

10 General

VALTRA

M120 M130

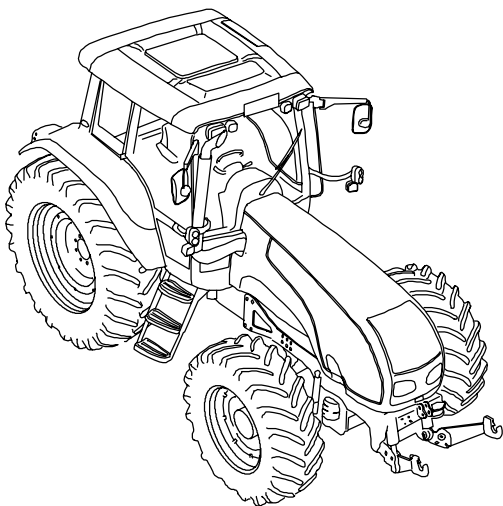
M150

T120 T130

T140, T160

T170 T180

T190



Service Manual

Tractors

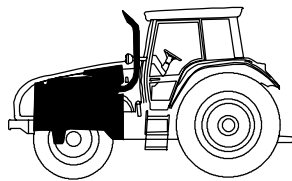
Valtra Inc.

FIN-44200 Suolahti, FINLAND

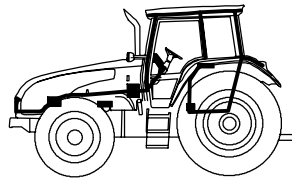
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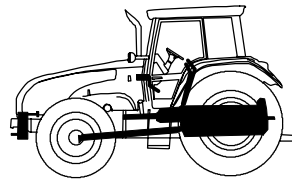
www.valtra.com



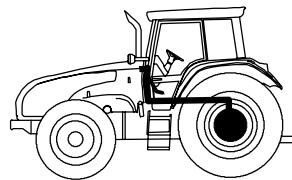
20 Engine



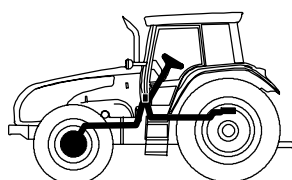
30 Electrical system



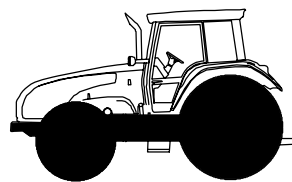
40 Power transmission



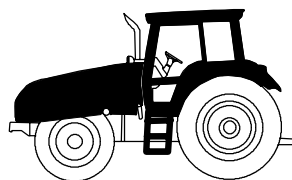
50 Brakes



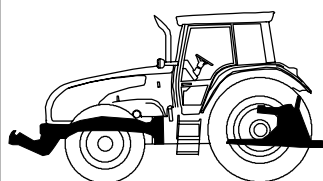
60 Front axle and steering system



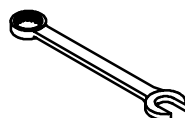
70 Frame and wheels



80 Cab and shields



90 Hydraulics



100 Tools

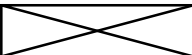
10. General

11. Layout

12. Construction

13. Maintanance

14. General technical specifications

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	2.1.2004	T120–T190 M120–M150	110	1

The following supplements have been published for the Valtra T and M–series Service Manual:

Order number	Date of publication	Notes

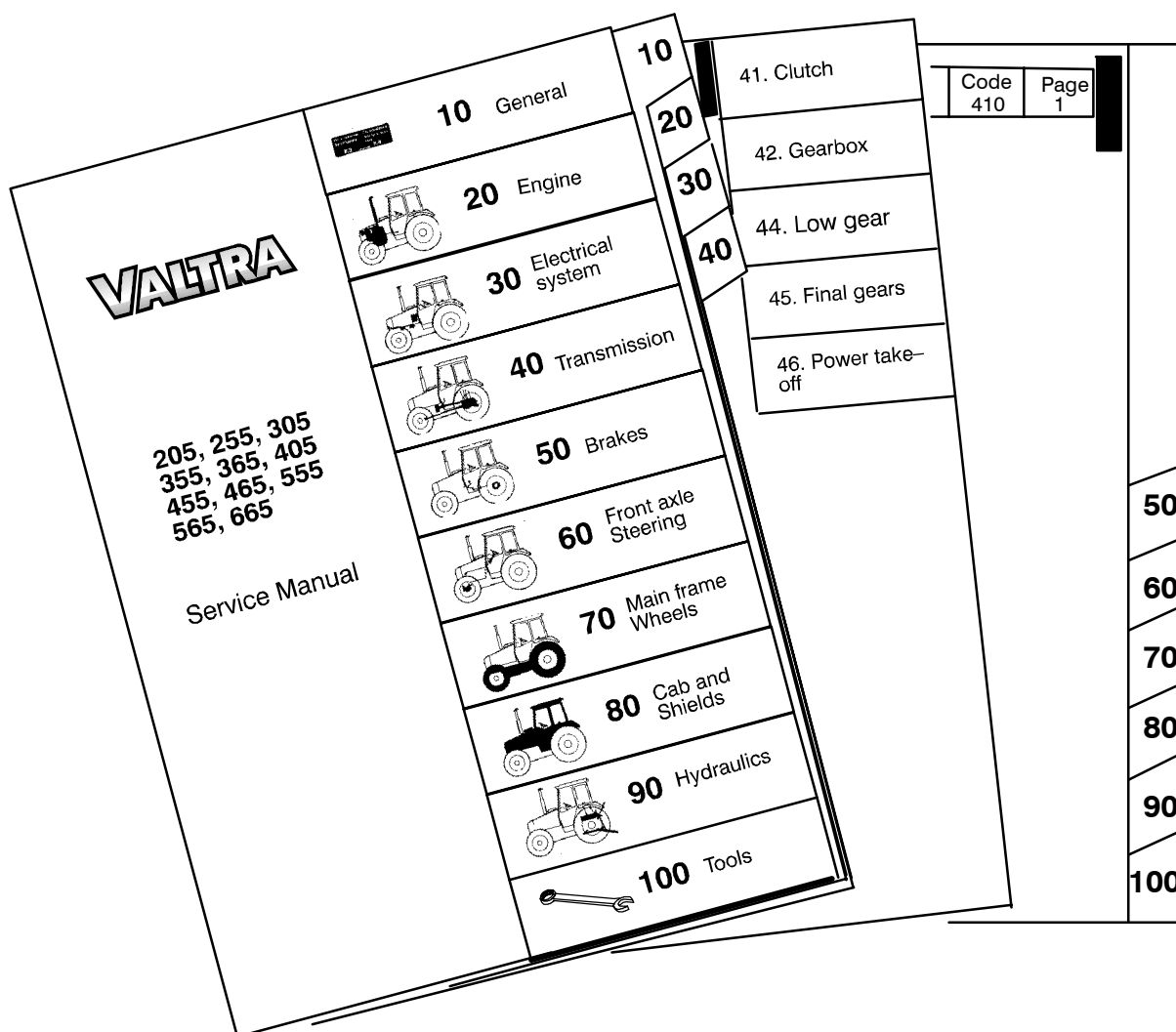
Layout of Service Manual

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).



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. Low gear
45. Final drives etc.

11. Layout	https://truckmanualshub.com/	Model	Code	Page
	2.1.2004	T120–T190 M120–M150	110	4

Tractor model

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

Code designation

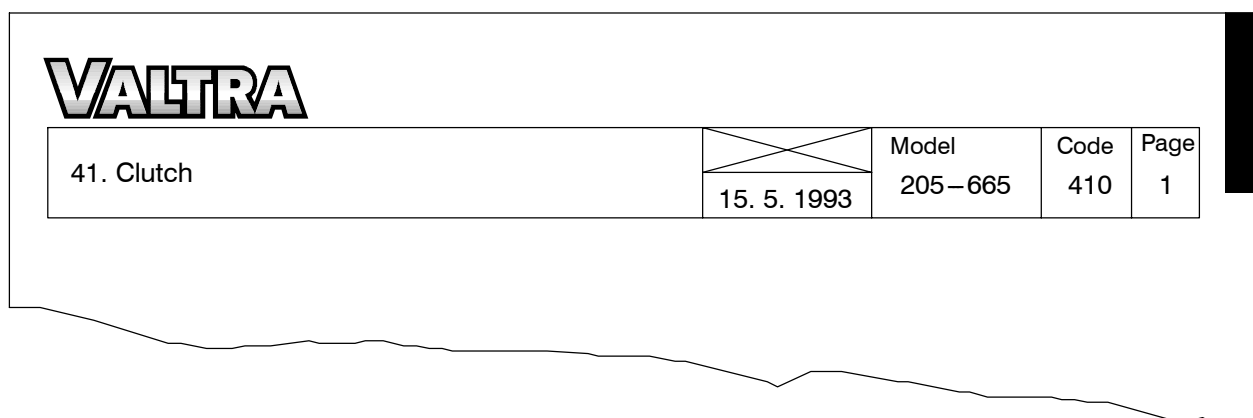
Three–digit code designations are used to separate the different document groups for the respective components. The same code is also used in the Time list as a reference to the text in this manual. The code designation numbers appear in the box at the top of the page and also in the headings.

Example: Code 410

- Group: power transmission (4)
- Component: clutch (41)
- Document group: general (410)

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.



Date

At the top of each page there are two boxes for dates. In a case of 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 proper date box.

Additions and amendments of the service manual

New and up–dated pages will be continuously 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) indicates 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, it is the page with the later date in the date box and the old date in the crossed–over box which is valid or which is the current page.

When an entirely new set of repair instructions is issued, it will be accompanied by instructions on where the pages should be inserted in the file.

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	2.1.2004	T120–T190 M120–M150	110	5

Code designations in the Service Manual

10. General

- 110 Layout
- 120 Repairs
- 130 Maintenance

20. Engine

21. Engine

- 210 General
- 211 Cylinder block
- 212 Flywheel housing
- 213 Cylinder head and valve mechanism
- 214 Crankshaft engine
- 215 Counterbalance
- 216 Timing gear assembly
- 217 Lubrication system
- 218 Inlet and exhaust system
- 219 Safety instructions

22. Fuel system

- 220 General
- 222 Fuel feed pump and fuel filters
- 223 Injection pump and injectors

23. Cooling system

- 230 General
- 231 Cooling system

24. Engine control system

- 240 General
- 241 Changing of control unit

30. Electrical system

31. Autocontrol 5.3

- 310. Electrical system
- 311. Wiring diagram

32. Autocontrol 5.5

33. Autocontrol 6.1

- 330. Electrical system
- 331. Wiring diagram

34. Service codes

- 340. Autocontrol system
- 341. Power lift system

35. Power lift electrical system

- 350. General
- 351. Services and fault codes

36. Working hydraulics electrical system

- 360. General

37. Service software

- 370. General

40. Power transmission

41. Clutch

- 410. General
- 411. Repair instructions of the clutch

42. Gearbox

- 420. General
- 421. Repair instructions of the selector forks
- 423. Repair instructions of the gearbox
- 424. Repair instructions of the differential

44. Quick–shift gear (DPS)

- Reverse shuttle
- 4WD clutch
- 440. General
- 441. Repair instructions of the quick–shift gear. (DPS) and reverse shuttle
- 442. Repair instructions of the 4WD clutch

45. Final drives

- 450. General
- 451. Repair instructions of the final drives

46. Power take off

- 460. General
- 462. Repair instructions of the rear PTO
- 462. Repair instructions of the front PTO

50. Brake system

51. Service brakes

- 510. General
- 511. Repair instructions of the service brakes

52. Parking brake

- 521. Repair instructions of the parking brake

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60. Front axle and steering system

61. Steering system

- 610 Technical data, description, tools
- 611 Reconditioning steering system
- 612 Priority valve
- 613 Steering cylinder

62. Powered front axle

- 620 Technical data, description, tools
- 621 Axle housing and central pivot bearing brackets
- 622 Drive shaft
- 623 Hub reduction gear
- 624 Differential

63. Powered front axle

- 630 Technical data, description, tools

64. Powered front axle

- 640 Technical data, description, tools
- 642 Drive shafts
- 643 Hubs
- 644 Differential

