is worn.

The faulty pump can be noisy which indicates a damage in the pump. Note that a blocked suction strainer causes a shrieking sound to the pump.

A worn pump "whips" oil and due to the fluid friction the whole hydraulic system overheats. This can be verified by feeling the temperatures of the pipes and the oil reservoir. In this case, for instance, the pump pressure pipe can be essentially warmer that other pipes and the oil reservoir.

D. Internal inspection of pump

Note! Never dismantle the pump if the warranty is valid, but in this case change a new spare pump.

1. Detach the damaged pump from the tractor. Make sure that the pump and a fitting table are clean before dismantling the pump.

3. Mark all removed parts in relation to each other for easier assembling.

4. Fit always new seals. A seal kit no. 32664100 is available for the pump.

Note! When the hydraulic system is in a perfect condition, the pump housing surfaces are smooth and shiny as well as the bearing surfaces. Text below presents how faults in the hydraulic system affect the oil pump.

1. Impurities in oil – Impurities cause clear dragging grooves on the pump housing and bearing surfaces in the direction of rotation. The most evident damage caused by impurities are deep grooves on the gearwheel side surfaces. Impurities wear the pump fast resulting lowered output value.

2. Cavitation damages – Mineral oils contain 10 percent of air. In the pump suction side if suction is too high, air bubbles are formed, which fasten onto the pump housing. When pressure in the pressure side rises rapidly, the bubbles "explode" causing deep pits on the pump housing. In certain cases the cavitation generates sound, which can be heard from the pump.

Possible reasons:
1. Suction pipe or suction strainer blocked.
2. Wrong oil viscosity.
3. Air enters into system.

3. Air in oil – If air enters into the system via the suction side or via the pump drive shaft seal, this causes the same damages as cavitation. If there is too much air in oil, the oil in the reservoir foams.

4. Pump drive shaft loading – If the pump drive shaft has a strong radial loading caused by the pump drive mechanism, this causes damages to the shaft seal and air and oil leaks by the seal and after a prolonged use, the drive shaft bearings are worn unevenly. For the same reason, the pump gears cut the pump housing on one side resulting internal leakages in the pump.

Observe the following when assembling the pump

Assemble the low pressure pump and tighten the end cover bolts to a correct torque. Assemble the high pressure pump and tighten the end cover bolts only to finger tight. Blow compressed air (~ 5 bar) through the pressure side hole (suction side hole open) at which time the shafts and gear wheels are centered and at the same time tighten the end cover bolts to a correct torque of **61–68 Nm**.

Note! Without this centering the pump will probably damage after a very short operating time.

E. Maintenance

1. Check the hydraulic oil weekly/at every 50 running hours. Oil quality: 10W/30, 5W/30 or 5W/20, API GL–4 (STOU) according to the outdoor temperature.

2. The pressure filter is changed the first time at 100 hours warranty service. The second change is done at 250 running hours and the third change at 500 running hours. After that the filter is changed at every 500 running hours.

3. Hydraulic oil should be changed at intervals of 1000 running hours or yearly which one is reached first. The suction strained should be cleaned always when the oil is changed. The suction strainer should be changed more often when necessary.

Note! If You use continually the auxiliary hydraulics, the hydraulic oil and the pressure filter should be changed more often.

4. The high pressure and the low pressure can be measured according to instructions. Also different clutch pressures can be checked. The pressure limiting valve and the shock valve can be opened and cleaned. These valves can also be adjusted by changing shims.

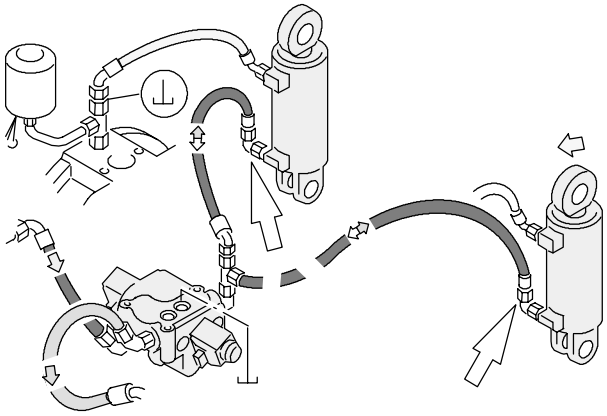
Important! If the hydraulic power lift or the Delta Powershift have malfunctions, the pressure filter insert should be changed immediately.

Hydraulic power lift

1. Control valve

A. Checking shock valve opening pressure

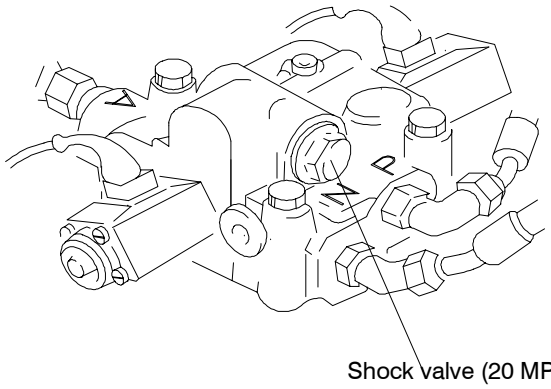
1. Lower the lower links to the lowest position.



2. Connect a pressure gauge and a hand pump to one pressure hose of the lifting cylinder (see arrows) (measuring equipment, see page **910/5).**

3. Raise the lower links to the upper position, stop the engine and switch off current.

4. Pump with the hand pump pressure into the control valve and read the opening pressure, which should be **20–21 MPa**.



Shock valve (20 MPa)

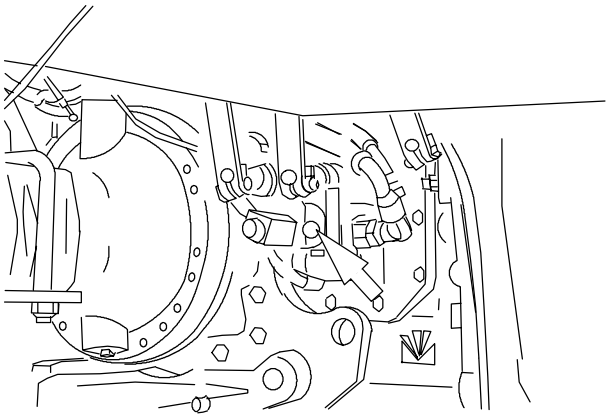
Note! The shock valve is accessible without removing the control valve.

Note! If you want to lower the lower links without starting the engine (e.g. during repair work), unscrew the shock valve after which the lower links can be pressed to the lower position.

B. Removing control valve

Note! The control valve is fitted on the RH side of the gearbox housing.

1. Remove the RH side rear wheel. Disconnect the solenoid valve leads from the control valve.



2. Disconnect all oil hoses from the control valve. Unscrew the control valve fixing bolts (3 pcs) and remove the valve.

Note! There is an oil hole between the control valve and the selector cover. This hole has been sealed with an o–ring, which must be fitted back when the control valve is fitted.

C. Fitting control valve

1. Make sure that the o–ring is in place between the control valve and the selector cover.

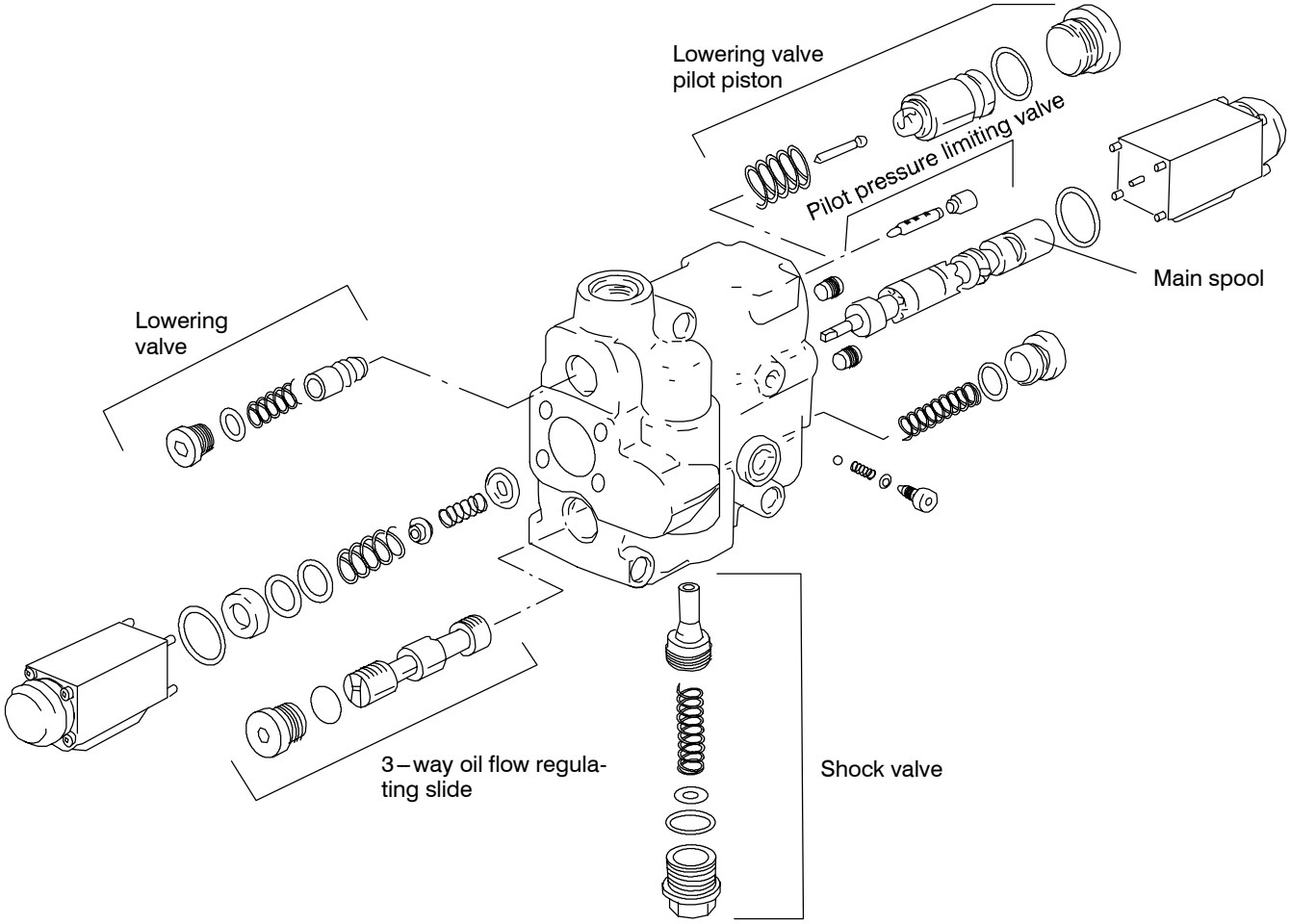
2. Fit the control valve and tighten the fixing bolts evenly to **23–27 Nm**.

3. Connect the solenoid valve leads and all oil hoses.

4. Test–drive the tractor and check the function of the hydraulic power lift.

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D. Reconditioning control valve



Lowering valve

If the hydraulic power lift makes many lifting corrections (reactions) per minute when a weight is attached to the three–point linkage, a possible fault can be faulty lowering valve (or its pilot piston).

In this case, the lowering valve can be disassembled and cleaned as well as the pilot piston. Leaking lowering valve must be changed. In addition, the valve spring must be checked and changed. **Note!** If the lift does not hold the load, possible fault can also be leaky lifting cylinder piston seal.

Shock valve (20 MPa)

If the lift does not hold the load, the possible fault can also be leaking shock valve. When the control valve is in neutral position, the load rests on the shock valve.

In this case, open and clean the shock valve and, if necessary, change the valve spring or adjust it with shims.

3–way oil flow regulating valve

This valve can be opened and cleaned. The valve slide must move easily in its bore.

Pilot pressure limiting valve
Note! The new pilot valve has neither a ball nor a spring but only a tapered valve pin and a locking nut.
The valve must not be screwed fully home, it must be opened 1/2–1 turn.

Adjusting pilot pressure:
Connect a pressure gauge to the pressure filter test point. Activate the power lift and adjust the engine revs to 1500 rpm. Turn the position potentiometer to lowering. Now the free circulation pressure must rise 5 bar, e.g.: not activated 20 bar and activated 25 bar.

The tighter the valve is, the greater is the lowering speed (if the valve is tightened too great, the free flow pressure rises too much in the lowering movement). If the valve is too loose, the lower links do not lower at all (lowering valve does not open).

Solenoids

Solenoid valves are available as a spare part. When fitting a new solenoid, fit the same shims onto the end of the main spool spring. **Do not tighten the solenoid screws too hard.**

Tightening torques

Shock valve plug	46 Nm
Lowering valve plug	30 Nm
Pilot piston plug	103 Nm

Note! When reconditioning the control valve, always fit new sealing rings. When opening the valve plugs, use good tight Allen keys because the plugs can be very tight. When slackening the plugs, knock at the Allen keys with a hammer.

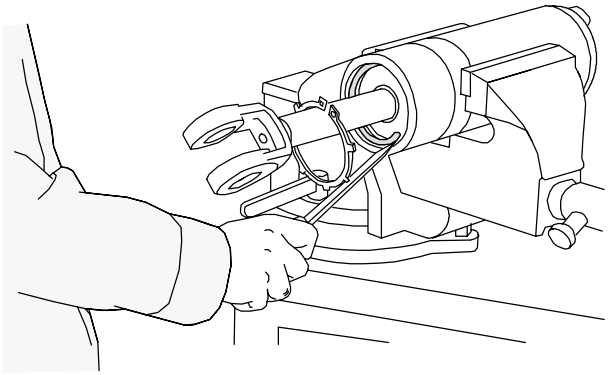
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2. Lifting cylinders

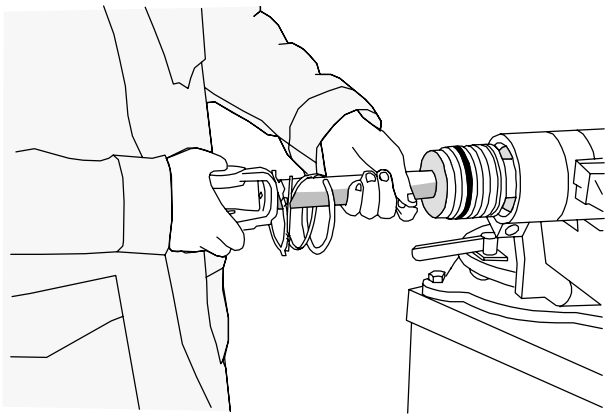
A. Changing lifting cylinder seals

1. Disconnect the lift cylinder pressure lines and remove the cylinder.

2. Take out the circlip and backing ring of the cover.



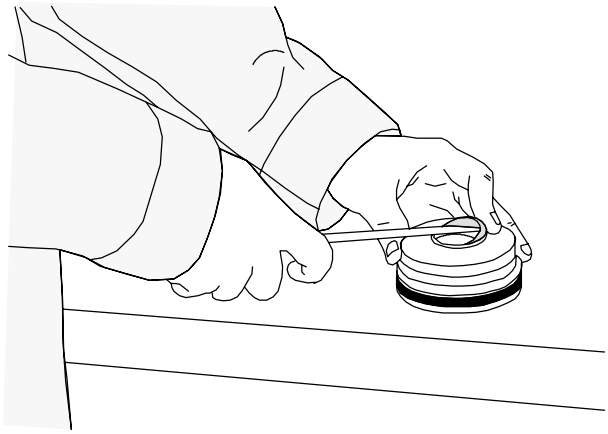
3. Knock the cover into the cylinder until the o–ring and circlip of the cover inside the cylinder can be removed.



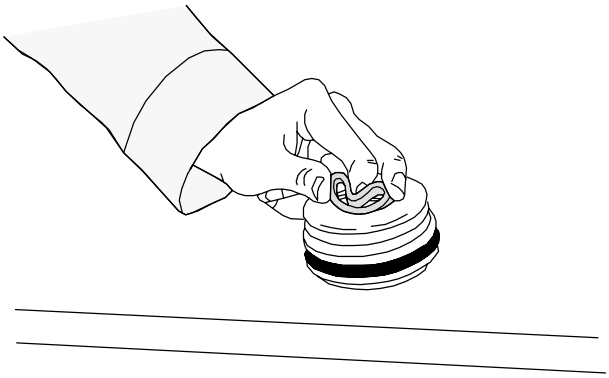
4. Pull the cover and piston out of the cylinder with a sharp movement.

5. Remove the sealing ring of the piston (cut off with a knife), the o–ring and guide ring. Remove the piston from the piston rod.

Note! Removal of the piston is facilitated by heating it up so that the locking fluid on the threads melts.



6. Remove the cover from the piston rod and the seals from the cover.



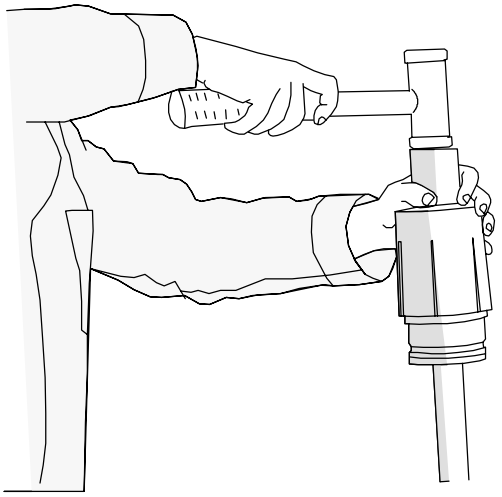
7. Squeeze the new seal as shown in the figure and press it into its groove (sealing lip downwards). Fit the piston rod oil stripper.

8. Change the o–ring and backing ring of the cover.

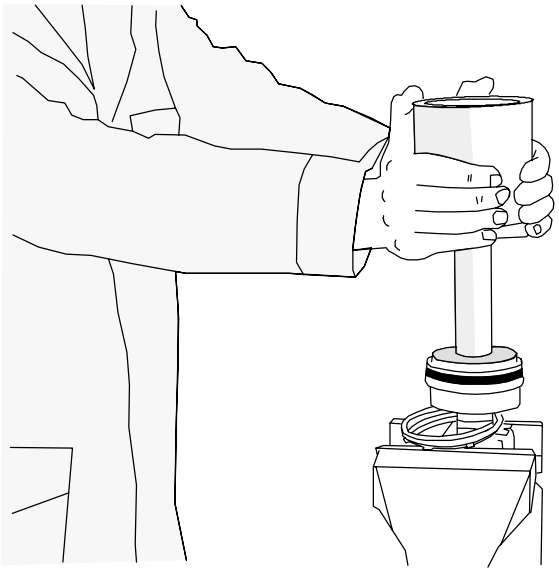
9. Place the circlip and backing ring on the piston rod. Grease the inside seals of the cover and push the cover on the piston rod.

10. Fit the piston on the piston rod. Use locking fluid Loctite 270 on the threads. The piston nut tightening torque is **150 Nm**

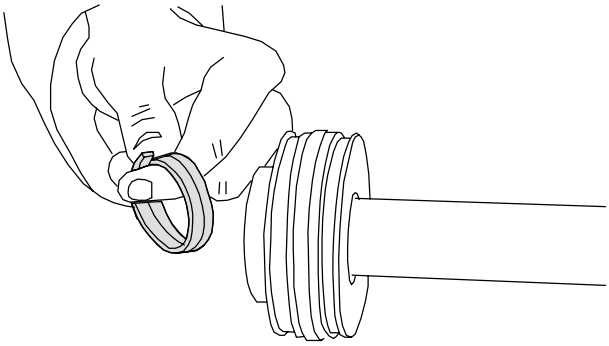
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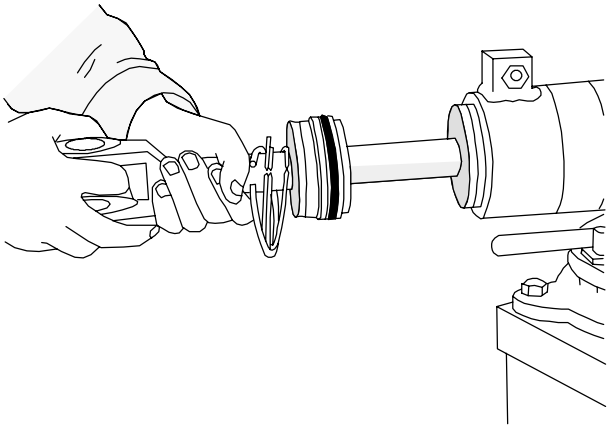
11.Fit the o–ring on the middle groove of the piston and the outside sealing ring. Use ETV 893580 (ø 80), ETV 894 280 (Ø 90), ETV 894 240 (ø 100) and ETV 893600 (ø 80), ETV 894 300 (Ø 90), ETV 894 260 (ø 100). Apply grease on the sliding surfaces of the tool.



