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Service Manual

Track excavator

6003



Machine model	**6003**
Edition	**2.0**
Language	**English**
Article number	**1000129840**

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Documentation

Description	***Order no.***
Operator's Manual	1000127717
Service manual	1000129840
Spare parts catalogue:up to serial no. AD07210	1000127435
from serial no. AH00645	1000182716

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The cover features the machine with possible optional equipment.

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A-4060 Linz-Leonding

Document: SERV-HB 6003 EN
Order no.: 1000129840
Edition: 2.0

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Operation

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1 Operation

1.1 Important information on this service manual

This service manual contains important information on how to service your machine safely, correctly and economically. Therefore, it aims not only at new operators, but it also serves as a reference for experienced ones. Your knowledge and skills will help to avoid dangerous situations and reduce repair costs and downtimes. Furthermore, the reliability and the service life of the machine will be increased by following the instructions in the service manual.

Careful and prudent working is the best way to avoid accidents!

Operational safety and readiness of the machine do not only depend on your skill, but also on maintenance and servicing of the machine.

Insist on using original spare parts when carrying out maintenance and repair work. This ensures operational safety and readiness of your machine, and maintains its value.

Your Neuson After-Sales Service will be pleased to answer any further questions regarding the machine or the service manual.

Abbreviations/symbols

- This symbol stands for a list
  - Subdivision within lists or an activity. Follow the steps in the recommended sequence.

☞ *This symbol requires you to carry out the activity described*

➥ Description of the effects or results of an activity

n. s. = not shown

“Option” = optional equipment

Stated whenever controls or other components of the machine are installed as an option.

A combination of digits, or a combination of digits and letters, e.g. 40/**18** or 40/**A** used for identifying the control elements, means:

Figure no. 40/control element no. 18 or position **A** in figure no. 40

Figures carry no numbers if they are placed to the left of the text.

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1.2 Identification of warnings and dangers

Important indications regarding the safety of the staff and the machine are identified in this Service Manual with the following terms and symbols:



Danger!

Failure to observe the instructions identified by this symbol can result in personal injury or death for the operator or other persons.

☞ *Measures for avoiding danger*



Caution!

Failure to observe the instructions identified by this symbol can result in damage to the machine.

☞ *Measures for avoiding danger for the machine*



Important!

This symbol identifies instructions for a more efficient and economical use of the machine.



Environment!

Failure to observe the instructions identified by this symbol can result in damage to the environment. The environment is in danger if environmentally hazardous material (e.g. waste oil) is not subject to proper use or disposal.

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1.3 Designated use and exemption from liability

- The machine is intended for:
  - moving earth, gravel, coarse gravel or ballast and rubble as well as for
  - working with the attachments mentioned in chapter *Fields of application*
  - Every other application is regarded as not designated for the use of the machine. Neuson Baumashinen GmbH will not be liable for damage resulting from use other than mentioned above. The user alone will bear the risk. Designated use also includes observing the instructions set forth in the Operator's Manual and observing the maintenance and service conditions.
- The safety of the machine can be negatively affected by carrying out machine modifications without proper authority and by using spare parts, equipment, attachments and optional equipment which have not been checked and released by Neuson Baumaschinen GmbH. Neuson Baumaschinen GmbH will not be liable for damage resulting from this.
- Neuson Baumaschinen GmbH shall not be liable for personal injury and/or damage to property caused by failure to observe the safety instructions and the Operator's Manual, and by the negligence of the duty to exercise due care when:
  - handling
  - operating
  - servicing and carrying out maintenance work and
  - repairing the machine. This is also applicable in those cases in which special attention has not been drawn to the duty to exercise due care, in the safety instructions, the Operator's Manuals and maintenance manuals (machine/engine).
  - Read and understand the Operator's Manual before starting up, servicing or repairing the machine. Observe the safety instructions.
- The machine may not be used for transport jobs on public roads

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1.4 Type labels and component numbers



Fig. 1: Type label: location

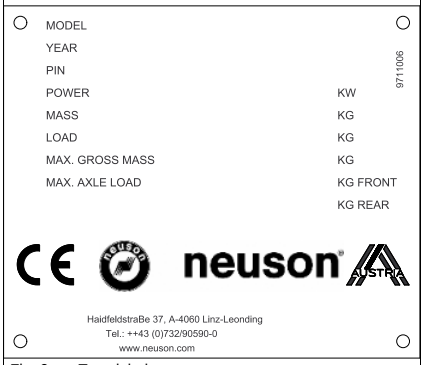


Fig. 2: Type label

Serial number

The serial number is stamped on the machine chassis. It is also located on the type label. The type label is located at the front right on the machine chassis (at cab level).

Type label information

Model:	6003
Year:	2004
PIN:	AC 000000
Power:	42.5 kW (57 hp)
Mass:	5700 kg (12566 lb)
Load:	----------
Max. gross mass:	----------
Max. axle load:	----------

Other information – *see chapter 2 Specifications* on page 2-1

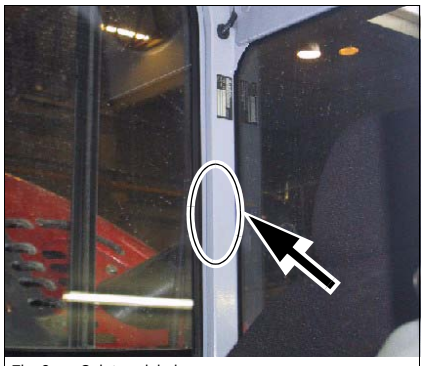


Fig. 3: Cab type label

Cab number

The type label (arrow) is located in the cab, on the upper rear right chassis member.

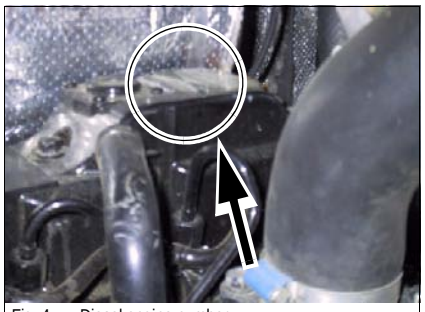


Fig. 4: Diesel engine number

Engine number

The type label (arrow) is located on the valve cover (engine).

Example: Yanmar 46557

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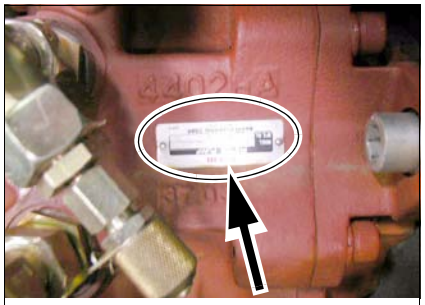


Fig. 5: Hydraulic pump type label

Hydraulic pump number

The type label (arrow) is located on the hydraulic pump housing.

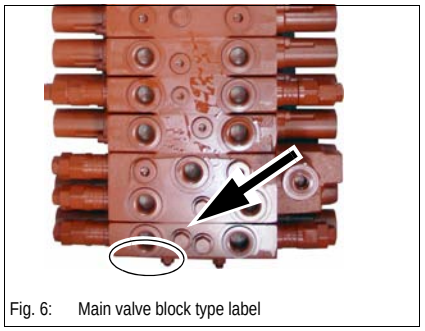


Fig. 6: Main valve block type label

Control valve number

The type label (arrow) is located on the lower side of the main valve block.

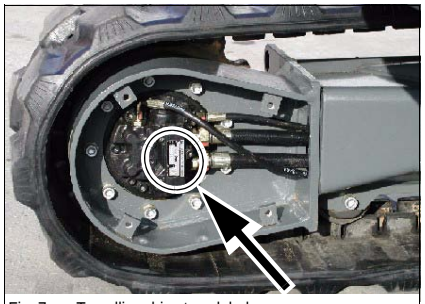


Fig. 7: Travelling drive type label

Travelling drive number

The type label (arrow) is located on the travelling drive.

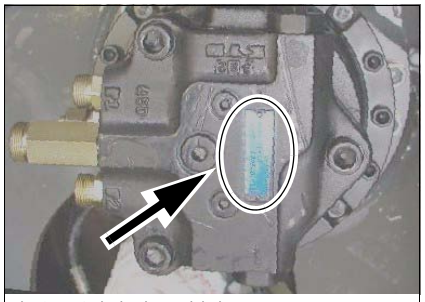


Fig. 8: Swivel unit type label

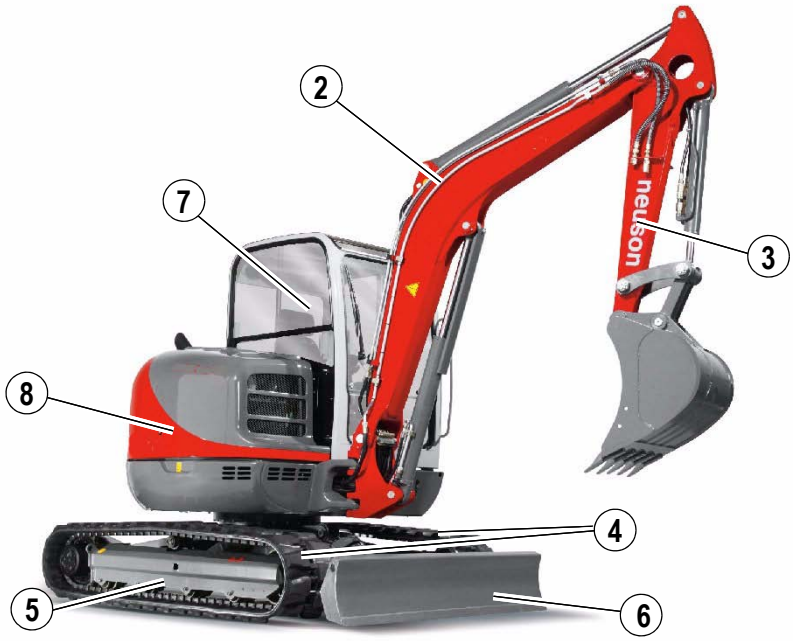
Swivel unit number

The type label (arrow) is located on the swivel unit.

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1.5 Machine overview

1 Boom light
2 Boom
3 Stick
4 Rubber chains
Steel chains (option)
5 Undercarriage
6 Stabiliser blade
7 Cab
8 Engine cover





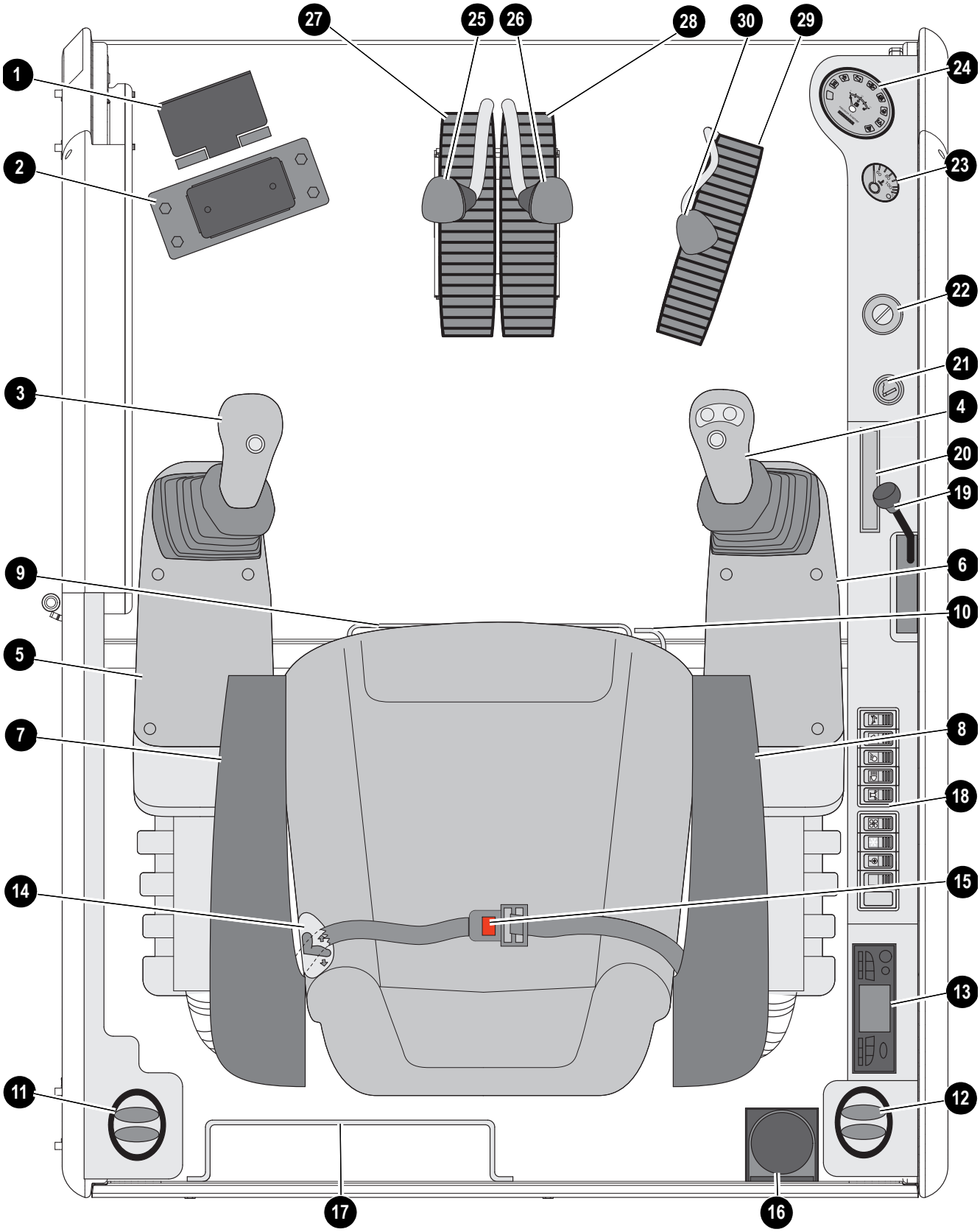
9 Handles
10 Tank filler inlet
11 Device for counterweight (option)
12 Exhaust pipe

Fig. 9: Machine outside views

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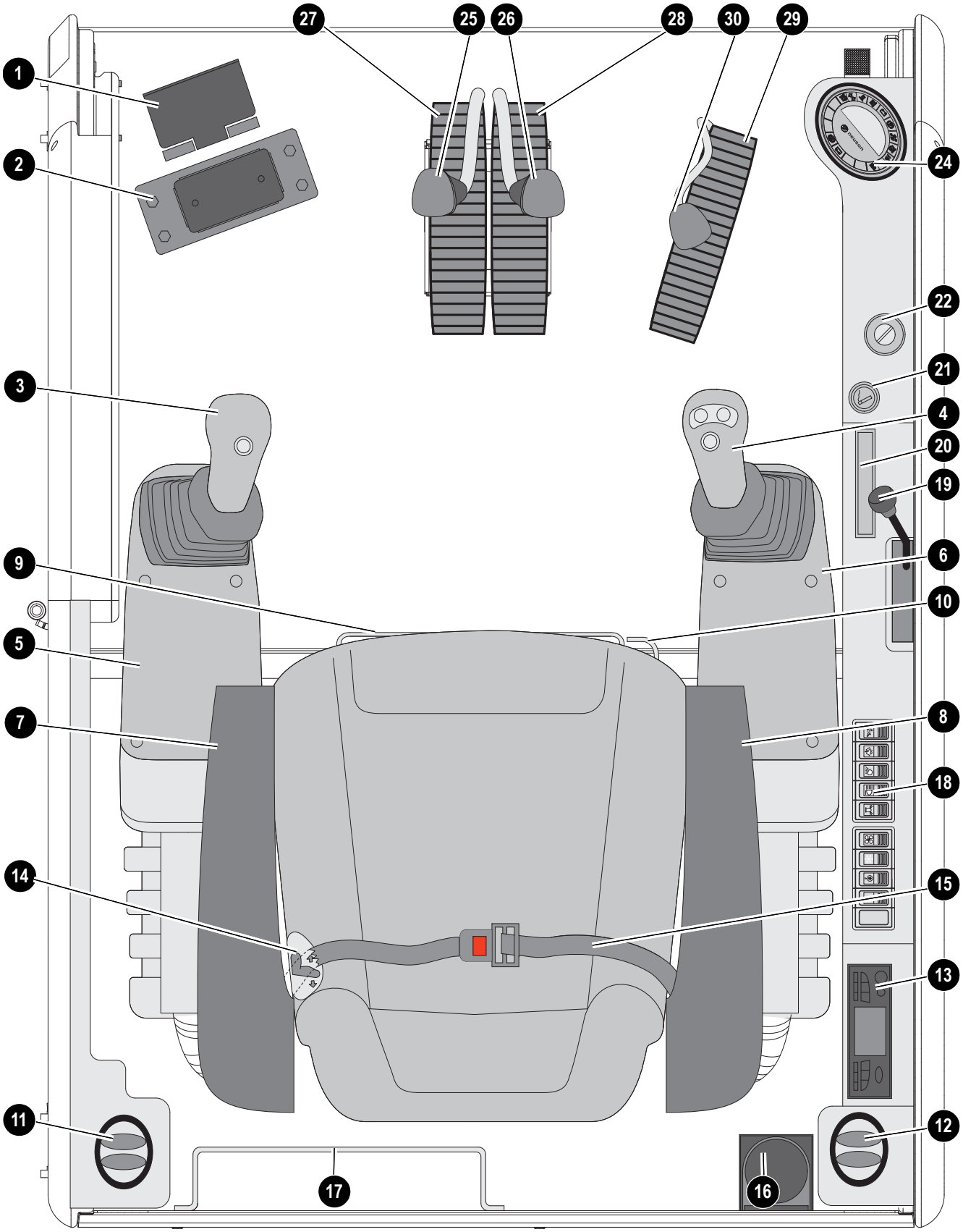
1.6 Cab overview

Up to serial no.: AD07210



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From serial no.: AH00645



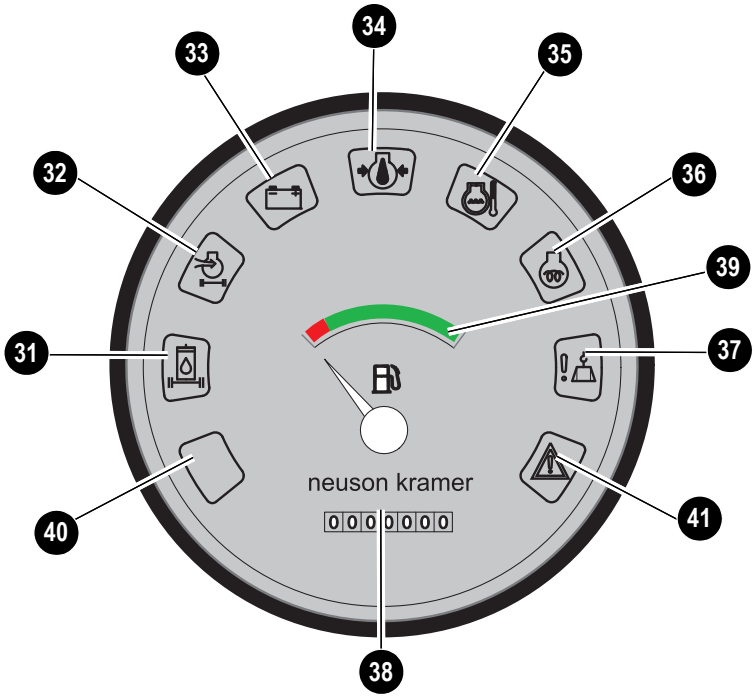
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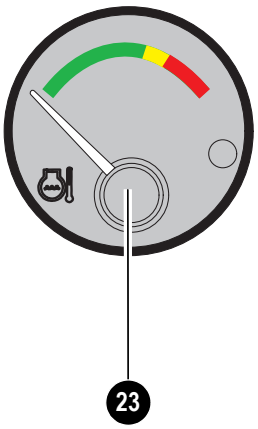
1.7 Cab (legend)

Pos.	Description
1	Cover for hammer pedal
2	Hammer pedal
3	Control lever (left)
4	Control lever (right)
5	Control lever base (left)
6	Control lever base (right)
7	Armrest (left)
8	Armrest (right)
9	Lever – horizontal seat adjustment
10	Lever – horizontal seat adjustment with control lever base
11	Air vent (rear window, on the left)
12	Air vent (rear window, on the right)
13	Radio (option)
14	Seat (backrest adjustment)
15	Seat belt (lock)
16	Cup holder
17	Bracket (storage box for documents)
18	Switch panel
19	Throttle
20	Fuse box
21	Cigarette lighter
22	Preheating start switch
23	Coolant temperature indicator
24	Round display element
25	Drive pedal (left)
26	Drive pedal (right)
27	Drive lever (left)
28	Drive lever (right)
29	Stabiliser blade pedal
30	Stabiliser blade lever

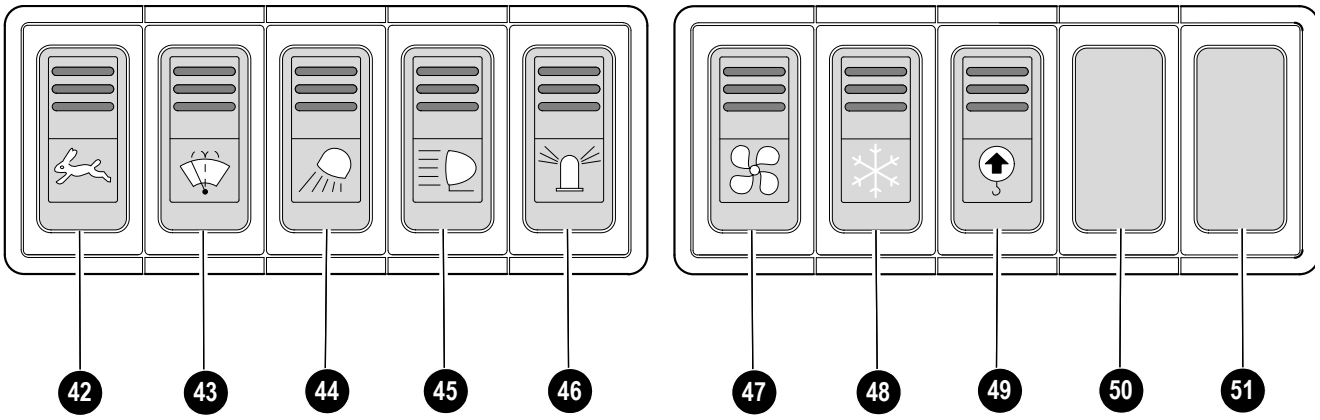
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1.8 Instrument panel up to serial no. AC02888: overview





Temperature range:
Green/yellow 90 °C (194 °F)
Yellow/red 100 °C (212 °F)



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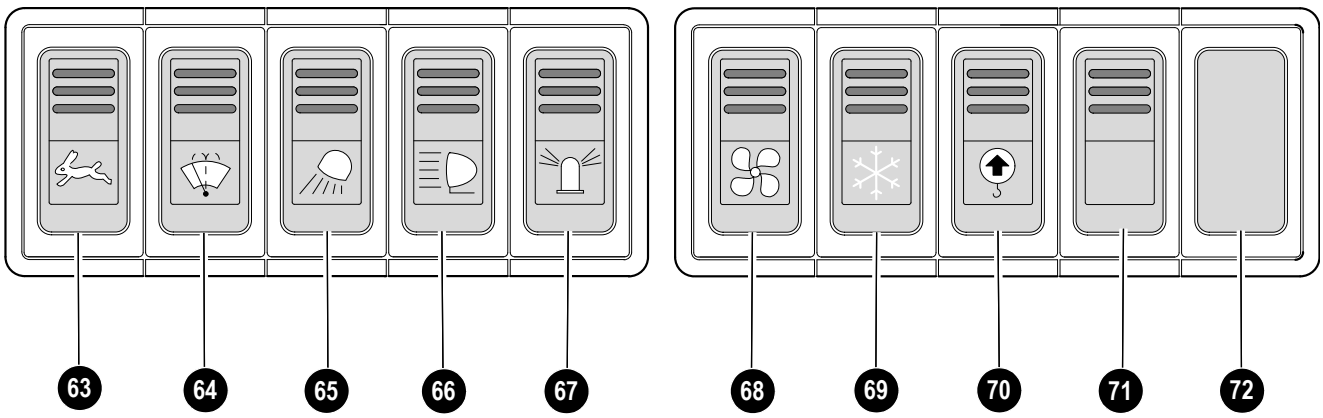
1.9 Instrument panel up to serial no. AC02888: legend

Pos.	Description
31	Hydraulic oil filter telltale (red)
32	Air filter telltale (red)
33	Telltale (red) – alternator charge function
34	Engine oil pressure telltale (red)
35	Coolant temperature telltale (red)
36	Cold starter telltale (yellow)
37	Safe load indicator telltale (red)
38	Hour meter
39	Fuel level indicator
40	Telltale – not assigned
41	Telltale – not assigned
42	High speed
43	Washer system
44	Working lights
45	Roof lights
46	Rotating beacon
47	Ventilation
48	Air conditioning (option)
49	Safe load indicator (option)
50	Not assigned
51	Not assigned

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1.10 Instrument panel from serial no. AC02890 to AD07210: overview





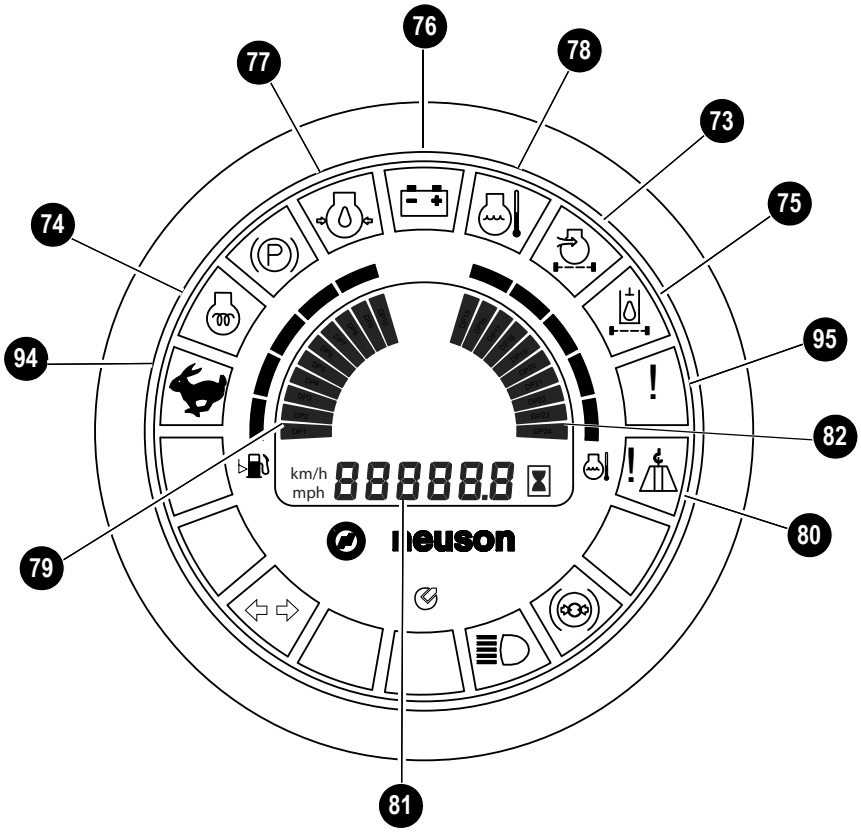
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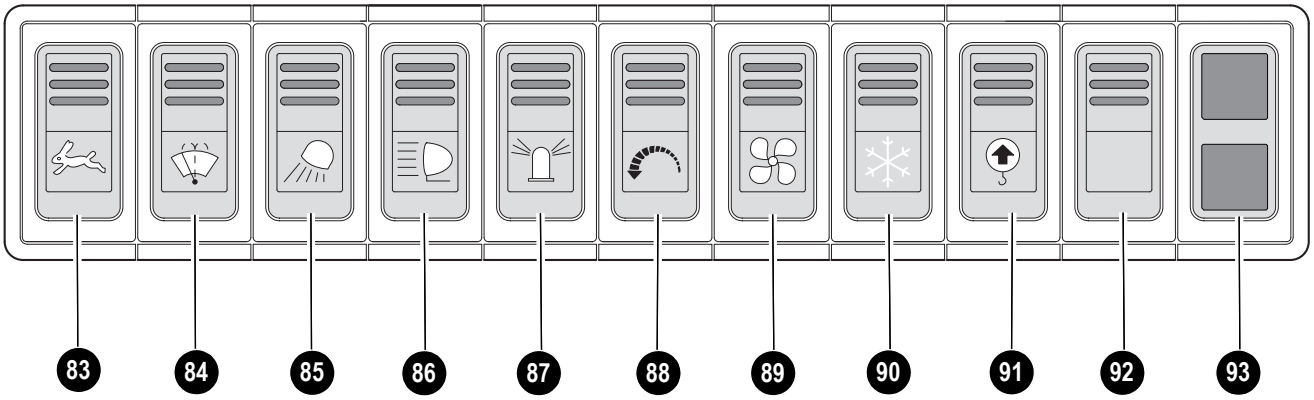
1.11 Instrument panel from serial no. AC02890 to AD07210: legend

Pos.	Description
52	Air filter telltale (red)
53	Cold starter telltale (yellow)
54	Hydraulic oil filter telltale (red)
55	Telltale (red) – hydraulic oil temperature
56	Telltale (red) – alternator charge function
57	Engine oil pressure telltale (red)
58	Coolant temperature telltale (red)
59	Fuel level indicator
60	Safe load indicator telltale (red)
61	Hour meter
62	Temperature indicator
63	High speed
64	Washer system
65	Working lights
66	Roof lights
67	Rotating beacon
68	Ventilation
69	Air conditioning (option)
70	Safe load indicator (option)
71	Not assigned
72	Not assigned

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1.12 Instrument panel from serial no. AH00645: overview





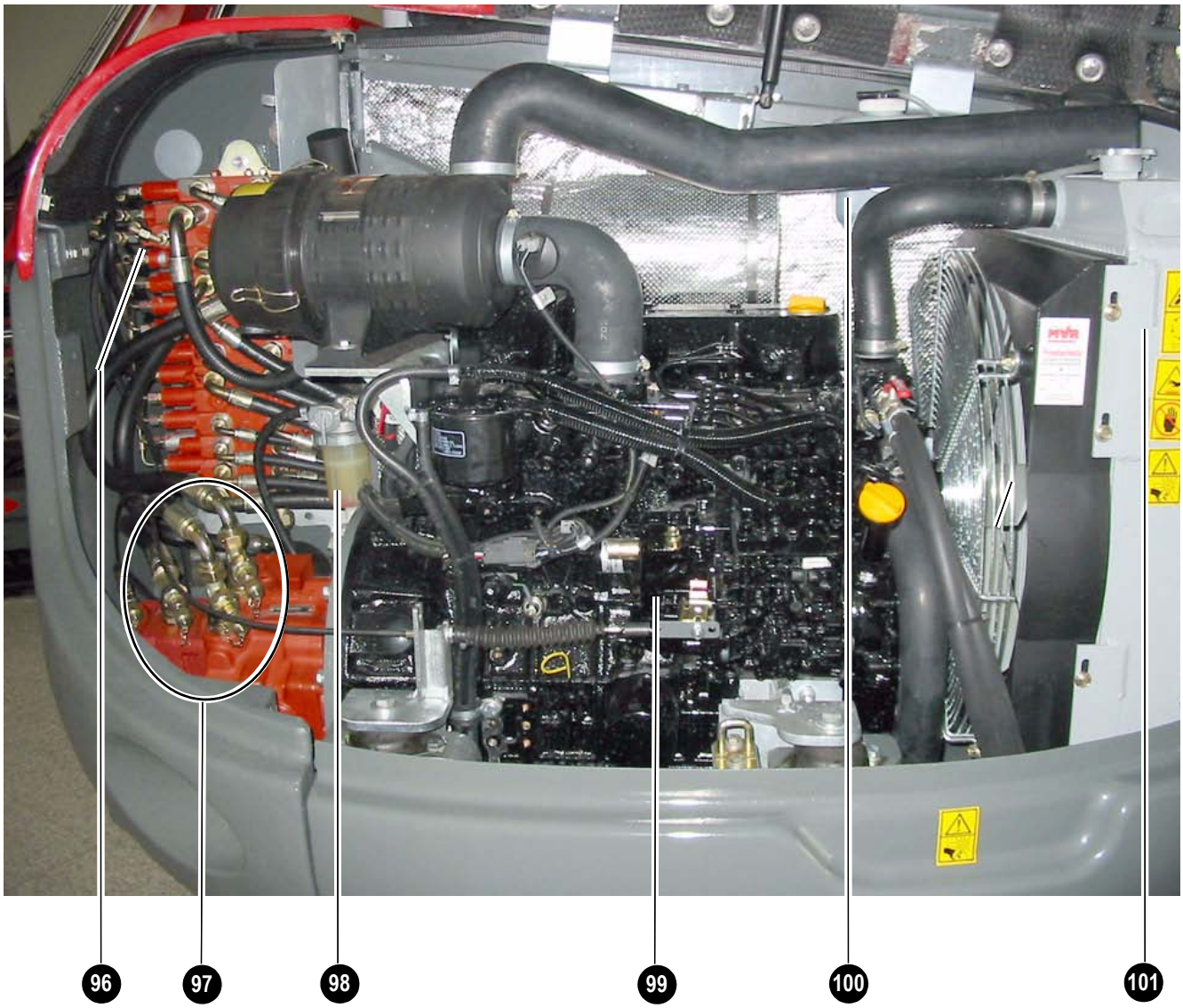
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1.13 Instrument panel from serial no. AH00645: legend

Pos.	Description
73	Air filter telltale (red)
74	Cold starter telltale (yellow)
75	Hydraulic oil filter telltale (red)
76	Telltale (red) – alternator charge function
77	Engine oil pressure telltale (red)
78	Telltale (red) – coolant temperature too high
79	Fuel level indicator
80	Safe load indicator telltale (red)
81	Hour meter
82	Coolant temperature indicator
83	High speed
84	Washer system
85	Working lights
86	Roof lights (option)
87	Rotating beacon (option)
88	Automatic revs setting
89	Ventilation
90	Air conditioning (option)
91	Safe load indicator (option)
92	Not assigned
93	Proportional controls (option)
94	Telltale (green) – high speed enabled
95	Engine error telltale (red)

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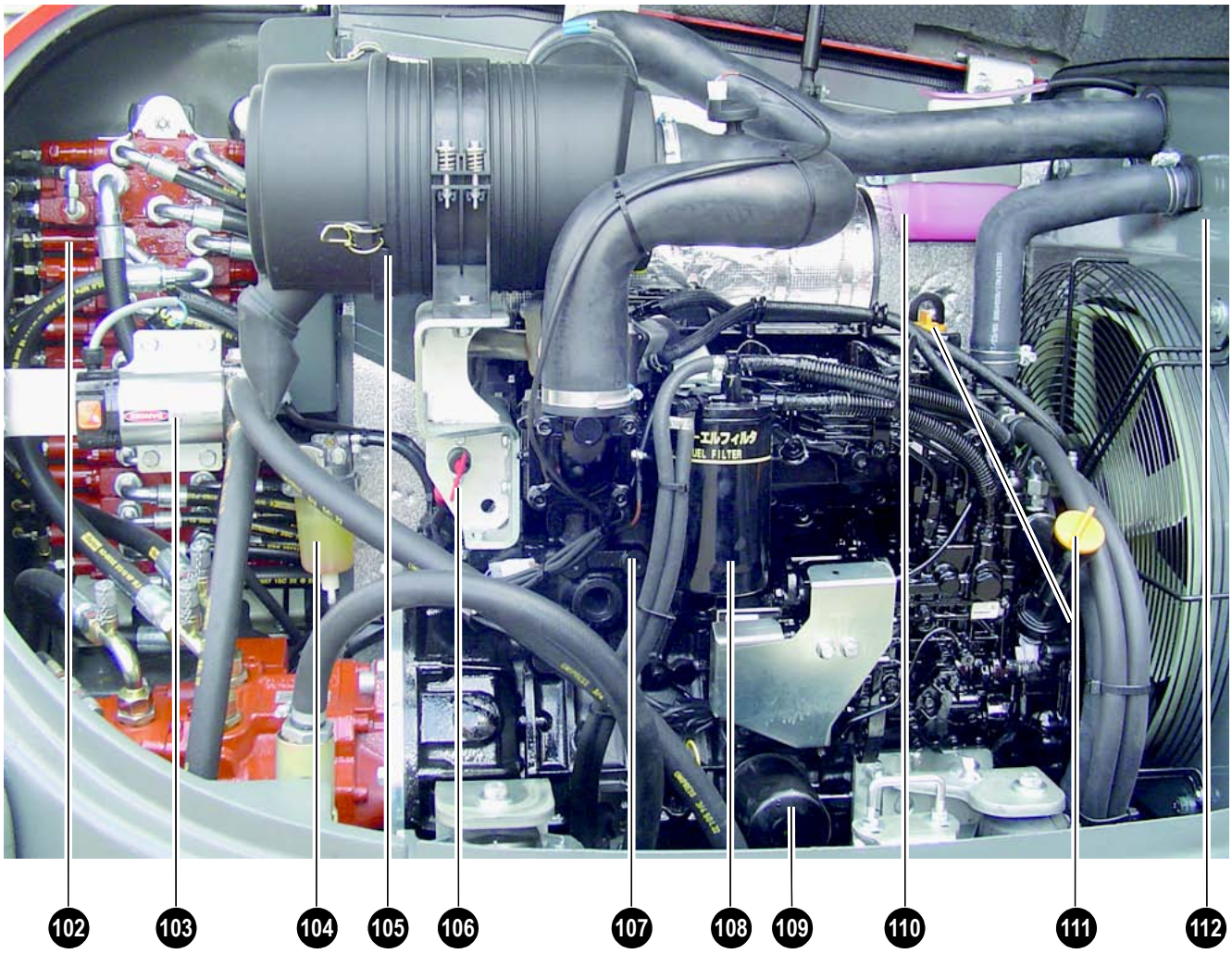
1.14 Engine compartment up to serial no. AD07210: overview



Pos.	Description	For more information see page
96	Main valve block	*5-6*
97	Measurement ports	*3-30*
98	Fuel prefilter	*3-11*
99	Engine	*4-1*
100	Coolant tank	*3-18*
101	Oil/water radiator	*3-19*

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1.15 Engine compartment from serial no. AD00611: overview



Pos.	Description	For more information see page
102	Main valve block	*5-6*
103	Fuel-filling pump	*7-17*
104	Fuel prefilter	*3-11*
105	Air filter	*3-20*
106	Battery master switch	*1-22*
107	Engine	*4-13*
108	Fuel filter	*3-12*
109	Engine oil filter	*3-16*
110	Coolant tank	*3-18*
111	Oil filler openings	*3-13*
112	Oil/water radiator	*3-19*

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1.16 Chassis overview



Pos.	Description	For more information see page
113	Swivel joint	5-37
114	Leak oil strip	
115	Swivel unit	5-31
116	Opening for cleaning the hydraulic oil tank	
117	Position of main fuse box with relays	2-5
118	Shuttle valve block	5-25
119	Pilot valve for stabiliser blade	5-22
120	Changeover valve	5-23
121	Pilot valve (driving)	5-18

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1.17 Tilting the cab

Danger!

Careful when tilting the cab –

Danger of accidents!

☞ *Always tighten screws **A** and **C** when driving and working with the machine.*

☞ *Always close the door.*

☞ *Stay clear from underneath the cab as you tilt it.*

- Switch off the engine.
- Remove the ignition key.
- Fold the control lever base (left) up.

Slackening the bolts

Unscrew the screw as follows:

☞ *Switch off the engine.*

☞ *Remove the ignition key.*

☞ *Fold the control lever base (left) up.*

☞ *Raise floor mat **B**.*

☞ *Unscrew screw **A** with a suitable tool.*

➥ Screw **A** is located at the front right of the cab.

☞ *Slacken screw **C** with a suitable tool.*

➥ Screw **C** is located at the rear right of the cab.

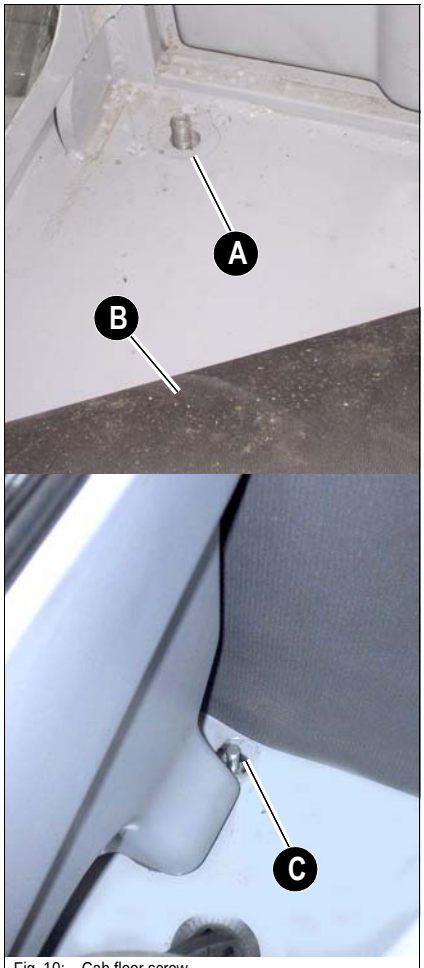


Fig. 10: Cab floor screw

Danger!

Always close the door. Even if the door is secured in the open position with the door arrester –

Danger of accidents!

☞ *Always close the door before tilting the cab.*

☞ *Should the door be open as you tilt the cab, do not actuate the door opener unintentionally.*

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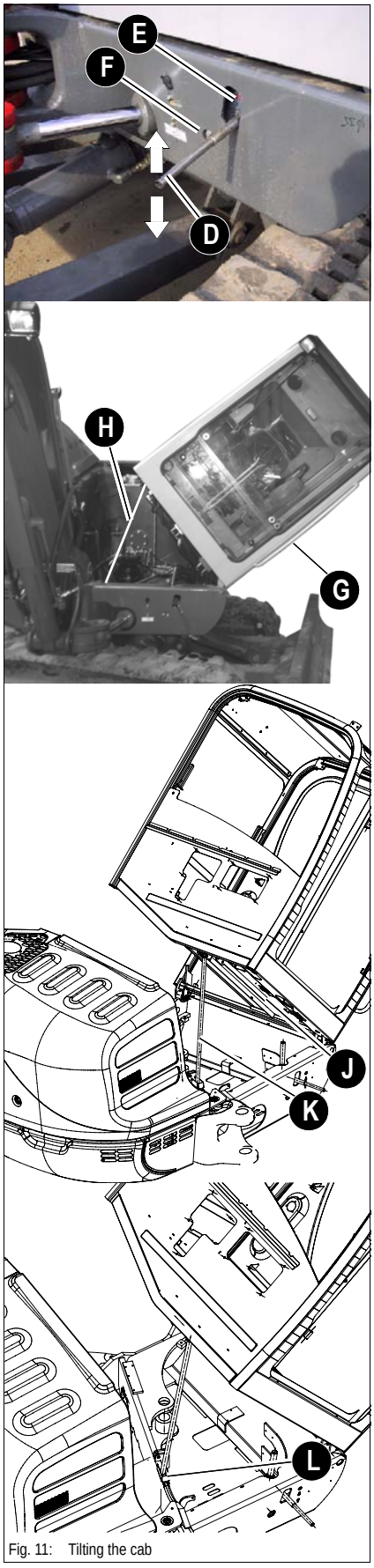


Fig. 11: Tilting the cab

Tilting the cab

Proceed as follows:

☞ *Insert tube **D** onto guide pin **E** and pump as far as it will go.*

➥ (jack function)

➥ The cab is raised as far as the pump will go.

☞ *Pull handle **G** until the cab is completely tilted beyond the centre of motion.*

➥ The cab is secured with safety cable **H**.

☞ *Remove the split pin from bracket* **J**.

➥ Slide tilt rod **K** into guide **L**.

➥ Secure tilt rod **K** with the split pin in guide **L**.

Tilting the cab down:

☞ *Remove the split pin from guide* **L**.

➥ Slide tilt rod **K** into bracket **J**.

➥ Secure tilt rod **K** with the split pin in bracket **J**.

☞ *Use handle **G** to lower the cab until it is back on the pump.*

☞ *Insert tube **D** on pin **F**.*

☞ *Slowly turn tube **D** counterclockwise (to the left).*

➥ The cab is lowered by its own weight.

➥ **The lift pump must be opened when driving with the machine (to prevent the lift piston from touching the cab.)**

☞ *Mount screws **A** (front) and **C** (rear) with suitable tools and the specific torque – see Tightening torques for high-resistance screw connections on page 2-10.*

Caution!

Check tilt rod **K**, the split pin and safety cables **H** at regular intervals for cracks and cuts.

☞ *Replace defective parts immediately.*

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1.18 Summer/winter operation

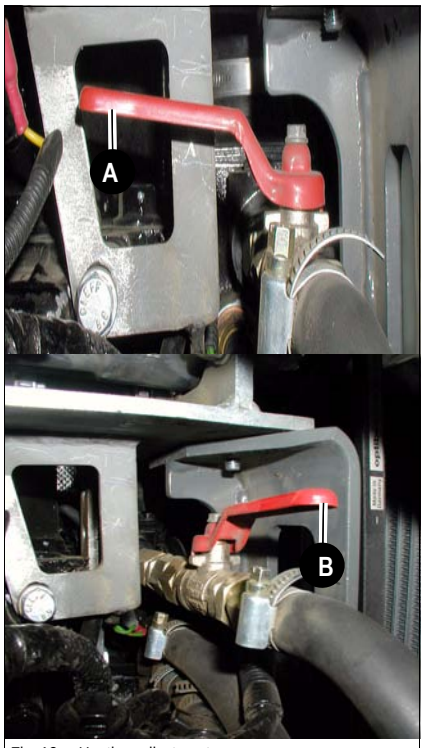


Fig. 12: Heating adjustment

Adjust cab temperature as follows:

Position	Function	
A	Summer operation	Cools
B	Winter operation	Heating water circuit open

☞ *Open the engine compartment.*

☞ *Turn the ball-type cock as described, to summer or winter operation.*

☞ *Close the engine compartment.*

Important!

Summer and winter operation does not depend on the season, adjust according to your personal requirements.

Preheated fresh air



Fig. 13: Fresh air

Selection of “cold” or “preheated” fresh air in winter.

A deflector plate on the heater can be set to two different positions.

➥ Fresh air: heater takes in air from outside the cab **fig. 13**.

➥ Preheated fresh air: heater takes in air from the chassis **fig. 14**.



Fig. 14: Preheated fresh air

Change from fresh air to preheated fresh air as follows:

☞ *Tilt the cab – see Tilting the cab on page 1-19.*

➥ The deflector plate is located on the heater under the cab.

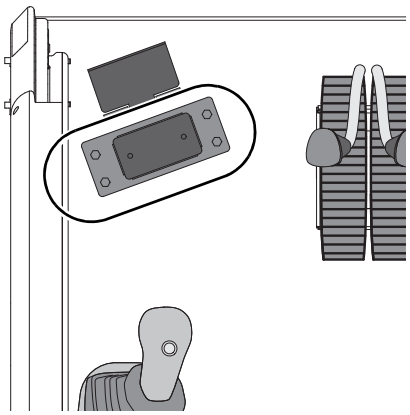
☞ *Slacken both fastening screws.*

☞ *Reposition and fit the deflector plate back on again.*

☞ *Tilt the cab back down again and secure it.*

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1.19 Auxiliary hydraulics/boom swivel pedal



The pedal for the auxiliary hydraulics/swivelling the boom can be rotated by 90°.

☞ *Slacken 4 screws.*

☞ *Rotate the pedal by 90°.*

☞ *Retighten the 4 screws.*

The length of the hydraulic hoses is sufficient for easily rotating the pedal by 90°.

Caution!

Make sure the hydraulic hoses are not squeezed as you tilt the cab.

1.20 Battery master switch

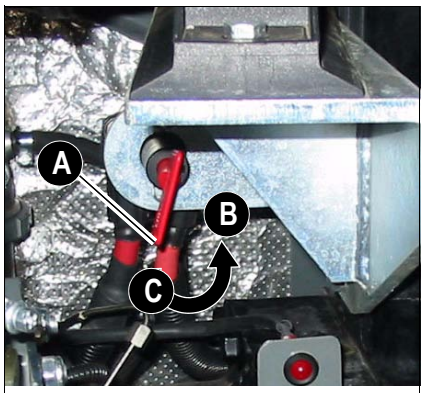


Fig. 15: Battery master switch

Important!

Power supply is interrupted directly after the battery, by means of a key:

- – Before working on the electric system
- – As an antitheft precaution

Interrupting power supply:

☞ *Turn key **A** of the battery master switch to position **B** and remove it.*

Switching on power supply:

☞ *Insert key **A** in the battery master switch.*

☞ *Turn the key down (**C**)* and let it lock into place.

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Specifications

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2 Specifications

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine

Engine	Model 6003	
	Tier 2 (up to AD07210)	European Tier 3A/ American Tier 3 (from AH00645)
Product	Yanmar diesel engine	
Type	4TNV98-VNS	4TNV98-ZVNS
Design	Water-cooled 4 stroke diesel engine	
No. of cylinders	4	
Fuel injection system	Direct injection	
Aspiration	Natural aspiration	
Cooling system	Water-cooled/aspirating fan	
Lubrication system	Force-feed lubrication with trochoidal pump	
Displacement	3319 cm³ (202.5 cu in)	
Nominal bore and stroke	98 x 110 mm (3.9 x 4.3")	
Output	42.5 kW at 2100 rpm (57 hp at 2100 rpm)	43.4 kW at 2100 rpm (58.2 hp at 2100 rpm)
Max. torque	246.1 Nm at 1000 rpm (181.5 ft. lbs. at 1000 rpm)	238.3 Nm at 1350 rpm (175.8 ft. lbs. at 1350 rpm)
Max. engine speed without load	2290 ± 25 rpm	2130 ± 25 rpm
Idling speed	1100 ± 25 rpm	
Valve clearance (intake = outlet)	0.15 – 0.25 mm/0.006 – 0.01" (cold)	
Compression	33.3 – 35.3 bar (483 – 512 psi) at 250 rpm	
Engine oil pressure	2.9 – 3.9 bar (42.1 – 56.6 psi)	
Pressure switch Engine oil pump	0.5 ± 0.1 bar (7.25 ± 1.45 psi)	
Thermostat Opening temperature	69.5 – 72.5 °C (157.1 – 162.5 °F)	
Thermal switch	107 – 113 °C (224.6 – 235.4 °F)	
Firing order	1 – 3 – 4 – 2	
Direction of rotation	Counterclockwise (as seen from the flywheel)	
Starting aid	Glow plug (preheating time 15 s)	Sheathed-element heater plugs (preheating time 15 s)
Max. inclined position (engine no longer supplied with oil):	25° in all directions Hill climbing ability (30°/58 %) of the machine!	30° in all directions Hill climbing ability (30°/58 %) of the machine!
Fuel consumption	8.7 l/h/2.30 gph (without air conditioning)[1]	8.0 l/h/2.11 gph (without air conditioning)[1]
	8.8 l/h/2.32 gph (with air conditioning)[1]	8.5 l/h/2.25 gph (with air conditioning)[1]
Specific fuel consumption	246 g/kWh/0.404 lb/hph	232 g/kWh/0.381 lb/hph
Exhaust values according to	97/68/EC European Tier 2 EPA Tier 2	97/68/EC European Tier 3A EPA Tier 3

1. Values based on an average 70 % load of the excavator and a diesel fuel density of 0.83 kg/dm³ and cannot be used for comparison with competitors. Specific fuel consumption should be used for this. The air conditioning system has been taken into account with 100 % operating time.

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Fuel injection pump

Type	YPD-MP4	
	Tier 2 (up to AD07210)	European Tier 3A/American Tier 3 (from AH00645)
Design	Single piston distributor injection pump	
Injection pressure	216 – 226 bar (3133 – 3278 psi)	
Revs control	Mechanical	Electronic
Lubrication system	Engine oil lubrication	

Capacities

Capacities	Model 6003	
	Tier 2 (up to AD07210)	European Tier 3A/American Tier 3 (from AH00645)
Fuel tank	93 l (24.6 gal)	
Engine oil (max./effect.)	9.4 l/4.4 l (2.5/1.2 gal)	10.2 l/4.5 l (2.7/1.2 gal)
Coolant (without radiator)	4.2 l (1.11 gal)	
Radiator	7 l (1.8 gal)	
Expansion tank	1.5 l (0.40 gal)	

Tightening torques

Tightening torques (Nm)	Nm/ft. lbs.
Cylinder-head bolt	103.1 – 112.9/76.04 – 83.27 (M11x1.25)
Connecting rod bearing screw	53.9 – 58.8/39.75 – 43.37 (M10x1)
Main bearing screw	108.1 – 117.9/79.73 – 86.96 (M11x1.25)
Flywheel screw	186.2 – 205.8/137.33 – 151.79 (M14x1.5)

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2.3 Hydraulic system

Hydraulics		6003
Pump	Tier 2 (up to AD07210)	Double variable displacement pump + twin gear pump 2 x 28 + 21 + 4.5 cm^3 (2 x 1.7 +1.3 + 0.3 in^3) PVD-2B44BP-16G5-4713F (variable displacement pump) GSP2H-BOF16A16AR-A0-A627-0 (gear pump)
	European Tier 3A/ American Tier 3 (from AH00645)	Double variable displacement pump + twin gear pump 2 x 28 + 21 + 4.5 cm^3 (2 x 1.7 +1.3 + 0.3 in^3) PVD-3B-56P-21G5-4626F (variable displacement pump) GSP2H-BOF16A16AR-A0-A627-0 (gear pump)
Flow rate	Tier 2 (up to AD07210)	2 x 64.1 + 48 + 10.3 l/min (2 x 17 + 13 + 3 gal/min) at 2290 rpm
	European Tier 3A/ American Tier 3 (from AH00645)	2 x 59.64 + 44.7 + 9.6 l/min (2 x 16 + 12 + 2.5 gal/min) at 2130 rpm
Control valve		11 sections/12 sections (3rd control circuit or triple articulation boom)
		13 sections (triple articulation boom control)
Max. service pressure		$240^{\pm 5}$ bar ($3481^{\pm 73}$ psi)
Main pressure limiting valve for pumps P1, P2		$240^{\pm 3}$ bar ($3481^{\pm 43.5}$ psi)
Main pressure limiting valve for pump P3		$240^{-0/+3}$ bar ($3481^{-0/+43.5}$psi)
Secondary pressure limiting valve for main valve block		$275^{0/+0.5}$ bar ($3989^{0/+7}$ psi) at 20 l/min (at 5.3 gal/min)
Main pressure limiting valve for pilot control pressure		$42^{\pm 1}$ bar ($609^{\pm 14.5}$ psi)
Swivel unit main pressure limiting valve		$215^{\pm 3}$ bar/$3118^{\pm 43.5}$ psi (at idling speed)
Hydraulic oil cooler		Standard
Hydraulic tank capacity		83 l (22 gal)
2nd speed shift pressure		180 bar (2611 psi)
Gear motor braking deceleration time		$3.7^{\pm 1.2}$ s at 50 °C/122 °F oil temperature
		Tier 2 / **European Tier 3A/ American Tier 3**
Circulation pressure P1 (max. revs)		15.0 bar (218 psi) / 14.5 bar (210 psi)
Circulation pressure P2 (max. revs)		15.0 bar (218 psi) / 14.5 bar (210 psi)
Circulation pressure P3 (max. revs)		21.0 bar (305 psi) / 20.5 bar (297 psi)

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Auxiliary hydraulics oil flow*

Pressure (bar/psi)	P2 + P3 (l/min / gal/min)		P2 (l/min / gal/min)	
	Tier 2	American Tier 3A	Tier 2	American Tier 3A
15/218	105/27.7	102/26.9	61/16.1	60/15.9
40/580	104/27.5	101/26.7	60/15.9	59/15.6
60/870	102.5/27.1	100/26.4	60/15.9	58/15.3
90/1305	100/26.4	98/25.9	59/15.6	57/15
120/1740	98/25.9	94/24.8	58/15.3	56/14.8
150/2176	87/23	84/22.2	57/15	55/14.5
180/2611	75/19.8	75/19.8	56/14.8	54/14.3
210/3046	65/17.2	60/15.9	55/14.5	53/14
230/3336	27/7.1	20/5.3	50/13.2	33/8.7

* Output indications for auxiliary hydraulics with unpressurised reflux line

Screwable hose burst valve

Location	Thread	Gap dimension
Stabiliser blade	1/2”	1.2 mm (0.05”)

– *see chapter 5.18 Hydraulics diagram A3* on page 5-42 item 22

2.4 Undercarriage and swivel unit

Undercarriage/swivel unit	Model 6003
2 speed ranges	3.0/5.22 kph (1.86/3.24 mph)
Hill climbing ability (briefly)	30°/58 %
Chain width	400 mm (15.75”)
No. of track rollers on either side	5
Ground clearance	290 mm (11.42”)
Ground pressure	0.33 kg/cm² (4.69 psi)
Upper carriage swivel speed	9.25 rpm

2.5 Stabiliser blade

Stabiliser blade	Model 6003
Width/height	1990/425 mm (78.35”/16.73”)
Max. lift over/under subgrade	390/400 mm (15.35”/15.75”)

2.6 Electric system

Electric system	
Alternator	12 V 55 A
Starter	12 V 2.3 kW (3.1 hp)
Battery	12 V 88 Ah
Socket	E.g. for cigarette lighter; 15 A max.

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Fuse box on the instrument panel up to serial no. AD07210

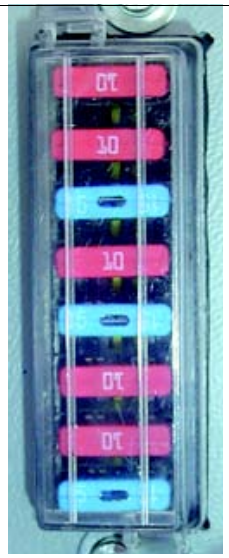


Fig. 1: Fuse box

Fuse no.	Rated current (A)	Protected circuit
F3	10 A	Indicators, engine relay
F4	10 A	Boom working light
F5	15 A	Cab working light
F6	10 A	Valves, horn
F7	15 A	Heating, air conditioning
F8	10 A	Wiper, interior light
F9	10 A	Rotating beacon, radio, drive interlock
F10	15 A	Socket, cigarette lighter

Main fuse box with relays under the cab up to serial no. AD07210

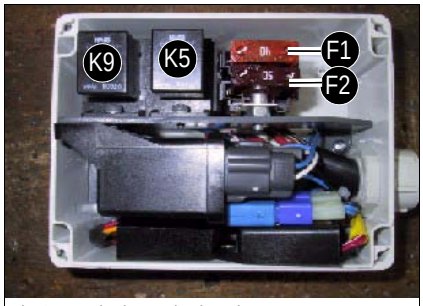


Fig. 2: Relay box under the cab

Fuse no.	Rated current (A)	Protected circuit
F1	40 A	Start, preheat, cutoff solenoid
F2	50 A	Fuel-filling pump, main fuse, ignition lock
Relay no.		
K 9	Cutoff solenoid switching relay	
K 5	Preheating high current relay	

Relays up to serial no. AD07210

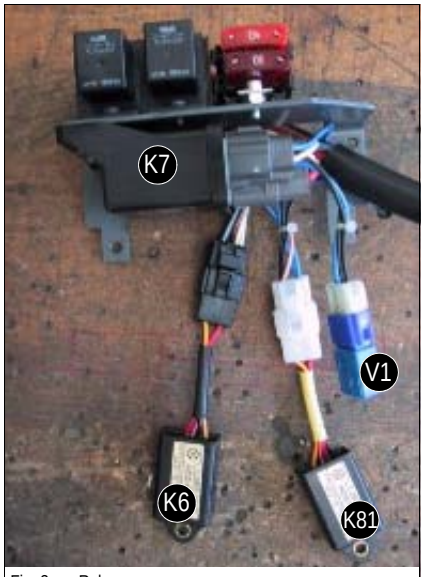


Fig. 3: Relays

Switching relay no.	Protected circuit
K 6	Preheating timer (telltale only) t = 10 s
K 7	Starting relay
K 8	Cutoff solenoid timer t = 1 s
V 1	Cutoff solenoid recovery diode

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Fuse box on the instrument panel from serial no. AH00645

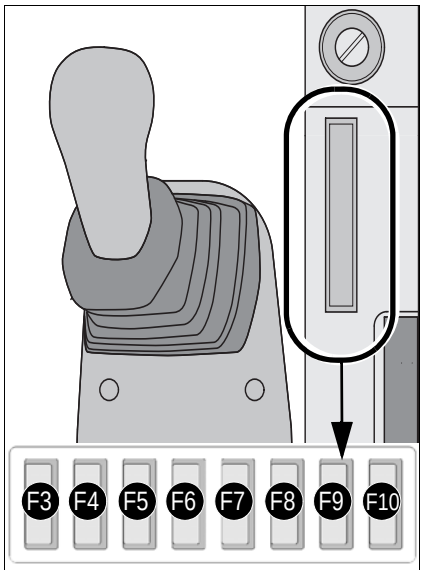


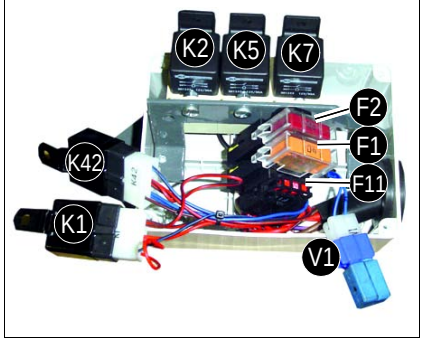
Fig. 4: Fuse box

Fuse no.	Rated current (A)	Protected circuit
F3	10 A	Displays, E-ECU
F4	10 A	Boom light
F5	15 A	Roof lights
F6	10 A	Valves, horn
F7	15 A	Heating, air conditioning
F8	10 A	Wiper, interior light
F9	10 A	Rotating beacon, radio
F10	15 A	Socket, cigarette lighter

Main fuse box with relays from serial no. AH00645



Fig. 5: Main fuse box under the cab



Main fuse box X is located under the cab, next to the swivelling console.

Fuse no.	Rated current (A)	Protected circuit
F1	40 A	– Start, preheat
F2	50 A	– Fuel-filling pump, main fuse, ignition lock
F11	10 A	– E-ECU, engine relay

Relay no.	
K1	– Engine electronics main relay
K2	– Fuel-filling pump relay
K5	– Preheating high current relay
K7	– Start high current relay
K42	– Fuel injection pump relay
V1	– Blocking diode

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2.7 Noise levels

Sound power level	Model 6003
Sound power level (L_{WA})	101 dB (A)
Sound pressure level (L_{PA}) at the driver's ear	78 dB (A)

Important!

Measurement of sound power level according to EC Directive 2000/14 EC. Noise level at the driver's ear measured according to EC Directives 84/532/EEC, 89/514/EEC and 95/27/EEC. Measurements carried out on asphalted surface.

2.8 Vibration

Vibration	
Effective acceleration value for the upper extremities of the body *	< Trigger value
Effective acceleration value for the body *	< Trigger value

* Measurements as per 2002/44/EC (excavating, driving and hammering with a Neuson hammer). Machine and attachment operation and maintenance as per Operator's Manual.

2.9 Coolant compound table

Outside temperature	Coolant: Halvoline XLC (based on ethylene glycol)			
	Water	Anticorrosion agent		Antifreeze agent
Up to °C (°F)	% by volume	cm^3/l (in^3/gal)	% by volume	% by volume
4 (39)	99	10 (2.6)	1	–
-10 (14)	79			20
-20 (-4)	65			34
-25 (-13)	59			40
-30 (-22)	55			44

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2.10 Model-specific tightening torques

6003		Nm (ft. lbs.)
Live ring	M14 10.9	180 (133)*
Track roller	M16 10.9	275 (203)*
Drive pinion	M14 10.9	180 (133)*
Travelling drive	M14 10.9	180 (133)*
Gear motor	M16 10.9	275 (203)*
Angled engine bracket	M10 8.8	45 (33)
Engine bearing	M10 8.8	45 (33)
Pump base	M10 8.8	50 (37)
Pump	M12 10.9	79 (58)
Swivel joint	M10 10.9	64 (47)*
Counterweight/extra weight	M20 8.8	290 (214)*

*) All connections with an * must be glued with Loctite S2420 or VaryBond 12-43.

2.11 General tightening torques

Tightening torques for hydraulic screw connections (dry assembly)

Metric hose fittings for hydraulic applications (light execution, DKOL)				
Nominal Ø	Outer Ø	Thread	Wrench size	Tightening torque Nm (ft. lbs.)
05	6L	M12X1.5	WS 14	15 (11)
06	8L	M14X1.5	WS 17	20 (15)
08	10L	M16X1.5	WS 19	40 (30)
10	12L	M18X1.5	WS 22	50 (37)
12	15L	M22X1.5	WS 27	75 (55)
16	18L	M26X1.5	WS 32	85 (63)
20	22L	M30X2	WS 36	100 (74)
25	28L	M36X2	WS 41	180 (133)
32	35L	M45X2	WS 55	220 (162)

Galvanised and dry surface (O-ring slightly oiled). Torque tolerance: -10 %
Values determined empirically and to be applied as approximate figures.

Metric hose fittings for hydraulic applications (heavy execution, DKOL)				
Nominal Ø	Outer Ø	Thread	Wrench size	Tightening torque Nm (ft. lbs.)
05	8S	M16X1.5	WS 19	40 (30)
06	10S	M18X1.5	WS 22	50 (37)
08	12S	M20X1.5	WS 24	60 (44)
10	14S	M22X1.5	WS 27	75 (55)
12	16S	M24X1.5	WS 30	90 (66)
16	20S	M30X2	WS 36	100 (74)
20	25S	M36X2	WS 41	180 (133)
25	30S	M42X2	WS 50	270 (199)
32	38S	M52X2	WS 60	400 (295)

Galvanised and dry surface (O-ring slightly oiled). Torque tolerance: -10 %
Values determined empirically and to be applied as approximate figures.

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Screw connections with various seals for hydraulic applications Light execution					
Thread	Straight pipe fitting with thread and screwed plug			Non-return valve with elastic seal	Identification aid outside Ø
	Sealing washer	elastic seal	O-ring		
	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	mm (")
M10X1.0	9 (7)	18 (13)	15 (11)	18 (13)	10 (0.4)
M12X1.5	20 (15)	25 (18)	25 (18)	25 (18)	12 (0.5)
M14X1.5	35 (26)	45 (33)	35 (26)	35 (26)	14 (0.6)
M16X1.5	45 (33)	55 (41)	40 (30)	50 (37)	16 (0.6)
M18X1.5	55 (41)	70 (52)	45 (33)	70 (52)	18 (0.7)
M22X1.5	65 (48)	125 (92)	60 (44)	125 (92)	22 (0.9)
M27X2.0	90 (66)	180 (133)	100 (74)	145 (107)	27 (1.0)
M33X2.0	150 (111)	310 (229)	160 (118)	210 (155)	33 (1.3)
M42X2.0	240 (177)	450 (332)	210 (155)	360 (266)	42 (1.7)
M48X2.0	290 (214)	540 (398)	260 (192)	540 (398)	48 (1.9)
G1/8A	9 (7)	18 (13)	15 (11)	18 (13)	9.73 (0.4)
G1/4A	35 (26)	35 (26)	30 (22)	35 (26)	13.16 (0.5)
G3/8A	45 (33)	70 (52)	45 (33)	50 (37)	16.66 (0.7)
G1/2A	65 (48)	90 (66)	55 (41)	65 (48)	20.96 (0.8)
G3/4A	90 (66)	180 (133)	100 (74)	140 (103)	26.44 (1.0)
G1A	150 (111)	310 (229)	160 (118)	190 (140)	33.25 (1.3)
G1 1/4A	240 (177)	450 (332)	210 (155)	360 (266)	41.91 (1.6)
G1 1/2A	290 (214)	540 (398)	360 (266)	540 (398)	47.80 (1.9)

Torque tolerance: – 10 %; countermaterial: steel/aluminium

Screw connections with various seals for hydraulic applications Heavy execution					
Thread	Straight pipe fitting with thread and screwed plug			Non-return valve with elastic Seal	Identification aid outside Ø
	Sealing washer	elastic Seal	O-ring		
	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	mm (")
M12X1.5	20 (15)	35 (26)	35 (26)	35 (26)	12 (0.5)
M14X1.5	35 (26)	55 (41)	45 (33)	45 (33)	14 (0.6)
M16X1.5	45 (33)	70 (52)	55 (41)	55 (41)	16 (0.6)
M18X1.5	55 (41)	90 (66)	70 (52)	70 (52)	18 (0.7)
M20X1.5	55 (41)	125 (92)	80 (59)	100 (74)	22 (0.8)
M22X1.5	65 (48)	135 (100)	100 (74)	125 (92)	27 (1.0)
M27X2.0	90 (66)	180 (133)	170 (125)	135 (100)	12 (0.5)
M33X2.0	150 (111)	310 (229)	310 (229)	210 (155)	33 (1.3)
M42X2.0	240 (177)	450 (332)	330 (243)	360 (266)	42 (1.7)
M48X2.0	290 (214)	540 (398)	420 (310)	540 (398)	48 (1.9)
G1/8A	35 (26)	55 (41)	45 (33)	45 (33)	13.16 (0.5)
G1/4A	45 (33)	80 (59)	60 (44)	60 (44)	16.66 (0.7)
G3/8A	65 (48)	115 (85)	75 (55)	100 (74)	20.96 (0.8)
G1/2A	90 (66)	180 (133)	170 (125)	145 (107)	26.44 (1.0)
G3/4A	150 (111)	310 (229)	310 (229)	260 (192)	33.25 (1.3)
G1A	240 (177)	450 (332)	330 (243)	360 (266)	41.91 (1.6)
G1 1/4A	290 (214)	540 (398)	420 (310)	540 (398)	47.80 (1.9)

Torque tolerance: – 10 %; countermaterial: steel/aluminium

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Tightening torques for high-resistance screw connections

With coarse-pitch thread					
Thread	Screws according to DIN 912, DIN 931, DIN 933 etc.			Screws according to DIN 7984	
	8.8	10.9	12.9	8.8	10.9
	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)
M5	5.5 (4)	8 (6)	10 (7)	5 (4)	7 (5)
M6	10 (7)	14 (10)	17 (13)	8.5 (6)	12 (9)
M8	25 (18)	35 (26)	42 (31)	20 (15)	30 (22)
M10	45 (33)	65 (48)	80 (59)	40 (30)	59 (44)
M12	87 (64)	110 (81)	147 (108)	69 (51)	100 (74)
M14	135 (100)	180 (133)	230 (170)	110 (81)	160 (118)
M16	210 (155)	275 (203)	350 (258)	170 (125)	250 (184)
M18	280 (207)	410 (302)	480 (354)	245 (181)	345 (254)
M20	410 (302)	570 (420)	690 (509)	340 (251)	490 (361)
M22	550 (406)	780 (575)	930 (686)	460 (339)	660 (487)
M24	710 (524)	1000 (738)	1190 (878)	590 (435)	840 (620)
M27	1040 (767)	1480 (1092)	1770 (1305)	870 (642)	1250 (922)
M30	1420 (1047)	2010 (1482)	2400 (1770)	1200 (885)	1700 (1254)

DIN 912 – hexagon socket head cap screw; DIN 931/DIN 933 – hexagon head screw with/without shaft;
DIN 7984 – hexagon socket head cap screw with short head
All values subject to a friction coefficient of $\mu = 0.12$ and are to be used as approximate figures.

With fine-pitch thread					
Thread	Screws according to DIN 912, DIN 931, DIN 933 etc.			Screws according to DIN 7984	
	8.8	10.9	12.9	8.8	10.9
	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)
M8X1.0	25 (18)	37 (28)	43 (32)	22 (16)	32 (24)
M10X1.0	50 (37)	75 (55)	88 (65)	43 (32)	65 (48)
M10X1.25	49 (36)	71 (52)	83 (61)	42 (31)	62 (46)
M12X1.25	87 (64)	130 (96)	150 (111)	75 (55)	110 (81)
M12X1.5	83 (61)	125 (92)	145 (107)	72 (53)	105 (77)
M14X1.5	135 (100)	200 (148)	235 (173)	120 (89)	175 (129)
M16X1.5	210 (155)	310 (229)	360 (266)	180 (133)	265 (195)
M18X1.5	315 (232)	450 (332)	530 (391)	270 (1991)	385 (284)
M20X1.5	440 (325)	630 (465)	730 (538)	375 (277)	530 (391)
M22X1.5	590 (435)	840 (620)	980 (723)	500 (369)	710 (524)
M24X2.0	740 (546)	1070 (789)	1250 (922)	630 (465)	900 (664)
M27X2.0	1100 (811)	1550 (1143)	1800 (1328)	920 (679)	1300 (959)
M30X2.0	1500 (1106)	2150 (1586)	2500 (1844)	1300 (959)	1850 (1364)

DIN 912 – hexagon socket head cap screw; DIN 931/DIN 933 – hexagon head screw with/without shaft;
DIN 7984 – hexagon socket head cap screw with short head
All values subject to a friction coefficient of $\mu = 0.12$ and are to be used as approximate figures.

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2.12 Dimensions model 6003

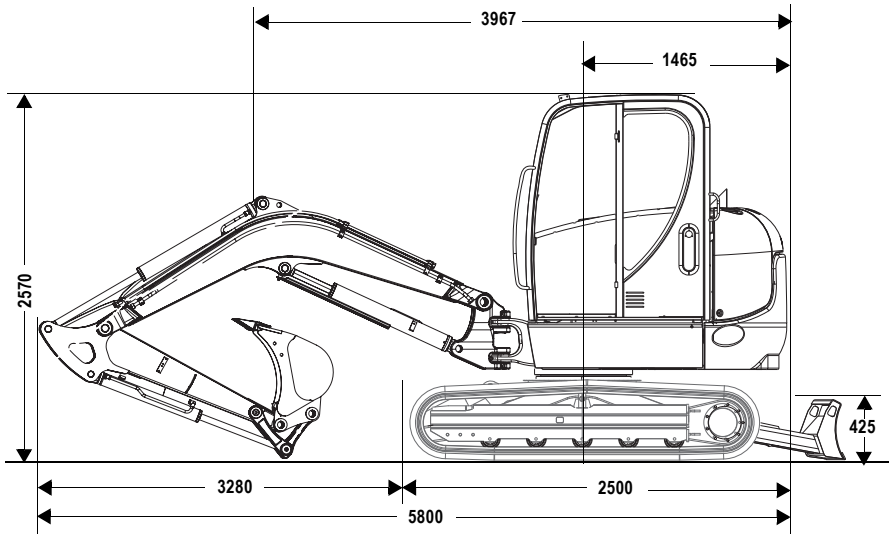
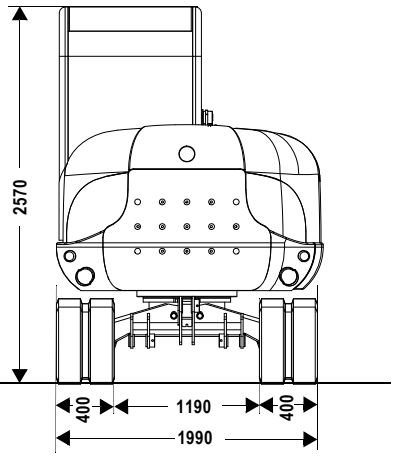
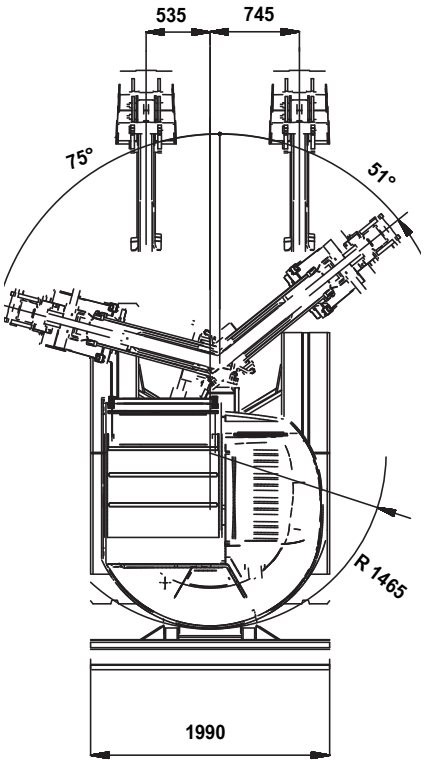


Fig. 6: Machine dimensions (model 6003)





Main data	Model 6003	Vario
Service weight	5500 kg (12125 lb)	5965 kg (13151 lb)
Height	2570 mm (8'5")	2684 mm (8'10")
Width	1990 mm (6'6")	1990 mm (6'6")
Transport length	5800 mm (19")	5800 mm (19")
Max. digging depth	3845 mm (12'7")	3736 mm (12'3")
Stick length (standard)	1685 mm (5'6")	1685 mm (5'6")
Stick length (long version)	1985 mm (6'6")	1985 mm (6'6")
Max. digging depth for long stick (+ 300 mm/11.8")	4140 mm (13'7")	4036 mm (13'3")
Max. vertical digging depth	2855 mm (9'4")	2735 mm (8'11")
Max. vertical digging depth (long stick)	3135 mm (10'3")	3014 mm (9'11")
Max. digging height	5660 mm (18'7")	5778 mm (18'11")
Max. digging height (long stick)	5850 mm (19'2")	5967 mm (19'7")
Max. dump height	3995 mm (13'1")	4109 mm (13'6")
Max. dump height (long stick)	4185 mm (13'9")	4298 mm (14'1")
Max. digging radius	6210 mm (20'4")	5960/6460 mm (19'7"/21'2")
Max. digging radius (long stick)	6490 mm (21'4")	6240/6740 mm (20'6"/22'1")
Max. reach at ground level	6090 mm (19'11")	5840/6340 mm (19'2"/20'10")
Max. reach at ground level (long stick)	6380 mm (20'11")	6130/6630 mm (20'1"/21'9")
Max. breakout force at bucket tooth	39.70 kN (8925 lbf)	39.70 kN (8925 lbf)
Max. tearout force (standard stick)	28.10 kN (6317 lbf)	28.10 kN (6317 lbf)
Max. tearout force (long stick)	25.10 kN (5643 lbf)	25.10 kN (5643 lbf)
Min. tail end slewing radius	1465 mm (4'10")	1465 mm (4'10")
Max. tail end lateral projection over chains	470 mm (1'6")	220/720 mm (8.7"/2'4")
Max. boom displacement to bucket centre (right-hand side)	745 mm (2'5")	995 mm (3'3")
Max. boom displacement to bucket centre (left-hand side)	535 mm (1'9")	785 mm (2'7")

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2.13 Lift capacity table 6003

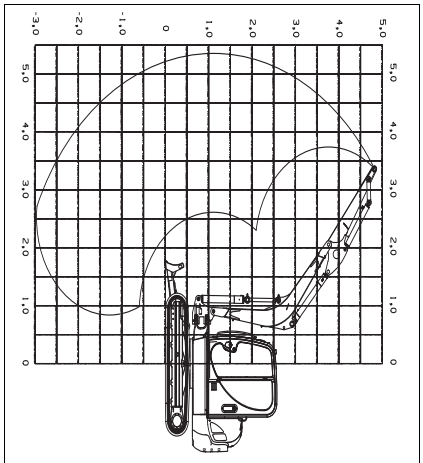
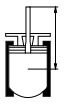
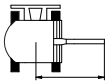


Fig. 7: Lift capacity table (model 6003)

All table indications in kg (lb) and horizontal position on firm ground without bucket.

A	max		5.0 m (16'5")		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B										
4.0 m (13'1")	1310* (2888*)	1020 (2249)			1245* (2745*)	1155 (2546)				
3.0 m (9'10")	1300* (2866*)	805 (1775)			1265* (2789*)	1145 (2524)				
2.0 m (6'7")	1320* (2910*)	710 (1565)	1330* (2932*)	775 (1709)	1490* (3285*)	1100 (2425)	1885* (4156*)	1700 (3748)		
1.0 m (3'3")	1360* (2998*)	675 (1488)	1435* (3164*)	750 (1653)	1775* (3913*)	1035 (2282)	2615* (5765*)	1550 (3417)		
0.0 m (0'0")	1410* (3109*)	690 (1521)	1495* (3296*)	730 (1609)	1970* (4343*)	990 (2183)	2970* (6548*)	1470 (3241)		
-1.0 m (-3'3")	1465* (3230*)	760 (1676)			1965* (4332*)	970 (2138)	2910* (6415*)	1450 (3197)	5010* (11045*)	2795 (6162)
-2.0 m (-6'7")	1495* (3296*)	965 (2127)					2450* (5401*)	1475 (3252)	4005* (8830*)	2855 (6294)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
*	Lift capacity limited by hydraulics

	With the stabiliser blade in driving direction
	Without the stabiliser blade, 90° to driving direction

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

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2.14 Lift capacity table 6003 with long stick option

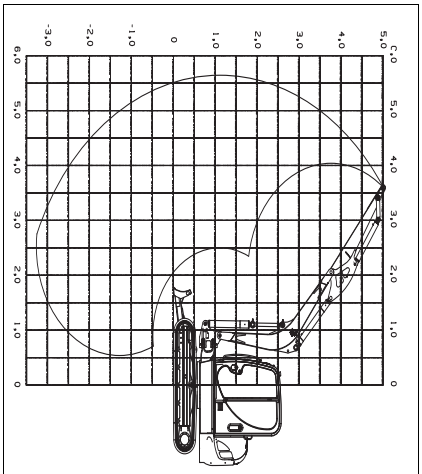
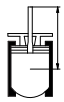
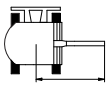


Fig. 8: Lift capacity table (model 6003)

All table indications in kg (lb) and horizontal position on firm ground without bucket.

A	max		5.0 m (16'5")		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B										
4.0 m (13'1")	1190* (2624*)	990 (2183)			1050* (2315*)	865 (1907)				
3.0 m (9'10")	1190* (2624*)	640 (1411)			1120* (2469*)	1055 (2326)				
2.0 m (6'7")	1120* (2469*)	285 (628)	1245* (2745*)	715 (1576)	1375* (3031*)	1085* (2392*)	1670* (3682*)	1670* (3682*)		
1.0 m (3'3")	1265* (2789*)	530 (1168)	1380* (3042*)	725 (1598)	1690* (3726*)	1030 (2271)	2400* (5291*)	1570 (3461)		
0.0 m (0'0")	1315* (2899*)	585 (1290)	1485* (3274*)	705 (1554)	1925* (4244*)	980 (2161)	2805* (6184*)	1465 (3230)		
-1.0 m (-3'3")	1375* (3031*)	665 (1466)			1990* (4387*)	955 (2105)	2855* (6294*)	1425 (3142)	4570* (10075*)	2785 (6140)
-2.0 m (-6'7")	1425* (3142*)	825 (1819)					2580* (5688*)	1440 (3175)	3980 (8774)	2800 (6173)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
*	Lift capacity limited by hydraulics

	With the stabiliser blade in driving direction
	Without the stabiliser blade, 90° to driving direction

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

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2.15 Lift capacity table 6003 with counterweight option

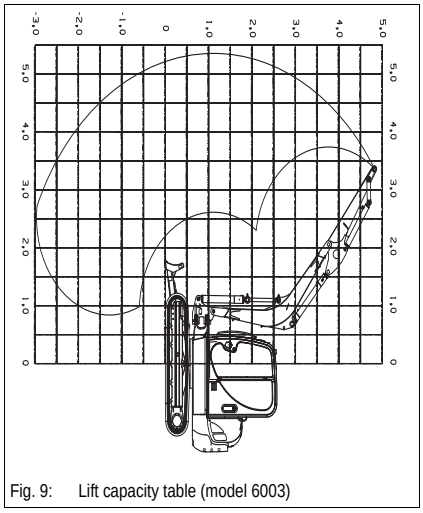
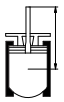
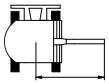


Fig. 9: Lift capacity table (model 6003)

All table indications in kg (lb) and horizontal position on firm ground without bucket.

A	max		5.0 m (16'5")		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B										
4.0 m (13'1")	1310* (2888*)	1175 (2590)			1245* (2745*)	1245* (2745*)				
3.0 m (9'10")	1300* (2866*)	935 (2061)			1265* (2789*)	1265* (2789*)				
2.0 m (6'7")	1320* (2910*)	830 (1830)	1330* (2932*)	905 (1995)	1490* (3285*)	1265 (2789)	1885* (4156*)	1885* (4156*)		
1.0 m (3'3")	1360* (2998*)	795 (1753)	1435* (3164*)	880 (1940)	1775* (3913*)	1205 (2657)	2615* (5765*)	1795 (3957)		
0.0 m (0'0")	1410* (3109*)	810 (1786)	1495* (3296*)	850 (1874)	1970* (4343*)	1155 (2546)	2970* (6548*)	1715 (3781)		
-1.0 m (-3'3")	1465* (3230*)	895 (1973)			1965* (4332*)	1140 (2513)	2910* (6415*)	1695 (3737)	5010* (11045*)	3250 (7165)
-2.0 m (-6'7")	1495* (3296*)	1130 (2491)					2450* (5401*)	1720 (3792)	4005* (8830*)	3310 (7297)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
*	Lift capacity limited by hydraulics

	With the stabiliser blade in driving direction
	Without the stabiliser blade, 90° to driving direction

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

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2.16 Lift capacity table 6003 with long stick and counterweight

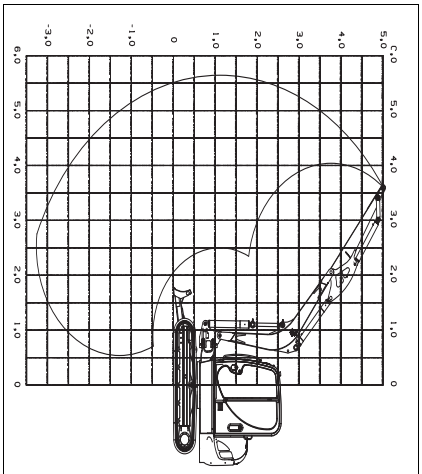
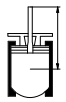
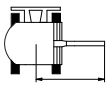


Fig. 10: Lift capacity table (model 6003)

All table indications in kg (lb) and horizontal position on firm ground without bucket.

A	max		5.0 m (16'5")		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B										
4.0 m (13'1")	1190* (2624*)	1130 (2491)			1050* (2315*)	1035 (2282)				
3.0 m (9'10")	1190* (2624*)	760 (1676)			1120* (2469*)	1120* (2469*)				
2.0 m (6'7")	1220* (2690*)	395 (871)	1245* (2745*)	845 (1863)	1375* (3031*)	1250 (2756)	1670* (3682*)	1670* (3682*)		
1.0 m (3'3")	1265* (2789*)	640 (1411)	1380* (3042*)	850 (1874)	1690* (3726*)	1200 (2646)	2400* (5291*)	1515 (3340)		
0.0 m (0'0")	1315* (2899*)	700 (1543)	1485* (3274*)	835 (1841)	1925* (4244*)	1145 (2525)	2805* (6184*)	1710 (3770)		
-1.0 m (-3'3")	1375* (3031*)	785 (1731)			1990* (4387*)	1120 (2469)	2855* (6294*)	1670 (3682)	4570* (10075*)	3240 (7143)
-2.0 m (-6'7")	1425* (3142*)	970 (2138)					2580* (5688*)	1685 (3715)	3980* (8774*)	3260 (7187)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
*	Lift capacity limited by hydraulics

	With the stabiliser blade in driving direction
	Without the stabiliser blade, 90° to driving direction

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

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2.17 Lift capacity table 6003 Vario

A	max			5.0 m (16'5")			4.0 m (13'1")			3.0 m (9'10")			2.0 m (6'7")		
B/C															
4.0 m (13'1")	1310* (2888*)	1310* (2888*)	780 (1720)				1245* (2745*)	1245* (2745*)	885 (1951)						
3.0 m (9'10")	1300* (2866*)	1105 (2436)	615 (1356)				1265* (2789*)	1265* (2789*)	880 (1940)						
2.0 m (6'7")	1320* (2910*)	975 (2150)	545 (1202)	1330* (2932*)	1060 (2337)	595 (1312)	1490* (3285*)	1490* (3285*)	845 (1863)	1885* (4156*)	1885* (4156*)	1305 (2877)			
1.0 m (3'3")	1360* (2998*)	925 (2039)	520 (1146)	1435* (3164*)	1030 (2271)	575 (1268)	1775* (3913*)	1420 (3131)	795 (1753)	2615* (5765*)	2125 (4685)	1190 (2624)			
0.0 m (0'0")	1410* (3109*)	945 (2083)	530 (1168)	1495* (3296*)	1000 (2205)	560 (1235)	1970* (4343*)	1355 (2987)	760 (1676)	2970* (6548*)	2015 (4442)	1125 (2480)			
-1.0 m (-3'3")	1465* (3230*)	1040 (2293)	585 (1290)				1965* (4332*)	1330 (2932)	745 (1642)	2910* (6415*)	1985 (4376)	1110 (2447)	5010* (11045*)	3830 (8444)	2145 (4729)
-2.0 m (-6'7")	1495* (3296*)	1320 (2910)	740 (1631)							2450* (5401*)	2020 (4453)	1130 (2491)	4005* (8830*)	3910 (8620)	2190 (4828)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
C	Vario position
*	Lift capacity limited by hydraulics

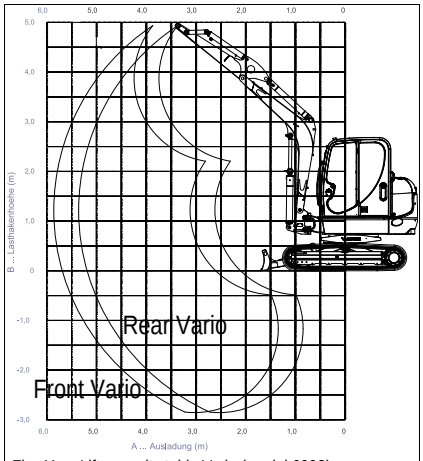


Fig. 11: Lift capacity table Vario (model 6003)

All table indications in kg (lb) and horizontal position on firm ground without bucket.

	With the stabiliser blade in driving direction
	Without the stabiliser blade 90° in driving direction Upper carriage shifted to the rear with Vario option
	Without the stabiliser blade 90° in driving direction Upper carriage shifted to the front with Vario option

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

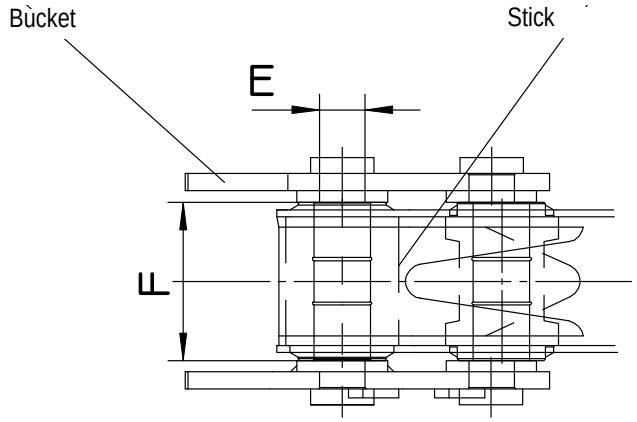
The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

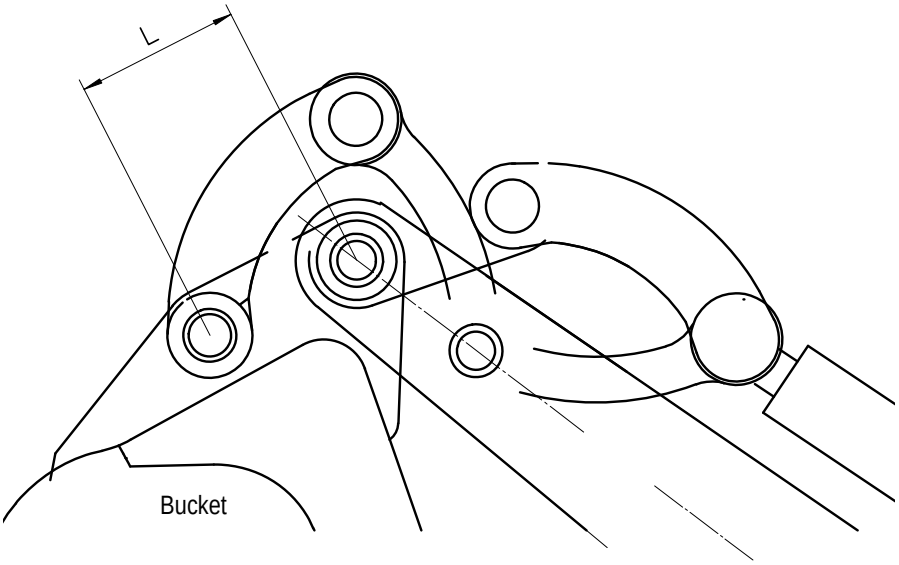
Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

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2.18 Kinematics

E	Pin diameter	50 mm (2”)
F	Stick width	195 mm (7.7”)
L	Pin distance to bucket mount	240 mm (9.4”)





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2.19 Attachments

Description	Width (mm/")	Capacity (l/gal)	Item No.	5002	6002	50Z3	6003
Rear excavator bucket 5002/6002	400/15.7	94/24.8	1000094242	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	500/19.7	132/34.9	1000094241	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	650/25.6	182/48.1	1000094243	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	850/33.5	250/66.0	1000094244	✔	✔	✔[2]	✔[1]
Rear excavator bucket 50Z3	340/13.4	58/15.3	1000112213	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	400/15.7	74/19.5	1000112216	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	500/19.7	95/25.1	1000108126	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	650/25.6	130/34.3	1000112218	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	850/33.5	175/46.2	1000112219	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 6003	340/13.4	74/19.5	1000112225	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	400/15.7	92/24.3	1000112226	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	500/19.7	120/31.7	1000109796	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	650/25.6	165/43.6	1000112227	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	850/33.5	225/59.4	1000112228	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket quickhitch system 5002/6002	340/13.4		1000017263	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/6002	400/15.7	94/24.8	1000017260	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/6002	500/19.7	132/34.9	1000019961	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/6002	650/25.6	182/48.1	1000017261	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/6002	850/33.5	250/66.0	1000017262	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 50Z3	340/13.4	58/15.3	1000112220	✔[1]	✔[1]	✔	✔[1]

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Description	Width (mm/")	Capacity (l/gal)	Item No.	5002	6002	50Z3	6003
Rear excavator bucket quickhitch system 50Z3	400/15.7	74/19.5	1000112221	✔[1]	✔[1]	✔	✔[1]
Rear excavator bucket quickhitch system 50Z3	500/19.7	95/25.1	1000112222	✔[1]	✔[1]	✔	✔[1]
Rear excavator bucket quickhitch system 50Z3	650/25.6	130/34.3	1000112223	✔[1]	✔[1]	✔	✔[1]
Rear excavator bucket quickhitch system 50Z3	850/33.5	175/46.2	1000112224	✔[1]	✔[1]	✔	✔[1]
Rear excavator bucket quickhitch system 6003	340/13.4	74/19.5	1000112229	✔[2]	✔[2]	X	✔
Rear excavator bucket quickhitch system 6003	400/15.7	92/24.3	1000112231	✔[2]	✔[2]	X	✔
Rear excavator bucket quickhitch system 6003	500/19.7	120/31.7	1000112232	✔[2]	✔[2]	X	✔
Rear excavator bucket quickhitch system 6003	650/25.6	165/43.6	1000112233	✔[2]	✔[2]	X	✔
Rear excavator bucket quickhitch system 6003	850/33.5	225/59.4	1000112234	✔[2]	✔[2]	X	✔
Ditch cleaning bucket 5002/6002	1200/47.2	205/54.2	1000096589	✔	✔	✔	✔
Ditch cleaning bucket 5002/6002	1400/55.1	238/62.9	1000096590	✔	✔	✔	✔

4 Attachment designed for this excavator model (optimal excavation output).
1. Attachment can be mounted but may be subject to restrictions regarding excavation forces, dump-in/out angles and productivity due to possibly reduced bucket volumes.
2. Same restrictions as for 1 but in addition, mounting these attachments can impair machine stability.
Same restrictions as for 1 and 2 but in addition, subject to possible collision with the boom ram.

Description	Width (mm/")	Capacity (l/gal)	Item No.	5002	6002	50Z3	6003
Ditch cleaning bucket quickhitch system 5002/6002	1200/47.2	205/54.2	1000096600	✔	✔	✔	✔
Ditch cleaning bucket quickhitch system 5002/6002	1400/55.1	238/62.9	1000096601	✔	✔	✔	✔
Offset bucket 5002/6002 short stick	1200/47.2	150/39.6	1000096583	✔	✔	✔[2]	✔
Offset bucket 5002/6002 short stick	1400/55.1	180/47.6	1000096584	✔	✔	✔[2]	✔
Offset bucket 5002/6002 long stick	1200/47.2	150/39.6	1000096581	✔	✔	✔[2]	✔
Offset bucket 5002/6002 long stick	1400/55.1	180/47.6	1000096582	✔	✔	✔[2]	✔
Offset bucket 50Z3 short stick	1200/47.2	110/29.1	1000127486	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 short stick	1400/55.1	130/34.3	1000127487	✔[2]	✔[2]	✔	✔[1]

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Description	Width (mm/")	Capacity (l/gal)	Item No.	5002	6002	50Z3	6003
Offset bucket 50Z3 long stick	1200/47.2	110/29.1	1000127483	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 long stick	1400/55.1	130/34.3	1000127485	✔[2]	✔[2]	✔	✔[1]
Offset bucket 5002/6002 quickhitch system short stick	1200/47.2	150/39.6	1000017254	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system short stick	1400/55.1	180/47.6	1000017255	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system long stick	1200/47.2	150/39.6	1000020878	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system long stick	1400/55.1	180/47.6	1000017253	✔	✔	X	✔
Offset bucket 50Z3 quickhitch system short stick	1200/47.2	110/29.1	1000127488	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system short stick	1400/55.1	130/34.3	1000127489	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system long stick	1200/47.2	110/29.1	1000127490	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system long stick	1400/55.1	130/34.3	1000127491	✔[2]	✔[2]	✔	✔[1]
Quickhitch system fork 5002/6002			1000012565	✔	✔	✔[1]	✔[1]
Quickhitch system fork 50Z3/6003			1000112204	✔[1]	✔[1]	✔	✔

4 Attachment designed for this excavator model (optimal excavation output).
1. Attachment can be mounted but may be subject to restrictions regarding excavation forces, dump-in/out angles and productivity due to possibly reduced bucket volumes.
2. Same restrictions as for 1 but in addition, mounting these attachments can impair machine stability.
Same restrictions as for 1 and 2 but in addition, subject to possible collision with the boom ram.

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Maintenance

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3 Maintenance

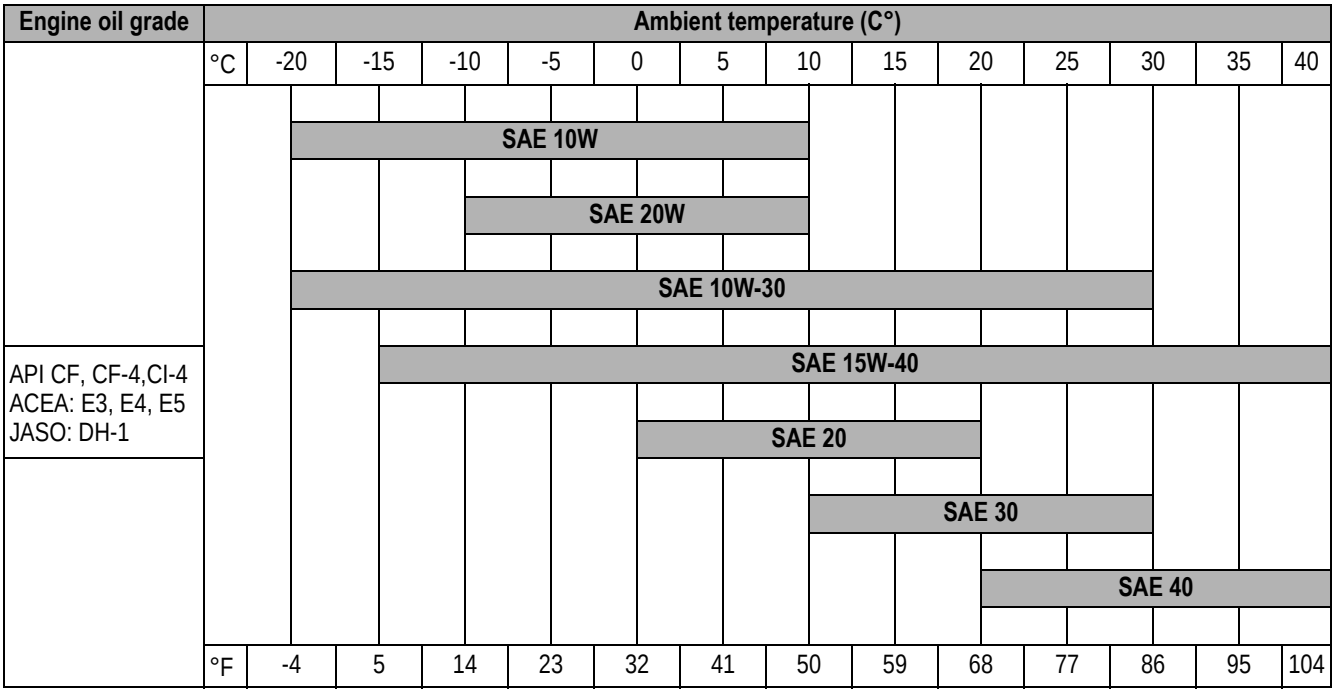
3.1 Fluids and lubricants

Component/ application	Engine/machine fluid	Specification	Season/ temperature	Capacities[1]
Diesel engine	Engine oil	SAE10W-40 [2]; API: CF, CF-4, CI-4 ACEA: E3, E4, E5 JASO: DH-1	-20 °C (-4 °F) +40 °C (104 °F)	10.2 l (2.7 gal)
Travelling drive	Gearbox oil[3]	Q8 T 55, SAE 85W-90[4]	Year-round	About 1 l each (0.26 gal)
		Q8 T 55, SAE 80W-90[5]		
		FINA PONTONIC GLS, SAE85W-90		
Hydraulic oil tank	Hydraulic oil	HVLP46[6]	Year-round	830 l (22 gal)
	Biodegradable oil[7]	PANOLIN HLP Synth 46		
		FINA BIOHYDRAN SE 46		
		BP BIOHYD SE-46		
Grease	Roller and friction bearings (live ring ball bearing race)	FINA Energrease L21M[8]	Year-round	As required
	Open gear (live ring gears)	BP Energrease MP-MG2[9]	Year-round	As required
Grease nipples	Multipurpose grease	FINA Energrease L21 M[10]	Year-round	As required
Battery terminals	Acid-proof grease[11]	FINA Marson L2	Year-round	As required
Fuel tank	Diesel fuel	2-D ASTM D975 – 94 (USA)	Summer or winter diesel depending on outside temperatures	93 l (24.6 gal)
		1-D ASTM D975 – 94 (USA)		
		EN 590 : 96 (EU)		
		ISO 8217 DMX (International)		
		BS 2869 – A1 (GB)		
		BS 2869 – A2 (GB)		
Radiator	Coolant	Soft water + antifreeze ASTM D4985	Year-round	7 l (1.8 gal)
		Distilled water + antifreeze ASTM D4985		
Air conditioning	Refrigerating agent	R134a[12]	Year-round	~ 950 g (2.1 lb)
	Compressor oil	Sanden SP10	Year-round	122 cm³ (7.4 in³) from AH00645
Washer system	Cleaning agent	Water + antifreeze	Year-round	2 l (0.5 gal)

1. The capacities indicated are approximative values; the oil level check alone is relevant for the correct oil level
2. According to DIN 51502
3. Hypoid gearbox oil based on basic mineral oil (SAE85W-90 according to DIN 51502), (API GL-4, GL5)
4. The Q8 T55 SAE 85W-90 gearbox oil is no longer produced
5. The Q8 T55 SAE 80W-90 gearbox oil is used from 10/2006 onwards. Do not mix both gearbox oils!
6. According to DIN 51524 section 3
7. Hydraulic ester oils (HEES)
8. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
9. KP2N-20 according to DIN 51502 EP multipurpose calcium sulphonate complex grease
10. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
11. Standard acid-proof grease
12. According to DIN 8960

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Oil grades for the diesel engine, depending on temperature



Additional oil change and filter replacement (hydraulics)

Caution!

An additional oil change and filter replacement can be required depending on how the machine is used. Failure to observe these replacement intervals can cause damage to hydraulic components.

☞ *Observe the following intervals*

Application		Hydraulic oil	Hydraulic oil filter insert
Normal work (excavation work)		Every 1000 s/h	Replace the first time after 50 s/h, then every 500 s/h
Percentage of hammer work	20 %	Every 800 s/h	300 s/h
	40 %	Every 400 s/h	
	60 %	Every 300 s/h	100 s/h
	Over 80 %	Every 200 s/h	

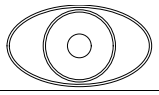
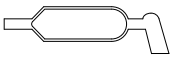
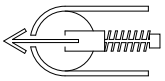
Important!

Please refer to the maintenance plan on page *3-5* for additional maintenance work.

