en

Service manual

Wheel loader

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Lock the working hydraulics in accordance with the instructions in the **operator's manual**.

17. Secure all loose parts of the machine.
18. Never start up a machine without first making a thorough tour of inspection and checking if any warning signs are missing or illegible.
19. Observe all signs with warnings or safety instructions.
20. Special safety apparatus must be fitted to the machine for certain applications. If this is the case, only work with this apparatus fitted and in working order.
21. Do not make any modifications, extensions or conversions to the machine which may impair safety. This also applies to installing and adjusting safety equipment and safety valves, as well as to welding on load-bearing components.
22. Avoid standing near the diesel engine while it is running. People who have a pacemaker must not stand next to the diesel diesel engine while it is running (minimum distance 50 cm).
23. Do no touch live components when the diesel engine is running!

010.1.2 Instructions on preventing crushing injuries and burns

1. Do not work under the attachment if it is not resting on the ground or supported.
2. Do not use any ropes or chains which are damaged or which have insufficient load bearing capacity.
   Wear protective gloves when handling wire ropes.
3. When working with the attachment, never align the boreholes with your fingers, instead, use a suitable mandrel for this purpose.
4. Make sure no objects come into contact with the fan when the diesel engine is running.
   Objects which fall or project into the fan will be thrown back out or destroyed and could damage the fan.
5. When the machine is near operating temperature, the engine cooler system is hot and pressurised.
   Do not touch parts carrying cooling water.
   This can lead to burns.
6. Only check the coolant level once the cap on the expansion tank has cooled down enough to touch.
   Carefully open the cap to let out excess pressure.
7. When running at or near the operating temperature, the engine oil and hydraulic oil are hot.
   Avoid touching hot oil or parts which carry oil.
8. Wear safety glasses and protective gloves when working on the battery.
   Avoid sparks and naked lights.
9. Never let anyone move the bucket or other working attachments into position by hand.
10. Any time you open the engine compartment, secure the compartment doors from falling shut.
11. Before starting up the machine, close and lock the engine compartment doors and the battery compartment cover.
12. Never lie under the machine when it is raised using the working attachment, unless the undercarriage is securely supported using wooden beams.
13. Avoid touching hot surfaces and liquids. This can lead to burns.

010.1.3 Instructions on preventing fires and explosions

1. When refuelling, the diesel engine must be turned off. Switch off the auxiliary heater, if installed.

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external fitting may not be installed or fitted on the machine without prior written consent from LIEBHERR.
2. The appropriate technical documentation should be made available to LIEBHERR for this purpose.
3. When adding or converting a working attachment or tyres, the field of view of the operator and the stability of the machine must be checked and ensured in accordance with **EN 474**.

010.1.19 Protection against vibrations

1. The vibrations to which mobile construction machines are subjected are mainly due to the way they are used.

   The following parameters in particular have a great effect:
   - Terrain conditions: bumps and potholes.
   - Operating methods: speed, steering, braking, use of the controls while driving and while working.
2. The amount of vibration largely depends on the driver, who determines the speed, gear ratio, working methods and distance covered.
   This results in a wide range of different vibrations for the same type of machine.
3. The driver's overall exposure to body vibration can be reduced by following these recommendations:
   - Select a suitable machine, equipment and accessories for the job.
   - Use a machine equipped with a suitable seat (i.e. for earthworking machines, one which complies with EN ISO 7096).
   - Keep the seat in good repair and adjust the position and cushioning according to the height and weight of the driver.
   - Regularly check the suspension and adjustment mechanisms of the seat and make sure the seat is kept in the condition specified by the manufacturer.
   - Check the maintenance status of the machine, especially: the tyre pressure, brakes, steering, mechanical connections etc.
   - Do not steer, brake, accelerate, shift gears or load the working attachment of the machine suddenly.
   - Adjust the speed of the machine to the distance to be driven in order to reduce vibrations.
     Slow down when driving over difficult terrain.
     Drive around obstacles and avoid difficult terrain.
   - Keep the area on which the machine is operated in a tidy condition.
     Remove any large rocks and obstacles.
     Fill in any trenches or holes.
     Have machines available to maintain good terrain and plan sufficient time to do so.
   - Travel over longer distances (e.g. public roads) at a suitable (medium) speed.
   - For machines which are often driven on open roads, use a special additional system (if available) to reduce vibrations during this type of use.
     If such systems are not available, control your speed to stop the machine from "rocking".

010.1.20 See and be seen

010.1.20.1 Field of view and visual aids

Sufficient visibility conditions are required in order to operate and drive the machine safety.

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Standards	Description
DIN 34800 (11/2016)	Bolts and screws with external hexalobular driving feature with small flange
VDI 2230 Sheet 1 (02/2003)	Systematic calculation of highly stressed bolted joints - Joints with one cylindrical bolt
LH 10215295-002 (06/2015)	LN 252-8 Corrosion protection for inexpensive standard parts (C parts) salt spray mist test > 480 hours
LH 10021432-010 (06/2015)	Delivery specification for steel fasteners with zinc flake coating (FIZn)

Tab. 14: Other applicable documents

010.3.1.3 Modifications and descriptions

The prestressing forces and tightening torques listed in the table are taken from VDI Standard 2230 of February 2003.

Assembly prestressing forces F_M and tightening torques M_A at 90% utilisation of the yield point for shank bolts with metric standard or fine threads as per DIN ISO 262 (and DIN ISO 965-2); head dimensions of hex head screws as per DIN EN ISO 4014 to 4018, bolts with external hex head as per DIN 34800 and cylinder-head bolts as per DIN EN ISO 4762 and “medium” bore as per DIN EN 20273.

Remarks:
- Tightening torques given on drawings or in documents from the Liebherr service documentation always take precedence over the works standards, and must be observed.
- For important bolt connections, angle control tightening may be advantageous. If so, required tightening torques (joining torque, rotary angle) must be calculated individually by customer service of manufacturing factory of machine.
- When tightening in aluminium with or without using a helicoil, and with weld nuts, values in class 8.8 must be used. However, tightening torques given on drawings or in documents from Liebherr service documentation are binding, take precedence and must be observed.

010.3.1.4 Tightening torques

Note

If torques are specified in Liebherr construction drawings or documents from the Liebherr service documentation, then these should take precedence.

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NOTICE
If the maximum operating pressure is exceeded, the adapters and the assembly unit itself can be damaged.

- ▶ The maximum operating pressures are embossed on the adapters. If the maximum operating pressure is not specified on an adapter, it can be found in the table of tightening values (see item 4) with the aid of the adapter identification number. This value must then be embossed on adapter!
- ▶ Maximum operating pressure for adapter must be set on hydraulic pump of assembly unit before tightening (see separate operating manual for assembly unit). If two adapters with different maximum operating pressures are used during assembly, then the lowest pressure applies. The ID number of the assembly unit to be used can be found using the 4-digit tightening value number from the table of tightening values (see item 4).

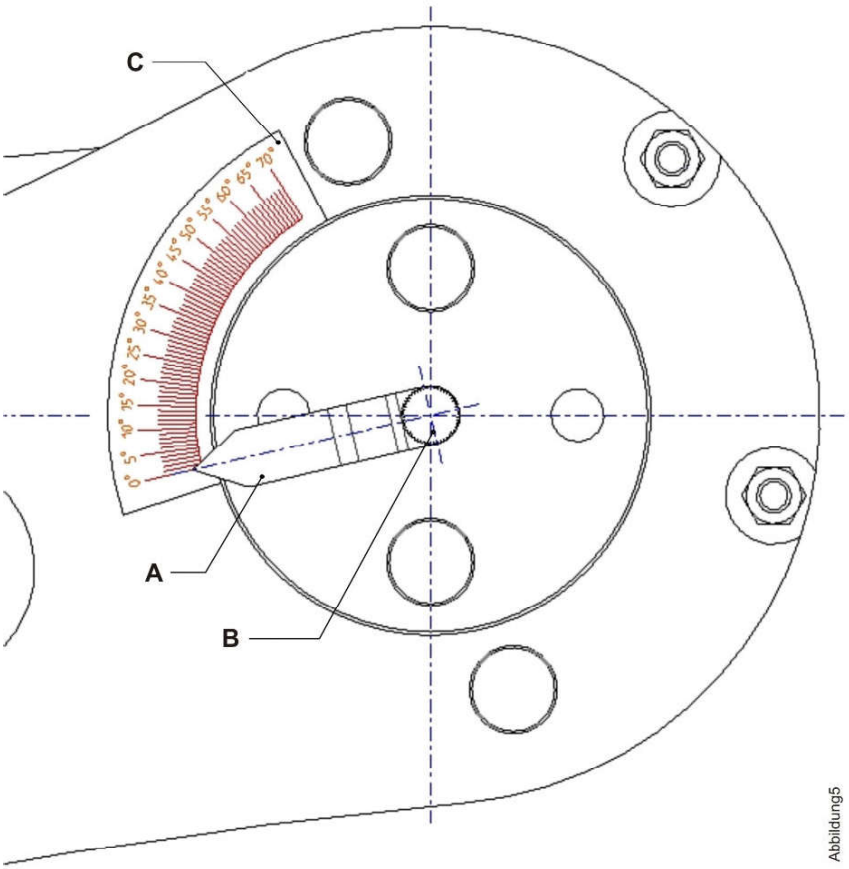

Fig. 9: Figure 5

A Indicator
B Adjusting screw
C Angle scale

– Before tightening, the indicator **A** must be set using the adjusting screw **B** to 0° on the angle scale **C**.
– The angle of torsion can be read on the angle scale. If the opening angle of the assembly unit is not enough to achieve the specified angle of torsion, reposition the assembly unit for another tightening procedure.