70 Frame and wheels

- 710 Frame
- 720 Wheels

80 Cab and shields

90. Hydraulics, power lift

91. Hydraulics

- 910. General
- 911. Repair instructions of the hydraulics

92. Valves for auxiliary hydraulics and front loader

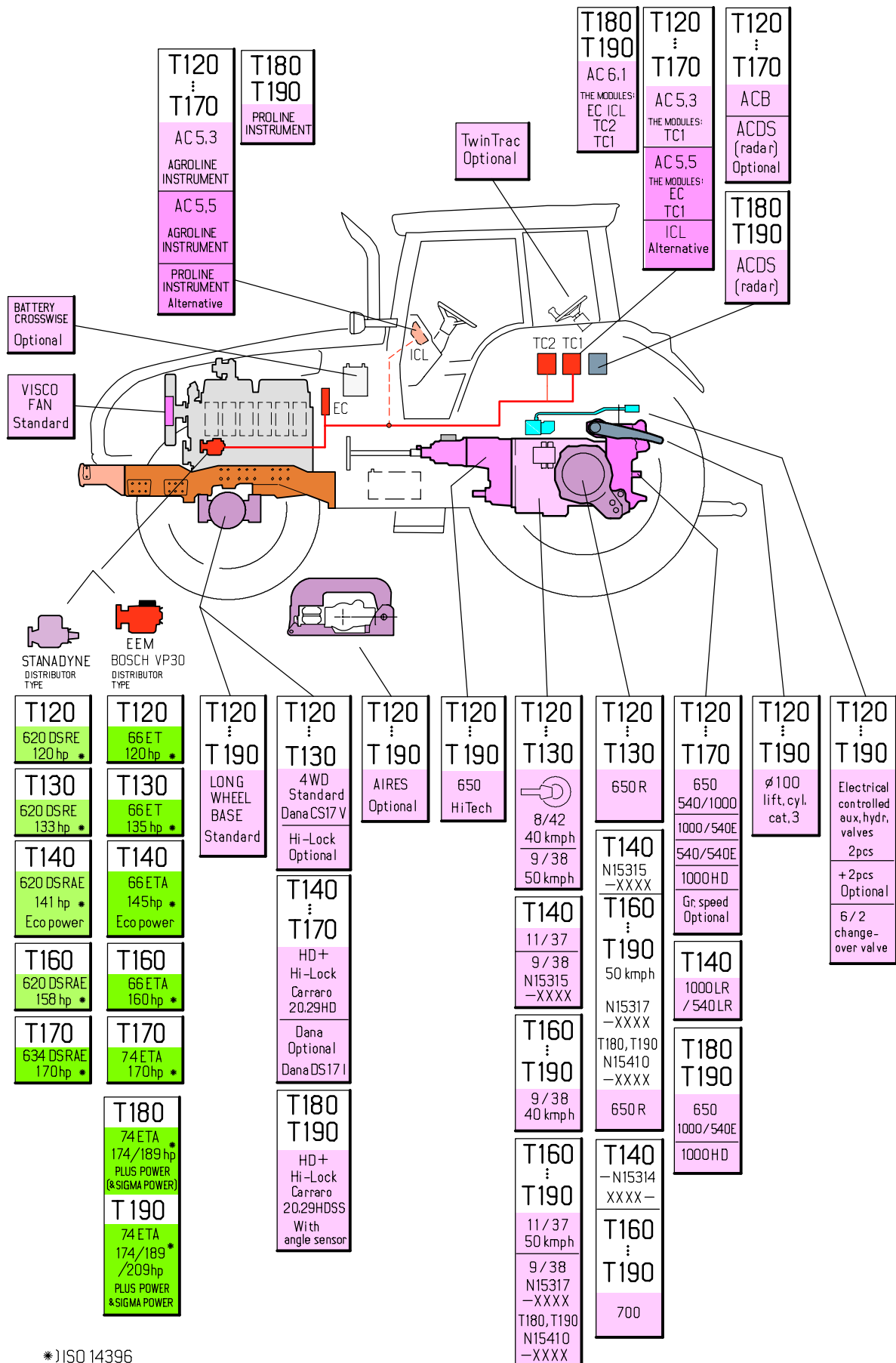
- 920. General
- 921. Repair instructions of the auxiliary hydraulics

93. Power lift

- 930 General
- 931. Repair instructions of the front and rear power lift

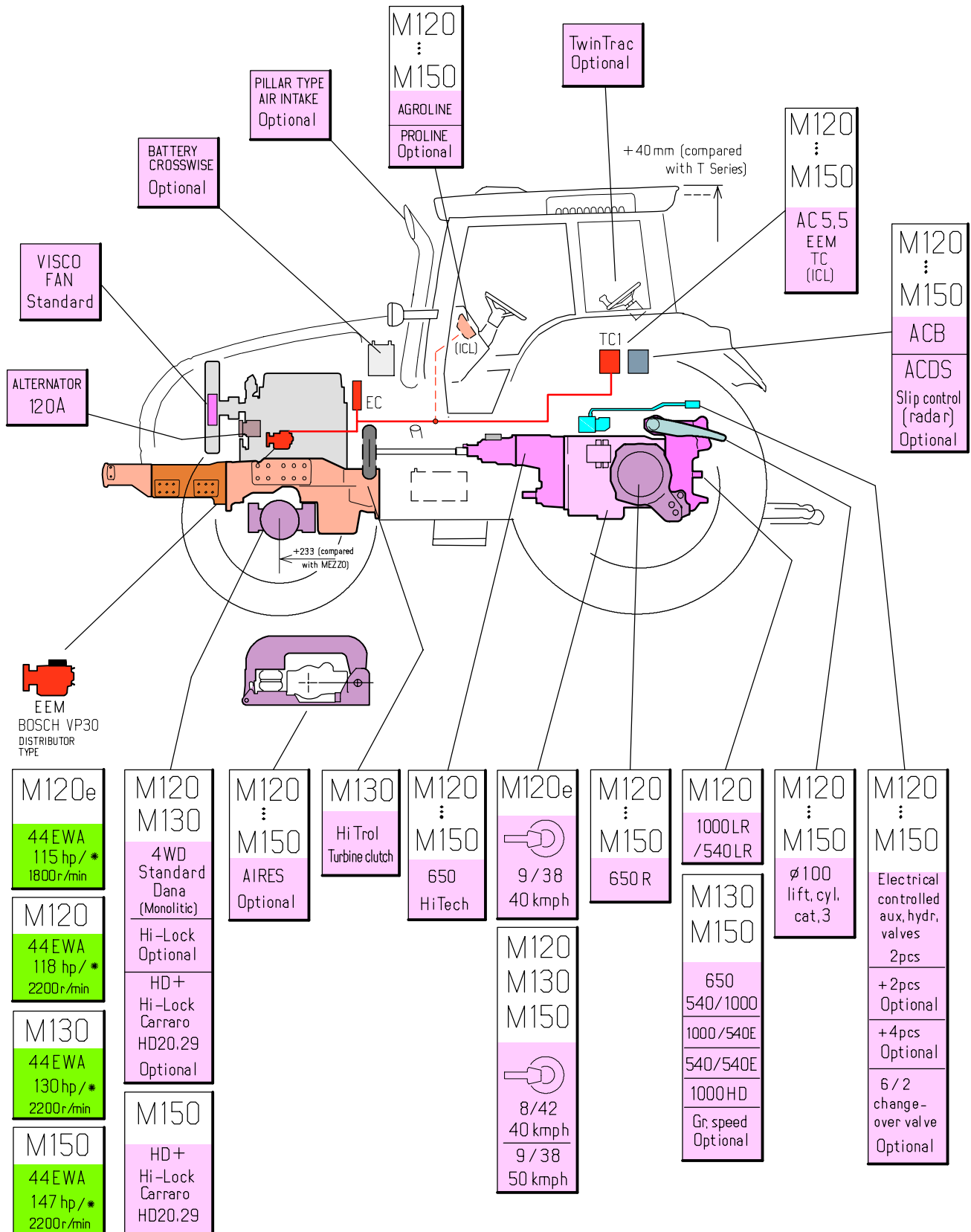
100 Special tools

T120–T190 series, construction



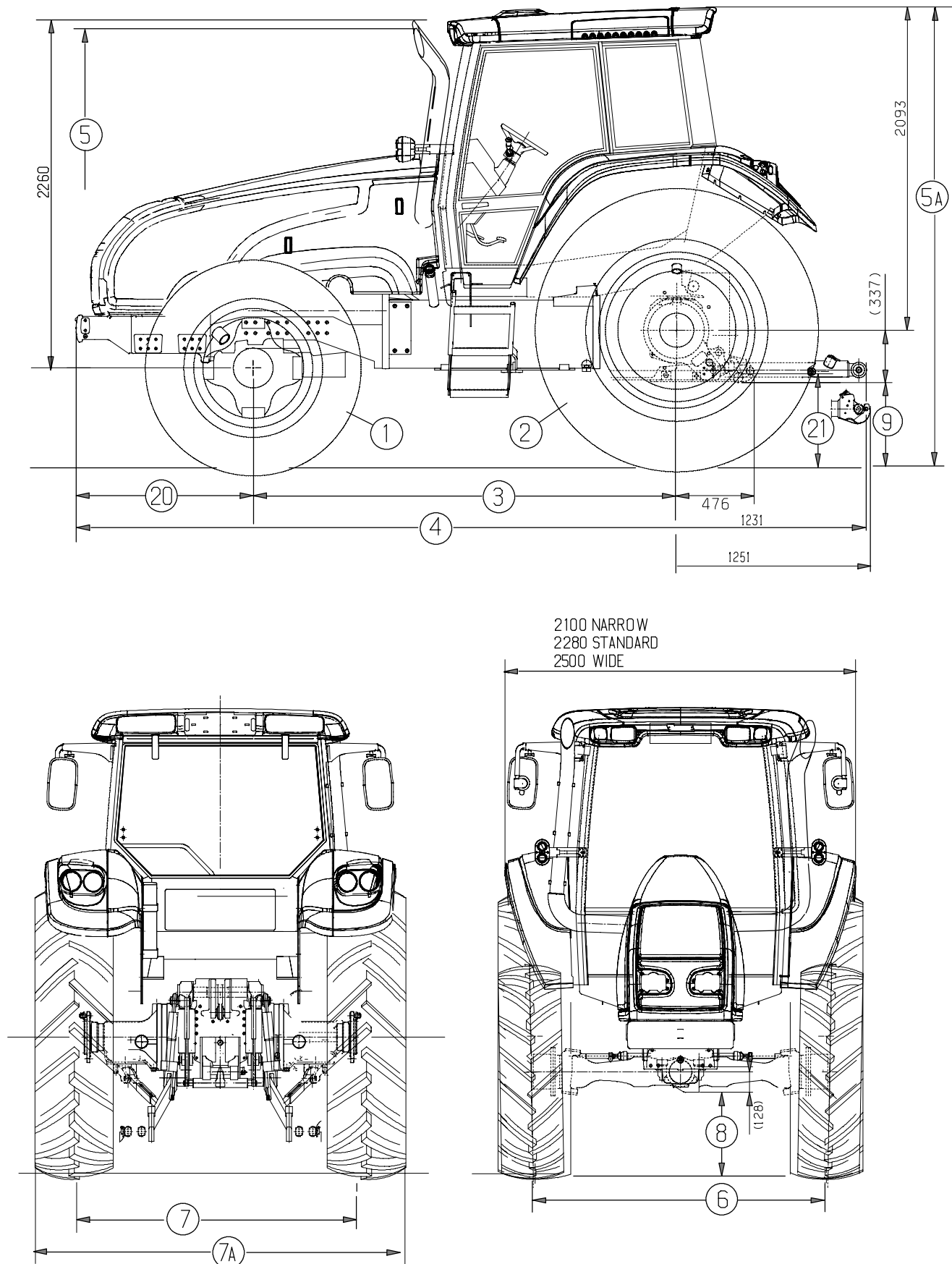
*) ISO 14396

M120–M150 series, construction



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T120–T190 series, dimensions



12. Construction

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Model

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Code

121

Page

2

Dimensions (mm)	T 120	T 130	T 140	T 160	T 170	T 180, T190
1. With front tyres/tires	16.9R28	16.9R28	16.9R28	460/85R30	460/85R30	460/85R30
2. With rear tyres/tires	20.8R38	20.8R38	20.8R38	20.8R42	20.8R42	20.8R42
4. Length	5148	5148	5148	5148	5148	5148
7a. Width	2338	2338	2338	2338	2338	2338
5a. Height to the roof	2960	2960	2960	3030	3030	3030
5. Height to the exhaust pipe	2900	2900	2900	2965	2965	2910
3. Wheel base	2748	2748	2748	2748	2748	2748
8. Ground clearance (front axle)	555/515 ¹⁾	555/515 ¹⁾	555/515 ¹⁾	600/560 ¹⁾	600/560 ¹⁾	600/560 ¹⁾
9. Ground clearance (rear axle)	535	535	535	600	600	600

¹⁾ With front axle suspension.