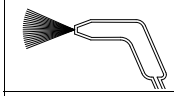
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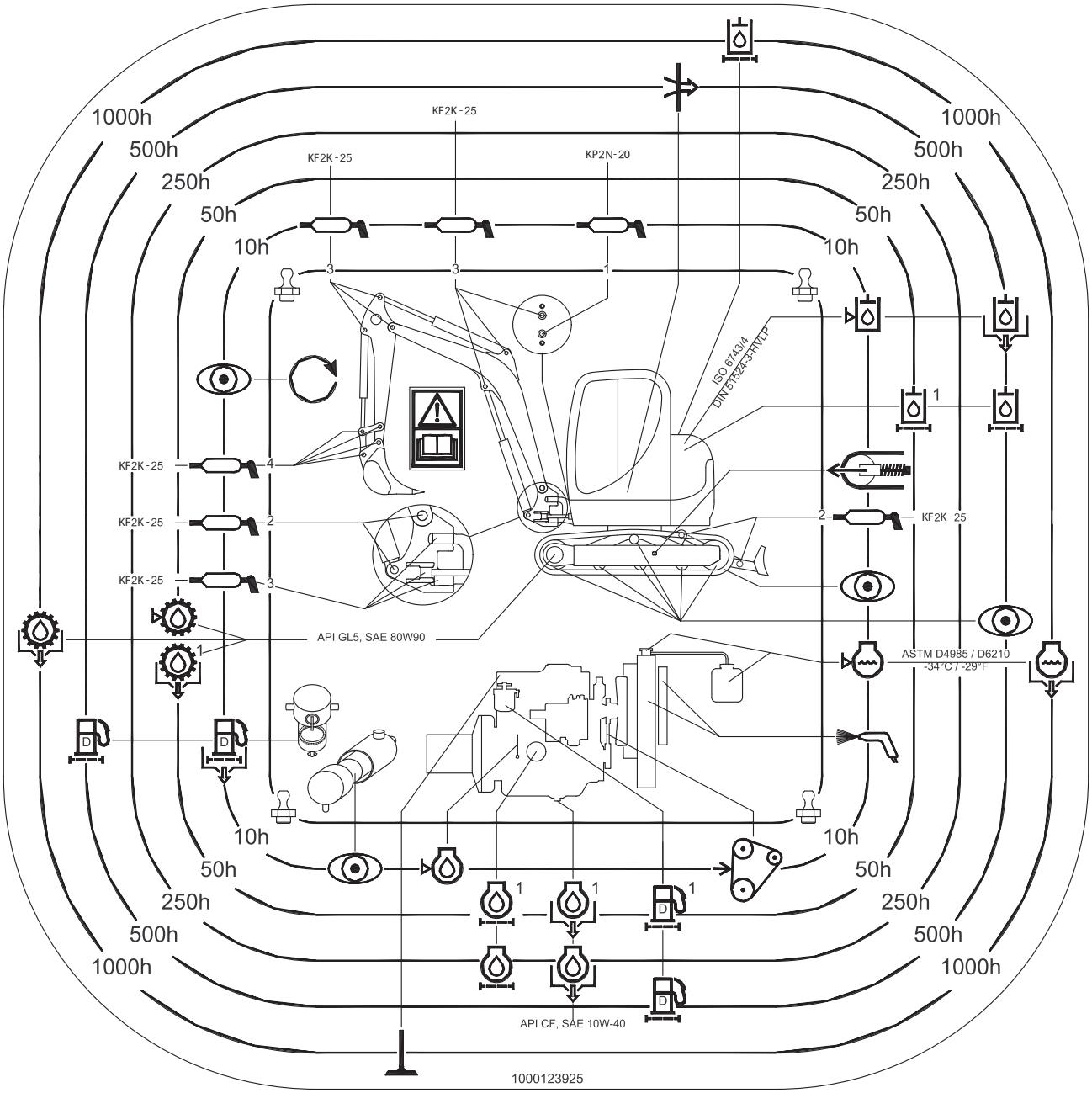
3.2 Maintenance label

Explanation of symbols on the maintenance label

Symbol	Assembly	Explanation
	General	Visual check
	General	Grease instructions
	Fuel system	Drain condensation water
	Fuel system	Replace the fuel filter, clean the fuel prefilter
	Radiator	Check the coolant level
	Radiator	Drain and fill in new coolant
	Engine	Check valve clearance. Adjust if necessary
	Engine	Check the engine oil level
	Engine	Change engine oil
	Engine	Replace the oil filter
	Engine	Check V-belt tension
	Travelling drive	Change oil
	Travelling drive	Check oil
	Undercarriage	Check chain tension
	Hydraulic system	Check oil level
	Hydraulic system	Change hydraulic oil
	Hydraulic system	Replace the hydraulic oil filter, replace the breather filter

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Symbol	Assembly	Explanation
	Radiator fins	Clean
	Heating, air conditioning	Change cab air filter



3.3 Maintenance plan (overview)

Work description

For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.

	Maintenance plan/service hours (s/h)						
	Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
Fluid and filter changes ( ):							
Carry out the following oil and filter changes (check oil levels after test run):							
• Engine oil[1]		●	●				●
• Engine oil filter[2]		●	●				●
• Fuel filter[3]		●	●				●
• Air filter element as indicated by telltale						●	
• Coolant				●			●
• Hydraulic oil filter insert [4]		●	●				●
• Hydraulic oil				●			●
• Hydraulic oil tank breather				●			●
• Gearbox oil[5,6]		●		●			●
Inspection work ( ):							
Check the following material. Refill if necessary:							
• Engine oil	●					●	
• Engine coolant	●					●	
• Hydraulic oil	●					●	
• Gearbox oil		●					●
Clean water ducts [7]				●			●
Check engine/hydraulic oil radiator and air conditioning for contamination. Clean if necessary	●					●	
Check cooling systems, heating and hoses for leaks and pressure (visual check)	●					●	
Check the joystick/drive valve pilot control filter for dirt, clean it if necessary[8]				●			
Replace cab filter for heating and air conditioning			●				●
Air filter (damage)	●					●	
Prefilter with water separator: drain water	●					●	
• Clean			●				●
Check V-belt condition and tension	●					●	
Check exhaust system for damage and condition	●					●	
Check valve clearance. Adjust if necessary				●			●

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3.3 Maintenance plan (overview)

Work description

For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.

	Maintenance plan/service hours (s/h)						
	Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
Clean and adjust the fuel injection pump [9]				●			●
Check and adjust the injection pressure of the injection nozzles, clean the injection needles/nozzles				●			●
Check and adjust injection time [10]				●			
Empty diesel fuel tank			●				●
Check battery electrolyte. Fill up with distilled water if necessary		●	●			●	
Check alternator, starter and electric connections, bearing play and function			●				●
Check preheating system and electric connections			●				●
Check correct function of air filter contamination gauge			●				●
Pressure check of primary pressure limiting valves		●	●				●
Check chains for cracks and cuts	●					●	
Check chain tension. Retighten if necessary	●					●	
Check bearing play of tread rollers, track carrier rollers, front idlers			●				●
Check piston rods for damage	●					●	
Check screws for tightness		●	●				●
Check pin lock	●					●	
Check line fixtures	●					●	
Check telltales for correct function		●	●				●
Check cab tilt lock, cables and cable holders for damage and correct function		●	●				●
Couplings, dirt pile-up on hydraulic system dust caps	●					●	
Check insulating mats in the engine compartment for damage/condition		●	●				●
Ensure grease supply of central lubrication system (option)	●					●	
Check labels and Operator's Manual for completeness and condition		●	●				●
Check function of engine cover gas strut	●					●	
Lubrication service ( ):							
Lubricate the following assemblies/components – *see Lubrication work* on page 3-42:							
• Stabiliser blade	●					●	
• Swivelling console	●					●	

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3.3 Maintenance plan (overview)

Work description For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	Maintenance plan/service hours (s/h) Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
• Boom	●					●	
• Stick	●					●	
• Attachments	●					●	
• Grease strip on chassis – *see Lubrication strip* on page 3-44	●					●	
Air conditioning (❄):							
Carry out the following maintenance and inspection work:							
• Air conditioning function		●	●				●
Replace cab filter			●				●
Check dehumidifier for corrosion, condensation and air bubbles		●					●
Replace dehumidifier					●		●
Compressor oil [11]					●		●
Functional check (👁):							
Check the function of the following assemblies/components. Rectify if necessary:							
• Lights, signalling system, acoustic warning system		●					●
• Heating function		●	●				●
Leakage check (💧):							
Check for tightness, leaks and chafing: pipes, flexible lines and screw connections of the following assemblies and components. Rectify if necessary:							
• Visual check	●					●	
☞ Engine and hydraulic system	●					●	
☞ Cooling and heating circuit	●					●	
☞ Travelling drive	●					●	

1. Drain engine oil the first time after 50 s/h, then every 500 s/h
2. Replace the engine oil filter the first time after 50 s/h, then every 500 s/h
3. Replace the fuel filter the first time after 50 s/h, then every 500 s/h
4. Replace the hydraulic oil filter insert the first time after 50 s/h, then every 500 s/h
5. Drain the gearbox oil the first time after 50 s/h, then every 1000 s/h
6. The Q8 T55 SAE 85W-90 gearbox oil is no longer produced. The Q8 T55 SAE 80W-90 gearbox oil is used from 10/2006 onwards. Do not mix both gearbox oils!
7. Clean the water ducts every other 1000 s/h servicing
8. Coarse dirt causes malfunctions and can even destroy the filter screen!
9. Clean and adjust the fuel injection pump every other 1000 s/h servicing
10. Check and adjust injection time every other 1000 s/h servicing
11. Replace the compressor oil every other 1500 s/h servicing

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3.4 Service package

Up to serial no. AD07210

1000127022	1	Service package 6003 (Tier 2)
1000125571	1	➥ Engine oil filter
1000106891	1	➥ Fuel filter
1000106892	1	➥ Water separator element
1000069998	1	➥ Seal for diesel fuel filter housing
1000064543	1	➥ O-ring
1000012360	1	➥ O-ring for oil drain plug
1000012847	1	➥ Hydraulic reflux filter insert
1000066727	1	➥ Vent filter
1000022075	1	➥ Air filter insert (inside)
1000022076	1	➥ Air filter insert (outside)
1000115808	1	➥ Cab filter
1000125682	1	➥ Valve cover gasket
1000003894	3	➥ O-ring

From serial no. AH00645

1000178852	1	Service package 6003 (European Tier 3A American Tier IV interim)
1000018587	1	➥ Engine oil filter
1000172001	1	➥ Fuel filter
1000106892	1	➥ Water separator element
1000069998	1	➥ Seal for diesel fuel filter housing
1000064543	1	➥ O-ring
1000012360	1	➥ O-ring for oil drain plug
1000126919	1	➥ Hydraulic reflux filter insert
1000109215	1	➥ Vent filter
1000113384	1	➥ Air filter insert (inside)
1000113383	1	➥ Air filter insert (outside)
1000115808	1	➥ Cab filter
1000125682	1	➥ Valve cover gasket
1000003894	3	➥ O-ring

3.5 Introduction

Operational readiness and the service life of machines are heavily dependent on maintenance.

Before carrying out service and maintenance work, always read, understand and follow the instructions given in

- Chapter 2 “SAFETY INSTRUCTIONS” in the Operator's Manual
- The Operator's Manuals of the attachments.

Secure open (engine) covers appropriately. Do not open (engine) covers on slopes or in strong wind.

Dirt can be blown away and cause severe injuries when using compressed air. Always wear protective goggles, masks and clothing.

Daily service and maintenance work, and maintenance according to the maintenance plan must be carried out by a specifically trained driver. All other maintenance work must be carried out by trained and qualified staff only.

The maintenance plans indicate when the maintenance work mentioned below must be carried out (– *see Maintenance plan (overview)* on page 3-5).

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3.6 Fuel system

Specific safety instructions

- Extreme caution is essential when handling fuel – high risk of fire.
- Never carry out work on the fuel system in the vicinity of naked flames or sparks.
- Do not smoke when working on the fuel system or when refuelling.
- Before refuelling, switch off the engine and remove the ignition key.
- Do not refuel in closed rooms.
- Wipe away fuel spills immediately.
- Keep the machine clean to reduce the risk of fire.

Refuelling



Fig. 1: Fuel filler inlet

Filler inlet **A** for the fuel tank is located behind the cab, on the left in driving direction. Lock **B** on the filler inlet can be opened with the key of the machine. Use handle **C** to climb onto the chain and as a safe hold during refuelling.

Danger!

All work involving fuel carries an increased

Danger of fire and poisoning!

☞ *Do not refuel in closed rooms.*

☞ *Never carry out work on the fuel system in the vicinity of naked flames or sparks.*

Environment!

Use a suitable container to collect the fuel as it drains and dispose of it in an environmentally friendly manner.

Important!

Do not run the fuel tank completely dry. Otherwise, air is drawn into the fuel system. This requires bleeding the fuel system – *see Bleeding the fuel system* on page 3-10.

Important!

Fill up the tank with the correct fuel type at the end of each working day to prevent the formation of condensation water in the fuel tank (condensation water damages the injection pump). Do not fill the tank completely but leave some space for the fuel to expand.

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Stationary fuel pumps

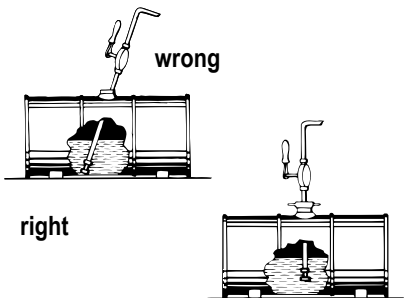


Fig. 2: Refuelling from a barrel

General

Only refuel from stationary fuel pumps. Fuel from barrels or cans is usually dirty.

Even the smallest particles of dirt can cause

- Increased engine wear
- Malfunctions in the fuel system and
- Reduced effectiveness of the fuel filters

Refuelling from barrels

If refuelling from barrels cannot be avoided, note the following points (see fig. 2):

- Barrels must neither be rolled nor tilted before refuelling.
- Protect the suction pipe opening of the barrel pump with a fine-mesh strainer.
- Immerse it down to a max. 15 cm (6”) above the floor of the barrel.
- Only fill the tank using refuelling aids (funnels or filler pipes) with integral microfilter.
- Keep all refuelling containers clean at all times.

Diesel fuel specification

Use only high-grade fuels.

Grade	Use
• 2-D ASTM D975 – 94 • 1-D ASTM D975 – 94	USA
• EN 590: 96	EU
• ISO 8217 DMX	International
• BS 2869 – A1 • BS 2869 – A2	England

Bleeding the fuel system

Danger!

If the fuel, as it drains, comes into contact with hot engine parts or the exhaust system, there is an increased

Danger of burns!

☞ *Never bleed the fuel system if the engine is hot.*

Bleed the fuel system in the following cases:

- After removing and fitting the fuel filter, prefilter or the fuel lines back on again
- After running the fuel tank empty
- After running the engine again, after it has been out of service for a longer period of time.

☞ *Bleed the fuel system as follows:*

- Fill up the fuel tank.
- Turn the ignition key to the first position.
- Wait about 5 minutes while the fuel system bleeds itself automatically.
- Start the engine.

If the engine runs smoothly for a while, and then stops; or if it does not run smoothly:

- Switch off the engine.
- Bleed the fuel system again as described above.
- Have this checked by authorised staff if necessary.

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Emptying the fuel tank

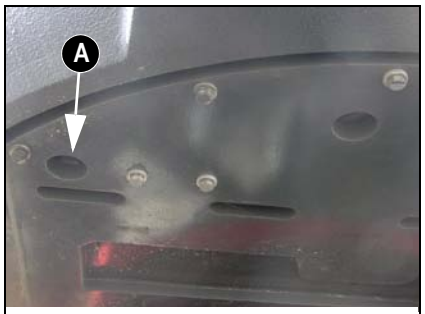


Fig. 3: Fuel drain plug

Danger!

If the fuel, as it drains, comes into contact with hot engine parts or the exhaust system, there is an increased

Danger of burns!

☞ *Never bleed the fuel system if the engine is hot.*

Due to dirt deposits and condensation water in the fuel tank, empty the fuel tank every 500 service hours as follows:

☞ *Place a container with sufficient capacity underneath the drain plug **A/fig.3** in the chassis.*

☞ *Open the drain plug to drain the fuel.*

☞ *Check the fuel tank for contamination and clean if necessary.*

☞ *Replace the filter according to the maintenance specifications.*

☞ *Screw the drain plug back in correctly.*

☞ *Fill up the fuel tank.*

☞ *Bleed the fuel system – see chapter Bleeding the fuel system on page 3-10.*

Fuel prefilter with water separator

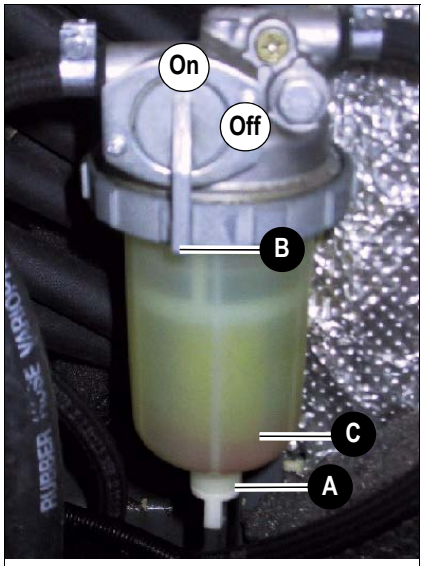


Fig. 4: Fuel prefilter

Check the fuel prefilter as follows:

☞ *If the red indicator ring rises to position **C**,*

☞ *unscrew thread **A**.*

➥ The water drains.

➥ Wait until the indicator ring returns to the bottom of the water separator.

☞ *Screw thread **A** back on again.*

Interrupt fuel supply as follows:

☞ *Turn ball-type cock **B** to the **OFF** mark.*

➥ Fuel supply is interrupted.

☞ *Turn ball-type cock **B** to the **ON** mark.*

➥ Fuel supply is open again.

Environment!

Thread **A** is fitted with a hose. Collect the water as it drains with a suitable container and dispose of it in an environmentally friendly manner.

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Replacing the fuel filter

Old engine type (up to serial number AD07210):

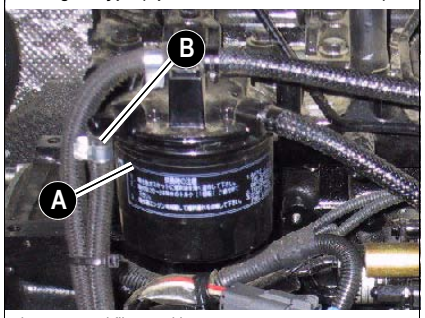
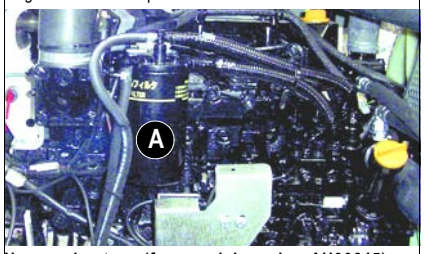


Fig. 5: Fuel filter position



New engine type (from serial number AH00645):

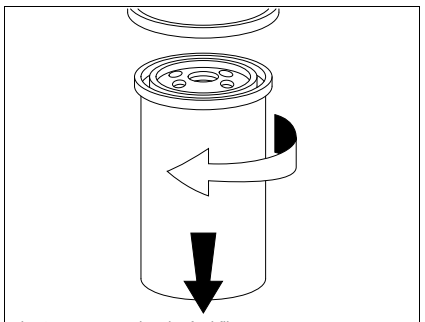


Fig. 6: Unscrewing the fuel filter

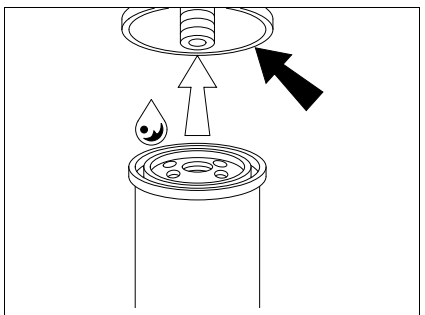


Fig. 7: Cleaning the sealing surface and oiling the gasket

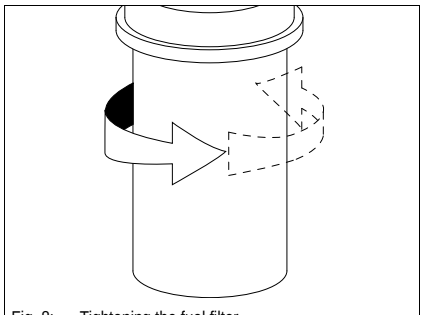


Fig. 8: Tightening the fuel filter

Danger!

If the fuel, as it drains, comes into contact with hot engine parts or the exhaust system, there is an increased

Danger of burns!

☞ *Never change the fuel filter if the engine is hot.*

Environment!

Use a suitable container to collect the fuel as it drains and dispose of it in an environmentally friendly manner.

☞ *Change fuel filter* 5/**A** *as follows:*

- Close the fuel feed line with the stop cock on the fuel prefilter.
- Thoroughly clean the outside surfaces of fuel filter 5/**A**.
- Place a suitable container under the filter.
- Slacken and unscrew fuel filter cartridge using a commercially available tool.
- Collect the fuel as it drains.

- Clean the sealing surface of the filter carrier if it is dirty.
- Lightly oil the rubber gasket of the new filter cartridge or apply a thin coat of clean diesel fuel to it.
- Screw on the cartridge by hand until the gasket makes contact.

- Tighten the fuel filter cartridge by turning it a further half revolution.
- Open the stop cock on the water separator again.
- Bleed the fuel system – *see Bleeding the fuel system* on page 3-10.
- Make a test run – and check for tightness.
- Dispose of the old fuel filter cartridge by an ecologically safe method.

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3.7 Engine lubrication system

Caution!

If the engine oil level is too low or if an oil change is overdue, this can cause

Engine damage or loss of output!

☞ *Have the oil changed by an authorised workshop – see Maintenance plan (overview) on page 3-5.*

Checking the oil level

Important!

Check the oil level once a day. We recommend checking it before starting the engine. After switching off a warm engine, wait at least 5 minutes before checking.

Checking the oil level

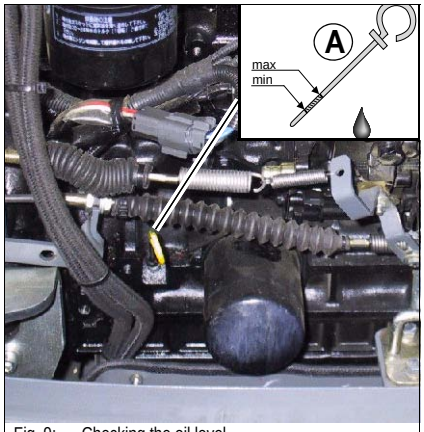


Fig. 9: Checking the oil level

☞ *Proceed as follows:*

- Park the machine on level ground.
- Switch off the engine.
- Fold the control lever base up.
- Let the engine cool down.
- Open the engine cover.
- Clean the area around the oil dipstick with a lint-free cloth.
- Pull out oil dipstick **A**.

☞ Wipe it with a lint-free cloth.

☞ Push oil dipstick **A** back in as far as possible.

☞ Withdraw it and read off the oil level.

☞ *However if necessary, fill up oil at the latest when the oil reaches the MIN mark on the oil dipstick* **A**.

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Filling up engine oil

Caution!

Too much or incorrect engine oil can result in engine damage! For this reason:

☞ *Do not add engine oil above the MAX mark of oil dipstick 10/***A**.

☞ *Use only the specified engine oil.*

☞ *Use engine oils of the same brand and grade => never mix different oils.*

Environment!

Use a suitable container to collect the engine oil as it drains and dispose of it in an environmentally friendly manner.

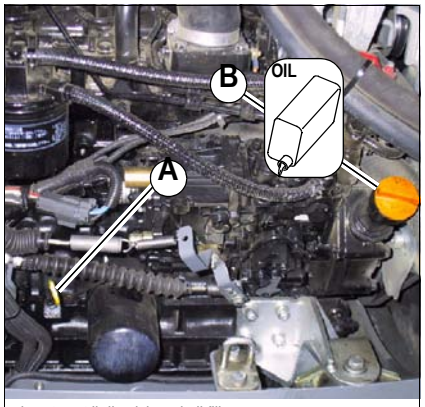


Fig. 10: Oil dipstick and oil filler cap

☞ *Proceed as follows:*

- Clean the area around oil filler cap **B** with a lint-free cloth.
- Open filler cap **B**.
- Raise oil dipstick **A** slightly to allow any trapped air to escape.
- Fill in engine oil.
- Wait about 3 minutes until all the oil has run into the oil sump.
- Check the oil level – *see Checking the oil level* on page 3-13.
- Fill up if necessary and check the oil level again.
- Close filler cap **B**.
- Push oil dipstick **A** back in as far as possible.
- Completely remove all oil spills from the engine.

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Changing engine oil

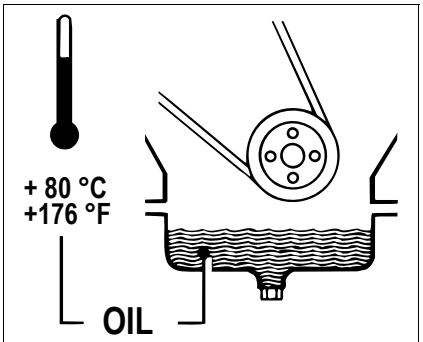


Fig. 11: Optimum engine oil temperature

Danger!

Caution when draining hot engine oil –

Danger of burns!

☞ *Wear protective gloves.*

☞ *Use suitable tools.*

Environment!

Use a suitable container to collect the engine oil as it drains and dispose of it in an environmentally friendly manner.

☞ *Change the engine oil as follows:*

- Park the machine on level ground.
- Let the engine run until it reaches its operating temperature (oil temperature about 80 °C/176 °F).
- Switch off the engine.
- Place a container under the opening to collect the oil as it drains.
- Unscrew the oil drain plug.
- Completely drain the oil.
- Screw the oil drain plug back on again.
- Fill in engine oil – *see chapter Filling up engine oil* on page 3-14.
- Start the engine and let it run briefly at low revs.
- Switch off the engine.
- Wait a moment until all the oil has run into the oil sump.
- Check the oil level again.
- Fill up if necessary and check again.
- Completely remove all oil spills from the engine.

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Replacing the engine oil filter cartridge

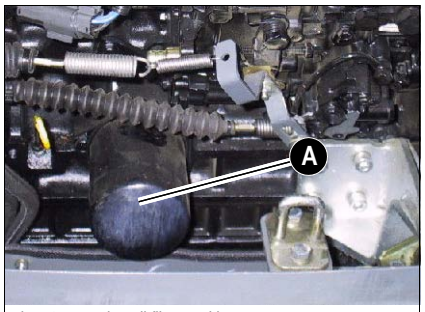


Fig. 12: Engine oil filter position

Danger!

Caution when draining hot engine oil –

Danger of burns!

☞ *Wear protective gloves.*

Environment!

Collect the drained engine oil in a suitable container. Dispose of used oil and filters in an environmentally friendly manner.

☞ *Change the filter as follows:*

- Switch off the engine.
- Place a suitable container underneath the oil filter to collect the oil as it drains.
- Slowly slacken oil filter cartridge **A** using a commercially available tool.
- Let the oil drain into the container.
- Remove the filter cartridge once the oil is completely drained.
- Make sure the thread adapter is correctly placed in the filter head.

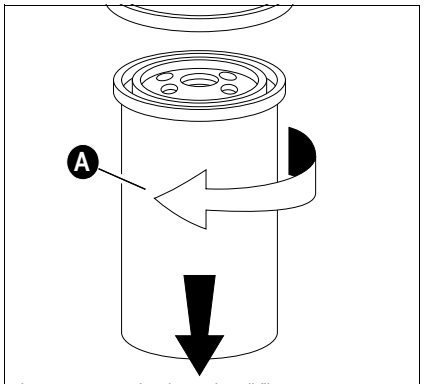


Fig. 13: Unscrewing the engine oil filter

- Clean the inside of the filter head.
- Apply a thin coat of fresh engine oil to rubber seal **B** of the new oil filter cartridge.
- Tighten the new filter cartridge by hand until the gasket makes contact.

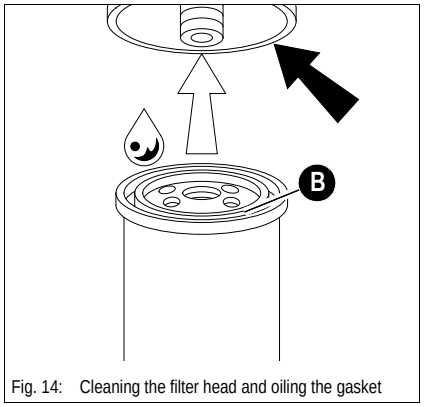


Fig. 14: Cleaning the filter head and oiling the gasket

- Tighten oil filter cartridge **A** by hand by about a further half revolution.
- Make sure the oil level is correct.
- Let the engine run briefly.
- Switch off the engine.
- Check the seal of oil filter cartridge **A** and retighten by hand.
- Check the oil level and fill in engine oil if necessary.
- Completely remove all oil spills from the engine.
- Dispose of the used oil filter in an environmentally friendly manner.

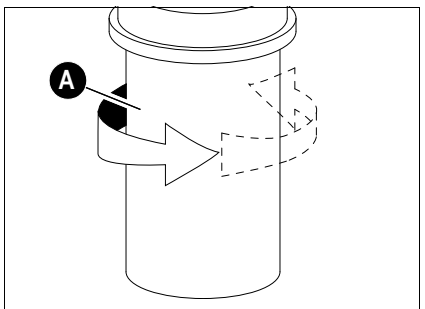


Fig. 15: Tightening the filter cartridge

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3.8 Cooling system

The oil and water cooler is located in the engine compartment, on the right side of the engine.

The expansion tank for the coolant is also located in the engine compartment, in front of the oil cooler.

Specific safety instructions

- Dirt on the radiator fins reduces the cooler's heat dissipation capacity! To avoid this:
  - ☞ Clean the outside of the radiator at regular intervals. Use oil-free compressed air (2 bar/29 psi max.) to clean. Maintain a certain distance to the radiator to avoid damage to the radiator fins. Refer to the maintenance plans in the appendix for the cleaning intervals.
  - ☞ In dusty or dirty work conditions, clean more frequently than indicated in the maintenance plans.
- An insufficient coolant level reduces the heat dissipation capacity as well and can lead to engine damage. Therefore:
  - ☞ Check the coolant level at regular intervals. Refer to the maintenance plans in the appendix for the intervals.
  - ☞ If coolant must be added frequently, check the cooling system for leaks and/or contact your dealer.
  - ☞ Never fill in cold water/coolant if the engine is warm.
  - ☞ After filling the expansion tank, test run the engine and check the coolant level again after switching off the engine.
- The use of the wrong coolant can destroy the engine and the cooler. Therefore:
  - ☞ Add enough antifreeze compound to the coolant – but never more than 50 %. If possible use brand-name antifreeze compounds with anticorrosion additives.
  - ☞ Observe the coolant compound table – *see Coolant compound table* on page 2-7.
  - ☞ Do not use cooler cleaning compounds if an antifreeze compound has been added to the coolant – otherwise this causes sludge to form, which can damage the engine.
- Once you have filled the expansion tank:
  - ☞ Test run the engine.
  - ☞ Switch off the engine.
  - ☞ Let the engine cool down.
  - ☞ Check the coolant level again.



Environment!

Use a suitable container to collect the coolant as it drains and dispose of it in an environmentally friendly manner.

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Checking/filling up coolant

Danger!

Never open the coolant tank and never drain coolant if the engine is warm since the cooling system is under high pressure –

Danger of burns!

☞ *Wait at least 15 minutes after switching off the engine.*

☞ *Wear protective gloves and clothing.*

☞ *Open filler cap **B** to the first notch and release the pressure.*

☞ *Make sure the coolant temperature is sufficiently low so you can touch the radiator plug with your hands.*

Danger!

Antifreeze is flammable and poisonous –

Danger of accidents!

☞ *Keep away from flames.*

☞ *Avoid eye contact with antifreeze.*

- If antifreeze comes into contact with the eyes,

➥ immediately rinse with clean water and seek medical assistance.

Checking the coolant level

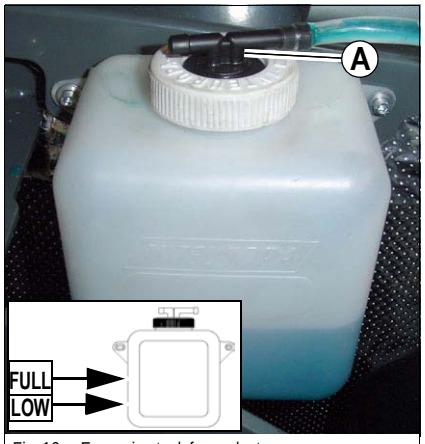


Fig. 16: Expansion tank for coolant

☞ *Proceed as follows:*

- Park the machine on level ground.
- Switch off the engine.
- Fold the control lever base up.
- Remove the key and carry it with you.
- Let the engine and the coolant cool down.
- Open the engine cover.
- Check the coolant level on the transparent coolant tank **A** and on the radiator **B**.

☞ If the coolant level is below the **LOW** seam or if there is no coolant at the radiator's filler inlet:

- Fill up coolant.

Important!

Check the coolant level once a day. We recommend checking it before starting the engine.

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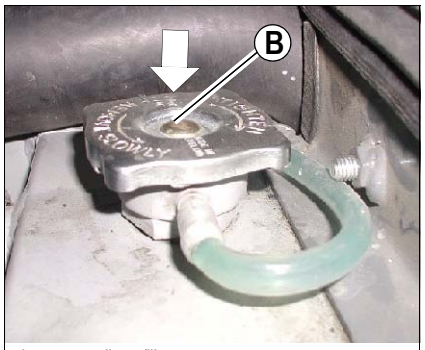


Fig. 17: Radiator filler cap

Filling up coolant

After the engine has cooled down:

☞ *Release overpressure in the radiator.*

☞ *Carefully open the cap to the first notch and fully release the pressure.*

☞ *Open filler cap **B**.*

☞ *Fill in coolant up to the lower edge of the filler inlet (radiator).*

☞ *Close filler cap **B**.*

☞ *Start the engine and let it warm up for about 5 – 10 minutes*

☞ *Switch off the engine.*

☞ *Remove the key and carry it with you.*

☞ *Let the engine cool down.*

☞ *Check the coolant level again.*

➥ The coolant level must be between the **LOW** and **FULL** tank seams.

☞ *If necessary, fill up coolant and repeat the procedure until the coolant level remains constant.*

Important!

Check the antifreeze every year before the cold season sets in.

Draining coolant

Danger!

Never open the coolant tank and never drain coolant if the engine is warm since the cooling system is under high pressure –

Danger of burns!

☞ *Wait at least 10 minutes after switching off the engine.*

☞ *Wear protective gloves and clothing.*

☞ *Open filler cap **17/B** to the first notch and release the pressure.*

After the engine has cooled down:

☞ *Release overpressure in the radiator.*

☞ *Open the cap to the first notch and fully release the pressure.*

☞ *Open filler cap **17/B**.*

☞ *Open the drain plug of the radiator and drain the coolant.*

☞ *Close the drain plug again.*

☞ *Fill up the radiator with suitable coolant – see Fluids and lubricants on page 3-1.*

☞ *Check the coolant level – see Checking the coolant level on page 3-18.*

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3.9 Air filter

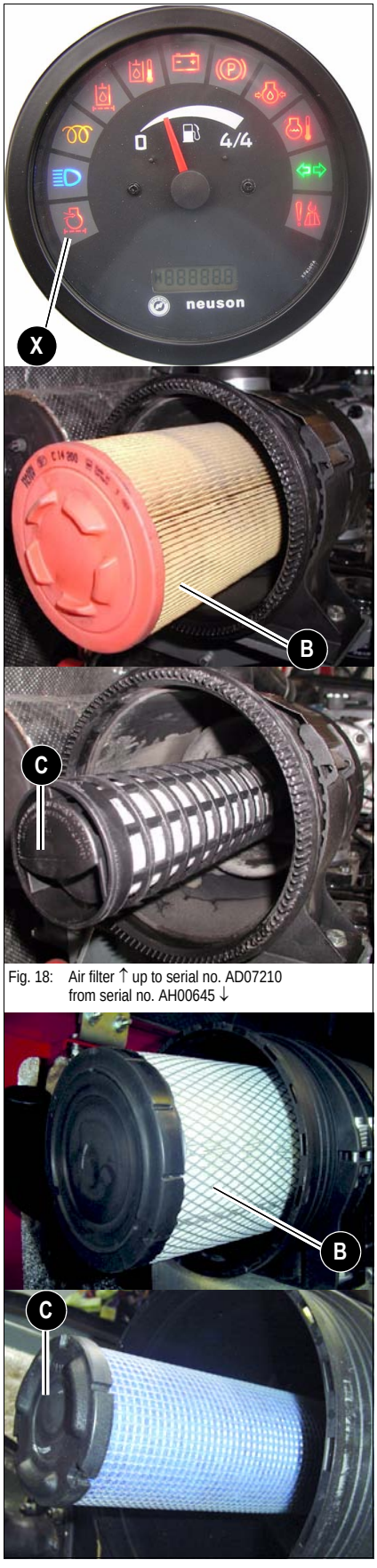


Fig. 18: Air filter ↑ up to serial no. AD07210
from serial no. AH00645 ↓

Caution!

The filter cartridge is damaged if it is washed or brushed out.
Bear in mind the following to avoid premature engine wear:

☞ *Do not clean the filter cartridge.*

☞ *Replace the filter cartridge when the telltale comes on.*

☞ *Never reuse a damaged filter cartridge.*

☞ *Ensure cleanliness when replacing the filter cartridge.*

Telltale **X** in the round display element monitors the filter cartridge.

☞ *Replace outside filter* **B** *and inside filter* **C***:*

- If telltale **X** in the round display element comes on.
- According to the maintenance plan.

Important!

For **applications in especially dusty environment**, the air filter is fitted with an extra inside filter **C**. Do not clean inside filter **C**.

Caution!

Filter cartridges degrade prematurely when in service in acidic air for longer periods of time. This risk is present for example in acid production facilities, steel and aluminium mills, chemical plants and other nonferrous-metal plants.

☞ *Replace outside filter* ***B*** *and inside filter* ***C*** *at the latest after 50 service hours.*

General instructions for air filter maintenance:

- Store filters in their original packaging and in a dry place.
- Do not knock the filter against other objects as you install it.
- Check air filter attachments, air intake hoses and air filters for damage, and immediately repair or replace if necessary.
- Check the screws at the induction manifold and the clamps for tightness.
- Check the function of the dust valve, replace if necessary.

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Replacing the filter

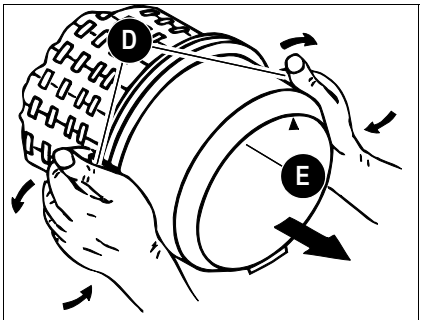


Fig. 19: Removing the lower housing section

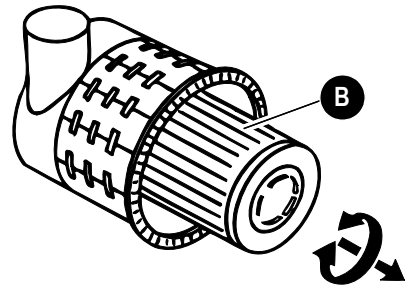


Fig. 20: Removing the filter element

- Replace outside filter ***20/B*** as follows:

☞ *Switch off the engine.*

☞ *Remove the key and carry it with you.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

☞ *Remove dirt and dust from the air filter and the area around the air filter.*

☞ *Fold both bow clips* **19/D** *on lower housing section* **19/E** *to the outside.*

☞ *Remove lower housing section* **E**.

☞ *Carefully remove outside filter* **B** *with slightly turning movements.*

☞ **Make sure** *all dirt (dust) inside the upper and lower housing sections, including the dust valve, has been removed.*

☞ Clean the parts with a clean lint-free cloth, do not use compressed air.

☞ *Check the air filter cartridges for damage, only install intact filters.*

☞ *Carefully insert new outside filter* **B** *in the upper housing section.*

☞ *Position lower housing section* **E** *(make sure it is properly seated).*

☞ *Close both bow clips* **D**.

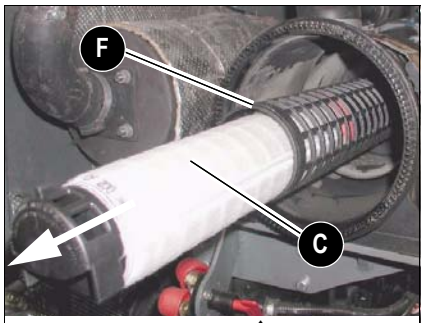
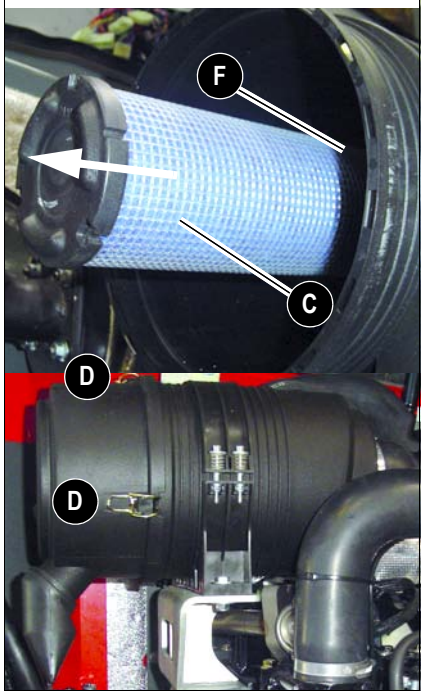


Fig. 21: Replacing the inside filter ↑ up to serial no. AD07210



- Replace inside filter ***21/C*** as follows:

☞ *Switch off the engine.*

☞ *Remove the key and carry it with you.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

☞ *Remove dirt and dust from the air filter and the area around the air filter.*

☞ *Fold both bow clips* **D** *on lower housing section* **E** *to the outside.*

☞ *Remove lower housing section* **E**.

☞ *Carefully remove outside filter* **B** *with slightly turning movements.*

☞ *Carefully remove inside filter* ***C***.

☞ Cover the air supply at the end of the filter with a clean lint-free cloth to prevent dust from entering the engine.

☞ **Make sure** *all dirt (dust) inside the upper and lower housing sections* **21/F**, *including dust valve* ***22/G***, *has been removed.*

☞ Clean the parts with a clean lint-free cloth, do not use compressed air.

☞ Remove the cloth from the air supply.

☞ *Check the air filter cartridges for damage, only install intact filters.*

☞ *Carefully insert the new inside filter* **C** *in the inside housing section* **F**.

☞ *Carefully insert outside filter* **B** *in the upper housing section.*

☞ *Position lower housing section* **E** *(make sure it is properly seated).*

☞ *Close bow clips* **D**.

Important!

Make sure dust valve **G** shows downwards once it is installed.

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Functional check once a week of the dust valve

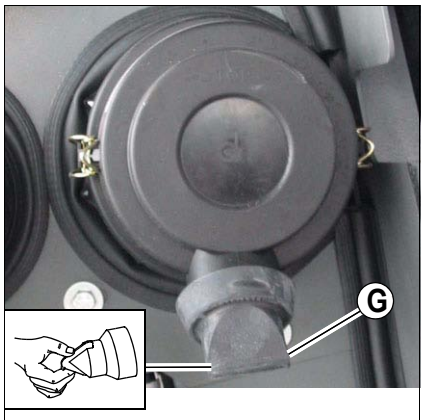


Fig. 22: Air filter dust valve

The air filter is located in the engine compartment, on the right-hand side of the machine.

☞ *Proceed as follows:*

- Switch off the engine.
- Apply the parking brake.
- Squeeze the discharge slot of dust valve **22/G**.
- Remove hardened dust by squeezing the upper area of the valve.

☞ *Clean the discharge slot if necessary.*

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3.10 V-belt

Danger!

Only check or retighten/replace the V-belt when the engine is switched off –

Danger of personal injury!

☞ *Switch off the engine before carrying out inspection work in the engine compartment.*

☞ *Disconnect the battery or the battery master switch.*

☞ *Let the engine cool down.*

Caution!

Cracked and stretched V-belts cause engine damage.

☞ *Have the V-belt replaced by an authorised workshop.*

Check the V-belt once a day, and retighten if necessary!

Retighten new V-belts after about 15 minutes of running time.

Checking V-belt tension

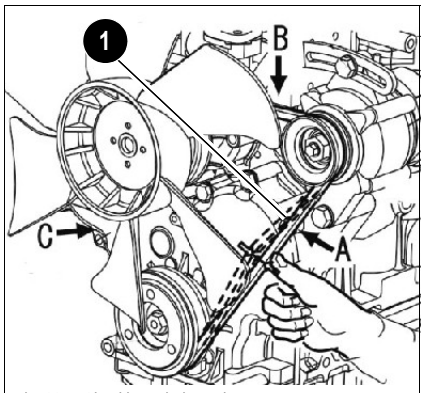


Fig. 23: Checking V-belt tension

- Check as follows:
  - ☞ Switch off the engine.
  - ☞ Fold the control lever base up.
  - ☞ Remove the key and carry it with you.
  - ☞ Disconnect the battery or the battery master switch.
  - ☞ Let the engine cool down.
  - ☞ Open the engine cover.
  - ☞ Carefully check V-belt **1** for damage, cracks or cuts.
  - ☞ Replace the V-belt if it touches the base of the V-belt groove or the discs of the pulley.
- If the V-belt is damaged:
  - ☞ Have the V-belt replaced by authorised staff.
  - ☞ Press with your thumb to check the deflection of the V-belt between the crankshaft disc and the fan wheel **position 23/C**. A new V-belt should have a deflection of 6 to 8 mm (0.2” – 0.3”), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3” – 0.35”)
  - ☞ Retighten the V-belt if necessary.

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Retightening the V-belt

Caution!

Overtightening the V-belt can damage the V-belt, the V-belt guide and the water pump bearing. Avoid contact of oil, grease or similar substances with the V-belt.

☞ *Check V-belt tension – see Checking V-belt tension on page 3-23.*

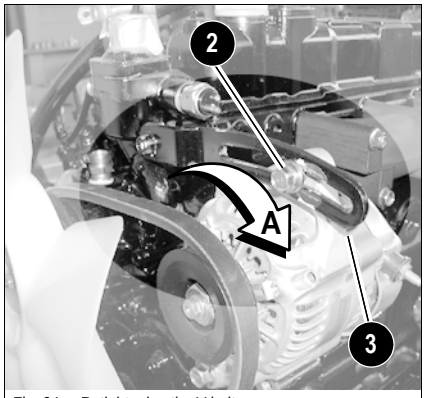


Fig. 24: Retightening the V-belt

- Retighten as follows:

☞ Switch off the engine.

☞ Fold the control lever base up.

☞ Remove the key and carry it with you.

☞ Disconnect the battery or the battery master switch.

☞ Let the engine cool down.

☞ Open the engine cover.

☞ Slacken fastening screws **2** of alternator **3**.

☞ Use a suitable tool to push the alternator in the direction of arrow **A** until reaching the correct V-belt tension (fig. 24).

☞ Keep the alternator in this position, and at the same time retighten fastening screws **2**.

☞ Check V-belt tension again and adjust it if necessary.

☞ Connect the battery or the battery master switch.

☞ Close the engine cover.

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Checking the V-belt of the air conditioning system

Caution!

Excessive or insufficient tension of the V-belt can cause damage to the V-belt or to the compressor of the air conditioning system.

☞ *Always make sure the V-belt has the correct tension.*

☞ *Replace V-belts with damage, cracks, cuts etc.*

☞ *Avoid contact of oil, grease or similar substances with the V-belt.*

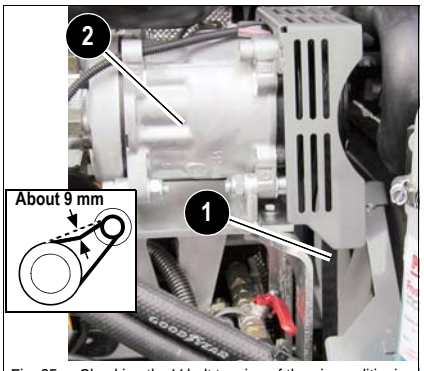


Fig. 25: Checking the V-belt tension of the air conditioning system

- Check as follows:
  - ☞ Switch off the engine.
  - ☞ Fold the control lever base up.
  - ☞ Remove the key and carry it with you.
  - ☞ Disconnect the battery or the battery master switch.
  - ☞ Let the engine cool down.
  - ☞ Open the engine cover.
  - ☞ Carefully check V-belt **1** for damage, cracks or cuts.
  - ☞ Replace the V-belt if it touches the base of the V-belt groove or the discs of the pulley.
- If the V-belt is damaged:
  - ☞ Have the V-belt replaced by authorised staff.
  - ☞ Press with your thumb to check the deflection of the V-belt. A new V-belt should have a deflection of 7 to 9 mm (0.3” – 0.35”), a used V-belt (after about 5 minutes running time) should have a deflection of 9 to 11 mm (0.35” – 0.4”).
  - ☞ Retighten the V-belt if necessary.

Tightening the V-belt of the air conditioning system

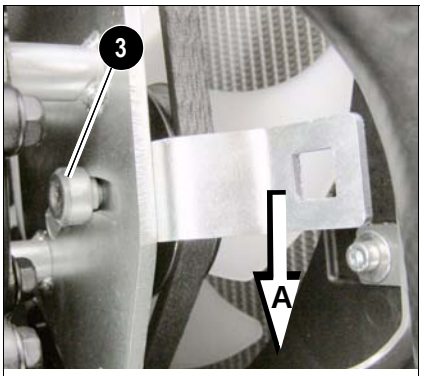


Fig. 26: Retightening the V-belt of the air conditioning system

- Retighten as follows:
  - ☞ Switch off the engine.
  - ☞ Fold the control lever base up.
  - ☞ Remove the key and carry it with you.
  - ☞ Disconnect the battery or the battery master switch.
  - ☞ Let the engine cool down.
  - ☞ Open the engine cover.
  - ☞ Slacken fastening screw **3** of alternator **2**.
  - ☞ Use a suitable tool to push the compressor in the direction of arrow **A** until reaching the correct V-belt tension (fig. 26).
  - ☞ Keep the compressor in this position, and at the same time retighten fastening screw **3**.
  - ☞ Check V-belt tension again and adjust it if necessary.
  - ☞ Connect the battery or the battery master switch.
  - ☞ Close the engine cover.

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3.11 Pressure check

General

- Run the machine warm before checking the pressure. The hydraulic oil should have a minimum temperature of 50 °C/122 °F (operating temperature).
- Pressure drop is checked by reducing revs from maximum to idling speed at constant load.
- Set the primary pressure limiting valves (PPLV) at maximum engine revs.
- Pressure settings: – *see Hydraulic system* on page 2-3.
- **Ensure utmost cleanliness of all measuring points, measuring ports, micro measuring lines and pressure gauges that are connected for checking pressure => even the slightest traces of dirt, e.g. a grain of sand, can impair tightness and cause leaks.**

Checking pilot control pressure

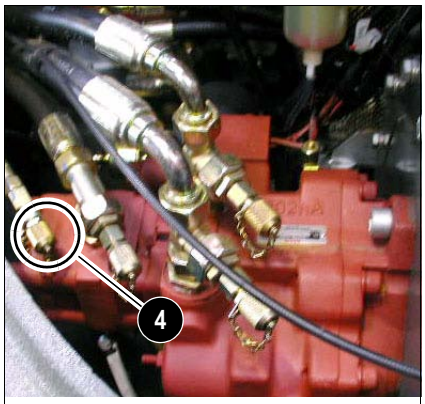


Fig. 27: Pilot control pressure measuring port

Checking pilot control pressure

☞ *Connect a pressure gauge to measuring port MP 4.*

☞ *Move the control lever base (safety switch) to work position.*

☞ *Check and make a note of the pressure value.*

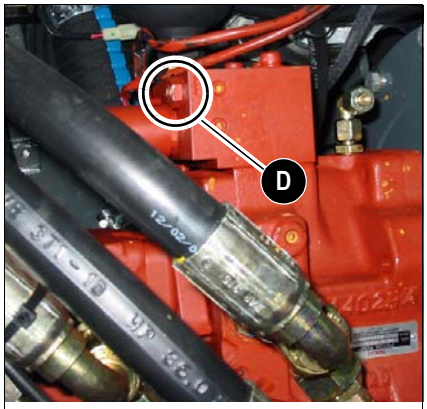


Fig. 28: Pressure reducing valve

Adjusting pilot control pressure limiting valve 4 (PLV 4)

☞ Adjust the pressure at pressure limiting valve 4 (PLV4) **27/4** at the pilot oil supply unit.

☞ Check the pilot control pressure again once adjustment is over.

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Pressure check of variable displacement pump P1

Hydraulic supply for boom, bucket and left-hand side drive functions

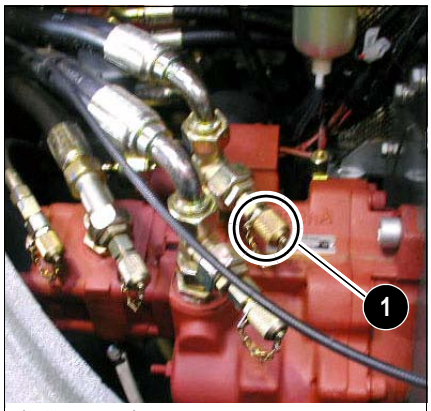


Fig. 29: Measuring port P1

Checking primary pressure limiting valve 1 (PPLV 1)

☞ *Connect a pressure gauge to measuring port MP 1* ***29/1****.*



☞ *Extend the boom ram as far as it will go at maximum engine revs.*

☞ *Check and make a note of the pressure value.*

Checking pressure drop

☞ *Extend the boom ram as far as it will go at maximum engine revs.*

☞ *Swiftly reduce engine revs from maximum to minimum -> pressure drop.*

☞ *Check and make a note of the pressure value.*

➥ Pressure drop should not exceed the specified value by more than 10 %.

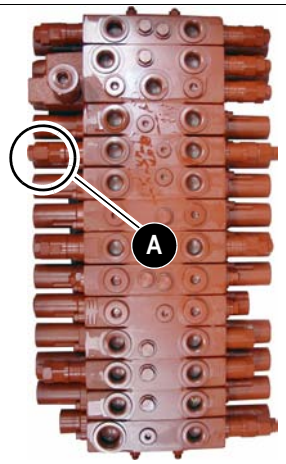


Fig. 30: Primary pressure limiting valve 1

Adjusting primary pressure limiting valve 1 (PPLV 1)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 1)* ***30/A*** *on the main valve block.*

☞ Slacken the locknut of the pressure limiting valve.

☞ Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge.

➥ The valve seat may be stuck and must be slackened first.

☞ Adjust the pressure limiting valve and tighten the locknut.

☞ *Check the primary pressure limiting valve 1 and the pressure drop once adjustment is over.*

Also check with the retract boom, the extend/retract bucket and with the left-hand side forwards/reverse drive functions!

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Pressure check of variable displacement pump P2

Hydraulic supply of stick, right-hand side drive and auxiliary hydraulics functions

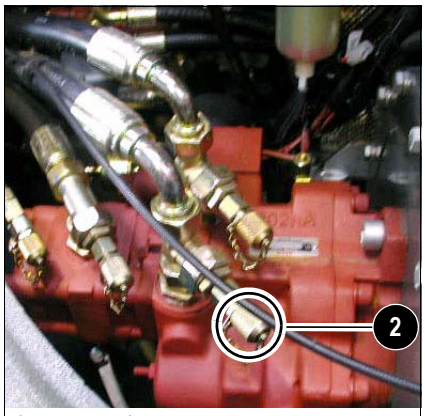


Fig. 31: Measuring port P2

Checking primary pressure limiting valve 2 (PPLV 2)

☞ *Connect a pressure gauge to measuring port MP 2* ***31/2****.*



☞ *Extend the stick ram as far as it will go at maximum engine revs.*

☞ *Check and make a note of the pressure value.*

Checking pressure drop

☞ *Extend the stick ram as far as it will go at maximum engine revs.*

☞ *Swiftly reduce engine revs from maximum to minimum -> pressure drop.*

☞ *Check and make a note of the pressure value.*

➥ Pressure drop should not exceed the specified value by more than 10 %.

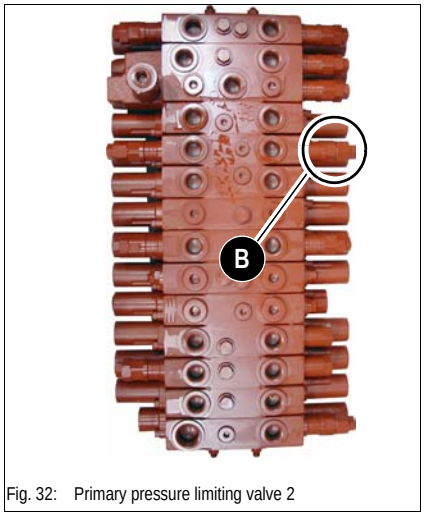


Fig. 32: Primary pressure limiting valve 2

Adjusting primary pressure limiting valve 2 (PPLV 2)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 2)* ***32/B*** *on the main valve block.*

☞ Slacken the locknut of the pressure limiting valve.

☞ Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge.

➥ The valve seat may be stuck and must be slackened first.

☞ Adjust the pressure limiting valve and tighten the locknut.

☞ *Check the primary pressure limiting valve 2 and the pressure drop once adjustment is over.*

Also check with the retract stick and the right-hand side forwards/reverse drive functions!

Checking the auxiliary hydraulics pressure

Important!

Factory indications for auxiliary hydraulics secondary valves are possibly invalid since the valves must be adapted to the attachment.

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Pressure check of gear pump P3

Hydraulic supply for stabiliser blade, auxiliary hydraulics/boom swivel, upper carriage rotation

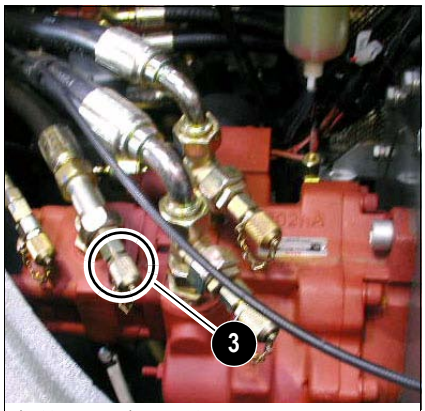


Fig. 33: Measuring port P3

Checking primary pressure limiting valve 3 (PPLV 3)

☞ *Connect a pressure gauge to measuring port MP 3* ***33/3****.*



☞ *Extend the stabiliser blade ram as far as it will go at maximum engine revs.*

☞ *Check and make a note of the pressure value.*

Checking pressure drop

☞ *Extend the stabiliser blade ram as far as it will go at maximum engine revs.*

☞ *Swiftly reduce engine revs from maximum to minimum -> pressure drop.*

☞ *Check and make a note of the pressure value.*

➥ Pressure drop should not exceed the specified value by more than 10 %.

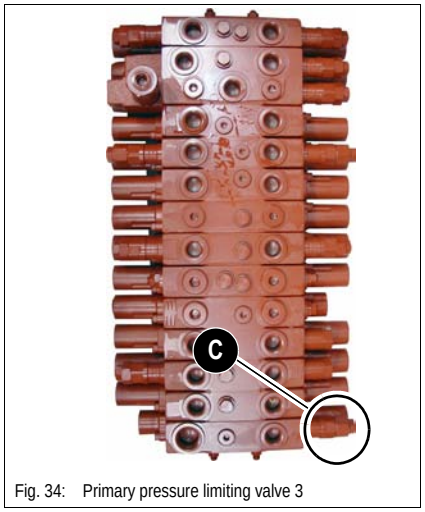


Fig. 34: Primary pressure limiting valve 3

Adjusting primary pressure limiting valve 3 (PPLV 3)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 3) on the main valve block.*

☞ Slacken the locknut of the pressure limiting valve.

☞ Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge.

➥ The valve seat may be stuck and must be slackened first.

☞ Adjust the pressure limiting valve and tighten the locknut.

☞ *Check the primary pressure limiting valve 3 and the pressure drop once adjustment is over.*

Also check with the retract stabiliser blade, boom swivel and rotate functions

Checking the auxiliary hydraulics pressure

Important!

Factory indications for auxiliary hydraulics secondary valves are possibly invalid since the valves must be adapted to the attachment.

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Secondary pressure limiting valve of the gear motor

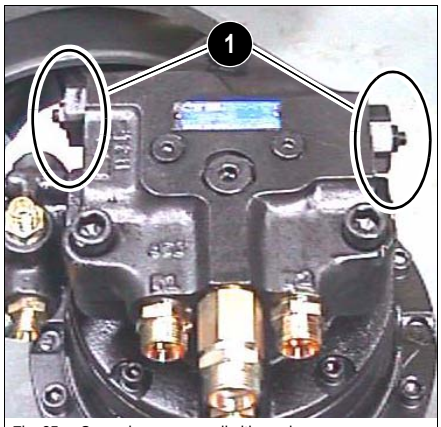


Fig. 35: Secondary pressure limiting valve

Check (at idling speed)

☞ *Connect a pressure gauge to measuring port MP 3 of the gear pump.*

☞ *Place the bucket or the boom against the ground or the stabiliser blade, or drive against hydraulic resistance.*

☞ *Check and make a note of the pressure value.*

Adjusting the secondary pressure limiting valve on the gear motor (at idling speed)

☞ *Adjust the pressure at the secondary pressure limiting valve on the gear motor.*

☞ Slacken the locknut of the pressure limiting valve.

☞ Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge.

➥ The valve seat may be stuck and must be slackened first.

☞ Adjust the pressure limiting valve and tighten the locknut.

☞ *Check the secondary pressure limiting valve again once adjustment is over.*

Measuring ports: overview

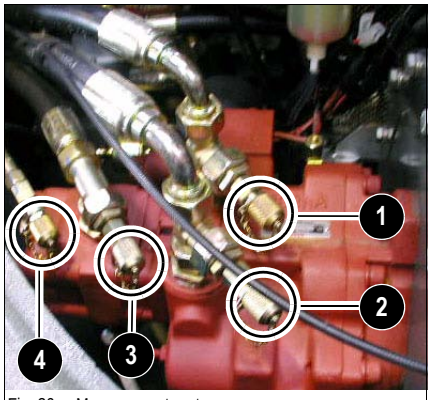
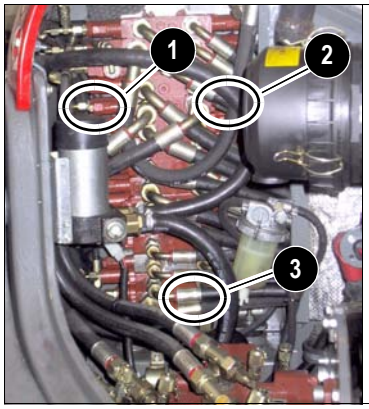
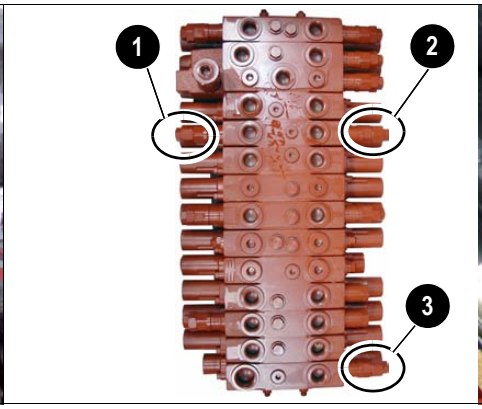


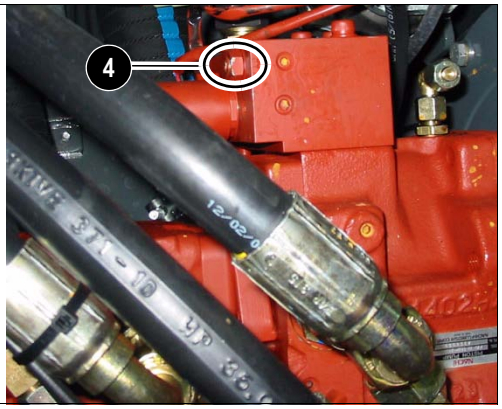
Fig. 36: Measurement ports

Pos.	Description	
1	Measuring port for pump 1	MP 1
2	Measuring port for pump 2	MP 2
3	Measuring port for pump 3	MP 3
4	Pilot oil supply unit measuring port	MP 4

Primary pressure limiting valves







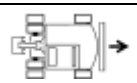
Pos.	Description	
1	Pump primary pressure limiting valve 1	PPLV 1
2	Pump primary pressure limiting valve 2	PPLV 2
3	Pump primary pressure limiting valve 3	PPLV 3
4	Pilot control pressure limiting valve	PLV 4

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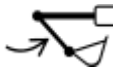
Pilot control

Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		1st measurement	2nd measurement
					Engine speed	Pressure in bar (psi)		
Joystick	ANY		Pressure reducing valve PRV 4 (pilot oil supply unit)	Measuring port MP 4 (pump)	Rated value	$42^{\pm 1}$ ($609^{\pm 14.5}$)		

Pump 1

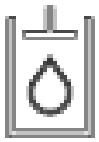
Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		1st measurement	2nd measurement
Boom 1	UP		Primary pressure limiting valve PPLV 1 (main valve block)	Measuring port MP 1 (pump)	max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	DOWN				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
Bucket	EXTEND				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	RETRACT				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
Left-hand side drive	FORWARDS				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	REVERSE				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		

Pump 2

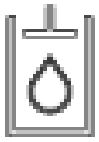
Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		1st measurement	2nd measurement
Stick	EXTEND		Primary pressure limiting valve PPLV 2 (MVB)	Measuring port MP 2 (pump)	max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	RETRACT				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		

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Right-hand side drive	FORWARDS		Primary pressure limiting valve PPLV 2 (MVB)	Measuring port MP 2 (pump)	max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	REVERSE				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
Auxiliary hydraulics	A				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	B				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
3rd control circuit (option)	LEFT				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
	RIGHT				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		
Boom 2	UP				max.	$240^{\pm 3}$ ($3481^{\pm 43.5}$)		
					Min.	$216^{\pm 3}$ ($3133^{\pm 43.5}$)		

Pump 3

Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		1st measurement	2nd measurement
					Engine speed	Pressure in bar (psi)		
Stabiliser blade	UP		Primary pressure limiting valve PPLV 3 (main valve block)	Measuring port MP 3 (pump)	max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)		
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)		
	DOWN				max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)		
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)		
Auxiliary hydraulics	A (2)				max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)		
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)		
	B (2)				max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)		
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)		

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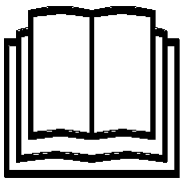
Swivel boom	LEFT		Primary pressure limiting valve PPLV 3 (main valve block)	Measuring port MP 3 (pump			max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)			
							Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)			
	RIGHT						max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)			
							Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)			
Function	**Movement**	**Symbol**	**Pressure limiting valve**	**Measuring port**	**Specified values**				**1st measurement**	**2nd measurement**	
					Engine speed	**Pressure in bar (psi)**					
Triple articulation boom (option)	UP		Primary pressure limiting valve PPLV 3 (main valve block)	Measuring port MP 3 (pump)	max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)					
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)					
	DOWN				max.	$240^{-0/+3}$ ($3481^{-0/+43.5}$)					
					Min.	$216^{-0/+3}$ ($3133^{-0/+43.5}$)					
Upper carriage rotation	LEFT		Secondary pressure limiting valve SPLV 4 (gear motor)	Gear motor	Rated value	$215^{\pm 3}$ ($3118^{\pm 43.5}$)					
	RIGHT				Rated value	$215^{\pm 3}$ ($3118^{\pm 43.5}$)					

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3.13 Hydraulic system

Specific safety instructions





- Release the pressure in all lines carrying hydraulic oil prior to any maintenance and repair work. To do this:
  - Lower all hydraulically controlled attachments to the ground
  - Move all control levers of the hydraulic control valves several times.
- Fold the control lever base up.
- Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries. Therefore always consult a doctor immediately, even in the case of minor wounds – otherwise serious infections could set in.
- If the hydraulic oil in the sight glass is cloudy, this indicates that water or air has penetrated the hydraulic system. This can cause damage to the hydraulic pump.
- Oil or fuel flowing out of high pressure lines can cause fire or malfunctions, and severe injuries or damage to property. Interrupt work immediately if slack nuts and damaged hoses and lines are detected.

  ☞ Contact your Neuson dealer immediately.
- Replace the hose or line if one of the problems mentioned below is detected.

  ☞ Damaged or leaky hydraulic seals.

  ☞ Worn or torn shells or uncovered reinforcement branches.

  ☞ Expanded shells in several positions.

  ☞ Entangled or crushed movable parts.

  ☞ Foreign bodies jammed or stuck in protective layers.



Caution!

Dirty hydraulic oil, lack of oil or wrong hydraulic oil –

Danger of severe damage to the hydraulic system!

☞ *Take care to avoid dirt when working.*

☞ *Always fill in hydraulic oil by means of a strainer or the reflux filter.*

☞ *Only use authorised oils of the same type – see Fluids and lubricants on page 3-1.*

☞ *Always fill up hydraulic oil before the level gets too low – see Filling up hydraulic oil on page 3-36.*

☞ *If the hydraulic system is filled with biodegradable oil, then only fill up with biodegradable oil of the same type – observe the sticker on the hydraulic oil tank.*

☞ *Contact customer service if the hydraulic system filter is dirty and contains metal chippings. Otherwise, follow-on damage can result.*



Environment!

Collect drained hydraulic oil and biodegradable oil in a suitable container. Dispose of drained oil and used filters by an ecologically safe method. Always contact the relevant authorities or commercial establishments in charge of oil disposal before disposing of biodegradable oil.

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Checking the hydraulic oil level

Caution!

Do not fill up oil if the oil level is above the **FULL** mark, otherwise the hydraulic system can be damaged and escaping oil can cause serious injuries.

☞ *Check the hydraulic oil level each time the machine is put into operation or once a day.*

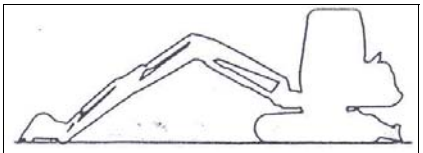


Fig. 37: Parking the excavator

- If the attachment is not positioned as shown:
  - ☞ Start the engine and let it run at idling speed
  - ☞ Retract the bucket and boom rams, lower the boom and the bucket teeth to the ground
  - ☞ Switch off the engine again.



Fig. 38: Oil level indicator on the hydraulic oil tank

☞ *Proceed as follows:*

- Park the machine on level ground.
- Switch off the engine.
- Fold the control lever base up.
- Open the engine cover.
- Sight glass **B** is located on hydraulic oil tank.
- Check the oil level on sight glass **B**.
- The oil level must be at the **FULL** level.
  - A gauge element in sight glass **B** indicates the oil level.

If the oil level is lower,

- Fill up hydraulic oil.

The oil level varies according to the machine's operating temperature:

Machine condition	Temperature	Oil level
• Before putting into operation	Between 10 and 30 °C (50 and 86 °F)	**LOW** mark
• Normal operation	Between 50 and 90 °C (122 and 194 °F)	**FULL** mark

Important!

Measure the oil level of the hydraulic system only after the machine reaches its operating temperature.

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Filling up hydraulic oil



Fig. 39: Hydraulic oil filler inlet with screen

Do not fill up the hydraulic oil unless the engine is switched off. Otherwise, hydraulic oil will overflow at the filler opening on the hydraulic tank.

☞ *Fill up as follows:*

- Park the machine on level ground.
- Position the machine as shown in **fig. 37**.
- Switch off the engine.
- Fold the control lever base up.
- Clean the area around filler opening **C** with a lint-free cloth.
- Open filler opening **C**.
- Fill in clean hydraulic oil through the screen.
- Check the hydraulic oil level on sight glass **B**.
- Fill up if necessary and check again.
- Close filler opening **C**.

Important!

You can also refill through the reflux filter to avoid contamination of the hydraulic oil as you fill up.

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Changing hydraulic oil

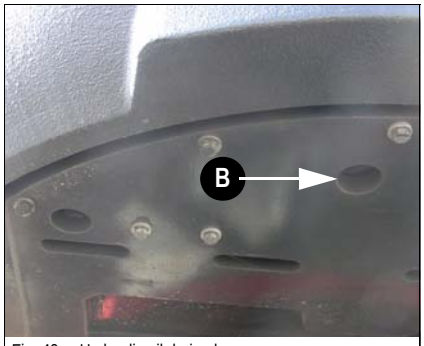


Fig. 40: Hydraulic oil drain plug

Important!

Only change the hydraulic oil if it is warm (about 50 °C/122 °F). Retract all hydraulic rams before changing the oil.

☞ *Open the breather filter to release pressure.*

☞ *Open drain plug **40/B** and let the oil drain into a container.*

☞ *Check the hydraulic oil tank for dirt and clean if necessary.*

☞ *Replace the filter according to the maintenance specifications.*

☞ *Screw the drain plug back in correctly.*

☞ *Fill in clean hydraulic oil through the strainer – see Filling up hydraulic oil on page 3-36.*

☞ *Close the hydraulic oil tank correctly.*

☞ *Let the machine run at idling speed without load for some minutes.*

Monitoring the hydraulic oil reflux filter

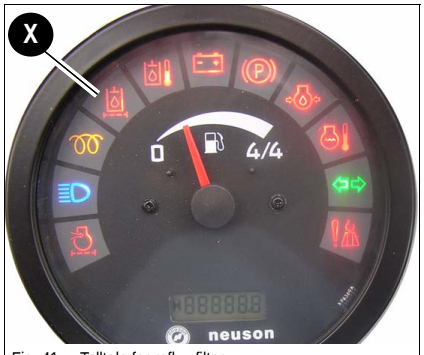


Fig. 41: Telltale for reflux filter

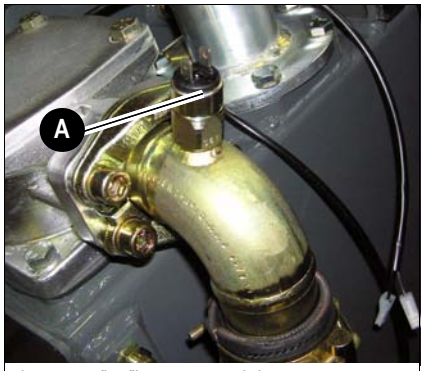


Fig. 42: Reflux filter pressure switch

Pressure switch A activates the red telltale **X** in the instrument panel which monitors the reflux filter.

The filter element must be replaced by an authorised workshop:

- If telltale **X** comes on when the hydraulic oil is at operating temperature,
- at the latest after 1000 service hours (once every year).

In cold weather telltale **X** can come on immediately when the engine is started. This is caused by increased oil viscosity. In this case:

☞ *Set engine speed so that telltale X goes out.*

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Checking hydraulic pressure lines

Specific safety instructions

Danger!

Caution when checking hydraulic lines, especially when searching for leaks. Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries.

Danger of personal injury!

☞ *Always consult a doctor immediately, even if the wound seems insignificant – otherwise serious infections could set in.*

☞ *Always observe the following instructions:*

- Retighten leaking screwed fittings and hose connections only when the system is not under pressure; i.e. release the pressure before working on pressurised lines.
- Never weld or solder damaged or leaking pressure lines and screw connections. Replace damaged parts with new ones.
- Never search for leaks with your bare hands, but wear protective gloves.
- Use paper or wood to check for minor leaks. Never use an unprotected light or naked flame.
- Have damaged flexible lines replaced by authorised workshops only.

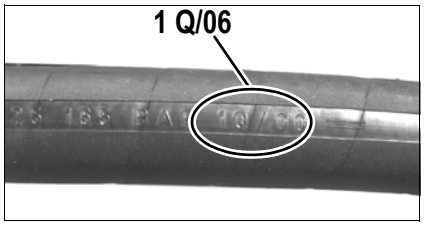
- Leaks and damaged pressure lines must be immediately repaired or replaced by an authorised workshop or after-sales staff. This not only increases the operating safety of your machine but also helps to protect the environment.
- Replace hydraulic hoses every 6 years from the date of manufacture, even if they do not seem to be damaged.

In this respect, we recommend that you observe all the relevant safety regulations for hydraulic lines, as well as the safety regulations regarding accident prevention and occupational health and safety in your country. Also observe DIN 20066, part 5.

The date of manufacture (month or quarter and year) is indicated on the flexible line.

Example:

The indication **"1 Q/06**" means manufactured in the 1st quarter of 2006.



3.14 Travelling drive

Danger!

Immediately after switching off the engine, the engine's components and the oil are very hot. This can cause burns. If the inside of the drive gear is under pressure, the oil or the plug can be squeezed out.

Danger of injury and scalding!

☞ *Wait until the engine has cooled down before taking up work.*

☞ *Slowly open the plug to reduce the pressure inside.*

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Caution!

The Q8 T55 SAE 85W-90 gearbox oil is no longer produced.

☞ *Therefore the Q8 T55 80W-90 gearbox oil is used from 10/2006 onwards.*

☞ **Do not mix both oils under no circumstances!**

Checking the oil level and filling up oil

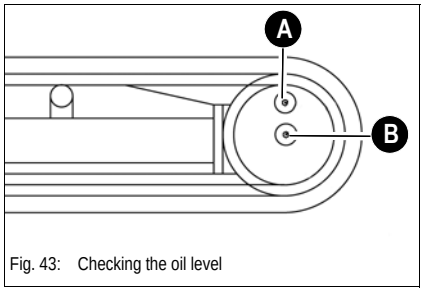


Fig. 43: Checking the oil level

☞ *Park the machine on firm and horizontal ground.*

☞ *Place the machine so that filler plug **A** is at the top.*

☞ *Switch off the engine.*

☞ *Let the engine cool down.*

☞ *Fold the control lever base up.*

☞ *Unscrew screws **A** and **B** with a suitable tool.*

☞ *A small quantity of oil must flow out of opening **B**.*

➥ If the oil does not flow out of opening **B**, fill up oil:

☞ Fill in oil through opening **A**,

➥ until a small quantity of oil flows out of opening **B**.

☞ *Screw screws **A** and **B** back in again.*

☞ *Move the machine a few metres.*

☞ *Check the oil level again.*

➥ If the oil level is not correct:

☞ Repeat the procedure.

Draining oil

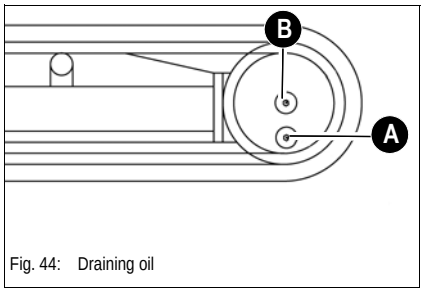


Fig. 44: Draining oil

☞ *Park the machine on firm and horizontal ground.*

☞ *Place the machine so that filler plug **A** is at the bottom.*

☞ *Switch off the engine.*

☞ *Let the engine cool down.*

☞ *Fold the control lever base up.*

☞ *Unscrew screws **A** and **B** with a suitable tool.*

➥ The oil now flows out of opening **A**.

☞ Use a suitable container to collect the oil as it drains.

Environment!

Collect the oil with a suitable container and dispose of it in an environmentally friendly manner.

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3.15 Chains

- Chain wear can vary according to work and ground conditions.

  ☞ We recommend checking chain wear and tension once a day.

  ☞ Park the machine on firm and level ground to check and carry out maintenance.

Checking chain tension

Danger!

Working under the machine with the chains off the ground and only supported by the attachment is extremely dangerous.

Caution, danger!

☞ *Firmly support the machine with chocks or suitable brackets.*

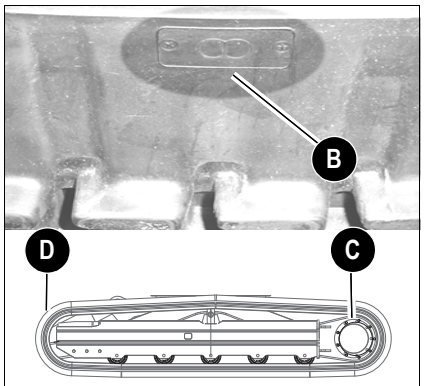


Fig. 45: Rubber chain mark

Check chain tension as follows:

- The rubber chain has a mark **B** as shown in *Fig. 45*.

☞ *Place the excavator so that mark **B** of the rubber chain is between the drive pinion **C** and the chain tension roller **D**.*

Important!

There is no mark on the steel chains (options). Positioning the steel chains is not possible.

- No specific position is required for the steel chains (option).

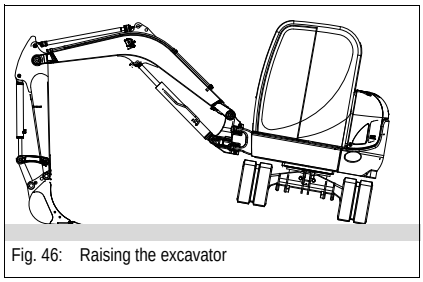


Fig. 46: Raising the excavator

☞ *Park the machine on firm and level ground.*

☞ *Raise the excavator with the boom and the stick.*

☞ Slowly and carefully actuate the control levers.

☞ *Switch off the engine.*

☞ *Remove the key and carry it with you.*

☞ *Fold the control lever base up.*

☞ *Use suitable auxiliary means to support the machine.*

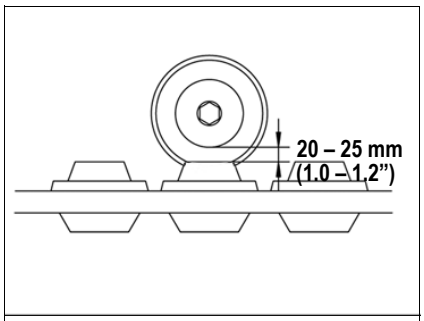


Fig. 47: Measuring distance

- Standard play between the sliding block's shoulder and the contact area of the second support roller of the drive pinion is 20 – 25 mm (1.0 – 1.2").

  ☞ Set the tension as follows if it is not in accordance with the rated value.

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Setting the chains

Danger!

The lubricating valve can be squeezed out due to the high grease pressure in the hydraulic ram.

Danger of personal injury!

☞ *Do not slacken and unscrew the lubricating valve by more than one turn.*

☞ *Slacken no other component except the lubricating valve.*

☞ *Keep your face away from the lubricating valve connection.*

➥ Contact your Neuson dealer if this does not reduce the tension of the rubber sliding block.

Caution!

Excessive tension of the chains causes severe damage to the ram and the chain.

☞ *Tighten the chains only up to the prescribed measuring distance.*

Tightening the chains

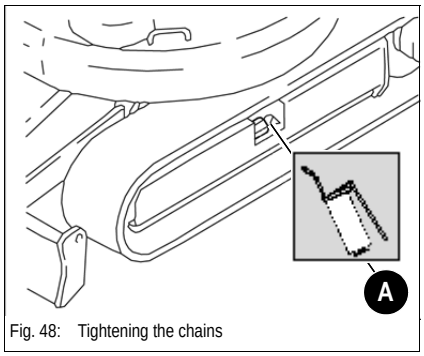


Fig. 48: Tightening the chains

☞ *Inject grease with the pump through lubricating valve **A**.*

☞ *Check the tension is correct by starting the engine, letting it run at idling speed and slowly moving the machine forwards and reverse and switching it off again.*

☞ *Check the tension of the track chains again.*

➥ If it is not correct:

☞ Adjust again.

☞ *Should the track chain still be slack after injecting more grease, replace the chain or the seal in the ram. Contact a Neuson dealer in this case.*

Reducing tension

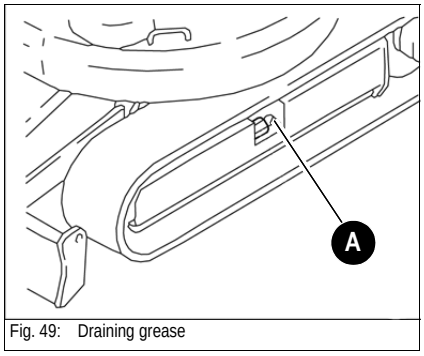


Fig. 49: Draining grease

- Draining grease in a way different from the one described below is very dangerous. Also bear in mind the safety instructions on this page.

☞ *Slowly open the lubricating valve **A** by 1 turn to allow the grease to flow out.*

☞ Place a suitable container underneath to collect the grease.

➥ The grease flows out of the groove of the lubricating valve.

☞ *Retighten the lubricating valve **A**.*

☞ *Check the tension is correct by starting the engine, letting it run at idling speed and slowly moving the machine forwards and reverse and switching it off again.*

☞ *Check the tension of the track chains again.*

➥ If it is not correct:

☞ Adjust again.

Environment!

Use a suitable container to collect the grease as it flows out and dispose of it in an environmentally friendly manner.

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3.16 Lubrication work

Apply multipurpose lithium grease with an MoS^2 additive to all lubrication points indicated.

Stabiliser blade

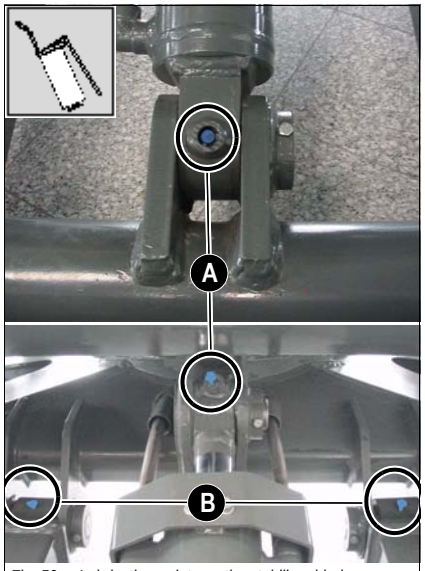


Fig. 50: Lubrication points on the stabiliser blade

☞ *Apply grease to lubrication points **A** on the stabiliser blade ram.*

☞ *Apply grease to lubrication points **B** on the stabiliser blade.*

Lubrication points on the swivelling console

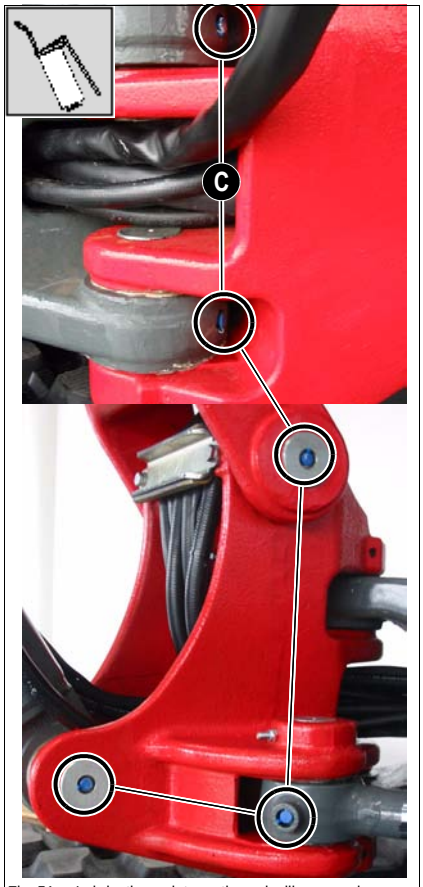


Fig. 51: Lubrication points on the swivelling console

☞ *Apply grease to lubrication points **C** of the swivelling console.*

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Boom lubrication points

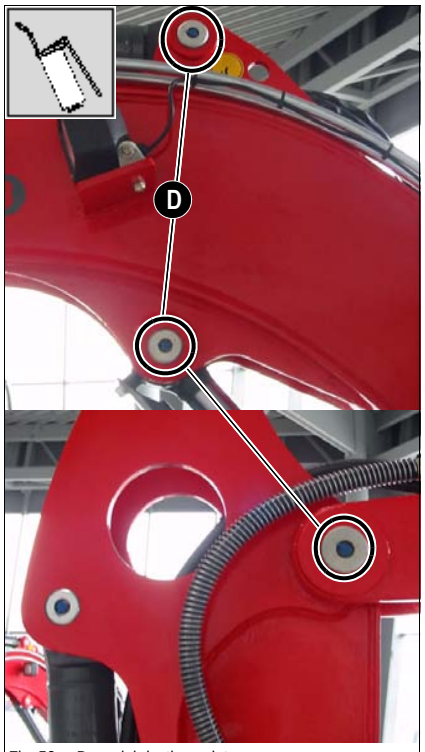


Fig. 52: Boom lubrication points

☞ *Apply grease to lubrication points **D** on the boom.*

Lubrication points on the stick

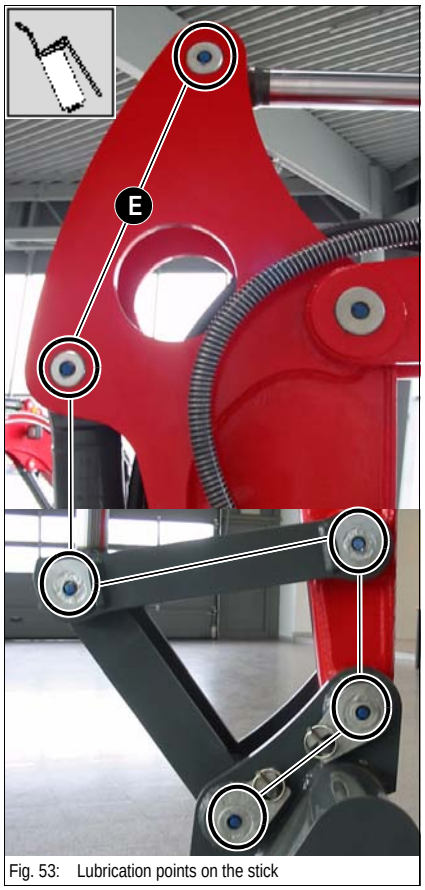


Fig. 53: Lubrication points on the stick

☞ *Apply grease to lubrication points **E** on the stick.*

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Lubrication strip

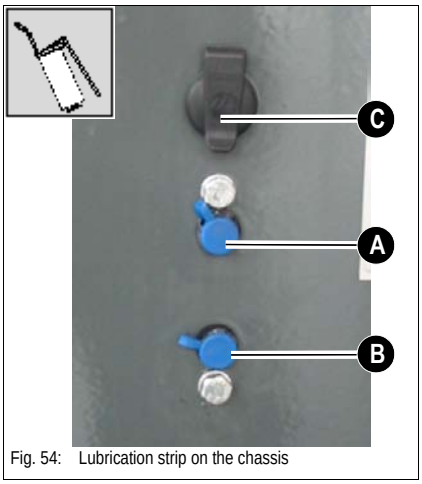


Fig. 54: Lubrication strip on the chassis

Apply grease to the lubrication strip as follows:

☞ *Lubrication point **A** for live ring ball bearing*

➥ Grease: BP Energrease MP-MG2

☞ *Lubrication point **B** for the offset ram*

Important!

Apply grease to lubrication points **A** and **B** once a day.

A portable lamp can be connected to the lubrication strip's 12 V connection **C**.

Maintenance of attachments

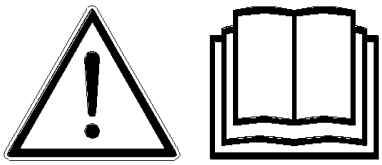
Important!

Correct maintenance and service is absolutely necessary for smooth and continuous operation, and for an increased service life of the attachments. Please observe the lubrication and maintenance instructions in the Operator's Manuals of the attachments.

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3.17 Electric system

Specific safety instructions



- The battery contains sulphuric acid. This acid must not be allowed to come into contact with the skin, the eyes, clothing or the machine.

  Therefore when recharging or working near the battery:

  ☞ Always wear goggles and protective clothing with long sleeves.

If acid is spilt:

☞ Thoroughly rinse all affected surfaces immediately with plenty of water.

☞ Thoroughly wash any part of the body touched by the sulphuric acid immediately with plenty of water and seek medical attention at once.

- Especially when charging batteries, as well as during normal operation of batteries, an oxyhydrogen mixture is formed in the battery cells – danger of explosion.
- Do not attempt to jump-start the machine if the battery is frozen or if the acid level is low. The battery can rupture or explode.

  ☞ Replace the battery immediately.
- Avoid naked flames and sparks and do not smoke in the vicinity of open battery cells – otherwise the gas produced during normal battery operation can ignite.
- Use only 12 V power sources. Higher voltages will damage the electric components.
- When connecting the battery leads, make sure the poles +/– are not inverted, otherwise sensitive electric components will be damaged.
- Do not interrupt voltage-carrying circuits at the battery terminals because of the danger of sparking.
- Never place tools or other conductive articles on the battery – danger of short circuit.
- Disconnect the negative (**–**) battery terminal from the battery before starting repair work on the electric system.
- Dispose of used batteries properly.

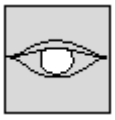
Service and maintenance work at regular intervals



Before driving the machine

☞ *Check every time before driving the machine:*

- Is the light system OK?
- Is the signalling and warning system OK?



Every week

☞ *Check once a week:*

- Electric fuses – *see Fuse box on the instrument panel up to serial no. AD07210* on page 2-5.
- Cable and earth connections.
- Battery charge condition – *see Battery* on page 3-47.
- Condition of battery terminals.

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Instructions concerning specific components

Cables, bulbs and fuses

Always observe the following instructions:

- Defective components of the electric system must always be replaced by an authorised expert. Bulbs and fuses may be changed by unqualified persons.
- When carrying out maintenance work on the electric system, pay particular attention to ensuring good contact in leads and fuses.
- Blown fuses indicate overloading or short circuits. The electric system must therefore be checked before installing the new fuse.
- Only use fuses with the specified load capacity (amperage) – *see Fuse box on the instrument panel up to serial no. AD07210* on page 2-5.

Important!

Always disconnect and remove the battery before carrying out welding work on the machine, and short-circuit the terminal cables of the machine to avoid damage to the electronic components.

Alternator

Always observe the following instructions:

- Only test run the engine with the battery connected.
- When connecting the battery, make sure the poles (+/–) are not inverted.
- Always disconnect the battery before carrying out welding work or connecting a quick battery charger.
- Replace defective charge telltales immediately – *see Telltale (red) – alternator charge function* on page 1-11.

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Battery

Danger!

Battery acid is highly caustic.

Danger of caustic injury!

Therefore when recharging and/or working near the battery:

☞ *Always wear goggles and protective clothing with long sleeves.*

If acid is spilt:

☞ *Thoroughly rinse all affected surfaces immediately with plenty of water.*

☞ *Thoroughly wash any part of the body touched by the sulphuric acid immediately with plenty of water and seek medical attention at once.*

Especially when charging batteries, as well as during normal operation of batteries, an oxyhydrogen mixture is formed in the battery cells –

Danger of explosion!

☞ *Avoid naked lights and sparks in the vicinity of the battery and do not smoke.*

☞ *Do not attempt to jump-start the machine if the battery is frozen or if the acid level is low. The battery can rupture or explode.*

- Replace the battery immediately.

☞ *Always disconnect the negative terminal (–) from the battery before starting repair work on the electric system.*

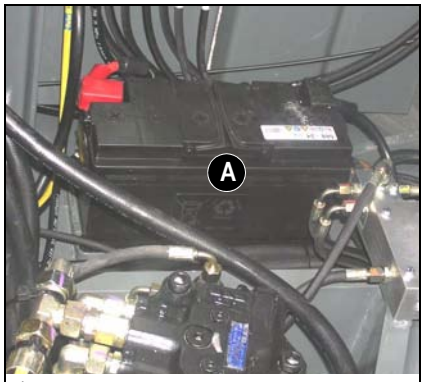


Fig. 55: Battery

The battery **A** is located in the chassis underneath the cab behind the gear motor. The battery is “maintenance-free”. However have the battery checked at regular intervals to make sure the electrolyte level is between the MIN and MAX marks.

Checking the battery requires it to be removed and must be carried out by an authorised workshop.

Always follow the specific battery safety instructions.

Important!

Do not disconnect the battery while the engine is running.

Jump-starting the engine

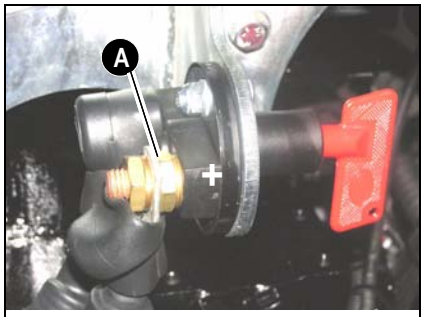


Fig. 56: Battery master switch

☞ *Connect the plus lead of the starting aid with plus lead **B** on the battery master switch of the machine requiring jump-start.*

☞ *Connect the earthing lead of the starting aid to a bare part of the chassis of the machine with the flat battery.*

☞ *Charge the flat battery for a few minutes.*

➥ Start the engine.

☞ *Remove the earthing lead of the starting aid from the chassis.*

☞ *Remove the plus lead of the starting aid from the emergency off switch.*

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3.18 Cab

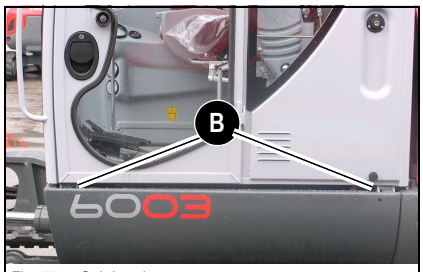


Fig. 57: Cab bearing

☞ *Check cab bearings **B** for damage.*

Important!

Check the cab fastening screws for tightness, retighten with a suitable tool if necessary – *see chapter Tightening torques for high-resistance screw connections* on page 2-10.

Replacing the cab filter

Tilt the cab to replace the filter – *see Tilting the cab* on page 1-19.

The heater is located at the rear half of the cab.

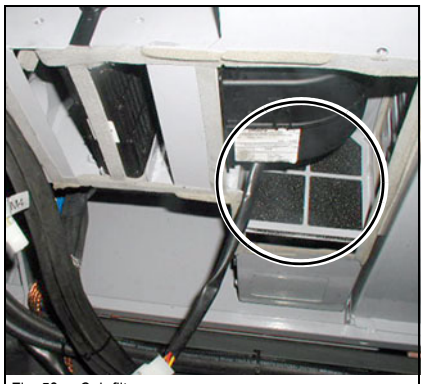


Fig. 58: Cab filter

Replacing the filter:

☞ *Slacken the heater cover.*

☞ *The cab filter can be accessed **fig. 58**.*

☞ *Remove the cab filter.*

☞ *Insert a new cab filter.*

☞ *Fit the heater cover back on again.*

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3.19 General maintenance work

Cleaning

Cleaning the machine is divided into 3 separate areas:

- Inside the cab
- Exterior of the machine
- Engine compartment

The wrong choice of cleaning equipment and agents can impair the operating safety of the machine on the one hand, and on the other undermine the health of the persons in charge of cleaning the machine. It is therefore essential to observe the following instructions.

General instructions for all areas of the machine

When using washing solvents

- Ensure adequate room ventilation.
- Wear suitable protective clothing.
- Do not use flammable liquids, such as petrol or diesel.

When using compressed air

- Work carefully.
- Wear goggles and protective clothing.
- Do not aim the compressed air at the skin or at other people.
- Do not use compressed air for cleaning your clothing.

When using a high-pressure cleaner or steam jet

- Electric components and damping material must be covered and not directly exposed to the jet.
- Cover the vent filter on the hydraulic oil tank and the filler caps for fuel, hydraulic oil etc.
- Protect the following components from moisture:
  - Engine
  - Electric components such as the alternator etc.
  - Control devices and seals
  - Air intake filters etc.

When using volatile and easily flammable anticorrosion agents and sprays:

- Ensure adequate room ventilation.
- Do not use unprotected lights or naked flames.
- Do not smoke.

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Inside the cab

Caution!

Never use high-pressure cleaners, steam jets or high-pressure water to clean inside the cab. Water under high pressure can
• penetrate into the electric system and cause short circuits and
• damage seals and disable the controls.

We recommend using the following aids to clean the cab:

- Broom
- Vacuum cleaner
- Damp cloth
- Bristle brush
- Water with mild soap solution

Cleaning the seat belt:

- Clean the seat belt (which remains fitted in the machine) only with a mild soap solution; do not use chemical agents as they can destroy the fabric.

Exterior of the machine

The following articles are generally suitable:

- High-pressure cleaner
- Steam jet

Engine compartment

Danger!

Clean the engine at engine standstill only –

Danger of personal injury!

☞ *Switch off the engine before cleaning.*

Caution!

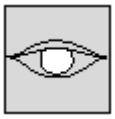
When cleaning the engine with a water or steam jet

☞ *The engine must be cold*

☞ *and do not point the jet directly at electric sensors such as the oil pressure switch.*

The humidity penetrating any such sensors causes them to fail and leads to engine damage.

Screw connections and attachments



All screw connections must be checked regularly for tightness, even if they are not listed in the maintenance schedules.

Retighten loose connections immediately. Contact an authorised workshop if necessary.

Pivots and hinges



All mechanical pivot points on the machine (e.g. door hinges, joints) and fittings (e.g. door arresters) must be lubricated regularly, even if they are not listed in the lubrication plan.

