

Service Manual

Track excavator

38Z₃



Machine model

38Z₃

Edition

2.1

Language

English

Item no.

1000160891

Documentation

Description	Order no.
Operator's Manual	1000155267
Service manual	1000160891
Spare parts catalogue:	
up to serial no. AE02803	1000154748
from serial no. AG00573	1000180706

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The cover features the machine with possible optional equipment.



**WACKER
NEUSON**

Wacker Neuson Linz GmbH

Haidfeldstr. 37

A-4060 Linz-Leonding

Document: SERV-HB 38Z3 EN

Order no.: 1000160891

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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.

Will be pleased to answer any further questions regarding the machine or the service manual.

Your Wacker Neuson dealer.

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. Wacker Neuson Linz 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 Wacker Neuson Linz GmbH. Wacker Neuson Linz GmbH will not be liable for damage resulting from this
- Wacker Neuson Linz 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

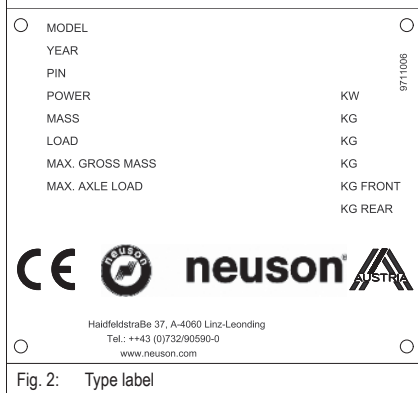


Fig. 2: Type label

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:	38z3
Year:	2005
PIN:	AC 000000
Output:	27.1 kW (36.3 hp)
Mass:	3800 kg (8378 lbs)
Load:	-----
Max. gross mass:	-----
Max. axle load:	-----

Other information – [see Specifications](#) on page 2-1

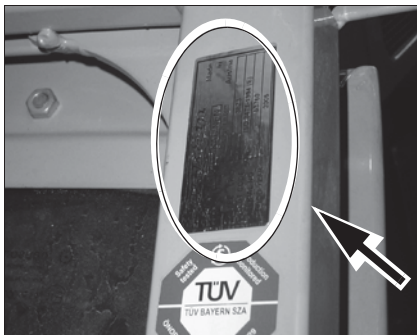


Fig. 3: Cab type label

Cab number

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

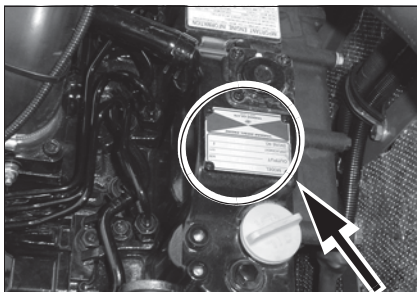


Fig. 4: Diesel engine number

Engine number

The type label (arrow) is located on the cylinder-head cover (engine).

Example: Yanmar 46557

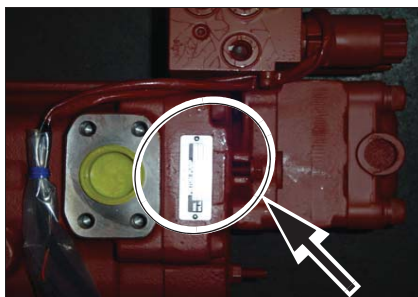


Fig. 5: Hydraulic pump type label

Hydraulic pump number

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

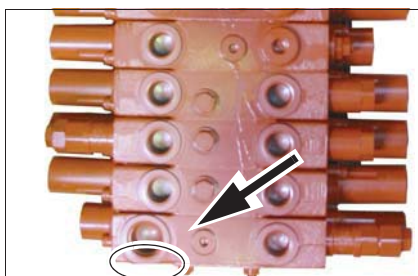


Fig. 6: Main valve block type label

Control valve number

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

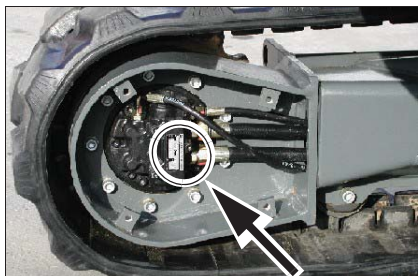


Fig. 7: Travelling drive type label

Travelling drive number

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

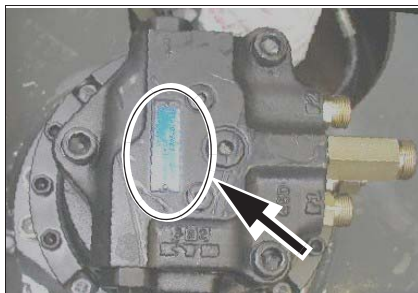


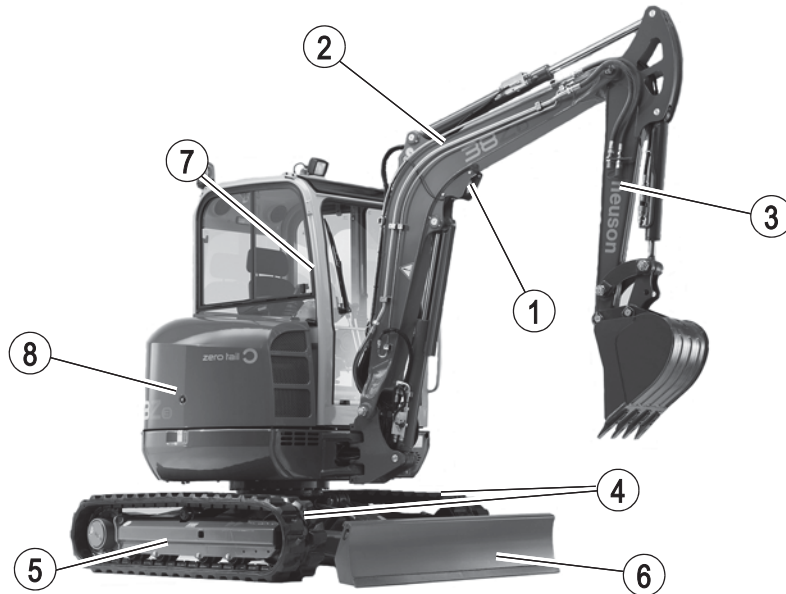
Fig. 8: Swivel unit type label

Swivel unit number

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

1.5 Machine: overview

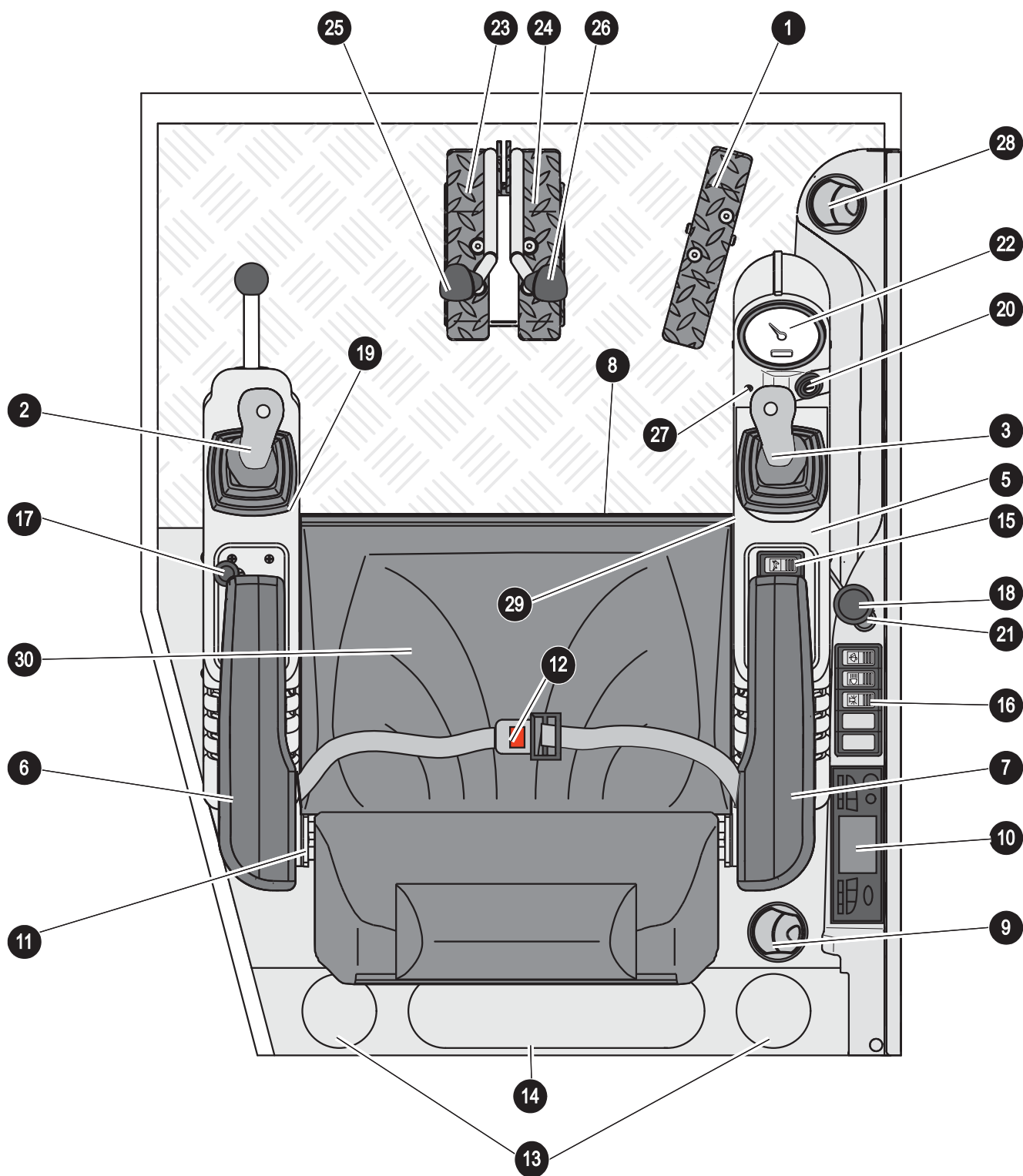
1	Boom light
2	Boom
3	Stick
4	Rubber chains
	Steel chains (option)
5	Undercarriage
6	Stabiliser blade
7	Cab
8	Engine cover



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

Fig. 9: Machine outside views

1.6 Cab overview



1.7 Cab (legend)

Pos.	Description
1	Hammer pedal
2	Control lever (left)
3	Control lever (right)
4	Control lever base (left)
5	Control lever base (right)
6	Armrest (left)
7	Armrest (right)
8	Lever – horizontal seat adjustment
9	Rear window air vent
10	Radio (option)
11	Seat (backrest adjustment)
12	Seat belt
13	Cup holder
14	Bracket – document storage bin
15	Console switch panel
16	Cab switch panel
17	Throttle
18	Stabiliser blade lever
19	Fuse box
20	Preheating start switch
21	Cigarette lighter
22	Round indicating instrument
23	Drive pedal (left)
24	Drive pedal (right)
25	Drive lever (left)
26	Drive lever (right)
27	Drive interlock status indicator (option)
28	Front air vent
29	Drive interlock emitter/receiver unit
30	Seat

1.8 Instrument panel overview (up to serial no. AE02803)



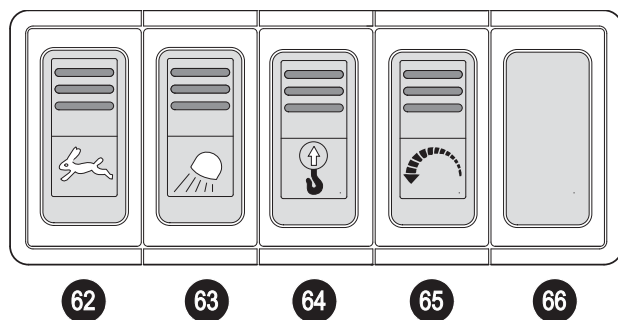
1.9 Instrument panel (legend)

Pos.	Description	For more information see page
31	Air filter telltale (red)	3-21
32	Cold starter telltale (yellow)	
33	Hydraulic oil filter telltale (red)	3-39
34	Telltale (red) – hydraulic oil temperature	
35	Telltale (red) – alternator charge function	
36	Telltale (red) – engine oil pressure	
37	Coolant temperature telltale (red)	
38	Telltale (yellow) – engine oil temperature	
39	Safe load indicator telltale (red)	7-13
40	Hour meter	
41	Turn indicators	
42	Temperature indicator	
43	Wiper	
44	Roof lights	
45	Rotating beacon	
46	High speed	
47	Working lights	
48	Fan	
49	Safe load indicator (option)	7-13
50	Proportional controls telltale	7-21
51	Fuel level indicator (diesel)	
52	Lights telltale	

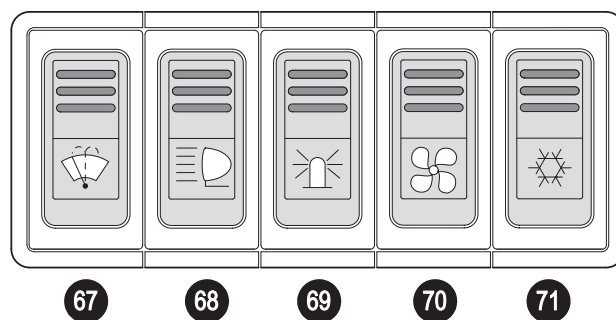
1.10 Instrument panel overview (from serial no. AG00573)



Control element on control console

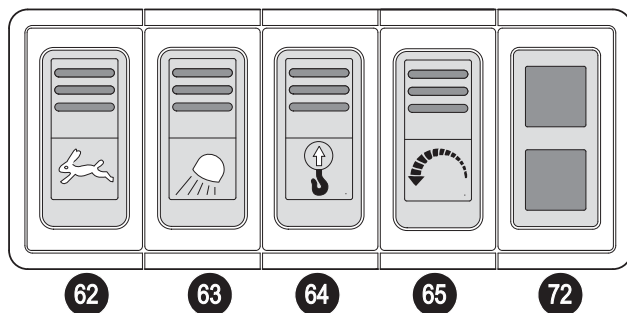


Control element on cab wall

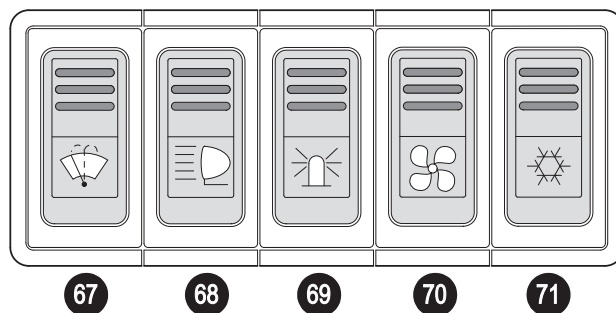


Control elements for proportional controls version (option):

Control element on control console



Control element on cab wall

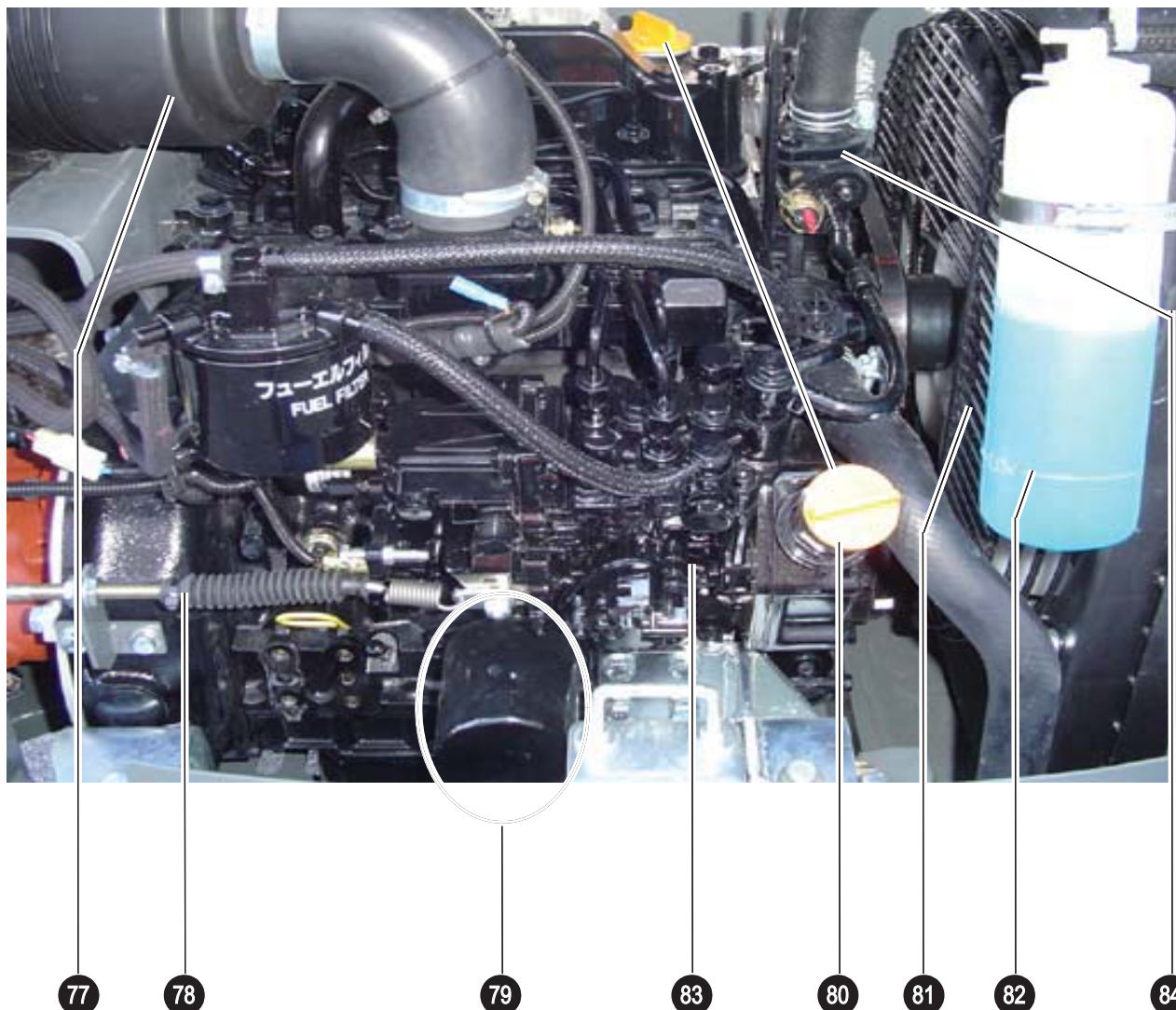


1.11 Instrument panel (legend)

Pos.	Description	For more information see page
53	Telltale (red) – air filter	3-20
54	Cold starter telltale (yellow)	
55	Telltale (red) – hydraulic oil filter	3-37
56	Telltale (red) – hydraulic oil temperature	
57	Telltale (red) – alternator charge function	
58	Telltale (red) – engine oil pressure	
59	Coolant temperature telltale (red)	
60	Telltale (red) – safe load indicator	7-13
61	Hour meter	
62	High speed	
63	Working light	
64	Safe load indicator (option)	7-13
65	Automatic revs setting (option)	7-30
66	Not assigned	
67	Washer system	
68	Roof lights	
69	Rotating beacon	
70	Ventilation	
71	Air conditioning (option ¹)	7-3
72	Proportional control status indicator (option)	7-21
73	Fuel level indicator (diesel)	
74	Not assigned	
75	Not assigned	
76	Not assigned	

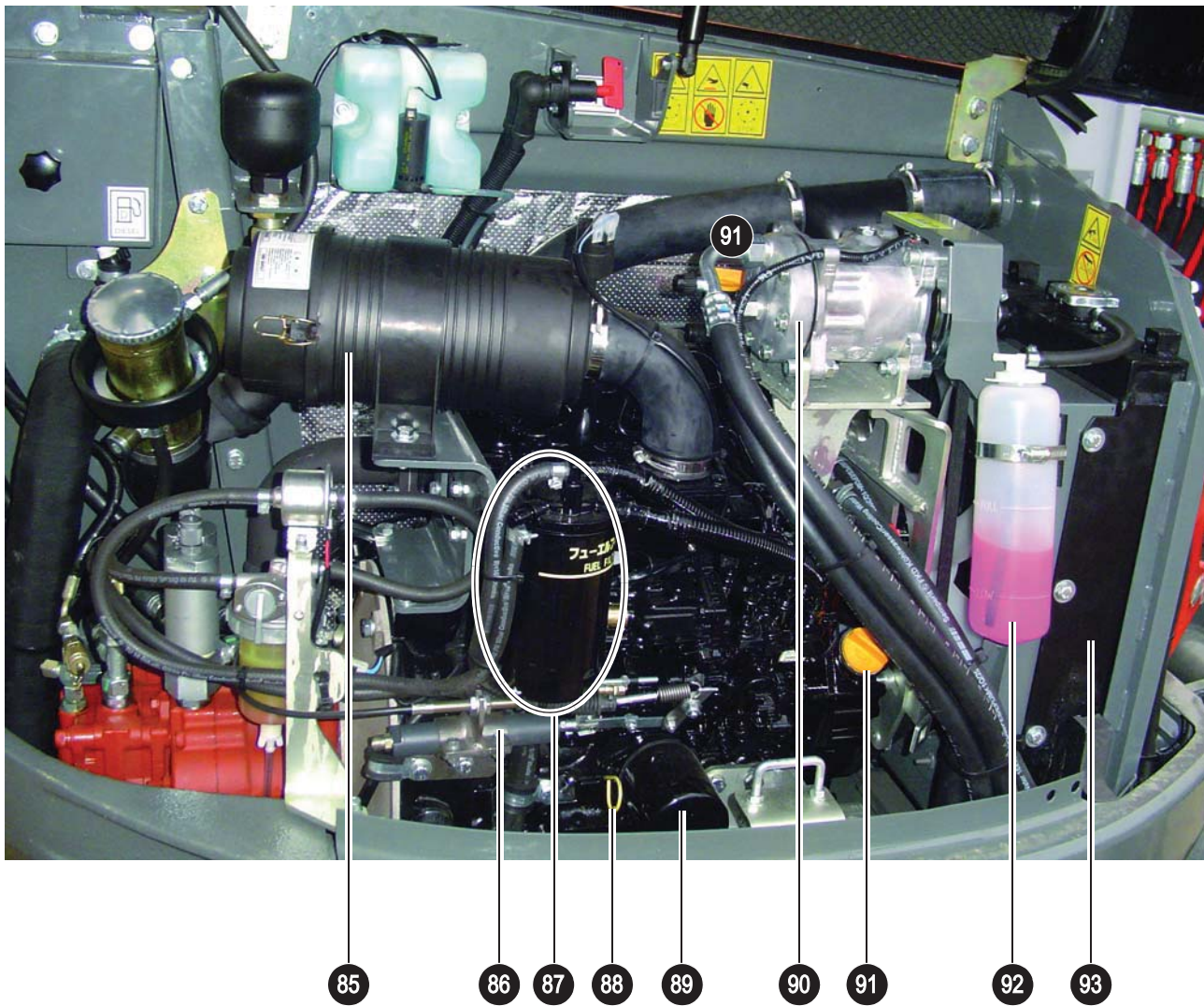
¹. If equipped with air conditioning and proportional controls, switch assignment is the same as without proportional controls. The status telltale is then installed in the control console on the right.

1.12 Engine compartment overview (Tier 2 up to AE02803)



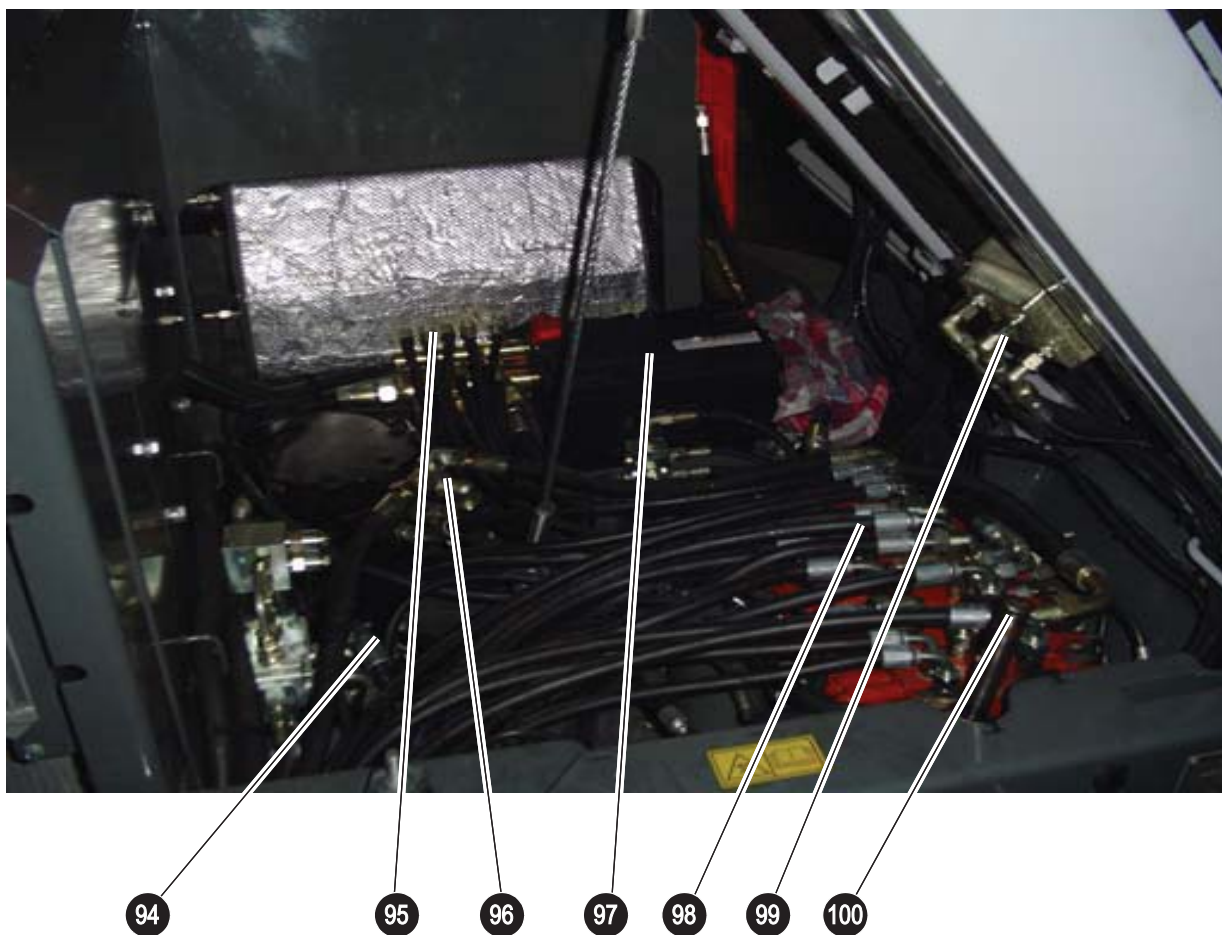
Pos.	Description	For more information see page
77	Air filter	5-5
78	Throttle cable	3-31
79	Engine oil filter	3-11
80	Oil filler neck	4-1
81	Fan wheel	3-18
82	Expansion tank	3-18
83	Fuel injection pump	4-8
84	Temperature control (thermostat)	4-10

1.13 Engine compartment overview (Tier 3A from AG00573)



Pos.	Description	For more information see page
85	Air filter	3-20
86	Automatic revs setting (option)	7-30
87	New fuel filter	4-13
88	Oil dipstick	
89	Engine oil filter	3-16
90	New air conditioning compressor (option)	
91	Oil filler neck	4-1
92	Expansion tank	3-18
93	Radiator	3-18

1.14 Chassis overview



Pos.	Description	For more information see page
94	Swivel joint	5-30
95	Leak oil strip	
96	Swivel unit	5-26
97	Battery	3-47
98	Main valve block	5-5
99	Pilot valve (drive)	5-13
100	Jack	

1.15 Tilting the cab



Danger!

Careful when tilting the cab –

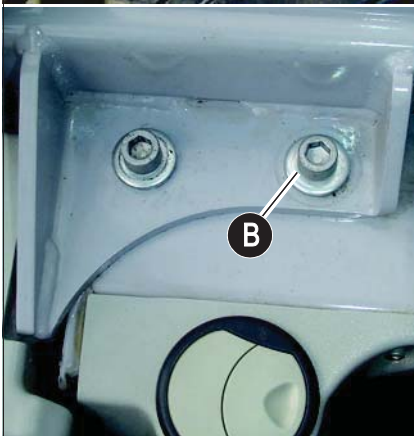
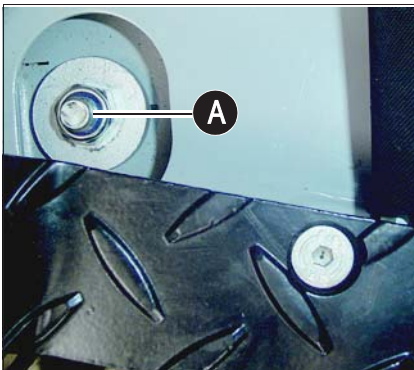
Danger of accidents!

- ☞ *Always tighten screws **A**, **B** and **C** firmly 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 lock screw

Slacken the screws as follows:

- ☞ *Switch off the engine*
- ☞ *Remove the ignition key*
- ☞ *Fold the control lever base (left) up*
- ☞ *Unscrew screw **A** with a suitable tool*
 - ➔ Screw **A** is located at the front right in the cab underneath the floor mat
- ☞ *Slacken screw **B** with a suitable tool*
 - ➔ Screw **B** is located in the cab at the right behind the seat



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*

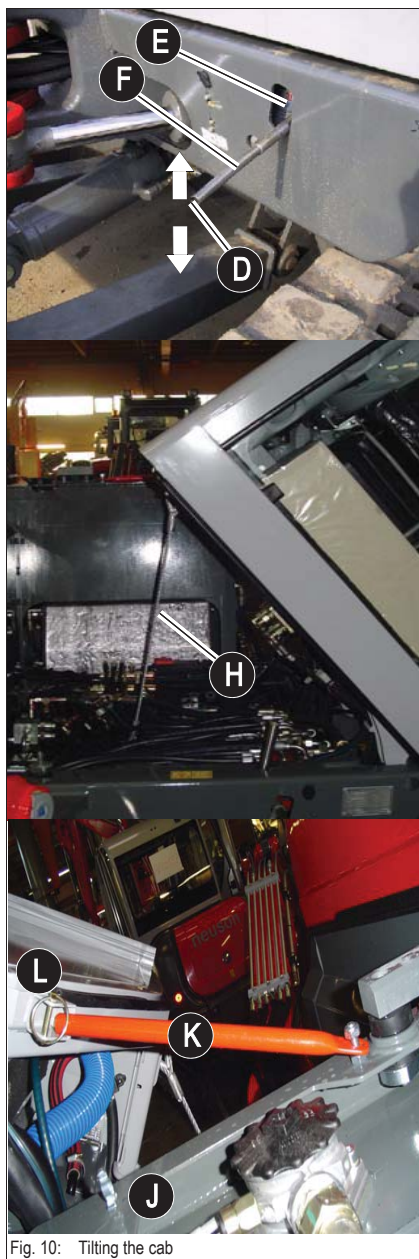


Fig. 10: Tilting the cab

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 the handle until the cab is completely tilted beyond the centre of motion
 - The cab is secured with safety cable **H**
- Remove the split pin from bracket **J**
 - Slide tilt rod **K** into guide **L**
 - Secure tilt rod **K** with the split pin in guide **L**

Tilting the cab down:

- Remove the split pin from guide **L**
 - Slide tilt rod **K** into clasp **J**
 - Insert the split pin into guide **L**
- Use the handle 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 lock screws **A** (front) and **B** (rear) with suitable tools and the specific torque
 - see Tightening torques for high-resistance screw connections on page 2-9



Caution!

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

- Replace defective parts immediately



Specifications

2 Specifications

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine

Model 38Z3		
Engine type	Tier 2	Tier 3A
Product	Yanmar diesel engine	
Type	3TNV88-PNS	3TNV88-BPNS
Design	Water-cooled 4 stroke diesel engine	
No. of cylinders	3	
Fuel injection system	Direct injection	
Aspiration	Natural aspiration	
Cooling system	Water-cooled/aspirating fan	
Lubrication system	Force-feed lubrication with trochoidal pump	
Displacement	1642 cm ³ (100.2 in ³)	
Nominal bore and stroke	88 x 90 mm (3.46 x 3.54")	
Output	21,0 kW (28.2 hp) at 2400 rpm	
Max. torque	101.5 – 110.5 Nm (74.9 - 81.5 lbf ft) at 1100 rpm	106.6 Nm (78.6 lbf ft) at 1440 rpm
Max. engine speed without load	2500 ± 10 rpm	
Idling speed	1100 ± 50 rpm	
Valve tip clearance (intake = outlet)	0.15 – 0.25 mm / 0.0059 - 0.0098" (cold)	
Compression	34.3 ± 1 bar at 250 rpm (497.5 ± 14.5 psi at 250 rpm)	33.3 – 35.3 bar at 250 rpm (483 - 512 psi at 250 rpm)
Engine oil pressure	3 – 4 bar (43.5 - 58 psi)	3.5–5.0 bar (50.8 - 72.5 psi)
Pressure switch for engine oil pump	0.5 ± 0.1 bar (7.25 ± 1.45 psi)	
Thermostat opening temperature	69.5 – 72.5 °C (157.1 - 162.5°F)	
Thermal switch	107 – 113 °C (224.6 - 235.4°F)	
Firing order	1 – 3 – 2	
Direction of rotation	Counterclockwise (as seen from the flywheel)	
Starting aid	Intake manifold preheating (preheating time 10 – 15 sec)	Glow elements (preheating time 10 – 15 seconds)
Max. inclined position (engine no longer supplied with oil):	30° in all directions 35° no longer than 3 minutes!	
Specific fuel consumption	257 g/kWh (0.423 lb/hph)	252 g/kWh (0.414 lb/hph)
Exhaust values according to	97/68/EC Tier 2 EPA Tier 2	97/68/EC Tier 3A EPA Tier 4 interim

Fuel injection pump

Type	YPD-MP2	
	Tier 2	Tier 3A
Design	Single piston distributor injection pump	
Injection pressure	216 – 226 bar (3133 - 3278 psi)	196 – 206 bar (2843 - 2988 psi)
Revs control	Mechanical	
Lubrication system	Engine oil lubrication	

Engine capacities

Capacities	Model 38Z3	
	Tier 2	Tier 3A
Fuel tank	44 l (11.6 gal)	
Engine oil	7,1 l (1.9 gal)	
Coolant (without radiator)	2 l (0.53 gal)	
Radiator	3,5 l (0.9 gal)	5,5 l (1.5 gal)
Expansion tank	0,84 l (0.22 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 38Z3
Pump	Tier 2 (up to AE02803)	Double variable displacement + twin gear pump 2 x 16 + 10.5 + 4.5 cm ³ (2 x 1.0 + 0.64 + 0.27 in ³) PVD-2B44BP-16G5-4713F
	Tier 3A (from AG00573)	Double variable displacement + gear pump 2 x 16 + 10.5 + 4.5 cm ³ (2 x 1.0 + 0.64 + 0.27 in ³) PVD-1B-34BP-10G5
Flow rate		2 x 40 + 26.3 + 11.3 l/min (2 x 11 + 7 + 3 gpm) at 2500 rpm
Control valve		11 sections/12 sections (3rd control circuit)
Main pressure limiting valve for pumps P1, P2		240 ^{±3} bar (3481 ^{±44} psi)
Main pressure limiting valve for pump P3		210 ^{±3} bar (3046 ^{±44} psi)
Secondary pressure limiting valve for main valve block		275 ^{-0/+0.5} bar (3989 ^{-0/+7} psi) at 20 l/min (5.3 gpm)
Main pressure limiting valve for pilot control pressure		35 ^{±1} bar (508 ± 14.5 psi)
Main pressure limiting valve for swivel unit engine pressure restriction		210 ^{±3} bar (3046 ^{±44} psi)
Hydraulic oil cooler		Standard
Hydraulic tank capacity		45 l (12 gal.US)
2nd speed shift pressure		180 bar (2611 psi)
Gear motor braking deceleration time		3.7 ^{-1.2/+1.2} sec at 50 °C / 122°F oil temperature
Circulation pressure P1,P2		15.5 bar (224.8 psi) / 12.5 bar (181.3 psi)
Circulation pressure P3		18 bar (261 psi)

Auxiliary hydraulics oil flow

Pressure (bar / psi)	P2 + P3 (l/min / gpm)	P2 (l/min / gpm)
15 / 218	65.5 / 17.3	40.5 / 10.7
40 / 580	64 / 16.9	40 / 10.6
60 / 870	62.5 / 16.5	39 / 10.3
90 / 1305	56 / 14.8	38.5 / 10.2
120 / 1740	50.5 / 13.3	37.5 / 9.9
150 / 2176	43.7 / 11.5	33.5 / 8.8
180 / 2611	37 / 9.8	29 / 7.7
200 / 2901	16 / 4.2	27 / 7.1



Important!

Output indications for auxiliary hydraulics with unpressurised reflux line.

Adjustment – see *Flow rate adjustment of auxiliary hydraulics* on page 5-12

2.4 Undercarriage and swivel unit

Undercarriage/swivel unit	Model 38Z3
2 speed ranges	2.8/4.6 km/h (1.7/2.9 mph)
Hill climbing ability (no longer than 3 minutes)	30°/58 %
Chain width	300 mm (11.8")
No. of track rollers on either side	4
Ground clearance	280 mm (11")
Ground pressure	0.34 kg/cm ² (4.8 psi)
Upper carriage swivel speed	8.8 rpm

2.5 Stabiliser blade

Stabiliser blade	Model 38Z3
Width/height	1740/345 mm (68.5"/13.6")
Max. lift over/under subgrade	390/450 mm (15.4"/17.7")

Screwable hose burst valve

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

– see chapter 5.17 Hydraulics diagram 38Z3 A3 on page 5-35 item 23

2.6 Electric system

Electric system	
Alternator	12 V 55 A
Starter	12 V 1.7 kW (2.3 hp)
Battery	12 V 71 Ah
Socket	E.g. for cigarette lighter; 15 A max.

Fuse box in instrument panel

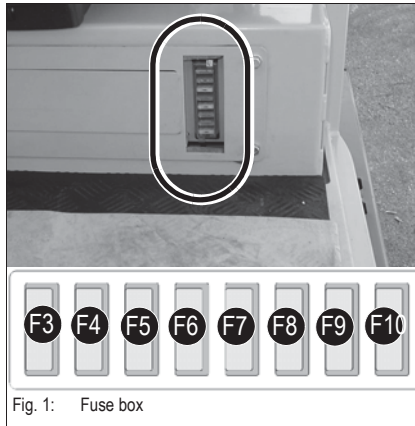
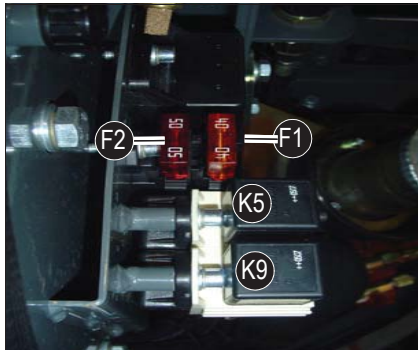


Fig. 1: Fuse box

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

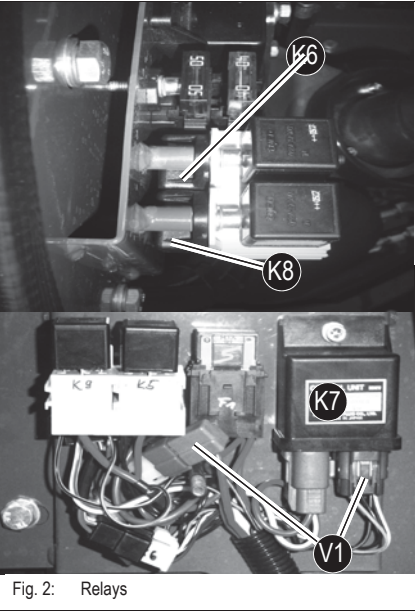
The main fuse box is located in the partition wall to the left of the engine.



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

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

Relays



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)
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 38Zs
Sound power level (L_{WA})	95 dB (A)
Sound pressure level (L_{PA})	75 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 Wacker 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 (in³/gal)	% by volume	% by volume
4 (39.2)	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

38Z3		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 (WS)	Tightening 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 WS	Tightening 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 elasticseal	Identification aid outside Ø
	Sealing washer	Elastic seal	O-ring		
	Nm (lbf ft)	Nm (lbf ft)	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 (0.55)
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 (0.38)
G1/4A	35 (26)	35 (26)	30 (22)	35 (26)	13,16 (0.52)
G3/8A	45 (33)	70 (52)	45 (33)	50 (37)	16,66(0.66)
G1/2A	65 (48)	90 (66)	55 (41)	65 (48)	20,96 (0.83)
G3/4A	90 (66)	180 (133)	100(74)	140 (103)	26,44 (1.04)
G1A	150 (111)	310 (229)	160 (118)	190 (140)	33,25 (1.31)
G1 1/4A	240 (177)	450 (332)	210 (155)	360 (266)	41,91 (1.65)
G1 1/2A	290 (214)	540 (398)	260 (192)	540 (398)	47,80 (1.88)

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

Screw connections with various seals for hydraulic applications (heavy execution)

Thread	Straight pipe fitting with thread and screwed plug			Non-return valve with elastic seal	Identification aid outside Ø
	Sealing washer	Elastic seal	O-ring		
	Nm (lbf ft)	Nm (lbf ft)	Nm (lbf ft)		mm (")
M12X1,5	20 (15)	35 (26)	35 (26)	35 (26)	12 (0.5)
M14X1,5	35 (26)	55 (41)	45 (33)	45 (33)	14 (0.55)
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 (0.9)
M22X1,5	65 (48)	135 (100)	100 (74)	125 (92)	27 (1.0)
M27X2,0	90 (66)	180 (133)	170 (126)	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 (0.52)
G1/4A	45 (33)	80 (59)	60 (44)	60 (44)	16,66(0.66)
G3/8A	65 (48)	115 (85)	75 (55)	100 (74)	20,96 (0.83)
G1/2A	90 (66)	180 (133)	170 (125)	145 (107)	26,44 (1.04)
G3/4A	150 (111)	310 (229)	310 (229)	260 (192)	33,25 (1.31)
G1A	240 (177)	450 (332)	330 (243)	360 (266)	41,91 (1.65)
G1 1/4A	290 (214)	540 (398)	420 (310)	540 (398)	47,80 (1.88)

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 $\mu = 0.12$ and are to be used as approximate figures.

With fine-pitch thread					
Thread	Screws according to DIN 912, DIN 931, DIN 933 etc.			Screws according to DIN 7984	
	8.8	10.9	12.9	8.8	10.9
	Nm (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 (199)	385 (284)
M20X1,5	440 (325)	630 (465)	730 (538)	375 (277)	530 (391)
M22X1,5	590 (435)	840 (620)	980 (723)	500 (369)	710 (524)
M24X2,0	740 (546)	1070 (789)	1250 (922)	630 (465)	900 (664)
M27X2,0	1100 (811)	1550 (1143)	1800 (1328)	920 (679)	1300 (959)
M30X2,0	1500 (1106)	2150 (1586)	2500 (1844)	1300 (959)	1850 (1364)

DIN 912 – hexagon socket head cap screw; DIN 931/DIN 933 – hexagon head screw with/without shaft;

DIN 7984 – hexagon socket head cap screw with short head

All values subject to a friction coefficient of $\mu = 0.12$ and are to be used as approximate figures.

2.12 Dimensions model 38Z3

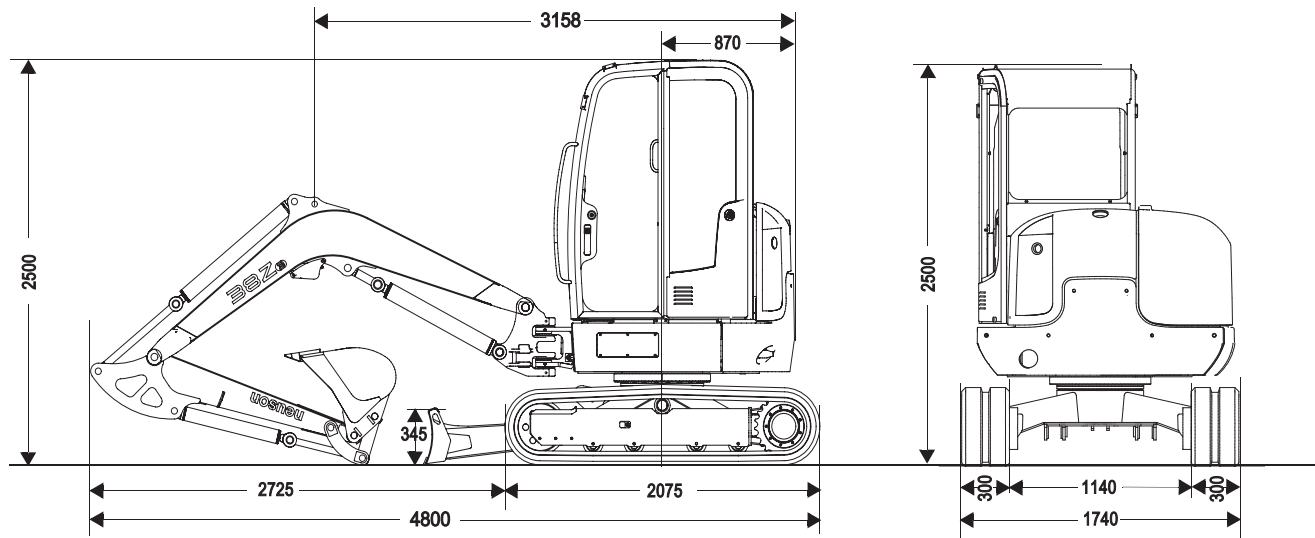
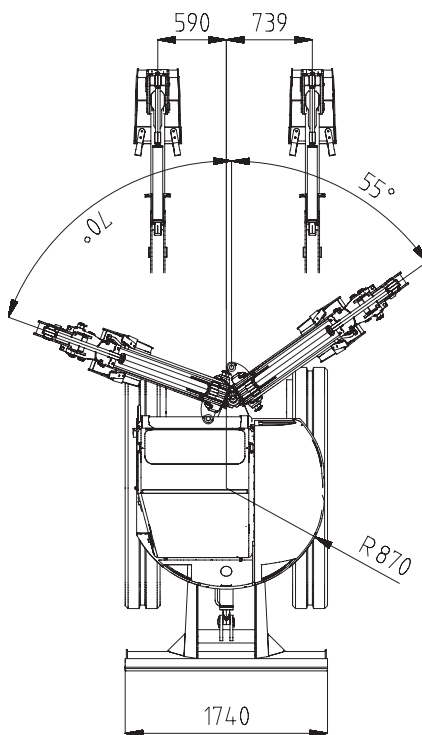


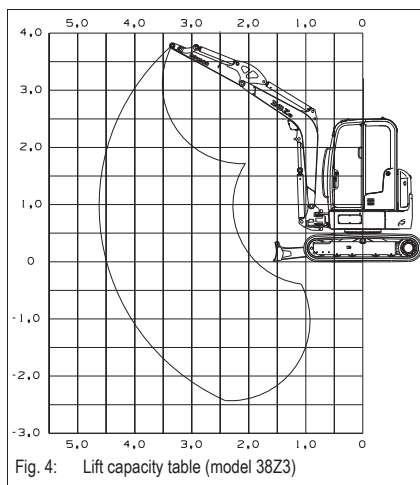
Fig. 3: Machine dimensions (model 38Z3)



Main data	Model 38Z3
Service weight	3630 kg (8003 lbs)
Height	2500 mm (8'2")
Width	1740 mm (5'9")
Transport length	4800 mm (15'9")
Max. digging depth	3110 mm (10'2")
Stick length (standard)	1500 mm (4'11")
Stick length (long version)	1750 mm (5'9")
Max. digging depth for long stick (+ 300 mm)	3360 mm (11'0")
Max. vertical digging depth	2430 mm (7'11")
Max. vertical digging depth (long stick)	2670 mm (8'9")
Max. digging height	4530 mm (14'10")
Max. digging height (long stick)	4660 mm (15'3")
Max. dump height	3220 mm (10'7")
Max. dump height (long stick)	3350 mm (11'0")
Max. digging radius	5300 mm (17'5")
Max. digging radius (long stick)	5540 mm (18'2")
Max. reach at ground level	5300 mm (17'5")
Max. reach at ground level (long stick)	5430 mm (17'10")
Max. breakout force at bucket tooth	25,70 kN (5778 lbf)
Max. tearout force (standard stick)	21,90 kN (4923 lbf)
Max. tearout force (long stick)	19,40 kN (4361 lbf)
Min. tail end slewing radius	870 mm (2'10")
Max. tail end lateral projection over chains	0 mm (0')
Max. boom displacement to bucket centre (right-hand side)	740 mm (2'5")
Max. boom displacement to bucket centre (left-hand side)	590 mm (1'11")

2.13 Lift capacity table 38Z3

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



A			4,5 m (14'8")		3,5 m (11'5")		2,5 m (8'2")	
B								
3,0 m (9'8")					660* (1455*)	660* (1455*)		
2,0 m (6'6")			790* (1742*)	425 (937)	785* (1731*)	640 (1411)		
1,0 m (3'3")	825* (1819*)	395 (871)	840* (1852*)	410 (904)	1050* (2315*)	600 (1323)	1735* (3825*)	975 (2150)
0,0 m (0'0")	805* (1775*)	385 (849)	855* (1885*)	400 (882)	1210* (2668*)	570 (1257)	2025* (4464*)	925 (2039)
-1,0 m (-3'3")					1160* (2557*)	565 (1246)	1875* (4134*)	915 (2017)
-2,0 m (-6'6")							1440* (3175*)	945 (2083)

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.

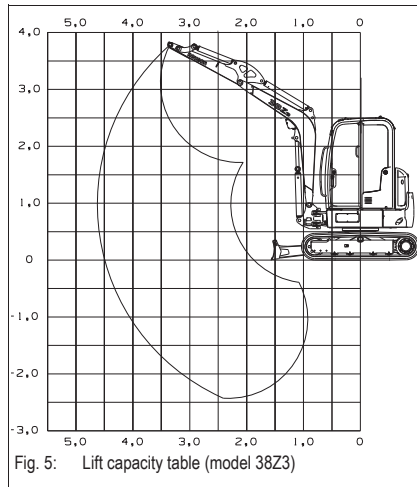
Calculation basis: according to ISO 10567










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 38Z3 short stick + extra weight

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



A			4,5 m (14'9")		3,5 m (11'6")		2,5 m (8'2")	
B								
3,0 m (9'10")					660* (1455*)	660* (1455*)		
2,0 m (6'7")			790* (1742*)	480 (1058)	785* (1731*)	715 (1576)		
1,0 m (3'3")	825* (1819*)	450 (992)	840* (1852*)	465 (1025)	1050* (2315*)	675 (1488)	1735* (3825*)	1095 (2414)
0,0 m (0'0")	805* (1775*)	440 (970)	855* (1885*)	455 (1003)	1210* (2668*)	645 (1422)	2025* (4464*)	1040 (2039)
-1,0 m (-3'3")					1160* (2557*)	640 (1411)	1875* (4134*)	1035 (2282)
-2,0 m (-6'7")							1440* (3175*)	1060 (2337)

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.