– Seal the complete machine (diesel engine, hydraulic components, main frame, containers, running gear, axles, oscillating axle frame, work equipment etc.) with Waxoyl 120-4 preservation wax. (Amount of corrosion protection agent: with one litre of Waxoyl, a preservation area of approx. 5 m^2 can be treated)

The following points must be observed when putting on the corrosion inhibiting wax:
– Keep to the drying time of 3 hours.
– Ambient temperature is at least 15 °C.
– Use protective equipment (breathing protection, protective goggles, extraction, etc.).
– The solvents used in the corrosion inhibiting wax are inflammable! (Avoid smoking and open flames).
– Resistance to cold down to a temperature of -40 °C.
– **Check the machine every month and apply preservation agents if required.**

010.4.3.3 Out of service for longer than 12 months

Carry out all tasks as described in the section on putting the machine out of service for up to 12 months.

Also required is:
– **If it is planned to put a machine out of service for longer than 12 months, then the diesel engine manufacturer's customer service must be contacted.**
– Seal air tight all openings like air filters, exhaust pipes, ventilation openings on units and so on. The fuel tank's ventilation and bleeder filters (if available) must stay open for safety reasons.
– Rub talcum powder into the sealing rubber of the containers and driver's cab, and seal the doors. If there is no operator's cab, cover the operator’s platform in a suitable manner. Cover the driver seat and control panel using suitable materials.

010.4.4 Putting back into service

010.4.4.1 After being out of service for 2 months

– Remove dehumidification capsule from the electronics box.
– Check fill levels and lubricate machines according to the operating instructions.
– Install batteries and clean and grease battery connections.
– Open exhaust outlet.
– Remove corrosion inhibiting grease.
– Let out water from the fuel tank or condensation from the diesel engine prefilter (see operating instructions).
– Clean the corrosion inhibiting wax off the ball joints, hinges, bare parts and exposed piston rods.
– Put the machine back into service according to the operating instructions.
– Before work with the machine, check all functions of the machine and immediately rectify any defects. Carry out a comprehensive visual inspection on the machine.
– Activate all the functions of the travel and working hydraulics and of the other hydraulic components, and operate alternately for approx. 20 minutes in total. Hydraulic cylinders must each be extended and retracted over their full stroke length.

Observe any extra guidelines for special construction equipment or local conditions.

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020.3 Working hydraulics

020.3.1 Working hydraulics pump

Valid for: L538-1268/31321-;

Description	Unit	Value
Type		A11VO 75 LRDS
Maximum displacement per turn	cm^3	75
Maximum flow rate at upper engine speed	l/min	171
Power	kW	51
Weight	kg	45

020.3.2 Z kinematics control valve block

Valid for: L538-1268/31321-;

Description	Unit	Value
Type		M6-15
Spool valve diameter	mm	18
Lifting function - maximum flow rate	l/min	140
Lowering function - maximum flow rate	l/min	60
Tilt-in function - maximum flow rate	l/min	120
Tilt-out function - maximum flow rate	l/min	80
3rd function A3 (optional) - maximum flow rate	l/min	160
3rd function B3 (optional) - maximum flow rate	l/min	100
Pretension valve	bar	$16^{\pm 3}$
Weight	kg	32

020.3.3 P kinematics control valve block

Valid for: L538-1268/31321-;

Description	Unit	Value
Type		M6-15
Spool valve diameter	mm	18
Lifting function - maximum flow rate	l/min	140
Lowering function - maximum flow rate	l/min	60
Tilt-in function - maximum flow rate	l/min	140
Tilt-out function - maximum flow rate	l/min	90

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020.7.5 Parking brake hydro accumulator

Valid for: L538-1268/31321-;

Description	Unit	Value
Storage volume	cm^3	320
Nitrogen filling - preload pressure	bar	80

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020.13.2.3 MX-F 45

Description	Unit	Value
Flow per outlet	mm^3	45
Flow per element	mm^3	90
Piston diameter	mm	4

020.13.2.4 MX-F 75

Description	Unit	Value
Flow per outlet	mm^3	75
Flow per element	mm^3	150
Piston diameter	mm	5

020.13.2.5 MX-F105

Description	Unit	Value
Flow per outlet	mm^3	105
Flow per element	mm^3	210
Piston diameter	mm	6

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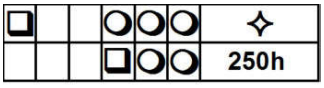
030.1 Maintenance and inspection schedule

The following abbreviations are used in this section:
– h = operating hours

Various symbols (solid or empty circles, boxes and stars) are used to indicate the maintenance tasks, which fall into two main types.

 G2036200	**The symbols have the following meanings:** Table with solid circle, box or star Responsibility for carrying out the maintenance work lies with the machine operator or its maintenance staff. Maintenance interval: on delivery, every 10 and 50 service hours (h), and at unscheduled times.

Tab. 21: Machine operator

 G2036201	**The symbols have the following meanings:** Table with empty circle, box or star, or service hours (h) The maintenance and inspection work must be performed or supervised by authorised specialist staff from Liebherr or its authorised dealers. Maintenance interval: on handover and every 500, 1000, 2000, 3000 operating hours (h), and at unscheduled times.

Tab. 22: Authorised specialist staff

You will find a list of the spare parts needed for maintenance and inspection work in the service package of the spare parts list.

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The following diesel engine oil is recommended for ambient temperatures from -30 °C to 45 °C:

Liebherr Motoroil 5W-30 low ash, specification ACEA E6

030.3.4.3 Complicating factors affect the oil change

Change the oil according to the climate zone, sulphur content in the fuel and oil quality as shown in the following table.

Even if the specified number of service hours (h) is not reached in the course of a year, the engine oil and filter should be replaced at least once a year.

Various **complicating factors** (harsh operating conditions) can affect the maintenance interval.

Possible complicating factors:
- Frequent cold-starts
- Sulphur content in the fuel
- Operating temperature

If complicating factors come into play, the oil must be changed and the filter replaced in accordance with the specifications in the following tables.

Complicating factor		**Oil quality**	
		CJ-4	
		E9	E6
Operating conditions	**Sulphur content in the fuel**	**Interval (h = operating hours)**	
Normal climate, down to -10 °C	Up to 0.0015%	250 h	500 h
Climates below -10 °C	Up to 0.0015%	125 h	250 h

Tab. 27: Oil change intervals according to complicating factors

030.3.5 Refrigerant

Valid for: L538-1268;

Description	**Air conditioning**
Refrigerant	R134a
Greenhouse gas potential	1430
CO_2 equivalent of 1 kg of R134a	1.43 t

Tab. 28: Minimum quality requirement

The air conditioning system contains fluorinated greenhouse gases.

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NOTICE
Oil quality

▶ Mixing various types of oil is not permitted.

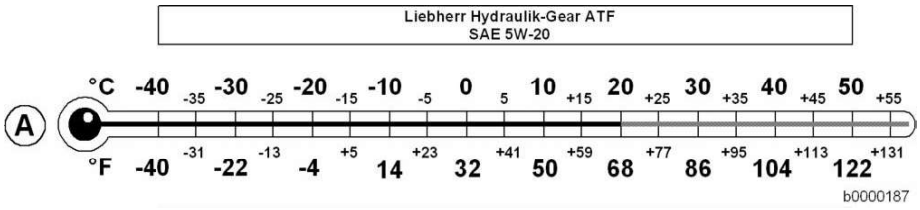

Fig. 21: Selection of the SAE class according to temperature

A Ambient temperature

The temperature ranges specified in the diagram are guidelines and can be briefly exceeded or fallen short of.

030.3.10 Lubricating oils for axles

Valid for: L538-1268/31321-;

Recommended lubricant	Specification
Liebherr Gear Basic 90LS	API: GL-5 MIL-L: 2105 D ZF: TE-ML 05C or 05F
LS = Gear oil with limited slip additives for disc brakes and self-locking differentials.	

Tab. 43: Lubricating oil specifications

For viscosity class SAE 90 LS, an oil of viscosity class SAE 80 W 90 LS can also be used.

If Liebherr oils cannot be purchased locally, oils that comply with specifications must be used instead (after consultation with customer service).

NOTICE
Oil quality

▶ Mixing various types of oil is not permitted.

▶ Phosphor content of at least 1900 mg/kg required.

