

Service Manual

Dumper

1001



Machine model

1001

Edition

1.1

Language

English

Item no.

1000144662

Documentation

Description	Order no.
Operation manual	1000103795
Service manual	1000144662
Spare parts list	1000164057

Legend

Edition	Issued
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The cover features the machine with possible optional equipment.



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Neuson Baumaschinen GmbH

Haidfeldstrasse 37

A-4060 Linz-Leonding

Document: SERV-HB 1001 EN

Order no.: 1000144662

Edition: 1.1

Product evolution:

The 1001 dumper was introduced in 2000 under the name LS850. Series production started in 2001. It was renamed 1001 in 2003. The predecessor to this machine is the LS750 (1002).

Measures taken	<i>Model</i>	<i>Serial number</i>	<i>Modifications</i>
Series introduction	LS850	BA000101F	Series introduction
Name changed	1001	BB000680	No modification
	1001	BB000865	Steering unit modified
	1001	BB001108	Articulated joint improved
	1001	BB001274	Articulated joint improved
	1001	BB001326	Standard colour changed from yellow to red
	1001	BB001361	Parking brake fitted with solenoid valve
	1001	AB100001H	Engine and hydraulic pump modified

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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 service of the machine.

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

Your Neuson dealer will be pleased to answer any further questions regarding the machine or the service manual.

Abbreviations/symbols

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

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

➡ Description of the effects or results of an activity

n. s. = not shown

"Option" = optional equipment

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

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

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

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

1.2 Identification of warnings and dangers

Important indications regarding the safety of the staff and the machine are indicated in this operation manual with the following terms and symbols:



Danger!

Failure to observe the instructions identified by this symbol may 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 may 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 may 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:
 - transporting the usual bulk material and concrete on construction sites
- Every other application is regarded as not designated for the use of the machine. Neuson Baumashinen GmbH will not be liable for damage resulting from use other than mentioned above. The user alone will bear the risk.
Designated use also includes observing the instructions set forth in the operation manual and observing the maintenance and service conditions.
- The safety of the machine can be negatively affected by carrying out machine modifications without proper authority and by using spare parts, equipment, attachments and optional equipment which have not been checked and released by Neuson Baumaschinen GmbH. Neuson Baumaschinen GmbH will not be liable for damage resulting from this
- Neuson Baumaschinen GmbH shall not be liable for personal injury and/or damage to property caused by failure to observe the safety instructions and the operation 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 as well as in the operation and maintenance manuals (machine/engine).
- Read and understand the operation manual before starting up, servicing or repairing the machine. Observe the safety instructions!

1.4 Type labels and component numbers

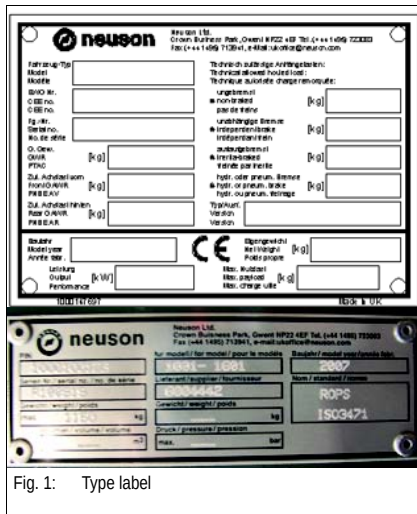


Fig. 1: Type label

Serial number

The serial number is stamped on the machine chassis next to the right-hand side front tyre. It is also located on the type label.

The type label is also located at the front right, on the chassis next to the tyre.

Type label information

Machine model:	1001
EEC no.:	-----
Serial no.:	BB 000000
Gross weight:	-----
Front gross axle weight rating:	1165 KG
Rear gross axle weight rating:	1000 KG
Year of construction:	2004
Output:	12.1 kW
Dead weight:	-----

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

Engine number

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

Example: Yanmar 46557

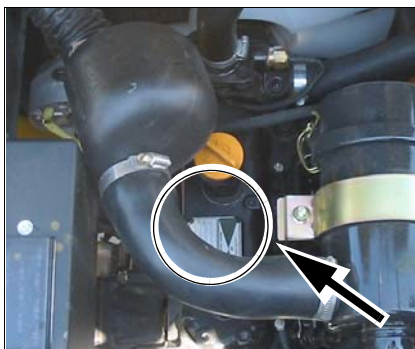


Fig. 2: Diesel engine number

Hydraulic pump number

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



Fig. 3: Hydraulic pump type label

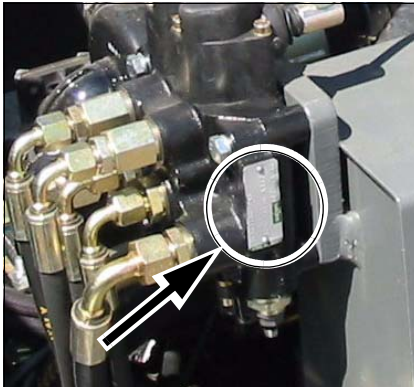


Fig. 4: Hydraulic pump type label

Spool number

The type label (arrow) is located on the spool housing



Fig. 5: Rollbar type label

Rollbar number

The type label (arrow) is located on the rollbar.

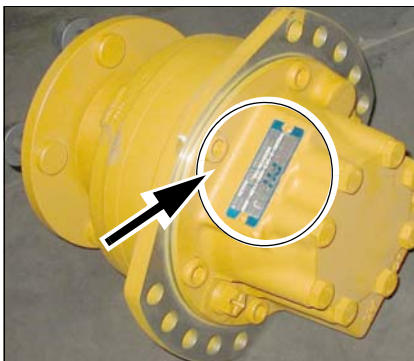


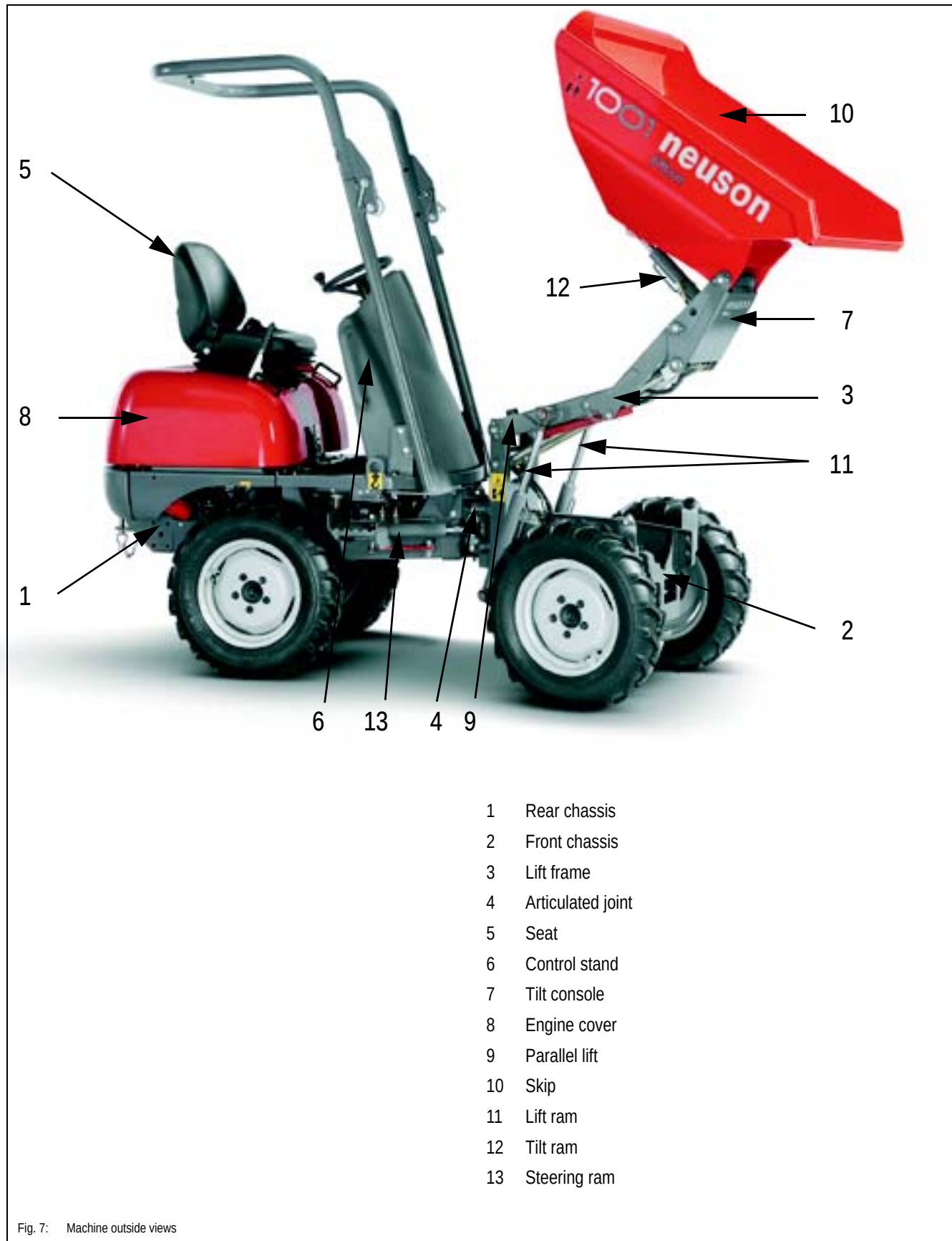
Fig. 6: Travelling drive type label

Hydraulic motor numbers

The type label (arrow) is located on the lower side of the hydraulic motor.

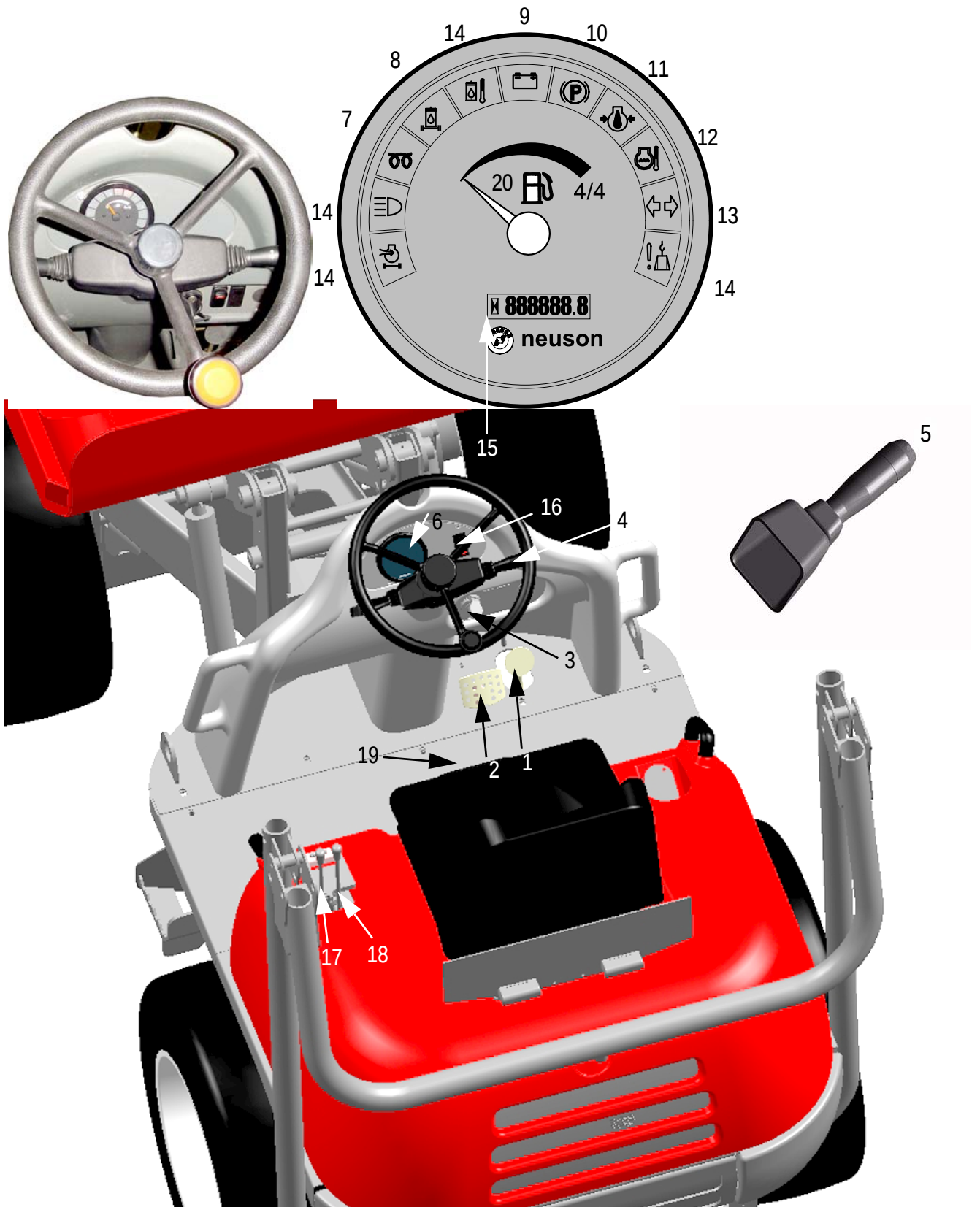


1.5 Machine: overview





1.6 Operating equipment: overview



1.7 Operating equipment: legend

Pos.	Description
1	Accelerator pedal
2	Service brake
3	Ignition lock
4	Forwards-reverse control
5	Horn
6	Instrument panel
7	Preheating telltale
8	Hydraulic oil filter telltale
9	Alternator charge function telltale
10	Parking brake telltale
11	Engine oil pressure telltale
12	Engine temperature telltale
13	Turn indicators
14	Not assigned
15	Hour meter
16	Parking brake
17	Lever for tilting/lowering the skip
18	Lever for raising/lowering the skip
19	Bar for horizontal seat adjustment
20	Fuel level indicator

1.8 Maintenance prop

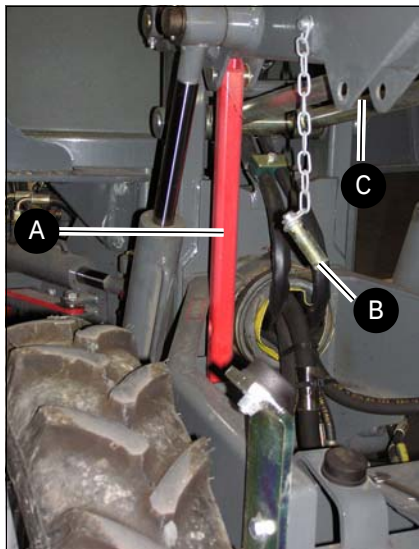


Fig. 8: Maintenance prop



Danger!

Fold down the red maintenance prop before you carry out maintenance work with the lift frame raised.

The maintenance prop shows downwards vertically and is automatically positioned in a socket in case the lift frame should be lowered.

Proceed as follows:

➡ Remove the spring plug from pin **B**

➡ Remove the pin from guide **C**

➡ Fold down maintenance prop **A**



Important!

Fold back the maintenance prop in the reverse order once maintenance work is over.

1.9 Centre pivot prop

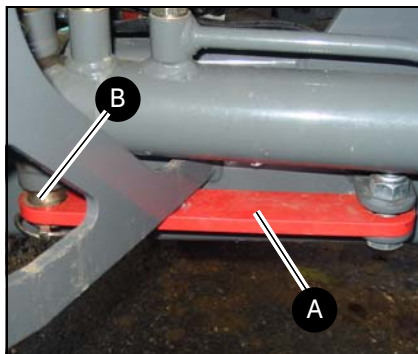


Fig. 9: Centre pivot prop

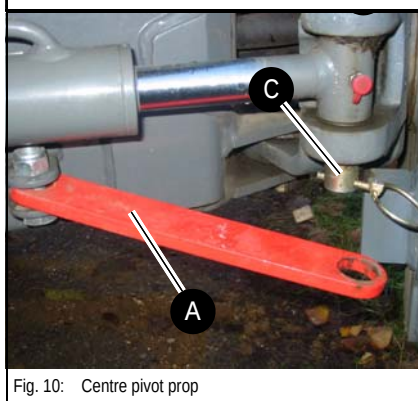


Fig. 10: Centre pivot prop



Danger!

Secure the steering ram with the red centre pivot prop when crane handling the machine.

The centre pivot prop secures the steering ram to prevent steering movements (via the articulated joint) when crane handling the dumper.

Proceed as follows:

- ☞ Remove the spring plug from pin **B**
- ☞ Rotate centre pivot prop **A** towards pin **C**
- ☞ Secure centre pivot prop **A** with the spring plug on pin **C**



Important!

Mount the centre pivot prop back onto pin **B** as soon as the machine is taken into service again.



Specifications



2 Specifications

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine

Engine	Up to BB001360	From AB100001H
Product	Yanmar diesel engine	Yanmar diesel engine
Model	3TNE74-NSR3	3TNV76-XNSV
Design	Water-cooled 4 stroke diesel engine	Water-cooled 4-stroke diesel engine, EPA2
No. of cylinders	3	3
Fuel injection system	Direct injection	Indirect injection
Aspiration	Natural aspiration	Natural aspiration
Cooling system	Water-cooled	Water-cooled/aspirating fan
Lubrication system	Force-feed lubrication with trochoidal pump	Force-feed lubrication with trochoidal pump
Displacement	1006 cm ³	1116 cm ³
Nominal bore and stroke	74 x 78 mm	76 x 82 mm
Output	12.1 kW at 2200 rpm	17 kW
Max. torque	63 Nm	65.8 Nm at 1600 rpm
Max. engine speed without load	2000 rpm	3000 rpm
Idling speed	~860 rpm	1100 +/- 25 rpm
Valve tip clearance (intake = outlet)	0.15 – 0.25 mm (cold)	0.15 – 0.25 mm (cold)
Compression		23.5 : 1
Compression: specified value	35 +/- 1 bar at 250 rpm	35 bar at 250 rpm
Compression: threshold value		28 bar at 250 rpm
Engine oil pressure under full load	3 – 4 bar	0.3 – 0.45 bar
Pressure switch for engine oil pump	0.5 +/- 0.1 bar	0.5 +/- 0.1 bar
Thermostat opens at	69.5 – 72.5 °C	69.5 – 72.5 °C
Thermal switch	107 – 113 °C	107 – 113 °C
Firing order	1 – 3 – 2	1 – 3 – 2
Direction of rotation	Counterclockwise (as seen from the flywheel)	Counterclockwise (as seen from the flywheel)
Starting aid	Glow plug (preheating time 10 – 15 seconds)	Glow plugs (preheating time 4 seconds)
Max. inclined position (engine no longer supplied with oil):	25°/45% in all directions	25°/46 % in all directions 30°/58 % for 3 minutes Observe the machine's climbing ability (30°/58 %)!
Specific fuel consumption		272 g/kWh
Exhaust values according to	97/68/EC	EPA Tier II

Specifications


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Fuel injection pump

Model	
Design	In-line fuel injection pump
Injection pressure	120 ⁺¹⁰ bar
Revs control	Mechanical
Injection time	16°
Lubrication system	Forced feed lubrication

Engine capacities

Capacities	Up to BB001360	From AB100001H
Fuel tank	15 l	15 l
Engine oil (max./effect.)	2.25 l/1.0 l	2.25 l/1.0 l
Coolant (without radiator)	0.9 l	0.9 l
Radiator	3.1 l	1.2 l
Expansion tank	0.84 l	0.5 l

Overview of capacities: – [see Fluids and lubricants](#) on page 3-1

Engine tightening torques

Tightening torques	Up to BB001360	From AB100001H
Cylinder-head bolt	60.0 – 65.0 (M9x1.25)	53.9 – 57.9 Nm (M9x1.25)
Connecting rod bearing screw	23.0 – 28.0 (M7x1)	22.6 – 27.5 Nm (M7x1)
Main bearing screw	80.0 – 85.0 (M10x1.25)	75.5 – 81.5 Nm (M10x1.25)
Flywheel screw	80.0 – 90.0 (M10x1.25)	80.4 – 86.4 Nm (M10x1.25)



2.3 Travelling drive

Variable displacement pump	Up to BB001360	From AB100001H
Design	Axial piston pump	Axial piston variable displacement pump
Displacement	0 – 45 cm³/rev	0 – 28 cm³/rev
Flow rate	99 l/min	54.6 kW
Max. service pressure	360 bar	350 bar
Boost pump (integrated in variable displacement pump)		
Design	Gear pump	Gear pump
Displacement	11.6 cm³/rev	6.1 cm³/rev
Flow rate		25 l/min
Charging/boost pressure	20 bar	25 bar

2.4 Brakes

Service brake/ parking brake	Up to BB001360	From AB100001H
Design	Hydrostatic	Pedal-operated hydrostatic drive brake
Location		Rear hydraulic motors
Effect		Hydraulic parking brake for auxiliary brake and parking brake with hand brake valve control

2.5 Steering system

Steering system	Model 1001
Design	Hydrostatic chassis articulation steering with emergency steering features.
Steering mode	Chassis articulation steering

2.6 Work hydraulics

Work hydraulics	A10VG45 DA1D2 up to BB001360	A10VG28 DA1D2 from AB100001H
Hydraulic pump displacement	8.3 cm³/rev	28 cm³/rev
Hydraulic pump flow rate	18 l/min	109 l/min
Control valve	2 sections	2 sections
Max. service pressure	170 bar	350 bar
Secondary pressure limiting for steering ram	150 bar	150 bar
Hydraulic oil cooler	Standard	Standard
Hydraulic tank capacity	20 l	20 l

2.7 Loader unit

Loader unit	Model 1001
Skip capacity	415 l struck
	525 l heaped
	275 l liquid capacity
Payload	1000 kg

Specifications

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2.8 Drive specifications

Steering system		Model 1001
Drive speed		0 – 14 kph
Articulation		+/- 33°
Oscillation		+/- 15°
Outside turning radius		3200 mm
Hill climbing ability		45 %
Safe authorised inclination		20 % in all directions
Max. authorised lateral inclination with narrow tyres		10 %

2.9 Vibration

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

* Measured according to 2002/44/EC. Machine and attachment operation and maintenance as per operation manual.

2.10 Electric system (up to BB001360)

Electric system

Alternator	12 V 20 A
Starter	12 V 1.2 kW
Battery	12 V 74 Ah

Fuse box

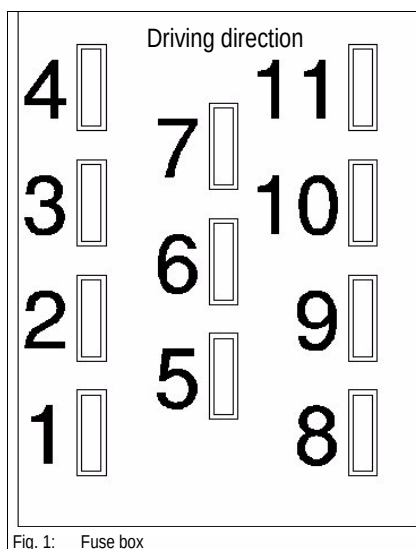


Fig. 1: Fuse box

Fuse no.	Rated current (A)	Protected circuit
1	30 A	– Cutoff solenoid, cutoff solenoid time lag relay
2	7.5 A	– Horn
3	7.5 A	– Alternator governor
4	7.5 A	– Solenoid valve pump
5	7.5 A	– Light switch
6		– Not assigned
7		– Not assigned
8	7.5 A	– Telltales
9		– Not assigned
10		– Not assigned
11		– Not assigned

Relays

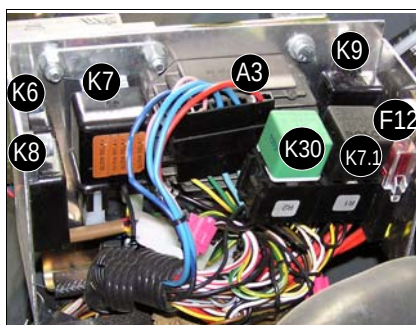


Fig. 2: Relays

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

Switching relay no.	Protected circuit
K 6	– Preheating time lag relay
K 8	– Cutoff solenoid time lag relay
K 7	– High current relay – start
K 9	– Cutoff solenoid switching relay
K 30	– Relay for parking brake warning buzzer
K 7.1	– Start interlock relay
A3	– Regulator
F12	– Main fuse

2.11 Electric system (from AB100001H)

Electric system	
Alternator	12 V 20 A
Starter	12 V 1.2 kW
Battery	12 V 45 Ah

Fuse box

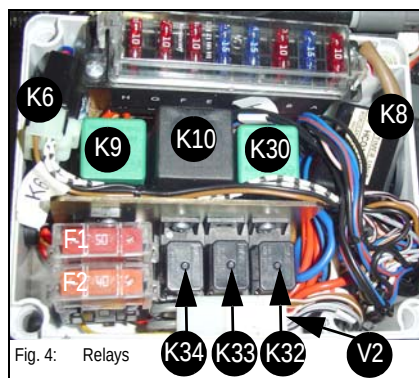
The fuse box is located on the right-hand side of the machine under the engine cover.



Fuse no.	Rated current (A)	Protected circuit
F 3	10 A	– Cutoff solenoid, cutoff solenoid time lag relay
F 4	15 A	– Drive solenoid valves
F 5	10 A	– Horn, parking brake, brake lights
F 6	15 A	– Turn indicators
F 7	15 A	– High beam
F 8	10 A	– Low beam
F 9	10 A	– Position light
F10	10 A	– Hazard warning system

Relays

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



Switching relay no.	Protected circuit
K 6	– Preheating time lag relay
K 8	– Cutoff solenoid time lag relay
K 9	– Cutoff solenoid switching relay
K 10	– Turn indicator relay
K 30	– Parking brake relay
K 32	– Start interlock relay
K 33	– Low beam relay
K 34	– High beam relay
V2	– Diodes
F 1, 2	– Main fuses

Parking brake relay



Fig. 5: Parking brake relay

2.12 Tyres

Tyre size	Tyre pressure		Wheel offset
	Front	Rear	
10.00/7.5x15	3 bar	3 bar	20
6.0 x 16 (optional narrow tyres)	3 bar	3 bar	25

2.13 Noise levels

Sound power level	Up to BB001360	From AB 100001H
Sound power level (L_{WA})	102 dB (A)	101 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.

2.14 Coolant compound table

Outside temperature	Coolant			
	Water	Anticorrosion agent		Antifreeze agent
Up to °C	% by volume	cm ³ /l	% by volume	% by volume
4	99	10	1	–
-10	79			20
-20	65			34
-25	59			40
-30	55			44



2.15 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	Width across flats	Tightening torque
05	6L	M12X1.5	W/F 14	15 Nm
06	8L	M14X1.5	W/F 17	20 Nm
08	10L	M16X1.5	W/F 19	40 Nm
10	12L	M18X1.5	W/F 22	50 Nm
12	15L	M22X1.5	W/F 27	75 Nm
16	18L	M26X1.5	W/F 32	85 Nm
20	22L	M30X2	W/F 36	100 Nm
25	28L	M36X2	W/F 41	180 Nm
32	35L	M45X2	W/F 55	220 Nm

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	Width across flats	Tightening torque
05	8S	M16X1.5	W/F 19	40 Nm
06	10S	M18X1.5	W/F 22	50 Nm
08	12S	M20X1.5	W/F 24	60 Nm
10	14S	M22X1.5	W/F 27	75 Nm
12	16S	M24X1.5	W/F 30	90 Nm
16	20S	M30X2	W/F 36	100 Nm
20	25S	M36X2	W/F 41	180 Nm
25	30S	M42X2	W/F 50	270 Nm
32	38S	M52X2	W/F 60	400 Nm

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

Screw connections with various seals for hydraulic applications (light execution)					
Thread	Straight pipe fitting with thread and screwed plug			Non-return valve with elastic seal	Identification aid outside Ø
	Sealing washer	Elastic seal	O-ring		
M10X1.0	9 Nm	18 Nm	15 Nm	18 Nm	10 mm
M12X1.5	20 Nm	25 Nm	25 Nm	25 Nm	12 mm
M14X1.5	35 Nm	45 Nm	35 Nm	35 Nm	14 mm
M16X1.5	45 Nm	55 Nm	40 Nm	50 Nm	16 mm
M18X1.5	55 Nm	70 Nm	45 Nm	70 Nm	18 mm
M22X1.5	65 Nm	125 Nm	60 Nm	125 Nm	22 mm
M27X2.0	90 Nm	180 Nm	100 Nm	145 Nm	27 mm
M33X2.0	150 Nm	310 Nm	160 Nm	210 Nm	33 mm


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

M42X2.0	240 Nm	450 Nm	210 Nm	360 Nm	42 mm
M48X2.0	290 Nm	540 Nm	260 Nm	540 Nm	48 mm
G1/8A	9 Nm	18 Nm	15 Nm	18 Nm	9.73 mm
G1/4A	35 Nm	35 Nm	30 Nm	35 Nm	13.16 mm
G3/8A	45 Nm	70 Nm	45 Nm	50 Nm	16.66 mm
G1/2A	65 Nm	90 Nm	55 Nm	65 Nm	20.96 mm
G3/4A	90 Nm	180 Nm	100 Nm	140 Nm	26.44 mm
G1A	150 Nm	310 Nm	160 Nm	190 Nm	33.25 mm
G1 1/4A	240 Nm	450 Nm	210 Nm	360 Nm	41.91 mm
G1 1/2A	290 Nm	540 Nm	260 Nm	540 Nm	47.80 mm

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		
M12X1.5	20 Nm	35 Nm	35 Nm	35 Nm	12 mm
M14X1.5	35 Nm	55 Nm	45 Nm	45 Nm	14 mm
M16X1.5	45 Nm	70 Nm	55 Nm	55 Nm	16 mm
M18X1.5	55 Nm	90 Nm	70 Nm	70 Nm	18 mm
M20X1.5	55 Nm	125 Nm	80 Nm	100 Nm	20 mm
M22X1.5	65 Nm	135 Nm	100 Nm	125 Nm	22 mm
M27X2.0	90 Nm	180 Nm	170 Nm	135 Nm	27 mm
M33X2.0	150 Nm	310 Nm	310 Nm	210 Nm	33 mm
M42X2.0	240 Nm	450 Nm	330 Nm	360 Nm	42 mm
M48X2.0	290 Nm	540 Nm	420 Nm	540 Nm	48 mm
G1/8A	35 Nm	55 Nm	45 Nm	45 Nm	13.16 mm
G1/4A	45 Nm	80 Nm	60 Nm	60 Nm	16.66 mm
G3/8A	65 Nm	115 Nm	75 Nm	100 Nm	20.96 mm
G1/2A	90 Nm	180 Nm	170 Nm	145 Nm	26.44 mm
G3/4A	150 Nm	310 Nm	310 Nm	260 Nm	33.25 mm
G1A	240 Nm	450 Nm	330 Nm	360 Nm	41.91 mm
G1 1/4A	290 Nm	540 Nm	420 Nm	540 Nm	47.80 mm

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

Specifications


neuson

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
M5	5.5 Nm	8 Nm	10 Nm	5 Nm	7 Nm
M6	10 Nm	14 Nm	17 Nm	8.5 Nm	12 Nm
M8	25 Nm	35 Nm	42 Nm	20 Nm	30 Nm
M10	45 Nm	65 Nm	80 Nm	40 Nm	59 Nm
M12	87 Nm	110 Nm	147 Nm	69 Nm	100 Nm
M14	135 Nm	180 Nm	230 Nm	110 Nm	160 Nm
M16	210 Nm	275 Nm	350 Nm	170 Nm	250 Nm
M18	280 Nm	410 Nm	480 Nm	245 Nm	345 Nm
M20	410 Nm	570 Nm	690 Nm	340 Nm	490 Nm
M22	550 Nm	780 Nm	930 Nm	460 Nm	660 Nm
M24	710 Nm	1000 Nm	1190 Nm	590 Nm	840 Nm
M27	1040 Nm	1480 Nm	1770 Nm	870 Nm	1250 Nm
M30	1420 Nm	2010 Nm	2400 Nm	1200 Nm	1700 Nm

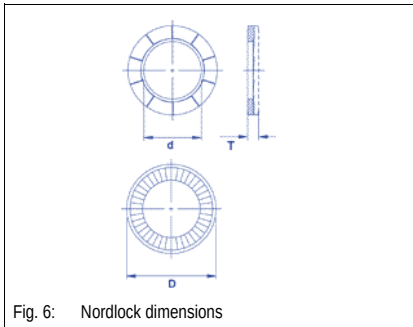
DIN 912 – hexagon socket head cap screw; DIN 931/DIN 933 – hexagon head screw with/without shaft;
 DIN 7984 – hexagon socket head cap screw with short head
 All values subject to a friction coefficient of $\mu = 0.12$ and are to be used as approximate figures.

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
M8X1.0	25 Nm	37 Nm	43 Nm	22 Nm	32 Nm
M10X1.0	50 Nm	75 Nm	88 Nm	43 Nm	65 Nm
M10X1.25	49 Nm	71 Nm	83 Nm	42 Nm	62 Nm
M12X1.25	87 Nm	130 Nm	150 Nm	75 Nm	110 Nm
M12X1.5	83 Nm	125 Nm	145 Nm	72 Nm	105 Nm
M14X1.5	135 Nm	200 Nm	235 Nm	120 Nm	175 Nm
M16X1.5	210 Nm	310 Nm	360 Nm	180 Nm	265 Nm
M18X1.5	315 Nm	450 Nm	530 Nm	270 Nm	385 Nm
M20X1.5	440 Nm	630 Nm	730 Nm	375 Nm	530 Nm
M22X1.5	590 Nm	840 Nm	980 Nm	500 Nm	710 Nm
M24X2.0	740 Nm	1070 Nm	1250 Nm	630 Nm	900 Nm
M27X2.0	1100 Nm	1550 Nm	1800 Nm	920 Nm	1300 Nm
M30X2.0	1500 Nm	2150 Nm	2500 Nm	1300 Nm	1850 Nm

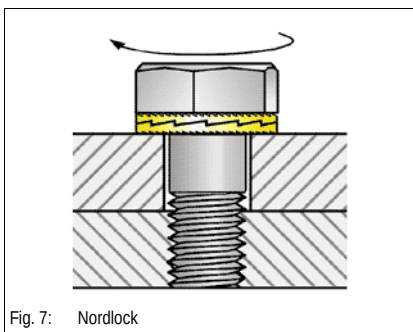
DIN 912 – hexagon socket head cap screw; DIN 931/DIN 933 – hexagon head screw with/without shaft;
 DIN 7984 – hexagon socket head cap screw with short head
 All values subject to a friction coefficient of $\mu = 0.12$ and are to be used as approximate figures.