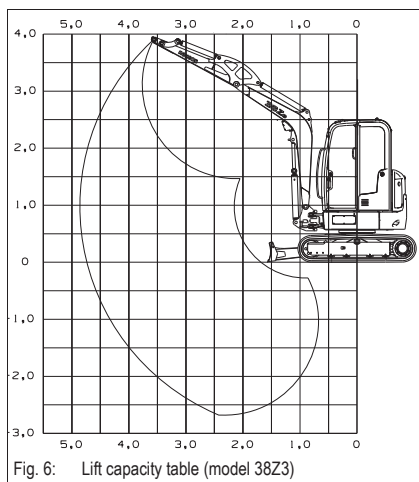
Calculation basis: according to ISO 10567

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 38Z3 long stick

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



A			4,5 m (14'9")		3,5 m (11'6")		2,5 m (8'2")	
B								
3,0 m (9'10")								
2,0 m (6'7")			705* (1554*)	425 (937)	670* (1477*)	645 (1422)		
1,0 m (3'3")	755* (1664*)	360 (794)	790* (1742*)	410 (904)	965* (2127*)	600 (1323)	1520* (3351*)	985 (2172)
0,0 m (0'0")	750* (1653*)	350 (772)	845* (1863*)	395 (871)	1170* (2579*)	565 (1246)	1975* (4354*)	910 (2006)
-1,0 m (-3'3")					1175* (2590*)	550 (1213)	1920* (4243*)	895 (1973)
-2,0 m (-6'7")							1570* (3461*)	915 (2017)

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.

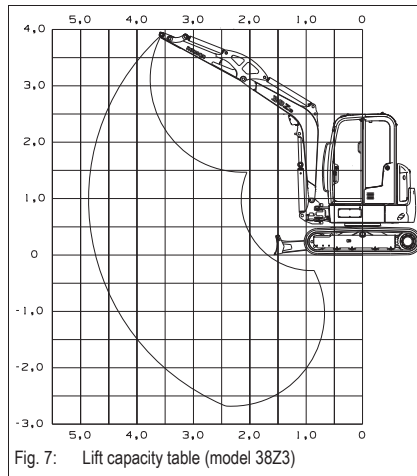
Calculation basis: according to ISO 10567

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 38Z3 with long stick + extra weight

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



A			4,5 m (14'9")		3,5 m (11'6")		2,5 m (8'2")	
B								
3,0 m (9'10")								
2,0 m (6'7")			705* (1554*)	475 (1047)	670* (1477*)	670* (1477*)		
1,0 m (3'3")	755* (1664*)	405 (893)	790* (1742*)	460 (1014)	965* (2127*)	670 (1477)	1520* (3351*)	1095 (2414)
0,0 m (0'0")	750* (1653*)	400 (882)	845* (1863*)	445 (981)	1170* (2579*)	635 (1400)	1975* (4354*)	1020 (2249)
-1,0 m (-3'3")					1175* (2590*)	620 (1367)	1920* (4243*)	1005 (2216)
-2,0 m (-6'7")							1570* (3461*)	1025 (2260)

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.

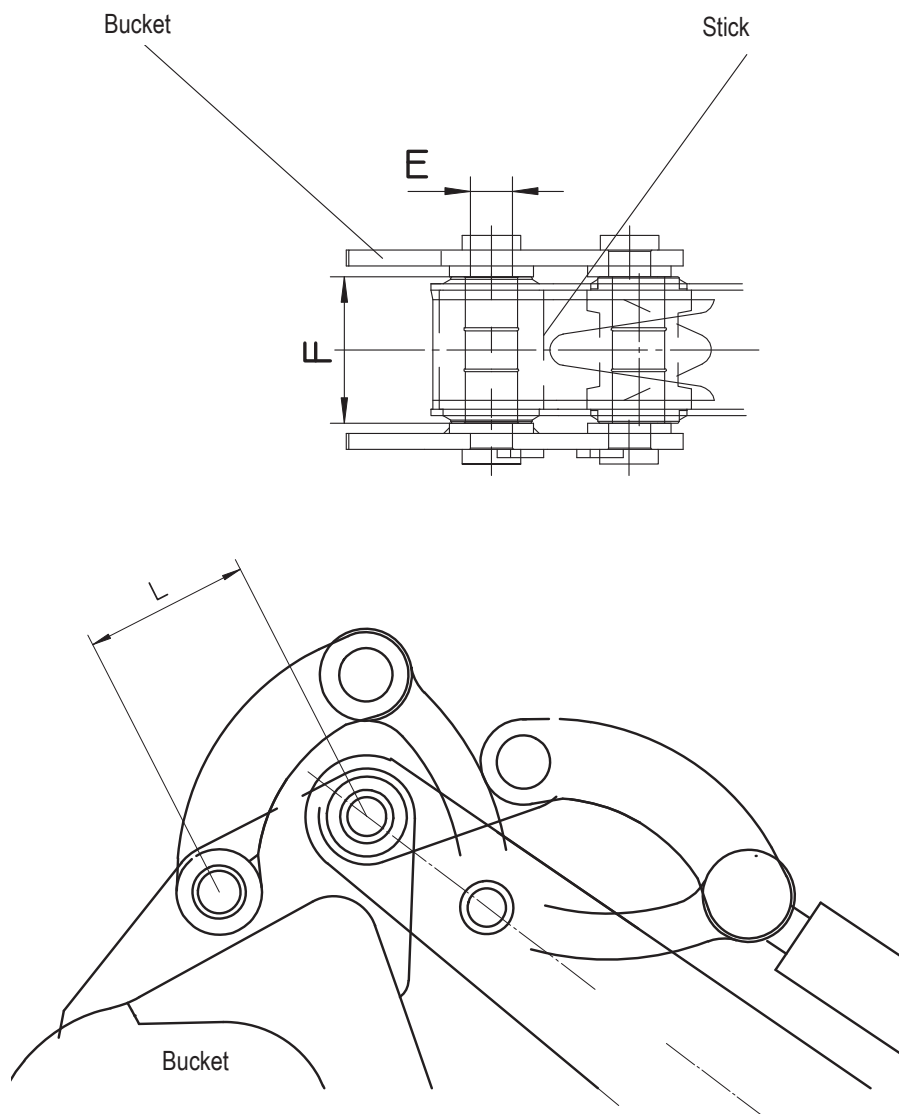
Calculation basis: according to ISO 10567

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	40 mm (1.575")
F	Stick width	140 mm (5.5")
L	Pin distance to bucket mount	180 mm (7.087")





2.18 Attachments

Description	Width mm (ft)	Capacity l (ft ³)	Item No.
Rear excavator bucket 38z3	300 (0'11")	50 (1.8)	1000093755
Rear excavator bucket 38z3	400 (1'4")	69 (2.4)	1000093756
Rear excavator bucket 38z3	500 (1'8")	88 (3.1)	1000093757
Rear excavator bucket 38z3	600 (1'11")	107 (3.8)	1000093758
Rear excavator bucket 38z3	700 (2'4")	127 (4.5)	1000093759
Offset bucket 38z3	1000 (3'3")	111 (3.9)	1000096569
Offset bucket 38z3	1400 (4'7")	158 (5.6)	1000096570
Ditch cleaning bucket	1000 (3'3")	117 (4.1)	1000096563
Ditch cleaning bucket	1400 (4'7")	166 (5.9)	1000096564



Maintenance

3 Maintenance

3.1 Fluids and lubricants

Component/ application	Engine/machine fluid	Specification	Season/temperature	Capacities ¹
Diesel engine	Engine oil	SAE 10W-40 ² ; API: CD, CF, CF-4, CI-4 ACEA: E3, E4, E5 JASO: DH-1	-20°C (-4°F) +40°C (104°F)	7.1 l (1.8 gal)
Travelling drive	Gearbox oil ³	Q8 T 55, SAE 85W-90 ⁴	Year-round	About 1.3 l each (0.3 gal)
		Q8 T 55, SAE 80W-90 ⁵		
		FINA PONTONIC GLS, SAE85W-90		
Hydraulic oil tank	Hydraulic oil	HVLP46 ⁶	Year-round	45 l (11.9 gal)
	Biodegradable oil ⁷	PANOLIN HLP Synth 46		
		FINA BIOHYDRAN SE 46		
		BP BIOHYD SE-46		
Grease	Roller and friction bearings (live ring ball bearing race)	FINA Energrease L21M ⁸	Year-round	As required
	Open gear (live ring gears)	BP Energrease MP-MG2 ⁹	Year-round	As required
Grease nipples	Multipurpose grease	FINA Energrease L21 M ¹⁰	Year-round	As required
Battery terminals	Acid-proof grease ¹¹	FINA Marson L2	Year-round	As required
Fuel tank	Diesel fuel	2-D ASTM D975 – 94 (USA)		44 l (11.6 gal)
		1-D ASTM D975 – 94 (USA)		
		EN 590 : 96 (EU)		
		ISO 8217 DMX (International)		
		BS 2869 – A1 (GB)	Summer or winter diesel depending on outside temperatures	
		BS 2869 – A2 (GB)		
Radiator	Coolant	Soft water + antifreeze ASTM D4985	Year-round	5.5 l (1.5 gal)
		Distilled water + antifreeze ASTM D4985		
Air conditioning	Refrigerating agent	R134a ¹²	Year-round	~ 950 g (2.1 lbs)
	Compressor oil	Sanden SP20	Year-round	122 cm ³ (7.45 in ³) bis AE02803 90 cm ³ (5.5 in ³) ab AG00573
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 MoS² 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 MoS² additive

11. Standard acid-proof grease

12. According to DIN 8960

Oil grades for the diesel engine, depending on temperature

Engine oil grade	Ambient temperature (C°)													
	°C	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40
		SAE 10W												
				SAE 20W										
								SAE 10W-30						
API CD, CF, CF-4, CI-4 ACEA: E3, E4, E5 JASO: DH-1		SAE 10W-40												
								SAE 15W-40						
								SAE 20						
										SAE 30				
												SAE 40		
	°F	-4	5	14	23	32	41	50	59	68	77	86	95	104

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	

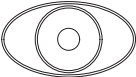


















Important!

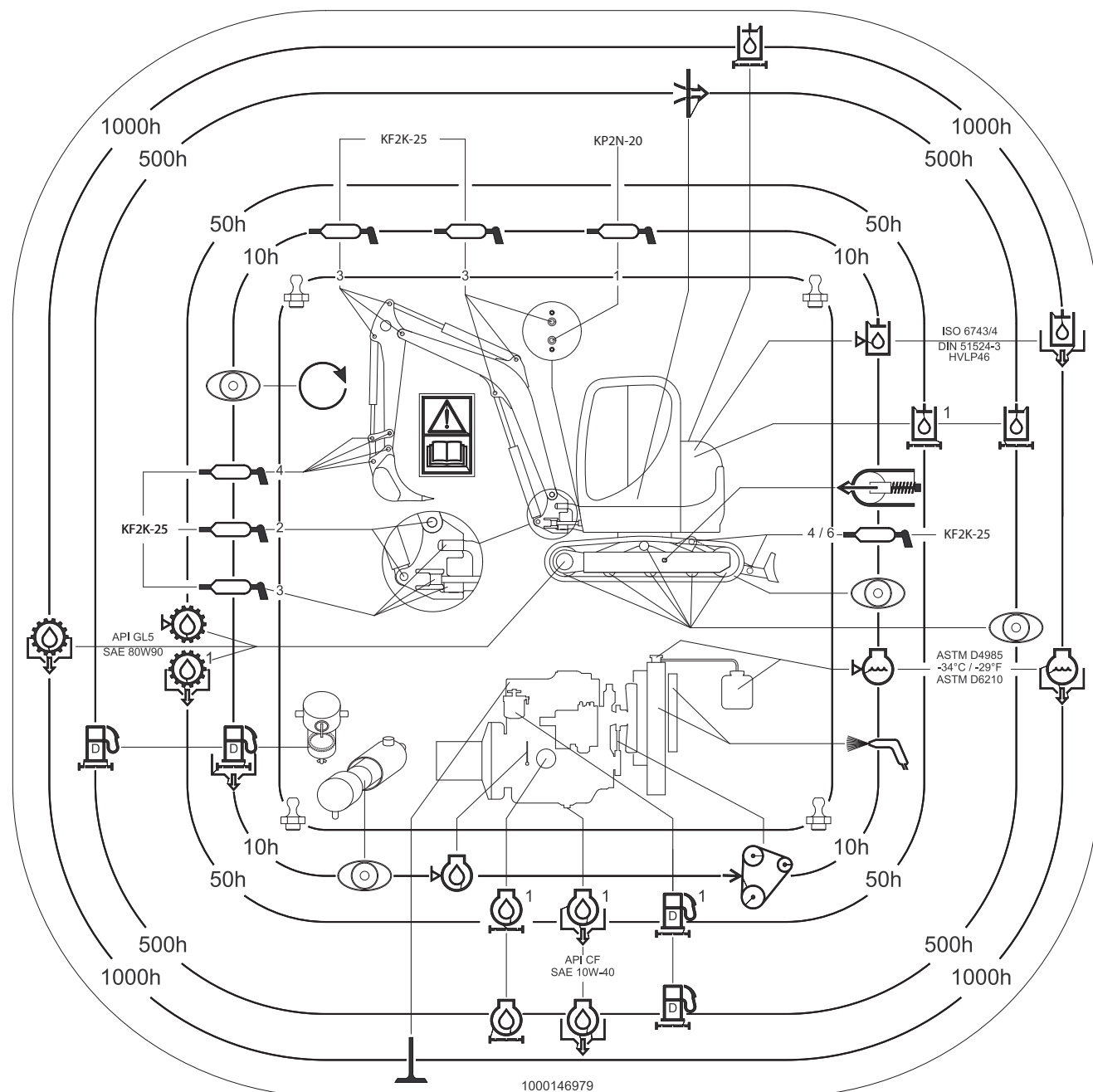
Please refer to the maintenance plan on page 3-5 for additional maintenance work.



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 tip 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	Replace the cabine air filter



3.3 Maintenance plan (overview)		Maintenance plan/service hours (s/h)							Authorised workshop
		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		
Work description									
For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.		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 tip clearance. Adjust if necessary							●		
Clean and adjust the fuel injection pump ⁹				●			●		

3.3 Maintenance plan (overview)	
Work description	Maintenance plan/service hours (s/h)
For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	
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 ¹⁰	●
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 ¹⁰	●
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 <i>Wartungsaufkleber</i> on page 5-35:	
• Stabiliser blade	●
• Swivelling console	●
• Boom	●
• Stick	●

3.3 Maintenance plan (overview)		Maintenance plan/service hours (s/h)							Authorised workshop
		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		
Work description									
For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.									
<ul style="list-style-type: none"> • Attachments • Grease strip on chassis – see <i>Wartungsaufkleber</i> on page 5-35 		●					●		
Air conditioning ():									
Carry out the following maintenance and inspection work:									
<ul style="list-style-type: none"> • Function of air conditioning ¹¹ 			●						●
Replace cab filter				●					●
Check dehumidifier for corrosion, condensation and air bubbles			●						●
Replace dehumidifier and refrigerating agent ¹²						●			●
Compressor oil ¹¹						●			●
Check the refrigerating agent				●					●
Functional check ():									
Check the function of the following assemblies/components. Rectify if necessary:									
<ul style="list-style-type: none"> • Lights, signalling system, acoustic warning system ¹⁰ • Heating function ¹⁰ 			●	●					●
			●	●					●
Leakage check ():									
Check for tightness, leaks and chafing: pipes, flexible lines and screw connections of the following assemblies and components. Rectify if necessary:									
<ul style="list-style-type: none"> • Visual check 		●							●
 Engine and hydraulic system		●							●
 Cooling and heating circuit		●							●
 Travelling drive		●							●
<ol style="list-style-type: none"> 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 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 10. Check the first time at 50 s/h, then every 500 s/h 11 Switch on once every week 12 Replace the dehumidifier and the refrigerating agent every 1500 s/h or every 2 years 									

3.4 Service package

Up to serial no. AE02803

1000127612	1	Service package 38Z3 (Tier 2)
1000018587	1	➡ Engine oil filter
1000178758	1	➡ Fuel filter
1000106892	1	➡ Water separator element
1000069998	1	➡ Seal for diesel fuel filter housing
1000064543	1	➡ O-ring for oil drain plug
1000012360	1	➡ Seal
1000004556	1	➡ Reflux filter insert
1000004567	1	➡ Air filter insert
1000004566	1	➡ Air filter insert
1000104765	1	➡ Cylinder head cover gasket
1000003894	3	➡ O-ring
1000146380	1	➡ Cab air filter (with heating)
1000143330	1	➡ Cab air filter (with air conditioning)

From serial no. AG00573

1000179349	1	Service package 38Z3 (Tier 3A)
1000018587	1	➡ Engine oil filter
1000180500	1	➡ Fuel filter
1000106892	1	➡ Water separator element
1000069998	1	➡ Seal for diesel fuel filter housing
1000064543	1	➡ O-ring for oil drain plug
1000012360	1	➡ Seal
1000004556	1	➡ Reflux filter insert
1000004567	1	➡ Air filter insert
1000004566	1	➡ Air filter insert
1000104765	1	➡ Cylinder head cover gasket
1000003894	3	➡ O-ring
1000146380	1	➡ Cab air filter (with heating)
1000143330	1	➡ Cab air filter (with air conditioning)

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.

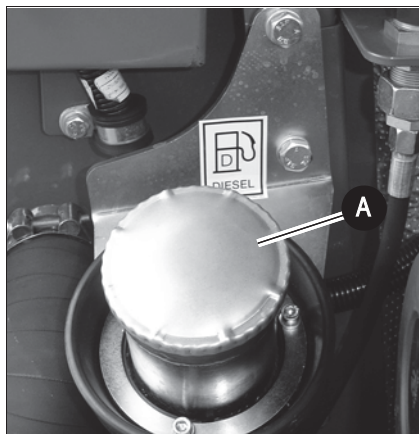
The maintenance plans indicate when the maintenance work mentioned below must be carried out (*– see Maintenance plan (overview) on page 3-5*).

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



Filler inlet **A** for the fuel tank is located in the engine compartment, on the right in driving direction.



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

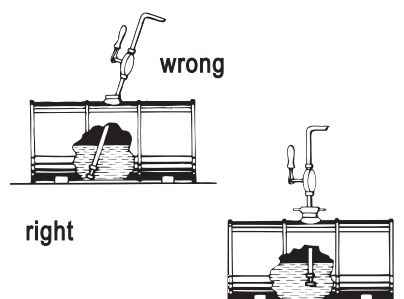


Fig. 2: Refuelling from a barrel

Diesel fuel specification

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

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

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

- ☞ Place a container (e.g. a barrel) with sufficient capacity
- ☞ Suck off the diesel fuel
- ☞ Check the fuel tank for contamination and clean if necessary
- ☞ Replace the filter according to the maintenance specifications
- ☞ Refill the fuel tank
- ☞ Bleed the fuel system – see Bleeding the fuel system on page 3-10

Fuel prefilter with water separator

Old engine type (up to serial number AE02803):

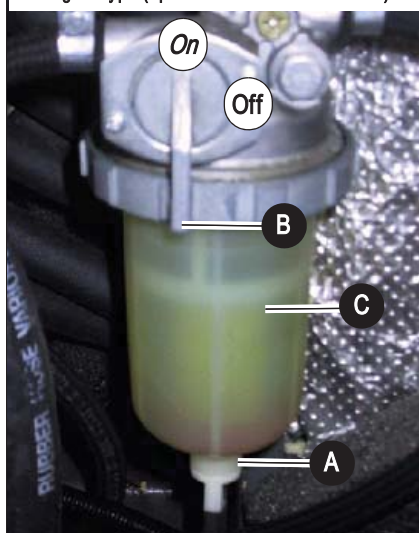


Fig. 3: Fuel prefilter



New engine type (from serial number AG00573):

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 AE02803):

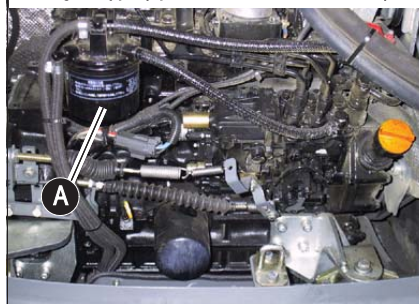
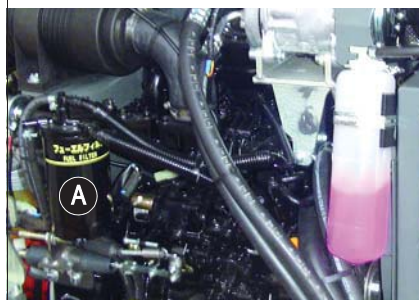


Fig. 4: Fuel filter position



New engine type (from serial number AG00573):

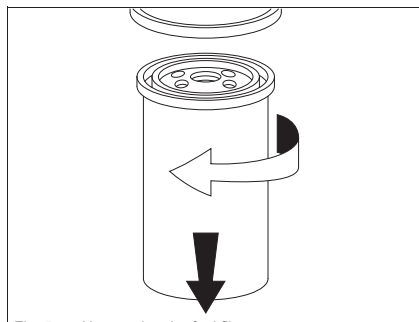


Fig. 5: Unscrewing the fuel filter

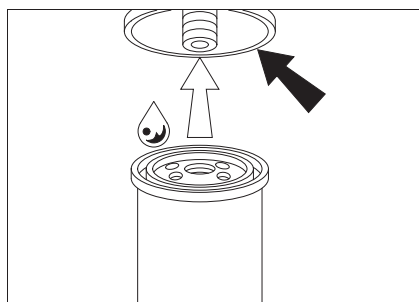


Fig. 6: Cleaning the sealing surface and oiling the gasket

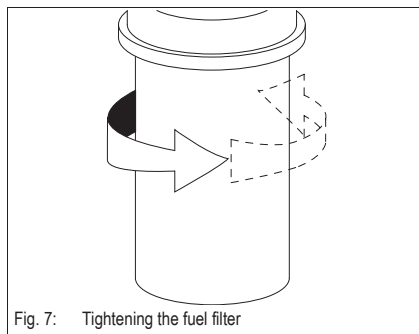


Fig. 7: Tightening the fuel filter

**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 4/A as follows:*

- Close the fuel feed line with the stop cock on the fuel prefilter
- Thoroughly clean the outside surfaces of fuel filter 4/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 AE02803):

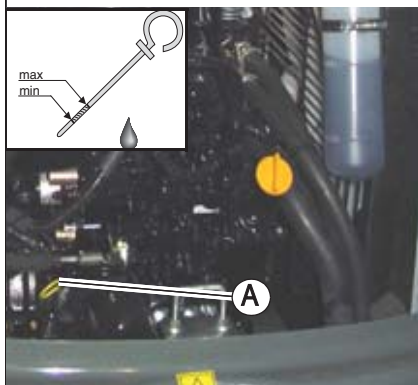


Fig. 8: Checking the oil level



New engine type (from serial number AG00573):

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 9/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 AE02803):

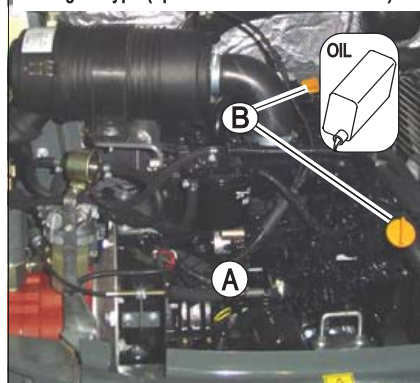
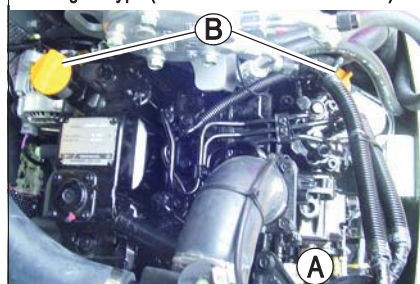


Fig. 9: Oil dipstick and oil filler cap

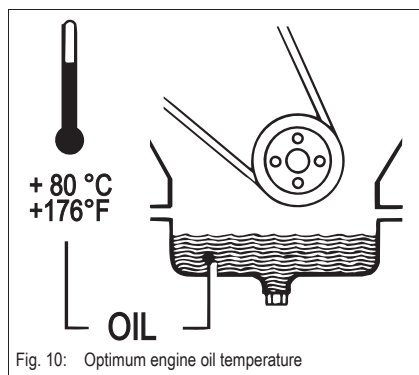
New engine type (from serial number AG00573):



☞ 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



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 reaching service 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 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 AE02803):

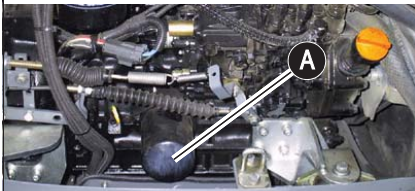
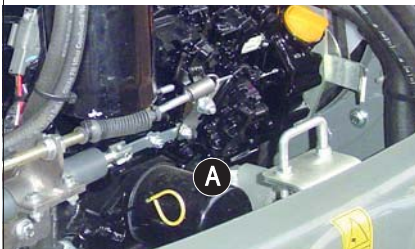


Fig. 11: Engine oil filter position



New engine type (from serial number AG00573):

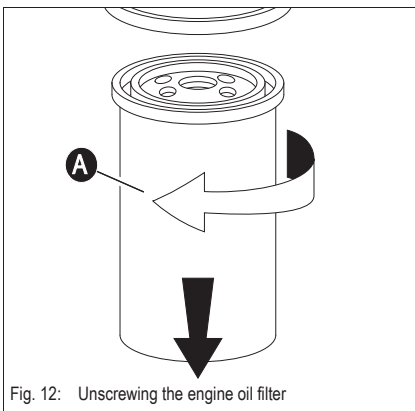


Fig. 12: Unscrewing the engine oil filter

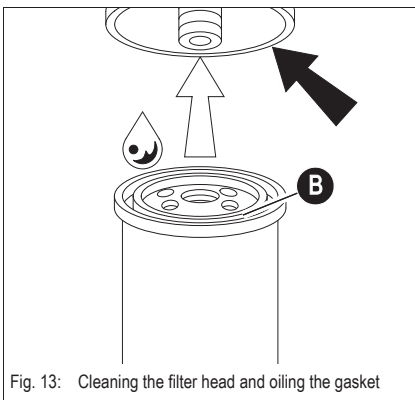


Fig. 13: Cleaning the filter head and oiling the gasket

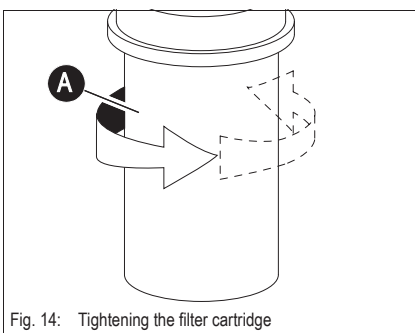


Fig. 14: Tightening the filter cartridge

**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 2-7*
 - ☞ Do not use cooler cleaning compounds if an antifreeze compound has been added to the coolant – otherwise this causes sludge to form, which can damage the engine
- Once you have filled the expansion tank:
 - ☞ Test run the engine
 - ☞ Switch off the engine
 - ☞ Let the engine cool down
 - ☞ Check the coolant level again



Environment!

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

Checking/filling up coolant

Old engine type (up to serial number AE02803):

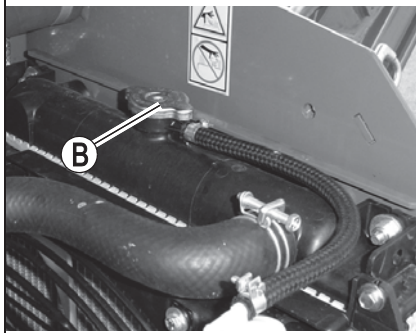
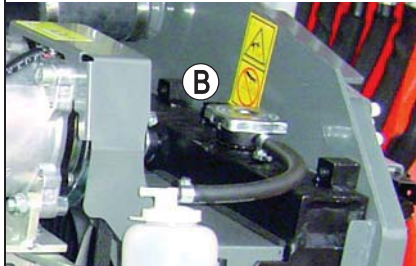


Fig. 15: Radiator filler cap



New engine type (from serial number AG00573):



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

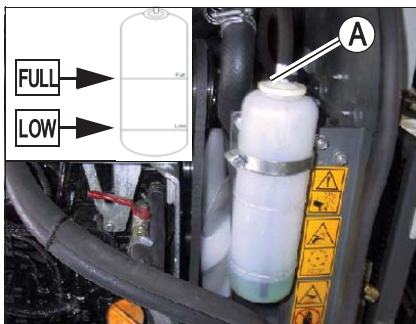
☞ Proceed as follows:

- 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 AE02803):

Fig. 16: Expansion tank for coolant



New engine type (from serial number AG00573):

Filling up coolant

Old engine type (up to serial number AE02803):

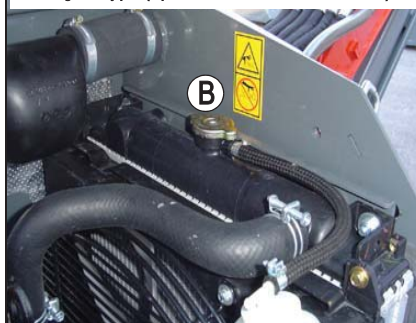
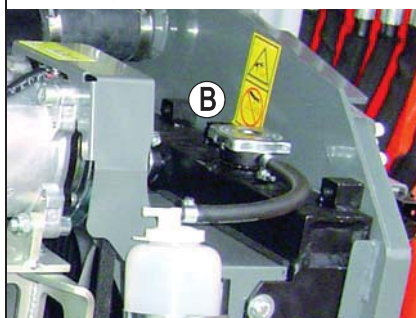


Fig. 17: Filling up coolant



New engine type (from serial number AG00573):

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

Old engine type (up to serial number AE02803):

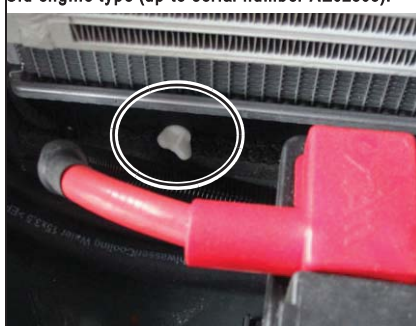


Fig. 18: Radiator drain plug



New engine type (from serial number AG00573):



Danger!

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

Danger of burns!

- ☞ Wait at least 10 minutes after switching off the engine!
- ☞ Wear protective gloves and clothing
- ☞ Open filler cap **17/B** to the first notch and release the pressure

After the engine has cooled down:

- ☞ Release overpressure in the radiator
- ☞ Open the cap to the first notch and fully release the pressure
- ☞ Open filler cap **17/B**
- ☞ Open the drain plug of the radiator and drain the coolant
- ☞ Close the drain plug again

• From serial number AG00573:

- ☞ The drain opening is closed with a plug. Open this plug carefully with a suitable tool, drain the coolant and screw the plug back in.
- ☞ Fill up the radiator with suitable coolant
 - see *Fluids and lubricants* on page 3-1
- ☞ Check the coolant level
 - see *Checking the coolant level* on page 3-18

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



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!*

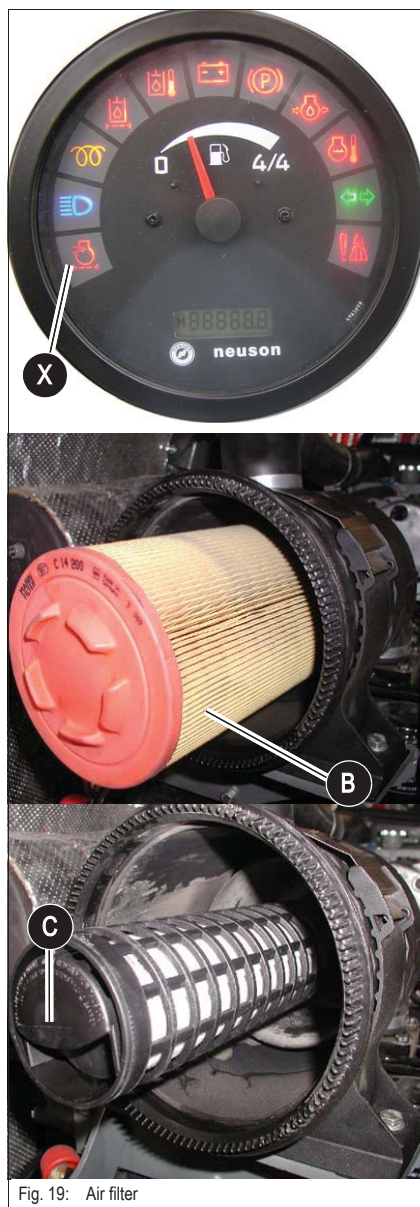


Fig. 19: Air filter

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

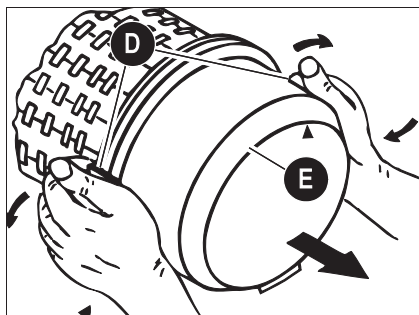


Fig. 20: Removing the lower housing section

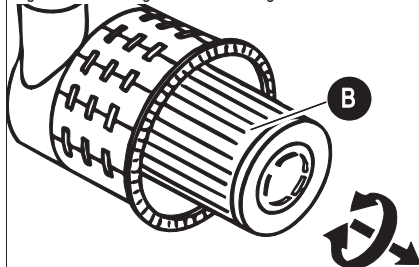


Fig. 21: Removing the filter element

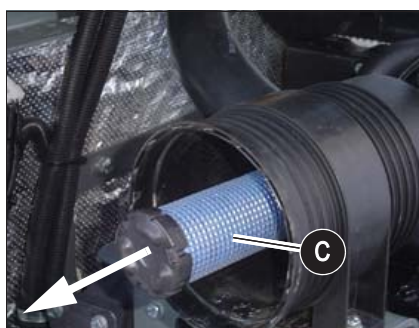


Fig. 22: Replacing the inside filter

• 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**

• 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 contamination (dust) inside the upper housing section and 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**
- 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

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

 *Proceed as follows:*

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

 *Clean the discharge slot if necessary*

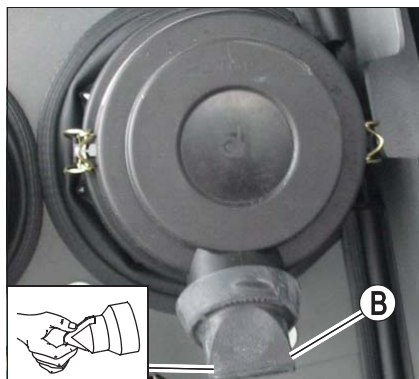


Fig. 23: Air filter – dust valve

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

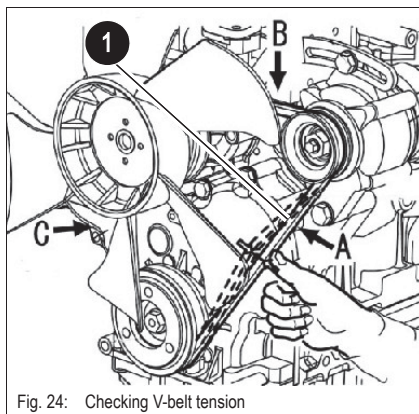


Fig. 24: Checking V-belt tension

- 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*

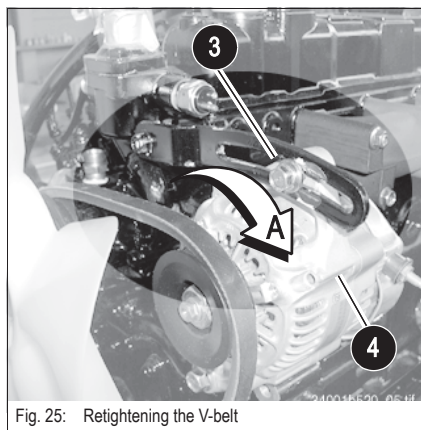


Fig. 25: Retightening the V-belt

- 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. *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

Old engine type (up to serial number AE02803):

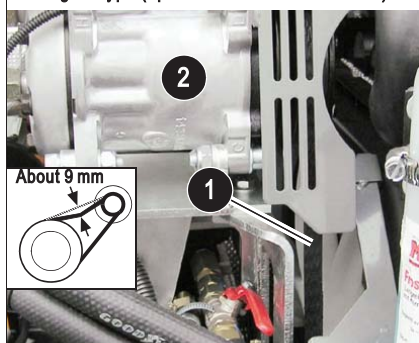
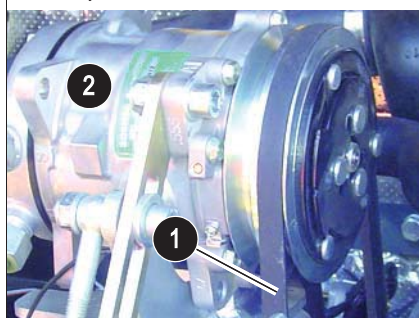


Fig. 26: Checking the V-belt tension of the air conditioning system



New engine type (from serial number AG00573):



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*

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

Tightening the V-belt of the air conditioning system

Old engine type (up to serial number AE02803):

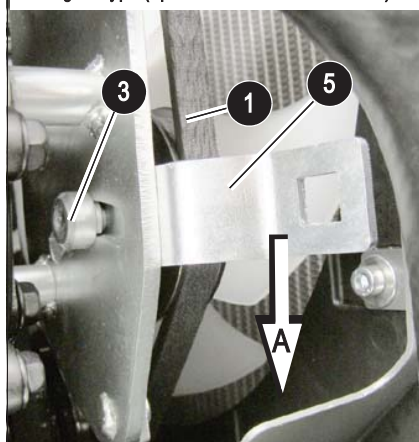
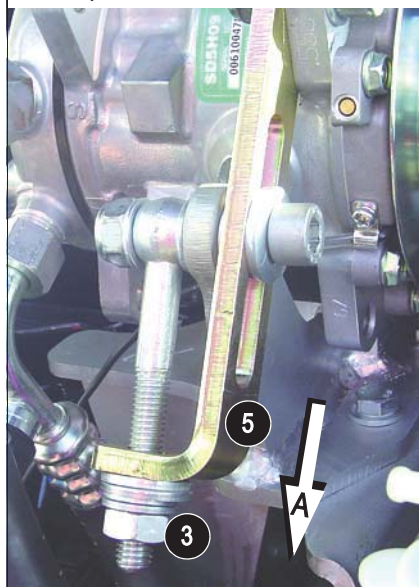


Fig. 27: Retightening the V-belt of the air conditioning system



New engine type (from serial number AG00573):

- Retighten as follows (up to serial number AE02803):
 - 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. [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 AG00573):
 - 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: 50 °C / 122°F min. (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

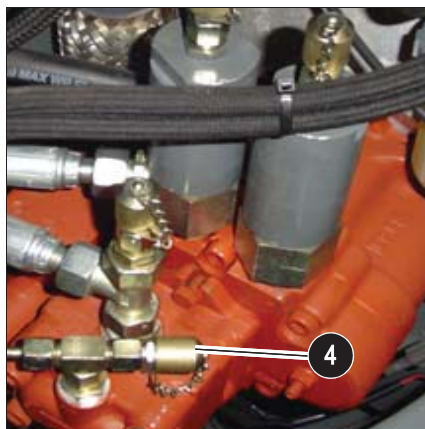


Fig. 28: Pilot control pressure measuring port

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.

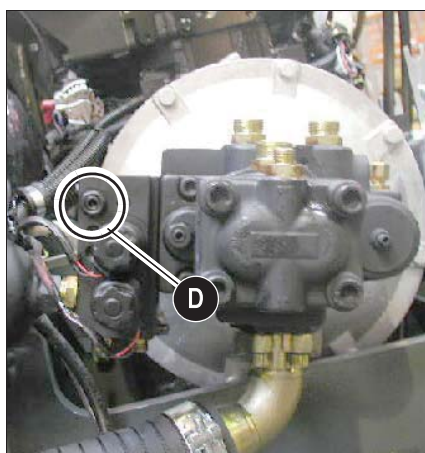


Fig. 29: Pressure reducing valve

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

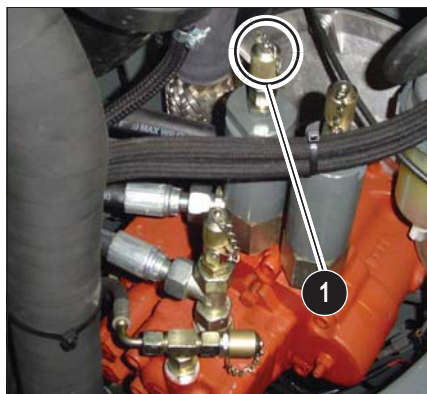


Fig. 30: Measuring port P1

Checking primary pressure limiting valve 1 (PPLV 1)

- ☞ Connect a pressure gauge to measuring port MP 1 30/1



- ☞ Extend the boom ram or the bucket 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 or the bucket 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!

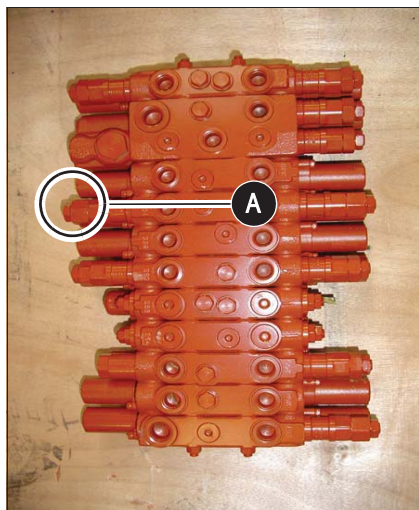


Fig. 31: Primary pressure limiting valve 1

Pressure check of variable displacement pump P2

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

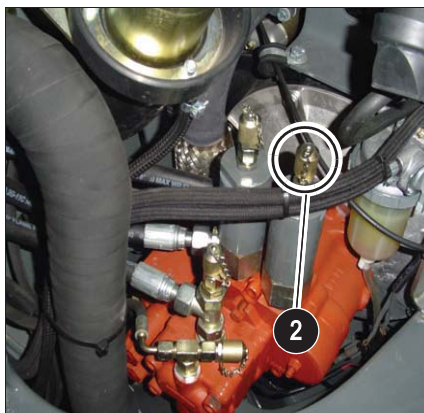


Fig. 32: Measuring port P2

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 %

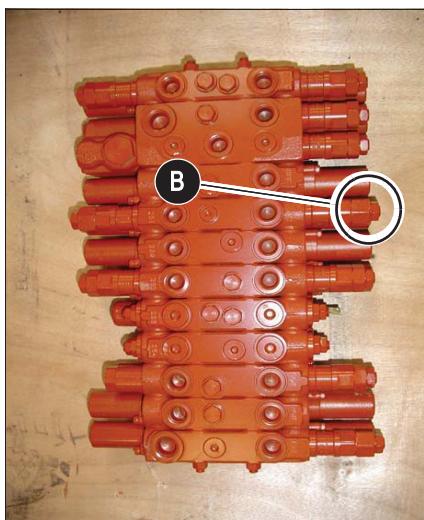


Fig. 33: Primary pressure limiting valve 2

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 – adapt these values to the attachment!

Pressure check of gear pump P3

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



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 %

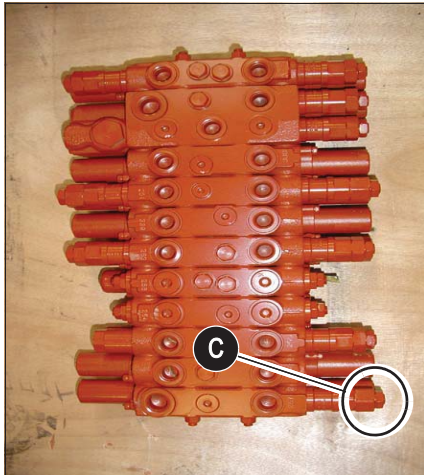


Fig. 35: Primary pressure limiting valve 3

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 – adapt these values to the attachment!

Secondary pressure limiting valve of the gear motor

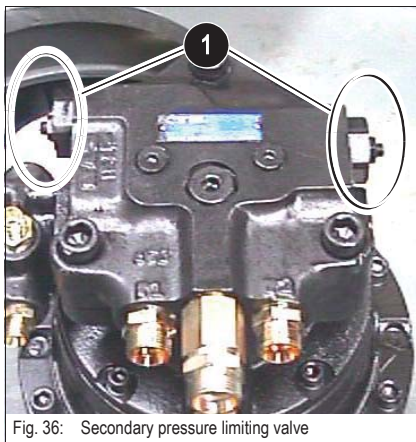


Fig. 36: Secondary pressure limiting valve

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)

- ☞ Set the pressure at the shock anticavitation valves 1 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

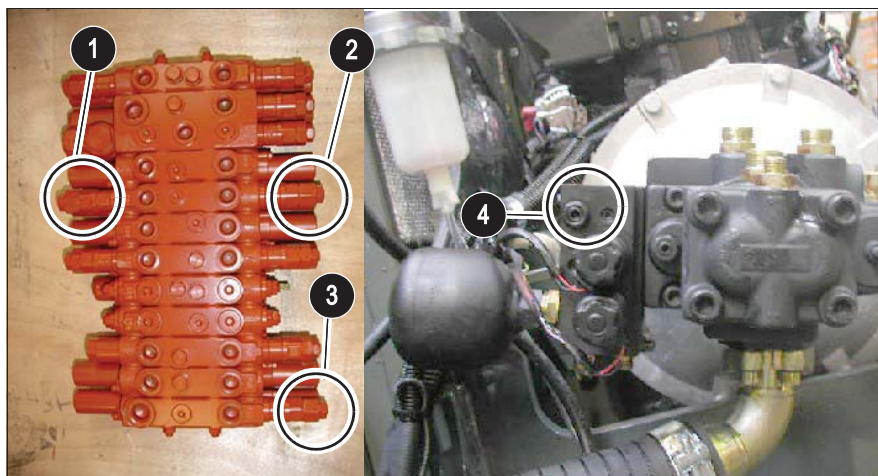
Measuring ports: overview












Fig. 37: Measurement ports

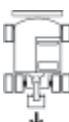

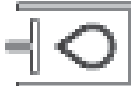


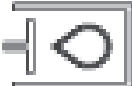



Pos.	Description	
1	Pump 1 measuring port	MP 1
2	Pump 2 measuring port	MP 2
3	Pump 3 measuring port	MP 3
4	Pilot oil supply unit measuring port	MP 4

Primary pressure limiting valves



Pos.	Description	
1	Pump primary pressure limiting valve 1	PPLV 1
2	Pump primary pressure limiting valve 2	PPLV 2
3	Pump primary pressure limiting valve 3	PPLV 3
4	Pilot oil supply unit pressure limiting valve	PLV 4

3.12 Test report								
Pilot control								
Function	Movement	Symbol	Measuring port	Pressure limiting valve	Specified values		1st measure- ment	2nd measure- ment
Joystick	ANY		Measuring port MP 4 (pump)	Pressure limiting valve PLV 4 (pilot oil supply unit)	Engine speed	Pressure (bar) (psi)		
					Rated value	35 \pm 4 (507.63 \pm 58)		
Pump 1								
Function	Movement	Symbol	Measuring port	Pressure limiting valve	Specified values		1st measure- ment	2nd measure- ment
Boom	UP		Measuring port MP 1 (pump)	Primary pressure limiting valve PPLV 1 (main valve block)	Engine speed	Pressure (bar) (psi)		
	DOWN				max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
					max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
Bucket	EXTEND				max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
	RETRACT				max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
					max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
Right-hand side drive	FORWARDS				max. 240 \pm 3 (3481 \pm 43.5)	min. 216 \pm 3 (3133 \pm 43.5)		
	REVERSE				max. 240 \pm 3 (3481 \pm 43.5)	Min. 216 \pm 3 (3133 \pm 43.5)		
Pump 2								
Function	Movement	Symbol			Measuring port	Pressure limiting valve	Specified values	
Stick	EXTEND		Measuring port MP 2 (pump)	Primary pressure limiting valve PPLV 2 (MVB)	max. 240 \pm 3 (3481 \pm 43.5)			
		min. 216 \pm 3 (3133 \pm 43.5)						
	RETRACT				max. 240 \pm 3 (3481 \pm 43.5)			
		min. 216 \pm 3 (3133 \pm 43.5)						

3.12 Test report										
Left-hand side drive	FORWARDS		Measuring port MP 2 (pump)	Primary pressure limiting valve PPLV 2 (MVB)	max.	240 ^{±3} (3481 ^{±43.5})				
	REVERSE				min.	216 ^{±3} (3133 ^{±43.5})				
					max.	240 ^{±3} (3481 ^{±43.5})				
	Auxiliary hydraulics	A				min.	216 ^{±3} (3133 ^{±43.5})			
max.			240 ^{±3} (3481 ^{±43.5})							
B		min.	216 ^{±3} (3133 ^{±43.5})							
		max.	240 ^{±3} (3481 ^{±43.5})							
Pump 3										
Function	Movement	Symbol	Measuring port	Pressure limiting valve	Engine speed	Specified values		1st measurement	2nd measurement	
Stabiliser blade	UP		Measuring port MP 3 (pump)	Primary pressure limiting valve PPLV 3 (main valve block)	max.	210 ^{±3} (3046 ^{±43.5})				
	DOWN				min.	189 ^{±3} (2741 ^{±43.5})				
Auxiliary hydraulics	A (2)				max.	210 ^{±3} (3046 ^{±43.5})				
	B (2)				min.	189 ^{±3} (2741 ^{±43.5})				
Boom swivel	LEFT				max.	210 ^{±3} (3046 ^{±43.5})				
	RIGHT				min.	189 ^{±3} (2741 ^{±43.5})				
Rotate	LEFT		Measuring port MP 3		Secondary pressure limiting valve SPLV (gear motor)	max.	210 ^{±3} (3046 ^{±43.5})			
	RIGHT					min.	189 ^{±3} (2741 ^{±43.5})			

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 Wacker 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 3-36
- ☞ 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*

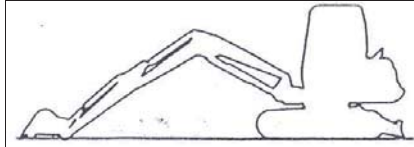


Fig. 38: Parking the excavator

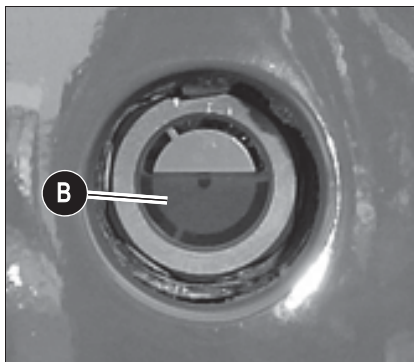


Fig. 39: Oil level indicator on the hydraulic oil tank

- 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 at the rear of the excavator
- Check the oil level on sight glass **B**
- The oil level should be at the middle of the sight glass
 - A yellowish colour of the entire sight glass is a sign that too much oil has been filled in

If the oil level is lower

- Fill up hydraulic oil

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

Machine condition	Temperature	Oil level
<ul style="list-style-type: none"> • Before putting into operation 	Between 10 and 30 °C (50°F und 86°F)	In the lower part of the sight glass
<ul style="list-style-type: none"> • Normal operation 	Between 50 and 90 °C (122°F und 194°F)	In the upper part of the sight glass



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. 38](#)
- Switch off the engine
- Fold the control lever base up
- Clean the area around filler opening with a cloth
- Open the filler opening
- 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 the filler opening

**Important!**

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

Changing hydraulic oil

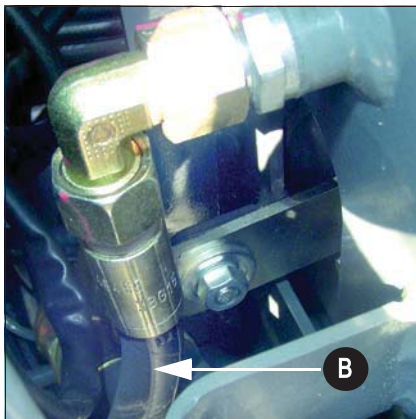


Fig. 41: Hydraulic oil tank drain hose

**Important!**

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

- ☞ *Open the breather filter to release pressure*
- ☞ *Take the drain hose (about 40 cm / 15.7" long) from the machine (screwed on the left-hand side of the hydraulic oil tank)*
- ☞ *Drain the oil into a container*
- ☞ *Check the hydraulic oil tank for contamination and clean if necessary*
- ☞ *Replace the filter according to the maintenance specifications*
- ☞ *Close the drain hose correctly again and store it*
- ☞ *Fill in clean hydraulic oil through the strainer*
– see [Filling up hydraulic oil on page 3-36](#)
- ☞ *Close the hydraulic oil tank correctly*
- ☞ *Let the machine run at idling speed without load for some minutes*

Monitoring the hydraulic oil reflux filter



Fig. 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*

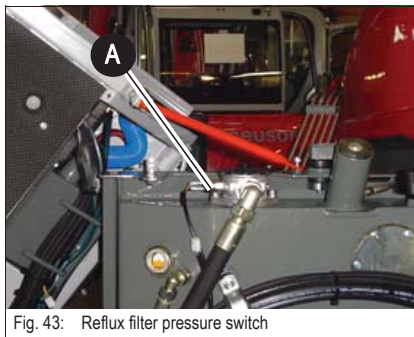


Fig. 43: Reflux filter pressure switch

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!