Dimension from the rear axle mid point to the cab roof part is 2093 mm.

Weights kg	T 120	T 130	T 140
With tyres/tires	16.9R28, 20.8R38	16.9R28, 20.8R38	16.9R28, 20.8R38
Total weight (with full fuel tank and without ballast weights)	5530	5530	5650
Front axle weight (%)	2480 (45)	2480 (45)	2600 (46)
Rear axle weight (%)	3050 (55)	3050 (55)	3050 (54)

Weights kg	T 160	T 170	T 180, T190
With tyres/tires	540/65R30, 650/65R42	540/65R30, 650/65R42	650/65R42, 540/65R30
Total weight (with full fuel tank and without ballast weights)	5950	5950	5990
Front axle weight (%)	2700 (45)	2700 (45)	2740 (46)
Rear axle weight (%)	3250 (55)	3250 (55)	3250 (54)

Track widths:

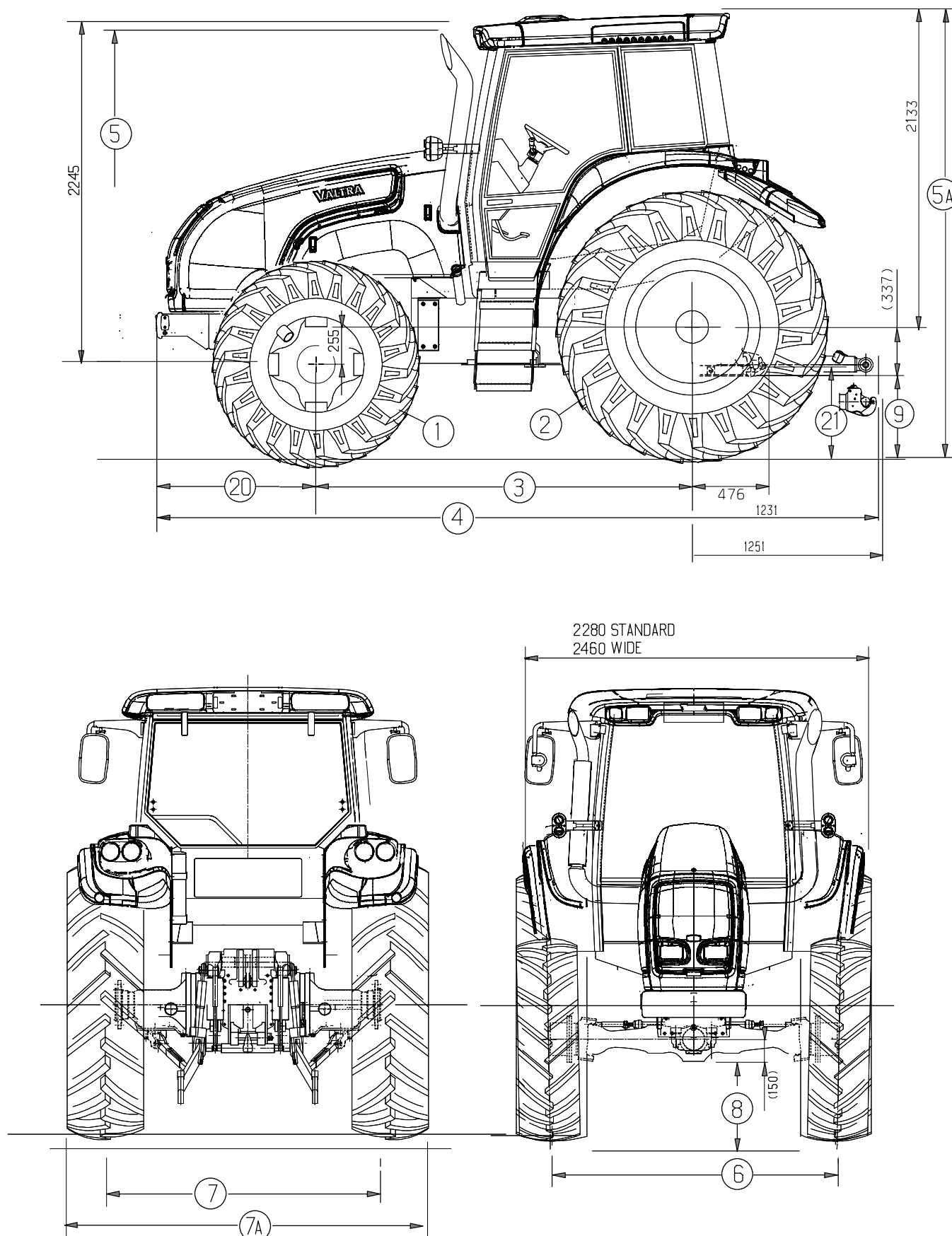
Front	6. Track width
14.9-28/6, 14.9R28, 380/70R28, 380/85R28, 420/70R28, 420/85R28, 440/65R28, 16.9R28, 16.9-28/8, 480/65R28, 480/65R28E1, 480/70R28, 540/65R28, 540/65R28E1 + more: see operator's manual	1540, 1635, 1740, <u>1835</u> , 1940, 2035
Rear	7. Track width
8.4R38, 18.4-38/8, 18.4R42, 460/85R38, 480/70R38, 20.8R38, 20.8-38/10, 520/70R38, 520/85R38, 520/85R42 540/65R38, 580/70R38, 480/80R42 + more: see operator's manual	1610, 1715, <u>1810</u> , 1910, 2010, 2115

Maximum permissible front– and rear axle loadings, kg

Regardless of any limitations due to the tyres/tires, with standard track widths max. speed.

Tractor	T120, T130	T140–T170	T180, T190
Front 4WD			
max 40 km/h	3300		
max 8 km/h	5500		
industrial front axle			
max 40 km/h	4500	4500	4500
max 8 km/h	6200	6200	6200
Rear, max 40 km/h	8000	9000	9000
Total weight, max 40 km/h	9000	11000	11000

M120-M150 series, dimensions



Dimensions (mm)	M120	M130	M150
1. With front tyres/tires	16.9R28	16.9R28	16.9R28
2. With rear tyres/tires	20.8R38	20.8R38	20.8R38
4. Length	4898	4898	4898
7a. Width	2338	2338	2338
5a. Height to the roof	3000	3000	3000
5. Height to the exhaust pipe	2930	2930	2930
3. Wheel base	2559	2559	2559
8. Ground clearance (front axle)	530/490 ¹⁾	530/490 ¹⁾	530/490 ¹⁾
9. Ground clearance (rear axle)	535	535	535

¹⁾ With front axle suspension

Dimension from the rear axle mid point to the cab roof part is 2133 mm.

Weights kg	M120	M130	M150
With tyres/tires	20.8R38	20.8R38	20.8R38
Total weight (with full fuel tank and without ballast weights)	5290 ²⁾	5290 ²⁾	5450
Front axle weight (%)	2320 (44) ²⁾	2320 (44) ²⁾	2480 (46)
Rear axle weight (%)	2970 (56)	2970 (56)	2970 (54)

²⁾ With industrial front axle 160 kg heavier, standard on model M150.

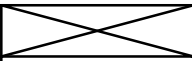
Track widths:

Front	6. Track width
13.6R28, 14.9R28, 14.9-28, 16.9R28, 16.9-28, 340/85R28, 380/85R28, 420/70R28, 420/85R28, 440/65R28, 480/65R28, 480/70R28, 540/65R28	1530, 1645, 1735, <u>1840</u> , 1930, 2045, 2135
230/95R36	<u>1504</u> , 1580, 1602, 1702, 1880, 1980, 2002, 2102
14.9R28, 14.9R28 IND, 16.9R28, 14.9-28/14 FOR, 420/85R28, 480/65R28 IND	<u>1840</u> , 1745
Industrial front axle	6. Track width
14.9R28*, 14.9-28*, 16.9R28, 16.9-28, 380/85R28*, 420/70R28*, 420/85R28, 480/65R28, 480/70R28, 540/65R28	1530, 1625, 1730, <u>1830*</u> , <u>1930</u> , 2025, 2130, 2230
230/95R36	<u>1500</u> , 1545, 1810, 1855, 1900, 1940, 2210, 2255
500/60-26,5 FOR	<u>1890</u> , 1880
14.9R28, 14.9R28 IND, 14.9-28 FOR, 16.9R28, 16.9R28 IND, 16.9-28 FOR, 420/85R28, 480/65R28 IND, 500/65R28 FOR, 540/65R28, 540/65R28 FOR	<u>1870</u> , 1890
Rear	7. Track width
16.9R38, 18.4R38, 18.4-38/8, 420/85R38, 460/85R38	1510, 1610, 1715, <u>1810</u> , 1910, 2010, 2115
20.8R38, 20.8-38/10, 520/70R38, 520/85R38, 540/65R38, 580/70R38	1610, 1715, <u>1810</u> , 1910, 2010, 2115
600/65R38, 650/65R38	1715, <u>1810</u> , 1910, 2010, 2115
270/95R48	<u>1500</u> , 1520, 1600, 1620, 1900, 1920, 2000, 2020
680/75R32	1714, <u>1810</u>
18.4-38/14 FOR, 18.4R38, 18.4R38 IND	1650, <u>1875</u>
600/65-34 FOR	1630, <u>1900</u>
20.8R38, 20.8R38 IND, 20.8-38/14 FOR, 520/85R38, 600/65R38 FOR, 600/65R38 IND, 650/65R38, 650/65R38 FOR	1675, <u>1850</u>

Maximum permissible front– and rear axle loadings, kg

Regardless of any limitations due to the tyres/tires, with standard track widths max. speed.

Tractor	M120–M150
Front 4WD	max 40 km/h
	max 8 km/h
	industrial front axle max 40 km/h
	Industrial front axle max 8 km/h
Rear, max 40 km/h	8000
Total weight, max 40 km/h	9000

13. Maintenance			Model	Code	Page
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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.

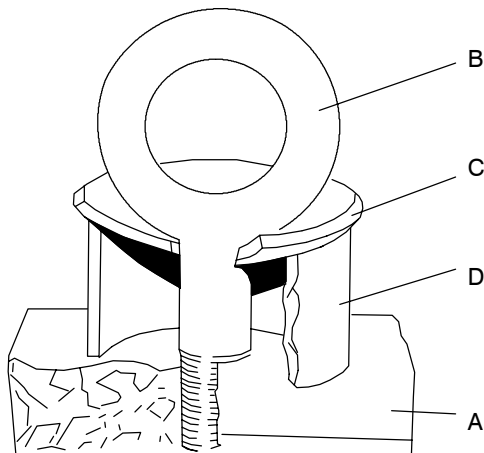
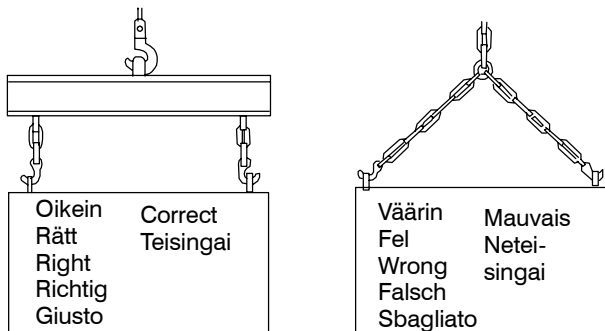
Trouble – shooting

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.

- Determine the problem
- List possible causes
- Differentiate the causes
- Conduct checks in logical order to determine the exact cause
- Consider approximate remaining service life against cost of parts and labour.
- Make any necessary repairs.
- Recheck the parts and functions for correct operation

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

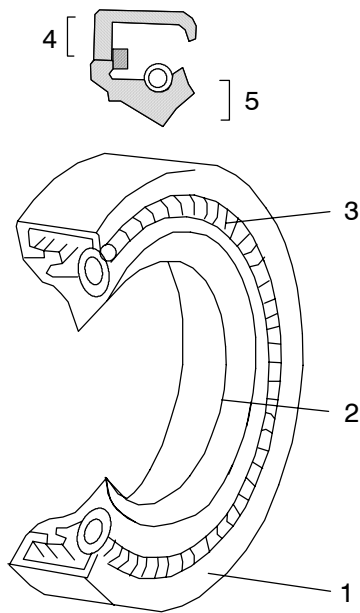
When shims are removed, tie them together and identify their location. Keep shims clean and take care not to bend them before refitting them.

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.