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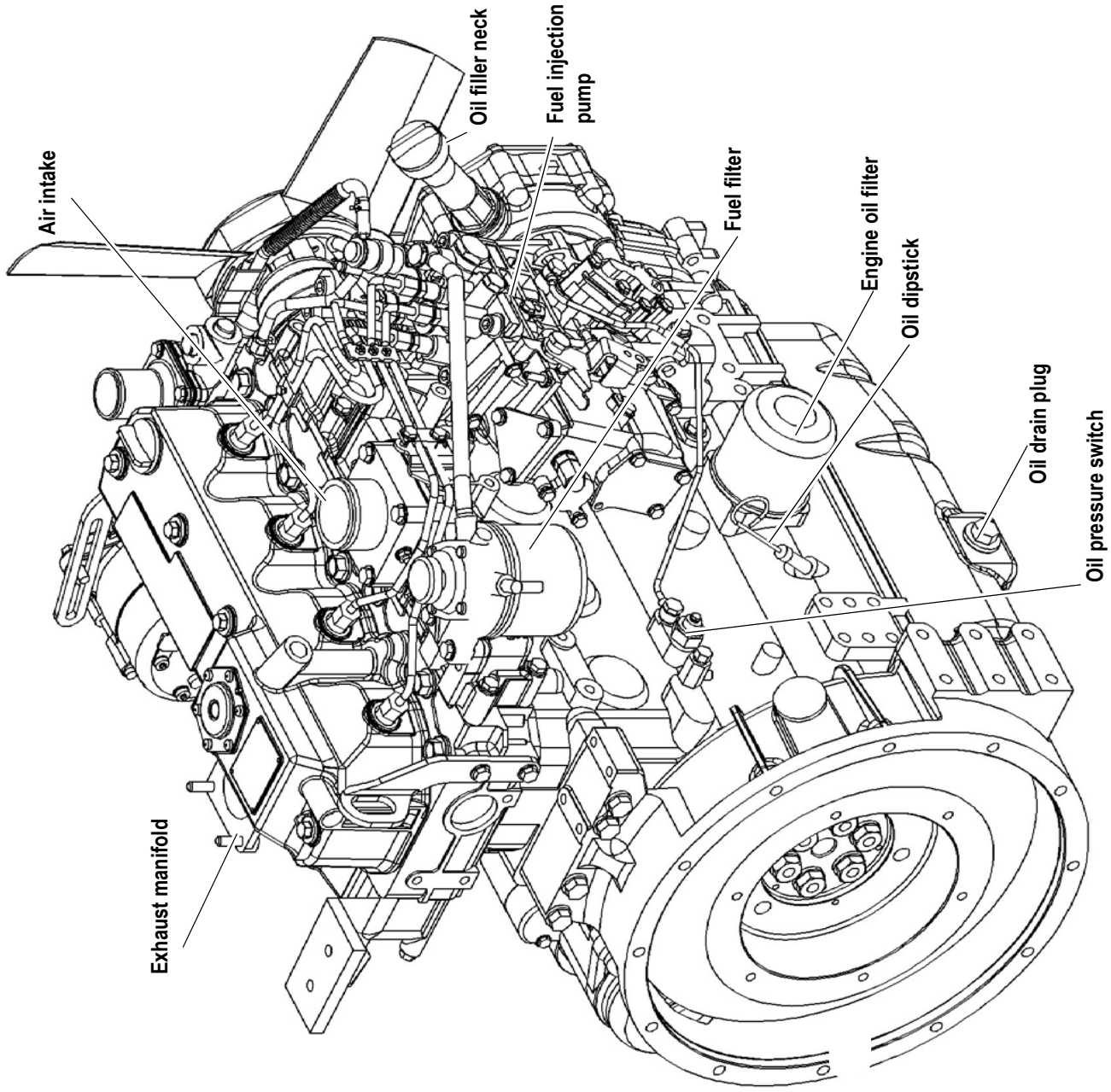
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Engine

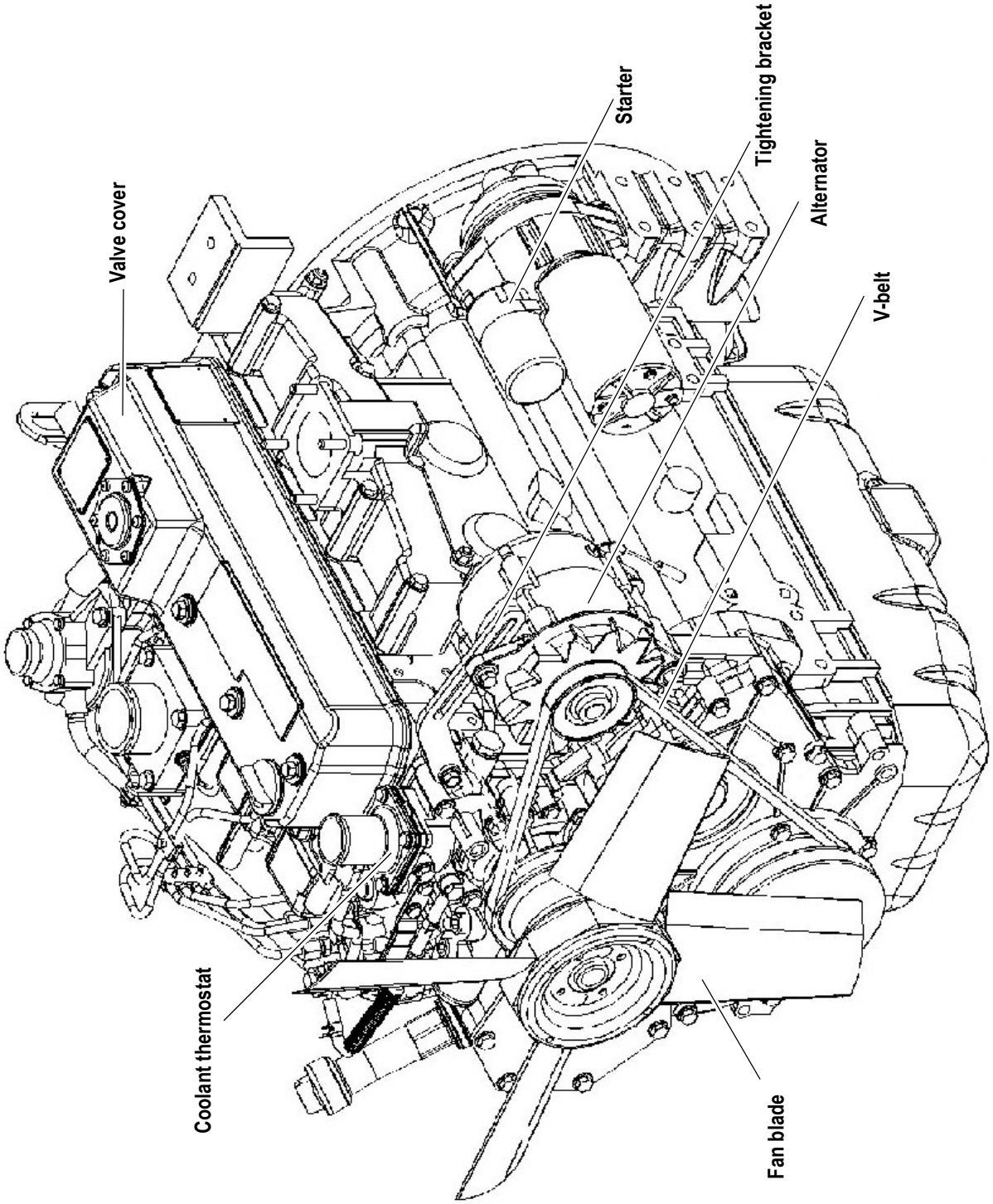
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4 Engine

4.1 Engine 4TNV98-VNS (Tier 2 up to serial no. AD07210)

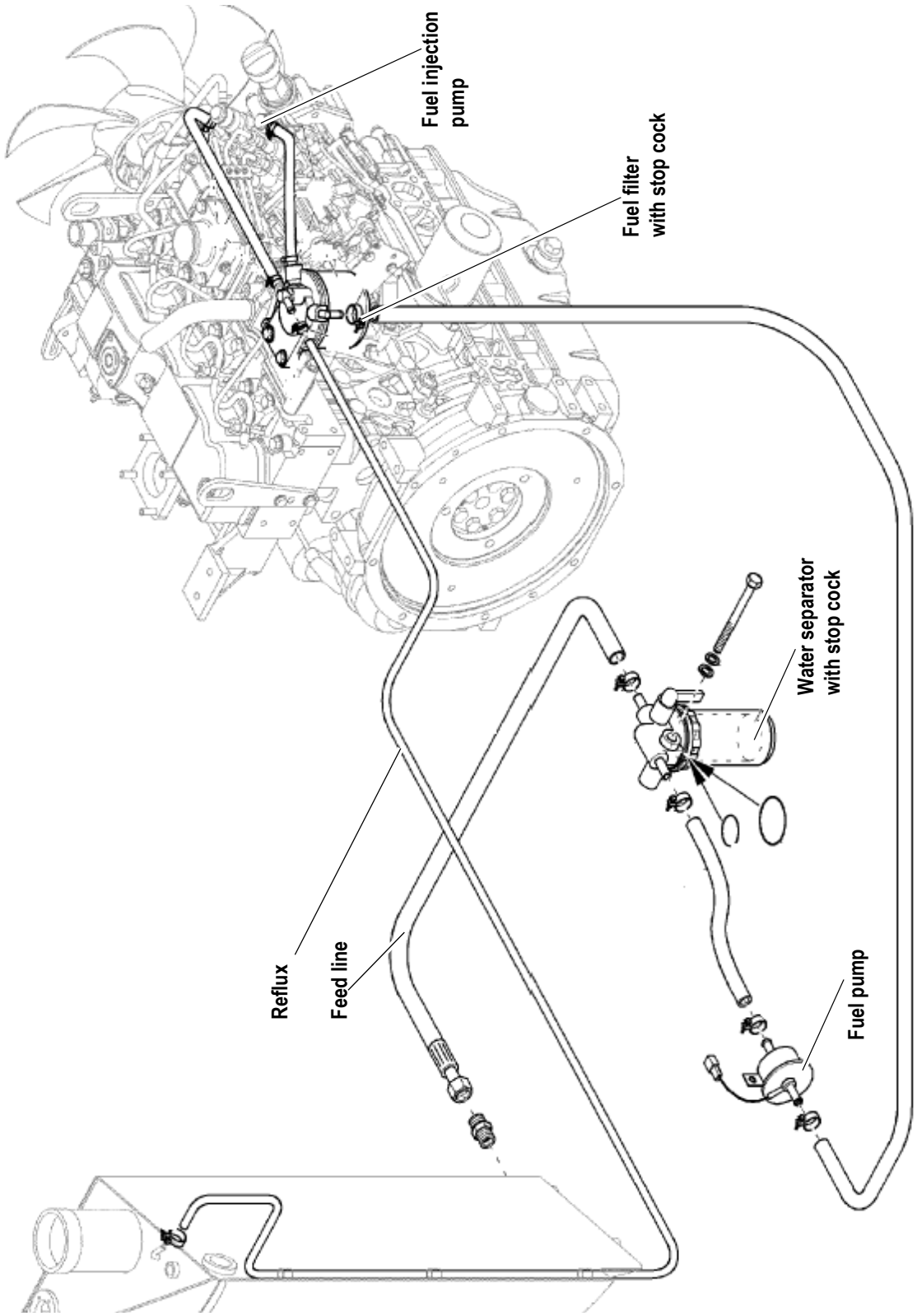


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4.2 Fuel system



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4.3 Removing the valve cover

Important!

The injection lines on this engine run through the valve cover. Therefore, remove the valve cover with extreme care.

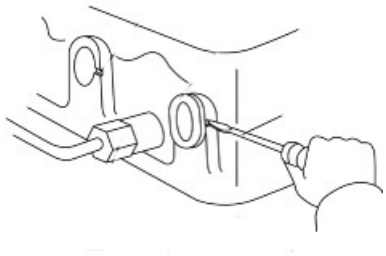


Fig. 1: Removing the valve cover

Remove as follows:

☞ *Unscrew all fuel injection lines from the valve cover.*

☞ *Slightly fold the injection lines away from the engine.*

☞ *Carefully remove the rubber grommets from the valve cover with a screw driver.*

☞ *Unscrew the valve cover.*

4.4 Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine

Checking valve clearance

☞ *Remove the valve cover.*

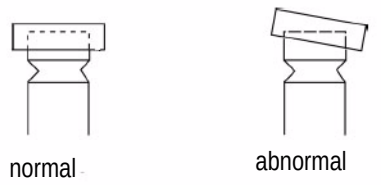


Fig. 2: Valve cap wear

☞ *Turn the engine until the respective cylinder reaches the top dead centre of the compression cycle.*

➥ Valve overlapping

☞ *Check the valve cap for abnormal wear.*

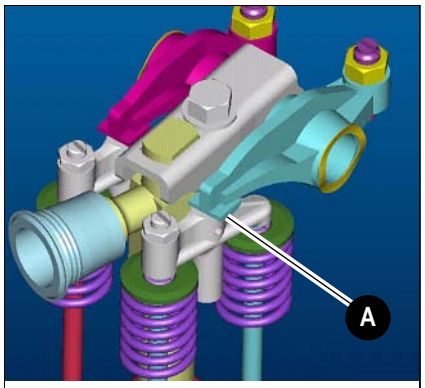


Fig. 3: Checking valve clearance

☞ *Check valve clearance **3/A** with a feeler gauge.*

➥ Valve clearance: 0.15 – 0.25 mm (0.006 – 0.01")

☞ *Repeat the procedure for each cylinder.*

☞ *Place the valve cover gasket*

☞ *Mount the valve cover*

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Setting zero play of the valve bridge

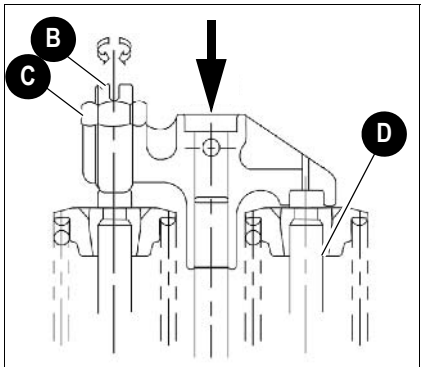


Fig. 4: Setting valve clearance

☞ *Remove the valve cover.*

☞ *Slacken locknut* **4/C** *and unscrew set screw* **4/B** *by one revolution.*

☞ *Press the valve bridge against valve* **4/D** *by hand until it makes contact.*

☞ Turn the set screw clockwise at the same time until it touches the valve.

☞ *Tighten locknut* **4/C**.

Setting valve clearance

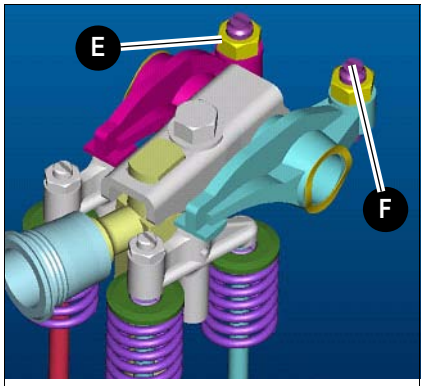


Fig. 5: Setting valve clearance

☞ *Turn the engine until the respective cylinder reaches the top dead centre of the compression cycle.*

➥ Valve overlapping

☞ *Slacken locknut* **5/E**.

☞ *Set valve clearance by turning set screw* **5/F**.

➥ Valve clearance: 0.15 – 0.25 mm (0.006 – 0.01”)

☞ *Tighten the locknut.*

➥ Check the setting again with the feeler gauge.

☞ *Repeat the procedure for each cylinder.*

☞ *Place the valve cover gasket*

☞ *Mount the valve cover*

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4.5 Tightening order for cylinder head bolts

☞ *Mount the cylinder-head bolts.*

➥ Tightening moments:

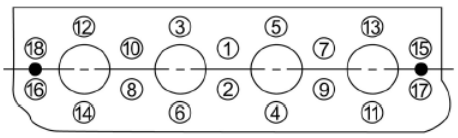
- 1st pass **49 – 58.8 Nm (36.1 – 43.4 ft. lbs.)**
- 2nd pass **103.1 – 112.9 Nm (76 – 83.3 ft. lbs.)**

Caution!

Bear in the mind the order for tightening the cylinder-head bolts.

☞ *See figure.*

Flywheel

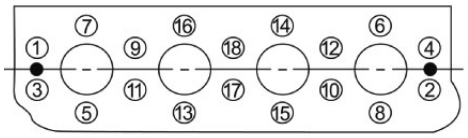


Fan

Oil the threads and the contact surfaces of the cylinder-head bolts before mounting them.

☞ *Order for removing the cylinder-head bolts.*

Flywheel



Fan

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4.6 Checking the injection nozzles

Pressure check

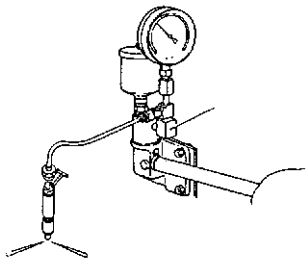


Fig. 6: Nozzle tester

☞ *Remove the injection line and the injection nozzle.*

☞ *Connect the injection nozzle with the high pressure line of the nozzle tester.*

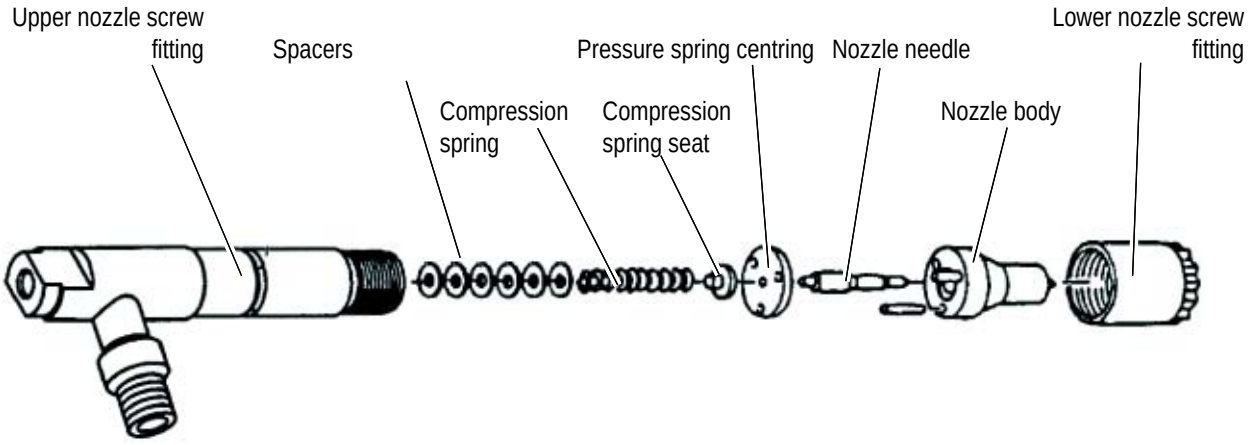
☞ *Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge.*

☞ *If the injection pressure is too low, replace the spacer in the nozzle by a thicker one. If the pressure is too high, replace the spacer by a thinner one.*

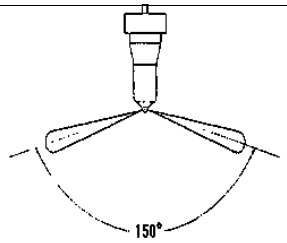
➥ Injection pressure: **220 – 230 bar (3191 – 3336 psi)**

- Spacer thickness of 0.1 mm (0.004") corresponds to modification by 19 bar (276 psi).
- Check the nozzle for drips after it has ejected fuel.

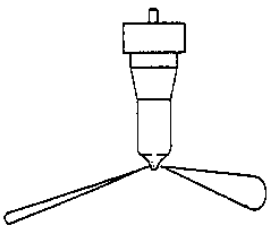
☞ Create a pressure of about 20 bar (290 psi) below injection pressure and check whether fuel drips from the nozzle.



4.7 Checking the nozzle jet



Normal atomisation



Bad atomisation

Fig. 7: Nozzle jet

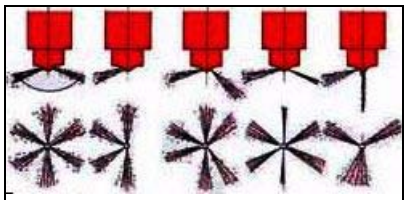
☞ *Remove the injection lines and the injection nozzles.*

☞ *Connect the injection nozzle with the high pressure line of the nozzle tester.*

☞ *Quickly create pressure until the nozzle ejects fuel (ejection 3 – 4 times).*

☞ *Hold a white sheet of paper about 30 cm (12") away from the nozzle and let the nozzle eject fuel.*

☞ *The nozzle jet must create a shape on the paper as shown in* **fig. 8/1**.



optimal ----------variation----------

Fig. 8: Shape of nozzle jet

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4.8 Injection time

Checking injection time

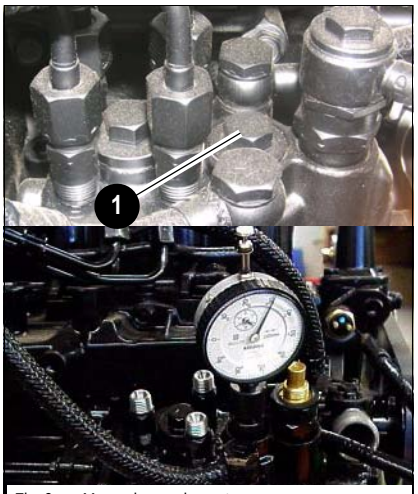


Fig. 9: Measuring equipment

- Preparatory work:

☞ *Remove the injection lines from the fuel injection pump.*

☞ *Remove plug* **9/1** *from the piston.*

☞ *Mount the sleeve (no. 1000158805) and the extension (no. 1000158806) onto the dial gauge (no. 1000158807) and fasten them with a clamp (no. 1000083308).*

☞ *Screw the dial gauge into the bore of the piston as shown in Fig. 9.*

- Measurement:

☞ *Remove the rubber cover from the flywheel housing.*

☞ *Turn the crankshaft (ring gear on flywheel) until the piston in the fuel injection pump reaches the lowest point (pay no attention to the position of the cylinders).*

☞ *Set the measuring equipment to "0".*

☞ *Use suitable equipment (at the ring gear) to turn the flywheel to the top until the piston of the fuel injection pump reaches a stroke of 2.5 mm (0.1").*

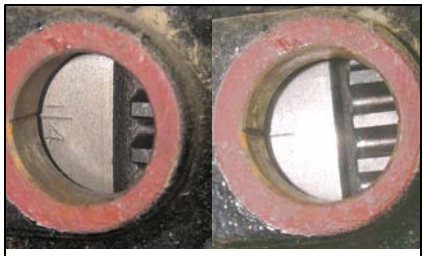


Fig. 10: Top dead centre indentation and 10° before top dead centre

☞ *Read the degrees before top dead centre by means of the indentations on the flywheel.*

- Indentations "1/4" and "2/3" stand for the top dead centre of the respective cylinders.
- Scaling: 10°/15°/20° before top dead centre

➥ Rated value: 14.5° ± 1° before top dead centre (~ second indentation)

Setting injection time

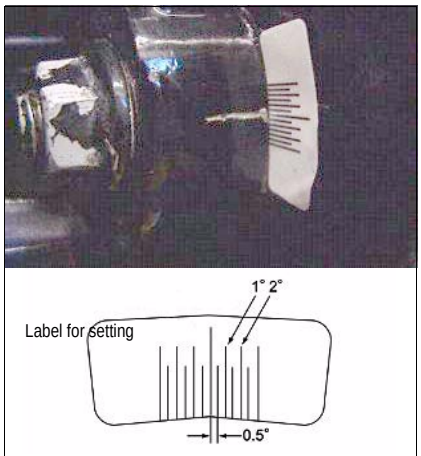


Fig. 11: Mark on housing

- Variations outside the tolerance range can be corrected by turning the fuel injection pump.

☞ *Mark the initial position on the pump and wheel case housing before setting the fuel injection pump – see Fig. 11.*

☞ *Remove all injection lines on the fuel injection pump and slacken the 4 flange screws by about ½ a revolution (do not unscrew completely).*

☞ *Rotate the pump in the required direction, and tighten one of the screws before you check the setting.*

➥ Rotated towards the engine: later injection time.

➥ Rotated away from the engine: earlier injection time.

☞ *Bend each of the injection lines before you mount them so they are not subject to tension once they are mounted.*

☞ *Check injection time again.*

☞ *Adhesive label number 1000158808*

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Replacement of fuel injection pump

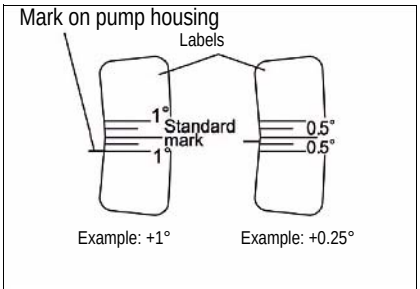


Fig. 12: Correction of injection angle

☞ *Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see fig. 12.*

☞ *Remove gear casing cover* **13/1** *of the fuel injection pump.*

☞ Mark the position of the gear of the fuel injection pump **14/A** with respect to gear **14/B** – see fig. 14.

☞ *Completely slacken lock nut* **14/2** *of the drive pinion.*

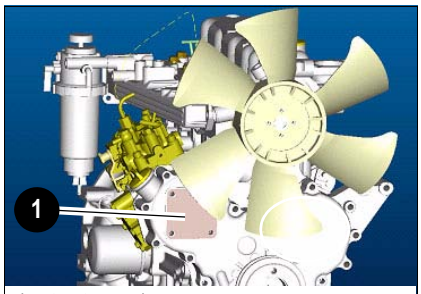


Fig. 13: Gear casing

☞ *Remove the fuel injection pump.*

☞ Read off the injection angle on the pump.

☞ Read off the injection angle on the new pump.

➥ Read off the imprint on the engine side of the fuel injection pump.

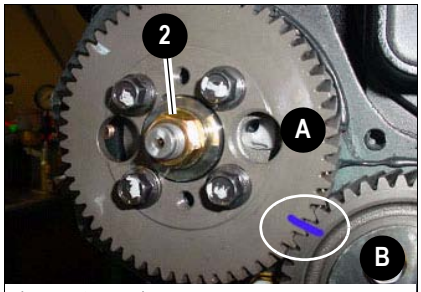


Fig. 14: Gear casing

☞ *Difference of "Angle of new pump" – "Angle of old pump" gives you the mounting angle of the new fuel injection pump – see fig. 12.*

➥ Positive value: later injection time (towards the engine).

➥ Negative value: earlier injection time (away from the engine).

☞ *Install the fuel injection pump*

☞ Check the marked position of the drive pinion of the fuel injection pump (fig. 14).

☞ *Screw on and tighten nut 14/2.*

☞ *Check injection time.*

☞ *Mount gear casing cover 13/1 of the fuel injection pump.*

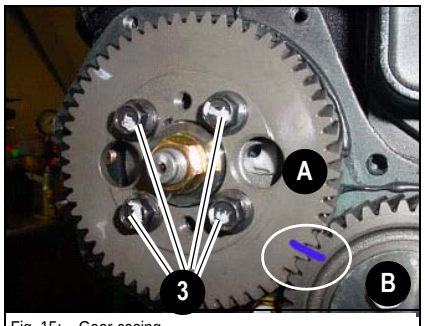


Fig. 15: Gear casing

Important!

Do not slacken screws **15/3** of the drive pinion of the fuel injection pump. These screws specify the precision setting of the fuel injection pump set by the manufacturer.

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4.9 Adjusting engine revs

Important!

Maximum engine revs are sealed in the factory and may not be modified.

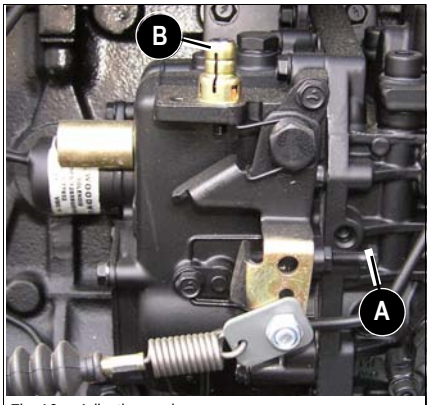


Fig. 16: Adjusting engine revs

Adjust engine revs without load

☞ *Run the diesel engine until it reaches operating temperature.*

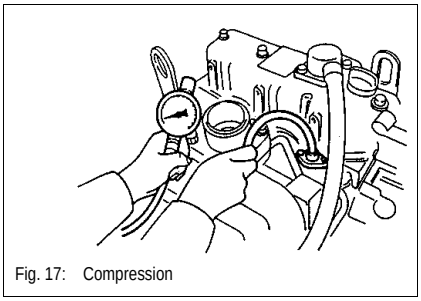
☞ *Check idling speed **A** and maximum revs **B** with all attachment functions in neutral.*

➥ Idling speed 1050 ± 50 rpm

➥ Max. revs: 2575 ± 50 rpm.

☞ *Correct the idling speed with set screw **16/A** if it is not correct.*

4.10 Compression


Fig. 17: Compression

☞ *Remove the injection lines and the injection nozzles.*

☞ *Set the fuel injection pump to zero delivery (remove the plug for the cutoff solenoid).*

☞ *Turn the engine.*

☞ *Mount the compression gauge on the cylinder you want to measure.*

☞ *Turn the engine with the starter and read the pressure off the pressure gauge.*

➥ Specified value: **35 ± 1 bar (508 ± 14.5 psi) at 250 rpm**

➥ Threshold value: **28 ± 1 bar (406 ± 14.5 psi) at 250 rpm**

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4.11 Checking the coolant thermostat

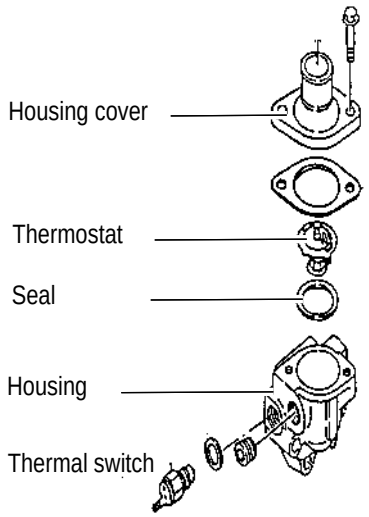
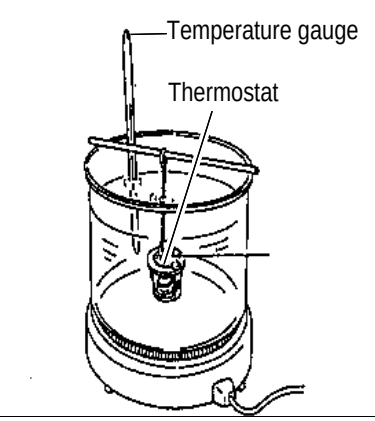


Fig. 18: Coolant thermostat

☞ *Remove the thermostat.*



☞ *Warm up the thermostat in a container with water.*

☞ *Check whether the thermostat opens at the specified temperature (check with a temperature gauge).*

➥ Thermostat opening temperature: **69.5 – 72.5 °C (157.1 – 162.5 °F)**

4.12 Checking the thermal switch

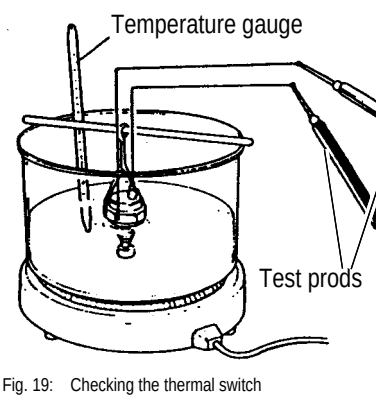


Fig. 19: Checking the thermal switch

☞ *Remove the thermal switch.*

☞ *Warm up the thermal switch in a container with antifreeze or oil.*

☞ *Measure the resistance of the thermal switch as shown by means of an ohmmeter.*

➥ The switch must allow the coolant to pass at a temperature of **107 – 113 °C (224.6-235.4 °F)**.

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4.13 Oil pressure switch

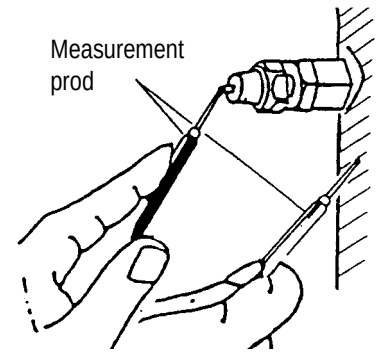


Fig. 20: Oil pressure switch

☞ *Remove the cable connection from the oil pressure switch (in the area of the cutoff solenoid).*

☞ *Start the engine, check for correct idling speed.*

☞ *Measure the resistance of the oil pressure switch as shown by means of an ohmmeter.*

➥ Oil pressure switch OK: infinite resistance.

➥ The oil pressure switch is defective if the oil can pass.

4.14 Checking the coolant circuit

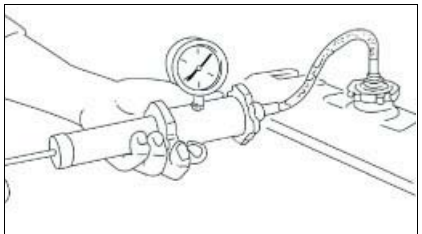


Fig. 21: Checking the radiator for leaks

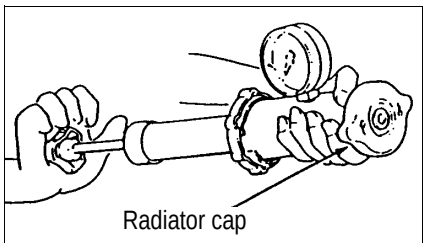


Fig. 22: Checking the radiator cap

Leakage check:

☞ *Fill up the radiator completely.*

☞ *Mount an adapter on the radiator as shown.*

☞ *Increase the pressure in the cooling system by means of a hand pump to about **1 bar (15 psi)**.*

➥ Check the lines and the connections for leaks if the pressure drops at the pressure gauge.

Check the radiator cap:

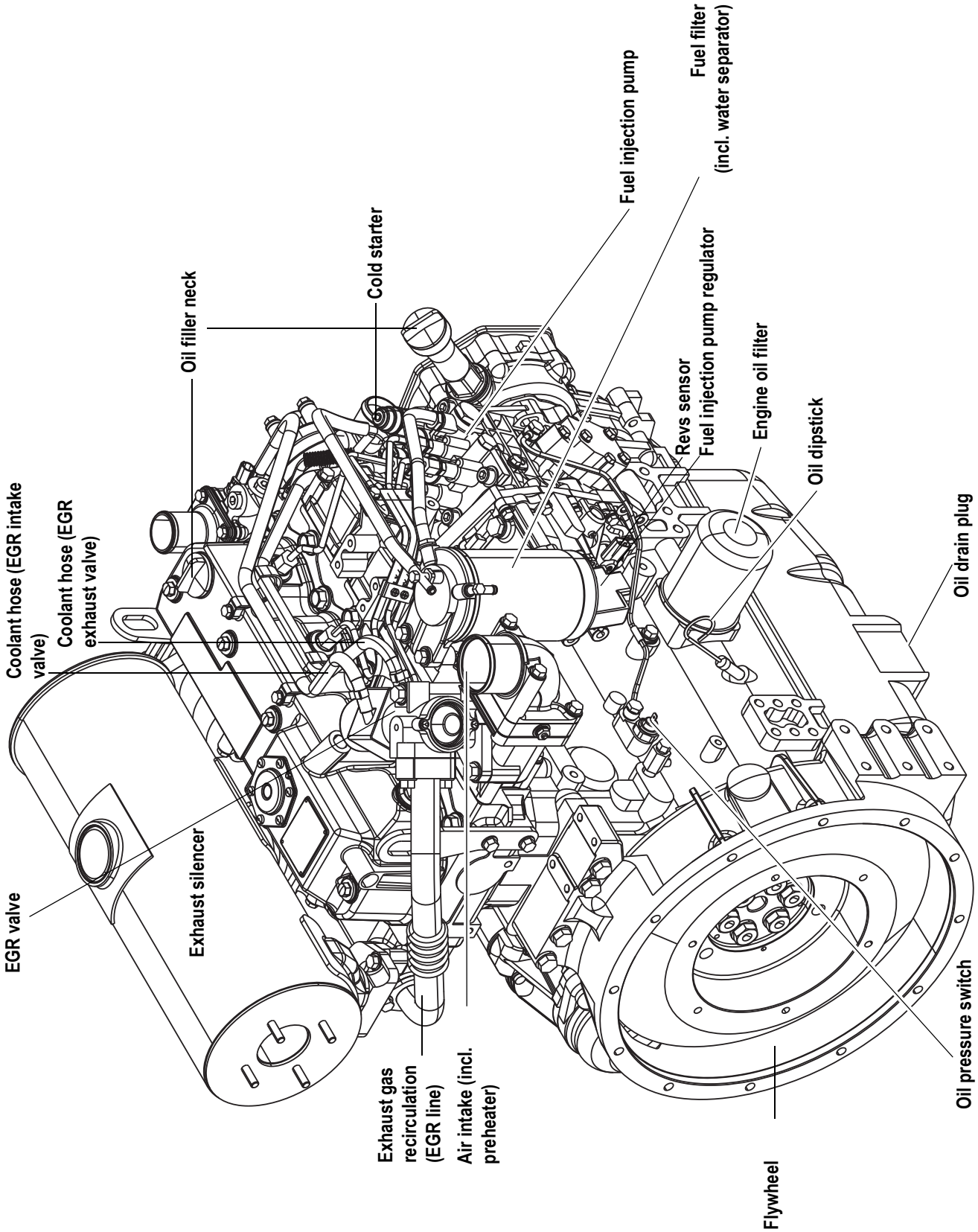
☞ *Remove the radiator cap and mount it onto the adapter as shown.*

☞ *Increase the pressure to about 1 bar/15 psi (stamped onto the radiator cap) with the hand pump.*

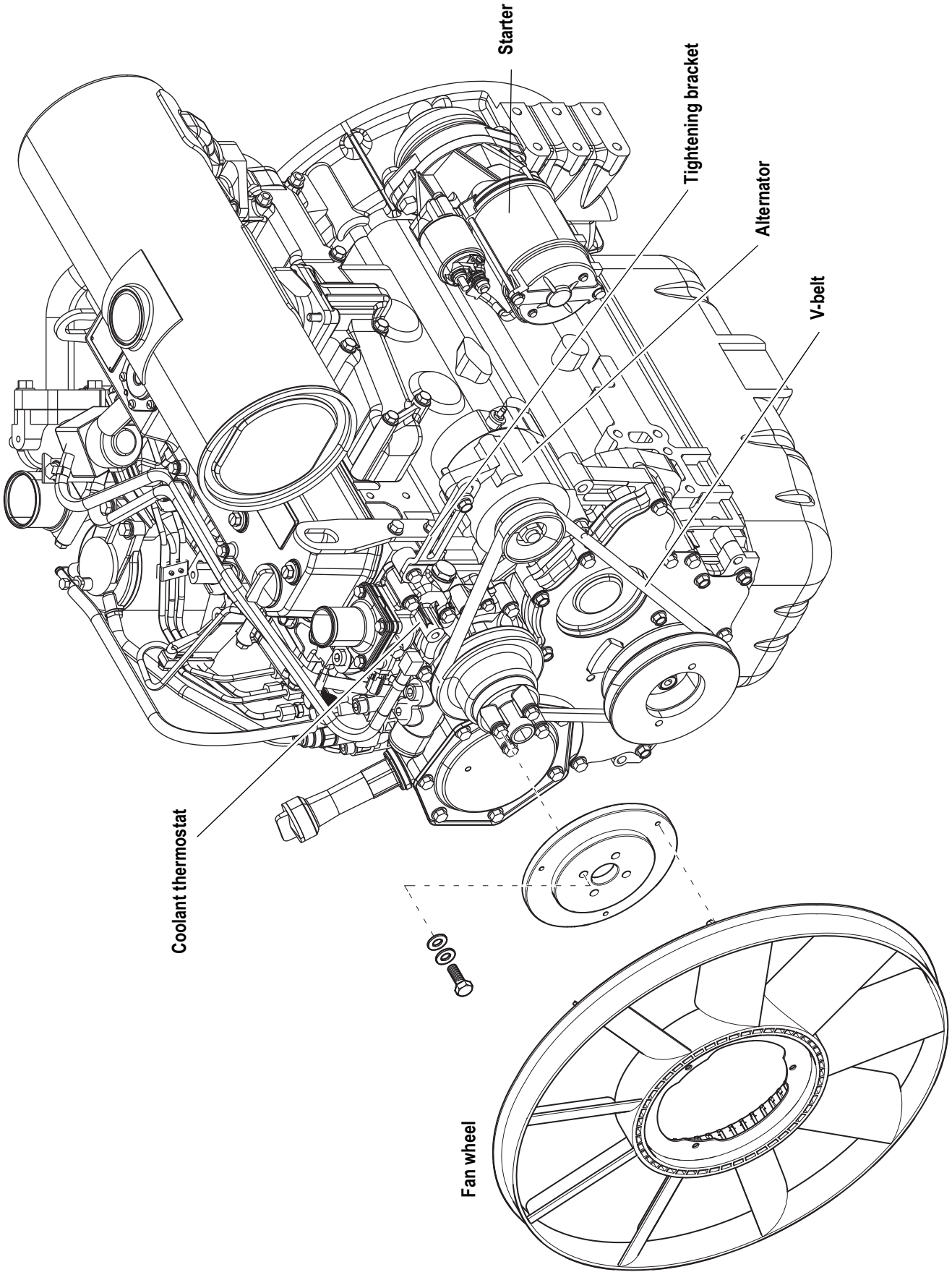
➥ The radiator cap must open.

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4.15 Engine 4TNV98-ZVNS from serial no. AH00645

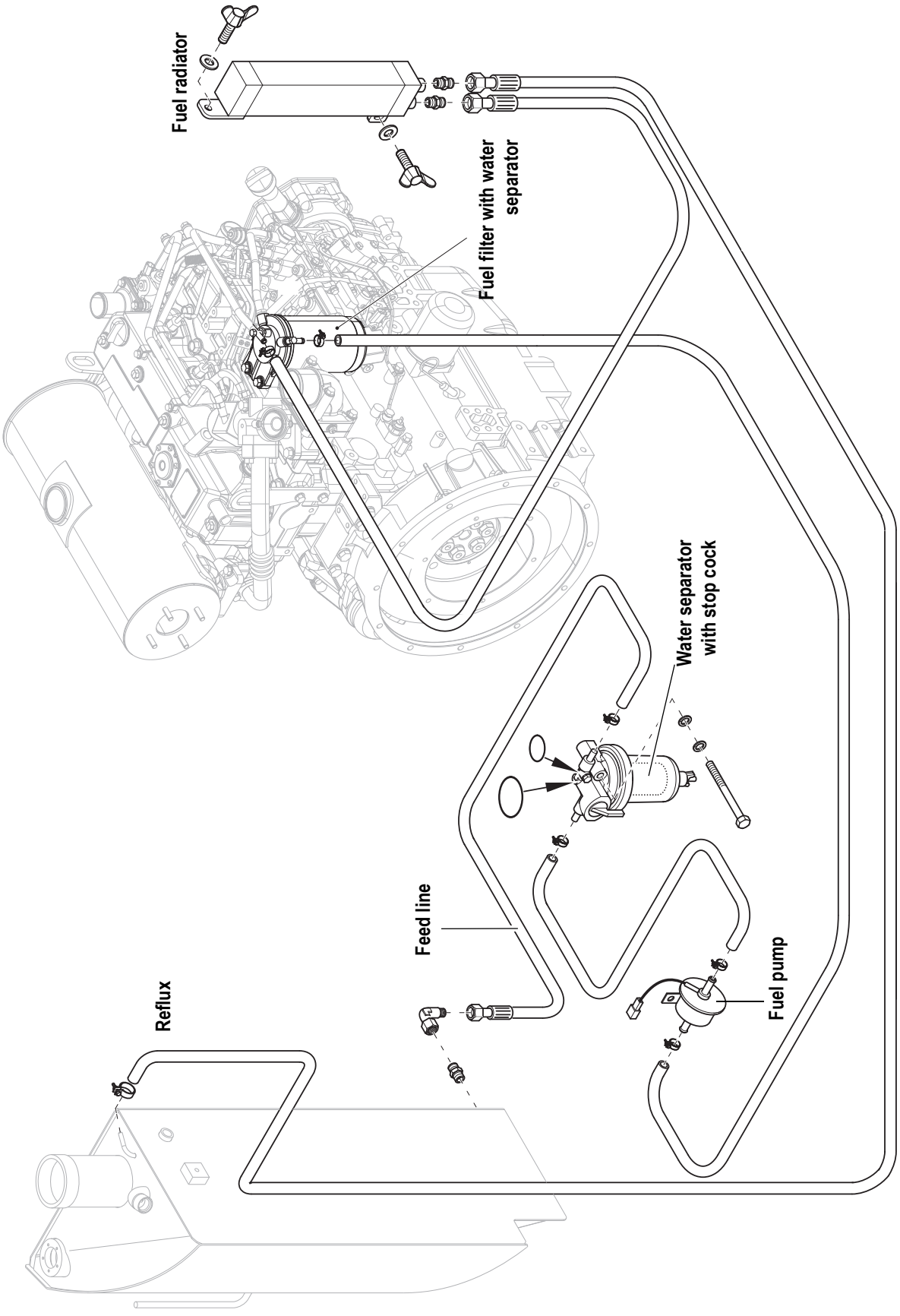


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4.16 Fuel system



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4.17 Removing the valve cover

Important!

The injection lines on this engine run through the valve cover. Therefore, remove the valve cover with extreme care.

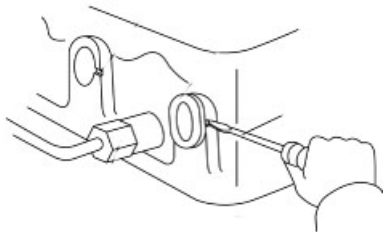


Fig. 23: Removing the valve cover

Allow the engine to cool down for at least 30 minutes before removing (engine oil temperature < 80 °C/< 176 °F), then drain the coolant in an environmentally friendly way.

Remove as follows:

☞ *Unscrew all fuel injection lines from the valve cover.*

☞ *Slightly fold the injection lines away from the engine.*

☞ *Carefully remove the rubber grommets from the valve cover with a screw driver.*

☞ *Unscrew the valve cover.*

4.18 Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine.

Checking valve clearance

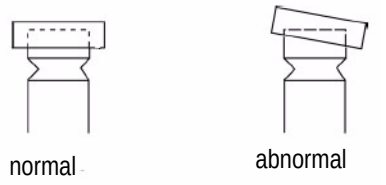


Fig. 24: Valve cap wear

☞ *Remove the valve cover.*

☞ *Turn the engine until the respective cylinder reaches the top dead centre of the compression cycle.*

➥ Valve overlapping.

☞ *Check the valve cap for abnormal wear.*

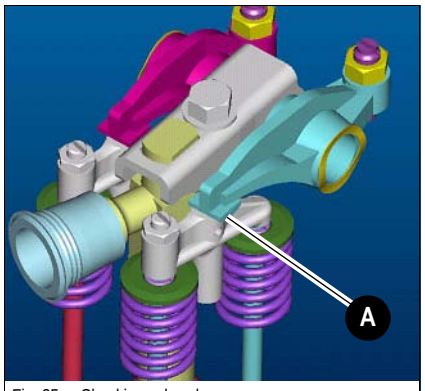


Fig. 25: Checking valve clearance

☞ *Check valve clearance **25**/**A** with a feeler gauge.*

➥ Valve clearance: 0.15 – 0.25 mm (0.006 – 0.01")

☞ *Repeat the procedure for each cylinder.*

☞ *Place the valve cover gasket*

☞ *Mount the valve cover*

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Setting zero play of the valve bridge

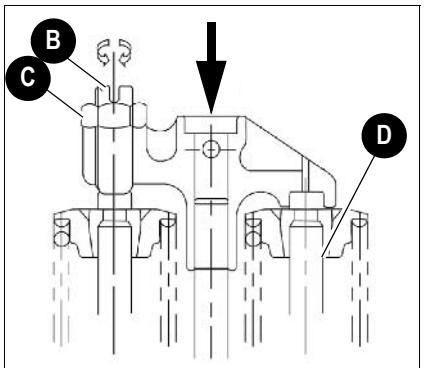


Fig. 26: Setting valve clearance

☞ *Remove the valve cover.*

☞ *Slacken locknut* **26/C** *and unscrew set screw* **26/B** *by one revolution.*

☞ *Press the valve bridge against valve* **26/D** *by hand until it makes contact.*

☞ Turn the set screw clockwise at the same time until it touches the valve.

☞ *Tighten locknut* **26/C**.

Setting valve clearance

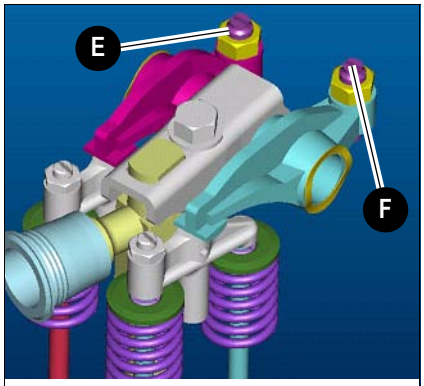


Fig. 27: Setting valve clearance

☞ *Turn the engine until the respective cylinder reaches the top dead centre of the compression cycle.*

➥ Valve overlapping.

☞ *Slacken locknut* **27/E**.

☞ *Set valve clearance by turning set screw* **27/F**.

➥ Valve clearance: 0.15 – 0.25 mm (0.001 – 0.01")

☞ *Tighten the locknut.*

➥ Check the setting again with the feeler gauge.

☞ *Repeat the procedure for each cylinder.*

☞ *Place the valve cover gasket*

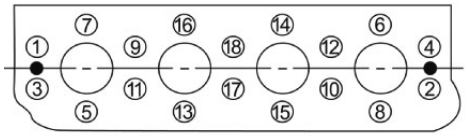
☞ *Mount the valve cover*

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4.19 Tightening order for cylinder head bolts

☞ *Order for removing the cylinder-head bolts*

Flywheel



Fan

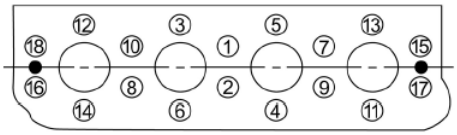
Oil the threads and the contact surfaces of the cylinder-head bolts before mounting them.

Caution!

Bear in the mind the order for tightening the cylinder-head bolts.

☞ *See figure*

Flywheel



Fan

☞ *Mount the cylinder-head bolts.*

➥ Tightening moments:

- 1st pass **51.5 – 56.5 Nm (38 – 41.7 ft. lbs.)**
- 2nd pass **103.1 – 112.9 Nm (76 – 83.3 ft. lbs.)**

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4.20 Checking the injection nozzles

Pressure check

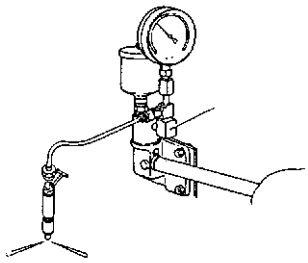


Fig. 28: Nozzle tester

☞ *Remove the injection line and the injection nozzle.*

☞ *Connect the injection nozzle with the high pressure line of the nozzle tester.*

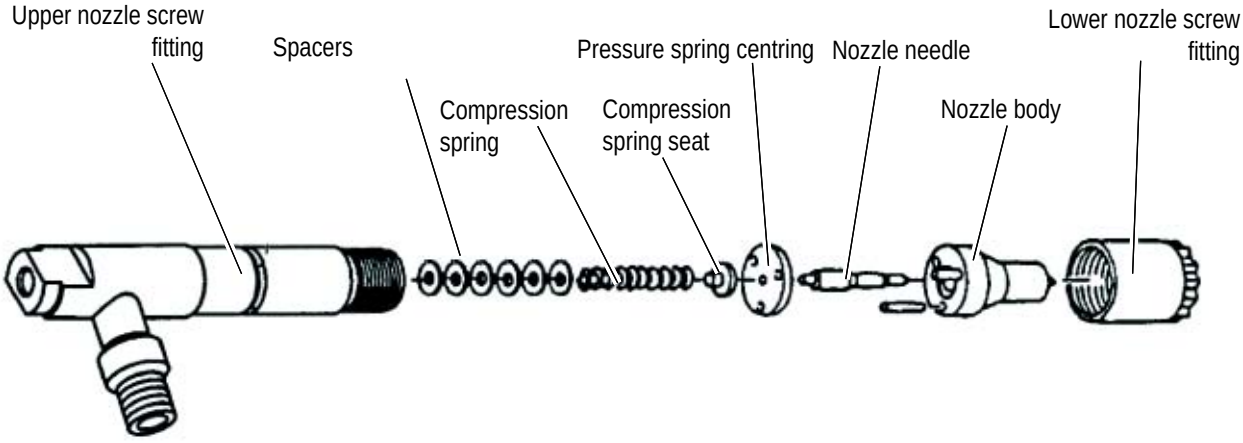
☞ *Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge.*

☞ *If the injection pressure is too low, replace the spacer in the nozzle by a thicker one. If the pressure is too high, replace the spacer by a thinner one.*

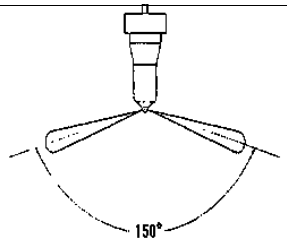
➥ Injection pressure: **216 – 226 bar (3133 – 3278 psi)**

- Spacer thickness of 0.1 mm (0.004") corresponds to modification by 19 bar (276 psi).
- Check the nozzle for drips after it has ejected fuel.

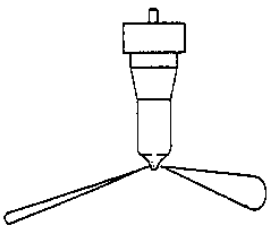
☞ Create a pressure of about 20 bar (290 psi) below injection pressure and check whether fuel escapes from the nozzle.



4.21 Checking the nozzle jet



Normal atomisation



Bad atomisation

Fig. 29: Nozzle jet

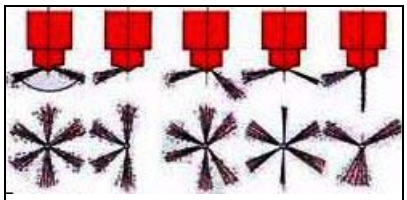
☞ *Remove the injection lines and the injection nozzles.*

☞ *Connect the injection nozzle with the high pressure line of the nozzle tester.*

☞ *Quickly create pressure until the nozzle ejects fuel (ejection 3 – 4 times).*

☞ *Hold a white sheet of paper about 30 cm (12") away from the nozzle and let the nozzle eject fuel.*

☞ *The nozzle jet must create a shape on the paper as shown in* **fig. 30/left**.



optimal ----------variation----------

Fig. 30: Shape of nozzle jet

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4.22 Injection time

Checking injection time

Caution!

Oil can escape.

☞ *Take measures to collect the oil.*

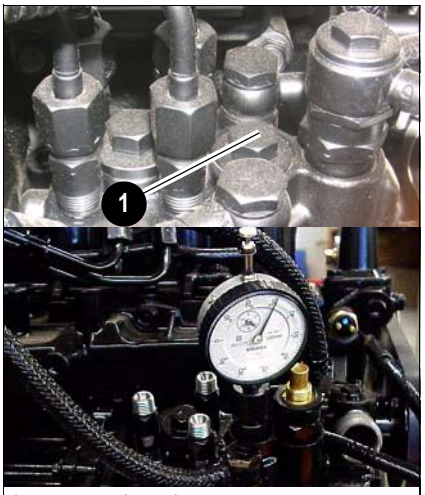


Fig. 31: Measuring equipment

- Preparatory work:

☞ *Clean the surface of the injection pump.*

☞ *Remove the injection lines from the fuel injection pump.*

☞ *Remove plug* **31/1** *from the piston.*

☞ *Mount the sleeve (no. 1000158805) and the extension (no. 1000158806) onto the dial gauge (no. 1000158807) and fasten them with a clamp (no. 1000083308).*

☞ *Mount the dial gauge into the bore of the piston as shown in Fig. 31.*

- Measurement:

☞ *Remove the rubber cover from the flywheel housing.*

☞ *Turn the crankshaft (ring gear on flywheel) until the piston in the fuel injection pump reaches the lowest point (pay no attention to the position of the cylinders).*

☞ *Set the measuring equipment to "0".*

☞ *Use suitable equipment (at the ring gear) to turn the flywheel to the top until the piston of the fuel injection pump reaches a stroke of 2.5 mm (0.1").*

☞ *Read the degrees before top dead centre by means of the indentations on the flywheel.*

- Indentations "1/4" and "2/3" stand for the top dead centre of the respective cylinders.
- Scaling: 10°/15°/20° before top dead centre

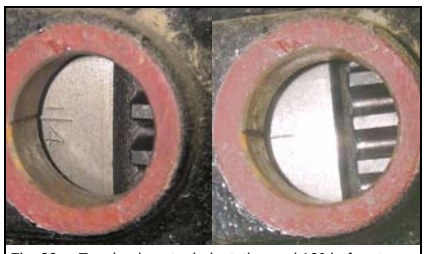
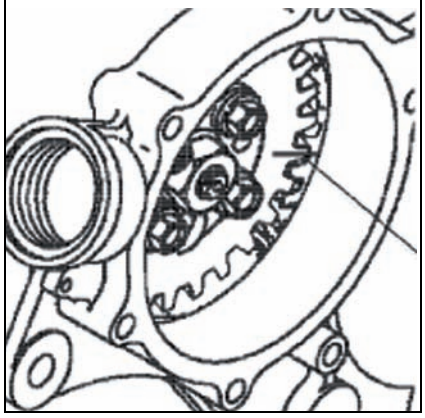


Fig. 32: Top dead centre indentation and 10° before top dead centre



➥ Rated value: 12.5° ± 1° before top dead centre (~ second indentation) -> up to serial no. AD07209

➥ From serial no. AH00646 -> calculation according to Yanmar manual:

Value on injection pump (in this case: 6.8 see *Fig. 32*) x 2 + FIR

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Setting injection time

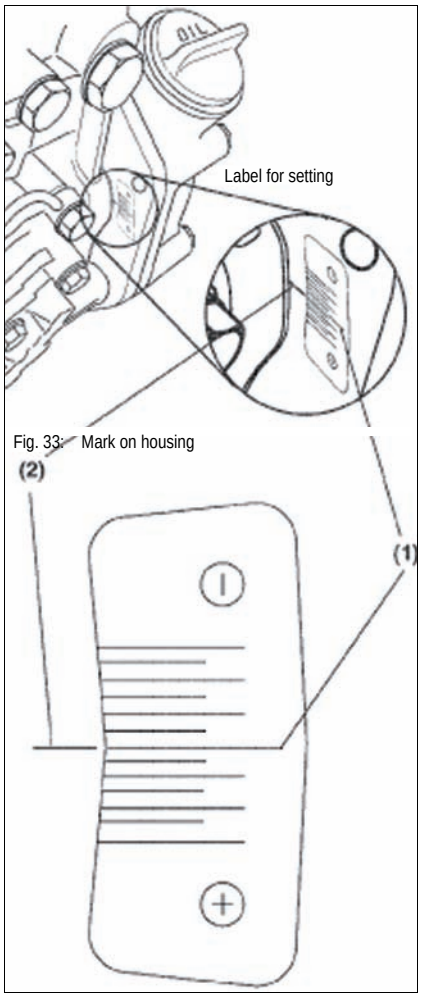


Fig. 33: Mark on housing

- Variations outside the tolerance range can be corrected by turning the fuel injection pump.

☞ *Mark the initial position on the pump and wheel case housing before setting the fuel injection pump – see Fig. 33.*

☞ *Remove all injection lines on the fuel injection pump and slacken the 4 flange screws by about ½ a revolution (do not unscrew completely).*

☞ *Rotate the pump in the required direction, and tighten one of the screws before you check the setting.*

➥ Rotated towards the engine: later injection time

➥ Rotated away from the engine: earlier injection time

☞ *Bend each of the injection lines before you mount them so they are not subject to tension once they are mounted.*

☞ *Check injection time again.*

☞ *Adhesive label number 1000158808*

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Replacement of fuel injection pump

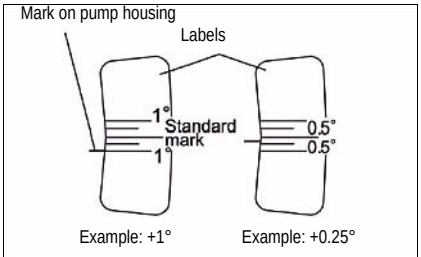


Fig. 34: Correction of injection angle

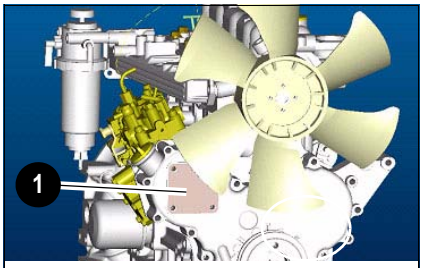
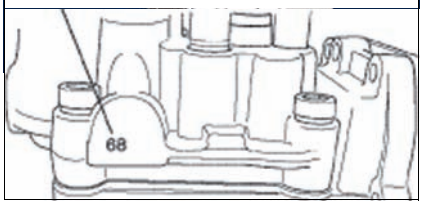


Fig. 35: Imprint on gear casing cover



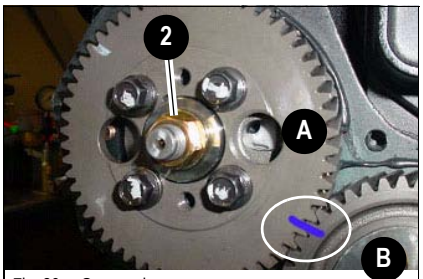
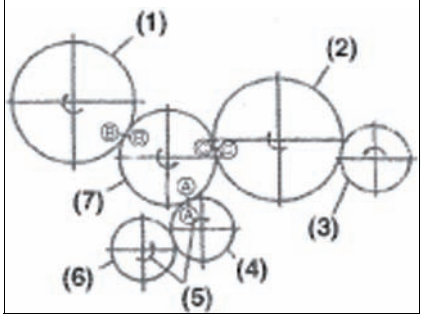


Fig. 36: Gear casing



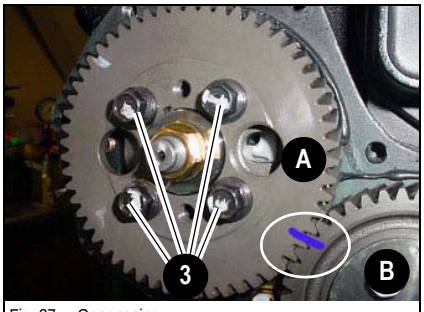


Fig. 37: Gear casing

☞ *Remove the injection lines from the fuel injection pump.*

☞ *Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see fig. 34.*

☞ *Remove gear casing cover* **35/1** *of the fuel injection pump.*

☞ Check the position of the gear of the fuel injection pump **36/A** with respect to the position of gear **36/B** – see fig. 36 (gears have marks).

☞ *Completely slacken lock nut* **36**/**2** *of the drive pinion.*

☞ *Adhesive label number 1000158808*

☞ *Remove the fuel injection pump.*

☞ Read off the injection angle on the pump.

☞ Read off the injection angle on the new pump.

➥ Read off the imprint on the engine side of the fuel injection pump.

- Tightening torque: 23 – 28 Nm (17 – 21 ft. lbs.)

☞ *Mounting angle of the new fuel injection pump – see fig. 34.*

➥ Positive value: later injection time (towards the engine)

➥ Negative value: earlier injection time (away from the engine)

☞ *Install the fuel injection pump.*

☞ Make the marks on the gears coincide, fig. 36.

☞ *Screw on and tighten nut 36/2 (tightening torque: 23 – 28 Nm/17 – 21 ft. lbs.).*

☞ *Check injection time.*

☞ *Mount gear casing cover 35/1 of the fuel injection pump.*

- Tightening torque: 113 – 123 Nm (83 – 91 ft. lbs.)

- If a front housing cover is installed, the drive wheel of the injection pump is adapted to the running wheel by means of marks A,B,C (see *Fig. 36*):
  - 1...Injection pump drive wheel
  - 2...Camshaft drive wheel
  - 3...Auxiliary drive wheel (option)
  - 4...Crankshaft drive wheel
  - 5...Direction of rotation
  - 6...Fuel pump drive wheel (4TNV only)
  - 7...Running wheel

Important!

Do not slacken screws **37/3** of the drive pinion of the fuel injection pump. These screws specify the precision setting of the fuel injection pump set by the manufacturer.

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4.23 Compression

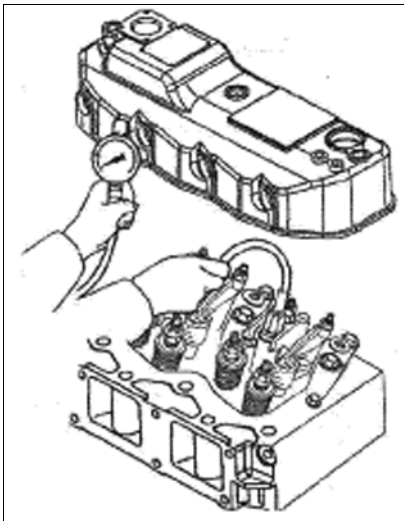


Fig. 38: Compression

☞ *Remove the injection lines and the injection nozzles.*

☞ *Set the fuel injection pump to zero delivery (remove the plug for the cutoff solenoid).*

☞ *Turn the engine.*

☞ *Mount the compression gauge on the cylinder you want to measure.*

☞ *Turn the engine with the starter and read the pressure off the pressure gauge.*

➥ Specified value: **33.3 – 35.3 bar (483 – 512 psi) at 250 rpm**

➥ Threshold value: **26.5 – 28.5 bar (384 – 413 psi) at 250 rpm**

4.24 Checking the coolant thermostat

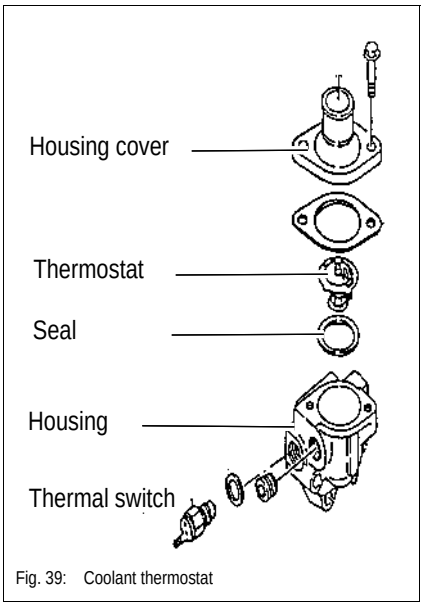
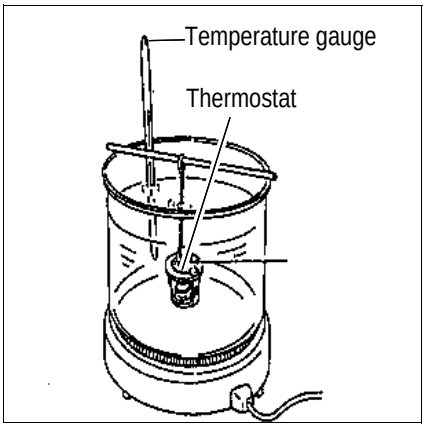


Fig. 39: Coolant thermostat

☞ *Remove the thermostat.*



☞ *Warm up the thermostat in a container with water.*

☞ *Check whether the thermostat opens at the specified temperature (check with a temperature gauge).*

➥ Thermostat opening temperature: **69.5 – 72.5 °C (157.1 – 162.5 °F)**

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4.25 Checking the thermal switch

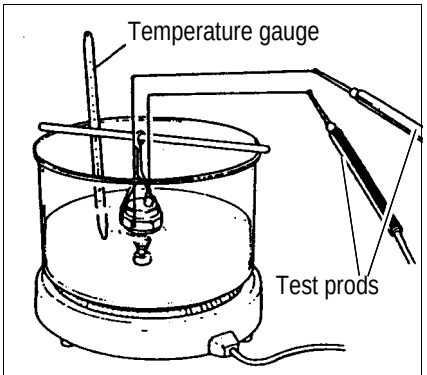


Fig. 40: Checking the thermal switch

☞ *Remove the thermal switch.*

☞ *Warm up the thermal switch in a container with antifreeze or oil.*

☞ *Measure the resistance of the thermal switch as shown by means of an ohmmeter.*

➥ The switch must allow the coolant to pass at a temperature of **107 – 113 °C (224.6-235.4 °F)**.

4.26 Oil pressure switch

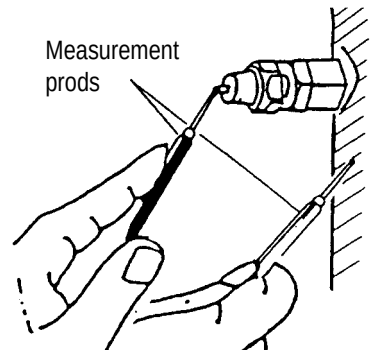


Fig. 41: Oil pressure switch

☞ *Remove the cable connection from the oil pressure switch (in the area of the cutoff solenoid).*

☞ *Start the engine, check for correct idling speed.*

☞ *Measure the resistance of the oil pressure switch as shown by means of an ohmmeter.*

➥ Oil pressure switch OK: infinite resistance

➥ The oil pressure switch is defective if the oil can pass.

4.27 Checking the coolant circuit

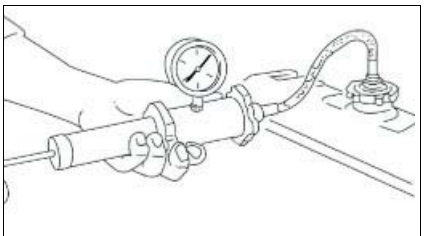


Fig. 42: Checking the radiator for leaks

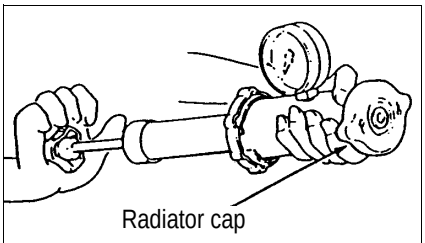


Fig. 43: Checking the radiator cap

Leakage check

☞ *Fill up the radiator completely.*

☞ *Mount an adapter on the radiator as shown.*

☞ *Increase the pressure in the cooling system by means of a hand pump to about **1 bar (15 psi)**.*

➥ Check the lines and the connections for leaks if the pressure drops at the pressure gauge.

Checking the radiator cap

☞ *Remove the radiator cap and mount it onto the adapter as shown.*

☞ *Increase the pressure to about 1 bar/15 psi (stamped onto the radiator cap) with the hand pump.*

➥ The radiator cap must open.

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4.28 Engine trouble

Problem	Possible causes
Engine does not start or is not easy to start	No fuel
	Air in fuel system
	Wrong SAE grade of engine lubrication oil
	Fuel grade does not comply with specifications
	Defective or flat battery
	Loose or oxidised cable connections in starter circuit
	Defective starter, or pinion does not engage
	Wrong valve clearance
	Defective fuel injector
	Defective starting relay
	Defective glow plug
	Close the injection pump
	Cutoff solenoid does not attract
	High pressure created immediately in the hydraulic system
Engine starts, but does not run smoothly or faultless	Fuel grade does not comply with specifications
	Wrong valve clearance
	Injection line leaks
	Defective fuel injector
	Air in fuel system
Engine overheats. Temperature warning system responds	Oil level too low
	Damaged water pump
	Oil level too high
	Dirty air filter
	Dirty cooler fins
	Defective fan, torn or loose V-belt
	Defective thermostat
	Resistance in cooling system too high, flow capacity too low
	Defective fuel injector
Insufficient engine output	Oil level too high
	Fuel grade does not comply with specifications
	Dirty air filter
	Wrong valve clearance
	Air in fuel system
	Injection line leaks
	Defective fuel injector
Engine does not run on all cylinders	Injection line leaks
	Defective fuel injector

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Problem		Possible causes
Insufficient or no engine oil pressure		Oil level too low
		Defective engine oil pump
		Machine inclination too high
		Clogged engine oil intake filter
		Wrong SAE grade of engine lubrication oil
Engine oil consumption too high		Oil level too high
		Machine inclination too high
Engine smoke	Blue	Oil level too high
		Machine inclination too high
		Engine oil combustion (defective cylinder-head gasket)
	White	Engine starting temperature too low
		Fuel grade does not comply with specifications
		Defective fuel injector
		Wrong valve clearance
		Coolant combustion (defective cylinder-head gasket)
		Exteme misalignment of injection time
	Black	Dirty air filter
		Wrong valve clearance
		Defective fuel injector (drips)
		Wrong fuel injection pump setting

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4.29 Electronic engine control unit (E-ECU)

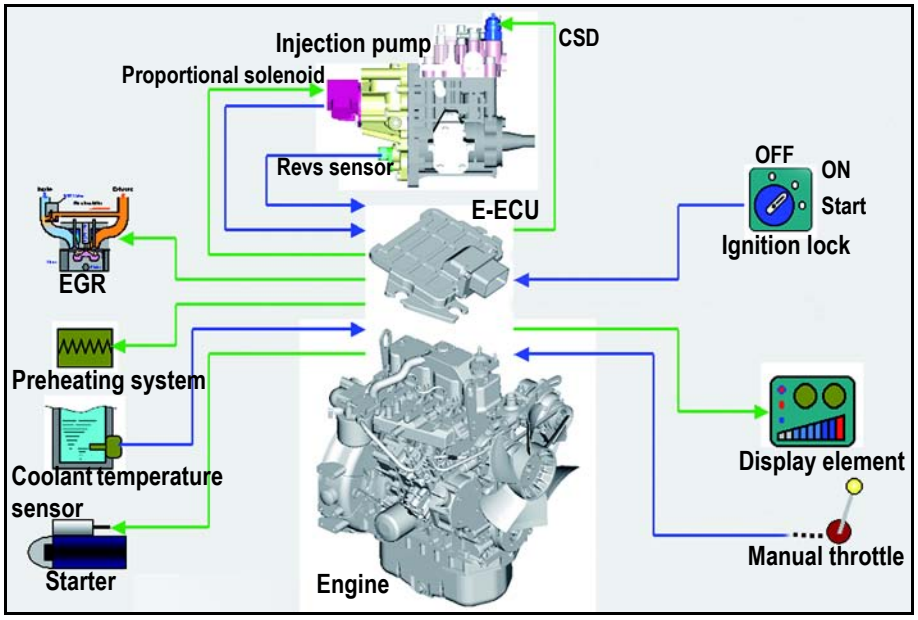
The Electronic Engine Control Unit (E-ECU) replaces the mechanical engine control used so far.

Features

The electronic engine control unit controls the engine revs, injection pump (flow rate), intake-air preheating, starting relay, cold start device (CSD) and exhaust gas recirculation (EGR) electronically as a function of engine load and temperature.

The following figure shows how the electronic engine control unit works:

CSD	Cold Start Device
ECU	Electronic Control Unit
EGR	Exhaust Gas Recirculation



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4.30 Engine error codes

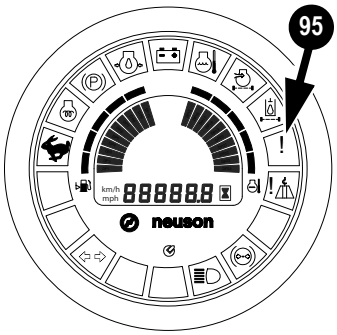
The ECU saves all important engine data. Error messages can be read out by means of a cable and software (diagnosis kit: 1000184395).

In the case of specific errors:

➥ Engine revs and output are reduced.

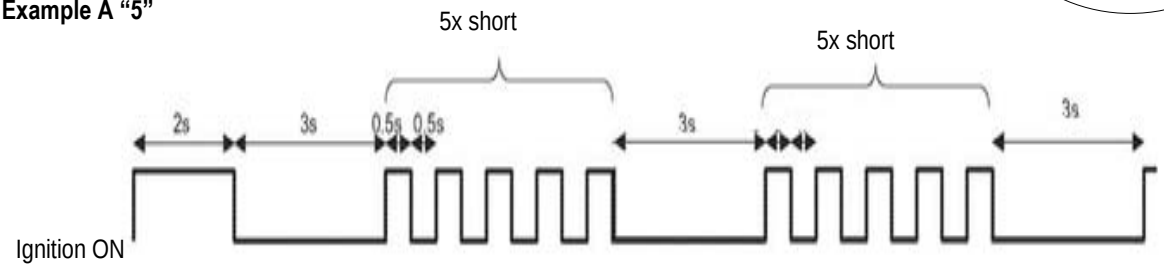
➥ The engine is switched off.

➥ The engine no longer starts.

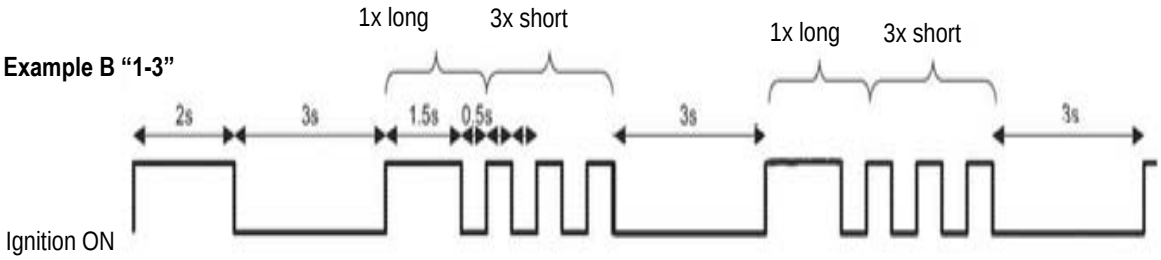


Example for flash codes:

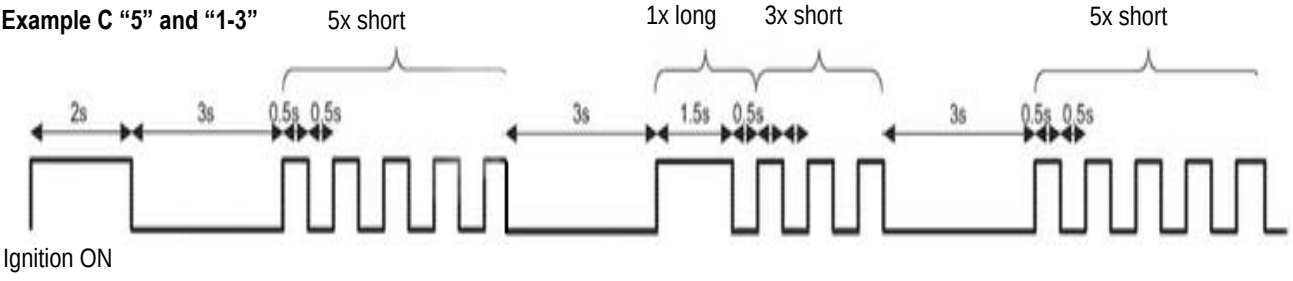
Example A “5”



Example B “1-3”



Example C “5” and “1-3”



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Engine diagnosis codes				Page
Flash code		**Component**	**Troubleshooting**	**Error diagnosis**
7	Proportional injection pump solenoid (control rack) (Rack position sensor failure)	Loose connector	Tighten the connector	*4-34*
		Wiring error	Check and replace the defective component	
		Defective sensor	Contact an authorised workshop	
5	Manual throttle lever (Accelerator sensor failure)	Wiring error Sensor voltage: 4.6 V or more, or 0.2 V or less	Check and replace the defective component	*4-38*
		Defective manual throttle lever sensor	Replace the manual throttle lever sensor	
4-1	ECU internal (ECU internal)	Internal ECU error	Contact your dealer	*4-41*
	ECU failure (ECU failure)			*4-44*
2-5	ECU overheated (ECU overheat alarm)	ECU temperature too high	Allow to cool down	*4-44*
4	Coolant temperature sensor (Coolant temperature sensor failure)	Wiring harness error Sensor voltage: 4.8 V or more, or 0.2 V or less	Check and replace the defective component	*4-45*
		Defective coolant temperature sensor	Replace the sensor	
3-6	Coolant temperature too high (Coolant temperature high alarm)	Overheated engine	Let the engine cool down	*4-47*
		Not enough coolant	Fill up coolant	
		Defective engine cooling system	Check the engine cooling system and replace the defective component if necessary	
		Defective coolant temperature sensor	Replace the sensor	
2-4	5 V sensor (Sensor 5 V failure)	Wiring harness error Sensor voltage: less than 4.5 V or more than 5.5 V	Check and replace the defective component	*4-49*
		Internal ECU error	Contact an authorised workshop	
2-3	Power supply (Power supply voltage abnormal)	Old battery	Replace the battery	*4-52*
		Oxidised battery terminals	Clean the battery terminals	
		Defective alternator	Replace the alternator	
		Wiring harness error Battery voltage: more than 10 V or more than 16 V	Check and replace the defective component	

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6	Revs sensor (Speed sensor failure)	Loose connector	Tighten the connector	*4-54*
		Defective starter	Replace the starter	
		Defective fuel injection	Contact an authorised workshop	
		Battery voltage too low	Charge the battery	
		Wiring harness error	Check and replace the defective component	
1-1	Backup revs sensor (alternator) (Backup speed sensor failure)	Loose connector	Tighten the connector	*4-59*
		Defective wiring harness	Check and replace the defective component	
		Internal ECU error	Contact an authorised workshop	
9	Overspeed (Overspeed)	Wiring harness error	Check and replace the defective component	*4-60*
		Engine runs at overspeed	Reduce engine revs and brake the machine	
		Internal ECU error	Contact an authorised workshop	
1-7	Proportional solenoid relay of injection pump (control rack) (Rack actuator relay failure)	Loose connector	Tighten the connector	*4-61*
		Defective relay	Contact an authorised workshop	
		Internal ECU error	Contact an authorised workshop	
		Wiring harness error	Check and replace the defective component	
1-5	Preheating relay (Air heater relay failure)	Loose connector	Tighten the connector	*4-65*
		Wiring harness error	Check and replace the defective component	
		Defective relay	Replace the start relay	
		Internal ECU error	Contact an authorised workshop	
1-4	Cold start device (CSD solenoid valve failure)	Loose connector	Tighten the connector	*4-69*
		Wiring harness error	Check and replace the defective component	
		Defective solenoid valve of cold start device	Contact an authorised workshop	
		Internal ECU error	Contact an authorised workshop	
1-3	Exhaust gas recirculation valve (EGR valve failure)	Loose connector	Tighten the connector	*4-72*
		Wiring harness error	Check and replace the defective component	
		Defective EGR valve stepping motor	Contact an authorised workshop	
		Internal ECU error	Contact an authorised workshop	
2-1	Oil pressure switch (Oil pressure switch failure)	Loose connector	Tighten the connector	*4-76*
		Wiring harness error	Check and replace the defective component	
		Defective oil pressure switch	Replace oil pressure switch	
		Internal ECU error	Contact an authorised workshop	

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3-1	Oil pressure loss (Oil pressure descend error)	Loose connector	Tighten the connector	*4-76*
		Wiring harness error	Check and replace the defective component	
		Defective oil pressure switch	Replace oil pressure switch	
		Internal ECU error	Contact an authorised workshop	
8	Proportional injection pump solenoid (control rack) (Rack actuator failure)	Loose connector	Tighten the connector	*4-80*
		Wiring harness error	Check and replace the defective component	
		Defective regulator	Contact an authorised workshop	
		Internal ECU error	Contact an authorised workshop	
		Regulator is stuck	Contact an authorised workshop	
		Engine runs at overspeed	Reduce engine revs and brake the machine	
1-6	Main relay (Main relay failure)	Loose connector	Tighten the connector	*4-84*
		Wiring harness error	Check and replace the defective component	
		Defective main relay	Replace main relay	
		Internal ECU error	Contact an authorised workshop	
1-2	CAN (Controller Area Network) connection (CAN communication failure)	Battery voltage too low	Charge the battery	*4-88*
		Loose connector	Tighten the connector	
		Wiring harness error	Check and replace the defective component	
		Internal ECU error	Contact an authorised workshop	

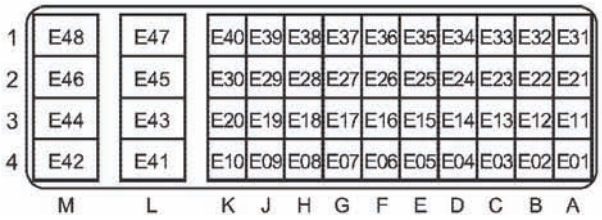
( ) Text in brackets appears in the diagnosis tool display.

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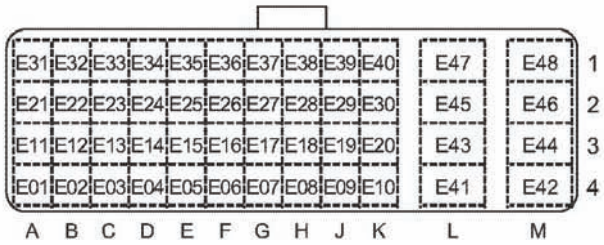
4.31 Error diagnosis

E-ECU connector assignment

Connector on wiring harness side



Connectors on ECU side



Number		Description	Code	Number		Description	Code
E01	4-A	D-phase stepping motor	STPM-D	E06	4-F	Automatic idling speed setting	APP-IP6
E07	4-G	Ignition lock	IGNSW	E08	4-H	Engine start recognition	STARTSW
E10	4-K	Backup revs sensor	RENRPM	E11	3-A	C-phase stepping motor	STPM-C
E12	3-B	Telltale failure	FAIL-LMP	E14	3-D	Oil pressure	APP-IP2
E16	3-F	Coolant temperature	RET	E17	3-G	Automatic idling speed pressure switch	APP-IP4
E18	3-H	Speed input (-)	NRPM-GND	E19	3-J	Speed input (+)	NRPM
E20	3-K	Start relay	APP-OP1	E21	2-A	B-phase stepping motor	STPM-B
E23	2-C	Preheating telltale	PREHT-LMP	E24	2-D	Drop mode	APP-IP1
E28	2-H	GND sensor	GND-A	E30	2-K	CAN terminal resistor	RECAN
E31	1-A	A-phase stepping motor	STPM-A	E33	1-C	Proportional solenoid relay of injection pump (control rack)	RACK-RLY
E34	1-D	Main relay	MAIN-RLY	E35	1-E	Manual throttle sensor	APS
E36	1-F	Proportional injection pump solenoid (control rack)	RPS	E38	1-H	5 V sensor	AVCC
E39	1-J	CANL	CANL	E40	1-K	CANH	CANH
E41	4-L	CSD solenoid coil	CSD-CL	E42	4-M	Proportional injection pump solenoid (control rack)	RACKSOL
E43	3-L	12 V sensor	AVB	E44	3-M	Preheating relay	AIRHT-RLY
E45	2-L	Power GND	GND	E47	1-L	GND CSD	GND-P
E48	1-M	12 V power	VB				

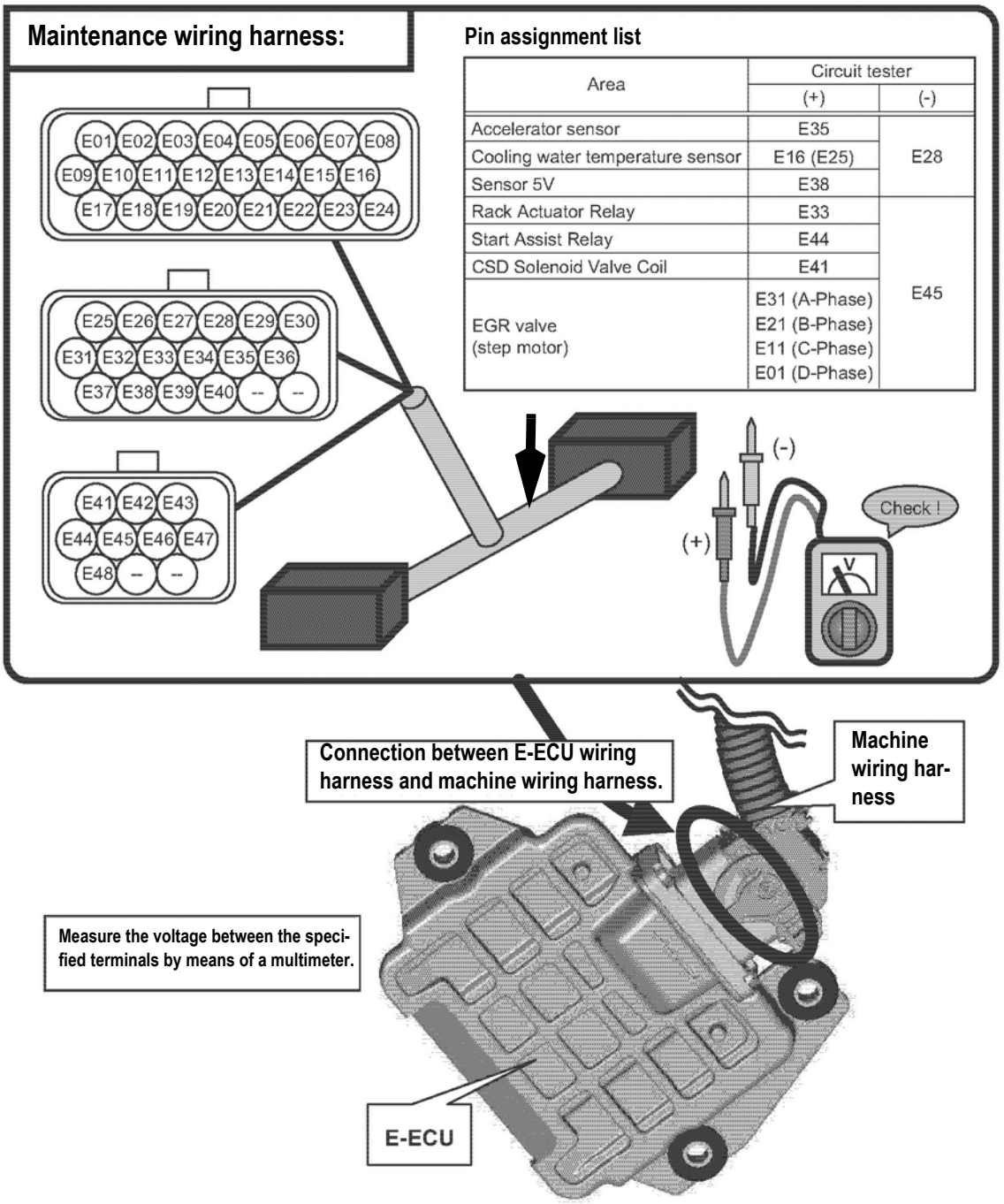
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Important information on the ECU maintenance wiring harness

Error diagnosis within the scope stated in this document includes measuring voltages with the maintenance wiring harness. Therefore, disconnect the E-ECU and the machine wiring harness before carrying out error diagnosis, and connect the maintenance wiring harness between the E-ECU and the machine wiring harness.

The ECU maintenance wiring harness can be ordered stating no. 1000188305.

- See below for details on the error diagnosis for the specific areas.
- Use a multimeter to measure the voltage in accordance with the following list.



Pin assignment list

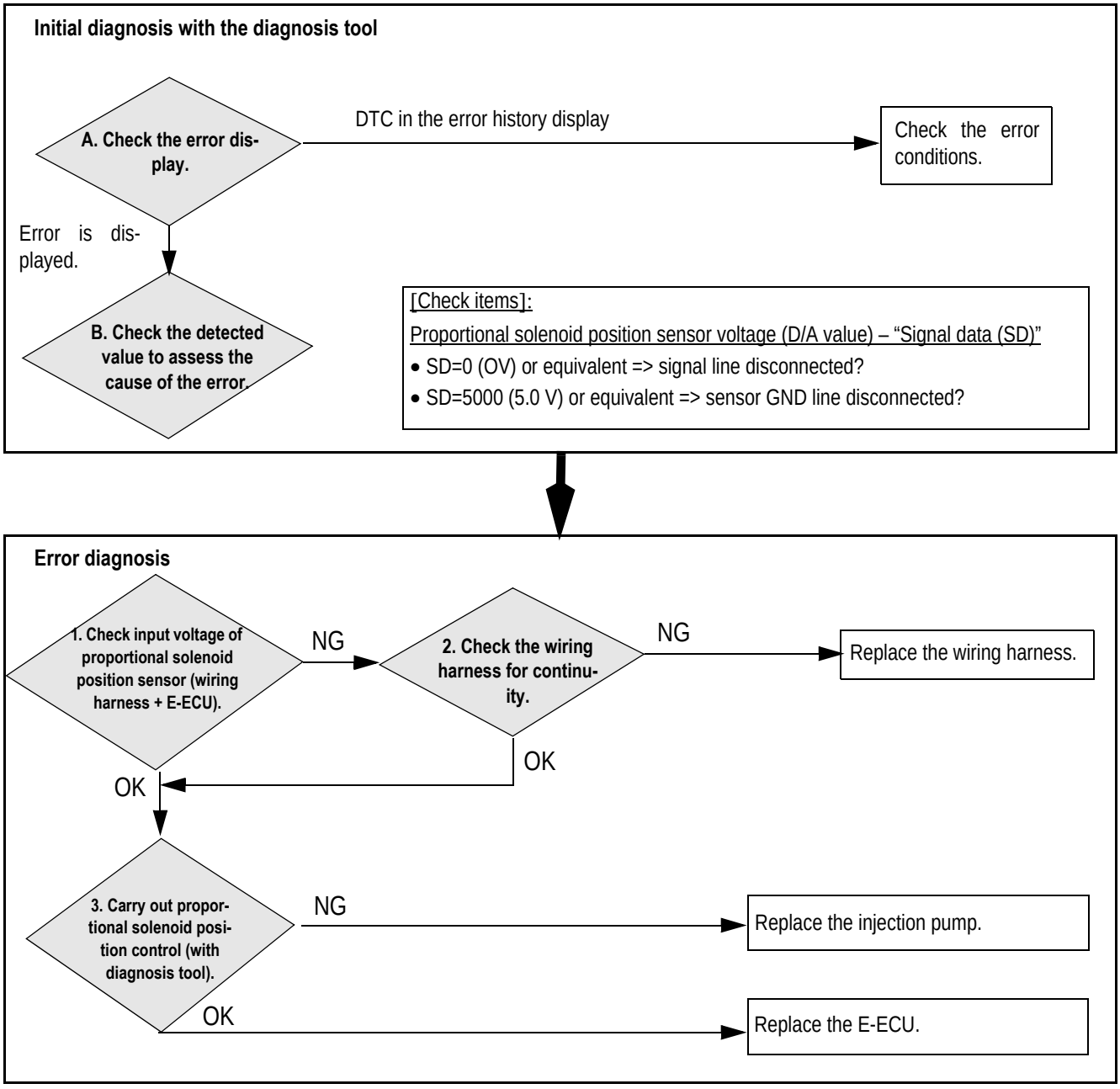
Area	Circuit tester (+)	Circuit tester (-)
Accelerator sensor	E35	E28
Cooling water temperature sensor	E16 (E25)	
Sensor 5V	E38	
Rack Actuator Relay	E33	E45
Start Assist Relay	E44	
CSD Solenoid Valve Coil	E41	
EGR valve (step motor)	E31 (A-Phase) E21 (B-Phase) E11 (C-Phase) E01 (D-Phase)	

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Flash code 7 – proportional injection pump solenoid (control rack)

Related DTC (Diagnostic Trouble Codes)

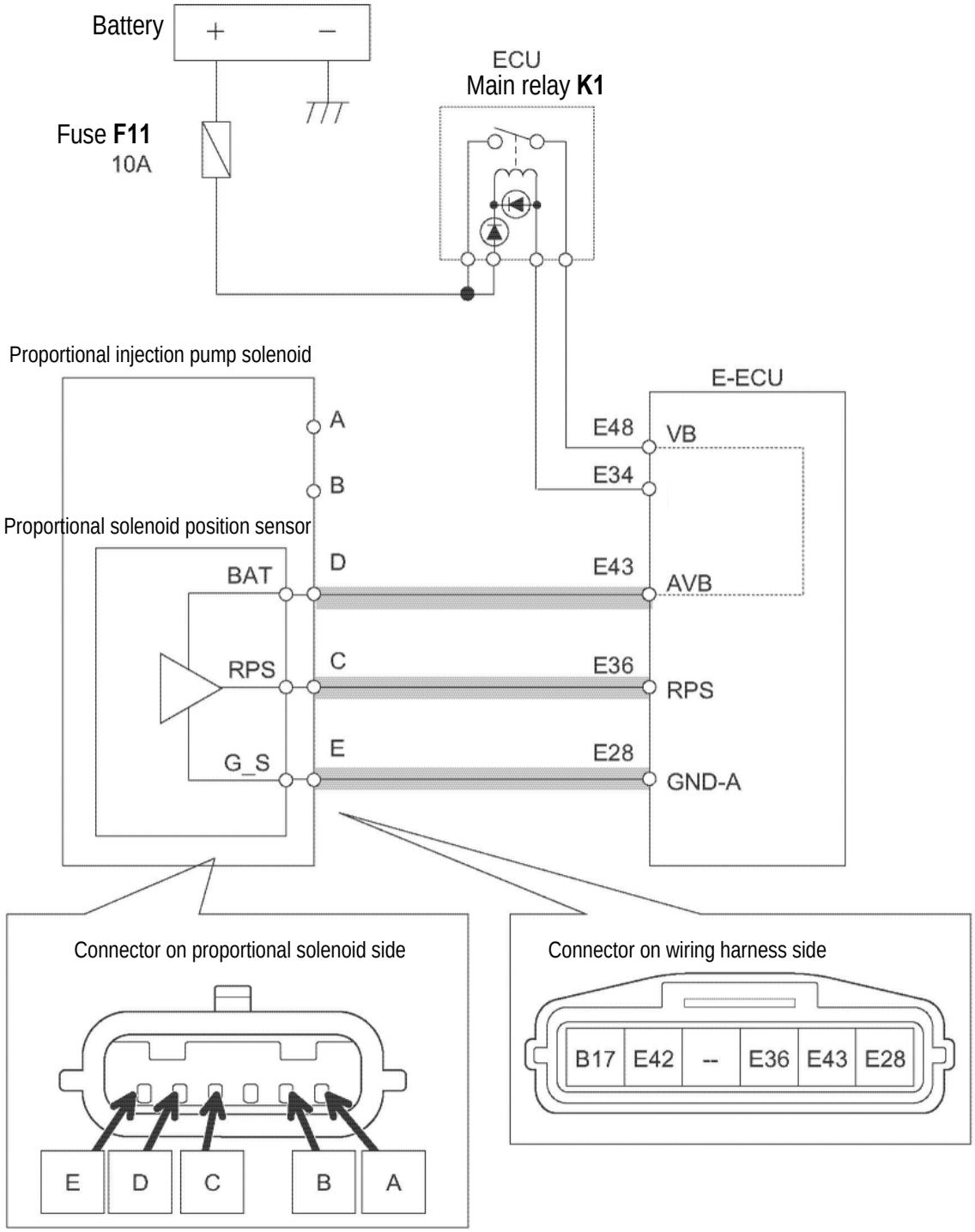
DTC	**P1202/4**	**Proportional solenoid position sensor error (voltage too low)**
	P1203/3	**Proportional solenoid position sensor error (voltage too high)**



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Diagnosis description

1. Check the input voltage of the proportional injection pump solenoid (wiring harness + E-ECU).

- Switch off ignition and disconnect connector of proportional solenoid from injection pump. Do not disconnect the E-ECU connector from the E-ECU.
- Switch on ignition to switch on E-ECU voltage.
- Measure the voltage between sensor terminals E43 and E28 by means of a multimeter.

Terminal	Normal value
Sensor connectors E43 – E28	Equivalent to the battery voltage

NG	Check the wiring harness for continuity. -> Next: [2. Check the wiring harness for continuity:]
OK	With the diagnosis tool “Diagnosis test: active control”, check whether “Position control for proportional injection pump solenoid” can be carried out. -> Next: [3. Check the execution of the position control of the proportional injection pump solenoid:]

2. Check the wiring harness for continuity:

- Disconnect the connector from the proportional injection pump solenoid, and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Sensor signal line E36 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Sensor GND line E28 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
12 V sensor line E43 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E36 and other terminal/GND and between E43 and other terminal/GND	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E28 and GND/E45/E47	Yes	OK: normal
	No	NG: open wiring harness
Between E28 and other terminals	No	OK: normal
	Yes	NG: wiring harness short-circuited with other cable

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	With the diagnosis tool “Diagnosis test: active control”, check whether “Position control for proportional injection pump solenoid” can be carried out. -> Next: [3. Check the execution of the position control of the proportional injection pump solenoid:]

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3. Check the execution of the position control of the proportional injection pump solenoid:

- Connect all connectors (sensors, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- With the diagnosis tool “Diagnosis test: active control”, carry out the position control for the proportional injection pump solenoid. Place the control rack in any position within the admissible setting range.
- Then check whether the proportional injection pump solenoid has moved to the control rack position that has been set.

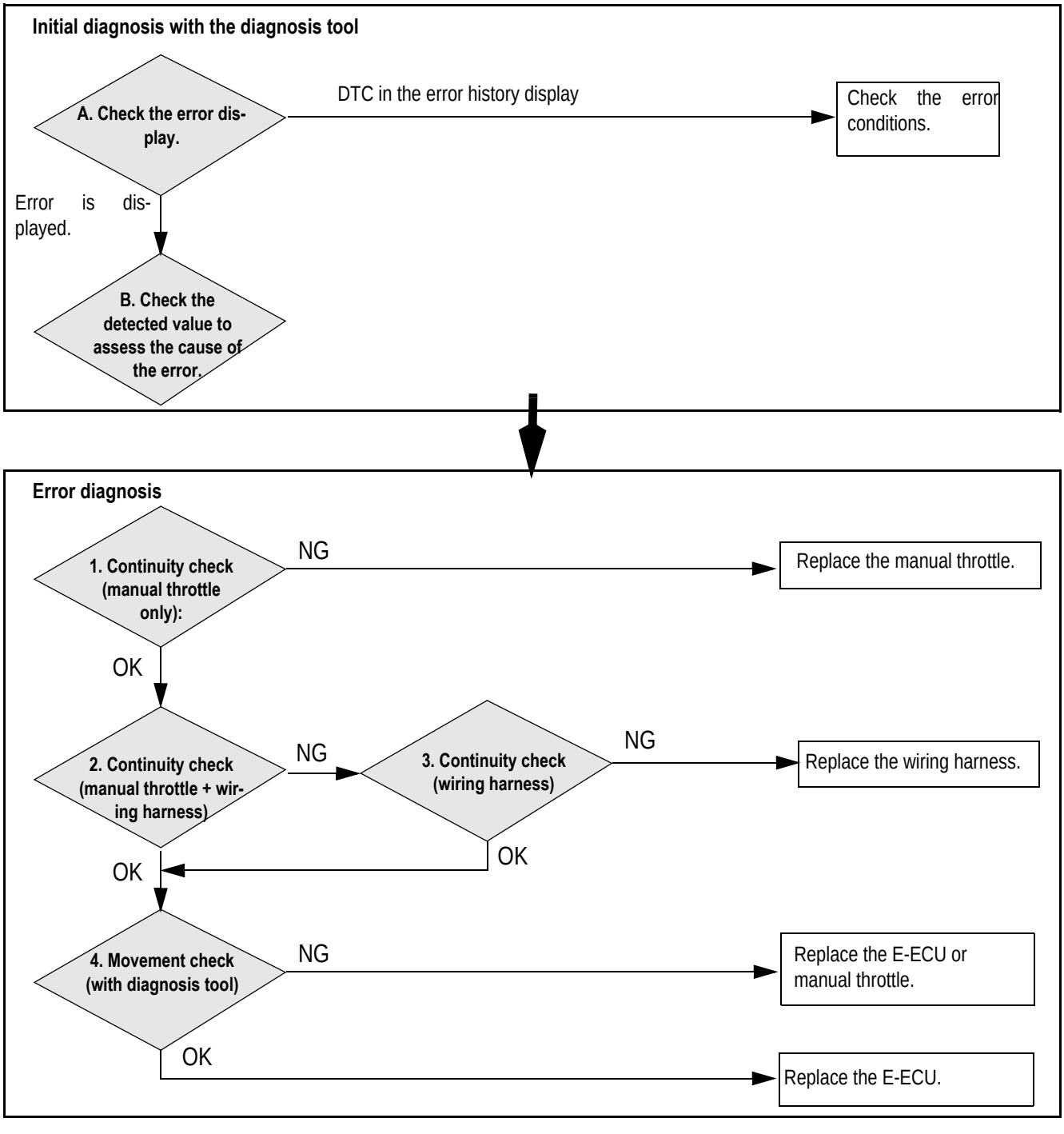
NG	Replace the injection pump.
OK	Replace the E-ECU.

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Flash code 5 – manual throttle

Related DTC

DTC	**P1125/1**	**Manual throttle sensor error (manual throttle in closed position)**
	P1126/0	**Manual throttle sensor error (manual throttle in open position)**
	P1225/1	**Manual throttle backup sensor error (manual throttle in closed position)**
	P1226/0	**Manual throttle backup sensor error (manual throttle in open position)**

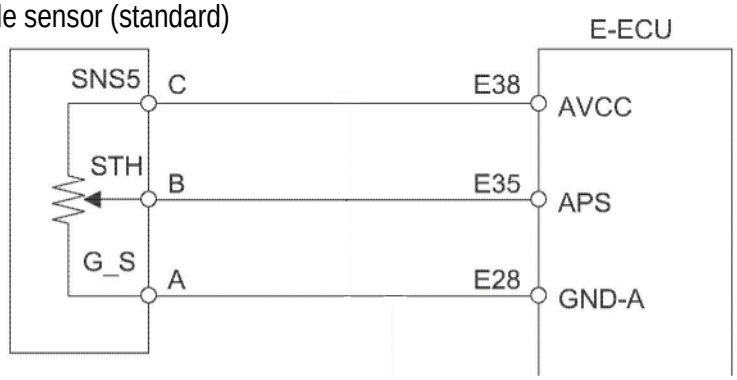


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Wiring diagram

	: Check points

Manual throttle sensor (standard)



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the wiring harness for continuity:

- Disconnect the manual throttle sensor and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Sensor signal line E35 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Sensor GND line E28 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
5 V sensor line E38 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E35 and other terminal/GND and between E38 and other terminal/GND	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E28 and GND/E45/E47	Yes	OK: normal
	No	NG: open wiring harness
Between E28 and other terminals	No	OK: normal
	Yes	NG: wiring harness short-circuited with other cable

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check output voltage of manual throttle sensor. -> Next: [4. Check manual throttle sensor output voltage:]

2. Check manual throttle sensor output voltage:

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (sensors, E-ECU).
- Measure the voltage between sensor terminals E35 and E28 by means of a multimeter.

Voltage	Status	Action
E35 ≤ 0.2 [V]	NG	• Replace the wiring harness. • Replace the manual throttle sensor.
0.2 [V] < E35 < 3.8 [V]	OK (normal range)	Replace the E-ECU.
3.8 V ≤ E35	NG	• Replace the wiring harness. • Replace the manual throttle sensor.

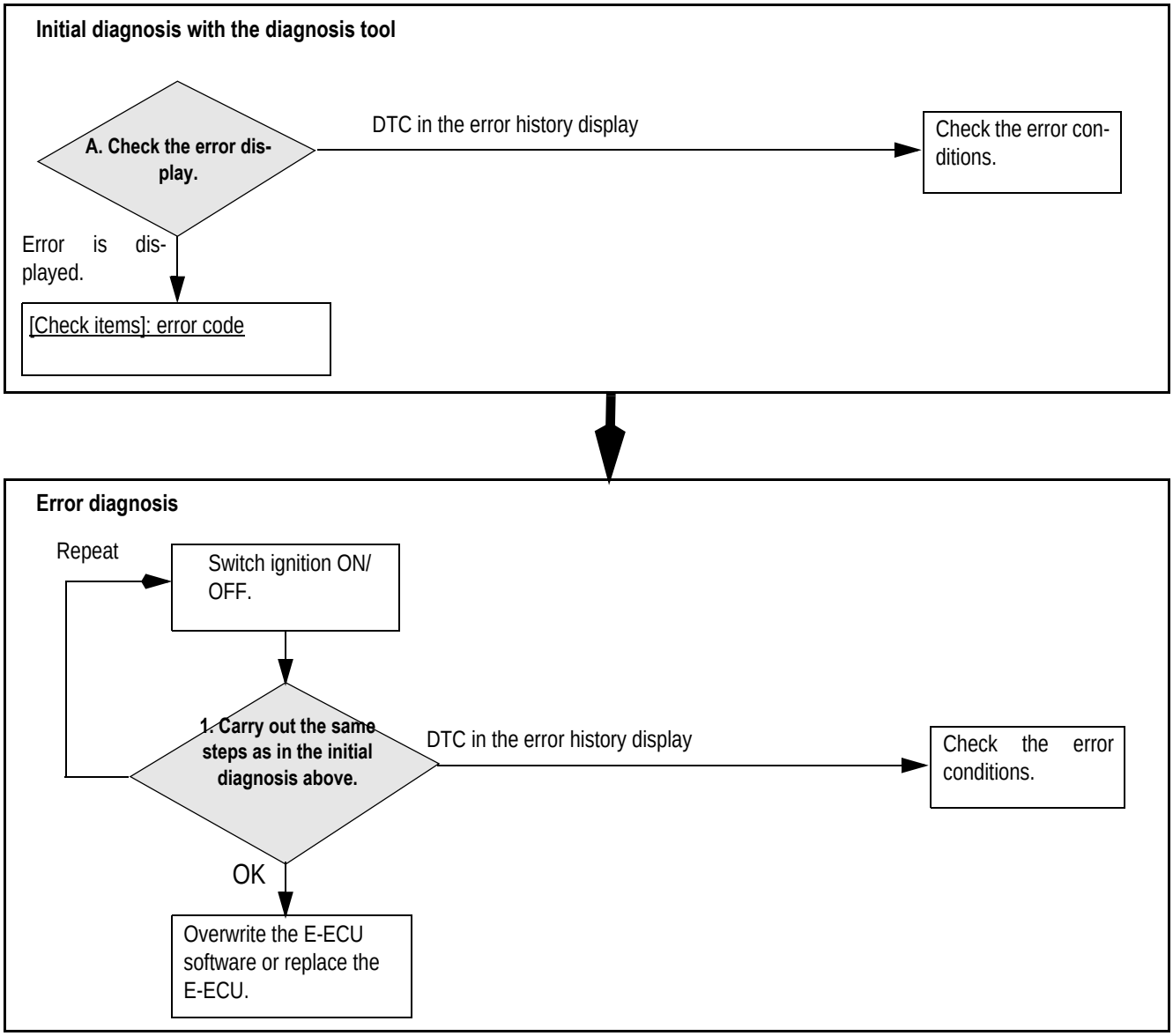
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 4-1 ECU internal

Related DTC

DTC	**P0601/12**	**EEPROM error (read/write error)**
	P1601/2	**EEPROM error (check sum)**
	P0605/12	**ROM error flashes (check sum A)**
	P1605/2	**ROM error flashes (check sum B)**
	P1606/2	**ROM error flashes (check sum C)**
	P1610/12	**Error A with sub-CPU**
	P1611/12	**Error B with sub-CPU**
	P1612/12	**Error C with sub-CPU**
	P1620/12	**Map format error**



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Work description

1. Work with the diagnosis tool:

- Switch off ignition.
- Connect the diagnosis tool and check whether errors have been detected on the error display.

