Service manual

Dumper

3001

Machine model	**3001**
	D03-05 (from WNCD0305VPAL00283
Edition	**2.6**
Language	**en**
Article number	**1000156004**

WACKER NEUSON

Documentation

Title	Language	Order no.
Operator's Manual	de	1000172670
Service manual	en	1000156004
Spare parts catalog de/en/fr	From AA31001D / AB27126D to AA31495D / AB27168D; From AC310003D/AD310200D to AC310199/AD310241; From AE310242D/EA01286	1000138134; 1000173900; 1000183393

Legend

Edition	Issued
1.0	01/2005
1.1	05/2007
2.0	02/2008
2.1	08/2012
2.2	10/2012
2.3	02/2014
2.4	06/2014
2.5	06/2015
2.6	10/2015

Wacker Neuson Linz GmbH keep abreast of the latest technical developments and constantly improve their products. For this reason, we may from time to time need to make changes to figures and descriptions in this documentation that do not reflect products that have already been delivered and that will not be implemented on these machines.

Technical data, dimensions and weights are only given as an indication. Responsibility for errors or omissions not accepted.

The cover features the machine with possible optional equipment.

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Refer to the Operator's Manual of the machine for information on labels.

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Operation

1 Operation

1.1 Information on this service manual

This chapter describes the controls and contains information on the function and handling of the indicator and warning lights and controls on the control stand.

The pages stated in the table refer to the description of the controls.

A combination of digits, or a combination of digits and letters (for example 40/**18** or 40/**A**) used for identifying the control elements, means:
fig. no. 40/control element no. 18 or position **A** in fig. no. 40

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

The symbols used in the description have the following meanings:

- Identifies a list.
  - Subdivision within lists or an activity. Follow the steps in the recommended order.

☞ *This symbol requires you to perform the activity described.*

➥ Description of the effects or results of an activity.

“Option” is stated whenever controls or other components of the machine are installed as an option.

1.2 Identification of warnings and dangers

Important indications regarding the safety of the personnel and the machine are identified in this service manual with the following terms and symbols:

Danger!

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

- Measures for avoiding danger

Caution!

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

- Measures for avoiding danger for the machine

Notice!

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

Environment!

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

1.3 Designated use and exemption from liability

- The machine is intended for:
  - transporting the usual bulk material and concrete on construction sites
  - Every other application is regarded as not designated for the use of the machine. Wacker Neuson will not be liable for damage resulting from use other than mentioned above. The user alone will bear the risk.
    Designated use also includes observing the instructions set forth in the Operator's Manual and observing the maintenance and service conditions.
- The safety of the machine can be negatively affected by performing machine modifications without proper authority and by using spare parts, equipment, attachments and optional equipment that have not been checked and released by Wacker Neuson. Wacker Neuson will not be liable for damage resulting from this
- Wacker Neuson GmbH shall not be liable for personal injury and/or damage to property caused by failure to observe the safety instructions, the Operator's Manual and the service manual, and by the negligence of the duty to exercise due care when:
  - handling
  - operating
  - servicing and performing maintenance and
  - repairing the machine. This is also applicable in those cases in which special attention has not been drawn to the duty to exercise due care, in the safety instructions, the Operator's Manuals and maintenance manuals (machine/engine).
  - Read and understand the Operator's Manual and the service manual before starting up, servicing or repairing the machine. Observe the safety instructions!

1.4 Type labels and component numbers

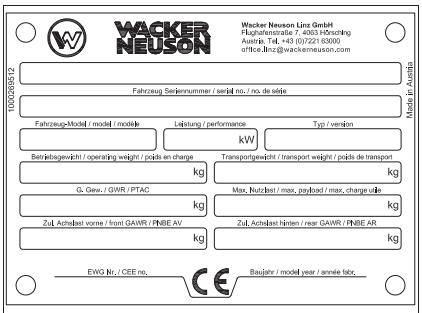


Fig. 1: Type label (symbolic representation)

Serial number

The serial number is located on the type label.

The serial number is also stamped on the machine chassis.

Refer to the Operator's Manual of the machine for more information.

Fig. 2: Cabin type label

Cabin type label (option)

The type label is located in the cabin on the left on the B pillar.

Fig. 3: Rollbar type label

Rollbar type label

The type label is located at the rear left on the rollbar.

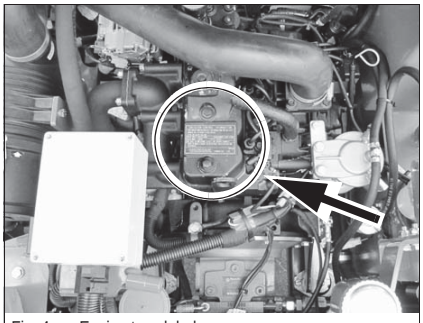


Fig. 4: Engine type label

Engine type label (Yanmar)

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

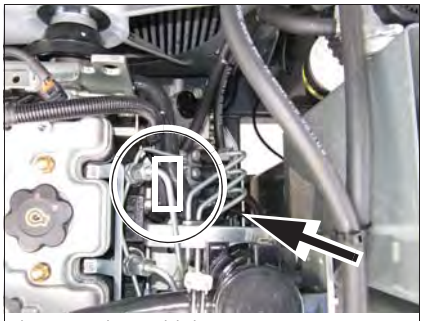


Fig. 5: Engine type label

Engine type label (Perkins)

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

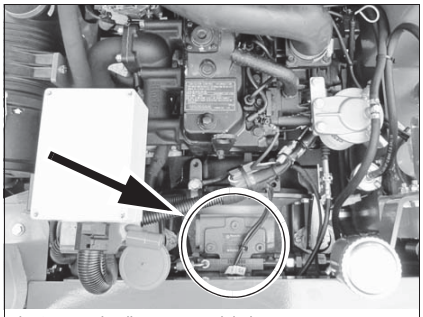


Fig. 6: Hydraulic pump type label

Hydraulic pump type label (cabin option)

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

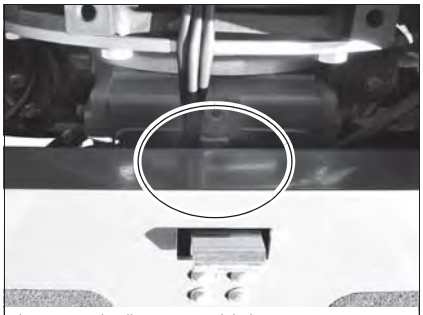


Fig. 7: Hydraulic pump type label

Hydraulic pump type label (rollbar)

The type label is located under the engine cover on the hydraulic pump housing.

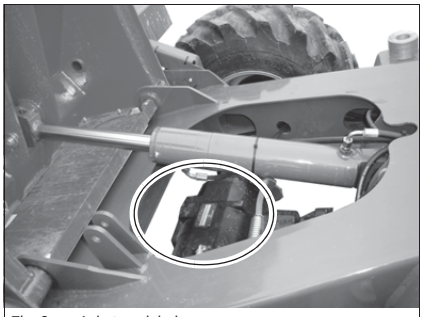


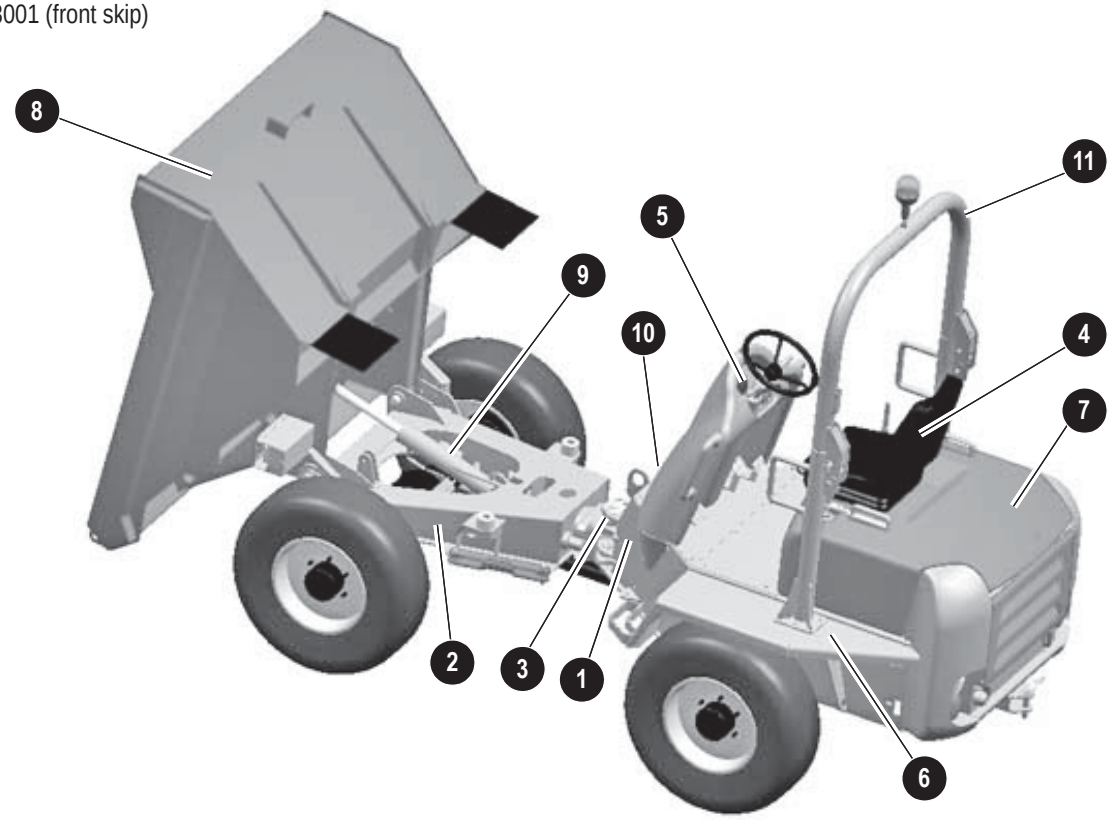
Fig. 8: Axle type label

Axle type label

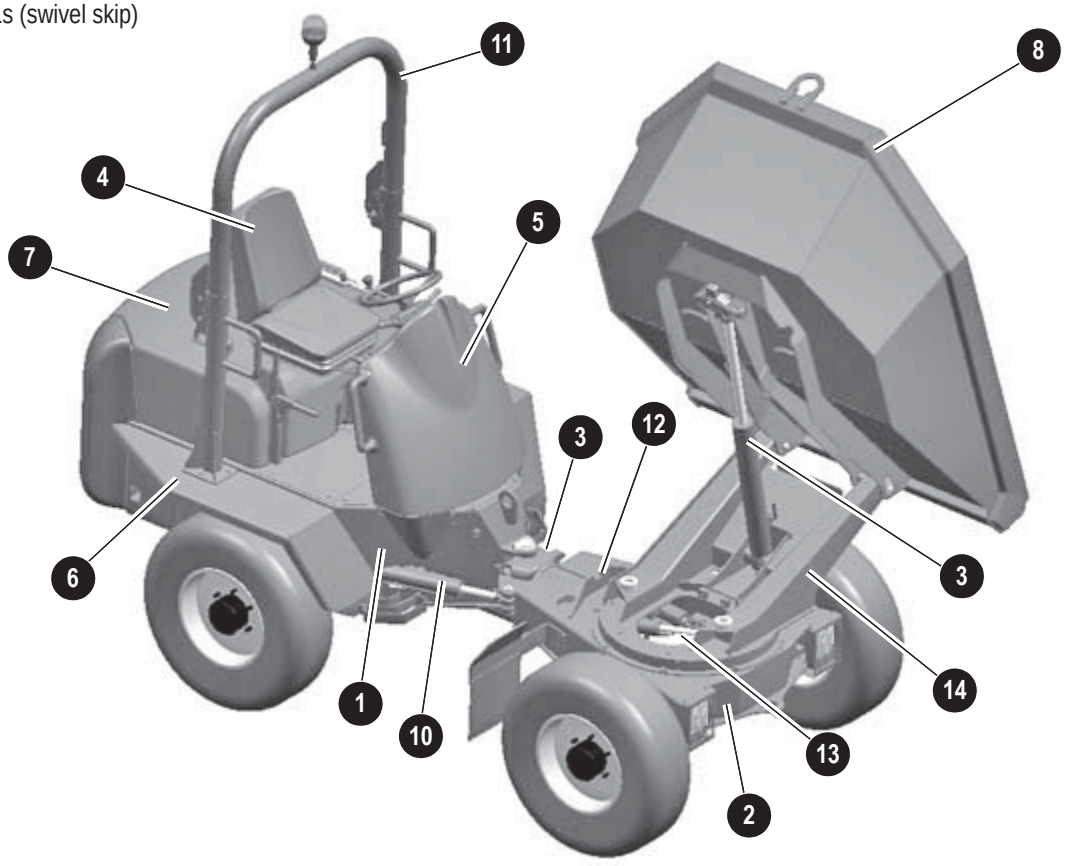
The type label (arrow) is located on the upper side of the axle housing.

1.5 Machine overview

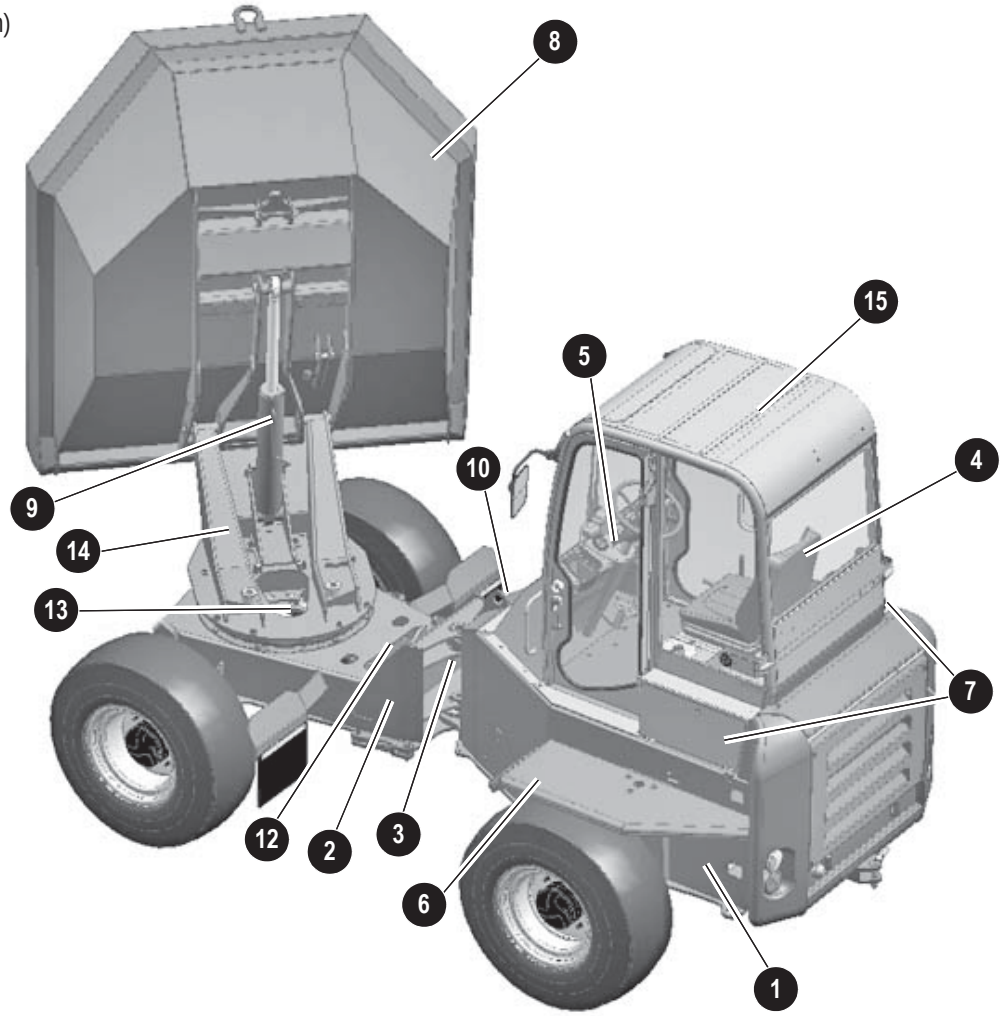
Model 3001 (front skip)



Model 3001s (swivel skip)
(option)



Model 3001s cabin (option)



Pos.	Designation
1	Rear chassis
2	Front chassis
3	Articulated joint
4	Operator seat
5	Control stand
6	Mudguard
7	Engine cover/left and right maintenance access (machine with optional cabin)
8	Skip
9	Tilt cylinder
10	Steering cylinder
11	Rollbar
12	Swivel center position (option)
13	Swiveling cylinder (option)
14	Swiveling console (option)
15	Cabin (option)

1.6 Control stand overview

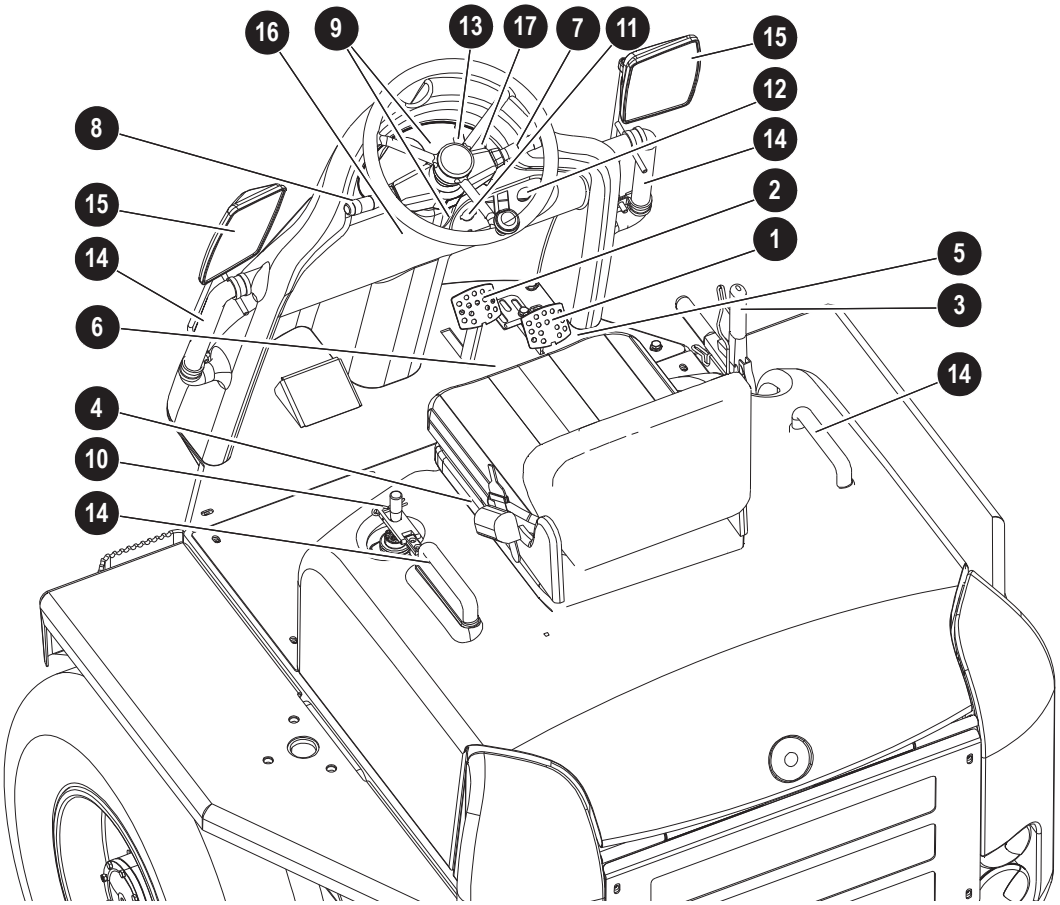


Fig. 9: Rollbar and front chassis not included in this figure for a clearer graphic representation (symbolic representation).

Pos.	Designation
1	Accelerator pedal
2	Service brake
3	Parking brake
4	Seat/backrest adjustment lever
5	Lever for horizontal seat adjustment
6	Adjusting wheel for seat weight adjustment
7	Multifunctional lever (right)
8	Multifunctional lever (left)
9	Display element
10	Skip control lever
11	Starter
12	Hazard warning switch (option) (Yanmar)
13	Low speed switch (turtle) (Yanmar)
14	Handhold
15	Rearview mirrors (option)
16	Hazard warning switch (option) (Perkins)
17	Push button for particulate filter regeneration (option) (Perkins)

1.7 Overview of cabin control stand (option)

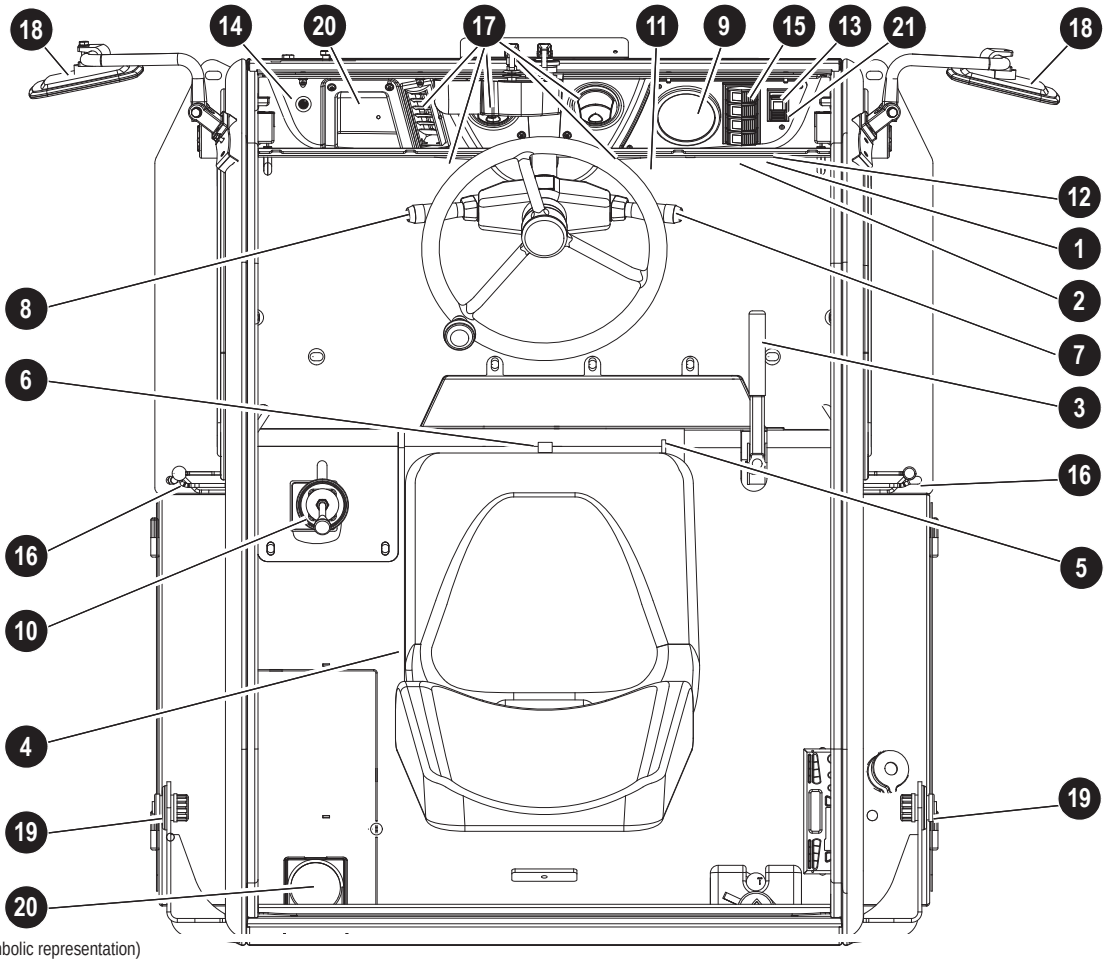
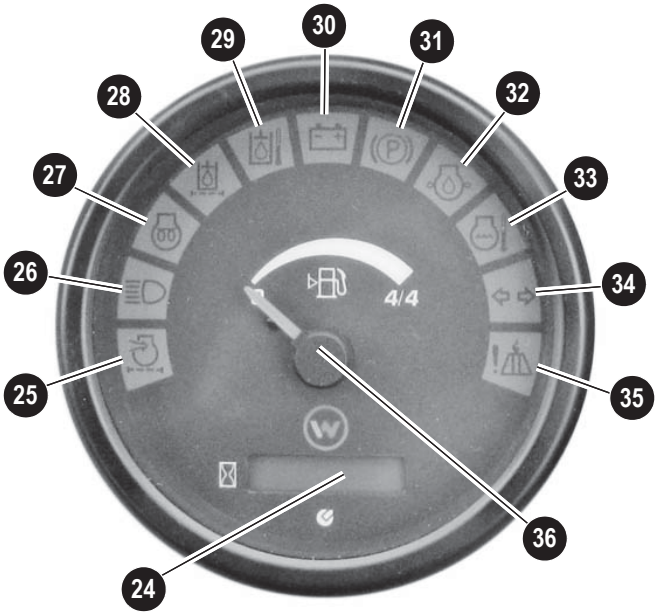
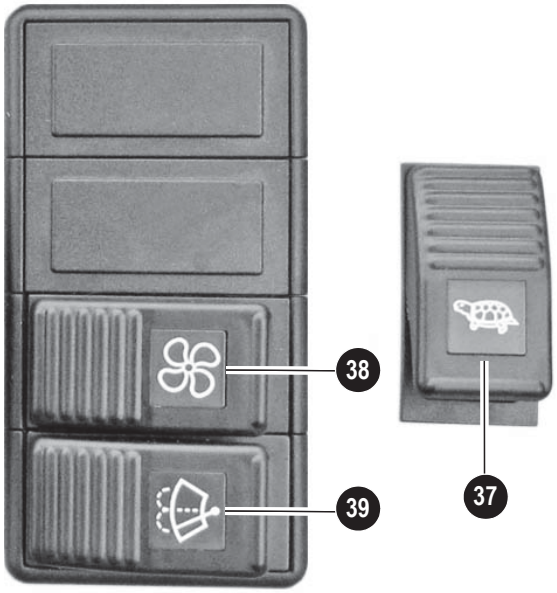


Fig. 10: (symbolic representation)

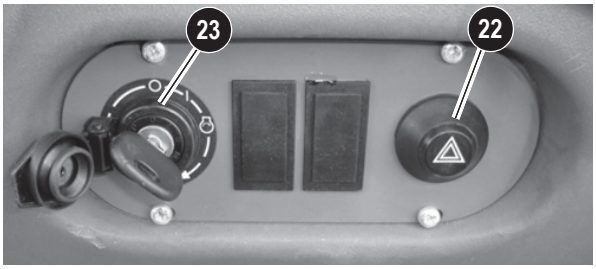
Pos.	Designation
1	Accelerator pedal
2	Service brake
3	Parking brake
4	Seat/backrest adjustment lever
5	Lever for horizontal seat adjustment
6	Adjusting wheel for seat weight adjustment
7	Multifunctional lever (right)
8	Multifunctional lever (left)
9	Display element
10	Skip control lever
11	Starter
12	Hazard warning switch (option)
13	Low speed switch (turtle) (Yanmar)
14	Heating/ventilation temperature controller
15	Switch panel
16	Handhold
17	Air vents
18	Rearview mirrors (option)
19	Door arresters
20	Drinks holder, storage compartment
21	Push button for particulate filter regeneration (option) (Perkins)

1.8 Instrument panel overview (Yanmar)

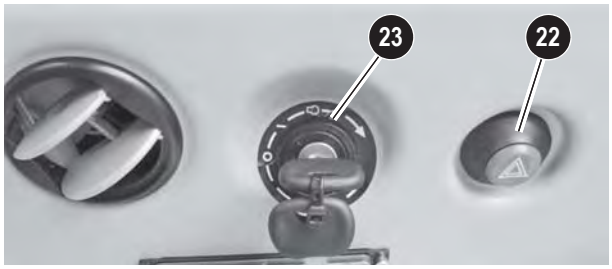




Machine with rollbar

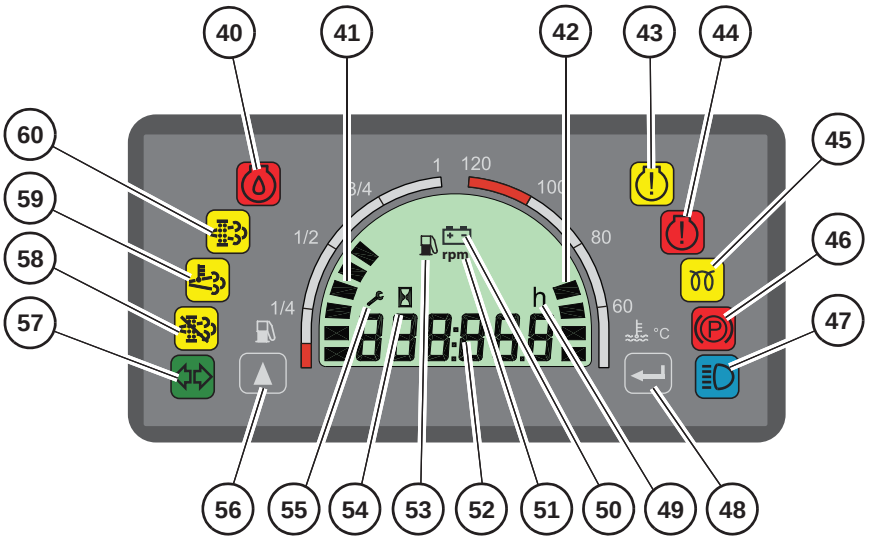


Machine with optional cabin

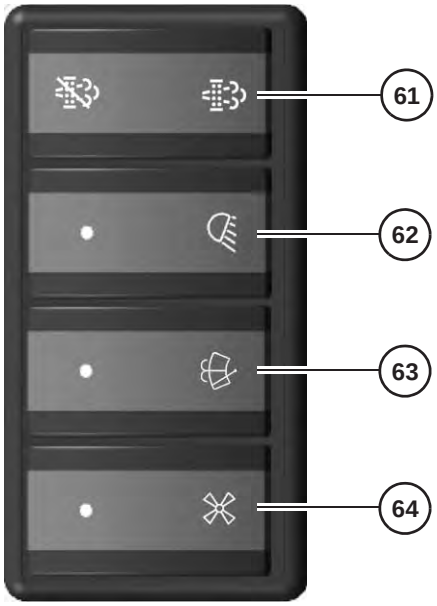


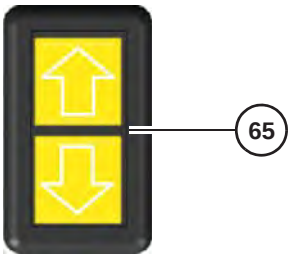
Pos.	Designation
22	Hazard warning switch (option)
23	Starter
24	Hour meter
25	Not assigned
26	Indicator light (blue) – high beam
27	Indicator light (yellow) – cold starter
28	Indicator light (red) – hydraulic oil filter
29	Not assigned
30	Indicator light (red) – alternator charge function
31	Indicator light (red) – parking brake
32	Indicator light (red) – engine oil pressure
33	Indicator light (red) – coolant temperature
34	Turn indicator light (green)
35	Not assigned
36	Fuel level indicator
37	Low speed switch
38	Heating/ventilation switch (with optional cabin)
39	Wipe/wash switch (with optional cabin)

1.9 Overview of display element and switches (Perkins)



Switches (machine with cabin) (option)





Switches (machine with rollbar)

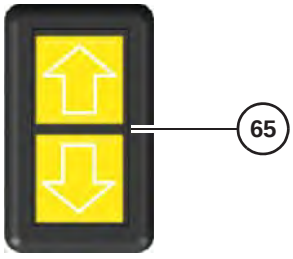


Fig. 11

Pos.	Designation
40	Engine oil pressure (red)
41	Fuel level indicator
42	Coolant temperature
43	Engine warning light (charge indicator light, hydraulic oil filter, air filter dirt indicator) (yellow)
44	Engine stop (red)
45	Preheating (yellow)
46	Parking brake (red)
47	High beam (blue)
48	For Wacker Neuson service center
49	Hours
50	Charge indicator light
51	Engine speed
52	Display: hour meter/maintenance meter/engine speed/speed (not assigned)
53	Low-fuel warning display
54	Operating hours
55	Maintenance meter
56	Changeover: hour meter/maintenance meter/engine speed/speed (not assigned)
57	Turn indicators (green)
58	Regeneration disabled (yellow)
59	Exhaust-gas temperature (yellow)
60	Regeneration required (yellow)
61	Regeneration push button
62	Roof lights switch (optional with cabin)
63	Wipe/wash switch (optional with cabin)
64	Fan switch (optional with cabin)
65	Indicator light: forward/reverse travel enabled (yellow)

1.10 Parking the machine

Danger!

Crushing hazard due to machine rolling away under its own weight after parking it!

Causes serious injury or death.

- Park the machine on firm, level and horizontal ground.
- Secure the wheels accordingly (for example chocks).

Notice!

Never stop the engine under full load, otherwise it can be damaged due to overheating.

- Let the engine briefly run at idling speed with no load before you switch it off.

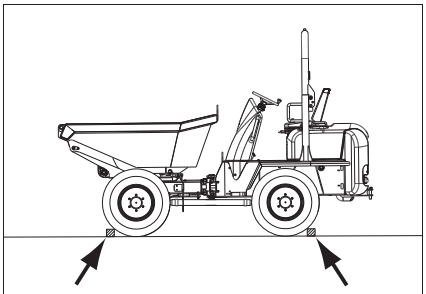


Fig. 12: Stopping and parking the machine

☞ *Park the machine on firm, level and horizontal ground.*
☞ *Set the multifunctional lever on the right to neutral position.*
☞ *Set the skip to base position.*
☞ *Apply the parking brake.*
☞ *Remove the starting key and carry it with you.*
☞ *Leave the control stand.*
☞ *Close and lock all covers.*
☞ *Park the machine only transversally to a slope.*
☞ Secure the machine with chocks to prevent it from rolling away.

Notice!

Secure the machine against unauthorized operation.

- Remove the starting key and carry it with you.
- Lock the cabin (option).

1.11 Engine cover

Danger!

Injury hazard due to hot and rotating parts!

Can cause serious injury.

- Open the engine cover only at engine standstill.
- Stop the engine and let it cool down.
- Wear protective equipment.

Notice!

The engine cover must always be safely locked.

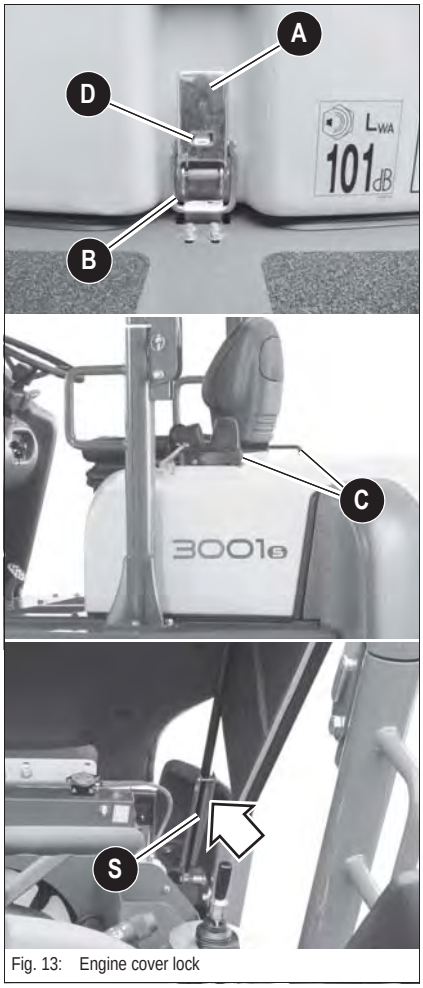


Fig. 13: Engine cover lock

Opening:

☞ *Press buckle **A** of the engine cover to the front and pull shackle **B** to the front at the same time.*

☞ *Pull the engine cover upward with handles **C** until the red safety prop **S** locks into place.*

Closing:

☞ *Press safety prop **S** to the rear.*

☞ *Press down the engine cover.*

☞ *Press buckle **A** forward and hitch shackle **B** into the hook at the same time.*

☞ *Press buckle **A** to the rear.*

Locking and unlocking:

The engine cover can be locked in eyelet **D** with an external lock.

Notice!

Do not lock the engine cover during machine operation since the emergency switch (battery master switch) is located under the engine cover.

1.12 Maintenance accesses (machine with optional cabin)

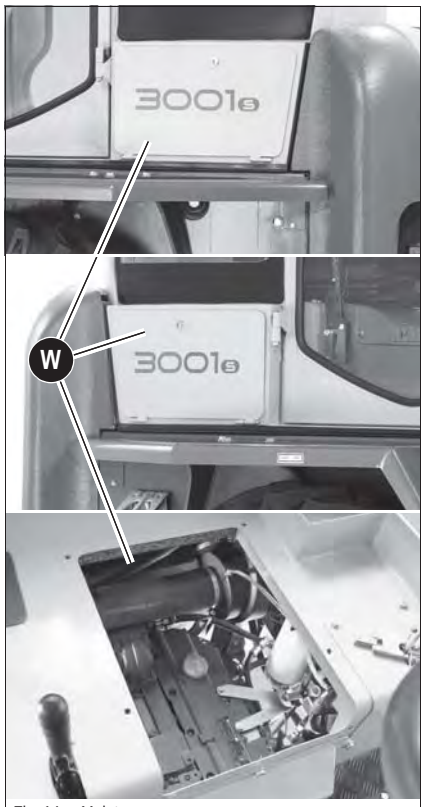


Fig. 14: Maintenance accesses

The maintenance accesses **W** are located outside on the left and right of the cabin, and inside under the operator seat.

1.13 Maintenance prop

Danger!

Crushing hazard if the skip is not supported correctly!

Causes serious injury or death.

- Support the skip before performing maintenance.

Danger!

Crushing hazard when lowering the skip!

Causes serious injury or death.

- Slowly and carefully lower the skip.

Front skip

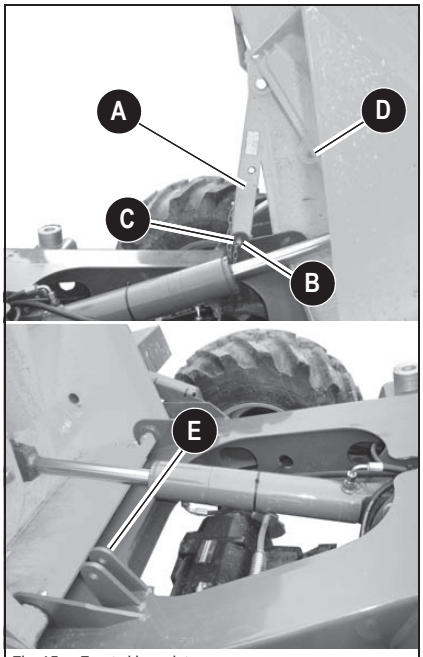


Fig. 15: Front skip maintenance prop

Installing the maintenance prop

☞ *Raise the skip.*

☞ *Remove spring plug **B** from pin **C**.*

☞ *Remove pin **C** from guide **D**.*

☞ *Lower the skip until the holes of guide **E** and the holes of maintenance prop **A** are aligned.*

☞ *Insert pin **C** in guide **E**.*

☞ *Secure pin **C** with spring plug **B**.*

- Install the maintenance prop back onto the skip, in the reverse order, if it is no longer needed.

Swivel skip

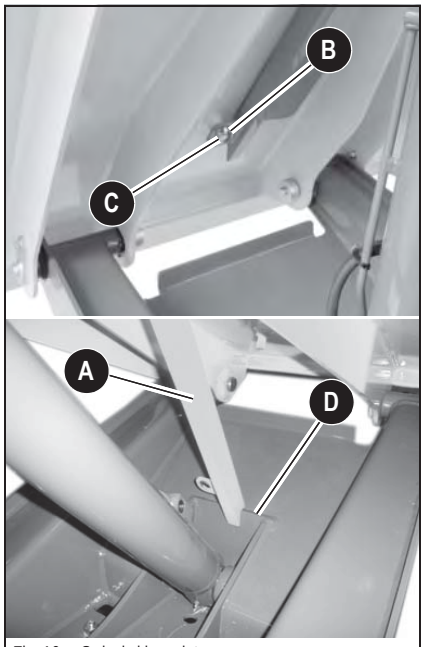


Fig. 16: Swivel skip maintenance prop

Installing the maintenance prop

☞ *Raise the skip.*

☞ *Pull safety pin **B** out of pin **C**.*

☞ *Lower the skip until maintenance prop **A** rests on swiveling console **D**.*

- Install the maintenance prop back onto the skip, in the reverse order, if it is no longer needed.

1.14 Center-pivot prop

Danger!

Crushing hazard if the chassis is not supported with a prop!

Causes serious injury or death.

- Support the skip before performing maintenance.

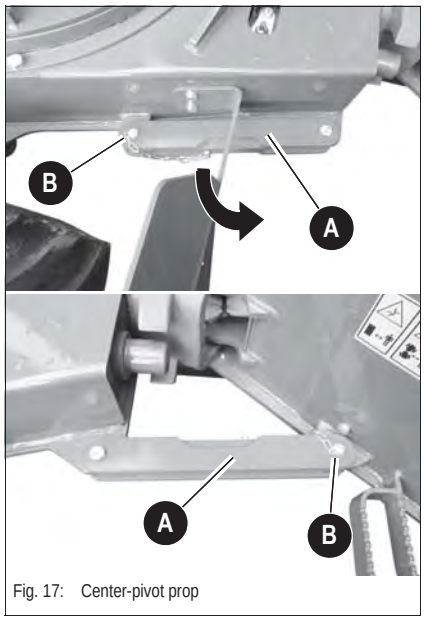


Fig. 17: Center-pivot prop

The center-pivot prop connects the front and rear chassis to prevent steering movements (via the articulated joint) when lifting the machine with a crane.

Procedure

☞ *Pull the spring plug out of pin **B** at the bottom.*

☞ *Pull pin **B** out of the guide.*

☞ *Turn the center-pivot prop **A** toward the rear chassis and secure it with pin **B**.*

☞ *Secure the center-pivot prop with the spring plug.*

Notice!

Fasten the center-pivot prop in its base position again before putting the machine into operation.

1.15 Rollbar

Danger!

Accident hazard when operating the machine with a lowered rollbar.

Causes serious injury or death.

- Machine operation is only allowed if the rollbar is raised and locked, and if the seat belt is fastened.
- Wear protective equipment (for example protective clothing, safety glasses).
- Depending on the situation, machine travel over very short distances with a lowered rollbar is allowed (for example in case of low clearance heights).

Caution!

Injury hazard when lowering or raising the rollbar!
Can cause injury.

- Lowering or raising the rollbar must be performed by two persons.

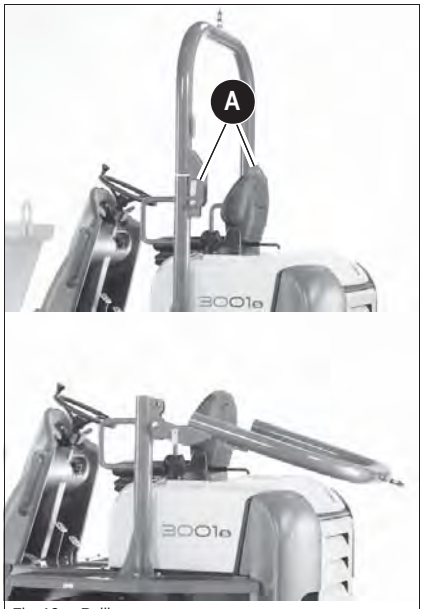


Fig. 18: Rollbar

Lowering the rollbar:

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

☞ *Remove the split pins from lock pins **A**.*

☞ *Remove lock pins **A**.*

☞ *Slowly and carefully lower the rollbar with the help of a second person.*

Raising the rollbar:

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

☞ *Slowly and carefully raise the rollbar with the help of a second person.*

☞ *Fasten the rollbar with lock pins **A** and secure it with split pins.*

1.16 Locking the control lever

Danger!

Accident hazard due to unintentional actuation of the skip!

Can cause serious injury or death.

- Lock the control lever for skip operation during road travel.

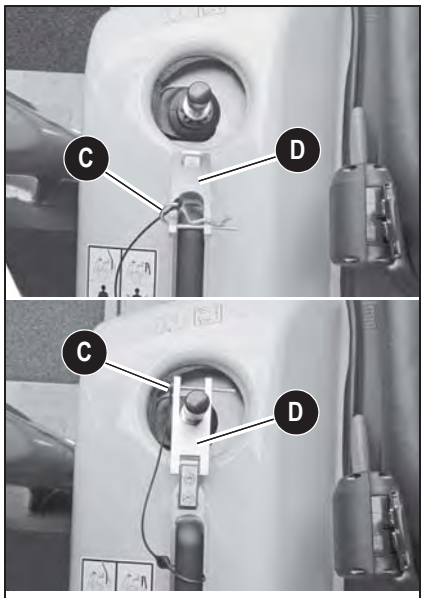


Fig. 19: Locking the control lever

☞ *Pull split pin **C** out of lock **D**.*

☞ *Fold lock **D** to the front.*

☞ *Insert split pin **C** in lock **D**.*

- Unlock in the reverse order.

1.17 Battery master switch up to serial number WNCD0305VPAL00283 (Yanmar)

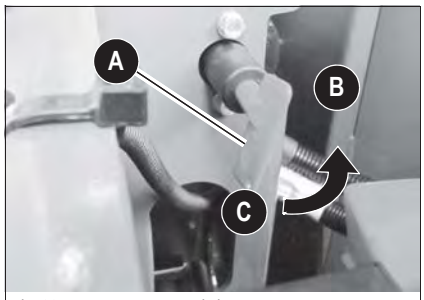


Fig. 20: Battery master switch

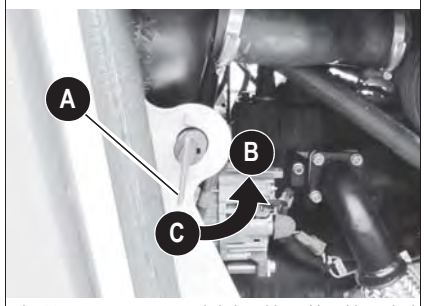


Fig. 20: Battery master switch (machine with cabin option)

The battery master switch is located on the right in the engine compartment.

- Machine with optional cabin:
  ➥ Behind the maintenance access on the right.

Notice!

Do not disconnect the battery while the engine is running.
The power supply is interrupted directly after the battery, by means of key **A** of the battery master switch.
Actuate the battery master switch:

- Before working on the electrical system.
- As an antitheft precaution.

Interrupting power supply:

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

Switching on power supply:

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

☞ *Turn the key downward to position **C**.*

1.18 Rotating beacon (option)

Fig. 21: Rotating beacon on rollbar

Fig. 21: Cabin rotating beacon

The rotating beacon is switched on as soon as the starting key is in position 1.

Refer to the Operator's Manual of the machine for more information.

Notice!

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

1.19 Opening the high-pressure circuit

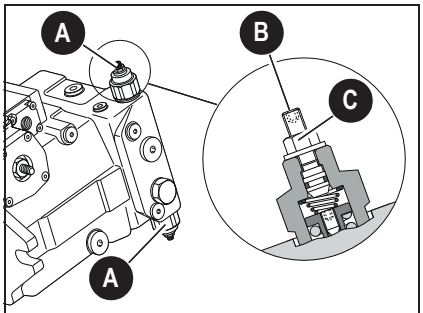


Fig. 22: Opening the high-pressure circuit

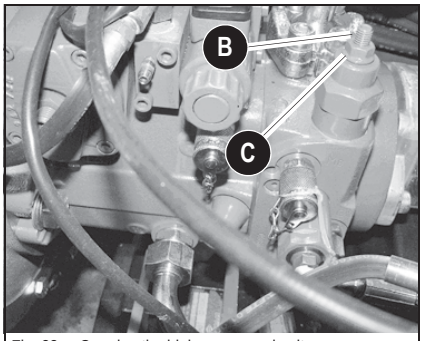


Fig. 23: Opening the high-pressure circuit

There are two HP pressure limiting valves **A** on the pump under the base plate, one on the upper left and the other on lower left.

Procedure

☞ *Stop the engine.*

☞ *Secure the machine to prevent it from rolling away (for example with wheel chocks).*

☞ *Remove the screws and the base plate.*

☞ *Loosen locknuts **C** on either side with half a revolution to the left.*

☞ *Turn each of the screws **B** to the right with an allen key until you can feel a firmer resistance.*

☞ *Then screw in a further half revolution to the right.*

➥ Screwing in any further damages the valve.

☞ *Tighten locknuts **C** on either side to the right to 22 Nm (16 ft.lbs).*

☞ *The manufacturer's warranty shall not apply to accidents or damage caused by towing.*

Notice!

Adjust the pressure and put into operation again once towing is over.

Technical data

2 Technical data

2.1 Chassis

Sturdy steel sheet chassis, rubber-mounted engine

2.2 Engine (Yanmar)

Engine	3001	
	(up to serial number AD310200)	(from serial no. AE310242)
Product	Yanmar diesel engine	
Type	3TNV88-KNSV	3TNV88-BKNSV
Design	Water-cooled 4 stroke diesel engine	
Number of cylinders	3	
Fuel injection system	Direct injection	
Aspiration	Natural aspiration	
Cooling system	Water-cooled/aspirating fan	
Lubrication system	Force-feed lubrication with trochoidal pump	
Displacement	1642 cm³ (100.2 in³)	
Nominal bore and stroke	88 x 90 mm (3.46 x 3.54 in)	
Output	26 kW +/− 5 % at 2800 rpm (34.9 hp +/− 5 % at 2800 rpm)	24.4 kW +/− 5 % at 2800 rpm (32.7 hp +/− 5 % at 2800 rpm)
Max. torque	101.5 – 110.5 Nm (75 – 82 lbf ft) at 1100 rpm	105 Nm (77 lbf ft) at 1000 rpm
Max. engine speed without load	2995 rpm +/− 25 rpm	
Idling speed	~1000 rpm +/− 25 rpm	
Valve clearance (intake = outlet)	0.15 – 0.25 mm (0.006 – 0.01")	
Injection pressure	196 – 206 bar (2843 – 2988 psi)	
Compression	Standard 34.3 bar (497.5 psi) Limit 27.5 ± 1 bar (399 ± 15 psi)	33.3 – 35.3 bar (483 – 512 psi) at 250 rpm
Engine oil pressure	2.9 – 3.9 bar (42 – 57 psi)	3.5 – 5.0 bar (51 – 73 psi)
Pressure switch for engine oil pump	0.5 ± 0.1 bar (7± 1.5 psi)	0.4 – 0.6 bar (6 – 9 psi)
Thermostat opening temperature	71 °C/160 °F (start) 85 °C/185 °F (fully open)	69.5 – 72.5 °C/157.1 – 162.5 °F
Thermal switch	107 – 113 °C/224.6 – 235.4 °F	
Firing order	1 – 3 – 2 (1st cylinder on fan wheel side)	
Direction of rotation	Anticlockwise (as seen from the flywheel)	
Starting aid	Preheater (preheating time 15 seconds)	Glow elements (preheating time 10 – 15 seconds)
Exhaust values according to	97/68/EC tier 2 EPA tier 2	EC tier 3A EPA tier IV interim

Engine capacities

Capacities	3001
Fuel tank	45 l (11.9 gal)
Engine oil (max./min. fill)	6.7 l/3.9 l (1.8/1.0 gal)
Coolant (without radiator)	2.0 l (0.5 gal)
Radiator	5.36 l (1.42 gal)
Coolant reservoir	0.84 l (0.22 gal)

Overview of capacities – *see Fluids and lubricants (Yanmar)* on page 3-2

Engine tightening torques

Tightening torques	Nm/lbf ft
Cylinder-head bolt	85.3 – 91.1/62.9 – 67.2 (M10x1.25)
Connecting rod bearing screw	44.1 – 49.0/32.5 – 36.1 (M9x1)
Main bearing screw	93.2 – 98.1/68.7 – 72.4 (M12x1.5)
Flywheel screw	83.3 – 88.2/61.4 – 65.1 (M10x1.25)

2.3 Engine (Perkins)

Engine	3001
Product	Perkins diesel engine
Type	403F-15T
Design	Water-cooled 4 stroke diesel engine
Number of cylinders	3
Fuel injection system	Indirect injection
Aspiration	Turbo-charging
Cooling system	Water-cooled
Displacement	1496 cm³ (91.3 in³)
Nominal bore and stroke	84 x 90 mm(3.3 x 3.5 in)
Output	27 kW +/− 5 % at 2800 rpm (36.2 hp +/− 5 % at 2,800 rpm)
Max. torque	112 Nm at 1800 rpm (78.6 ft lbs at 1800 rpm)
Max. engine speed without load	2800 rpm +/− 25 rpm (2,800 rpm +/– 25 rpm)
Idling speed	1200 rpm +/− 25 rpm (1,200 rpm +/− 25 rpm)
Valve clearance (intake = outlet)	0.20 mm (0.008 in) 0.20 mm (0.008 in)
Injection pressure	14.7 MPa (2132 psi)
Compression	22.5 : 1
Engine oil pressure	262 – 359 kPa (38 – 52 psi)
Pressure switch for engine oil pump	50 – 80 kPa (7.2 – 11.6 psi)
Thermostat opening temperature	82 °C (179.6 °F)
Thermal switch	
Firing order	1-2-3
Direction of rotation	Anticlockwise (as seen from the flywheel)
Starting aid	Glow elements (preheating time 10 – 15 seconds)
Exhaust values according to	EU NRMM 97/68/EC Level 3A US EPA 40 CFR Part 89 Tier IV final UN/ECE-R120

Engine capacities

Capacities	3001
Fuel tank	45 l (11.9 gal)
Engine oil (max./min. fill)	4.5 l/6.0 l (1.18/1.58 gal)
Cooling system	2.6 (0.68 gal)

Overview of capacities – *see Fluids and lubricants (Perkins)* on page 3-3

2.4 Operating hydraulics

Operating hydraulics	3001
Hydraulic pump displacement	16.8 cm³/rev (1 in³/rev)
Hydraulic pump flow rate (at 2,800 rpm)	47 l/min (12.4 gal/min)
Max. operating pressure	220 bar (3,191 psi)
Secondary pressure limiting for swiveling cylinder	145 bar (2,103 psi)
Steering system	140 bar (2,031 psi)
Hydraulic reservoir capacity	33 l (8.7 gal)
Hydraulic oil quantity (system fill)	48 l (12.7 gal)
Breather filter opening pressure (from serial number WNCD0305APAL00401)	0.2 +/- 0.04 bar (0.029 +/- 0.0058 psi)

2.5 Traveling drive

Variable displacement pump	3001
Design	Axial piston pump
Flow rate (at 2800 rpm)	47 l/min (12.4 gal/min)
Max. operating pressure	360 bar (5,221 psi)

2.6 Machine travel specifications

Steering system	3001 (standard tires)	3001 (tire size 10.0/75 x 15.3)
Travel speed I	0 – 7 kph (0 – 4.35 mph)	0 – 6.3 kph (0 – 4 mph)
Travel speed II	0 – 24.5 kph (15.2 mph)	0 – 22 kph (0 – 13.7 mph)
Articulation	+/− 37°	
Oscillation	+/− 15°	
Outside turning radius	3850 mm (12'-8")	
Safe authorized inclination	14° (25 %) in all directions	

2.7 Brakes

Service brake/parking brake	3001
Design	Wet multidisk brakes
Location	Front axle
Effect	Hydraulic service brake mechanical parking brake

2.8 Steering system

Steering system	3001
Design	Hydrostatic
Steering mode	Chassis articulation steering

2.9 Tires

Type	Tire size	Tire pressure	Load-bearing capacity
TS 05, standard tires (WNCD0305TPAL00339)	11.5/80 x 15.3	3.5 bar (51 psi)	PR 10
TS 05, standard tires (WNCD0305EPAL00340)	11.5/80 x 15.3	3.5 bar (51 psi)	PR 14
TR 03 (option)	11.5/80 x 15.3	4.75 bar (69 psi)	PR 14
TS 05, for special skip (option)	10.0/75 x 15.3	3.2 bar (46 psi)	PR 8
TS 05, foam-filled (option) (WNCD0305TPAL00339)	11.5/80 x 15.3	--	PR 10
IM04, golf-course tires (option)	15.0/55 x 17	3.1 bar (45 psi)	PR 14
Spare wheel (option) corresponds to respective tires			

2.10 Skip

Skip		Front skip	Swivel skip (option)	Special swivel skip (option)
Skip capacity	Struck	1500 l (396 gal)	1315 l (347 gal)	1020 l (269 gal)
	Heaped	1850 l (489 gal)	1790 l (473 gal)	1300 l (343 gal)
	Liquid capacity	1160 l (306 gal)	930 l (246 gal)	820 l (217 gal)
Payload		3000 kg (6614 lbs)		2600 kg (5732 lbs)

2.11 Coolant compound table

Yanmar

Outside temperature	Coolant			
	Water	Anticorrosion agent		Antifreeze
Up to °C (°F)	% by volume	cm³/l / (in³/gal)	% by volume	% by volume
−37 (−34.6)	50	10 (2.6)	1	50

Use the 1:1 concentration for warm outside temperatures, too:

- Protection against corrosion, cavitation and deposits.

Do not mix the coolant with other coolants.

Machine filled at the factory with Eurolub SF D12 coolant (ethylene glycol basis).

Perkins

Water	Antifreeze
% by volume	% by volume
50	50
40	60

Do not mix the coolant with other coolants.

2.12 Vibration

Vibration	
Effective acceleration value for the upper extremities of the body (hand-arm vibration)	< Trigger value < 2.5 m/s²
Effective acceleration value for the body (whole-body vibration)	< 0.5 m/s²

Vibration values indicated in m/s².

2.13 Electrical system

Electrical system	3001 (Yanmar)	3001 (Perkins)
Alternator	12 V 40 A (up to serial number EA02427) 80 A (from serial number EA02428)	12 V 85 A
Alternator (machine with optional cabin)	12 V 40 A (up to serial number EA02427) 80 A (from serial number EA02428)	12 V 85 A
Starter	12 V 1.4 kW (1.9 hp) (3TNV88-KNSV) 12 V 1.7 kW (2.3 hp) (3TNV88-BKNSV)	12 V 2.0 kW (2.7 hp)
Battery	12 V 88 Ah	
Socket (option)	7-pole	

Fuses and relays (up to serial no. EA01931, Yanmar)

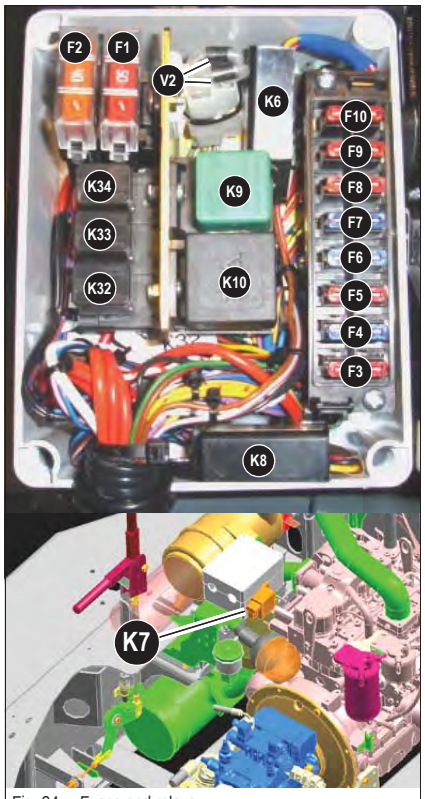


Fig. 24: Fuses and relays

- The fuse box is located on the right under the engine cover.
- Machine with optional cabin:
  ➥ In the cabin on the right beside the operator seat.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	40 A	Main fuse
F 3	10 A	Cutoff solenoid, cutoff solenoid time lag relay
F 4	15 A	Machine travel solenoid valves
F 5	10 A	Horn, brake lights
F 6	15 A	Turn indicators
F 7	15 A	High beam
F 8	10 A	Low beam
F 9	10 A	Clearance light
F 10	10 A	Hazard warning system (option)

Relay no.	Protected circuit
K 6	Preheating time lag relay
K7	Start high-current relay
K 8	Cutoff solenoid time lag relay
K 9	Cutoff solenoid switching relay
K 10	Turn indicator relay

Relay no.	Protected circuit
K32	Start interlock relay
K33	Low beam relay
K34	High beam relay
V2	Diodes

Fuses and relays (serial nos. EA01932 to EA01950, Yanmar)

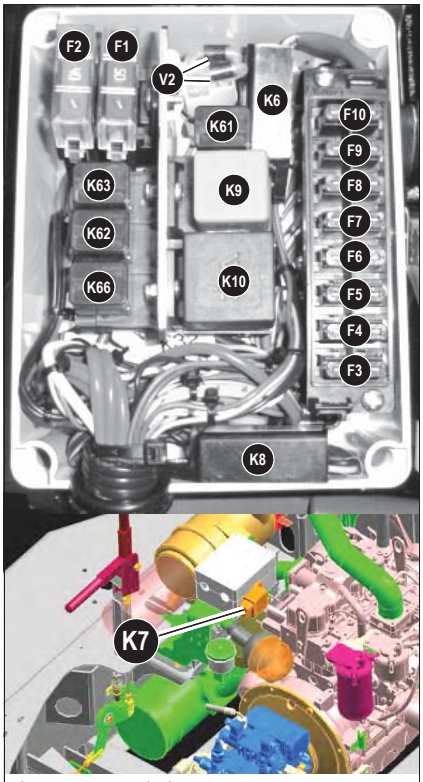


Fig. 25: Fuses and relays

- The fuse box is located on the right under the engine cover.
- Machine with optional cabin:
  ➥ In the cabin on the right beside the operator seat.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	40 A	Main fuse
F 3	10 A	Cutoff solenoid, cutoff solenoid time lag relay, fuel pump, indicator
F 4	15 A	Machine travel solenoid valves, parking brake, 2nd speed
F 5	10 A	Horn, brake lights
F 6	15 A	Turn indicators
F 7	15 A	High beam, rotating beacon
F 8	10 A	Low beam
F 9	10 A	Clearance light
F 10	10 A	Hazard warning system (option)

Relay no.	Protected circuit	Relay no.	Protected circuit
K 6	Preheating time lag relay	K61	Parking brake relay
K7	Start high-current relay	K62	Low beam relay
K 8	Cutoff solenoid time lag relay	K63	High beam relay
K 9	Cutoff solenoid switching relay	K66	Start interlock relay
K 10	Turn indicator relay	V2	Diodes

Additional fuses for machine with optional cabin (Yanmar)

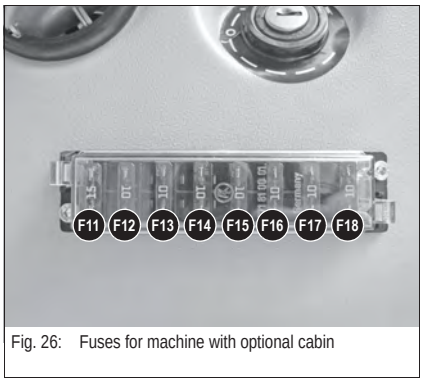


Fig. 26: Fuses for machine with optional cabin

The fuse panel is located on the right under the instrument panel, under the starter.

Fuse no.	Rated current (A)	Protected circuit
F11	15 A	Roof lights
F12	10 A	Wiper, radio
F 13	10 A	Heating
F 14	10 A	Rotating beacon
F 15	10 A	Not assigned
F 16	10 A	Radio, interior lighting
F 17	10 A	Not assigned
F18	10 A	Not assigned

Fuses and relays (Perkins)

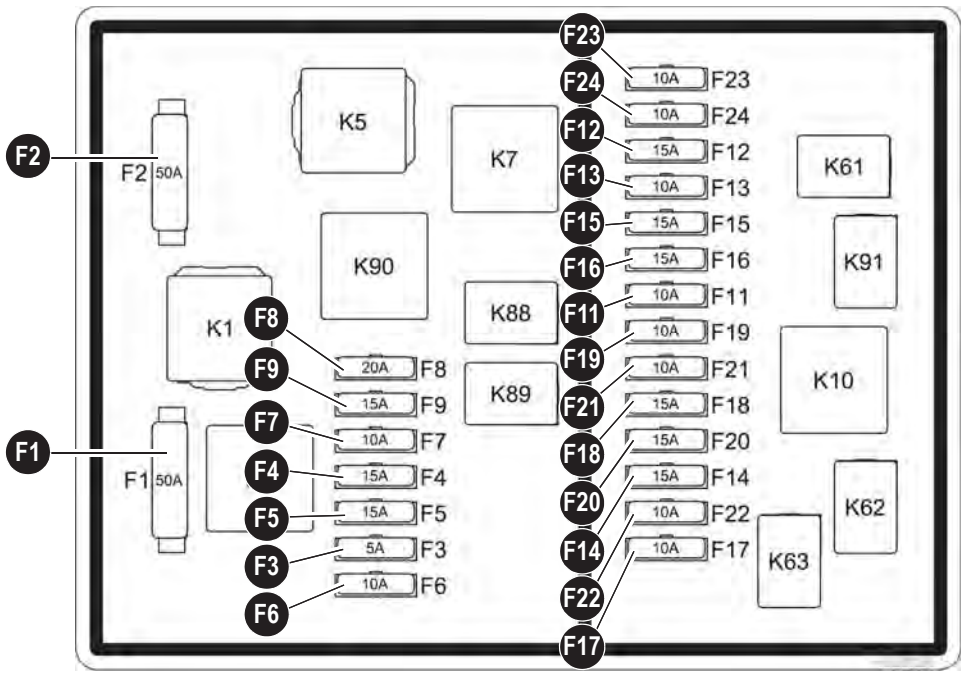


Fig. 27: Fuses

The fuse box is located at the front right of the chassis under the control stand.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	50 A	Main fuse
F3	5 A	ECU (engine control unit)
F4	15 A	ECU (engine control unit)
F5	15 A	ECU (engine control unit)
F6	10 A	ECU (engine control unit)
F7	10 A	Particulate filter, fuel pump
F8	20 A	Particulate filter
F9	15 A	Starter
F10	10 A	--
F11	10 A	ECU (engine control unit)
F12	15 A	Wiper (option)
F13	10 A	Heating (option)
F14	15 A	Radio (option)
F15	15 A	Roof lights (option)
F16	15 A	Lights
F17	10 A	Spare
F18	15 A	Low/high beam
F19	10 A	2nd speed, parking brake, drive valves
F20	15 A	Brake lights, horn
F21	10 A	Left/right turn indicators 12 V 15, radio, rotating beacon (option)
F22	10 A	Hazard warning system 12 V 30
F23	10 A	Clearance light (right)
F24	10 A	Clearance light (left)

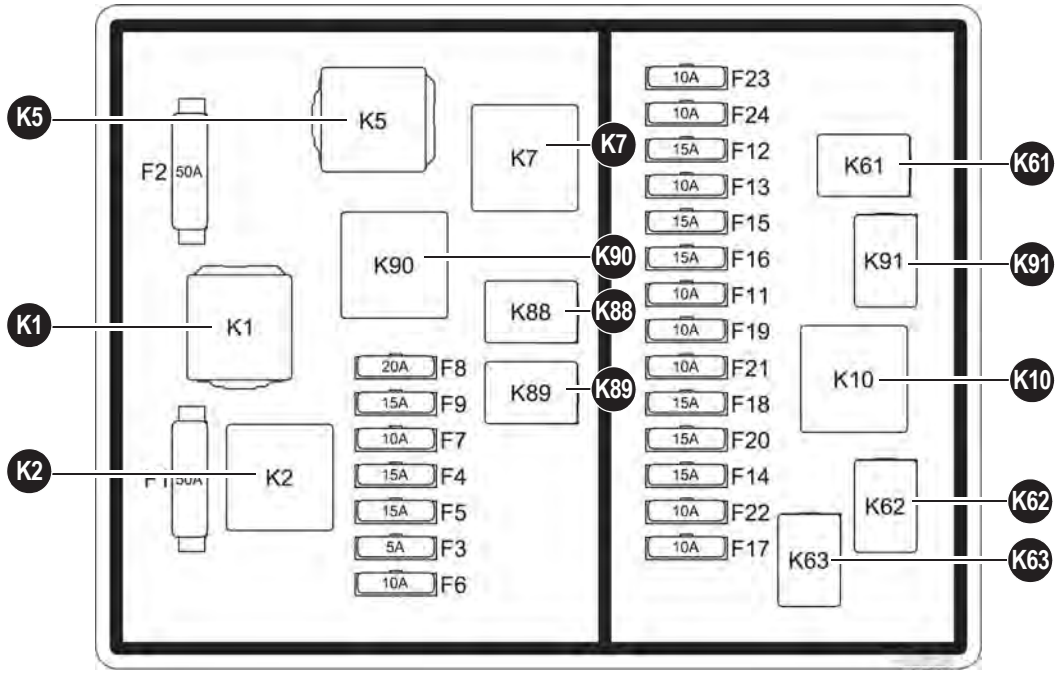


Fig. 28: Relays

Relay no.	Protected circuit
K1	Main relay
K2	Main relay ECU
K5	Preheating
K7	Starting relay
K10	Turn indicator relay
K61	Starting relay
K62	Low beam
K63	High beam
K88	Fuel pump
K89	Particulate filter
K90	Particulate filter
K91	Parking brake

2.14 Noise levels (Yanmar)

	3001
Measured sound power level LwA [1]	100.5 dB(A)
Guaranteed sound power level LwA[1]	101 dB(A)
Uncertainty factor KpA [2]	0.9
Operator-perceived sound pressure level LpA (without cabin)[3]	83 dB (A)
Operator-perceived sound pressure level LpA (with cabin)[3]	87 dB (A)

1. According to ISO 6395 (EC Directives 2000/14/EC and 2005/88/EC)
2. According to EN ISO 4871 (EC Directives 2000/14/EC and 2005/88/EC)
3. According to ISO 6394 (EC Directives 84/532/EEC, 89/514/EEC, 95/27/EEC)

Notice!

Measurements performed on asphalted surface.

