Service Manual

Track excavator

50Z3

Machine model	50Z3
Edition	2.0
Language	English
Item no.	1000129833

Documentation

Description	*Order no.*
Operator's Manual	1000127717
Service manual	1000129833
Spare parts catalogue:	
Up to serial no. AD07125	1000125820
From serial no. AH00579	1000180709

The cover features the machine with possible optional equipment.

neuson

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Document: SERV-HB 50Z3 EN
Order no.: 1000129833
Edition: 2.0

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Operation

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. It helps 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.

1.2 Identification of warnings and dangers

Important indications regarding the safety of the staff and the machine are identified in this Operator's 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.

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

1.4 Type labels and component numbers

Fig. 1: Type label: location

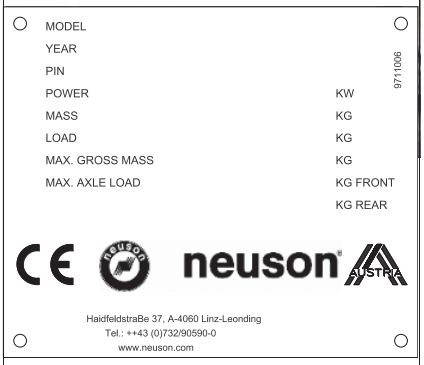


Fig. 2: Type label

Serial number

The serial number is stamped on the machine chassis under the hydraulic pump. 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:	5003 RD
Year:	2004
PIN:	AC 000000
Power:	28.2 kW (37.8 hp)
Mass:	4800 kg (10582 lbs)
Load:	----------
Max. gross mass:	----------
Max. axle load:	----------

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

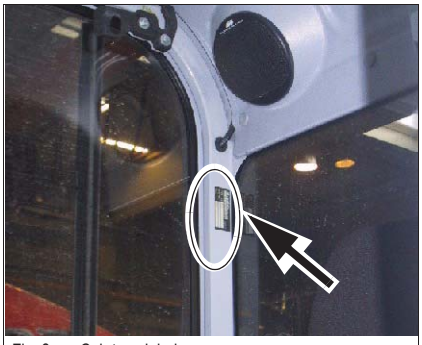


Fig. 3: Cab type label

Cab number

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

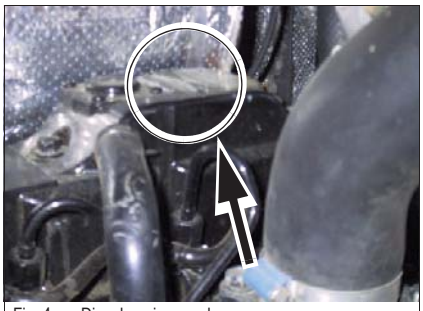


Fig. 4: Diesel engine number

Engine number

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

Example: Yanmar 46557

Fig. 5: Hydraulic pump type label

Hydraulic pump number

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

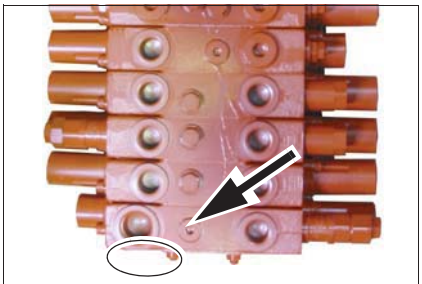


Fig. 6: Main valve block type label

Control valve number

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

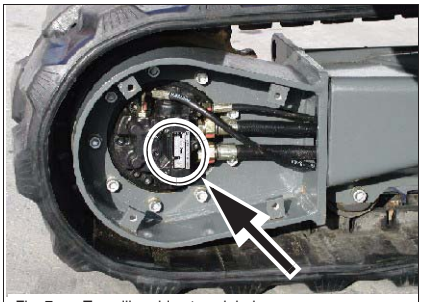


Fig. 7: Travelling drive type label

Travelling drive number

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

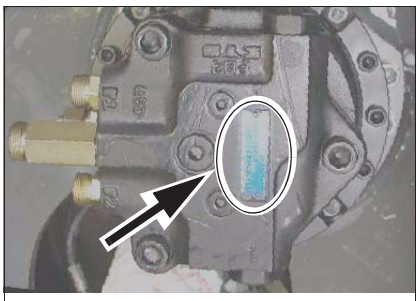


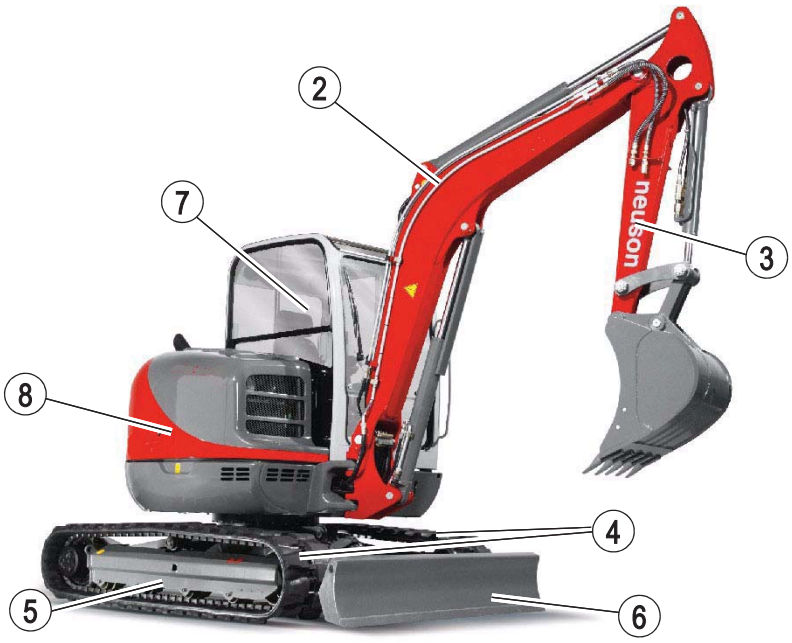
Fig. 8: Swivel unit type label

Swivel unit number

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

1.5 Machine: overview

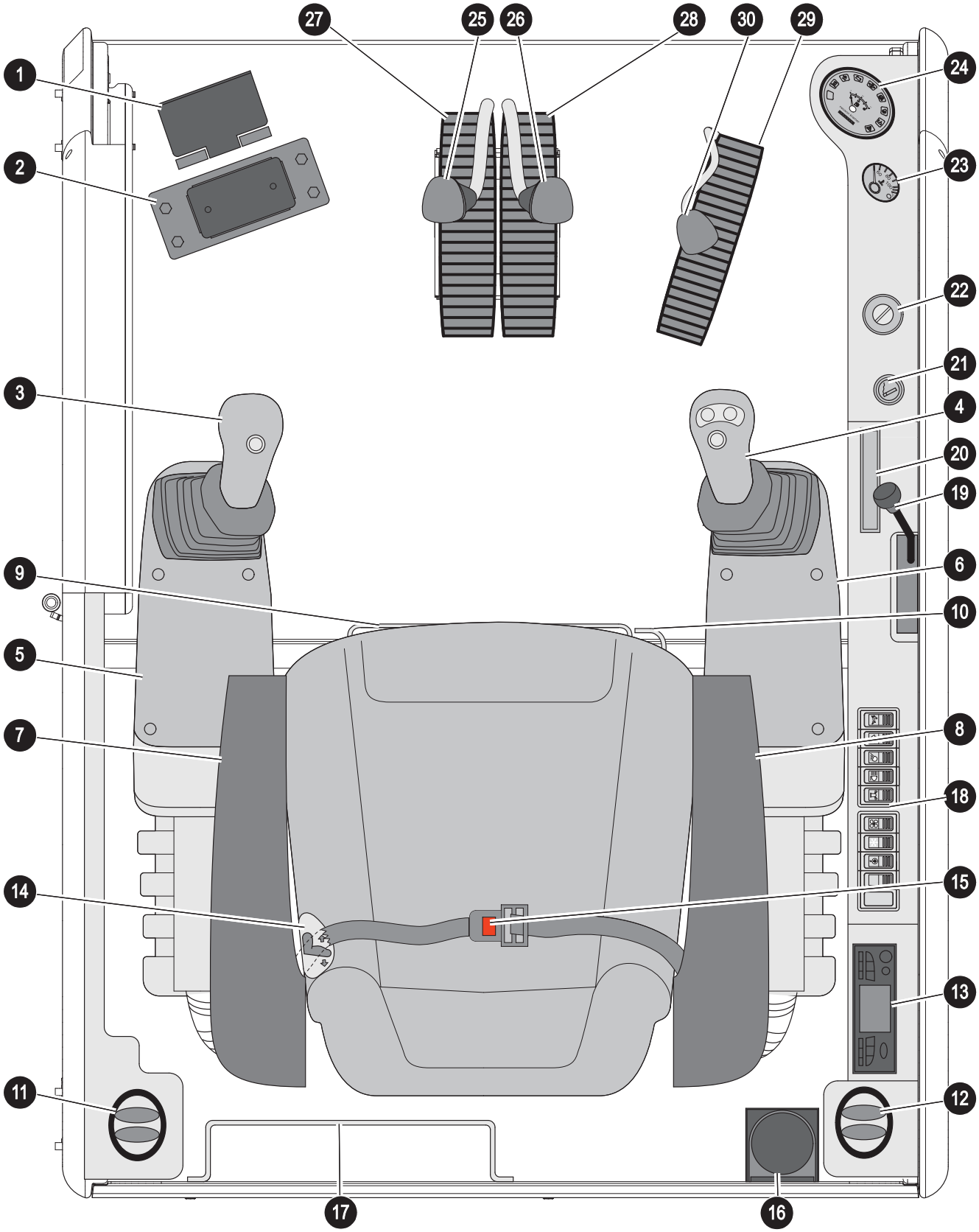
1 Boom light
2 Boom
3 Stick
4 Rubber chains
Steel chains (option)
5 Undercarriage
6 Stabiliser blade
7 Cab
8 Engine cover



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

Fig. 9: Machine outside views

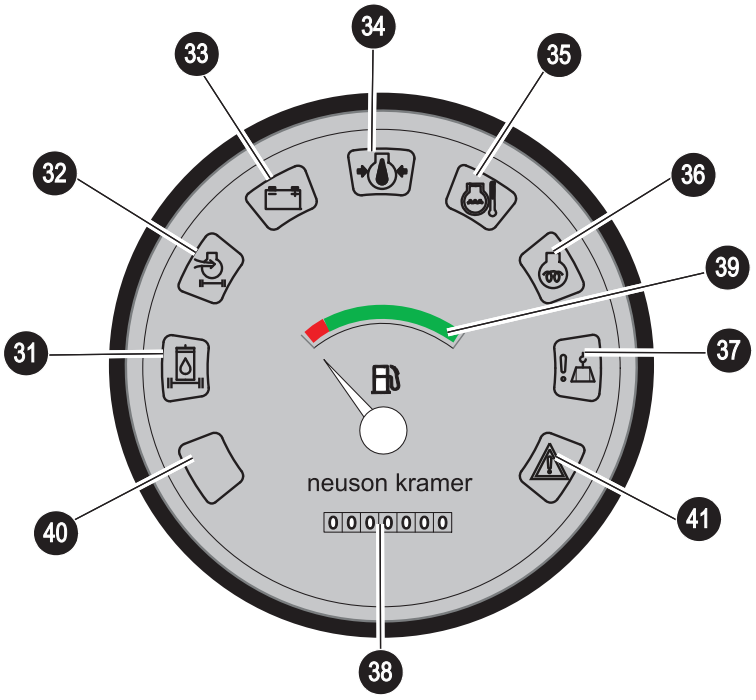
1.6 Cab overview

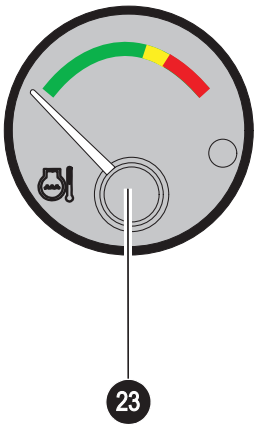


1.7 Cab (legend)

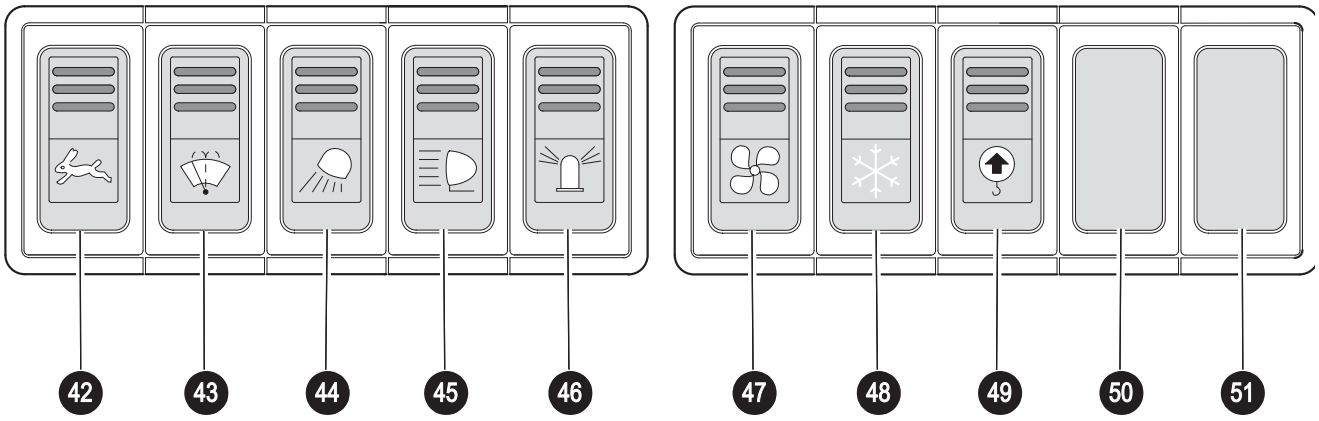
Pos.	Description
1	Cover for hammer pedal
2	Hammer pedal
3	Control lever (left)
4	Control lever (right)
5	Control lever base (left)
6	Control lever base (right)
7	Armrest (left)
8	Armrest (right)
9	Lever – horizontal seat adjustment
10	Lever – horizontal seat adjustment with control lever base
11	Air 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

1.8 Instrument panel up to serial no. AC02877: overview





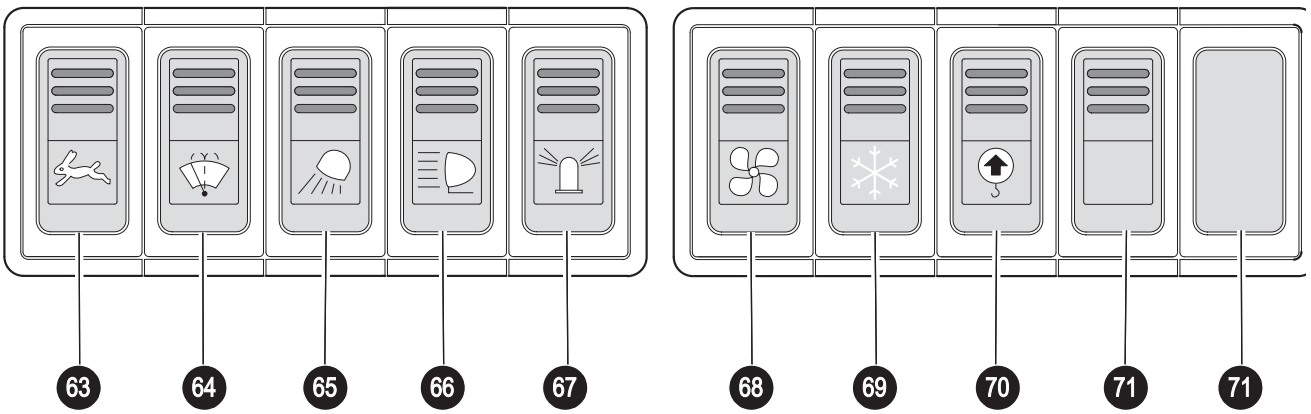
Temperature range:
Green/yellow 90 °C (194 °F)
Yellow/red 100 °C (212 °F)



1.9 Instrument panel up to serial no. AC02877: legend

Pos.	Description
31	Hydraulic oil filter telltale (red)
32	Air filter telltale (red)
33	Telltale (red) – alternator charge function
34	Telltale (red) – engine oil pressure
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 light
45	Roof lights
46	Rotating beacon
47	Ventilation
48	Air conditioning (option)
49	Safe load indicator (option)
50	Not assigned
51	Not assigned

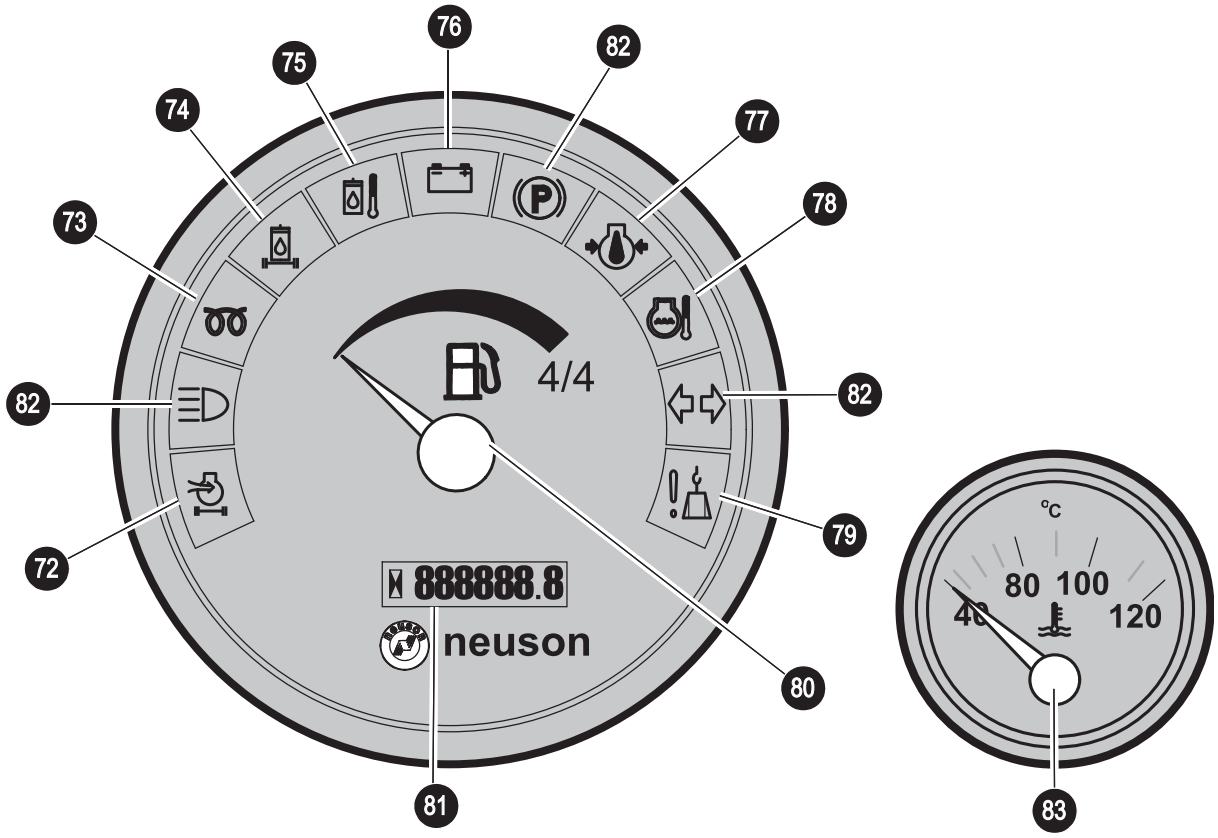
1.10 Instrument panel from serial no. AC02893 to serial no. AD07125: overview

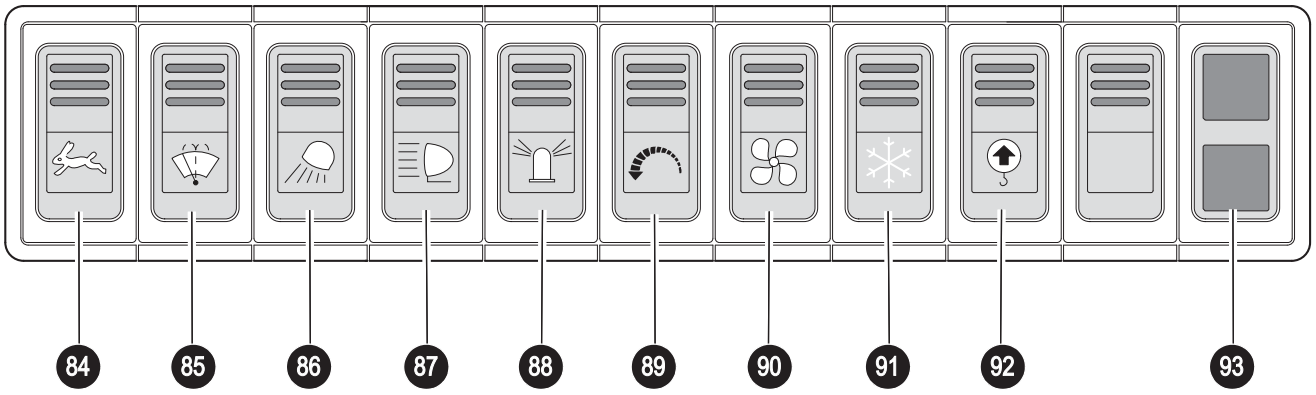


1.11 Instrument panel from serial no. AC02893 to serial no. AD07125: legend

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	Telltale (red) – engine oil pressure
58	Coolant temperature telltale (red)
59	Cold starter telltale (yellow)
60	Safe load indicator telltale (red)
61	Hour meter
62	Fuel level 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

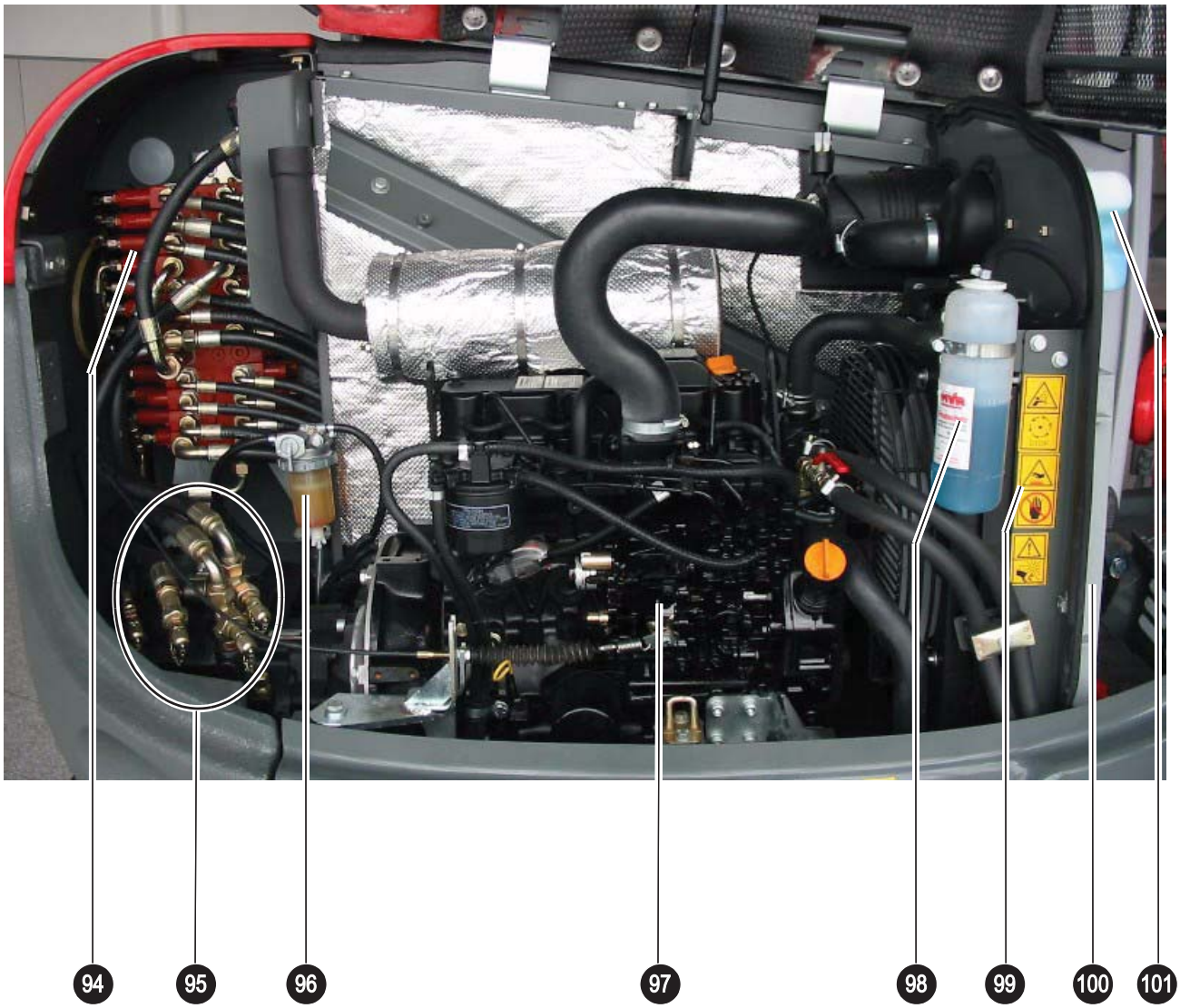
1.12 Control elements 50Z3 (from serial no. AH00579)





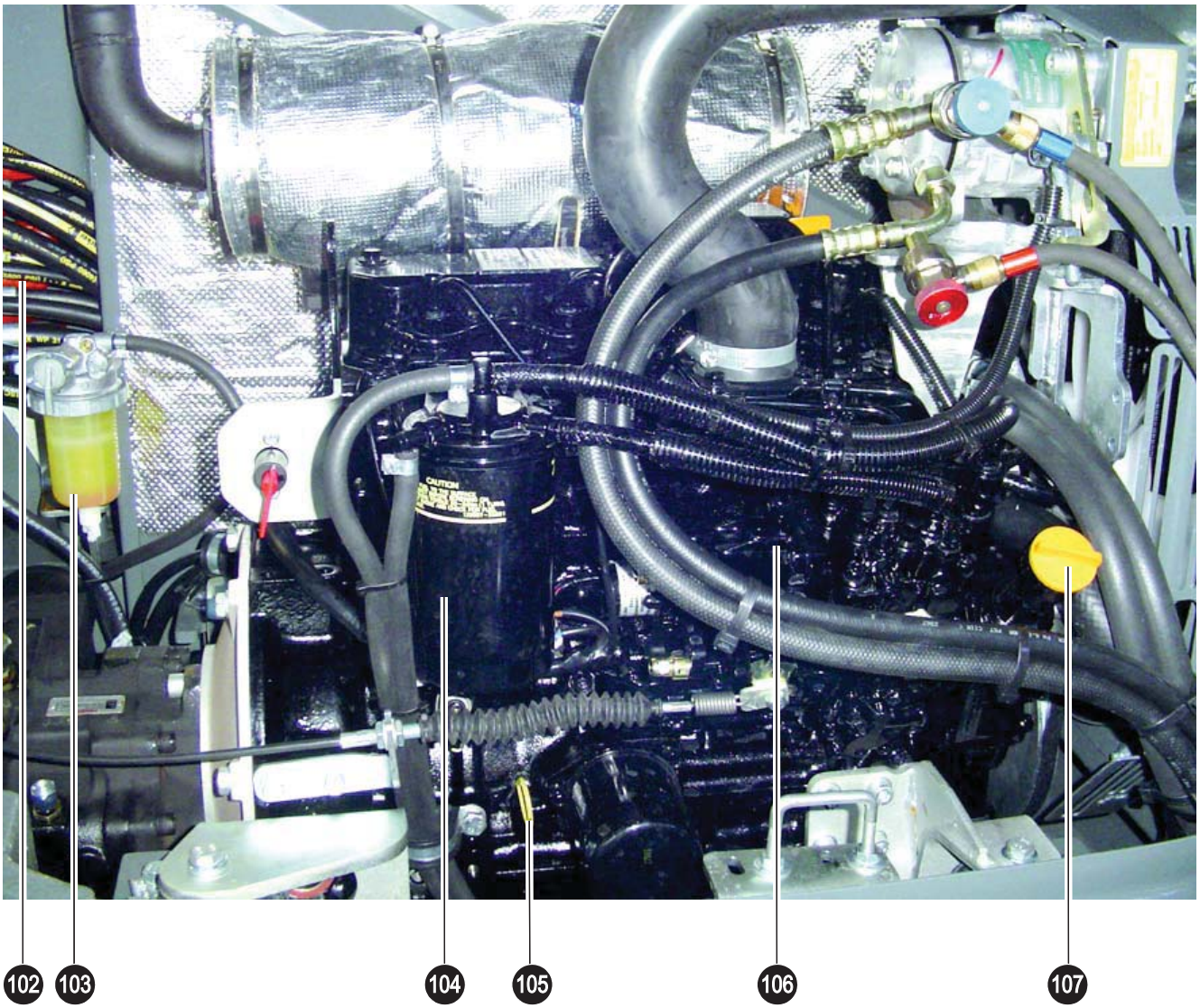
Pos.	Description
72	Telltale (red) – air filter
73	Cold starter telltale (yellow)
74	Telltale (red) – hydraulic oil filter
75	Telltale (red) – hydraulic oil temperature
76	Telltale (red) – alternator charge function
77	Telltale (red) – engine oil pressure
78	Telltale (red) – coolant temperature too high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

1.13 Engine compartment up to serial no. AD07125: overview



Pos.	Description	For more information see page
94	Main valve block	*5-6*
95	Measurement ports	*3-31*
96	Fuel prefilter	*3-11*
97	Engine	*4-1*
98	Coolant tank	*3-18*
99	Radiator	*3-18*
100	Oil cooler	
101	Tank for washer system	

1.14 Engine compartment (from serial no. AH00579): overview



Pos.	Description	For more information see page
102	Main valve block	*5-6*
103	Fuel prefilter	*3-11*
104	Fuel filter (new)	*3-12*
105	Oil dipstick	*4-1*/*4-12*
106	Engine (Tier III)	*4-12*
107	Oil filler neck	*4-1*/*4-12*

1.15 Chassis overview

Pos.	Description	For more information see page
108	Swivel joint	*5-35*
109	Leak oil strip	
110	Swivel unit	*5-29*
111	Opening for cleaning the hydraulic oil tank	
112	Position of main fuse box with relays	*2-5*
113	Shuttle valve block	*5-23*
114	Pilot valve for stabiliser blade	*5-20*
115	Changeover valve	*5-21*
116	Pilot valve (driving)	*5-17*

1.16 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 screws 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

☞ *Unscrew screw **C** with a suitable tool*

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

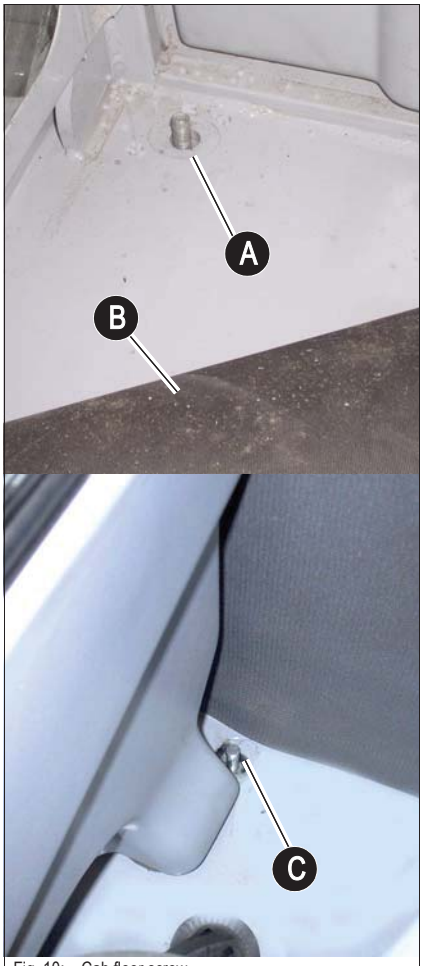


Fig. 10: Cab floor screw

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*

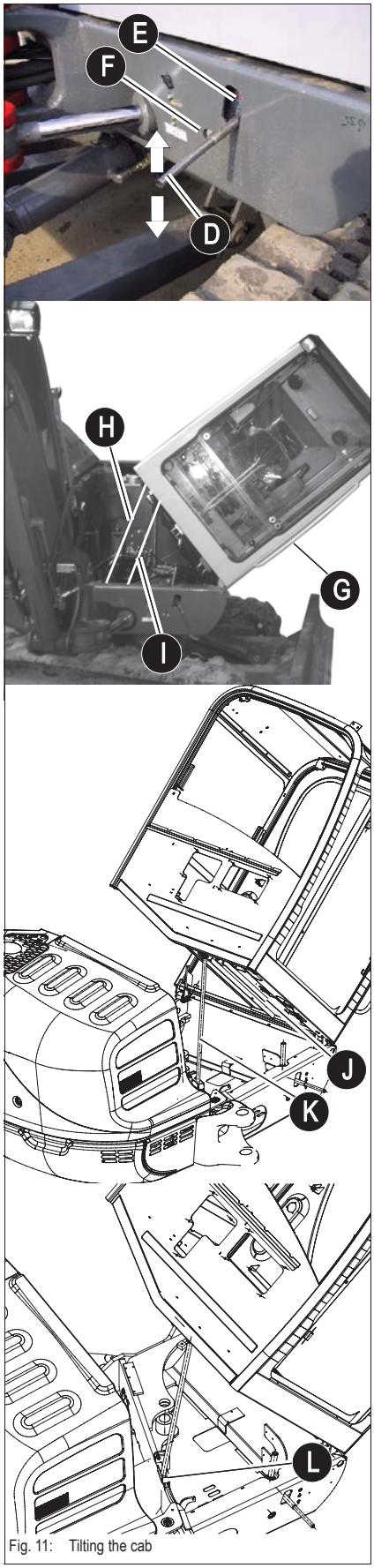


Fig. 11: Tilting the cab

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 cables **H** and **I**

☞ *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 **B** (rear) with suitable tools and the specific torque*
– see General tightening torques on page 2-7

Caution!

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

☞ *Replace defective parts immediately*

1.17 Summer/winter operation

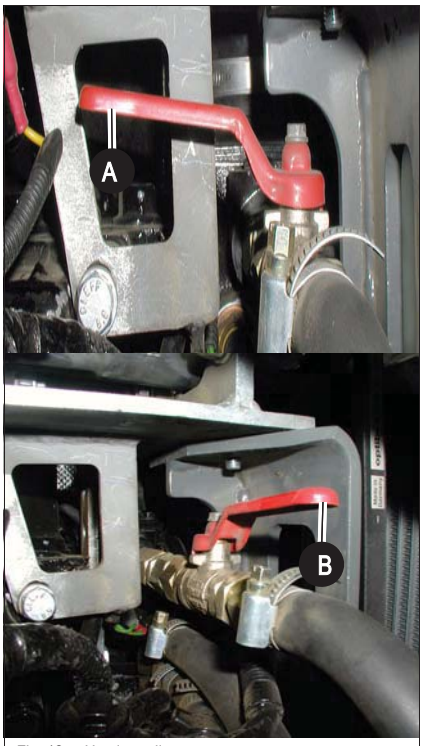


Fig. 12: Heating adjustment

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 1-18*

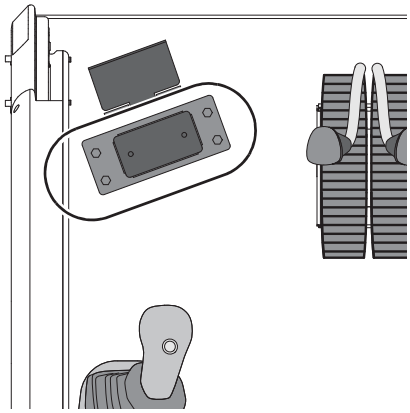
➥ The deflector plate is located on the heater under the cab

☞ *Slacken both fastening screws*

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

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

1.18 Turning the auxiliary hydraulics/boom swivel pedal around



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!

Specifications

2 Specifications

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine

Engine	Model 50z3	
	Tier 2 (up to AD07125)	European tier 3A / Tier IV interim (from AH00579)
Product	Yanmar diesel engine	
Type	4TNV88-PNS	4TNV88-BPNS
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	2190 cm³ (133.6 cu in)	
Nominal bore and stroke	88 x 90 mm (3.46 x 3.54")	
Output	28.2 kW (37.8 hp) at 2400 rpm	28.1 kW (37.7 hp) at 2400 rpm
Max. torque	138.3 Nm (102 lbf ft) at 1100 rpm	142 Nm (105 lbf ft) at 1440 rpm
Max. engine speed without load	2590 ± 25 rpm	
Idling speed	1100 ± 25 rpm	
Valve clearance (intake = outlet)	0.15 – 0.25 mm (0.0059 – 0.0098") cold	
Compression	33.3 – 35.3 bar (483 – 512 psi) at 250 rpm	
Engine oil pressure	2.9 – 3.9 bar (42 – 57 psi)	3.2 – 4.7 bar (46 – 68 psi)
Pressure switch for engine oil pump	0.5 ± 0.1 bar (7.3 ± 1.5 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	Intake manifold preheating (preheating time 15 sec)	Glow plug (preheating time 15 sec)
Max. inclined position (engine no longer supplied with oil):	30° in all directions	
Fuel consumption	6.3 l/h (1.7 gal/h) (without air conditioning)[1]	5.9 l/h (1.6 gal/h) (without air conditioning)[1]
	6.3 l/h (1.7 gal/h) (with air conditioning)[1]	5.9 l/h (1.6 gal/h) (with air conditioning)[1]
Specific fuel consumption	264 g/kWh (0.434 lb/hph)	249 g/kWh (0.409 lb/hph)
Exhaust values according to	97/68/EC Tier 2 EPA Tier 2	97/68/EC Tier 3A EPA Tier 4 interim

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.

Fuel injection pump

Type	YPD-MP2	
	Tier 2	Tier 3A
Design	Single piston distributor injection pump	
Injection pressure	215 – 225.5 bar (3118 – 3271 psi)	196 – 206 bar (2843 – 2988 psi)
Revs control	Mechanical	
Lubrication system	Engine oil lubrication	

Engine capacities

Capacities	Model 50Z3
Fuel tank	83 l (22 gal)
Engine oil (max./effect.)	7.4 l / 3.4 l (2.0 gal / 0.9 gal)
Coolant (without radiator)	2.7 l (0.7 gal)
Radiator	3.5 l (0.9 gal)
Expansion tank	0.45 l (0.1 gal)

Overview of capacities: – *see Fluids and lubricants* on page 3-1

Engine tightening torques

Tightening torques	Nm / lbf ft
Cylinder-head bolt	85.3 – 91.1 / 62.96 – 67.20 (M10x1.25)
Connecting rod bearing screw	44.1 – 49.0 / 32.5 – 36.1 (M9x1)
Main bearing screw	93.2 – 98.1 / 68.7 – 72.4 (M12x1.5)
Flywheel screw	83.3 – 88.2 / 61.4 – 65.1 (M10x1.25)

2.3 Hydraulic system

Hydraulics		Model 50Z3
Pump	Tier 2 (up to AD07125)	Double variable displacement + twin gear pump 2 x 22 + 16 + 4.5 cm^3 (2 x 1.34 + 1.0 + 0.27 cu in) PVD-2B-44BP-16G5-4713F
	Tier 3A (from AH00579)	Double variable displacement + twin gear pump 2 x 20.7 + 16 + 4.5 cm^3 (2 x 1.26 + 1.0 + 0.27 cu in) PVD-2B-41BP-16G5-4713F
Flow rate	Tier 2 (up to AD07125)	2 x 57 + 41.4 + 11.6 l/min (2 x 15 + 10.9 + 3.1 gpm) at 2590 rpm
	Tier 3A (from AH00579)	2 x 53.6 + 41.4 + 11.7 l/min (2 x 14.2 + 10.9 + 3.1 gpm) at 2590 rpm
Control valve		10 sections/11 sections (3rd control circuit)
Main pressure limiting valve for pumps P1, P2		$230^{-0/+5}$ bar ($3336^{-0/+73}$ psi)
Main pressure limiting valve for pump P3		$230^{\pm 3}$ bar ($3336^{\pm 44}$ psi)
Secondary pressure limiting valve for main valve block		$275^{-0/+0.5}$ bar ($3989^{-0/+7.3}$ psi) at 20 l/min (5.3 gpm)
Main pressure limiting valve for pilot control pressure		$42^{\pm 1}$ bar ($609^{\pm 15}$ psi)
Main pressure limiting valve for swivel unit engine pressure restriction		$215^{\pm 3}$ bar/$3118^{\pm 44}$ psi (at idling speed)
Hydraulic oil cooler		Standard
Hydraulic tank capacity		80 l (21.1 gal)
2nd speed shift pressure		180 bar (2611 psi)
Gear motor braking deceleration time		$3.7^{-1.2/+1.2}$s at 50 °C (122 °F) oil temperature
Circulation pressure P1, P2		15.5 bar (225 psi) / 12.5 bar (181 psi)
Circulation pressure P3		18 bar (261 psi)

Auxiliary hydraulics oil flow

Pressure (bar/psi)	P2 + P3 (l/min / gpm)		P2 (l/min / gpm)	
	Tier 2	Tier 3A	Tier 2	Tier 3A
15 / 218	97 / 26	92 / 24.3	57 / 15.1	53 / 14
40 / 580	95 / 25	91 / 24	56.6 / 15	52 / 13.7
60 / 870	93.2 / 24.6	90 / 23.8	56 / 14.8	51 / 13.5
90 / 1305	92 / 24	87 / 23	55 / 14.5	50 / 13.2
120 / 1740	83 / 22	80 / 21	54.2 / 14.3	49 / 12.9
150 / 2176	73 / 19	70 / 18.5	53.1 / 14	48 / 12.7
180 / 2611	65 / 17	61 / 16	52.3 / 13.8	45 / 11.9
210 / 3046	56.6 / 15	42 / 11	43.1 / 11.4	34 / 9
230 / 3191	30 / 8	18 / 5	34.4 / 9.1	20 / 5.3

* Output indications for auxiliary hydraulics with unpressurised reflux line

Adjustment – *see Flow rate adjustment of auxiliary hydraulics* on page 5-14

Screwable hose burst valve

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

– *see Hydraulics diagram 50Z3 A3* on page 5-41 **item 23**

2.4 Undercarriage and swivel unit

Undercarriage/swivel unit	Model 50Z3
2 speed ranges	2.74 / 4.56 kph (1.7 / 2.8 mph)
Hill climbing ability (briefly)	30° / 58 %
Chain width	400 mm (16")
No. of track rollers on either side	4 pieces
Ground clearance	305 mm (12")
Ground pressure	0.28 kg/cm² (3.84 psi)
Upper carriage swivel speed	8.7 rpm

2.5 Stabiliser blade

Stabiliser blade	Model 50Z3
Width/height	1990 / 380 mm (78 / 15")
Max. lift over/under subgrade	385 / 390 mm (15 / 15")

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.

Fuse box in instrument panel

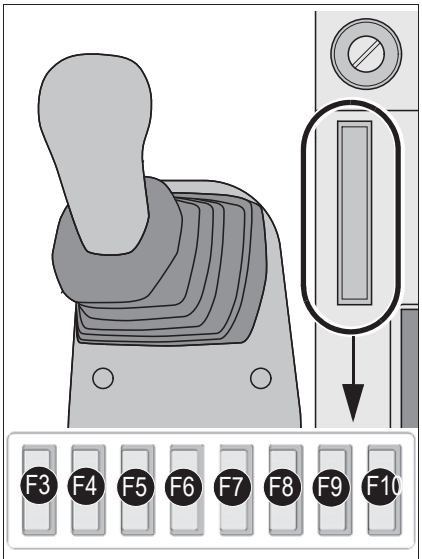


Fig. 1: Fuse box

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 underneath the cab

The main fuse box is located under the cab, next to the swivelling console.

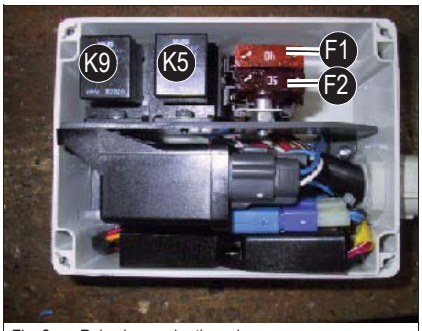


Fig. 2: Relay box under the cab

Fuse no.	Rated current (A)	Protected circuit
F1	40 A3	Start, preheat, cutoff solenoid
F2	50 A3	Fuel-filling pump, main fuse, ignition lock
Relay no.		
K 9	– Cutoff solenoid switching relay	
K 5	– Preheating high current relay	

Relays

The relays are located in the relay box under the cab, next to the swivelling console

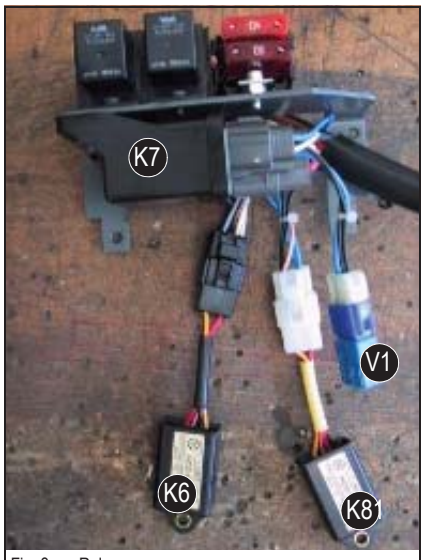


Fig. 3: Relays

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

2.7 Noise levels

Sound power level	Model 50Z3
Sound power level (L_{WA})	97 dB (A)
Sound pressure level (L_{PA})	77 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	cm³/l (cu in/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

2.10 Model-specific tightening torques

50Z3		Nm (lbf ft)
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 10.9	70 (52)
Pump	M12 10.9	110 (81)
Swivel joint	M10 10.9	64 (47)*
Counterweight/additional counterweight	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	Torque Nm (lbf ft)
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	Torque Nm (lbf ft)
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.

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 Nm (lbf ft)	Identification aid, outside Ø mm (")
	Sealing washer Nm (lbf ft)	Elastic seal Nm (lbf ft)	O-ring Nm (lbf ft)		
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 Nm (lbf ft)	Identification aid, outside Ø mm (")
	Sealing washer Nm (lbf ft)	Elastic seal Nm (lbf ft)	O-ring Nm (lbf ft)		
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)
G1 1/2A	290 (214)	540 (398)	260 (192)	540 8398)	47.80 (1.9)

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

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 (lbf ft)	Nm (lbf ft)	Nm (lbf ft)	Nm (lbf ft)	Nm (lbf ft)
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 μ = 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 (lbf ft)	Nm (lbf ft)	Nm (lbf ft)	Nm (lbf ft)	Nm (lbf ft)
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 μ = 0.12 and are to be used as approximate figures.

2.12 Dimensions model 50Z3

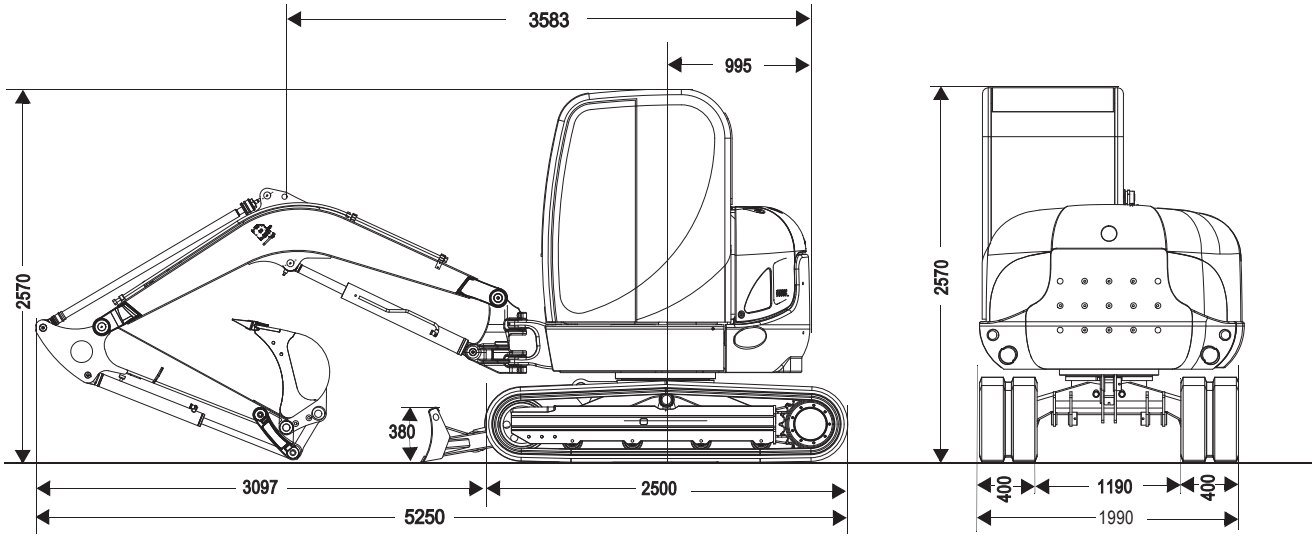
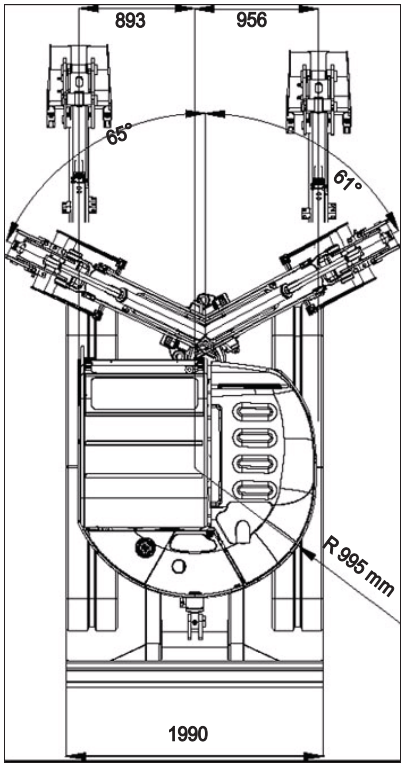


Fig. 4: Machine dimensions (model 50Z3)



Main data	Model 50Z3
Service weight	4800 kg (10582 lbs)
Height	2570 mm (8'5")
Width	1990 mm (6'6")
Transport length	5250 mm (17'3")
Max. digging depth	3570 mm (11'9")
Stick length (standard)	1450 mm (4'9")
Stick length (long version)	1750 mm (59")
Max. digging depth for long stick (+ 300 mm)	3870 mm (12'8")
Max. vertical digging depth	2630 mm (8'8")
Max. vertical digging depth (long stick)	2915 mm (9'7")
Max. digging height	5320 mm (17'5")
Max. digging height (long stick)	5500 mm (18'1")
Max. dump height	3720 mm (12'2")
Max. dump height (long stick)	3900 mm (12'10")
Max. digging radius	6030 mm (19'9")
Max. digging radius (long stick)	6300 mm (20'8")
Max. reach at ground level	5900 mm (19'4")
Max. reach at ground level (long stick)	6185 mm (20'3")
Max. breakout force at bucket tooth	33.80 kN (7599 lbf)
Max. tearout force (standard stick)	26.60 kN (5980 lbf)
Max. tearout force (long stick)	23.50 kN (5283 lbf)
Min. tail end slewing radius	995 mm (3'3")
Max. tail end lateral projection over chains	0 mm (0")
Max. boom displacement to bucket centre (right-hand side)	960 mm (3'1")
Max. boom displacement to bucket centre (left-hand side)	895 mm (2'11")

2.13 Lift capacity table 50Z3

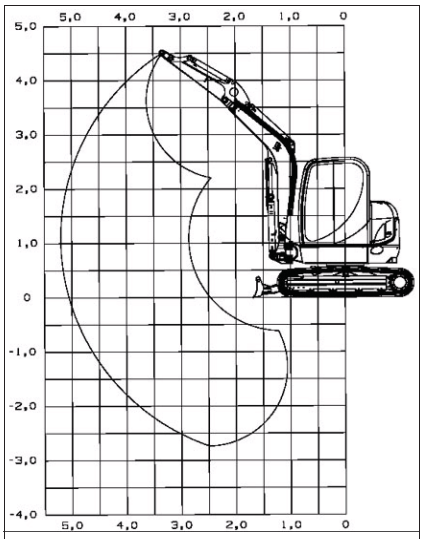
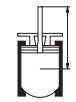
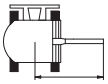


Fig. 5: Lift capacity table (model 50Z3)

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

A	max		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B								
4.0 m (13'1")	1060* (2337*)	810 (1786)						
3.0 m (9'10")	1025* (2260*)	585 (1290)	1010* (2227*)	780 (1720)				
2.0 m (6'7")	1045* (2304*)	490 (1080)	1185* (2612*)	730 (1609)	1580* (3483*)	1150 (2535)		
1.0 m (3'3")	1090* (2403*)	455 (1003)	1415* (3120*)	670 (1477)	2225* (4905*)	990 (2183)		
0.0 m (0'0")	1145* (2524*)	460 (1014)	1555* (3428*)	625 (1378)	2435* (5368*)	920 (2028)		
-1.0 m (-3'3")	1210* (2668*)	515 (1135)	1510* (3329*)	610 (1345)	2290* (5049*)	915 (2017)	4070* (8973)	1790 (3946)
-2.0 m (-6'7")	1255* (2767*)	705 (1554)			1780* (3924*)	950 (2094)	3000* (6614*)	1860 (4101)

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.

2.14 Lift capacity table 50Z3 with long stick

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

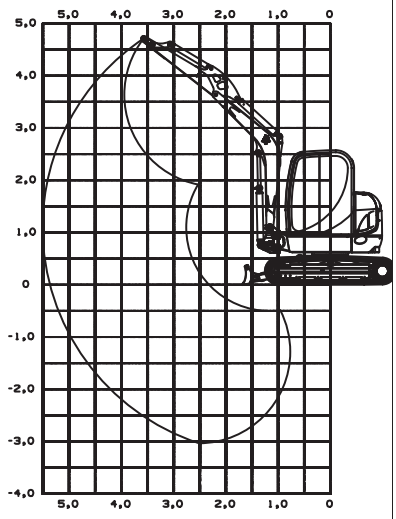
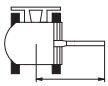


Fig. 6: Lift capacity table (model 50Z3)

A	max		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B								
4.0 m (13'1")	920* (2028*)	660 (1455)	855* (1885*)	785 (1731)				
3.0 m (9'10")	915* (2017*)	500 (1102)	865* (1907*)	780 (1720)				
2.0 m (6'7")	935* (2061*)	425 (937)	1050* (2315*)	730 (1609)	1315* (2899*)	1170 (2579)		
1.0 m (3'3")	970* (2138*)	395 (871)	1310 (2888)	665 (1466)	2025* (4464*)	1010 (2227)		
0.0 m (0'0")	1015* (2238*)	400 (882)	1495* (3296*)	610 (1345)	2385* (5258*)	915 (2017)		
-1.0 m (-3'3")	1065* (2348*)	440 (970)	1515* (3340*)	590 (1301)	2350* (5181*)	890 (1962)	4570* (10075*)	1750 (3858)
-2.0 m (-6'7")	1110* (2447*)	565 (1246)	1250* (2756*)	600 (1323)	1970* (4343*)	910 (2006)	3590* (7915*)	1805 (3979)

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.

2.15 Lift capacity table 50Z3 with counterweight

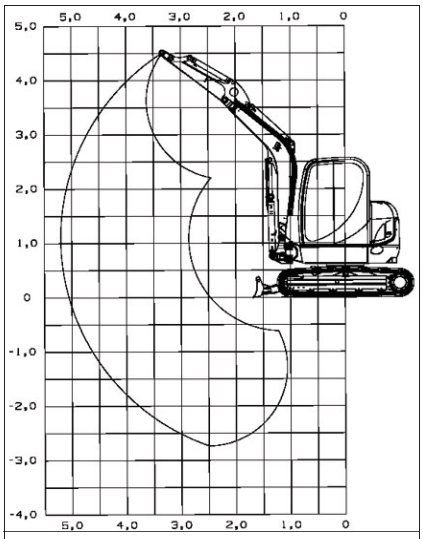
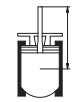
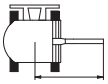


Fig. 7: Lift capacity table (model 50Z3)

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

A	max		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B								
4.0 m (13'1")	1060* (2337*)	915 (2017)						
3.0 m (9'10")	1025* (2260*)	675 (1488)	1010* (2227*)	910 (2006)				
2.0 m (6'7")	1045* (2304*)	580 (1279)	1185* (2612*)	865 (1907)	1580* (3483*)	1345 (2965)		
1.0 m (3'3")	1090* (2403*)	545 (1202)	1415* (3120*)	805 (1775)	2225* (4905*)	1185 (2612)		
0.0 m (0'0")	1145* (2524*)	550 (1213)	1555* (3428*)	760 (1676)	2435* (5368*)	1115 (2458)		
-1.0 m (-3'3")	1210* (2668*)	620 (1367)	1510* (3329*)	745 (1642)	2290* (5049*)	1110 (2447)	4070* (8973*)	2155 (4751)
-2.0 m (-6'7")	1255* (2767*)	830 (1830)			1780* (3924*)	1140 (2513)	3000* (6614*)	2225 (4905)

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.