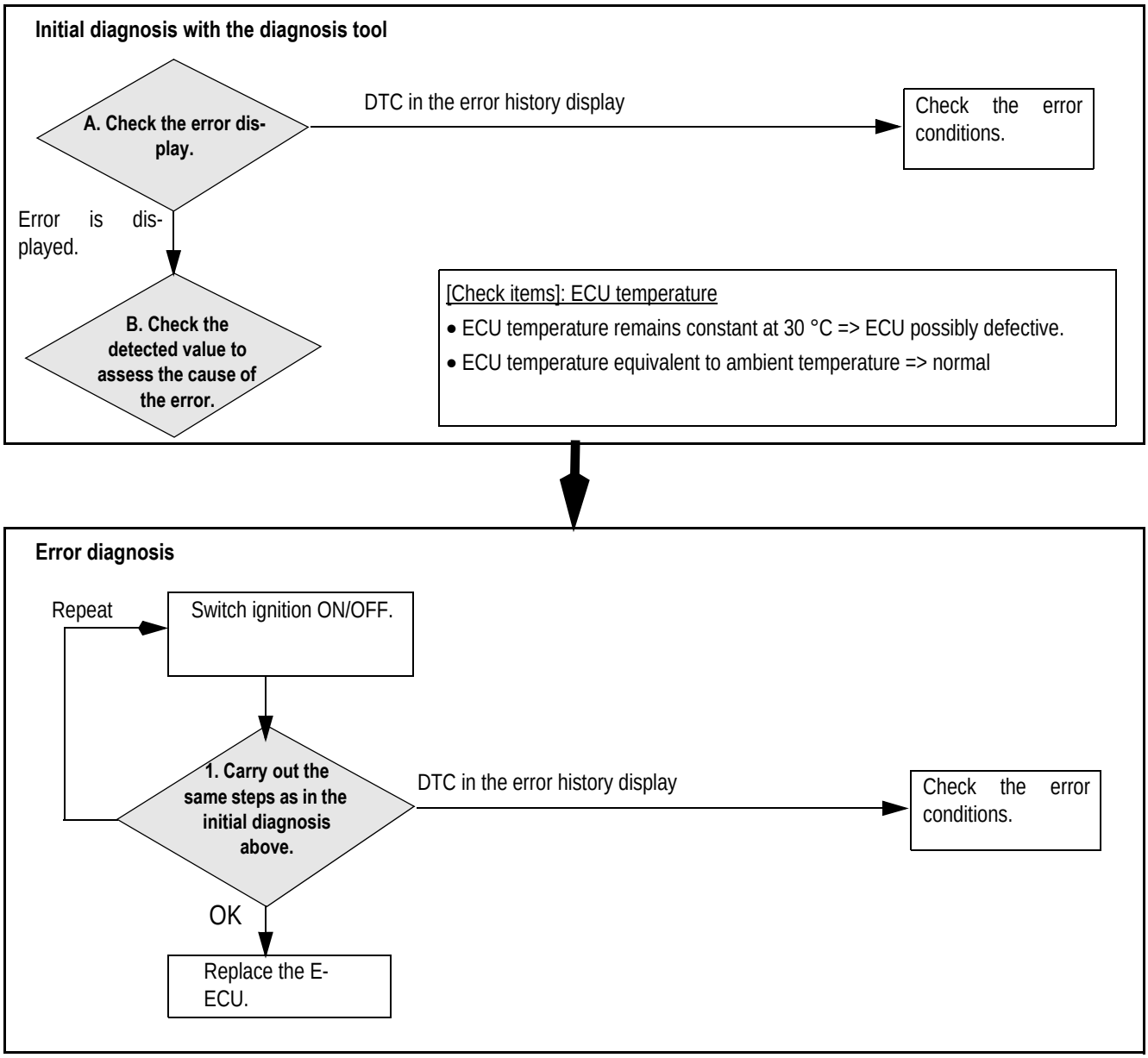
No	Check the error history display, confirm errors if an error history is displayed.
Yes	• Switch ignition ON/OFF. -> Next: [1. Work with the diagnosis tool:] • Overwrite the E-ECU software. • Replace the E-ECU.

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Flash code 4-1 ECU temperature sensor and 2-5 ECU temperature rise alarm

Related DTC

DTC	**P0668/4**	**ECU temperature sensor error (voltage too low)**
	P0669/3	**ECU temperature sensor error (voltage too high)**
	P1644/2	**Intermittent error with ECU temperature sensor**



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Work description

1. Work with the diagnosis tool:

- Check the error display.
  - Switch ignition off and on again.
  - Connect the diagnosis tool and check whether errors have been detected on the error display.

No	Check the error history display, confirm errors if an error history is displayed.
Yes	Check the detected value by means of the diagnosis tool. -> Next: [• Check the detected value]

- Check the detected value.
  - Check the value indicated in the “E-ECU temperature” with the “Diagnosis test“ diagnosis tool function.

Displayed value	Status	Action
Constant at 30 °C/86 °F	NG	Replace the E-ECU.
Ambient temperature	OK	Replace the E-ECU.

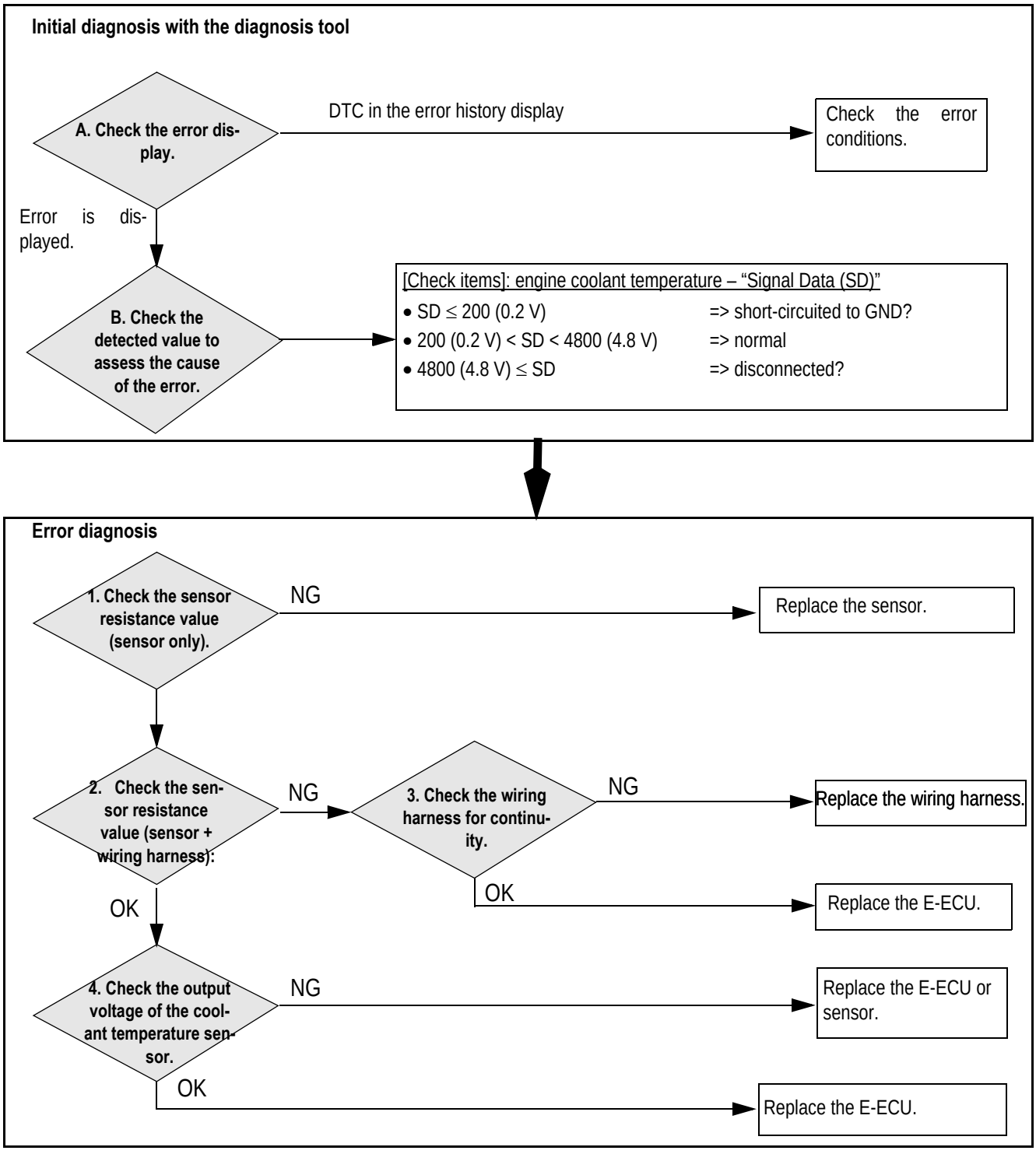
NG	Replace the E-ECU.
OK	Switch ignition ON/OFF again and carry out [• Check the error display] • [Check the detected value]. Replace the E-ECU.

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Flash code 4 coolant temperature sensor and 3-6 coolant temperature rise alarm

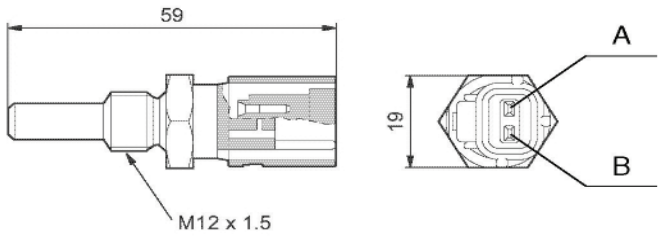
Related DTC

DTC	**P0117/4**	**Coolant temperature sensor error (voltage too low)**
	P0118/3	**Coolant temperature sensor error (voltage too high)**
	P0119/2	**Intermittent coolant temperature sensor error**



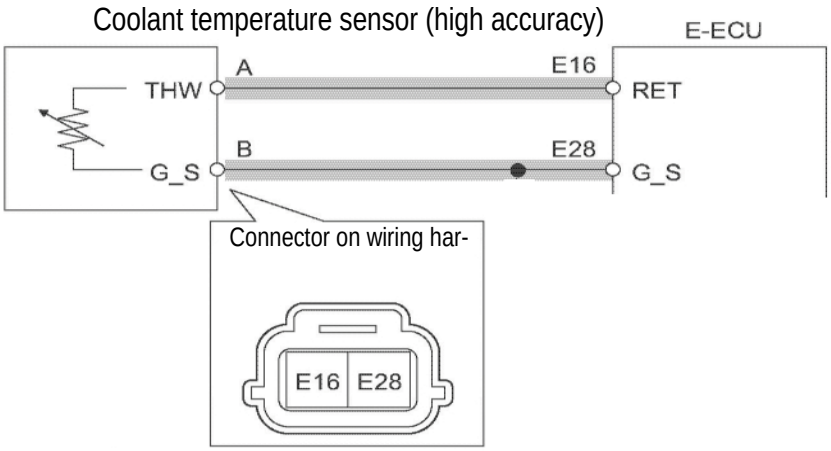
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Sensor drawing



Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the sensor resistance value (sensor only)

- Disconnect the wiring harness from the coolant temperature sensor.
- Measure the resistance between the terminals A and B of the coolant temperature sensor by means of a multimeter.
- Check whether the measured resistance value is within the normal range. See the following table <Parameters of coolant temperature sensor>.

Parameters of coolant temperature sensor

- Ratio between coolant temperature and sensor resistance:

Temperature (°C/°F)	Resistance (kΩ)
	High accuracy
-30/-22	25.4
-20/- 4	15.04
-10/14	9.16
0/32	5.74
10/50	3.7
20/68	2.45
30/86	1.66
40/104	1.15
50/122	0.811
60/140	0.584
70/158	0.428
80/176	0.318
90/194	0.24
100/212	0.1836
110/230	0.1417
120/248	0.1108

NG	Replace the coolant temperature sensor.
OK	Check the sensor resistance with the sensor and the wiring harness connected. -> Next: [2. Check the sensor resistance value (sensor + wiring harness):]

2. Check the sensor resistance value (sensor + wiring harness):

- Connect the coolant temperature sensor and the wiring harness, and disconnect E-ECU from the wiring harness.
- Measure the resistance between the E-ECU connector terminals E16 and E28 on the wiring harness side by means of a multimeter.
- Check whether the measured resistance value is within the normal range. See the previous table <Parameters of coolant temperature sensor>.

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the output voltage of the coolant temperature sensor. -> Next: [4. Check the output voltage of the coolant temperature sensor:]

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3. Check the wiring harness for continuity:

- Disconnect the coolant temperature sensor and E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Sensor signal line E16 [E-ECU between sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Sensor GND line E28 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E16 and other terminal/GND	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
E28 GND/E45/E47	Yes	OK: normal
	No	NG: open wiring harness
Between E28 and other terminals	No	OK: normal
	Yes	NG: wiring harness short-circuited with other cable

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check the output voltage of the coolant temperature sensor. -> Next: [4. Check the output voltage of the coolant temperature sensor:]

4. Check the output voltage of the coolant temperature sensor.

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (sensors, E-ECU).
- Measure the voltage between sensor terminals E16 and E28 (E35 and E28) by means of a multimeter.

Voltage	Status	Action
E16 ≤ 0.2 [V]	NG	• Replace the wiring harness. • Replace the coolant temperature sensor.
0.2 [V] < E16 < 4.8 [V]	OK (normal range)	Replace the E-ECU.
4.8 V ≤ E16	NG	• Replace the wiring harness. • Replace the coolant temperature sensor.

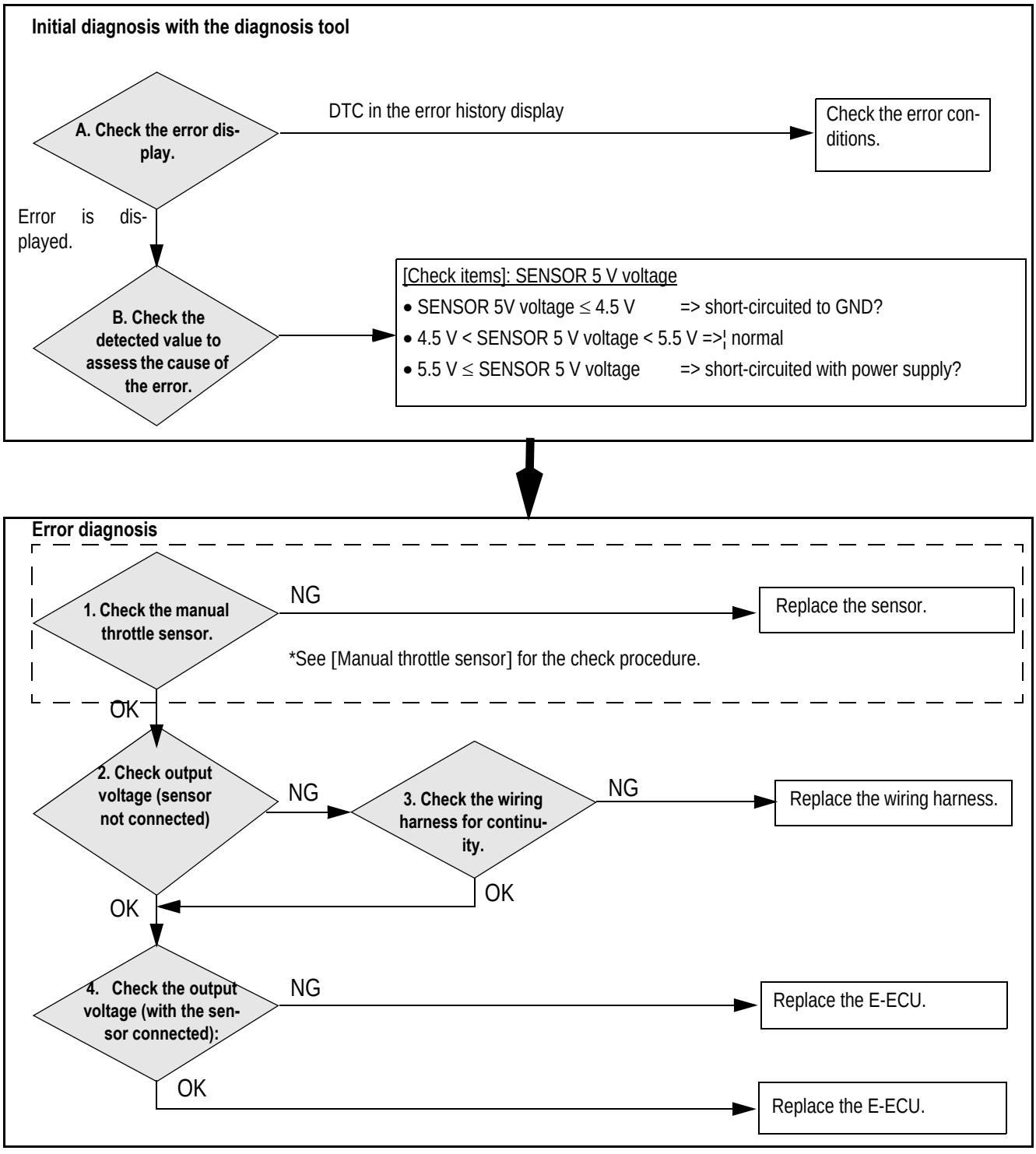
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 2-4 – sensor 5 V

Related DTC

DTC	**P0642/4**	**SENSOR 5 V error (voltage too low)**
	P0643/3	**SENSOR 5 V error (voltage too high)**
	P1644/2	**Intermittent SENSOR 5 V error**



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Work description

1. Check the manual throttle sensor.

- For details, see [Manual throttle sensor] (see page *4-38*).

2. Check output voltage (sensor not connected)

- Disconnect the manual throttle sensor from the wiring harness. Do not disconnect the E-ECU connector from the E-ECU.
- Switch on ignition to switch on E-ECU voltage.
- Measure the voltage between the wiring-harness side connector terminals E38 and GND of the manual throttle sensor by means of a multimeter.

Terminal	Normal value
Sensor connectors E38 – GND	5 V

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	With the manual throttle sensor connected, check the output voltage. -> Next: [4. Check the output voltage (with the sensor connected):]

3. Check the wiring harness for continuity:

- Disconnect the manual throttle sensor and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Between E38 and E28/E45/E47/GND	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E38 and E43/E48	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply
Sensor GND line E28 Between E-ECU and sensor connector	Yes	OK: normal
	No	NG: open wiring harness
Between E28 and GND/E45/E47	Yes	OK: normal
	No	NG: open wiring harness
Between E38/E28 and other terminals	No	OK: normal
	Yes	NG: wiring harness short-circuited with other cable

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	With the manual throttle sensor connected, check the output voltage. -> Next: [4. Check the output voltage (with the sensor connected):]

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4. Check the output voltage (with the sensor connected):

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (sensors, E-ECU).
- Measure the voltage between sensor terminals E38 and E28 by means of a multimeter.

Voltage	Status	Action
E38 ≤ 4.5 [V]	NG	• Replace the wiring harness. • Replace the manual throttle sensor.
4.5 [V] < E38 < 5.5 [V]	OK (normal range)	Replace the E-ECU.
5.5 V ≤ E38	NG	• Replace the wiring harness. • Replace the manual throttle sensor.

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 2-3 – power supply voltage

(1) P0562/1: power supply voltage error (voltage too low)

DTC	P0562/1	Power supply voltage error (voltage too low)

DTC detection conditions

1 – Prerequisite; 2 – Detection condition(s); 3 – Flash code in error display	Check points
1. Engine runs.	Battery
2. E-ECU supply voltage below 10 [V]	Alternator
3. 2 flash pulses followed by 3 flash pulses.	Wiring harness

Troubleshooting

Error mode	[Operation is resumed]: The system lets the engine run without any restrictions after the error has been detected.
Operation restrictions?	No.
Recovery conditions	Yes: This error is automatically reset if a normal supply voltage (10 to 16 [V]) is applied.
Remarks	

Possible error cause/condition

- Bad battery condition.
- Wrong battery connection.
- Alternator defect.
- Wiring harness disconnected or short-circuited.
- Defect in internal E-ECU circuit.

Diagnosis description

1) Initial diagnosis with the diagnosis tool	• Check the error display. • Check the battery voltage.
2) Engine inspection	• Switch off ignition to stop the engine. • Check battery voltage with a multimeter. • Inspect the charging system of the engine. • Switch on ignition after a short time to check whether a DTC has been detected.
	*Refer to the Service Manual (“Engine“) for a description of the engine inspection and how to carry it out.
3) Error diagnosis	• Check whether the battery connections are OK and whether the cable insulation is undamaged.

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(2) P0563/0: power supply voltage error (voltage too high)

DTC	P0563/0	Power Supply Voltage Error (High Voltage)

DTC detection conditions

1 – Prerequisite; 2 – Detection condition(s); 3 – Flash code in error display	Check points
1. Engine runs.	Battery
2. E-ECU supply voltage over 16 [V]	Alternator
3. 2 flash pulses followed by 3 flash pulses.	Wiring harness

Troubleshooting

Error mode	[Operation is resumed]: The system lets the engine run without any restrictions after the error has been detected.
Operation restrictions?	No.
Recovery conditions	Yes: This error is automatically reset if a normal supply voltage (10 to 16 [V]) is applied.
Remarks	

Possible error cause/condition

- An incompatible battery (such as a 24 V battery) has possibly been used.
- Wrong battery connection.
- Alternator defect.
- Wiring harness disconnected or short-circuited.
- Defect in internal E-ECU circuit.

Diagnosis description

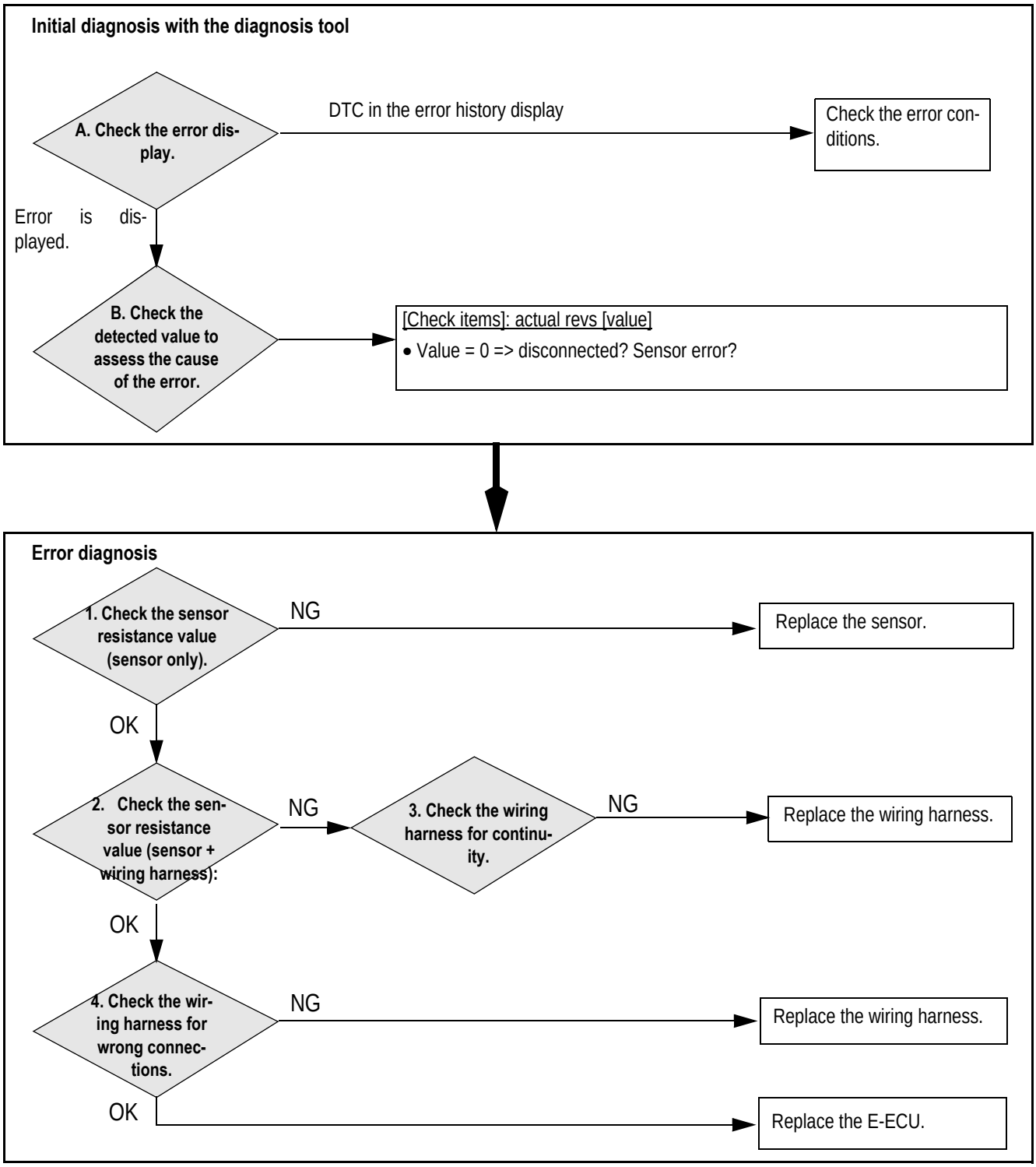
1) Initial diagnosis with the diagnosis tool	• Check the error display. • Check the battery voltage.
2) Engine inspection	• Switch off ignition to stop the engine. • Check battery voltage with a multimeter. • Inspect the charging system of the engine. • Switch on ignition after a short time to check whether a DTC has been detected.
	*Refer to the Service Manual (“Engine“) for a description of the engine inspection and how to carry it out.
3) Error diagnosis	• Check whether the battery connections are OK and whether the cable insulation is undamaged.

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Flash code 6 – revs sensor

Related DTC

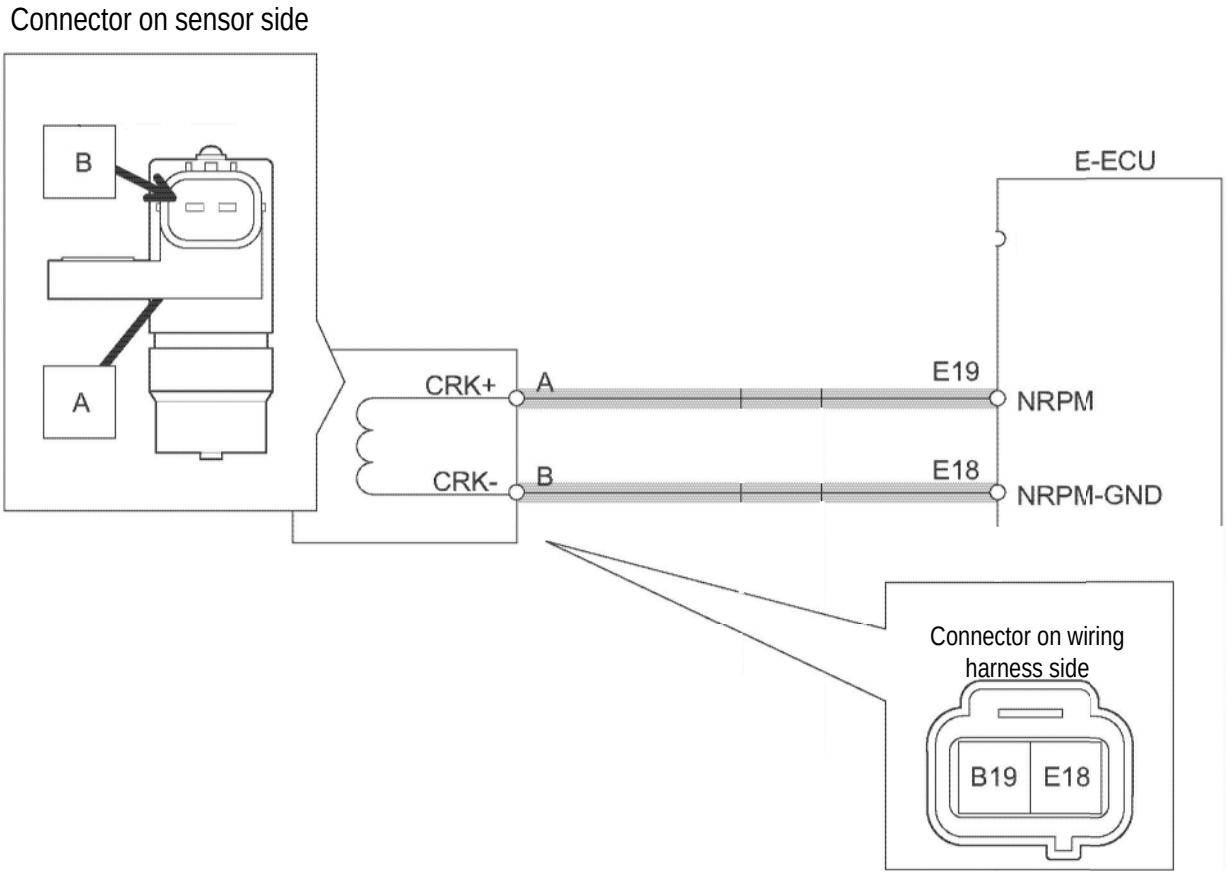
DTC	P0340/4	Revs sensor error



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Wiring diagram

▒▒▒	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the sensor resistance value (sensor only)

- Disconnect the revs sensor from the wiring harness.
- Measure the resistance between the revs sensor terminals A and B by means of a multimeter.

Coil resistance value of standard Yanmar revs sensor.

Terminal	Specification
Sensor A – B	500 ± 100 kΩ

NG	Replace the revs sensor.
OK	With the revs sensor and the wiring harness connected, check the resistance between sensor terminals A and B. -> Next: [2. Check the sensor resistance value (sensor + wiring harness):]

2. Check the sensor resistance value (sensor + wiring harness):

- Connect the revs sensor and the wiring harness, and disconnect the E-ECU from the wiring harness.
- Measure the resistance between the E-ECU connector terminals E19 and E18 on the wiring harness side by means of a multimeter.

*See above, “Coil resistance value of standard Yanmar revs sensors”.

NG	Replace the wiring harness.
OK	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]

3. Check the wiring harness for continuity:

- Disconnect the revs sensor and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Sensor signal line (+) E 19 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Sensor signal line (-) E 18 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E 19 and GND/E45/E47 (between E 18 and GND/E45/E47)	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND

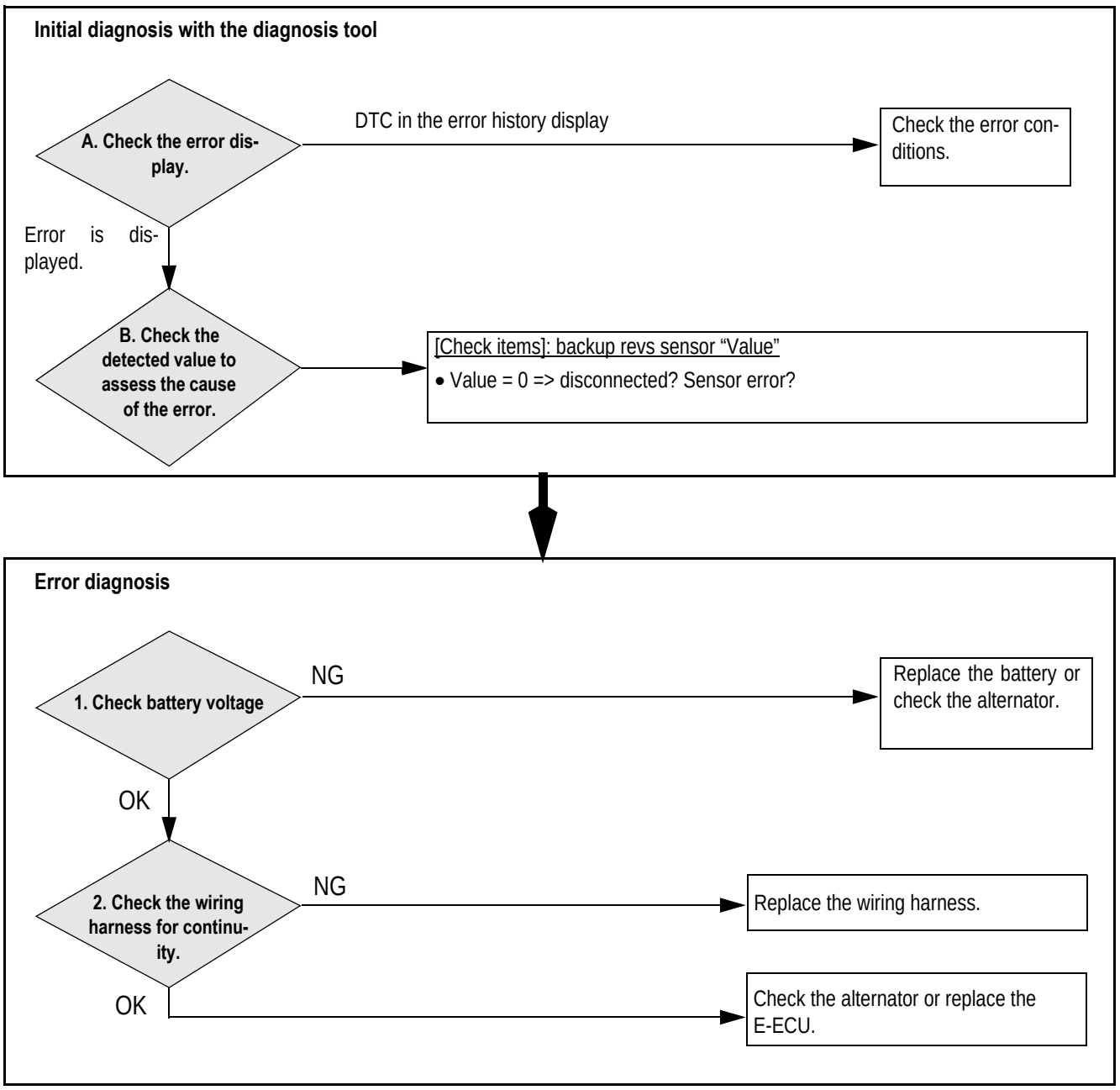
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 1-1 – backup revs sensor

Related DTC

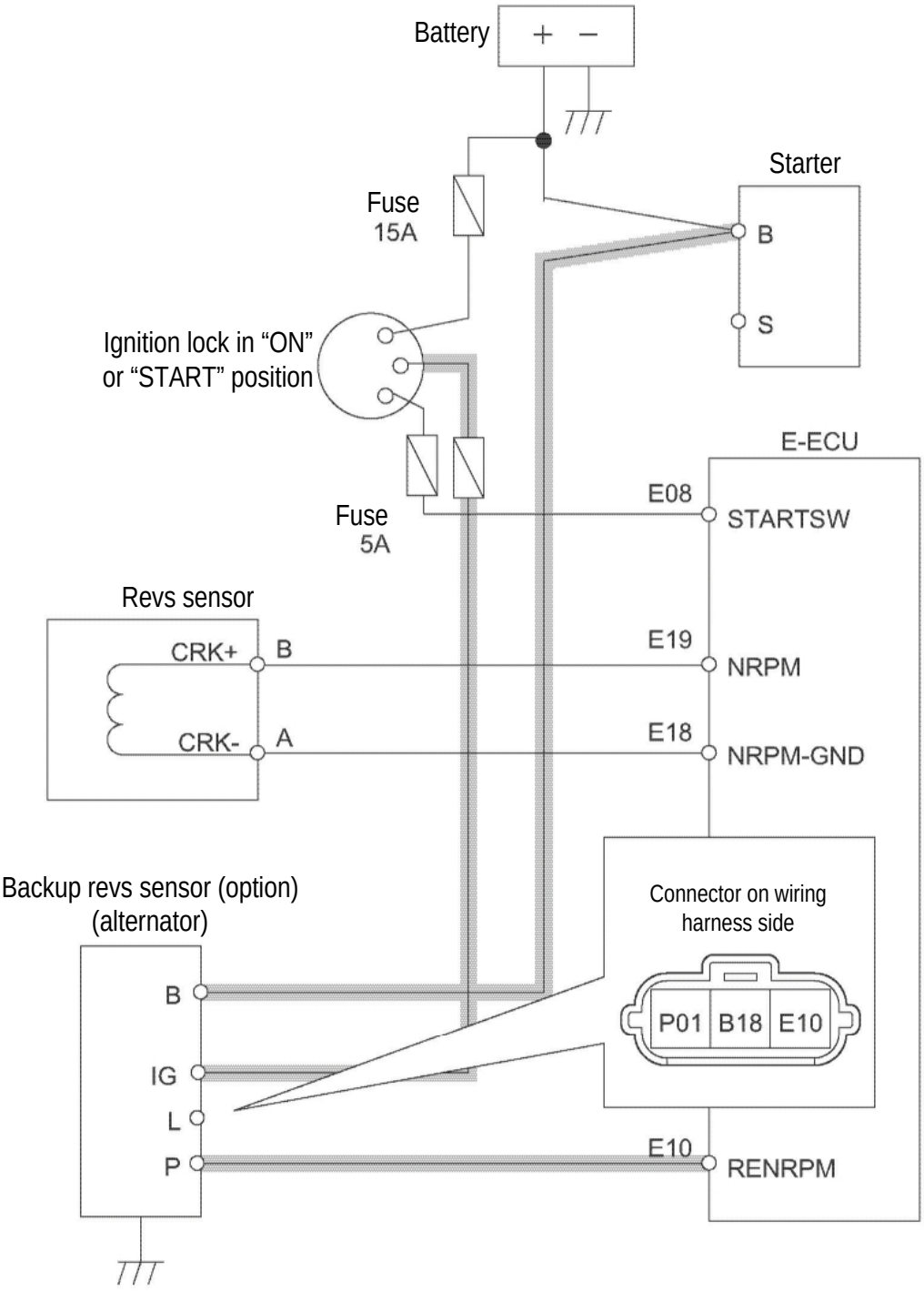
DTC	P1340/4	Backup revs sensor error



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Battery voltage check:

- Set the manual throttle lever to the lowest position and start the engine.
- Check battery voltage with a multimeter.

Terminal	Specification
Battery voltage (in normal condition)	10 to 16 [V]

NG	• Check the alternator. • Replace the battery.
OK	Check the wiring harness for continuity. -> Next: [2. Check the wiring harness for continuity:]

2. Check the wiring harness for continuity:

- Disconnect the connector from the backup revs sensor, and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Alternator terminal P (E10) [between E-ECU and alternator]	Yes	OK: normal
	No	NG: open wiring harness
Alternator terminal IG [between ignition lock and alternator]	Yes	OK: normal
	No	NG: open wiring harness
Alternator terminal B [between battery and alternator]	Yes	OK: normal
	No	NG: open wiring harness
Between E10 and GND/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	• Check the alternator. • Replace the E-ECU.

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Flash code 9 – overspeed error

(1) P0219/0: overspeed error

DTC	P0219/0	Overspeed error

DTC detection conditions

1 – Prerequisite; 2 – Detection condition(s); 3 – Flash code in error display	Check points
1. Engine runs.	Wiring harness
2. Sensor signal at or above the upper limit (high idling speed +600[min^{-1}])	Revs sensor
3. 2 flash pulses followed by 3 flash pulses.	Proportional injection pump solenoid E-ECU

Troubleshooting

Error mode	[Immediate stop]: The engine stops running.
Operation restrictions?	Yes: The proportional solenoid relay of the injection pump is switched off and the control rack position is forced to the engine stop position.
Recovery conditions	No.
Remarks	

Possible error cause/condition

- Wiring defect in wiring harness
  - The wiring of the proportional injection pump solenoid is possibly short-circuited to GND.
- Revs sensor signal pulse created incorrectly
  - Incorrect wiring of revs sensor
- Engine overspeed due to consumer
- Control error of injection pump
  - The wiring of the proportional injection pump solenoid is possibly short-circuited to GND.
- Defect in internal E-ECU circuit.

Diagnosis description

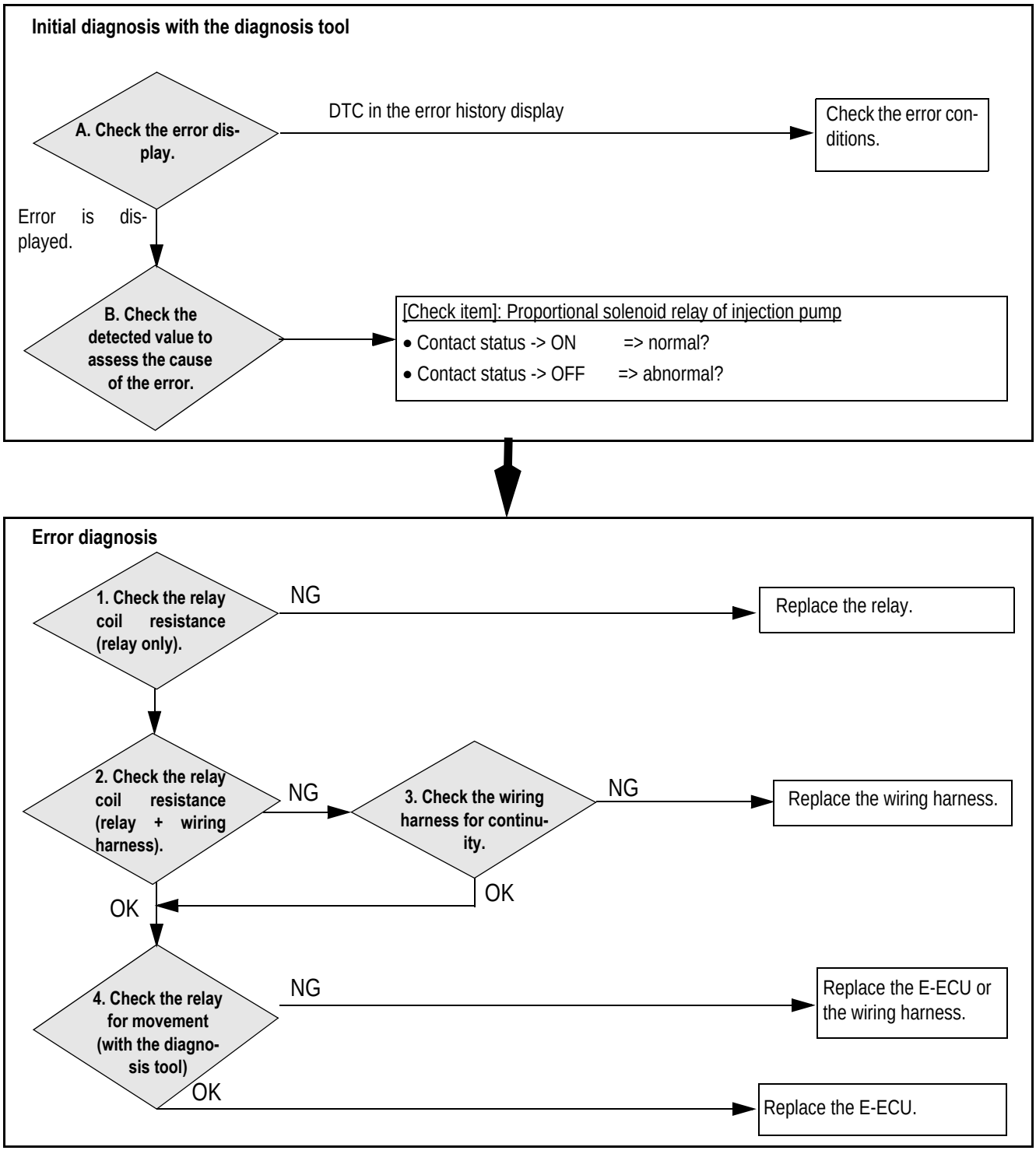
1) Initial diagnosis with the diagnosis tool	• Check the error display.
2) Engine inspection	• Switch off ignition to stop the engine. • Inspect the engine and the machine. • Switch on ignition after a short time to check whether a DTC has been detected.
	*Refer to the Service Manual (“Engine“) for a description of the engine inspection and how to carry it out.
3) Error diagnosis	• Check the proportional injection pump solenoid.
	*See *4-57* for more details on the diagnosis method and procedure

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Flash code 1-7 – proportional solenoid relay of the injection pump (control rack)

Related DTC

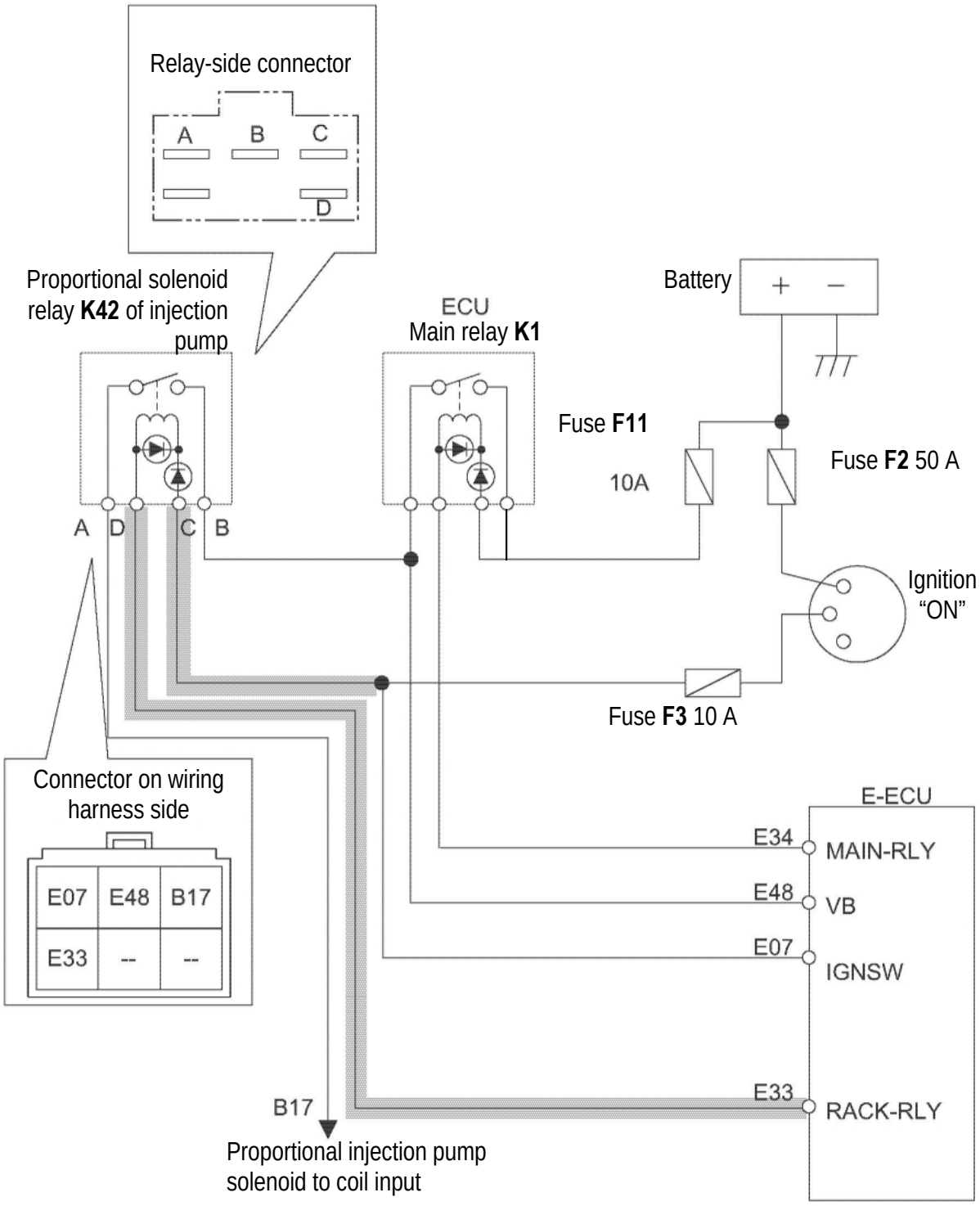
DTC	**P1222/4**	**Error A on proportional solenoid relay of the injection pump**
	P1223/3	**Error B on proportional solenoid relay of the injection pump**
	P1224/2	**Intermittent error A on proportional solenoid relay of the injection pump**



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Wiring diagram

	: Check points



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Work description

1. Check the relay coil resistance value (relay only):

- Disconnect the proportional solenoid relay of the injection pump from the wiring harness.
- Measure the resistance between terminals C and D on the relay side by means of a multimeter.

Measurement conditions		Measured value	Status
Tester (+) side	**Tester (-) side**		
Terminal C	Terminal D	Existing (*)	OK if both are normal
Terminal D	Terminal C	Infinite (*)	
Terminal C	Terminal D	Infinite (*)	NG: internal relay circuit error
Terminal D	Terminal C		

*A series-connected diode integrated in reverse direction requires using the checking method mentioned above and causes the measured value to vary depending on the multimeter used.

NG	Replace the proportional solenoid relay of the injection pump.
OK	With the proportional solenoid relay of the injection pump and the wiring harness connected, check the relay coil resistance. -> Next: [2. Check the relay coil resistance value (relay + wiring harness side):]

2. Check the relay coil resistance value (relay + wiring harness side):

- Connect the proportional solenoid relay of the injection pump onto the wiring harness.
- Disconnect the E-ECU from the wiring harness.
- Measure the resistance between E-ECU connectors E07 and E33 by means of a multimeter.

Measurement conditions		Measured value	Status
Tester (+) side	**Tester (-) side**		
E07	E33	Existing (*)	OK: normal
E33	E07	Infinite (*)	
E07	E33	Infinite (*)	NG: wiring harness error
E33	E07		

*A series-connected diode integrated in reverse direction requires using the checking method mentioned above and causes the measured value to vary depending on the multimeter used.

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the movement of the proportional solenoid relay of the injection pump with the diagnosis tool. -> Next: [4. Check the relay for movement:]

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3. Check the wiring harness for continuity:

- Disconnect the proportional solenoid relay of the injection pump and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Relay coil (output side) E33 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Relay coil (input side) E07 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E33 and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E33 and E43/E48	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check the movement of the proportional solenoid relay of the injection pump with the diagnosis tool. -> Next: [4. Check the relay for movement:]

4. Check the relay for movement:

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (proportional solenoid relay of injection pump, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- Activate the proportional solenoid relay of the injection pump by means of the diagnosis tool “Diagnosis test: active control“, and measure the voltage between terminals E33 and E45.

ON/OFF setting status	Voltage	Status
ON	1.75 [V] and below	OK: normal
	Over 1.75 [V]	NG: wiring harness short-circuited with power supply or E-ECU error
OFF	2.5 [V] and above	OK: normal
	Under 2.5 [V]	NG: wiring harness short-circuited to GND or E-ECU error

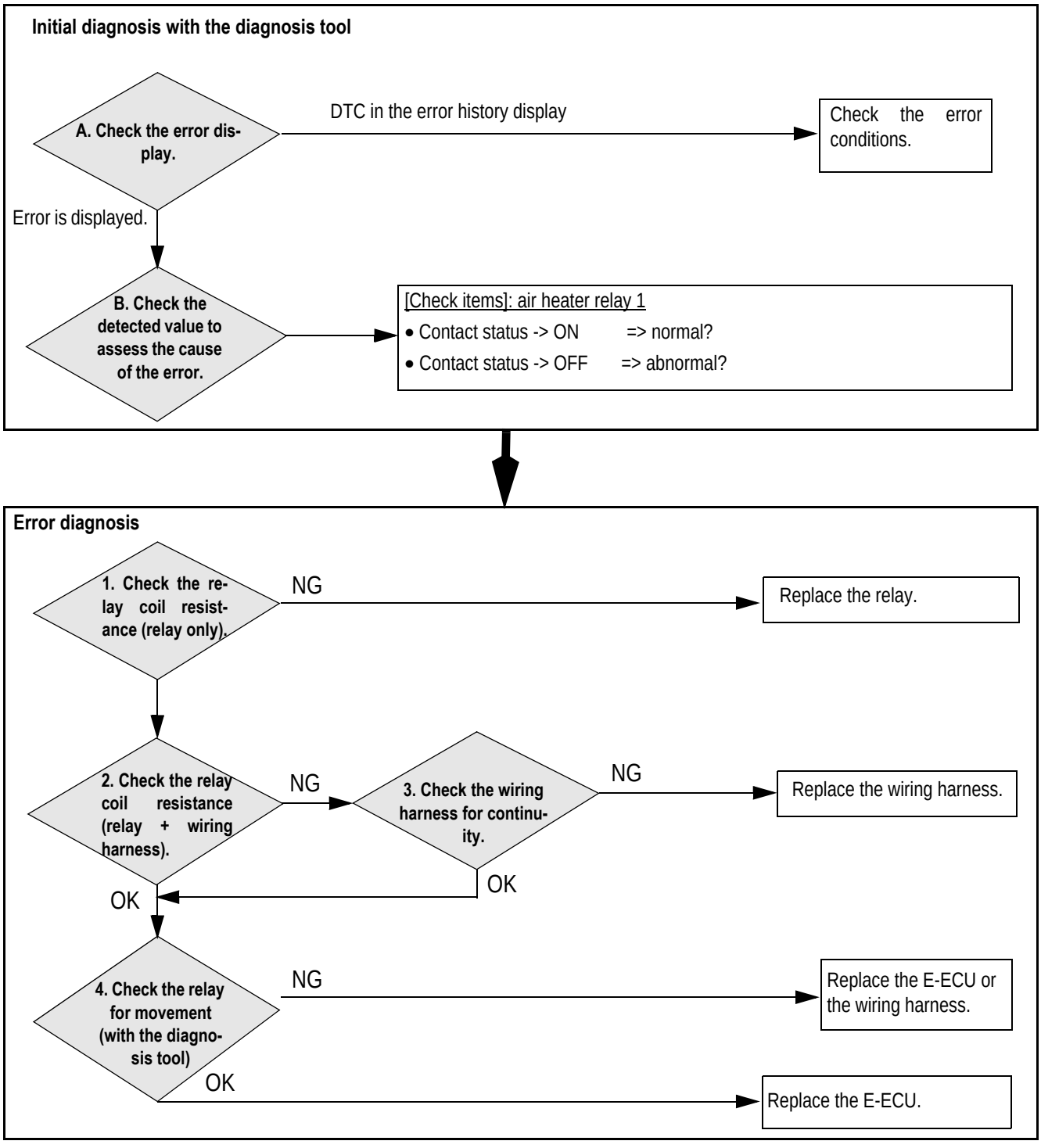
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 1-5 – preheating relay

Related DTC

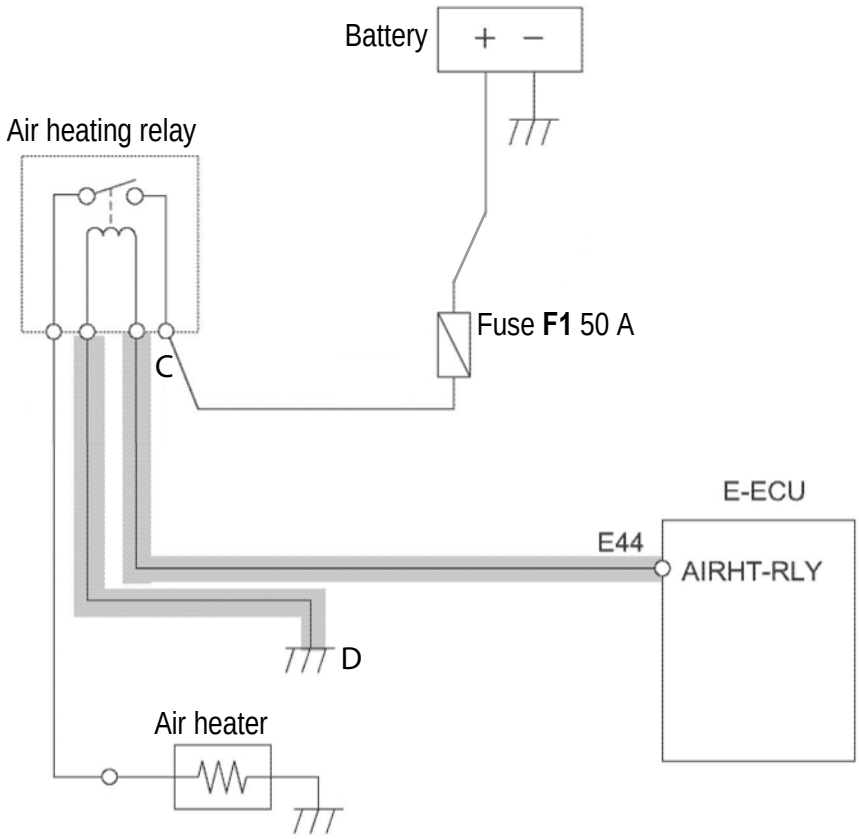
DTC	P1232/4	Error A of preheating relay
	P1233/3	Error B of preheating relay
	P1234/2	Intermittent error B of preheating relay



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

Work description

1. Check the relay coil resistance value (relay only):

- Disconnect the preheating relay from the wiring harness.
- Measure the resistance between terminals C and D on the relay side by means of a multimeter.

Total resistance value of Yanmar preheating relay.

Terminal	Specification
Relay coil side C – D (40 A relay)	103 Ω ± 10 % (at 20 °C/68 °F)
Relay coil side C – D (70 A relay)	103 Ω ± 10 % (at 20 °C/68 °F)
Relay coil side C – D (90 A relay)	80 Ω (at 20 °C/68 °F)

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NG	Replace the preheating relay.
OK	With the preheating relay and the wiring harness connected, check the relay coil resistance. -> Next: [2. Check the relay coil resistance value (relay + wiring harness side):]

2. Check the relay coil resistance value (relay + wiring harness side):

- Connect the preheating relay onto the wiring harness.
- Disconnect the E-ECU from the wiring harness.
- Measure the resistance between E-ECU connectors E44 and B00 with a multimeter.

*See above, “Coil resistance value of standard Yanmar preheating relay”.

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the movement of the preheating relay with the diagnosis tool. -> Next: [4. Check the relay for movement:]

3. Check the wiring harness for continuity:

- Disconnect the preheating relay and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Relay coil (input side) E44 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Relay coil (output side) B00 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E33 and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E44 and E43/E48	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check the movement of the proportional solenoid relay of the injection pump with the diagnosis tool. -> Next: [4. Check the relay for movement:]

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4. Check the relay for movement:

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (preheating relay, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- Activate the preheating relay by means of the diagnosis tool “Diagnosis test: active control“, and measure the voltage between terminals E44 and E45.

ON/OFF setting status	Voltage	Status
ON	2.5 [V] and above	OK: normal
	Under 2.5 [V]	NG: wiring harness short-circuited to GND or E-ECU error
OFF	1.75 [V] and below	OK: normal
	Over 1.75 [V]	NG: wiring harness short-circuited with power supply or E-ECU error

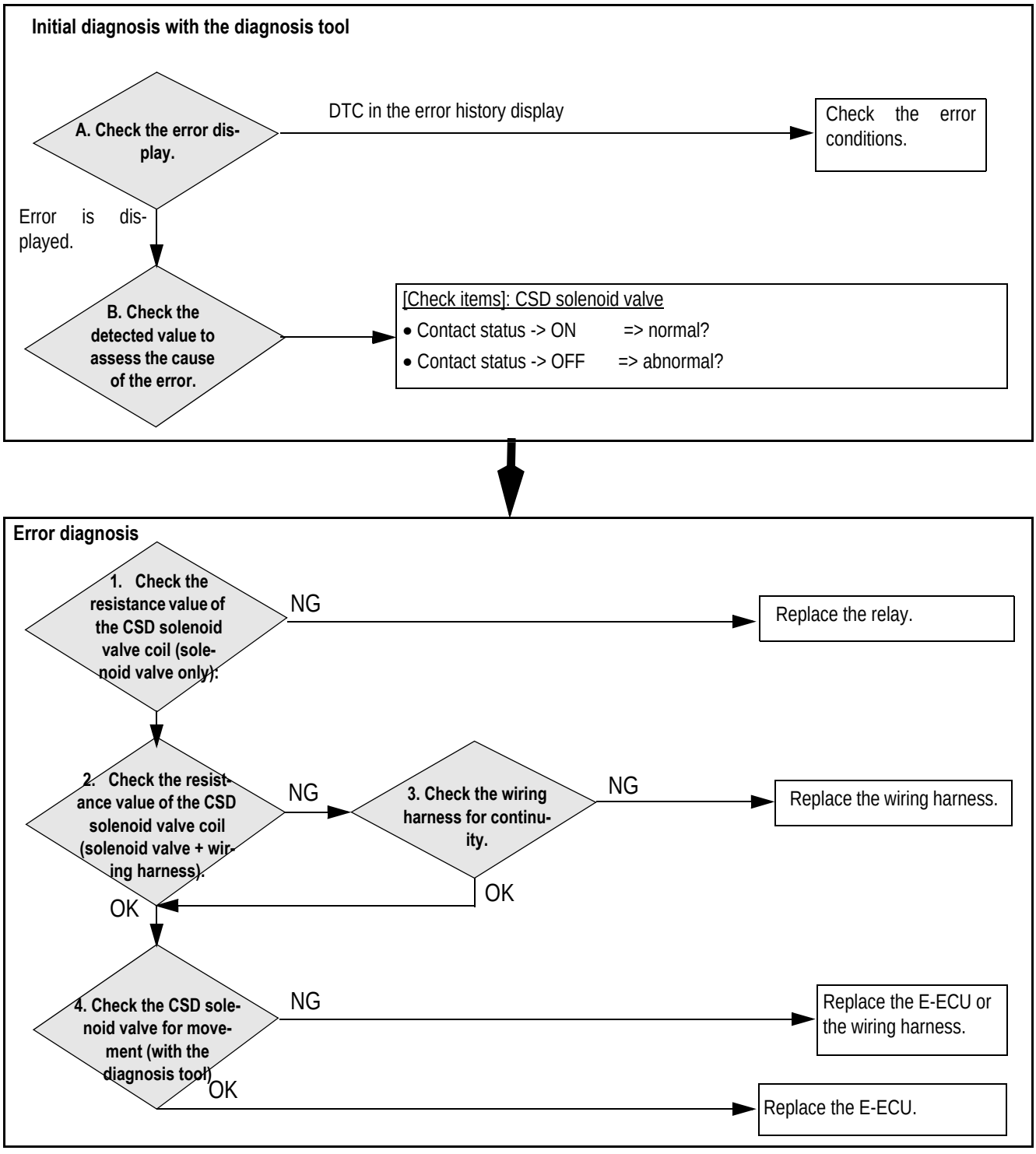
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 1-4 – CSD (cold start device) solenoid coil

Related DTC

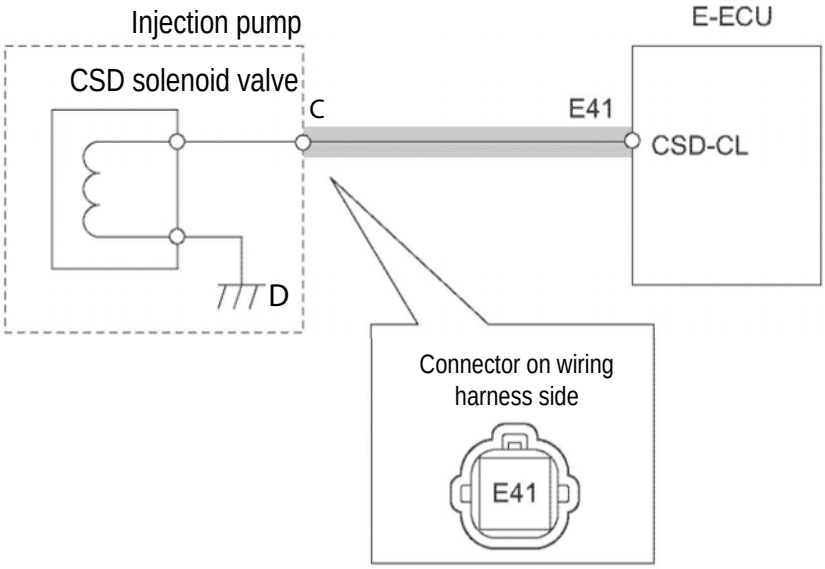
DTC	**P1242/4**	**Error A at CSD solenoid valve**
	P1243/3	**Error B at CSD solenoid valve**
	P1244/2	**Intermittent CSD solenoid valve error**



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

Work description

1. Check the resistance value of the CSD solenoid valve coil (solenoid valve only):

- Disconnect the CSD solenoid valve connector from the wiring harness.
- Measure the resistance between terminals C and D on the side of the CSD solenoid valve by means of a multimeter.

Coil resistance of the CSD solenoid valve

Terminal	Specification
CSD solenoid valve side C – D (400W)	8 Ω (at 23 °C/73.4 °F)

NG	Replace the solenoid valve.
OK	With the CSD solenoid valve connector and the wiring harness connected, check the coil resistance of the CSD solenoid valve. -> Next: [2. Check the resistance value of the CSD solenoid valve coil (solenoid valve + wiring harness):]

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2. Check the resistance value of the CSD solenoid valve coil (solenoid valve + wiring harness)

- Connect the CSD solenoid valve and the wiring harness.
- Disconnect the E-ECU from the wiring harness.
- Measure the resistance between E-ECU connectors E41 and B00 by means of a multimeter.

*See “Coil resistance of standard Yanmar CSD solenoid valve“ above

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the movement of the CSD solenoid valve by means of the diagnosis tool. -> Next: [4. Check the CSD solenoid valve for movement:]

3. Check the wiring harness for continuity:

- Disconnect the CSD solenoid valve connector and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
CSD solenoid valve (input side) E41 [between E-ECU and sensor connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E41 and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E41 and E43/E48	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check the movement of the CSD solenoid valve by means of the diagnosis tool. -> Next: [4. Check the CSD solenoid valve for movement:]

4. Check the CSD solenoid valve for movement:

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (CSD solenoid valve connector, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- Activate the preheating relay by means of the diagnosis tool “Diagnosis test: active control“, and measure the voltage between terminals E41 and E45.

ON/OFF setting status	Voltage	Status
ON	2.5 [V] and above	OK: normal
	Under 2.5 [V]	NG: wiring harness short-circuited to GND or E-ECU error
OFF	1.75 [V] and below	OK: normal
	Over 1.75 [V]	NG: wiring harness short-circuited with power supply or E-ECU error

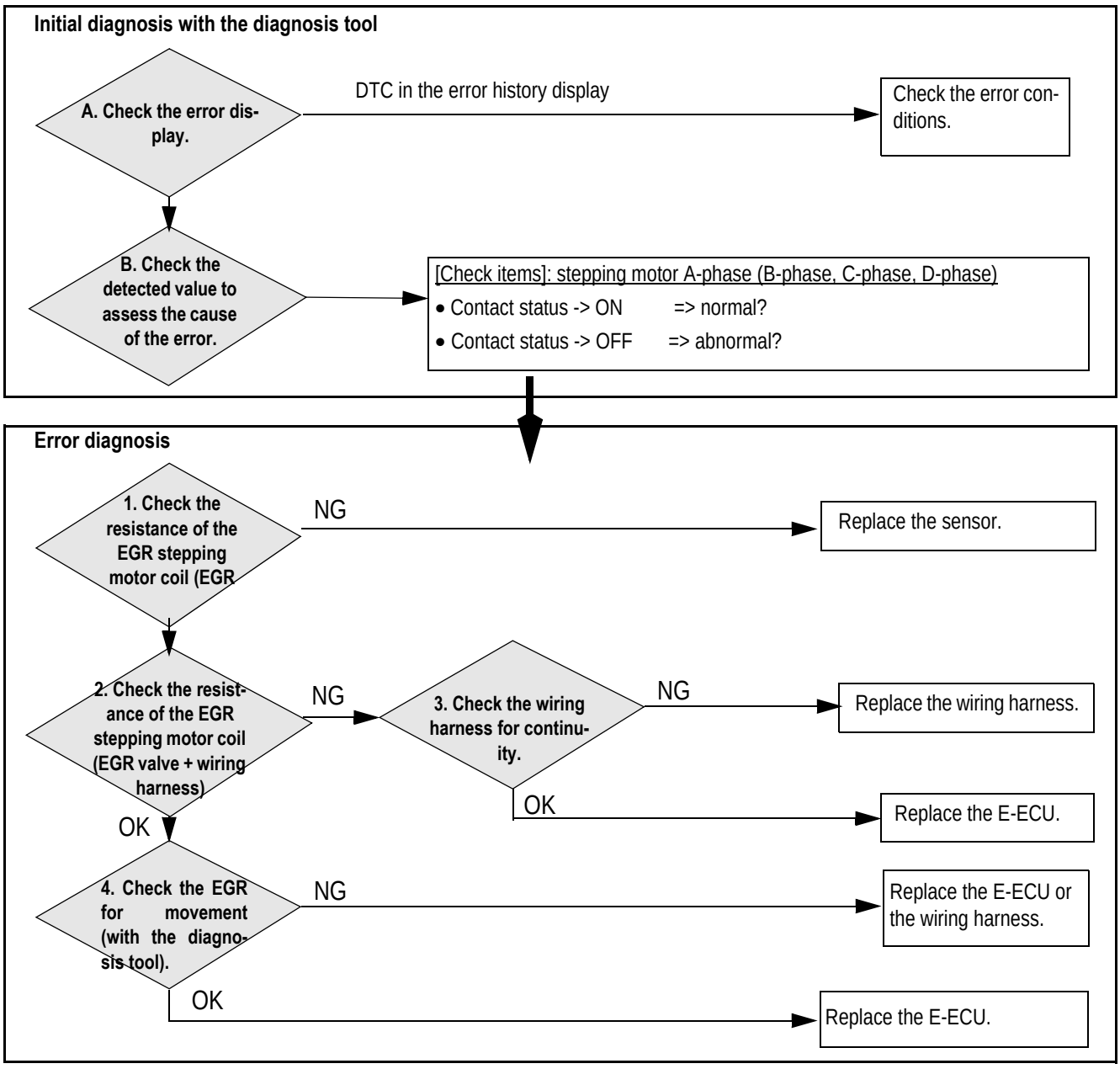
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 1-3 – EGR (exhaust gas recirculation) valve

Related DTC

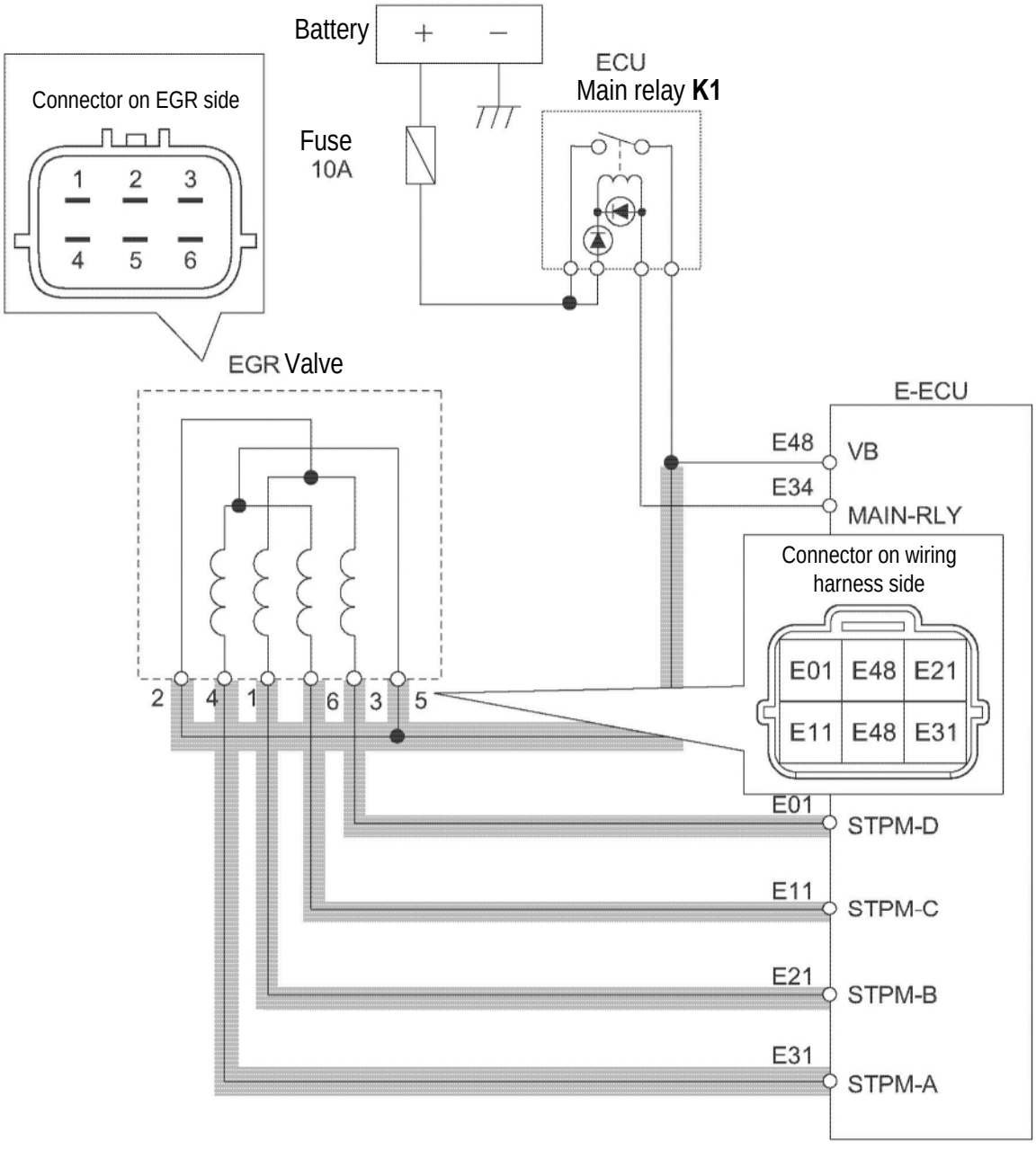
DTC	P1402/4	Error A at EGR valve (stepping motor A-phase)
	P1403/3	Error B at EGR valve (stepping motor A-phase)
	P1412/4	Error A at EGR valve (stepping motor B-phase)
	P1413/3	Error B at EGR valve (stepping motor B-phase)
	P1422/4	Error A at EGR valve (stepping motor C-phase)
	P1423/3	Error B at EGR valve (stepping motor C-phase)
	P1432/4	Error A at EGR valve (stepping motor D-phase)
	P1433/3	Error B at EGR valve (stepping motor D-phase)



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the resistance of the EGR stepping motor coil (EGR only):

- Disconnect the EGR valve from the wiring harness.
- Measure the resistance between the coil terminals 4-5, (1-2, 5-6, 2-3) on the EGR side by means of a multimeter.

Resistance value of standard Yanmar EGR stepping motor coil

Terminal	Specification
Coil terminal 4 – 5 (A-phase) Coil terminal 1 – 2 (B-phase) Coil terminal 5 – 6 (C-phase) Coil terminal 2 – 3 (D-phase)	15 ± 2 Ω

NG	Replace the EGR valve.
OK	With the EGR valve and the wiring harness connected, check the EGR stepping motor coil resistance. -> Next: [2. Check the resistance of the EGR stepping motor coil (relay + wiring harness side):]

2. Check the resistance of the EGR stepping motor coil (relay + wiring harness side):

- Connect the EGR valve with the wiring harness.
- Disconnect the E-ECU from the wiring harness.
- Measure the coil resistance at the E-ECU connector by means of a multimeter.

***See "Resistance of standard Yanmar EGR stepping motor coil" above.**

Stepping motor	ECU connector terminal number
A-phase	E31-E48
B-phase	E21-E48
C-phase	E11-E48
D-phase	E01-E48

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the EGR for movement by means of the diagnosis tool. -> Next: [4. Check the EGR for movement:]

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3. Check the wiring harness for continuity:

- Disconnect the EGR valve and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Motor coil (output side) E31 (E21/E11/E01) [between E-ECU and EGR connector]	Yes	OK: normal
	No	NG: open wiring harness
Motor coil (input side) E48 [between E-ECU and EGR connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E31 (E21/E11/E01) and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between E31 (E21/E11/E01) and E43/E48	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Check the EGR for movement by means of the diagnosis tool. -> Next: [4. Check the EGR for movement:]

4. Check the EGR for movement:

- Connect the maintenance wiring harness between the E-ECU and the machine wiring harness (see [Important information on the maintenance wiring harness] *4-33* for details). Connect all connectors (EGR valve, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- Activate each stepping motor of the EGR valve by means of the diagnosis tool “Diagnosis test: active control“, and measure the voltage between stepping motor coil terminals E31 – E45, (E21 – E45, E11 – E45, E01 – E45).

ON/OFF setting status	Voltage	Status
ON	1.75 [V] and below	OK: normal
	Over 1.75 [V]	NG: wiring harness short-circuited with power supply or E-ECU error
OFF	2.5 [V] and above	OK: normal
	Under 2.5 [V]	NG: wiring harness short-circuited to GND or E-ECU error

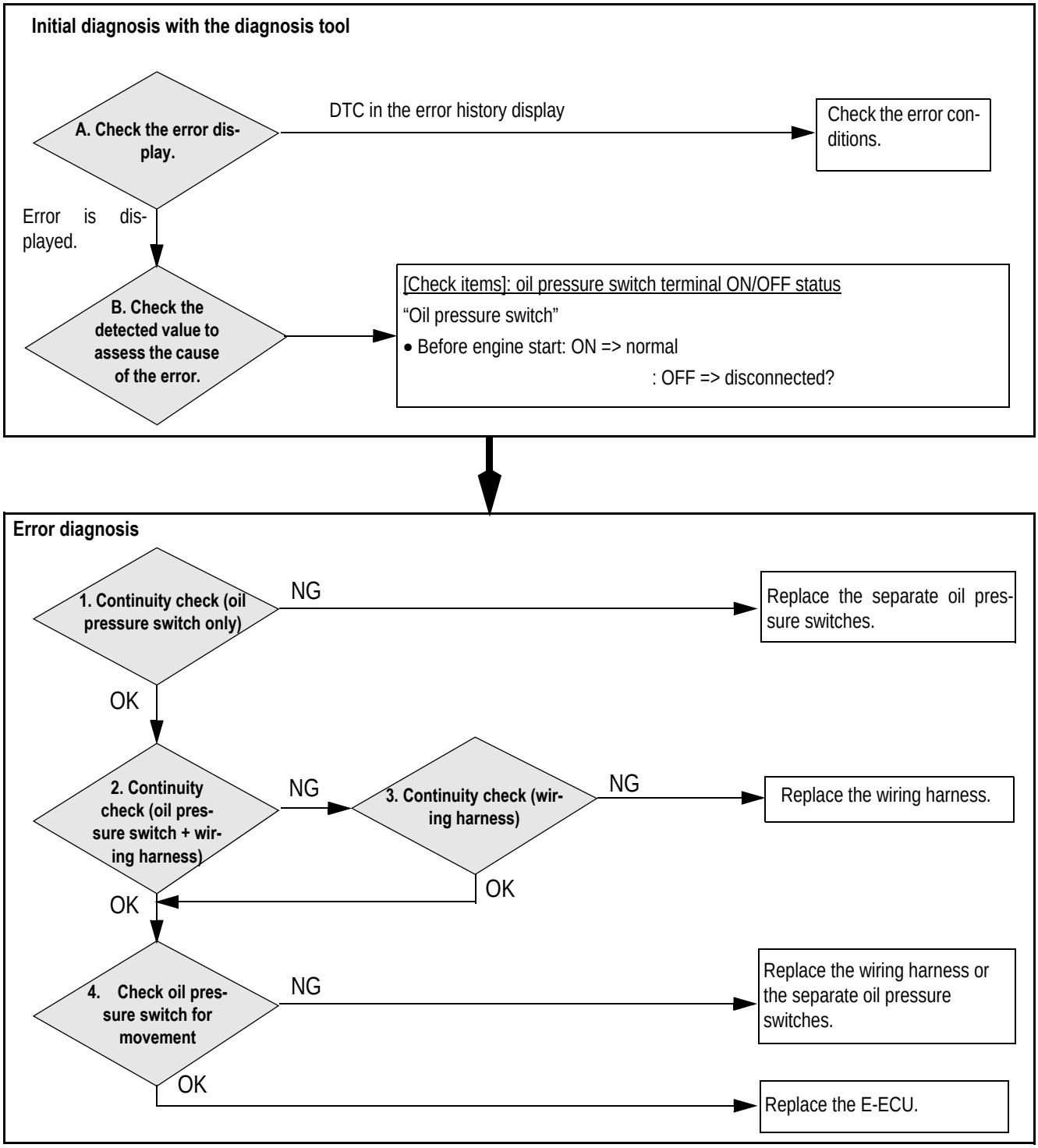
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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Flash code 2-1 – oil pressure switch and 3-1 – oil pressure drop error

Related DTC

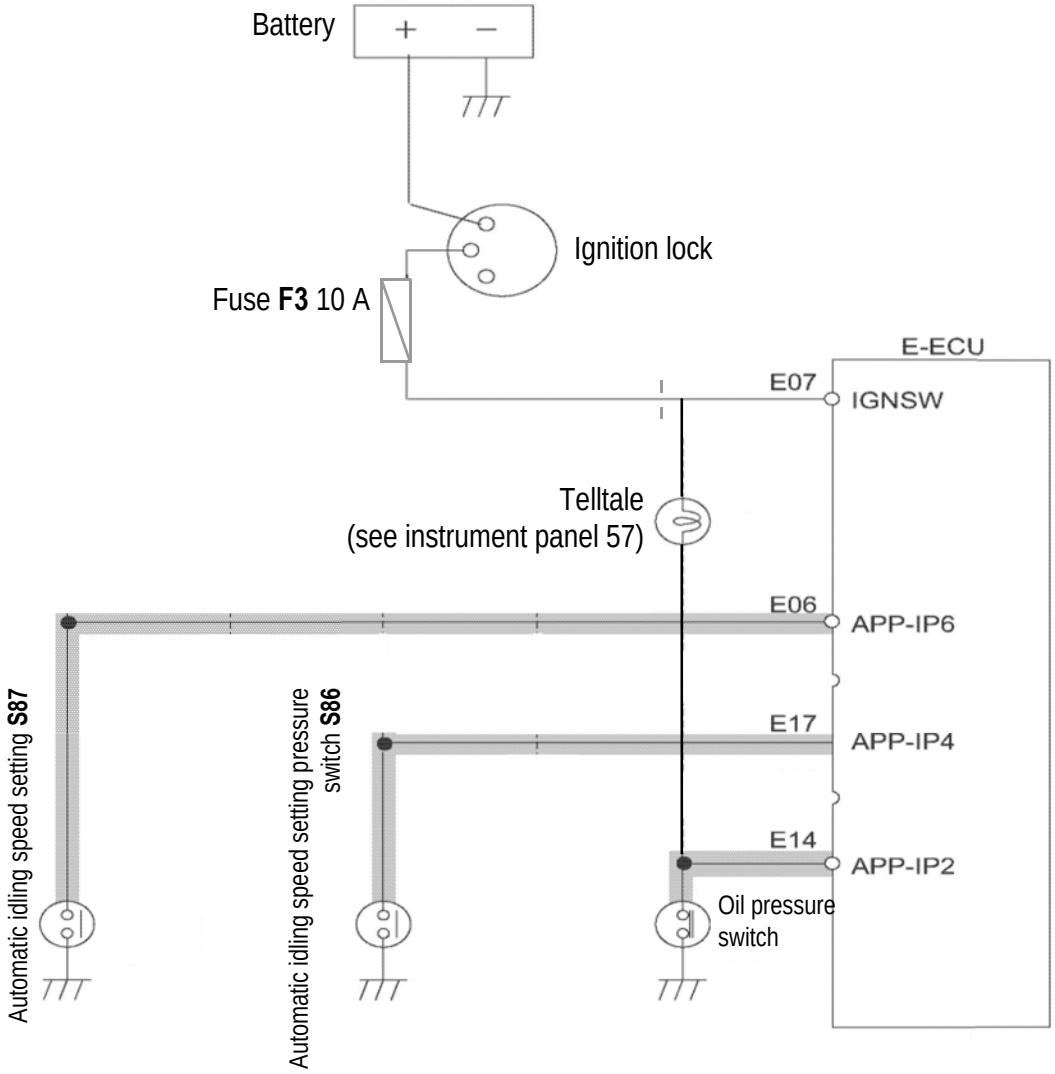
DTC	**P1192/4**	**Oil pressure switch error**
	P1198/1	**Abnormal oil pressure drop**



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Continuity check (oil pressure switch only)

- Disconnect the wiring harness from the separate oil pressure switches.
- Check the continuity between the oil pressure switch terminal and the chassis by means of a multimeter and the following table.

Pos.	Terminal name (terminal no.)	Continuity [between terminal and chassis]	Status
Oil pressure switch	APP-IP2 (E14)	Yes	OK: normal
		No	NG: internal circuit error

NG	Replace the oil pressure switch.
OK	Check the continuity with the oil pressure switch and the wiring harness connected. -> Next: [2. Continuity check (oil pressure switch + wiring harness):]

2. Continuity check (oil pressure switch + wiring harness)

- Connect the oil pressure switch and the wiring harness, and disconnect the E-ECU from the wiring harness.
- Check the continuity between the ECU connector terminal on the wiring harness and the chassis by means of a multimeter. Refer to the text above for the contact to be checked [1. Continuity check (oil pressure switch only):].

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Use the diagnosis tool “Diagnosis test” to check whether the movement of the oil pressure switch is correctly detected. -> Next: [4. Check the oil pressure switch for movement:]

3. Check the wiring harness for continuity:

- Disconnect the oil pressure switch and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Switch signal line E14 (*) [between E-ECU and switch connector]	Yes	OK: normal
	No	NG: open wiring harness
Between E14 (*) and E38/E43/E48 (power supply line)	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply
Between E14 (*) and E28/E45/E47 (GND line)/GND	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND

*An oil pressure switch is used as an example in this table. Use the same procedure to check the coolant temperature switch (E17) for continuity.

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Use the diagnosis tool “Diagnosis test” to check whether the movement of the oil pressure switch is correctly detected. -> Next: [4. Check the oil pressure switch for movement:]

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4. Check the oil pressure switch for movement:

- Connect all connectors (oil pressure switch, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- Monitor the separate components displayed with the diagnosis tool “Diagnosis test: digital input etc.”. Check ON/OFF display of the oil pressure switch under the circumstances indicated.

Pos.	Check conditions	ON/OFF display	Status
Oil pressure switch	Before engine start	ON	OK: normal
		OFF	NG: wiring harness error or internal circuit error
	With the engine running	OFF	OK: normal
		ON	NG: wiring harness error or internal circuit error

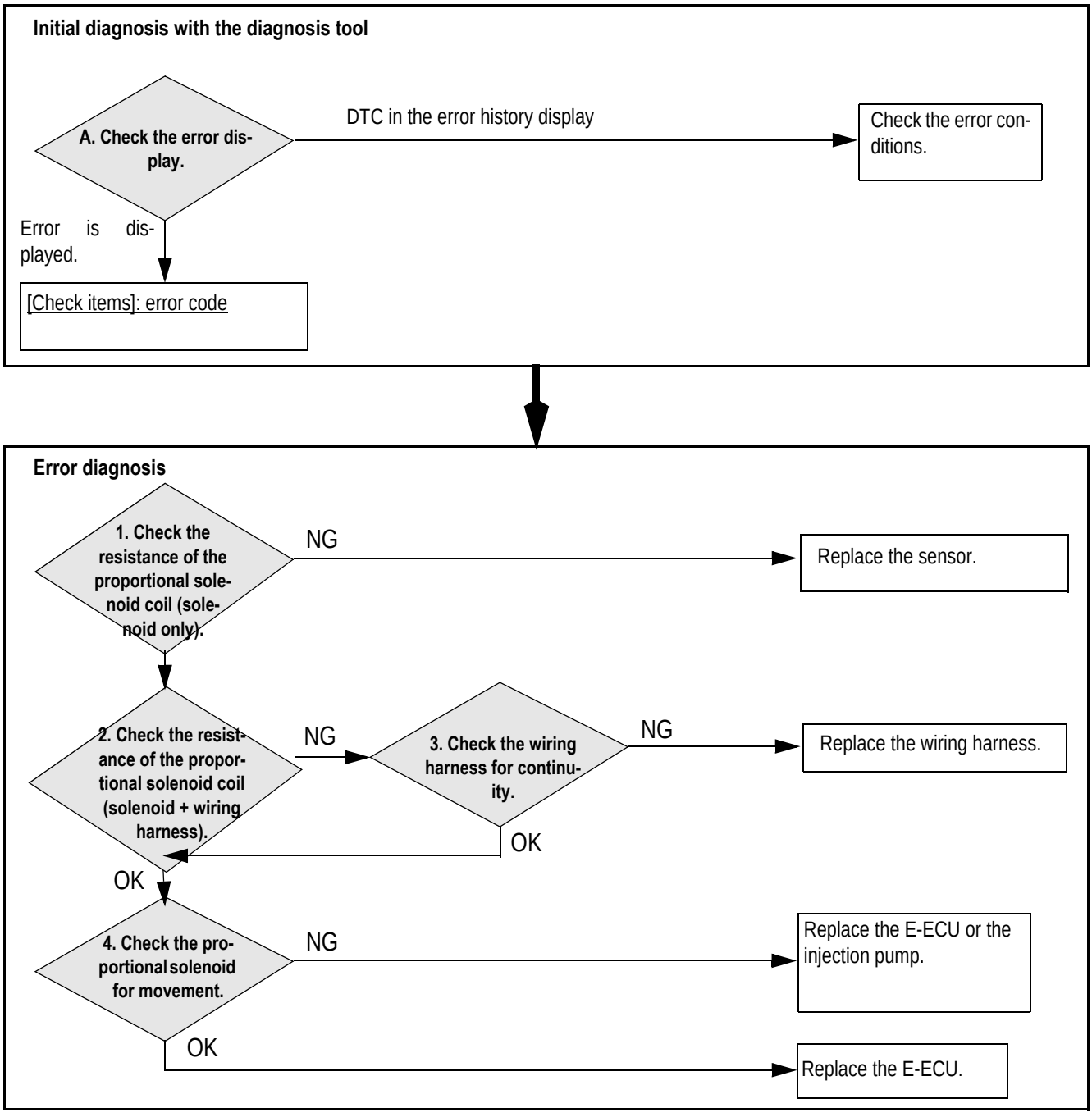
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness. • Replace the oil pressure switch.
OK	Replace the E-ECU.

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Flash code 8 – proportional injection pump solenoid (control rack)

Related DTC

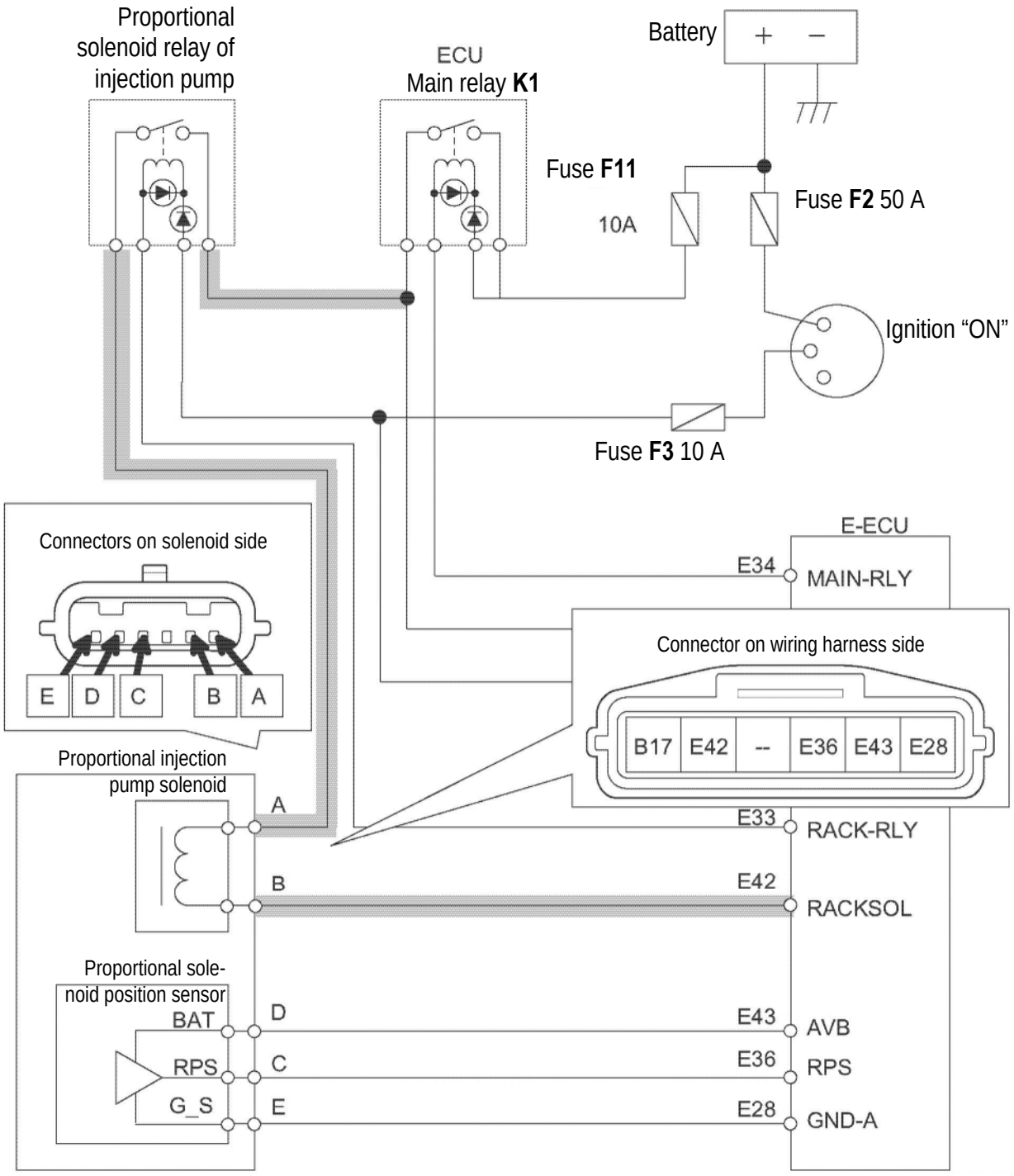
DTC	**P1212/4**	**Proportional injection pump solenoid error (voltage too low)**
	P1213/3	**Proportional injection pump solenoid error (voltage too high)**
	P1211/7	**Proportional injection pump solenoid, mechanical error**



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the coil resistance of the proportional injection pump solenoid (solenoid only):

- Disconnect the wiring harness from the proportional injection pump solenoid.
- Measure the resistance between terminals A and B of the proportional injection pump solenoid by means of a multimeter.

Coil resistance value of standard Yanmar proportional injection pump solenoid.

Terminal	Specification
Coils A – B	1 Ω ± 10 %

NG	Replace the injection pump.
OK	With the proportional injection pump solenoid and the wiring harness connected, check the resistance between solenoid terminals A and B. -> Next: [2. Check the coil resistance of the proportional injection pump solenoid (relay + solenoid):]

2. Check the coil resistance of the proportional injection pump solenoid (solenoid + wiring harness):

- Connect the proportional injection pump solenoid and the wiring harness, and disconnect the E-ECU and the proportional injection pump solenoid from the wiring harness.
- Measure the resistance between the E-ECU connector terminal E42 on the wiring harness side and the relay contact of the proportional injection pump solenoid E18 on the output side by means of a multimeter.

*See above, “Coil resistance value of standard Yanmar revs sensors”.

NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the solenoid for movement by means of the diagnosis tool. -> Next: [4. Check the proportional injection pump solenoid for movement:]

3. Check the wiring harness for continuity:

- Disconnect the proportional injection pump solenoid and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Solenoid coil line (output side) E42	Yes	OK: normal
[between E-ECU and sensor connector]	No	NG: open wiring harness
Between solenoid coil (input) and	Yes	OK: normal
relay contact of proportional injection pump solenoid (output)	No	NG: open wiring harness
Between relay contact of proportional injection pump solenoid (output)	Yes	OK: normal
and main relay contact (output)	No	NG: open wiring harness

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	Replace the E-ECU.

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4. Check the proportional injection pump solenoid for movement:

- Connect all connectors (proportional injection pump solenoid, E-ECU).
- Connect the diagnosis tool, switch on ignition and log in to the diagnosis tool.
- With the diagnosis tool “Diagnosis test: active control”, carry out the position control for the proportional solenoid. Place the control rack in any position within the settings.
- Then check whether the proportional injection pump solenoid has moved to the control rack position that has been set.

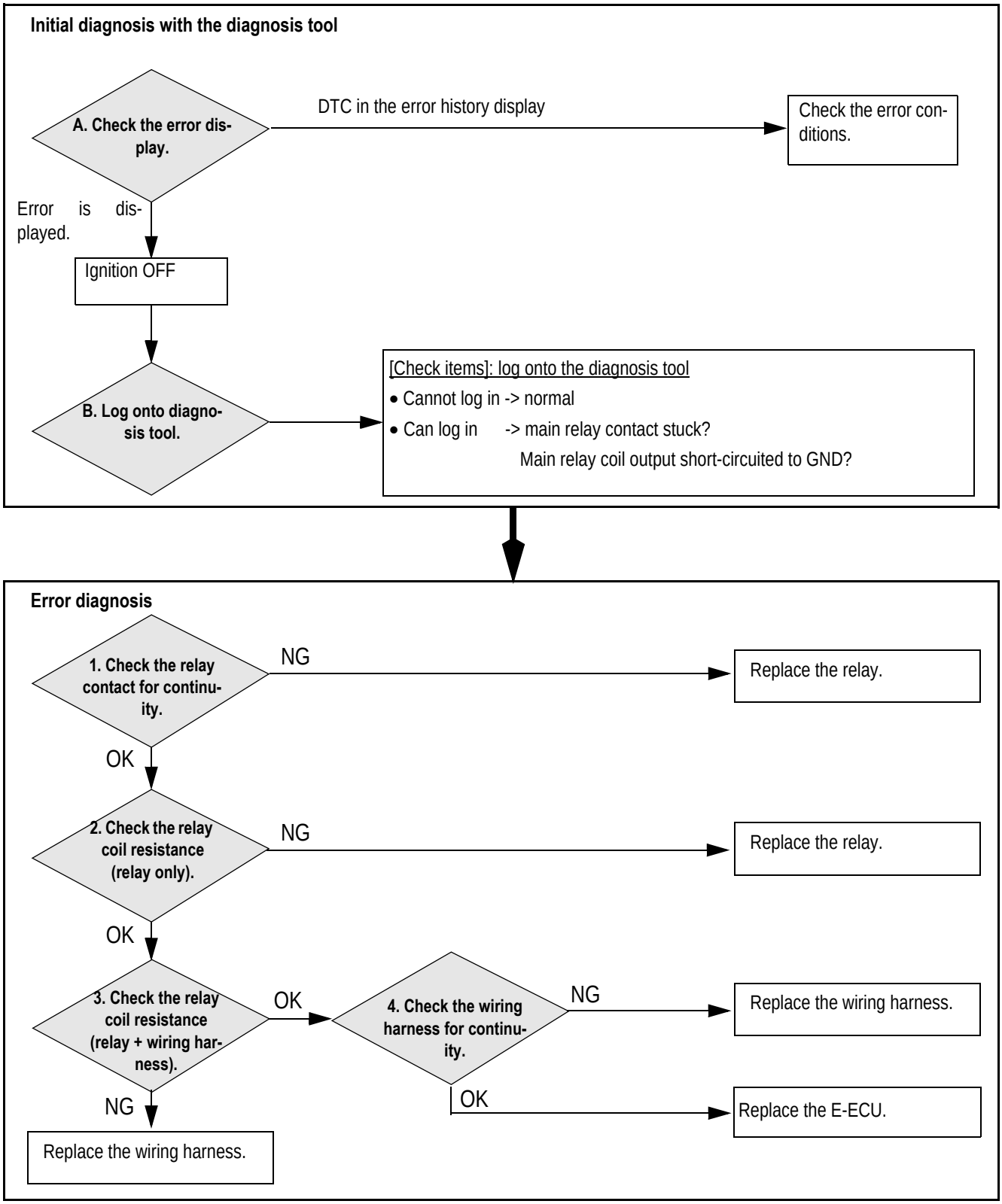
NG	Check the wiring harness for continuity. -> Next: [3. Check the wiring harness for continuity:]
OK	Check the solenoid for movement by means of the diagnosis tool. -> Next: [4. Check the proportional injection pump solenoid for movement:]

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Flash code 1-6 – main relay

Related DTC

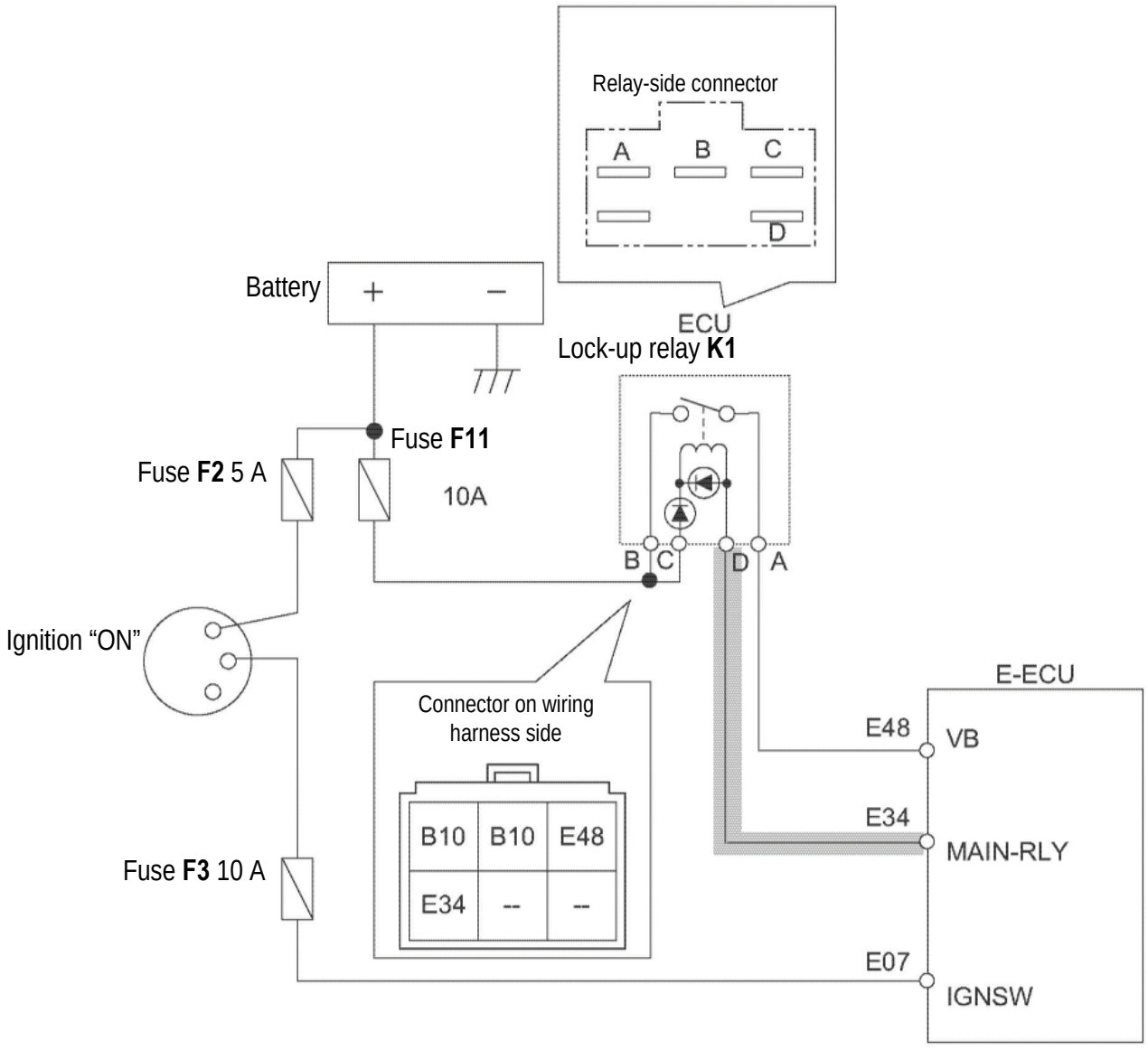
DTC	P0686/4	Main relay error



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Wiring diagram

	: Check points



*E-ECU connector assignment – *see E-ECU connector assignment* on page 4-32.

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Work description

1. Check the relay coil resistance value (relay only):

- Disconnect the E-ECU main relay from the wiring harness.
- Check the continuity between terminals A and B on the relay side by means of a multimeter.

NG	Replace the E-ECU main relay.
OK	Check the resistance of the E-ECU main relay coil. -> Next: [2. Check the resistance value of the relay coil (relay only):]

2. Check the relay coil resistance value (relay only):

- Disconnect the E-ECU main relay from the wiring harness.
- Measure the resistance between terminals C and D on the relay side by means of a multimeter.