12. Squeeze the seal into the groove with ETV 893590 (ø 80), ETV 894 290 (Ø 90), ETV 894 250 (ø 100).



13. Roll the two guide rings together as shown in the figure and fit them on the piston.

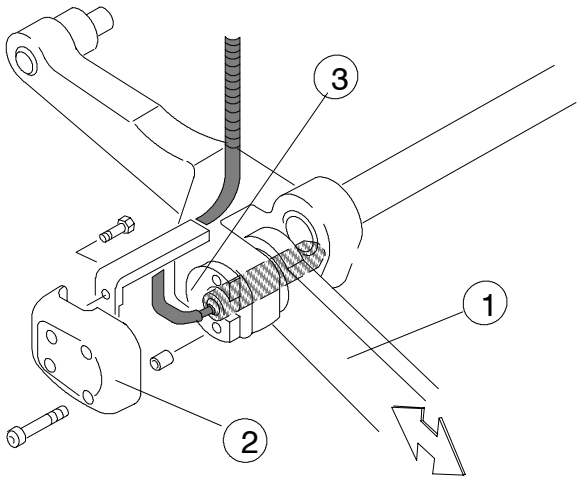


14. Lubricate the sealing surfaces of the piston and cover and push the unit into the cylinder with a sharp movement. Fit the circlip inside the cylinder. Pull out the cover against the circlip and fit the o–ring, backing ring and outer circlip.

15. Fit the lift cylinder. Connect the oil hoses and tighten to **45 Nm.**

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Three–point linkage and towing hook



Lower links

If the lower link (1) must be changed, first remove the draft sensor cover (2) and the draft sensor locking piece (3). Now the lower link can be removed after the draft sensor is pulled out.

Pick–up hitch

When removing the pick–up hitch the lower links must be detached first. After that drive out the locking pins of the pick–up hitch shaft and remove the pick–up hitch shaft.

Note! Remove the check link bracket from one rear axle housing. Remove, if necessary one rear wheel, if the pick–up hitch shaft cannot be pulled out from its place.

The pick–up hitch loosens when the locking pins at the front end of the hitch is removed. Now the hitch releases from its cast iron guide ways under the gearbox housing.

Lifting arm shaft

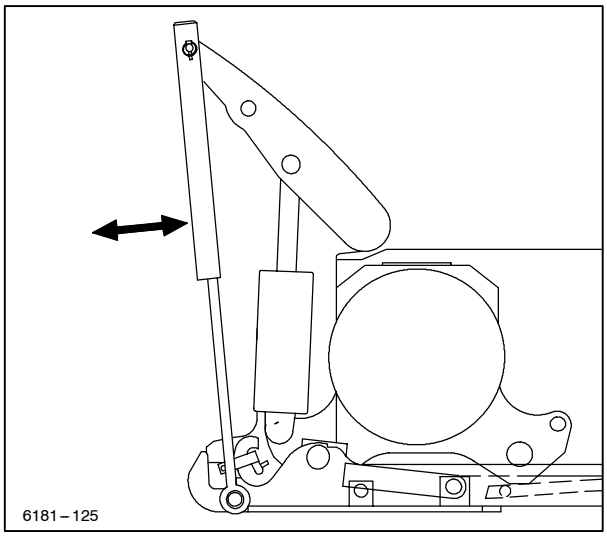
If the lifting arm shaft has to be changed, the PTO housing must be detached from the tractor. Then remove the PTO unit front cover and the PTO clutch shaft.

Remove the position sensor cam from the lifting arm shaft through the opening in the upper part of the PTO housing.

Remove the lifting arms and pull out the lifting arm shaft from its location on the PTO housing.

Note! Do not damage the position sensor when removing the PTO housing. Remove the position sensor always before detaching the PTO housing from the tractor (see section 46).

Adjusting pick–up hitch lifting links



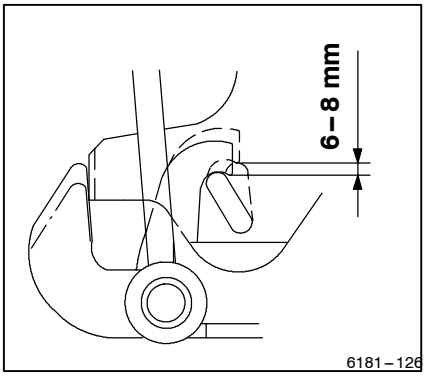
The lifting links should always have a certain amount of clearance when the hydraulic lift is in its upper position. However, they must be adjusted in such a way that the pick–up hitch is securely locked by the pawl, even when the towing hook is loaded.

Before adjusting, raise the hydraulic lift to its upper position using the position control knob (towing hook unloaded). Check the adjustment by moving the lifting links manually. Adjustment is correct when the link moves loosely and when the lift is lowered the towing hook is locked positively by the pawl. Make sure that the spring returns the pawl fully home.

Adjust the length of the links if necessary by removing the cotter at the upper end of the links and turning until the correct length is obtained. Check that **both lifting links are the same length after adjustment**.The lifting links may be tightened when lifting with push buttons.

Correctly adjusted lifting links ensure that the hydraulic lift can be raised to its uppermost position. The pick–up hitch is locked when the lift is lowered to the point where the hitch rests on the pawl, thereby preventing unnecessary loading on the hydraulic pump and overheating of the oil.

Checking locking of pick–up hitch



Make sure that the spring returns the pawl fully home. When the pawl is turned upwards the pick–up hitch should move up by **6–8 mm**.

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Oil flow control valve 32530310.

– Depending on the tractor serial number, it must be observed modifications on the valve bracket and on the pump side end plate.

– **ORDER NUMBER**:
mounting kit **32530310**
(incl. valve and mounting parts)

Fixing screws:
32691400 . . . . . 4pcs . . . . . (2 valves)
32607400 . . . . . 4pcs . . . . . (3 valves)
32691500 . . . . . 4pcs . . . . . (4 valves)

Extra parts needed up to ser no –> 657670 :

Pump side end plate . . . **32556410** . 1
Plug . . . . . **GR0286** . . 3
O–ring . . . . . **KH4081** . . 3
Hose . . . . . **32691700** . 1
Nut (M10) . . . . . **JB1110** . . . 1

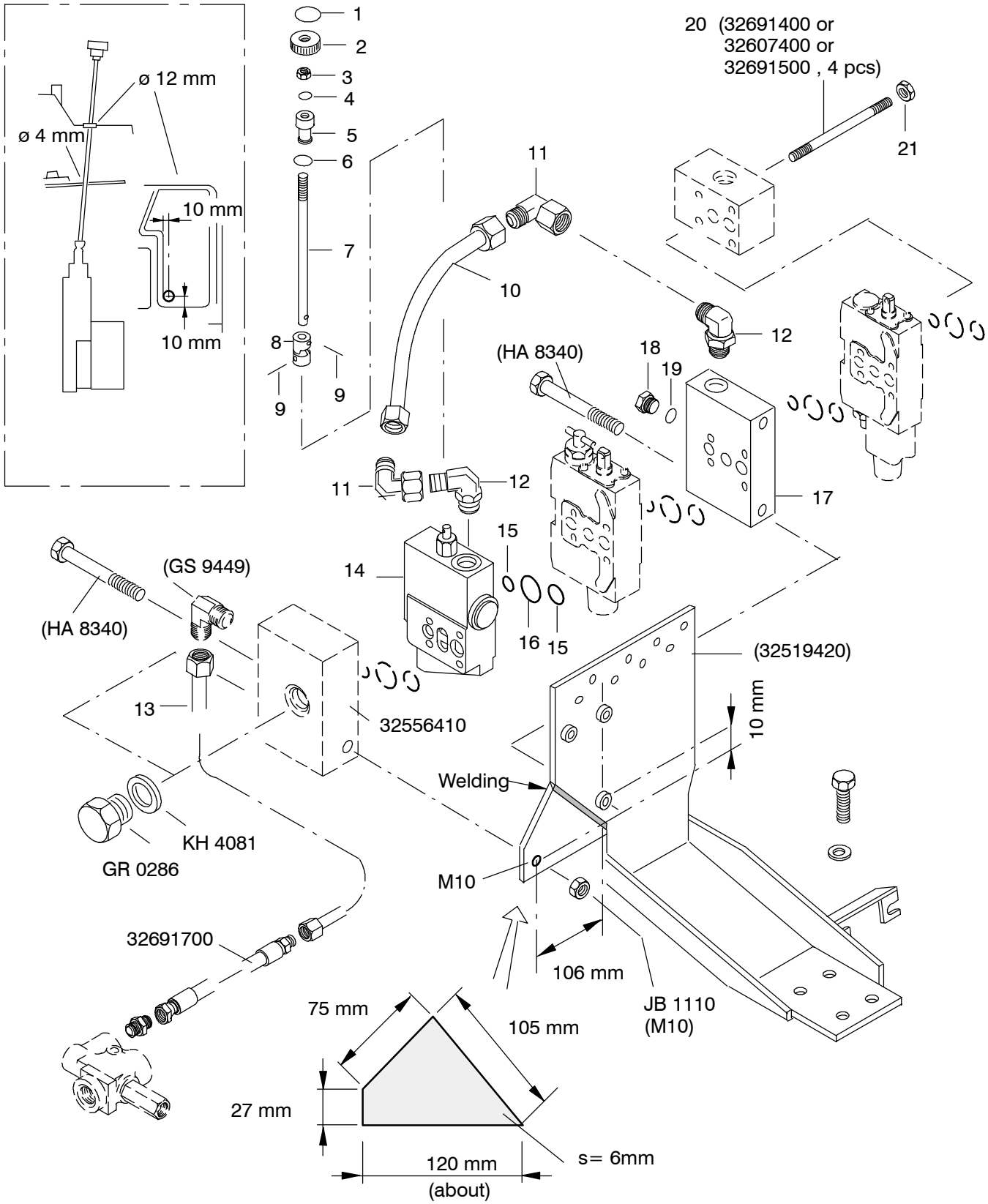
WORKING INSTRUCTION:

– Remove the RH side rear wheel. Remove the access hole cover on the RH side rear mudguard.
– Remove the valve block studs and the end plates. Disconnect the pressure hose from the pump side end. Unscrew the intermediate plate bolts and remove the intermediate plate.
– Detach the angle union (GS 9449) and the upper plug (GR 0286) and change over their places.
– Drill a ø12 hole mm through the lever console according to the figure. Drill or cut a hole ø 4 mm through the lever rubber bellows (estimate the place of the hole).
– Assemble the valve block and the oil flow control valve using new studs. Fit the pressure pipes. Fit the valve block attaching screws (HA 8340 2 st) according to the figure. Fit the control rod of the oil flow control valve.
Fit the other detached parts.

EXTRA WORK NEEDED UP TO SERIAL NUMBER –> **657670**:

– Fit new plugs onto the new pump side end plate and the angle union and the pressure control valve. Fit the pressure pipe and hose.
– Make from steel sheet a plate (see picture) and weld it onto the valve block bracket. Drill a M10 hole according to the measurements in the picture. Do correction painting.

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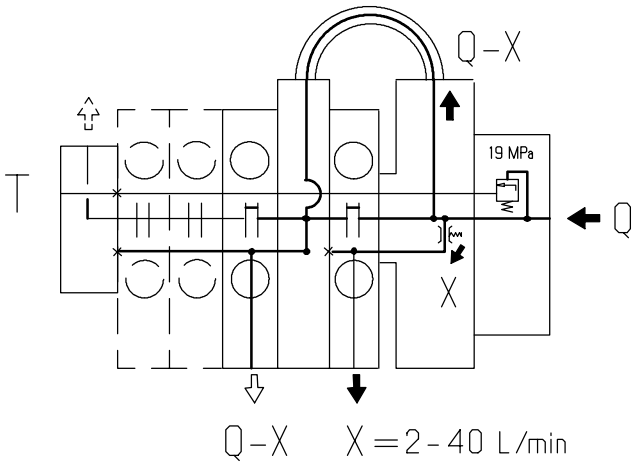


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Nro Pos Ref	Kpl St Qty	Tilaus nro Beställ.nr Order no	Osan nimi	Benämning	Description	Huomautuksia Anmärkningar Notes
	1	32530310	Virransäätöventtiili, asennussarja	Flödesregleringsv. monteringssats	Flow control valve fitting set	
1	1	32621700	.Tarra	Dekal	Sticker	
2	1	32619800	.Nuppi	Knopp	Knob	
3	1	JB1106	.Mutteri	Mutter	Nut	
4	1	KH4002	.O–rengas	O–ring	O–ring	
5	1	32619700	.Holkki	Bussning	Gushing	
6	1	30145500	.Läpivientirengas	Genomföringsring	Inlet ring	
7	1	32619900	.Tanko	Stång	Rod	
8	1	32250700	.Nivel	Led	Joint	
9	2	JE8027	.Sokka	Pinne	Pin	
10	1	32691200	.Putki	Rör	Pipe	
11	2	GS9319	.Liitin	Anslutning	Connection	
13	1	32691100	.Putki	Rör	Pipe	
14	1	32599900	.Virransäätöventtiili	Flödesreglerventil	Flow control valve	
15	2	KH7070	..O–rengas	O–ring	O–ring	
16	1	KH7006	..O–rengas	O–ring	O–ring	
12	2	GS9400	..Liitin	Anslutning	Connection	
	2	KH9032	...O–rengas	O–ring	O–ring	
17	1	32691300	.Välilaatta	Melladlock	Block	
18	1	GR0284	.Tulppa	Plugg	Plug	
19	1	KH4946	.O–rengas	O–ring	O–ring	
20	4	32691400	Ruuvi	Skruv	Screw	2 valve
	4	32607400	Ruuvi	Skruv	Screw	3 valve
	4	32691500	Ruuvi	Skruv	Screw	4 valve
21	4	JB8904	Mutteri	Mutter	Nut	
	1	32449400	Tiivistesarja venttiilille 32599900	Packningssats ventil 32599900	Gasket set valve 32599900	

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Oil flow control valve



– The oil flow control valve makes it possible to use simultaneously two hydraulic cylinders, or simultaneous use of power lift and one auxiliary cylinder.

  With the oil flow control valve the oil flow can be adjusted so that it suits the implement, when maximal flow is not needed for e.g. speed control of hydraulic motors (together with a special valve of the motor).

  The oil flow control valve is situated between the pump end plate and the valve block. The oil flow is adjusted with a knob on the side panel in the cab.

– The regulated oil flow is independent of the pressure

Functions:

– The valve directs the required priority flow (that can be steplessly adjusted from 2 to 40 litres per minute) to the spool valve that is mounted between the oil flow control valve and the intermediate plate.

– The rest of the flow is directed through an external pipe to the next, downstream spool valves.

  X = pressure channel for the regulated oil flow
  Q – X = the surplus flow to other spool valves

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Extra filter, 6000–8400 . . . . . **31983810**
(Extra filter 6000–6400, 8000 . . . . . 31983800)
(Extra filter 6600, 8100–8400 . . . . . 31983900)

This filter increases filtering capacity of the hydraulic system. Additionally it ensures a correct function of the solenoid valves in the low pressure circuit

FITTING:

– Assemble the filter and fasten parts **45**, **46**, **47**, **43** onto the filter (tightening torques, see picture).
Fasten with aid of sleeves **39** and bolts **42** the filter onto the bracket **38**.

– Models 6000–6400, 8000: Make a notch onto the bracket for the PTO wire/leak oil reservoir, if not made earlier.

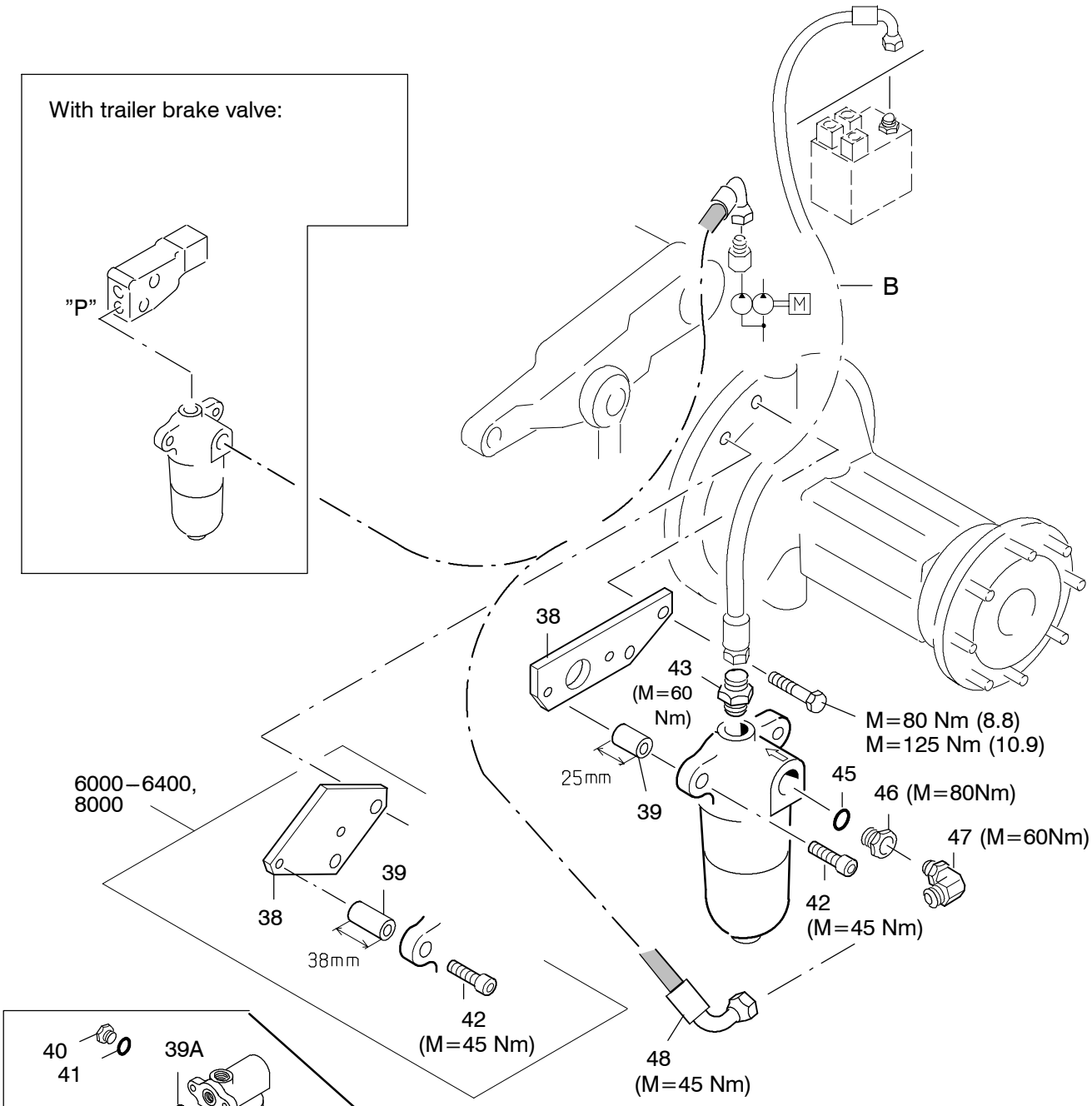
Fasten the filter under bolts (2 pcs) of the RH side rear axle housing, see picture (tightening torque (8.8): 80 Nm, (10.9):125 Nm).

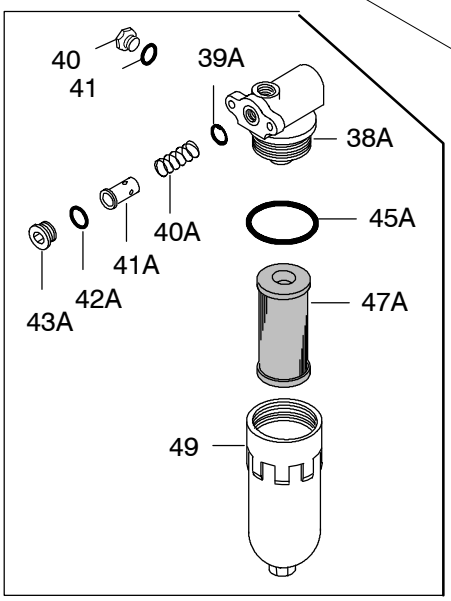
– Clean connectors before opening them.
Open the pump side end of hose B (valve block–pump) and fasten the hose to the upper connector on the filter.