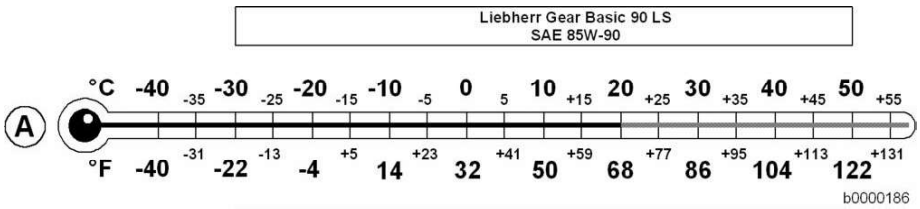

Fig. 22: Selection of SAE class according to temperature

A Ambient temperature

030.4.3.5 Making sure the bolted connections are tight

Valid for: L538-1268/31321-;

Make sure that the following requirements are fulfilled:
- ❑ The machine is in maintenance position 2.
- ❑ The service doors, hatches and hoods are open.

▶ Check that all bolts and screws are tight.

▶ Tighten any loose screws or bolts with the required tightening torque.

030.4.3.6 Corrosion protection system for use with salt and artificial fertilisers (optional): Carrying out corrosion protection

Valid for: L538-1268/31321-;

This equipment is optional.

If you carry out corrosion protection:

▶ See the separate operator's manual “Using salt and artificial fertiliser”.

030.4.3.7 Oil analyses

Valid for: L538-1268/31321-;

Oil analyses are only meaningful if there has been compliance with the specific procedure. The results of the analyses in the printed laboratory reports are not only affected by the condition of the oil but by other factors as well.

Note the following points when taking oil samples:
- – Take oil samples from clean sampling points.
- – Take oil samples at operating temperature.
- – Use a hand pump for sections where no pressure is built up.
- – When using a hand pump, take the oil sample immediately after the machine has come to a standstill because the dirt and abraded particles are still in suspension and any water in the oil has not yet separated.
- – When using the hand pump, dip the sampling hose into the middle of the oil.
- – Always use the same method and take the oil sample at the same place (this makes the values comparable with each other).
- – Never take the oil sample from the filter.
- – Do not take samples immediately after an oil change or after large amounts of oil have been added.
- – Fill the oil that is to be tested into a clean and dry original sample container from the sampling kit.
- – The sampling systems must be **CLEAN**. The exterior of the sample container, sampling valve and sampling hose may also not come into contact with dust and dirt, neither whilst flushing nor during sampling. This is the only way to ensure that unobjectionable results are obtained.

Tools required:

Quantity	Description	Item code
1	1 m test line	7002437
1	Hand pump with sampling hose	8145666

Tab. 46: Tools required

Oil analysis kits

Liebherr recommends having the oil analyses carried out by Oelcheck.

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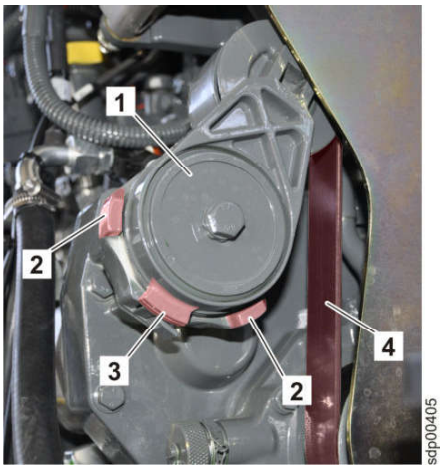

Fig. 40: Tensioning device stops

1	Tensioning device	**3**	Tensioning device stop
2	Fixed cast stops	**4**	V-ribbed belt

The following damage could occur on the V-ribbed belt **4**:
- Broken ribs
- Cracks across several ribs
- Lumps of rubber on the belt
- Accumulated dirt or grit
- Ribs coming loose from the belt
- Cracks across the back

▶ Check the V-ribbed belt **4** for damage.

If damage is found:
▶ Replace the V-ribbed belt. (For more information see: Changing V-ribbed belt of diesel engine, page 030-49)

The engine is equipped with an automatic tensioning device for the V-ribbed belt.

▶ Conduct visual check of the stops **2** and **3**.
  ▷ The tensioning device **3** stop must not be touching the cast stops **2**.

If the tensioning device stop is touching one of the cast stops:
▶ Check the length of the V-ribbed belt and fastenings of the generator, the clamping device, the deflecting rollers, etc.

▶ Start the engine.

WARNING
Risk of injury from rotating parts in the diesel engine!

▶ Watch out for rotating engine parts.

▶ Check V-ribbed belt and tensioning device for running noise.

If the V-ribbed belt wobbles or noises occur:
▶ Replace the tensioning device.

030.4.4.5 Changing V-ribbed belt of diesel engine

Valid for: L538-1268/31321-;

Make sure that following requirements are fulfilled:
❑ Machine is in maintenance position 1.
❑ Engine compartment hood is open.

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- ▶ Place a receptacle under the fuel tank.
- ▶ Unscrew the cap **2** on the drain valve **1** on the bottom of the fuel tank.
- ▶ Screw the drain hose **3** onto the drain valve **1**.
  ▷ Condensate and sediment drain off.
- ▶ Drain the condensation and sediment into a suitable receptacle until clean fuel begins to flow.
- ▶ Unscrew the drain hose **3**.
- ▶ Screw the cap **2** onto the drain valve **1** and tighten it.

030.4.4.11 Draining off condensate from the fuel pre-filter

Valid for: L538-1268/31321-;

When the water level sensor in the fuel pre-filter is activated (the service code is displayed), the water collector tank must be drained.

Make sure that the following requirements are fulfilled:
- ❑ The machine is in maintenance position 1.
- ❑ The service access is open.
- ❑ You have a suitable receptacle ready.
- ❑ The engine has cooled down.

DANGER
Beware of fire

- ▶ Naked flames and smoking are prohibited.

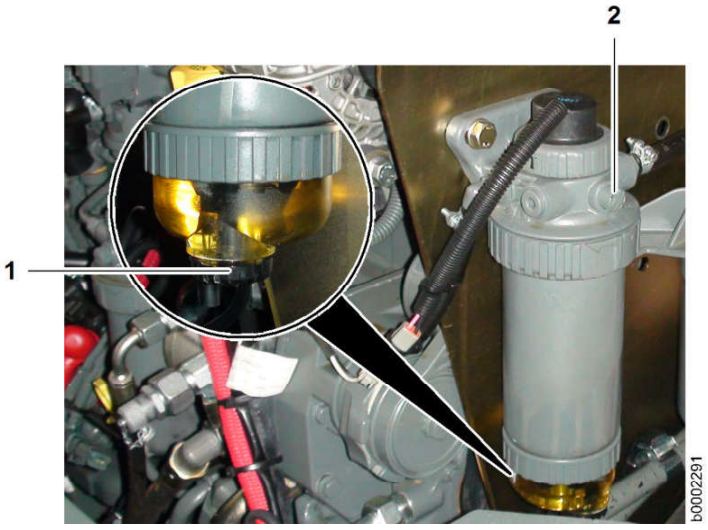

Fig. 52: Draining off condensate from the fuel pre-filter

1 Drain valve **2** Bleeder screw

Note
To prevent condensate flowing back into the fuel tank:

- ▶ Open the bleeder screw in front of the drain valve.

- ▶ Place a receptacle under the fuel pre-filter.

030.4.4.18 Changing the air filter safety element

Valid for: L538-1268/31321-;

NOTICE
Always carry out maintenance correctly.
Otherwise the engine may be damaged.

- ▶ Do not clean the safety element.
- ▶ Always replace the safety element.

Make sure the following preconditions are met:
- ❑ The machine is in maintenance position 1.
- ❑ The service access is open.
- ❑ The engine has cooled down.
- ❑ Suitable protective equipment is used.

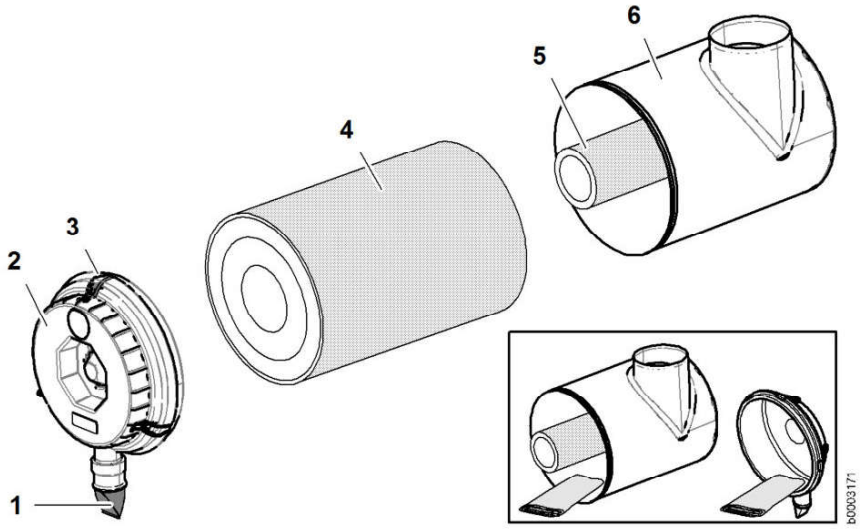

Fig. 63: Changing the air filter safety element

1	Dust discharge valve	**4**	Main element
2	Service cover	**5**	Safety element
3	Fixing clips	**6**	Filter housing

- ▶ Release the fixing clips **3** on the service cover **2**.
- ▶ Take off the service cover **2**.
- ▶ Remove the main element **4**.
- ▶ Clean the service cover **2** and the filter housing **6** with a clean cloth.
- ▶ Remove the safety element **5**.
- ▶ Lightly oil the sealing faces of the new safety element **5** and the main element **4**.
- ▶ Install the new safety element **5** and the main element **4**.
- ▶ Put the service cover **2**, with the dust discharge valve **1** facing down, on the filter housing **6**.
- ▶ Close the fixing clips **3**.