The main parts of lip-type seal:

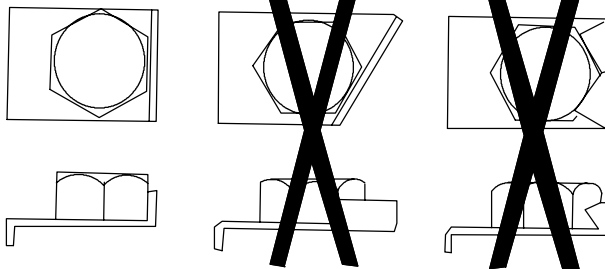
1. Case
2. Sealing element
3. Ring spring

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.

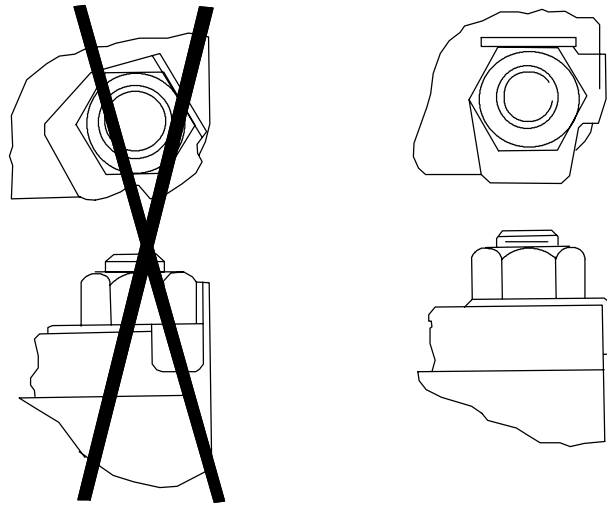
Cables and wires

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.

Conversion table for common units

Quantities and units

Overall and detail dimensions millimetres (mm)

Short distances e.g. turning circles metres (m)

Travel distances kilometres

Tractor weights, axle loadings kilograms (kg)

Travel speed kilometres per h (km/h)

Drawbar pull kilonewtons (kN)

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)

Engine torque newton metres (Nm)

Fuel consumption by weight (kilograms per hr, kg/h)
(by volume) litres per hr (l/h)Fuel economy (specific fuel consumption)
grams per kilowatt hr (g/kWh)

Engine displacement litres (l)

Hydraulic pump
pressure – megapascal (MPa)
delivery – millimetres per sec (ml/s)

Tyre pressure – kilopascal (kPa)

Area acres – hectare

Volume bushel – litre

Quantity pound per acre – kilogram per hectare

Volume
superficial foot – cubic metre

Conversion factors

100 mm = 3,94 inches
1 inch = 25,4 mm1 m = 3,28 ft
1 ft = 0,305 m1 km = 0,62 mile
1 mile = 1,61 km1 kg = 2,2 lbs
1 lb = 0,454 kg1 km/h = 0,62 mph
1 mph = 1,61 km/h1 kN = 224,8 lbs
1 lb = 4,448 N1 kW = 1,34 hp
1 hp = 0,746 kW1 Nm = 0,74 ft lb
1 ft lb = 1,356 Nm1 kg/h = 2,2 lb/hr
1 lb = 0,454 kg
1 l/h = 0,22 gal/hr
1 gal = 4,54 l

304 g/kWh = 0,5 lb/hp hr

1 l = 61,02 cu in
100 cu in = 1,639 l1 MPa = 145 psi
1000 psi = 6,9 MPa
100 ml/s = 1,32 gpm
1 gpm = 75,77 ml/s
100 kPa = 14,5 psi
1 psi = 6,9 kPaTo convert multiply by
0,404686To convert multiply by
39,3687

Multiply by 1,12085

Multiply by
0,002360

Valtra service

Maintenance

Correct maintenance at the right time is essential for reliable operation of the tractor. Maintenance costs are small compared with repair costs resulting from lack of maintenance. The most important measures are those which you carry out yourself 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.

Carrying out the maintenance

Other points:

- Lubricate according to chart
 - Road test tractor. Check during the road test all the functions of the controls and instruments. After the road test, check for oil leaks, check the coolant and fuel system.
 - 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 blocked.
 - Wash down the tractor first so that the work can be done easily and quicker.
- NOTE: Do not let the water get to the electrical equipment when washing the machine.**
- 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.

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.
- Avoid touching the exhaust manifold, turbocharger and other hot parts of the engine.
- Keep the engine surfaces clean in order to avoid the risk of fire.
- The fuel, lubricating oil and coolant cause irritation to skin if in contact for long periods.
- After completion of service work 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.

Scheduled maintenance

The maintenance schedule begins with the running hour meter reading 0. This means that maintenance scheduled at 250 h intervals is performed at meter readings 250 h, 500 h etc., even if the same procedures were carried out at the 50 h maintenance. At the 500 h maintenance, for example, the daily, weekly and 250 hour maintenance procedures must also be undertaken.

Service inspection (after 100 hours)

Your dealer gives a cost-free service inspection (excluding oil and filter costs) to all new tractors after 100 hours running.

The service procedure is as follows:

20 Engine:

- Change engine oil and filter
- Change prefilter, fuel system
- Change fuel filter

40 Power transmission:

- Change pressure filters and hydraulic return filter

60 Front axle and steering system:

- Change oil in differential
- Change oil in hubs

13. Maintenance	https://truckmanualshub.com/	Model	Code	Page
	2.1.2004	T120–T190	130	6

Recommended fuel and lubricants

All volumes are with filters.

Part of machine	Valtra – grade	SAE – grade	API – grade	Volume, when changing (liter)
Engine – T180, T190	Valtra Engine E	10W–30: –20°C...+30°C 15W–40: –10°C...+40°C	CG–4 CH–4	19
Hydraulic system and transmission	Valtra Transmission	HT 60: –30°C...+30°C HT 100: –10°C...+40°C	GL–4 (G2–98)	45 (55 max) (extra max 65)
Industrial front axle – differential	Valtra Axle	80W–90	GL–5 (LS)	7
– hub reduction gears				2x1.5
Front PTO (extra equipment) – T180, T190	Shell Donax TX			2.2
Fuel tank	Diesel fuel which conforms to EN 590 norm			165
– Extra fuel tank				170
Cooling system – T180, T190	water + anti freeze agent (standard ASTM D3306–86a or BS 6580:1985)			31
Brake fluid reservoir	Brake fluid SAE J1703			0,3
Windscreen washer	Washer fluid			11

Part of machine	Valtra – grade	SAE – grade	API – grade	Volume, when changing (liter)
Engine – T120 – T170	Valtra Engine E	10W – 30: – 20 °C... + 30 °C 15W – 40: – 10 °C... + 40 °C	CG – 4 CH – 4	19
Hydraulic system and transmission	Valtra Transmission	HT 60: – 30 °C... + 30 °C HT 100: – 10 °C... + 40 °C	GL – 4 (G2 – 98)	45 (55 max) (extra max 65)
Powered front axle – differential	Valtra Axle	80W – 90	GL – 5 (LS)	8
– hub reduction gears				2x1
– differential industrial axle (standard on T140 – T170)				6
– hub reduction gears ind. axle (standard on T140 – T170)				2x1.5
Front PTO (extra equipment) – T120 – T170	Shell Donax TX			2.2
Fuel tank	Diesel fuel			165
– Extra fuel tank				170
Cooling system – T120, T130	water + anti freeze agent (standard ASTM D3306 – 86a or BS 6580:1985)			28
– T140				30
– T160, T170				27
Brake fluid reservoir	Brake fluid SAE J1703			0,3
Windscreen washer	Washer fluid			11

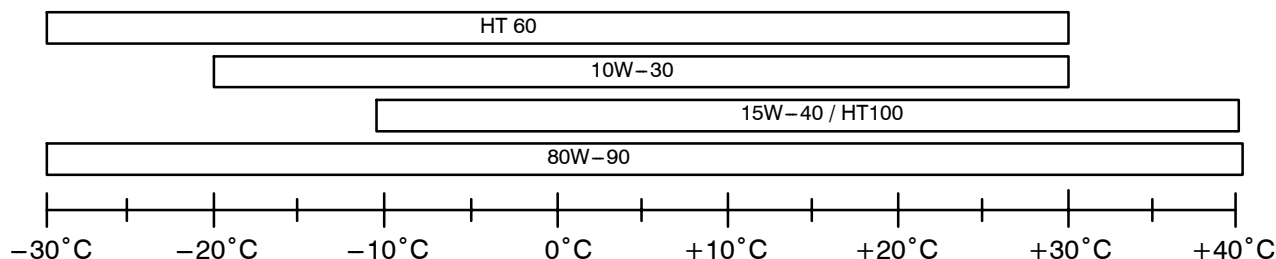
13. Maintenance	https://truckmanualshub.com/	Model	Code	Page
	2.1.2004	M120 – M150	130	7

All volumes are with filters.

Part of machine	Valtra – grade	SAE – grade	API – grade	Volume, when changing (liter)
Engine – M120 – M150	Valtra Engine E	10W – 30: – 20°C... + 30°C 15W – 40: – 10°C... + 40°C	CG – 4 CH – 4	15
Hydraulic system and transmission	Valtra Transmission	HT 60: – 30°C... + 30°C HT 100: – 10°C... + 40°C	GL – 4 (G2 – 98)	45 (55 max) (extra max 65)
Powered front axle – differential	Valtra Axle	80W – 90	GL – 5 (LS)	8
– hub reduction gears				2x1
Industrial front axle (standard on M150) – differential				7
– hub reduction gears				2x1.5
Front PTO (extra equipment) – M120 – M150	Shell Donax TX			2.2
Fuel tank	Diesel fuel which conforms to EN 590 norm			165
– Extra fuel tank				170
Cooling system – M120 – M150	water + anti freeze agent (standard ASTM D3306 – 86a or BS 6580:1985)			22
Brake fluid reservoir	Brake fluid SAE J1703			0,3
Windscreen washer	Washer fluid			11

Oil recommendations according to outdoor temperature

When starting the tractor in a warm garage, oil meant for warmer areas may be used.



The synthetic bio oil can be used in the transmission/hydraulics, which conforms to OECD 301 A–F norm.

Quality requirements of engine fuel

Property	Requirement	Test standard
Specific weight +15°C, ISO 12185	0,82...0,86 kg/litre	ASTM D 4052, EN
Viscosity +40°C, 445, ISO 31041	1,2...4,5 mm ² /s	ASTM D
Sulphur content	max. 0,2 p-%	ASTM D 4294, ISO 8754
Cetane number 4737	min. 51	ASTM D
Water content	max. 200 mg/kg	ASTM D 1744

Fuel

- The properties of light fuel oil that is only intended for warming use do not meet the requirements of modern diesel engines and cannot be used as fuel.
- In particular, distributor-type injector pumps require the fuel to have sufficient lubricity, because they do not have oil lubrication in the same way as typical multi-element pumps. Adding oil to diesel fuel is not recommended, because it causes carbon build-up, and if oil is mixed with even a small amount of water it will clog the filter.
- Additionally, various fuel quality requirements imposed by taxation and seasonal changes have to be taken into consideration.

Fuel storage

- Storing and distributing fuel must be arranged in conditions where no water or impurities can enter the storage tanks. The storage tanks must be installed in a slanted position, so that water and impurities are collected at the opposite end from the suction pipe of the pump. The suction pipe of the pump should not reach the bottom of the tank.
- Water must be periodically drained from the tank in order to prevent problems. Refueling at the same time the tank is being refilled must be avoided without exception.
- When the tank is filled with winter-quality fuel in good time, the engine is guaranteed to run flawlessly during the cold season.

Filter system

- The engine's standard filter system gives sufficient protection for the injection system from impurities that can be present in well-tended distribution systems.
- The control of distributor-type injection pumps is based on internal pressure, which will drop if the fuel system is clogged. If the pilot pressure drops too low, engine power is reduced, smoke increased and starting becomes more difficult. Additionally, water in the injection system will destroy it in a very short time. **For this reason, the water trap and the filters must always be serviced according to the specified amount of running hours.**
- It is also important always to use original Valtra (or Sisu Diesel) fuel filters. They guarantee sufficient filtration, preventing impurities from damaging the fuel system. There are many cheap filter kits (so-called pirates) on the market, with lower quality and performance in order to minimise the cost. Among other things, the quality and amount of filter paper are often insufficient. There are also often dangerous defects in the basic structure that may cause expensive damage even in a short period of time.

Grease

Always use the following greases in Valtra tractors. Each point requires its own type of grease.

Valtra Grease, Universal grease

Lithium–based universal grease. Is suitable for greasing all heavy machines.
–30° ... +130° C

Universal grease of high quality, lithium based grease for vehicle use. It is recommended for greasing wheel bearings, chassis water pumps, caterpillar rollers etc. The grease is adhesive, protects against corrosion and resists water and varying temperatures.