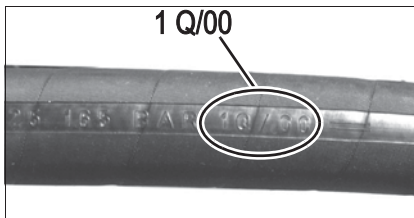
- Leaks and damaged pressure lines must be immediately repaired or replaced by an authorised workshop or after-sales staff.
This not only increases the operating safety of your machine but also helps to protect the environment.
- Replace hydraulic hoses every 6 years from the date of manufacture, even 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/00" means manufactured in the 1st quarter of 2000.



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

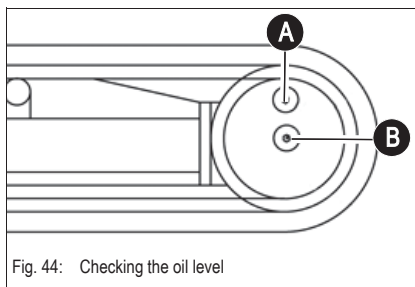


Fig. 44: Checking the oil level

- ☞ *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

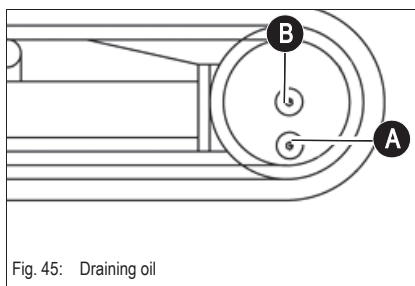


Fig. 45: Draining oil

- ☞ *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*

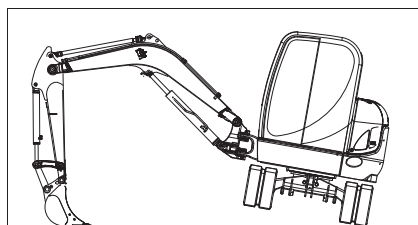


Fig. 46: Raising the excavator

Check chain tension as follows:

- ☞ *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*

- 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").
 - ☞ If the tension of the steel or rubber chain is not in accordance with the rated value, adjust the tension as follows.

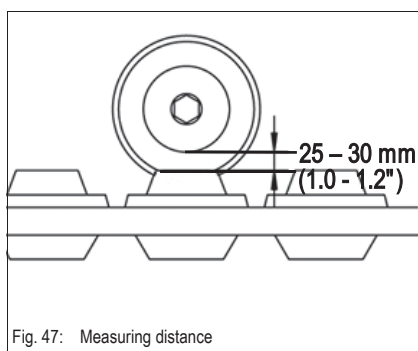


Fig. 47: Measuring distance

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 Wacker 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*

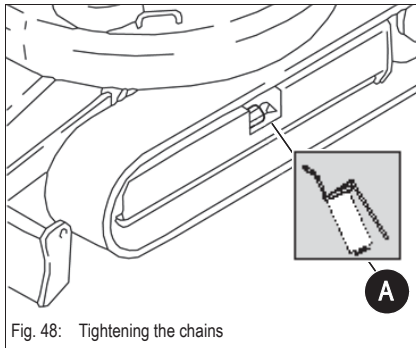


Fig. 48: Tightening the chains

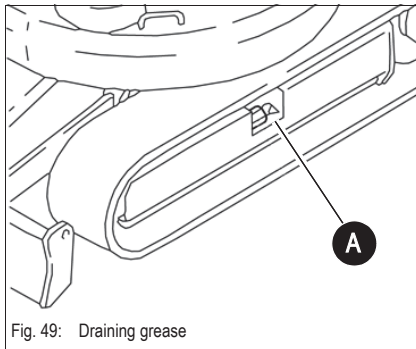


Fig. 49: Draining grease

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 Wacker Neuson dealer in this case*

Reducing tension

- *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 MoS₂ additive to all lubrication points indicated.

Stabiliser blade

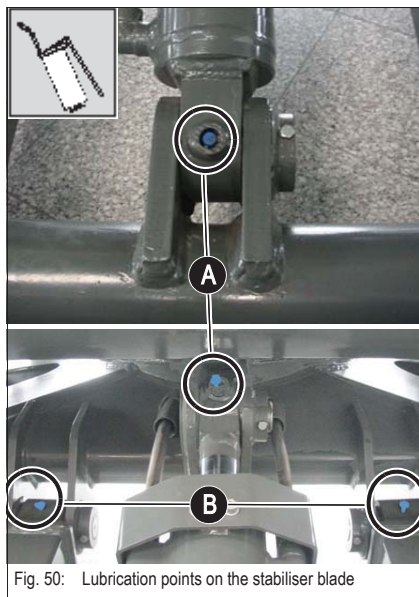


Fig. 50: Lubrication points on the stabiliser blade

- Apply grease to lubrication points **A** on the stabiliser blade ram
- Apply grease to lubrication points **B** on the stabiliser blade

Lubrication points on the swivelling console

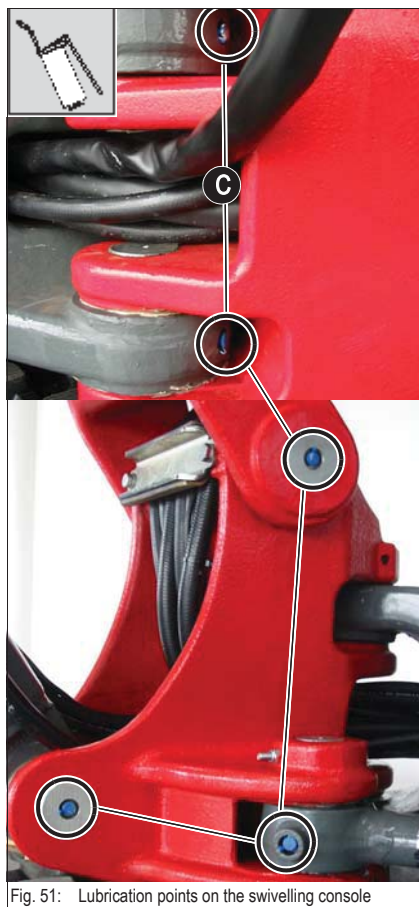
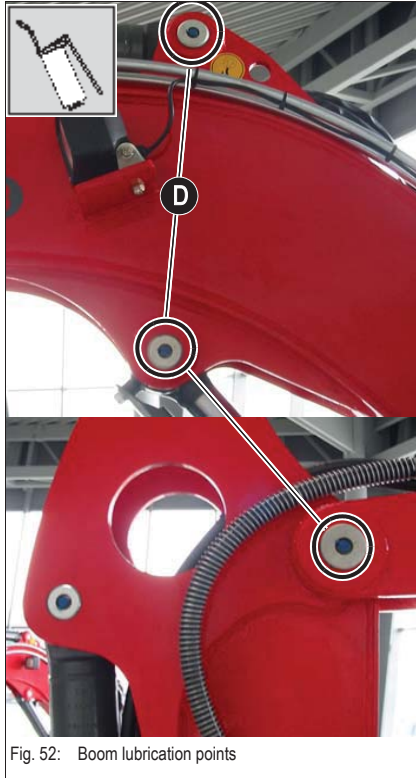


Fig. 51: Lubrication points on the swivelling console

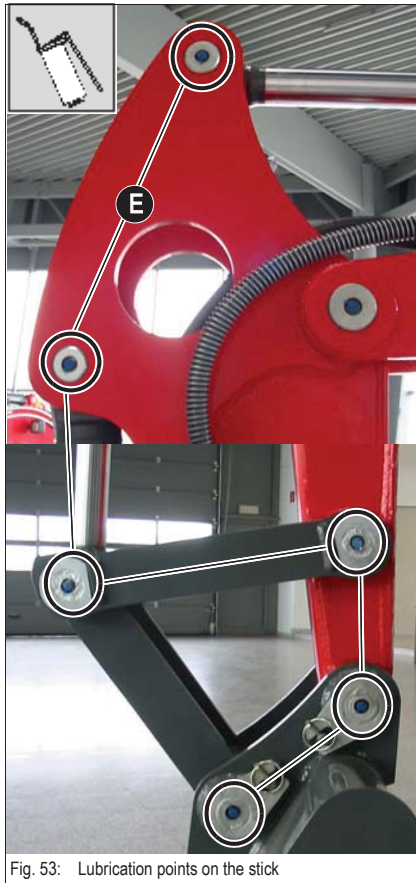
- Apply grease to lubrication points **C** of the swivelling console

Boom lubrication points



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

Lubrication points on the stick



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

Lubrication strip

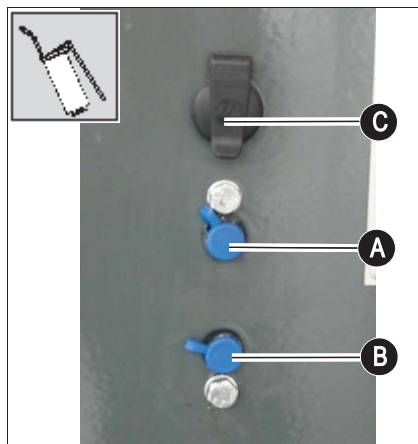


Fig. 54: Lubrication strip on the chassis

Apply grease to the lubrication strip as follows:

- 🔧 Lubrication point **A** for live ring ball bearing
 - ➡ Grease: BP Energrease MP-MG2
- 🔧 Lubrication point **B** for the offset ram

**Important!**

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

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

Maintenance of attachments

**Important!**

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

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 3-47
- 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 1-12

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!*

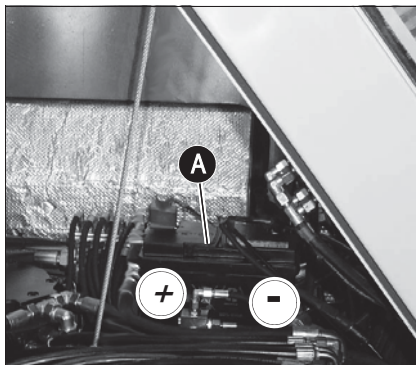


Fig. 55: Battery

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*

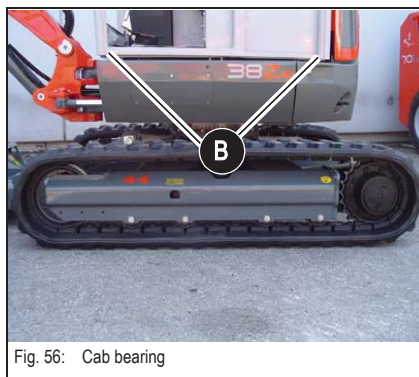
☞ *Charge the flat battery for a few minutes*

➡ 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



☞ Check cab bearings **B** for damage

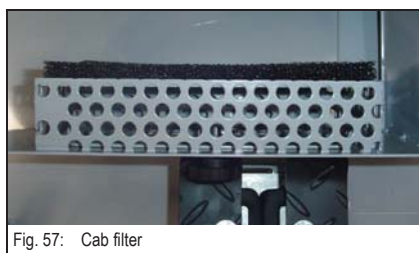


Important!

Check the cab fastening screws for tightness, retighten with a suitable tool if necessary

– see *Tightening torques for high-resistance screw connections* on page 2-9

Replacing the cab filter



Fresh/recirculated air filter

Remove the ventilation grill in the cab to replace the filter. Make sure not to overstretch the cables of the fuse box as you tilt the grill. You can now see the filter mat.

Replacing the filter:

- ☞ *Slacken the ventilation grill in the cab*
- ☞ *You can now access the cab filter*
- ☞ *Remove the cab filter (lever out the clips with a screw driver)*
- ☞ *Insert a new cab filter*
- ☞ *Mount the cover of the ventilation in the cab 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

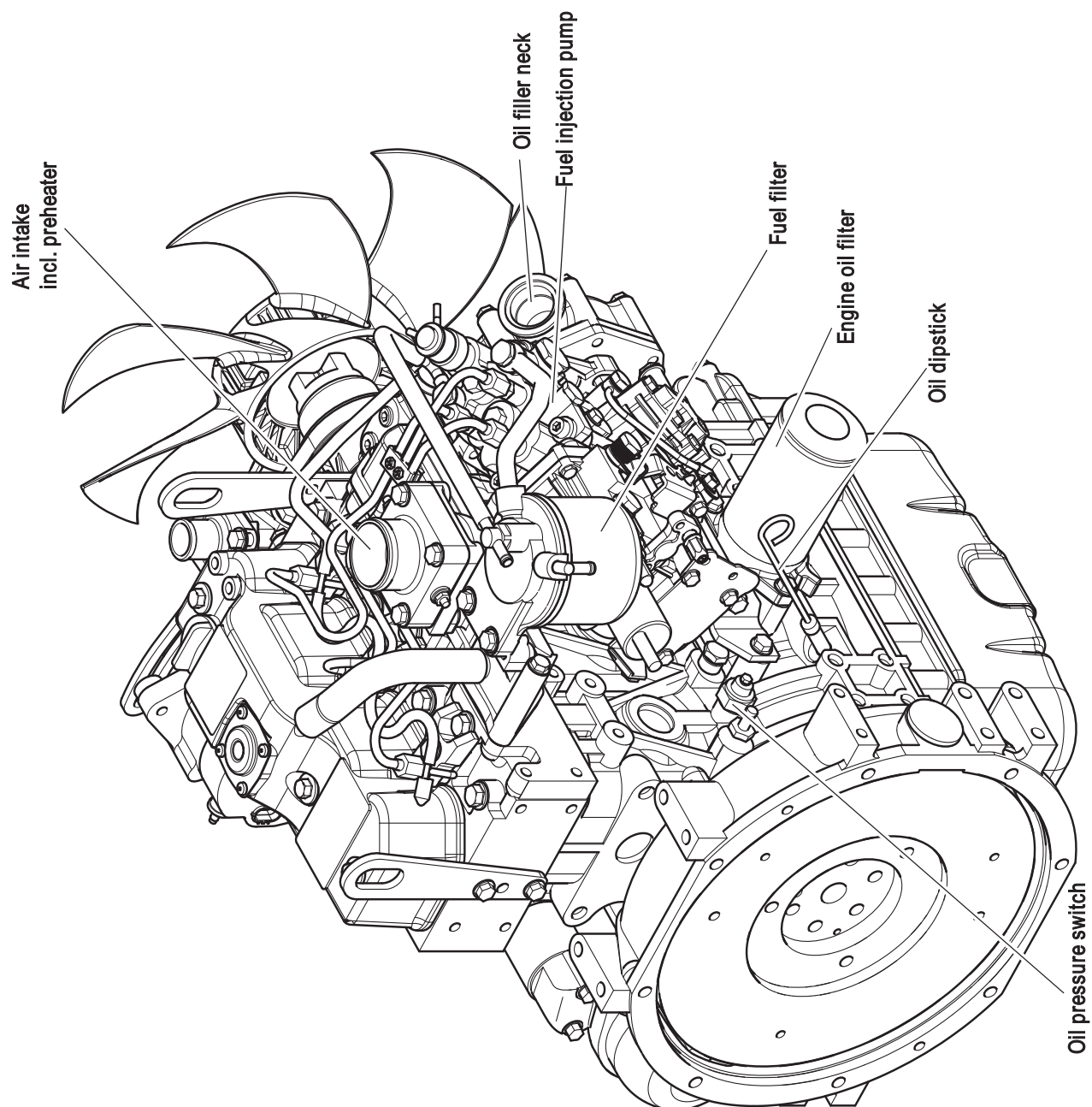


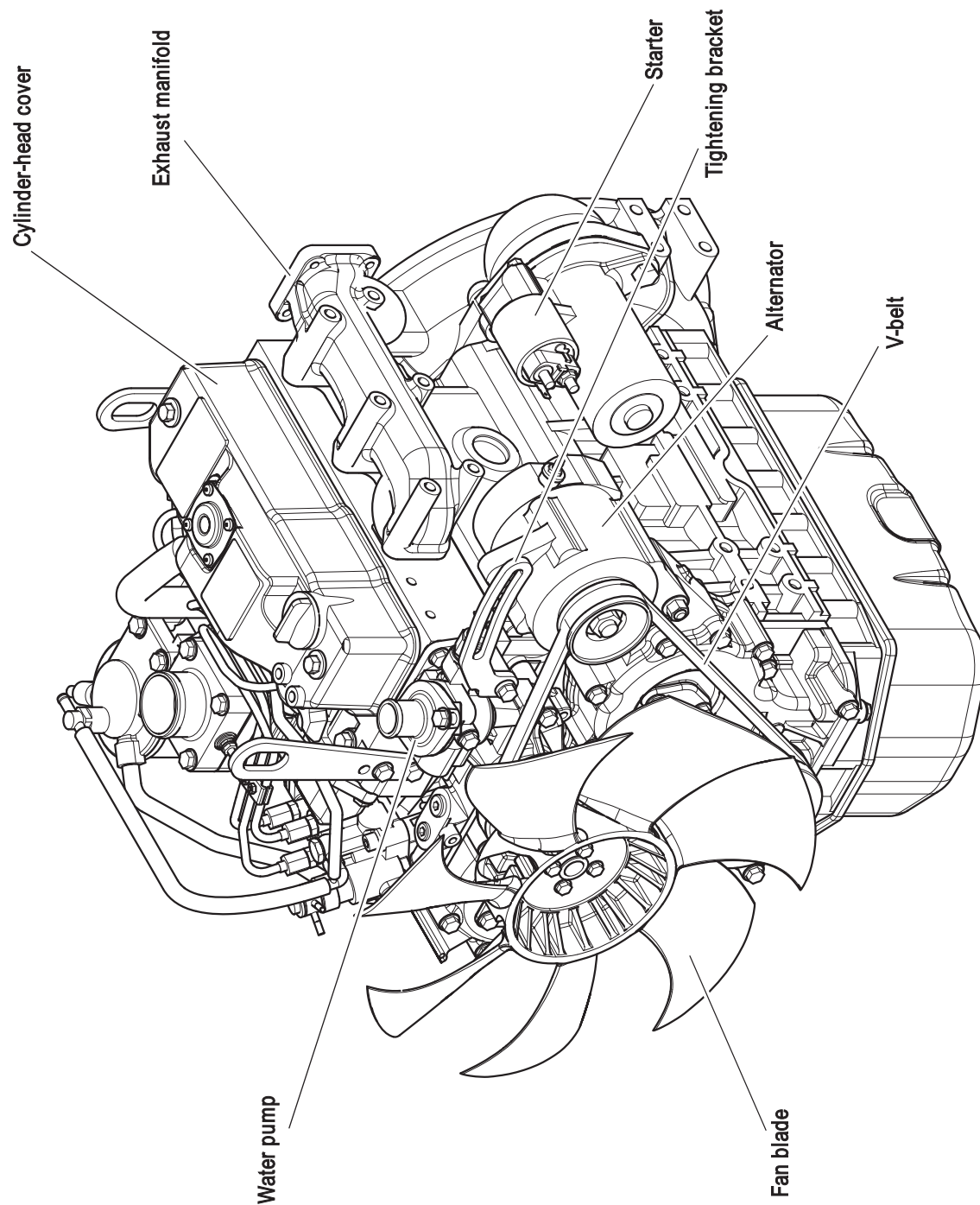
All mechanical pivot points on the machine (e.g. door hinges, joints) and fittings (e.g. door arresters) must be lubricated regularly, even if they are not listed in the lubrication plan.

Engine

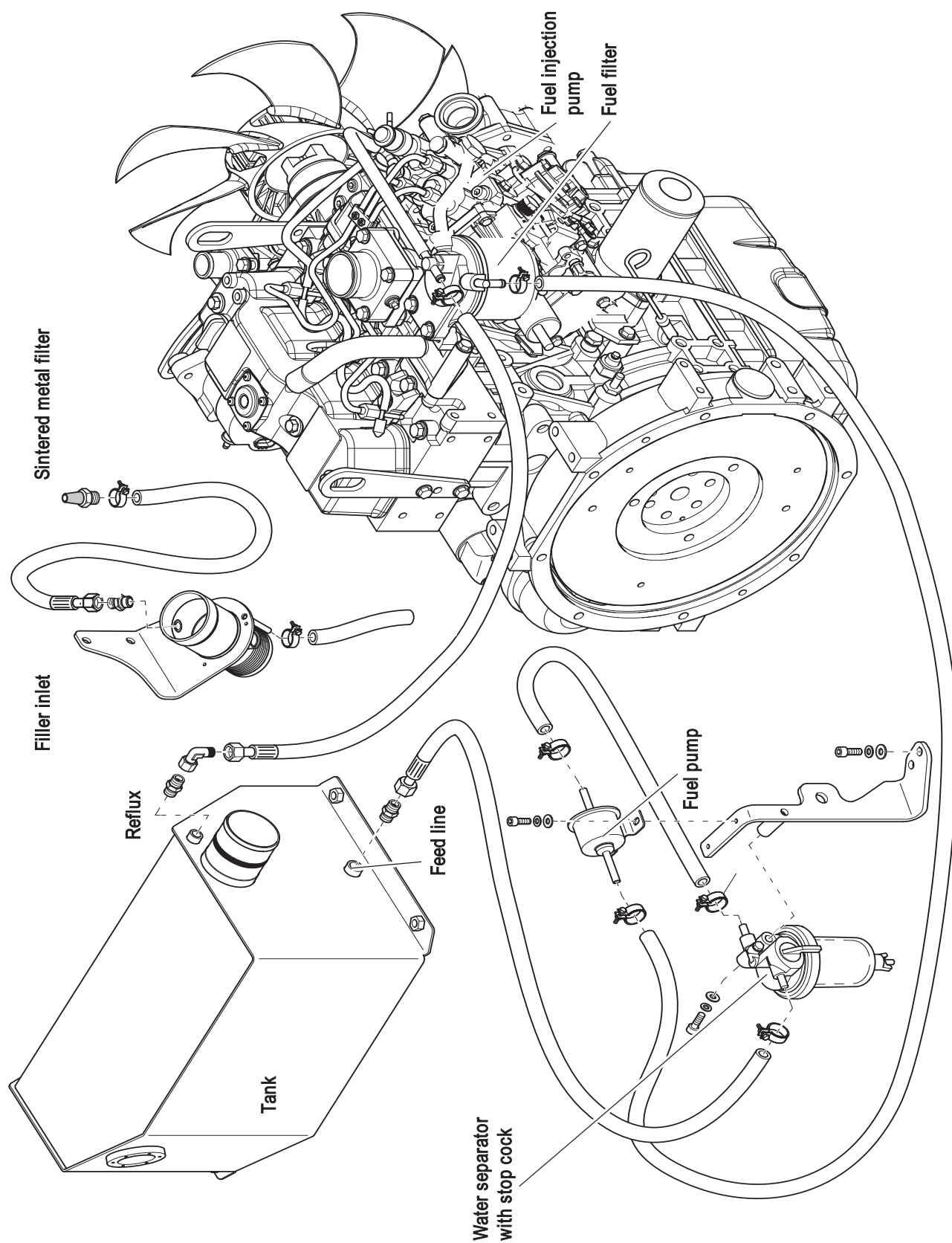
4 Engine

4.1 Engine overview 3TNV88-PNS (Tier 2)

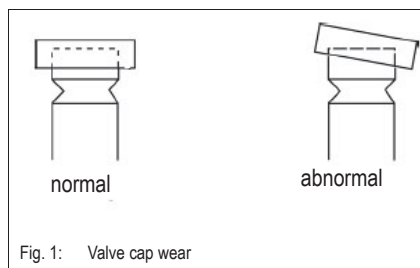




4.2 Fuel system



4.3 Checking and adjusting valve tip clearance



☞ *Standard setting of valve tip clearance is possible:*

➡ On a cold engine

☞ *Remove the cylinder-head cover*

☞ *Turn the engine with a screwdriver (as in 4.7) until the cylinder reaches the top dead centre of the compression cycle.*

➡ Valve overlapping

☞ *Check the valve cap for abnormal wear*

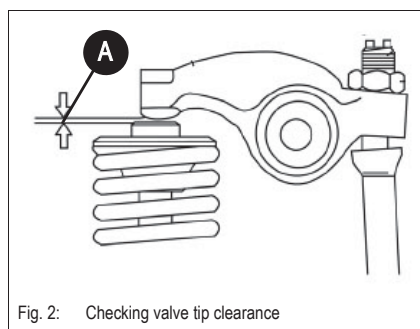
☞ *Check valve tip clearance **2/A** with a feeler gauge*

➡ Valve tip clearance: 0.15 – 0.25 mm (0.006 - 0.01")

☞ *Repeat the procedure for each cylinder*

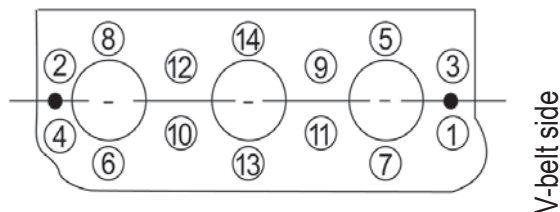
☞ *Place the cylinder head cover gasket*

☞ *Mount the cylinder-head cover*



4.4 Tightening order for cylinder head bolts

Order for removing the cylinder-head bolts



Important!

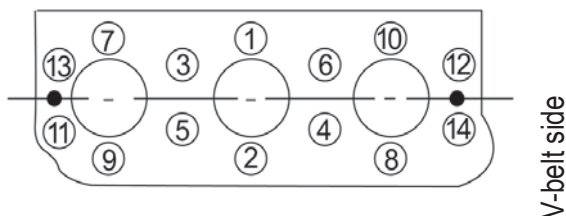
Always carry out work on the cylinder head on a cold engine!



Caution!

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

See figure



Important!

Apply oil to the threads and contact surfaces before mounting.

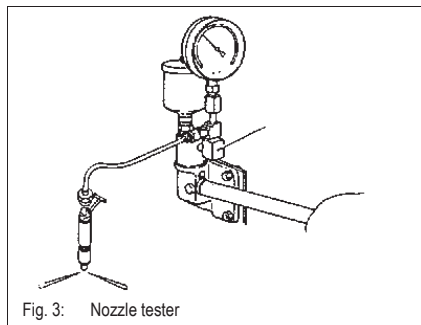
Mount the cylinder-head bolts

➔ Tightening torques:

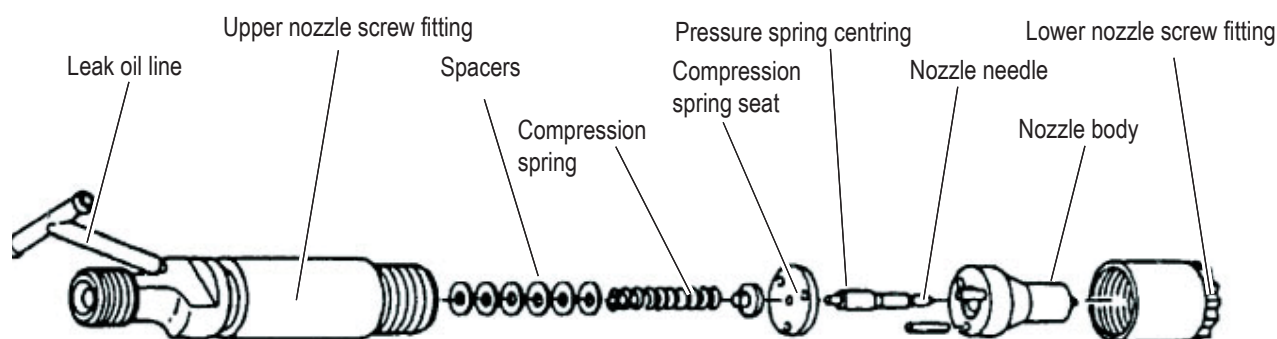
- 1st pass 41,1 - 46,9 Nm (30.31 - 34.59 lbf ft)
- 2nd pass 85,3 - 91,1 Nm (62.91 - 67.19 lbf ft)

4.5 Checking the injection nozzles

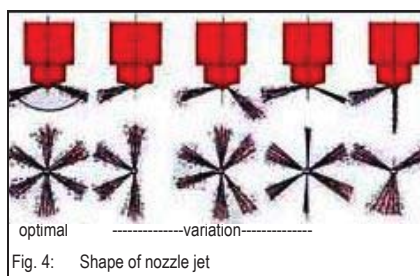
Pressure check



- Remove the injection line and the injection nozzle
- Connect the injection nozzle with the high pressure line of the nozzle tester
- Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge
- If the injection pressure is too low, replace the spacer in the nozzle by a thicker one. If the pressure is too high, replace the spacer by a thinner one.
 - ➡ Injection pressure: **216 - 226 bar (3133 - 3278 psi)**
- Spacer thickness of 0.1 mm (0.004") corresponds to modification by 19 bar (276 psi)
- Check the 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



- 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. 41

4.7 Injection time

Checking injection time

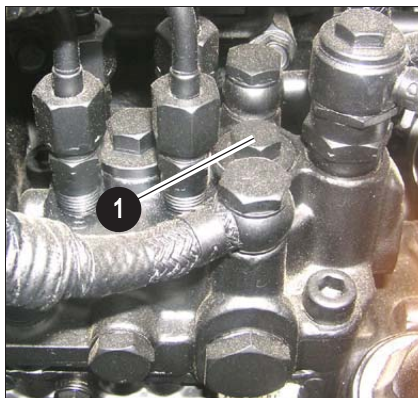


Fig. 5: Measuring equipment



Fig. 6: Measuring equipment

- Preparatory work:

- Remove the high pressure injection lines first.

- Unscrew plug 5/1 of 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. 5.

- 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)

- 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. 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

- Mark the "1/4" and "2/3" indents (top dead centre)
- In front of each of these indents, there are 3 more indents without numbers. These indents stand for 10°, 15° and 20° before top dead centre

➡ Rated value: $14.5^\circ \pm 1^\circ$ before top dead centre (~ second indentation)

Setting injection time

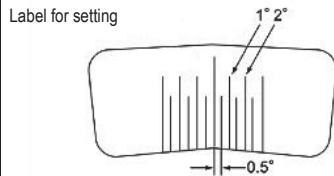
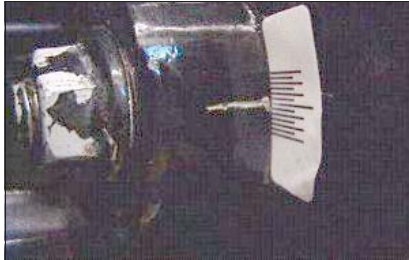


Fig. 8: Mark on housing

- 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

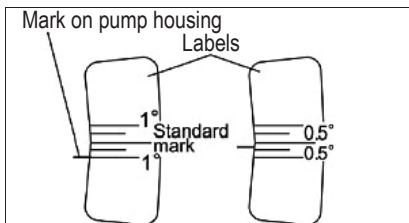


Fig. 9: Correction of injection angle

☞ 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

☞ 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

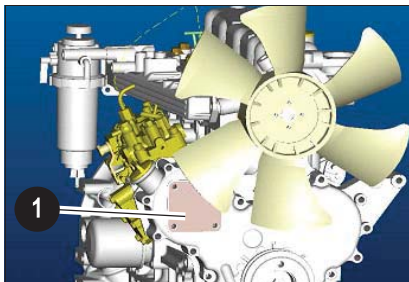


Fig. 10: Gear casing

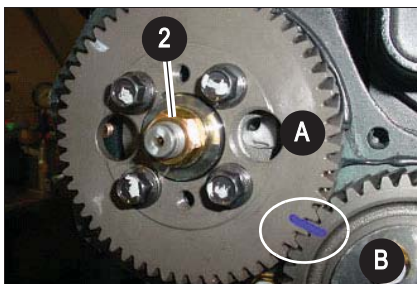


Fig. 11: Gear casing

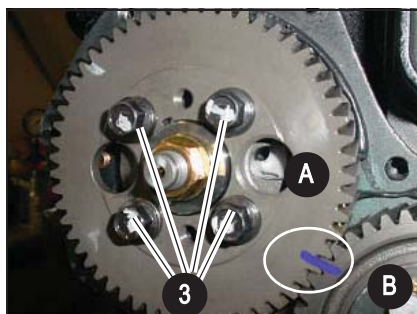


Fig. 12: Gear casing

☞ 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



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!

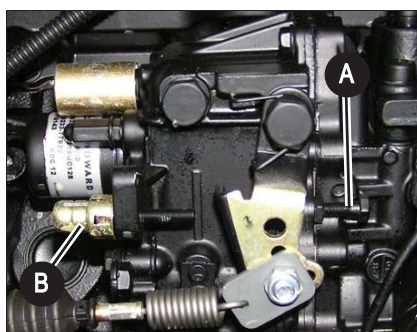


Fig. 13: Adjusting engine revs

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 ± 50 rpm
- ➔ Max. revs: 2500 ± 10 rpm

☞ Adjust as shown if values differ.

4.9 Compression

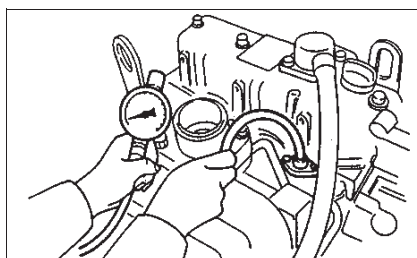


Fig. 14: Compression

☞ Remove the injection lines and the injection nozzles

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

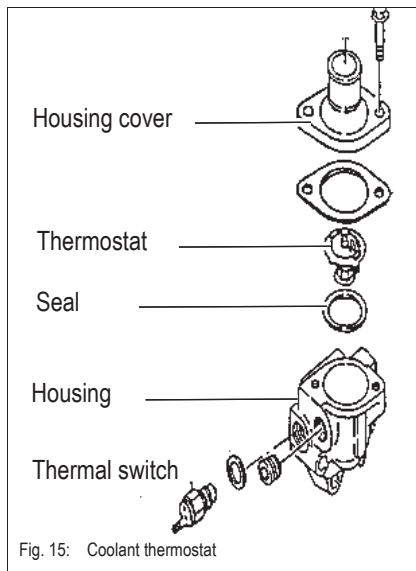
☞ Turn the engine

☞ 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

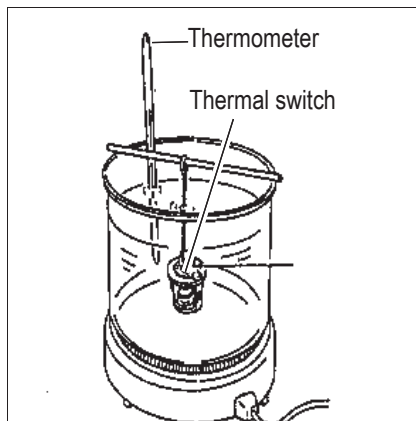
- ➔ Specified value: $34,3 \pm 1$ bar bei 250U/min (497.5 ± 14.5 psi at 250 rpm)
- ➔ Threshold value: 28 ± 1 bar bei 250U/min (406 ± 14.5 psi at 250 rpm)

4.10 Checking the coolant thermostat



Remove the thermostat

- ➔ The thermostat is located on the water pump
 - see *Engine overview 3TNV88-PNS (Tier 2)* 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

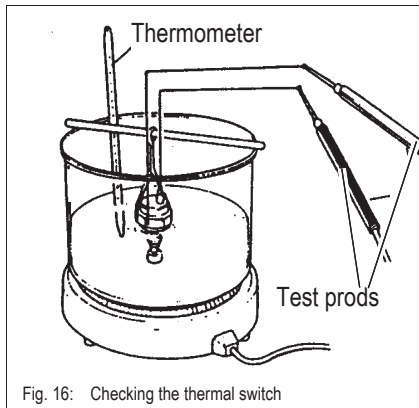


Fig. 16: Checking the thermal switch

- 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

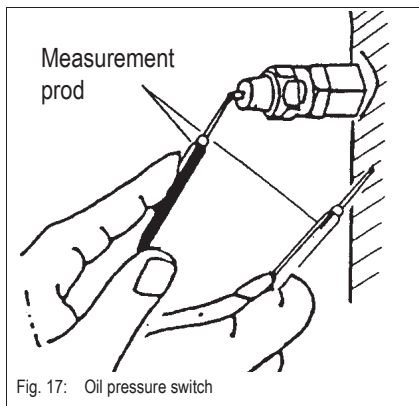


Fig. 17: Oil pressure switch

- 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

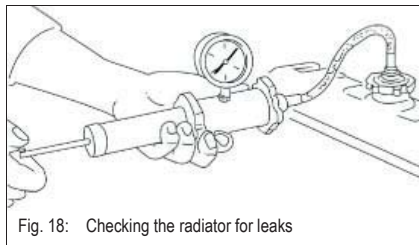


Fig. 18: Checking the radiator for leaks

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

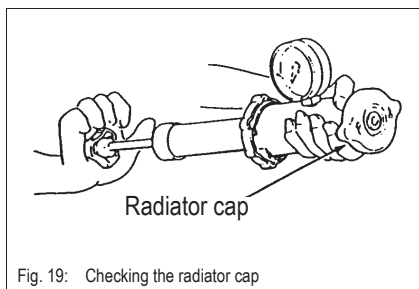
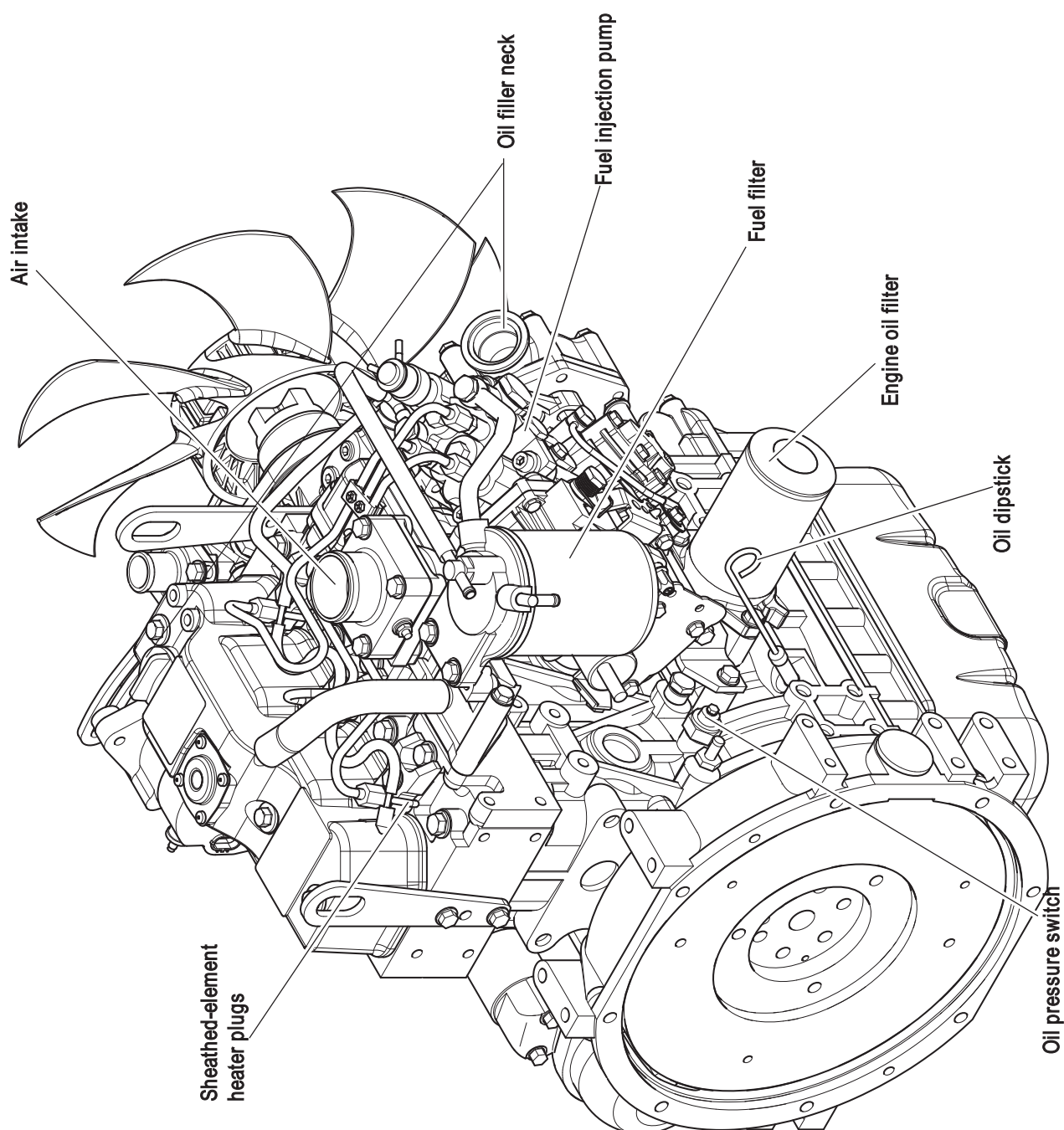


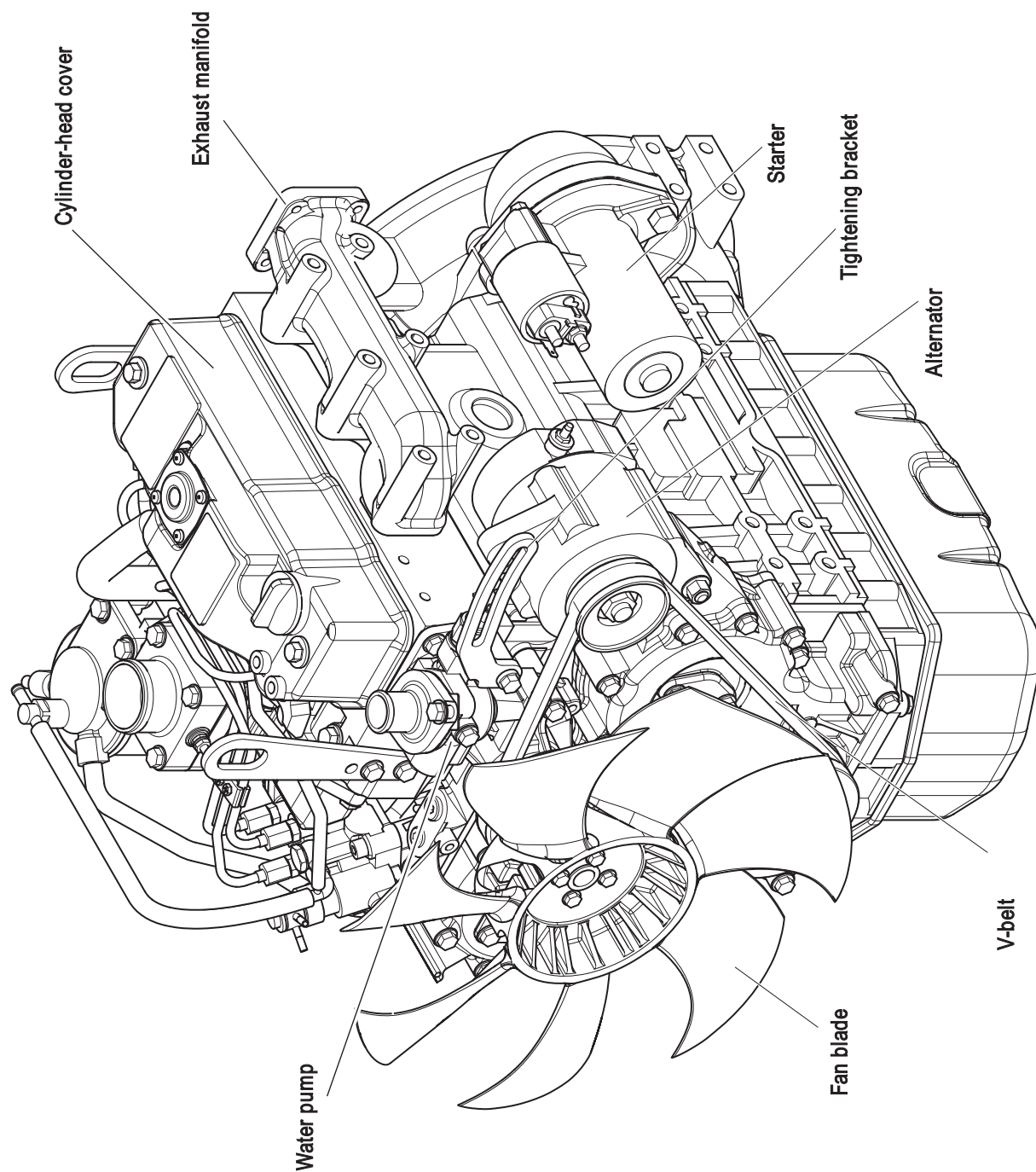
Fig. 19: Checking the radiator cap

Checking the radiator cap

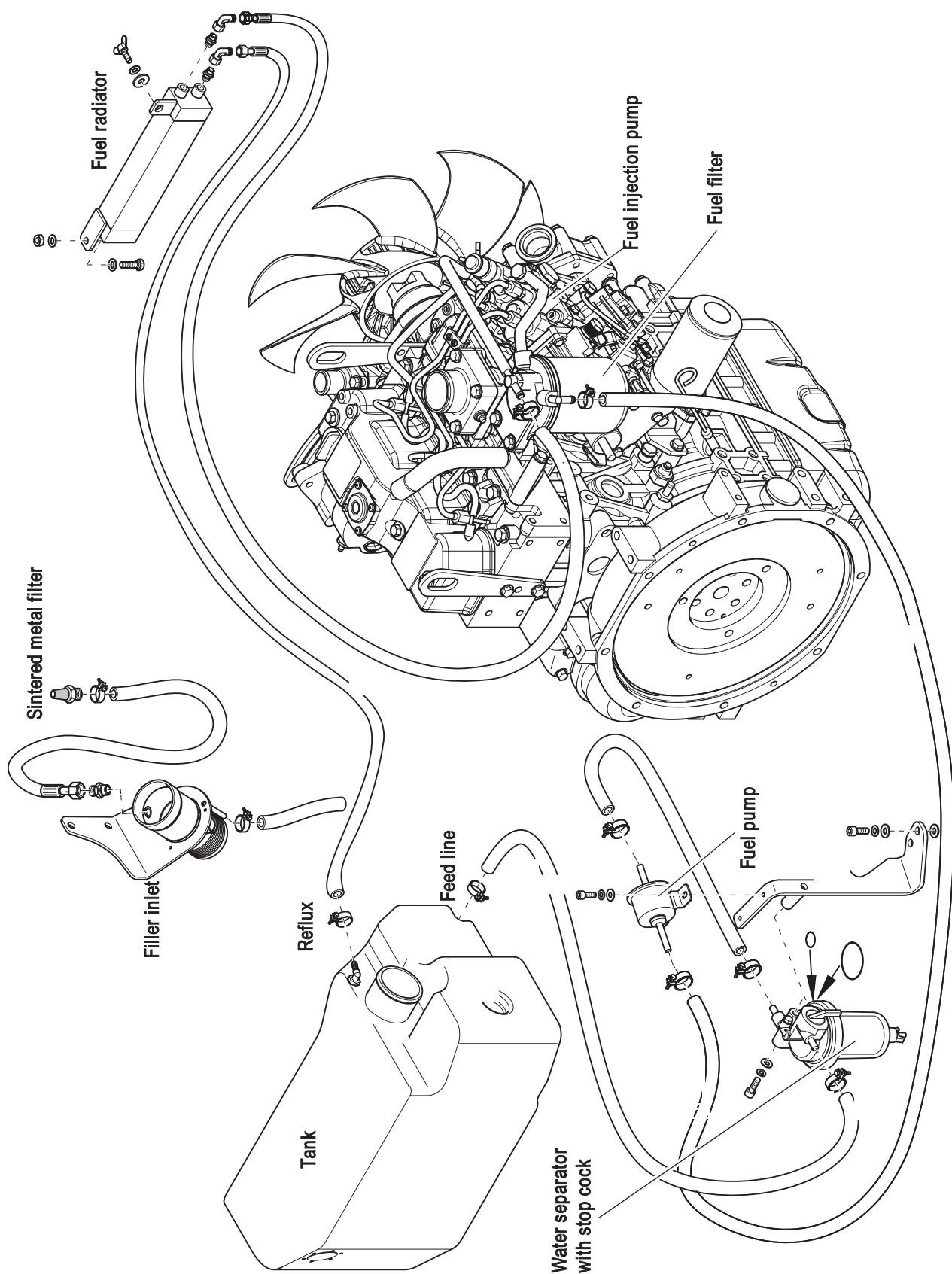
- Remove the radiator cap and mount it onto the adapter as shown
- Increase the pressure to about 1 bar / 15 psi (stamped onto the radiator cap) with the hand pump
 - ➔ The radiator cap must open

4.1 Engine overview 3TNV88-BPNS (Tier 3A)





4.2 Fuel system



4.3 Removing the cylinder-head cover



Important!

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

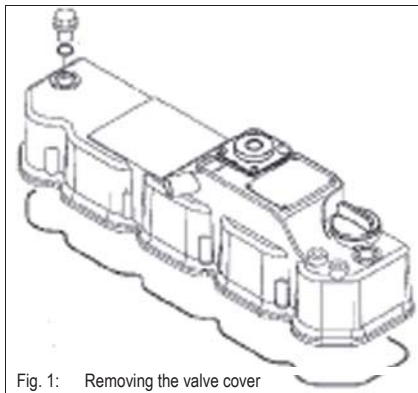


Fig. 1: Removing the valve cover

How to remove:

- 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

4.4 Checking and adjusting valve tip clearance

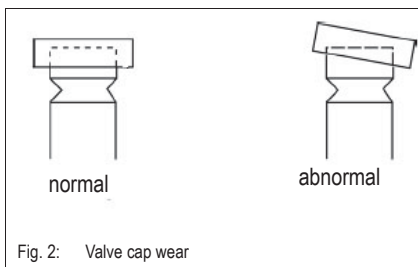


Fig. 2: Valve cap wear

- Standard setting of valve tip clearance is possible:
 - ➔ On a cold engine
- Turn the engine with a screwdriver (as in 4.7) until the cylinder reaches the top dead centre of the compression cycle.
 - ➔ Valve overlapping
- Check the valve cap for abnormal wear
- Check valve tip clearance **2/A** with a feeler gauge
 - ➔ Valve tip clearance: 0.15 – 0.25 mm (0.006 - 0.01")
- Repeat the procedure for each cylinder
- Put the cylinder head cover gasket in place
- Mount the cylinder-head cover

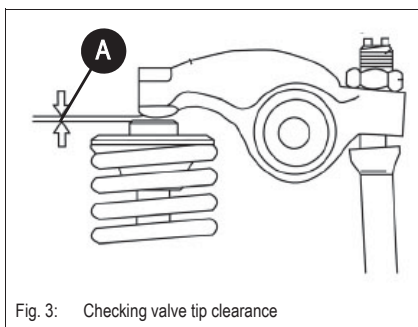
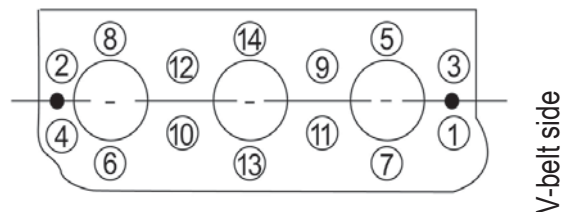


Fig. 3: Checking valve tip clearance

4.5 Tightening order for cylinder head bolts

Order for removing the cylinder-head bolts



Mount the cylinder-head bolts

➔ Tightening torques:

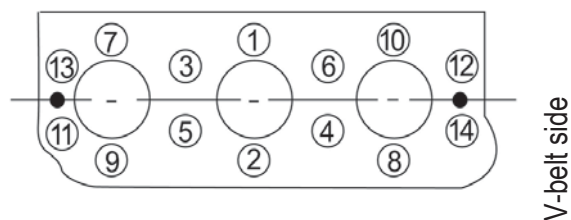
- 1st pass 42,6 - 45,5 Nm (31.4 - 33.6 lbf ft)
- 2nd pass 85,3 - 91,1 Nm (62.9 - 67.2 lbf ft)



Caution!