2.16 Lift capacity table 50Z3 with long stick and counterweight

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

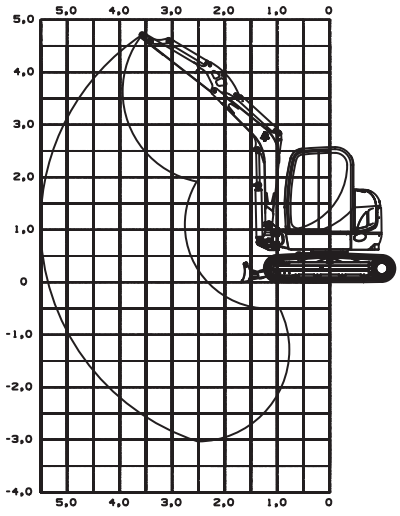
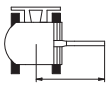


Fig. 8: Lift capacity table (model 50Z3)

A	max		4.0 m (13'1")		3.0 m (9'10")		2.0 m (6'7")	
B								
4.0 m (13'1")	920* (2028*)	780 (1720)	855* (1885*)	855* (1885*)				
3.0 m (9'10")	915* (2017*)	600 (1323)	865* (1907*)	865* (1907*)				
2.0 m (6'7")	935* (2061*)	520 (1146)	1050* (2315*)	865 (1907)	1315* (2899*)	1315* (2899*)		
1.0 m (3'3")	970* (2138*)	485 (1069)	1310* (2888*)	800 (1764)	2025* (4464*)	1205 (2657)		
0.0 m (0'0")	1015* (2238*)	490 (1080)	1495* (3296*)	745 (1642)	2385* (5258*)	1110 (2447)		
-1.0 m (-3'3")	1065* (2348*)	540 (1190)	1515* (3340*)	720 (1587)	2350* (5181*)	1085 (2392)	4570* (10075*)	2115 (4663)
-2.0 m (-6'7")	1110* (2447*)	690 (1521)	1250* (2756*)	735 (1620)	1970* (4343*)	1105 (2436)	3590* (7915*)	2115 (4663)

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.

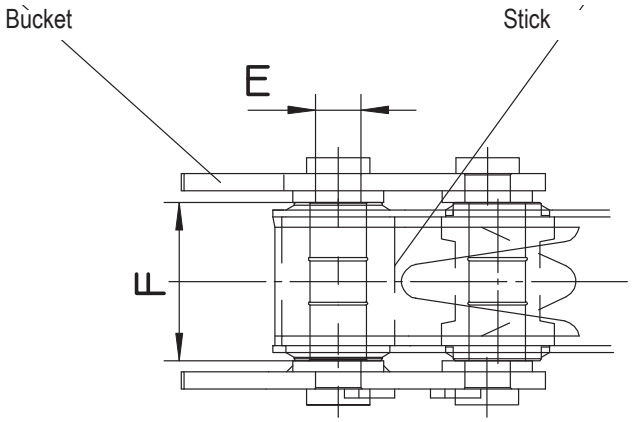
Calculation basis: according to ISO 10567

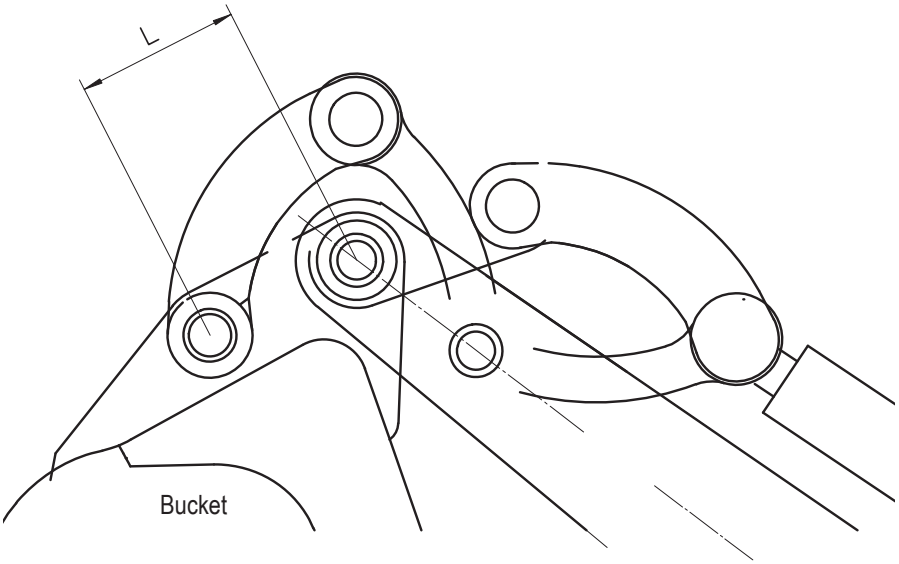
The track excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

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

2.17 Kinematics

E	Pin diameter	50 mm (1.97")
F	Stick width	195 mm (7.68")
L	Pin distance to bucket mount	240 mm (9.45")





2.18 Attachments

Description	Width mm (")	Capacity l (gal)	Item No.	5002	6002	50Z3	6003
Rear excavator bucket 5002/6002	400 (15.75)	94 (25)	1000094242	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	500 (19.69)	132 (35)	1000094241	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	650 (25.59)	182 (48)	1000094243	✔	✔	✔[2]	✔[1]
Rear excavator bucket 5002/6002	850 (33.46)	250 (66)	1000094244	✔	✔	✔[2]	✔[1]
Rear excavator bucket 50Z3	340 (13.39)	58 (15)	1000112213	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	400 (15.75)	74 (19.5)	1000112216	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	500 (19.69)	95 (25)	1000108126	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	650 (25.59)	130 (34)	1000112218	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 50Z3	850 (33.46)	175 (46)	1000112219	✔[2]	✔[2]	✔	✔[1]
Rear excavator bucket 6003	340 (13.39)	74 (19.5)	1000112225	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	400 (15.75)	92 (24)	1000112226	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	500 (19.69)	120 (32)	1000109796	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	650 (25.59)	165 (43.5)	1000112227	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket 6003	850 (33.46)	225 (59)	1000112228	✔[2]	✔[2]	✔[2]	✔
Rear excavator bucket quickhitch system 5002/ 6002	340 (13.39)		1000017263	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/ 6002	400 (15.75)	94 (25)	1000017260	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/ 6002	500 (19.69)	132 (35)	1000019961	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/ 6002	650 (25.59)	182 (48)	1000017261	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 5002/ 6002	850 (33.46)	250 (66)	1000017262	✔	✔	X	✔[2]
Rear excavator bucket quickhitch system 50Z3	340 (13.39)	58 (15)	1000112220	✔[1]	✔[1]	✔	✔[1]

Description	Width mm (")	Capacity l (gal)	Item No.	5002	6002	50Z3	6003
Rear excavator bucket quickhitch system 50Z3	400 (15.75)	74 (19.5)	1000112221	✔1	✔1	✔	✔1
Rear excavator bucket quickhitch system 50Z3	500 (19.69)	95 (25)	1000112222	✔1	✔1	✔	✔1
Rear excavator bucket quickhitch system 50Z3	650 (25.59)	130 (34)	1000112223	✔1	✔1	✔	✔1
Rear excavator bucket quickhitch system 50Z3	850 (33.46)	175 (46)	1000112224	✔1	✔1	✔	✔1
Rear excavator bucket quickhitch system 6003	340 (13.39)	74 (19.5)	1000112229	✔2	✔2	X	✔
Rear excavator bucket quickhitch system 6003	400 (15.75)	92 (24)	1000112231	✔2	✔2	X	✔
Rear excavator bucket quickhitch system 6003	500 (19.69)	120 (32)	1000112232	✔2	✔2	X	✔
Rear excavator bucket quickhitch system 6003	650 (25.59)	165 (43.5)	1000112233	✔2	✔2	X	✔
Rear excavator bucket quickhitch system 6003	850 (33.46)	225 (59)	1000112234	✔2	✔2	X	✔
Ditch cleaning bucket 5002/6002	1200 (47.24)	205 (54)	1000096589	✔	✔	✔	✔
Ditch cleaning bucket 5002/6002	1400 (55.12)	238 (63)	1000096590	✔	✔	✔	✔

X: 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.
X 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 (47.24)	205 (54)	1000096600	✔	✔	✔	✔
Ditch cleaning bucket quickhitch system 5002/6002	1400 (55.12)	238 (63)	1000096601	✔	✔	✔	✔
Offset bucket 5002/6002 short stick	1200 (47.24)	150 (40)	1000096583	✔	✔	✔2	✔
Offset bucket 5002/6002 short stick	1400 (55.12)	180 (47.5)	1000096584	✔	✔	✔2	✔
Offset bucket 5002/6002 long stick	1200 (47.24)	150 (40)	1000096581	✔	✔	✔2	✔
Offset bucket 5002/6002 long stick	1400 (55.12)	180 (47.5)	1000096582	✔	✔	✔2	✔
Offset bucket 50Z3 short stick	1200 (47.24)	110 (29)	1000127486	✔2	✔2	✔	✔1
Offset bucket 50Z3 short stick	1400 (55.12)	130 (34)	1000127487	✔2	✔2	✔	✔1
Offset bucket 50Z3 long stick	1200 (47.24)	110 (29)	1000127483	✔2	✔2	✔	✔1

Description	Width mm (")	Capacity l (gal)	Item No.	5002	6002	50Z3	6003
Offset bucket 50Z3 long stick	1400 (55.12)	130 (34)	1000127485	✔[2]	✔[2]	✔	✔[1]
Offset bucket 5002/6002 quickhitch system short stick	1200 (47.24)	150 (40)	1000017254	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system short stick	1400 (55.12)	180 (47.5)	1000017255	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system long stick	1200 (47.24)	150 (40)	1000020878	✔	✔	X	✔
Offset bucket 5002/6002 quickhitch system long stick	1400 (55.12)	180 (47.5)	1000017253	✔	✔	X	✔
Offset bucket 50Z3 quickhitch system short stick	1200 (47.24)	110 (29)	1000127488	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system short stick	1400 (55.12)	130 (34)	1000127489	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system long stick	1200 (47.24)	110 (29)	1000127490	✔[2]	✔[2]	✔	✔[1]
Offset bucket 50Z3 quickhitch system long stick	1400 (55.12)	130 (34)	1000127491	✔[2]	✔[2]	✔	✔[1]
Quickhitch system fork 5002/6002			1000012565	✔	✔	✔[1]	✔[1]
Quickhitch system fork 50Z3/6003			1000112204	✔[1]	✔[1]	✔	✔

X: 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.
X Same restrictions as for 1 and 2 but in addition, subject to possible collision with the boom ram

Maintenance

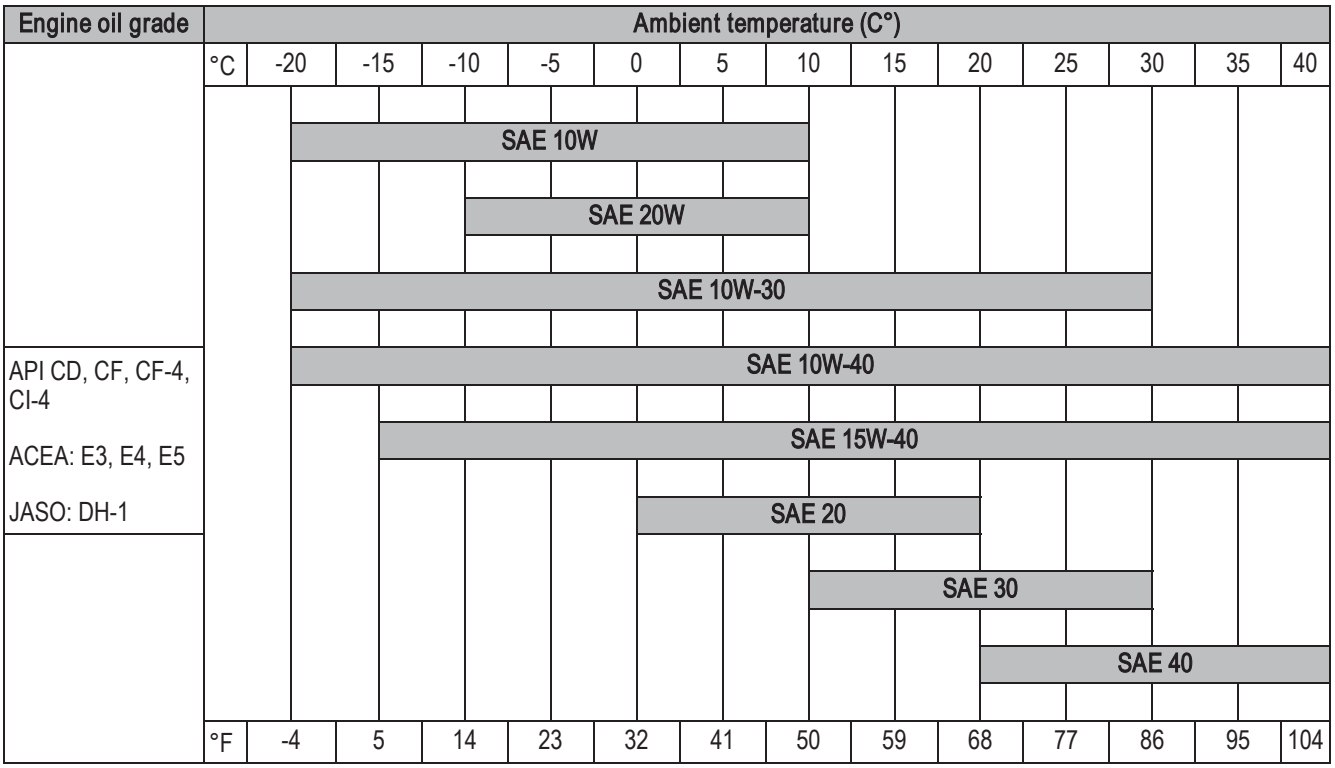
3 Maintenance

3.1 Fluids and lubricants

Component/ application	Engine/machine fluid	Specification	Season / temperature	Capacities[1]
Diesel engine	Engine oil	SAE10W-40 [2]; API: CD, CF, CF-4, CI-4 ACEA: E3, E4, E5 JASO: DH-1	-20 °C (-4 °F) +40 °C (104 °F)	7.8 l (2.1 gal)
Travelling drive	Gearbox oil[3]	Q8 T 55, SAE 85W-90[4]	Year-round	About 1.3 l (0.3 gal) each
		Q8 T 55, SAE 80W-90[5]		
		FINA PONTONIC GLS, SAE85W-90		
Hydraulic oil tank	Hydraulic oil	HVLP46[6]	Year-round	80 l (21.1 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[10]	FINA Energrease L21 M[11]	Year-round	As required
Battery terminals	Acid-proof grease[12]	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	78 l (20.6 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	7.0 l (1.8 gal)
		Distilled water + antifreeze ASTM D4985		
Air conditioning	Refrigerating agent	R134a[13]	Year-round	~ 950 g (~2.1 lbs)
	Compressor oil	Sanden SP20	Year-round	122 cm³ (7.45 cu in) up to AD07125 90 cm³ (5.5 cu in) from AH00579
Washer system	Cleaning agent	Water + antifreeze	Year-round	1.2 l (0.32 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. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
12. Standard acid-proof grease
13. According to DIN 8960

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*

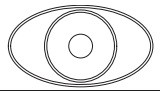
Application		Hydraulic oil	Hydraulic oil filter insert
Normal work (excavation work)		Every 1000 s/h	Replace the first time after 50 s/h, then every 500 s/h
Percentage of hammer work	20 %	Every 800 s/h	300 s/h
	40 %	Every 400 s/h	
	60 %	Every 300 s/h	100 s/h
	Over 80 %	Every 200 s/h	

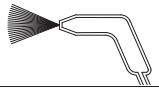
Important!

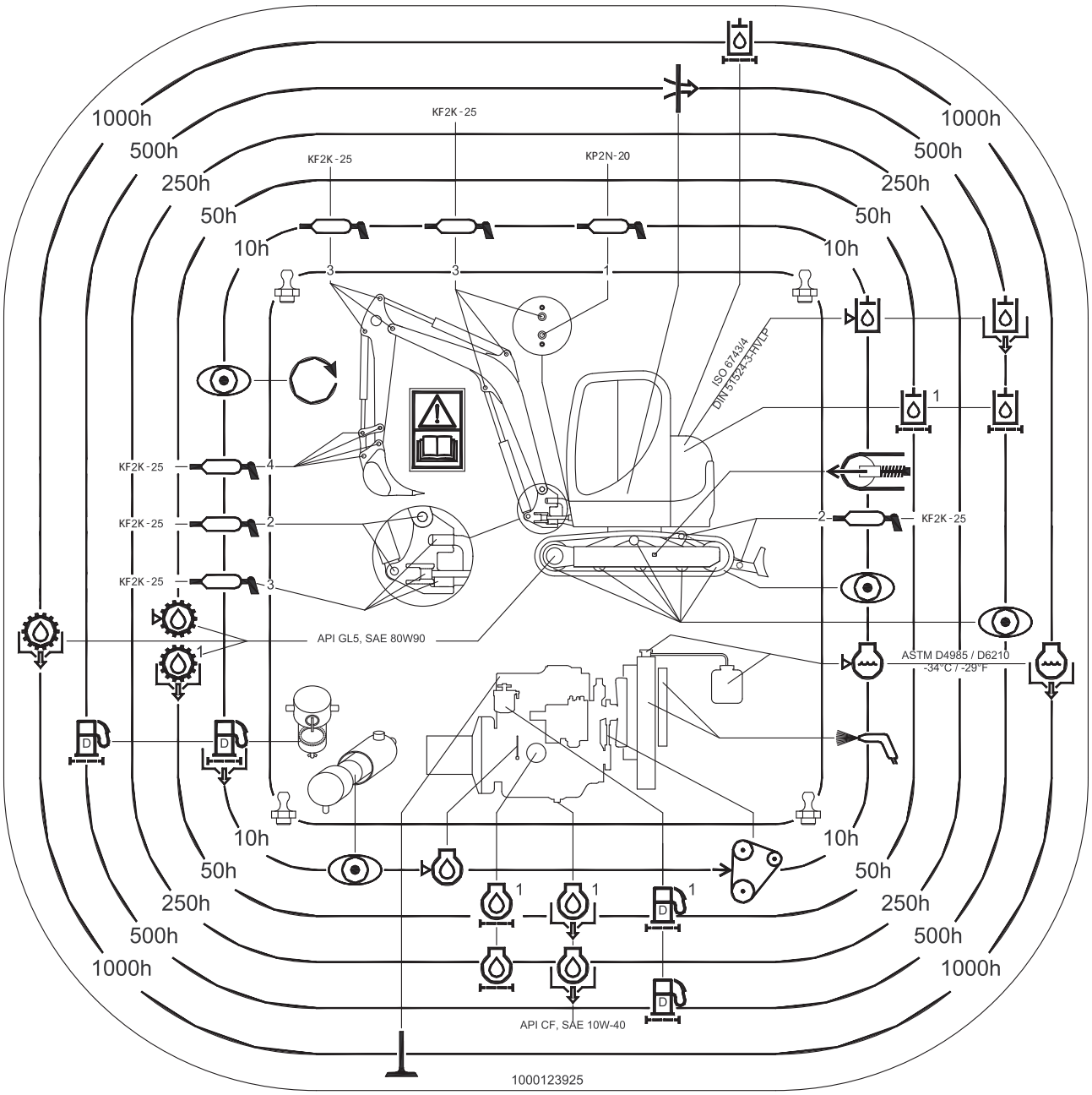
Please refer to the maintenance plan on page *3-5* for additional maintenance work.

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

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				●			●
Clean and adjust the fuel injection pump [9]				●			●

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
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 3-43:							
• Stabiliser blade	●					●	
• Swivelling console	●					●	
• Boom	●					●	
• Stick	●					●	

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
• Attachments	●					●	
• Grease strip on chassis – *see Lubrication strip* on page 3-45	●					●	
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]					●		●
Check the coolant level			●				
Functional check (👁):							
Check the function of the following assemblies/components. Rectify if necessary:							
• Lights, signalling system, acoustic warning system		●					●
• Heating function [12]		●	●				●
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 or every 2 years
12. Check the first time after 50 s/h, then every 500 s/h

3.4 Service package

Up to serial no.: AD07125

1000124486	**1**	**Service package 50Z₃**
1000018587	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
1000070003	1	➥ O-ring for oil drain plug
1000012847	1	➥ Hydraulic reflux filter insert
1000066727	1	➥ Vent filter
1000004567	1	➥ Air filter insert (inside)
1000004566	1	➥ Air filter insert (outside)
1000115808	1	➥ Cab filter
1000106273	1	➥ Valve cover gasket
1000003894	3	➥ O-ring

From serial no.: AH00579

1000180101	**1**	**Service package 50Z₃**
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
1000070003	1	➥ O-ring for oil drain plug
1000126919	1	➥ Hydraulic reflux filter insert
1000004567	1	➥ Air filter insert (inside)
1000004566	1	➥ Air filter insert (outside)
1000106273	1	➥ Valve cover gasket
1000003894	3	➥ O-ring
1000115808	1	➥ Cab filter
1000109215	1	➥ Recirculated-air filter (air conditioning option)

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 maintenance plan **“A”** 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).

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.

Stationary fuel pumps

General

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

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

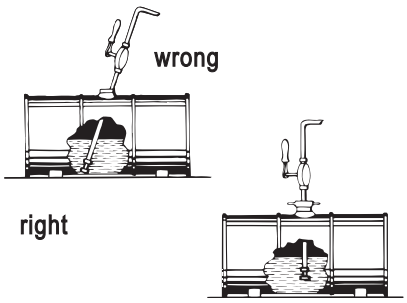


Fig. 2: Refuelling from a barrel

Diesel fuel specification

Use only high-grade fuels

Grade	Cetane number	Use
• No. 2-D according to DIN 51601	Min. 45	For normal outside temperatures
• No. 1-D according to DIN 51601		For outside temperatures below 4 °C (39°F) or for operation above 1500 m (4921') altitude

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 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

Emptying the fuel tank

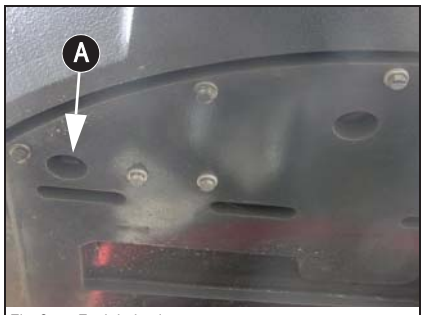


Fig. 3: Fuel drain plug

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 the formation of dirt 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 the fuel tank*

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

Fuel prefilter with water separator

Old engine type (up to serial number AD07125):

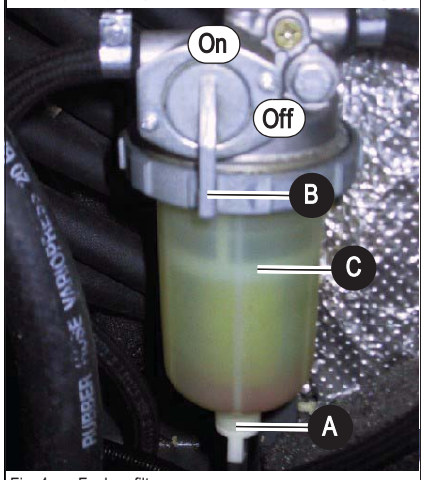


Fig. 4: Fuel prefilter

New engine type (from serial number AH00579):

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.

Replacing the fuel filter

Old engine type (up to serial number AD07125):

Fig. 5: Fuel filter position

New engine type (from serial number AH00579):

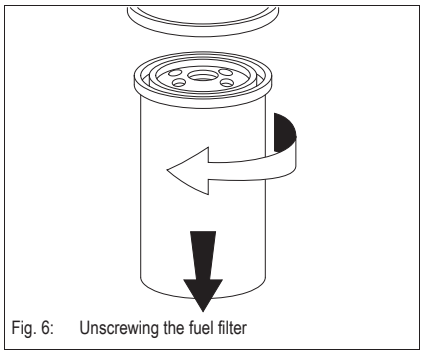


Fig. 6: Unscrewing the fuel filter

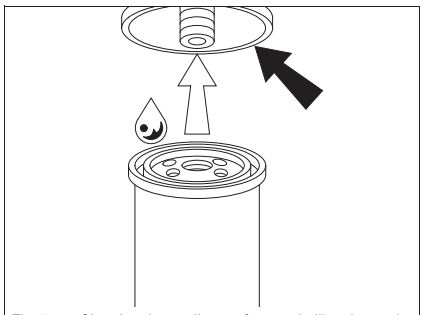


Fig. 7: Cleaning the sealing surface and oiling the gasket

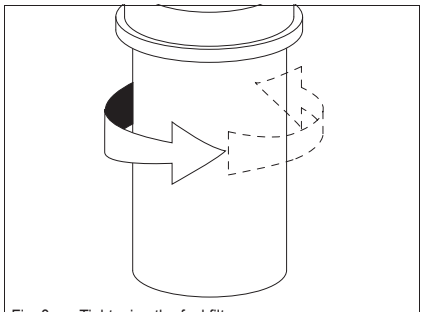


Fig. 8: Tightening the fuel filter

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

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

☞ *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
- Oil dipstick **A**:

☞ Pull it out
☞ Wipe it with a lint-free cloth
☞ Push it 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**

Old engine type (up to serial number AD07125):

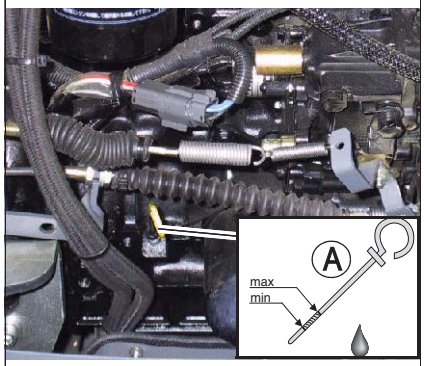
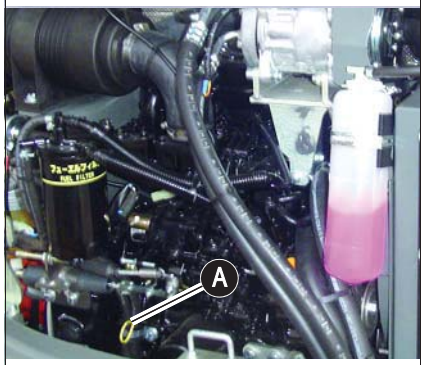


Fig. 9: Checking the oil level



New engine type (from serial number AH00579):

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!

Old engine type (up to serial number AD07125):

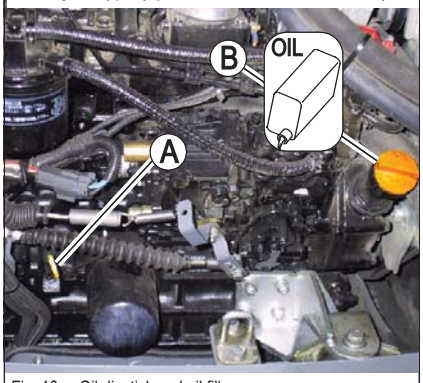
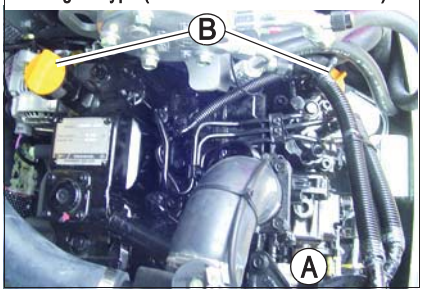


Fig. 10: Oil dipstick and oil filler cap

New engine type (from serial number AH00579):



☞ *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

Changing engine oil

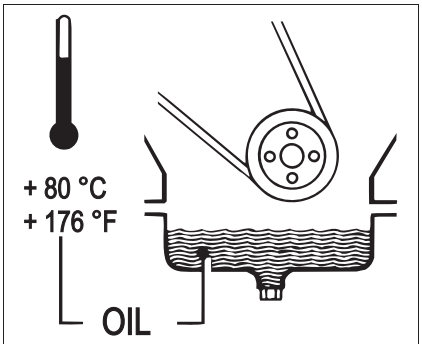


Fig. 11: Optimum engine oil temperature

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
- Checking the oil level
- Completely remove all oil spills from the engine
- 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

Replacing the engine oil filter cartridge

Old engine type (up to serial number AD07125):

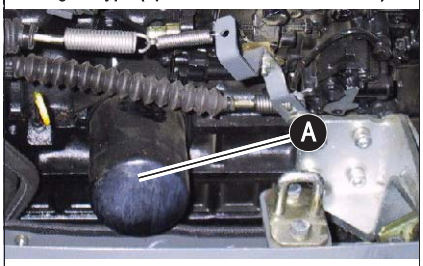
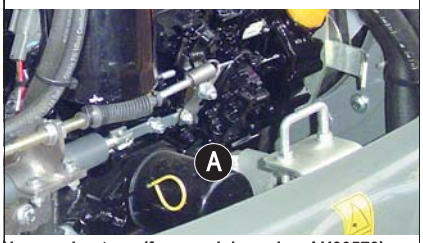


Fig. 12: Engine oil filter position



New engine type (from serial number AH00579):

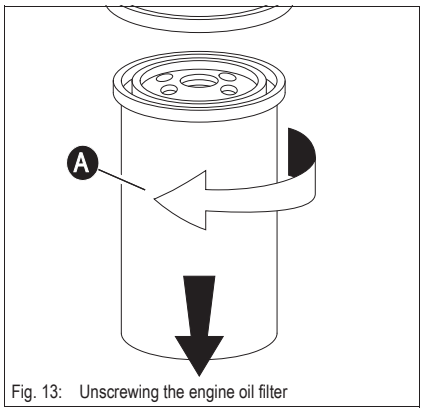


Fig. 13: Unscrewing the engine oil filter

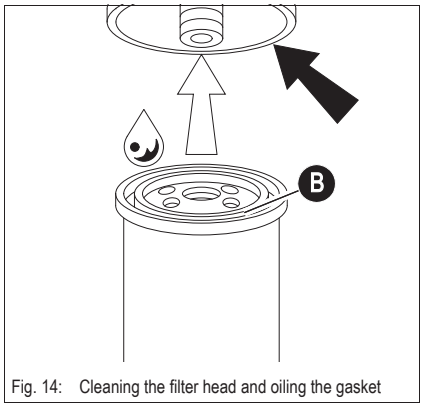


Fig. 14: Cleaning the filter head and oiling the gasket

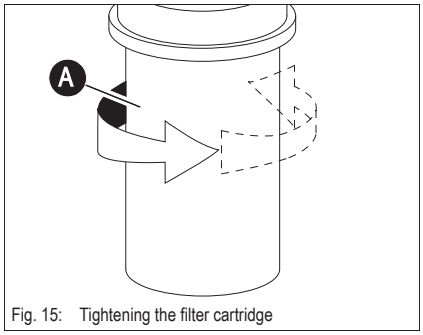


Fig. 15: Tightening the filter cartridge

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

- 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

- Tighten oil filter cartridge **A** by hand by about a further half revolution
- Make sure the oil level is correct!
- Completely remove all oil spills from the engine
- 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
- Dispose of the used oil filter in an environmentally friendly manner

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, make a test run with 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 2-6
  - ☞ 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!

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!

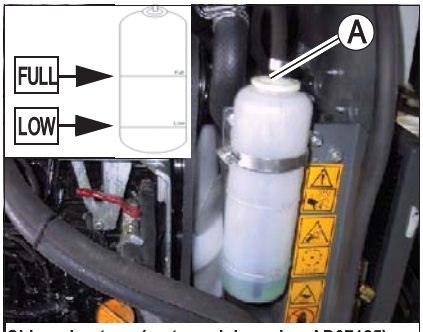
☞ *Keep away from flames*

☞ *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



Old engine type (up to serial number AD07125):

Fig. 16: Expansion tank for coolant

New engine type (from serial number AH00579):

☞ *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 (use only coolants of the same brand and grade => do not mix different coolants!)

Important!

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

Old engine type (up to serial number AD07125):

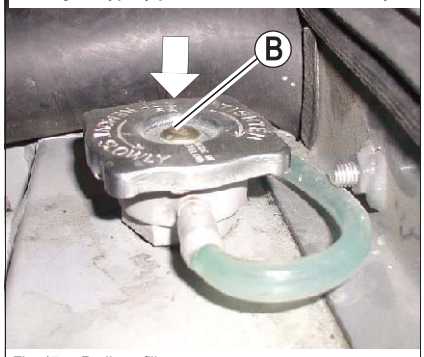
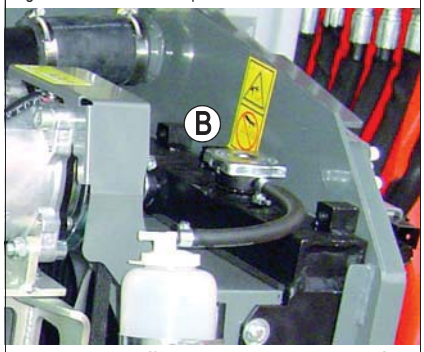


Fig. 17: Radiator filler cap



New engine type (from serial number AH00579):

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 up coolant up to the lower edge of the filler inlet (radiator) and of the expansion tank (use coolants of the same brand and grade => never mix different coolants!)*

☞ *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*

Fig. 18: Radiator drain plug

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 (only up to serial no. AD07125) and drain the coolant*

☞ *Close the drain plug again*

• **The radiator no longer has a drain plug from serial no. AH00579!**

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

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

3.9 Air filter

Caution!

The filter cartridge will be 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

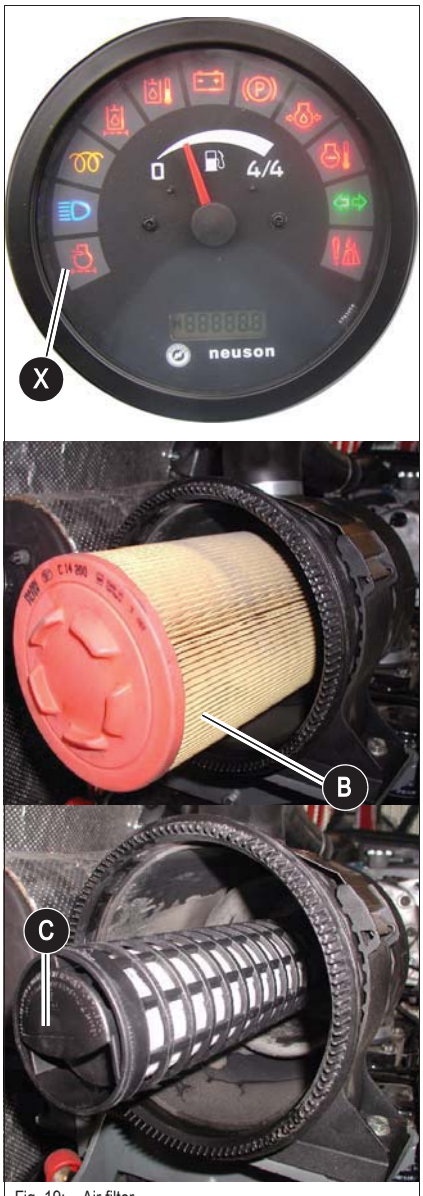


Fig. 19: Air filter

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

Replacing the filter

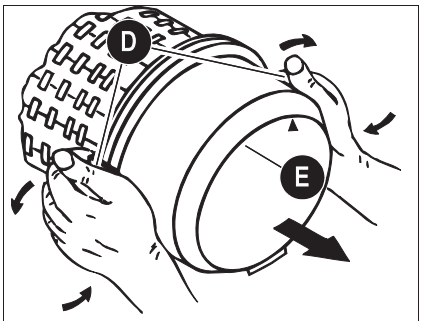


Fig. 20: Removing the lower housing section

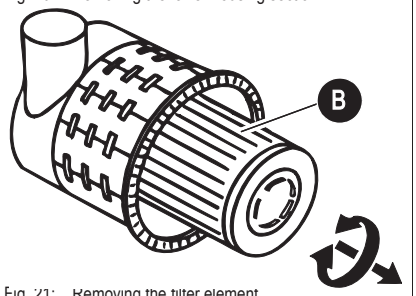


Fig. 21: Removing the filter element

- Replace outside filter ***A*** 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*

☞ **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**

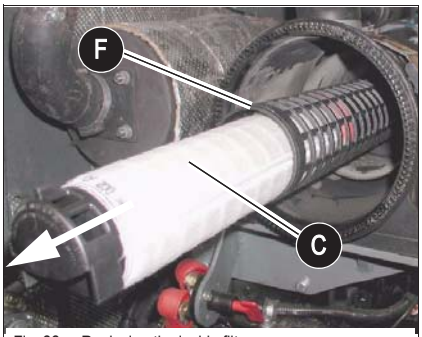


Fig. 22: Replacing the inside filter

- Replace inside filter ***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* **F** *(model 6003 only), including dust valve* ***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** *(model 6003 only)*

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

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

☞ *Close both bow clips* **D**

Important!

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

Functional check once a week of the dust valve

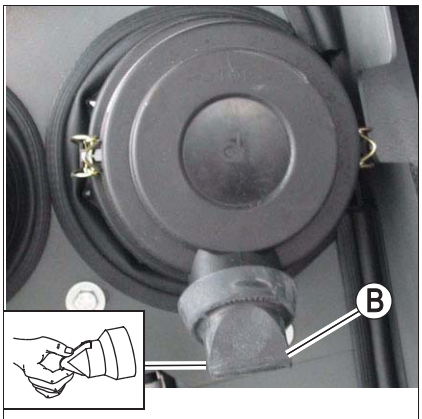


Fig. 23: Air filter – dust valve

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

☞ *Proceed as follows:*

- Switch off the engine
- Apply the parking brake
- Squeeze the discharge slot of dust valve **B**
- Remove hardened dust by compressing the upper area of the valve

☞ *Clean the discharge slot if necessary*

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 or every 10 service hours, and retighten if necessary!
Retighten new V-belts after about 15 minutes of running time.

Checking V-belt tension

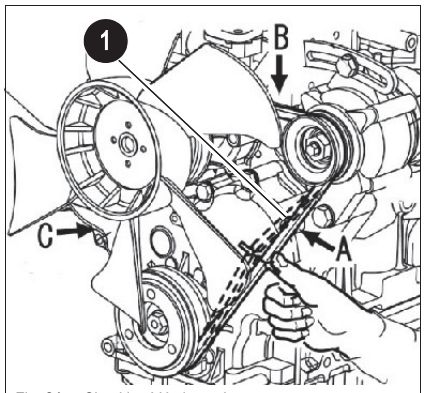


Fig. 24: Checking V-belt tension

- 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 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.

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

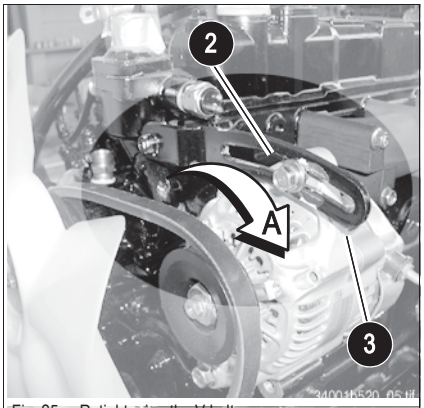


Fig. 25: Retightening the V-belt

- 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 **3** of alternator **4**
  - ☞ Use a suitable tool to push the alternator in the direction of arrow **A** until reaching the correct V-belt tension (fig. 25)
  - ☞ Keep the alternator in this position, and at the same time retighten fastening screws **3**
  - ☞ Check V-belt tension again and adjust it if necessary
  - ☞ Connect the battery or the battery master switch
  - ☞ Close the engine cover

Checking the V-belt of the air conditioning system

Caution!

Excessive or insufficient tension of the V-belt can cause damage to V-belt **1** or to compressor **2** 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*

Old engine type (up to serial number AD07125):

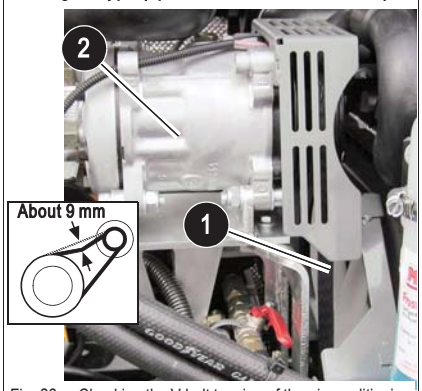
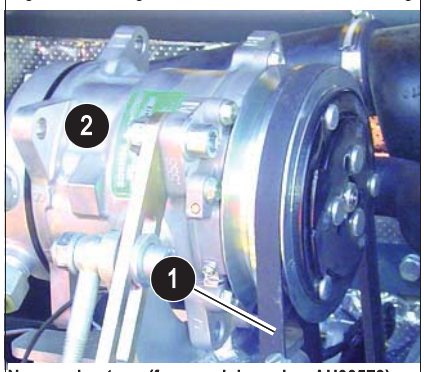


Fig. 26: Checking the V-belt tension of the air conditioning



New engine type (from serial number AH00579):

- 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 (0.3" – 0.4")
  - ☞ Retighten the V-belt if necessary.

Tightening the V-belt of the air conditioning system

Old engine type (up to serial number AD07125)

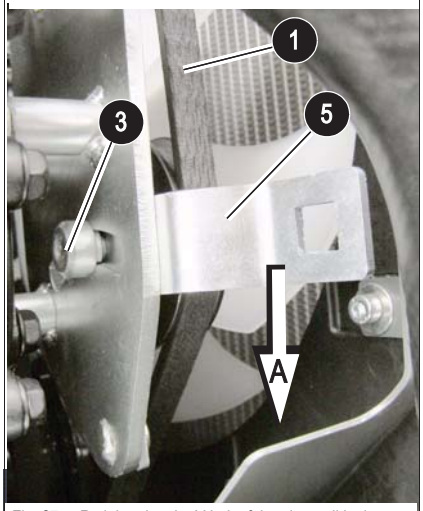
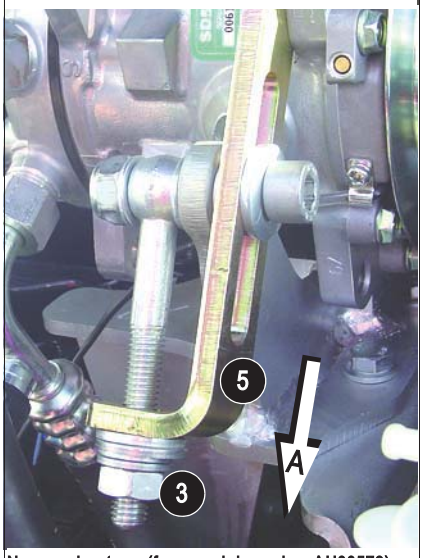


Fig. 27: Retightening the V-belt of the air conditioning system



New engine type (from serial number AH00579):

- 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 slide nut **3** on tightening bracket **5**
  - ☞ Push the tightening bracket in the direction of arrow **A** by hand until reaching the correct V-belt tension (fig. 27)
  - ☞ Keep the tightening bracket in this position, and at the same time retighten slide nut **3**
  - ☞ Check V-belt tension again and adjust it if necessary
  - ☞ Connect the battery or the battery master switch
  - ☞ Close the engine cover
- Retighten as follows (from serial number AH00579):
  - ☞ 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 nut **3** on tightening bracket **5**
  - ☞ Push the tightening bracket in the direction of arrow **A** by hand until reaching the correct V-belt tension (fig. *Fig. 27*)
  - ☞ Keep the tightening bracket in this position, and at the same time retighten nut **3**
  - ☞ Check V-belt tension again and adjust it if necessary
  - ☞ Connect the battery or the battery master switch
  - ☞ Close the engine cover

3.11 Pressure check

General

- Run the machine warm before checking the pressure! Hydraulic oil temperature 40 – 50 °C / 104 – 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.
- See chapter “Specifications”
  – *see Hydraulic system* on page 2-3 for the pressure settings
- **Ensure utmost cleanliness of all measuring points and 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. 28: Pilot control pressure measuring port

Checking pilot control pressure

☞ *Connect a pressure gauge to measuring port MP 4* ***28/4***

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

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

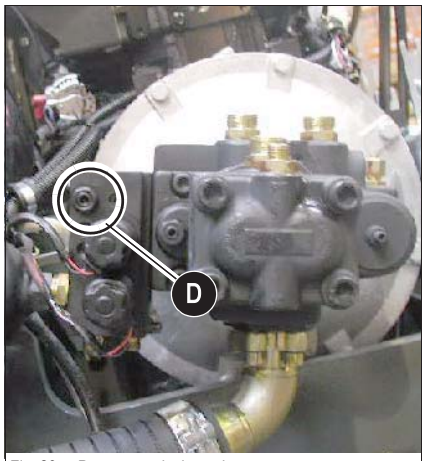


Fig. 29: Pressure reducing valve

Adjusting pressure limiting valve 4 (PLV4)

☞ Adjust the pressure at the pressure limiting valve 4 (PLV4) **29/D** at the pilot oil supply unit

☞ Check the pilot control pressure again once adjustment is over

Pressure check of variable displacement pump P1

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

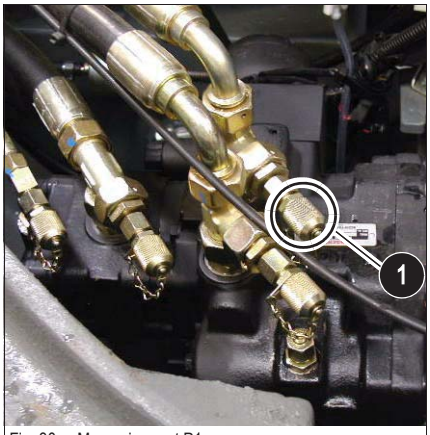


Fig. 30: Measuring port P1

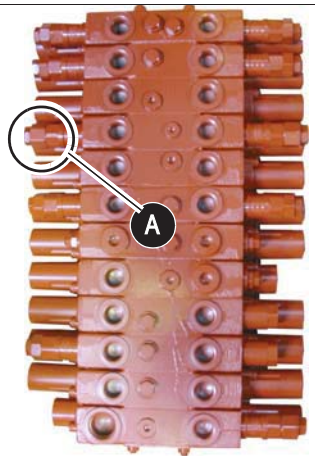


Fig. 31: Primary pressure limiting valve 1

Checking primary pressure limiting valve 1 (PPLV 1)

☞ *Connect a pressure gauge to MP 1* ***30/1***

☞ *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 %

Adjusting primary pressure limiting valve 1 (PPLV 1)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 1)* ***31/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!

Pressure check of variable displacement pump P2

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

Fig. 32: Measuring port P2

Checking primary pressure limiting valve 2 (PPLV 2)

☞ *Connect a pressure gauge to measuring port MP 2* ***32/2***

☞ *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 %

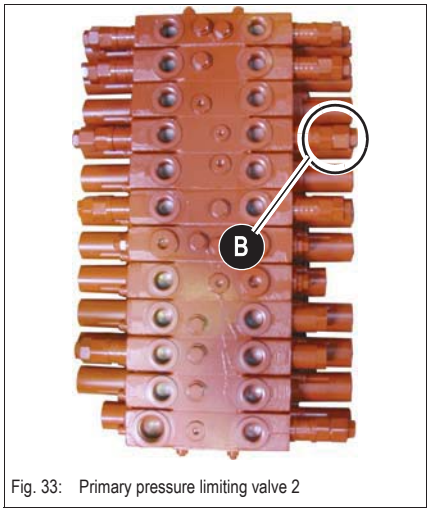


Fig. 33: Primary pressure limiting valve 2

Adjusting primary pressure limiting valve 2 (PPLV 2)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 2)* ***33/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!

Pressure check of gear pump P3

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

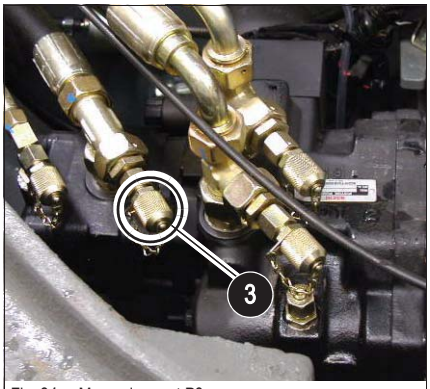


Fig. 34: Measuring port P3

Checking primary pressure limiting valve 3 (PPLV 3)

☞ *Connect a pressure gauge to measuring port MP 3* ***34/3***

☞ *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 %

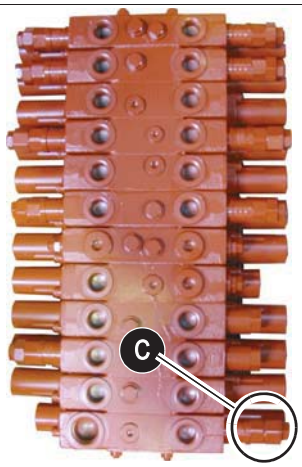


Fig. 35: Primary pressure limiting valve 3

Adjusting primary pressure limiting valve 3 (PPLV 3)

☞ *Adjust the pressure at the primary pressure limiting valve (PPLV 3)* ***35/C*** *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 upper carriage rotation 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!

Secondary pressure limiting valve of the gear motor

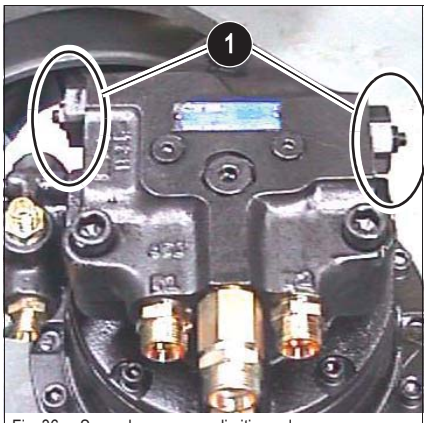


Fig. 36: Secondary pressure limiting valve

Check (at idling speed)

☞ *Connect a pressure gauge to measuring port MP 3*

☞ *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

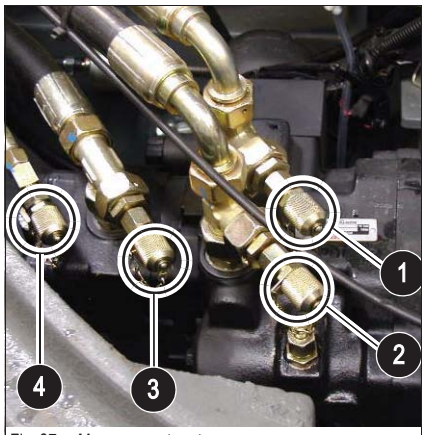
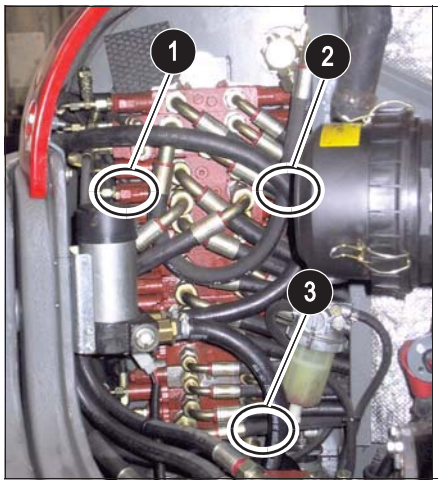
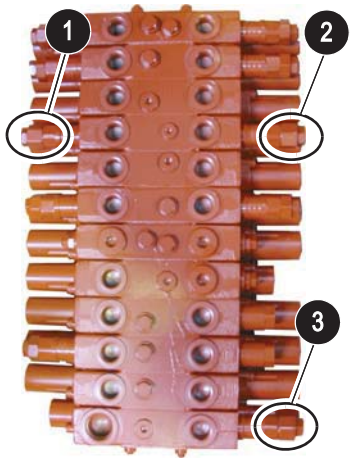


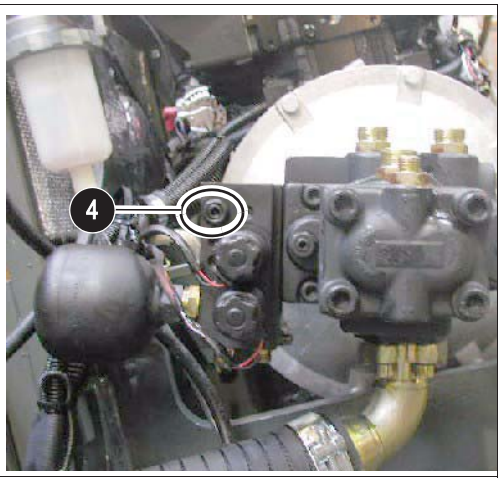
Fig. 37: Measurement ports

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







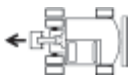
Pos.	Description	
1	Pump primary pressure limiting valve 1	PPLV 1
2	Pump primary pressure limiting valve 2	PPLV 2
3	Pump primary pressure limiting valve 3	PPLV 3
4	Pressure limiting valve	PLV 4

3.12 Test report

Pilot control

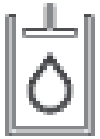
Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		Measurement 1	Measurement 2
					Engine speed	Pressure in bar (psi)		
Joystick	ANY		Pressure limiting valve PLV 4 (pilot oil supply unit)	Measuring port MP 4 (pump)	Rated value	$42^{\pm 1}$ ($609^{\pm 15}$)		

Pump 1

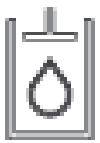
Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		Measurement 1	Measurement 2
					Engine speed	Pressure in bar (psi)		
Boom	UP		Primary pressure limiting valve PPLV 1 (main valve block)	Measuring port MP 1 (pump)	max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	DOWN				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
Bucket	EXTEND				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	RETRACT				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
Left-hand side drive	FORWARDS				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	REVERSE				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		

3.12 Test report

Pump 2

Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		Measurement 1	Measurement 2
Stick	EXTEND		Primary pressure limiting valve PPLV 2 (MVB)	Measuring port MP 2 (pump)	max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	RETRACT				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
Right-hand side drive	FORWARDS				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	REVERSE				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
Auxiliary hydraulics	A				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		
	B				max.	$230^{-0/+5}$ ($3336^{-0/+73}$)		
					Min.	$205^{-0/+5}$ ($2973^{-0/+73}$)		

Pump 3

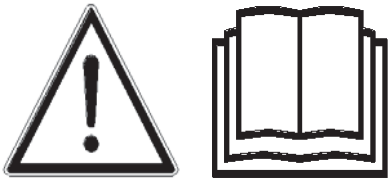
Function	Movement	Symbol	Pressure limiting valve	Measuring port	Specified values		Measurement 1	Measurement 2
					Engine speed	Pressure in bar (psi)		
Stabiliser blade	UP		Primary pressure limiting valve PPLV 3 (main valve block)	Measuring port MP 3 (pump)	max.	$230^{\pm3}$ ($3336^{\pm44}$)		
					Min.	$205^{\pm3}$ ($2973^{\pm44}$)		
	DOWN				max.	$230^{\pm3}$ ($3336^{\pm44}$)		
					Min.	$205^{\pm3}$ ($2973^{\pm44}$)		
Auxiliary hydraulics	A (2)				max.	$230^{\pm3}$ ($3336^{\pm44}$)		
					Min.	$205^{\pm3}$ ($2973^{\pm44}$)		
	B (2)				max.	$230^{\pm3}$ ($3336^{\pm44}$)		
					Min.	$205^{\pm3}$ ($2973^{\pm44}$)		

3.12 Test report

Swivel boom	LEFT		Primary pressure limiting valve PPLV 3 (main valve block	Measuring port MP 3 (pump)	max.	$230^{\pm 3}$ ($3336^{\pm 44}$)		
					Min.	$205^{\pm 3}$ ($2973^{\pm 44}$)		
	RIGHT				max.	$230^{\pm 3}$ ($3336^{\pm 44}$)		
					Min.	$205^{\pm 3}$ ($2973^{\pm 44}$)		
3rd control circuit	LEFT				max.	$230^{\pm 3}$ ($3336^{\pm 44}$)		
	RIGHT				Min.	$205^{\pm 3}$ ($2973^{\pm 44}$)		
Rotate	LEFT		Secondary pressure limiting valve SPLV (gear motor)	Measuring port MP 3	Rated value	$215^{\pm 3}$ ($3118^{\pm 44}$)		
	RIGHT				Rated value	$215^{\pm 3}$ ($3118^{\pm 44}$)		

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. Always consult a doctor immediately even if the wound seems insignificant – 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 or 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!

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

Danger of severe damage to the hydraulic system!

☞ *Take care to avoid contamination 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 3-37

☞ *If the hydraulic system is filled with biodegradable oil, then only use biodegradable oil of the same type for filling up – observe the sticker on the hydraulic oil tank!*

☞ *Contact customer service if the hydraulic system filter is contaminated with 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.

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*

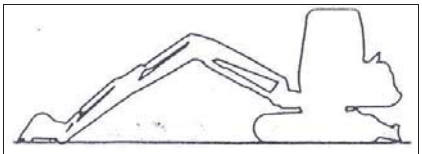


Fig. 38: Parking the excavator

- 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, the bucket teeth and the stabiliser blade to the ground.
  - ☞ Switch off the engine again.

☞ *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

Fig. 39: Oil level indicator on the hydraulic oil tank

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 / 86 °F)	**LOW** mark
• Normal operation	Between 50 and 90 °C (122 / 194 °F)	**FULL** mark

Important!

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

Filling up hydraulic oil

Fig. 40: Hydraulic oil filler inlet with strainer

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. 39**
- Switch off the engine
- Fold the control lever base up
- Clean the area around filler opening **C** with a cloth
- Open filler opening **C**
- Fill in clean hydraulic oil through the strainer
- 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.

Changing hydraulic oil

Important!

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

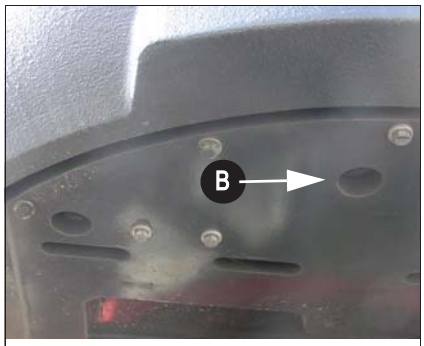


Fig. 41: Hydraulic oil drain plug

☞ *Open the breather filter to release pressure*

☞ *Open drain plug **41/B** and let the oil drain into a container*

☞ *Check the hydraulic oil tank for contamination 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 3-37

☞ *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. 42: Telltale for reflux filter

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

The control pressure is set at 2.5 bar (36 psi) and cannot be modified.