Temperature range is –30° ... +130° C.

Valtra Calcium LF, Calcium Grease LF

Is suitable for greasing all heavy machines. Long fibre grease. Colour red.
–20° ... +60° C

Calcium LF is of long fibre, high quality and calcium based universal grease for vehicle use. It is recommended for greasing chassis, water pumps, pins etc. The grease is adhesive, protects against corrosion and resists water and varying temperatures. Temperature range is –20° ... +60° C.

Valtra Grease Moly

Is suitable for greasing all heavy machines. Lithium–based universal grease.
–30° ... +130° C

Universal grease of high quality, lithium based grease for vehicle use. It is recommended for greasing wheel bearings, chassis water pumps, caterpillar rollers etc. The grease is adhesive, protects against corrosion and resists water and varying temperatures.

Temperature range is –30° ... +130° C.

Avoid repeating skin contact.

Protect nature and take care of empty packages.

Maintenanceschedule

The same numbering system as used on the detached maintenance schedule are placed in brackets where applicable.

Daily maintenance

1. Check engine oil level.
2. Check coolant level, radiator fins and front grilles of the engine cover.
3. Check for oil and fluid leaks.

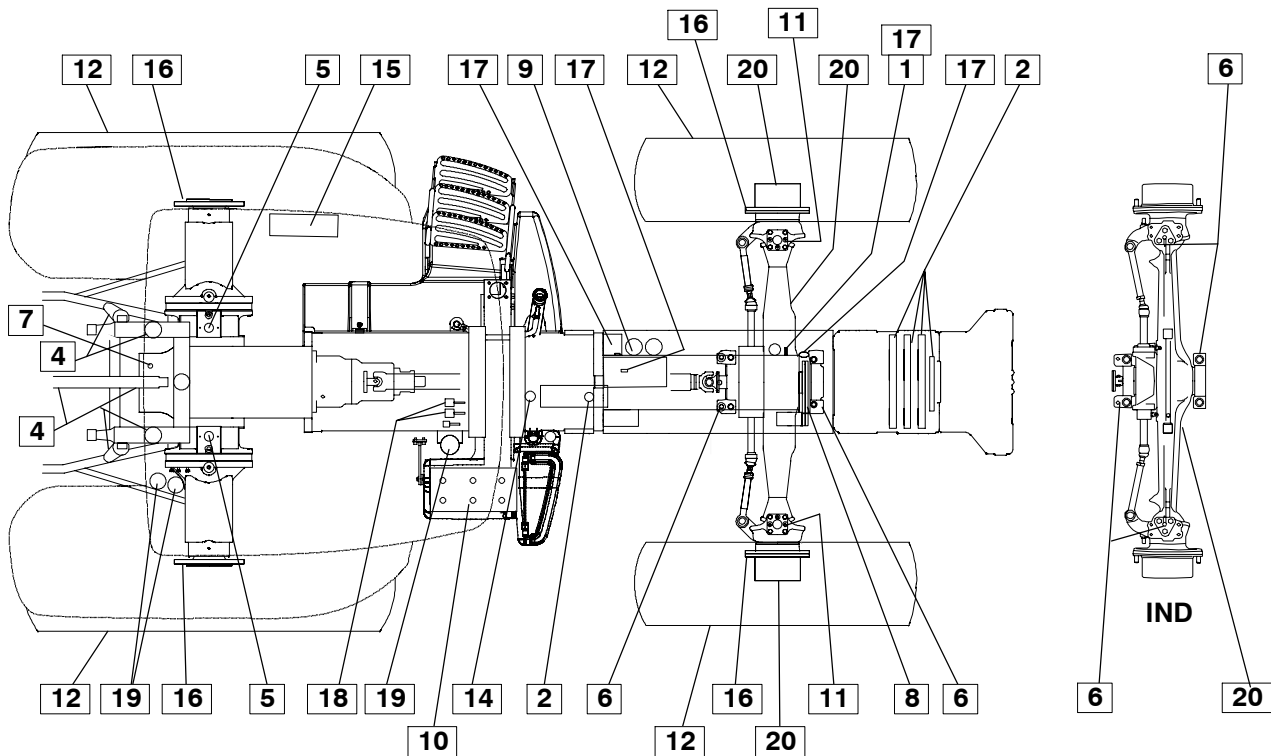
Weekly maintenance

4. Grease three–point linkage and towing device (towing devices are available as extra equipment).
5. Grease brake mechanism (high pressure grease).
6. Grease front axle mounting nipples (all models) and steering knuckles of industrial axle.
7. Check oil level in transmission and hydraulics.
8. Check belt/belts tightness (replace belts if necessary).
9. Check fuel system prefilter and sediment bowl.
10. Check electrolyte level in battery.
11. Grease the drive shaft joint nipples of the agricultural front axle.
12. Check tyre/tire pressure.

Every 500 hours

13. Grease door hinges.
14. Check brake fluid level.
15. Clean cab ventilation air filter (more often when needed).
16. Check wheel nuts tightness.
17. Change engine oil and filter (or yearly), in extremely dusty conditions at 250–hour.
18. Check brake pedal free travel.
19. Change pressure filters of the transmission and hydraulics and also hydraulic return oil filter or if the filter indicator lamp illuminates.
20. Check oil level in front axle differential and hubs.

NOTE: When carrying out servicing you must follow the service intervals, you must also do all previously mentioned items. For example, when doing 500 hours service you must also do the servicing required at weekly and daily.



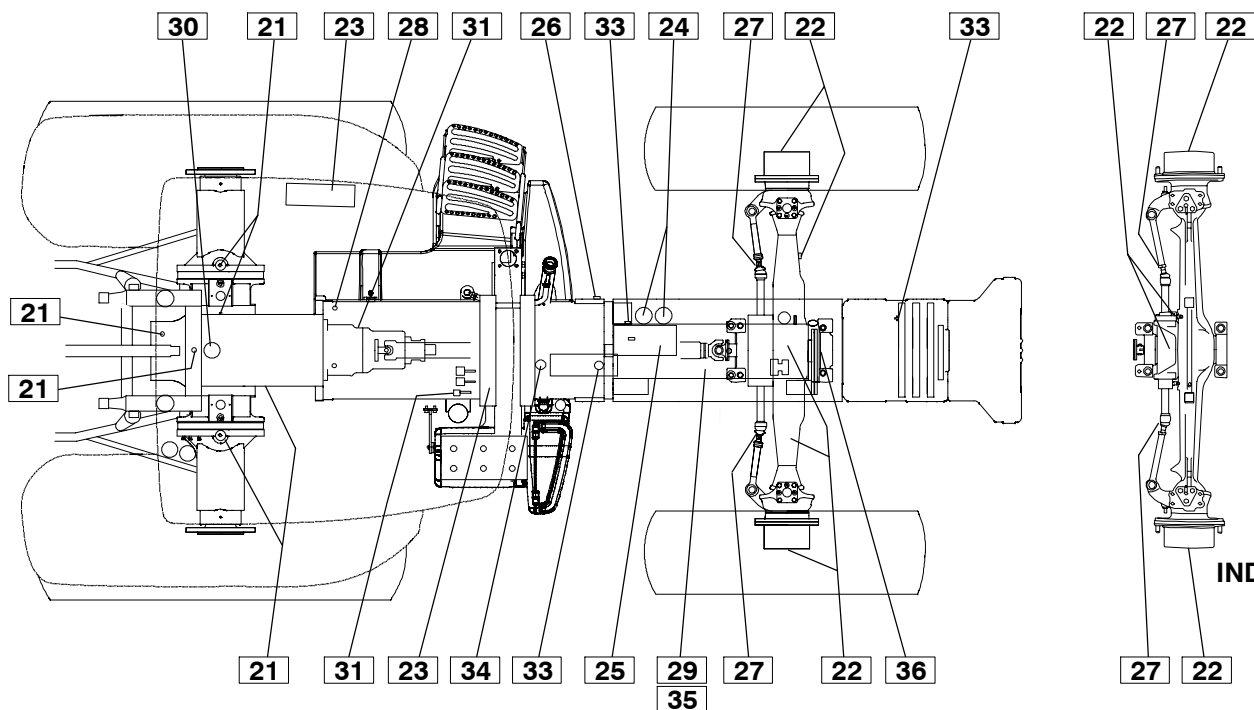
Every 1000–hour

21. Change oil in transmission/hydraulics and clean suction strainer.
22. Change oil in front axle differential and hubs.
23. Change cab ventilation air filter and recirculation filter.
24. Change fuel filter and prefilter.
25. Change air filter and safety filter.
26. Grease flywheel ring gear.
27. Check/adjust front wheel toe–in.
28. Clean fuel tank.
29. Adjust valves.
30. Change transmission housing breather.
31. Accelerator pedal calibration and checking of power shuttle operation.
32. Tighten frame nuts and bolts.

Every 2000 hours or every other hour

33. Clean cooling system.
34. Change brake fluid.
35. Check and clean injectors.
36. Check/change engine vibration damper on models which have rubber vibration dampers

NOTE: When carrying out servicing you must follow the service intervals, i.e., you must also do all previously mentioned items. For example, when doing 2000 hours service you must also do the servicing required at 1000, 500, weekly and daily.



The same numbering system as used on the detached maintenance schedule are placed in brackets where applicable.

Daily maintenance

1. Check engine oil level.
2. Check coolant level, radiator fins and front grilles of the engine cover.
3. Check for oil and fluid leaks.

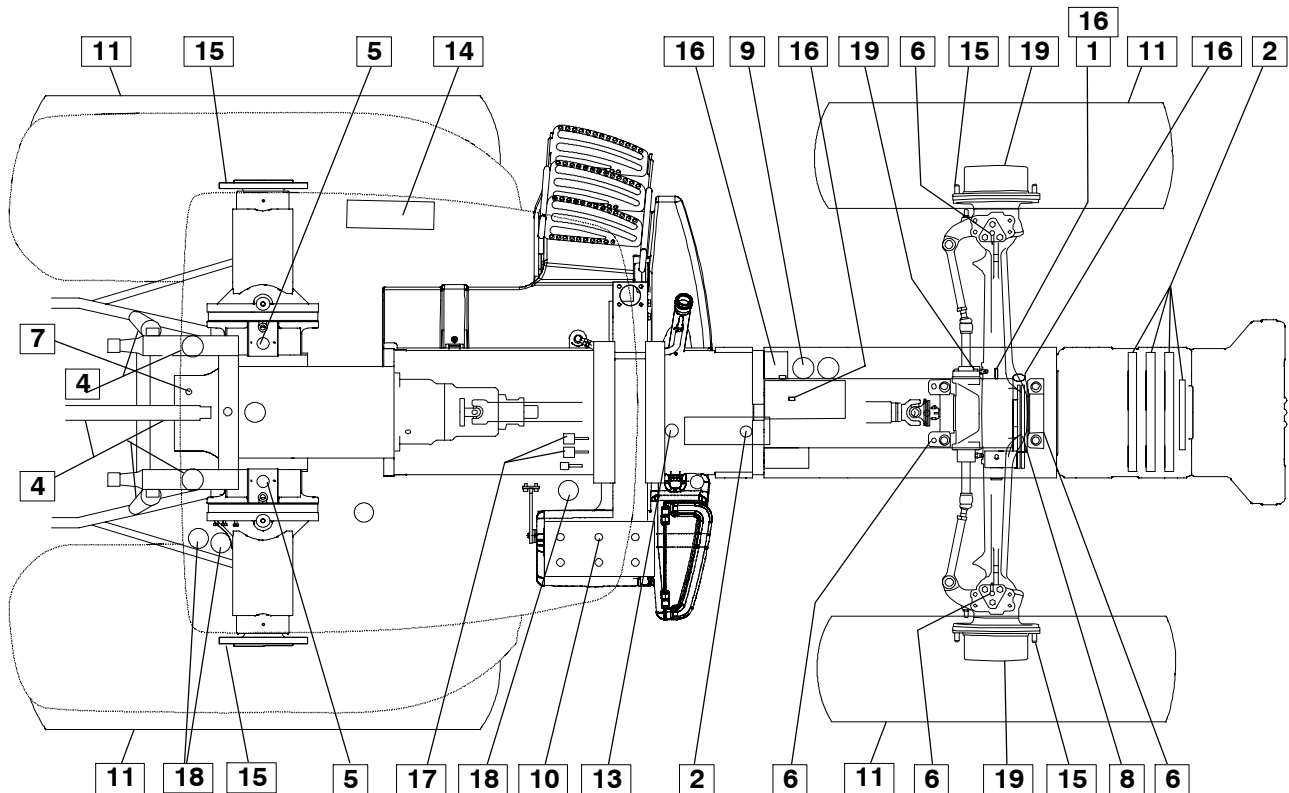
Weekly maintenance

4. Grease three–point linkage and towing device (towing devices are available as extra equipment).
5. Grease brake mechanism (high pressure grease).
6. Grease front axle mounting nipples and steering knuckles of industrial axle.
7. Check oil level in transmission and hydraulics.
8. Check belt/belts tightness (replace belts if necessary).
9. Check fuel system prefilter and sediment bowl.
10. Check electrolyte level in battery.
11. Check tyre/tire pressures.