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

See figure



Important!

Apply oil to the threads and contact surfaces before mounting.

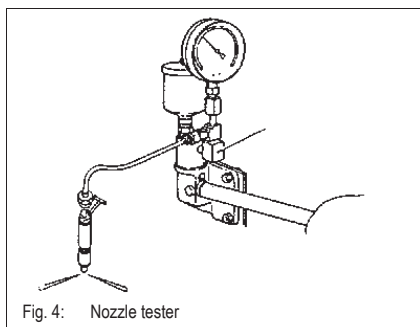


Important!

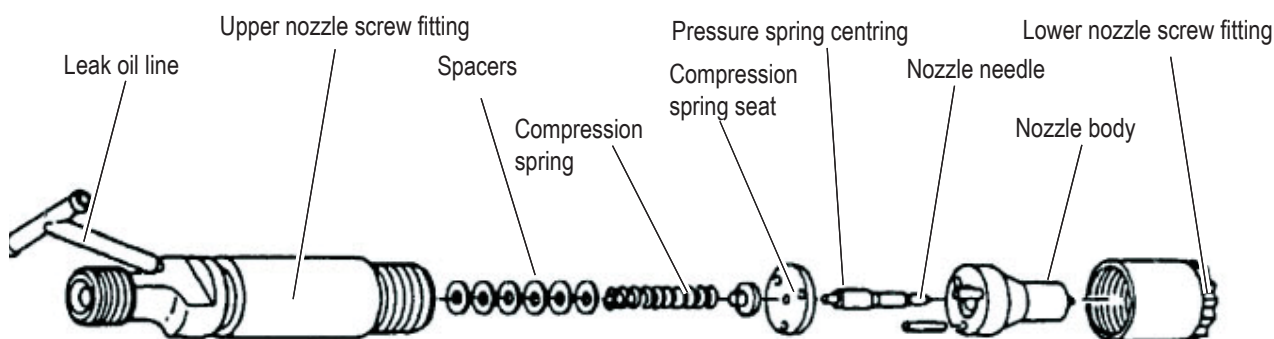
Always carry out work on the cylinder head on a cold engine!

4.6 Checking the injection nozzles

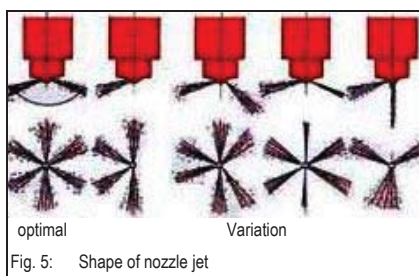
Pressure check



- 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 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



4.7 Checking the 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. 51](#)

4.8 Injection time

Checking injection time

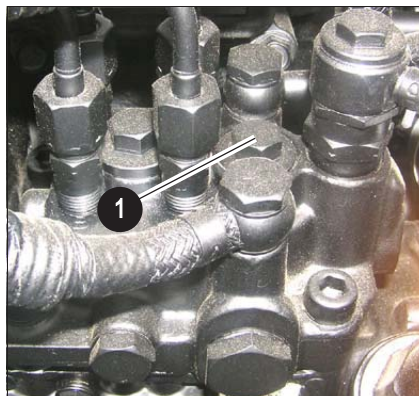


Fig. 6: Measuring equipment



Fig. 7: Measuring equipment

- Preparatory work:

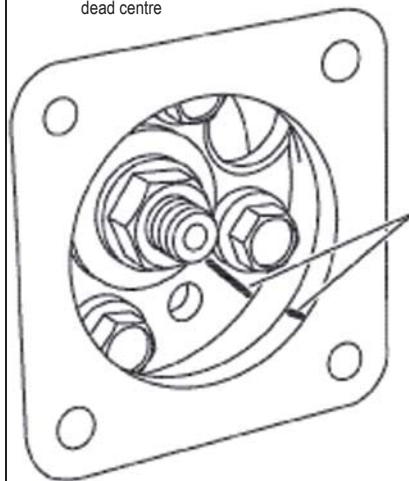
- ☞ Remove all dirt on the engine with a lint-free cloth
- ☞ Remove the high pressure fuel injection lines
- ☞ Unscrew plug Fig. 6'1 of the piston.
- ☞ Mount the sleeve (no. 1000158805) and the extension (no. 1000158806) onto the dial gauge (no. 1000158807) and fasten them with a clamp (no. 1000083308).
- ☞ Screw the dial gauge into the bore of the piston as shown in Fig. 6.

- Measurement:

- ☞ Remove the rubber 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. 8: 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

- Mark the “1/4” and “2/3” indents (top dead centre)
- In front of each of these indents, there are 3 more indents without numbers. These indents stand for 10°, 15° and 20° before top dead centre

☞ Rated value: calculation according to Yanmar manual:
value on injection pump (in this case: 6.8 see Fig. 11) x 2 + FIR
(FIR for 38Z3 = 4.5)

Setting injection time

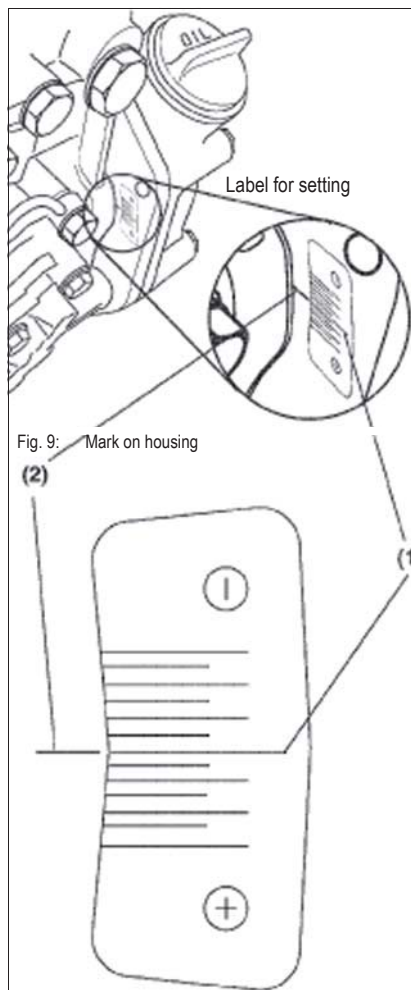
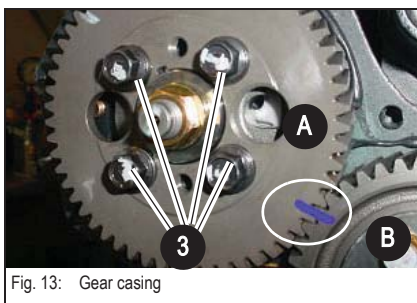
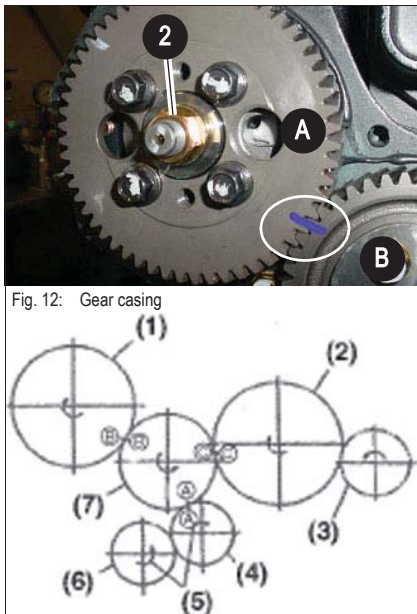
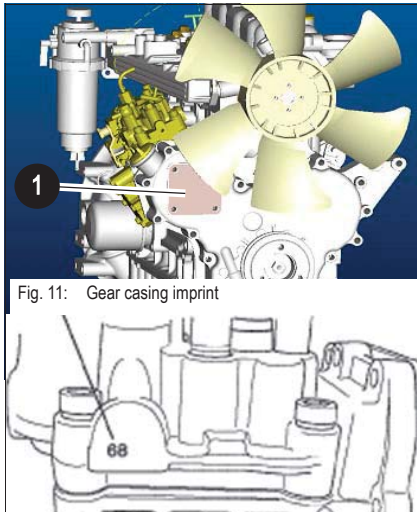
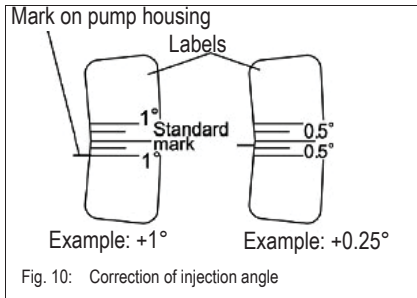


Fig. 9: Mark on housing

- 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. 9
- ☞ 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



☞ Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see Fig. 10

☞ Remove gear casing cover 11/1 of the fuel injection pump

☞ Turn the engine until the indents on the gears coincide

☞ Completely slacken lock nut 12/2 of the drive pinion

☞ Adhesive label number 1000158808

☞ Remove the fuel injection pump

☞ Read off the injection angle on the pump

☞ Read off the injection angle on the new pump

➡ Read off the imprint on the engine side of the fuel injection pump

• Tightening torque: 23 – 28 Nm (17 - 21 lbf ft)

☞ 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. 12)

☞ Slacken and tighten nut 12/2 (tightening torque: 23 – 28 Nm / 17 - 21 lbf ft)

☞ Check injection time

☞ Mount gear casing cover 11/1 of the fuel injection pump

• Tightening torque: 78 – 88 Nm (58 - 65 lbf ft)

• If a front housing cover is installed, the drive wheel of the injection pump is adapted to the impeller by means of marks A,B,C (see Fig. 12):

- | | |
|------------------------------------|---------------------------------------|
| • 1...Injection pump drive wheel | 2...Camshaft drive wheel |
| 3...Auxiliary drive wheel (option) | 4...Crankshaft drive wheel |
| 5...Direction of rotation | 6...Fuel pump drive wheel (4TNV only) |
| 7...Impeller | |



Important!

Do not slacken screws 13/3 of the drive pinion of the fuel injection pump. These screws specify the precision setting of the fuel injection pump set by the manufacturer!

4.9 Adjusting engine revs



Important!

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

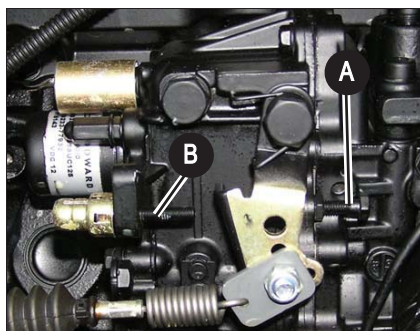


Fig. 14: Adjusting engine revs

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 ± 50 rpm
 - Max. revs: 2500 ± 10 rpm
- Adjust as shown if values differ.

4.10 Compression

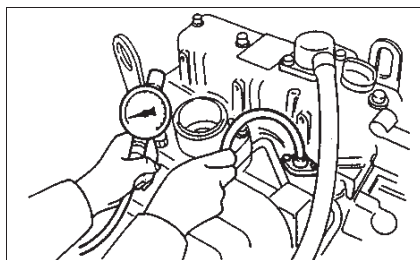


Fig. 15: Compression

- 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 bei 250U/min (483 - 512 psi at 250 rpm)
 - Threshold value: 26,5 - 28,5 bar bei 250U/min (384 - 413 psi at 250 rpm)

4.11 Checking the coolant thermostat

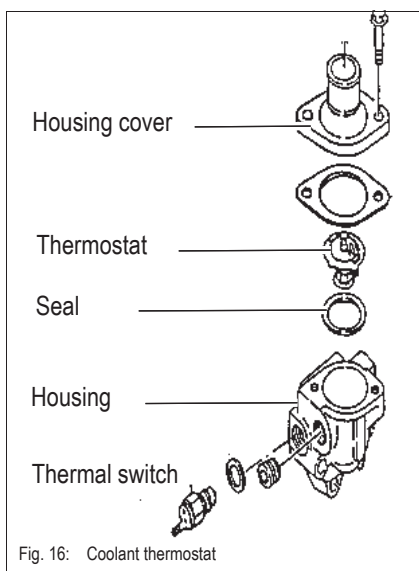
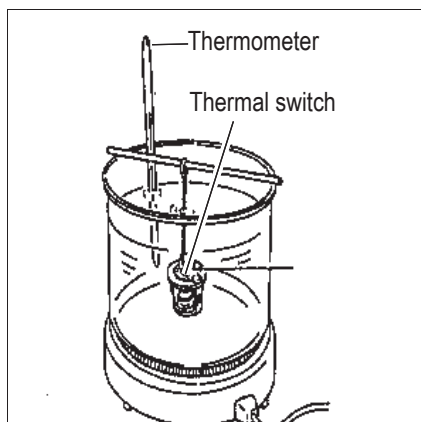


Fig. 16: Coolant thermostat

- Remove the thermostat
 - The thermostat is located on the water pump
 - see on page 4-13



- ☞ Warm up the thermostat in a container with water
- ☞ Check whether the thermostat opens at the specified temperature (check with a temperature gauge)
- ➡ Thermostat opening temperature: 69,5 - 72,5 °C (157.1 - 162.5°F)

4.12 Checking the thermal switch

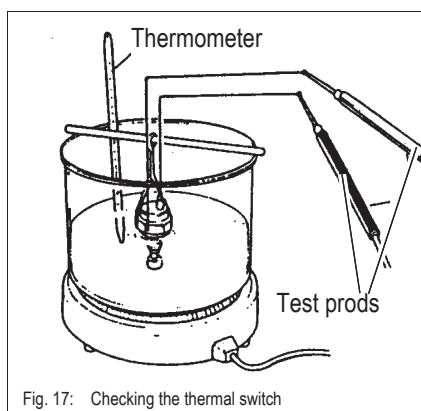


Fig. 17: Checking the thermal switch

- ☞ 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).

4.13 Oil pressure switch

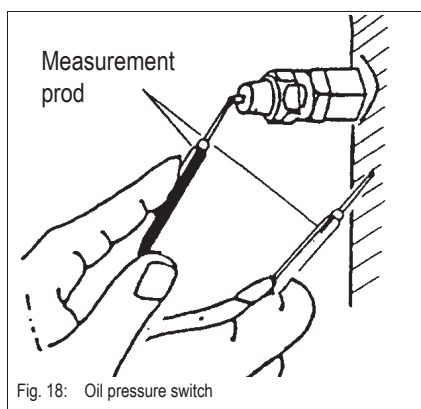


Fig. 18: Oil pressure switch

- ☞ Remove the cable connection from the oil pressure switch (in the area of the cutoff solenoid)
- ☞ Start the engine, check for correct idling speed
- ☞ Measure the resistance of the oil pressure switch as shown by means of an ohmmeter.
- ➡ Oil pressure switch OK: infinite resistance
- ➡ The oil pressure switch is defective if the oil can pass

4.14 Checking the coolant circuit

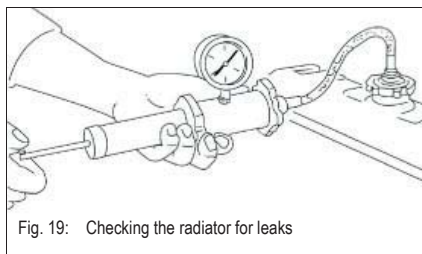


Fig. 19: Checking the radiator for leaks

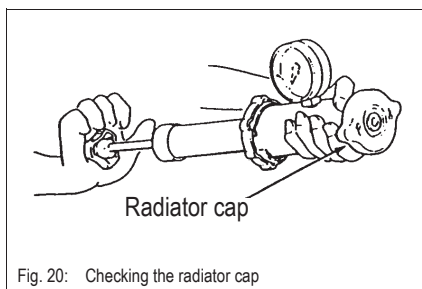


Fig. 20: Checking the radiator cap

Leakage check

- Fill up the radiator completely
- Mount an adapter on the radiator as shown
- Increase the pressure in the cooling system by means of a hand pump to about **1 bar (15 psi)**
 - ➔ Check the lines and the connections for leaks if the pressure drops at the pressure gauge

Checking the radiator cap

- Remove the radiator cap and mount it onto the adapter as shown
- Increase the pressure to about 1 bar / 15 psi (stamped onto the radiator cap) with the hand pump
 - ➔ The radiator cap must open

4.15 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 tip clearance
	Defective fuel injector
	Defective starting relay
	Defective glow plug
	Defective solenoid switch
	Cutoff solenoid does not attract
	Cutoff solenoid without current
Engine starts, but does not run smoothly or faultless	High pressure created immediately in the hydraulic system
	Fuel grade does not comply with specifications
	Wrong valve tip 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 tip 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 tip clearance
		Coolant combustion (defective cylinder-head gasket)
		Extreme misalignment of injection time
	Black	Dirty air filter
		Wrong valve tip clearance
		Defective fuel injector (drips)
		Wrong fuel injection pump setting

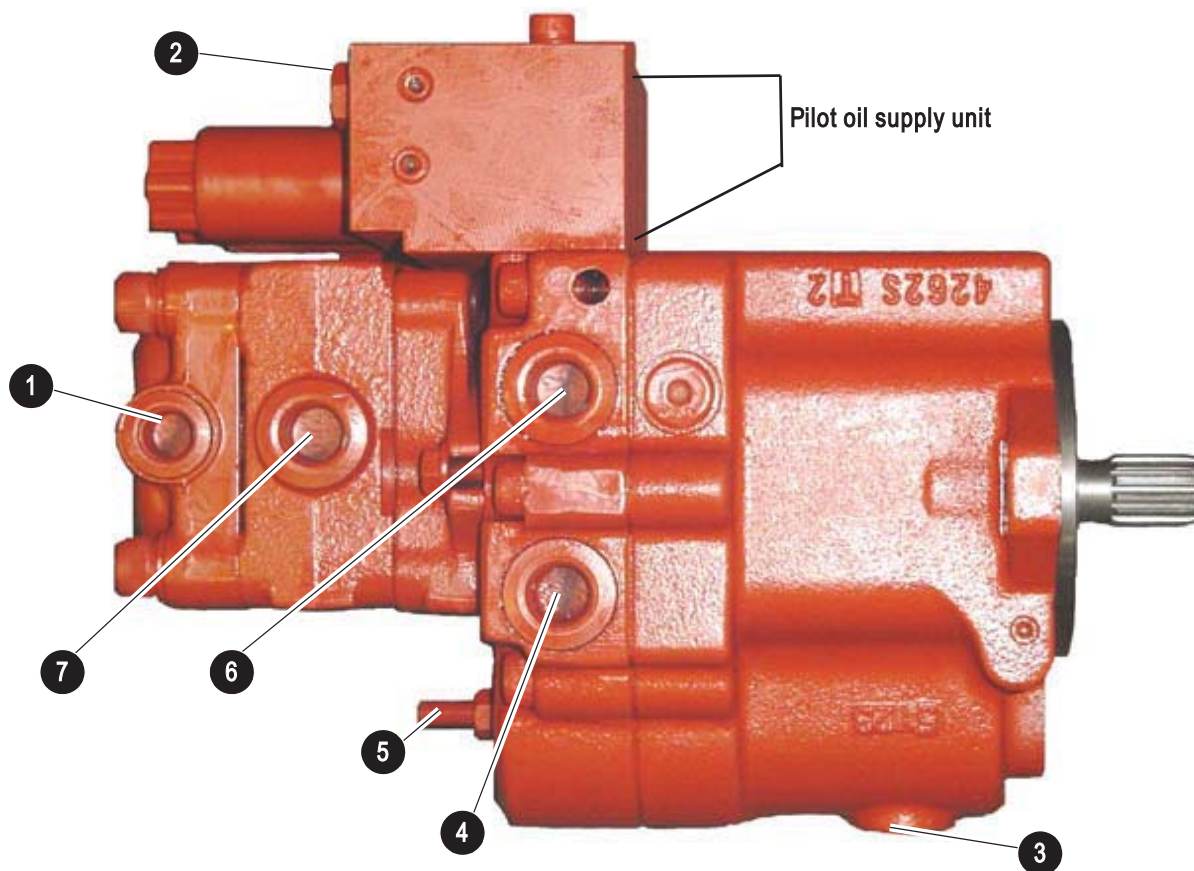
Hydraulic system

5 Hydraulic system

The hydraulic system is governed by a throttle

5.1 Hydraulic pump PVD-1B-32BP-11G5-4904A (up to AE02803) PVD-1B-34BP-10G5 (from AG00573)

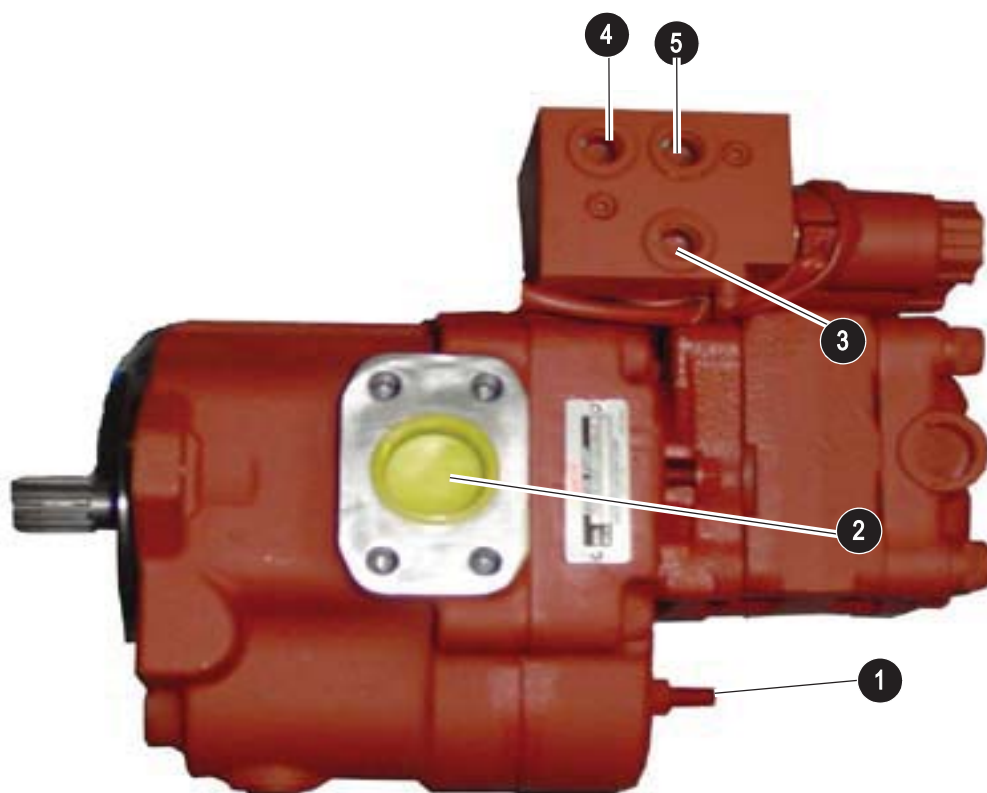
Double variable displacement pump + 2 gear pumps



Gear pump unit

Variable displacement pump unit

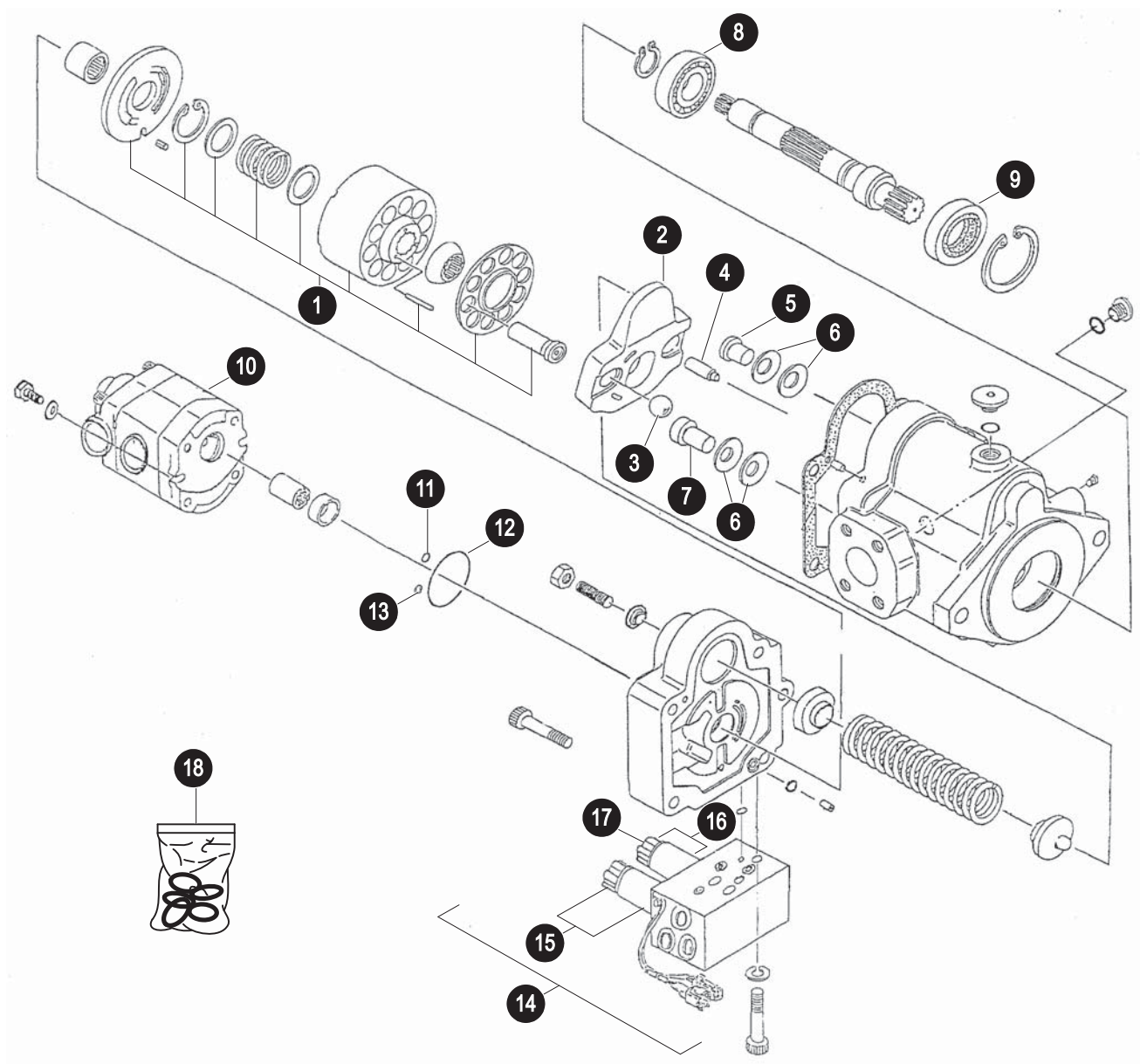
Pos.	Description
1	Port P4
2	Pressure limiting valve
3	Bleed screw
4	Port P1
5	Control initiation set screw
6	Port P2
7	Port P3



Variable displacement pump unit

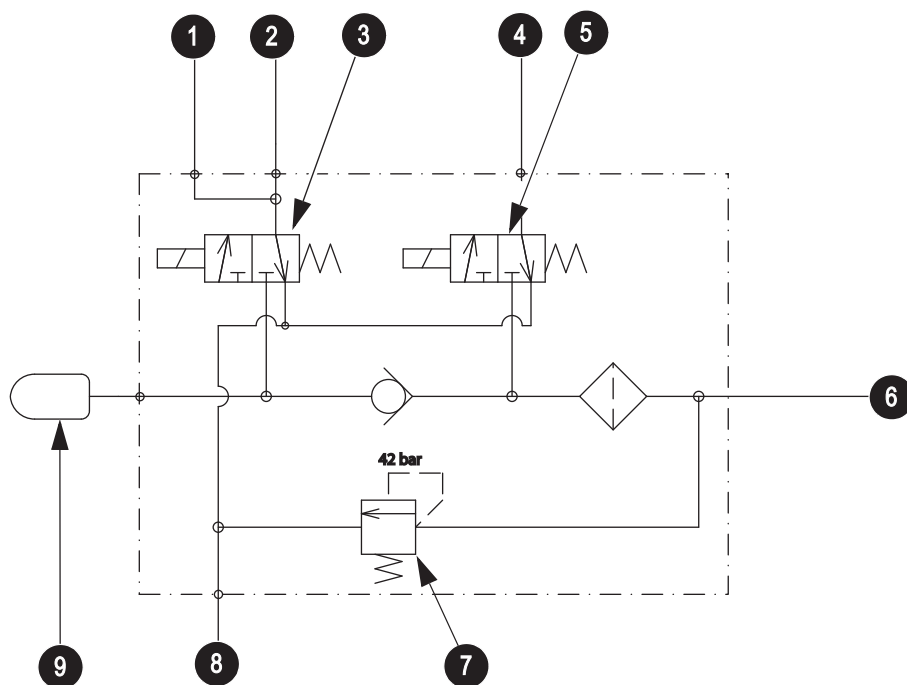
Gear pump unit

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

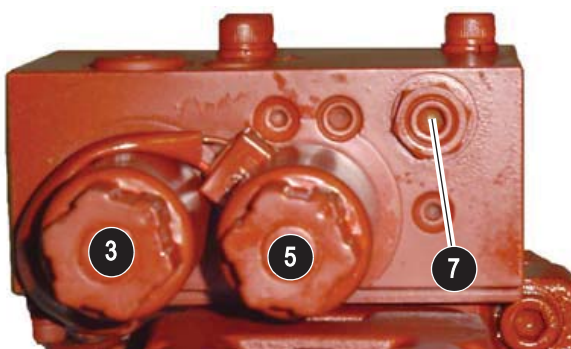
Pump unit: exploded view


Pos.	Description	Pos.	Description
1	Drive unit	10	Gear pump
2	Swash plate	11	O-ring
3	Ball	12	O-ring
4	Stop stud	13	O-ring
5	Stop pin	14	Pilot oil supply unit
6	Spring	15	Solenoid switch
7	Stop pin	16	Solenoid switch
8	Grooved ball bearing	17	Fastening screw
9	Rotary shaft lip seal	18	Variable displacement pump sealing kit

Pilot oil supply unit



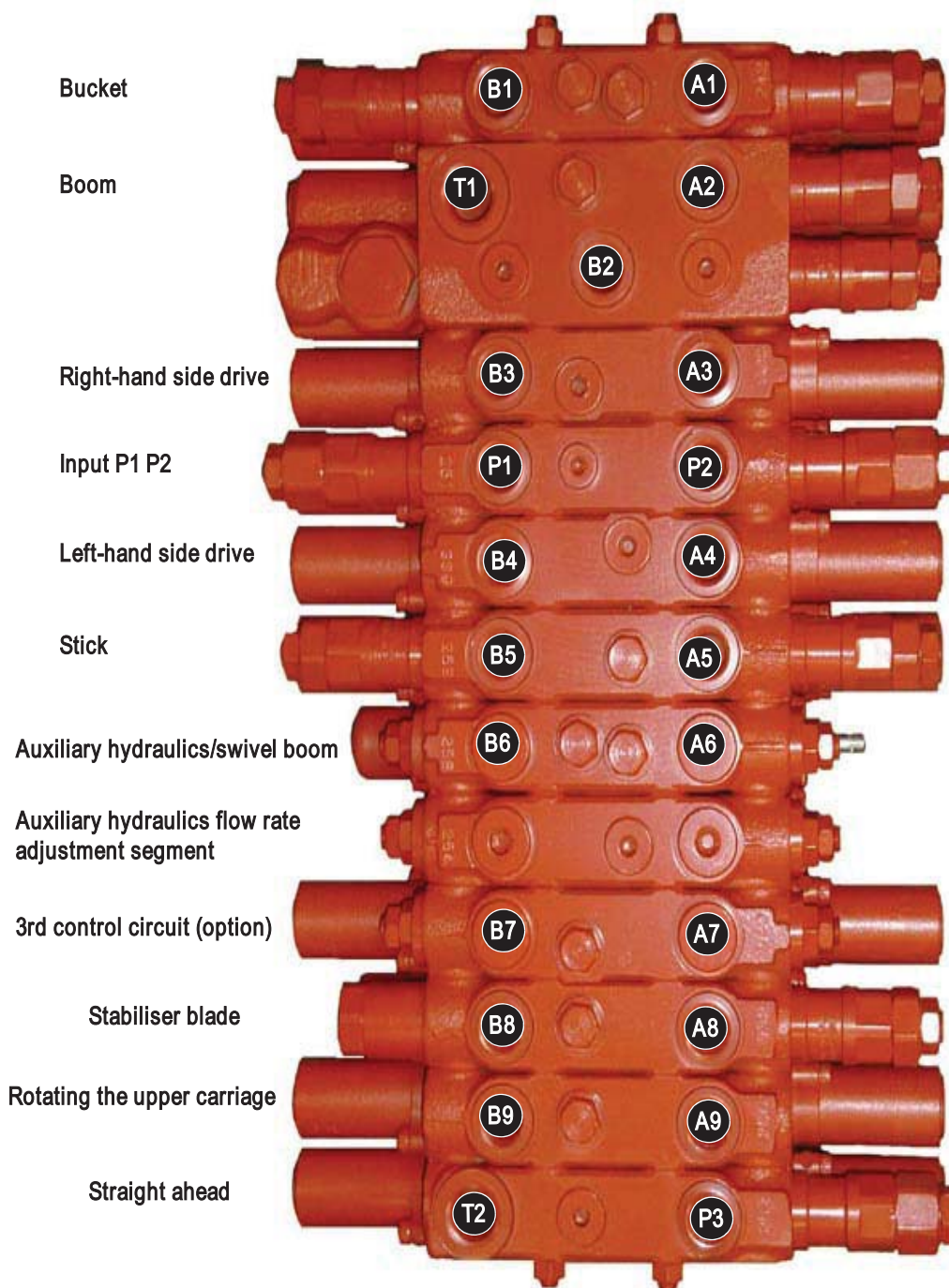
Both valves can be interchanged



Pos.	Description	Port
1	Gear motor brake release supply	PR
2	Pilot valve supply	BV
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

Main control lines

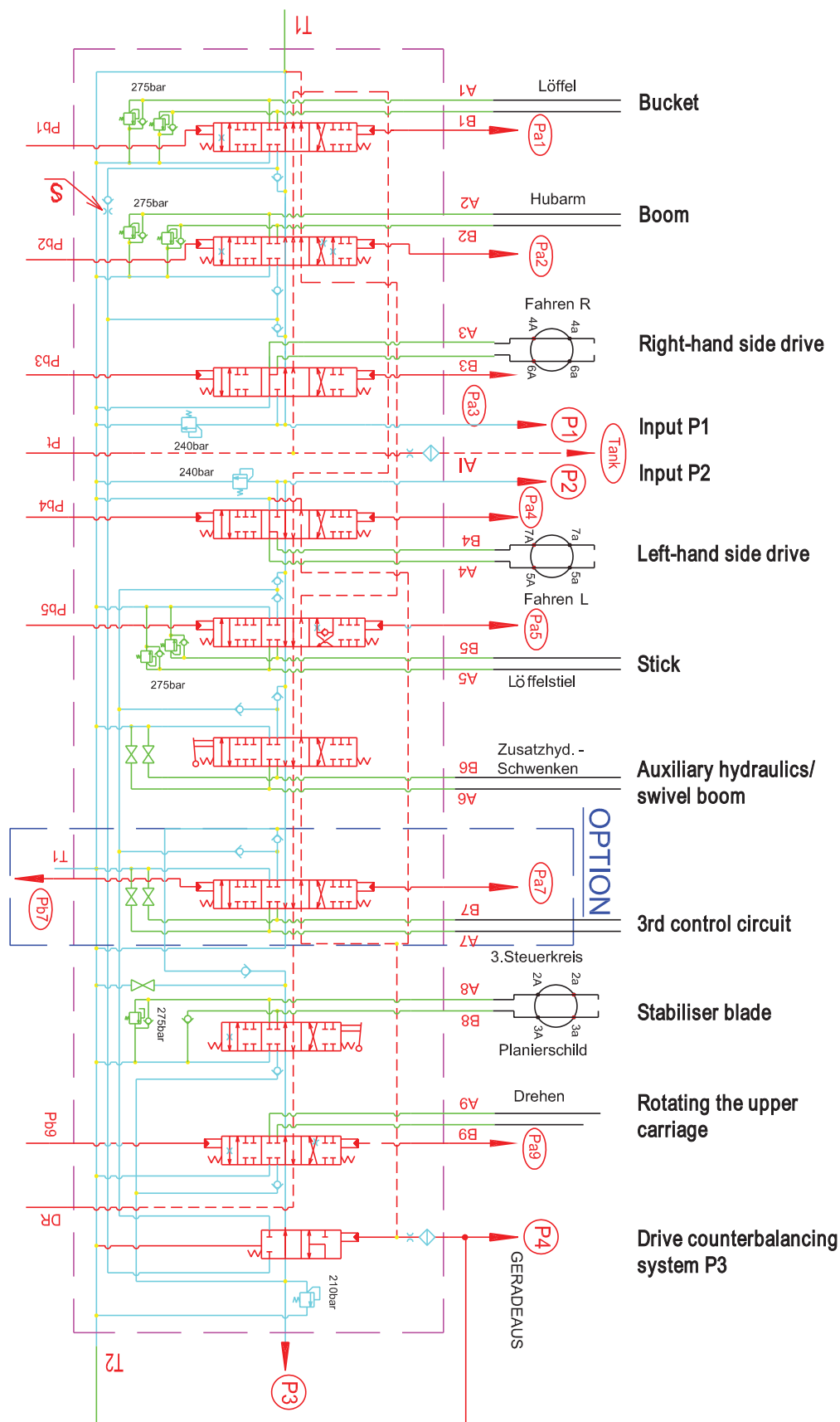
Port	Legend
A1, B1	Bucket ram
A2, B2	Boom ram
A3, B3	Drive (left) via swivel joint
A4, B4	Drive (right) via swivel joint
A5, B5	Stick ram
A6, B6	Auxiliary hydraulics/boom swivel
A7, B7	3rd control circuit (option)
A8, B8	Stabiliser blade
A9, B9	Upper carriage rotation
T2 , P3	Straight ahead

Pump/tank lines

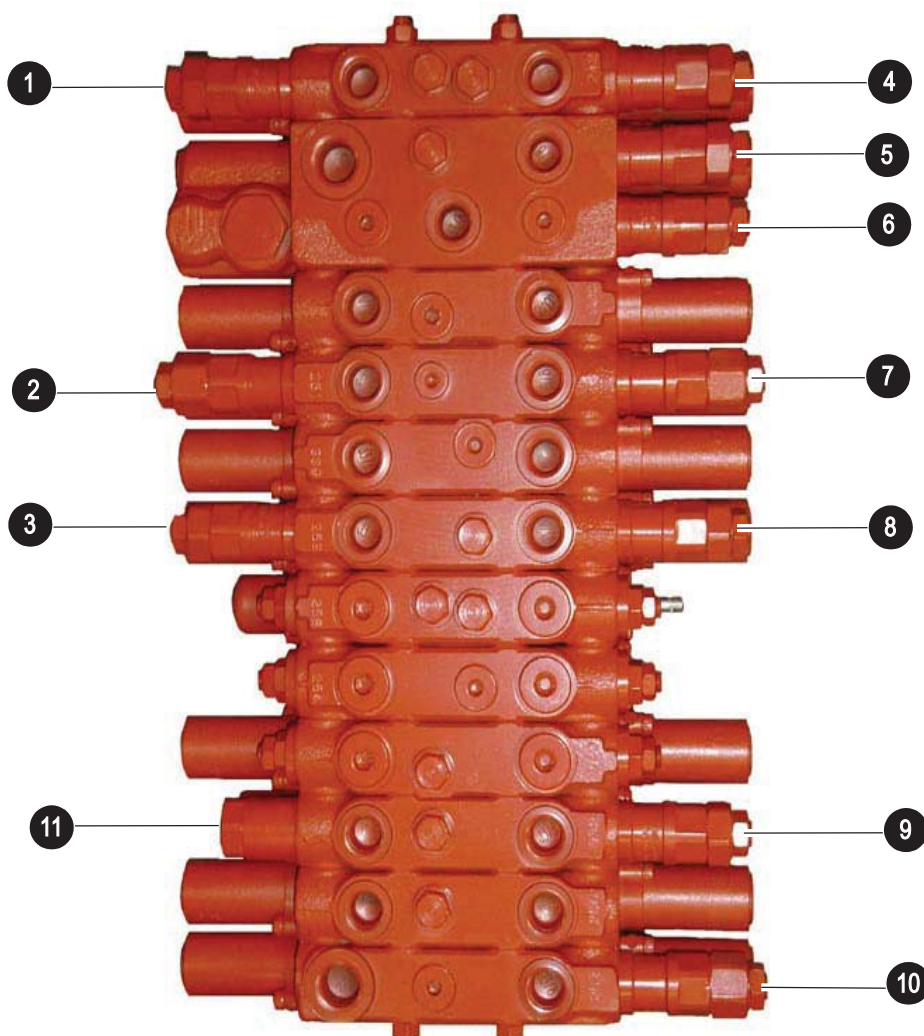
Port	Legend
P1	Pump 1 port
P2	Pump 2 port
P3	Pump 3 port
T1	Tank line via non-return valve and filter in tank
T2	Tank line via oil cooler and filter in tank

S: bucket pre-tension

– [see Bucket pre-tension](#) on page 5-11

Main valve block diagram


Pressure limiting valves



Pos.	Description
1	Secondary pressure limiting valve (bucket base side)
2	Primary pressure limiting valve P1
3	Secondary pressure limiting valve (stick rod side)
4	Secondary pressure limiting valve (bucket rod side)
5	Secondary pressure limiting valve (boom rod side)
6	Secondary pressure limiting valve (boom base side)
7	Primary pressure limiting valve P2
8	Secondary pressure limiting valve (stick base side)
9	Secondary pressure limiting valve (stabiliser blade base side)
10	Primary pressure limiting valve P3
11	Anticavitation valve

Pump assignment

Hydraulic supply by pump 1

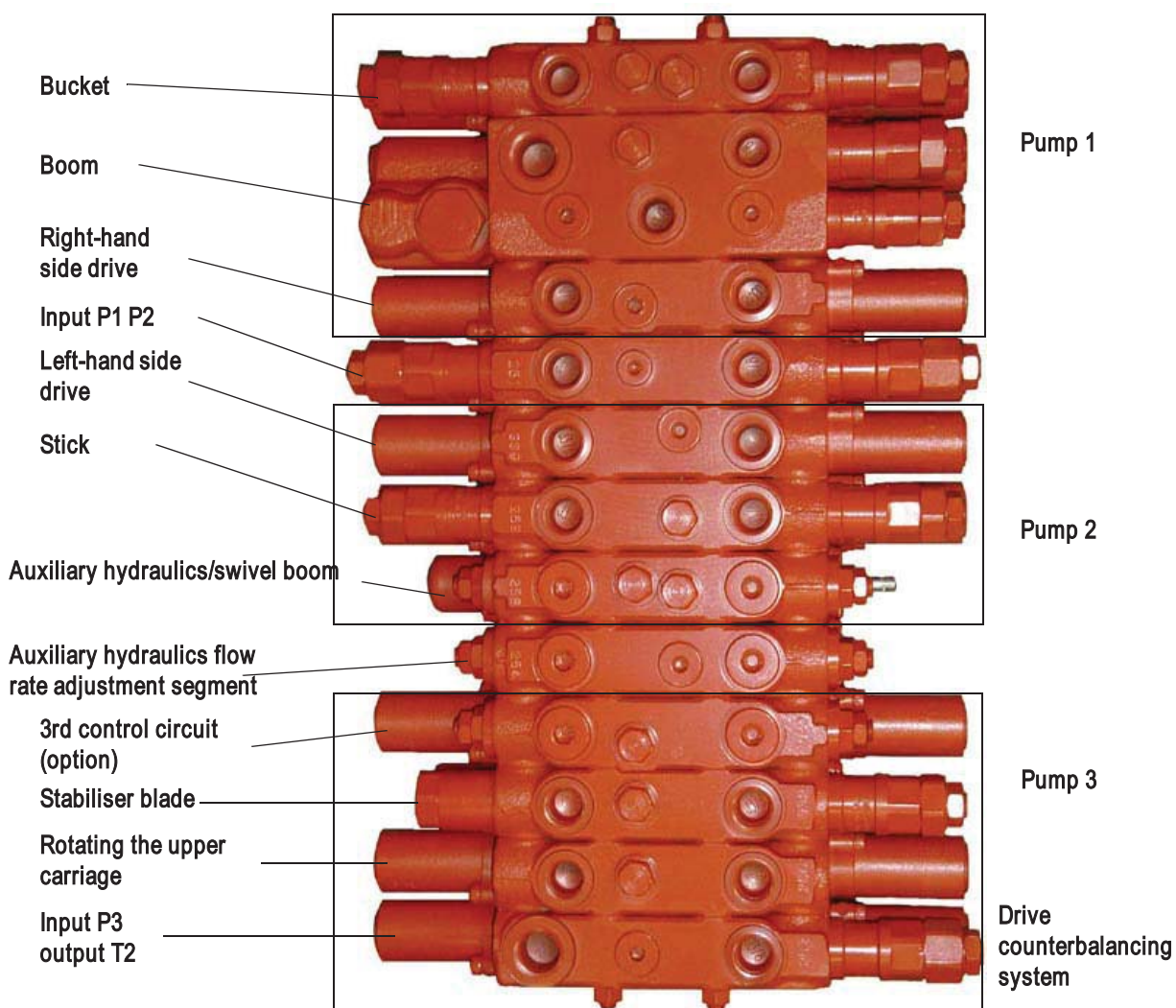
- Bucket section
- Boom section
- Right-hand side drive section

Hydraulic supply by pump 2

- Left-hand side drive section
- Stick section
- Auxiliary hydraulics/boom swivel section

Hydraulic supply by pump 3

- 3rd control circuit section (option)
- Stabiliser blade section
- Upper carriage rotation 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

- Right-hand side drive section

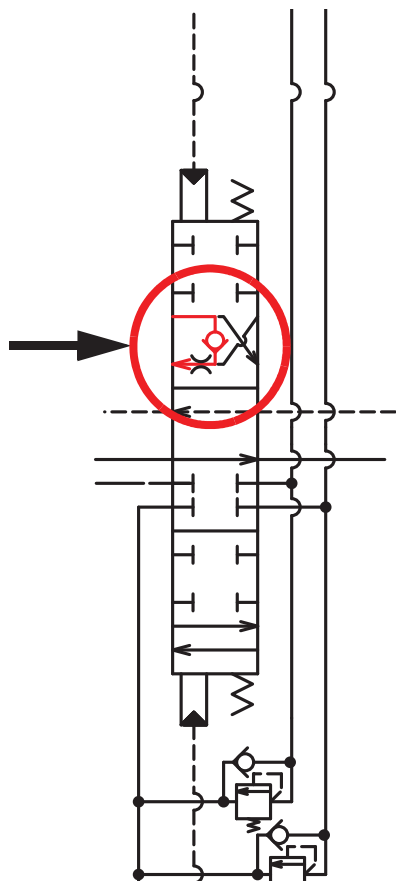
Hydraulic supply by pump 2

- Left-hand side drive section

Hydraulic supply by pump 3

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

5.4 Regeneration – stick section



Problem

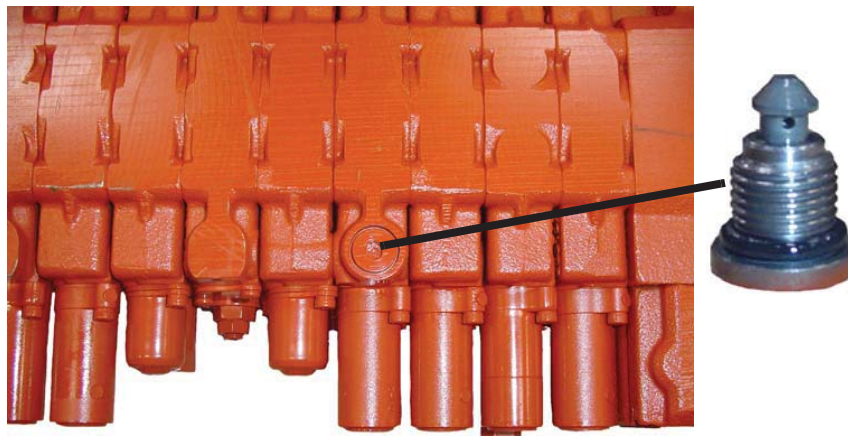
High loads on the stick can cause the stick ram to be “emptied” on the base side, which can cause the stick to stop in vertical position.

Solution

A non-return valve is integrated in the stick segment so the rod-side oil can flow to the base side.

Location

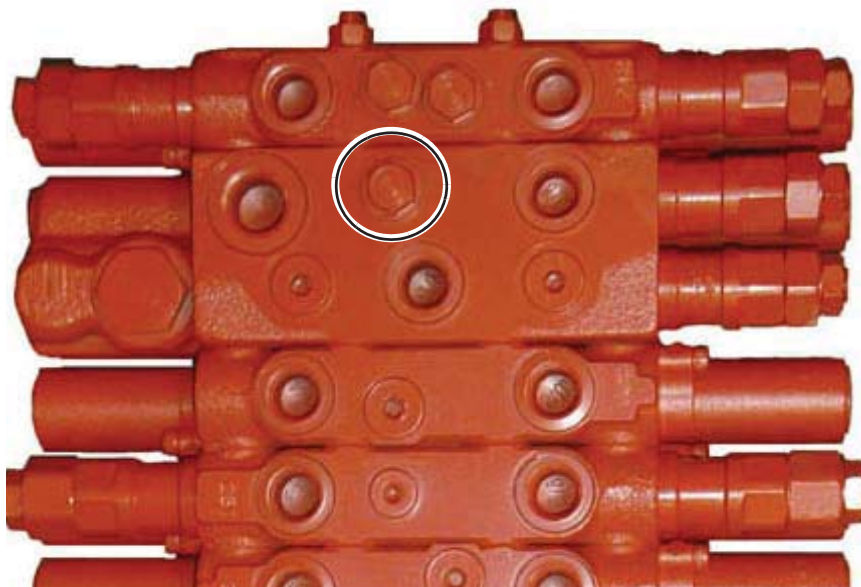
The regeneration valve is located in the stick segment on the lower side.



5.5 Bucket pre-tension

A nozzle is integrated in the pressure line of the bucket segment. If the bucket and the boom (both supplied with oil by the same pump) are actuated at the same time, both move simultaneously, and not the bucket (with its smaller mass) first, and then the boom with its larger mass – *see Main valve block diagram on page 5-7.*

Location



5.6 Flow rate adjustment of auxiliary hydraulics

The available oil quantity at the auxiliary hydraulics ports can be modified by means of set screws A or B on the main valve block.

Set screw – [see Pressure limiting valves](#) on page 5-8



Important!

The effect described below is achieved by simply opening one of the set screws.