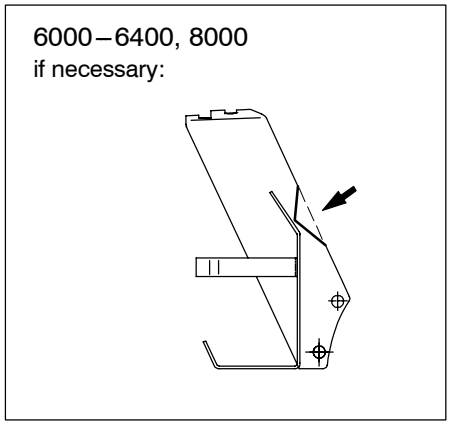
– Fit hose **48** between pressure filter–pump.

	1	31983810	Lisäsuodatin	Extra filter	Extra filter	Extra Filter	6000–8400
	1	31983800	Lisäsuodatin	Extra filter	Extra filter	Extra Filter	ei var. / not stored
	1	31983900	Lisäsuodatin	Extra filter	Extra filter	Extra Filter	ei var. / not stored
38	1	33159700	.Kannatin	Hållare	Support	Halter	6000–6400, 8000
	1	33159600	.Kannatin	Hållare	Support	Halter	6600, 8100–8400
39	2	33161300	.Holkki, L= 38 mm	Hylsa	Sleeve	Hülse	6000–6400, 8000
	2	33161200	.Holkki, L= 25 mm	Hylsa	Sleeve	Hülse	6600, 8100–8400
40	1	GR0282	.Tulppa	Plugg	Plug	Stopfen	
41	1	KH4923	.O-rengas	O-ring	O-ring	O-ring	
42	2	HC8340	.Ruuvi	Skruv	Screw	Schraube	6000–6400, 8000
	2	HC8339	.Ruuvi	Skruv	Screw	Schraube	6600, 8100–8400
43	1	GS9270	.Liitin	Nippel	Union	Verbindung	
45	1	KH4006	.O-rengas	O-ring	O-ring	O-ring	
46	1	33159800	.Liitin	Nippel	Union	Verbindung	
47	1	GS9265	.Liitin	Nippel	Union	Verbindung	
48	1	33186600	.Letku	Slang	Hose	Schlauch	
	1	33179400	.Painesuodatin	Tryckfilter	Pressure filter	Druckfilter	
38A	1	32578010	..Runko	Ram	Frame	Rahmen	
39A	1	KG3024	..Pidätinrengas	Låsring	Circlip	Sicherungsring	
40A	1	30168500	..Jousi	Fjäder	Spring	Feder	
41A	1	32783100	..Venttiili	Ventil	Valve	Ventil	
42A	1	KH4006	..O-rengas	O-ring	O-ring	O-ring	
43A	1	GR0288	..Tulppa	Plugg	Plug	Stopfen	
45A	1	KH4916	..O-rengas	O-ring	O-ring	O-ring	
47A	1	31539610	..Suodin	Filter	Filter	Filter	
49	1	31539420	..Kotelo	Hus	Housing	Gehäuse	

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Lifting cyl. covering (6000–6400,8000) . . 33287400
Lifting cyl. covering (6600–8750) 33275600

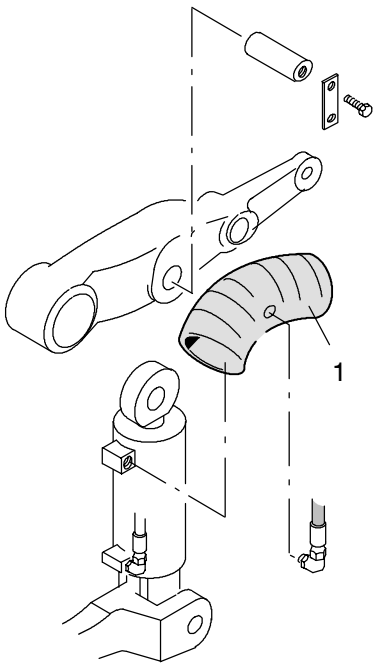
Protective covering is intended to protect the piston rod and its seals in very difficult conditions (e.g. mud fields etc).

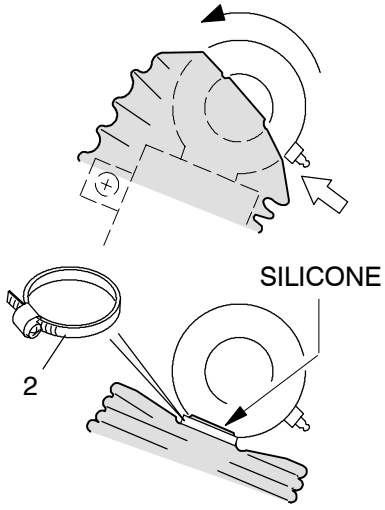
FITTING:

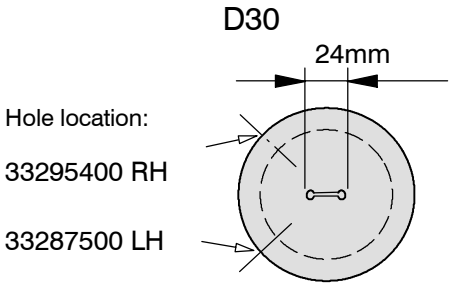
– Lower the lower links to the lowest position. Release the cylinder upper end from the lifting arm. Disconnect the breather hose.

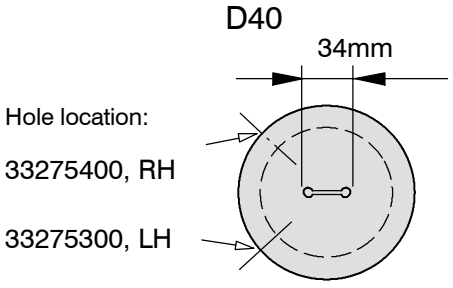
– Place the covering round the piston rod so that the grease nipple fits at the hole at the end of the covering.
Hold the lid of the protective covering (so that the glue joint between the lid and the lower part not rend) and rotate **carefully** the covering round the piston rod end.
NOTE! Do not use any sliding compound (otherwise the covering does not stay later in its place).

– Fasten the covering with a clip. Refit the breather hose
Tighten, if needed, the upper end of the protective covering with silicone.









	1	33287400	Syl. suojat	Skydd kmpl.	Protective covering	Schutze kompl.	D30, 6000–6400,8000
	1	33275600	Syl. suojat	Skydd kmpl.	Protective covering	Schutze kompl.	D40, 6600–8750
1	1	33287500	.Suoja	Skydd	Shield	Schutz	LH, 6000–6400,8000
	1	33295400	.Suoja	Skydd	Cover	Schutz	RH, 6000–6400,8000
	1	33275300	.Suoja	Skydd	Shield	Schutz	LH, 6600–8750
	1	33275400	.Suoja	Skydd	Cover	Schutz	RH, 6600–8750
2	2	SA9104	.Letkunkiristin	Slangklämma	Hose clip	Schlauchbinder	

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Extra oil reservoir 33141900

The oil reservoir volume is 19 litres, 15 l of which can be used e.g. for the auxiliary hydraulics.
The reservoir is fitted under the LH side final drive. The ground clearance does not become smaller.
The steering system return oil pipe is connected to the reservoir. Thus the cooling effect increases. Also the oil in the reservoir is kept warmer in the cold seasons. The gearbox oil draining is done through the reservoir draining plug **2**.

FITTING:

– Support the tractor and remove the LH side rear wheel. Unscrew the gearbox oil draining plug and drain the oil.

– Disconnect the steering return oil connector **Y** on the gearbox and connect it to the reservoir **1**. In place of the connector are fitted parts **14** and **15**. Fasten connecting pipe parts **3, 8** to the gearbox and parts **4, 3, 2 ,9** to the reservoir.

– Fit the extra reservoir **1** (it is fastened with two brake housing–to–final drive bolts, see picture B). Do not yet tighten the bolts!

– Fit the steering system return oil pipe. Assemble the connecting pipe parts **5** – **7** and tighten them. After that is tightened the reservoir attaching bolts (tightening torque = 80 Nm).

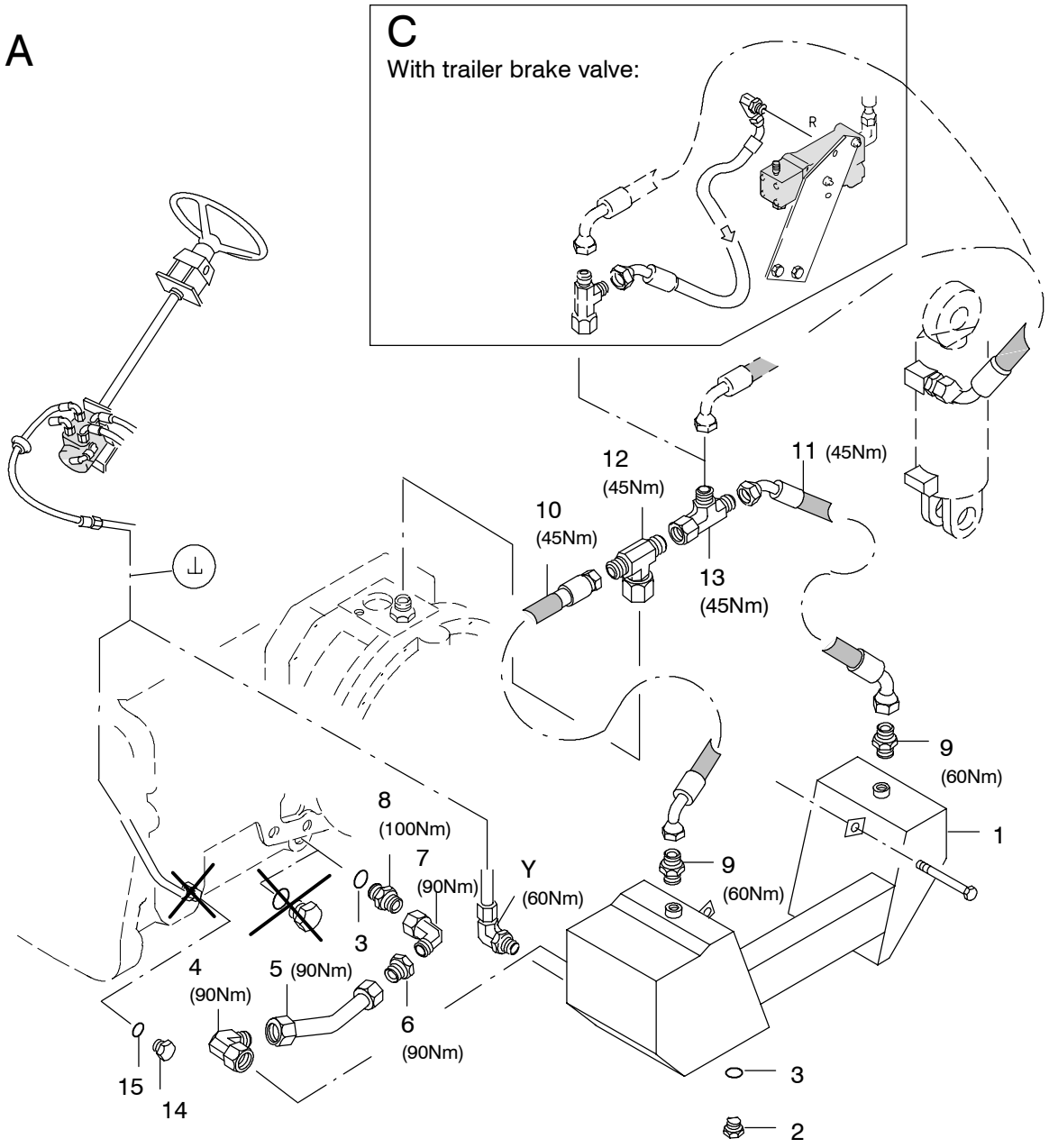
– Disconnect the lifting cylinder breather pipe end on the brake housing. Attach the parts **12** – **13** to the hose **10**. Fix connector **12** in place of the detached hose. Fit hose **11**. Connect the breather pipe end to the connector **13**.
Note! Do not tighten the connectors too hard (sealing surfaces can damage)

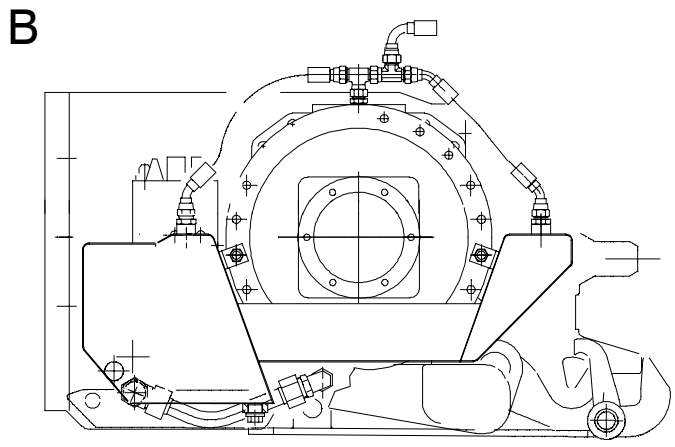
– If the tractor has the trailer brake cylinder, the hoses are connected as shown in picture C.

– Fit the wheel. Fill the gearbox housing with oil. Add 19 litres oil (volume of the extra reservoir. NOTE! the extra reservoir makes the filling slower.

	1	33141900	Öljysäiliö	Oljebehållare	Oil tank	Ölbehälter
1	1	33080400	.Säiliö	Behållare	Container	Behälter
2	1	GR0225	.Tulppa	Plugg	Plug	Stopfen
3	2	KH3610	.Tiiviste	Tätning	Gasket	Dichtung
4	1	GS9382	.Liitin	Nippel	Union	Verbindung
5	1	33142200	.Putki	Rör	Pipe	Rohr
6	1	33185900	.Liitin	Nippel	Union	Verbindung
7	1	GS9332	.Liitin	Nippel	Union	Verbindung
8	1	33080500	.Liitin	Nippel	Union	Verbindung
9	2	GS9270	.Liitin	Nippel	Union	Verbindung
10	1	33142000	.Letku	Slang	Hose	Schlauch
11	1	33142100	.Letku	Slang	Hose	Schlauch
12	1	GS9268	.Liitin	Nippel	Union	Verbindung
13	1	GS9276	.Liitin	Nippel	Union	Verbindung
14	1	GR0284	.Tulppa	Plugg	Plug	Stopfen
15	2	KH4946	.Tiiviste	Tätning	Gasket	Dichtung

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Fitting serie (6000–6400,6900,8000) . . . 33774000
Fitting serie (6600,6800,8050–8750) 33766700

– The return oil filter filters return oil from the auxiliary hydraulics.

In connection with oil change is recommended that new oil is poured in through the return oil filter for the auxiliary hydraulics.

FITTING:

– From ser. no. F16407 incl:
Remove the low pressure circuit filter and its support plate.

– All tractors: Fasten a new support plate **62** under the bolt of the final drives, see picture (tightening torque (8.8): 80 Nm, (10.9):125 Nm).
Move the leak oil support to the left side of the tractor (picture B), and shape it if needed. Check that the oil reservoir don't touch the power lift linkage.

NOTE! Replace on models 6000–6400, 6900, 8000 (smaller final drives) the support fixing bolts with 10 mm longer ones (ref. 4).

– Refit the low pressure filter + sleeves **61** and a new return oil filter **15** (compl.) on the support plate.
If the tractor has not the low pressure filter, fit the return oil filter to the foremost holes of the support.

The lower edge of the cab (picture A) may touch the filter cover (NB! the flexibility of the cab).
Grind the lower edge when needed, paint the grounded points.

– Connect the outlet and inlet unions of the return oil filter.

– Fasten the extension pipe **1** of the return oil connection.

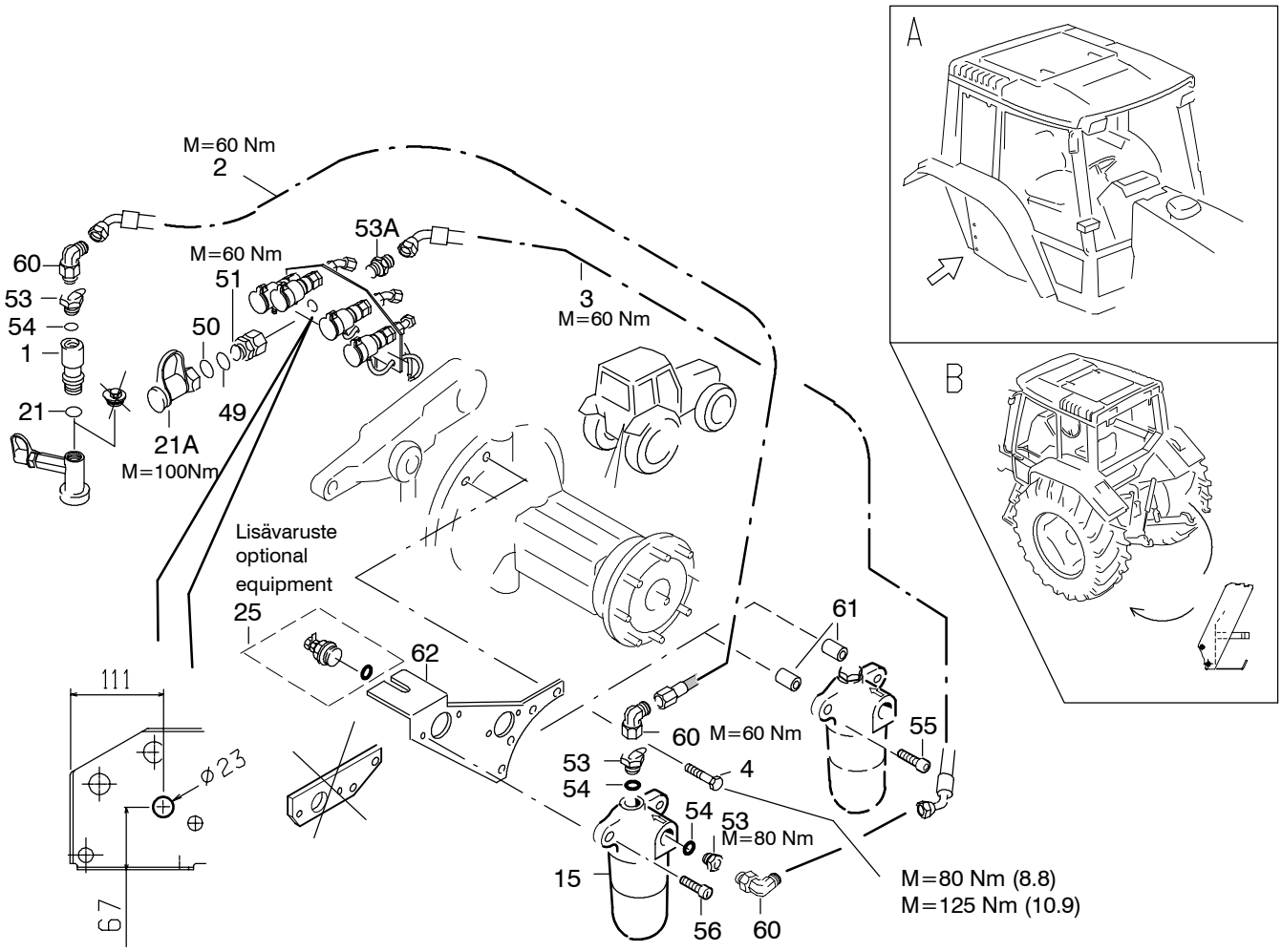
– Drill a 23 mm hole through the support plate for the quick coupling (see picture). Fasten quick coupling **21A** on the support.

– Connect the pressure hoses and fit they so that they do not touch the cab or lifting lever.

– Check the function of the fitting.

NOTE! Do not use any more the old return oil connection, since then the return oil does not circulate via the filter.