Every 500 hours

12. Grease door hinges.
13. Check brake fluid level.
14. Clean cab ventilation air filter (more often when needed).
15. Check wheel nuts tightness.
16. Change engine oil and filter (or yearly), in extremely dusty conditions at 250–hour.
17. Check brake pedal free travel.
18. Change pressure filters of the transmission and hydraulics and also hydraulic return oil filter or if the filter indicator lamp illuminates.
19. Check oil level in front axle differential and hubs.

NOTE: When carrying out servicing you must follow the service intervals, you must also do all previously mentioned items. For example, when doing 500 hours service you must also do the servicing required at weekly and daily.



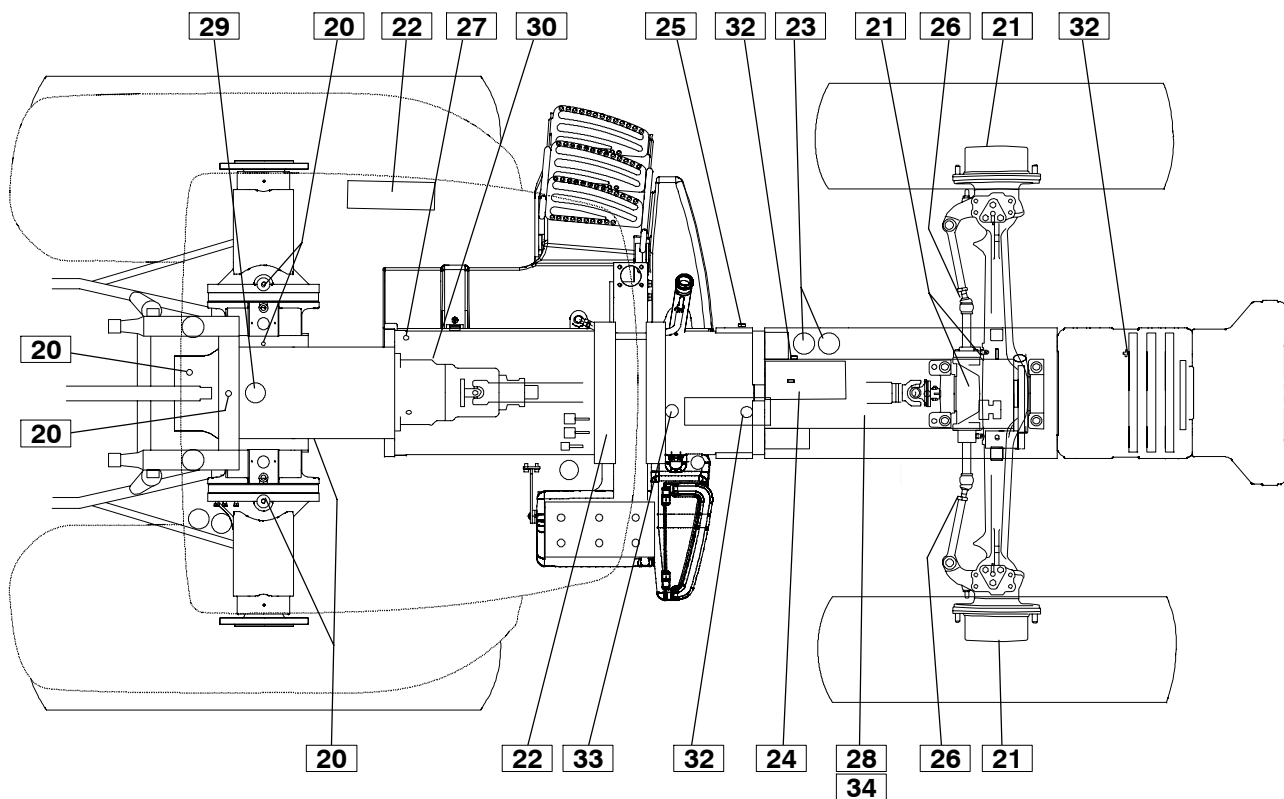
Every 1000–hour

20. Change oil in transmission/hydraulics and clean suction strainer.
21. Change oil in front axle differential and hubs.
22. Change cab ventilation air filter and recirculation filter.
23. Change fuel filter and prefilter.
24. Change air filter and safety filter.
25. Grease flywheel ring gear.
26. Check/adjust front wheel toe–in.
27. Clean fuel tank.
28. Adjust valves.
29. Change transmission housing breather.
30. Checking of power shuttle operation.
31. Tighten bolts and screws of the tractor frame.

Every 2000 hours or every other hour

32. Clean cooling system.
33. Change brake fluid.
34. Check and clean injectors.

NOTE: When carrying out servicing you must follow the service intervals, i.e., you must also do all previously mentioned items. For example, when doing 2000 hours service you must also do the servicing required at 1000, 500, hours, weekly and daily.



The same numbering system as used on the detached maintenance schedule are placed in brackets where applicable.

Daily

1. Check engine oil level
2. Check coolant level, radiator fins and front grilles of the engine cover
3. Check for oil and fuel leaks

Weekly

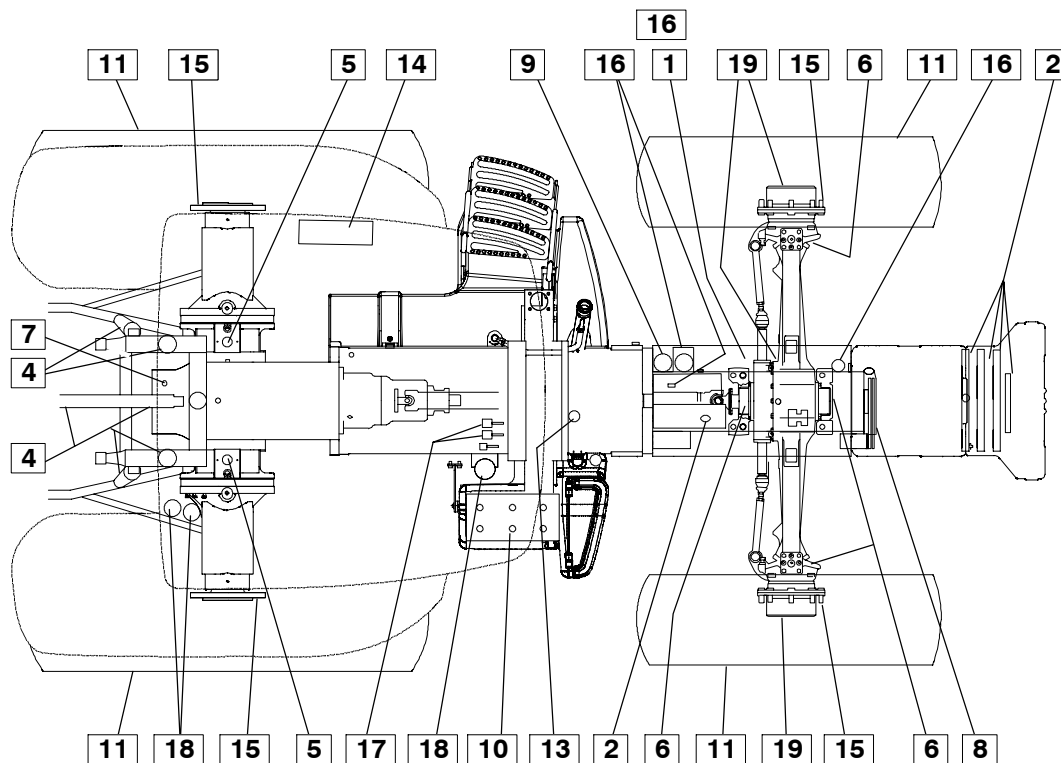
4. Grease three–point linkage and towing device (towing devices are available as extra equipment)
5. Grease brake mechanism (high pressure grease)
6. Grease front axle mounting nipples (all models) and drive shaft joint nipples of the agricultural front axle
7. Check oil level in transmission and hydraulics
8. Check belt/belts tightness (replace belts if necessary)

9. Check fuel system prefilter and sediment bowl
10. Check electrolyte level in battery
11. Check tyre/tire pressures

Every 500 hours

12. Grease door hinges
13. Check brake fluid level
14. Clean cab ventilation air filter (more often if needed)
15. Check wheel nuts tightness
16. Change engine oil and filter (or yearly), in extremely dusty conditions at 250–hour
17. Check brake pedal free travel
18. Change pressure filters of the transmission and hydraulics and also hydraulic return oil filter if the filter indicator lamp illuminates
19. Check oil level in front axle differential and hubs

NOTE: When carrying out servicing you must follow the service intervals, you must also do all previously mentioned items. For example, when doing 500 hours service you must also do the servicing required at weekly and daily.



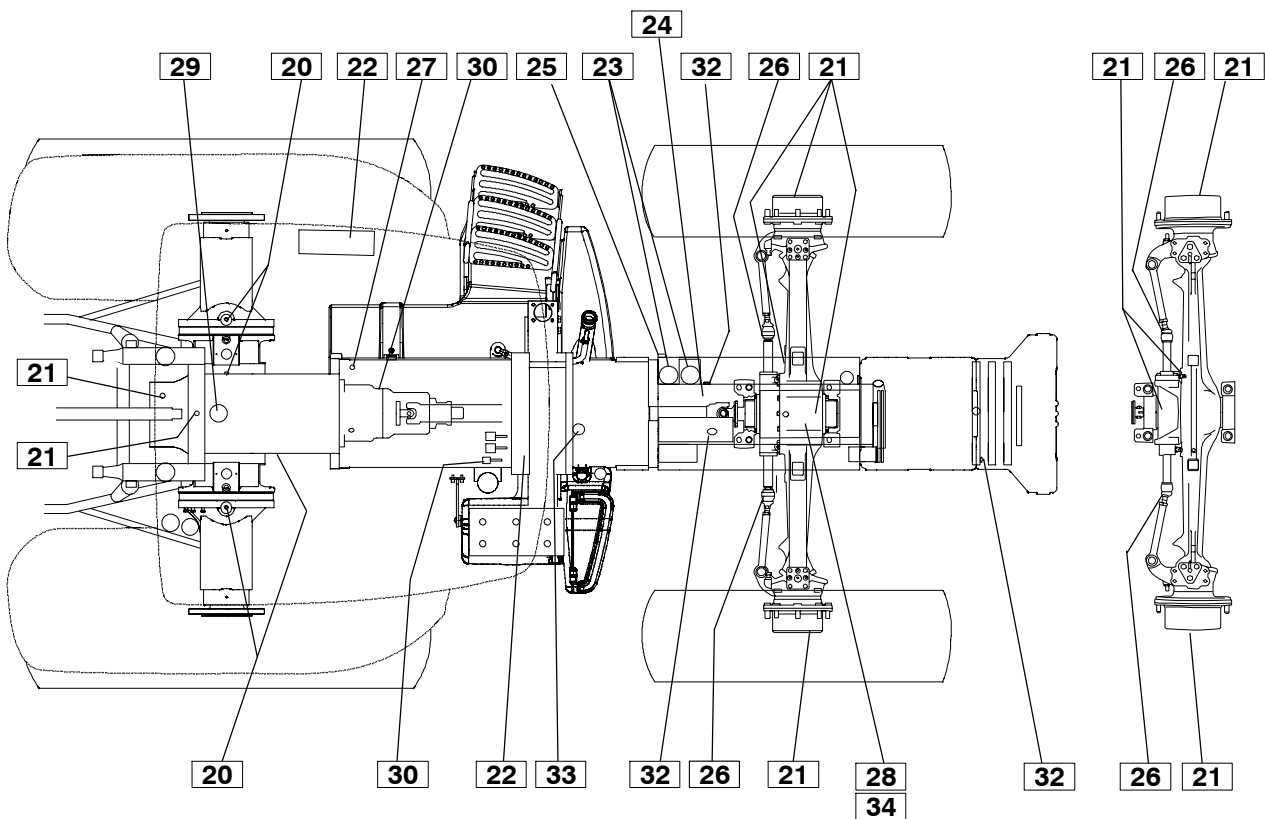
Every 1000 hours / yearly

20. Change oil in transmission/hydraulics and clean suction strainer
21. Change oil in front axle differential and hubs
22. Change cab ventilation air filter and recirculation filter
23. Change fuel filter and prefilter
24. Change air filter and safety filter
25. Grease flywheel ring gear
26. Check/adjust front wheel toe—in
27. Clean fuel tank
28. Adjust valves
29. Change transmission housing breather
30. Accelerator pedal calibration and checking of power shuttle operation
31. Tighten frame nuts and bolts

Every 2000 hours / every other year

32. Clean cooling system
33. Change brake fluid
34. Check and clean injectors

NOTE: When carrying out servicing you must follow the service intervals, i.e., you must also do all previously mentioned items. For example, when doing 2000 hours service you must also do the servicing required at 1000, 500 hours, weekly and daily.