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

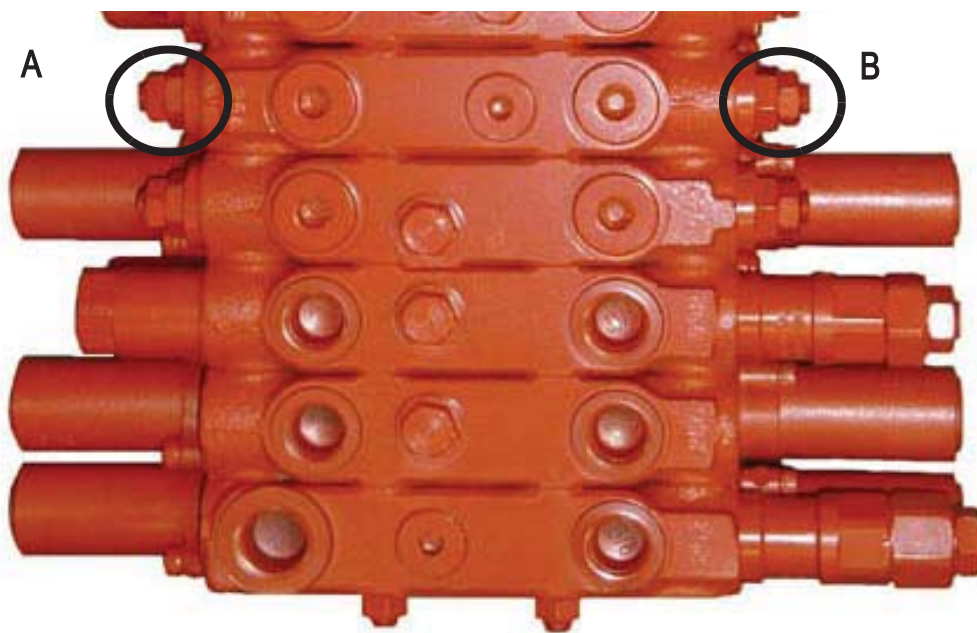
Unscrew the valve seat by at least 2 revolutions, but no more than 3, to open the valve seat completely.

- P2 supplies the auxiliary hydraulics section with oil
- The oil supplied by P3 flows to the tank via the open valve seat.



Important!

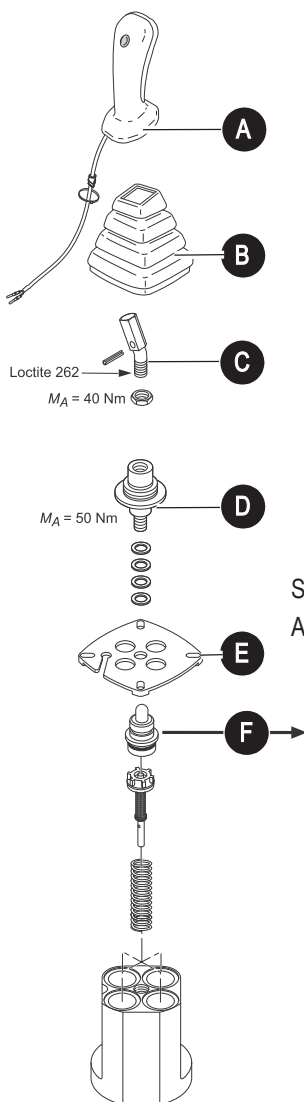
Intermediate positions of the set screws cause the hydraulic oil to warm up – danger of overheating!



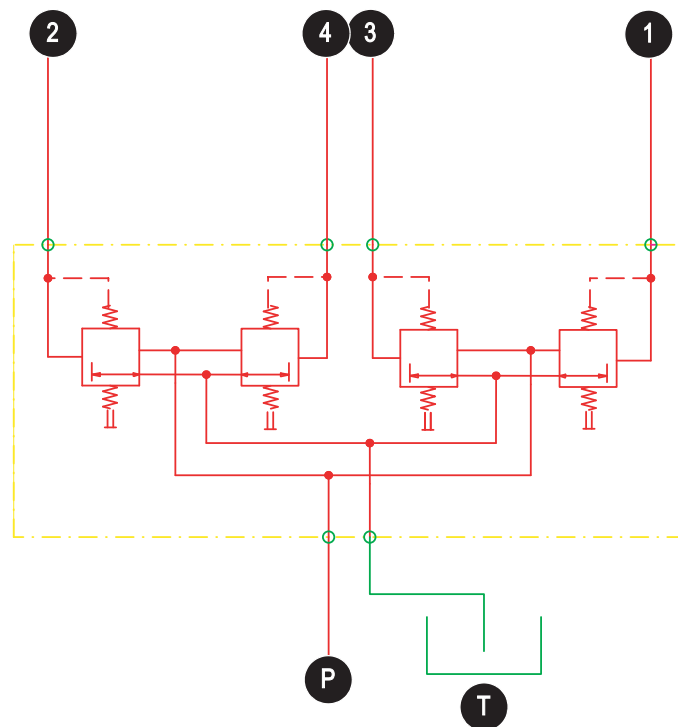
5.7 Pilot valves

Joystick

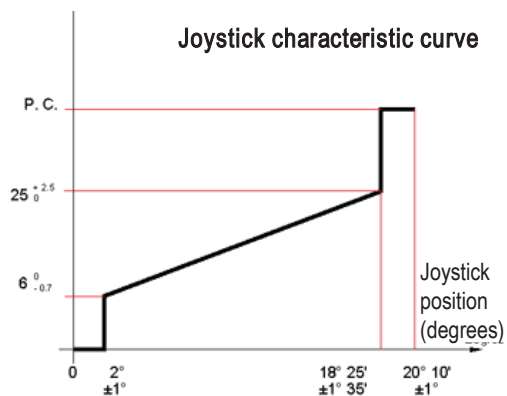
- Pilot valve for bucket, boom, stick and rotation
- Consists of a lever and four pressure reducing valves



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



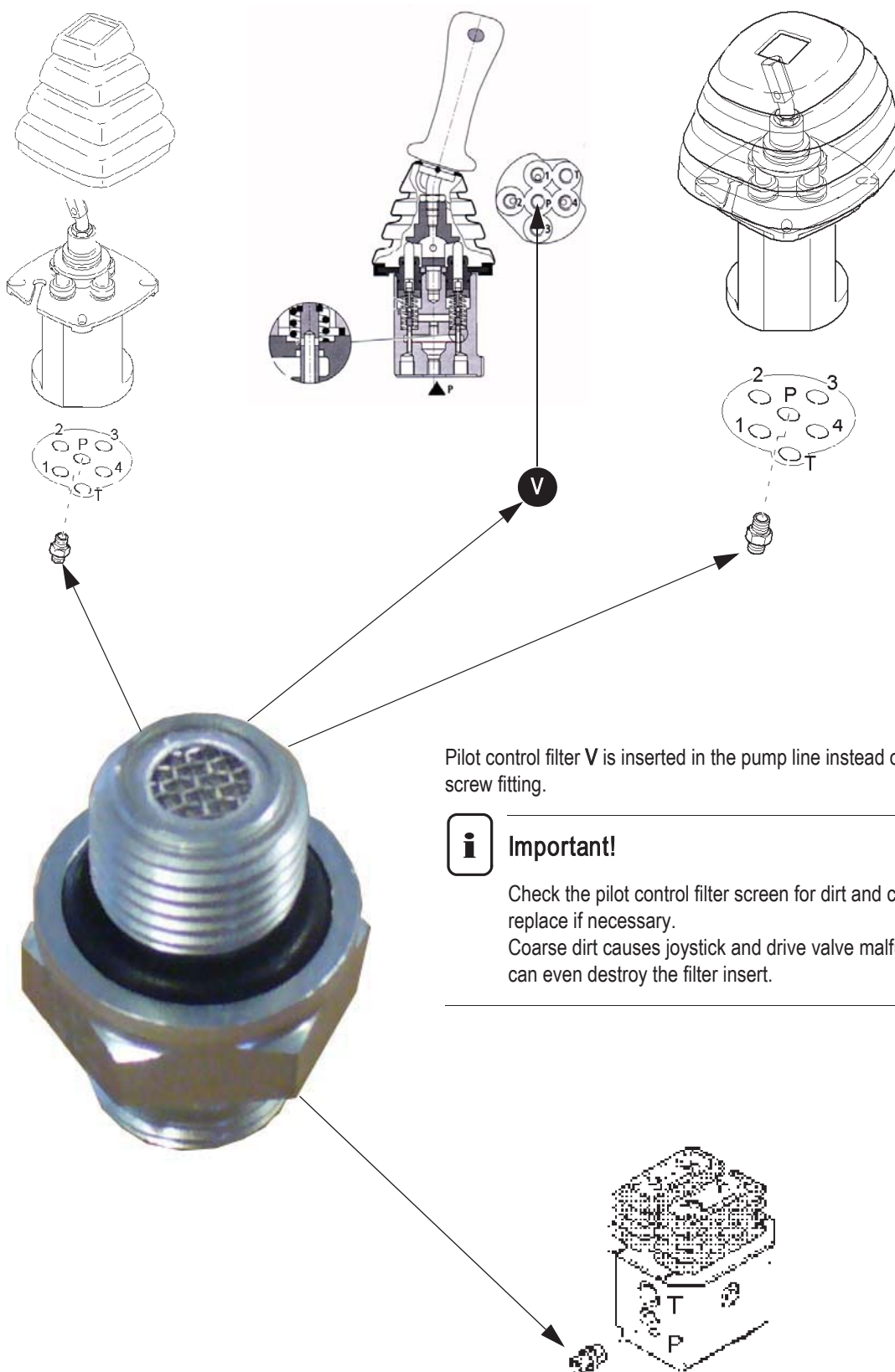
Pressure (bar)



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



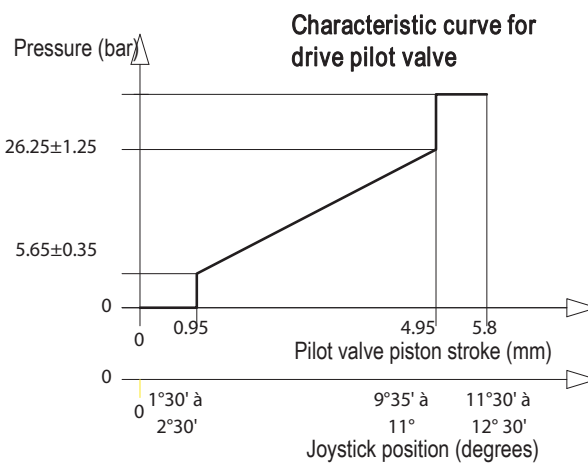
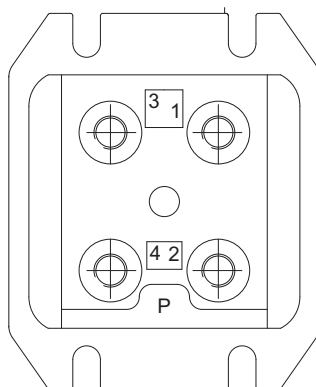
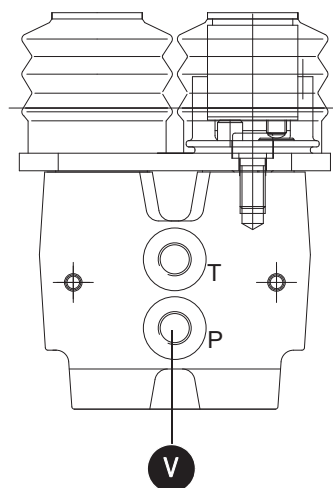
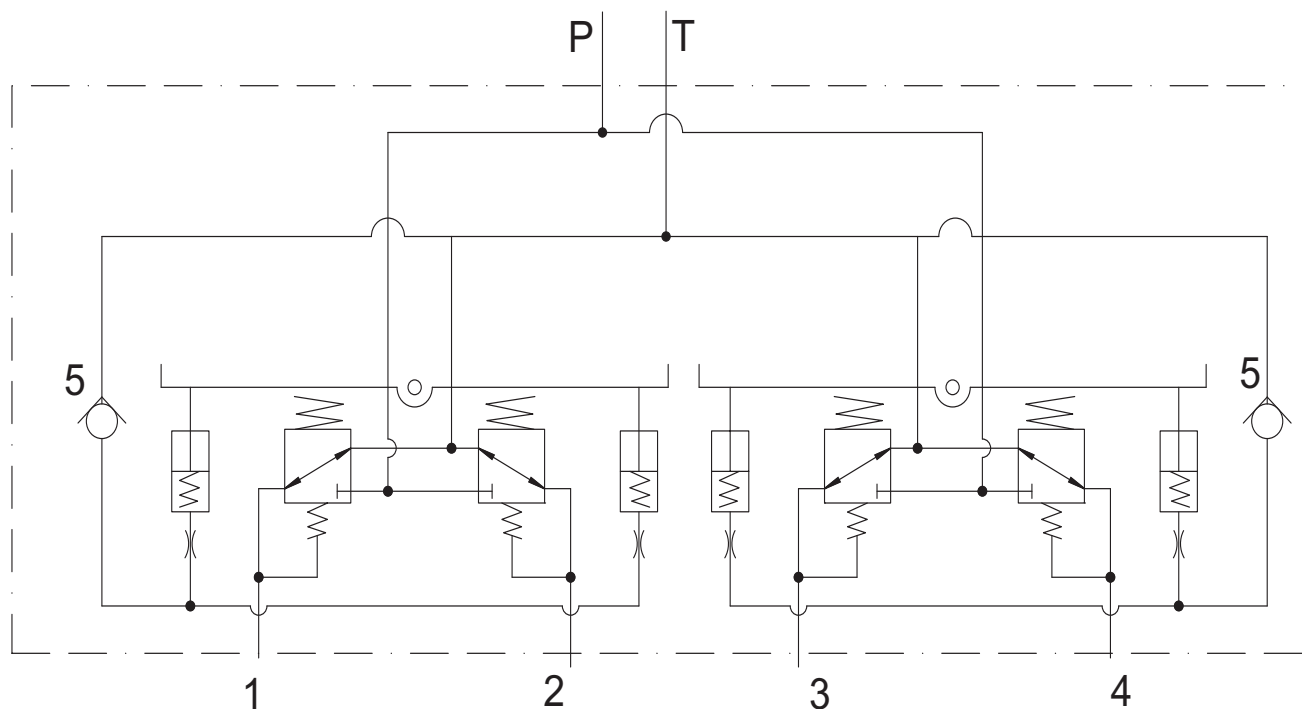
Important!

Check the pilot control filter screen for dirt and clean or replace if necessary.

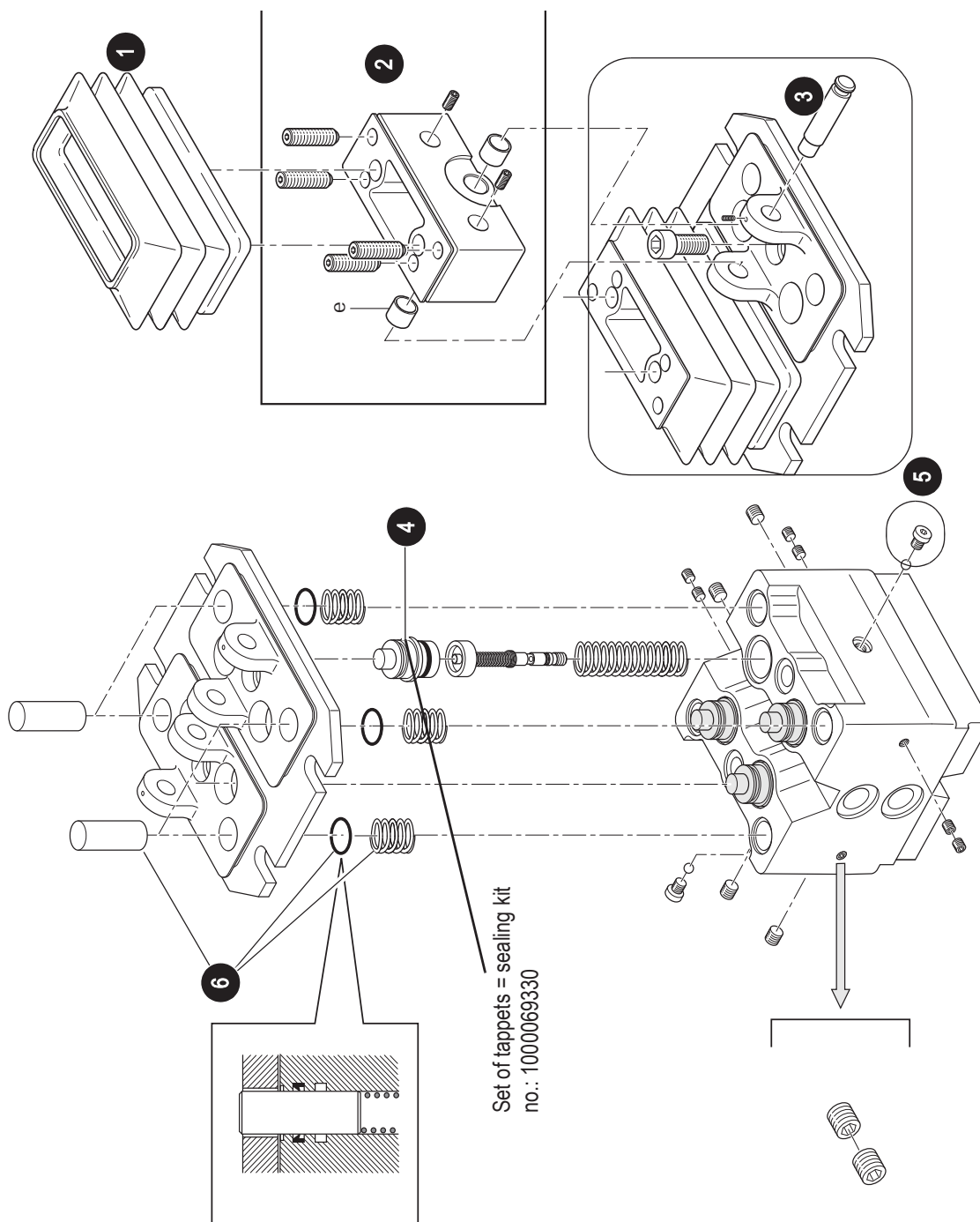
Coarse dirt causes joystick and drive valve malfunctions and can even destroy the filter insert.

Pilot valve (driving)

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



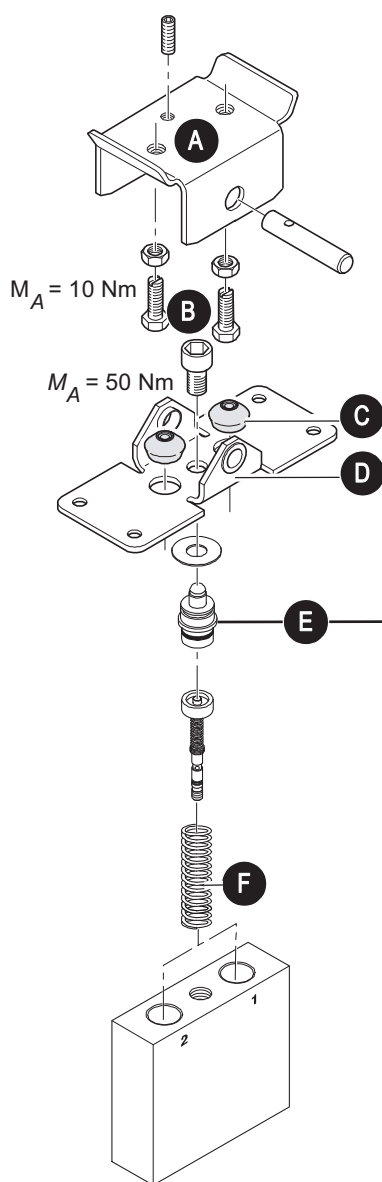
Pos.	Description
1	Left-hand side drive segment control
2	Left-hand side drive segment control
3	Right-hand side drive segment control
4	Right-hand side drive segment control
5	Non-return valve
P	Pilot control pressure
T	Tank line
V	Pilot control filter



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

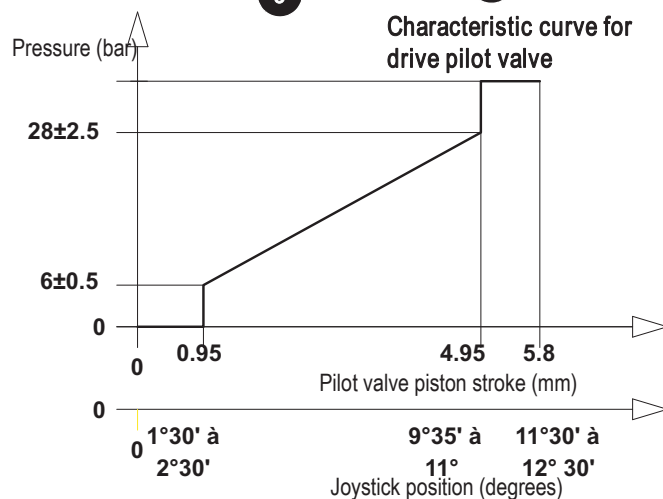
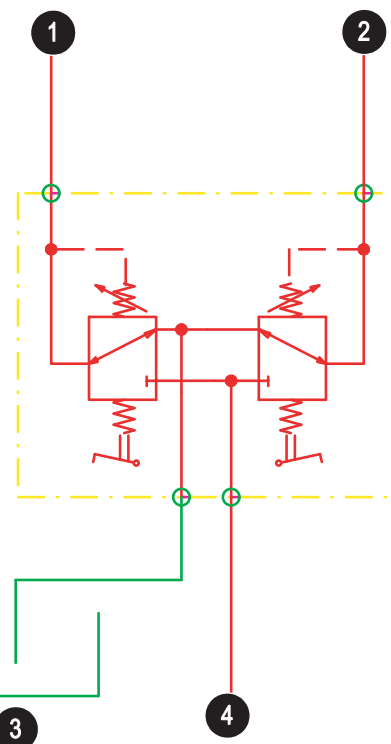
Pilot valve for auxiliary hydraulics

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



Set of tappets = sealing kit

Article no.: 1000012382



Pos.	Description
A	Pedal
B	Pedal fixture
C	Protective caps
D	Mounting plate
E	Tappet
F	Spring

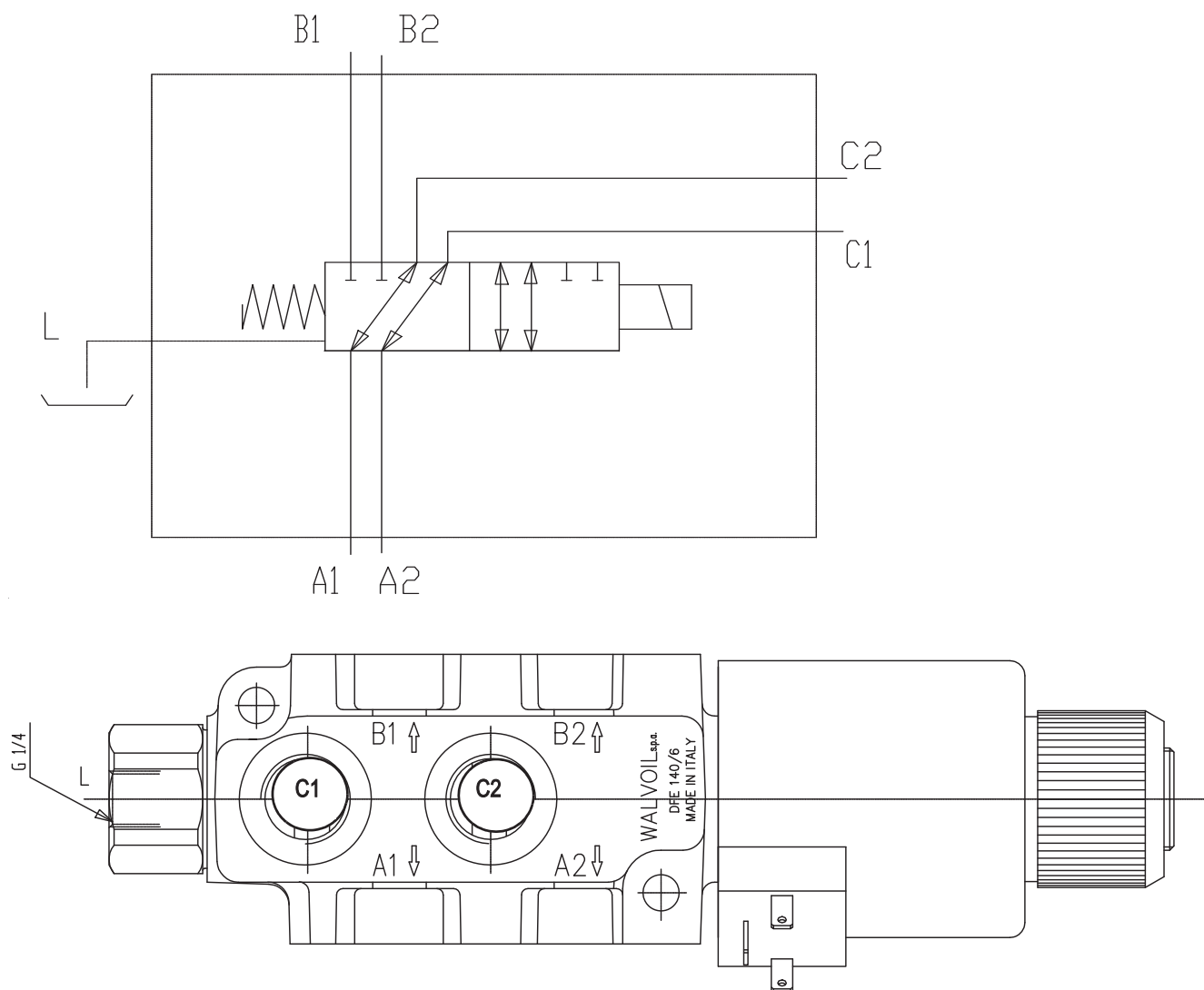
Pos.	Description
1	Auxiliary hydraulics control/offset ram extension control
2	Auxiliary hydraulics control/offset ram retraction control
3	Tank line
4	Supply from pilot oil supply unit

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.	Port
A1	Main valve block
A2	Main valve block
B1	Boom swivel
B2	Boom swivel
C1	Auxiliary hydraulics
C2	Auxiliary hydraulics
L	Leak oil

Changeover valve for SAE/ISO controls (option)

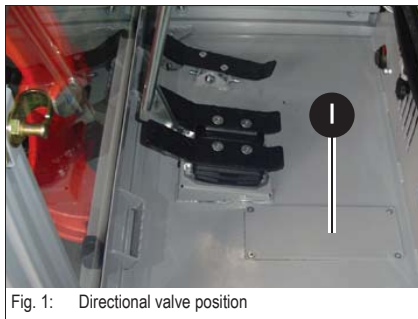


Fig. 1: Directional valve position

The directional valve is located under cover I in the floor panel of the cab.

- ☞ *Open the cover in the base plate (4 screws)*
- ☞ *You can now see the lever of the changeover valve*
- ☞ *Change over*
- ☞ *Screw the cover back on again*

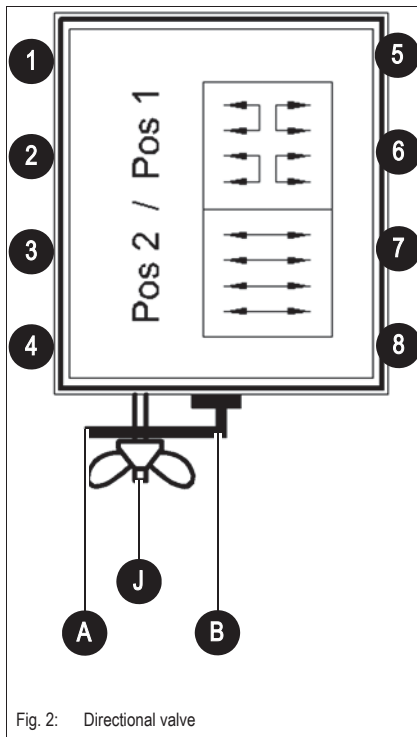


Fig. 2: Directional valve

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!

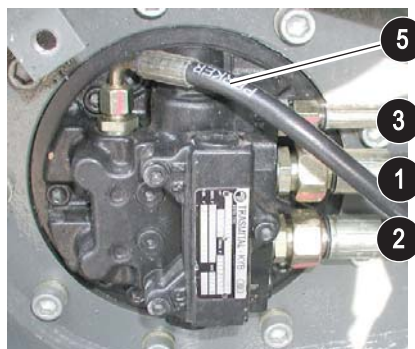
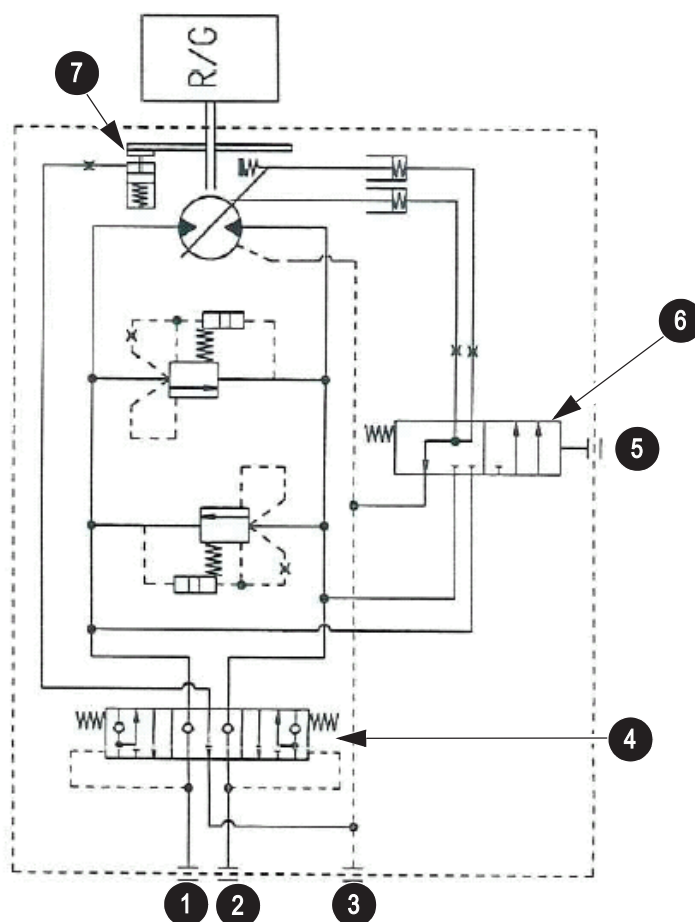
Changing the directional valve over modifies the controls (control levers) –

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	Offset ram retraction control
3	Joystick (right) port 3
4	Main valve block, offset 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 up to no. AE00854



Pos.	Description
1	Drive port (-> swivel joint 2/7)
2	Drive port (-> swivel joint 6/5)
3	Leak oil port (-> swivel joint 1)
4	Forwards/reverse directional valve
5	2nd speed range port (-> swivel joint 8)
6	2nd speed range directional valve
7	Brake piston

Function

Driving:

If high pressure is applied to one of the drives, the brake release piston is actuated first and passes high pressure on to the brake cylinder, which releases the brake. The throttle slowly actuates the brake piston at the same time. Brake piston control causes high pressure to be applied to the motor, which starts turning.

Stopping:

The oil flows from both ports to the tank upon releasing the joystick. The brake piston slowly returns to home position by means of the throttle orifices. The slow drop of the brake piston prevents the hydraulic motor from coming to an abrupt standstill. With the brake piston in neutral position, the ports are no longer connected to the motor, which can no longer turn. The brake release pressure is reduced via both throttles shortly afterwards.

2 speed range functions

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.

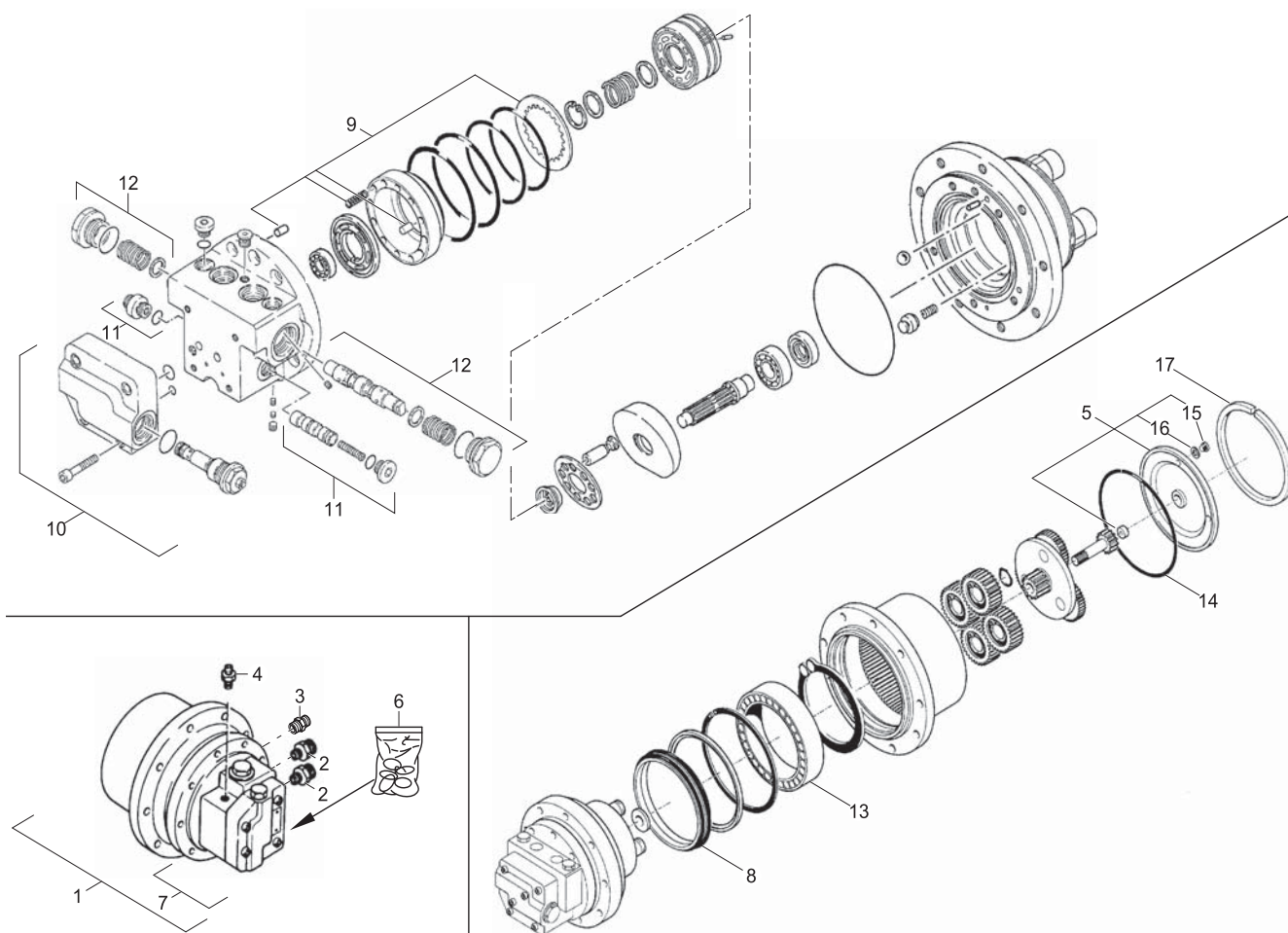
Speed range 2

- 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.

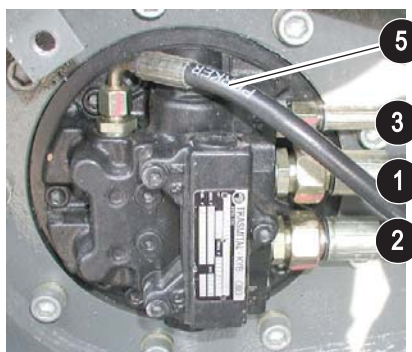
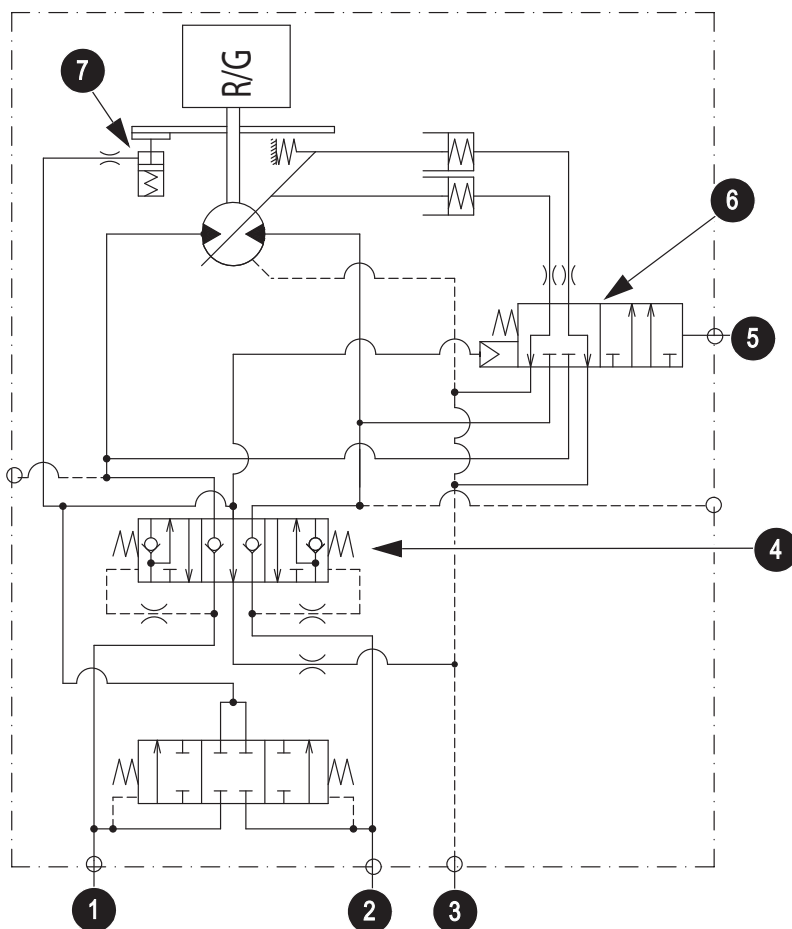
Pos.	Description
1	Travelling drive
2	Screw connection
3	Screw connection
4	Screw connection
5	Cover
6	Hydraulic motor sealing kit
7	Hydraulic motor
8	Lifetime seal
9	Travelling drive brake
10	Valve set
11	Piston valve for speed range
12	Brake valve
13	Bearing
14	O-ring
15	Screw connection
16	Washer
17	Snap ring



5.10 Travelling drive starting no. AE00855

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 2/7)
2	Drive port (-> swivel joint 6/5)
3	Leak oil port (-> swivel joint 1)
4	Forwards/reverse directional valve
5	2nd speed range port (-> swivel joint 8)
6	2nd speed range directional valve
7	Brake piston

Function

Driving:

If high pressure is applied to one of the drives, 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.

2 speed range functions

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 the hydraulic motor's swash plate returns to maximum capacity.

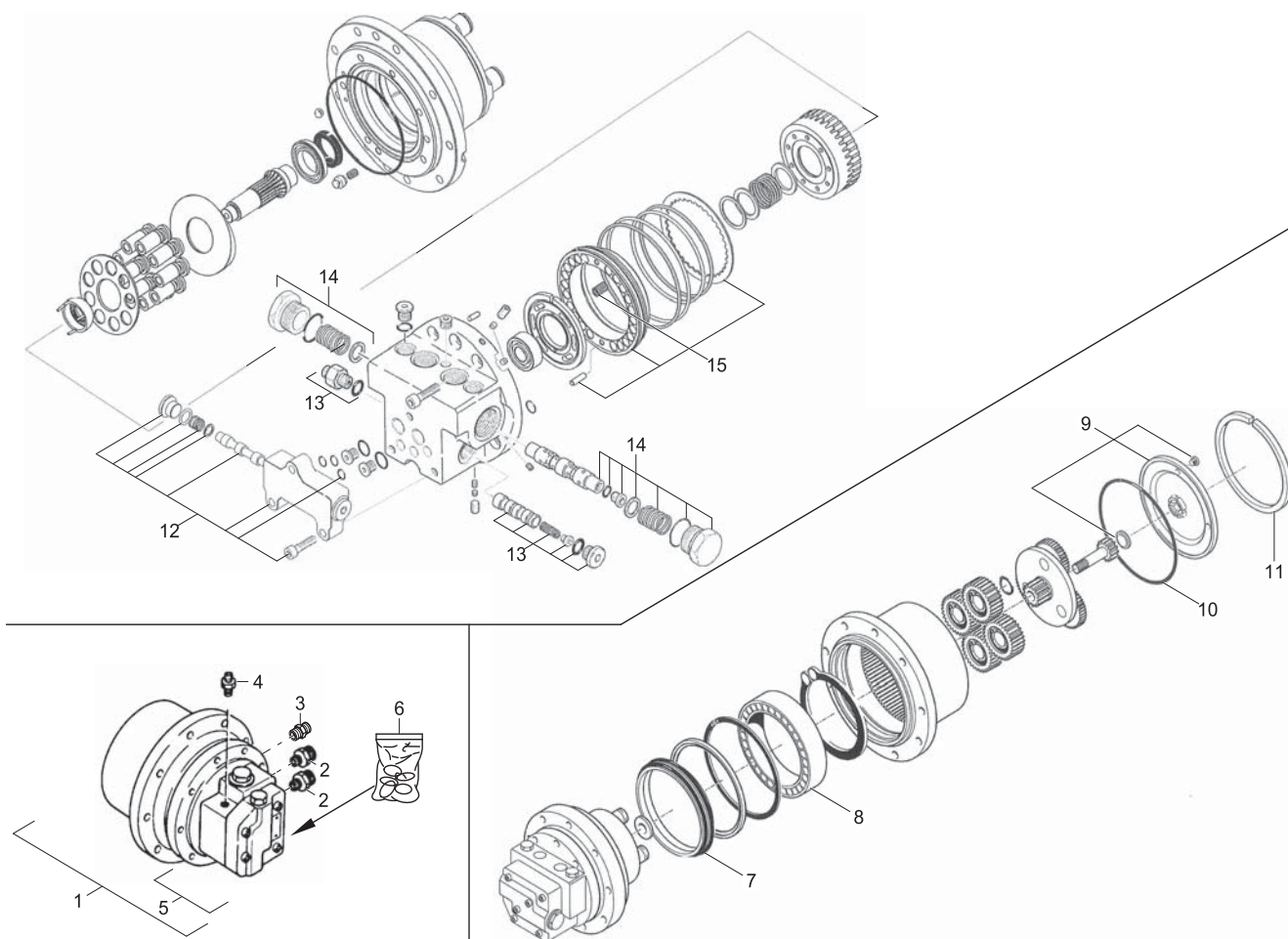
➡ The motor now runs at low speed.

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.

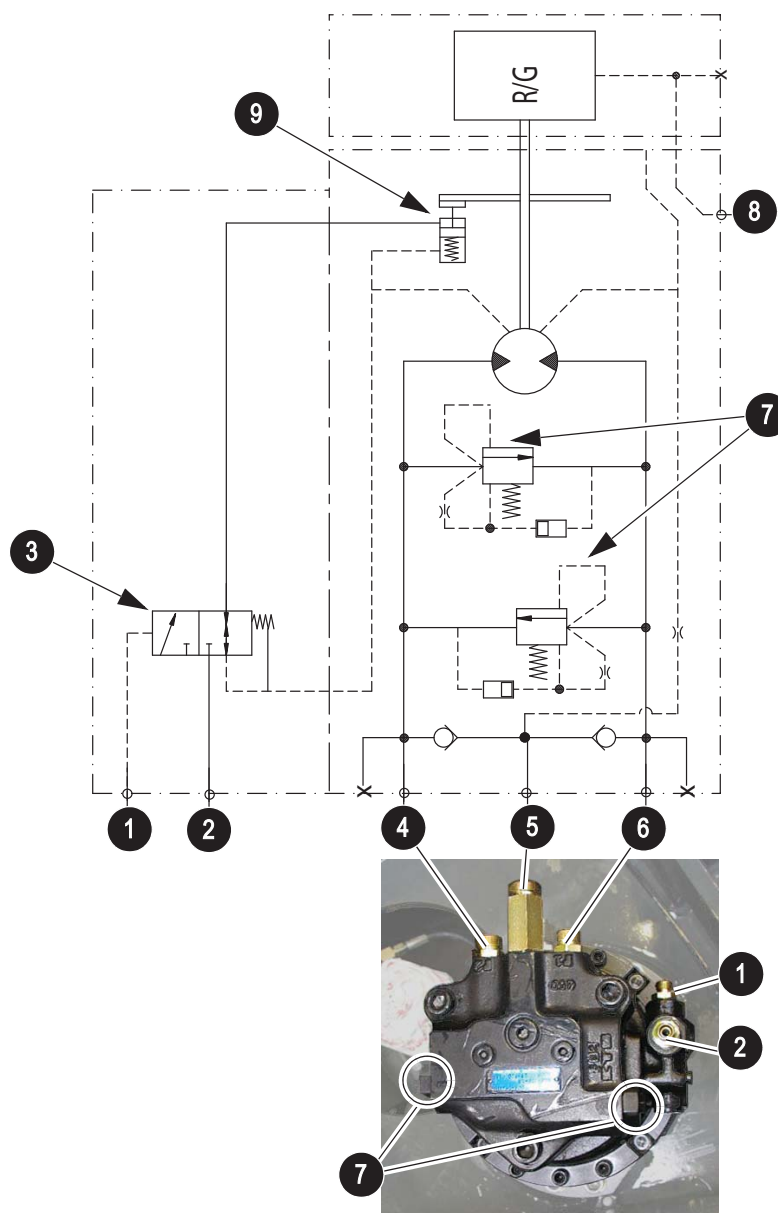
Switch operating point of valve pos. 6: 180 bar (2611 psi)

Pos.	Description
1	Travelling drive
2	Screw connection
3	Screw connection
4	Screw connection
5	Hydraulic motor
6	Hydraulic motor sealing kit
7	Lifetime seal
8	Bearing
9	Cover
10	O-ring
11	Snap ring
12	Anticavitation valve
13	Piston valve for speed range
14	Brake valve
15	Travelling drive brake



5.11 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)
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



Fig. 3: Shuttle valve

Opening the brake

The **shuttle valve** (Fig. 3) 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.

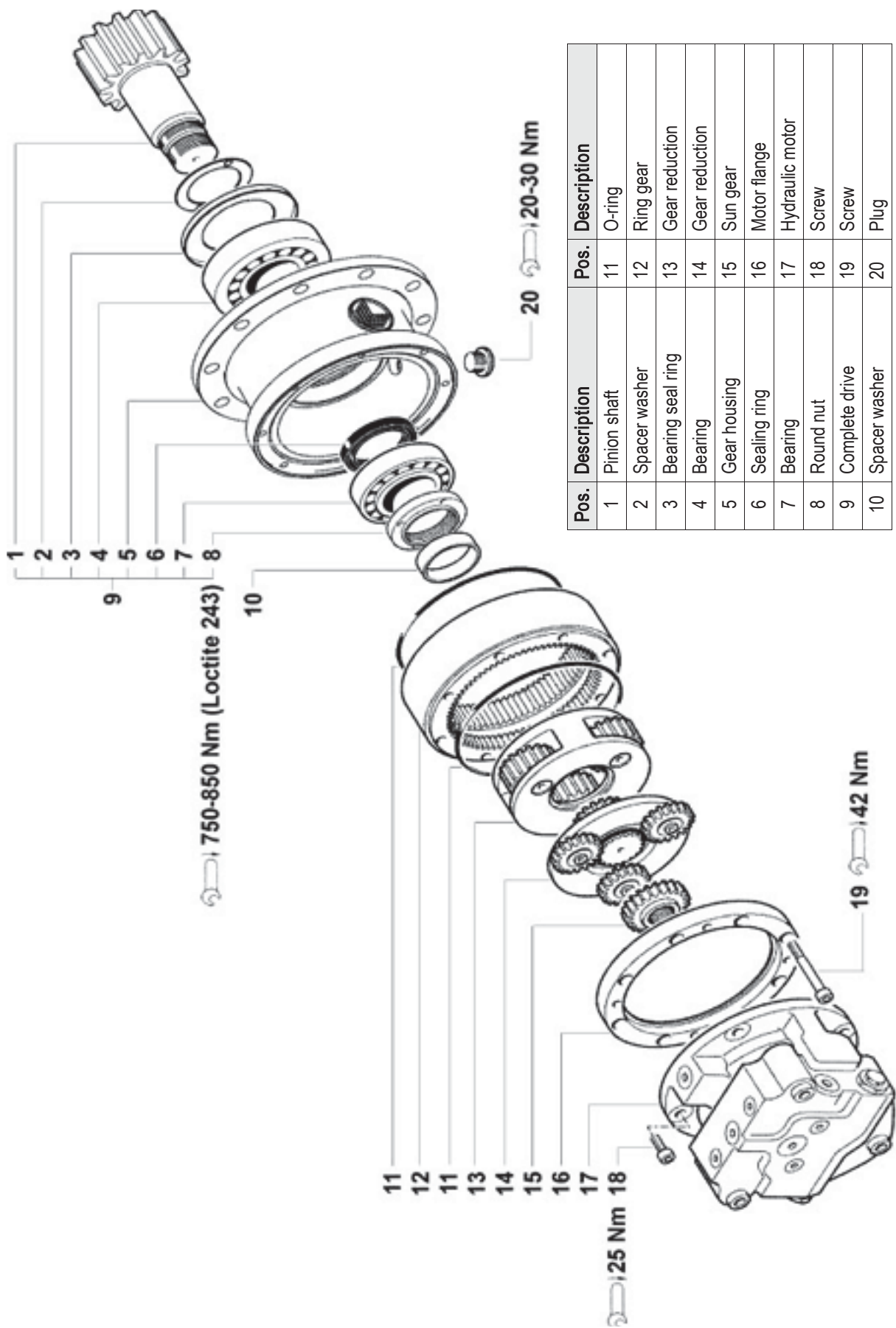
- Movement: upper carriage rotation, boom swivel or stick retraction
- Pilot control pressure is present at the SH input
- The piston of the brake release valve moves to work position
- Pilot control pressure is directed to the brake piston
- Brake is released

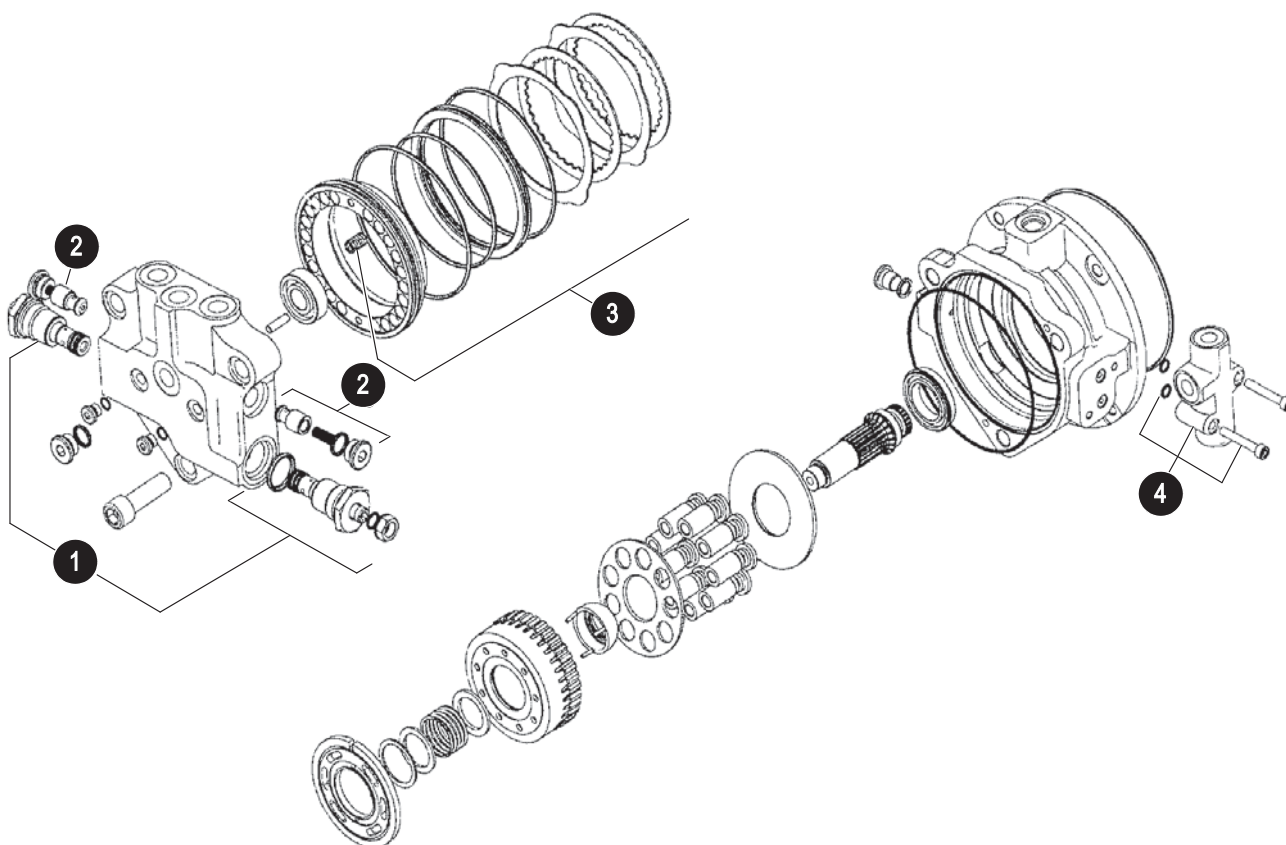
Closing the brake

The shuttle valve causes the pilot control pressure to drop and the SH input is unpressurised upon termination of upper carriage rotation, boom swivel or stick retraction. The piston in the brake release valve switches to home position (brake) if there is no pressure at the SH input. The pressure in the brake cylinder escapes via the brake release valve to the leak oil system. This enables the brake with some delay (depending on oil viscosity and brake valve leakage).