Tightening moments for Nordlock lock washers



Standard dimensions				
Thread	d (mm)	D (mm)	T (mm)	Mv (Nm)
M3	3.2	7.0	1.8	1.5
M4	4.3	9.0	1.8	3.5
M5	5.2	9.0	1.8	7.2
M6	6.5	10.8	1.8	12
M8	8.2	13.5	2.6	30
M10	10.3	16.6	2.6	59
M12	13.0	19.5	2.6	103
M14	14.5	23.0	3.7	160
M16	17.0	25.4	3.7	250
M18	19.5	29.0	3.7	350
M20	21.0	30.7	3.7	490
M22	22.9	34.5	3.7	660
M24	26.0	39.0	3.7	850
M27	28.5	42.0	4.6	1220
M30	30.5	47.0	4.6	1600
M33	33.5	48.5	4.6	2200
M36	36.6	56.0	4.6	2900
M39	39.5	58.5	4.6	3800



Dimensions with larger outside diameters (oblong bores)				
Thread	d (mm)	D (mm)	T (mm)	Mv (Nm)
M6	6.5	13.5	2.6	13
M8	8.6	16.6	2.6	32
M10	10.3	21.0	2.6	64
M12	13.0	25.4	3.7	110
M16	17.0	30.7	4.0	260

2.16 Dimensions model 1001

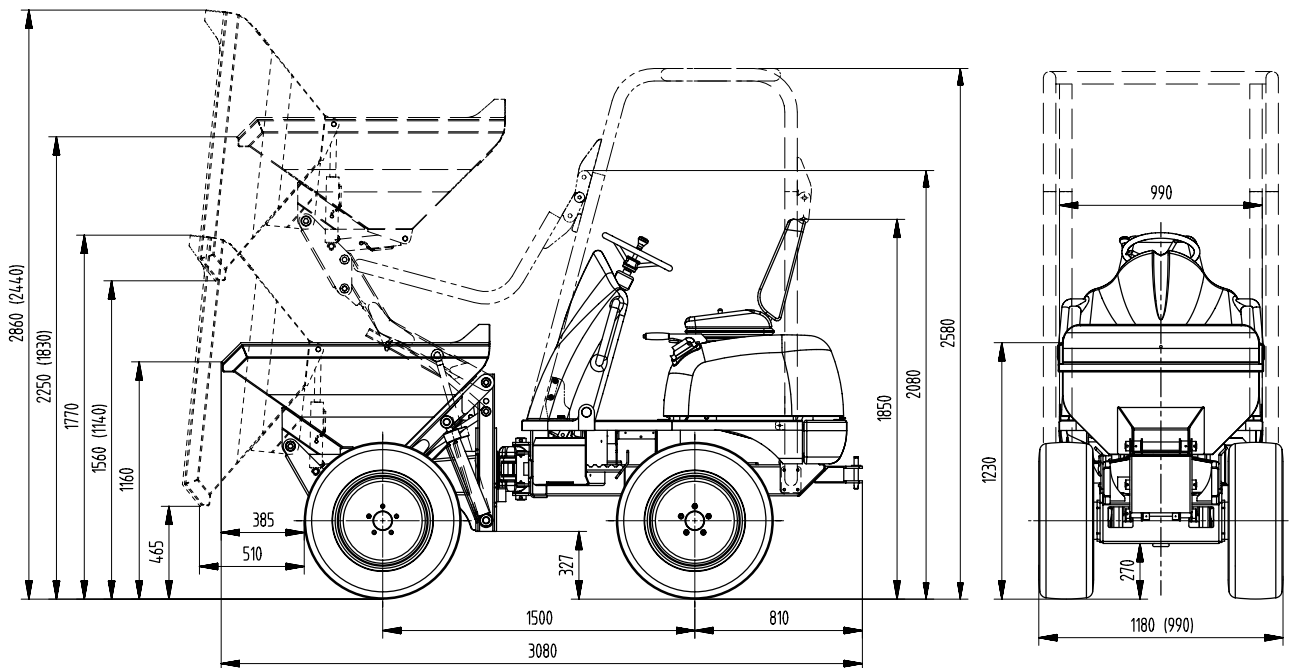


Fig. 8: Machine dimensions (model 1001)

Main data	Model 1001
Dead weight	1165 kg
Overall height	2580 mm
Overall height with rollbar folded down	2080 mm
Overall height without rollbar	1850 mm
Overall width	1180 mm
Overall width (narrow version)	990 mm
Ground clearance	270 mm
Wheelbase	1500 mm
Outside turning radius	3200 mm

Maintenance



3 Maintenance

3.1 Fluids and lubricants

Component/ application	Engine/machine fluid	Specification	Season/ temperature	Capacities ¹
Diesel engine	Engine oil	API CD, CF, CF-4, CI-4	- 20 °C +40 °C	5.8 l
		ACEA: E3, E4, E5 (SAE 10W40) ²		
Hydraulic oil tank	Hydraulic oil	HVLP46 ³	Year-round	25 l
	Biodegradable oil ⁴	PANOLIN HLP Synth 46		
		FINA BIOHYDRAN SE 46		
		BP BIOHYD SE-46		
Grease nipples	Multipurpose grease ⁵	FINA Energrease L21 M	Year-round	As required
Battery terminals	Acid-proof grease ⁶	FINA Marson L2	Year-round	As required
Fuel tank	Diesel fuel	2-D ASTM D975 – 94 (USA)		15 l
		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 tem- peratures	
		BS 2869 – A2 (GB)		
Radiator	Coolant	Soft water + antifreeze ASTM D4985	Year-round	4 l
		Distilled water + antifreeze ASTM D4985		

1. The capacities indicated are approximative values; the oil level check alone is relevant for the correct oil level

Capacities indicated are no system fills

2. According to DIN 51511

3. According to DIN 51524 section 3

4. Hydraulic ester oils (HEES)

5. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS₂ additive

6. Standard acid-proof grease



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														
		SAE 10W-40														
		API CD, CF, CF-4, CI-4 ACEA: E3, E4, E5	SAE 15W-40													
			SAE 20													
			SAE 30													
			SAE 40													
	°F	-4	5	14	23	32	41	50	59	68	77	86	95	104		



3.3.2 Maintenance plan (overview)		Work description For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	Maintenance plan/service hours (s/h)						Authorised workshop
			Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Customer		
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 if fouling indicator is at "Service"							•		
• Coolant								•	
• Hydraulic oil filter insert ⁴				•				•	
• Hydraulic oil ⁵					•			•	
Inspection work ():									
Check the following material. Refill if necessary:									
• Engine oil			•					•	
• Engine coolant			•					•	
• Hydraulic oil			•					•	
Clean water ducts ⁶						•		•	
Check engine cooler and hydraulic oil for contamination. Clean if necessary			•				•		
Check cooling systems, heating and hoses for leakages and pressure (visual check)			•				•		
Check the pilot control filter on the main valve block for dirt, clean it if necessary ⁷						•			
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							•	•	



3.2 Maintenance plan (overview)	Work description For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	Maintenance plan/service hours (s/h)					Authorised workshop
		Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Customer	
		Clean and adjust the fuel injection pump ⁸			●		●
		Check and adjust the injection pressure of the injection nozzles, clean the injection needles/nozzles			●		●
		Check and adjust injection time ⁹			●		●
		Empty diesel fuel tank ¹⁰		●			●
	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			●			●
	Pressure check of primary pressure limiting valves ¹¹		●	●			●
	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 ⁸		●	●			●
	Check pin lock	●				●	
	Check line fixtures	●				●	
	Check telltales for correct function		●	●			●
	Couplings, dirt pile-up on hydraulic system dust caps if necessary	●				●	
	Check insulating mats in the engine compartment for damage/condition		●			●	
	Check labels and operation manual for completeness and condition		●			●	
	Lubrication service (): Lubricate the following assemblies/components (all grease nipples): • Stabiliser blade • Swivelling console						
		●				●	
		●				●	



3.2 Maintenance plan (overview)	Work description For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	Maintenance plan/service hours (s/h)					Authorised workshop
		Maintenance work (once a day)	Every 50 s/h	Every 500 s/h	Every 1000 s/h once a year	Customer	
	• Lift frame	●				●	
	• Stick	●				●	
	• Attachments	●				●	
	• Grease strip on chassis	●				●	
	Functional check (): Check the function of the following assemblies/components. Rectify if necessary:						
	• Lights, signalling system, acoustic warning system ¹²		●	●			●
	Leakage check (): Check for tightness, leaks and chafing: pipes, flexible lines and screw connections of the following assemblies and components. Rectify if necessary:						
	• Visual check	●				●	
	 Engine, hydraulic system and hydraulic components	●				●	
	 Cooling circuit	●				●	
	 Travelling drive	●				●	
	1. Drain engine oil the first time after 50 s/h, then every 250 s/h						
	2. Replace the engine oil filter the first time after 50 s/h, then every 250 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. Replace the hydraulic oil the first time after 500 s/h, then every 1000 s/h						
	6. Clean the water ducts every other 1000 s/h servicing						
	7. Coarse dirt causes malfunctions and can even destroy the filter screen!						
	8. Clean and adjust the fuel injection pump every other 1000 s/h servicing						
	9. Check and adjust the fuel injection time every other 1000 s/h servicing						
	10. Empty the fuel tank every 250 s/h						
	11. First check after 50 s/h, then every 500 s/h						
	12. Check the first time at 50 s/h, then every 500 s/h						



3.3 Service package

1000163375	1	Service package 1001
1000003052	1	➡ Engine oil filter
1000147873	1	➡ Fuel filter insert
1000005134	1	➡ Water separator element
1000019708	2	➡ O-ring
1000050807	1	➡ Filter element
1000141558	1	➡ Air filter element
1000141559	1	➡ Air filter element
1000071058	2	➡ Sealing ring
1000148554	1	➡ Cylinder-head cover gasket

3.4 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 operation manual
- The operation manuals of the attachments.

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

Dirt may 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 3-3).

3.5 Fuel system

Specific safety instructions

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

Refuelling

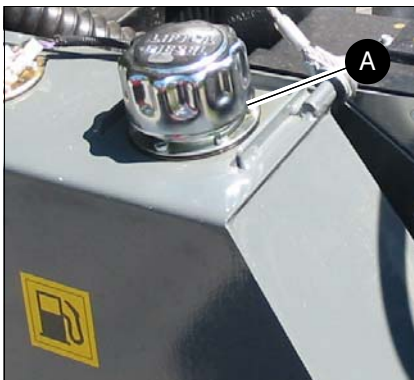


Fig. 1: Fuel filler inlet

Filler inlet A for the fuel tank is located under the engine cover, 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 3-9.



Important!

Fill up the tank with the correct fuel type at the end of each working day. This prevents condensation water from forming in the fuel tank over night. Do not fill the tank completely but leave some space for the fuel to expand.

Stationary fuel pumps**General**

Only refuel from stationary fuel pumps. Fuel from barrels or cans is usually contaminated. Even the smallest particles of dirt can cause:

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

Refuelling from barrels

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

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

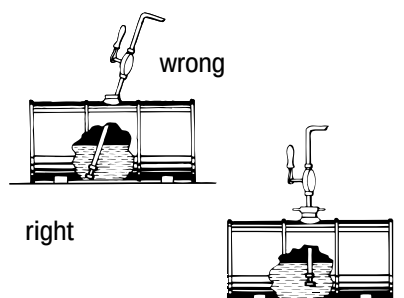


Fig. 2: Refuelling from a barrel

Diesel fuel specification**Use only high-grade fuels**

Grade	Cetane number	Use
• No. 2-D according to DIN 51601	Min. 45	For normal outside temperatures
• No. 1-D according to DIN 51601		For outside temperatures below 4 °C or for operation above 1500 m 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*
- ☞ *Fill in fuel in the main fuel filter and prefilter, and mount both filters*
- ☞ *Check whether the stop cocks are open*
- ☞ *Slacken the injection lines on the injection nozzles*
- ☞ *Pump the breather pump until the fuel escapes from the slackened injection lines without air*
- ☞ *Tighten the injection lines*

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



Fuel prefilter with water separator

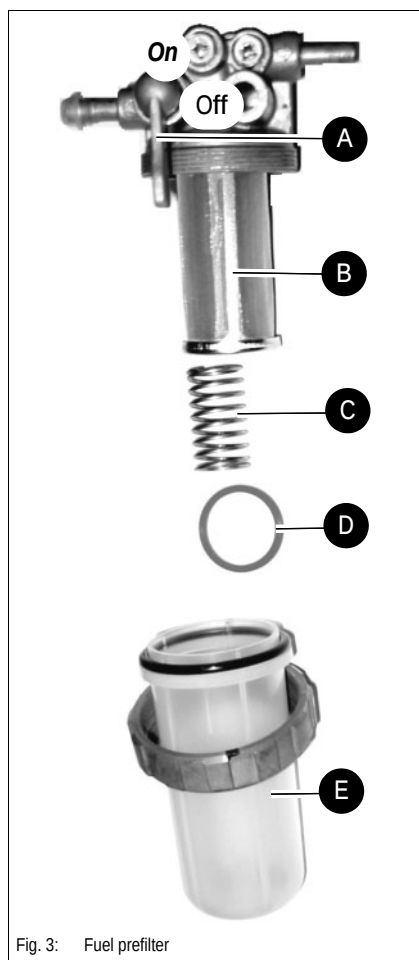


Fig. 3: Fuel prefilter

Check the fuel prefilter as follows:

- If the red indicator ring **D** in sight glass **E** rises
 - ☞ Remove the housing (sight glass) and clean it
 - ☞ Remove and clean filter insert **B**
 - ☞ Mount filter insert
 - ☞ Mount the housing (sight glass) with the maintenance display (red ring) and spring **D**
 - ☞ Open stop cock **A**

Interrupt fuel supply as follows:

- ☞ Turn ball-type cock **A** to the **OFF** mark
 - ➔ Fuel supply is interrupted
- ☞ Turn ball-type cock **A** 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



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!

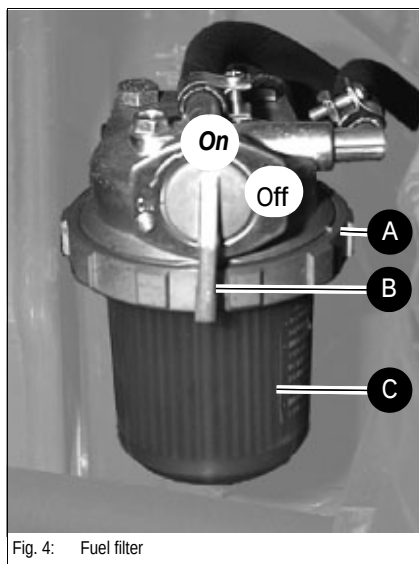


Fig. 4: Fuel filter

Removing the fuel filter

- ☞ *Close fuel cock B*
- ☞ *Slacken union nut A*
Caution: the filter housing contains fuel
- ☞ *Remove filter housing C*

Mounting the fuel filter

- ☞ *Mount all elements in the reverse order with a new filter element*
- ☞ *Open the stop cock on the water separator again*
- ☞ *Bleed the fuel system – see Bleeding the fuel system on page 3-9*
- ☞ *Make a test run – and check for tightness!*
- ☞ *Dispose of the old fuel filter cartridge by an ecologically safe method*

3.6 Engine lubrication system



Caution!

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

Engine damage or loss of output!

☞ *Have the oil changed by an authorised workshop
– see [chapter 3.2 Maintenance plan \(overview\)](#) on page 3-3*

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!
- Let the engine cool down
- Open the engine cover
- Clean the area around the oil dipstick with a lint-free cloth
- Pull out oil dipstick A
- Wipe it with a lint-free cloth
- Push 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*

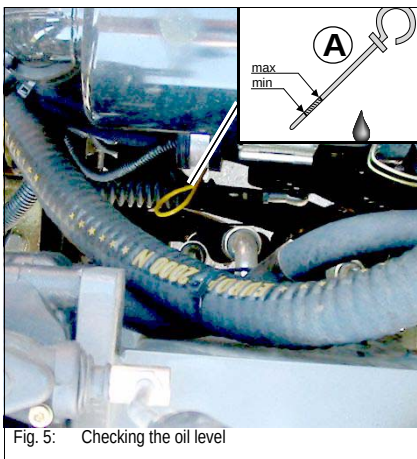


Fig. 5: Checking the oil level

Filling up engine oil



Caution!

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

- ☞ Do not add engine oil above the MAX mark of oil dipstick 6/A
- ☞ Use only the specified engine oil



Environment!

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

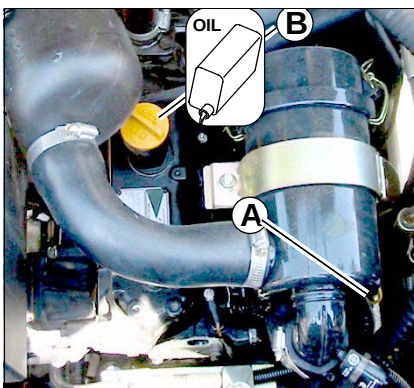


Fig. 6: Oil dipstick and oil filler cap

☞ Proceed as follows:

- Clean the area around oil filler cap B with a lint-free cloth
- Open filler cap B
- Raise oil dipstick A slightly to allow any trapped air to escape
- Fill in engine oil
- Wait about 3 minutes until all the oil has run into the oil sump
- Check the oil level – see *Checking the oil level* on page 3-12
- Fill up if necessary and check the oil level again
- Close filler cap B
- Push oil dipstick A back in as far as possible
- Completely remove all oil spills from the engine

Changing engine oil

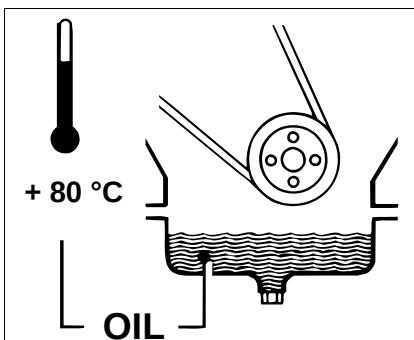


Fig. 7: Optimum engine oil temperature



Danger!

Caution when draining hot engine oil –

Danger of burns!

- ☞ Wear protective gloves
- ☞ Use suitable tools



Environment!

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



☞ *Change the engine oil as follows:*

- Park the machine on level ground
- Let the engine run until reaching service temperature (oil temperature about 80 °C)
- 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 in again
- Fill in engine oil – [see chapter Filling up engine oil](#) on page 3-13
- Start the engine and run it at low speed for a short time
- 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

Replacing the engine oil filter cartridge

The oil filter is located on the engine next to the oil dipstick.



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!!

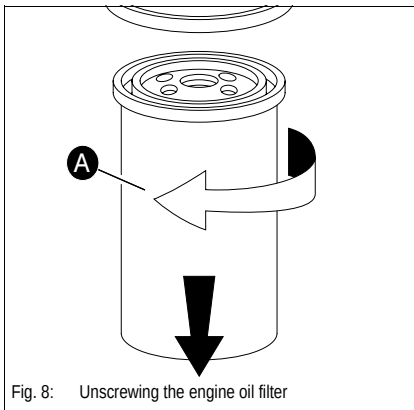


Fig. 8: Unscrewing the engine oil filter

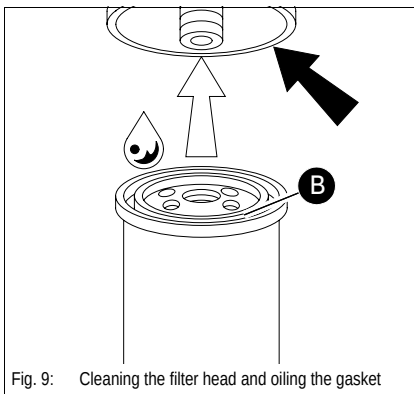


Fig. 9: Cleaning the filter head and oiling the gasket

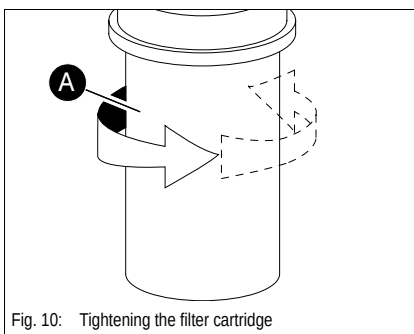


Fig. 10: Tightening the filter cartridge

☞ *Change the filter as follows:*

- Switch off the engine
- Place a suitable container under the oil filter to collect the oil
- 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!
- Run the engine for a short time
- Switch off the engine
- Check the seal of oil filter cartridge A and retighten by hand
- Check the oil level and add engine oil if necessary
- Completely remove all oil spills from the engine
- Dispose of the used oil filter in an environmentally friendly manner

3.7 Cooling system

The oil and water radiator is located in the engine compartment, behind the engine.

The expansion tank for the coolant is also located in the engine compartment, beside 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 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 leakages 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 chapter 2.14 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



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

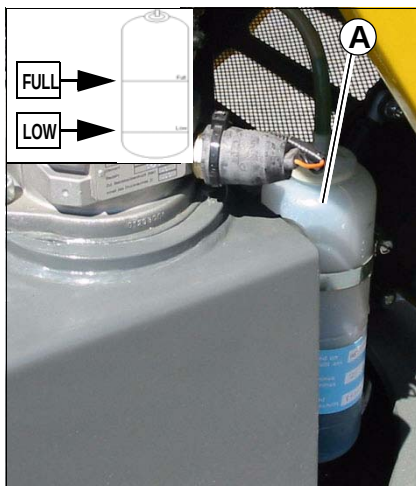


Fig. 11: Expansion tank for coolant

Checking the coolant level

☞ *Proceed as follows:*

- Park the machine on level ground
 - Switch off the engine!
 - Remove the key and carry it with you
 - Let the engine and the coolant cool down
 - Open the engine cover
 - Check the coolant level on the transparent coolant tank A and on the radiator B
- ☞ If the coolant level is below the LOW seam or if there is no coolant at the radiator's filler inlet:
- Fill up coolant



Important!

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

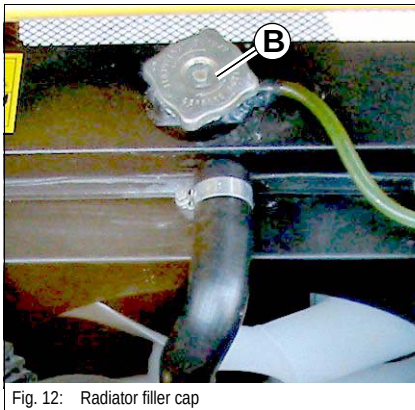


Fig. 12: Radiator filler cap

Filling up coolant

After the engine has cooled down:

- ☞ Release overpressure in the radiator
- ☞ Carefully open the cap to the first notch and fully release the pressure
- ☞ Open filler cap **B**
- ☞ Fill in coolant up to the lower edge of the filler inlet (radiator)
- ☞ Close filler cap **B**
- ☞ Start the engine and let it warm up for about 5 – 10 minutes
- ☞ Switch off the engine
- ☞ Remove the key and carry it with you
- ☞ Let the engine cool down
- ☞ Check the coolant level again
 - ➔ The coolant level must be between the LOW and FULL tank seams
- ☞ If necessary, fill up coolant and repeat the procedure until the coolant level remains constant



Important!

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

Draining coolant



Danger!

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

Danger of burns!

- ☞ Wait at least 10 minutes after switching off the engine!
- ☞ Wear protective gloves and clothing
- ☞ Open filler cap **12/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 **12/B**
- ☞ Slacken the lower radiator hose and drain the coolant in a container
- ☞ Retighten the radiator hose
- ☞ Fill up the radiator with suitable coolant – see chapter 3.1 Fluids and lubricants on page 3-1
- ☞ Check the coolant level
 - see chapter Checking the coolant level on page 3-17

3.8 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!*

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

Weekly check of air filter contamination

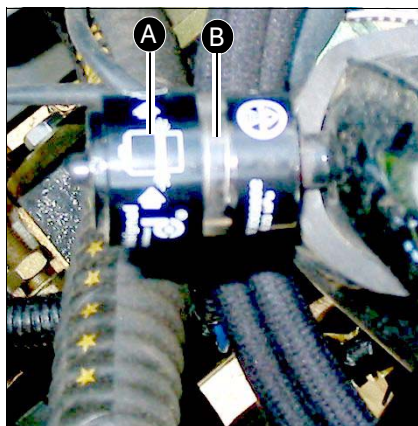


Fig. 13: Air filter fouling indicator

Maintenance display A on the filter housing monitors the filter cartridge.

☞ *Replace the filter cartridge:*

- If the red mark B in the window of maintenance display A can be seen (check with the engine running only)
- According to the maintenance interval



Filter replacement

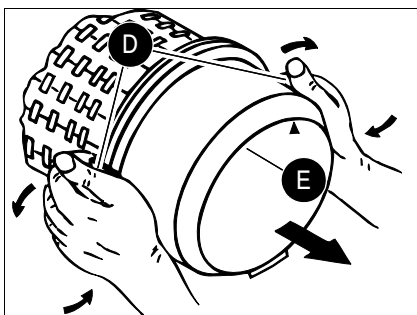


Fig. 14: Removing the lower housing section

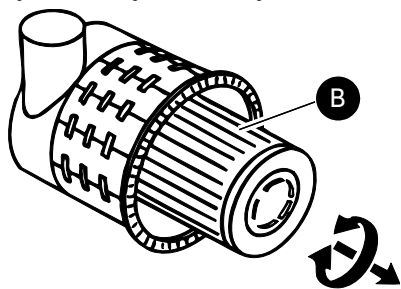


Fig. 15: Removing the filter element

- Replace the filter 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 filter B with slightly turning movements
- ☞ Make sure all contamination (dust) inside the upper and lower housing sections 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 filter B in the upper housing section
- ☞ Position lower housing section E (make sure it is properly seated)
- ☞ Close both bow clips D

3.9 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

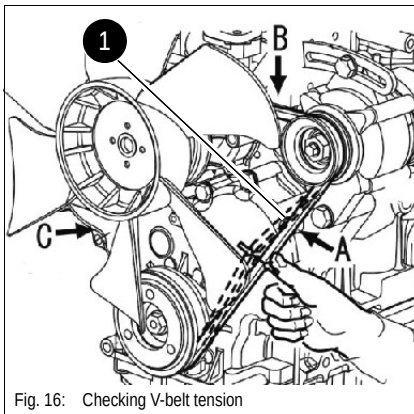


Fig. 16: Checking V-belt tension

- Check as follows:
 - ☞ Switch off the engine
 - ☞ 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, a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm.
 - ☞ 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 3-21](#)

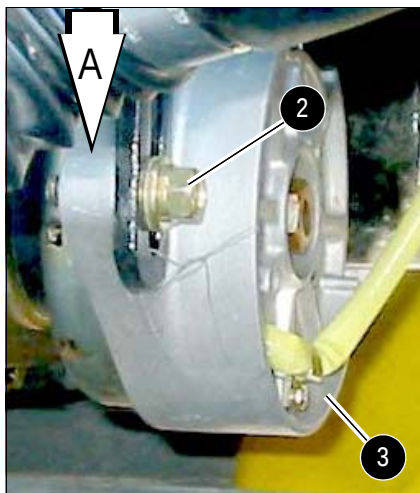


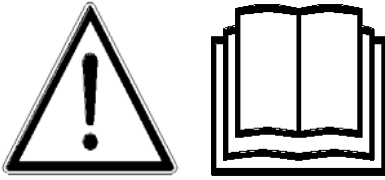
Fig. 17: Retightening the V-belt

- Retighten as follows:
 - ☞ Switch off the engine
 - ☞ Remove the key and carry it with you
 - ☞ Remove the battery master switch
 - ☞ Let the engine cool down
 - ☞ Open the engine cover
 - ☞ Slacken fastening screws 2 of alternator 3
 - ☞ Use a suitable tool to push the alternator in the direction of arrow A until reaching the correct V-belt tension (fig. 17)
 - ☞ Keep the alternator in this position, and at the same time retighten fastening screws 2
 - ☞ Check V-belt tension again and adjust it if necessary
 - ☞ Connect the battery or the battery master switch
 - ☞ Close the engine cover



3.10 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
- 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 may cause damage to the hydraulic pump!
- Oil or fuel flowing out of high pressure lines may cause fire or malfunctions, and severe injuries or damage to property. Interrupt work immediately if slack nuts or damaged hoses and lines are detected.
 - ☞ Contact your Neuson dealer immediately
- Replace the hose or line if one of the problems mentioned below is detected:
 - ☞ Damaged or leaky hydraulic seals
 - ☞ Worn or torn shells or uncovered reinforcement branches
 - ☞ Expanded shells in several positions
 - ☞ Entangled or crushed movable parts
 - ☞ Foreign bodies jammed or stuck in protective layers



Caution!

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

Danger of severe damage to the hydraulic system!

- ☞ Take care to avoid contamination when working!
- ☞ Always fill in hydraulic oil by means of a strainer or the reflux filter!
- ☞ Only use authorised oils of the same type
 - see [Fluids and lubricants on page 3-1](#)
- ☞ Always fill up hydraulic oil before the level gets too low
 - see [Filling up hydraulic oil on page 3-24](#)
- ☞ 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 may 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



Fig. 18: Oil level indicator on the hydraulic oil tank

➡ Proceed as follows:

- Park the machine on level ground
- Lower the skip, dumper must be in straight-ahead position
- Switch off the engine
- Apply the parking brake
- Open the engine cover
- Sight glass B is located on hydraulic oil tank
- Check the oil level on sight glass B
- The sight glass must be half full with oil

If the oil level is lower

- Fill up hydraulic oil



Important!

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

Filling up hydraulic oil



Fig. 19: Hydraulic oil filler opening

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

➡ Fill up as follows:

- Park the machine on level ground
- Lower the skip, dumper must be in straight-ahead position
- Switch off the engine
- 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 18/B
- Fill up if necessary and check again
- Close the filler opening

Changing hydraulic oil



Important!

Only change the hydraulic oil if it is warm (about 50 °C).

Lower the skip and put the dumper to the straight-ahead position before changing the oil.

- ☞ Open the breather filter to release pressure
- ☞ Open the drain plug to let the oil drain into a container
- ☞ Check the hydraulic oil tank for contamination and clean if necessary
- ☞ Replace the filter according to the maintenance specifications
- ☞ Screw the drain plug back in correctly
- ☞ Fill in clean hydraulic oil through the strainer
 - see Filling up hydraulic oil on page 3-24
- ☞ Close the hydraulic oil tank correctly
- ☞ Let the machine run at idling speed without load for some minutes

Monitoring the hydraulic oil reflux filter

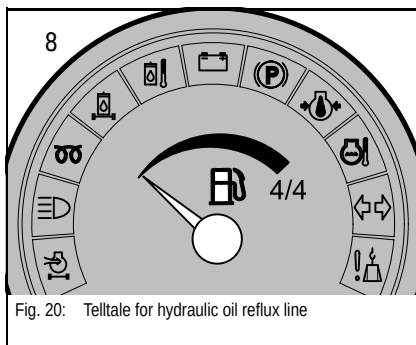


Fig. 20: Telltale for hydraulic oil reflux line

A red telltale on the instrument panel monitors the filter – see Hydraulic oil filter telltale on page 1-8.

Replace the filter:

- If the telltale comes on when the hydraulic oil is at operating temperature
- According to the maintenance interval

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

- ☞ Let the engine run for about 2 minutes at idling speed

Replacing the hydraulic oil reflux filter

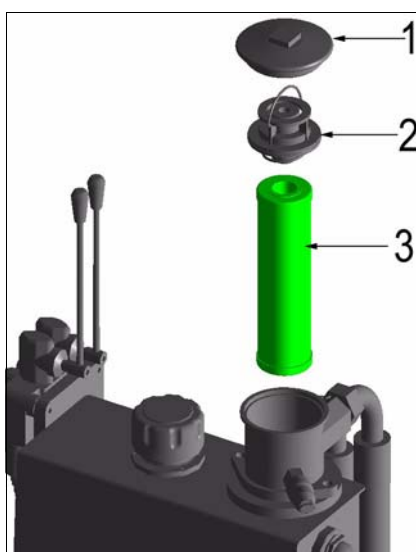


Fig. 21: Telltale for hydraulic oil reflux line

Proceed as follows:

- ☞ Switch off the engine
- ☞ Remove the breather filter (pressure release)
- ☞ Open cover 1 by about 2 turns and wait until the oil level in the filter housing drops to the oil level in the hydraulic oil tank
- ☞ Open the cover completely and remove it
- ☞ Pull filler pipe 2 upwards with a slightly turning movement, together with filter element 3
- ☞ Remove the filter element from the filler pipe and dispose of it
- ☞ Slide the filler pipe onto the new filter element and insert it in the filter
- ☞ Tighten the cover by hand
- ☞ Screw on the breather filter



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 leakages 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.

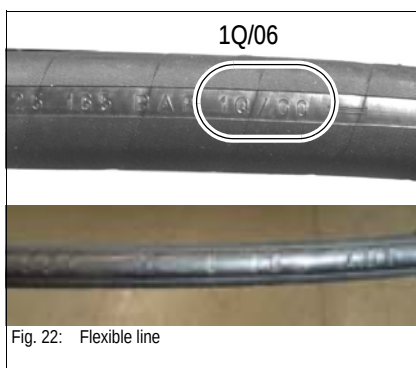


Fig. 22: Flexible line

The article number is marked on the clamping section, and the date of manufacture is indicated on the hose of each hose connection.

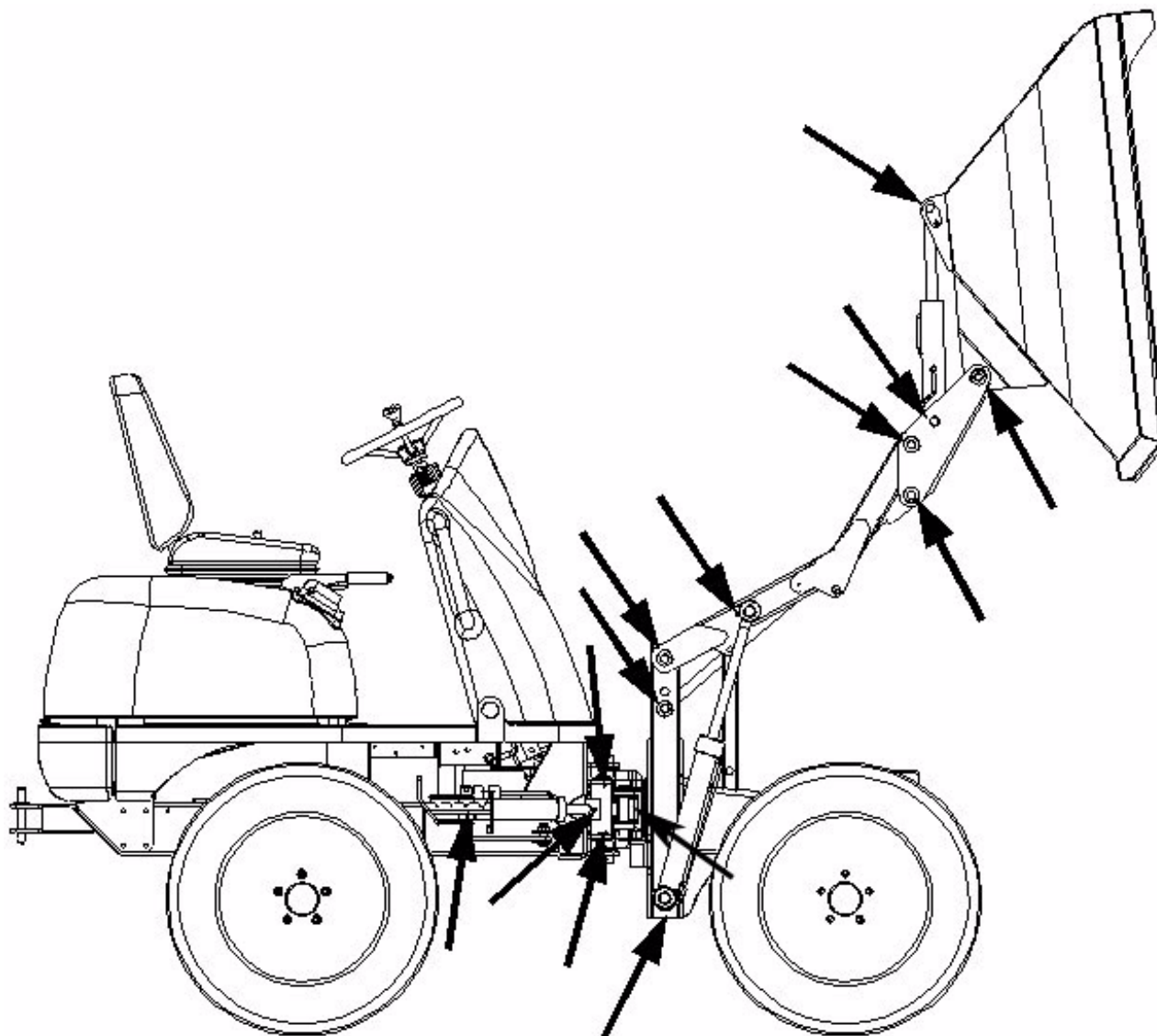
Example:

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



3.11 Lubrication points

Fold down the red maintenance prop before you carry out maintenance work with the lift frame raised. – see *Maintenance prop* on page 1-8



Apply multipurpose lithium grease with an MoS² additive to all lubrication points indicated.



3.12 Tyre maintenance



Danger!

Improper tyre repairs –

Danger of accidents!

☞ All repair work on tyres and rims may only be carried out by authorised workshops

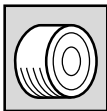


Important!

Refer to the table in chapter "Specifications" for the authorised tyre types and the correct tyre pressures. A label affixed ex works to the machine also contains the prescribed tyre pressures. Regular inspection of the tyres.

- Improves operating safety
- Increases the service life of the tyres
- Reduces machine downtimes

Checks once a day



☞ Carry out the following maintenance work once a day:

- Check tyre pressure
- Check tyres and rims for damage (cracks, ageing etc.) – also on the inside
- Remove foreign bodies from the tyre tread
- Remove traces of oil and grease from the tyres

Checks once a week

☞ Carry out the following maintenance work once a week:

- Check tyres for wear and measure tread depth



3.13 Changing wheels



Danger!

Use of wrong tyres or wheels –

Danger of accidents!

☞ Use only wheels and tyres authorised for your machine – [see chapter 2.12 Tyres on page 2-7](#)

☞ Check the wheel nuts for tightness after every wheel or tyre change



Caution!

