

Service Manual

Skid steer loader

501s



Machine model	501s
Edition	1.0
Language	Englisch
Article number	1000155663

Documentation

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Operation manual	1000151639
Service manual	1000155663
Spare parts list	1000147859

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The cover features the machine with possible optional equipment.



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Neuson Baumaschinen GmbH

Haidfeldstrasse 37

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Document: SERV-HB 501s De

Order no.: 1000155663

Edition: 1.0

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Operation

1 Operation

1.1 Important information on this service manual

This service manual contains important information on how to service your machine safely, correctly and economically. Therefore, it aims not only at new staff, but it also serves as a reference for experienced users. 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 operation 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 Neuson original spare parts when carrying out maintenance and repair work. This ensures operational safety and readiness of your machine, and maintains its value.

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

Your Neuson dealer.

Abbreviations/symbols

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

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

 Description of the effects or results of an activity

n. s. = not shown

“Option” = optional equipment

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

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

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

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



1.2 Identification of warnings and dangers

Important indications regarding the safety of the staff and the machine are 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:
 - moving earth, gravel, coarse gravel or ballast and rubble as well as for
 - working with the implements mentioned in section *Fields of application*
 - Every other application is regarded as not designated for the use of the machine. Neuson Baumashinen GmbH will not be liable for damage resulting from use other than mentioned above. The user alone will bear the risk.
Designated use also includes observing the instructions set forth in the 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, implements 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!
- The machine may not be used for transport jobs on public roads

1.4 Type labels and component numbers



Fig. 1: Type label: location

[illegible]

Fig. 2: Type label

Serial number

The serial number is stamped on the machine chassis under the hydraulic pump (photo). It is also located on the type label.

The type label is located on the left on the chassis in the leg room area

Type label information

Model:	501s
Year:	2005
PIN:	DA 00000
Output:	27 kW
Mass:	1810 kg
Load:	510 kg -----
Max. gross load:	-----
Max. front axle load:	-----
Max. rear axle load:	-----

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

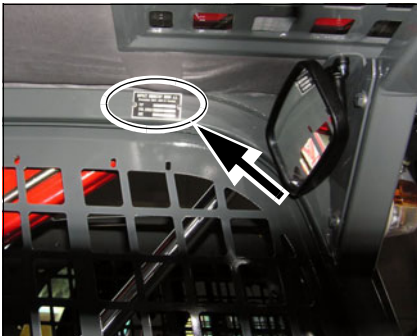


Fig. 3: Cab type label

Cab number

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



Fig. 4: Diesel engine number

Engine number

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

Example: Yanmar 46557

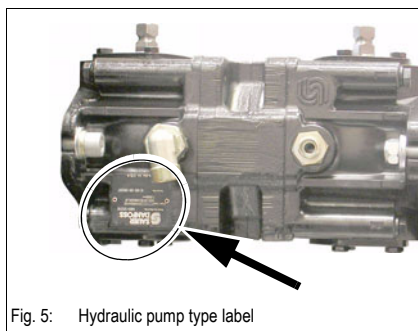


Fig. 5: Hydraulic pump type label

Hydraulic pump number

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

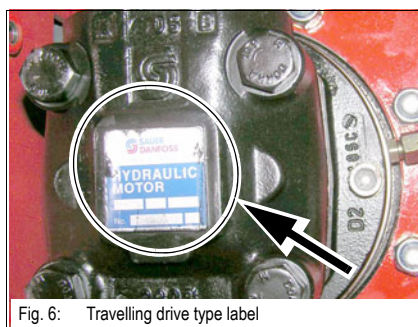


Fig. 6: Travelling drive type label

Travelling drive number

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



1.5 Machine: overview

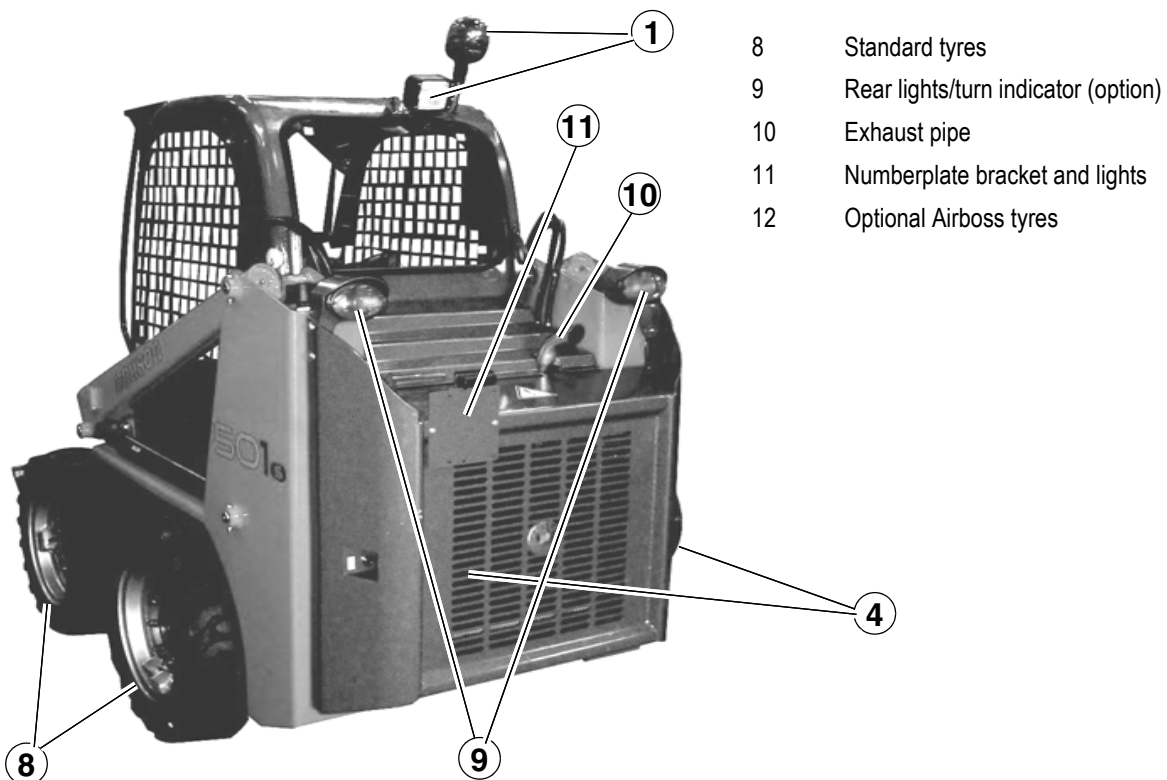
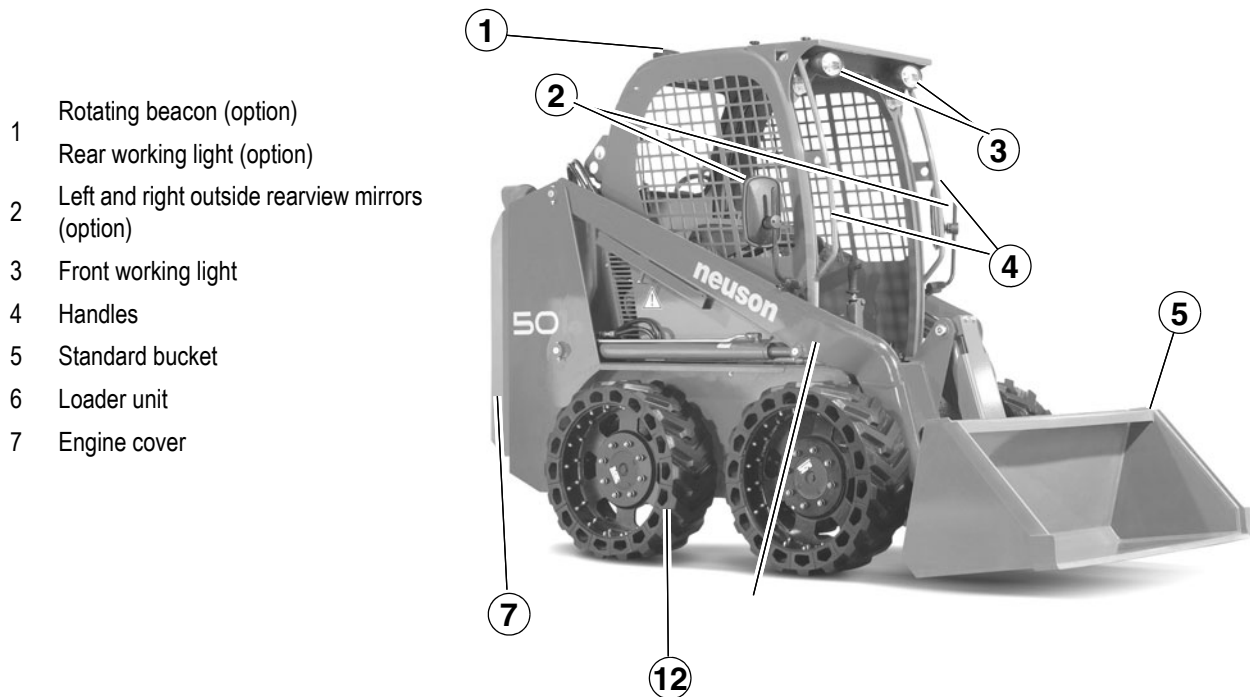
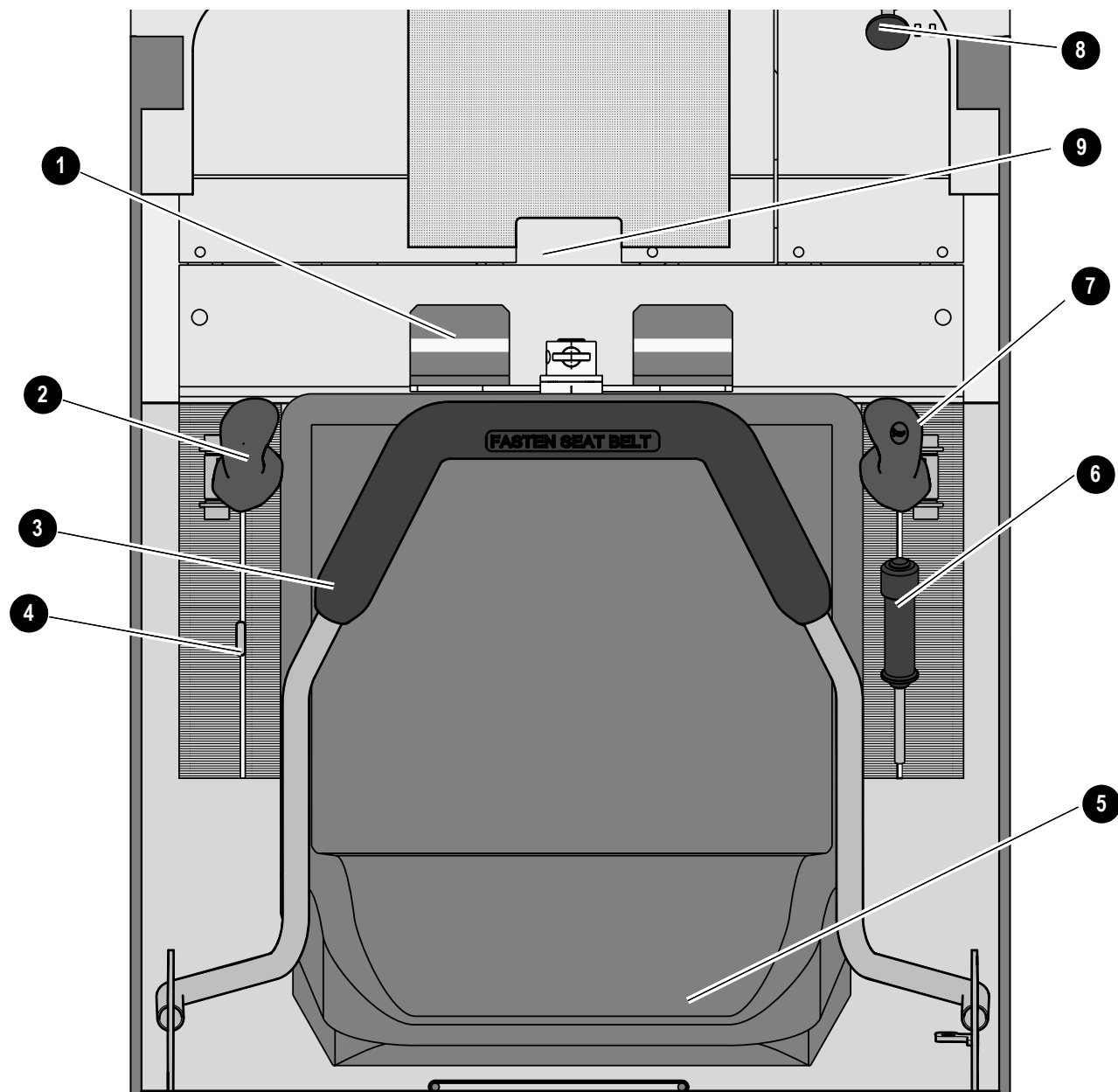


Fig. 7: Machine outside views

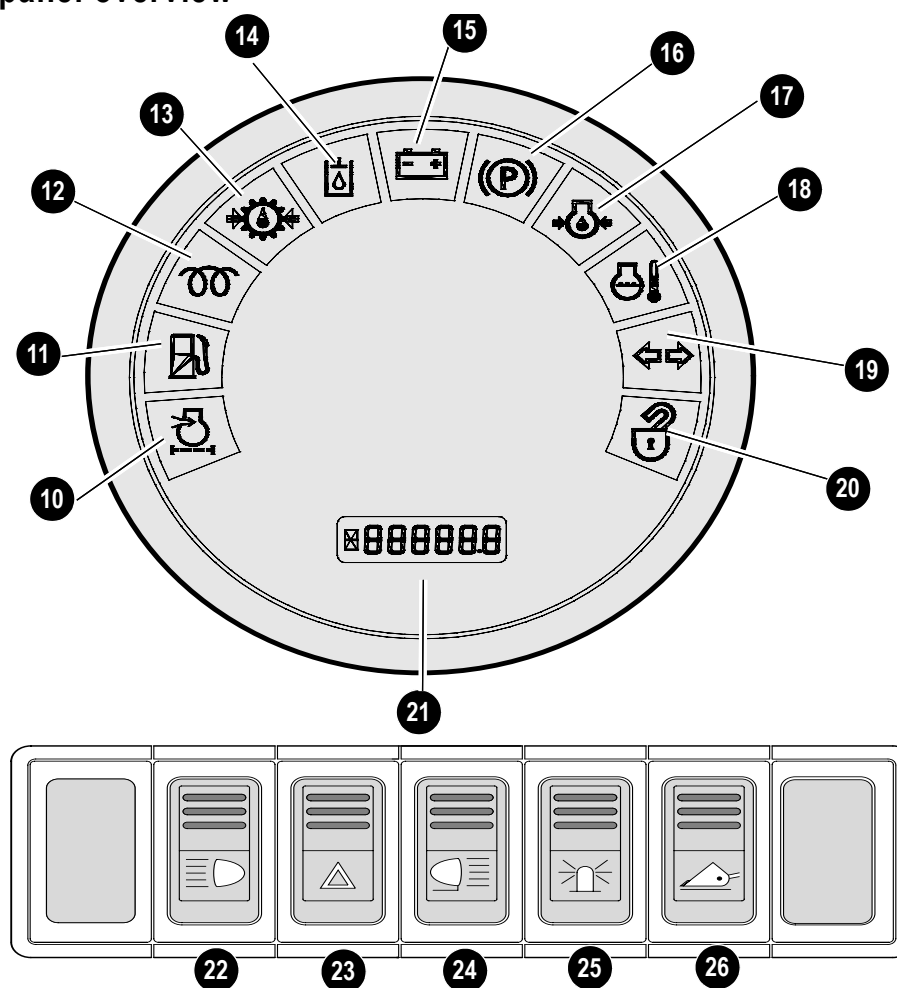
1.6 Cab: overview



1.7 Cab: legend

Pos.	Description
1	Auxiliary hydraulics pedal
2	Control lever (left)
3	Safety bar
4	Throttle
5	Seat
6	Handbrake
7	Control lever (right)
8	Accelerator pedal (option)
9	Dirt opening

1.8 Instrument panel overview

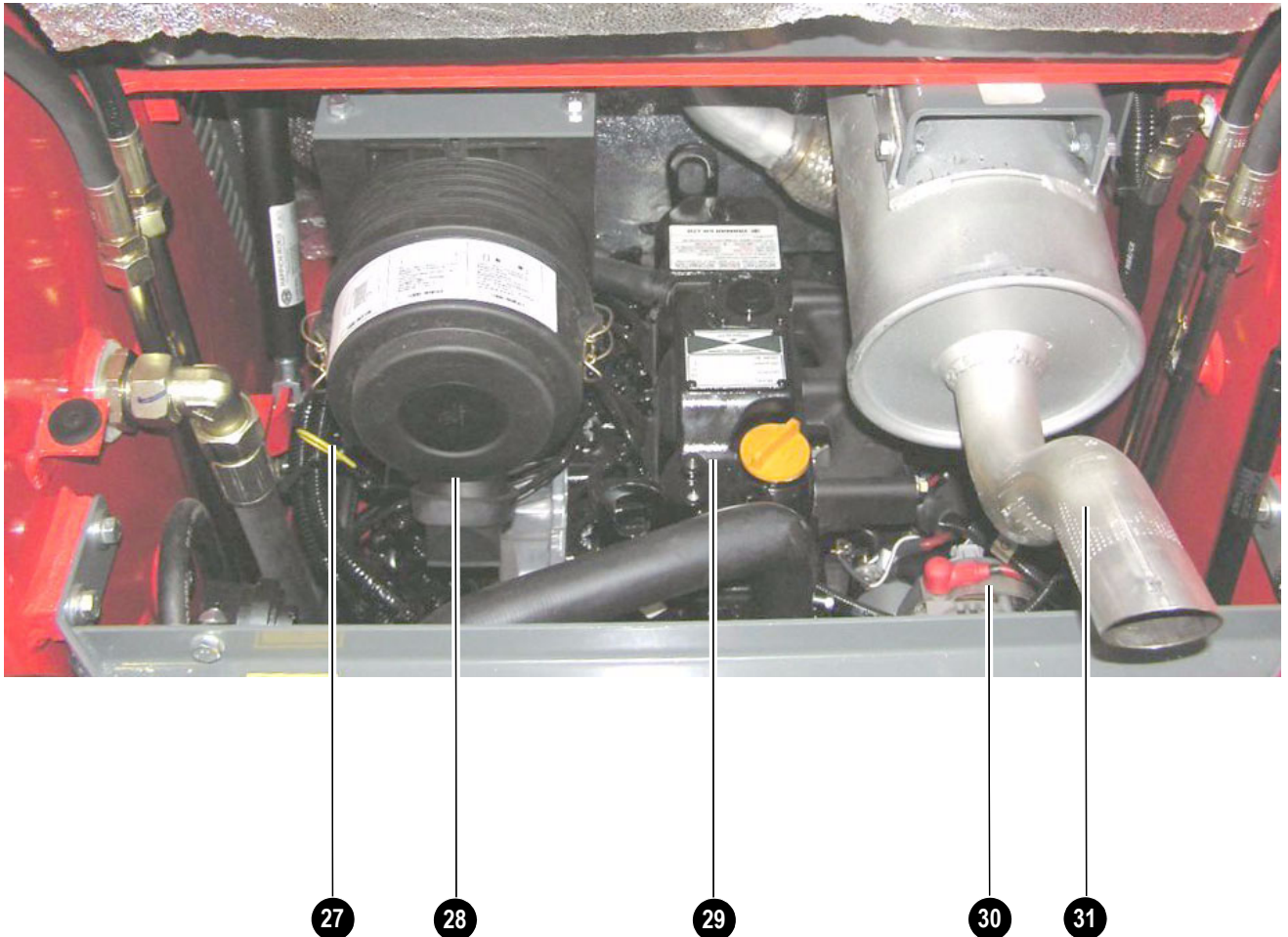


1.9 Instrument panel: legend

Pos.	Description
10	Telltale (red) – air filter
11	Telltale (yellow) – fuel
12	Telltale (yellow) – cold starter
13	Telltale (red) – pump pressure
14	Telltale (red) – hydraulic oil filter
15	Telltale (red) – alternator charge function
16	Telltale (red) – handbrake
17	Telltale (red) – engine oil pressure
18	Telltale (red) – coolant temperature
19	Telltale (green) – turn indicators
20	Telltale – not assigned
21	Hour meter
22	Front working light
23	Hazard warning system (option)
24	Rear working light (option)
25	Rotating beacon
26	Parallel bucket lift (option)



1.10 Engine compartment: overview



Pos.	Description	For more information see page
27	Oil dipstick	4-1
28	Air filter	
29	Engine	4-1
30	Alternator	6-9
31	Silencer.....	4-1

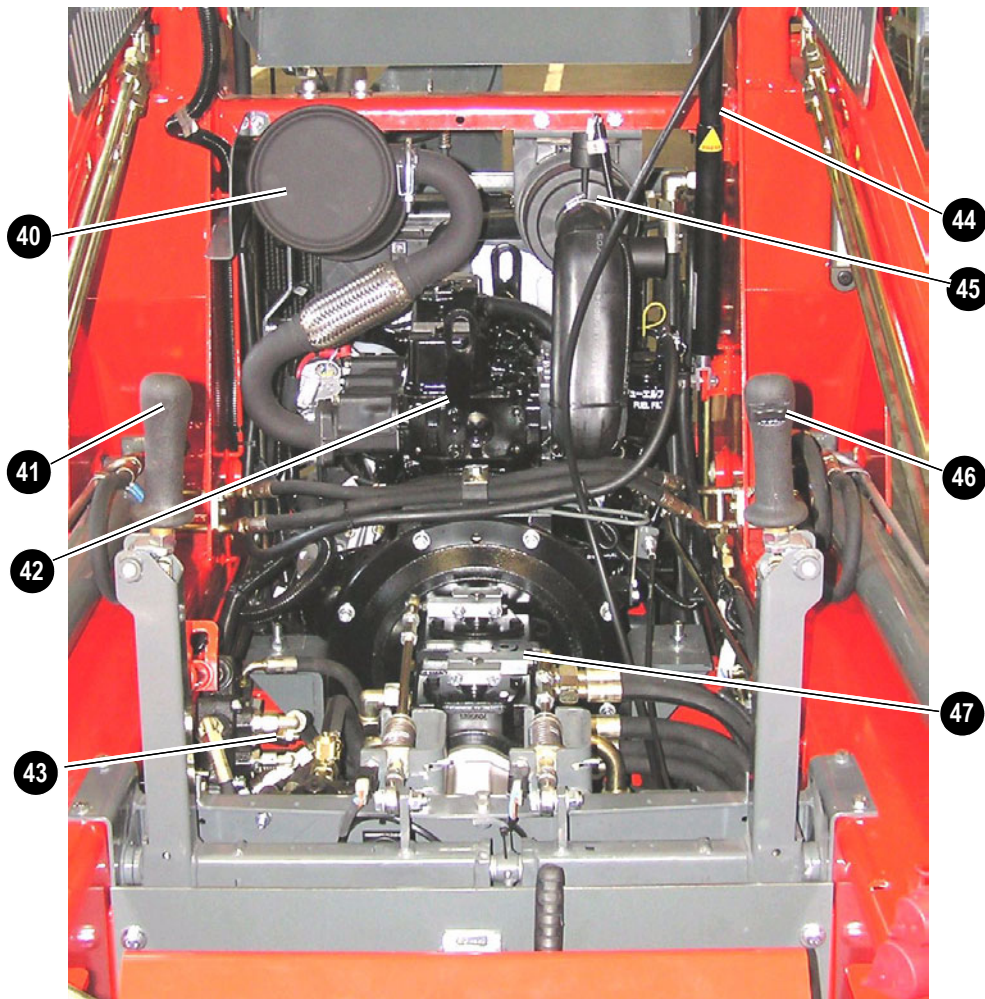


1.11 Engine cover (open): overview



Pos.	Description	For more information see page
32	Expansion tank	
33	Water separator.....	
34	Fuel pump	4-3
35	Silencer	4-1
36	Radiator	
37	Reflux filter	4-3
38	Oil cooler	
39	Engine cover	

1.12 Chassis: overview



Pos.	Description	For more information see page
40	Silencer.....	4-1
41	Control lever (right).....	5-7
42	Diesel engine.....	4-1
43	Main valve block.....	5-4
44	Maintenance prop.....	
45	Air filter.....	
46	Control lever (left).....	5-7
47	Hydraulic pump.....	5-1

1.13 Tilting the cab



Danger!

Careful when tilting the cab –

Danger of accidents!

- ⚠ Always tighten lock screws **A** and **B** when driving and working with the machine.
- ⚠ Place the machine on level ground
- ⚠ Lower the loader unit and the implements
- ⚠ Stay clear from underneath the cab as you tilt it
 - Switch off the engine
 - Remove the ignition key
 - Fold up the safety bar
- ⚠ Close the door (option)

Slackening the lock screw

Unscrew the lock screw as follows:

- ⚠ Switch off the engine
- ⚠ Remove the ignition key
- ⚠ Fold up the safety bar
- ⚠ Unscrew lock screws **A** with a suitable tool
 - ➡ Lock screws **A** are located at the front left and right of the cab

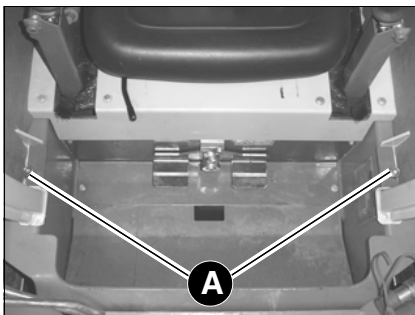


Fig. 8: Cab lock screw

Tilting the cab:



Danger!

Tilting the cab and incorrect locking of the gas strut –

Danger of accidents!

- ☞ Always make sure gas strut **C** is safely locked when the cab is tilted
- ☞ When tilting the cab make sure no-one is underneath the cab

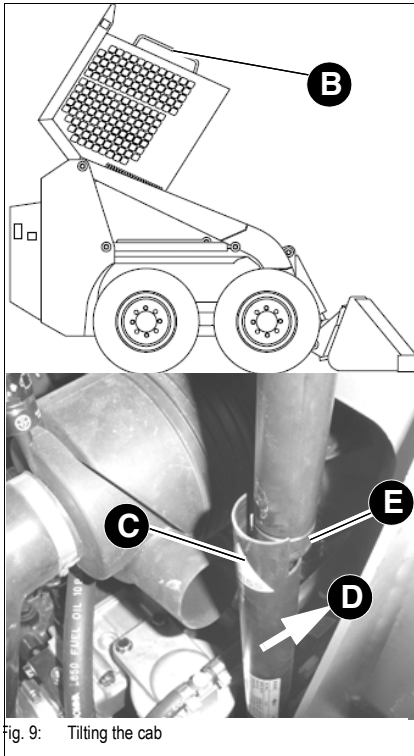


Fig. 9: Tilting the cab

- ☞ Carefully tilt the cab back fully with handles **B**

- ☞ Make sure safety tube **C** is locked (visual check)
- ☞ The safety tube must engage underneath the cylinder (see Fig. 9)

Lowering and locking the cab:



Danger!

Incorrect lowering of the cab –

Danger of accidents and of crushing!

- ☞ Once the end **E** of the cylinder can no longer be seen, stay clear of the area of danger underneath the cab.
 - Lower the cab with both hands on the handles
- ☞ Make sure no-one is underneath the cab
- ☞ Before lowering the cab all the way down, make sure no limbs or equipment are squeezed
- ☞ Firmly retighten lock screws **A** once the cab is fully lowered

- ☞ Push the cab upwards with handles **B**

- ☞ Press safety tube **C** in the direction of **D** and at the same time:

- ☞ Carefully lower the cab, and as soon as the end **E** of the cylinder can no longer be seen:
- ☞ Carefully lower the cab all the way down with the handles
- ☞ Screw in and firmly tighten lock screws **A** with a suitable tool



Caution!

Check safety tube **C**, the cylinder and the tilt lock at regular intervals for cracks, cuts and other defects

- ☞ Replace defective parts immediately



Specifications



2 Specifications

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine

Engine	Model 501
Product	Yanmar diesel engine
Model	3TNV88
Design	Water-cooled 4-stroke diesel engine, EPA2
No. of cylinders	3
Fuel injection system	Direct injection
Aspiration	Natural aspiration
Cooling system	Water-cooled
Lubrication system	Force-feed lubrication with trochoidal pump
Displacement	1642 cm ³
Nominal bore and stroke	88 x 90 mm
Output	26.4 kW @ 3000 rpm
Max. torque	100 – 108.9 Nm @ 1680 rpm
Max. engine speed without load	3200 +/- 25 rpm
Idling speed	1000 +/- 25 rpm
Valve tip clearance (intake = outlet)	0.15 – 0.25 mm (cold)
1 cylinder	Flywheel side
Compression	19.1 : 1
Compression: specified value	35+/- bar @ 250 rpm
Compression: threshold value	28+/- bar @ 250 rpm
Engine oil pressure	3.5 bar +/- 0.5 bar
Engine oil pump pressure switch	0.5 +/- 0.1 bar
Thermostat opening temperature	69.5 – 72.5 °C
Thermal switch	107 – 113 °C
Firing order	1 – 3 – 4 – 2 – 1
Direction of rotation	Counterclockwise (as seen from the flywheel)
Starting aid	Intake manifold preheating (preheating time 10 – 15 sec)
Max. inclined position (engine still supplied with oil):	25°/46 % in all directions Observe the vehicle's hill climbing ability (30°/58%)!
Specific fuel consumption	261 g/kWh
Exhaust values according to	97/68/EC Tier II EPA Tier II



Fuel injection pump

Model	YPD-MP2
Design	Single piston & distributor pump
Injection pressure	19.6 – 20.6 bar
Revs control	Mechanical
Injection time	18 – 19°
Lubrication system	Engine oil lubrication

Capacity

Capacities	
Fuel tank	45 l
Engine oil (max./actual)	6.7 l/2.8
Coolant (without radiator)	5 l
Radiator	2 l
Expansion tank	0,3 l

Tightening torque

Tightening torques	Model 6003
Cylinder-head bolt	85.3 – 91.1 (lubricated)
Connecting rod bearing screw	44.1 – 49 (lubricated)
Main bearing screw	93.2 – 98.1 (lubricated)
Flywheel screw	83.3 – 88.2 (lubricated)



2.3 Travelling drive

Variable displacement pump		Model 501s
Design	Reversing axial-piston variable displacement pump	
Displacement	0 – 24.6 cm³/rev	
Max. system service pressure	250 bar	
Starting RPMs	1450 rpm	
Boost pump		Model 501s
Design	Gear (external)	
Displacement	14.0 cm³/rev	
Charging/boost pressure	16 bar @ minimum rotation 18 bar @ maximum rotation	
Driving direction	Mechanical	
Hydraulic motor		Model 501s
Design	Alternator	
Max. capacity	161.1 cm³/rev	
Drive speed	10.5 kph	
Traction force	1800 daN	

2.4 Brakes

Service brake		Model 501s
Design	Hydrostatic	
Location	Travelling drive	
Effect	Service brake via hydrostatic, closed circuit by means of neutral position of pump	
Handbrake		Model 501s
Design	Manual, negative-effect mechanical disc brake	
Location	Rear gearbox (left and right)	
Effect	Hydraulic release; braked if no pressure	

2.5 Work hydraulics

Component	Model 501s
Hydraulic pump displacement	14 cm³/rev = 42 l/min @ 3000 rpm
Control valve	3 sections
Control valve primary pressure limitation	185 bar
Secondary protection bucket ram	Rod side 300 bar
Filter	Pressure filter
Hydraulic oil tank	44 l



2.6 Electric system

Electric system	501s
Alternator	12 V 40 Ah
Starter	12 V 2.3 kW
Battery	12 V 71 Ah
Socket	E.g. for cigarette lighter; 15 A max.
Battery start output	680 A (EN)

Fuse box in instrument panel

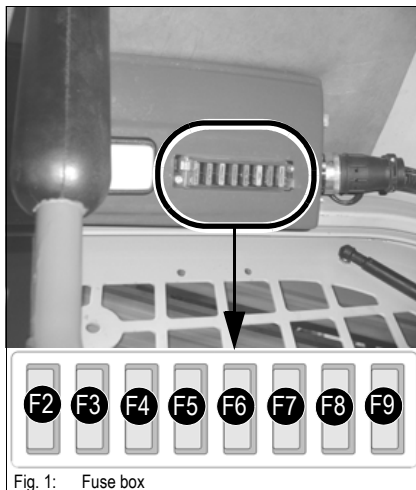


Fig. 1: Fuse box

Fuse no.	Rated current (A)	Protected circuit
F2	10 A	– Tank sensor, starting relay, alternator, gauge element
F3	10 A	– Cutoff solenoid
F4	15 A	– Valves, horn
F5	10 A	– Rear working light, interior light
F6	10 A	– Front lights
F7	15 A	– Turn indicator
F8	10 A	– Hazard warning system
F9	15 A	– Socket, rotating beacon

Main fuse box with relays

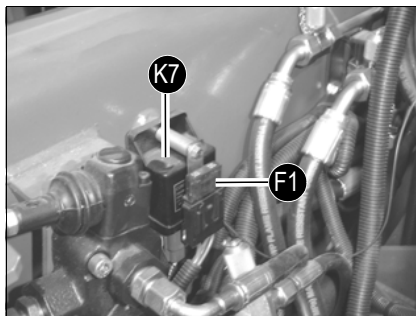
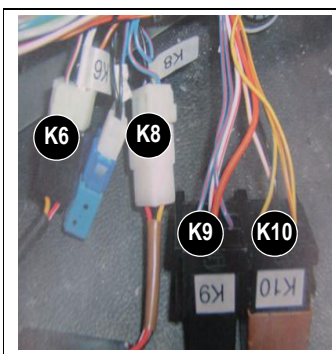


Fig. 2: Relay box under the cab

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	– Main fuse

Relay no.	Protected circuit
K 7	– Starting relay

Relays



The relays are located behind the fuse box in the cab

Switching relay no.	Protected circuit
K 6	– Preheating timer 10 – 15 sec
K 8	– Cutoff timer 1 sec
K9	– Cutoff solenoid timer, pick-up contact 1 sec
K 10	– Turn indicator relay

2.7 Tyres

Tyre size	Tyre pressure			
	Remarks	Front	Rear	Model
27 x 10.5-15	Standard tyres	4.1 bar	4.1 bar	501
27 x 8.5-15	(option)	2.5 bar	2.5 bar	501
10 - 16,5	Standard tyres	4.5 bar	4.5 bar	701
7,0 - 15	(option)	4.1 bar	4.1 bar	701



Important!

Same tyre sizes apply to Airboss® tyres (option) as to standard tyres.

2.8 Noise levels

Sound power level	Model 501s	Model 701s	Model 701sp
Sound power level (L_{WA})	103.8 dB (A)	103.5 dB (A)	99.9 dB (A)
Sound pressure level (L_{PA})	89 dB (A)	90 dB (A)	88 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.