Measurement conditions		Measured value	Status
Tester (+) side	**Tester (-) side**		
Terminal C	Terminal D	Existing (*)	OK if both are normal
Terminal D	Terminal C	Infinite (*)	
Terminal C	Terminal D	Infinite (*)	NG: internal relay circuit error
Terminal D	Terminal C		

*A series-connected diode integrated in reverse direction requires using the checking method mentioned above and causes the measured value to vary depending on the multimeter used.

NG	Replace the E-ECU main relay.
OK	With the E-ECU main relay and the wiring harness connected, check the relay coil resistance. -> Next: [3. Check the resistance value of the relay coil (relay + wiring harness side):

3. Check the resistance value of the relay coil (relay + wiring harness side):

- Connect the E-ECU main relay onto the wiring harness.
- Disconnect the E-ECU from the wiring harness.
- Measure the resistance between the battery cable (+) and the E-ECU connector E34 on the wiring harness side.

Measurement conditions		Measured value	Status
Tester (+) side	**Tester (-) side**		
Battery (+) line	E34	Existing (*)	OK: normal
E34	Battery (+) line	Infinite (*)	
Battery (+) line	E34	Infinite (*)	NG: wiring harness error
E34	Battery (+) line		

*A series-connected diode integrated in reverse direction requires using the checking method mentioned above and causes the measured value to vary depending on the multimeter used.

NG	Replace the wiring harness.
OK	Check the wiring harness for continuity. -> Next: [4. Check the wiring harness for continuity:]

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4. Check the wiring harness for continuity:

- Disconnect the E-ECU main relay and the E-ECU from the wiring harness.
- Check the wiring harness for continuity by means of a multimeter.

Terminal	Continuity	Status
Between relay coil (output side) E34 and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND
Between relay contact (output side) E48 and E43/battery (+)	No	OK: normal
	Yes	NG: wiring harness short-circuited with power supply

NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	• Connect all connectors (E-ECU main relay, E-ECU) and check again whether all errors have been detected with the diagnosis tool “Error code: error display”. • Replace the E-ECU.

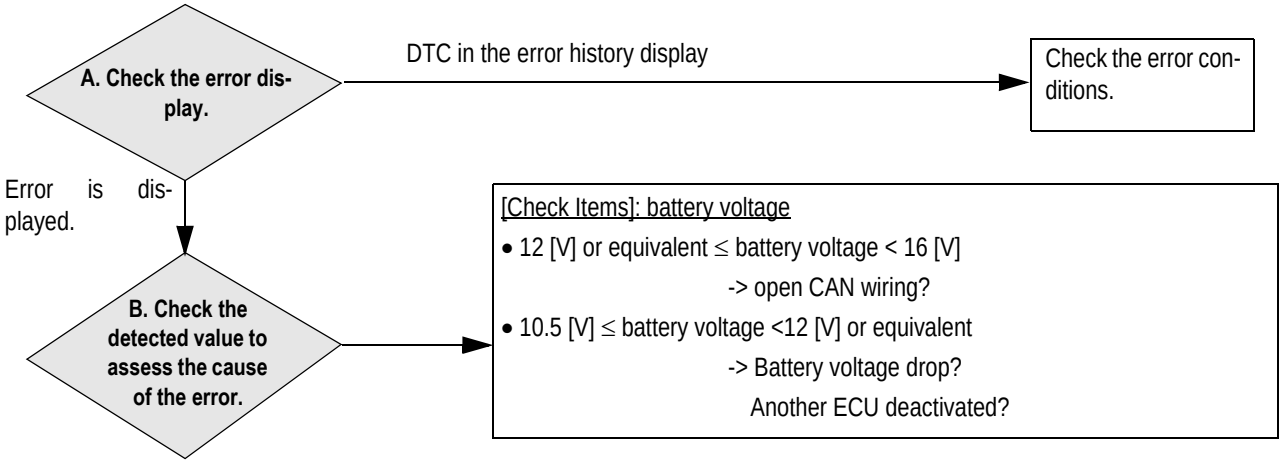
https://truckmanualshub.com/

Flash code 1-2 – CAN (Controller Area Network) communication

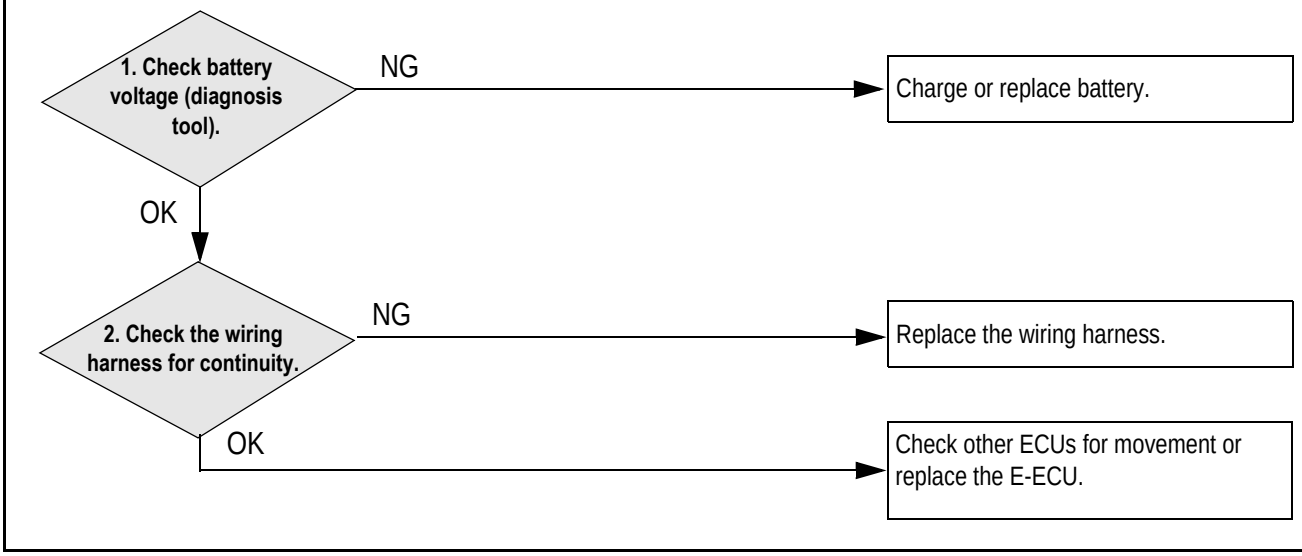
Related DTC

DTC	U0001/12	CAN communication error

Initial diagnosis with the diagnosis tool



Error diagnosis



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Work description

1. Battery voltage check:

- With the engine running, connect the diagnosis tool and log in to the diagnosis tool.
- Check the battery voltage with the diagnosis tool “Diagnosis test: pulse/analog etc.“.

Voltage	Status	Action
Approx.12 [V] ≤ battery voltage < 16 [V]	OK (normal range)	Check the wiring harness for continuity.
10.5 [V] ≤ battery voltage < approx.12 [V]	NG	• Charge or replace the battery. • Check the movement of other E-ECUs.

NG	• Charge or replace the battery. • Check the movement of other E-ECUs.
OK	Check the wiring harness for continuity. -> Next: [2. Check the wiring harness for continuity:]

2. Check the wiring harness for continuity:

- Check the wiring harness for continuity by means of a multimeter.

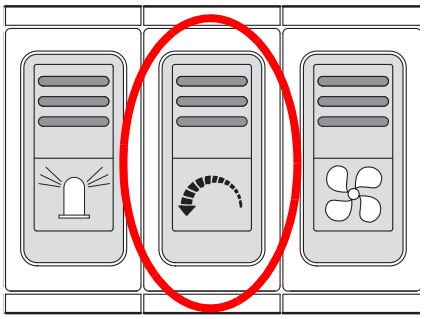
Terminal	Continuity	Status
CAN wiring (high side) E40 (between E-ECU and sensor connector)	Yes	OK: normal
	No	NG: open wiring harness
CAN wiring (low side) E39 (between E-ECU and sensor connector)	Yes	OK: normal
	No	NG: open wiring harness
Between E39/E40 and GND/E28/E45/E47	No	OK: normal
	Yes	NG: wiring harness short-circuited to GND

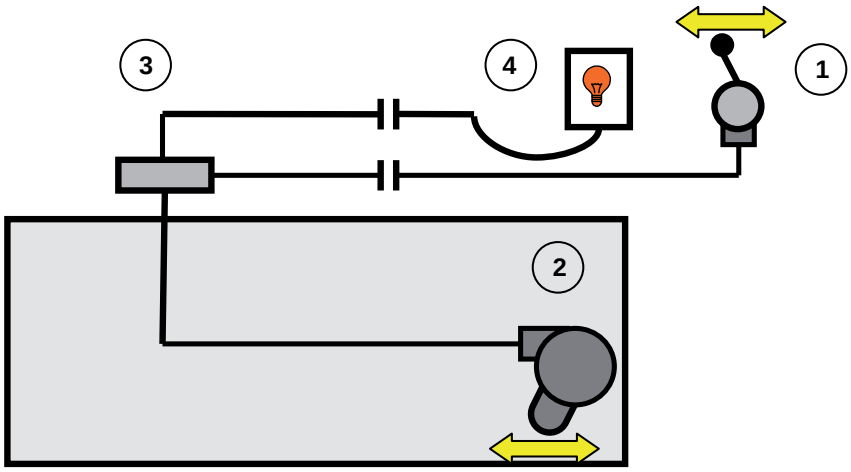
NG	• Check whether the wiring harness is damaged, or whether the wiring is correct. • Replace the wiring harness.
OK	• Check the other E-ECUs for movement. • Replace the E-ECU.

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4.32 Automatic revs setting

How it works





The required engine revs are transmitted to the E-ECU **3** by means of the electronic manual throttle lever **1**. The ECU enables the proportional solenoid **2** (on the diesel engine) which controls engine revs together with the ECU **3**. The automatic revs setting can be enabled by means of switch **4** (88) with optical monitoring in the cab.

Automatic revs setting enabled

If automatic revs setting is enabled and no work operation is carried out with the machine for about 4 seconds, the diesel engine is set to idling speed by means of the proportional solenoid and the ECU. As soon as a work operation is carried out, the engine is immediately reset to the revs that have been set previously.

Automatic revs setting not enabled

Revs are not reduced automatically. It reacts purely electronically by means of the manual throttle lever.

Automatically lowering revs significantly reduces fuel consumption and noise.

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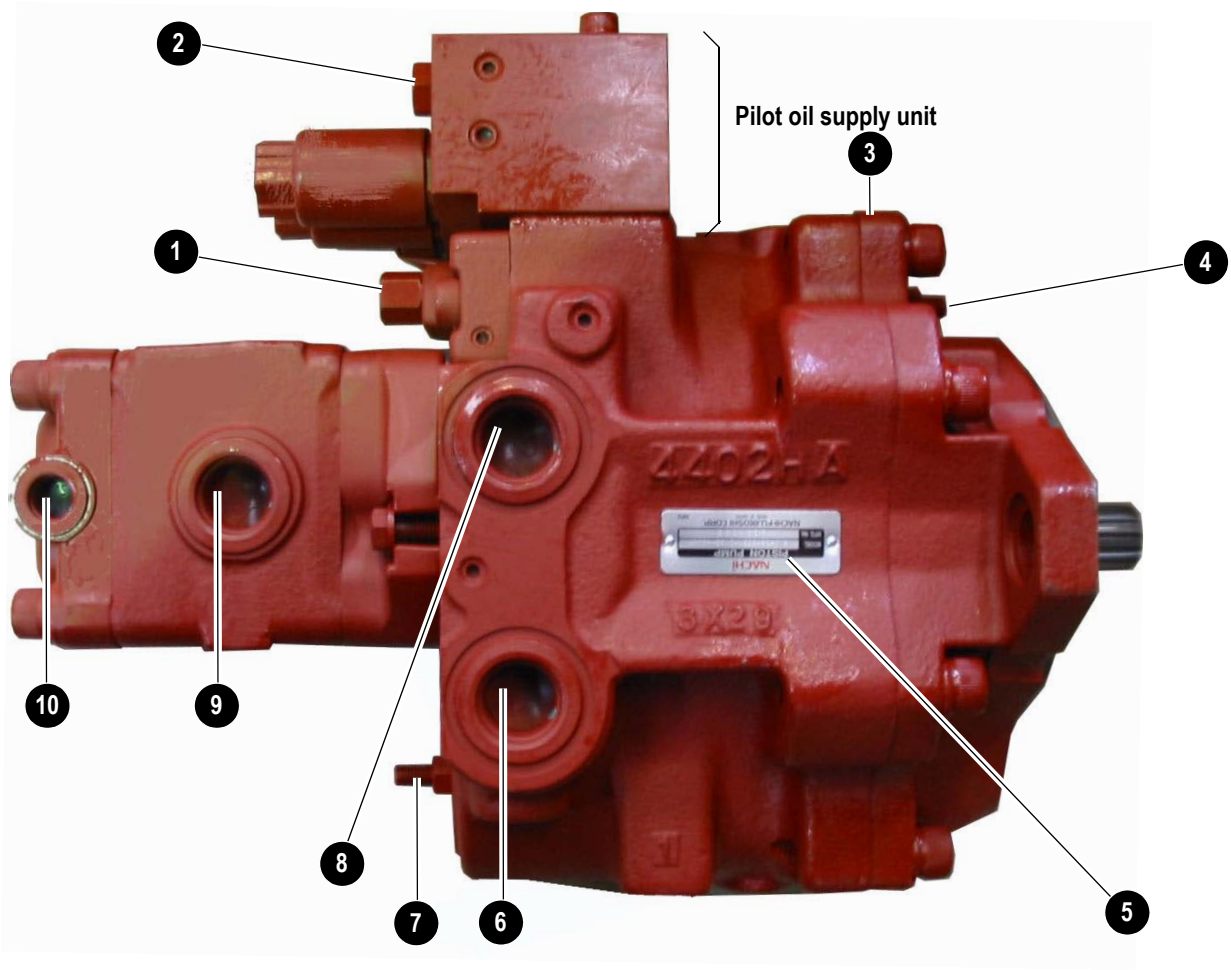
Hydraulic system

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5 Hydraulic system

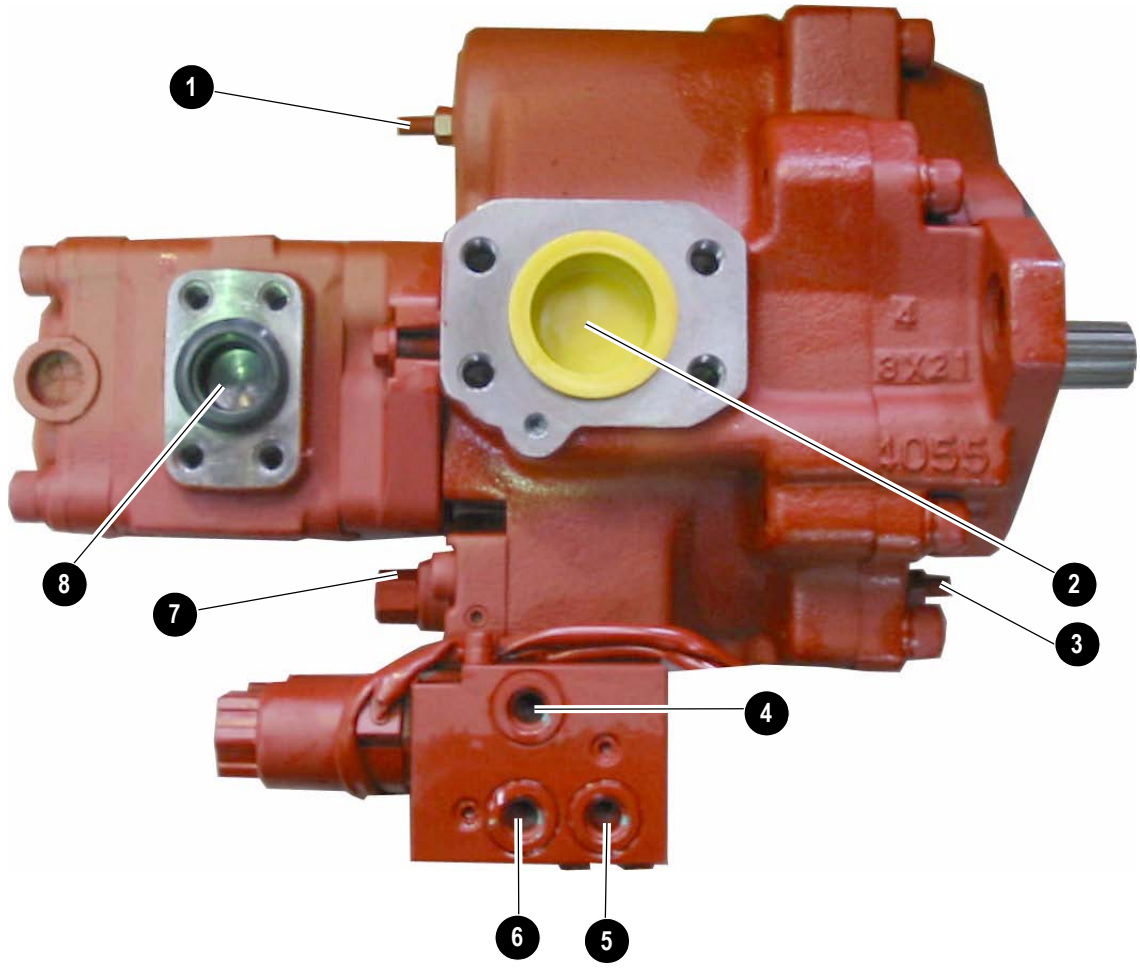
5.1 Hydraulic pump PVD-3B-56P-21G5-4626F

Double variable displacement pump + twin gear pumps



Pos.	Description
1	Oil flow set screw Qmax
2	Pressure reducing valve PRV 4
3	Bleed screw (not active)
4	Oil flow set screw Qmin
5	Type label
6	Port P2
7	Control initiation set screw
8	Port P1
9	Port P3
10	Port P4

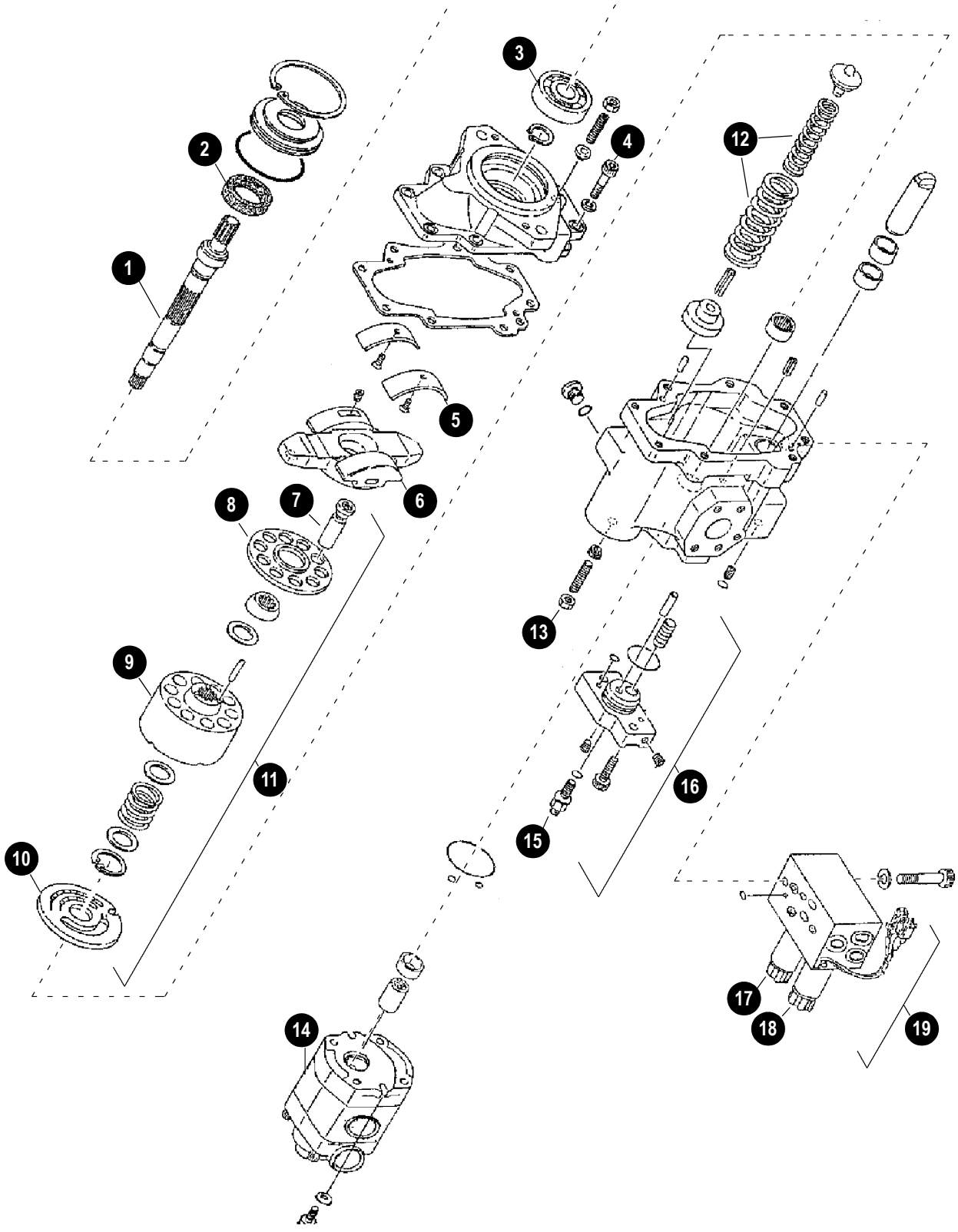
https://truckmanualshub.com/



Pos.	Description
1	Control initiation set screw
2	Suction line port to variable displacement pump
3	Oil flow set screw Qmin
4	Port PR (2nd speed range)
5	Port PV (gear motor brake release supply)
6	Pilot valve supply
7	Oil flow set screw Qmax
8	Suction line port to gear pump

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Pump unit: exploded view

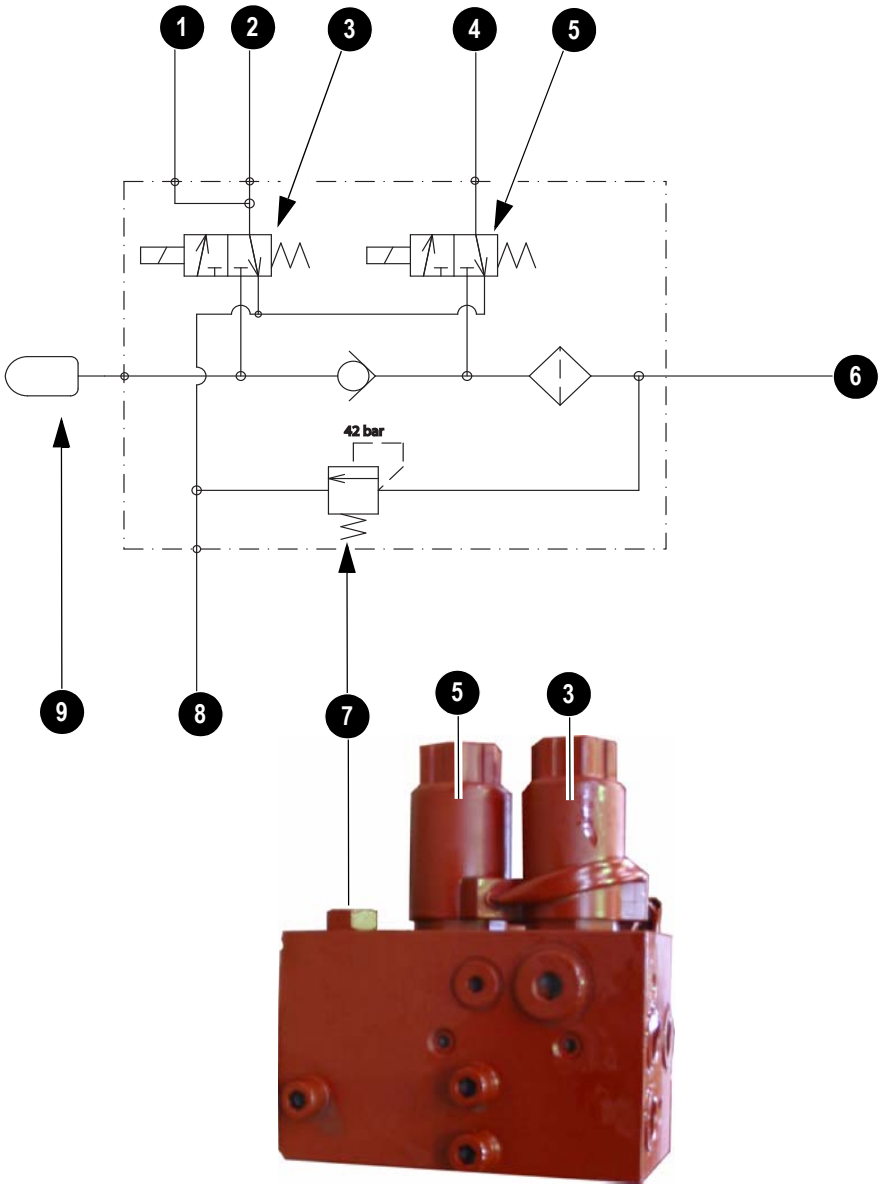


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Pos.	Description
1	Input shaft
2	Shaft seal
3	Bearing
4	Set screw Qmin
5	Bearing
6	Swash plate
7	Piston
8	Pressure plate
9	Cylinder drum
10	Control disc
11	Drive unit
12	Springs for control characteristics
13	Control initiation set screw
14	Gear pump
15	Set screw Qmax
16	Governor housing
17	2nd speed range solenoid valve
18	Solenoid valve for safety valve
19	Pilot oil supply unit

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Pilot oil supply unit



Pos.	Description	Port
1	Gear motor brake release supply	PR
2	Pilot valve supply	
3	Solenoid valve for safety valve	
4	Drives/2nd speed range supply	PV
5	2nd speed range solenoid valve	
6	Pump 4 supply	Internal to P4
7	Pressure limiting valve	
8	Tank line	
9	Accumulator	
10	Shuttle valve block/main valve block swivelling segment	

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5.2 Main valve block with 3rd control circuit and triple articulation boom

Ports

Bucket

Boom

Left-hand side drive

Input P1 P2

Right-hand side drive

Boom 2

Stick

Auxiliary hydraulics

Auxiliary hydraulics flow rate adjustment

Swivel boom

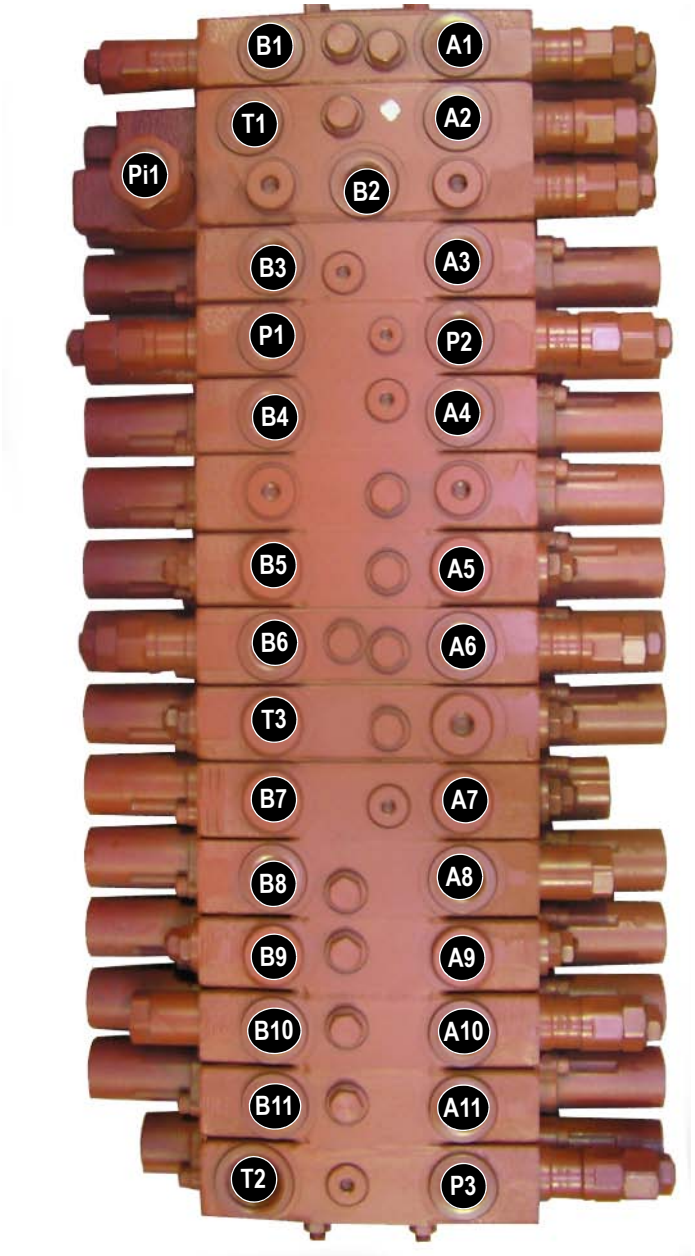
3rd control circuit/triple articulation boom

Stabiliser blade

Rotating the upper carriage

Straight-ahead driving

Input P3 out-put T2



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Legend

Pilot control lines

Port	Legend	Controlled via
Pa1, Pb1	Bucket control	Joystick (right)
Pa2, Pb2	Boom control	Joystick (right)
Pa3, Pb3	Left-hand side drive control	Drive pedal (left)
Pa4, Pb4	Right-hand side drive control	Drive pedal (right)
Pa5, Pb5	Stick control	Joystick (left)
Pa6, Pb6	Auxiliary hydraulics control	Auxiliary hydraulics pedal
Pa7, Pb7	Boom swivel control	Auxiliary hydraulics pedal
Pa8, Pb8	3rd control circuit/triple articulation boom control	– see Triple articulation boom, page 7-29
Pa9, Pb9	Stabiliser blade control	Stabiliser blade pedal
Pa10, Pb10	Upper carriage rotation control	Joystick (left)
Pi3	Straight-ahead driving control	Joystick (left)
Pi1 Pi2	Boom summation control	Joystick (right)

Main control lines

Port	Legend
A1 rod side, B1 base side	Bucket ram
A2 rod side, B2 base side	Boom ram
A3, B3	Drive unit (left) via swivel joint
A4, B4	Drive unit (right) via swivel joint
A5 base side, B5 rod side	Stick
A6, B6	Auxiliary hydraulics
A7 rod side, B7 base side	Swivel boom
A8, B8	3rd control circuit/triple articulation boom
A9 rod side, B9 base side	Stabiliser blade
A10, B10	Rotate

Pump/tank lines

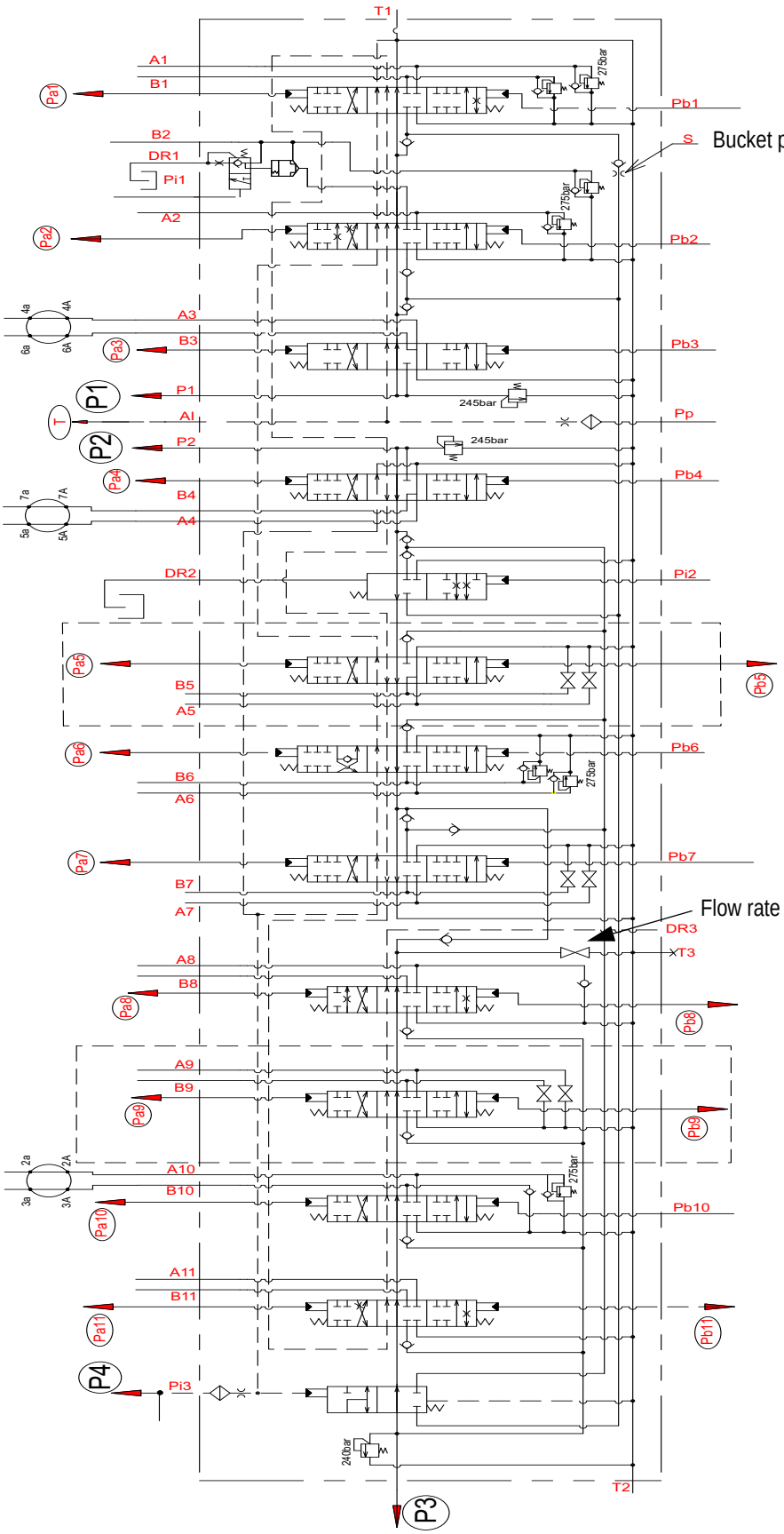
Port	Legend
P1	Pump 1 port
P2	Pump 2 port
P3	Pump 3 port
T1	Tank line via non-return valve and filter in tank
T2, T3	Tank line via oil cooler and filter in tank
DR1, DR2	Boom summation tank lines

S: bucket pre-tension

– *see* *Bucket pre-tension* on page 5-13

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Main valve block diagram



Bucket

S Bucket pre-tension

Boom

Left-hand side drive

Input P1

Input P2

Right-hand side drive

Boom summation

Triple articulation boom option

Stick

Auxiliary hydraulics

Flow rate adjustment of auxiliary hydraulics

Swivel boom

3rd control circuit option

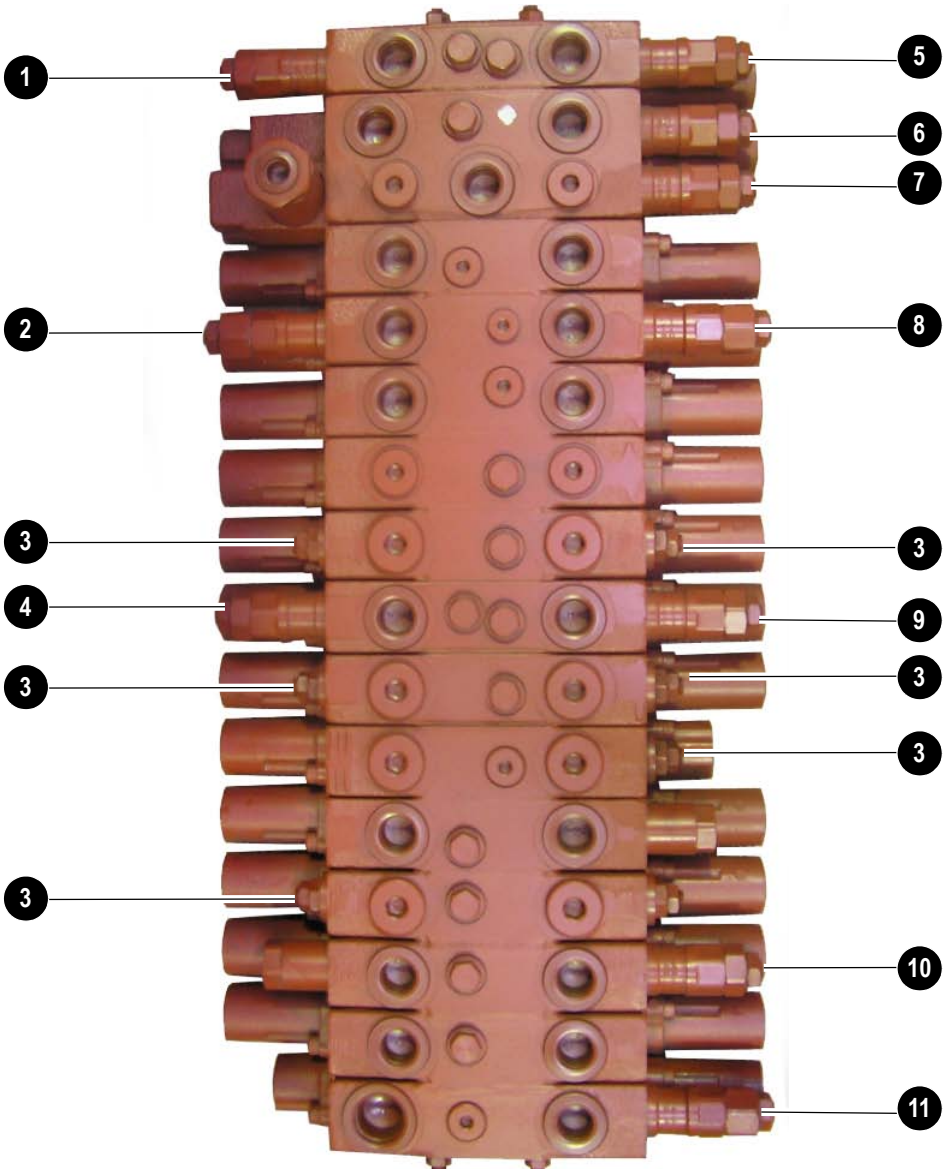
Stabiliser blade

Rotating the upper carriage

Drive counterbalancing system

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Pressure limiting valves



Pos.	Description
1	Secondary pressure limiting valve (bucket base side)
2	Primary pressure limiting valve P1
3	Plug (secondary pressure limiting valve option see *5-15*)
4	Secondary pressure limiting valve (stick rod side)
5	Secondary pressure limiting valve (bucket rod side)
6	Secondary pressure limiting valve (rod side)
7	Secondary pressure limiting valve (boom base side)
8	Primary pressure limiting valve P2
9	Secondary pressure limiting valve (stick base side)
10	Secondary pressure limiting valve stabiliser blade rod side
11	Primary pressure limiting valve P3

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Pump assignment

Hydraulic supply by pump 1

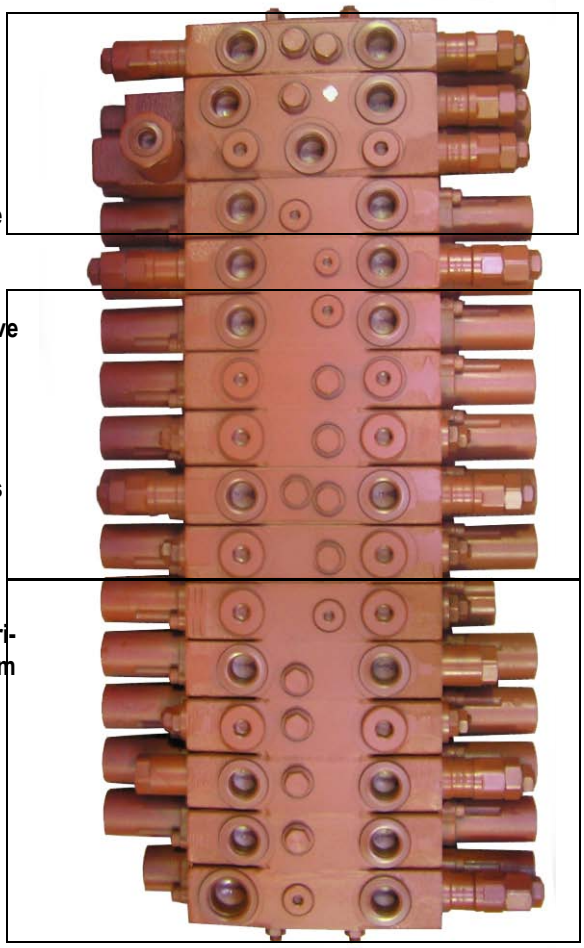
- Bucket section
- Boom section
- Left-hand side drive section

Hydraulic supply by pump 2

- Right-hand side drive section
- Boom section 2
- **3**rd control circuit option with additional triple articulation boom option
- Stick section
- Auxiliary hydraulics section

Hydraulic supply by pump 3

- Auxiliary hydraulics section
- Boom swivel section
- 3rd control circuit option with additional **triple articulation boom** option **Only triple articulation boom** option **Only 3rd control circuit**option
- Stabiliser blade section
- Rotate section
- Drive counterbalancing system section



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5.3 Drive counterbalancing system

Without drive counterbalancing system

Actuating the boom as you drive causes the machine to leave its track.

(P1, P2 each supply a drive, and the alarm function is also governed by P1 or P2.)

With drive counterbalancing system

If the boom is actuated as you drive straight ahead, the machine stays in its track, but drive speed does not remain constant.

The drive counterbalancing system is only enabled if both drive valves are enabled.

Function

☞ *The drive counterbalancing system is enabled by means of an increased banking-up pressure if both piston valves for driving and a boom function are activated.*

➥ P3 takes over all boom functions.

Pump assignment for drive counterbalancing

Hydraulic supply by pump 1

- Left-hand side drive section

Hydraulic supply by pump 2

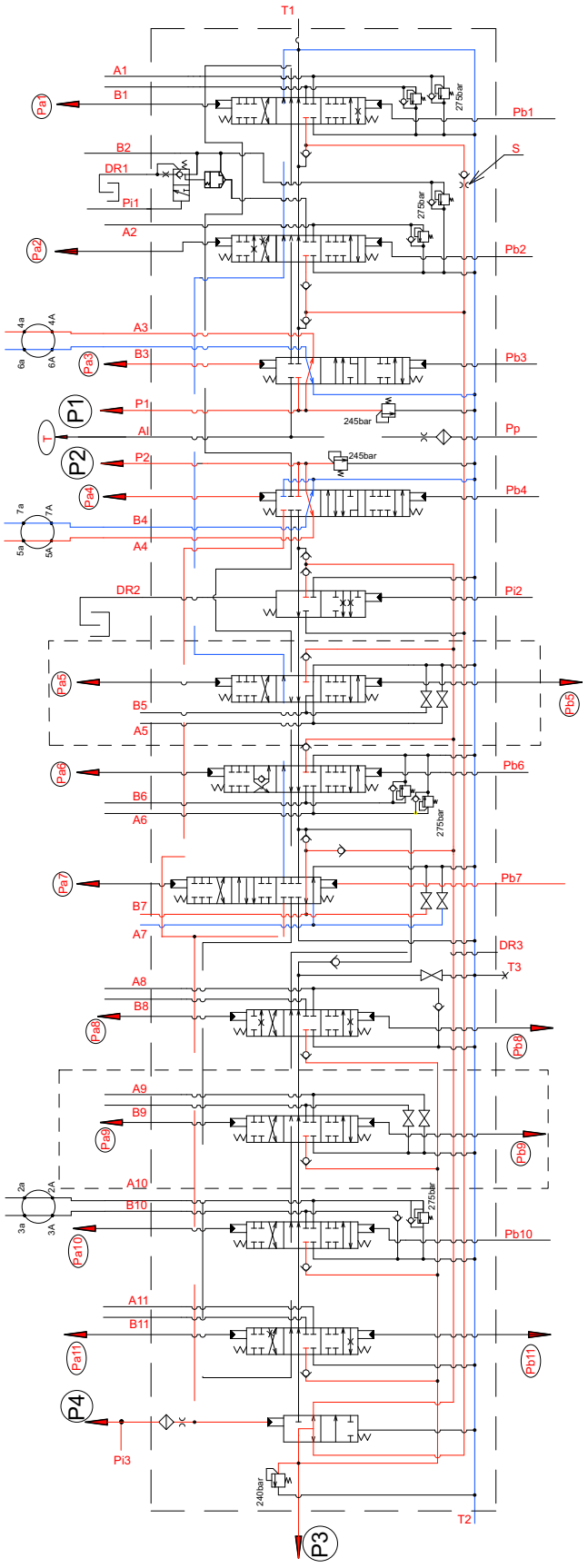
- Right-hand side drive section

Hydraulic supply by pump 3

- Bucket section
- Boom section
- Triple articulation boom option
- Stick section
- Auxiliary hydraulics section
- Swivel section
- 3rd control circuit option
- Stabiliser blade section
- Swivel unit section
- Drive counterbalancing section

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Drive counterbalancing diagram



Bucket

Boom

Left-hand side drive

Input P1

Input P2

Right-hand side drive

Boom summation

Triple articulation boom option

Stick

Auxiliary hydraulics

Swivel

3rd control circuit option

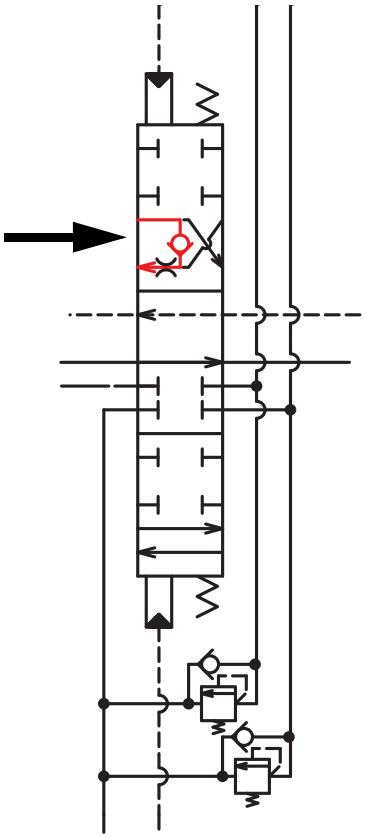
Stabiliser blade

Rotate

Drive counterbalancing system

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5.4 Regeneration – stick section



Problem

High loads on the stick can cause the stick ram to be “emptied” on the base side, which can cause the stick to stop in vertical position.

Solution

A non-return valve is integrated in the spool valve so the rod-side oil can flow to the base side.

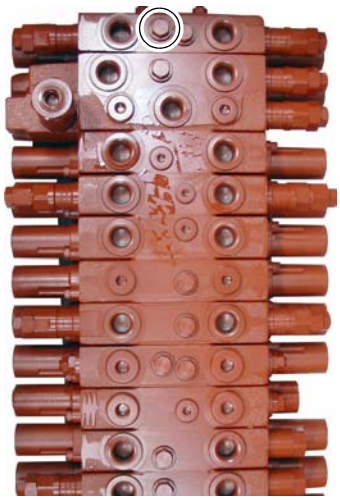
Location

The regeneration valve is located between the stick and (for 3rd control circuit or triple articulation boom options) the boom summation segments

5.5 Bucket pre-tension

A nozzle is integrated in the pressure line of the bucket segment. If the bucket and the boom (both supplied with oil by the same pump) are actuated at the same time, both move simultaneously, and not the bucket (with its smaller mass) first, and then the boom with its larger mass – *see Main valve block with 3rd control circuit and triple articulation boom* on page 5-6.

Location:



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5.6 Boom summation – raise

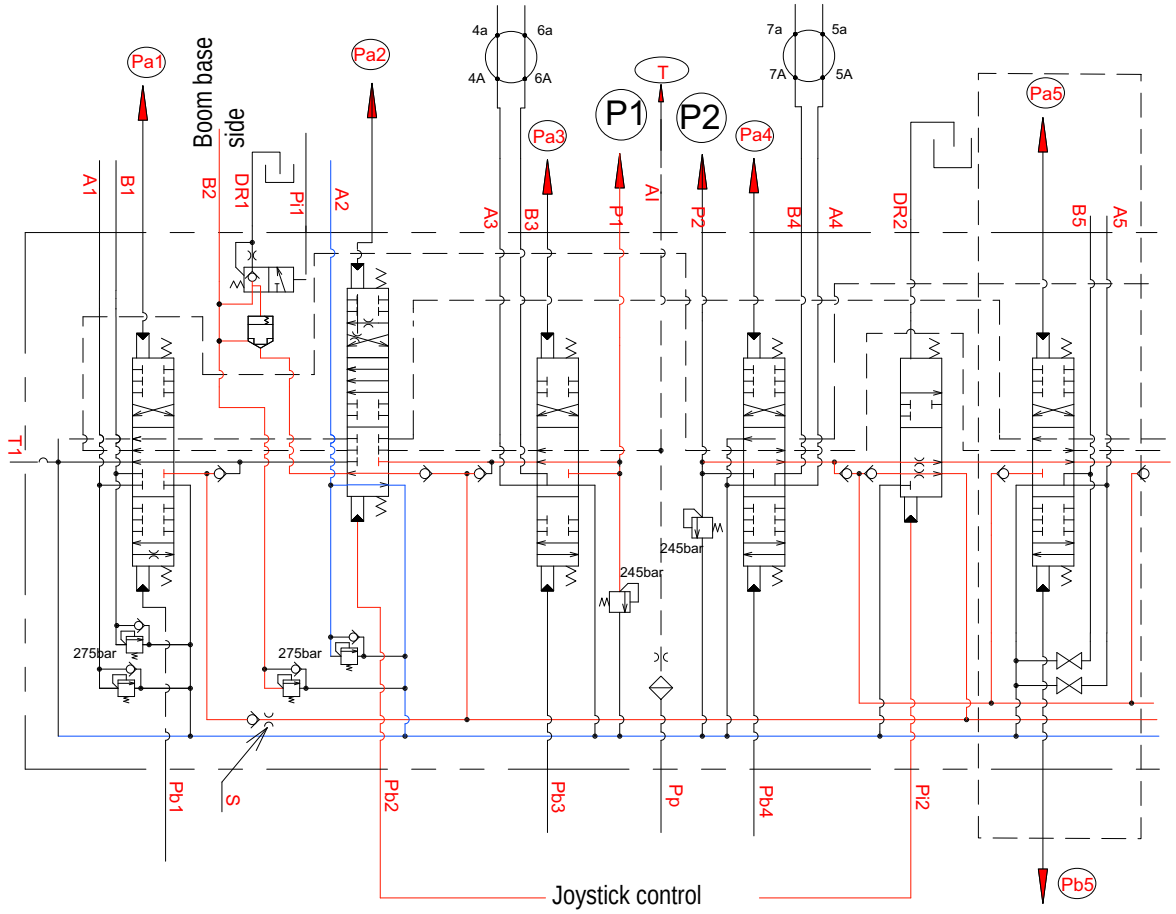
Both P1 & P2 pumps are used to raise the boom at higher speed.

Raising the boom

- Moving the joystick also controls a second segment (boom 2).
- Pump P2 supplies the boom 2 segment with oil.
- The summation time (the time the boom 2 segment is switched) is specified by the piston spring in the boom 2 segment.

Lowering the boom

– *see Lowering the boom:* on page 5-15



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5.7 Check valve (load retaining valve)

- Boom ram base side

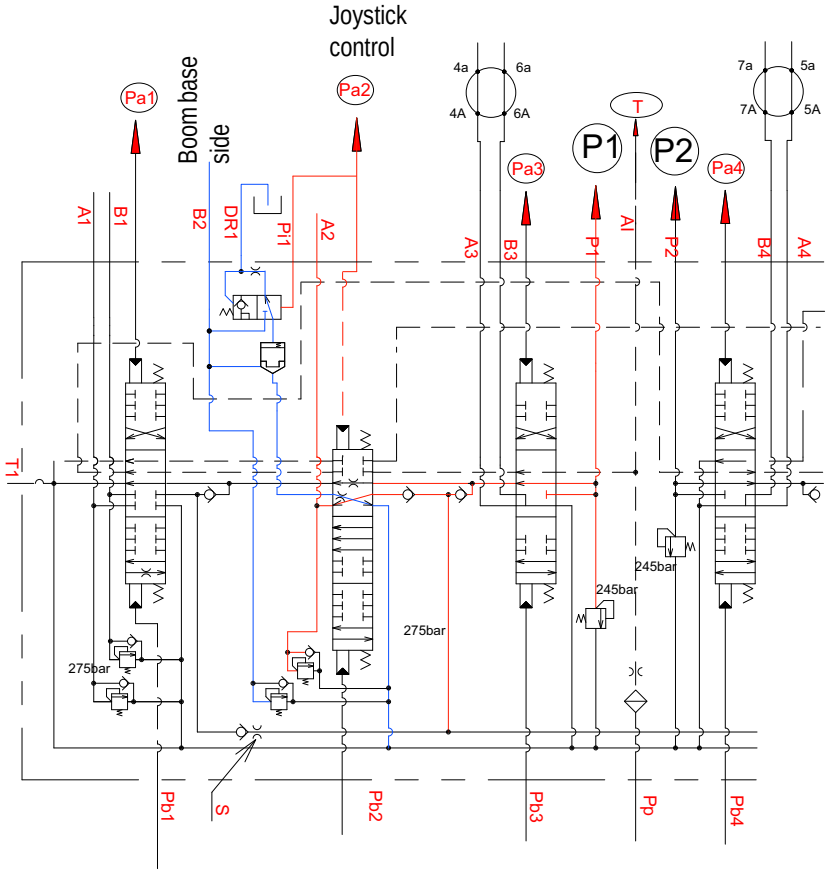
A pilot-operated load retaining valve is used to prevent spool leakage, which allows the ram to retain its home position.

Raising the boom:

The oil opens the check valve and flows to the base side of the boom ram.

Lowering the boom:

The load on the check valve is reduced by means of the pilot control line and a piston (reflux to tank). This allows the base side oil to flow back via the check valve.



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5.8 Flow rate adjustment of auxiliary hydraulics

The available oil quantity at the auxiliary hydraulics ports can be modified by means of the set screw on the main valve block.

- Set screw – *see Pressure limiting valves* on page 5-9

There are two possible positions: – *see Auxiliary hydraulics oil flow** on page 2-4.

Set screw “against hydraulic resistance”

The valve seat is closed.

- P2 + P3 supply the auxiliary hydraulics section with oil.
- Factory setting

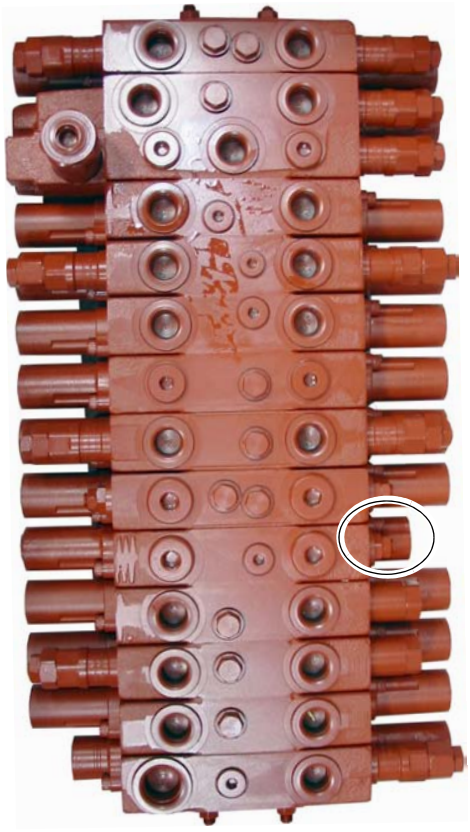
“Open” set screw

Unscrew the valve seat by at least 2 revolutions, but no more than 3, to open the valve seat completely.

- P2 supplies the auxiliary hydraulics section with oil.
- The oil supplied by P3 flows to the tank via the open valve seat.

Important!

Intermediate positions of the set screws cause the hydraulic oil to warm up – danger of overheating.

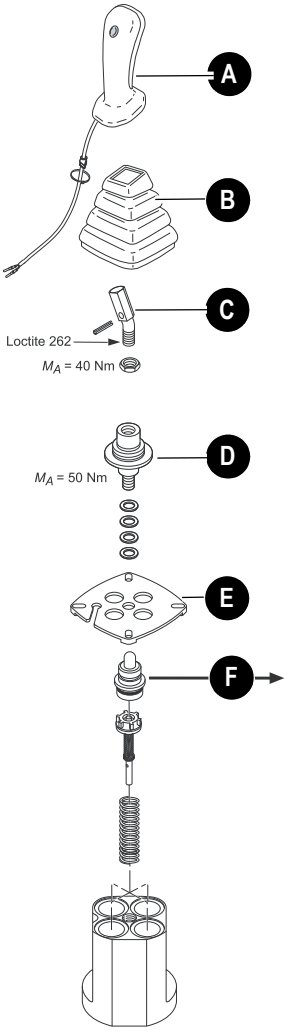


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5.9 Pilot valves

Joystick

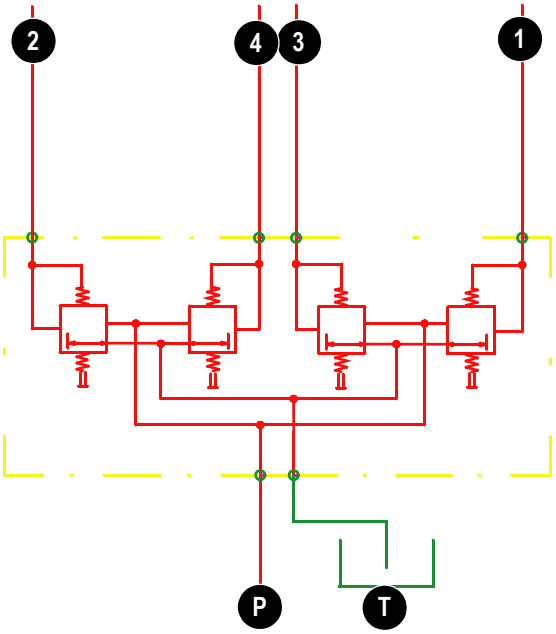
- Pilot valve for bucket, boom, stick and upper carriage rotation
- Consists of a lever and four pressure reducing valves



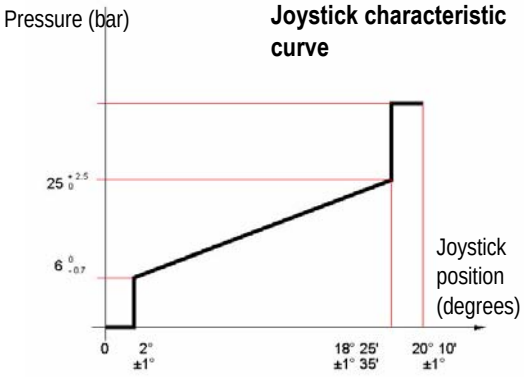
Set of tappets
Article no.: 1000021259



Numbering for right-hand side joystick. Left-hand side joystick: 3-1-2-4



Joystick characteristic curve

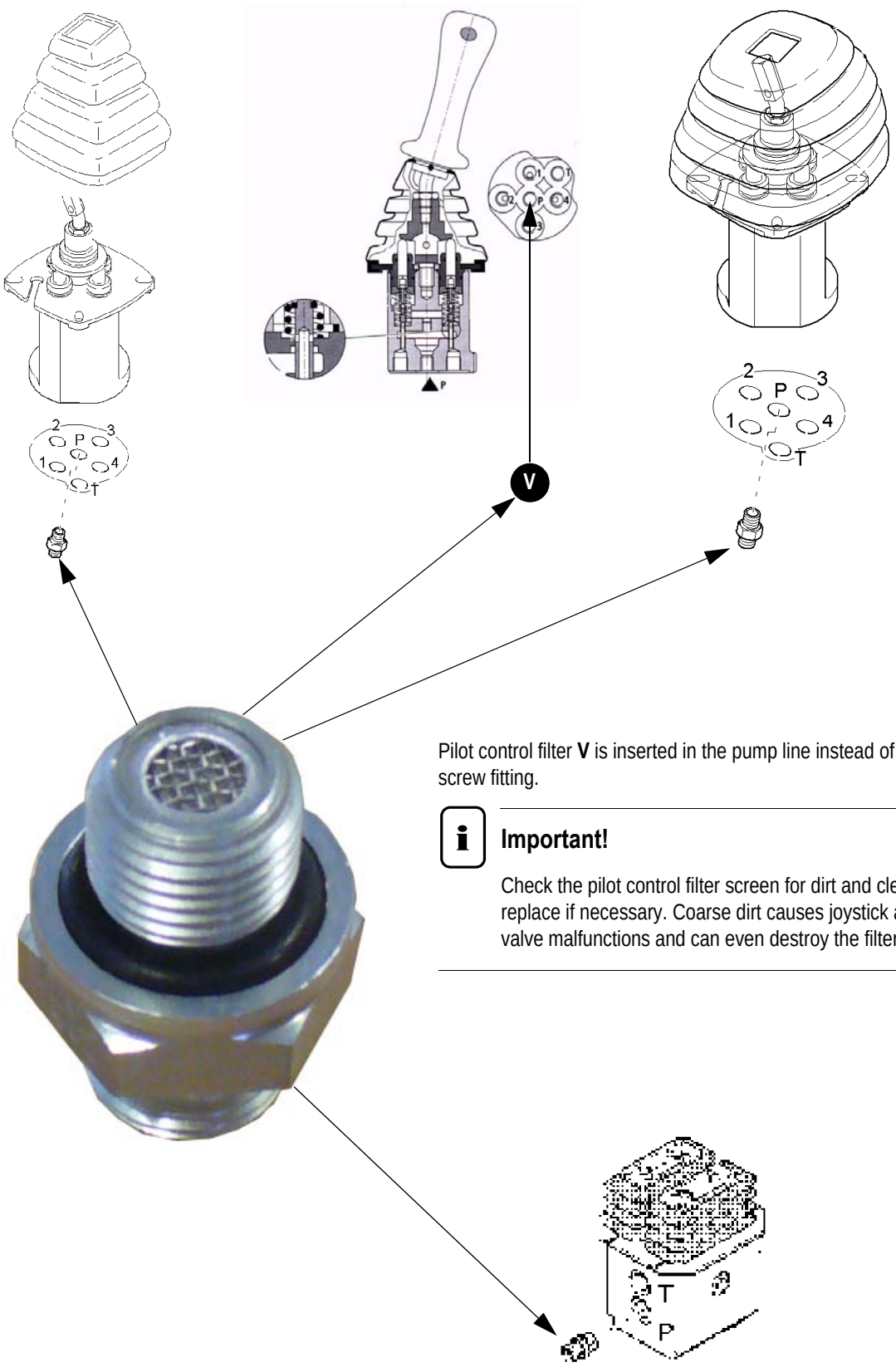


Pos.	Description	Pos.	Description (left-hand side joystick)	Description (right-hand side joystick)
A	Control lever	1	Stick extension control	Boom ram extension control
B	Rubber collar	2	Left-hand side rotation control	Bucket ram extension control
C	Linkage	3	Stick retraction control	Boom ram retraction control
D	Universal joint	4	Right-hand side rotation control	Bucket ram retraction control
E	Guide plate	P	Supply from pilot oil supply unit	Supply from pilot oil supply unit
F	Tappet	T	Tank line	Tank line

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Joystick up to model: **AD05131**

Joystick from model: **AD051132**



Pilot control filter **V** is inserted in the pump line instead of the GE screw fitting.

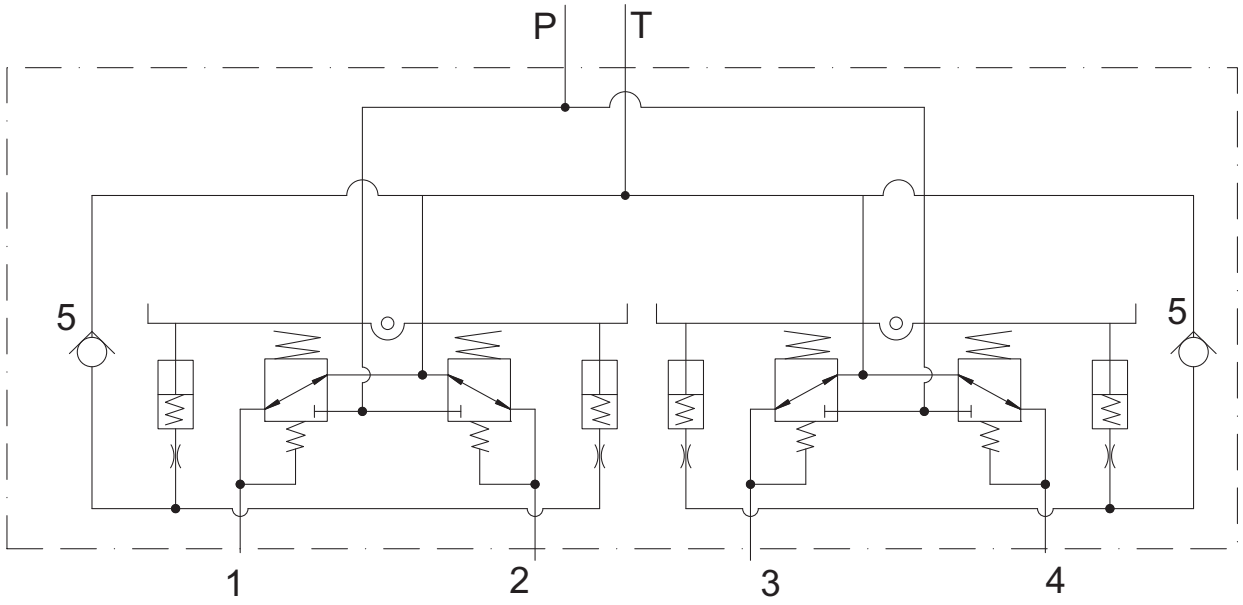
Important!

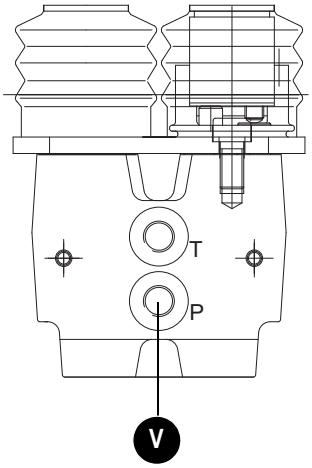
Check the pilot control filter screen for dirt and clean or replace if necessary. Coarse dirt causes joystick and drive valve malfunctions and can even destroy the filter insert.

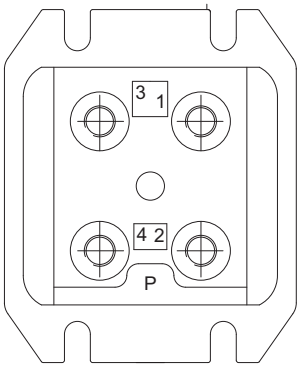
https://truckmanualshub.com/

Pilot valve (driving)

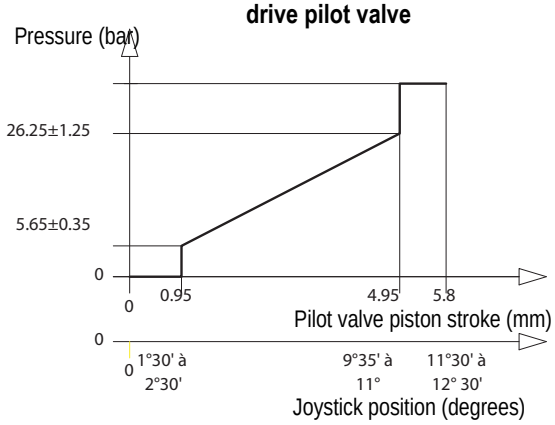
- Pedal with hydraulic damping
- Consists of two pedals and four pressure reducing valves





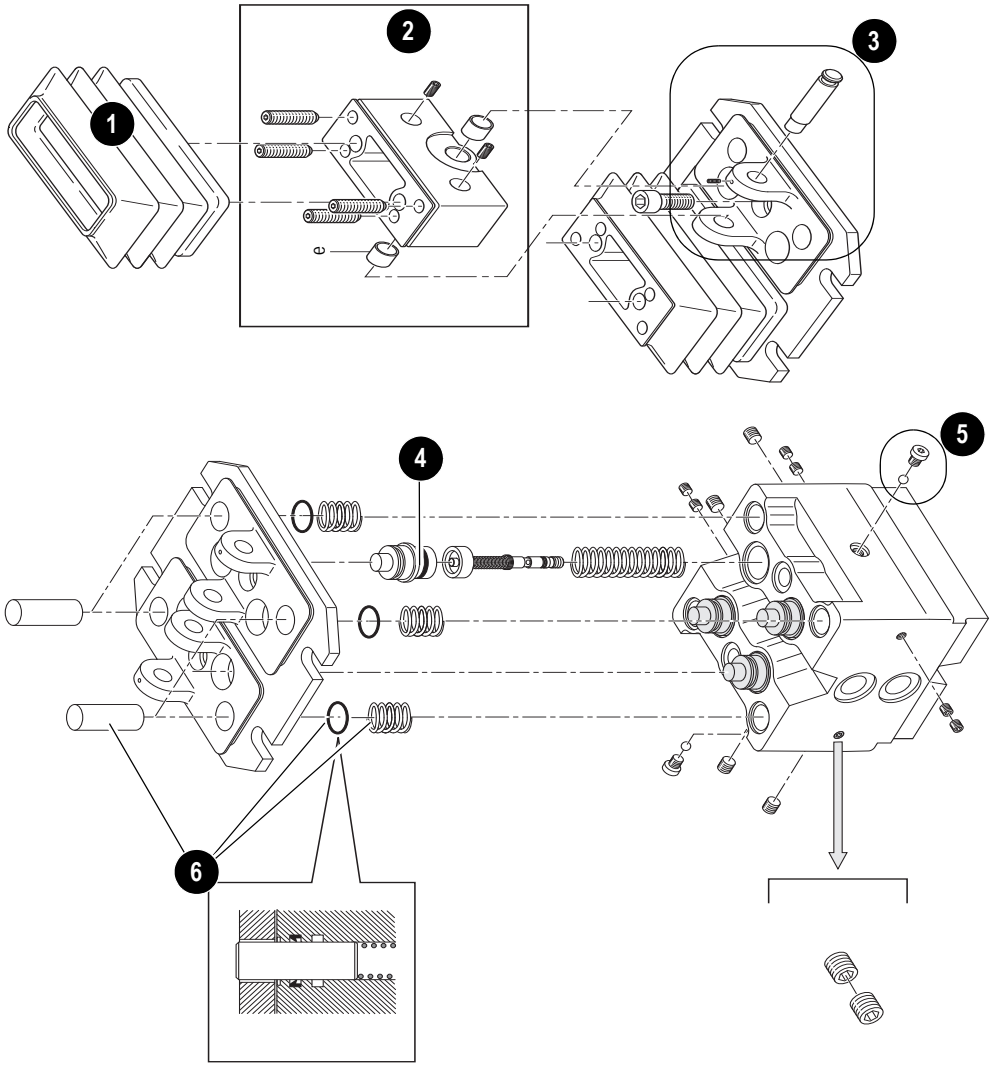


Characteristic curve for drive pilot valve



Pos.	Description
1	Left-hand side drive segment control
2	Left-hand side drive segment control
3	Right-hand side drive segment control
4	Right-hand side drive segment control
P	Pilot control pressure
T	Tank line
V	Pilot control filter

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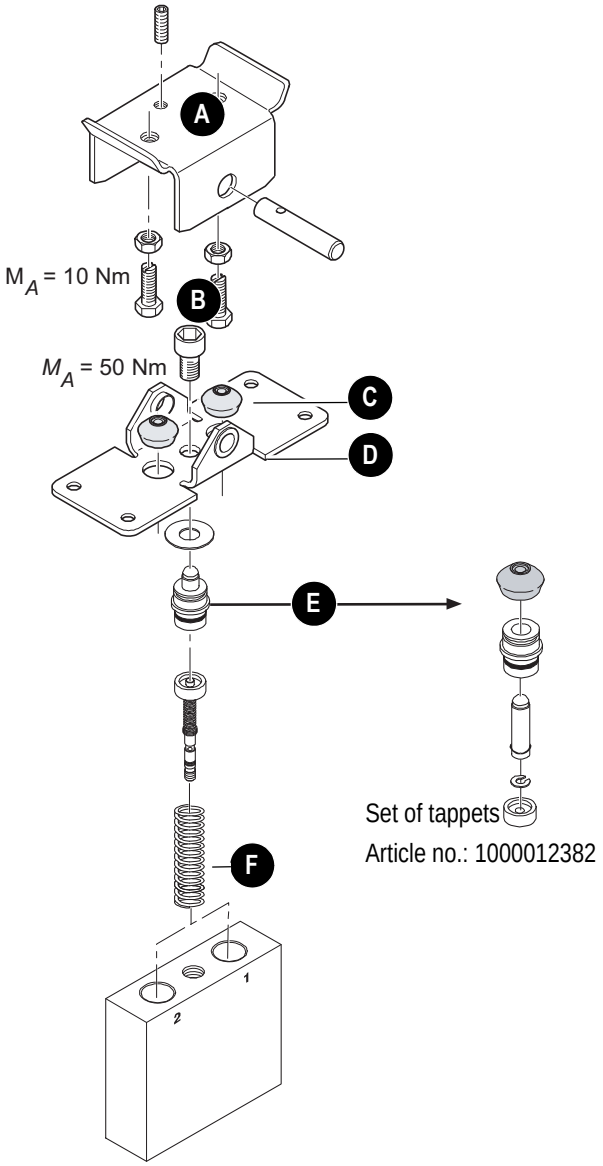


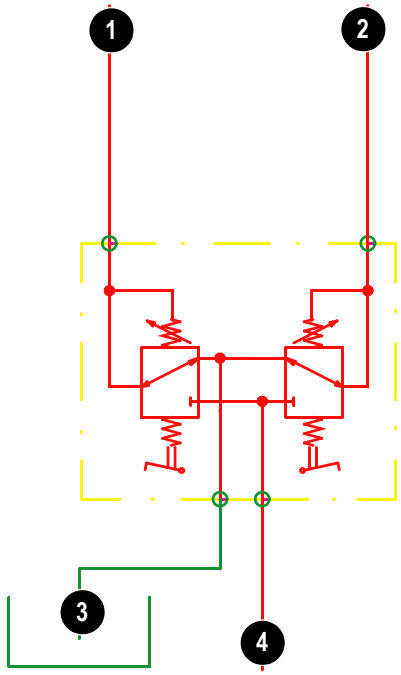
Pos.	Description
1	Bellows
2	Shift unit (kit)
3	Plate (kit)
4	Tappet
5	Non-return valve (also bleeds the pedal)
6	Damping

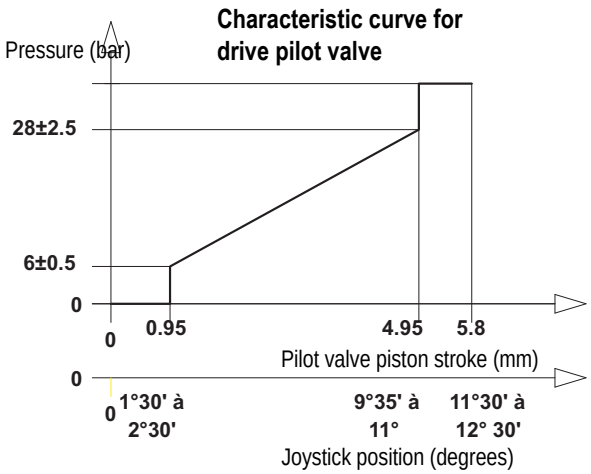
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Pilot valve for auxiliary hydraulics

- Pilot control unit with pedals for remote control of directional valves
- Consists of a pedal and two pressure reducing valves





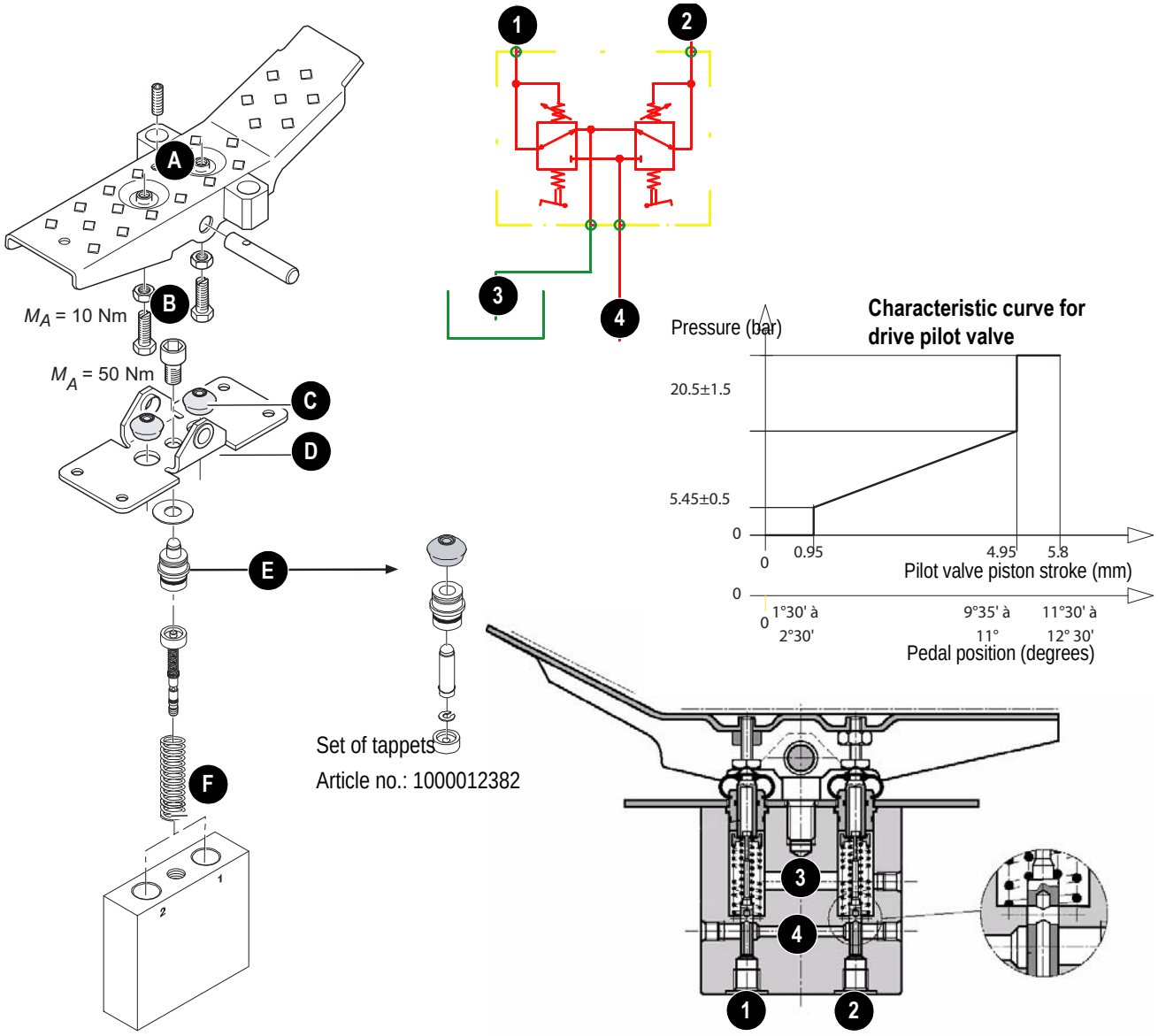


Pos.	Description	Pos.	Description
A	Pedal	1	Auxiliary hydraulics control/offset ram extension control
B	Pedal fixture	2	Auxiliary hydraulics control/offset ram retraction control
C	Protective caps	3	Tank line
D	Mounting plate	4	Supply from pilot oil supply unit
E	Tappet		
F	Spring		

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Pilot valve for stabiliser blade

- Pilot control unit with pedals for remote control of directional valves
- Consists of a pedal and two pressure reducing valves



☞ *Set pedal slack to minimum with screws **B** bearing in mind that the pedal does not actuate the valve pistons when it is in home position.*

Pos.	Description	Pos.	Description
A	Pedal	1	Stabiliser blade ram extension control
B	Pedal fixture	2	Stabiliser blade ram retraction control
C	Protective caps	3	Tank line
D	Mounting plate	4	Supply from pilot oil supply unit
E	Tappet		
F	Springs		

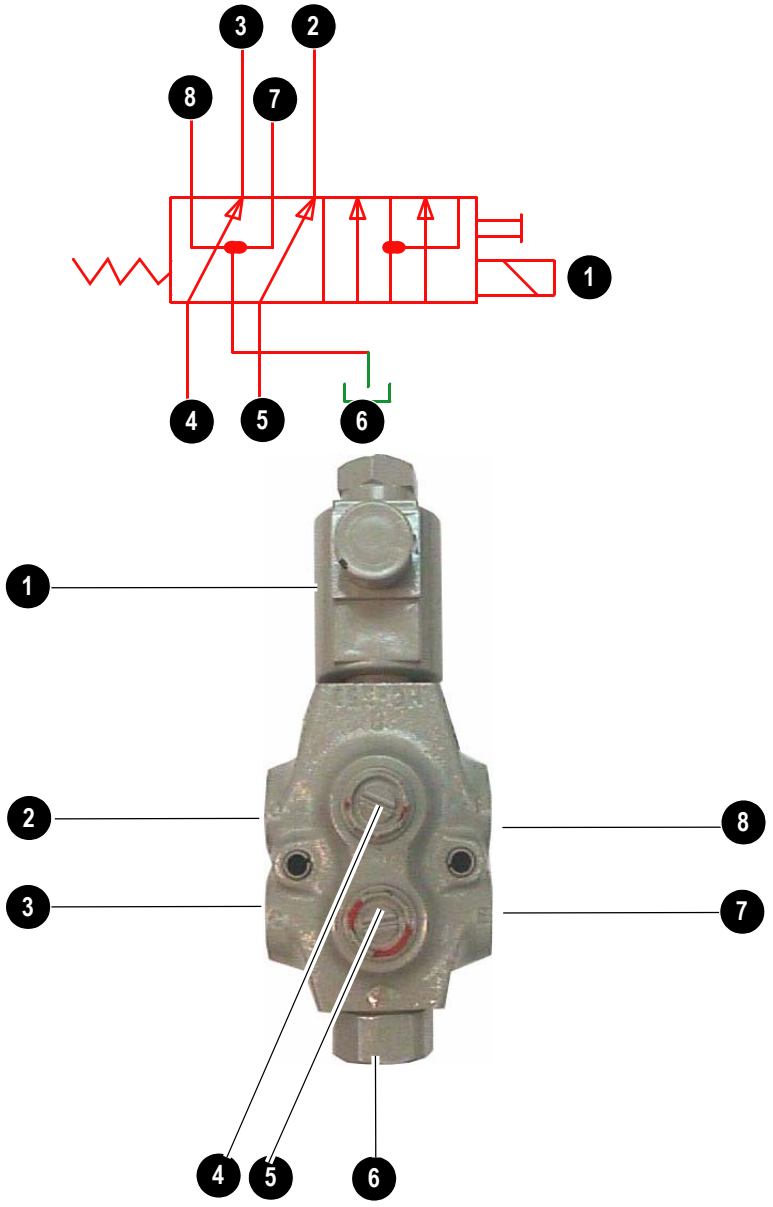
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5.10 Valves

7/2 directional valve (changeover valve)

Switches from auxiliary hydraulics (valve de-energised) to boom swivel and vice versa (valve energised).

Electric control via push button on left-hand side joystick.



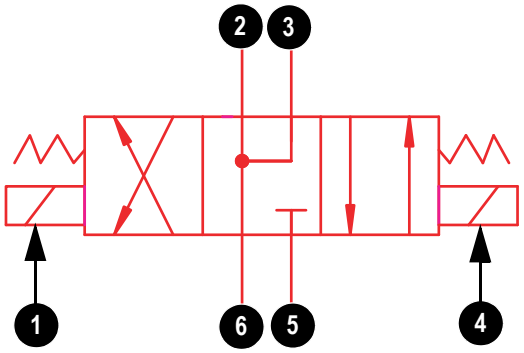
Pos.	Description
1	Solenoid
2	Main valve block for auxiliary hydraulics segment
3	Main valve block for auxiliary hydraulics segment
4	Pilot valve for auxiliary hydraulics
5	Pilot valve for auxiliary hydraulics
6	Tank line
7	Shuttle valve block/main valve block, offset ram retraction control
8	Shuttle valve block/main valve block, offset ram extension control

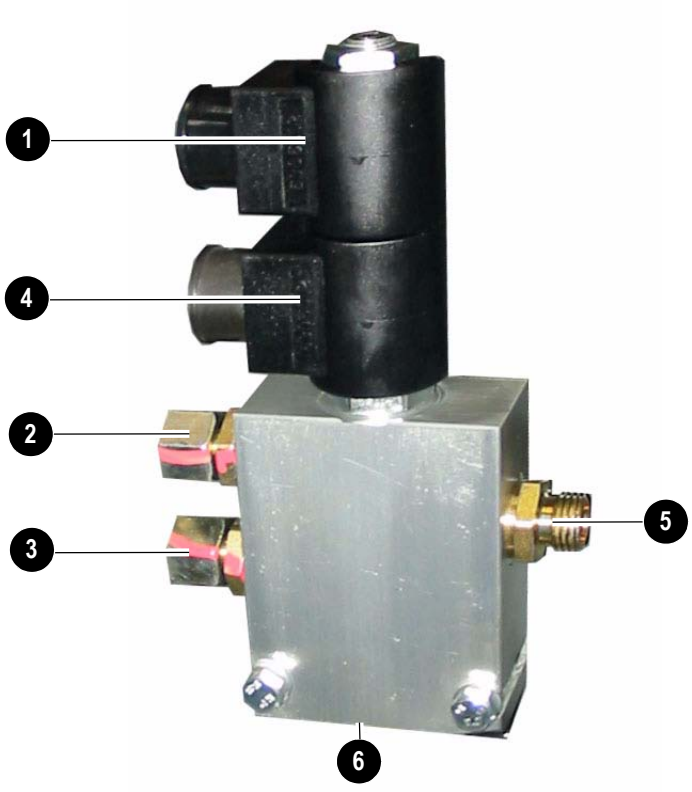
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4/3 directional valve

Used for electric auxiliary hydraulics and 3rd control circuit.

Valve is located in pilot control branch and is controlled via tip switches on left-hand side joystick.





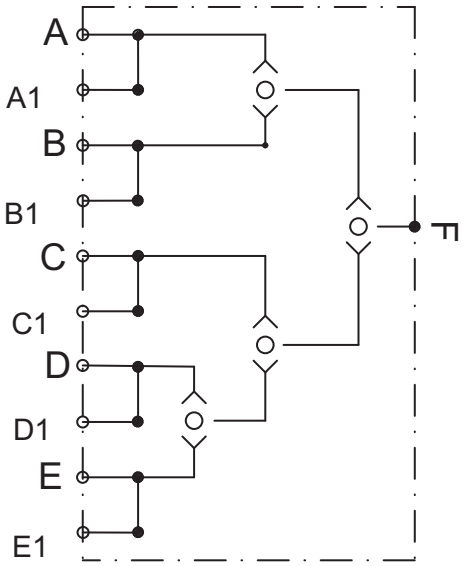
Pos.	Description
1	Solenoid 1
2	Main valve block for auxiliary hydraulics segment
3	Main valve block for auxiliary hydraulics segment
4	Solenoid 2
5	Supply from pilot oil supply unit
6	Tank line

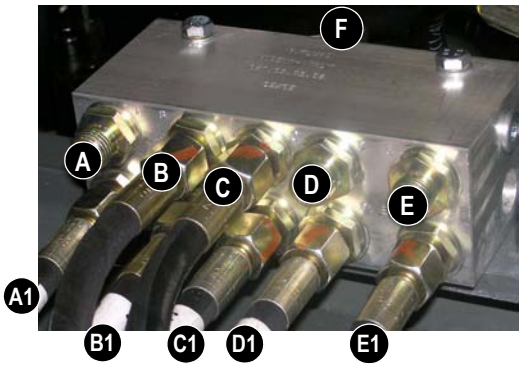
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Shuttle valve block

Actuating upper carriage rotation, boom swivel and stick retraction must release the gear motor's brake.

High forces act on the brake and destroy it if it is not released during these operations.





Pos.	Description
A	Right-hand side rotation control (from the joystick)
A1	Right-hand side rotation control (to the main valve block)
B	Left-hand side rotation control (from the joystick)
B1	Left-hand side rotation control (to the main valve block)
C	Offset ram extension control (from the joystick)
C1	Offset ram extension control (to the main valve block)
D	Offset ram retraction control (from the joystick)
D1	Offset ram retraction control (to the main valve block)
E	Stick ram extension control (from the joystick)
E1	Stick ram extension control (to the main valve block)
F	Gear motor brake release control

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Changeover valve for SAE/ISO controls (option)

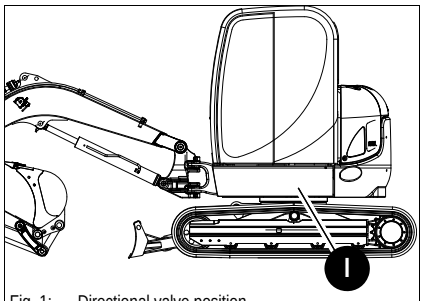


Fig. 1: Directional valve position

The directional valve is located on the left in base plate **I** of the chassis.

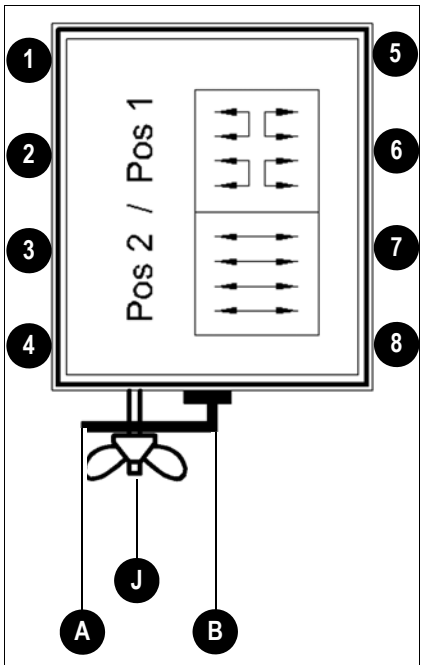


Fig. 2: Directional valve

Switching from ISO to SAE controls and vice versa with the directional valve

Position	Function
A	➥ ISO controls
B	➥ SAE controls

☞ *Tighten wing nut **J** after changing control mode.*

Danger!

Changing the directional valve over modifies the controls (control levers) –

Danger of accidents!

☞ *Make sure you know which control mode has been selected before starting work.*

☞ *Always secure wing nut **J** on the changeover lever of the directional valve.*

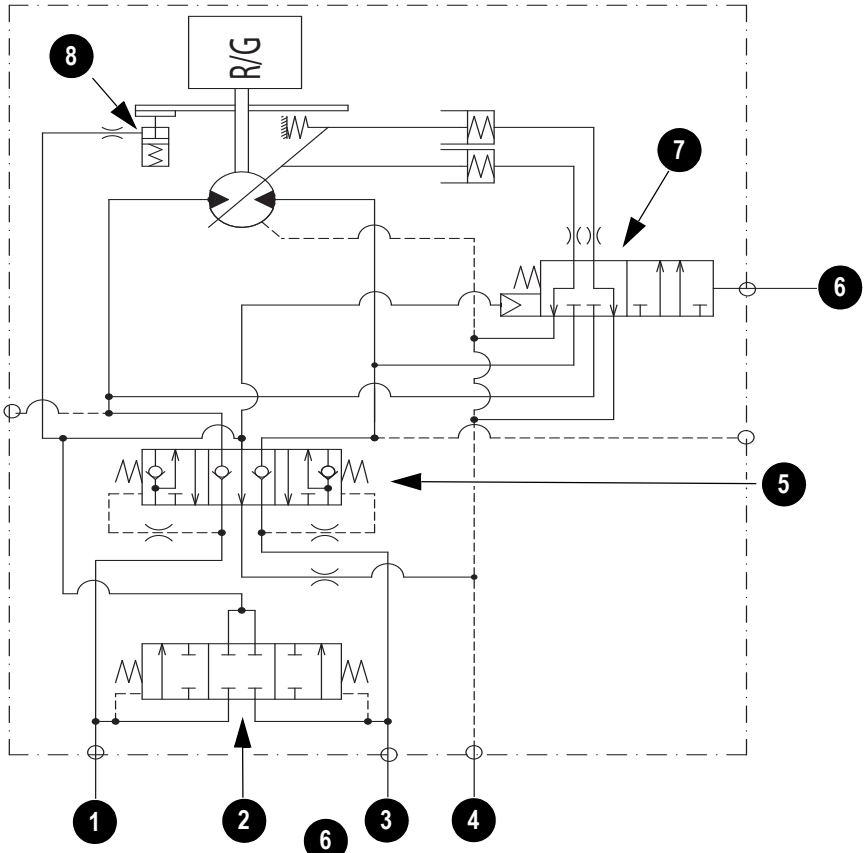
Directional valve ports	
1	Joystick (right) port 1
2	Main valve block, boom ram retraction control
3	Joystick (right) port 3
4	Main valve block, boom ram extension control
5	Main valve block, stick ram extension control
6	Joystick (left) port 1
7	Main valve block, stick ram retraction control
8	Joystick (left) port 3

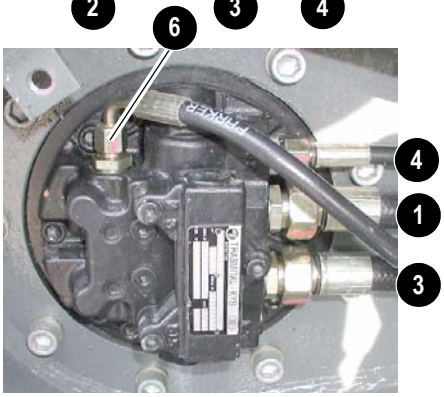
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5.11 Travelling drive

The travelling drive now has an “automatic powershift” gearbox. The travelling drive is basically in 2nd speed if the switch for 2nd speed range is switched on (high speed). 1st speed is automatically engaged if more power is required.

.





Pos.	Description
1	Drive port (-> swivel joint 4a/7a)
2	Brake release piston
3	Drive port (-> swivel joint 6a/5a)
4	Leak oil port (-> swivel joint 8a)
5	Brake piston
6	2nd speed range port (-> swivel joint 1a)
7	2nd speed range directional valve
8	Brake piston

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Function

Driving:

If high pressure is applied to one of the drive ports, the brake release piston is actuated first and passes high pressure on to the brake cylinder, which releases the brake. The throttle slowly actuates the brake piston at the same time. Brake piston control causes high pressure to be applied to the motor, which starts turning.

Stopping:

The oil flows from both ports to the tank upon releasing the joystick. The brake piston slowly returns to home position by means of the throttle orifices. The slow drop of the brake piston prevents the hydraulic motor from coming to an abrupt standstill. With the brake piston in neutral position, the ports are no longer connected to the motor, which can no longer turn. The brake release pressure is reduced via both throttles shortly afterwards.

2nd speed range function

Speed range 1

- 2nd speed range switch: switched off

The directional valve for the 2nd speed range remains in home position (position as shown in diagram), and the hydraulic motor's swash plate is in maximum capacity position.

➥ The motor runs at low speed.

Speed range 2

- 2nd speed range switch: switched on

The directional valve for the 2nd speed range is enabled, and the hydraulic motor's swash plate is in minimum capacity position.

➥ The motor runs at high speed.

If the pressure rises in the travelling drive, the directional valve for the 2nd speed range is forced back to home position and and hydraulic motor's swash plate returns to maximum capacity.

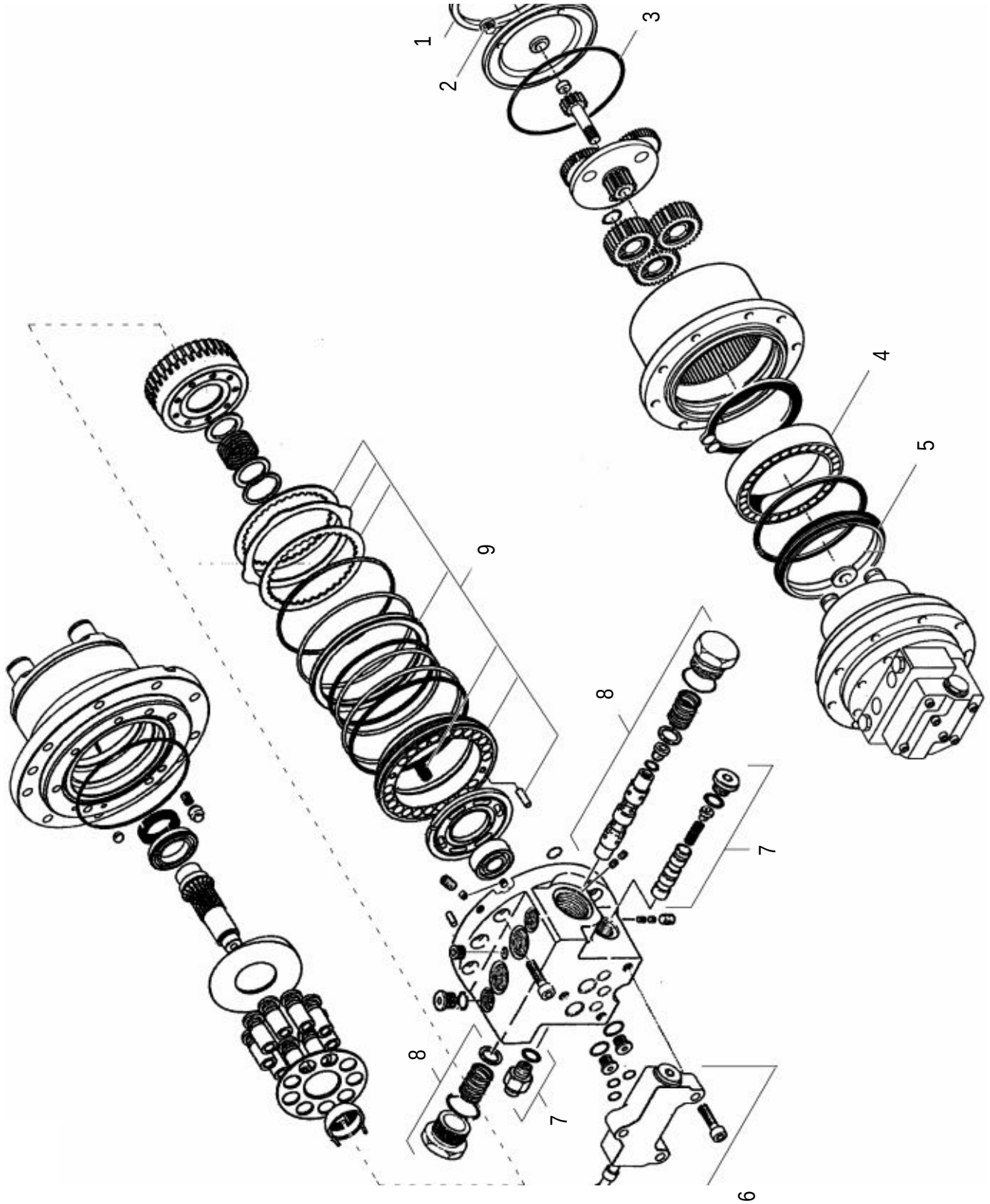
➥ The motor now runs at low speed.

The directional valve returns to 2nd speed range as soon as the pressure in the travelling drive drops again.

➥ The motor runs at high speed again.

Switch operating point of 2nd speed range valve: 180 bar (2611 psi)

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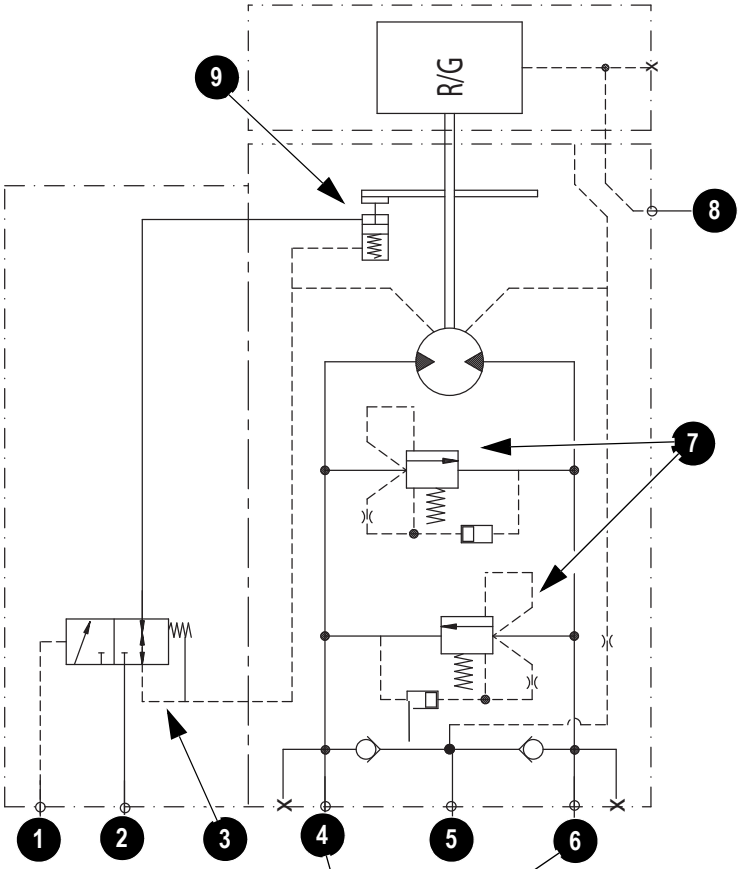
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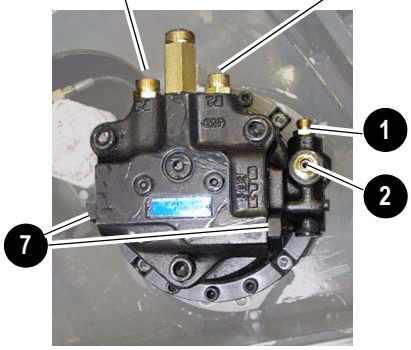
Pos.	Description
1	Circlip
2	Plug
3	O-ring
4	Bearing
5	Seal
6	Anticavitation valve
7	Piston valve for speed range
8	Brake valve
9	Engine brake set

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5.12 Swivel unit

Hydraulically controlled swash-plate piston motor with maintenance-free swivel gearbox and mechanical motor brake.





Pos.	Description
1	SH brake release port (-> shuttle valve block)
2	Pilot control pressure port (-> pilot oil supply unit)
3	Brake release valve
4	Right-hand side rotation port (-> main valve block)
5	Anticavitation line port (-> main valve block/tank)
6	Left-hand side rotation port (-> main valve block)
7	Shock anticavitation valves
8	Leak oil port (-> tank)
9	Brake piston

The shock anticavitation valves are dampened for smooth braking.

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Parking brake/multidisc brake function

Opening the brake

The shuttle valve block directs the pilot control pressure to the SH input if upper carriage rotation, boom swivel or stick retraction is carried out. The pilot control pressure at the SH input causes the piston in the brake release valve to shift to active state (brake release). This directs the pilot control pressure at the PG input to the brake cylinder and releases the brake.

- Movement: upper carriage rotation, boom swivel or stick retraction
- Pilot control pressure is present at the SH input.
- The piston of the brake release valve moves to work position.
- Pilot control pressure is directed to the brake piston.
- Brake is released.