The wheels are heavy and can damage the threads on the wheel studs if they are handled incorrectly!

☞ Use suitable assembly tools, such as covering sleeves for the studs, a jack etc.

Removing the wheels

☞ Proceed as follows:

- Park the machine on level and firm ground and prevent it from rolling away
- Slightly loosen the wheel nuts of the tyre you want to remove
- Place a jack under the chassis, making sure it is standing firmly
- Raise the side from which you want to remove the tyre
- Check the machine is standing firmly
- Completely remove the wheel nuts
- Remove the wheel

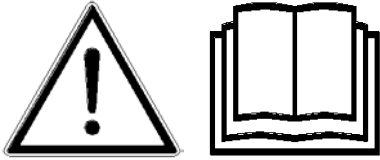
Fitting the wheels

☞ Proceed as follows:

- Place the wheel onto the wheel studs
- Tighten all wheel nuts part-way
- Lower the raised side
- Tighten the wheel nuts to the prescribed tightening torque
– [see chapter 2.15 General tightening torques on page 2-8](#)

3.14 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!
- During charging in particular, but also during normal battery operation, 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 may 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 may ignite!
- Use only 12 V power sources. Higher voltages will damage the electric components
- When connecting the battery leads, make sure the poles +/- are not inverted, otherwise sensitive electric components will be damaged
- Do not interrupt voltage-carrying circuits at the battery terminals because of the danger of sparking!
- Never place tools or other conductive articles on the battery – danger of short circuit!
- Disconnect the negative (-) battery terminal from the battery before starting repair work on the electric system
- Dispose of used batteries properly

Service and maintenance work at regular intervals



Before driving the machine

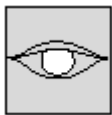
☞ Check every time before driving the machine:

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

Every week

☞ Check once a week:

- Electric fuses
– see Fuse box on page 2-6
- Cable and earth connections
- Battery charge condition – see Battery on page 3-32
- 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](#) on page 2-6

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 Preheating telltale](#) on page 1-8

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!*

During charging in particular, but also during normal battery operation, 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 may rupture or explode!*

- Replace the battery immediately

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

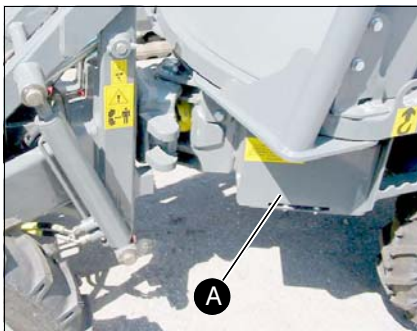


Fig. 23: Battery

The battery is located underneath the control stand, behind cover A on the left 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.

3.15 Battery master switch

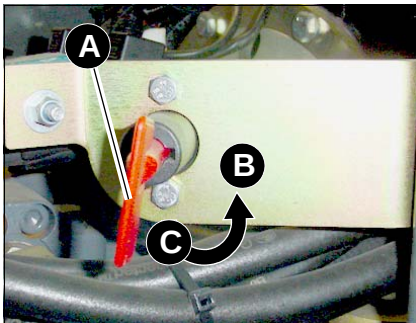


Fig. 24: Battery master switch



Important!

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

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

The battery master switch is located in front of the rear left wheel next to the foothold (arrow).

Interrupting power supply

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

Switching on power supply

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

☞ Turn the key down to the notched position **C**

3.16 General maintenance work

Cleaning

Cleaning the machine is divided into 2 separate areas:

- Exterior of the machine
- Engine compartment

The wrong choice of cleaning equipment and agents may 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

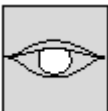
When using a high-pressure cleaner or steam jet

- 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!

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



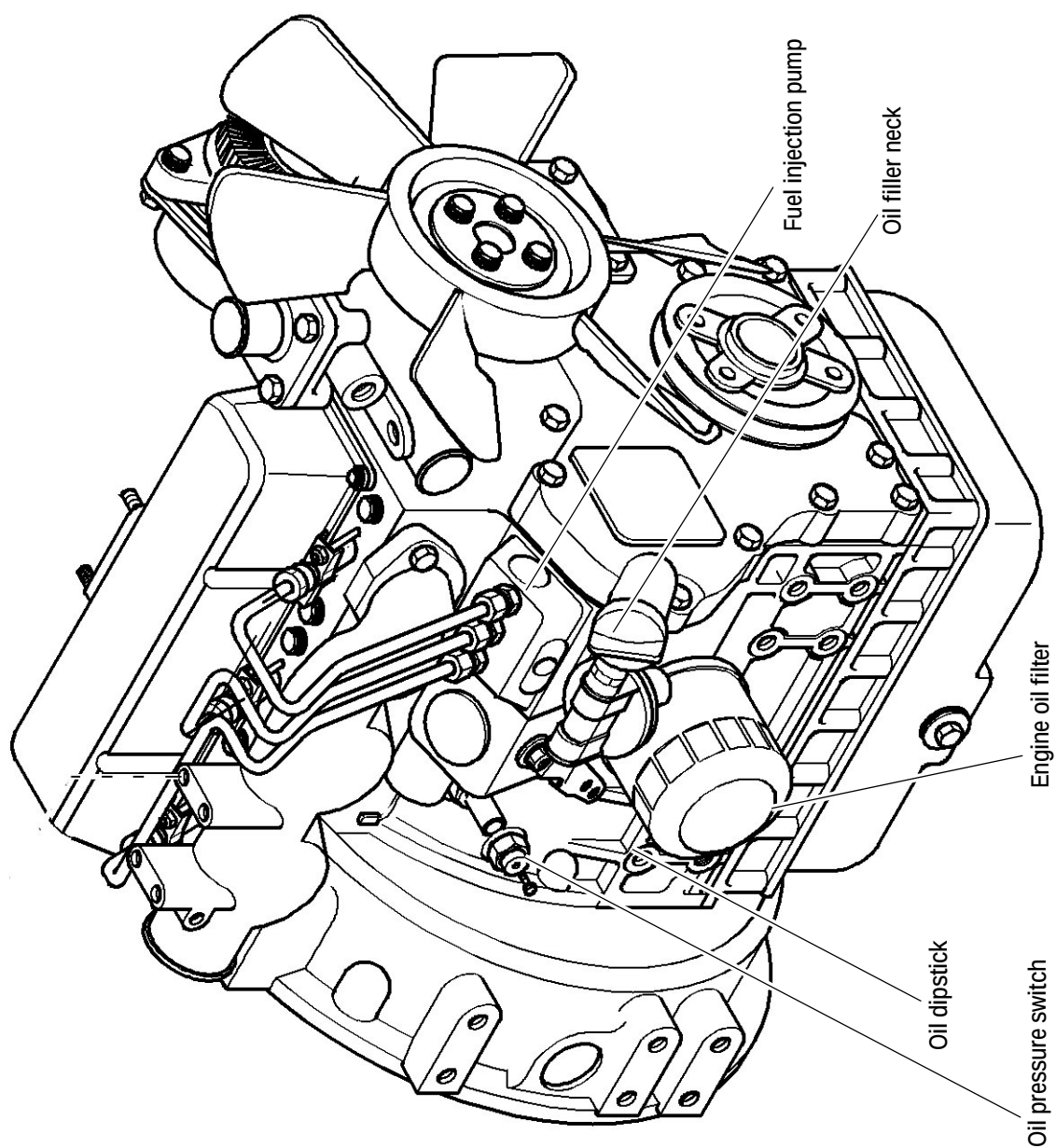
All mechanical pivot points on the machine (e.g. door hinges, joints) and fittings (e.g. door arresters) must be lubricated regularly, even if they are not listed in the lubrication plan.

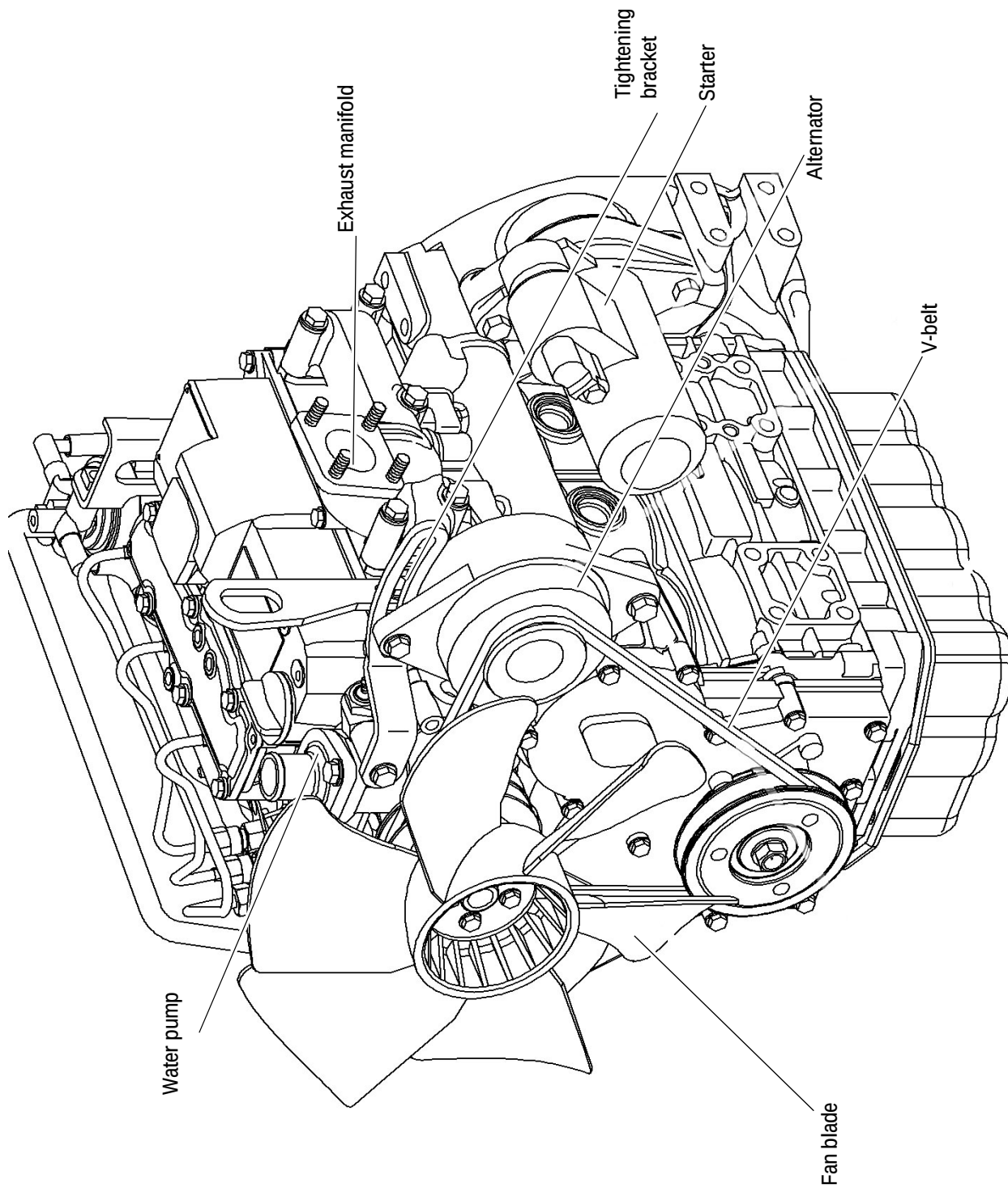
Engine



4 Engine

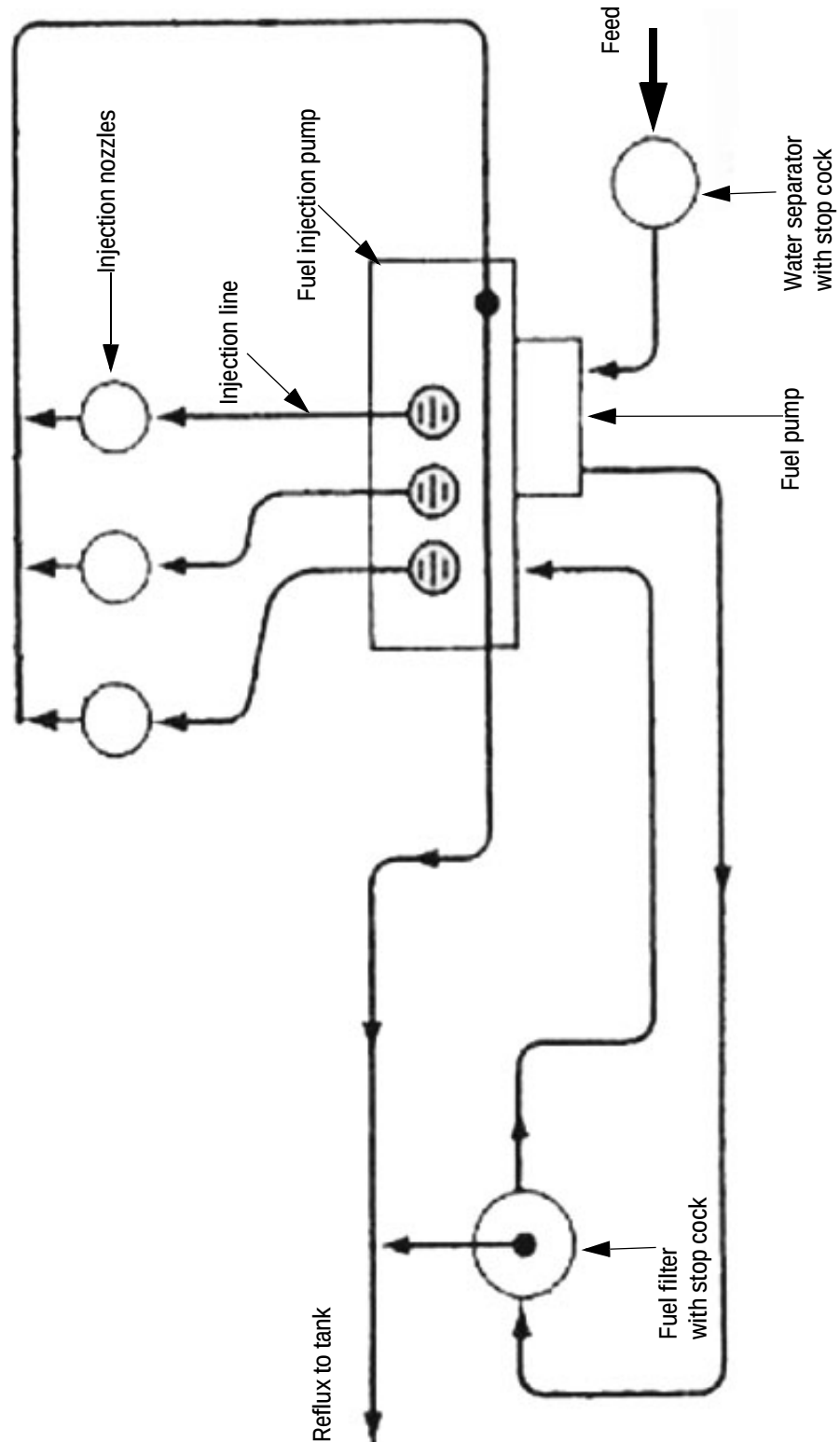
4.1 Engine overview 3TNE74 (up to BB001360)



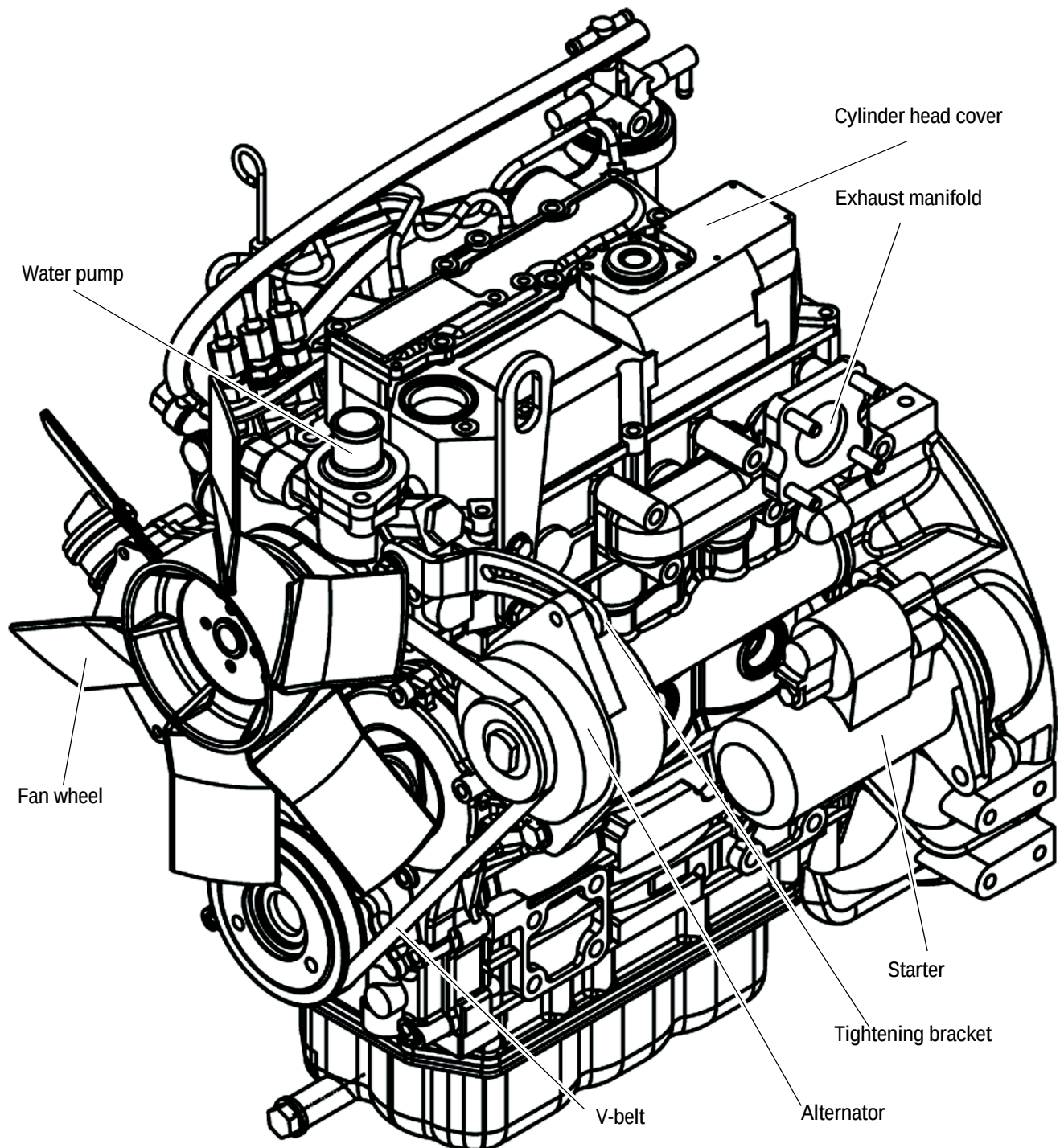


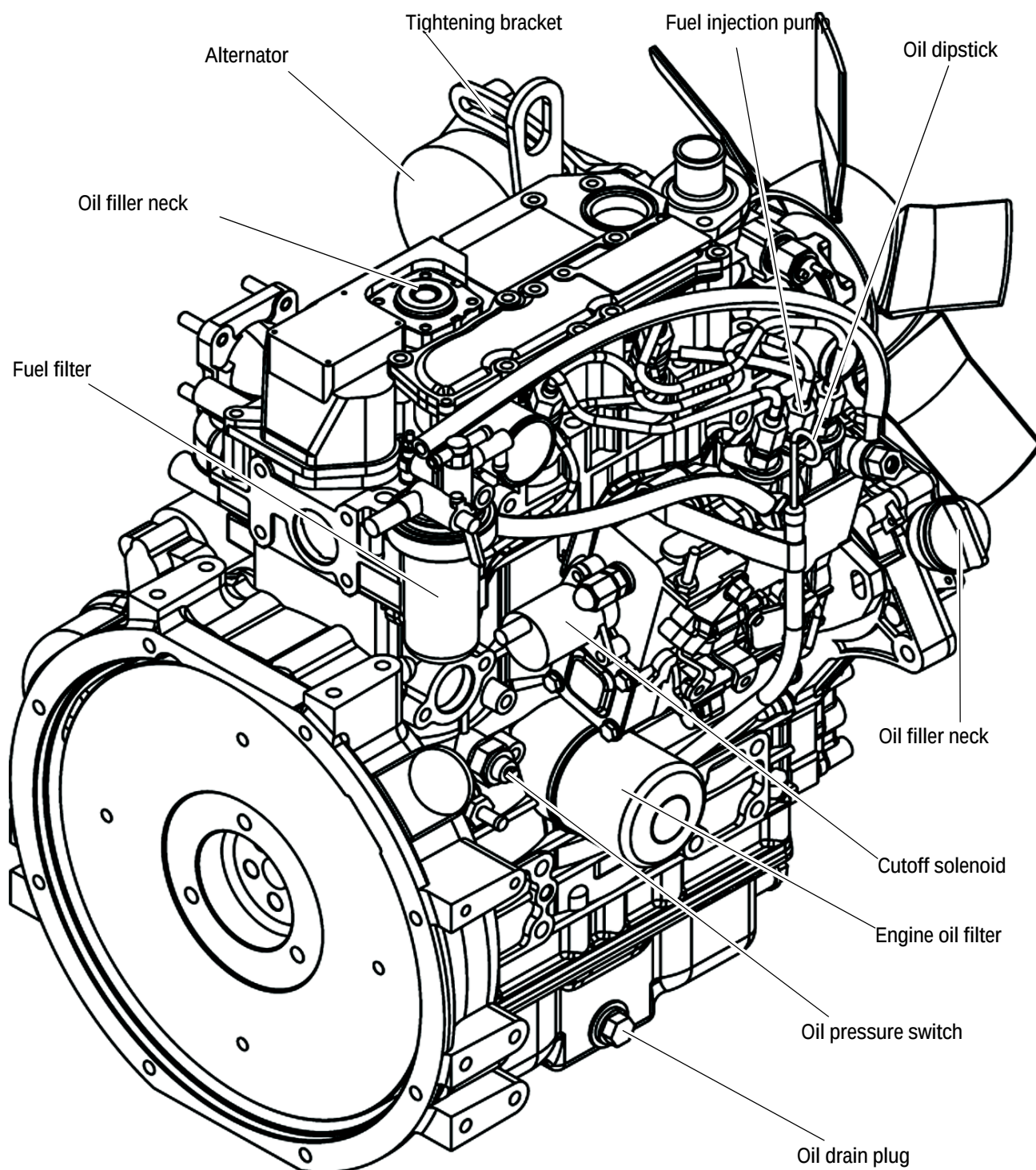


4.2 Fuel system (up to BB001360)

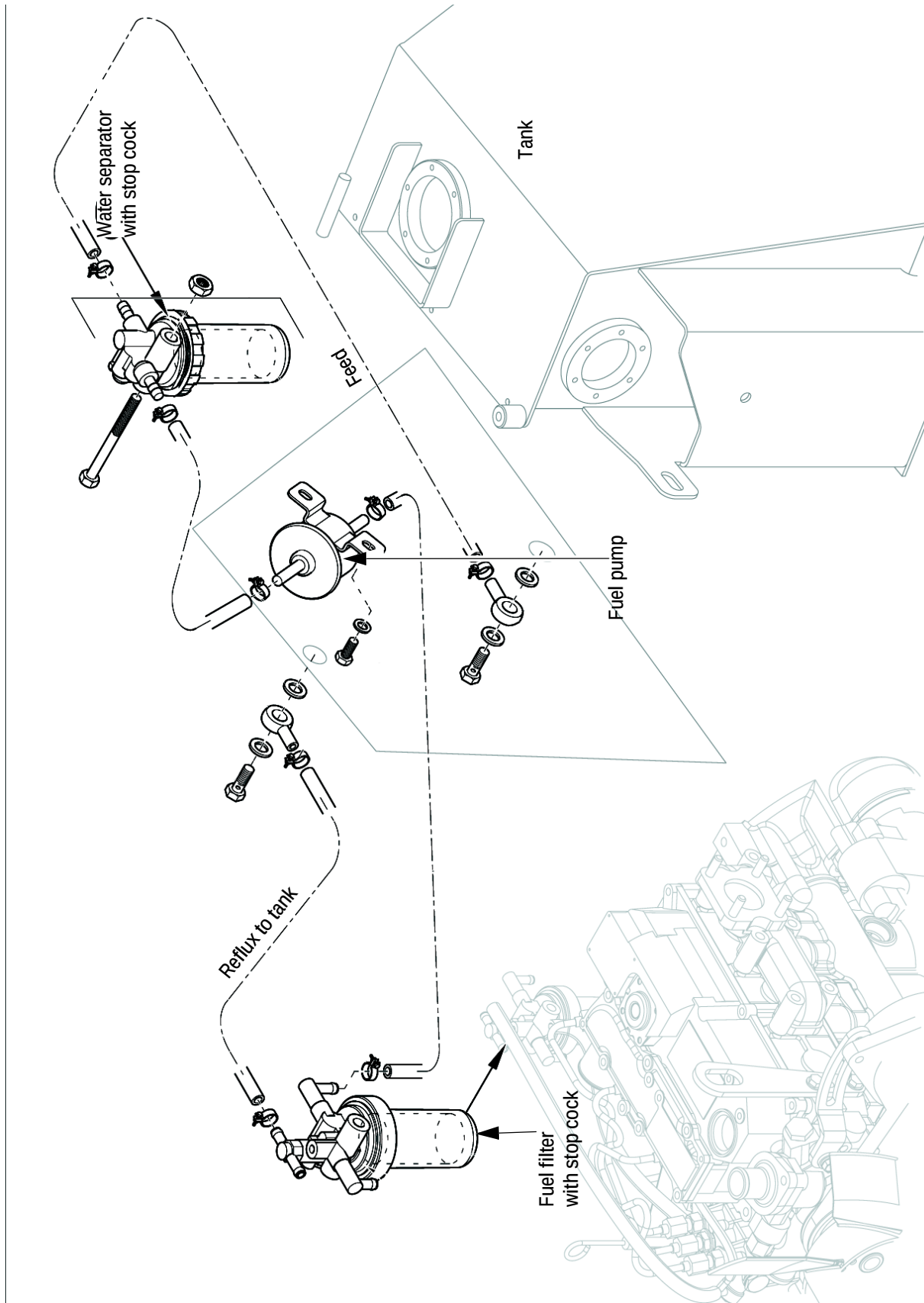


4.3 Engine overview 3TNV76-XNSV (from AB100001H)





4.4 Fuel system (from AB100001H)



4.5 Checking and adjusting valve tip clearance

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

➡ On a cold engine

Procedure

☞ *Remove the cylinder-head cover*

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

➡ Valve overlapping (both rocker arms move freely)

☞ *Check the valve cap for abnormal wear*

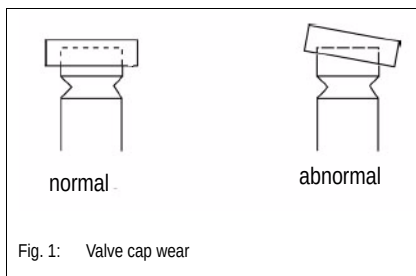


Fig. 1: Valve cap wear

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

➡ Valve tip clearance: 0.15 – 0.25 mm

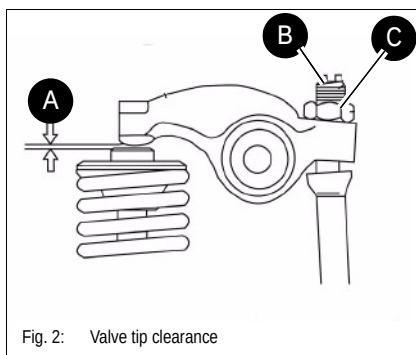


Fig. 2: Valve tip clearance

☞ *Set the valve tip clearance on the cylinder by turning set screw **B***

➡ Valve tip clearance: 0.15 – 0.25 mm

☞ *Tighten locknut **C***

➡ Check the setting again with the feeler gauge

☞ *Repeat the procedure for each cylinder*

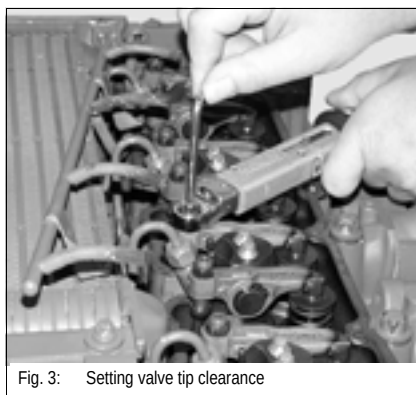


Fig. 3: Setting valve tip clearance

☞ *Place the cylinder-head cover gasket*

☞ *Mount the cylinder-head cover*

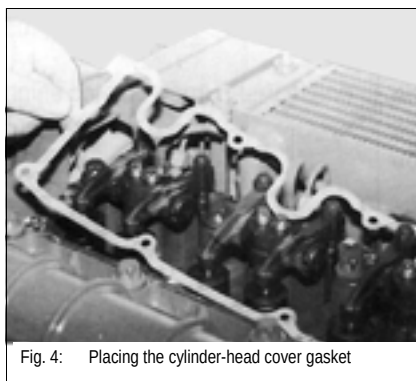


Fig. 4: Placing the cylinder-head cover gasket

4.6 Tightening order for cylinder head bolts

☞ Mount the cylinder-head bolts

➡ Tightening moments:

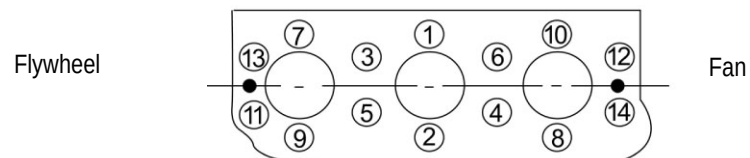
- 60 – 65 Nm



Caution!

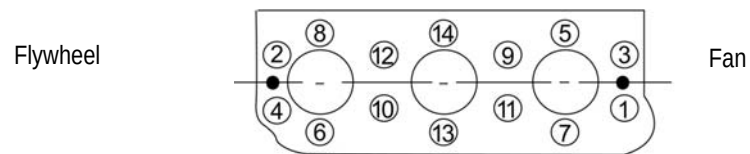
Bear in the mind the order for tightening the cylinder-head bolts!

☞ See figure



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

☞ Order for removing the cylinder-head bolts

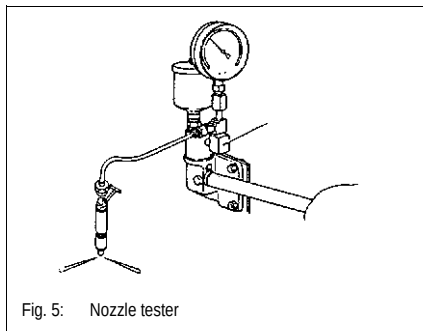


Important!

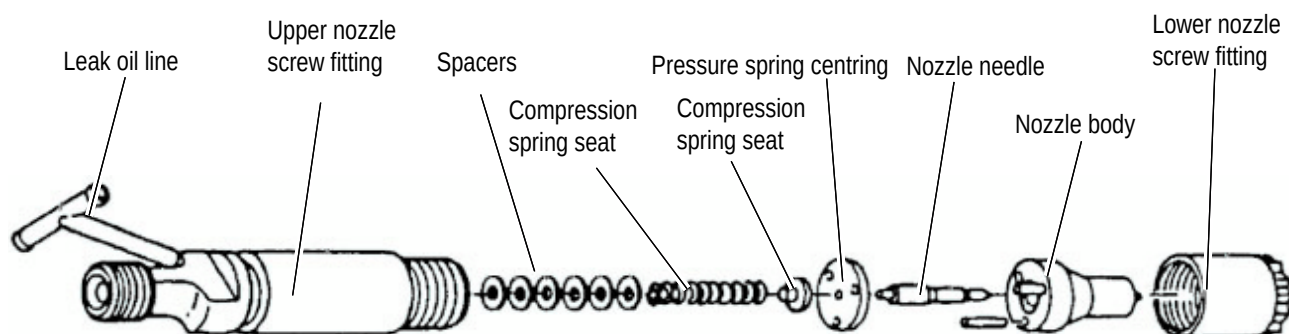
Always carry out work on the cylinder head on a cold engine!

4.7 Checking the injection nozzles

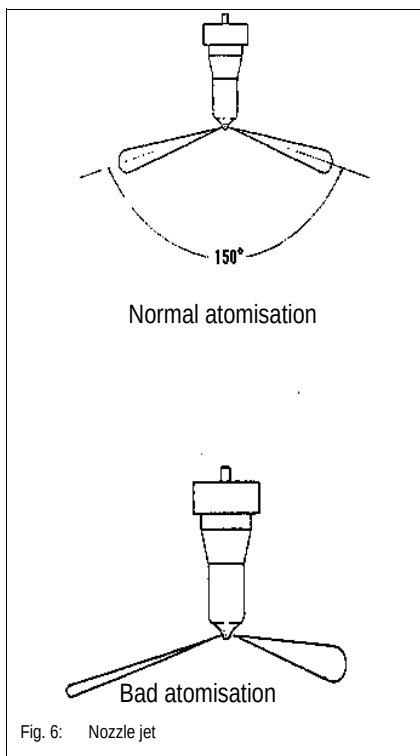
Pressure check



- ✚ 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: 220 – 230 bar
- Spacer thickness of 0.1 mm corresponds to modification by 19 bar
- Check the injection nozzle for drips after it has ejected fuel
- ✚ Create a pressure of about 20 bar below injection pressure and check whether fuel escapes from the nozzle



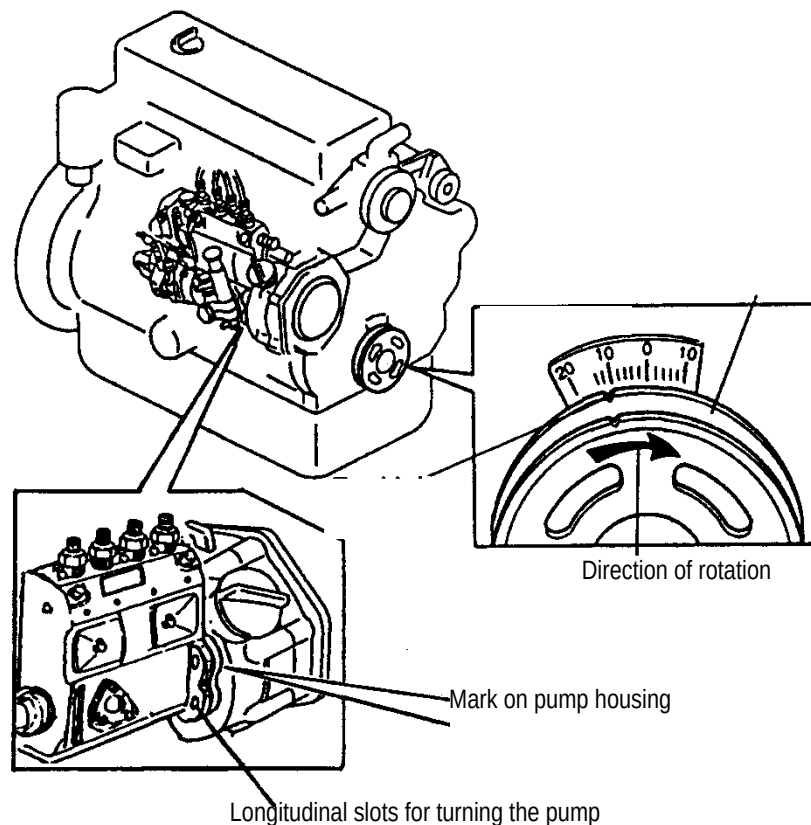
4.8 Checking the nozzle jet



- ✚ 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 away from the nozzle and let the nozzle eject fuel
- ✚ The nozzle jet must create a circle on the paper
- ✚ Check the nozzle for drips after it has ejected fuel
- ✚ Create a pressure of about 20 bar below injection pressure and check whether fuel escapes from the nozzle

4.9 Fuel injection time (up to BB001360)

- ☞ Remove the injection line for the 1st cylinder
Cylinder numbering always starts from the flywheel side
- ☞ Turn the engine clockwise (as seen from the radiator) via the crankshaft until fuel escapes from the injection pump's base valve.
- ☞ Remove the rubber cover from the flywheel housing and read injection time off the marks on the flywheel and flywheel housing
- ☞ If the marks do not coincide, correct injection time by turning the fuel injection pump
 - ➔ Injection too late: turn the pump away from the engine
 - ➔ Injection too early: turn the pump towards the engine



4.10 Fuel injection time (from AB100001H)

Checking and adjusting

☞ Preparatory work: remove the injection lines, set the engine to full-load position

☞ Turn crankshaft pulley **1** of the engine counterclockwise.