14. Common technical specifications			Model	Code	Page
	2.1.2004		T120–T190 M120–M150	140	1

Tractor model	T120	T130	T140	T160	T170	T180	T190
Engine type	66 ET	66 ET	66ETA	66ETA	74 ETA	74ETA	74ETA
Compression pressure (MPa)	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1	16,5:1
Oil pressure, normal (kPa)	250–400	250–400	250–400	250–400	250–400	250–400	250–400
Oil pressure, min. (kPa)	100	100	100	100	100	100	100
Clearance, induction valve (mm)	0,35	0,35	0,35	0,35	0,35	0,35	0,35
Clearance, exhaust valve (mm)	0,35	0,35	0,35	0,35	0,35	0,35	0,35
Injector opening pressure (MPa)	27	27	27	27	27	27	27
Injector setting pressure (MPa)	27,8	27,8	27,8	27,8	27,8	27,8	27,8
Fitting position ° BTDC (static)	5°	5°	5°	5°	5°	5°	5°
Engine speed, idle (rpm)	850	850	850	850	850	850	850
Engine max. speed (rpm)	2400	2500	2000	2300	2300	2300	2300
Battery voltage (V)	12	12	12	12	12	12	12
Capacity (Ah)	174	174	174	174	174	174	174
Accelerator pedal free play (mm)							
PTO output at 540 rpm/min. (kW)							
PTO output at 1000 rpm/min. (kW)	71	82	89	99	104	116	129
Brake pedal free play (mm)	70–80	70–80	70–80	70–80	70–80	70–80	70–80
Parking brake free play (mm)							
Toe-in (mm)	0–2	0–2	0–2	0–2	0–2	0–2	0–2
Ratio, front axle/rear axle, 40km/h	1,309	1,309	–	1,327	1,327	1,327	1,327
Ratio, front axle/rear axle, 50km/h	1,315	1,315	1,320	1,320	1,320	1,320	1,320
Max. working pressure (steering, MPa)	14	14	14	14	14	14	14
Low pressure circuit max. pressure (MPa)	1,8	1,8	1,8	1,8	1,8	1,8	1,8
Low pressure circuit pump capacity at max. engine speed (l/min.)	28	28	25	30	30	30	30
High pressure circuit max. pressure (MPa)	19,6	19,6	19,6	19,6	19,6	19,6	19,6
Shock valve opening pressure of pump avautumispaine (MPa)	23	23	23	23	23	23	23
High pressure circuit pump capacity at max. engine speed (l/min.)	91	91	82	87	87	87	87
Hydraulic linkage max. lifting force (kN)	77	77	77	77	77	77	77
Capacities (l)							
Engine	6,6	6,6	6,6	6,6	7,4	7,4	7,4
Cooling system	28	28	30	27	27	31	31
Air conditioning	1,4	1,4	1,4	1,4	1,4	1,4	1,4
Transmission	45	45	45	45	45	45	45
Fillings (l)							
Differential	8	8	6/8	6/8	6/8	6/8	6/8
Poles	2x1	2x1	2x1,5	2x1,5	2x1,5	2x1,5	2x1,5
Fuel tank	165	165	165	165	165	165	165
Filters service (change) intervals (h)							
Oil filter	500	500	500	500	500	500	500
Fuel filter	1000	1000	1000	1000	1000	1000	1000
Air filter	1000	1000	1000	1000	1000	1000	1000
Safety filter	1000	1000	1000	1000	1000	1000	1000
Prefilter	1000	1000	1000	1000	1000	1000	1000
Recirculation filter	1000	1000	1000	1000	1000	1000	1000
Pressure filters	500	500	500	500	500	500	500
Return oil filter	500	500	500	500	500	500	500
Transmission housing breather	1000	1000	1000	1000	1000	1000	1000
Tightening torques (Nm)							
Cylinder head bolts and nuts	1)	1)	1)	1)	1)	1)	1)
Main bearing screws	200	200	200	200	200	200	200
Connecting rod screws	40+90°	40+90°	40+90°	40+90°	40+90°	40+90°	40+90°
Flywheel housing screws (M12/M10)	110/60	110/60	110/60	110/60	110/60	110/60	110/60
Crankshaft nut	1000	1000	1000	1000	1000	1000	1000
Exhaust manifold screws	50	50	50	50	50	50	50
Injector nozzle sleeve	60	60	60	60	60	60	60
Injector attaching nuts (on studs)	15	15	15	15	15	15	15
Wheel nuts	550	550	550	550	550	550	550
Rim–wheel disc	310	310	310	310	310	310	310

1) 80 Nm + 90° + 90°

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.

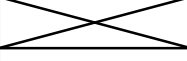
20. Engine

21. Engine

22. Fuel system

23. Cooling system

24. Engine control system

21. Engine		Model	Code	Page
		T120–T190 M120–M150	210	1

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Cooling system	14
Inlet and exhaust system	15

Work instructions:

Cylinder block (code 211):

Measuring cylinder liner wear	1
Removing cylinder liner	1
Checking cylinder block	1
Changing camshaft bushings	2
Fitting plug at camshaft rear end	3
Oversize bushings for camshaft	3
Fitting plug at camshaft rear end	3
Fitting cylinder liner	4

Flywheel housing (code 212):

Fitting flywheel housing	1
Changing crankshaft rear oil seal	1

Cylinder head and valve mechanism (code 213):

Removing cylinder head	1
Removing valves	1
Checking cylinder head	1
Changing valve guides	2
Machining valve seat	2
Changing valve seat rings	3
Grinding valves	3
Fitting valves	3
Fitting cylinder head	4
Reconditioning valve mechanism	5
Changing camshaft / camshaft gear	5
Adjusting valves	6

Crankshaft engine (code 214):

Removing crankshaft	1
Checking crankshaft	1
Changing crankshaft gears	1
Fitting crankshaft	2
Checking element of the rubber damper	3
Viscose type vibration damper	3
Changing crankshaft pulley / vibration damper	4
Removing pistons together with connecting rods	5
Changing connecting rod bearings	5
Changing connecting rod	5
Changing piston rings	6
Checking pistons	7
Fitting piston together with connecting rod	7
Changing starter ring gear on flywheel	9
Fitting flywheel	9

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Counterbalance (code 215):

Removing and disassembling counterbalance unit	1
Reconditioning counterbalance unit	1
Fitting counterbalance unit	1
Changing crankshaft gear rim	2

Timing gear assembly (code 216):

Removing timing gear casing	1
Reconditioning idler gear	1
Fitting timing gear casing	2
Idler gear with bevelled ball bearings	3
Power take – off	4

Lubrication system (code 217):

Oil pressure regulating valve	1
Removing and dismantling lubricating oil pump	1
Assembling and fitting lubricating oil pump	1
Piston cooling nozzles	2
Fitting oil sump gasket	2
Lubricating oil cooler	3
Lubricating oil quality requirements	3

Inlet and exhaust system (code 218):

Checking air cleaner	1
Checking inlet and exhaust pipes	1
Checking turbocharger	1
Fitting turbocharger	2

Safety instructions (code 219)

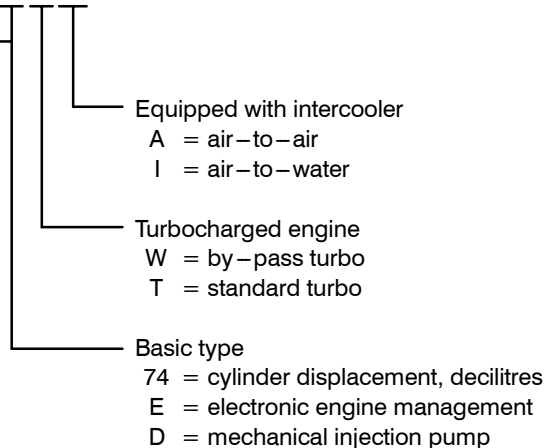
Technical specifications

Model	T 120	T 130	T 140
Designation	66 ET	66 ET	66 ETA
Type	Four - stroke direct injection diesel engine		
Turbocharged and intercooler	yes	yes	yes, intercooler
Number of cylinders	6	6	6
Numbering of cylinders (fr. front)	1–2–3–4–5–6	1–2–3–4–5–6	1–2–3–4–5–6
Cylinder bore, mm	108	108	108
Stroke, mm	120	120	120
Cylinder displacement, dm ³	6,6	6,6	6,6
Compression ratio	16,5:1	16,5:1	16,5:1
Max. output, DIN kW/(hp)/r/min (ISO 14396)	88/(120/2200)	99/(135/2200)	106,5/(145/1800)
Max Torque, Nm/r/min (ISO 14396)	505/1400	550/1400	655/1100
Max. no load speed, r/min	2400	2400	2000
Low idling speed, r/min	850	850	850

Model	T 160	T 170
Designation	66 ETA	74 ETA
Type	Four - stroke direct injection diesel engine	
Turbocharged and intercooler	yes, intercooler	yes, intercooler
Number of cylinders	6	6
Numbering of cylinders (fr. front)	1–2–3–4–5–6	1–2–3–4–5–6
Cylinder bore, mm	108	108
Stroke, mm	120	134
Cylinder displacement, dm ³	6,6	7,4
Compression ratio	16,5:1	16,5:1
Max. output, DIN kW/(hp)/r/min (ISO 14396)	117,5/(160/2100)	125/(170/2100)
Max Torque, Nm/r/min (ISO 14396)	650/1400	655/1400
Max. no load speed, r/min	2300	2300
Low idling speed, r/min	850	850

Engine type designations

66 ETA



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Technical specifications

Model	T 180	T 190
Designation	74ETA	74ETA
Type	Four - stroke direct injection diesel engine	
Turbocharged	yes, intercooler	yes, intercooler
Number of cylinders	6	6
Numbering of cylinders (fr. front)	1–2–3–4–5–6	1–2–3–4–5–6
Cylinder bore, mm	108	108
Stroke, mm	134	134
Cylinder displacement, dm ³	7,4	7,4
Compression ratio	16,5:1	16,5:1
Max. output, DIN kW/(hp)/r/min (ISO 14396)	129/(175)/2100 139,5/(190)/2100 ³⁾	129/(175)/2100 ¹⁾ 139,5/(190)/2100 ³⁾ 154,5/(210)/2100 ²⁾
Max Torque, Nm/r/min (ISO 14396)	660/1400 745/1400 ³⁾	660/1400 ¹⁾ 745/1400 ³⁾ 830/1400 ²⁾
Max. no load speed, r/min	2300	2300
Low idling speed, r/min	850	850

¹⁾ Sigma Power model, the smaller output area. ²⁾ Sigma Power model, the larger output area, the output/torque is available only from power take–off, ³⁾ + Power output range.