- End of movement: upper carriage rotation, boom swivel or stick retraction
- The pilot control pressure at the SH input drops
- The piston of the brake release valve moves to home position
- No more pilot control pressure on the brake piston
- The oil in the brake piston flows to the tank via a throttle orifice
- The brake is enabled

Time for releasing the brake: 3.7 sec ± 1.2 at 50 °C (122°F) oil temperature

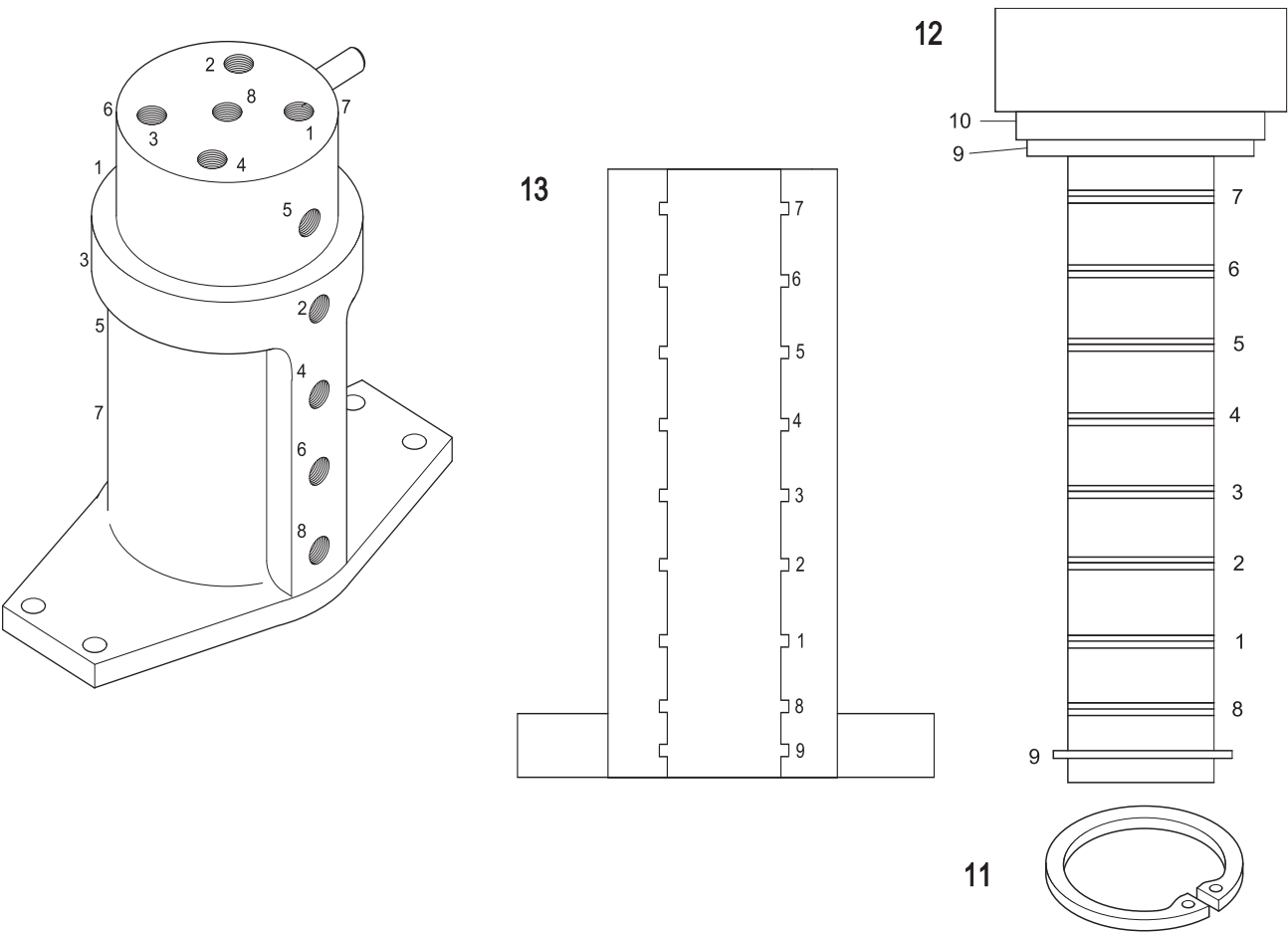




Pos.	Description
1	Shock anticavitation valves
2	Gear motor valve set
3	Timer valve
4	Engine brake set

5.12 Swivel joint

8-port swivel joint



Pos.	Port	Pos.	Description
1a	Pilot control pressure (PV) pilot oil supply unit	1-8	Sealing rings
2a	Stabiliser blade	9	PU prop ring
3a	Stabiliser blade	10	V sealing ring
4a and 6a	Left-hand side drive	11	Circlip
5a and 7a	Right-hand side drive	12	Inside part
8a	Travelling drive tank line	13	Outside part

Sealing

- ☞ *Slacken the circlip on the lower side*
- ☞ *Pull the swivel joint apart*
- ☞ *Replace the sealing rings*
- ☞ *Push together again*
- ☞ *Insert the circlip again*

5.13 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)



The breather filter is located at the rear of the machine next to the hydraulic oil 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!

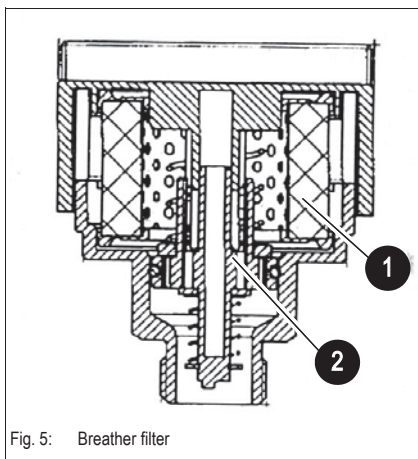
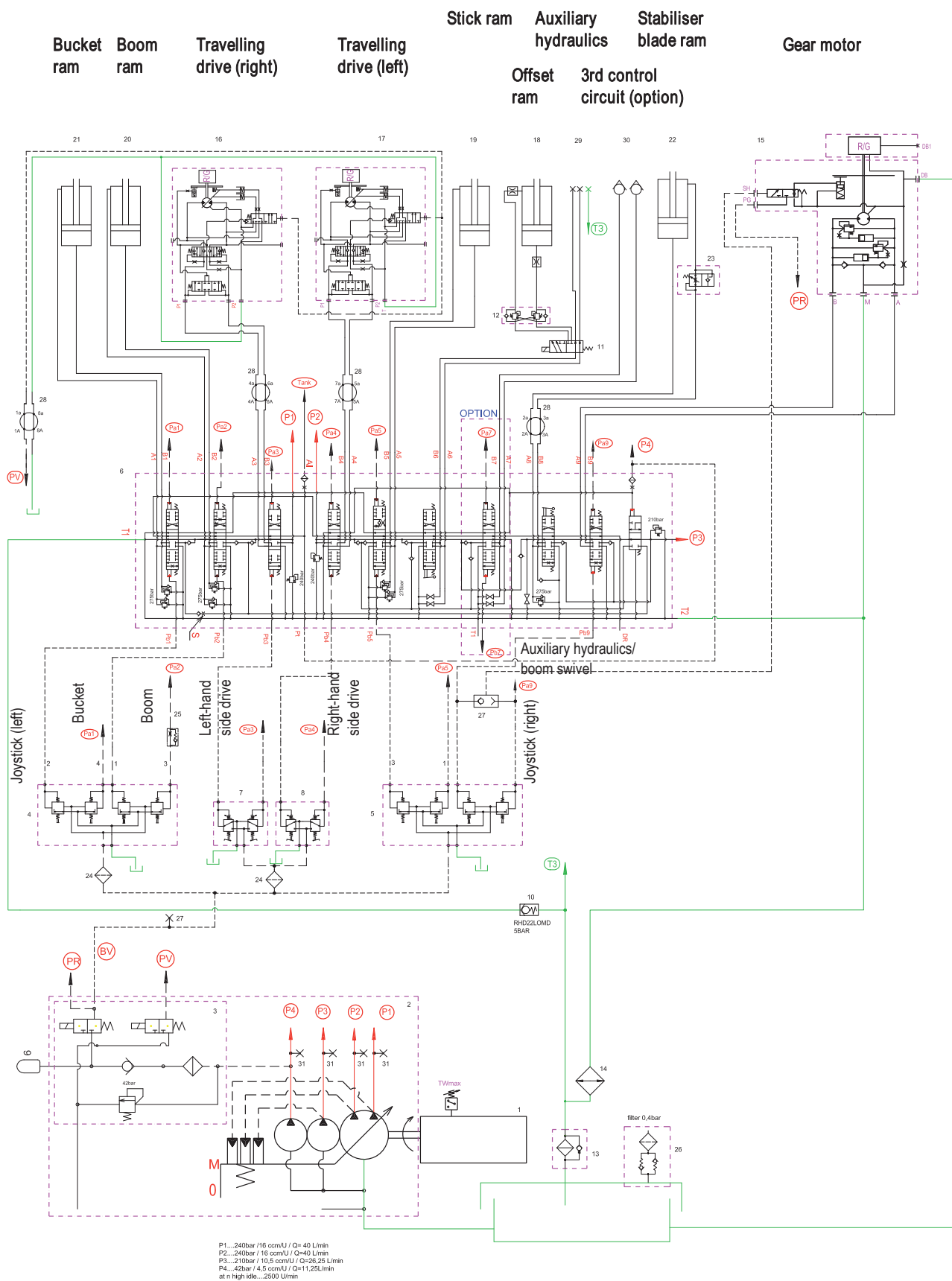


Fig. 5: Breather filter

Pos.	Description
1	Filter fabric
2	Bleeder valve

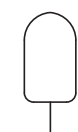
5.14 Troubleshooting in the hydraulic system

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

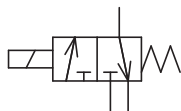


5.16 Hydraulics diagram (legend)

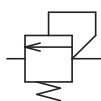
Pos.	Description
1	Diesel engine
2	Variable displacement pump + gear pump
3	Pilot oil supply unit
4	Left-hand side joystick pilot valve
5	Right-hand side joystick pilot valve
6	Main valve block
7	Left-hand side drive pilot valve
8	Right-hand side drive pilot valve
9	Pressure accumulator
10	Non-return valve
11	Changeover valve: boom swivel/auxiliary hydraulics
12	Overcentre valve
13	Oil filter
14	Oil cooler
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	Shuttle valve
28	Swivel joint
29	Auxiliary hydraulics
30	3rd control circuit (option)
31	Measuring ports



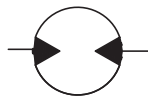
Pressure accumulator



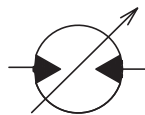
Spring-loaded solenoid valve



Pressure limiting valve



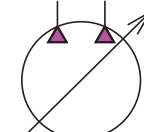
Fixed displacement motor



Variable displacement motor



Fixed displacement pump



Double variable displacement pump



Tank line



Measuring port



Stop cock



Non-return valve



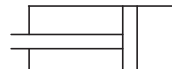
Throttle orifice



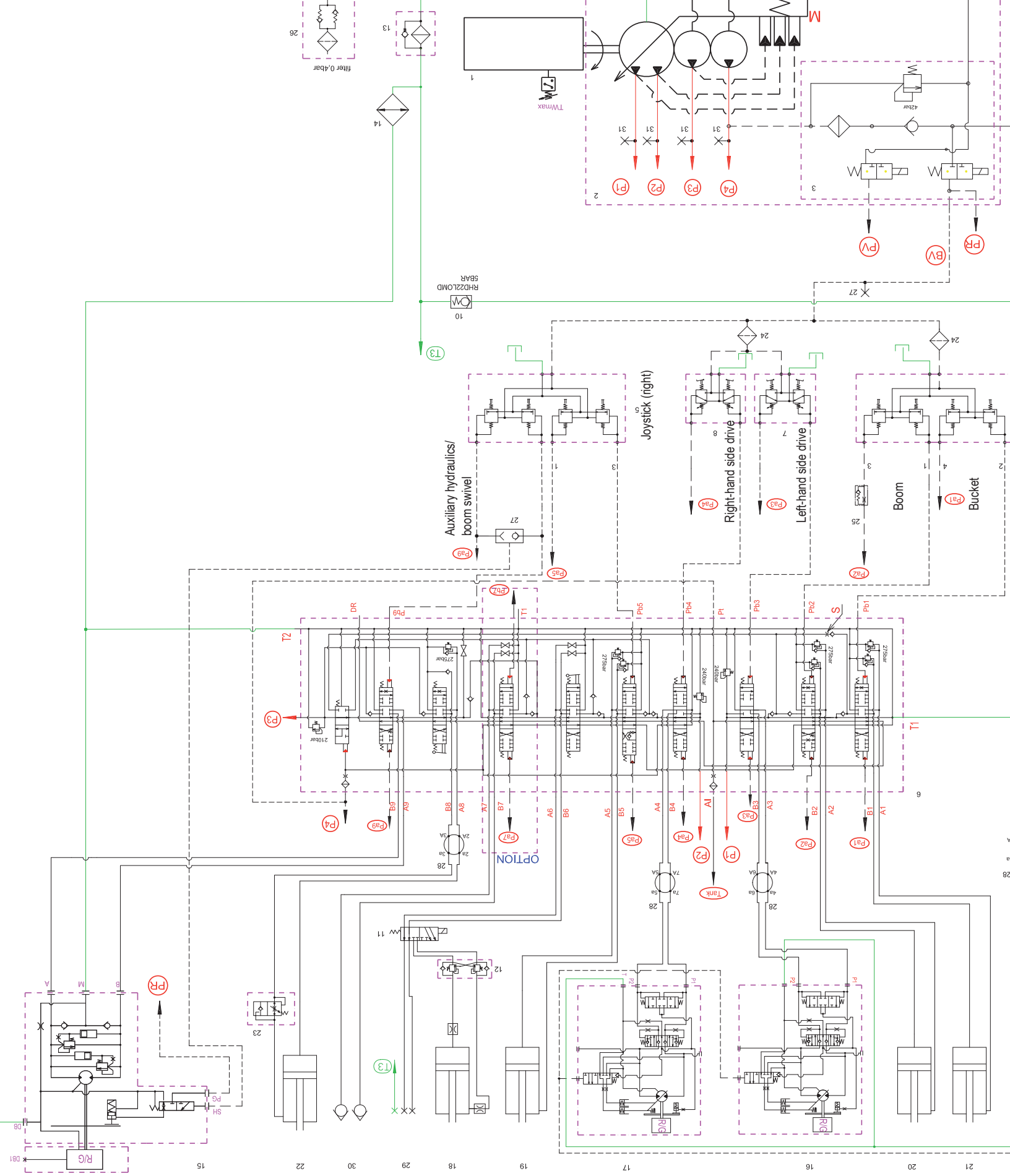
Oil cooler

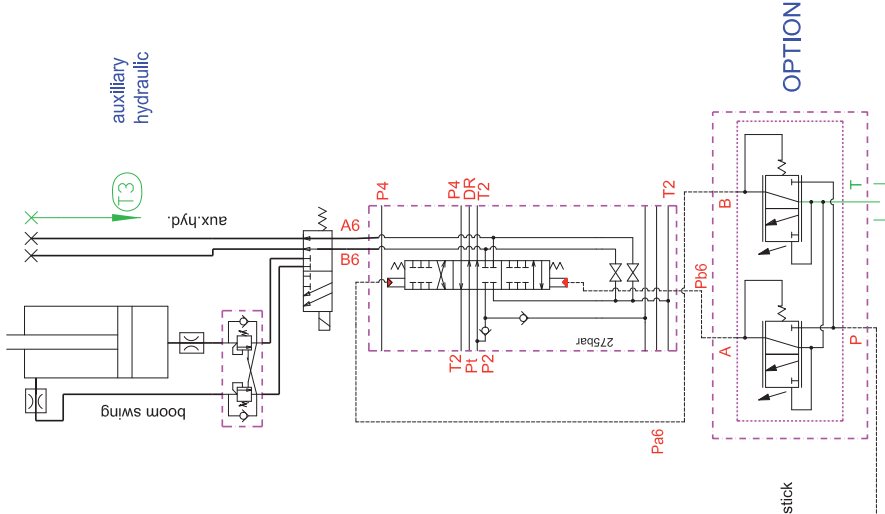


Filter



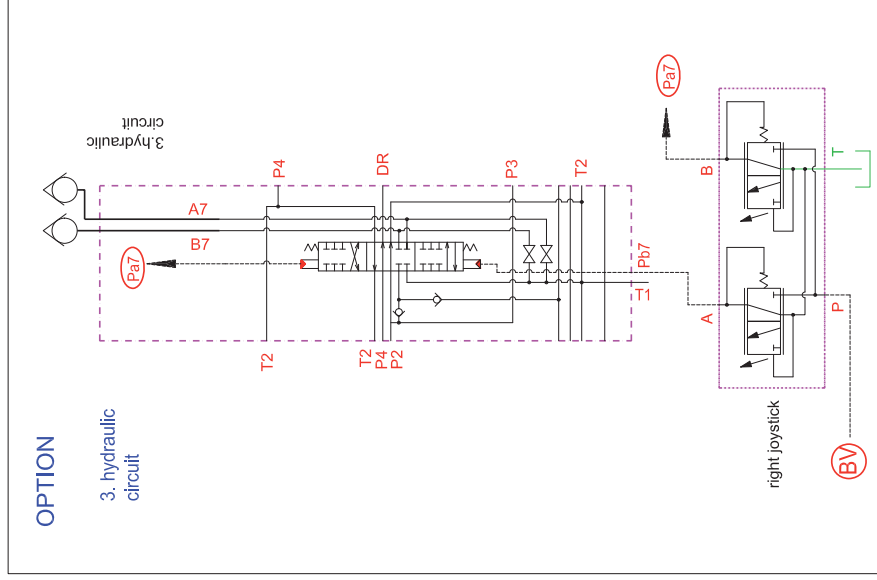
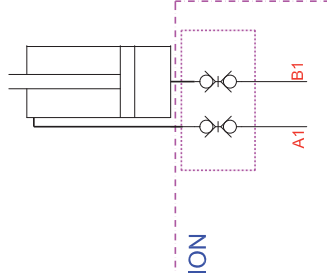
Double-acting ram





OPTION: grapple

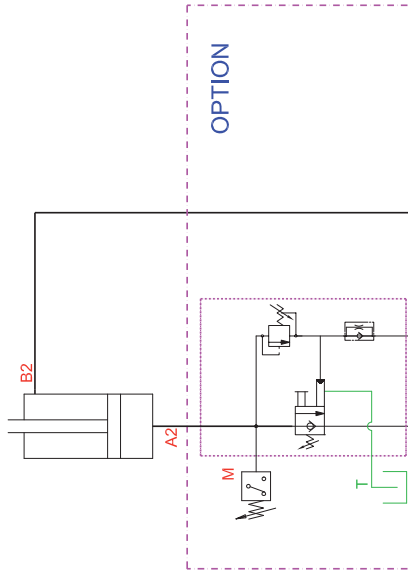
bucket
D70/40-490



If option 3. hydraulic circuit does not exist, section 7 drops out!!!

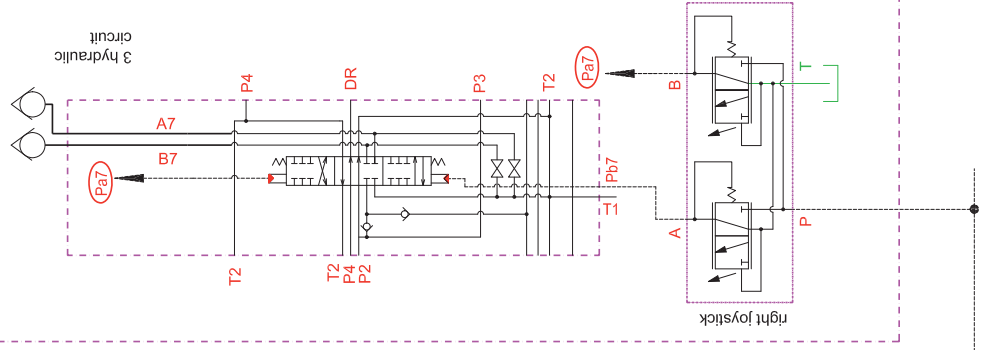
OPTION: overload system Germany

boom
D85/45-556



OPTION

3. hydraulic circuit

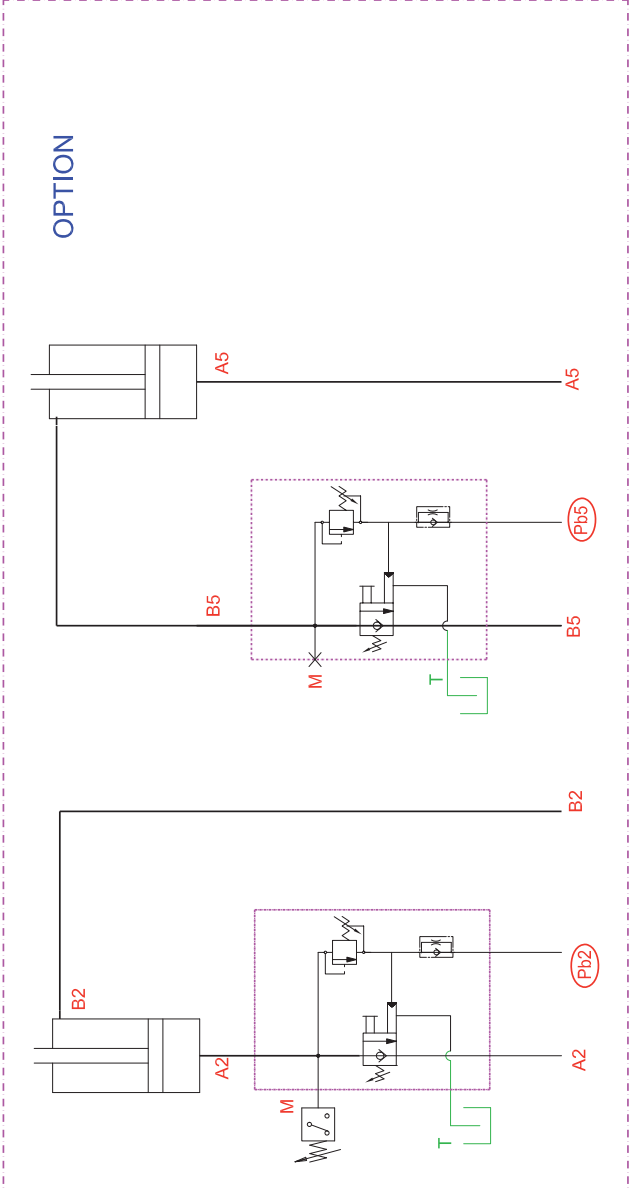


OPTION

OPTION

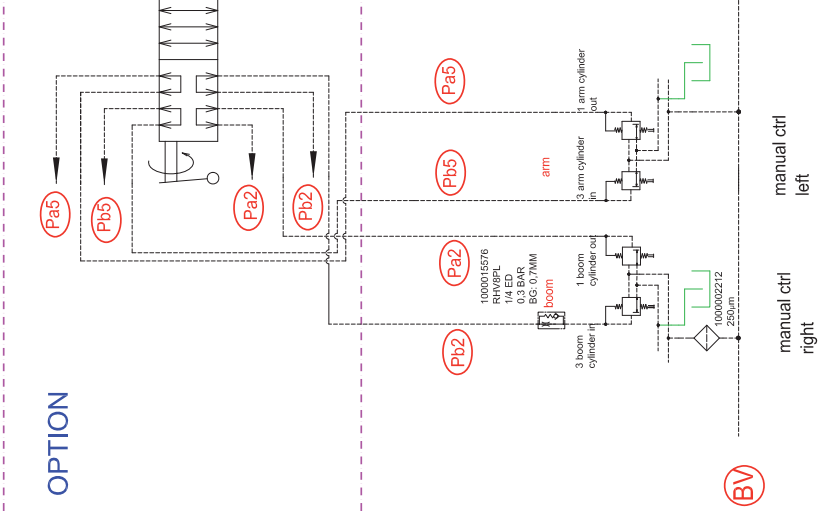
boom
D85/45-556

arm
D75/45-658



OPTION

OPTION: SAE-switch

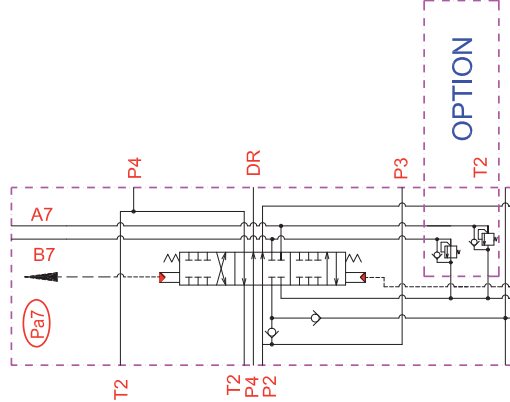


OPTION

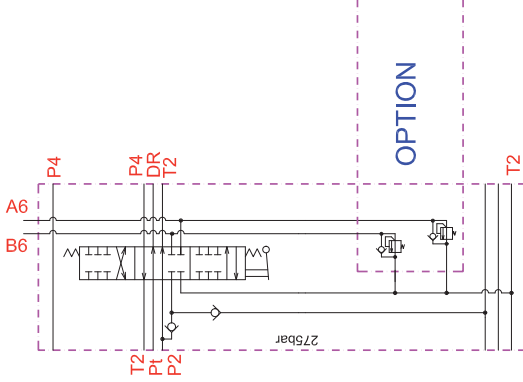
BV

OPTION: overload valve 3.hc

OPTION: overload valve aux.hyd.



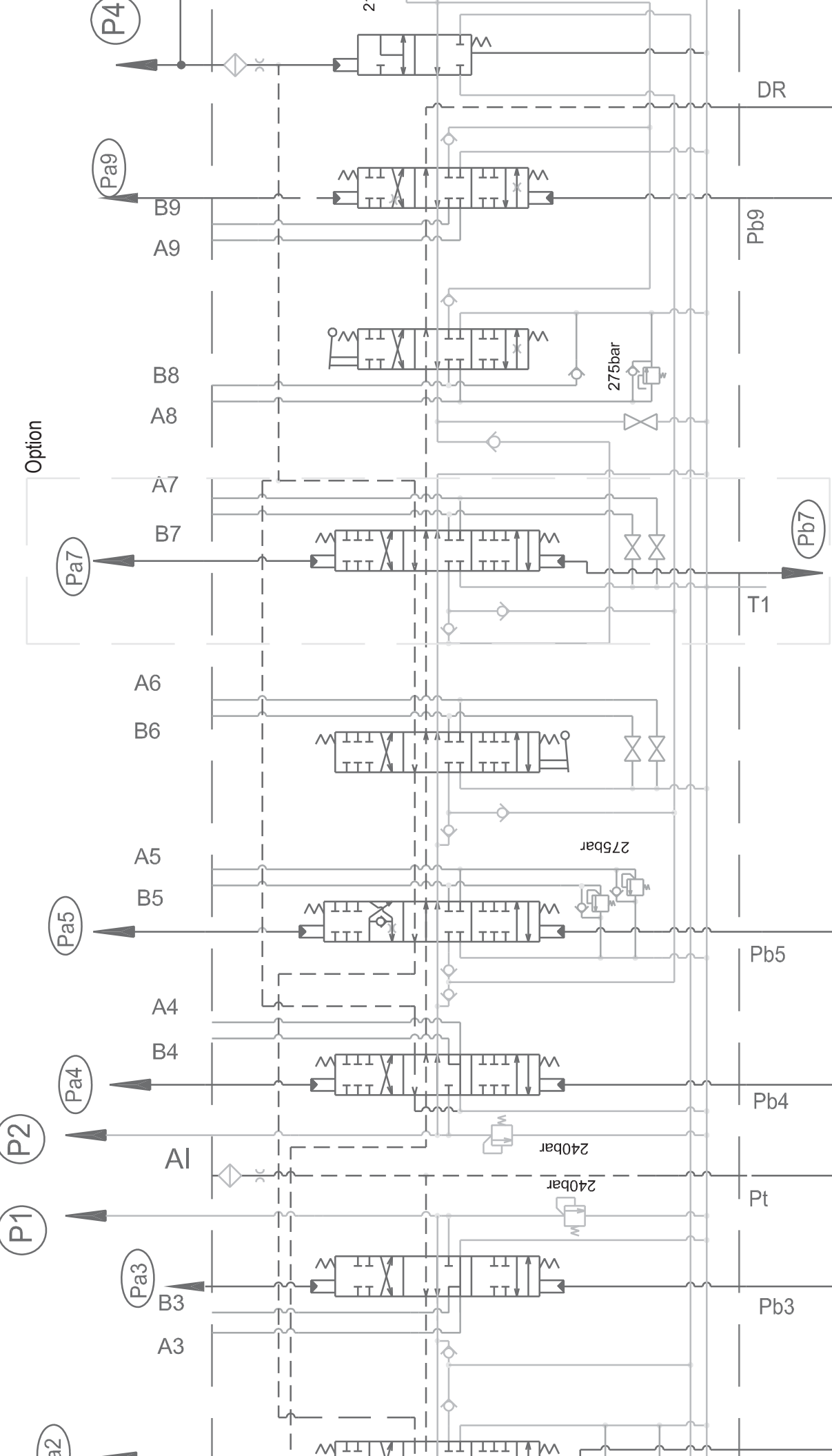
OPTION



OPTION

manual ctrl
right

manual ctrl
left



Pump/tank lines

Main control lines

Controlled via	
Joystick (right)	
Joystick (right)	
Drive pedal (left)	
Drive pedal (right)	
Joystick (left)	
Switch on joystick + pedal	
Switch on joystick	
Stabilizer blade lever	

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/offset ram
A7, B7	3rd control circuit
A8, B8	Stabilizer blade lever

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

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.

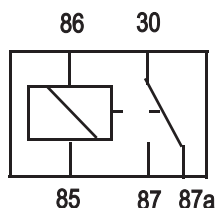


Fig. 1: Terminal description on relay

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 1.7 kW (2.3 hp)
Battery	12 V 71 Ah
Socket	E.g. for cigarette lighter; 15 A max.

6.6 Fuse box in instrument panel

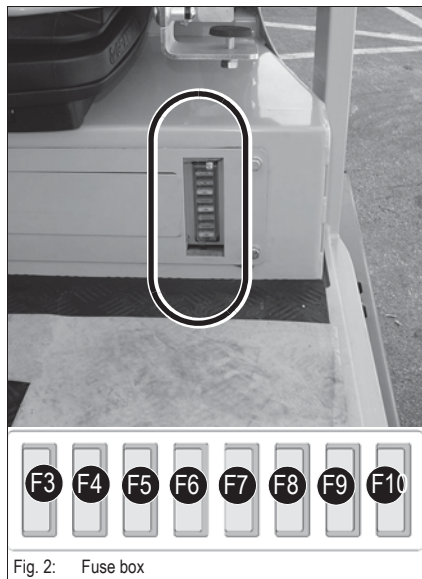


Fig. 2: Fuse box

Fuse no.	Rated current (A)	Protected circuit
F3	10 A	Indicators, cutoff solenoid, relays
F4	10 A	Boom working light
F5	15 A	Roof lights
F6	10 A	Valves, horn
F7	15 A	Heating, air conditioning
F8	10 A	Wipers, lights
F9	10 A	Rotating beacon, radio
F10	15 A	Socket, cigarette lighter

6.7 Main fuse box with relays

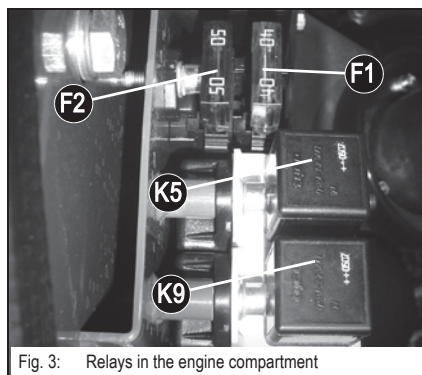


Fig. 3: Relays in the engine compartment

The main fuse box is located in the partition wall to the left of the engine.

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

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

6.8 Relays

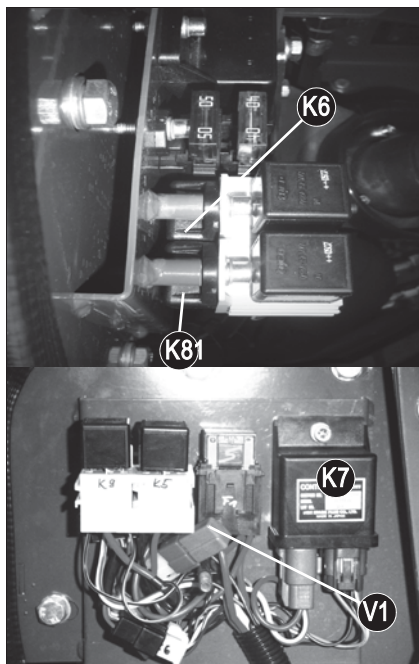


Fig. 4: Relays

The relays are located in the relay box on the partition wall to the left of the engine

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

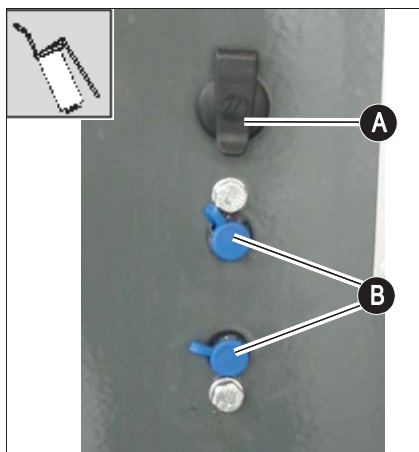


Fig. 5: Lubrication strip on the chassis

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

6.10 Joystick tip switches

Joystick (left)

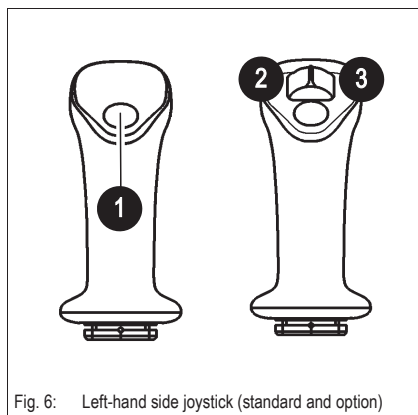


Fig. 6: Left-hand side joystick (standard and option)

Pos.	Description
1	Switch on auxiliary hydraulics/boom swivel
2	Slide to the left = low throughput (slow movement)
3	Slide to the right = high throughput (fast movement)

Two characteristic curves can be selected if the slide switch is moved to the left or right for 2 seconds as you switch on ignition.

If you want to change the characteristic curve again, switch off the ignition to repeat the procedure described above.

Joystick (right)

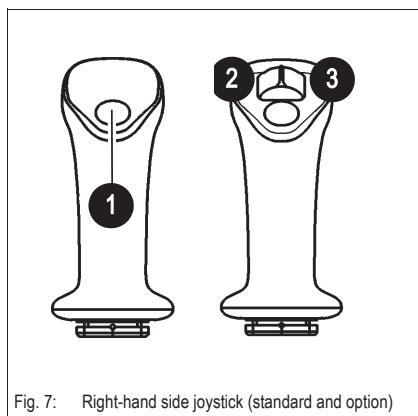
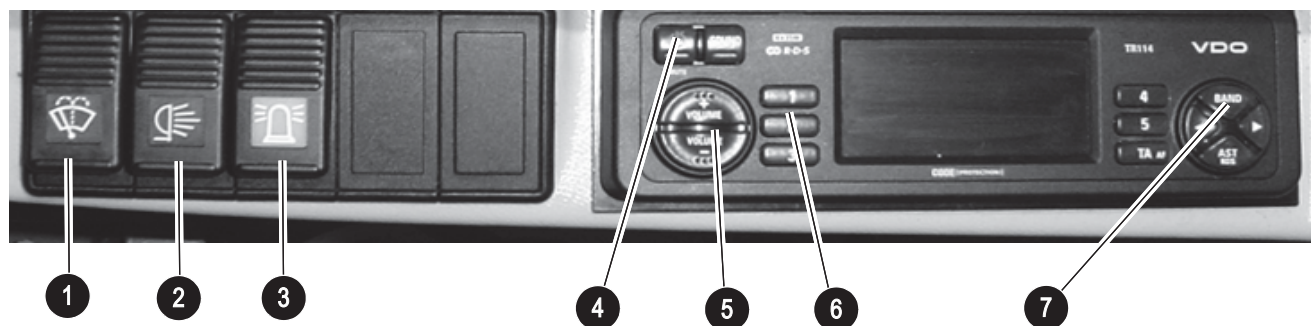


Fig. 7: Right-hand side joystick (standard and option)

Pos.	Description
1	Switch on auxiliary hydraulics/boom swivel
2	Slide to the left = low throughput (slow movement)
3	Slide to the right = high throughput (fast movement)

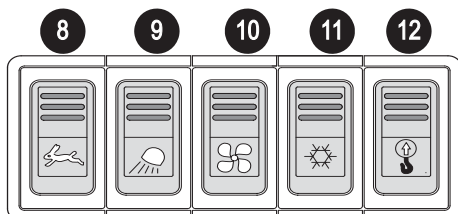
6.11 Instrument panel overview



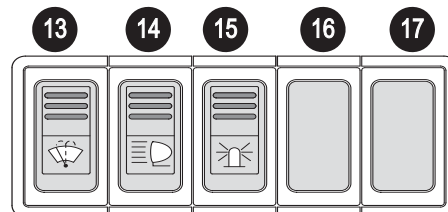
Pos.	Description
1	Wipers
2	Roof lights
3	Rotating beacon
4	Radio ON button (option)
5	Volume
6	Radio station memory
7	Frequency selection

6.12 Switch overview (up to serial no. AE02803)

Control elements on control console

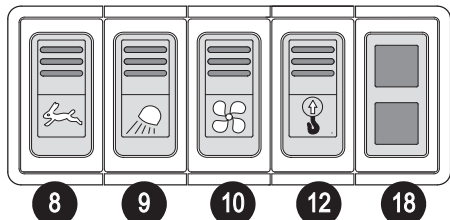


Control elements on cab wall

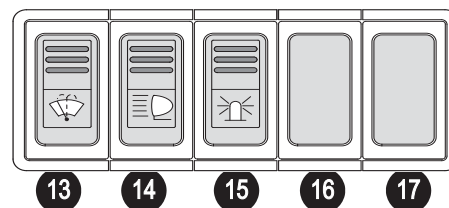


Control elements for proportional controls version (option)

Control elements on control console



Control elements on cab wall

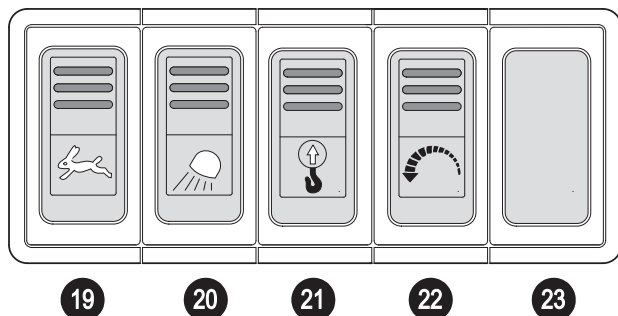


Pos.	Description	For more information see page
8	High speed	
9	Working light	
10	Ventilation	
11	Air conditioning (option ¹)	7-3
12	Safe load indicator (option)	7-13, 7-15
13	Washer system	
14	Roof lights	
15	Rotating beacon	
16	Not assigned	
17	Not assigned	
18	Proportional control status indicator (option)	7-21

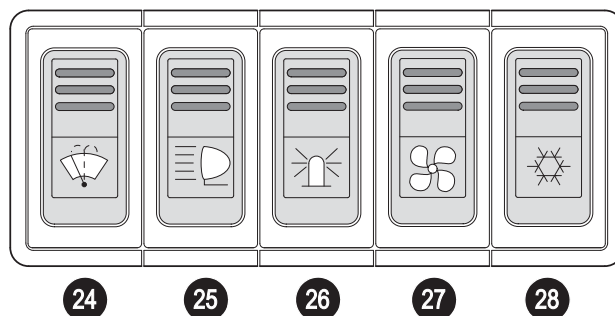
1. If equipped with air conditioning and proportional controls, switch assignment is the same as without proportional controls. The status telltale is then installed in the control console on the right.

6.13 Switch overview (from serial no. AG00573)

Control element on control console

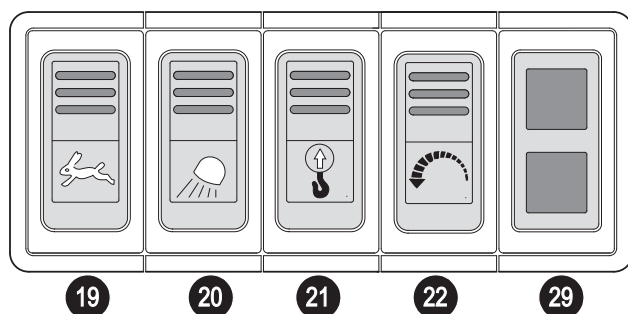


Control element on cab wall

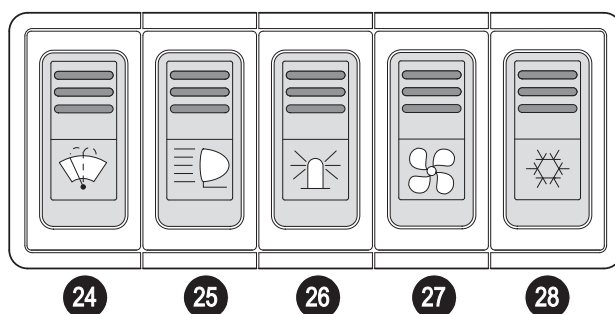


Control elements for proportional controls version (option):

Control element on control console



Control element on cab wall



Pos.	Description	For more information see page
19	High speed	
20	Working light	
21	Safe load indicator (option)	7-13
22	Automatic revs setting (option)	7-30
23	Not assigned	
24	Washer system	
25	Roof lights	
26	Rotating beacon	
27	Ventilation	
28	Air conditioning (option ¹)	7-3
29	Proportional control status indicator (option)	7-21

¹. If equipped with air conditioning and proportional controls, switch assignment is the same as without proportional controls. The status telltale is then installed in the control console on the right.

6.14 Alternator

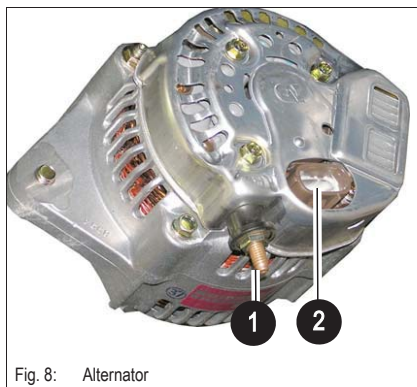


Fig. 8: Alternator

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)
	Port L telltale (during service 12V, otherwise earth)

6.15 Starter

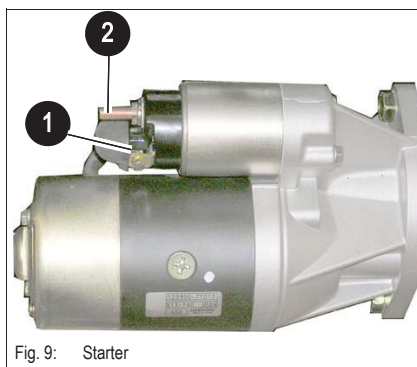


Fig. 9: Starter

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



Wiring diagrams and wiring harnesses include all options.