2.9 Vibration

Vibration	
Effective acceleration value for the upper extremities of the body	$< 2.5 \frac{m}{s^2}$
Effective acceleration value for the body	$< 0.5 \frac{m}{s^2}$

2.10 Coolant compound table

Outside temperature	Halvoline XLC (ethylene glycol)			
	Water	Anticorrosion agent		Antifreeze agent
Up to °C	% by volume	cm³/l	% by volume	% by volume
4	99	10	1	–
-10	79			20
-20	65			34
-25	59			40
-30	55			44



2.11 Dimensions

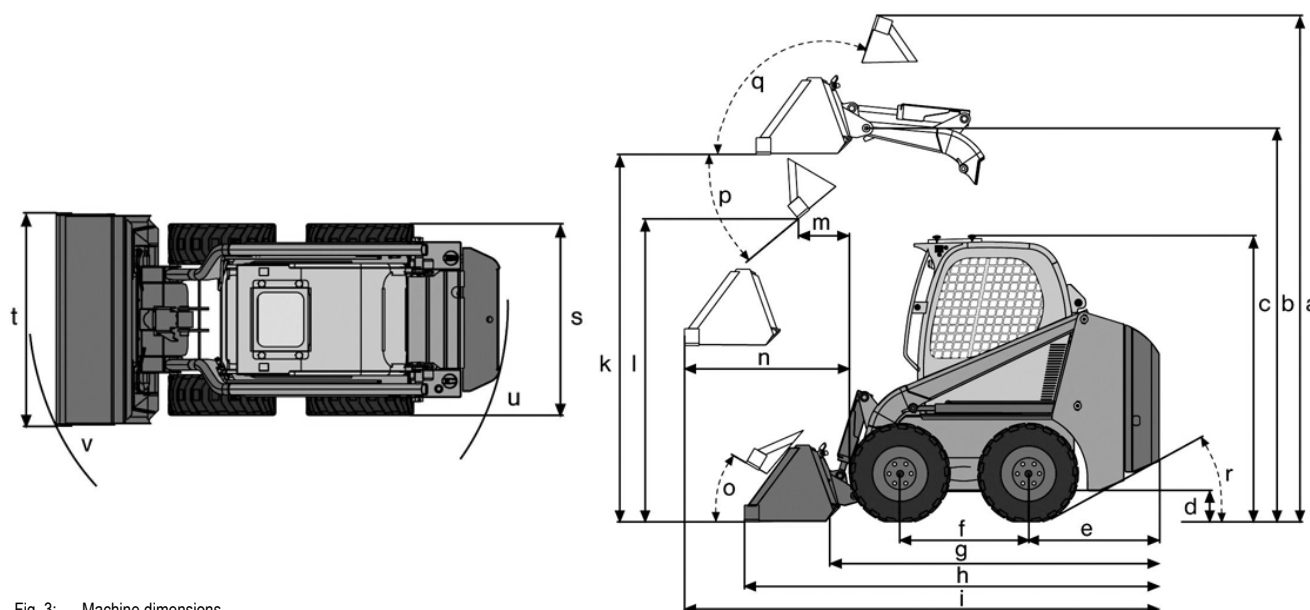


Fig. 3: Machine dimensions

Main data		Model 501
a	Maximum height	3475 mm
b	Height below bucket joint	2700 mm
c	Cab height	1930 mm
d	Ground clearance	225 mm
e	Rear projection (rear axle onwards)	898 mm
f	Wheelbase	885 mm
g	Overall length without implement	2263 mm
h	Overall length with standard bucket	2860 mm
i	Maximum length of machine	3258 mm
k	Topmost bucket position	2522 mm
l	Maximum dump height	2122 mm
m	Reach	424 mm
n	Maximum reach (horizontal loader unit position)	1136 mm
o	Dump-in angle	30°
p	Dump-out angle	40°
q	Dump-in angle	40°
r	Departure angle	29°
s	Machine width (with standard tyres)	1230 mm
t	Bucket width	1370 mm
u	Rear turning radius	1381 mm
v	Front turning radius	1656 mm

2.12 Model-specific tightening torques

501s		
Component	Thread	Tightening torque
Travelling drive	M14 10.9	
Angled engine bracket	M10 8.8	
Engine mounting	M10 8.8	
Pump mounting	M10 10.9	
Pump	M12 10.9	

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

2.13 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
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

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.



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	-15 °C	7.12 l (model 501)
		SAE ² E3, E4, E5	+45 °C	7.82 l (model 701)
Travelling drive	Gearbox oil ³	Q8 T 55, SAE85W-90	Year-round	About 1.3 l each
		FINA PONTONIC GLS, SAE85W-90		
Hydraulic oil tank	Hydraulic oil	HVLP46 ⁴	Year-round	45 l (model 501) 55 l (model 701)
	Biodegradable oil ⁵	PANOLIN HLP Synth 46		
		FINA BIOHYDRAN SE 46		
		BP BIOHYD SE-46		
Grease nipples	Multipurpose grease ⁶	FINA Energ grease L21 M	Year-round	As required
Battery terminals	Acid-proof grease ⁷	FINA Marson L2	Year-round	As required
Fuel tank	Diesel fuel	No. 2-D, DIN 51601 grade	Over 4 °C	45 l (model 501)
		No. 1-D, DIN 51601 grade	Below 4 °C	52 l (model 701)
Diesel engine radiator	Coolant	Water + antifreeze; ASTM 4985, based on ethylene glycol, silicone-free	Year-round	3.3 l (model 501) 4.6 l (model 701)

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

1. Capacities indicated are no system fills

2. According to DIN 51511

3. Hypoid gearbox oil based on basic mineral oil (SAE85W-90 according to DIN 51502), (API GL-4, GL5)

4. According to DIN 51524 section 3

5. Hydraulic ester oils (HEES)

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

7. Standard acid-proof grease

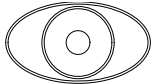
Oil grades for the diesel engine, depending on temperature

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	SAE 15W-40														
SAE ¹ E3, E4, E5															
						SAE 20									
									SAE 30						
											SAE 40				
	°F	-4	5	14	23	32	41	50	59	68	77	86	95	104	

1. According to DIN 51511

3.2 Maintenance label

Explanation of symbols on the maintenance label

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

The diagram illustrates the maintenance schedule for a skid steer loader, centered around a 10-hour service interval. The machine is shown with various components labeled with icons and text. The maintenance schedule is indicated by concentric circles representing different service intervals: 1000h, 500h, 50h, and 10h.

Engine and Fluids:

- Engine Oil:** API GL5 SAE 80W90 (2x)
- Hydraulic Oil:** DIN 51 502 (4)
- Transmission Oil:** API CF SAE 10W-40 (1)
- Engine Coolant:** ASTM D4985 -34°C / -29°F, ASTM D6210 (2x)

Filters:

- Oil Filter:** 1
- Hydraulic Filter:** 1
- Transmission Filter:** 1
- Engine Air Filter:** 1
- Hydraulic Air Filter:** 1
- Engine Water Filter:** 1
- Hydraulic Water Filter:** 1

Other Components:

- Light:** 1
- Warning Light:** 1
- Warning Horn:** 1
- Warning Bell:** 1
- Warning Buzzer:** 1
- Warning Chime:** 1
- Warning Siren:** 1
- Warning Alarm:** 1
- Warning Signal:** 1
- Warning Indicator:** 1
- Warning Display:** 1
- Warning Panel:** 1
- Warning Control:** 1
- Warning Switch:** 1
- Warning Button:** 1
- Warning Lever:** 1
- Warning Knob:** 1
- Warning Wheel:** 1
- Warning Roller:** 1
- Warning Pin:** 1
- Warning Bolt:** 1
- Warning Nut:** 1
- Warning Washer:** 1
- Warning Gasket:** 1
- Warning Seal:** 1
- Warning O-ring:** 1
- Warning Spring:** 1
- Warning Shock:** 1
- Warning Damper:** 1
- Warning Piston:** 1
- Warning Rod:** 1
- Warning Pin:** 1
- Warning Bolt:** 1
- Warning Nut:** 1
- Warning Washer:** 1
- Warning Gasket:** 1
- Warning Seal:** 1
- Warning O-ring:** 1
- Warning Spring:** 1
- Warning Shock:** 1
- Warning Damper:** 1
- Warning Piston:** 1
- Warning Rod:** 1





3.3 Maintenance plan (overview)

Work description

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

Fluid and filter changes ():

Carry out the following oil and filter changes (check oil levels after test run):

	Maintenance work (once a day)	After 50 s/h	Every 250 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
• Engine oil ¹		●	●					●
• Engine oil filter ²		●	●					●
• Fuel filter ³		●		●				●
• Air filter element as indicated by telltale							●	
• Coolant					●			●
• Hydraulic oil filter insert ⁴		●			●			●
• Hydraulic oil					●			●
• Breather – hydraulic oil tank					●			●
• Gearbox oil ⁵			●		●			●
• Suction-screen hydraulic oil tank (model 501)				●				●
• Hydraulic oil reflux filter (model 701)				●				●

Inspection work ():

Check the following material. Refill if necessary:

• Engine oil	●						●	
• Engine coolant	●						●	
• Hydraulic oil	●						●	
• Gearbox oil ⁶		●					●	
Clean water ducts ⁷					●			●
Check engine/hydraulic oil radiator and air conditioning for contamination. Clean if necessary	●						●	
Check cooling systems, heating and hoses for leakages and damage (visual check)	●						●	
Replace the filter for cab heating or air conditioning (air conditioning system option)				●				●
Air filter (damage)	●						●	

3.3 Maintenance plan (overview)

Work description

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

Maintenance plan/service hours (s/h)

	Maintenance work (once a day)	After 50 s/h	Every 250 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
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					●			●
Check the fuel injection pump						●		●
Check the injection pressure					●			●
Check the injection nozzles ⁸						●		●
Empty the diesel fuel tank (to avoid condensation water)				●				●
Check battery fluid, fill up with distilled water if necessary, check for leakage, visual check		●		●			●	
Check alternator, starter and electric connections, bearing play and function ⁹		●		●				●
Preheating system, electric connections ¹⁰		●		●				●
Check wheels for cracks, cuts, check profile and air pressure	●						●	
Check wheel nuts	●						●	
Check piston rods for damage	●						●	
Check screws for tightness		●		●				●
Pin lock	●						●	
Line fixtures	●						●	
Check telltales for correct function		●		●				●
Tilt lock and gas strut of cab		●		●				●
Couplings, dirt pile-up on hydraulic system dust caps	●						●	
Check insulating mats in the engine compartment for damage/attachment		●		●				●
Adhesive labels and operation manual		●		●				●
Engine cover gas strut	●						●	





3.3 Maintenance plan (overview)

Work description

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

Pressure check of work and drive hydraulics

Maintenance plan/service hours (s/h)

	Maintenance work (once a day)	After 50 s/h	Every 250 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 1500 s/h	Customer	Authorised workshop
Pressure check of work and drive hydraulics				●				●

Lubrication service ():

Lubricate the following assemblies/components:

• Quickhitch facility	●						●	
• Mobile parts of lock mechanism	●						●	
• Implements	●						●	

Functional check ():

Check the function of the following assemblies/components. Rectify if necessary:

• Lights, signalling system, acoustic warning system	●						●	
• Check function of safety bar, check for damage	●						●	
• Check emergency lowering	●						●	
• Safety device: maintenance prop of loader unit	●						●	

Leakage check ():

Check for tightness, leakage and chafing: pipes, flexible lines and screw connections of the following assemblies and components. Rectify if necessary:

• Visual check	●						●	
 Engine and hydraulic system	●						●	
 Cooling and heating circuit	●						●	
 Travelling drive	●						●	

1. Drain engine oil the first time after 50 s/h, then every 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. Drain the gearbox oil the first time after 50 s/h, then every 1000 s/h
6. Check the gearbox oil every other 50 s/h servicing
7. Clean the water ducts every other 1000 s/h servicing
8. Check the injection nozzles and the valves every other 1500 s/h servicing
9. First check of alternator and starter at 50 s/h, then every 500 s/h
10. First check of preheating system at 50 s/h, then every 500 s/h





3.4 Service package

1000147716	1	Service package 501s
1000012537	1	↪ Engine oil filter
1000106891	1	↪ Fuel filter
1000106892	1	↪ Water separator element
1000069998	1	↪ Seal for diesel fuel filter housing
1000064543	1	↪ O-ring
1000012360	1	↪ O-ring for oil drain plug
1000147015	1	↪ Hydraulic reflux filter insert
1000004567	1	↪ Air filter insert (inside)
1000004566	1	↪ Air filter insert (outside)
1000104765	1	↪ Cylinder-head cover gasket
1000003894	3	↪ O-ring

3.5 Introduction

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

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

- Section 2 "SAFETY INSTRUCTIONS" in the operation manual
- The operation manuals of the implements.

Secure open (engine) covers appropriately.

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 3-5).

3.6 Fuel system

Specific safety instructions

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

Refuelling

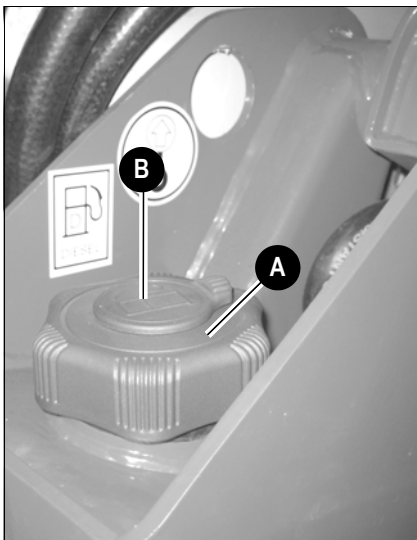


Fig. 1: Fuel filler inlet

Filler inlet **A** for the fuel tank is located behind the cab, on the right in driving direction. Lock **B** on the filler inlet can be opened with the key of the machine.



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
- ☞ No smoking, no fire!



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 3-11.



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

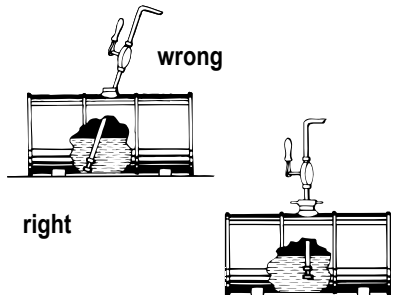


Fig. 2: Refuelling from a barrel

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

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

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

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

Emptying the fuel tank

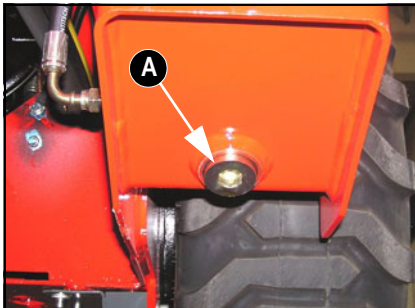


Fig. 3: Fuel drain plug



Danger!

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

Danger of burns!

⚠ *Never bleed the fuel system if the engine is hot!*

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

- ⚠ *Place a container with sufficient capacity under the fuel tank to collect the fuel as it drains*
- ⚠ *Open the drain plug to drain the fuel **A***
- ⚠ *Check the fuel tank for contamination and clean if necessary*
- ⚠ *Replace the filter according to the maintenance specifications*
- ⚠ *Screw the drain plug back in correctly*
- ⚠ *Fill the fuel tank*
- ⚠ *Bleed the fuel system – see section [Bleeding the fuel system on page 3-11](#)*

Fuel prefilter with water separator

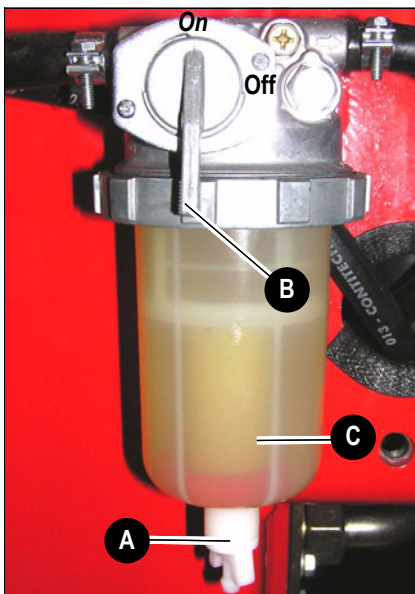


Fig. 4: Fuel prefilter

Check the fuel prefilter as follows:

- ⚠ *If the red indicator ring rises to position **C***
- ⚠ *Unscrew thread **A***
 - ➔ The water drains
 - ➔ Wait until the indicator ring returns to the bottom of the water separator
- ⚠ *Screw thread **A** back on again*

Interrupt fuel supply as follows:

- ⚠ *Turn ball-type cock **B** to the **OFF** mark*
 - ➔ Fuel supply is interrupted
- ⚠ *Turn ball-type cock **B** to the **ON** mark*
 - ➔ Fuel supply is open again



Environment!

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

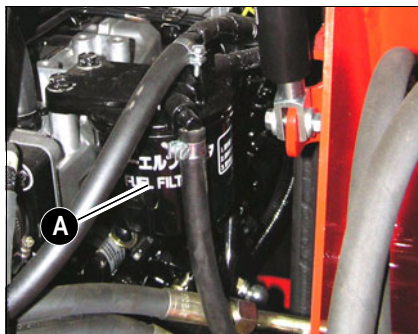
Replacing the fuel filter

Fig. 5: Fuel filter position

**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!

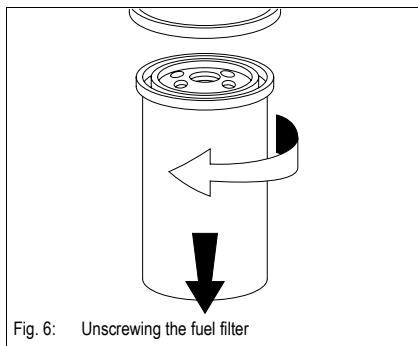


Fig. 6: Unscrewing the fuel filter

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

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

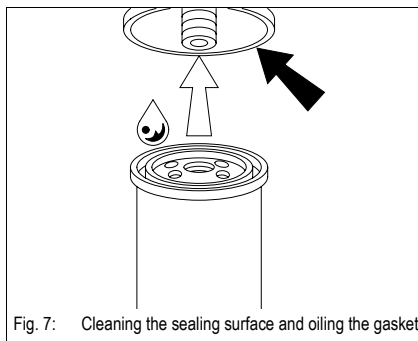


Fig. 7: Cleaning the sealing surface and oiling the gasket

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

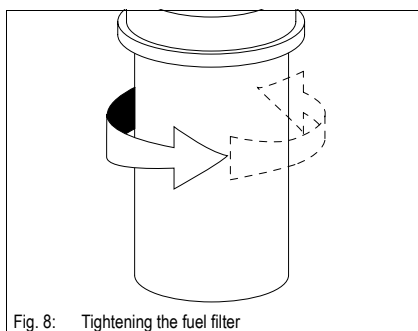


Fig. 8: Tightening the fuel filter

- Tighten the fuel filter cartridge by turning it a further half revolution
- Open the stop cock on the water separator again
- Bleed the fuel system— [see Bleeding the fuel system](#) on page 3-11
- Make a test run – and check for tightness!
- Dispose of the old fuel filter cartridge by an ecologically safe method



3.7 Engine lubrication system



Caution!

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

Engine damage or loss of output!

☞ Have the oil changed by an authorised workshop
– see section 3.3 Maintenance plan (overview) on page 3-5

Checking the oil level



Important!

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

Checking the oil level

☞ Proceed as follows:

- Park the machine on level ground
- Switch off the engine!
- Fold up the safety bar
- Let the engine cool down
- Open the engine cover
- Clean the area around the oil dipstick with a lint-free cloth
- Oil dipstick A:

☞ Pull it out

☞ Wipe it with a lint-free cloth

☞ Push it back in as far as possible

☞ Withdraw it and read off the oil level

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

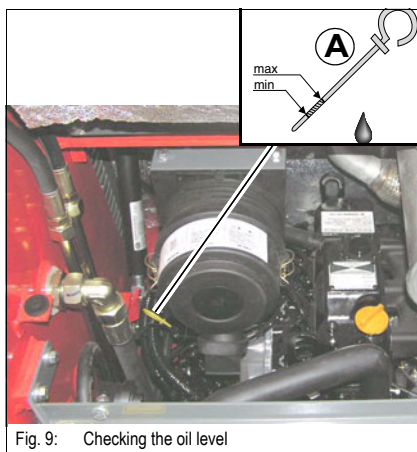


Fig. 9: Checking the oil level

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 10/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!

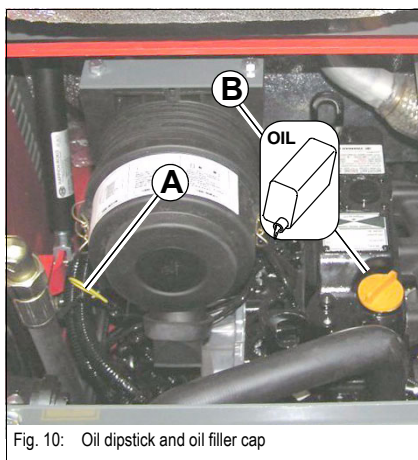


Fig. 10: Oil dipstick and oil filler cap

☞ *Proceed as follows:*

- Clean the area around oil filler cap **B** with a lint-free cloth
- Open filler cap **B**
- Raise oil dipstick **A** slightly to allow any trapped air to escape
- Fill in engine oil
- Wait about 3 minutes until all the oil has run into the oil sump
- Check the oil level – see *Checking the oil level* on page 3-14
- Fill up if necessary and check the oil level again
- Close filler cap **B**
- Push oil dipstick **A** back in as far as possible
- Completely remove all oil spills from the engine

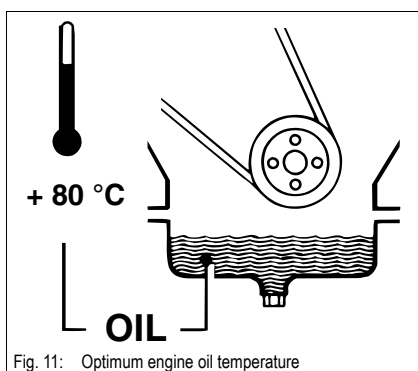
Changing engine oil

Fig. 11: Optimum engine oil temperature

**Danger!**

Caution when draining hot engine oil –

Danger of burns!

- ☞ *Wear protective gloves*
- ☞ *Use suitable tools*

**Environment!**

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

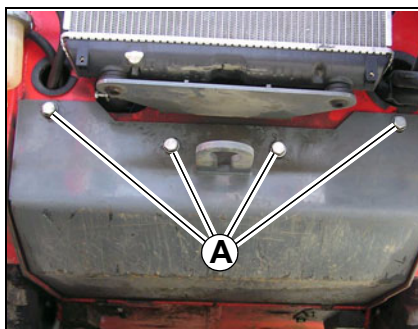


Fig. 12: Chassis cover

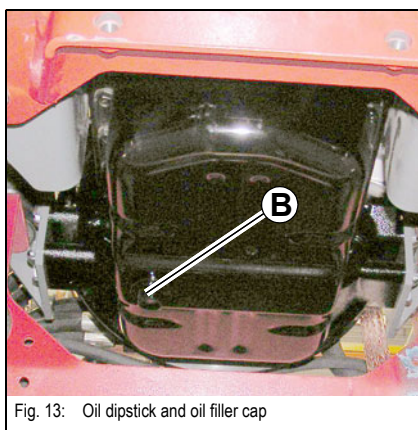


Fig. 13: Oil dipstick and oil filler cap

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
- Remove the chassis cover (fig.12):
 - ▣ Slacken the 4 fastening screws A
 - ▣ Remove the plate



Caution!

Danger of injuries due to the weight of the chassis cover! Secure the plate to prevent it from falling down.

- Place a container under the opening to collect the oil as it drains
- Unscrew oil drain plug B
- Completely drain the oil
- Screw oil drain plug back on again
- Fill in engine oil – see section *Filling up engine oil* on page 3-15
- 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
- Mount the chassis cover



Replacing the engine oil filter cartridge

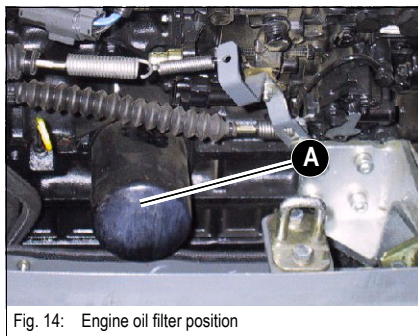


Fig. 14: Engine oil filter position



Danger!

Caution when draining hot engine oil –

Danger of burns!

☞ Wear protective gloves



Environment!

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

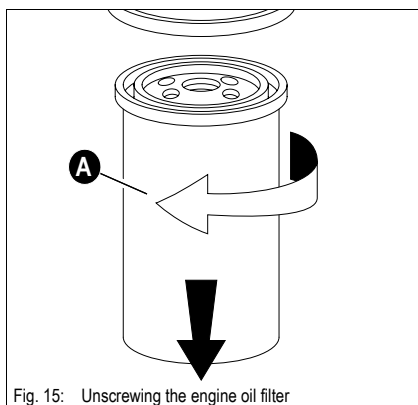


Fig. 15: Unscrewing the engine oil filter

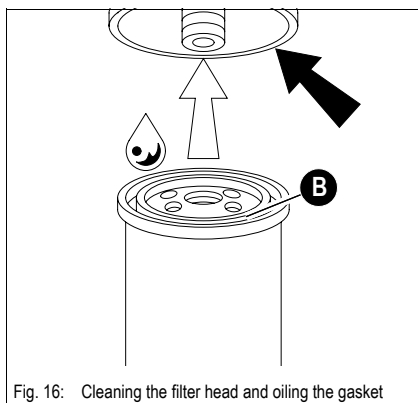


Fig. 16: Cleaning the filter head and oiling the gasket

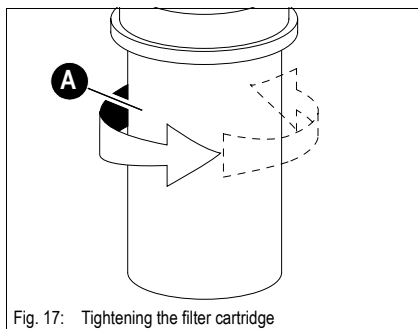


Fig. 17: Tightening the filter cartridge

☞ 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

3.8 Cooling system

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

The hydraulic oil cooler is located in the engine cover.

The expansion tank for the coolant is also located in the engine compartment, to the left of the water cooler.

Specific safety instructions

- Dirt on the cooling ribs 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 section 2.10 Coolant compound table](#) on page 2-5
 - ☞ 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 19/B to the first notch and allow the pressure to escape
- ☞ 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

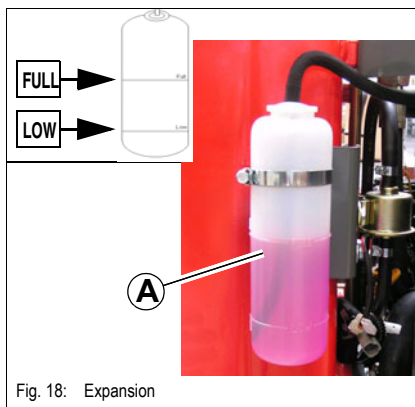


Fig. 18: Expansion

Checking the coolant level

- ☞ Proceed as follows:
 - Park the machine on level ground
 - Switch off the engine!
 - Fold up the safety bar
 - 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 18/A and on radiator 19/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.

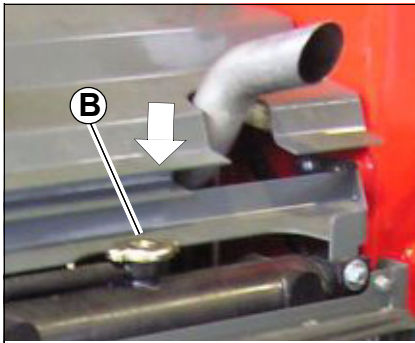


Fig. 19: Radiator filler cap

Filling up coolant

After the engine has cooled down:

- ☞ Release overpressure in the radiator
- ☞ Carefully open the cap to the first notch and allow the pressure to fully escape
- ☞ Open filler cap 19/B
- ☞ Fill in coolant up to the lower edge of the filler inlet (radiator)
- ☞ Close filler cap 19/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 **19/B** to the first notch and allow the pressure to escape

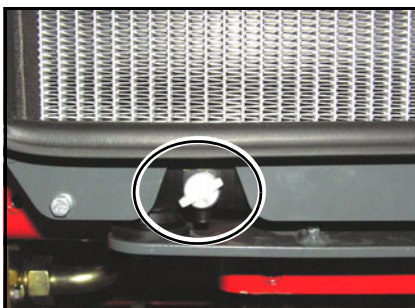


Fig. 20: Radiator drain plug

After the engine has cooled down:

- ☞ Release overpressure in the radiator
- ☞ Open the cap to the first notch and allow the pressure to fully escape
- ☞ Open filler cap **20/B**
- ☞ Open the drain plug of the radiator and drain the coolant
- ☞ Close the drain plug again
- ☞ Fill up the radiator with suitable coolant
 - see section 3.1 Fluids and lubricants on page 3-1
- ☞ Check the coolant level
 - see section Checking the coolant level on page 3-19

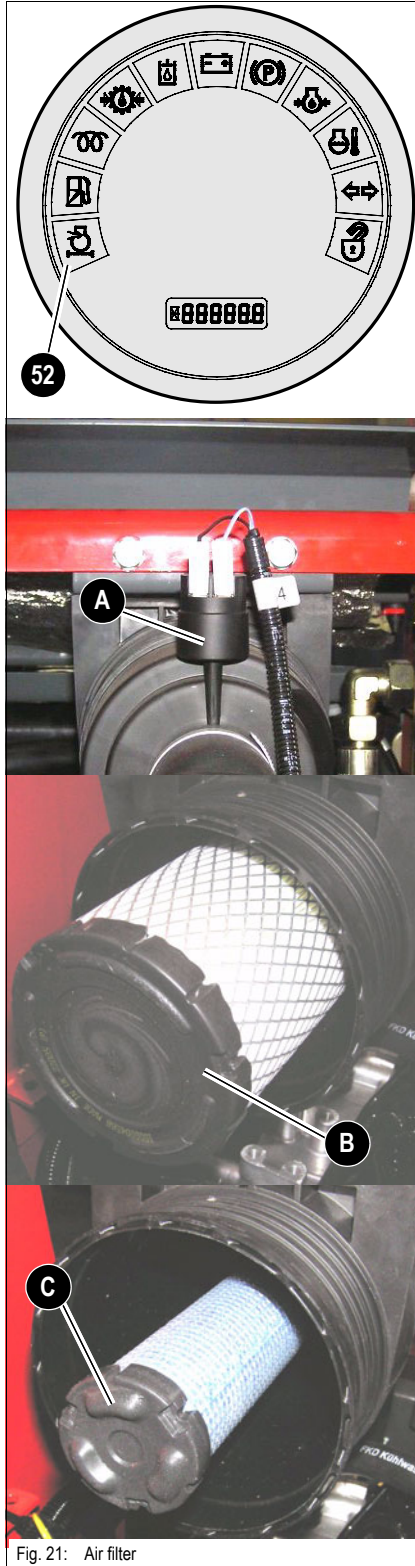
3.9 Air filter

Fig. 21: 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!

Maintenance switch **A** on the air filter activates telltale **52** on the round display element which monitors the filter cartridge.

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

- If telltale **52** in the round display element comes on
- According to the maintenance plan

**Important!**

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

**Caution!**

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

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

General instructions for air filter maintenance:

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



Replacing the filter

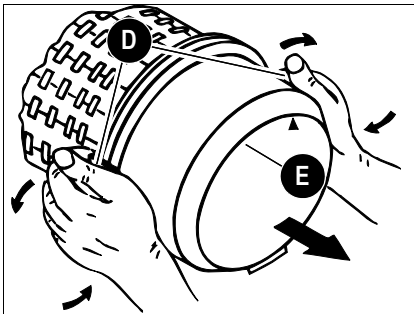


Fig. 22: Removing the lower housing section

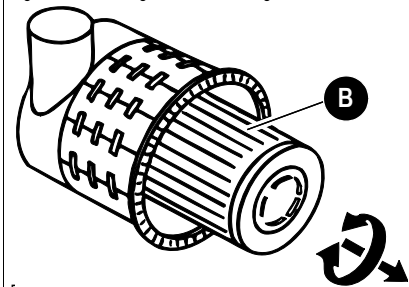


Fig. 23: Removing the filter element

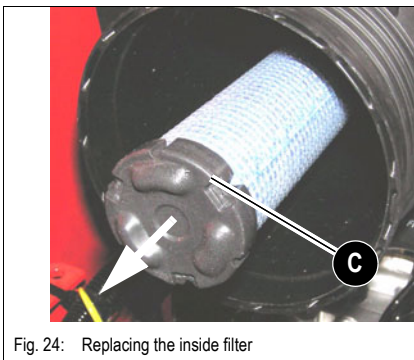


Fig. 24: Replacing the inside filter

- Replace outside filter **A** as follows:

- ☞ Switch off the engine
- ☞ Remove the key and carry it with you
- ☞ Let the engine cool down
- ☞ Open the engine cover
- ☞ Remove dirt and dust from the air filter and the area around the air filter
- ☞ Fold both bow clips **D** on lower housing section **E** to the outside
- ☞ Remove lower housing section **E**
- ☞ Carefully remove outside filter **B** with slightly turning movements
- ☞ **Make sure** all dirt (dust) inside the upper and lower housing sections, including the dust valve, has been removed
 - ☞ Clean the parts with a clean lint-free cloth, do not use compressed air
- ☞ Check the air filter cartridges for damage, only install intact filters
- ☞ Carefully insert new outside filter **B** in the upper housing section
- ☞ Position lower housing section **E** (make sure it is properly seated)
- ☞ Close both bow clips **D**

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

- ☞ Switch off the engine
- ☞ Remove the key and carry it with you
- ☞ Let the engine cool down
- ☞ Open the engine cover
- ☞ Remove dirt and dust from the air filter and the area around the air filter
- ☞ Fold both bow clips **D** on lower housing section **E** to the outside
- ☞ Remove lower housing section **E**
- ☞ Carefully remove outside filter **B** with slightly turning movements
- ☞ Carefully remove inside filter **C**
 - ☞ Cover the air supply at the end of the filter with a clean lint-free cloth to prevent dust from entering the engine
 - ☞ Clean the parts with a clean lint-free cloth, do not use compressed air
 - ☞ Remove the cloth from the air supply
- ☞ Check the air filter cartridges for damage, only install intact filters
- ☞ Carefully insert the new inside filter **C**
- ☞ Carefully insert outside filter **B**
- ☞ Position lower housing section **E** (make sure it is properly seated)
- ☞ Close both bow clips **D**

**Important!**

Make sure the dust valve shows downwards once it is installed!

Functional check once a week of the dust valve

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

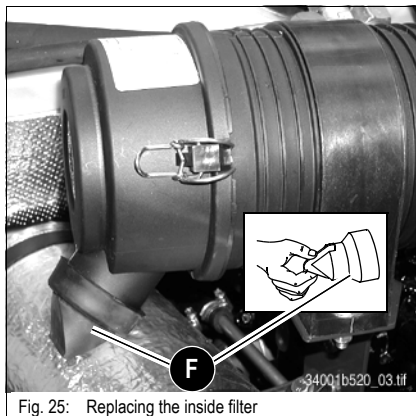


Fig. 25: Replacing the inside filter

➤ *Proceed as follows:*

- Switch off the engine
- Apply the handbrake
- Squeeze the discharge slot of dust valve F
- Remove hardened dust by compressing the upper area of the valve

➤ *Clean the discharge slot if necessary*

3.10 V-belt



Danger!

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

Danger of personal injury!