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*

Old engine type (up to serial number AD07125):

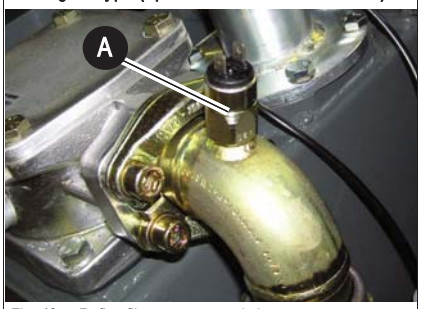
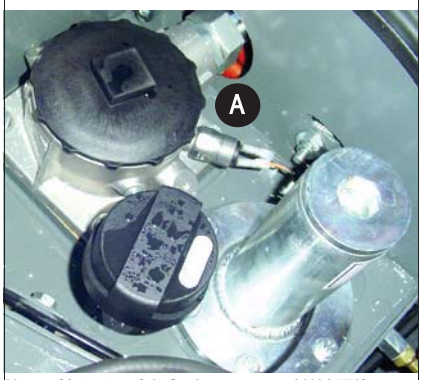


Fig. 43: Reflux filter pressure switch



Neuer Motortyp (ab Seriennummer AH00579):

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!

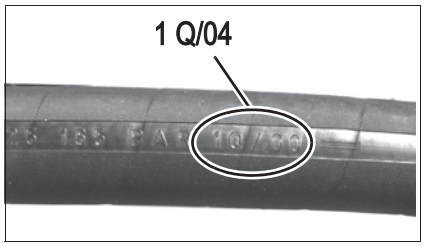
☞ *Always consult a doctor immediately, even if the wound seems insignificant – otherwise serious infections could set in!*

☞ *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/04" means manufactured in the 1st quarter of 2004.

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.*

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

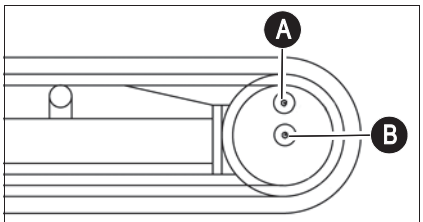


Fig. 44: Checking the oil level

☞ *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

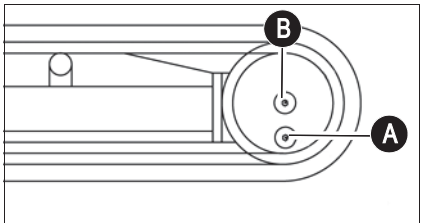


Fig. 45: Draining oil

☞ *Park the machine on firm and horizontal ground*

☞ *Place the machine so that filler plug **B** 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.

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*

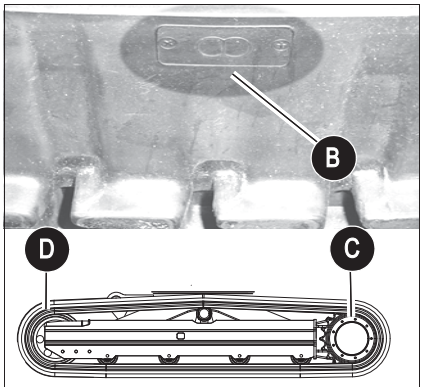


Fig. 46: Rubber chain mark

Check chain tension as follows:

- The rubber chain has a mark **B** as shown in *Fig. 46*

☞ *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).

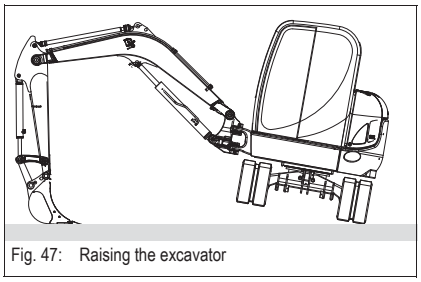


Fig. 47: Raising the excavator

☞ *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*

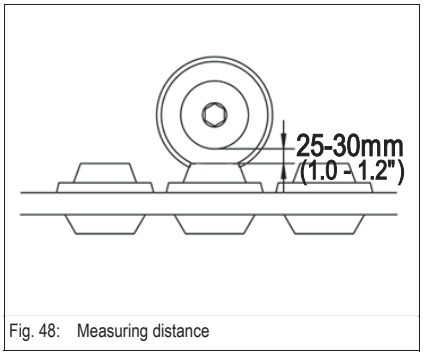


Fig. 48: Measuring distance

- Standard play between the sliding block's shoulder and the contact area of the second support roller of the drive pinion is 25 - 30 mm (1.0 - 1.2").

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

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

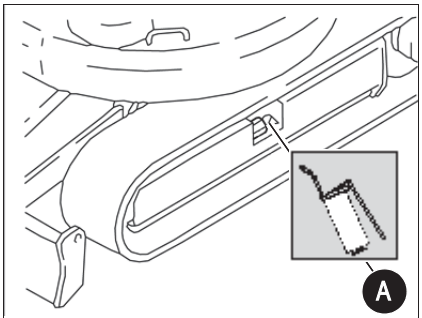


Fig. 49: Tightening the chains

☞ *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

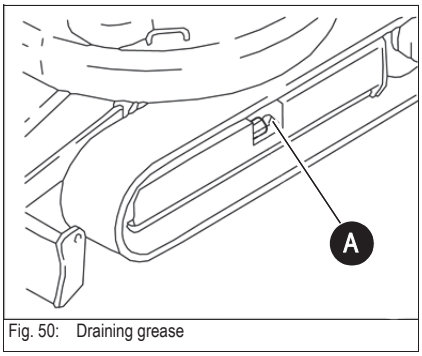


Fig. 50: Draining grease

- 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.

3.16 Lubrication work

Apply multipurpose lithium grease with an MoS_2 additive to all lubrication points indicated.

Stabiliser blade

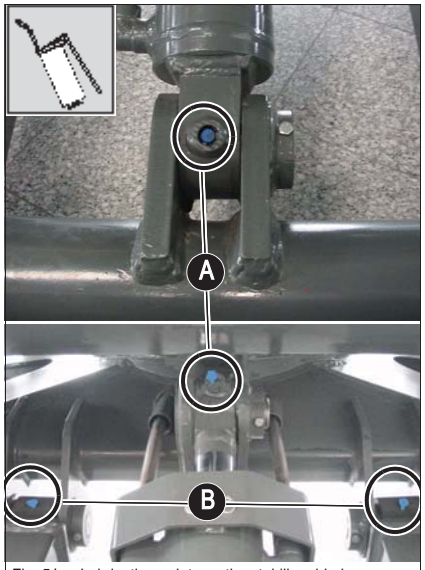


Fig. 51: Lubrication points on the stabiliser blade

☞ *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

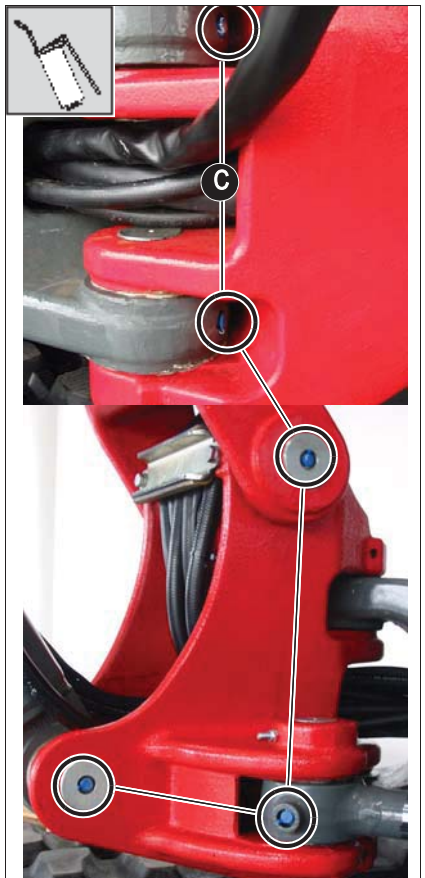


Fig. 52: Lubrication points on the swivelling console

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

Boom lubrication points

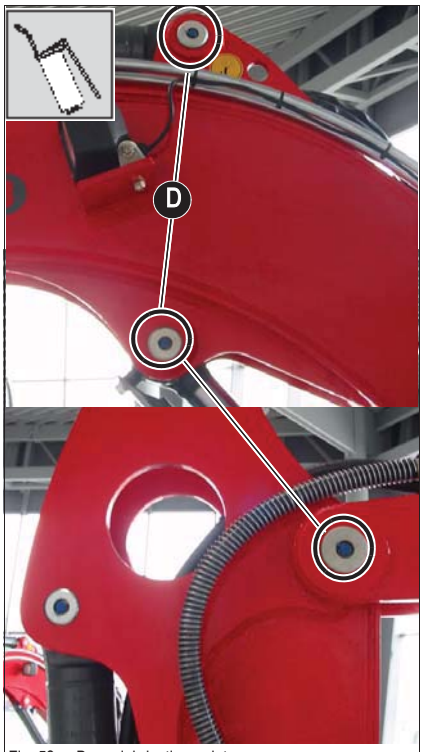


Fig. 53: Boom lubrication points

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

Lubrication points on the stick

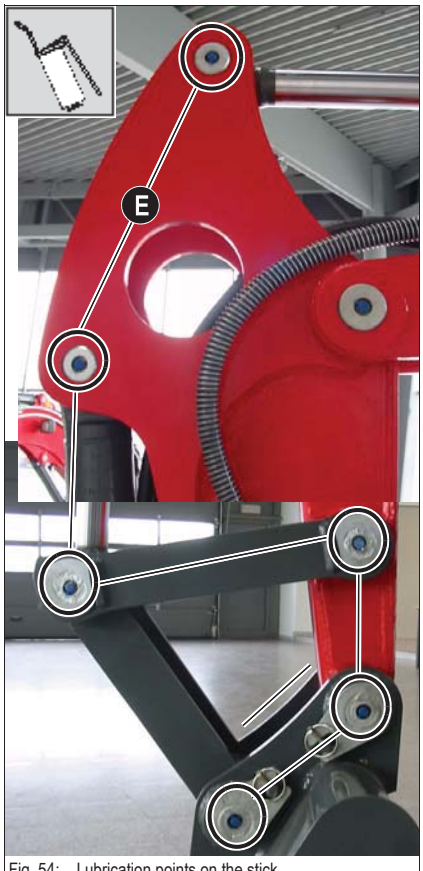


Fig. 54: Lubrication points on the stick

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

Lubrication strip

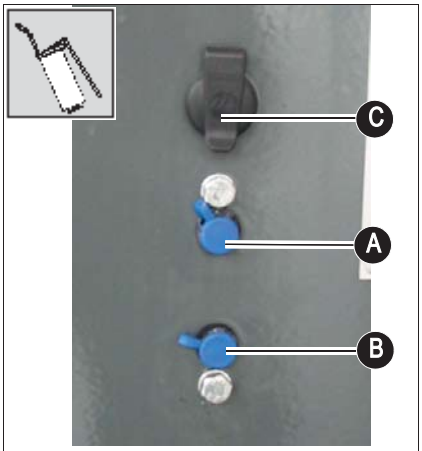


Fig. 55: Lubrication strip on the chassis

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**.

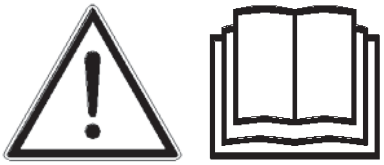
Maintenance of attachments

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.

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 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 in instrument panel on page 2-5
- Cable and earth connections
- Battery charge condition
  – see Battery on page 3-48
- Condition of battery terminals

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 in instrument panel* 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 1-10

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 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!*

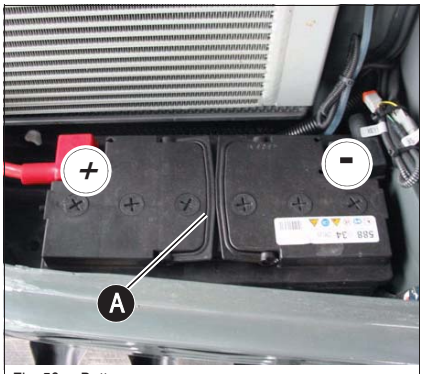


Fig. 56: Battery

Battery **A** is located in the engine compartment, on the right in driving direction. 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:

☞ *Connect the plus lead of the starting aid to the positive terminal of the flat battery*

☞ *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 positive terminal of the battery on the jump-started machine*

3.18 Cab

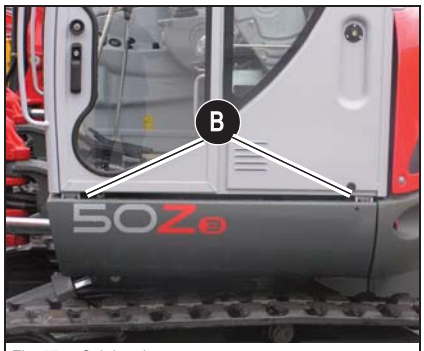


Fig. 57: Cab bearing

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

Important!

Check the cab fastening screws for tightness, retighten with a suitable tool if necessary
– see General tightening torques on page 2-7

Replacing the cab filter

Tilt the cab to replace the filter
– see chapter 1.16 Tilting the cab on page 1-18.
The heater is located at the rear half of the cab.


Fig. 58: Cab filter

Replacing the filter:

☞ *Slacken the heater cover*
☞ *You can now access the cab filter* ***fig. 58***
☞ *Remove the cab filter*
☞ *Insert a new cab filter*
☞ *Fit the heater cover back on again*

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!

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!

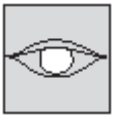
When cleaning the engine with a water or steam jet

☞ *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.

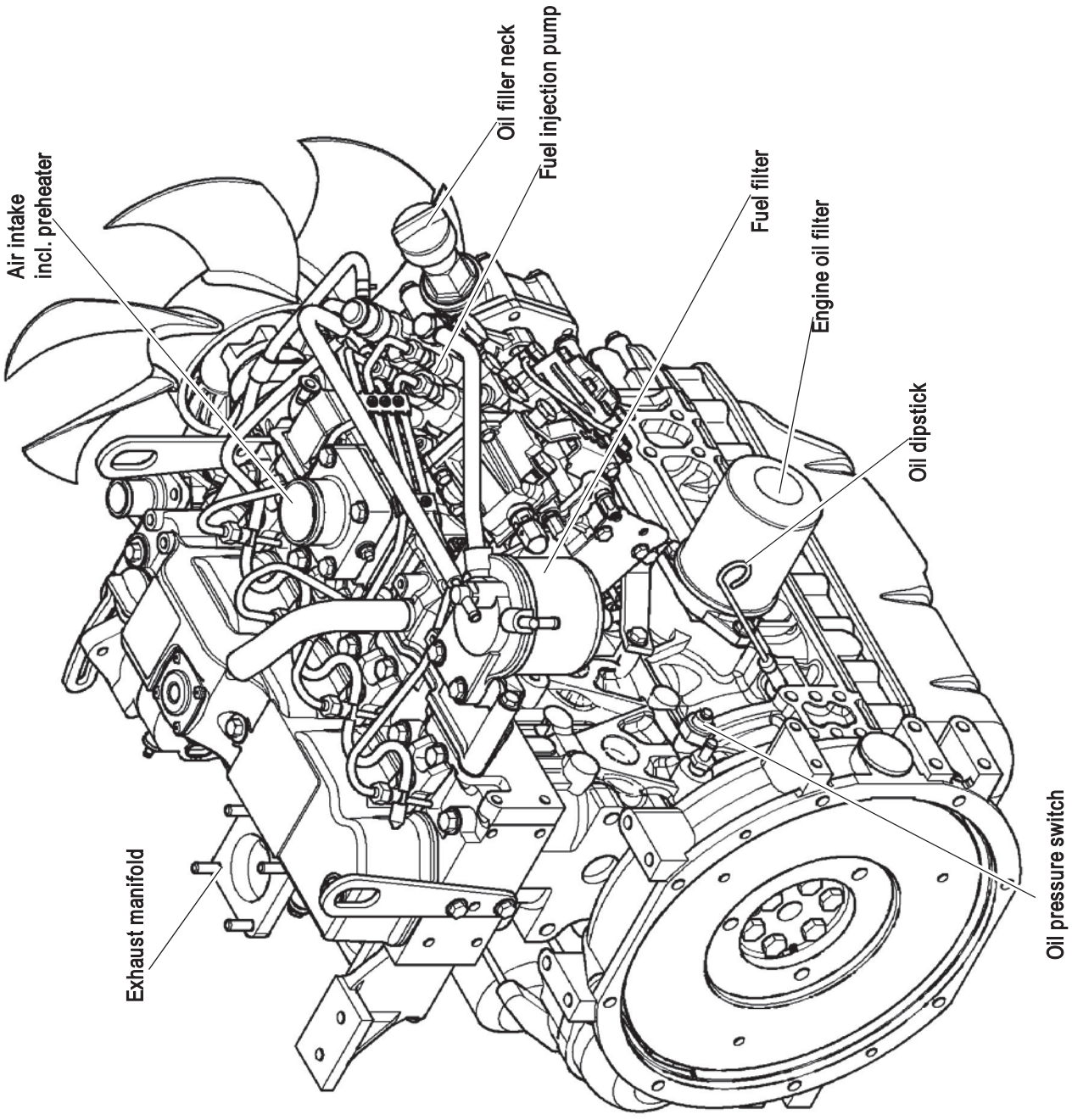
Pivots and hinges

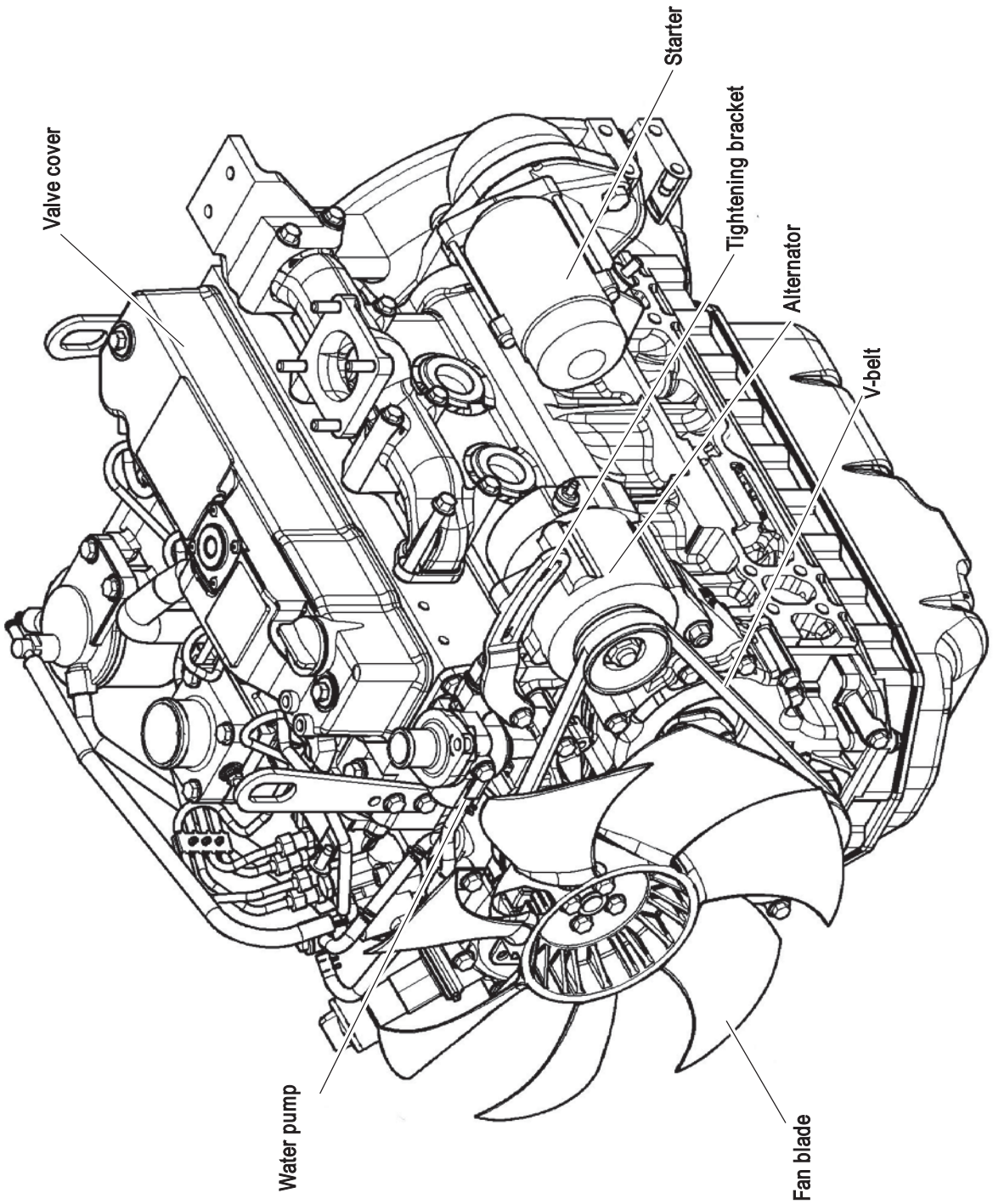
All mechanical pivot points on the machine (e.g. door hinges, joints) and fittings (e.g. door arresters) must be lubricated regularly, even if they are not listed in the lubrication plan.

Engine

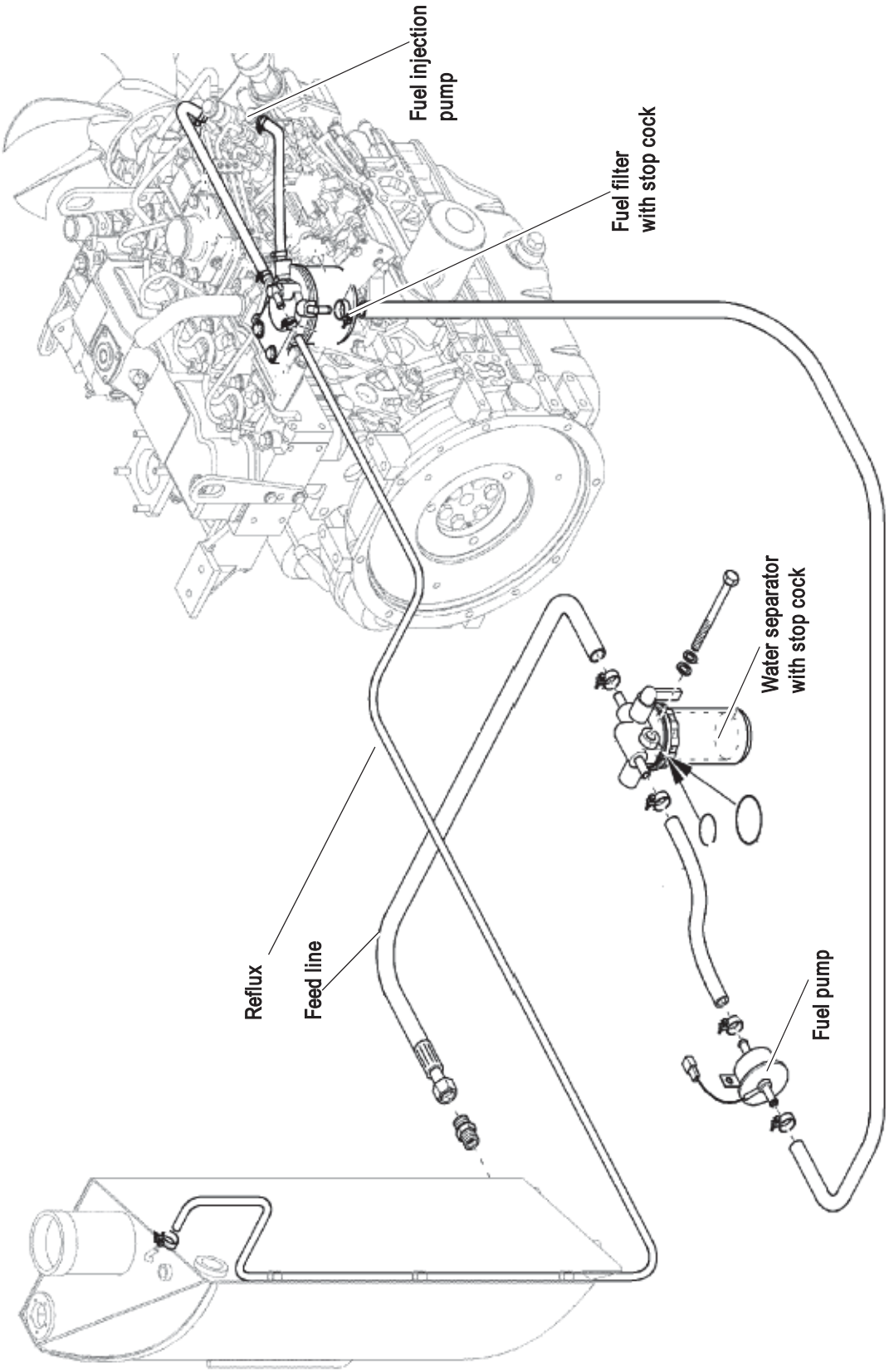
4 Engine

4.1 Engine 4TNV88-PNS (up to serial no. AD07125): overview




Valve cover
Starter
Tightening bracket
Alternator
V-belt
Water pump
Fan blade

4.2 Fuel system



4.3 Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine

☞ *Remove the valve cover*

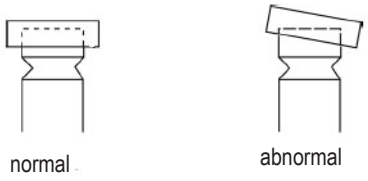


Fig. 1: Valve cap wear

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

➥ Valve overlapping

☞ *Check the valve cap for abnormal wear*

☞ *Check valve clearance* **2/A** with a feeler gauge

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

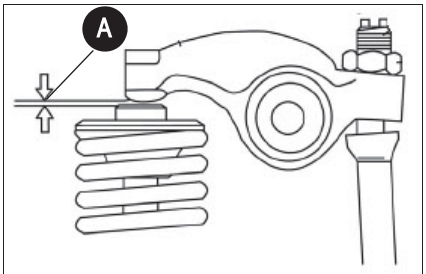


Fig. 2: Checking valve clearance

☞ *Repeat the procedure for each cylinder*

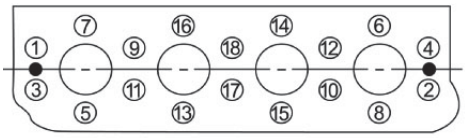
☞ *Put the valve cover gasket in place*

☞ *Mount the valve cover*

4.4 Tightening order for cylinder head bolts

☞ *Order for removing the cylinder-head bolts*

Flywheel



Fan

Important!

Always carry out work on the cylinder head on a cold engine!

☞ *Mount the cylinder-head bolts*

➥ Tightening torques:

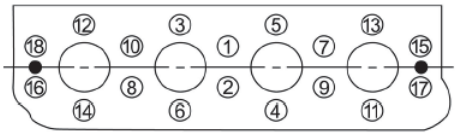
- 1st pass **41.1 – 46.9 Nm (30.3 – 34.6 lbf ft)**
- 2nd pass **85.3 – 91.1 Nm (62.9 – 67.2 lbf ft)**

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!

4.5 Checking the injection nozzles

Pressure check

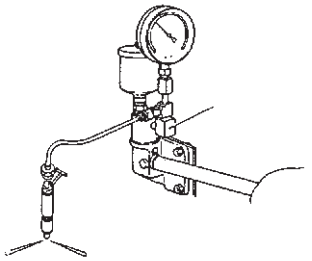


Fig. 3: Nozzle tester

☞ *Remove the injection line and the injection nozzle*

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

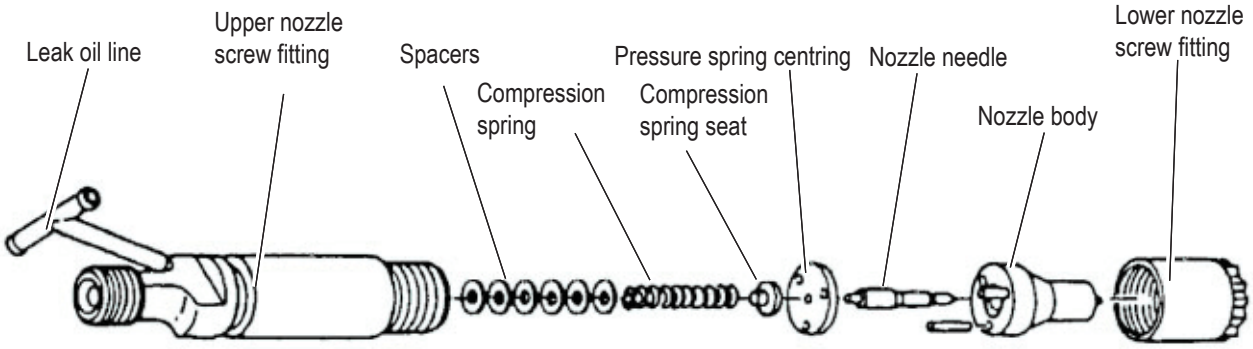
☞ *Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge*

☞ *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.*

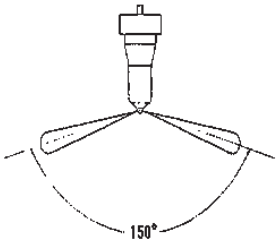
➥ Injection pressure: **215 – 225.5 bar (3118 – 3271 psi)**

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

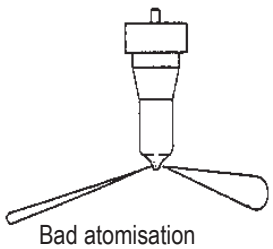
☞ Create a pressure of about 20 bar (290 psi) below injection pressure and check whether fuel escapes from the nozzle



4.6 Checking the nozzle jet



Normal atomisation



Bad atomisation

Fig. 4: 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. 5/left**

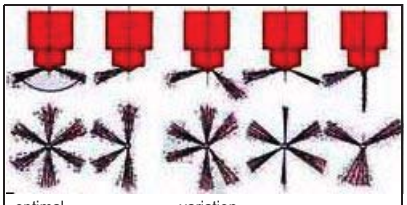


Fig. 5: Shape of nozzle jet

4.7 Injection time

Checking injection time

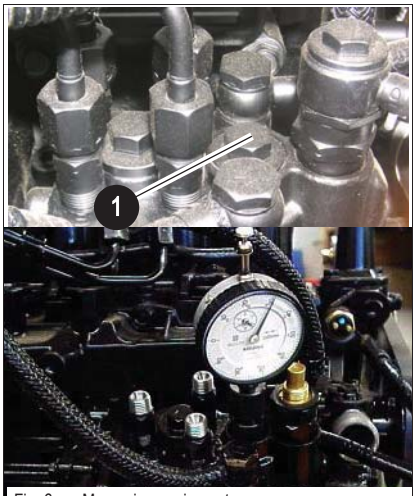


Fig. 6: Measuring equipment

- Preparatory work:

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

☞ *Remove plug* **6/1** *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. 6*

- 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").*

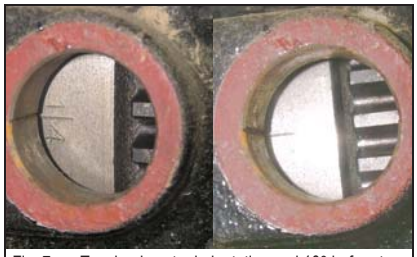


Fig. 7: Top dead centre indentation and 10° before top dead centre

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

- Indentations "1/4" and "3/2" stand for the top dead centre of the respective cylinders
- Scaling: 12°/15°/20°/25° before top dead centre

➥ Rated value: 15.5° ± 1° before top dead centre (~ second indentation)

Setting injection time

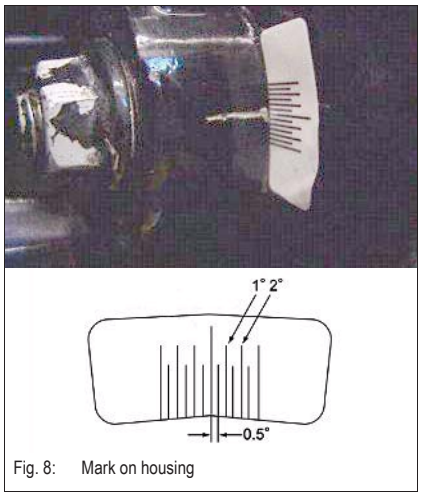


Fig. 8: Mark on housing

- 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. 8*

☞ *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: earlier injection time

➥ Rotated away from the engine: later 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*

Replacement of fuel injection pump

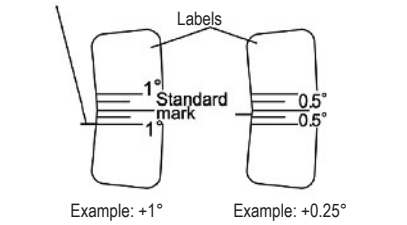


Fig. 9: Correction of injection angle

☞ *Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see fig. 9*

☞ *Remove gear casing cover* **10/1** *of the fuel injection pump*

☞ Mark the position of the gear of the fuel injection pump **11/A** with respect to gear **11/B** – see fig. 11

☞ *Completely slacken lock nut* **11/2** *of the drive pinion*

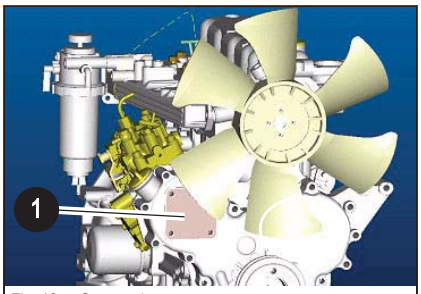


Fig. 10: Gear casing

☞ *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

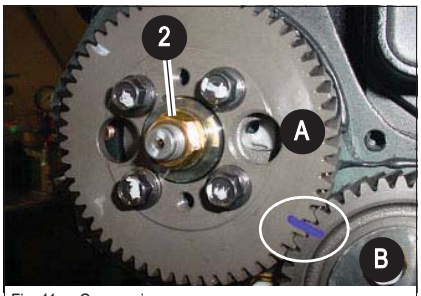


Fig. 11: Gear casing

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

➥ Positive value: later injection time (away from the engine)

➥ Negative value: earlier injection time (towards the engine)

☞ *Install the new fuel injection pump*

☞ Check the marked position of the drive pinion of the fuel injection pump (fig. 11)

☞ *Screw on and tighten nut 11/2*

☞ *Check injection time*

☞ *Mount gear casing cover 10/1 of the fuel injection pump*

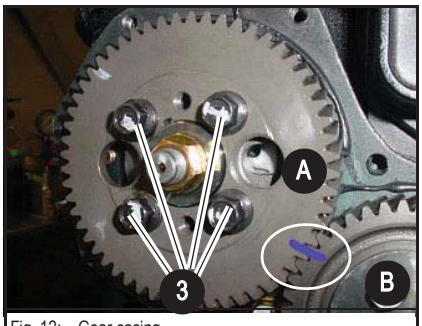


Fig. 12: Gear casing

Important!

Do not slacken screws **12/3** of the drive pinion of the fuel injection pump. These screws specify the precision setting of the fuel injection pump set by the manufacturer!

4.8 Adjusting engine revs

Important!

The maximum engine revs are set and sealed by the manufacturer without the pump and may not be modified!

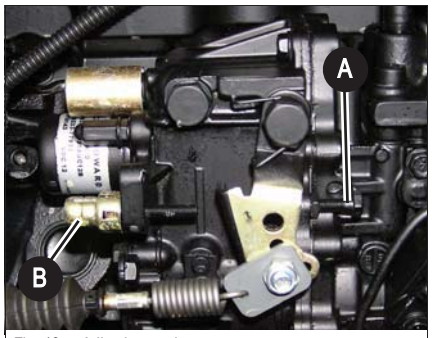


Fig. 13: Adjusting engine revs

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 1100 ± 25 rpm

➥ Max. revs: 2590 ± 25 rpm

☞ *Adjust as shown if values differ.*

4.9 Compression

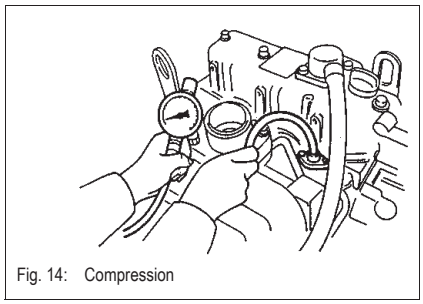


Fig. 14: Compression

☞ *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**

4.10 Checking the coolant thermostat

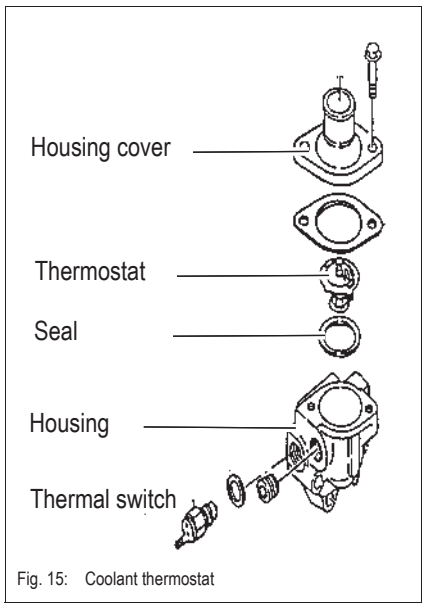
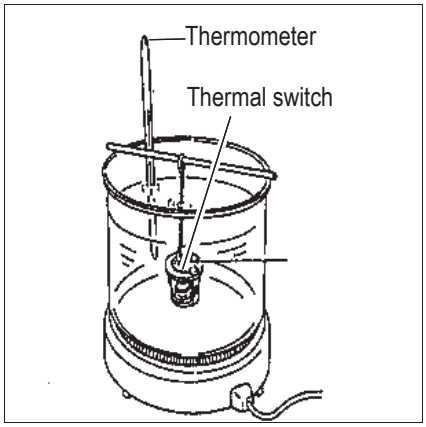


Fig. 15: Coolant thermostat

☞ *Remove the thermostat*

➥ The thermostat is located on the water pump
– see Engine 4TNV88-PNS (up to serial no. AD07125): overview on page 4-1



☞ *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)**

4.11 Checking the thermal switch

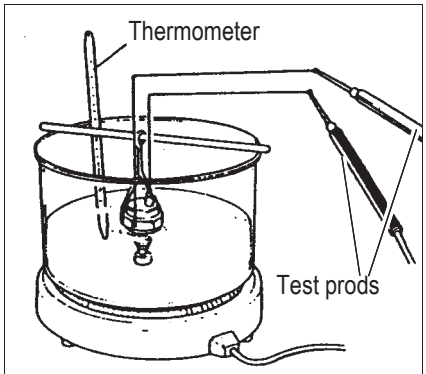


Fig. 16: Checking the thermal switch

☞ *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)**

4.12 Oil pressure switch

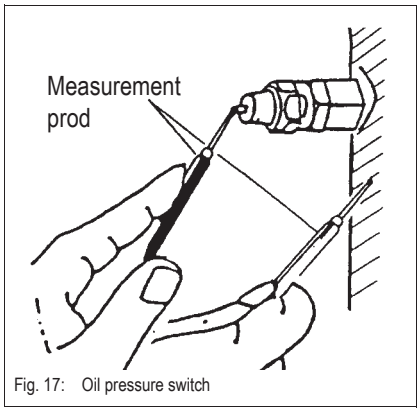


Fig. 17: Oil pressure switch

☞ *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

4.13 Checking the coolant circuit

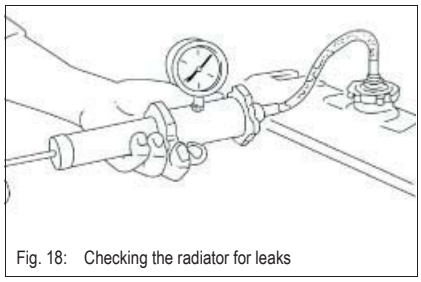


Fig. 18: Checking the radiator for leaks

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

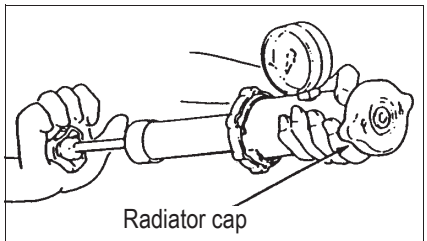


Fig. 19: Checking the radiator cap

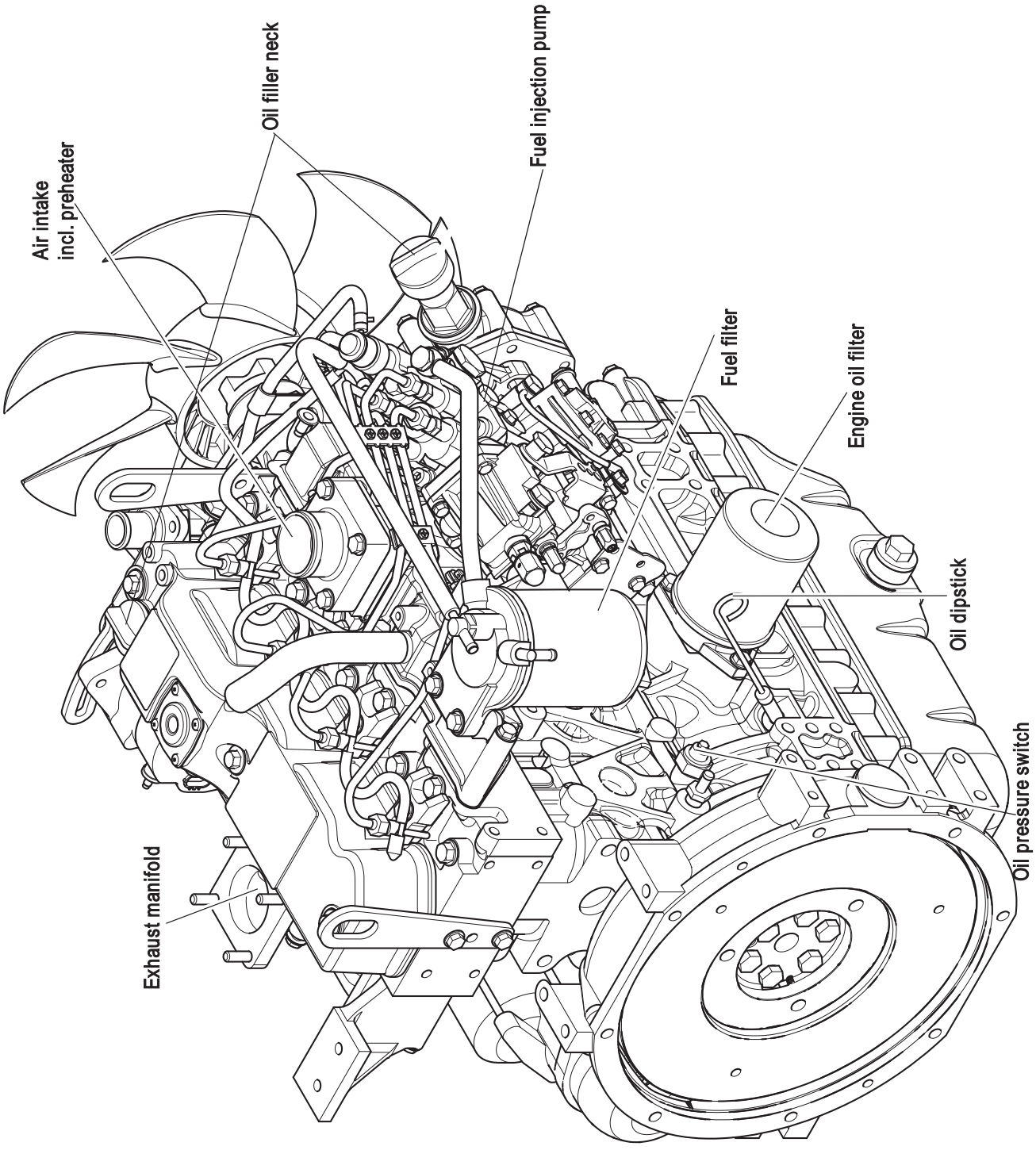
Checking the radiator cap

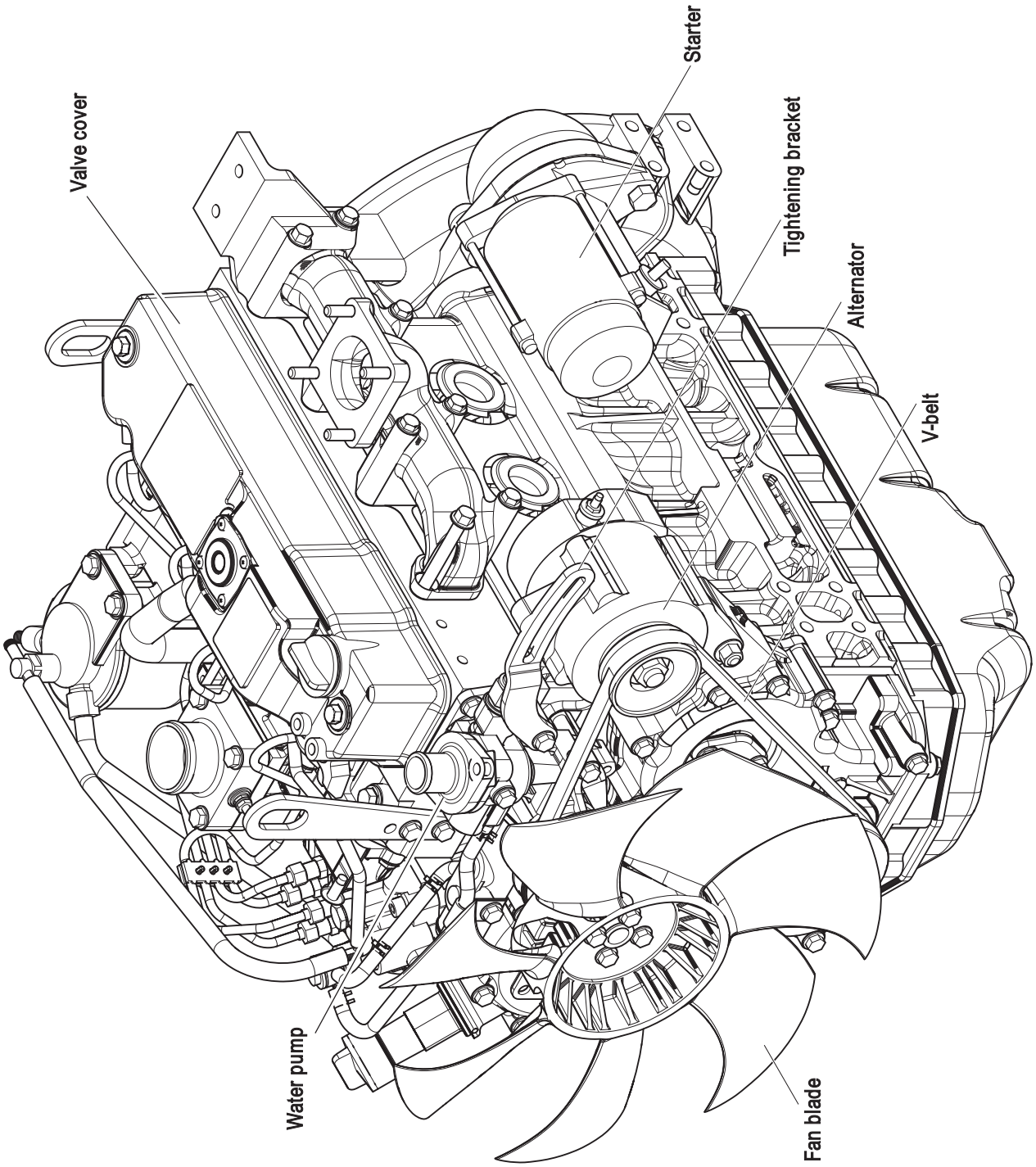
☞ *Remove the radiator cap and mount it onto the adapter as shown*

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

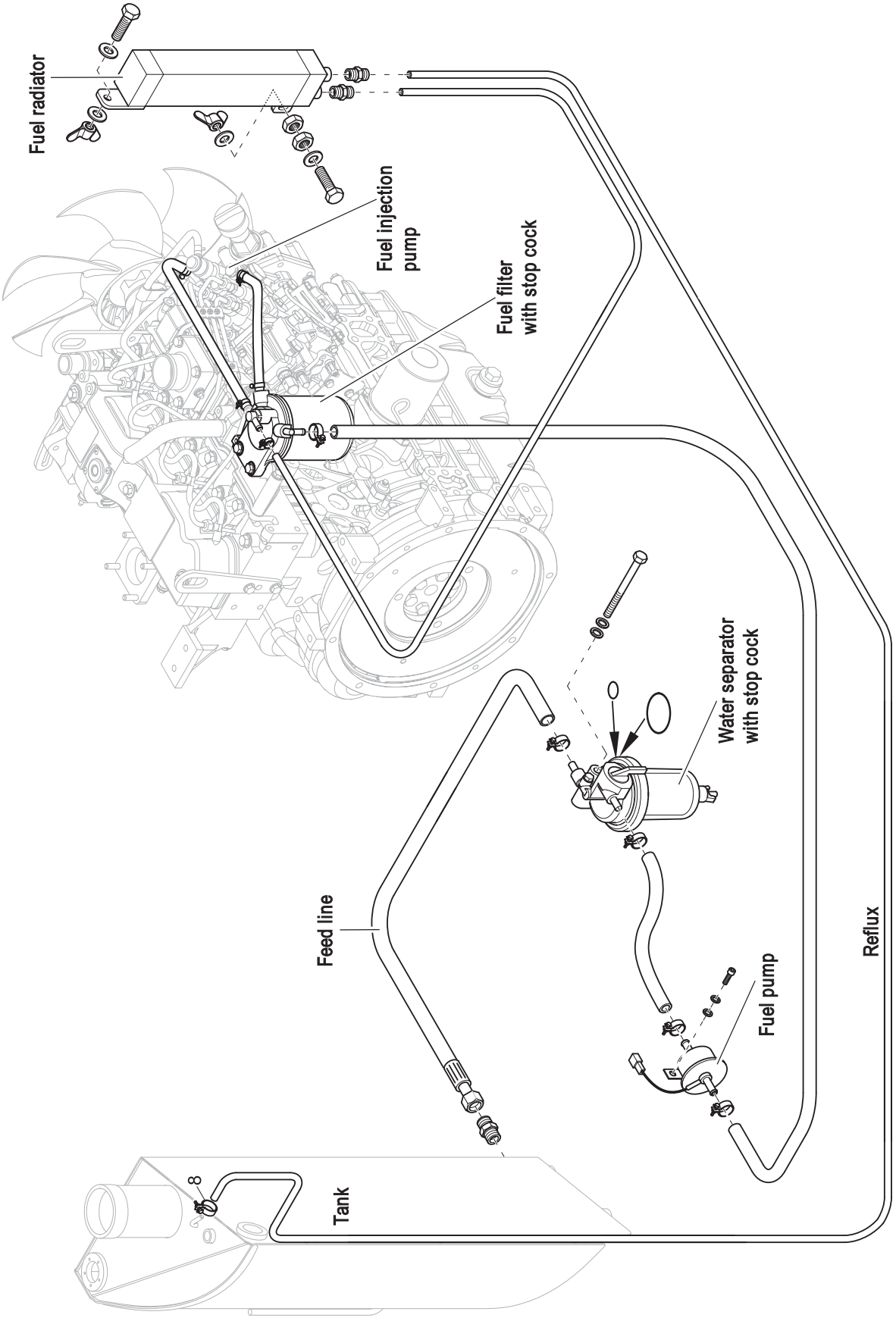
➥ The radiator cap must open

4.14 Engine 4TNV88-PNS (from serial no. AH00579): overview




Valve cover
Starter
Tightening bracket
Alternator
V-belt
Water pump
Fan blade

4.15 Fuel system



4.16 Removing the valve cover

Important!

In order to avoid damage to the glow elements, remove them before removing the cylinder head.

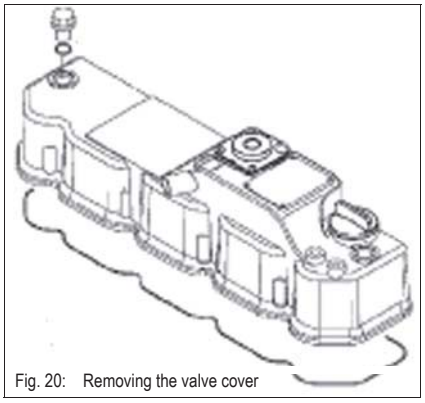


Fig. 20: Removing the valve cover

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:

☞ *Remove all dirt on the engine with a lint-free cloth*

☞ *Unscrew all hoses and fuel injection lines from the valve cover*

☞ *Remove the air intake and the exhaust manifold*

☞ *Unscrew and remove the valve cover*

4.17 Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine

☞ *Remove the valve cover*

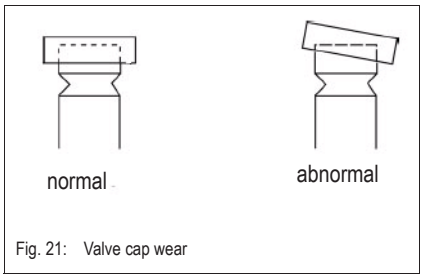


Fig. 21: Valve cap wear

☞ *Turn the engine (as described in 4.21) until the cylinder reaches the top dead centre of the compression cycle.*

➥ Valve overlapping

☞ *Check the valve cap for abnormal wear*

☞ *Check valve clearance* **2/A** with a feeler gauge

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

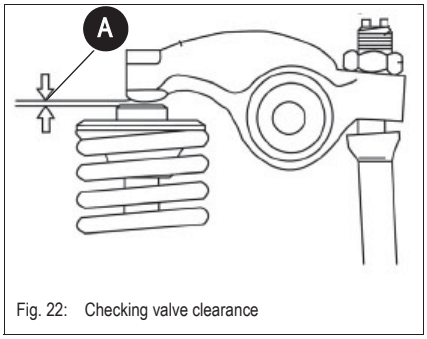


Fig. 22: Checking valve clearance

☞ *Repeat the procedure for each cylinder*

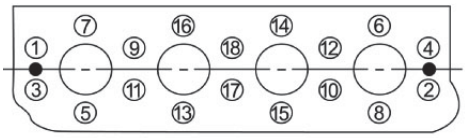
☞ *Place the valve cover gasket*

☞ *Mount the valve cover*

4.18 Tightening order for cylinder head bolts

☞ *Order for removing the cylinder-head bolts*

Flywheel



Fan

Important!

Always carry out work on the cylinder head on a cold engine!

☞ *Mount the cylinder-head bolts*

➥ Tightening torques:

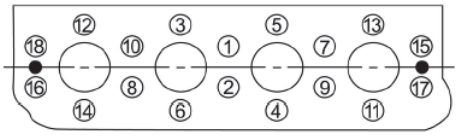
- 1st pass **42.6 – 45.5 Nm (31.4 – 33.6 lbf ft)**
- 2nd pass **85.3 – 91.1 Nm (62.9 – 67.2 lbf ft)**

Caution!

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

☞ *See figure*

Flywheel



Fan

Important!