As you turn the engine, the fuel level in the bore of the 1st cylinder of the fuel injection pump rises.

Turn the engine until the fuel starts overflowing at the fuel injection pump.

Determine the fuel injection time on cylinder 1 (2) by means of the mark on the flywheel (sight hole 3) and compare it with the engine data.

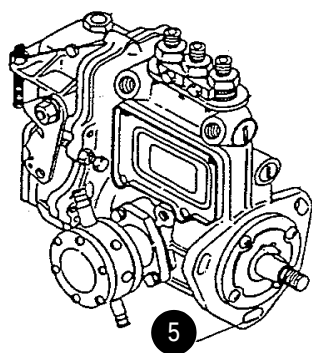
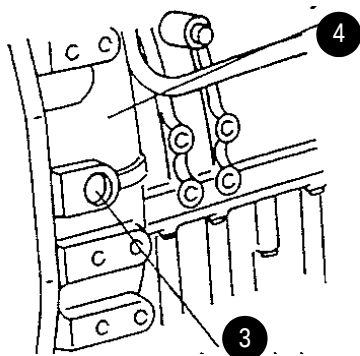
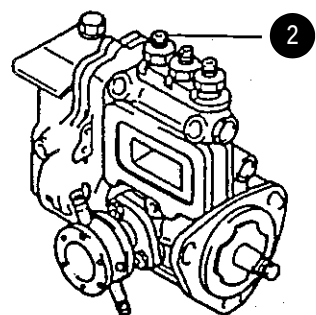
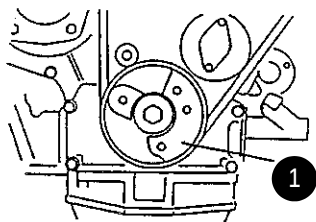
➡ -9° – 17° depending on engine type

- Modify the injection time by turning the fuel injection pump on the engine if the values do not coincide with the specified values. Slacken lock screws (5) on the fuel injection pump to do so.

➡ If injection time is too late, turn the fuel injection pump away from the engine.

➡ If injection time is too early, turn the fuel injection pump towards the engine.

☞ Retighten the lock screws and install the injection lines.



4.11 Adjusting engine revs



Important!

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

Adjust engine revs without load!

- ☞ Run the diesel engine until it reaches operating temperature
- ☞ Check idling speed **A**, all machine functions in neutral position
 - ➔ Idling speed is indicated in the "Specifications" for each engine type.
- ☞ Adjust as shown if values differ.

Caution: Only idling speed is allowed to be set!

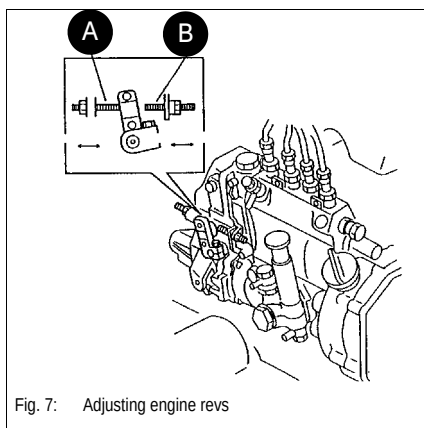


Fig. 7: Adjusting engine revs

4.12 Compression

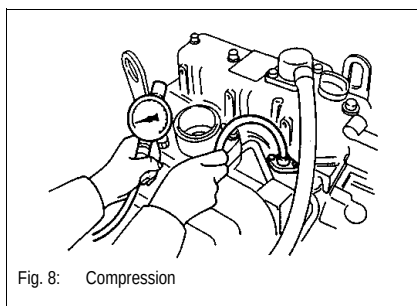


Fig. 8: Compression

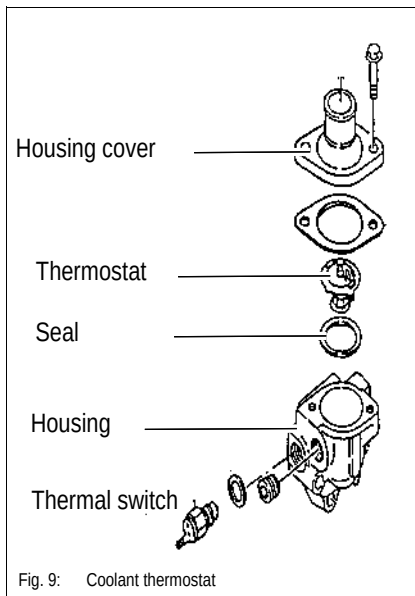
- ☞ Remove the injection lines and the injection nozzles
- ☞ Set the fuel injection pump to zero delivery (remove the plug for the cutoff solenoid)
- ☞ Turn the engine
- ☞ Mount the compression gauge on the cylinder you want to measure
- ☞ Turn the engine with the starter and read the pressure off the pressure gauge
 - ➔ Specified value: 35 +/- 1 bar at 250 rpm
 - ➔ Limit value: 28 +/- 1 bar at 250 rpm



4.13 Checking the coolant thermostat

☞ Remove the thermostat

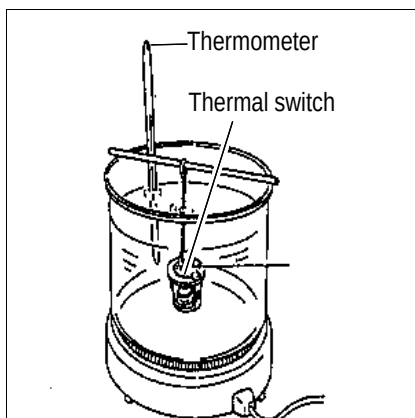
➡ The thermostat is located on the water pump – see [Engine overview 3TNV76-XNSV](#) (from AB100001H) on page 4-4



☞ 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



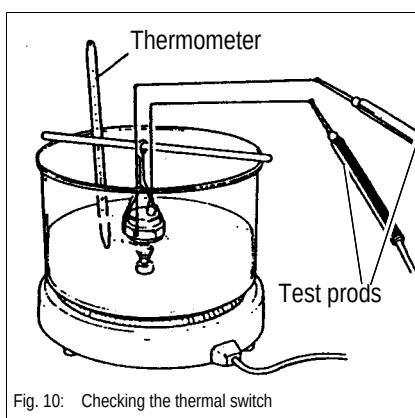
4.14 Checking the thermal switch

☞ Remove the thermal switch

☞ Warm up the thermal switch in a container with coolant

☞ 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.



4.15 Oil pressure switch

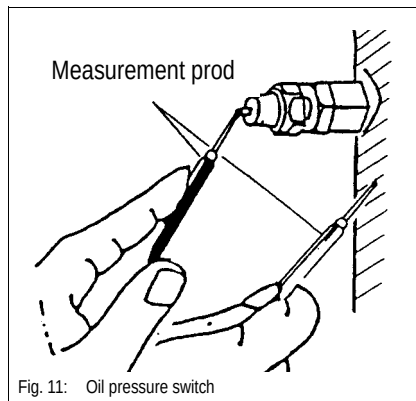


Fig. 11: Oil pressure switch

- 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

4.16 Checking the coolant circuit

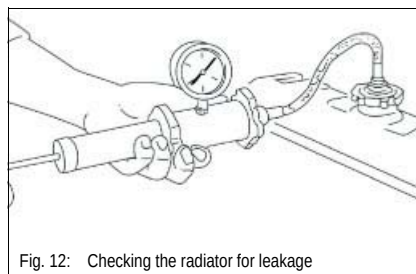


Fig. 12: Checking the radiator for leakage

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
 - ➔ Check the lines and the connections for leaks if the pressure drops at the pressure gauge

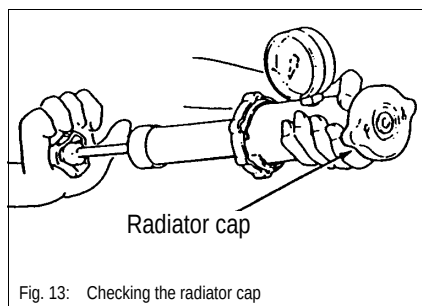


Fig. 13: Checking the radiator cap

Checking the radiator cap

- Remove the radiator cap and mount it onto the adapter as shown
- Increase the pressure to about 0.9 bar (stamped onto the radiator cap) with the hand pump
 - ➔ The radiator cap must open



4.17 Engine trouble

Problem	Possible causes
Engine does not start or is not easy to start	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 intake-air preheating
	Defective solenoid switch
	Cutoff solenoid does not attract
	Cutoff solenoid without current
	Clogged filter
	Defective fuel pump
	Air in fuel system
	Defective cutoff solenoid, timer or relay
	High pressure created immediately in the hydraulic system
Engine starts, but does not run smoothly or faultless	Fuel grade does not comply with specifications
	Wrong valve tip clearance
	Air in fuel system
	Injection line leaks
	Defective fuel injector
Engine overheats. Temperature warning system responds	Oil level too low
	Oil level too high
	Dirty air filter
	Dirty oil cooler fins
	Defective fan, torn or loose V-belt
	Resistance in cooling system too high, flow capacity too low
	Damaged seal on radiator
	Coolant level too low
	Defective fuel injector

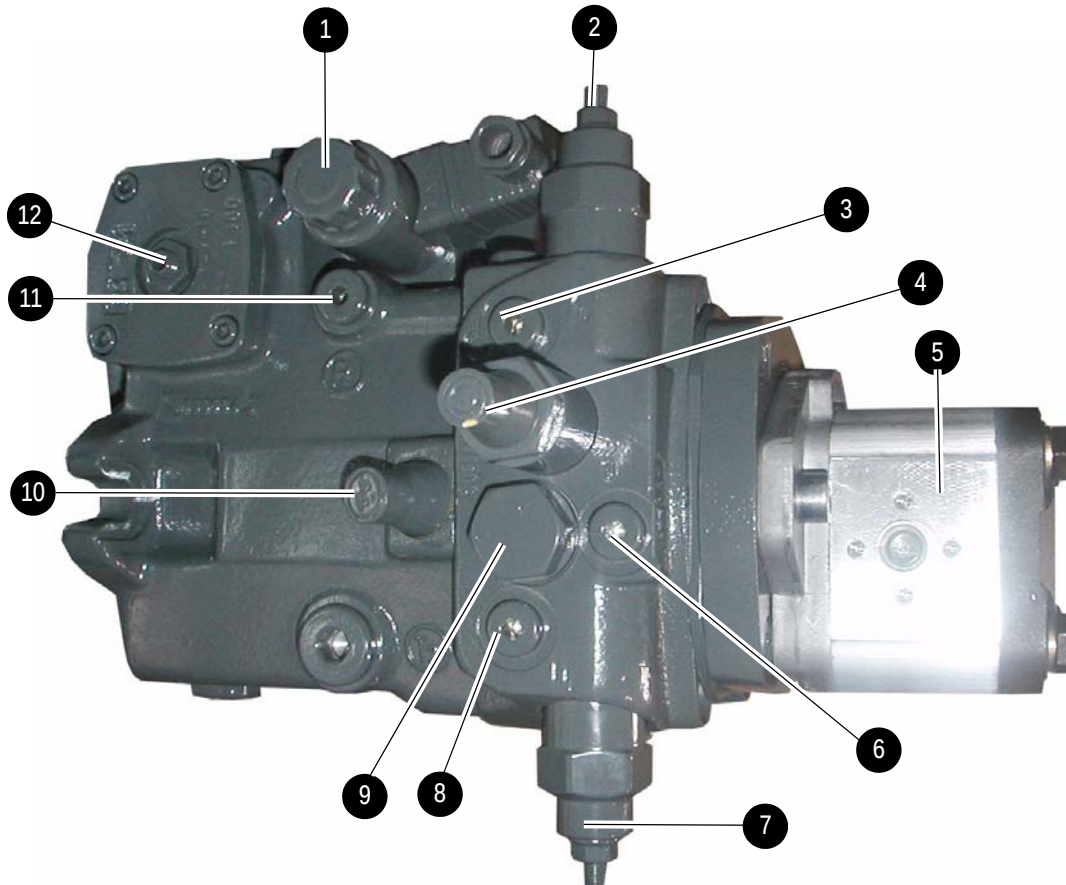


Problem		Possible causes
Insufficient engine output		Oil level too high
		Fuel grade does not comply with specifications
		Dirty air filter
		Defective air filter maintenance switch or gauge
		Wrong valve tip clearance
		Injection line leaks
		Defective fuel injector
Engine does not run on all cylinders		Injection line leaks
		Defective fuel injector
Insufficient or no engine oil pressure		Oil level too low
		Machine inclination too high (max. 15°)
		Dirty oil intake filter
		Wrong SAE grade of engine lubrication oil
Engine oil consumption too high		Oil level too high
		Machine inclination too high (max. 15°)
Engine smoke	Blue	Oil level too high
		Machine inclination too high (max. 20°)
		Engine oil combustion (defective cylinder-head gasket)
	White	Engine starting temperature too low
		Fuel grade does not comply with specifications
		Wrong valve tip clearance
		Defective fuel injector
		Coolant combustion (defective cylinder-head gasket)
	Black	Dirty air filter
		Defective air filter maintenance switch or gauge
		Wrong valve tip clearance
		Defective fuel injector (drips)
		Wrong fuel injection pump setting

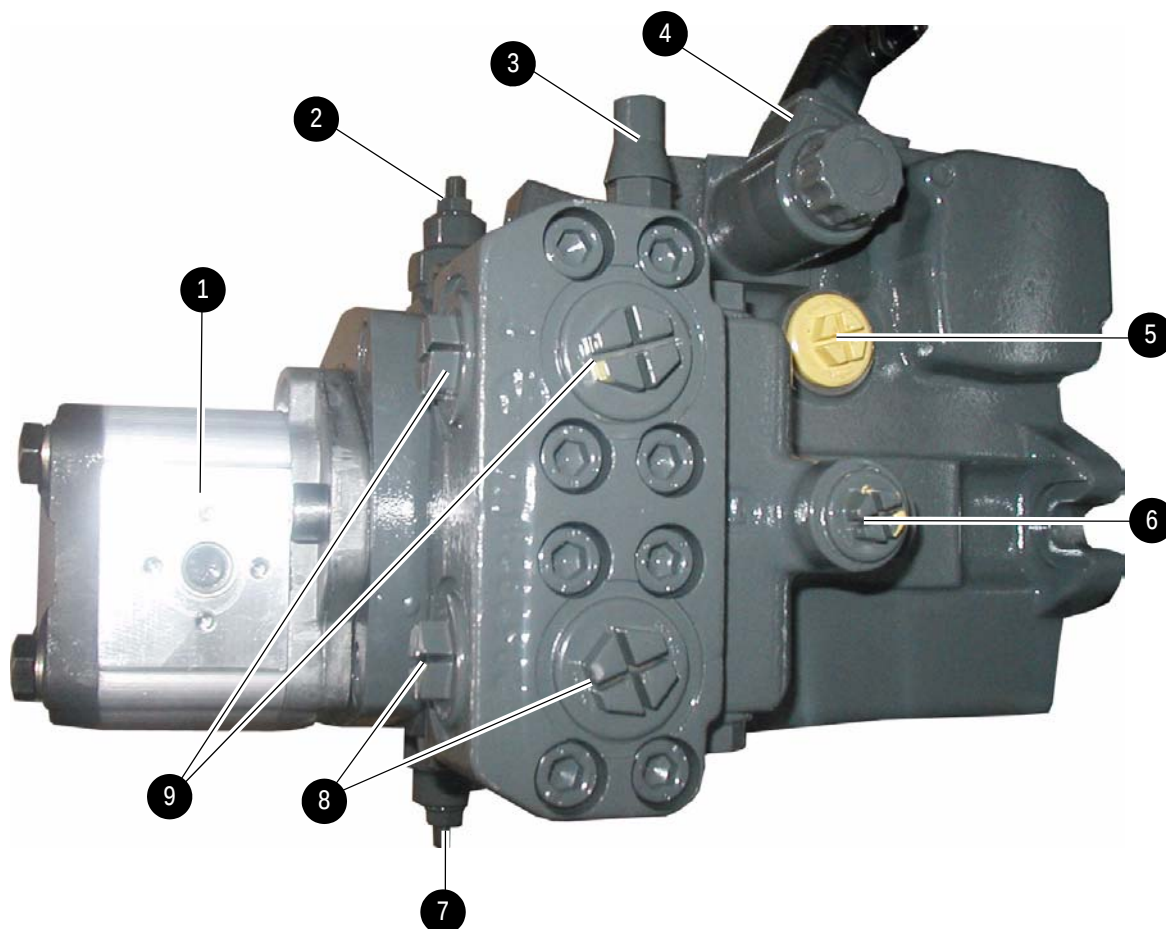
Travelling drive

5 Travelling drive

5.1 Variable displacement pump A10VG45DA (up to BB001360)



Pos.	Description
1	Forwards solenoid
2	Forwards high pressure limiting valve
3	Forwards high pressure measuring point
4	Control cartridge with orifice
5	Gear pump
6	Boost pressure measuring point
7	Reverse high pressure limiting valve
8	Reverse high pressure measuring point
9	Boost pressure valve
10	Transposition screw
11	Pilot pressure
12	Mechanical zero position



Pos.	Description
1	Gear pump
2	Forwards high pressure limiting valve
3	Pressure cutoff
4	Reverse solenoid
5	Tank line
6	Flush valve tank line
7	Reverse high pressure limiting valve
8	Port A
9	Port B



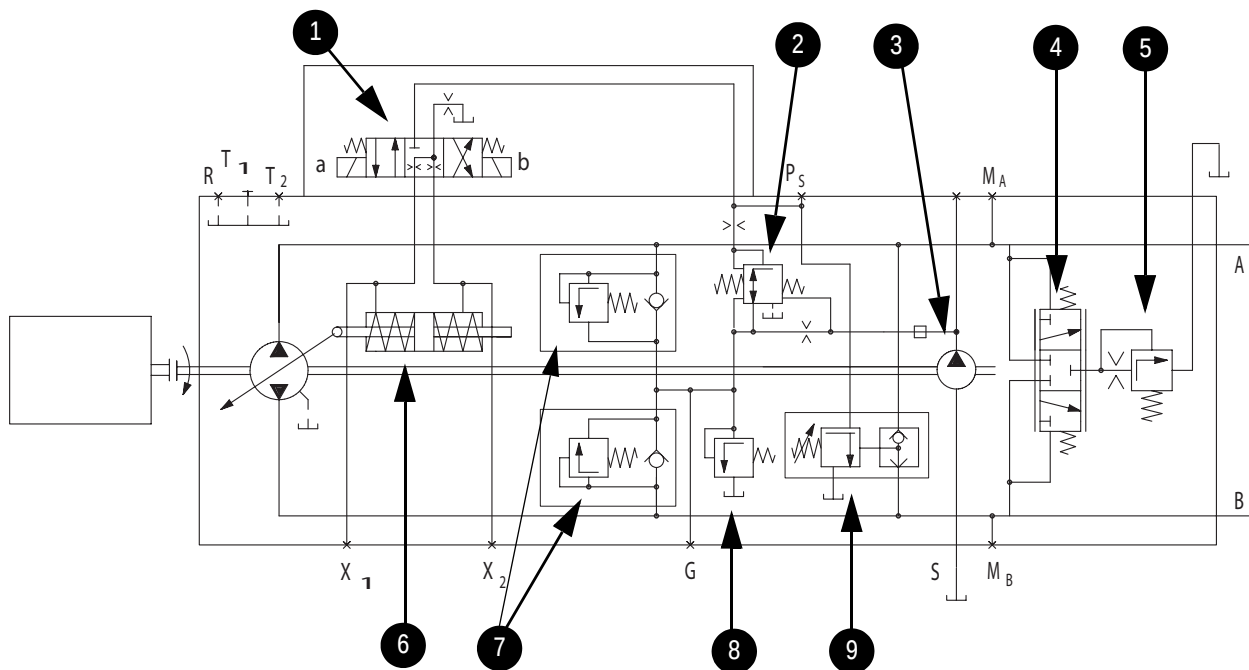
Description:

- A10 VG
 - ➔ Axial-piston machine, swash plate design, adjustable, closed circuit
- 45
 - ➔ Displacement volume V_g max in cm^3
- DA
 - ➔ Hydraulic adjustment, speed-sensitive

The A10VG is a variable displacement pump in axial-piston swash plate design. The volume flow is proportional to the drive revs and can be infinitely adjusted to the displacement volume. The volume flow increases from 0 to maximum value the higher the deflection. The feed flow changes as soon as the swash plate goes out of line through the zero position, i.e. the flow direction changes.

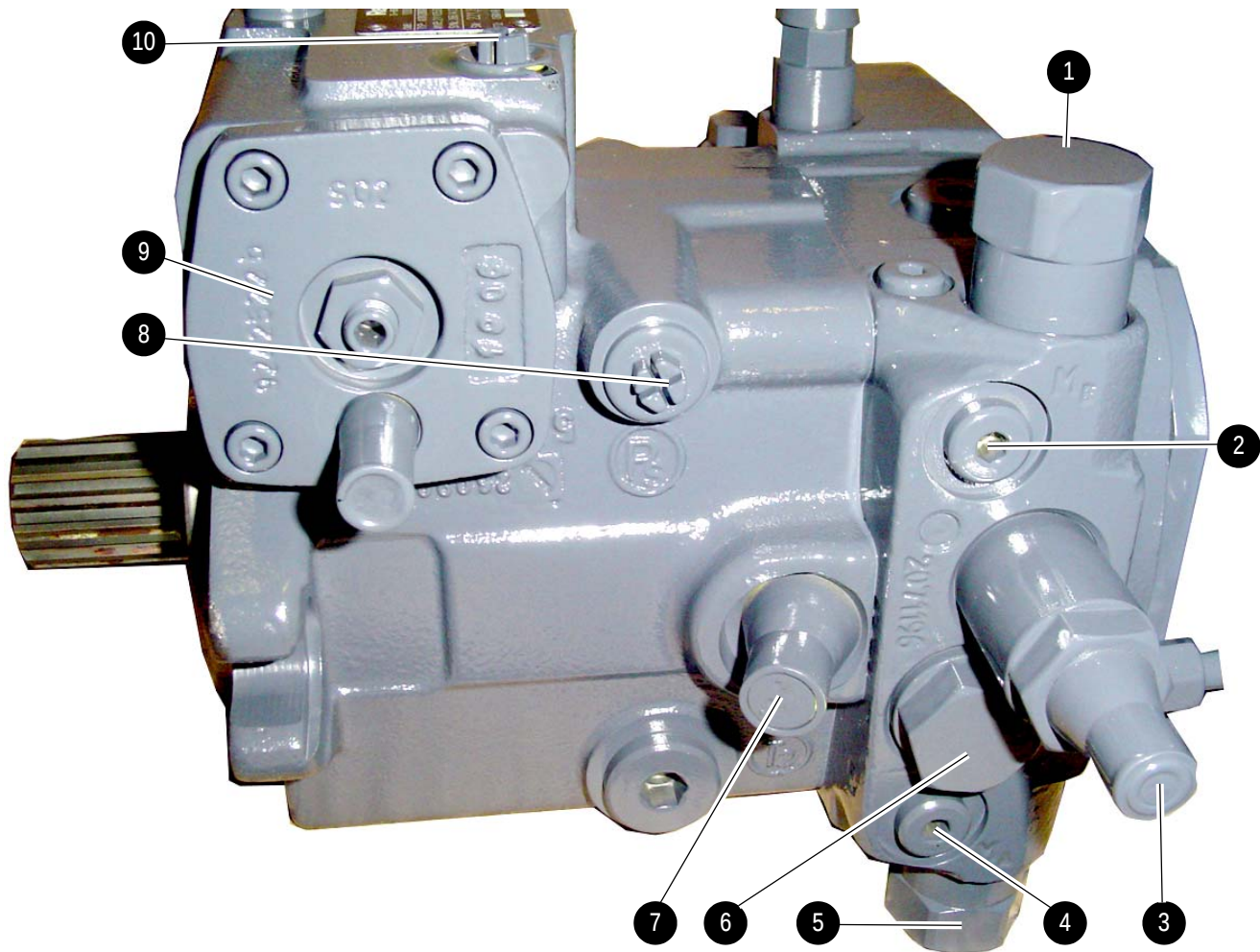
The pump is fitted with two pressure limiting valves, pressure cutoff, control cartridge, boost pressure valve and a forwards/reverse solenoid valve.

Variable displacement pump: diagram

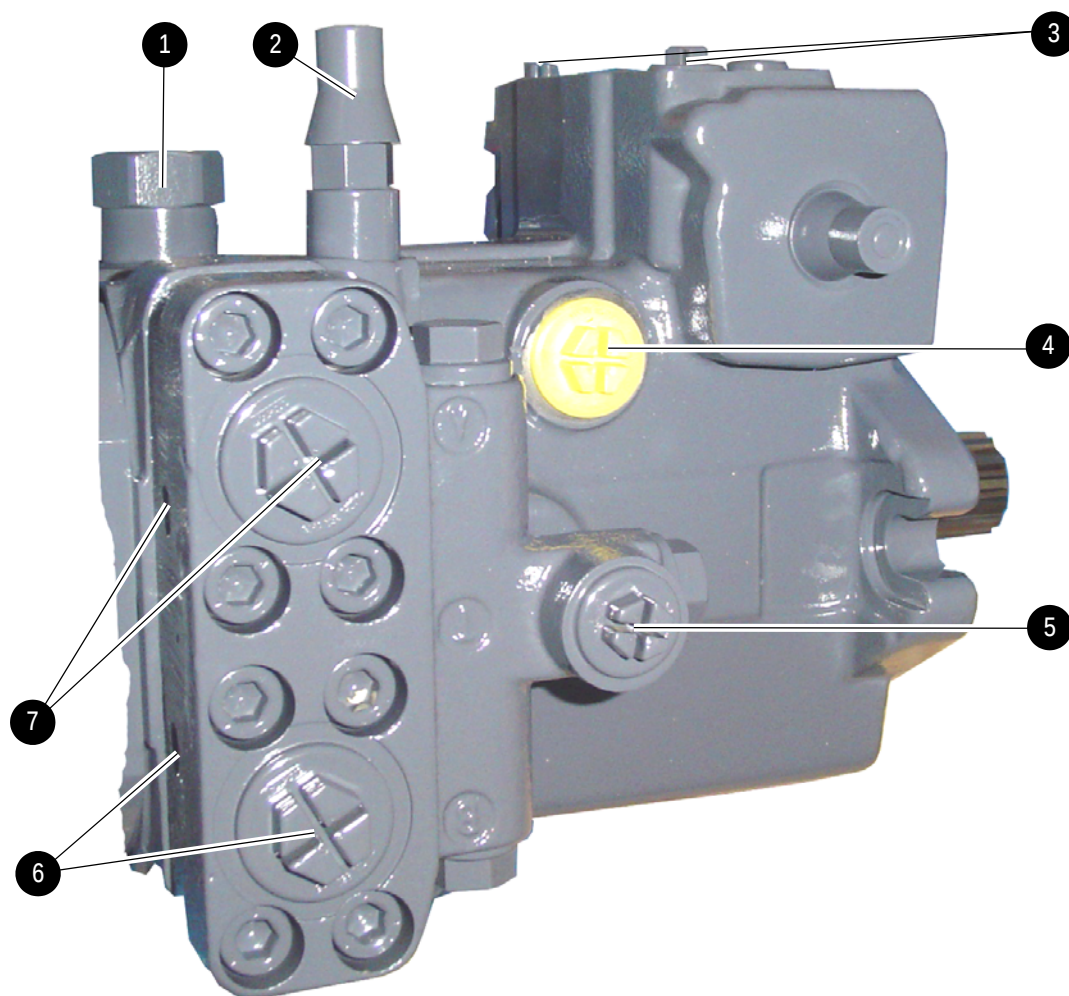


Pos.	Description
1	Solenoid (a reverse; b forwards)
2	Control cartridge
3	Boost pump
4	Scouring slide valve
5	Flush valve
6	Servo cylinder
7	HP valve
8	Boost pressure valve
9	Pressure cutoff

5.2 Variable displacement pump A10VG28DA (from AB100001H)



Pos.	Description
1	Forwards high pressure limiting valve
2	Forwards high pressure measuring point
3	Control cartridge with orifice
4	Reverse high pressure measuring point
5	Reverse high pressure limiting valve
6	Boost pressure valve
7	Transposition screw
8	Pilot pressure
9	Mechanical zero position
10	Pedal-operated hydrostatic drive brake



Pos.	Description
1	Forwards high pressure limiting valve
2	Pressure cutoff
3	Pedal-operated hydrostatic drive brake
4	Tank line
5	Tank line flush valve
6	Port A
7	Port B

Description:

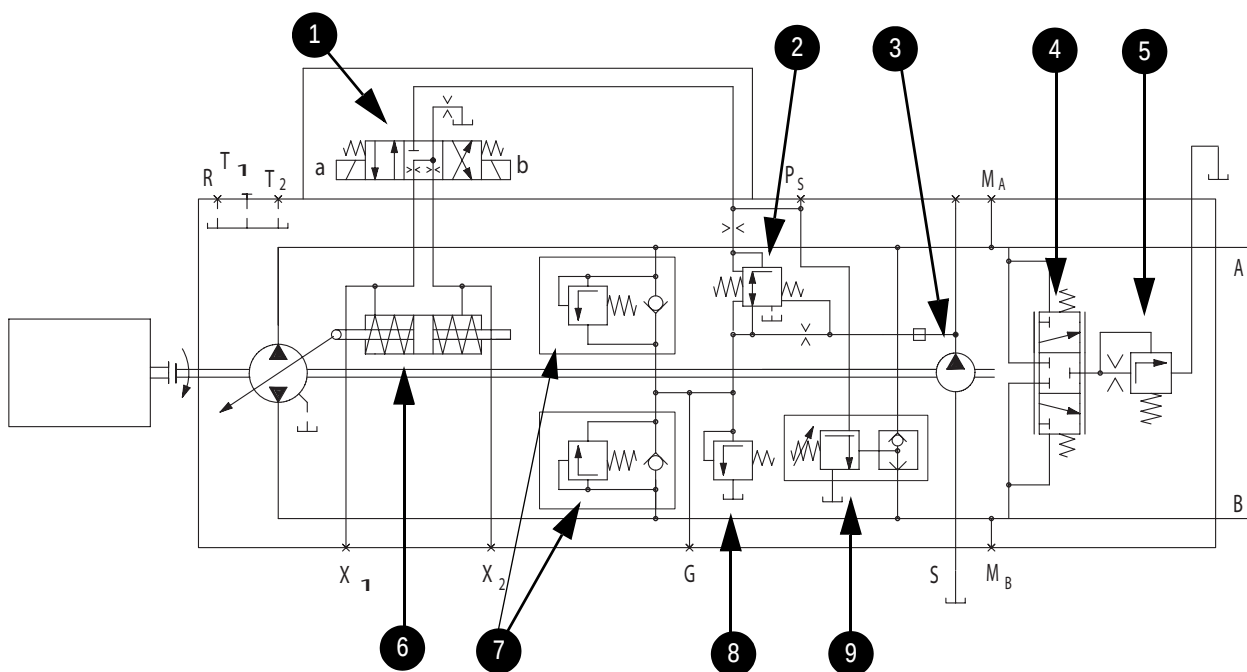
- A10 VG
 - ➔ Axial piston variable displacement pump, swash plate design for hydrostatic gearboxes in closed circuits
- 28
 - ➔ Displacement volume V_g max in cm^3
- DA
 - ➔ Hydraulic adjustment, speed-sensitive

The A10VG is a variable displacement pump in axial-piston swash plate design. The volume flow is proportional to the drive revs and the displacement volume, and can be infinitely adjusted. The volume flow increases from 0 to maximum value the higher the deflection of the swash plate. The flow direction changes without any jerks as soon as the swash plate goes out of line through the zero position.

The pump is fitted with two pressure limiting valves for each high-pressure side to protect the hydrostatic gearbox (pump and motor) from overload. The high pressure limiting valves also have the function of feed valves.

The integrated boost pump has the function of a feed pump and pilot oil pump. The max. boost pressure is limited by the built-in boost pressure limiting valve.