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- ▶ Continue along the guide line **3**, starting from the temperature -15 °C, and move diagonally left to the bottom.
- ▶ Finally, starting from the point where the lines cross, go horizontally along the (identified) line **2** to the far left.
  - ▷ This gives you the topping up quantity of pure antifreeze and corrosion inhibitor **1** (7.6 litres in this example) to be added in order to achieve protection down to -37 °C.
- ▶ To restore the correct mixing ratio, you must drain off at least the previously calculated quantity (the top-up quantity) from the cooling system.
- ▶ Top up with the correct quantity of pure antifreeze and corrosion inhibitor.
- ▶ The coolant previously drained off can be used if necessary to restore the required coolant level.

Using corrosion inhibitor without antifreeze

In exceptional cases and when outside temperatures never fall below freezing, such as in tropical zones, where it is demonstrable that no approved antifreeze and corrosion inhibitor is available, pure corrosion inhibitor may be used.

The coolant must be changed once a year.

The mixing ratio must consist of 7.5% corrosion inhibitor and 92.5% water.

The Gefo 2710 refractometer is recommended for testing.

Procedure for checking the coolant antifreeze concentration

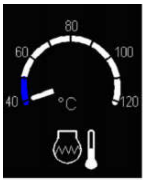

Fig. 76: Procedure for checking the coolant antifreeze concentration

CAUTION
Beware of scalding due to coolant escaping under pressure
Do not open the cap on the filler neck until the engine has cooled down.

- ▶ Let the engine cool down.

- ▶ Carefully open the sealing cap on the coolant equalising reservoir.
- ▶ Check the antifreeze concentration with a Gefo 2710 refractometer.

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▶ Screw on the breather filter **1**.

▶ Remove the plug **2** and keep it in a safe place.

030.4.7.4 Draining off condensate and sediment from the hydraulic tank

Valid for: L538-1268/31321-;

Make sure that the following requirements are fulfilled:
- ❑ The machine has not been started for at least one hour (condensate can build up).
- ❑ The machine is in maintenance position 1.
- ❑ The service access is open.
- ❑ You have a suitable collecting pan ready.
- ❑ You have a drain hose ready.

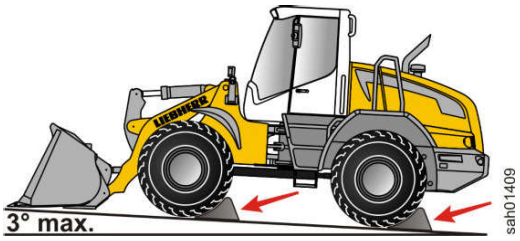

Fig. 89: Positioning the machine at an incline, putting wedges in place

Note
The drain valve of the hydraulic tank is not at the lowest point of the hydraulic tank. To be able to completely drain the condensate, the machine has to be positioned at a slight incline.

▶ Position the machine at a slight incline.

▶ Put the wheel wedges into position.

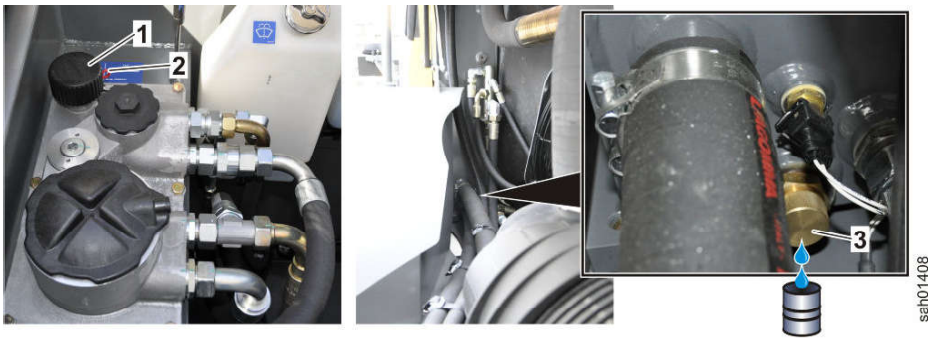

Fig. 90: Draining off condensate and sediment from the hydraulic tank

▶ Insert the plug **2** in the breather filter **1**.
▷ The anti-twist device of the breather filter is released.

▶ Unscrew the bleeder filter **1**.
▷ The tank pre-tension is released.

▶ Screw off the sealing cap on the hydraulic tank drain valve **3** on the back of the hydraulic tank.

▶ Screw the drain hose on to the hydraulic tank drain valve **3**.

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Checking the rear axle brake discs for wear

Measure the wear on the rear axle brake discs if the brake discs on the front axle are worn. The brake discs on the rear axle should therefore have a minimum thickness of **5.6 mm**.

This ensures that the brake discs do not become too worn by the time the next inspection is due.

▶ The procedure is the same as for the front axle.

030.4.9.3 Checking gap and wear on parking brake linings

Valid for: L538-1268/31321-;

Make sure that following requirements are fulfilled:
❑ Machine is cold.
❑ Machine is parked on level ground.

Make sure that following tools are ready:
❑ Feeler gauge
❑ Laptop with Sculi diagnostic software
❑ Torque wrench

Preparations

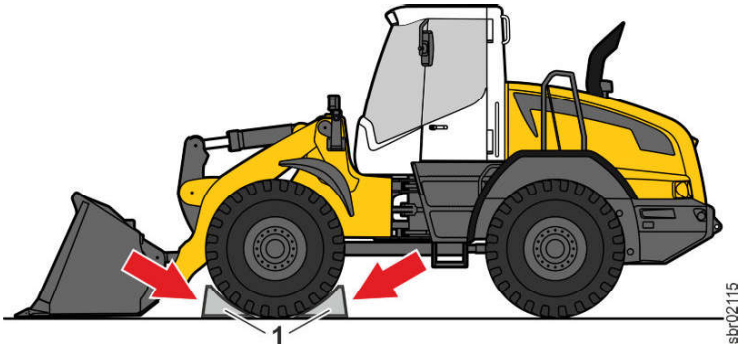

Fig. 102: Use chocks to secure the machine against rolling away

▶ Start diesel engine.

▶ Lay bucket flat on ground.

▶ Turn off diesel engine.

▶ Use chocks **1** to secure machine against rolling away.

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Fig. 110: Button cover and buttons

▶ Undo the two TORX screws **3** (size 8).

Note

▶ To remove the push button covering **4** more easily, push together the two grips of the control lever.

▶ Note that the push buttons **5** are different sizes.

▶ Take off the button cover **4**.

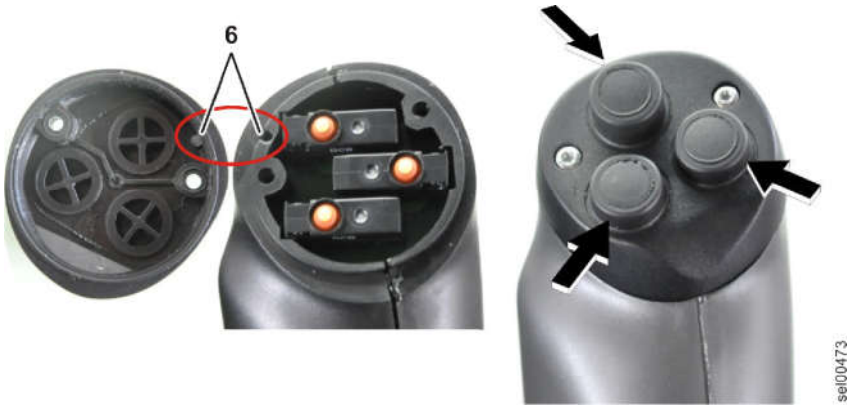

Fig. 111: Fitting the button cover

▶ Fit the buttons **5** in the new cover **4**.

▶ Fit the push button covering **4** on the control lever while paying attention to the anti-twist device **6**.

Note

To stop the buttons **5** from falling out of the cover **4** during assembly:

▶ Gently press the three buttons **5** from outside to hold them in place.

▶ Tighten the two TORX screws **3** to 0.5 Nm.

- ▶ The lower bucket bearings **a** should be lubricated daily in accordance with requirements.
- ▶ Put the cap on the grease fitting.