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	1	**33774000**	**Paluuöljysuodatin.**	**Returoljefilter.**	**Return oil filter**	**Rücklaufölfilter**	6000–6400, 6900, 8000
	1	**33766700**	**Paluuöljysuodatin.**	**Returoljefilter.**	**Return oil filter**	**Rücklaufölfilter**	6600,6800, 8050–8750
1	1	33767000	.Jatko–osa	Förlängn.stycke	Extension part	Verlängerungsstück	
2	1	33767100	.Letku	Slang	Hose	Schlauch	L=970
3	1	33766900	.Letku	Slang	Hose	Schlauch	L=1010
4	4	HA8348	.Ruuvi	Skruv	Screw	Schraube	M12x70, 6000–6400, 6900, 8000
15	1	33179400	.Painesuodatin täyd.	Tryckfilter kmpl	Pressure filter assy	Druckfilter kmpl	
	1	20639610	..Suodin	.Filter	.Filter	.Filter	
21	1	KH4111	.O–rengas	O–ring	O–ring	O–Ring	24.2x3
21A	1	30322100	.Pikaliitin	Snabbkoppling	Quick coupler	Schnellkupplung	/
(25	1	33093900	Indikaattori	Indikator	Indicator	Indikator	Lisävaruste/ Optional)
49	1	KH7302	.O–rengas	O–ring	O–ring	O–Ring	
50	1	KH5074	.Tukirengas	Stödring	Support ring	Stützring	
51	1	GS9327	.Liitin	Nippel	Union	Verbindung	
53	3	33159800	.Liitin	Nippel	Union	Verbindung	
53A	1	GS9451	.Liitin	Nippel	Union	Verbindung	
54	3	KH4006	.O–rengas	O–ring	O–ring	O–Ring	22,2x3
55	2	HC8339	.Ruuvi	Skruv	Screw	Schraube	M10x50
56	2	HC9337	.Ruuvi	Skruv	Screw	Schraube	M10x30
60	3	GS9400	.Liitin	Nippel	Union	Verbindung	90_
61	2	33161200	.Holkki	Hylsa	Sleeve	Hülse	
62	1	34039900	.Kannatin	Hållare	Support	Halter	6000–6400, 6900, 8000
	1	33529300	.Kannatin	Hållare	Support	Halter	6600,6800, 8050–8750

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The indication light indicates the blocked filter.

FITTING:

– Clean the filter rear part. Remove the plug and fit the indicator **1** and o–ring **2** into the pressure filter.

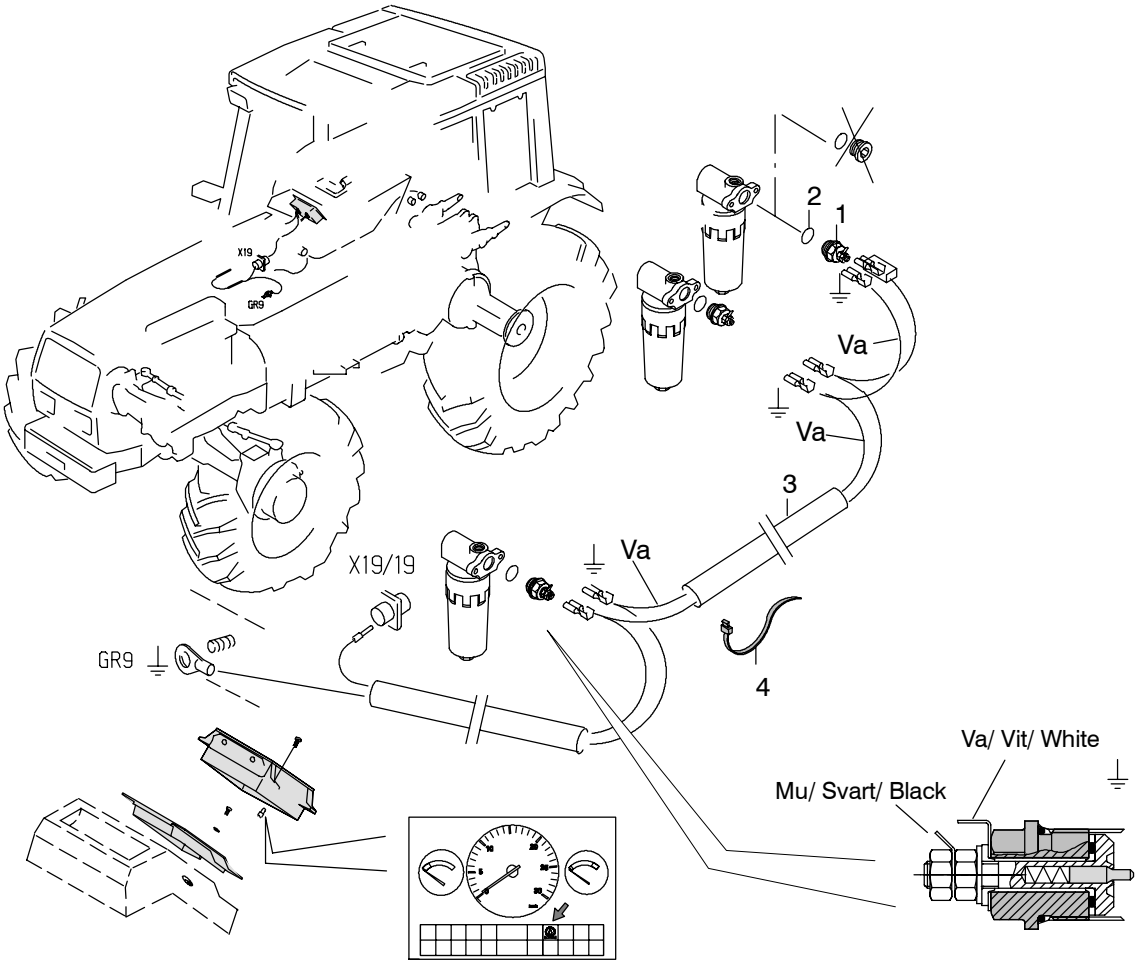
– Connect the indicators to the wire loom **3** according to the picture (white wires to the earth connection). Pass the wire loom under the cab and bind it with plastic binders. Check that the wires do not remain under moveable parts.

– Connect the wire with a cable shoe under the earth screw on the cab front wall (on the engine side beside the brake pedal master cylinders). The black wire is connected to pin 19 in connector on the cab front wall (37 pins).

– Remove the combination instrument frame and the instrument. Fit a lamp at the warning light symbol. Reassemble the parts. Check the function by earthing the black wire.

– If all filters do not have the indicator, the free ends of the wires must be isolated and fasten on the wire loom.

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1	1	33093900	Indikaattori	Indikator	Indicator	Indikator	
2	1	KH4006	O–rengas	O–ring	O–ring	O–Ring	
3	1	33766800	Johdinsarja	Ledningssats	Wiring set	Verkabelung	
4	5	SA1900	Johdinside	Buntband	Wiring band	Leitungsklemme	
	1	SH2667	.Lamppu	Lampa	Bulb	Lampe	12V/1,2W

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100. Special tools

101. Special tools (ETV)

102. Locally prepared tools (ET)

Contents

1. Special tools (Op. no. 101)
21. Engine
22. Fuel system
23. Cooling system
32. Electro–hydraulic power lift . . . 1
41. Clutch . . . 2
42. Gearbox . . . 3
44. Quick–shift gear, reverse shuttle and 4WD clutch . . . 5
45. Final drives . . . 7
46. Power take–off . . . 7
61. Steering system . . . 8
64. Powered front axle . . . 8
70. Frame and wheels . . . 9
91. Hydraulic power lift . . . 10

2. Locally prepared tools (Op. no. 102)
21. Engine
41. Clutch . . . 1
42. Gearbox . . . 2
44. Quick–shift gear . . . 3
45. Final drives . . . 3
46. Power take–off . . . 4
61. Steering system, pressure measuring equipments . . . 5
64. Powered front axle . . . 7
70. Frame and wheels . . . 8
80. Cab and shields . . . 9
91. Hydraulic power lift . . . 10
– equipments for measuring pressures in hydraulic circuits . . . 10
– equipments for measuring shock valve opening pressure . . . 11

Special tools (ETV)

(can be ordered from the factory)

Class A includes tools needed for service, minor repairs and changing of external seals.

Class B includes tools needed for more extensive jobs**.**

Locally prepared tools (ET)

(ET tools are not supplied by Valmet).

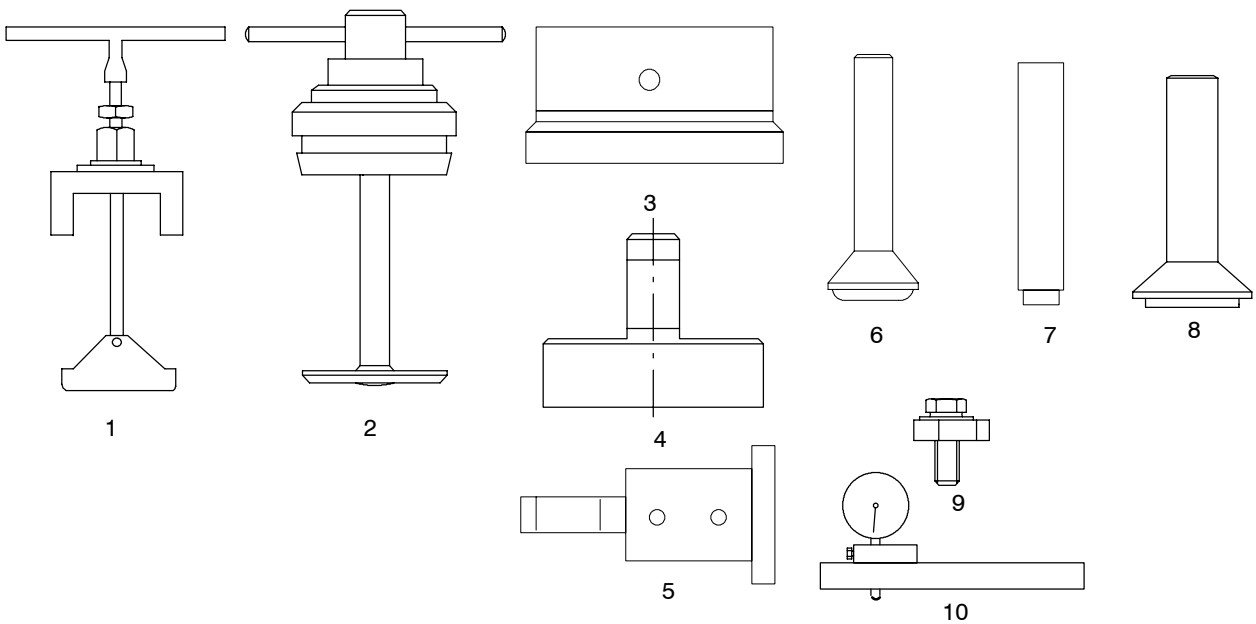
Simple special tools which can be prepared locally. Drawings for these tools can be found under code 102

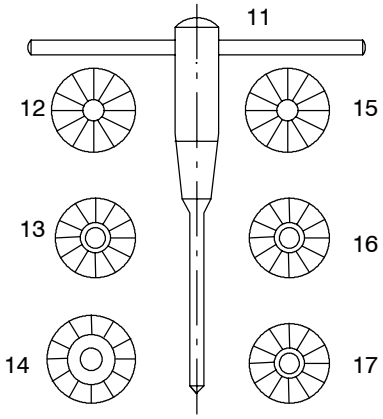
Special tools are grouped according to the tractor component concerned. The primary use of a tool is shown in brackets after the description.

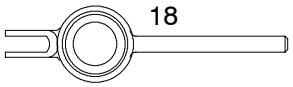
21. Engine

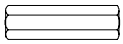
Order no		Description
1	9051 73100	Puller for cylinder liner
2	9101 65600 *)	Milling cutter for cylinder liner seat
3	9052 46400	Centring tool for flywheel housing
4	9052 46300	Drift for fitting rear crankshaft seal
5	9030 15200	Drift for fitting front crankshaft seal
6	9052 46620	Drift for 40 mm cap plug
7	9052 46650	Drift for 16 mm cap plug
8	9025 87400	Drift for fitting camshaft cup plug
9	9101 66300 *)	Press tool for cylinder liner
10	9025 79200	Holder for dial gauge
11	9101 66100 *)	T–handle for valve seat milling cutter
12	9101 71100 *)	Milling cutter for facing exhaust valve seat
13	9101 65502 *)	Milling cutter for exhaust valve seat
14	9101 65503 *)	Inner milling cutter for exhaust valve seat
15.	9101 75800 *)	Milling cutter for facing inlet valve seat
16	9101 65505 *)	Milling cutter for inlet valve seat
17	9101 65506 *)	Inner milling cutter for inlet valve seat
18	9101 66200 *)	Lever for compressing valve spring
19	9052 47200	Counter nut for lever above
20	9101 66000 *)	Milling tool for injector seat
21	9052 46660	Drift for 36 mm cup plug
22	9101 65800 *)	Drift for removing valve guide
23	9101 65900 *)	Drift for fitting valve guide
24	9024 55800	Spanner for crankshaft nut, 634–engines
25	9101 65700 *)	Spanner for crankshaft nut
26	9052 48800	Puller for crankshaft gears
27	9020 01100	Conical sleeve for fitting pistons
28	9025 98900	Drift for fitting dust cover, crankshaft front seal
29	9025 98800	Drift for fitting tension pin in timing gear casing
30	9025 98700	Drift for fitting tension pins in timing gear casing and flywheel housing
31	8366 62022	Electronical device for checking injection timing on E–engines

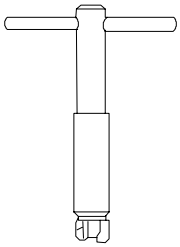
*) New tools for 20–series engines. Other tools are the same as for engines on 505–905 tractors.

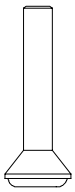



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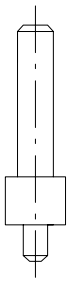

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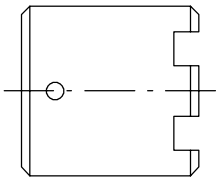

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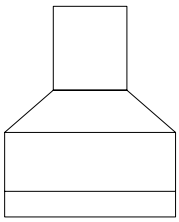

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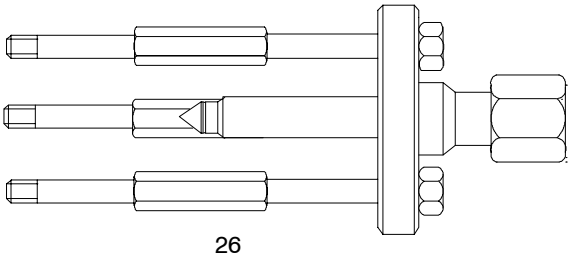

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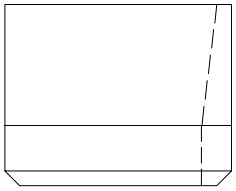

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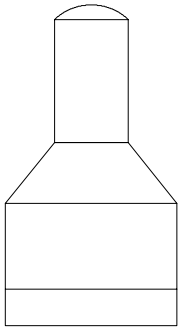

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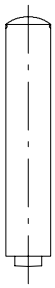

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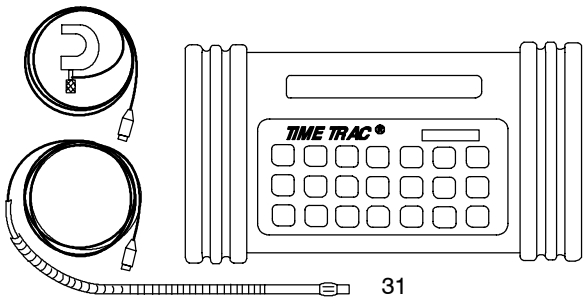

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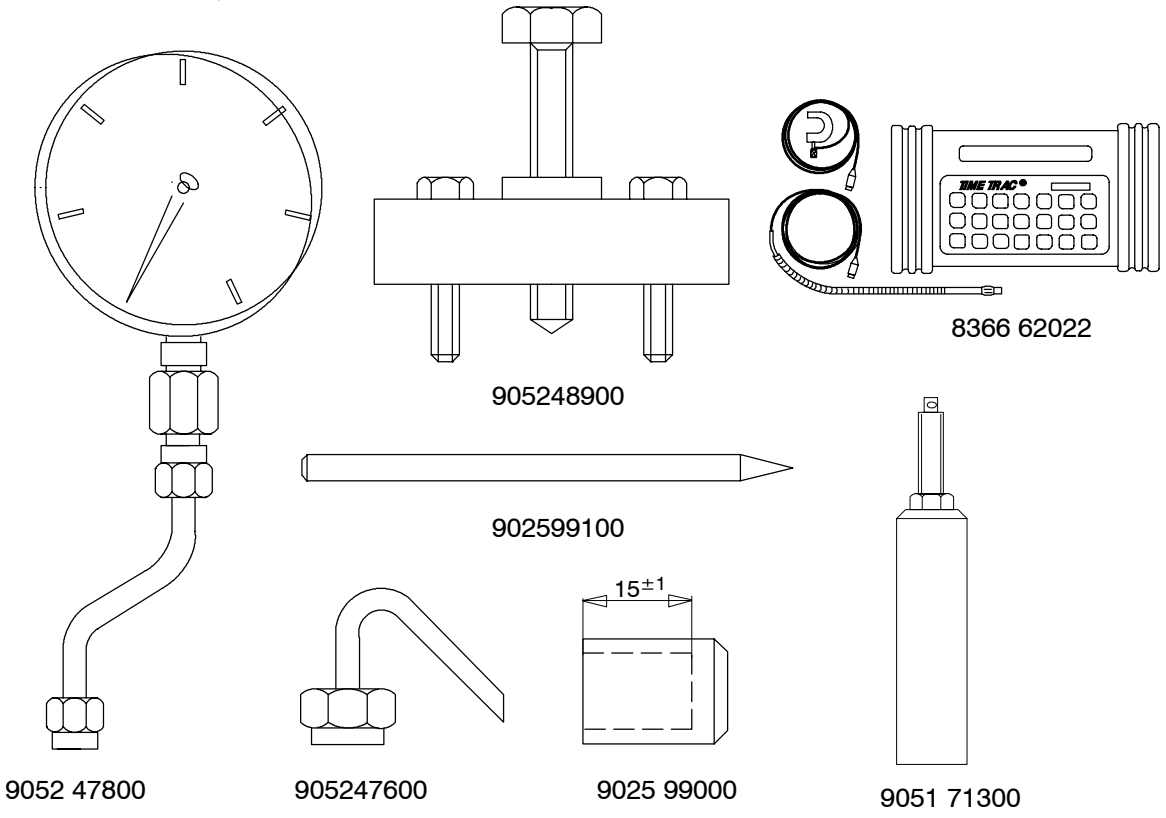

30


TIME TRAC
31

22. Fuel system

9052 47800 *) Pressure gauge for checking delivery valve
9052 48900 *) Puller for injection pump drive gear
9025 99100 *) Locator for timing mark on the flywheel
9052 47600 *) Control pipe for injection timing
9052 99000 *) Sleeve for limiting control rod travel
9051 71300 *) Extractor for injectors
8366 62022 Electronic device for checking injection timing (E–engines), which incl. parts 1–3 below:
1. 836662121 Magnetic detector
2. 836662122 Cable
3. 836662123 Fastening device
Parts 4–10 below are available, but not needed for Valtra–engines (not illustrated):
4. 836662120 Timing light
5. 836859466 TimeTrac in–line sensor
6. 836662124 Clamp–on Transducer, 4,5 mm
7. 836662125 –"–, 5,0 mm
8. 836662126 –"– ,6,0 mm
9. 836662127 –"– ,8,0 mm
10. 836662128 –"– ,1/4 inches

*) Same tool as for fuel system on 505–905 tractors.