- ☞ Switch off the engine before carrying out inspection work in the engine compartment!
- ☞ Disconnect the battery
- ☞ 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

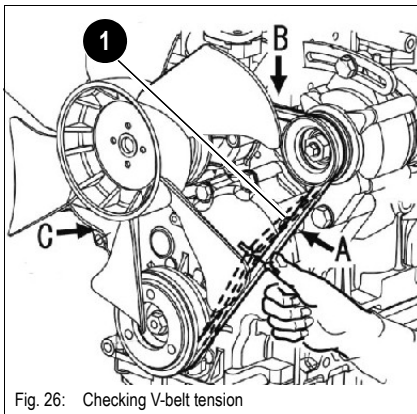


Fig. 26: Checking V-belt tension

- Check as follows:
 - ☞ Switch off the engine
 - ☞ Fold up the safety bar
 - ☞ Remove the key and carry it with you
 - ☞ Disconnect the battery
 - ☞ Let the engine cool down
 - ☞ Open the engine cover
 - ☞ Carefully check V-belt 26/1 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 about 100 N 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 3-24*

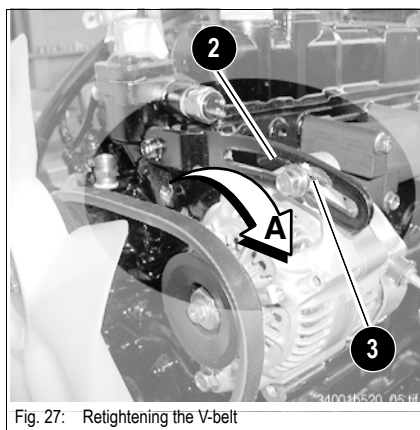


Fig. 27: Retightening the V-belt

- Retighten as follows:
 - ☞ Switch off the engine
 - ☞ Fold up the safety bar
 - ☞ Remove the key and carry it with you
 - ☞ Disconnect the battery
 - ☞ Let the engine cool down
 - ☞ Open the engine cover
 - ☞ Slacken fastening screws 27/3 of alternator 27/4
 - ☞ Use a suitable tool to push the alternator in the direction of arrow 27/A until reaching the correct V-belt tension
 - ☞ Keep the alternator in this position, and at the same time retighten fastening screws 27/3
 - ☞ Check V-belt tension again and adjust it if necessary
 - ☞ Connect the battery
 - ☞ Close the engine cover



3.11 Pressure check

General

- Run the machine warm before checking the pressure! Hydraulic oil temperature: 50 °C min. (operating temperature)
- Set the primary pressure limiting valves (PPLV) at maximum engine revs.
- See chapter “Specifications” – [see Work hydraulics](#) on page 2-3 for the pressure settings

Checking boost pressure

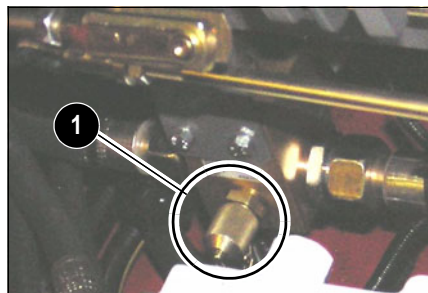


Fig. 28: Boost pressure measuring port

Checking boost pressure

- ☞ Tilt the cab upwards– [see section 1.13 Tilting the cab](#) on page 1-12
- ☞ Connect a pressure gauge to measuring port MP 1 28/1
- ☞ Start the engine – leave the cab in the tilted position
- ☞ Check and make a note of the pressure value.

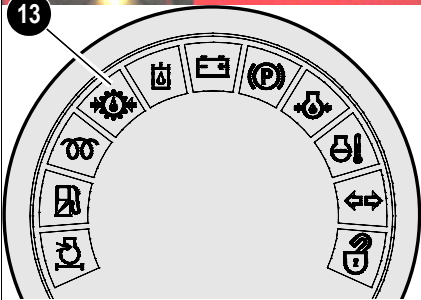
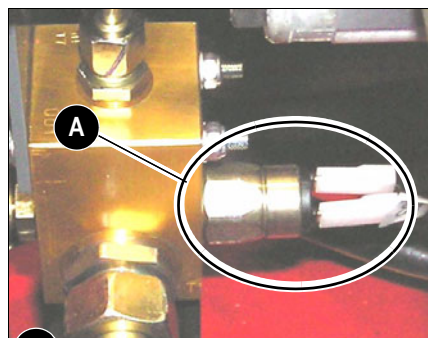


Fig. 29: Boost pressure switch

- The boost pressure is monitored by pressure switch **A** on the distributing block.
- If the boost pressure drops below 8.0 bar, the pump can be damaged by cavitation.
 - ➔ The pressure switch activates telltale **29/13** “pump pressure”.

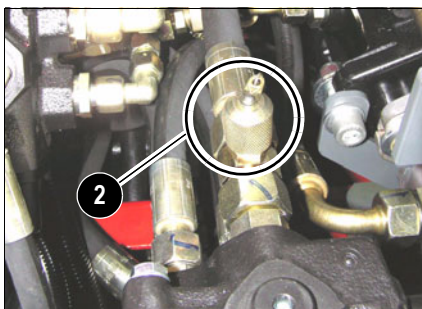
Gear pump pressure check

Fig. 30: Work hydraulics measuring port

Checking the work hydraulics pressure

- ☞ Tilt the cab upwards – see [section 1.13 Tilting the cab](#) on page 1-12
- ☞ Connect a pressure gauge to measuring port MP 2 30/1
- ☞ Lower the cab
- ☞ Extend/retract (base/rode side) the bucket ram as far as it will go
- ☞ Check and make a note of the pressure value.

Adjusting the work hydraulics pressure

- ☞ Adjust the pressure at the pressure limiting valve (PLV 1) 31/A on the control valve
 - ☞ Slacken the locknut of the pressure limiting valve
 - ☞ Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge
 - ➡ The valve seat may be stuck and must be slackened first
 - ☞ Adjust the pressure limiting valve and tighten the locknut
 - ➡ Adjustment value see – see [section 2.5 Work hydraulics](#) on page 2-3
- ☞ Check the pressure limiting valve 1 and the pressure drop once adjustment is over

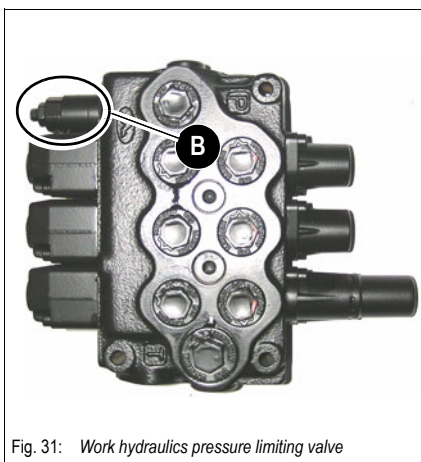


Fig. 31: Work hydraulics pressure limiting valve

You can also check by extending/retracting the loader unit ram.

**Danger!**

Checking the pressure or adjusting with the loader unit function –

Danger of personal injury!



Checking the parking brake pressure

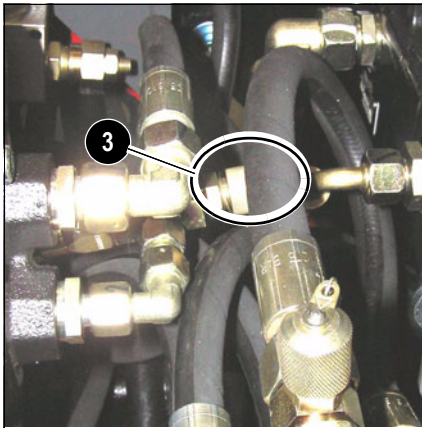


Fig. 32: Brake pressure measuring port

Brake pressure check

- ☞ Tilt the cab upwards— see [section 1.13 Tilting the cab](#) on page 1-12
- ☞ Connect a pressure gauge to measuring port MP 1 32/3
- ☞ Start the engine – leave the cab in the tilted position
- ☞ Apply the handbrake and run the engine at max. revs
- ☞ Check and make a note of the pressure value.
 - ➡ Pressure must correspond to the boost pressure with the handbrake released

Measuring ports: overview

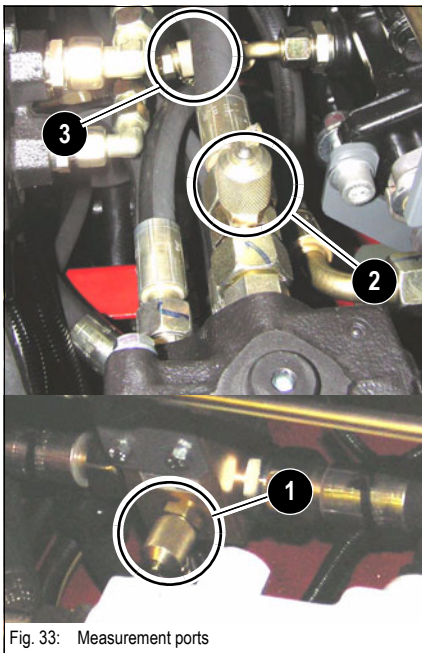


Fig. 33: Measurement ports

Pos.	Description	
1	Boost pressure measuring port	MP 1
2	Gear pump measuring port	MP 2
3	Parking brake measuring port	MP 3

3.12 Test report

Boost pressure

Controlled via P3			Specified values		Measured	✓
	Measuring port MP 2	Min. revs	Rated value	16 ^{±1} bar		
	Measuring port MP 2	Max. revs	Rated value	18 ^{±1} bar		

Work hydraulics

Function	Movement	Pressure limiting valve	Measuring port	Specified values		Measured	✓
Bucket	EXTEND	Pressure limiting valve (control valve)	Measuring port MP 2	Rated value	185 ^{±3} bar		
				Drop	25 bar		
	RETRACT			Rated value	185 ^{±3} bar		
				Drop	25 bar		
Loader unit	UP			Rated value	185 ^{±3} bar		
				Drop	25 bar		
	DOWN			Rated value	185 ^{±3} bar		
				Drop	25 bar		



neuson

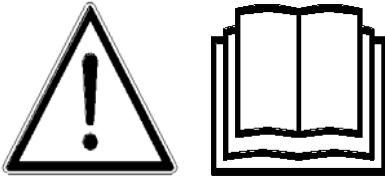
Maintenance





3.13 Hydraulic system

Specific safety instructions



- Release the pressure in all lines carrying hydraulic oil prior to any maintenance and repair work. To do this:
 - Lower all hydraulically controlled implements to the ground
 - Move all control levers of the hydraulic control valves several times
- Fold the control lever base up
- Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries. Always consult a doctor immediately even if the wound seems insignificant – otherwise serious infections could set in!
- If the hydraulic oil in the sight glass is cloudy, this indicates that water or air has penetrated the hydraulic system. This 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 using the filling screen!
- ☞ 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 3-33](#)
- ☞ 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 shavings. 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



Caution!

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

☞ Check the hydraulic oil level each time the machine is taken into service or once a day

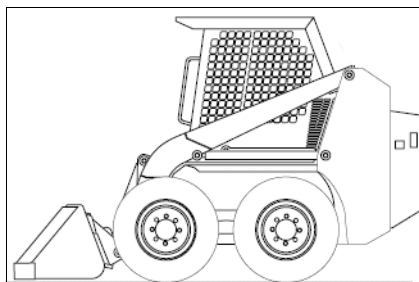


Fig. 34: Parking the loader

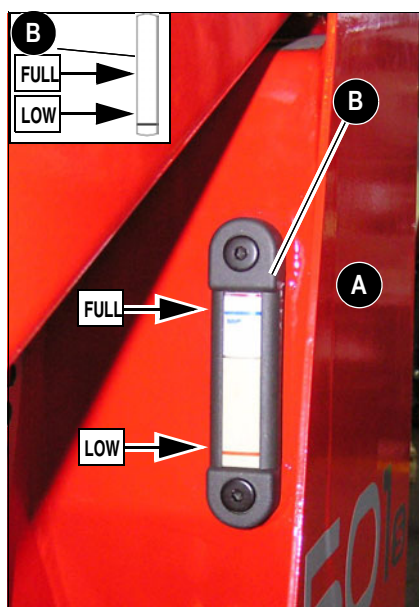


Fig. 35: Oil level indicator on the hydraulic oil tank

- If the implement is not positioned as shown:
 - ☞ Start the engine and let it run at idling speed
 - ☞ Retract the loader unit ram, lower the bucket to the ground
 - ☞ Switch off the engine again.

☞ Proceed as follows:

- Park the machine on level ground
- Switch off the engine
- Fold up the safety bar
- Sight glass 35/B is located on hydraulic oil tank 35/A
- Check the oil level on sight glass **B**
- The oil level must be at the **FULL** level
 - A gauge element in sight glass **B** indicates the oil level

If the oil level is lower

- Fill up hydraulic oil

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

Machine condition	Hydraulic oil temperature	Oil level
• Before taking into service	Between 10 and 30 °C	LOW mark
• Normal operation	Between 50 and 90 °C	FULL mark



Important!

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

Filling up hydraulic oil



Danger!

Removing the filler plug may cause oil to escape –

Danger of accidents!

 Carefully unscrew the plug to slowly reduce the pressure inside the tank.

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
- Retract the rams of the loader unit, lower the bucket to the ground
- Switch off the engine
- Fold up the safety bar
- Let the engine cool down
- Slowly open plug **C**

With the filter insert in place:

- Fill up hydraulic oil
- Check the hydraulic oil level on sight glass **B**
- Fill up if necessary and check again
- Firmly retighten plug **C**

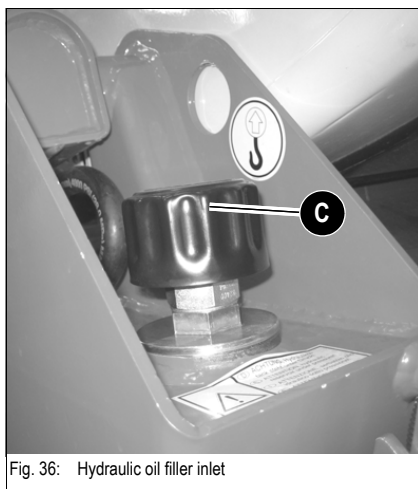


Fig. 36: Hydraulic oil filler inlet



Changing hydraulic oil



Important!

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

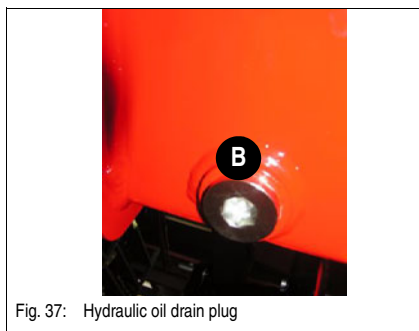


Fig. 37: Hydraulic oil drain plug

- ☞ Open the breather filter to release pressure
- ☞ Open drain plug **41/B** and let the oil drain into a container
- ☞ Check the hydraulic oil tank for contamination and clean if necessary
- ☞ Replace the filter according to the maintenance specifications
- ☞ Screw the drain plug back in correctly
- ☞ Fill in clean hydraulic oil through the strainer
– see Filling up hydraulic oil on page 3-33
- ☞ Close the hydraulic oil tank correctly
- ☞ Let the machine run at idling speed without load for some minutes

Monitoring the hydraulic oil reflux filter

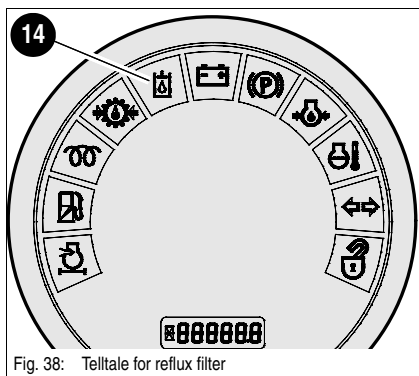


Fig. 38: Telltale for reflux filter

Pressure switch 39/A activates the red telltale 42/14 in the instrument panel which monitors the reflux filter.

The control pressure is set at 2.5 bar and can not be modified

The filter element must be replaced by an authorised workshop:

- If telltale **14** comes on when the hydraulic oil is at operating temperature
- At the latest after 1000 service hours (once every year)

In cold weather telltale **14** may come on immediately when the engine is started. This is caused by increased oil viscosity. In this case:

- ☞ Set engine speed so that telltale **14** goes out



Fig. 39: Reflux filter pressure switch



Checking hydraulic pressure lines

Specific safety instructions



Danger!

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

Danger of personal injury!

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

☞ *Always observe the following instructions:*

- Retighten leaking screwed fittings and hose connections only when the system is not under pressure; i.e. release the pressure before working on pressurised lines!
- Never weld or solder faulty or leaking pressure lines and 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!

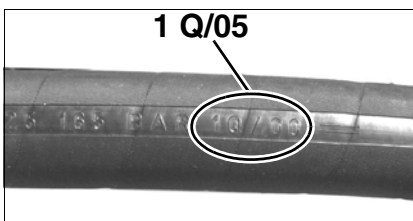
- Leakages and damaged pressure lines must be repaired immediately or replaced by an authorised workshop or after-sales staff.
This not only increases the operating safety of your machine but also helps to protect the environment
- Replace hydraulic hoses every 6 years from the date of manufacture, even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

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

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

Example:

The indication “1 Q/05” means manufactured in the 1st quarter of 2005.





3.14 Travelling drive



Danger!

Immediately after switching off the engine, the engine's components and the oil are very hot. This may cause burns.

If the inside of the travelling drive is under pressure, the oil or the plug may be squeezed out.

Danger of injury and scalding!

- ⚠ Wait until the engine has cooled down before taking up work.
- ⚠ Slowly open the plug to reduce the pressure inside.

Checking the oil level and filling up oil

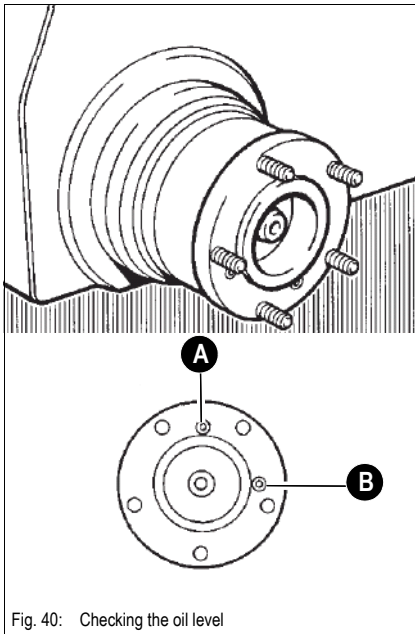


Fig. 40: Checking the oil level

- ⚠ Park the machine on firm and level ground
- ⚠ Place the machine so that filler plug **A** is in the topmost position and screw **B** is at an angle of 90° with respect to the filler plug
- ⚠ Switch off the engine
- ⚠ Fold up the safety bar
- ⚠ Let the engine cool down
- ⚠ Unscrew screws **A** and **B** with a suitable tool
- ⚠ A small quantity of oil must flow out of opening **B**
- ➡ If the oil does not flow out of opening **B**, fill up oil:
 - ⚠ Fill in oil at opening **A**,
 - ➡ until a small quantity of oil flows out of opening **B**
- ⚠ Screw screws **A** and **B** back in again
- ⚠ Move the machine a few metres
- ⚠ Check the oil level again
- ➡ If the oil level is not correct:
 - ⚠ Repeat the procedure

Draining oil

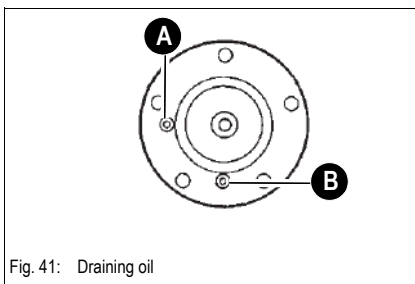


Fig. 41: Draining oil

- ⚠ Park the machine on firm and level ground
- ⚠ Place the machine so that filler plug **B** is at the bottom
- ⚠ Switch off the engine
- ⚠ Fold up the safety bar
- ⚠ Let the engine cool down
- ⚠ Unscrew screws **A** and **B** with a suitable tool
- ➡ The oil now flows out of opening **B**
- ⚠ Use a suitable container to collect the oil as it drains



Environment!

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



3.15 Tyre care



Danger!

Improper tyre repairs –

Danger of accidents!

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



Important!

Regular inspection of the tyres

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

Refer to [Section 2](#) “Specifications” for the authorised tyre types and the correct tyre pressures.

Tyre check

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
- Check tyres for wear and measure tread depth

Wheel change



Danger!

Use of wrong tyres or wheels –

Danger of accidents!

Use only wheels and tyres authorised for your machine

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.



Raising and jacking up the machine



Danger!

Jacking up the machine incorrectly or insufficiently –

Danger of accidents!

☞ *Jack up the machine with adequately sized jacks*

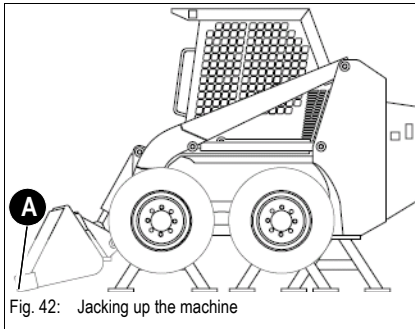


Fig. 42: Jacking up the machine

☞ *Jack up the machine as follows:*

- Raise the machine at the points provided for to this effect
- Place jacks underneath the machine's main chassis. Make sure the jacks can support the machine's gross weight rating
- Carefully lower the machine onto the jacks
- The front edge of the bucket must be lowered to the ground

Removing the wheels

☞ *Proceed as follows:*

- Park the machine on level and firm ground and prevent it from rolling away
- Slacken the wheel nuts of the wheel you want to remove by one turn
- Jack up the machine
- Check the machine is standing firmly
- Completely remove the wheel nuts
- Remove the wheel

Mounting the wheels

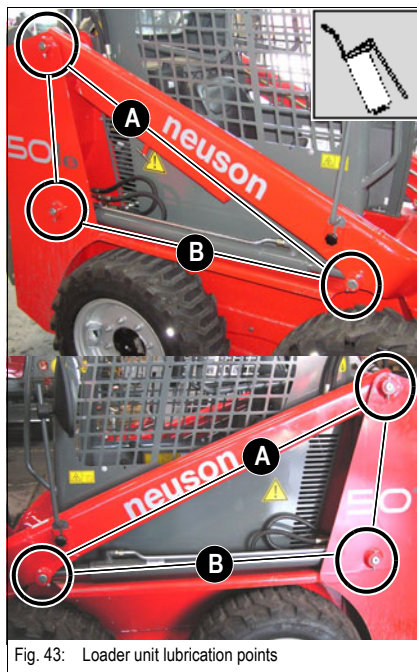
☞ *Proceed as follows:*

- Place the wheel onto the wheel studs
- Tighten all wheel nuts part-way
- Raise the machine from the jacks and lower it again on firm and level ground
- Fully tighten the wheel nuts with 175 Nm of torque

3.16 Lubrication work

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

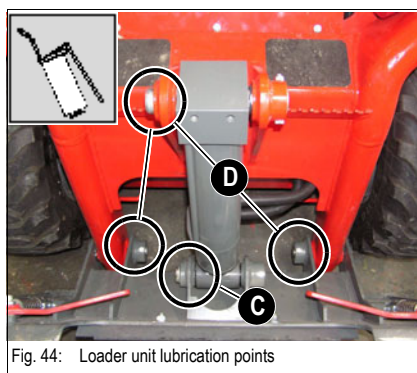
Loader unit



- Apply grease to lubrication points **A** on the loader unit ram
- Apply grease to lubrication points **B** on the loader unit
- The grease nipples are located on the pins on the inside of the chassis
- Apply grease to lubrication points **C** of the swivelling console

Lubricate once a day or every 10 hours

Lubrication points on the bucket



- Lubrication point **C** on the bucket ram
- Apply grease to lubrication points **D** on the loader unit

Maintenance of implements



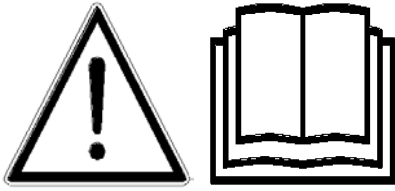
Important!

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



3.17 Electric system

Specific safety instructions



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

Therefore when recharging or working near the battery:

- ☞ Always wear goggles and protective clothing with long sleeves

If acid is spilt:

- ☞ Thoroughly rinse all affected surfaces immediately with plenty of water
- ☞ Thoroughly wash any part of the body touched by the acid immediately with plenty of water and seek medical attention at once!
- 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 can 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 reversed, 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

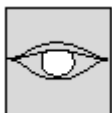
Service and maintenance work at regular intervals



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 [section 6.6](#) Fuse box in instrument panel on page 6-4
- Cable and earth connections
- Battery charge condition – see [Battery](#) on page 3-42
- 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 section 6.6 Fuse box in instrument panel](#) on page 6-4

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 reversed
- Always disconnect the battery before carrying out welding work or connecting a quick battery charger

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!

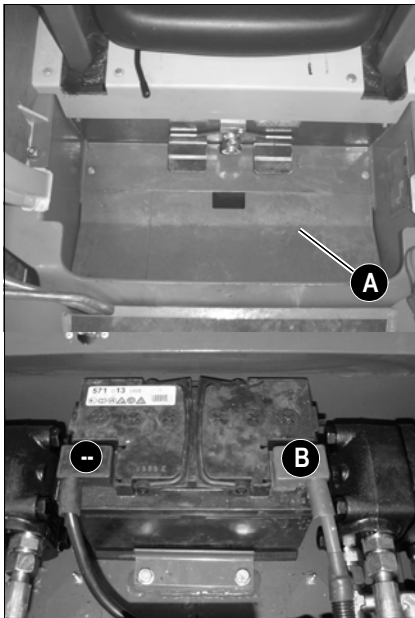


Fig. 45: Battery

The low-maintenance battery is located in the leg room area under floor panel **A**. However have the battery checked at regular intervals to make sure the electrolyte level is between the MIN and MAX marks.

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

Always follow the specific battery safety instructions!



Important!

Do not disconnect the battery while the engine is running.

Jump-starting the engine

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

☞ Connect the earthing lead of the starting aid to a bare part of the chassis of the machine requiring jump-start

☞ Charge the flat battery for a few minutes (let the engine run)

➔ Start the engine

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

☞ Remove the plus lead of the starting aid from the battery of the machine requiring jump-start.

3.18 General maintenance work

Cleaning

Cleaning the machine is divided into 3 separate areas:

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

The wrong choice of cleaning equipment and agents 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!



Inside the cab



Caution!

Never use high-pressure cleaners, steam jets or high-pressure water to clean inside the cab. Water under high pressure may

- penetrate into the electric system and cause short circuits and
- damage seals and disable the controls!

We recommend using the following aids to clean the cab:

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

Cleaning the seat belt:

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

Exterior of the machine

The following articles are generally suitable:

- High-pressure cleaner
- Steam jet

Engine compartment



Danger!

Clean the engine at engine standstill only –

Danger of personal injury!

☞ *Switch off the engine before cleaning*



Caution!

When cleaning the engine with a water or steam jet

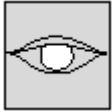
☞ *The engine must be cold*

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

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



Screw connections and attachments



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

Retighten loose connections immediately. Contact a 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.

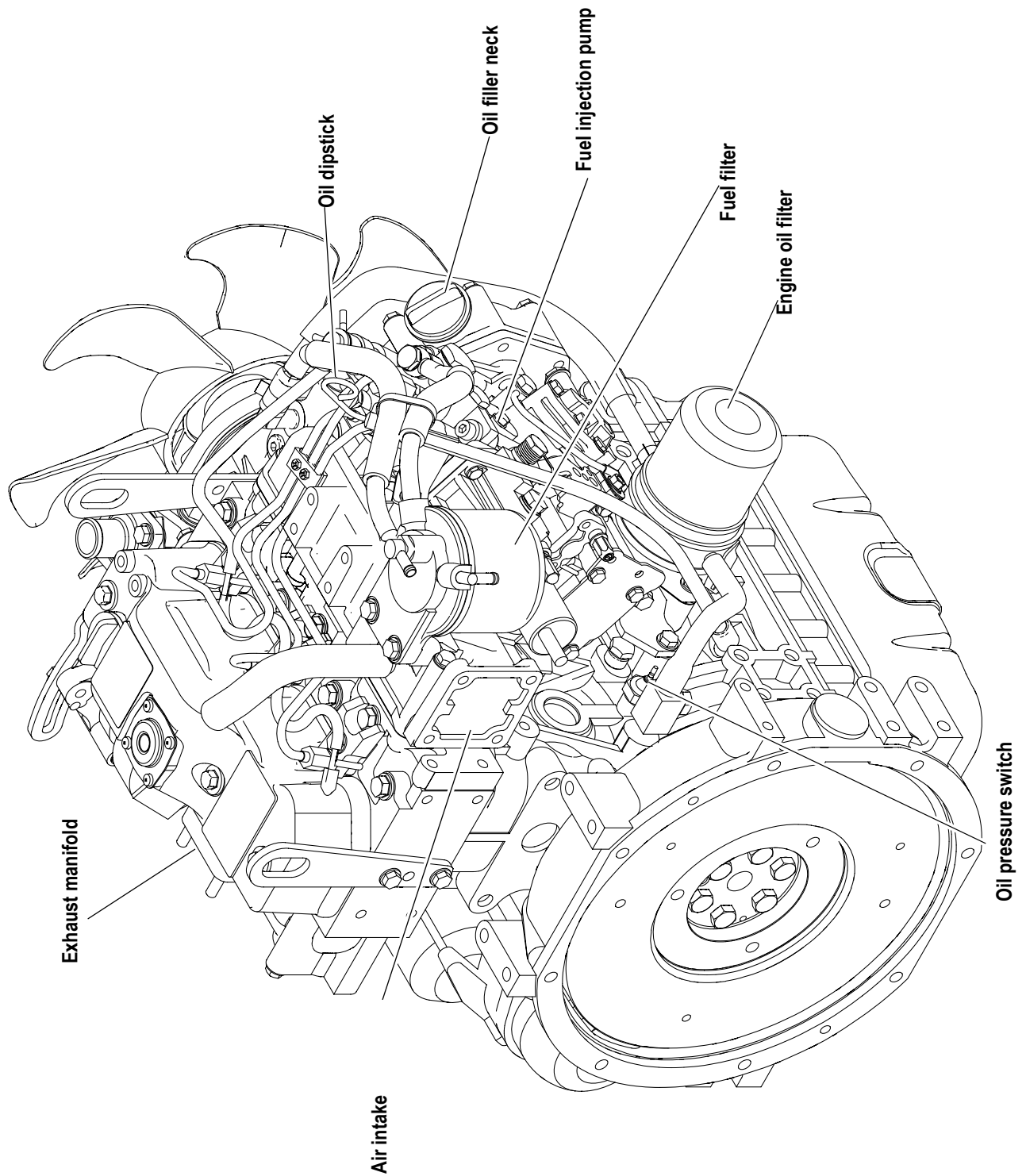


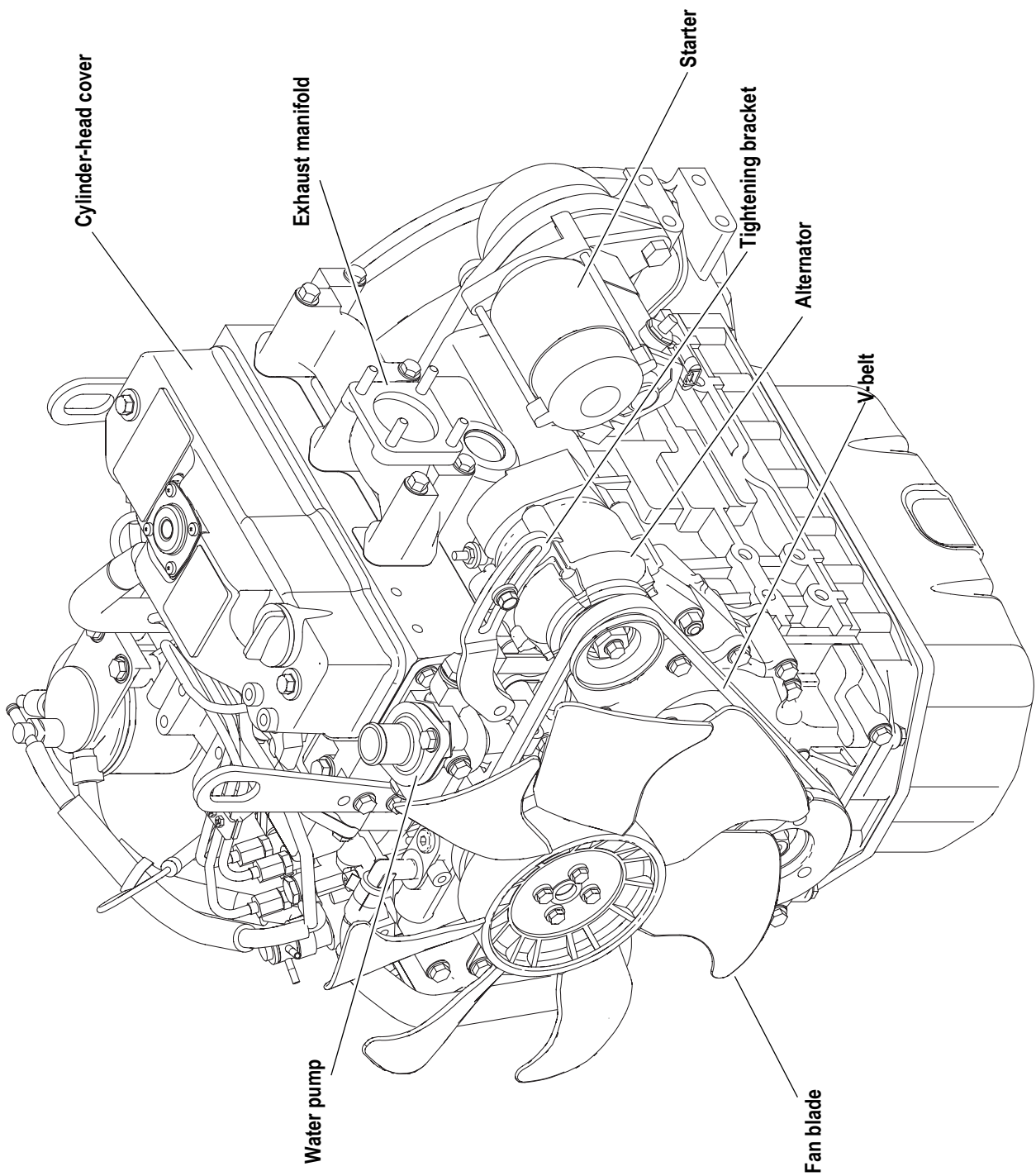
Engine



4 Engine

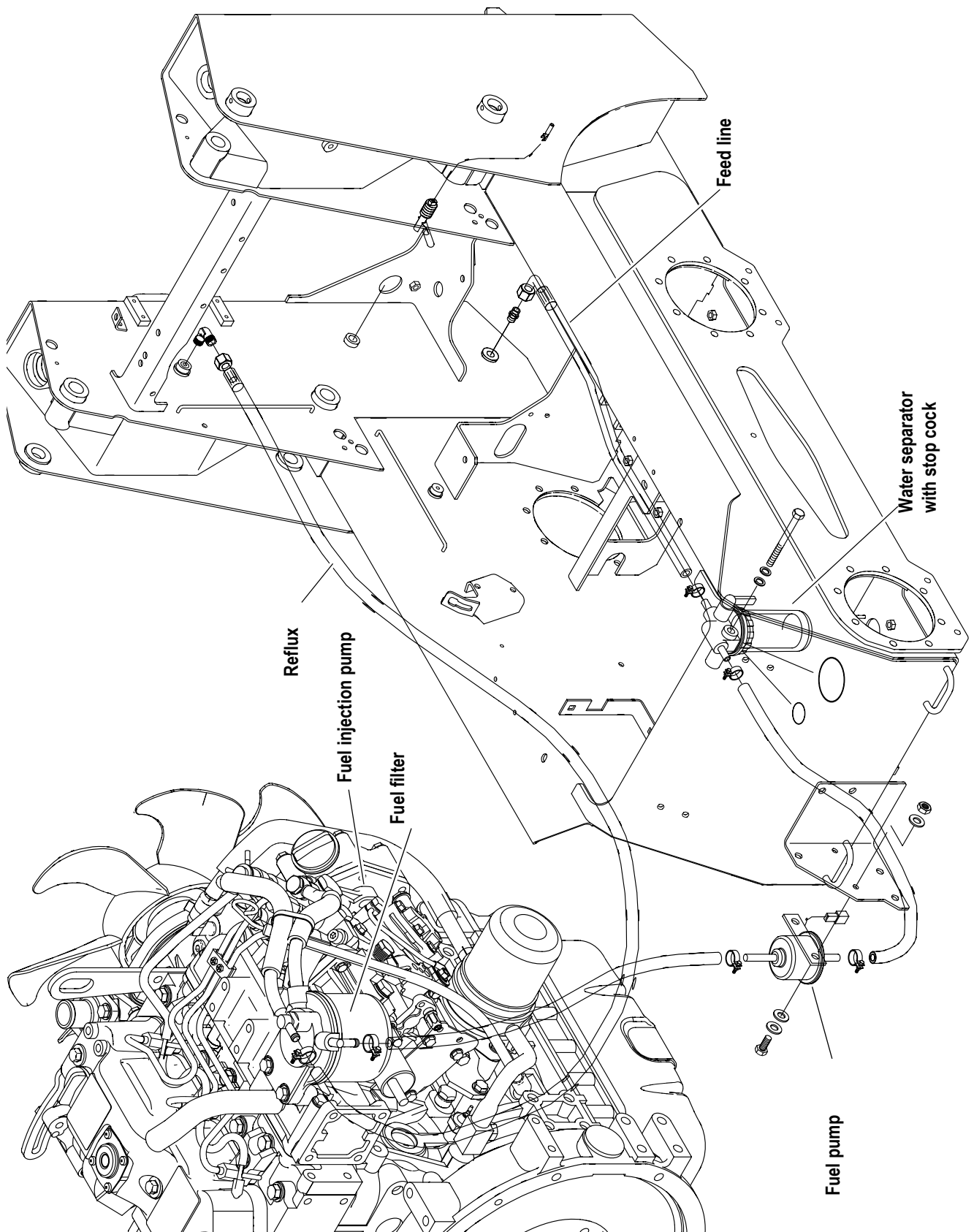
4.1 3TNV88-XNSS engine: overview







4.2 Fuel system



4.3 Checking and adjusting valve tip clearance

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

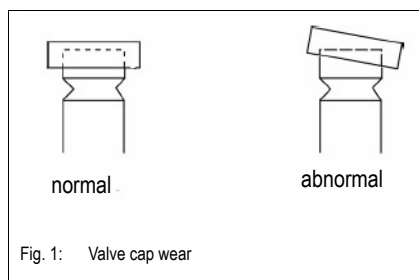
➡ On a cold engine

☞ *Remove the cylinder-head cover*

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

➡ Valve overlapping

☞ *Check the valve cap for abnormal wear*



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

➡ Valve tip clearance: 0.15 – 0.25 mm

☞

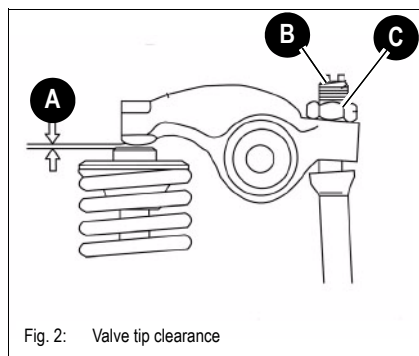
*Set the valve tip clearance on the cylinder by turning set screw **2/B**.*

➡ Valve tip clearance: 0.15 – 0.25 mm

☞ *Tighten locknut **2/C***

– see section [Tightening torques for high-resistance screw connections](#) on page 2-9.