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

4.19 Checking the injection nozzles

Pressure check

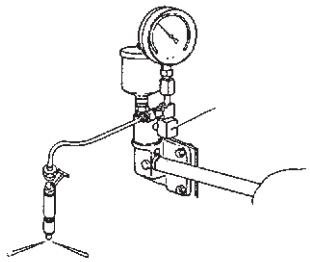


Fig. 23: Nozzle tester

☞ *Remove the injection line and the injection nozzle*

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

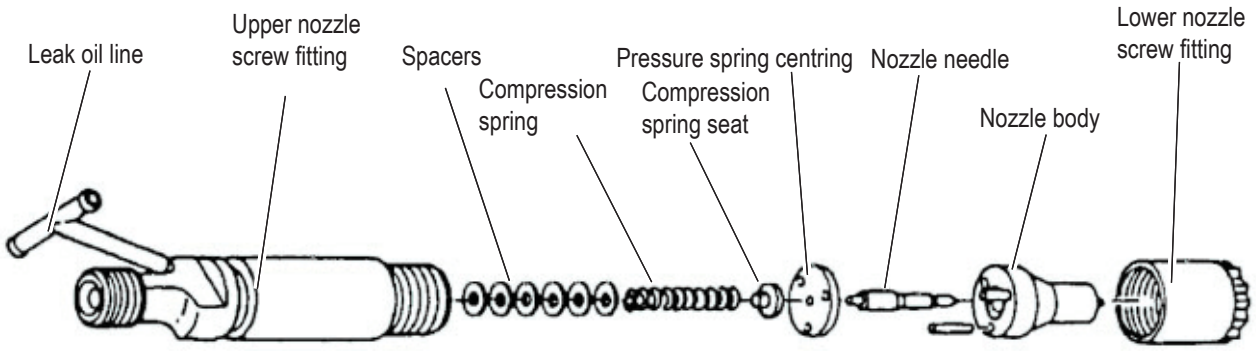
☞ *Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge*

☞ *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.*

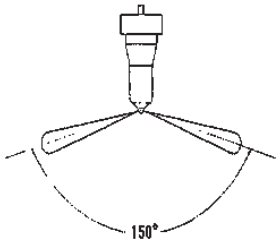
➥ Injection pressure: **196 – 206 bar (2843 – 2988 psi)**

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

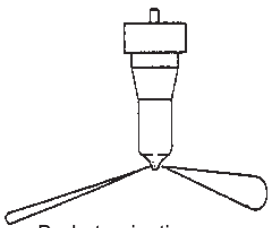
☞ Create a pressure of about 20 bar (290 psi) below injection pressure and check whether fuel escapes from the nozzle



4.20 Checking the nozzle jet



Normal atomisation



Bad atomisation

Fig. 24: 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. 25/left**

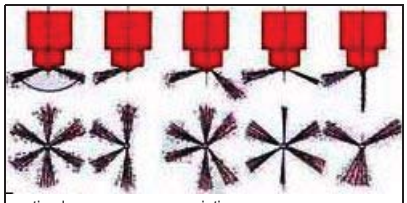


Fig. 25: Shape of nozzle jet

4.21 Injection time

Checking injection time

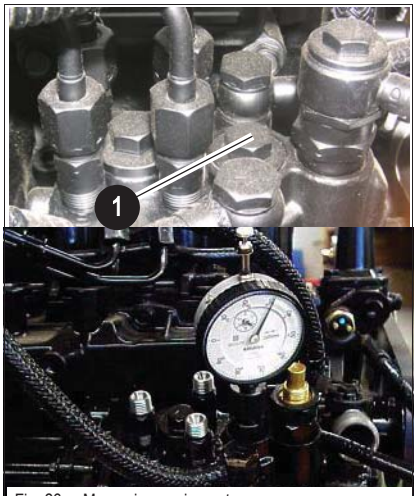


Fig. 26: Measuring equipment

- Preparatory work:

☞ *Remove all dirt on the engine with a lint-free cloth*

☞ *Remove the high pressure fuel injection lines*

☞ *Remove plug* **26/1** *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. 26*

- Measurement:

☞ *Remove the rubber plug from the flywheel housing*

☞ *Turn the ring gear on the flywheel with a screwdriver until the piston reaches the lowest point in the fuel injection pump (proceed by comparing with the first cylinder), or turn at the front on the crankshaft disc with a key (WAF 19)*

☞ *Set the measuring equipment to "0"*

☞ *Continue turning the ring gear upwards on the flywheel with the screwdriver until the piston in the fuel injection pump reaches a stroke of 2.5 mm (0.1").*

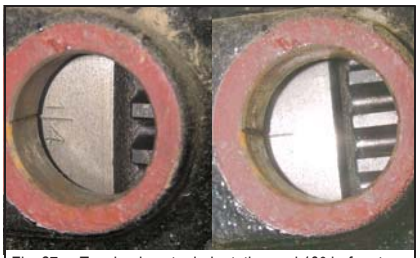
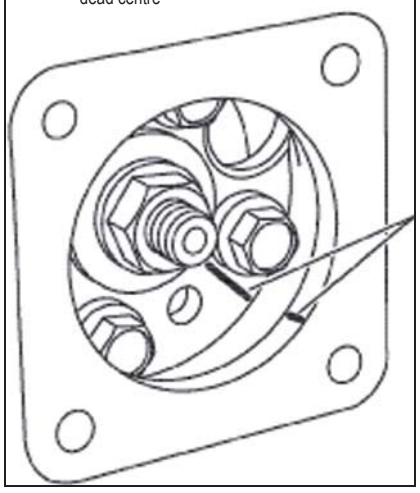


Fig. 27: Top dead centre indentation and 10° before top dead centre



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

- Indentations "1/4" and "3/2" stand for the top dead centre of the respective cylinders
- Scaling: 12°/15°/20°/25° before top dead centre

➥ Rated value: calculation according to Yanmar manual:
value on injection pump (example: 6.8 see page 20, *Fig. 30*) x 2 + FIR

Setting injection time

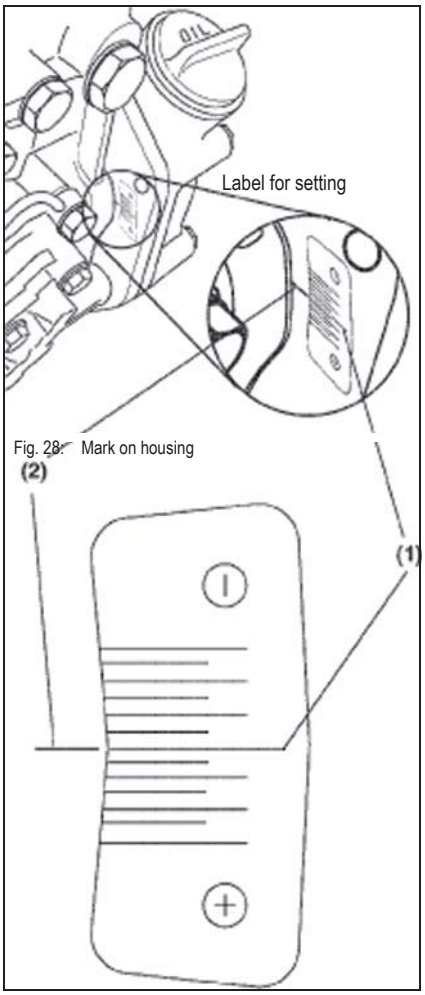


Fig. 28: Mark on housing

- 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. 28*

☞ *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*

Replacement of fuel injection pump

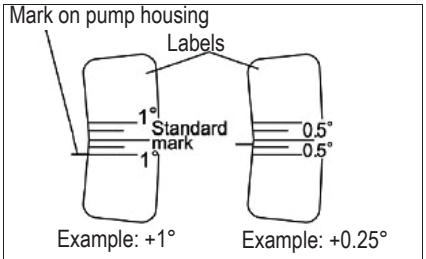


Fig. 29: Correction of injection angle

☞ *Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see Fig. 29*

☞ *Remove gear casing cover* **30/1** *of the fuel injection pump*

☞ Turn the engine until the indents on the gears coincide

☞ *Completely slacken lock nut* **31/2** *of the drive pinion*

☞ *Adhesive label number 1000158808*

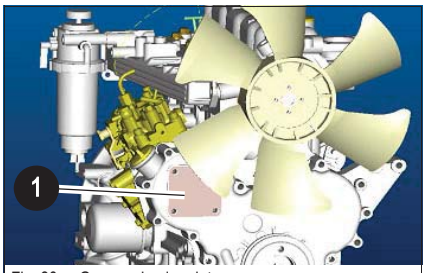
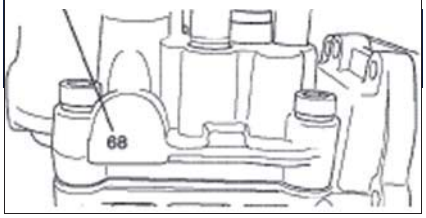


Fig. 30: Gear casing imprint



☞ *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 lbf ft)

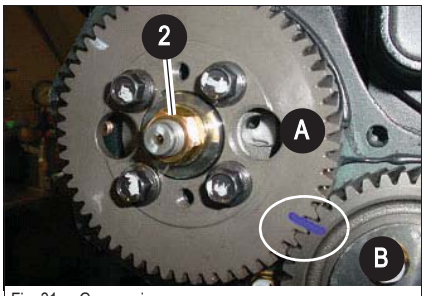


Fig. 31: Gear casing

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

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

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

☞ *Install the new fuel injection pump*

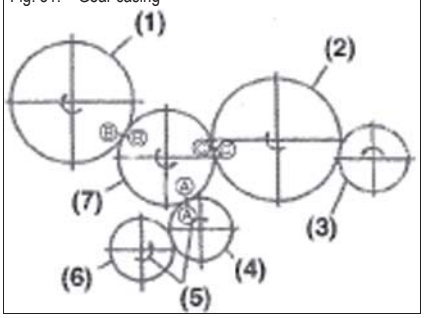
☞ Check the marked position of the drive pinion of the fuel injection pump (fig. 31)

☞ *Screw on and tighten nut 31/2 (tightening torque: 23 – 28 Nm / 17 – 21 lbf ft)*

☞ *Check injection time*

☞ *Mount gear casing cover 30/1 of the fuel injection pump*

- Tightening torque: 78 – 88 Nm (57.5 – 65 lbf ft)



- 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. 31*):
  - 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)
  - 7...Running wheel

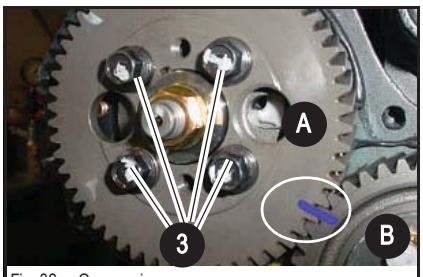


Fig. 32: Gear casing

Important!

Do not slacken screws **32/3** of the drive pinion of the fuel injection pump. These screws specify the precision setting of the fuel injection pump set by the manufacturer!

4.22 Adjusting engine revs

Important!

The maximum engine revs are set and sealed by the manufacturer without the pump and may not be modified!

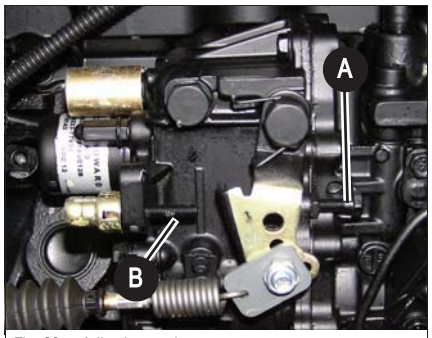


Fig. 33: Adjusting engine revs

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 1100 ± 25 rpm

➥ Max. revs: 2590 ± 25 rpm

☞ *Adjust as shown if values differ.*

4.23 Compression

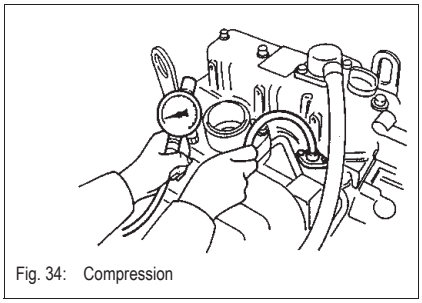


Fig. 34: Compression

☞ *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

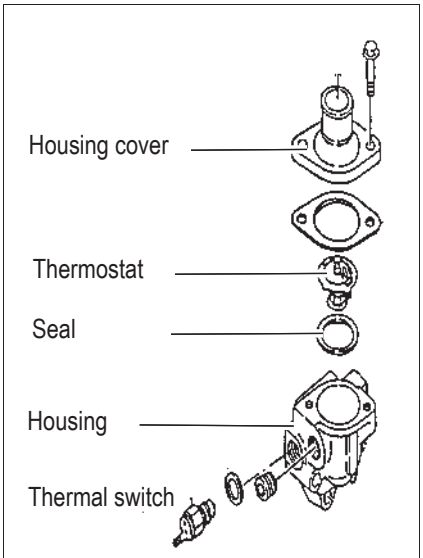
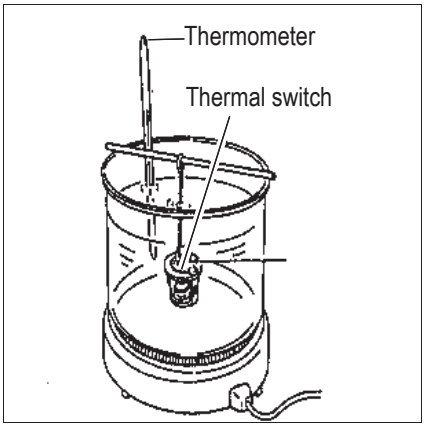


Fig. 35: Coolant thermostat

☞ *Remove the thermostat*

➥ The thermostat is located on the water pump
– see Engine 4TNV88-PNS (from serial no. AH00579): overview on page 4-12



☞ *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)**

4.25 Checking the thermal switch

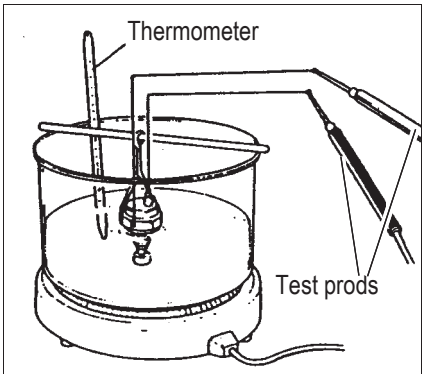


Fig. 36: Checking the thermal switch

☞ *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

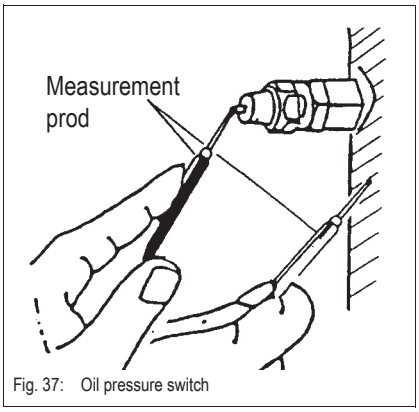


Fig. 37: Oil pressure switch

☞ *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

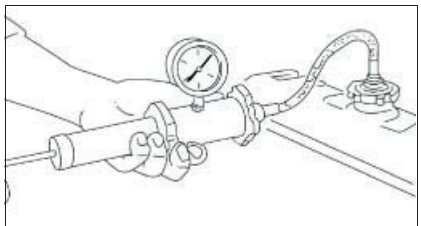


Fig. 38: Checking the radiator for leaks

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

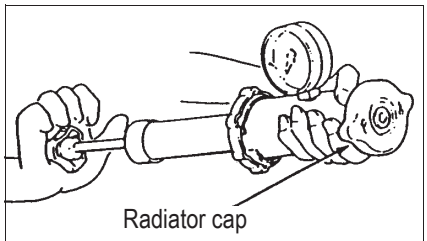


Fig. 39: Checking the radiator cap

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

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
	Defective solenoid switch
	Cutoff solenoid does not attract
	Cutoff solenoid without current
	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

Problem		Possible causes
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
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

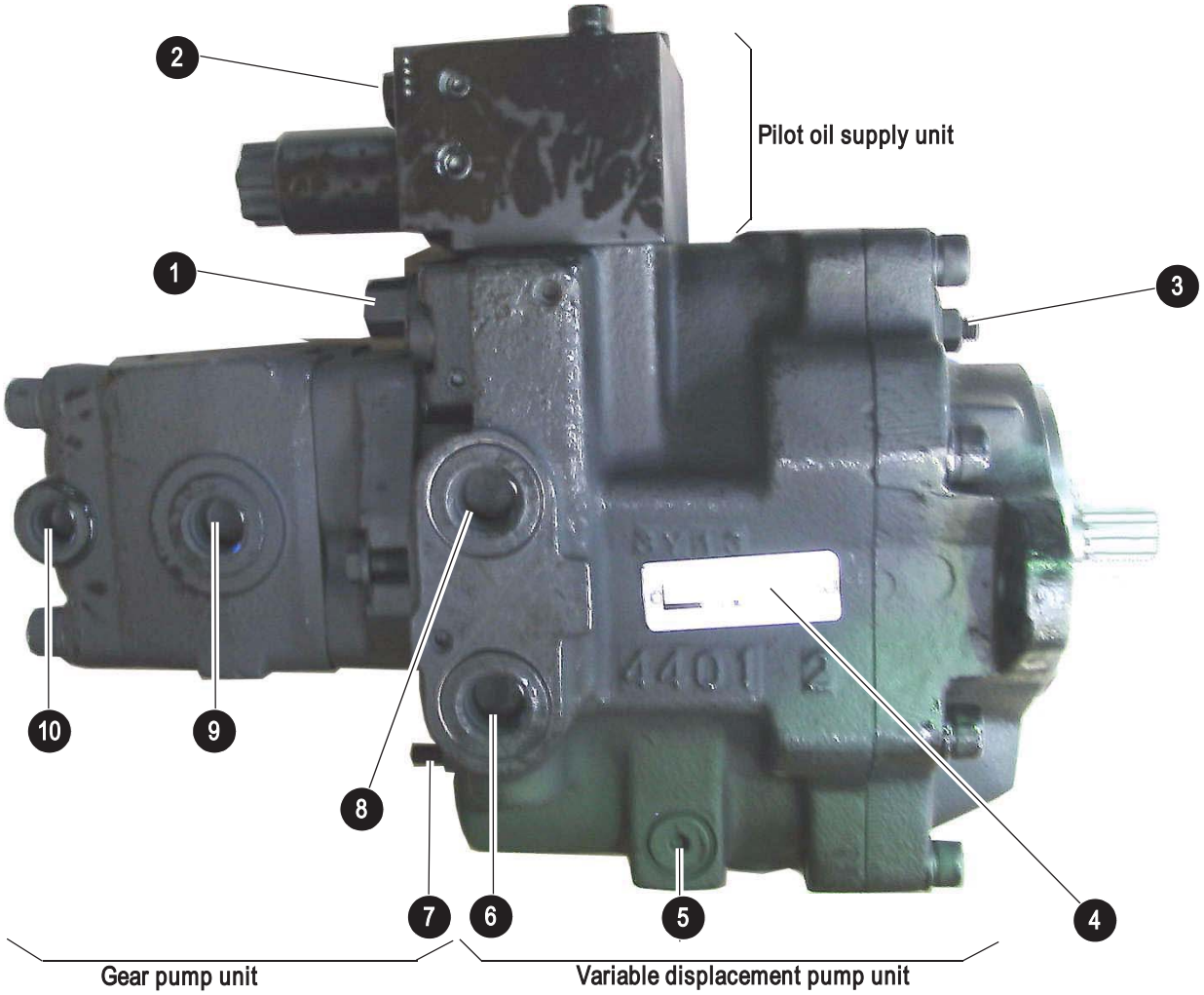
Hydraulic system

5 Hydraulic system

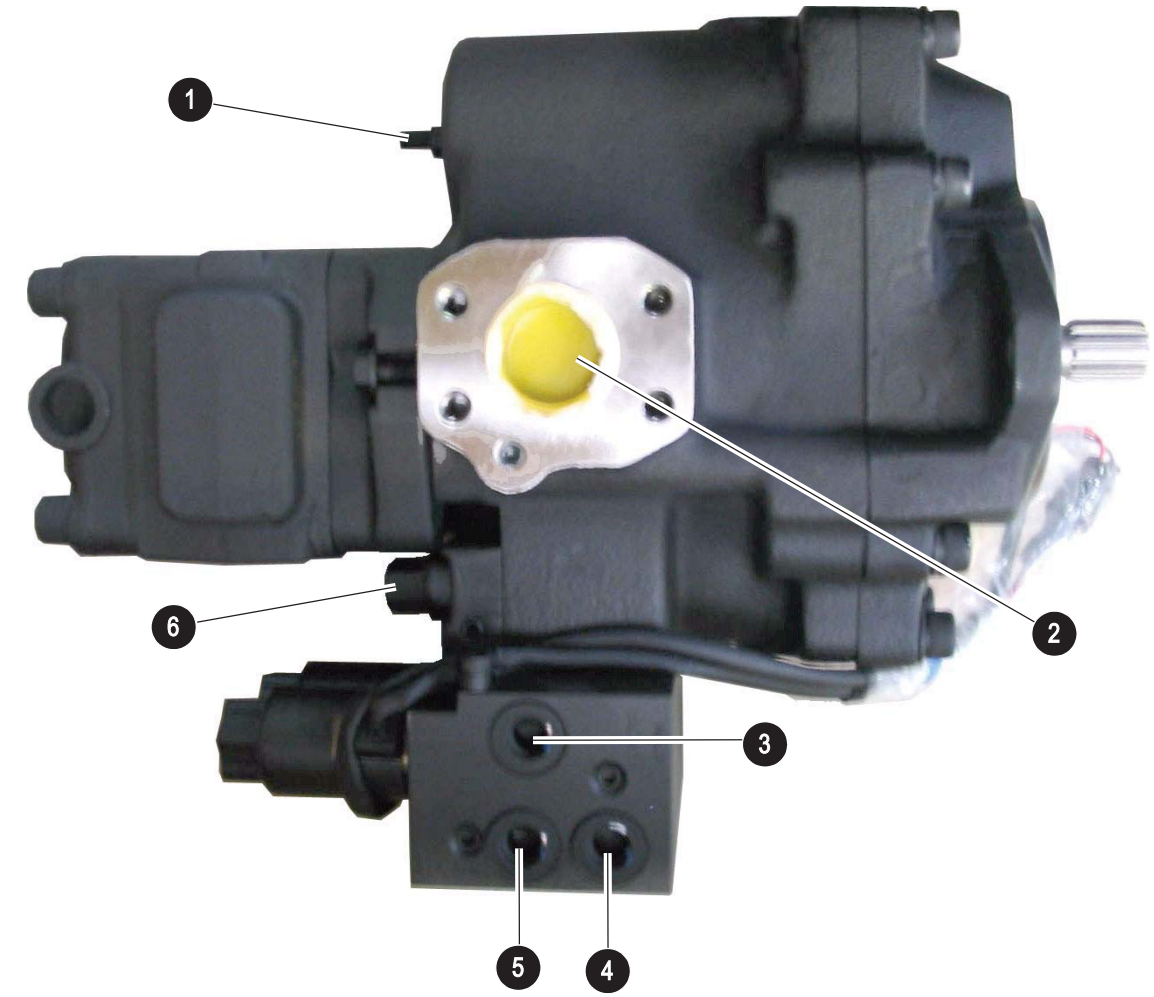
The hydraulic system is governed by a throttle

5.1 Hydraulic pump PVD-2B-44BP-16G5-4713F (up to AD07125) PVD-2B-41BP-16G5-4713F (from AH00579)

Double variable displacement pump + 2 gear pumps

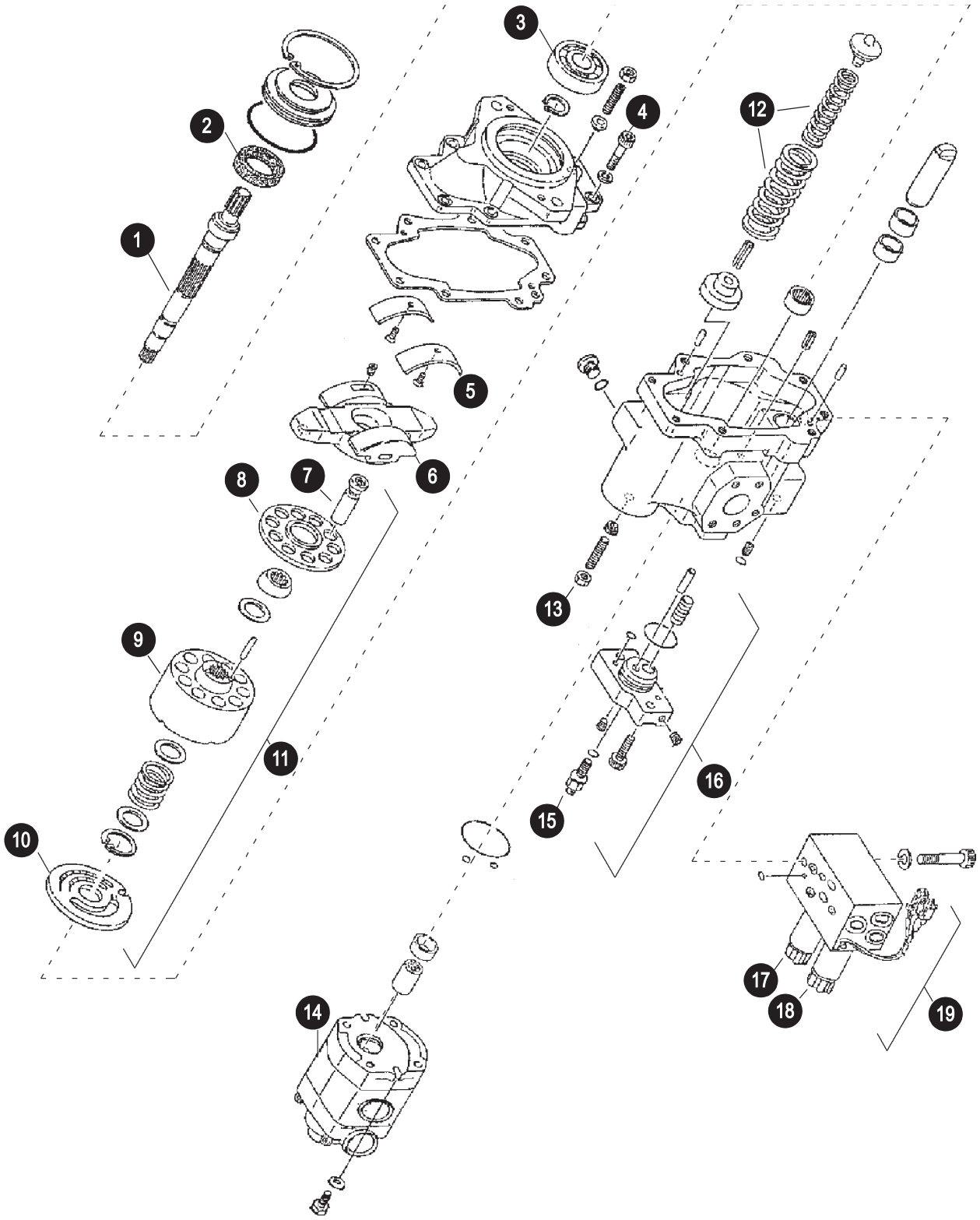


Pos.	Description
1	Oil flow set screw Qmax
2	Pressure limiting valve PLV 4
3	Oil flow set screw Qmin
4	Type label
5	Bleed screw
6	Port P2
7	Control initiation set screw
8	Port P1
9	Port P3
10	Port P4 (drive counterbalancing system)



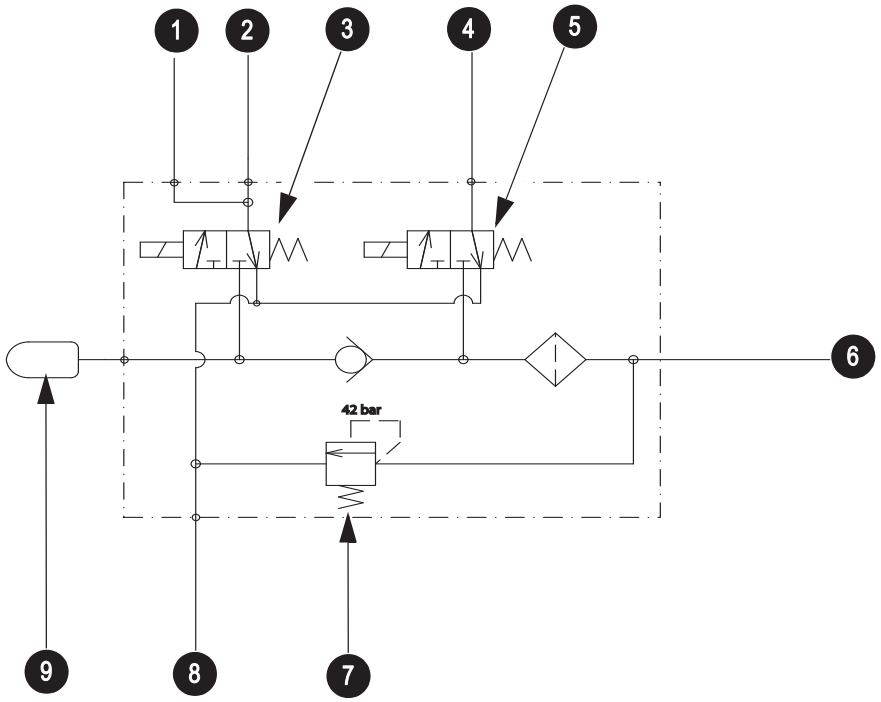
Pos.	Description
1	Control initiation set screw
2	Suction line Port
3	Port PR (2nd speed range)
4	Port PV (gear motor brake release supply)
5	Pilot valve supply
6	Oil flow set screw Qmax

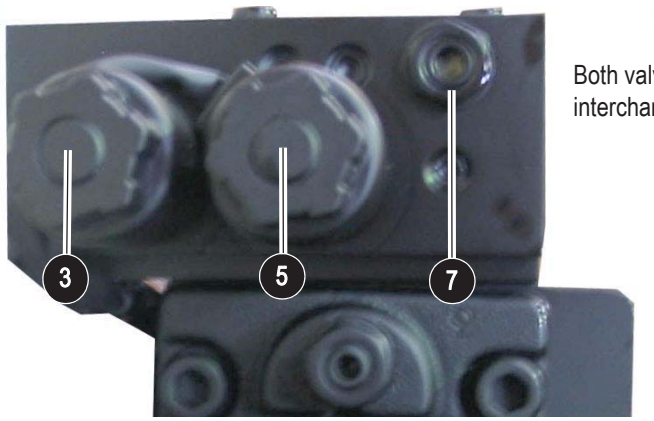
Pump unit: exploded view



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

Pilot oil supply unit



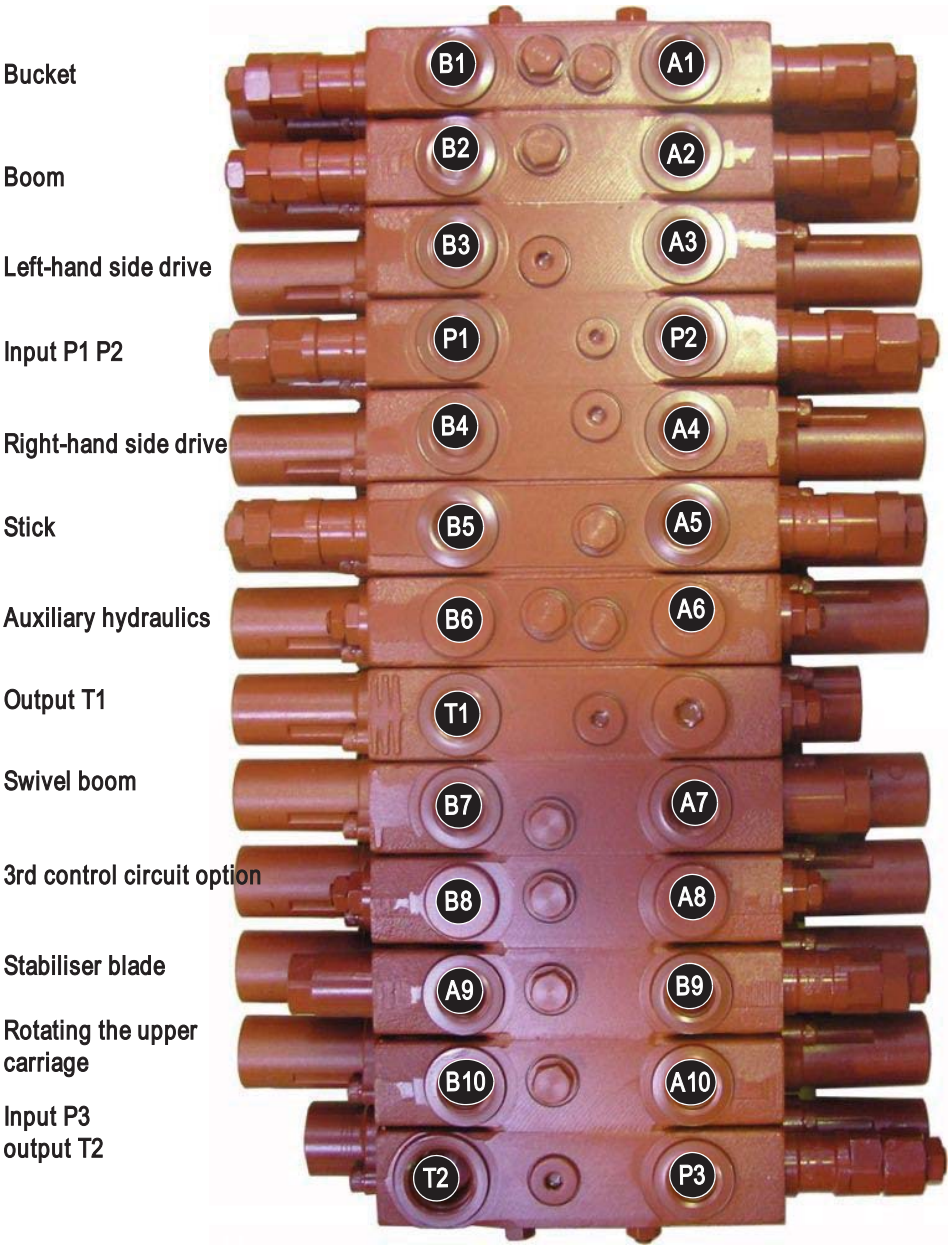


Both valves can be interchanged

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	

5.2 Main valve block

Ports



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	Swivel control	Auxiliary hydraulics pedal
Pa8, Pb8	3rd control circuit (control)	4/3 directional valve
Pa9, Pb9	Stabiliser blade control	Stabiliser blade pedal
Pa10, Pb10	Rotation control	Joystick (left)

Main control lines

Port	Legend
A1 rod side, B1 base side	Bucket ram
A2 base side, B2 rod 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 ram
A6, B6	Auxiliary hydraulics
A7 rod side, B7 base side	Offset ram
A8, B8	3rd control circuit
A9 rod side, B9 base side	Stabiliser blade ram
A10 rotation to the right, B10 rotation to the left	Gear motor

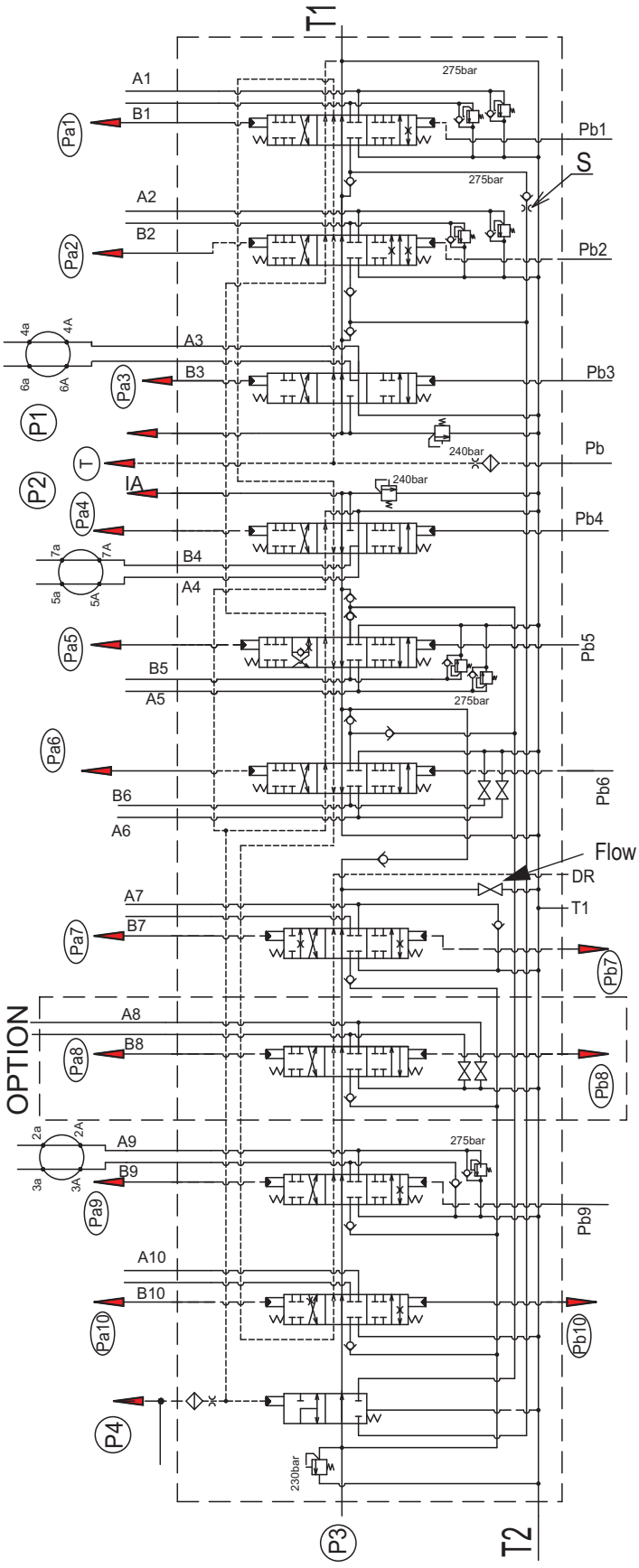
Pump/tank lines

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

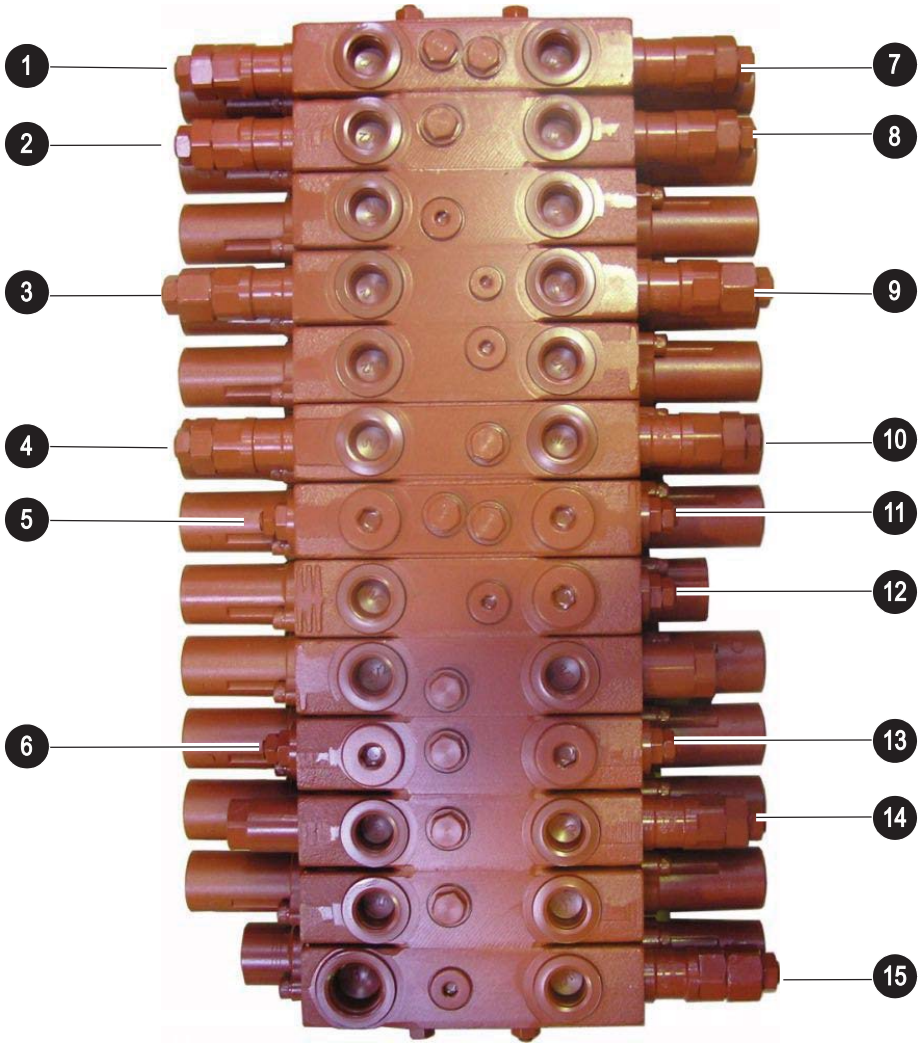
S: bucket pre-tension

– *see Bucket pre-tension* on page 5-13

Main valve block diagram



Pressure limiting valves



Pos.	Description
1	Secondary pressure limiting valve (bucket base side)
2	Secondary pressure limiting valve (boom rod side)
3	Primary pressure limiting valve P1
4	Secondary pressure limiting valve (stick rod side)
5	Auxiliary hydraulics plug (secondary pressure limiting valve option see *7-27*)
6	3rd control circuit plug (secondary pressure limiting valve option see *7-28*)
7	Secondary pressure limiting valve (bucket rod side)
8	Secondary pressure limiting valve (boom base side)
9	Primary pressure limiting valve P2
10	Secondary pressure limiting valve (stick base side)
11	Auxiliary hydraulics plug (secondary pressure limiting valve option see *7-27*)
12	Plug – *see Flow rate adjustment of auxiliary hydraulics* on page 5-14
13	3rd control circuit plug (secondary pressure limiting valve option see *7-28*)
14	Secondary pressure limiting valve stabiliser blade rod side
15	Primary pressure limiting valve P3

Pump assignment

Hydraulic supply by pump 1

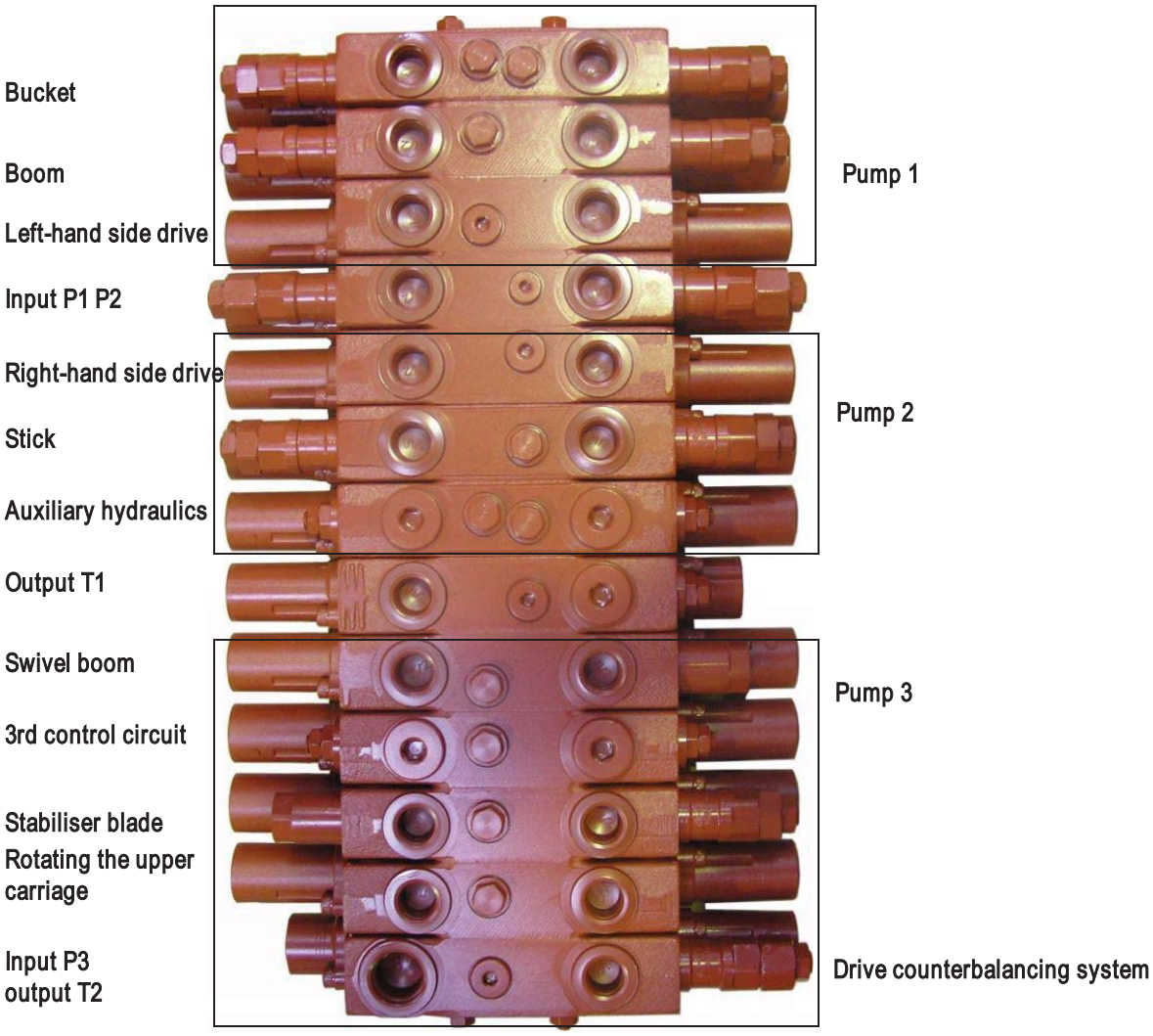
- Bucket section
- Boom section
- Left-hand side drive section

Hydraulic supply by pump 2

- Right-hand side drive section
- Stick section
- Auxiliary hydraulics section

Hydraulic supply by pump 3

- Stabiliser blade section
- Upper carriage rotation section
- 3rd control circuit section (option)
- Swivel boom section
- Drive counterbalancing system section



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 boom 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 activated with right-hand side drive and a boom function (bucket, boom, stick or auxiliary hydraulics).

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

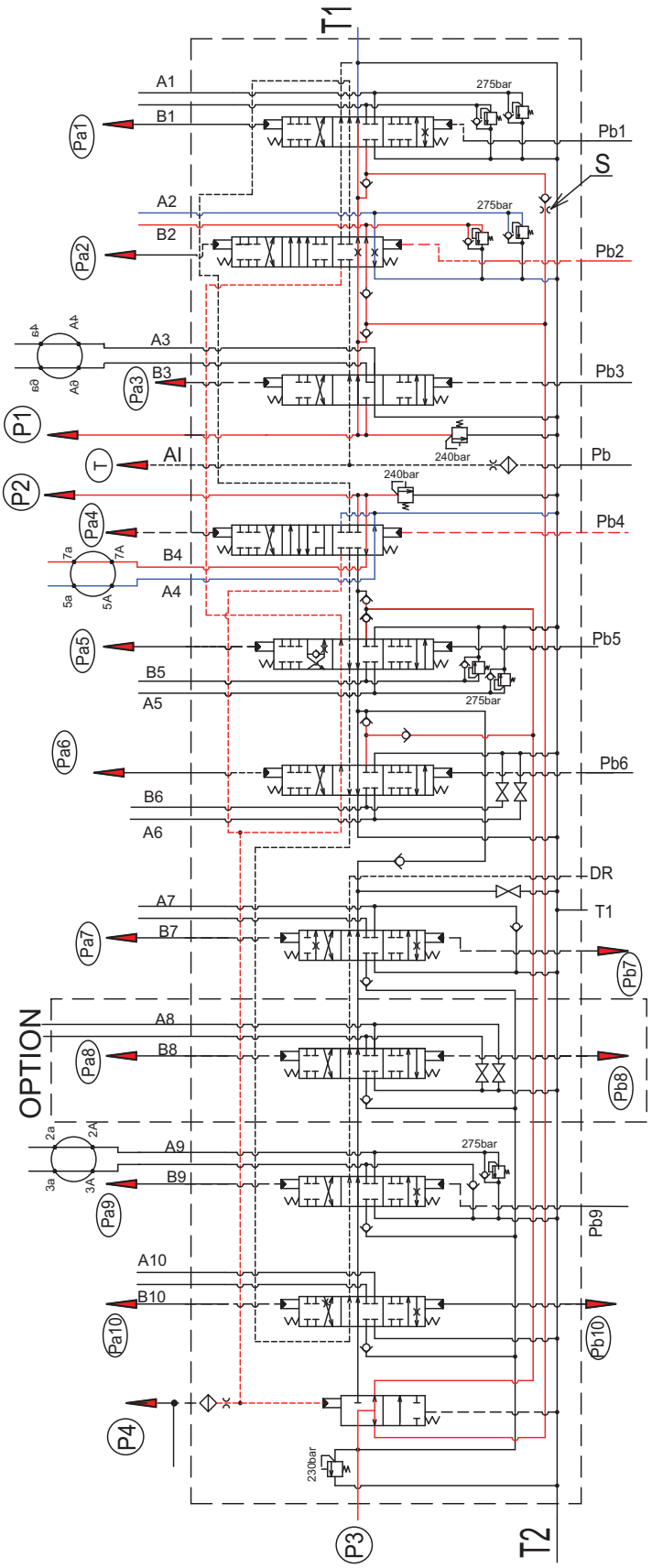
Hydraulic supply by pump 2

- Right-hand side drive section

Hydraulic supply by pump 3

- Bucket section
- Boom section
- Stick section
- Auxiliary hydraulics section
- 3rd control circuit section (option)
- Stabiliser blade section
- Swivel unit section
- Swivel boom section
- Drive counterbalancing system section

Drive counterbalancing system with boom and right-hand side drive activation



Bucket

Boom

Left-hand side drive

Input P1

Input P2

Right-hand side drive

Stick

Auxiliary hydraulics

Swivel boom

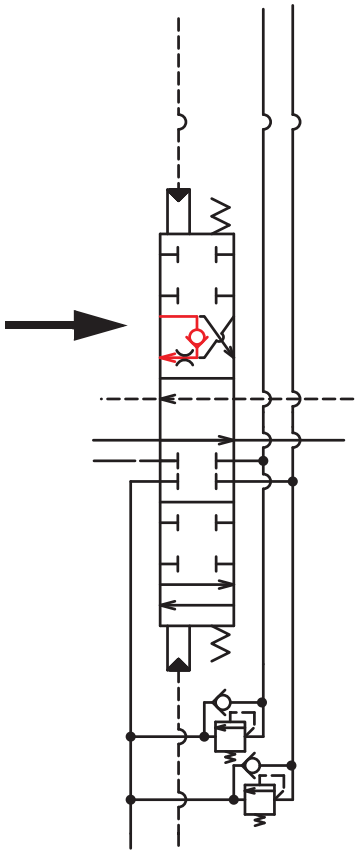
3rd control circuit option

Stabiliser blade

Rotating the upper carriage

Drive counterbalancing system

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 right-hand side drive 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.

Location

5.6 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 2-3

Set screw "against hydraulic resistance"

The valve seat is closed in this position

- P2 + P3 supply the auxiliary hydraulics section with oil
- Factory setting

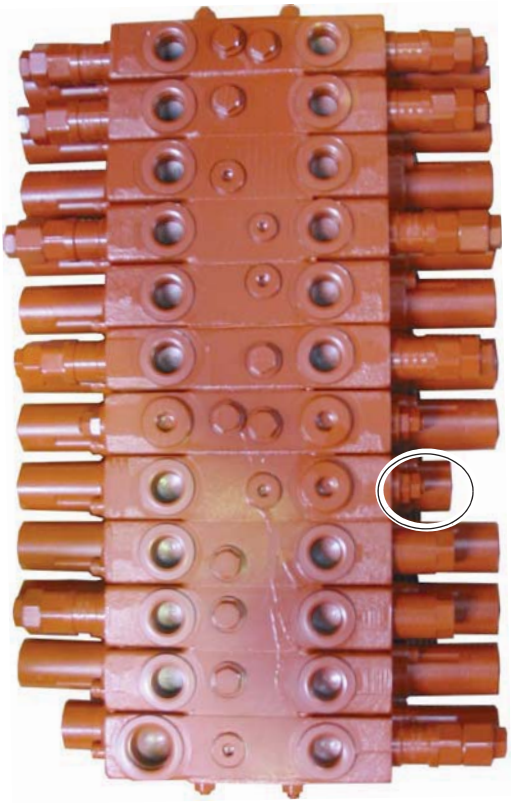
"Open" set screw

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!

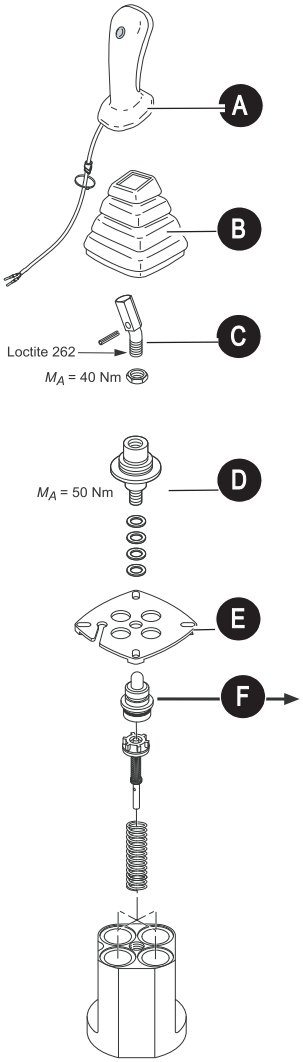
Intermediate positions of the set screws cause the hydraulic oil to warm up – danger of overheating!



5.7 Pilot valves

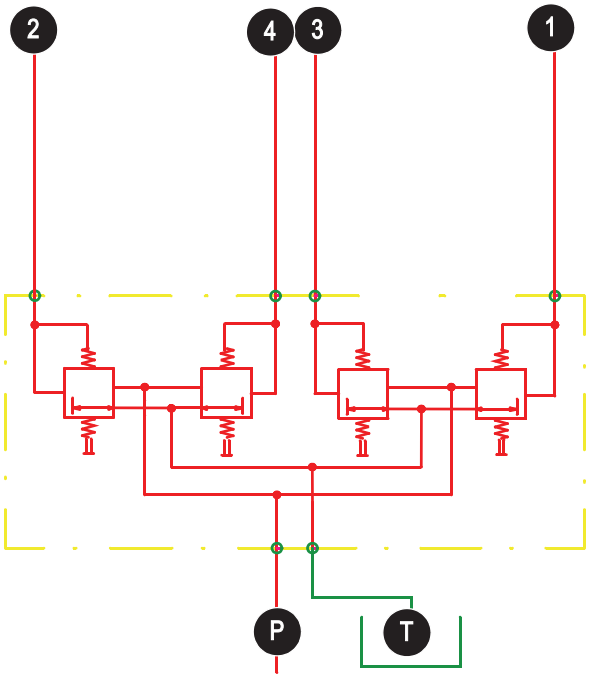
Joystick

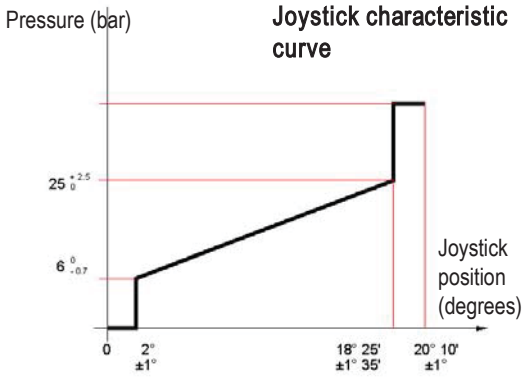
- Pilot valve for bucket, boom, stick and rotation
- Consists of a lever and four pressure reducing valves



Set of tappets
Article no.: 1000021259

Numbering for right-hand side joy-stick. Left-hand side joystick: 3-1-2-4

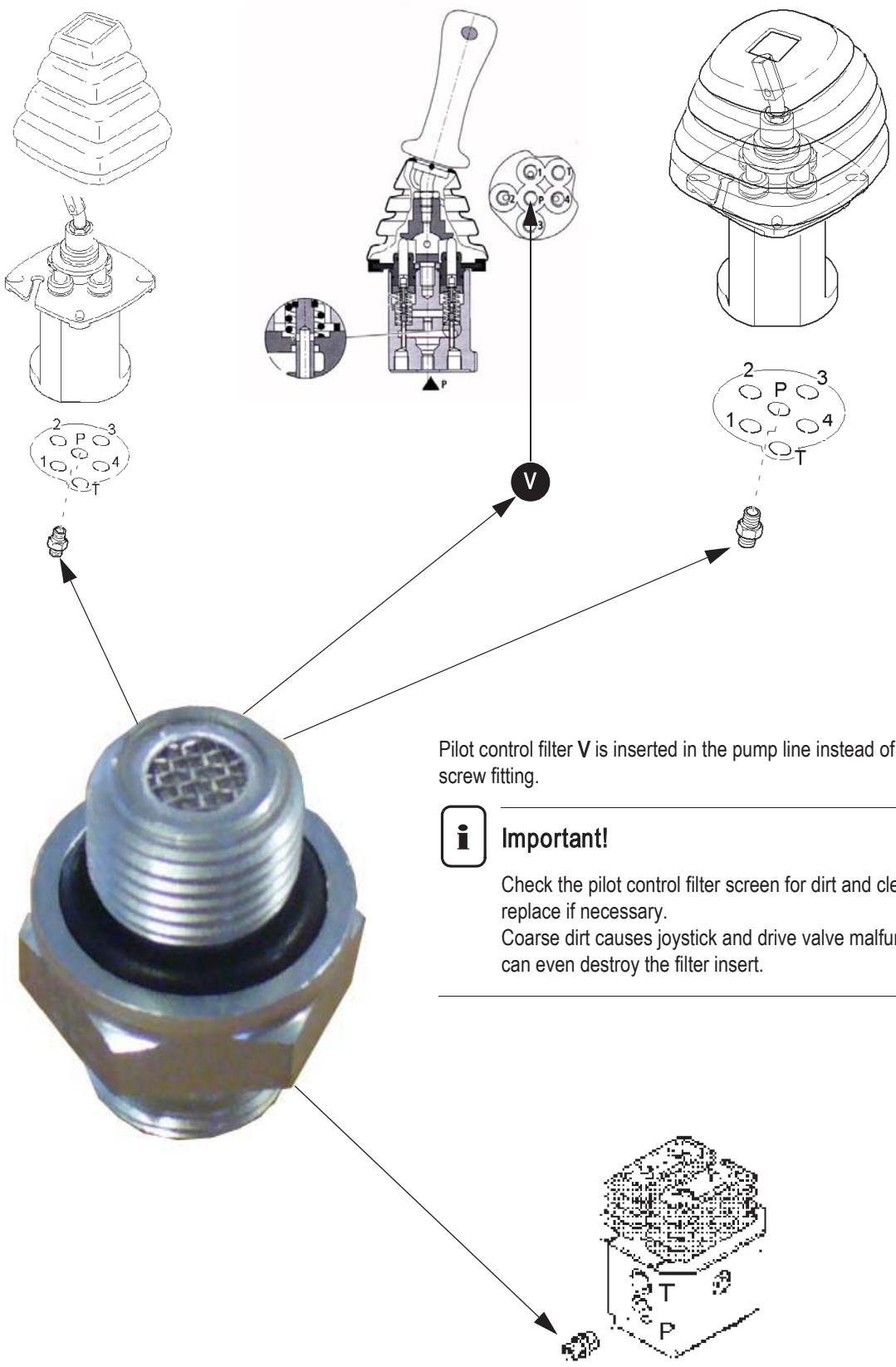




Pos.	Description	Pos.	Description (left-hand side joystick)	Description (right-hand side joystick)
A	Control lever	1	Stick extension control	Boom ram extension control
B	Rubber collar	2	Left-hand side rotation control	Bucket ram extension control
C	Linkage	3	Stick retraction control	Boom ram retraction 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

Joystick up to model: **AD05131**

Joystick from model: **AD05132**



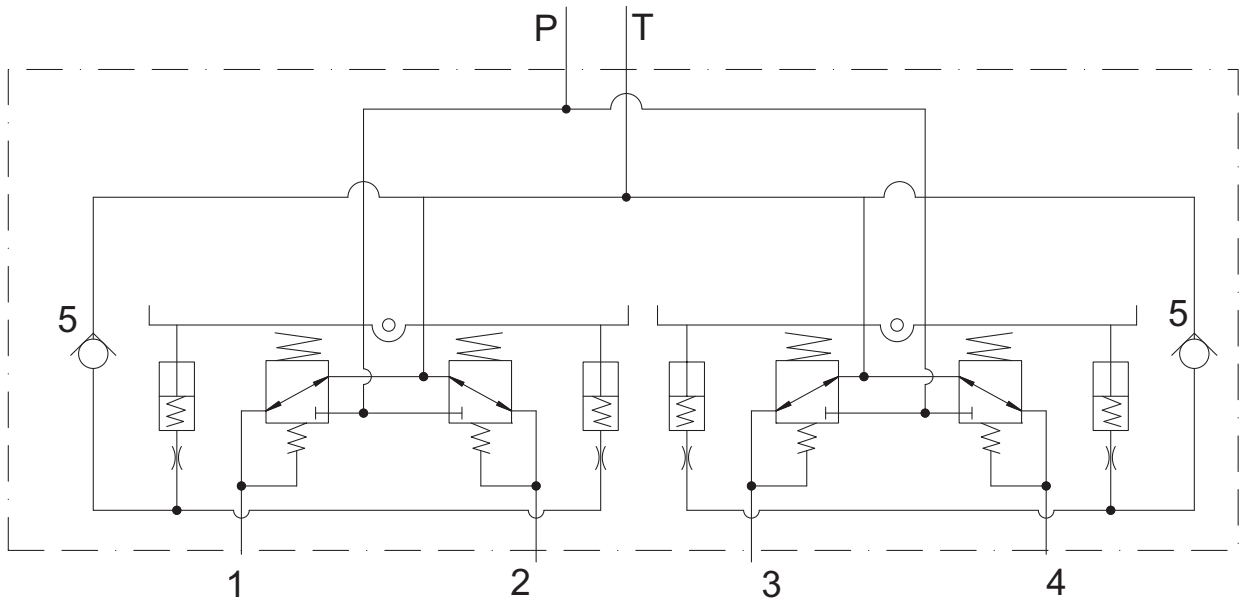
Pilot control filter **V** is inserted in the pump line instead of the GE screw fitting.