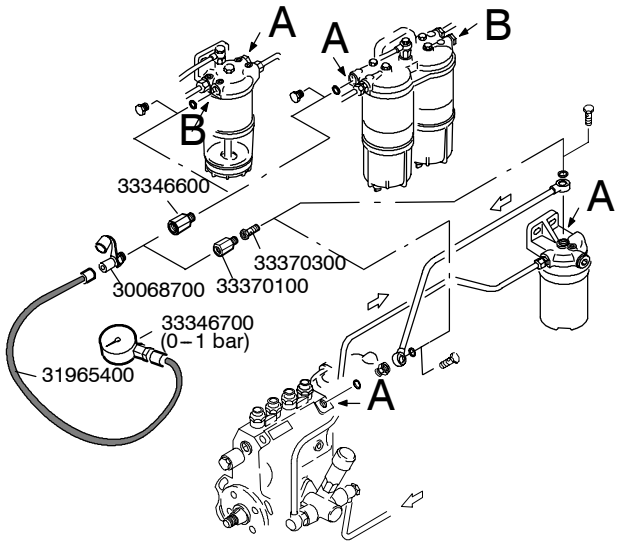


9052 47800 905247600 9025 99000 9051 71300

8366 62022

905248900

902599100



Measuring equipment for fuel feed pressure:

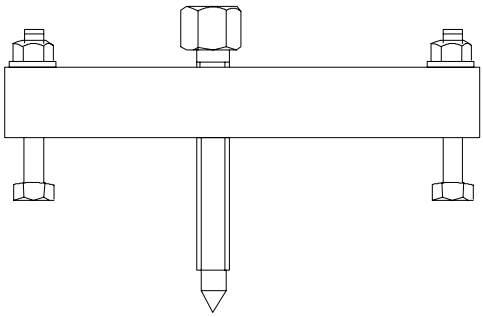
If the pressure is too low in point A, check the pressure in point B. If further too low, the fault lies in the fuel feed pump. Otherwise the filter is blocked.

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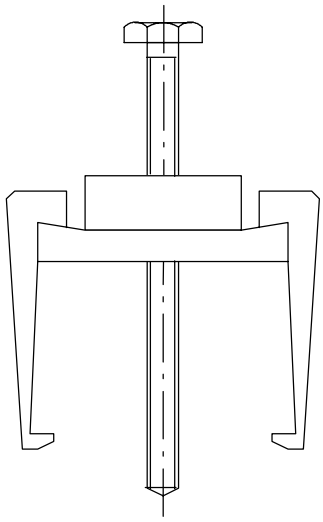
23. Engine cooling system

Ordering no	Description
9101 93200 *)	Puller for coolant pump impeller, 620–engines
9022 03500 *)	Puller for coolant pump impeller, 320– and 420–engines (earlier no 8360 85499)
9051 40200 *)	Drift for fitting coolant pump seal (seal no 8353 31202)
9051 79300 *)	Drift for fitting coolant pump seal (seal no 8353 39425)
9051 64900 *)	Drift for fitting coolant pump shaft, 320– and 420–engines
9052 48900*)	Puller for fan hub (see Fuel system)

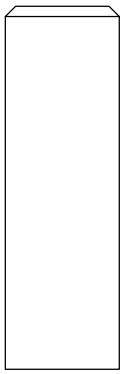
*) Same tool as for engines on 505–905 tractors.



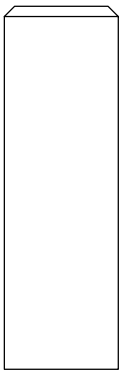
9101 93200



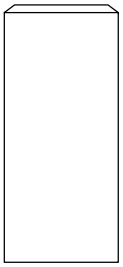
9022 03500



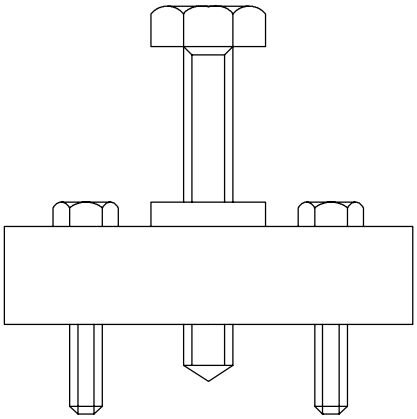
905140200



905179300



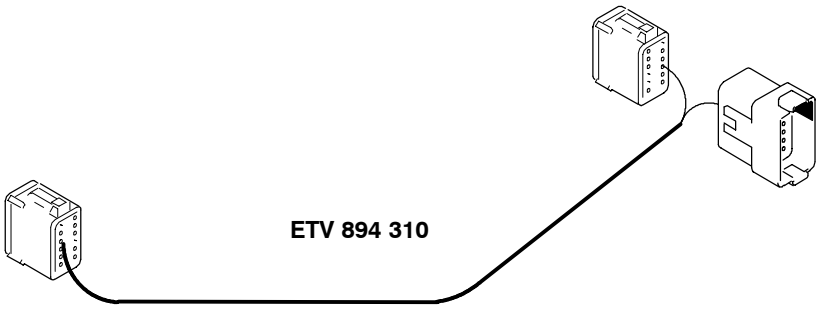
905164900



9052 48900

31. Σ – Power

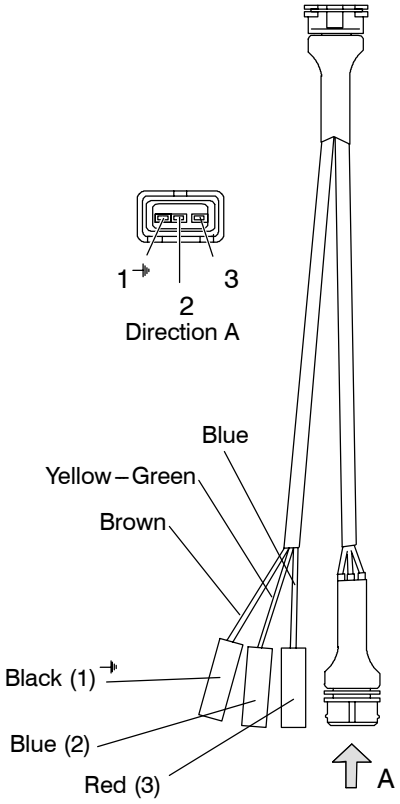
ETV 894 310 Test cable to make fault tracing in Σ – Power system from ser. no. **G22507** incl.



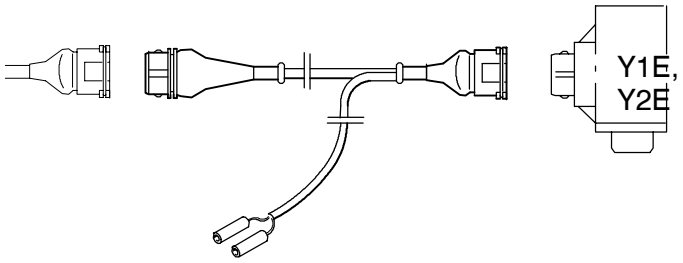
32. Hydraulic power lift (AC, ACD, ACB)

A

ETV 894 100 Cable for measuring internal voltages of position and draft sensors (AC, ACB and ACD)
ETV 894 220 Cable to check control valve solenoid valves (Y1E, Y2E) (see pages 320/14 (AC) and 321/9 (ACB/ACD)).



ETV 894 100



ETV 894 220

37. Autocontrol 5/5.2 (HiTech)

(see picture on page 370/24C (AC 5) or 371/26 (AC 5.2))

Ordering no.	Description
337 00 600	Programming cable L=1,5 m. To be used when programming AC 5/5.2 control unit, which is fitted on tractor.
337 00 610	Programming cable L=8 m. To be used when programming AC 5/5.2 control unit, which is fitted on tractor.
340 42 500	Programming device for AC 5/5.2 and control units. To be used when programming removed control units. Supply voltage 230 V 50/60 Hz, Euro – socket. In some markets must be used a separate adapter.
340 42 260	Computer disk (3½, Win. 95/98) to program AC 5 control unit (incl. program versions 53,65 and parameter files).
344 04 620	Computer disk (3½, Win. 95/98) to program AC 5.2 control unit (incl. program version 86 and parameter files).
ETV 894100	Cable for checking internal voltages of **clutch and gas pedal** position sensors. (AC5)
ETV 894510	Cable for checking internal voltages of **clutch and gas pedal** position sensors. (AC5.2)

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41. Clutch

A

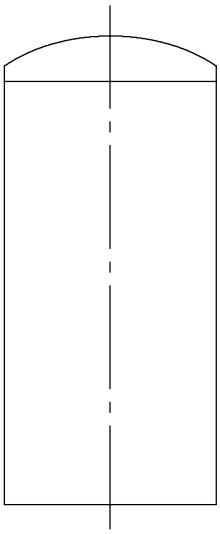
Part no	Description
ETV 891900	Sleeve for fitting clutch release bearing (not HiTech tractors)
ETV 892380	Sleeve for removing clutch release bearing (not HiTech tractors)
ETV 893790	Centring tool for clutch disc (not HiTech tractors)

Locally prepared tools

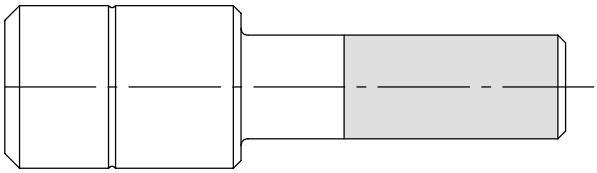
ET 893470	Support roller for splitting tractor (Frame and Wheels 505–905)
ET 893480	Support plate (2 pcs) (Frame and Wheels 505–905)

HiShift

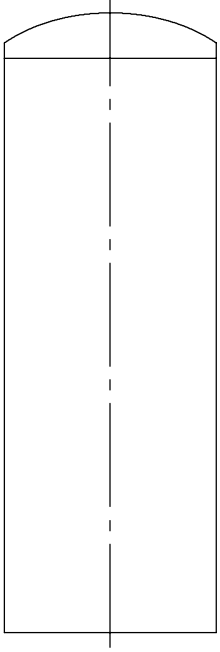
ETV 894 320	Fitting tool for HiShift hydraulic block piston seal KH 3714 (not illustrated)



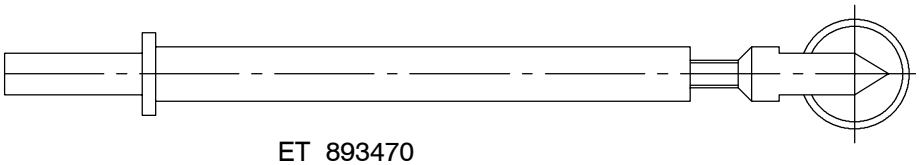
ETV 891900



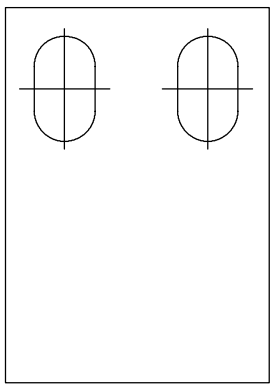
ETV 893790



ETV 892380



ET 893470



ET 893480

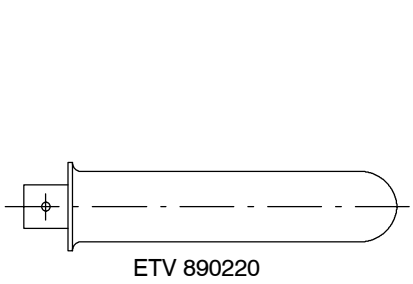
42. Gearbox

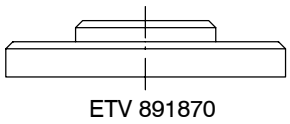
B

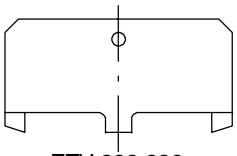
Order no	Description
ETV 890 220	Universal handle
ETV 891 870	Plate for fitting thrust bearing for differential side gear (Gearbox 505–905)
ETV 892 230	Socket spanner for bevel pinion shaft ring nut (Gearbox 305–555)
ETV 894 190	Socket spanner for 4WD clutch drum nut
ETV 892 370	Sleeve for fitting input shaft front end bearing (Front axle 505–905) Sleeve for fitting bevel pinion shaft front end bearing
ETV 892 380	Sleeve for fitting input shaft rear end bearing (Gearbox 505–905)
ETV 893 300	Puller for differential bearings (Gearbox 505–905)
ETV 893 340	Plate for fitting bearing race, rear pinion shaft bearing (Gearbox 505–905)
ETV 893 400	Plate for fitting differential bearings (Gearbox 505–905)
ETV 894 080	Drift for fitting selector fork rail for LL–range
ETV 894 050	Drift for fitting locking pins for selector forks
ETV 894 120	Counter hold for puller ETV 893 300

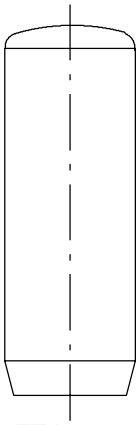
Locally prepared tools

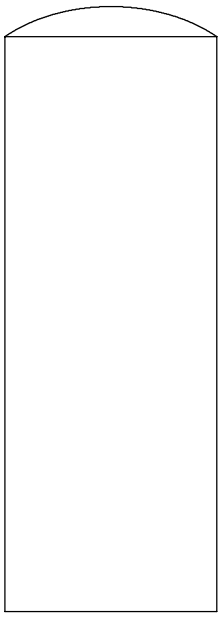
ET 894 060	Press plate for adjusting selector forks

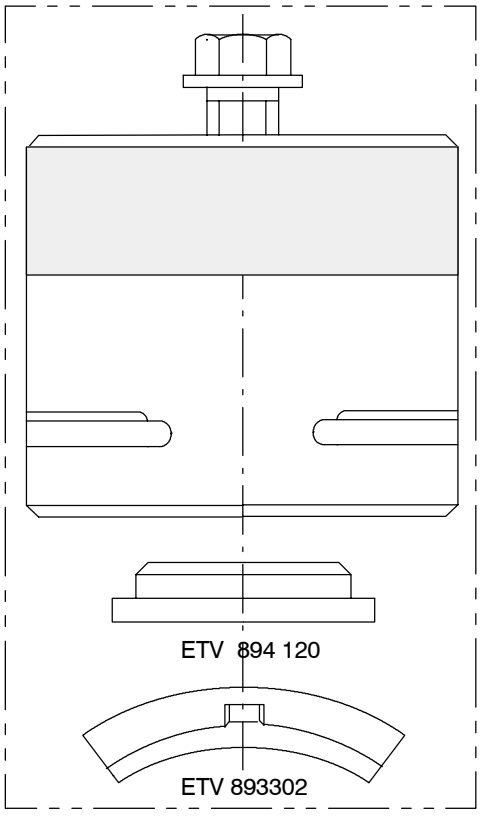

ETV 890220

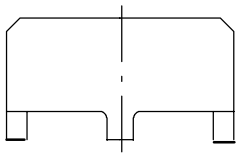

ETV 891870

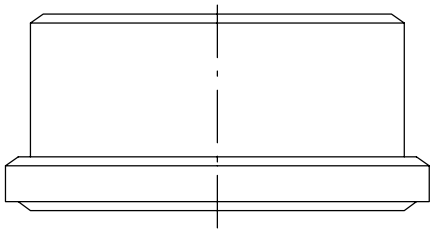

ETV 892 230


ETV 892 370


ETV 892380

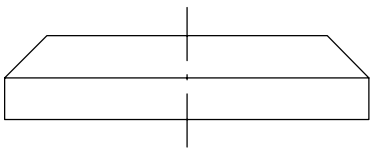

ETV 893 300


ETV 894 190

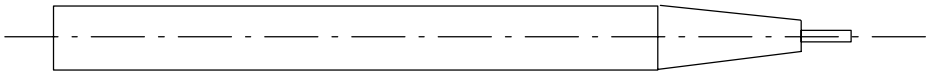

ETV 893340

ETV 894 120

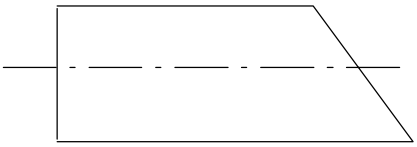
ETV 893302


ETV 893400

https://truckmanualshub.com/



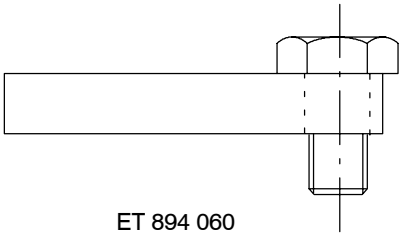
ETV 894 050



ETV 894 080



ETV 894 120



ET 894 060

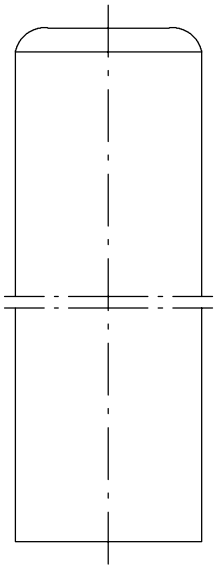
44.1 Quick–shift gear

A

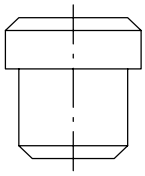
Part no.	Description
ETV 891 840	Sleeve for fitting seal on input shaft (Gearbox 505–905)
ETV 892 180	Drift for fitting needle bearing/sealing ring on input shaft (Gearbox 505–905)
ET 893 480	Support plate for front frame, 2 pcs (Frame and Wheels 505–905)

B

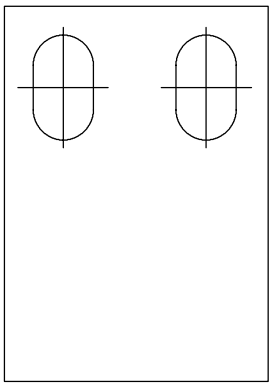
ETV 890 220	General handle
ETV 893 303	Plate for removing bearings for planet carrier (Quick–shift gear 505–905)
ET 893 420	Sleeve for fitting bearings on planet carrier (Final drives 505–905)
	Sleeve for fitting bearings at front end of cylinder



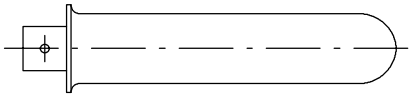
ETV 891 840



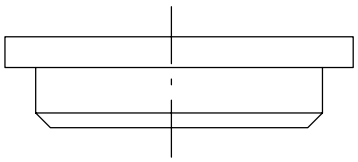
ETV 892 180



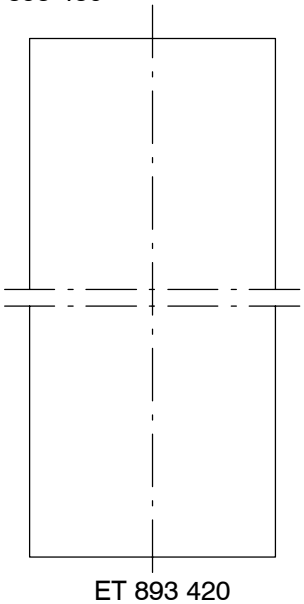
ET 893 480



ETV 890220



ETV 893 303



ET 893 420

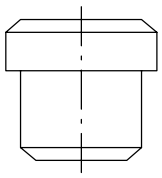
https://truckmanualshub.com/

44.2 Mechanical reverse shuttle

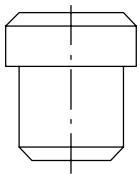
A

ETV 892 180 Drift for fitting needle bearing/sealing ring inside the reverse shuttle input shaft in transmission 300 and 460. These parts only on tractors without the quick–shift gear or the DPS.

ETV 894 200 Drift for fitting needle bearing/sealing ring inside the reverse shuttle input shaft in transmission 650 (8450–8750). These parts only on tractors without the DPS gear.



ETV 892 180



ETV 894 200

44.3 4WD clutch/4WD output shaft

A

ETV 893 260 [1] Socket spanner for 4WD output shaft nut (Gearbox 505–905)

ETV 894 170 [2] Socket spanner for 4WD output shaft nut (new tool)

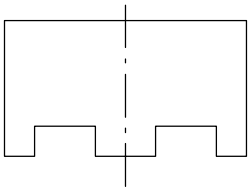
ETV 891 900 [1] Sleeve for fitting 4WD output shaft sealing ring/bearing (Gearbox 505–905)

B

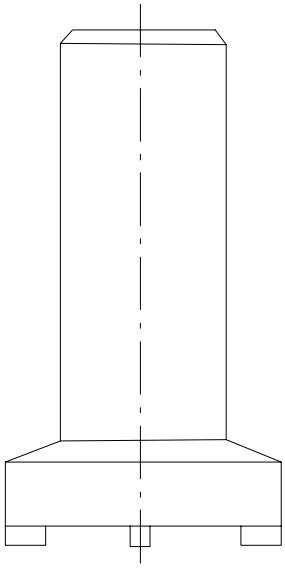
ETV 890 830 [1] Sleeve for fitting 4WD clutch piston onto the output shaft (PTO 505–905)

[1]) Tractors without quick–shift gear or with 2–step quick–shift gear

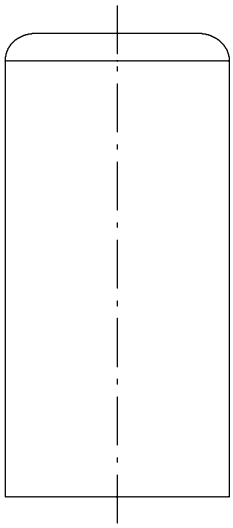
[2]) Tractors with 3–step quick–shift gear Delta Powershift. The nut is the same as the nut at the front end of the bevel pinon shaft on 505–905 tractors. For this nut spanner ETV 893 440 is used. Spanner ETV 894 170 can be replaced by welding a sleeve onto the tool ETV 893 440.