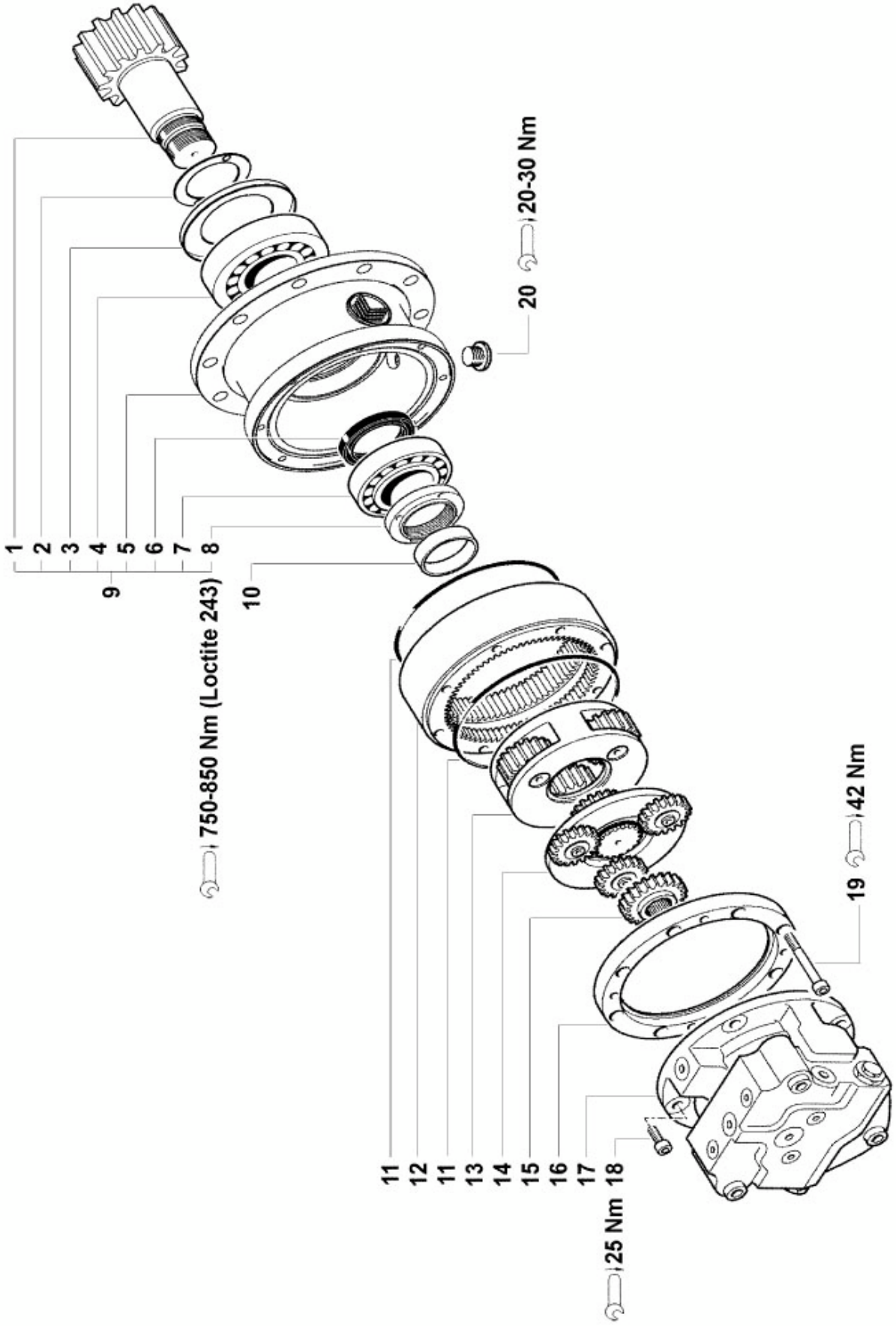
Closing the brake

The shuttle valve block causes the pilot control pressure to drop and the SH input is unpressurised upon termination of upper carriage rotation, boom swivel or stick retraction. The piston in the brake release valve switches to home position (brake) if there is no pressure at the SH input. The pressure in the brake cylinder escapes via the brake release valve to the leak oil system. This enables the brake with some delay (depending on oil viscosity and brake valve leakage).

- End of movement: upper carriage rotation, boom swivel or stick retraction
- The pilot control pressure at the SH input drops.
- The piston of the brake release valve moves to home position.
- No more pilot control pressure on the brake piston.
- The oil in the brake piston flows to the tank via a throttle orifice.
- The brake is enabled.

Time for releasing the brake: 3.7 sec ± 1.2 at 50 °C (122 °F) oil temperature

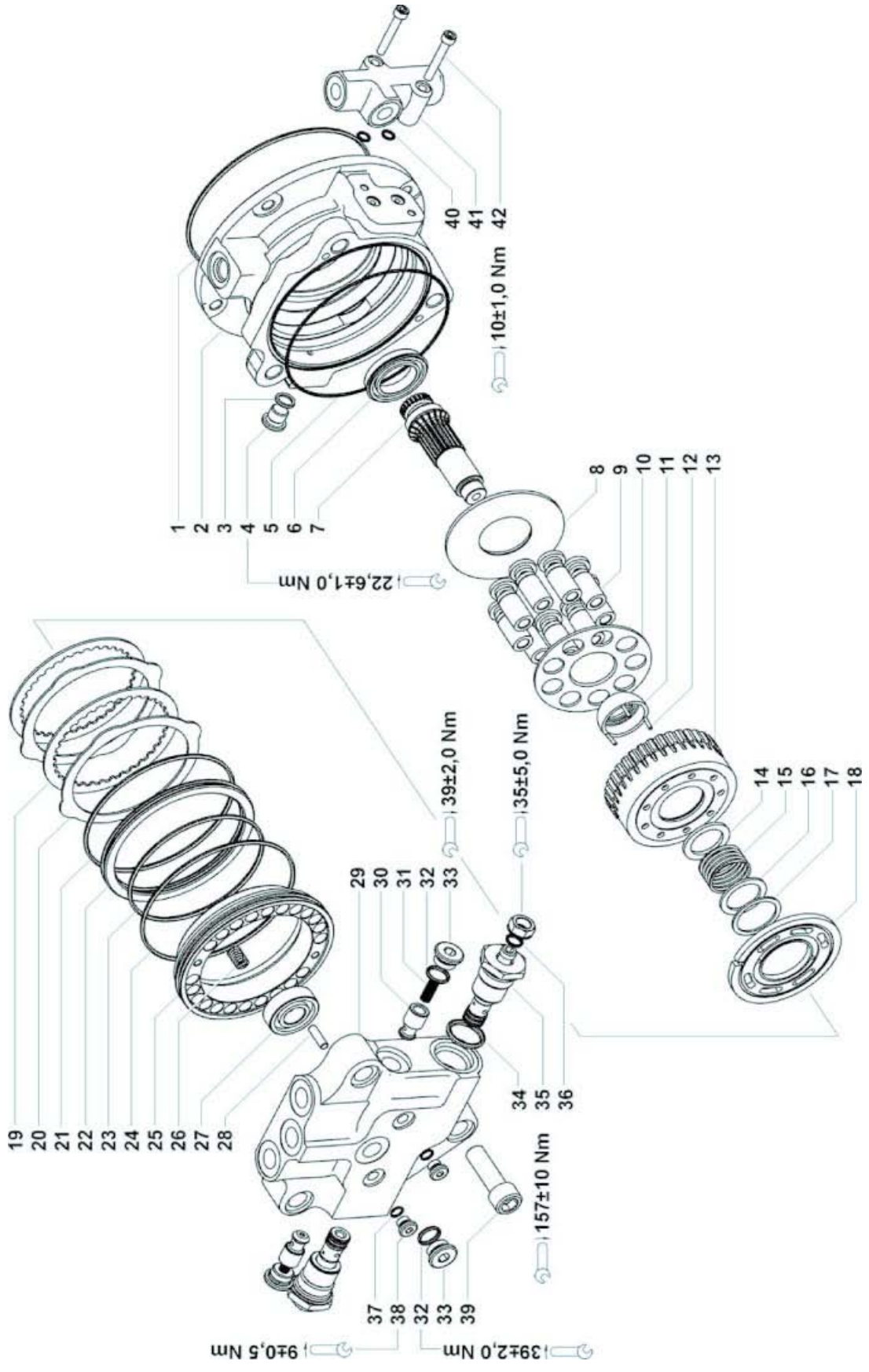
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Pos.	Description
1	Pinion shaft
2	Spacer washer
3	Bearing seal ring
4	Bearing
5	Gear housing
6	Sealing ring
7	Bearing
8	Round nut
9	Complete drive
10	Spacer washer
11	O-ring
12	Ring gear
13	Gear reduction
14	Gear reduction
15	Sun gear
16	Motor flange
17	Hydraulic motor
18	Screw
19	Screw
20	Plug

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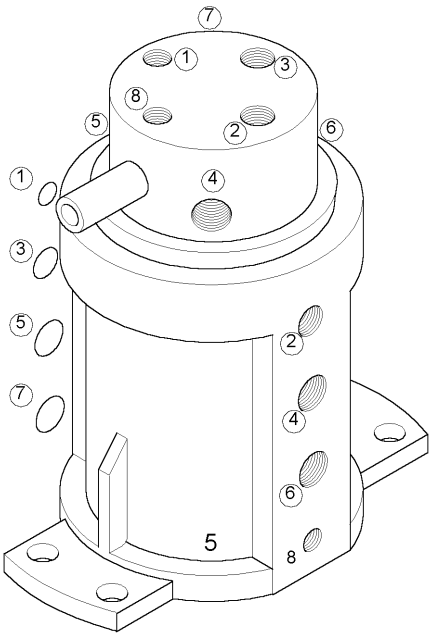
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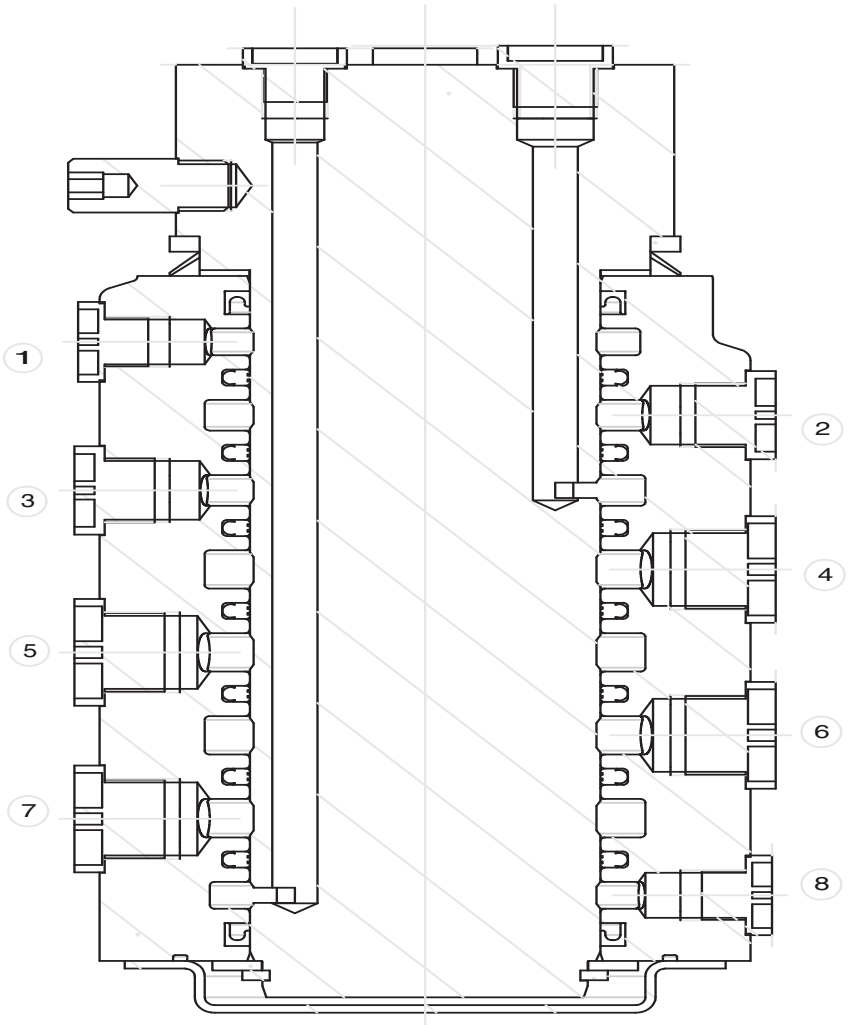
Pos.	Description
1	O-ring
2	Motor housing
3	O-ring
4	Plug
5	O-ring
6	Bearing
7	Motor shaft
8	Plate
9	Piston
10	Plate
11	Bush
12	Pin
13	Cylinder block
14	Plate
15	Spring
16	Plate
17	Circlip
18	Control disc
19	Parking brake steel ring
20	Brake disc
21	O-ring
22	Spacer washer
23	O-ring
24	O-ring
25	Parking brake piston
26	Brake piston spring
27	Bearing
28	Pin
29	Motor head
30	Anticavitation valve
31	Spring
32	O-ring
33	Plug
34	O-ring
35	Shock valve
36	O-ring
37	O-ring
38	Plug
39	Screw
40	O-ring
41	Brake release valve block
42	Screw

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5.13 Swivel joint

8-port swivel joint





Pos.	Description
1	High speed
2	Blade (base side)
3	Blade (rod side)
4	Drive (upper right)
5	Drive (upper left)
6	Drive (lower right)
7	Drive (lower left)
8	Leak oil

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5.14 Breather filter

The breather filter is in charge of:

- Air intake and outlet for pressure compensation in the hydraulic oil tank (varying oil level) – prevents the oil tank from inflating.
- Pre-tension of the oil tank to the specified overpressure -> supports the variable displacement pump's suction.
- Filtering the intake air.

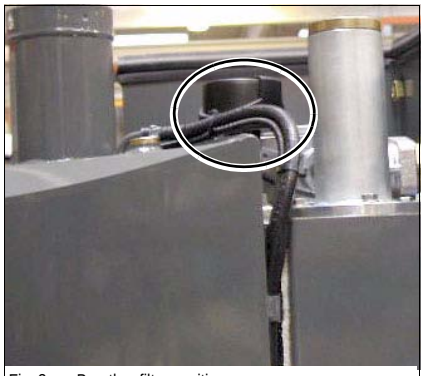


Fig. 3: Breather filter position

The breather filter is located under the tank cover, between the hydraulic filler inlet and the fuel filler inlet.

Replace the breather filter according to the instructions in the maintenance plan – *see Maintenance plan (overview)* on page 3-5.

Important!

The breather filter must be replaced at 1000 s/h.

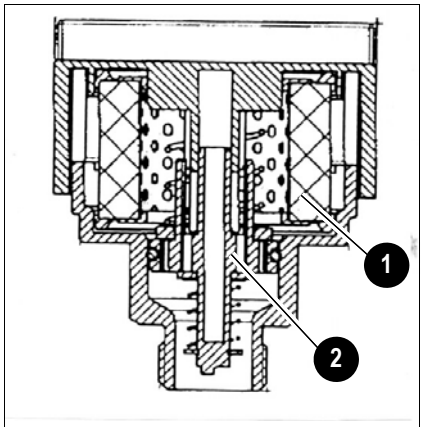


Fig. 4: Breather filter

Pos.	Description
1	Filter fabric
2	Bleeder valve

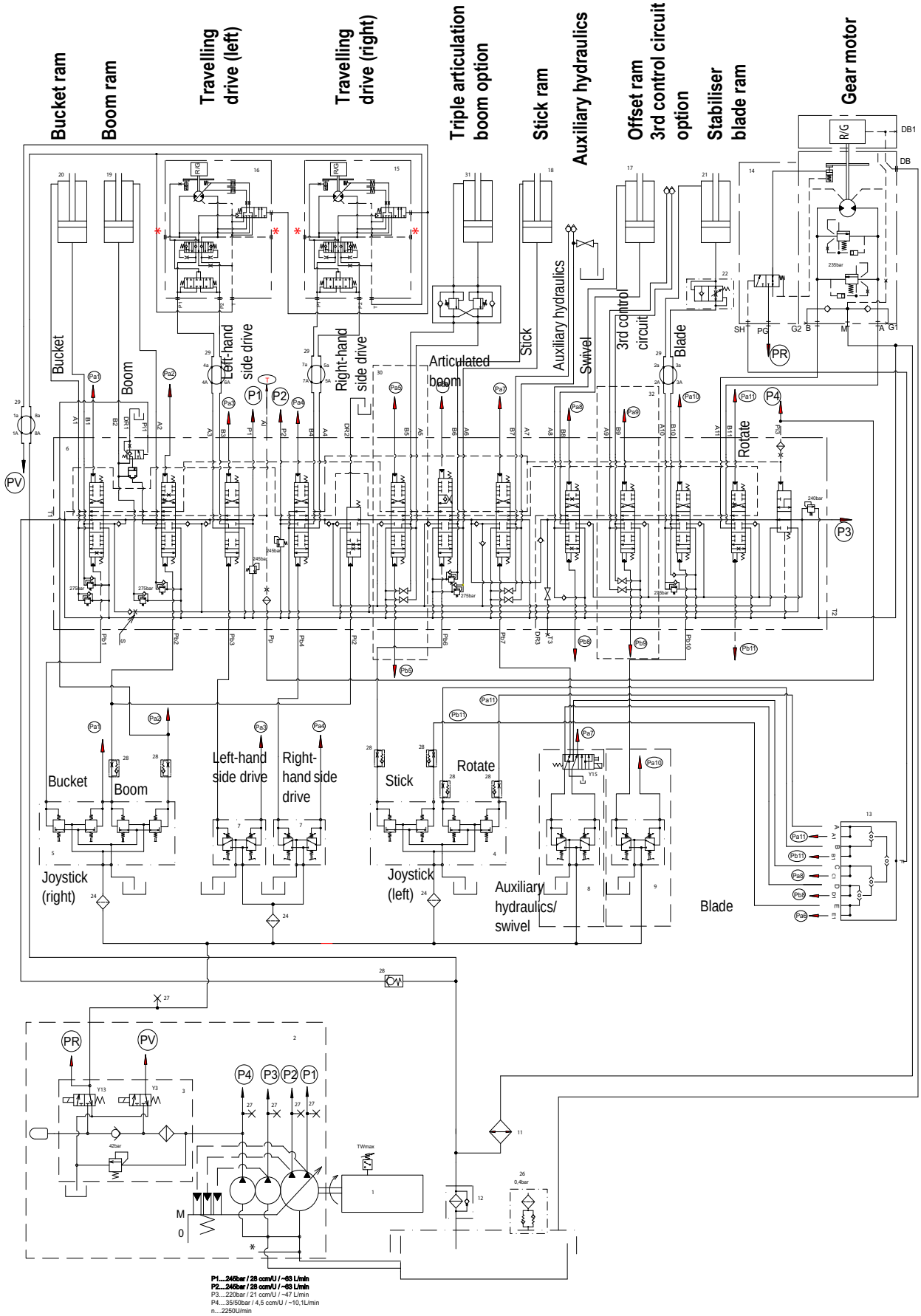
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5.15 Troubleshooting in the hydraulic system

Problem	Possible causes
Hydraulic system without function	Defective safety switch on control lever base
	Wrong setting of safety switch on control lever base
	Defective solenoid valve on pilot oil supply unit
	Contaminated solenoid valve on pilot oil supply unit
	Hydraulic oil level too low
	Defective valve fuses
	Defective/interrupted plug and socket connection towards solenoid valve
Hydraulic hammer does not work correctly.	Quickhitch couplings not connected correctly
	Hydraulic oil quantity too high/too low
	Hydraulic oil pressure too high/too low
Excavator runs in 1st speed only.	Defective switch for 2nd speed range
	Defective solenoid valve on pilot oil supply unit
	Contaminated solenoid valve on pilot oil supply unit
	Defective valve fuses
	Defective/interrupted plug and socket connection towards solenoid valve
	Counterpressure in travelling drive does not drop below control pressure

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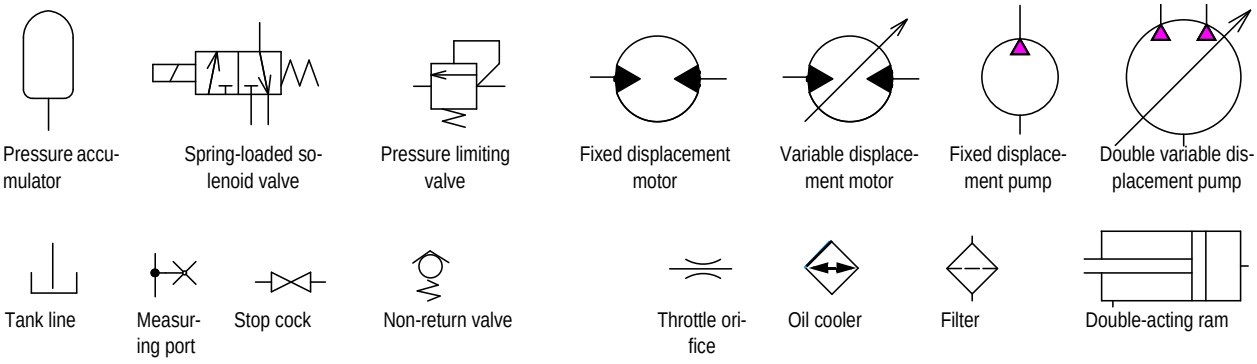
5.16 Hydraulics diagram A4



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5.17 Hydraulics diagram (legend)

Pos.	Description
1	Diesel engine
2	Variable displacement pump + gear pump
3	Pilot oil supply unit
4	Left-hand side joystick pilot valve
5	Right-hand side joystick pilot valve
6	Main valve block
7	Left-hand side drive pilot valve
8	Boom swivel pilot valve
9	Stabiliser blade pilot valve
10	Changeover valve: boom swivel/auxiliary hydraulics
11	Oil cooler
12	Oil filter
13	Shuttle valve block
14	Swivel unit
15	Travelling drive
16	Travelling drive
17	Offset ram
18	Stick ram
19	Boom ram
20	Bucket ram
21	Stabiliser blade ram
22	Hose burst valve
23	Electric pilot valve: auxiliary hydraulics (option)
24	Pilot control filter
25	Throttle non-return valve
26	Breather filter
27	Measuring port
28	Throttle non-return valve
29	Swivel joint
30	Triple articulation boom segment (option)
31	Triple articulation boom ram (option)
32	3rd control circuit segment (option)



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5.18 Hydraulics diagram A3

Gear motor

Stabiliser blade ram

Triple articulation boom option

Offset ram

Auxiliary hydraulics

Stick ram

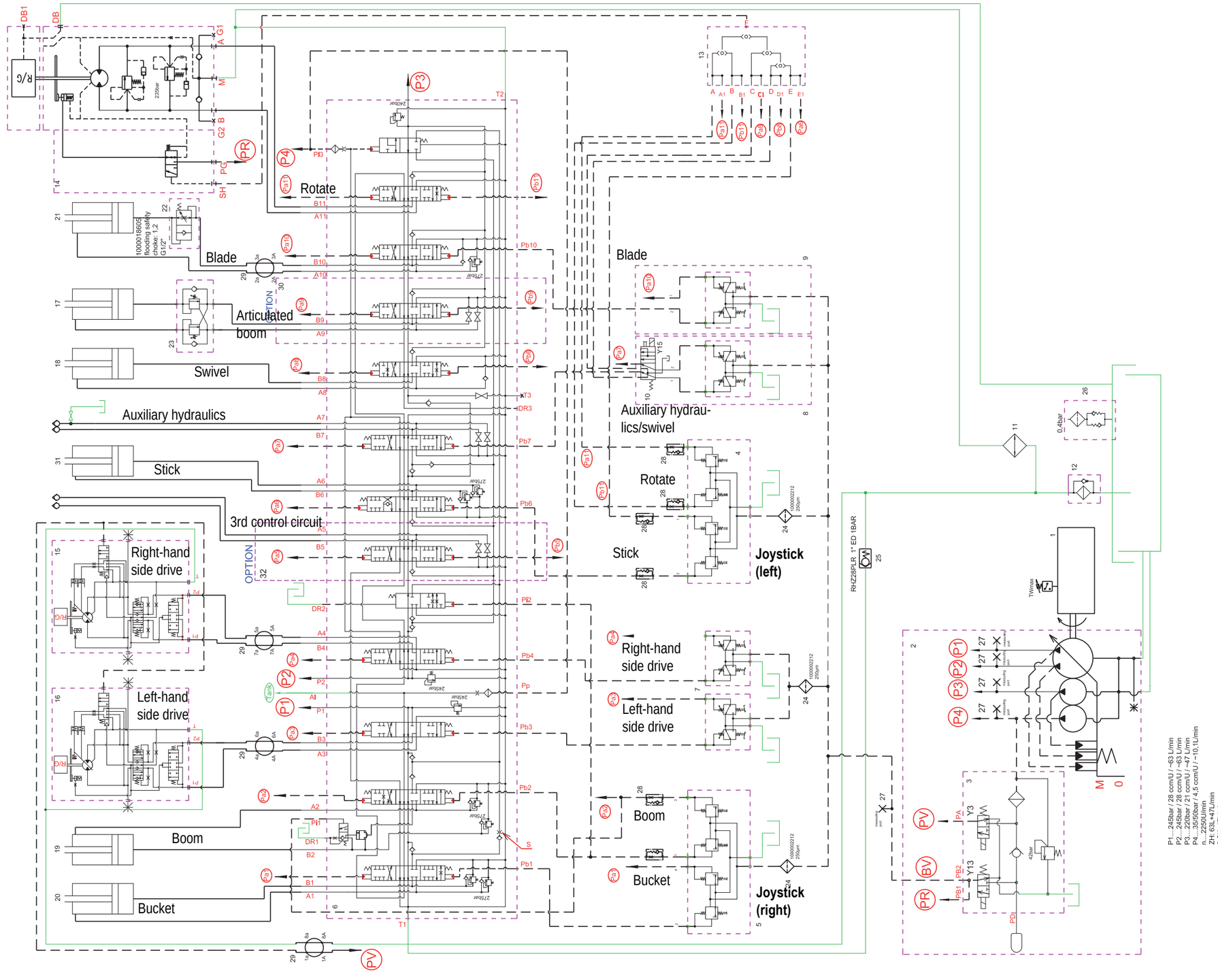
3rd control circuit option

Travelling drive (right)

Travelling drive (left)

Boom ram

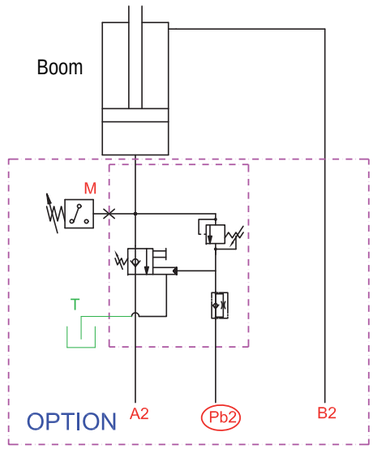
Bucket ram



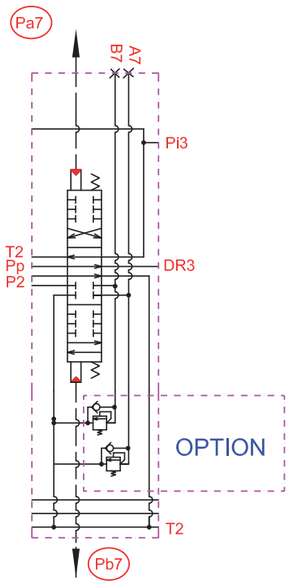
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5.19 Options diagrams 1 (from serial no. AC04070)

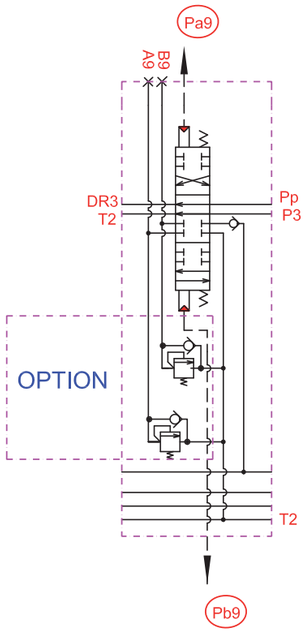
Safe load indicator DE



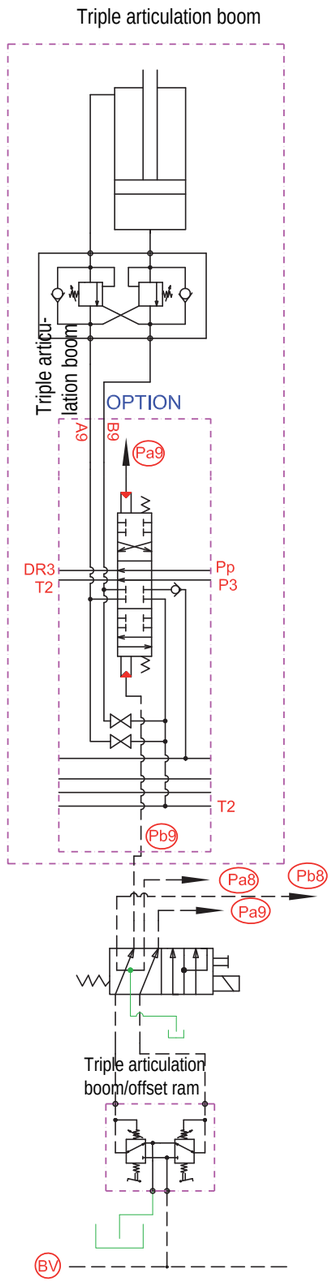
Auxiliary hydraulics shock cartridge



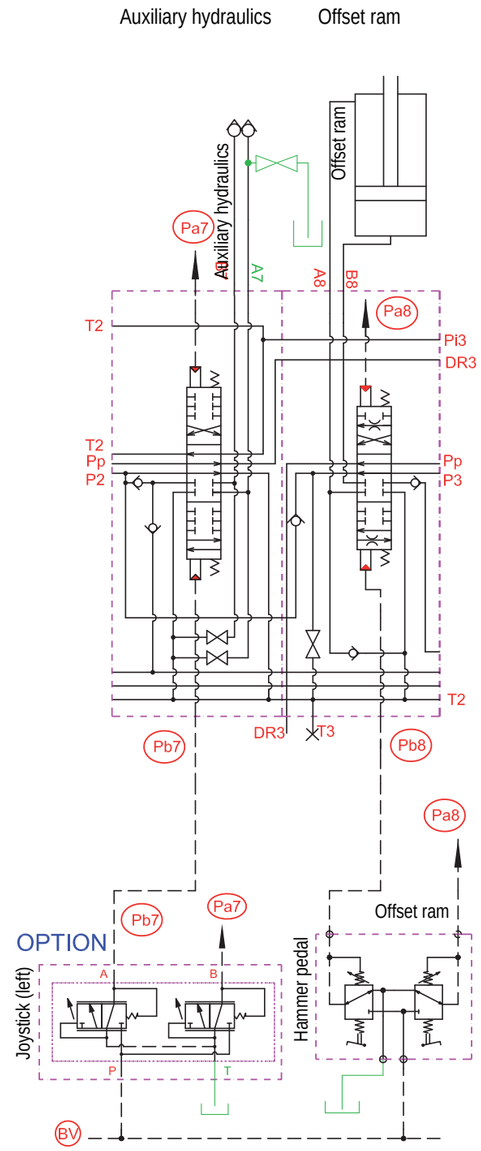
3rd control circuit shock cartridge



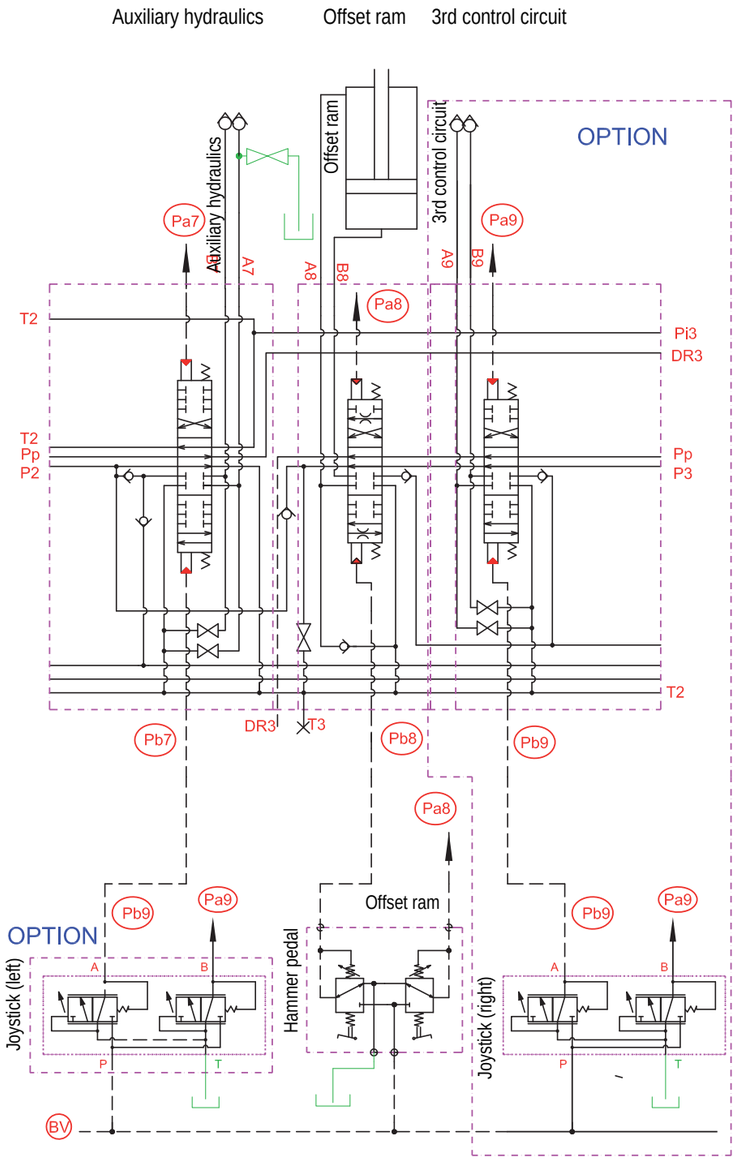
Triple articulation boom



Proportional controls (auxiliary hydraulics)



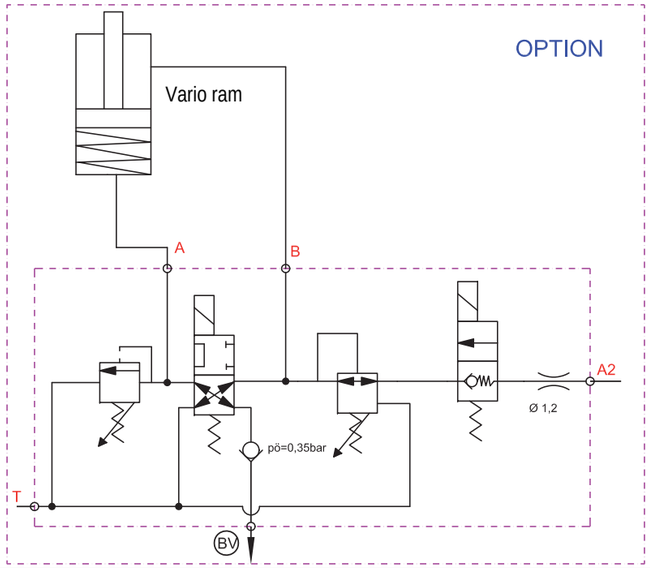
Proportional controls (auxiliary hydraulics) + 3rd control circuit (proportional)



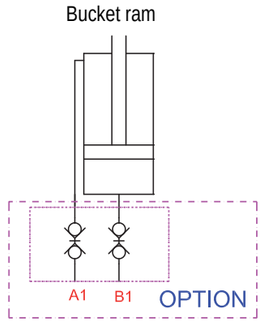
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5.20 Options diagrams 2 (from serial no. AC04070)

Vario

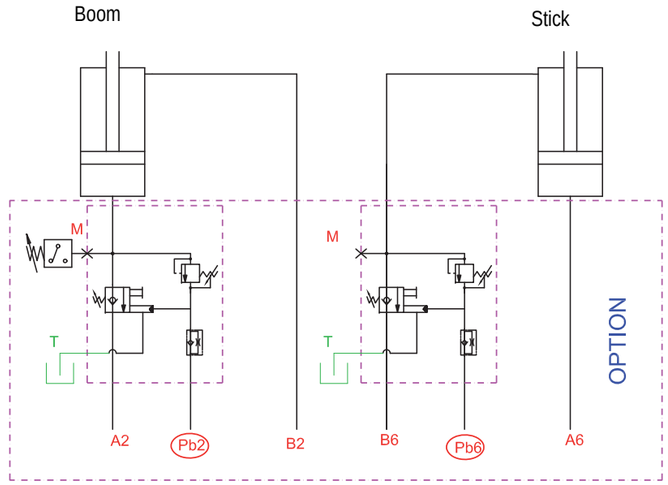


Grab

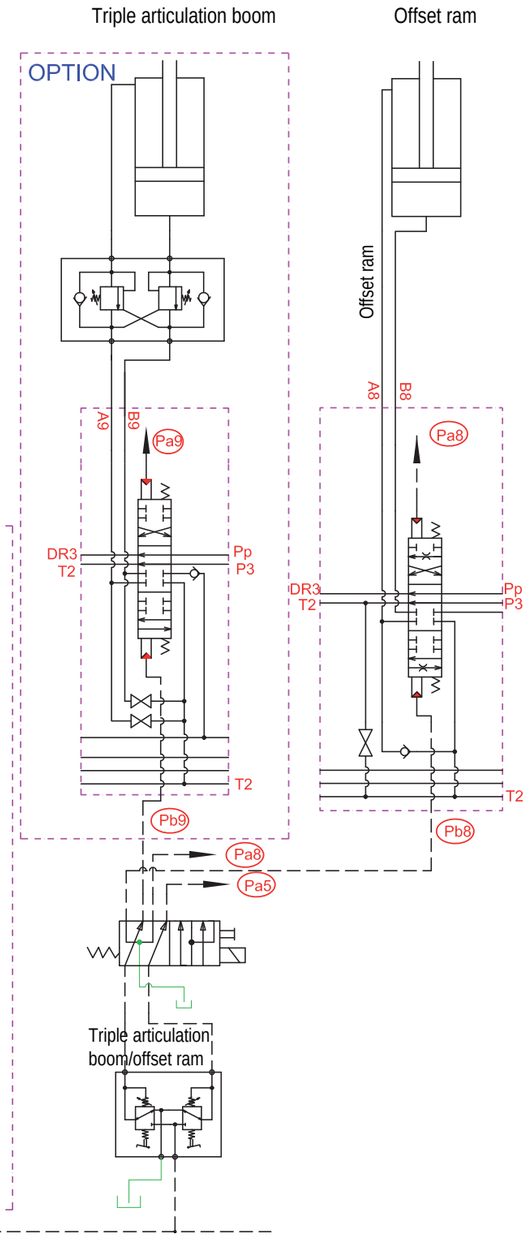


The grab is controlled by the bucket pilot valve.

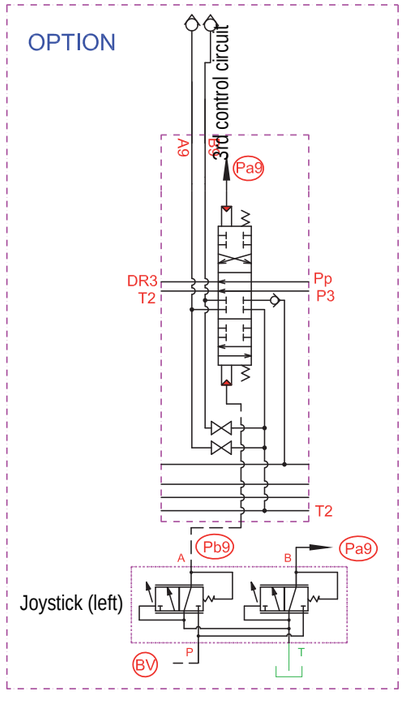
Safe load indicator FR



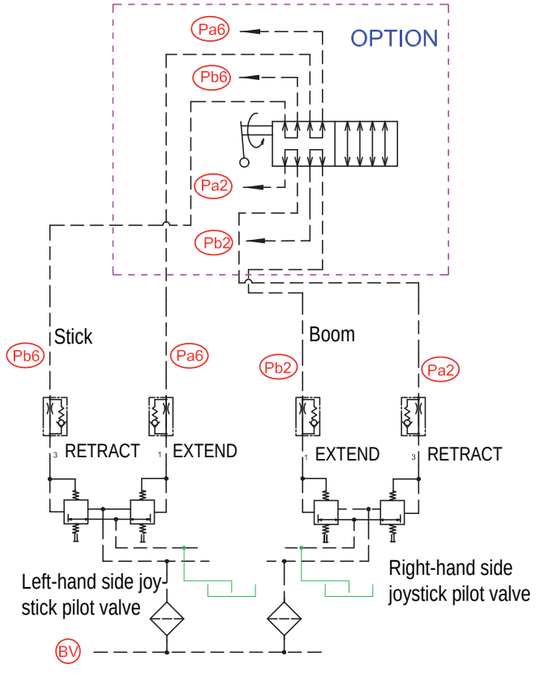
Triple articulation boom + 3rd control circuit (proportional) + proportional controls (auxiliary hydraulics)



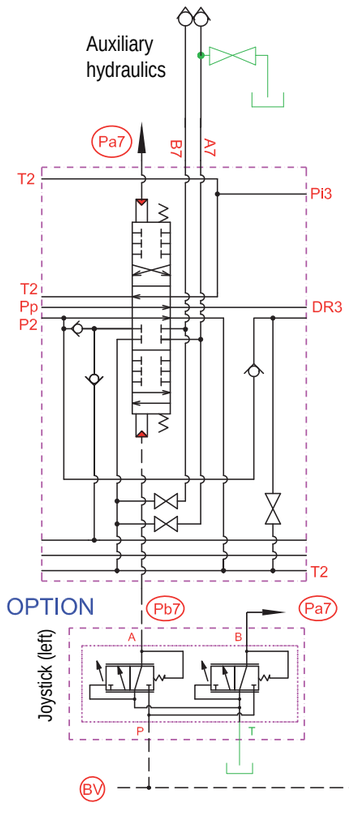
3rd control circuit



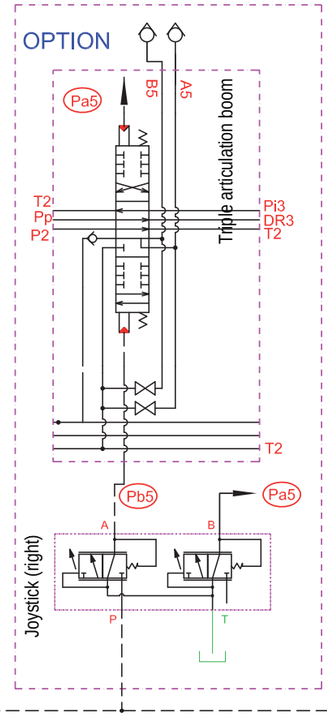
SAE valve



Auxiliary hydraulics

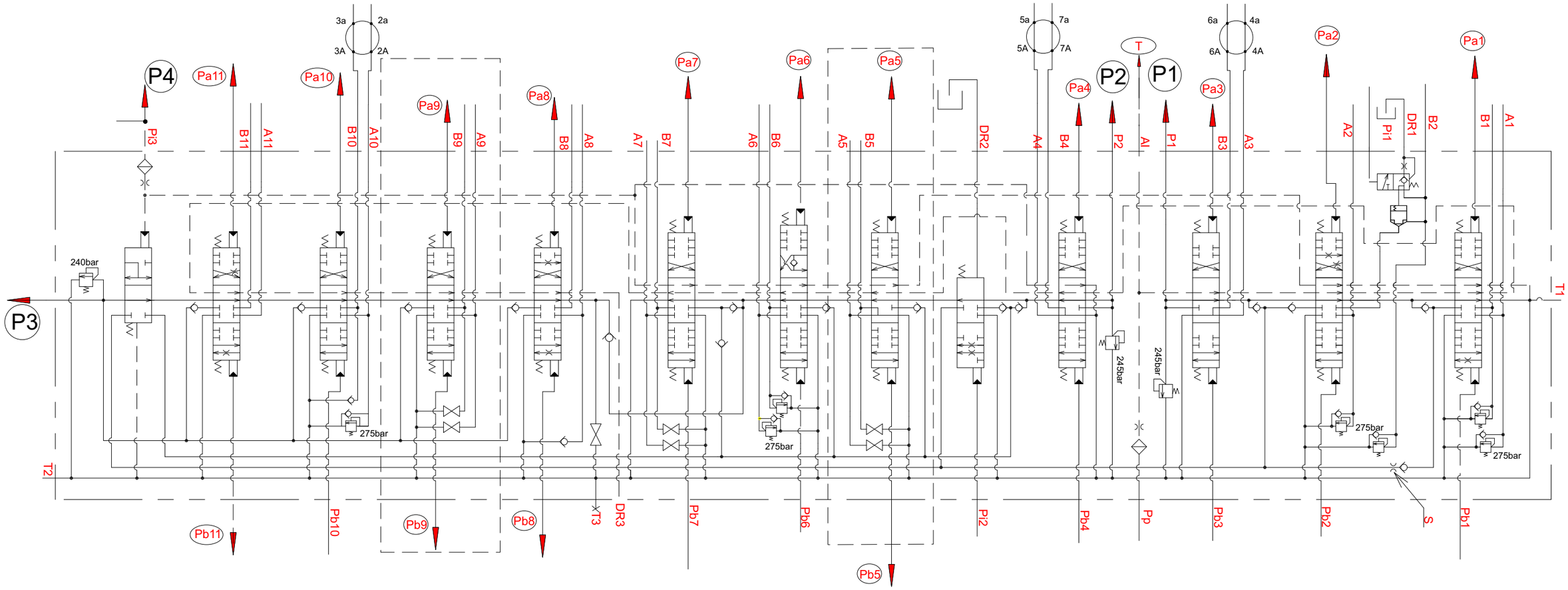


3rd control circuit



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5.21 Main valve block A3 diagram



Pilot control lines

Port	Legend	Controlled via
Pa1, Pb1	Bucket control	Joystick (left)
Pa2, Pb2	Boom control	Joystick (left)
Pa3, Pb3	Left-hand side drive control	Drive pedal (left)
Pa4, Pb4	Right-hand side drive control	Drive pedal (right)
Pa5, Pb5	Triple articulation boom control	– *see chapter 7.15 Triple articulation boom* on page 7-31
Pa6, Pb6	Stick control	Joystick (left)
Pa7, Pb7	Auxiliary hydraulics control	Auxiliary hydraulics pedal
Pa8, Pb8	Swivel control	Stabiliser blade pedal
Pa9, Pb9	3rd control circuit (control)	– *see chapter 7.14 3rd control circuit* on page 7-29
Pi1 Pi2	Boom summation control	Joystick (right)

Main control lines

Port	Legend
A1, B1	Bucket ram
A2, B2	Boom ram
A3, B3	Drive unit (left) via swivel joint
A4, B4	Drive unit (right) via swivel joint
A5, B5	Stick ram
A6, B6	Auxiliary hydraulics
A7, B7	Offset ram
A8, B8	Stabiliser blade ram
A9, B9	Gear motor

Pump/tank lines

Port	Legend
P1	Pump 1 port
P2	Pump 2 port
P3	Pump 3 port
P4	Pump 4 port
T1	Tank line via non-return valve and filter in tank
T2	Tank line via oil cooler and filter in tank
DR1, DR2	Tank lines for boom summation

S: bucket pre-tension – *see S: bucket pre-tension* on page 5-7

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Electric system

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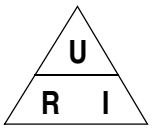
6 Electric system

6.1 Ohm's Law (current, voltage, resistance); power

It describes the interrelation between current, voltage and resistance.

Current "**I**" – Ampere (A)
Voltage "**U**" – Volt (V)
Resistance "**R**" – Ohm (ΩW)

Mnemonic:



Output
Power "P" – Watt (W)

$P = U \times I = R \times I^2 = U^2/R$

6.2 Measuring equipment, measuring methods

Multifunction measuring device

- Measurements of values (U, R, I, f)
- Continuity test
- Diode test

Calculate the measuring range using known data (P, U, R, I) and set before measuring.
Observe AC/DC basic setting:
➥ AC = alternating current/voltage;
➥ DC = direct current/voltage.

Test device with acoustic and optical signal output

- Continuity test in de-energised machine electric system and of wiring harnesses

Measuring methods – multifunction measuring device

- Measuring current (ignition switched on):
  - Black cable in COM socket (earth),
  - red cable in A socket or mA socket; connect in series to consumer.
- Measuring voltage (ignition switched on):
  - Black cable in COM socket (earth),
  - red cable in V socket;
  - connect in parallel to consumer.
  - Measuring resistance (ignition switched off):
  - Black cable in COM socket (earth),
  - red cable in Ω socket;
  - connect in parallel to consumer (see measuring voltage).

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Test lamp

The test lamp is used to test lines and functions with the ignition switched on.

- Line test (testing voltage):

Connect test lamp between test point (live cable) and machine earth or between test point (earth line) and a live cable.

- Functional check (testing current):

Connect test lamp between a connection on the consumer to be tested and the connection line.

6.3 Cable colour coding

Colour	Code
Black	blk
Brown	brn
Red	red
Orange	org
Yellow	yel
Green	grn
Blue	blu
Violet	vio
Grey	gry
White	wht
Pink	pnk

6.4 Relays

Use, mode of function

Relays are used for switching electric loads (high currents) whereby the control power of the relay coil is relatively low. Relays can therefore be controlled by microelectronics or microswitches (e.g. touchpad keyboards, sensors). The switch contacts can be make-contact, break-contact or changeover switches. These undertake the actual switching function.

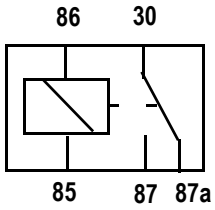


Fig. 5: Terminal description on relay

Zero-centre relay

86 = Start of coil (control line)
85 = End of coil (earth)
30 = Input (load line)
87 = Make-contact switch output (load line)
87 a= Break-contact switch output (load line)

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6.5 Electric units

Units	
Alternator	12 V 55 A
Starter	12 V 2.3 kW (3.1 hp)
Battery	12 V 88 Ah
Socket	E.g. for cigarette lighter; 15 A max.

6.6 Fuse box on the instrument panel up to serial no. AD07210

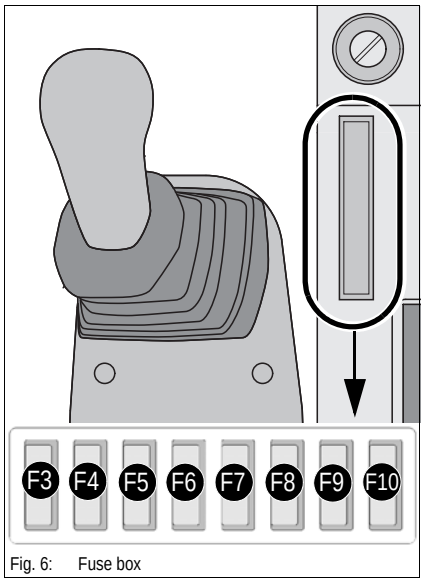


Fig. 6: Fuse box

Fuse no.	Rated current (A)	Protected circuit
F3	10 A	– Indicators, engine relay
F4	10 A	– Boom working light
F5	15 A	– Cab working lights
F6	10 A	– Valves, horn
F7	15 A	– Heating, air conditioning
F8	10 A	– Wiper, interior light
F9	10 A	– Rotating beacon, radio, drive interlock
F10	15 A	– Socket, cigarette lighter

6.7 Main fuse box with relays up to serial no. AD07210

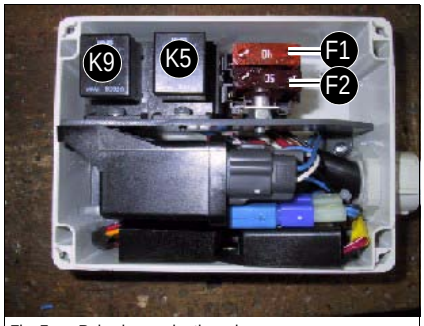


Fig. 7: Relay box under the cab

The main fuse box is located under the cab, next to the swivelling console.

Fuse no.	Rated current (A)	Protected circuit
F1	40 A	– Start, preheat, cutoff solenoid
F2	50 A	– Fuel-filling pump, main fuse, ignition lock

Relay no.	
K 9	– Cutoff solenoid switching relay
K 5	– Preheating high current relay

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6.8 Relays

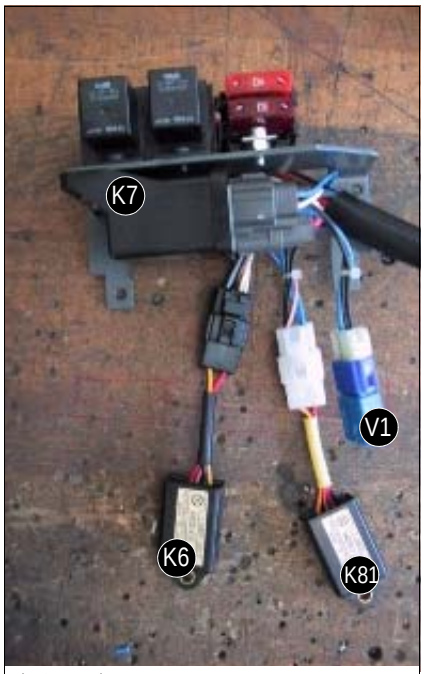


Fig. 8: Relays

The relays are located in the relay box under the cab, next to the swivelling console.

Switching relay no.	Protected circuit
K 6	– Preheating timer (telltale only); black plug t = 10 s
K 7	– Starting relay
K 8	– Cutoff solenoid timer; white plug t = 1 s
V 1	– Cutoff solenoid recovery diode

6.9 Fuse box on the instrument panel from serial no. AH00645

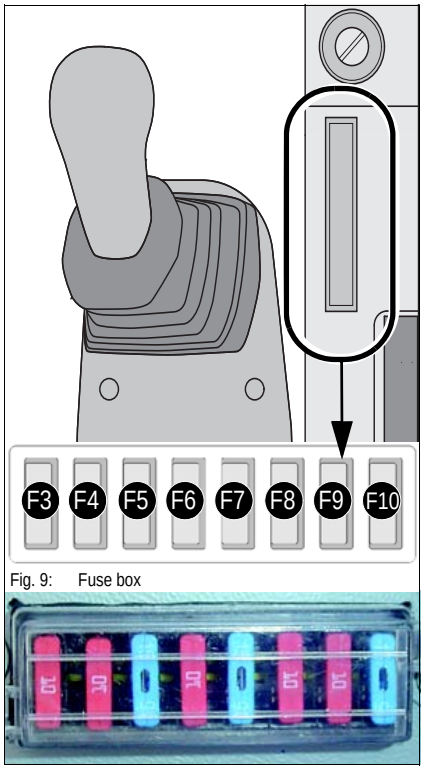


Fig. 9: Fuse box

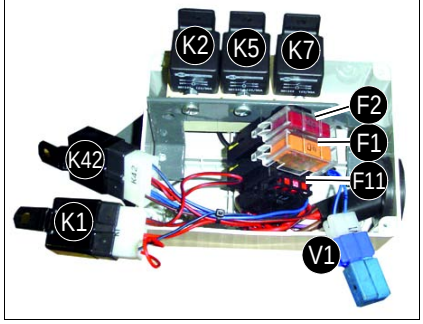
Fuse no.	Rated current (A)	Protected circuit
F3	10 A	Displays, E-ECU
F4	10 A	Boom light
F5	15 A	Roof lights
F6	10 A	Valves, horn
F7	15 A	Heating, air conditioning
F8	10 A	Wiper, interior light
F9	10 A	Rotating beacon, radio
F10	15 A	Socket, cigarette lighter

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6.10 Main fuse box with relays from serial no. AH00645



Fig. 10: Main fuse box under the cab



Main fuse box X is located under the cab, next to the swivelling console.

Fuse no.	Rated current (A)	Protected circuit
F1	40 A	– Start, preheat
F2	50 A	– Fuel-filling pump, main fuse, ignition lock
F11	10 A	– E-ECU, engine relay

Relay no.	
K1	– Engine electronics main relay
K2	– Fuel-filling pump relay
K5	– Preheating high current relay
K7	– Start high current relay
K42	– Fuel injection pump relay
V1	– Blocking diode

6.11 ECU from serial no. AH00645

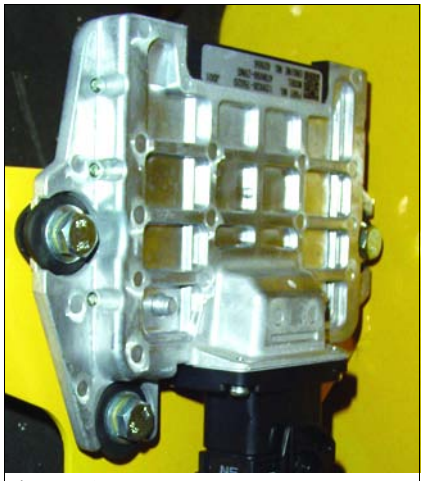


Fig. 11: ECU

The ECU is located above the main fuse box, under the cab.

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6.12 Socket

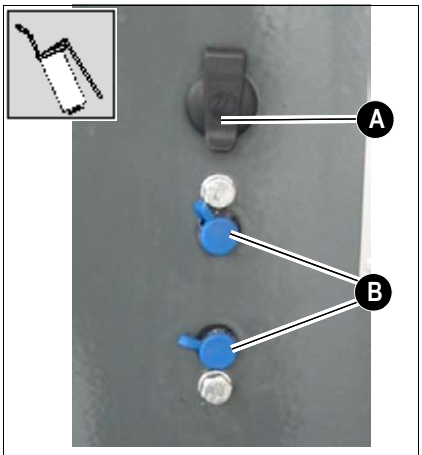


Fig. 12: Lubrication strip on the chassis

The socket **A** is located above the lubrication strip **B**.

6.13 Joystick tip switches

Joystick (left)

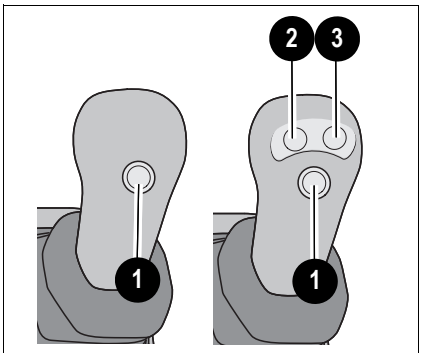


Fig. 13: Left-hand side joystick (standard and option)

Pos.	Description
1	Changeover between “Boom swivel” and auxiliary hydraulics (S27)
2	Tip switch for additional control circuit (S30)
3	Tip switch for additional control circuit (S31)

Joystick (right)

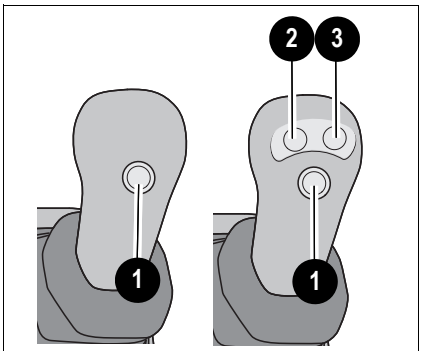
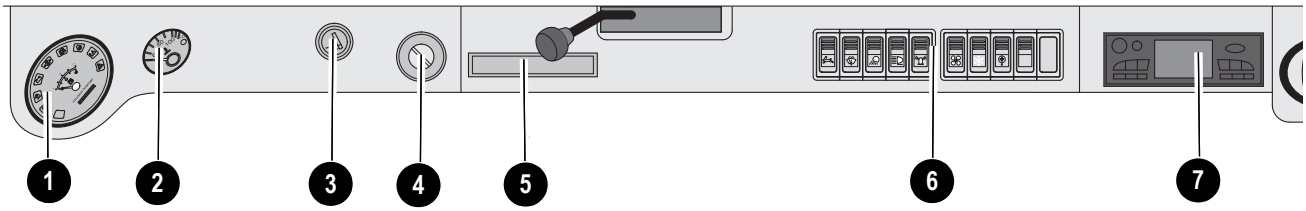


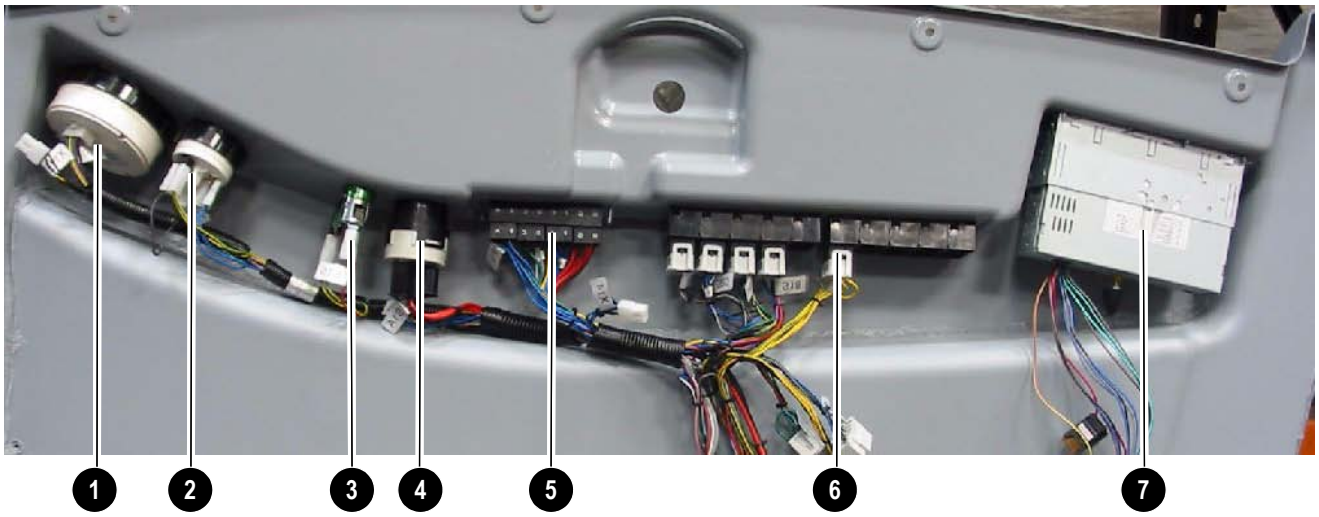
Fig. 14: Right-hand side joystick (standard and option)

Pos.	Description
1	Horn (S55)
2	Not assigned
3	Automatic idling speed feature (S48)

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6.14 Instrument panel overview

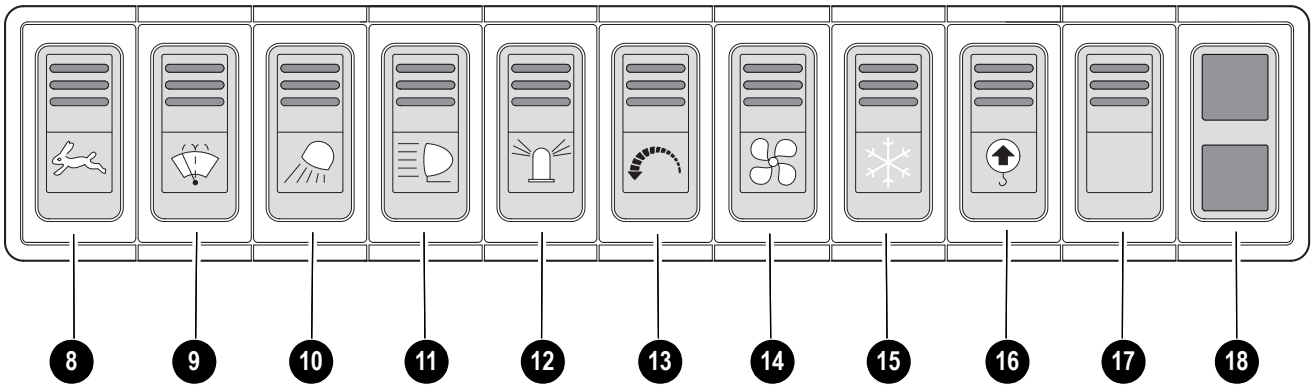




Pos.	Description
1	Instrument panel (X10)
2	Temperature indicator – diesel engine (X13)
3	Cigarette lighter (E15)
4	Preheating start switch (S1)
5	Fuse box (– *see Fuse box on the instrument panel up to serial no. AD07210* on page 6-3)
6	Switch panel
7	Radio option (A1)

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6.15 Switches: overview



Pos.	Description
8	Switch – high speed (S21)
9	Switch – wiper/washer system (S20)
10	Switch – boom working light (S16)
11	Roof lights (option) switch (S17)
12	Rotating beacon (option) switch (S18)
13	Automatic revs setting switch
14	Switch – ventilation (S15)
15	Air conditioning (option) switch (S51)
16	Safe load indicator (option) switch (S42)
17	Not assigned
18	Proportional controls switch

6.16 Alternator



Fig. 15: Alternator

The alternator charges the battery and supplies direct current to electric consumers.

Pos.	Description
1	Connection B (battery)
2	Connection P starting relay
	Connection IG telltale (12 V)
	Connection L telltale (earth)

6.17 Starter

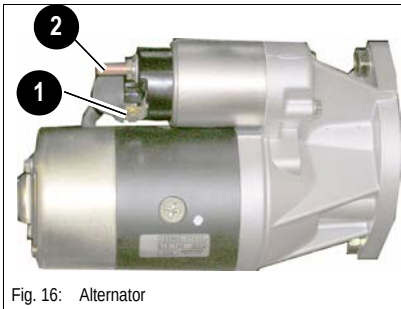


Fig. 16: Alternator

Pos.	Description
1	Connection S starting relay
2	Connection B battery

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Wiring harnesses: overview

Wiring diagrams include all options.

6.18 Wiring diagram A4 up to serial no. AC02888 (legend)

No.	Description	Section	
A1	Radio	E14	Option
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Option
B12	Loudspeaker	E15	Option
E7	Rear roof lights	F14	Option
E9	Front roof light	F13	Option
E10	Front roof light		Option
E11	Boom light	F8/9	
E14	Interior light	E/F13	
E15	Cigarette lighter	A14	
F1	Main fuse: starter, preheating	E2	
F2	Main fuse + fuel-filling pump	E1	
F3	Indicators, engine relay	A5	
F4	Boom working light	A7	
F5	Cab working lights	A8	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A10	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio, drive interlock	A13	
F10	Socket, cigarette lighter	A14	
G1	Alternator	F3	
G2	Battery	F1	
H2	Preheating telltale	B3	
H3	Engine temperature telltale	B3	
H4	Engine oil pressure telltale	B3	
H5	Alternator charge function telltale	B3	
H6	Air filter telltale	B3	
H7	Hydraulic oil filter telltale	B3	
H9	Safe load indicator telltale	C3	Option
H28	Rotating beacon	F13	Option
H33	Spare telltale	B3	
H30	Spare telltale	C3	
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	D5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	E3	

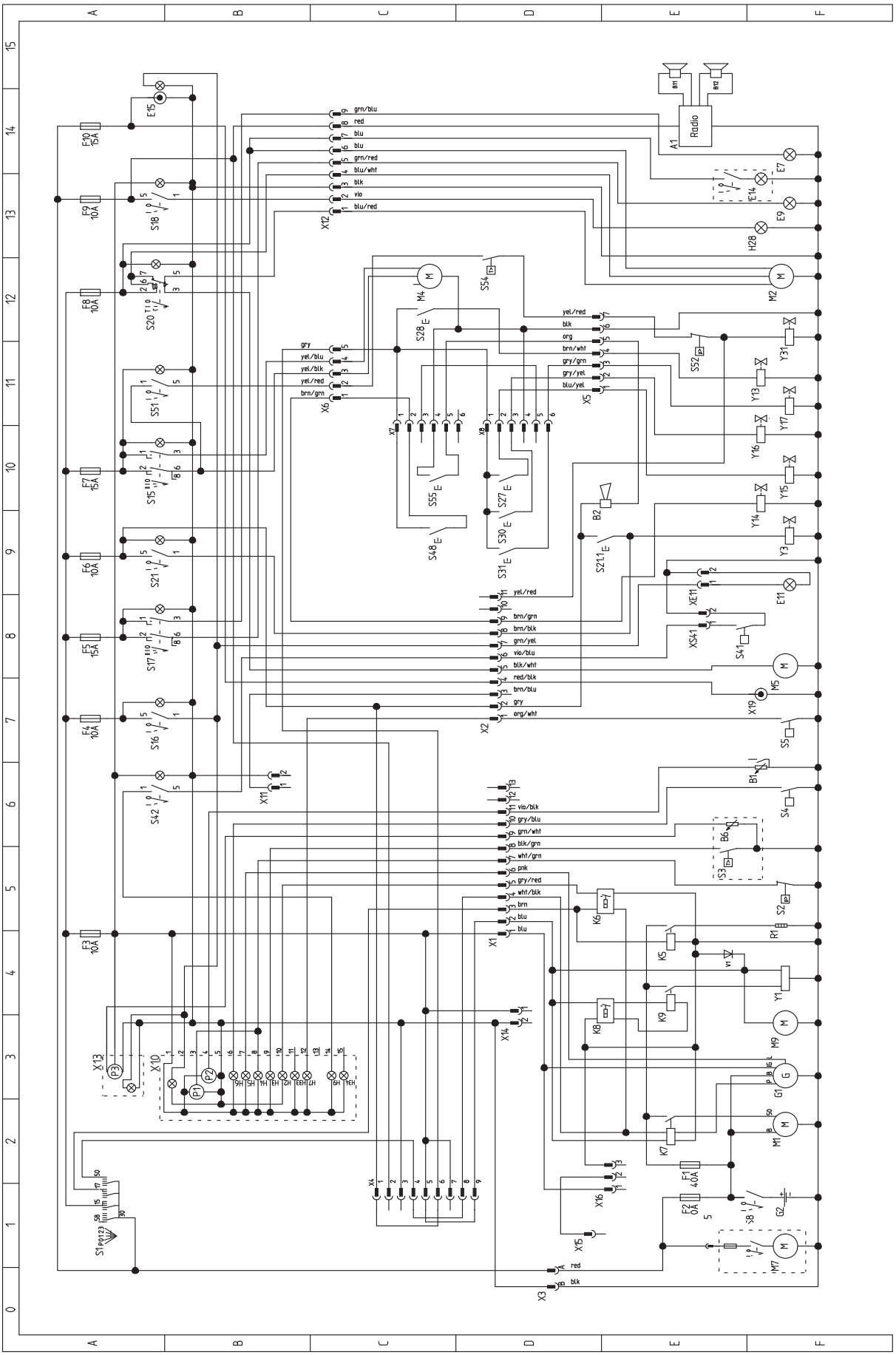
No.	Description	Section	
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F13	Option
M4	Fan	C12	Option
M5	Washer pump	F8	Option
M7	Fuel-filling pump	F1	Option
M9	Fuel pump	F3	
P1	Hour meter	B3	
P2	Fuel level indication	B3	
P3	Engine oil temperature gauge	A3	
R1	Glow plug	F5	
S1	Preheating start switch	A1	
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S8	Battery master switch	E/F 1	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Option
S18	Rotating beacon switch	A/B 13	Option
S20	Wiper/washer switch	A12	Option
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Option
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C12	
S30	Additional control circuit tip switch	D9	Option
S31	Additional control circuit tip switch	D9	Option
S41	Safe load indicator pressure switch	E8	Option
S42	Safe load indicator switch	A6	Option
S48	Automatic idling speed tip switch	C9	Option
S51	Air conditioning switch	A11	Option
S52	Air conditioning pressure switch	E12	Option
S54	Air conditioning thermostat	D12	Option
S55	Horn tip switch	C10	
V1	Recovery diode	E4	
X1	13 pole connection – engine/chassis	D4-6	
X2	11 pole connection – engine/chassis	D7-9	

No.	Description	Section	
X3	2 pole main connection	D0	
X4	9 pole connection – drive interlock	C/D1	
X5	7 pole connection – armrest/chassis	D11/12	
X6	5 pole connection – armrest switch	C11/12	
X7	6 pole connection – joystick (right)	C11	
X8	6 pole connection – joystick (left)	D11	
X10	15 pole connection – instrument panel	B/C3	
X11	2 pole connection – Vario indicator	B6	
X12	9 pole connection – cab	C13/14	
X13	5 pole connection – engine temperature	A3	
X14	2 pole connection – automatic revs setting	C/D 3	
X15	1 pole connection – drive alarm	D/E 1	
X16	3 pole connection – drive alarm	E2	
X19	1 pole connection – socket	F7	
XE11	2 pole connection – boom working light	E9	
XS41	2 pole connection – safe load indicator	E8	
Y1	Cutoff solenoid	F4	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F11	
Y14	Solenoid valve – automatic idling speed setting	F9	Option
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Option
Y17	Solenoid valve – additional control circuit	F11	Option
Y31	Solenoid valve – air conditioning	F12	Option

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6.19 Wiring diagram A4 up to serial no. AC02888



6.20 Wiring diagram A4 from serial no. AC02890 (legend)

No.	Description	Section	
A1	Radio	E14	Option
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Option
B12	Loudspeaker	E15	Option
B14	Warning buzzer	C2	
E7	Rear roof lights	F14	Option
E9	Front roof light	F13	Option
E10	Front roof light		Option
E11	Boom light	F8/9	
E14	Interior light	E/F13	
E15	Cigarette lighter	A14	
F1	Main fuse: starter, preheating	E2	
F2	Main fuse + fuel-filling pump	E1	
F3	Indicators, engine relay	A5	
F4	Boom working light	A7	
F5	Cab working lights	A8	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A10	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio, drive interlock	A13	
F10	Socket, cigarette lighter	A14	
G1	Alternator	F3	
G2	Battery	F1	
H2	Preheating telltale	B1	
H3	Engine temperature telltale	C1	
H4	Engine oil pressure telltale	B1	
H5	Alternator charge function telltale	B1	
H6	Air filter telltale	B1	
H7	Hydraulic oil filter telltale	B1	
H9	Safe load indicator telltale	C1	Option
H28	Rotating beacon	F13	Option
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	D5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	D3	
K9	Cutoff solenoid switching relay	E3	

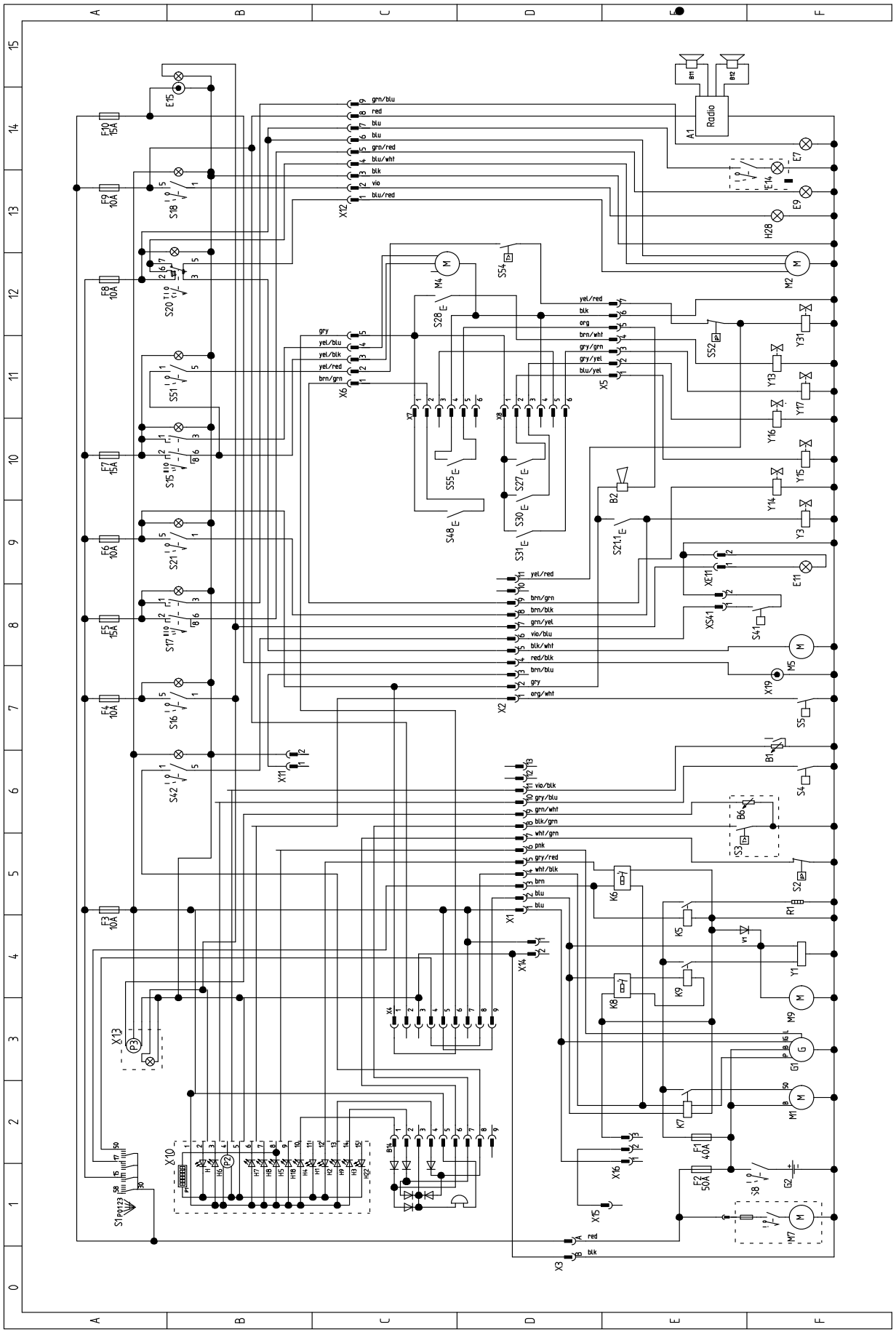
No.	Description	Section	
M1	Starter	F2	
M2	Wiper motor	F13	Option
M4	Fan	C12	Option
M5	Washer pump	F8	Option
M7	Fuel-filling pump	F1	Option
M9	Fuel pump	F3	
P1	Hour meter	B1	
P2	Fuel level indication	B1	
P3	Engine oil temperature gauge	A3	
R1	Glow plug	F5	
S1	Preheating start switch	A1	
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S8	Battery master switch	F1	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Option
S18	Rotating beacon switch	A/B 13	Option
S20	Wiper/washer switch	A12	Option
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Option
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C28	
S30	Additional control circuit tip switch	D9	Option
S31	Additional control circuit tip switch	D9	Option
S41	Safe load indicator pressure switch	E8	Option
S42	Safe load indicator switch	A6	Option
S48	Automatic idling speed tip switch	C9	Option
S51	Air conditioning switch	A11	Option
S52	Air conditioning pressure switch	E12	Option
S54	Air conditioning thermostat	D12	Option
S55	Horn tip switch	C10	
V1	Recovery diode	E4	
X1	13 pole connection – engine/chassis	D4-6	
X2	11 pole connection – engine/chassis	D7-9	
X3	2 pole main connection	D0	

No.	Description	Section	
X4	9 pole connection – drive interlock	C/D3	
X5	7 pole connection – armrest/chassis	D11/12	
X6	5 pole connection – armrest switch	C11/12	
X7	6 pole connection – joystick (right)	C/D 11	
X8	6 pole connection – joystick (left)	D11	
X10	15 pole connection – instrument panel	B/C 1/2	
X11	2 pole connection – Vario indicator	B6	
X12	9 pole connection – cab	C13/14	
X13	5 pole connection – engine temperature	A3	
X14	2 pole connection – automatic revs setting	D4	
X15	1 pole connection – drive alarm	D/E 1	
X16	3 pole connection – drive alarm	E2	
X19	1 pole connection – socket	F7	
XE11	2 pole connection – boom working light	E9	
XS41	2 pole connection – safe load indicator	E8	
Y1	Cutoff solenoid	F4	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F11	
Y14	Solenoid valve – automatic idling speed setting	F9	Option
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Option
Y17	Solenoid valve – additional control circuit	F11	Option
Y31	Solenoid valve – air conditioning	F12	Option

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6.21 Wiring diagram A4 from serial no. AC02890



6.22 Wiring diagram A4 from serial no. AH00645 (legend)

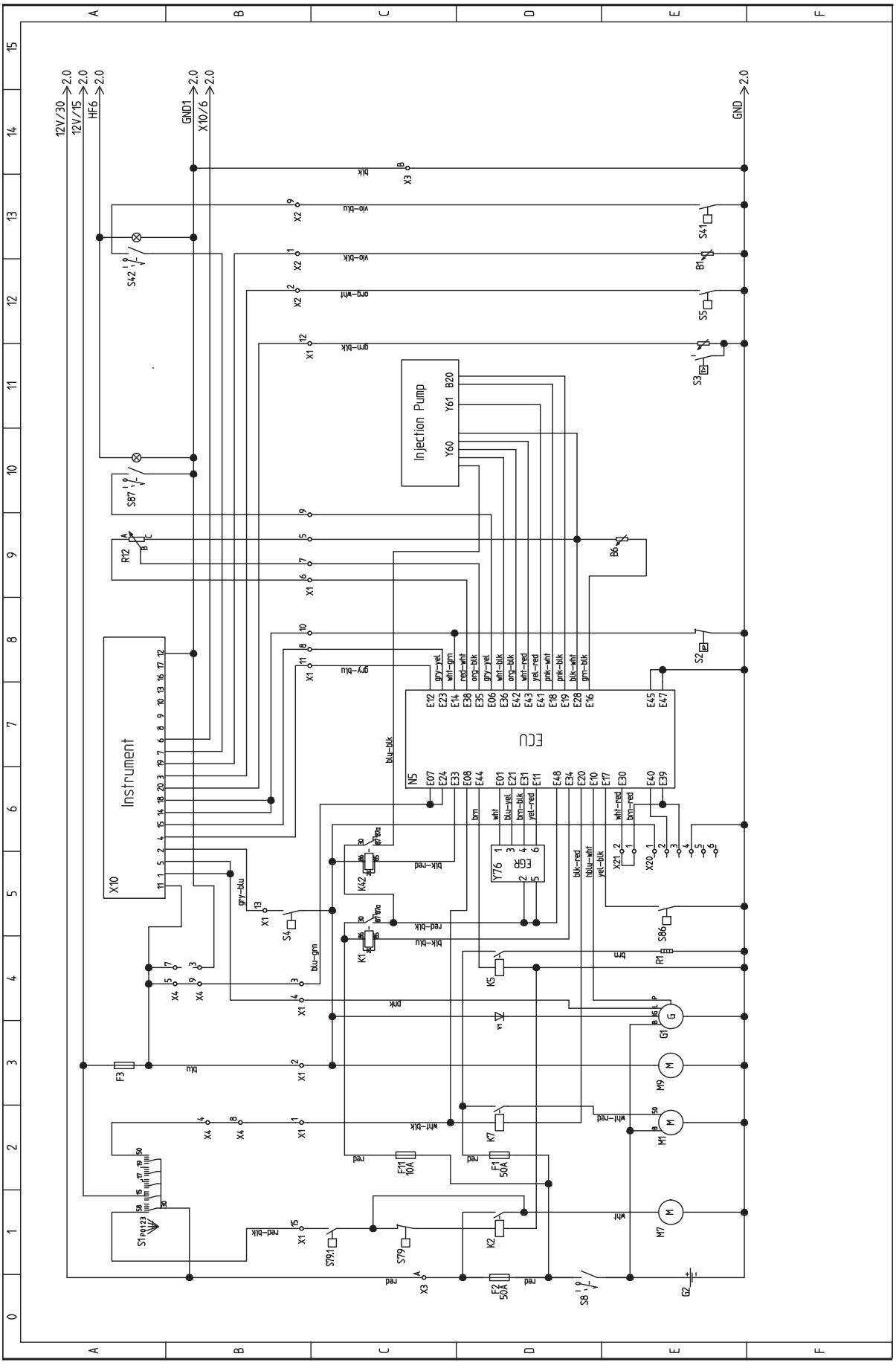
No.	Description	Section	
A1	Radio	(2) E12	Option
B1	Fuel level indicator	(1) E13	
B2	Horn	(2) D4	
B6	Engine temperature sensor	(1) E9	
B11	Loudspeaker	(2) E12	Option
B12	Loudspeaker	(2) E12	Option
B19	Quickhitch warning buzzer	(2) C3	
B20	Engine revs	(1) C/D11	
E7	Rear working lights	(2) E8	Option
E9	Front working light	(2) E8	Option
E11	Boom working light	(2) E1	
E14	Interior light	(2) E10	
E15	Cigarette lighter	(2) B13	
F1	Main fuse: starter, preheating	(1) D2	
F2	Main fuse	(1) D0	
F3	Displays, E-ECU	(1) A3	
F4	Boom working light	(2) A1	
F5	Roof working lights	(2) A8	
F6	Valves, horn	(2) A2	
F7	Fan, air conditioning	(2) A6	
F8	Wiper, interior light	(2) A9	
F9	Rotating beacon, radio	(2) A11	
F10	Socket, cigarette lighter	(2) A13	
F11	E-ECU, engine relay	(1) C2	
G1	Alternator	(1) E4	
G2	Battery	(1) E0	
H28	Rotating beacon	(2) E11	Option
K1	Engine electronics main relay	(1) C4	
K2	Fuel-filling pump relay	(1) D1	
K5	Preheating high current relay	(1) D4	
K7	Start high current relay	(1) D2	
K42	Fuel injection pump relay	(1) C5	
M1	Starter	(1) E2	
M2	Front wiper motor	(2) E10	Option
M4	Fan	(2) D6	Option
M5	Front washer pump	(2) E9	Option
M7	Fuel-filling pump	(1) E1	Option

No.	Description	Section	
M9	Fuel pump	(1) E3	
N5	Diesel engine electronics	(1)C-E/6-7	
R1	Glow plug	(1) E4	
R12	Engine speed potentiometer	(1) A9	
S1	Preheating start switch	(1) A1	
S2	Engine oil pressure switch	(1) E8	
S3	Engine temperature switch	(1) E11	
S4	Air filter pressure switch	(1) B5	
S5	Hydraulic oil pressure switch	(1) E12	
S8	Battery master switch	(1) D0	
S15	Heating switch	(2) B6	
S16	Working light switch	(2) B1	
S17	Working light switch	(2) B8	Option
S18	Rotating beacon switch	(2) B11	Option
S20	Wiper/washer switch	(2) B9	Option
S21	1st/2nd speed switch	(2) B2	
S27	Changeover valve tip switch	(2) D5	
S28	Left-hand side safety switch	(2) D4-5	
S40	Quickhitch lock switch	(2) B3	Option
S41	Safe load indicator pressure switch	(1) E13	Option
S42	Safe load indicator switch	(1) A13	Option
S51	Air conditioning switch	(2) B7	Option
S52	Air conditioning pressure switch	(2) D7	Option
S54	Air conditioning temperature switch	(2) C7	Option
S55	Horn tip switch	(2) D6	
S79	Fuel-filling pump switch	(1) C1	
S86	Automatic revs setting pressure switch	(1) E5	
S87	Automatic revs setting switch	(1) A10	
Y3	Normal speed solenoid valve	(2) E2	
Y13	Pilot control safety valve	(2) E4-5	
Y15	Auxiliary hydraulics/boom swivel changeo-ver solenoid valve	(2) E5	
Y25	Quickhitch lock solenoid valve	(2) E3	Option
Y31	Electro-magnetic clutch compressor	(2) E7	Option
Y60	Fuel injection pump	(1) C10	Option
Y61	Cold start valve	(1) C11	
Y76	Exhaust gas recirculation	(1) D5	

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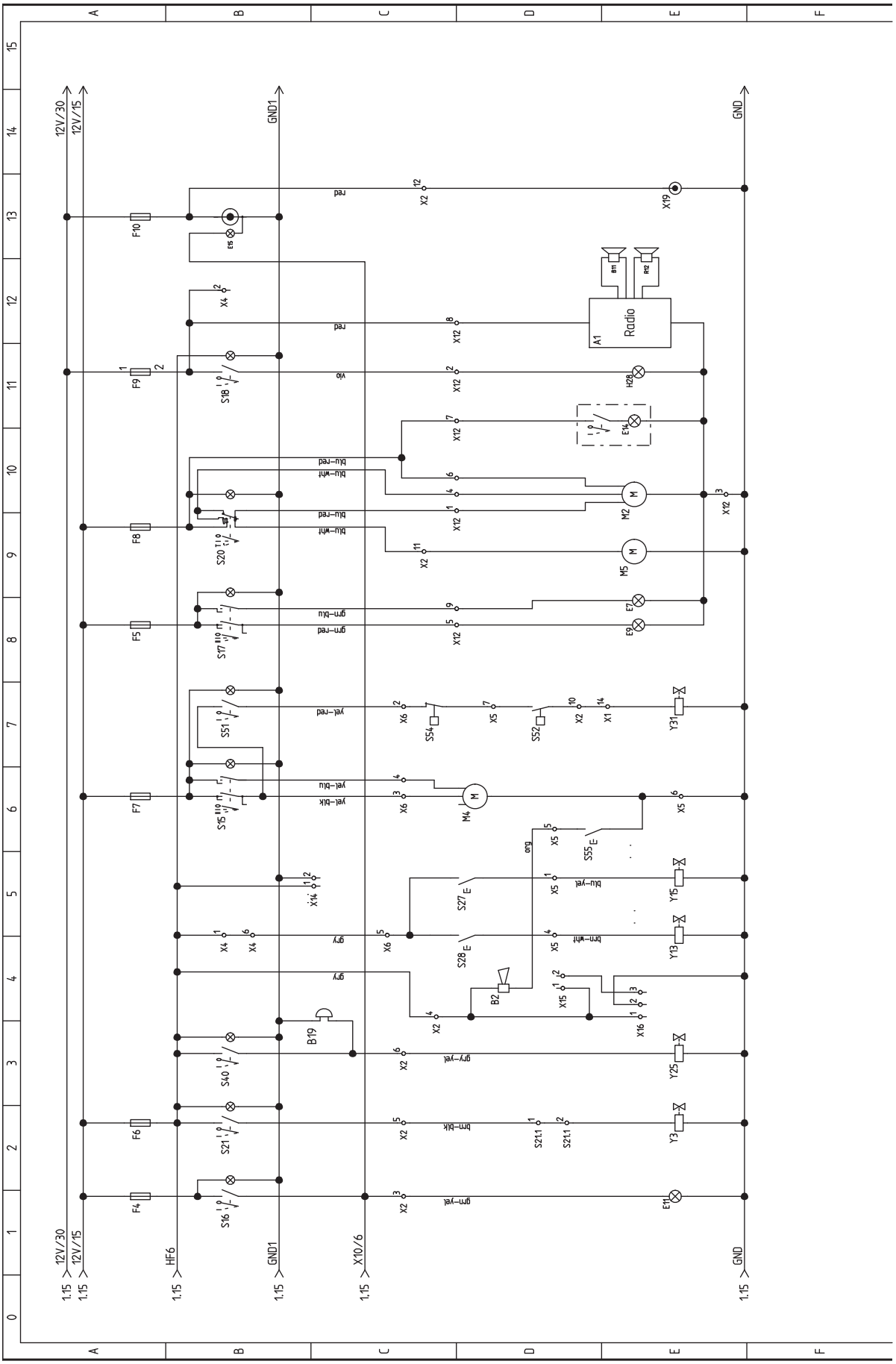
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6.23 Wiring diagram A4 (1) from serial no. AH00645



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6.24 Wiring diagram A4 (2) from serial no. AH00645



6.25 Engine – chassis A4 wiring harness 1000109624 up to AD07210 (legend)

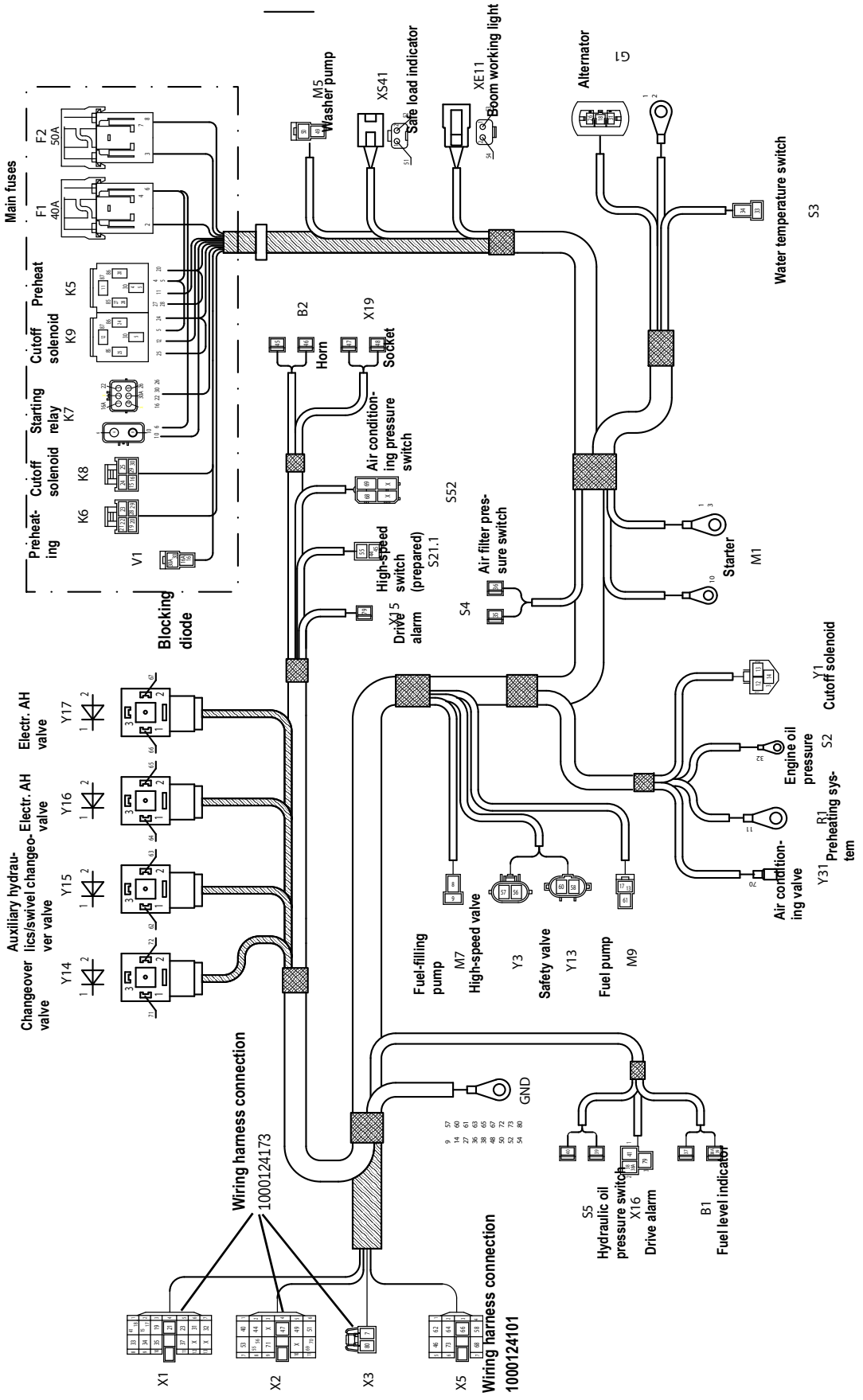
No.	Up to	To	Colour	mm²
1	G1/B alternator	M1 starter	red	10
2	G1/B alternator	F1 main fuse	red	6
3	M1 starter	F2 main fuse	red	6
4	F1 main fuse	K5/30 preheating relay	red	4
5	K5/30 preheating relay	K9/30 cutoff solenoid relay	red	4
6	F1 main fuse	K7/A start high current relay	red	4
7	F2 main fuse	X3/A main connection	red	6
8	F2 main fuse	M7 fuel-filling pump	red	4
9	GND	M7 fuel-filling pump	blk	4
10	K7/B start high current relay	M1 starter	wht/red	4
11	K5/87 preheating relay	R1 glow plug	brn	6
12	K9/87 cutoff solenoid switching relay	Y1/1 cutoff solenoid	wht	4
13	M9/1 fuel pump	Y1/2 cutoff solenoid	blu	1
14	GND	Y1/3 cutoff solenoid	blk	2.5
15	K8 cutoff solenoid time lag relay	X1/2 engine/chassis connection	blu	1
16	K8 cutoff solenoid time lag relay	V1 blocking diode	blu	1
16 A	V1 blocking diode	K7/1 start high current relay	blu	1
17	M9/1 fuel pump	X1/2 engine/chassis connection	blu	1
18	G1/2 alternator	X1/1 engine/chassis connection	blu	1
19	K6 preheating time lag relay	X1/3 engine/chassis connection	brn	1
20	K6 preheating time lag relay	K5/86 preheating relay	brn	1
21	K6 preheating time lag relay	X1/4 engine/chassis connection	wht/blk	1
22	K6 preheating time lag relay	K7/3 start high current relay	wht/blk	1
23	K6 preheating time lag relay	X1/5 engine/chassis connection	gry/red	1
24	K8 cutoff solenoid time lag relay	K9/86 cutoff solenoid switching relay	blu/blk	1
25	K8 cutoff solenoid time lag relay	K9/85 cutoff solenoid switching relay	pnk/blk	1
26	K7/6 start high current relay	G1/3 alternator	blk/blu	1
27	GND	K5/85 preheating relay	blk	1
28	K5/85 preheating relay	K6 preheating time lag relay	blk	1
29	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
30	K8 cutoff solenoid time lag relay	V1 blocking diode	blk	1
30A	V1 blocking diode	K7/5 start high current relay	blk	1
31	G1/1 alternator	X1/6 engine/chassis connection	pnk	1
32	S2 engine oil pressure switch	X1/7 engine/chassis connection	wht/grn	1
33	S3 engine temperature switch	X1/8 engine/chassis connection	blk/grn	1
34	S3 engine temperature switch	X1/9 engine/chassis connection	grn/wht	1
35	S4 air filter pressure switch	X1/10 engine/chassis connection	gry/blu	1

No.	Up to	To	Colour	mm²
36	S4 air filter pressure switch	GND	blk	1
37	B1 fuel level indicator	X1/11 engine/chassis connection	vio/blk	1
38	GND	X16/2 drive alarm connection	blk	1
38A	B1 fuel level indicator	X16/2 drive alarm connection	blk	1
39	B1 fuel level indicator	S5 preheating start switch	blk	1
40	S5 preheating start switch	X2/1 engine/chassis connection	org/wht	1
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis connection	red/blk	1.5
48	X19 socket	GND	blk	1.5
49	M5 washer pump	X2/5 engine/chassis connection	blk/wht	1
50	M5 washer pump	GND	blk	1
51	XS41/1 safe load indicator	X2/6 engine/chassis connection	vio/blu	1
52	XS41/2 safe load indicator	GND	blk	1
53	XE11/1 boom working light	X2/7 engine/chassis connection	grn/yel	1
54	XE11/2 boom working light	GND	blk	1
55	S21.1/1 high-speed tip switch (prepared)	X2/8 engine/chassis connection	brn/blk	1
56	Y3 high-speed solenoid valve	X2/8 engine/chassis connection	brn/blk	1
57	Y3 high-speed solenoid valve	GND	blk	1
58	Y13 solenoid valve for safety valve	X5/4 armrest/chassis connection	brn/wht	1
60	GND	Y13 solenoid valve for safety valve	blk	1
61	GND	M9/2 fuel pump	blk	1
62	Y15/1 auxiliary hydraulics/swivel solenoid valve	X5/1 armrest/chassis connection	blu/yel	1
63	Y15/2 auxiliary hydraulics/swivel solenoid valve	GND	blk	1
64	Y16/1 electr. auxiliary hydraulics solenoid valve	X5/2 armrest/chassis connection	gry/yel	1
65	Y16/2 electr. auxiliary hydraulics solenoid valve	GND	blk	1
66	Y17/1 electr. auxiliary hydraulics solenoid valve	X5/3 armrest/chassis connection	gry/grn	1
67	Y17/2 electr. auxiliary hydraulics solenoid valve	GND	blk	1
68	S52 air conditioning pressure switch	X5/7 armrest/chassis connection	yel/red	1
69	S52 air conditioning pressure switch	X2/11 engine/chassis connection	yel/red	1
70	X2/11 engine/chassis connection	Y31 air conditioning solenoid valve	yel/red	1
71	Y14/1 changeover valve solenoid valve	X2/9 engine/chassis connection	brn/grn	1
72	Y14/2 changeover valve solenoid valve	GND	blk	1
73	GND	X5/6 armrest/chassis connection	blk	1
79	X15 drive alarm connection	X16/3 drive alarm connection	gry/blk	1
80	GND	X3/B main connection	blk	6

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6.26 Engine – chassis A4 wiring harness 1000109624 up to AD07210



6.27 Engine – chassis A4 wiring harness 1000173970 from AH00645 (legend)

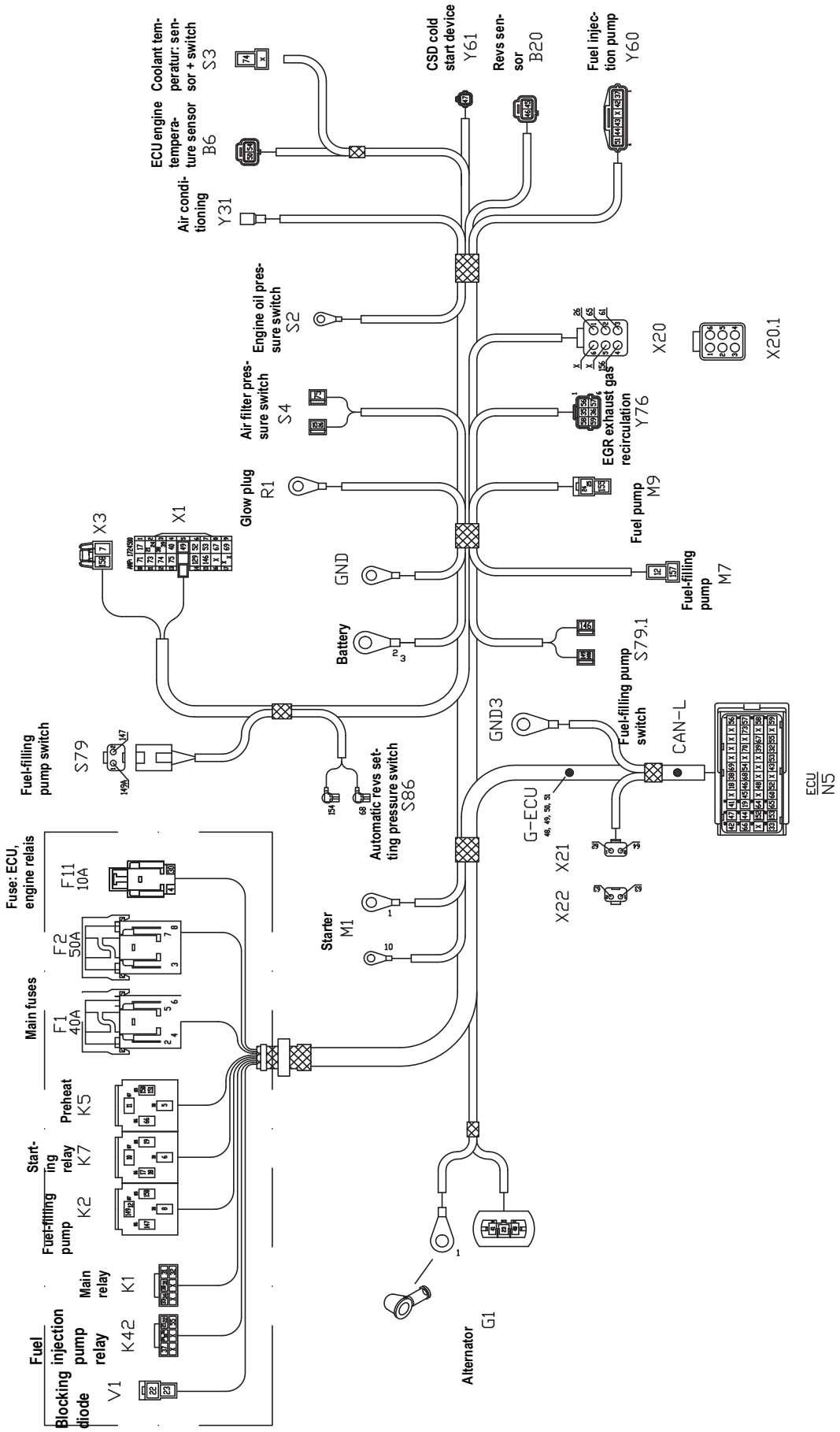
No.	Up to	To	Colour	mm²
1	G1/B alternator	M1 starter	red	10
2	Battery	F1 main fuse	red	6
3	Battery	F2 main fuse	red	6
4	F1 main fuse	F11 E-ECU, engine relay fuse	red	2.5
5	F1 main fuse	K5/30 preheating relay	red	4
6	F1 main fuse	K7/30 start high current relay	red	4
7	F2 main fuse	X3/A cab connection	red	6
8	F2 main fuse	K2/30 fuel-filling pump	red	4
10	K7/87 start high current relay	M1 starter	wht/red	4
11	K5/87 preheating relay	R1 glow plug	brn	6
12	K2/87 fuel-filling pump	M7 fuel-filling pump	wht	4
17	K7/86 start high current relay	X1/1 engine/chassis connection	wht/blk	1
18	K7/86 start high current relay	N5/8 diesel engine electronics	wht/blk	0.5
19	K7/85 start high current relay	N5/20 diesel engine electronics	blk/red	0.5
21	K42/86 fuel injection pump	X1/2 engine/chassis connection	blu	1
22	K42/86 fuel injection pump	V1 blocking diode	blu	1
23	G1/2 alternator	V1 blocking diode	blu	1
24	M9 fuel feed pump	X1/2 engine/chassis connection	blu	1
25	M9 fuel feed pump	S4 air filter pressure switch	blu	1
26	X20/1	S4 air filter pressure switch	blu	1
30	F11 E-ECU, engine relay fuse	K1/30 engine electronics main relay	red	1
31	K1/86 engine electronics main relay	K1/30 engine electronics main relay	red	1
32	N5/34 diesel engine electronics	K1/85 engine electronics main relay	blk/blu	0.5
33	N5/48 diesel engine electronics	K1/87 engine electronics main relay	red/blk	1
34	K42/30 fuel injection pump	K1/87 engine electronics main relay	red/blk	1
35	K42/30 fuel injection pump	Y76/2 exhaust gas recirculation (EGR)	red/blk	1
36	K42/30 fuel injection pump	Y76/5 exhaust gas recirculation (EGR)	red/blk	1
37	K42/87 fuel injection pump	Y60/1 fuel injection pump	blu/blk	0.75
38	N5/7 diesel engine electronics	X1/3 engine/chassis connection	blu/grn	0.5
39	N5/24 diesel engine electronics	X1/3 engine/chassis connection	blu/grn	0.5
40	G1/2 alternator	X1/4 engine/chassis connection	pnk	1
41	G1/3 alternator	N5/10 diesel engine electronics	hblu/wht	0.5
42	N5/42 diesel engine electronics	Y60/2 fuel injection pump	org/blk	0.75
43	N5/36 diesel engine electronics	Y60/4 fuel injection pump	wht/blk	0.5
44	N5/43 diesel engine electronics	Y60/5 fuel injection pump	wht/red	0.75
45	N5/19 diesel engine electronics	B20 revs sensor	pnk/blk	0.5
46	N5/18 diesel engine electronics	B20 revs sensor	pnk/wht	0.5
47	N5/41 diesel engine electronics	Y61 cold start device (CSD)	yel/red	1
48	G-ECU	N5/28 diesel engine electronics	blk/wht	0.5
49	G-ECU	X1/5 engine/chassis connection	blk/wht	1
50	G-ECU	B6 engine temperature sensor	blk/wht	1