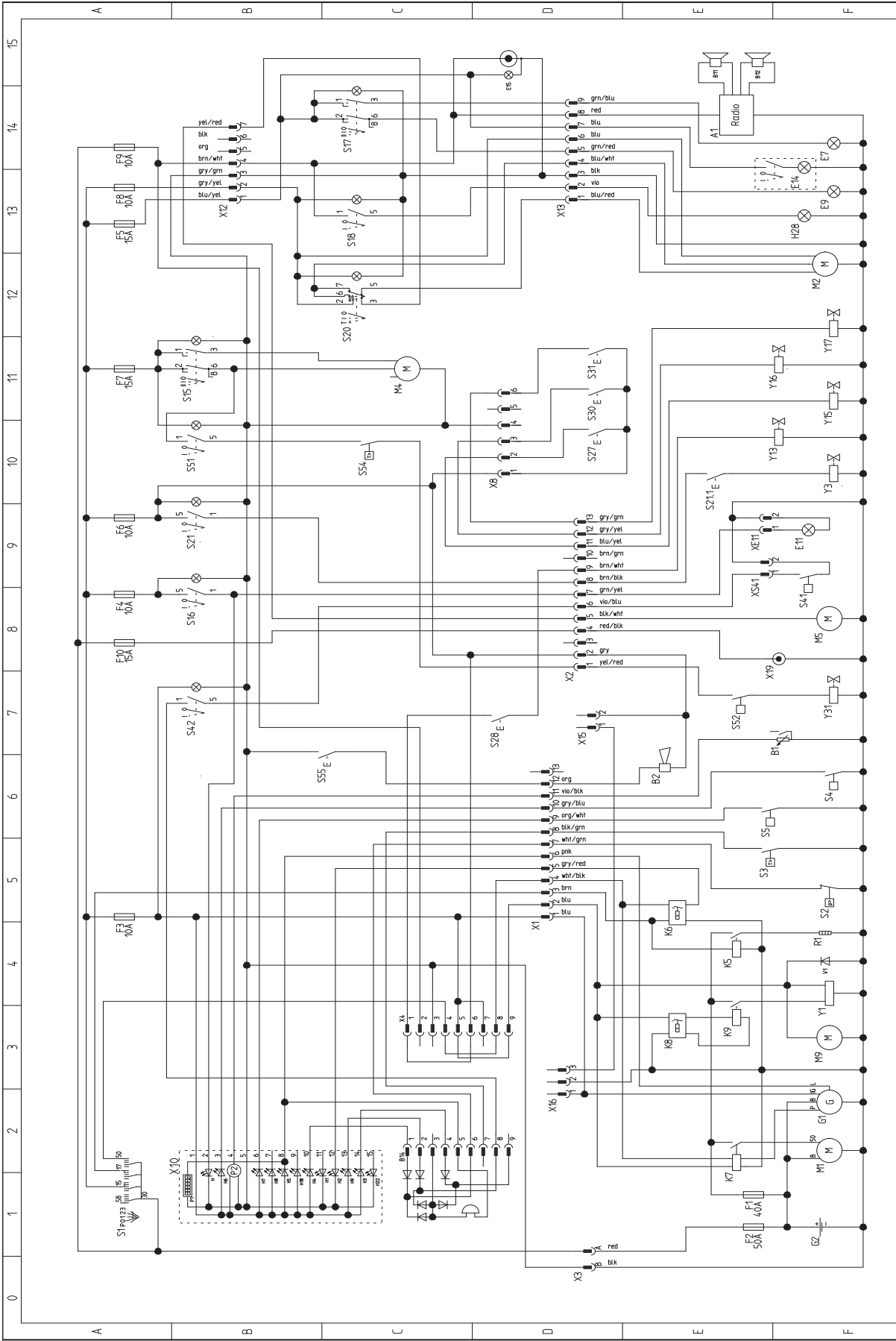
6.16 Wiring diagram A4 38Z3 (legend)

No.	Description	Section	Loc.
A1	Radio	E14	Opt
B1	Fuel indicator	F7	
B2	Horn	E7	
B11	Loudspeaker	E15	Opt
B12	Loudspeaker	E15	Opt
B14	Warning buzzer	C2	
E7	Rear roof light	F14	Opt
E9	Front roof light	F13	Opt
E11	Boom light	F8/9	
E14	Interior light	F13	
E15	Cigarette lighter	D15	
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	A13	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A11	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio, drive interlock	A14	
F10	Socket, cigarette lighter	A8	
G1	Alternator	F2	
G2	Battery	F1	
H2	Preheating telltale	B/C1	
H3	Engine temperature telltale	B/C1	
H4	Engine oil pressure telltale	B/C1	
H5	Alternator charge function telltale	B/C1	
H6	Air filter telltale	B/C1	
H7	Hydraulic oil filter telltale	B/C1	
H9	Safe load indicator telltale	B/C1	Opt
H28	Rotating beacon	F13	Opt
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	E5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	E3	
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F12	Opt

No.	Description	Section	Loc.
M4	Fan	C12	Opt
M5	Washer pump	F8	Opt
M9	Fuel pump	F3	
P1	Hour meter	B1	
P2	Fuel level indication	B1	
R1	Glow plug	F4	
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	F5	
S16	Boom working light switch	B8	
S17	Cab working light switch	C14	Opt
S18	Rotating beacon switch	C13	Opt
S15	Heating switch	B11	
S20	Wiper/washer switch	C12	Opt
S21	High speed switch	B9	
S21.1	High-speed tip switch (prepared)	E9	Opt
S27	Additional hydraulics/boom swivel tip switch	D10	
S28	Safety switch	D7	
S30	Additional control circuit tip switch	E10	Opt
S31	Additional control circuit tip switch	E11	Opt
S41	Safe load indicator pressure switch	E8	Opt
S42	Safe load indicator switch	B7	Opt
S48	Automatic idling speed tip switch	C9	Opt
S51	Air conditioning switch	B10	Opt
S52	Air conditioning pressure switch	E7	Opt
S54	Air conditioning thermostat	C10	Opt
S55	Horn tip switch	C6	
V1	Recovery diode	F4	
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	
X8	6 pole connection – joystick (left)	D10	
X10	15 pole connection – instrument panel	B/C1	
X12	9 pole connection – cab	D13/14	
X13	5 pole connection – engine temperature	A3	

No.	Description	Section	Loc.
X15	1 pole connection – drive alarm	D7	
X16	3 pole connection – drive alarm	D2-3	
X19	1 pole connection – socket	F7	
XE11	2 pole connection – boom working light	F9	
XS41	2 pole connection – safe load indicator	F8	
Y1	Cutoff solenoid	F3	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F10	
Y15	Auxiliary hydraulics/boom swivel solenoid valve	F10	
Y16	Auxiliary hydraulics solenoid valve	F11	Opt
Y17	Auxiliary hydraulics solenoid valve	F11	Opt
Y31	Air conditioning clutch	F7	Opt

6.17 Wiring diagram A4

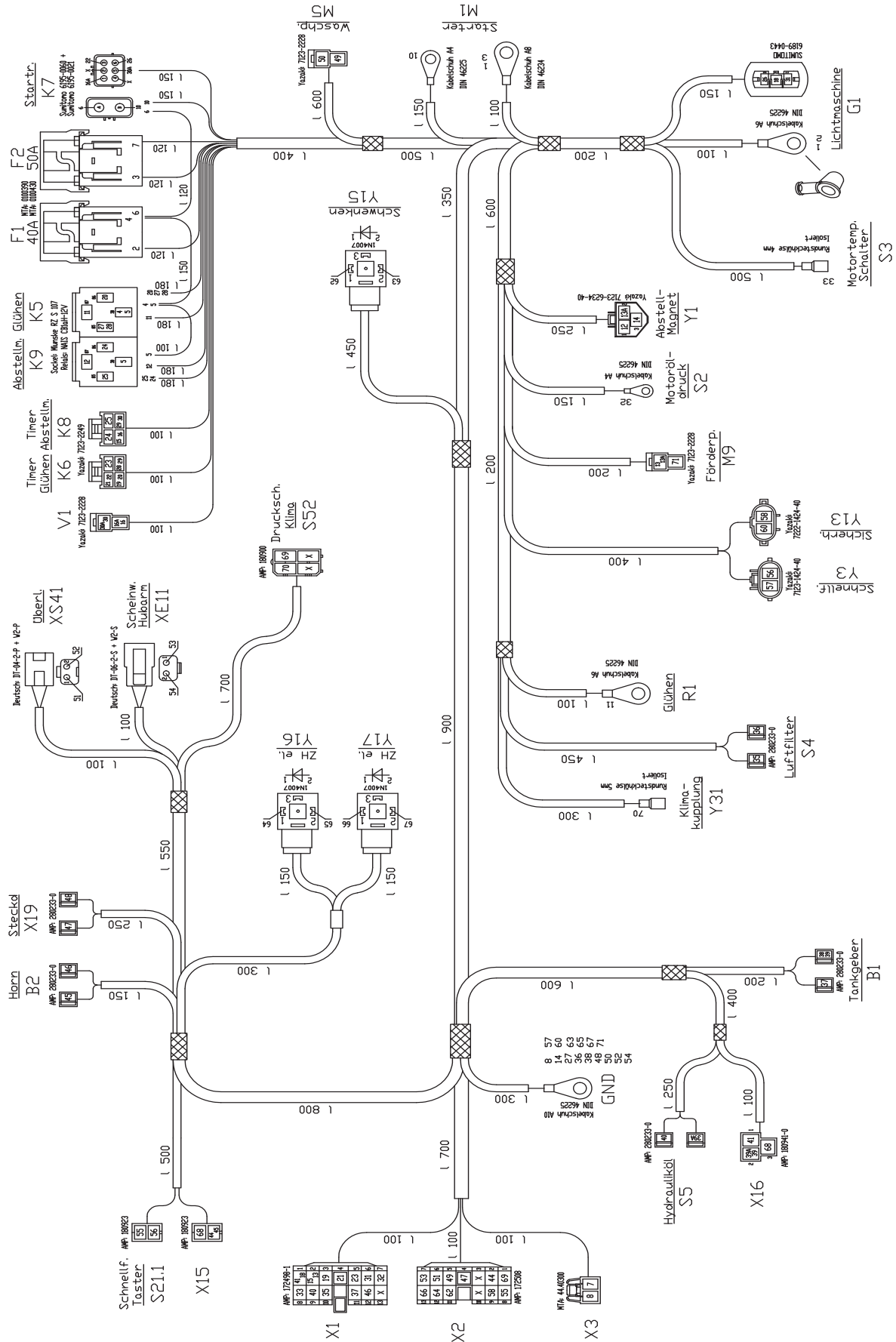


6.18 Engine wiring harness (legend)

No.	Up to	To	Colour	mm ²
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	GND	X3/B earth	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	X1/2 cutoff solenoid	blu	1
13A	M9 fuel feed pump	Y1/2 cutoff solenoid	blu	1
14	GND	Y1/3 cutoff solenoid	blk	2.5
15	K8 cutoff solenoid time lag relay	X1/2 engine/chassis connection	blu	1
16	K8 cutoff solenoid time lag relay	V1 blocking diode	blu	1
16	V1 blocking diode	K7/1 start high current relay	blu	1
A				
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
30	V1 blocking diode	K7/5 start high current relay	blk	1
A				
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
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

No.	Up to	To	Colour	mm ²
38	GND	X16/2 drive alarm connection	blk	1
38A	B1 fuel level indicator	X16/2 drive alarm connection	blk	1
39	B1 fuel level indicator	S5 preheating start switch	blk	1
40	S5 preheating start switch	X2/1 engine/chassis connection	org/wht	1
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis connection	red/blk	1.5
48	X19 socket	GND	blk	1.5
49	M5 washer pump	X2/5 engine/chassis connection	blk/wht	1
50	M5 washer pump	GND	blk	1
51	XS41/1 safe load indicator	X2/6 engine/chassis connection	vio/blu	1
52	XS41/2 safe load indicator	GND	blk	1
53	XE11/1 boom working light	X2/7 engine/chassis connection	gm/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
62	Y15/1 auxiliary hydraulics/boom swivel solenoid valve	X5/1 armrest/chassis connection	blu/yel	1
63	Y15/2 auxiliary hydraulics/boom 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

6.19 Engine wiring harness A4



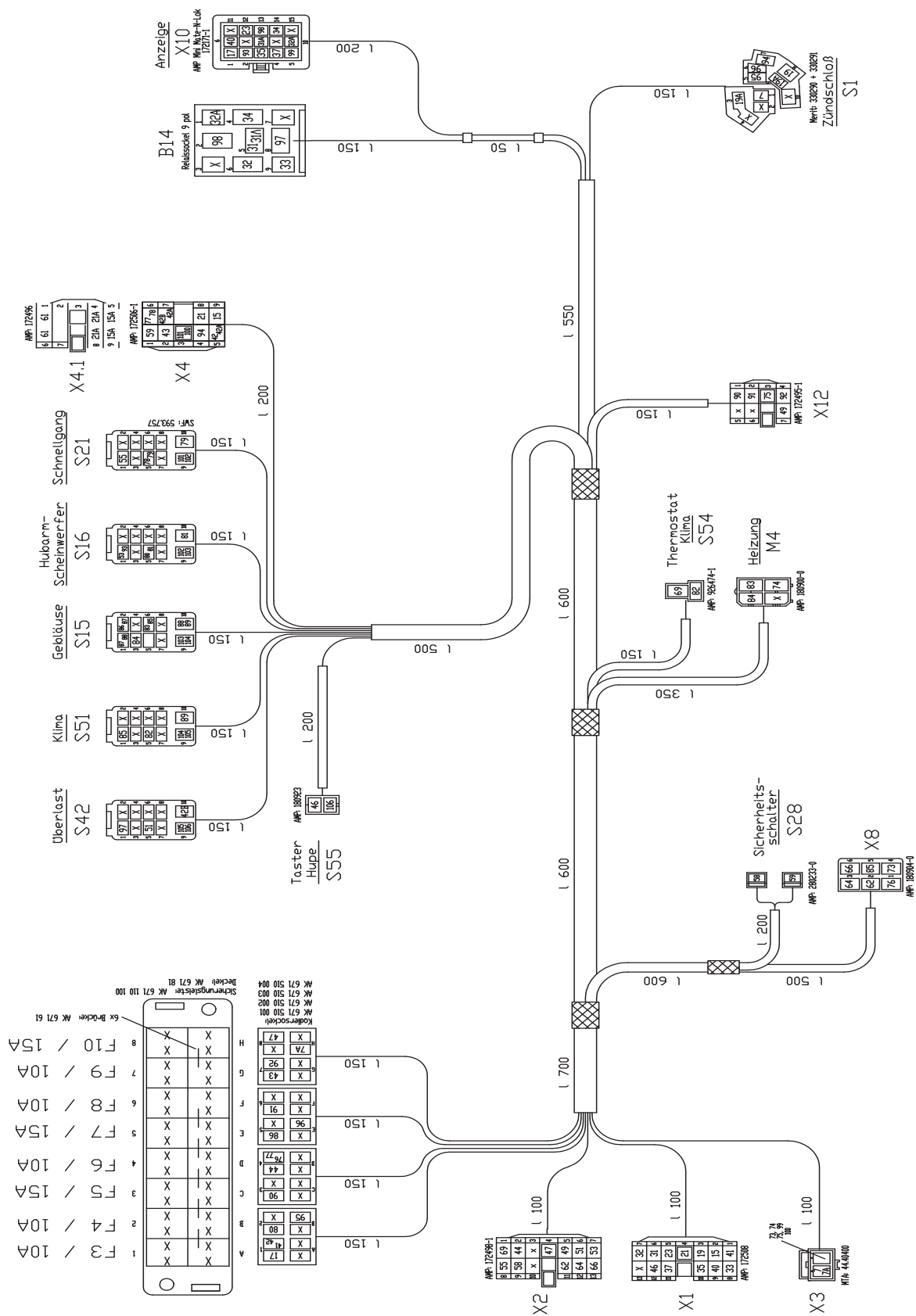


6.20 Cab wiring harness A4 (legend)

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
17	F3 ignition lock fuse	X10/1 instrument panel 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	prk	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
42 A	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
46	X1/12 horn connection	S55/1 horn switch	org	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	gm/vel	1
55	X2/8 engine/chassis connection	S21/1 high-speed switch	brn/blk	1
58	X2/9 engine/chassis connection	S28 horn switch	brn/wht	1
59	X4.1/1 drive interlock connection	X4.1/6 drive interlock connection	brn/wht	1
62	X2/11 engine/chassis connection	X8/2 joystick connection	gry	1
64	X2/12 engine/chassis connection	X8/3 joystick connection	gry/vel	1
66	X2/13 engine/chassis connection	X8/6 joystick connection	vel/grn	1
69	X2/1 engine/chassis connection	S54 horn switch	vel/red	1
73	X3/B main connection	X8/4 joystick connection	blk	1
74	X3/B main connection	M4/2 heater fan	blk	1
75	X3/B main connection	X12/3 fuel gauge	blk	1
76	F6 valves and horn fuse	X8/1 joystick connection	gry	1
77	F6 valves and horn fuse	X4/6 drive interlock connection	gry	1
78	S21/5 high-speed switch	X4/6 drive interlock connection	gry	1
79	S21/5 high-speed switch	S21/10 high-speed switch	gry	1
80	F4 fuse 10A working light	S16/5 boom light switch	gm	1

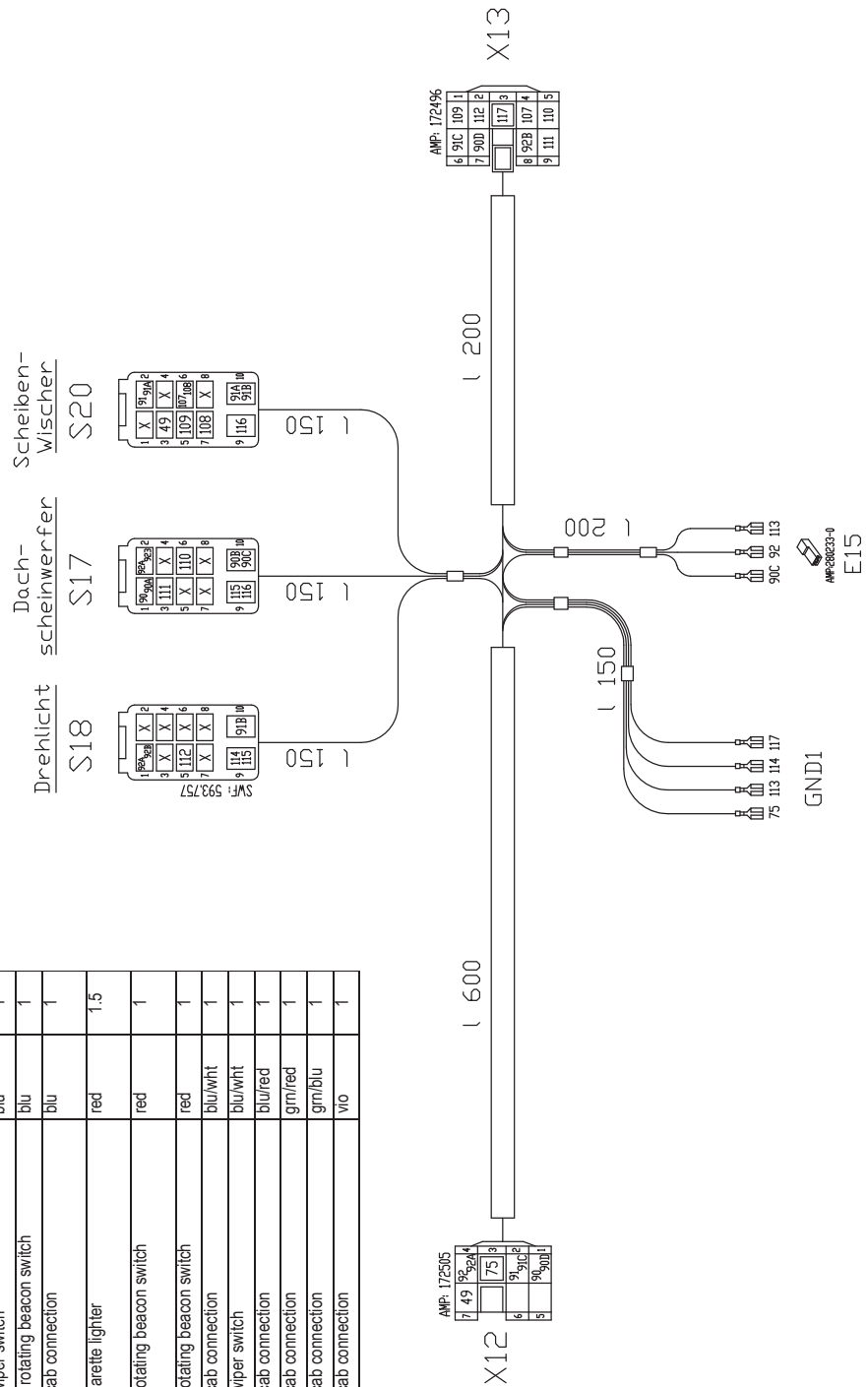
No.	Up to	To	Colour	
81	S16/10 boom light switch	S16/5 boom light switch	gm	1
82	S51/5 air conditioning switch	S54 air conditioning thermostat	vel/red	1
83	S15/6 ventilation switch	M4/1 heater fan connection	vel/blk	1
84	S15/3 heater switch	M4/3 heater fan connection	vel/blu	1
85	S15/6 ventilation switch	S51/1 air conditioning switch	vel/blk	1
86	F7 air conditioning fuse	S15/2 heater switch	vel	1.5
87	S15/1 heater switch	S15/2 heater switch	vel	1
88	S15/1 heater switch	S15/10 heater switch	vel	1
89	S51/10 air conditioning switch	S15/10 heater switch	vel	1
90	F5 lights fuse	X12/1 cab connector	gm	1
91	F8 wiper fuse	X12/2 cab connection	blu	1
92	F9 radio fuse	X12/2 cab connection	red	1
93	S16/1 boom working light switch	X10/2 instrument panel connection	gm	1
94	X4/4 drive interlock	S177 ignition switch	wht/blk	1
95	S15/5 ignition switch	F4 fuse 10A working light	blu	2.5
96	S16/6 ignition switch	F7 air conditioning fuse	blu	2.5
97	S42/1 switch for safe load indicator (France)	B14/8 warning buzzer	vio/blu	1
98	X10/13 instrument panel connection	B14/2 warning buzzer	vio/blu	1
99	X3/B main connector	X10/5 instrument panel connection	blk	1
100	X3/B main connector	X4/3 drive interlock	blk	1
101	S21/9 high-speed switch	X4/3 drive interlock	blk	1
102	S21/9 high-speed switch	S16/9 boom light switch	blk	1
103	S15/9 heater switch	S16/9 boom light switch	blk	1
104	S15/9 heater switch	S51/9 air conditioning switch	blk	1
105	S42/9 safe load indicator switch	S51/9 air conditioning switch	blk	1
106	S42/9 safe load indicator switch	S55/2 horn push button	blk	1

6-16

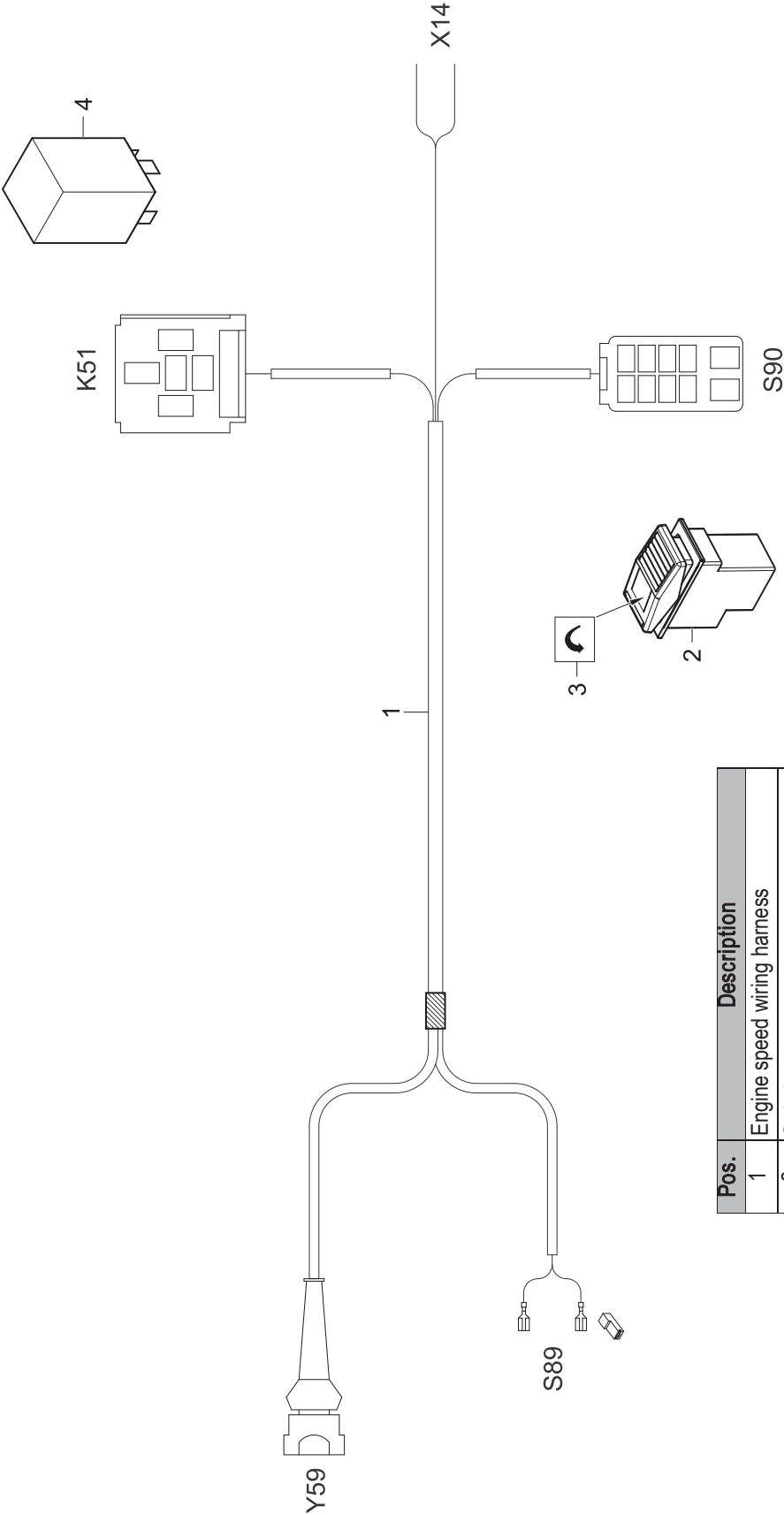


6.22 Roof wiring harness A4

No.	Up to	To	Colour	mm ²
49	X12 (7) 9 pole plug and socket connector - cab	S20/3 wiper switch	blk/wht	1
75	X12 (3) 9 pole plug and socket connector - cab	GND1	blk	1
90	X12 (1) 9 pole plug and socket connector - cab	S17/1 cab lights switch	grn	1.5
90 A	S17/2 cab lights switch	S17/1 cab lights switch	grn	1.5
90 B	S17/2 cab lights switch	S17/10 cab lights switch	grn	1
90 C	E15 cigarette lighter	S17/10 cab lights switch	grn	1
90 D	X12 (1) 9 pole plug and socket connector 3/	X13/7 cab connection	grn	1
91	X12 (2) 9 pole plug and socket connector - cab	S20/2 wiper switch	blu	1.5
91 A	S20/10 wiper switch	S20/2 wiper switch	blu	1
91 B	S20/10 wiper switch	S18/10 rotating beacon switch	blu	1
91 C	X12 (2) 9 pole plug and socket connector - cab	X13/6 cab connection	blu	1
92	X12 (4) 9 pole plug and socket connector - cab	E15 cigarette lighter	red	1.5
92 A	X12 (4) 9 pole plug and socket connector - cab	S18/1 rotating beacon switch	red	1
92 B	X13/8 cab connection	S18/1 rotating beacon switch	red	1
107	S20/6 wiper switch	X13/4 cab connection	blu/wht	1
108	S20/6 wiper switch	S20/7 wiper switch	blu/wht	1
109	S20/5 wiper switch	X13/1 cab connection	blu/red	1
110	S17/6 cab lights switch	X13/5 cab connection	grn/red	1
111	S17/3 cab lights switch	X13/9 cab connection	grn/blu	1
112	S18/5 rotating beacon switch	X13/2 cab connection	vio	1



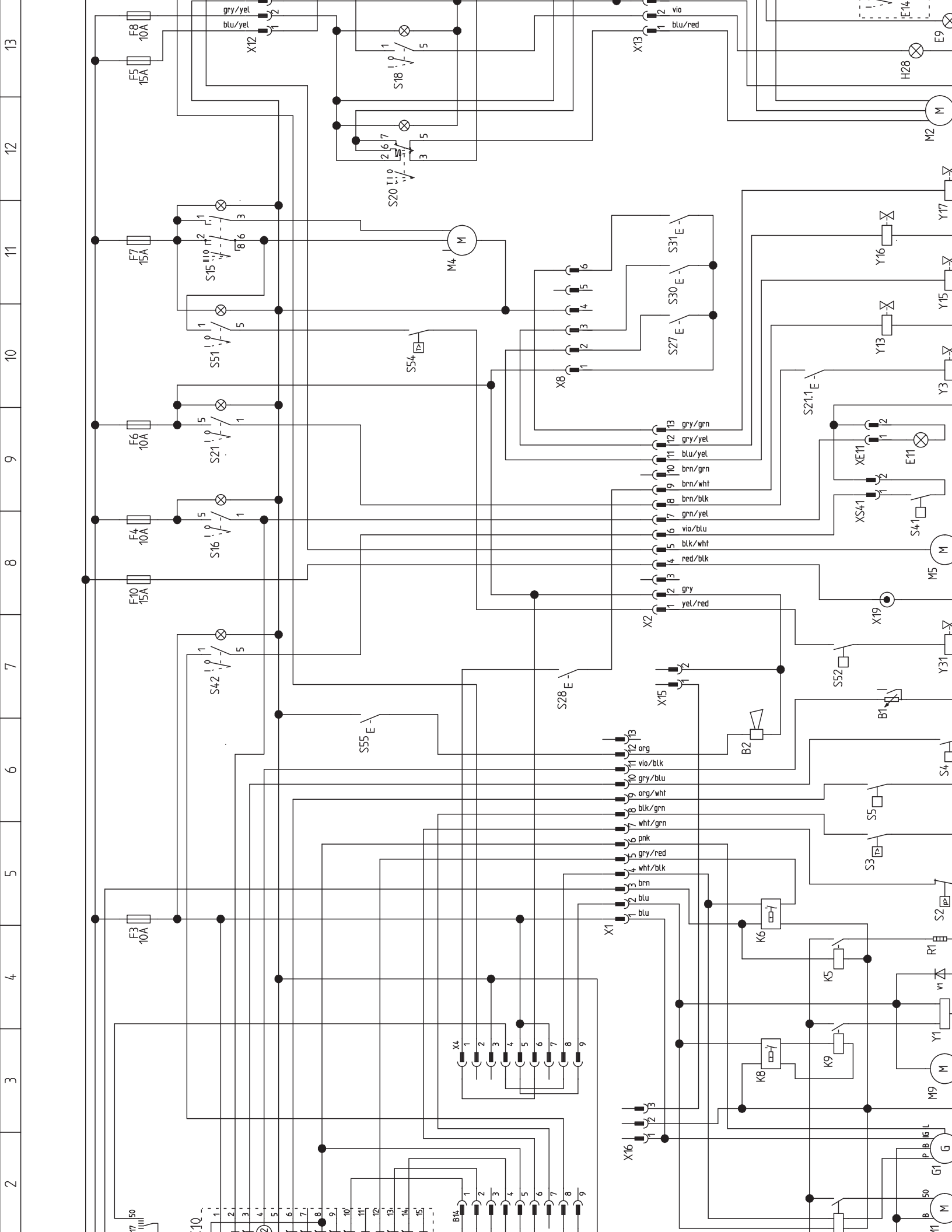
6.23 Revs control wiring harness (option)



Wiring diagrams and wiring options.

Function	No.	Description	Section	Loc.
Engine	M1	Starter	F2	
	M2	Wiper motor	F12	Opt
	M4	Fan	C12	Opt
	M5	Washer pump	F8	Opt
	M9	Fuel pump	F3	
	P1	Hour meter	B1	
	P2	Fuel level indication	B1	
	R1	Glow plug	F4	
	S1	Preheating start switch	A1	
	S2	Engine oil pressure switch	F5	
Heating	S3	Engine temperature switch	E5	
	S4	Air filter pressure switch	F6	
	S5	Hydraulic oil pressure switch	F5	
	S16	Boom working light switch	B8	
	S17	Cab working light switch	C14	Opt
	S18	Rotating beacon switch	C13	Opt
	S15	Heating switch	B11	
	S20	Wiper/washer switch	C12	Opt
	S21	High speed switch	B9	
	S21.1	High-speed tip switch (prepared)	E9	Opt
Interlock, drive interlock	S27	Additional hydraulics/boom swivel tip switch	D10	
	S28	Safety switch	D7	
	S30	Additional control circuit tip switch	E10	Opt
	S31	Additional control circuit tip switch	E11	Opt
	S41	Safe load indicator pressure switch	E8	Opt
	S42	Safe load indicator switch	B7	Opt
	S48	Automatic idling speed tip switch	C9	Opt
	S51	Air conditioning switch	B10	Opt
	S52	Air conditioning pressure switch	E7	Opt
	S54	Air conditioning thermostat	C10	Opt
Relay	S55	Horn tip switch	C6	
	V1	Recovery diode	F4	
	X1	13 pole connection – engine/chassis	D4-6	
	X2	11 pole connection – engine/chassis	D7-9	

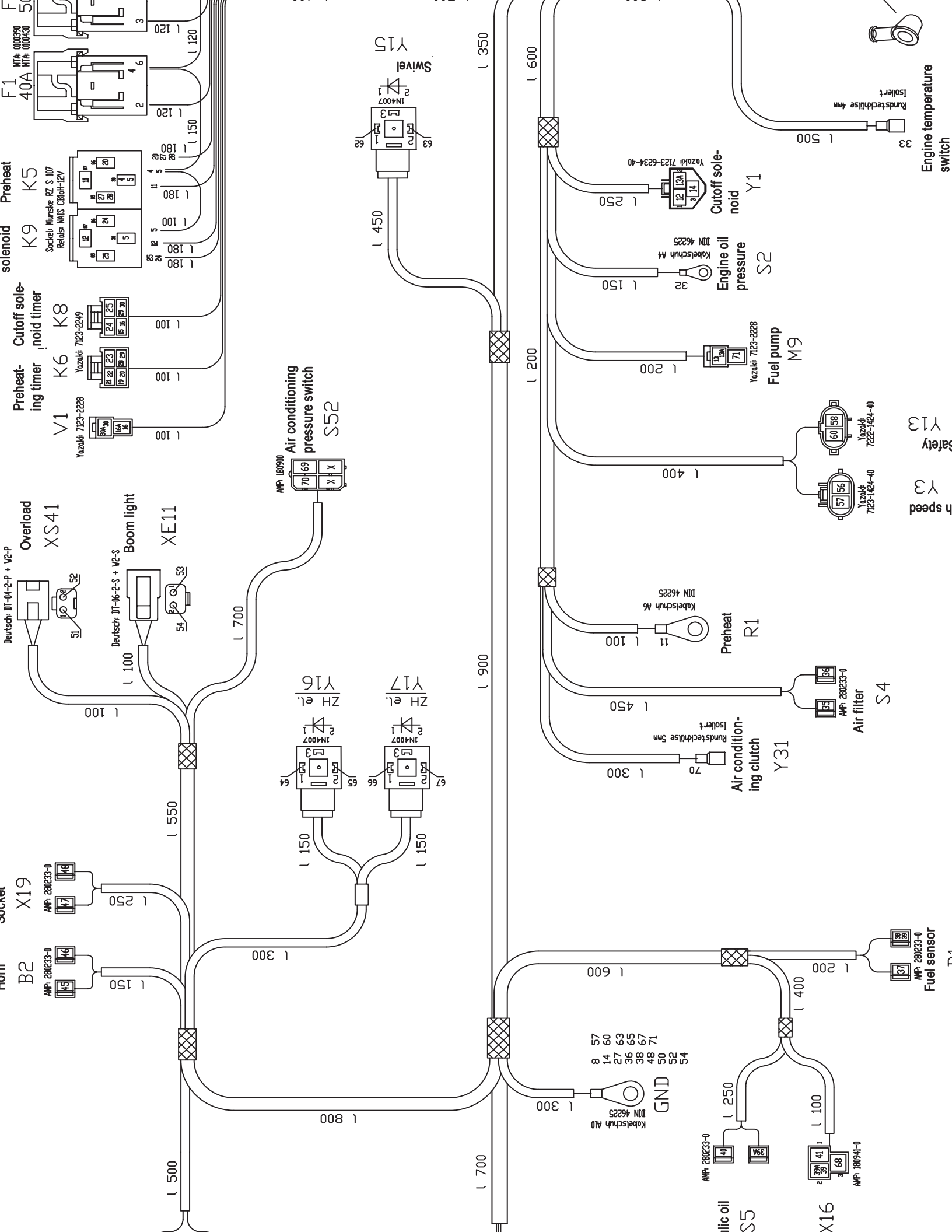
No.	Description	Section	Loc.
X4	9 pole connection – drive interlock	F2	
X8	6 pole connection – joystick (left)	F12	Opt
X10	15 pole connection – instrument panel	C12	Opt
X12	9 pole connection – cab	F8	Opt
X13	5 pole connection – engine temperature	F3	
X15	1 pole connection – drive alarm	B1	
X16	3 pole connection – drive alarm	B1	
X19	1 pole connection – socket	F4	
XE11	2 pole connection – boom working light	A1	
XS41	2 pole connection – safe load indicator	F5	
Y1	Cutoff solenoid	F6	
Y3	High-speed solenoid valve	F5	
Y13	Solenoid valve for safety valve	B8	
Y15	Auxiliary hydraulics/boom swivel solenoid valve	C14	Opt
Y16	Auxiliary hydraulics solenoid valve	C13	Opt
Y17	Auxiliary hydraulics solenoid valve	B11	
Y31	Air conditioning clutch	C12	Opt
		B9	
		E9	Opt
		D10	
		D7	
		E10	Opt
		E11	Opt
		E8	Opt
		B7	Opt
		C9	Opt
		B10	Opt
		E7	Opt
		C10	Opt
		C6	
		F4	
		D4-6	
		D7-9	

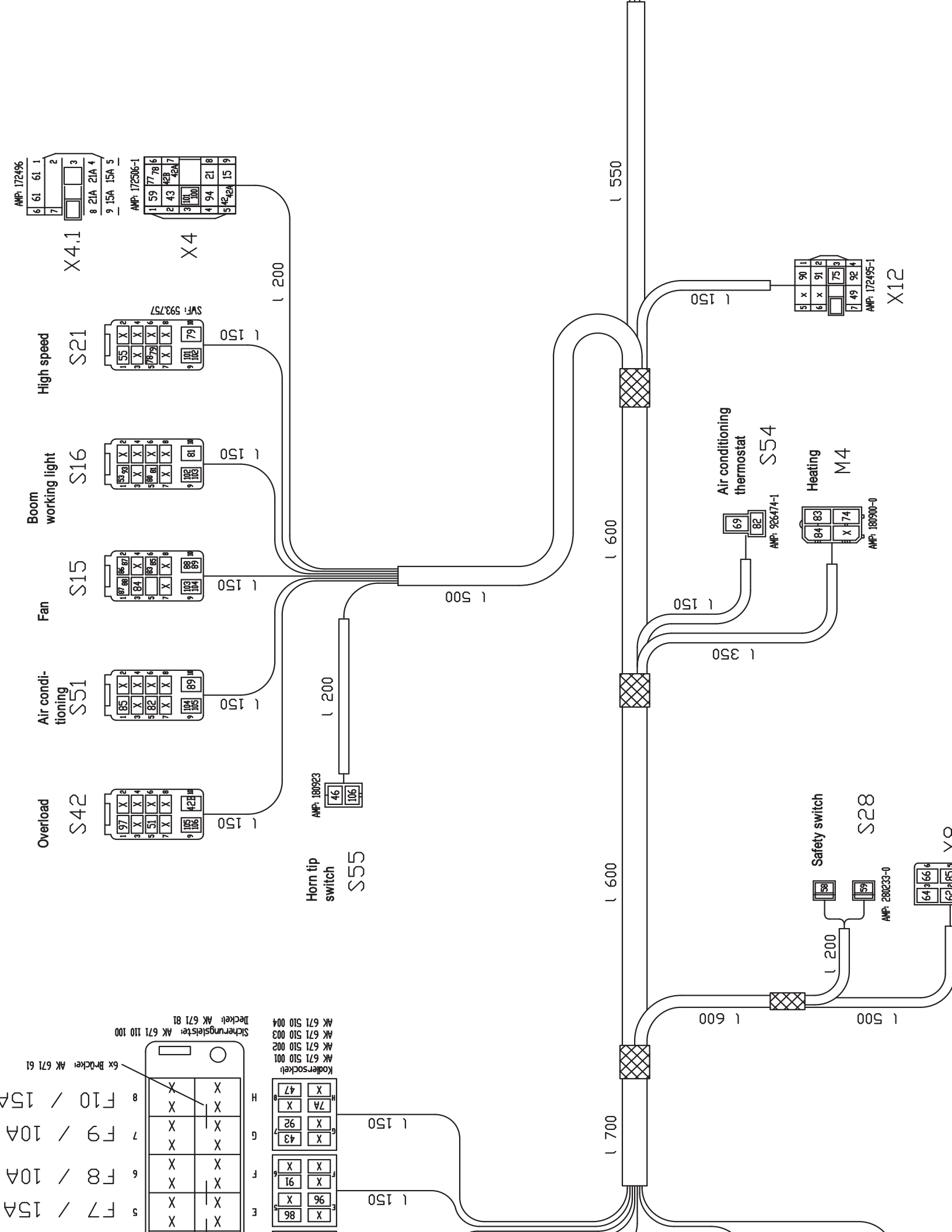


No.	Up to	To	Colour	mm ²
29	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
30	K8 cutoff solenoid time lag relay	V1 blocking diode	blk	1
30 A	V1 blocking diode	K7/5 start high current relay	blk	1
31	G1/1 alternator	X1/6 engine/chassis connection	pnk	1
32	S2 engine oil pressure switch	X1/7 engine/chassis connection	wht/grm	1
33	S3 engine temperature switch	X1/8 engine/chassis connection	blk/grm	1
35	S4 air filter pressure switch	X1/10 engine/chassis connection	gry/blu	1
36	S4 air filter pressure switch	GND	blk	1
37	B1 fuel level indicator	X1/11 engine/chassis connection	vio/blk	1
38	GND	X16/2 drive alarm connection	blk	1
38A	B1 fuel level indicator	X16/2 drive alarm connection	blk	1
39	B1 fuel level indicator	S5 preheating start switch	blk	1
40	S5 preheating start switch	X2/1 engine/chassis connection	org/wht	1
41	X16/1 drive alarm connection	X1/1 engine/chassis connection	blu	1
44	S21.1 high-speed tip switch (prepared)	X2/2 engine/chassis connection	gry	1
45	S21.1 high-speed tip switch (prepared)	B2 horn	gry	1
46	B2 horn	X5/5 armrest/chassis connection	org	1
47	X19 socket	X2/4 engine/chassis connection	red/blk	1.5
48	X19 socket	GND	blk	1.5
49	M5 washer pump	X2/5 engine/chassis connection	blk/wht	1
50	M5 washer pump	GND	blk	1
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

No.	Up to	To	Colour	mm ²
54	XE11/2 boom working light	GND	blk	1
55	S21.1/1 high-speed tip switch (prepared)	X2/8 engine/chassis connection	blk	1
56	Y3 high-speed solenoid valve	X2/8 engine/chassis connection	blk	1
57	Y3 high-speed solenoid valve	GND	pnk	1
58	Y13 solenoid valve for safety valve	X5/4 armrest/chassis connection	wht/grm	1
60	GND	Y13 solenoid valve	blk/grm	1
62	Y15/1 auxiliary hydraulics/boom swivel solenoid valve	X5/1 armrest/chassis connection	gry/blu	1
63	Y15/2 auxiliary hydraulics/boom swivel solenoid valve	GND	blk	1
64	Y16/1 electr. auxiliary hydraulics solenoid valve	X5/2 armrest/chassis connection	blk	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	org/wht	1
67	Y17/2 electr. auxiliary hydraulics solenoid valve	GND	blu	1
68	S52 air conditioning pressure switch	X5/7 armrest/chassis connection	gry	1
69	S52 air conditioning pressure switch	X2/11 engine/chassis connection	org	1
70	X2/11 engine/chassis connection	Y31 air conditioning valve	red/blk	1.5
71	Y14/1 changeover valve solenoid valve	X2/9 engine/chassis connection	blk	1.5

Engine chassis wiring harness

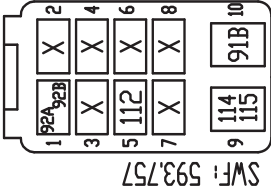




	To	Colour	mm ²
- cab	S20/3 wiper switch	blk/wht	1
- cab	GND1	blk	1
- cab	S17/1 cab lights switch	grn	1.5
	S17/1 cab lights switch	grn	1.5
	S17/10 cab lights switch	grn	1
	S17/10 cab lights switch	grn	1
- cab	X13/7 cab connection	grn	1
- cab	S20/2 wiper switch	blu	1.5
	S20/2 wiper switch	blu	1
	S18/10 rotating beacon switch	blu	1
- cab	X13/6 cab connection	blu	1
- cab	E15 cigarette lighter	red	1.5
- cab	S18/1 rotating beacon switch	red	1
	S18/1 rotating beacon switch	red	1
	X13/4 cab connection	blu/wht	1
	S20/7 wiper switch	blu/wht	1
	X13/1 cab connection	blu/red	1
	X13/5 cab connection	grn/red	1
	X13/9 cab connection	grn/blu	1
	X13/2 cab connection	vio	1
	E15 cigarette lighter	blk	1.5
	S18/9 rotating beacon switch	blk	1
	S18/9 rotating beacon switch	blk	1
	S20/9 wiper switch	blk	1
	X13/3 cab connection	blk	1

Rotating beacon

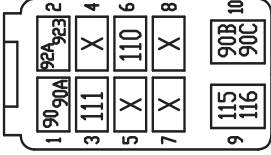
S18



1 150

Roof working lights

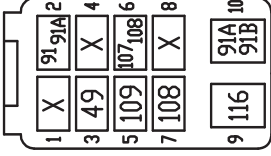
S17



1 150

Wiper

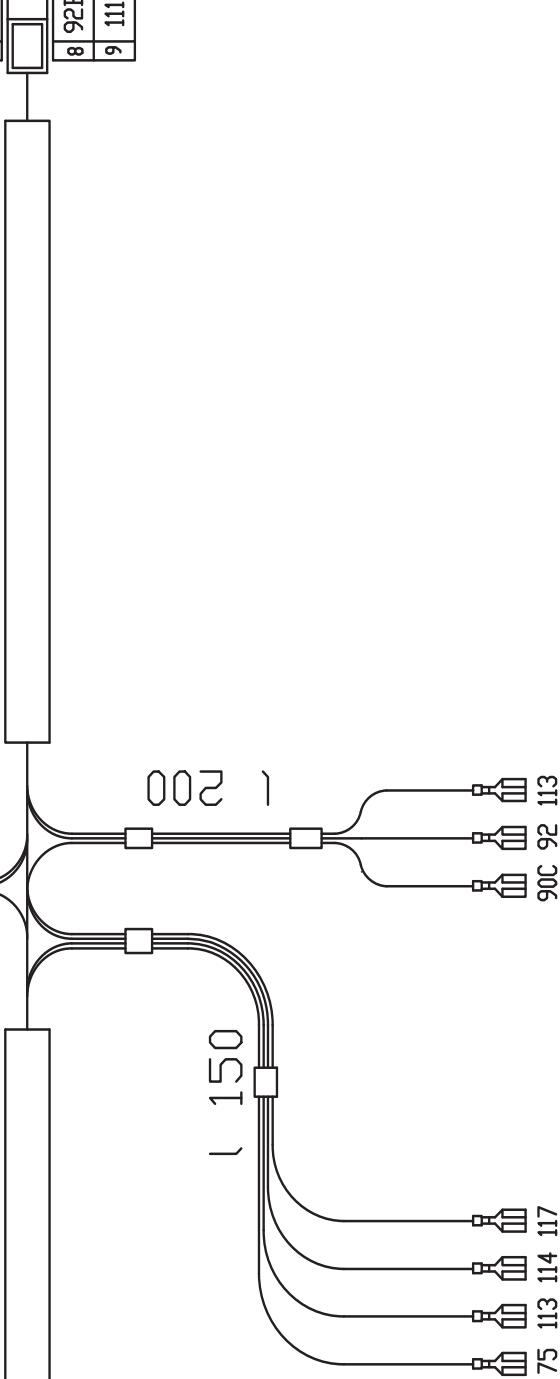
S20



1 150

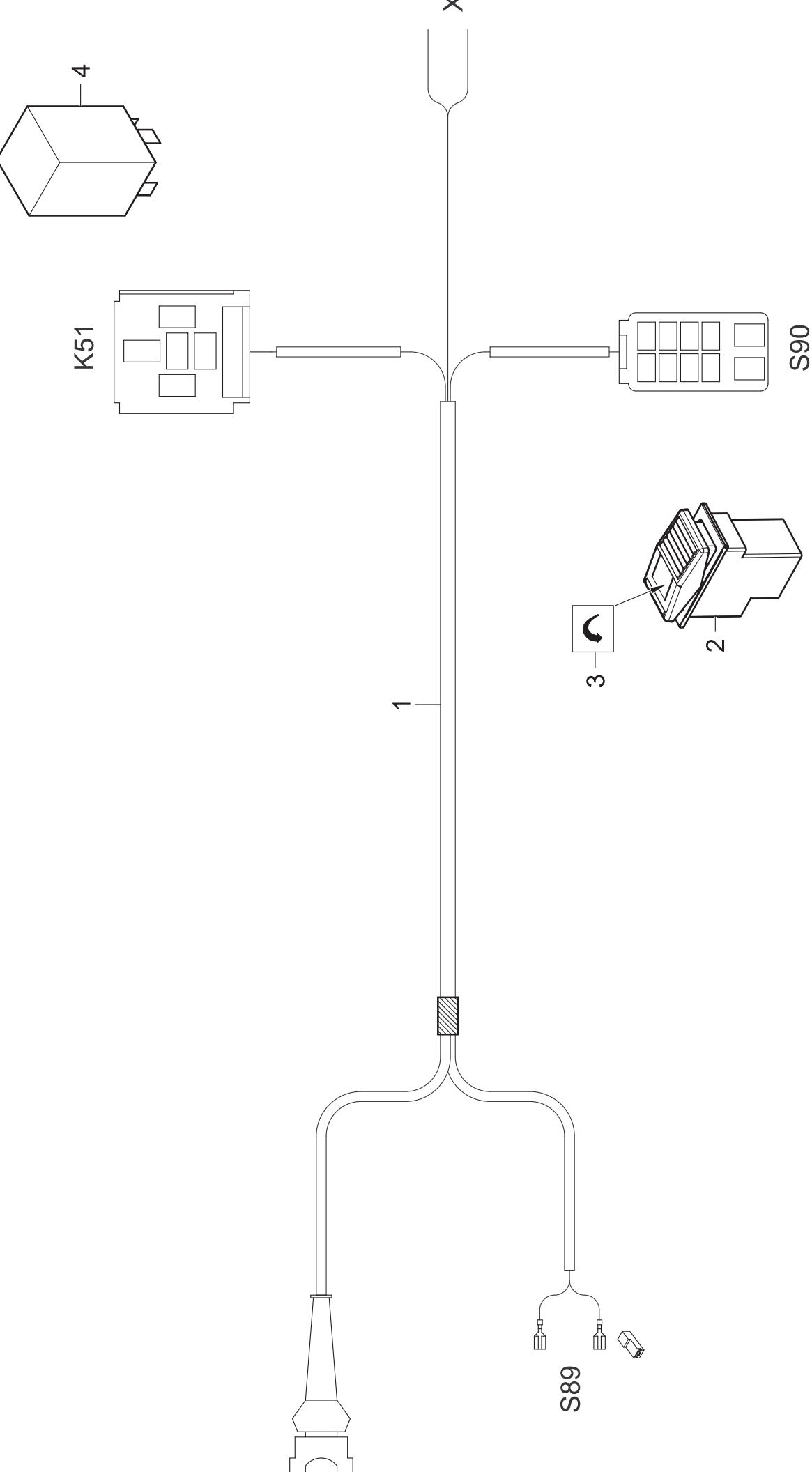
l 600

l 200



GND1





s.	Description
	Engine speed wiring harness
	Switch
	Symbol
	Time lag relay
1	Base
9	Insulating sleeve
0	Socket housing
9	Housing

Options

7 Options

7.1 Air conditioning

Specific safety instructions

- Article numbers for options and retrofit kits: please refer to the 38Z3 spare parts list



Danger!

Avoid contact with the heat exchanger or the condenser and the supply lines. Lines and hoses carrying refrigerating agents or coolants can be pressurised and hot.

Danger of burns!

Always observe the following instructions:

- Always empty the system before carrying out maintenance work on the cooling circuit.
- Avoid contact with parts carrying coolant.
- Carry out maintenance work with the fan at a standstill only.
- Have maintenance and repair work carried out by specialised staff only.



Important!

Make sure the cooling system does not come into contact with chlorine, choric substances, oil, grease or humidity. Use drain and fill systems for R134a only.



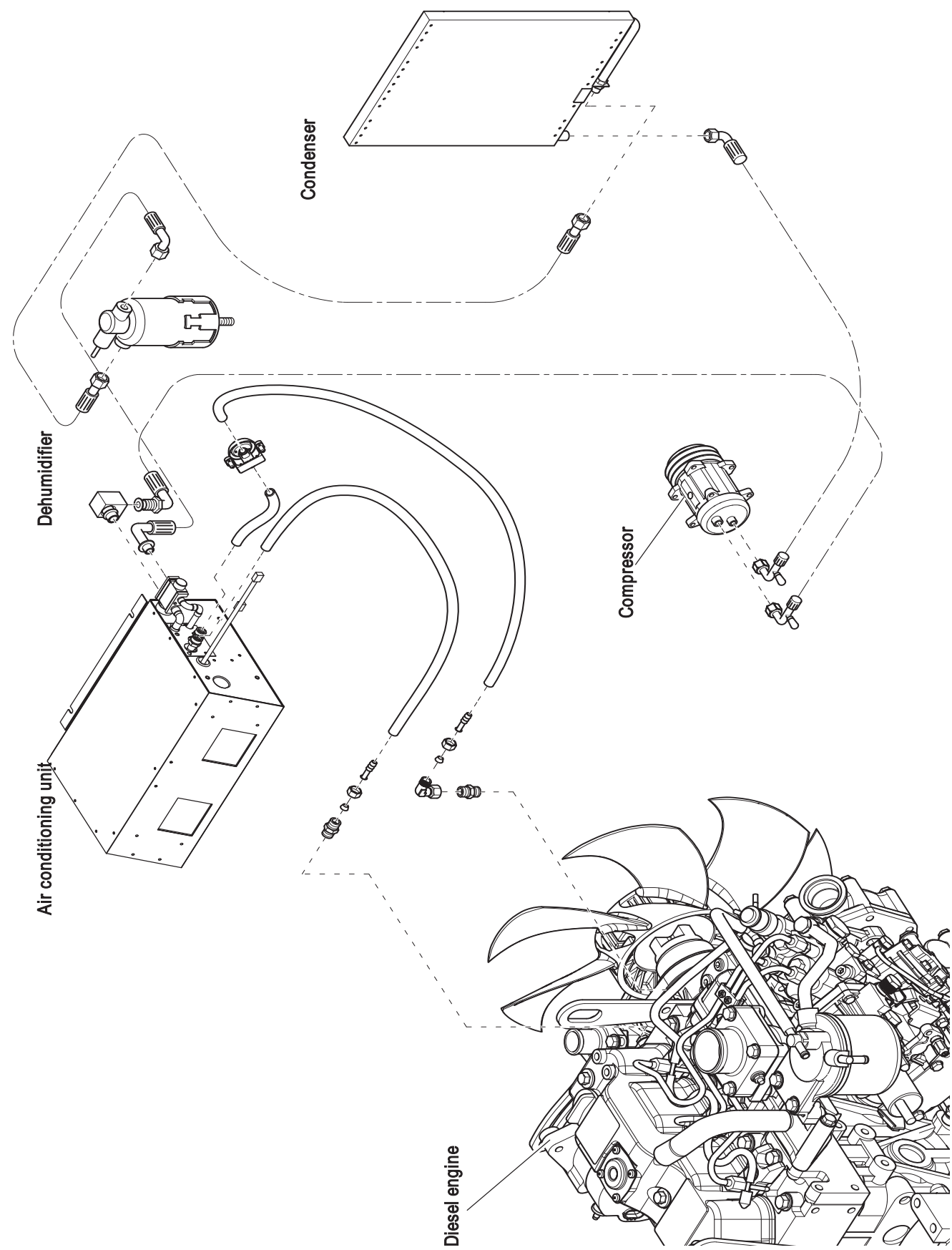
Important!

The air conditioning system runs best by taking in "outside" air.