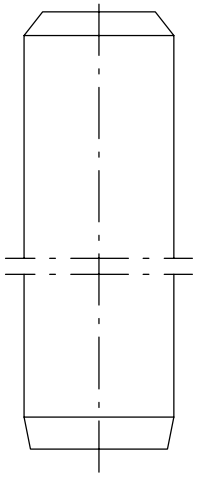
ETV 893 260



ETV 894 170



ETV 891900

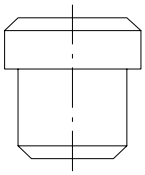


ETV 890 830

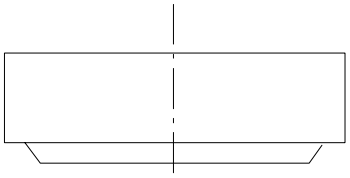
https://truckmanualshub.com/

44.4 3–step quick–shift gear Delta Powershift

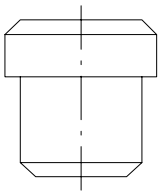
Part no	Description
A	
ETV 892 180	Drift for fitting oil seal and needle bearing inside input shaft front end (see 2–step quick–shift gear)
ETV 893720	Plate for fitting quick–shift gear front oil seal (front axle ZF on 305–665)
ETV 894 200	Drift for fitting oil seal and needle bearing inside the DPS input shaft front end in transmission 650.
ET 893 480	Support plate for front end frame, 2 pcs (see 2–step quick–shift gear)
B	
ETV 893700	Sleeve for fitting oil seal inside the middle sun gear (PTO 205–665)
ETV 894030	Sleeve for fitting planetary carrier ball bearing (Hydraulic power lift 205–665)



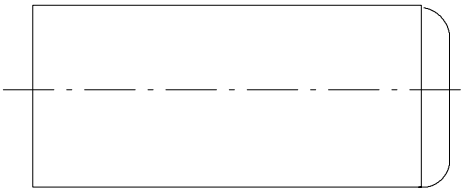
ETV 892 180



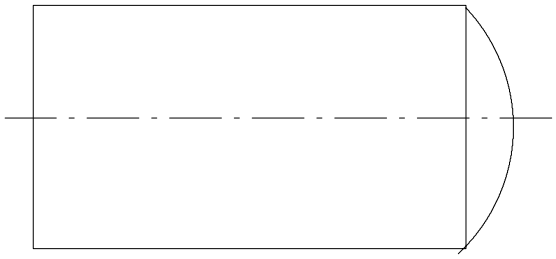
ETV 893 720



ETV 894 200



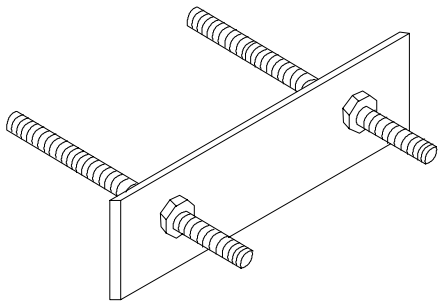
ETV 893 700



ETV 894 030

44.5. HiTech Shuttle

ETV 894 350 Compressing tool for F–clutch large coil spring

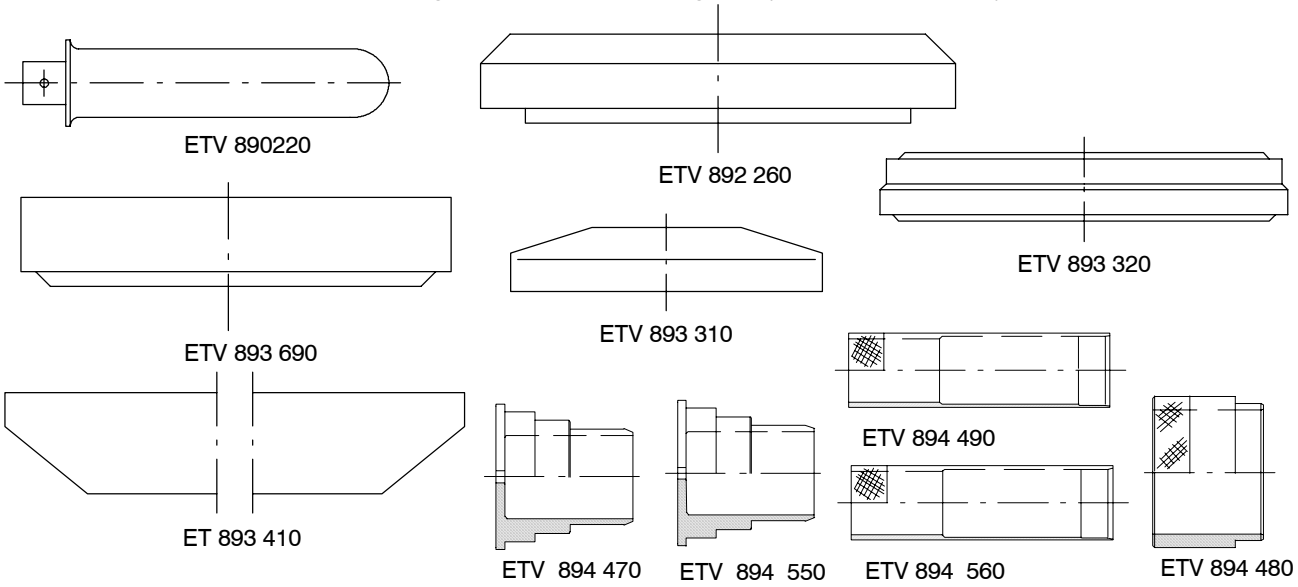


ETV 894 350

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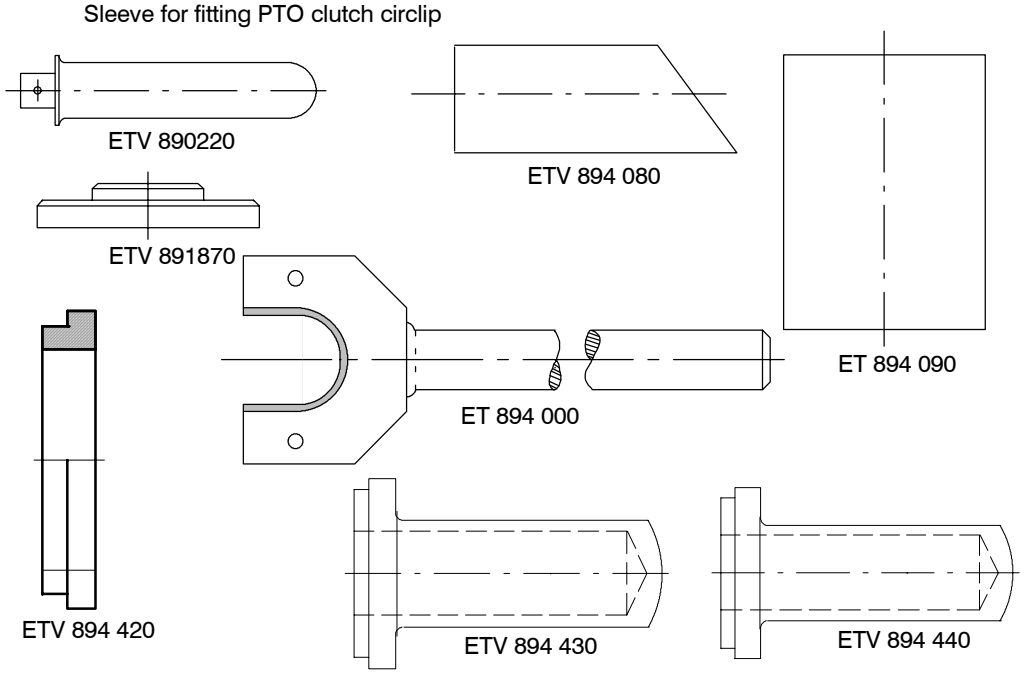
45. Final drives

Part. no.	Description
ETV 890 220	Universal handle
ETV 892 260	6600 and 8100; Plate for fitting outer drive shaft inner bearing race
ETV 893 690	6600 and 8100; Plate for fitting outer drive shaft inner oil seal (Final drives 305–555)
ETV 893 310	6100–6400 and 8000; Plate for fitting outer drive shaft inner oil seal (Final drives 505–905
ETV 893 320	6100–6400 and 8000; Plate for fitting outer drive shaft bearing race (Final drives 505–905)
ETV 894 470	6200–8950: Tool to fit the cassette seal (rear axle housing with greater oil volume)
ETV 894 480	6200–8950: Guide sleeve to assemble the final gears (rear axle housing with greater oil volume)
ETV 894 490	6200–8950: Guide pipe to assemble the final gears (rear axle housing with greater oil volume)
ETV 894 550	8350–8950Hi: Fitting tool for cassette seal in final drives 700.
ETV 894 560	8350–8950Hi: Guide pipe to assembling the final drives 700.
Locally prepared tools	
ET 893 410	Support for removing outer drive shaft bearing race (Final drives 505–905)



46. Power take–off

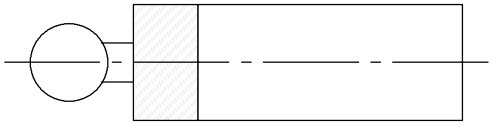
A	
ETV 890 220	Universal handle
ETV 891 870	Plate for fitting PTO shaft seal (Gearbox 505–905)
ETV 894 080	Drift for fitting selector fork rail locking ball (Gearbox 6100–8100)
ETV 894 420	Ring for fitting PTO shaft new cassette seal (to be used with below listed sleeves)
ETV 894 430	Sleeve (ø 35) for fitting PTO shaft new cassette seal (to be used with above mentioned ring)
ETV 894 440	Sleeve (ø 44,6) for fitting PTO shaft new cassette seal (to be used with above mentioned ring)
B	
ET 894 000	Tool for unscrewing locking flange (earlier version) at front end of PTO shaft (Steering system 505–905)
ET 894 090	Sleeve for fitting PTO clutch circlip

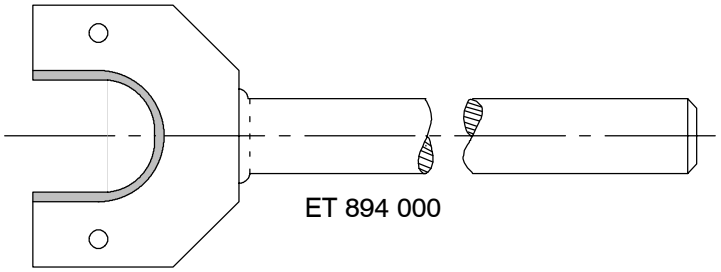


61. Steering system

B

ETV 893 100 Fitting tool for steering valve seal (Steering valve 505–905)
ET 894 000 Tool for rotating steering cylinder head (Front axle Sige 505–905)
Note! Steering system pressure measuring equipment, see pages **101/11–13**.


ETV 893100


ET 894 000

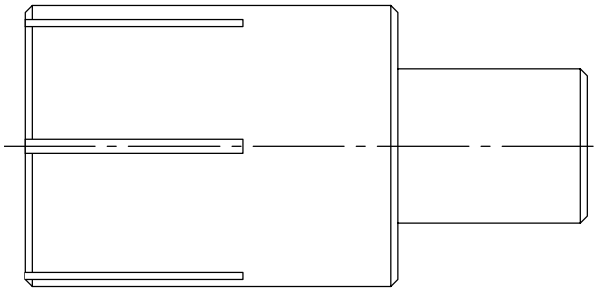
64. Powered front axle (Dana)

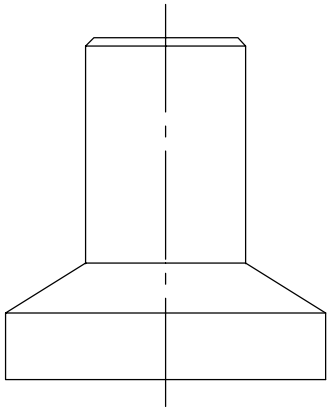
A

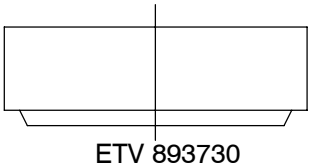
ETV 893 600 Sleeve for fitting pinion shaft oil seals (powered front axle 505–905)

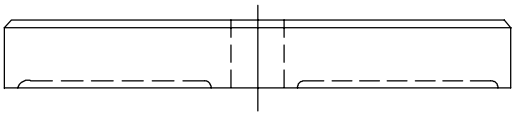
B

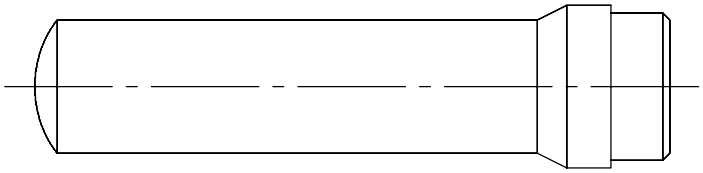
ETV 892 290 Sleeve for fitting drive shaft outer oil seal (powered front axle 505–905)
ETV 893 730 Plate for fitting drive shaft inner oil seal (powered front axle 505–905))
ETV 894 020 Plate for fitting hub oil seal (powered front axle 505–905)
ETV 894 150 Plate for fitting cassette type oil seal (1701/94–)
ET 894 010 Drift for fitting/removing drive shaft bushing (powered front axle 505–905)
Extractor for removing king pins, **see page 640/3**)

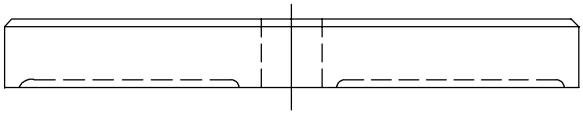

ETV 893600


ETV 892290


ETV 893730


ETV 894 150

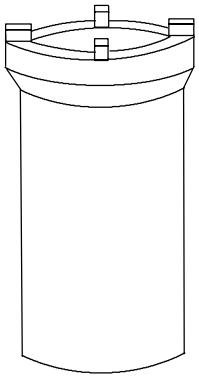

ET 894010


ETV 894020

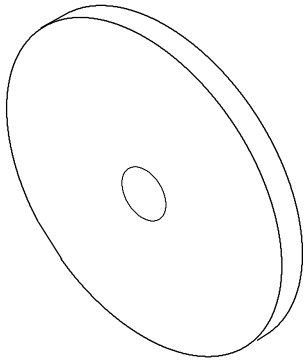
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67. Powered front axle Carraro 20.29 (industrial front axle)

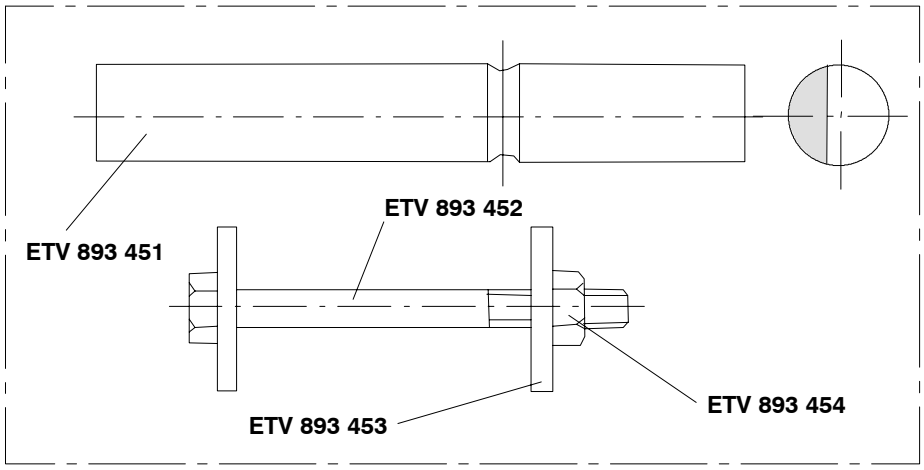
Ordering no.	Description
ETV 893 490	Socket spanner for bevel pinion shaft nut (also Carraro 505–905)
ETV 894 460	Plate to fit hub cassette seal (new)
ETV 893 450	Tool to adjust bevel pinion shaft position, which incl.:
	ETV 893 451, Measuring rod (1 pcs) (also Carraro 505–905)
	ETV 893 452, Screw M10x100 (1 pcs) (also Carraro 505–905)
	ETV 893 453, Compression plate (2 pcs) (also Carraro 505–905)
	ETV 893 454, Nut M10 (1 pcs) (also Carraro 505–905)



ETV 893 490



ETV 894 460



ETV 893 450

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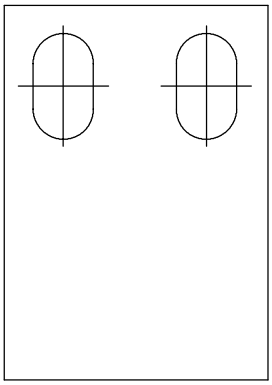
70. Main frame and wheels

A

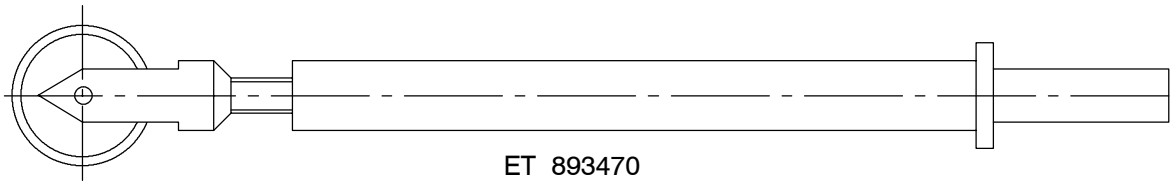
Order no	Description
ET 893480	Support plate for front frame, 2 pcs (Frame and wheels 505–905)

B

ET 893470	Support roller for splitting tractor (Frame and wheels 505–905)



ET 893480



ET 893470

91. Hydraulic power lift

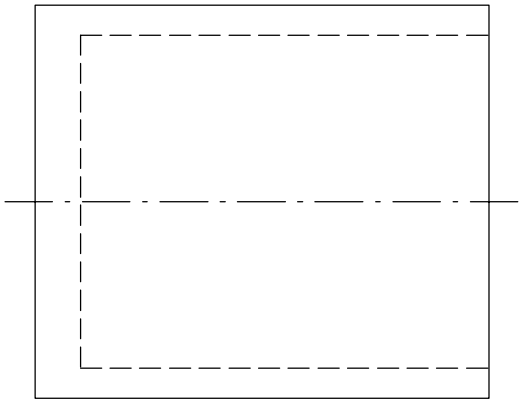
A

Locally prepared tool

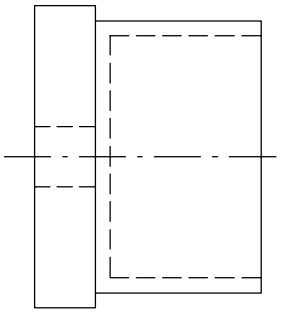
ET 893 530	Sleeve for fitting lifting arm shaft seals (Hydraulic lift 505–905)

B

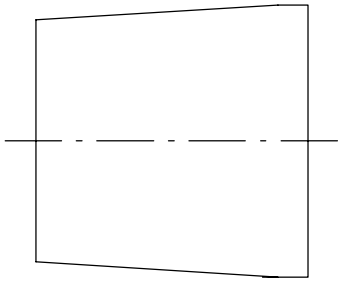
ETV 893 540	Sleeve for removing/fitting lifting arm shaft bushes (Hydraulic lift 505–905)
ETV 893 580	Conic sleeve for fitting lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 893 590	Sleeve for crimping lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 893 600	Drift for fitting lifting cylinder piston seal, 6000–6400 and 8000 (Lifting cylinder ø 80)
ETV 894 240	Conic sleeve for fitting lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)
ETV 894 250	Sleeve for crimping lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)
ETV 894 260	Drift for fitting lifting cylinder piston seal, 8150–8750 (Lifting cylinder ø 100)