➡ Check the setting again with the feeler gauge.



☞ *Repeat the procedure for each cylinder*



4.4 Tightening order for cylinder head bolts

🔧 Mount the cylinder-head bolts

➡ Tightening torque:

- 1st pass **41.1 – 46.9 Nm**
- 2nd pass **85.3 – 91.1 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!

4.5 Checking the injection nozzles

Pressure check

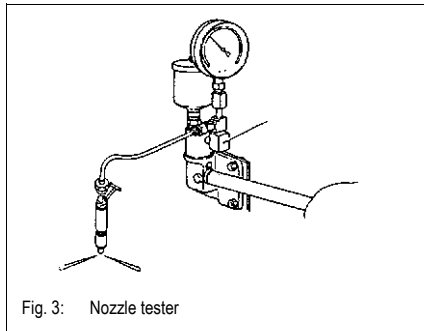
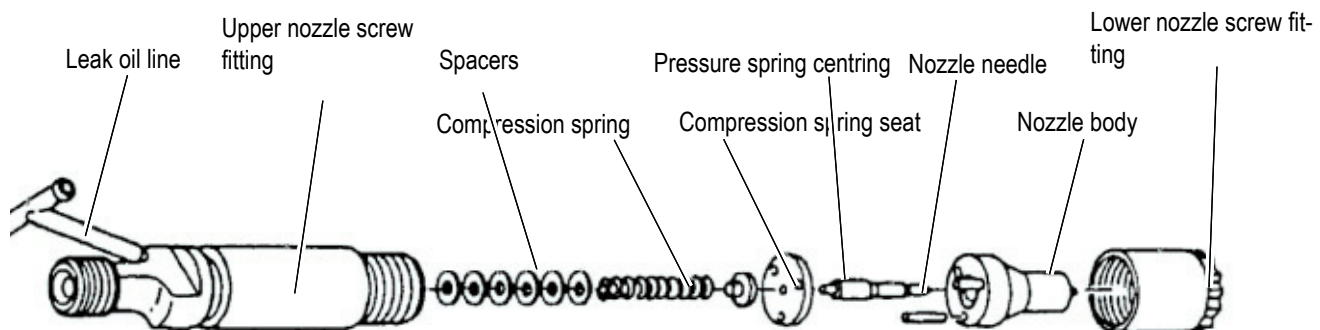


Fig. 3: Nozzle tester

- ☞ Remove the injection line and the injection nozzle
- ☞ Connect the injection nozzle with the high pressure line of the nozzle tester
- ☞ Slowly increase pressure until the nozzle ejects fuel and read the pressure off the pressure gauge
- ☞ If the injection pressure is too low, replace the spacer in the nozzle by a thicker one. If the pressure is too high, replace the spacer by a thinner one.
 - ➔ Injection pressure: **220 – 230 bar**
- Spacer thickness of 0.1 mm corresponds to modification by 19 bar
- Check the injection nozzle 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



4.6 Checking the nozzle jet

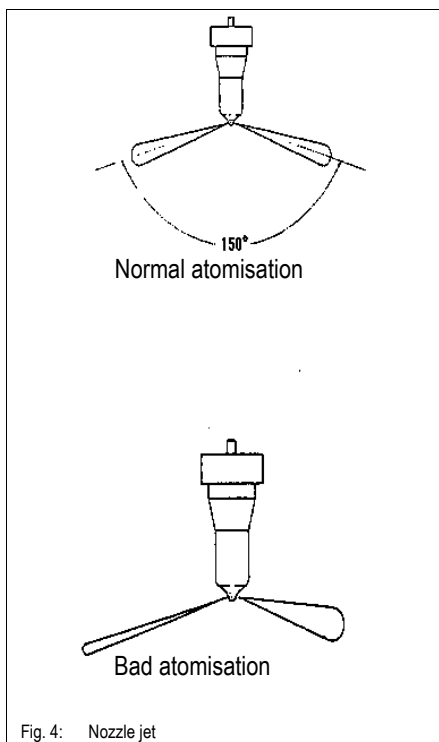


Fig. 4: Nozzle jet

- ☞ Remove the injection lines and the injection nozzles
- ☞ Connect the injection nozzle with the high pressure line of the nozzle tester
- ☞ Quickly create pressure until the nozzle ejects fuel (ejection 3 – 4 times)
- ☞ Hold a white sheet of paper about 30 cm away from the nozzle and let the nozzle eject fuel
- ☞ The nozzle jet must create a shape on the paper as shown in fig.5/1

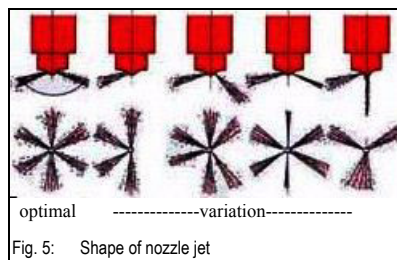


Fig. 5: Shape of nozzle jet

4.7 Injection time

Checking injection time

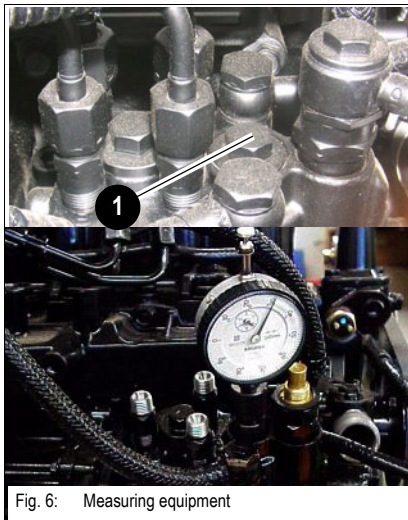


Fig. 6: Measuring equipment

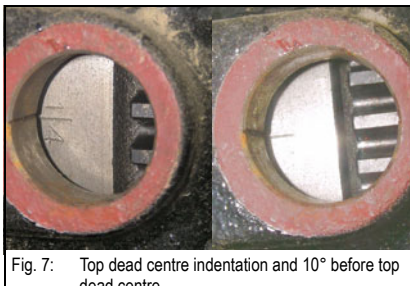


Fig. 7: Top dead centre indentation and 10° before top dead centre

- Preparatory work:
 - Remove the injection lines from the fuel injection pump
 - Remove plug 6/1 from the piston
 - Install a dial gauge in the piston bore as shown in fig. 6
- Measurement
 - Remove the rubber cover from the flywheel housing
 - Turn the crankshaft (ring gear on flywheel) until the piston in the fuel injection pump reaches the lowest point (pay no attention to the position of the cylinders)
 - Set the measuring equipment to "0"
 - Use suitable equipment (at the ring gear) to turn the flywheel to the top until the piston of the fuel injection pump reaches a stroke of 2.5 mm.
- Read the degrees before top dead centre by means of the indentations on the flywheel
 - Indentations "1", "2" and "3" stand for the top dead centre of the respective cylinders
 - Scaling: 12°/15°/20°/25° before top dead centre
 - Rated value: 25° ± 1° before top dead centre (fourth indentation)

Setting injection time

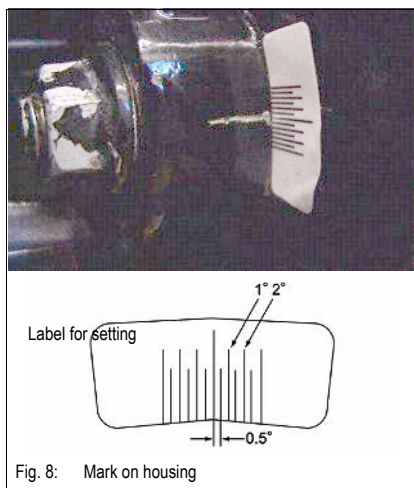
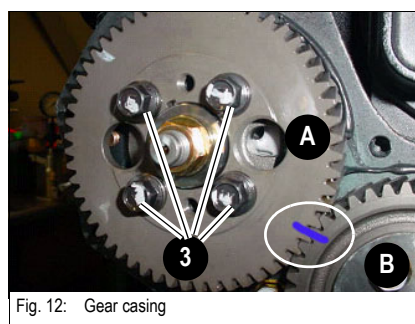
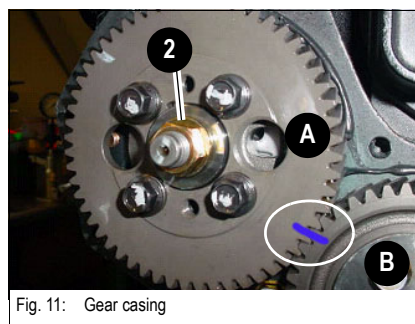
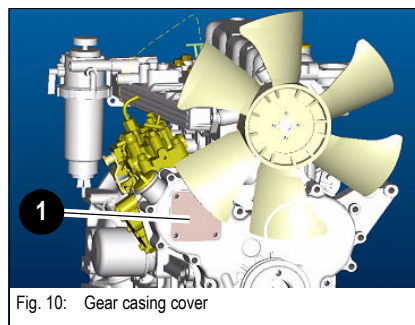
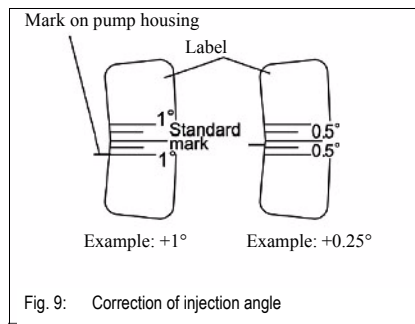


Fig. 8: Mark on housing

- Variations outside the tolerance range can be corrected by turning the fuel injection pump.
 - Mark the initial position on the pump and wheel case housing before setting the fuel injection pump – see fig. 8
 - Remove all injection lines on the fuel injection pump and slacken the 4 flange screws by about ½ a revolution (do not unscrew completely)
 - Rotate the pump in the required direction, and tighten one of the screws before you check the setting
 - Rotated towards the engine: earlier injection time
 - Rotated away from the engine: later injection time
 - Bend each of the injection lines before you mount them so they are not subject to tension once they are mounted
 - Check injection time again

Replacement of fuel injection pump



- ☞ Mark the initial position on the pump and wheel case housing before removing the fuel injection pump – see fig. 9
- ☞ Remove gear casing cover 10/1 of the fuel injection pump
 - ☞ Mark the position of the gear of the fuel injection pump 11/A with respect to gear 11/B – see fig. 11
- ☞ Completely slacken lock nut 11/2 of the drive pinion
- ☞ Remove the fuel injection pump
 - ☞ Read off the injection angle on the pump
 - ☞ Read off the injection angle on the new pump
 - ➡ Read off the imprint on the engine side of the fuel injection pump
- ☞ Difference of “Angle of new pump” – “Angle of old pump” gives you the mounting angle of the new fuel injection pump
 - ➡ Positive value: later injection time (away from the engine)
 - ➡ Negative value: earlier injection time (towards the engine)
- ☞ Install the fuel injection pump
 - ☞ Check the marked position of the drive pinion of the fuel injection pump (fig. 11)
- ☞ Screw on and tighten nut 11/2
- ☞ Check injection time
- ☞ Mount gear casing cover 10/1 of the fuel injection pump

i Important!

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



4.8 Adjusting engine revs



Important!

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

Adjust engine revs without load!

- Run the diesel engine until it reaches operating temperature
- Check idling speed **A** and maximum revs **B** with all implement functions in neutral
 - Idling speed: 1000 +/- 25 rpm
 - Max. revs: 3200 +/- 25 rpm
- Adjust as shown if values differ.

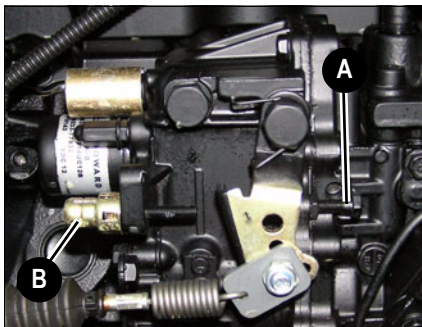


Fig. 13: Adjusting engine revs

4.9 Compression

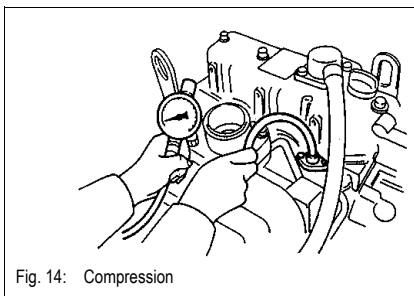
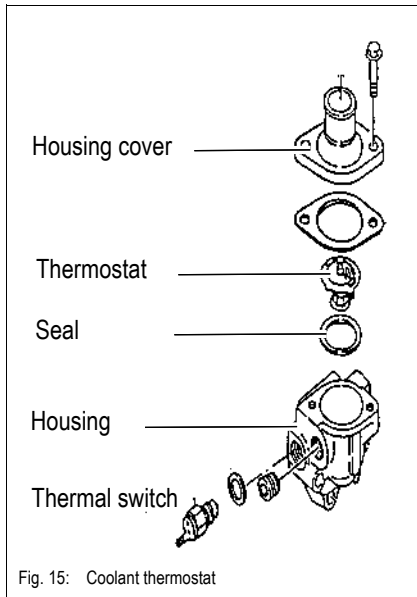


Fig. 14: Compression

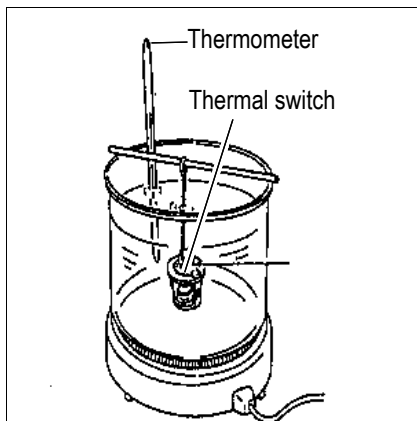
- Remove the injection lines and the injection nozzles
- Set the fuel injection pump to zero delivery (remove the plug for the cutoff solenoid)
- Turn the engine
- Mount the compression gauge on the cylinder you want to measure
- Turn the engine with the starter and read the pressure off the pressure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

4.10 Checking the coolant thermostat



Remove the thermostat

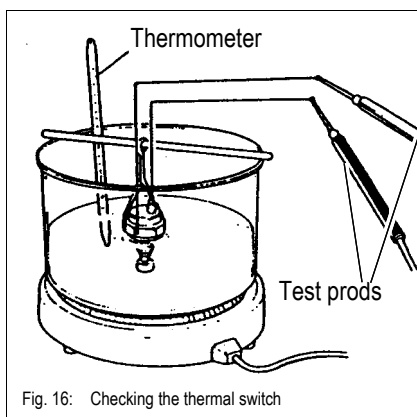
- ➔ The thermostat is located on the water pump
- see 3TNV88-XNSS engine: overview on page 4-1



Warm up the thermostat in a container with water

- Check whether the thermostat opens at the prescribed temperature (check with a temperature gauge)
- ➔ Thermostat opening temperature: **69.5 – 72.5 °C**

4.11 Checking the thermal switch

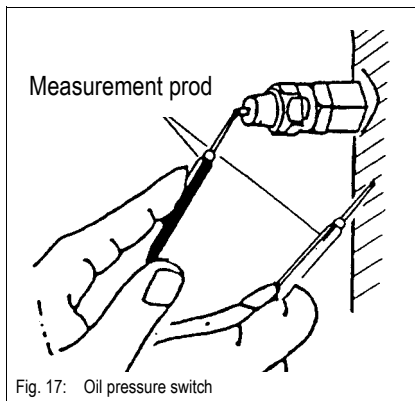


Remove the thermal switch

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

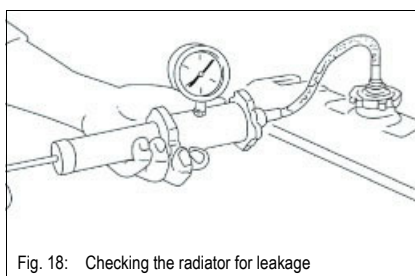
- Measure the resistance of the thermal switch as shown by means of an ohmmeter.
- ➔ The switch must allow the coolant to pass at a temperature of 107 – 113 °C.

4.12 Oil pressure switch



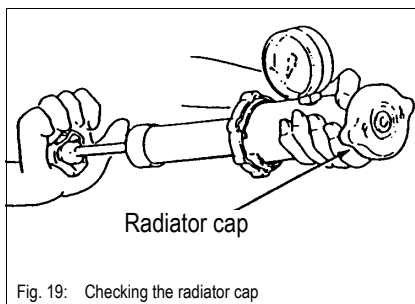
- Remove the cable connection from the oil pressure switch (in the area of the cutoff solenoid)
- Start the engine, check for correct idling speed
- Measure the resistance of the oil pressure switch as shown by means of an ohmmeter.
 - Oil pressure switch OK: infinite resistance
 - The oil pressure switch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

4.13 Checking the coolant circuit



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



Checking the radiator cap

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



4.14 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 solenoid switch
	Cutoff solenoid does not attract
	Cutoff solenoid without current
	High pressure created immediately in the hydraulic system
Engine starts, but does not run smoothly or faultless	Fuel grade does not comply with specifications
	Wrong valve tip clearance
	Injection line leaks
	Defective fuel injector
Engine overheats. Temperature warning system responds	Oil level too low
	Oil level too high
	Fouled air filter
	Fouled oil cooler fins
	Defective fan, torn or loose V-belt
	Resistance in cooling system too high, flow capacity too low
	Defective fuel injector
Insufficient engine output	Oil level too high
	Fuel grade does not comply with specifications
	Fouled 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°)
	Wrong SAE grade of engine lubrication oil



Problem		Possible causes
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
		Defective fuel injector
		Coolant combustion (defective cylinder-head gasket)
	Black	Fouled air filter
		Defective air filter maintenance switch or gauge
		Wrong valve tip clearance
		Defective fuel injector (drips)
		Wrong fuel injection pump setting



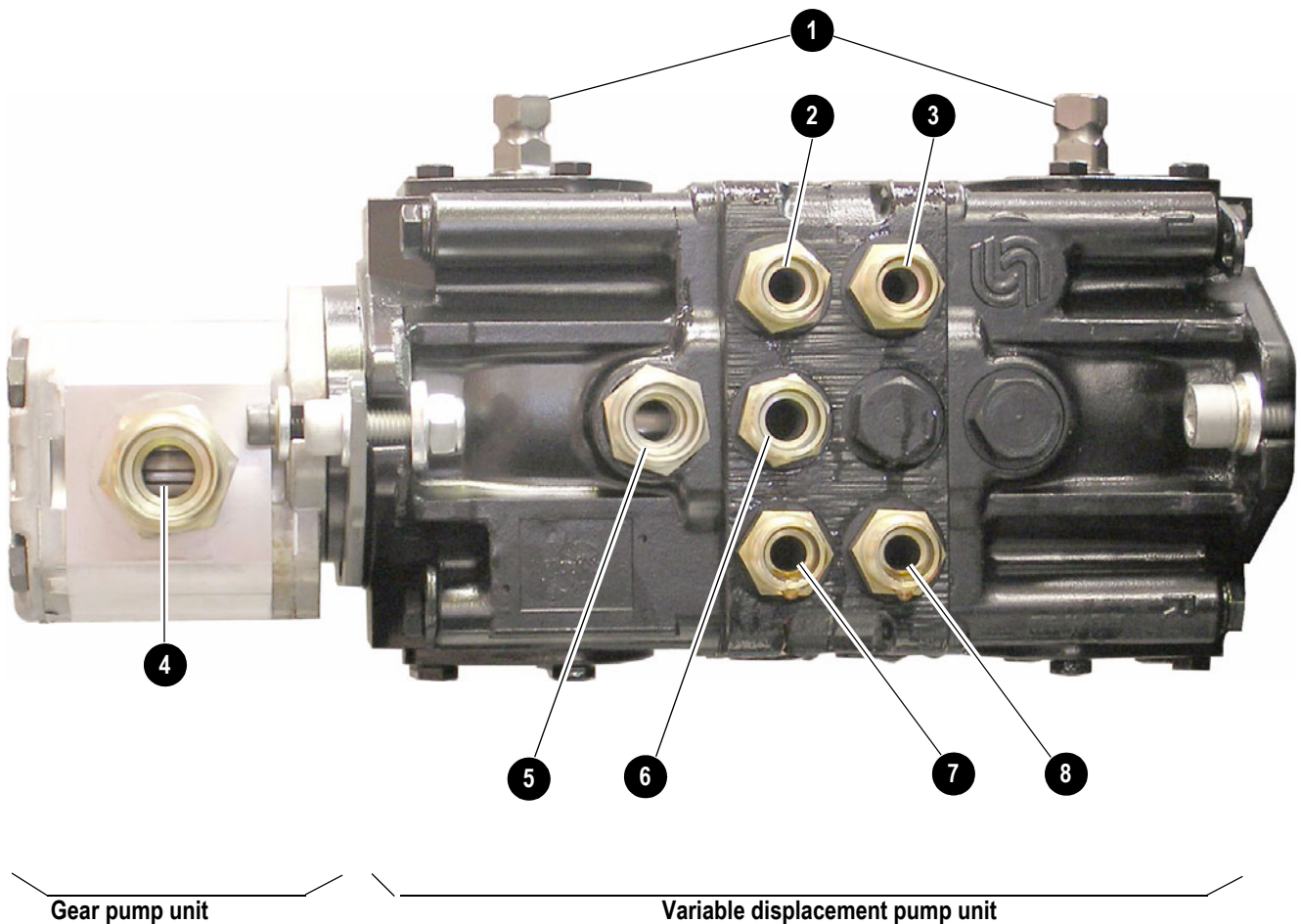
Hydraulic system

5 Hydraulic system

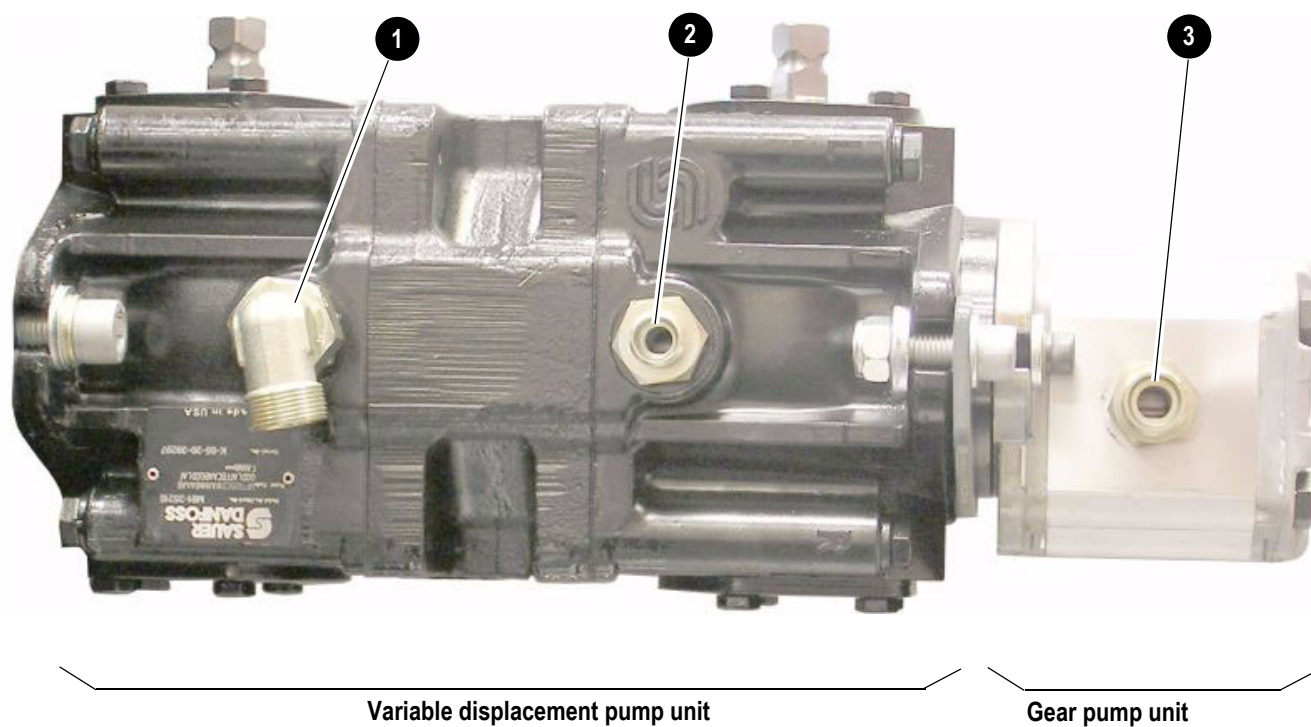
The hydraulic system is a closed system

5.1 Danfoss MPT 025 hydraulic pump

Twin variable displacement pump + gear pump



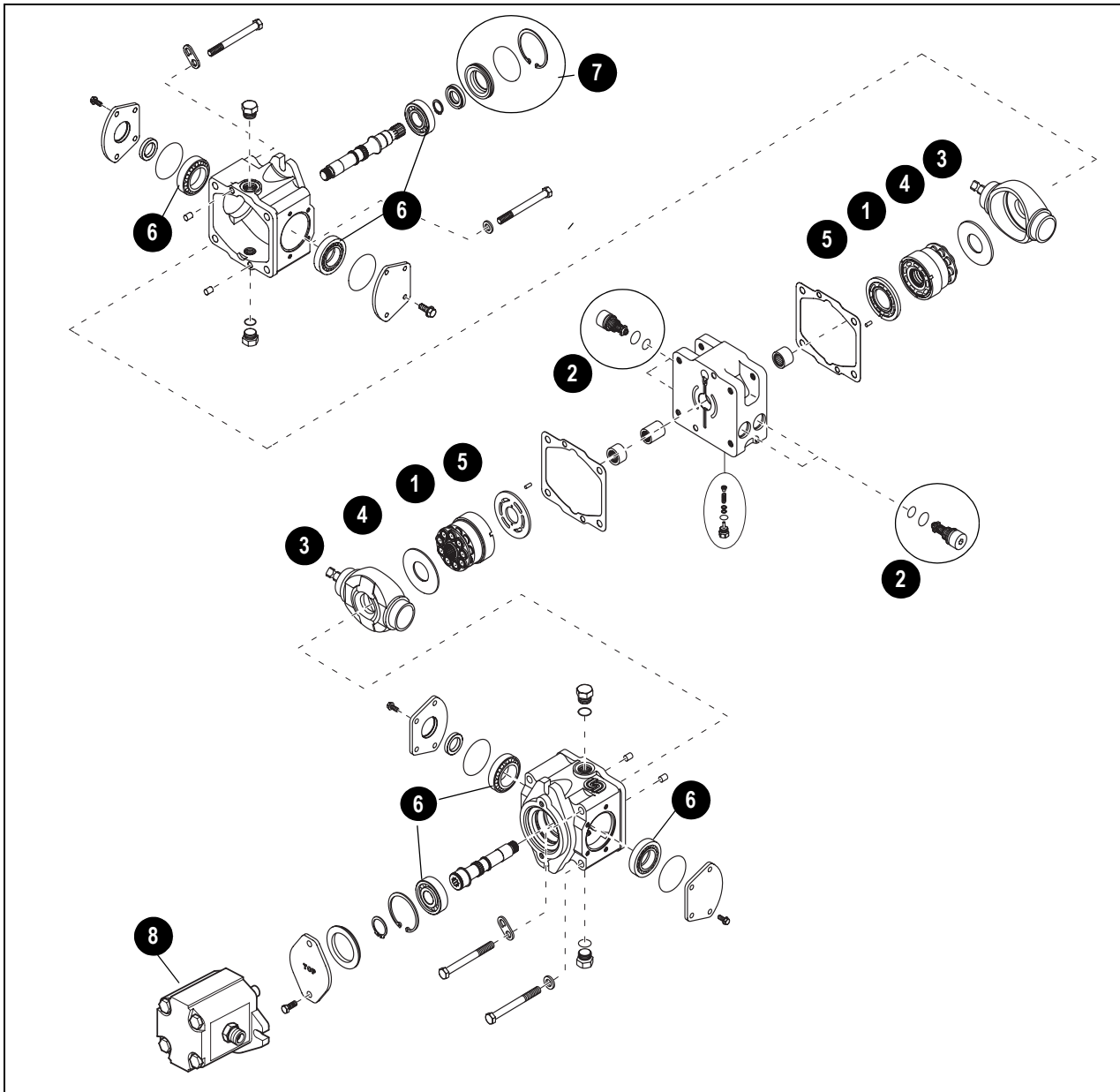
Pos.	Description
1	Mechanical actuation of cradle P1/P2
2	Rear left hydraulic motor port
3	Rear right hydraulic motor port
4	Gear pump suction-side port
5	Tank line
6	Boost pressure supply
7	Front left hydraulic motor port
8	Front right hydraulic motor port



Pos.	Description
1	Oil cooler output
2	Parking brake leak oil
3	Gear pump pressure-side port



Pump unit: exploded view

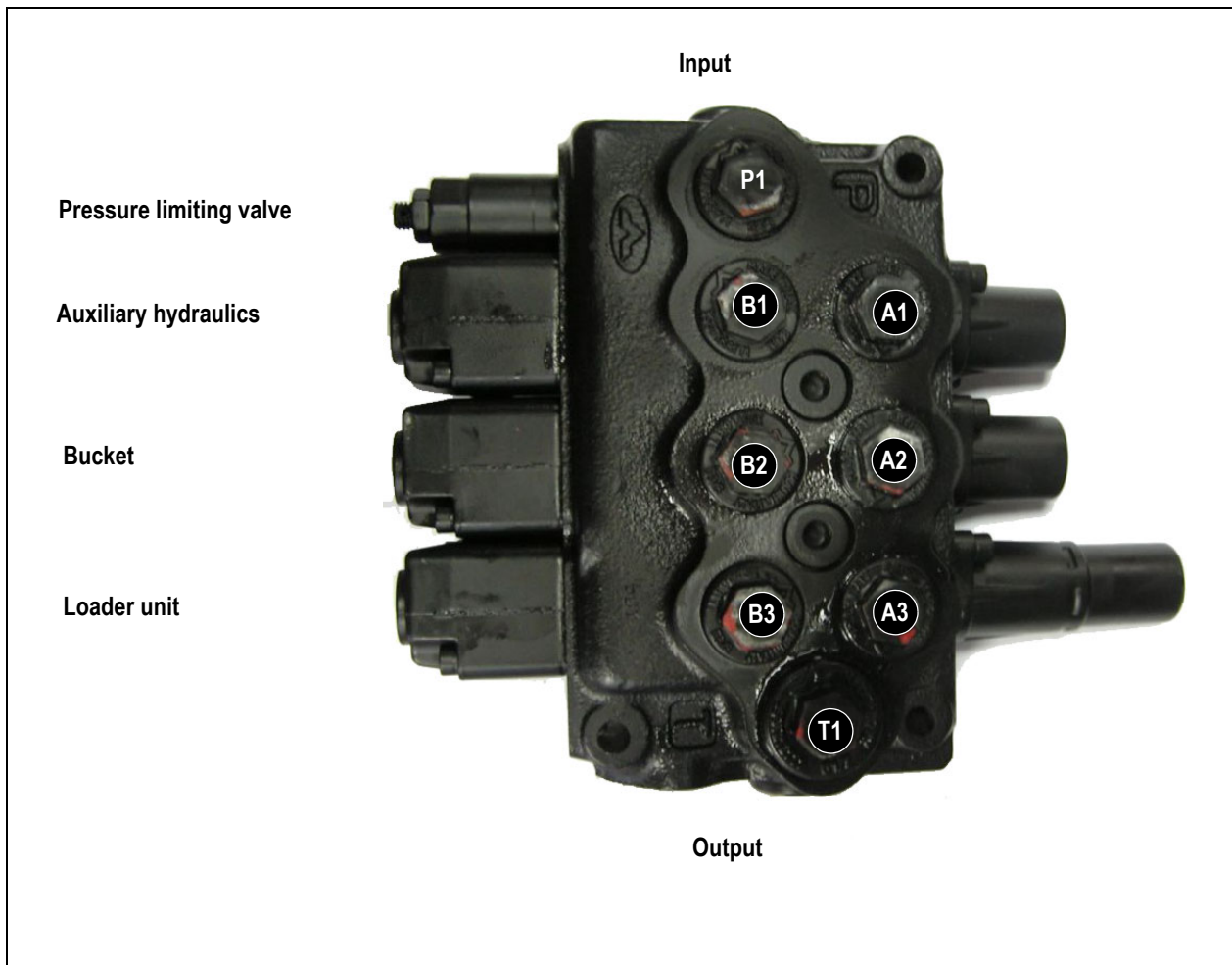


Pos.	Description
1	Drive unit
2	Pressure limiting valve
3	Cradle
4	Thrust plate
5	Control disc
6	Ball bearing
7	Rotary shaft lip seal
8	Gear pump



5.2 Main valve block

Ports



Legend

Control lines

Port	Legend	Controlled via
A1	Auxiliary hydraulics control (left)	Auxiliary hydraulics pedal
B1	Auxiliary hydraulics control (right)	Auxiliary hydraulics pedal
A2	Bucket dump-in control	Left-hand side control lever
B2	Bucket dump-out control	Left-hand side control lever
A3	Control: raise loader unit	Right-hand side control lever
B3	Control: lower loader unit	Right-hand side control lever

Pump/tank lines

Port	Legend
P1	Gear pump port
T1	Tank line via pressure filter to boost pressure port of pump