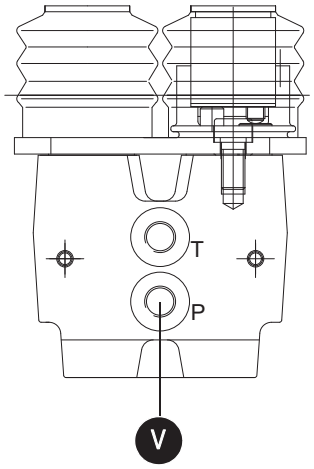
Important!

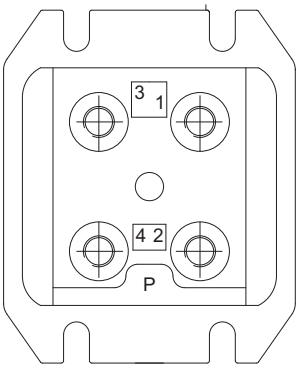
Check the pilot control filter screen for dirt and clean or replace if necessary.
Coarse dirt causes joystick and drive valve malfunctions and can even destroy the filter insert.

Pilot valve (driving)

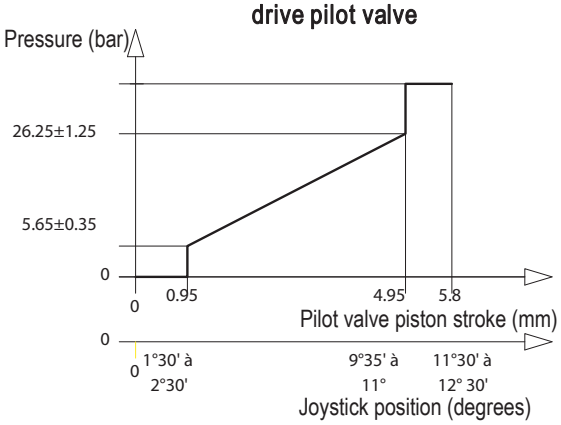
- Pedal with hydraulic damping
- Consists of two pedals and four pressure reducing valves



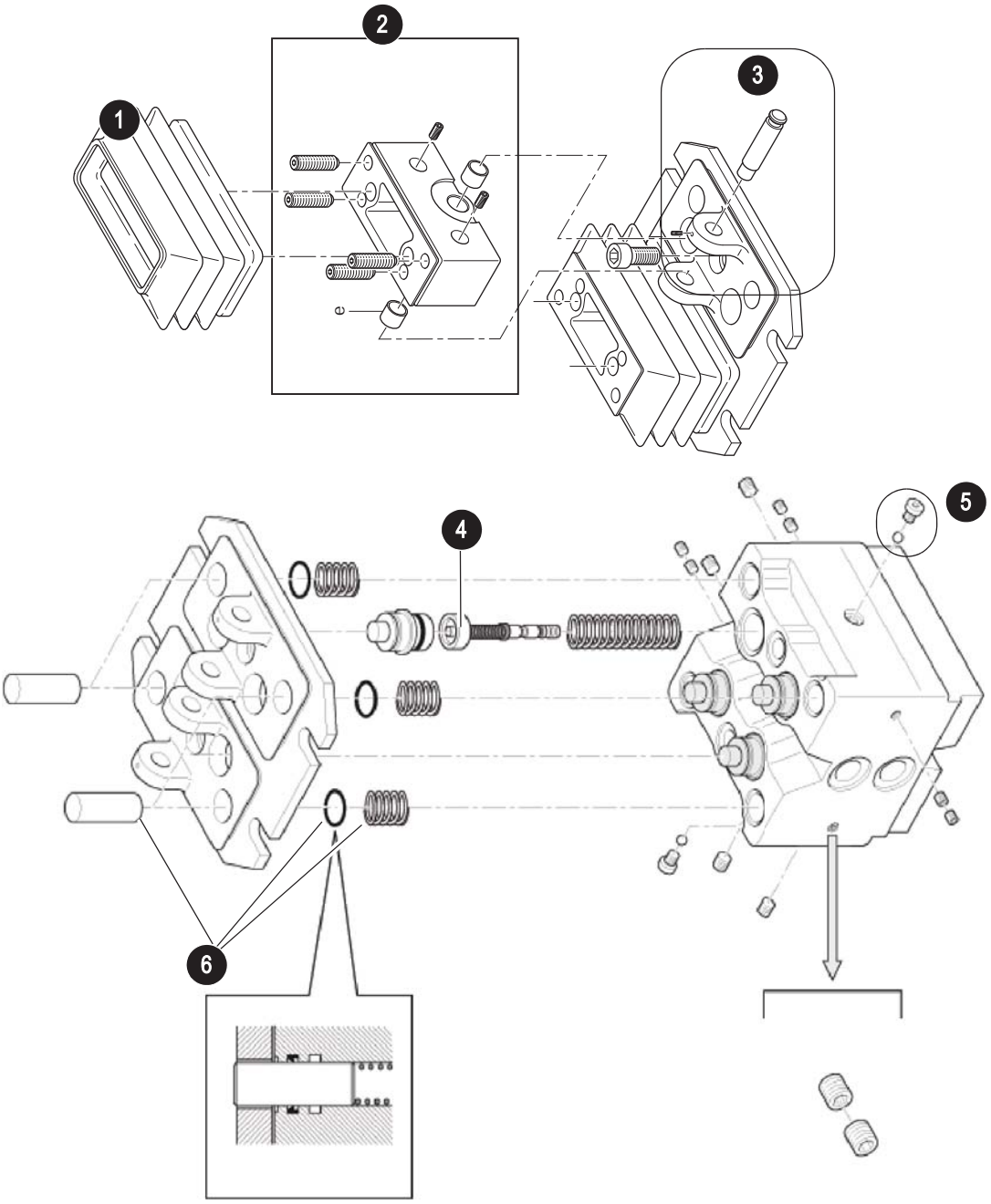




Characteristic curve for drive pilot valve



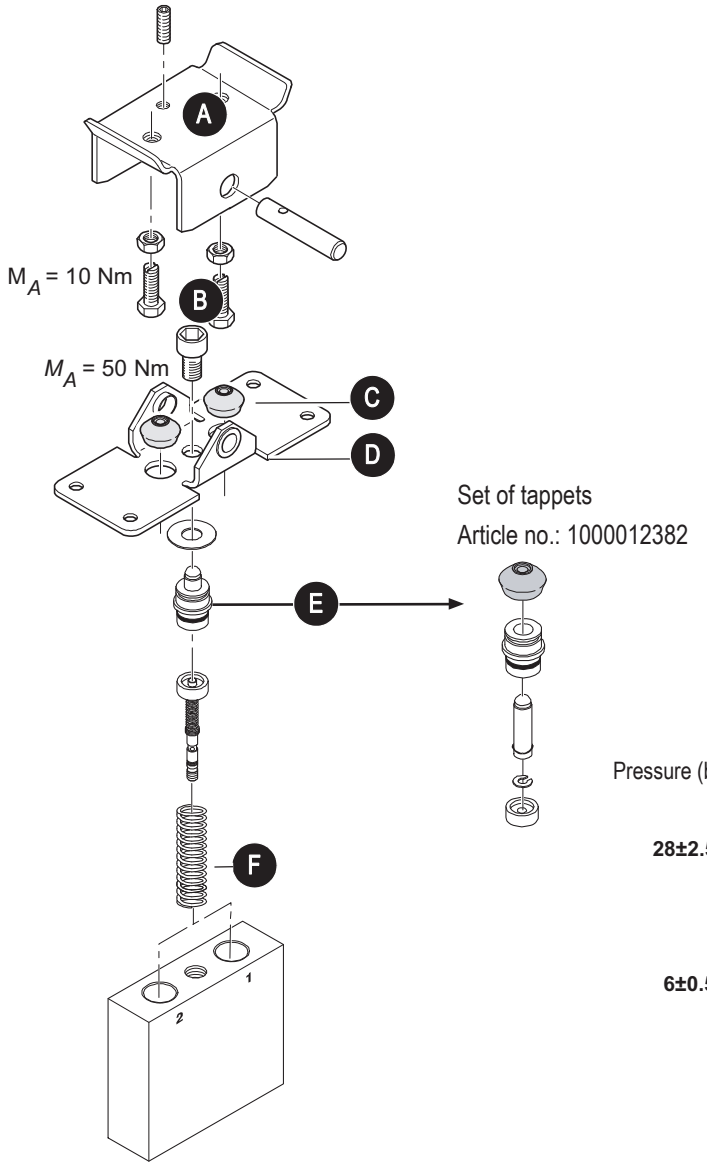
Pos.	Description
1	Left-hand side drive segment control
2	Left-hand side drive segment control
3	Right-hand side drive segment control
4	Right-hand side drive segment control
5	Non-return valve
P	Pilot control pressure
T	Tank line
V	Pilot control filter



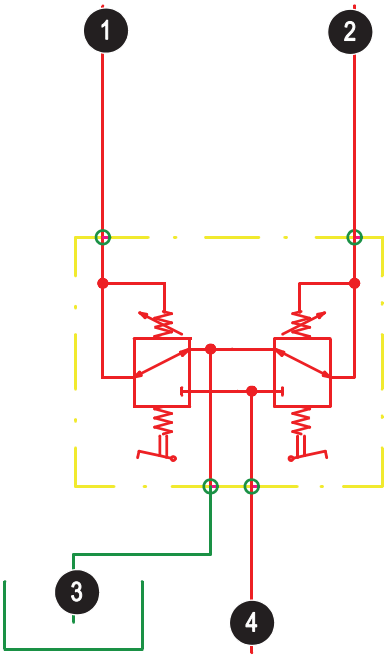
Pos.	Description
1	Bellows
2	Shift unit (kit)
3	Plate (kit)
4	Tappet
5	Non-return valve (also used for bleeding pedal damping)
6	Damping

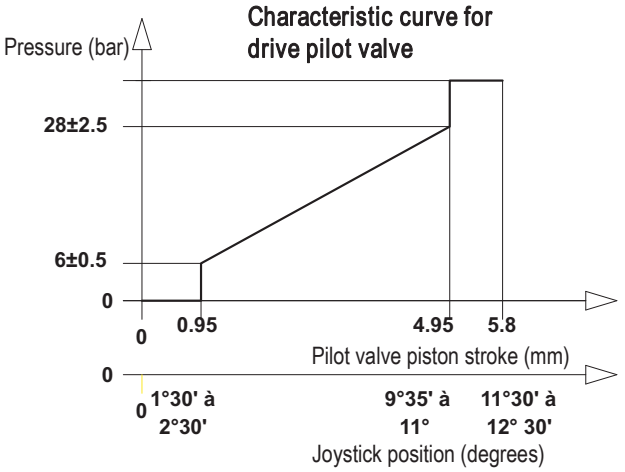
Pilot valve for auxiliary hydraulics

- Pilot control unit with pedals for remote control of directional valves
- Consists of a pedal and two pressure reducing valves



Set of tappets
Article no.: 1000012382



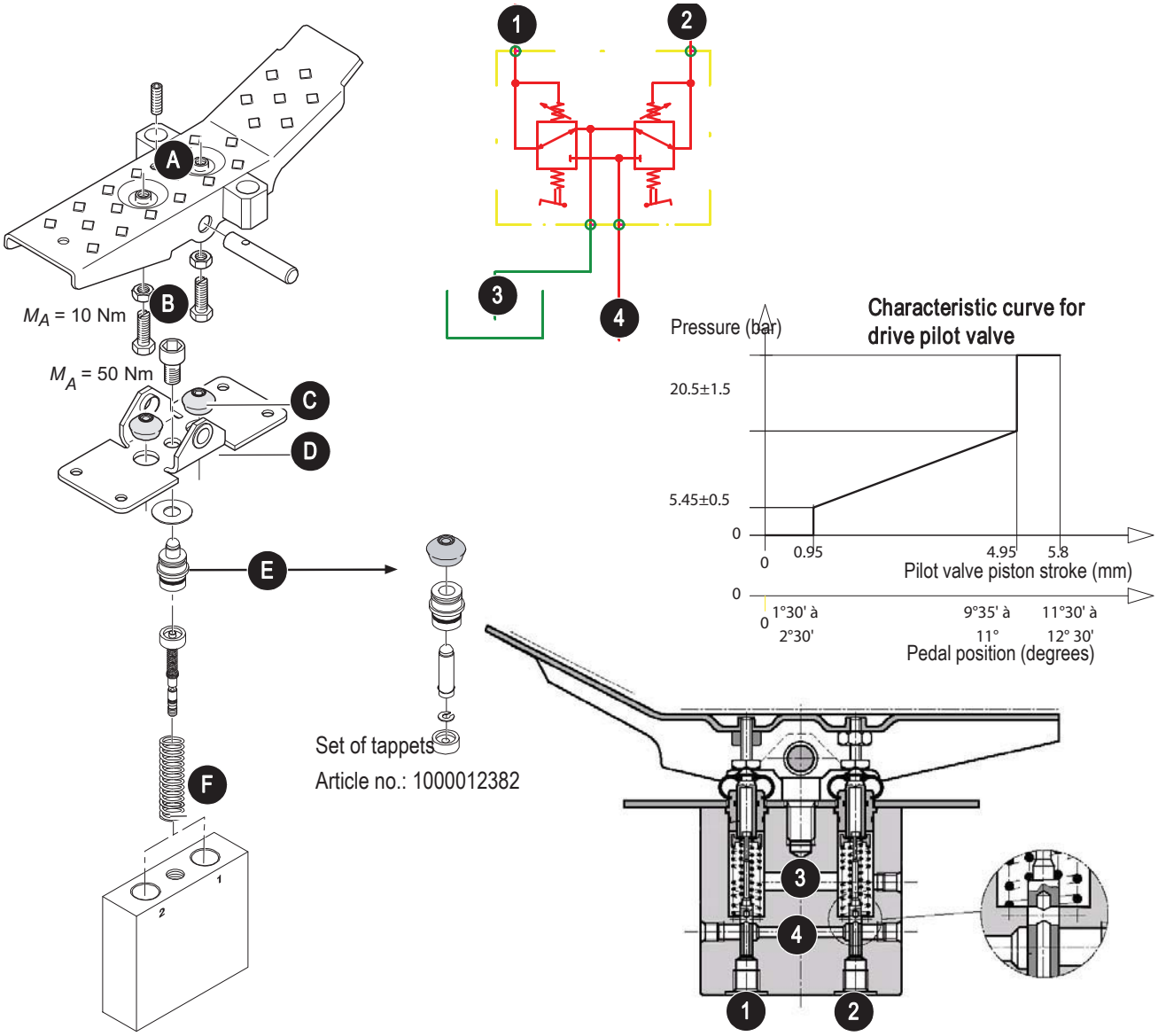


Pos.	Description	Pos.	Description
A	Pedal	1	Auxiliary hydraulics control/offset ram extension control
B	Pedal fixture	2	Auxiliary hydraulics control/offset ram retraction control
C	Protective caps	3	Tank line
D	Mounting plate	4	Supply from pilot oil supply unit
E	Tappet		
F	Spring		

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.*

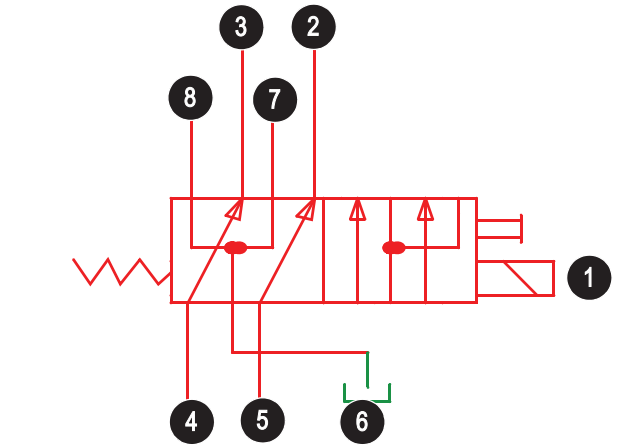
Pos.	Description	Pos.	Description
A	Pedal	1	Stabiliser blade ram extension control
B	Adjusting screws	2	Stabiliser blade ram retraction control
C	Protective caps	3	Tank line
D	Mounting plate	4	Supply from pilot oil supply unit
E	Tappet		
F	Springs		

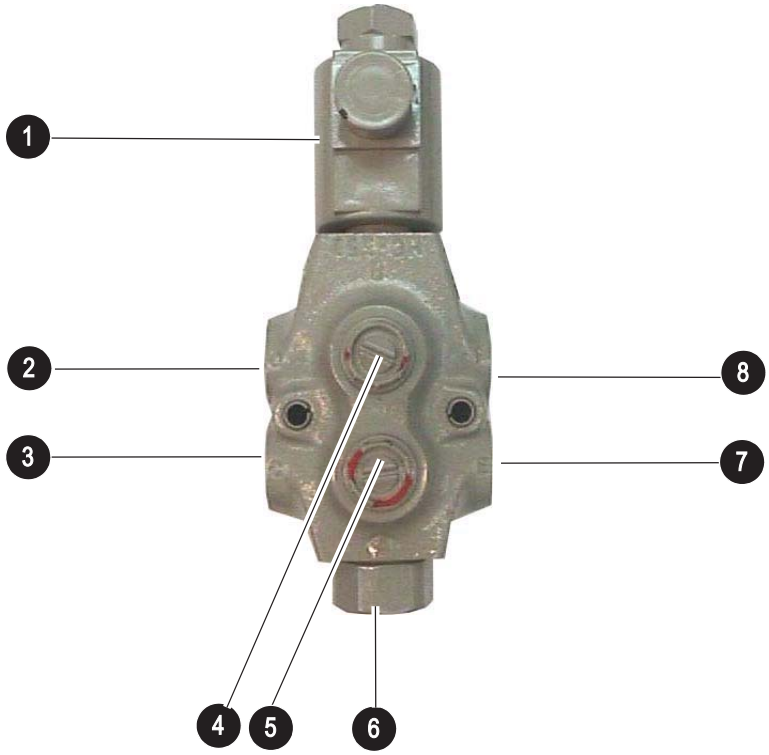
5.8 Valves

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.



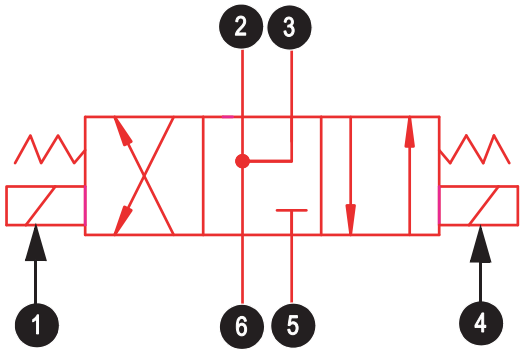


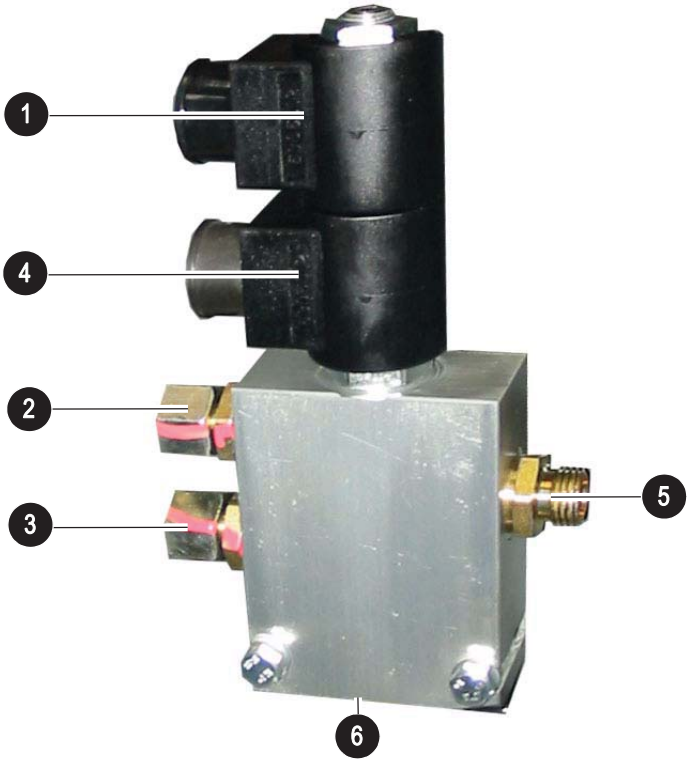
Pos.	Description
1	Solenoid
2	Main valve block for auxiliary hydraulics segment
3	Main valve block for auxiliary hydraulics segment
4	Pilot valve for auxiliary hydraulics
5	Pilot valve for auxiliary hydraulics
6	Tank line
7	Shuttle valve block/main valve block, offset ram retraction control
8	Shuttle valve block/main valve block, offset ram extension control

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.



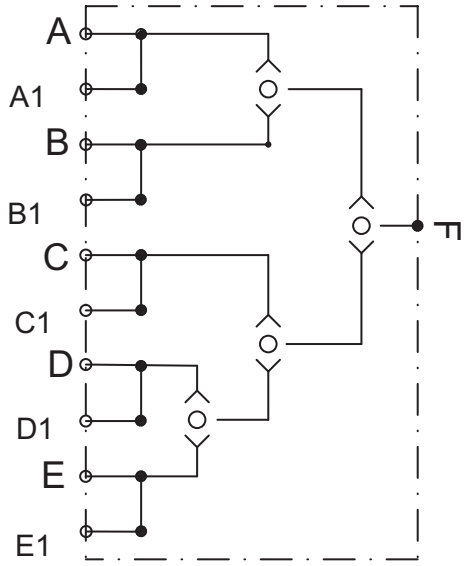


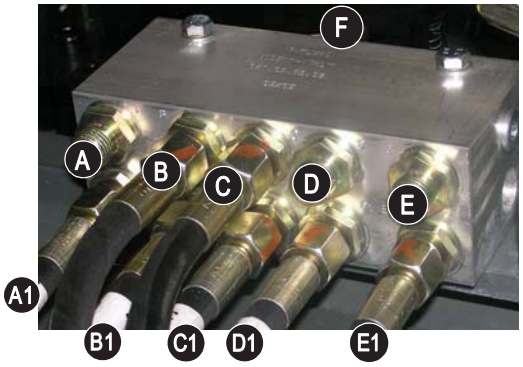
Pos.	Description
1	Solenoid 1
2	Main valve block for auxiliary hydraulics segment
3	Main valve block for auxiliary hydraulics segment
4	Solenoid 2
5	Supply from pilot oil supply unit
6	Tank line

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

Changeover valve for SAE/ISO controls (option)

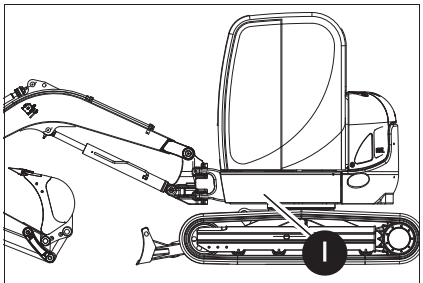


Fig. 1: Directional valve position

The directional valve is located on the left in base plate **I** of the chassis.

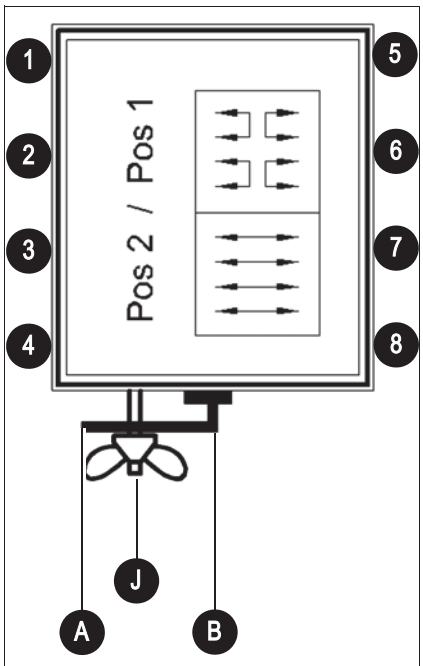


Fig. 2: Directional valve

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!

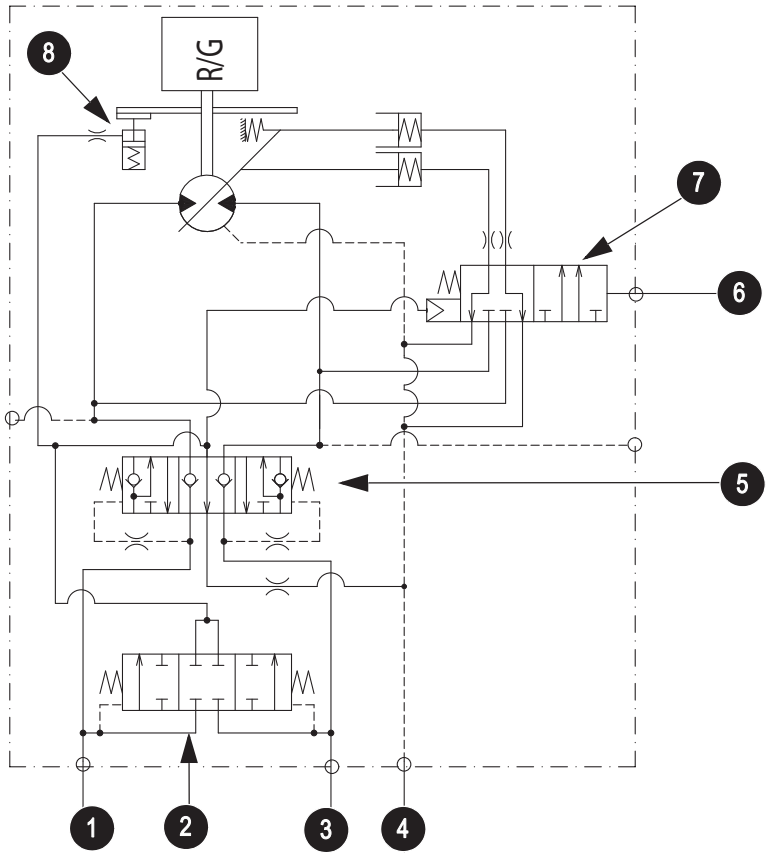
☞ *Make sure you know which control mode has been selected before starting work*

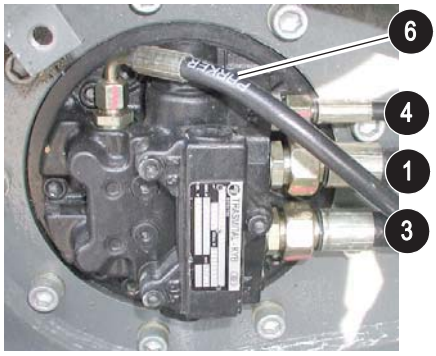
☞ *Always secure wing nut **J** on the changeover lever of the directional valve*

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

5.9 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

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 release piston and the brake piston slowly return to their base positions (via the throttle). 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.

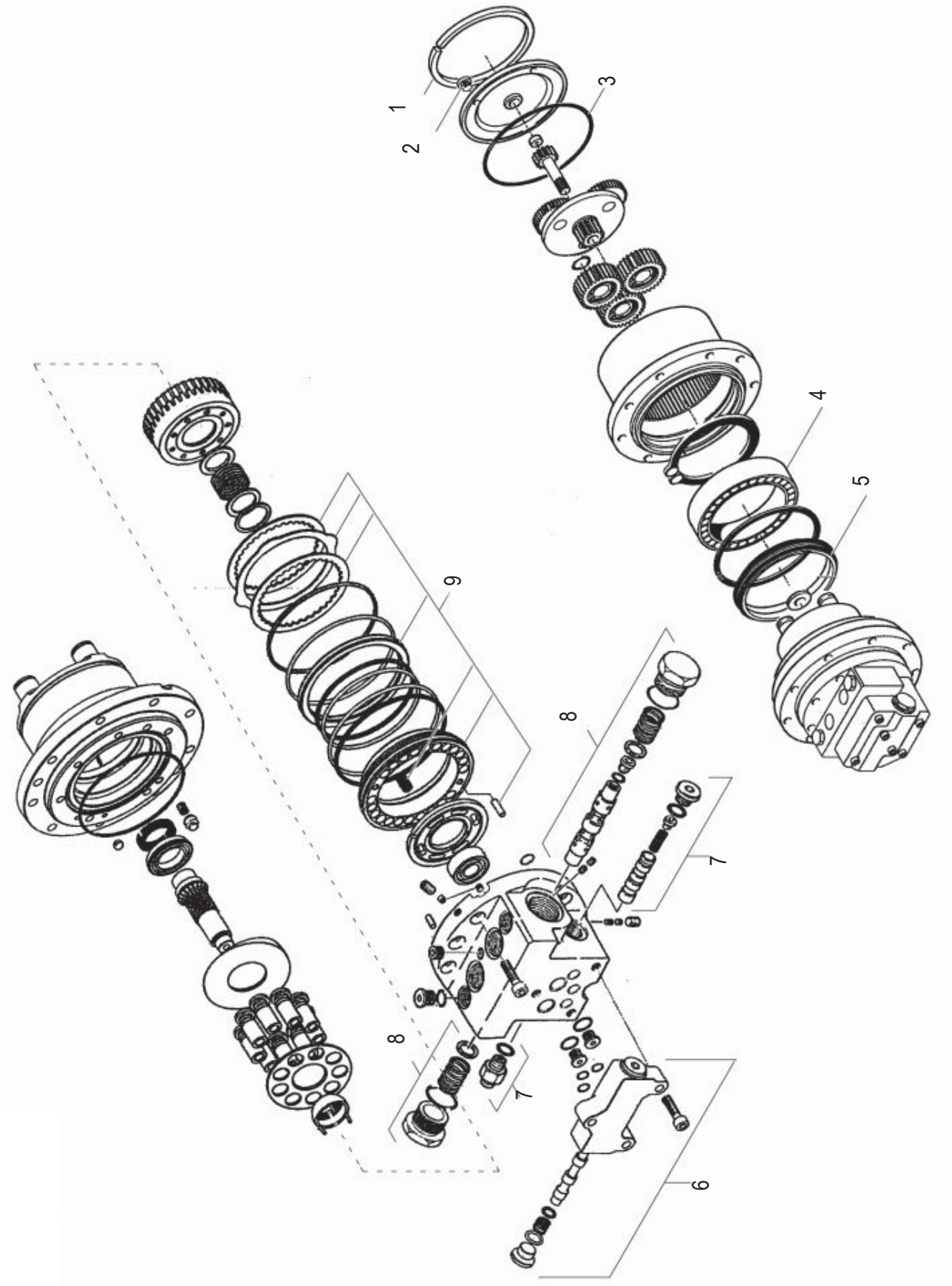
If the pressure rises in the travelling drive, the directional valve for the 2nd speed range is forced back to home position and and hydraulic motor's swash plate returns to maximum capacity.

➥ 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.

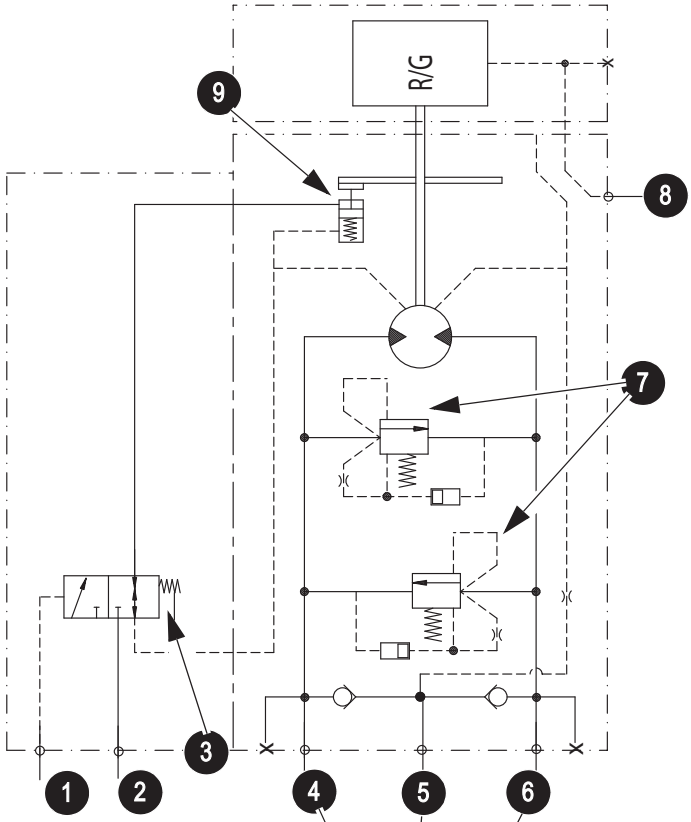
Switch operating point of valve pos. 6: 180 bar (2611 psi)

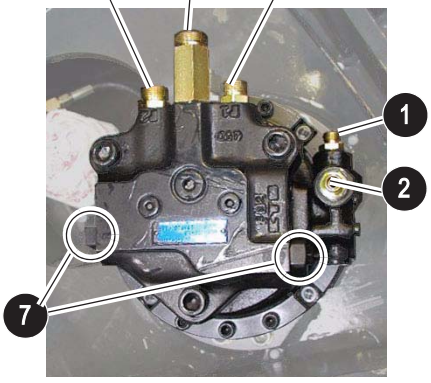

1
2
3
4
5
9
8
7
8
7
6

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

5.10 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 upper carriage rotation port (-> main valve block)
5	Anticavitation line port (-> main valve block/tank)
6	Left-hand side upper carriage 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.

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.

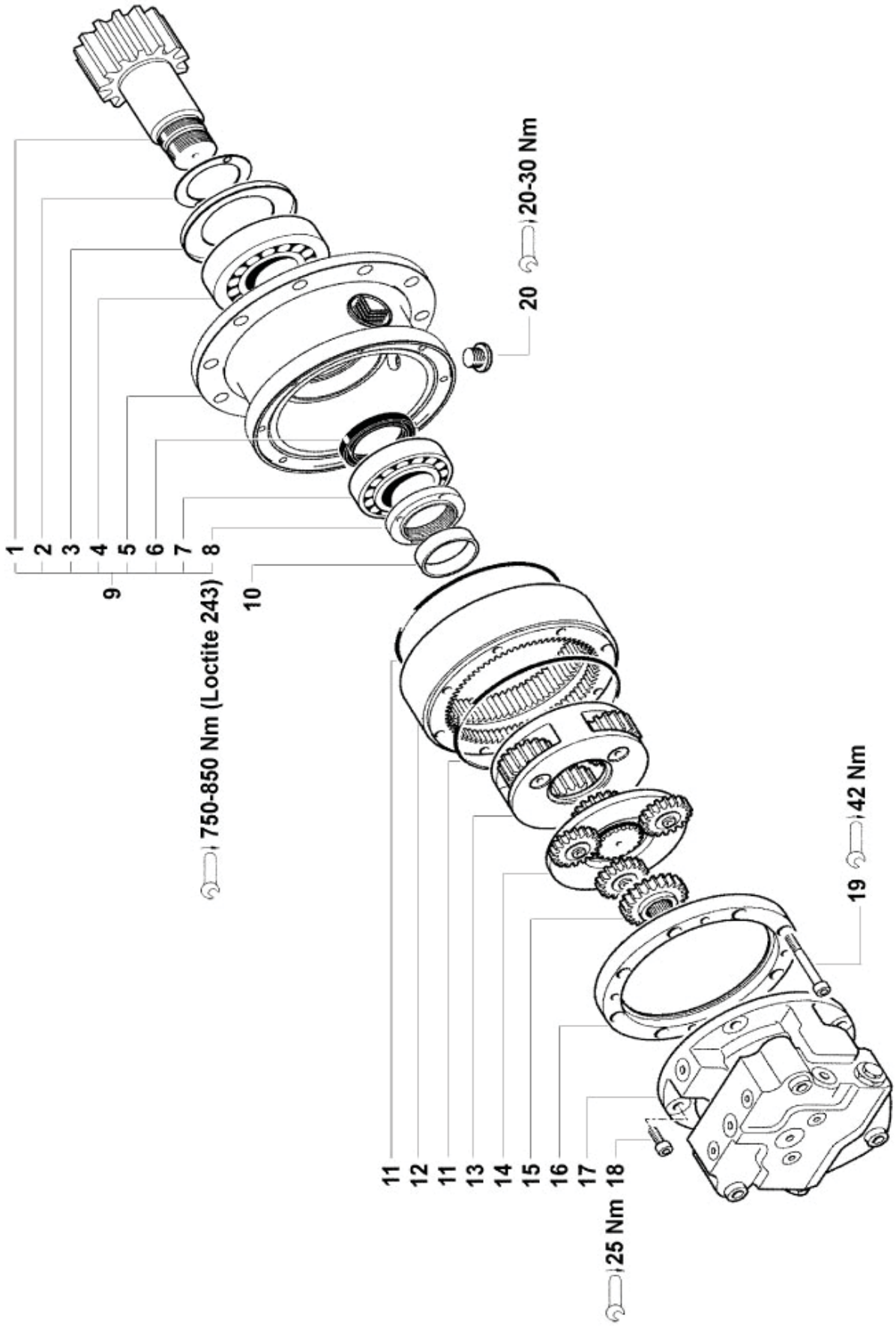
- Movement: upper carriage rotation, boom swivel or stick retraction
- Pilot control pressure is present at the SH input
- The piston of the brake release valve moves to work position
- Pilot control pressure is directed to the brake piston
- Brake is released

Closing the brake

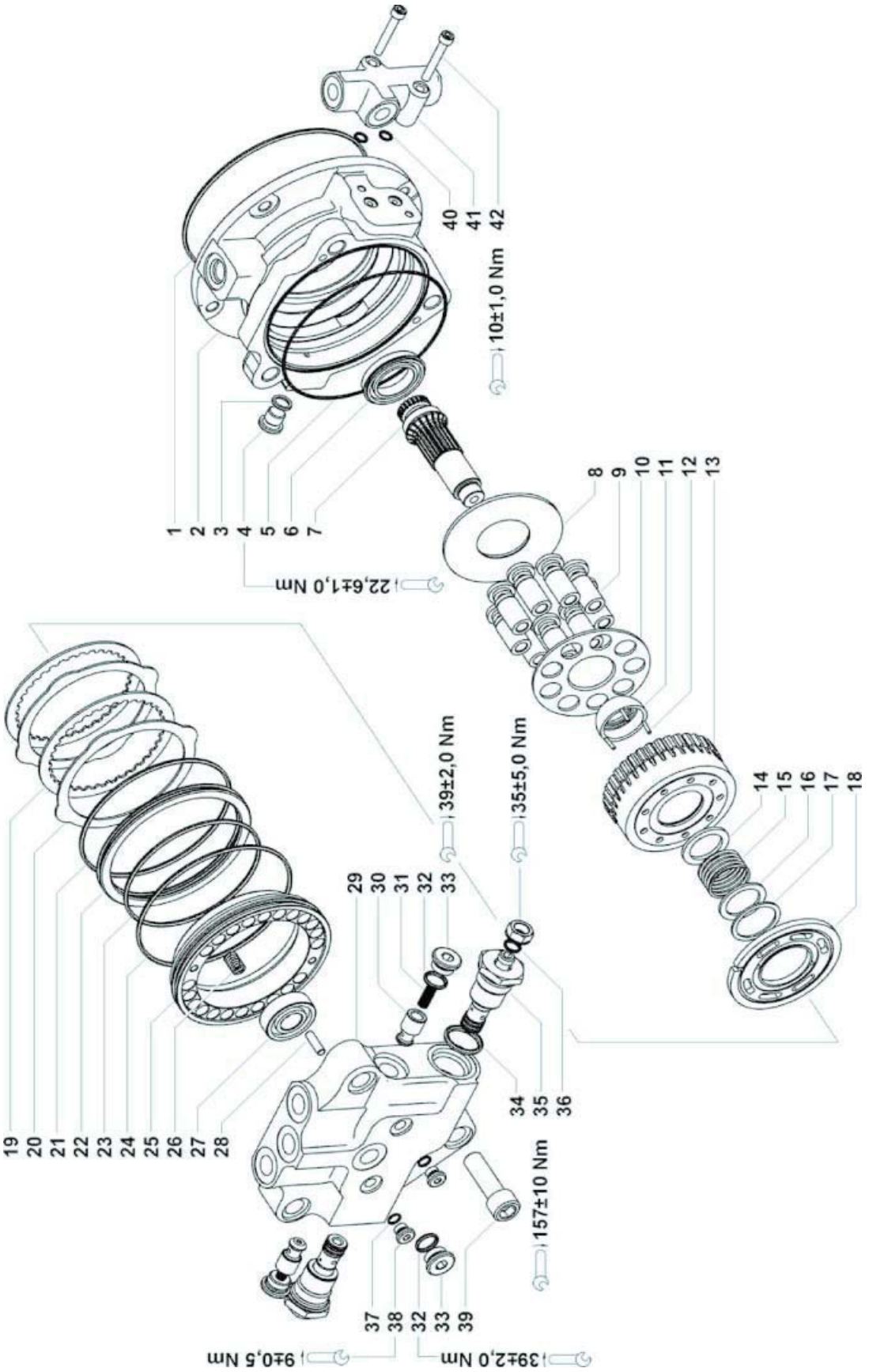
The shuttle valve block causes the pilot control pressure to drop and the SH input is unpressurised upon termination of upper carriage rotation, boom swivel or stick retraction. With no pressure at the SH input, the piston of the brake release valve moves to home position (braking). The pressure in the 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


1
2
3
4
5
6
7
8
9
10
11
12
11
13
14
15
16
17
18
20
20-30 Nm
750-850 Nm (Loctite 243)
19
42 Nm
25 Nm

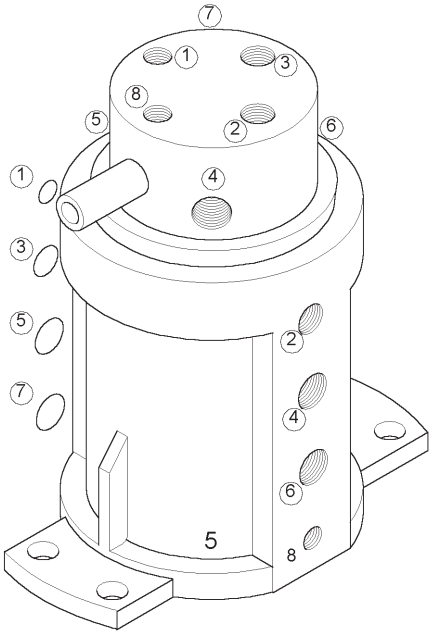
Pos.	Description
1	Pinion shaft
2	Spacer washer
3	Bearing seal ring
4	Bearing
5	Gear housing
6	Sealing ring
7	Bearing
8	Round nut
9	Complete drive
10	Spacer washer
11	O-ring
12	Ring gear
13	Gear reduction
14	Gear reduction
15	Sun gear
16	Motor flange
17	Hydraulic motor
18	Screw
19	Screw
20	Plug

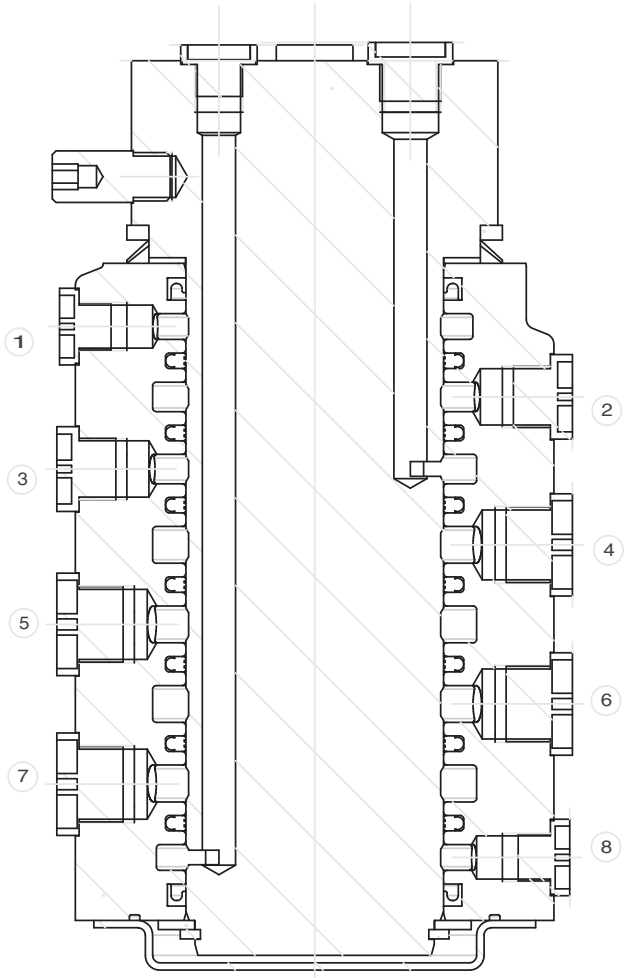

1
2
3
4
5
6
7
22,6±1,0 Nm
8
9
10
11
12
13
14
15
16
17
18
10±1,0 Nm
40
41
42
39±2,0 Nm
35±5,0 Nm
29
30
31
32
33
34
35
36
19
20
21
22
23
24
25
26
27
28
157±10 Nm
37
38
32
33
39
9±0,5 Nm
39±2,0 Nm

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

5.11 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

5.12 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
- Opens at 0.4 bar (5.8 psi)

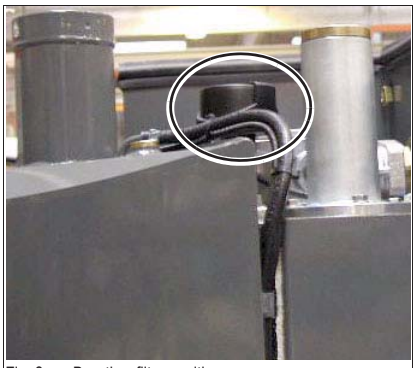


Fig. 3: Breather filter position

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 h under all circumstances!

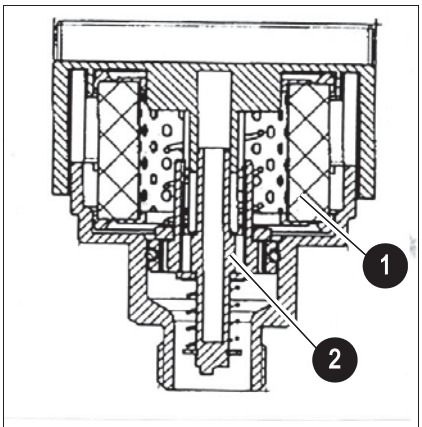


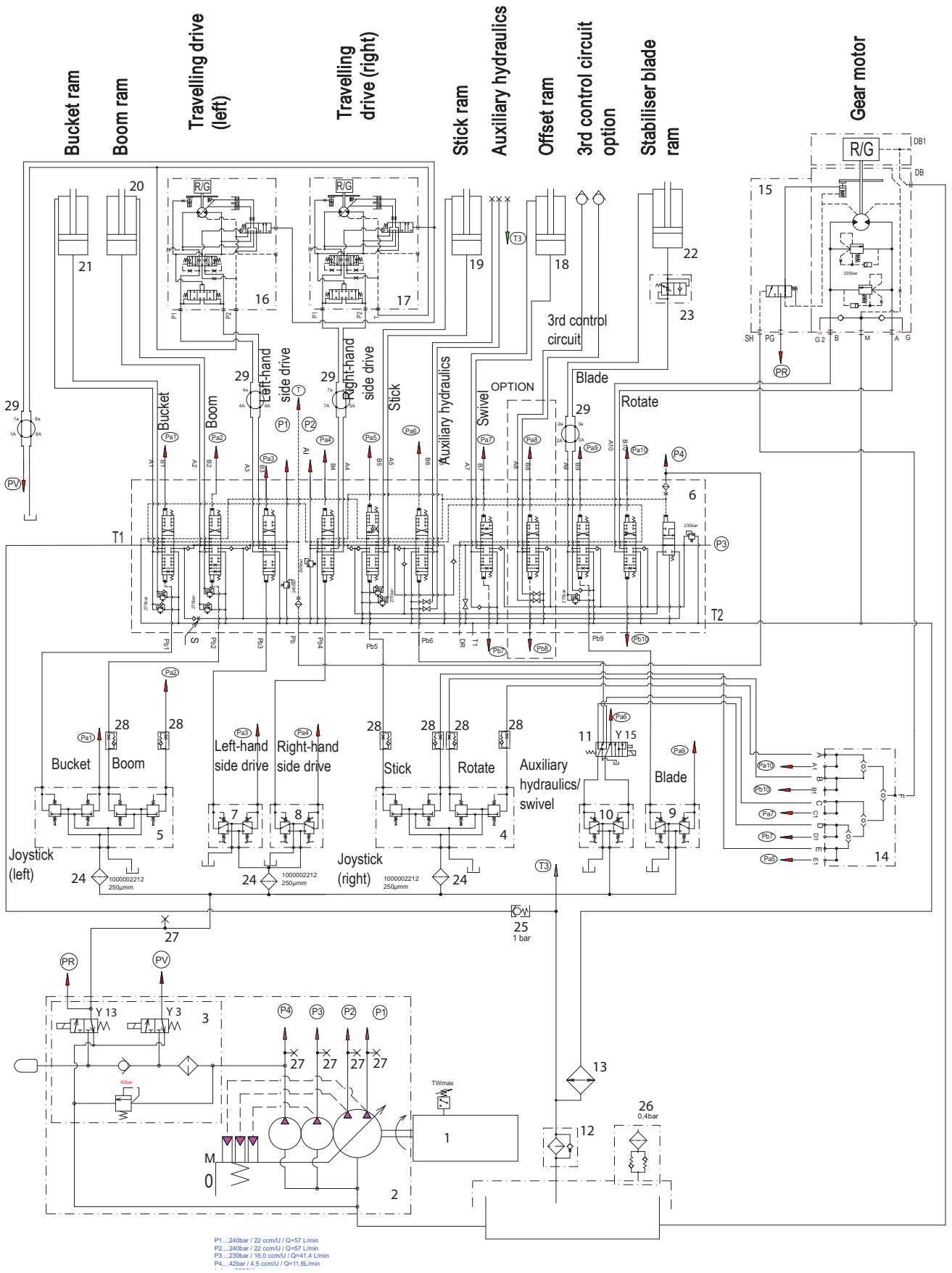
Fig. 4: Breather filter

Pos.	Description
1	Filter fabric
2	Bleeder valve

5.13 Troubleshooting in the hydraulic system

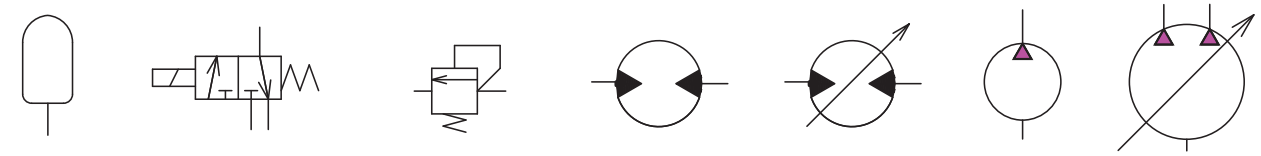
Problem	Possible causes
Hydraulic system without function	Defective safety switch on control lever base
	Wrong setting of safety switch on control lever base
	Defective solenoid valve on pilot oil supply unit
	Contaminated solenoid valve on pilot oil supply unit
	Hydraulic oil level too low
	Defective 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

5.14 Hydraulics diagram A4



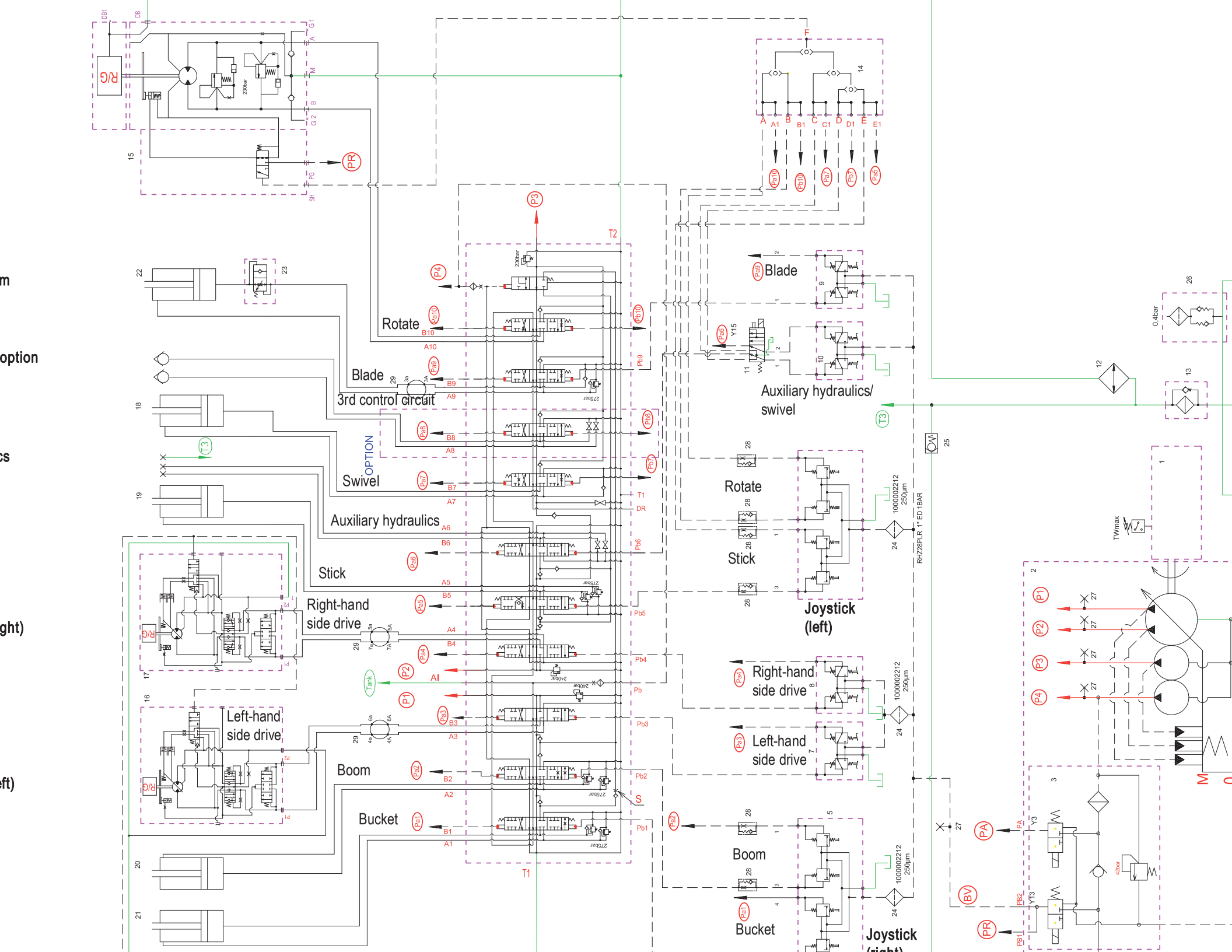
5.15 Hydraulics diagram (legend)

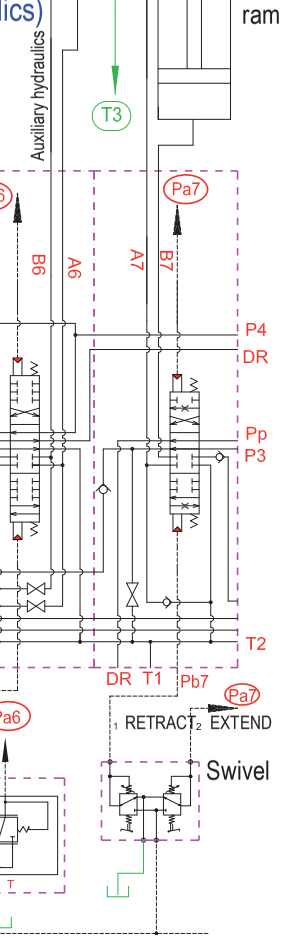
Pos.	Description
1	Diesel engine
2	Variable displacement pump + gear pump
3	Pilot oil supply unit
4	Left-hand side joystick pilot valve
5	Right-hand side joystick pilot valve
6	Main valve block
7	Left-hand side drive pilot valve
8	Pilot valve for drive (right)
9	Stabiliser blade pilot valve
10	Boom swivel pilot valve
11	Changeover valve: boom swivel/auxiliary hydraulics
12	Oil filter
13	Oil cooler
14	Shuttle valve block
15	Swivel unit
16	Travelling drive (left)
17	Travelling drive (right)
18	Offset ram
19	Stick ram
20	Boom ram
21	Bucket ram
22	Stabiliser blade ram
23	Hose burst valve
24	Pilot control filter
25	Throttle non-return valve
26	Breather filter
27	Measurement ports
28	Throttle non-return valve
29	Swivel joint

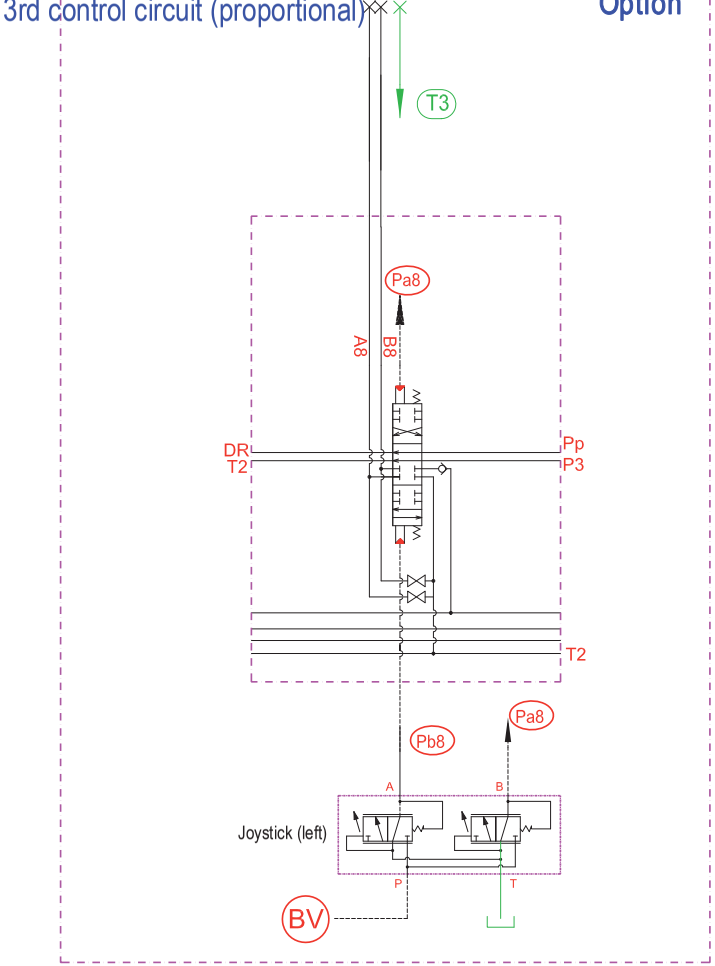


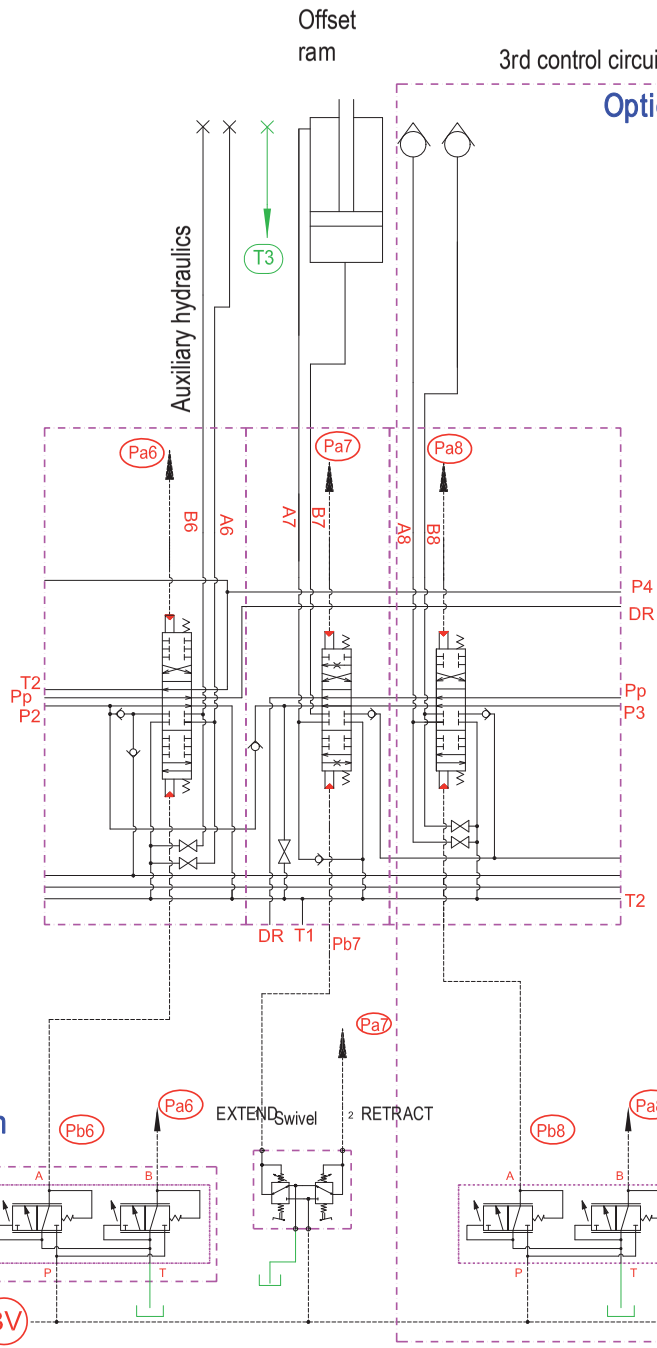
Pressure accumulator | Spring-loaded solenoid valve | Pressure limiting valve | Fixed displacement motor | Variable displacement motor | Fixed displacement pump | Double variable displacement pump

Tank line | Measuring port | Stop cock | Non-return valve | Throttle orifice | Oil cooler | Filter | Double-acting ram

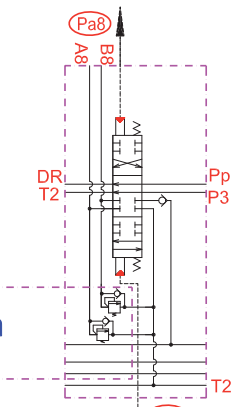

Rotate
Blade
3rd control circuit
OPTION
Swivel
Auxiliary hydraulics
Stick
Right-hand side drive
Left-hand side drive
Boom
Bucket
Auxiliary hydraulics/ swivel
Joystick (left)
Joystick (right)
RHZ28PLR 1" ED 1BAR
T1
T2
T3
P1
P2
P3
P4
PR
PA
PB
BV
DR
S
Tank



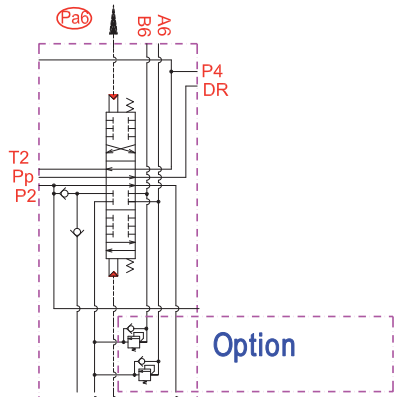




ol circuit shock cartridge



Auxiliary hydraulics shock cartridge



Grab

Bucket ram

on

A1 B1

rab is controlled by the
t pilot valve.