2.15 General tightening torques

Tightening torques for hydraulic threaded fittings (dry assembly)

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

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

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

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

Threaded fittings with various seals for hydraulic applications (light execution)

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

Torque tolerance: −10 %; countermaterial: steel/aluminum

Threaded fittings with various seals for hydraulic applications (heavy execution)

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

Torque tolerance: −10 %; countermaterial: steel/aluminum

Tightening torques for high-resistance threaded fittings

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

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

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

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

Tightening torques for Nordlock lock washers

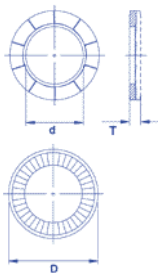


Fig. 29: Nordlock dimensions

Standard dimensions				
Thread	d mm (")	D mm (")	T mm (")	Mv Nm (lbf ft)
M3	3.2 (0.13)	7.0 (0.28)	1.8 (0.07)	1.5 (1.1)
M4	4.3 (0.17)	9.0 (0.35)	1.8 (0.07)	3.5 (2.6)
M5	5.2 (0.20)	9.0 (0.35)	1.8 (0.07)	7.2 (5.3)
M6	6.5 (0.26)	10.8 (0.43)	1.8 (0.07)	12 (8.9)
M8	8.2 (0.32)	13.5 (0.53)	2.6 (0.10)	30 (22.1)
M10	10.3 (0.41)	16.6 (0.65)	2.6 (0.10)	59 (43.5)
M12	13.0 (0.51)	19.5 (0.77)	2.6 (0.10)	103 (76)
M14	14.5 (0.57)	23.0 (0.91)	3.7 (0.15)	160 (118)
M16	17.0 (0.67)	25.4 (1.00)	3.7 (0.15)	250 (184)
M18	19.5 (0.77)	29.0 (1.14)	3.7 (0.15)	350 (258)
M20	21.0 (0.83)	30.7 (1.21)	3.7 (0.15)	490 (361)
M22	22.9 (0.90)	34.5 (1.36)	3.7 (0.15)	660 (487)
M24	26.0 (1.02)	39.0 (1.54)	3.7 (0.15)	850 (627)
M27	28.5 (1.12)	42.0 (1.65)	4.6 (0.18)	1220 (900)
M30	30.5 (1.20)	47.0 (1.85)	4.6 (0.18)	1600 (1180)
M33	33.5 (1.32)	48.5 (1.91)	4.6 (0.18)	2200 (1623)
M36	36.6 (1.44)	56.0 (2.20)	4.6 (0.18)	2900 (2139)
M39	39.5 (1.56)	58.5 (2.30)	4.6 (0.18)	3800 (2803)

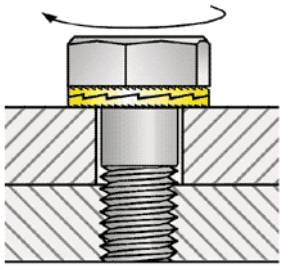
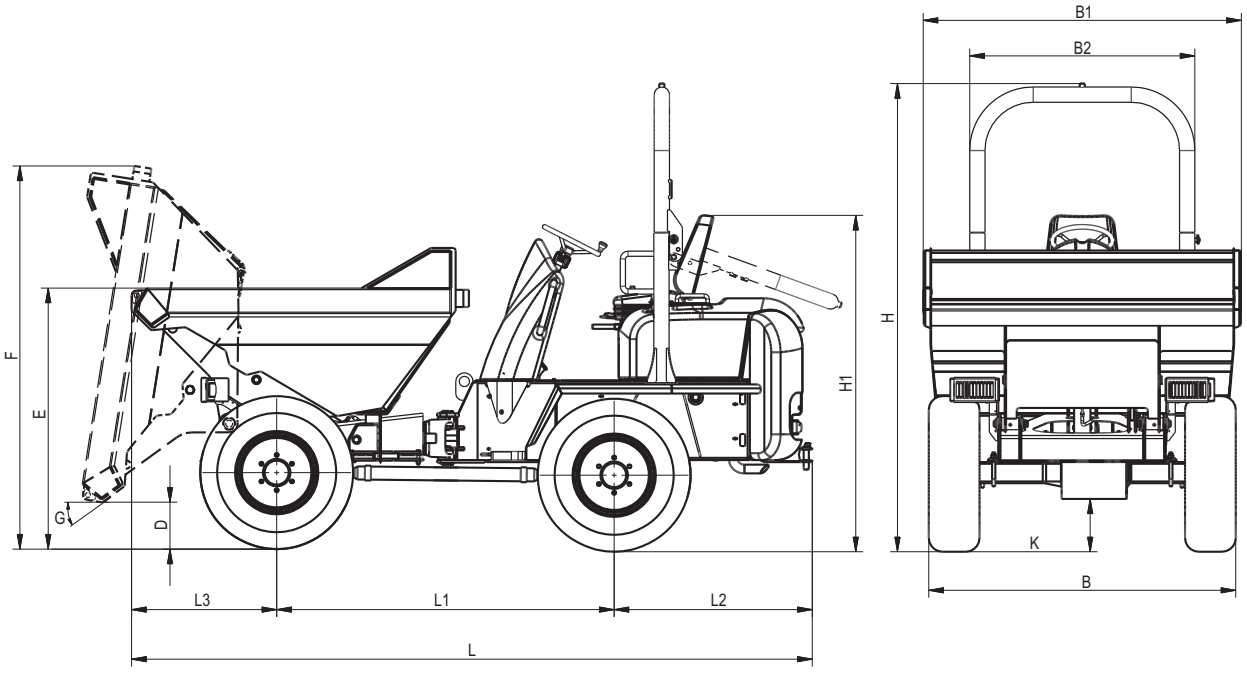


Fig. 30: Nordlock

Dimensions with larger outside diameters (oblong bores)				
Thread	d mm (")	D mm (")	T mm (")	Mv Nm (lbf ft)
M6	6.5 (0.26)	13.5 (0.53)	2.6 (0.10)	13 (9.6)
M8	8.6 (0.34)	16.6 (0.65)	2.6 (0.10)	32 (23.6)
M10	10.3 (0.41)	21.0 (0.83)	2.6 (0.10)	64 (47.2)
M12	13.0 (0.51)	25.4 (1.00)	3.7 (0.15)	110 (81)
M16	17.0 (0.67)	30.7 (1.21)	4.0 (0.16)	260 (192)

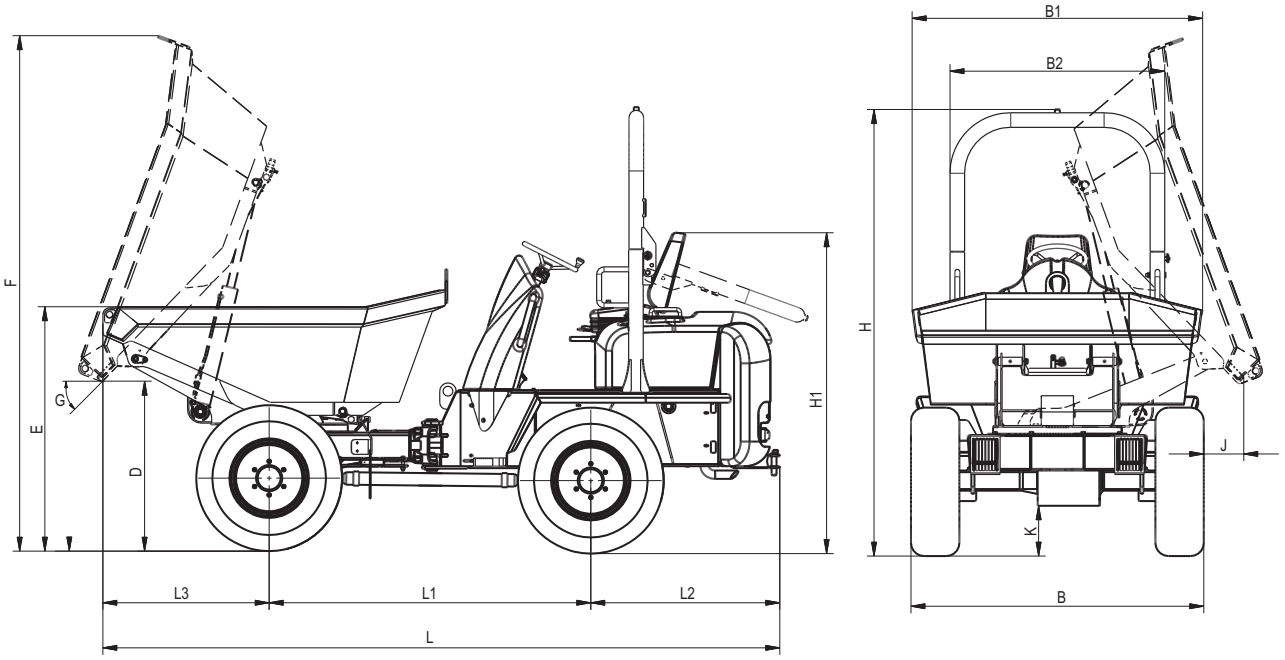
2.16 Dimensions model 3001 (front skip)



	Main data	3001 (Yanmar)	3001 (Perkins)
	Transport weight[1]	2450 kg (5,401 lbs)	2470 kg (5,445 lbs)
	Operating weight [2]	2525 kg (5,566 lbs)	2545 kg (5,611 lbs)
B	Width	1785 mm (70 in)	
B1	Skip width	1860 mm (73 in)	
B2	Rollbar width	1310 mm (52 in)	
D	Ground clearance of tilted skip	260 mm (10 in)	
E	Height of front edge of skip	1475 mm (58 in)	
F	Height of upper edge of tilted skip	2220 mm (87 in)	
G	Tilt angle of skip	51°	
H	Height of raised rollbar	2670 mm (8'-9")	
H1	Height of lowered rollbar	1870 mm (74 in)	
K	Ground clearance	280 mm (11 in)	
L	Length	3980 mm (13'-1")	4080 mm (13'-5")
L1	Wheelbase	1960 mm (77 in)	
L2	Tail-end lateral projection	1160 mm (46 in)	1260 mm (50 in)
L3	Front projection	860 mm (34 in)	
	Outside turning radius	3850 mm (12'-8")	
	Safe authorized inclination	14° (25 %) in all directions	

1. Transport weight: basic machine + 10 % fuel capacity.
2. Operating weight: basic machine + user (75 kg/165 lbs).

2.17 Dimensions model 3001s (swivel skip) (option)

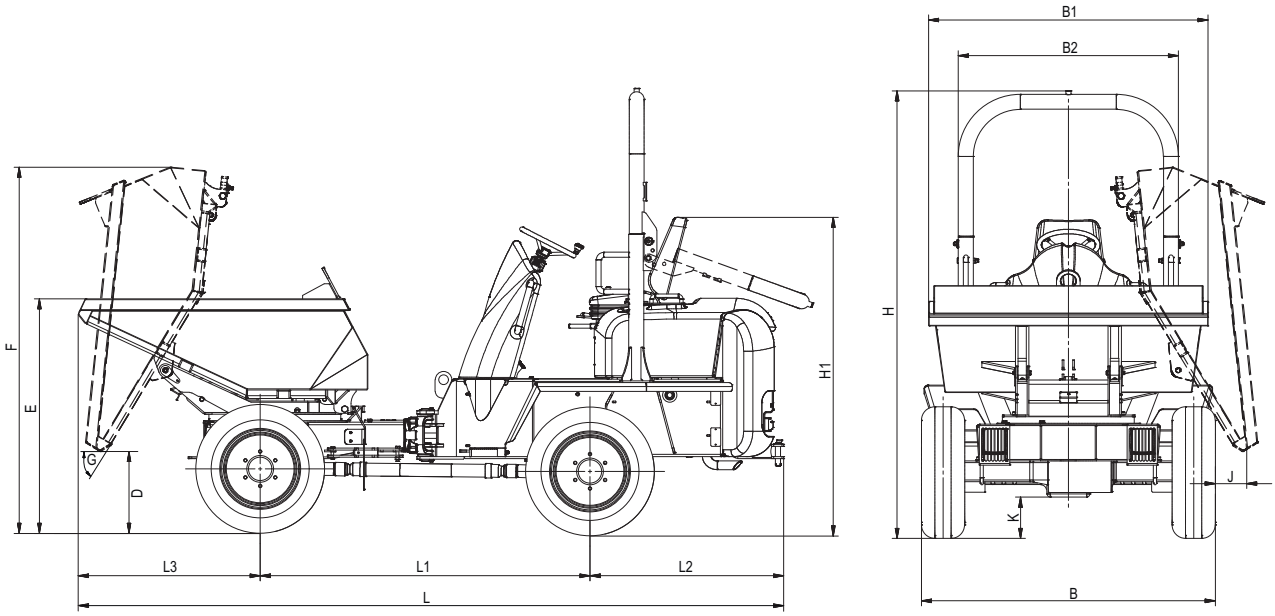


	Main data	3001s (Yanmar)	3001s (Perkins)
	Transport weight[1]	2550 kg (5,622 lbs)	2570 kg (5,666 lbs)
	Operating weight [2]	2625 kg (5,787 lbs)	2645 kg (5,831 lbs)
B	Width	1785 mm (70 in)	
B1	Skip width	1775 mm (70 in)	
B2	Rollbar width	1310 mm (52 in)	
D	Ground clearance of tilted skip	1020 mm (40 in)	
E	Height of front edge of skip	1475 mm (58 in)	
F	Height of upper edge of tilted skip	3125 mm (10'-3")	
G	Tilt angle of skip	46°	
H	Height of raised rollbar	2670 mm (8'-9")	
H1	Height of lowered rollbar	1870 mm (74 in)	
K	Ground clearance	280 mm (11 in)	
L	Length	4140 mm (13'-7")	4240 mm (13'-11")
L1	Wheelbase	1960 mm (77 in)	
L2	Tail-end lateral projection	1160 mm (46 in)	1260 mm (50 in)
L3	Front projection	1020 mm (40 in)	
J	Projection of rotated skip	245 mm (10 in)	
	Outside turning radius	3850 mm (12'-8")	
	Safe authorized inclination	14° (25 %) in all directions	

1. Transport weight: basic machine + 10 % fuel capacity.
2. Operating weight: basic machine + user (75 kg/165 lbs).

2.18 Dimensions model 3001s special skip (swivel skip) (option)

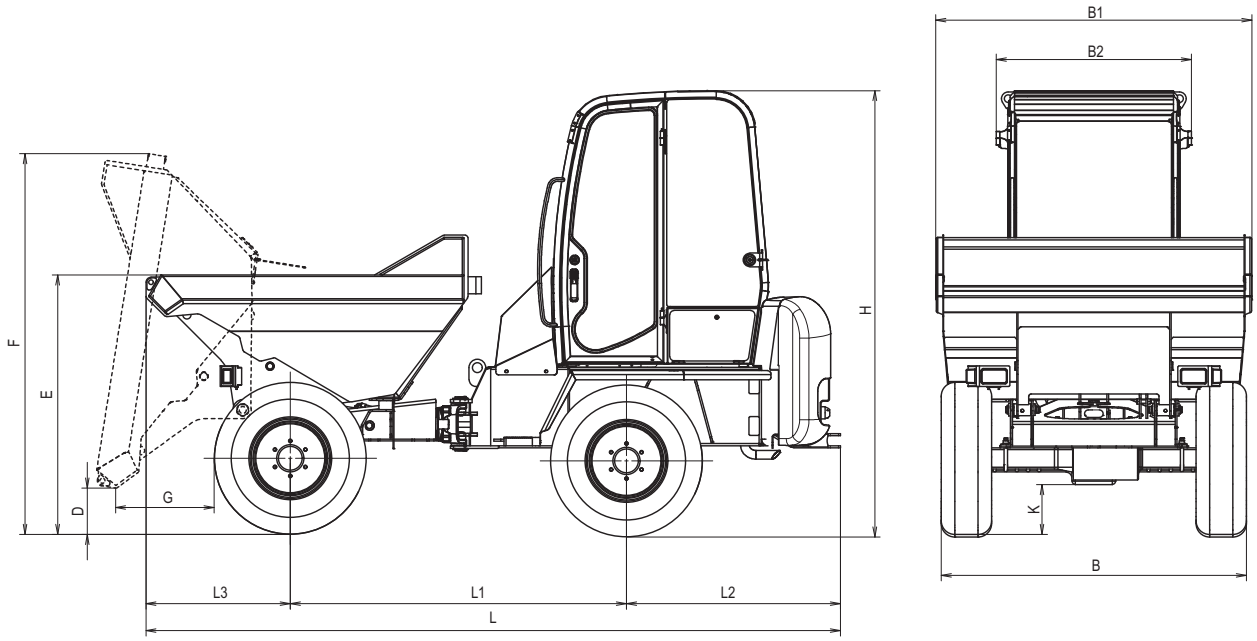
Tilted height 2.2 m (86.6 in)



	Main data	3001s (Yanmar)	3001s (Perkins)
	Transport weight[1]	2400 kg (5,291 lbs)	2570 kg (5,666 lbs)
	Operating weight [2]	2475 kg (5,456 lbs)	2645 kg (5,831 lbs)
B	Width	1785 mm (70 in)	
B1	Skip width	1775 mm (70 in)	
B2	Rollbar width	1310 mm (52 in)	
D	Ground clearance of tilted skip	1020 mm (40 in)	
E	Height of front edge of skip	1475 mm (58 in)	
F	Height of upper edge of tilted skip	2200 mm (87 in)	
G	Tilt angle of skip	46°	
H	Height of raised rollbar	2670 mm (8'-9")	
H1	Height of lowered rollbar	1870 mm (74 in)	
K	Ground clearance	280 mm (11 in)	
L	Length	4140 mm (13'-7")	4240 mm (13'-11")
L1	Wheelbase	1960 mm (77 in)	
L2	Tail-end lateral projection	1160 mm (45.7 in)	1260 mm (50 in)
L3	Front projection	1020 mm (40 in)	
J	Projection of rotated skip	245 mm (10 in)	
	Outside turning radius	3850 mm (12'-8")	
	Safe authorized inclination	14° (25 %) in all directions	

1. Transport weight: basic machine + 10 % fuel capacity.
2. Operating weight: basic machine + user (75 kg/165 lbs).

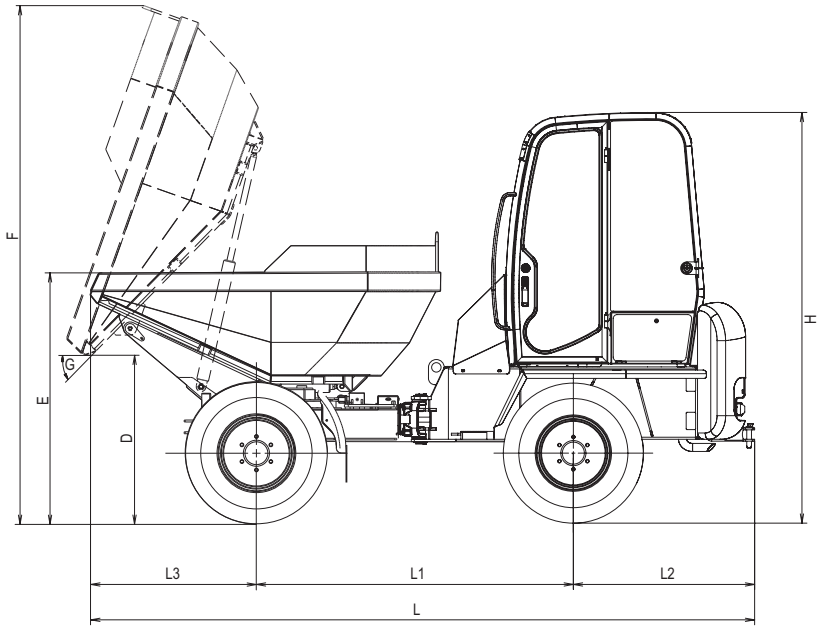
2.19 Dimensions model 3001 (front skip) cabin (option)

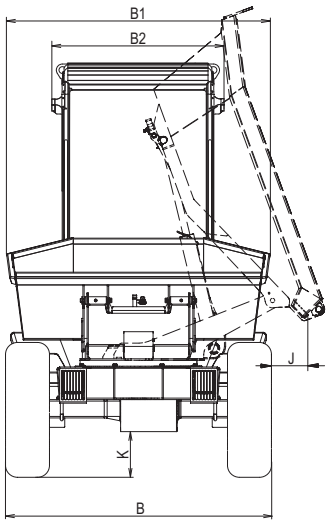


	Main data	3001 (Yanmar)	3001 (Perkins)
	Transport weight[1]	2550 kg (5,622 lbs)	2640 kg (5,821 lbs)
	Operating weight [2]	2625 kg (5,787 lbs)	2715 kg (5,986 lbs)
B	Width	1785 mm (70 in)	
B1	Skip width	1860 mm (73 in)	
B2	Cabin width	1140 mm (45 in)	
D	Ground clearance of tilted skip	260 mm (10 in)	
E	Height of front edge of skip	1475 mm (58 in)	
F	Height of upper edge of tilted skip	2200 mm (87 in)	
G	Tilt angle of skip	51°	
H	Height	2610 mm (8'-7")	
K	Ground clearance	280 mm (11 in)	
L	Length	3980 mm (13'-1")	4080 mm (13'-5")
L1	Wheelbase	1960 mm (77 in)	
L2	Tail-end lateral projection	1160 mm (46 in)	1260 mm (50 in)
L3	Front projection	860 mm (34 in)	
J	Projection of rotated skip	-	
	Outside turning radius	3850 mm (12'-8")	
	Safe authorized inclination	14° (25 %) in all directions	

1. Transport weight: basic machine + 10 % fuel capacity.
2. Operating weight: basic machine + user (75 kg/165 lbs).

2.20 Dimensions model 3001s (swivel skip) cabin (option)





	Main data	3001s (Yanmar)	3001s (Perkins)
	Transport weight[1]	2650 kg (5,842 lbs)	2740 kg (6,041 lbs)
	Operating weight [2]	2725 kg (6,001 lbs)	2815 kg (6,206 lbs)
B	Width	1785 mm (70 in)	
B1	Skip width	1775 mm (70 in)	
B2	Cabin width	1140 mm (45 in)	
D	Ground clearance of tilted skip	1020 mm (40 in)	
E	Height of front edge of skip	1475 mm (58 in)	
F	Height of upper edge of tilted skip	3125 mm (10'-3")	
G	Tilt angle of skip	46°	
H	Height	2610 mm (8'-7")	
K	Ground clearance	280 mm (11 in)	
L	Length	4140 (13'-7")	4240 mm (13'-11")
L1	Wheelbase	1960 mm (77 in)	
L2	Tail-end lateral projection	1160 mm (46 in)	1260 mm (50 in)
L3	Front projection	1020 mm (40 in)	
J	Projection of rotated skip	245 mm (10 in)	
	Outside turning radius	3850 mm (12'-8")	
	Safe authorized inclination	14° (25 %) in all directions	

1. Transport weight: basic machine + 10 % fuel capacity.
2. Operating weight: basic machine + user (75 kg/165 lbs).

Maintenance

3 Maintenance

3.1 Introduction

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

It is therefore in the interest of the machine owner to perform the mandatory maintenance.

Bear in mind the following points before performing servicing and maintenance:

- Chapter 2 “SAFETY INSTRUCTIONS” of this Operator’s Manual.

Perform the prescribed inspections and rectify any disorders immediately before putting the machine into operation, or have them rectified by a Wacker Neuson service center.

Secure open (engine) covers appropriately.

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

When using compressed air, dirt and debris can be blown into your face. Therefore, wear safety glasses, protective masks and clothing when using compressed air.

3.2 Safety-relevant parts

Servicing and maintenance must be performed by a specifically trained person.

All other maintenance that is not indicated in this Operator’s Manual must be performed only by the trained and qualified personnel of a Wacker Neuson service center.

The following maintenance plans indicate the maintenance to be performed.

This is necessary to ensure optimal functioning.

– *see chapter 3.6 Maintenance plan (overview – Yanmar)* on page 3-8.

– *see chapter 3.7 Maintenance plan (Perkins)* on page 3-13.

Immediately repair or replace parts that are already damaged or not working properly before they are due for replacement.

Notice!

Safety-relevant parts may only be repaired or replaced by a Wacker Neuson dealer or a Wacker Neuson service center.

Parts	Interval
Hydraulic hoses	Replace hydraulic hoses every 6 years from the date of manufacture, even if they do not seem to be damaged.
Seat belt	No replacement necessary. Replace the seat belt after an accident.

3.3 Fluids and lubricants (Yanmar)

Component/application		Fluid/lubricant	Specification	Season/ temperature	Capacity[1]
Diesel engine		Engine oil[2]	SAE10W40	−20 °C (−4 °F) +40 °C (+104 °F)	5.25 l (1.4 gal)
Braking system		Hydraulic oil	HVLP 46[3]	Year-round	1.5 l (0.4 gal)
Hydraulic system		Hydraulic oil	HVLP 46[4]	Year-round[5]	48 l (12.7 gal)
			HV 46[6]		
		Biodegradable oil[7]	HLP Synth 46		
			BIOHYD SE-S 46		
Traveling drive	Front axle 110	Gearbox oil[8]	Gear LS SAE80W90[9]	Year-round	4.7 l (1.24 gal)
	Rear axle 110				4.2 l (1.1 gal)
	Front axle 111				4.3 l (1.13 gal)
	Rear axle 111				4.6 l (1.21 gal)
	Gearbox				0.6 l (0.16 gal)
Grease zerks		Multipurpose grease	KPF 2 K-20[10]	Year-round	As required
Battery terminals		Acid-proof grease [11]	FINA Marson L2	Year-round	As required
Fuel tank [12]		Diesel fuel[13]	ASTM D975-94: 1D, 2D (USA)	Depending on outside temperatures Summer or winter diesel fuel	45 l (11.9 gal)
			EN 590		
			ISO 8217 DMX (International)		
			BS 2869-A1, A2 (GB)		
			JIS K2204		
			KSM-2610		
			GB252		
		Biodiesel	EN 14214		
			ASTM D-6751		
Engine cooling system		Coolant	Distilled water and antifreeze ASTM D4985 (reddish)[14]	Year-round	7.50 l (2 gal)
			Distilled water and antifreeze ASTM D6210 (violet)[15]		
Washer system		Cleaning solution	Water + antifreeze	Year-round	1.2 l (0.31 gal)

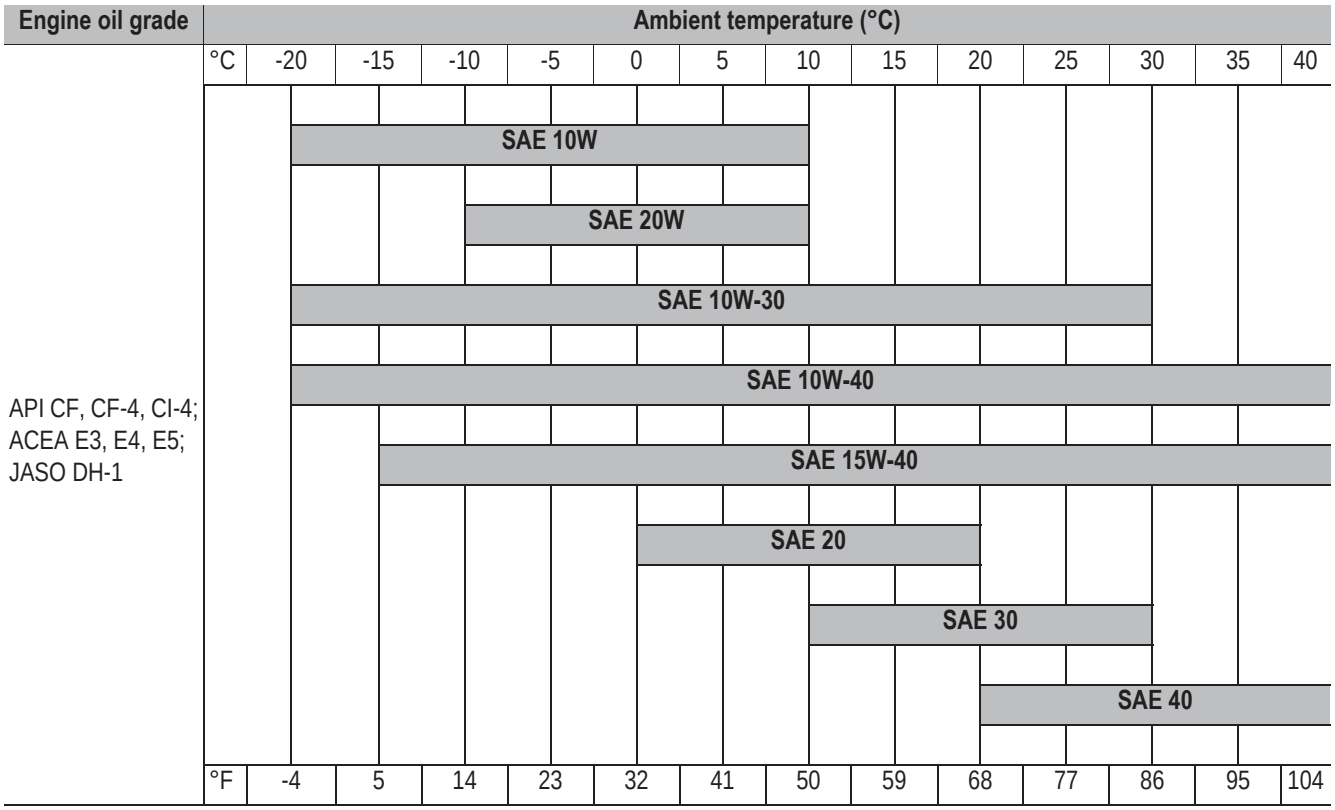
1. The capacities indicated are approximate values; the oil level check alone is relevant for the correct oil level. Capacities indicated are no system fills.
2. According to DIN 51511 (API CF, CF-4, CI-4; ACEA E3, E4, E5; JASO DH-1).
3. According to DIN 51524 section 3, ISO-VG 46.
4. According to DIN 51524 section 3, ISO-VG 46.
5. Depending on local conditions – *see Hydraulics oil grade* on page 3-5.
6. According to ISO 6743/4.
7. Biodegradable hydraulic oil based on saturated synthetic esters with an iodine value of < 10, according to DIN 51524, section 3, HVLP, HEES
8. Hypoid gearbox oil based on basic mineral oil (SAE80W-90 according to DIN 51502), (API GL4, API GL5).
9. According to DIN 51502 on a mineral oil basis. Do not mix gearbox oils.
10. KPF 2 K-20 according to DIN 51502 lithium-saponified grease.
11. Standard acid-proof grease NGLI category 2.
12. Sulfur content below 0.05 %, cetane number over 45
13. In countries where level IIIA (or higher) or Tier IV interim (or higher) exhaust emission regulations apply, use diesel fuels with a maximum sulfur content of 0.0015 % (= 15 mg/kg).
14. Up to serial number WNCD0305TPAL00499
15. From serial number WNCD0305LPAL00500

3.4 Fluids and lubricants (Perkins)

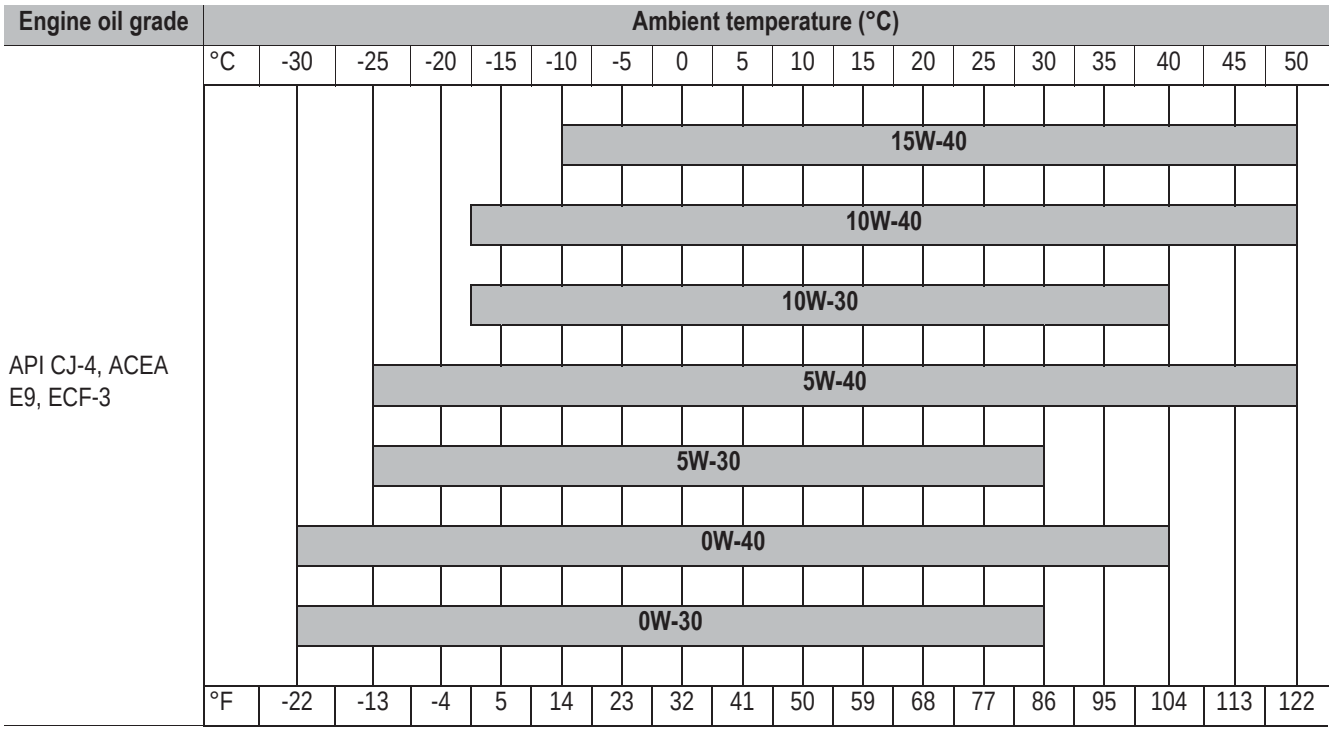
Component/application		Fluid/lubricant	Specification	Season/temperature	Capacity[1]
Diesel engine		Engine oil[2]	SAE10W40	−18 °C (−0.4 °F) +50 °C (+122 °F)	Max. 6.0 l (1.6 gal) Max. 4.5 l (1.2 gal)
Braking system		Hydraulic oil	HVLP 46[3]	Year-round	1.5 l (0.4 gal)
Hydraulic system		Hydraulic oil	HVLP 46[4]	Year-round[5]	48 l (12.7 gal)
			HV 46[6]		
		Biodegradable oil[7]	HLP Synth 46		
			BIOHYD SE-S 46		
Traveling drive	Front axle 110	Gearbox oil[8]	Gear LS SAE80W90[9]	Year-round	4.7 l (1.24 gal)
	Rear axle 110				4.2 l (1.1 gal)
	Front axle 111				4.3 l (1.13 gal)
	Rear axle 111				4.6 l (1.21 gal)
	Gearbox				0.6 l (0.16 gal)
Grease zerks		Multipurpose grease	KPF 2 K-20[10]	Year-round	As required
Battery terminals		Acid-proof grease [11]	FINA Marson L2	Year-round	As required
Fuel tank		Diesel fuel[12]	ASTM D975 grade 2D S15[13]	Depending on outside temperatures Summer or winter diesel fuel	45 l (11.9 gal)
			EN 590[14]		
			BS 2869:2010 class A2[15]		
Engine cooling system		Coolant	Distilled water and antifreeze ASTM D4985 (reddish)[16]	Year-round	7.50 l (2 gal)
			Distilled water and antifreeze ASTM D6210 (violet)[17]		
Washer system		Cleaning solution	Water + antifreeze	Year-round	1.2 l (0.31 gal)

1. The capacities indicated are approximate values; the oil level check alone is relevant for the correct oil level. Capacities indicated are no system fills.
2. According to DIN 51511 (API CJ-4, ACEA E9, ECF-3) – *see* *Oil grades for the diesel engine, depending on temperature (Perkins)* on page 3-4
3. According to DIN 51524 section 3, ISO-VG 46.
4. According to DIN 51524 section 3, ISO-VG 46.
5. Depending on local conditions – *see* *Hydraulics oil grade* on page 3-5.
6. According to ISO 6743/4.
7. Biodegradable hydraulic oil based on saturated synthetic esters with an iodine value of < 10, according to DIN 51524, section 3, HVLP, HEES
8. Hypoid gearbox oil based on basic mineral oil (SAE80W-90 according to DIN 51502), (API GL4, API GL5).
9. According to DIN 51502 on a mineral oil basis. Do not mix gearbox oils.
10. KPF 2 K-20 according to DIN 51502 lithium-saponified grease.
11. Standard acid-proof grease NGLI category 2.
12. In countries where level IIIA (or higher) or Tier IV interim (or higher) exhaust emission regulations apply, use diesel fuels with a maximum sulfur content of 0.0015 % (= 15 mg/kg).
13. With a sulfur content of less than 0.0015 % (15 mg/kg)
14. With a sulfur content of less than 0.001 % (10 mg/kg)
15. With a sulfur content of less than 0.001 % (10 mg/kg)
16. Up to serial number WNCD0305TPAL00499
17. From serial number WNCD0305LPAL00500

Oil grades for the diesel engine, depending on temperature (Yanmar)



Oil grades for the diesel engine, depending on temperature (Perkins)



Oil grades for the hydraulic system, depending on temperature

Hydraulics oil grade	Ambient temperature (°C)														
	°C	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	50
HVLP 46 [1] HV 46 [2]		ISO VG32													
					ISO VG46										
							ISO VG68								
	°F	-4	5	14	23	32	41	50	59	68	77	86	95	104	122

1. According to DIN 51524 section 3, ISO-VG 46.
2. According to ISO 6743/4.

Additional oil change and filter replacement (hydraulic system)

Notice!

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

Important information regarding operation with biodegradable hydraulic oil

- Use only the biodegradable oils that have been tested and released by Wacker Neuson.
- Add only biodegradable oil of the same type. In order to avoid misunderstandings, attach a label on the hydraulic oil filler inlet providing clear information regarding the type of oil currently used.
  The joint use of two different biodegradable oils can affect the quality of one of the oil types. Therefore ensure that the remaining amount of biodegradable oil complies with the national and regional regulations as you replace it. Observe the manufacturer's indications.
- Do not add mineral oil – the content of mineral oil should not exceed 2 % of the system fill in order to avoid foaming problems and to ensure biological degradability.
- When running the machine with biodegradable oil, the same oil and filter replacement intervals are valid as for mineral oil.
- Always have the condensation water in the hydraulic oil reservoir drained by a Wacker Neuson service center before the cold season. The water content may not exceed 0.1 % by weight.
- The instructions in this Operator's Manual concerning environmental protection are also valid for the use of biodegradable oil.
- Subsequent change from mineral oil to biodegradable oil may be performed only by a Wacker Neuson service center.

3.5 Maintenance label

Some maintenance may only be performed by a Wacker Neuson service center (see maintenance plan).

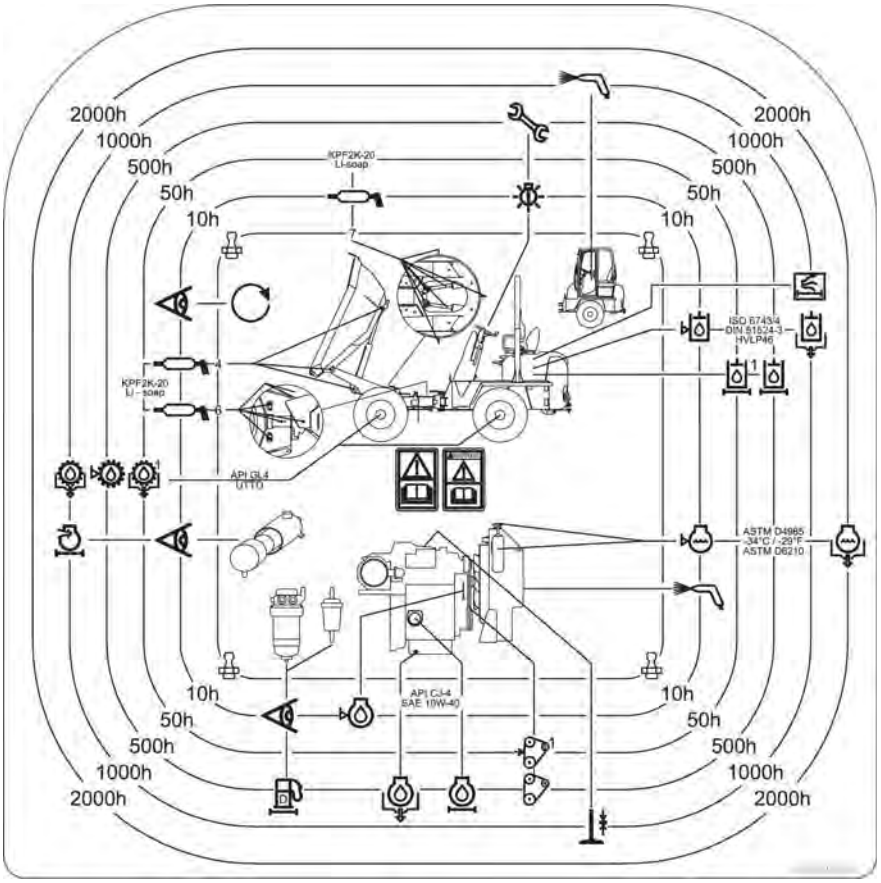
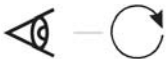


Fig. 31 (Perkins)

Explanation of symbols on the maintenance label

Symbol	Assembly	Explanation
	General	Visual check
	General	Visual check of machine (walk-around)
	General	Lubrication points
	General	Clean the radiator fins and the water separator
	Fuel system	Replacing the fuel filter
	Radiator	Check the coolant
	Radiator	Draining coolant
	Engine	Check the engine oil level
	Engine	Change the engine oil
	Engine	Replace the engine oil filter
	Engine	Replace the V-belt
	Engine	Check the V-belt tension
	Engine	Replace the air filter element
	Engine	Checking valve clearance
	Traveling drive	Check the gearbox oil of the drive
	Traveling drive	Replace the gearbox oil of the drive
	Hydraulic system	Check the oil level of the hydraulic system
	Hydraulic system	Change the hydraulic oil
	Hydraulic system	Replace the hydraulic oil filter insert
	Hydraulic system	Replace the breather filter of the hydraulic oil reservoir
	Cabin and rollbar	Indicator lights are being checked
	Cabin and rollbar	Resetting the maintenance meter

3.6 Maintenance plan (overview – Yanmar)

Work description

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

	Maintenance plan/operating hours (o/h)								
	Service work (daily)	Every 50 o/h	Every 250 o/h	Every 500 o/h	Every 1000 o/h Once a year	Every 1500 o/h	Every 2000 o/h	Customer	Authorized service center
Fluid and filter changes ( ):									
Perform the following oil and filter changes (check oil levels after test run):									
• Engine oil [1]		●	●						●
• Engine oil filter [2]		●	●						●
• Fuel filter [3]		●		●					●
• Air filter [4]				●				●	
• Coolant					●				●
• Gear oil in axles, transfer gearbox [5]		●			●				●
• Brake fluid				●					●
• Hydraulic oil filter insert [6]		●		●					●
• Hydraulic oil [7]					●				●
• Hydraulic oil reservoir breather					●				●
Inspection work ( ):									
Check the following material. Refill if necessary:									
• Engine oil	●							●	
• Engine coolant	●							●	
• Hydraulic oil	●							●	
• Fuel	●							●	
• Gearbox oil			●						●
• Check the gearbox and axles for leaks	●							●	
• Brake fluid	●							●	
Clean water ducts							●		●
Retighten the axle fastening screws		●						●	

3.6 Maintenance plan (overview – Yanman)

Work description

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

	Maintenance plan/operating hours (o/h)								
	Service work (daily)	Every 50 o/h	Every 250 o/h	Every 500 o/h	Every 1000 o/h Once a year	Every 1500 o/h	Every 2000 o/h	Customer	Authorized service center
Check the protective structures (rollbar, optional cabin, protective screen)					●			●	
Check radiator for engine and hydraulic oil for dirt. Clean if necessary	●							●	
Check cooling systems, heating and hoses for leaks and pressure (visual check)	●							●	
Check the air filters for dirt and damage, clean/replace them if necessary			●					●	
Remove dust from dust valve	●							●	
Check correct function of air filter dirt indicator				●					●
Fuel prefilter with water separator: drain water	●							●	
• Clean				●					●
Check V-belt condition and tension	●							●	
Replace the V-belt				●					●
Check the exhaust system for damage and condition	●							●	
Check valve clearance. Adjust if necessary					●				●
Lapping the intake and exhaust valves							●		●
Check and adjust the injection pressure of the injection nozzles, clean the injection needles/nozzles						●			●
Empty the fuel tank and check for dirt				●					●
Check battery electrolyte. Add distilled water if necessary		●		●				●	
Check the tires (damage, inflation pressure, tread depth)	●							●	
Check wheel nuts for tightness		●						●	
Check electric connections, bearing play and function of alternator and starter				●					●
Check preheating system and electric connections				●					●
Pressure check of primary pressure limiting valves					●				●
Check piston rods for damage	●							●	
Check the threaded fittings of the safety devices (for example cabin, etc.) for tightness	●							●	

3.6 Maintenance plan (overview – Yanmar)

Work description For servicing and maintenance on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.	Maintenance plan/operating hours (o/h)								
	Service work (daily)	Every 50 o/h	Every 250 o/h	Every 500 o/h	Every 1000 o/h Once a year	Every 1500 o/h	Every 2000 o/h	Customer	Authorized service center
Check screws for tightness				●					●
Check pin lock	●							●	
Check line fixtures	●							●	
Check indicator lights for correct function	●							●	
Check couplings, dirt pile-up on hydraulic system dust caps	●							●	
Check insulating mats in engine compartment for damage/condition		●						●	
Adjust the mirrors (option) correctly, clean them and check them for damage and correct function	●							●	
Check all fastening screws on the mirrors (option) and tighten them if necessary		●						●	
Check accesses and exits for dirt	●							●	
Check labels and Operator's Manual for completeness and condition		●						●	
Check function of engine cover gas strut	●							●	
Lubrication service ( ):									
Lubricate the following assemblies/components – *see Overview of lubrication points* on page 3-53:									
• Steering cylinder	●							●	
• Tilt cylinder – swiveling cylinder	●							●	
• Articulated joint	●							●	
• Swiveling console	●							●	
Functional check ( ):									
Check the function of the following assemblies/components. Rectify if necessary:									
• Lights, signaling system, acoustic warning system [8]	●							●	
• Heating function (option)		●						●	
• Pedal function	●							●	
• Parking brake function	●							●	

3.6 Maintenance plan (overview – Yanmar)

Work description

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

	Maintenance plan/operating hours (o/h)								
	Service work (daily)	Every 50 o/h	Every 250 o/h	Every 500 o/h	Every 1000 o/h Once a year	Every 1500 o/h	Every 2000 o/h	Customer	Authorized service center
• Steering function	●							●	
Leakage check ( ):									
Check for tightness, leaks and chafing: pipes, flexible lines and threaded fittings of the following assemblies and components. Rectify if necessary:									
• Visual check	●							●	
☞ Engine, hydraulic system and components	●							●	
☞ Cooling and heating circuit	●							●	
☞ Traveling drive	●							●	

1. Drain engine oil the first time after 50 o/h, then every 250 o/h.
2. Replace the engine oil filter the first time after 50 o/h, then every 250 o/h.
3. Replace the fuel filter the first time after 50 o/h, then every 500 o/h.
4. According to the dirt indicator, replace every 500 o/h at the latest. (Replace after 50 o/h when in extensive use in environments with acidic air, such as acid production facilities, steel and aluminum mills, chemical plants and other nonferrous-metal plants).
5. Replace the oil the first time after 50 o/h, then every 1000 o/h or once a year.
6. Replace the hydraulic oil filter insert the first time after 50 o/h, then every 500 o/h.
7. Replace the hydraulic oil the first time after 500 o/h, then every 1000 o/h.
8. Check once a week.

3.7 Maintenance plan (Perkins)

Daily maintenance (operator)	
Inspection work (Check the following fluids and lubricants, check the oil levels after a test run and add oil if necessary)	Page
Check the engine/machine fluids (engine oil, engine coolant, hydraulic oil, brake fluid)	*3-26*, *3-31*, *3-46*, *3-57*,
Check the radiators (for example water, hydraulic oil) for dirt, clean them if necessary	*3-36*
Lubricate the machine according to the lubrication plan	*3-53*, *3-54*
Check the dirt indicator on the air filter[1]	*3-37*
Check the water separator and fuel filter: drain water if necessary (see sight glass)	*3-24*
Check the tires (damage, inflation pressure, tread depth)	*3-55*
Check the engine air intake	*3-39*
Check pin lock	--
Check line fixtures	--
Check indicator lights for correct function	*1-11*
Checking the service and parking brake function	--
Check the threaded fittings of the protective structures (for example the rollbar, cabin) for tightness	--
Clean the lights/light system, signaling system	--
Option	
Adjust the mirrors correctly, clean them and check them for damage, check the fastening screws and tighten them if necessary	--
Leakage check	
Check for tightness, leaks and chafing: pipes, flexible lines and threaded fittings of the following assemblies and components. Repair if necessary	Page
Engine and hydraulic system	--
Traveling drive, axles and transfer gearbox	--
Braking system	--
Cooling systems, heating and hoses (visual check)	--
Visual check	
Correct function; deformations, damage, surface cracks, wear and corrosion	Page
Check the exhaust system for damage	--
Check the insulating mats in the engine compartment for damage	--
Check the cabin and protective structures for damage (for the example rollbar)	--
Check the piston rods of the cylinders for damage	--
Check the seat belt for damage	--
Check function of engine cover gas strut	--
Check the lifting eyes	--

1. Air filter replacement according to the dirt indicator, every 1000 o/h or once a year at the latest. (Replace after 50 o/h when in extensive use in environments with acidic air, such as acid production facilities, steel and aluminum mills, chemical plants and other nonferrous-metal plants, independently of the dirt indicator)

Weekly maintenance (every 50 operating hours) (operator)	Page
Lubricate the machine according to the lubrication plan	*3-53*
Retighten the axle mounting	*3-58*
Check wheel nuts for tightness	*3-55*
Check accesses and exits for dirt	--
All steps for previous maintenance intervals	--

Only once after the first 50 operating hours (Wacker Neuson service center)	
Hydraulic oil filter insert replacement	--
Replacement of gearbox oil in traveling drive, axles and transfer gearbox	--
Check V-belt condition and tension	--
Check the threaded fittings for tightness	--
Check labels and Operator's Manual for completeness and condition	--
Pressure check of primary pressure limiting valves	--
All steps for maintenance once a day and once a week	--

Every 500 operating hours or once a year (Wacker Neuson service center)	
Engine oil replacement	--
Engine oil filter replacement	--
Fuel filter replacement	--
Replace the water separator (prefilter element)	--
Hydraulic oil filter insert replacement	--
Replace the V-belt	--
Replace the braking system fluid	--
Check the gearbox oil in the traveling drive, axles and transfer gearbox	--
Clean the dust valve	--
Drain the condensation water (fuel tank)	--
Check the electric cables and connectors (cable and grounding connections, etc.)	--
Check the threaded fittings for tightness	--
Clean the cabin air filter (replace it if necessary)	--
Reset the maintenance meter	--
All steps for maintenance once a day and once a week	--

Every 1000 operating hours (Wacker Neuson service center)	
Hydraulic oil replacement	--
Replacement of hydraulic oil reservoir breather filter	--
Replacement of gearbox oil in traveling drive, axles and transfer gearbox	--
Replacement of air filter elements [1]	--
Replace the crankshaft housing filter	--
Check the exhaust-gas turbocharger	--
Check valve clearance, adjust if necessary	--
Replace the cabin air filter	--
Pressure check of primary pressure limiting valves	--
Check the battery condition (charge condition, terminals, etc.)	--
Lifting eye wear (check at least once a year)	--
All steps for maintenance once a day and once a week (and all steps for maintenance at 500 operating hours)	--

1. Air filter replacement according to the dirt indicator, every 1000 o/h or once a year at the latest. (Replace after 50 o/h when in extensive use in environments with acidic air, such as acid production facilities, steel and aluminum mills, chemical plants and other nonferrous-metal plants, independently of the dirt indicator)

Every 2000 operating hours or every 2 years (Wacker Neuson service center)	
Coolant replacement	--
All steps for maintenance once a day and once a week (and all steps for maintenance at 500 and 1000 operating hours)	--

Every 3000 operating hours or every 3 years (Wacker Neuson service center)	
Check the injection nozzle and clean it if necessary	--
Clean the diesel particulate filter/replacement program	--
Replace the fuel-burner glow plug	--
Check the water pump (visual check)	--
Replace the coolant thermostat	--
Check the radiator cap	--
All steps for maintenance once a day and once a week (and all steps for maintenance at 500 and 1000 operating hours)	--

Information!

Maintenance with the note **Wacker Neuson service center** must be performed only by the trained and qualified personnel of a **Wacker Neuson service center**.

Information!

The maintenance meter starts at 500.0 hours. It counts down to 0.0 hours. A wrench symbol flashes as soon as the maintenance meter reaches this value.

3.8 Fuel system

Danger!

Explosion and fire hazard when handling fuel!

Can cause serious burns or death.

- Before refueling, stop the engine and remove the starting key.
- Never perform work on the fuel system near open flames or sparks.
- Do not refuel in closed rooms.
- No smoking, no fire.
- Do not smoke when working on the fuel system or when refueling.
- Wipe away fuel spills immediately.
- Use a suitable container to collect the fuel as it drains and dispose of it in an environmentally friendly manner.
- Keep the machine clean to reduce the fire hazard.

Notice!

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 (Yanmar)* on page 3-21.

Notice!

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.

Bear in mind the following important points when refueling:

- Avoid refueling with cans in order to avoid dirt in the fuel.
- When refueling the machine without a fuel-filling pump, use safety-oriented ladders and work platforms.
- Never use machine parts or attachments/superstructures as a climbing aid.

Refueling

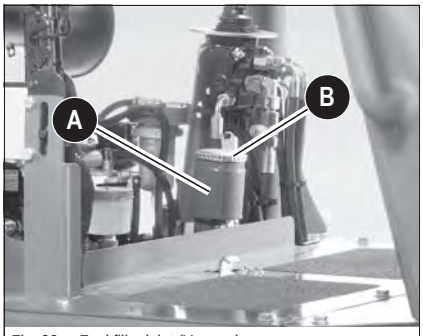


Fig. 32: Fuel filler inlet (Yanmar)

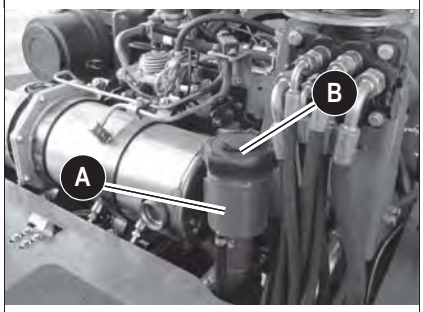


Fig. 32: Fuel filler inlet (Perkins)

Filler inlet **A** for the fuel tank is located under the engine cover, on the left in travel direction.

☞ *Before refueling, stop the engine and remove the starting key.*

☞ *Unscrew and remove filler cap **B**.*

☞ *Refuel.*

☞ *Screw in filler cap **B**.*

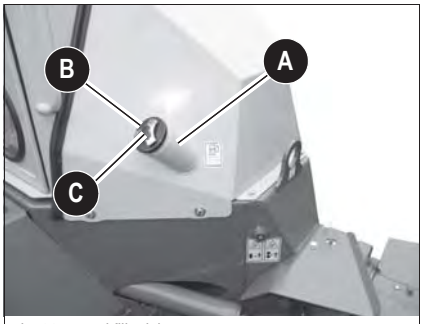


Fig. 33: Fuel filler inlet
(machine with optional cabin) (Yanmar)

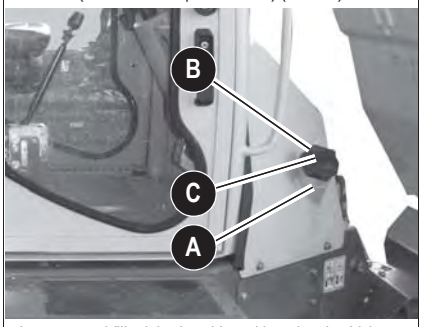


Fig. 33: Fuel filler inlet (machine with optional cabin)
(Perkins)

Machine with optional cabin:

☞ *Unlock lock **C** on filler inlet **A** with the starting key.*

☞ *Refuel.*

☞ *Screw in and lock filler cap **B**.*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Stationary fuel pumps

General

If possible, refuel only from stationary fuel pumps. Fuel from barrels or cans is usually dirty.

Even the smallest particles of dirt can cause:

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

Refueling from barrels

If refueling from barrels cannot be avoided, note the following points:

- Barrels must neither be rolled nor tilted before refueling.
- Protect the suction pipe opening of the barrel pump with a fine-mesh screen.
- Immerse the suction pipe opening down to a max. 15 cm (5.9 in) above the bottom of the barrel.
- Only fill the tank using refueling aids (funnels or filler pipes) with integral microfilter.
- Keep all refueling containers clean at all times.

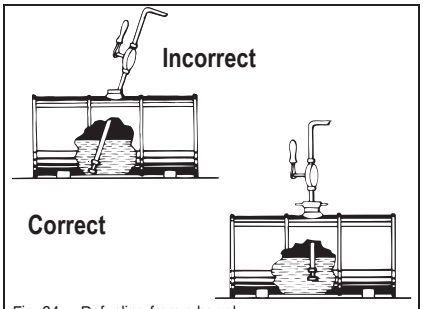


Fig. 34: Refueling from a barrel

Emptying the fuel tank

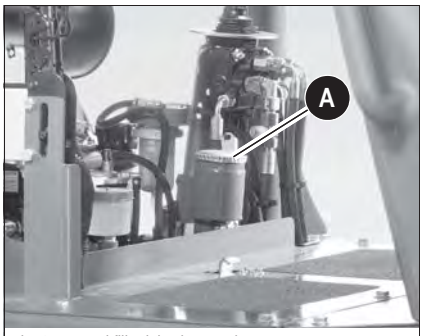


Fig. 35: Fuel filler inlet (Yanmar)

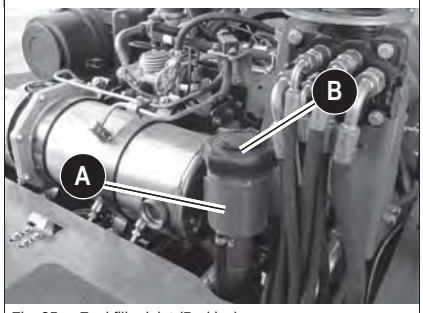


Fig. 35: Fuel filler inlet (Perkins)

Filler cap **A** for the fuel tank is located under the engine cover, on the left in travel direction.

☞ *Stop and park the machine. Stop the engine.*

☞ *Remove filler cap **A**.*

- Machines with a Perkins engine:
  ☞ Unlock lock **B** on the filler cap with the starting key.

☞ *Pump out the fuel with a suitable pump.*

☞ *Screw in the filler cap.*

- Machines with a Perkins engine:
  ☞ Close the lock on filler cap **A**.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

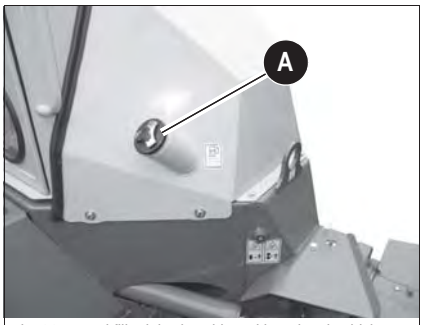


Fig. 36: Fuel filler inlet (machine with optional cabin) (Yanmar)

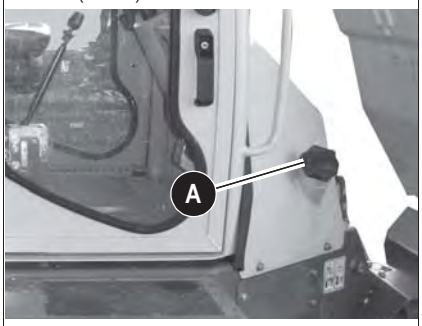


Fig. 36: Fuel filler inlet (machine with optional cabin) (Perkins)

If the machine is equipped with a cabin (option), filler cap **A** is located on the fuel tank on the right in travel direction.

☞ *Stop and park the machine. Stop the engine.*

☞ *Unlock lock **A** on the filler cap with the starting key.*

☞ *Pump out the fuel with a suitable pump.*

☞ *Screw in and lock filler cap **A**.*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Draining the condensation water in the fuel tank

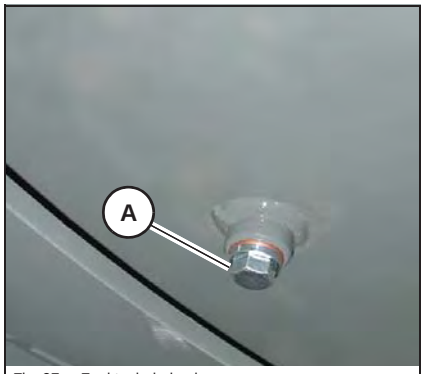


Fig. 37: Fuel tank drain plug

☞ *Stop and park the machine. Stop the engine.*

☞ *Place a suitable container under the fuel tank.*

☞ *Unscrew drain plug **A** with a suitable tool and let the fuel/water mixture drain into the container until only fuel comes out.*

☞ *Install drain plug **A** with a suitable tool.*

Notice!

Use a suitable container to collect engine/machine fluids as they flow out and dispose of them in an environmentally friendly manner.

Bleeding the fuel system (Yanmar)

Danger!

Fire hazard due to diesel fuel! Diesel fuel gives off flammable vapors.

Can cause serious burns or death.

- Work on the fuel system may be performed only in an absolutely clean environment.
- Bleed the fuel system only if the engine is cold.
- Filter elements and drained fuel must be disposed of correctly.
- Always wear protective equipment and safety glasses when working with fuel.
- Wear protective equipment.
- Do not smoke, avoid fire and open flames.

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.

Bleeding the fuel system:

☞ *Remove the starting key.*

☞ *Fill up the fuel tank.*

☞ *Turn the starting 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:

☞ *Stop the engine.*

☞ *Remove the starting key.*

☞ *Bleed the fuel system again as described above.*

☞ *Check for leaks after starting the engine.*

☞ *Have this checked by authorized personnel if necessary.*

Yanmar fuel prefilter with water separator (Yanmar)

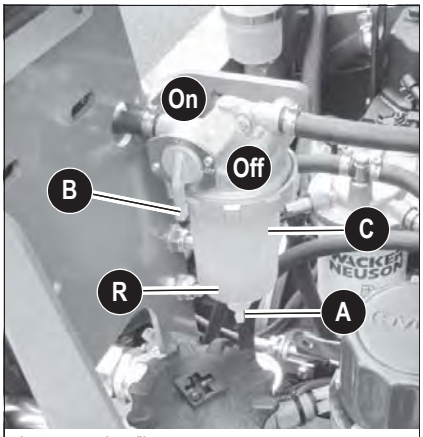


Fig. 38: Fuel prefilter

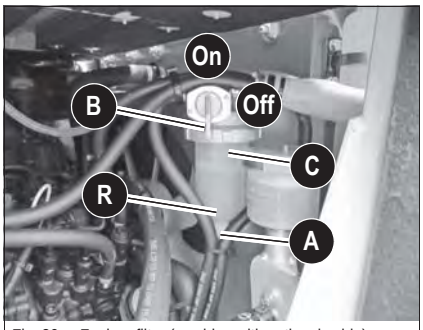


Fig. 39: Fuel prefilter (machine with optional cabin)

Draining the fuel/water mixture

- If the red indicator ring **R** rises to position **C**.

☞ *Stop and park the machine. Stop the engine.*

☞ *Open the engine cover.*

- Machine with optional cabin:

  ☞ Open the maintenance access on the left.

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

➥ Fuel supply is interrupted.

☞ *Place a suitable container under the fuel prefilter to collect the fuel/water mixture as it drains.*

☞ *Unscrew thread **A**.*

➥ Fuel/water mixture drains.

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

☞ *Screw thread **A** back on again.*

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

➥ Fuel supply is open again.

☞ *Close the engine cover.*

- Machine with optional cabin:

  ☞ Close the maintenance access on the left.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Replacing the fuel filter (Yanmar)

Danger!

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

Fire hazard!

- Never change the fuel filter if the engine is hot!

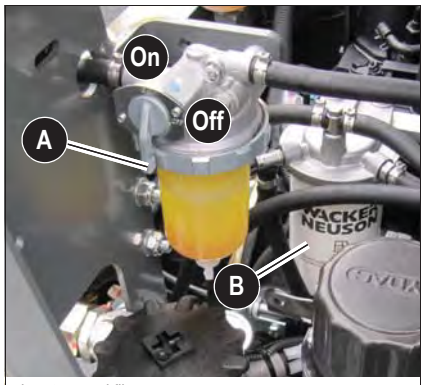


Fig. 40: Fuel filter

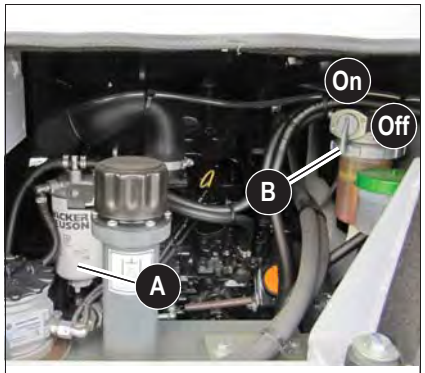


Fig. 41: Fuel prefilter (machine with optional cabin)

☞ *Stop and park the machine. Stop the engine.*

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Turn ball-type cock **A** to the **Off** mark.*

➥ Fuel supply is interrupted.

☞ *Place a suitable container under the fuel filter to collect the fuel/water mixture as it drains.*

☞ *Remove fuel filter **B** and install the new fuel filter.*

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

➥ Fuel supply is open again.

☞ *Bleed the fuel system*
– see Bleeding the fuel system (Yanmar) on page 3-21

☞ *Check for leaks after a test run.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

☞ *Dispose of replaced fuel filters in an environmentally friendly manner*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Fuel filter with water separator (Perkins)

The water separator is located at the rear right of the engine compartment.

If the machine is equipped with a cabin, the water separator is located under the maintenance access on the left.

Checking the fuel filter

Empty the fuel filter if the fuel/water mixture reaches position **A**.

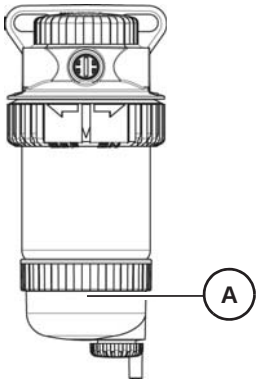


Fig. 42: Checking the fuel filter

Emptying the fuel filter (Perkins)

Notice!

The fuel system can be bled automatically even if the engine is at operating temperature.

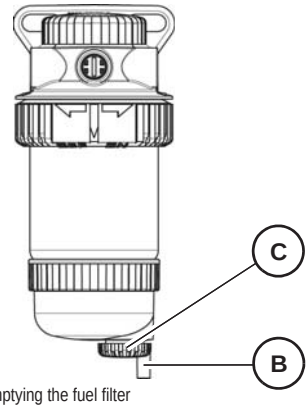


Fig. 43: Emptying the fuel filter

☞ *Stop and park the machine. Stop the engine.*

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Prepare a suitable container for collecting the fuel/water mixture.*

☞ *Connect a drain hose to connection **B**. Place the hose into a container on the ground.*

☞ *Open screw **C**.*

☞ *Collect the fuel/water mixture in a suitable container.*

☞ *Close screw **C**.*

☞ *Remove the hose.*

☞ *Close and lock the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Replacing the fuel filter (Perkins)

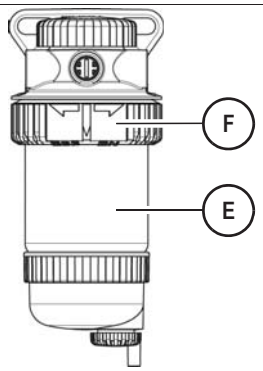


Fig. 44: Replacing the fuel filter

☞ *Stop and park the machine. Stop the engine.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Empty fuel filter **E** – see Emptying the fuel filter (Perkins) on page 3-24.*
☞ *Unscrew union nut **F**.*
☞ *Remove the housing.*
☞ *Remove the old filter insert.*
☞ *Put the new filter insert in place.*
☞ *Fit the housing back on again (apply a thin coat of oil or diesel fuel to the sealing surface).*
☞ *Check the filter for tightness after a short test run.*
☞ *Dispose of the old filter insert in an environmentally friendly manner.*
☞ *Close and lock the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Changing the fuel prefilter (Perkins)

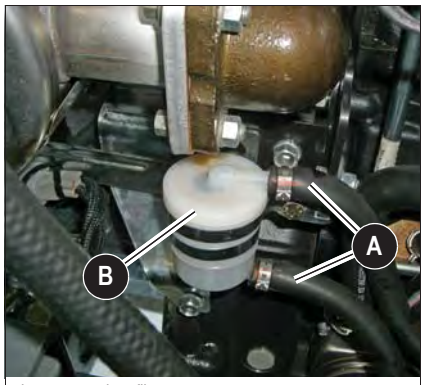


Fig. 45: Fuel prefilter

☞ *Stop and park the machine. Stop the engine.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Prepare a suitable container for collecting the fuel/water mixture.*
☞ *Remove fuel lines **A** with a suitable tool.*
☞ *Remove fuel prefilter **B** with a suitable tool and install the new fuel prefilter.*
☞ *Install fuel lines **A** with a suitable tool.*
☞ *Check for leaks after a test run.*
☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

☞ *Dispose of the replaced fuel prefilter in an environmentally friendly manner.*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

3.9 Engine lubrication system

Notice!

Possible engine damage or power loss due to improper oil management. If the engine oil level is too low or if an oil change is overdue, this can cause engine damage or loss of power.

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

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Checking the engine oil level (Yanmar)

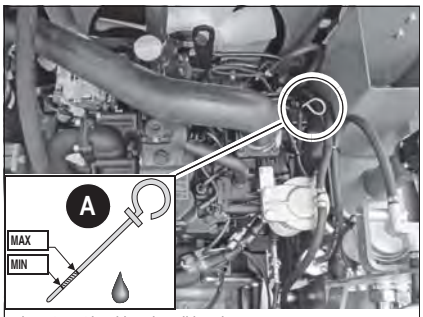


Fig. 46: Checking the oil level

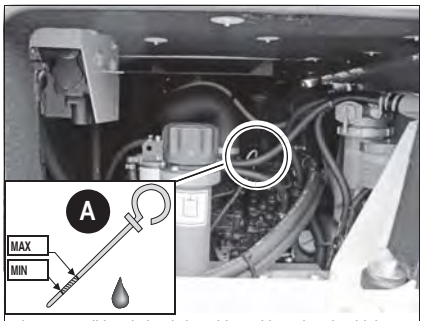


Fig. 47: Oil level check (machine with optional cabin)

☞ *Park the machine on firm, level and horizontal ground.*
☞ *Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Let the engine cool down.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Clean the area around the oil dipstick with a lint-free cloth.*
☞ *Pull out oil dipstick **A**.*
☞ *Clean it with a lint-free cloth.*
☞ *Push oil dipstick **A** back in as far as possible.*
☞ *Withdraw it and read off the oil level.*

Notice!

The oil level must be between the MAX and MIN marks. However if necessary, add oil at the latest when the oil reaches the MIN mark on the oil dipstick.

☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

Checking the engine oil level (Perkins)

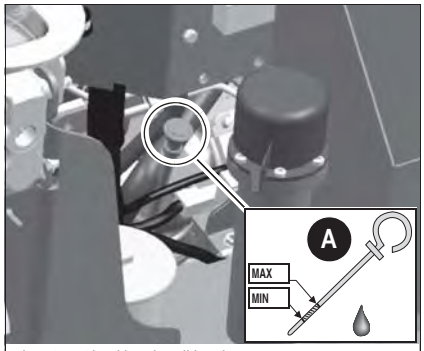


Fig. 48: Checking the oil level

☞ *Park the machine on firm, level and horizontal ground.*
☞ *Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Let the engine cool down.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Clean the area around the oil dipstick with a lint-free cloth.*
☞ *Pull out oil dipstick **A**.*
☞ *Clean it with a lint-free cloth.*
☞ *Push oil dipstick **A** back in as far as possible.*
☞ *Withdraw it and read off the oil level.*

Notice!

The oil level must be between the MAX and MIN marks. However if necessary, add oil at the latest when the oil reaches the MIN mark on the oil dipstick.

☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

Adding engine oil

Notice!

Filling in the engine oil too fast via filler inlet **B** can cause engine damage.
Too much or incorrect engine oil can cause engine damage!

- Do not add engine oil above the MAX mark of oil dipstick
- Use only the specified engine oil
- Add the engine oil slowly so it can go down without entering the intake system.

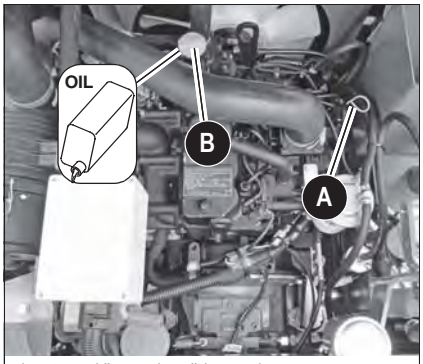


Fig. 49: Adding engine oil (Yanmar)

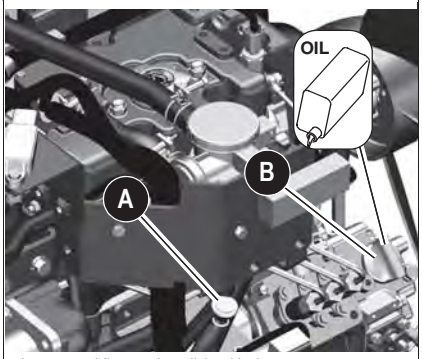


Fig. 49: Adding engine oil (Perkins)

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *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.*

☞ *Add engine oil.*

☞ *Wait about 3 minutes until all the oil has run into the oil sump.*

☞ *Check the oil level.*

☞ *Add oil if necessary and check the oil level again.*

☞ *Close filler cap **B**.*

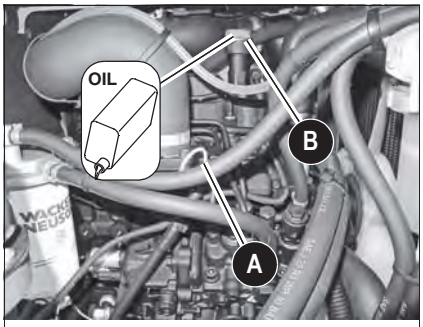


Fig. 50: Adding engine oil (machine with optional cabin)

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

☞ *Completely remove all oil spills.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the left.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Changing engine oil

Danger!

Caution when draining hot engine oil –

Burn hazard!

- Wear protective gloves
- Use suitable tools

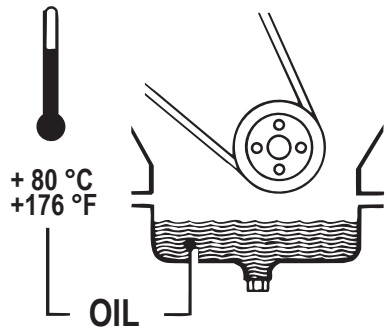


Fig. 51: Optimum engine oil temperature

☞ *Park the machine on level ground.*

☞ *Let the engine run until it reaches its operating temperature (engine oil temperature about 80 °C/176 °F).*

☞ *Stop the engine.*

☞ *Place a suitable container under the oil drain plug to collect the engine oil.*

☞ *Remove the oil drain plug from the oil sump with a suitable tool.*

☞ *Drain the engine oil completely.*

☞ *Install the oil drain plug with a suitable tool.*

☞ *Add engine oil – see Adding engine oil on page 3-28.*

☞ *Check the oil level.*

☞ *Completely remove all engine oil spills from the engine.*

☞ *Start the engine and let it run briefly at low speed.*

☞ *Stop the engine.*

☞ *Wait a moment until all the engine oil has run into the oil sump.*

☞ *Check the oil level again.*

☞ *Add if necessary and check again.*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Replacing the engine-oil filter cartridge

Danger!

Caution when draining hot engine oil

Burn hazard!

- Wear protective gloves

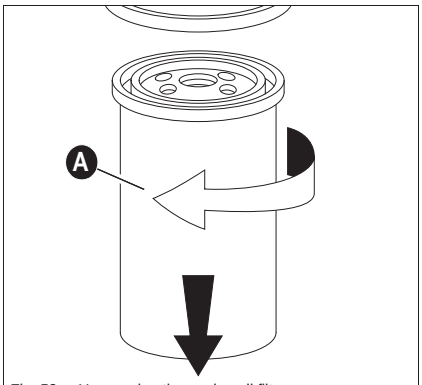


Fig. 52: Unscrewing the engine oil filter

☞ *Stop the engine.*
☞ *Place a suitable container underneath the oil filter to collect the oil as it drains.*
☞ *Slowly loosen oil filter cartridge **A** using a commercially available oil filter wrench.*
☞ *Let the oil drain into the container.*
☞ *Remove the filter cartridge once the oil is completely drained.*
☞ *Ensure that the thread adapter is correctly placed in the filter head.*

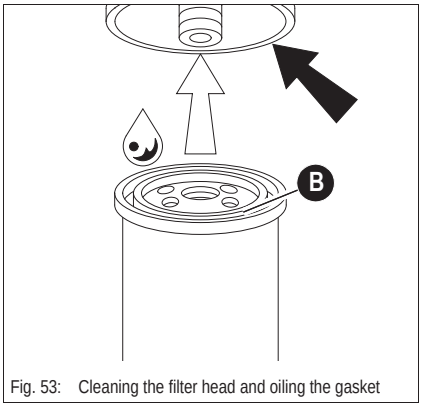


Fig. 53: Cleaning the filter head and oiling the gasket

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

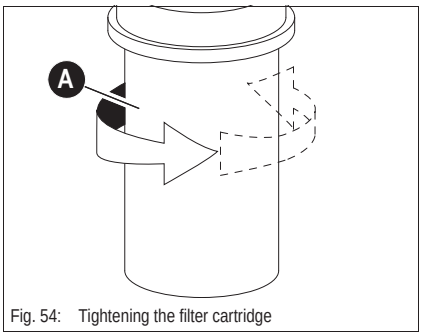


Fig. 54: Tightening the filter cartridge

☞ *Tighten oil filter cartridge **A** with a commercially available oil filter wrench by about a further 3/4 of a revolution.*
☞ *Ensure that the oil level is correct.*
☞ *Completely remove all oil spills from the engine.*
☞ *Let the engine run briefly.*
☞ *Stop the engine.*
☞ *Check the seal of oil filter cartridge **A** and retighten by hand.*
☞ *Check the oil level and add engine oil if necessary.*
☞ *Dispose of the used oil filter in an environmentally friendly manner.*

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner. Dispose of engine-oil filter cartridge in an environmentally friendly manner.

3.10 Engine and hydraulics cooling system

The oil/water radiator is located in the engine compartment, behind the engine. It cools the engine, and the hydraulic oil of the drive and operating hydraulics.

The coolant reservoir is located in the engine compartment next to the toolbox.

Specific safety instructions

- Dirt on the radiator fins reduces the radiator's heat dissipation capacity.
  To avoid this:
  - ☞ Clean the outside of the radiator at regular intervals. Use oil-free compressed air (2 bar/29 psi max.) to clean. Maintain a certain distance from 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 cause engine damage.
  Therefore:
  - ☞ Check the coolant level at regular intervals. Refer to the maintenance plans in the appendix for the intervals.
  - ☞ If coolant must be added frequently, check the cooling system for leaks and/or contact a Wacker Neuson service center.
  - ☞ Never add cold water/coolant if the engine is warm.
  - ☞ After filling up the coolant reservoir, test run the engine and then check the coolant level again at engine standstill.
- The use of the wrong coolant can destroy the engine and the radiator. Therefore:
  - ☞ Add enough antifreeze compound to the coolant – but never more than 50 %. If possible, use brand-name antifreeze agents since they already contain anticorrosion agents.
  - ☞ Observe the coolant compound table – *see Coolant compound table* on page 2-6.
  - ☞ Do not use radiator cleaning compounds if an antifreeze compound has been added to the coolant – otherwise this causes sludge to form that can damage the engine.
- Once you have filled the coolant reservoir:
  - ☞ Test run the engine.
  - ☞ Stop the engine.
  - ☞ Let the engine cool down.
  - ☞ Check the coolant level again.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner. Dispose of engine-oil filter cartridge in an environmentally friendly manner.

Checking the coolant level/adding coolant

Danger!

Burn hazard! The engine coolant is under pressure at high temperature!

Can cause serious injury or death.

- Wait at least 15 minutes after stopping the engine.
- Wear protective gloves and clothing.
- Turn filler cap **B** to the first notch and release the pressure.
- Ensure that the coolant temperature is sufficiently low so you can touch the radiator plug with your hands.

Caution!

Burn hazard! Antifreeze is flammable and toxic.
Can cause injury.

- 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.

Notice!

Do not mix the coolant with other coolants.

- Only use the coolant recommended by Wacker Neuson
  – see chapter 2.11 Coolant compound table on page 2-6.

Notice!

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

- Check the coolant level on the coolant reservoir and radiator filler inlet.

Notice!

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

Notice!

Do not add a different coolant to the one in the reservoir.

- Only use the coolant prescribed by Wacker Neuson
  – *see Fluids and lubricants (Yanmar)* on page 3-2.
- – *see Fluids and lubricants (Perkins)* on page 3-3

Checking the coolant level

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

☞ *Stop the engine.*

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

☞ *Let the engine and the coolant cool down.*

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Loosen the screws on cover **C**.
  ☞ Raise cover **C**.

☞ *Check the coolant level on the transparent coolant reservoir **A** and at the filler inlet **B** of the radiator.*

☞ *If the coolant level is below the **MIN (LOW)** mark or if there is no coolant at the radiator filler inlet **B**:*

☞ Add coolant.

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Install cover **C**.

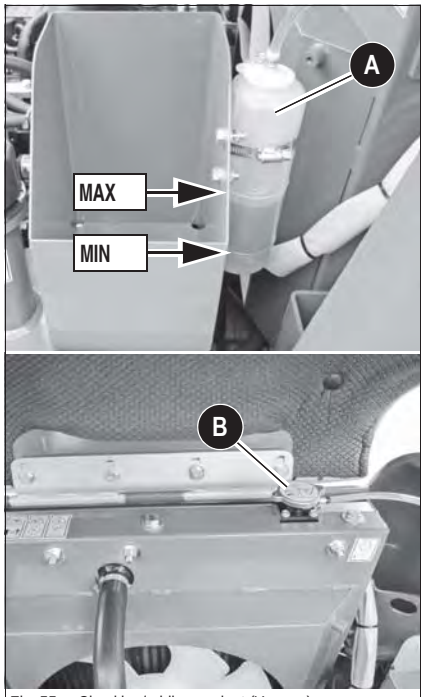


Fig. 55: Checking/adding coolant (Yanmar)

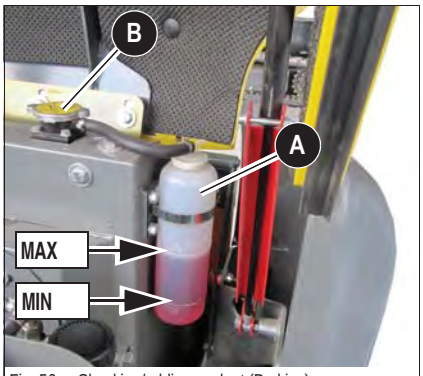


Fig. 56: Checking/adding coolant (Perkins)

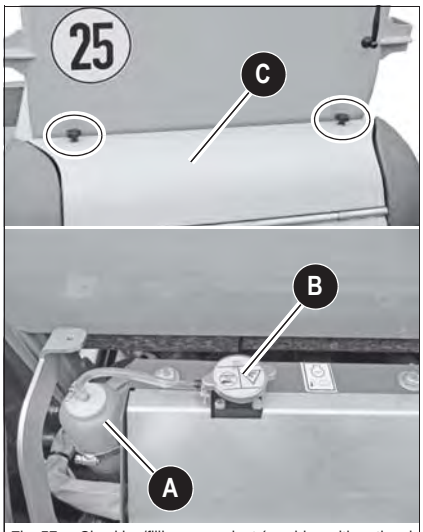


Fig. 57: Checking/filling up coolant (machine with optional cabin)

Adding coolant

After the engine has cooled down:

☞ *Release overpressure in the radiator.*

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

☞ *Open radiator filler cap **B**.*

☞ *Add coolant up to the lower edge of the filler inlet **B** (radiator).*

☞ *Close radiator filler cap **B**.*

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

☞ *Stop the engine.*

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

☞ *Let the engine cool down.*

☞ *Check the coolant level again.*

➥ The cooolant level on reservoir **A** must be between the **MIN (LOW)** and **MAX (FULL)** marks.

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

☞ *Close the engine cover.*

- Machine with optional cabin:

  ☞ Install cover **C**.

Draining coolant

Caution!

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

–

Burn hazard!

- Wait at least 10 minutes after stopping the engine!
- Wear protective gloves and clothing
- Turn filler cap **56/B** to the first notch and release the pressure

Notice!

Do not add a different coolant to the one in the reservoir.

- Only use the coolant prescribed by Wacker Neuson
  – *see Fluids and lubricants (Yanmar)* on page 3-2.
- *– see Fluids and lubricants (Perkins)* on page 3-3

☞ *Stop and park the machine. Stop the engine.*

☞ *Open the engine cover.*

After the engine has cooled down:

☞ *Release overpressure in the radiator.*

☞ *Carefully turn filler cap **56/B** of the radiator to the first notch and allow the pressure to fully escape.*

☞ Open filler cap **56/*B***.

☞ *Place a suitable container under the radiator hose to collect the coolant.*

☞ *Loosen clamp **C** on the lower radiator hose **D** with a suitable tool.*

☞ Carefully remove radiator hose **D** and drain the coolant.

☞ *Install radiator hose **D**.*

☞ *Install clamp **C** with a suitable tool.*

☞ *Fill the radiator with coolant.*
– see Fluids and lubricants (Yanmar) on page 3-2,
– see Fluids and lubricants (Perkins) on page 3-3

☞ *Check the coolant level*
– see Checking the coolant level on page 3-33.

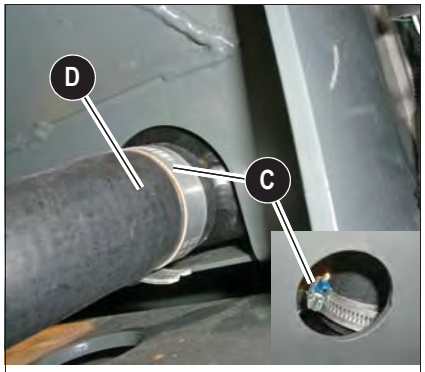


Fig. 58: Removing the radiator hose

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Cleaning the radiator

Caution!

The hot radiator can cause burns.

Burn hazard when performing maintenance on the radiator

- Stop the engine and let it cool down.
- Wear protective equipment.

Notice!

Damage to diesel engine and hydraulic system due to dirt on the radiator.

- Check and if necessary clean the radiator once a day.
- In dusty or dirty work conditions, clean more frequently than indicated in the maintenance plans

Notice!

Damage to radiator fins during cleaning.

- Keep a safe distance from the radiator during cleaning.
- Use oil-free compressed air (2 bar/29 psi max.) to clean.

Radiator **A** and the hydraulic oil radiator **B** are located under the rear panel.

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

☞ *Stop the engine.*

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

☞ *Let the engine and the coolant cool down.*

☞ *Unscrew the four screws to remove rear panel **C**.*

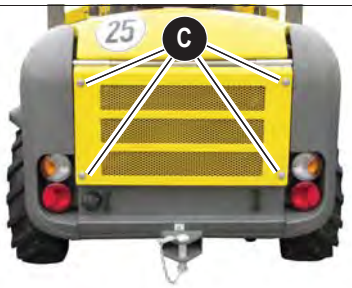


Fig. 59: Rear chassis, rear panel

☞ *Remove dust and other foreign bodies from the fins with compressed air.*

☞ *Install the rear panel.*

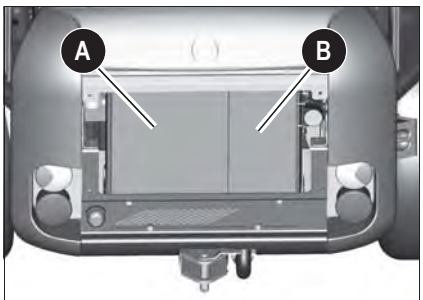


Fig. 60: Rear panel installed

3.11 Air filter

Notice!

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 indicator light illuminates
- Never reuse a damaged filter cartridge
- Ensure cleanliness when replacing the filter cartridge!

Dirt indicator (Yanmar)

Dirt indicator **A** on the air filter housing monitors the air filters.