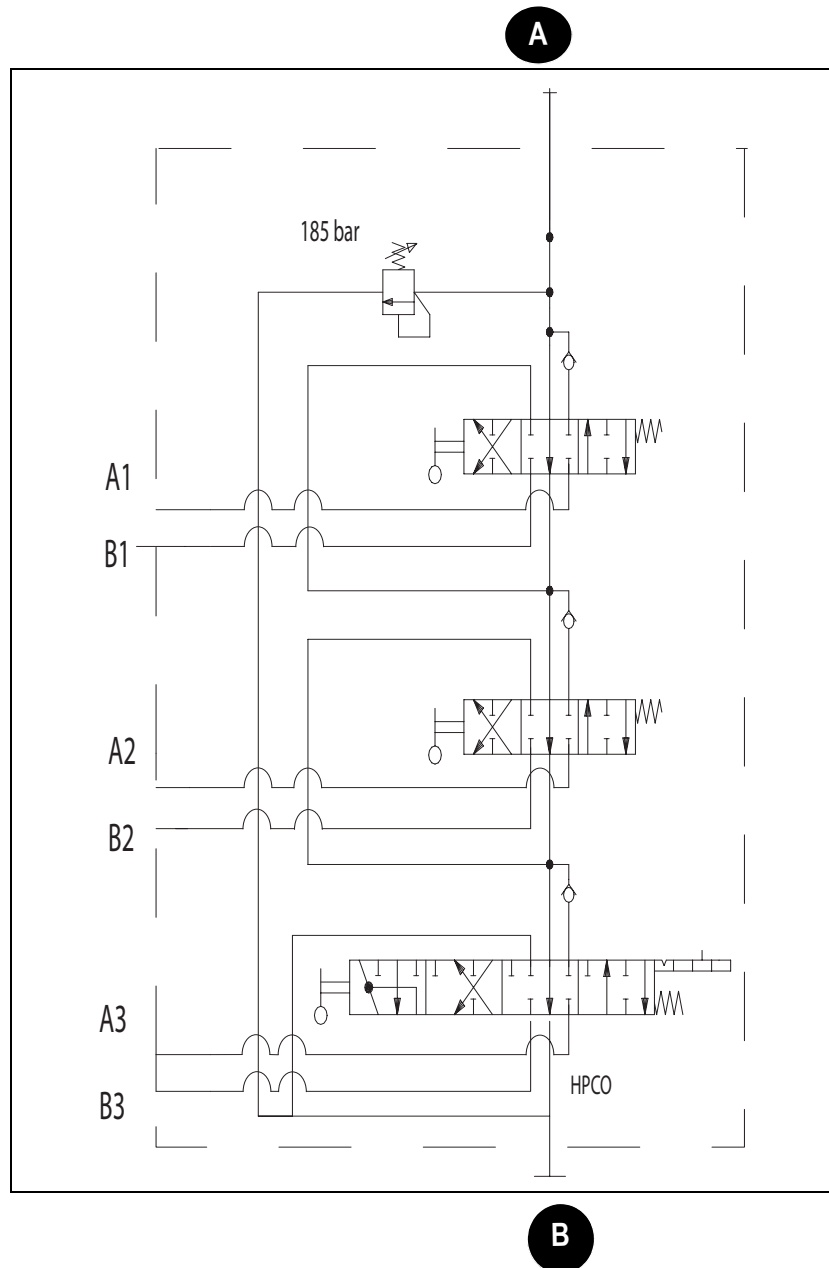


Main valve block diagram

Auxiliary hydraulics

Bucket

Loader unit



Pos.	Description
A	Gear pump input
B	Output via pressure filter to boost pressure port of pump



Pump sections

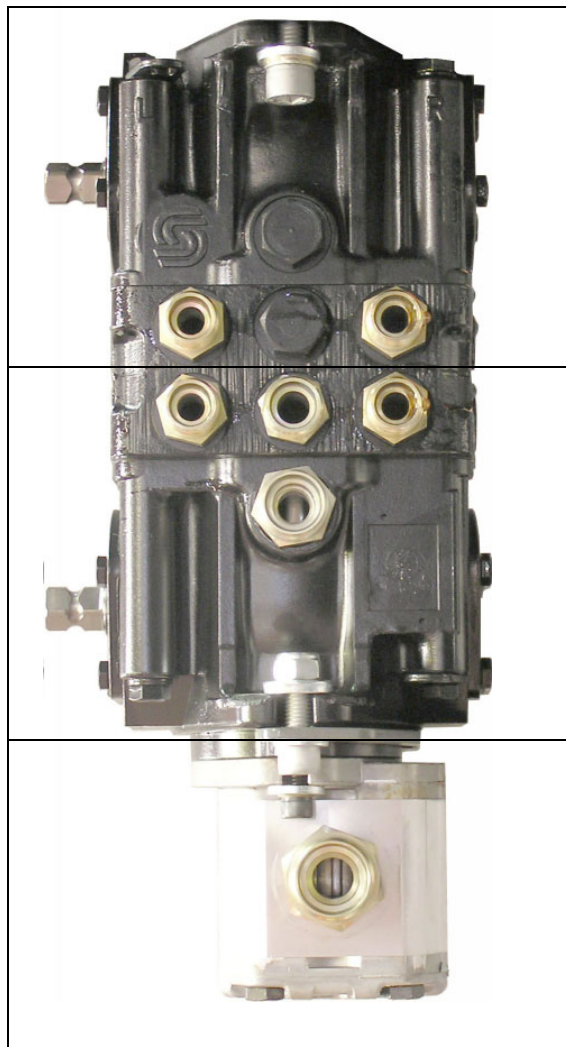
Twin variable displacement pump

- Drive section

Gear pump

- Auxiliary hydraulics section
- Loader unit section
- Bucket section

Twin variable displacement pump



Drive (right)

Drive (left)

Gear pump

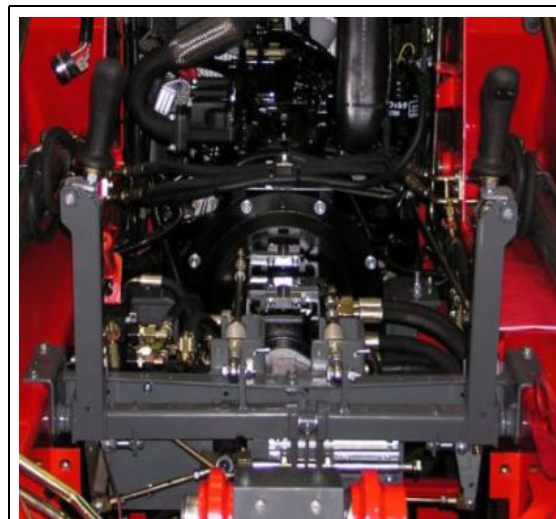
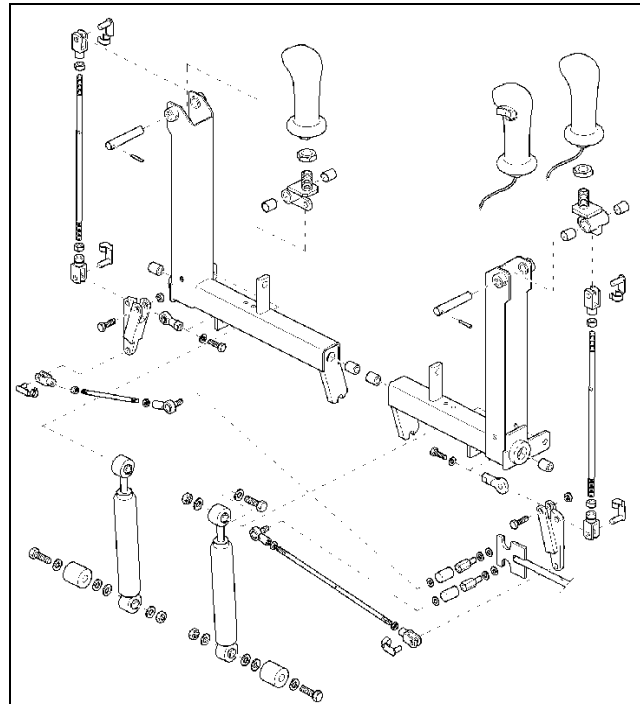
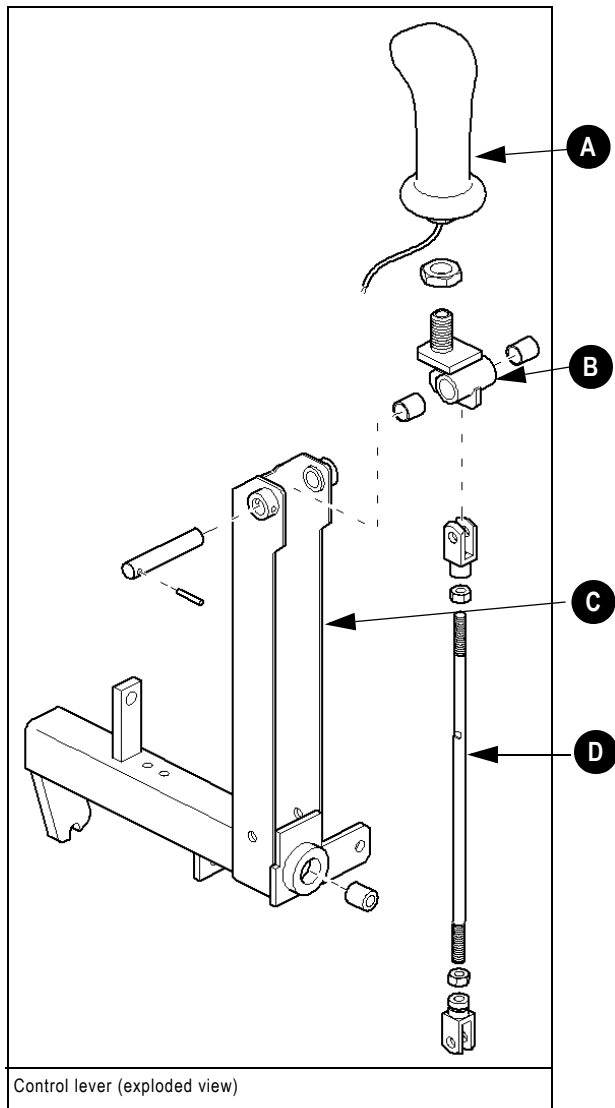
Work hydraulics



5.3 Mechanical control

Control lever

- Drive control
- Loader unit and bucket control



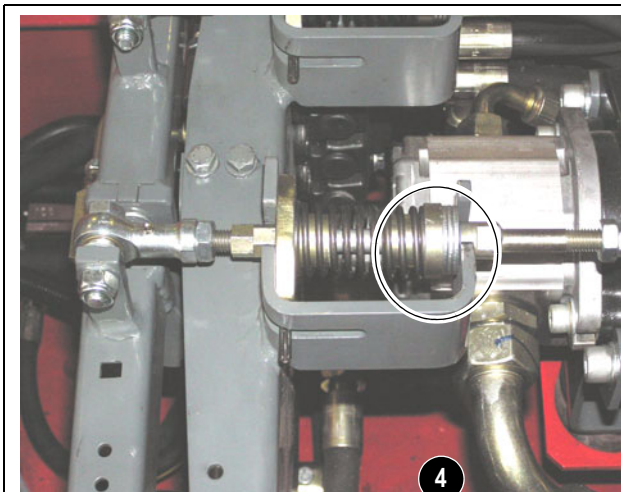
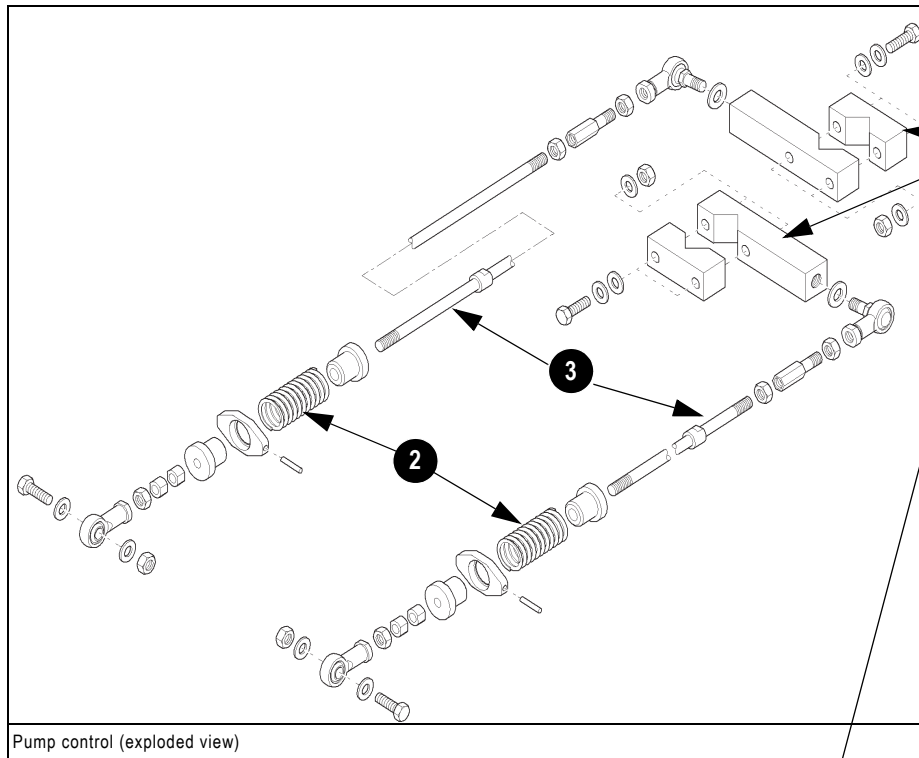
Control lever

Pos.	Description	Actuation of left-hand side lever	Actuation of right-hand side lever
A	Handle		
B	Bracket		
C	Control lever	Travelling drive (left)	Travelling drive (right)
D	Threaded rod	Raises and lowers the loader unit	Dumps bucket in and out

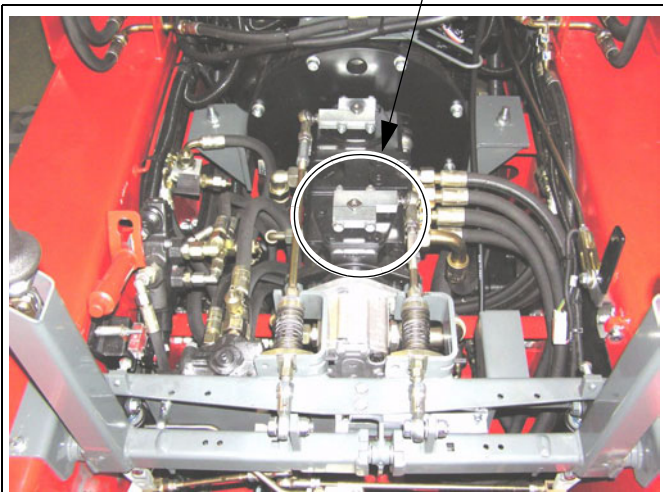
Hydraulic system



Pump control



Initial spring tension



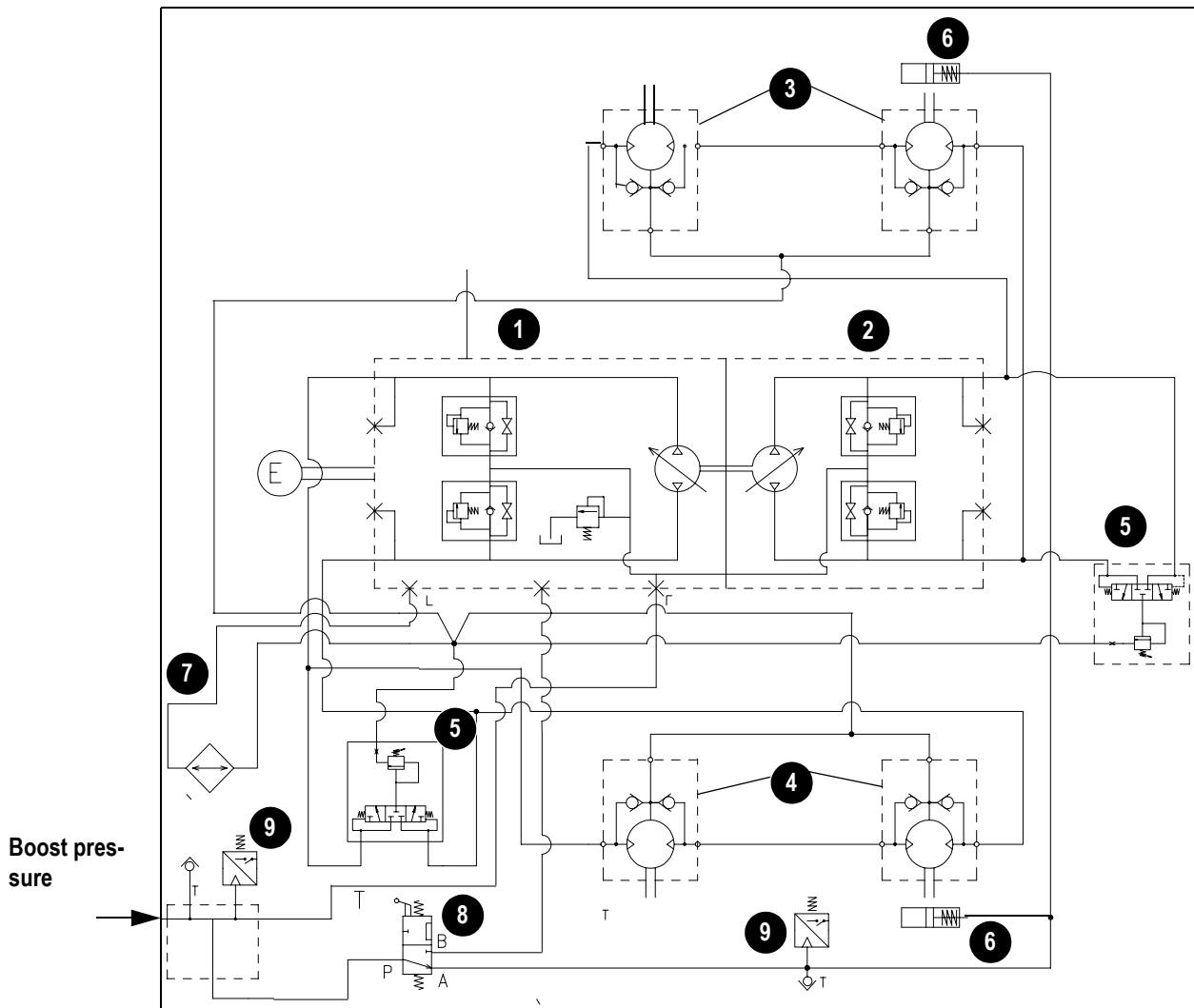
Clamping for pump actuation

Pos.	Description
1	Clamping for pump actuation
2	Compression spring
3	Traction bar
4	Washers for initial spring tension



Drive control

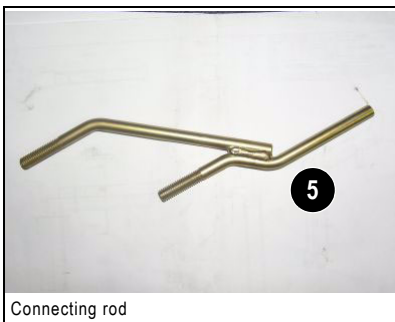
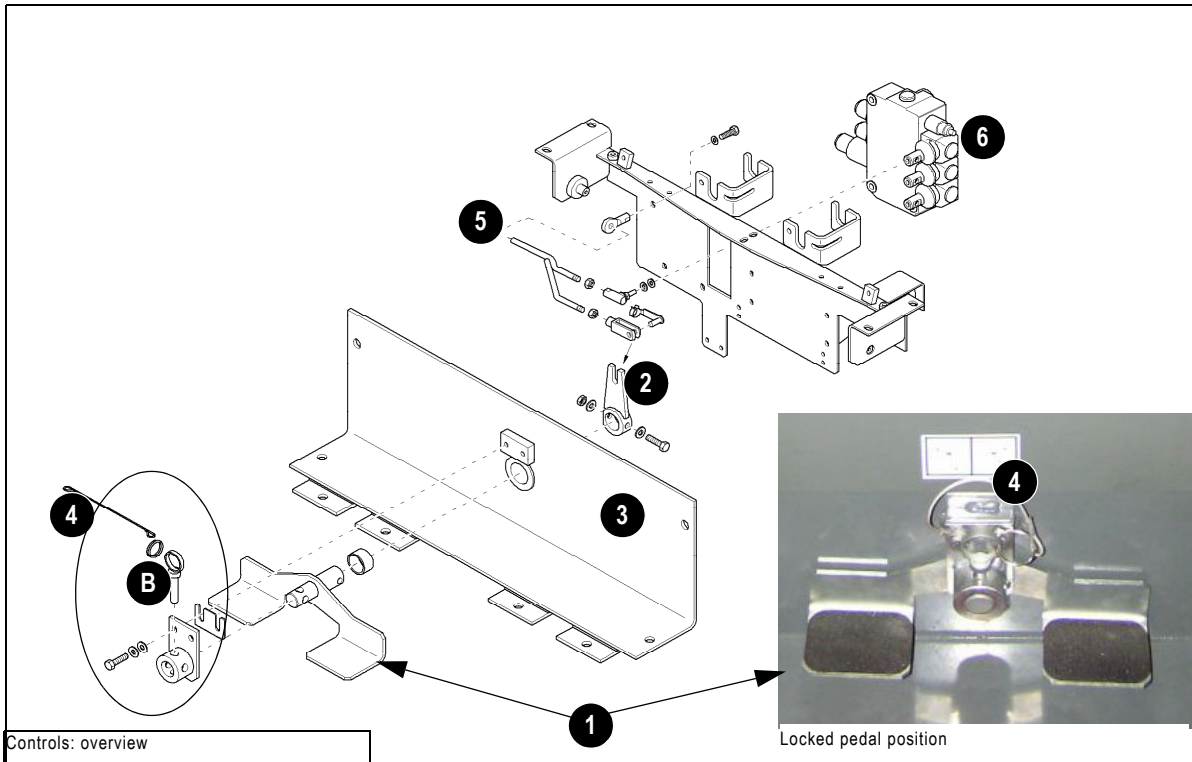
- Consists of a twin axial-piston variable displacement pump
- Controlled via the control levers



Pos.	Description
1	Pump (rear)/drive (left)
2	Pump (front)/drive (right)
3	Travelling drive (right)
4	Travelling drive (left)
5	Flush valve
6	Brakes
7	Oil cooler
8	Brakes
9	Pressure switch

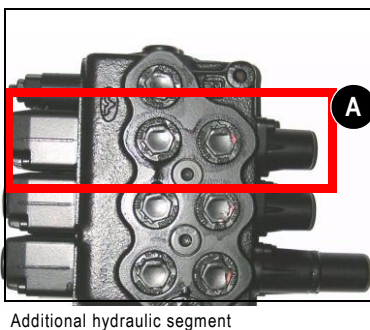
Auxiliary hydraulics control

- Control valve (rocker pedal version)



Pos.	Description
1	Rocker pedal
2	Control lever
3	Cover
4	Lock unit
5	Connecting rod
6	Main valve block

Function



Main valve block segment (A) is actuated by means of a connecting rod (B) mounted on control lever (2). Pressing the pedal to the left or right actuates the auxiliary hydraulics segment on the main valve block.



Danger!

Unintentional actuation of the auxiliary hydraulics pedal –

Danger of accidents

Always lock the pedal with lock pin (B) if it is not in use



5.4 Travelling drive

Function

General

The diesel engine permanently drives two axial-piston variable displacement pumps whose oil flow is sent to the right and left-hand side drive motors.

Driving:

Moving the control lever deflects the swash plate in the pump.

The deflection of the swash plate creates high pressure on ports A or B (depending on the direction in which the control lever is moved), and the hydraulic motors rotate.

This overall pressure is distributed to the motors connected in series, which are driven by the oil flow (forwards or reverse, depending on the direction in which the control lever is actuated).

Brakes:

Moving the control levers to neutral interrupts the oil flow and the motors can no longer be driven. However the oil pressure does not drop.

Parking brake:

14 cm³ gear pump in charge of work hydraulics, doubles up as the boost pump for the twin variable displacement pump (tandem pump). Boost pressure is 18 bar. This pressure also opens the brake discs in the gearbox. Switching off the diesel engine causes this pressure to drop and to enable the brake. If the engine is running, the brake lever must be actuated for fully intentional braking as usual.

Hydraulic system



neuson®

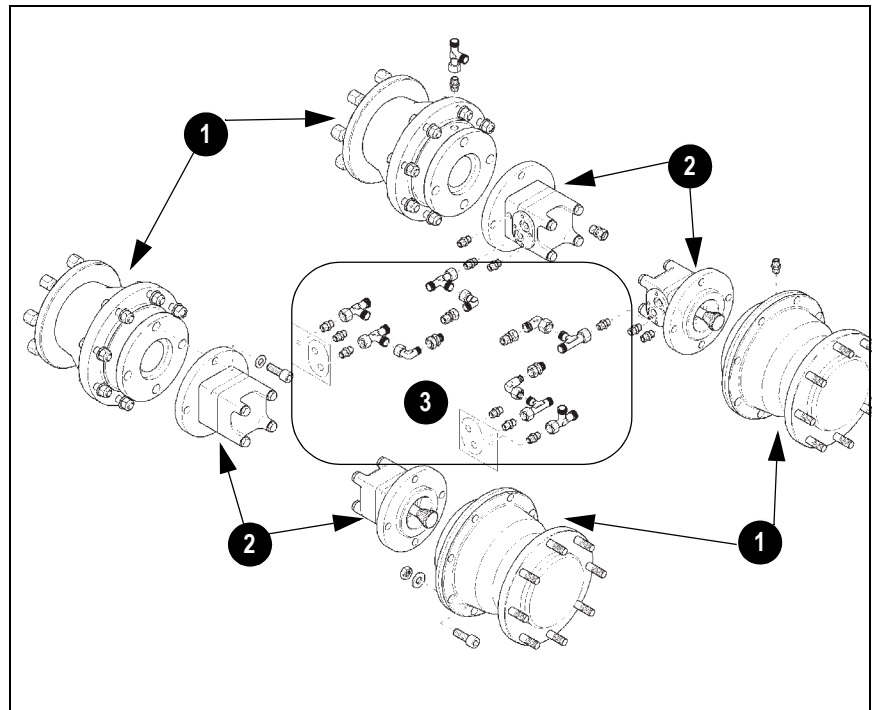
Drive (exploded view)



Hydraulic motor



Gearbox



Pos.	Description
1	Gearbox
2	Hydraulic motor
3	Screw connections

Diagram– [see section Drive control](#) on page 5-9



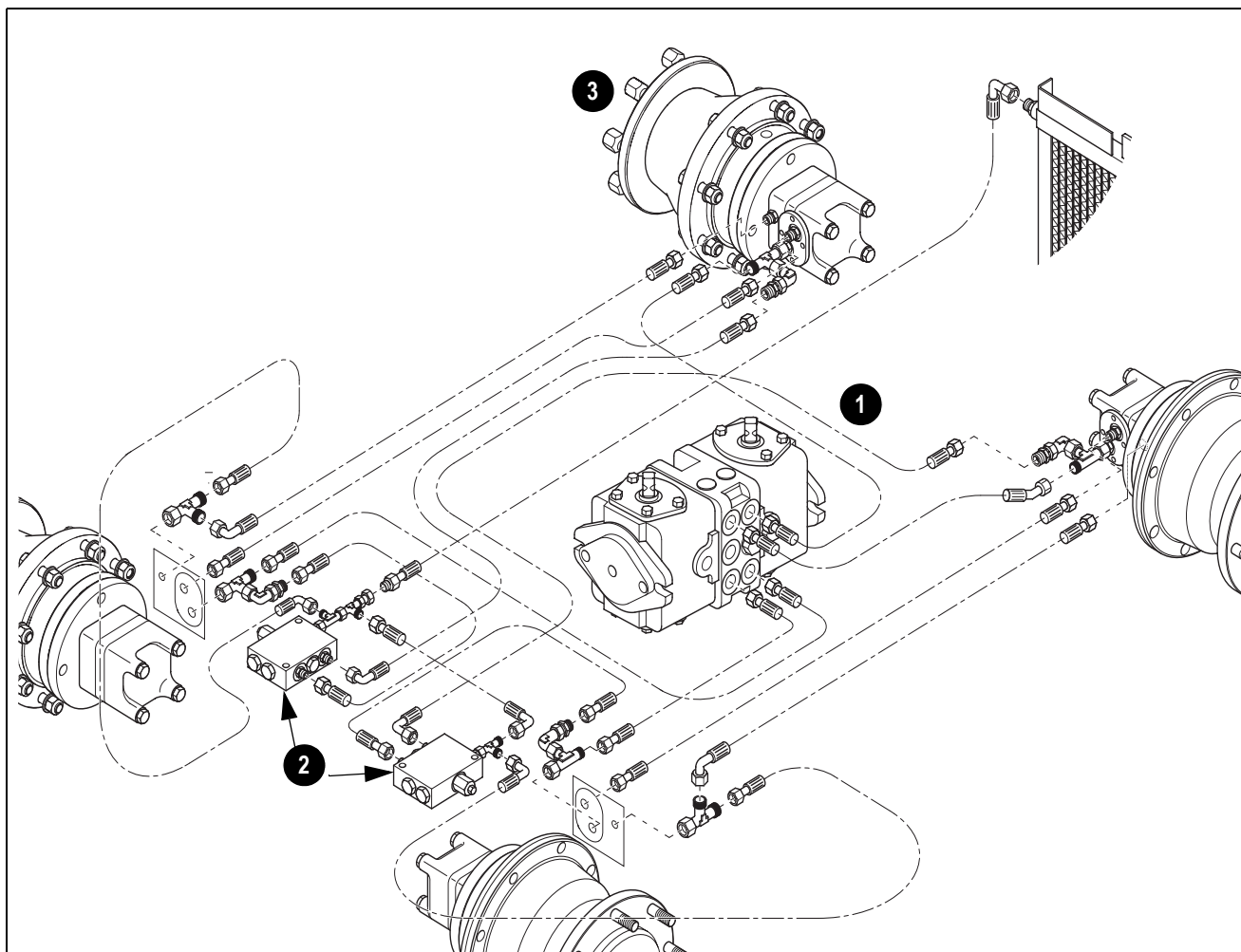
Caution!

The travelling drive can be damaged when towing the machine!

- ☞ Switch off the engine,
short-circuit the drive hydraulics circuit before towing the machine,
tow away the machine with a max. 3 – 4 km/h,
the machine cannot be steered



Travelling drive layout



Pos.	Description
1	Axial-piston variable displacement pump
2	Flush valve
3	Travelling drive



Danger!

These components and the oil are very hot after switching off the engine!

Danger of burns

Always allow the oil to cool down before carrying out (repair) work!

5.5 Valves

3/3 directional valve (flush valve)

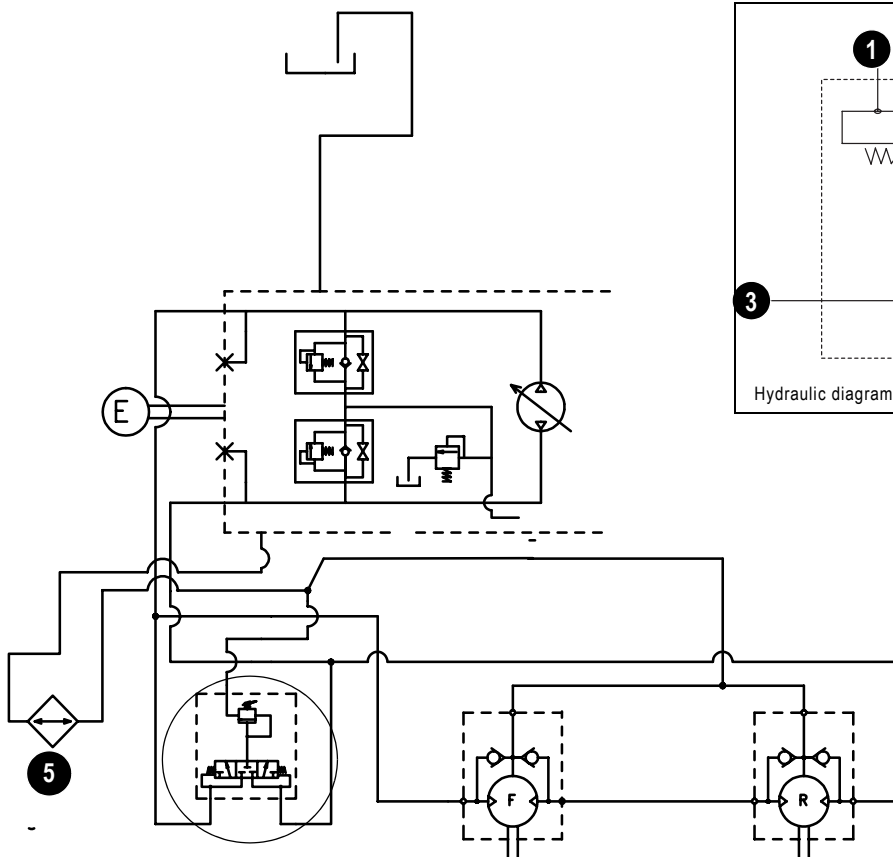
Function

Mixes the oil. If the oil pressure rises beyond 13 bar (to which the pressure limitation has been set), oil is drawn from the closed system on the low-pressure side.

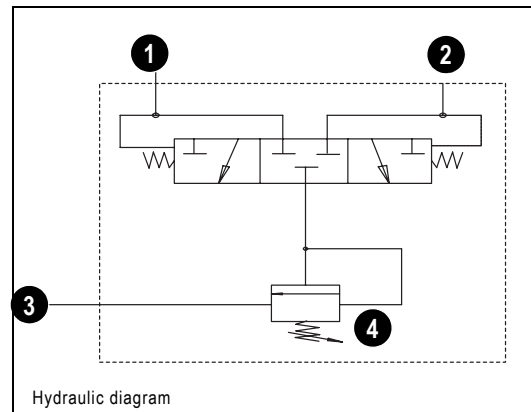
In doing so, the warm oil flows to the radiator (via the flush valve) where it is cooled and then passes on to the pump housing. The cooled oil in turn cools the pump.

The oil then flows to the tank.

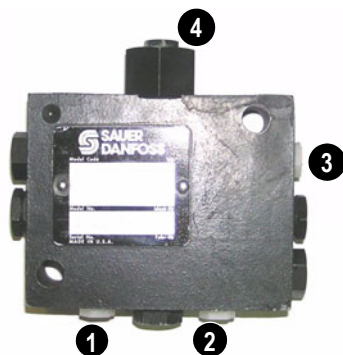
The system has 2 flush valves installed in the travelling drive circuit.