Boom

A2

Option

M

T

A2 Pb2 B2

SAE valve

Option

Pb5

Pa5

Pa2

Pb2

Pb2 Pa2 Pb5

1000015576
RHV8PL
1/4 ED
0,3 BAR
BG: 0,7MM

RETRACT EXTEND RETRACT

1000002212
250µm

BV

Right-hand side
joystick pilot valve

Safe load indicator FR

Boom

B2

A2

M

T

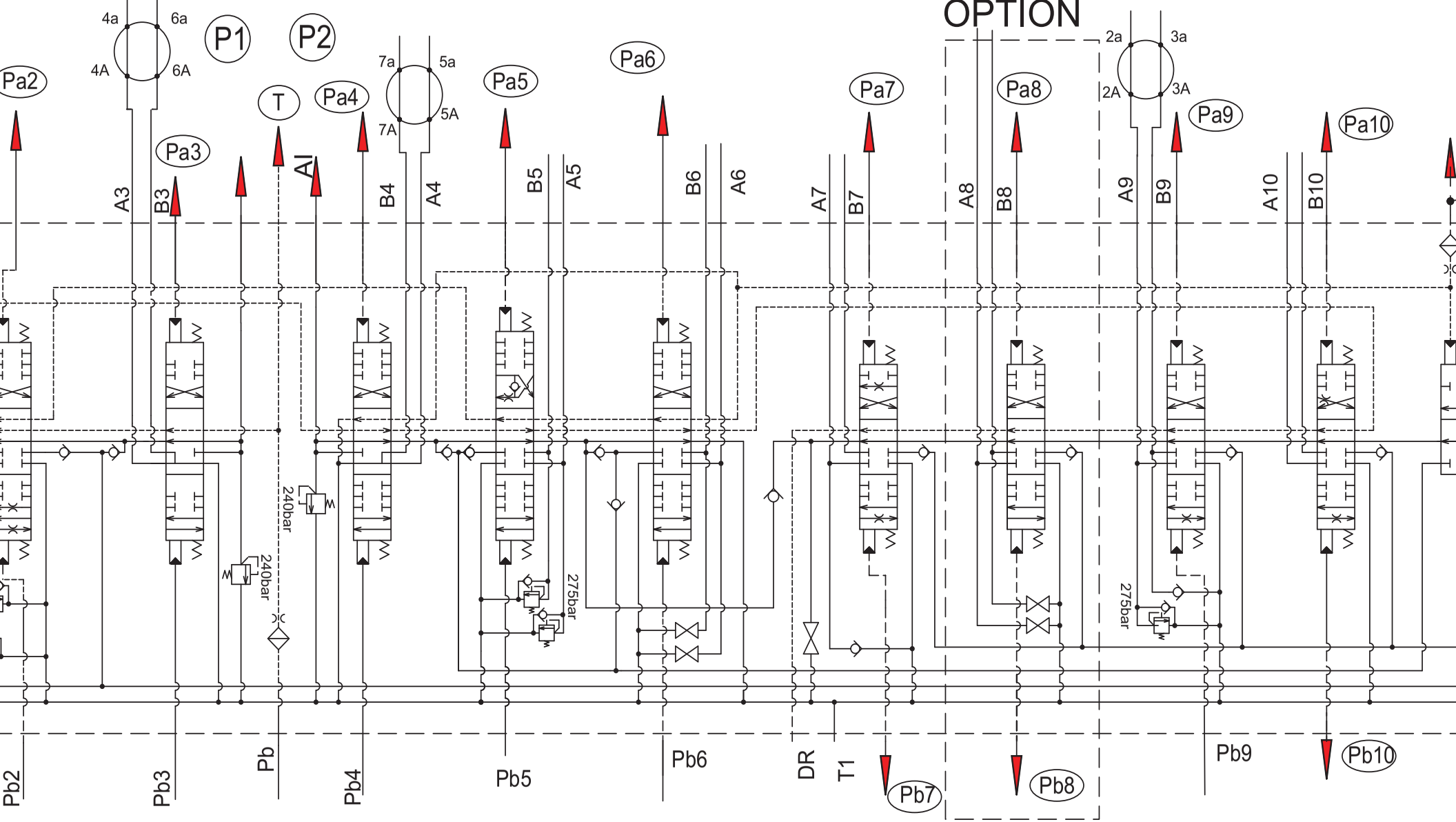
Stick

B5

A5

M

T



	Controlled via
	Joystick (left)
	Joystick (left)
trol	Drive pedal (left)
ntrol	Drive pedal (right)
	Joystick (right)
rol	Auxiliary hydraulics pedal
	Auxiliary hydraulics pedal
ol)	4/3 directional valve

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	3rd control circuit

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 ta
T2	Tank line via oil cooler and filter in tank

S: bucket pre-tension – *see S: bucket pre-tension* on page 5-7

Electric system

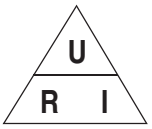
6 Electric system

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 (Ω)

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).

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.

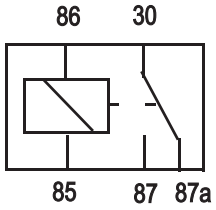


Fig. 1: Terminal description on relay

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)

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 in instrument panel

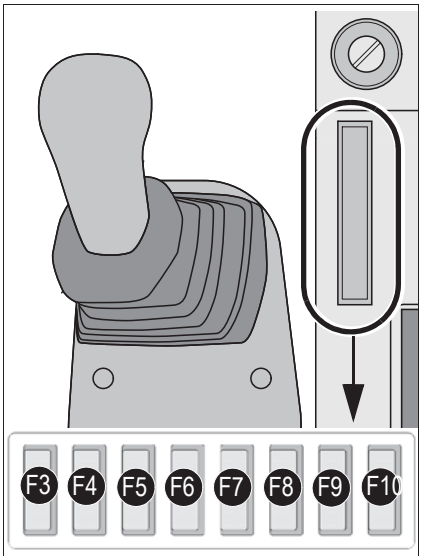


Fig. 2: Fuse box

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

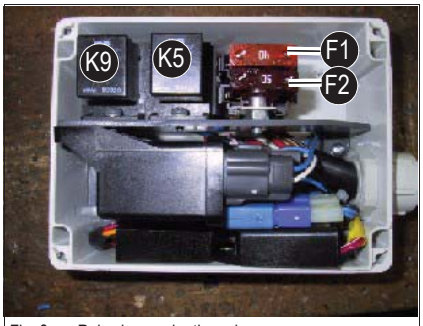


Fig. 3: Relay box under the cab

The main fuse box is located under the cab.

Fuse no.	Rated current (A)	Protected circuit
F1	40 A3	– Start, preheat, cutoff solenoid
F2	50 A3	– Fuel-filling pump, main fuse, ignition lock

Relay no.	
K 9	– Cutoff solenoid switching relay
K 5	– Preheating high current relay

6.8 Relays

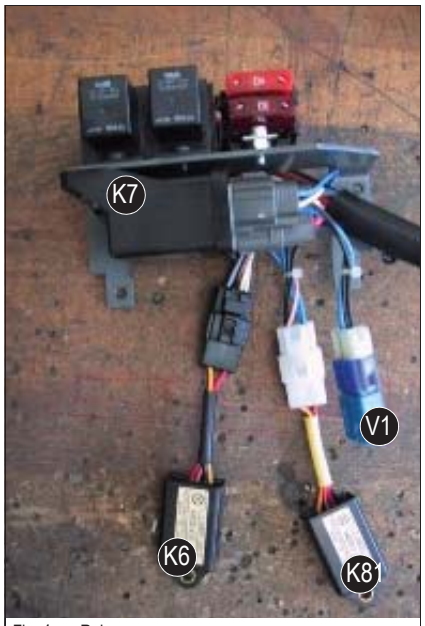


Fig. 4: Relays

The relays are located in the relay box under the cab, next to the swivelling console

Switching relay no.	Protected circuit
K 6	– 10 s preheating timer (telltale only); black plug
K 7	– Starting relay
K 8	– 1s cutoff solenoid timer; white plug
V 1	– Cutoff solenoid recovery diode

6.9 Socket

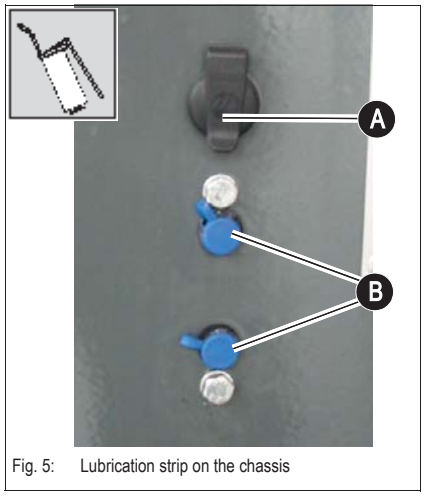


Fig. 5: Lubrication strip on the chassis

The socket **A** is located above the lubrication strip **B**.

6.10 Joystick tip switches

Joystick (left)

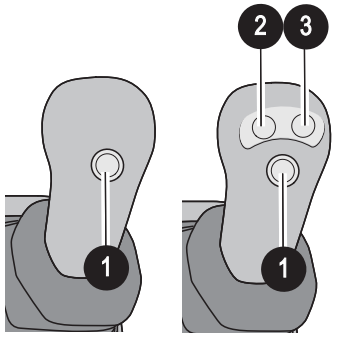


Fig. 6: Left-hand side joystick (standard and option)

Pos.	Description
1	Changeover or boom swivel and auxiliary hydraulics (S27)
2	Tip switch for additional control circuit (S30)
3	Tip switch for additional control circuit (S31)

Joystick (right)

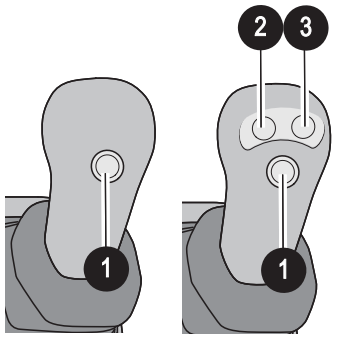
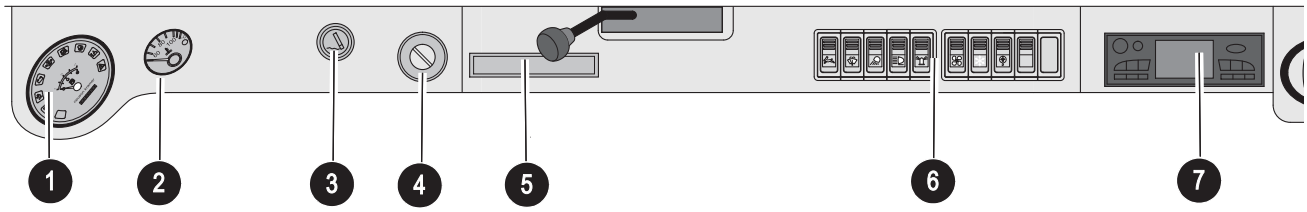
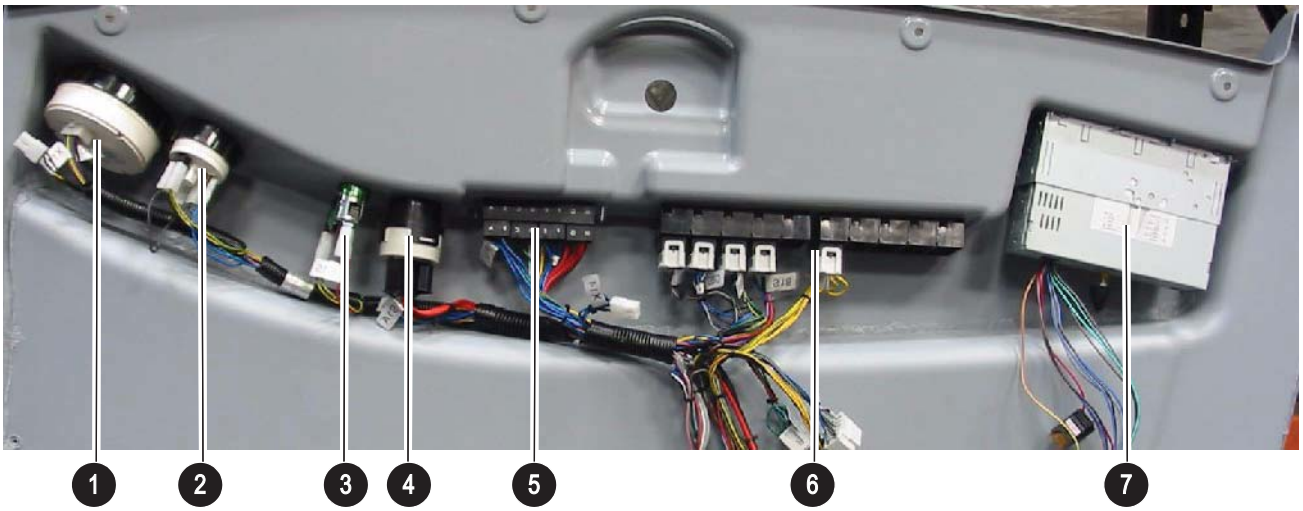


Fig. 7: Right-hand side joystick (standard and option)

Pos.	Description
1	Horn (S55)
2	Not assigned
3	Automatic idling speed feature (S48)

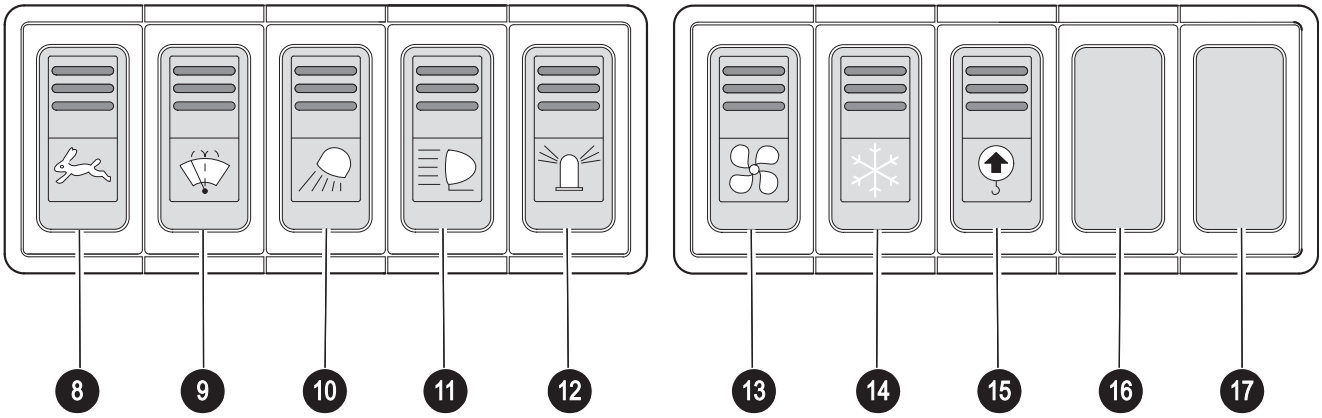
6.11 Instrument panel overview





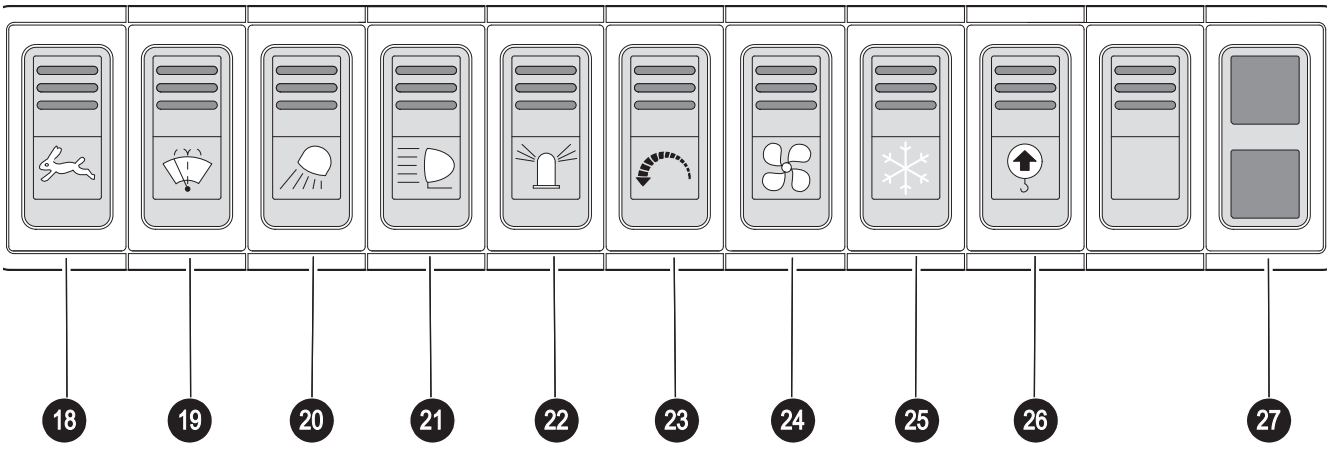
Pos.	Description
1	Instrument panel (X10)
2	Temperature indicator – diesel engine (X13)
3	Cigarette lighter (E15)
4	Preheating start switch (S1)
5	Fuse box (– *see Fuse box in instrument panel* on page 6-4)
6	Switch panel
7	Radio option (A1)

6.12 Switch overview (up to serial no. AD07125)



Pos.	Description	Pos.	Description
8	Switch – high speed (S21)	9	Switch – wiper/washer (S20)
10	Switch – boom working light (S16)	11	Switch – cab working lights (S17)
12	Switch – rotating beacon (S18)	13	Switch – ventilation (S15)
14	Switch – air conditioning system option (S51)	15	Switch – safe load indicator option (S42)
16	Not assigned	17	Not assigned
18	High speed	19	Washer system
20	Working lights	21	Roof lights (option)
22	Rotating beacon (option)	23	Automatic revs setting (option)
24	Ventilation	25	Air conditioning (option)
26	Safe load indicator (option)	27	Proportional controls (option)

6.13 Switch overview (from serial no. AH00579)



6.14 Alternator

Fig. 8: 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 (12V)
	Connection L telltale (earth)

6.15 Starter

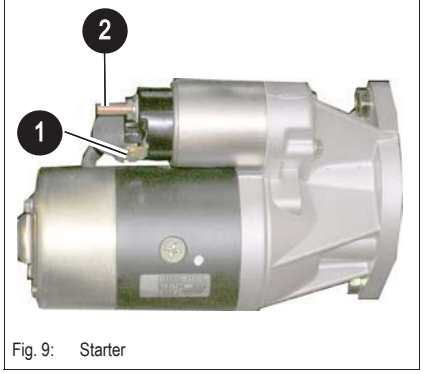


Fig. 9: Starter

Pos.	Description
1	Connection S starting relay
2	Connection B battery

Wiring harnesses: overview

Wiring diagrams include all options.

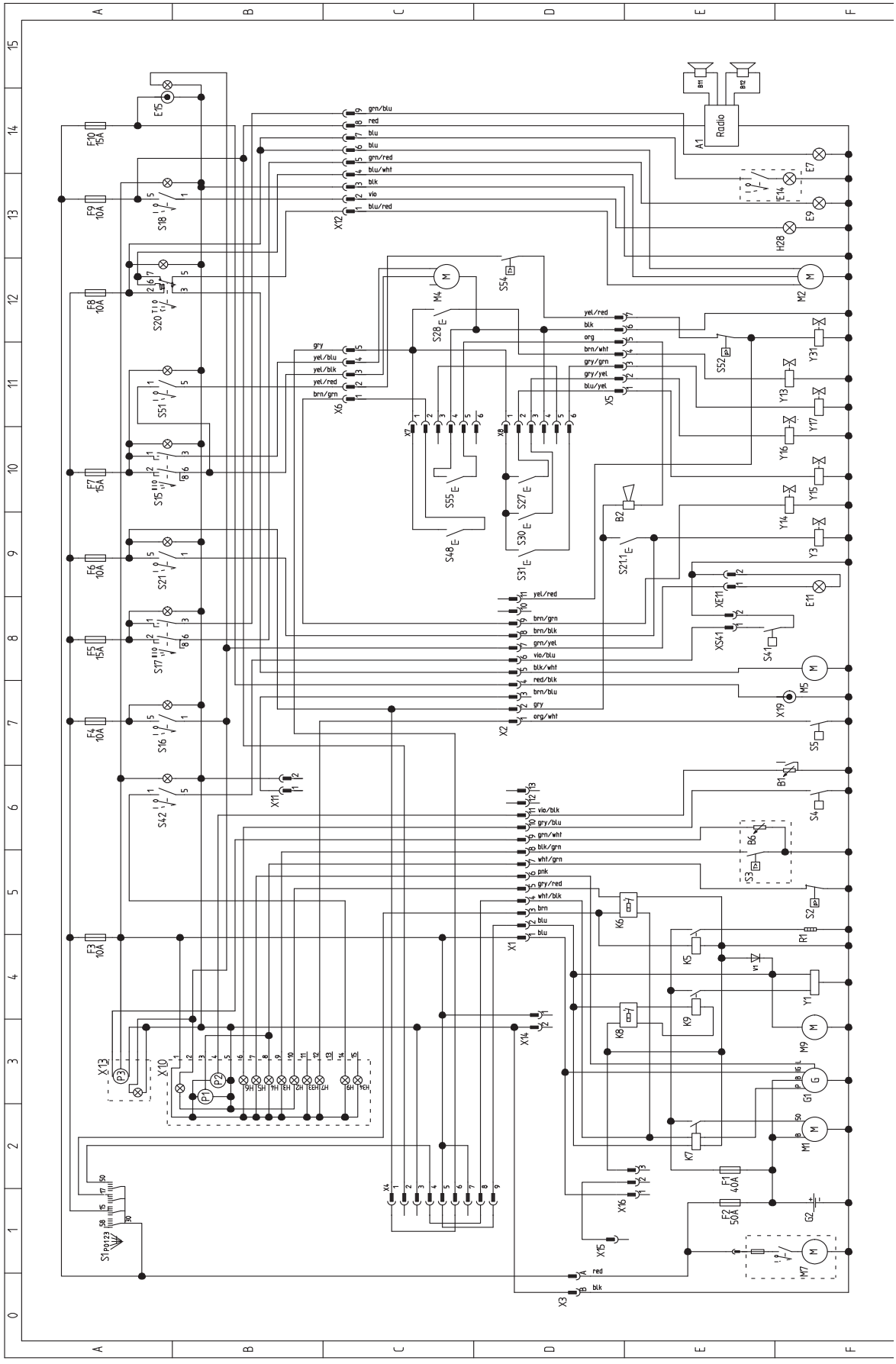
6.16 Wiring diagram A4 legend up to serial no. AC02889

No.	Description	Section	Loc.
A1	Radio	E14	Opt
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Opt
B12	Loudspeaker	E15	Opt
E7	Rear roof lights	F14	Opt
E9	Front roof light	F13	Opt
E10	Front roof light		Opt
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	Opt
H28	Rotating beacon	F13	Opt
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	Loc.
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F13	Opt
M4	Fan	C12	Opt
M5	Washer pump	F8	Opt
M7	Fuel-filling pump	F1	Opt
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	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Opt
S18	Rotating beacon switch	A/B 13	Opt
S20	Wiper/washer switch	A12	Opt
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Opt
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C12	
S30	Additional control circuit tip switch	D9	Opt
S31	Additional control circuit tip switch	D9	Opt
S41	Safe load indicator pressure switch	E8	Opt
S42	Safe load indicator switch	A6	Opt
S48	Automatic idling speed tip switch	C9	Opt
S51	Air conditioning switch	A11	Opt
S52	Air conditioning pressure switch	E12	Opt
S54	Air conditioning thermostat	D12	Opt
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	Loc.
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/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	Opt
Y15	Solenoid valve – auxiliary hydraulics/ swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Opt
Y17	Solenoid valve – additional control circuit	F11	Opt
Y31	Solenoid valve – air conditioning	F12	Opt

6.17 Wiring diagram A4 up to serial no. AC02889



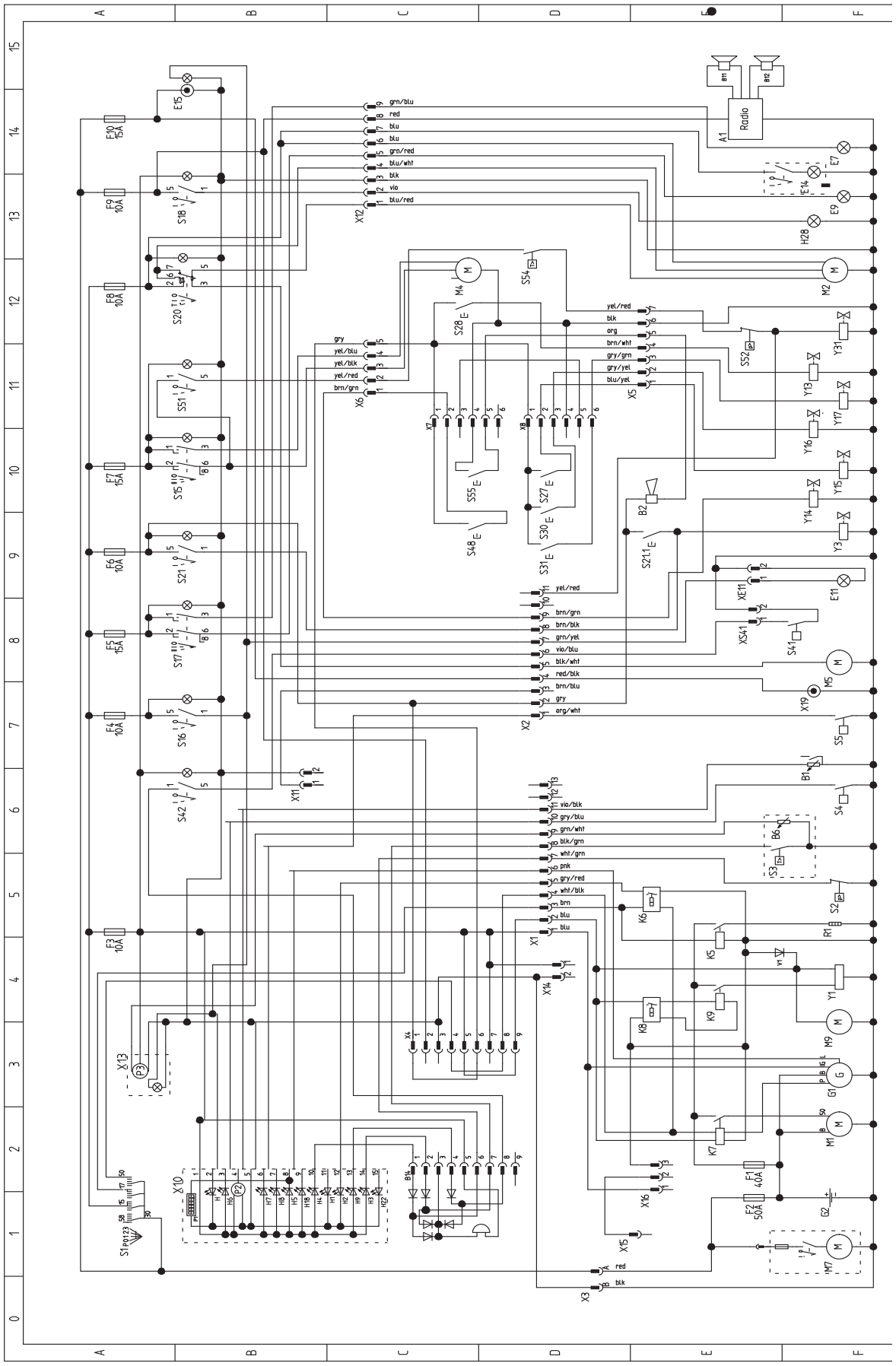
6.18 Wiring diagram A4 legend from serial no. AC02890

No.	Description	Section	Loc.
A1	Radio	E14	Opt
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Opt
B12	Loudspeaker	E15	Opt
B14	Warning buzzer	C2	
E7	Rear roof lights	F14	Opt
E9	Front roof light	F13	Opt
E10	Front roof light		Opt
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	Opt
H28	Rotating beacon	F13	Opt
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	
K9	Cutoff solenoid switching relay	E3	

No.	Description	Section	Loc.
M1	Starter	F2	
M2	Wiper motor	F13	Opt
M4	Fan	C12	Opt
M5	Washer pump	F8	Opt
M7	Fuel-filling pump	F1	Opt
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	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Opt
S18	Rotating beacon switch	A/B 13	Opt
S20	Wiper/washer switch	A12	Opt
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Opt
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C28	
S30	Additional control circuit tip switch	D9	Opt
S31	Additional control circuit tip switch	D9	Opt
S41	Safe load indicator pressure switch	E8	Opt
S42	Safe load indicator switch	A6	Opt
S48	Automatic idling speed tip switch	C9	Opt
S51	Air conditioning switch	A11	Opt
S52	Air conditioning pressure switch	E12	Opt
S54	Air conditioning thermostat	D12	Opt
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/D3	

No.	Description	Section	Loc.
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/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	Opt
Y15	Solenoid valve – auxiliary hydraulics/ swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Opt
Y17	Solenoid valve – additional control circuit	F11	Opt
Y31	Solenoid valve – air conditioning	F12	Opt

6.19 Wiring diagram A4 from serial no. AC02890

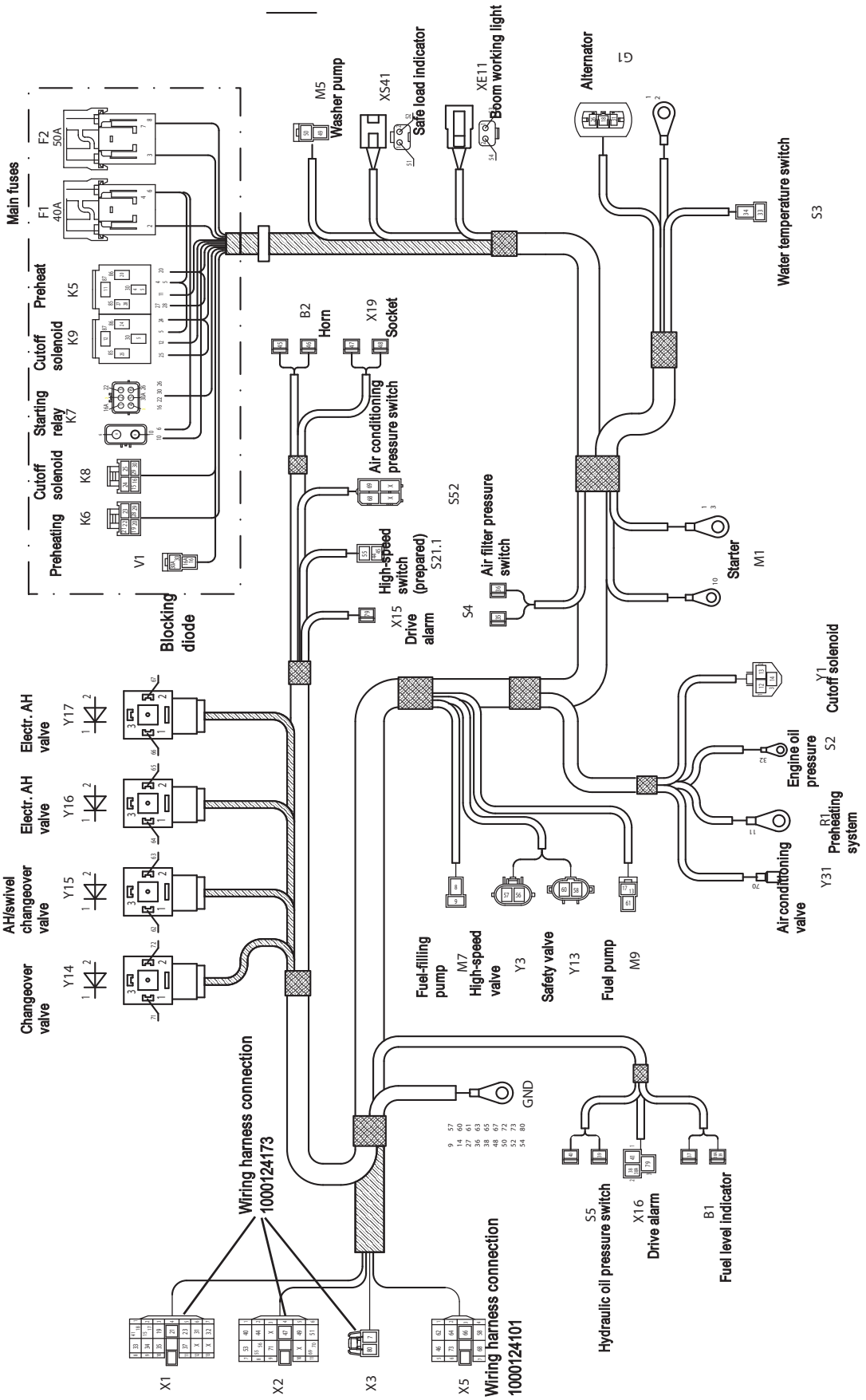


6.20 Engine – chassis wiring harness A4 (legend)

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
16A	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
30A3	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

No.	Up to	To	Colour	mm²
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

6.21 Engine – chassis wiring harness A4

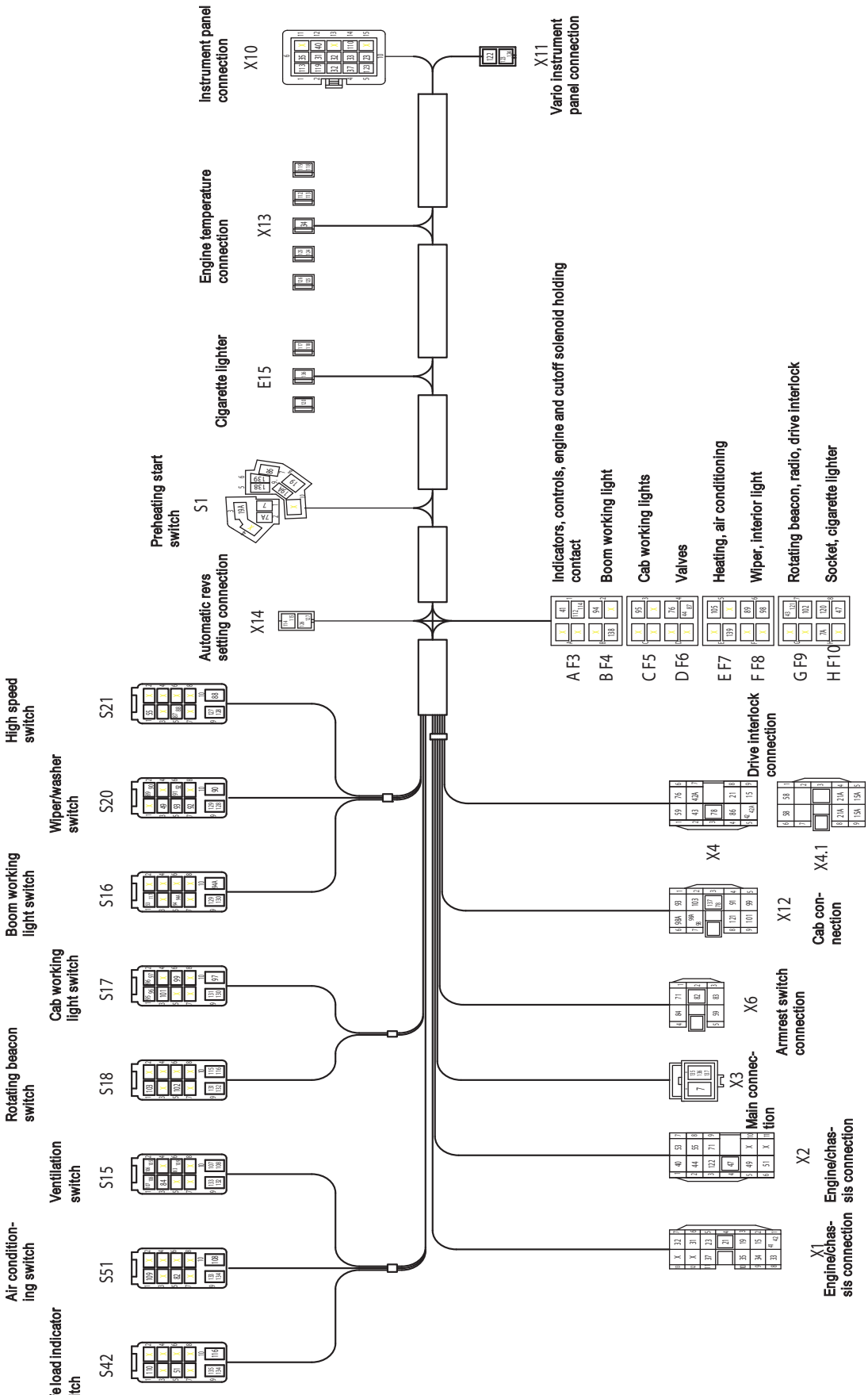


6.22 Wiring harness 1000109630 switches A4 up to serial no. AC02889: legend

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
21A3	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 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
58A3	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 switch	blu	1
90	S20/10 wiper/washer switch	S20/2 wiper/washer switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer switch	blu/wht	1
92	S20/7 wiper/washer switch	S20/6 wiper/washer switch	blu/wht	1
93	S20/5 wiper/washer switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94 A	S16/10 boom working light switch	S16/5 boom working light switch	grn	1

No.	Up to	To	Colour	
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 instrument panel connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario instrument panel connection	blk	1
124	X13 engine temperature connection	X11/2 Vario instrument panel 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 switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer 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

6.23 Wiring harness 1000109630 switches A4 up to serial no. AC02889

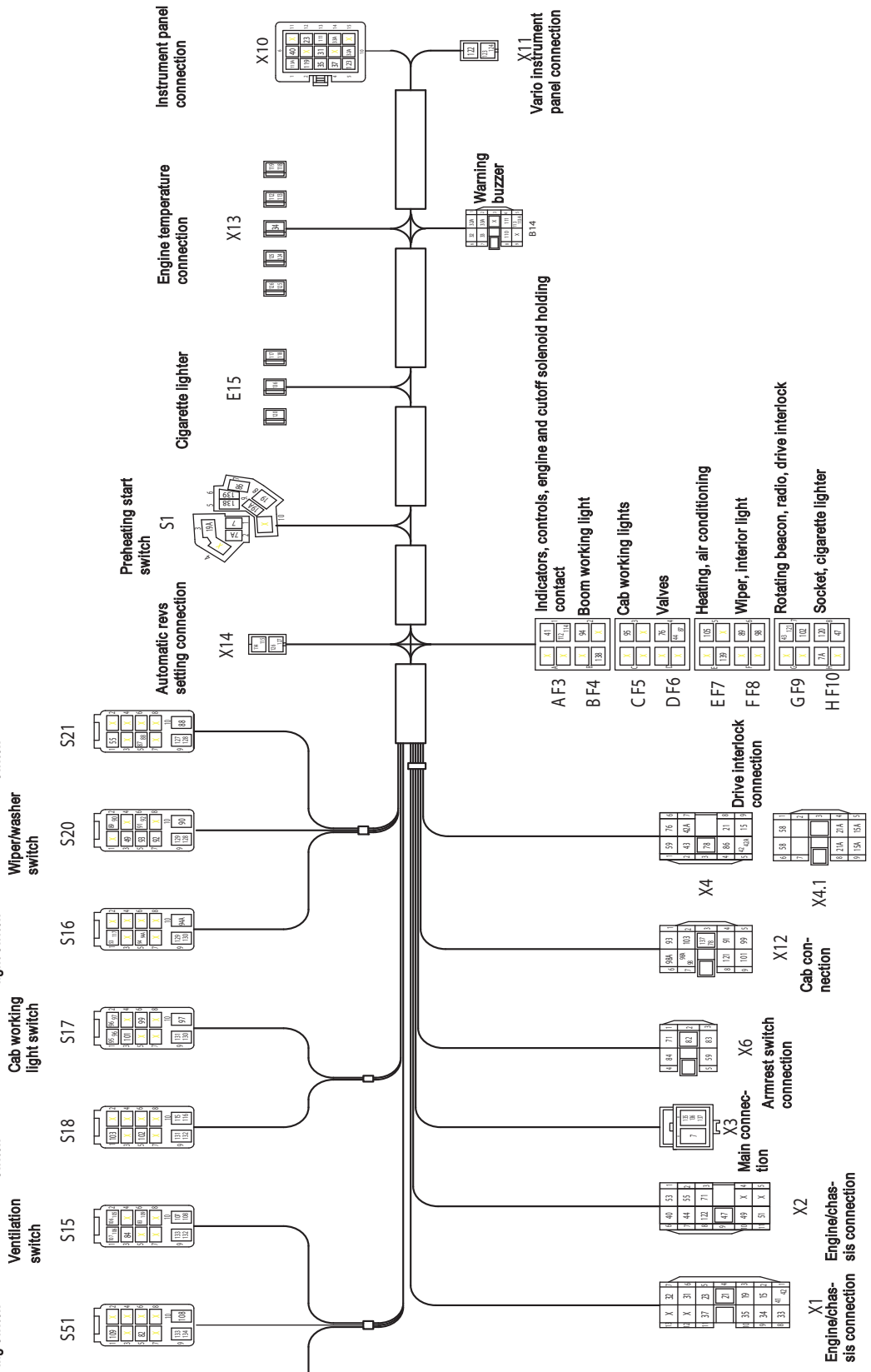


6.24 Wiring harness switches A4 from serial no. AC02890 (legend)

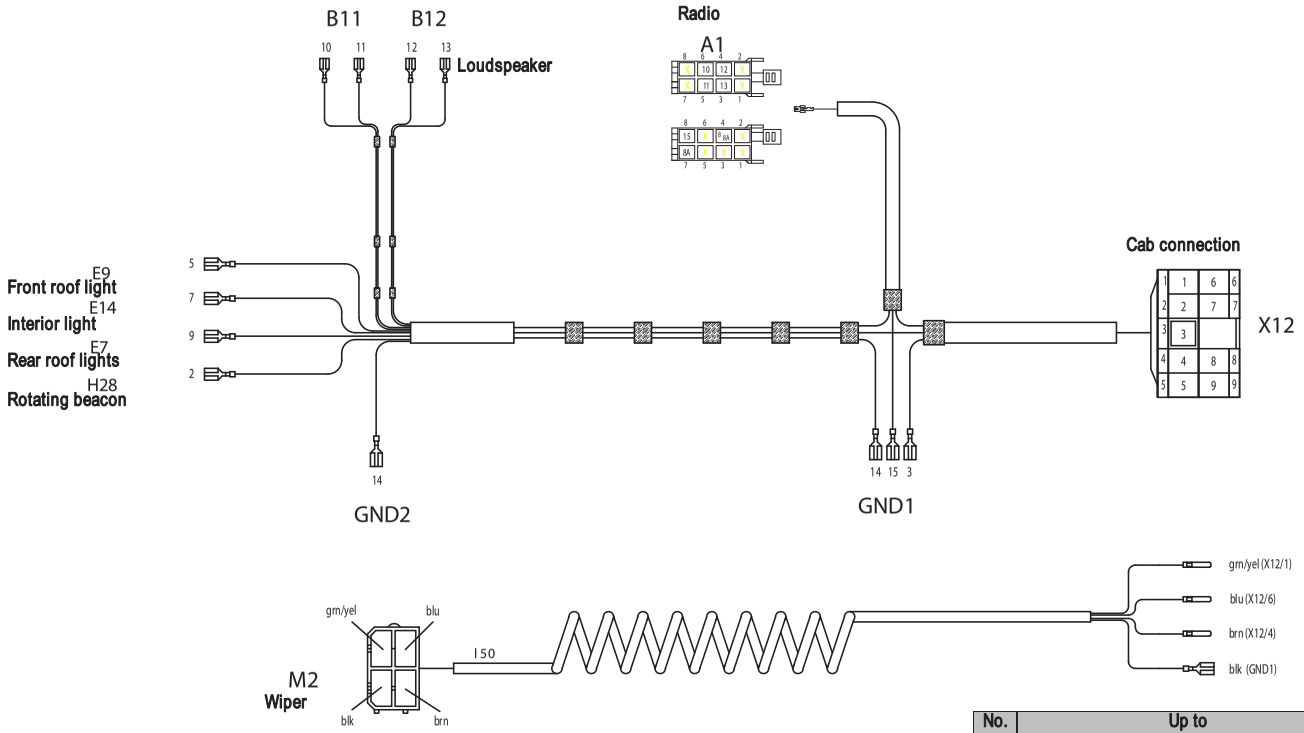
No.	Up to	To	Colour	
7	X3/A main connection	S1/1 preheating start switch	red	6
7A	S1/1 preheating start switch	F10 socket and cigarette lighter fuse	red	4
15	X1/2 engine/chassis connection	X4/9 drive interlock connection	blu	1
15A	X4.1/9 drive interlock connection	X4.1/5 drive interlock connection	blu	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 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 switch	blu	1
90	S20/10 wiper/washer switch	S20/2 wiper/washer switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer switch	blu/wht	1
92	S20/7 wiper/washer switch	S20/6 wiper/washer switch	blu/wht	1
93	S20/5 wiper/washer switch	X12/1 cab connection	blu/red	1

No.	Up to	To	Colour	
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94 A	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 instrument panel connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario instrument panel connection	blk	1
124	X13 engine temperature connection	X11/2 Vario instrument panel 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 switch	S21/9 high-speed switch	blk	1
129	S20/9 wiper/washer 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

6.25 Wiring harness switches A4 from serial no. AC02890

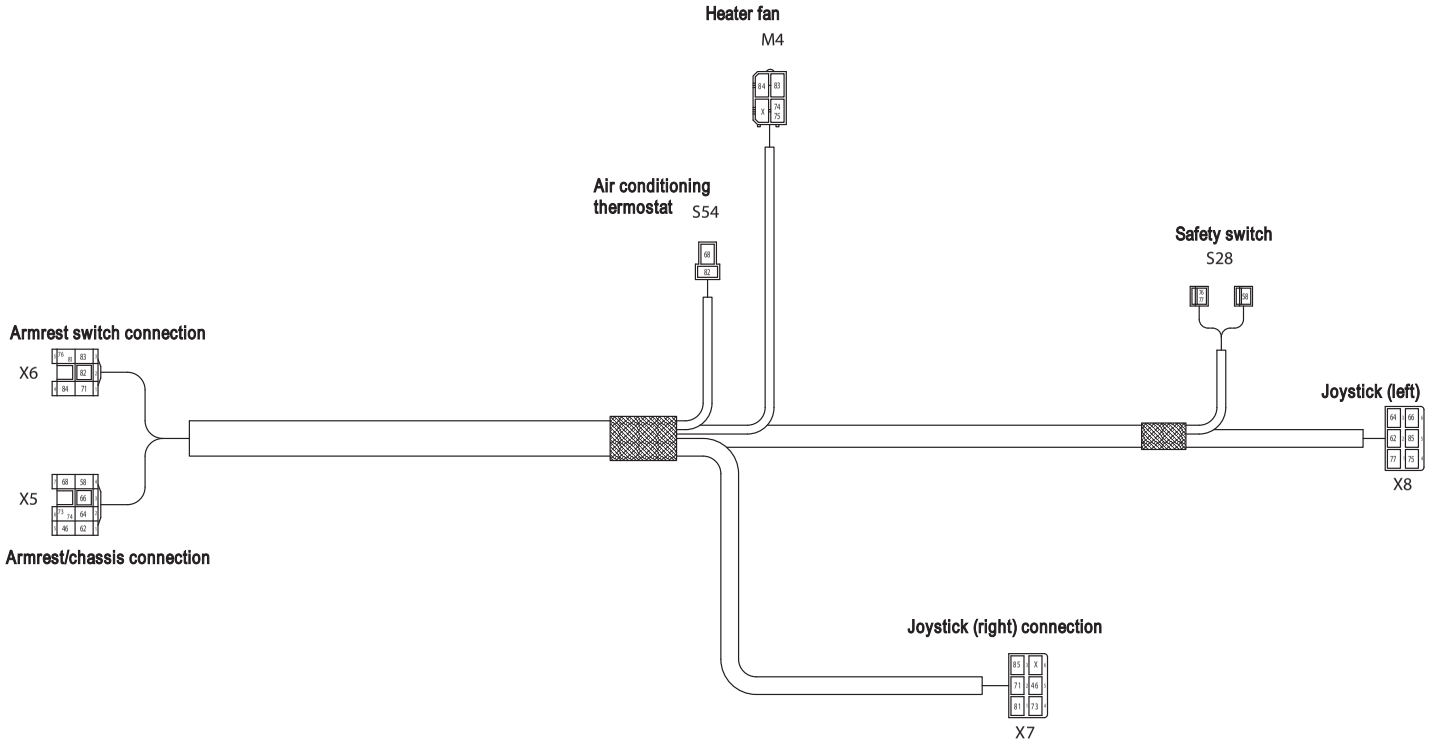


6.26 Cab roof wiring harness



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

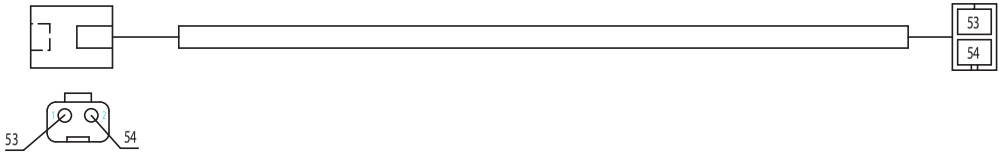
6.27 Armrest wiring harness



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

6.28 Boom working light wiring harness



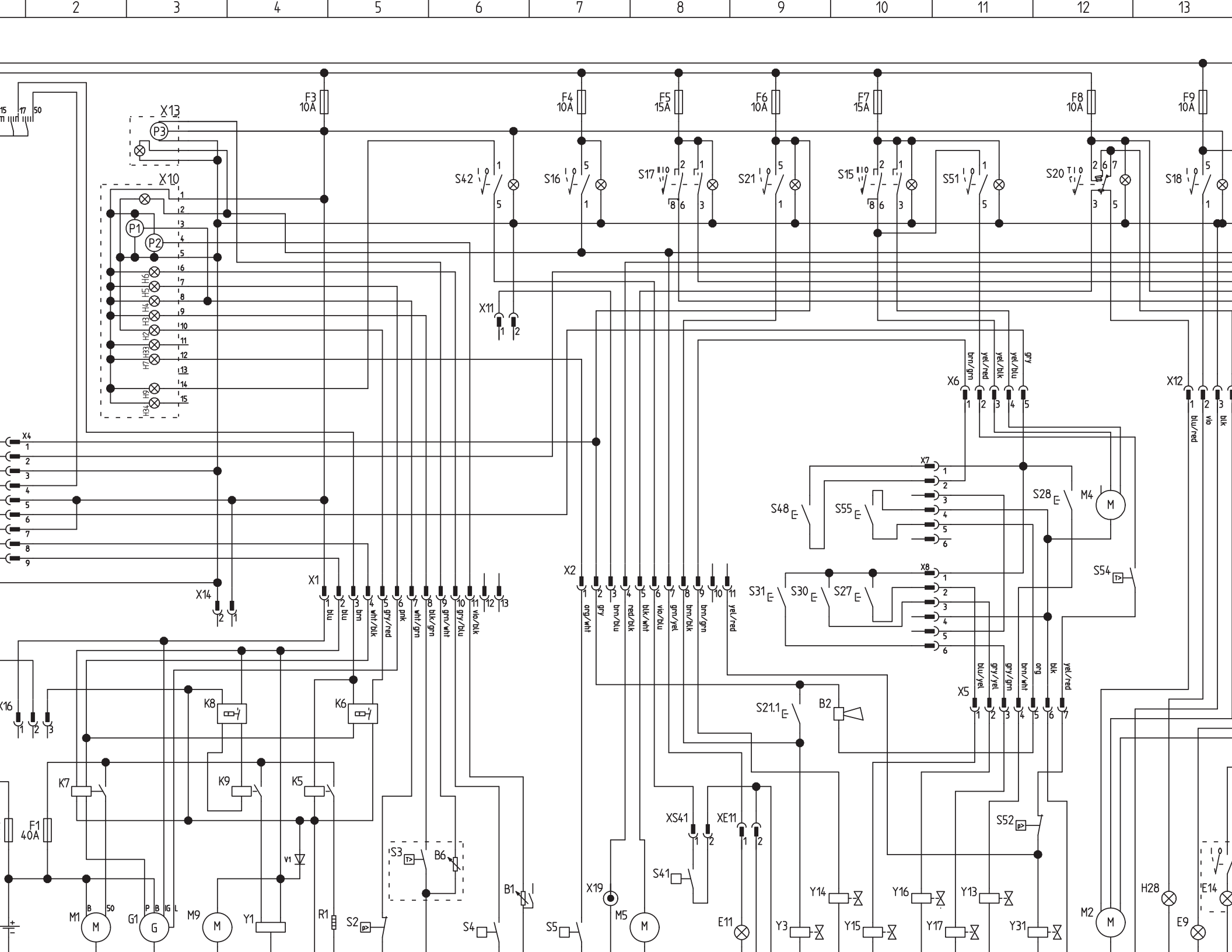
No.	Up to	To	Colour	mm²
53	XE11/1 boom working light	E1 boom working light	grn/yel	1
54	XE11/2 boom working light	E1 boom working light	blk	1