The air filters must be replaced:

- If the dirt indicator **A** indicates dirt.
- According to the maintenance plan.

The dirt indicator is located on the air filter housing under the engine cover.

Machine with cabin (option): behind the maintenance access on the right.

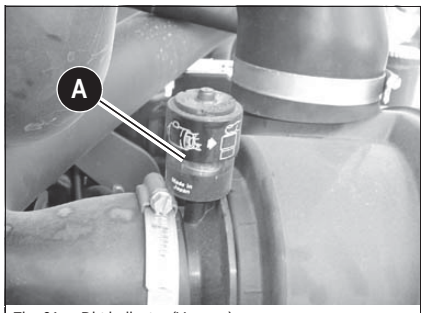


Fig. 61: Dirt indicator (Yanmar)

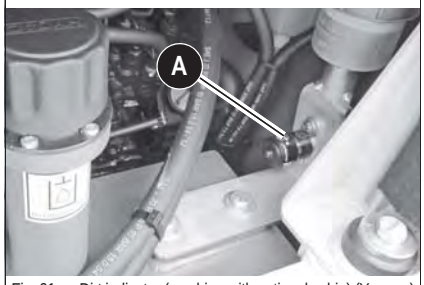


Fig. 61: Dirt indicator (machine with optional cabin) (Yanmar)

Notice!

Air filters 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 aluminum mills, chemical plants and other nonferrous-metal plants

- Check and if necessary, replace the air filters every 50 operating hours at the latest.

General instructions for air filter maintenance:

- Store filters in their original packaging and in a dry place.

☞ *Do not knock the air filters against other objects as you install them.*

☞ *Check air filters, air filter attachments and air intake hoses for damage, and immediately repair or replace if necessary.*

☞ *Check the screws at the induction manifold and the clamps for tightness.*

Air filter dirt indicator (Perkins)

If the air filter is dirty, the yellow indicator light illuminates and the wrench symbol flashes.

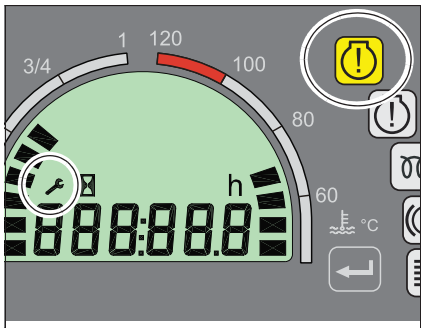


Fig. 62: Air filter dirt indicator (Perkins)

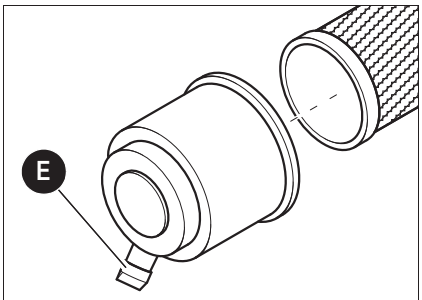


Fig. 63: Dust valve

Dust valve

☞ *Check the function of dust valve **E**, clean it and replace it if necessary.*

☞ Squeeze the end of dust valve **E**.

☞ *Close the engine cover or the maintenance access.*

Replacing the filter

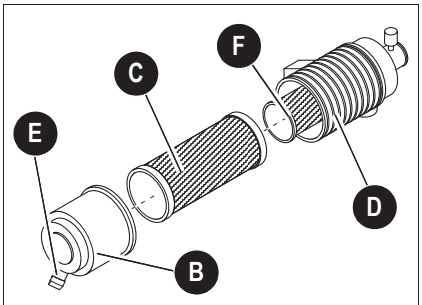


Fig. 64: Replacing the air filter

Replacing the outside air filter

☞ *Stop and park the machine. Stop the engine.*

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

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

- Machine with optional cabin:

  ☞ Open the maintenance access on the right.

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

☞ *Fold the bow clips on lower housing section **B** to the outside.*

☞ *Remove the lower housing section **B**.*

☞ *Carefully remove the outside air filter **C** with slightly turning movements.*

☞ *Ensure that all dirt (dust) inside the upper and lower housing sections (**D** and **B**), including dust valve **E**, has been removed.*

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

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

☞ *Carefully insert the new outside air filter **C** in the upper housing section **D**.*

☞ *Position lower housing section **B** (ensure that it is properly seated).*

☞ *Close the bow clips.*

Replacing the inside air filter

☞ *Remove outside air filter **C** as described above to access inside air filter **F**.*

☞ *Carefully extract inside air filter **F**.*

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

☞ *Ensure that all dirt (dust) inside the upper and lower housing sections **D** and **B**, including dust valve **E**, has been removed.*

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

  ☞ Remove the cloth from the air supply.

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

☞ *Carefully insert the new inside air filter **F** in the upper housing section **D**.*

☞ *Carefully insert the outside air filter **C** in the upper housing section **D**.*

☞ *Position lower housing section **B** (ensure that it is properly seated).*

☞ *Close the bow clips.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

Notice!

Ensure that dust valve **E** shows downward once it is installed.

Checking the engine air intake (Perkins)

Notice!

In order to avoid engine damage.

- Check once a day for cleanliness before putting the machine into operation.

Fig. 65: Engine air intake

☞ *Stop and park the machine. Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Let the engine cool down.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the right.

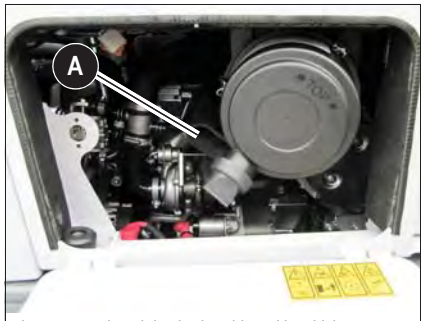


Fig. 66: Engine air intake (machine with cabin)

☞ *Check and, if necessary, clean air intake **A**.*
☞ *Close and lock the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

3.12 Replacing the cabin air filter

Fig. 67: Removing the cabin trim

☞ *Stop and park the machine. Stop the engine.*
☞ *Remove the bolts of cabin trim **A** with a suitable tool.*
☞ *Turn cabin trim **A** toward the operator seat.*

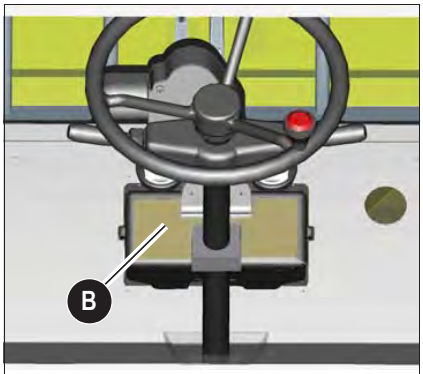


Fig. 68: Replacing the cabin air filter (symbolic representation)

☞ *Remove cabin air filter **B** and replace it by a new one.*

☞ *Install cabin trim **A** again.*

3.13 V-belt

Danger!

Only check or retension/replace the V-belt when the engine is stopped

Injury hazard!

- Stop the engine before performing inspection work in the engine compartment!
- Disconnect the battery or the battery master switch
- Let the engine cool down

Check the V-belt once a day, and retension it if necessary.

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

Checking V-belt tension

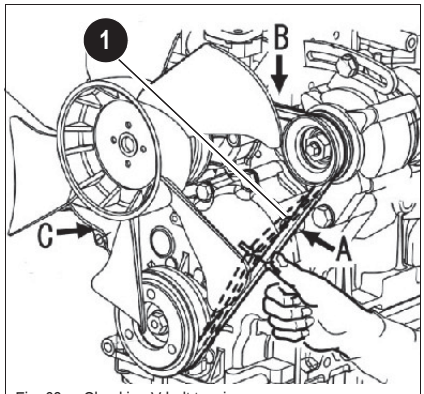


Fig. 69: Checking V-belt tension

☞ *Stop and park the machine. Stop the engine.*

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

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

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Open the maintenance access on the right.

☞ *Carefully check V-belt **1** for damage, cracks or cuts.*

☞ *Replace the V-belt if it touches the base of the V-belt groove or the disks of the pulley.*

- If the V-belt is damaged:

☞ *Replace the V-belt.*

☞ *Press with your thumb to check the deflection of the V-belt between the crankshaft disk and the fan wheel position **C**. A new V-belt should have a deflection of 6 to 8 mm (0.2" – 0.3"), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3" – 0.35").*

☞ *Retension the V-belt if necessary.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

Replacing the alternator V-belt

Caution!

Overtensioning 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 the V-belt tension

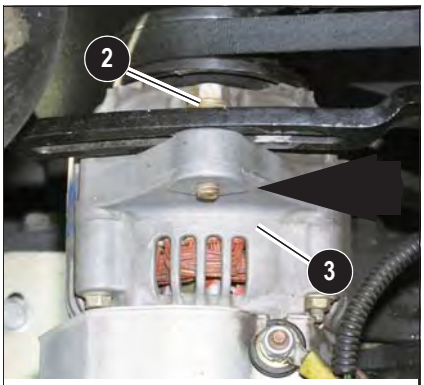


Fig. 70: V-belt (Yanmar)

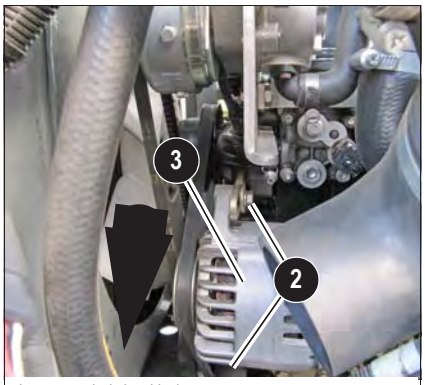


Fig. 71: V-belt (Perkins)

☞ *Stop and park the machine. Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Remove the battery master switch.*
☞ *Let the engine cool down.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the right.

☞ *Loosen fastening screws **2** on alternator **3** with a suitable tool.*
☞ *Remove the old V-belt.*
☞ *Insert the new V-belt.*
☞ *Use a suitable tool to push the alternator in the direction of arrow **A** until reaching the correct V-belt tension.*
☞ *Keep the alternator in this position, and at the same time tighten fastening screw **2** with a suitable tool.*
☞ *Press with your thumb to check the deflection of the V-belt between the crankshaft disk and the fan wheel position **C**. A new V-belt should have a deflection of 6 to 8 mm (0.2" – 0.3"), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3" – 0.35").*
☞ *Retension the V-belt if necessary.*
☞ *Switch on the battery master switch.*
☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

Retensioning the alternator V-belt

☞ *Loosen fastening screws **2** on alternator **3** with a suitable tool.*
☞ *Use a suitable tool to push the alternator in the direction of arrow **A** until reaching the correct V-belt tension.*
☞ *Keep the alternator in this position, and at the same time tighten fastening screw **2** with a suitable tool.*
☞ *Press with your thumb to check the deflection of the V-belt between the crankshaft disk and the fan wheel position **C**. A new V-belt should have a deflection of 6 to 8 mm (0.2" – 0.3"), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3" – 0.35").*
☞ *Retension the V-belt if necessary.*
☞ *Switch on the battery master switch.*
☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

Replacing the compressor V-belt (Perkins)

Caution!

Overtightening can cause damage to the compressor.
Avoid contact of oil, grease or similar substances with the V-belt.

- Check the V-belt tension

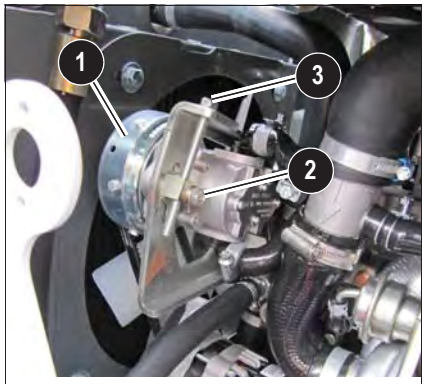


Fig. 72: Compressor V-belt (Perkins)

☞ *Stop and park the machine. Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Remove the battery master switch.*
☞ *Let the engine cool down.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the right.

☞ *Loosen fastening screw **2** of compressor **1** with a suitable tool.*
☞ *Loosen the V-belt with adjusting screw **3**.*
☞ *Remove the old V-belt.*
☞ *Insert the new V-belt.*
☞ *Tighten the V-belt with adjusting screw **3**.*
☞ *Press with your thumb to check the deflection of the V-belt. A new V-belt should have a deflection of 6 to 8 mm (0.2" – 0.3"), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3" – 0.35").*
☞ *Retension the V-belt if necessary.*
☞ *Tighten fastening screw **2** with a suitable tool.*
☞ *Switch on the battery master switch.*
☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

Retensioning the compressor V-belt (Perkins)

☞ *Loosen fastening screw **2** of compressor **1** with a suitable tool.*
☞ *Tighten the V-belt with adjusting screw **3**.*
☞ *Press with your thumb to check the deflection of the V-belt. A new V-belt should have a deflection of 6 to 8 mm (0.2" – 0.3"), a used V-belt (after about 5 minutes running time) should have a deflection of 7 to 9 mm (0.3" – 0.35").*
☞ *Retension the V-belt if necessary.*
☞ *Tighten fastening screw **2** with a suitable tool.*
☞ *Switch on the battery master switch.*
☞ *Close the engine cover.*
- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

3.14 Replacing the crankcase breather filter

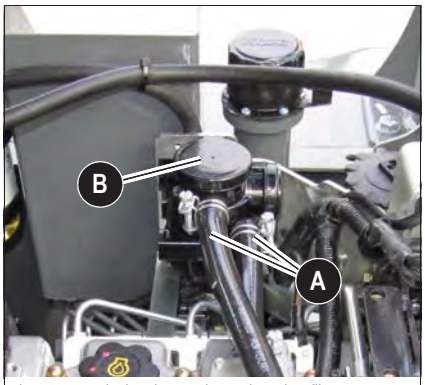


Fig. 73: Replacing the crankcase breather filter

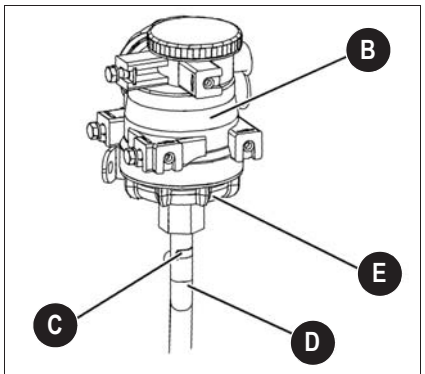


Fig. 74: Replacing the crankcase breather filter

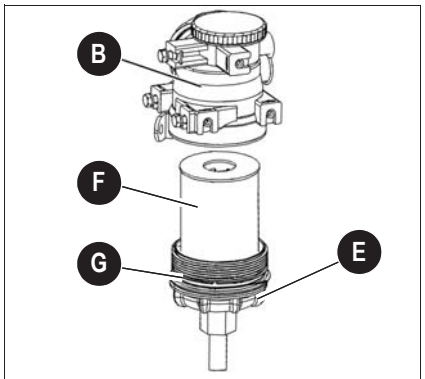


Fig. 75: Replacing the crankcase breather filter

☞ *Stop and park the machine. Stop the engine.*

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

☞ *Remove the battery master switch.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

- Machine with optional cabin:

  ☞ Open the maintenance access on the left.

☞ *Place a suitable container under the crankcase breather to collect the fluids and lubricants.*

☞ *Remove air hoses **A** with a suitable tool.*

☞ *Remove crankcase breather **B** with a suitable tool.*

☞ *Remove clamp **C** and hose **D** from cap **E**.*

☞ *Remove cap **E** from crankcase breather **B**.*

☞ *Remove filter **F** and O-ring **G**.*

☞ *Install a new filter **F** and a new O-ring **G** on cap **E**.*

☞ *Install cap **E** on crankcase breather **B** and tighten it to 10 Nm (7.4 ft.lbs.).*

☞ *Install clamp **C** and hose **D** on cap **E**.*

☞ *Install crankcase breather **B** with a suitable tool.*

☞ *Switch on the battery master switch.*

☞ *Close the engine cover.*

- Machine with optional cabin:

  ☞ Close the maintenance access on the left.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

3.15 Replace the fuel-burner glow plug

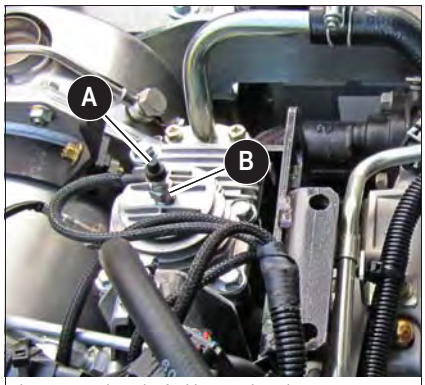


Fig. 76: Replace the fuel-burner glow plug

☞ *Stop and park the machine. Stop the engine.*

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

☞ *Remove the battery master switch.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

- Machine with optional cabin:
  ☞ Open the maintenance access on the right.

☞ *Remove cable **A** with a suitable tool.*

☞ *Remove glow plug **B** with a suitable tool.*

☞ *Install a new glow plug and tighten it to 17 Nm (12.5 ft.lbs.) with a suitable tool.*

☞ *Install cable **B** and tighten it to 1.5 Nm (1.1 ft.lbs.) with a suitable tool.*

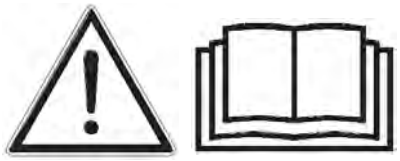
☞ *Switch on the battery master switch.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  ☞ Close the maintenance access on the right.

3.16 Hydraulic system

Specific safety instructions



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

  ☞ Contact a Wacker Neuson dealer immediately.
- Have the respective line replaced if one of the following problems 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.

Notice!

Contaminated hydraulic oil, lack of oil or wrong hydraulic oil – danger of serious damage to the hydraulic system!

- Take care to avoid dirt when working.
- Always add hydraulic oil using the filling screen.
- Only use authorized oils of the same type
  – *see chapter 3.4 Fluids and lubricants (Perkins)* on page 3-3
- Always add hydraulic oil before the level gets too low
  – *see Adding hydraulic oil* on page 3-48
- If the hydraulic system is filled with biodegradable oil, then use only biodegradable oil of the same type for filling up – observe the sticker on the hydraulic oil reservoir.
- Contact customer service if the hydraulic system filter is dirty and contains metal chippings. Otherwise, follow-on damage can result.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner. 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

Notice!

Damage to hydraulic system due to incorrect hydraulic oil level.

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

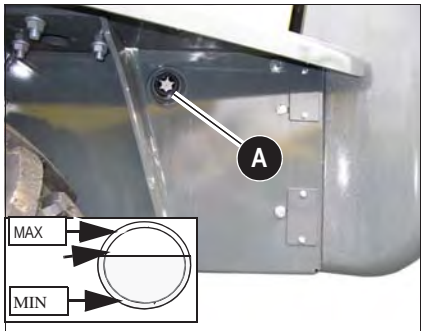


Fig. 77: Oil level indicator on the hydraulic oil reservoir

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

☞ *Retract all hydraulic cylinders.*

☞ Fully lower the skip.

☞ *Stop the engine.*

☞ *Sight glass **A** is located under the left mudguard.*

☞ *Check the oil level on sight glass **A**.*

- The oil level must be about 1 cm (0.39 in) over the center, between positions **MIN** and **MAX**, as shown by the arrows in fig. 77.

  ➥ The **MIN** level is marked by the lower joint.

  ➥ The **MAX** level is marked by the upper joint.

- If the oil level is lower:

  ☞ Add hydraulic oil.

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

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

Adding hydraulic oil

Caution!

Danger of fluid escaping under high pressure! Removing the filler plug can cause oil to escape.
Can cause serious injury or death.

- Carefully unscrew the plug to slowly reduce the pressure inside the reservoir.
- Wear protective equipment. If oil contacts the eye flush immediately with clean water and seek medical treatment.

Notice!

Do not add hydraulic oil unless the engine is stopped. Otherwise, hydraulic oil will overflow at the filler opening on the hydraulic oil reservoir.

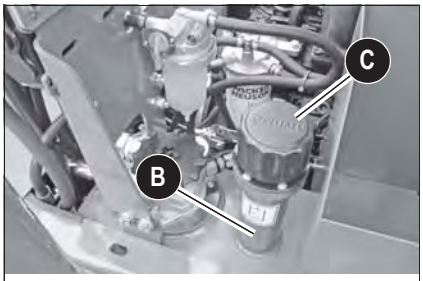


Fig. 78: Adding hydraulic oil (Yanmar)

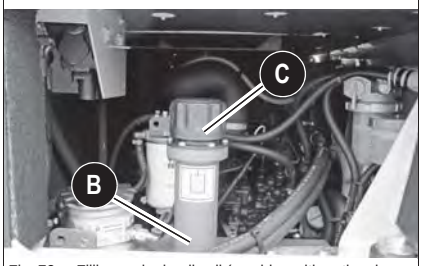


Fig. 78: Filling up hydraulic oil (machine with optional cabin) (Yanmar)

☞ *Park the machine on firm, level and horizontal ground.*
☞ *Retract all hydraulic cylinders.*
☞ *Stop the engine.*
☞ *Open the engine cover.*
- Machine with optional cabin:
  ☞ Open the maintenance access on the left.

☞ *Clean the area around filler inlet **B** with a cloth.*
☞ *Open filler plug **C**.*
- With the filter insert in place:
  ☞ Add hydraulic oil.

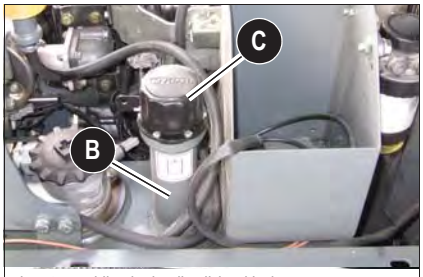


Fig. 79: Adding hydraulic oil (Perkins)

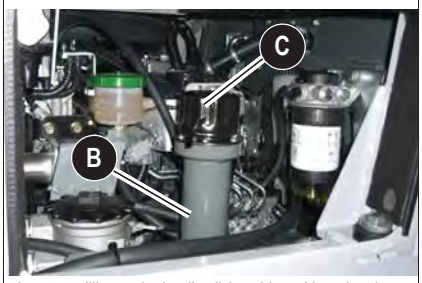


Fig. 79: Filling up hydraulic oil (machine with optional cabin) (Perkins)

☞ *Check the hydraulic oil level on sight glass **A**.*

☞ *Add if necessary and check again.*

☞ *Firmly close filler plug **C**.*

☞ *Close the engine cover.*

- Machine with optional cabin:
  - Close the maintenance access on the left.

Changing hydraulic oil

Notice!

Only change the hydraulic oil if it is warm (about 50 °C/122 °F). Lower the skip in center position before draining the oil (machine in straight-ahead position).

☞ *Open the drain plug and collect the oil in a suitable container.*

☞ *Check the hydraulic oil reservoir for contamination and clean it if necessary*

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

☞ *Screw the drain plug back in correctly.*

☞ *Add clean hydraulic oil through the screen*
– see Adding hydraulic oil on page 3-48.

☞ *Close the hydraulic oil reservoir correctly.*

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

☞ Then check the oil level *– see Adding hydraulic oil* on page 3-48.

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

Wear indicator of hydraulic oil filter insert

Fig. 80: Wear indicator (Yanmar)

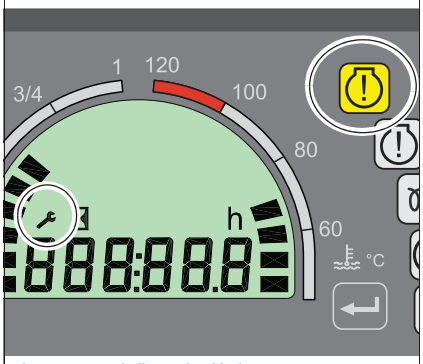


Fig. 80: Wear indicator (Perkins)

An indicator light monitors the hydraulic oil filter:

- Red indicator light (Yanmar)
- The yellow indicator light and the wrench symbol flash (Perkins)

Replace the filter insert:

- If the indicator light illuminates when the hydraulic oil is at operating temperature.
- As indicated in the maintenance plan.

In cold weather the indicator light can illuminate immediately when the engine is started. This is caused by increased oil viscosity.

In this case:

- Warm up the machine at low engine speed and little load.
- Rectify the error if the indicator light continues to illuminate.

Replacing the hydraulic oil filter element

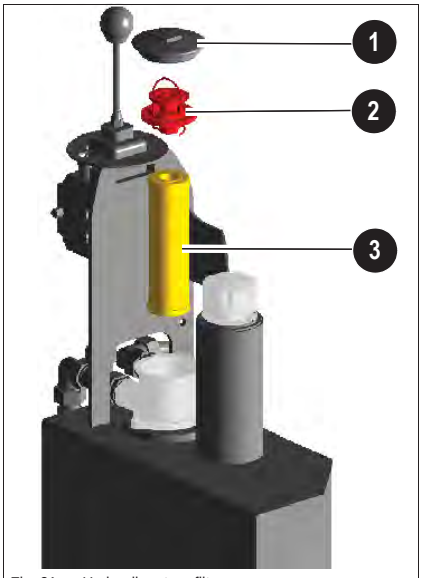


Fig. 81: Hydraulic return filter

☞ *Stop the engine*

☞ *Open cover **1** by about 2 turns and wait until the oil level in the filter housing drops to the oil level in the hydraulic oil reservoir*

☞ *Open the cover completely and remove it*

☞ *Pull filler pipe **2** upward with a slightly turning movement, together with filter element **3***

☞ *Remove the filter element from the filler pipe and dispose of it*

☞ *Slide the filler pipe onto the new filter element and insert it in the filter*

☞ *Tighten the cover by hand*

Replace the braking system fluid

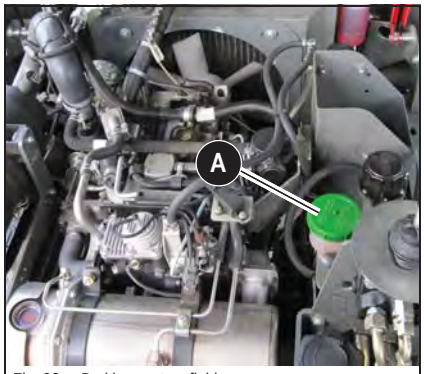


Fig. 82: Braking system fluid

☞ *Stop and park the machine. Stop the engine.*

☞ *Unscrew and remove the cover of reservoir **A**.*

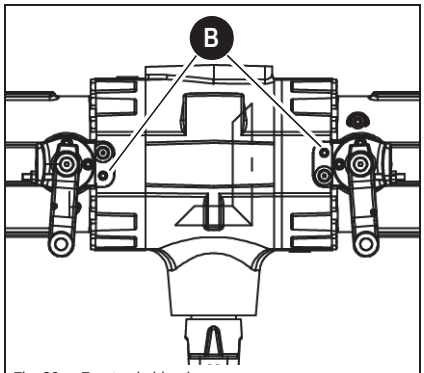


Fig. 83: Front axle bleed screw

☞ *Place a suitable container under the front axle.*

☞ *Unscrew bleed screw **B** on the upper side of the front axle with a suitable tool.*

☞ *Press the brake pedal constantly and at the same time, add brake fluid in reservoir **A** to replace the old fluid by the new one.*

- You can also use a pump to replace the fluid.

☞ *Screw in bleed screw **B** and tighten it with a suitable tool.*

☞ *Screw in the cover of reservoir **A**.*

Notice!

Use a suitable container to collect engine/machine fluids as they flow out and dispose of them in an environmentally friendly manner.

Checking hydraulic pressure lines

Specific safety instructions

Caution!

Injury hazard due to lines under high pressure!
Hydraulic oil escaping under high pressure can penetrate the skin and cause serious 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 threaded fittings and hose connections only when the system is not under pressure. In other words, release the pressure before working on pressurized lines.*
  - *Never weld or solder damaged or leaking pressure lines and threaded fittings. Replace damaged parts with new ones.*
  - *Never search for leaks with your bare hands, but wear protective gloves.*
  - *Use paper or wood to check for minor leaks. Never use an unprotected light or open flame.*
  - *Have damaged flexible lines replaced by a Wacker Neuson service center only.*

- Leaks and damaged pressure lines must be immediately repaired or replaced by a Wacker Neuson service center.
  - This not only increases the operating safety of the 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.

Environment!

Ensure environmentally compatible disposal.

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

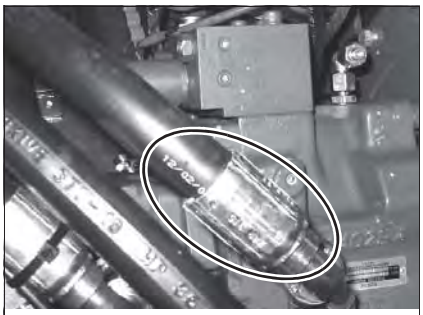
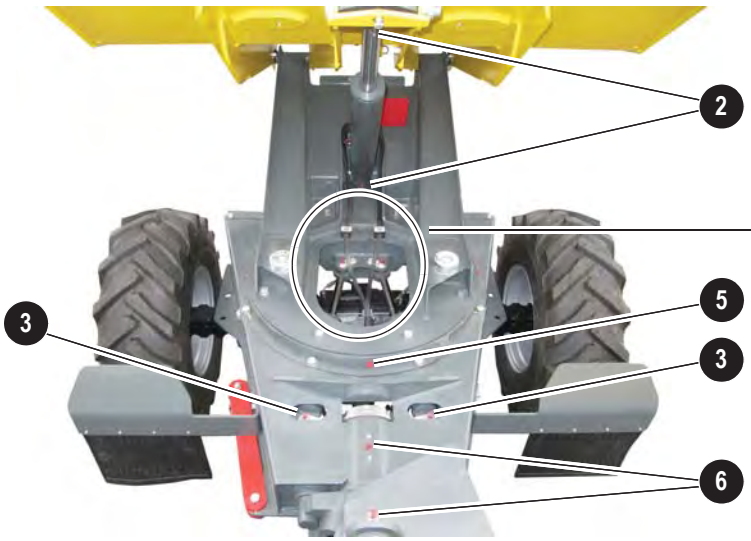


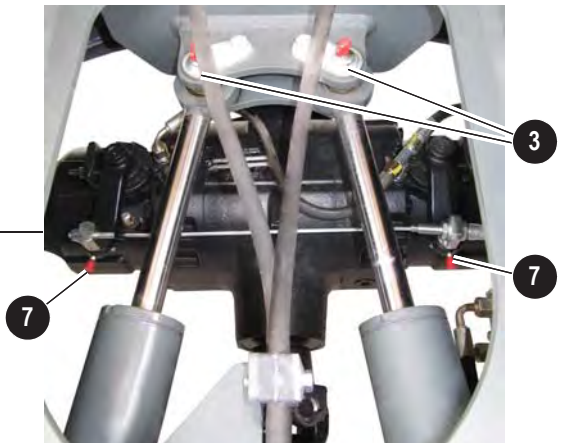
Fig. 84: Article number, date of manufacture

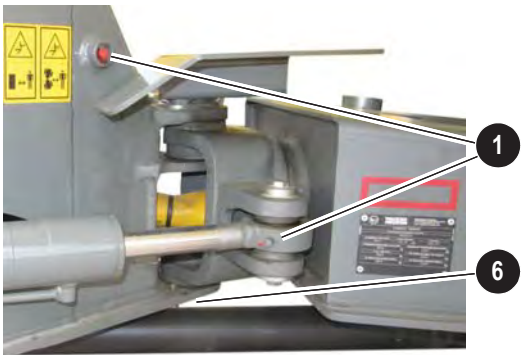
3.17 Overview of lubrication points

Lower the red maintenance prop before you perform maintenance with the skip tilted out – *see chapter 1.13 Maintenance prop* on page 1-16.

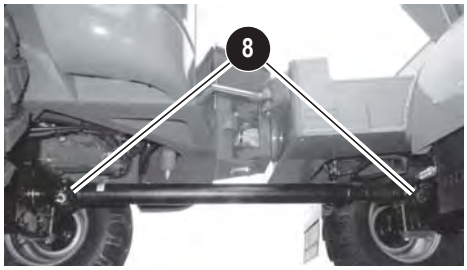
Lubrication plan for swivel skip (option)







Steering cylinder and articulated joint – shown from the right

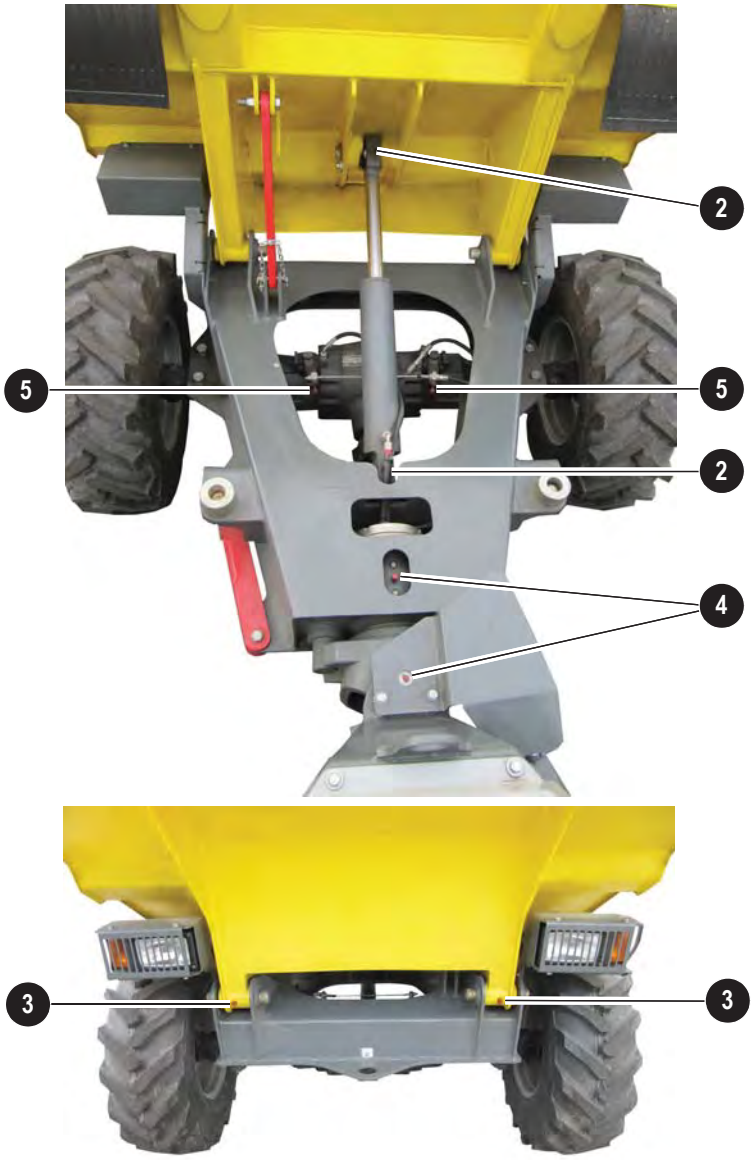


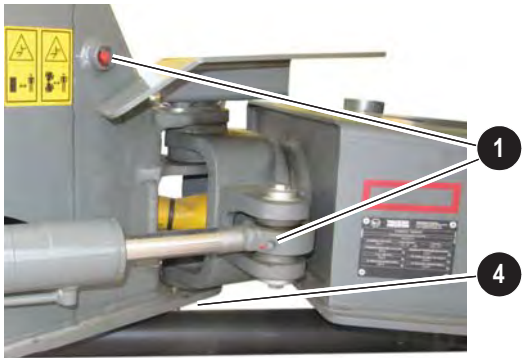
Cardan shaft – shown from the right (symbolic representation)

Pos.	Designation	Interval	Quantity
1	Steering cylinder[1]	Daily	2
2	Tilt cylinder	Daily	2
3	Swiveling cylinder	Daily	4
4	Skip	Daily	2
5	Live ring	Daily	4
6	Articulated joint	Daily	3
7	Parking brake (Yanmar)	Every week	2
8	Cardan shaft	Every 500 o/h [2]	2

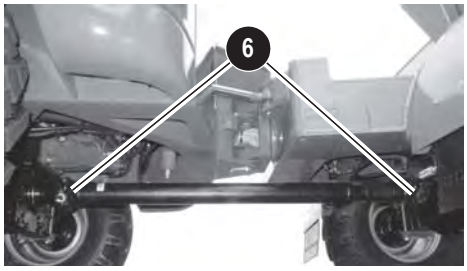
1. Steer the machine to the left and right when applying grease.
2. If the machine is used under extreme conditions (dirt, increased dust), reduce the interval to 250 o/h.

Lubrication plan for front skip (option)





Steering cylinder and articulated joint – shown from the right



Cardan shaft – shown from the right (symbolic representation)

Pos.	Designation	Interval	Quantity
1	Steering cylinder[1]	Daily	2
2	Tilt cylinder	Daily	2
3	Skip	Daily	2
4	Articulated joint	Daily	3
5	Parking brake (Yanmar)	Every week	2
6	Cardan shaft	Every 500 o/h [2]	2

1. Steer the machine to the left and right when applying grease.
2. If the machine is used under extreme conditions (dirt, increased dust), reduce the interval to 250 o/h.

3.18 Tires

Fig. 85: Tires

Tire wear can vary according to work and ground conditions.

Danger!

Accident hazard due to incorrect tire repairs!

Causes serious injury or death.

- All repair work on tires and rims may be performed only by a Wacker Neuson service center.

Checking the tires at regular intervals increases operational safety and the service life of the tires, and reduces machine downtimes.

Please refer to – *see chapter 2 Technical data* on page 2-1 for the authorized tire types and the correct tire pressures.

Notice!

Replace tires with new ones after 6 years (irrespective of wear) and dispose of them correctly. After this period, the rubber no longer has its full capability due to various chemical and physical processes.

☞ *We recommend checking the tires for wear and the wheel nuts for tightness once a day.*

☞ *Park the machine on firm, level and horizontal ground to check and perform maintenance.*

Inspection work

☞ *Perform the following maintenance once a day:*

- Visual check of the tire condition,.
- Check the tire pressure.
- Tire and rim (outside and inside) for damage.
- Check for wear.
- Remove foreign bodies from the tire tread.
- Remove traces of oil and grease from the tires.
- Check the tread depth.

Changing wheels

Notice!

The wheels 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.

Notice!

Use only wheels and tires that are released for the machine.

- – *see chapter 2 Technical data* on page 2-1.

Removing

☞ *Park the machine on firm, level and horizontal ground and prevent it from rolling away.*

☞ Use the chock to prevent the machine from rolling away.

☞ *Loosen the wheel nuts of the wheel you want to remove.*

☞ *Place a jack under the axle body, making sure it is standing firmly.*

☞ *Apply the parking brake.*

☞ *Raise the side of the axle from which you want to remove the wheel.*

☞ *Check the machine is standing firmly.*

☞ *Secure the machine with trestles in appropriate places.*

Notice!

Trestles must be positioned so as to avoid machine damage.

☞ *Completely remove the wheel nuts.*

☞ *Remove the wheel.*

Assembly

☞ *Place the wheel onto the wheel bolts.*

➥ Bear in mind the correct direction of rotation.

☞ *Tighten the wheel nuts.*

☞ Tighten the opposite wheel nut alternately.

☞ *Remove the trestles.*

☞ *Lower the raised axle.*

☞ *Tighten the wheel nuts to the specified torque of 210 Nm (155 ft. lbs.).*

☞ Tighten the opposite wheel nut alternately.

Notice!

After changing wheels, check the wheel nuts after 10 operating hours for tightness. Retighten the wheel nuts if necessary.

3.19 Braking system

Notice!

Only use hydraulic oil for filling up
– see chapter 3.6 Maintenance plan (overview – Yanmar) on page 3-8.– see chapter 3.7 Maintenance plan (Perkins) on page 3-13

Notice!

Before adding hydraulic oil, first check the machine for possible leaks. Only then can hydraulic oil be added.

- If leaks are detected: rectify the error.

Fig. 86: Braking system

Fig. 86: Braking system of machine with cabin (Yanmar)

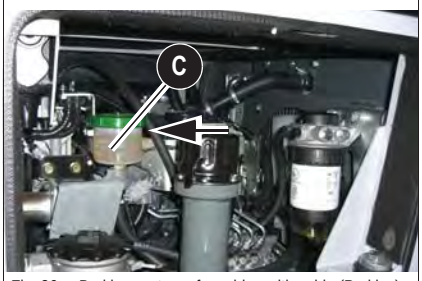


Fig. 86: Braking system of machine with cabin (Perkins)

☞ *Park the machine on firm, level and horizontal ground and prevent it from rolling away.*
☞ *Stop the engine.*
☞ *Remove the starting key and carry it with you.*
☞ *Open the engine cover.*
☞ *Open the maintenance access (machine equipped with optional cabin).*
☞ *Open cover **C**.*
☞ *Add hydraulic oil.*
☞ *Check the hydraulic oil level up to the mark.*
☞ *Add if necessary and check again.*
☞ *Firmly close cover **C**.*
☞ *Close and screw the maintenance access (machine equipped with optional cabin).*
☞ *Close and lock the engine cover.*

3.20 Axles

Danger!

Some components of the machine and the oil are still very hot after switching off the machine –

Burn hazard!

- Wait until the engine has cooled down before taking up work.
- Slowly open filler plug **A** to release the pressure inside.

Checking the oil level and adding oil

Fig. 87: Checking the oil level

☞ *Park the machine on level and horizontal ground*
☞ *Position the machine so that filler plug **A** is at the left*
☞ *Remove the starting key*
☞ *Unscrew screws **A***
➥ The oil must be level with opening **A**
➥ If the oil level is lower,
☞ *Add oil through opening **A** until it flows out slightly*
☞ *Screw screws **A** back in again*
☞ *Move the machine a few metres*

Draining oil

☞ *Park the machine on level and horizontal ground*
☞ *Position the machine so that filler plug **A** is at the bottom*
☞ *Remove the starting key*
☞ *Unscrew screws **A***
➥ The oil now flows out of opening **A**
☞ Use a suitable container to collect the oil as it drains

Environment!

Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.

3.21 Axle mounting

Front axle

Danger!

Accident hazard due to machine rolling away!

Causes serious injury or death.

- Secure the machine to prevent it from rolling away.

Notice!

Retighten the axle fastening screws every 50 o/h.

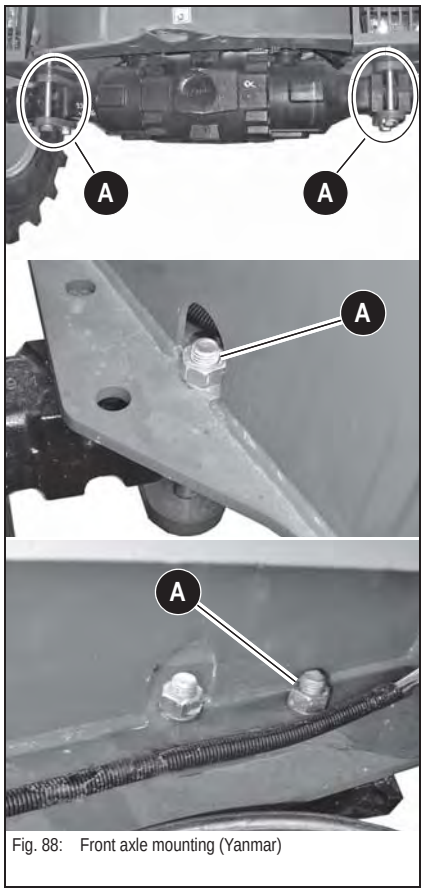


Fig. 88: Front axle mounting (Yanmar)

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

☞ *Secure the machine to prevent it from rolling away.*

☞ *Retighten all **4** fastening screws **A**.*

➥ Tightening torque: 490 Nm (360 ft lbs).

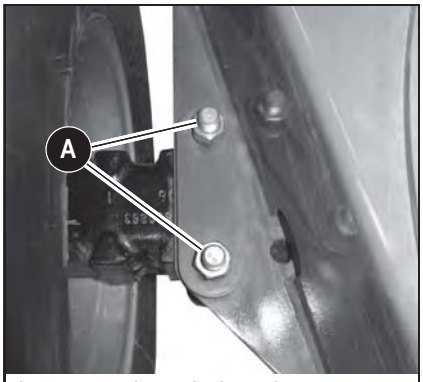


Fig. 89: Front axle mounting (Yanmar)

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

☞ *Secure the machine to prevent it from rolling away.*

☞ *Retighten all **4** fastening screws **A**.*

➥ Tightening torque: 490 Nm (360 ft lbs).

Rear axle

Danger!

Accident hazard due to machine rolling away!

Causes serious injury or death.

- Secure the machine to prevent it from rolling away.

Notice!

Retighten the axle fastening screws every 50 o/h.

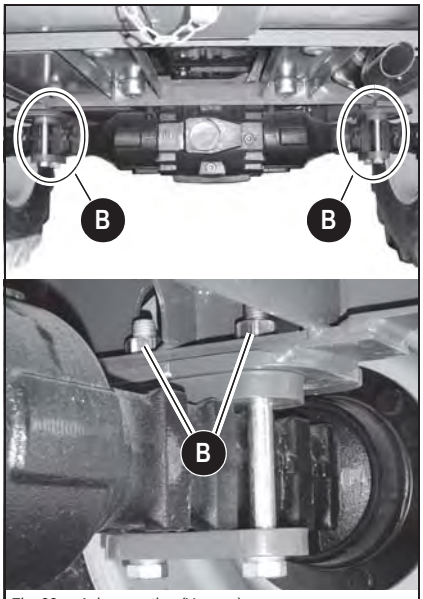


Fig. 90: Axle mounting (Yanmar)

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

☞ *Secure the machine to prevent it from rolling away.*

☞ *Retighten all **4** fastening screws **B**.*

➥ Tightening torque: 490 Nm (360 ft lbs).

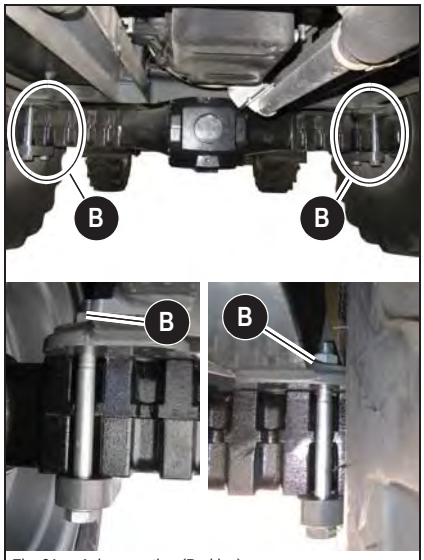


Fig. 91: Axle mounting (Perkins)

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

☞ *Secure the machine to prevent it from rolling away.*

☞ *Retighten all **4** fastening screws **B**.*

➥ Tightening torque: 490 Nm (360 ft lbs).

3.22 Electrical system

Specific safety instructions

Maintenance and repair work on the electrical system may be performed only by trained technical personnel or a Wacker Neuson service center!

- Malfunctioning components of the electrical system must be replaced by a Wacker Neuson service center.
- Light bulbs and fuses may be replaced by the user.

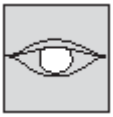
Alternator

- Start the engine only if the battery is connected.
- When connecting the battery, ensure that the poles are not inverted.
- Have a malfunctioning charge indicator light immediately replaced.

Servicing and maintenance at regular intervals

Checks before performing machine travel or when changing users

- Is the light system OK?
- Do the lights and the signaling and warning system work?



Every week

- Electric fuses.
- Cable and grounding connections.
- Battery charge condition.
- Condition of battery terminals.

Fuses and relays

- Blown fuses indicate overloading or short circuits. Have the electrical system checked by a Wacker Neuson service center.
- Only use fuses with the specified load capacity (amperage).

3.23 Battery

Battery charge condition

☞ *Stop and park the machine. Stop the engine.*

- The battery is maintenance-free according to DIN.
- However check the battery at regular intervals to ensure that the electrolyte level is between the MIN and MAX marks.

More maintenance is required if:

- The engine does not start easily.
- The battery is used in areas with higher temperatures.
- The machine was out of operation over a longer period of time (2 – 3 months).

Notice!

The battery must be removed before it can be checked.

Charging the battery

☞ *Stop and park the machine. Stop the engine.*

☞ *Remove the battery with a suitable tool – see Replacing the battery on page 3-63.*

☞ *Charge the battery with a suitable battery charger.*

- Recommended battery charging current: 1/10 of the battery capacity.

☞ *After charging the battery, check the electrolyte level to ensure that it is between the MIN and MAX marks.*

☞ Correct the electrolyte level if necessary.

Replacing the battery

- The battery is located on the right under the engine cover.
  - On machines with cabin, the battery is located behind the maintenance access on the right.
- Always follow the specific battery safety instructions.

☞ *Stop and park the machine. Stop the engine.*

☞ *Open the engine cover.*

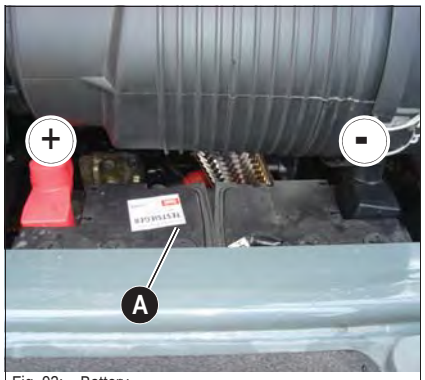


Fig. 92: Battery

☞ *First remove the black battery lead from the negative terminal (−), then the red battery lead from the positive terminal (+) with a suitable tool.*

☞ *Remove battery **A** with a suitable tool.*

☞ *Install the battery.*

☞ *First install the battery lead on the positive terminal (+), then on the negative terminal (−).*

☞ *Close the engine cover.*

Notice!

In order to avoid damage to the engine electronics, do not disconnect the battery while the engine is running.

3.24 General maintenance

Cleaning

Cleaning the machine is divided into 3 separate areas:

- Exterior of the machine.
- Engine compartment.
- Inside the cabin (option).

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

General instructions for all areas of the machine

Cleaning with washing solvents

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

Cleaning with compressed air

- Work carefully.
- Wear safety glasses 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.

Cleaning with a high-pressure cleaner or steam jet

- Cover electric parts.
- Do not directly expose electrical components and damping material to the jet.
- Cover the vent filter on the hydraulic oil reservoir and the filler caps for fuel, hydraulic oil, etc.
- Protect the following components from moisture:
  - Electrical components such as the alternator, etc.
  - Control devices and seals.
  - Air intake filters, etc.

Cleaning with volatile and easily flammable anticorrosion agents and sprays:

- Ensure sufficient room ventilation.
- Do not use unprotected lights or open flames.
- Do not smoke.

Exterior of the machine

Notice!

Cleaning the machine can cause engine damage.

- Protect the engine against humidity
- Follow the recommendations below to properly clean the machine and the engine.

The following articles are generally suitable:

- High-pressure cleaner
- Steam jet

Cleaning the seat belt

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

Inside the cabin

Notice!

Never use high-pressure cleaners, steam jets or high-pressure water to clean inside the cabin.
Water under high pressure can:

- penetrate into the electrical system and cause short circuits and
- damage seals and disable the controls.

We recommend using the following aids to clean the cabin:

- Broom.
- Vacuum cleaner.
- Damp cloth.
- Brush.
- Water with mild soap solution.

Engine compartment

Caution!

Injury hazard when working on a running engine!
Can cause serious injury or death.

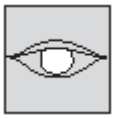
- *Stop the engine before performing maintenance.*
- *Remove the starting key and carry it with you.*

Notice!

The humidity penetrating any such sensors causes them to fail and leads to engine damage. When cleaning the engine with a water or steam jet:

- The engine must be cold.
- Do not point the jet directly at electric sensors such as the oil pressure switch.

Threaded fittings and attachments



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

☞ *Engine fastening screws.*

☞ *Axle fastening screws.*

☞ *Fastening screws on the hydraulic system.*

☞ *Line and pin fastenings on the attachment.*

☞ *Retighten loose connections immediately. Contact a Wacker Neuson service center if necessary.*

Pivots and hinges

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

3.25 Preparatory work before taking out of service

The measures indicated below refer to putting the machine out of operation for 30 days or longer.

- Put the machine out of operation
  – *see chapter 1.10 Parking the machine* on page 1-13.
- Check whether oil or other fluids leak from the machine.
- Clean the engine with a high-pressure cleaner in a suitable place
  – *see General maintenance* on page 3-64.
- Carefully clean and dry the entire machine.
- Spray an anticorrosion agent onto bare metal parts of the machine (for example on the piston rods of hydraulic cylinders).
- Apply grease to all lubrication points.
- Fill the fuel tank completely.
- Change engine oil.
- Check and if necessary add hydraulic oil and coolant.
- Store the machine indoors if possible.
- If the machine is stored outdoors, place it on a wooden base and cover it with a water-tight tarp to protect it against humidity.
- Remove the battery and store it in a safe place.
- Interrupt fuel supply (turn the ball-type cock on the fuel prefilter to OFF).
  Only possible with a Yanmar engine.
- Close the exhaust pipe and the air intake opening of the air filter system.

3.26 Maintenance if the machine is out of service for a longer period of time

The following measures must be taken if the machine is out of service for more than 30 days.

Putting into operation again (Yanmar)

- Remove anticorrosion agent from the piston rods.
- Install or connect the battery.
- Remove the seals from the exhaust pipe and the air filter intake.
- Check the condition of the air filter element and replace the element if necessary.
- Check the dust valve.
- Open fuel supply (turn the ball-type cock on the fuel prefilter to ON).
- Turn the starter to position 1 for 2 minutes (to supply the engine with fuel).
- Check whether oil or other fluids leak from the machine.
- Lubricate the machine according to the lubrication plan.
- Check and if necessary add engine oil, hydraulic oil, coolant and fuel in the units and reservoirs.
- If the machine was out of service for over 6 months, change the oil in the gearbox, engine, etc. and the hydraulic oil reservoir.
- Also replace hydraulic oil filters (return and breather filters) if the machine has been out of service for over 6 months.
- Remove the starting key and fuse F2 in the fuse box.
- Let the engine run 15 seconds.
- Wait 15 seconds.
- Let the engine run 15 seconds again.
- Remove the starting key, put fuse F2 back in.
- Start the diesel engine.
- Let the engine run at idling speed at least 15 minutes without load.
- Check the oil levels in all units and add oil if necessary.

- Start the machine and ensure that each function and all warnings work correctly before putting the machine back into operation.

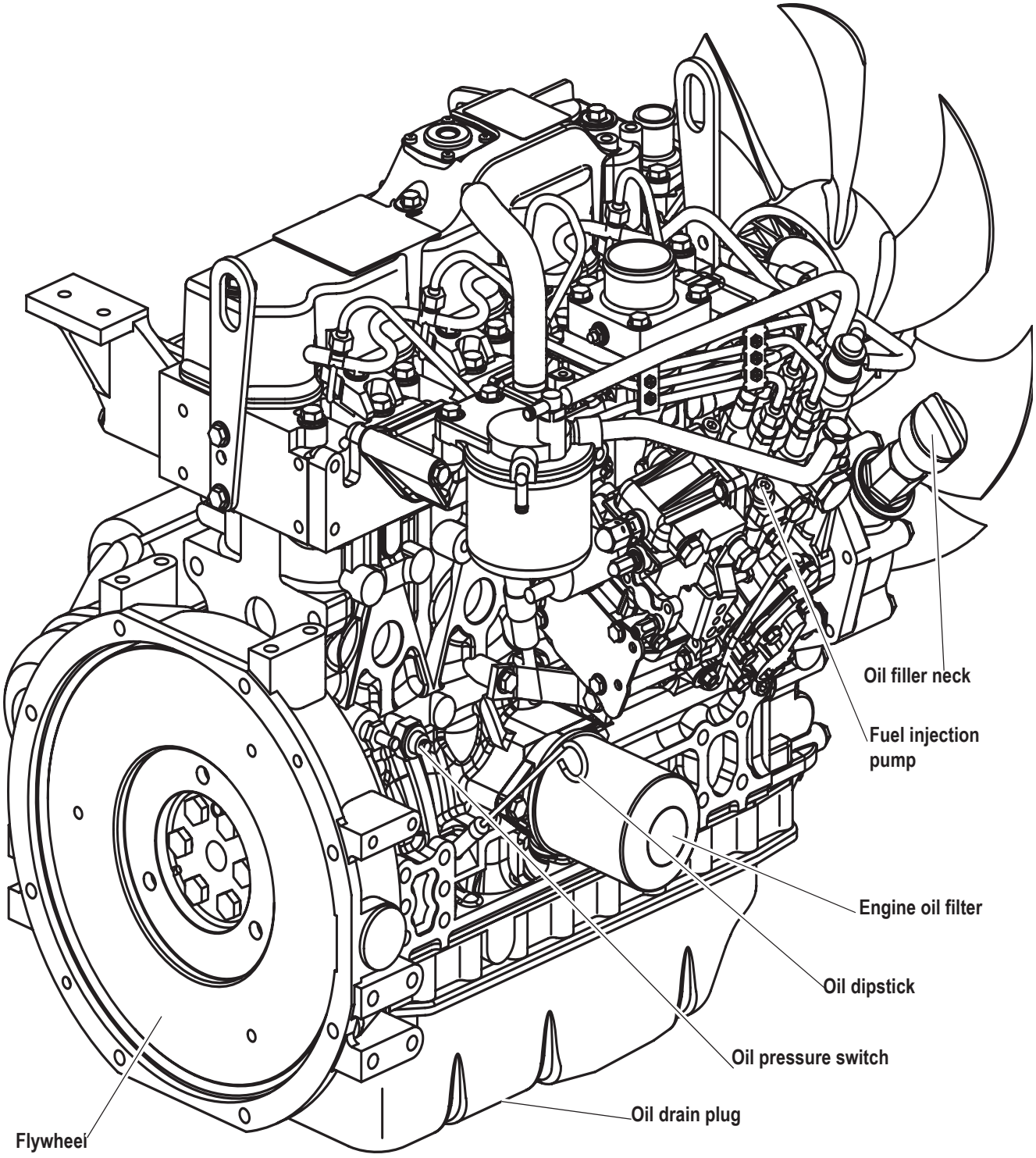
Putting into operation again (Perkins)

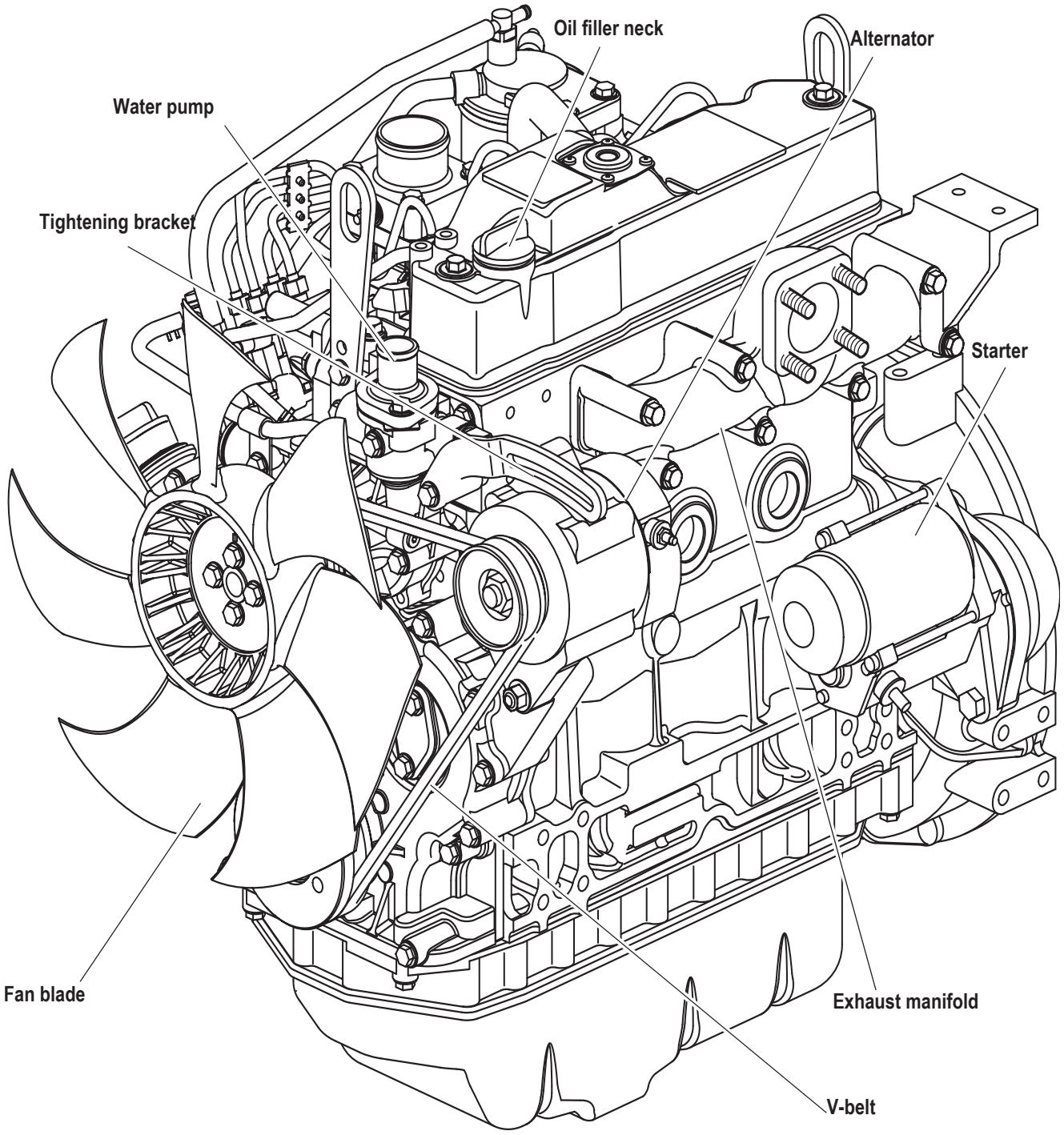
- Remove anticorrosion agent from the piston rods.
- Install or connect the battery.
- Remove the seals from the exhaust pipe and the air filter intake.
- Check the condition of the air filter element and replace the element if necessary.
- Check the dust valve.
- Turn the starter to position 1 for 2 minutes (to supply the engine with fuel).
- Check whether oil or other fluids leak from the machine.
- Lubricate the machine according to the lubrication plan.
- Check and if necessary add engine oil, hydraulic oil, coolant and fuel in the units and reservoirs.
- If the machine was out of service for over 6 months, change the oil in the gearbox, engine, etc. and the hydraulic oil reservoir.
- Also replace hydraulic oil filters (return and breather filters) if the machine has been out of service for over 6 months.
- Operate the starting key only briefly so that the engine does not start.
- Wait at least 30 seconds.
- Operate the starting key only briefly so that the engine does not start. Repeat this procedure five times and wait at least 30 seconds in between.
- Wait at least 30 seconds.
- Start the engine.
- Let the engine run at idling speed at least 15 minutes without load.
- Check the oil levels in all units and add oil if necessary.
- Start the machine and ensure that each function and all warnings work correctly before putting the machine back into operation.

Engine

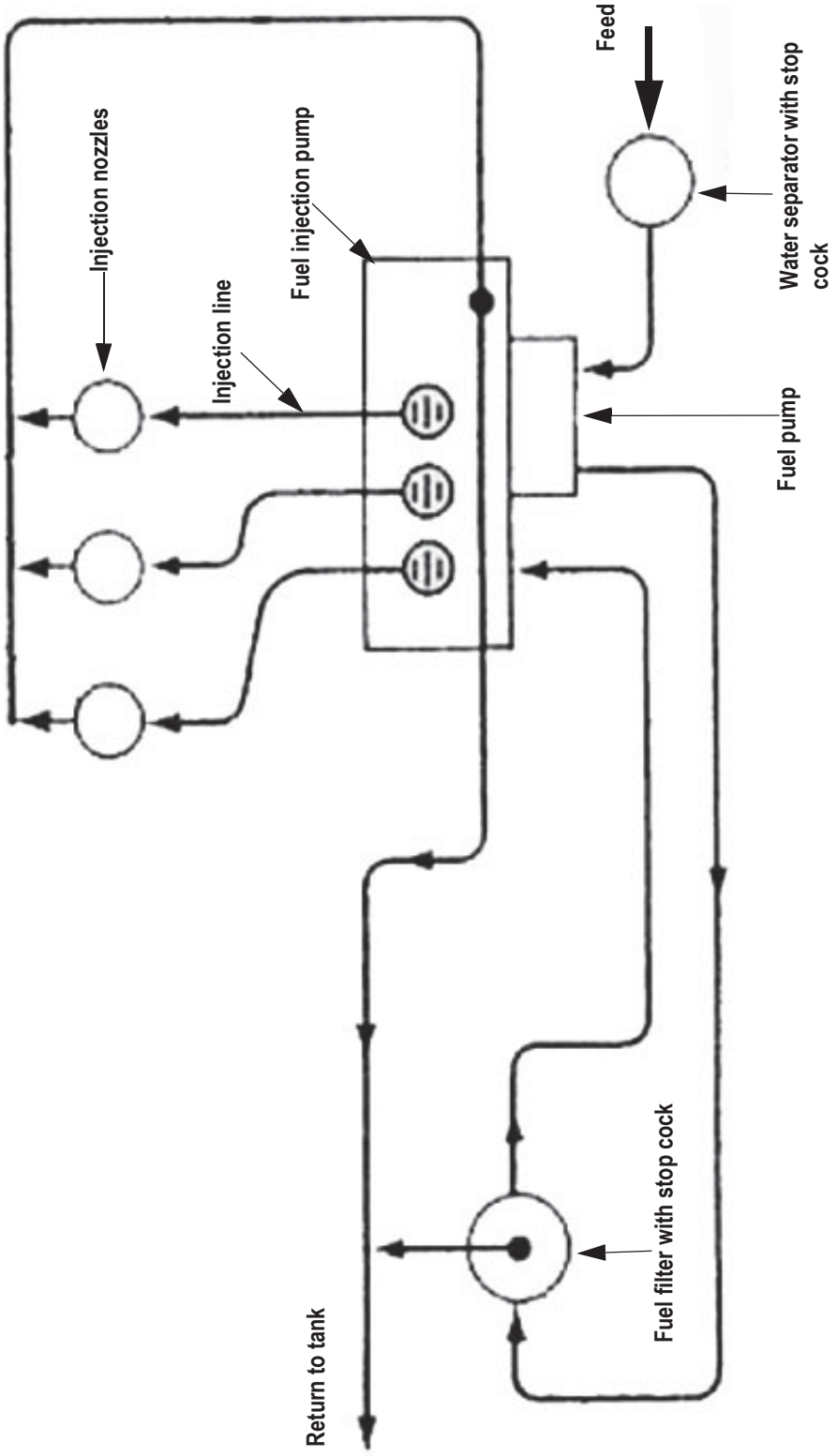
4 Engine

4.1 3TNV88-KNSV engine (overview)



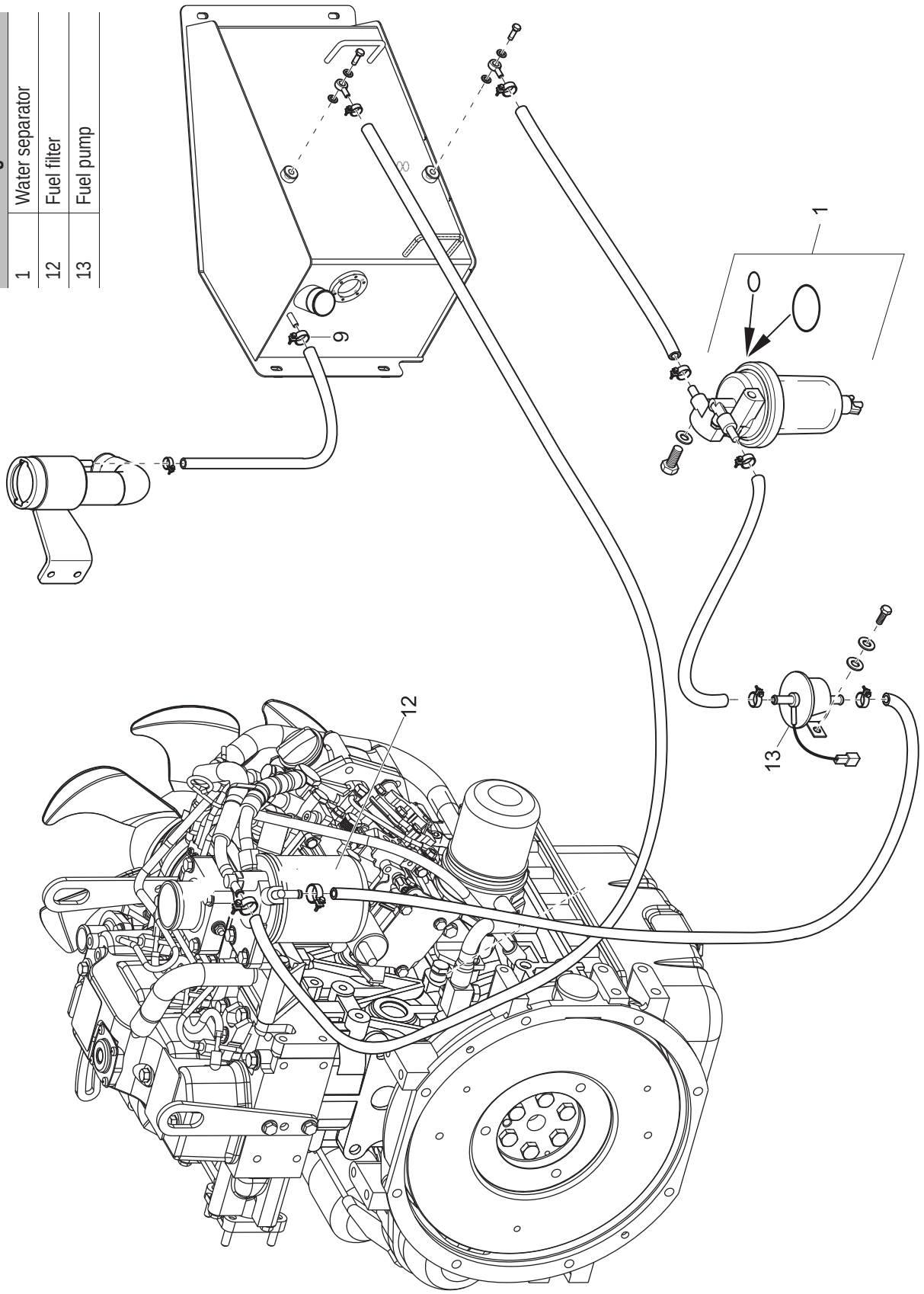

Oil filler neck
Alternator
Water pump
Tightening bracket
Starter
Fan blade
Exhaust manifold
V-belt

4.2 Fuel system (up to AB)



4.3 Fuel system (from AC)

Pos.	Designation
1	Water separator
12	Fuel filter
13	Fuel pump



Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine

☞ *Remove the cylinder-head cover*

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

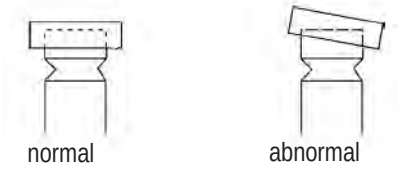


Fig. 1: Valve cap wear

☞ *Check the valve cap for abnormal wear*

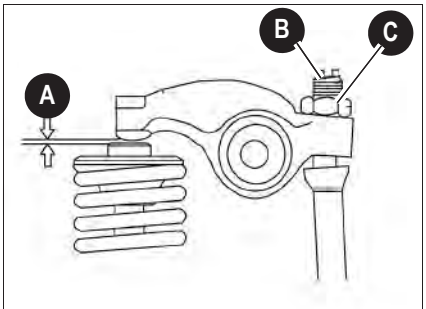


Fig. 2: Valve clearance

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

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

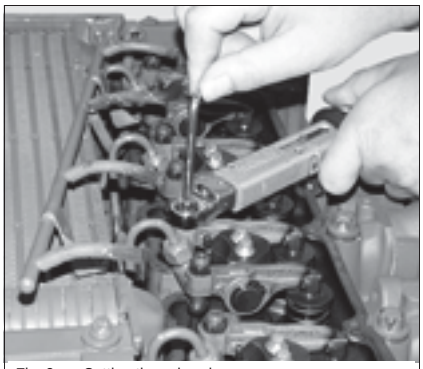


Fig. 3: Setting the valve clearance

☞ *Adjust valve clearance on the cylinder by turning adjusting screw* **2/B**.

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

☞ *Tighten locknut* **2/C**.

➥ Check the setting again with the feeler gage.

☞ *Repeat the procedure for each cylinder*

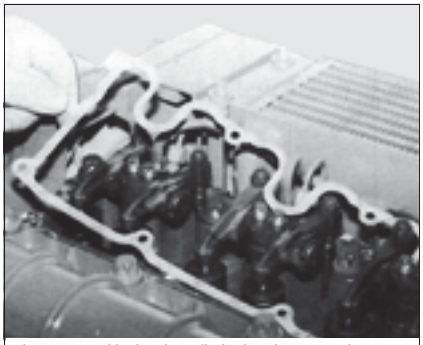


Fig. 4: Positioning the cylinder-head cover gasket

☞ *Position the cylinder-head cover gasket.*

☞ *Install the cylinder-head cover.*

Tightening order for cylinder head bolts

☞ *Install the cylinder-head bolts*

➥ Tightening torques:

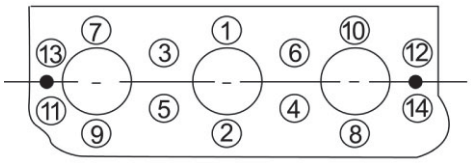
- **1st pass 41.1 – 46.9 Nm (30.31 – 34.59 lbf ft)**
- **2nd pass 85.3 – 91.1 Nm (62.91 – 67.19 lbf ft)**

Caution!

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

☞ *See figure*

Flywheel

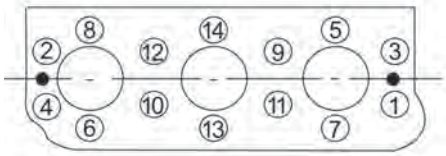


Fan

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

☞ *Order for removing the cylinder-head bolts*

Flywheel



Fan

Notice!

Always perform work on the cylinder head on a cold engine!

4.4 Checking the injection nozzles

Pressure check

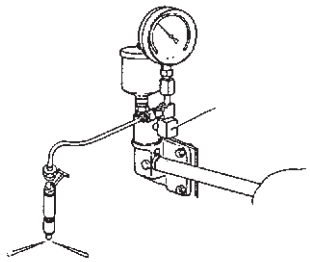


Fig. 5: Nozzle tester

☞ *Remove the injection line and the injection nozzle*

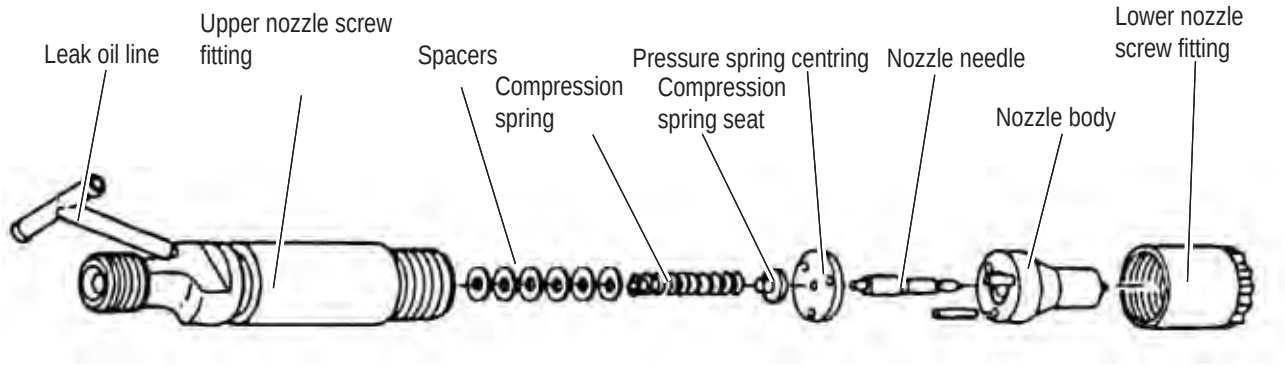
☞ *Connect the injection nozzle with the high pressure line of the nozzle tester*

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

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

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

- Spacer thickness of 0.1 mm (0.004") corresponds to modification by 19 bar (276 psi)



Checking the nozzle jet

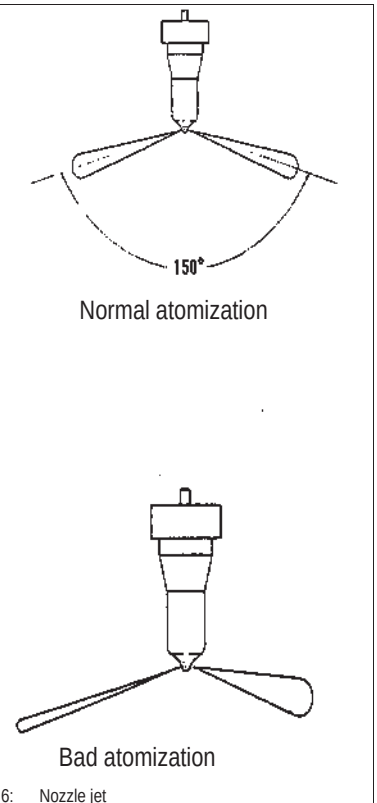


Fig. 6: Nozzle jet

☞ *Remove the injection lines and the injection nozzles*

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

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

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

☞ *The nozzle jet must create a circle on the paper*

☞ *Check the nozzle for drips after it has ejected fuel*

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

Injection time

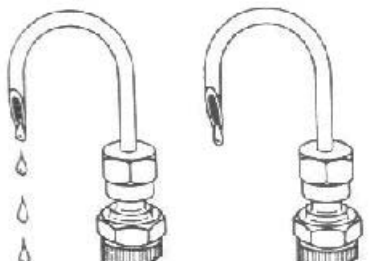


Fig. 7: Drip tube

Checking injection time

☞ *Remove the cylinder-head cover*

☞ *Turn the engine clockwise with the crankshaft (as seen from the radiator) up to the top dead center of the first cylinder and check whether both cams show upward to the left and right*

☞ *Remove the rubber covers from the flywheel housing and check whether the mark on the belt pulley is aligned with the 0 mark on the scale*

☞ *Unscrew the injection line of the first cylinder and replace it by the drip tube (place a container to collect the fuel (Fig. 7)*

☞ *Rotate the engine 1.5 revolutions until it is 40° before top dead center in the compression stroke*

☞ *Slowly keep on turning the engine (degree by degree) until dripping stops*

- Do not turn back if you have turned too much!