Lift arms with parallel kinematics

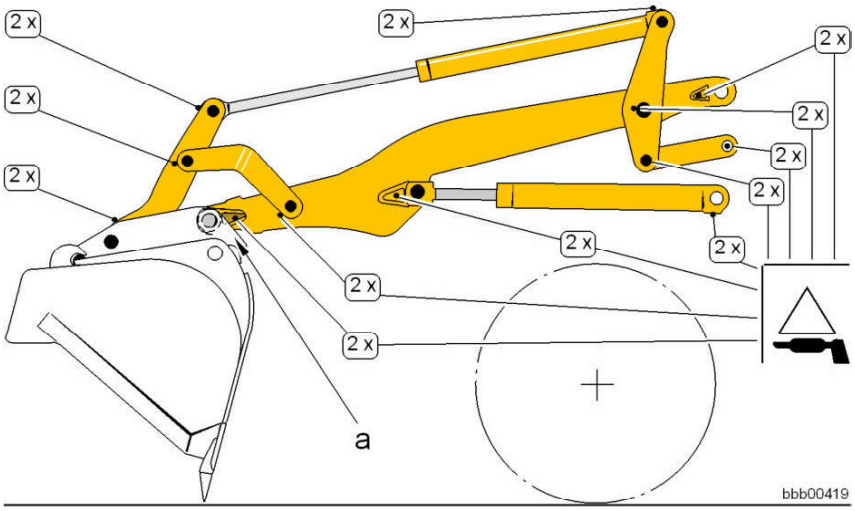

Fig. 124: Lift arms with parallel kinematics

a Lower bucket bearing

- ▶ Take the cap off the grease fitting.
- ▶ Grease all the bearing and lubrication points on the lift arms.
- ▶ The lower bucket bearings **a** should be lubricated daily in accordance with requirements.
- ▶ Put the cap on the grease fitting.

Lubricating the attachment

Make sure that the machine is in maintenance position 2.

Note
Lubricate the attachment.

- ▶ Ensure that the lubricating points are easy to access. Disconnect the attachment if necessary.
- ▶ For detailed information on maintenance for non-Liebherr attachments, see the manufacturer's instructions.

030.4.14.2 Checking the lift arm bearing bushings

Valid for: L538-1268/31321-;

Dirt or insufficient lubrication causes wear on the bearing bushings. Wear is recognisable through increased play between the pin and bearing bushing or through loud noises. Replace the bearing bushings in good time to prevent damage to the bucket arms.

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▷ The value should be within the specified range.

If the value is not within the specified range:

- ▶ Check the fresh and recirculated air filters for contamination and replace if necessary.
- ▶ If a dryer with indicator beads is installed: check the indicator beads on the dryer (For more information see: 160.4.4 Dryer, page 160-33)
- ▶ Check the air conditioning condenser for contamination, leaks and damage.
- ▶ Check the condenser fan.
- ▶ Check the dryer for damage and leaks.
- ▶ Check the air conditioning compressor and compressor coupling.

If the value is still not correct:

- ▶ Troubleshoot the entire air conditioning unit

Testing the heater

Make sure that the following equipment is ready:

- ❑ Thermometer
- ▶ Start the diesel engine.
- ▶ Warm up the machine until the coolant temperature is at least 80 °C.
- ▶ Switch off the air conditioning unit.
- ▶ Set the fan to level 2.
- ▶ Set the temperature control to minimum.
- ▶ Run the engine for 1 minute at medium speed.
- ▶ Measure the outlet temperature at the right driver-level nozzle.
  ▷ The outlet temperature should be roughly (±2 °C) the same as the outside temperature.
- ▶ Set the temperature control to maximum.
- ▶ Run the engine for 1 minute at medium speed.
  ▷ The outlet temperature increases.
- ▶ Measure the outlet temperature at the right driver-level nozzle.
  ▷ Measured outlet temperature: at least 60 °C

030.4.16 Lubrication system

030.4.16.1 Checking the lubrication system grease reservoir level

Valid for: L538-1268/31231-;

This equipment is optional.

Make sure that the machine is in maintenance position 1.

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Special tools		
Number	**Description**	**Item code**
2	Test line, 1500 mm	7002475
1	Hydro accumulator testing and filling device	8460226

Tab. 58: Special tools

030.6.2.2 Bringing the machine up to operating temperature

Valid for: L538-1268/31321-;

During testing and adjustment, the machine must be at an operating temperature of 58$^{\pm 5}$ °C. The temperature is measured by the hydraulic oil temperature sensor and can be seen in Sculi.

Make sure that the machine is in the maintenance position for testing and adjustments.

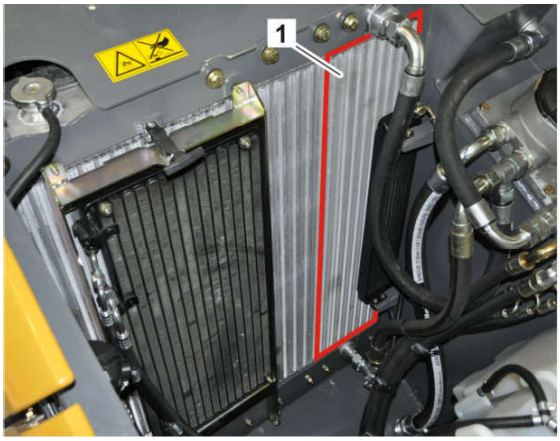

Fig. 141: Hydraulic oil cooler (red marking)

- ▶ Place a piece of cardboard or similar in front of the hydraulic oil cooler **1**.
  - ▷ The cooling capacity is reduced. This allows the operating temperature to be attained faster.
- ▶ Start the engine.
- ▶ Connect the Sculi diagnostic software to the machine.
- ▶ In the variables editor in the group structure, select the ***Check cooling system*** folder.
- ▶ During the adjustment, read the hydraulic oil temperature for the variable ***MDmaFanHydTemp***.

Bring the machine up to operating temperature as follows:

When working on the hydraulic system, the hydraulic oil temperature must be within the prescribed range (58$^{\pm 5}$ °C).

- ▶ Let the engine run at about 2200 rpm.
- ▶ Activate the tilt-in function as far as it will go and hold the control lever in this position.
- ▶ At the same time, lower the lift arms and hold the control lever in the float position function.

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After completing testing and adjustment

When all the values are correct:
- ▶ Set the bucket down on the ground on its teeth or cutting edge.
- ▶ Turn off the engine and take out the ignition key.
- ▶ Disconnect the pressure gauge from the high pressure test connection **P**.

Screw in the adjusting screw on the following secondary pressure relief valves by precisely half a turn:
- ▶ Secondary pressure relief valve for tilting in **1**
- ▶ Secondary pressure relief valve for tilting out **2**
- ▶ Secondary pressure relief valve for raising lift arms **3**

030.6.5.3 Working hydraulics LS pressure cut-off

Valid for: L538-1268/31321-;

Make sure that the following requirements are fulfilled:
- ❑ Machine is in the maintenance position for testing and adjustments.
- ❑ The service hatches are open.

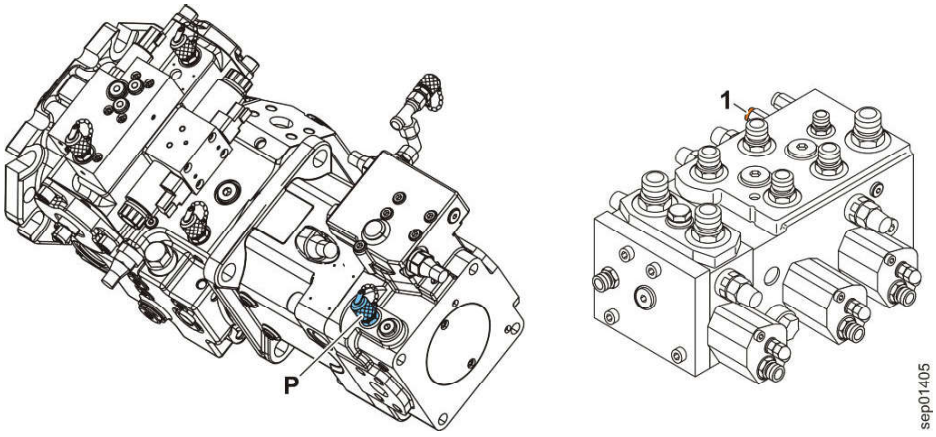

Fig. 150: Working hydraulics LS pressure cut-off

- ▶ Connect a pressure gauge (600 bar) to the high pressure test connection **P** on the working hydraulics pump.
- ▶ Start the engine.
- ▶ Raise the lift arms as far as they will go.
- ▶ Increase the engine speed and activate the lifting function fully. Keep the engine speed at approximately 1200 rpm.
- ▶ Check that the high pressure **P** is correct.

Description	Unit	Value
High pressure **P**	bar	$350^{\pm 5}$

If the required value is not reached:
- ▶ Set the bucket down on the ground on its teeth or cutting edge.
- ▶ Turn off the engine and take out the ignition key.
- ▶ Adjust the working hydraulics LS pressure cut-off **1** adjusting screw.

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Description	Unit	Value
The maximum distance **X** is	mm	11

If the distance **X** is more than the maximum:
▶ Contact the technical customer service department.

If the distance **X** is less than the maximum:
▶ The leakage is within the tolerance range. Disconnect the pressure gauge from the load sensing pressure test connection **LS**.