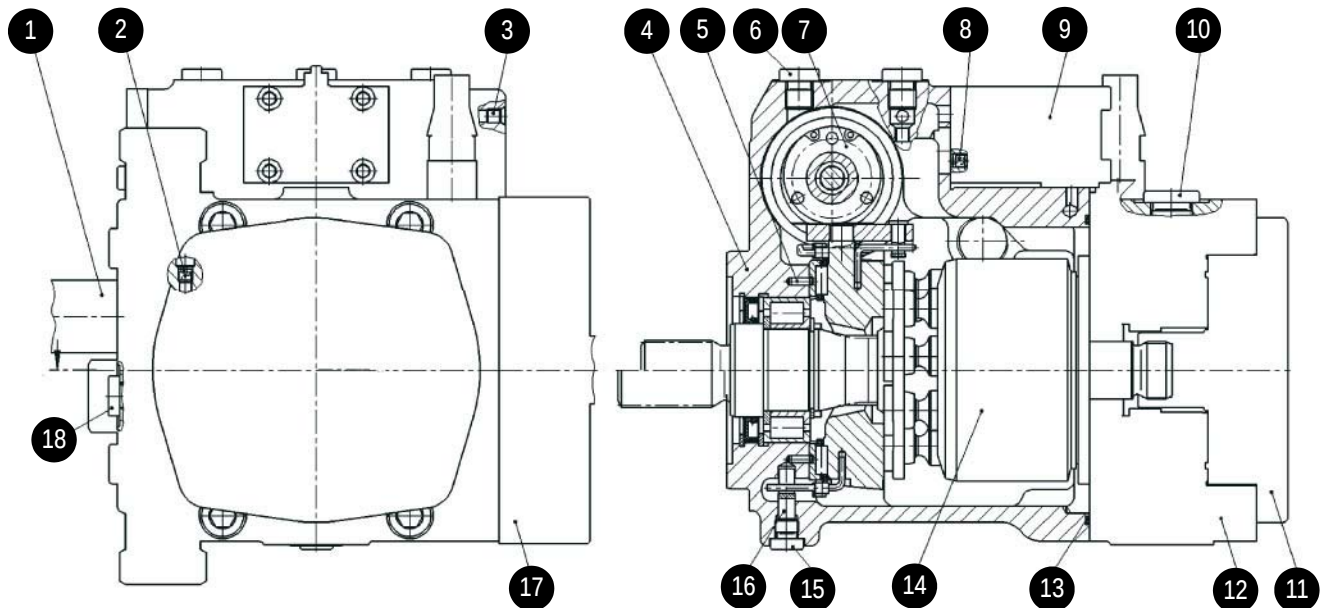
Variable displacement pump: diagram



Pos.	Description
1	Solenoid (a reverse; b forwards)
2	Control cartridge
3	Boost pump
4	Scouring slide valve
5	Flush valve
6	Servo cylinder
7	HP valve
8	Boost pressure valve
9	Pressure cutoff

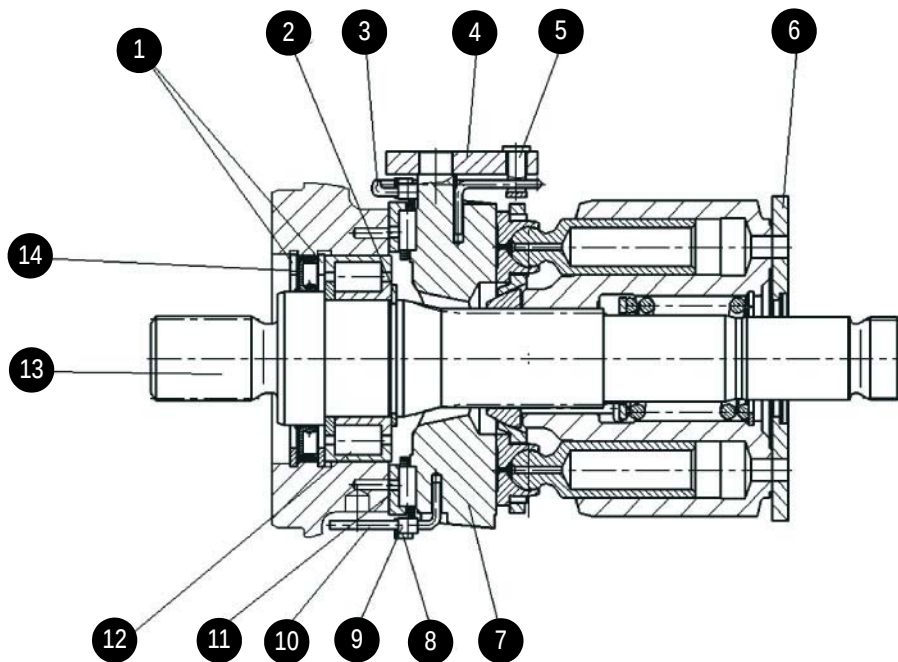


Variable displacement pump: design



Pos.	Description
1	Control cartridge
2	Nozzle
3	Double tear-off plug
4	Housing
5	Straight pin
6	Screw plug
7	Hydraulic adjustment
8	Nozzle
9	4/3 directional valve
10	Screw plug
11	Internal-gear pump set
12	Connecting plate with valves
13	O-ring
14	Travelling drive
15	Screw plug
16	Articulated pin
17	Flush and boost pressure valve
18	Screw plug

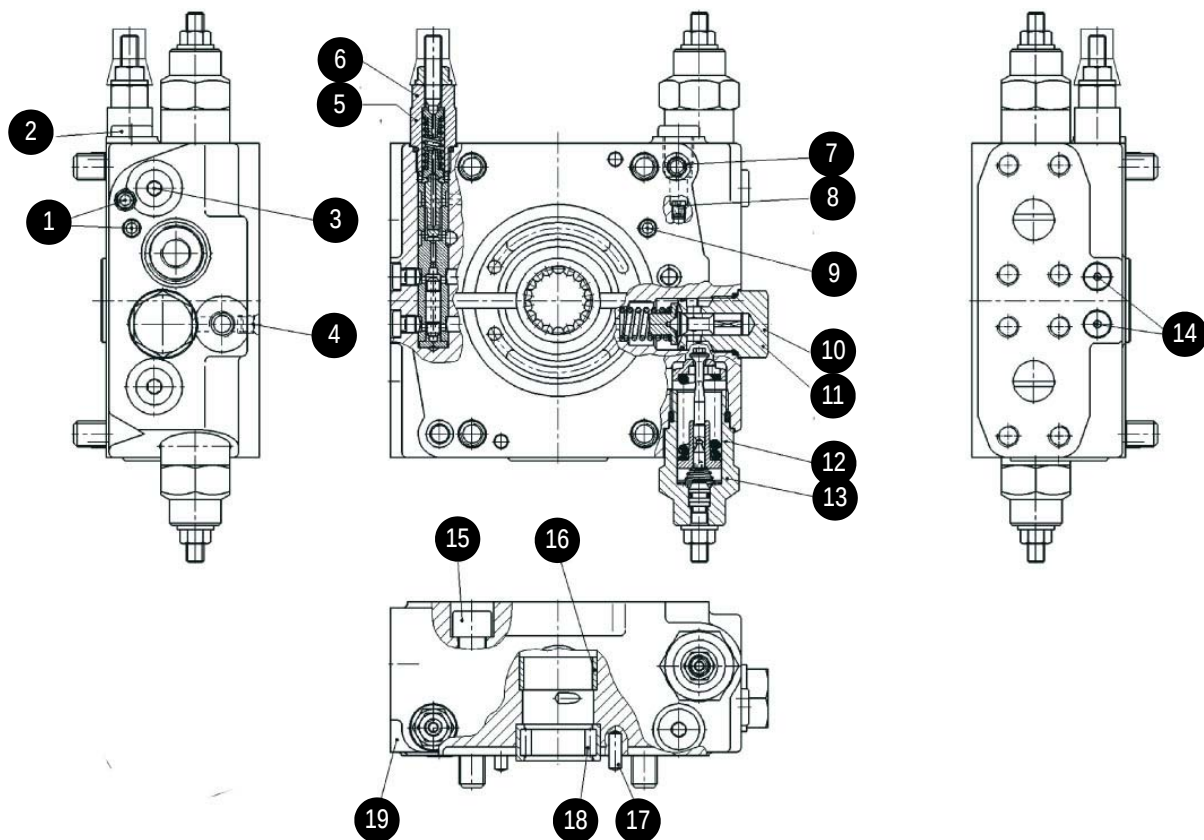
Travelling drive: overview



Pos.	Description
1	V-ring
2	Circlip
3	Wire
4	Sliding block
5	Articulated pin
6	Power train, hydraulic part
7	Cradle
8	Cage pair
9	Roller
10	Wire
11	Pair of bearing pins
12	Cylindrical roller bearing
13	Driving shaft
14	Rotary shaft lip seal

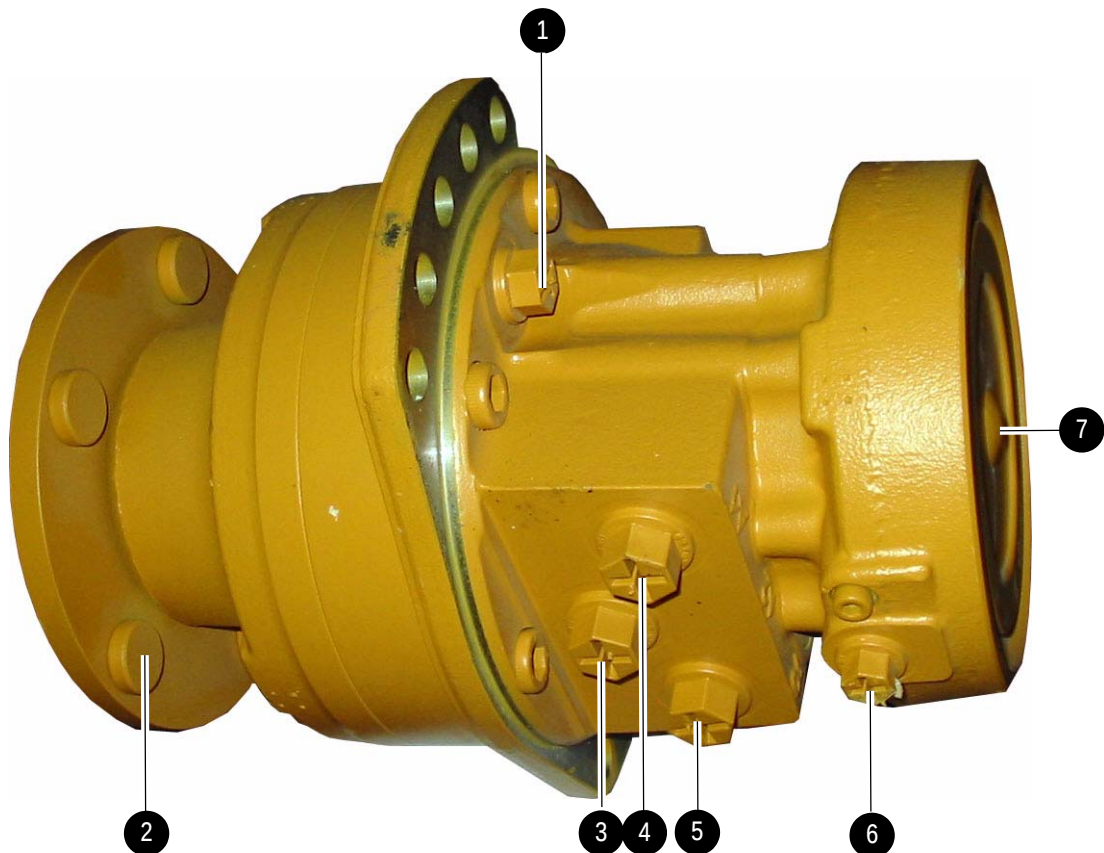


Connecting plate with valves



Pos.	Description
1	Double tear-off plug
2	Screw plug
3	Screw plug
4	Double tear-off plug
5	Screw plug screwed in at 35 Nm
6	Cutoff valve
7	O-ring
8	Nozzle
9	Double tear-off plug
10	Pressure limiting valve
11	Valve screwed in at 70 Nm
12	Pressure limiting valve
13	Valve screwed in at 160 +/- 10 Nm
14	Screw plug
15	Cheese-head screw
16	Bearing bushing
17	Parallel pin
18	Cylindrical roller bearing
19	Connecting plate

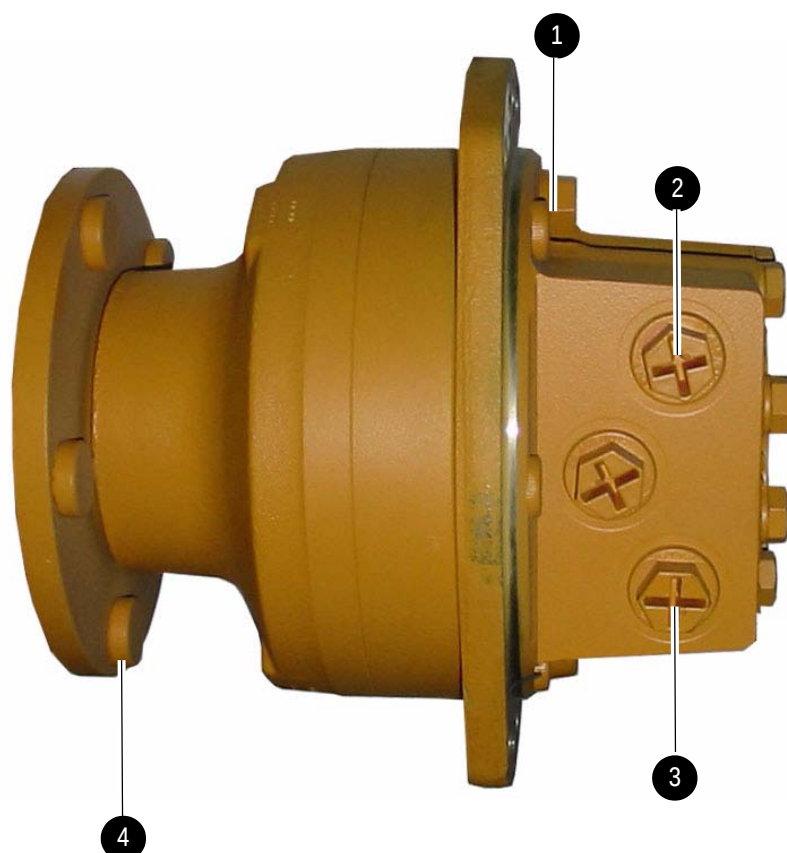
5.3 Rear hydraulic motor



Pos.	Description
1	Leak oil port
2	Wheel screws
3	Forwards high pressure supply
(right-hand side hydraulic motor A2/left-hand side hydraulic motor R)	
4	A1 front hydraulic motor serial line
5	Reverse high pressure supply
(right-hand side hydraulic motor R/left-hand side hydraulic motor A2)	
6	X parking brake connection
7	Parking brake release M12

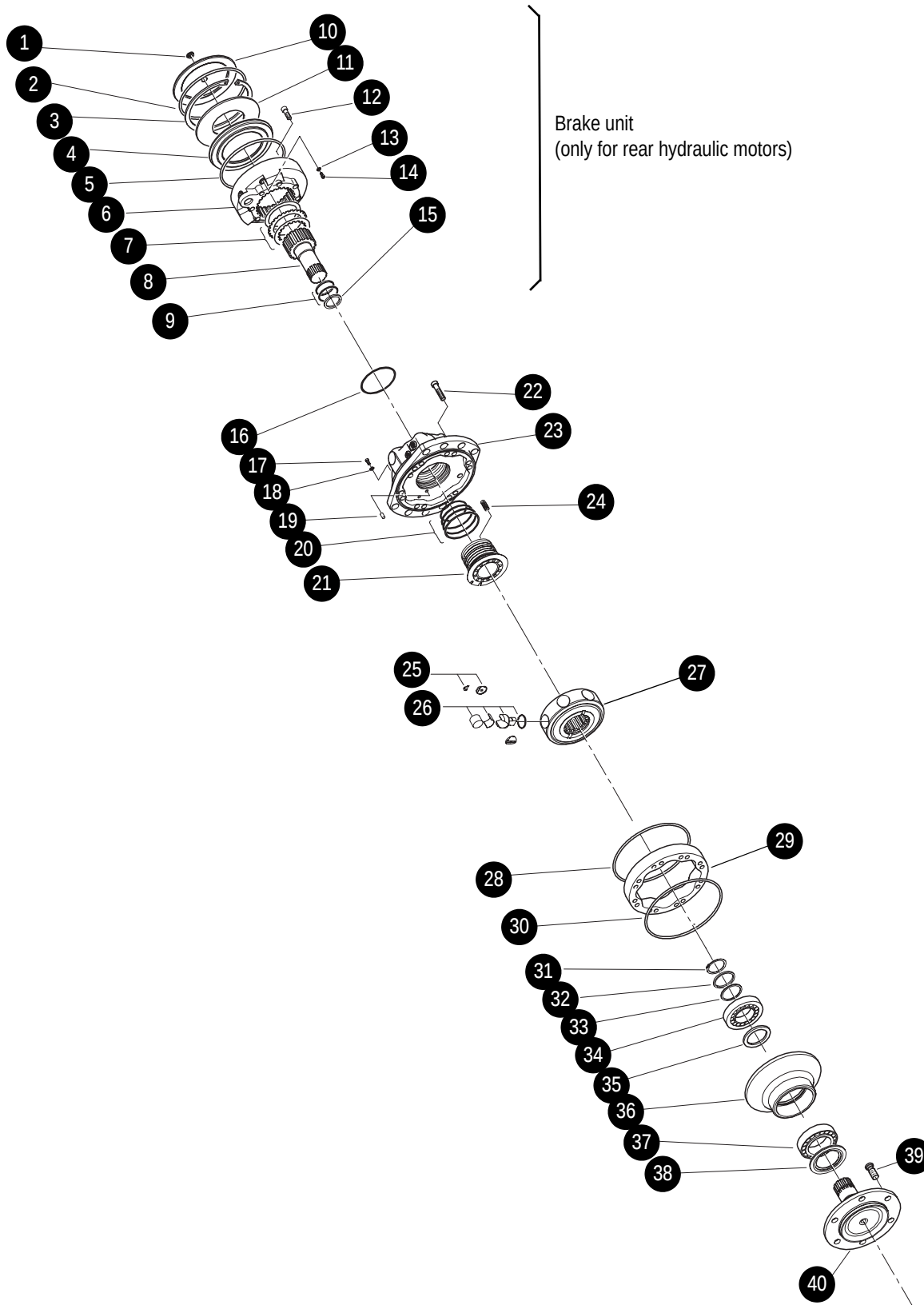


5.4 Front hydraulic motor



Pos.	Description
1	Leak oil port
2	L rear hydraulic motor series line
3	R forwards high pressure supply
4	Wheel screws

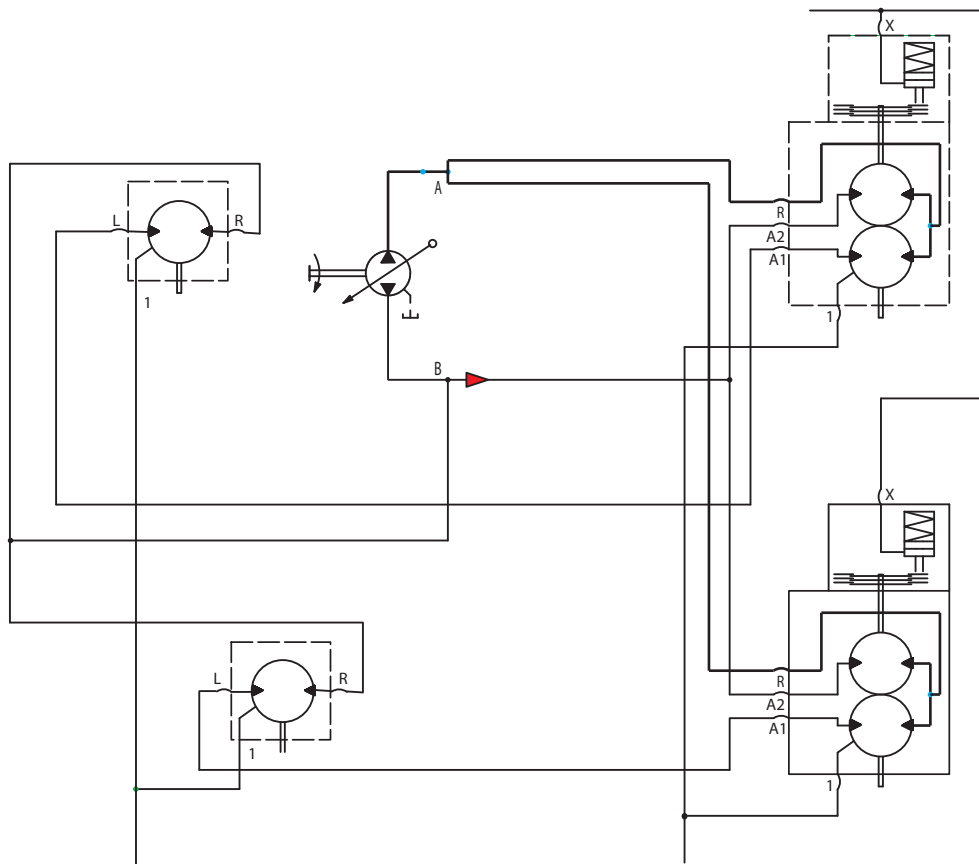
Hydraulic motor: overview





Pos.	Description
1	Sealing kit
2	Sealing kit (O-ring)
3	Circlip
4	Brake piston
5	Sealing kit (O-ring)
6	Brake housing
7	Set of brake discs
8	Shaft
9	Sealing kit
10	Sealing kit
11	Belleville spring washer
12	Screw
13	Sealing kit
14	Screw
15	Set of brake discs
16	Sealing kit (O-ring)
17	Screw
18	O-ring
19	Pin
20	Sealing kit
21	Mirror
22	Screw
23	Cover
24	Spring
25	Repair kit
26	Piston
27	Cylinder block
28	Sealing kit (O-ring)
29	Cam disc
30	Sealing kit (O-ring)
31	Circlip
32	Ring
33	Set of claws
34	Bearing
35	Sealing kit
36	Bearing housing
37	Bearing
38	Sealing kit
39	Stud bolt
40	Shaft

5.5 Travelling drive: overview



Forwards driving function:

Flow-through direction of variable displacement pump from B to A

Reverse driving function:

Flow-through direction of variable displacement pump from A to B



5.6 Towing and transporting the machine

Safety instructions

- The machine may only be towed using suitable towing equipment (towing bar or cable) in connection with suitable towing facilities, such as a towing coupling, hooks and eyes!
- Move off slowly!
Make sure no-one is dangerously close to the towing bar
- The machine may only be towed with a cable if the service brakes and steering are fully operational!

Towing



Caution!

The hydrostatic drive can be damaged when towing the machine!

- ☞ Switch off the engine!
- ☞ Open the high-pressure circuit on the pump
- ☞ Release the hydraulic parking brakes on both wheel motors
- ☞ Do not tow the machine for more than 1 km and no faster than 2 kph!

Opening the high-pressure circuit

Both high-pressure limiting valves are located on the left side of the pump, underneath the floor panel.

Proceed as follows:

- ☞ Slacken locknut w/f 14 **1** and unscrew it to the end of the screw
- ☞ Screw the screw with allen key w/f 4 **2** until you can feel a firmer resistance
- ☞ Then screw in a further half revolution



Caution!

Screwing in any further damages the valve.

- ☞ Retighten the locknut
- ☞ Slowly tow the machine (max. 2 kph) over a short distance (max. 1 km)
- ☞ Then reset the valves. Proceed in the reverse order to do this.

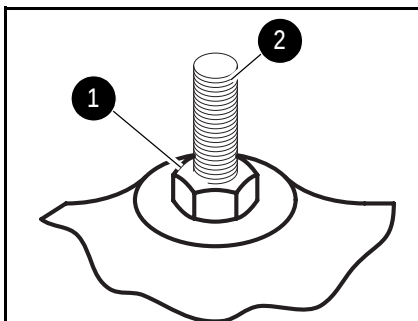


Fig. 1: High-pressure circuit screw



Releasing the hydraulic parking brake

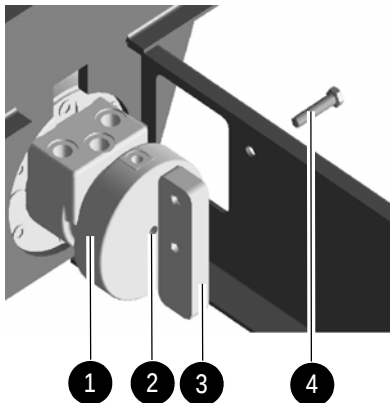


Fig. 2: Removing the extraction unit

- ✎ Remove both extraction units **3** mounted on the rear axle body to release the hydraulic parking brake **1**.
- ✎ Remove hexagon head screw **4** M12x35 w/f 19 to this effect
- ✎ Remove plastic plugs **2** in the middle on the face of the wheel motors.

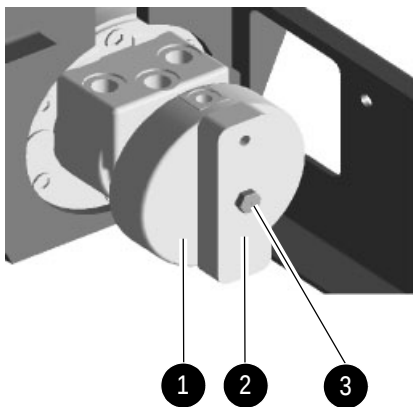


Fig. 3: Removing the extraction unit

- ✎ Place extraction unit **2** on the face of the axle on hydraulic parking brake **1** and fasten it with screw **3** M12x35 w/f 19
- ✎ Tighten screw with 42 Nm until the wheel can be turned freely



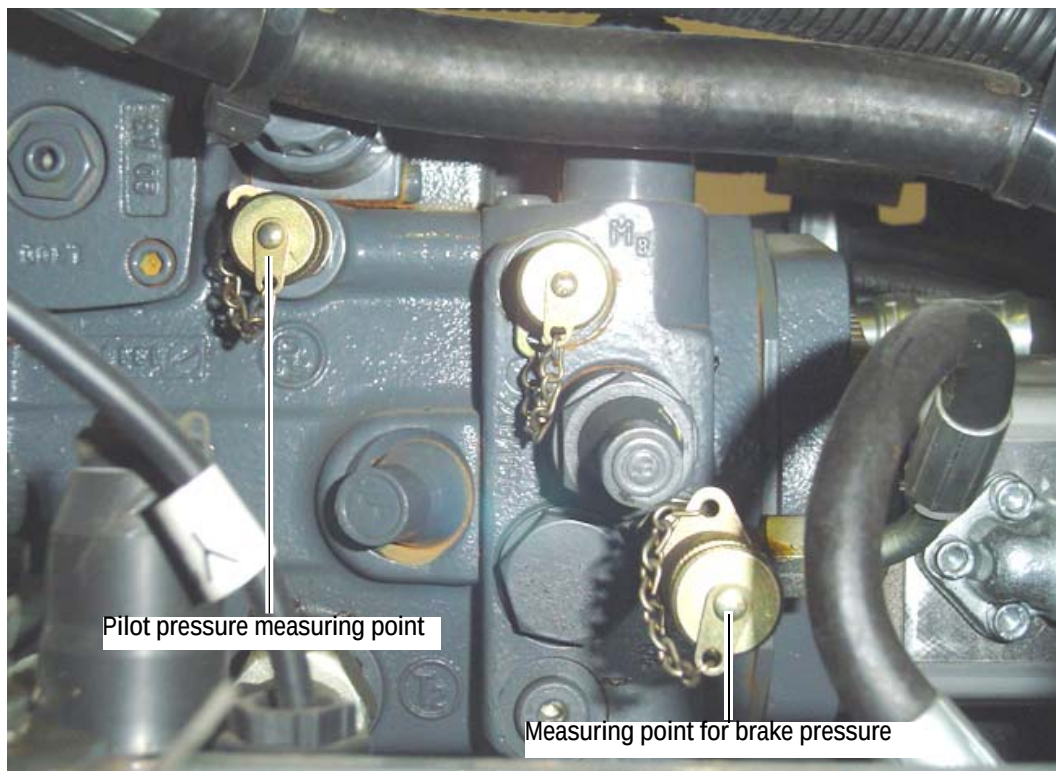
5.7 Test instruction

Pilot pressure check

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!

Tools required:

- 1 x pressure gauge 60 bar



Check the pilot pressure as follows:

- ☞ Move the drive lever to neutral
- ☞ Apply the parking brake
- ☞ Connect the 60 bar pressure gauge to the test port
- ☞ Start the diesel engine
 - Rated pilot pressure at full revs about 20 bar
 - Rated pilot pressure at idling speed about 5 – 7 bar

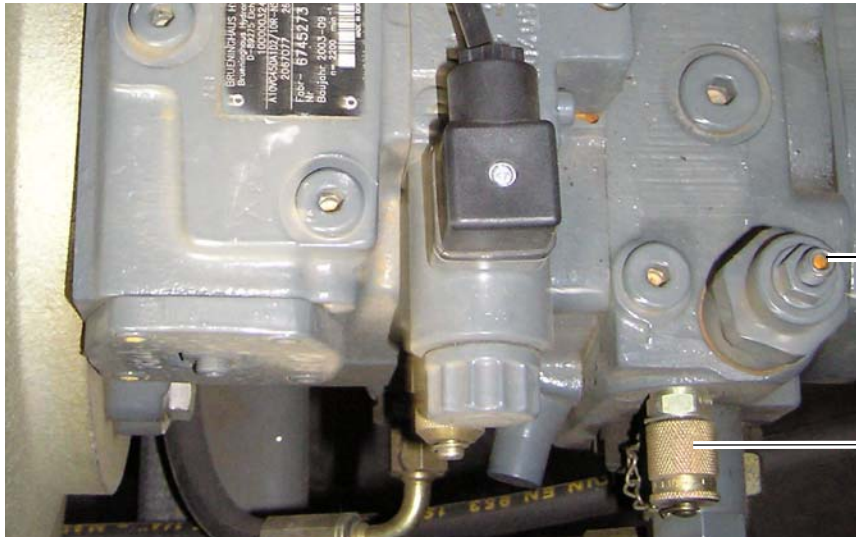
Check brake pressure as follows:

- ☞ Move the drive lever to neutral
- ☞ Apply the parking brake
- ☞ Connect the 60 bar pressure gauge to the test port
- ☞ Start the diesel engine
 - Rated brake pressure at full revs about 25 – 30 bar
 - Rated brake pressure at idling speed about 5 – 7 bar

High pressure check

Tools required:

- Pressure gauge (600 bar)



Check high pressure as follows:

- ☞ Switch off the ignition
- ☞ Connect the pressure gauge
- ☞ Start the diesel engine and move the drive lever to forwards speed range
- ☞ Drive the machine against hydraulic resistance
 - ➔ Do not allow the wheels to spin
- ☞ Read the pressure gauge
 - ➔ High pressure must be about 360 bar



Important!

It is not possible to adjust the high pressure valves.

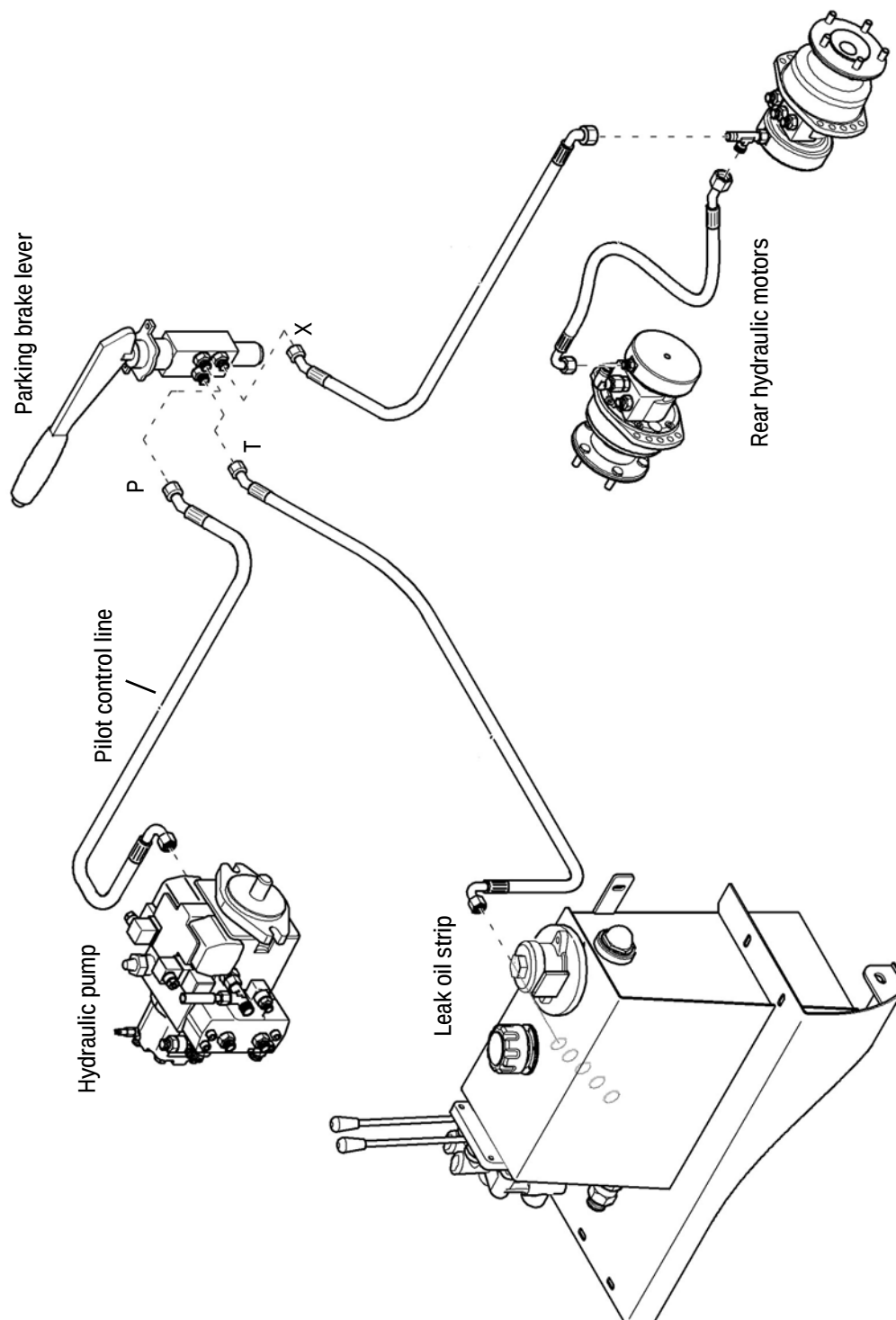
Brakes



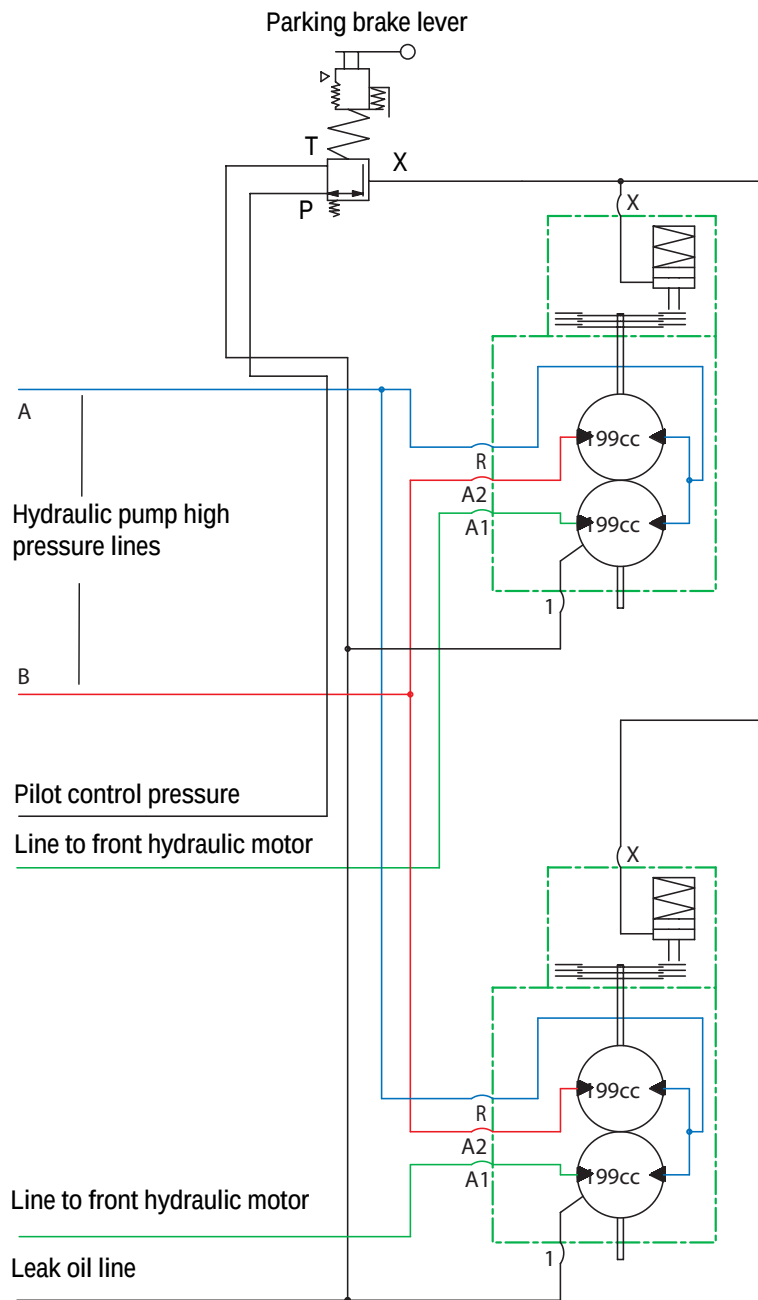
6 Brakes

6.1 Brake circuit up to serial no. BB001360

Hydrostatic drive, hydraulic parking brake on rear wheel motors for auxiliary brake and parking brake controlled via hand brake valve.