Technical data

Cylinder block

Holes for guide pins	13,250...13,320 mm
Main bearing housing diameter	91,000...91,025 mm
Main bearing housing diameter (with bearing 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
Height of cylinder block	428,170...428,430 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	108,010...108,032 mm

Cylinder head

Height of the cylinder head	104,800...105,000 mm
Height of the cylinder head after repair grinding (minium)	104,000 mm
Inside diameter of the valve guide (not fitted)	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
Position of valve guide top above cylinder head surface	21 mm
Depth of valve head face below cylinder head surface:	
- inlet valve	0,7±0,05 mm (max. 2,20 mm)
- exhaust valve	0,6±0,05 mm (max. 2,20 mm)
Angle of valve seat:	
- inlet valve	35°+20'
- exhaust valve	45°+20'
Width of valve seat:	
- inlet valve	2,9...3,7 mm
- exhaust valve	1,3...2,3 mm

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Diameter of exhaust valve seat ring	44,070...44,132 mm
Diameter of exhaust valve seat rings recess	44,000...44,025 mm
Diameter of exhaust valve seat ring (overhaul part 8366 52269)	44,270...44,332 mm
Diameter of exhaust valve seal ring recess (overhaul part 8366 52269)	44,200...44,225 mm
Diameter of inlet valve seat ring	48,570...48,632 mm
Diameter of inlet valve seat ring recess	48,500...48,525 mm
Diameter of inlet valve seat ring (overhaul part 8368 55347)	48,770...48,832 mm
Diameter of inlet valve seat ring recess (overhaul part 8368 55347)	48,700...48,725 mm

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 (max. 2,20 mm)
- exhaust valve	0,6±0,05 mm (max. 2,20 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 22,970...22,990

Diameter of rocker arm bore 23,000...23,021

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

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Camshaft

Diameter of camshaft bearing journal no 1	49,925...49,950 mm
Diameter of camshaft bearing journals (others than no. 1)	49,885...49,910 mm
Diameter of camshaft bearing journals nos 2, 3 and 4 (66/74/84-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 (66/74/84-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

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 housing 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
- bearing 8361 40950	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 (44-engines)	150,220...150,260 mm
Balancing unit ring gear I.D. (44-engines)	150,000...150,040 mm

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Flywheel

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

Balancing unit, 44-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...0,3 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

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
Idle gear (slide bearing)	
- Idler gear shaft, diameter	54,951...54,970 mm
- Inner diameter of idler gear bushing (fitted)	55,000...55,030 mm
Idle gear (slide bearing, 50 mm length shaft)	
- Idler gear shaft, diameter	55,151...55,170 mm
- Inner diameter of idler gear bushing (fitted)	55,200...55,230 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

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	44,080...44,120 mm
Outside diameter of piston pin bush (oversize 8353 28326)	44,580...44,620 mm
Interference fit: connecting rod small end bushing-connecting rod	0,057...0,120 mm
Connecting rod small end bore	44,000...44,025 mm
Connecting rod small end bore (oversize bush)	44,500...44,525 mm
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

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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; weight marking at valve mechanism side (away from the combustion chamber in the piston)	

Piston, rings and pin

Minimum distance between piston and cylinder head (measured with a piece of lead wire through the injector location hole)	0,900...1,150 mm
Piston diameter:	
- 17 mm from lower edge (44/66-engines)	107,873...107,887 mm
- 19 mm from lower edge (74-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)	2,560...2,580 mm
- 2nd groove	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)	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)	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)	0,40...0,55 mm
- 1st ring (right-angled ring)	0,30...0,45 mm
- 2nd ring	0,60...0,80 mm
- 3rd ring	0,30...0,60
- reject limit 1st and 3rd ring	1,0 mm
- reject limit 2nd ring	1,5 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.	

Lubricating system

Oil pressure at normal running temperature:	
- at idling speed (min.)	1,0 bar
- at running speed	2,5...5,0 bar
Oil pressure regulating valve (engines w/o oil cooled piston)	
Free length of oil pressure valve spring	49,5 mm
Assembly length / load of oil pressure valve spring	28,5 mm / 76 N
Oil pressure regulating valve (engines with oil cooled piston)	
Free length of oil pressure valve spring	49,8 mm
Assembly length / load of oil pressure valve spring	28,5 mm / 127 N
Oil filter by-pass valve opens at a pressure difference of	2±0,5 bar

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Oil pump, 44-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 shaft at bearings for body and cover	17,966...17,984 mm
Diameter of shaft holes on body and cover	18,000...18,018 mm
Diameter of gear wheel hole	18,060...18,078 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 (33/44-engines)	55 pcs
Number of teeth on drive gear (44-engines)	60 pcs

Oil pump, 66– and 74–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 shaft at bearings for body and cover	17,966...17,984 mm
Diameter of drive shaft bearing hole on body and cover	18,000...18,018 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 mm
Thickness of cover gasket	0,06...0,08 mm
Outer diameter of gear wheels	55,824...55,870 mm
Housing diameter	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

Coolant pump, 44-engines

Outside diameter of bearing	52 mm
Diameter of bearing housing	51,979...52,009 mm
Shaft diameter at bearing	20,002...20,015 mm
Shaft diameter at impeller	15,907...15,920 mm
Impeller hole diameter	15,876...15,894 mm
Diameter of fan hub	0,3 Ncm max.
Max. permissible eccentricity of fan	±0,3 mm
The fan belt tension pushing from the middle, deflection from the line	10...15 mm

Coolant pump, 66– and 74–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 mm
Impeller hole diameter	15,876...15,894 mm
Diameter of the seal recess in the pump body	36,450...36,489 mm
Balancing precision of fan	0,3 Ncm max.
Belt deflection	10...15 mm
Pump equipped with reinforced bearing	
Outer diameter of the front bearing	95 mm
Bearing up diameter in water pump wheel	95,000...95,035 mm
Outer diameter of bearings position in pump frame	59,991...60,009 mm

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Turbocharger

Schwitzer

	S1A	S1B	S2A	S2B
Axial clearance max.	0,14 mm	0,14 mm	0,14 mm	0,14 mm
Radial clearance (compressor end) max.	0,61 mm	0,51 mm	0,82 mm	0,95 mm
Compressor wheel locknut torque	6,8 Nm	8,1 Nm	10,2 Nm	15,6 Nm
Compressor housing screws torque	13,6 Nm	13,6 Nm	13,6 Nm	13,6 Nm
Turbine housing screws torque	21,0 Nm	21,0 Nm		21,0 Nm

Schwitzer

	S100	S200	S300
Axial clearance max.	0,10 mm	0,10 mm	0,12 mm
Radial clearance (compressor end) max.	0,82 mm	0,88 mm	0,88 mm
Compressor wheel locknut torque	6,8 Nm	13,6 Nm	20,3 Nm
Compressor housing screws torque	13,6 Nm	13,6 Nm	13,6 Nm
Turbine housing screws torque	21,0 Nm	21,0 Nm	21,0 Nm

Tightening torques

Object	Nm
Cylinder head bolts and nuts	80 Nm + 90° + 90°
Cylinder head studs to cylinder block	30
Main bearing screws	200
Connecting rod screws	40 Nm + 90°
Crankshaft nut, 33/44	600
Crankshaft nut, 66/74/84	1000
Crankshaft pulley screws	30
Crankshaft pulley screws, 84	80
Flywheel screws	150
Flywheel screws, 84	200
Flywheel housing screws:	
- M12	110
- M10	60
Idler gear screws, 33/44/66:	
- M10	60
- M14	200
Idler gear screws (with ball bearing), 66/74/84:	
- M14	180
- M8	22
Piston cooling valve	30
Oil pump retaining screws	60
Oil cooler connecting piece	60
Coolant pump pulley screw, 33/44	80
Coolant pump pulley nut, 66/74	120
Coolant pump gear nut, 84	180
Belt tightener screw	48
Exhaust manifold screws	50
Injector attaching nuts (on studs)	15
Injector nozzle sleeve	60

Always use the torque values listed in the following tables when specific torque values are not available.
Use a washer with the aluminium parts.

Thread	Strength class	
	8.8	10.9
M8	25 Nm	35 Nm
M10	50 Nm	75 Nm

General

The 44–, 66– and 74–engine series consists of water-cooled in-line diesel engines with four and six cylinders. The turbocharged engines are equipped with wet, changeable cylinder liners.

The all engine types 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 66– and 74–engines have separate bearing sleeves in all camshaft bearing locations. The drilling for the camshaft rear end is covered with a plug.

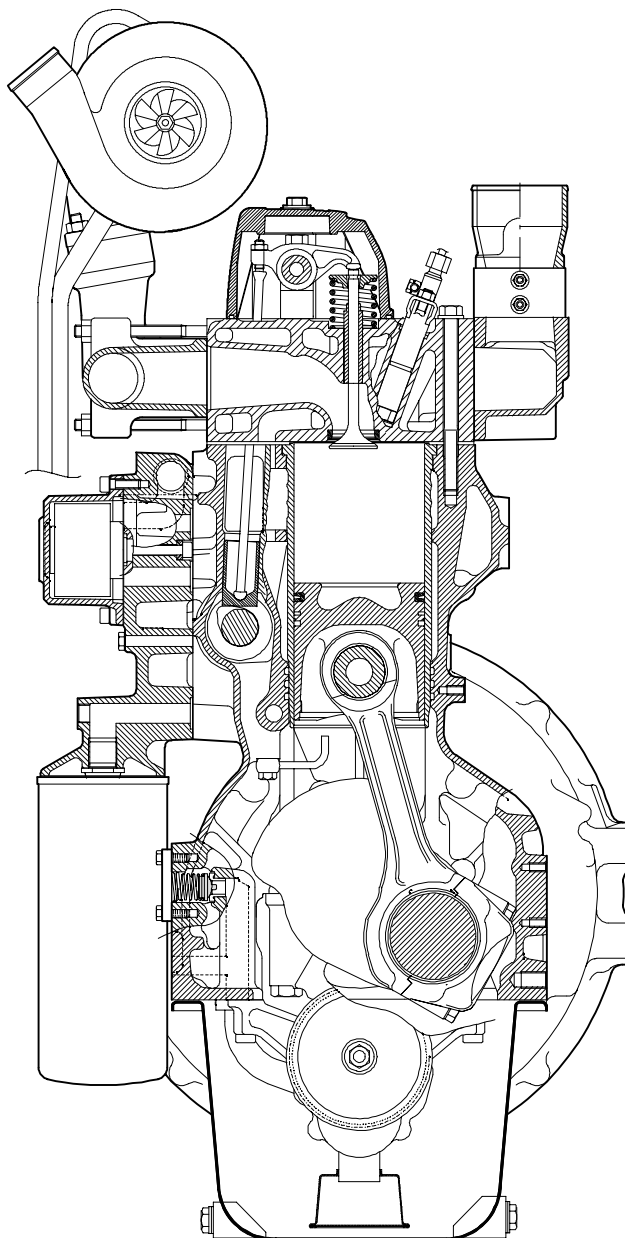
There are spaces on both sides of the rear main bearing for guide bearing shims (the crankshaft thrust bearings).

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.

The flywheel housing are delivered according to the requirements set, by the engine application and different flywheel housings can be mounted on all engine types.



Cylinder head

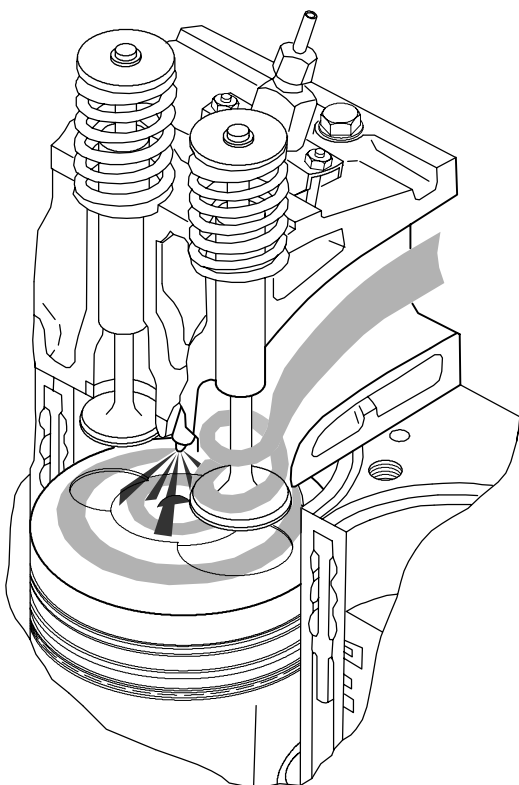
44-engines have one cylinder head. 66– and 74-engines have two cylinder heads which are exchangeable with each other. Each cylinder has its own inlet and exhaust ports located on either side of the head. Between hot exhaust valves a cool inlet valve is fitted to balance the thermal load.

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. Exhaust valves are fitted with separate valve seat rings. Also the engines with high output are equipped with separate inlet valve seats.

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 push rods. 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 cylinder 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 connecting rod has an I-section cross-section. The bearing location at the bottom end of the connecting rod is fracture-split, and the bearing cup is secured by two special elongated screws. 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 upper ring location is formed in a cast iron ring which is cast in the piston. In addition, the piston is graphite coated to ensure correct running-in.

The piston has three rings. The upper molybdenum-coated ring has a wedge-shaped cross-section. On some 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.

Some four-cylinder engines (44) 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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