No.	Up to	To	Colour	mm²
51	G-ECU	Y60/6 fuel injection pump	blk/wht	0.75
52	N5/38 diesel engine electronics	X1/6 engine/chassis connection	red/wht	0.5
53	N5/35 diesel engine electronics	X1/7 engine/chassis connection	org/blk	0.5
54	N5/16 diesel engine electronics	B6 engine temperature sensor	grn/blk	0.5
55	N5/33 diesel engine electronics	K42/85 fuel injection pump	blk/red	0.5
56	N5/1 diesel engine electronics	Y76/1 exhaust gas recirculation (EGR)	wht	0.5
57	N5/11 diesel engine electronics	Y76/6 exhaust gas recirculation (EGR)	yel/red	0.5
58	N5/21 diesel engine electronics	Y76/3 exhaust gas recirculation (EGR)	blu/yel	0.5
59	N5/31 diesel engine electronics	Y76/4 exhaust gas recirculation (EGR)	brn/blk	0.5
60	CANL (low)	N5/39 diesel engine electronics	brn/red	0.5
61	CANL (low)	X20/3	brn/red	1
62	CANL (low)	X21/1	brn/red	1
63	X22/1	X22/2	wht/blu	1
64	X21/2	N5/39 diesel engine electronics	wht/blu	0.5
65	N5/40 diesel engine electronics	X20/2	wht/red	0.5
66	N5/44 diesel engine electronics	K5/86 preheating relay	brn	1
67	N5/23 diesel engine electronics	X1/8	gry/red	0.5
68	N5/17 diesel engine electronics	S86 automatic revs setting pressure switch	yel/blk	0.5
69	N5/6 diesel engine electronics	X1/9 engine/chassis connection	gry/yel	0.5
70	S2 engine oil pressure switch	N5/14 diesel engine electronics	wht/grn	0.5
71	S2 engine oil pressure switch	X1/10 engine/chassis connection	wht/grn	1
73	N5/12 diesel engine electronics	X1/11 armrest/chassis connection	gry/blu	0.5
74	S3 engine temperature switch	X1/12	grn/blk	1
75	S4 air filter pressure switch	X1/13	gry/blu	1
129	Y31 air conditioning	X1/14	red/yel	1
146	S79.1 fuel-filling pump switch	X1/15	red/blk	1
147	S79/2 fuel-filling pump switch	K2/86 fuel-filling pump relay	vio	1
149	S79.1 fuel-filling pump switch	K2/87 fuel-filling pump relay	vio/wht	1
149A	S79.1 fuel-filling pump switch	S79/1 fuel-filling pump switch	vio/wht	1
150	K2/85 fuel-filling pump relay	K5/85 fuel-filling pump relay	blk	1
151	GND	K5/85 fuel-filling pump relay	blk	1
152	GND3	N5/45 diesel engine electronics	blk	1
153	GND3	N5/47 diesel engine electronics	blk	1
154	GND	S86 automatic revs setting pressure switch	blk	1
155	GND	M9 fuel feed pump	blk	1
156	GND	X20/4	blk	1
157	GND	M7 fuel-filling pump	blk	4
158	GND	X3/B	blk	2.5

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6.28 Engine – chassis A4 wiring harness 1000173970 from AH00645



6.29 Switches A4 wiring harness 1000109630 up to serial no. AC02888 (legend)

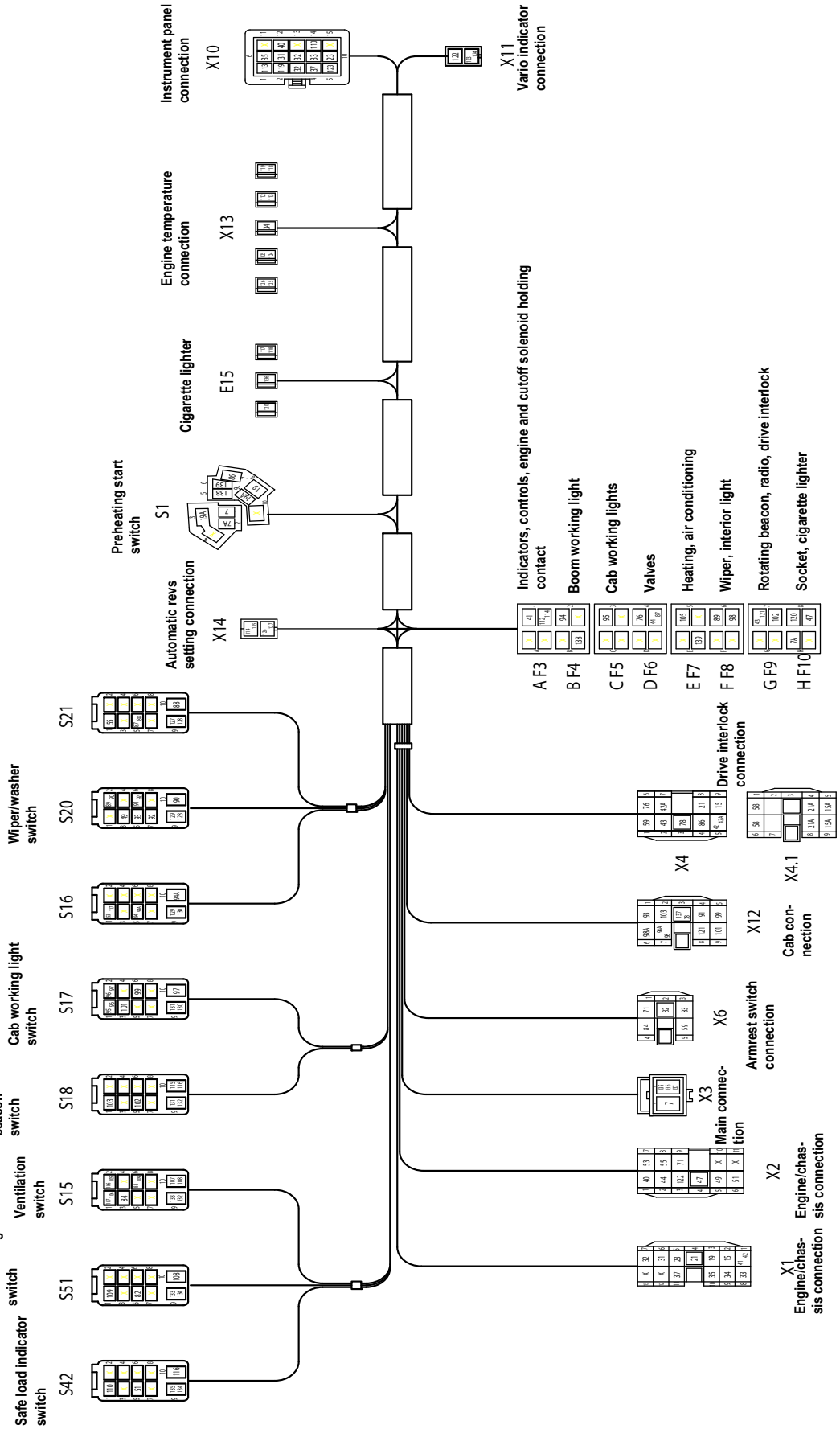
No.	Up to	To	Colour	mm²
7	X3/A main connection	S1/1 preheating start switch	red	6
7A	S1/1 preheating start switch	F10 socket and cigarette lighter fuse	red	4
15	X1/2 engine/chassis connection	X4/9 drive interlock connection	blu	1
15A	X4.1/9 drive interlock connection	X4.1/5 drive interlock connection	blu	1
19	X1/3 engine/chassis connection	S1/8 preheating start switch	brn	1
19A	S1/3 preheating start switch	S1/6 preheating start switch	brn	1
21	X1/4 engine/chassis connection	X4/8 drive interlock connection	wht/blk	1
21A	X4.1/4 drive interlock connection	X4.1/8 drive interlock connection	wht/blk	1
23	X1/5 engine/chassis connection	X10/10 instrument panel connection	gry/red	1
31	X1/6 engine/chassis connection	X10/7 instrument panel connection	pnk	1
32	X1/7 engine/chassis connection	X10/8 instrument panel connection	wht/grn	1
33	X1/8 engine/chassis connection	X10/9 instrument panel connection	blk/grn	1
34	X1/9 engine/chassis connection	X13 engine temperature connection	grn/wht	1
35	X1/10 engine/chassis connection	X10/6 instrument panel connection	gry/blu	1
37	X1/11 engine/chassis connection	X10/4 instrument panel connection	vio/blk	1
40	X2/1 engine/chassis connection	X10/12 instrument panel connection	org/wht	1
41	X1/1 engine/chassis connection	F3 indicators and engine relay fuse	blu	1
42	X1/1 engine/chassis connection	X4/5 drive interlock connection	blu	1
42A	X4/7 drive interlock connection	X4/5 drive interlock connection	blu	1
43	X4/5 drive interlock connection	F9 rotating beacon, radio and drive interlock fuse	red	1
44	X2/2 engine/chassis connection	F6 valves and horn fuse	gry	1
47	X2/4 engine/chassis connection	F10 socket and cigarette lighter fuse	red/blk	1.5
49	X2/5 engine/chassis connection	S20/3 wiper/washer system switch	blk/wht	1
51	X2/6 engine/chassis connection	S42/5 safe load indicator switch	vio/blu	1
53	X2/7 engine/chassis connection	S16/1 boom working light switch	grn/yel	1
55	X2/8 engine/chassis connection	S21/1 high-speed switch	brn/blk	1
58A	X4.1/1 drive interlock connection	X4.1/6 drive interlock connection	brn/wht	1
59	X4/1 drive interlock connection	X6/5 armrest switch connection	gry	1
71	X2/9 engine/chassis connection	X6/1 armrest switch connection	brn/grn	1
76	F6 valves and horn fuse	X4/6 drive interlock connection	gry	1
78	X4/3 drive interlock connection	X12/3 cab connection	blk	1
82	S51/5 air conditioning switch	X6/2 armrest switch connection	yel/red	1
83	S15/3 ventilation switch	X6/3 armrest switch connection	yel/blk	1
84	S15/6 ventilation switch	X6/4 armrest switch connection	yel/blu	1
86	X4/4 drive interlock connection	S1/7 preheating start switch	wht/blk	1
87	F6 valves and horn fuse	S21/5 high-speed switch	gry	1
88	S21/10 high-speed switch	S21/5 high-speed switch	gry	1
89	F8 wiper and interior light fuse	S20/2 wiper/washer system switch	blu	1
90	S20/10 wiper/washer system switch	S20/2 wiper/washer system switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer system switch	blu/wht	1
92	S20/7 wiper/washer system switch	S20/6 wiper/washer system switch	blu/wht	1
93	S20/5 wiper/washer system switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94A	S16/10 boom working light switch	S16/5 boom working light switch	grn	1

No.	Up to	To	Colour	mm²
95	F5 cab working light fuse	S17/1 cab working light switch	grn	1
96	S17/1 cab working light switch	S17/2 cab working light switch	grn	1
97	S17/1 cab working light switch	S17/10 cab working light switch	grn	1
98	F8 wiper and interior light fuse	X12/7 cab connection	blu	1
98A	X12/7 cab connection	X12/8 cab connection	blu	1
99	S17/1 cab working light switch	X12/5 cab connection	grn/red	1
101	S17/3 cab working light switch	X12/9 cab connection	grn/blu	1
102	F9 rotating beacon, radio and drive interlock fuse	S18/5 rotating beacon switch	red	1
103	S18/1 rotating beacon switch	X12/2 cab connection	vio	1
105	F7 fan and air conditioning fuse	S15/2 ventilation switch	yel	1
106	S15/1 ventilation switch	S15/2 ventilation switch	yel	1
107	S15/1 ventilation switch	S15/10 ventilation switch	yel	1
108	S51/10 air conditioning switch	S15/10 ventilation switch	yel	1
109	S15/3 ventilation switch	S51/1 air conditioning switch	yel/blk	1
110	S42/1 safe load indicator switch	X10/14 instrument panel connection	vio/blu	1
112	F3 indicators and engine relay fuse	X13 engine temperature connection	blu	1
113	X10/1 instrument panel connection	X13 engine temperature connection	blu	1
114	F3 indicators and engine relay fuse	X14/1 automatic revs setting connection	blu	1
115	S18/10 rotating beacon switch	X14/1 automatic revs setting connection	blu	1
116	S18/10 rotating beacon switch	S42/10 safe load indicator switch	vio/blu	1
117	S16/B boom working light switch	E15 cigarette lighter	grn/yel	1
118	X13 engine temperature connection	E15 cigarette lighter	grn/yel	1
119	X13 engine temperature connection	X10/2 instrument panel connection	grn/yel	1
120	F10 socket, cigarette lighter	E15 cigarette lighter	red/blk	1.5
121	F9 rotating beacon, radio and drive interlock fuse	X12/8 cab connection	red	1
122	X11/1 Vario indicator connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario indicator connection	blk	1
124	X13 engine temperature connection	X11/2 Vario indicator connection	blk	1
125	X13 engine temperature connection	X13 engine temperature connection	blk	1
126	X14/2 automatic revs setting connection	X13 engine temperature connection	blk	1
127	X14/2 automatic revs setting connection	S21/9 high-speed switch	blk	1
128	S20/9 wiper/washer system switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer system switch	S16/9 boom working light switch	blk	1
130	S17/9 cab working light switch	S16/9 boom working light switch	blk	1
131	S17/9 cab working light switch	S18/9 rotating beacon switch	blk	1
132	S15/9 ventilation switch	S18/9 rotating beacon switch	blk	1
133	S15/9 ventilation switch	S51/9 air conditioning switch	blk	1
134	S42/9 safe load indicator switch	S51/9 air conditioning switch	blk	1
135	S42/9 safe load indicator switch	X3/B main connection	blk	1
136	E15 cigarette lighter	X3/B main connection	blk	1.5
137	X12/3 cab connection	X3/B main connection	blk	1.5
138	S1/5 preheating start switch	F4 boom working light fuse	blu	2.5
139	S1/6 preheating start switch	F7 fan and air conditioning fuse	blu	2.5

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6.30 Switches A4 wiring harness 1000109630 up to serial no. AC02888



6.31 Switches A4 wiring harness from serial no. AC02890 (legend)

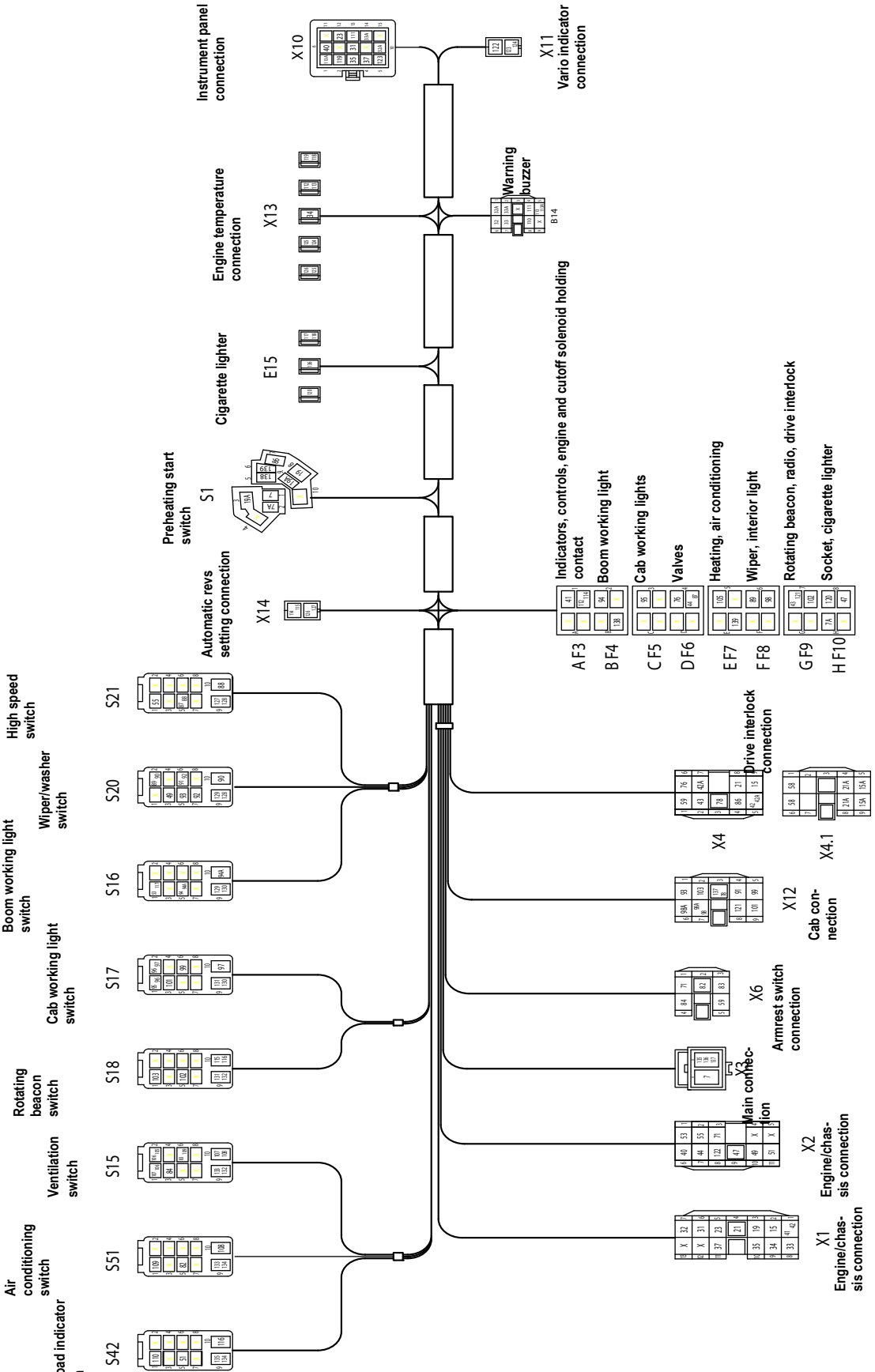
No.	Up to	To	Colour	mm²
7	X3/A main connection	S1/1 preheating start switch	red	6
7A	S1/1 preheating start switch	F10 socket and cigarette lighter fuse	red	4
15	X1/2 engine/chassis connection	X4/9 drive interlock connection	blu	1
15A	X4.1/9 drive interlock connection	X4.1/5 drive interlock connection	blu	1
19	X1/3 engine/chassis connection	S1/8 preheating start switch	brn	1
19A	S1/3 preheating start switch	S1/6 preheating start switch	brn	1
21	X1/4 engine/chassis connection	X4/8 drive interlock connection	wht/blk	1
21A	X4.1/4 drive interlock connection	X4.1/8 drive interlock connection	wht/blk	1
23	X1/5 engine/chassis connection	X10/10 instrument panel connection	gry/red	1
31	X1/6 engine/chassis connection	X10/8 instrument panel connection	pnk	1
32	X1/7 engine/chassis connection	B14/5 warning buzzer connection	wht/grn	1
32A	X10/10 instrument panel connection	B14/5 warning buzzer connection	wht/grn	1
33	X1/8 engine/chassis connection	B14/6 warning buzzer connection	blk/grn	1
33A	X10/14 instrument panel connection	B14/6 warning buzzer connection	blk/grn	1
34	X1/9 engine/chassis connection	X13 engine temperature connection	grn/wht	1
35	X1/10 engine/chassis connection	X10/3 instrument panel connection	gry/blu	1
37	X1/11 engine/chassis connection	X10/4 instrument panel connection	vio/blk	1
40	X2/1 engine/chassis connection	X10/6 instrument panel connection	org/wht	1
41	X1/1 engine/chassis connection	F3 indicators and engine relay fuse	blu	1
42	X1/1 engine/chassis connection	X4/5 drive interlock connection	blu	1
42A	X4/7 drive interlock connection	X4/5 drive interlock connection	blu	1
43	X4/5 drive interlock connection	F9 rotating beacon, radio and drive interlock fuse	red	1
44	X2/2 engine/chassis connection	F6 valves and horn fuse	gry	1
47	X2/4 engine/chassis connection	F10 socket and cigarette lighter fuse	red/blk	1.5
49	X2/5 engine/chassis connection	S20/3 wiper/washer system switch	blk/wht	1
51	X2/6 engine/chassis connection	S42/5 safe load indicator switch	vio/blu	1
53	X2/7 engine/chassis connection	S16/1 boom working light switch	grn/yel	1
55	X2/8 engine/chassis connection	S21/1 high-speed switch	brn/blk	1
58A	X4.1/1 drive interlock connection	X4.1/6 drive interlock connection	brn/wht	1
59	X4/1 drive interlock connection	X6/5 armrest switch connection	gry	1
71	X2/9 engine/chassis connection	X6/1 armrest switch connection	brn/grn	1
76	F6 valves and horn fuse	X4/6 drive interlock connection	gry	1
78	X4/3 drive interlock connection	X12/3 cab connection	blk	1
82	S51/5 air conditioning switch	X6/2 armrest switch connection	yel/red	1
83	S15/3 ventilation switch	X6/3 armrest switch connection	yel/blk	1
84	S15/6 ventilation switch	X6/4 armrest switch connection	yel/blu	1
86	X4/4 drive interlock connection	S1/7 preheating start switch	wht/blk	1
87	F6 valves and horn fuse	S21/5 high-speed switch	gry	1
88	S21/10 high-speed switch	S21/5 high-speed switch	gry	1
89	F8 wiper and interior light fuse	S20/2 wiper/washer system switch	blu	1
90	S20/10 wiper/washer system switch	S20/2 wiper/washer system switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer system switch	blu/wht	1
92	S20/7 wiper/washer system switch	S20/6 wiper/washer system switch	blu/wht	1
93	S20/5 wiper/washer system switch	X12/1 cab connection	blu/red	1

No.	Up to	To	Colour	mm²
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94A	S16/10 boom working light switch	S16/5 boom working light switch	grn	1
95	F5 cab working light fuse	S17/1 cab working light switch	grn	1
96	S17/1 cab working light switch	S17/2 cab working light switch	grn	1
97	S17/1 cab working light switch	S17/10 cab working light switch	grn	1
98	F8 wiper and interior light fuse	X12/7 cab connection	blu	1
98A	X12/7 cab connection	X12/8 cab connection	blu	1
99	S17/1 cab working light switch	X12/5 cab connection	grn/red	1
101	S17/3 cab working light switch	X12/9 cab connection	grn/blu	1
102	F9 rotating beacon, radio and drive interlock fuse	S18/5 rotating beacon switch	red	1
103	S18/1 rotating beacon switch	X12/2 cab connection	vio	1
105	F7 fan and air conditioning fuse	S15/2 ventilation switch	yel	1
106	S15/1 ventilation switch	S15/2 ventilation switch	yel	1
107	S15/1 ventilation switch	S15/10 ventilation switch	yel	1
108	S51/10 air conditioning switch	S15/10 ventilation switch	yel	1
109	S15/3 ventilation switch	S51/1 air conditioning switch	yel/blk	1
110	S42/1 safe load indicator switch	B14/3 warning buzzer connection	vio/blu	1
111	X10/13 instrument panel connection	B14/3 warning buzzer connection	vio/blu	1
112	F3 indicators and engine relay fuse	X13 engine temperature connection	blu	1
113	B14/1 warning buzzer connection	X13 engine temperature connection	blu	1
113A	B14/1 warning buzzer connection	X10/1 instrument panel connection	blu	1
114	F3 indicators and engine relay fuse	X14/1 automatic revs setting connection	blu	1
115	S18/10 rotating beacon switch	X14/1 automatic revs setting connection	blu	1
116	S18/10 rotating beacon switch	S42/10 safe load indicator switch	vio/blu	1
117	S16/B boom working light switch	E15 cigarette lighter	grn/yel	1
118	X13 engine temperature connection	E15 cigarette lighter	grn/yel	1
119	X13 engine temperature connection	X10/2 instrument panel connection	grn/yel	1
120	F10 socket, cigarette lighter	E15 cigarette lighter	red/blk	1.5
121	F9 rotating beacon, radio and drive interlock fuse	X12/8 cab connection	red	1
122	X11/1 Vario indicator connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario indicator connection	blk	1
124	X13 engine temperature connection	X11/2 Vario indicator connection	blk	1
125	X13 engine temperature connection	X13 engine temperature connection	blk	1
126	X14/2 automatic revs setting connection	X13 engine temperature connection	blk	1
127	X14/2 automatic revs setting connection	S21/9 high-speed switch	blk	1
128	S20/9 wiper/washer system switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer system switch	S16/9 boom working light switch	blk	1
130	S17/9 cab working light switch	S16/9 boom working light switch	blk	1
131	S17/9 cab working light switch	S18/9 rotating beacon switch	blk	1
132	S15/9 ventilation switch	S18/9 rotating beacon switch	blk	1
133	S15/9 ventilation switch	S51/9 air conditioning switch	blk	1
134	S42/9 safe load indicator switch	S51/9 air conditioning switch	blk	1
135	S42/9 safe load indicator switch	X3/B main connection	blk	1

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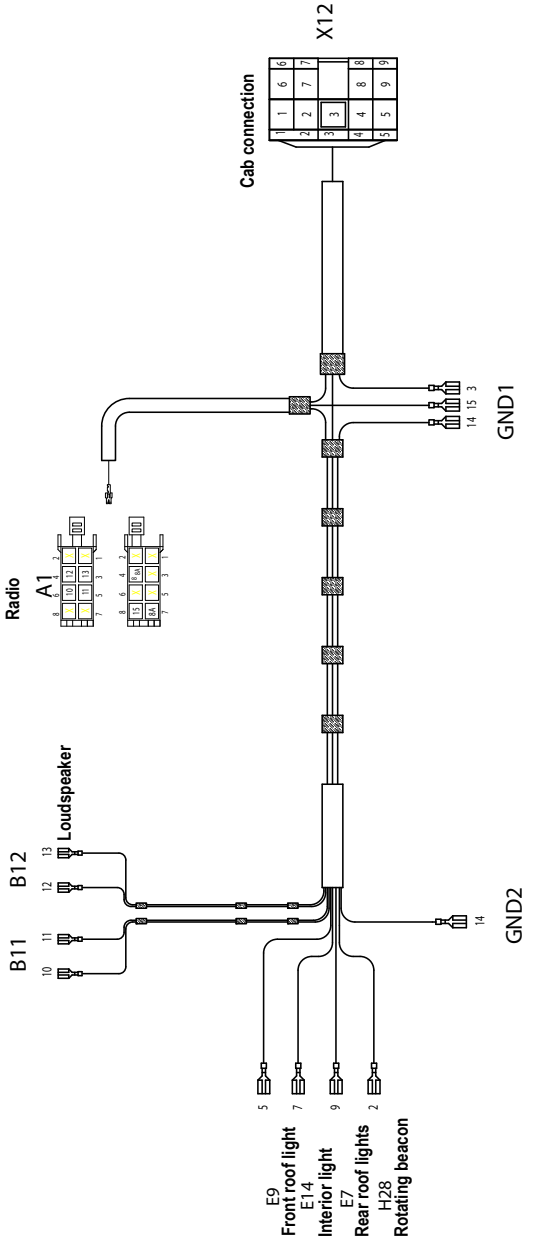
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6.32 Switches A4 wiring harness from serial no. AC02890



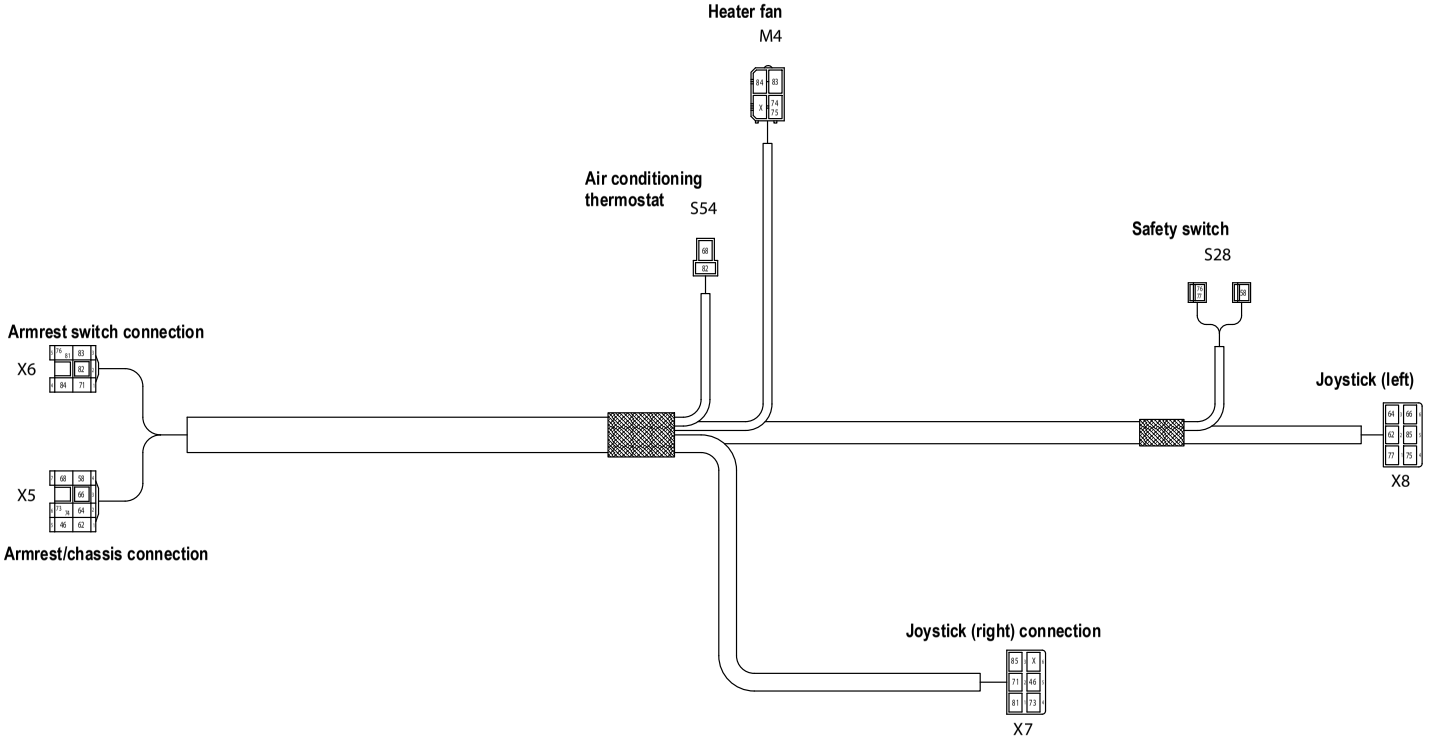
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6.33 Wiring harness 1000109629: cab roof



No.	Up to	To	Colour	mm²
1	X12 (1) 9 pole plug and socket connector – cab	M2 wiper motor	grn/yel	0.75
2	X12 (2) 9 pole plug and socket connector – cab	H28 rotating beacon	vio	1
3	X12 (3) 9 pole plug and socket connector – cab	GND1	blk	1
4	X12 (4) 9 pole plug and socket connector – cab	M2 wiper motor	brn	0.75
5	X12 (5) 9 pole plug and socket connector – cab	E9 front roof light	grn/red	1
6	X12 (6) 9 pole plug and socket connector – cab	M2 wiper motor	blu	0.75
7	X12 (7) 9 pole plug and socket connector – cab	E14 interior light	blu	1
8	X12 (8) 9 pole plug and socket connector – cab	A1.1/4 radio	red	1
8A	A1.1/4 radio	A1.1/7 radio	red	1
9	X12 (9) 9 pole plug and socket connector – cab	E7 rear roof lights	grn/blu	1
10	A1/6 radio	B11 loudspeaker	wht	0.5
11	A1/5 radio	B11 loudspeaker	wht/blk	0.5
12	A1/4 radio	B12 loudspeaker	wht	0.5
13	A1/3 radio	B12 loudspeaker	wht/blk	0.5
14	GND1	GND2	blk	1.5
15	GND1	A1.1/8 radio	blk	1
16	GND1	M2 wiper motor	blk	0.75

6.34 Wiring harness 1000109628: armrest



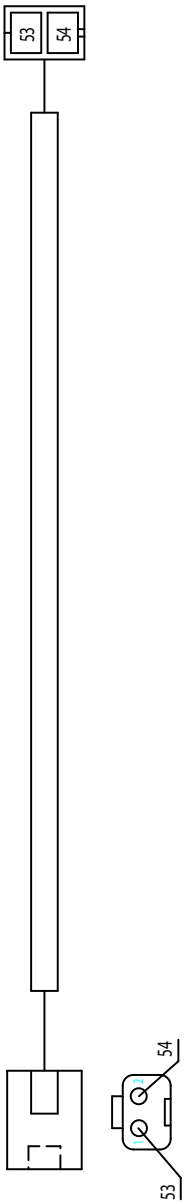
No.	Up to	To	Colour	mm²
46	X5/5 armrest/chassis connection	X7/85 joystick (right) connection	org	1
58	X5/4 armrest/chassis connection	S28 safety switch	brn/wht	1
62	X5/1 armrest/chassis connection	X8/2 joystick (left) connection	blu/yel	1
64	X5/2 armrest/chassis connection	X8/3 joystick (left) connection	gry/yel	1
66	X5/3 armrest/chassis connection	X8/6 joystick (left) connection	gry/grn	1
68	X5/7 armrest/chassis connection	S54 air conditioning thermostat	yel/red	1
71	X6/1 armrest switch connection	X7/2 joystick (right) connection	brn/grn	1
73	X5/6 armrest/chassis connection	X7/4 joystick (right) connection	blk	1
74	X5/6 armrest/chassis connection	M4/2 fan	blk	1

No.	Up to	To	Colour	mm²
75	M4/2 fan	X8/4 joystick (left) connection	blk	1
76	X6/5 armrest switch connection	S28 safety switch	gry	1
77	S28 safety switch	X8/1 joystick (left) connection	gry	1
81	X6/5 armrest switch connection	X7/1 joystick (right) connection	gry	1
82	X6/2 armrest switch connection	S54 air conditioning thermostat	yel/red	1
83	X6/3 armrest switch connection	M4/1 fan	yel/blk	1
84	X6/4 armrest switch connection	M4/3 fan	yel/blu	1
85	X8/5 joystick (left) connection	X7/3 joystick (right) connection	gry/blk	1

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6.35 Wiring harness 1000116138: boom working light



No.	Up to	To	Colour	mm²
53	XE11/1 boom working light	E1 boom working light	grn/yel	1
54	XE11/2 boom working light	E1 boom working light	blk	1

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Wiring harnesses: overview

Wiring diagrams include all options.

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6.36 Wiring diagram A3 up to serial no. AC02888 (legend)

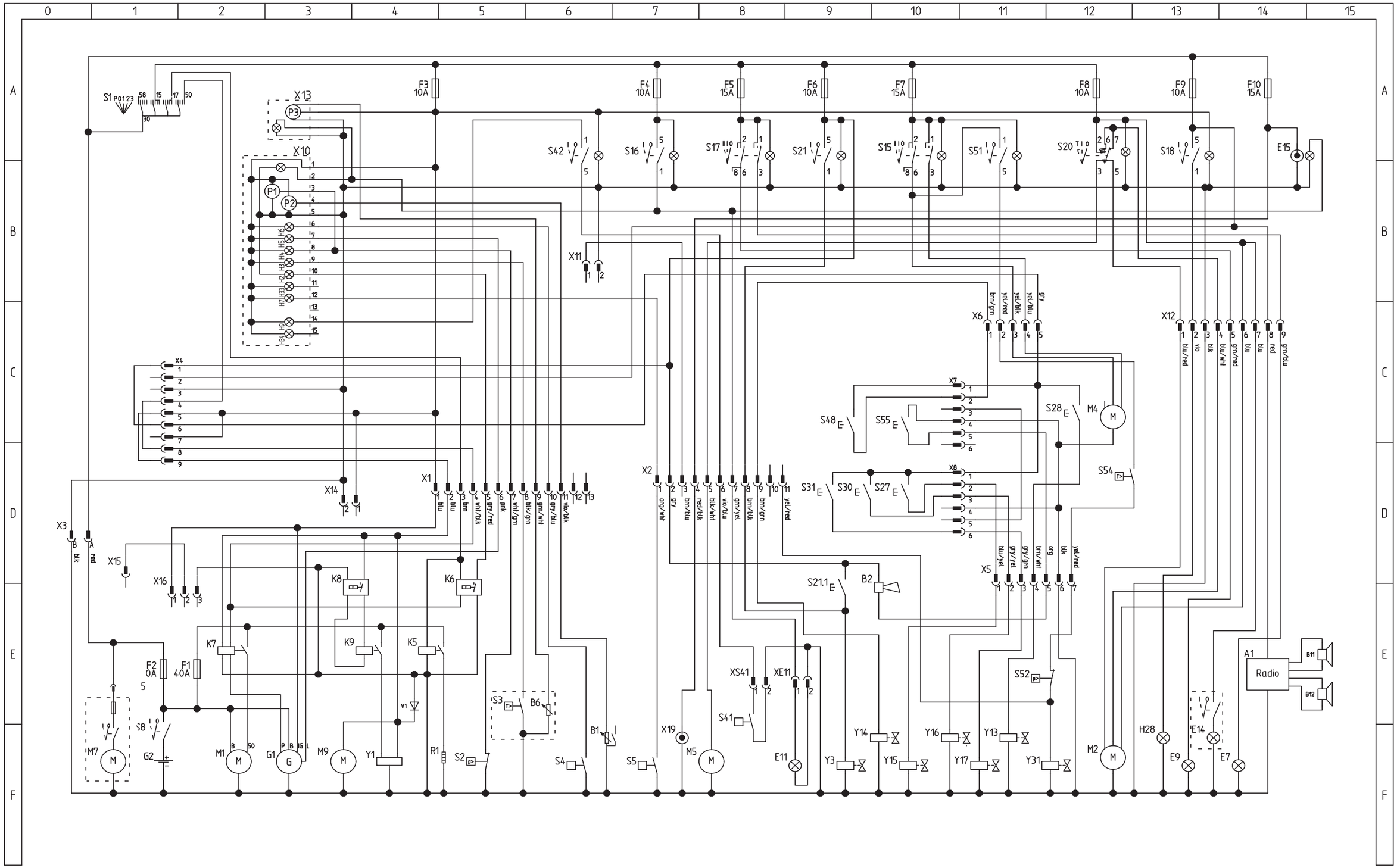
No.	Description	Section	
A1	Radio	E14	Option
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Option
B12	Loudspeaker	E15	Option
E7	Rear roof lights	F14	Option
E9	Front roof light	F13	Option
E10	Front roof light		Option
E11	Boom light	F8/9	
E14	Interior light	E/F13	
E15	Cigarette lighter	A14	
F1	Main fuse: starter, preheating	E2	
F2	Main fuse + fuel-filling pump	E1	
F3	Indicators, engine relay	A5	
F4	Boom working light	A7	
F5	Cab working lights	A8	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A10	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio, drive interlock	A13	
F10	Socket, cigarette lighter	A14	
G1	Alternator	F3	
G2	Battery	F1	
H2	Preheating telltale	B3	
H3	Engine temperature telltale	B3	
H4	Engine oil pressure telltale	B3	
H5	Alternator charge function telltale	B3	
H6	Air filter telltale	B3	
H7	Hydraulic oil filter telltale	B3	
H9	Safe load indicator telltale	C3	Option
H28	Rotating beacon	F13	Option
H33	Spare telltale	B3	
H30	Spare telltale	C3	
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	D5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	D3	
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F13	Option
M4	Fan	C12	Option
M5	Washer pump	F8	Option
M7	Fuel-filling pump	F1	Option
M9	Fuel pump	F3	
P1	Hour meter	B3	
P2	Fuel level indication	B3	
P3	Engine oil temperature gauge	A3	
R1	Glow plug	F5	
S1	Preheating start switch	A1	

No.	Description	Section	
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S8	Battery master switch	F1	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Option
S18	Rotating beacon switch	A13	Option
S20	Wiper/washer switch	A12	Option
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Option
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C28	
S30	Additional control circuit tip switch	D9	Option
S31	Additional control circuit tip switch	D9	Option
S41	Safe load indicator pressure switch	E8	Option
S42	Safe load indicator switch	A6	Option
S48	Automatic idling speed tip switch	C9	Option
S51	Air conditioning switch	A11	Option
S52	Air conditioning pressure switch	E12	Option
S54	Air conditioning thermostat	D12	Option
S55	Horn tip switch	C10	
V1	Recovery diode	E4	
X1	13 pole connection – engine/chassis	D4-6	
X2	11 pole connection – engine/chassis	D7-9	
X3	2 pole main connection	D0	
X4	9 pole connection – drive interlock	C/D1	
X5	7 pole connection – armrest/chassis	D11/12	
X6	5 pole connection – armrest switch	C11/12	
X7	6 pole connection – joystick (right)	C/D 11	
X8	6 pole connection – joystick (left)	D11	
X10	15 pole connection – instrument panel	B/C3	
X11	2 pole connection – Vario indicator	B6	
X12	9 pole connection – cab	C13/14	
X13	5 pole connection – engine temperature	A3	
X14	2 pole connection – automatic revs setting	C/D3	
X15	1 pole connection – drive alarm	D/E 1	
X16	3 pole connection – drive alarm	E2	
X19	1 pole connection – socket	F7	
XE11	2 pole connection – boom working light	E9	
XS41	2 pole connection – safe load indicator	E8	
Y1	Cutoff solenoid	F4	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F11	
Y14	Solenoid valve – automatic idling speed setting	F9	Option
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Option
Y17	Solenoid valve – additional control circuit	F11	Option
Y31	Solenoid valve – air conditioning	F12	Option

Wiring diagram (legend)

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6.37 Wiring diagram A3 up to serial no. AC02888



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6.38 Wiring diagram A3 from serial no. AC02890 – AD07210 (legend)

No.	Description	Section	
A1	Radio	E14	Option
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Option
B12	Loudspeaker	E15	Option
B14	Warning buzzer	C2	
E7	Rear roof lights	F14	Option
E9	Front roof light	F13	Option
E10	Front roof light		Option
E11	Boom light	F8/9	
E14	Interior light	E/F13	
E15	Cigarette lighter	A14	
F1	Main fuse: starter, preheating	E2	
F2	Main fuse + fuel-filling pump	E1	
F3	Indicators, engine relay	A5	
F4	Boom working light	A7	
F5	Cab working lights	A8	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A10	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio, drive interlock	A13	
F10	Socket, cigarette lighter	A14	
G1	Alternator	F3	
G2	Battery	F1	
H2	Preheating telltale	B1	
H3	Engine temperature telltale	C1	
H4	Engine oil pressure telltale	B1	
H5	Alternator charge function telltale	B1	
H6	Air filter telltale	B1	
H7	Hydraulic oil filter telltale	B1	
H9	Safe load indicator telltale	C1	Option
H28	Rotating beacon	F13	Option
H33	Spare telltale	B1	
H30	Spare telltale	C3	
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	D5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	D3	
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F13	Option

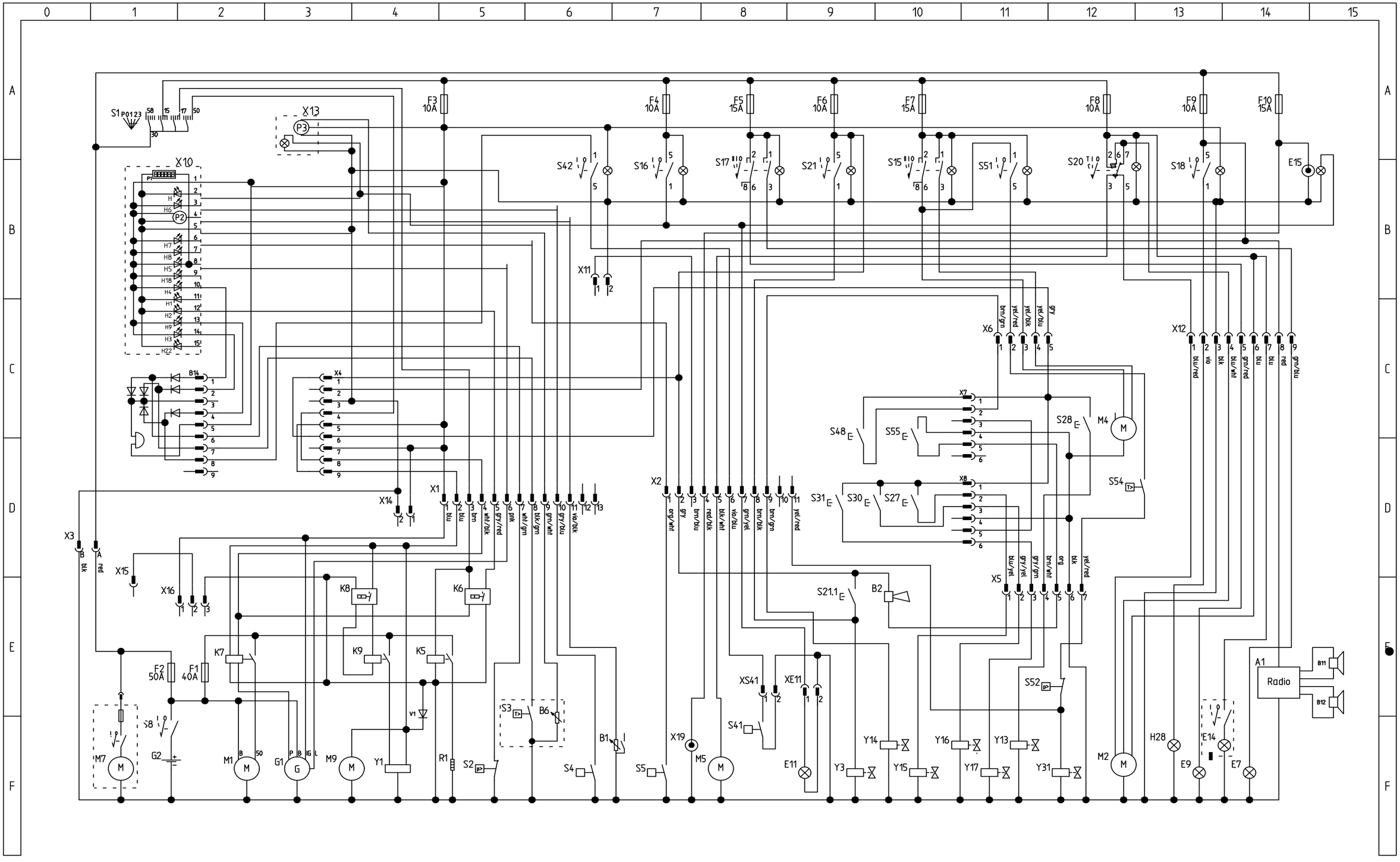
No.	Description	Section	
M4	Fan	C12	Option
M5	Washer pump	F8	Option
M7	Fuel-filling pump	F1	Option
M9	Fuel pump	F3	
P1	Hour meter	B1	
P2	Fuel level indication	B1	
P3	Engine oil temperature gauge	A3	
R1	Glow plug	F5	
S1	Preheating start switch	A1	
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S8	Battery master switch	F1	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Option
S18	Rotating beacon switch	A13	Option
S20	Wiper/washer switch	A20	Option
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Option
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	A12	
S30	Additional control circuit tip switch	D9	Option
S31	Additional control circuit tip switch	D9	Option
S41	Safe load indicator pressure switch	E8	Option
S42	Safe load indicator switch	A6	Option
S48	Automatic idling speed tip switch	C9	Option
S51	Air conditioning switch	A11	Option
S52	Air conditioning pressure switch	E12	Option
S54	Air conditioning thermostat	D12	Option
S55	Horn tip switch	C10	
V1	Recovery diode	E4	
X1	13 pole connection – engine/ chassis	D4-6	
X2	11 pole connection – engine/ chassis	D7-9	
X3	2 pole main connection	D0	

No.	Description	Section	
X4	9 pole connection – drive interlock	C/D3	
X5	7 pole connection – armrest/ chassis	D11/12	
X6	5 pole connection – armrest switch	C11/12	
X7	6 pole connection – joystick (right)	C/D 11	
X8	6 pole connection – joystick (left)	D11	
X10	15 pole connection – instrument panel	B/C1/2	
X11	2 pole connection – Vario indicator	B6	
X12	9 pole connection – cab	C13/14	
X13	5 pole connection – engine temperature	A3	
X14	2 pole connection – automatic revs setting	D4	
X15	1 pole connection – drive alarm	D/E1	
X16	3 pole connection – drive alarm	E2	
X19	1 pole connection – socket	F7	
XE11	2 pole connection – boom working light	E9	
XS41	2 pole connection – safe load indicator	E8	
Y1	Cutoff solenoid	F4	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F11	
Y14	Solenoid valve – automatic idling speed setting	F9	Option
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Option
Y17	Solenoid valve – additional control circuit	F11	Option
Y31	Solenoid valve – air conditioning	F12	Option

Wiring diagram (legend)

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6.39 Wiring diagram A3 from serial no. AC02890 – AD07210



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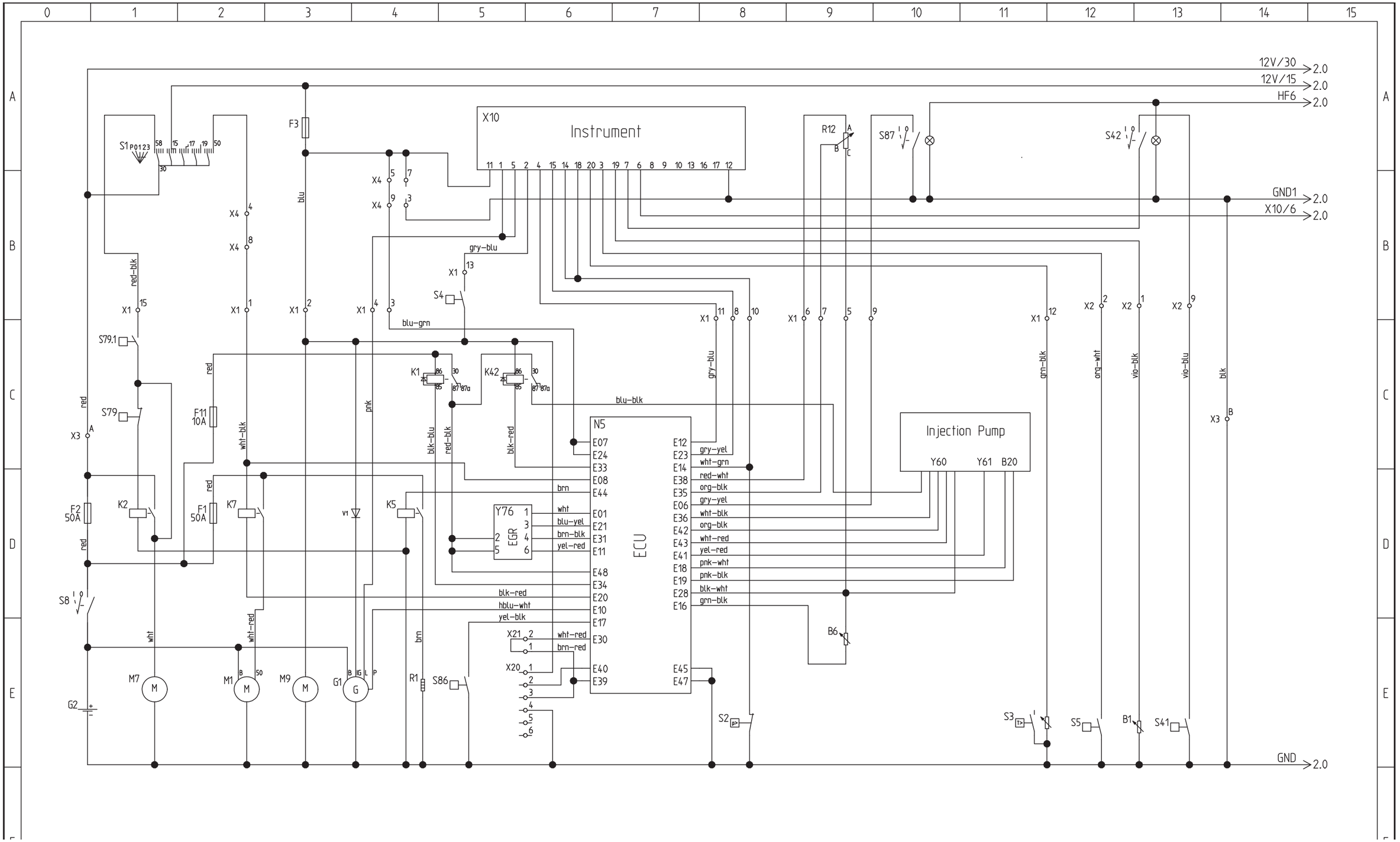
6.40 Wiring diagram A4 from serial no. AH00645 (legend)

No.	Description	Section	Loc.
A1	Radio	(2) E12	Option
B1	Fuel level indicator	(1) E13	
B2	Horn	(2) D4	
B6	Engine temperature sensor	(1) E9	
B11	Loudspeaker	(2) E12	Option
B12	Loudspeaker	(2) E12	Option
B19	Quickhitch warning buzzer	(2) C3	
B20	Engine revs	(1) C/D11	
E7	Rear working lights	(2) E8	Option
E9	Front working light	(2) E8	Option
E11	Boom working light	(2) E1	
E14	Interior light	(2) E10	
E15	Cigarette lighter	(2) B13	
F1	Main fuse: starter, preheating	(1) D2	
F2	Main fuse	(1) D0	
F3	Displays, E-ECU	(1) A3	
F4	Boom working light	(2) A1	
F5	Roof working lights	(2) A8	
F6	Valves, horn	(2) A2	
F7	Fan, air conditioning	(2) A6	
F8	Wiper, interior light	(2) A9	
F9	Rotating beacon, radio	(2) A11	
F10	Socket, cigarette lighter	(2) A13	
F11	E-ECU, engine relay	(1) C2	
G1	Alternator	(1) E4	
G2	Battery	(1) E0	
H28	Rotating beacon	(2) E11	Option
K1	Engine electronics main relay	(1) C4	
K2	Fuel-filling pump relay	(1) D1	
K5	Preheating high current relay	(1) D4	
K7	Start high current relay	(1) D2	
K42	Fuel injection pump relay	(1) C5	
M1	Starter	(1) E2	
M2	Front wiper motor	(2) E10	Option
M4	Fan	(2) D6	Option
M5	Front washer pump	(2) E9	Option
M7	Fuel-filling pump	(1) E1	Option
M9	Fuel pump	(1) E3	
N5	Diesel engine electronics	(1)C-E/6-7	
R1	Glow plug	(1) E4	
R12	Engine speed potentiometer	(1) A9	
S1	Preheating start switch	(1) A1	
S2	Engine oil pressure switch	(1) E8	
S3	Engine temperature switch	(1) E11	
S4	Air filter pressure switch	(1) B5	
S5	Hydraulic oil pressure switch	(1) E12	
S8	Battery master switch	(1) D0	
S15	Heating switch	(2) B6	
S16	Working light switch	(2) B1	
S17	Working light switch	(2) B8	Option
S18	Rotating beacon switch	(2) B11	Option
S20	Wiper/washer switch	(2) B9	Option
S21	1st/2nd speed switch	(2) B2	
S27	Changeover valve tip switch	(2) D5	
S28	Left-hand side safety switch	(2) D4-5	
S40	Quickhitch lock switch	(2) B3	Option
S41	Safe load indicator pressure switch	(1) E13	Option
S42	Safe load indicator switch	(1) A13	Option
S51	Air conditioning switch	(2) B7	Option
S52	Air conditioning pressure switch	(2) D7	Option
S54	Air conditioning temperature switch	(2) C7	Option
S55	Horn tip switch	(2) D6	
S79	Fuel-filling pump switch	(1) C1	
S86	Automatic revs setting pressure switch	(1) E5	
S87	Automatic revs setting switch	(1) A10	
Y3	Normal speed solenoid valve	(2) E2	
Y13	Pilot control safety valve	(2) E4-5	
Y15	Auxiliary hydraulics/boom swivel changeover solenoid valve	(2) E5	
Y25	Quickhitch lock solenoid valve	(2) E3	Option
Y31	Electro-magnetic clutch compressor	(2) E7	Option
Y60	Fuel injection pump	(1) C10	Option
Y61	Cold start valve	(1) C11	
Y76	Exhaust gas recirculation	(1) D5	

Wiring diagram (legend)

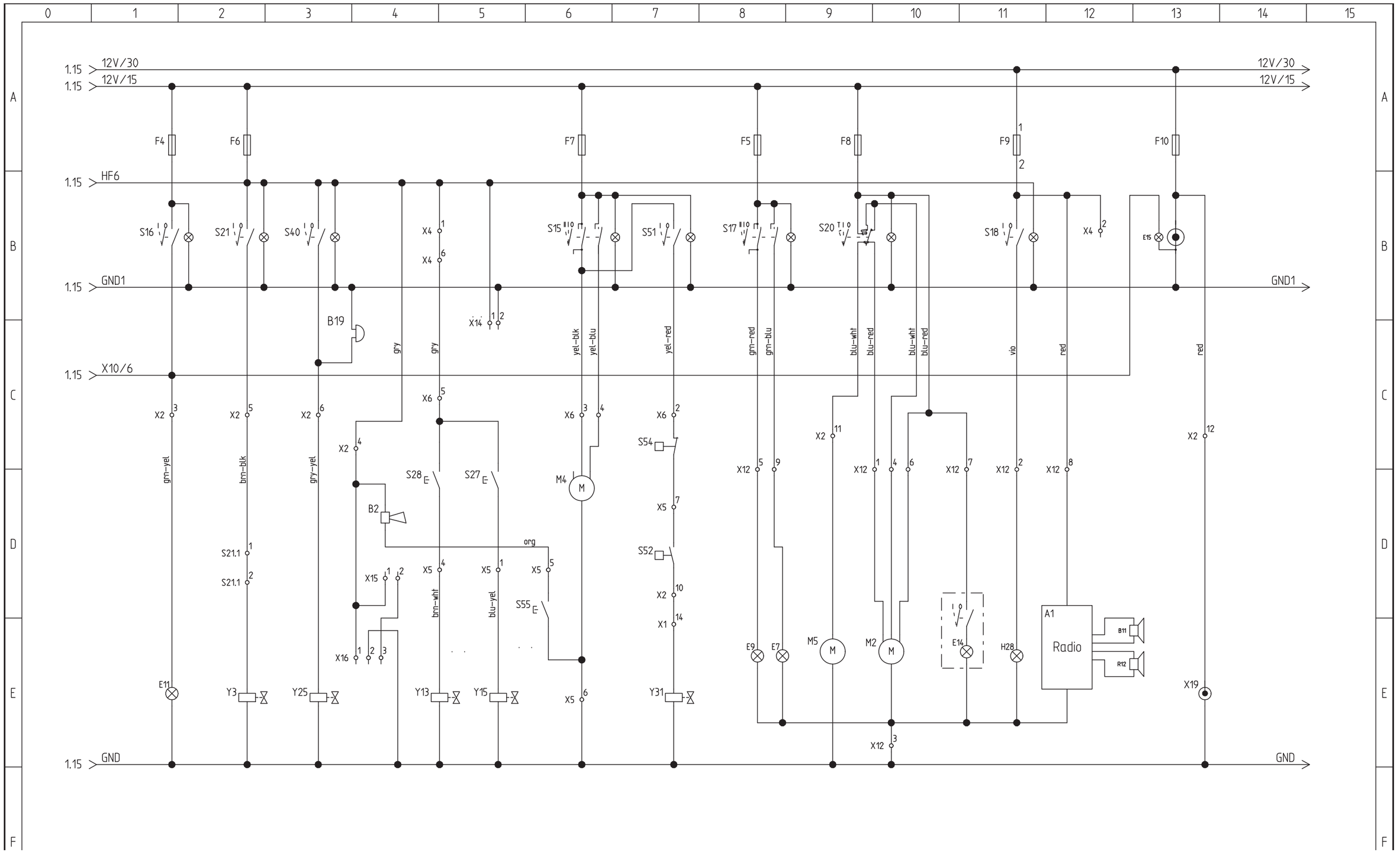
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6.41 Wiring diagram A4 (1) from serial no. AH00645



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6.42 Wiring diagram A4 (2) from serial no. AH00645



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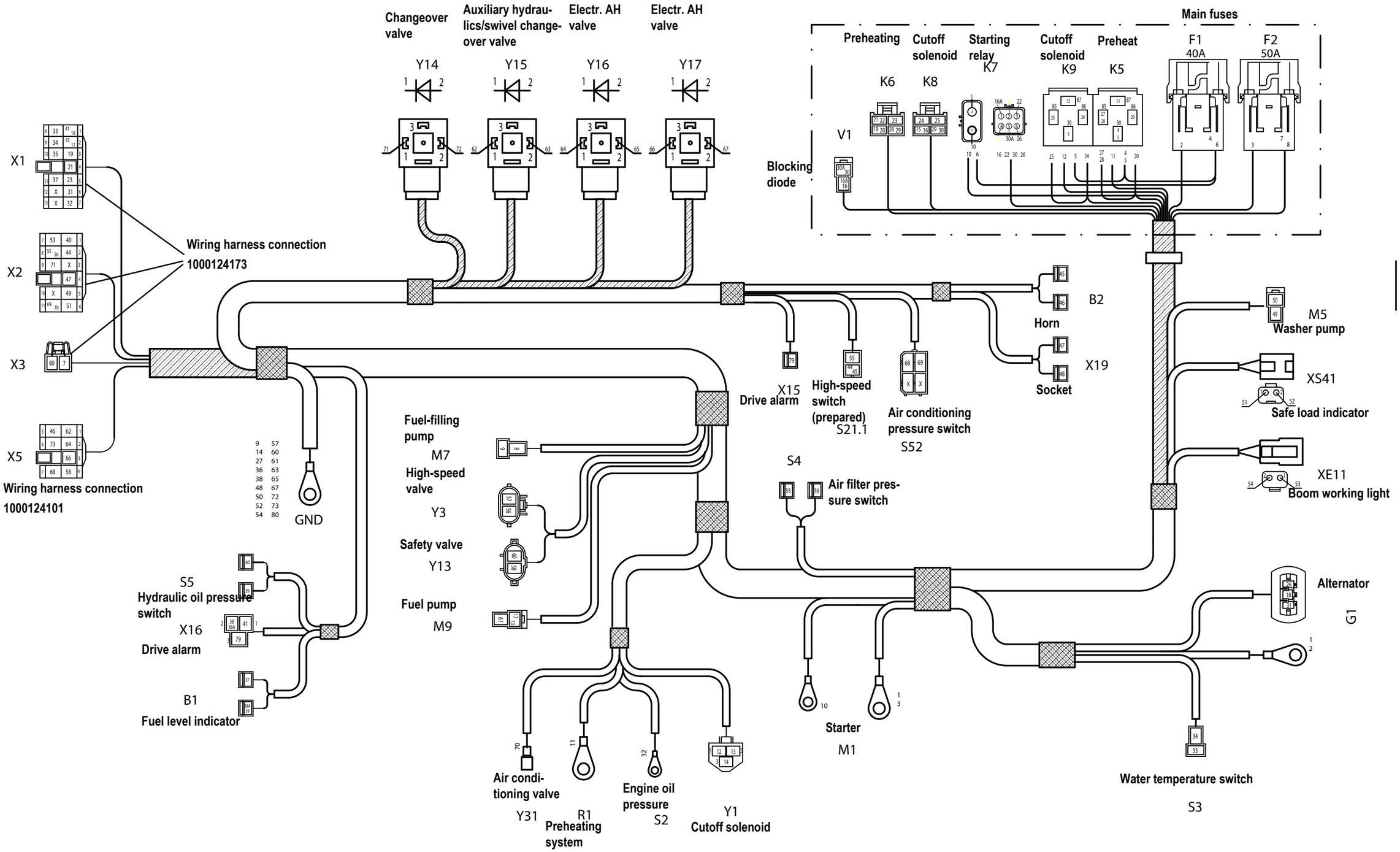
6.43 Engine – chassis A3 wiring harness 1000109624 (legend)

No.	Up to	To	Colour	mm²
1	G1/B alternator	M1 starter	red	10
2	G1/B alternator	F1 main fuse	red	6
3	M1 starter	F2 main fuse	red	6
4	F1 main fuse	K5/30 preheating relay	red	4
5	K5/30 preheating relay	K9/30 cutoff solenoid relay	red	4
6	F1 main fuse	K7/A start high current relay	red	4
7	F2 main fuse	X3/A main connection	red	6
8	F2 main fuse	M7 fuel-filling pump	red	4
9	GND	M7 fuel-filling pump	blk	4
10	K7/B start high current relay	M1 starter	wht/red	4
11	K5/87 preheating relay	R1 glow plug	brn	6
12	K9/87 cutoff solenoid switching relay	Y1/1 cutoff solenoid	wht	4
13	M9/1 fuel pump	Y1/2 cutoff solenoid	blu	1
14	GND	Y1/3 cutoff solenoid	blk	2.5
15	K8 cutoff solenoid time lag relay	X1/2 engine/chassis connection	blu	1
16	K8 cutoff solenoid time lag relay	V1 blocking diode	blu	1
16 A	V1 blocking diode	K7/1 start high current relay	blu	1
17	M9/1 fuel pump	X1/2 engine/chassis connection	blu	1
18	G1/2 alternator	X1/1 engine/chassis connection	blu	1
19	K6 preheating time lag relay	X1/3 engine/chassis connection	brn	1
20	K6 preheating time lag relay	K5/86 preheating relay	brn	1
21	K6 preheating time lag relay	X1/4 engine/chassis connection	wht/blk	1
22	K6 preheating time lag relay	K7/3 start high current relay	wht/blk	1
23	K6 preheating time lag relay	X1/5 engine/chassis connection	gry/red	1
24	K8 cutoff solenoid time lag relay	K9/86 cutoff solenoid switching relay	blu/blk	1
25	K8 cutoff solenoid time lag relay	K9/85 cutoff solenoid switching relay	pnk/blk	1
26	K7/6 start high current relay	G1/3 alternator	blk/blu	1
27	GND	K5/85 preheating relay	blk	1
28	K5/85 preheating relay	K6 preheating time lag relay	blk	1
29	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
30	K8 cutoff solenoid time lag relay	V1 blocking diode	blk	1
30A	V1 blocking diode	K7/5 start high current relay	blk	1
31	G1/1 alternator	X1/6 engine/chassis connection	pnk	1
32	S2 engine oil pressure switch	X1/7 engine/chassis connection	wht/grn	1
33	S3 engine temperature switch	X1/8 engine/chassis connection	blk/grn	1
34	S3 engine temperature switch	X1/9 engine/chassis connection	grn/wht	1
35	S4 air filter pressure switch	X1/10 engine/chassis connection	gry/blu	1
36	S4 air filter pressure switch	GND	blk	1
37	B1 fuel level indicator	X1/11 engine/chassis connection	vio/blk	1
38	GND	X16/2 drive alarm connection	blk	1
38A	B1 fuel level indicator	X16/2 drive alarm connection	blk	1
39	B1 fuel level indicator	S5 preheating start switch	blk	1
40	S5 preheating start switch	X2/1 engine/chassis connection	org/wht	1
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis connection	red/blk	1.5
48	X19 socket	GND	blk	1.5
49	M5 washer pump	X2/5 engine/chassis connection	blk/wht	1
50	M5 washer pump	GND	blk	1

No.	Up to	To	Colour	mm²
51	XS41/1 safe load indicator	X2/6 engine/chassis connection	vio/blu	1
52	XS41/2 safe load indicator	GND	blk	1
53	XE11/1 boom working light	X2/7 engine/chassis connection	grn/yel	1
54	XE11/2 boom working light	GND	blk	1
55	S21.1/1 high-speed tip switch (prepared)	X2/8 engine/chassis connection	brn/blk	1
56	Y3 high-speed solenoid valve	X2/8 engine/chassis connection	brn/blk	1
57	Y3 high-speed solenoid valve	GND	blk	1
58	Y13 solenoid valve for safety valve	X5/4 armrest/chassis connection	brn/wht	1
60	GND	Y13 solenoid valve for safety valve	blk	1
61	GND	M9/2 fuel pump	blk	1
62	Y15/1 auxiliary hydraulics/swivel solenoid valve	X5/1 armrest/chassis connection	blu/yel	1
63	Y15/2 auxiliary hydraulics/swivel solenoid valve	GND	blk	1
64	Y16/1 electr. auxiliary hydraulics solenoid valve	X5/2 armrest/chassis connection	gry/yel	1
65	Y16/2 electr. auxiliary hydraulics solenoid valve	GND	blk	1
66	Y17/1 electr. auxiliary hydraulics solenoid valve	X5/3 armrest/chassis connection	gry/grn	1
67	Y17/2 electr. auxiliary hydraulics solenoid valve	GND	blk	1
68	S52 air conditioning pressure switch	X5/7 armrest/chassis connection	yel/red	1
69	S52 air conditioning pressure switch	X2/11 engine/chassis connection	yel/red	1
70	X2/11 engine/chassis connection	Y31 air conditioning solenoid valve	yel/red	1
71	Y14/1 changeover valve solenoid valve	X2/9 engine/chassis connection	brn/grn	1
72	Y14/2 changeover valve solenoid valve	GND	blk	1
73	GND	X5/6 armrest/chassis connection	blk	1
79	X15 drive alarm connection	X16/3 drive alarm connection	gry/blk	1
80	GND	X3/B main connection	blk	6

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6.44 Engine – chassis A3 wiring harness 1000109624



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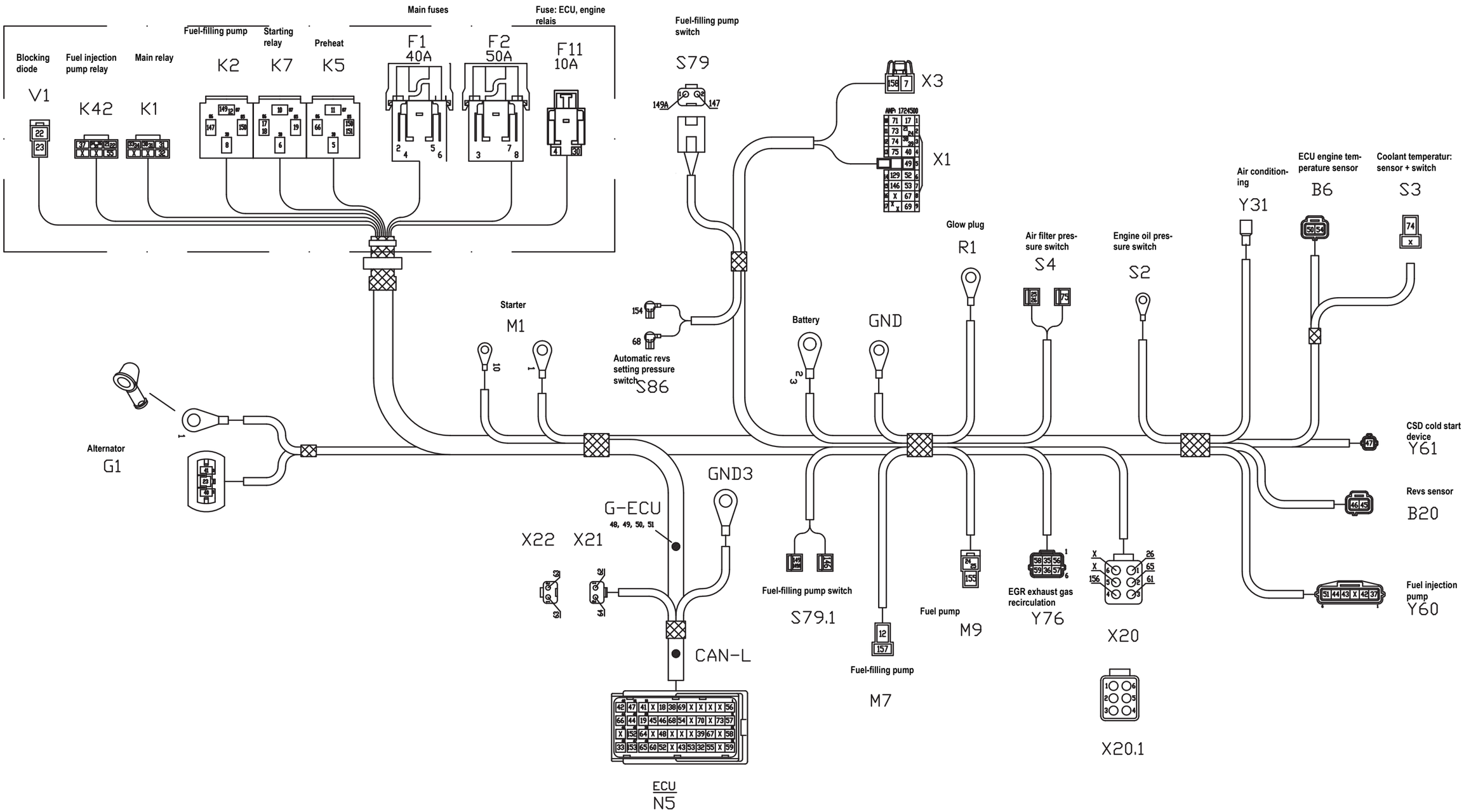
6.45 Engine – chassis A3 wiring harness 1000173970 from serial no. AH00611 (legend)

No.	Up to	To	Colour	mm²
1	G1/B alternator	M1 starter	red	10
2	G1/B alternator	F1 main fuse	red	6
3	M1 starter	F2 main fuse	red	6
4	F1 main fuse	K5/30 preheating relay	red	4
5	K5/30 preheating relay	K9/30 cutoff solenoid relay	red	4
6	F1 main fuse	K7/A start high current relay	red	4
7	F2 main fuse	X3/A main connection	red	6
8	F2 main fuse	M7 fuel-filling pump	red	4
9	GND	M7 fuel-filling pump	blk	4
10	K7/B start high current relay	M1 starter	wht/red	4
11	K5/87 preheating relay	R1 glow plug	brn	6
12	K9/87 cutoff solenoid switching relay	Y1/1 cutoff solenoid	wht	4
13	M9/1 fuel pump	Y1/2 cutoff solenoid	blu	1
14	GND	Y1/3 cutoff solenoid	blk	2.5
15	K8 cutoff solenoid time lag relay	X1/2 engine/chassis connection	blu	1
16	K8 cutoff solenoid time lag relay	V1 blocking diode	blu	1
16 A	V1 blocking diode	K7/1 start high current relay	blu	1
17	M9/1 fuel pump	X1/2 engine/chassis connection	blu	1
18	G1/2 alternator	X1/1 engine/chassis connection	blu	1
19	K6 preheating time lag relay	X1/3 engine/chassis connection	brn	1
20	K6 preheating time lag relay	K5/86 preheating relay	brn	1
21	K6 preheating time lag relay	X1/4 engine/chassis connection	wht/blk	1
22	K6 preheating time lag relay	K7/3 start high current relay	wht/blk	1
23	K6 preheating time lag relay	X1/5 engine/chassis connection	gry/red	1
24	K8 cutoff solenoid time lag relay	K9/86 cutoff solenoid switching relay	blu/blk	1
25	K8 cutoff solenoid time lag relay	K9/85 cutoff solenoid switching relay	pnk/blk	1
26	K7/6 start high current relay	G1/3 alternator	blk/blu	1
27	GND	K5/85 preheating relay	blk	1
28	K5/85 preheating relay	K6 preheating time lag relay	blk	1
29	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
30	K8 cutoff solenoid time lag relay	V1 blocking diode	blk	1
30A	V1 blocking diode	K7/5 start high current relay	blk	1
31	G1/1 alternator	X1/6 engine/chassis connection	pnk	1
32	S2 engine oil pressure switch	X1/7 engine/chassis connection	wht/grn	1
33	S3 engine temperature switch	X1/8 engine/chassis connection	blk/grn	1
34	S3 engine temperature switch	X1/9 engine/chassis connection	grn/wht	1
35	S4 air filter pressure switch	X1/10 engine/chassis connection	gry/blu	1
36	S4 air filter pressure switch	GND	blk	1
37	B1 fuel level indicator	X1/11 engine/chassis connection	vio/blk	1
38	GND	X16/2 drive alarm connection	blk	1
38A	B1 fuel level indicator	X16/2 drive alarm connection	blk	1
39	B1 fuel level indicator	S5 preheating start switch	blk	1

No.	Up to	To	Colour	mm²
40	S5 preheating start switch	X2/1 engine/chassis connection	org/wht	1
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis connection	red/blk	1.5
48	X19 socket	GND	blk	1.5
49	M5 washer pump	X2/5 engine/chassis connection	blk/wht	1
50	M5 washer pump	GND	blk	1
51	XS41/1 safe load indicator	X2/6 engine/chassis connection	vio/blu	1
52	XS41/2 safe load indicator	GND	blk	1
53	XE11/1 boom working light	X2/7 engine/chassis connection	grn/yel	1
54	XE11/2 boom working light	GND	blk	1
55	S21.1/1 high-speed tip switch (prepared)	X2/8 engine/chassis connection	brn/blk	1
56	Y3 high-speed solenoid valve	X2/8 engine/chassis connection	brn/blk	1
57	Y3 high-speed solenoid valve	GND	blk	1
58	Y13 solenoid valve for safety valve	X5/4 armrest/chassis connection	brn/wht	1
60	GND	Y13 solenoid valve for safety valve	blk	1
61	GND	M9/2 fuel pump	blk	1
62	Y15/1 auxiliary hydraulics/swivel solenoid valve	X5/1 armrest/chassis connection	blu/yel	1
63	Y15/2 auxiliary hydraulics/swivel solenoid valve	GND	blk	1
64	Y16/1 electric auxiliary hydraulics solenoid valve	X5/2 armrest/chassis connection	gry/yel	1
65	Y16/2 electric auxiliary hydraulics solenoid valve	GND	blk	1
66	Y17/1 electric auxiliary hydraulics solenoid valve	X5/3 armrest/chassis connection	gry/grn	1
67	Y17/2 electric auxiliary hydraulics solenoid valve	GND	blk	1
68	S52 air conditioning pressure switch	X5/7 armrest/chassis connection	yel/red	1
69	S52 air conditioning pressure switch	X2/11 engine/chassis connection	yel/red	1
70	X2/11 engine/chassis connection	Y31 air conditioning solenoid valve	yel/red	1
71	Y14/1 changeover valve solenoid valve	X2/9 engine/chassis connection	brn/grn	1
72	Y14/2 changeover valve solenoid valve	GND	blk	1
73	GND	X5/6 armrest/chassis connection	blk	1
79	X15 drive alarm connection	X16/3 drive alarm connection	gry/blk	1
80	GND	X3/B main connection	blk	6

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6.46 Engine – chassis A3 wiring harness 1000173970 from serial no. AH00611



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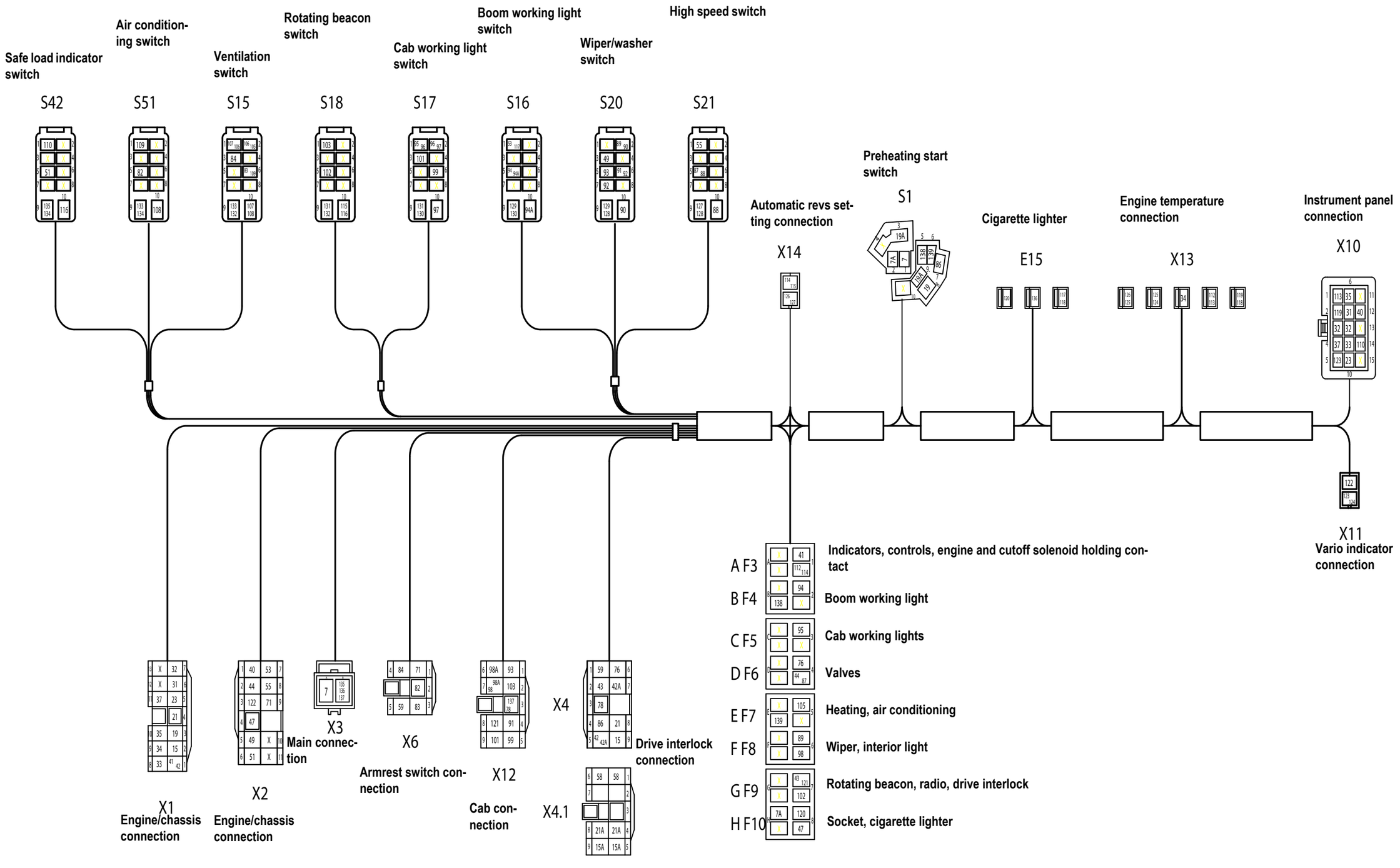
6.47 Switches A3 wiring harness 1000109630 up to serial no. AC02888 (legend)

No.	Up to	To	Colour	
7	X3/A main connection	S1/1 preheating start switch	red	6
7A	S1/1 preheating start switch	F10 socket and cigarette lighter fuse	red	4
15	X1/2 engine/chassis connection	X4/9 drive interlock connection	blu	1
15A	X4.1/9 drive interlock connection	X4.1/5 drive interlock connection	blu	1
19	X1/3 engine/chassis connection	S1/8 preheating start switch	brn	1
19A	S1/3 preheating start switch	S1/6 preheating start switch	brn	1
21	X1/4 engine/chassis connection	X4/8 drive interlock connection	wht/blk	1
21A	X4.1/4 drive interlock connection	X4.1/8 drive interlock connection	wht/blk	1
23	X1/5 engine/chassis connection	X10/10 instrument panel connection	gry/red	1
31	X1/6 engine/chassis connection	X10/7 instrument panel connection	pnk	1
32	X1/7 engine/chassis connection	X10/8 instrument panel connection	wht/grn	1
33	X1/8 engine/chassis connection	X10/9 instrument panel connection	blk/grn	1
34	X1/9 engine/chassis connection	X13 engine temperature connection	grn/wht	1
35	X1/10 engine/chassis connection	X10/6 instrument panel connection	gry/blu	1
37	X1/11 engine/chassis connection	X10/4 instrument panel connection	vio/blk	1
40	X2/1 engine/chassis connection	X10/12 instrument panel connection	org/wht	1
41	X1/1 engine/chassis connection	F3 indicators and engine relay fuse	blu	1
42	X1/1 engine/chassis connection	X4/5 drive interlock connection	blu	1
42A	X4/7 drive interlock connection	X4/5 drive interlock connection	blu	1
43	X4/5 drive interlock connection	F9 rotating beacon, radio and drive interlock fuse	red	1
44	X2/2 engine/chassis connection	F6 valves and horn fuse	gry	1
47	X2/4 engine/chassis connection	F10 socket and cigarette lighter fuse	red/blk	1.5
49	X2/5 engine/chassis connection	S20/3 wiper/washer system switch	blk/wht	1
51	X2/6 engine/chassis connection	S42/5 safe load indicator switch	vio/blu	1
53	X2/7 engine/chassis connection	S16/1 boom working light switch	grn/yel	1
55	X2/8 engine/chassis connection	S21/1 high-speed switch	brn/blk	1
58A	X4.1/1 drive interlock connection	X4.1/6 drive interlock connection	brn/wht	1
59	X4/1 drive interlock connection	X6/5 armrest switch connection	gry	1
71	X2/9 engine/chassis connection	X6/1 armrest switch connection	brn/grn	1
76	F6 valves and horn fuse	X4/6 drive interlock connection	gry	1
78	X4/3 drive interlock connection	X12/3 cab connection	blk	1
82	S51/5 air conditioning switch	X6/2 armrest switch connection	yel/red	1
83	S15/3 ventilation switch	X6/3 armrest switch connection	yel/blk	1
84	S15/6 ventilation switch	X6/4 armrest switch connection	yel/blu	1
86	X4/4 drive interlock connection	S1/7 preheating start switch	wht/blk	1
87	F6 valves and horn fuse	S21/5 high-speed switch	gry	1
88	S21/10 high-speed switch	S21/5 high-speed switch	gry	1
89	F8 wiper and interior light fuse	S20/2 wiper/washer system switch	blu	1
90	S20/10 wiper/washer system switch	S20/2 wiper/washer system switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer system switch	blu/wht	1
92	S20/7 wiper/washer system switch	S20/6 wiper/washer system switch	blu/wht	1
93	S20/5 wiper/washer system switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94A	S16/10 boom working light switch	S16/5 boom working light switch	grn	1
95	F5 cab working light fuse	S17/1 cab working light switch	grn	1
96	S17/1 cab working light switch	S17/2 cab working light switch	grn	1
97	S17/1 cab working light switch	S17/10 cab working light switch	grn	1
98	F8 wiper and interior light fuse	X12/7 cab connection	blu	1
98A	X12/7 cab connection	X12/8 cab connection	blu	1
99	S17/1 cab working light switch	X12/5 cab connection	grn/red	1
101	S17/3 cab working light switch	X12/9 cab connection	grn/blu	1
102	F9 rotating beacon, radio and drive interlock fuse	S18/5 rotating beacon switch	red	1
103	S18/1 rotating beacon switch	X12/2 cab connection	vio	1
105	F7 fan and air conditioning fuse	S15/2 ventilation switch	yel	1
106	S15/1 ventilation switch	S15/2 ventilation switch	yel	1
107	S15/1 ventilation switch	S15/10 ventilation switch	yel	1
108	S51/10 air conditioning switch	S15/10 ventilation switch	yel	1
109	S15/3 ventilation switch	S51/1 air conditioning switch	yel/blk	1
110	S42/1 safe load indicator switch	X10/14 instrument panel connection	vio/blu	1
112	F3 indicators and engine relay fuse	X13 engine temperature connection	blu	1
113	X10/1 instrument panel connection	X13 engine temperature connection	blu	1
114	F3 indicators and engine relay fuse	X14/1 automatic revs setting connection	blu	1
115	S18/10 rotating beacon switch	X14/1 automatic revs setting connection	blu	1
116	S18/10 rotating beacon switch	S42/10 safe load indicator switch	vio/blu	1
117	S16/B boom working light switch	E15 cigarette lighter	grn/yel	1
118	X13 engine temperature connection	E15 cigarette lighter	grn/yel	1
119	X13 engine temperature connection	X10/2 instrument panel connection	grn/yel	1
120	F10 socket, cigarette lighter	E15 cigarette lighter	red/blk	1.5
121	F9 rotating beacon, radio and drive interlock fuse	X12/8 cab connection	red	1
122	X11/1 Vario indicator connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario indicator connection	blk	1
124	X13 engine temperature connection	X11/2 Vario indicator connection	blk	1
125	X13 engine temperature connection	X13 engine temperature connection	blk	1
126	X14/2 automatic revs setting connection	X13 engine temperature connection	blk	1
127	X14/2 automatic revs setting connection	S21/9 high-speed switch	blk	1
128	S20/9 wiper/washer system switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer system switch	S16/9 boom working light switch	blk	1
130	S17/9 cab working light switch	S16/9 boom working light switch	blk	1
131	S17/9 cab working light switch	S18/9 rotating beacon switch	blk	1
132	S15/9 ventilation switch	S18/9 rotating beacon switch	blk	1
133	S15/9 ventilation switch	S51/9 air conditioning switch	blk	1
134	S42/9 safe load indicator switch	S51/9 air conditioning switch	blk	1
135	S42/9 safe load indicator switch	X3/B main connection	blk	1
136	E15 cigarette lighter	X3/B main connection	blk	1.5
137	X12/3 cab connection	X3/B main connection	blk	1.5
138	S1/5 preheating start switch	F4 boom working light fuse	blu	2.5
139	S1/6 preheating start switch	F7 fan and air conditioning fuse	blu	2.5

Wiring harness 1000109630 switches (legend)

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6.48 Switches A3 wiring harness 1000109630 up to serial no. AC02888



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6.49 Switches A3 wiring harness from serial no. AC02890 (legend)

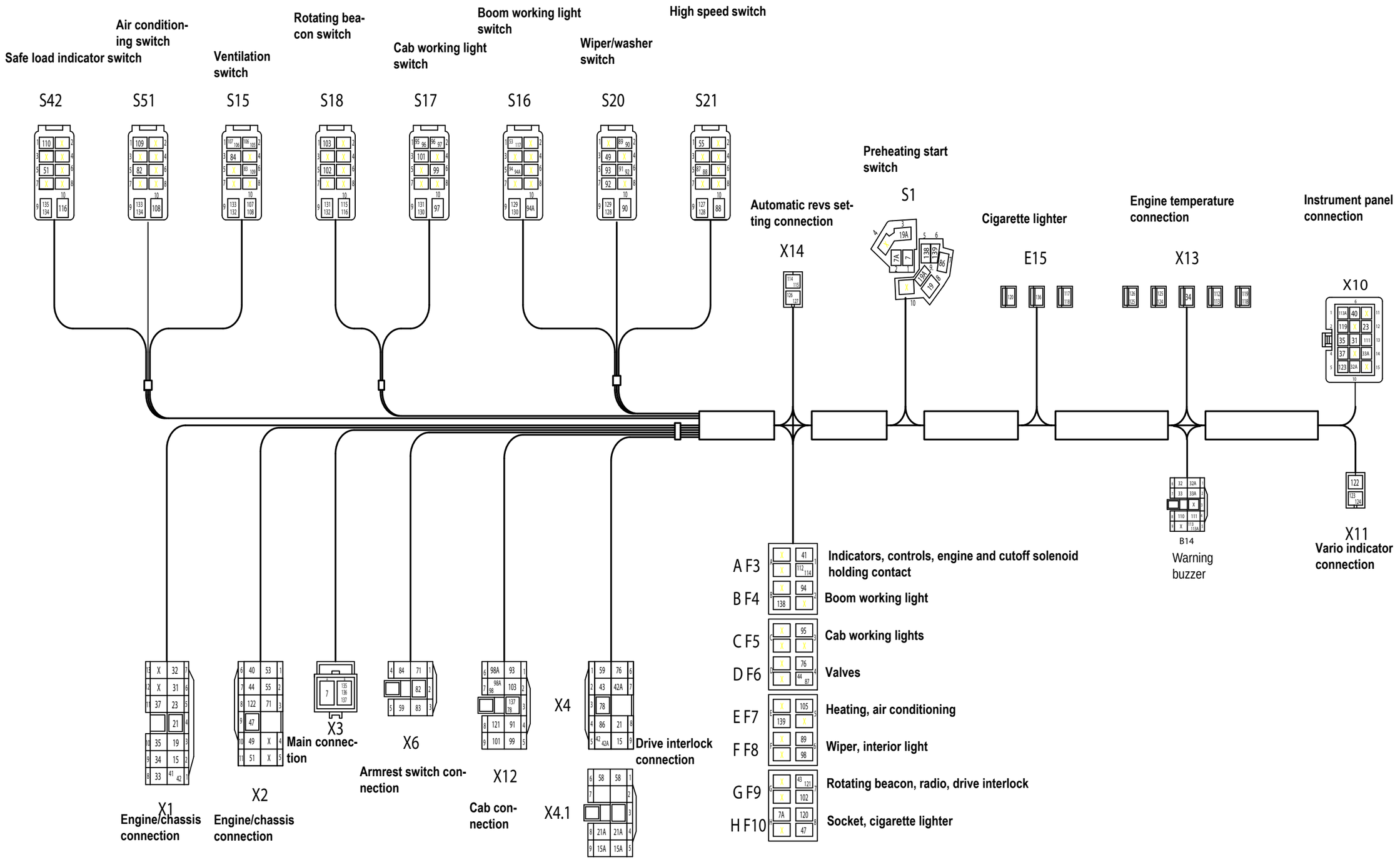
No.	Up to	To	Colour	
7	X3/A main connection	S1/1 preheating start switch	red	6
7A	S1/1 preheating start switch	F10 socket and cigarette lighter fuse	red	4
15	X1/2 engine/chassis connection	X4/9 drive interlock connection	blu	1
15A	X4.1/9 drive interlock connection	X4.1/5 drive interlock connection	blu	1
19	X1/3 engine/chassis connection	S1/8 preheating start switch	brn	1
19A	S1/3 preheating start switch	S1/6 preheating start switch	brn	1
21	X1/4 engine/chassis connection	X4/8 drive interlock connection	wht/blk	1
21A	X4.1/4 drive interlock connection	X4.1/8 drive interlock connection	wht/blk	1
23	X1/5 engine/chassis connection	X10/10 instrument panel connection	gry/red	1
31	X1/6 engine/chassis connection	X10/8 instrument panel connection	pnk	1
32	X1/7 engine/chassis connection	B14/5 warning buzzer connection	wht/grn	1
32A	X10/10 instrument panel connection	B14/5 warning buzzer connection	wht/grn	1
33	X1/8 engine/chassis connection	B14/6 warning buzzer connection	blk/grn	1
33A	X10/14 instrument panel connection	B14/6 warning buzzer connection	blk/grn	1
34	X1/9 engine/chassis connection	X13 engine temperature connection	grn/wht	1
35	X1/10 engine/chassis connection	X10/3 instrument panel connection	gry/blu	1
37	X1/11 engine/chassis connection	X10/4 instrument panel connection	vio/blk	1
40	X2/1 engine/chassis connection	X10/6 instrument panel connection	org/wht	1
41	X1/1 engine/chassis connection	F3 indicators and engine relay fuse	blu	1
42	X1/1 engine/chassis connection	X4/5 drive interlock connection	blu	1
42A	X4/7 drive interlock connection	X4/5 drive interlock connection	blu	1
43	X4/5 drive interlock connection	F9 rotating beacon, radio and drive interlock fuse	red	1
44	X2/2 engine/chassis connection	F6 valves and horn fuse	gry	1
47	X2/4 engine/chassis connection	F10 socket and cigarette lighter fuse	red/blk	1.5
49	X2/5 engine/chassis connection	S20/3 wiper/washer system switch	blk/wht	1
51	X2/6 engine/chassis connection	S42/5 safe load indicator switch	vio/blu	1
53	X2/7 engine/chassis connection	S16/1 boom working light switch	grn/yel	1
55	X2/8 engine/chassis connection	S21/1 high-speed switch	brn/blk	1
58A	X4.1/1 drive interlock connection	X4.1/6 drive interlock connection	brn/wht	1
59	X4/1 drive interlock connection	X6/5 armrest switch connection	gry	1
71	X2/9 engine/chassis connection	X6/1 armrest switch connection	brn/grn	1
76	F6 valves and horn fuse	X4/6 drive interlock connection	gry	1
78	X4/3 drive interlock connection	X12/3 cab connection	blk	1
82	S51/5 air conditioning switch	X6/2 armrest switch connection	yel/red	1
83	S15/3 ventilation switch	X6/3 armrest switch connection	yel/blk	1
84	S15/6 ventilation switch	X6/4 armrest switch connection	yel/blu	1
86	X4/4 drive interlock connection	S1/7 preheating start switch	wht/blk	1
87	F6 valves and horn fuse	S21/5 high-speed switch	gry	1
88	S21/10 high-speed switch	S21/5 high-speed switch	gry	1
89	F8 wiper and interior light fuse	S20/2 wiper/washer system switch	blu	1
90	S20/10 wiper/washer system switch	S20/2 wiper/washer system switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer system switch	blu/wht	1
92	S20/7 wiper/washer system switch	S20/6 wiper/washer system switch	blu/wht	1
93	S20/5 wiper/washer system switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94A	S16/10 boom working light switch	S16/5 boom working light switch	grn	1
95	F5 cab working light fuse	S17/1 cab working light switch	grn	1
96	S17/1 cab working light switch	S17/2 cab working light switch	grn	1
97	S17/1 cab working light switch	S17/10 cab working light switch	grn	1
98	F8 wiper and interior light fuse	X12/7 cab connection	blu	1
98A	X12/7 cab connection	X12/8 cab connection	blu	1
99	S17/1 cab working light switch	X12/5 cab connection	grn/red	1

No.	Up to	To	Colour	
101	S17/3 cab working light switch	X12/9 cab connection	grn/blu	1
102	F9 rotating beacon, radio and drive interlock fuse	S18/5 rotating beacon switch	red	1
103	S18/1 rotating beacon switch	X12/2 cab connection	vio	1
105	F7 fan and air conditioning fuse	S15/2 ventilation switch	yel	1
106	S15/1 ventilation switch	S15/2 ventilation switch	yel	1
107	S15/1 ventilation switch	S15/10 ventilation switch	yel	1
108	S51/10 air conditioning switch	S15/10 ventilation switch	yel	1
109	S15/3 ventilation switch	S51/1 air conditioning switch	yel/blk	1
110	S42/1 safe load indicator switch	B14/3 warning buzzer connection	vio/blu	1
111	X10/13 instrument panel connection	B14/3 warning buzzer connection	vio/blu	1
112	F3 indicators and engine relay fuse	X13 engine temperature connection	blu	1
113	B14/1 warning buzzer connection	X13 engine temperature connection	blu	1
113A	B14/1 warning buzzer connection	X10/1 instrument panel connection	blu	1
114	F3 indicators and engine relay fuse	X14/1 automatic revs setting connection	blu	1
115	S18/10 rotating beacon switch	X14/1 automatic revs setting connection	blu	1
116	S18/10 rotating beacon switch	S42/10 safe load indicator switch	vio/blu	1
117	S16/B boom working light switch	E15 cigarette lighter	grn/yel	1
118	X13 engine temperature connection	E15 cigarette lighter	grn/yel	1
119	X13 engine temperature connection	X10/2 instrument panel connection	grn/yel	1
120	F10 socket, cigarette lighter	E15 cigarette lighter	red/blk	1.5
121	F9 rotating beacon, radio and drive interlock fuse	X12/8 cab connection	red	1
122	X11/1 Vario indicator connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario indicator connection	blk	1
124	X13 engine temperature connection	X11/2 Vario indicator connection	blk	1
125	X13 engine temperature connection	X13 engine temperature connection	blk	1
126	X14/2 automatic revs setting connection	X13 engine temperature connection	blk	1
127	X14/2 automatic revs setting connection	S21/9 high-speed switch	blk	1
128	S20/9 wiper/washer system switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer system switch	S16/9 boom working light switch	blk	1
130	S17/9 cab working light switch	S16/9 boom working light switch	blk	1
131	S17/9 cab working light switch	S18/9 rotating beacon switch	blk	1
132	S15/9 ventilation switch	S18/9 rotating beacon switch	blk	1
133	S15/9 ventilation switch	S51/9 air conditioning switch	blk	1
134	S42/9 safe load indicator switch	S51/9 air conditioning switch	blk	1
135	S42/9 safe load indicator switch	X3/B main connection	blk	1
136	E15 cigarette lighter	X3/B main connection	blk	1.5
137	X12/3 cab connection	X3/B main connection	blk	1.5
138	S1/5 preheating start switch	F4 boom working light fuse	blu	2.5
139	S1/6 preheating start switch	F7 fan and air conditioning fuse	blu	2.5

Wiring harness 1000109630 switches (legend)

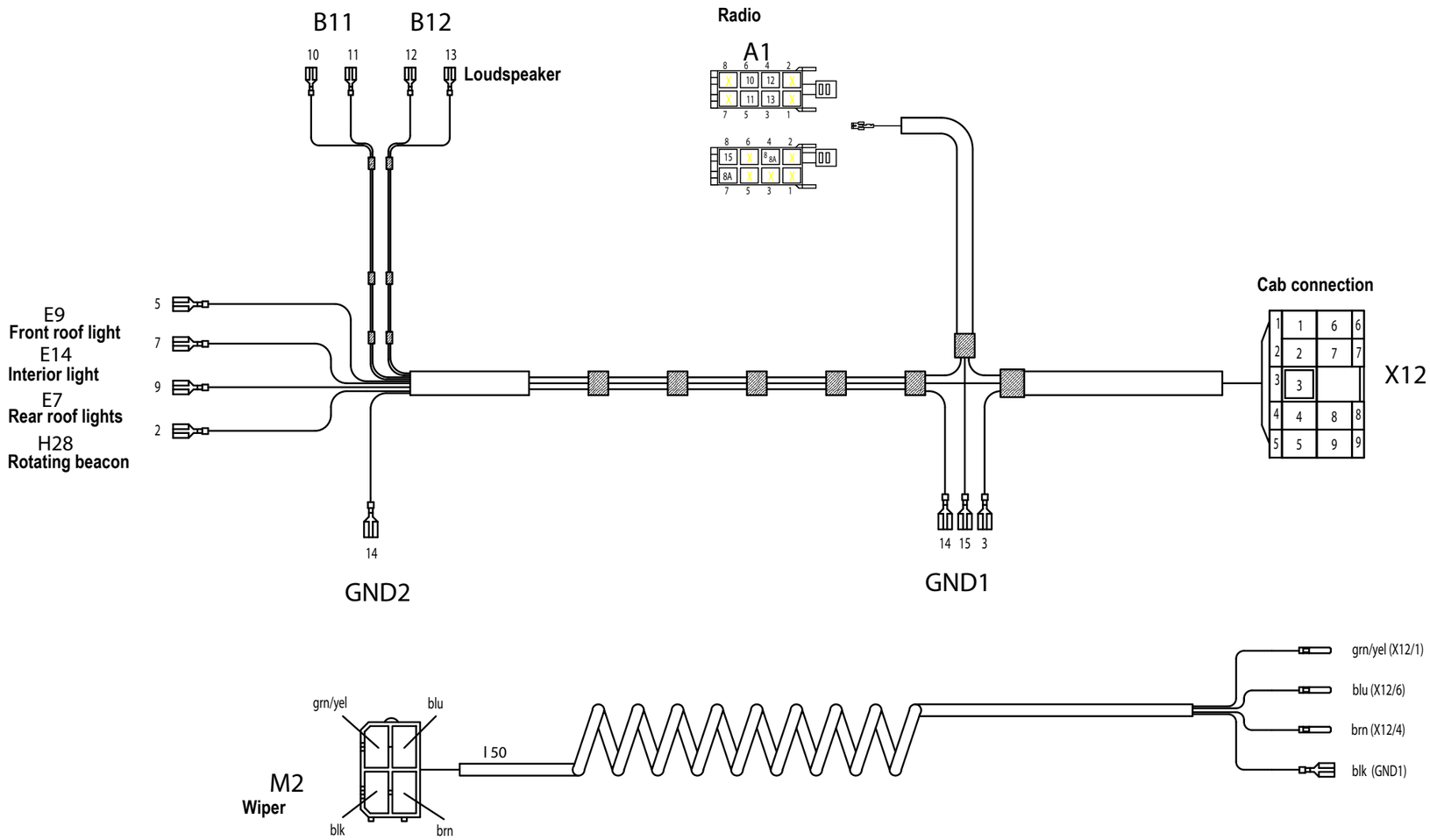
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6.50 Switches A3 wiring harness from serial no. AC02890



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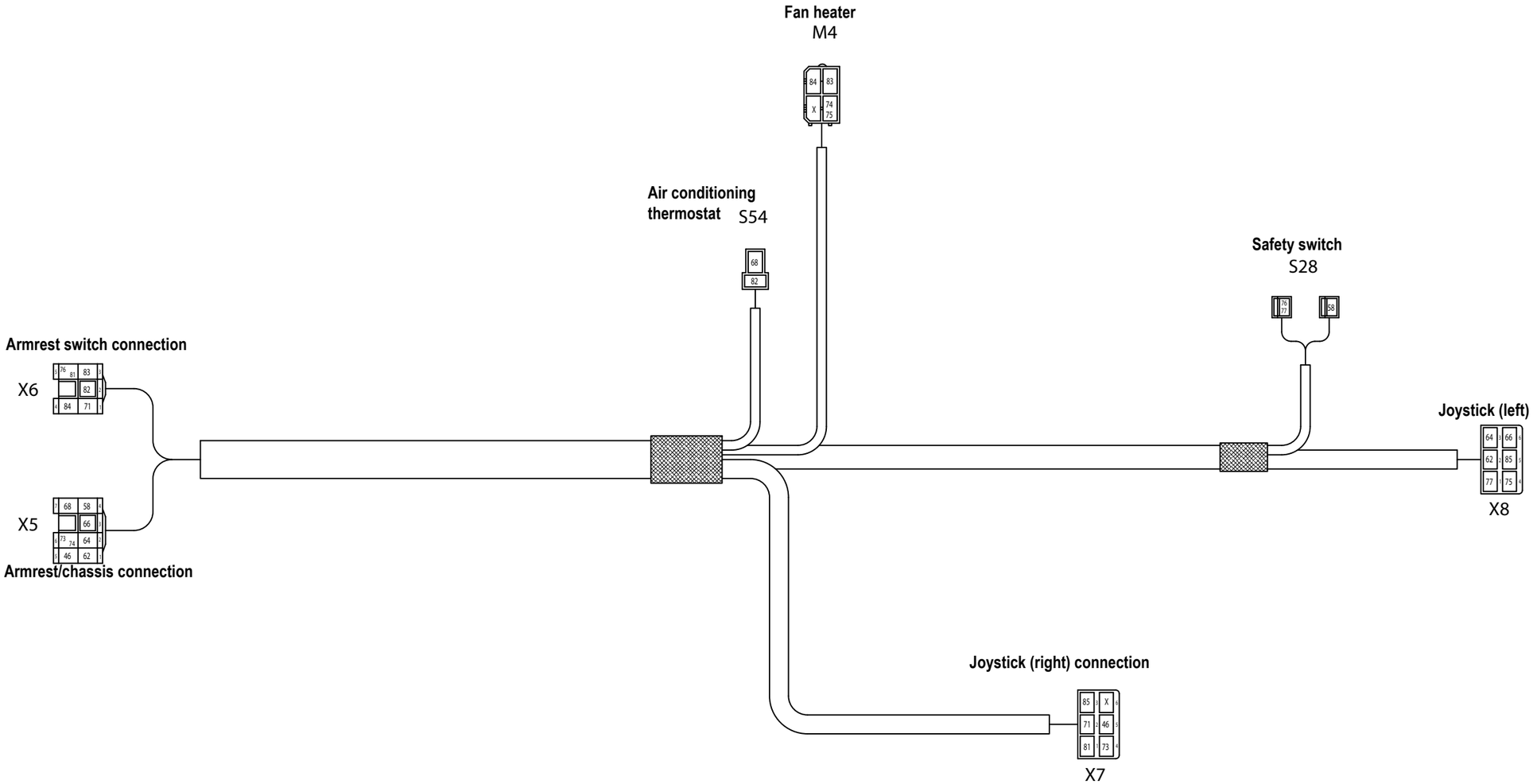
6.51 Wiring harness 1000109629: cab roof A3



No.	Up to	To	Colour	mm²
1	X12 (1) 9 pole plug and socket connector – cab	M2 wiper motor	grn/yel	0.75
2	X12 (2) 9 pole plug and socket connector – cab	H28 rotating beacon	vio	1
3	X12 (3) 9 pole plug and socket connector – cab	GND1	blk	1
4	X12 (4) 9 pole plug and socket connector – cab	M2 wiper motor	brn	0.75
5	X12 (5) 9 pole plug and socket connector – cab	E9 front roof light	grn/red	1
6	X12 (6) 9 pole plug and socket connector – cab	M2 wiper motor	blu	0.75
7	X12 (7) 9 pole plug and socket connector – cab	E14 interior light	blu	1
8	X12 (8) 9 pole plug and socket connector – cab	A1.1/4 radio	red	1
8A	A1.1/4 radio	A1.1/7 radio	red	1
9	X12 (9) 9 pole plug and socket connector – cab	E7 rear roof lights	grn/blu	1
10	A1/6 radio	B11 loudspeaker	wht	0.5
11	A1/5 radio	B11 loudspeaker	wht/blk	0.5
12	A1/4 radio	B12 loudspeaker	wht	0.5
13	A1/3 radio	B12 loudspeaker	wht/blk	0.5
14	GND1	GND2	blk	1.5
15	GND1	A1.1/8 radio	blk	1
16	GND1	M2 wiper motor	blk	0.75

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6.52 Wiring harness 1000109628: armrest A3

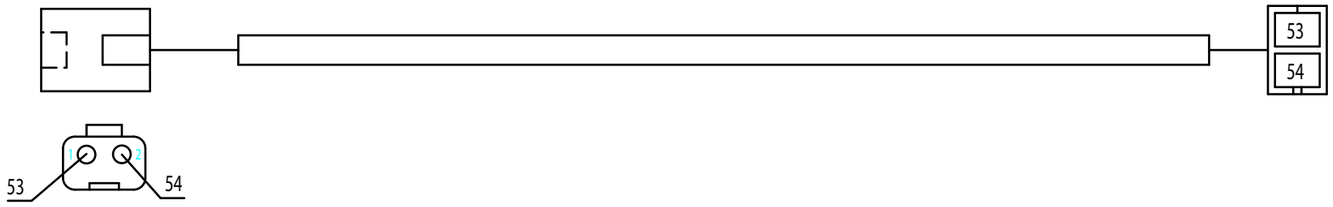


No.	Up to	To	Colour	mm²
46	X5/5 armrest/chassis connection	X7/85 joystick (right) connection	org	1
58	X5/4 armrest/chassis connection	S28 safety switch	brn/wht	1
62	X5/1 armrest/chassis connection	X8/2 joystick (left) connection	blu/yel	1
64	X5/2 armrest/chassis connection	X8/3 joystick (left) connection	gry/yel	1
66	X5/3 armrest/chassis connection	X8/6 joystick (left) connection	gry/grn	1
68	X5/7 armrest/chassis connection	S54 air conditioning thermostat	yel/red	1
71	X6/1 armrest switch connection	X7/2 joystick (right) connection	brn/grn	1
73	X5/6 armrest/chassis connection	X7/4 joystick (right) connection	blk	1
74	X5/6 armrest/chassis connection	M4/2 fan	blk	1

No.	Up to	To	Colour	mm²
75	M4/2 fan	X8/4 joystick (left) connection	blk	1
76	X6/5 armrest switch connection	S28 safety switch	gry	1
77	S28 safety switch	X8/1 joystick (left) connection	gry	1
81	X6/5 armrest switch connection	X7/1 joystick (right) connection	gry	1
82	X6/2 armrest switch connection	S54 air conditioning thermostat	yel/red	1
83	X6/3 armrest switch connection	M4/1 fan	yel/blk	1
84	X6/4 armrest switch connection	M4/3 fan	yel/blu	1
85	X8/5 joystick (left) connection	X7/3 joystick (right) connection	gry/blk	1

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6.53 Wiring harness 1000116138: boom working light A3



No.	Up to	To	Colour	mm²
53	XE11/1 boom working light	E1 boom working light	grn/yel	1
54	XE11/2 boom working light	E1 boom working light	blk	1

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Options

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7 Options

- Article numbers for options and retrofit kits: please refer to the 6003 spare parts list

7.1 Air conditioning

Specific safety instructions

Danger!