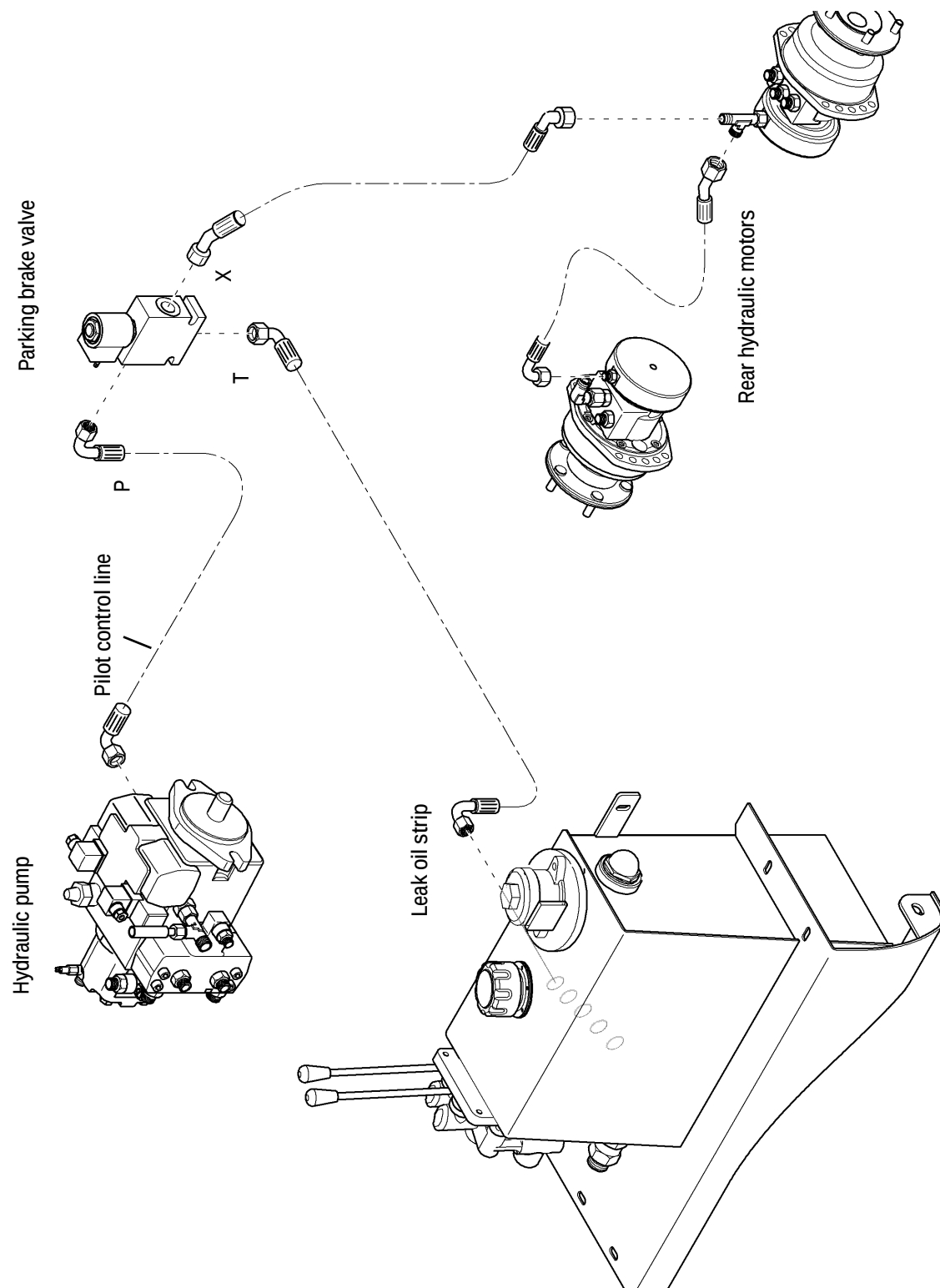
Brake diagram



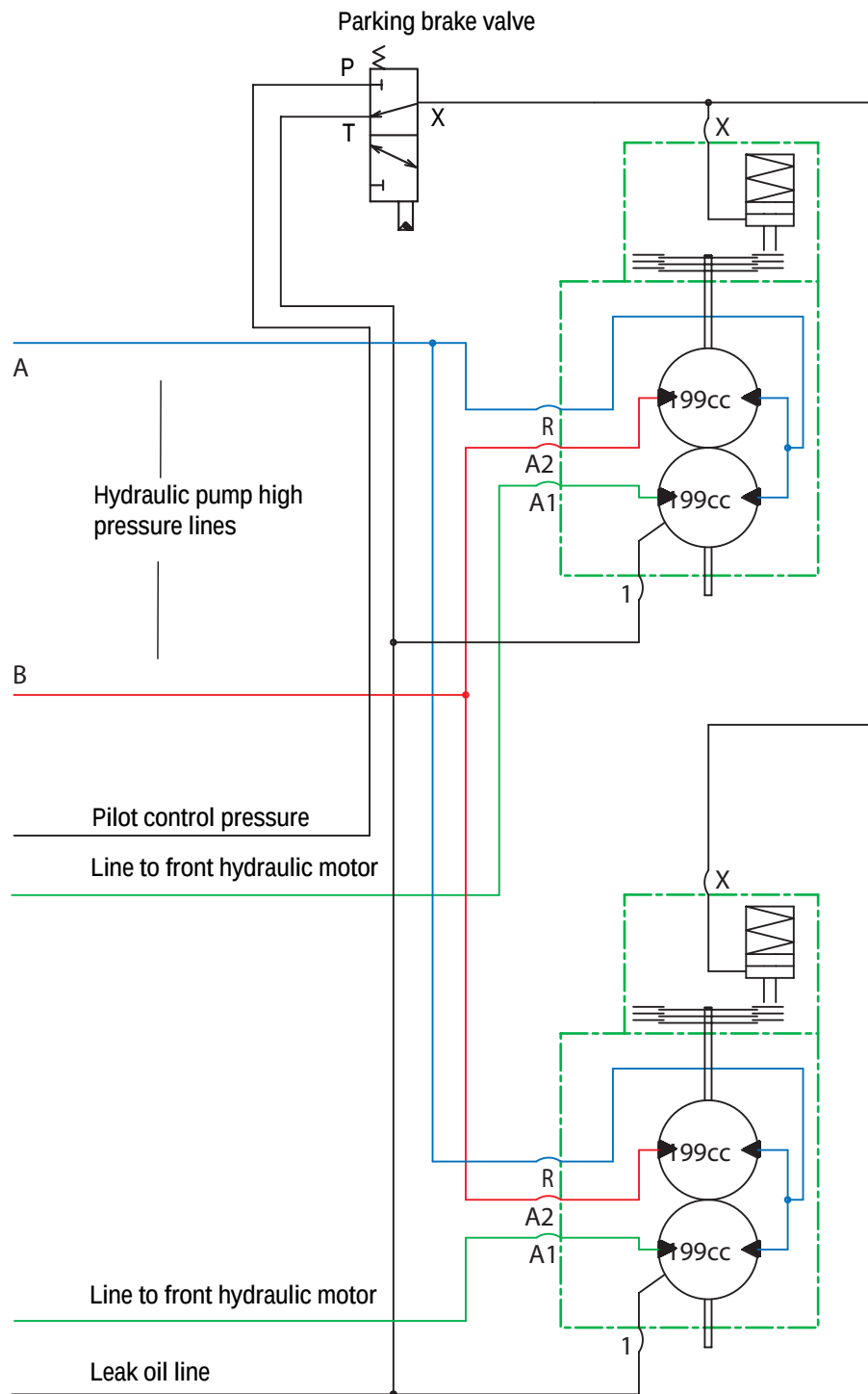


6.2 Brake circuit from serial no. BB001361

Hydrostatic drive, hydraulic parking brake on rear wheel motors for auxiliary brake and parking brake controlled via solenoid valve. Solenoid valve controlled via time lag relay 3 s after switching off the engine.



Brake diagram



Steering system

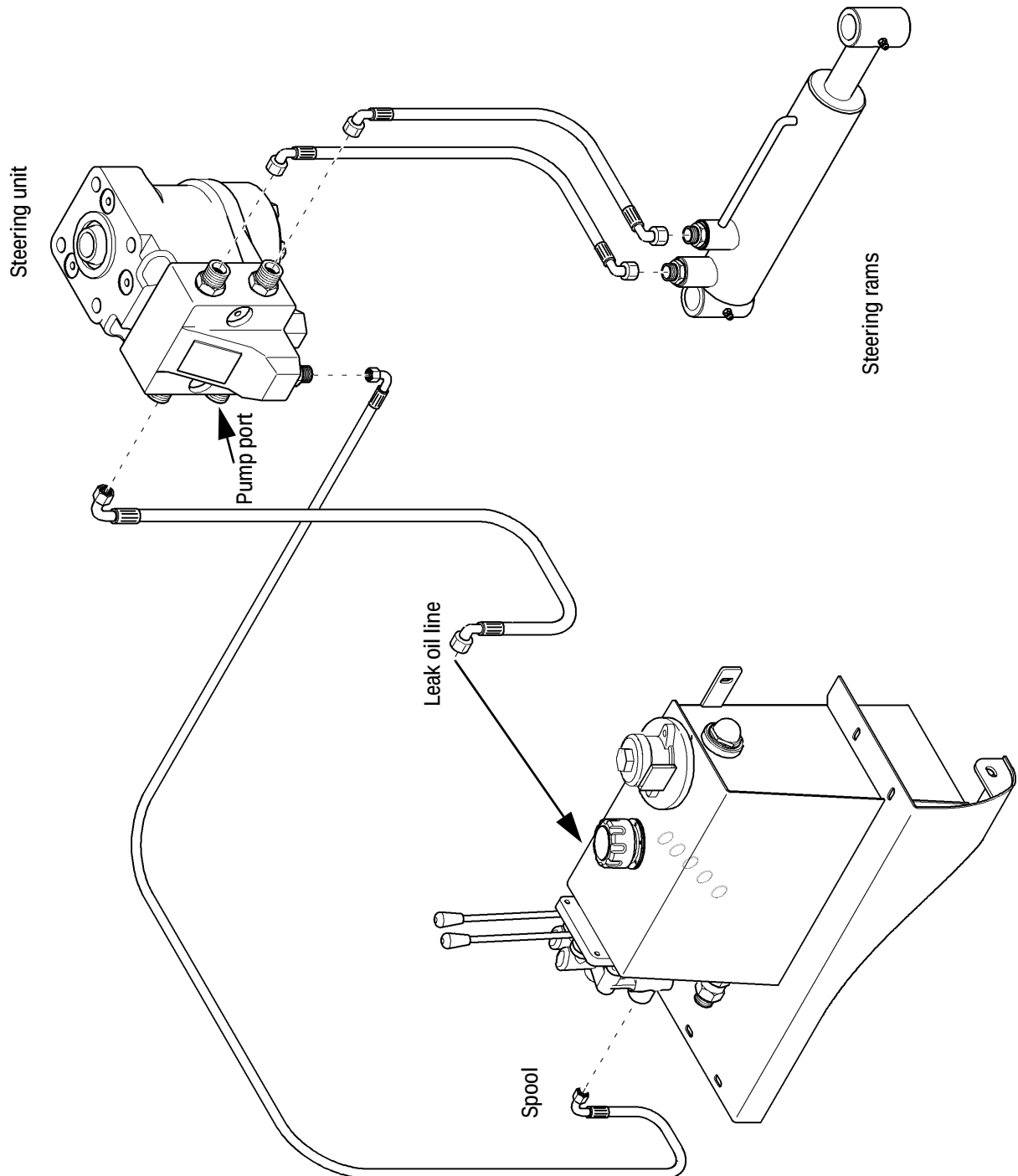


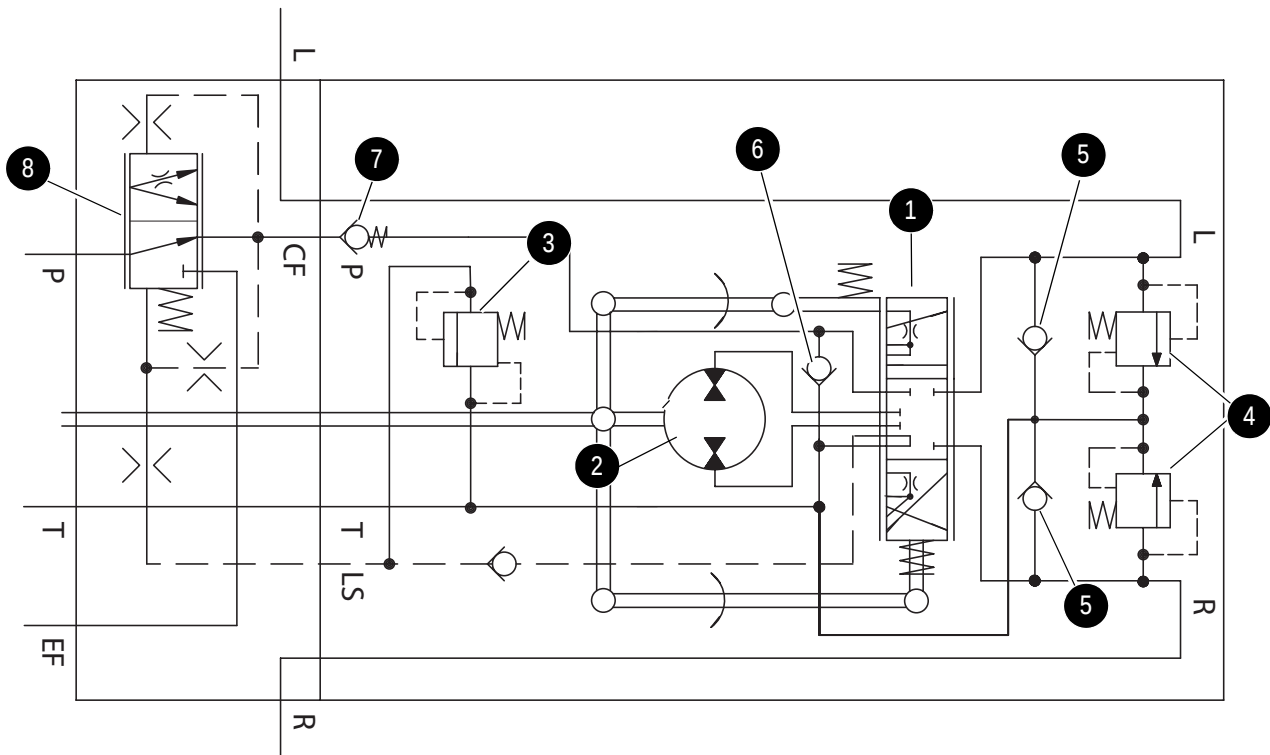
7 Steering system

Up to serial number BB000864: 1000065029 (Bosch Rexroth)

From serial number BB000865: 1000079043 (Sauer-Danfoss)

7.1 Steering circuit



7.2 Steering unit: diagram

Pos.	Description
1	Spool
2	Rotor
3	Pilot valve for load signal
4	Shock valves
5	Steering ram anticavitation valves
6	Anticavitation valve
7	Non-return valve
8	Priority valve

Function

Both shock valves 4 protect the L and R connections to the steering ram. The oil is directed to the other side via the anticavitation valve 5 as soon as one of the shock valves responds. These anticavitation valves 5 also allow for resuction of leak oil from the tank.

The steering unit runs as a manual pump in the case of a defective pump. Via anticavitation valve 6, the oil is reaspirated from the leak oil line. In doing so, non-return valve 7 avoids air being aspirated via pump port P. In normal operation, this same valve prevents high external steering forces from affecting the steering wheel (shocks).

Using a priority valve is necessary given the fact that the steering system and the work hydraulics are supplied with oil by the same pump. This valve ensures the steering unit is supplied with oil first. In the process, the valve is controlled by the load signal of the steering unit. The entire oil volume of the pump is available for the work hydraulics if no steering movements are carried out.



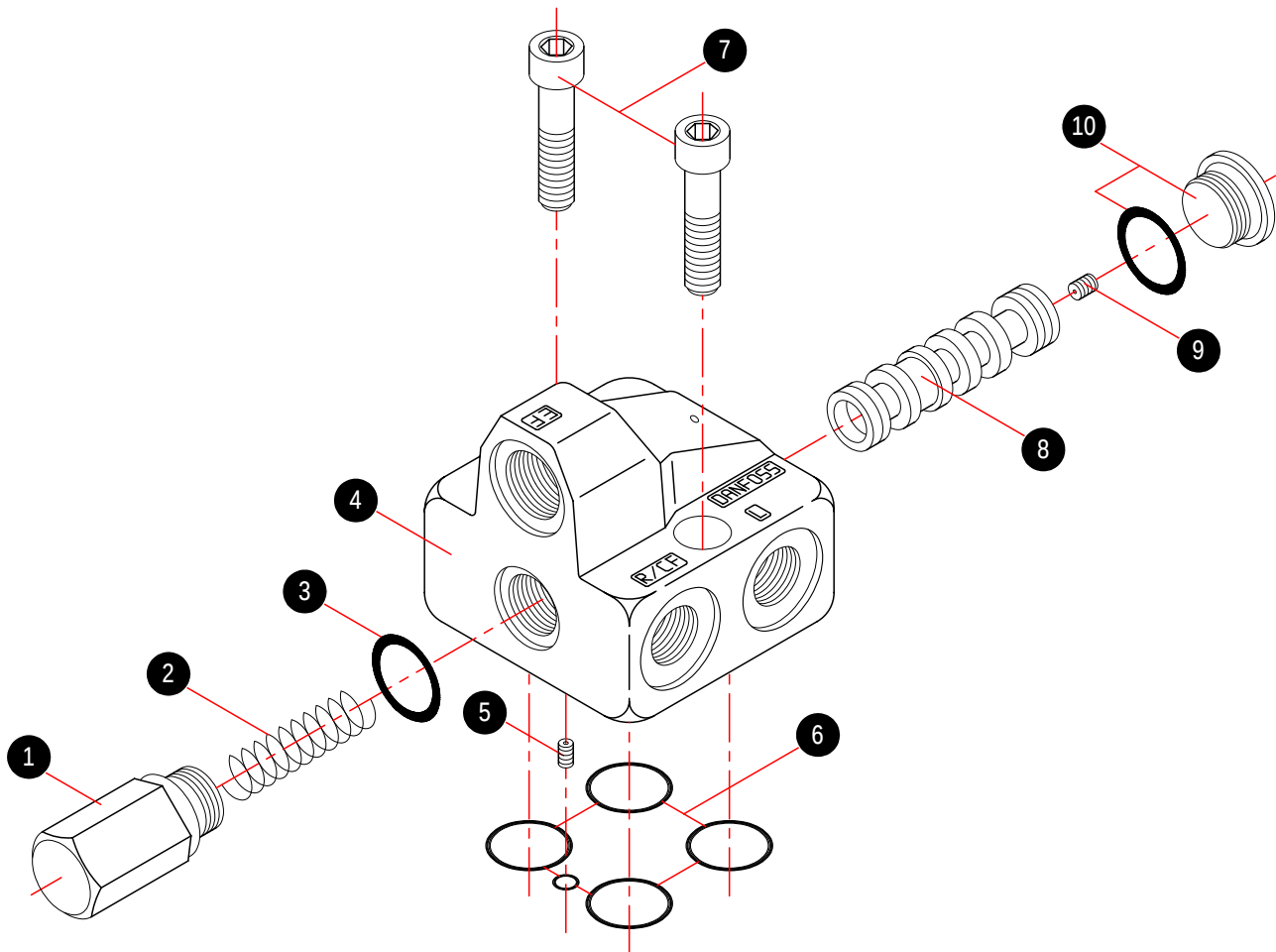
7.3 Steering unit connections



Port	
P	Pump line
T	Leak oil line
EF	Control valve pressure line
L	Steering ram bottom side
R	Steering ram rod side

7.4 Steering unit: overview

Priority valve: overview

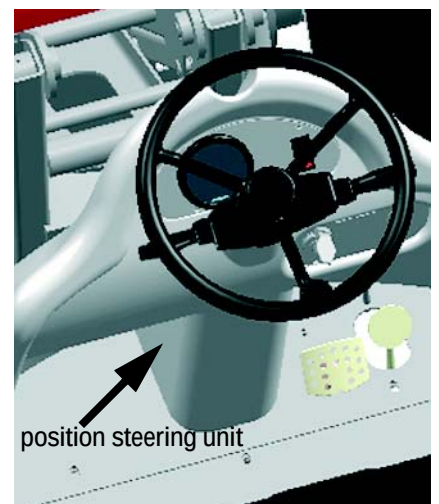
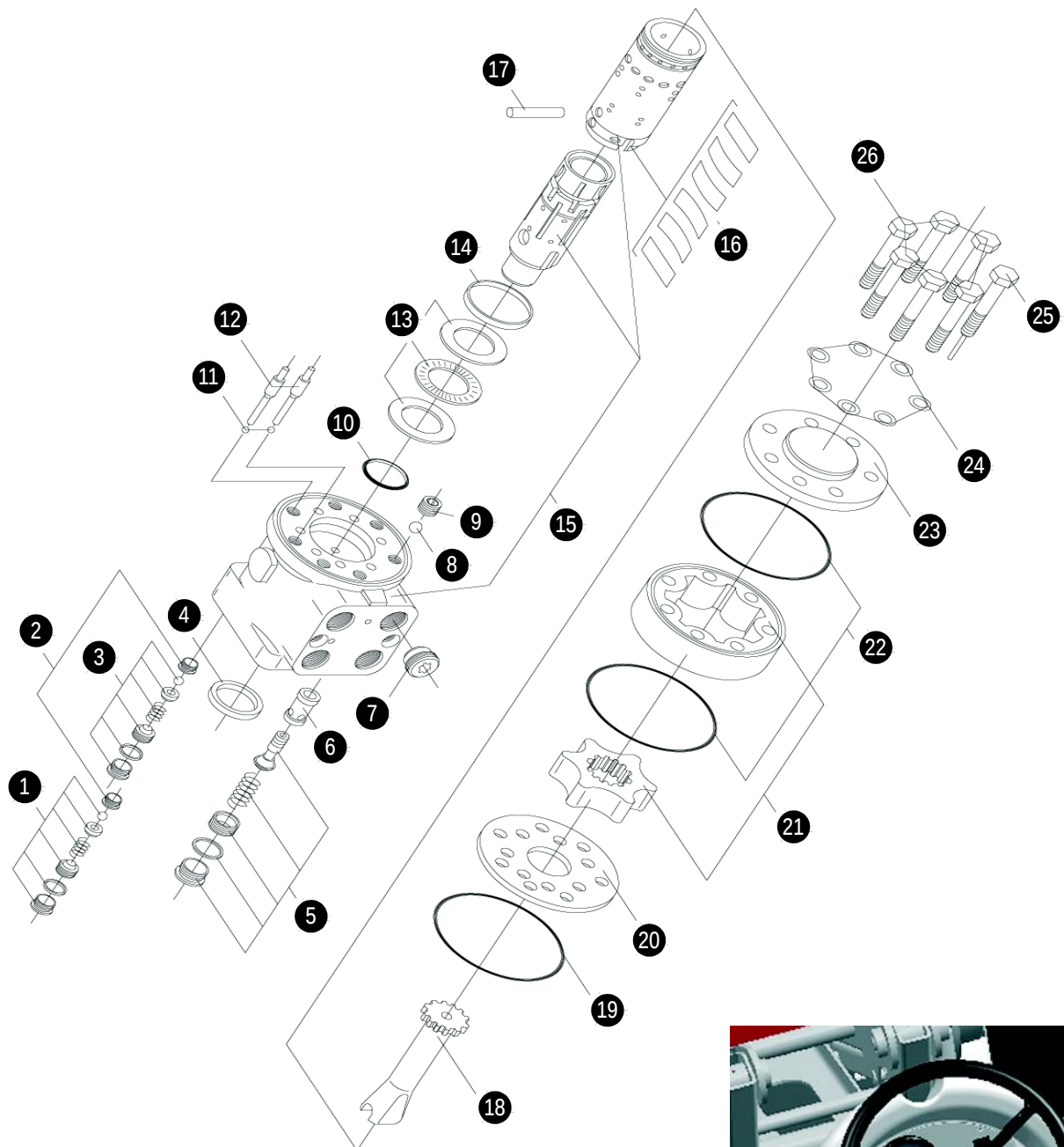


Priority valve: legend

Pos.	Description
1	Plug 50 +/- 10 Nm
2	Spring 7 bar
3	O-ring
4	Housing
5	Nozzle diameter 1 mm
6	O-ring
7	Fastening screws 65 +/- 5 Nm
8	Piston
9	Nozzle diameter 0.8 mm
10	Plug with O-ring 50 +/- 10 Nm



Steering unit



Steering system



neuson®

Steering unit: legend

Pos.	Description
1	Shock valve 200 – 220 bar
2	Valve housing
3	Shock valve 200 – 220 bar
4	Dust seal
5	Pilot valve 140 – 145 bar
6	Housing for pilot valve
7	Plug
8	Non-return valves
9	Threaded bushing
10	O-ring
11	Non-return valves
12	Bushing with pin
13	Bearing
14	Ring
15	Piston housing
16	Set of springs
17	Safety pin
18	Cardan shaft
19	O-ring
20	Distributor plate
21	Gear set
22	O-ring
23	Terminal plate
24	Washer
25	Screw with pin 30 +/- 6 Nm
26	Screw 30 +/- 6 Nm

Hydraulic system

8 Hydraulic system

8.1 Control valve connections: overview



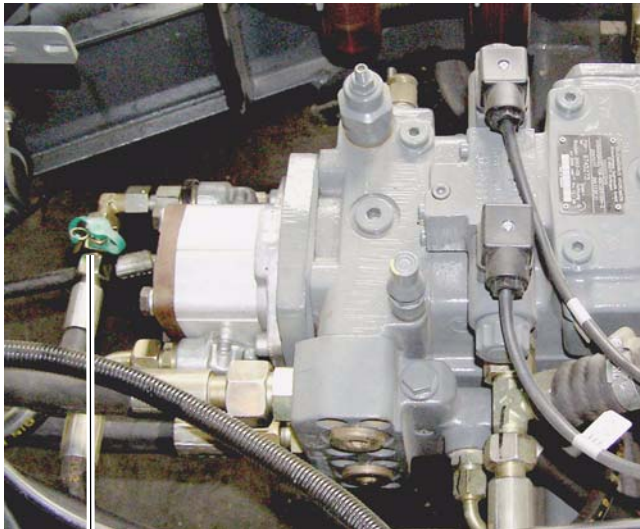
Pos.	Description
1	Lift ram base side port
2	Tilt ram rod side connection
3	Tilt ram bottom side connection
4	Supplied via steering unit
5	Pressure limiting valve
6	Tank line
7	Lift ram rod side connection

8.2 Test instructions

Check: work pump pressure

Tools required:

- 1 x pressure gauge min. 200 bar



Test port



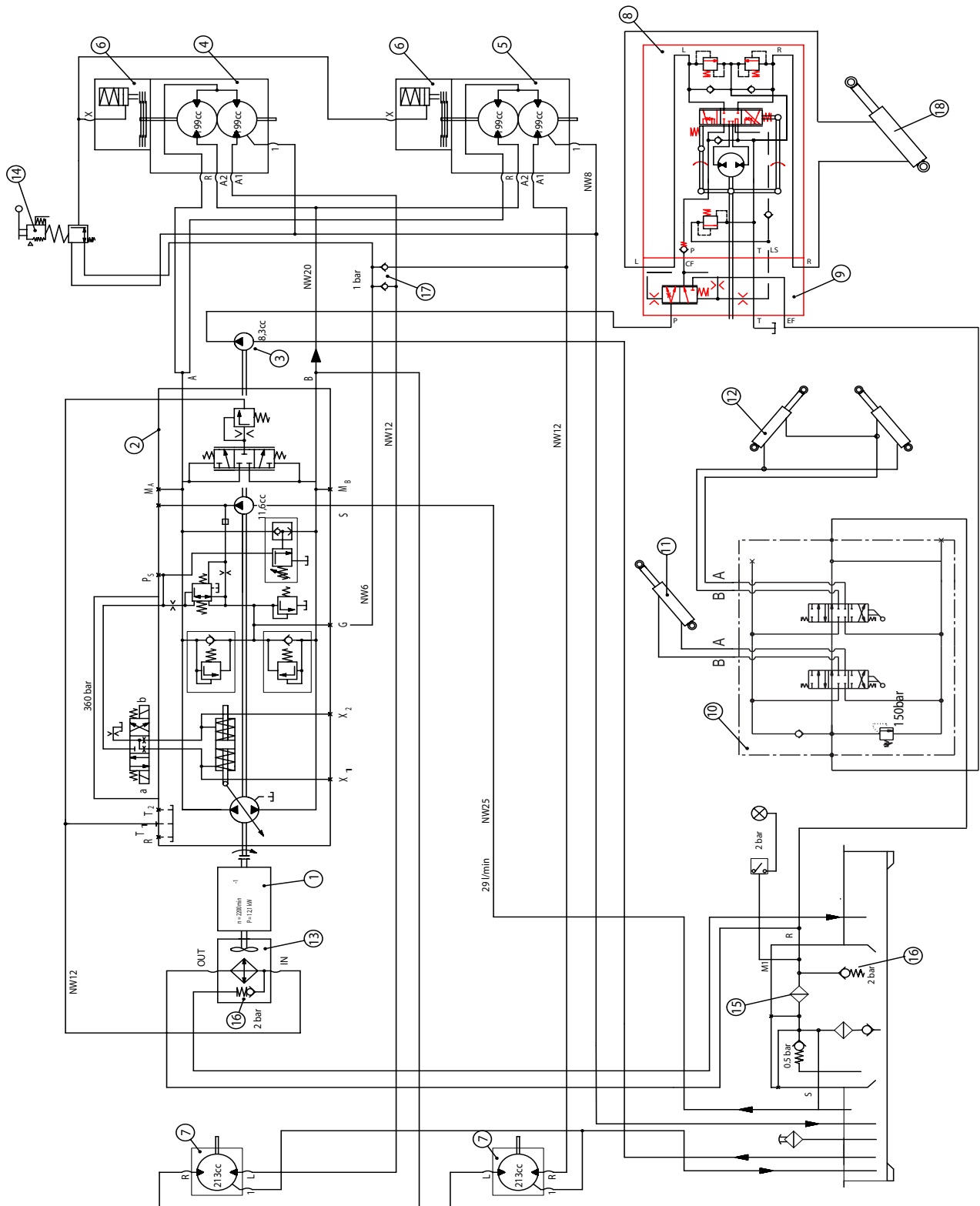
Set screw

Check the pressure as follows:

- ☞ *Connect the pressure gauge to the test port*
- ☞ *Start the diesel engine*
- ☞ *Extend or retract the tilt ram completely*
- ☞ *Check the pressure*
 - ➡ *Rated value: 150 bar*
- ☞ *Correct any pressure deviation by means of the set screw*



8.3 Diagram up to serial no. BB001360



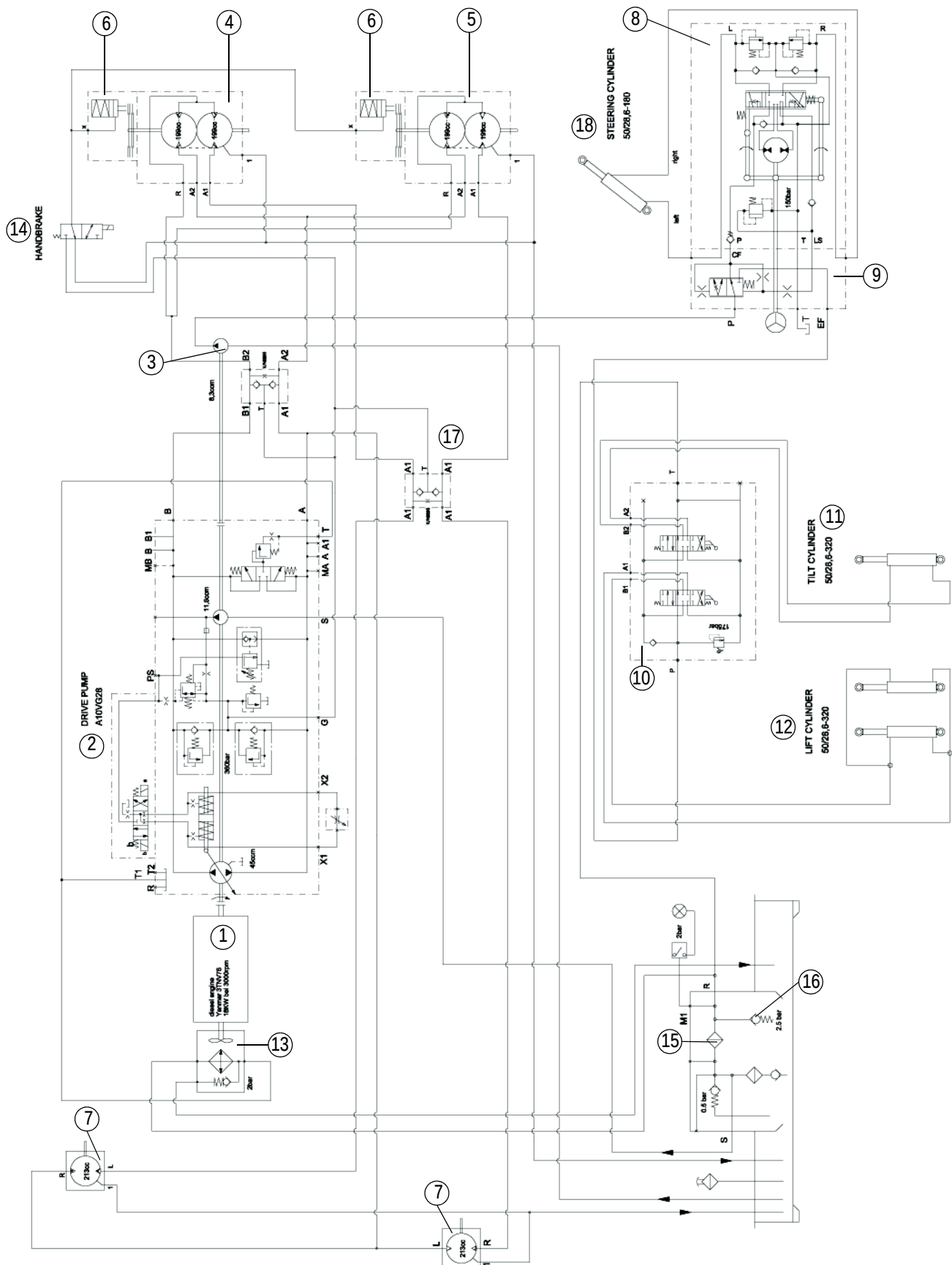


8.4 Diagram up to serial no. BB001360: legend

Pos.	Description
1	Diesel engine
2	Variable displacement pump with flush valve
3	Work pump (gear pump)
4	Rear right hydraulic motor
5	Rear left hydraulic motor
6	Hydraulic motor parking brake
7	Front hydraulic motors
8	Steering unit
9	Steering unit priority valve
10	Spool
11	Tilt ram
12	Lift ram
13	Combined oil/water radiator
14	Parking brake valve
15	Combined filter
16	Non-return valve 2 bar
17	Non-return valve 1 bar
18	Steering ram