Specifications

Air conditioning	Model 38Z3
Refrigerating agent R134a	~ 950 g (2.1 lbs)
Control pressure high pressure on	19 ^{±2} bar (276 ^{±29} psi)
Control pressure high pressure off	25 ^{±2} bar (363 ^{±29} psi)
Control pressure low pressure on	2.4 bar (34.8 psi)
Control pressure low pressure on	1.2 ^{±0.3} bar (17.4 ^{±4.4} psi)
Thermostat switch-on temperature	+ 2.2 °C (36°F)
Thermostat switch-off temperature	–1.1 °C (+30°F)
Compressor oil	116.5 ml (7.1 in ³)

Installation overview

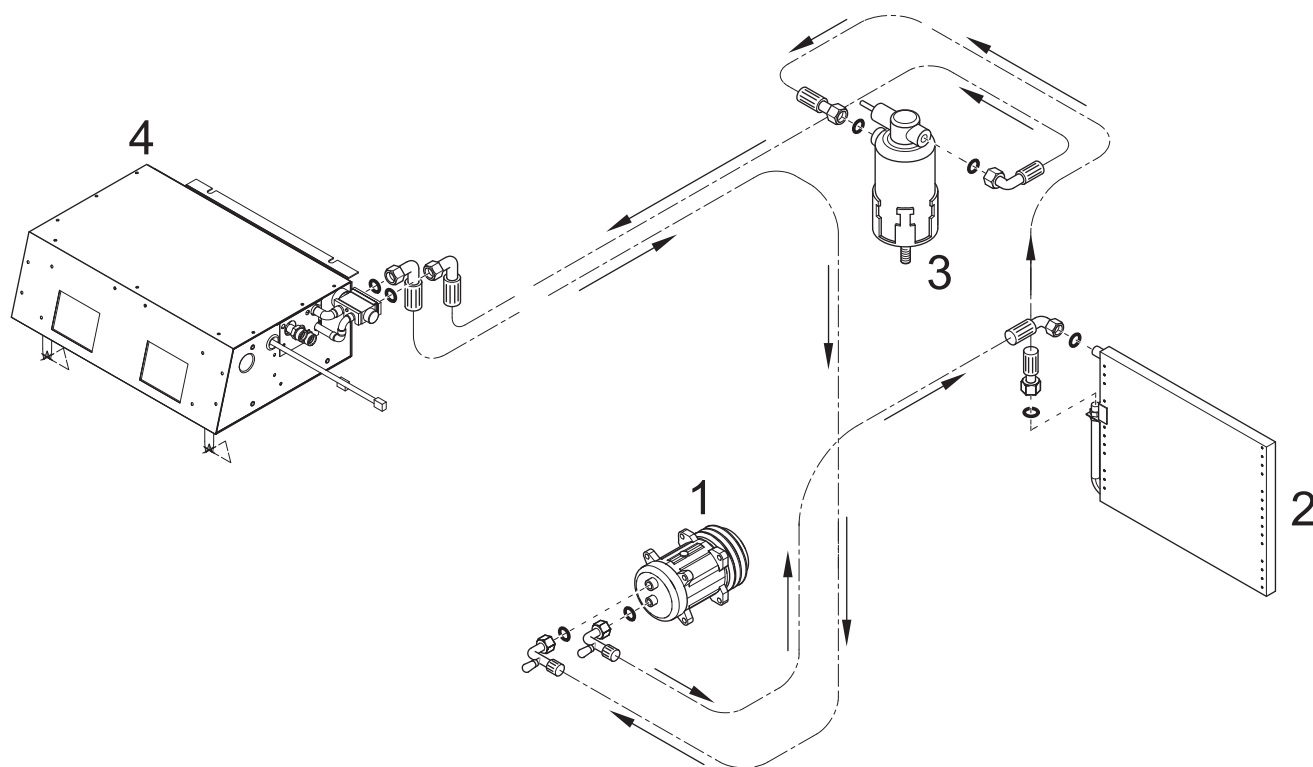


Components

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 $-1.1\text{ °C} \pm 0.8\text{ °C}$ ($30 \pm 34\text{ °F}$) and on again at $+2.2\text{ °C} \pm 0.8\text{ °C}$ ($36 \pm 34\text{ °F}$) 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	Compressor
2	Condenser
3	Dehumidifier
4	Air conditioning unit

Compressor

Old engine type (up to serial number AE02803):



Fig. 1: Compressor



New engine type (from serial number AG00573):



Fig. 2: Dehumidifier with pressure switch

The compressor takes in the gaseous refrigerating agent from the evaporator, compresses it and presses the refrigerating agent into the condenser. The diesel engine drives the compressor via a V-belt and an electro-magnetic clutch.

Condenser

The condenser condenses the compressed refrigerating agent, i.e. it is delivered to the condenser in gaseous state and emerges at the lowest position of the condenser in liquid form.

Dehumidifier with pressure switch

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.

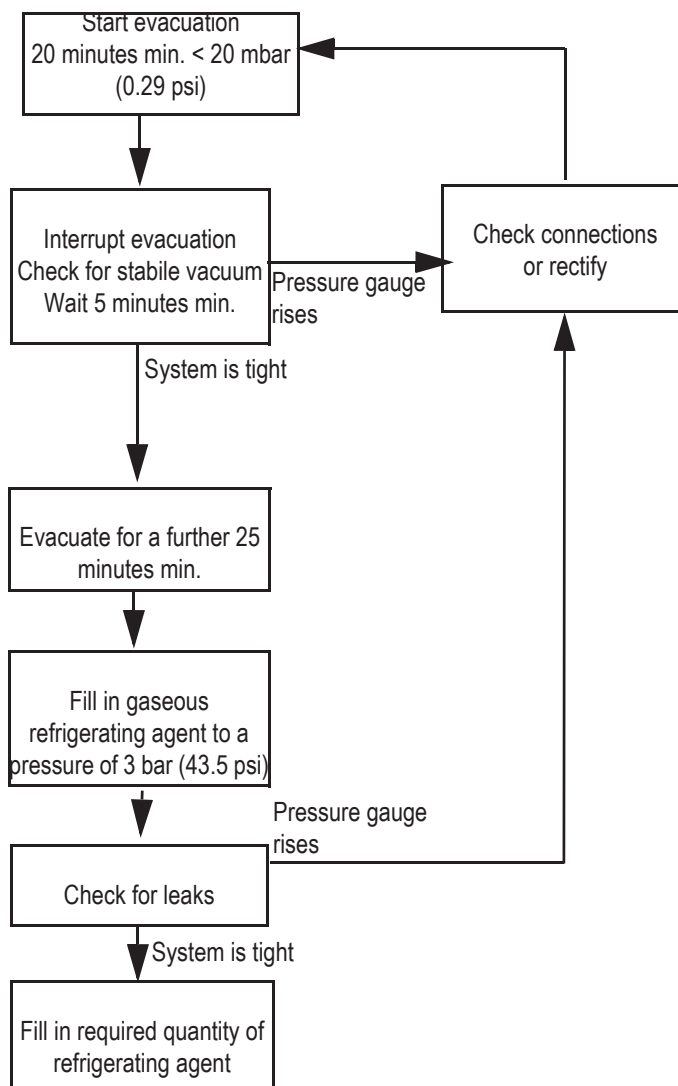
Filling up the air conditioning system



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

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

- the system leaks oil
- Replace the compressor oil in this case.

☞ *Slacken the screw underneath the compressor and drain the oil.*

☞ *Retighten the screw again*

☞ *Open the oil filler opening*

☞ *Fill in fresh oil*

☞ *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*

➡ Tightening torque 15 – 20 Nm (11 - 15 lbf ft)

Old engine type (up to serial number AE02803):



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



New engine type (from serial number AG00573):



Fig. 4: Cab filter

Fresh/recirculated air filter

Remove the ventilation grill in the cab to replace the filter. Make sure not to overstretch the cables of the fuse box as you tilt the grill. You can now see the filter mat.

**Important!**

The filter mat has other dimensions in the case of the air conditioning option (no.1000143330 instead of 1000146380 for heating).

Replacing the filter:

☞ *Slacken the ventilation cover in the cab*

☞ *You can now access the cab filter*

☞ *Remove the cab filter (lever out the clips with a screw driver)*

☞ *Insert a new cab filter*

☞ *Mount the cover of the ventilation in the cab 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 Counterweight

Specifications

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

Counterweight	Model 38Z3
Weight	152.5 kg (336 lbs)
Tightening torque for screws	290 Nm (214 psi)
Max. tail end lateral projection over chains	60 mm (2.4")



Important!

Bear in mind the lift capacity table when using a counterweight!

7.3 Long stick

Specifications

Long stick	Model 38Z3
Short stick	1400 mm (55")
Long stick	1650 mm (65")



Important!

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

7.4 Control circuit (pipework) connections for grab

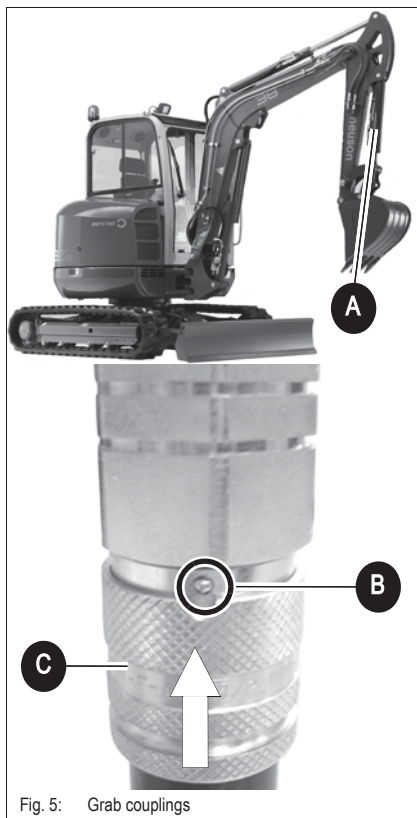


Fig. 5: Grab couplings

Connect and disconnect the grab couplings as follows:

Removing the coupling:

- ☞ Park the machine on firm and level ground
- ☞ Extend stick ram **A** halfway through
- ☞ Switch off the engine
- ☞ Release the pressure on stick ram **A** 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

Changing over the ball-type cock:

Bucket operation:

- ☞ Set the ball-type cocks to position **A**

Grab operation:

- ☞ Set the ball-type cocks to position **B**

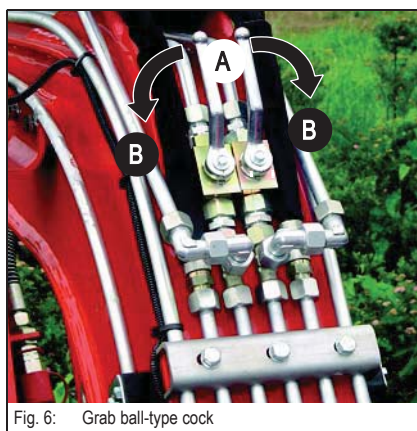


Fig. 6: Grab ball-type cock

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.

7.5 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 ISO De 12.5 1/2"

Couplings cannot be coupled under pressure!

7.6 Auxiliary hydraulics connections

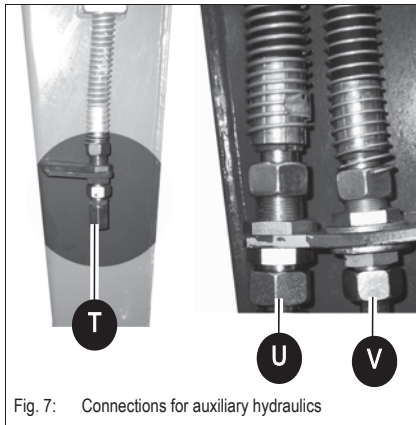


Fig. 7: Connections for auxiliary hydraulics



Important!

Follow the instructions in the Operator's Manual of the attachment manufacturer for connecting the auxiliary hydraulics to attachments.

Standard connections:

Port	Stick (left)	Stick (right)
T	Pressure line bulkhead coupling 1/2"	
V		<i>Pressure line</i> bulkhead coupling 1/2"
U		<i>Unpressurised reflux line (hammer)</i> bulkhead coupling 1/2"

Quick coupler options:

Port	Stick (left)	Stick (right)
T	Pressure line quick coupler 12.5 1/2"	
V		Pressure line quick coupler ISO De 12.5 1/2"
U		<i>Unpressurised reflux line (hammer)</i> quick coupler 1/2"

Couplings according to ISO 16028

Couplings cannot be coupled under pressure!

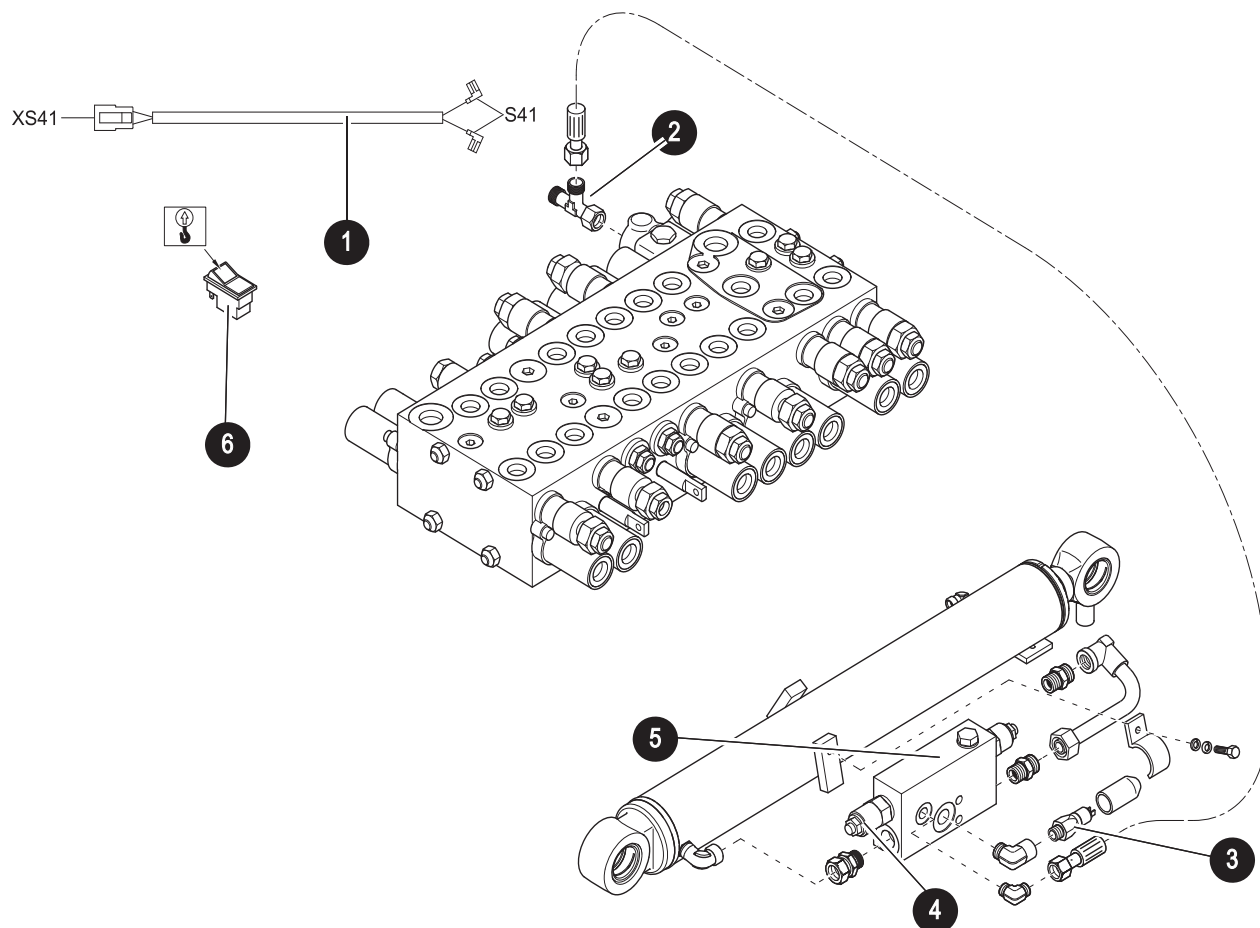


Important!

Follow the instructions in the Operator's Manual of the attachment manufacturer for connecting the auxiliary hydraulics to attachments.

7.7 Safe load indicator DE (safety valve for boom)

Position



Pos.	Description
1	Safe load indicator cable
2	Pilot control segment port
3	Pressure switch
4	Set screw
5	Hose burst valve
6	Switch

Setting the pressure switch

- ☞ A set screw is located at the rear of the pressure switch (no. 3).
- ☞ Mount a test weight according to the lift capacity table (turned by 90° to the driving direction).
- ☞ Set the values specified in the lift capacity table
– see [chapter 2.13 Lift capacity table 38Z3](#) on page 2-12.
 - Unscrew the screw = earlier response
 - Tighten the screw = later response
- ☞ Check again and fit the protective cap back on again.

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)

In the event of a hose rupture, the load is safely held in base position by means of the non-return valve.

“Retract ram” function:

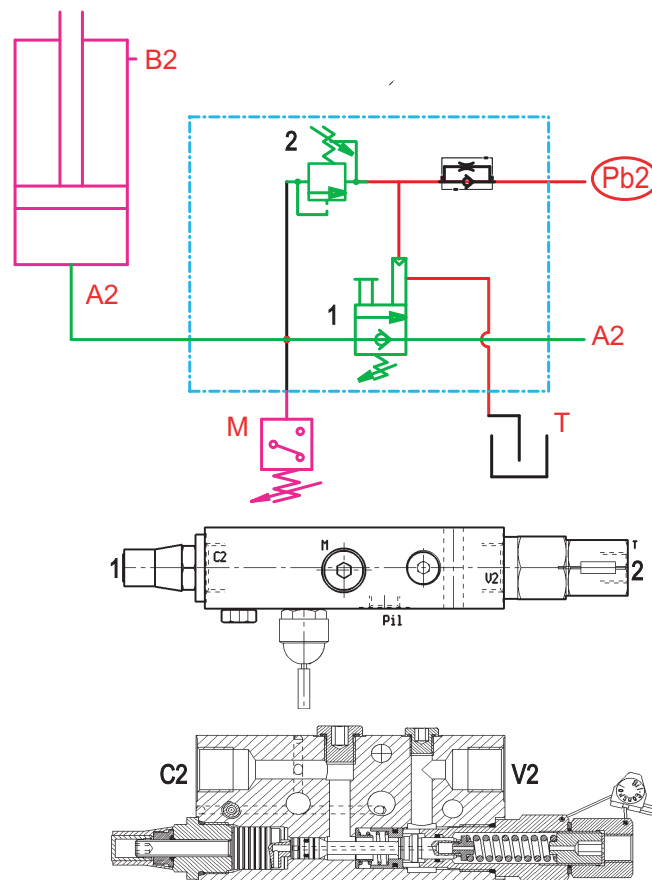
- Pilot control pressure moves valve (1) to work position (free oil reflux from the base side)
- The valve moves back to home position if the pilot control pressure drops

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

**Important!**

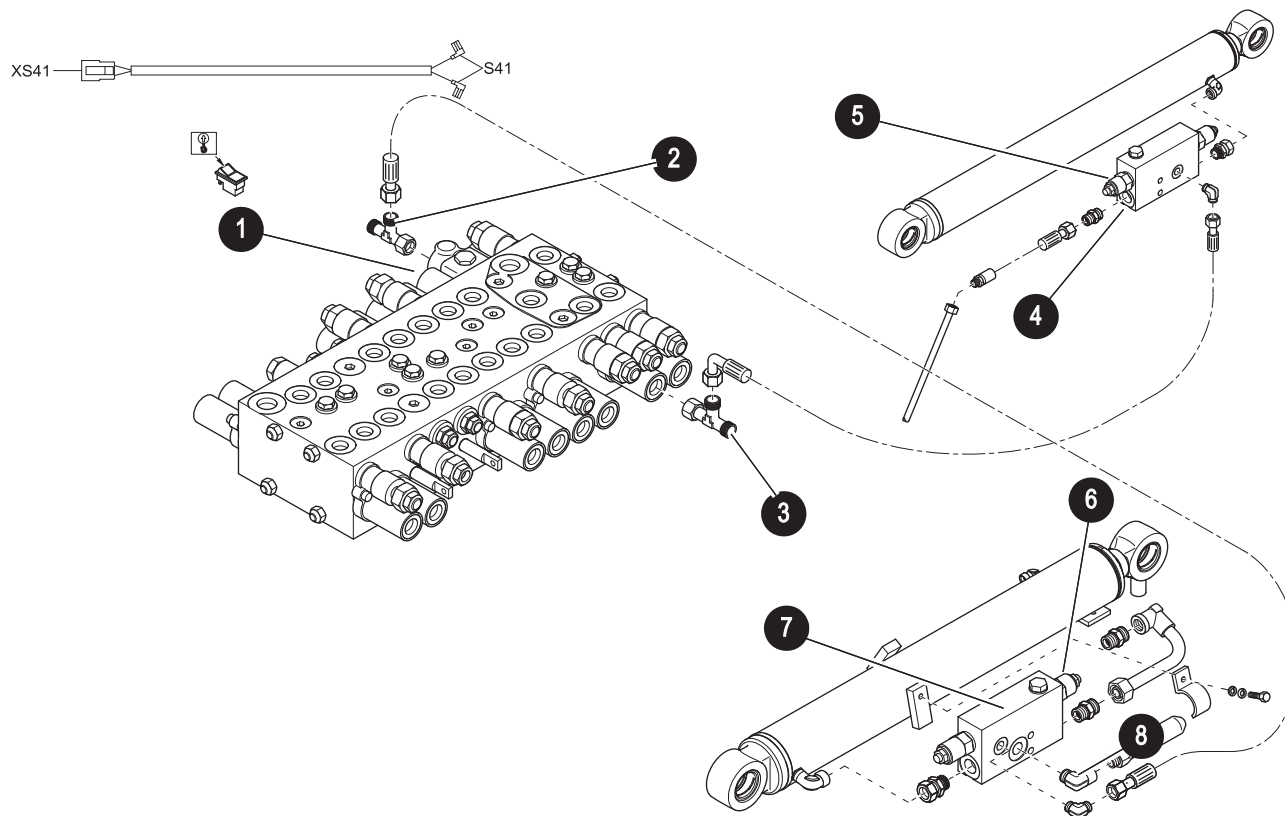
The valve settings are sealed, no modifications for legal reasons!

Wiring diagram



7.8 Safe load indicator FR (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

Setting the pressure switch

- ☞ A set screw is located at the rear of the pressure switch (no. 6).
- ☞ Mount a test weight according to the lift capacity table (turned by 90° to the driving direction).
- ☞ Set the values specified in the lift capacity table
– see [chapter 2.13 Lift capacity table 38Z3](#) on page 2-12.
 - Unscrew the screw = earlier response
 - Tighten the screw = later response
- ☞ Check again and fit the protective cap back on again.

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)

In the event of a hose rupture, the load is safely held in base position by means of the non-return valve.

“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:

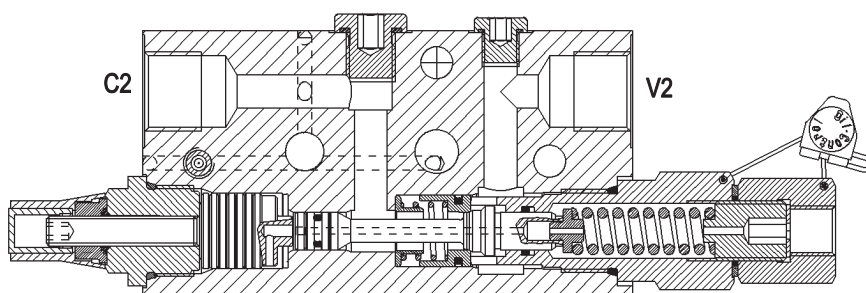
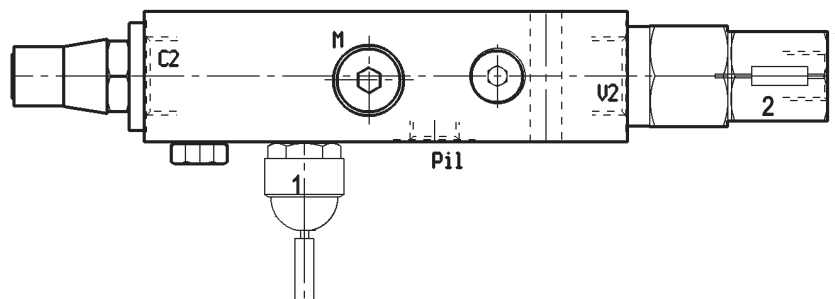
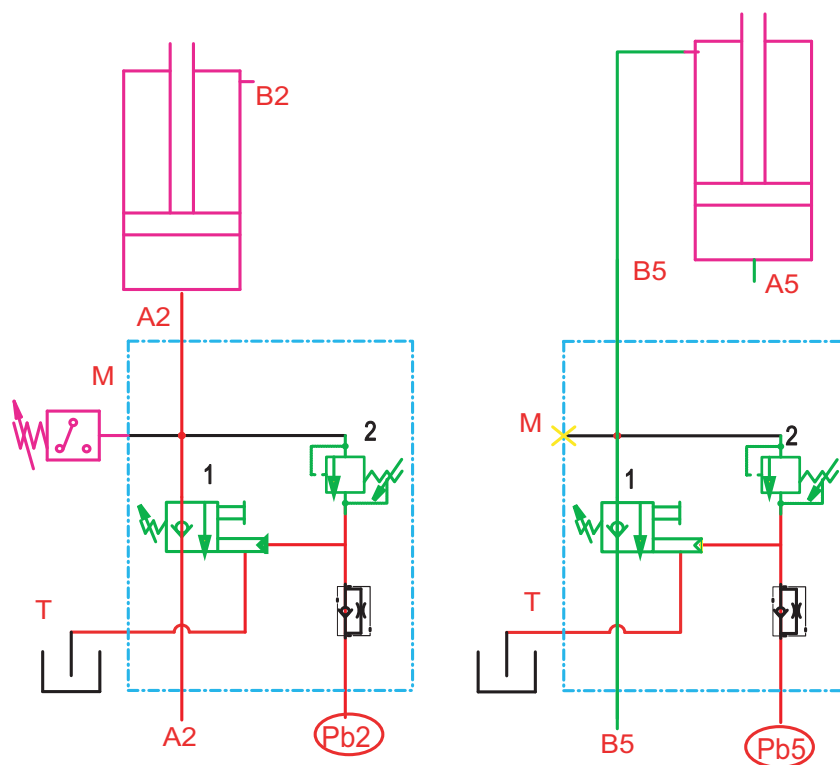
- Pilot control pressure moves valve (1) to work position (free oil flow to the base side)
- The valve moves back to home position if the pilot control pressure drops

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


7.9 3rd control circuit

Function

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

- The 3rd control circuit is actuated proportionally via the slide switch on the right-hand side joystick.

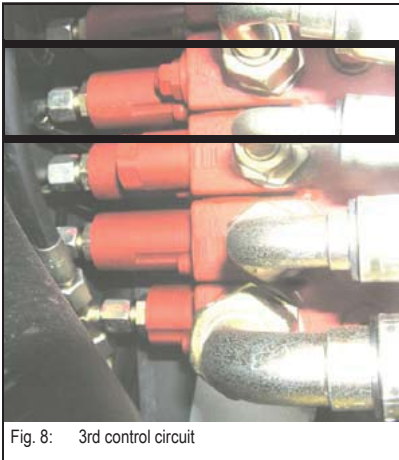
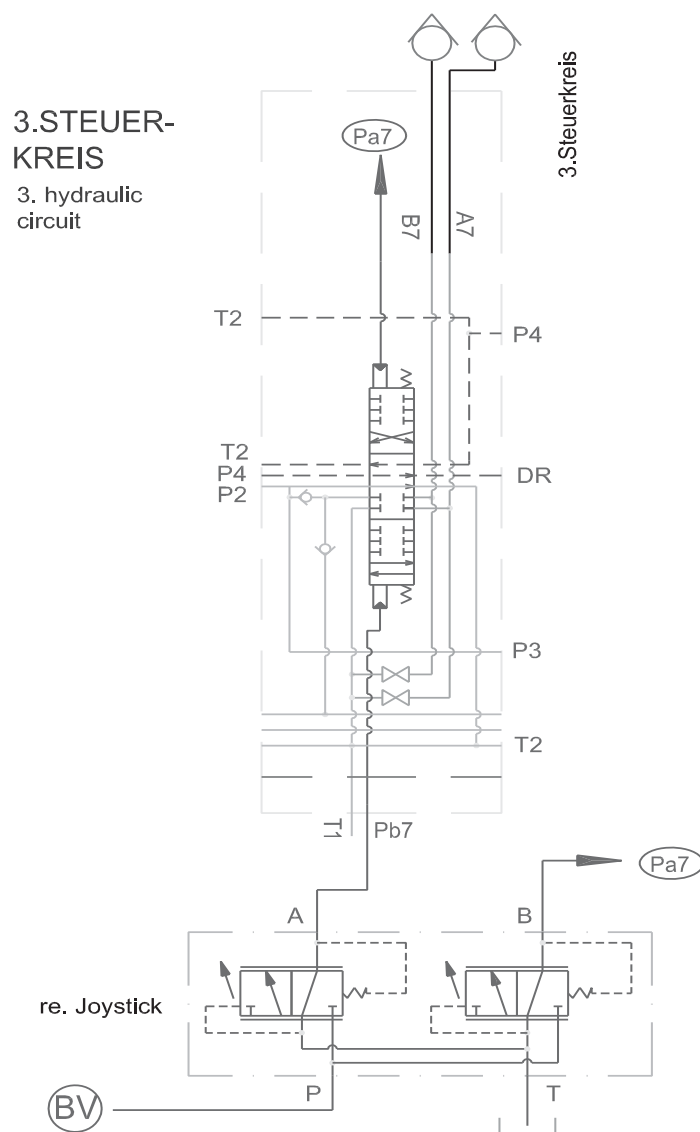


Fig. 8: 3rd control circuit



- ➔ If the machine is equipped with a 3rd control circuit option, a control valve with an additional segment for the 3rd control circuit is installed.

Diagram



7.10 Drive interlock (antitheft protection)

Position

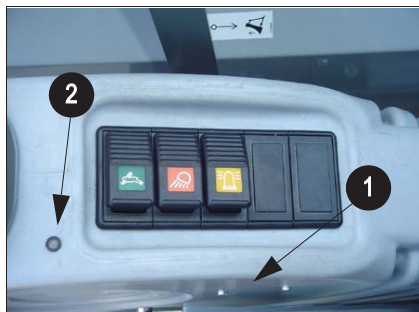


Fig. 9: Drive interlock

Pos.	Description
1	Transponder receiver surface
2	Red LED

Disabling the drive interlock

- ☞ *Approach the transponder to 2 cm (0.8") 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 7-19*
 - ☞ 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 7-19](#)
 - ➡ 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 7-19](#).



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.

7.11 Proportional controls

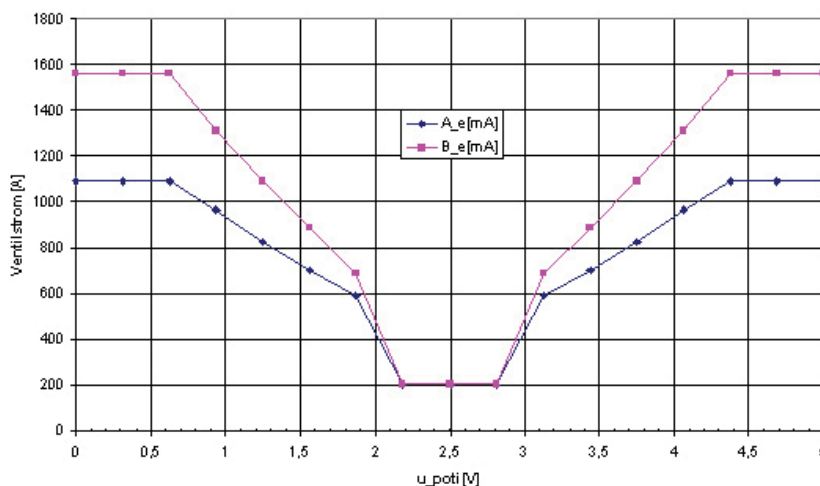
Function

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 characteristic 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 Adjusting control response](#) on page 7-22.

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).

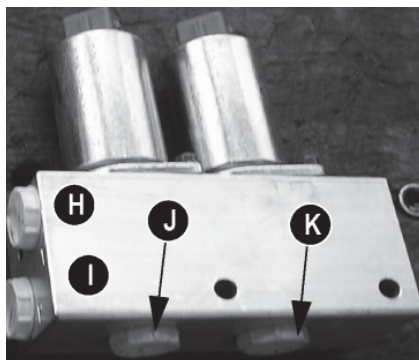


Caution!

Always use button B (– [see Hammer operation](#) on page 7-22) on the joystick for hammer operation.

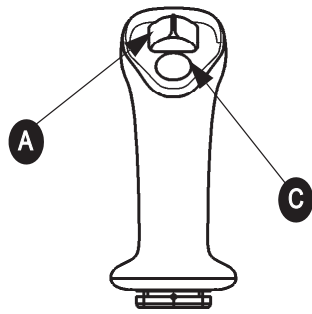
Do not operate the hammer with characteristic curve 1 too often since the slide switch described above does not ensure full throughput, causing power loss and system overheating.

Ports

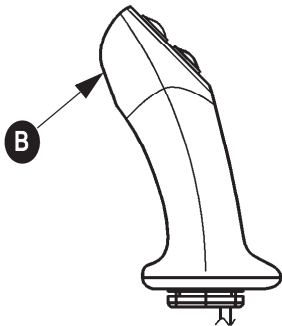


Connections	Hose designation
H	T line
I	P line
J	Auxiliary hydraulics (left)
K	Auxiliary hydraulics (right)

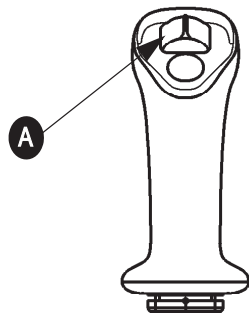
Overview

**Auxiliary hydraulics control/3rd control circuit control**

- ☞ Move slide switch **A** to the left or right
- ☞ Slide switch **A** ensures proportional control of the auxiliary hydraulics circuit/of the 3rd control circuit
- ☞ Button **C** ensures permanent changeover between auxiliary hydraulics and boom swivelling

**Hammer operation****Switching on hammer operation**

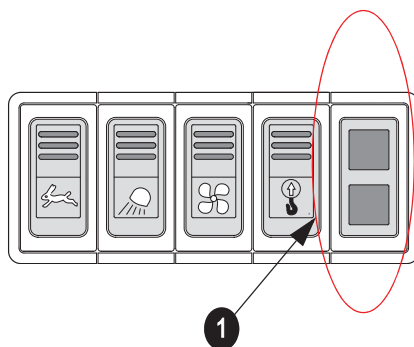
- ☞ Press button **B** permanently on the control lever

**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 curves – status display**

Displays the characteristic curve that has been selected for the control valve.

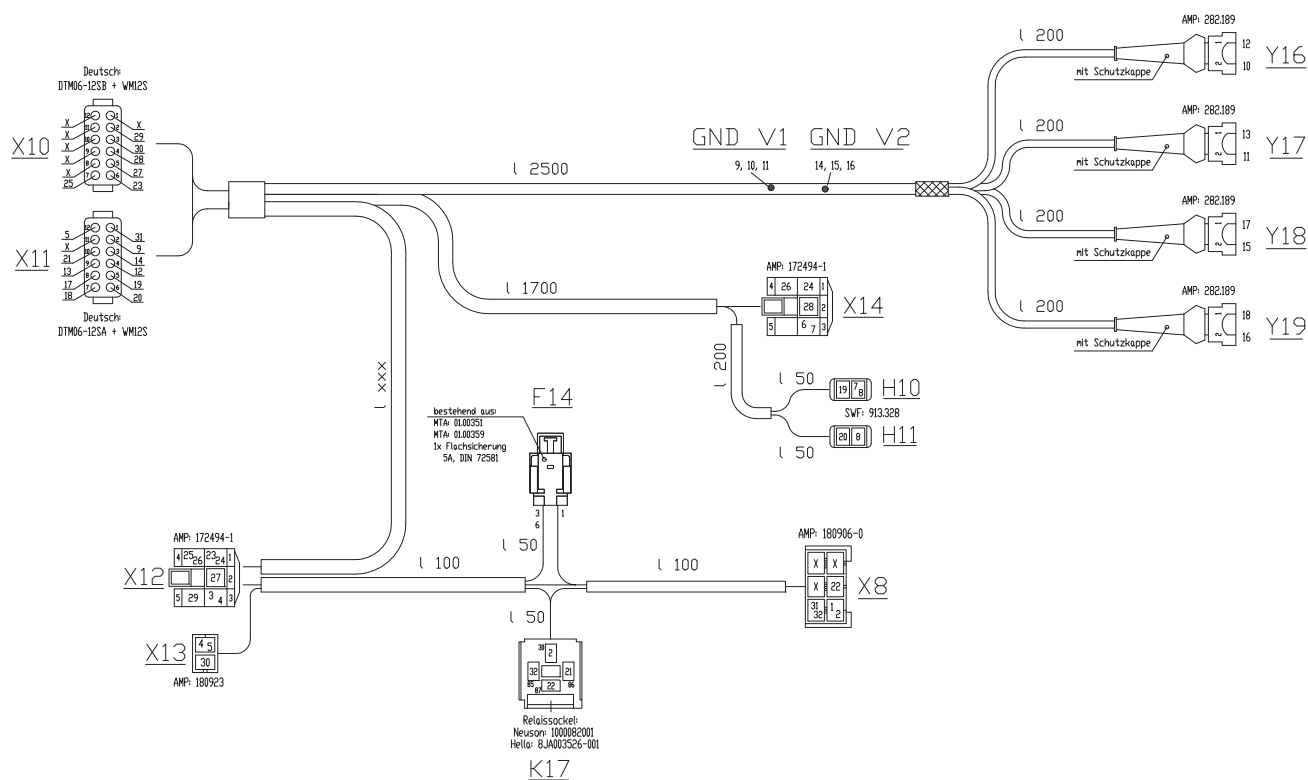
Characteristic curve 1 (slow movements)

- ☞ 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



Ports	Hose designation
X10	Connector 1 control unit
X11	Connector 2 control unit
X12	Joystick (left)
X13	Changeover valve tip switch
F14	Blade-type fuse
K17	Relay changeover valve
X14	Joystick (right)
H10	Proportional circuit 1 telltale
H11	Proportional circuit 2 telltale
X8	Power supply
Y16	Connector 1 for auxiliary hydraulics
Y17	Connector 2 for auxiliary hydraulics
Y18	Connector 1 for 3rd control circuit
Y19	Connector 2 for 3rd control circuit

Control valve plug assignment



X10 digital/analog inputs

PIN	Description	Connections
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

PIN	Description	Connections
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

7.12 Fuel-filling pump

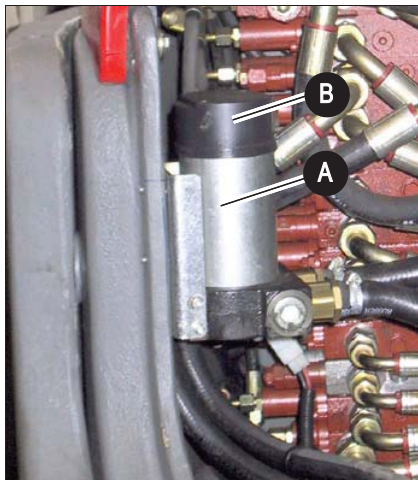


Fig. 10: Fuel-filling pump

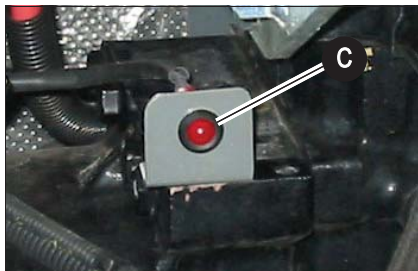


Fig. 11: Fuel-filling pump telltale



Fig. 12: Float switch

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**



Important!

Switch off the fuel-filling pump as soon as telltale **C** comes on, otherwise the fuel tank may overflow and can be damaged.

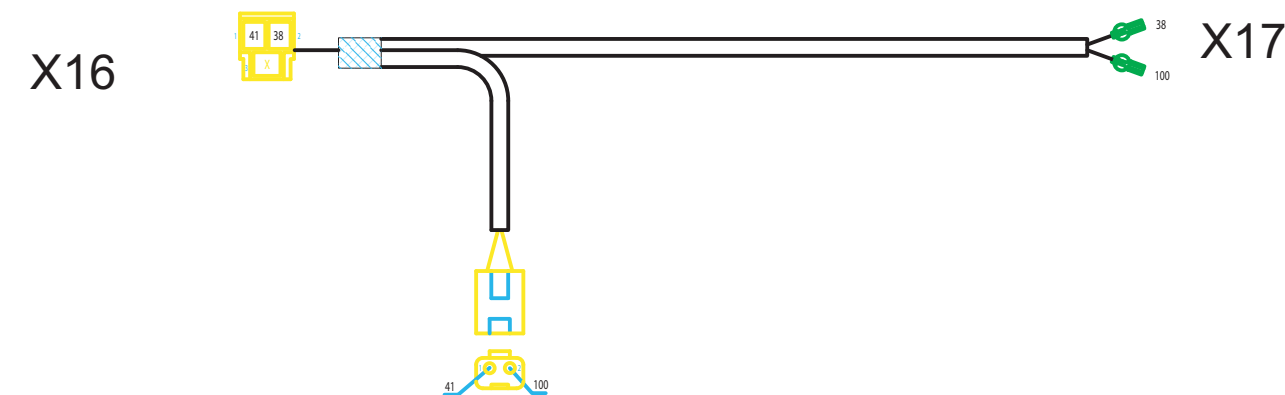
- Bear in mind the fuel tank's maximum capacity

The float switch screwed into the fuel tank triggers the telltale.

Connections

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.

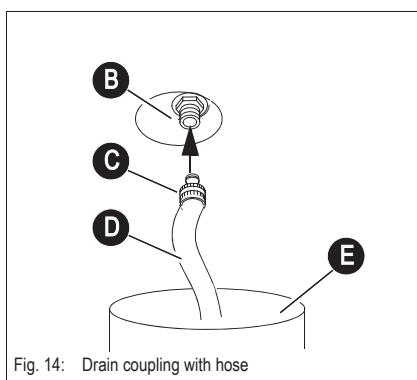
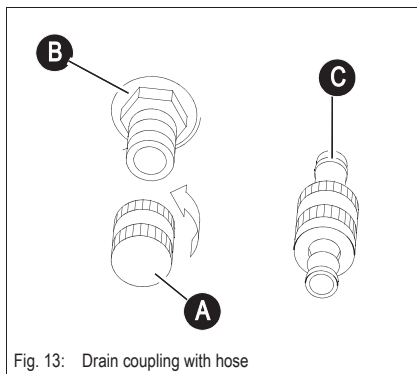


S60

No.	Up to	To	Colour	mm ²
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

7.13 Service valve

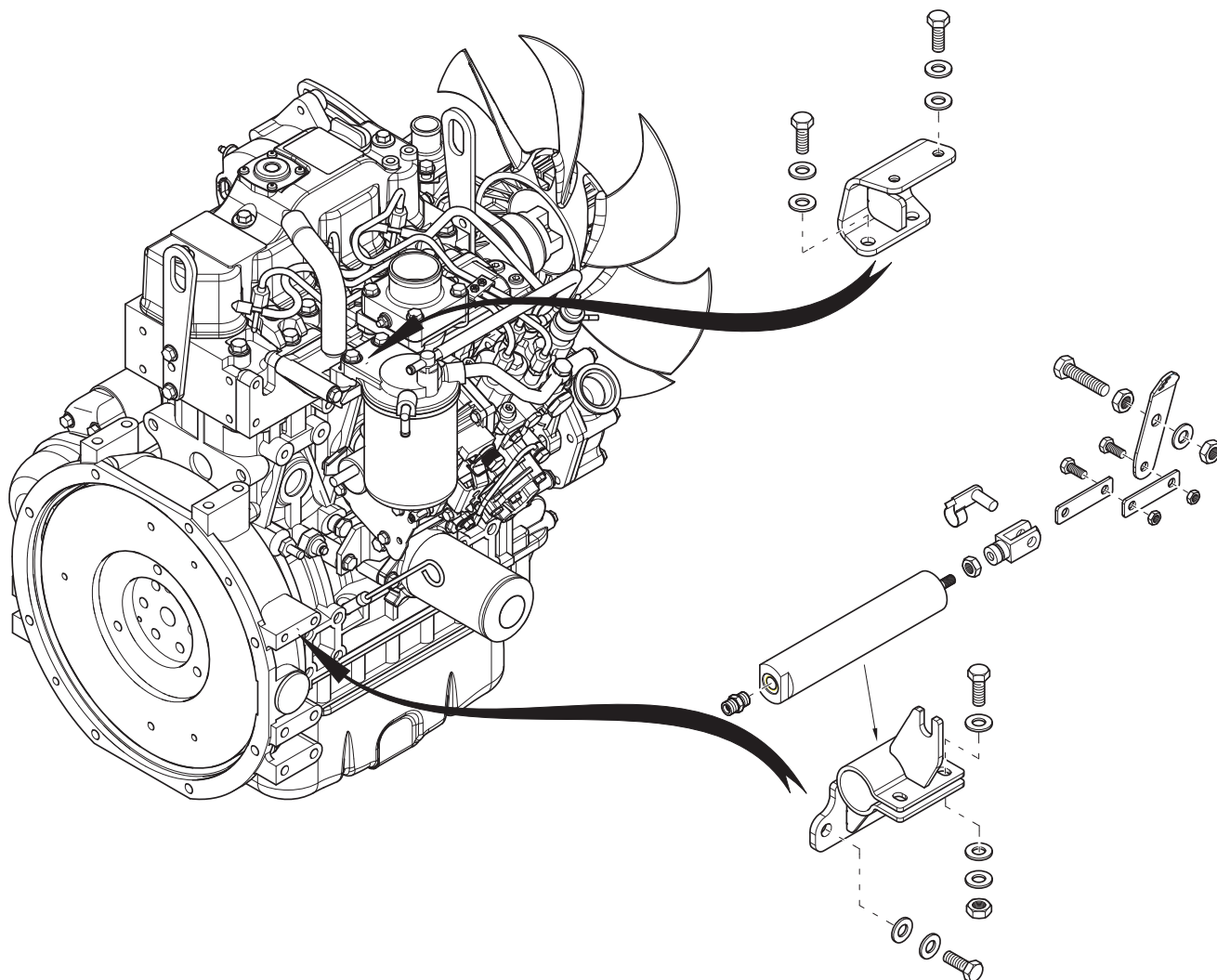
Function



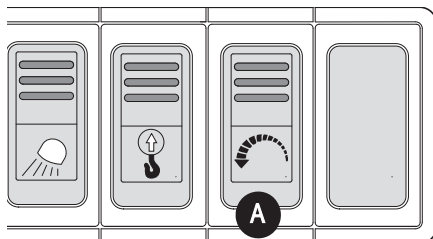
The service valve replaces the conventional oil drain plug by a quick coupler for draining the engine oil more easily.

- Park the machine on level ground
- Let the engine run until reaching service 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
- Completely drain the oil
- Unscrew drain coupling **C**
- Screw on cap **A** of the oil drain valve
- Fill in engine oil
 - *see chapter Filling up engine oil* on page 3-14
- Start the engine and let it run briefly at low revs
- Switch off the engine
- Wait a moment until all the oil has run into the oil sump
- Check the oil level again
- Fill up if necessary and check again
- Completely remove all oil spills from the engine

7.14 Automatic revs setting (Tier 3A from AG00573)



Function

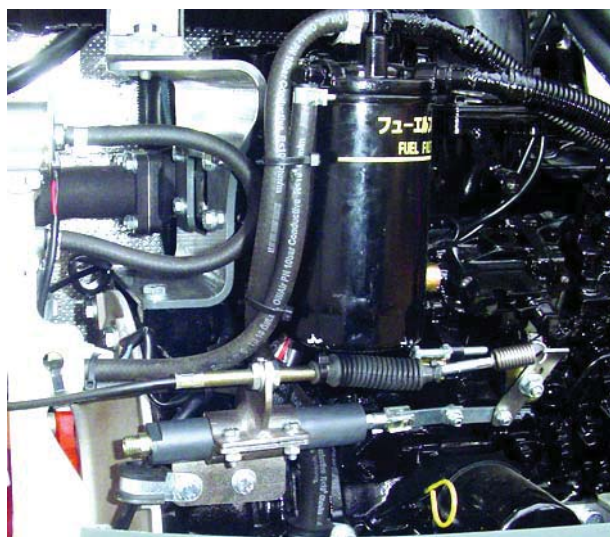
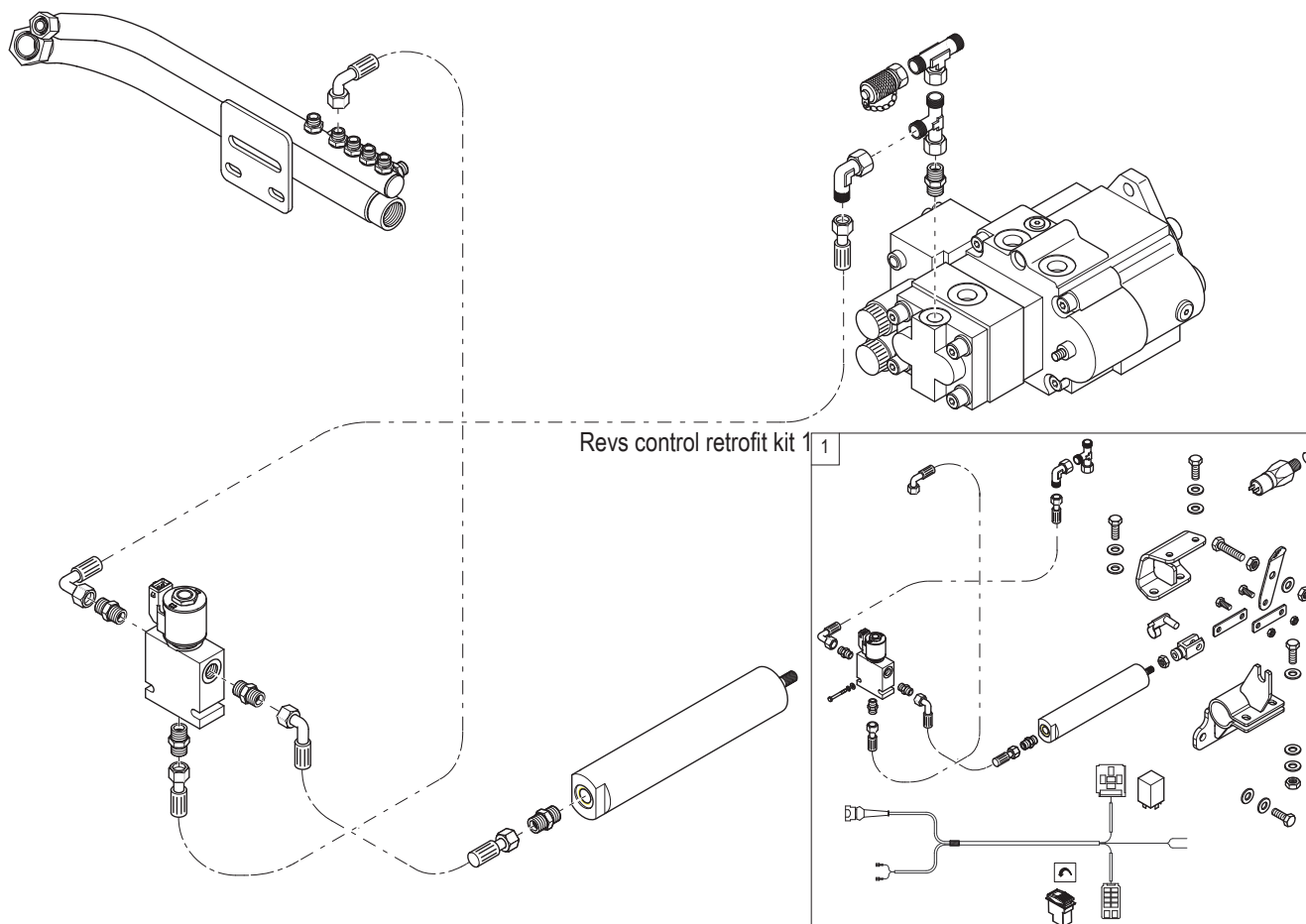


The required diesel engine revs are mechanically adjusted by means of a cable pull, and the manual throttle. The automatic revs setting is enabled via switch **A** in the cab.

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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