☞ *The point at which the dripping stops is the start of delivery (injection time) of the fuel injection pump*

➥ You can now read the value (in degrees before top dead center) off the belt pulley

Setting injection time

☞ *If injection time should no longer be correct, you can adjust it by rotating the fuel injection pump*

☞ *Mark the initial position on the pump and wheel case housing before setting the fuel injection pump*

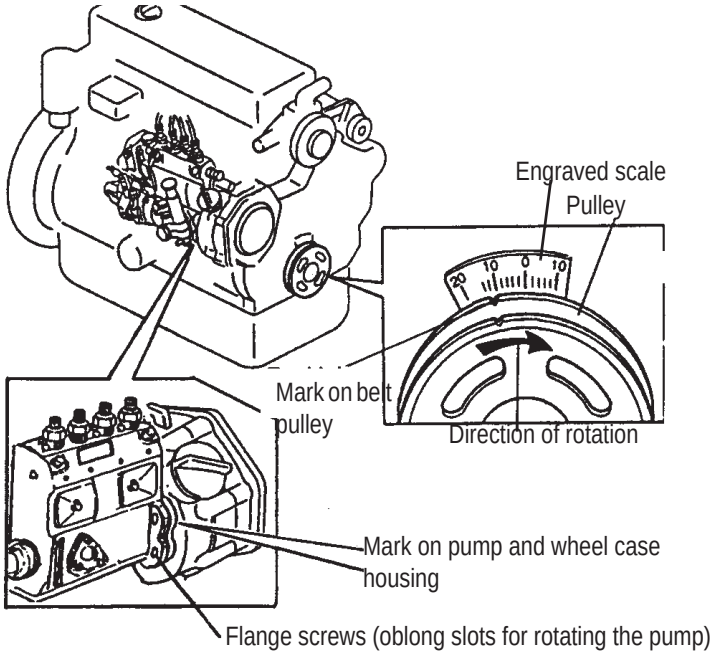
☞ *Remove all injection lines before rotating the injection pump, and loosen the 4 flange screws by about half a revolution*

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

➥ Rotated toward the engine: earlier injection time

➥ Rotated away from the engine: later injection time

☞ *Bend each of the injection lines before you install them so they are not subject to tension once they are installed*



4.5 Adjusting engine speed

Notice!

Maximum engine speed is sealed in the factory and may not be modified!

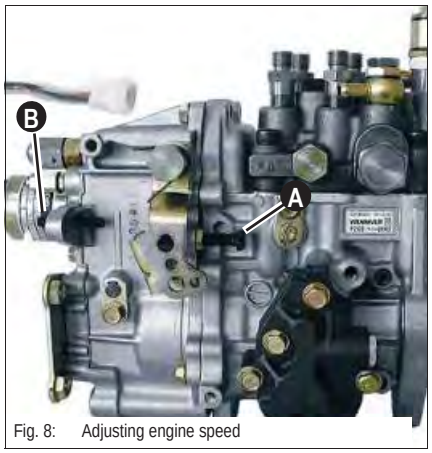


Fig. 8: Adjusting engine speed

Adjust engine speed without load!

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

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

➥ Idling speed: 1000 ± 25 rpm

➥ Max. engine speed: 3000 ± 25 rpm

☞ Adjust if engine speed differs

– *see Setting injection time* on page 4-8

4.6 Compression

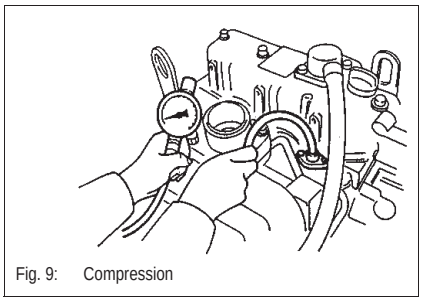


Fig. 9: Compression

☞ *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*

☞ *Install the compression gage on the cylinder you want to measure*

☞ *Turn the engine with the starter and read the pressure off the pressure gage*

➥ Standard **34.3 bar (497 psi)**

➥ Limit **27.5 bar (399 psi)**

4.7 Checking the coolant thermostat

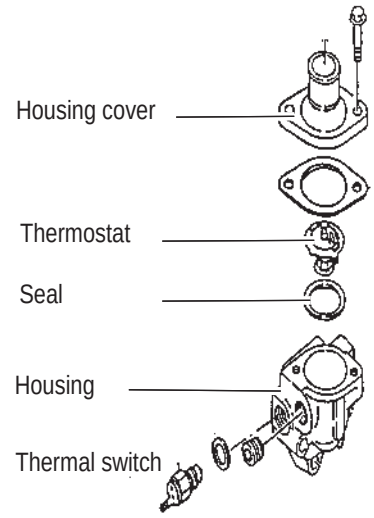
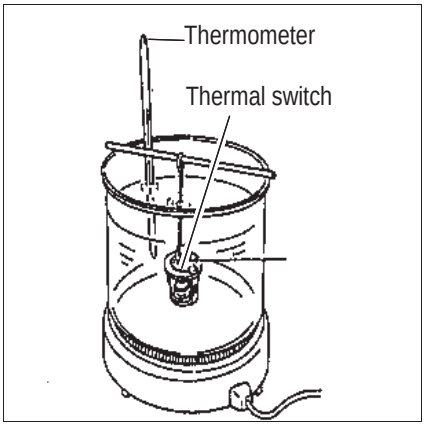


Fig. 10: Coolant thermostat

☞ *Remove the thermostat*

➥ The thermostat is located on the water pump
– *see 3TNV88-KNSV engine (overview)* on page 4-1



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

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

➥ Thermostat opening temperature: **begins at 71 °C (160 °F), fully open at 85 °C (185 °F)**

Checking the thermal switch

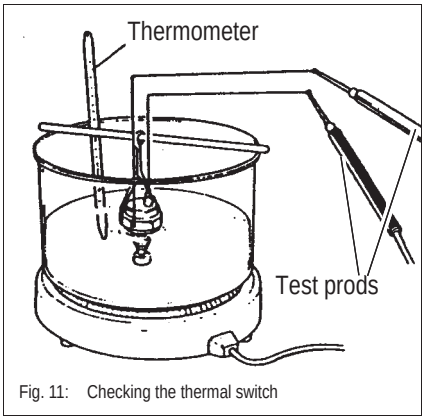


Fig. 11: Checking the thermal switch

☞ *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 (224.6 – 235.4 °F)**

4.8 Oil pressure switch

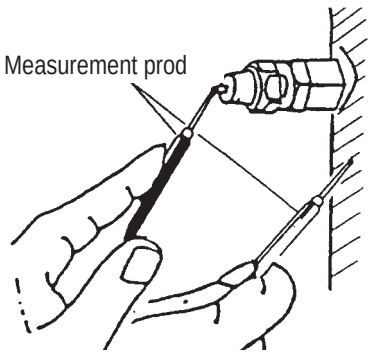


Fig. 12: Oil pressure switch

☞ *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 malfunctioning if the oil can pass

4.9 Checking the coolant circuit

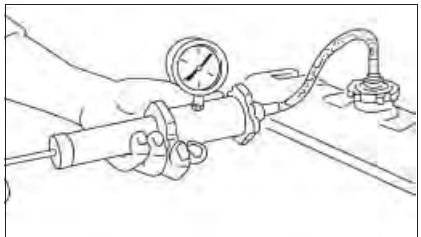


Fig. 13: Checking the radiator for leaks

Leakage check

☞ *Fill up the radiator completely*

☞ *Install an adapter on the radiator as shown*

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

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

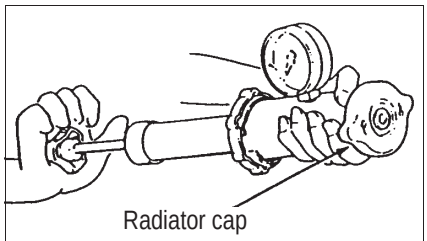


Fig. 14: Checking the radiator cap

Checking the radiator cap

☞ *Remove the radiator cap and install it on the adapter as shown*

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

➥ The radiator cap must open

4.10 Clutch

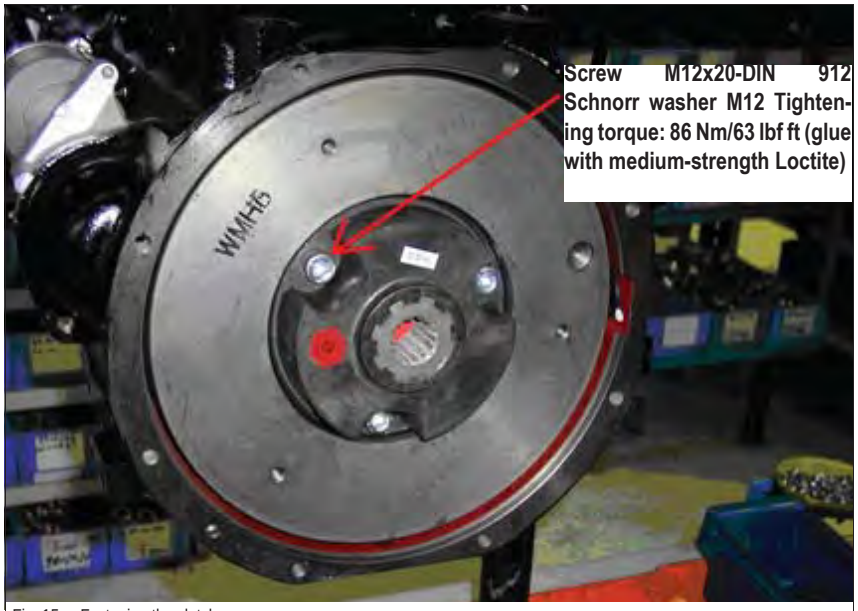


Fig. 15: Fastening the clutch

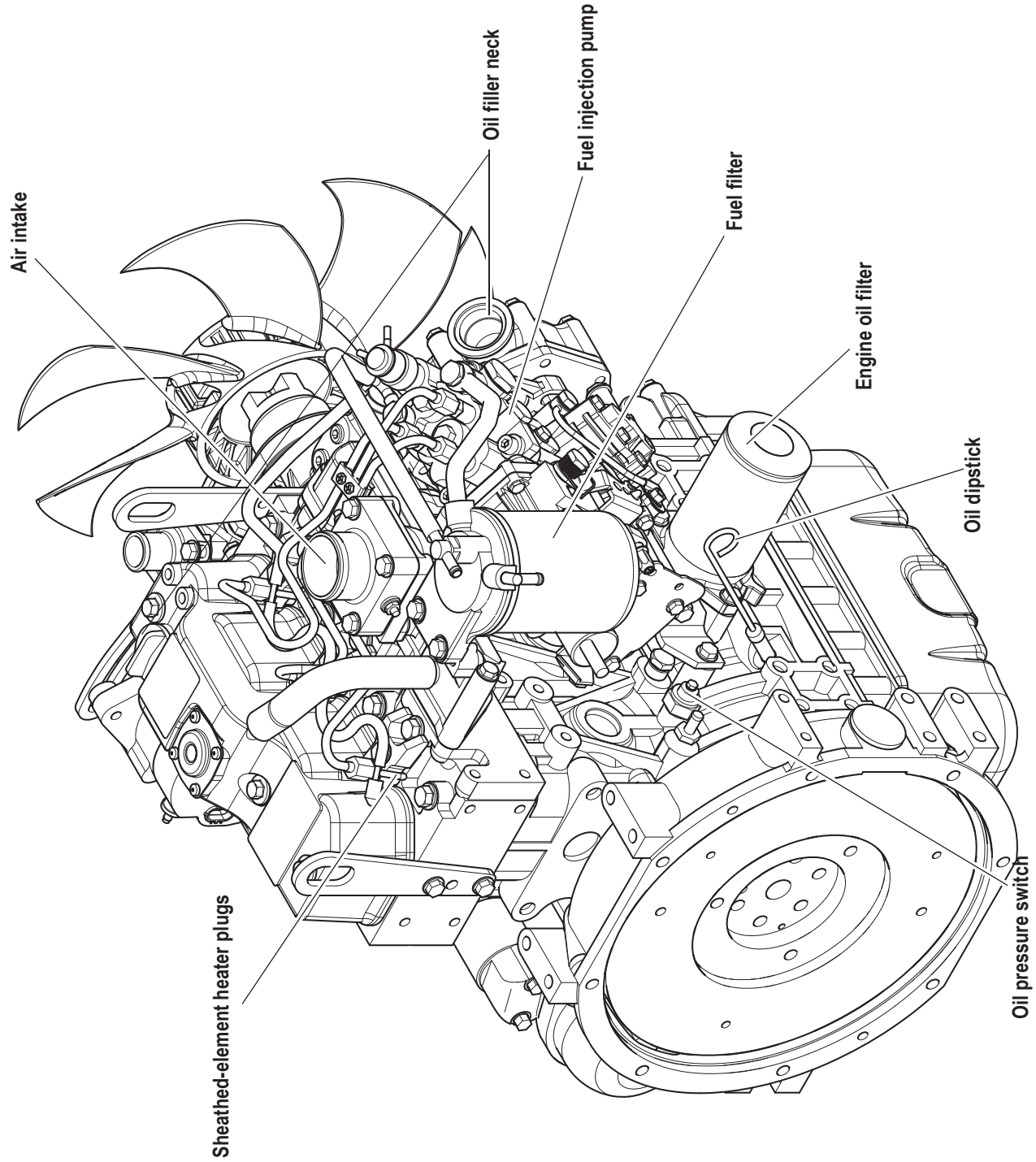
Fastening material:

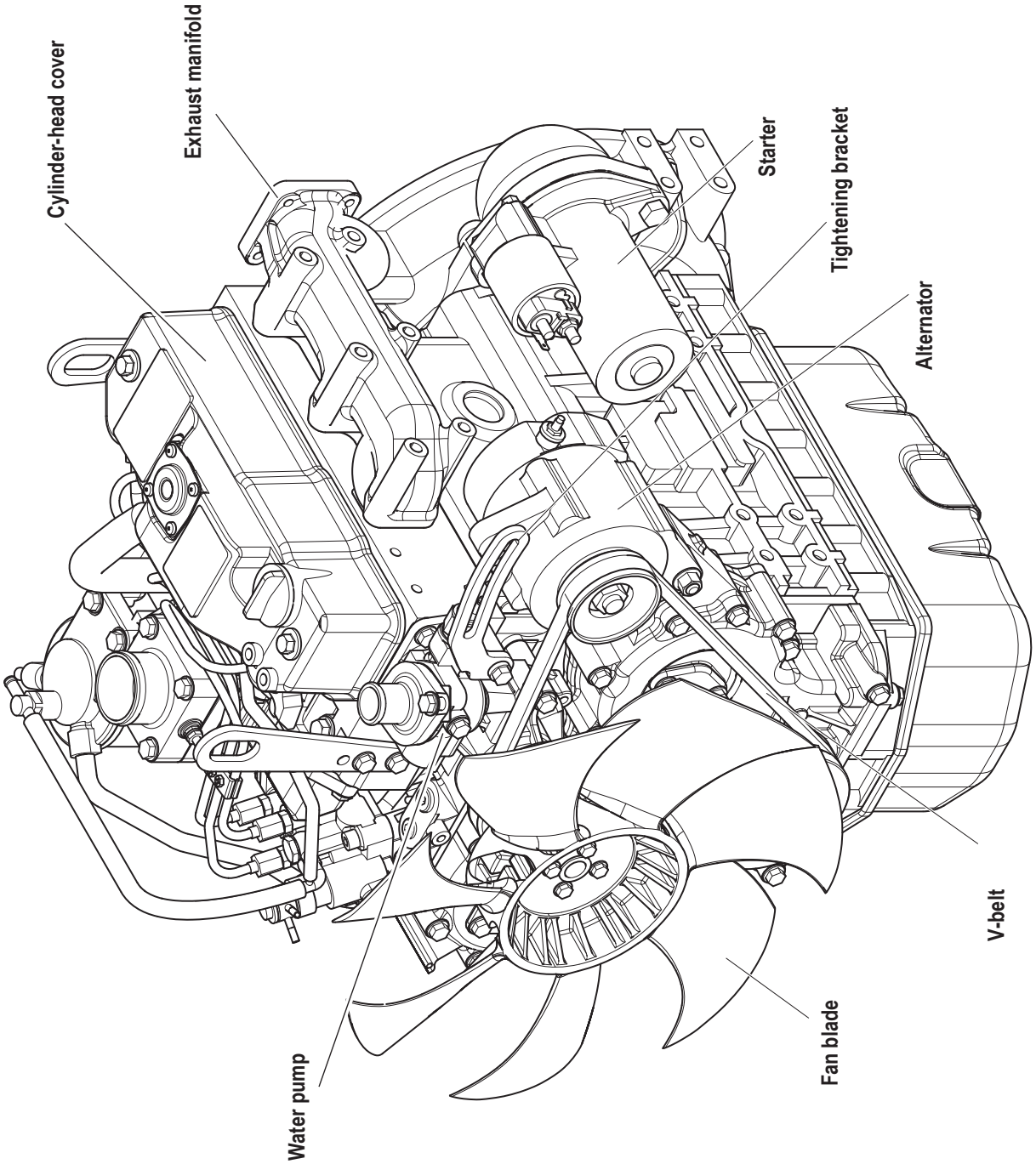
3 off ISK M12 x 20 – DIN 912

3 off M12 Schnorr washers

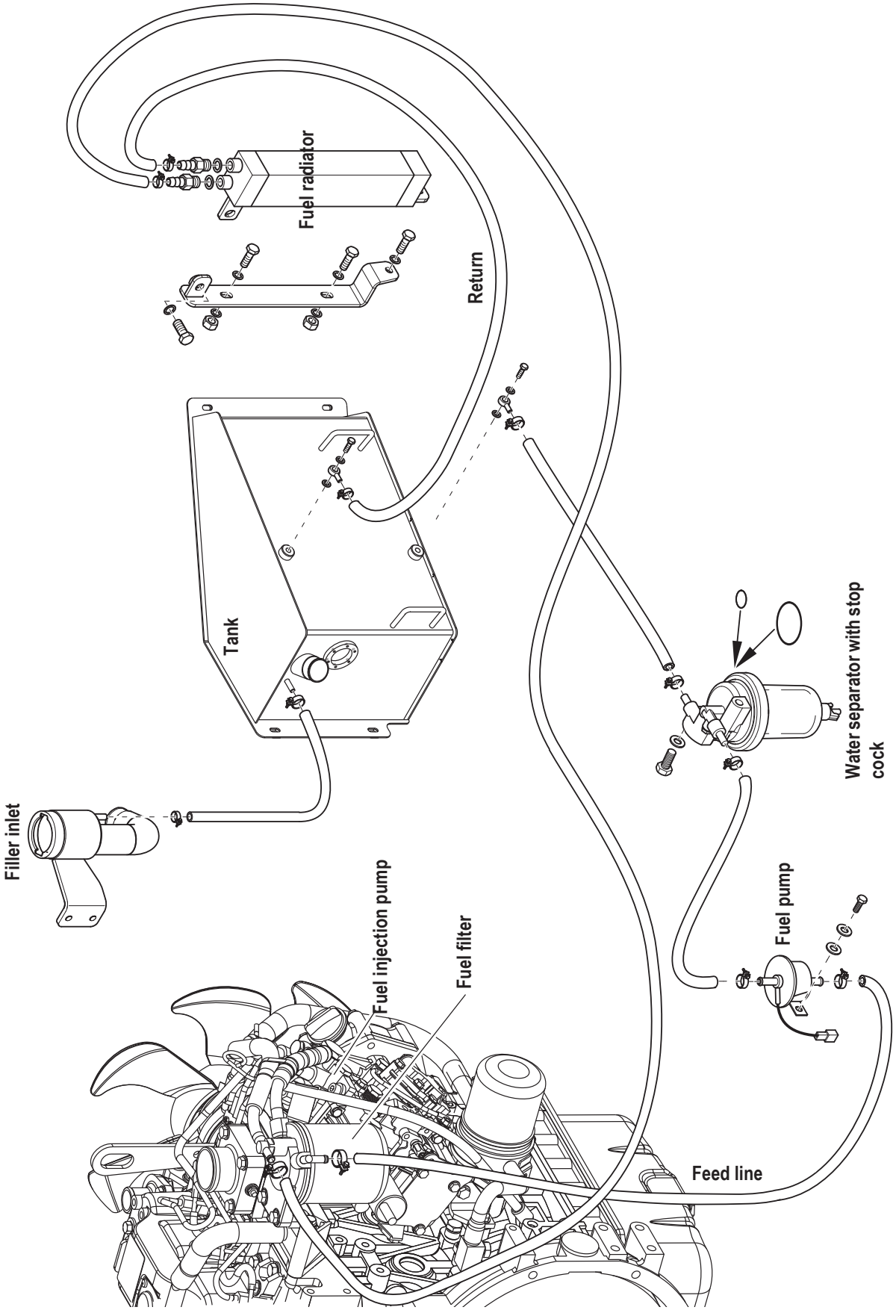
➥ Fasten the clutch by gluing the screws with Loctite and then tightening them to 86 Nm (63 lbf ft).

4.11 Engine 3TNV88-BKNSV overview (from serial no. AE310242D)




Cylinder-head cover
Exhaust manifold
Starter
Tightening bracket
Alternator
V-belt
Fan blade
Water pump

4.12 Fuel system (from serial no. AE310242D)



Checking and adjusting valve clearance

☞ *Standard setting of valve clearance is possible:*

➥ On a cold engine

☞ *Remove the cylinder-head cover*

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

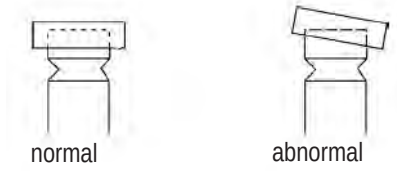


Fig. 16: Valve cap wear

☞ *Check the valve cap for abnormal wear*

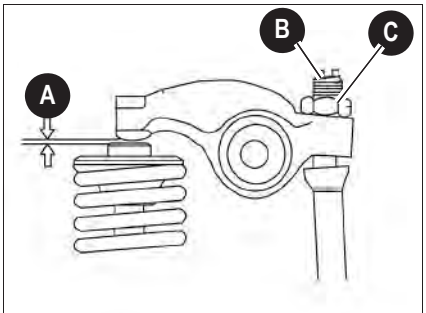


Fig. 17: Valve clearance

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

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

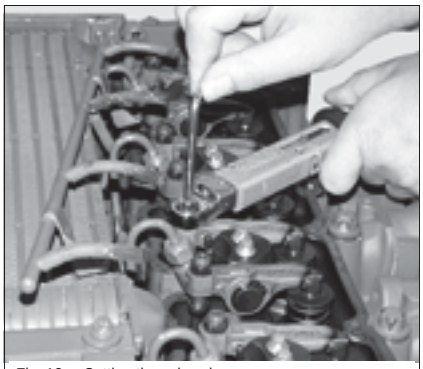


Fig. 18: Setting the valve clearance

☞ *Adjust valve clearance on the cylinder by turning adjusting screw* **2/B**.

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

☞ *Tighten locknut* **2/C**.

➥ Check the setting again with the feeler gage.

☞ *Repeat the procedure for each cylinder*

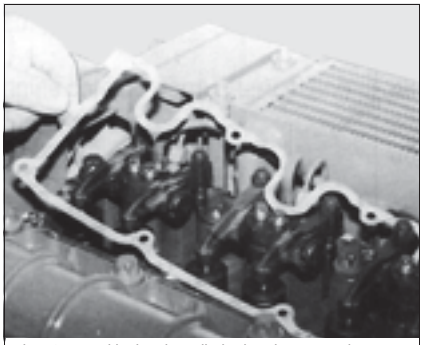


Fig. 19: Positioning the cylinder-head cover gasket

☞ *Position the cylinder-head cover gasket.*

☞ *Install the cylinder-head cover.*

Tightening order for cylinder head bolts

☞ *Install the cylinder-head bolts*

➥ Tightening torques:

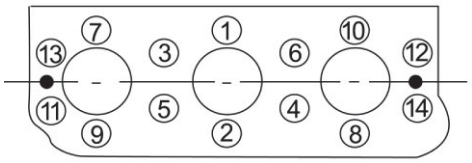
- **1st pass 42.6 – 45.5 Nm (31.4 – 33.6 lbf ft)**
- **2nd pass 85.3 – 91.1 Nm (62.9 – 67.2 lbf ft)**

Caution!

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

☞ *See figure*

Flywheel

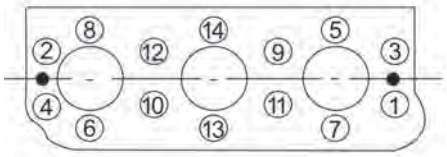


Fan

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

☞ *Order for removing the cylinder-head bolts*

Flywheel



Fan

Notice!

Always perform work on the cylinder head on a cold engine!

4.13 Checking the injection nozzles

Pressure check

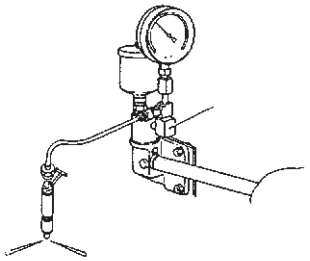


Fig. 20: Nozzle tester

☞ *Remove the injection line and the injection nozzle*

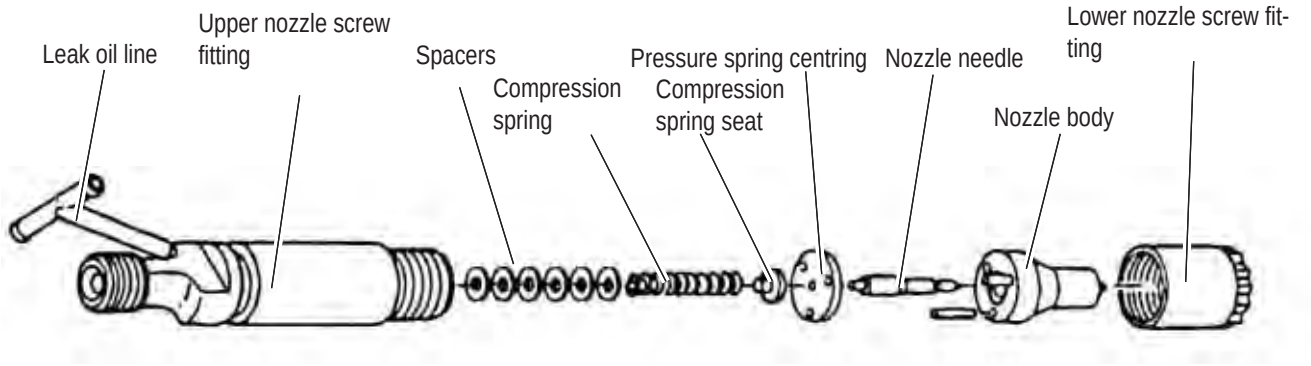
☞ *Connect the injection nozzle with the high pressure line of the nozzle tester*

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

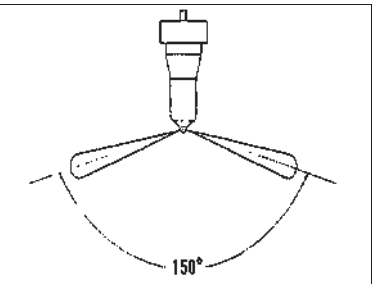
☞ *If the injection pressure is too low, replace the spacer in the nozzle by a thicker one. If the pressure is too high, replace the spacer by a thinner one.*

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

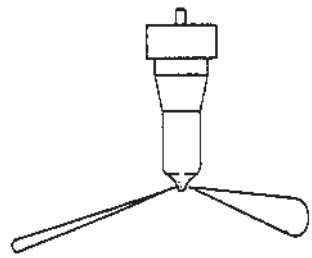
- Spacer thickness of 0.1 mm (0.004") corresponds to modification by 19 bar (276 psi)



Checking the nozzle jet



Normal atomization



Bad atomization

Fig. 21: Nozzle jet

☞ *Remove the injection lines and the injection nozzles*

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

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

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

☞ *The nozzle jet must create a circle on the paper*

☞ *Check the nozzle for drips after it has ejected fuel*

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

Injection time

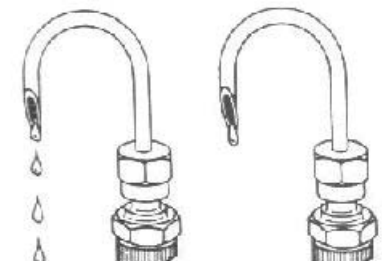


Fig. 22: Drip tube

Checking injection time

☞ *Remove the cylinder-head cover*

☞ *Turn the engine clockwise with the crankshaft (as seen from the radiator) up to the top dead center of the first cylinder and check whether both cams show upward to the left and right*

☞ *Remove the rubber covers from the flywheel housing and check whether the mark on the belt pulley is aligned with the 0 mark on the scale*

☞ *Unscrew the injection line of the first cylinder and replace it by the drip tube (place a container to collect the fuel (Fig. 22)*

☞ *Rotate the engine 1.5 revolutions until it is 40° before top dead center in the compression stroke*

☞ *Slowly keep on turning the engine (degree by degree) until dripping stops*

- Do not turn back if you have turned too much!

☞ *The point at which the dripping stops is the start of delivery (injection time) of the fuel injection pump*

➥ You can now read the value (in degrees before top dead center) off the belt pulley

Setting injection time

☞ *If injection time should no longer be correct, you can adjust it by rotating the fuel injection pump*

☞ *Mark the initial position on the pump and wheel case housing before setting the fuel injection pump*

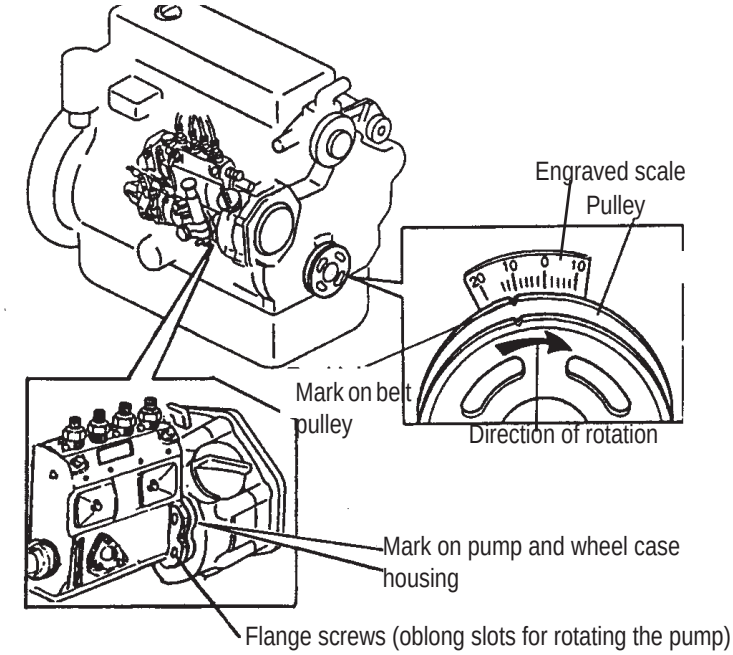
☞ *Remove all injection lines before rotating the injection pump, and loosen the 4 flange screws by about half a revolution*

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

➥ Rotated toward the engine: earlier injection time

➥ Rotated away from the engine: later injection time

☞ *Bend each of the injection lines before you install them so they are not subject to tension once they are installed*



4.14 Adjusting engine speed

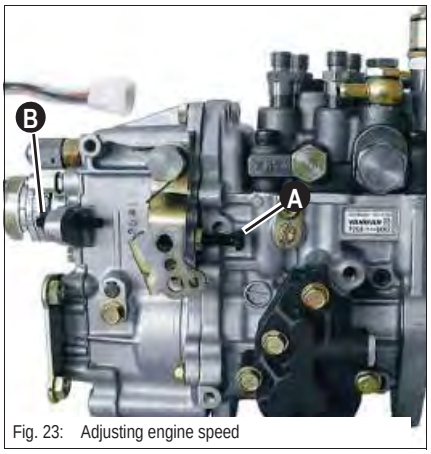


Fig. 23: Adjusting engine speed

Notice!

Maximum engine speed is sealed in the factory and may not be modified!

Adjust engine speed without load!

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

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

➥ Idling speed 1000 ± 25 rpm

➥ Max. engine speed: 2590 ± 25 rpm

☞ Adjust if engine speed differs

– *see* *Setting injection time* on page 4-19

4.15 Compression

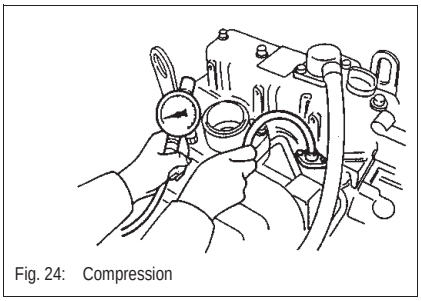


Fig. 24: Compression

☞ *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*

☞ *Install the compression gage on the cylinder you want to measure*

☞ *Turn the engine with the starter and read the pressure off the pressure gage*

➥ Standard **33.3 – 35.3 bar (483 – 512 psi) at 250 rpm**

➥ Limit **26.5 – 28.5 bar (384 – 413 psi) at 250 rpm**

4.16 Checking the coolant thermostat

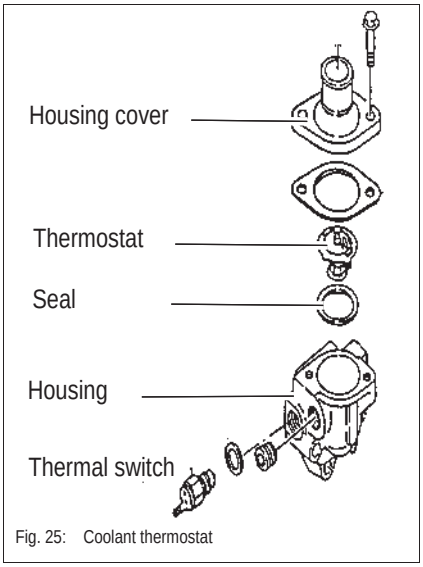
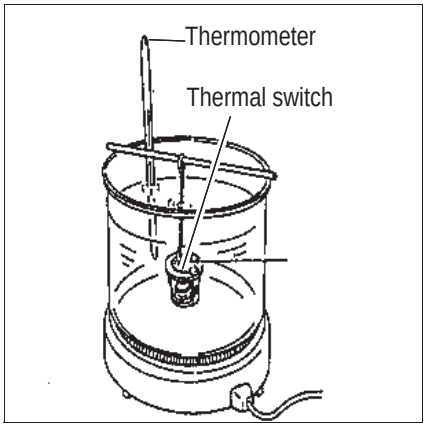


Fig. 25: Coolant thermostat

☞ *Remove the thermostat*

➥ The thermostat is located on the water pump

– *see* *Engine 3TNV88-BKNSV overview (from serial no. AE310242D)* on page 4-13



Checking the thermal switch

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

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

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

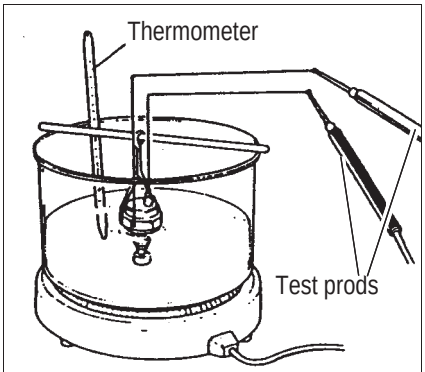


Fig. 26: Checking the thermal switch

☞ *Remove the thermal switch*

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

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

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

4.17 Oil pressure switch

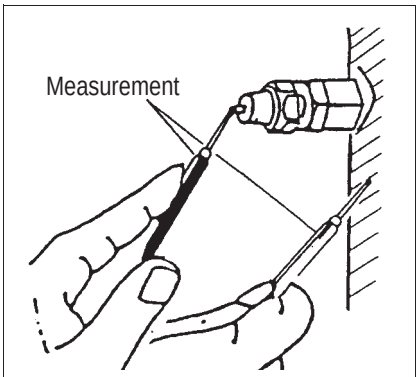


Fig. 27: Oil pressure switch

☞ *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 malfunctioning if the oil can pass

4.18 Checking the coolant circuit

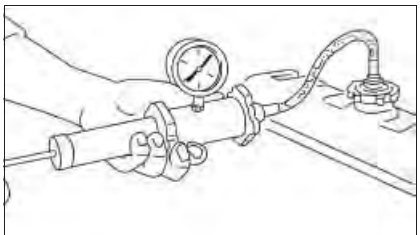


Fig. 28: Checking the radiator for leaks

Leakage check

☞ *Fill up the radiator completely*

☞ *Install an adapter on the radiator as shown*

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

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

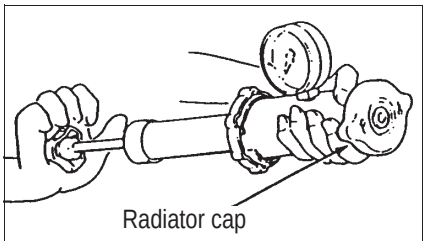


Fig. 29: Checking the radiator cap

Checking the radiator cap

☞ *Remove the radiator cap and install it on the adapter as shown*

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

➥ The radiator cap must open

4.19 Clutch

Fig. 30: Fastening the clutch

Fastening material:

3 off ISK M12 x 20 – DIN 912

3 off M12 Schnorr washers

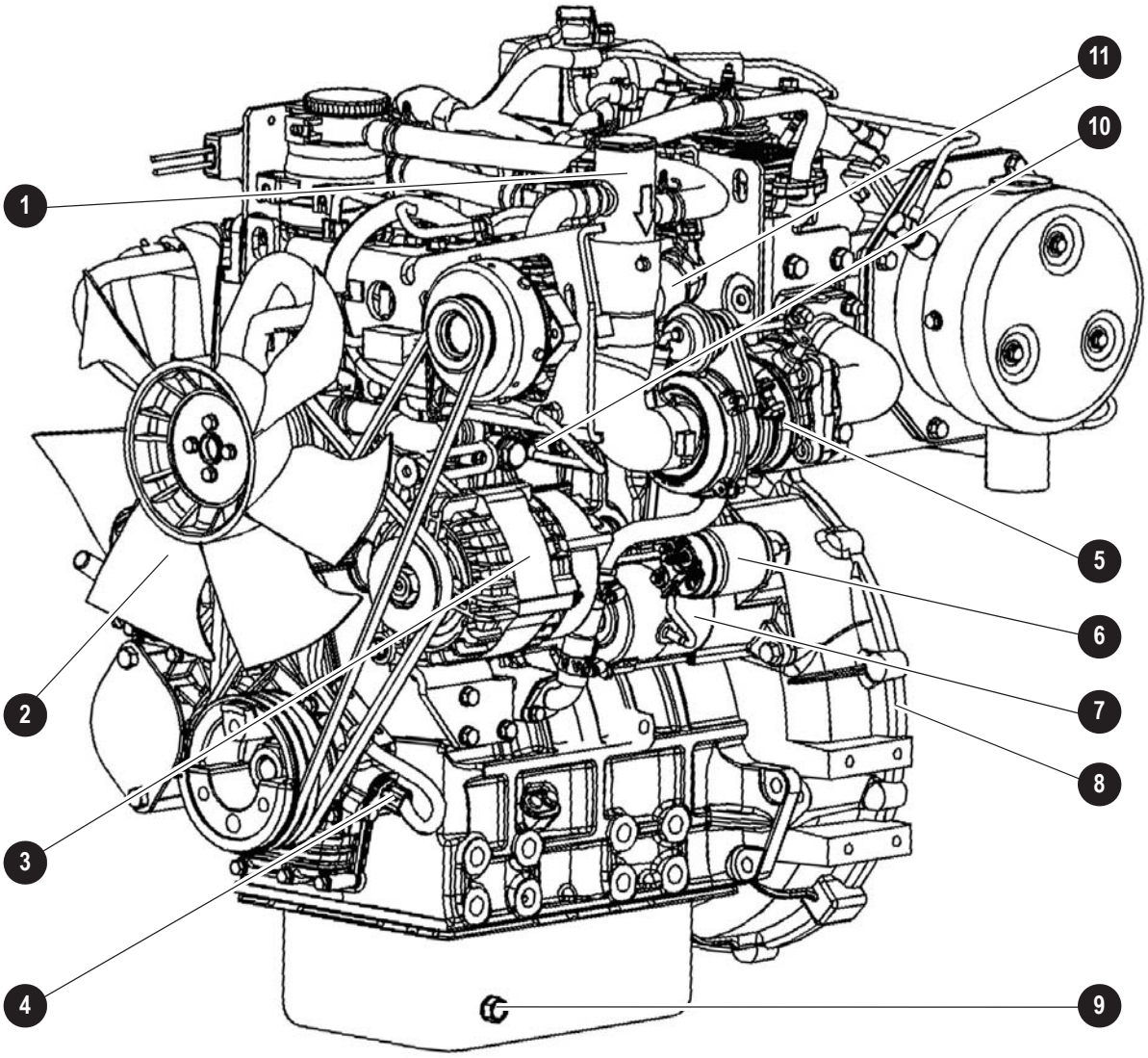
➥ Fasten the clutch by gluing the screws with Loctite and then tightening them to 86 Nm (63 lbf ft).

4.20 Engine malfunctions

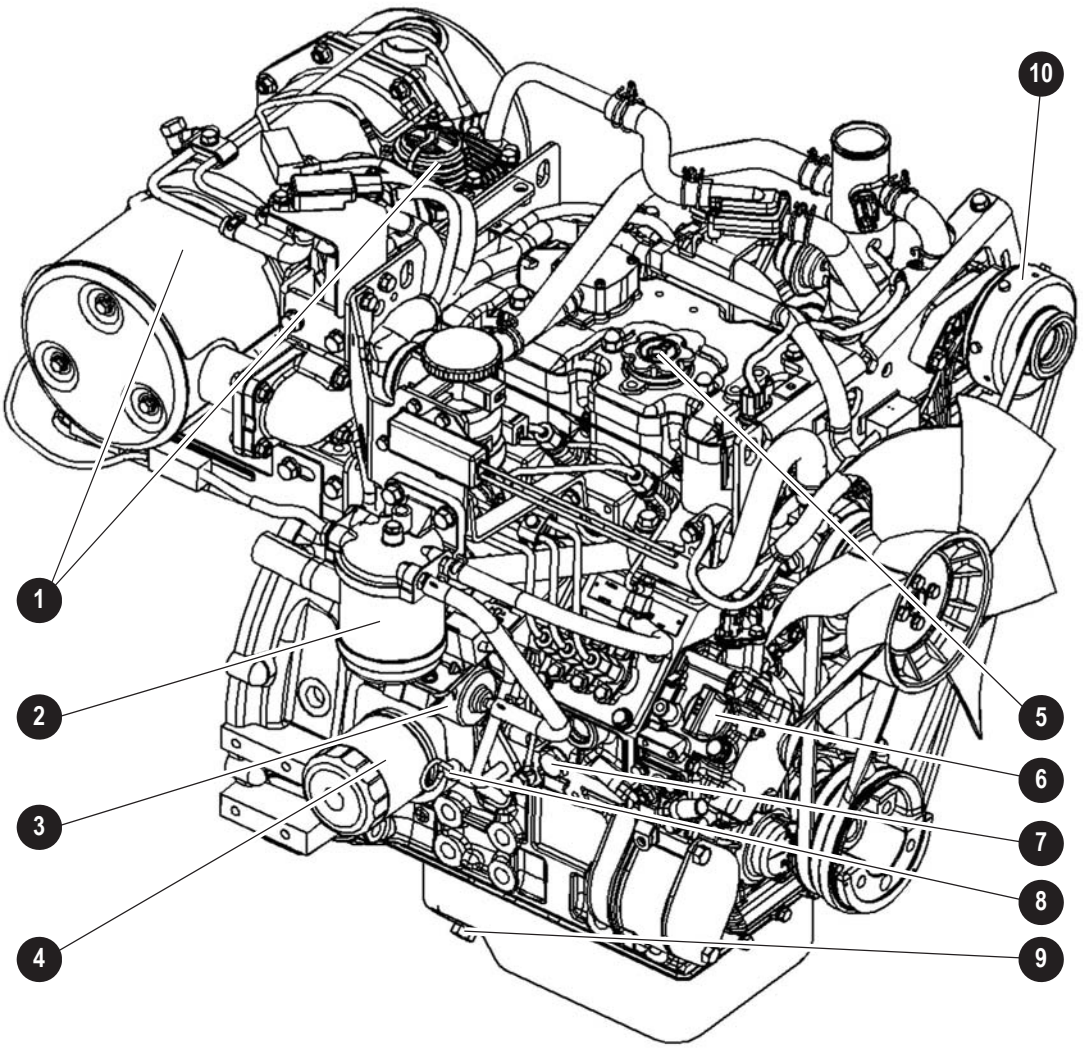
Problem	Possible causes
Engine does not start or is not easy to start	Wrong SAE grade of engine lubrication oil
	Fuel grade does not comply with specifications
	Malfunctioning or empty battery
	Loose or oxidized cable connections in starter circuit
	Malfunctioning starter, or pinion does not engage
	Wrong valve clearance
	Malfunctioning fuel injector
	Malfunctioning starting relay
	Malfunctioning glow plug
	Malfunctioning solenoid switch
	Cutoff solenoid does not attract
	Cutoff solenoid without current
	High pressure created immediately in the hydraulic system
Engine starts, but does not run smoothly or faultless	Fuel grade does not comply with specifications
	Wrong valve clearance
	Injection line leaks
	Malfunctioning fuel injector
Engine overheats. Temperature warning system responds	Oil level too low
	Oil level too high
	Dirty air filter
	Dirty oil radiator fins
	Malfunctioning fan, torn or loose V-belt
	Resistance in cooling system too high, flow capacity too low
	Malfunctioning thermostat
	Malfunctioning fuel injector
Insufficient engine output	Oil level too high
	Fuel grade does not comply with specifications
	Dirty air filter
	Malfunctioning air filter maintenance switch or gage
	Wrong valve clearance
	Injection line leaks
	Malfunctioning fuel injector
Engine does not run on all cylinders	Injection line leaks
	Malfunctioning fuel injector
Insufficient or no engine oil pressure	Oil level too low
	Machine inclination too high (max. 25°)
	Wrong SAE grade of engine lubrication oil

Problem		Possible causes
Engine oil consumption too high		Oil level too high
		Machine inclination too high (max. 25°)
Engine smoke	Blue	Oil level too high
		Machine inclination too high (max. 20°)
		Engine oil combustion (malfunctioning cylinder-head gasket)
	White	Engine starting temperature too low
		Fuel grade does not comply with specifications
		Wrong valve clearance
		Malfunctioning fuel injector
		Coolant combustion (malfunctioning cylinder-head gasket)
	Black	Dirty air filter
		Malfunctioning air filter maintenance switch or gage
		Wrong valve clearance
		Malfunctioning fuel injector

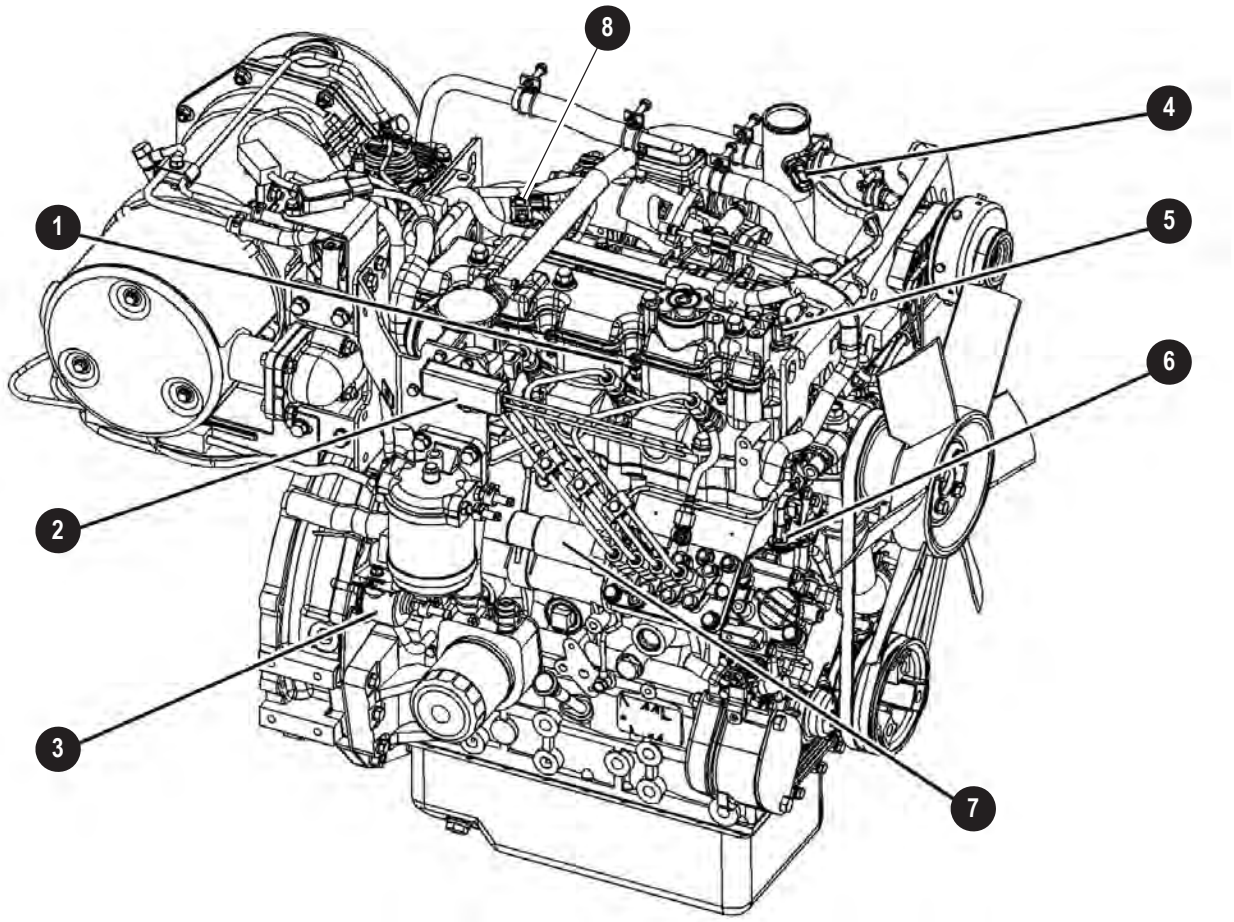
4.21 Perkins engine 403F-15T (overview)



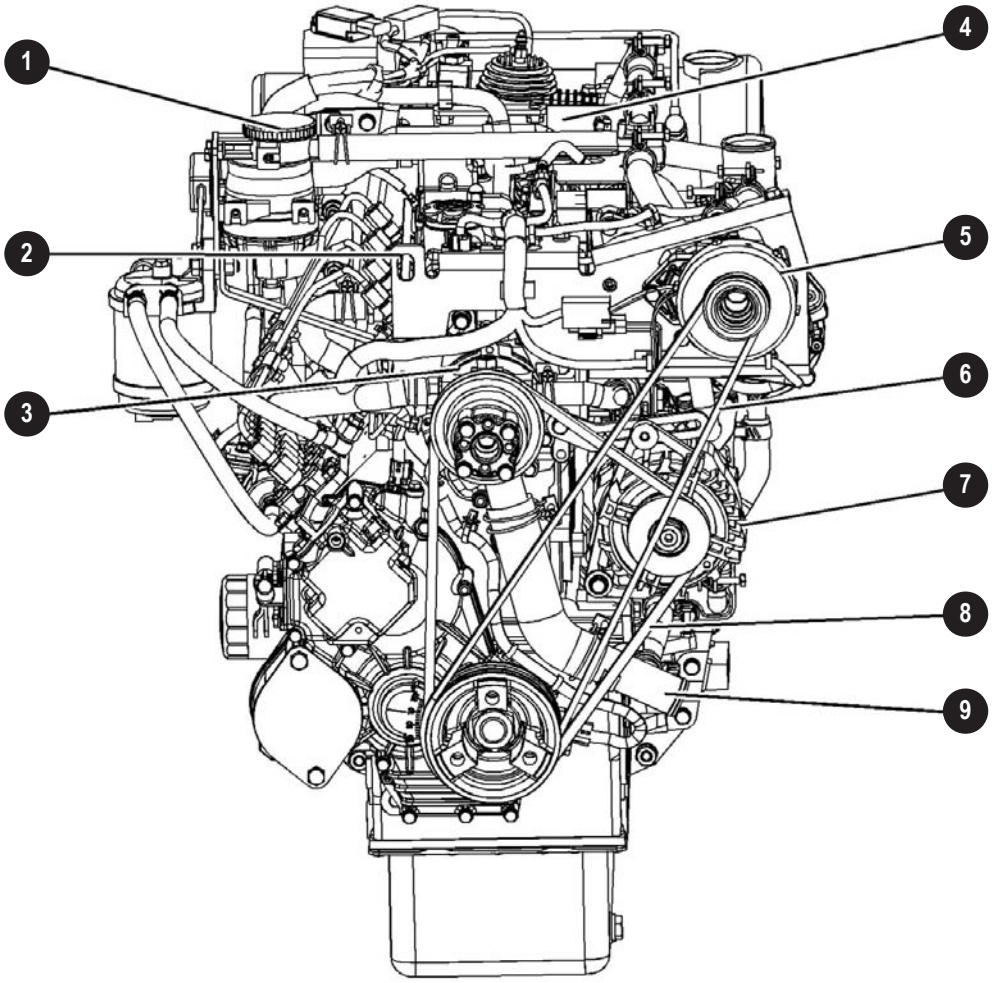
Pos.	Designation
1	Air intake
2	Fan
3	Alternator
4	Primary engine-speed sensor
5	Turbocharger
6	Solenoid valve of starter
7	Starter
8	Flywheel
9	Front oil-drain plug
10	Coolant thermostat
11	NRS (nitrogen oxide reduction system) – control valve



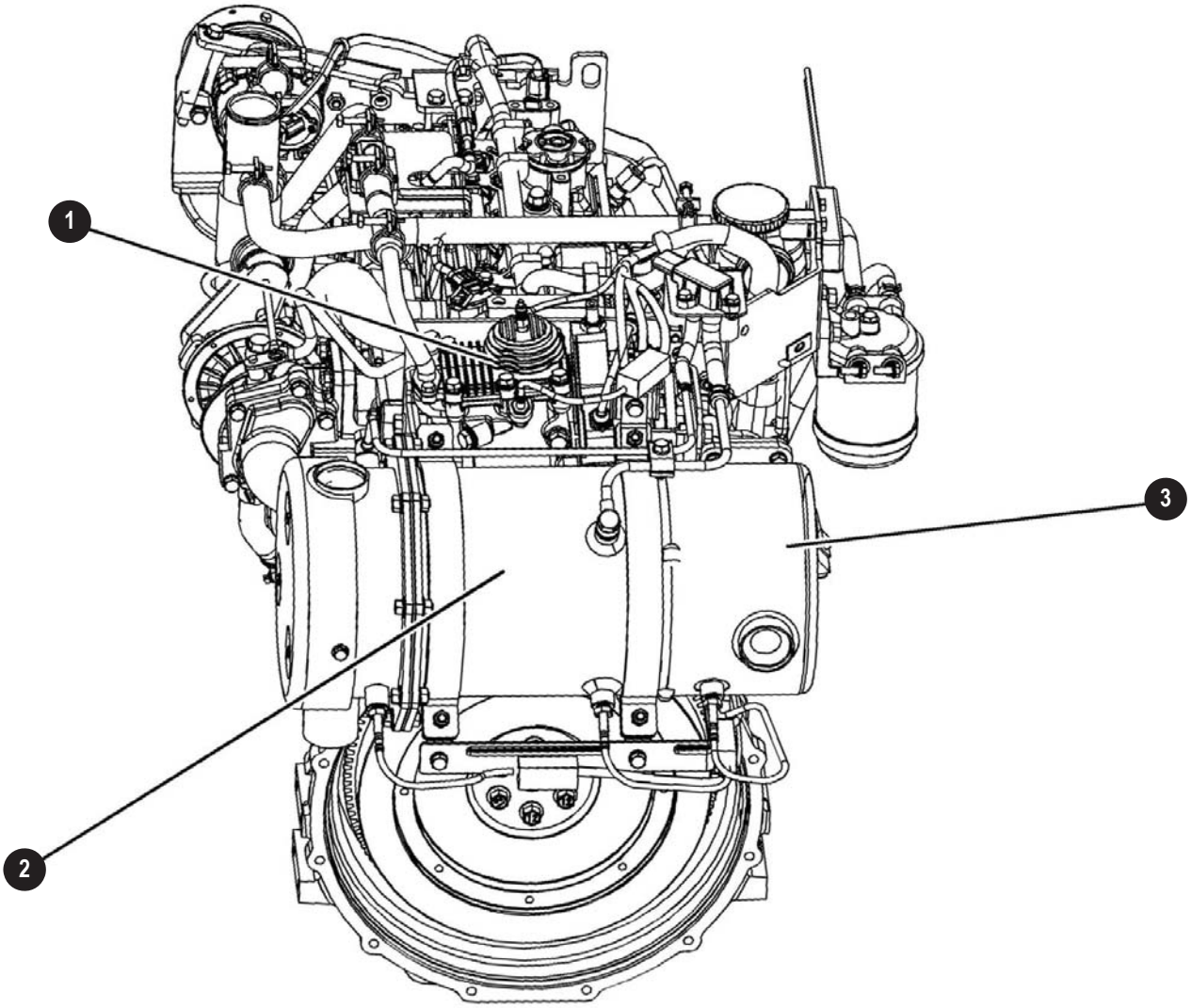
Pos.	Designation
1	Aftertreatment system
2	Fuel safety filter
3	Electric fuel pump
4	Oil filter
5	Upper oil filler neck
6	Lateral oil filler neck
7	Cylinder-block drain plug
8	Oil dipstick
9	Rear oil drain plug
10	Air pump



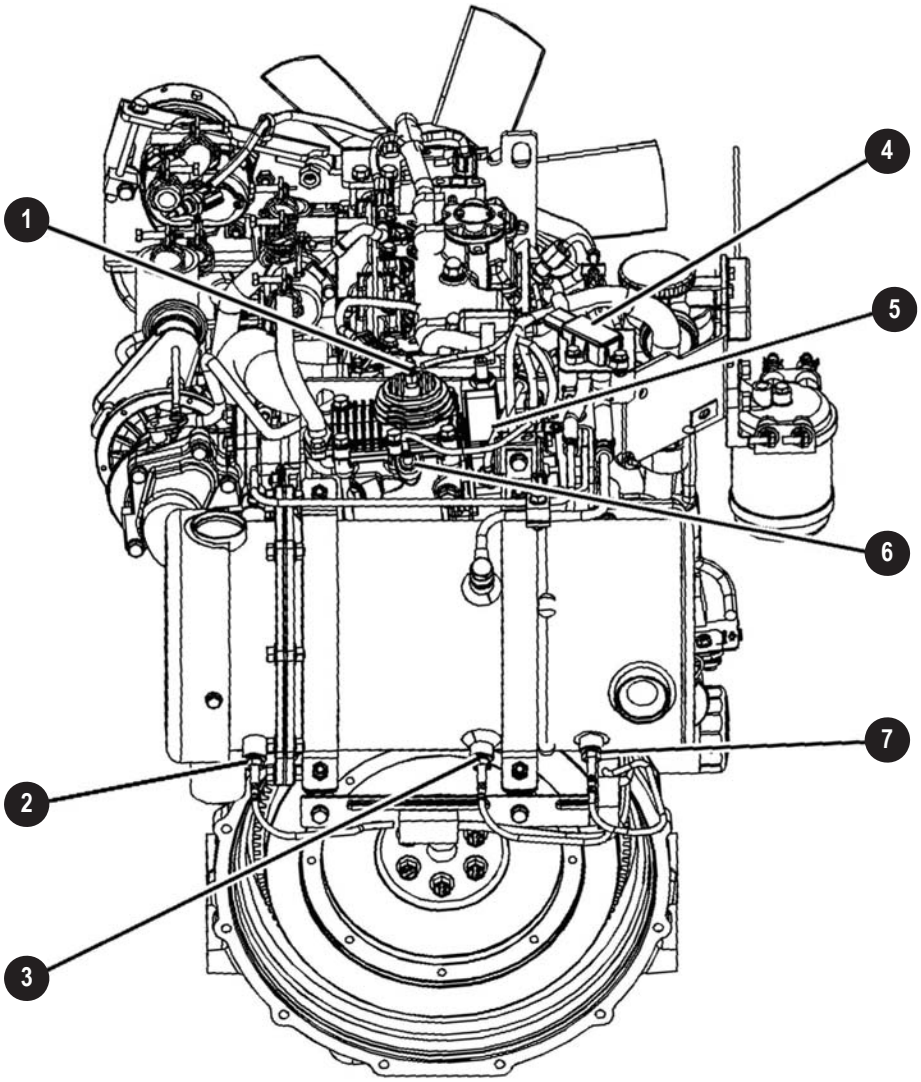
Pos.	Designation
1	Glow plugs
2	Glow plug resistor of aftertreatment regeneration device
3	Fuel pump/breather pump
4	Intake-air temperature sensor
5	Oil pressure switch
6	Secondary engine-speed sensor
7	Control-rack solenoid valve and position sensor
8	Intake manifold air-pressure sensor



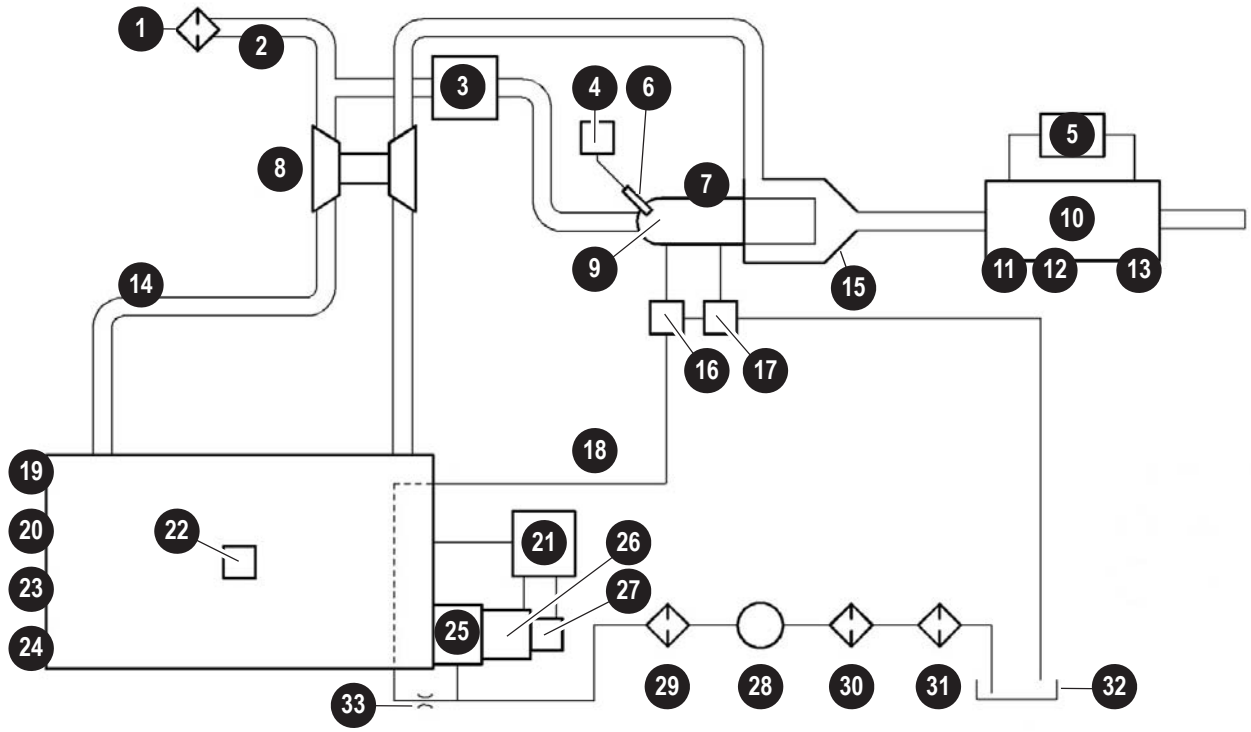
Pos.	Designation
1	Crankcase breather
2	Front lifting eye
3	Water pump
4	Rear lifting-eye bracket
5	Air pump
6	Air-pump drive belt
7	Alternator
8	Drive belt
9	Coolant intake



Pos.	Designation
1	Aftertreatment regeneration device (ARD), also called burner
2	Diesel oxidation catalyst (DOC)
3	Diesel particulate filter (DPF)

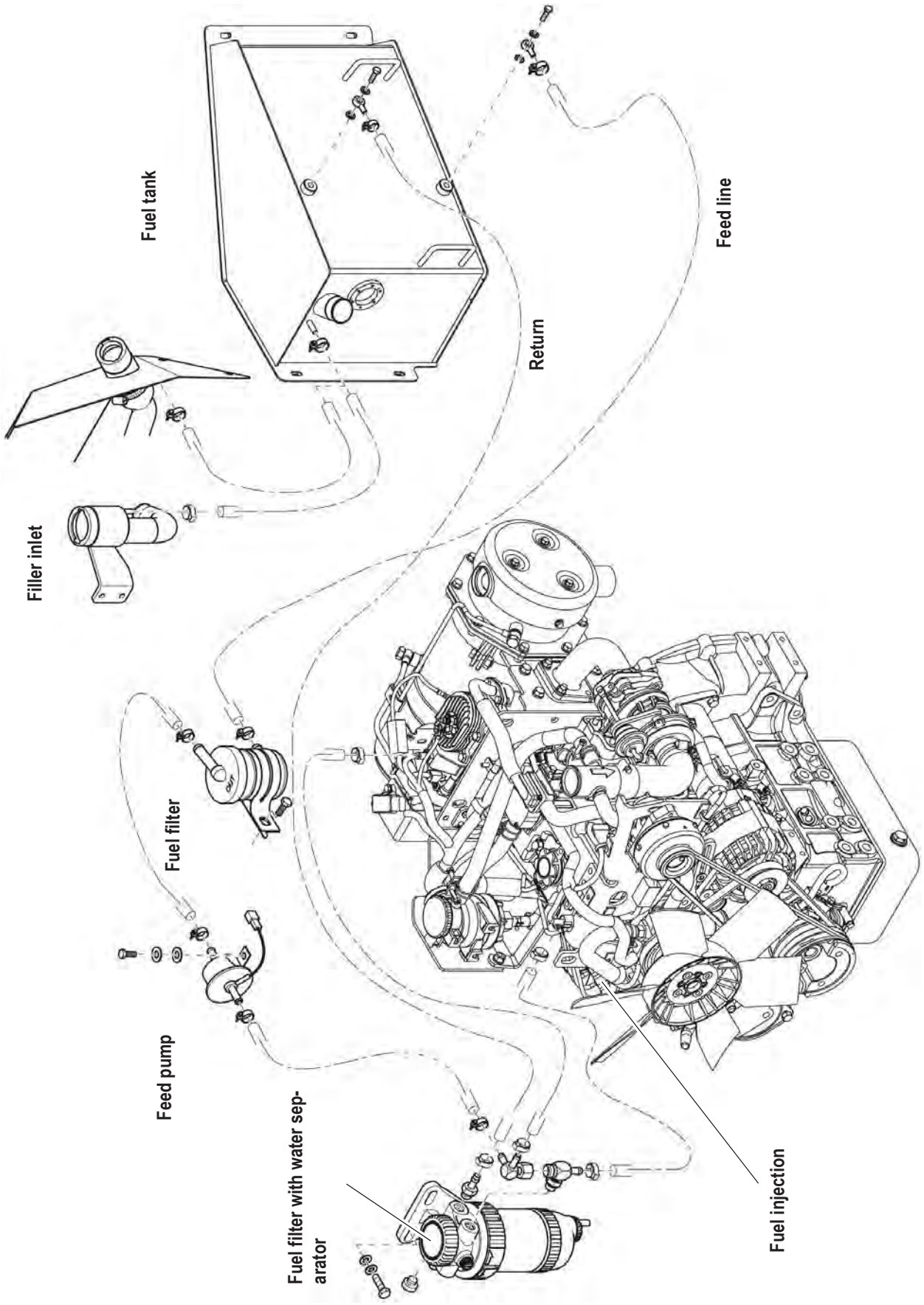


Pos.	Designation
1	ARD glow plug
2	DPF outlet temperature sensor
3	DPF intake temperature sensor
4	DPF pressure-difference sensor
5	ARD injection nozzles
6	ARD temperature sensor
7	DOC intake temperature sensor



Pos.	Designation	Pos.	Designation
1	Air filter	18	Fuel-injector return line
2	Intake temperature sensor	19	Coolant temperature sensor
3	ARD air pump	20	Primary engine-speed sensor
4	Relay for ARD glow plug	21	Control unit
5	DPF pressure-difference sensor	22	Engine
6	ARD glow plug	23	Oil pressure switch
7	ARD temperature sensor	24	Glow plug relay (engine)
8	Turbocharger	25	Injection pump and control rack
9	ARD combustion chamber	26	Control rack drive
10	DOC and DPF	27	Control-rack position sensor
11	DOC intake temperature sensor	28	Fuel pump
12	DPF intake temperature sensor	29	Fuel filter with water separator
13	DPF outlet temperature sensor	30	Fuel prefilter
14	Charge-air pressure sensor	31	Fuel line filter
15	ARD body	32	Fuel tank
16	ARD injection nozzle 1	33	Flow restrictor
17	ARD injection nozzle 2		

4.22 Fuel system



4.23 Checking and adjusting valve clearance

Notice!

These activities may only be performed by authorized Perkins service centers during the warranty period.

4.24 Clean the diesel particulate filter

Notice!

These activities may only be performed by authorized Perkins service centers during the warranty period.

4.25 Checking the injection nozzles

Notice!

These activities may only be performed by authorized Perkins service centers during the warranty period.

4.26 Turbocharger

Caution!

If a turbocharger bearing malfunction results in a major loss of engine output, do not operate the engine before the exhaust-gas turbocharger is replaced.

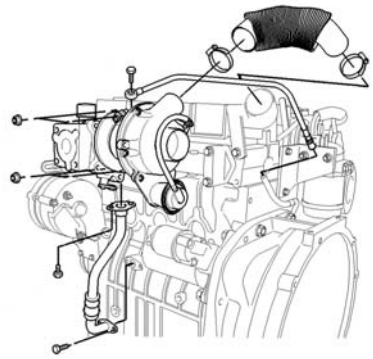


Fig. 31: Turbocharger

Check

We recommend performing regular visual checks of the exhaust-gas turbocharger. All the exhaust gas from the crankcase is filtered by the air-intake system.

Therefore, waste products created by the combustion of oil are possibly accumulated in the turbocharger compression housing.

These accumulations can gradually cause output loss of the engine, increased development of black smoke and reduced engine efficiency in general.

Notice!

A breakdown of the exhaust-gas turbocharger on a running engine can cause serious damage to the turbocharger compressor impeller or to the engine. Damage to the turbocharger compressor impeller can cause further damage to the pistons, valves and cylinder head.

In case of a malfunction of the turbocharger bearings, large quantities of oil can get into the air-intake and exhaust system. This can result in insufficient engine lubrication, and serious damage to the engine.

4.27 Checking/replacing the coolant thermostat

Notice!

These activities may only be performed by authorized Perkins service centers during the warranty period.

4.28 Checking the coolant circuit

Notice!

A malfunctioning seal on the radiator cap can be the reason for a pressure loss in the cooling system.

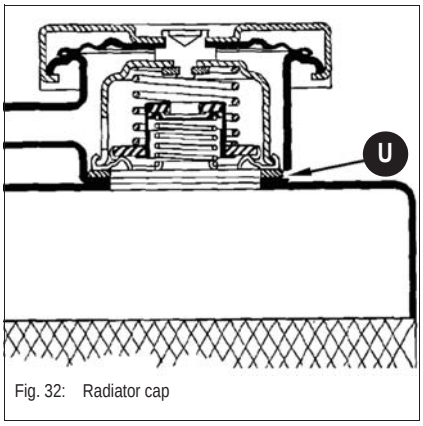


Fig. 32: Radiator cap

Cooling system

☞ *If there is an error in the cooling system, check the temperature and pressure since the cooling system pressure affects the temperature in the cooling system.*

➥ In case of pressure loss, check the lines and connections for leaks.

Checking the radiator cap

☞ *Let the engine cool down.*

☞ *Carefully open the radiator cap and release the pressure slowly.*

☞ *Remove the radiator cap.*

☞ *Check the radiator cap for damage on the seal and sealing surface **U**.*

☞ *Remove all dirt from the radiator cap, seal and sealing surface.*

☞ *Install the radiator cap on a suitable adapter (test device/pump).*

☞ *Make a note of the pressure at which the radiator cap opens and compare it with the pressure value on the radiator cap.*

☞ *Replace the radiator cap if it is malfunctioning.*

4.29 Engine malfunctions

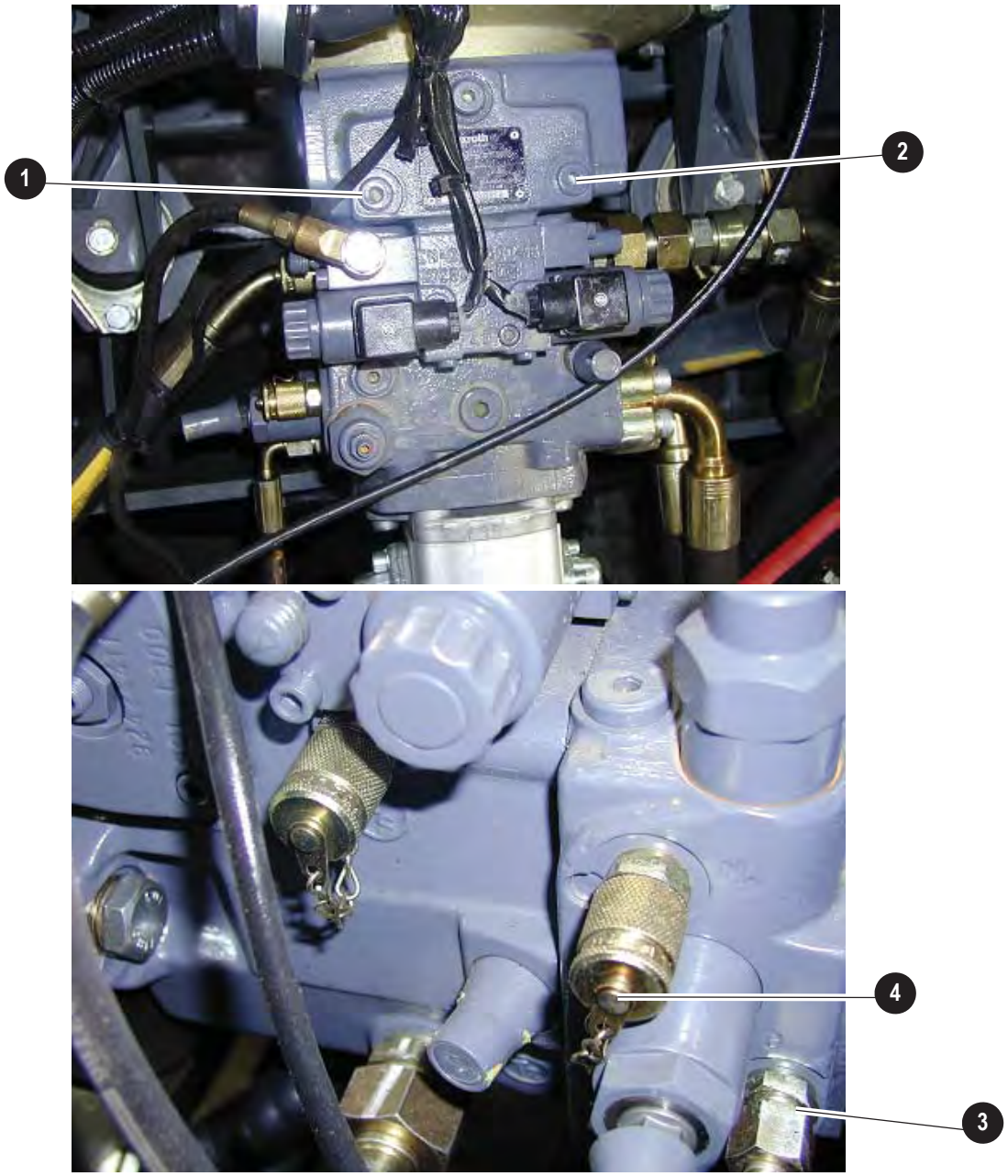
Problem	Possible causes
Engine does not start or is not easy to start	Malfunctioning glow plugs
	Error in the fuel system
	Malfunctioning compression
	Malfunctioning speed transmitter
	Malfunctioning air-intake and exhaust system
	Malfunctioning components (visual damage)
	Damaged or interrupted electric cables
	Leaks in oil or fuel system
	Clogged air filter
	Too much wear on valves
	Malfunctioning cylinder-head gasket
	Malfunctioning starter or error in starter circuit
	Error in electric supply
Engine starts, but does not run smoothly or faultless	Malfunctioning air intake and exhaust system (hoses, filters, lines)
	Poor fuel supply (hoses, filters, lines)
	Malfunctioning compression
	Malfunctioning throttle valve sensor
Fuel consumption too high	Wrong reading of fuel level
	Fuel loss
	Fuel grade
	Oil grade
	Malfunctioning fan
	Engine temperature too low
	Wrong valve clearance
	Malfunctioning air-intake and exhaust system
	ARD malfunction
	Wrong operating engine speed
	Malfunction of primary engine-speed sensor
Oil pressure too low	Oil level too low
	Oil grade
	Clogged engine oil filter
	Wrong engine oil cooler throughput
	Fuel in oil
	Malfunctioning oil pump
	Bearing play (crankshaft, camshaft, ...)