8.5 Diagram from serial no. AB100001H

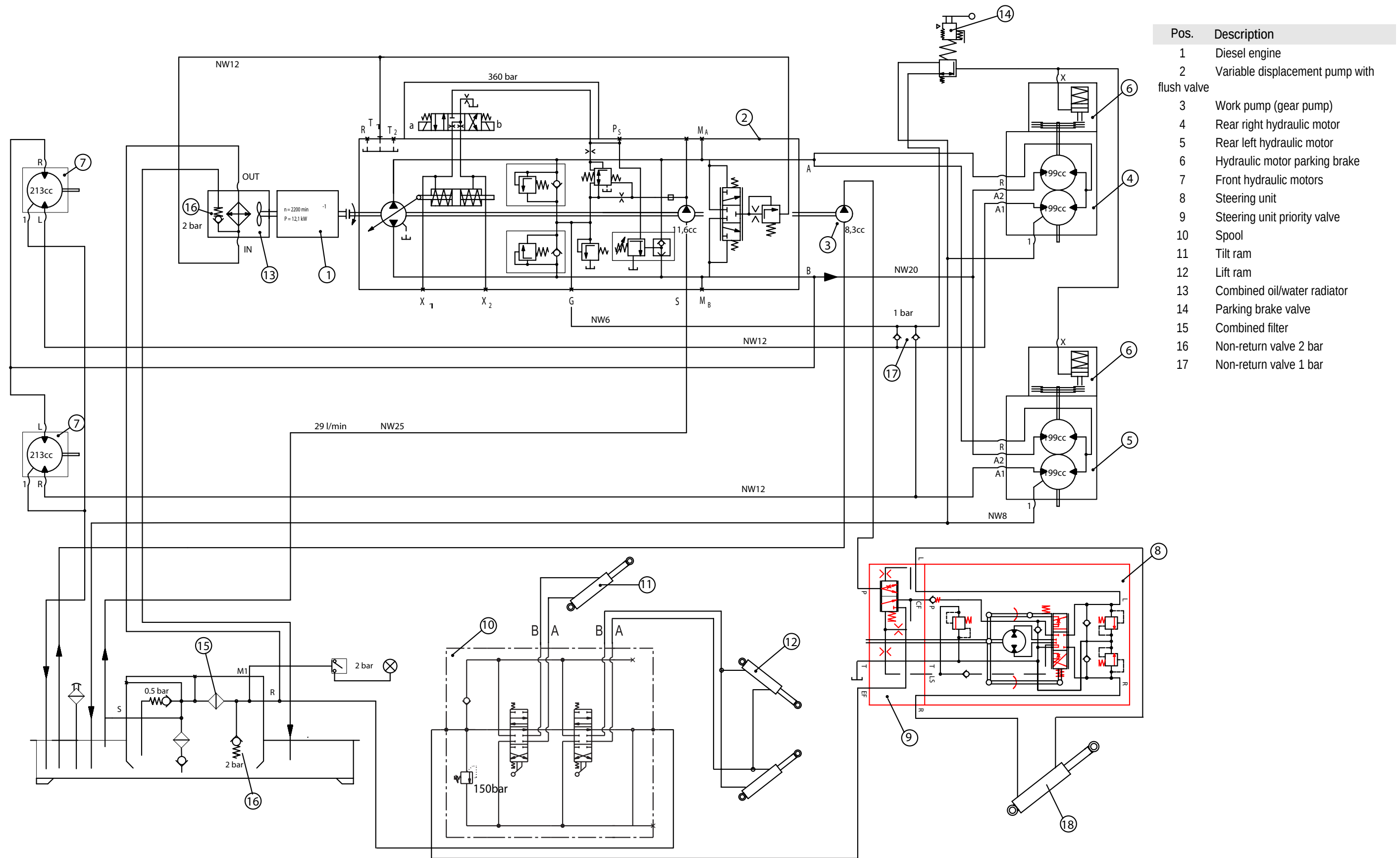




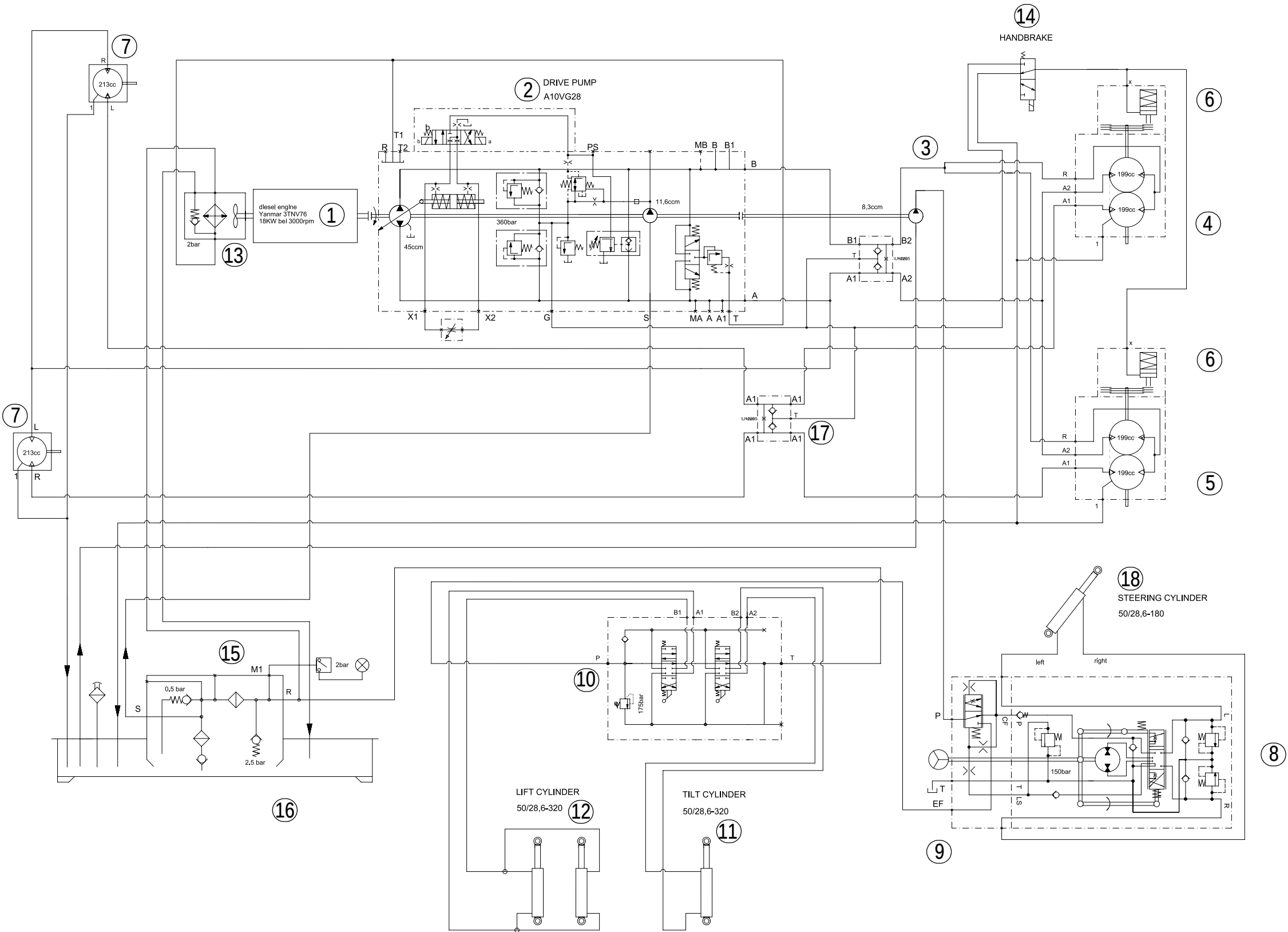
8.6 Diagram from serial no. AB100001H: legend

Pos.	Description
1	Diesel engine
2	Variable displacement pump with flush valve
3	Work pump (gear pump)
4	Rear right hydraulic motor
5	Rear left hydraulic motor
6	Hydraulic motor parking brake
7	Front hydraulic motors
8	Steering unit
9	Steering unit priority valve
10	Spool
11	Tilt ram
12	Lift ram
13	Combined oil/water radiator
14	Parking brake solenoid valve
15	Combined filter
16	Non-return valve 2 bar
17	Non-return valve 1 bar
18	Steering ram

8.7 Hydraulics diagram A3 up to serial no. BB001360



8.8 Hydraulics diagram A3 from serial no. AB10001H



Pos.	Description
1	Diesel engine
2	Variable displacement pump with flush valve
3	Work pump (gear pump)
4	Rear right hydraulic motor
5	Rear left hydraulic motor
6	Hydraulic motor parking brake
7	Front hydraulic motors
8	Steering unit
9	Steering unit priority valve
10	Spool
11	Tilt ram
12	Lift ram
13	Combined oil/water radiator
14	Solenoid valve for parking brake
15	Combined filter
16	Non-return valve 2 bar
17	Non-return valve 1 bar

Electric system



9 Electric system

9.1 Ohm's Law (current, voltage, resistance); power

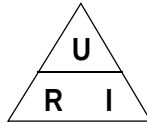
It describes the interrelation between current, voltage and resistance.

Current "I" – Ampere (A)

Voltage "U" – Volt (V)

Resistance "R" – Ohm (WW)

Mnemonic:



Output

Power "P" – Watt (W)

$$P = U \times I = R \times I^2 = U^2/R$$

9.2 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 W 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.

9.3 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.

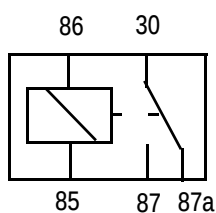


Fig. 1: Terminal description on relay

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)

9.4 Electric components

Units	
Alternator	12 V 20 A
Starter	12 V 1.2 kW
Battery	12 V 74 Ah

9.5 Fuse box in instrument panel (up to BB001360)

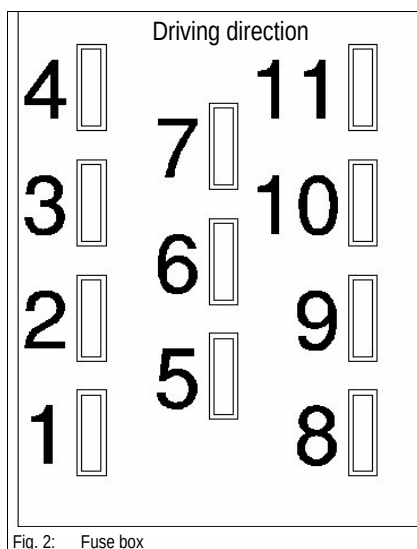


Fig. 2: Fuse box

Fuse no.	Rated current (A)	Protected circuit
1	30 A	– Cutoff solenoid, cutoff solenoid time lag relay
2	7.5 A	– Horn
3	7.5 A	– Alternator governor
4	7.5 A	– Solenoid valve pump
5	7.5 A	– Light switch
6		– Not assigned
7		– Not assigned
8	7.5 A	– Telltales
9		– Not assigned
10		– Not assigned
11		– Not assigned

Relays

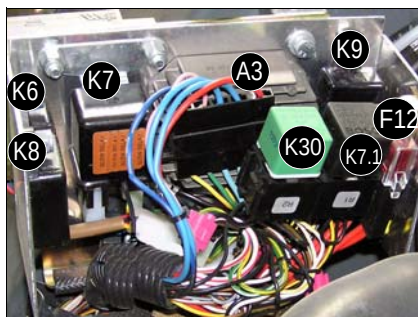
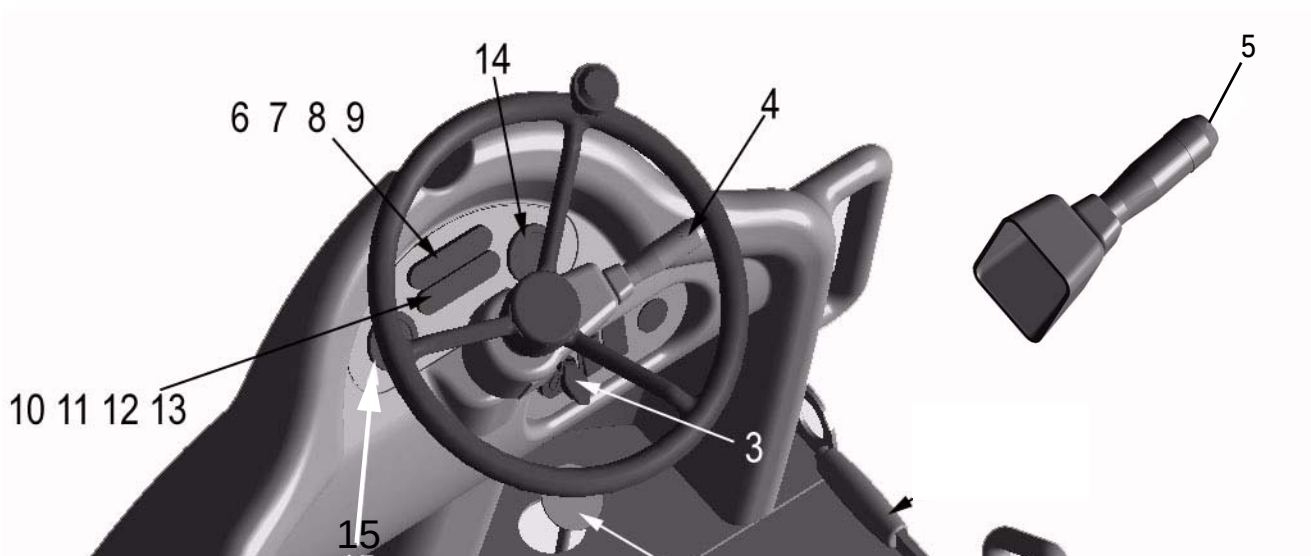
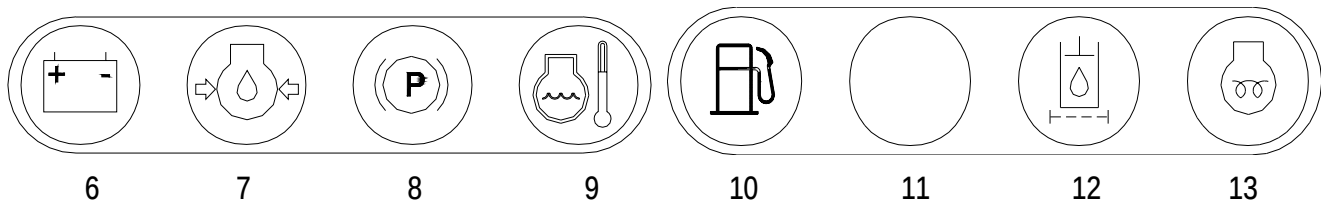


Fig. 3: Relays

The relays are located in the relay box in the engine compartment, to the right of the seat

Switching relay no.	Protected circuit
K 6	– Preheating time lag relay
K 8	– Cutoff solenoid time lag relay
K 7	– High current relay – start
K 9	– Cutoff solenoid switching relay
K 30	– Relay for parking brake warning buzzer
K 7.1	– Start interlock relay
A3	– Regulator
F12	– Main fuse

9.6 Instrument panel up to BB001360: overview



Pos.	Description
6	Alternator charge function telltale
7	Engine oil pressure telltale
8	Parking brake telltale
9	Engine temperature telltale
10	Spare fuel telltale
11	Not assigned
12	Hydraulic oil filter telltale
13	Preheating telltale
14	Hour meter
15	Fuel level indicator

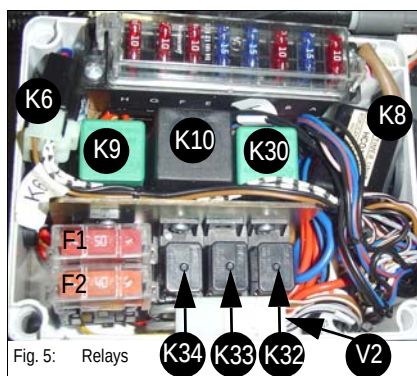
9.7 Fuse box in instrument panel (from AB100001H)

The fuse box is located on the right-hand side of the machine, under the engine cover next to the seat.



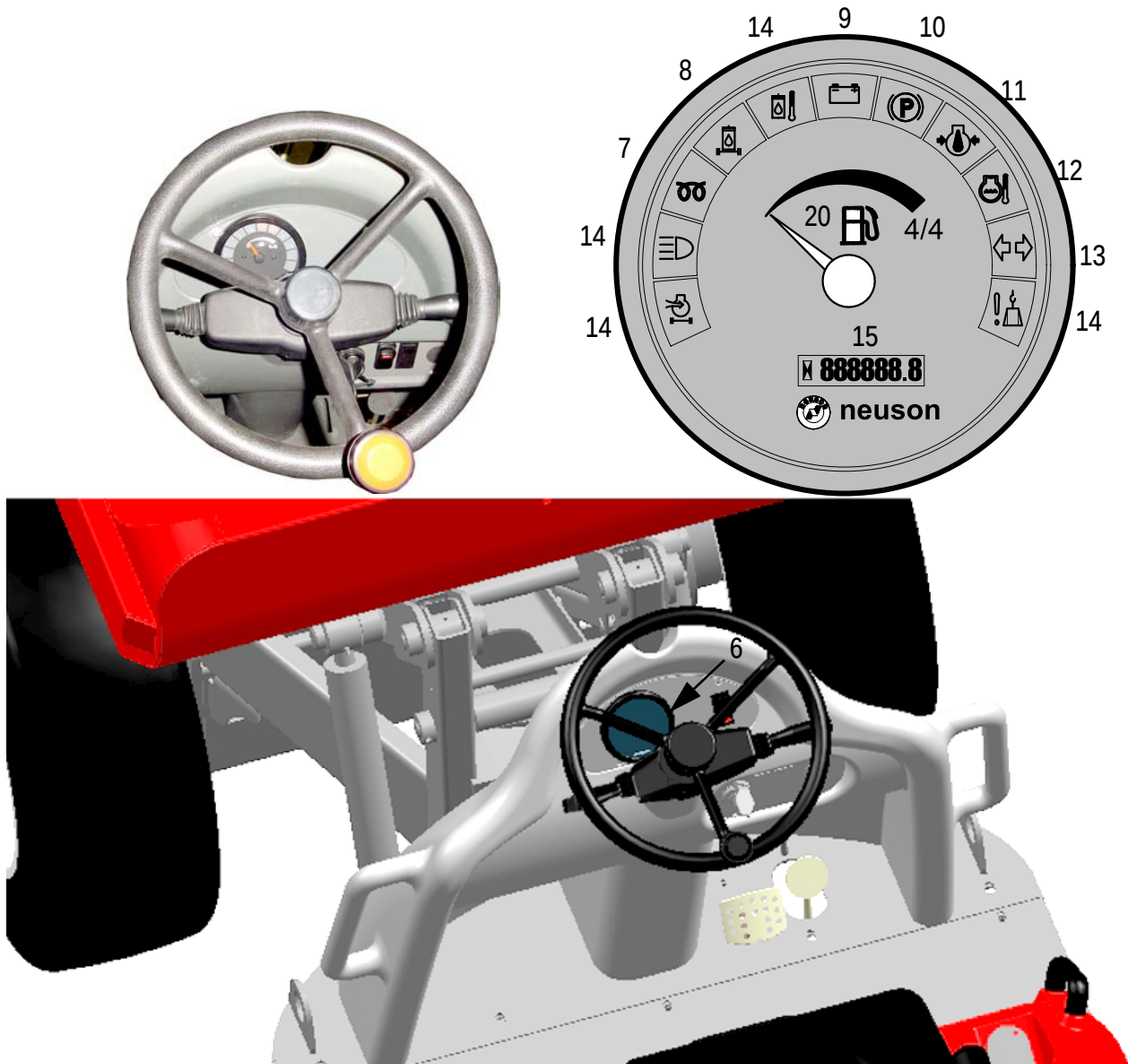
Fuse no.	Rated current (A)	Protected circuit
F 3	10 A	– Cutoff solenoid, cutoff solenoid time lag relay
F 4	15 A	– Drive solenoid valves
F 5	10 A	– Horn, parking brake, brake lights
F 6	15 A	– Turn indicators
F 7	15 A	– High beam
F 8	10 A	– Low beam
F 9	10 A	– Position light
F10	10 A	– Hazard warning system

Relays



Switching relay no.	Protected circuit
K 6	– Preheating time lag relay
K 8	– Cutoff solenoid time lag relay
K 9	– Cutoff solenoid switching relay
K 10	– Turn indicator relay
K 30	– Parking brake relay
K 32	– Start interlock relay
K 33	– Low beam relay
K 34	– High beam relay
V2	– Diodes
F 1, 2	– Main fuses

9.8 Instrument panel (from AB100001H): overview



Pos.	Description
6	Instrument panel
7	Preheating telltale
8	Hydraulic oil filter telltale
9	Alternator charge function telltale
10	Parking brake telltale
11	Engine oil pressure telltale
12	Engine temperature telltale
13	Turn indicators
14	Not assigned
15	Hour meter
20	Fuel level indicator



Wiring diagram: overview



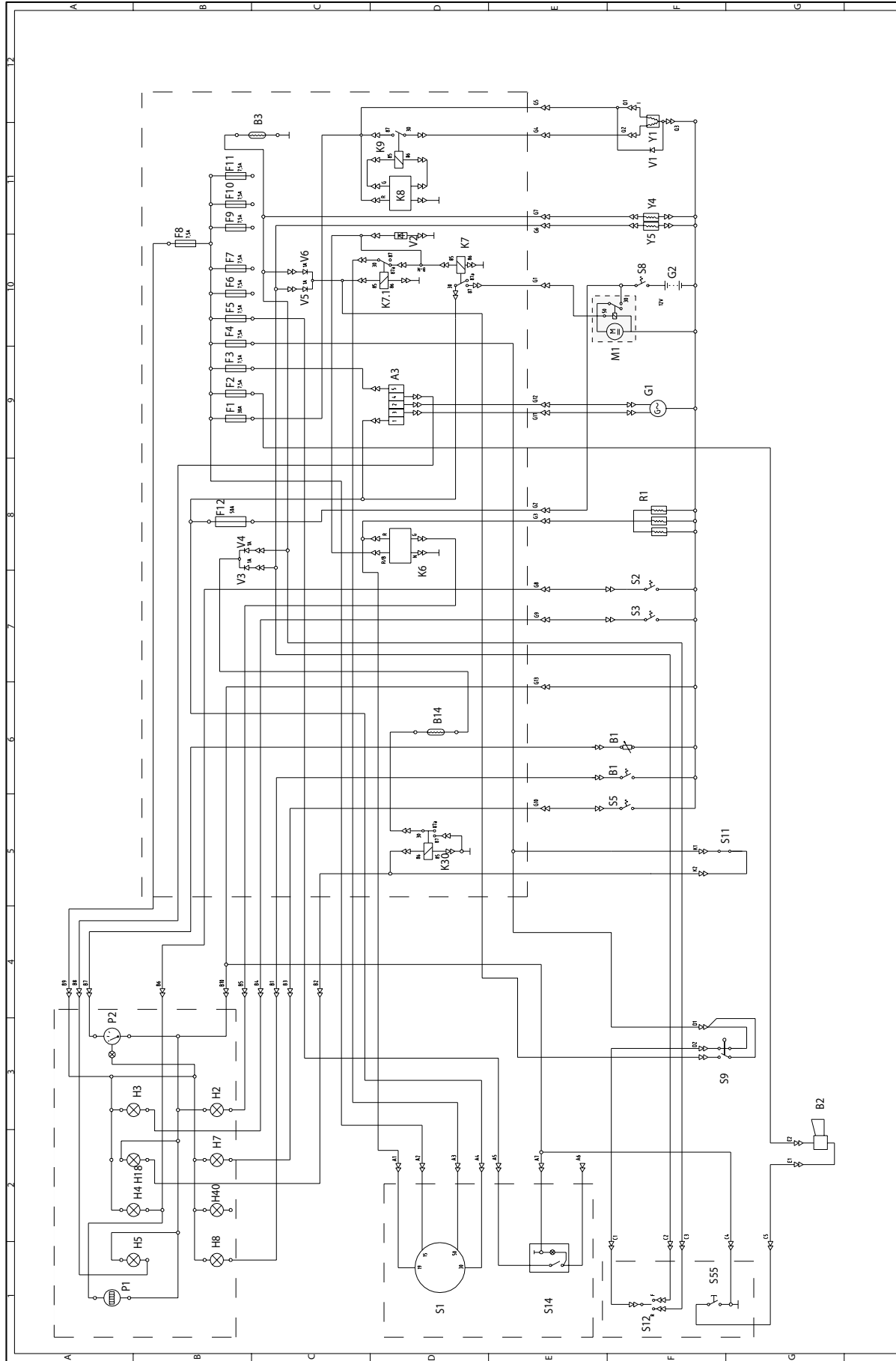
9.9 Wiring diagram up to serial no. BB001360: legend

No.	Description	Section
R1	Glow plugs	F8
S1	Preheating start switch	D1
S2	Engine oil pressure switch	F7
S3	Engine temperature switch	F7
S5	Hydraulic oil pressure switch	F5
S8	Battery master switch	F10
S9	Accelerator switch	F3
S11	Parking brake switch	F5
S12	Forwards-reverse control	F1
S14	Light switch	E1
S55	Horn tip switch	F/G 1
V1	Recovery diode	E4
V2	Recovery diode	D10
V3	Recovery diode	B8
V4	Recovery diode	B8
V5	Recovery diode	C10
V6	Recovery diode	C10
Y1	Cutoff solenoid	F4
Y4	Reverse solenoid valve	F11
Y5	Forwards solenoid valve	F10

No.	Description	Section
A3	Regulator	D9
B1	Fuel indicator	F6
B2	Horn	G2
B3	Backup warning system	B/C 11
B14	Parking brake warning buzzer	D6
F1	Cutoff solenoid, cutoff solenoid time lag relay	B9
F2	Horn	B9
F3	Alternator governor	B9
F4	Solenoid valve pump	B9
F5	Light switch	B10
F6	Not assigned	B10
F7	Not assigned	B10
F8	Telltale	B10
F9	Not assigned	B11
F10	Not assigned	B11
F11	Not assigned	B11
F12	Main fuse	B8
G1	Alternator	F9
G2	Battery	F10
H2	Preheating telltale	B3
H3	Engine temperature telltale	A/B 3
H4	Engine oil pressure telltale	A/B 2
H5	Alternator charge function telltale	A/B 1
H7	Hydraulic oil filter telltale	B2
H8	Fuel telltale	B3
H18	Parking brake telltale	A/B 2
H40	Not assigned	B2
K6	Preheating time lag relay	D8
K7	High current relay – start	F10
K7.1	Start interlock relay	D10
K8	Cutoff solenoid time lag relay	D11
K9	Cutoff solenoid switching relay	D11
K30	Relay for parking brake warning buzzer	D5
M1	Starter	F10
P1	Hour meter	A1
P2	Fuel level indication	A3



9.10 Wiring diagram version 1 A4 up to serial no. BB001360





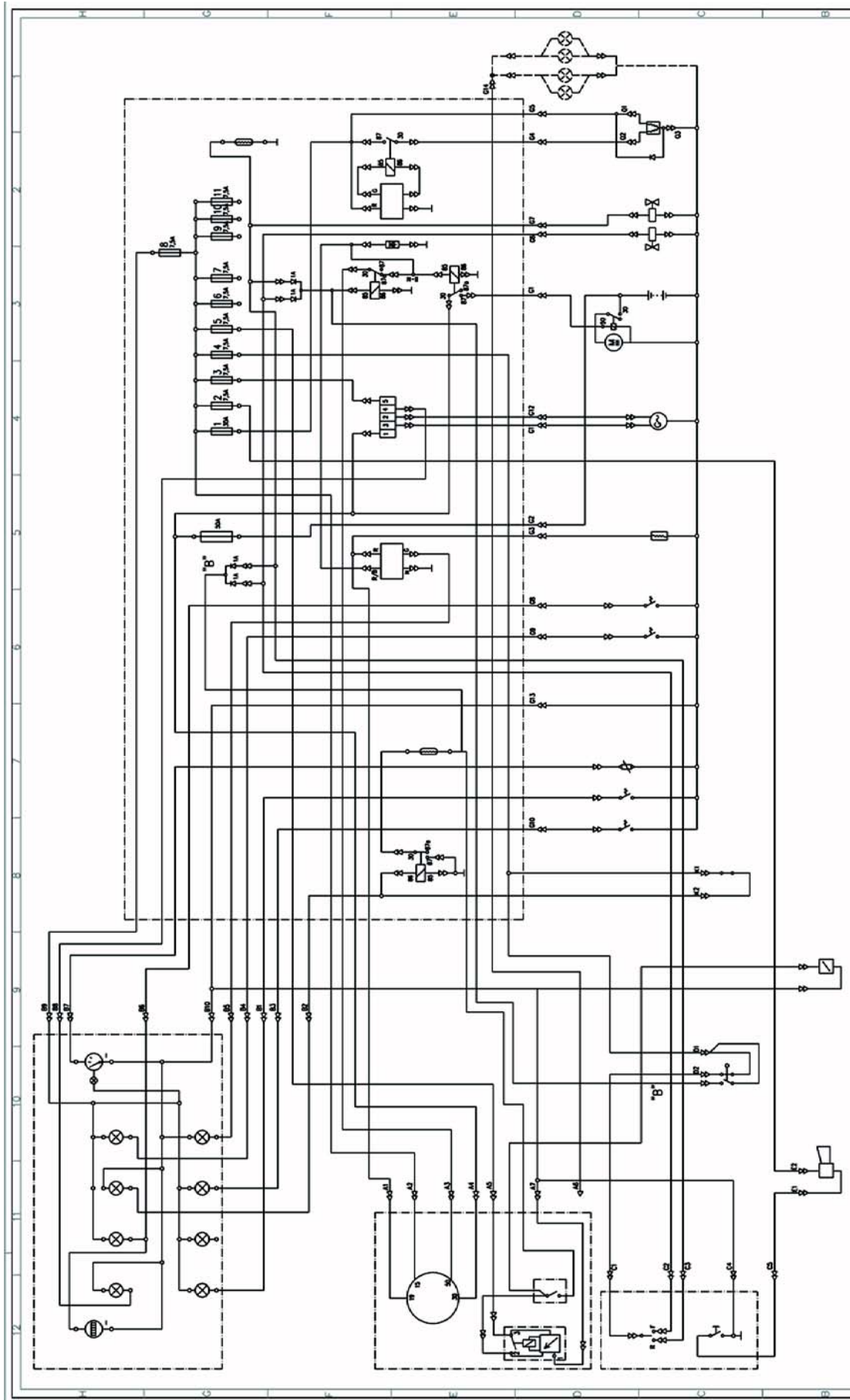
9.11 Wiring diagram from serial no. AB100001H: legend

No.	Description	Section
R1	Glow plugs	F8
S1	Preheating start switch	D1
S2	Engine oil pressure switch	F7
S3	Engine temperature switch	F7
S5	Hydraulic oil pressure switch	F5
S8	Battery master switch	F10
S9	Accelerator switch	F3
S11	Parking brake switch	F5
S11.1	Brake valve switch	E1
S12	Forwards-reverse control	F1
S14	Light switch	E1
S55	Horn tip switch	F/G 1
V1	Recovery diode	E4
V2	Recovery diode	D10
V3	Recovery diode	B8
V4	Recovery diode	B8
V5	Recovery diode	C10
V6	Recovery diode	C10
Y1	Cutoff solenoid	F4
Y4	Reverse solenoid valve	F11
Y5	Forwards solenoid valve	F10
Y32	Parking brake solenoid valve	G4

No.	Description	Section
A3	Regulator	D9
B1	Fuel indicator	F6
B2	Horn	G2
B3	Backup warning system	B/C 11
B14	Parking brake warning buzzer	D6
F1	Cutoff solenoid, cutoff solenoid time lag relay	B9
F2	Horn	B9
F3	Alternator governor	B9
F4	Solenoid valve pump	B9
F5	Light switch	B10
F6	Not assigned	B10
F7	Not assigned	B10
F8	Telltale	B10
F9	Not assigned	B11
F10	Not assigned	B11
F11	Not assigned	B11
F12	Main fuse	B8
G1	Alternator	F9
G2	Battery	F10
H2	Preheating telltale	B3
H3	Engine temperature telltale	A/B 3
H4	Engine oil pressure telltale	A/B 2
H5	Alternator charge function telltale	A/B 1
H7	Hydraulic oil filter telltale	B2
H8	Fuel telltale	B3
H18	Parking brake telltale	A/B 2
H40	Not assigned	B2
K6	Preheating time lag relay	D8
K7	High current relay – start	F10
K7.1	Start interlock relay	D10
K8	Cutoff solenoid time lag relay	D11
K9	Cutoff solenoid switching relay	D11
K30	Relay for parking brake warning buzzer	D5
K32	Parking brake time lag relay	E1
M1	Starter	F10
P1	Hour meter	A1
P2	Fuel level indication	A3



9.12 Wiring diagram version 1 A4 from serial no. AB100001H





9.13 Main wiring harness from AB100001H: legend

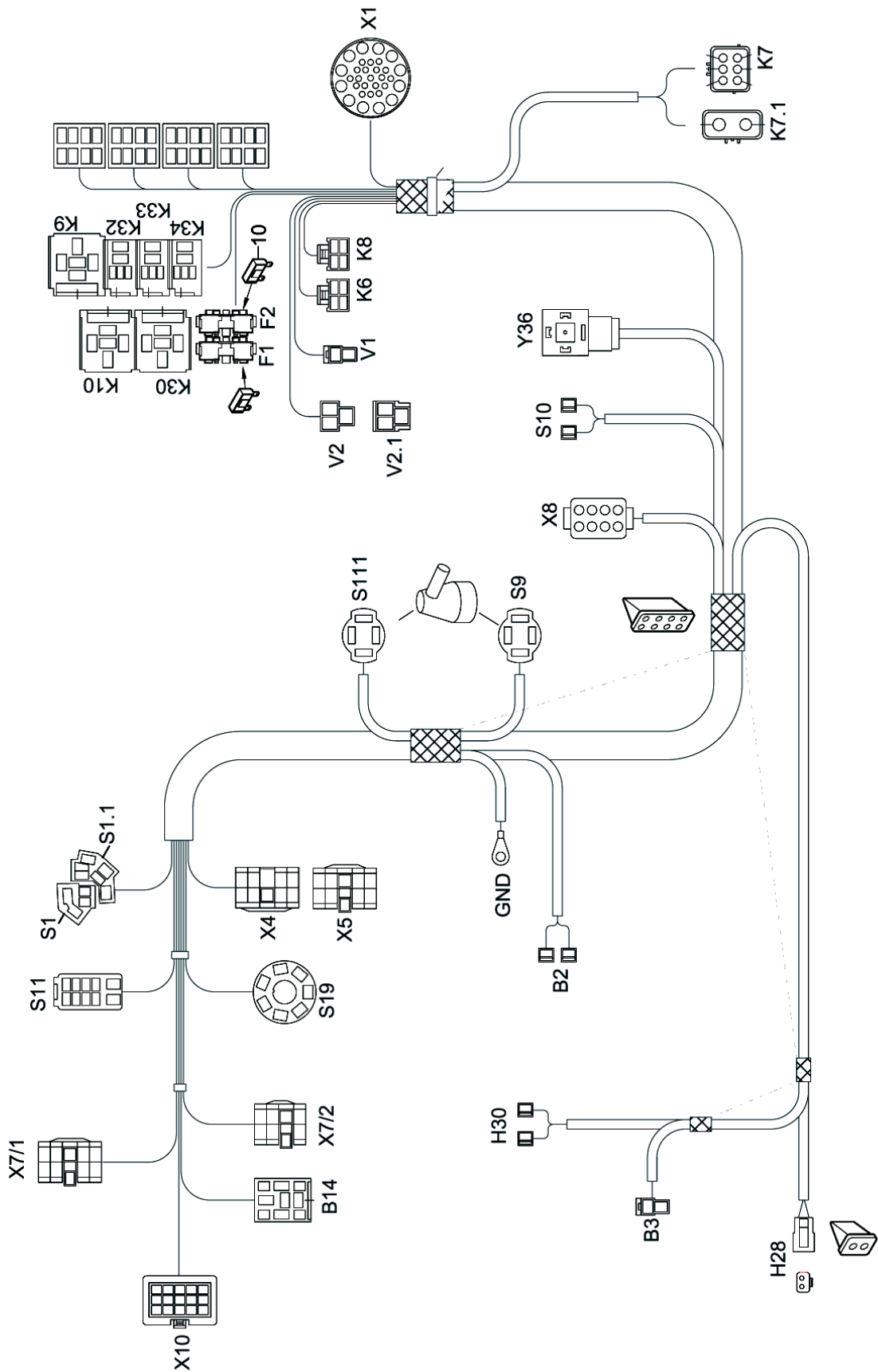
No.	Up to	To	Colour	mm ²
2	X1 A 12V/30	F1.1	red	4
3	X1 B 12V/30	F1.1	red	4
4	X1 C 12V/30	F2.1	red	4
5	X1 D 12V/30	F2.1	red	4
6	F1.2 12V/30	S1.1	red	6
7	F1.2 12V/30	F10 H	red	4
8	F2.2 12V/30	K9.30	red	4
9	F2.2 12V/30	K7 A	red	4
10	S1.5 12V/15	F4 B	blu	4
11	S1.6 12V/15	F7 E	blu	4
12	X1 E starter	K7 B	wht/red	2.5
13	X1 F cutoff solenoid pick-up contact	K9.87	wht	4
14	X1 G preheating	S1.3	brn	4
15	S1.8 preheating	S1.4	brn	4
16	S1.9 preheating	K6	brn	1
17	F3.1 12V/15 indicating instrument/relay	X4.5	blu	1
18	X4.7 12V/15 indicating instrument/relay	X4.5	blu	1
19	X4.7 12V/15 indicating instrument/relay	X10.1	blu	1
20	X4.9 cutoff solenoid/fuel pump	V1	blu/red	1
21	X1.1 fuel pump	V1	blu/red	1
23	X4.9 timer cutoff solenoid	K8	blu/red	1
24	K7.1 12V/15 starting relay	K8	blu/red	1
25	X1.2 12V/15 indicating instrument/relay	F3.1	blu	1
26	K8 cutoff solenoid relay	K9.86	blu/blk	1
27	K8 cutoff solenoid relay	K9.85	pnk/blk	1
28	X1.9 alternator charge telltale	B14.5	pnk	1
29	X10.8 alternator charge telltale	B14.5	pnk	1
30	X1.10 engine oil pressure	B14.6	wht/grn	1
31	B14.1 engine oil pressure	X10.10	wht/grn	1
32	X1.11 engine temperature	B14.9	blk/grn	1
33	B14.4 engine temperature	X10.14	blk/grn	1
34	X1.12 hydraulic oil filter	X10.6	org/wht	1
35	X1.13 tank sensor	X10.4	vio/blk	1
36	X1.14 revs signal	K7.6	blk/blu	1
37	S1.7 starter	X4.4	wht/blk	1
38	X5.8 starter	X5.4	wht/blk	1
39	X4.8 starter	K6	wht/blk	1