Flush valve diagram



Hydraulic diagram



Flush valve

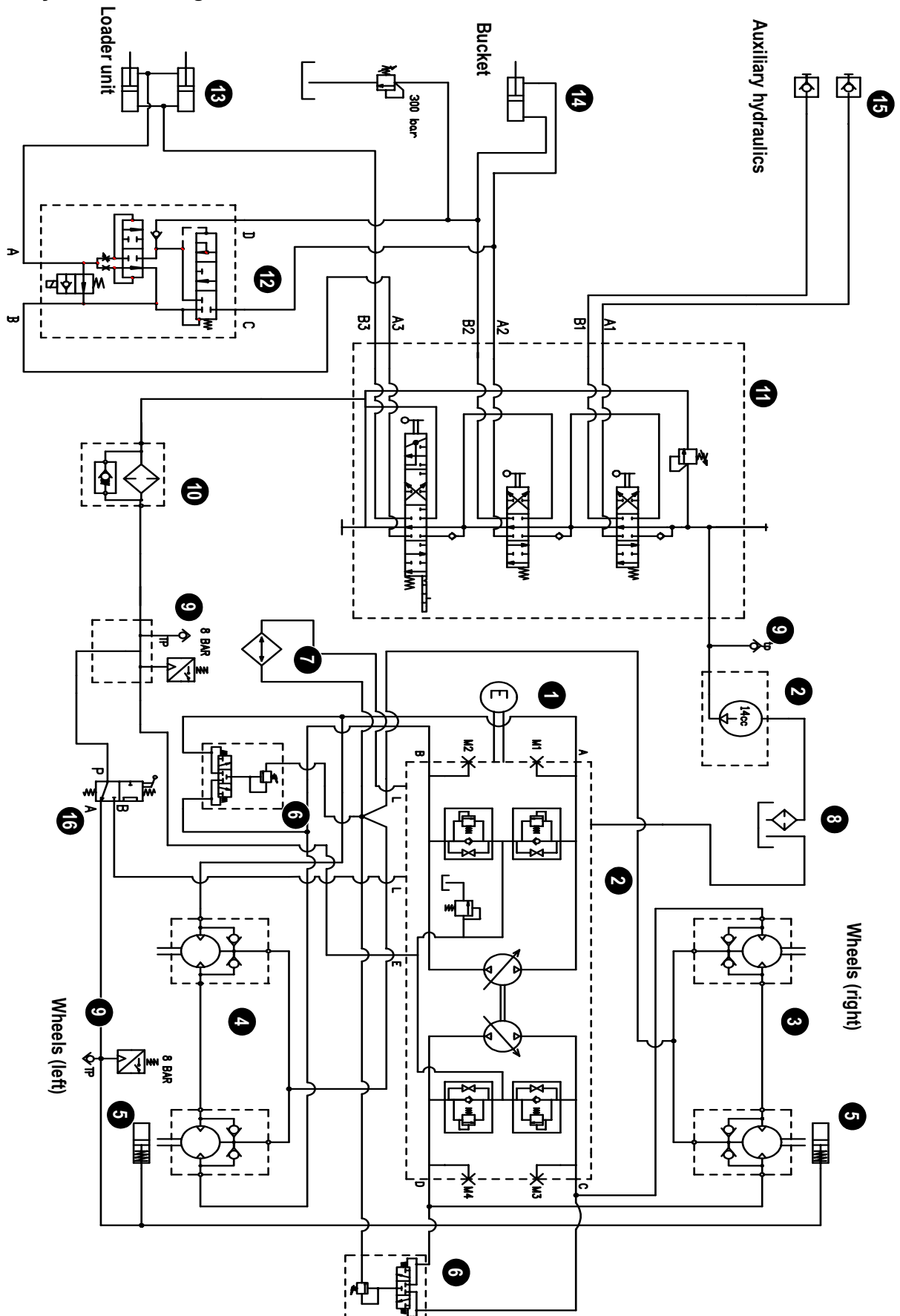
Pos.	Description
1	Input
2	Input
3	Output to radiator
4	Pressure limiting valve 13 bar
5	Radiator



5.6 Troubleshooting in the hydraulic system

Problem	Possible causes
Hydraulic system without function	Hydraulic oil level too low
	Defective pressure limiting valve on main valve block
	Spool is stuck
	Hose rupture (work hoses)
	Defective connection on solenoid valve
Driving without actuating the control levers – More propulsion on one side!	Misalignment of neutral position – slackened fastening nut
Brake is released	
	Defective brake valve

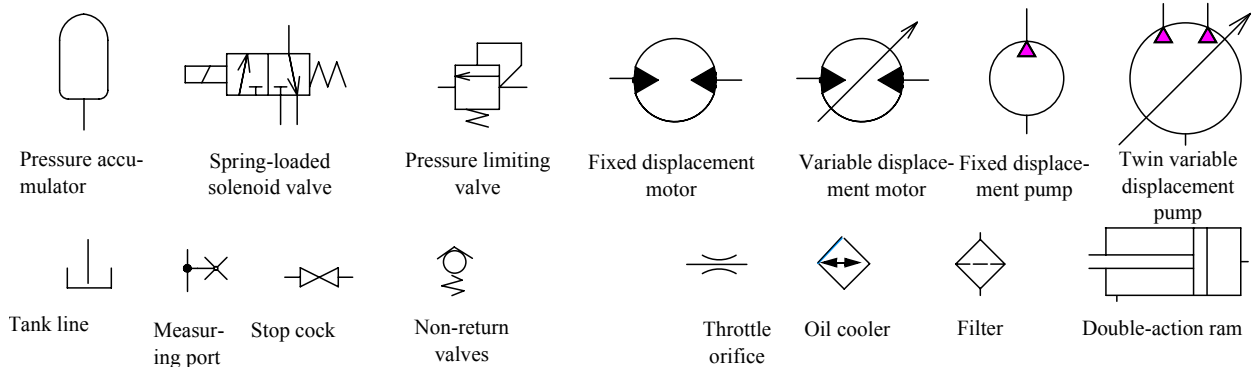
5.7 Hydraulics diagram A4





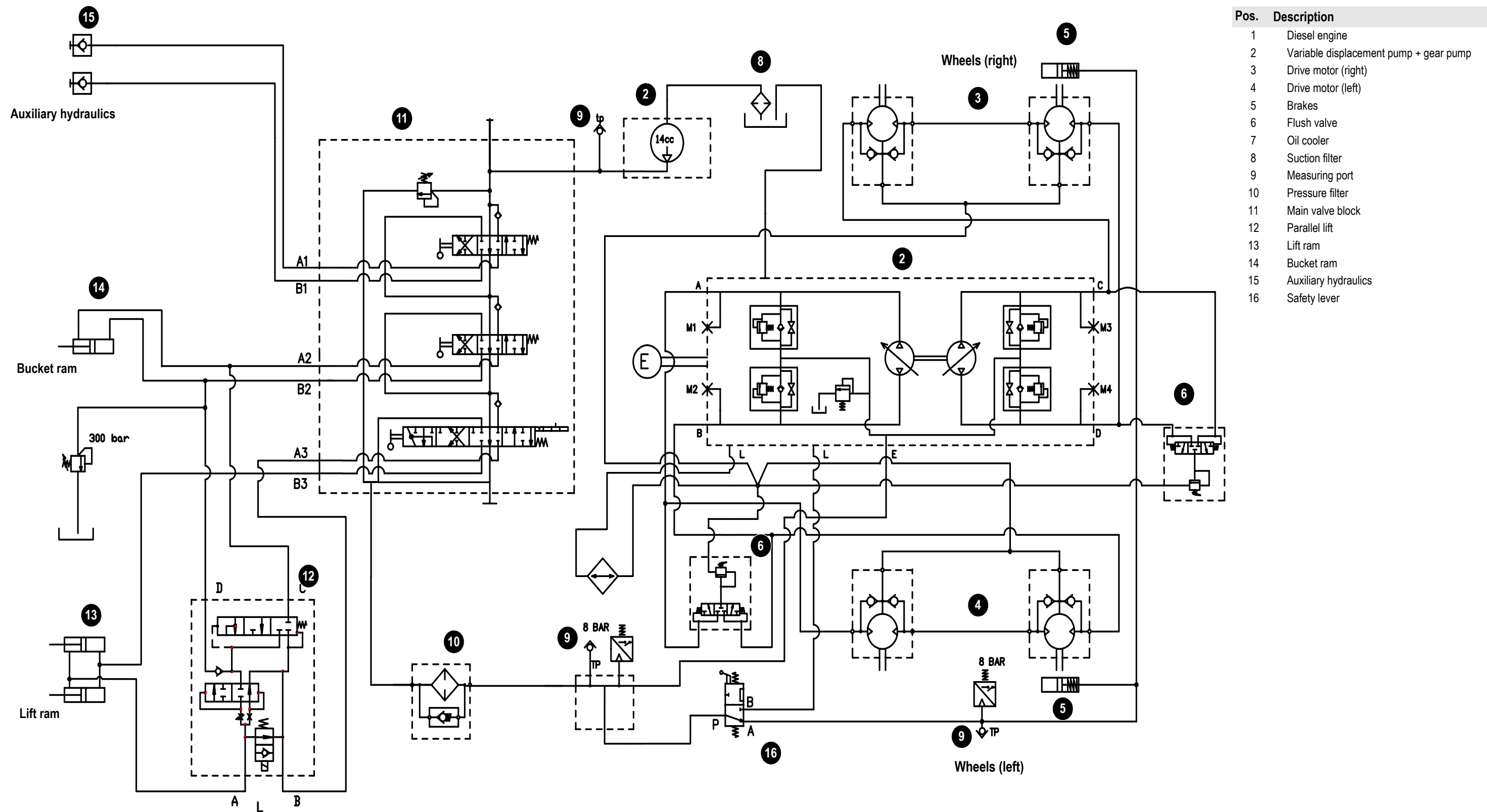
5.8 Hydraulics diagram (legend)

Pos.	Description
1	Diesel engine
2	Variable displacement pump + gear pump
3	Drive motor (right)
4	Drive motor (left)
5	Brakes
6	Flush valve
7	Oil cooler
8	Suction filter
9	Measuring port
10	Pressure filter
11	Main valve block
12	Parallel lift
13	Lift ram
14	Bucket ram
15	Auxiliary hydraulics
16	Safety lever





5.1 Hydraulics diagram 501S A3



Electric system



6 Electric system

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

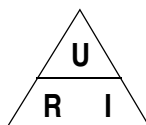
It describes the interrelation between current, voltage and resistance.

Current "I" – Ampere (A)

Voltage "U" – Volt (V)

Resistance "R" – Ohm (Ω W)

Mnemonic:



Output

Power "P" – Watt (W)

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

6.2 Measuring equipment, measuring methods

Multifunction measuring device

- Measurements of values (U, R, I, f)
- Continuity test
- Diode test

Calculate measuring range using known data (P, U, R, I)
and set before measuring!

Observe AC/DC basic setting.

➡ AC = alternating current/voltage;

➡ DC = direct current/voltage

Test device with acoustic and optical signal output

- Continuity test in de-energised machine electric system and of wiring harnesses



Measuring methods – multifunction measuring device

- Measuring current (ignition switched on):
 - Black cable in COM socket (earth),
 - red cable in A socket or mA socket; connect in series to consumer.
- Measuring voltage (ignition switched on):
 - Black cable in COM socket (earth),
 - red cable in V socket;
 - connect in parallel to consumer.
- Measuring resistance (ignition switched off):
 - Black cable in COM socket (earth),
 - red cable in Ω socket;
 - connect in parallel to consumer (see measuring voltage).

Test lamp

The test lamp is used to test lines and functions with the ignition switched on.

- Line test (testing voltage):

Connect test lamp between test point (live cable) and machine earth or between test point (earth line) and a live cable.

- Functional check (testing current):

Connect test lamp between a connection on the consumer to be tested and the connection line.



6.3 Cable colour coding

Colour	Code
Black	blk
Brown	brn
Red	red
Orange	org
Yellow	yel
Green	grn
Blue	blu
Violet	vio
Grey	gry
White	wht
Pink	pnk

6.4 Relays

Use, mode of function

Relays are used for switching electric loads (high currents) whereby the control power of the relay coil is relatively low. Relays can therefore be controlled by microelectronics or microswitches (e.g. touchpad keyboards, sensors). The switch contacts can be make-contact, break-contact or changeover switches. These undertake the actual switching function.

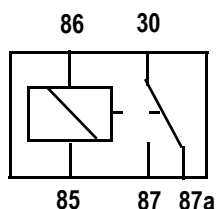


Fig. 1: Terminal description on relay

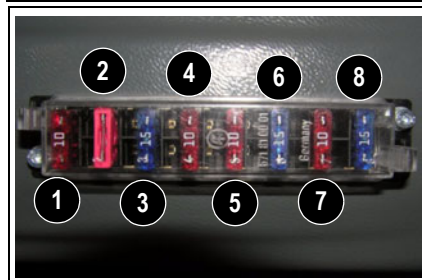
Zero-centre relay

- 86 = Start of coil (control line)
- 85 = End of coil (earth)
- 30 = Input (load line)
- 87 = Make-contact switch output (load line)
- 87 a= Break-contact switch output (load line)

6.5 Electric components

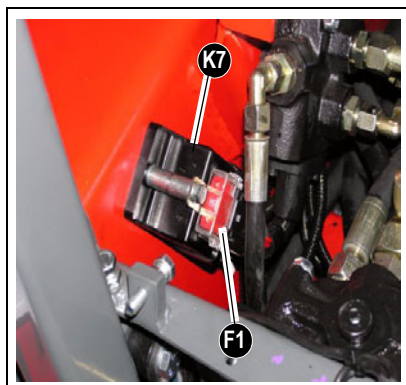
Units	
Alternator	12 V 40 Ah
Starter	12 V 2.3 kW
Battery	12 V 71 Ah
Socket	E.g. for cigarette lighter; 15 A max.

6.6 Fuse box in instrument panel



Pos.	Fuse	Rated current (A)	Protected circuit
1	F2	10 A	– Tank sensor, starting relay, alternator, gauge element
2	F3	10 A	– Cutoff solenoid
3	F4	15 A	– Valves, horn
4	F5	10 A	– Rear working light, interior light
5	F6	10 A	– Front lights
6	F7	15 A	– Turn indicator
7	F8	10 A	– Hazard warning system
8	F9	15 A	– Socket, rotating beacon

6.7 Main fuse box with relays



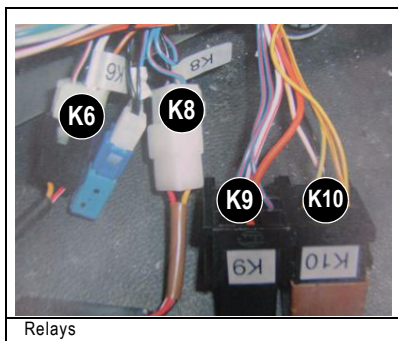
The main fuse box is located under the cab.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	– Main fuse

Relay no.	
K 7	– Starting relay

6.8 Relays

The relays are located underneath the fuse box in the cab



Relays

Switching relay no.	Protected circuit
K 6	– 10 s preheating timer
K 8	– Cutoff timer
K 9	– Cutoff solenoid timer, pick-up contact
K 10	– Turn indicator relay

6.9 Socket

The socket is located in the cab



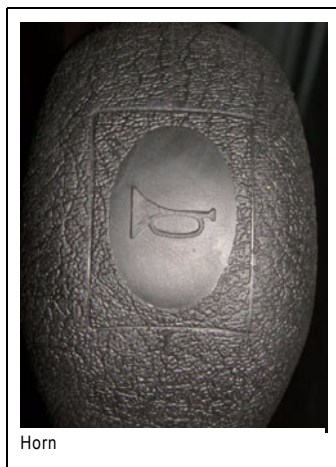
Socket



6.10 Control lever

Right-hand side control lever

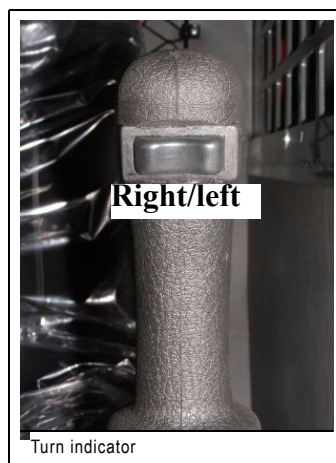
Horn



Left-hand side control lever

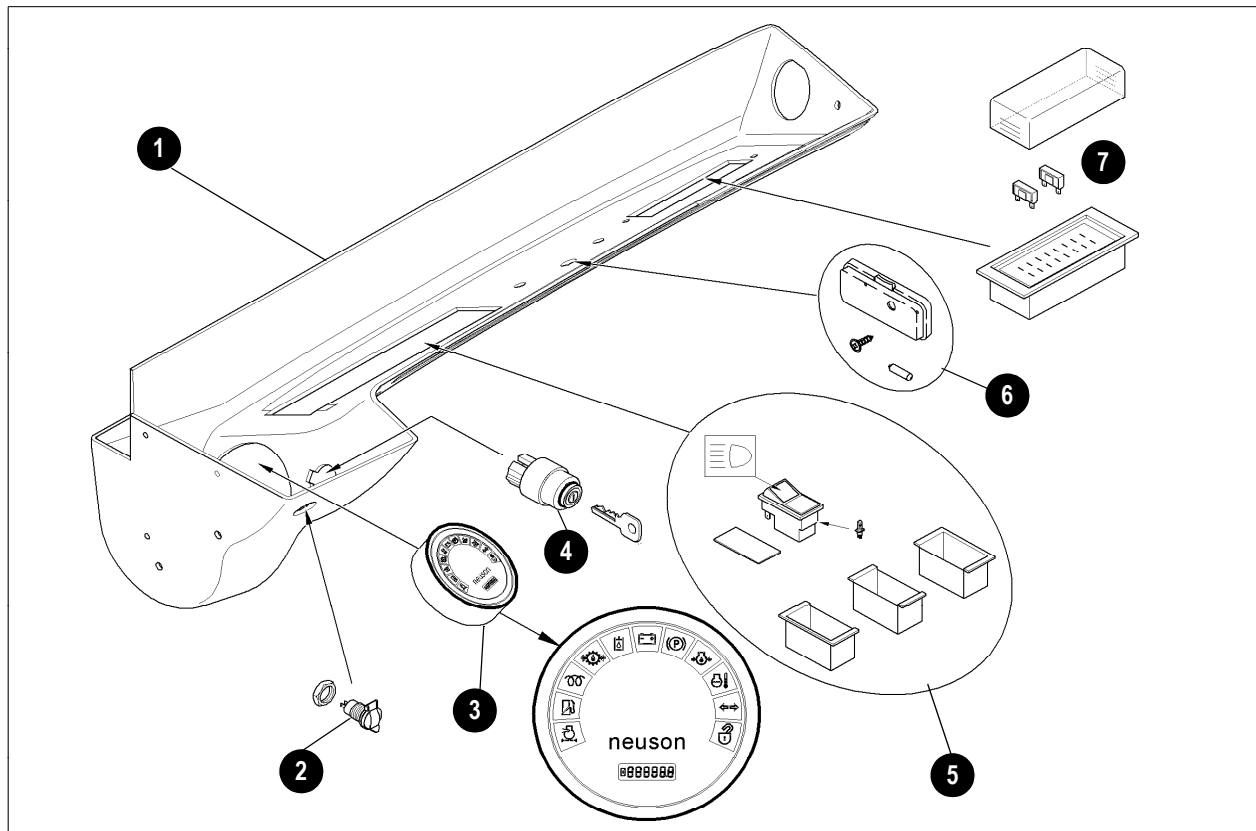
Turn indicators (option)

– see [section 7.16](#) Road travel certification on page 7-11





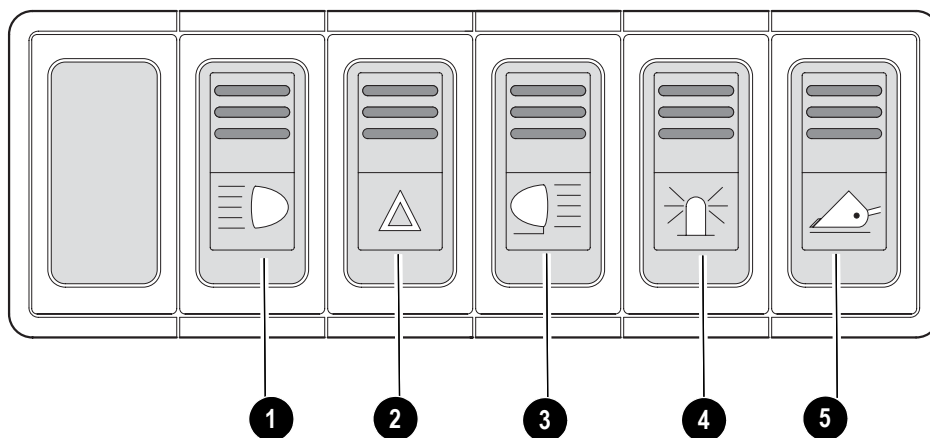
6.11 Instrument panel: overview



Pos.	Description
1	Instrument panel console
2	Socket
3	Indicator
4	Preheating start switch (S1)
5	Switch (– see section 6.12 Switches: overview on page 6-8)
6	Interior lights
7	Fuse box (– see section 6.6 Fuse box in instrument panel on page 6-4)



6.12 Switches: overview



Pos.	Description
1	Switch – lights
2	Switch – hazard warning system
3	Switch – rear working light (option)
4	Switch – rotating beacon (option)
5	Switch – parallel bucket lift (option)

6.13 Alternator

The alternator charges the battery and supplies rectified 3 phase alternating current to electric consumers.

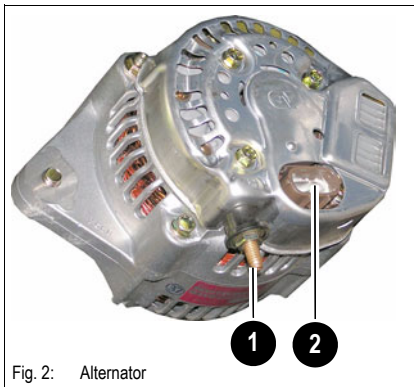


Fig. 2: Alternator

Pos.	Description
1	Connection B (battery)
2	Connection P starting relay
	Ignition (IG) telltale (12V) connection
	Connection L telltale (earth)

6.14 Starter

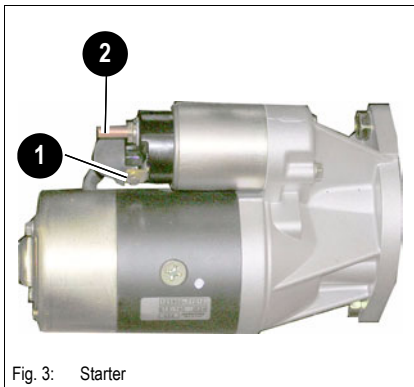


Fig. 3: Starter

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





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Wiring harnesses: overview

Fully wired wiring harnesses allow for easy retrofitting of options.

6.15 Wiring diagram A4: legend

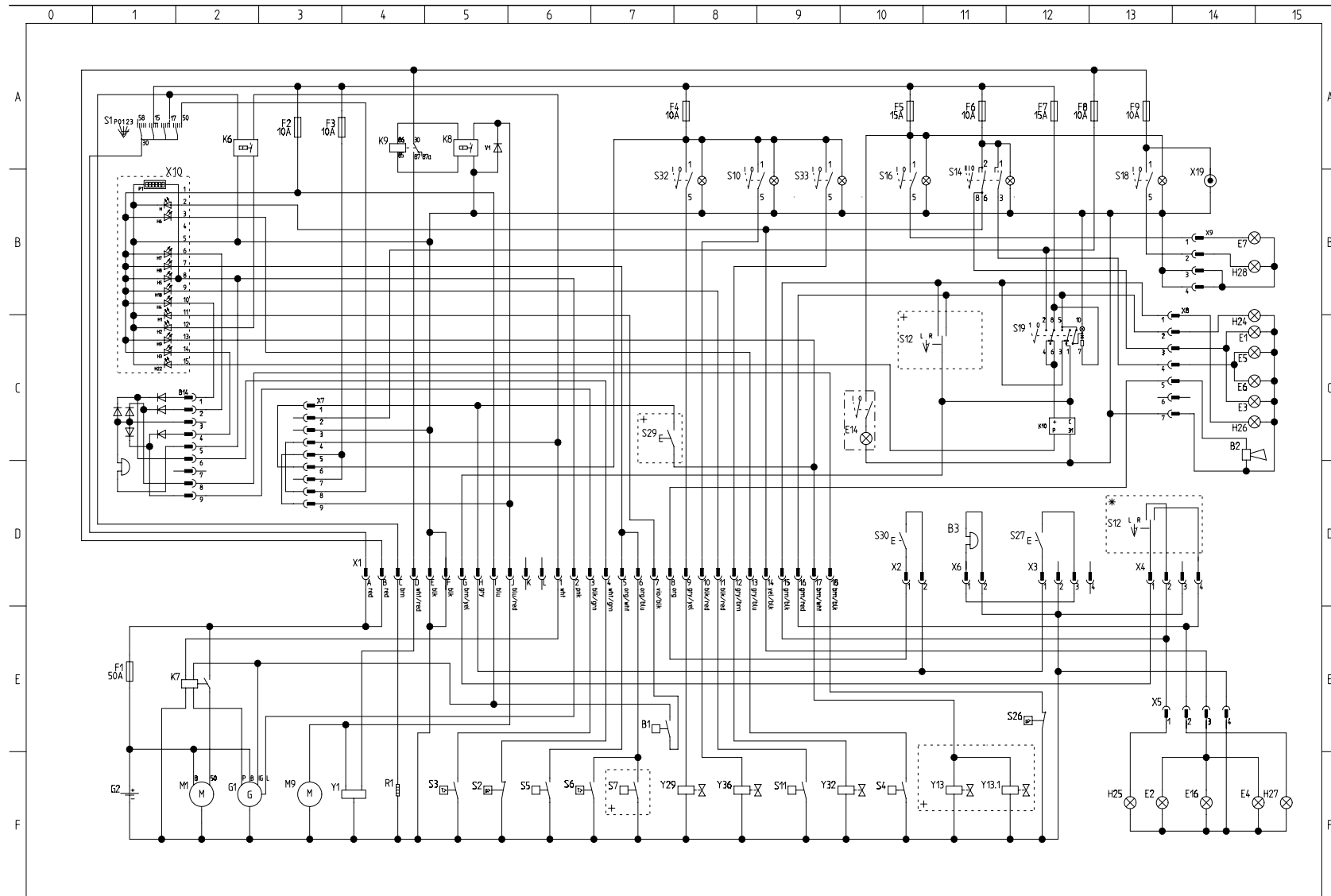
No.	Description	Section	Loc.	No.	Description	Section	Loc.	No.	Description	Section	Loc.
i1	Fuel level indicator	E7		H27	Rear left turn indicator	F15	Option	X4	9 pole connection – drive interlock	C/D1	
i2	Horn	C14		H28	Rotating beacon	B14/15	Option	X5	7 pole connection – armrest/chassis	D11/12	
i3	Backup warning system	D11		K6	Preheating time lag relay	A2		X6	5 pole connection – armrest switch	C11/12	
i4	Diodes (warning buzzer unit)	E6		K7	High current relay – start	E2		X7	6 pole connection – joystick (right)	C/D 11	
i1	Front right parking light	C14	Option	K8	Cutoff solenoid time lag relay	A5		X8	6 pole connection – joystick (left)	D11	
i2	Rear right light	F13	Option	K9	Cutoff solenoid switching relay	A4		X10	15 pole connection – indicator	B/C3	
i3	Front left parking light	C14	Option	K10	Turn indicator relay	C12	Option	X11	2 pole connection – Vario indicator	B6	
i4	Rear left light	F15	Option	M1	Starter	F2		X12	9 pole connection – cab	C13/14	
i5	High, low beam (right)	C14	Option	M9	Fuel pump	F3		X13	5 pole connection – engine temperature	A3	
i6	High, low beam (left)	C14	Option	P1	Hour meter	B1		X14	2 pole connection – automatic revs setting	C/D 3	
i7	Rear working light	B14/15	Option	R1	Glow plug	F4		X15	1 pole connection – drive alarm	D/E 1	
i14	Interior light	C10	Option	S1	Preheating start switch	A1		X16	3 pole connection – drive alarm	E2	
i16	Main fuse: starter, preheating	F14	Option	S2	Engine oil pressure switch	F5		X19	1 pole connection – socket	F7	
i1	Main fuse	E1		S3	Engine temperature switch	F5		XE11	2 pole connection – loader unit working light	E9	
i2	Indicating instrument, alternator, tank sensor	A3		S4	Air filter pressure switch	F10		XS41	2 pole connection – safe load indicator	E8	
i3	Cutoff solenoid, fuel feed pump	A3/A4		S5	Hydraulic oil pressure switch	F6		Y1	Cutoff solenoid	F4	
i4	Valves	A8		S6	Hydraulic oil temperature switch	F7		Y3	High-speed solenoid valve	F9	
i5	Interior light	A10		S7	Hydraulic oil level switch (701)	F7		Y13	Solenoid valve for safety valve	F11	
i6	Front lights	A11		S10	Handbrake switch (spare)	B8/9		Y14	Solenoid valve – automatic idling speed setting	F9	Option
i7	Turn indicators	A12		S11	Parking brake pressure switch	F9		Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
i8	Hazard warning system	A13		S12	Turn indicator switch (501)	C11	Option	Y16	Solenoid valve – additional control circuit	F10	Option
i9	Socket, rotating beacon	A13		S14	Light switch	B11	Option	Y17	Solenoid valve – additional control circuit	F11	Option
i1	Alternator	F2/F3		S16	Rear working light switch	B10	Option	Y31	Solenoid valve – air conditioning	F12	Option
i2	Battery	F1		S18	Rotating beacon switch	B13	Option				
i1	High beam telltale	C1		S19	Hazard warning light switch	C12					
i2	Preheating telltale	C1		S26	Pump pressure switch	E12					
i3	Engine temperature telltale	C1		S27	Backup warning system switch	D12	Option				
i4	Engine oil pressure telltale	B1		S29	Safety switch (701)	C7					
i5	Alternator charge function telltale	B1		S30	Horn tip switch	D10					
i6	Air filter telltale	B1		S32	Parallel lift switch	B8	Option				
i7	Hydraulic oil filter telltale	B1		S33	Highflow switch	B9					
i8	Hydraulic oil temperature telltale	B1		Y1	Cutoff solenoid	F3					
i9	Overload telltale	C1		Y13	Safety valve (701)	F11					
i18	Handbrake telltale	B1		Y29	Parallel lift magnet	F8	Option				
i22	Turn indicator telltale	C1		Y32	Highflow magnet	F9/10					
i24	Front right turn indicator	H25	Option	Y36	Parking brake magnet	D4-6					
i25	Rear right turn indicator	F13	Option	X19	Socket	B14					
				X3	2 pole main connection	D0					





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6.16 Wiring diagram A4

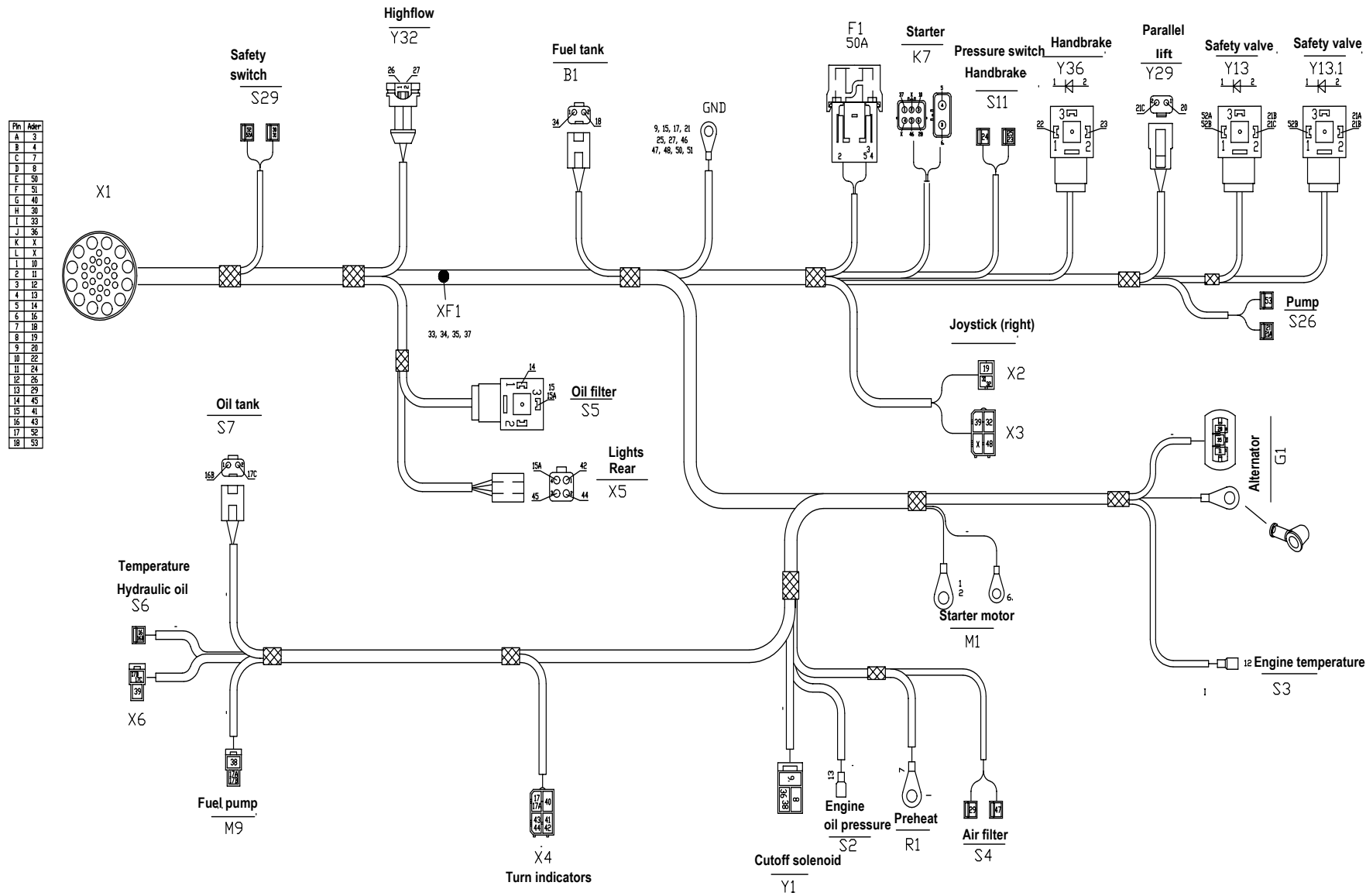


6.17 Wiring harness 1000147293 (legend): engine – chassis A4

No.	From	Up to	Colour	mm ²
1	M1/ starter	G1/ alternator	red	10
2	M1/ starter	F1 main fuse	red	10
3	F1/ main fuse	X1/A engine/chassis connection	red	4
4	F1 main fuse	X1/B engine/chassis connection	red	4
5	F1/ main fuse	K7/A start high current relay	red	2,5
6	K7/B start high current relay	M1/ starter	wht/brn	2,5
7	R1/ glow plug	X1/C engine/chassis connection	brn	4
8	Y1/ cutoff solenoid	X1/D engine/chassis connection	wht/red	2,5
9	Y1/ cutoff solenoid	GND earth	blk	2,5
10	K7/3 start high current relay	X1/1 engine/chassis connection	wht	1
11	G1/1 alternator	X1/2 engine/chassis connection	pnk	1
12	S3 engine temperature switch	X1/3 engine/chassis connection	blk/grn	1
13	S2 engine oil pressure switch	X1/4 engine/chassis connection	wht/grn	1
14	S5/1 hydraulic oil pressure switch	X1/5 engine/chassis connection	org/wht	1
15	S5/3 hydraulic oil pressure switch	GND earth	blk	1
15 A	S5/3 hydraulic oil pressure switch	X5/4 lights	blk	1
16	S6 temperature switch	X1/6 engine/chassis connection	org/blu	1
16B	S6 temperature switch	S7/1 hydraulic oil level switch	org/wht	1
17	X4/3 turn indicator connection	GND earth	blk	1
17A2	X4/3 turn indicator connection	M9 fuel feed pump	blk	1
17B	X6 backup warning system connection	M9 fuel feed pump	blk	1
17C	X6 backup warning system connection	S7/2 hydraulic oil level switch	blk	1
18	B1/2 fuel tank sensor	X1/7 engine/chassis connection	vio/blk	1
19	X2/1 joystick (right)	X1/8 engine/chassis connection	org	1
20	Y29/1 parallel lift magnet	X1/9 engine/chassis connection	gry/yel	1
21	S 26 pump pressure switch	GND earth	blk	1
21A	S 26 pump pressure switch	Y13.1/2 safety valve	blk	1
21B	Y13/2 safety valve	Y13.1/2 safety valve	blk	1
21C	Y13/2 safety valve	Y29 parallel lift magnet	blk	1
22	Y36/1 parking brake magnet	X1/10 engine/chassis connection	blk/red	1
23	S11 parking brake pressure switch	Y36/2 parking brake magnet	blk	1
24	S11 parking brake pressure switch	X1/11 engine/chassis connection	blk/red	1
25	S11 parking brake pressure switch	GND	blk	1
26	Y32/1 Highflow magnet	X1/12 engine/chassis connection	gry/brn	1
27	Y32/2 Highflow magnet	GND	blk	1
28	G1/3 alternator	K7/6 high current relay	blk/blu	1
29	S4 air filter pressure switch	X1/12 engine/chassis connection	gry/blu	1
31	X2/2 horn connection	X1/H engine/chassis connection	gry	1
32	X2/2 horn connection	X3/1 backup warning system connection	gry	1