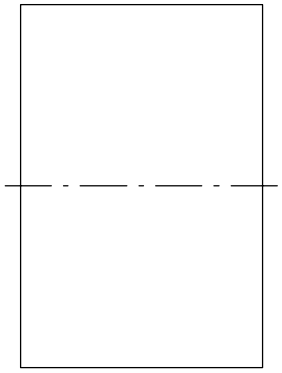
ET 893 530



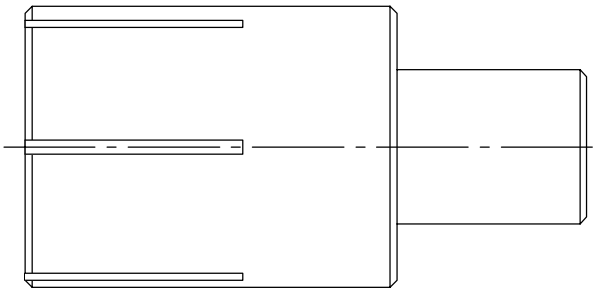
ETV 893 540



ETV 893 580 (ø 80)
ETV 894 280 (Ø 90)
ETV 894 240 (ø 100)



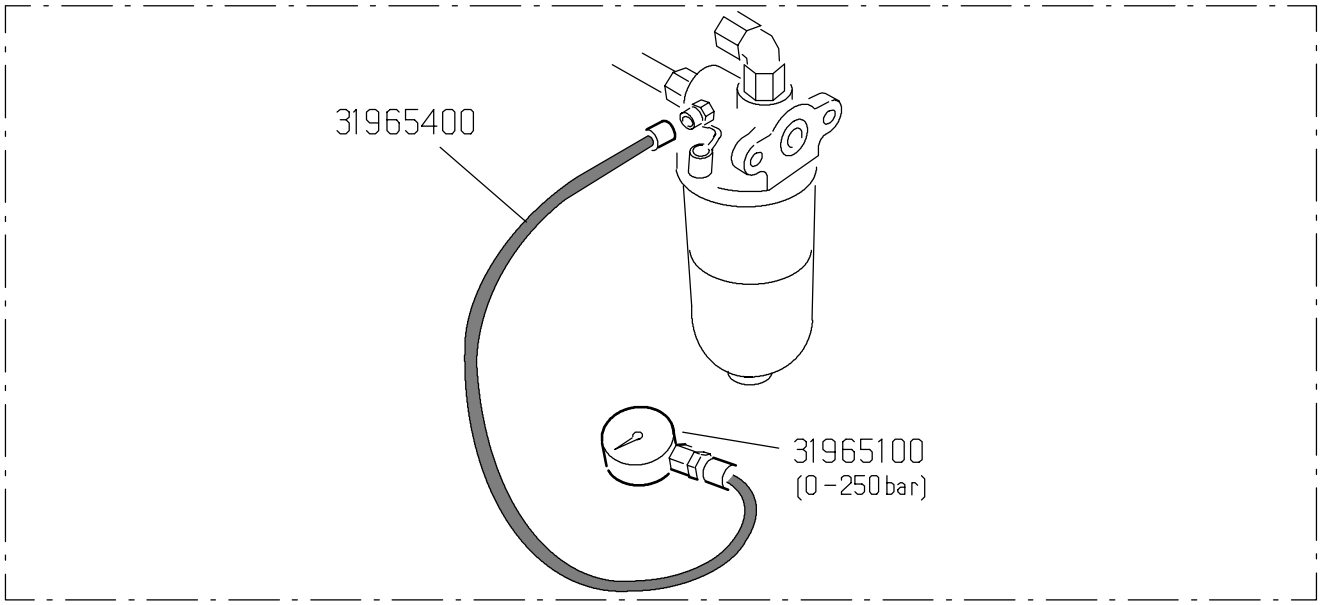
ETV 893590 (ø 80)
ETV 894 290 (Ø 90)
ETV 894 250 (ø 100)



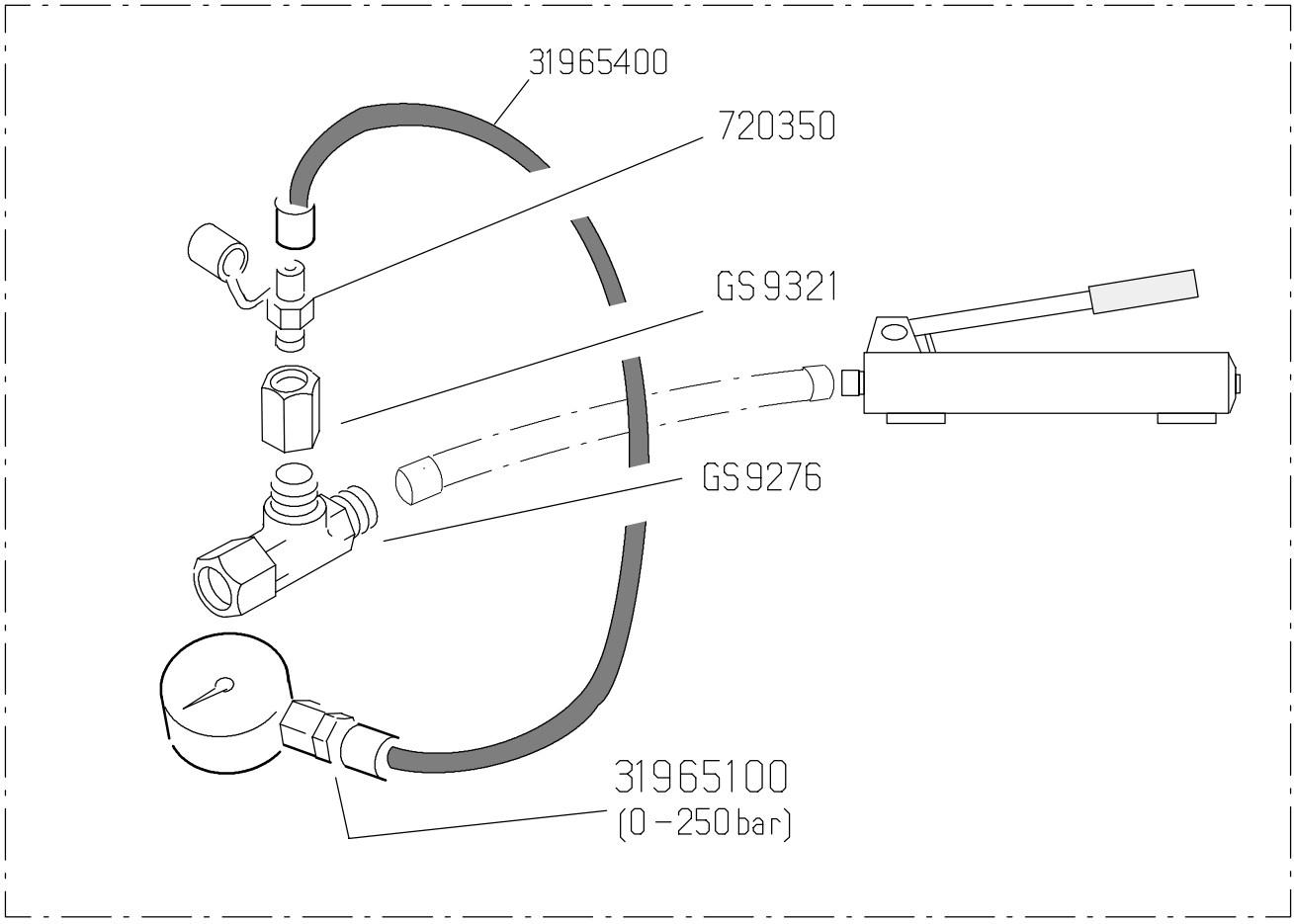
ETV 893600 (ø 80)
ETV 894 300 (Ø 90)
ETV 894 260 (ø 100)

92. Pressure measuring equipment

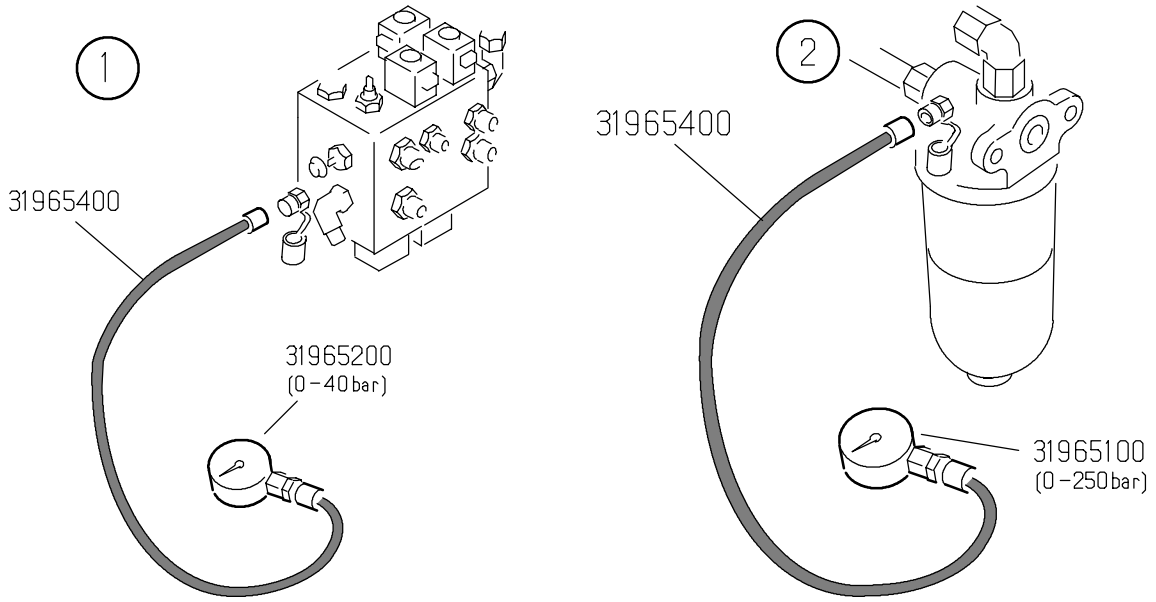
Note! Measuring equipment shown on pages 101/11–13 are included in the pressure measuring kit **31965000** which can be ordered from Tractor Works. These equipment can also be ordered separately.



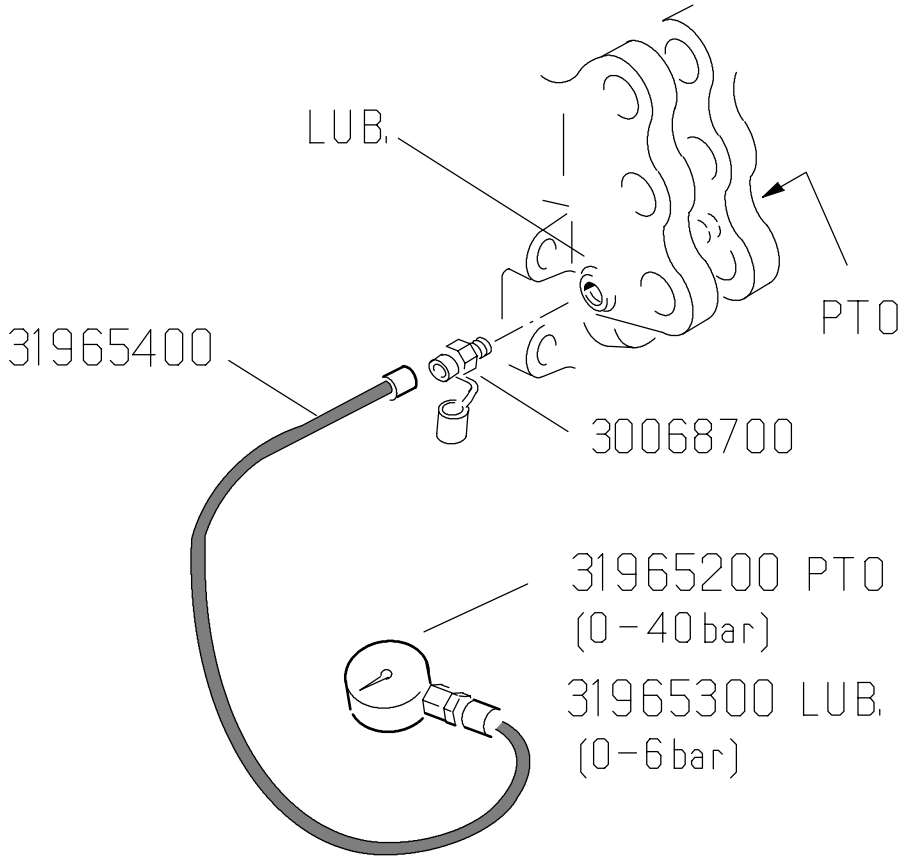
Measuring steering system working pressure (**pressure at test point 14,0–15,5 MPa**).



A. Measuring opening pressure of steering system shock valve **(opening pressure 19,0–21,5 MPa)**.
B. Measuring opening pressure of power lift shock valve **(opening pressure 20–21 MPa)**.
Note! Connector GS9276 has thread 3/4–16 for connecting the hand pump. The hand pump is not included in the pressure measuring kit 31965000.



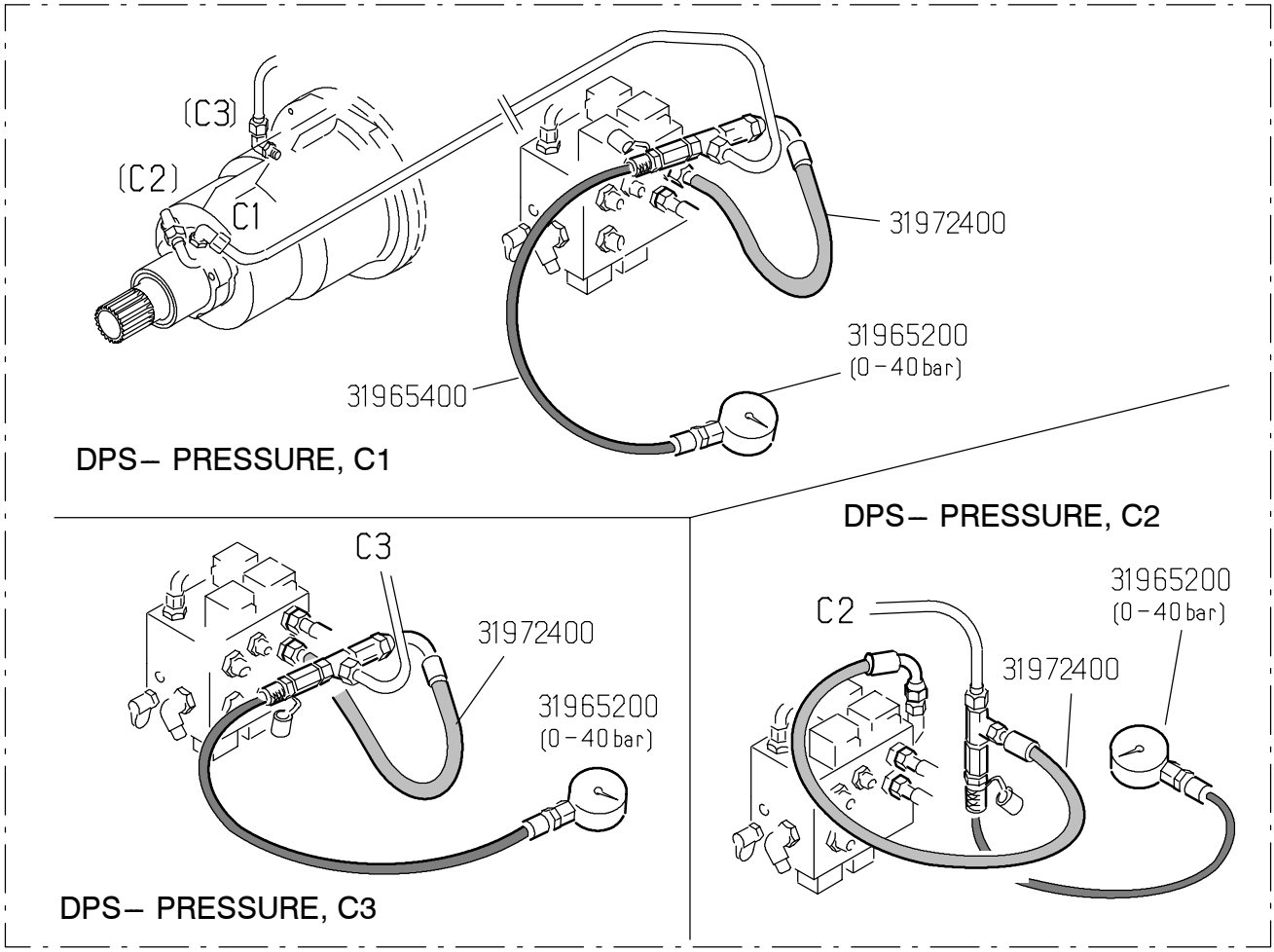
1. Pressure in low pressure circuit (pressure at test point **2,1–2,3 MPa** (–660070) or **1,8–1,9 MPa** (660071–, also on HiTech models)). On tractors with HiTech Shuttle the test point is fitted in the different place, see picture on page **440**/**24**.
2. Pressure in high pressure circuit (pressure at test point **19,0–19,8 MPa**)



1. Measuring PTO clutch pressure (pressure at test point **0,05–0,1 MPa** lower that pressure at pressure test point on the servo valve block).

2. Measuring lubricating oil pressure (LUB) (min. pressure is **0,03 MPa**). On the HiTech tractors there is a separate HPR test point in the rear part of the suction strainer housing on the gearbox (–J26433) or on the rearmost pressure filter bracket (J26434–) , see picture on page **440**/**25** (lubricating pressure value on HiTech tractors min. **0,12 MPa**).

Note! Measuring pressure in diff. lock clutch, see page 911/2.



Measuring Delta Powershift clutch pressures on tractors which have the mechanical shuttle unit. Pressure in each clutch should be **1,8–1,9 MPa**.
C1=foremost clutch.
C2=middle clutch
C3=planetary gear clutch (rearmost clutch).

Note! If the tractor has HiTech Shuttle, all three DPS clutches have their own HPR test point and a pressure gauge can be connected direct to the test points with measuring hose 31965400. Concerning the pressure test points, see page **440**/**25**.

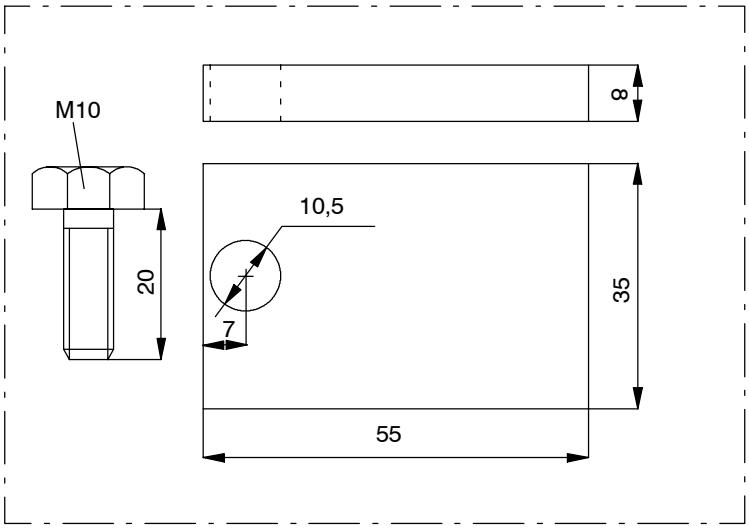
Note! On tractors which have the lock valve (see page **420**/**20B**), the oil piping deviates from the pictures above. The lock valve is fitted in transmissions **460** and **650**, but the lock valve is not fitted in the HiTech tractors.