Problem		Possible causes
Oil contains coolant		Malfunctioning cylinder-head gasket
		Malfunctioning cylinder head
		Malfunctioning cylinder block
		Engine oil cooler leaks
Exhaust temperature too high		Leak in air-intake channel
		Damage in exhaust system
		Wrong engine operating conditions
		Geographical altitude
Engine oil consumption too high		Wrong reading of oil level
		Malfunctioning crankcase breather
		Malfunctioning air-intake and exhaust system
		Malfunctioning exhaust-gas turbocharger
		Malfunctioning compression
		Oil loss
Engine smoke	White	Malfunctioning coolant temperature sensor
		Malfunctioning cooling system
		Wrong valve clearance
		Malfunctioning glow plug(s)
		Malfunctioning compression
		Fuel grade
		Malfunctioning fuel injector
		Coolant too cold
	Black	Malfunctioning ECM software
		Malfunctioning air-intake and exhaust system
		Malfunctioning exhaust-gas turbocharger
		Wrong valve clearance
		Malfunctioning compression

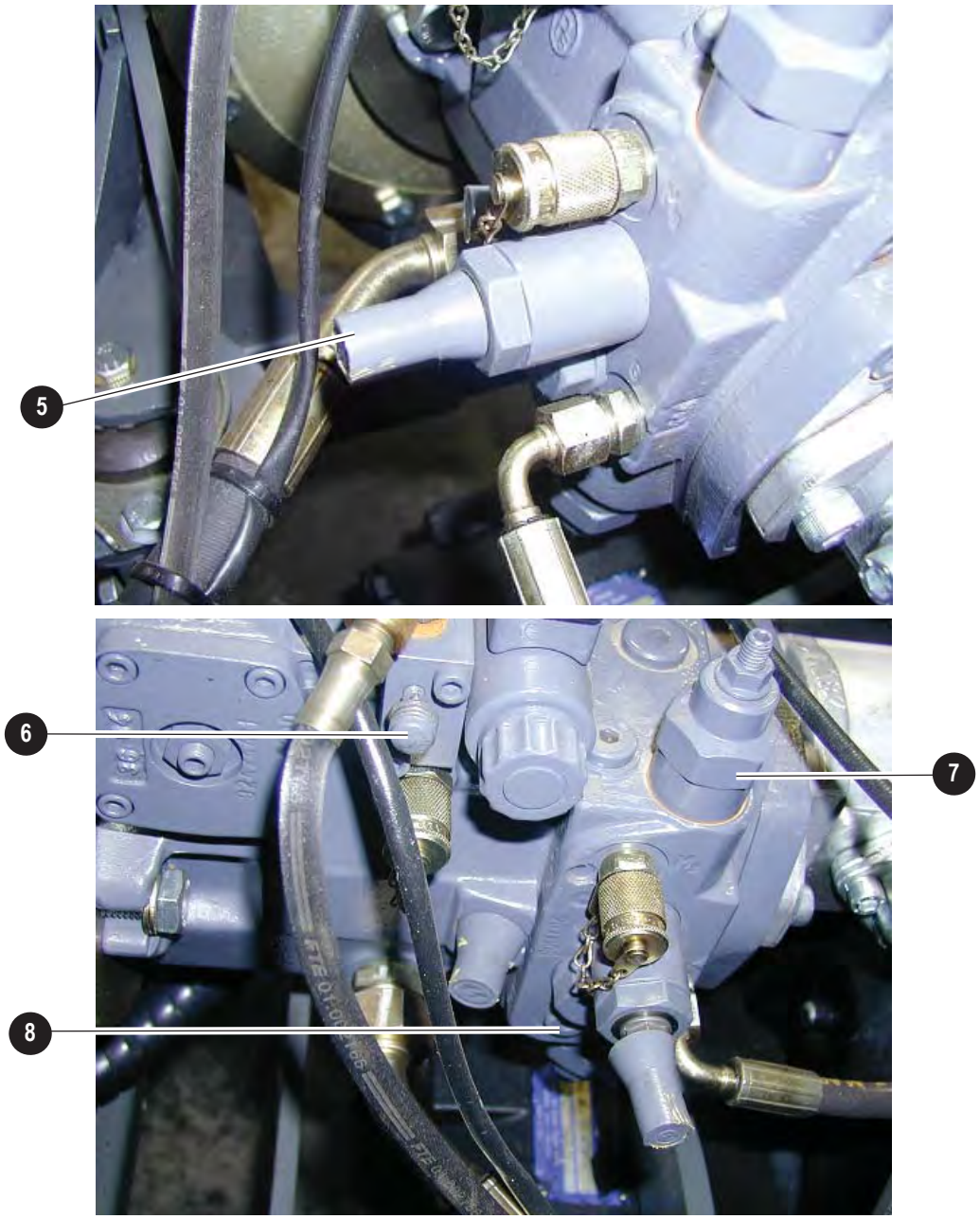
Traveling drive

5 Traveling drive

5.1 Variable displacement pump A10VG45DA



Pos.	Designation
1	X2 pressure in control piston
2	X1 pressure in control piston
3	Boost pressure – G
4	High pressure Mb



Pos.	Designation
5	Control cartridge
6	Inching valve
7	High-pressure valve
8	High pressure Ma

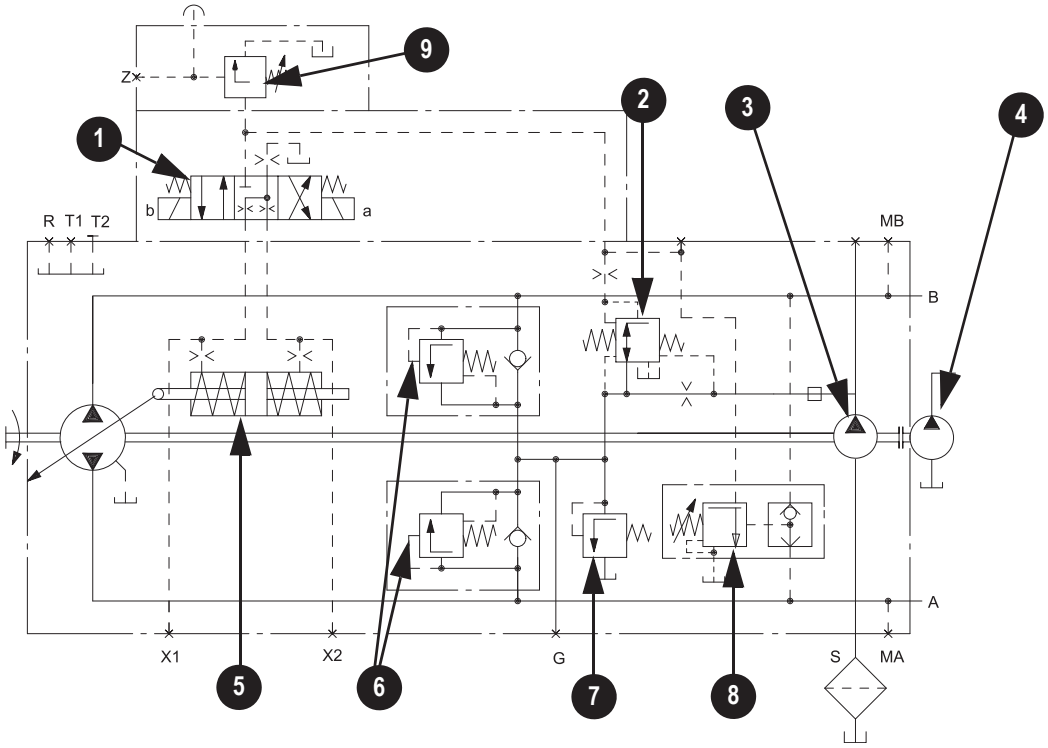
Description:

- A10 VG
  ➥ Axial-piston machine, swash plate design, adjustable, closed circuit
- 45
  ➥ Displacement volume Vg max in cm³
- DA
  ➥ Hydraulic adjustment, speed-sensitive

The A10VG pump is a variable displacement pump in axial-piston swash plate design. The volume flow can be adjusted progressively and proportionally to the number of revolutions of the drive and the displacement volume. The volume flow increases from 0 to maximum value the higher the deflection. The feed flow changes as soon as the swash plate goes out of line through the zero position. This means that the flow direction changes.

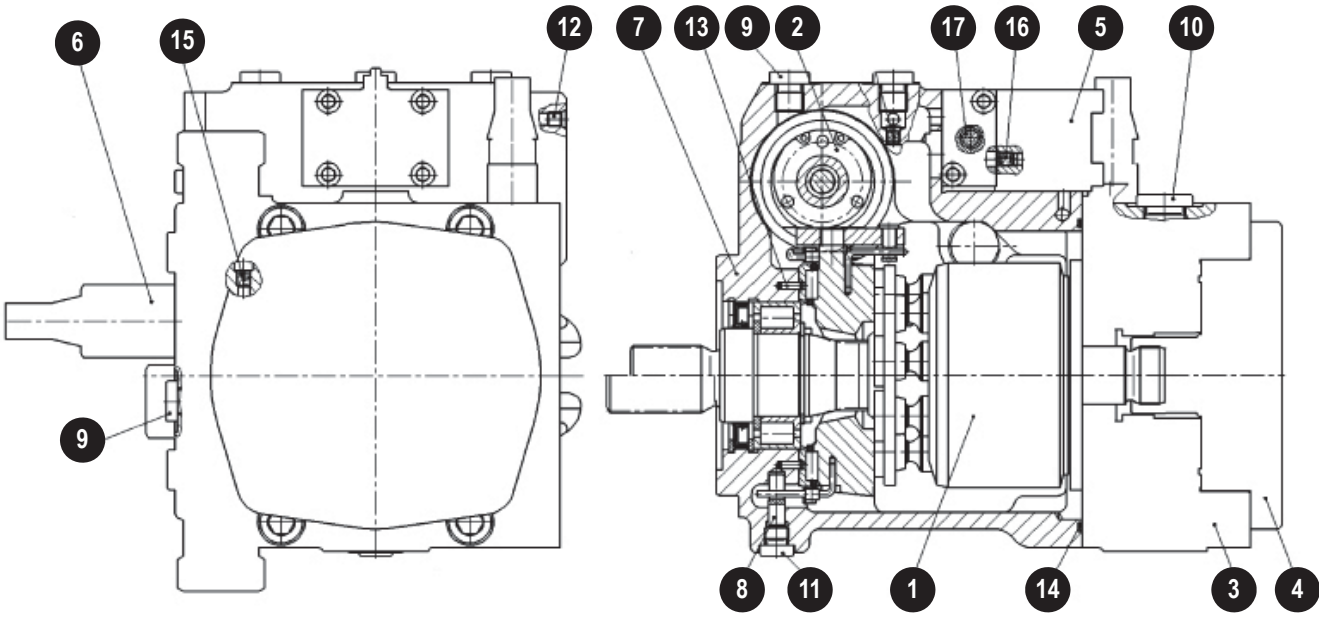
The pump is fitted with two pressure limiting valves, pressure cutoff, control cartridge with hydraulic inching valve, boost-pressure valve and a forward/reverse solenoid valve.

Variable displacement pump: diagram



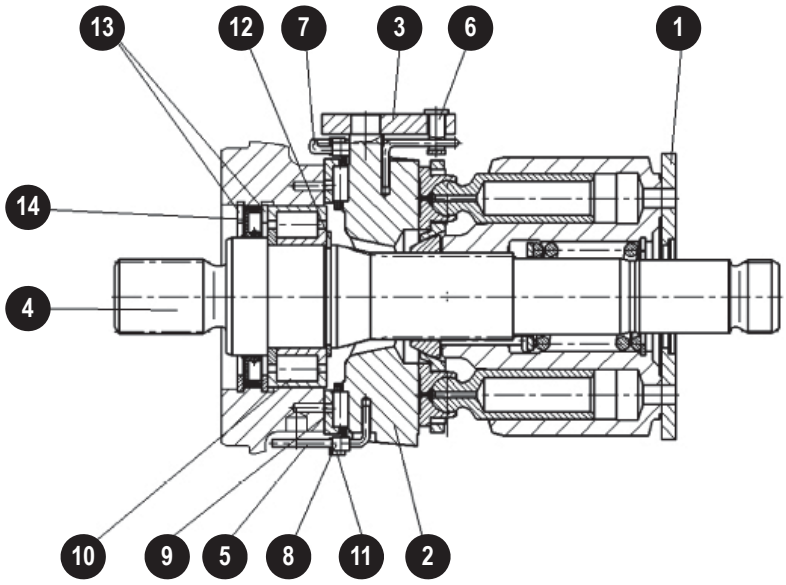
Pos.	Designation
1	Solenoid (a reverse; b forward)
2	Control cartridge
3	Boost pump
4	Work pump
5	Servo cylinder
6	HP valve
7	Boost-pressure valve
8	Pressure cutoff
9	Inching valve

Variable displacement pump: design



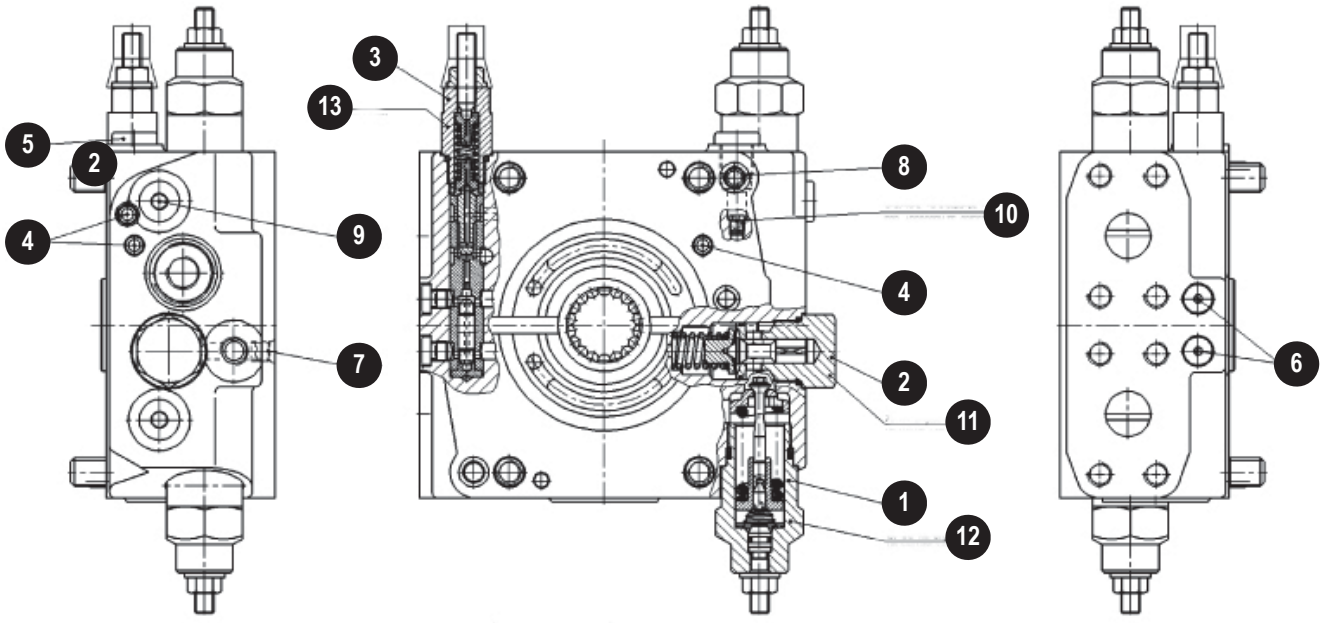
Pos.	Designation
1	Traveling drive
2	Hydraulic adjustment
3	Connecting plate with valves
4	Internal gear pump
5	Inching valve
6	Set cartridge
7	Pump housing
8	Articulated pin
9	Screw plug
10	Screw plug
11	Screw plug
12	Double tear-off plug
13	Parallel pin
14	O-ring
15	Nozzle
16	Nozzle
17	Set element

Traveling drive overview



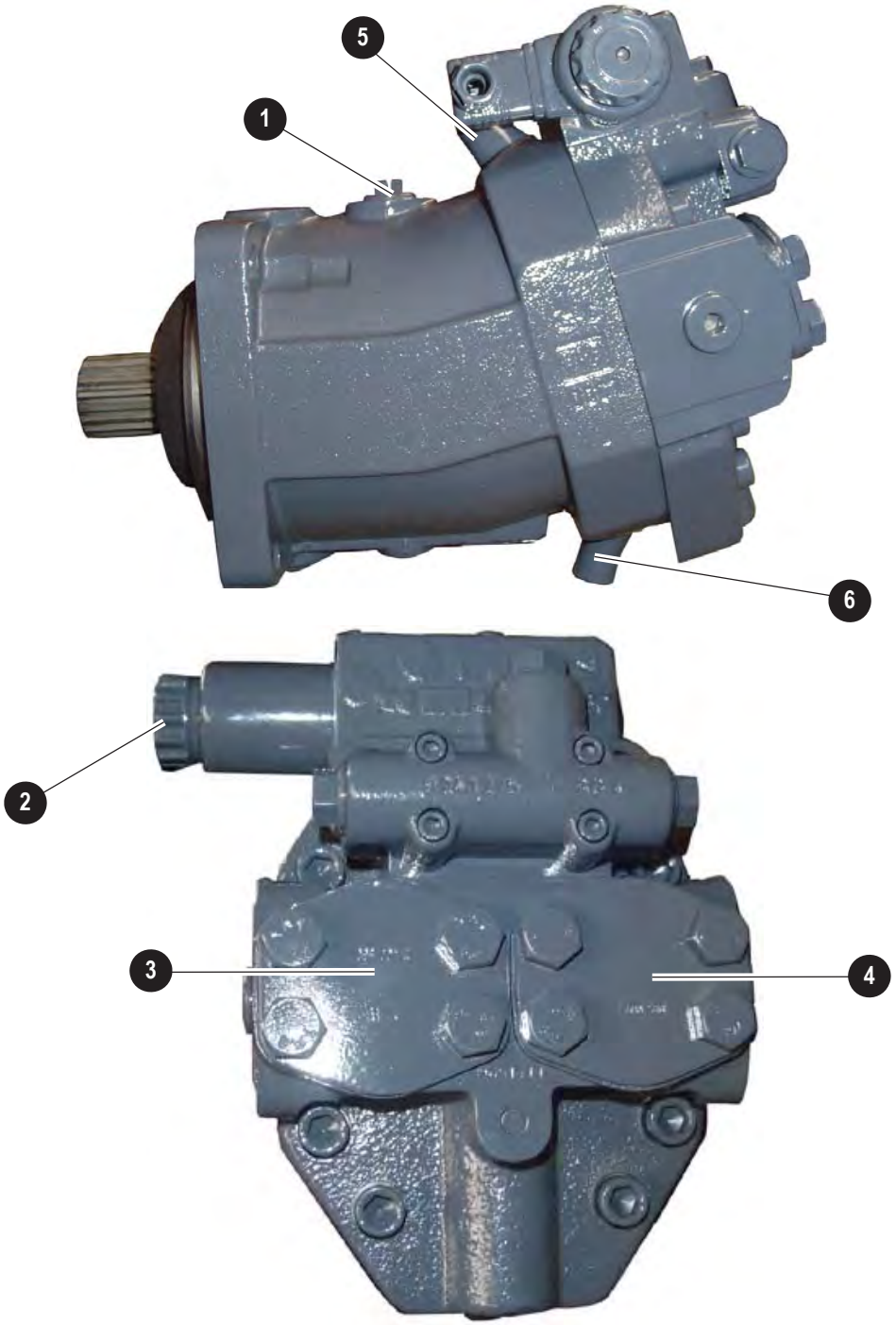
Pos.	Designation
1	Traveling drive
2	Cradle
3	Sliding block
4	Drive shaft
5	Wire
6	Articulated pin
7	Wire
8	Roller
9	Pair of bearing pins
10	Cylindrical roller bearing
11	Cage pair
12	Circlip
13	Circlip
14	Rotary shaft lip seal

Connecting plate with valves



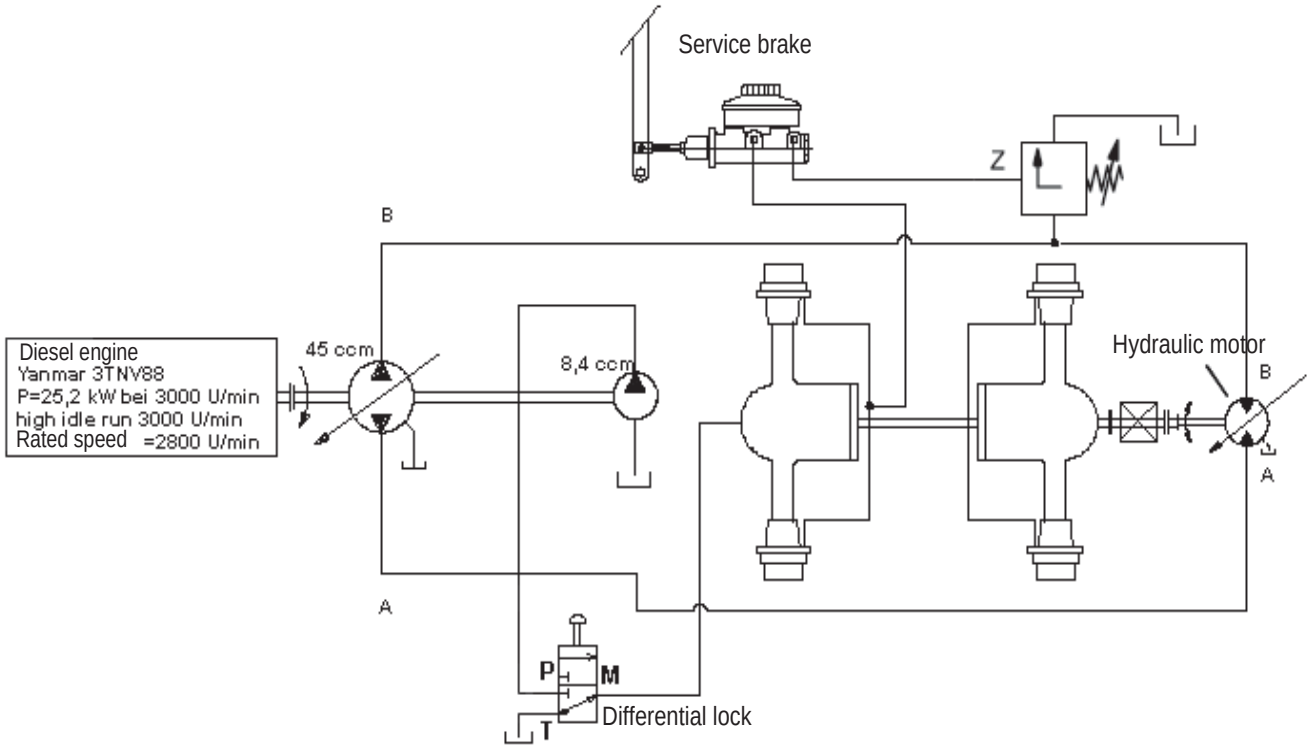
Pos.	Designation
1	Pressure limiting valve
2	Pressure limiting valve
3	Cutoff valve
4	Double tear-off plug
5	Screw plug
6	Screw plug
7	Double tear-off plug
8	O-ring
9	Screw plug
10	Nozzle
11	HP valve
12	HP valve
13	Screw plug

5.2 Hydraulic motor A6VM80EZ



Pos.	Designation
1	Leak fluid/oil drain
2	Switching magnet slow/fast
3	MA pump connection
4	MB pump connection
5	Maximum flow rate limit -> fast
6	Minimum flow rate limit -> slow

5.3 Traveling drive overview (up to AB)



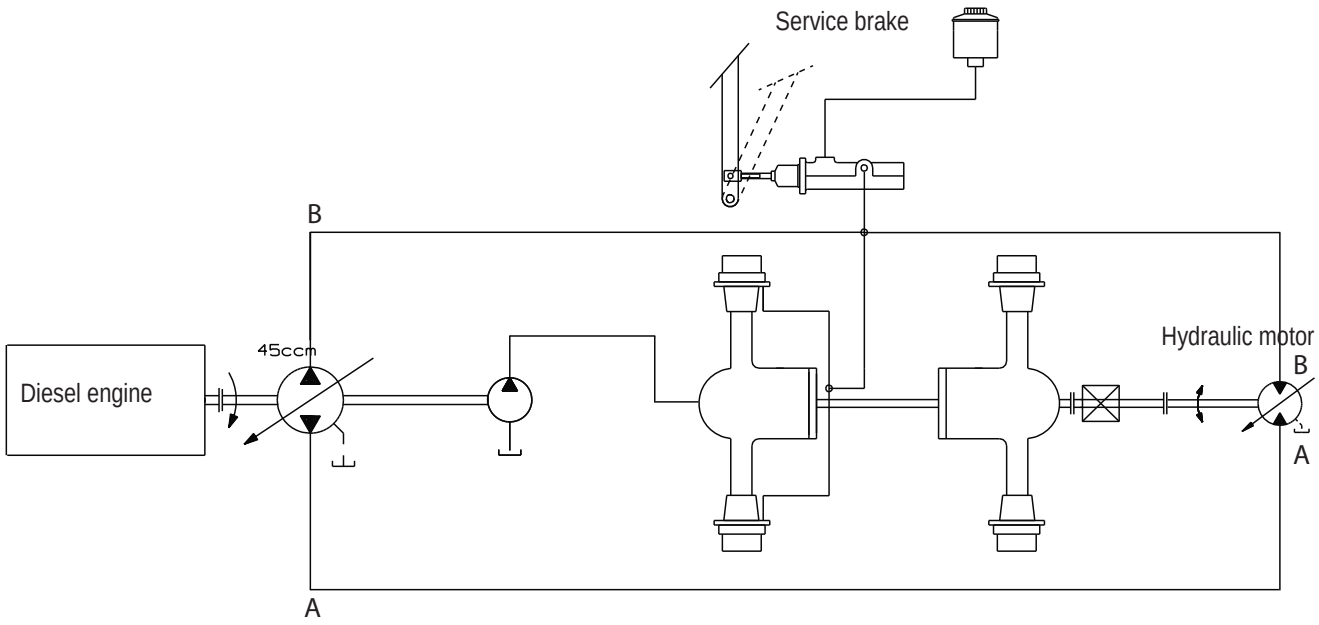
Forward travel function:

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

Reverse travel function:

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

5.4 Traveling drive overview (from AC)



5.5 Towing and transporting the machine

Safety instructions

- The machine may only be towed using suitable towing equipment (towing bar or cable) in connection with suitable towing facilities, such as a towing coupling, hooks and eyes!
- Start machine travel slowly! Ensure that no one is in the danger zone of the towing bar!
- The machine may only be towed with a cable if the service brakes and steering are fully operational!

Towing

Caution!

The hydrostatic drive can be damaged when towing the machine!

☞ *Stop the engine!*

☞ *Open the high-pressure circuit on the pump*

☞ *Release the hydraulic parking brakes on both wheel motors*

☞ *Do not tow the machine for more than 1 km (0.62 miles) and no faster than 2 kph (1.2 mph)!*

Opening the high-pressure circuit

There are two HP pressure limiting valves on the pump under the floor panel, one on the upper left and the other on lower left.

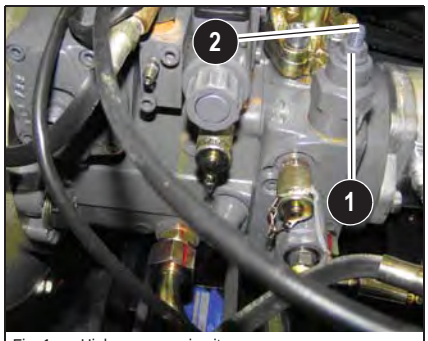


Fig. 1: High-pressure circuit screw

Proceed as follows:

☞ *Loosen locknut ws 14 (part 1) and unscrew it to the end of the screw*

☞ *Screw in the screw with allen key ws 4 (part 2)* until you can feel a firmer resistance

☞ *Then screw in a further half revolution*

Caution!

Screwing in any further damages the valve.

☞ *Retighten the locknut*

☞ *Slowly tow the machine (max. 2 kph/1.2 mph) over a short distance (max. 1 km/0.62 miles)*

☞ *Then reset the valves. Proceed in the reverse order to do this (unscrew the screw as far as it will go).*

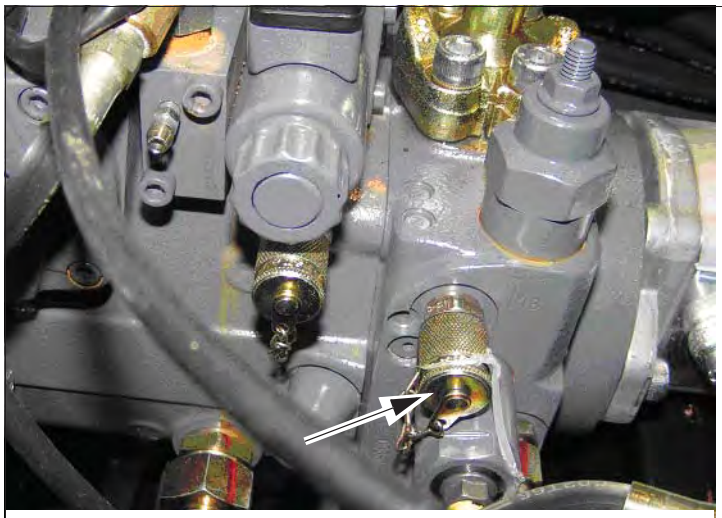
5.6 Test instructions

High pressure check

Ensure utmost cleanliness of all measuring points and connections, micro measuring lines and pressure gages that are connected for checking pressure => even the slightest traces of dirt, for example a grain of sand, can impair tightness and cause leaks

Tools required:

- Pressure gage 600 bar/8702 psi



Test connection HP

Parking brake switch (up to AB)

Check high pressure as follows:

☞ *Disengage the starter*

☞ ***Up to AB**: disconnect or remove the parking brake switch to ensure that there is no contact by applying the parking brake*

☞ ***From AC**: disconnect or remove the parking brake lever to ensure that there is no contact by applying the parking brake*

☞ *Connect the pressure gage*

☞ *Start the diesel engine and move the machine travel lever to forward speed range*

☞ *Make the machine travel against hydraulic resistance*

➥ Do not allow the wheels to spin

☞ *Read the pressure gage*

➥ High pressure must be about 360 bar/5221 psi

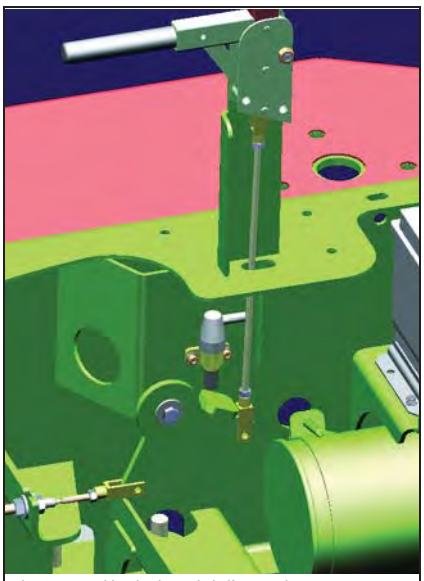


Fig. 2: Parking brake switch (from AC)

Notice!

It is not possible to adjust the high pressure valves

Check: boost pressure

Tools required:

- Pressure gage 50 bar/725 psi

Check boost pressure as follows:

☞ *Disengage the starter*

☞ *Remove flexible line **A** from the differential circuit*

☞ *Connect the pressure gage*

☞ *Start the diesel engine*

➥ Boost pressure about 25 bar/363 psi

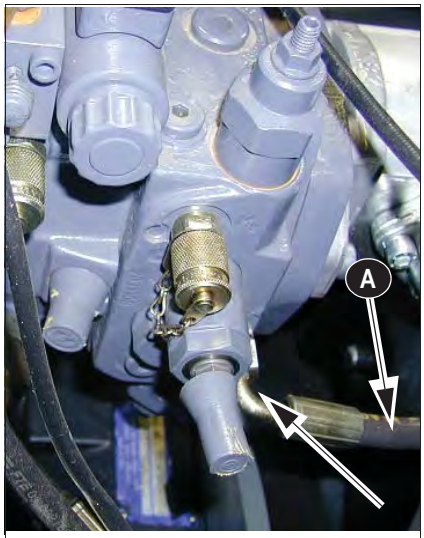


Fig. 3: Boost pressure test connection

Check: setting pressure

Tools required:

- Pressure gage 50 bar/725 psi

Check the setting pressure as follows:

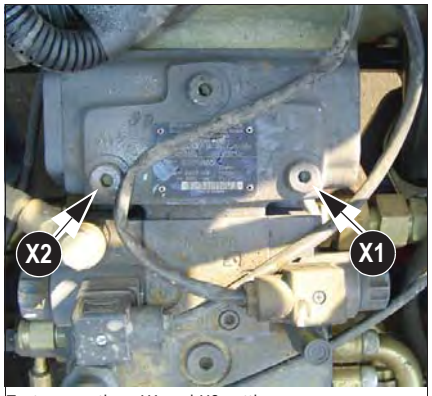
☞ *Disengage the starter*

☞ *Connect a pressure gage to **X1** or **X2***

☞ *Start the diesel engine*

☞ *The pump starts to swivel at about 12 bar/174 psi and the dumper moves*

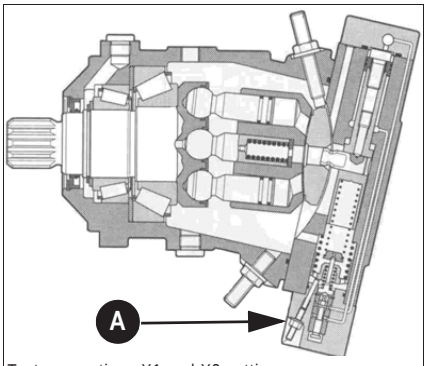
➥ Maximum pressure is about 25 bar/363 psi



Test connections X1 and X2 setting pressure

5.7 Adjustment

Setting: control initiation



Test connections X1 and X2 setting pressure

Tools required:

- 2 x pressure gages 600 bar/8702 psi

Adjust control initiation as follows

☞ *Disengage the starter*

☞ *Connect the pressure gage to connections G and M1*

☞ *Make the machine travel against hydraulic resistance*

- Brake the machine firmly
- Disconnect or remove the parking brake switch to ensure that there is no contact by applying the parking brake
- Shift to road-travel speed

☞ *Start the diesel engine*

☞ *Slowly increase the operating pressure (shown on the pressure gage on connection G)*

☞ *The pressure gage on connection M1 indicates the setting pressure*

➥ Operating pressure x 0.5 = setting pressure

☞ *Readjust the setting pressure until reaching control initiation with adjusting screw **A***

Notice!

Clockwise rotation: earlier control initiation!
Anticlockwise rotation: later control initiation!

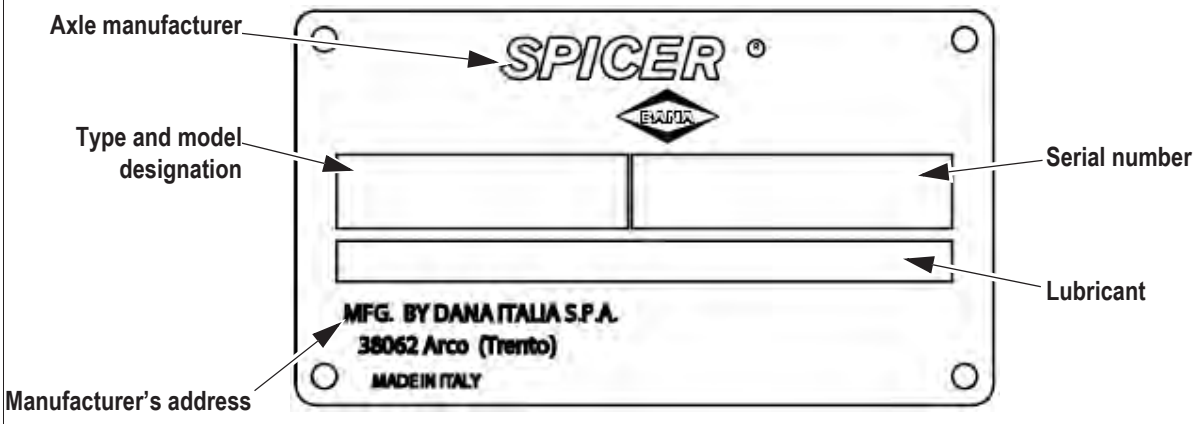
Axles

6 Axles

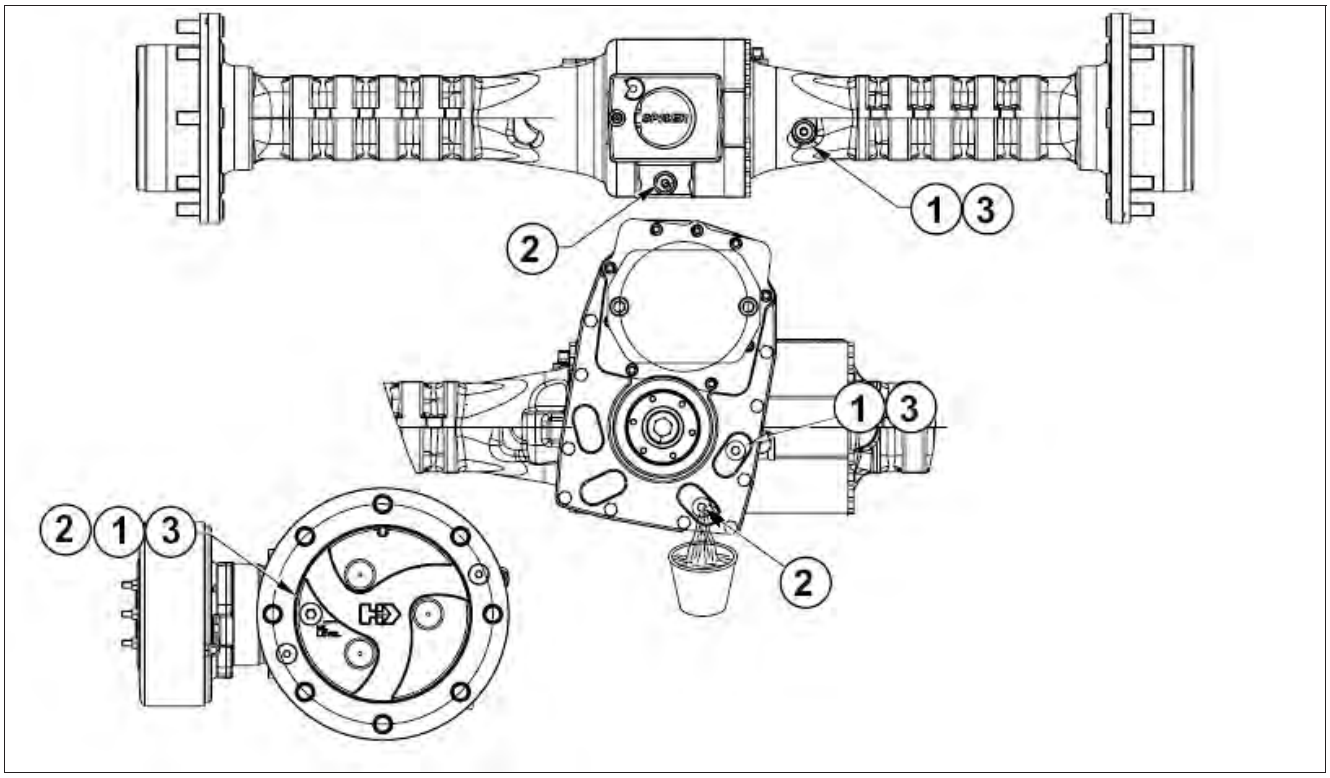
6.1 Axle type label

Type label contains all axle data

Axle type label



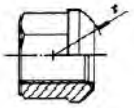
6.2 Drain, fill and check plug



Pos	Description
1	Fill plug
2	Drain plug
3	Checking the oil level

6.3 Tightening torques

Wheel screws

Wheel nut	Thread	Tightening torque	
With taper	M18x1.5	300 – 350 Nm 221 – 258 lbf ft	

Notice!

Check the wheel nuts for tightness every 50 o/h!

Axle mounting

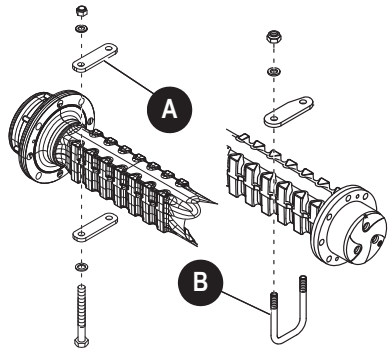


Fig. 1: Axle mounting

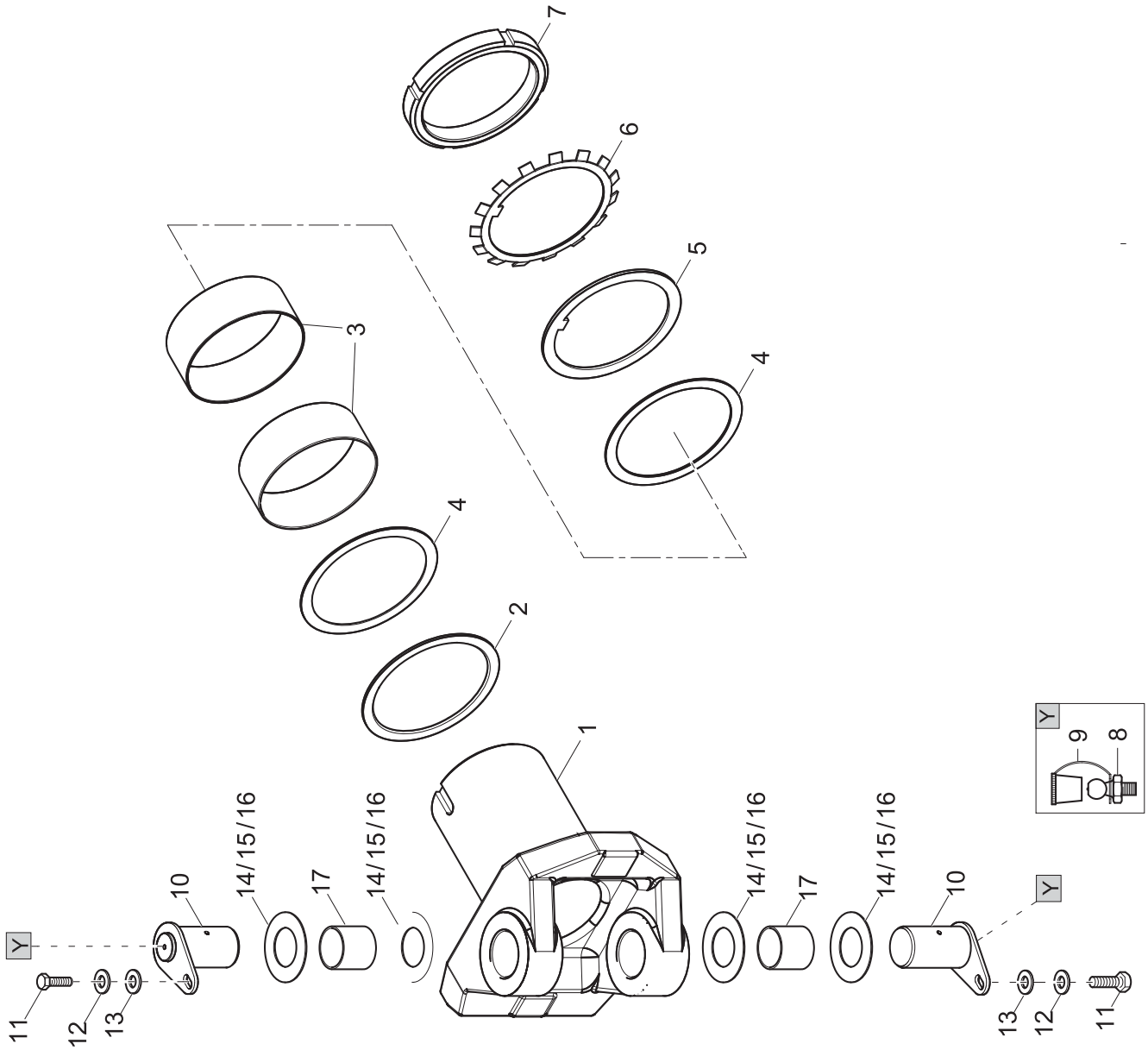
☞ *Tighten shackles **A** and axle hoops **B** to 490 Nm (361.4 ft.lbs.).*

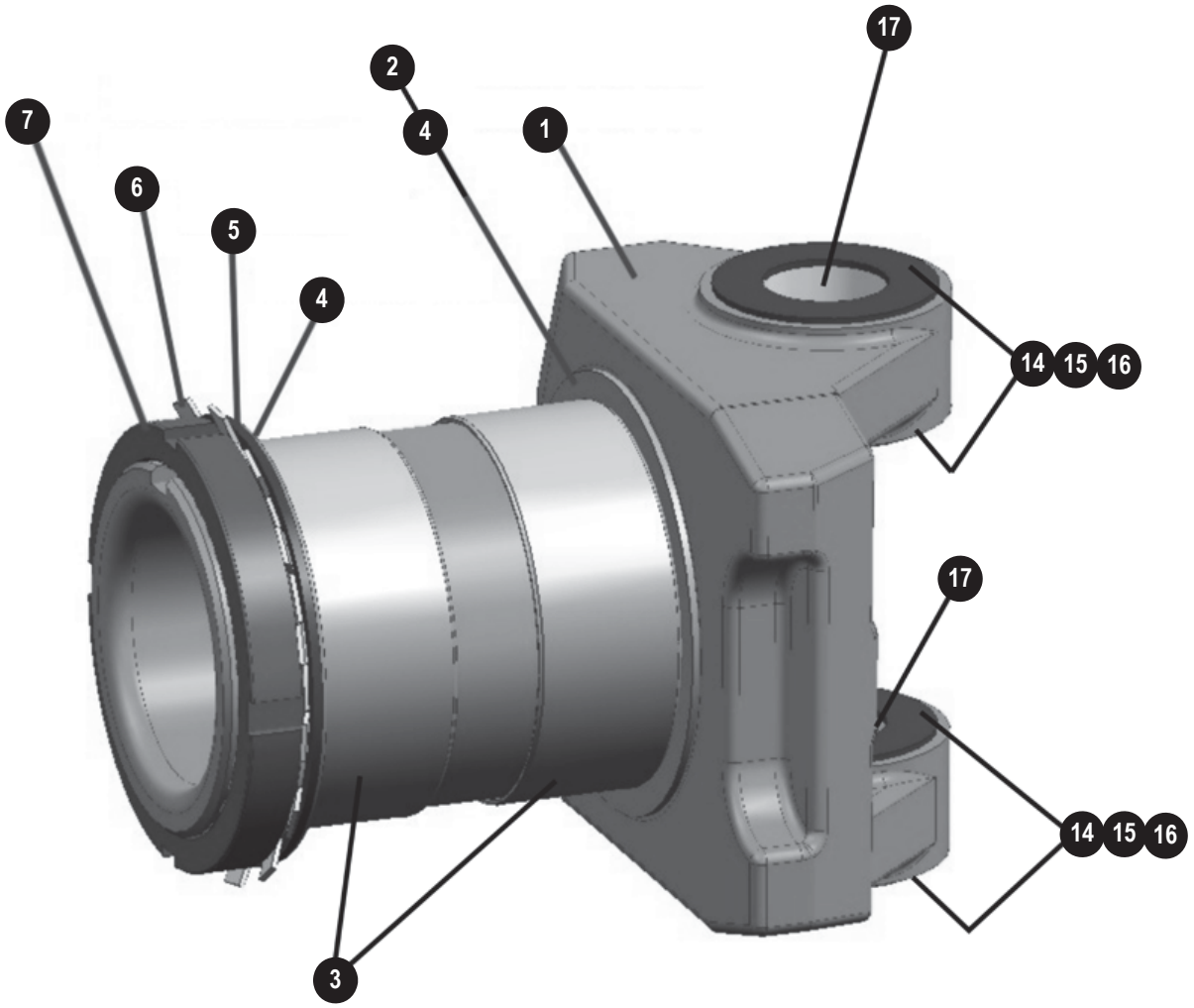
General tightening torques

Thread size	Thread					
	Normal	+Loctite 270	Normal	+Loctite 270	Normal	+Loctite 270
	8.8		10.9		12.9	
	Nm (lbf ft)					
M6x1	9.5 – 10.5 7 – 7.7	10.5 – 11.5 7.7 – 8.5	14.3 – 15.7 10.5 – 11.6	15.2 – 16.8 11.2 – 12.4	16.2 – 17.8 11.9 – 13.1	18.1 – 20.0 13.3 – 14.8
M8x1.25	23.8 – 26.2 17.6 – 19	25.6 – 28.4 18.9 – 20.9	34.2 – 37.8 25.2 – 27.9	36.7 – 40.5 27.1 – 29.9	39.0 – 43.0 28.8 – 31.7	43.7 – 48.3 32.2 – 35.6
M10x1.5	48 – 53 35 – 39	52 – 58 38 – 43	68 – 75 50.2 – 55.3	73 – 81 53.8 – 59.7	80 – 88 59 – 64.9	88 – 97 64.9 – 71.5
M12x1.75	82 – 91 60.5 – 67.1	90 – 100 66.4 – 73.8	116 – 128 85.6 – 94.4	126 – 139 92.9 – 102.5	139 – 153 102.5 – 112.8	152 – 168 112.1 – 123.9
M14x2	129 – 143 95.1 – 105	143 – 158 105 – 117	182 – 202 134.2 – 149	200 – 221 148 – 163	221 – 244 163 – 180	238 – 263 176 – 194
M16x2	200 – 221 148 – 163	219 – 242 161 – 178	283 – 312 209 – 230	309 – 341 228 – 251.5	337 – 373 249 – 275	371 – 410 274 – 302
M18x2.5	276 – 305 203.5 – 225	299 – 331 220.5 – 244	390 – 431 288 – 318	428 – 473 316 – 349	466 – 515 344 – 380	509 – 562 375 – 415
M20x2.5	390 – 431 288 – 318	428 – 473 316 – 349	553 – 611 408 – 451	603 – 667 445 – 492	660 – 730 487 – 538	722 – 798 533 – 589
M22x2.5	523 – 578 386 – 426	575 – 635 424 – 468	746 – 824 550 – 608	817 – 903 603 – 666	893 – 987 659 – 728	974 – 1076 718 – 794
M24x3	675 – 746 498 – 550	732 – 809 540 – 597	950 – 1050 701 – 774	1040 – 1150 767 – 848	1140 – 1260 841 – 929	1240 – 1370 915 – 1010

Thread						
M27x3	998 – 1103 736 – 814	1088 – 1202 802 – 887	1411 – 1559 1041 – 1150	1539 – 1701 1135 – 1255	1710 – 1890 1261 – 1394	1838 – 2032 1356 – 1499
M30x3.5	1378 – 1523 1016 – 1123	1473 – 1628 1086 – 1201	1914 – 2115 1412 – 1560	2085 – 2305 1538 – 1700	2280 – 2520 1682 – 1859	2494 – 2757 1839 – 2033
M8x1	25.7 – 28.3 19 – 20.9	27.5 – 30.5 20.3 – 22.5	36.2 – 39.8 26.7 – 29.4	40 – 44 29.5 – 32.5	42.8 – 47.2 31.6 – 34.8	47.5 – 52.5 35 – 38.7
M10x1.25	49.4 – 54.6 36.4 – 40.3	55.2 – 61 40.7 – 45	71.5 – 78.5 52.7 – 57.9	78 – 86 57.5 – 63.4	86 – 94 63.4 – 69.3	93 – 103 68.6 – 76
M12x1.25	90 – 100 66.4 – 73.8	98 – 109 72.3 – 80.4	128 – 142 94.4 – 105	139 – 154 102.5 – 114	152 – 168 112.1 – 123.9	166 – 184 122.4 – 135.7
M12x1.5	86 – 95 63.4 – 70	94 – 104 69.3 – 76.7	120 – 132 88.5 – 97.4	133 – 147 98.1 – 108.4	143 – 158 105 – 117	159 – 175 117.3 – 129
M14x1.5	143 – 158 105 – 117	157 – 173 116 – 128	200 – 222 148 – 164	219 – 242 161 – 178	238 – 263 176 – 194	261 – 289 193 – 213
M16x1.5	214 – 236 158 – 174	233 – 257 172 – 190	302 – 334 223 – 246.3	333 – 368 245.6 – 271	361 – 399 266 – 294	394 – 436 291 – 322
M18x1.5	312 – 345 230 – 254	342 – 378 252 – 279	442 – 489 326 – 361	485 – 536 358 – 395	527 – 583 389 – 430	580 – 641 428 – 473
M20x1.5	437 – 483 322 – 356	475 – 525 350 – 387	613 – 677 452 – 499	674 – 745 497 – 549	736 – 814 543 – 600	808 – 893 596 – 659
M22x1.5	581 – 642 429 – 474	637 – 704 470 – 519	822 – 908 606 – 670	903 – 998 666 – 736	998 – 1103 736 – 814	1078 – 1191 795 – 878
M24x2	741 – 819 547 – 604	808 – 893 596 – 659	1045 – 1155 771 – 852	1140 – 1260 841 – 929	1235 – 1365 911 – 1007	1363 – 1507 1005 – 1112
M27x2	1083 – 1197 799 – 883	1178 – 1302 869 – 960	1520 – 1680 1121 – 1239	1672 – 1848 1233 – 1363	1834 – 2027 1353 – 1495	2000 – 2210 1475 – 1630
M30x2	1511 – 1670 1114 – 1232	1648 – 1822 1216 – 1344	2138 – 2363 1577 – 1743	2332 – 2577 1720 – 1901	2565 – 2835 1892 – 2091	2788 – 3082 2056 – 2273

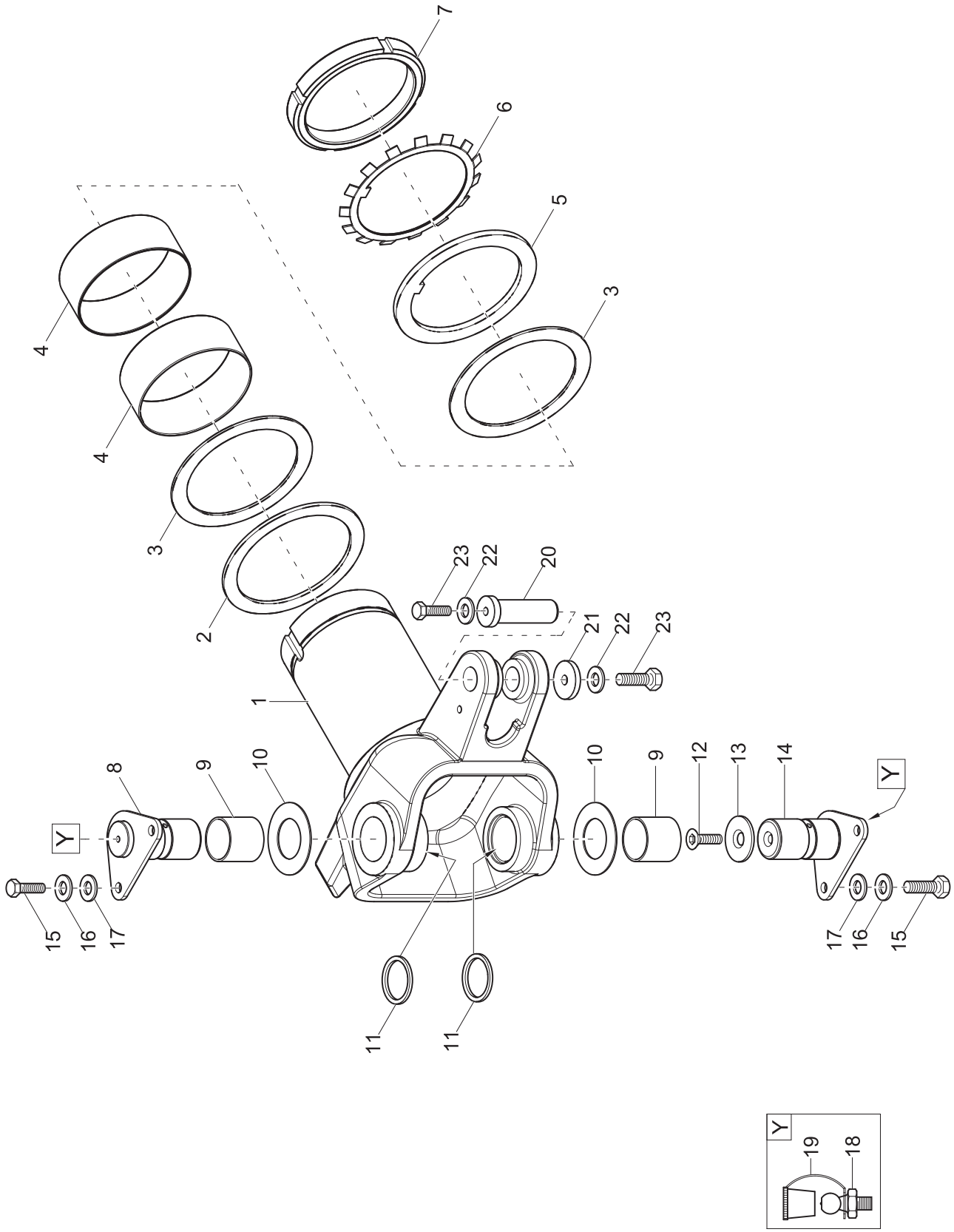
6.4 Articulated joint (up to AB)





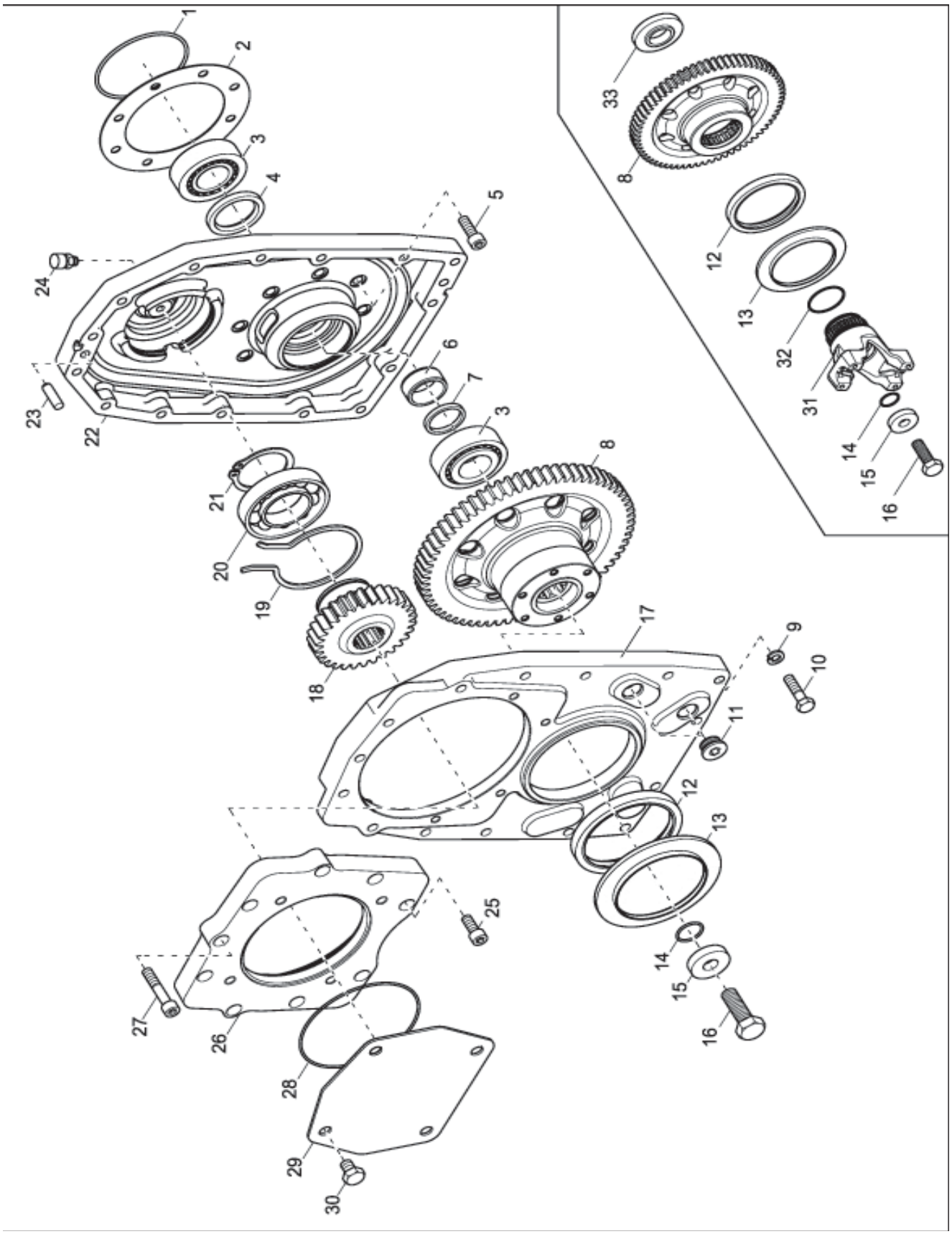
Pos.	Designation	
1	Articulated joint	
2	Spacer washer	
3	Bushing	
4	Spacer washer	
5	Supporting washer	
6	Tab washer	
7	Slotted nut	
8	Grease zerks	
9	Protective cap	
10	Articulated joint pin	
11	Hexagon head screw	
12	Schnorr lock	
13	Washer	
14	Spacer washer	2 mm (0.08")
15	Spacer washer	2.5 mm (0.1")
16	Spacer washer	3 mm (0.12")
17	Bushing	

6.5 Articulated joint (from AC)



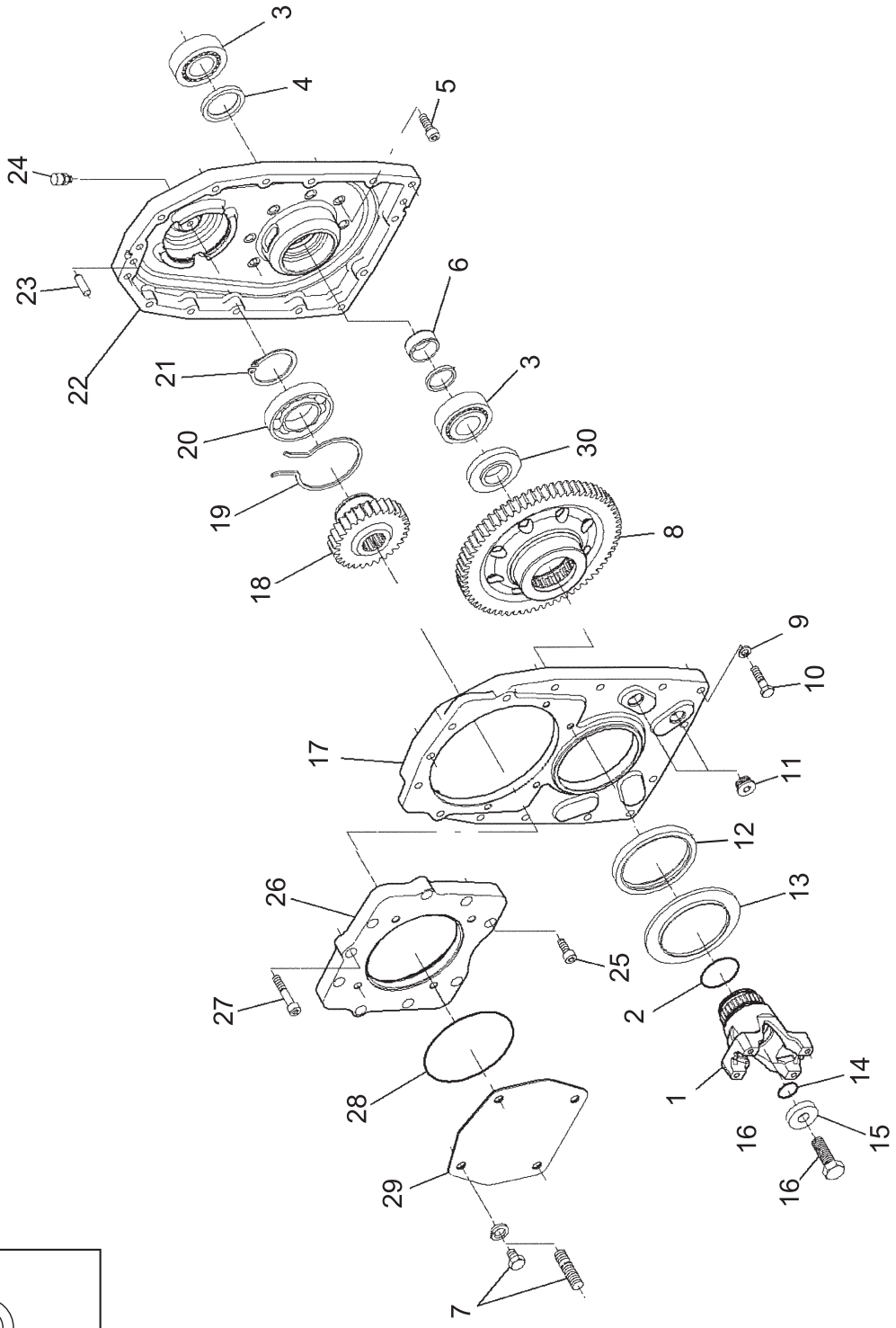
Pos.	Designation
1	Articulated joint
2	Thrust washer
3	Thrust washer
4	Bushing
5	Supporting washer
6	Tab washer
7	Slotted nut
8	Articulated joint pin
9	Bushing
10	Spacer washer
11	Pin gasket
12	Countersunk screw
13	Washer
14	Articulated joint pin
15	Hexagon head screw
16	Schnorr lock
17	Washer
18	Grease zerks
19	Protective cap
20	Steering cylinder pin
21	Washer
22	Schnorr lock
23	Hexagon head screw

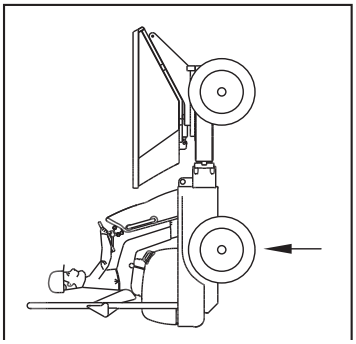
6.6 Transfer gearbox (up to AD)



Pos.	Designation
1	O-ring
2	Shim ring
3	Bearing
4	Sealing ring
5	Screw
6	Spacer ring
7	Set of rings
8	Gear
9	Spring lock washer
10	Hexagon head screw
11	Plug
12	Sealing ring
13	Protective plate
14	O-ring
15	Washer
16	Screw
17	Cover
18	Gear
19	Circlip
20	Grooved ball bearing
21	Circlip
22	Housing
23	Pin
24	Breather
25	Cheese-head screw
26	Cover
27	Cheese-head screw
28	O-ring
29	Sheet metal
30	Hexagon head screw
31	Flange
32	O-ring
33	Centering ring

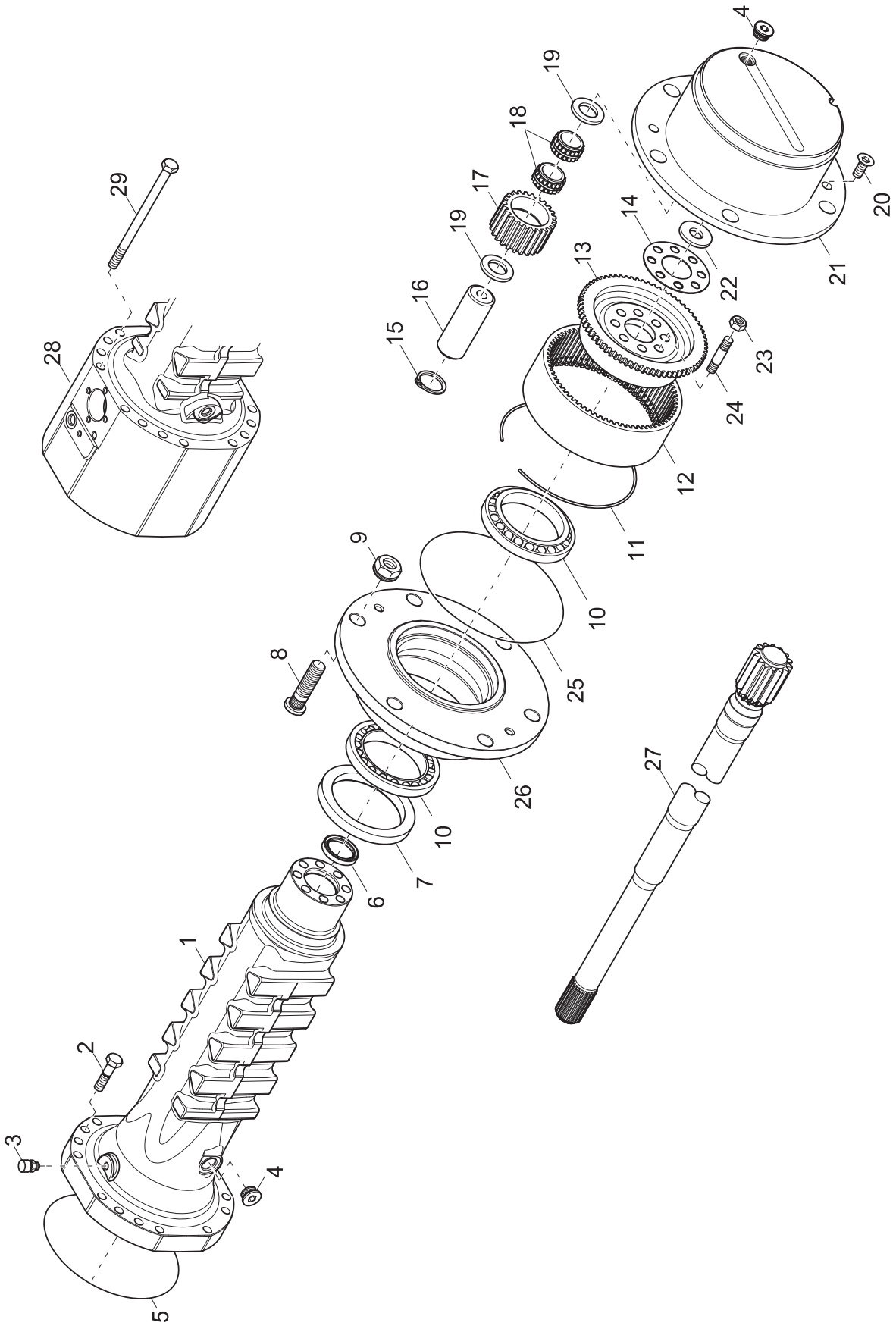
6.7 Transfer gearbox (from AE310242D)





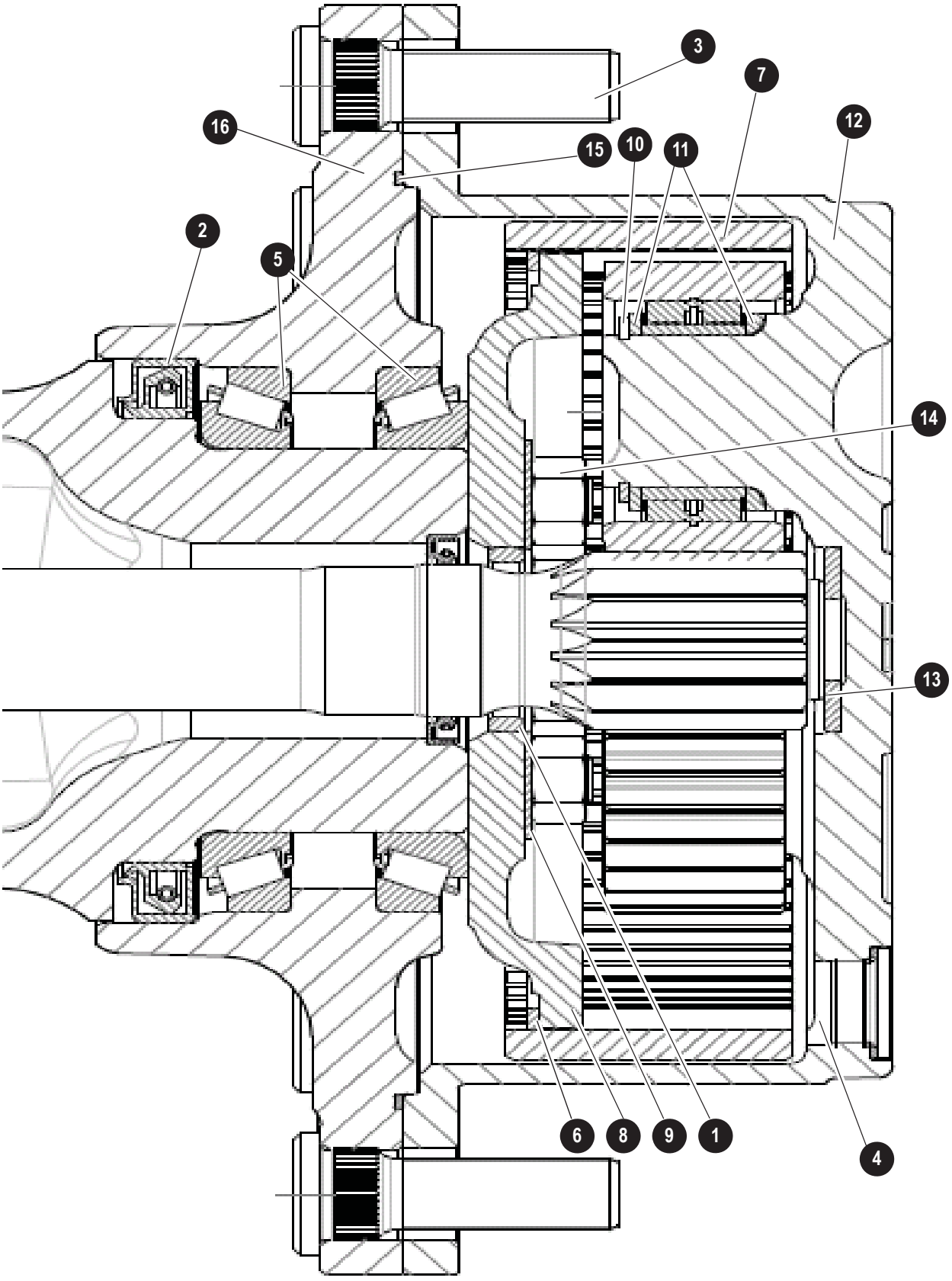
Pos.	Designation
1	Flange
2	O-ring
3	Bearing
4	Sealing ring
5	Screw
6	Spacer ring
7	Hexagon head screw
8	Gear
9	Spring lock washer
10	Hexagon head screw
11	Plug
12	Sealing ring
13	Protective plate
14	O-ring
15	Washer
16	Screw
17	Cover
18	Gear
19	Circlip
20	Grooved ball bearing
21	Circlip
22	Housing
23	Pin
24	Breather
25	Cheese-head screw
26	Cover
27	Cover
28	O-ring
29	Sheet metal
30	Centering ring

6.8 Semiaxles



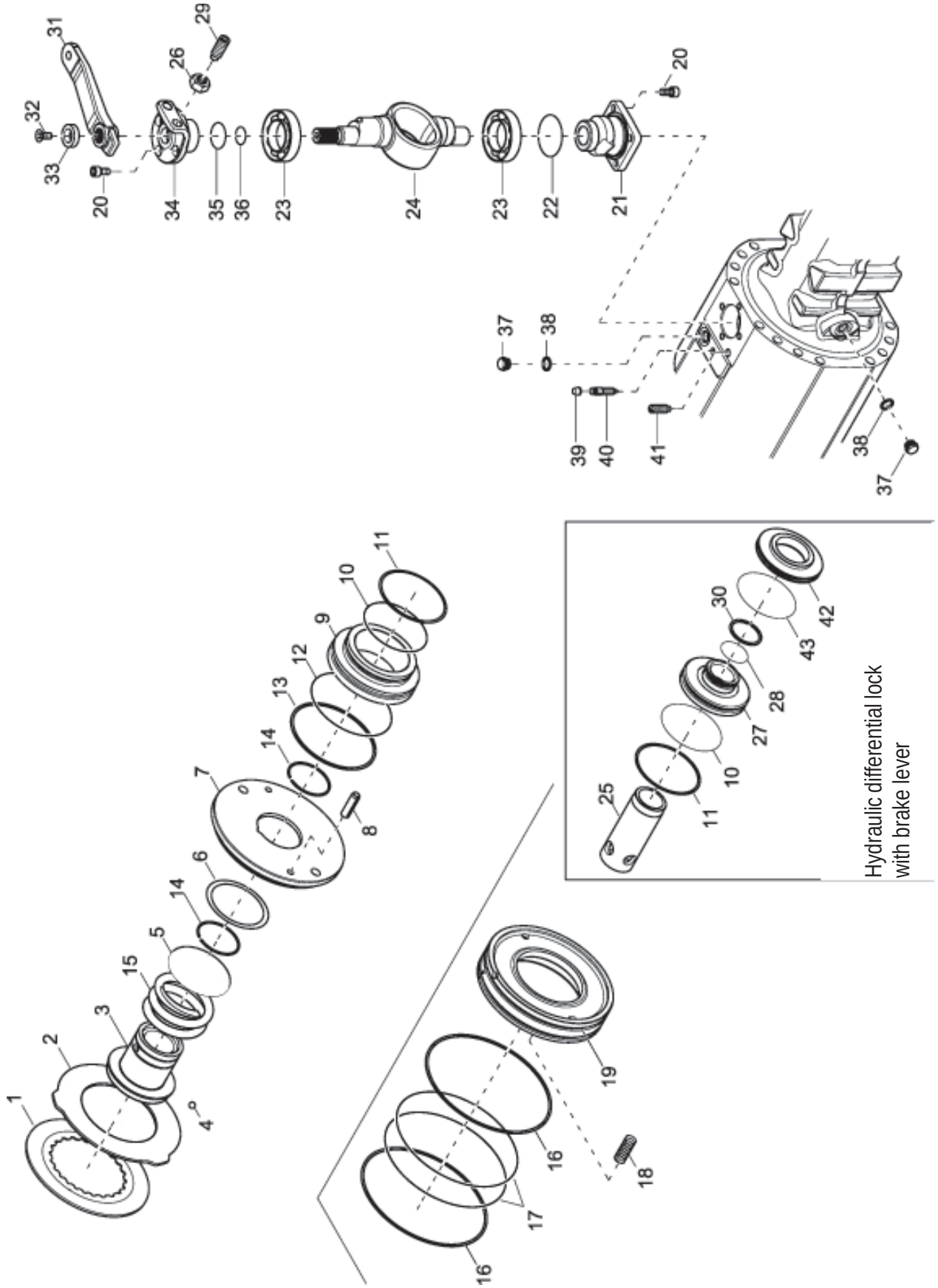
Pos.	Designation
1	Axle housing
2	Screw
3	Breather
4	Plug
5	O-ring
6	Ring
7	Sealing ring
8	Wheel bolt
9	Spherical collar nut
10	Bearing
11	Circlip
12	Ring gear
13	Internal-geared wheel support
14	Tab washer
15	Circlip
16	Pin
17	Planetary gear
18	Needle cage
19	Thrust washer
20	Screw
21	Planetary housing
22	Thrust washer
23	Nut
24	Stud
25	Ring
26	Wheel hub
27	Axle shaft
28	Axle housing
29	Hexagon head screw

6.9 Wheel hub

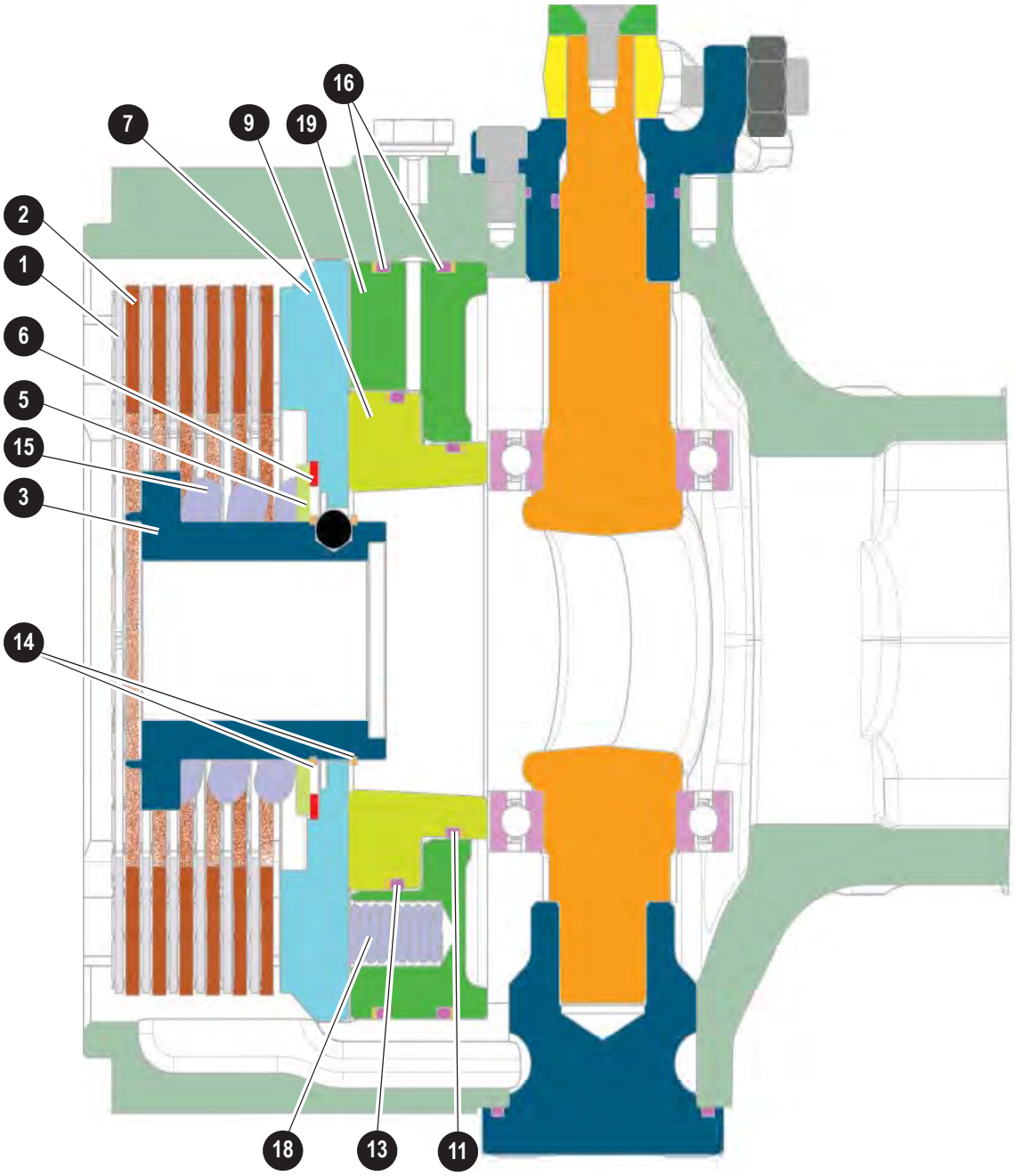


Pos.	Designation
1	Ring
2	Sealing ring
3	Wheel bolt
4	Plug
5	Bearing
6	Circlip
7	Ring gear
8	Internal-geared wheel support
9	Tab washer
10	Circlip
11	Thrust washer
12	Planetary housing
13	Thrust washer
14	Hexagon nut
15	Ring
16	Wheel hub