No.	From	Up to	Colour	mm ²
33	XF1	X1/I engine/chassis connection	blu	1
34	XF1	B1/I fuel tank sensor	blu	1
35	XF1	G1/2 alternator	blu	1
36	Y1 cutoff solenoid	X1/J engine/chassis connection	blu/red	1
37	XF1	K7/1 start high current relay	blu	1
38	Y1	M9 feed pump	blu/red	1
39	X3/3 joystick (right)	X6	gry/blk	1
40	X4/1 turn indicator connection	X1/G engine/chassis connection	brn/yel	1
41	X4/2 turn indicator connection	X1/15 engine/chassis connection	grn/blk	1
42	X4/2 turn indicator connection	X5/1 rear lights	grn/blk	1
43	X4/4 turn indicator connection	X1/16 engine/chassis connection	grn/red	1
44	X4/4 turn indicator connection	X5/2 rear lights	grn/red	1
45	X5/3 rear lights	X1/14 engine/chassis connection	yel/blk	1
46	K7/5 start high current relay	GND earth	blk	1
47	S4 air filter pressure switch	GND earth	blk	1
48	X3/2 backup warning system connection	GND earth	blk	1
50	GND earth	X1/E engine/chassis connection	blk	1,5
51	GND earth	X1/F engine/chassis connection	blk	1,5
52 A	Y13/1 safety valve (701)	X1/17	brn/wht	1
52B	Y13/1 safety valve (701)	Y13.1/1 safety valve (701)	brn/wht	1
53	S26 pump pressure switch	X1/18 engine/chassis connection	brn/blk	1

6.18 Wiring harness 1000147293: engine – chassis A4



6.19 Wiring harness 1000139289 (legend): switches A4

No.	From	To	Colour	
3	X1/A engine/chassis connection	S1/1 preheating start switch	red	4
4	X1/A engine/chassis connection	F8 hazard warning system	red	4
7	X1/C engine/chassis connection	S1/1 preheating start switch	brn	4
7A	S1/4 preheating start switch	S1/9 preheating start switch	brn	2,5
7B	S1/8 preheating start switch	K6 preheating time lag relay	brn	1
8	X1/D engine/chassis connection	K9/87 cutoff solenoid switching relay	wh/red	2,5
10	X1/1 engine/chassis connection	K6 preheating time lag relay	wht	1
10 A	X7/4 terminal strip connection	K6 preheating time lag relay	wht	1
10B	X7/8 terminal strip connection	S1/7 preheating start switch	wht	1
10C	X7.1/4 terminal strip connection	X7.1/8 terminal strip connection	wht	1
11	X1/2 engine/chassis connection	B14/5 warning buzzer unit diodes	pnk	1
11 A	X10/8 indicator connection	B14/5 warning buzzer unit diodes	pnk	1
12	X1/3 engine/chassis connection	B14/9 warning buzzer unit diodes	blk/grn	1
12A2	X10/14 indicator connection	B14/4 warning buzzer unit diodes	blk/grn	1
13	X1/4 engine/chassis connection	B14/6 warning buzzer unit diodes	wht/grn	1
13A2	X10/10 indicator connection	B14/1 warning buzzer unit diodes	wht/grn	1
14	X1/5 engine/chassis connection	XS 5	org/wht	1
16	X1/6 engine/chassis connection	XS 5	org/blu	1
16A	X10/7 indicator connection	XS 5	org/blk	1
18	X1/7 engine/chassis connection	X10/11 indicator connection	vio/blk	1
19	X1/8 engine/chassis connection	X8/5 lights connection	org	1
20	X1/9 engine/chassis connection	S32/5 parallel lift switch	gry/yel	1
22	X1/10 engine/chassis connection	S10/7 parking brake switch	blk/red	1
24	X1/11 engine/chassis connection	X10/9 indicator connection	blk/red	1
26	X1/12 engine/chassis connection	S33/5 HighFlow switch	gry/brn	1
29	X1/13 engine/chassis connection	X10/3 indicator connection	gry/blu	1
30	S29 safety switch	X7/1 terminal strip connection	gry	1
30A	F4 valves	X7/6 terminal strip connection	gry	1
30B	X7.1/1 terminal strip connection	X7.1/6 terminal strip connection	gry	1
31	X1/H engine/chassis connection	S29 safety switch	gry	1
33	X1/I engine/chassis connection	F2 alternator, fuel level sensor, indicators, start relay fuse	blu	1
36	X1/J engine/chassis connection	X7/9 terminal strip connection	blu/red	1
36 A	V1 diode	X7/9 terminal strip connection	blu/red	1
36B1	V1 diode	K8 cutoff solenoid timer	blu/red	1
40	X1/G engine/chassis connection	K10/C turn indicator relay	brn/yel	1
40 A	S19/1 hazard warning system switch	K10/C turn indicator relay	brn/yel	1
40B	S19/1 hazard warning system switch	S12 turn indicator switch	brn/yel	1
41	X1/15 engine/chassis connection	S19/3 hazard warning system	grn/blk	1
41 A	X8/1 lights switch	S19/3 hazard warning system	grn/blk	1
41B1	X8/1 lights switch	S12 turn indicator switch	grn/blk	1
43	X1/16 engine/chassis connection	S19/5 hazard warning system	grn/red	1
43 A	X8/2 lights connection	S19/5 hazard warning system	grn/red	1
43B	X8/2 lights connection	S12 turn indicator switch	grn/red	1
45	X1/14 engine/chassis connection	S14/6 light switch	yel/blk	1

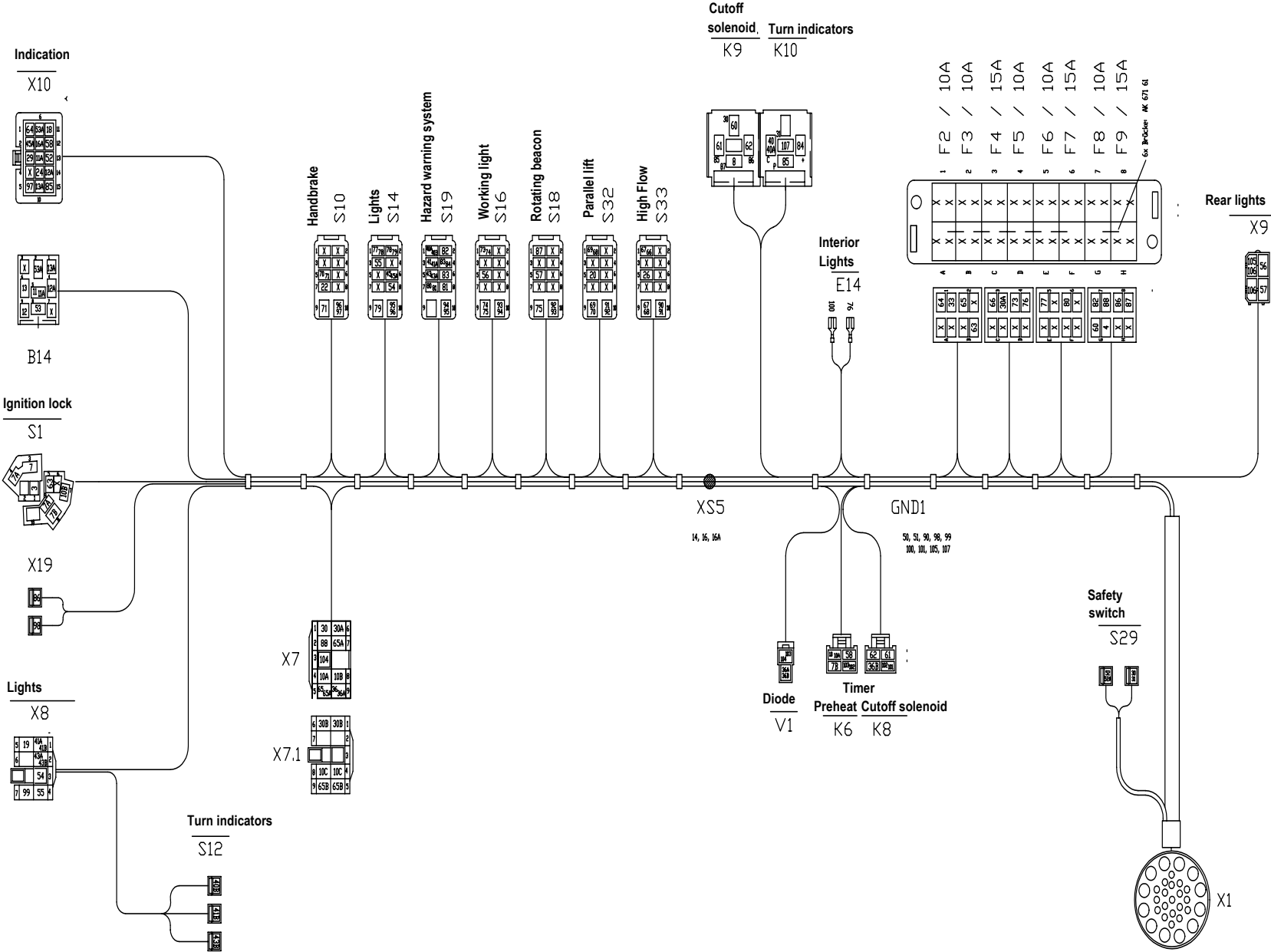
No.	From	To	Colour	
45 A	X10/2 indicator connection	S14/6 light switch	yel/blk	1
50	X1/E engine/chassis connection	GND1	blk	1,5
51	X1/F engine/chassis connection	GND1	blk	1
52	X10/2 indicator connection	S29 safety switch	brn/wht	1
52 A	X1/17 engine/chassis connection	S29 safety switch	brn/wht	1
53	X1/18 engine/chassis connection	B14/8 warning buzzer unit diodes	brn/blk	1
53 A	X10/6 indicator connection	B14/2 warning buzzer unit diodes	brn/blk	1
54	S14/8 light switch	X8/3 lights connection	yel/blk	1
55	S14/3 light switch	X8/4 lights connection	yel/grn	1
56	S16/5 working light switch	X9/1 rear lights connection	yel/red	1
57	S18/5	X9/2 rear lights connection	vio	1
58	X10/12 indicator connection	K6 preheating time lag relay	gry/red	1
60	F8 hazard warning system fuse	K9/30 cutoff solenoid switching relay	red	2,5
61	K9/85 cutoff solenoid switching relay	K8 cutoff solenoid time lag relay	blu/red	1
62	K9/86 cutoff solenoid switching relay	K8 cutoff solenoid time lag relay	blu/red	1
63	S1/5 preheating start switch	F3 cutoff solenoid fuse	blu/red	1
64	F2 indicator fuse	X10/1 indicator connection	blu	1
65	F3 indicators and engine relay fuse	X7/5 terminal strip connection	blu/red	1
65 A	X7/7 terminal strip connection	X7/5 terminal strip connection	blu/red	1
65B	X7.1/9 terminal strip connection	X7.1/5 terminal strip connection	blu/red	1
66	F4 valve fuse	S33/1 High Flow switch	gry	1
67	S33/9 High Flow switch	S33/1 High Flow switch	gry	1
68	S33/9 High Flow switch	S32/1 parallel lift switch	gry	1
69	S32/9 parallel lift switch	S32/1 parallel lift switch	gry	1
70	S32/9 parallel lift switch	S10/5 parking brake switch	gry	1
71	S10/9 parking brake switch	S10/5 parking brake switch	gry	1
73	F5 interior light fuse	S16/1 working light switch	blu/yel	1
74	S16/9 working light switch	S16/1 working light switch	blu/yel	1
75	S16/9 working light switch	S18/9 rotating beacon switch	blu/yel	1
76	F5 interior light fuse	E14 interior light	blu/yel	1
77	F6 front lights fuse	S14/1 light switch	yel	1
78	S14/2 light switch	S14/1 light switch	yel	1
79	S14/2 light switch	S14/9 light switch	yel	1
80	F7 turn indicator fuse	S19/7 hazard warning system switch	grn	1
81	S19/8 hazard warning system switch	S19/7 hazard warning system switch	grn	1
82	F8 hazard warning system fuse	S19/2 hazard warning system switch	red/blu	1
83	S19/4 hazard warning system switch	S19/6 hazard warning system switch	grn/blu	1
84	S19/4 hazard warning system switch	K10/+ turn indicator relay	grn/blu	1
85	K10/P turn indicator relay	X10/15 indicator connection	grn/yel	1
86	F9 socket fuse	X19 socket	red	1
87	F9 socket fuse	S18/1 rotating beacon switch	red	1
88	F8 hazard warning system fuse	X7/2 terminal strip connection	red	1
90	GND1 earth	S33/10 High Flow switch	blk	1
91	S32/10 parallel lift switch	S33/10 High Flow switch	blk	1

No.	From	Up to	Colour	mm²
92	S32/10 parallel lift switch	S18/1 rotating beacon switch	blk	1
93	S16/10 rear working light switch	S18/10 rotating beacon switch	blk	1
94	S16/10 rear working light switch	S19/10 hazard warning system switch	blk	1
95	S14/10 light switch	S19/10 hazard warning system switch	blk	1
96	S14/10 light switch	S10/10 parking brake switch	blk	1
97	X10/5 indicator connection	S10/10 parking brake switch	blk	1
98	DNG1 earth	X19 socket	blk	1
99	GND1 earth	X8/7 lights connection	blk	1
100	GND1 earth	E14 interior light	blk	1
101	GND1 earth	K8 cutoff solenoid time lag relay	blk	1
102	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
103	K6 preheating time lag relay	V1 diode	blk	1
104	X7/3 terminal strip connection	V1 diode	blk	1
105	GND1 earth	X9/3 rear lights connection	blk	1
106	X9/4 rear lights connection	X9/3 rear lights connection	blk	1
107	GND1 earth	K10/87 turn indicator relay	blk	1

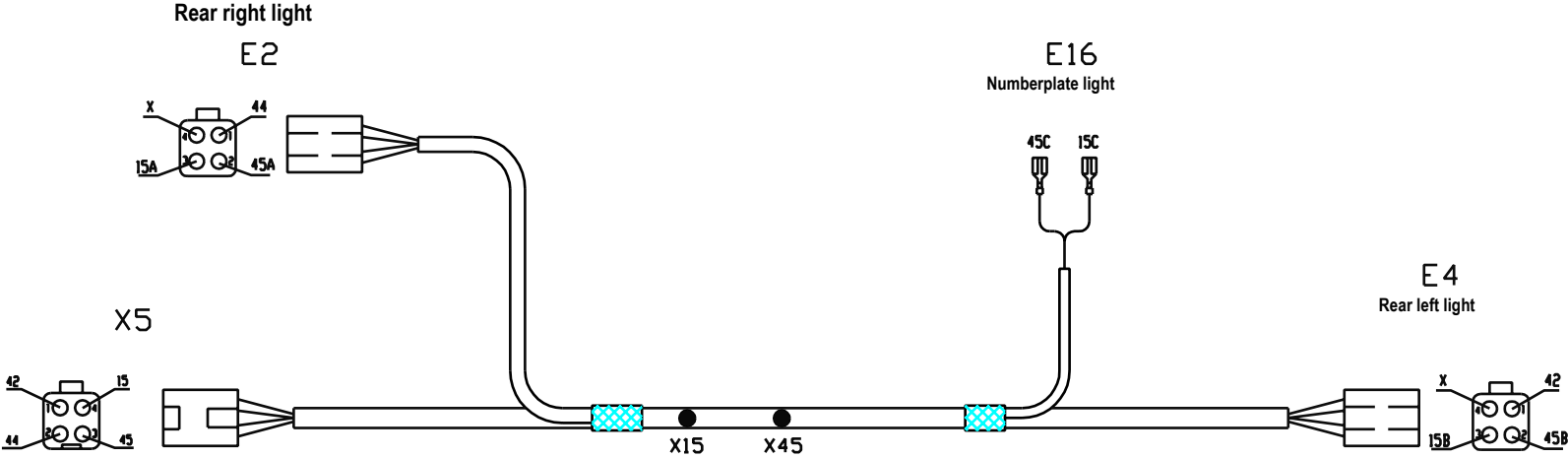


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6.20 Wiring harness 1000139289: switches A4



6.21 Wiring harness 1000147262: rear lights (option)



No.	Up to	To	Colour	mm²
15	X5/4 rear lights connection	X15 earth	blk	1
15 A	E2/3 rear right light switch	X15 earth	blk	1
15B	E4/3 rear left light switch	X15 earth	blk	1
15C	E16 numberplate light	X15 earth	blk	1
42	X5/1 rear lights connection	E4/1 rear left turn indicator switch	grn/blk	1
44	X5/2 rear lights connection	E2/1 rear right turn indicator switch	grn/red	1
45	X5/4 rear lights connection	X45 position light	yel/blk	1
45 A	E2/2 rear right light switch	X45 position light	yel/blk	1
45b	E4/2 rear left light switch	X45 position light	yel/blk	1
45C	E16 numberplate light switch	X45 position light	yel/blk	1



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Wiring harnesses: overview

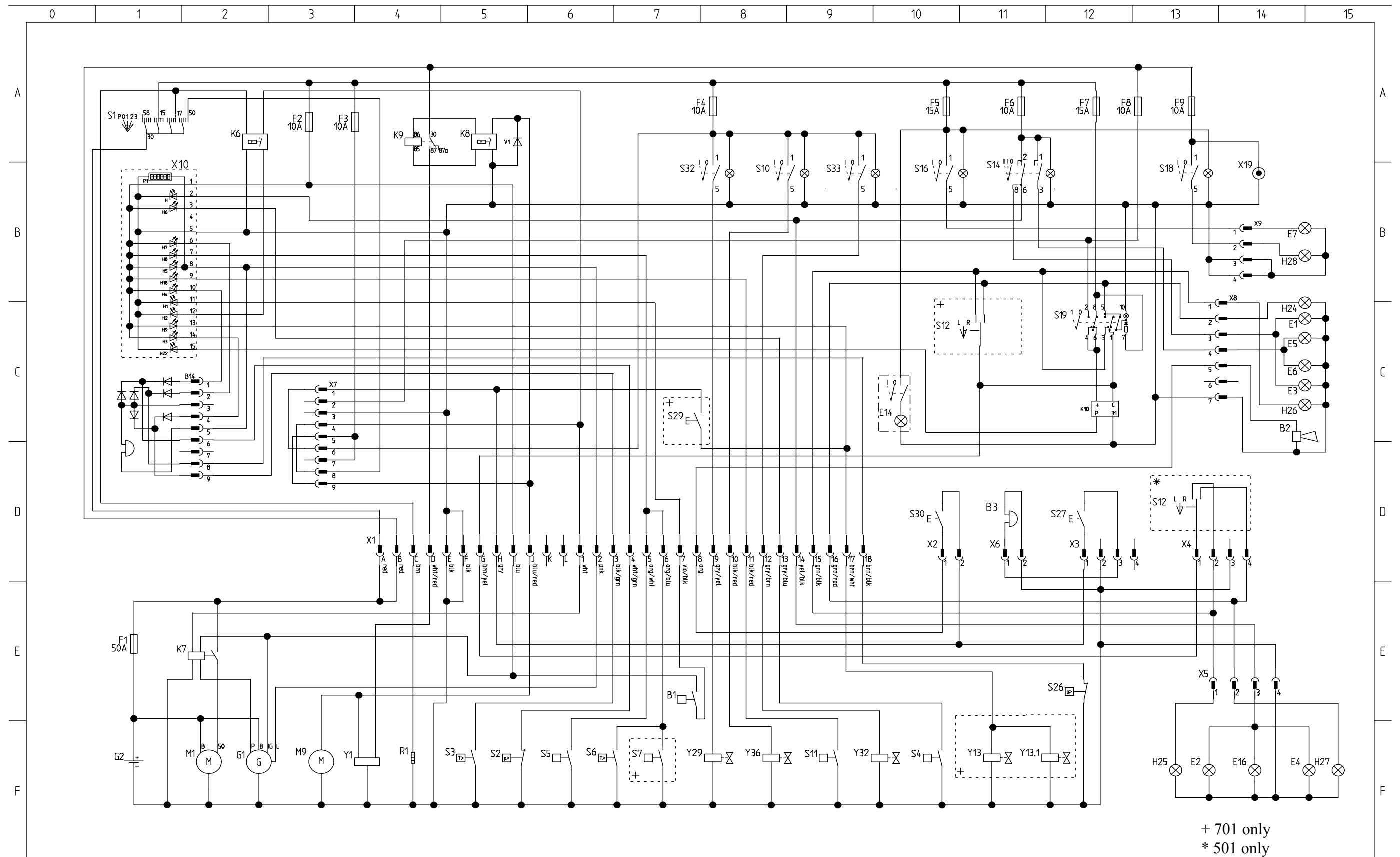
Fully wired wiring harnesses allow for easy retrofitting of options.

6.22 Wiring diagram A3: legend

No.	Description	Section	Loc.
B1	Fuel level indicator	E7	
B2	Horn	C14	
B3	Backup warning system	D11	
B14	Diodes (warning buzzer unit)	E6	
E1	Front right parking light	C14	Option
E2	Rear right light	F13	Option
E3	Front left parking light	C14	Option
E4	Rear left light	F15	Option
E5	High, low beam (right)	C14	Option
E6	High, low beam (left)	C14	Option
E7	Rear working light	B14/15	Option
E14	Interior light	C10	Option
E16	Main fuse: starter, preheating	F14	Option
F1	Main fuse	E1	
F2	Indicating instrument, alternator, tank sensor	A3	
F3	Cutoff solenoid, fuel feed pump	A3/A4	
F4	Valves	A8	
F5	Interior light	A10	
F6	Front lights	A11	
F7	Turn indicators	A12	
F8	Hazard warning system	A13	
F9	Socket, rotating beacon	A13	
G1	Alternator	F2/F3	
G2	Battery	F1	
H1	High beam telltale	C1	
H2	Preheating telltale	C1	
H3	Engine temperature telltale	C1	
H4	Engine oil pressure telltale	B1	
H5	Alternator charge function telltale	B1	
H6	Air filter telltale	B1	
H7	Hydraulic oil filter telltale	B1	
H8	Hydraulic oil temperature telltale	B1	
H9	Overload telltale	C1	
H18	Handbrake telltale	B1	
H22	Turn indicator telltale	C1	
H24	Front right turn indicator	H25	Option
H25	Rear right turn indicator	F13	Option
H27	Rear left turn indicator	F15	Option
H28	Rotating beacon	B14/15	Option
K6	Preheating time lag relay	A2	
K7	High current relay – start	E2	
K8	Cutoff solenoid time lag relay	A5	
K9	Cutoff solenoid switching relay	A4	

No.	Description	Section	Loc.
K10	Turn indicator relay	C12	Option
M1	Starter	F2	
M9	Fuel pump	F3	
P1	Hour meter	B1	
R1	Glow plug	F4	
S1	Preheating start switch	A1	
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	F5	
S4	Air filter pressure switch	F10	
S5	Hydraulic oil pressure switch	F6	
S6	Hydraulic oil temperature switch	F7	
S7	Hydraulic oil level switch (701)	F7	
S10	Handbrake switch (spare)	B8/9	
S11	Parking brake pressure switch	F9	
S12	Turn indicator switch (501)	C11	Option
S14	Light switch	B11	Option
S16	Rear working light switch	B10	Option
S18	Rotating beacon switch	B13	Option
S19	Hazard warning light switch	C12	
S26	Pump pressure switch	E12	
S27	Backup warning system switch	D12	Option
S29	Safety switch (701)	C7	
S30	Horn tip switch	D10	
S32	Parallel lift switch	B8	Option
S33	Highflow switch	B9	
Y1	Cutoff solenoid	F3	
Y13	Safety valve (701)	F11	
Y29	Parallel lift magnet	F8	Option
Y32	Highflow magnet	F9/10	
Y36	Parking brake magnet	D4-6	
X19	Socket	B14	

Wiring diagram: legend

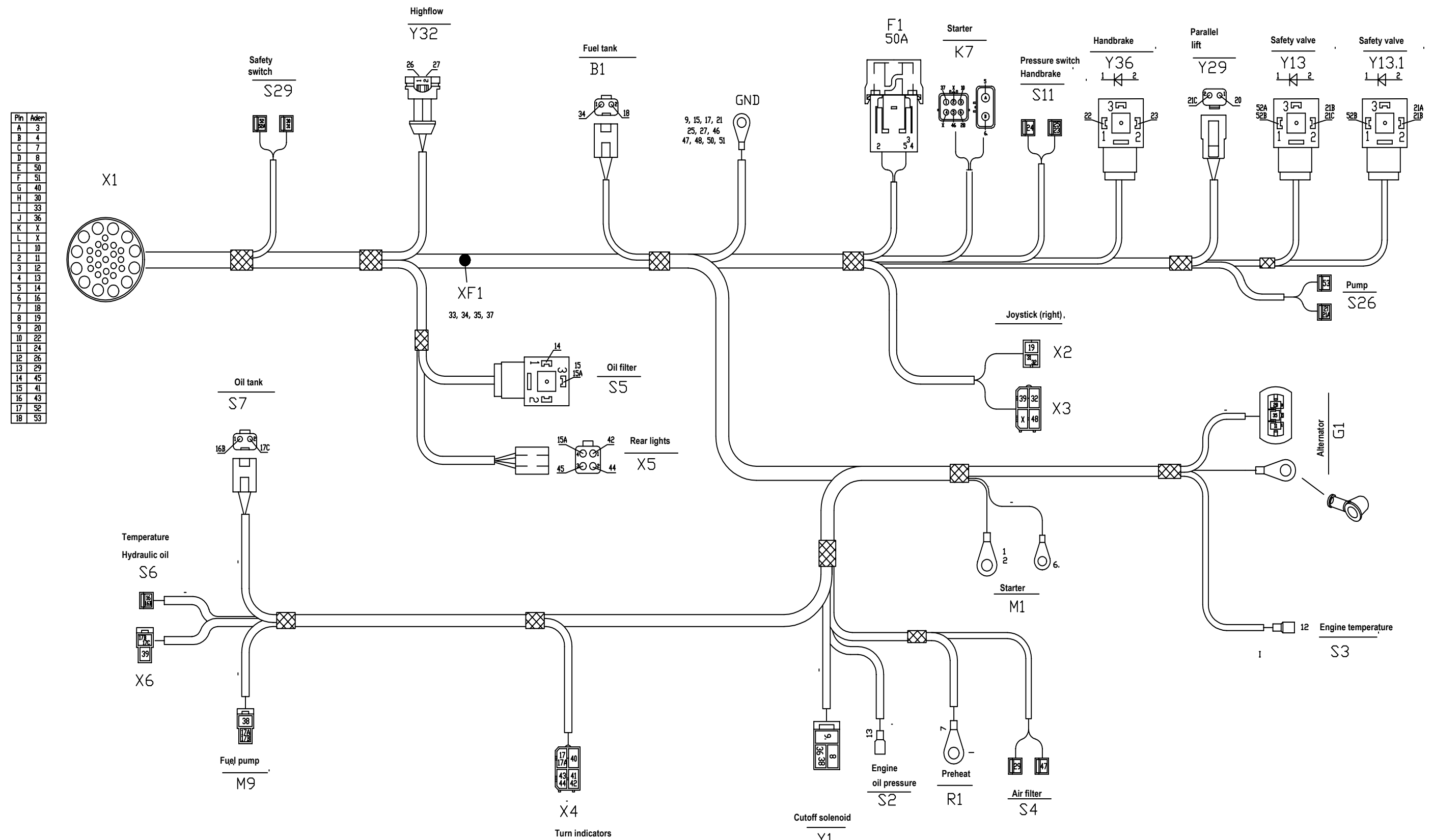
6.23 Wiring diagram A3

6.24 Wiring harness 1000147293 (legend): engine – chassis A3

No.	From	Up to	Colour	mm²
1	M1/ starter	G1/ alternator	red	10
2	M1/ starter	F1 main fuse	red	10
3	F1/ main fuse	X1/A engine/chassis connection	red	4
4	F1 main fuse	X1/B engine/chassis connection	red	4
5	F1/ main fuse	K7/A start high current relay	red	2,5
6	K7/B start high current relay	M1/ starter	wht/brn	2,5
7	R1/ glow plug	X1/C engine/chassis connection	brn	4
8	Y1/ cutoff solenoid	X1/D engine/chassis connection	wht/red	2,5
9	Y1/ cutoff solenoid	GND earth	blk	2,5
10	K7/3 start high current relay	X1/1 engine/chassis connection	wht	1
11	G1/1 alternator	X1/2 engine/chassis connection	pnk	1
12	S3 engine temperature switch	X1/3 engine/chassis connection	blk/grn	1
13	S2 engine oil pressure switch	X1/4 engine/chassis connection	wht/grn	1
14	S5/1 hydraulic oil pressure switch	X1/5 engine/chassis connection	org/wht	1
15	S5/3 hydraulic oil pressure switch	GND earth	blk	1
15A	S5/3 hydraulic oil pressure switch	X5/4 lights	blk	1
16	S6 temperature switch	X1/6 engine/chassis connection	org/blu	1
16B	S6 temperature switch	S7/1 hydraulic oil level switch	org/wht	1
17	X4/3 turn indicator connection	GND earth	blk	1
17A	X4/3 turn indicator connection	M9 fuel feed pump	blk	1
2				
17B	X6 backup warning system connection	M9 fuel feed pump	blk	1
17C	X6 backup warning system connection	S7/2 hydraulic oil level switch	blk	1
18	B1/2 fuel tank sensor	X1/7 engine/chassis connection	vio/blk	1
19	X2/1 joystick (right)	X1/8 engine/chassis connection	org	1
20	Y29/1 parallel lift magnet	X1/9 engine/chassis connection	gry/yel	1
21	S 26 pump pressure switch	GND earth	blk	1
21A	S 26 pump pressure switch	Y13.1/2 safety valve	blk	1
21B	Y13/2 safety valve	Y13.1/2 safety valve	blk	1
21C	Y13/2 safety valve	Y29 parallel lift magnet	blk	1
22	Y36/1 parking brake magnet	X1/10 engine/chassis connection	blk/red	1
23	S11 parking brake pressure switch	Y36/2 parking brake magnet	blk	1
24	S11 parking brake pressure switch	X1/11 engine/chassis connection	blk/red	1
25	S11 parking brake pressure switch	GND	blk	1
26	Y32/1 Hightflow magnet	X1/12 engine/chassis connection	gry/brn	1
27	Y32/2 Hightflow magnet	GND	blk	1
28	G1/3 alternator	K7/6 high current relay	blk/blu	1
29	S4 air filter pressure switch	X1/12 engine/chassis connection	gry/blu	1
31	X2/2 horn connection	X1/H engine/chassis connection	gry	1
32	X2/2 horn connection	X3/1 backup warning system connection	gry	1
33	XF1	X1/I engine/chassis connection	blu	1
34	XF1	B1/I fuel tank sensor	blu	1
35	XF1	G1/2 alternator	blu	1
36	Y1 cutoff solenoid	X1/J engine/chassis connection	blu/red	1
37	XF1	K7/1 start high current relay	blu	1
38	Y1	M9 feed pump	blu/red	1
39	X3/3 joystick (right)	X6	gry/blk	1
40	X4/1 turn indicator connection	X1/G engine/chassis connection	brn/yel	1
41	X4/2 turn indicator connection	X1/15 engine/chassis connection	grn/blk	1
42	X4/2 turn indicator connection	X5/1 rear lights	grn/blk	1
43	X4/4 turn indicator connection	X1/16 engine/chassis connection	grn/red	1
44	X4/4 turn indicator connection	X5/2 rear lights	grn/red	1
45	X5/3 rear lights	X1/14 engine/chassis connection	yel/blk	1
46	K7/5 start high current relay	GND earth	blk	1
47	S4 air filter pressure switch	GND earth	blk	1
48	X3/2 backup warning system connection	GND earth	blk	1
50	GND earth	X1/E engine/chassis connection	blk	1,5
51	GND earth	X1/F engine/chassis connection	blk	1,5
52	Y13/1 safety valve (701)	X1/17	brn/wht	1
A				
52B	Y13/1 safety valve (701)	Y13.1/1 safety valve (701)	brn/wht	1
53	S26 pump pressure switch	X1/18 engine/chassis connection	brn/blk	1