030.6.6 Hydraulic components

030.6.6.1 Checking the hydraulic lines for damage

Valid for: L538-1268;

Damage to hydraulic lines is divided into three types of damage:
– Minor damage
– Medium damage
– Severe damage

The type of damage determines whether the hydraulic line is renewed or whether the machine can be operated with the damaged hydraulic line.

The general safety instructions must be observed when working on the hydraulic system. (For more information see: 010.1 Safety instructions, page 010-4)

Make sure that the following requirements are fulfilled:
❑ The machine is in maintenance position 2.

Minor damage to the hydraulic lines

Wear or damage to the outer jacket of the hydraulic line

Wear or damage to the outer jacket of the hydraulic line is caused by friction or contact with other components. As long as the steel fabric of the hydraulic line is not damaged or not visible, this is classified as minor damage.

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Description	Unit	Value
High pressure **MH**	bar	$440^{\pm 5}$

If the required value is not reached:

▶ Turn off the engine and take out the ignition key.

▶ Adjust the pressure cut-off **1** adjusting screw.

Note
To adjust the pressure cut-off:

▶ Turning the adjusting screw clockwise increases the high pressure.

▶ Turning the adjusting screw anticlockwise reduces the high pressure.

▶ Repeat the procedure and adjustment until the required value is attained.

If the required value is reached:

▶ Repeat the check.

▶ Check that the engine droop is correct.

Description	Unit	Value
Maximum engine droop	rpm	50

Note
If the engine droop is too high, this indicates that there is a fault in the travel hydraulics (e.g. a high degree of leakage in the closed circuit or a malfunction of the pressure cut-off).

▶ Check the travel hydraulics for damage.

▶ Turn off the engine and take out the ignition key.

▶ Disconnect the pressure gauge from the high pressure test connection **MH**.

030.6.7.4 Travel pump block curve calibration

Valid for: L538-1268/31321-;

Make sure that the following requirements are fulfilled:

❑ Machine is in the maintenance position for testing and adjustments.

❑ The service access is open.

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- ▶ Slowly press the compact brake valve down several times until the accumulator charge pressure **M3** is 130 bar.
- ▶ **Slowly** press the compact brake valve down nine times and then keep it pressed down.
- ▶ Check that the brake pressure shown by the pressure gauge on **M4** and the pressure gauge on **M5** is above the required value.

Description	Unit	Value
Brake pressure at least	bar	50

If the required value at the front axle brake pressure test connection **M4** is not reached:
- ▶ Replace the front axle hydro accumulator **1**.

If the required value at the rear axle brake pressure test connection **M5** is not reached:
- ▶ Replace the rear axle hydro accumulator **2**.

If the required values are reached:
- ▶ Disconnect the pressure gauge from the accumulator charge pressure test connection **M3**.
- ▶ Disconnect the pressure gauge from the brake pressure test connection **M4**.
- ▶ Disconnect the pressure gauge from the brake pressure test connection **M5**.

030.6.9.4 Accumulator charge pressure switch shift pressure

Valid for: L538-1268/31321-;

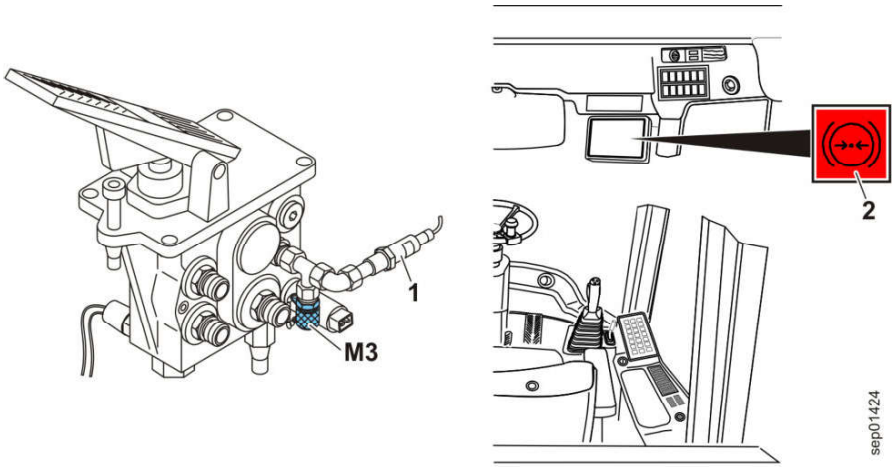

Fig. 178: Accumulator charge pressure switch shift pressure

1 Accumulator charge pressure switch
2 *Brake system accumulator pressure* symbol field
M3 Accumulator charge pressure test connection

- ▶ Connect a pressure gauge (600 bar) to the accumulator charge pressure test connection **M3** on the compact brake valve.
- ▶ Switch on the ignition.
- ▶ Slowly press the compact brake valve down several times until the *brake system accumulator pressure* symbol field in the display lights up.

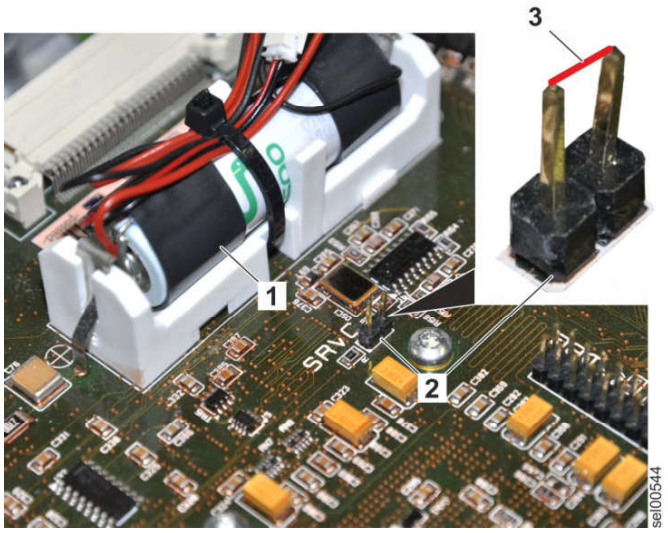

Fig. 193: Central control unit - Performing a reset

1 Back-up battery
2 Pins
3 Electrical lead

For the reset to function and prevent machine data from being lost, the memory card with the machine software must be inserted in slot CF-1.

Connecting the two pins **2** together and switching on the ignition performs a reset.

▶ Connect the pins **2** with an electrical line **3**.

▶ Switch on the ignition.

▶ Remove the connection between the two pins after ten seconds.
  ▷ Resetting the central control unit is started.
  ▷ The machine software is installed again.
  ▷ This process can take several minutes.

Resetting and installing the machine software have been successful if a connection can be made to the central control unit using the Sculi diagnostic software.

▶ Check the connection to the central control unit using the Sculi diagnostic software.

When resetting and installing the machine software have been successfully completed:

NOTICE
Beware of damage to the central control unit.

▶ Pay attention to the seal when screwing on the cover.

▶ Screw the cover back onto the central control unit (tightening torque 10 Nm).

It may be necessary to install the latest machine software.

▶ Install the latest machine software.

030.6.10.5 Testing the CAN line

Valid for: L538-1268/31321-;

The CAN line can be tested by measuring the resistance or by measuring the voltage.

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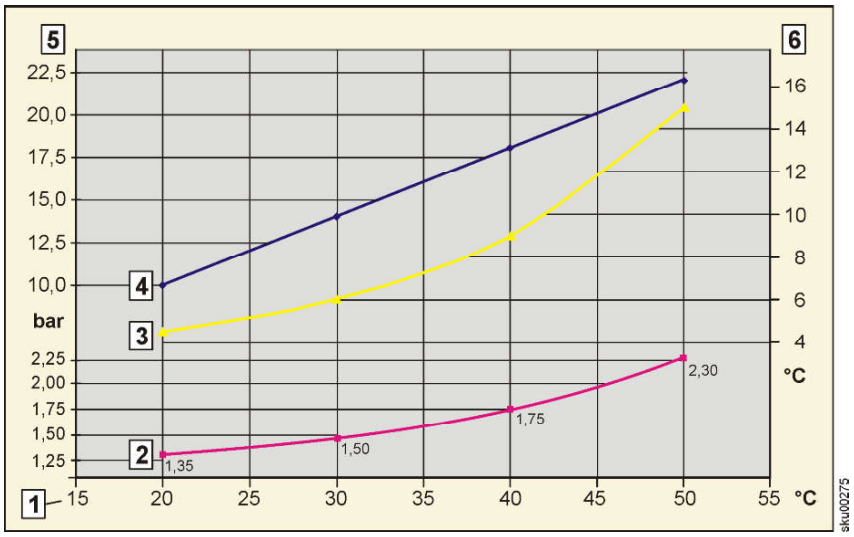

Fig. 202: Temperature/pressure diagram for air conditioning unit

1	Ambient temperature in °C	**4**	High pressure range depending on the ambient temperature
2	Low pressure range depending on the ambient temperature	**5**	High and low pressure in bar
3	Outlet temperature depending on the ambient temperature	**6**	Outlet temperature in °C

- ▶ Connect the pressure gauge strip to the quick couplings.
- ▶ Start the engine.
- ▶ Switch on the air conditioning unit (maximum cooling).
- ▶ Set the heater fan to maximum.
- ▶ Allow the air conditioning compressor to run for 3 to 5 minutes.
- ▶ Measure the outflow temperature at the left driver-level nozzle.
- ▶ Read the values from the pressure gauge strip and compare with the temperature/pressure diagram.
  - ▷ The values must agree with the diagram.