Wiring harnesses: overview

Wiring diagrams include all op

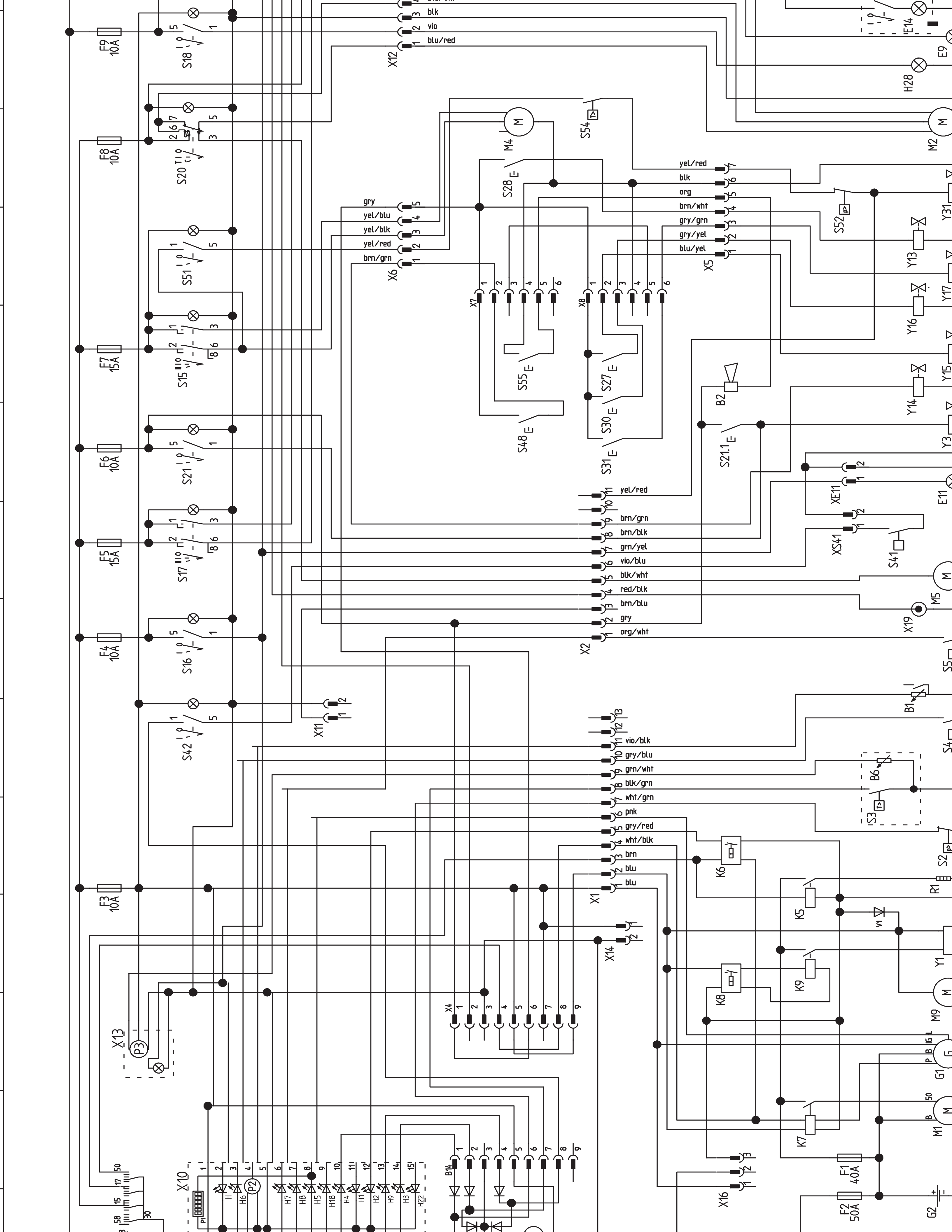
	E14	Opt
	F6	
	D/E10	
ture sensor	E6	
	E15	Opt
	E15	Opt
	F14	Opt
	F13	Opt
		Opt
	F8/9	
	E/F13	
	A14	
preheating	E2	
ng pump	E1	
elay	A4	
	A7	
	A8	
	A9	
g	A10	
	A12	
adio, drive interlock	A13	
ghter	A14	
	F3	
	F1	
	B3	
e telltale	B3	
telltale	B3	
unction telltale	B3	
	B3	
lltale	B3	
telltale	C3	Opt
	F13	Opt
	B3	
	C3	
rrent relay	E4	
relay	D5	
elay	E2	
e lag relay	E3	
tching relay	E3	
	F2	
	F13	Opt
	C12	Opt
	F8	Opt
	F1	Opt
	F3	
	B3	
n	B3	

S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Opt
S18	Rotating beacon switch	A/B 13	Opt
S20	Wiper/washer switch	A12	Opt
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Opt
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C12	
S30	Additional control circuit tip switch	D9	Opt
S31	Additional control circuit tip switch	D9	Opt
S41	Safe load indicator pressure switch	E8	Opt
S42	Safe load indicator switch	A6	Opt
S48	Automatic idling speed tip switch	C9	Opt
S51	Air conditioning switch	A11	Opt
S52	Air conditioning pressure switch	E12	Opt
S54	Air conditioning thermostat	D12	Opt
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	D3/4	
X15	1 pole connection – drive alarm	D1	
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	Opt
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Opt


2 3 4 5 6 7 8 9 10 11 12 13
F3 10A
F4 10A
F5 15A
F6 10A
F7 15A
F8 10A
F9 10A
X13
P3
X10
P1
P2
S42
S16
S17
S21
S15
S51
S20
S18
X11
X6
X12
X7
X8
X4
X14
X1
X2
X5
S48 E
S55 E
S28 E
M4
S31 E
S30 E
S27 E
S54
S21.1 E
B2
S52
K16
K8
K6
K7
K9
K5
F1 40A
V1
S3
B6
B1
XS41
XE11
S41
X19
M5
E11
Y14
Y16
Y13
Y3
Y15
Y17
Y31
M2
H28
E9
E14
M1
G1
M9
Y1
R1
S2
S4
S5
org/wht
gry
brn/blu
red/blk
blk/wht
vio/blu
grn/yel
brn/blk
brn/grn
yel/red
blu
blu
brn
wht/blk
gry/red
pnk
wht/grn
blk/grn
grn/wht
gry/blu
vio/blk
brn/grn
yel/red
yel/blk
yel/blu
gry
blu/red
vio
blk
blu/yel
gry/yel
gry/grn
brn/wht
org
blk
yel/red

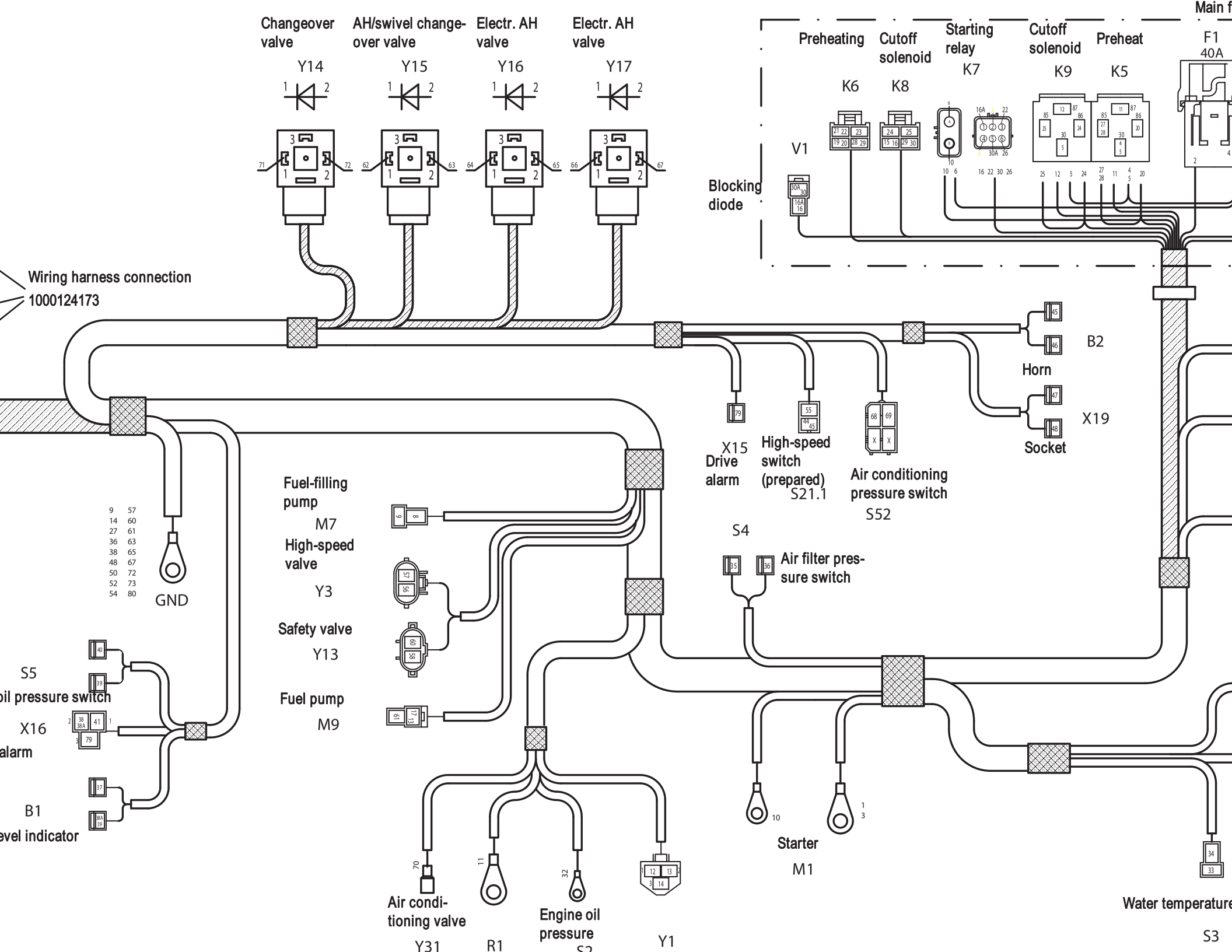
	E14	Opt
	F6	
	D/E10	
sensor	E6	
	E15	Opt
	E15	Opt
	C2	
	F14	Opt
	F13	Opt
		Opt
	F8/9	
	E/F13	
	A14	
eating	E2	
ump	E1	
	A5	
	A7	
	A8	
	A9	
	A10	
	A12	
, drive interlock	A13	
r	A14	
	F3	
	F1	
	B1	
ltale	C1	
tale	B1	
ion telltale	B1	
	B1	
e	B1	
ale	C1	Opt
	F13	Opt
t relay	E4	
ay	D5	
	E2	
g relay	E3	
ng relay	E3	
	F2	
	F13	Opt
	C12	Opt
	F8	Opt
	F1	Opt
	F3	
	B1	
	B1	
gauge	A3	

S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Opt
S18	Rotating beacon switch	A/B 13	Opt
S20	Wiper/washer switch	A12	Opt
S21	High speed switch	A9	
S21.1	High-speed tip switch (prepared)	E9	Opt
S27	Additional hydraulics/swivel tip switch	D10	
S28	Safety switch	C12	
S30	Additional control circuit tip switch	D9	Opt
S31	Additional control circuit tip switch	D9	Opt
S41	Safe load indicator pressure switch	E8	Opt
S42	Safe load indicator switch	A6	Opt
S48	Automatic idling speed tip switch	C9	Opt
S51	Air conditioning switch	A11	Opt
S52	Air conditioning pressure switch	E12	Opt
S54	Air conditioning thermostat	D12	Opt
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/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/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	Opt
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Opt


F9 10A
S18
X12
blk
vio
blu/red
F8 10A
S20
M4
S54
M2
E14
E9
H28
S28
yel/red
blk
org
brn/wht
gry/grn
gry/yel
blu/yel
X5
S52
Y31
Y13
Y17
Y16
Y15
Y14
Y3
gry
yel/blu
yel/blk
yel/red
brn/grn
X6
X7
X8
S51
F7 15A
S15
S55
S27
S30
S48
S31
B2
S21.1
F6 10A
S21
XE11
E11
XS41
S41
F5 15A
S17
yel/red
brn/grn
brn/blk
grn/yel
vio/blu
blk/wht
red/blk
brn/blu
gry
org/wht
X2
M5
X19
S5
F4 10A
S16
B1
X11
S42
S4
vio/blk
gry/blu
grn/wht
blk/grn
wht/grn
pnk
gry/red
wht/blk
brn
blu
blu
X1
B6
S3
S2
K6
R1
F3 10A
K5
V1
X14
Y1
X13
P3
K9
M9
K8
X4
G1
M1
K7
X16
F1 40A
F2 50A
G2
X10
B14
P2

to	To	Colour	mm²
	M1 starter	red	10
	F1 main fuse	red	6
	F2 main fuse	red	6
	K5/30 preheating relay	red	4
g relay	K9/30 cutoff solenoid relay	red	4
	K7/A start high current relay	red	4
	X3/A main connection	red	6
	M7 fuel-filling pump	red	4
	M7 fuel-filling pump	blk	4
urrent relay	M1 starter	wht/red	4
g relay	R1 glow plug	brn	6
enoid switching	Y1/1 cutoff solenoid	wht	4
	Y1/2 cutoff solenoid	blu	1
	Y1/3 cutoff solenoid	blk	2.5
d time lag relay	X1/2 engine/chassis connection	blu	1
d time lag relay	V1 blocking diode	blu	1
e	K7/1 start high current relay	blu	1
	X1/2 engine/chassis connection	blu	1
	X1/1 engine/chassis connection	blu	1
me lag relay	X1/3 engine/chassis connection	brn	1
me lag relay	K5/86 preheating relay	brn	1
me lag relay	X1/4 engine/chassis connection	wht/blk	1
me lag relay	K7/3 start high current relay	wht/blk	1
me lag relay	X1/5 engine/chassis connection	gry/red	1
d time lag relay	K9/86 cutoff solenoid switching relay	blu/blk	1
d time lag relay	K9/85 cutoff solenoid switching relay	pnk/blk	1
urrent relay	G1/3 alternator	blk/blu	1
	K5/85 preheating relay	blk	1
g relay	K6 preheating time lag relay	blk	1
me lag relay	K8 cutoff solenoid time lag relay	blk	1
d time lag relay	V1 blocking diode	blk	1
e	K7/5 start high current relay	blk	1
	X1/6 engine/chassis connection	pnk	1
essure switch	X1/7 engine/chassis connection	wht/grn	1
erature switch	X1/8 engine/chassis connection	blk/grn	1
erature switch	X1/9 engine/chassis connection	grn/wht	1
sure switch	X1/10 engine/chassis connection	gry/blu	1
sure switch	GND	blk	1
cator	X1/11 engine/chassis connection	vio/blk	1
	X16/2 drive alarm connection	blk	1
cator	X16/2 drive alarm connection	blk	1
cator	S5 preheating start switch	blk	1
art switch	X2/1 engine/chassis connection	org/wht	1

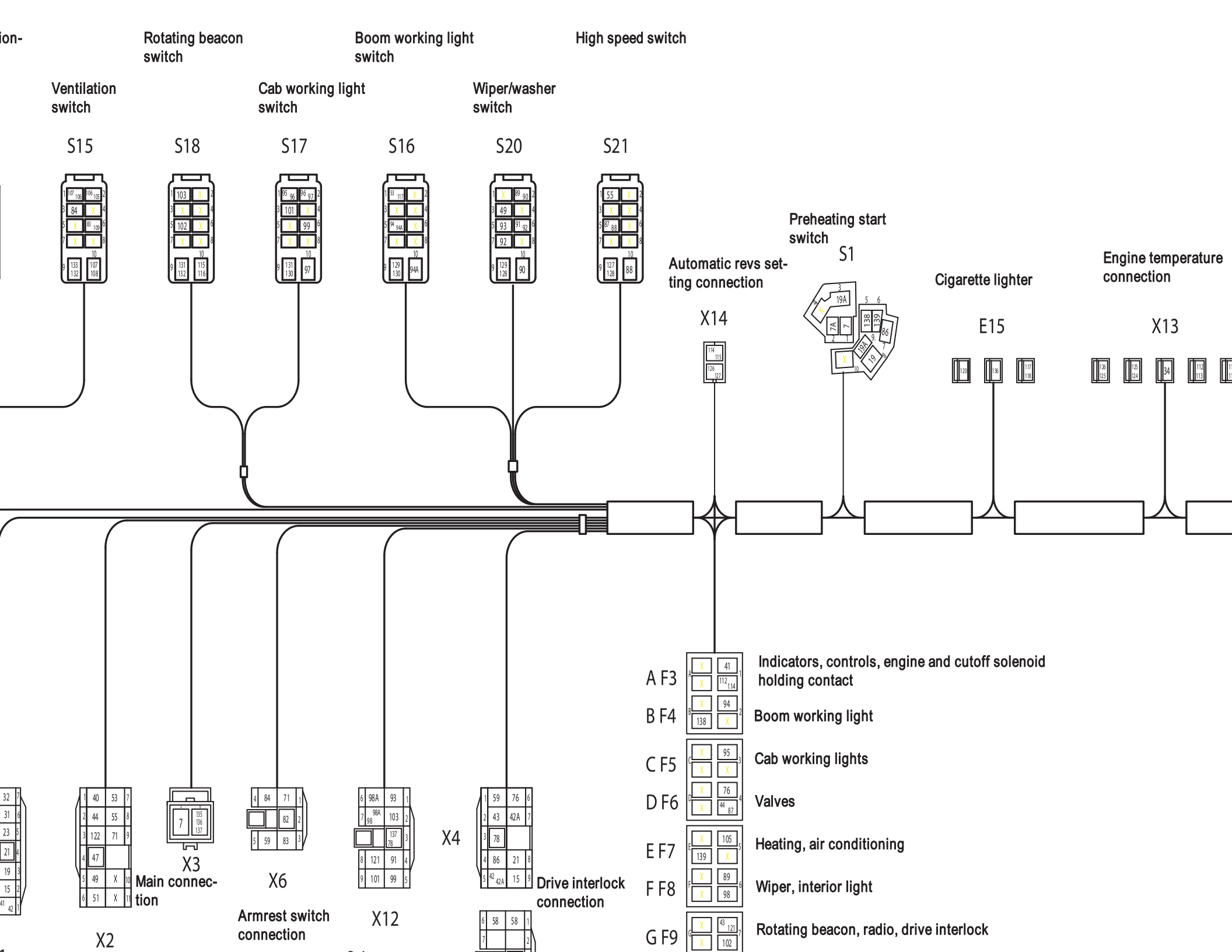
No.	Up to	To	Colour	mm²
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis 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


Changeover valve
Y14
AH/swivel change-over valve
Y15
Electr. AH valve
Y16
Electr. AH valve
Y17
Main f
Preheating
Cutoff solenoid
Starting relay
K7
Cutoff solenoid
K9
Preheat
K5
F1
40A
K6
K8
V1
Blocking diode
Wiring harness connection
1000124173
B2
Horn
X19
Socket
X15
Drive alarm
High-speed switch (prepared)
S21.1
Air conditioning pressure switch
S52
S4
Air filter pres-sure switch
Fuel-filling pump
M7
High-speed valve
Y3
Safety valve
Y13
Fuel pump
M9
GND
S5
oil pressure switch
X16
alarm
B1
evel indicator
Starter
M1
Air condi-tioning valve
Y31
R1
Engine oil pressure
S2
Y1
Water temperature
S3

To	Colour	
/1 preheating start switch	red	6
0 socket and cigarette lighter fuse	red	4
/9 drive interlock connection	blu	1
.1/5 drive interlock connection	blu	1
/8 preheating start switch	brn	1
/6 preheating start switch	brn	1
/8 drive interlock connection	wht/blk	1
.1/8 drive interlock connection	wht/blk	1
0/10 instrument panel connection	gry/red	1
0/7 instrument panel connection	pnk	1
0/8 instrument panel connection	wht/grn	1
0/9 instrument panel connection	blk/grn	1
3 engine temperature connection	grn/wht	1
0/6 instrument panel connection	gry/blu	1
0/4 instrument panel connection	vio/blk	1
0/12 instrument panel connection	org/wht	1
indicators and engine relay fuse	blu	1
/5 drive interlock connection	blu	1
/5 drive interlock connection	blu	1
rotating beacon, radio and drive erlock fuse	red	1
valves and horn fuse	gry	1
0 socket and cigarette lighter fuse	red/blk	1.5
0/3 wiper/washer switch	blk/wht	1
2/5 safe load indicator switch	vio/blu	1
6/1 boom working light switch	grn/yel	1
1/1 high-speed switch	brn/blk	1
.1/6 drive interlock connection	brn/wht	1
/5 armrest switch connection	gry	1
/1 armrest switch connection	brn/grn	1
/6 drive interlock connection	gry	1
2/3 cab connection	blk	1
/2 armrest switch connection	yel/red	1
/3 armrest switch connection	yel/blk	1
/4 armrest switch connection	yel/blu	1
/7 preheating start switch	wht/blk	1
1/5 high-speed switch	gry	1
1/5 high-speed switch	gry	1
0/2 wiper/washer switch	blu	1
0/2 wiper/washer switch	blu	1

No.	Up to	To	Colour	
93	S20/5 wiper/washer switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94 A	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 instrument panel connection	X2/3 engine/chassis connection	brn/blu	1
123	X10/5 instrument panel connection	X11/2 Vario instrument panel connection	blk	1
124	X13 engine temperature connection	X11/2 Vario instrument panel 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

No.	Up to	To
128	S20/9 wiper/washer switch	S21/9 high-speed s
129	S20/9 wiper/washer switch	S16/9 boom working
130	S17/9 cab working light switch	S16/9 boom working
131	S17/9 cab working light switch	S18/9 rotating beac
132	S15/9 ventilation switch	S18/9 rotating beac
133	S15/9 ventilation switch	S51/9 air conditioni
134	S42/9 safe load indicator switch	S51/9 air conditioni
135	S42/9 safe load indicator switch	X3/B main connecti
136	E15 cigarette lighter	X3/B main connecti
137	X12/3 cab connection	X3/B main connecti
138	S1/5 preheating start switch	F4 boom working lig
139	S1/6 preheating start switch	F7 fan and air cond

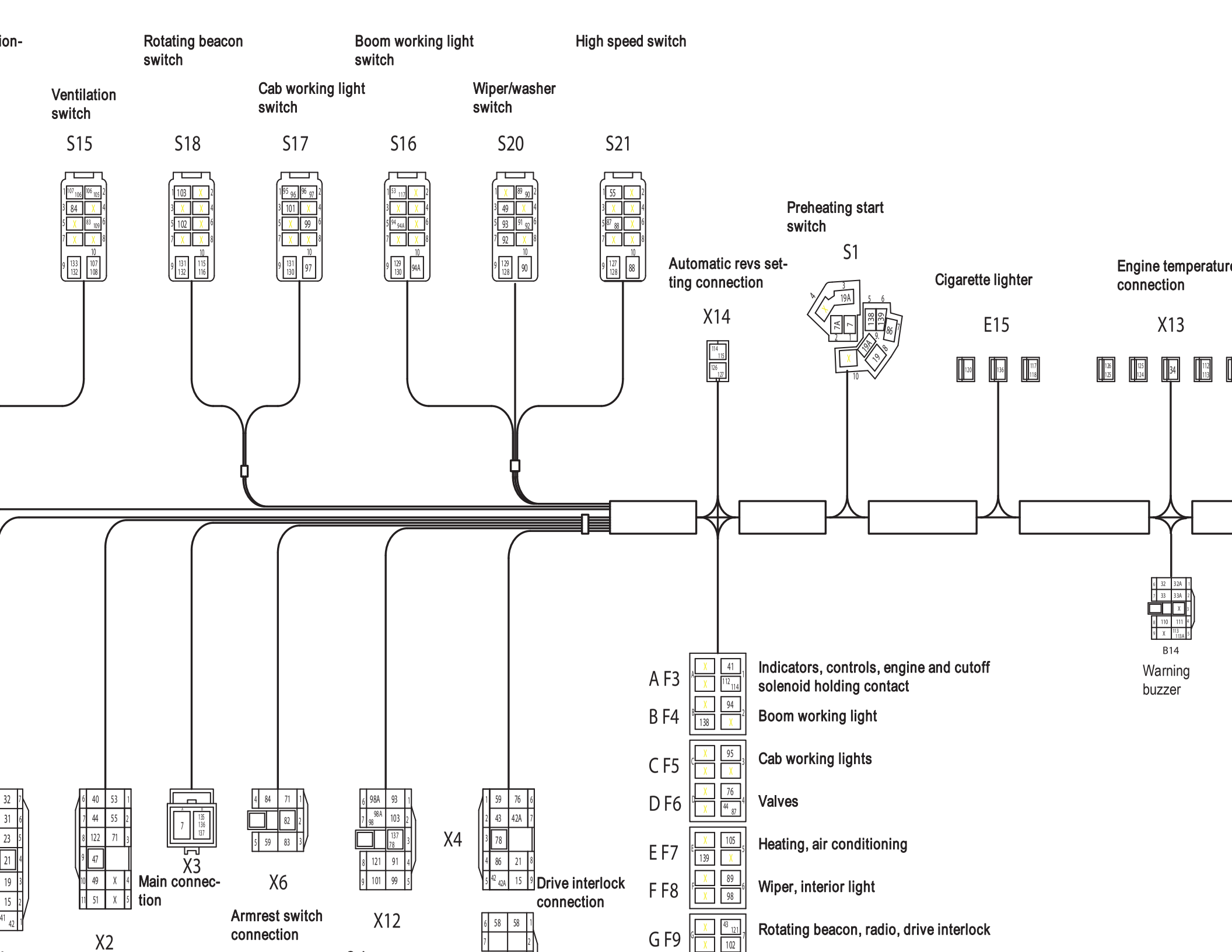

ion-
Rotating beacon switch
Boom working light switch
High speed switch
Ventilation switch
Cab working light switch
Wiper/washer switch
S15
S18
S17
S16
S20
S21
Preheating start switch
S1
Automatic revs setting connection
X14
Cigarette lighter
E15
Engine temperature connection
X13
A F3
Indicators, controls, engine and cutoff solenoid holding contact
B F4
Boom working light
C F5
Cab working lights
D F6
Valves
E F7
Heating, air conditioning
F F8
Wiper, interior light
G F9
Rotating beacon, radio, drive interlock
X3
X6
X12
X4
Drive interlock connection
Armrest switch connection
Main connection
X2

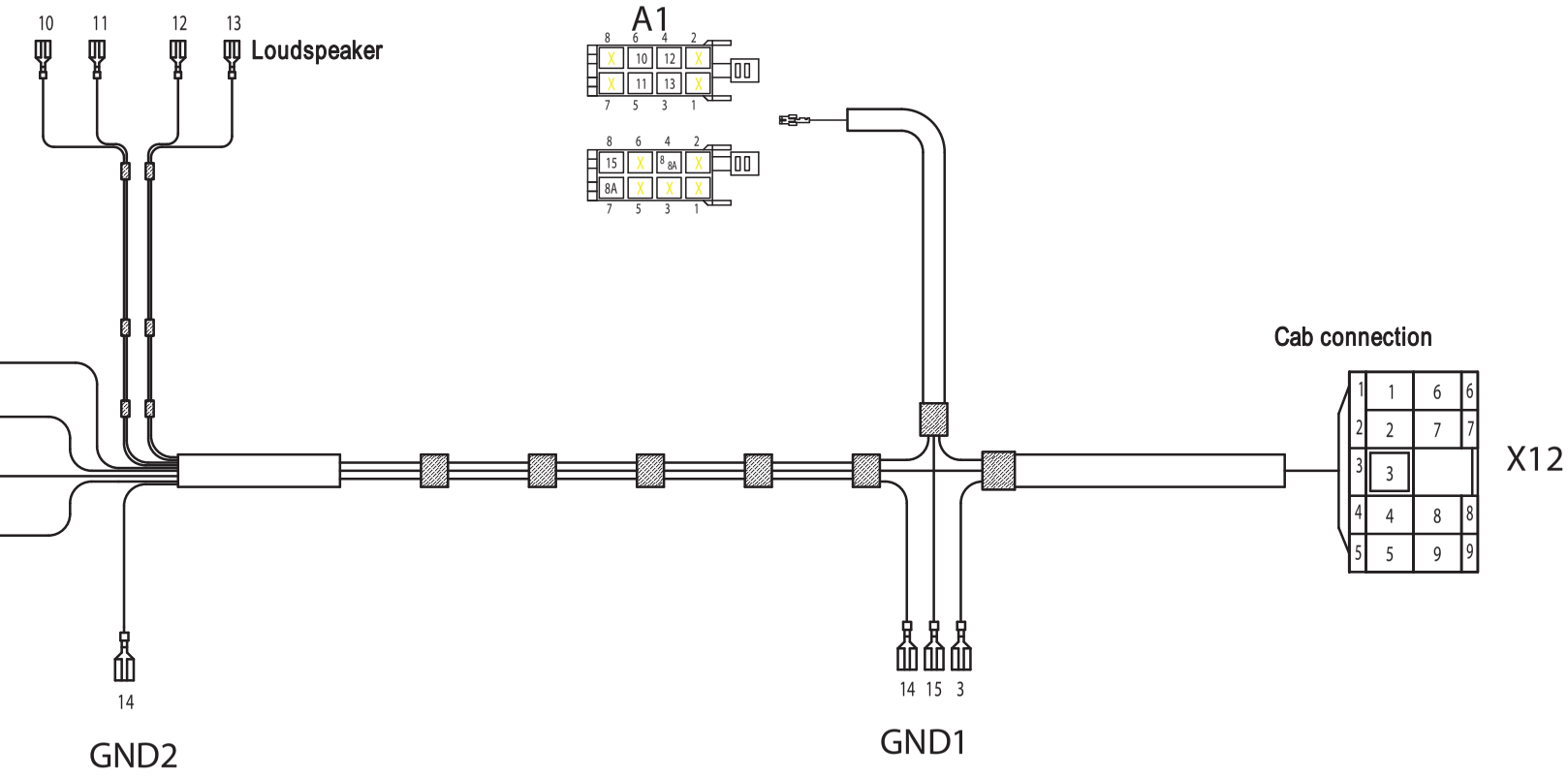
To	Colour	
S1/1 preheating start switch	red	6
F10 socket and cigarette lighter fuse	red	4
X4/9 drive interlock connection	blu	1
X4.1/5 drive interlock connection	blu	1
S1/8 preheating start switch	brn	1
S1/6 preheating start switch	brn	1
X4/8 drive interlock connection	wht/blk	1
X4.1/8 drive interlock connection	wht/blk	1
X10/10 instrument panel connection	gry/red	1
X10/8 instrument panel connection	pnk	1
B14/5 warning buzzer connection	wht/grn	1
B14/5 warning buzzer connection	wht/grn	1
B14/6 warning buzzer connection	blk/grn	1
B14/6 warning buzzer connection	blk/grn	1
X13 engine temperature connection	grn/wht	1
X10/3 instrument panel connection	gry/blu	1
X10/4 instrument panel connection	vio/blk	1
X10/6 instrument panel connection	org/wht	1
F3 indicators and engine relay fuse	blu	1
X4/5 drive interlock connection	blu	1
X4/5 drive interlock connection	blu	1
F9 rotating beacon, radio and drive interlock fuse	red	1
F6 valves and horn fuse	gry	1
F10 socket and cigarette lighter fuse	red/blk	1.5
S20/3 wiper/washer switch	blk/wht	1
S42/5 safe load indicator switch	vio/blu	1
S16/1 boom working light switch	grn/yel	1
S21/1 high-speed switch	brn/blk	1
X4.1/6 drive interlock connection	brn/wht	1
X6/5 armrest switch connection	gry	1
X6/1 armrest switch connection	brn/grn	1
X4/6 drive interlock connection	gry	1
X12/3 cab connection	blk	1
X6/2 armrest switch connection	yel/red	1
X6/3 armrest switch connection	yel/blk	1
X6/4 armrest switch connection	yel/blu	1
S1/7 preheating start switch	wht/blk	1

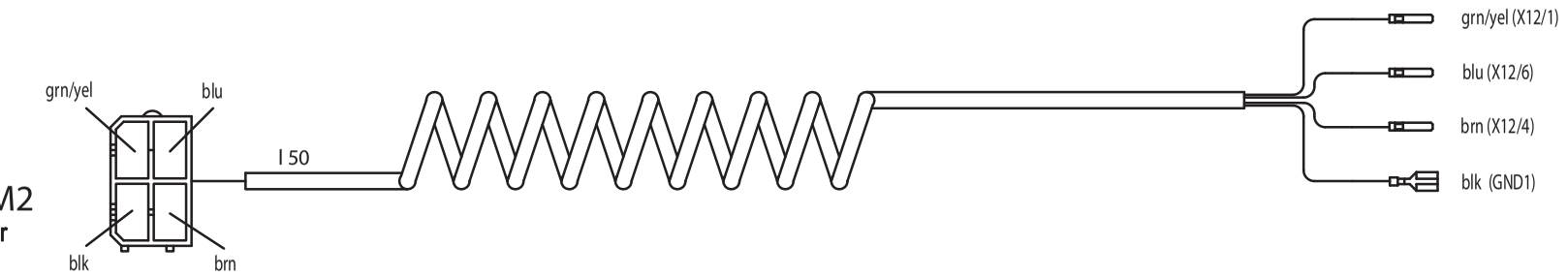
No.	Up to	To	Colour	
88	S21/10 high-speed switch	S21/5 high-speed switch	gry	1
89	F8 wiper and interior light fuse	S20/2 wiper/washer switch	blu	1
90	S20/10 wiper/washer switch	S20/2 wiper/washer switch	blu	1
91	X12/4 cab connection	S20/6 wiper/washer switch	blu/wht	1
92	S20/7 wiper/washer switch	S20/6 wiper/washer switch	blu/wht	1
93	S20/5 wiper/washer switch	X12/1 cab connection	blu/red	1
94	F4 boom working light fuse	S16/5 boom working light switch	grn	1
94 A	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
113A3	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 instrument panel connection	X2/3 engine/chassis connection	brn/blu	1

No.	Up to	To
123	X10/5 instrument panel connection	X11/2 Vario instrument panel connection
124	X13 engine temperature connection	X11/2 Vario instrument panel connection
125	X13 engine temperature connection	X13 engine temperature connection
126	X14/2 automatic revs setting connection	X13 engine temperature connection
127	X14/2 automatic revs setting connection	S21/9 high-speed
128	S20/9 wiper/washer switch	S21/9 high-speed
129	S20/9 wiper/washer switch	S16/9 boom work
130	S17/9 cab working light switch	S16/9 boom work
131	S17/9 cab working light switch	S18/9 rotating be
132	S15/9 ventilation switch	S18/9 rotating be
133	S15/9 ventilation switch	S51/9 air conditio
134	S42/9 safe load indicator switch	S51/9 air conditio
135	S42/9 safe load indicator switch	X3/B main connec
136	E15 cigarette lighter	X3/B main connec
137	X12/3 cab connection	X3/B main connec
138	S1/5 preheating start switch	F4 boom working
139	S1/6 preheating start switch	F7 fan and air co

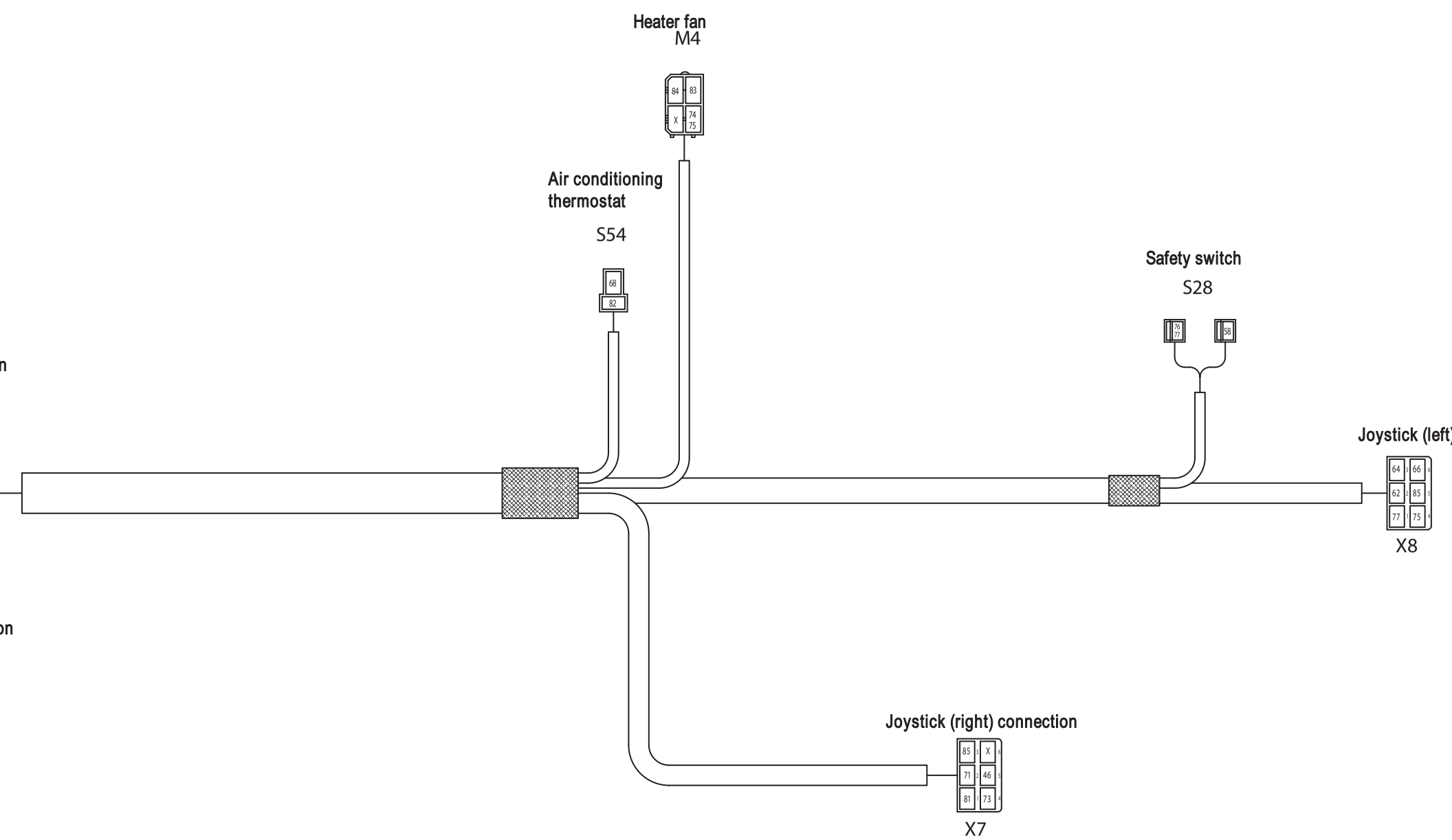
Switch wiring legend


ion-
Rotating beacon switch
Boom working light switch
High speed switch
Ventilation switch
Cab working light switch
Wiper/washer switch
S15
S18
S17
S16
S20
S21
Preheating start switch
S1
Automatic revs setting connection
X14
Cigarette lighter
E15
Engine temperature connection
X13
B14
Warning buzzer
A F3
Indicators, controls, engine and cutoff solenoid holding contact
B F4
Boom working light
C F5
Cab working lights
D F6
Valves
E F7
Heating, air conditioning
F F8
Wiper, interior light
G F9
Rotating beacon, radio, drive interlock
X4
Drive interlock connection
X3
Main connection
X6
Armrest switch connection
X12
X2



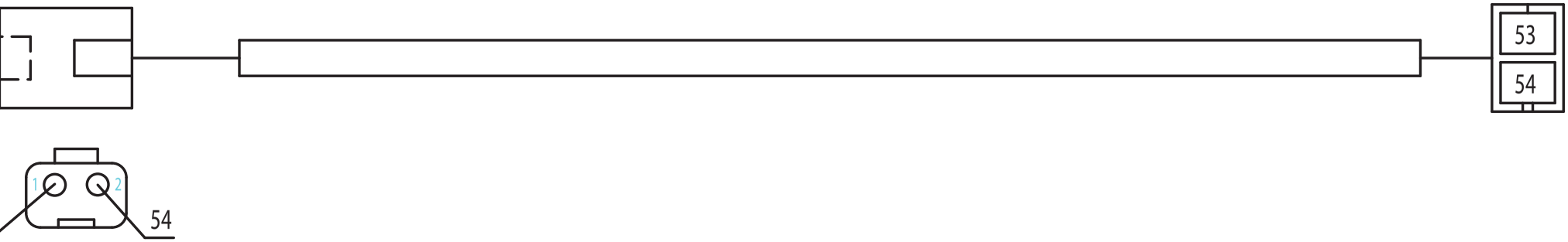


No.	Up to	
1	X12 (1) 9 pole plug and socket connector – cab	M2 wiper r
2	X12 (2) 9 pole plug and socket connector – cab	H28 rotatir
3	X12 (3) 9 pole plug and socket connector – cab	GND1
4	X12 (4) 9 pole plug and socket connector – cab	M2 wiper r
5	X12 (5) 9 pole plug and socket connector – cab	E9 front ro
6	X12 (6) 9 pole plug and socket connector – cab	M2 wiper r
7	X12 (7) 9 pole plug and socket connector – cab	E14 interio
8	X12 (8) 9 pole plug and socket connector – cab	A1.1/4 rad
8A	A1.1/4 radio	A1.1/7 rad
9	X12 (9) 9 pole plug and socket connector – cab	E7 rear roo
10	A1/6 radio	B11 loudsp
11	A1/5 radio	B11 loudsp
12	A1/4 radio	B12 loudsp
13	A1/3 radio	B12 loudsp
14	GND1	GND2



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
75	M4/2 fan	X8/4 joystick (left) c
76	X6/5 armrest switch connection	S28 safety switch
77	S28 safety switch	X8/1 joystick (left) c
81	X6/5 armrest switch connection	X7/1 joystick (right)
82	X6/2 armrest switch connection	S54 air conditioning
83	X6/3 armrest switch connection	M4/1 fan
84	X6/4 armrest switch connection	M4/3 fan
85	X8/5 joystick (left) connection	X7/3 joystick (right)



No.	Up to	To
53	XE11/1 boom working light	E1 boom working light
54	XE11/2 boom working light	E1 boom working light

Options

7 Options

- Article numbers for options and retrofit kits: please refer to the 50Z3 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.

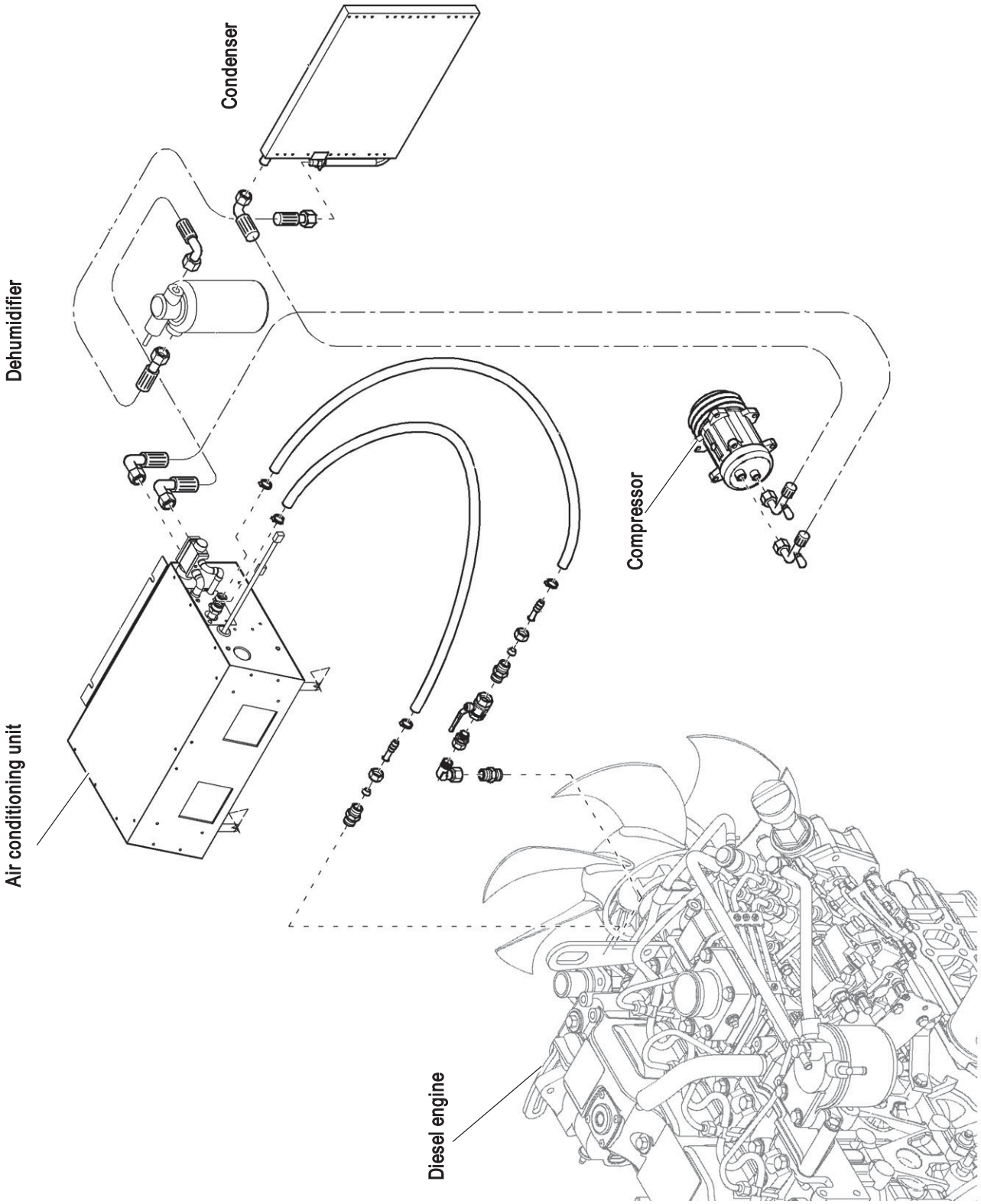
Important!

The air conditioning system runs best by taking in “outside” ai
– *see Summer/winter operation* on page 1-20.

Specifications

Air conditioning	Model 50Z3
Refrigerating agent R134a	~ 950 g (~2.1 lbs)
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)

Installation overview

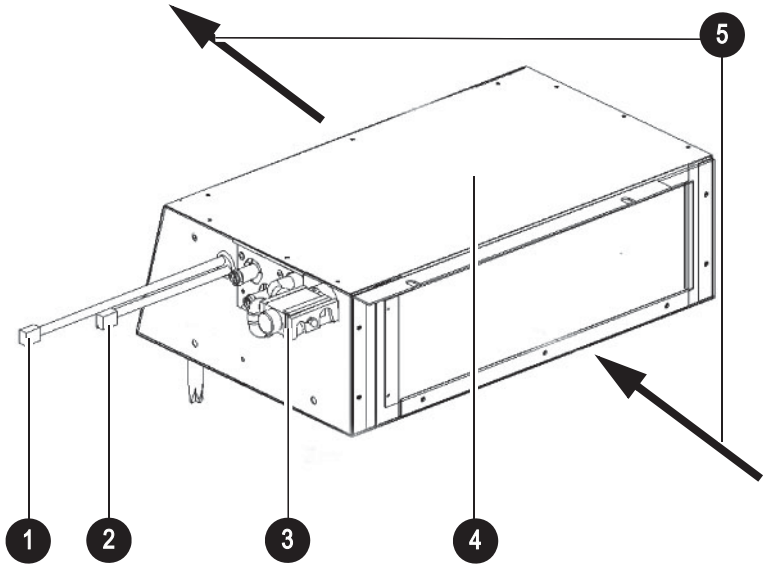


Components

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 direction

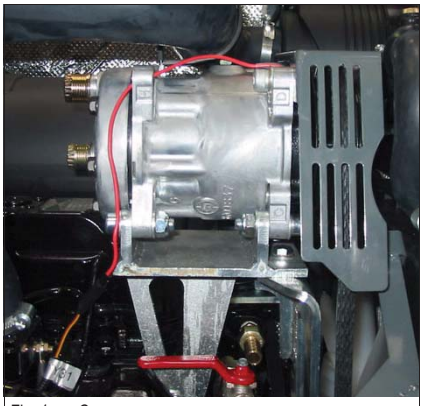


Fig. 1: Compressor

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.

Fig. 2: Dehumidifier with pressure switch

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!

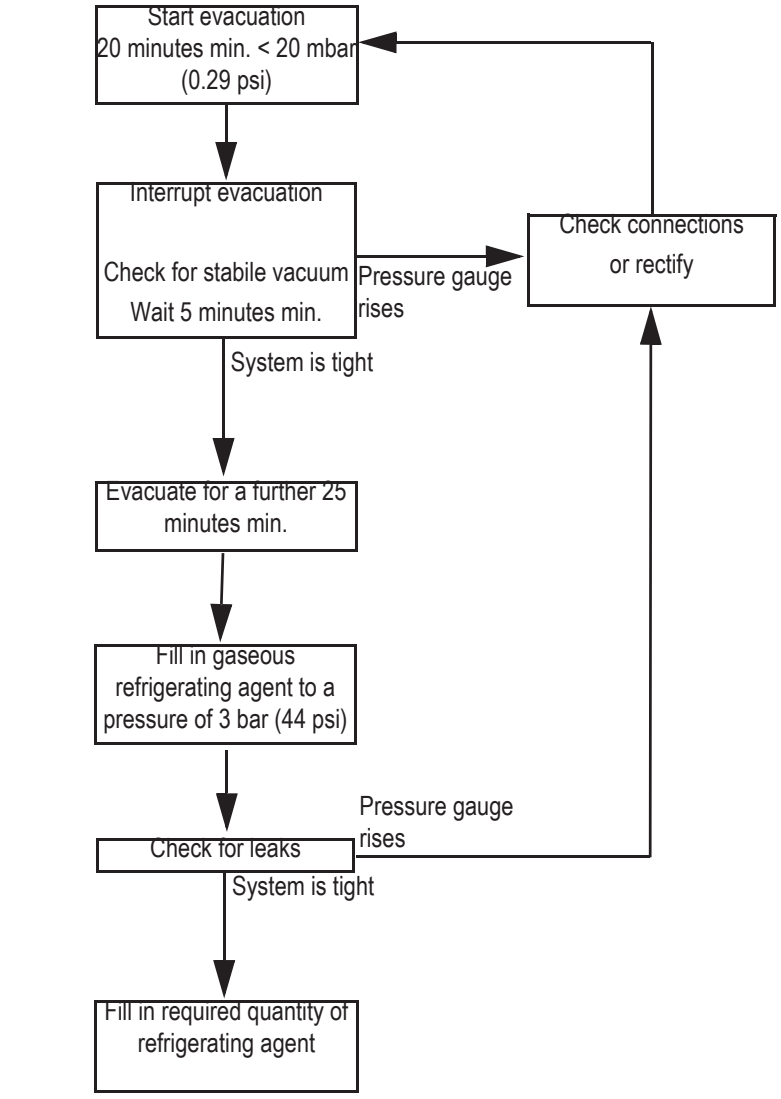
Always keep the dehumidifier closed otherwise the dryer is saturated by the humidity in the air and is no longer serviceable.

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.*

Maintenance

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

Old engine type (up to serial number AD07125):

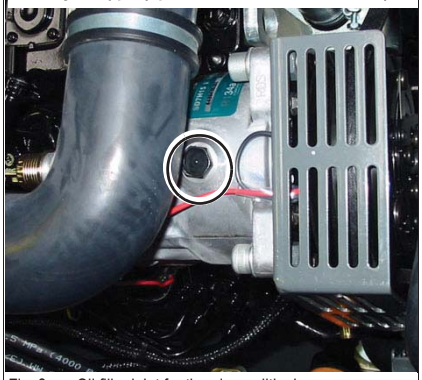


Fig. 3: Oil filler inlet for the air conditioning compressor

New engine type (from serial number AH00579):

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*

☞ *Close the oil filler opening again*

➥ Screw tightening torque: 15 – 20 Nm (11 – 15 lbf ft)

Fresh/recirculated air filter

Tilt the cab to replace the filter
– *see Tilting the cab* on page 1-18.

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*

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.
	Heat exchanger heavily contaminated	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

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 cleaner
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

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	X7/1 joystick (right) connection	Seat earth

7.3 Counterweight

Specifications

Lock the screw connection with Loctite S2420 or VaryBond 12-43

Counterweight	Model 50Z3
Weight	300 kg (661 lbs)
Tightening torque for screws	290 Nm (214 lbf ft)
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	Model 50Z3
Difference in length with regard to standard stick	300 mm (11.8")

Important!

Bear in mind the lift capacity table when using a long stick!

7.5 Control circuit (pipework) connections for grab

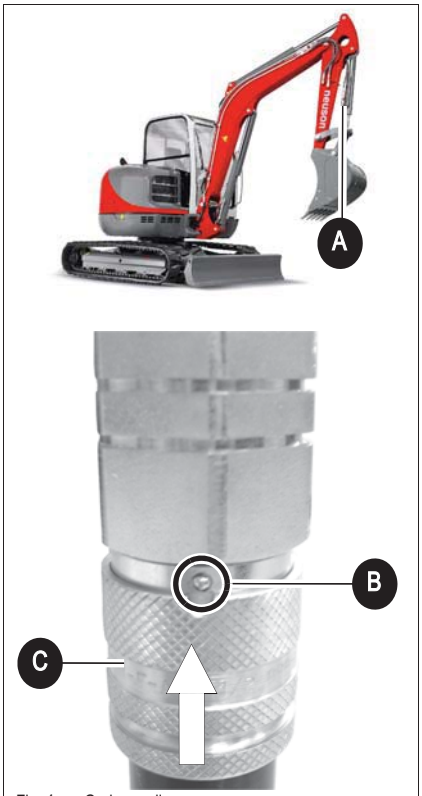


Fig. 4: Grab couplings

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”

Couplings cannot be coupled under pressure!

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.