No.	Up to	To	Colour	mm ²
40	K32.30 starter	K6	wht/blk	1
41	K32.87a starter	K7.3	wht/blk	1
42	F4.2 12 V drive	S9	grn	1
43	X7/2.2 12 V drive	S9	grn	1
44	X7/2.2 12 V drive	S11.9	grn	1
45	S9 drive	X4.1	grn/blu	1
46	X5.6 drive	X5.1	grn/blu	1
47	X4.6 drive	X7/2.4	grn/blu	1
48	X7/2.1 forwards driving	V2.1	brn/wht	1
49	X1.17 forwards driving	V2.1	brn/wht	1
50	X7/2.3 reversing light	X8.5	grn/blk	1
51	X7/2.3 reverse driving	V2.2	grn/blk	1
52	X1.18 reverse driving	V2.2	grn/blk	1
53	B3 backup warning system	V2.2	grn/blk	1
54	B3 reversing light	H30	grn/blk	1
55	S1.5 12V/15 lights	X7/1.3	blu	1.5
56	X7/1.4 position light	F9 G	yel/blk	1
57	X7/1.4 position light	X10.2	yel/blk	1
58	F9.7 position light	X8.1	yel/blk	1
66	X7/1.2 low beam	K33.86	yel	1
67	X7/1.9 high beam telltale	X10.11	grn	1
68	X7/1.9 high beam	K34.86	grn	1
69	F8.6 low beam	K33.30	yel/red	1
70	K33.87 low beam	X8.3	yel/red	1
72	F7.5 high beam	K34.30	grn/red	1
73	K34.87 high beam	X8.2	grn/red	1
75	F10.8 turn indicators 12V/30	S19.3	red	1
76	F6.4 turn indicators 12V/15	S19.1	blu	1
77	S19.4 turn indicators +	K10+	blu/wht	1
78	S19.5 turn indicators COM	X7/1.5	blu/yel	1
79	S19.5 turn indicators COM	K10 C	blu/yel	1
80	K10 P turn indicator telltale	X10.15	grn/yel	1
81	S19.7 turn indicators (right)	X7/1.1	grn/grn	1
82	S19.7 turn indicators (right)	X8.8	grn/grn	1
86	S19.6 turn indicators (left)	X7/1.6	grn/yel	1
87	S19.6 turn indicators (left)	X8.7	grn/yel	1
91	F5.3 12V brakes/horn	S9	org/blk	1

No.	Up to	To	Colour	mm ²
92	B2 12V brakes/horn	S9	org/blk	1
93	F5.3 12V brakes/horn	K30.30	org/blk	1
94	K30.87 parking brake	S11.1	blk/red	1
95	S11/1 parking brake	S11.5	blk/red	1
96	S11/1 parking brake	Y36.1	blk/red	1
97	S9 brake lights	X8.6	red/blk	1
100	X10.9 parking brake telltale	S10	red/wht	1
101	K6 preheating telltale	X10/12	grn/red	1
102	V2.3 start interlock	K32.86	wht/red	1
103	V2.3 start interlock	K30.86	wht/red	1
104	F7.5 rotating beacon	H28	vio	1
105	X7/1.7 horn	B2	org	1
106	S19.3 12V drive interlock	X4.3	red	1
107	X5.9 12V cutoff solenoid/feed pump	X5.5	blu	1
108	K7.5 earth	K8	blk	1
109	K6 earth	K8	blk	1
110	K6 earth	V1	blk	1
111	K34.85 earth	V1	blk	1
112	K34.85 earth	K33.85	blk	1
113	K32.85 earth	K33.85	blk	1
114	K32.85 earth	K10.31	blk	1
115	K30.85 earth	K10.31	blk	1
116	K30.85 earth	GND	blk	1
117	Y36.2 earth	GND	blk	1
118	S10 earth	GND	blk	1
119	GND earth	X8.4	blk	1.5
120	H28.2 earth	B3	blk	1
121	H30 earth	B3	blk	1
122	H30 earth	GND	blk	1
123	X10.5 earth	X7/1.8	blk	1
124	S11.10 earth	X7/1.8	blk	1
125	S11.10 earth	X4.3	blk	1
126	GND earth	X4.3	blk	1
127	X1 K earth	GND	blk	2.5



9.14 Main wiring harness from AB100001H



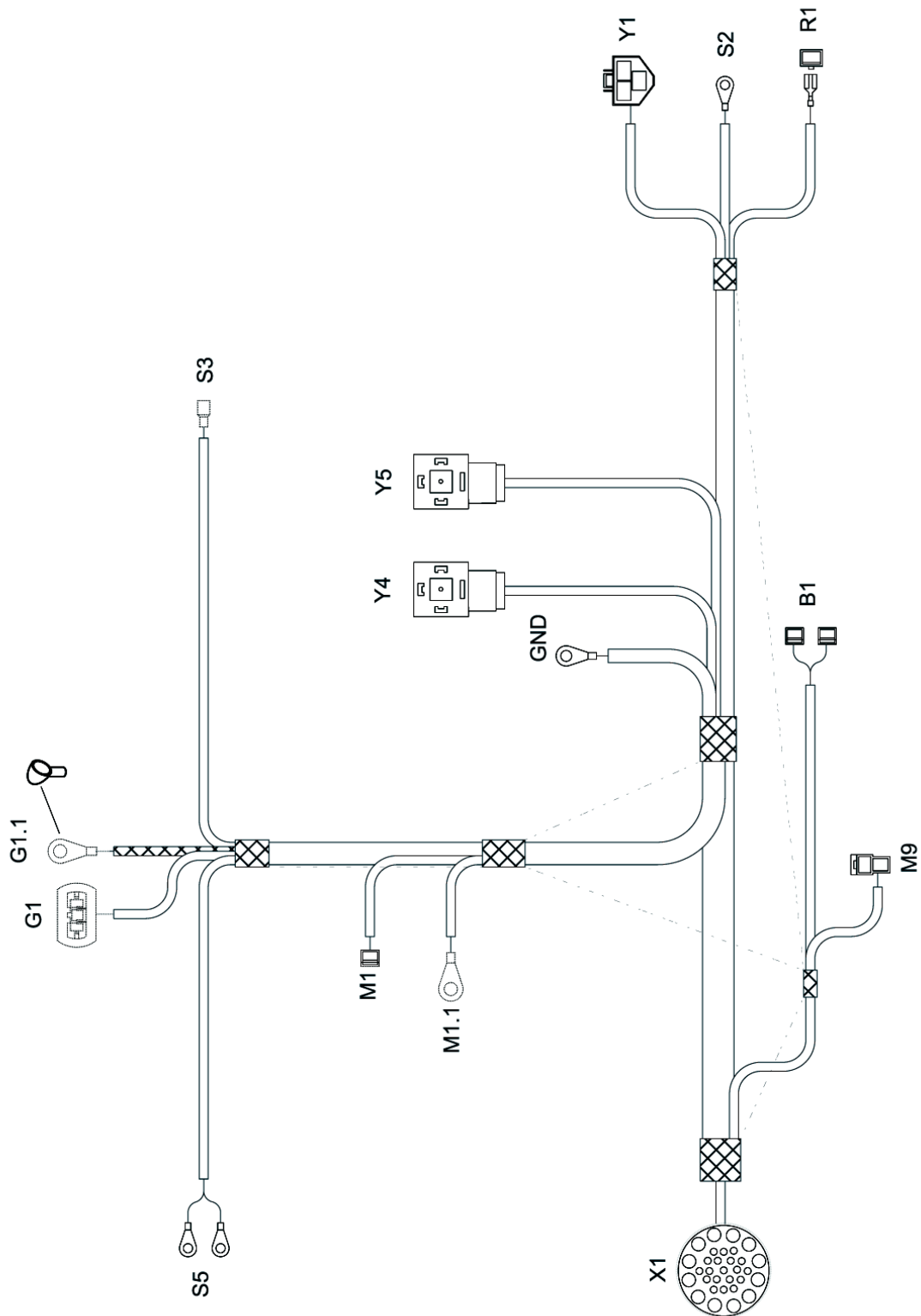


9.15 Engine wiring harness from AB100001H: legend

No.	Up to	To	Colour	mm ²
1	M1 12V/30	G1	red	10
2	M1 12V/30	X1 A	red	4
3	M1 12V/30	X1 B	red	4
4	G1 12V/30	X1 C	red	4
5	G1 12V/30	X1 D	red	4
12	M1 starter	X1 E	wht/red	2.5
13	Y1.1 cutoff solenoid pick-up contact	X1 F	wht	4
14	R1 preheating	X1 G	brn	4
21	M9 fuel feed pump	X1.1	blu/red	1
22	M9 cutoff solenoid holding contact	Y1.2	blu/red	1
25	G1.2 12V/15 indicating instrument/relay	X1.2	blu	1
28	G1.1 alternator charge telltale	X1.9	prnk	1
30	S2 engine oil pressure	X1.10	wht/grn	1
32	S3 engine temperature	X1.11	blk/grn	1
34	S5 hydraulic oil filter	X1.12	org/wht	1
35	B1 tank sensor	X1.13	vio/blk	1
36	G1.3 revs signal	X1.14	blk/blu	1
49	Y5.1 forwards driving	X1.17	brn/wht	1
52	Y4.1 reverse driving	X1.18	gry/blk	1
127	GND earth	X1 K	blk	2.5
128	GND earth	S5	blk	1
129	GND earth	Y4.2	blk	1
130	GND earth	Y5.2	blk	1
131	GND earth	M9	blk	1
132	B1 earth	M9	blk	1
133	GND earth	Y1.3	blk	1



9.16 Engine wiring harness from AB100001H





Wiring diagram: overview

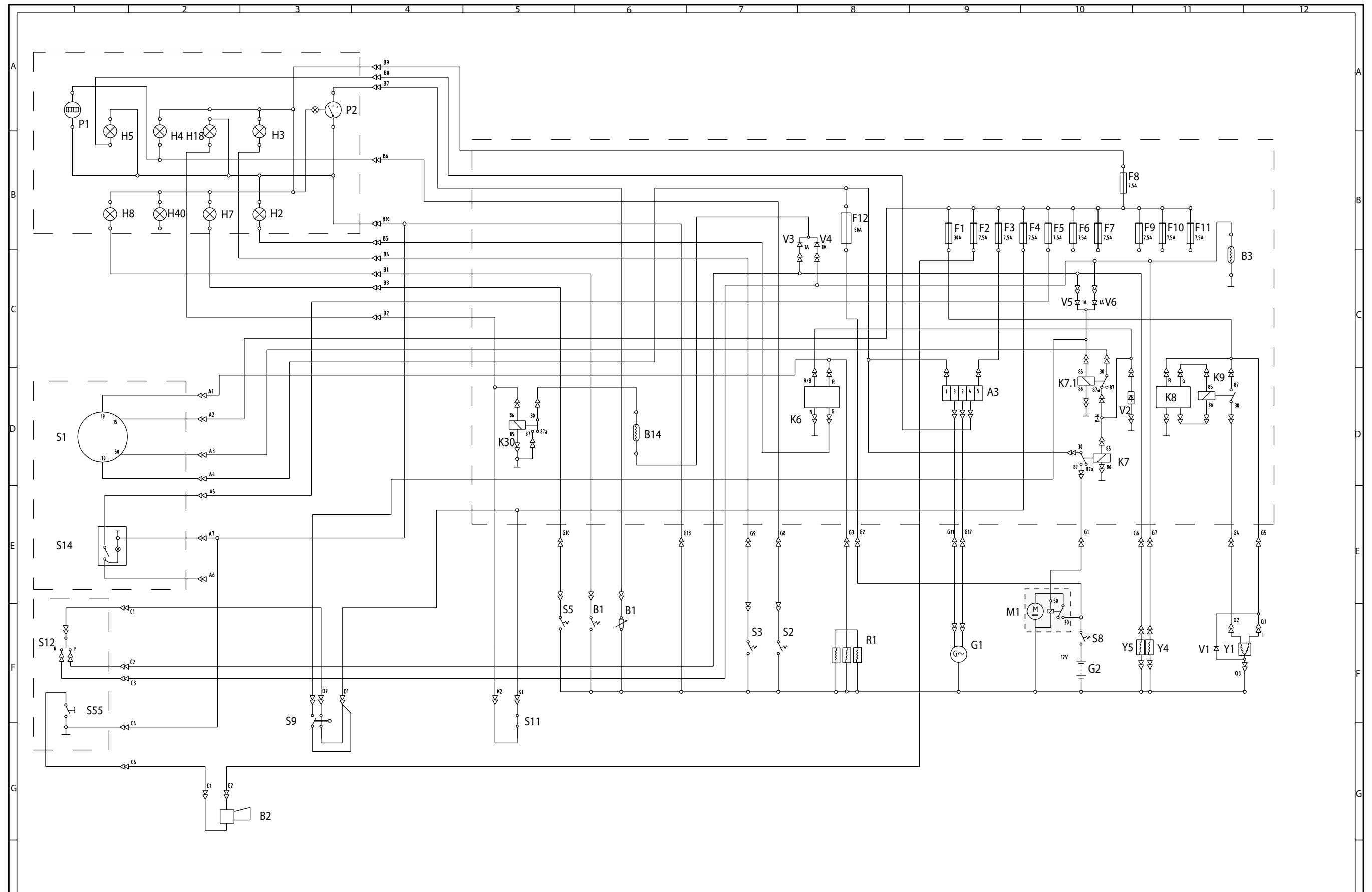
9.17 Wiring diagram A3 up to serial no. BB001360: legend

No.	Description	Section	
A3	Regulator	D9	
B1	Fuel indicator	F6	
B2	Horn	G2	
B3	Backup warning system	B/C 11	Option
B14	Parking brake warning buzzer	D6	
F1	Cutoff solenoid, cutoff solenoid time lag relay	B9	
F2	Horn	B9	
F3	Alternator governor	B9	
F4	Solenoid valve pump	B9	
F5	Light switch	B10	
F6	Not assigned	B10	
F7	Not assigned	B10	
F8	Telltale	B10	
F9	Not assigned	B11	
F10	Not assigned	B11	
F11	Not assigned	B11	
F12	Main fuse	B8	
G1	Alternator	F9	
G2	Battery	F10	
H2	Preheating telltale	B3	
H3	Engine temperature telltale	A/B 3	
H4	Engine oil pressure telltale	A/B 2	
H5	Alternator charge function telltale	A/B 1	
H7	Hydraulic oil filter telltale	B2	
H8	Preheating telltale	B3	
H18	Parking brake telltale	A/B 2	
H40	Not assigned	B2	
K6	Preheating time lag relay	D8	
K7	High current relay – start	F10	
K7.1	Start interlock relay	D10	
K8	Cutoff solenoid time lag relay	D11	
K9	Cutoff solenoid switching relay	D11	
K30	Relay for parking brake warning buzzer	D5	
M1	Starter	F10	
P1	Hour meter	A1	
P2	Fuel level indication	A3	
R1	Glow plug	F8	
S1	Preheating start switch	D1	
S2	Engine oil pressure switch	F7	
S3	Engine temperature switch	F7	
S5	Hydraulic oil pressure switch	F5	
S8	Battery master switch	F10	
S9	Accelerator switch	F3	
S11	Parking brake switch	F5	
S12	Forwards-reverse control	F1	
S14	Light switch	E1	

No.	Description	Section	
S55	Horn tip switch	F/G 1	
V1	Recovery diode	E4	
V2	Recovery diode	D10	
V3	Recovery diode	B8	
V4	Recovery diode	B8	
V5	Recovery diode	C10	
V6	Recovery diode	C10	
Y1	Cutoff solenoid	F4	
Y4	Reverse solenoid valve	F11	
Y5	Forwards solenoid valve	F10	

Wiring diagram: legend

9.18 Wiring diagram A3 up to serial no. BB001360



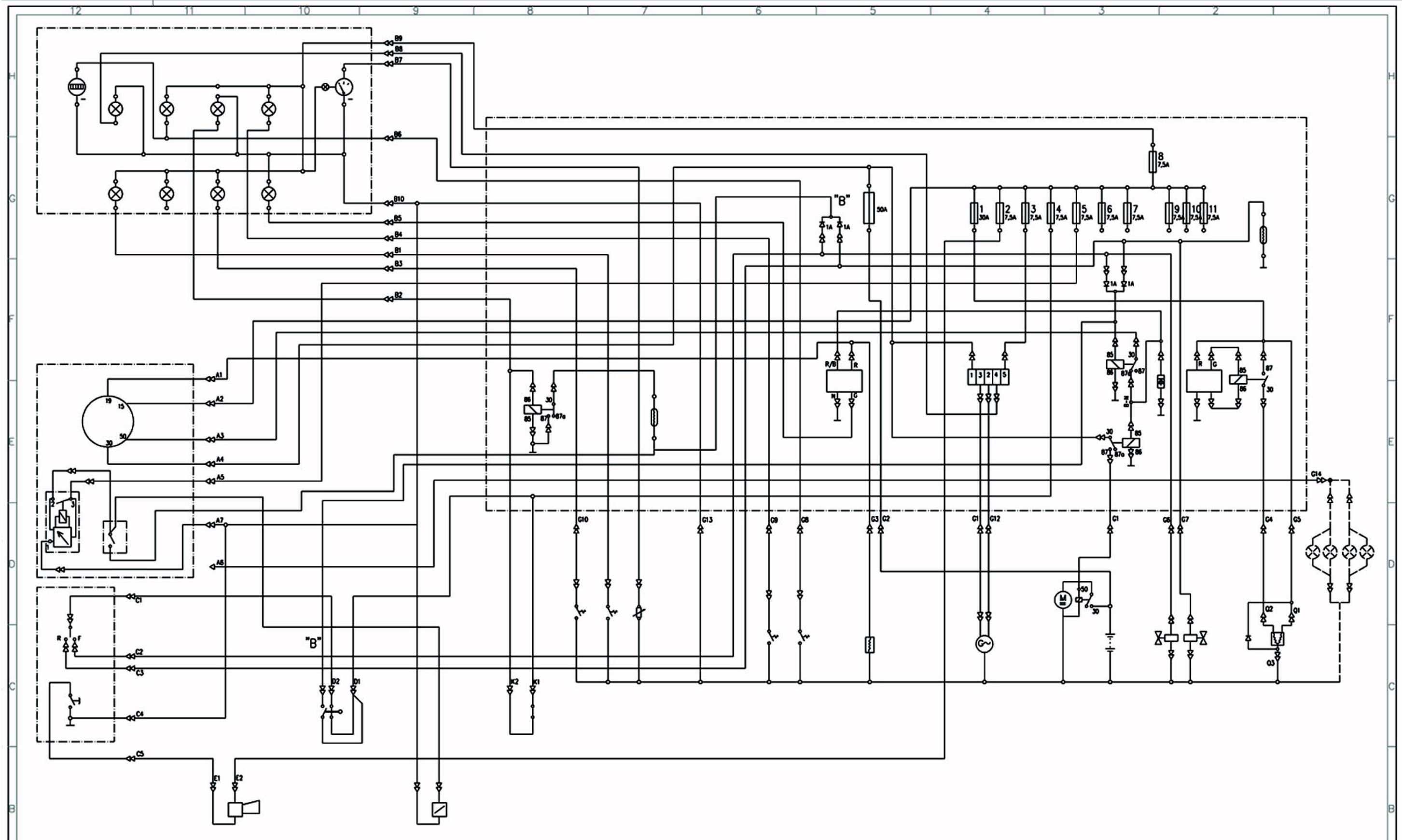
9.19 Wiring diagram A3 from serial no. AB100001H: legend

No.	Description	Section	
A3	Regulator	D9	
B1	Fuel indicator	F6	
B2	Horn	G2	
B3	Backup warning system	B/C 11	Option
B14	Parking brake warning buzzer	D6	
F1	Cutoff solenoid, cutoff solenoid time lag relay	B9	
F2	Horn	B9	
F3	Alternator governor	B9	
F4	Solenoid valve pump	B9	
F5	Light switch	B10	
F6	Not assigned	B10	
F7	Not assigned	B10	
F8	Telltale	B10	
F9	Not assigned	B11	
F10	Not assigned	B11	
F11	Not assigned	B11	
F12	Main fuse	B8	
G1	Alternator	F9	
G2	Battery	F10	
H2	Preheating telltale	B3	
H3	Engine temperature telltale	A/B 3	
H4	Engine oil pressure telltale	A/B 2	
H5	Alternator charge function telltale	A/B 1	
H7	Hydraulic oil filter telltale	B2	
H8	Preheating telltale	B3	
H18	Parking brake telltale	A/B 2	
H40	Not assigned	B2	
K6	Preheating time lag relay	D8	
K7	High current relay – start	F10	
K7.1	Start interlock relay	D10	
K8	Cutoff solenoid time lag relay	D11	
K9	Cutoff solenoid switching relay	D11	
K30	Relay for parking brake warning buzzer	D5	
K32	Parking brake time lag relay	E1	
M1	Starter	F10	
P1	Hour meter	A1	
P2	Fuel level indication	A3	
R1	Glow plug	F8	
S1	Preheating start switch	D1	
S2	Engine oil pressure switch	F7	
S3	Engine temperature switch	F7	
S5	Hydraulic oil pressure switch	F5	
S8	Battery master switch	F10	
S9	Accelerator switch	F3	
S11	Parking brake switch	F5	
S11.1	Brake valve switch	E1	
S12	Forwards-reverse control	F1	
S14	Light switch	E1	
S55	Horn tip switch	F/G 1	

No.	Description	Section	
V1	Recovery diode	E4	
V2	Recovery diode	D10	
V3	Recovery diode	B8	
V4	Recovery diode	B8	
V5	Recovery diode	C10	
V6	Recovery diode	C10	
Y1	Cutoff solenoid	F4	
Y4	Reverse solenoid valve	F11	
Y5	Forwards solenoid valve	F10	
Y32	Parking brake solenoid valve	G4	

Wiring diagram: legend

9.20 Wiring diagram A3 from serial no. AB100001H



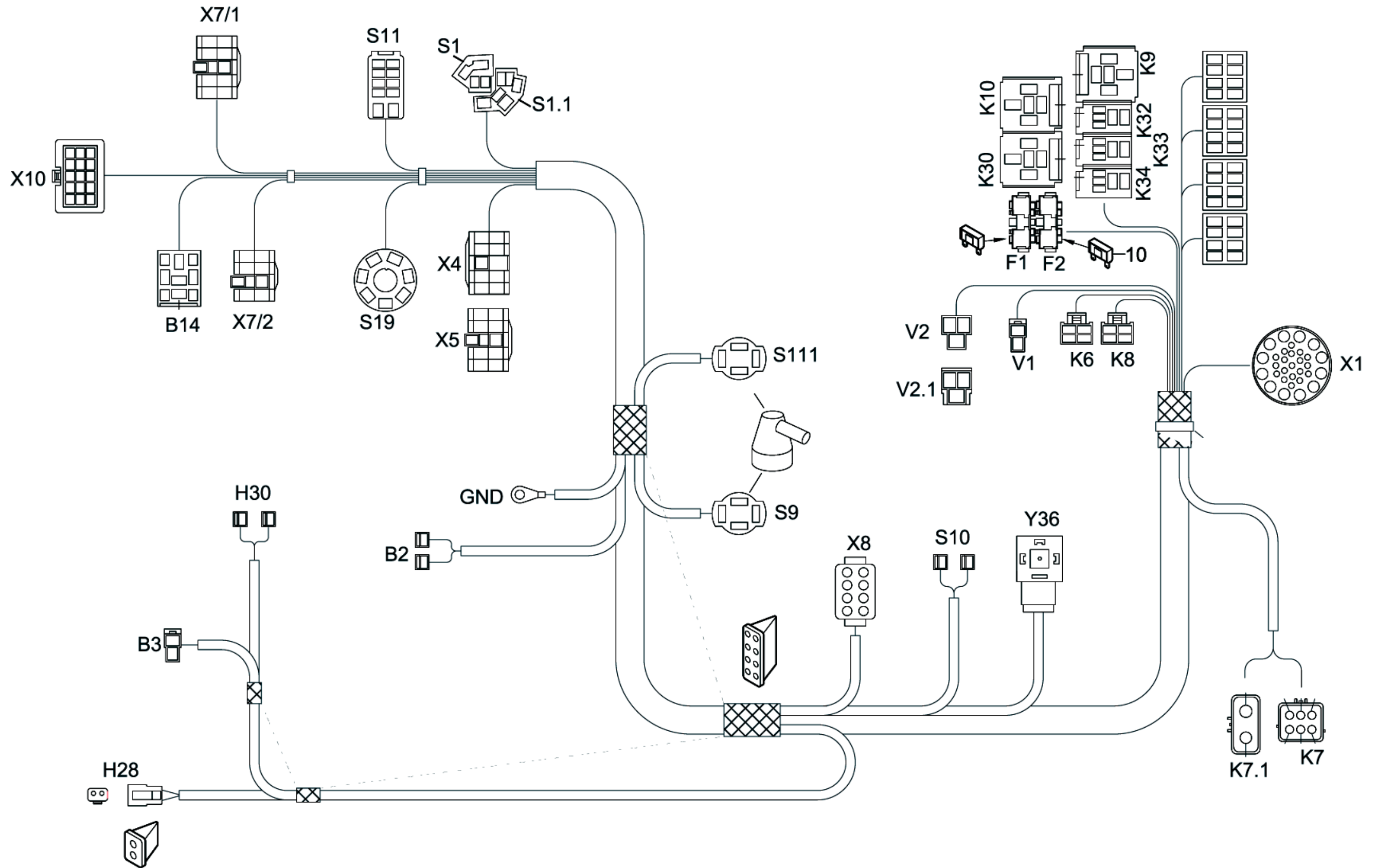
9.21 Main wiring harness from AB100001H: legend

No.	Up to	To	Colour	mm ²
2	X1 A 12V/30	F1.1	red	4
3	X1 B 12V/30	F1.1	red	4
4	X1 C 12V/30	F2.1	red	4
5	X1 D 12V/30	F2.1	red	4
6	F1.2 12V/30	S1.1	red	6
7	F1.2 12V/30	F10 H	red	4
8	F2.2 12V/30	K9.30	red	4
9	F2.2 12V/30	K7 A	red	4
10	S1.5 12V/15	F4 B	blu	4
11	S1.6 12V/15	F7 E	blu	4
12	X1 E starter	K7 B	wht/red	2.5
13	X1 F cutoff solenoid pick-up contact	K9.87	wht	4
14	X1 G preheating	S1.3	brn	4
15	S1.8 preheating	S1.4	brn	4
16	S1.9 preheating	K6	brn	1
17	F3.1 12V/15 indicating instrument/relay	X4.5	blu	1
18	X47 12V/15 indicating instrument/relay	X4.5	blu	1
19	X47 12V/15 indicating instrument/relay	X10.1	blu	1
20	X4.9 cutoff solenoid/fuel pump	V1	blu/red	1
21	X1.1 fuel pump	V1	blu/red	1
23	X4.9 timer cutoff solenoid	K8	blu/red	1
24	K7.1 12V/15 starting relay	K8	blu/red	1
25	X1.2 12V/15 indicating instrument/relay	F3.1	blu	1
26	K8 cutoff solenoid relay	K9.86	blu/blk	1
27	K8 cutoff solenoid relay	K9.85	pnk/blk	1
28	X1.9 alternator charge telltale	B14.5	pnk	1
29	X10.8 alternator charge telltale	B14.5	pnk	1
30	X1.10 engine oil pressure	B14.6	wht/grn	1
31	B14.1 engine oil pressure	X10.10	wht/grn	1
32	X1.11 engine temperature	B14.9	blk/grn	1
33	B14.4 engine temperature	X10.14	blk/grn	1
34	X1.12 hydraulic oil filter	X10.6	org/wht	1
35	X1.13 tank sensor	X10.4	vio/blk	1
36	X1.14 revs signal	K7.6	blk/blu	1
37	S1.7 starter	X4.4	wht/blk	1
38	X5.8 starter	X5.4	wht/blk	1
39	X4.8 starter	K6	wht/blk	1
40	K32.30 starter	K6	wht/blk	1
41	K32.87a starter	K7.3	wht/blk	1
42	F4.2 12 V drive	S9	gry	1
43	X7/2.2 12 V drive	S9	gry	1
44	X7/2.2 12 V drive	S11.9	gry	1
45	S9 drive	X4.1	gry/blu	1
46	X5.6 drive	X5.1	gry/blu	1
47	X4.6 drive	X7/2.4	gry/blu	1
48	X7/2.1 forwards driving	V2.1	brn/wht	1
49	X1.17 forwards driving	V2.1	brn/wht	1
50	X7/2.3 reversing light	X8.5	gry/blk	1

No.	Up to	To	Colour	mm ²
51	X7/2.3 reverse driving	V2.2	gry/blk	1
52	X1.18 reverse driving	V2.2	gry/blk	1
53	B3 backup warning system	V2.2	gry/blk	1
54	B3 reversing light	H30	gry/blk	1
55	S1.5 12V/15 lights	X7/1.3	blu	1.5
56	X7/1.4 position light	F9 G	yel/blk	1
57	X7/1.4 position light	X10.2	yel/blk	1
58	F9.7 position light	X8.1	yel/blk	1
66	X7/1.2 low beam	K33.86	yel	1
67	X7/1.9 high beam telltale	X10.11	grn	1
68	X7/1.9 high beam	K34.86	grn	1
69	F8.6 low beam	K33.30	yel/red	1
70	K33.87 low beam	X8.3	yel/red	1
72	F7.5 high beam	K34.30	grn/red	1
73	K34.87 high beam	X8.2	grn/red	1
75	F10.8 turn indicators 12V/30	S19.3	red	1
76	F6.4 turn indicators 12V/15	S19.1	blu	1
77	S19.4 turn indicators +	K10+	blu/wht	1
78	S19.5 turn indicators COM	X7/1.5	blu/yel	1
79	S19.5 turn indicators COM	K10 C	blu/yel	1
80	K10 P turn indicator telltale	X10.15	gry/red	1
81	S19.7 turn indicators (right)	X7/1.1	gry/grn	1
82	S19.7 turn indicators (right)	X8.8	gry/grn	1
86	S19.6 turn indicators (left)	X7/1.6	gry/yel	1
87	S19.6 turn indicators (left)	X8.7	gry/yel	1
91	F5.3 12V brakes/horn	S9	org/blk	1
92	B2 12V brakes/horn	S9	org/blk	1
93	F5.3 12V brakes/horn	K30.30	org/blk	1
94	K30.87 parking brake	S11.1	blk/red	1
95	S11/1 parking brake	S11.5	blk/red	1
96	S11/1 parking brake	Y36.1	blk/red	1
97	S9 brake lights	X8.6	red/blk	1
100	X10.9 parking brake telltale	S10	red/wht	1
101	K6 preheating telltale	X10/12	gry/red	1
102	V2.3 start interlock	K32.86	wht/red	1
103	V2.3 start interlock	K30.86	wht/red	1
104	F7.5 rotating beacon	H28	vio	1
105	X7/1.7 horn	B2	org	1
106	S19.3 12V drive interlock	X4.3	red	1
107	X5.9 12V cutoff solenoid/feed pump	X5.5	blu	1
108	K7.5 earth	K8	blk	1
109	K6 earth	K8	blk	1
110	K6 earth	V1	blk	1
111	K34.85 earth	V1	blk	1
112	K34.85 earth	K33.85	blk	1
113	K32.85 earth	K33.85	blk	1
114	K32.85 earth	K10.31	blk	1
115	K30.85 earth	K10.31	blk	1

No.	Up to	To	Colour	mm ²
116	K30.85 earth	GND	blk	1
117	Y36.2 earth	GND	blk	1
118	S10 earth	GND	blk	1
119	GND earth	X8.4	blk	1.5
120	H28.2 earth	B3	blk	1
121	H30 earth	B3	blk	1
122	H30 earth	GND	blk	1
123	X10.5 earth	X7/1.8	blk	1
124	S11.10 earth	X7/1.8	blk	1
125	S11.10 earth	X4.3	blk	1
126	GND earth	X4.3	blk	1
127	X1 K earth	GND	blk	2.5

9.22 Main wiring harness from AB100001H

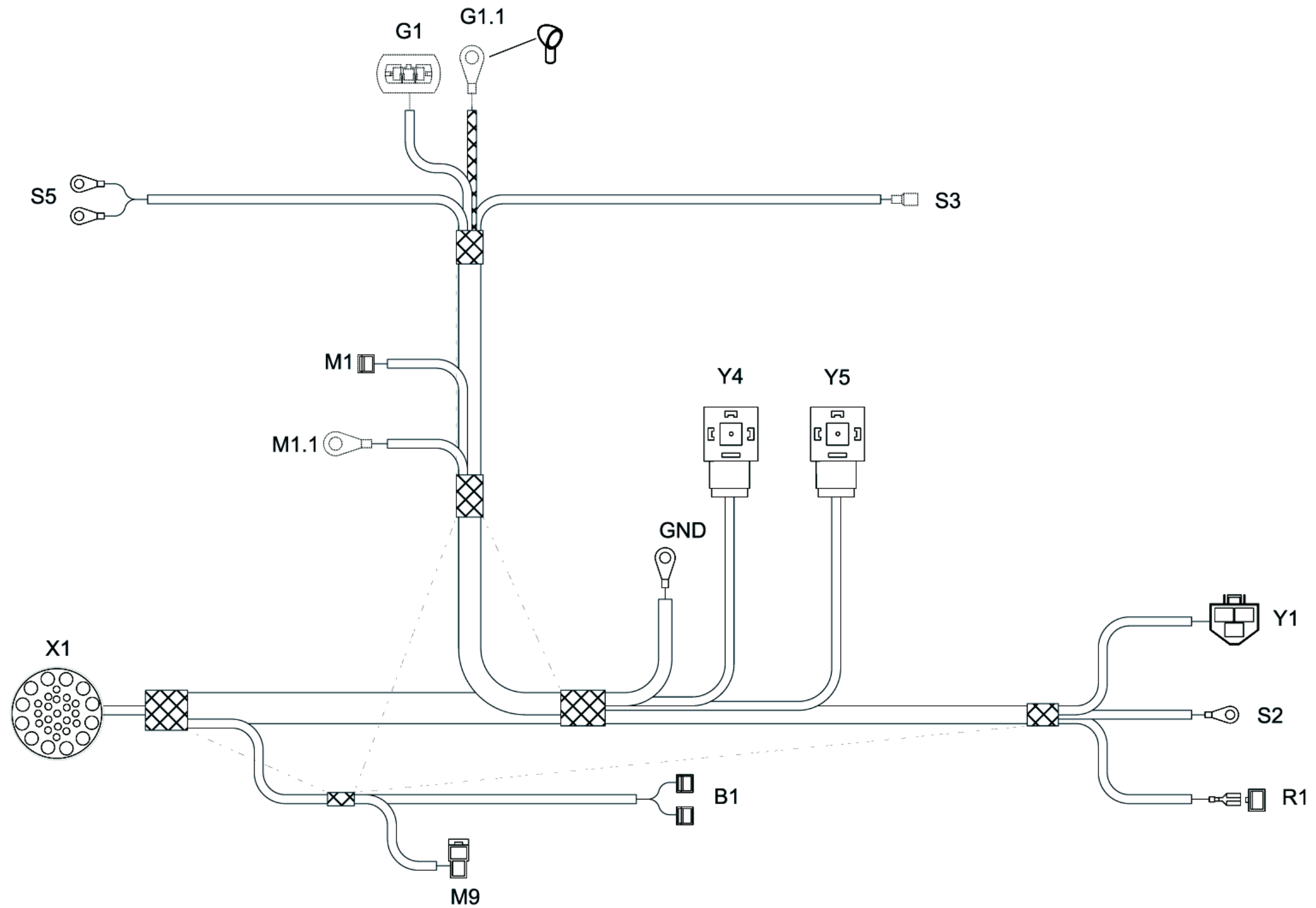


Electric system

9.23 Engine wiring harness from AB100001H: legend

No.	Up to	To	Colour	mm ²
1	M1 12V/30	G1	red	10
2	M1 12V/30	X1 A	red	4
3	M1 12V/30	X1 B	red	4
4	G1 12V/30	X1 C	red	4
5	G1 12V/30	X1 D	red	4
12	M1 starter	X1 E	wht/red	2.5
13	Y1.1 cutoff solenoid pick-up contact	X1 F	wht	4
14	R1 preheating	X1 G	brn	4
21	M9 fuel feed pump	X1.1	blu/red	1
22	M9 cutoff solenoid holding contact	Y1.2	blu/red	1
25	G1.2 12V/15 indicating instrument/relay	X1.2	blu	1
28	G1.1 alternator charge telltale	X1.9	pnk	1
30	S2 engine oil pressure	X1.10	wht/grn	1
32	S3 engine temperature	X1.11	blk/grn	1
34	S5 hydraulic oil filter	X1.12	org/wht	1
35	B1 tank sensor	X1.13	vio/blk	1
36	G1.3 revs signal	X1.14	blk/blu	1
49	Y5.1 forwards driving	X1.17	brn/wht	1
52	Y4.1 reverse driving	X1.18	gry/blk	1
127	GND earth	X1 K	blk	2.5
128	GND earth	S5	blk	1
129	GND earth	Y4.2	blk	1
130	GND earth	Y5.2	blk	1
131	GND earth	M9	blk	1
132	B1 earth	M9	blk	1
133	GND earth	Y1.3	blk	1

9.24 Engine wiring harness from AB100001H



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