If the values do not agree:

- ▶ For corrective action, see the service documentation: Documentation_Wheel loader_Repair instructions_Others_ Air conditioning unit_Principles of air conditioning

030.6.12.3 Calibrating the display

Valid for: L538-1268/31321-;

If no function or an incorrect function is carried out when a button is pressed on the display, it must be calibrated.

- ▶ Switch off ignition.
- ▶ Place a finger on the touchscreen of the display and switch on the ignition at the same time.
  - ▷ The display starts up in setting mode.

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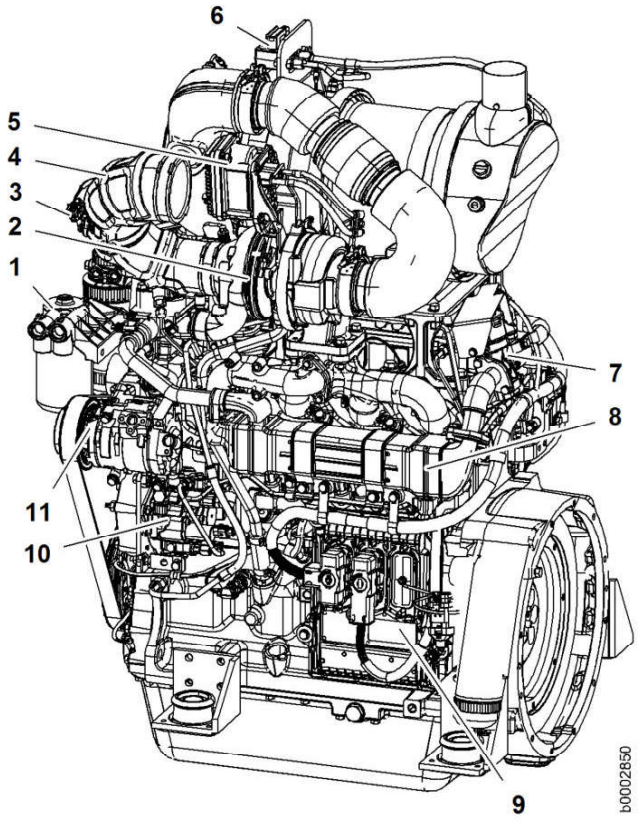

Fig. 215: Engine

1 Oil filter
2 Turbocharger
3 Air mass sensor
4 Air intake pipe
5 Water-cooled servo motor
6 Differential pressure sensor for diesel particulate filter
7 EGR valve
8 EGR cooler
9 Engine control unit
10 High-pressure fuel pump
11 Air conditioning compressor (optional)

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040.1.4.1 Overview of the exhaust system

Valid for: L538-1268/31321-;

1 Layout

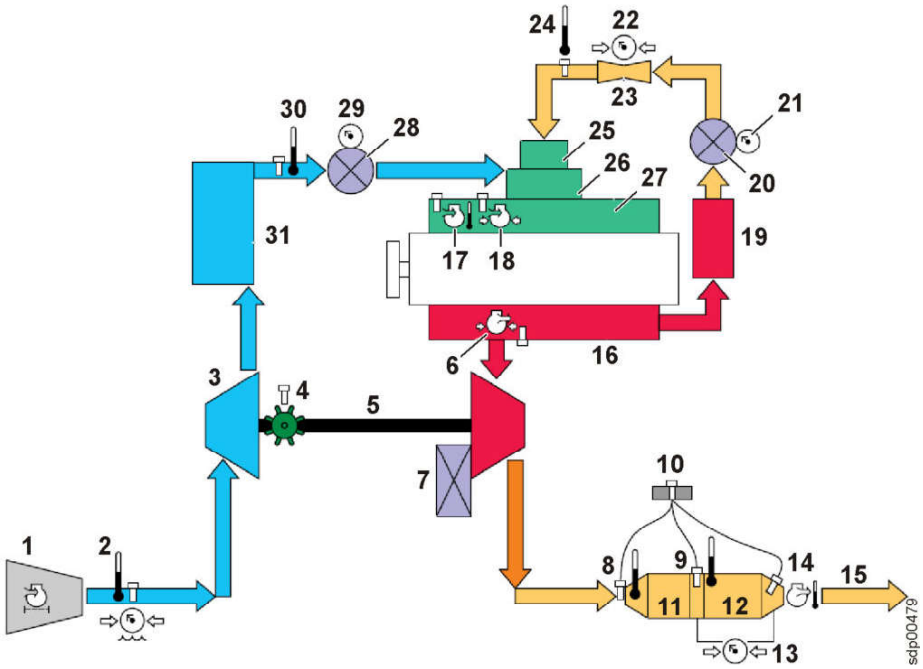

Fig. 226: Overview of the exhaust system (diagram of the PVX)

1	Air filter	**17**	Intake manifold temperature sensor
2	Air mass sensor	**18**	Intake manifold pressure sensor
3	Turbocharger with variable geometry (VGT)	**19**	EGR cooler
4	Turbocharger speed sensor	**20**	EGR valve
5	Connection shaft	**21**	EGR valve position sensor
6	Exhaust manifold pressure sensor	**22**	Sensor for EGR flow
7	Turbocharger servo motor	**23**	Venturi pipe
8	Temperature sensor at DOC inlet	**24**	EGR temperature sensor
9	Temperature sensor at DOC outlet	**25**	Membrane valve
10	Temperature sensor control device	**26**	Mixer
11	Diesel oxidation catalyst (DOC)	**27**	Intake manifold
12	Diesel particulate filter (DPF)	**28**	Throttle valve
13	Differential pressure sensor	**29**	Throttle valve position sensor
14	Temperature sensor at DPF outlet	**30**	Intercooler outlet temperature sensor
15	Exhaust pipe	**31**	Intercooler
16	Exhaust manifold		

2.1 Basic function

Ambient air is drawn through the air filter **1**. The air filter **1** protects the engine from dirt in the intake air. (For more information see: Air filter, page 040-12) The turbocharger **3** compresses the air.

Compressing the air can increase the engine power. The compression raises the temperature of the intake air and increases the volume of the air. The intake air is

– Fan gear motor with fan blade

The following components are part of the electrical control system (For more information see: 050.3.1 Electronic control system – general overview, page 050-11) :
– Coolant temperature sensor
– Hydraulic oil temperature sensor
– Charge air temperature sensor

The following components are part of the cooler unit (For more information see: 050.4 Cooler, page 050-17) :
– Water cooler
– Intercooler
– Hydraulic oil cooler
– Fuel cooler
– Air-conditioning condenser (optional)

2 Function

The following media and components are cooled by the cooling system:
– Coolant of the engine
– Engine
– Charge air
– Hydraulic oil
– Diesel fuel
– Air-conditioning condenser (optional)

The fan draws in ambient air behind the cab. The air is drawn through the cooler unit.

The air is then blown over the engine and accordingly also cools the engine.

The air is blown back out through the grille in the engine compartment hood and then underneath the vehicle.

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2 Function

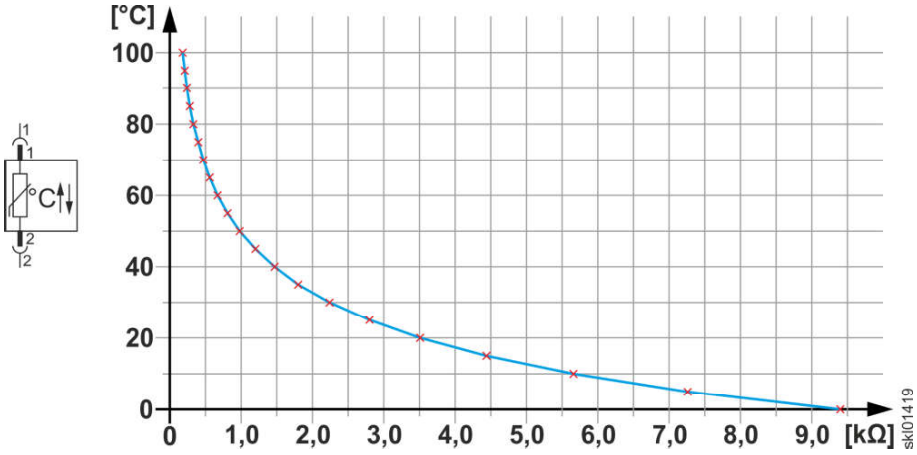

Fig. 244: Wiring diagram and characteristic

Temperature	Resistance
0 °C	9399.0 Ω
5 °C	7263.0 Ω
10 °C	5658.0 Ω
15 °C	4441.0 Ω
20 °C	3511.0 Ω
25 °C	2795.0 Ω
30 °C	2240.0 Ω
35 °C	1806.0 Ω
40 °C	1465.0 Ω
45 °C	1195.0 Ω
50 °C	980.3 Ω
55 °C	808.8 Ω
60 °C	670.9 Ω
65 °C	559.4 Ω
70 °C	468.7 Ω
75 °C	394.6 Ω
80 °C	333.8 Ω
85 °C	283.5 Ω
90 °C	241.8 Ω
95 °C	207.1 Ω
100 °C	178.0 Ω

Tab. 75: Relationship of temperature to resistance

The central control unit measures the resistance of the temperature sensor and calculates the temperature from it.