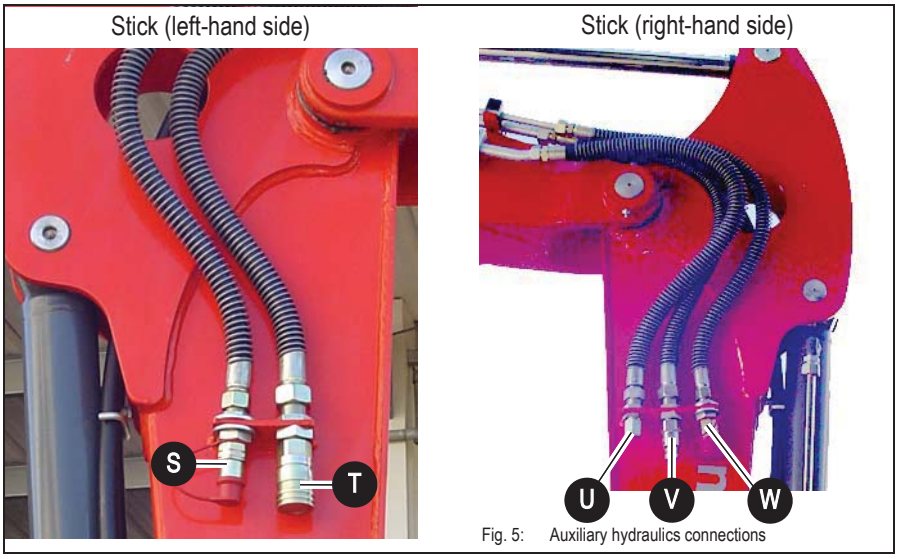


Fig. 5: Auxiliary hydraulics connections

Quickhitch couplings

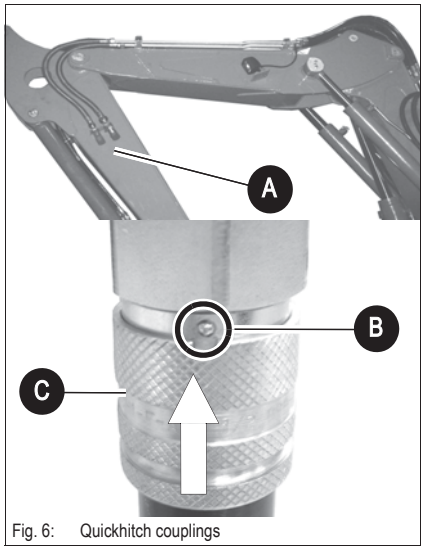


Fig. 6: Quickhitch couplings

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

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.

7.8 Fuel-filling pump

Important!

Up to serial number AC02650: use of sight glass instead of telltale!

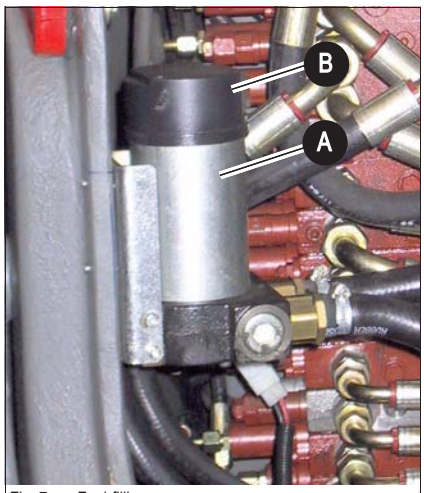


Fig. 7: Fuel-filling pump

Refuel with the fuel-filling pump **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 **A***

➥ The fuel tank is full as soon as telltale **C** comes on

☞ *Press button **B** to switch off fuel-filling pump **A***

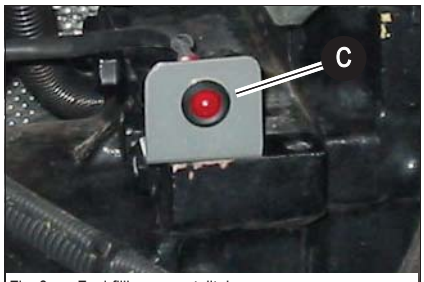


Fig. 8: Fuel-filling pump telltale

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.

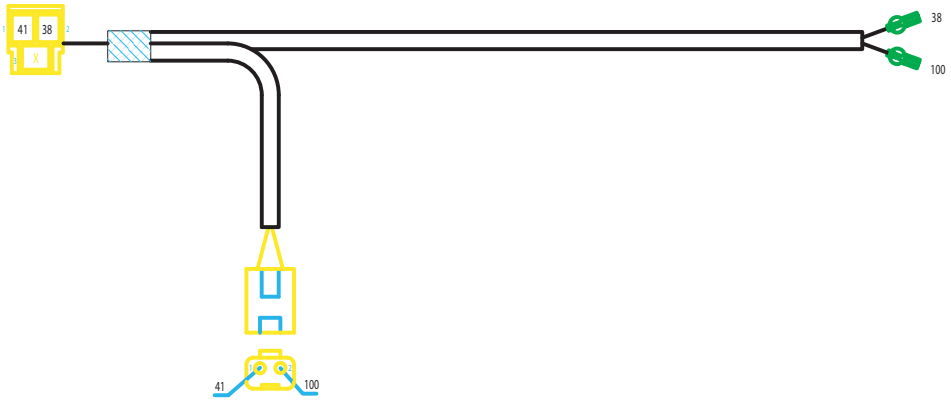

Fig. 9: Float switch

Ports

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.

X16



X17

S60

No.	Up to	To	Colour	mm²
38	XE16/2 drive alarm connection	X17 float switch	blk	1
41	XE16/1 drive alarm connection	S60/1 telltale	blu	1
100	X17 float switch	S60/2 telltale	vio	1

7.9 Central lubrication system

Grease-based central lubrication system with 12 lubrication points

Position

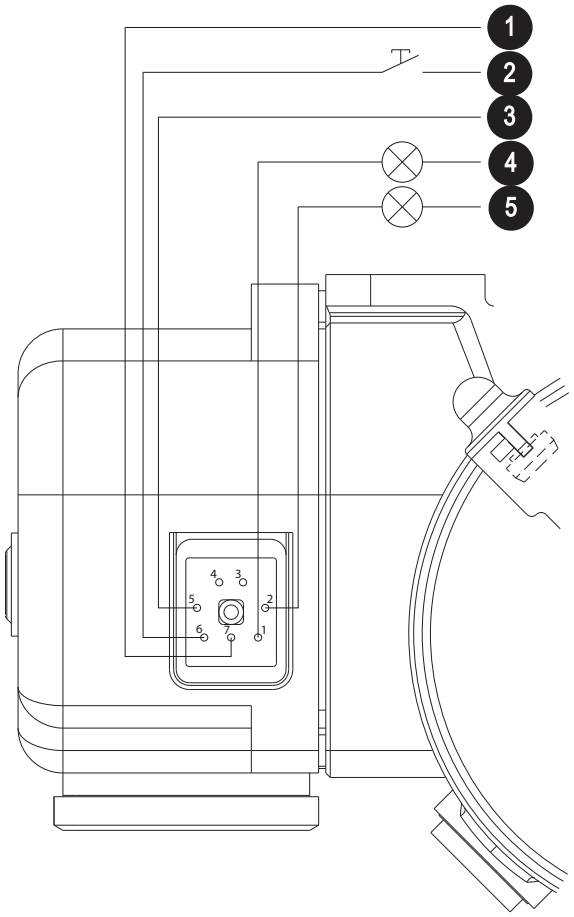
Fig. 10: Central lubrication system pump

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.

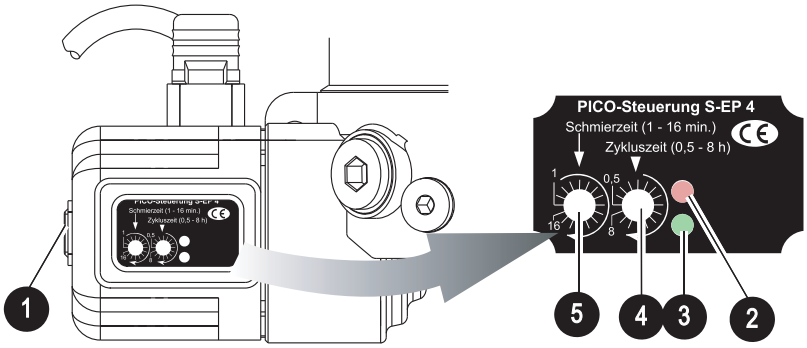
From the distributing block, the grease passes on to the lubrication points.

Ports



Pos.	Description
1	– Earth (brown)
2	+ Intermediate lubrication tip switch connection (orange)
3	+ Ignition (black)
4	– Error telltale (red)
5	+ Lubrication telltale (green)

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.

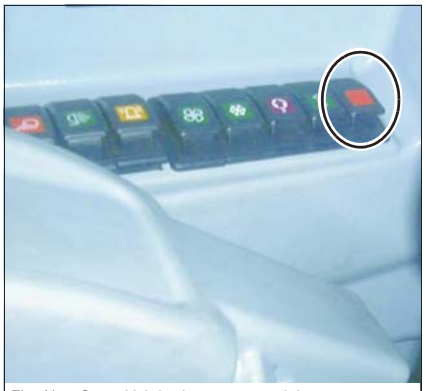


Fig. 11: Central lubrication system push button

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.

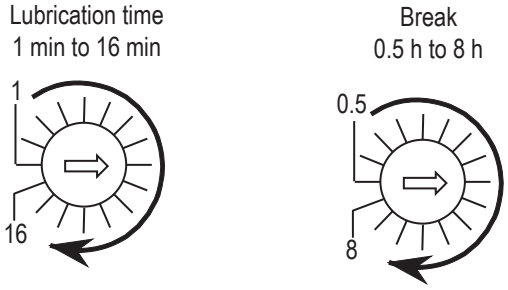
Pressing the push button on the motor housing or on the instrument panel starts intermediate lubrication at any given time if ignition is switched on.

Status LEDs

Indication	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

Adjusting breaks and lubrication times

Adjust breaks and lubrication times with potentiometers.



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 the 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

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

7.10 Service valve

Function

The service valve replaces the conventional oil drain plug by a quick coupler for draining the engine oil more easily.

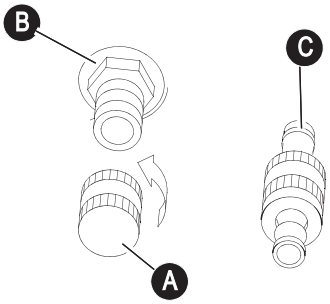


Fig. 12: Drain coupling with hose

- 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

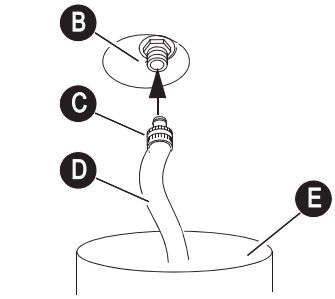
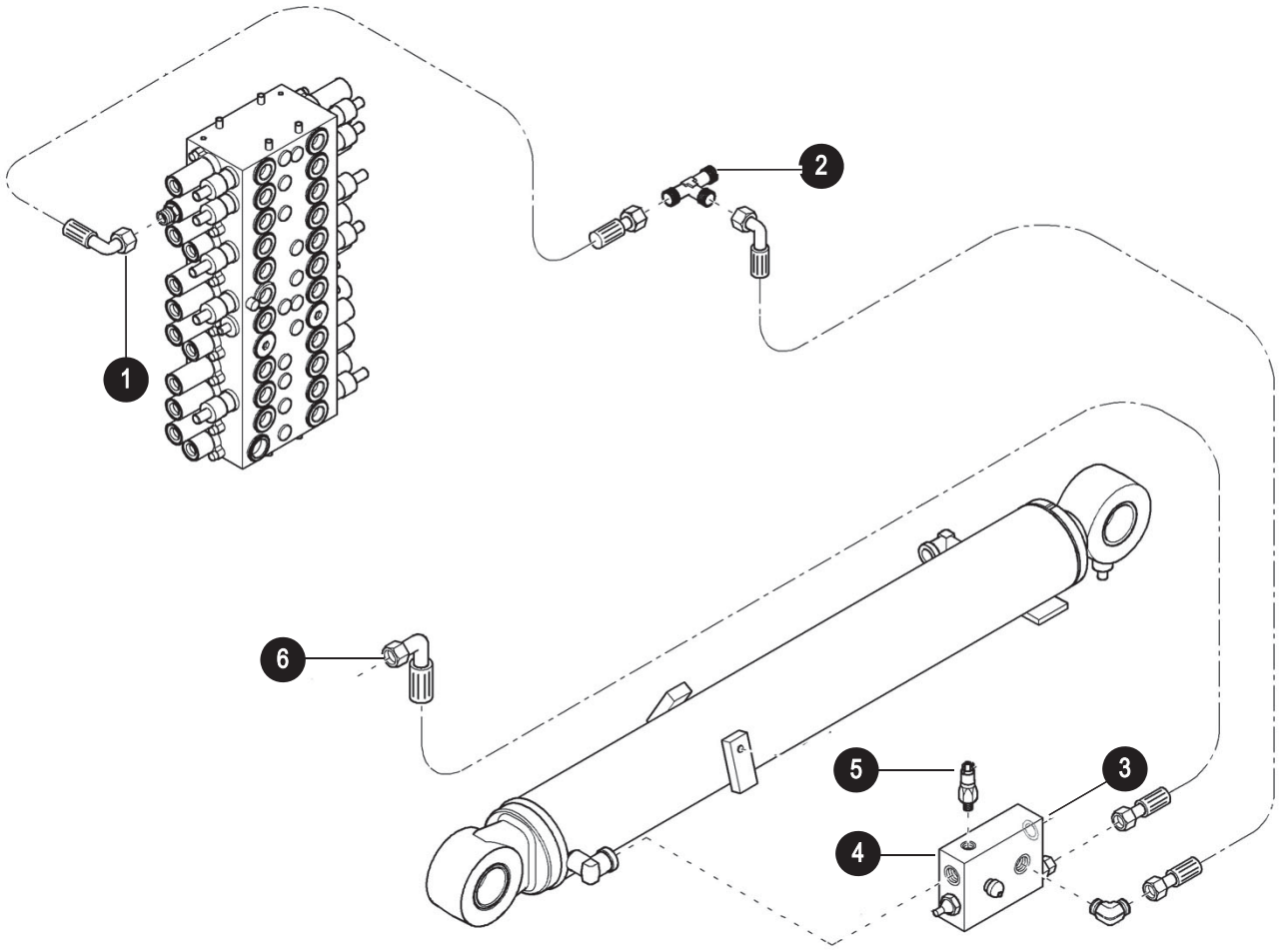


Fig. 13: Drain coupling with hose

- Completely drain the oil
- Unscrew drain coupling **C**
- Screw on cap **A** of the oil drain valve
- Fill in engine oil
  – *see 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

7.11 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.

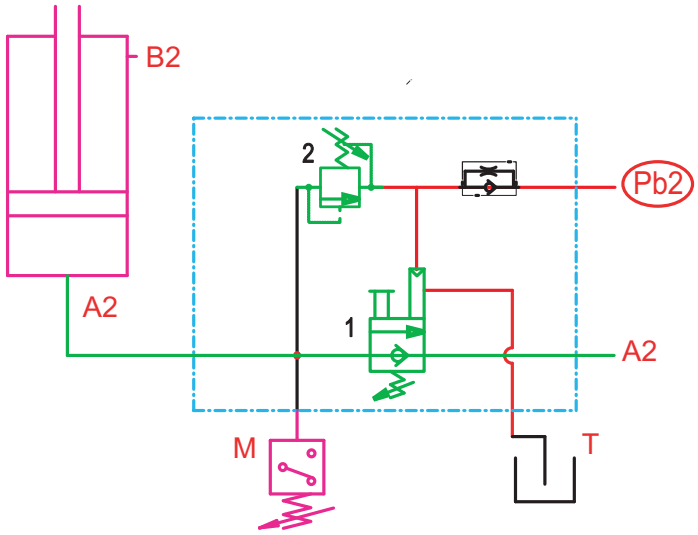
"Retract ram" function:

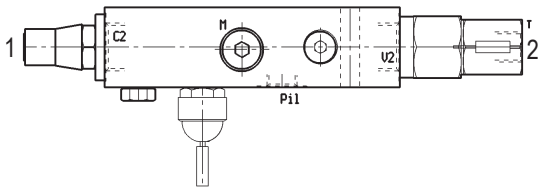
- Pilot control pressure moves valve (1) to work position (free oil reflux from the base side)
- In addition, a safety valve (2) protects the hydraulic ram from overload. Overload actuates the pressure switch (M), the warning device lights up and the buzzer sounds.

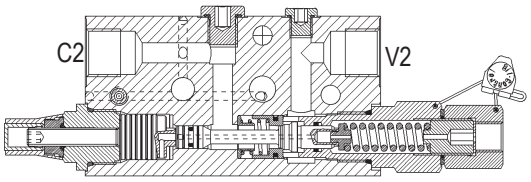
Important!

The valve settings are sealed, no modifications for legal reasons!

Wiring diagram

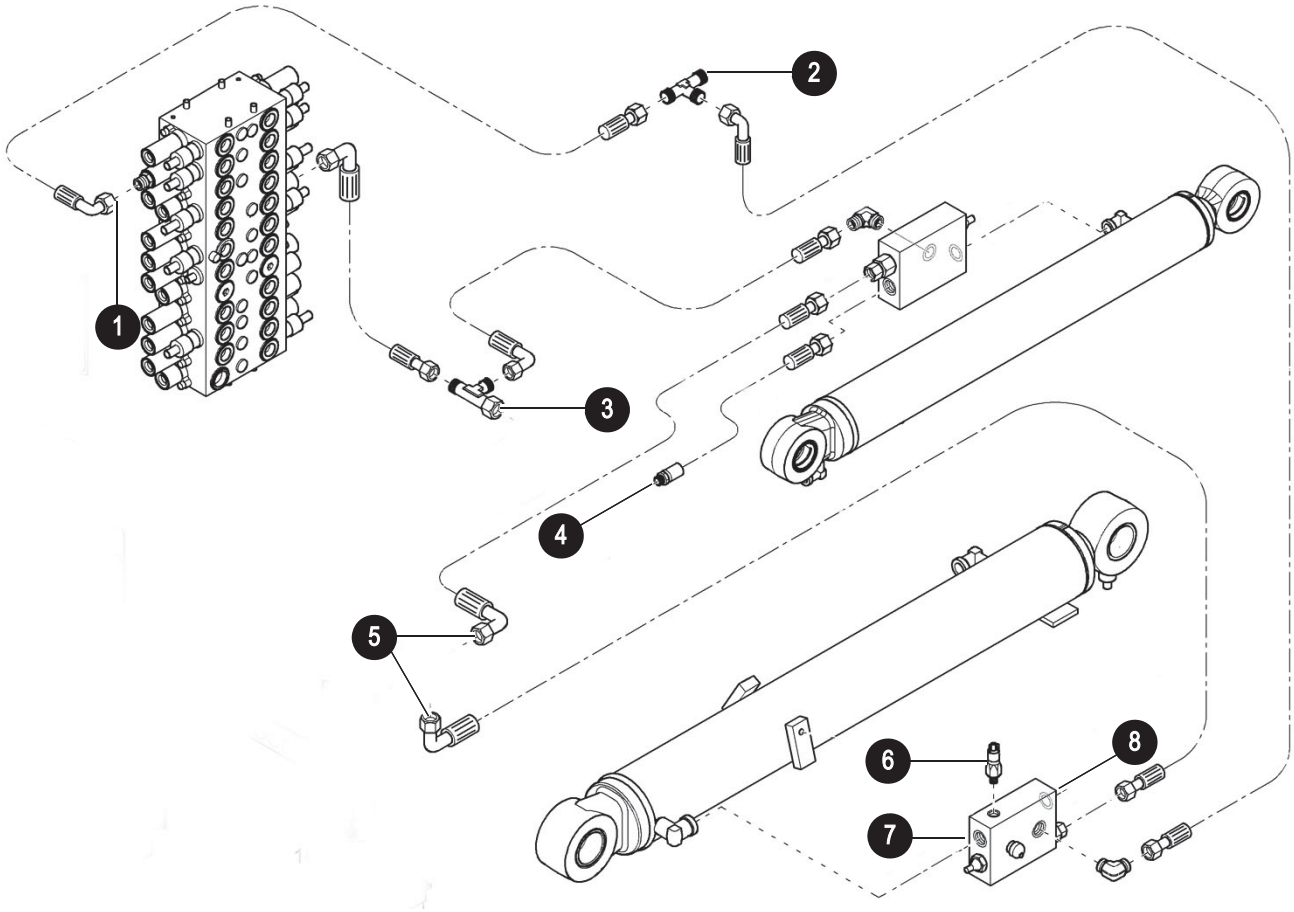






7.12 Safe load indicator F (safety valves for boom and stick)

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

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:

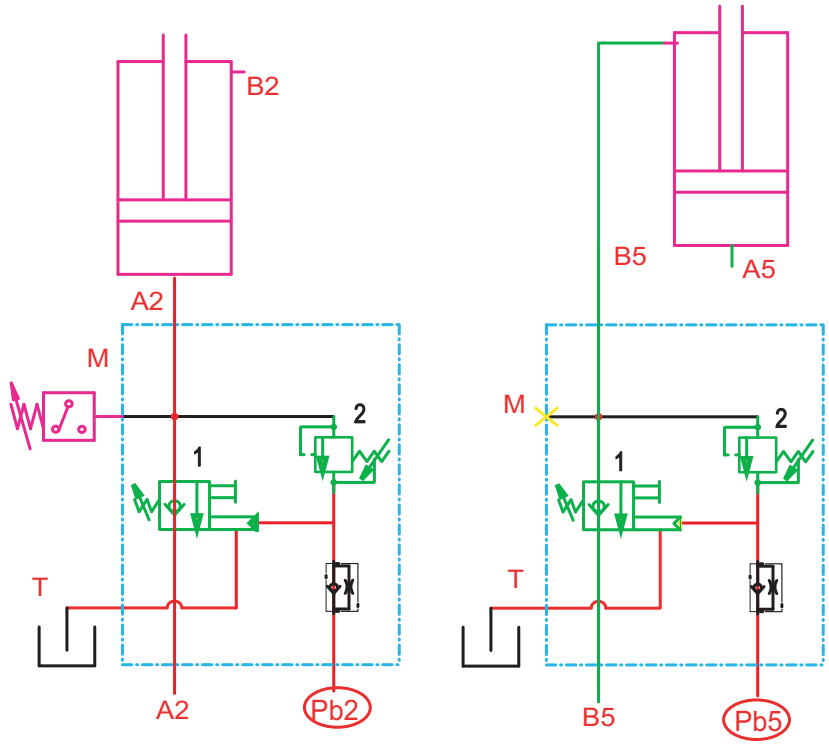
- Pilot control pressure moves valve (1) to work position (free oil flow to the base side)
- The valve moves back to home position if the pilot control pressure drops

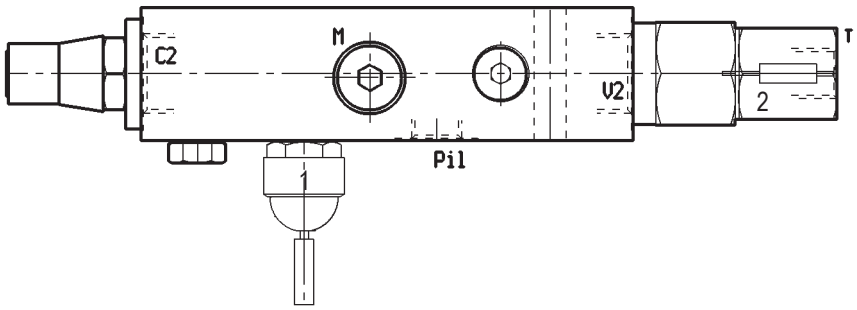
In addition, a safety valve (2) protects the hydraulic ram from overload. Overload actuates the pressure switch (M), the warning device lights up and the buzzer sounds.

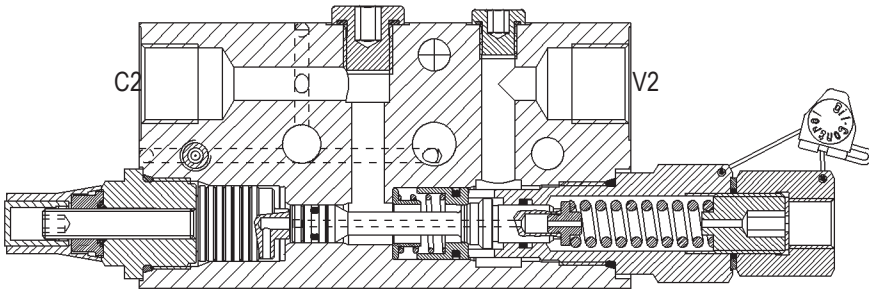
Important!

The valve settings are sealed, no modifications for legal reasons!

Wiring diagram







7.13 3rd control circuit

Function

Fig. 14: 3rd control circuit

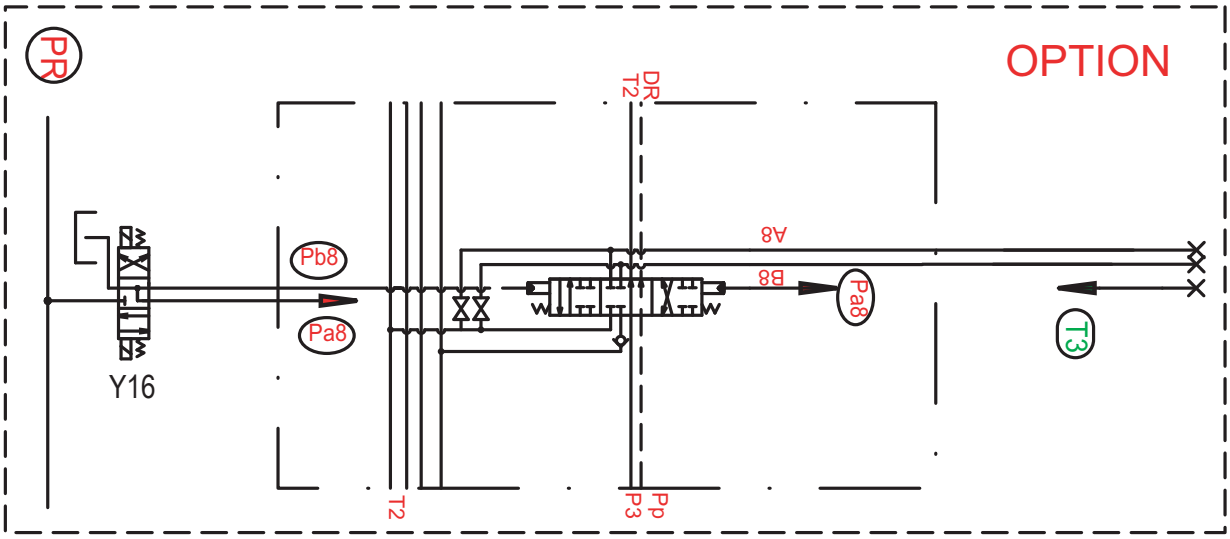
The 3rd control circuit allows you to operate a range of attachments with up to 3 hydraulic circuits.

- 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

Diagram



Port	Legend	Controlled via
Pa8	3rd control circuit (control)	
Pb8	3rd control circuit (control)	
A8	3rd control circuit (connection)	
B8	3rd control circuit (connection)	
P3	High-pressure supply	Pump 3
T2, T3	Tank lines	
PR	Pilot control pressure	Pilot oil supply unit

7.14 Electric auxiliary hydraulics

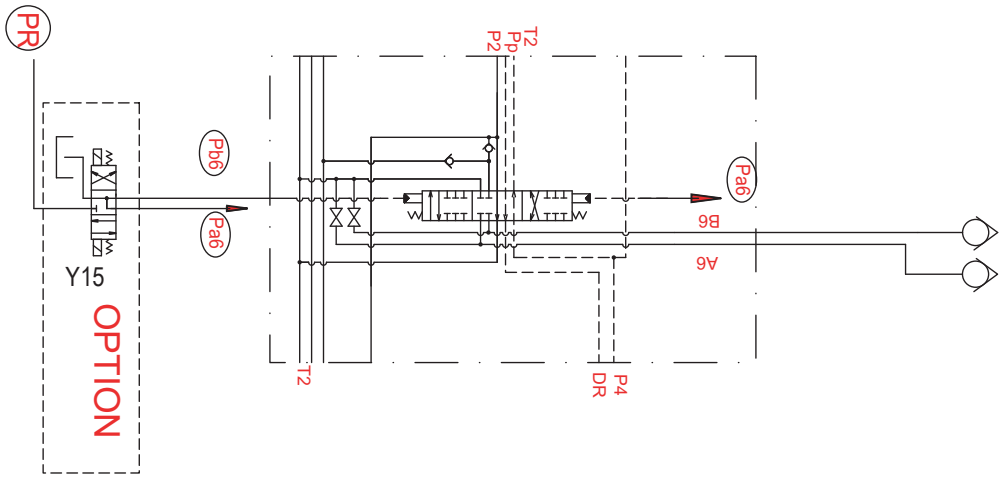
Function

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. 15: Solenoid valve Y15

☞ *Pressing the tip switch on the joystick activates the solenoid valve Y15 (fig. 15)*
– see 4/3 directional valve on page 5-22

Port	Legend
Pa6	Auxiliary hydraulics control
Pb6	Auxiliary hydraulics control
A6	Auxiliary hydraulics connection
B6	Auxiliary hydraulics connection
P2	Pump P1 connection
P4, Pp	Pilot control pressure circulation
PR	Pilot control pressure supply



7.15 Auxiliary hydraulics shock cartridge

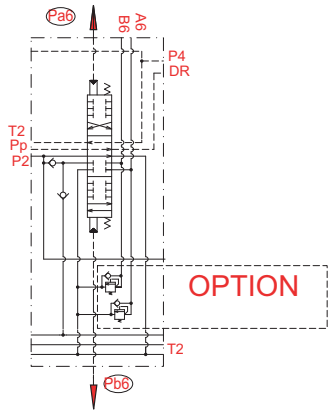


Fig. 16: Auxiliary hydraulics shock cartridges

- 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 280 bar (4061 psi).

Please observe the following should the pressure limiting valves be set to less than 280 bar (4061 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 280 bar (4061 psi) when changing attachment.

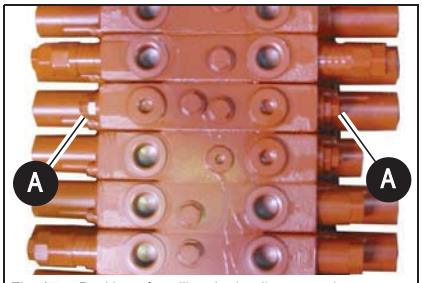


Fig. 17: Position of auxiliary hydraulics secondary pressure limiting valve

Location:

Shock cartridges **17/A** are screwed into the auxiliary hydraulics segment of the main valve block

– *see Pressure limiting valves* on page 5-9

7.16 3rd control circuit shock cartridge

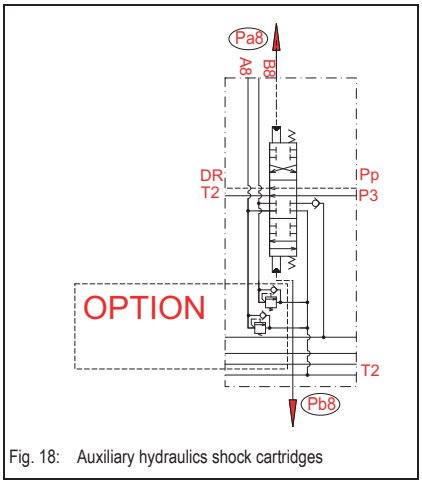


Fig. 18: Auxiliary hydraulics shock cartridges

- 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 280 bar (4061 psi).

Please observe the following should the pressure limiting valves be set to less than 280 bar (4061 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 280 bar (4061 psi) when changing attachment.

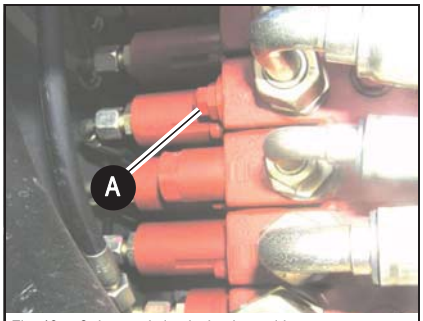


Fig. 19: 3rd control circuit shock cartridges

Location:

Shock cartridges **19/A** are screwed into the auxiliary hydraulics segment of the main valve block
– *see Pressure limiting valves* **on page 5-9**

7.17 Drive interlock (antitheft protection)

Position

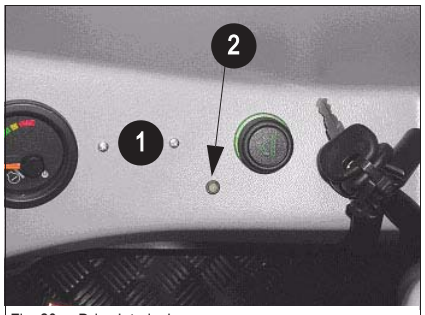


Fig. 20: Drive interlock

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 7-29

➥ 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 LED comes on slowly three times

☞ *Hold further keys next to the transponder 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

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 7-29

➥ 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 LED 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 7-29.

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.

7.18 Quickhitch

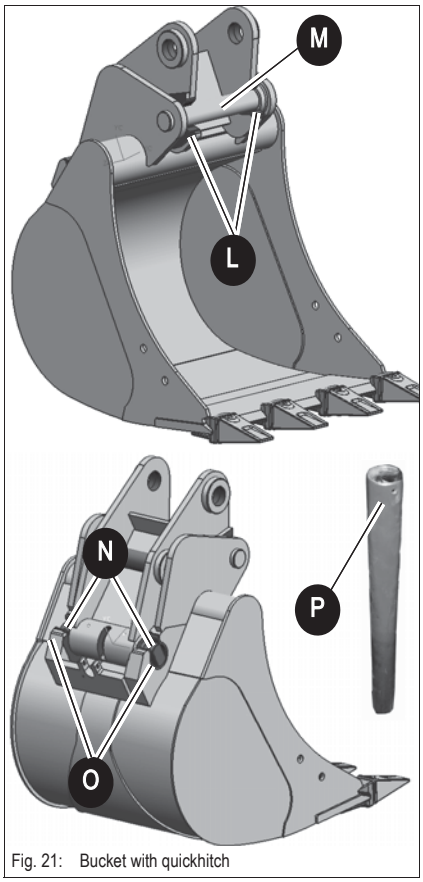


Fig. 21: Bucket with quickhitch

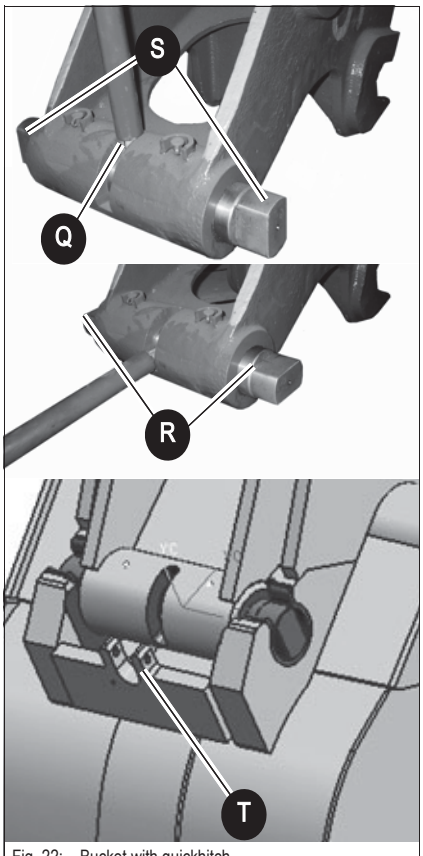


Fig. 22: Bucket with quickhitch

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 pins 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 pins must be in position **S**

7.19 Automatic idling speed feature

Function

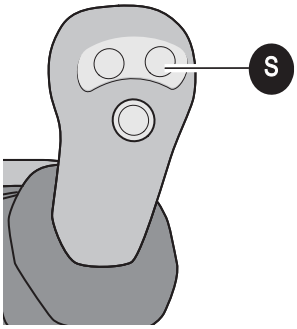
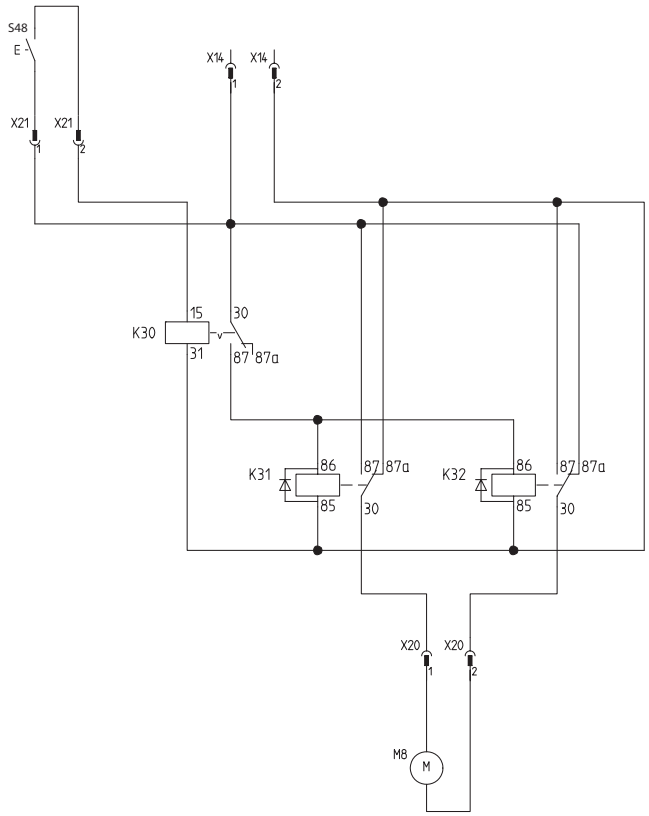


Fig. 23: Right-hand side joystick with tip switch

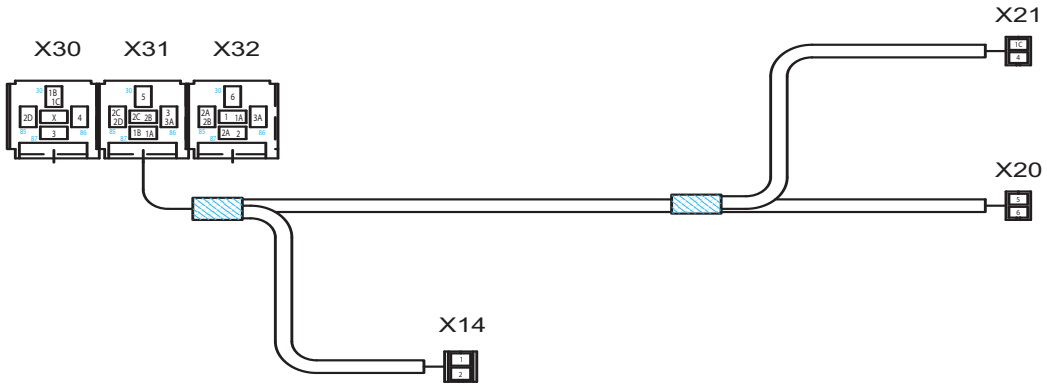
- ☞ *Switch on with tip switch **S** (S59)*
- ☞ *Stepless adjustment of engine speed with the throttle lever*
- ☞ *Actuating tip switch **S** again causes the engine speed to return to idling speed even if the throttle lever is in maximum position.*
- ☞ *Pressing tip switch **S** on the control lever again automatically increases the engine speed*
- ☞ *again to the engine speed previously set with the throttle lever.*

Diagram



No.	Description
X14	Supply connection
X20	Motor connection
X21	Tip switch connection
K30	Step-by-step relay
K31	Relays
K32	Relays
S59	Joystick tip switch
M8	Spindle motor

Wiring harness



No.	Up to	To	Colour	mm²
1	X14/1 supply connection	K32/87A relay	blu	1
1 A	K32/87A relay	K31/87 relay	blu	1
1b3	K31/87 relay	K30/30 step-by-step relay	blu	1
1C	K30/30 step-by-step relay	X21/1 tip switch connection	blu	1
2	X14/2 supply connection	K32/87 relay	blk	1
2A3	K32/87 relay	K32/85 relay	blk	1
2b3	K32/85 relay	K31/87 relay	blk	1
2C	K31/87 relay	K31/85 relay	blk	1
2D	K31/85 relay	K30/85 step-by-step relay	blk	1
3	K30/87 step-by-step relay	K31/86 relay	grn	1
3A3	K31/86 relay	K32/86 relay	grn	1
4	K30/86 step-by-step relay	X21/2 tip switch connection	yel	1
5	K31/30 relay	X20/1 motor connection	vio	1
6	K32/30 relay	X20/2 motor connection	brn	1

The relays are located behind the instrument panel and can be accessed from outside the cab
– *see Cab overview* on page 1-7.

The motor is mounted on the lower side of the cab.

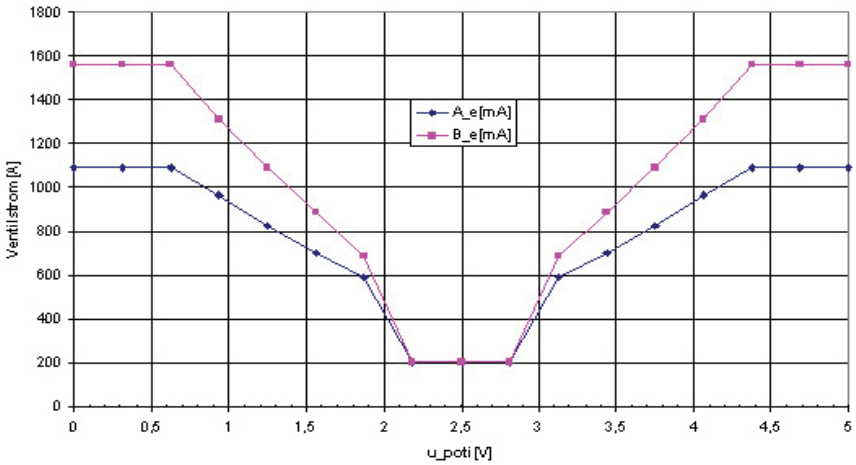
7.20 Proportional controls

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 7-35.

The slide switch is not pressed fully in this position and you can move the machine more smoothly (flat characteristic curve).



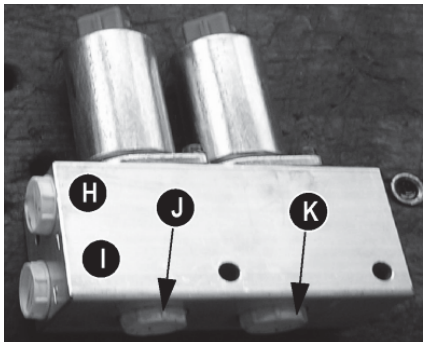
If you require the full throughput then characteristic curve 2 will be the choice to make (slide switch pressed as far as it will go).

Caution!

Always use button B (– *see chapter Hammer operation* on page 7-35) on the joystick for hammer operation.

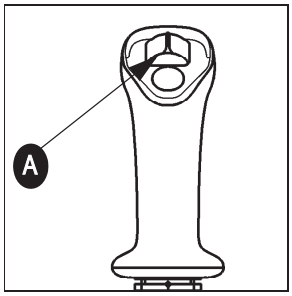
☞ *Do not operate the hammer with characteristic curve 1 too often since the slide switch described above does not ensure full throughput, causing power loss and system overheating.*

Ports



Ports	Hose designation
H	T line
I	P line
J	Auxiliary hydraulics (left)
K	Auxiliary hydraulics (right)

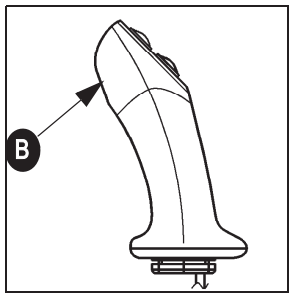
Overview



Auxiliary hydraulics controls

☞ *Move slide switch A to the left or right*

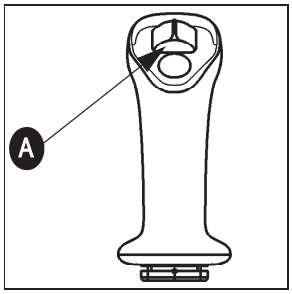
☞ *Ensures proportional control of the auxiliary hydraulic circuit*



Hammer operation

Switching on hammer operation

☞ *Press button B on the control lever*



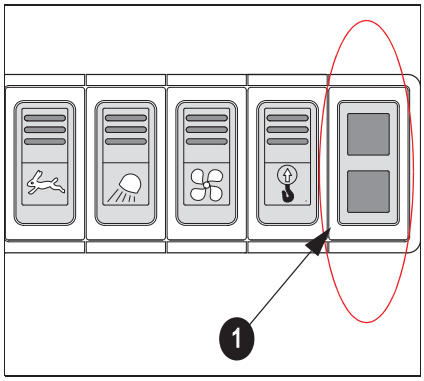
Adjusting control response

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.

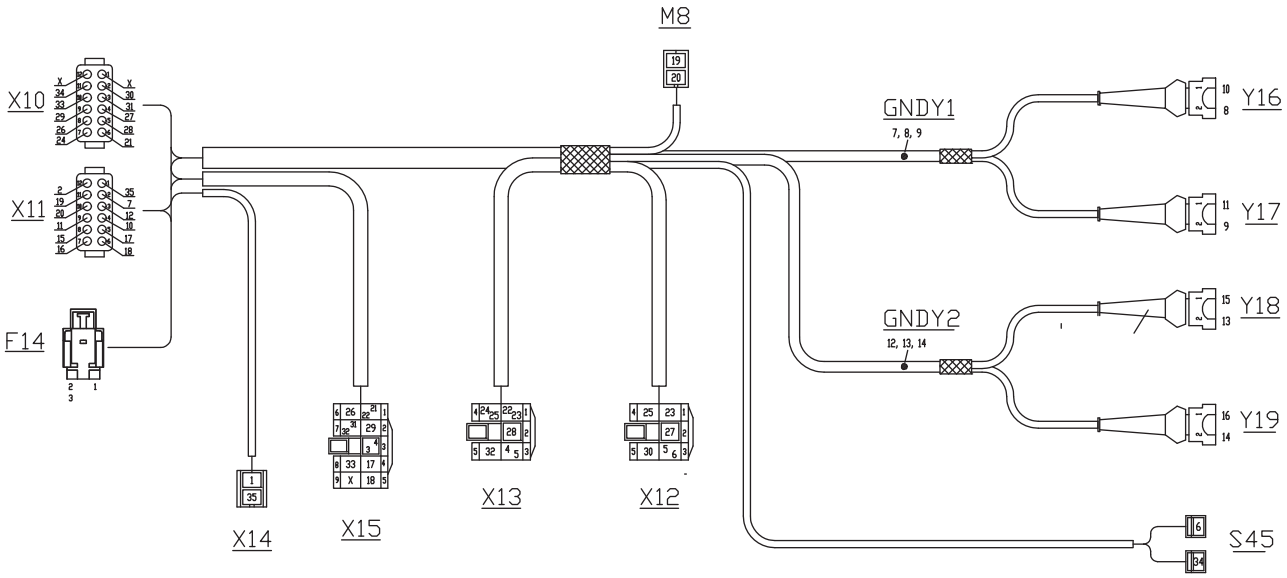
Characteristic curve 1 (slow movements)

☞ *Telltale 1 in the status display flashes once after switching on ignition*

Characteristic curve 2 (fast movements – max. throughput)

☞ *Telltale 1 in the status display flashes twice after switching on ignition*

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

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 +5V
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

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	-	-
1	B 5	Channel 1 input (left)	Defective input voltage	Check voltage, home position: 2.5 V deflected: 0.7 V – 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
4	B4	Channel 2 input (right)	Defective input voltage	Check voltage, home position: 2.5 V deflected: 0.7 V – 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	+5V joystick	Defective 5V supply	-	x

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)

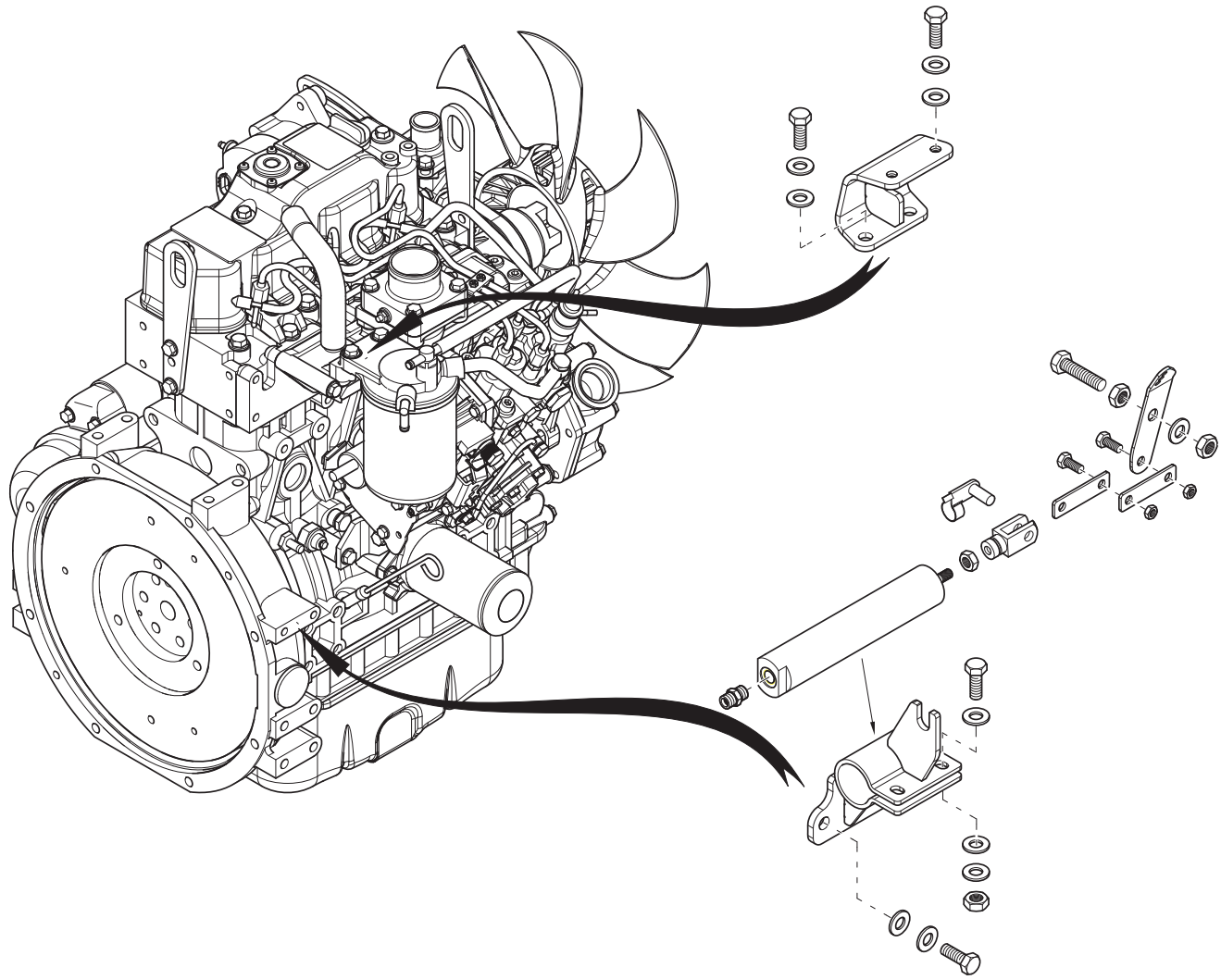
➥ B: channel 1/magnet 1 has an “Overtemp” error and channel 2 has a “Short circuit to earth” error, the following flash sequence is issued:

2 > Pause > 1 > Pause > 1 > Pause > 4

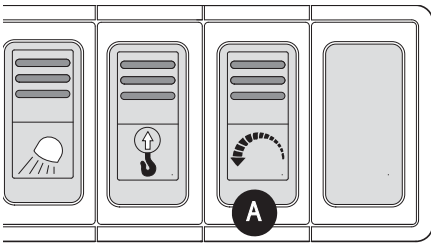
Cause of error:

- 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

7.21 Automatic revs setting (Tier 3A from AH00579)



Function

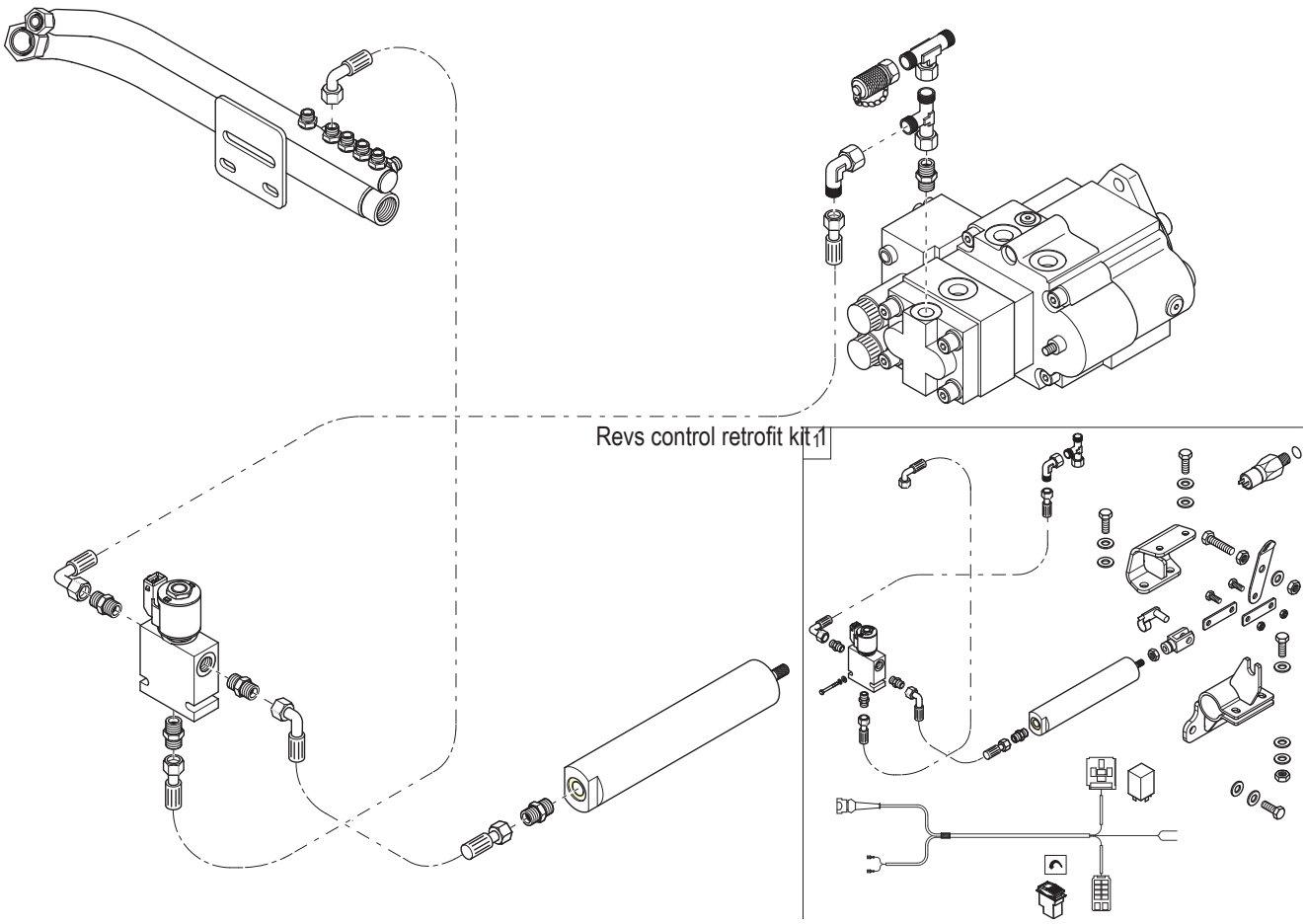


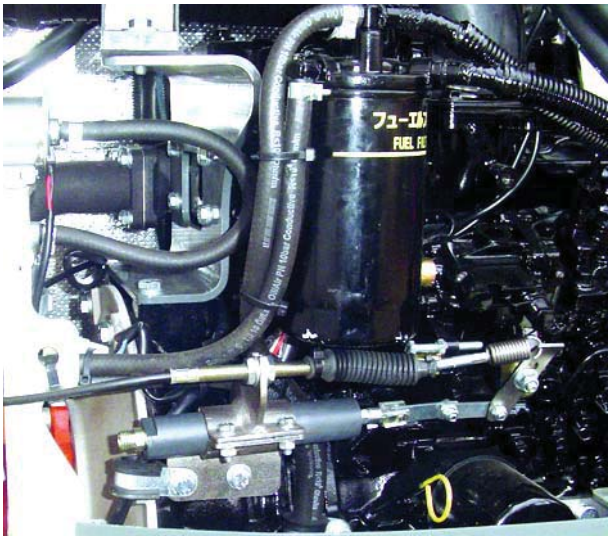
The required diesel engine revs are mechanically adjusted by means of a cable pull, and the manual throttle. The automatic revs setting is enabled via switch **A** in the cab.

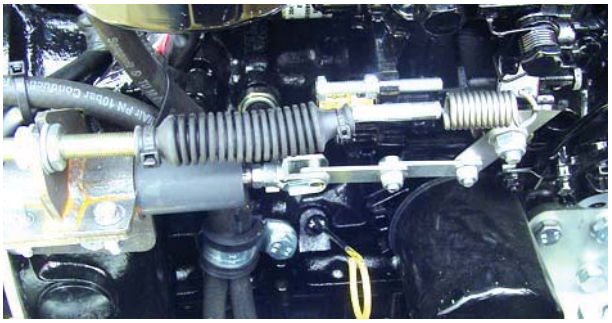
If the automatic revs setting is enabled and the machine does not carry out any work movements for about 5 seconds, the diesel engine is set to idling speed by means of the hydraulic ram and the controls (= directional valve and time lag relay). As soon as a work operation is carried out again, the engine is reset to the engine speed that has been set previously.

If the automatic revs setting is not enabled, engine speed is not lowered automatically. This is then carried out mechanically with the cable pull and the manual throttle lever.

Installation







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