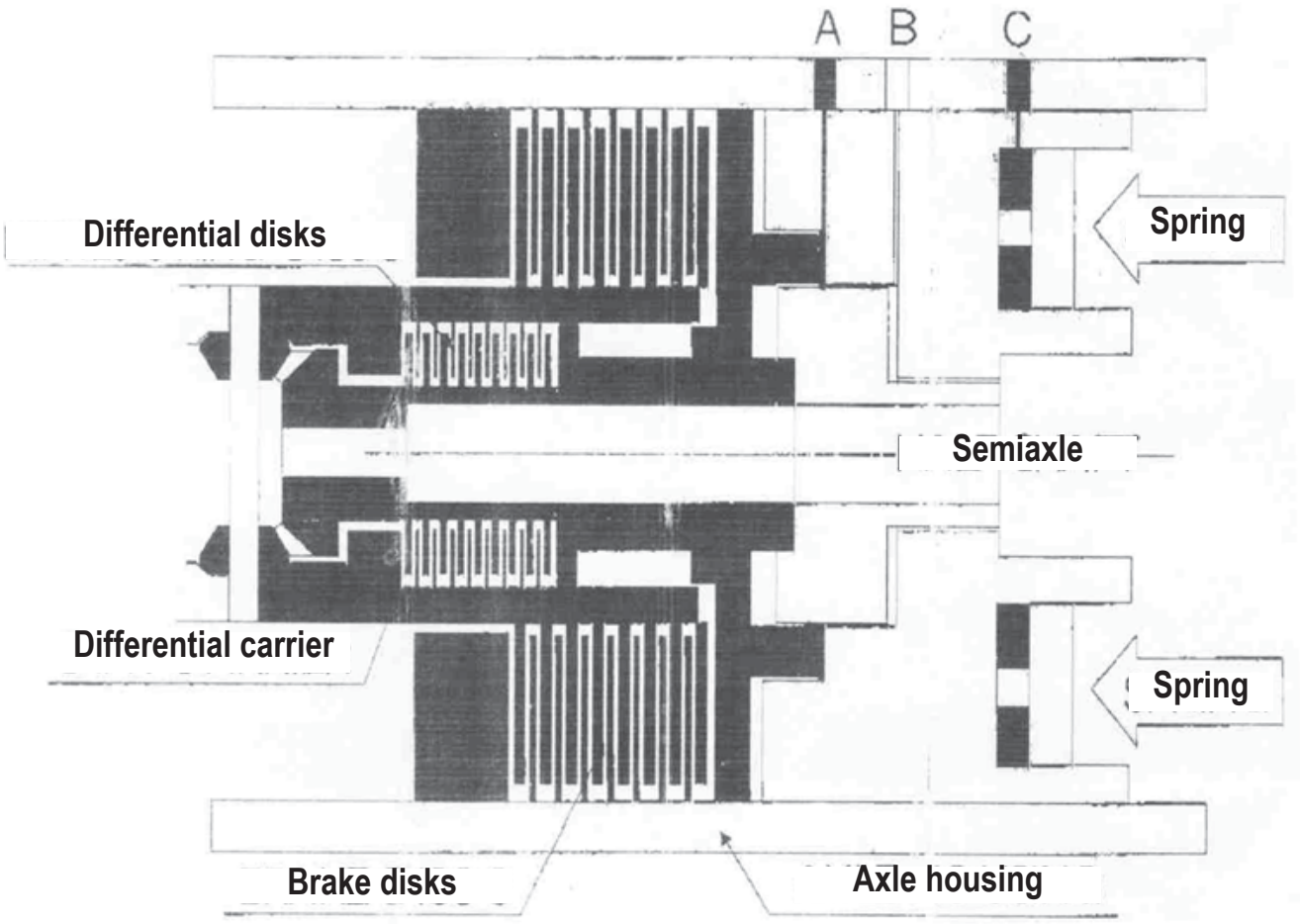
6.10 Front axle brake (up to AB)



6.11 Brake diagram



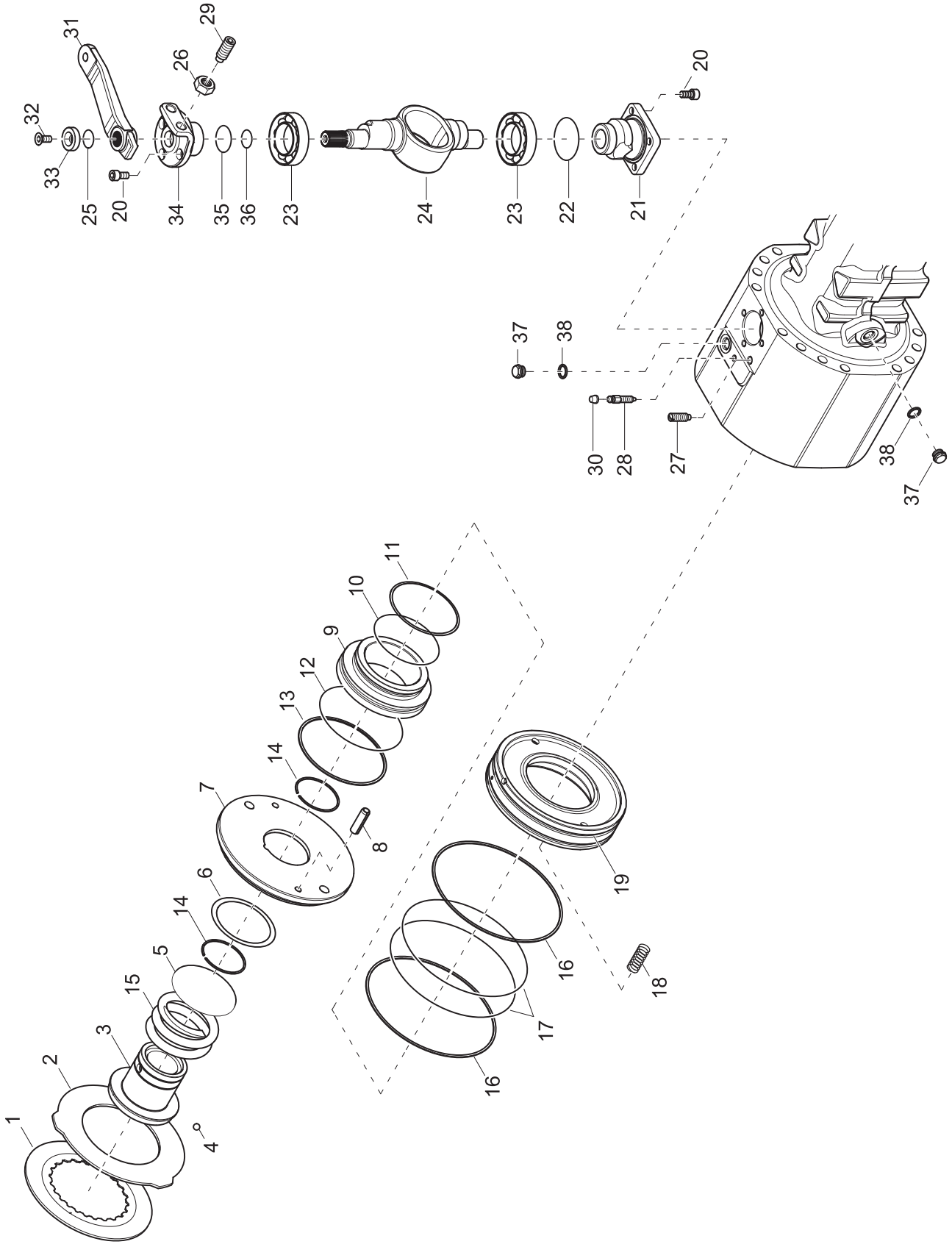
Pos.	Designation
1	Brake disk
2	Counterdisc
3	Intermediate bushing
4	Ball
5	Spacer ring
6	Shim ring
7	Counterdisc
8	Clamping sleeve
9	Piston
10	O-ring
11	Antiextrusion ring
12	O-ring
13	Antiextrusion ring
14	Circlip
15	Tension spring
16	Antiextrusion ring
17	O-ring
18	Tension spring
19	Piston
20	Cheese-head screw
21	Intermediate bushing
22	O-ring
23	Bearing
24	Brake lever
25	Spacer ring
26	Nut
27	Piston
28	O-ring
29	Screw
30	Antiextrusion ring
31	Lever
32	Countersunk screw
33	Spacer ring
34	Intermediate bushing
35	O-ring
36	O-ring
37	Screw
38	Sealing ring
39	Plug
40	Bleed screw
41	Stud bolt
42	Plug
43	O-ring



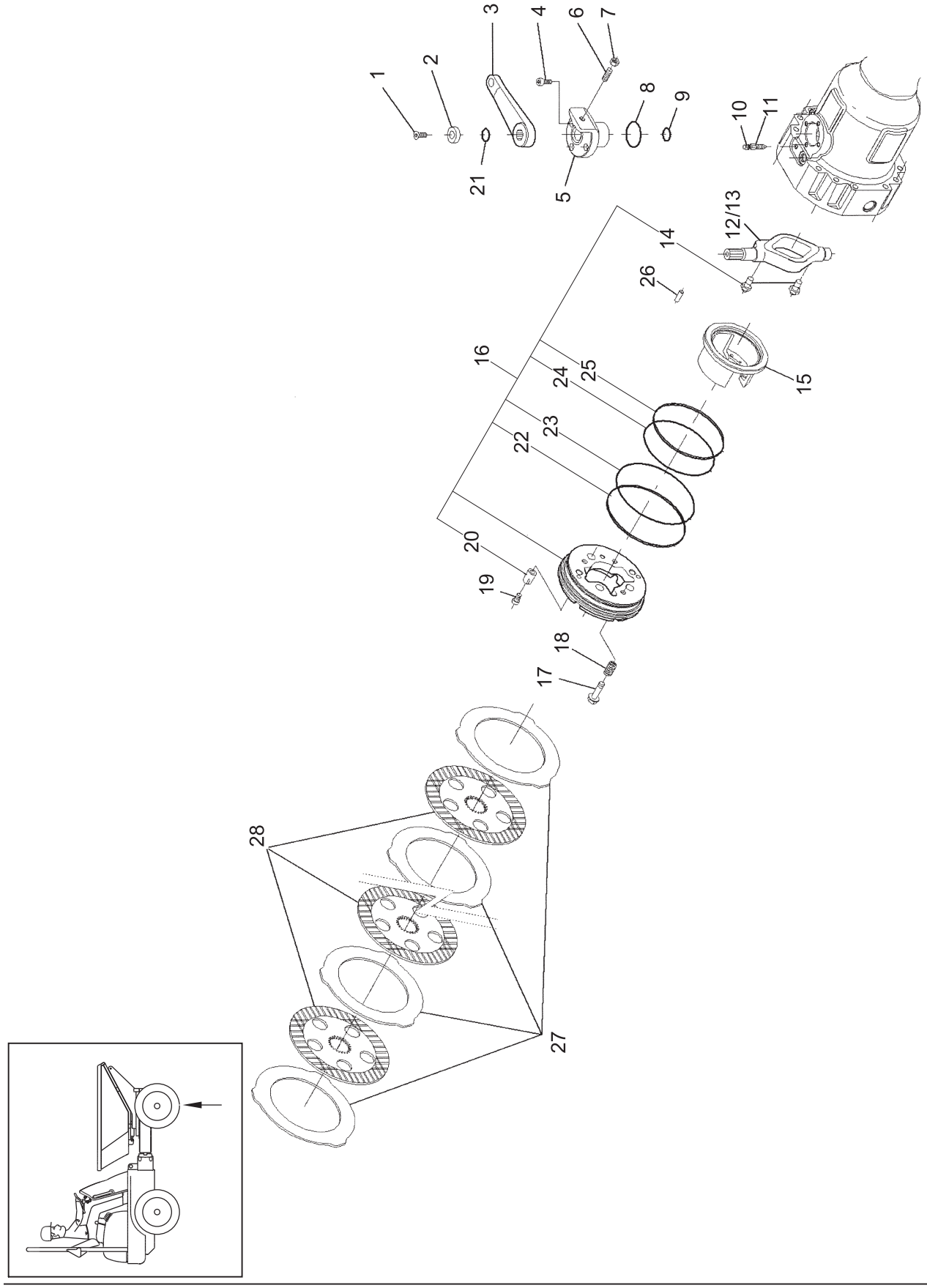
The service brake is actuated hydraulically by applying pressure through feed hole A (max. pressure 80 bar/1160 psi).

The brake piston acts both on the differential disks and on the brake disks. The differential is locked with a slight shift by means of the preloaded elastic intermediate part, with regard to the closure of the disk play of the braking system. This creates a brake effect between the differential housing (which forms a unit with the stub shafts that are already locked) and the axle body. This system of locking the differential lock ensures an even distribution of the braking effect on both stub shafts.

6.12 Front axle brake (from AC to AD)



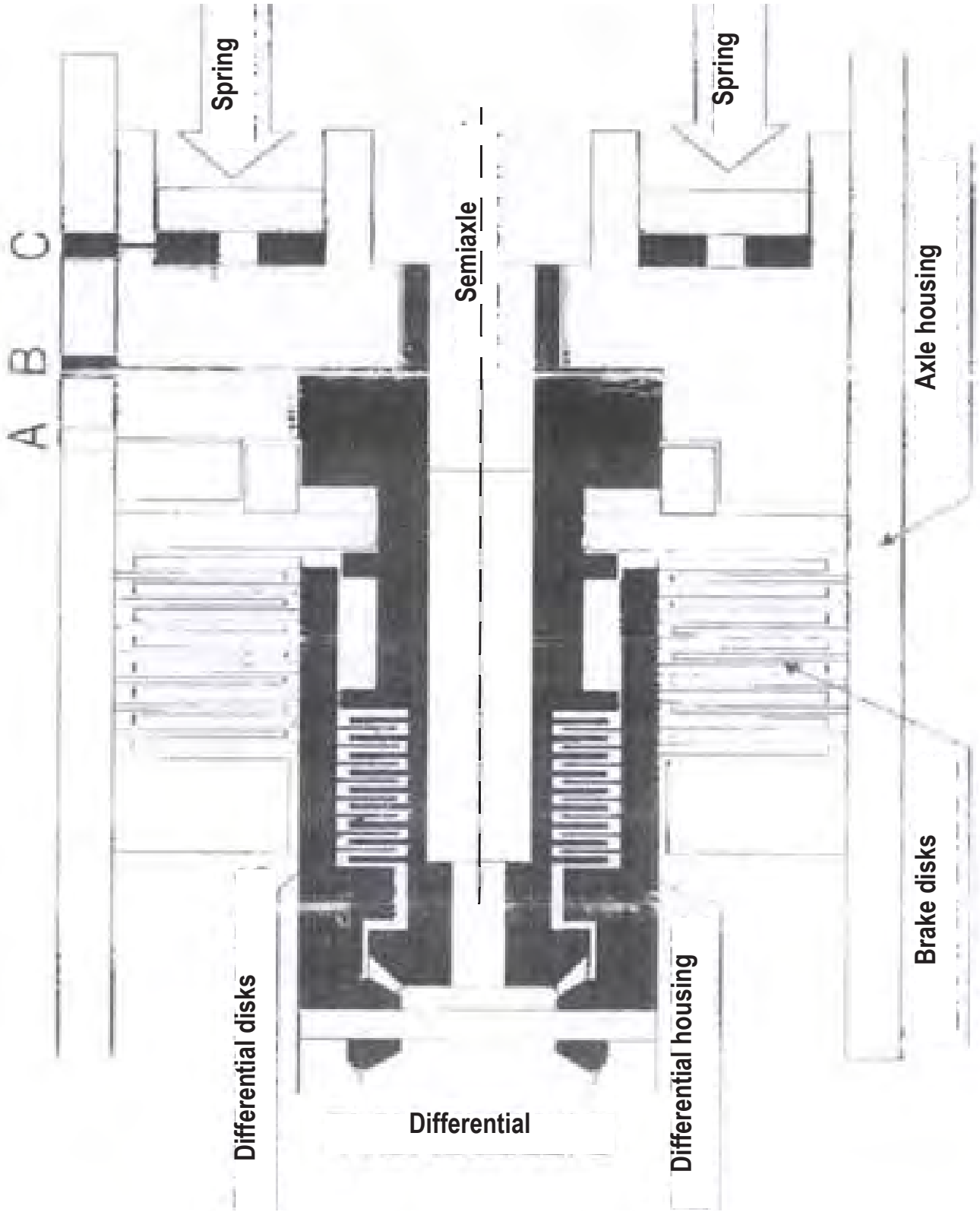
6.13 Front axle brake (from AE310242D)



Pos.	Designation (from AC to AD)
1	Brake disk
2	Counterdisc
3	Intermediate bushing
4	Ball
5	Spacer ring
6	Shim ring
7	Counterdisc
8	Clamping sleeve
9	Piston
10	O-ring
11	Antiextrusion ring
12	O-ring
13	Antiextrusion ring
14	Circlip
15	Tension spring
16	Antiextrusion ring
17	O-ring
18	Tension spring
19	Piston
20	Cheese-head screw
21	Intermediate bushing
22	O-ring
23	Bearing
24	Brake lever
25	O-ring
26	Nut
27	Stud bolt
28	Bleed screw
29	Screw
30	Plug
31	Lever
32	Countersunk screw
33	Spacer ring
34	Intermediate bushing
35	O-ring
36	O-ring
37	Screw
38	Sealing ring

Pos.	Designation (from AE310242D)
1	Countersunk screw
2	Spacer ring
3	Lever
4	Cheese-head screw
5	Intermediate bushing
6	Stud bolt
7	Nut
8	O-ring
9	O-ring
10	Plug
11	Drain plug
12	Lever (left)
13	Lever (right)
14	Pin
15	Sleeve
16	Counterdisc
17	Screw
18	Tension spring
19	Screw
20	Tension spring
21	O-ring
22	Spacer ring
23	O-ring
24	O-ring
25	Spacer ring
26	Clamping sleeve
27	Brake disk
28	Brake disk

6.14 Differential (up to AB)

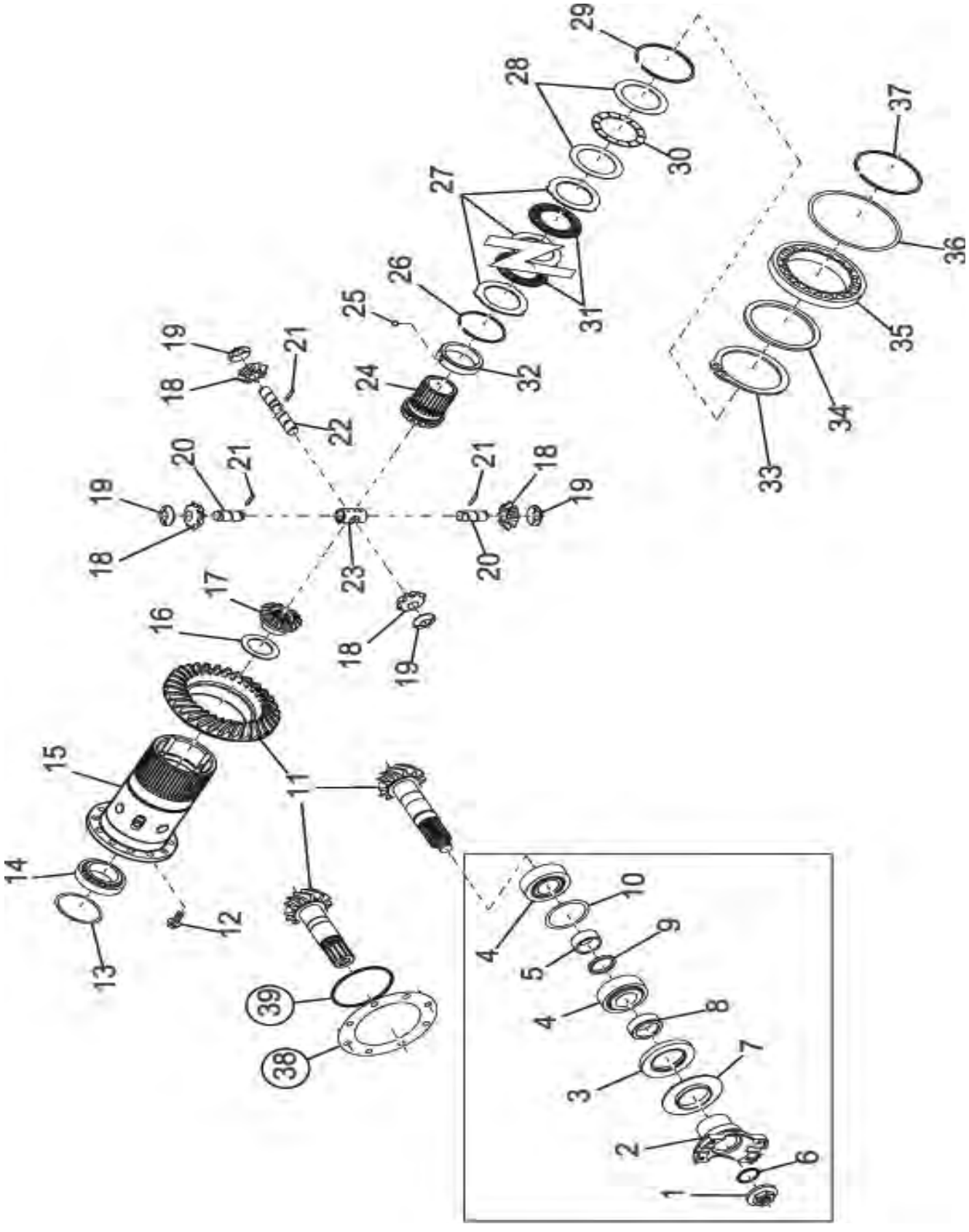


The 100 % differential lock is actuated hydraulically by supplying a continous pressure (15 bar/218 psi min. – 25 bar/363 psi max.) via feed hole B. Compacting the clutch disks with the center piston locks the differential, and the differential housing forms one unit with one of the stub shafts. The differential is fully locked.

As soon as the pressure is released, the stroke of the planetary carrier removes the clutch disks and the lock is disabled.

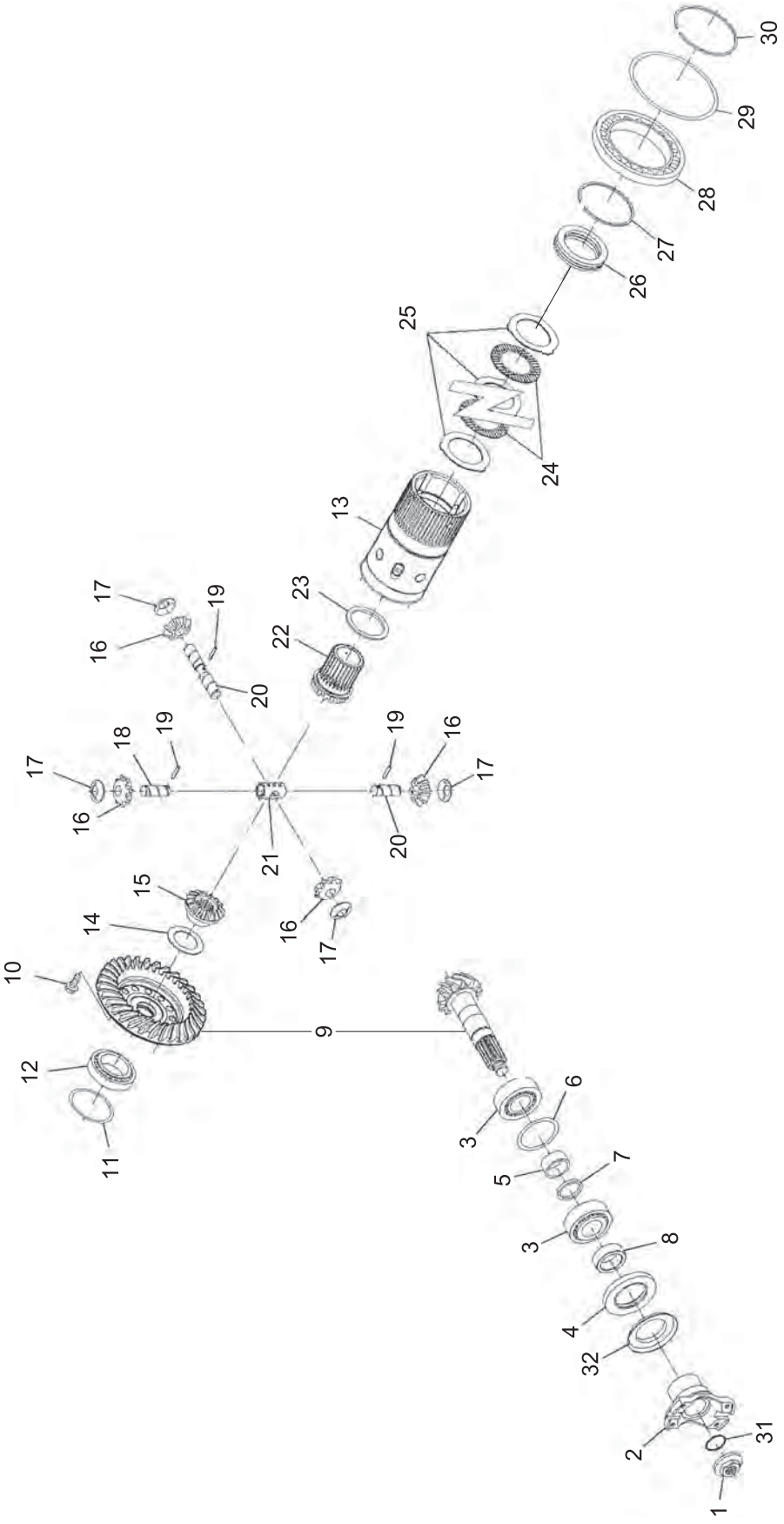
Unless locked hydraulically, the differential is preloaded under normal circumstances. This improves traction considerably in extreme off-road conditions.

Front axle (up to AB)

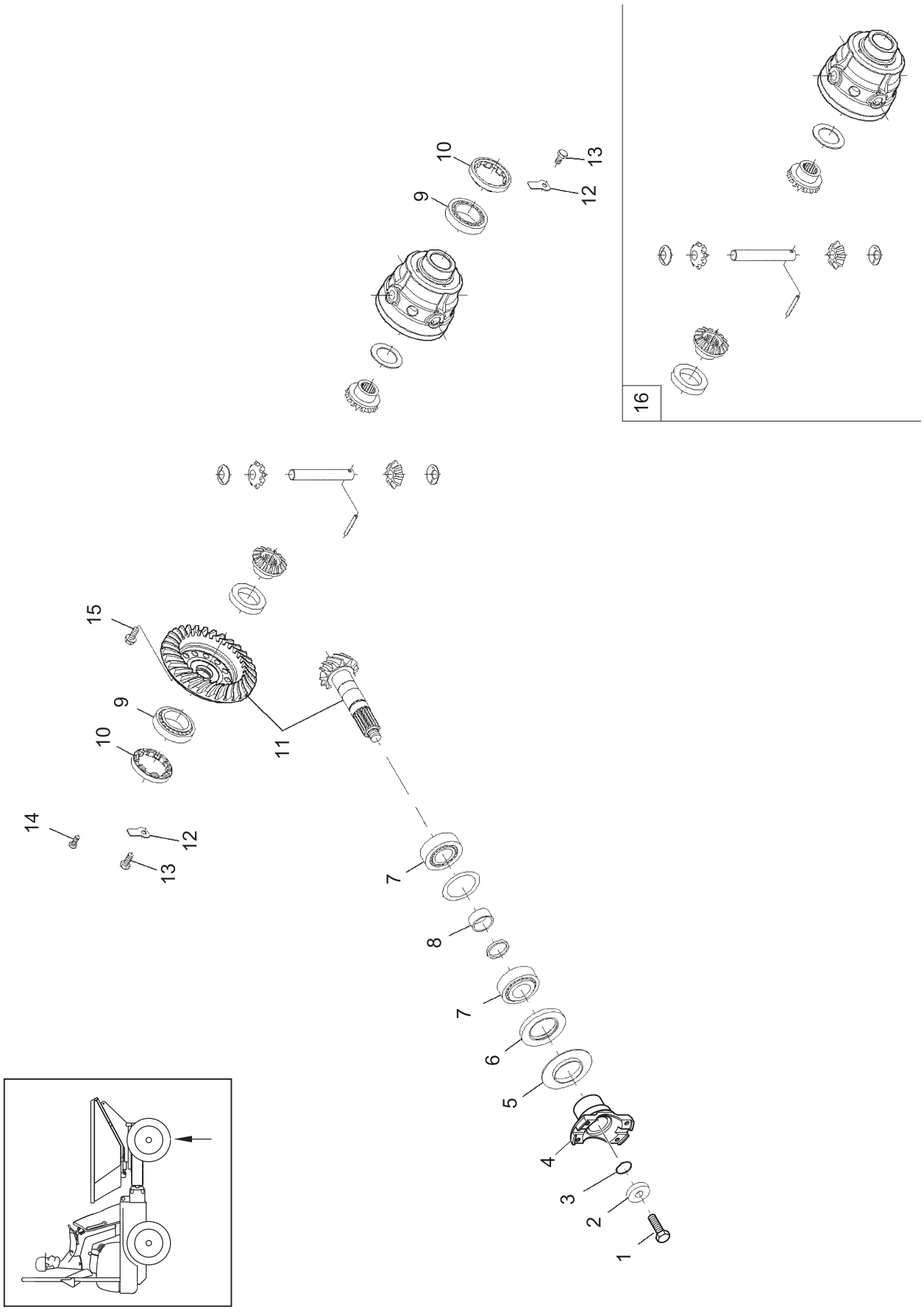


Pos.	Designation
1	Nut
2	Flange
3	Sealing ring
4	Bearing
5	Spacer ring
6	O-ring
7	Protective plate
8	Spacer ring
9	Set of rings
10	Shim ring
11	Crown wheel pair
12	Screw
13	Shim ring
14	Taper roller bearing
15	Differential housing
16	Thrust washer
17	Compensating shaft gear
18	Bevel gear
19	Thrust washer
20	Pin
21	Pin
22	Pin
23	Cross piece
24	Compensating shaft gear
25	Ball
26	Ring
27	Circlip
28	Clutch disk
29	Ring
30	Bearing
31	Circlip
32	Bearing
33	Clutch disk
34	Intermediate bushing
35	Bearing
36	Spacer ring
37	Circlip
38	Shim ring
39	Circlip

Front axle (from AC to AD)



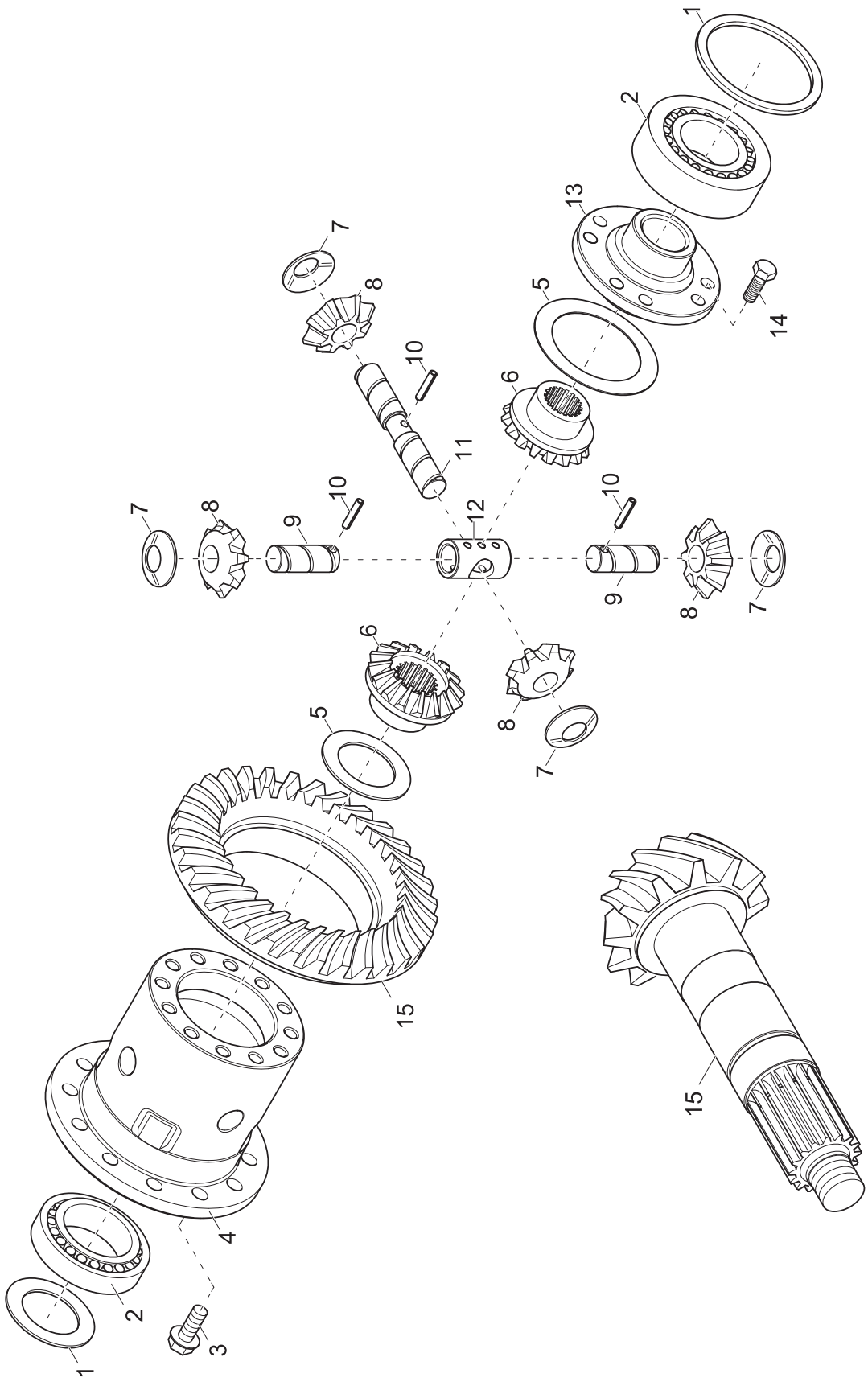
Front axle (from AE310242D)



Pos.	Designation (from AC to AD)
1	Nut
2	Flange
3	Bearing
4	Sealing ring
5	Spacer ring
6	Shim ring
7	Set of rings
8	Spacer ring
9	Crown wheel pair
10	Screw
11	Shim ring
12	Taper roller bearing
13	Differential housing
14	Thrust washer
15	Compensating shaft gear
16	Bevel gear
17	Thrust washer
18	Pin
19	Pin
20	Pin
21	Cross piece
22	Compensating shaft gear
23	Thrust washer
24	Clutch disk
25	Clutch disk
26	Bearing
27	Circlip
28	Bearing
29	Shim ring
30	Circlip
31	O-ring
32	Protective plate

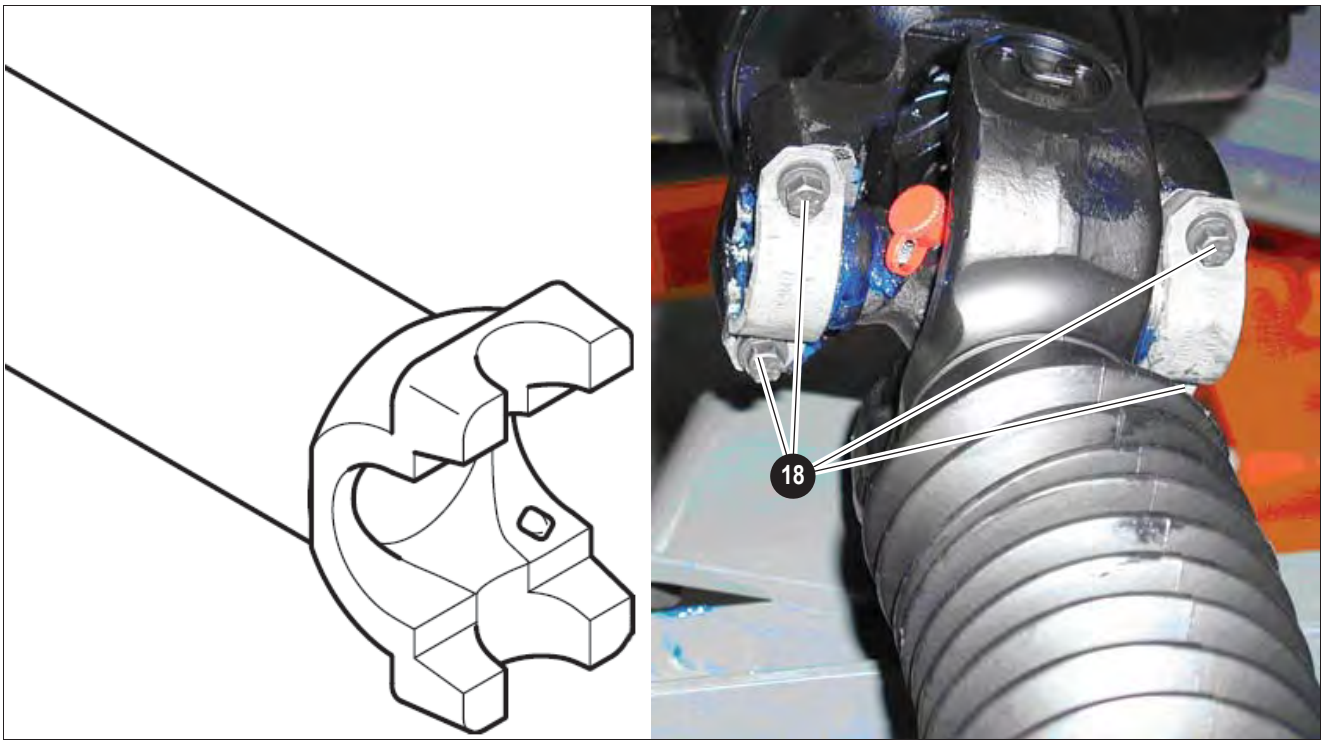
Pos.	Designation (from AE310242D)
1	Screw
2	Washer
3	O-ring
4	Flange
5	Protective plate
6	Sealing ring
7	Bearing
8	Spacer ring
9	Taper roller bearing
10	Shaft nut
11	Crown wheel pair
12	Tab washer
13	Hexagon head screw
14	Cheese-head screw
15	Screw
16	Differential

Rear axle



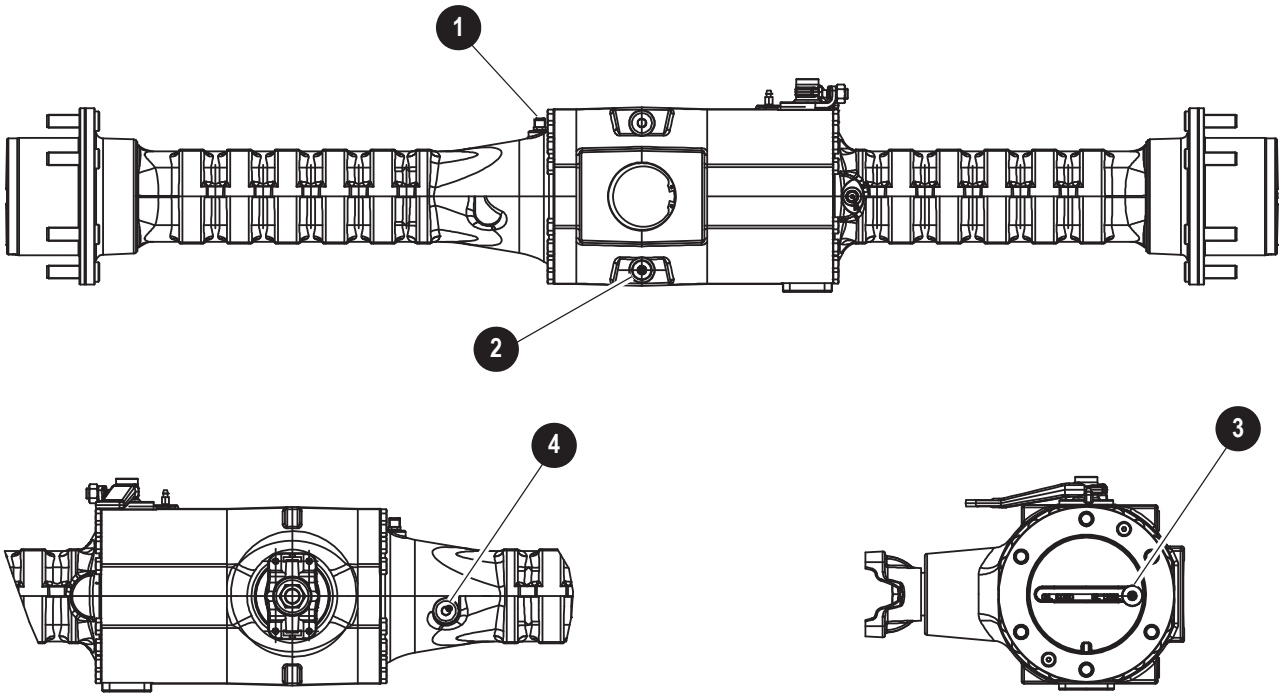
Pos.	Designation
1	Shim ring
2	Taper roller bearing
3	Screw
4	Differential housing
5	Thrust washer
6	Compensating shaft gear
7	Thrust washer
8	Bevel gear
9	Pin
10	Pin
11	Pin
12	Cross piece
13	Cover
14	Hexagon head screw
15	Bevel gear and crown wheel pair

6.15 Cardan shaft



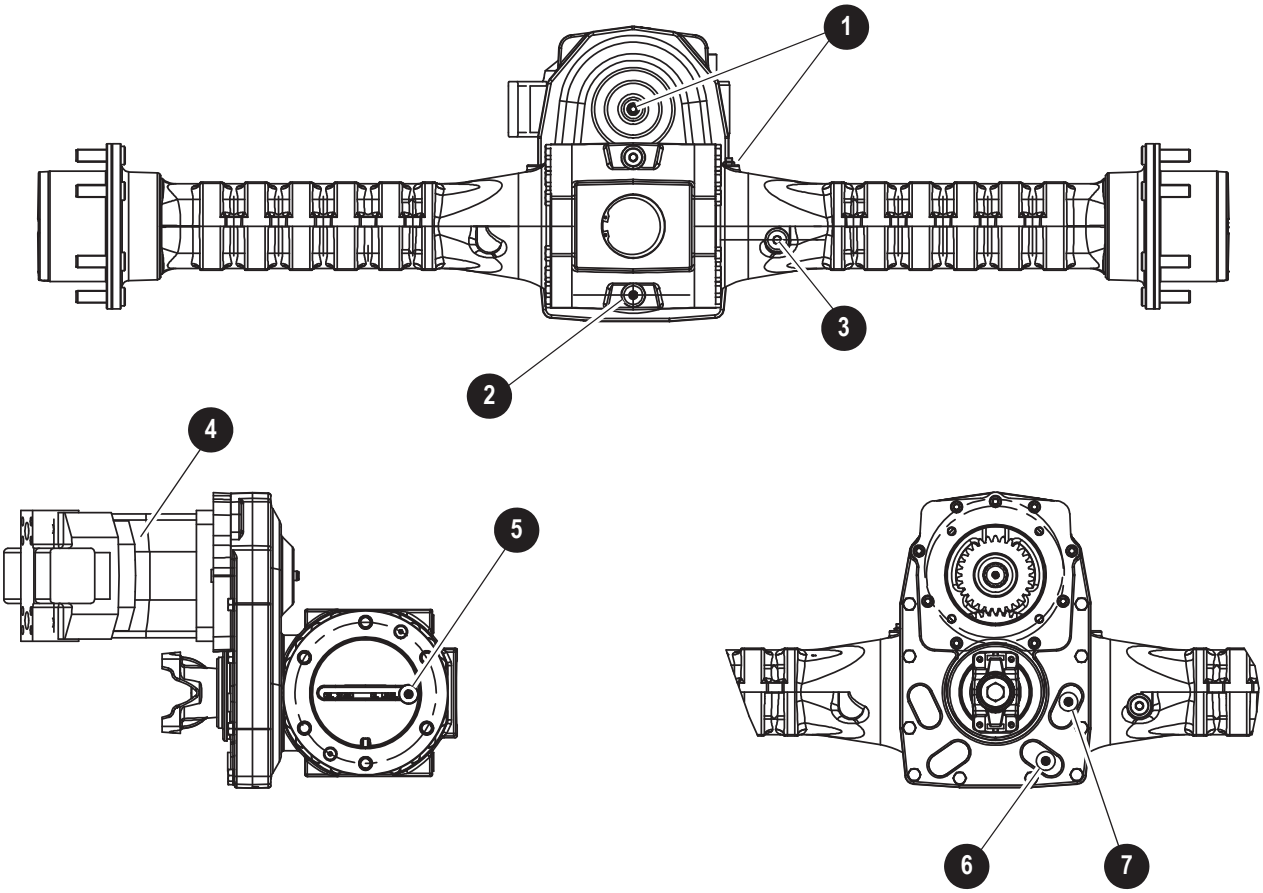
Screws **A** are tightened to a torque of 38 Nm (28 lbf ft).

6.16 Front axle (Tier IV Perkins)



Pos.	Designation
1	Breather
2	Oil drain plug
3	Oil plug
4	Oil check and filler plug

6.17 Rear axle (Tier IV Perkins)



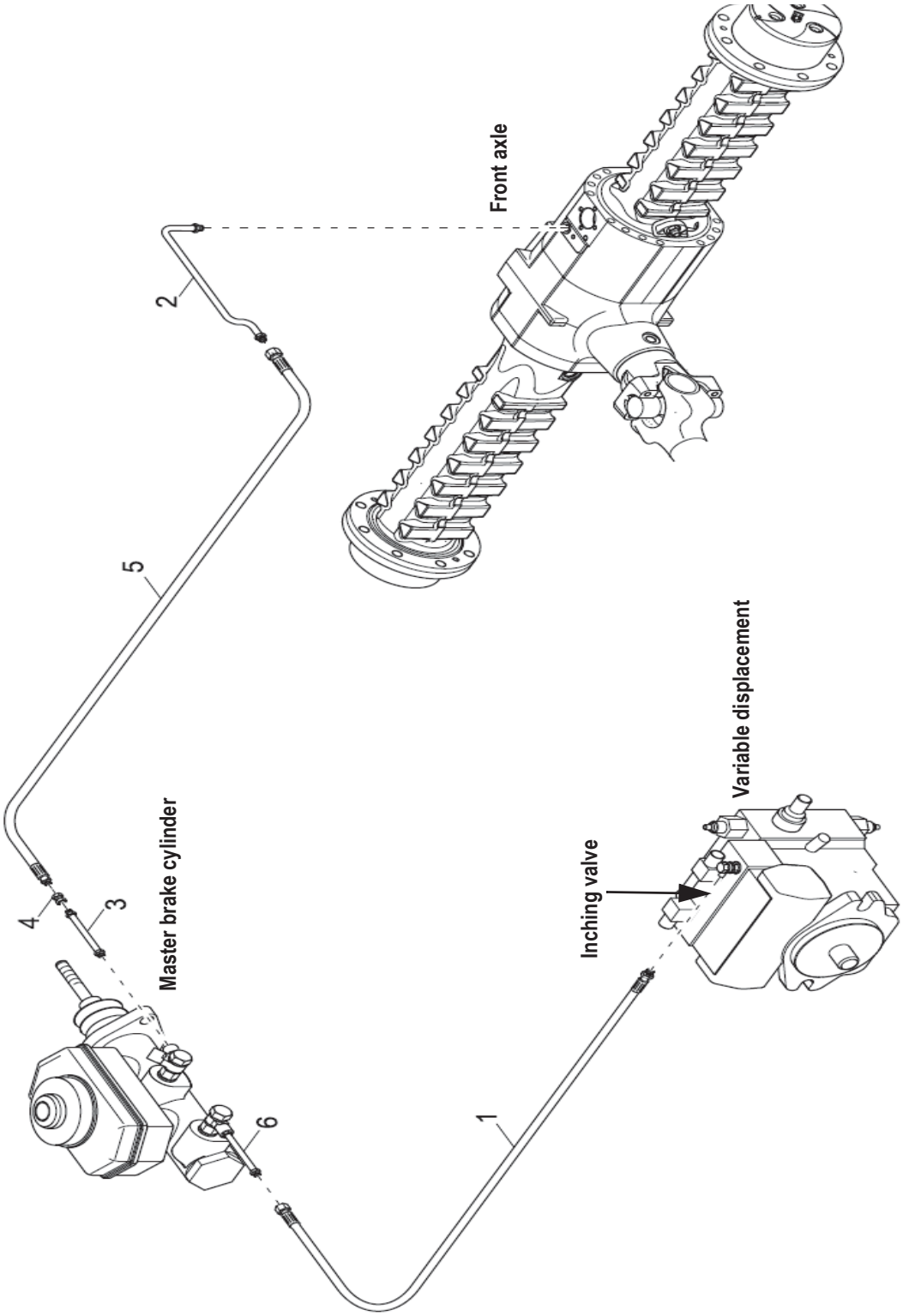
Pos.	Designation
1	Breather
2	Oil drain plug
3	Oil check and filler plug
4	Hydromatic engine
5	Oil plug
6	Oil drain plug
7	Oil check and filler plug

Brakes

7 Brakes

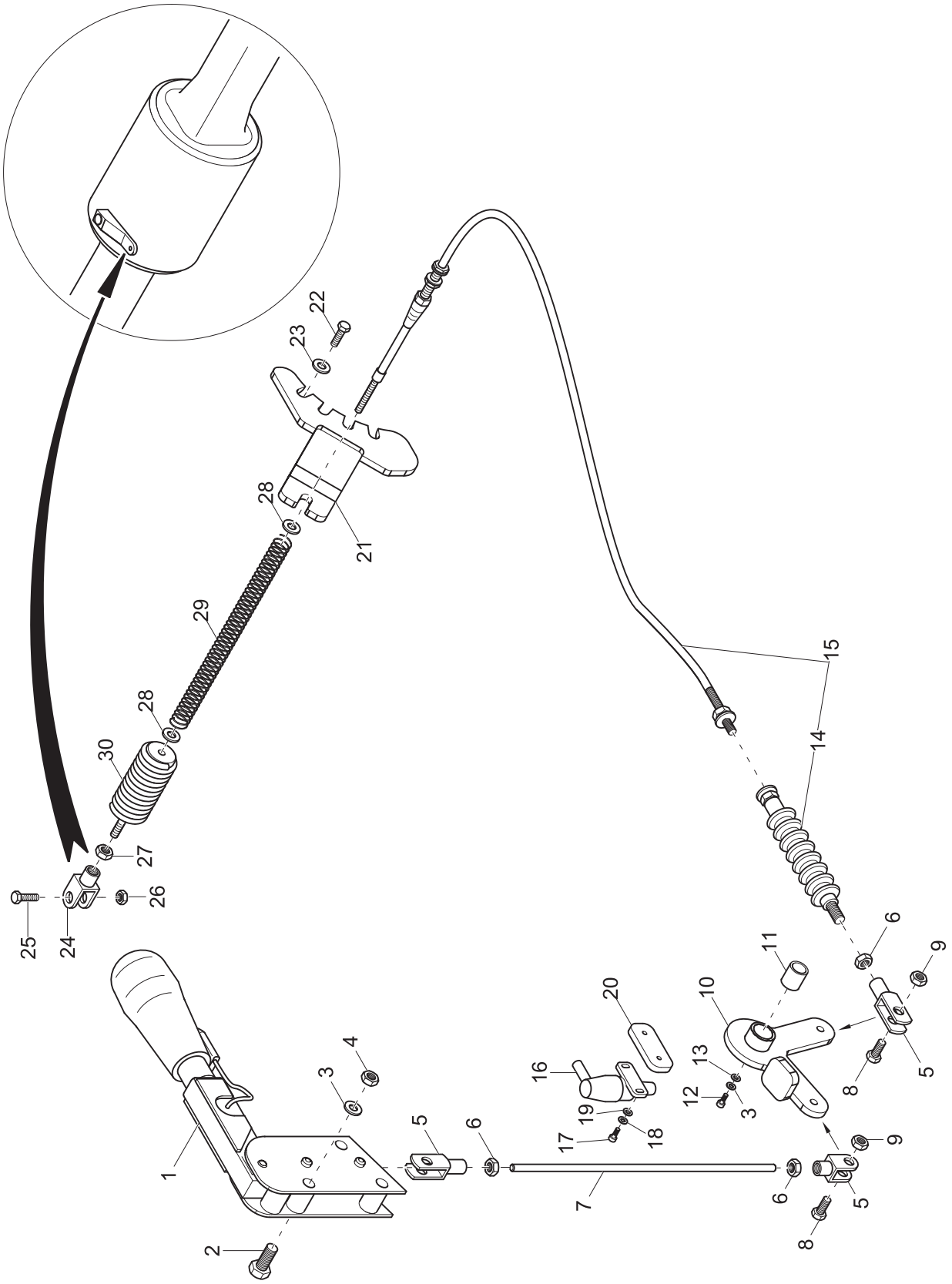
7.1 Brake circuit (up to AB)

Hydrostatic automotive traveling drive, service brake effect on front axle via master brake cylinder.



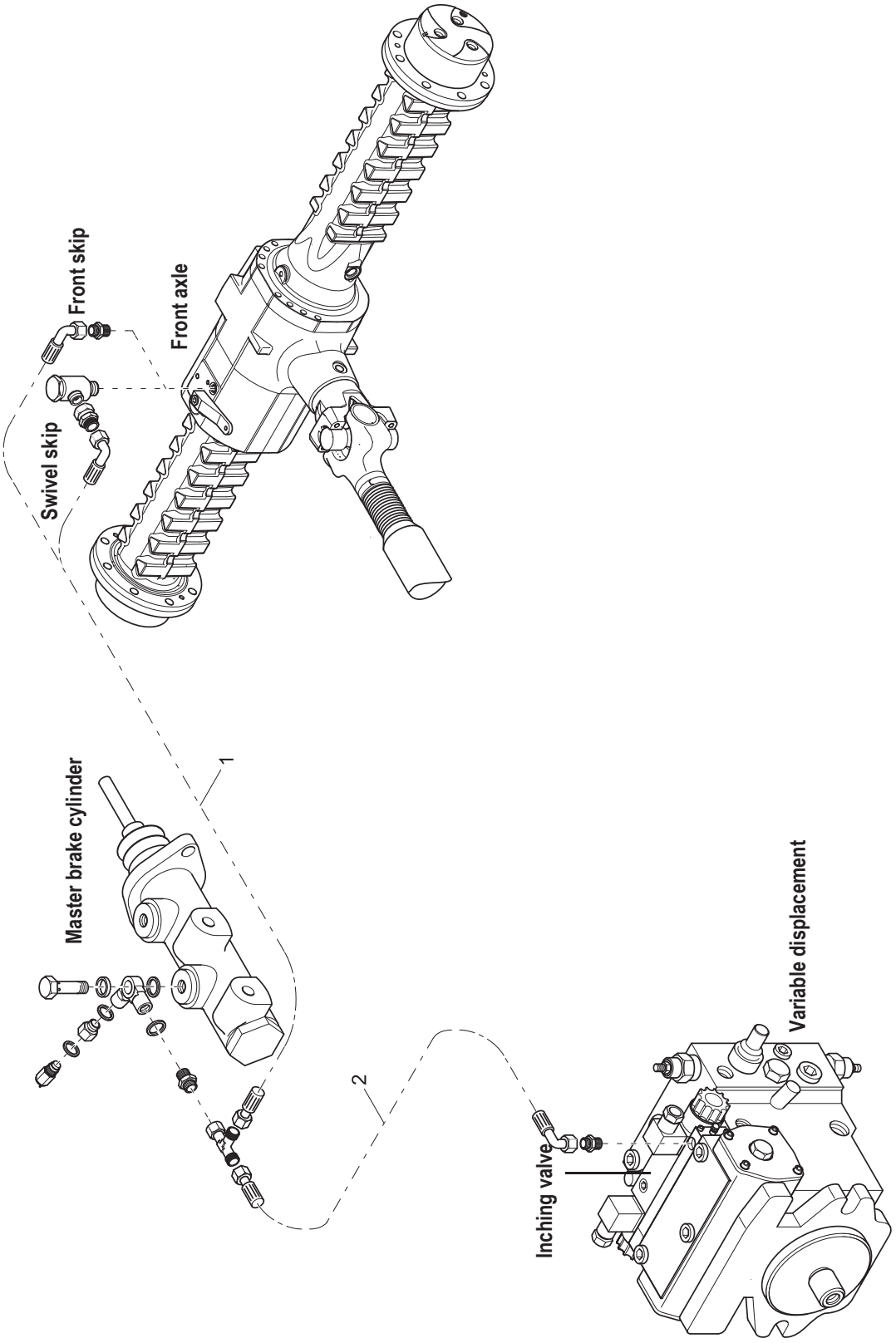
7.2 Brake circuit

Parking brake



Pos.	Designation
1	Parking brake lever
2	Hexagon head screw
3	Schnorr lock
4	Hexagon nut
5	Fork joint
6	Hexagon nut
7	Traction bar
8	Hexagon head screw
9	Hexagon nut
10	Joint
11	Bushing
12	Washer
13	Hexagon head screw
14	Tension spring
15	Bowden cable
16	Microswitch
17	Cheese-head screw
18	Spring lock washer
19	Washer
20	Parking brake switch plate
21	Bowden cable bracket
22	Hexagon head screw
23	Nord-Lock washer
24	Fork joint
25	Hexagon head screw
26	Hexagon nut
27	Hexagon nut
28	Washer
29	Compression spring
30	Tension spring

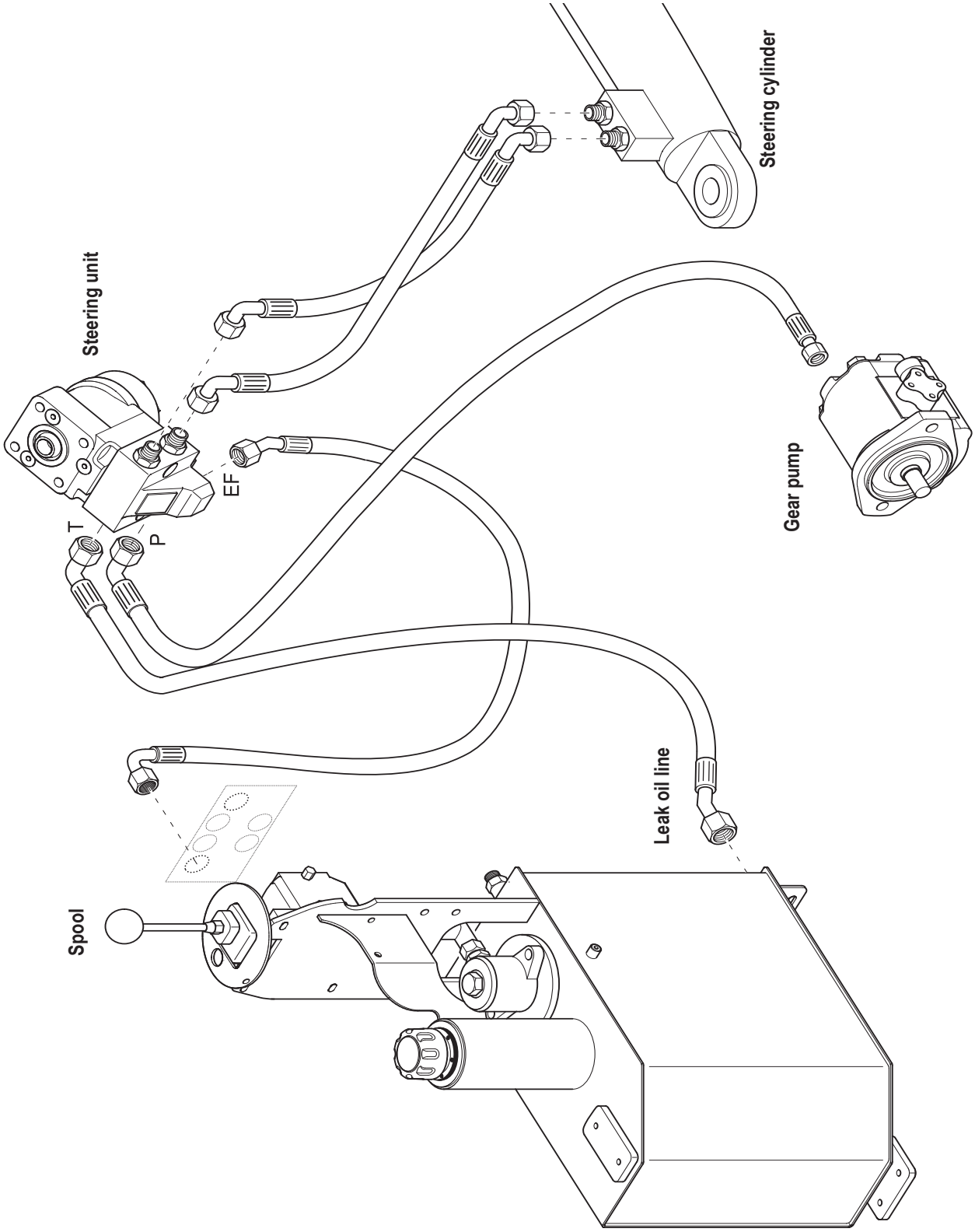
Service brake



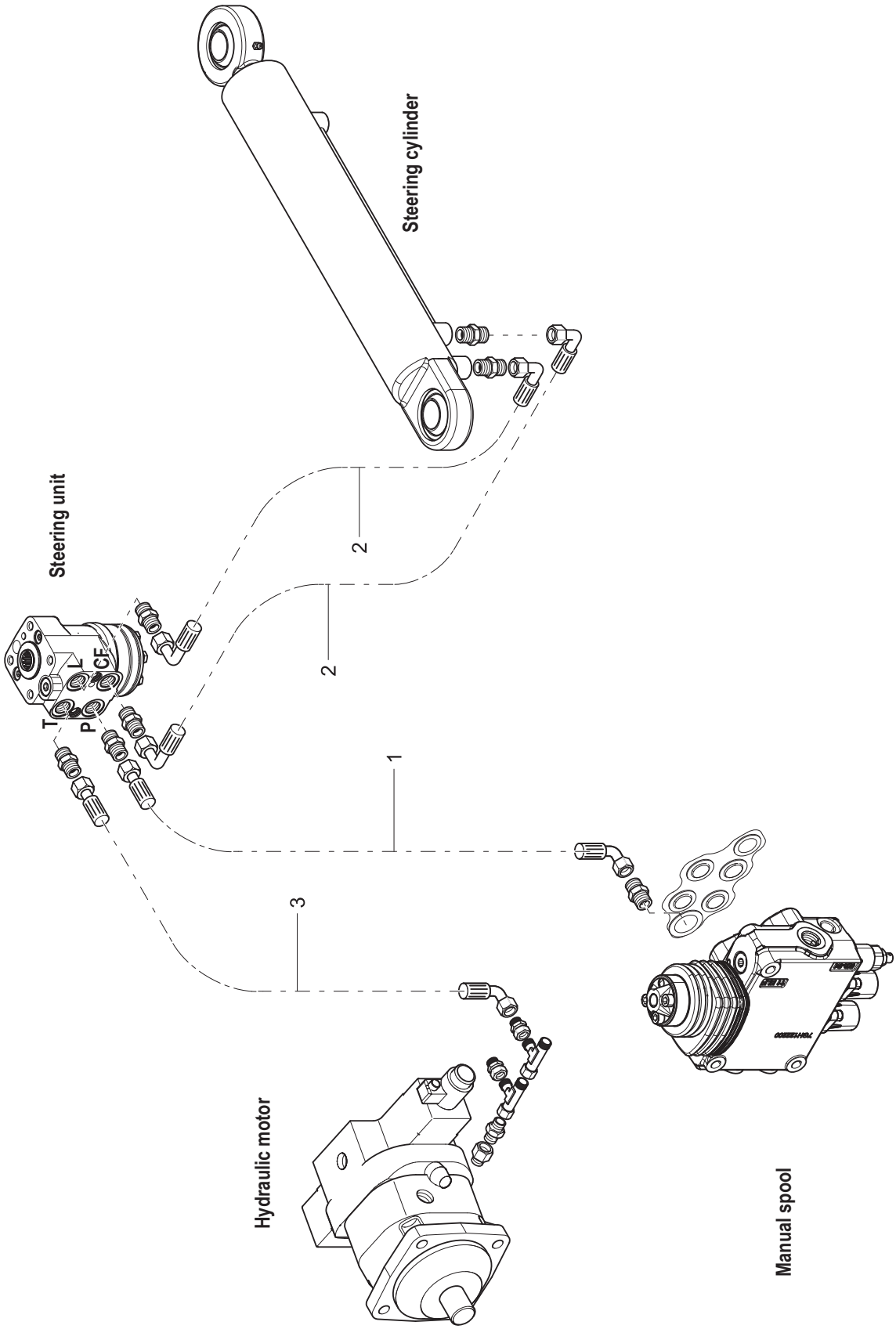
Steering system

8 Steering system

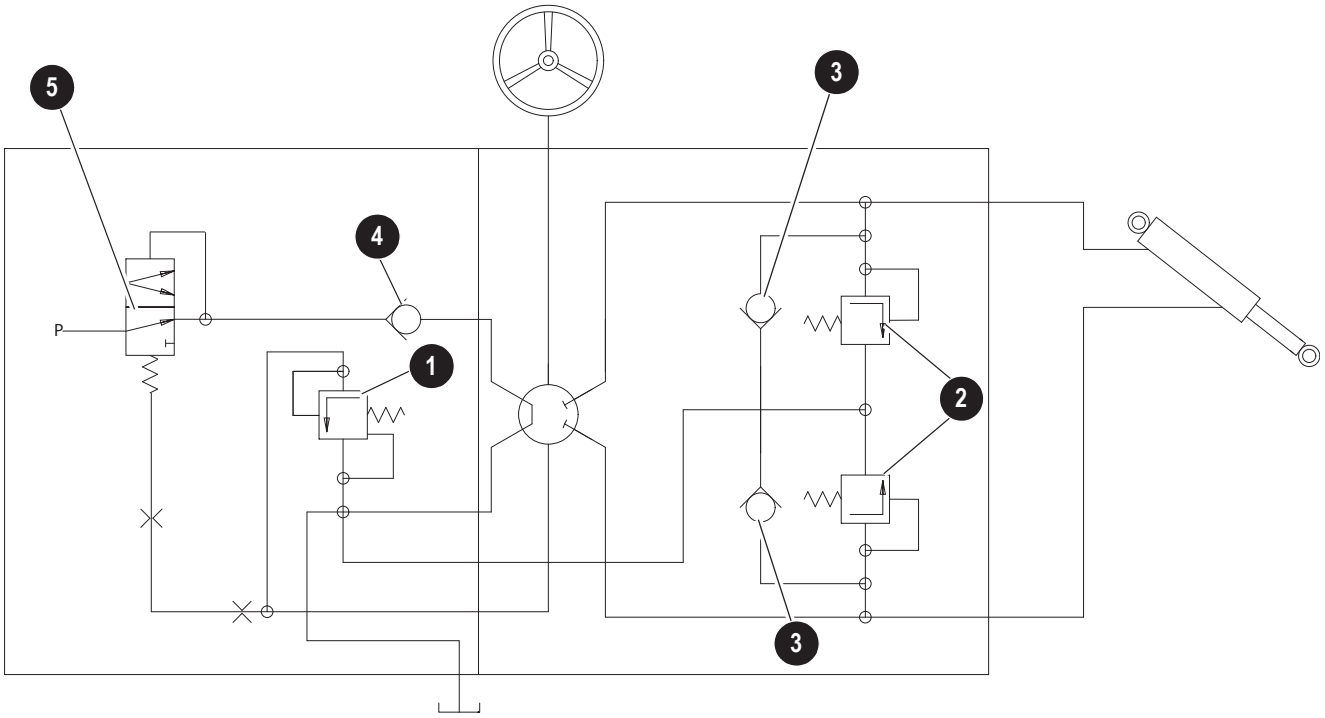
8.1 Steering circuit (up to AB)



8.2 Steering circuit (from AC)



8.3 Steering unit: diagram



Pos.	Designation
1	Pilot valve for load signal
2	Shock valves
3	Steering cylinder anticavitation valves
4	Non-return valve
5	Priority valve

Function

Both shock valves **2** protect the **L** and **R** connections to the steering cylinder. The oil is directed to the other side via the anticavitation valve **3** as soon as one of the shock valves responds. These anticavitation valves **3** also allow for resuction of leak oil from the reservoir.

The steering unit runs as a manual pump in the case of a malfunctioning pump. The oil is reaspirated from the leak oil line via the anticavitation valve. In doing so, non-return valve **4** avoids air being aspirated via pump connection **P**. In normal operation, this same valve prevents high external steering forces from affecting the steering wheel (shocks).