Wiring harness 1000147293 (legend): engine – chassis

6.25 Wiring harness 1000147293: engine – chassis A3



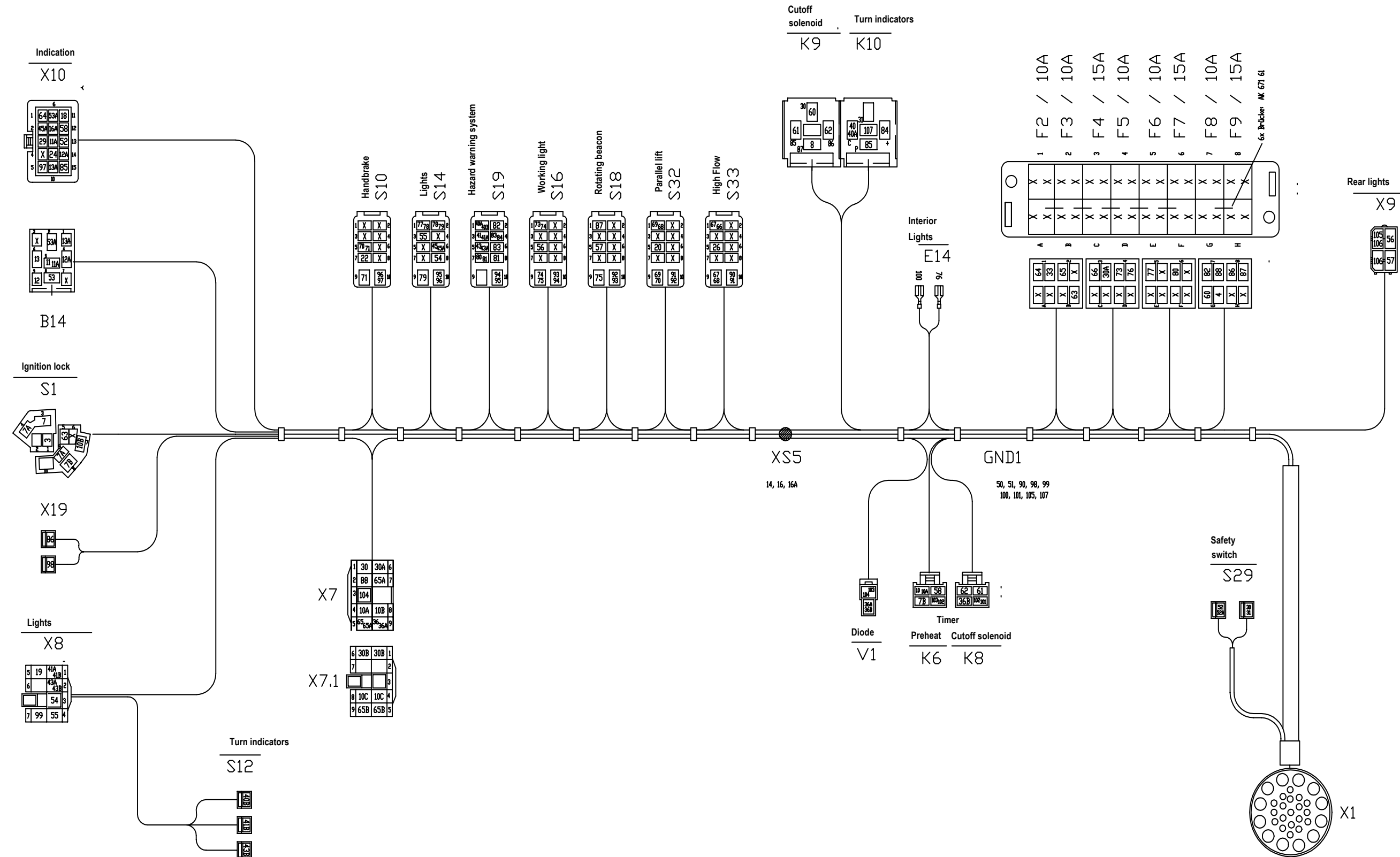


6.26 Wiring harness 1000139289 (legend): switches A3

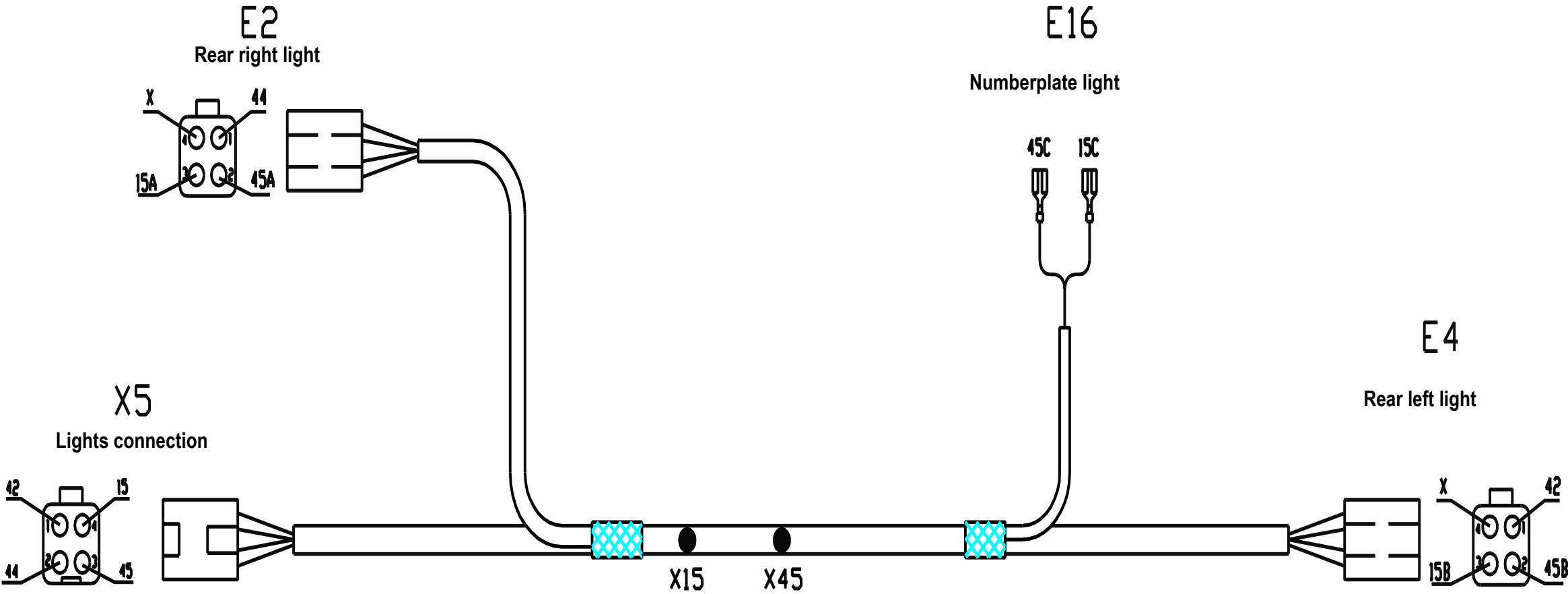
No.	Up to	To	Colour		No.	Up to	To	Colour		No.	Up to	To	Colour	
3	X1/A engine/chassis connection	S1/1 preheating start switch	red	4	45	X10/2 indicator connection	S14/6 light switch	yel/blk	1	98	DNG1 earth	X19 socket	blk	1
4	X1/A engine/chassis connection	F8 hazard warning system	red	4	A					99	GND1 earth	X8/7 lights connection	blk	1
7	X1/C engine/chassis connection	S1/1 preheating start switch	brn	4	50	X1/E engine/chassis connection	GND1	blk	1,5	100	GND1 earth	E14 interior light	blk	1
7A	S1/4 preheating start switch	S1/9 preheating start switch	brn	2,5	51	X1/F engine/chassis connection	GND1	blk	1	101	GND1 earth	K8 cutoff solenoid time lag relay	blk	1
7B	S1/8 preheating start switch	K6 preheating time lag relay	brn	1	52	X10/2 indicator connection	S29 safety switch	brn/wht	1	102	K6 preheating time lag relay	K8 cutoff solenoid time lag relay	blk	1
8	X1/D engine/chassis connection	K9/87 cutoff solenoid switching relay	wh/red	2,5	52	X1/17 engine/chassis connection	S29 safety switch	brn/wht	1	103	K6 preheating time lag relay	V1 diode	blk	1
10	X1/1 engine/chassis connection	K6 preheating time lag relay	wht	1	A					104	X7/3 terminal strip connection	V1 diode	blk	1
10	X7/4 terminal strip connection	K6 preheating time lag relay	wht	1	53	X1/18 engine/chassis connection	B14/8 warning buzzer unit diodes	brn/blk	1	105	GND1 earth	X9/3 rear lights connection	blk	1
A					53	X10/6 indicator connection	B14/2 warning buzzer unit diodes	brn/blk	1	106	X9/4 rear lights connection	X9/3 rear lights connection	blk	1
10B	X7/8 terminal strip connection	S1/7 preheating start switch	wht	1	A					107	GND1 earth	K10/87 turn indicator relay	blk	1
10C	X7.1/4 terminal strip connection	X7.1/8 terminal strip connection	wht	1	54	S14/8 light switch	X8/3 lights connection	yel/blk	1					
11	X1/2 engine/chassis connection	B14/5 warning buzzer unit diodes	pnk	1	55	S14/3 light switch	X8/4 lights connection	yel/grn	1					
11	X10/8 indicator connection	B14/5 warning buzzer unit diodes	pnk	1	56	S16/5 working light switch	X9/1 rear lights connection	yel/red	1					
A					57	S18/5	X9/2 rear lights connection	vio	1					
12	X1/3 engine/chassis connection	B14/9 warning buzzer unit diodes	blk/grn	1	58	X10/12 indicator connection	K6 preheating time lag relay	gry/red	1					
12A	X10/14 indicator connection	B14/4 warning buzzer unit diodes	blk/grn	1	60	F8 hazard warning system fuse	K9/30 cutoff solenoid switching relay	red	2,5					
2					61	K9/85 cutoff solenoid switching relay	K8 cutoff solenoid time lag relay	blu/red	1					
13	X1/4 engine/chassis connection	B14/6 warning buzzer unit diodes	wht/gn	1	62	K9/86 cutoff solenoid switching relay	K8 cutoff solenoid time lag relay	blu/red	1					
13A	X10/10 indicator connection	B14/1 warning buzzer unit diodes	wht/grn	1	63	S1/5 preheating start switch	F3 cutoff solenoid fuse	blu/red	1					
2					64	F2 indicator fuse	X10/1 indicator connection	blu	1					
14	X1/5 engine/chassis connection	XS 5	org/wht	1	65	F3 indicators and engine relay fuse	X7/5 terminal strip connection	blu/red	1					
16	X1/6 engine/chassis connection	XS 5	org/blu	1	65	X7/7 terminal strip connection	X7/5 terminal strip connection	blu/red	1					
16A	X10/7 indicator connection	XS 5	org/blk	1	A									
18	X1/7 engine/chassis connection	X10/11 indicator connection	vio/blk	1	65B	X7.1/9 terminal strip connection	X7.1/5 terminal strip connection	blu/red	1					
19	X1/8 engine/chassis connection	X8/5 lights connection	org	1	66	F4 valve fuse	S33/1 High Flow switch	gry	1					
20	X1/9 engine/chassis connection	S32/5 parallel lift switch	gry/yel	1	67	S33/9 High Flow switch	S33/1 High Flow switch	gry	1					
22	X1/10 engine/chassis connection	S10/7 parking brake switch	blk/red	1	68	S33/9 High Flow switch	S32/1 parallel lift switch	gry	1					
24	X1/11 engine/chassis connection	X10/9 indicator connection	blk/red	1	69	S32/9 parallel lift switch	S32/1 parallel lift switch	gry	1					
26	X1/12 engine/chassis connection	S33/5 HighFlow switch	gry/brn	1	70	S32/9 parallel lift switch	S10/5 parking brake switch	gry	1					
29	X1/13 engine/chassis connection	X10/3 indicator connection	gry/blu	1	71	S10/9 parking brake switch	S10/5 parking brake switch	gry	1					
30	S29 safety switch	X7/1 terminal strip connection	gry	1	73	F5 interior light fuse	S16/1 working light switch	blu/yel	1					
30A	F4 valves	X7/6 terminal strip connection	gry	1	74	S16/9 working light switch	S16/1 working light switch	blu/yel	1					
30B	X7.1/1 terminal strip connection	X7.1/6 terminal strip connection	gry	1	75	S16/9 working light switch	S18/9 rotating beacon switch	blu/yel	1					
31	X1/H engine/chassis connection	S29 safety switch	gry	1	76	F5 interior light fuse	E14 interior light	blu/yel	1					
33	X1/I engine/chassis connection	F2 alternator, fuel level sensor, indicators, start relay fuse	blu	1	77	F6 front lights fuse	S14/1 light switch	yel	1					
36	X1/J engine/chassis connection	X7/9 terminal strip connection	blu/red	1	78	S14/2 light switch	S14/1 light switch	yel	1					
36	V1 diode	X7/9 terminal strip connection	blu/red	1	79	S14/2 light switch	S14/9 light switch	yel	1					
A					80	F7 turn indicator fuse	S19/7 hazard warning system switch	grn	1					
36B	V1 diode	K8 cutoff solenoid timer	blu/red	1	81	S19/8 hazard warning system switch	S19/7 hazard warning system switch	grn	1					
1					82	F8 hazard warning system fuse	S19/2 hazard warning system switch	red/blu	1					
40	X1/G engine/chassis connection	K10/C turn indicator relay	brn/yel	1	83	S19/4 hazard warning system switch	S19/6 hazard warning system switch	grn/blu	1					
40	S19/1 hazard warning system switch	K10/C turn indicator relay	brn/yel	1	84	S19/4 hazard warning system switch	K10/+ turn indicator relay	grn/blu	1					
A					85	K10/P turn indicator relay	X10/15 indicator connection	grn/yel	1					
40B	S19/1 hazard warning system switch	S12 turn indicator switch	brn/yel	1	86	F9 socket fuse	X19 socket	red	1					
41	X1/15 engine/chassis connection	S19/3 hazard warning system	grn/blk	1	87	F9 socket fuse	S18/1 rotating beacon switch	red	1					
41	X8/1 lights switch	S19/3 hazard warning system	grn/blk	1	88	F8 hazard warning system fuse	X7/2 terminal strip connection	red	1					
A					90	GND1 earth	S33/10 High Flow switch	blk	1					
41B	X8/1 lights switch	S12 turn indicator switch	grn/blk	1	91	S32/10 parallel lift switch	S33/10 High Flow switch	blk	1					
1					92	S32/10 parallel lift switch	S18/1 rotating beacon switch	blk	1					
43	X1/16 engine/chassis connection	S19/5 hazard warning system	grn/red	1	93	S16/10 rear working light switch	S18/10 rotating beacon switch	blk	1					
43	X8/2 lights connection	S19/5 hazard warning system	grn/red	1	94	S16/10 rear working light switch	S19/10 hazard warning system switch	blk	1					
A					95	S14/10 light switch	S19/10 hazard warning system switch	blk	1					
43B	X8/2 lights connection	S12 turn indicator switch	grn/red	1	96	S14/10 light switch	S10/10 parking brake switch	blk	1					
45	X1/14 engine/chassis connection	S14/6 light switch	yel/blk	1	97	X10/5 indicator connection	S10/10 parking brake switch	blk	1					

Wiring harness 1000139289 (legend): switches

6.27 Wiring harness 1000139289: switches A3



6.28 Wiring harness 1000147262: rear lights (option) A3



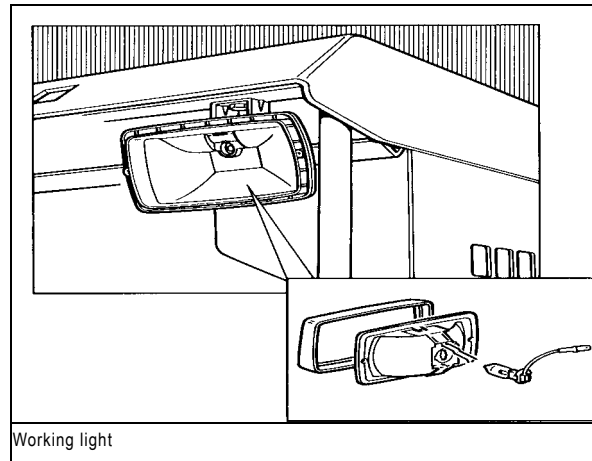
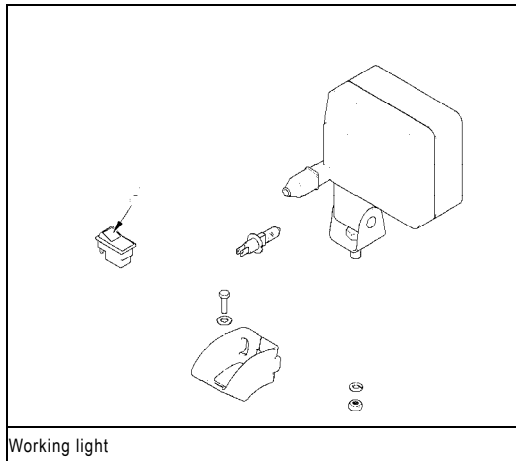
No.	Up to	To	Colour	mm²
15	X5/4 rear lights connection	X15 earth	blk	1
15 A	E2/3 rear right light switch	X15 earth	blk	1
15B	E4/3 rear left light switch	X15 earth	blk	1
15C	E16 numberplate light	X15 earth	blk	1
42	X5/1 rear lights connection	E4/1 rear left turn indicator switch	grn/blk	1
44	X5/2 rear lights connection	E2/1 rear right turn indicator switch	grn/red	1
45	X5/4 rear lights connection	X45 position light	yel/blk	1
45 A	E2/2 rear right light switch	X45 position light	yel/blk	1
45b	E4/2 rear left light switch	X45 position light	yel/blk	1
45C	E16 numberplate light switch	X45 position light	yel/blk	1

Rear lights wiring harness (option)

Options

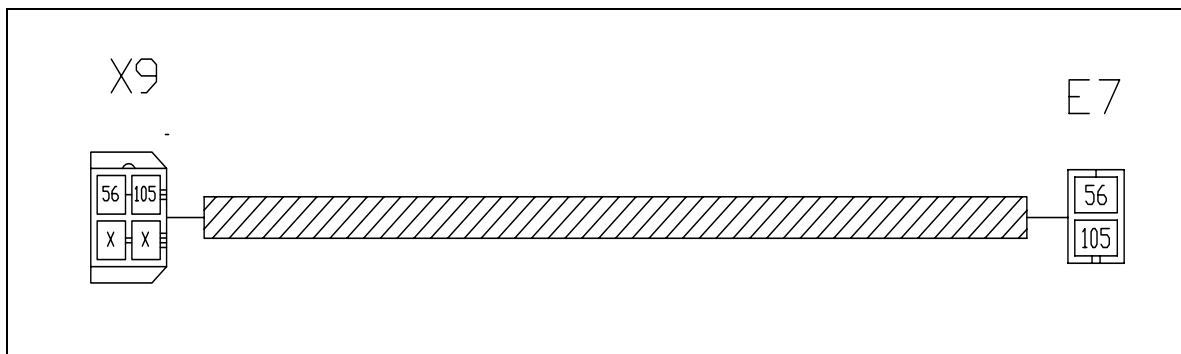
7 Options

7.1 Rear working light



Important!

Depending on the legal regulations of your country, the rear working light may possibly only be available if your machine is certified for road travel.



Wiring harness

Connections

No.	From	To
56	X9/1 rear lights connection	E7/1 rear working light
105	X9/3 rear lights connection	E7/2 rear working light



7.2 BP – Biohyd SE 46

Properties

Hydraulic ester oil (HEES)

BP Biohyd SE-S is a pressure medium based on saturated synthetic esters and synthetic hydrocarbons

It can be used in all hydraulic systems!

Viscosity @ 40 °C	Viscosity @ 100 °C
46 cSt	9 cSt

7.3 Biodegradable oil Panolin

Properties

A fully synthetic, environmentally compatible high-performance hydraulic oil based on saturated esters. A combination of special additives and high-performance base oils greatly reduces the formation of ageing products, deposits and gumming at high service temperatures

Viscosity @ 40 °C	Viscosity @ 100 °C
48.7 cSt	8.7 cSt

7.4 Immobilizer antitheft protection



Enabling the drive interlock

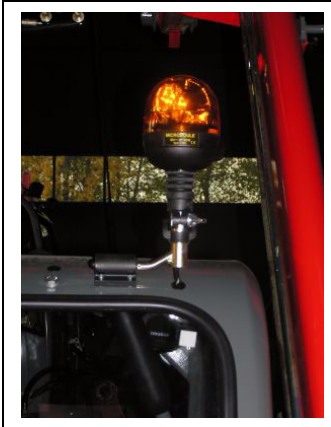
This automatic system enables the drive interlock 30 seconds after having removed the ignition key or turned it to the ZERO position. The machine can be restarted within 30 seconds without having to disable the drive interlock again.

Disabling the drive interlock

Approach the transponder key about 2 cm to the sender and receiver unit to disable the drive interlock. The drive interlock is switched off as soon as the red light goes out. The driver now has 30 seconds to insert the ignition key in the ignition lock and to start the machine.

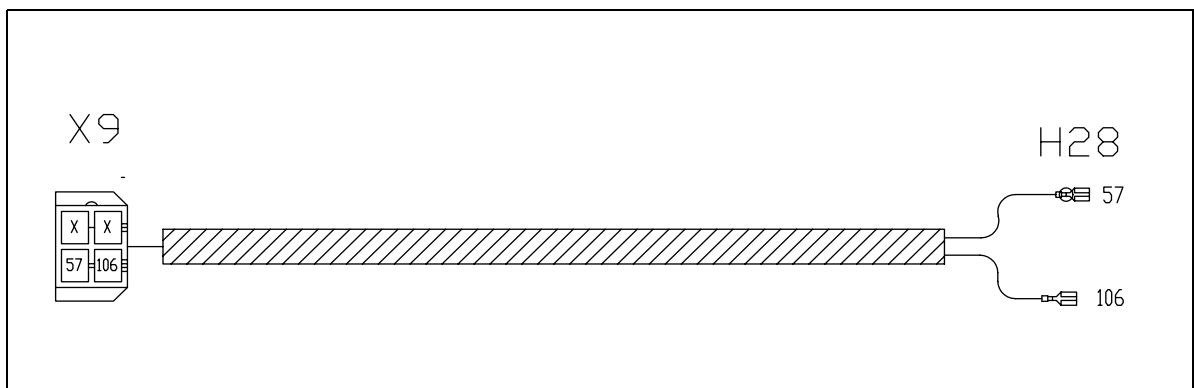
Pos.	Description
1	Receiver unit
2	LED
3	Electronics

7.5 Rotating beacon



Located at the rear right of the roof

Wiring harness



Connections

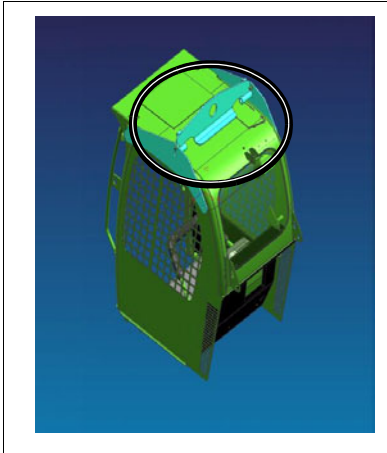
Pos.	From	To
57	X9/2 rear lights connection	H28 rotating beacon
106	X9/4 rear lights connection	H28 rotating beacon



Important!

Observe the legal regulations of your country for operating the rotating beacon.

7.6 Loading tie-bar



Fixture for raising the complete skid steer loader.

7.7 FOPS roof level 2

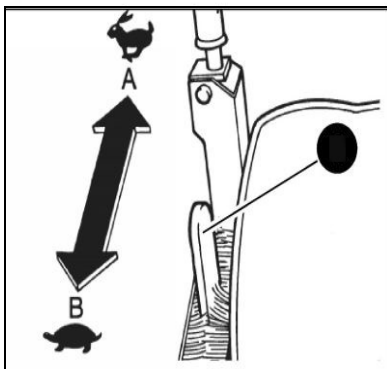


FOPS falling object protective structures

The FOPS protective structure must cover and go beyond the complete vertical projection of the deformation limit range.

Level 2 absorbs more energy (up to 10 000 J) in an emergency.

7.8 Accelerator pedal



Speed regulation with the accelerator

Used for frequent changes of the revs setting.

Pressing the accelerator briefly increases the revs set with the manual throttle.



Important!

Output can not be increased with the accelerator pedal if maximum revs have been set with the manual throttle.



7.9 Inside rearview mirror

Position

In upper left of cab.



7.10 Comfort seat

Properties



- Horizontal adjustment
- Weight adjustment
- Length and inclination adjustment of armrests



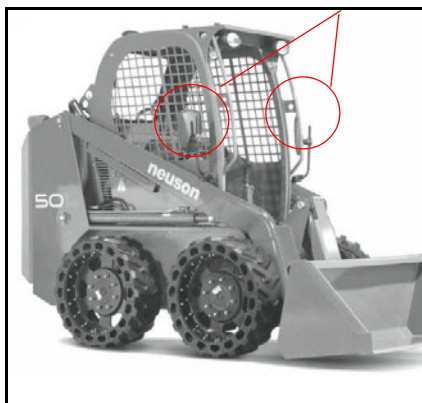
Danger!

Never change the seat position when driving or working

Danger of accidents

 *Adjust the seat before moving the machine*

7.11 Mirror package



Important!

Depending on the legal regulations of your country, the mirror package may be available with the road travel option – [see section 7.16 Road travel certification](#) on page 7-11

7.12 Backup warning system

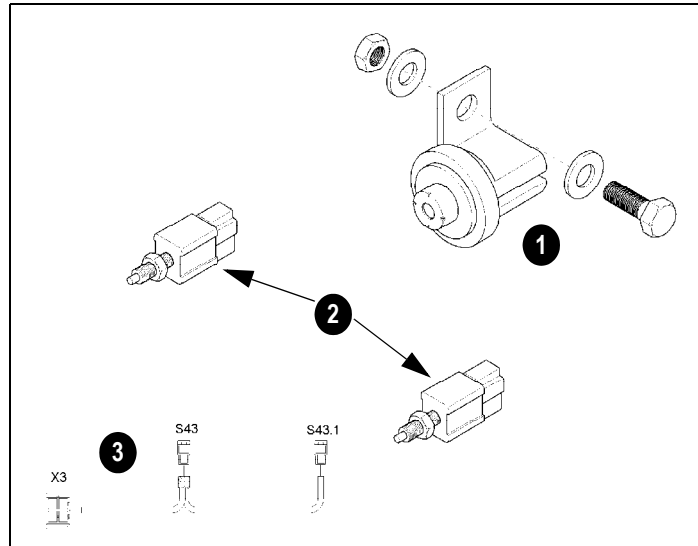
Function

Emits a signal when reversing.

Pulling back both control levers actuates two switches and emits a signal. The signal is emitted upon actuating one switch only.

Position

In the engine compartment on the left

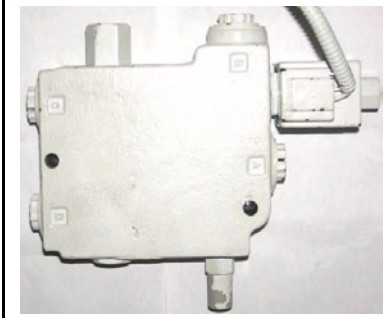


Pos.	Description
1	Signal transmitter
2	Switch
3	Connections



7.13 Parallel bucket lift

Function

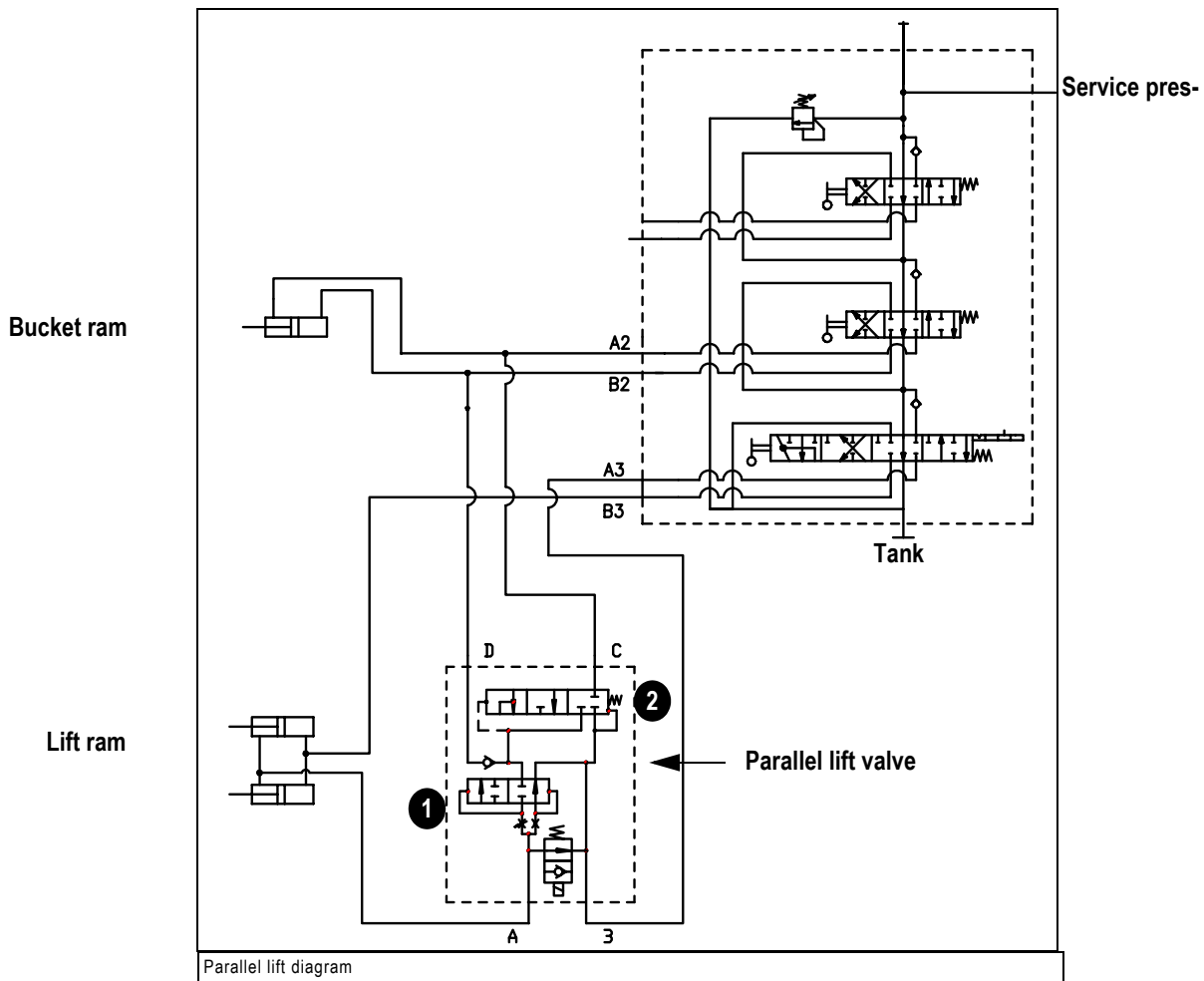


Actuating parallel bucket lift keeps the bucket at the preset angle with respect to the ground. The bucket does not need to be corrected manually when raising the loader unit. Bucket ram action is automatically corrected in order to maintain the correct angle. Lowering the bucket deactivates the parallel lift.

Explanation

Oil is pumped into the lift rams (base side) by actuating the loader unit, and the oil displaced on the rod side flows to the parallel lift valve (which has to be connected). In this unit the oil flows through two throttle orifices (adjustable and fixed setting) where a small quantity flows to the tank initially. Once the pressure that has been built up switches the internal 4/2 directional valve (1), the oil flows to the bucket ram's base side. The oil displaced on the rod side passes on to the tank after the pressure that has been built up switches the internal 3/3 directional valve (2).

This keeps the bucket in a parallel position.



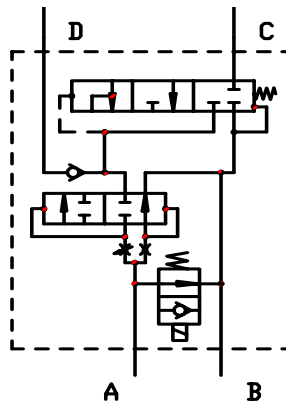
Options



neuson®

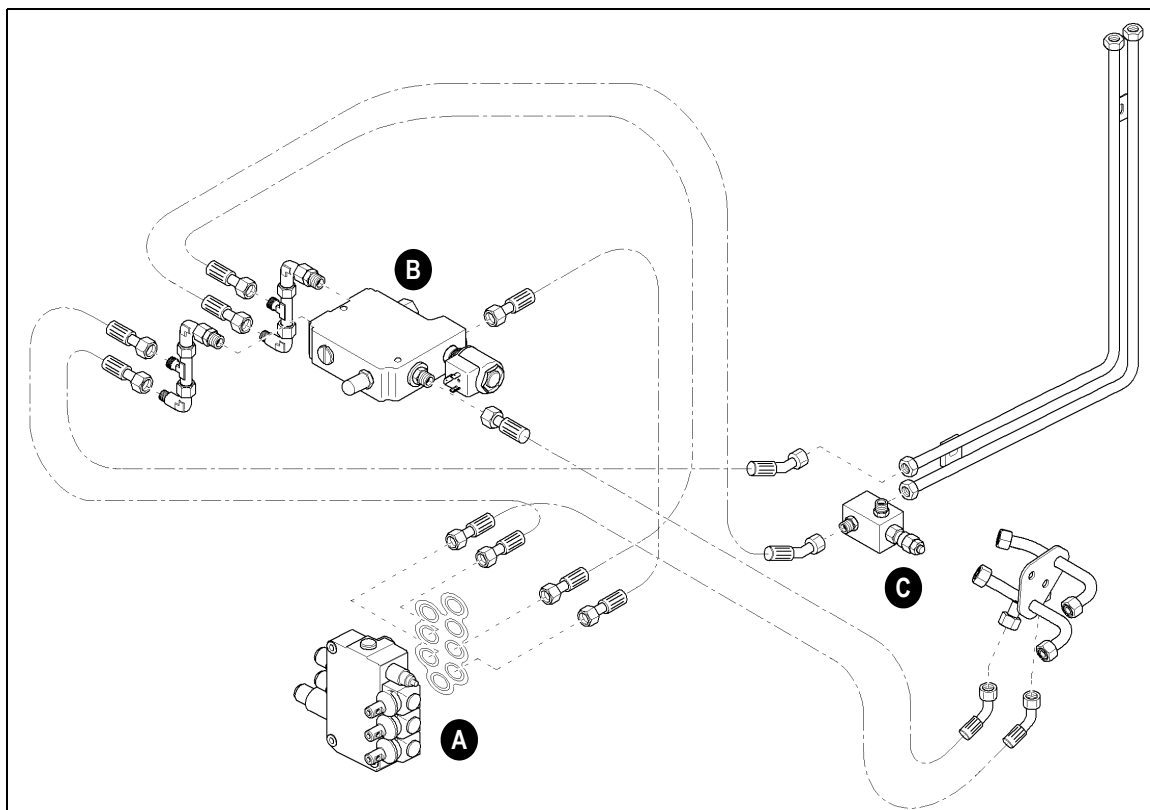
Hydraulic diagram

Hydraulic diagram



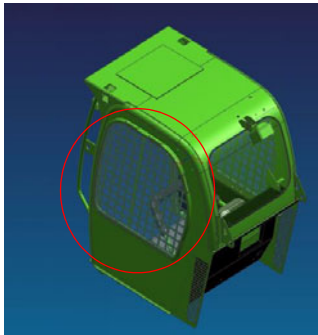
Port	Legend
A	Lift ram port (rod side)
B	Main valve block port
C	Bucket ram port (rod side)
D	Bucket ram port (base side)

Installation



Port	Legend
A	Main valve block
B	Parallel lift valve
C	Work hydraulics pressure limiting valve

7.14 Side window



Cab ventilation

7.15 Paint other than standard

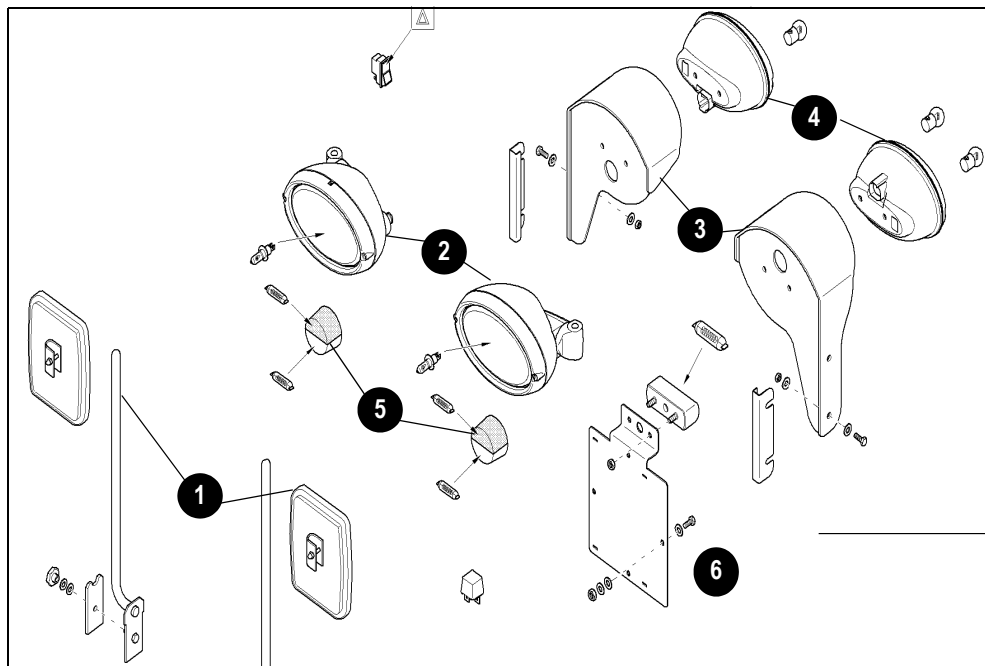
All primer-coated parts can be ordered in any RAL colour.

7.16 Road travel certification



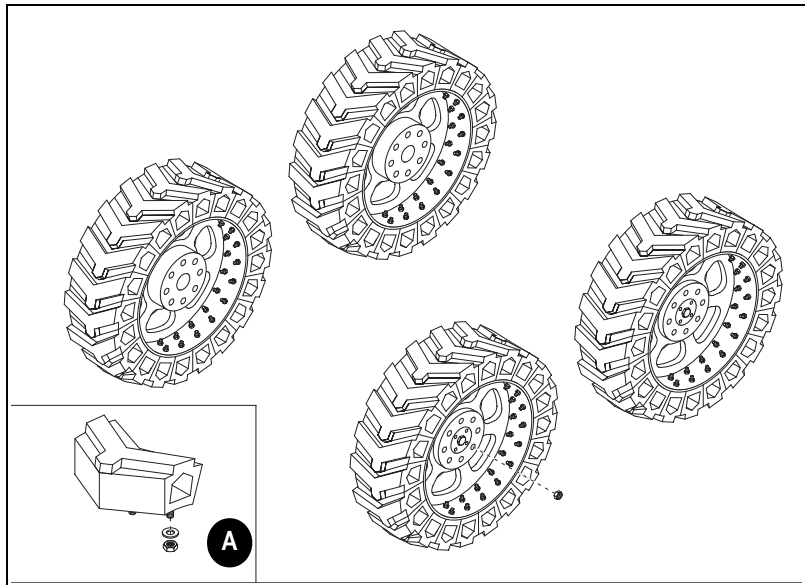
Important!

Depending on the legal regulations of your country, only specifically certified machines may be allowed to travel on public roads



No.	Description
1	Rearview mirror
2	Lights
3	Bracket for rear light
4	Rear light
5	Turn indicators
6	Numberplate bracket

7.17 Airboss tyres



Pos.	Description
A	Tyre segment 27x8.50-15



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