102. Locally prepared tools	~~8. 11. 1990~~ 1. 4. 1997	Model 6000--8750	Code 102	Page 1

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42. Gearbox
B

ET 894 060 Press plate for adjusting selector forks



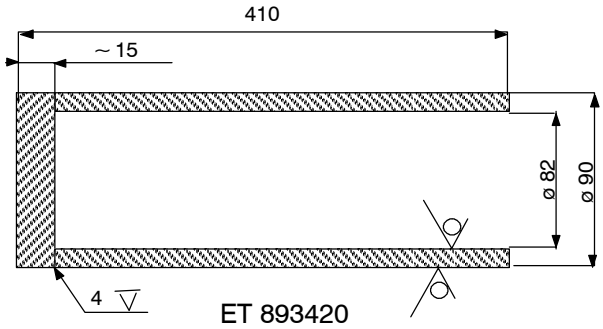
ET 894 060

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44. Quick–shift gear

B

ET 893 420 Sleeve for fitting bearings on planet carrier (Final drives 505–905)
Sleeve for fitting bearings on front end of cylinder

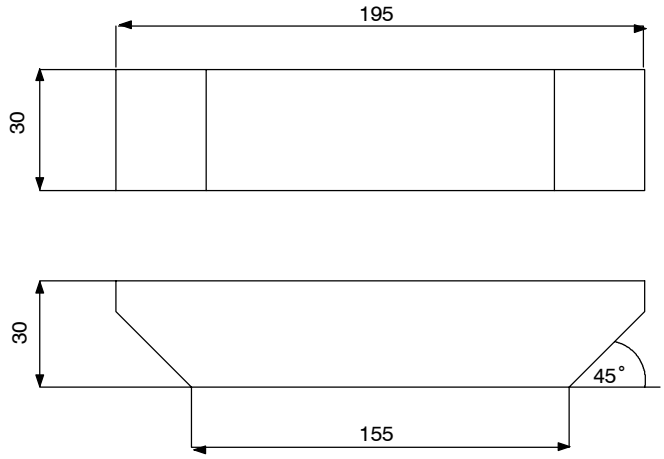


ET 893420

45. Final drives

B

ET 893 410 Support plate for removing bearing race, outer drive shaft (Final drives 505–905)



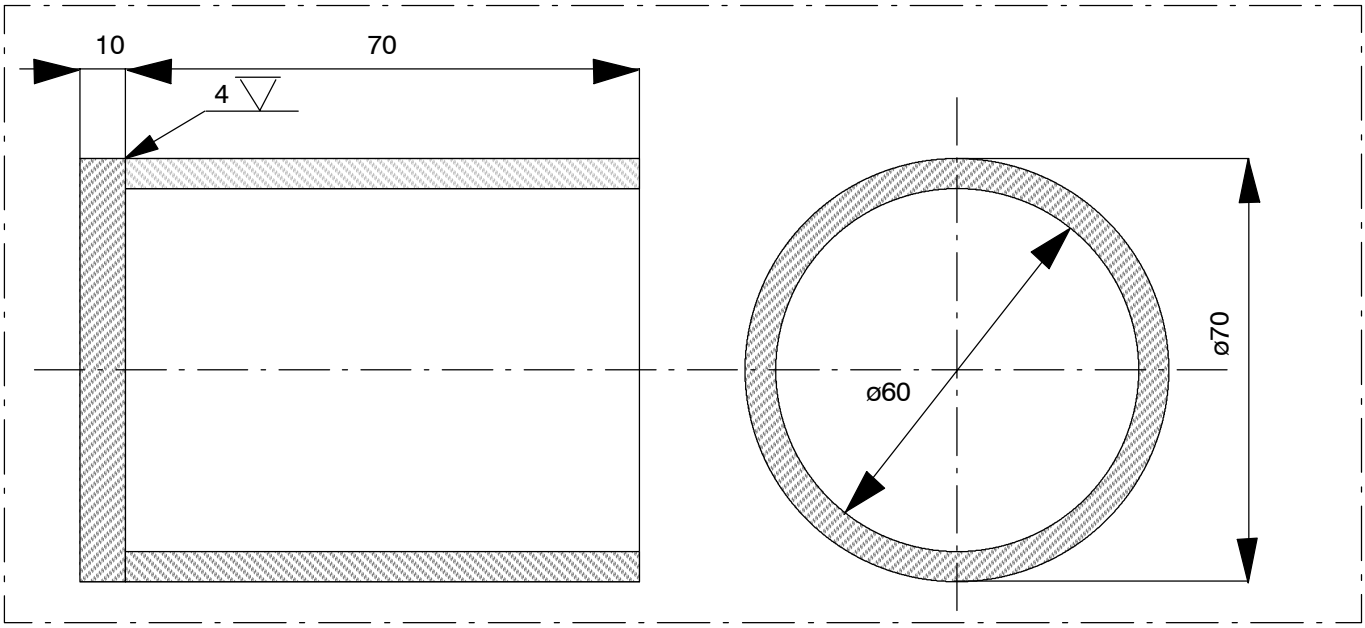
ET 893 410

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46. Power take off

B

ET 894 000	Tool for loosening the locking flange at the front end of the PTO shaft (see Steering system 6100–8100)
ET 894 090	Sleeve for fitting PTO clutch circlip (new)

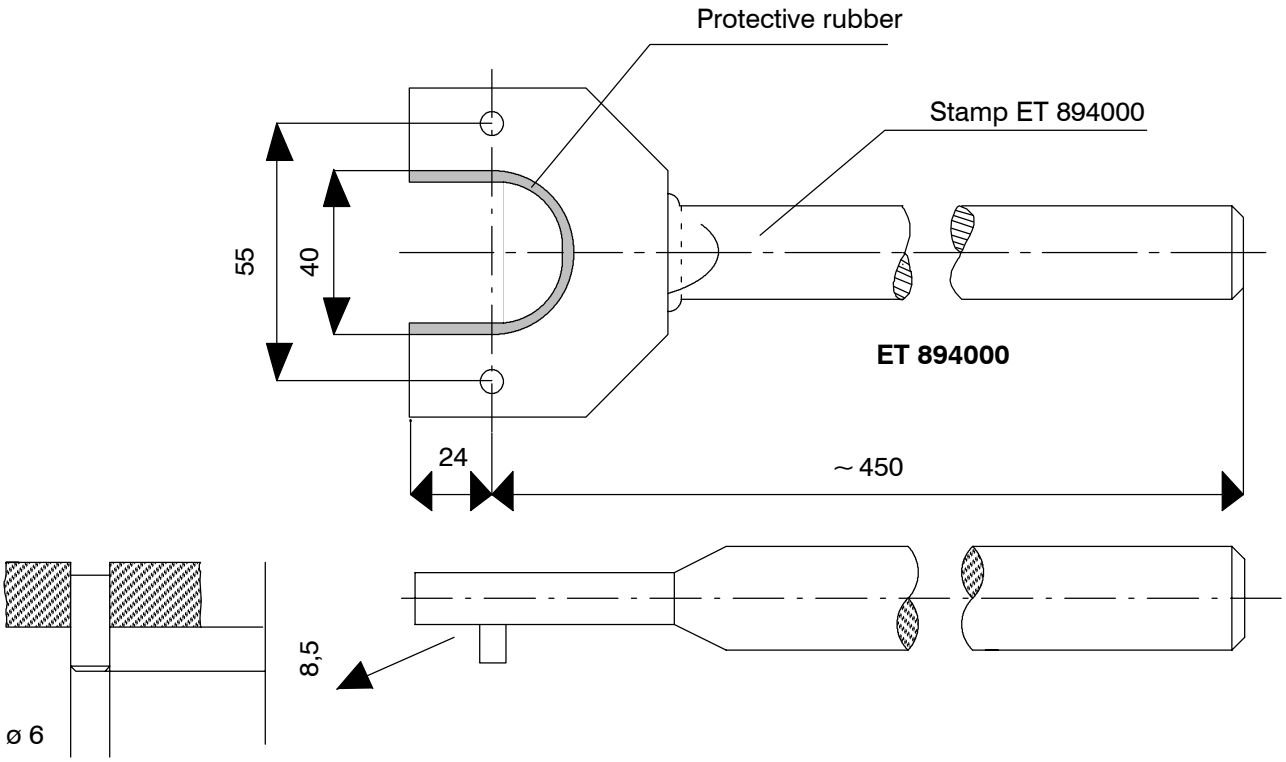


ET 894 090

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61. Steering system

ET 894000 Tool for rotating steering cylinder head (Steering cylinder 505–905)



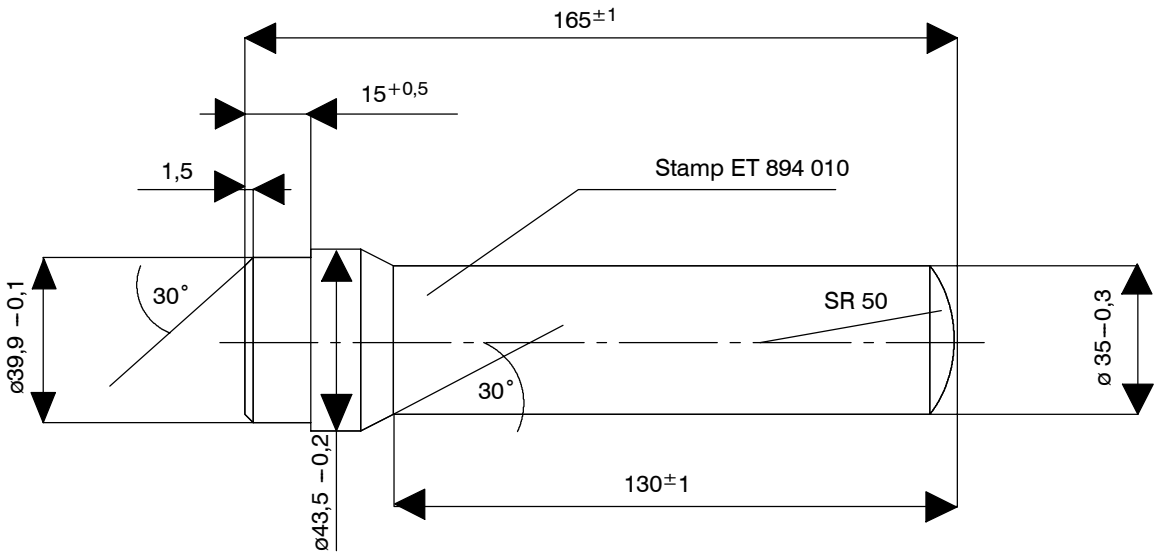
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https://truckmanualshub.com/

64. Powered front axle (Sige)

B

Part no	Description
ET 894 010	Drift for fitting/removing drive shaft bushing (powered front axle 505–905)



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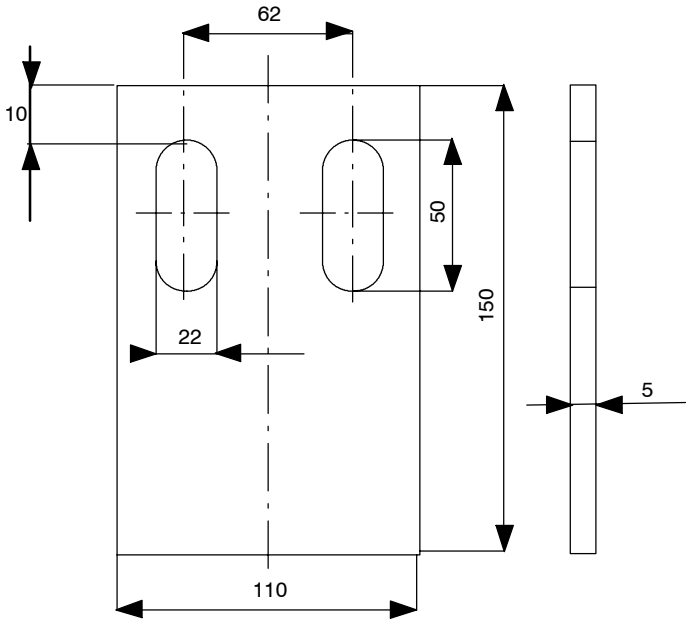
70. Frame and wheels

A

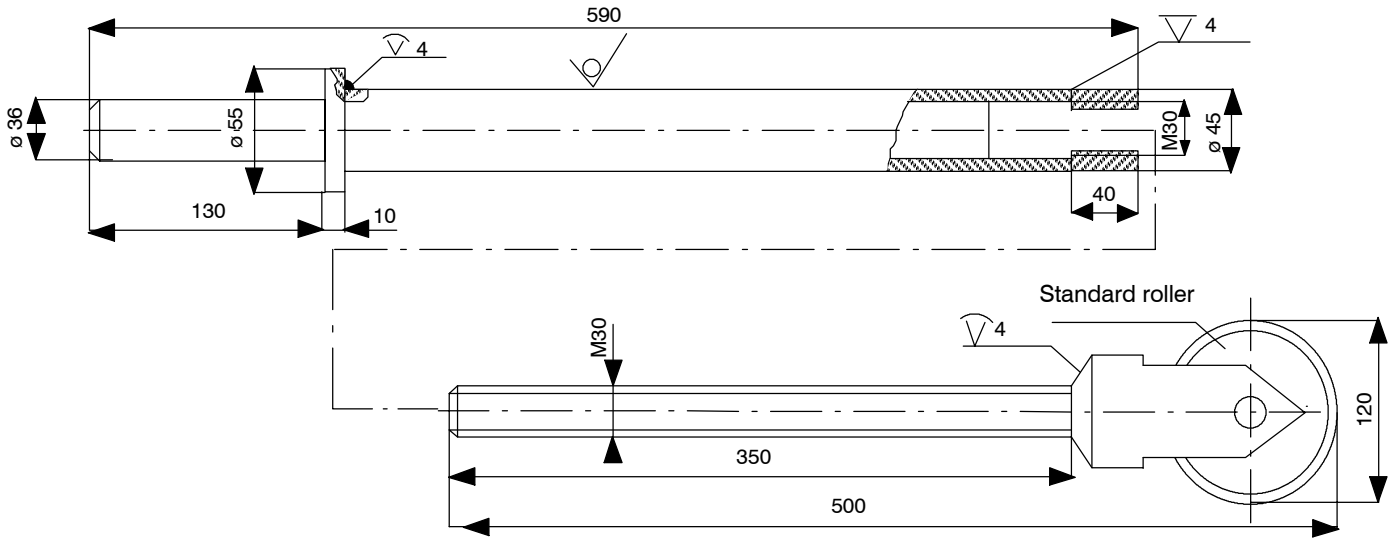
ET 893480 Support plate for front frame (Frame and wheels 505–905)

B

ET 893470 Support roller for front frame (Frame and wheels 505–905)



ET 893480

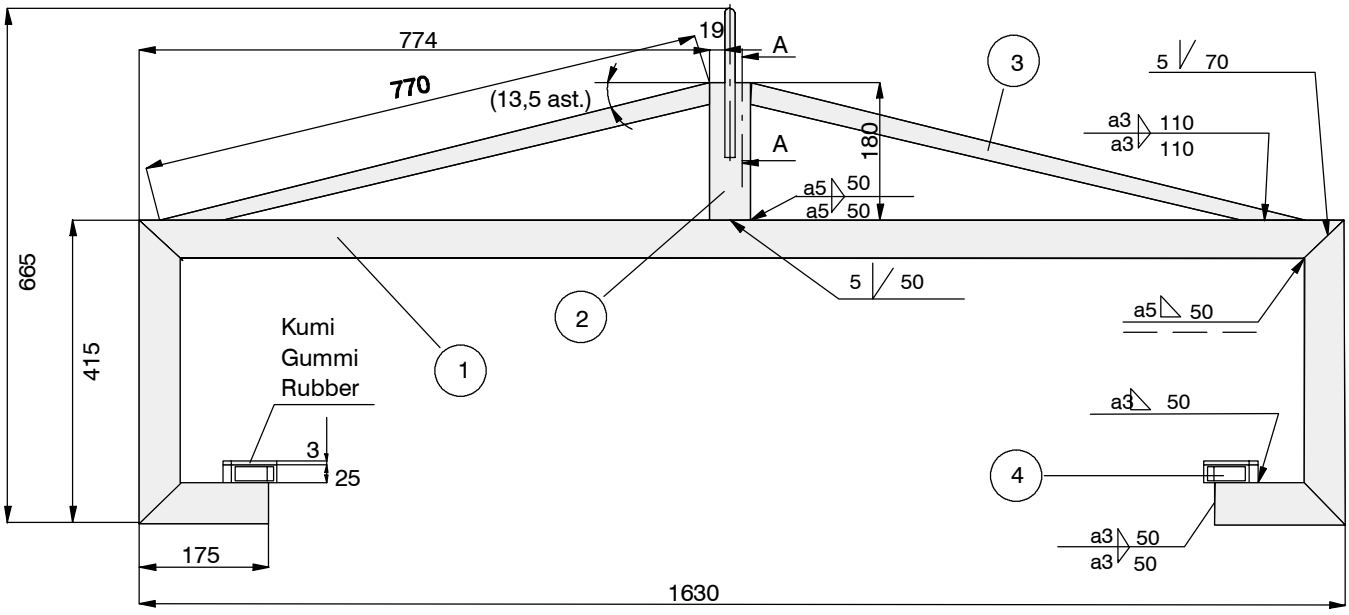


ET 893470

https://truckmanualshub.com/

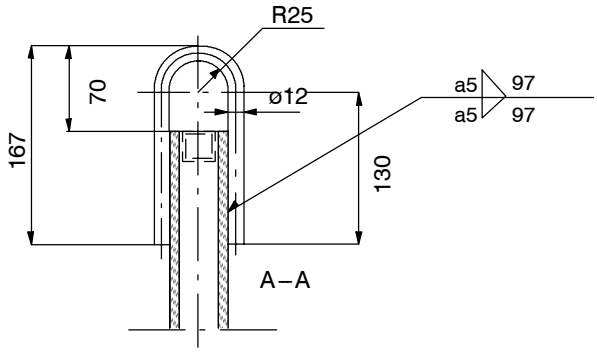
80. Cab and shields

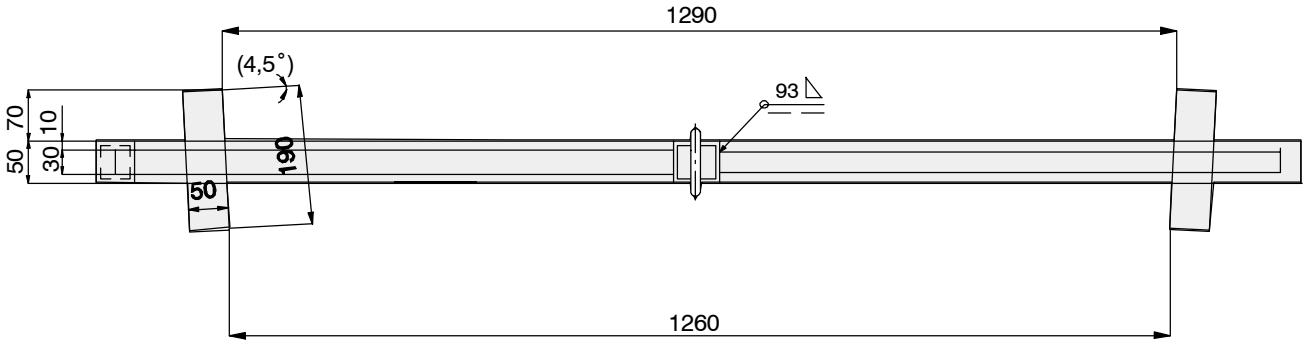
ET 894 110 Lifting tool for cab



1. 50 x 50 x 5
2. 50 x 50 x 5
3. 30 x 30 x 3
4. 50 x 25 x 2,5

Lifting eye ø 12 mm



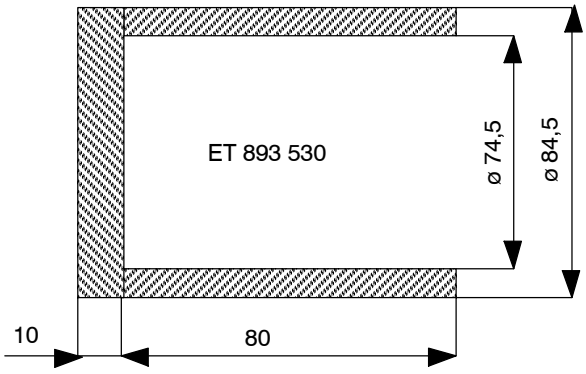


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91. Hydraulic power lift

A

ET 893 530 Sleeve for fitting lifting arm shaft seal (Hydraulic lift 505–905)



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