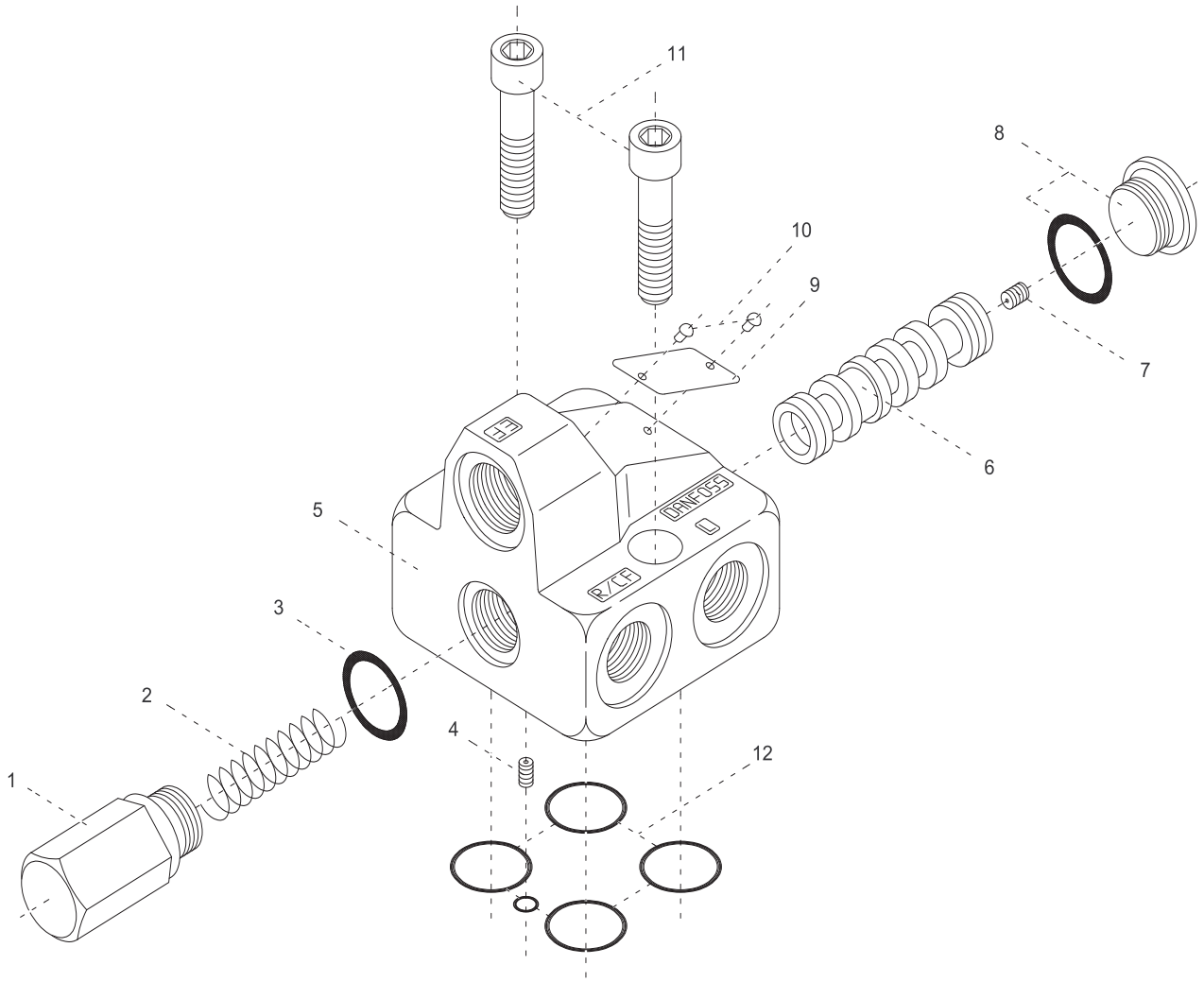
Using a priority valve is necessary given the fact that the steering system and the operating hydraulics are supplied with oil by the same pump. This valve ensures the steering unit is supplied with oil first. In the process, the valve is controlled by the load signal of the steering unit. The entire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

8.4 Steering unit connections

Pos.	Connection
P	Pump line
T	Leak oil line
EF	Control valve pressure line
L	Steering cylinder base side
R/CF	Steering cylinder rod side

8.5 Steering unit overview

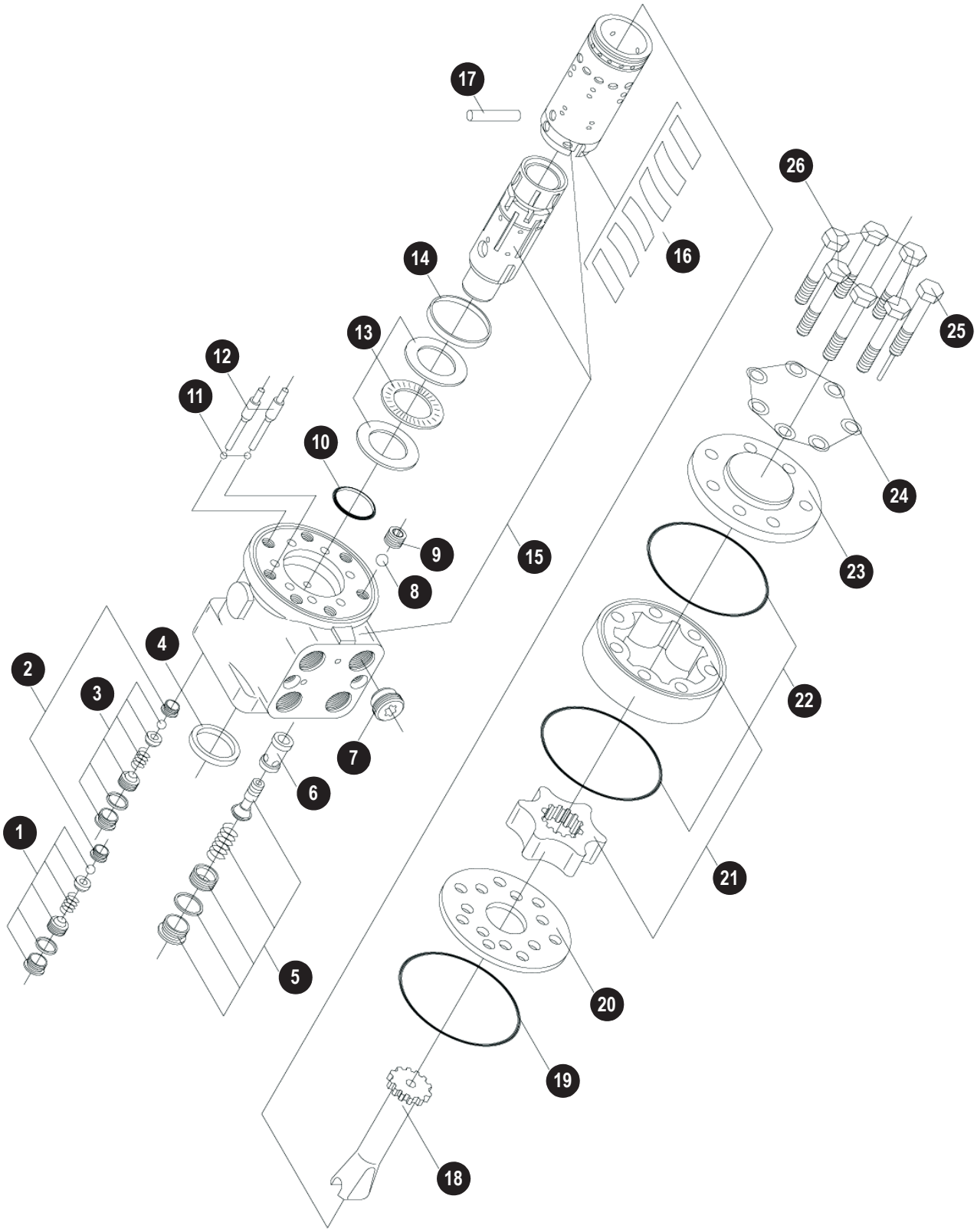
Priority valve overview



Priority valve (legend)

Pos.	Designation	
1	Plug	50 ± 10 Nm/37 ± 7.4 lbf ft
2	Spring	7 bar/102 psi
3	O-ring	
4	Nozzle diameter	1 mm/0.04"
5	Housing	
6	Piston	
7	Nozzle diameter	0.8 mm/0.03"
8	Plug with O-ring	50 ± 10 Nm/37 ± 7.4 lbf ft
9	Type label	
10	Type label rivets	
11	Fastening screws	65 ± 5 Nm/48 ± 3.7 lbf ft
12	O-ring	

Steering unit



Steering unit (legend)

Pos.	Designation	
1	Shock valve	200 – 220 bar/2901 – 3191 psi
2	Valve housing	
3	Shock valve	200 – 220 bar/2901 – 3191 psi
4	Dust seal	
5	Pilot valve	140 – 145 bar/2031 – 2103 psi
6	Housing for pilot valve	
7	Plug	
8	Non-return valve	
9	Threaded bushing	
10	O-ring	
11	Non-return valve	
12	Bushing with pin	
13	Bearing	
14	Ring	
15	Piston housing	
16	Set of springs	
17	Safety pin	
18	Cardan shaft	
19	O-ring	
20	Distributor plate	
21	Gear set	
22	O-ring	
23	Terminal plate	
24	Washer	
25	Screw with pin	30 ± 6 Nm/22 ± 4.4 lbf ft
26	Screw	30 ± 6 Nm/22 ± 4.4 lbf ft

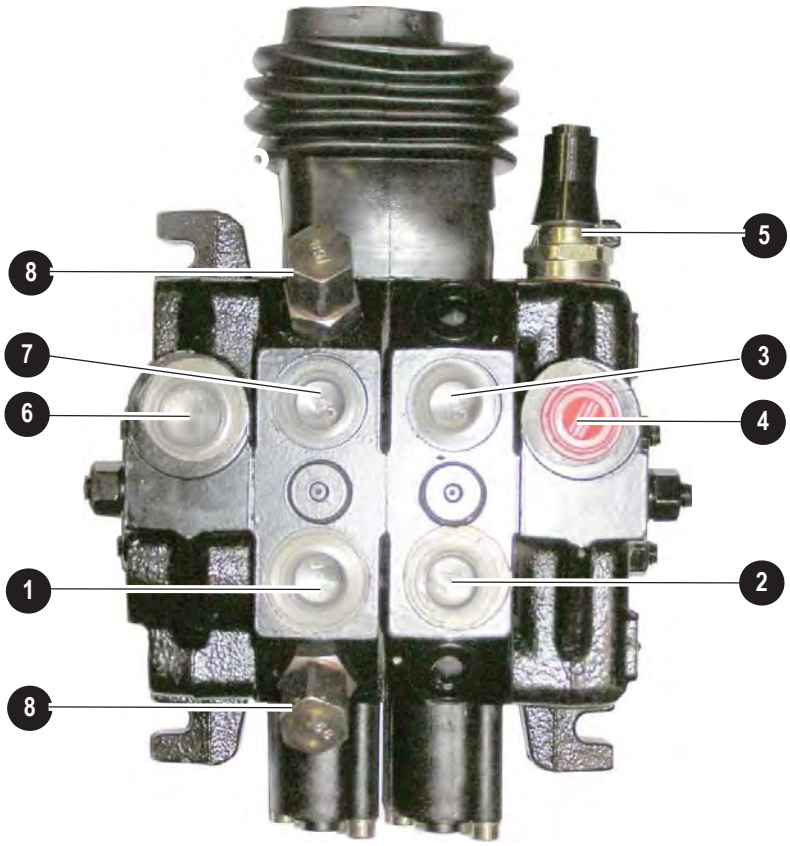
Hydraulic system

9 Hydraulic system

9.1 Control valve

Machines with front skip up to serial no. EA03236

Overview of connections

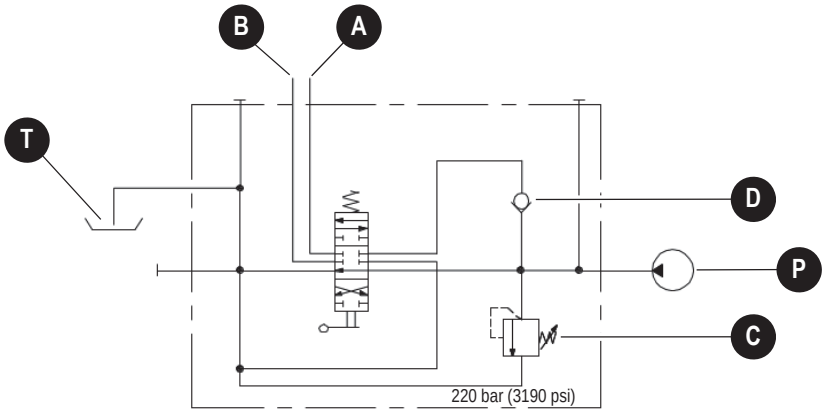


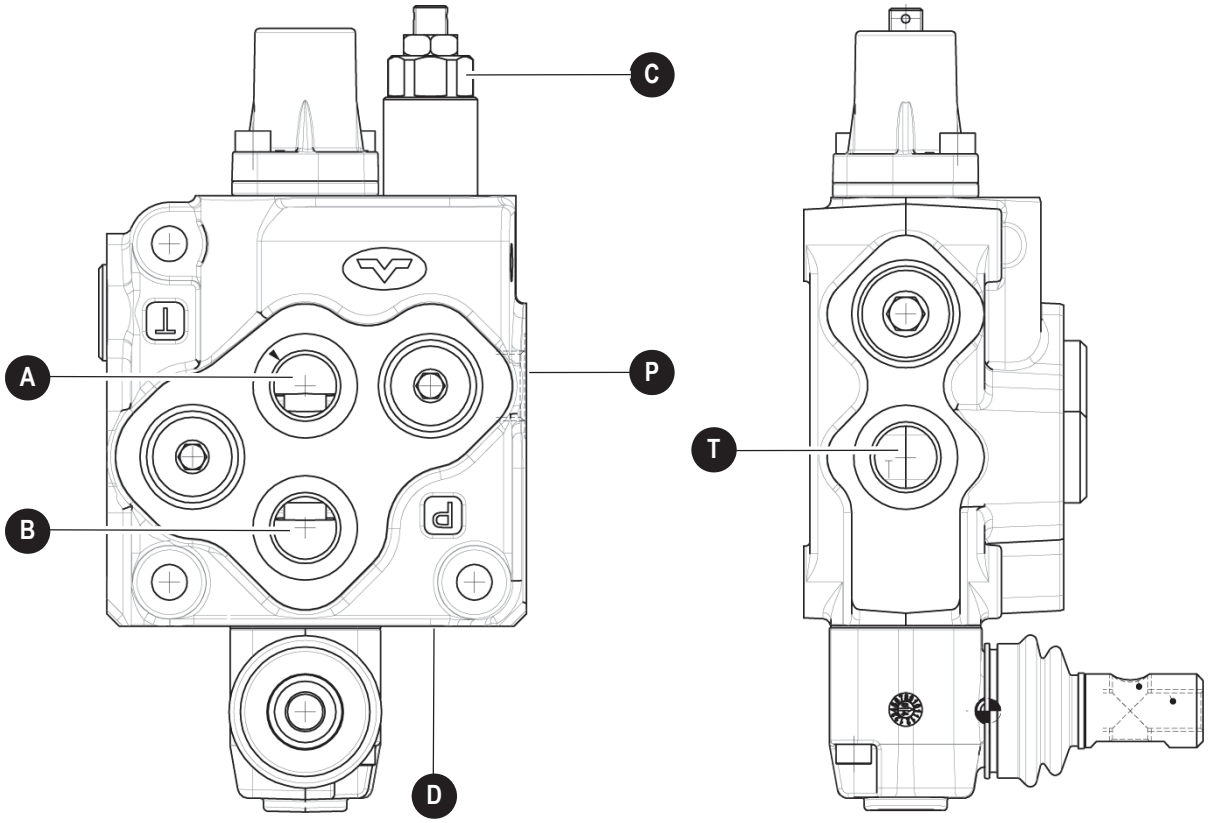
Pos.	Designation
1	Connection: swivel to the left
2	Tilt cylinder base-side connection
3	Tilt cylinder rod-side connection
4	Supplied via steering unit
5	Primary pressure limiting valve 175 bar/2538 psi
6	Reservoir line
7	Connection: swivel to the right
8	Secondary pressure limiting valves (swivel) 160 bar/2321 psi

Machines with front skip from serial no. EA03237

Overview of connections


Symbolic representation



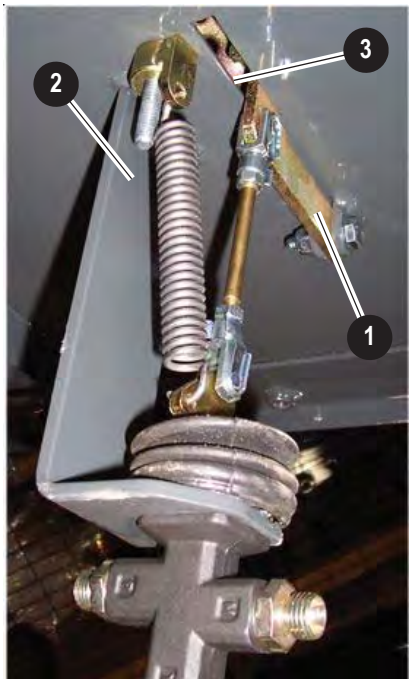


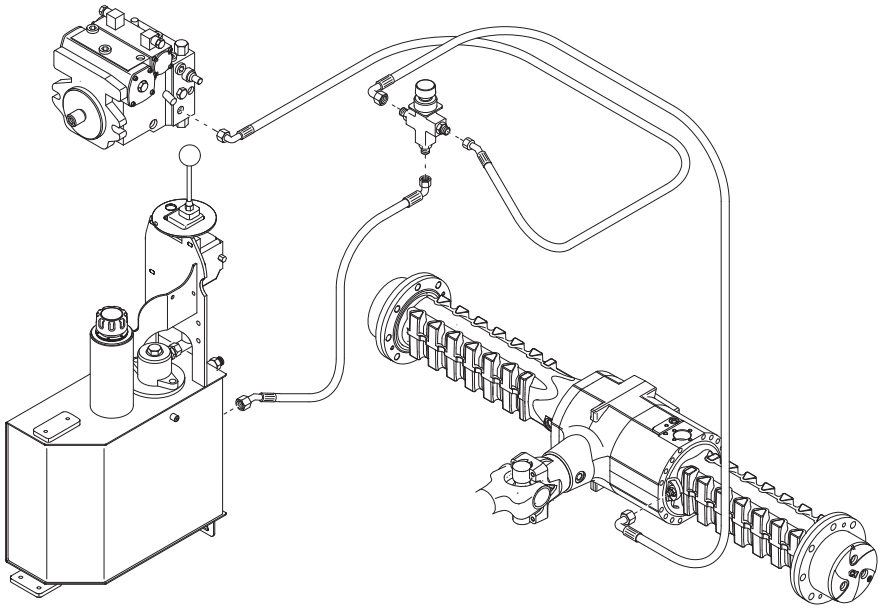
Pos.	Designation
A	Cylinder connection
B	Cylinder connection
C	Pressure limiting valve (new: 220 bar)
D	Non-return valve
P	Pump connection
T	Reservoir line

9.2 Valves – differential lock (up to AB)

Check valve

As soon as the differential lock is actuated, the boost pressure of 30 bar (435 psi) closes the disk package of the axle. Upon releasing the differential lock, the disk package opens again and the hydraulic oil returns to the hydraulic oil reservoir.



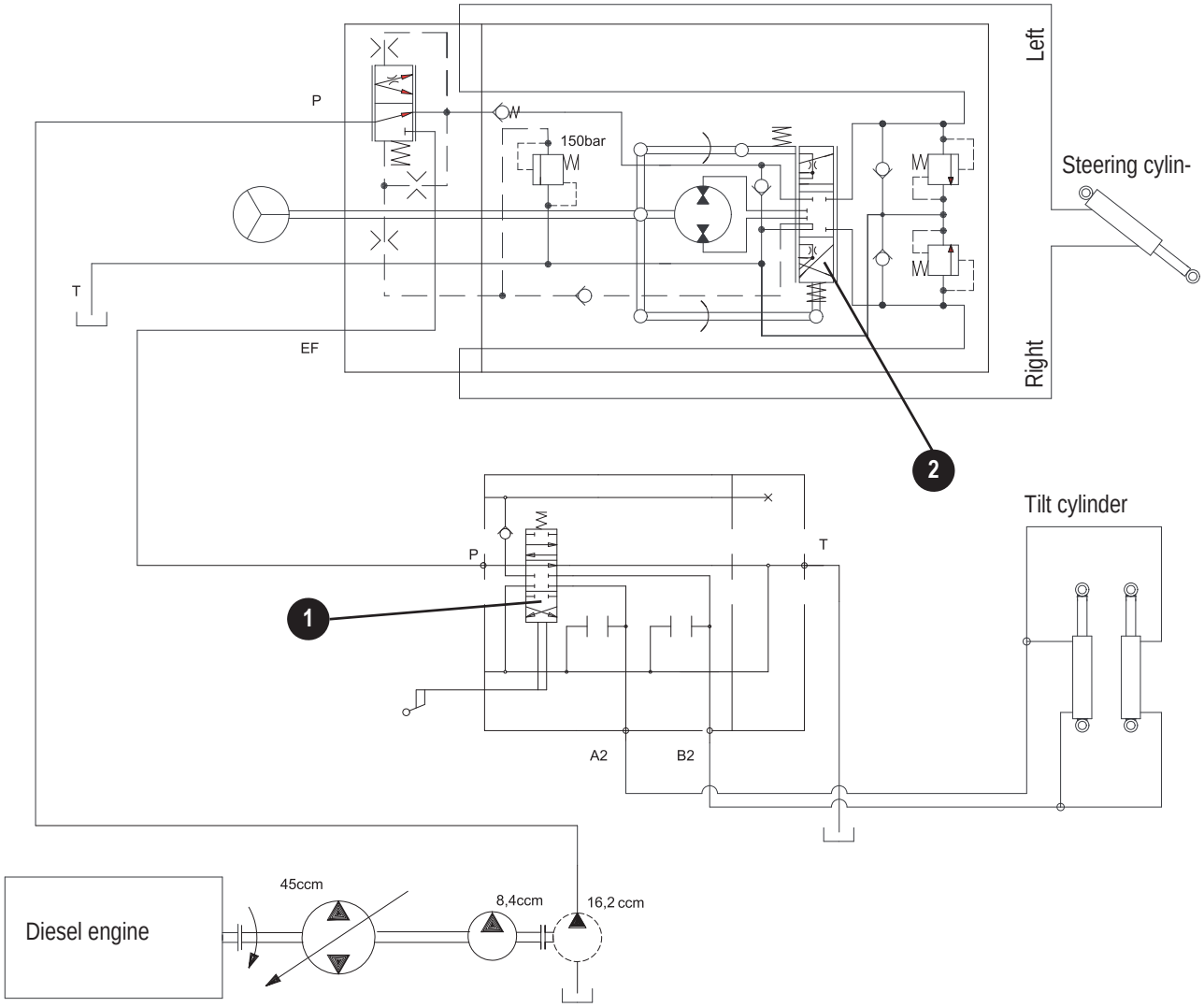


Pos.	Designation
1	Hydraulic pump connection
2	Axle connection
3	Hydraulic oil reservoir connection

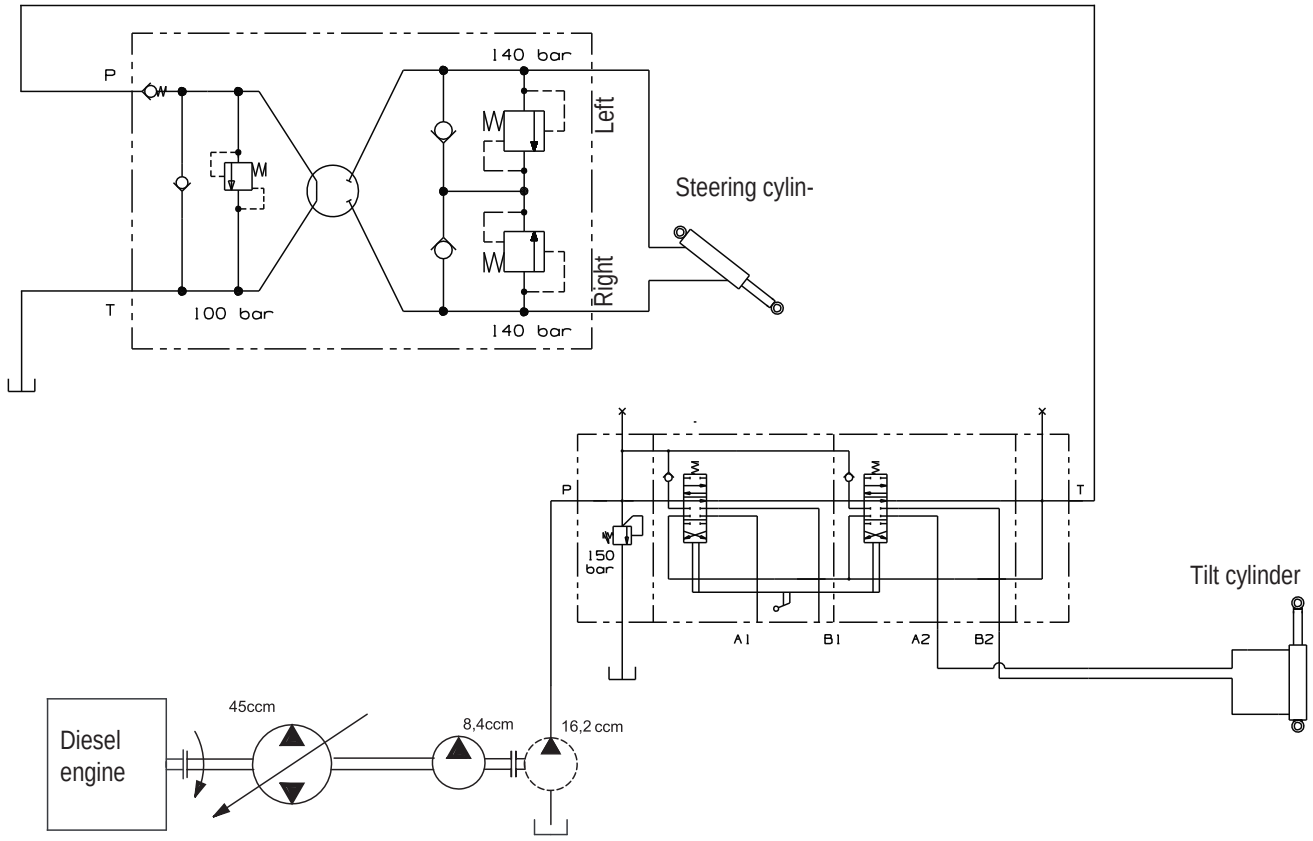
Notice!

There is no more differential lock from series AC!

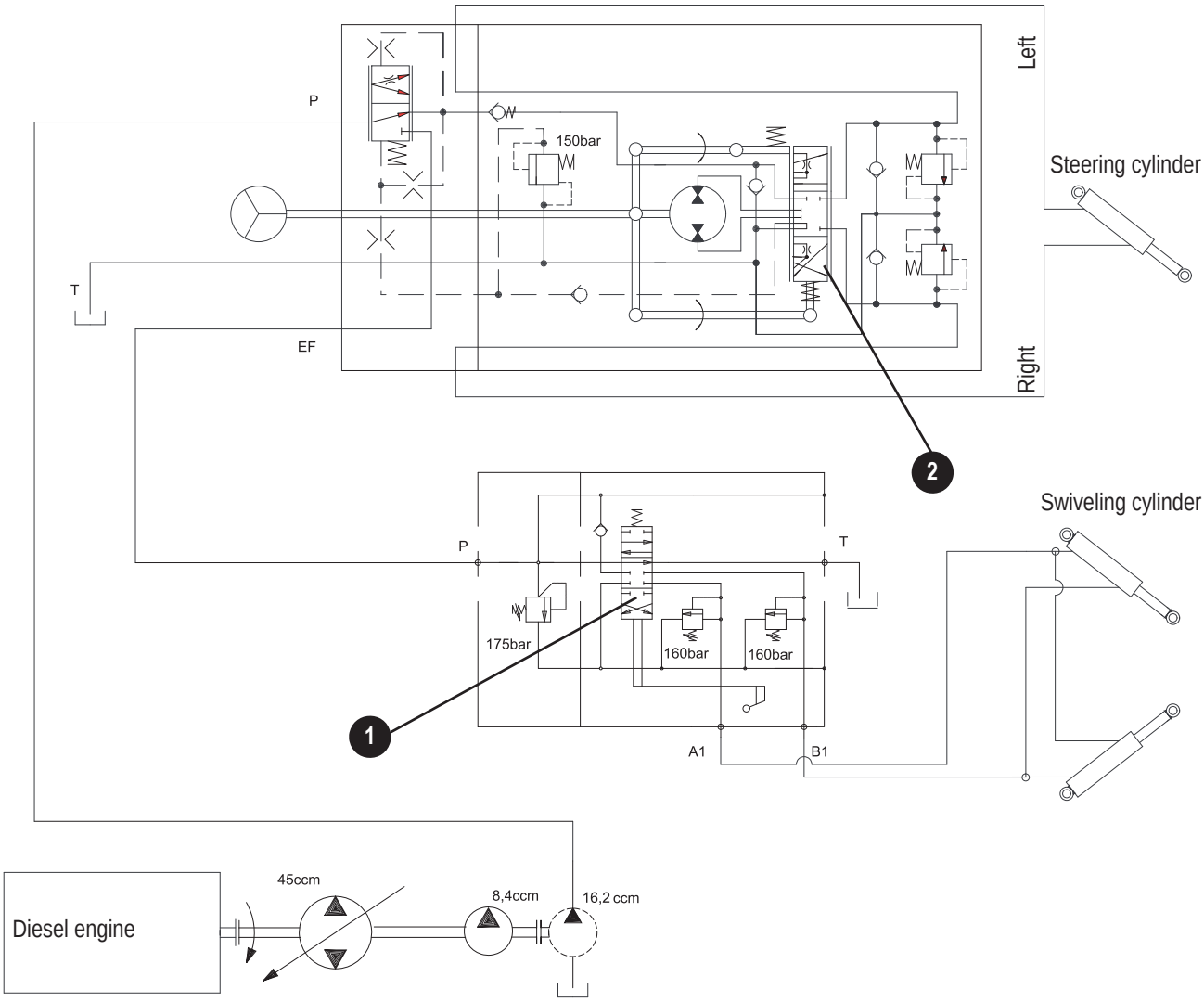
9.3 Tilting the skip: hydraulic diagram (up to AB)



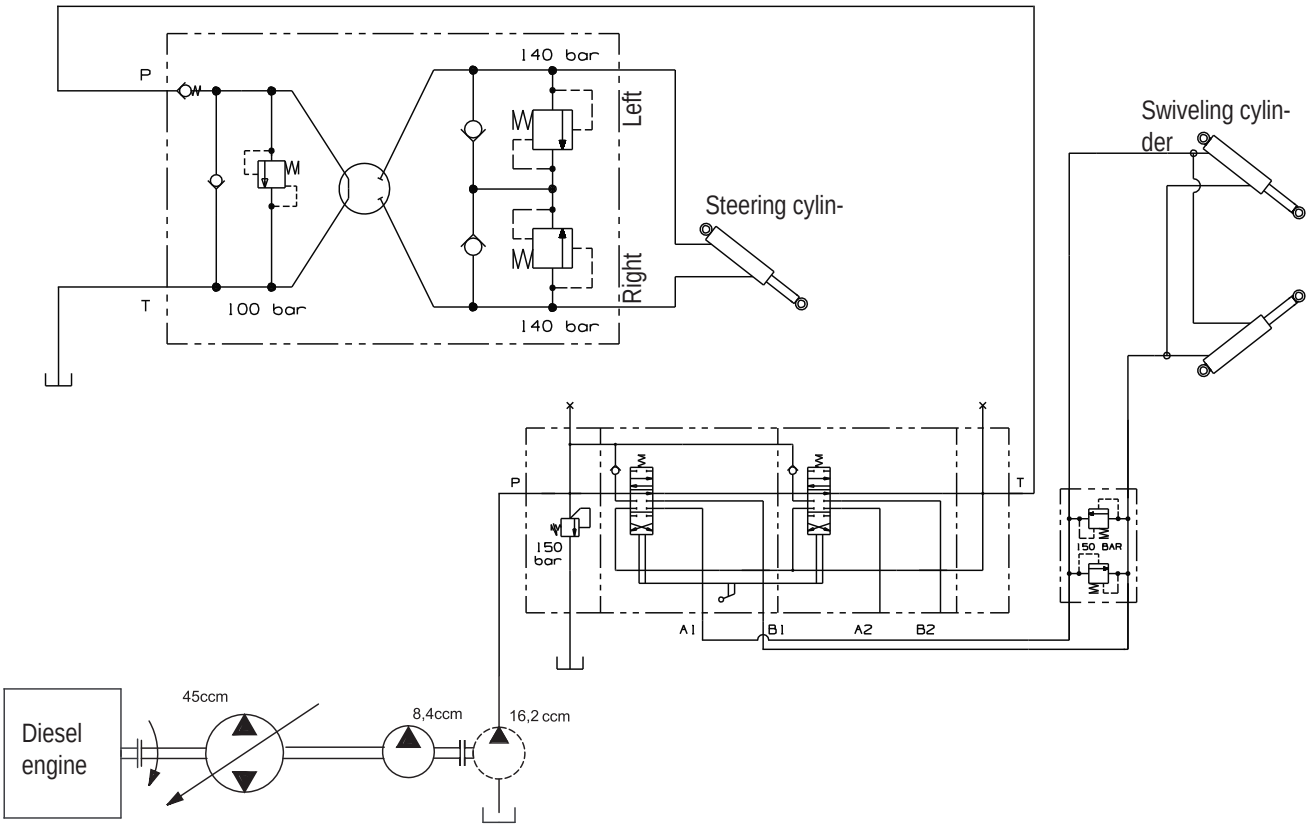
9.4 Tilting the skip: hydraulic diagram (from AC)



9.5 Swiveling the skip: hydraulics diagram (up to AB)



9.6 Swiveling the skip: hydraulics diagram (from AC)



9.7 Test instructions

Check: operating hydraulics

Tools required:

- 1 x pressure gage 200 bar (2901 psi)

Operating hydraulics measuring point

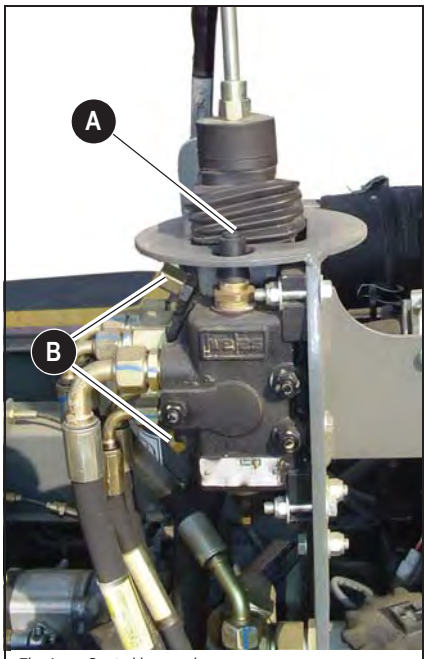


Fig. 1: Control lever valves

Check the operating hydraulics pressure as follows:

☞ *Move the machine travel lever to neutral*

☞ *Apply the parking brake*

☞ *Connect the 200 bar (2901 psi) pressure gage to the test connection*

☞ *Start the diesel engine*

☞ *Raise the skip with the control lever*

➥ Pressure at 2000 rpm: about 175 bar (2538 psi)

➥ The pressure can be set with operating pressure valve **A**

☞ *Swivel the skip with the control lever as far as it will go, then swivel it to the other side*

➥ Pressure at 1000 rpm: about 160 bar (2321 psi)

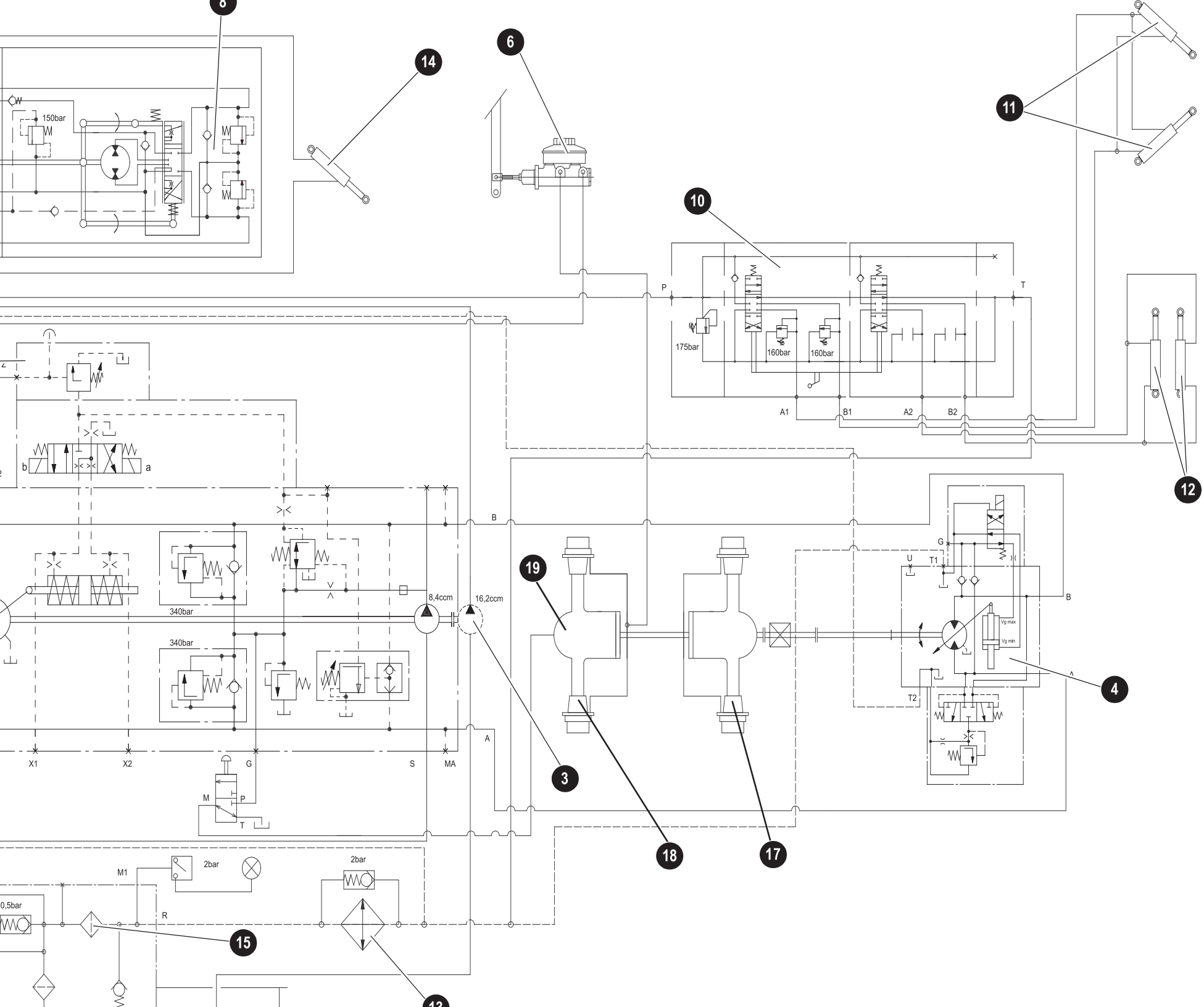
➥ The pressure can be set with secondary valves **B**

☞ *Turn the steering wheel as far as it will go*

➥ Pressure must be about 150 bar (2176 psi)

Notice!

The pressure of the steering system cannot be adjusted



Pos.
1
2
3
4
5
6
7
8
9
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11
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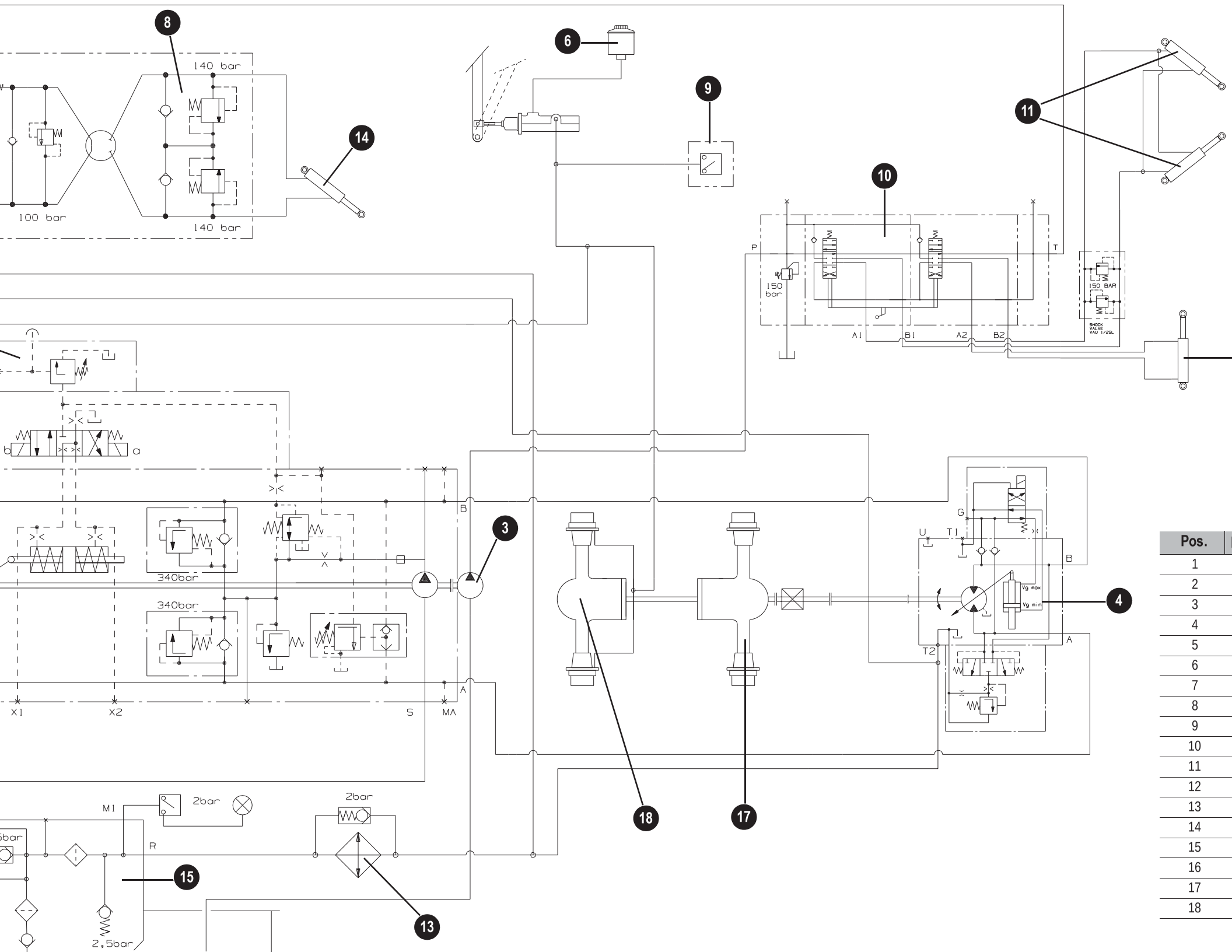

Pos.
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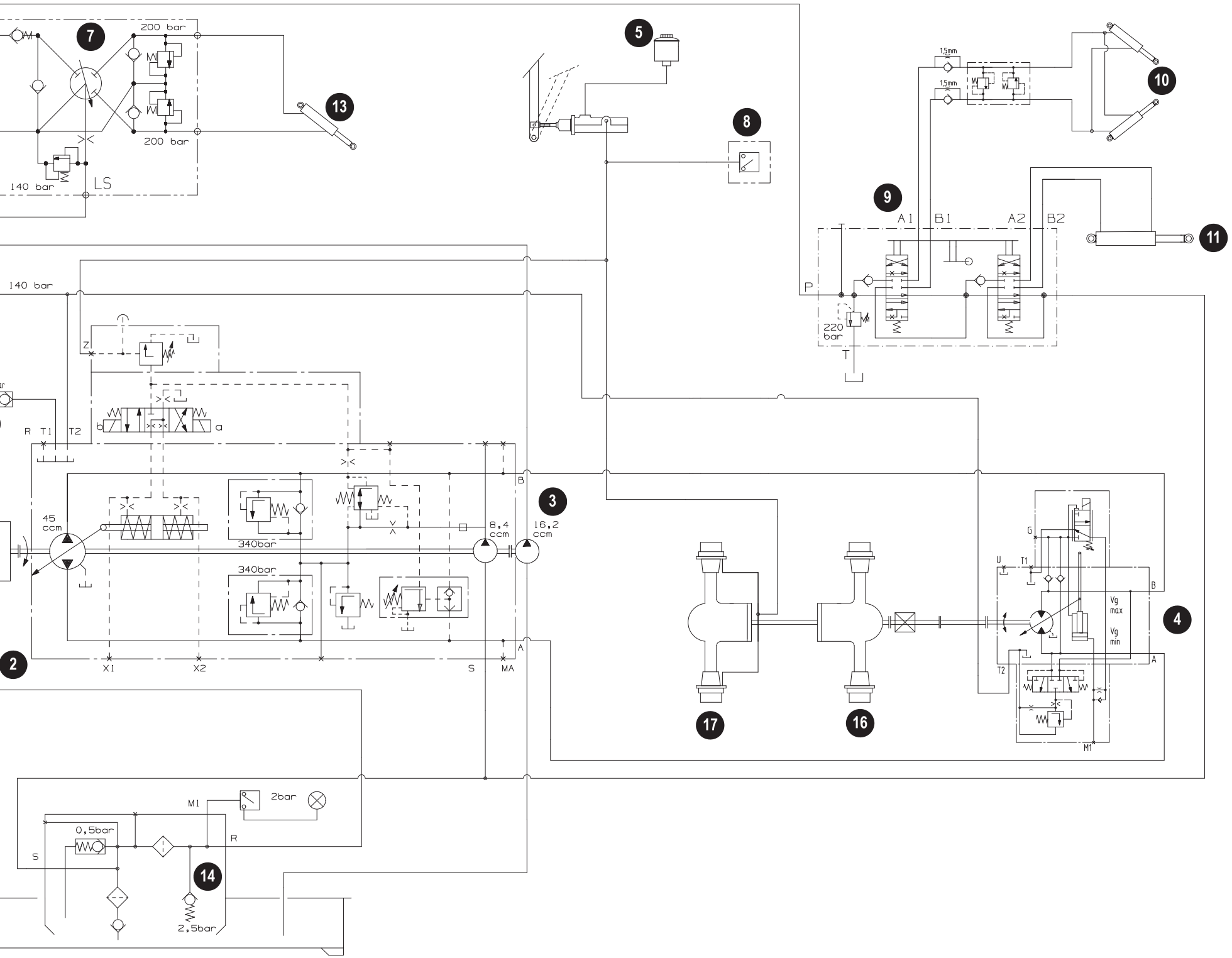

Pos.
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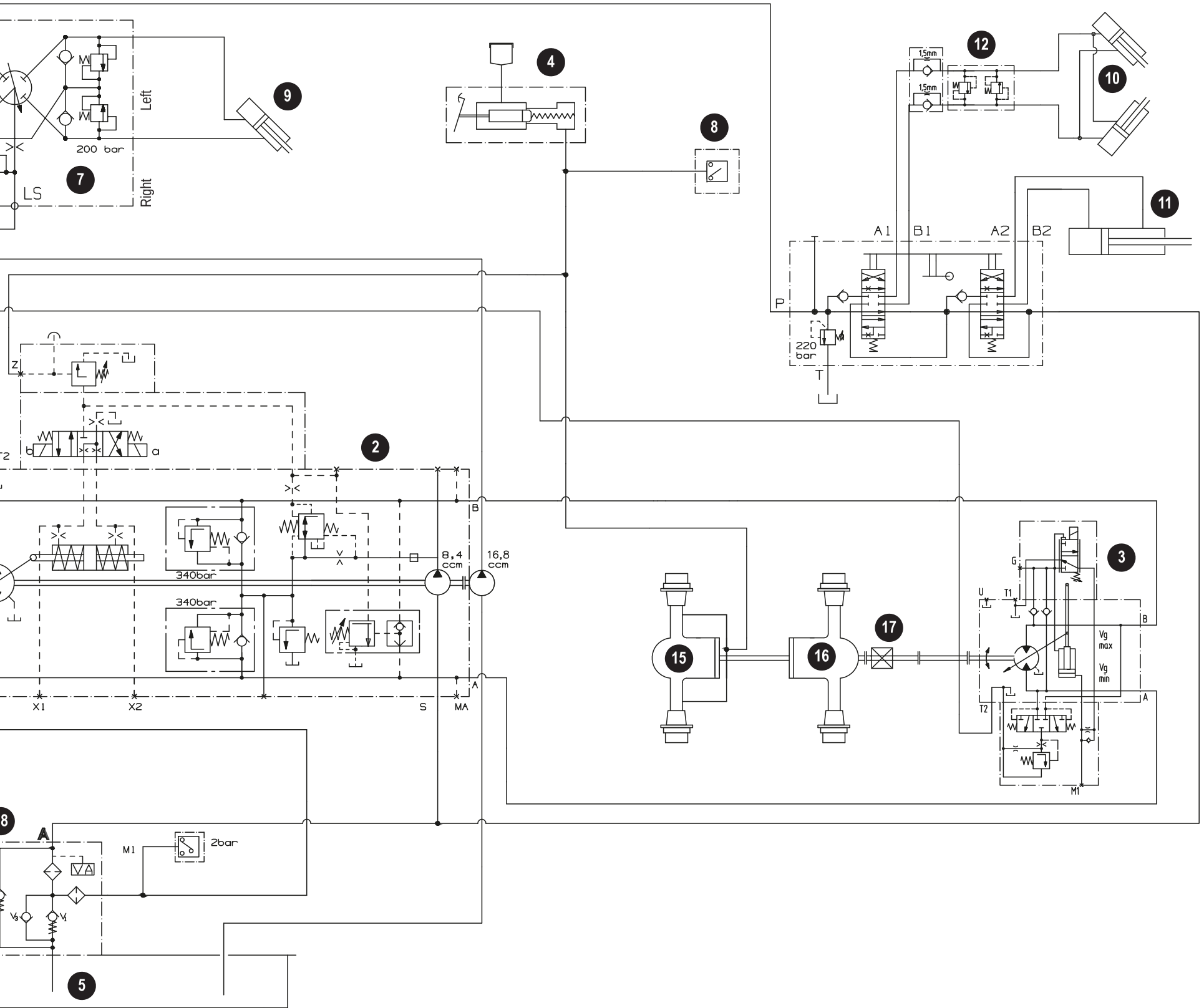


Pos.	D
1	D
2	H
3	H
4	B
5	F
6	C
7	S
8	L
9	S
10	S
11	T
12	S
13	F
14	C
15	F
16	F
17	F
18	C

Electrical system

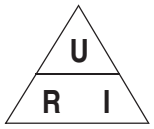
10 Electrical system

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

It describes the interrelation between current, voltage and resistance.

Current "**I**" – Ampere (A)
Voltage "**U**" – Volt (V)
Resistance "**R**" – Ohm (Ω)

Mnemonic:



Power

Power "P" – Watt (W)

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

10.2 Measuring equipment, measuring methods

Multifunction measuring device

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

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

Observe AC/DC basic setting.

➥ AC = alternating current/voltage;

➥ DC = direct current/voltage

Test device with acoustic and optical signal output

- Continuity test in de-energized machine electrical system and of wiring harnesses

Measuring methods – multifunction measuring device

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

Test lamp

The test lamp is used for testing lines and functions with the starter switched on.

- Line test (testing voltage):

Connect test lamp between test point (live cable) and machine ground or between test point (grounding 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.

10.3 Relays

Use, mode of function

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

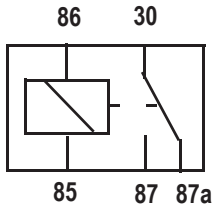


Fig. 1: Terminal description on relay

Zero-center relay

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

10.4 Electric units

Electrical system	
Alternator	12 V 40 A
Starter	12 V 1.7 kW (2.3 hp)
Battery	12 V 88 Ah

Fuses and relays (up to serial no. EA01931, Yanmar)

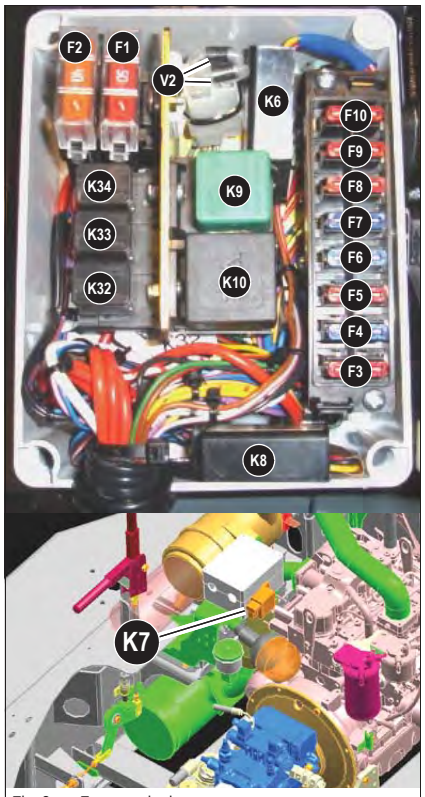


Fig. 2: Fuses and relays

- The fuse box is located on the right under the engine cover.
- Machine with optional cabin:

  ➥ In the cabin on the right beside the operator seat.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	40 A	Main fuse
F 3	10 A	Cutoff solenoid, cutoff solenoid time lag relay
F 4	15 A	Machine travel solenoid valves
F 5	10 A	Horn, brake lights
F 6	15 A	Turn indicators
F 7	15 A	High beam
F 8	10 A	Low beam
F 9	10 A	Clearance light
F 10	10 A	Hazard warning system (option)

Relay no.	Protected circuit
K 6	Preheating time lag relay
K7	Start high-current relay
K 8	Cutoff solenoid time lag relay
K 9	Cutoff solenoid switching relay
K 10	Turn indicator relay

Relay no.	Protected circuit
K32	Start interlock relay
K33	Low beam relay
K34	High beam relay
V2	Diodes

Fuses and relays (serial nos. EA01932 to EA01950, Yanmar)

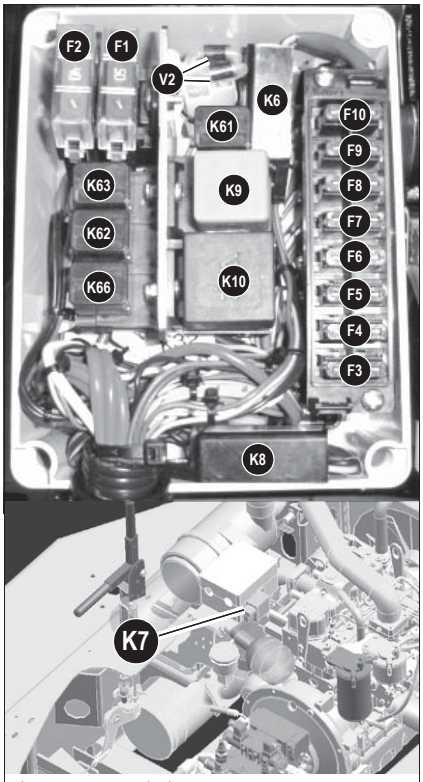


Fig. 3: Fuses and relays

- The fuse box is located on the right under the engine cover.
- Machine with optional cabin:

  ➥ In the cabin on the right beside the operator seat.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	40 A	Main fuse
F 3	10 A	Cutoff solenoid, cutoff solenoid time lag relay, fuel pump, indicator
F 4	15 A	Machine travel solenoid valves, parking brake, 2nd speed
F 5	10 A	Horn, brake lights
F 6	15 A	Turn indicators
F 7	15 A	High beam, rotating beacon
F 8	10 A	Low beam
F 9	10 A	Clearance light
F 10	10 A	Hazard warning system (option)

Relay no.	Protected circuit	Relay no.	Protected circuit
K 6	Preheating time lag relay	K61	Parking brake relay
K7	Start high-current relay	K62	Low beam relay
K 8	Cutoff solenoid time lag relay	K63	High beam relay
K 9	Cutoff solenoid switching relay	K66	Start interlock relay
K 10	Turn indicator relay	V2	Diodes

Additional fuses for machine with optional cabin (Yanmar)

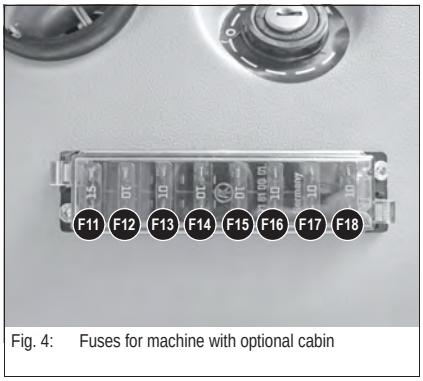


Fig. 4: Fuses for machine with optional cabin

The fuse panel is located on the right under the instrument panel, under the starter.

Fuse no.	Rated current (A)	Protected circuit
F11	15 A	Roof lights
F12	10 A	Wiper, radio
F 13	10 A	Heating
F 14	10 A	Rotating beacon
F 15	10 A	Not assigned
F 16	10 A	Radio, interior lighting
F 17	10 A	Not assigned
F18	10 A	Not assigned

Fuses and relays (Perkins)

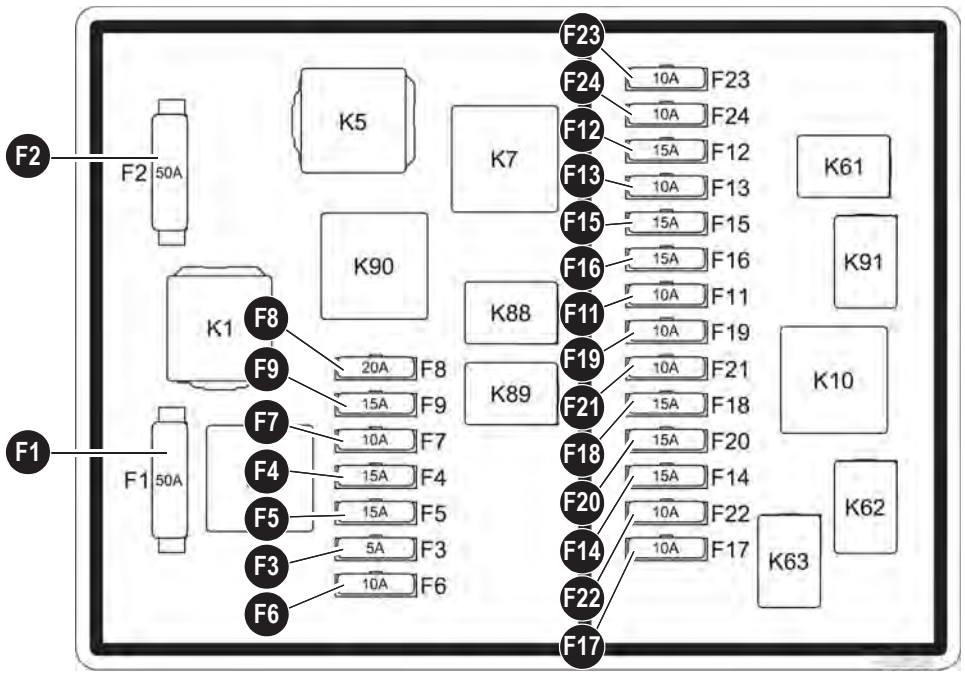


Fig. 5: Fuses

The fuse box is located at the front right of the chassis under the control stand.

Fuse no.	Rated current (A)	Protected circuit
F1	50 A	Main fuse
F2	50 A	Main fuse
F3	5 A	ECU (engine control unit)
F4	15 A	ECU (engine control unit)
F5	15 A	ECU (engine control unit)
F6	10 A	ECU (engine control unit)
F7	10 A	Particulate filter, fuel pump
F8	20 A	Particulate filter
F9	15 A	Starter
F10	10 A	--
F11	10 A	ECU (engine control unit)
F12	15 A	Wiper (option)
F13	10 A	Heating (option)
F14	15 A	Radio (option)
F15	15 A	Roof lights (option)
F16	15 A	Lights
F17	10 A	Spare
F18	15 A	Low/high beam
F19	10 A	2nd speed, parking brake, drive valves
F20	15 A	Brake lights, horn
F21	10 A	Left/right turn indicators 12 V 15, radio, rotating beacon (option)
F22	10 A	Hazard warning system 12 V 30
F23	10 A	Clearance light (right)

F24	10 A	Clearance light (left)

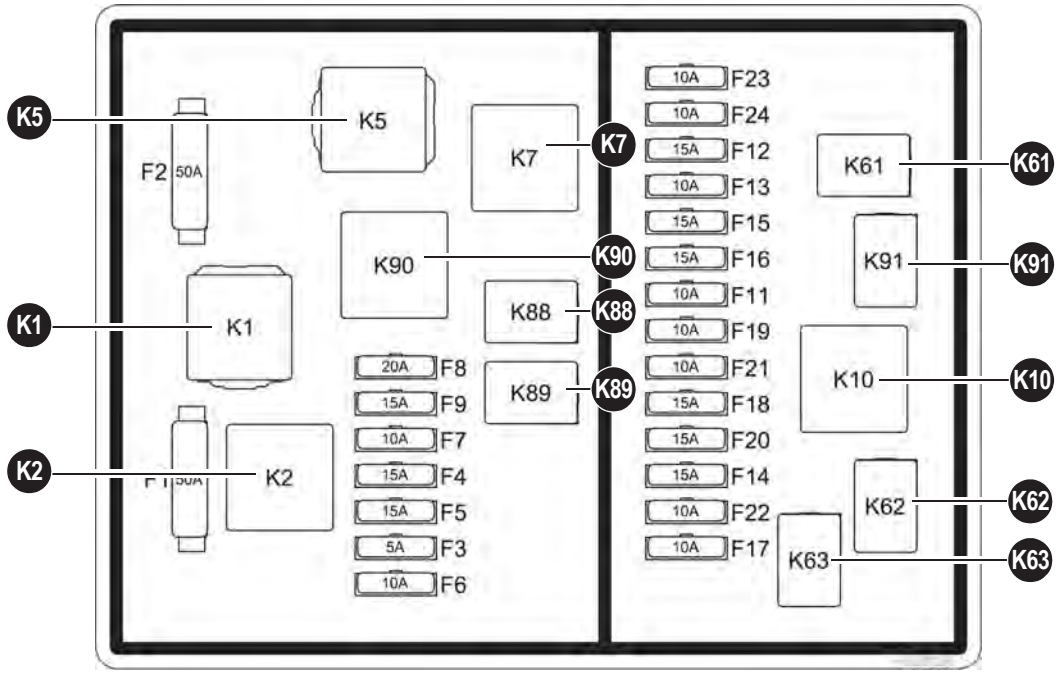


Fig. 6: Relays

Relay no.	Protected circuit
K1	Main relay
K2	Main relay ECU
K5	Preheating
K7	Starting relay
K10	Turn indicator relay
K61	Starting relay
K62	Low beam
K63	High beam
K88	Fuel pump
K89	Particulate filter
K90	Particulate filter
K91	Parking brake

10.5 Telematic

Fig. 7: Telematic

After installing the Telematic system, module **A** is enabled and sends data to the Telematic web portal.

Technical data

- This works in 90 countries with currently 160 roaming partners with a GPRS data network.
- The GPS receiver registers the movements and has a low power consumption.
- Backup battery for additional safety with an autonomy time of 48 – 96 hours.
- Supplies additional information via the web-based Wacker Neuson Telematic software.
- Module has 3 digital inputs and one digital output of which 2 digital inputs (engine and starter) are assigned at the factory. One input and output is freely assignable with other functions, such as for monitoring an additional heating system or particulate-soot filter or controlling these functions via SMS.
- Certified according to IP67.

Connections

Pos.	Connection	Color	Designation
1	Power supply	rd	12 V permanent plus via a series-connected 1 ampere high-speed fuse
2	Ground	bl	-
3	Digital input 1	wh	Engine START/STOP signal
4	Digital input 2	bn	Starter ON/OFF signal
5	Digital input 4	pk	Not assigned at the factory. Can be used for determining an operating state.
6	Digital output 1	ye	The digital output of the module can be used for enabling/disabling additional functions via SMS, such as an auxiliary heater. Important: Selection is only possible for comfort functions. Remote-control of safety-relevant functions or functions affecting handling is prohibited under all circumstances.

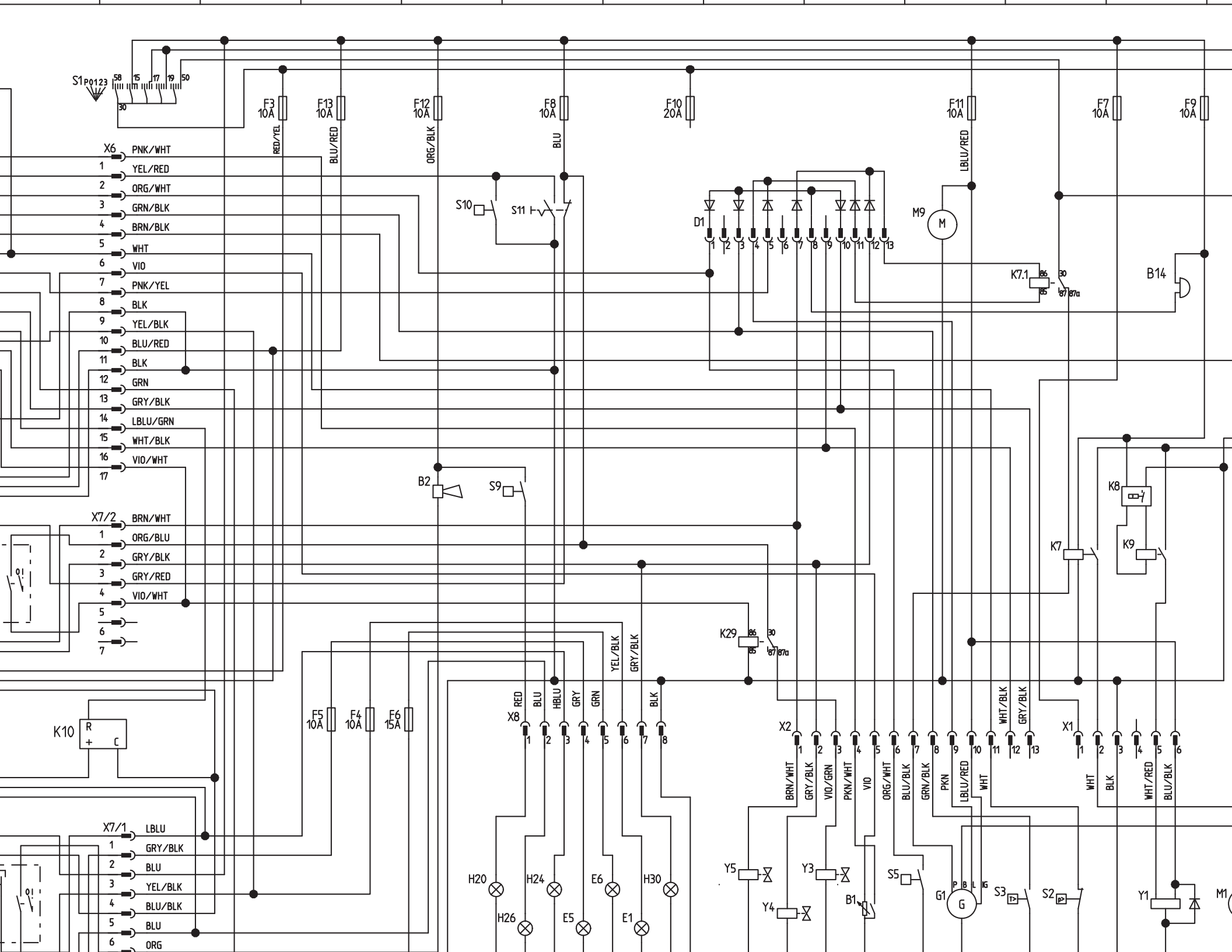
Functional check/diode

LED mode	Operating state
Steady green light with short, red flashing interruptions	The unit is connected with the GSM network and the GPS module is navigating > all is OK
No light	The unit is not connected with a power source
Steady red light	The unit is supplied with power, but is not connected with a GSM network
Short red flashing	The unit is supplied with power and is connected with a GSM network
Steady green light	The unit is navigating (fixed GPS satellite position)

Wiring diagram a

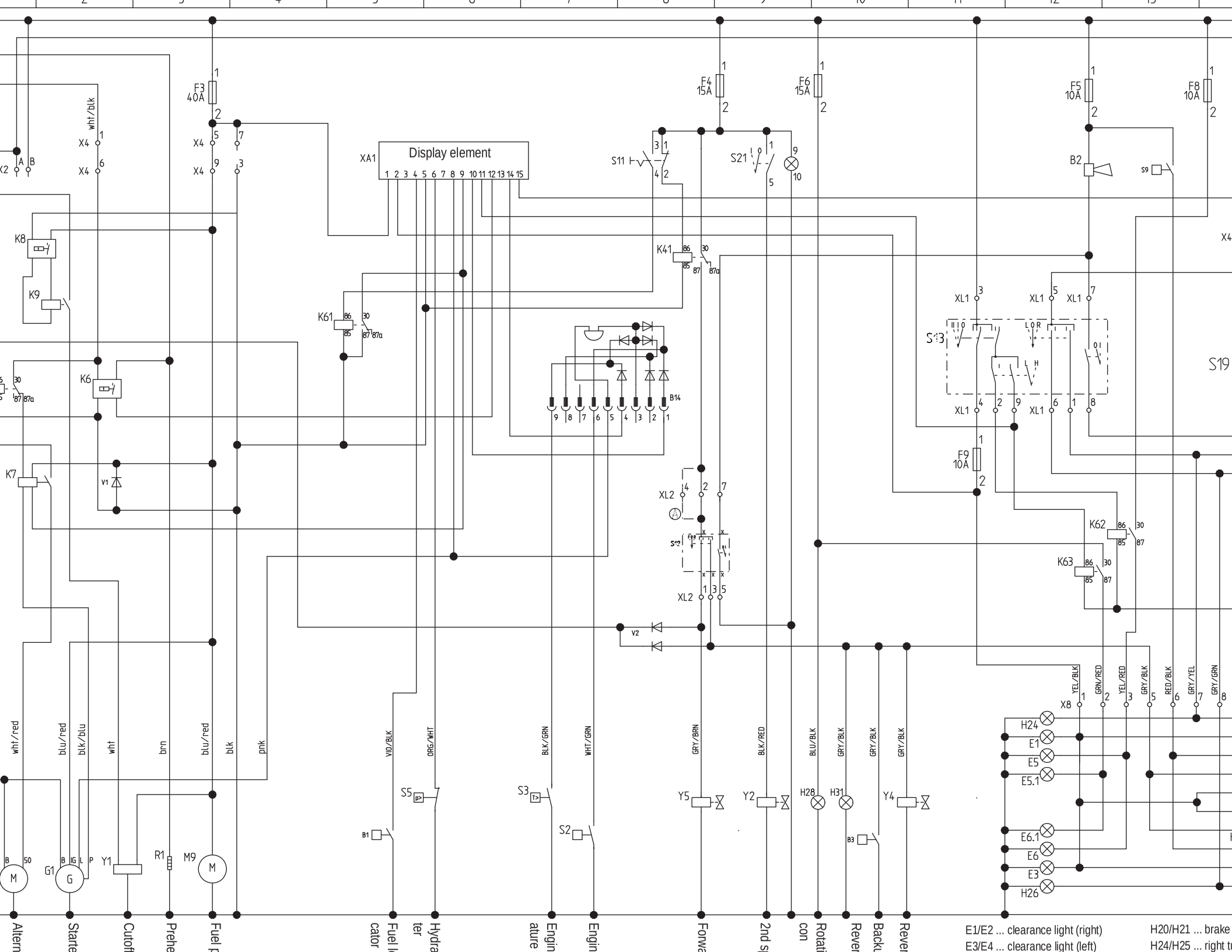
vel sensor	F10
	C6
	B13
box	B9
g light	F8
eam	F7
eam	F7
use	D14
use	D14
warning system	A4
g light	E5
eam	E5
eam	E5-6
	A13
e travel valves	A7
g buzzer, relay	A13-14
	A8
solenoid, fuel feed pump	A11
brake lights	A6
s, turn indicators	A5
tor	F11
	F14-15
eam indicator light	B1
ting indicator light	B1
temperature indicator light	B1
oil pressure indicator light	B1
tor charge function indicator light	B1
r indicator light	B1
lic oil filter indicator light	B1
lic oil temperature indicator light	C1
eed indicator light	C1
g brake indicator light	A1
ights	F6
e turn indicator light	B1
dicators (right)	F7
dicators (left)	F7

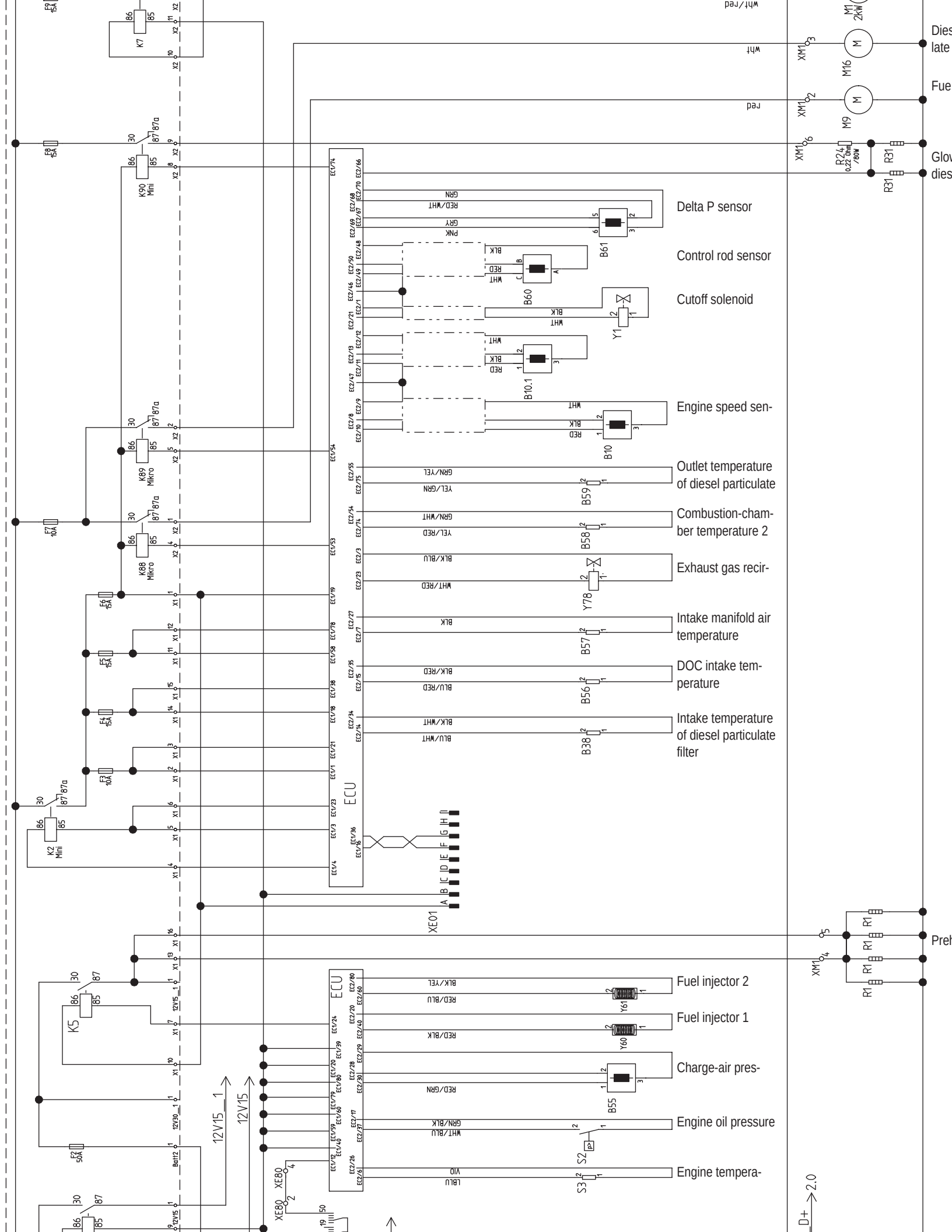
K6	Preheating time lag relay	C14
K7	Start high-current relay	D12
K7.1	Start interlock relay	B12
K8	Pull contact time lag relay	C13
K9	Pull contact high current relay	D13
K10	Turn indicator relay	E2-3
K29	1st/2nd speed relay	D9
M1	Starter	F14
M9	Fuel pump	B11
P1	Hour meter	A1
P2	Fuel level indicator	C1
R1	Glow plug	E15
S1	Preheating start switch	A2-3
S2	Engine oil pressure switch	F12
S3	Engine temperature switch	F12
S5	Hydraulic oil pressure switch	F11
S8	Battery master switch	F14
S9	Brake light switch	C7
S10	Hydraulic parking brake switch	B6
S11	Parking brake switch	B7
S12	Steering-column control lever (right)	D1
S13	Steering-column control lever (left)	F0-1
S19	Hazard warning switch	E1
Y1	Cutoff solenoid	F13
Y4	Reverse travel solenoid valve	F9-1
Y5	Forward travel solenoid valve	F9

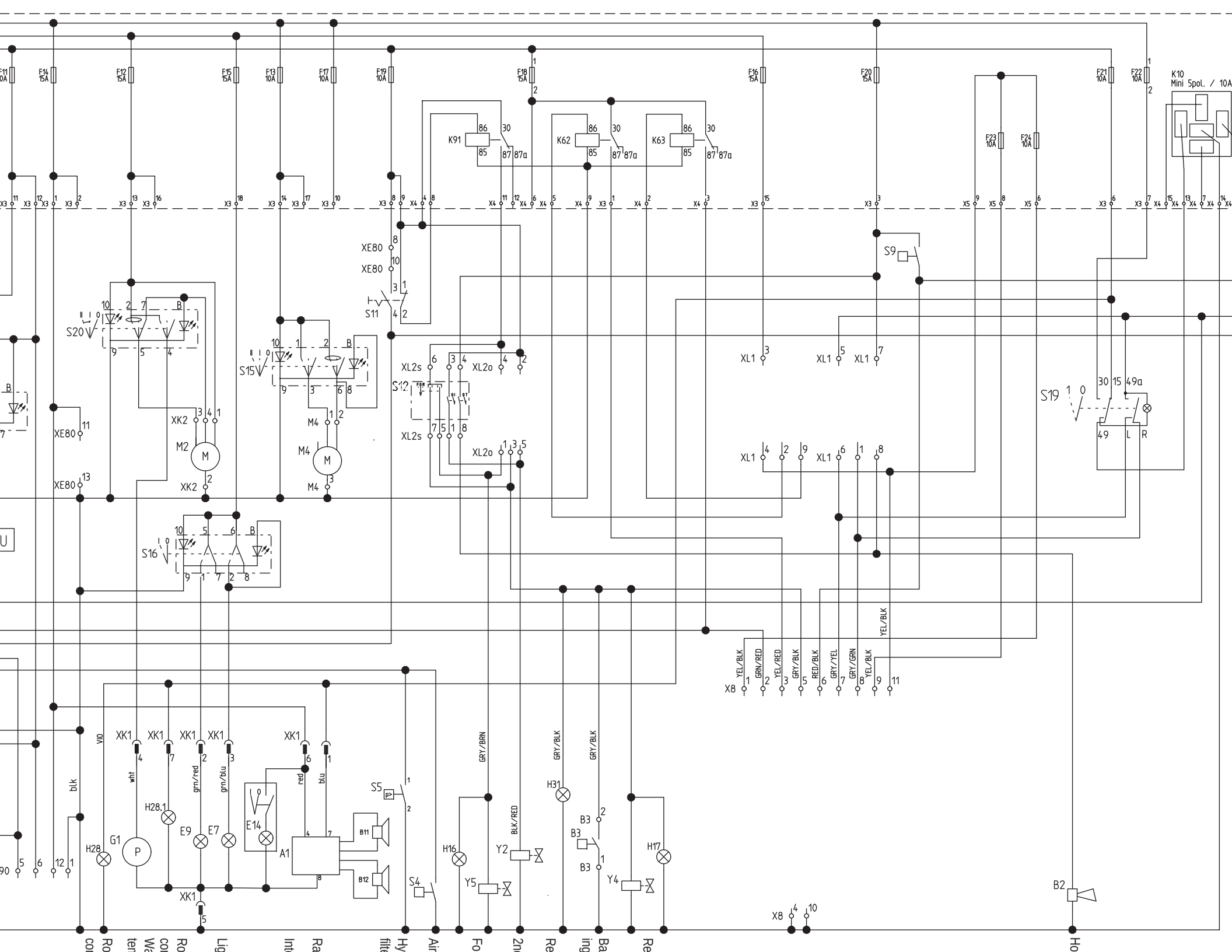

S1
P0123
58
15
17
19
50
30
F3 10A
F13 10A
F12 10A
F8 10A
F10 20A
F11 10A
F7 10A
F9 10A
RED/YEL
BLU/RED
ORG/BLK
BLU
LBLU/RED
X6
PNK/WHT
YEL/RED
ORG/WHT
GRN/BLK
BRN/BLK
WHT
VIO
PNK/YEL
BLK
YEL/BLK
BLU/RED
BLK
GRN
GRY/BLK
LBLU/GRN
WHT/BLK
VIO/WHT
S10
S11
D1
M9
M
K7.1
B14
B2
S9
K8
K7
K9
X7/2
BRN/WHT
ORG/BLU
GRY/BLK
GRY/RED
VIO/WHT
K29
YEL/BLK
GRY/BLK
F5 10A
F4 10A
F6 15A
K10
R
+
C
X8
RED
BLU
HBLU
GRY
GRN
BLK
X2
BRN/WHT
GRY/BLK
VIO/GRN
PKN/WHT
VIO
ORG/WHT
BLU/BLK
GRN/BLK
PKN
LBLU/RED
WHT
WHT/BLK
GRY/BLK
X1
WHT
BLK
WHT/RED
BLU/BLK
X7/1
LBLU
GRY/BLK
BLU
YEL/BLK
BLU/BLK
BLU
ORG
H20
H24
E6
H30
H26
E5
E1
Y5
Y3
Y4
B1
S5
G1
G
S3
S2
Y1
M1

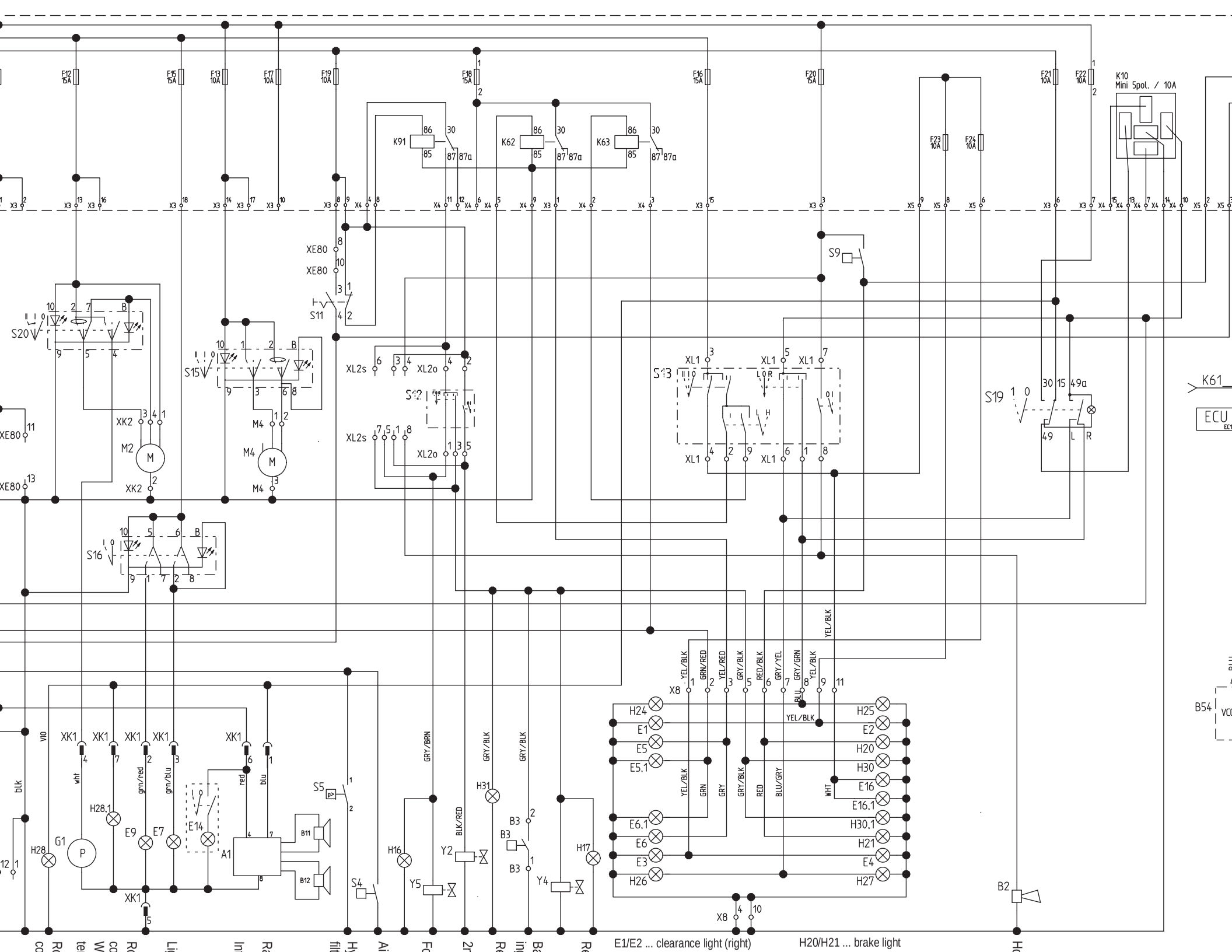
Fuel-level sensor	
Horn	
Backup warning system	
Buzzer	
Diode box	
Front right parking light	
Rear right parking light	
Front left parking light	
Rear left side marker light	
Low beam (right)	
High beam (right)	
Low beam (left)	
High beam (left)	
Numberplate light	
Numberplate light	
Main fuse	
Main fuse	
Indicating instrument, cutoff solenoid, fuel feed pump	
Machine travel, 2nd speed	
Horn, brake lights	
Hazard warning system	
High beam, rotating beacon	
Low beam	
Parking light	
Hazard warning system	
Alternator	
Battery	
Clearance light (right)	
Clearance light (left)	
Brake lights	
Brake lights	
Front right turn indicator	
Rear right turn indicator	
Front left turn indicator	
Rear left turn indicator	
Rotating beacon	

K6	High-current relay preheating
K7	Start high-current relay
K8	Start interlock relay
K9	Start interlock relay
K10	Turn indicator relay
K41	Machine travel relay
K61	Parking brake indicator light relay
K62	Low beam relay
K63	High beam relay
K66	Start interlock relay
M1	Starter
M9	Fuel pump
R1	Glow plug
S1	Preheating start switch
S2	Engine oil pressure switch
S3	Engine temperature switch
S5	Hydraulic oil pressure switch
S8	Battery master switch
S9	Brake light switch
S11	Parking brake switch
S12	Steering-column control lever (left)
S13	Steering-column control lever (right)
S19	Hazard warning switch
S21	2nd speed
Y1	Cutoff solenoid
Y2	Normal speed solenoid valve
Y4	Reverse travel solenoid valve
Y5	Forward travel solenoid valve