Avoid contact with the heat exchanger or the condenser and the supply lines. Lines and hoses carrying refrigerating agents or coolants can be pressurised and hot.

Danger of burns!

☞ *Always observe the following instructions:*

- Always empty the system before carrying out maintenance work on the cooling circuit.
- Avoid contact with parts carrying coolant.
- Carry out maintenance work with the fan at a standstill only.
- Have maintenance and repair work carried out by specialised staff only.

Important!

Make sure the cooling system does not come into contact with chlorine, choric substances, oil, grease or humidity. Use drain and fill systems for R134a only.

Important!

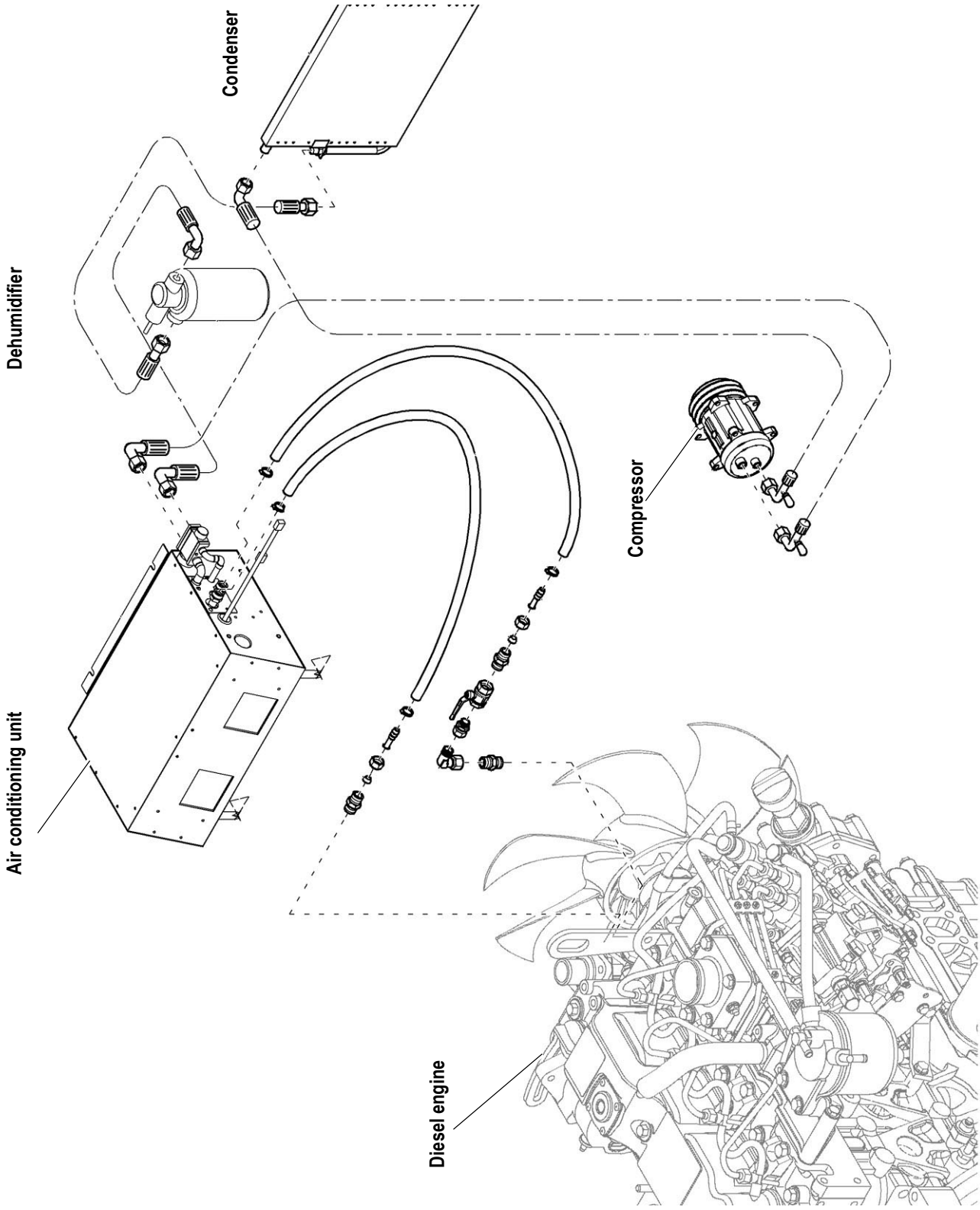
The air conditioning system runs best by taking in “outside” air – *see Summer/ winter operation* on page 1-21.

Specifications

Air conditioning	Model 6003
Refrigerating agent R134a	~ 950 g (2.1 lb)
Control pressure high pressure on	$19^{\pm 2}$ bar ($276^{\pm 29}$ psi)
Control pressure high pressure off	$25^{\pm 2}$ bar ($363^{\pm 29}$ psi)
Control pressure low pressure on	2.4 bar (34.8 psi)
Control pressure low pressure on	$1.2^{\pm 0.3}$ bar ($17.4^{\pm 4}$ psi)
Thermostat switch-on temperature	+ 2.2 °C (+36 °F)
Thermostat switch-off temperature	- 1.1 °C (+30 °F)

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Installation: overview



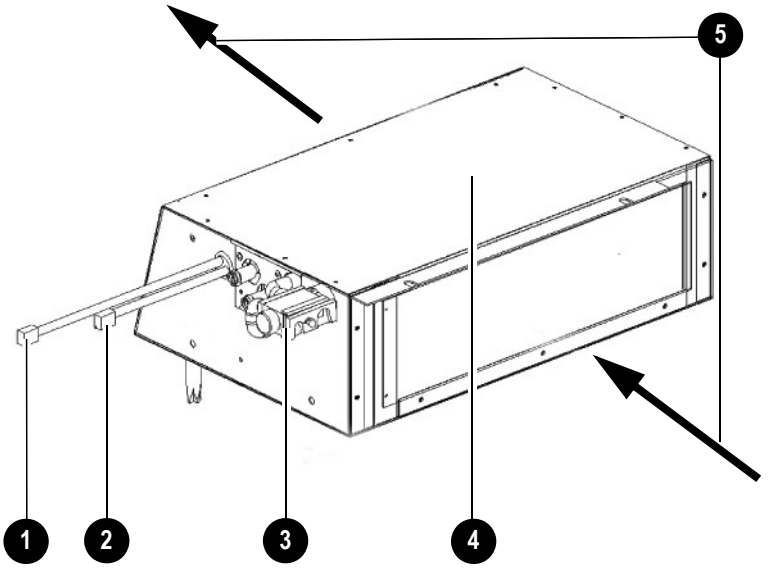
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Components

Heater/air conditioning unit

The air conditioning unit consists of:

- **Evaporator:** this is where the liquid refrigerating agent evaporates, and the air taken in by the fan is cooled.
- **Expansion valve:** installed in the evaporator and controls the quantity of liquid refrigerating agent injected.
- **Ice guard:** a fixed-setting thermostat with sensors placed between the evaporator fins prevents them from icing up due to freezing condensation water. The thermostat switches the evaporator's refrigerating agent supply off at –1.1 ± 0.8 °C (30 ±34 °F) and on again at +2.2 ± 0.8 °C (36 ±34 °F) as required.
- **Heat exchanger**
- **Twin radial fan:** can be controlled in steps and is overload-protected by means of a temperature microfuse.



Pos.	Description
1	Thermostat cable
2	Fan cable
3	Expansion valve
4	Service cover
5	Intake/outlet

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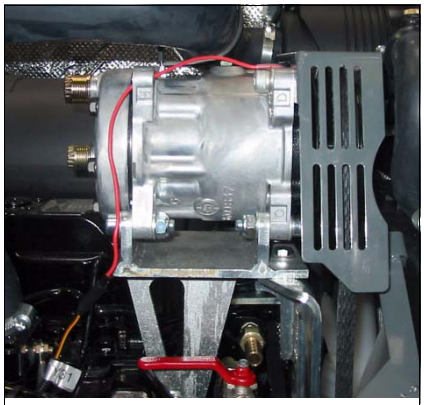


Fig. 1: Compressor

Compressor

The compressor takes in the gaseous refrigerating agent from the evaporator, compresses it and presses the refrigerating agent into the condenser. The diesel engine drives the compressor via a V-belt and an electro-magnetic clutch.

Condenser

The condenser condenses the compressed refrigerating agent, i.e. it is delivered to the condenser in gaseous state and emerges at the lowest position of the condenser in liquid form.

Dehumidifier with pressure switch



Fig. 2: Dehumidifier with pressure switch

The dehumidifier consists of a collector with integrated dryer, a sight glass and a pressure switch.

The dehumidifier serves as an expansion receptacle and tank for the refrigerating agent. It can bind a small quantity of water chemically, thereby withdrawing it from the circuit.

A sight glass on the dehumidifier enables to check the level of the circuit.

Important!

The cooling system is not working properly if gas bubbles appear in the sight glass. Replace the dehumidifier if the sight glass is cloudy or shows traces of corrosion.

Caution!

Always keep the dehumidifier closed otherwise the dryer is saturated by the humidity in the air and is no longer serviceable.

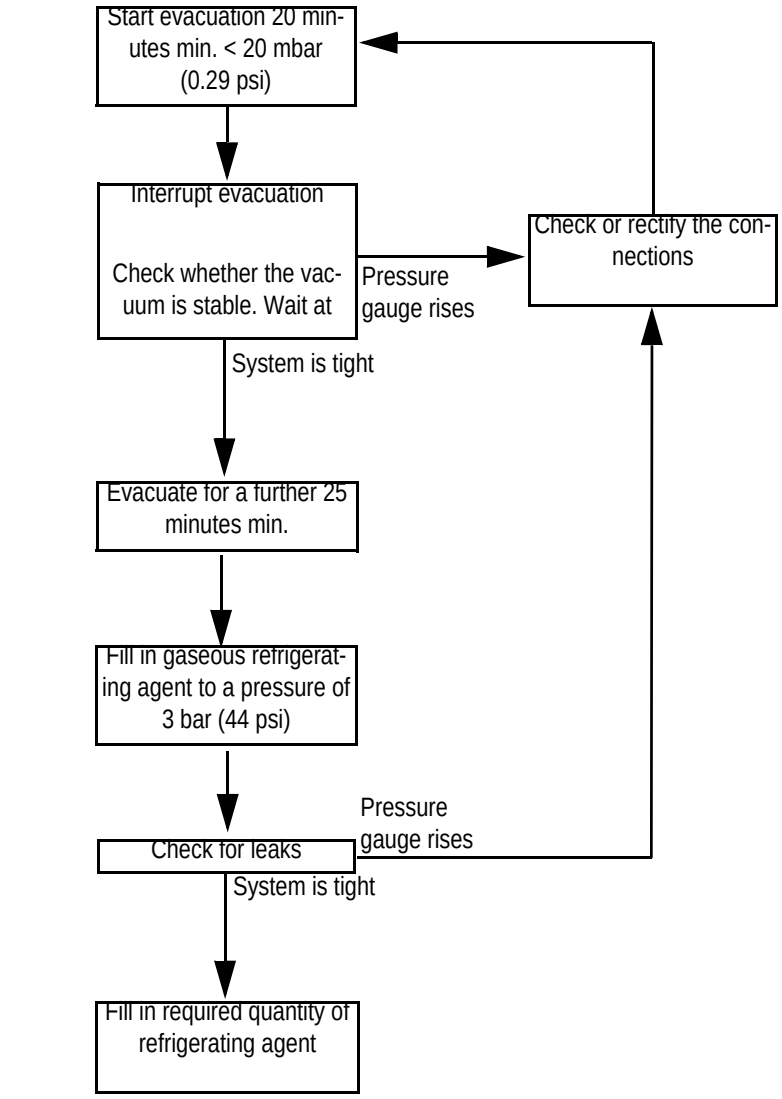
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Filling up the air conditioning system

Important!

Always have the air conditioning system filled up by an authorised workshop with specialised staff.

- Only use refrigerating agent R134a according to DIN 8960 – *see Fluids and lubricants* on page 3-1.
- Fill up the system in accordance with the Operator's Manual of the manufacturer of the fill station.
- Fill up the system with enough refrigerating agent. Make sure no bubbles appear in the sight glass.



Caution!

Do not overfill the system.

☞ *Overfilling reduces the system's cooling capacity and can cause damage to the system.*

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Maintenance

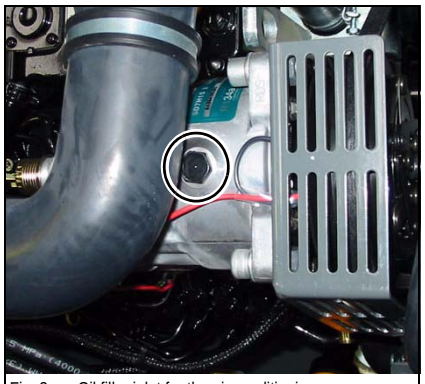


Fig. 3: Oil filler inlet for the air conditioning compressor

Important!

Important information for maintenance and repair work:

- There may be residual pressure in the system even if it is empty. Release this pressure with extreme care as you remove the connections.
- When working on the cooling circuit, close all openings tightly to prevent humidity from penetrating into the system.
- Do not open the cooling circuit outdoors in humid weather or rain.

Checking the compressor oil

Check the oil level if:

- a system component has been replaced.
- the system leaks oil.
- the maintenance interval is due – *see Maintenance plan (overview)* on page 3-5.

Proceed as follows:

☞ *Let the compressor run at idling speed with the diesel engine for 10 minutes.*

☞ *Open the oil filler opening.*

☞ *Push the oil dipstick into the oil filler opening.*

➥ Article number for oil dipstick: 1000136739

☞ *Withdraw the oil dipstick from the compressor and read off the oil level at the grooves on the oil dipstick.*

➥ The oil level must reach 5 – 7 grooves.

☞ *Fill in oil of the same grade if the oil level is lower* – *see Fluids and lubricants on page 3-1.*

Fresh/recirculated air filter

Tilt the cab to replace the filter – *see Tilting the cab* on page 1-19.

The air conditioning system is located at the rear half of the cab.

Replacing the filter:

☞ *Remove the cover between the air conditioning unit and the front air duct.*

☞ *You can now access the cab filter.*

☞ *Remove the cab filter.*

☞ *Insert a new cab filter.*

☞ *Fit the cover between the air conditioning unit and the front air duct back on again.*

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Troubleshooting

Problem	Possible causes	Troubleshooting
Fan does not work.	Defective or loose fuse	Check the fuse's seat, insert correctly if necessary. Replace a defective fuse. Trouble occurring again within short time indicates there is a short circuit or obstruction in the system. Check the fan for obstruction or a defect and rectify the cause.
	Line interruption	Check the line for loose contacts or ruptures.
	Defective fan motor	Replace the fan.
	Defective fan switch	Check or replace the switch.
Fan cannot be switched off.	Short circuit in cable or fan switch	Eliminate the short circuit. Install a new cable and/or switch if necessary.
Reduced fan output.	Contaminated contacts.	Clean the pins. Proceed with extreme care to avoid short circuits.
	Heavily contaminated heat exchanger.	Clean carefully and avoid damage that could cause leaks.
No or insufficient heating output	Flow temperature too low	Wait for the engine to warm up.
	Defective thermostat	Replace the thermostat.
	Heat exchanger fins contaminated	Check and/or clean the heat exchanger.
	Folded or pinched line	Eliminate the cause for the error and reroute the hoses.
Coolant leaks from the unit	Loose hose connection	Check the seat of the flexible lines and tighten the clamps.
	Damaged hose	Mount and connect a new hose.
	Damaged heat exchanger	Replace the heat exchanger.
Compressor does not work.	Loose or torn V-belt	Adjust V-belt tension, replace the V-belt.
	Interruption in the compressor's solenoid coil	Check the current to the clutch.
	V-belt pulley does not turn even though electro-magnetic clutch is applied.	Check and/or replace the compressor.
	Compressor clutch slips.	Repair the clutch or replace the compressor.
Condenser overflow.	Expansion valve is blocked or stuck in open position.	Replace the expansion valve.
Iced condenser.	Thermostat sensor in wrong position	Place the sensor in new position.
	Defective expansion valve or thermostat	Replace the expansion valve or thermostat.
Loss of refrigerating agent	Interruption of refrigerating agent line	Check all lines for external damage or chafing.
	System leak	Evacuate, fill up, check for leaks and repair.

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Problem	Possible causes	Troubleshooting
Insufficient cooling output	Fan duct obstructed.	Check air intake and outlet for obstruction. Eliminate the cause for trouble.
	Refrigerating agent level too low	Fill up refrigerating agent.
	Humidity in system	Empty the air conditioning system, replace the dehumidifier, evacuate and fill up.
	Dehumidifier saturated or clogged	Replace the dehumidifier.
	Condenser fins contaminated	Clean the fins. Important: no use of high-pressure cleaners.
System cools with interruptions.	Line interruption	Check, repair and/or replace the lines.
	Defective fan motor	Replace the fan.
System runs very loudly	Loose or excessively worn V-belt.	Retighten or replace the V-belt.
	Loose compressor bracket or worn inside parts of the compressor.	Repair the bracket, replace the compressor.
	Excessive wear of fan motor	Replace the fan
	System too full.	Suck off refrigerating agent.
	Not enough refrigerating agent in the system	Check for leaks, fill up the system.

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7.2 Air-suspension seat

Ports

The air compressor of the air-suspension seat requires a 12 Volt power supply.
Tension is picked off the connector on the right-hand side joystick X7.

No.	Up to	To
81	X7/1 joystick (right) connection	Seat +12 V
73	X7/4 joystick (right) connection	Seat earth

7.3 Counterweight

Specifications

Lock the screw connection with Loctite S2420 or VaryBond 12-43.

Counterweight	Model 6003
Weight	300 kg/661 lb
Tightening torque for screws	290 Nm/214 ft. lbs.
Max. tail end lateral projection over chains	60 mm/2.4”

Important!

Bear in mind the lift capacity table when using a counterweight.

7.4 Long stick

Specifications

Long stick	6003
Length	1985 mm/78”

Important!

Bear in mind the lift capacity table when using a counterweight.

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7.5 Control circuit (pipework) connections for grab

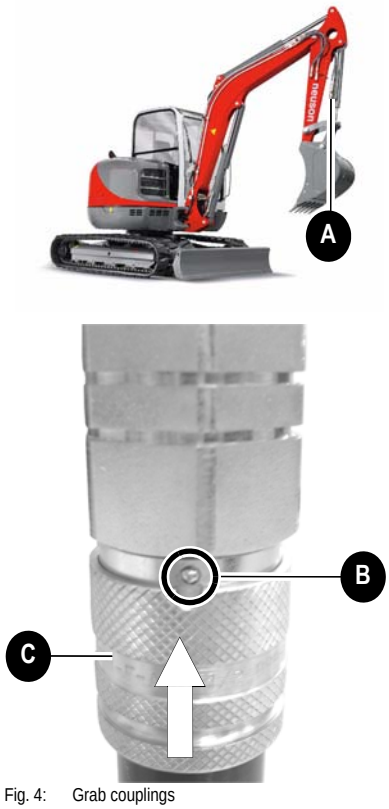


Fig. 4: Grab couplings

Connect and disconnect the grab couplings as follows:

Removing the coupling:

☞ *Park the machine on firm and horizontal ground.*

☞ *Extend stick ram **A** halfway through.*

☞ *Switch off the engine.*

☞ *Release the pressure on the stick ram by moving the right-hand side control lever to the left and right.*

☞ *Fold the control lever base up.*

☞ *Turn lock sleeve **C** towards lock ball **B**.*

☞ *Pull lock sleeve **C** upwards.*

☞ The coupling opens.

Connecting the coupling:

☞ *Connect the coupling onto the stick ram connection making sure it is straight.*

☞ Wait until you hear a hissing sound of the connection.

☞ Fully connect the coupling on the connection.

☞ *Turn back the lock again (away from lock ball **B**).*

Flat-seal couplings (can be coupled under residual pressure)

	ISO designation	Thread
Plug	12.5	1/2 BSP
Sleeve	12.5	1/2 BSP

Couplings according to ISO 16028

7.6 3rd control circuit connections

Important!

Follow the instructions in the Operator's Manual of the attachment manufacturer for connecting the 3rd control circuit to attachments.

Standard connections:

Port	Bush
Standard	Bulkhead coupling 1/2”
Quick coupler option	Quick coupler 12.5 1/2”

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7.7 Auxiliary hydraulics connections

Port	Function
S	3rd control circuit (option)
T	Auxiliary hydraulics
U	Hammer reflux line
V	Auxiliary hydraulics
W	3rd control circuit (option)

Important!

Follow the instructions given in the Operator's Manuals of the attachments as you connect them.

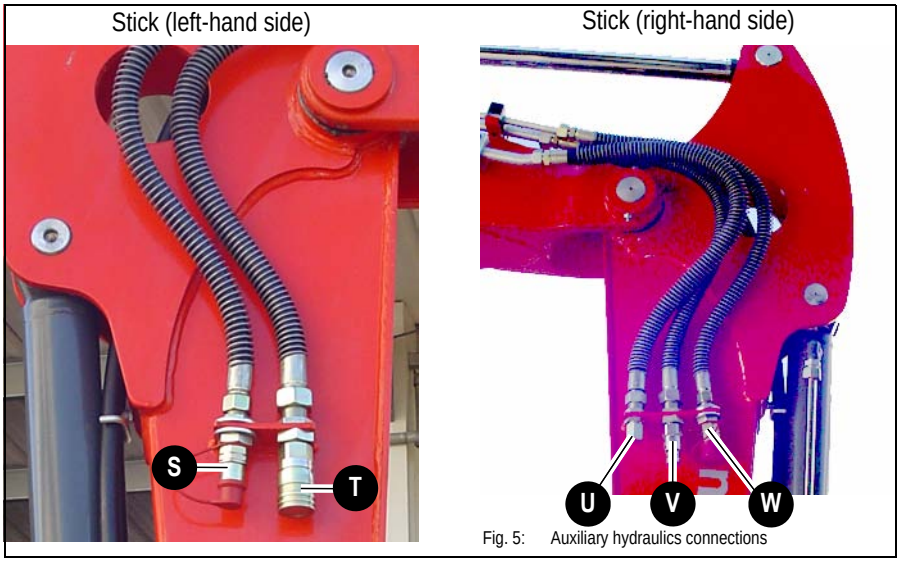


Fig. 5: Auxiliary hydraulics connections

Quickhitch couplings

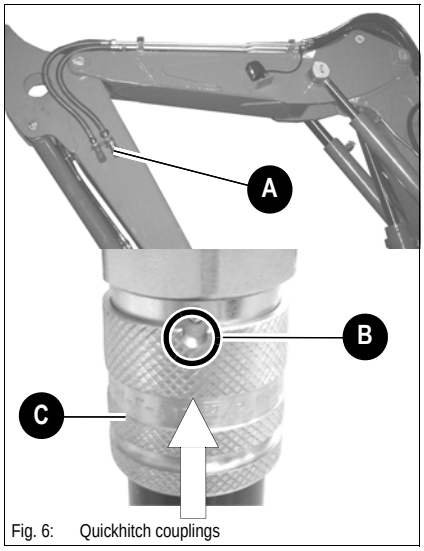


Fig. 6: Quickhitch couplings

Connect and disconnect the quickhitch couplings as follows:

Removing the hose from the coupling:

☞ *Park the machine on firm and horizontal ground.*

☞ *Extend stick ram **A** halfway through.*

☞ *Switch off the engine.*

☞ *Switch on ignition.*

➥ Release the load only after you have switched on ignition and waited 2 seconds (otherwise if actuated too early, the characteristic curve is shifted and the load is not released).

☞ *Release the pressure on the auxiliary hydraulics or the 3rd control circuit by pressing the auxiliary hydraulics pedal or moving the left or right-hand side proportional joystick to the left and right.*

☞ *Raise the control lever base and turn lock sleeve **C** towards lock ball **B** straight away (otherwise pressure is created again).*

☞ *Pull lock sleeve **C** upwards.*

☞ The coupling opens.

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Connecting the hose onto the coupling:

☞ *Park the machine on firm and horizontal ground.*

☞ *Extend stick ram **A** halfway through.*

☞ *Switch off the engine.*

☞ *Switch on ignition.*

➥ Release the load only after you have switched on ignition and waited about 2 seconds (otherwise if actuated too early, the characteristic curve is shifted and the load is not released).

☞ *Release the pressure on the auxiliary hydraulics or the 3rd control circuit by pressing the auxiliary hydraulics pedal or moving the left or right-hand side proportional joystick to the left and right.*

☞ *Fold the control lever base up.*

☞ *Remove dirt from the coupling (extends the service life of the coupling).*

☞ *Then firmly insert the coupling into the port of the stick ram straight away.*

☞ *Turn back the lock again (away from lock ball **B**).*

Attachments

Important!

Please refer to the Operator's and maintenance manual of the attachment manufacturer for using and carrying out maintenance on attachments such as hammers, grabs etc.

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7.8 Neuson Vario



Using the Neuson Vario feature

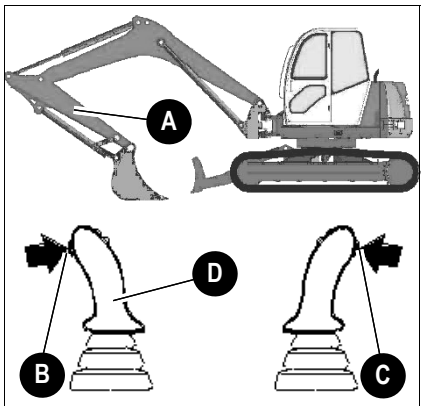


Fig. 7: Using the Neuson Vario feature

Danger!

Lower the excavator arm to the ground when using the Neuson Vario feature, otherwise –

Danger of accidents

☞ *Support the machine with the excavator arm when using the Vario feature.*

The following steps must be followed under all circumstances when changing the eccentric position:

☞ *Brace excavator arm* **6/A** *on the ground with the boom ram.*

☞ *To unlock the Neuson Vario feature, press and hold both front switches on the left-hand side* **6/B** *and right-hand side* **6/C** *joystick.*

☞ Press and hold both buttons **B** and **C** about 5 seconds without moving the joysticks to unlock.

The Neuson Vario feature has four lock positions at offset positions of 90° each (0°/360°, 90°, 180°, 270°).

☞ *Press the left-hand side joystick* ***D*** *to the left or right for a 90° rotation, press and hold buttons* ***B*** *and* ***C*** *as you do so.*

☞ Both buttons **B** and **C** can be released once the excavator has moved.

➥ The Neuson Vario feature automatically engages after a 90° rotation.

☞ *If repositioning beyond 90° is required with the Neuson Vario feature, press buttons* ***B*** *and* ***C*** *beyond the 90° lock position.*

➥ As soon as buttons **B** and **C** are released, the Neuson Vario feature engages in the next possible lock position.

Important!

Always check whether the lock position is engaged.

For improved driving features on slopes, reposition the centre of gravity towards the slope with the Neuson Vario feature.

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Vario diagram

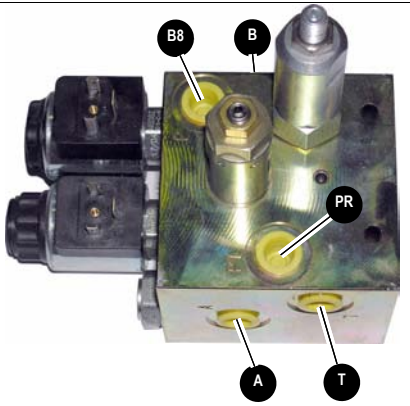
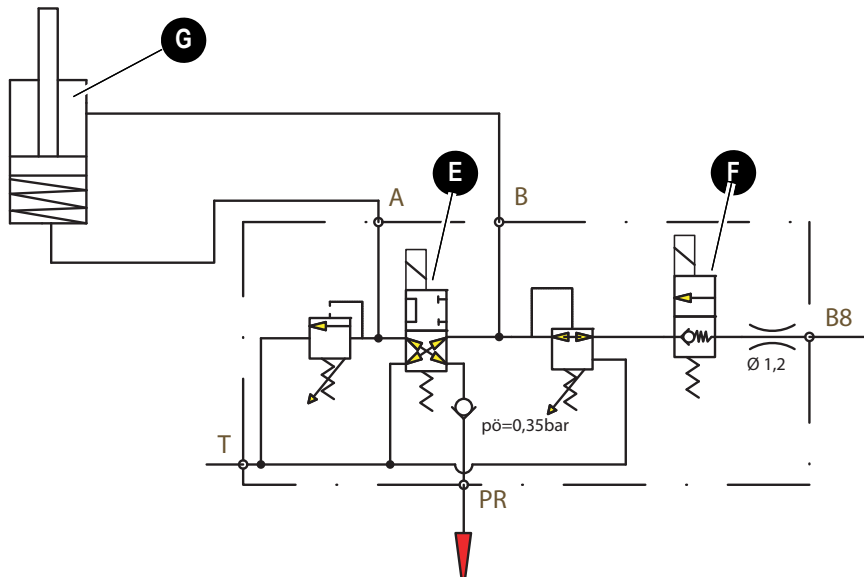


Fig. 8: Neuson Vario valve



Description	Description
B8	Boom rod side port
B	Lock ram rod side port
A	Lock ram base side port
T	Tank line port
PR	Pilot control pressure port
E	Solenoid valve
F	Solenoid valve
G	Lock ram

Function

Opening the lock

☞ *Brace the excavator arm on the ground with the boom ->*

- Pressure is applied to boom ram rod side port **B8**.

☞ *Press buttons **B** and **C** on the joysticks on either side*

- Solenoid valves **E** and **F** are enabled -> pressure from **B8** to **B**.
- Pressure is applied to lock ram rod side port.
- Lock ram base side port is switched to tank.
- The lock opens.

Locking

☞ *Release buttons **B** and **C**.*

- Solenoid valves return to initial position -> pressure is interrupted.
- Pilot control pressure is applied to lock ram base side port **A**.
- Lock ram rod side port **B** is switched to tank.

☞ *Keep on rotating the upper carriage*

- Lock ram engages in the next possible lock position.

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Neuson Vario warning device

Danger!

Do not bypass the warning device or make it inoperative. Working with the excavator is only allowed with a fully functional warning light.

Caution, danger!

☞ *This safety feature must be checked by an authorised workshop every time maintenance is carried out.*

☞ *The warning light features a functional check. The warning light comes on briefly every time the machine is started. Always make sure the warning light is fully functional.*

Depending on the position of the Vario feature, stability is higher or lower with respect to a standard excavator. Observe the lift capacity table and the warning ranges in *Fig. 9*.

Warning ranges:

A	B
☞ *Crosswise excavation*	☞ *Lengthwise excavation*
Reduced stability	Upper carriage not in proper range with respect to Vario feature, no modification of stability (hydraulically limited).

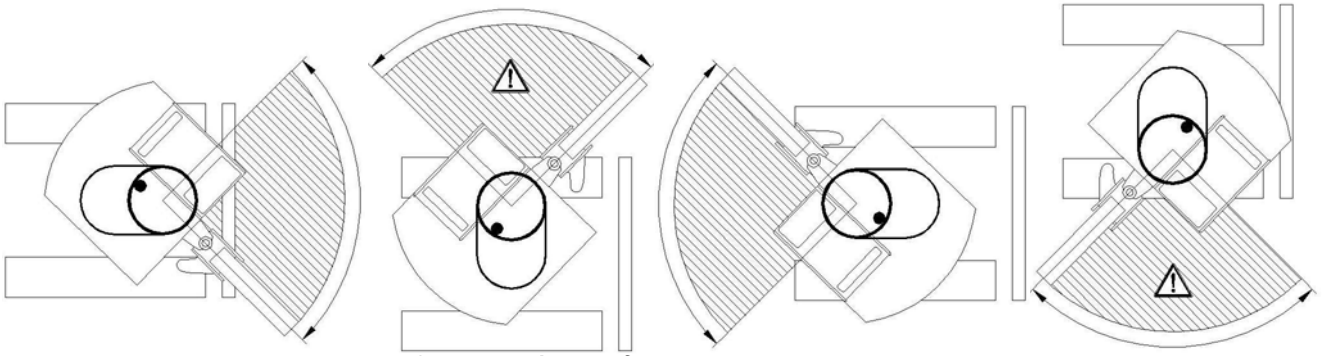


Fig. 9: Warning range

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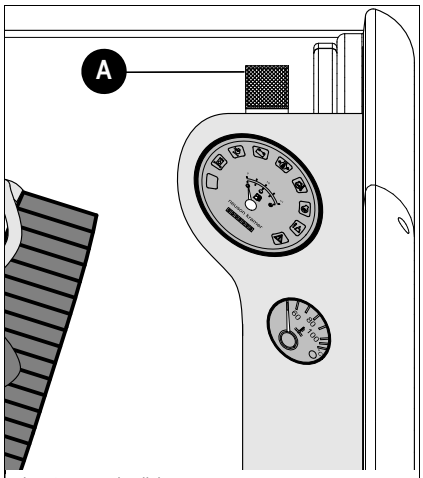


Fig. 10: Warning light

Danger!

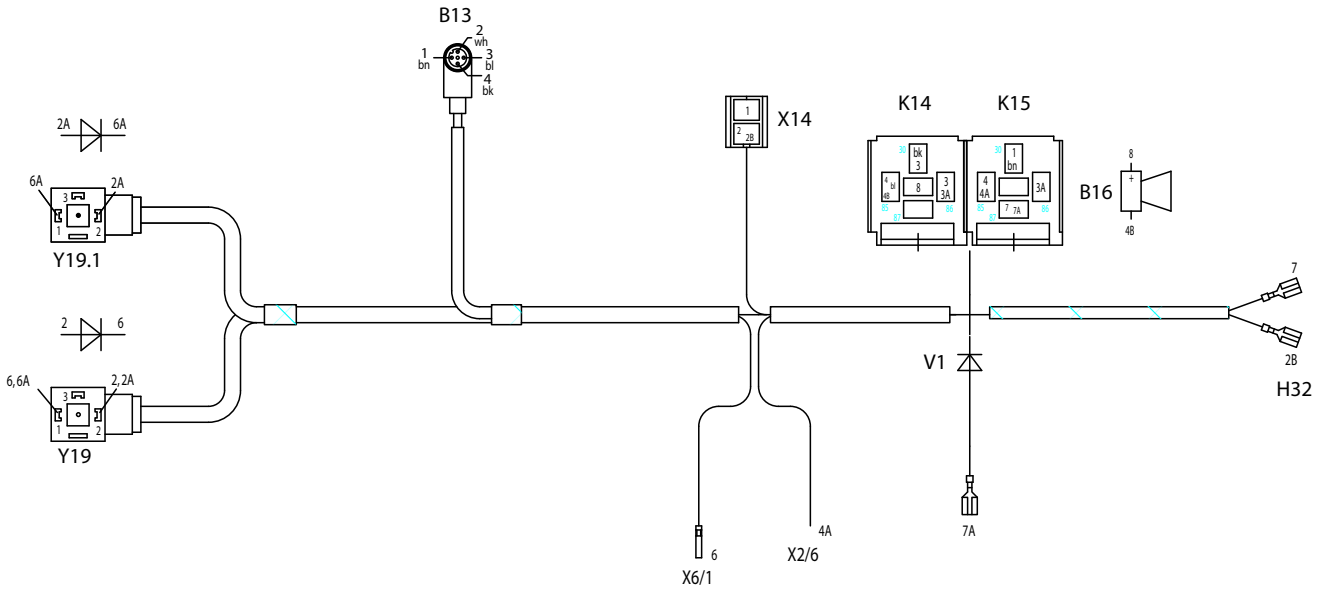
The machine can tilt if the boom is not lowered and swivelled out of the danger area as soon as the alarm is given (warning sound, warning light **A**), or if the alarm is ignored.

Danger of accidents!

☞ *Brake the upper carriage and rotate it in the other direction.*

The warning device is set to 73 % of the static tilt load in an unfavourable position of the upper carriage. As soon as the load is exceeded and work is carried in an unfavourable position of the upper carriage (warning range), or if the upper carriage is rotated into the warning range, the warning sounds briefly and warning light **A** comes on.

Ports



No.	From	Via	Up to	Colour
1	X14 supply port		K15 Vario switching relay	blu
2	X14 supply port	B13 proximity switch	Y19 Vario solenoid valve	blk
2A	Y19 Vario solenoid valve		Y19.1 Vario solenoid valve	blk
2B	X14 supply port		H32 Vario telltale	blk
3	B13 proximity switch		K14 Vario time lag relay	yel
3A	K14 Vario time lag relay		K15 Vario switching relay	yel
4	B13 Vario proximity switch	K14 Vario time lag relay	K15 Vario switching relay	vio
4A	K15 Vario switching relay		X2/6 pressure switch connection	vio
4b	K14 Vario time lag relay		B16 Vario buzzer	vio
6	X6/1 armrest connection		Y19 Vario solenoid valve	brn
6A	Y19 Vario solenoid valve		Y19.1 Vario solenoid valve	brn
7	H32 Vario telltale		K15 Vario switching relay	gry
7A	S1 start switch		K15 Vario switching relay	gry
8	K14 Vario time lag relay		B16 Vario buzzer	

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7.9 Fuel-filling pump

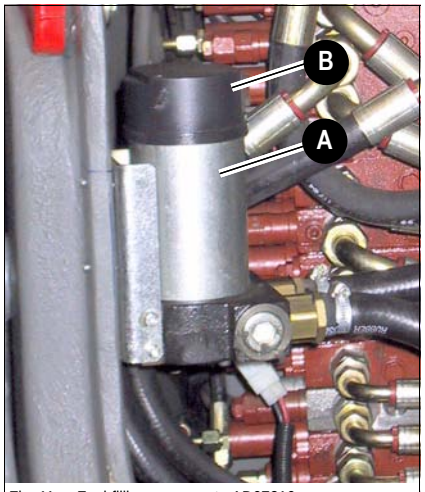


Fig. 11: Fuel-filling pump up to AD07210

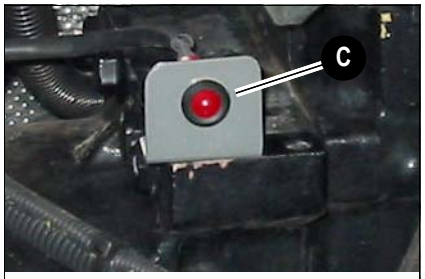


Fig. 12: Fuel-filling pump telltale

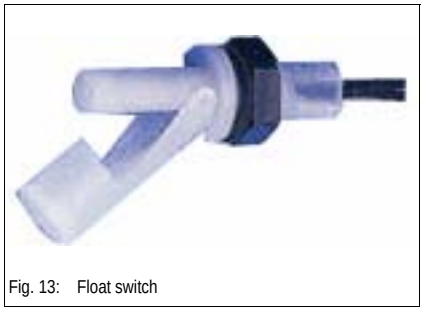


Fig. 13: Float switch

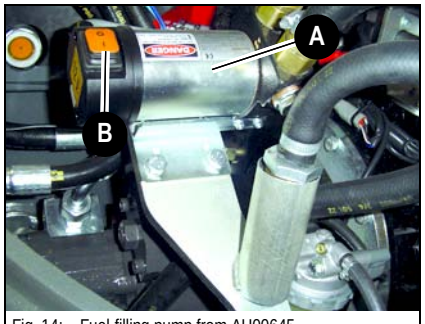


Fig. 14: Fuel-filling pump from AH00645

Important!

Up to serial number AC02650: use of sight glass instead of telltale.

Up to serial number AD07210

Refuel with the fuel-filling pump 11/A as follows:

☞ *Place the machine on level ground.*

☞ *Switch off the engine.*

☞ *Open the engine cover.*

☞ *Insert the hose of fuel-filling pump **A** into the container with the fuel – see Stationary fuel pumps on page 3-10.*

☞ *Press button **B** to switch on fuel-filling pump **11/A**.*

➥ The fuel tank is full as soon as telltale **12/C** comes on.

☞ *Press button **B** to switch off fuel-filling pump **A**.*

Important!

Switch off the fuel-filling pump as soon as telltale **C** comes on, otherwise the fuel tank may overflow and can be damaged.

- Bear in mind the fuel tank's maximum capacity.

The float switch screwed into the fuel tank triggers the telltale.

From serial number AH00645

Refuel with the fuel-filling pump 14/A as follows:

☞ *Place the machine on level ground.*

☞ *Switch off the engine.*

☞ *Open the engine cover.*

☞ *Insert the hose of fuel-filling pump **A** into the container with the fuel – see Stationary fuel pumps on page 3-10.*

☞ *Press button **B** to switch on fuel-filling pump **14/A**.*

➥ As soon as the fuel tank is full, the fuel-filling pump is automatically switched off by means of float switch **13** screwed into the fuel tank.

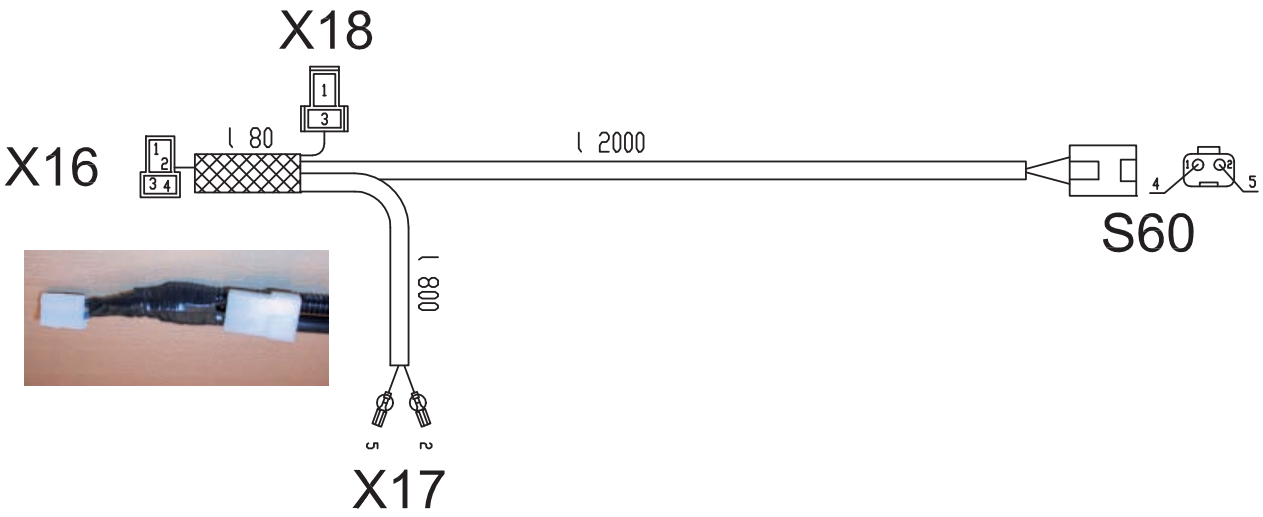
☞ *Press button **B** to switch off fuel-filling pump **A**.*

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Connections up to serial no. AD07210

The electric connection for the fuel-filling pump is already installed.

The telltale has its own wiring harness, connected to the engine/chassis wiring harness by means of plug X16.



Strand no.	From	Up to	Colour	mm²
1	X16/1	X18/1	blu	2.5
2	X16/1	X17	blu	1
3	X16/2	X18/1	blk	2.5
4	X16/2	S60	blk	1
5	X17	S60	vio	1

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7.10 Central lubrication system

Grease-based central lubrication system with 12 lubrication points

Position



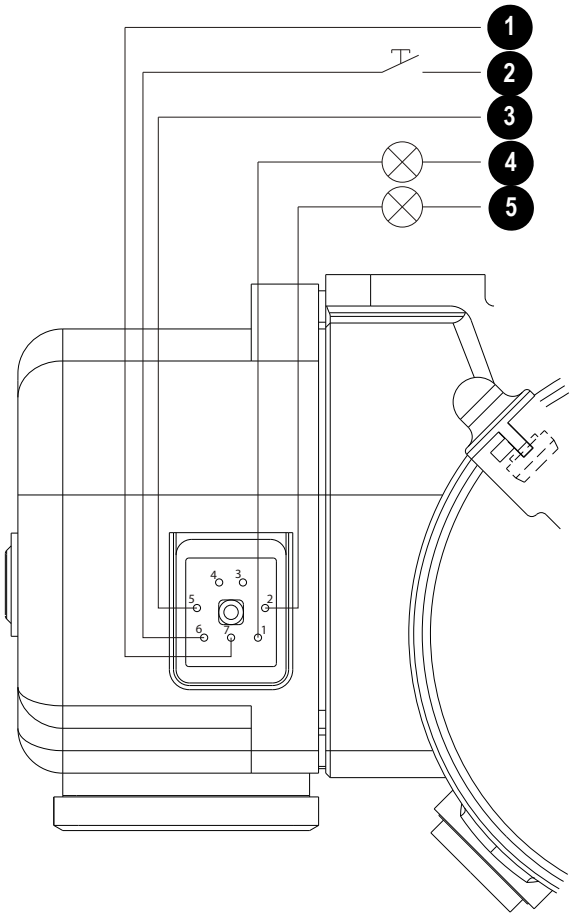
Fig. 15: Central lubrication system pump

The electric pump for the central lubrication system is installed over the hydraulic pump.

The electric pump presses the grease through the lubrication line towards the distributing block on the boom.

From the distributing block, the grease passes on to the lubrication points.

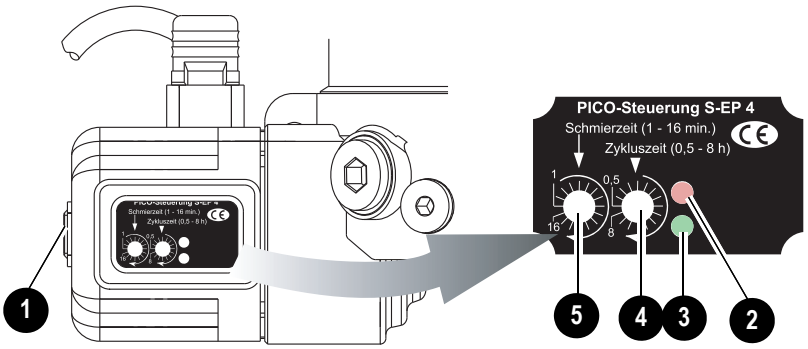
Connections



Pos.	Description
1	– Earth (brown)
2	+ Intermediate lubrication tip switch connection (orange)
3	+ Ignition (black)
4	– Error telltale (red)
5	+ Lubrication telltale (green)

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Function



Pos.	Description
1	Push button on motor housing
2	Red LED
3	Green LED
4	Cycle time potentiometer
5	Break time potentiometer

The green LED comes on for about 1.5 sec once ignition is switched on to indicate readiness.



Fig. 16: Central lubrication system push button

Pressing the push button on the pump's motor housing switches on the pump and starts the lubrication cycle. The pump drive motor is switched off and cycle time begins once lubrication time is over.

All further lubrications start automatically according to the cycle time set.

Lubrication time is stopped and saved if ignition or lubrication is switched off during cycle time. The data is read from the memory upon switching ignition on again, and lubrication is resumed where it was interrupted.

Pressing the push button on the motor housing or on the instrument panel starts intermediate lubrication at any given time if ignition is switched on.

Status LEDs

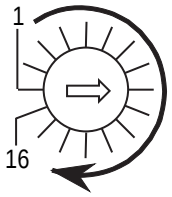
Display	Meaning
Green LED 1.5 sec	Ignition on (operational readiness)
Steady green light	Comes on during lubrication
Steady red light	Grease level error Remains lit until grease tank is refilled
Blinking red light	Overpressure error

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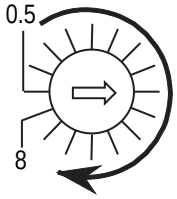
Adjusting breaks and lubrication times

Adjust breaks and lubrication times with potentiometers.

Lubrication time 1 min to 16 min



Break 0.5 h to 8 h



Repair in case of clogging

Clogging indication

Overpressure beyond service pressure means the system is clogged and is indicated as follows:

- Grease escapes by the pressure limiting valve.
- Blinking red LED on the pump housing.

Causes for clogging in the system

- Crushed or clogged lubrication line
- Bearing overfilled or clogged with lubricant
- Inadequate lubricant for central lubrication systems
- Clogged distributor output
- Clogged distributor

Detecting clogging

☞ *Unscrew the main line off the main distributor.*

☞ *Actuate the pump with the push button and check whether the lubricant is delivered correctly.*

☞ *Screw the main line onto the main distributor.*

☞ *Unscrew the lines one after another and actuate the pump every time.*

Repairing a clogged distributor

- Remove the distributor from the system.
- Unscrew the screw plugs of the piston bore.
- Move the piston back and forth (do not remove).
- Screw the screw plugs back in again.

You can remove the piston of a defective distributor and check it for scratches or damage.

If there are traces of hardened grease on the piston or the bores, remove the grease with compressed air or by washing the piston.

Important!

Traces of hardened grease are a sign that the grease is not suitable for central lubrication systems.

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Problem	Possible causes	Troubleshooting
Pump does not work	Defective integrated electronic controls	Replace the controls and the cap
	Electric line interrupted	Replace the electric line
	Defective pump	Replace the pump
Pump works but does not supply grease	Air inclusions in piston	Bleed the pump
	Level too low	Fill up the tank
	Defective pump element	Replace the pump element
No grease rims on *all* lubrication points	Pump does not work	See “Pump does not work”
	Breaks too long or lubrication time too short	Shorten breaks or increase lubrication time
	System clogged	See “Grease escapes by the pressure limiting valve”
No grease rims on *some* lubrication points	Burst or leaky supply lines to secondary distributor	Replace the lines
	Leaky screw connections	Retighten or replace the screw connections
No grease rim on *one* lubrication point	Burst or leaky lubrication line to lubrication point	Replace the line
	Leaky screw connections	Retighten or replace the screw connections
Reduced pump revs	High system pressure	Check system bearings
	Low ambient temperatures	No damage (intermediate lubrication once or twice if necessary)
	System pressure too high	Detect and eliminate clogging
Grease escapes by the pressure limiting valve	System pressure too high	Detect and eliminate clogging
	Clogged distributor	Replace the distributor
	Clogged system	Repair clogged/stuck bearings
	Defective valve spring	Replace the pressure limiting valve

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7.11 Service valve

Function

The service valve replaces the conventional oil drain plug by a quick coupler for draining the engine oil more easily.

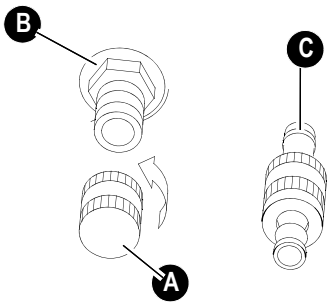


Fig. 17: Drain coupling with hose

- Park the machine on level ground.
- Let the engine run until it reaches its operating temperature (oil temperature about 80 °C/176 °F).
- Switch off the engine.
- Place a container under the opening to collect the oil as it drains.
- Unscrew cap **A** of oil drain valve **B**.
- Screw in the drain coupling with a sufficiently long hose **D**, making sure the end of the hose is in oil drip tray **E**.

  ➥ Oil drain valve **B** opens and the engine oil drains.

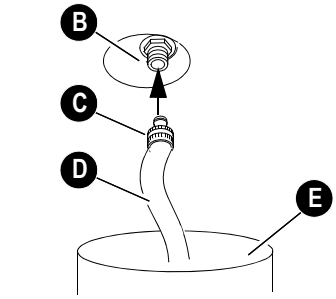


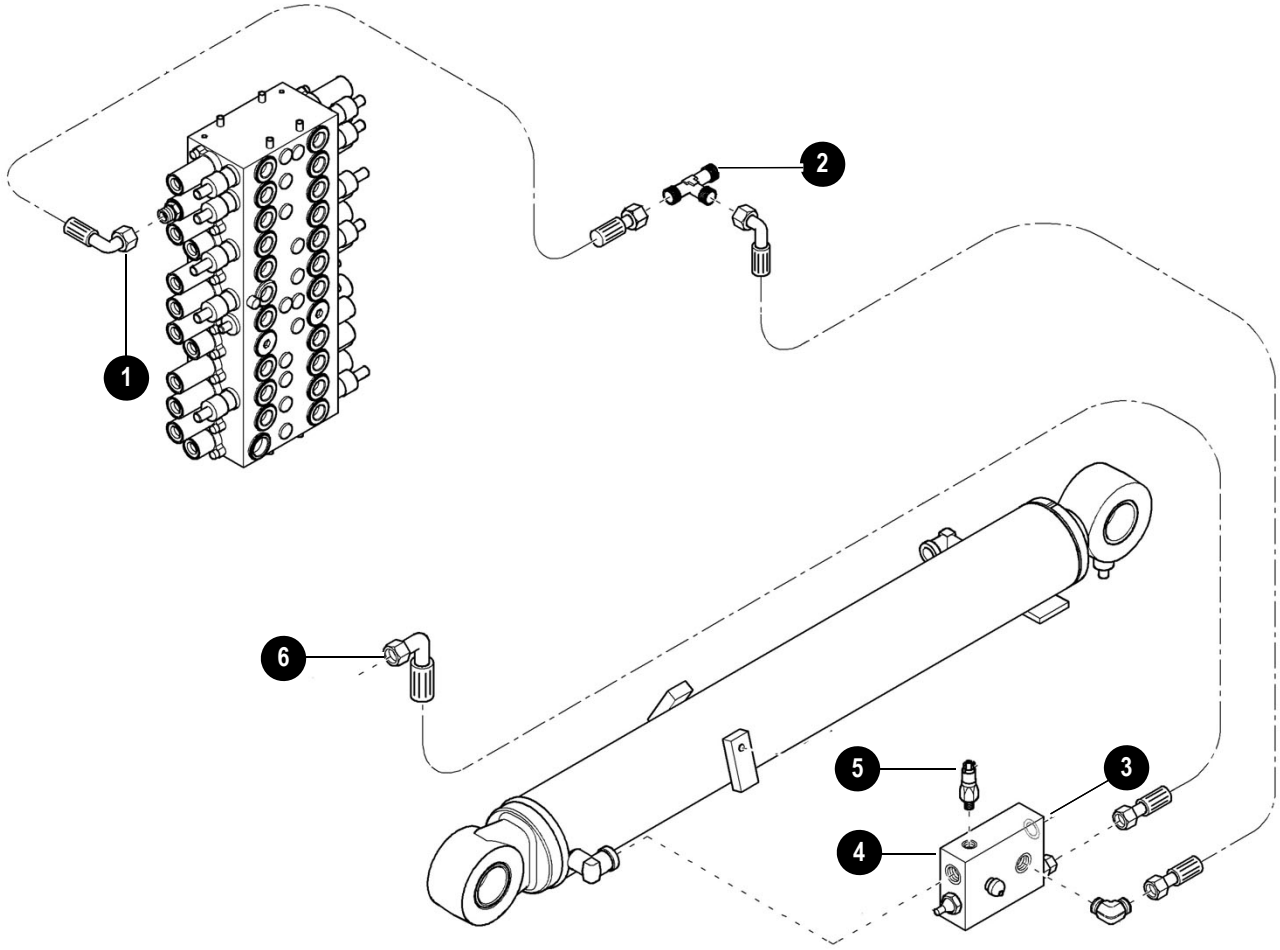
Fig. 18: Drain coupling with hose

- Completely drain the oil.
- Unscrew drain coupling **C**.
- Screw on cap **A** of the oil drain valve.
- Fill in engine oil – *see chapter Filling up engine oil* on page 3-14.
- Start the engine and let it run briefly at low revs.
- Switch off the engine.
- Wait a moment until all the oil has run into the oil sump.
- Check the oil level again.
- Fill up if necessary and check again.
- Completely remove all oil spills from the engine.

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7.12 Safe load indicator D (safety valve for boom)

Position



Pos.	Description
1	Boom segment pilot control port
2	Joystick connection
3	Boom pressure line port
4	Hose burst valve
5	Pressure switch
6	Leak oil strip port

Function

The valve is mounted direct on the base-side port of the boom ram.

“Extend ram” function:

- Ram can be extended as usual (always “free flow” towards the ram)

The built-in non-return valve safely holds the load in rest position.

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“Retract ram” function:

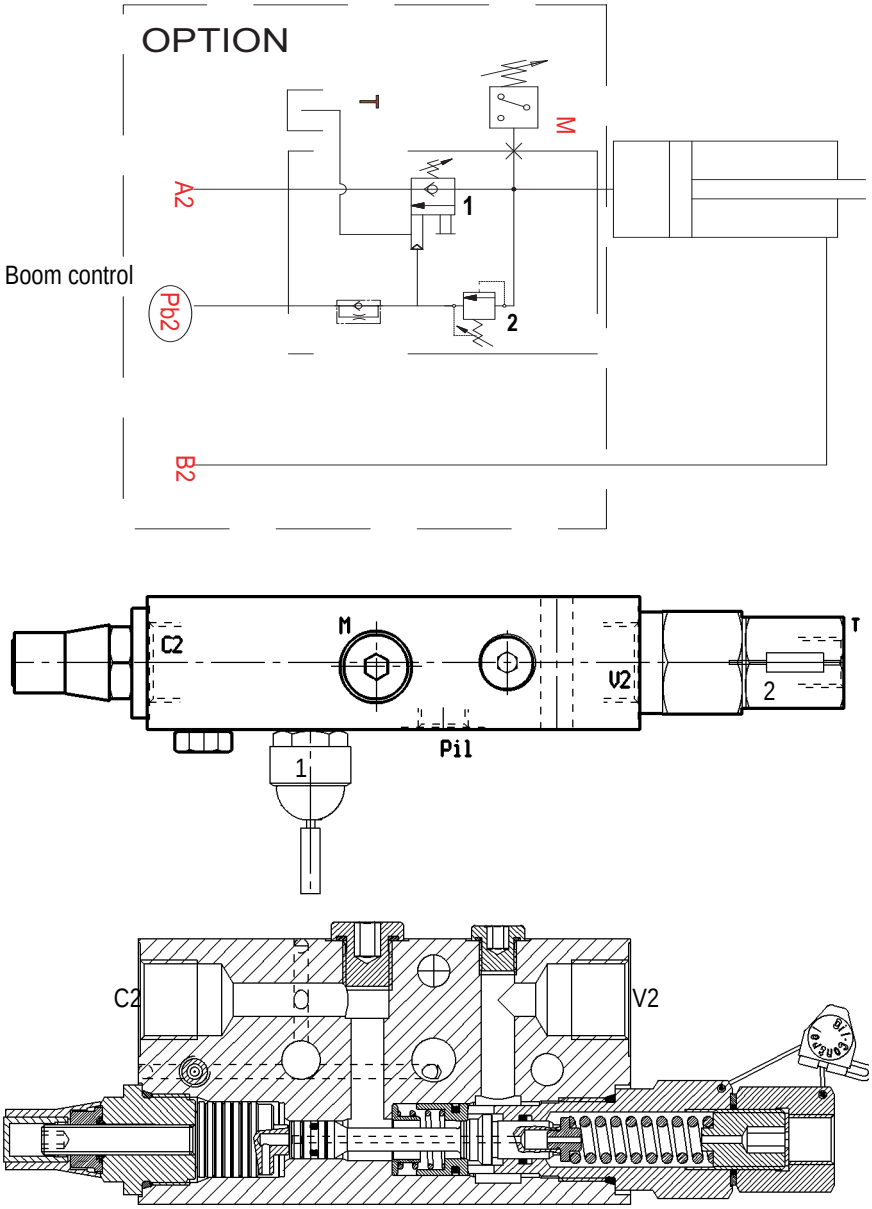
- Pilot control pressure moves valve (1) to work position (free oil reflux from the base side).
- The valve moves back to home position if the pilot control pressure drops.

In addition, a safety valve (2) protects the hydraulic ram from overload. Overload actuates the pressure switch (M), the warning device lights up and the buzzer sounds.

Important!

The valve settings are sealed.

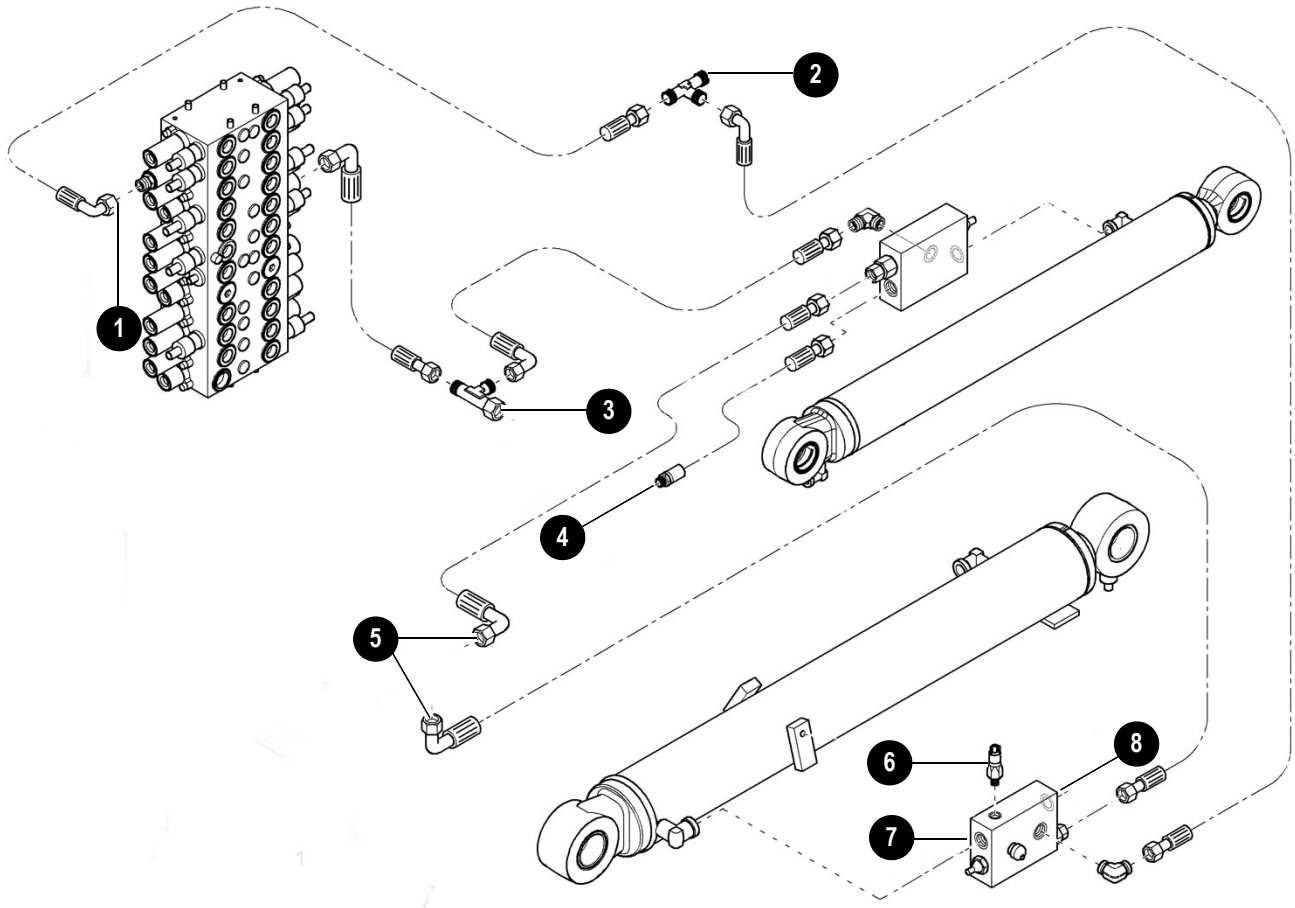
Diagram



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7.13 Safe load indicator F (safety valves for boom and stick)

Position



Pos.	Description
1	Boom segment pilot control port
2	Joystick connection
3	Joystick connection
4	Stick pressure line port
5	Leak oil strip port
6	Pressure switch
7	Hose burst valve
8	Boom pressure line port

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Function

One valve is mounted direct on the base-side port of the boom ram, the other valve is mounted on the rod-side port of the stick ram.

“Extend boom ram” function:

- Ram can be extended as usual (always “free flow” towards the ram)

The built-in non-return valve safely holds the load in rest position.

“Retract boom ram” function:

- Pilot control pressure moves valve (1) to work position (free oil reflux from the base side).
- The valve moves back to home position if the pilot control pressure drops.

“Retract stick ram” function:

- Ram can be retracted as usual (always “free flow” from the ram)

The built-in non-return valve safely holds the load in rest position.

“Extend stick ram” function:

- Pilot control pressure moves valve (1) to work position (free oil flow to the base side).
- The valve moves back to home position if the pilot control pressure drops.

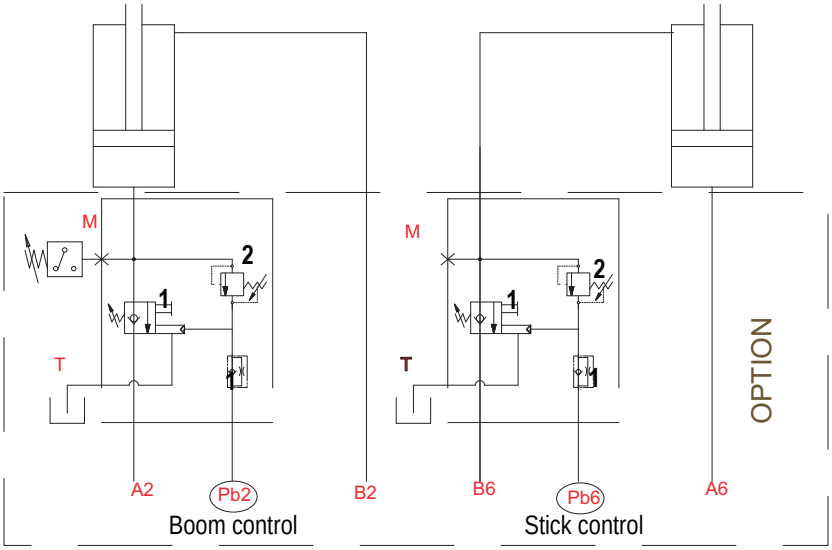
In addition, a safety valve (2) protects the hydraulic ram from overload. Overload actuates the pressure switch (M), the warning device lights up and the buzzer sounds.

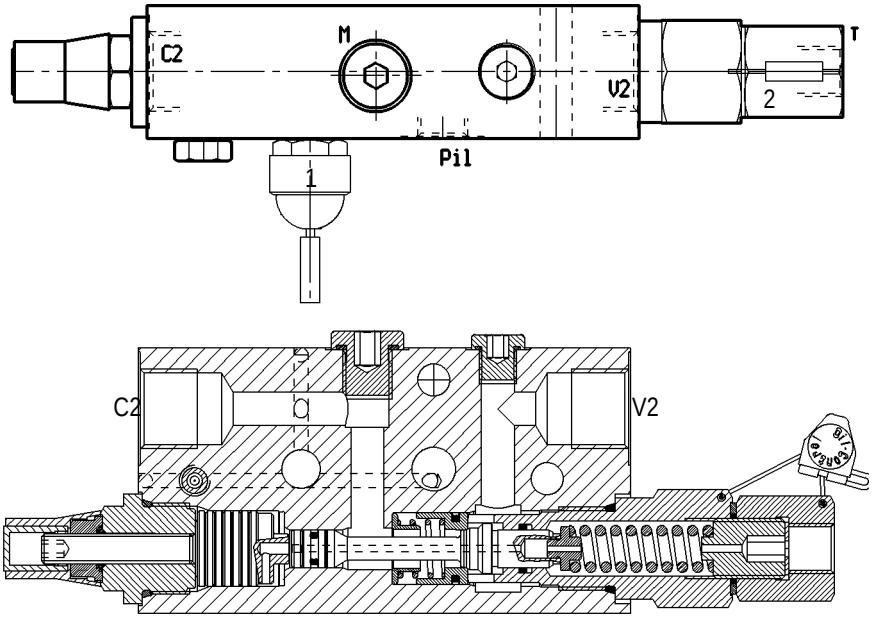
Important!

The valve settings are sealed, no modifications for legal reasons.

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Diagram





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7.14 3rd control circuit

Function

The 3rd control circuit allows you to operate a range of attachments with up to 3 hydraulic circuits.

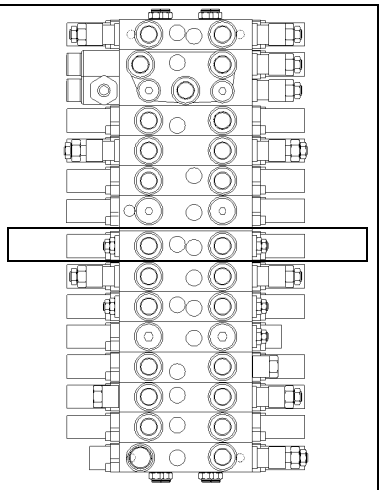


Fig. 19: 3rd control circuit

- The 3rd control circuit is actuated electrically by means of tip switches (S30, S31) on the joystick on the left. The solenoid valve Y16 is moved to the corresponding position.

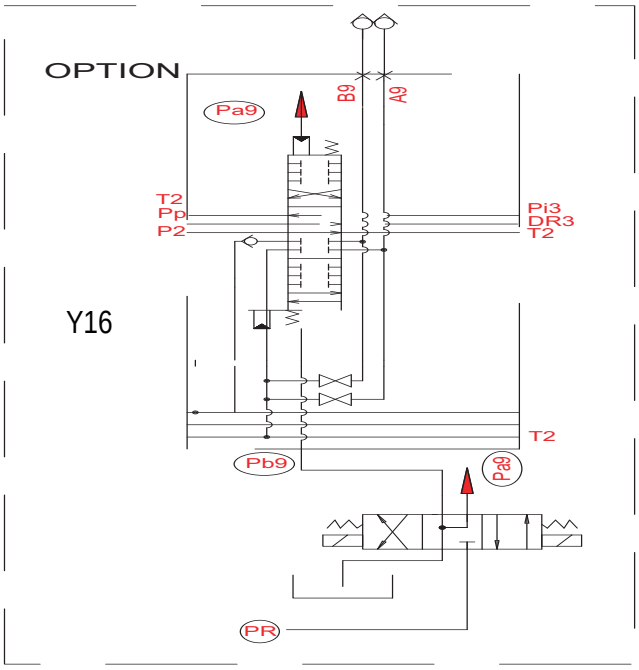


➥ If the machine is equipped with the triple articulation boom option, the 3rd control circuit is operated by means of the joystick on the right.

➥ If the machine is equipped with the electric auxiliary hydraulics option, the 3rd control circuit is operated by means of the hammer pedal.

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Diagram



Port	Legend	Controlled via
Pa9	3rd control circuit (control)	
Pb9	3rd control circuit (control)	
A9	3rd control circuit (connection)	
B9	3rd control circuit (connection)	
P3	High-pressure supply	Pump 3
Pp	Circulation pressure of drive counterbalancing system	
PR	Pilot control pressure	Pilot oil supply unit

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7.15 Triple articulation boom

Function

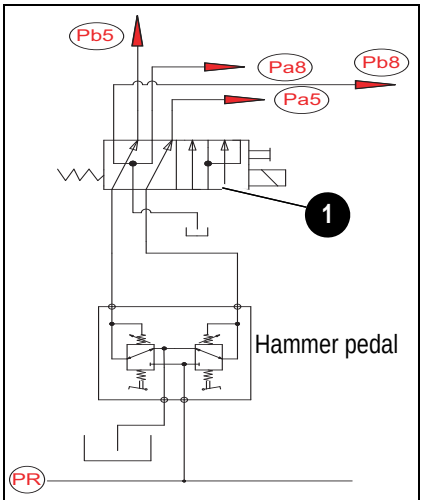


Fig. 20: Triple articulation boom control

The triple articulation boom increases the machine's reach and flexibility.

- The triple articulation boom and slewing is controlled by means of the hammer pedal.
- Solenoid valve Y15 (**20/1**) is switched via the tip switch function (S27) on the left-hand side joystick.

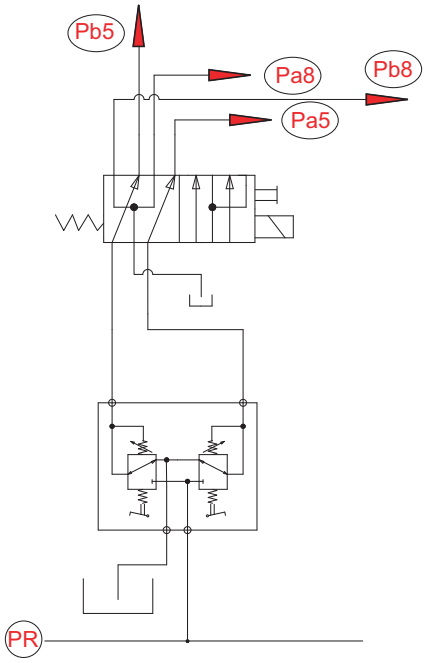


➥ The auxiliary hydraulics is operated electrically via the left-hand side joystick.

➥ The 3rd control circuit option is operated electrically via the right-hand side joystick.

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Diagram



Port	Legend	Controlled via
Pa5	Triple articulation boom extension control	Hammer pedal
Pb5	Triple articulation boom retraction control	Hammer pedal
Pa8	Offset ram retraction control	Hammer pedal
Pb8	Offset ram extension control	Hammer pedal
P3	High-pressure supply	Pump 3
A5	Triple articulation boom ram (base side)	Pump 3
B5	Triple articulation boom ram (rod side)	Pump 3
PR	Pilot control pressure	Pilot oil supply unit
Pp	Circulation pressure of drive counterbalancing system	

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7.16 Electric auxiliary hydraulics

Function

The auxiliary hydraulics segment is not controlled via the hammer pedal, but electrically via the tip switch function (S30, S31) on the joystick on the left.

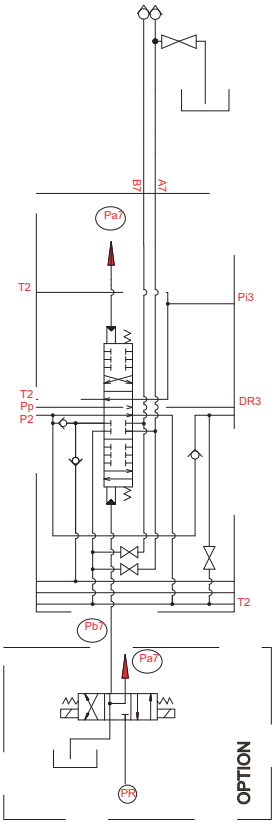


Fig. 21: Solenoid valve Y15



☞ *Pressing the tip switch on the joystick activates the solenoid valve Y15 (fig. 19)* *– see 4/3 directional valve on page 5-24.*

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Unpressurised reflux to hydraulic tank

Port	Legend
Pa7	Auxiliary hydraulics control
Pb7	Auxiliary hydraulics control
A7	Auxiliary hydraulics connection
B7	Auxiliary hydraulics connection
P3	Pump P3 port
Pp	Circulation pressure of drive counterbalancing system
PR	Pilot control pressure

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7.17 Auxiliary hydraulics shock cartridge

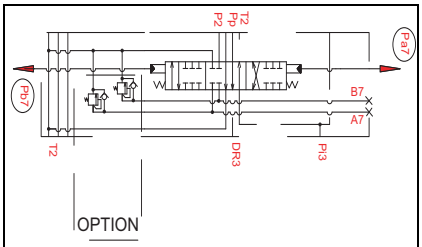


Fig. 22: Auxiliary hydraulics shock cartridges

- Overpressure protection for consumers in secondary circuit
- e.g. hydraulic hammer

Important!

The attachment manufacturer (e.g. hammer, offset bucket ...) is in charge of overpressure protection for his attachments. Neuson Baumaschinen GmbH shall not be liable for damage to attachments.

Problem:

The secondary circuit is also protected by the primary pressure limiting valve if the spool valve is enabled. There is no protection if the spool valve is not enabled – *see Pressure limiting valves* on page 5-9.

Ensuring protection with the spool valve disabled requires two secondary pressure limiting valves instead of the plugs.

Adjusting the secondary pressure limiting valves:

The pressure limiting valves must be set at 275 bar (3989 psi).

Please observe the following should the pressure limiting valves be set to less than 275 bar (3989 psi):

- Have the pressure setting carried out by a specialist.
- The pump's high flow rate, and the fact that the pressure peaks are now reduced by the secondary pressure limiting valve cartridges at the auxiliary hydraulics section, can cause the hydraulic oil to overheat.
- Reset the pressure setting to the initial 275 bar (3989 psi) when changing attachment.

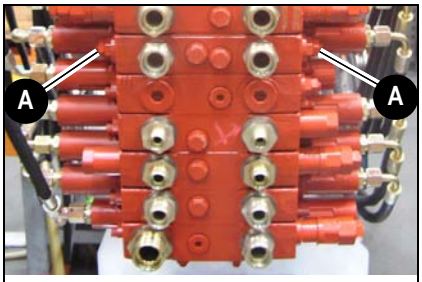


Fig. 23: Position of secondary pressure limiting valve for auxiliary hydraulics (standard)

Location:

Shock cartridges **23/A** are screwed into the main valve block at the auxiliary hydraulics segment (see figure without options 3rd control circuit/triple articulation boom) – *see Pressure limiting valves* **on page 5-9**.

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7.18 3rd control circuit shock cartridge

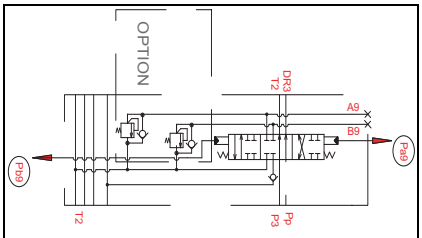


Fig. 24: Auxiliary hydraulics shock cartridges

- Overpressure protection for consumers in secondary circuit
- e.g. demolition tongs

Important!

The attachment manufacturer is responsible for overpressure protection of his attachments. Neuson Baumaschinen GmbH shall not be liable for damage to attachments.

Problem:

The secondary circuit is also protected by the primary pressure limiting valve if the spool valve is enabled. There is no protection if the spool valve is not enabled – *see Pressure limiting valves* on page 5-9.

Ensuring protection with the spool valve disabled requires two secondary pressure limiting valves instead of the plugs.

Adjusting the secondary pressure limiting valves:

The pressure limiting valves must be set at 275 bar (3989 psi).

Please observe the following should the pressure limiting valves be set to less than 275 bar (3989 psi):

- Have the pressure setting carried out by a specialist.
- The pump's high flow rate, and the fact that the pressure peaks are now reduced by the secondary pressure limiting valve cartridges at the auxiliary hydraulics section, can cause the hydraulic oil to overheat.
- Reset the pressure setting to the initial 275 bar (3989 psi) when changing attachment.

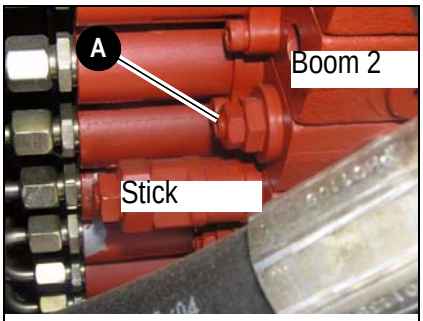


Fig. 25: Position of secondary pressure limiting valve for 3rd control circuit

Location:

Shock cartridges **25/A** are screwed into the auxiliary hydraulics segment of the main valve block – *see Pressure limiting valves* **on page 5-9**.

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7.19 Drive interlock (antitheft protection)

Position

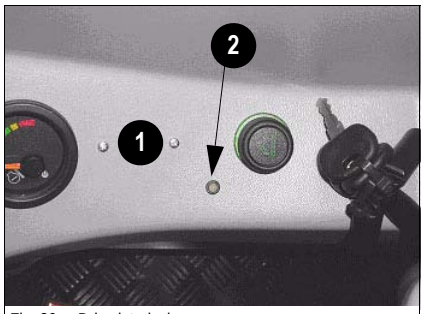


Fig. 26: Drive interlock

Pos.	Description
1	Transponder receiver surface
2	Red LED

Disabling the drive interlock

☞ *Approach the transponder to 2 cm (0.79") to the* transponder receiver surface.

➥ The red LED goes out.

☞ *Insert the ignition key into the ignition lock within 30 seconds and turn it at least to position 1.*

➥ The drive interlock remains disabled.

Enabling the drive interlock

☞ *Remove or turn the ignition key to position 0.*

➥ The drive interlock is enabled after 30 seconds.

➥ The blinking red LED indicates the drive interlock is enabled.

Programming

Coding transponder keys

The so-called main or master key is required for coding a new or uncoded key, or a key with different coding, for the drive interlock.

☞ *Disable the drive interlock with the master key and in addition, keep it close to the transponder receiver surface for 30 – 45 seconds – see Disabling the drive interlock on page 7-37.*

➥ The LED changes to a steady green light.

➥ The system is in programming mode now (coding mode).

☞ *Remove the master key from the* transponder receiver surface.

➥ The LED changes to a rapidly blinking green light.

☞ *Hold the key to be programmed against the* transponder receiver surface.

➥ The key is coded once the diode comes on slowly three times.

☞ *Hold further keys next to the transmitter/receiver surface to code them as mentioned above.*

The drive interlock is enabled as soon as there is no key contact for 30 seconds.

➥ Blinking red light

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Deleting programming/coding

☞ *Disable the drive interlock with the master key and in addition, keep it close to the transponder receiver surface for 30 – 45 seconds – see Disabling the drive interlock on page 7-37.*

➥ The LED changes to a steady green light.

➥ The system is in programming mode now (coding mode).

☞ *Hold the master key against the* transponder receiver surface *for a further 30 seconds.*

➥ The LED changes to a steady red light.

➥ The system is in delete mode now (coding mode).

☞ *Remove the master key*

➥ The LED changes to a rapidly blinking red light.

☞ *You have 30 seconds to hold the master key again to the* transponder receiver surface *to confirm deletion.*

➥ The system is deleted once the diode comes on slowly three times.

Caution!

Deletion deletes all “normal“ transponders and the master!

- *Reason: once a key is lost, you can no longer delete it.*
- *Therefore, the entire system is deleted for safety reasons and can be completely recoded with the remaining (or newly ordered) keys.*

Configuration of the deleted system

Once deletion is over, the system recognises any TREBE transponder key, i.e. the system can be disabled with any key.

The first transponder key to be recoded for the system is automatically the new master and can be used for coding the “normal” transponder keys – *see Programming* on page 7-37.

Important!

The following applies both to the coding and programming mode: the system leaves the coding and programming modes and is disabled as soon as the ignition key is inserted in the ignition lock and turned to the first position.

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7.20 Quickhitch

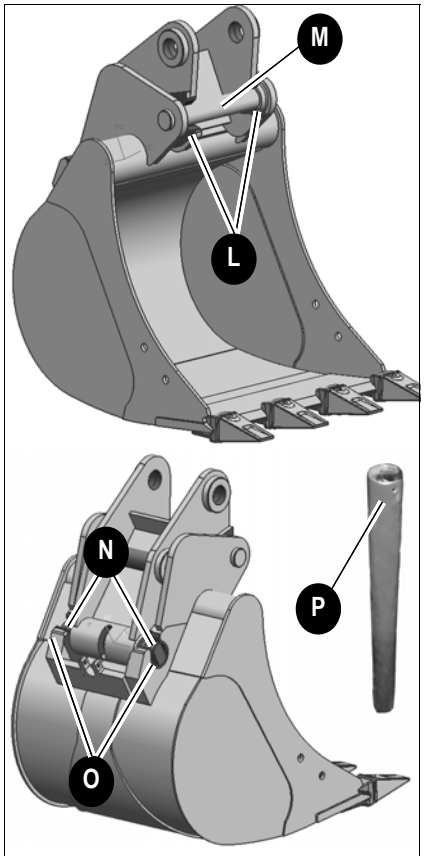


Fig. 27: Bucket with quickhitch

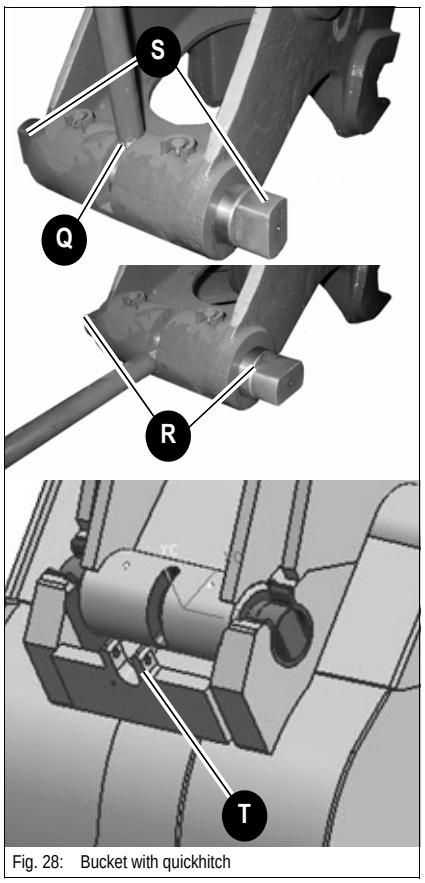


Fig. 28: Bucket with quickhitch

Danger!

The attachment must always be safely locked onto the quickhitch –

Danger of accidents!

☞ *Before starting work, make sure the attachment is securely locked onto the quickhitch by means of the lock mechanism. You must be able to see the lock on either side of the mounting bore of the attachment.*

☞ *Re-equip as follows:*

- Approach the machine to the attachment.
- Hitch coupling bar **M** onto coupling claws **L** of the quickhitch to pick up the bucket.
- Engage lock mechanism **N** in mounting bores **O**.
- Place the bucket on level ground.

☞ *Lock as follows:*

- Switch off the engine.
- Insert tube **P** (included in scope of delivery) in clamping sleeve **Q**.
- Press the tube downwards.
- The lock pin must be in position **R**.
- Insert the spring plug in fixture **T** to lock the quickhitch.

Caution!

Always make sure the spring plug is inserted correctly.

☞ *Unlock as follows:*

- Switch off the engine.
- Remove the spring plug from fixture **T**.
- Insert tube **P** (included in scope of delivery) in clamping sleeve **Q**.
- Press the tube upwards.
- The lock pin must be in position **S**.

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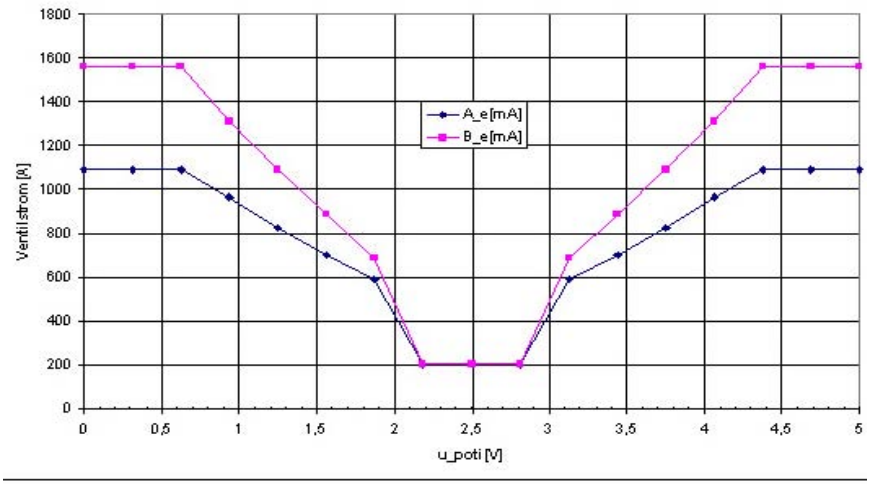
7.21 Proportional controls

Function

This control mode offers proportional operation of the auxiliary hydraulics circuit depending on the position of switch B on the joystick.

You can also modify the properties of the characterisitic curve. Precision work, for instance with the offset bucket, does not require the full throughput of the auxiliary hydraulics. Therefore we recommend setting the controls to the low characteristic curve 1 (slow movements) – *see chapter* *Adjusting control response* on page 7-41.

The slide switch is not pressed fully in this position and you can move the machine more smoothly (flat characteristic curve).



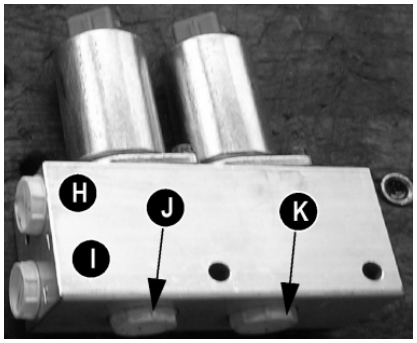
If you require the full throughput then characteristic curve 2 will be the choice to make (slide switch pressed as far as it will go).

Caution!

Always use button B (– *see chapter* on page 7-41) on the joystick for hammer operation.

☞ *Do not operate the hammer with characteristic curve 1 too often since the slide switch described above does not ensure full throughput, causing power loss and system overheating.*

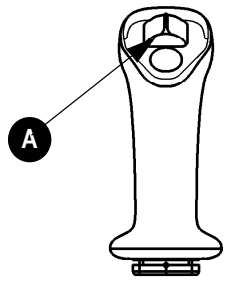
Ports



Ports	Hose designation
H	T line
I	P line
J	Auxiliary hydraulics (left)
K	Auxiliary hydraulics (right)

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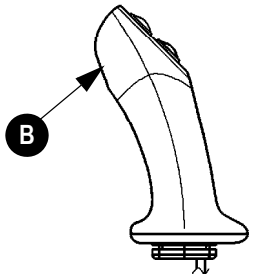
Overview of auxiliary hydraulics controls



☞ *Move slide switch A to the left or right.*

☞ *Ensures proportional control of the auxiliary hydraulic circuit.*

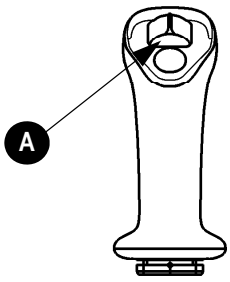
Hammer operation



Switching on hammer operation

☞ *Press button B on the control lever.*

Adjusting control response



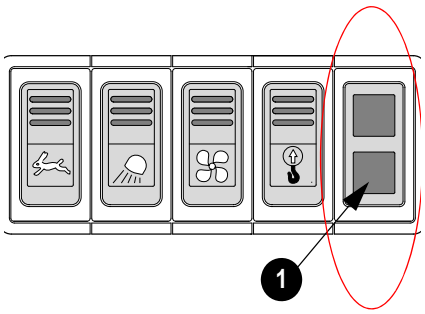
Characteristic curve 1 (slow movements)

☞ *Switch off ignition, hold slide switch **A** to the left and switch on ignition at the same time. Then wait 2 seconds and release the slide switch. The status display acknowledges by flashing once.*

Characteristic curve 2 (fast movements):

☞ *Switch off ignition, hold slide switch **A** to the right and switch on ignition at the same time. Then wait 2 seconds and release the slide switch. The status display acknowledges by flashing twice.*

Characteristic curve – status display



Displays the characteristic curve that has been selected for the control valve.

Characteristic curve 1 (slow movements)

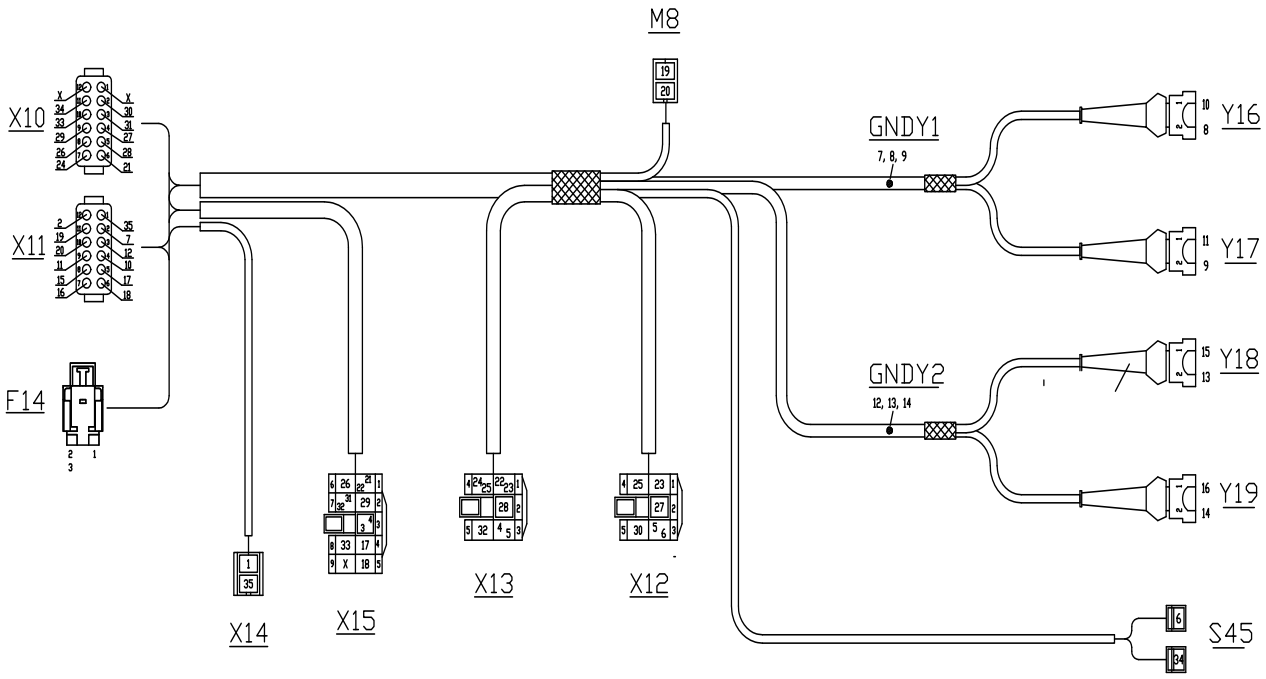
☞ *Telltale 1 in the status display flashes once after switching on ignition.*

Characteristic curve 2 (fast movements – maximum throughput)

☞ *Telltale 1 in the status display flashes twice after switching on ignition.*

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Wiring harness



X10	Connector 1 control unit
X11	Connector 2 control unit
F14	Blade-type fuse
X12	Joystick (left)
X13	Joystick (right)
X14	Power supply
X15	Plug for telltales
S45	Pressure switch (automatic revs setting only)
Y16	Plug 1 proportional circuit 1
Y17	Plug 2 proportional circuit 1
Y18	Plug 1 (3rd control circuit only)
Y19	Plug 2 (3rd control circuit only)
M8	Motor for automatic revs setting

Control unit



Pos.	Connections
1	Plug X10
2	Plug X11

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Control valve plug assignment

X10 digital/analog inputs

1	TX	Serial interface
2	SW2	Hammer operation
3	SW4	Power
4	A_POT2	Joystick signal channel 2
5	A_POT1	Joystick signal channel 1
6	U-analog	Analogous supply +5 V
7	R_POT1	GND joystick
8	R_POT2	GND potentiometer
9	A_POT3	Potentiometer signal
10	SW3	Auto
11	SW1	Pressure switch
12	RX	Serial interface

X11 supply outputs

1	M_ECU	Earth
2	MVH1	+ channel 1
3	MVH2	+ channel 2
4	MVL1A	Pulse modulation channel 1/magnet 1
5	LSW2	Telltale
6	LSW3	Telltale
7	MVL2A	Pulse modulation channel 2/magnet 1
8	MVL2B	Pulse modulation channel 2/magnet 2
9	MVL1B	Pulse modulation M channel 1/magnet 2
10	MOT2	Engine
11	MOT1	Engine
12	U_ECU	+12 V supply

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Safety features

☞ *Microcontroller ... diagnoses errors supplied by the output stage.*

☞ *Monitor...disables the output stage if the microcontroller breaks down.*

☞ *Output stage...controls the status of the supply lines from the pressure regulating valves.*

☞ *Watchdog...disables the microcontroller in case the microcontroller breaks down.*

☞ *Switch for valve supply...disables the power supply to the valves if a critical error is detected.*

Measures to be taken in case of malfunctions

Caution!

System breakdowns can never be excluded, therefore:

- Disconnect the electronic controls from the power supply before carrying out repair work or maintenance on the hydraulic system.
- Stay clear of areas and parts with danger of crushing.
- Stay clear of in-between moving hydraulic components and fixed obstacles. DANGER OF CRUSHING!
- The operator of the machine or hydraulic system must be aware of possible machine or system errors.

Diagnosis display

The control valve status is displayed to the user by means of a flashing code. The following errors are identified by the number of flash pulses:

No.	Pin no.	Description	Error	Troubleshooting	Critical error
0	-	-	No error	-	-
				Check voltage	
1	B 5	Channel 1 input (left)	Defective input voltage	Home position: 2.5 V	-
				Deflected: 0.7 to 4.3 V	
2	A4, A9	Channel 1 output; Y16/Y17	Overload or overheating (output stage)	Check magnet on valve	-
3	A4, A9	Channel 1 output; Y16/Y17	Short circuit on earth or operating voltage	Check wiring	x
				Check voltage	
4	B4	Channel 2 input (right)	Defective input voltage	Home position: 2.5 V	-
				Deflected: 0.7 to 4.3 V	
5	A7, A8	Channel 2 output; Y18/Y19	Overload or overheating (output stage)	Check magnet on valve	-
6	A7, A8	Channel 2 output; Y18/Y19	Short circuit on earth or operating voltage	Check wiring	x
7	-		System start	-	x
8	A10, A11	Motor output	Overheating (output stage)	Check motor	x
9	-	-	EEProm data error	-	x
10	B6	+5 V joystick	Defective 5 V supply	-	x

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The system switches off automatically if a critical error is detected. Activating the control unit is only possible by repeatedly switching on the supply voltage.

Only the error occurring last is issued if several errors occur at the same time. We therefore recommend troubleshooting one error after another until the diagnosis telltale no longer flashes.

In order to obtain a detailed status of the output stage for channels no. 1 and 2, the hammer operation input must be activated during system start. The system flashes only briefly if there are no errors.

In case of an error, the error code is issued in the following order of the pulse modulation outputs:

☞ *Channel 1/Magnet 1* > *Pause* > *Channel 1/Magnet 2* > *Pause* > *Channel 2/Magnet 1* > *Pause* > *Channel 2/Magnet 2*

An error code (number of flash pulses) is assigned to each of the pulse modulation outputs:

Error code	Error
1	No error
2	overload, overtemp
3	open load
4	Short circuit on earth

The error code ends at the last output stage by displaying an error.

Examples:

➥ A: channel 2/magnet 1 has an “open load” interruption. The following flash sequence is then issued:

1 > Pause > 1 > Pause > 3

Cause of error: interruption of coil from solenoid valve (Y19), wiring interrupted, contact error on plug (Y16; X11)

➥ B: channel 1/magnet 1 has an “Overtemp” error and channel 2 has a “Short circuit to earth” error, the following flash sequence is issued:

2 > Pause > 1 > Pause > 1 > Pause > 4

Cause of error:

- Channel 1: output stage overload; short circuit of coil from solenoid valve, short circuit of valve wiring (not to earth or operating voltage)
- Channel 2: wiring, earth contact in valve

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