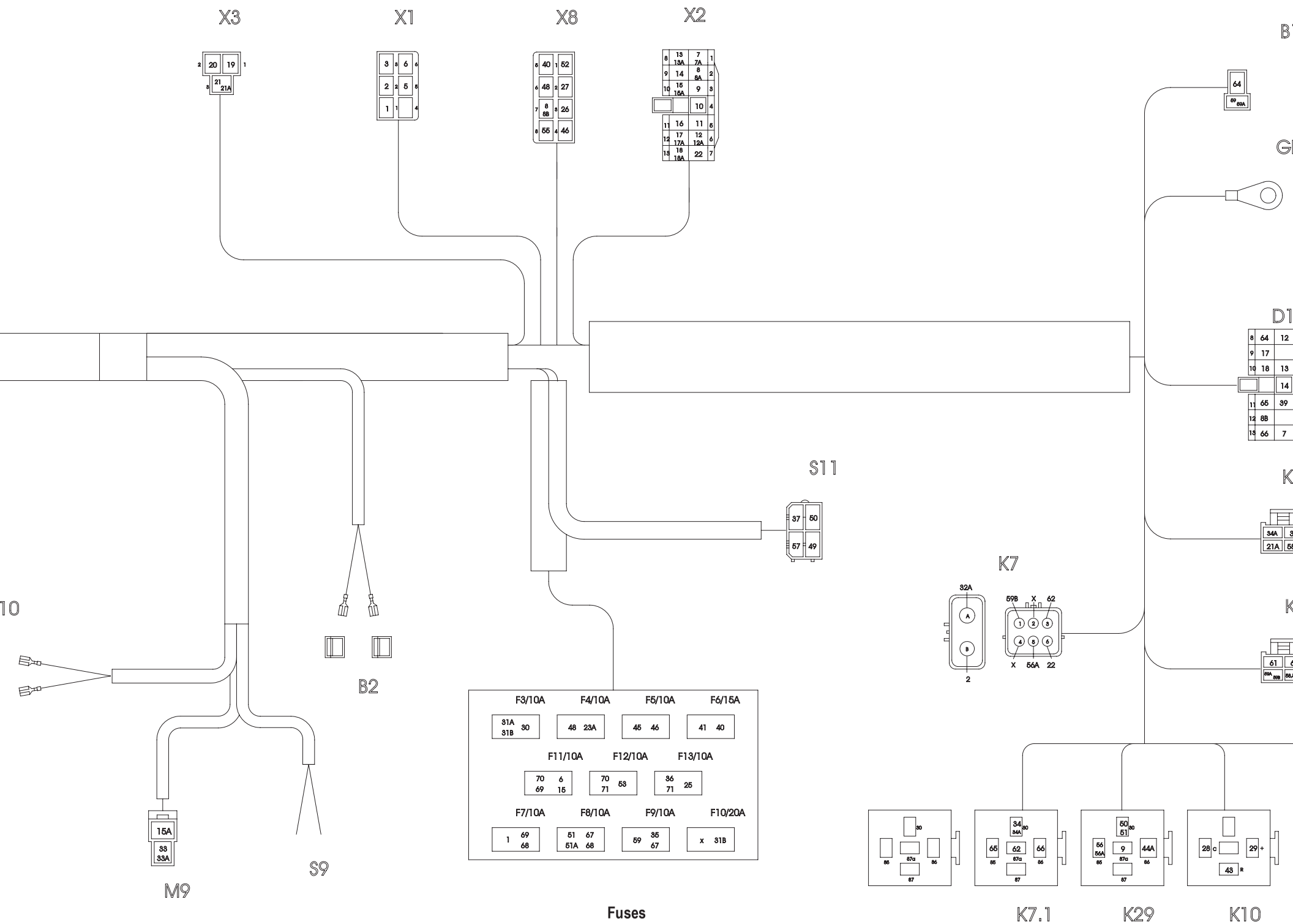

Display element
XA1
F3 40A
F4 15A
F6 15A
F5 10A
F8 10A
F9 10A
S11
S21
S13
S19
S9
B2
B14
K8
K9
K6
K7
K41
K61
K62
K63
V1
V2
XL1
XL2
X4
X8
wht/blk
wht/red
blu/red
blk/blu
wht
brn
blu/red
blk
pnk
VIO/BLK
ORG/WHT
BLK/GRN
WHT/GRN
GRY/BRN
BLK/RED
BLU/BLK
GRY/BLK
GRY/BLK
GRY/BLK
YEL/BLK
GRN/RED
YEL/RED
GRY/BLK
RED/BLK
GRY/YEL
GRY/GRN
S5
S3
S2
B1
B3
Y5
Y2
Y1
Y4
R1
M9
G1
H28
H31
H24
E1
E5
E5.1
E6.1
E6
E3
H26
Alternator
Starter motor
Cutoff solenoid
Preheater
Fuel pump
Fuel level indicator
Hydraulic filter
Engine temperature
Engine
Forward
2nd speed
Rotation control
Reverse
Backup
Reverse
E1/E2 ... clearance light (right)
E3/E4 ... clearance light (left)
H20/H21 ... brake
H24/H25 ... right tu


Delta P sensor
Control rod sensor
Cutoff solenoid
Engine speed sen-
Outlet temperature of diesel particulate
Combustion-chamber temperature 2
Exhaust gas recir-
Intake manifold air temperature
DOC intake temperature
Intake temperature of diesel particulate filter
Fuel injector 2
Fuel injector 1
Charge-air pres-
Engine oil pressure
Engine tempera-
ECU
XE01
12V15_1
12V15
D+ 2.0

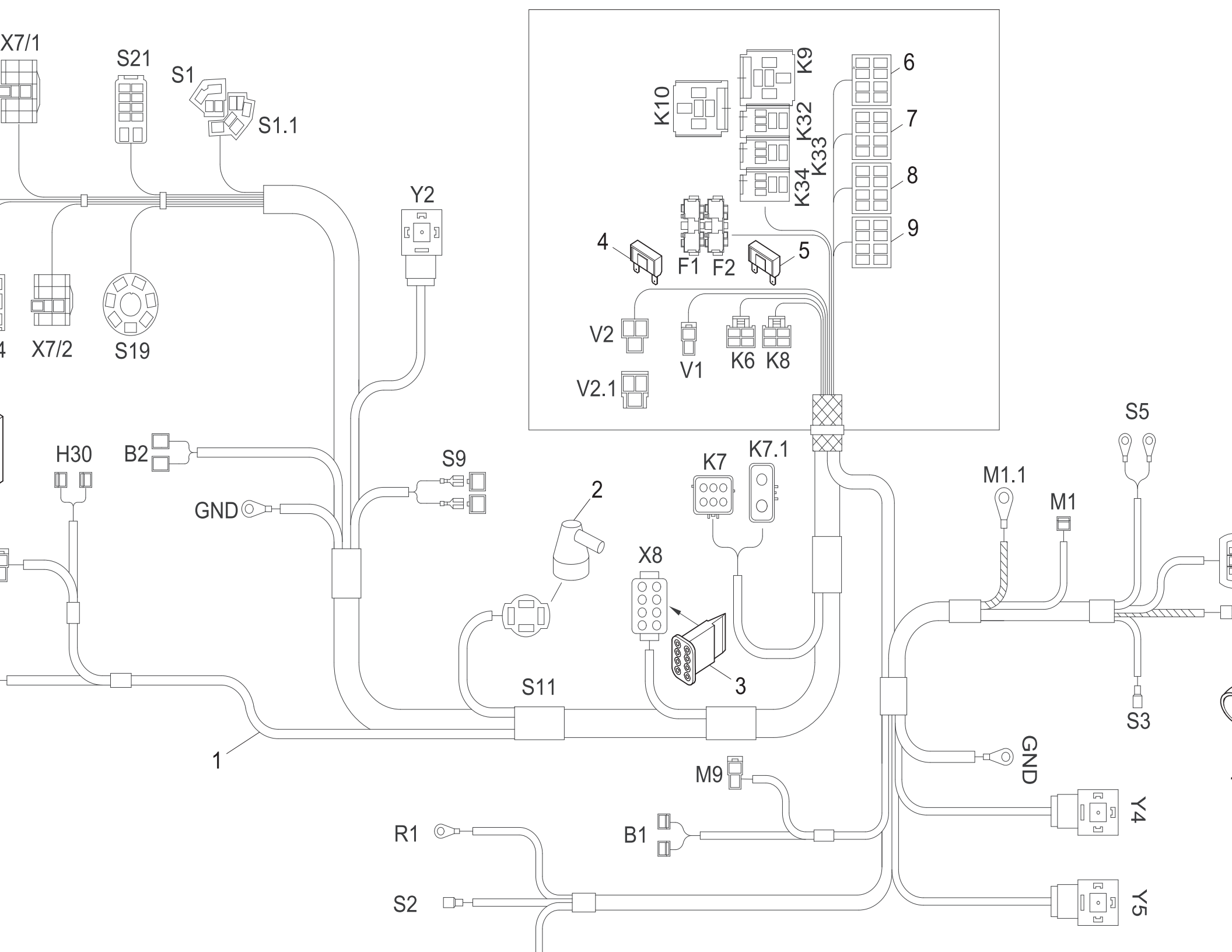

F11 10A
F14 15A
F12 15A
F15 15A
F13 10A
F17 10A
F19 10A
F18 15A
F16 15A
F20 15A
F21 10A
F22 10A
F23 10A
F24 10A
K10 Mini 5pol. / 10A
K91
K62
K63
S9
S11
S15
S16
S19
S20
XE80
XK2
XK1
XL1
XL2s
XL2o
M2
M4
H28
H28.1
H31
H16
H17
E9
E7
E14
G1
A1
B11
B12
B2
B3
S4
S5
Y2
Y4
Y5
X8
YEL/BLK
GRN/RED
YEL/RED
GRY/BLK
RED/BLK
GRY/YEL
GRY/GRN
GRY/BRN
BLK/RED
blk
wht
vio
grn/red
grn/blu
red
blu


F12 15A
F15 15A
F13 10A
F17 10A
F19 10A
F18 15A
F16 15A
F20 15A
F23 10A
F24 10A
F21 10A
F22 10A
K10 Mini Spol. / 10A
K91
K62
K63
S9
S11
S20
S15
S12
S13
S19
S16
XE80
XK2
M2
M4
XL2s
XL2o
XL1
ECU
S5
S4
H31
H16
H17
Y2
Y5
Y4
B3
H24
H25
E1
E2
E5
E5.1
H20
H30
E16
E16.1
H30.1
E6.1
E6
E3
H21
E4
H26
H27
X8
B2
B54
H28
G1
H28.1
E9
E7
E14
A1
B11
B12
XK1
E1/E2 ... clearance light (right)
H20/H21 ... brake light

To	Designation	Color	mm²	No.	From	To	Designa
F7		wht/blk	1	32A	K7	F2	+12 V/30
K7	Starter 50	wht	2.5	33	M9	GND	Ground
GND	Ground	blk	2.5	33A	M9	S10	Ground
K9	Pull contact cutoff solenoid	wht/red	2.5	34	S1	K7.1	Start
F11	Holding contact cutoff solenoid	blu/blk	1.5	34A	K6	K7.1	Start
D1	Forward travel	brn/wht	1	35	S1	F9	+12 V/15
X7/2	Forward travel	brn/wht	1	35A	S1	X7/1	+12 V/15
X8	Reverse travel	gry/blk	1	36	S1	F13	+12 V/15
X7/2	Reverse travel	gry/blk	1	37	X6	S11	Parking brake
X8	Reverse travel	gry/blk	1	37 A	X6	S10	Parking brake
K29	Fast machine travel	vio/grn	1	38	X6	K6	Preheating indicator
X6	Empty reservoir	pkn/wht	1	39	X6	D1	Charge indicator ligh
X6	Fuel level indicator	vio	1	40	X8	F6	High beam
D1	Fouled hydraulic oil filter	org/wht	1	41	X7/1	F6	High beam
X6	Fouled hydraulic oil filter	org/wht	1	42	X7/1	X6	High beam indicator
D1	Engine temperature	grn/blk	1	43	X6	K10	Turn indicator light
X6	Engine temperature	grn/blk	1	44	X6	X7/2	Low-speed indicator
D1	Charge indicator light	pkn	1	44A	X6	K29	Slow machine travel
F11	Alternator excitation	ltblu/red	1	45	X7/1	F5	Low beam
M9	Feed pump	ltblu/red	1	46	X8	F5	Low beam
X6	Engine oil pressure	wht	1	47	X7/1	B2	Horn
D1	Hydraulic oil temperature	wht/blk/wht	1	48	X8	F4	Parking light
X6	Hydraulic oil temperature	wht/blk/wht	1	49	X7/2	S11	+12 V machine trave
D1	Dirty air filter	gry/blk/gry	1	50	S11	K29	+12 V machine trave
X6	Dirty air filter	gry/blk/gry	1	51	F8	K29	+12 V machine trave
F1	+12 V/30	red	6	51 A	F8	X7/2	+12 V machine trave
F2	+12 V/30	red	6	52	X8	S9	Brake lights
S1	Preheating system	brn	4	53	F12	B2	+12 V horn, brake lig
S1	Preheating system	brn	2.5	54	B2	S9	+12 V horn, brake lig
K6	Preheating system	brn	1	55	X8	GND	Ground
K7	Engine speed signal	blu/blk	1	56	K29	GND	Ground
X6	Parking light	yel/blk	1	56A	K29	K7	Ground
F4	Parking light	yel/blk	1	57	S11	GND	Ground
GND	Ground	blk	1	58	K8	GND	Ground
X6	Ground	blk	1	58A	K8	K6	Ground
X6	Ground	blk	1	59	B14	F9	+12 V relay
F13	+12 V/15 turn indicators/indicators	blu/red	1	59A	B14	K8	+12 V relay
X6	+12 V/15 turn indicators/indicators	blu/red	1	59B	K7	K8	+12 V relay
X8	Turn indicators (right)	ltblu	1	60	K8	K9	Cutoff solenoid timer
X7/1	Turn indicators (right)	ltblu	1	61	K8	K9	Cutoff solenoid timer
X8	Turn indicators (left)	blu	1	62	K7	K7.1	Start
X7/1	Turn indicators (left)	blu	1	64	D1	B14	Buzzer
K10	Turn indicators	blu/blk	1	65	D1	K7.1	Start interlock
X7/1	Turn indicators	blu/blk	1	66	D1	K7.1	Start interlock
K10	Turn indicators +12 V	blu/yel	1	67	F9	F8	+12 V/15
F3	+12 V/30 turn indicators	red/yel	1	68	F7	F8	+12 V/15
F1	+12 V/30	red	6	69	F7	F11	+12 V/15
F1	+12 V/30	red	2.5	70	F12	F11	+12 V/15
F10	+12 V/30	red	2.5	71	F12	F11	+12 V/15
F2	+12 V/30	red	4				

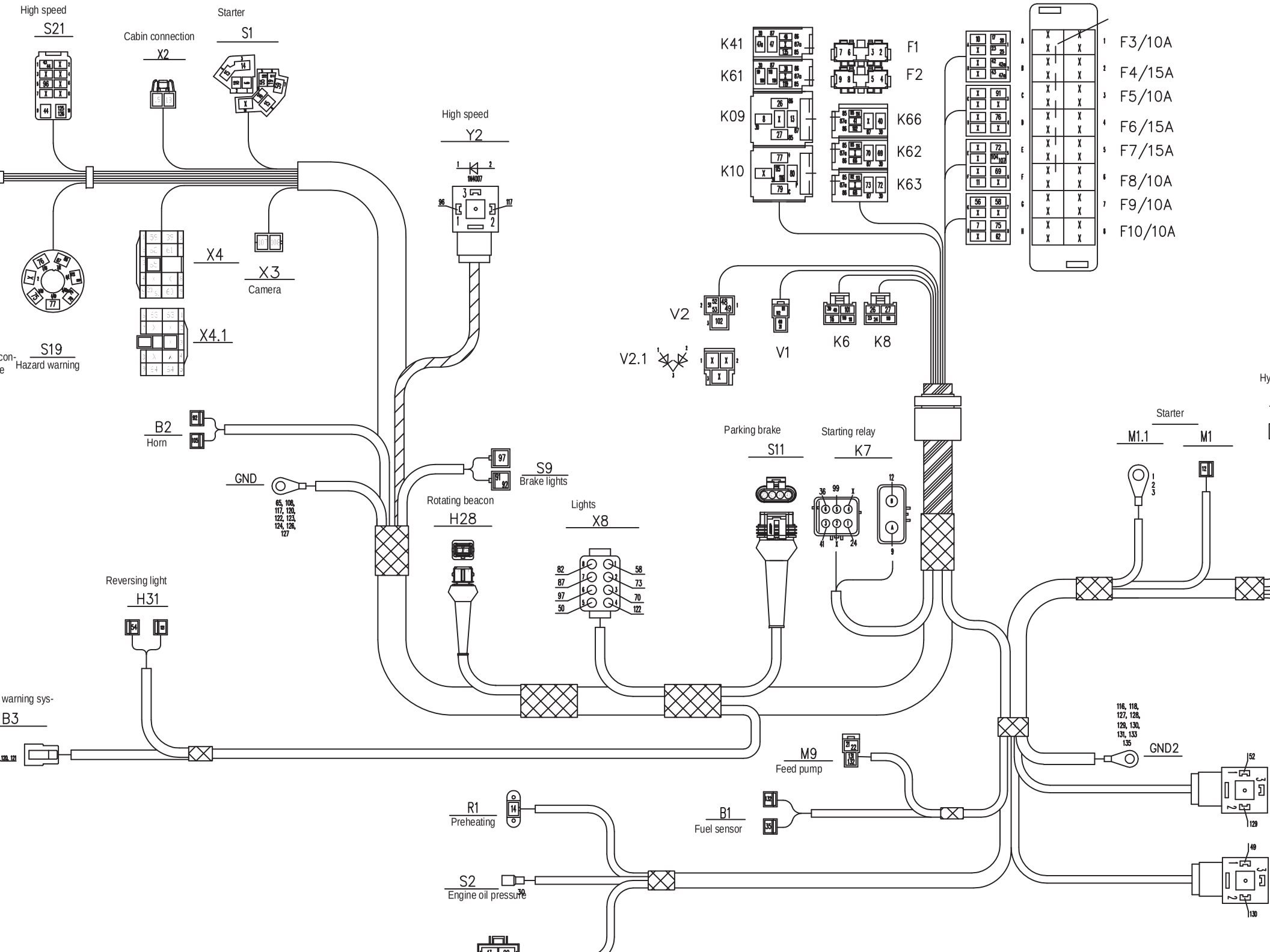

X3
X1
X8
X2
S11
B2
S9
M9
F3/10A
F4/10A
F5/10A
F6/15A
F11/10A
F12/10A
F13/10A
F7/10A
F8/10A
F9/10A
F10/20A
Fuses
K7
K7.1
K29
K10

To	Designation	Color	mm²	No.	From	To	Designation
.1	12 V/30	red	10	57	X10.2	X7/1.4	Clearance light
	12 V/30	red	4	58	X8.1	F9.7	Clearance light
	12 V/30	red	4	66	X7/1.2	K33.86	Low beam
	12 V/30	red	4	67	X10.11	X7/1.9	High beam indicator light
	12 V/30	red	4	68	X7/1.9	K34.86	High beam
.2	12 V/30	red	6	69	F8.6	K33.30	Low beam
.2	12 V/30	red	4	70	X8.3	K33.87	Low beam
.30	12 V/30	red	4	72	F7.5	K34.30	High beam
.2	12 V/30	red	4	73	X8.2	K34.87	High beam
2	12 V/15	blu	4	75	S19.3	F10.8	Turn indicators 12 V/30
.5	12 V/15	blu	4	76	S19.1	F6.4	Turn indicators 12 V/15
	Starter	wht/red	2.5	77	S19.4	K10+	Turn indicators +
.87	Pull contact cutoff solenoid	wht	4	78	X7/1.5	S19.5	Turn indicators COM
	Preheating	brn	4	79	S19.5	K10 C	Turn indicators COM
.8	Preheating	brn	4	80	X10.15	K10 P	Turn indicator light
	Preheating	brn	1	81	X7/1.1	S19.7	Turn indicators (right)
.1	12 V/15 indicating instrument/relays	blu	1	82	S19.7	X8.8	Turn indicators (right)
	Cutoff solenoid/fuel feed pump	blu/red	1	86	X7/1.6	S19.6	Turn indicators (left)
	Fuel pump	blu/red	1	87	S19.6	X8.7	Turn indicators (left)
	Holding contact cutoff solenoid	blu/red	1	91	S9	F5.3	12 V brakes/horn
	Cutoff solenoid timer	blu/red	1	92	B2	S9	12 V brakes/horn
	12 V/15 starting relay	blu/red	1	96	Y2.1	S21.5	High speed
.1	12 V/15 indicating instrument/relays	blu	1	97	X8.6	S9	Brake lights
.86	Cutoff solenoid relay	blu/blk	1	99	K7.5	S11	Parking brake indicator light
.85	Cutoff solenoid relay	pnk/blk	1	100	X10.9	S11	Parking brake indicator light
.2 1	Charge indicator light	pnk	1	101	X10.12	K6	Preheating indicator light
4.5	Charge indicator light	pnk	1	102	V2.3	K32.86	Start interlock
	Engine oil pressure	wht/grn	1	104	H28	F7.5	Rotating beacon
4.1	Engine oil pressure	wht/grn	1	105	B2	X7/1.7	Horn
	Engine temperature	blk/grn	1	110	K8	K6	Ground
4.4	Engine temperature	blk/grn	1	111	V1	K6	Ground
	Hydraulic oil filter	org/wht	1	112	V1	K34.85	Ground
	Fuel sensor	vio/blk	1	113	K33.85	K34.85	Ground
.2 3	Engine speed signal	blk/blu	1	114	K33.85	K32.85	Ground
	Starter	wht/blk	1	115	K10.31	K32.85	Ground
	Starter	wht/blk	1	116	K10.31	GND	Ground
2.87a	Starter	wht/blk	1	117	Y2.2	GND	Ground
.2	12 V machine travel	gry	1	118	GND	S11	Ground
/2.2	12 V machine travel	gry	1	119	X8.4	GND	Ground
/2.2	12 V machine travel	gry	1	120	B3	GND	Ground
1.9	12 V machine travel	gry	1	121	H30	B3	Ground
1	Machine travel	gry/blu	1	124	X10.5	X7/1.8	Ground
.1	Forward travel	brn/wht	1	125	S21.10	X7/1.8	Ground
.1	Forward travel	brn/wht	1	126	S21.10	GND	Ground
.5	Reversing light	gry/blk	1	127	GND	GND2	Ground
.2	Reverse travel	gry/blk	1	128	S5	GND2	Ground
.2	Reverse travel	gry/blk	1	129	Y4.2	GND2	Ground
.2	Backup warning system	gry/blk	1	130	Y5.2	GND2	Ground
	Reversing light	gry/blk	1	131	GND2	M9	Ground
.5	12 V/15 lights	blu	1.5	132	B1	M9	Ground
.C	Clearance light	yel/blk	1	133	GND3	X1.3	Ground


X7/1
S21
S1
S1.1
Y2
K10
K9
K32
K33
K34
6
7
8
9
4
F1
F2
5
V2
V1
K6
K8
V2.1
X7/2
S19
H30
B2
S9
GND
2
K7
K7.1
S5
M1.1
M1
X8
3
S11
S3
1
GND
M9
Y4
R1
B1
S2
Y5

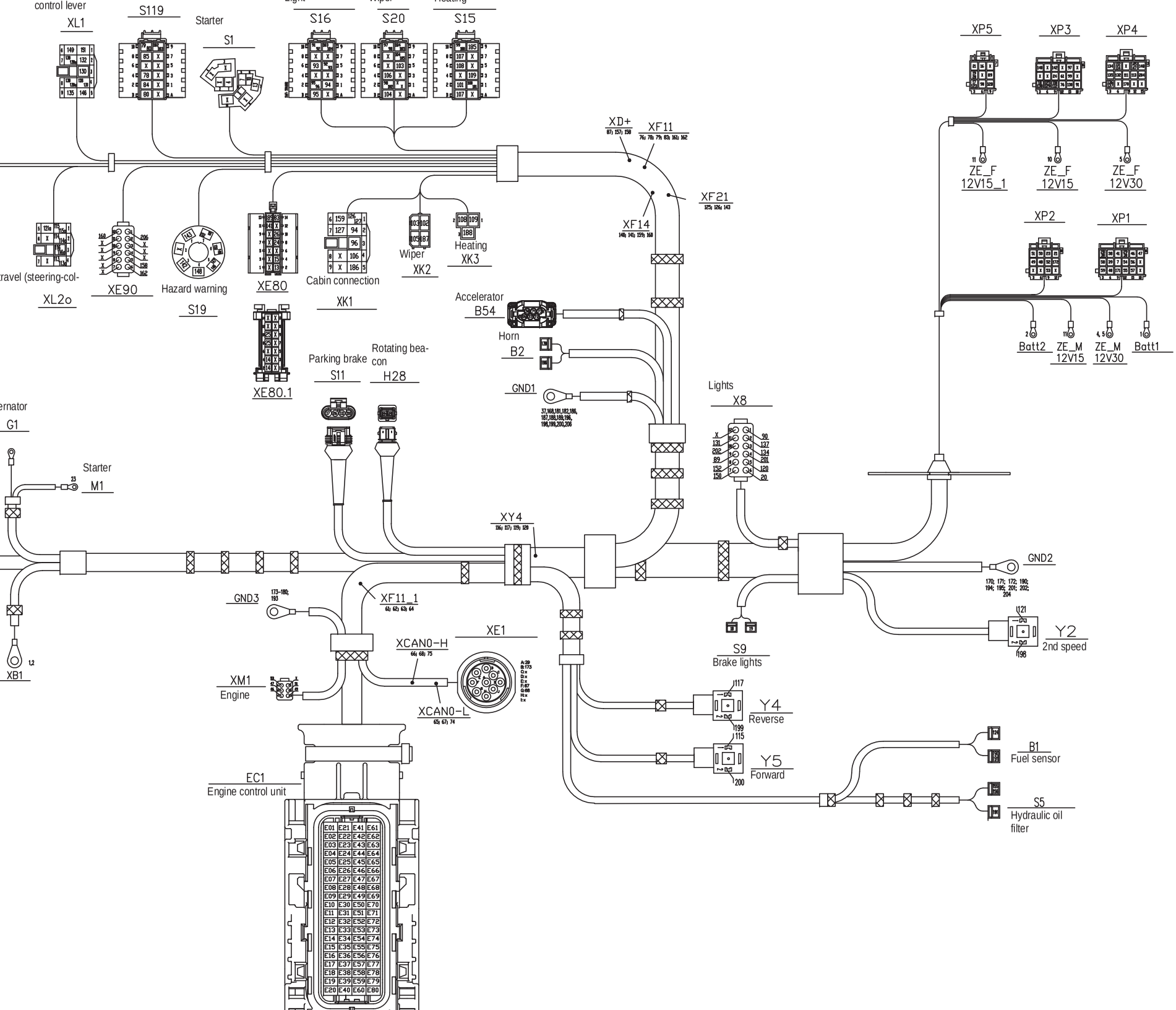
To	Color	mm²	Designation	No.	From	To	Color	mm²	
M1.1	10	red	12 V/30	52	Y4	V2	1	gry/blk	
F1	4	red	12 V/30	53	B3	V2	1	gry/blk	
F1	4	red	12 V/30	54	H31	B3	1	gry/blk	
F2	4	red	12 V/30	55	XL1	S1	1.5	blu	
F2	4	red	12 V/30	56	XL1	F9	1	yel/blk	
F1	6	red	12 V/30	57	XA1	XL1	1	yel/blk	
F1	4	red	12 V/30	58	X8	F9	1	yel/blk	
K9	4	red	12 V/30	59	S1	X4	1	wht/blk	
F2	4	red	12 V/30	60	X4	V1	1	blu/red	
F3	4	blu	12 V/15	61	X4	X4	1	blu/red	
F8	4	blu	12 V/15	62	F10	X4	1	red	
M1	2.5	wht/red	Starter	63	X4.1	X4.1	1	wht/blk	
K9	4	wht	Pull contact cutoff solenoid	64	X4.1	X4.1	1	blu/red	
R1	4	brn	Preheating	65	GND	X4	1	blk	
S1	4	brn	Preheating	66	XL1	K62	1	yel	
K6	1	brn	Preheating	67	XA1	XL1	1	grn	
F3	1	blu	12 V/15 indicating instrument/relays	68	XL1	K63	1	grn	
X2	1.5	red	12 V/30	69	F8	K62	1	yel/red	
X2	4	blu	12 V/15	70	X8	K62	1	yel/red	
X4	1	blu/red	Cutoff solenoid/fuel feed pump	72	F7	K63	1	grn/red	
V1	1	blu/red	Fuel pump	73	X8	K63	1	grn/red	
M9	1	blu/red	Holding contact cutoff solenoid	75	S19	F10	1	red	
K8	1	blu/red	Cutoff solenoid timer	76	S19	F6	1	blu	
K8	1	blu/red	12 V/15 starting relay	77	S19	K10	1	blu/wht	
F3	1	blu	12 V/15 indicating instrument/relays	78	XL1	S19	1	blu/yel	
K9	1	blu/blk	Cutoff solenoid relay	79	S19	K10	1	blu/yel	
K9	1	pnk/blk	Cutoff solenoid relay	80	XA1	K10	1	gry/red	
G1.2	1	pnk	Charge indicator light	81	XL1	S19	1	gry/grn	
B14	1	pnk	Charge indicator light	82	S19	X8	1	gry/grn	
S2	1	wht/grn	Engine oil pressure	86	XL1	S19	1	gry/yel	
B14	1	wht/grn	Engine oil pressure	87	S19	X8	1	gry/yel	
S3	1	blk/grn	Engine temperature	91	S9	F5	1	org/blk	
B14	1	blk/grn	Engine temperature	92	B2	S9	1	org/blk	
S5	1	org/wht	Hydraulic oil filter	96	Y2	S21	1	brn/blk	
B1	1	vio/blk	Fuel sensor	97	X8	S9	1	red/blk	
G1.2	1	blk/blu	Engine speed signal	99	K7	K61	1	red/wht	
K61	1	red/wht	Parking brake	100	XA1	K61	1	red/wht	
K6	1	wht/blk	Starter	101	XA1	K6	1	gry/red	
K6	1	wht/blk	Starter	102	V2	K66	1	wht/red	
K66	1	wht/blk	Starter	104	H28	F7	1	vio	
F4	1	gry	12 V machine travel	105	B2	XL1	1	org	
F4	1	gry	12 V parking brake	106	XL1	XL2	1	org	
S21	1	gry	12 V machine travel	107	X3	F7	1	blu	
S21	1	gry	12 V machine travel	108	X3	GND	1	blk	
K41	1	gry/blu	Machine travel	110	K8	K6	1	blk	
K41	1	gry/blu	Machine travel	111	V1	K6	1	blk	
K41	1	gry	12 V machine travel	112	V1	K63	1	blk	
V2	1	brn/wht	Forward travel	113	K62	K63	1	blk	
V2	1	brn/wht	Forward travel	114	K62	K66	1	blk	
X8	1	gry/blk	Reversing light	115	K10	K66	1	blk	
V2	1	gry/blk	Reverse travel	116	K10	GND	1	blk	

	1	blk	Ground	129	Y4	GND2	1	blk		
	1	blk	Ground	130	Y5	GND2	1	blk		
	1	blk	Ground	131	GND2	M9	1	blk		
	1.5	blk	Ground	132	B1	M9	1	blk		
	1	blk	Ground	133	GND2	Y1	1	blk		
2	1	blk	Ground	134	XL1	XL2	1	blk		
	1	blk	Ground	135	K41	GND2	1	blk		
	1	blk	Ground							


High speed
S21
Cabin connection
X2
Starter
S1
High speed
Y2
1N4007
K41
K61
K09
K10
F1
F2
K66
K62
K63
F3/10A
F4/15A
F5/10A
F6/15A
F7/15A
F8/10A
F9/10A
F10/10A
X4
X4.1
X3
Camera
S19
Hazard warning
V2
V2.1
V1
K6
K8
B2
Horn
GND
65, 108, 117, 120, 122, 123, 124, 126, 127
S9
Brake lights
Rotating beacon
H28
Lights
X8
Parking brake
S11
Starting relay
K7
Starter
M1.1
M1
Reversing light
H31
warning sys-
B3
M9
Feed pump
116, 118, 127, 128, 129, 130, 131, 133, 135
GND2
R1
Preheating
B1
Fuel sensor
S2
Engine oil pressure

TT1		6	red	12 V/30	73	EC1	50	B54	1	0.75	red	+5 V acce
TT2		6	red	12 V/30	74	XCAN0-L		XA2	8	0.5	lgrn	CAN0 – L (tw
S1	1	6	red	12 V/30	75	XCAN0-H		XA2	1	0.5	blu/yel	CAN0 – H (tw
12V30		6	red	12 V/30	76	XP3	12	XF11		1	blu	12
P1	8	1	blu	12 V/15	78	XF11		S119	4	0.5	blu	12
12V15		6	blu	12 V/15	79	XF11		S119	10	0.5	blu	12
2V15_1		6	blu	12 V/15	80	S119	10	S119	B	0.5	blu	12
E80	2	0.5	wht/red	Start 50	83	XF11		XE80	14	0.5	blu	12
30.1	4	0.5	wht/red	Start 50	84	S119	2	EC1	11	0.75	blk	DPF sw
C1	12	0.75	wht/red	Start 50	85	S119	8	EC1	31	0.75	grn/yel	DPF reject
P5	4	0.75	wht-red	ECU start release	87	XD+		G1	D+	0.5	pnk	Diode for alternator
P5	3	0.5	wht-red	ECU start release	89	XP5	8	X8	9	1	yel/blk	Cleara
S9	1	0.75	blu	12 V/15	90	XP5	6	X8	1	1	yel/blk	Cleara
P5	2	0.5	wht-red	Brakes start release	91	XP3	18	S16	10	1	blu	12 V/15
X8	6	1	red/blk	Brake lights	92	S16	10	S16	5	1	blu	12 V/15
P2	10	0.5	wht-red	Brakes start release	93	S16	5	S16	6	1	blu	12 V/15
M1	S	2	wht/red	ECU start release	94	S16	1	XK1	2	1	grn/red	Fron
E80	8	0.75	blu	12 V/15	95	S16	2	S16	B	1	grn/blu	Switc
30.1	10	0.75	blu	12 V/15	96	S16	2	XK1	3	1	grn/blu	Rea
11	3	0.75	blu	12 V/15 parking brake	97	XP3	13	S20	10	1	blu	12 V/
C1	19	0.75	red	12 V/30	98	S20	10	S20	2	1	blu	12 V/
E1	A	1.25	red	12 V/30	99	XP3	14	S15	10	1	blu	12 V
P1	10	1.25	red	12 V/30 preheating	100	S15	10	S15	1	1	blu	12 V
54	3	0.75	grn/gry	Idling speed final position switch signal	101	S15	1	S15	2	1	blu	12 V
C1	66	0.75	wht	Idling speed final position switch GND	102	S20	2	XK2	1	1	blu	12 V/
C1	51	0.75	red	+5 V idling speed final position switch	103	S20	5	XK2	3	1	wht	Wipe
P1	4	0.75	blu/red	ECU main relay	104	S20	7	S20	B	1	red	Switc
C1	3	0.75	gry/blu	ECU main relay	105	S20	7	XK2	4	1	red	W
C1	23	0.75	gry/blu	ECU main relay	106	S20	4	XK1	4	1	wht/blk	Wash
C1	24	0.75	lgrn	Preheating	107	S15	B	S15	8	1	yel-blk	Switc
M1	4	2	brn	Preheating	108	S15	6	M4	2	1	yel-blk	Hea
M1	5	2	brn	Preheating	109	S15	3	M4	1	1	yel-blu	Hea
C1	54	0.75	blk/yel	DPF pump	110	XP3	9	S11	1	1	gry	12 V tr
M1	3	0.75	wht	DPF pump	111	S11	2	XP4	8	1	gry	12 V tr
C1	53	0.75	yel/red	Fuel pump	112	X3	9	XP4	4	1	gry	12 V tr
M1	2	0.75	red	Fuel pump	113	XP4	11	XL2o	4	1	gry	12 V ma
C1	74	0.75	yel/wht	DPF glow plugs	113a	XL2o	4	XL2s	6	1	gry	12 V ma
M1	6	2	brn	DPF glow plugs	114	XP4	4	XL2o	2	1	gry/blu	12 V 2
C1	58	0.75	red/blk	12 V/30	114a	XL2o	2	XL2s	3	1	gry/blu	12 V 2
C1	78	0.75	red/blk	12 V/30	115	XL2o	1	Y5	1	1	brn/wht	Forward
C1	18	0.75	red/wht	12 V/30	115a	XL2o	1	XL2s	5	1	brn/wht	Forward
C1	38	0.75	red/wht	12 V/30	115b	XL2s	5	H16	1	1	brn/wht	Forward
C1	1	0.75	wht/yel	12 V/30	116	XL2o	3	XY4		1	gry/blk	Rever
C1	21	0.75	wht/yel	12 V/30	116a	XL2o	3	XL2s	7	1	gry/blk	Rever
1_1		0.75	blu	12 V/15	116b	XL2s	7	H17	1	1	gry/blk	Rever
C1	13	0.75	blu	12 V/15	117	XY4		Y4	1	1	gry/blk	Reverse
C1	32	0.75	blu	12 V/15	119	XY4		B3	1	1	gry/blk	Backup wa
C1	33	0.75	blu	12 V/15	120	XY4		X8	5	1	gry/blk	Rear lights for StVO (Aus
AN0-L		0.75	lgrn	CAN0 – L (twisted wire 62/63)	121	XL2s	1	Y2	1	1	brn/blk	2nd sp
AN0-H		0.75	blu/yel	CAN0 – H (twisted wire 62/63)	121a	XL2s	1	XL2o	5	1	brn/blk	2nd sp
E1	F	0.5	lgrn	CAN0 – L (twisted wire 67/68)	123	XA1	4	XP5	3	1	red/wht	Parking brak

XL1	3	1	blu	12 V steering column lever lights	193	GND3		S4	2	1	blk	
X8	11	1	yel/blk	Clearance lights	194	GND2		H28	2	1	blk	
XP4	5	1	yel/red	Low beam relay	195	GND2		B3	2	1	blk	
X8	3	1	yel/red	Low beam	196	GND1		B2	2	1	blk	
XP4	2	1	grn	High-beam relay	198	GND1		Y2	2	1	blk	
XA01	3	1	grn	High beam indicator light	199	GND1		Y4	2	1	blk	
X8	2	1	grn/red	High beam	200	GND1		Y5	2	1	blk	
XL1	7	1	org	Horn	201	GND2		X8	4	1.5	blk	
XL2s	4	1	org	Horn	202	GND2		X8	10	1.5	blk	
B2	1	1	org	Horn	204	GND2		XP4	14	1	blk	
XL2s	8	1	org	Horn	206	GND1		XE90	1	1	blk	
XF14		1	red	12 V/30 radio								
XE80	11	1	red	12 V/30								
S19	3	1	red	12 V/30 hazard warning system								
S19	1	1	blu	12 V/15 hazard warning system								
XP4	10	1	gry/red	Turn indicator light								
S19	5	1	blu/yel	Turn indicators COM								
XP4	10	1	blu/yel	Turn indicators COM								
XP4	13	1	blu/wht	Turn indicators +								
S19	6	1	gry/yel	Turn indicators (left)								
X8	7	1	gry/yel	Turn indicators (left)								
S19	7	1	gry/grn	Turn indicators (right)								
X8	8	1	gry/grn	Turn indicators (right)								
S5	1	1	gry/blu	Air filter clogging								
S5	1	1	org/wht	Hydraulic oil filter clogging								
XA1	5	0.5	pnk	Alternator charge indicator light								
XE90	5	0.5	pnk	Alternator charge indicator light								
XK1	6	1	red	12 V/30 radio								
XE90	12	1	red	12 V/30 radio								
XA2	7	0.5	blu	12 V/15 indicating instrument								
XE90	6	0.5	blu	12 V/15 indicating instrument								
H17	2	1	blk	Ground								
H16	2	1	blk	Ground								
XP4	9	1	blk	Ground								
XP1	9	1	blk	Ground								
XP2	11	1	blk	Ground								
XE1	B	1	blk	Ground								
EC1	20	0.75	blk	Ground								
EC1	39	0.75	blk	Ground								
EC1	40	0.75	blk	Ground								
EC1	59	0.75	blk	Ground								
EC1	60	0.75	blk	Ground								
EC1	79	0.75	blk	Ground								
EC1	80	0.75	blk	Ground								
XA2	6	1	blk	Ground								
S119	9	1	blk	Ground								
S16	9	1	blk	Ground								
S20	9	1	blk	Ground								
S15	9	1	blk	Ground								
XK1	5	1	blk	Ground								
XK2	2	1	blk	Ground								
XK3	3	1	blk	Ground								



Pin
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4
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11
12
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14
16
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19
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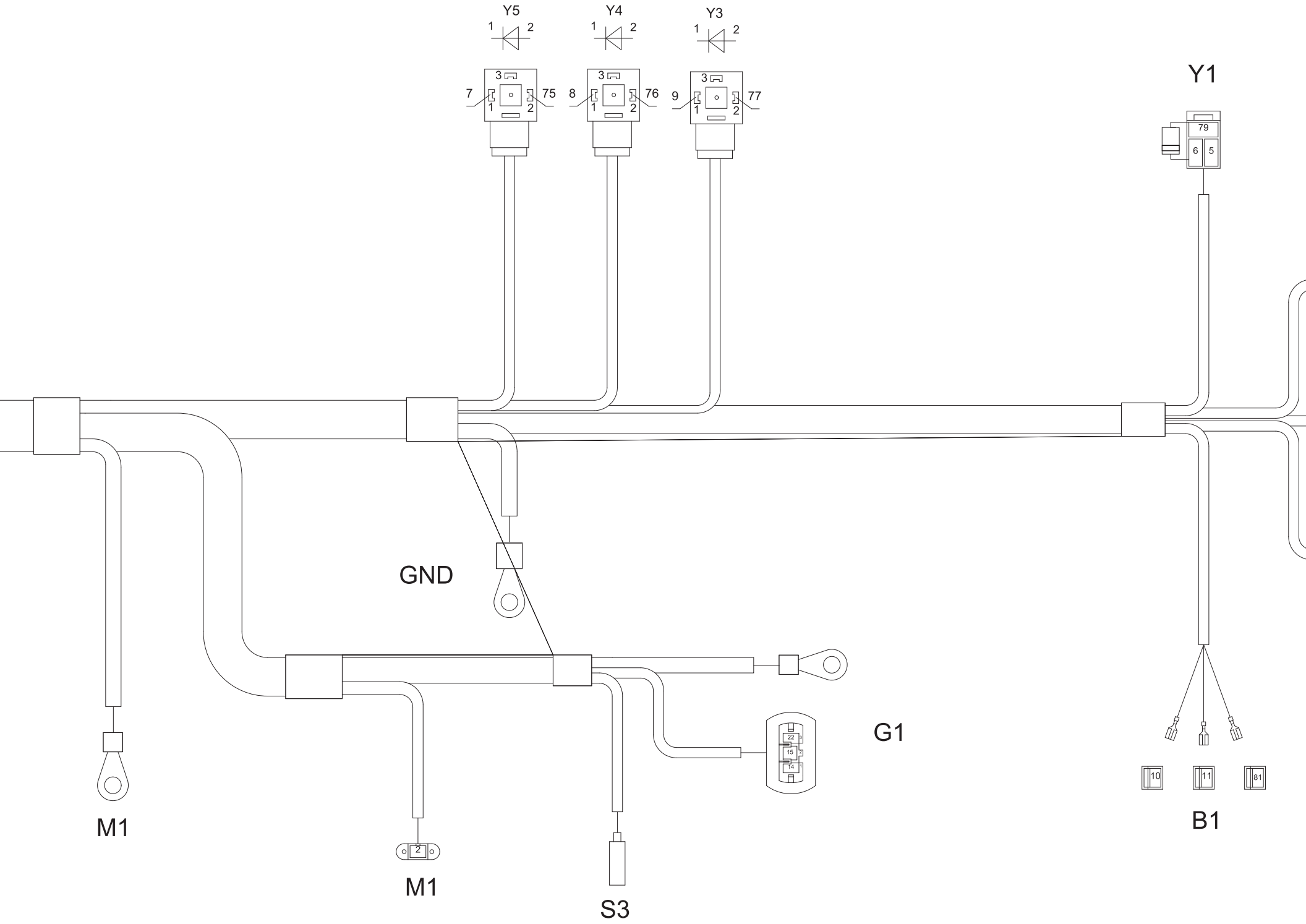
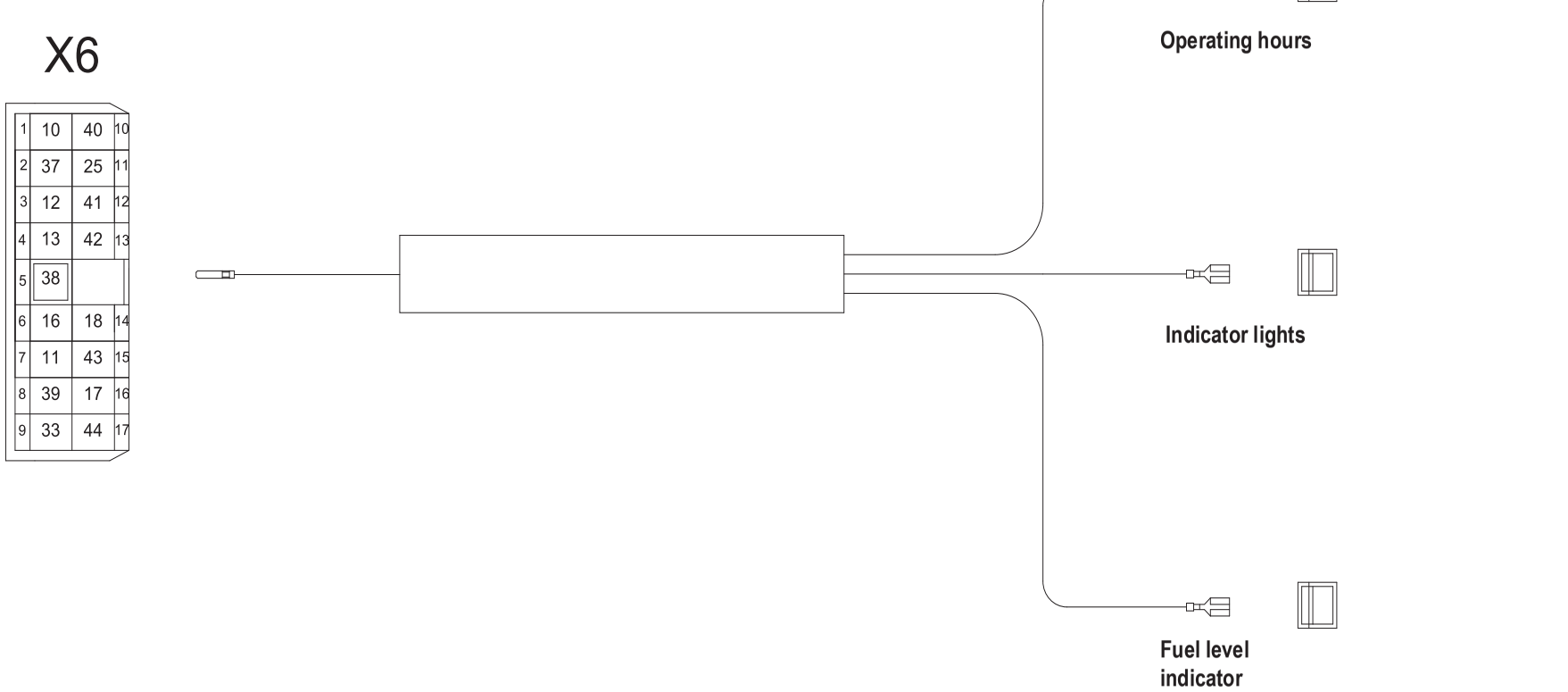
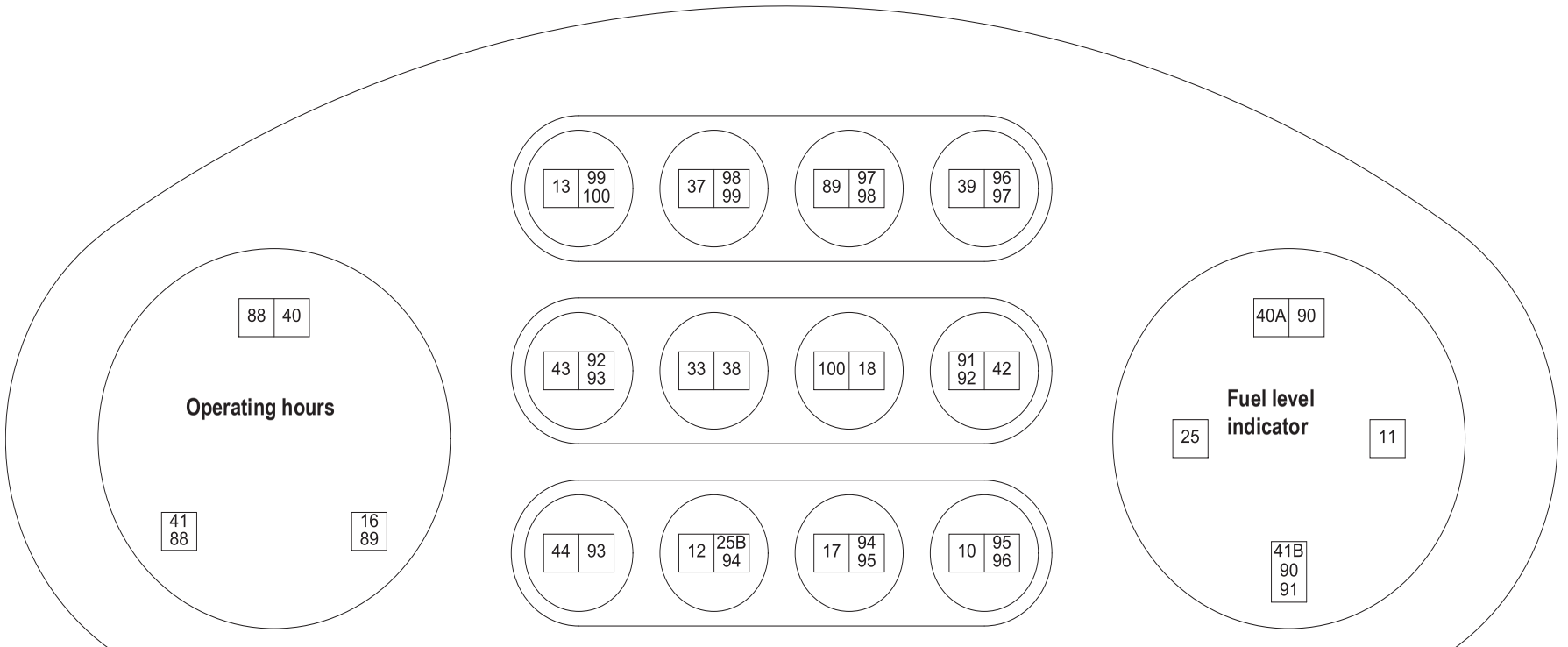
80

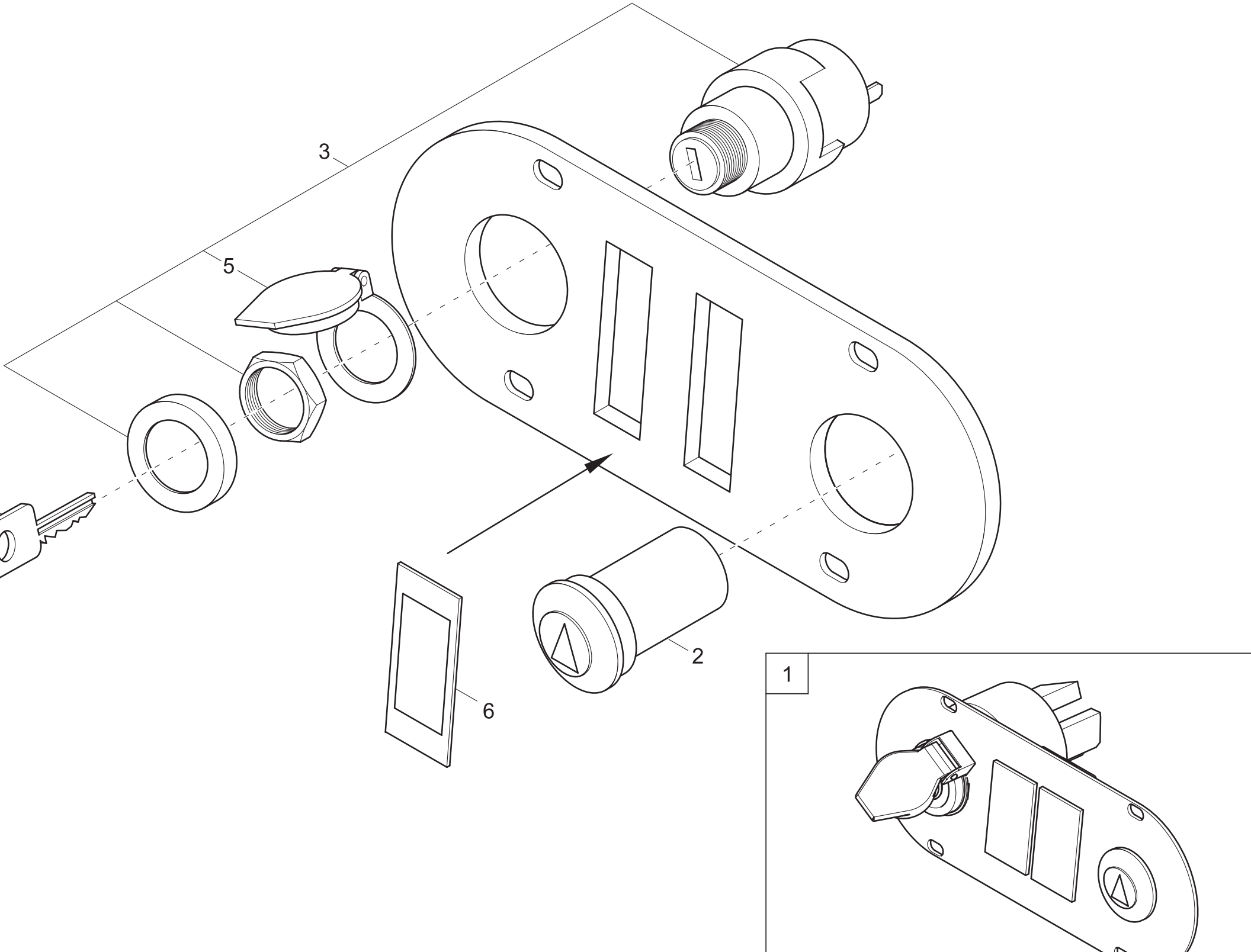
om	To		Color	mm^2
	X1	Starter 50	wht	2.5
	X1	Ground	blk	2.5
	X1	Pull contact cutoff solenoid	wht/red	2.5
	X1	Holding contact cutoff solenoid	blu/blk	1.5
	X2	Forward travel	brn/wht	1
	X2	Reverse travel	gry/blk	1
	X2	Fast machine travel	vio/grn	1
	X2	Empty reservoir	pkn/wht	1
	X2	Fuel level indicator	vio	1
	X2	Fouled hydraulic oil filter	org/wht	1
	X2	Engine temperature	grn/blk	1
	X2	Charge indicator light	pkn	1
	X2	Alternator excitation	ltblu/red	1
	X2	Engine oil pressure	wht	1
	X3	+12 V/30	red	6
	X3	+12 V/30	red	6
	X3	Preheating system	brn	4
	X2	Engine speed signal	blu/blk	1
	M1	+12 V/30	red	2.5
	M1	+12 V/30	red	2.5
	GND	Ground	blk	1
	GND	Ground	blk	1
	GND	Ground	blk	1
	GND	Ground	blk	1.5
	GND	Ground	blk	1
	GND	Ground	blk	1

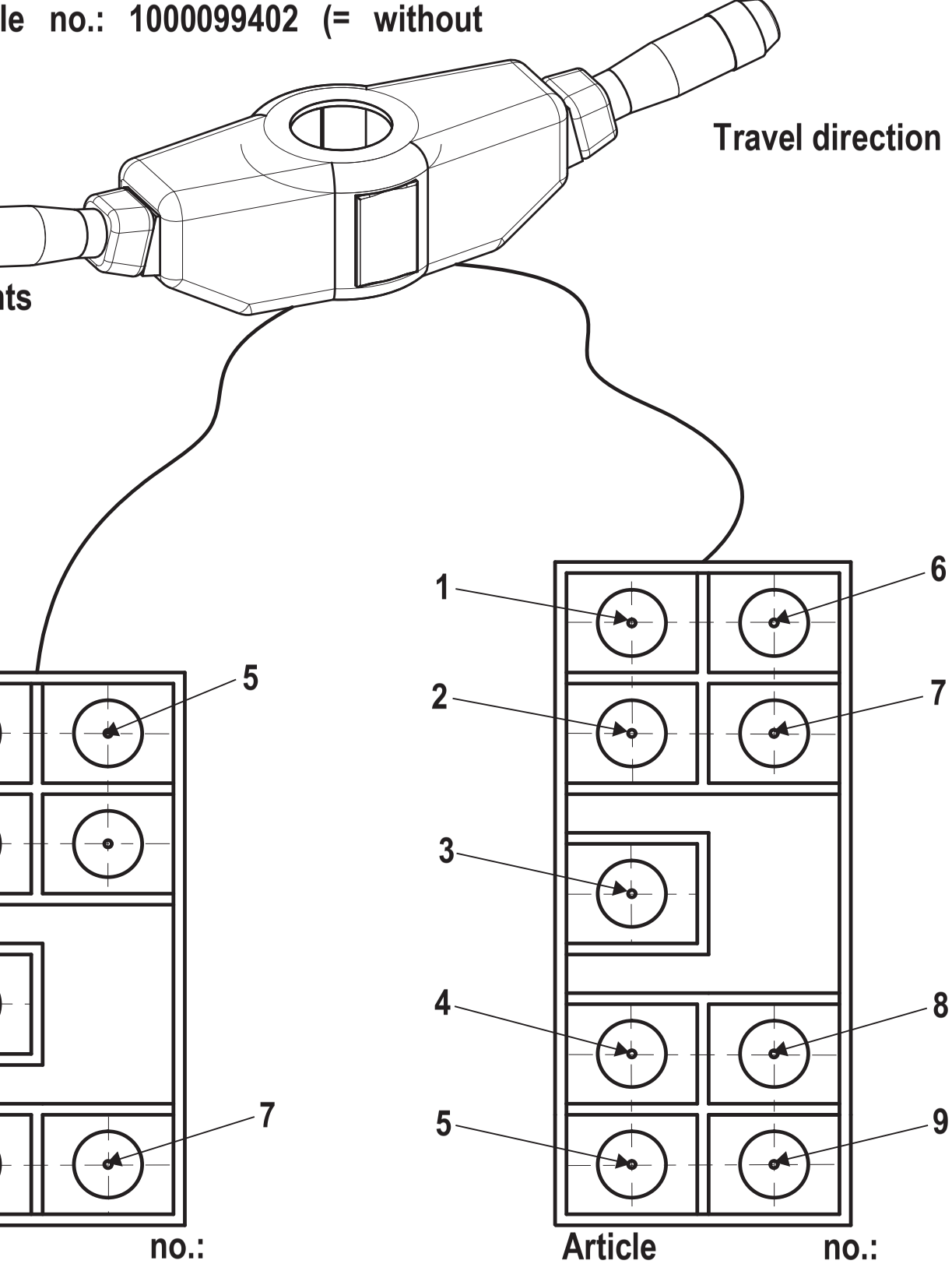

Y5
Y4
Y3
Y1
GND
G1
M1
M1
S3
B1

From	To	Color	mm^2
	Instrument panel	pkn/wht	320
	Instrument panel	yel/red	320
	Instrument panel	org/wht	320
	Instrument panel	grn/blk	320
	Instrument panel	brn/blk	320
	Operating hours	wht	380
	Fuel level indicator	vio	380
	Instrument panel	pkn/yel	320
	Instrument panel	brn/blk	320
	Operating hours	yel/blk	380
	Fuel level indicator	yel/blk	380
	Fuel level indicator	red	320
	Instrument panel	red	320
	Operating hours	blk	380
	Fuel level indicator	blk	380
	Instrument panel	grn	320
	Instrument panel	gry/blk/gry	320
	Instrument panel	ltblu/grn/ltblu	320
	Instrument panel	wht/blk/wht	320
	Instrument panel	vio/wht/vio	320
	Operating hours	blk	110
	Instrument panel	wht	360
	Fuel level indicator	blk	110
	Instrument panel	blk	360
	Instrument panel	blk	110
	Instrument panel	blk	110
	Instrument panel	red	110
	Instrument panel	red	110
	Instrument panel	red	110
	Instrument panel	red	110
	Instrument panel	red	110
	Instrument panel	red	110
	Instrument panel	red	110
	Starter	brn	340
	Starter	red	340
	Starter	red	340
	Starter	blu	340
	X4	yel	110
	Starter	blu	340
	Starter	wht	340
	Hazard warning lights	blu/red	340
	Hazard warning lights	ltblu	340
	Hazard warning lights	blu	340
	Hazard warning lights	blu/blk	340
	Hazard warning lights	blu/yel	340
	Hazard warning lights	red/yel	340


X6
1 10 40 10
2 37 25 11
3 12 41 12
4 13 42 13
5 38
6 16 18 14
7 11 43 15
8 39 17 16
9 33 44 17
Operating hours
Indicator lights
Fuel level indicator


13 99 100
37 98 99
89 97 98
39 96 97
88 40
Operating hours
41 88
16 89
43 92 93
33 38
100 18
91 92 42
44 93
12 25B 94
17 94 95
10 95 96
40A 90
Fuel level indicator
25
11
41B 90 91

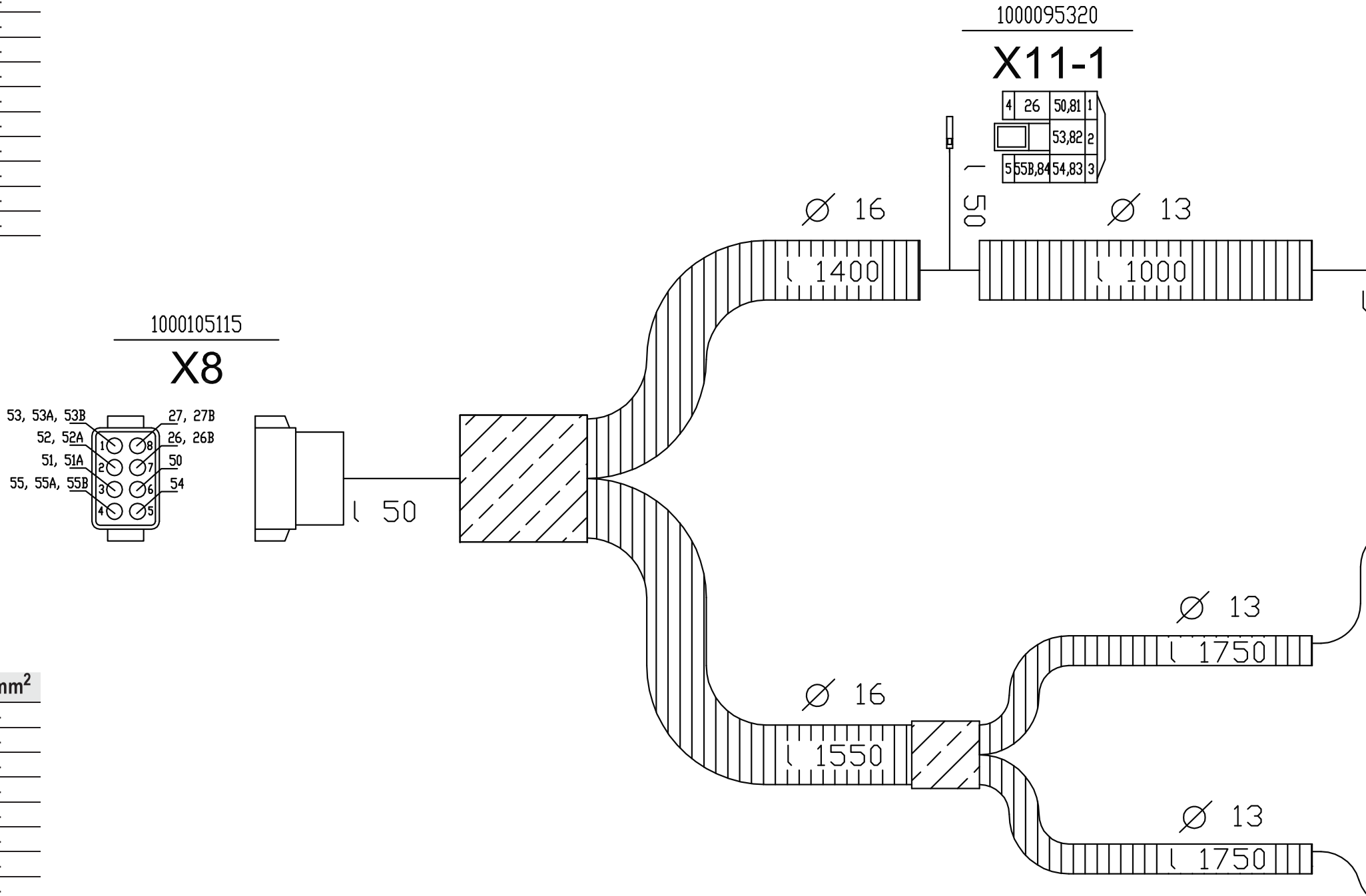

3
5
6
2
1



Connector article no.:		
Pos. no.	Color	
1	Blue – black	For
2	Red	+ (1
3	Blue	Rev
4	White	+ (1
5	Green	Fas
7	Yellow	Slo

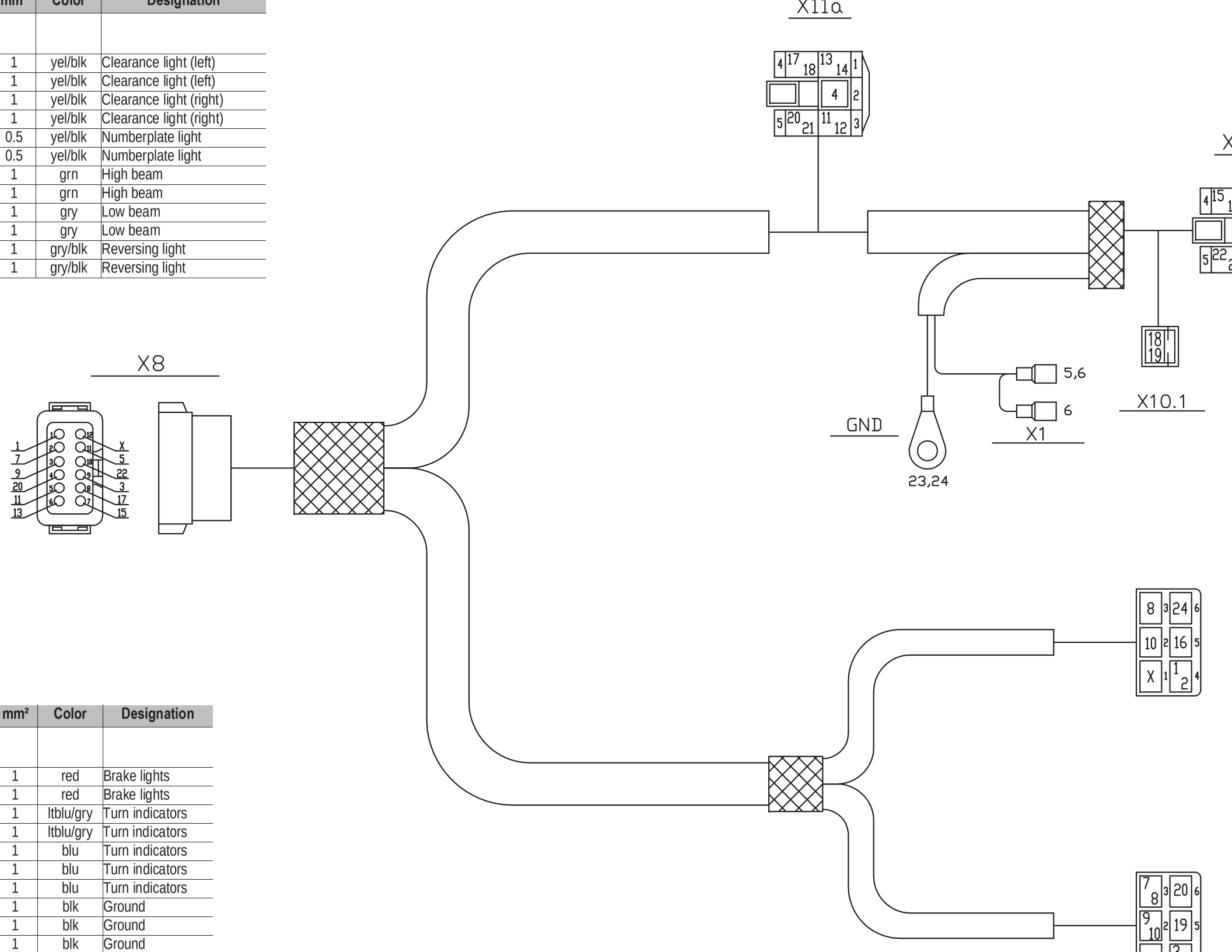
Connector article no.:		
Pos. no.	Color	
1	Blue – black	Tur
2	Gray	Low
3	Brown	+ (1
4	Yellow	Par
5	Orange	Tur
6	Blue	Tur
7	White	Hor
8	Black	Gro
9	Green	Hig

r	mm²
	1
	1
	1
	1
k	1
	1
	1
	1
	1
k	1



r	mm²
k	1
k	1
	1
	1
	1
	1
k	1
k	1
	1
	1

mm	Color	Designation
1	yel/blk	Clearance light (left)
1	yel/blk	Clearance light (left)
1	yel/blk	Clearance light (right)
1	yel/blk	Clearance light (right)
0.5	yel/blk	Numberplate light
0.5	yel/blk	Numberplate light
1	grn	High beam
1	grn	High beam
1	gry	Low beam
1	gry	Low beam
1	gry/blk	Reversing light
1	gry/blk	Reversing light



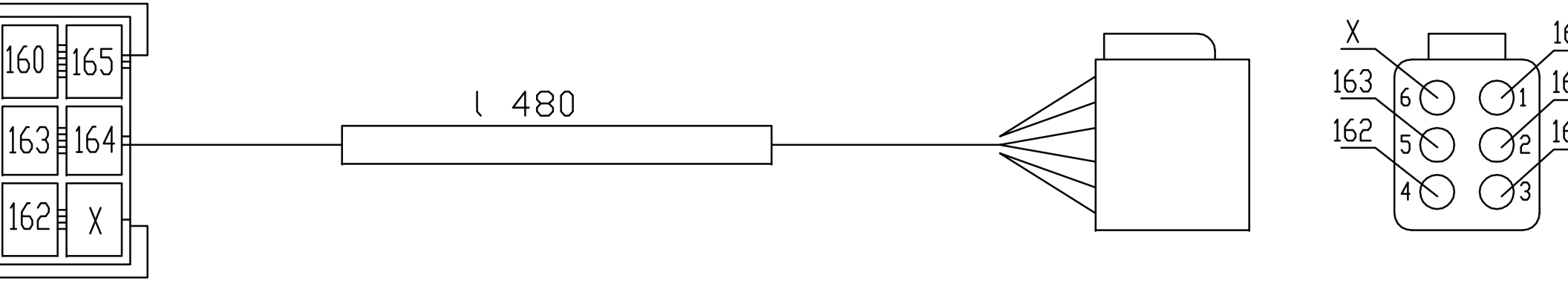
mm²	Color	Designation
1	red	Brake lights
1	red	Brake lights
1	ltblu/gry	Turn indicators
1	ltblu/gry	Turn indicators
1	blu	Turn indicators
1	blu	Turn indicators
1	blu	Turn indicators
1	blk	Ground
1	blk	Ground
1	blk	Ground

LE1

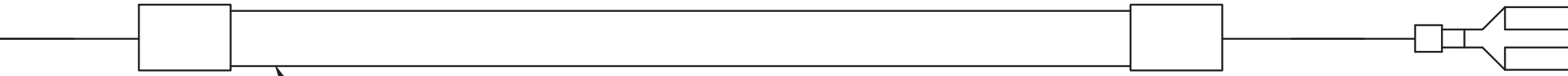
180906-0
00095335

LE2

DT06-6-S-C015
1000027431



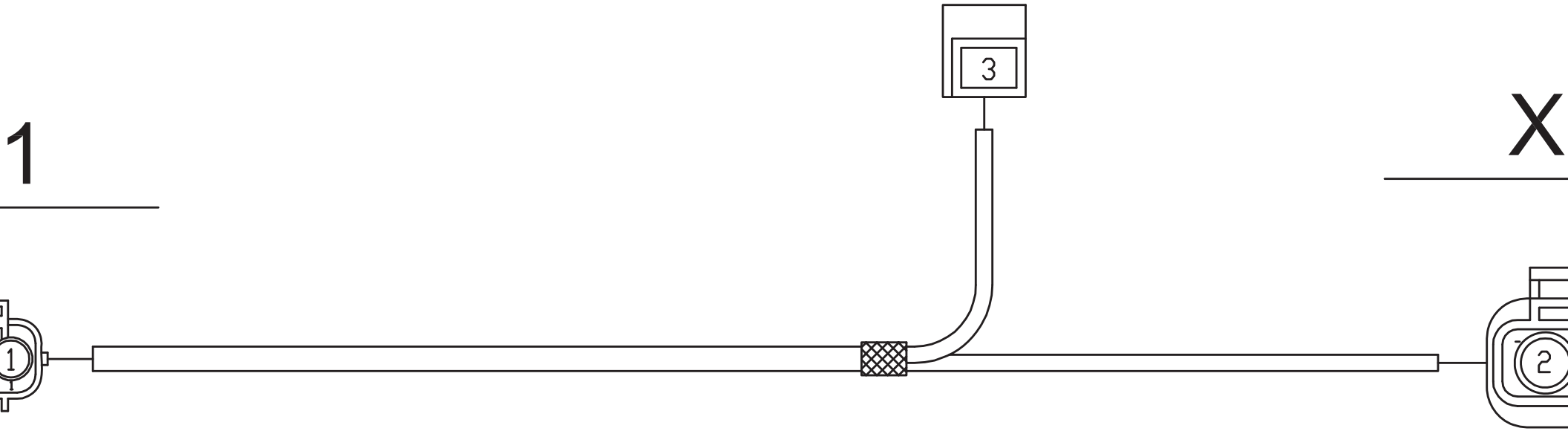
160	–	Black	1.0mm
162	–	yellow/black	1.0mm
163	–	blue	1.0mm
164	–	gray	1.0mm
165	–	green	1.0mm



Corrugated pipe PP

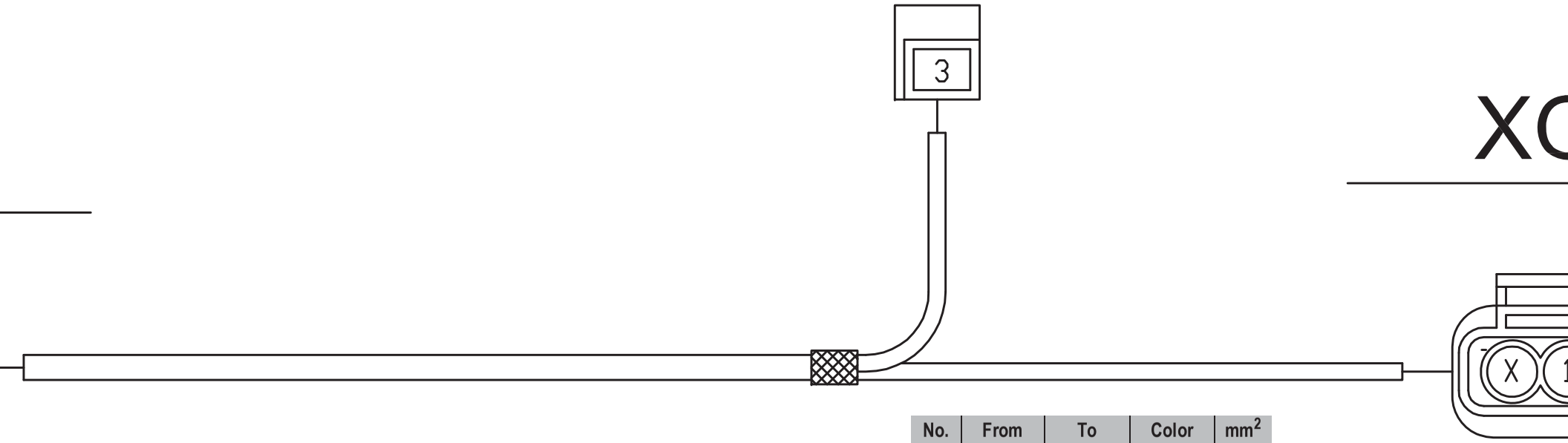
Temperature range −30 °C to + 100 °C (−22 °F to 212 °F)

XG1.1

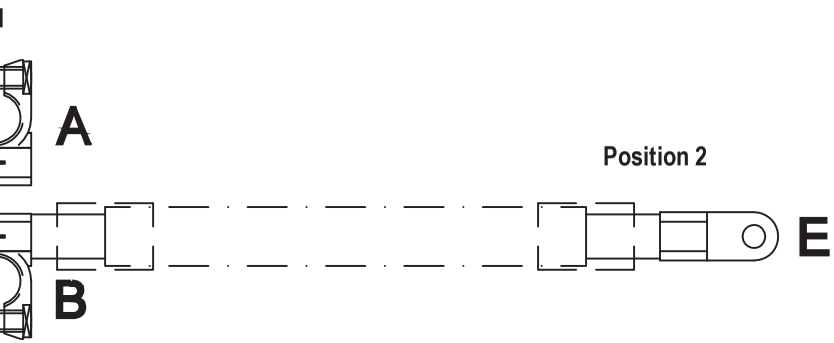


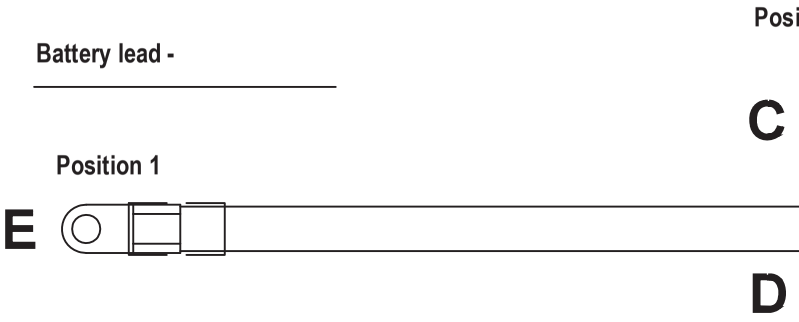
No.	From	To	Color	mm^2
1	G1/1	XG1/−	pnk	1
2	G1/2	XG1/+	blu	1
3	G1/3	XG1.1	wht	1

XG1.1

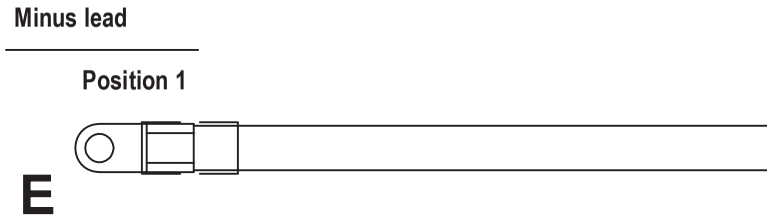


No.	From	To	Color	mm^2
1	G1/1	XG1/–	pnk	1
3	G1/3	XG1.1	wht	1


A
Position 2
E
B


Battery lead -
C
Position 1
E
D


Plus lead
Position 1
E


Minus lead
Position 1
E

Wacker Neuson Linz GmbH keep abreast of the latest technical developments and constantly improve their products. For this reason, we may from time to time need to make changes to figures and descriptions in this documentation that do not reflect products that have already been delivered and that will not be implemented on these machines.

Technical data, dimensions and weights are only given as an indication. Responsibility for errors or omissions not accepted.

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Order no. 1000156004
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