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2 Function

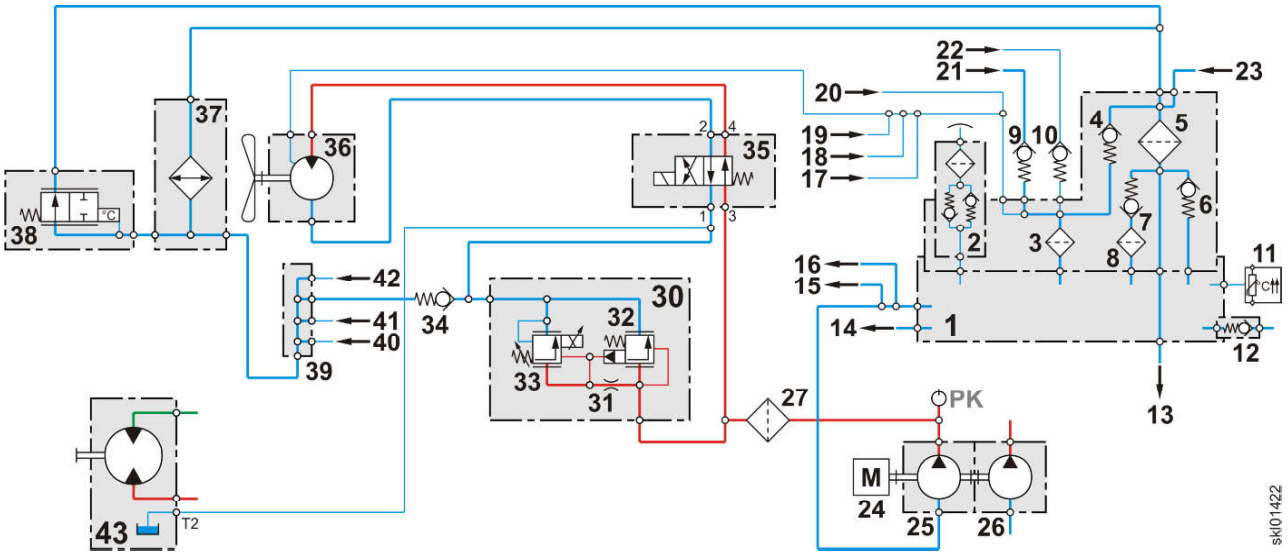

Fig. 255: Hydraulic diagram of reversible fan drive

1	**Hydraulic tank**	**15**	Brake system gear pump suction port	**31**	Restrictor
2	Breather filter	**16**	Emergency steering pump suction port	**32**	Primary piston
3	Return strainer	**17**	Transmission return flow	**33**	Secondary piston with proportional solenoid Y13
4	Bypass valve	**18**	Compact brake valve return flow	**34**	0.25 bar check valve
5	Return suction filter	**19**	Pilot control unit return flow	**35**	Fan reversal solenoid valve Y50
6	Pre-tension valve	**20**	Working hydraulics pump leak oil	**36**	Fan gear motor
7	Replenishing valve	**21**	Servostat return flow	**37**	Hydraulic oil cooler
8	Strainer	**22**	Travel pump leak oil	**38**	Temperature valve
9	9 bar check valve	**23**	Control valve block return flow	**39**	Collector pipe
10	2.5 bar bypass valve	**24**	Engine	**40**	Travel pump leak oil
11	Hydraulic oil temperature sensor B8	**25**	Fan gear pump	**41**	Discharge in travel motor 2
12	Drain valve	**26**	Brake system gear pump	**42**	Travel motor 2 leak oil
13	Replenishing pump suction port	**27**	80 µm in-line filter	**43**	**Travel motor 1**
14	Working hydraulics pump suction port	**30**	**Proportional pressure relief valve**	**PK**	Cooling system high pressure

When fan reversal is activated, the central control unit energises the fan reversal solenoid valve **35**. This swaps the pressure side and the tank side of the fan gear motor **36**. The fan gear motor turns in the opposite direction.

The fan speed is controlled via the pressure relief proportional valve **30**. The pressure relief proportional valve for the reversible fan drive is identical to the pressure relief proportional valve in the fan gear motor when fitted as a standard fan drive.
(For more information see: Output speed, page 050-9)

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1	Hydraulic tank	**10**	Quick coupler hydraulic cylinder	**19**	Right lift cylinder
2	Pilot control unit	**11**	Control valve block	**20**	Left tilt cylinder
3	Working hydraulics lockout solenoid valve Y14	**12**	Compact brake valve (housing preheating)	**21**	Right tilt cylinder
4	Check valve	**13**	Servostat oil supply	**LS**	Load sensing pressure test connection
5	Pilot control hydro accumulator	**14**	Servostat LS connection	**P**	Working hydraulics pump high pressure test connection
6	Travel pump	**15**	Check valve	**G**	Replenishing pressure test connection
7	Working hydraulics pump	**16**	Stabilisation module	**MX**	Test connection for hydro accumulator ride control load pressure
8	Quick coupler LS signal solenoid valve Y53a	**17**	Ride control hydro accumulator		
9	Quick coupler solenoid valve Y53	**18**	Left lift cylinder		

The working hydraulics consist of the following components:

- Hydraulic tank (For more information see: 080.1.1 Overview of the hydraulic tank, page 080-2)
- Working hydraulics pump
- Control valve block (For more information see: 060.5 Control valve block for P kinematics, page 060-23)
- Pilot control (For more information see: 060.6.1 Overview of the pilot control unit, page 060-28)
- Ride control (optional) (For more information see: 060.7.1 Ride control overview, page 060-36)
- Lift cylinder (For more information see: P kinematics lift cylinder, page 060-47)
- Tilt cylinder (For more information see: P kinematics tilt cylinder, page 060-48)

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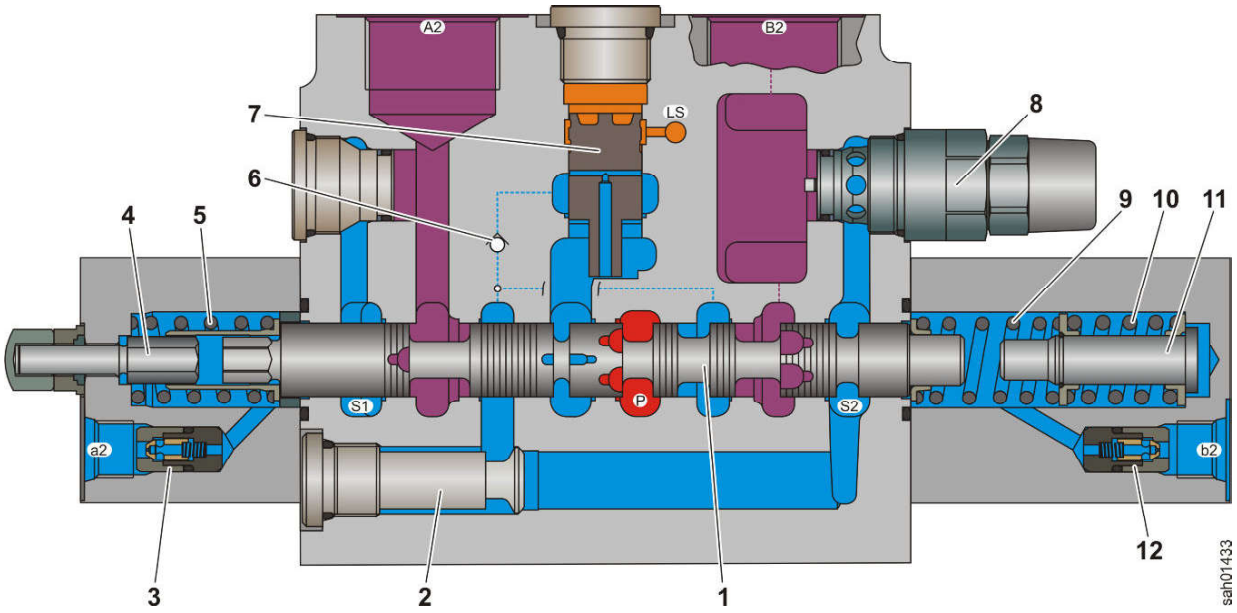

Fig. 267: Sectional view of lift cylinder section

1	Lift cylinder spool valve	**5**	Return spring	**9**	Return spring
2	Feeding valve	**6**	Load retaining valve	**10**	Float position compression spring
3	Restrictor check valve	**7**	Lift cylinder pressure balance with restrictor	**11**	Float position stop pin
4	Spool stroke adjusting screw	**8**	Secondary pressure relief valve for lifting	**12**	Restrictor check valve

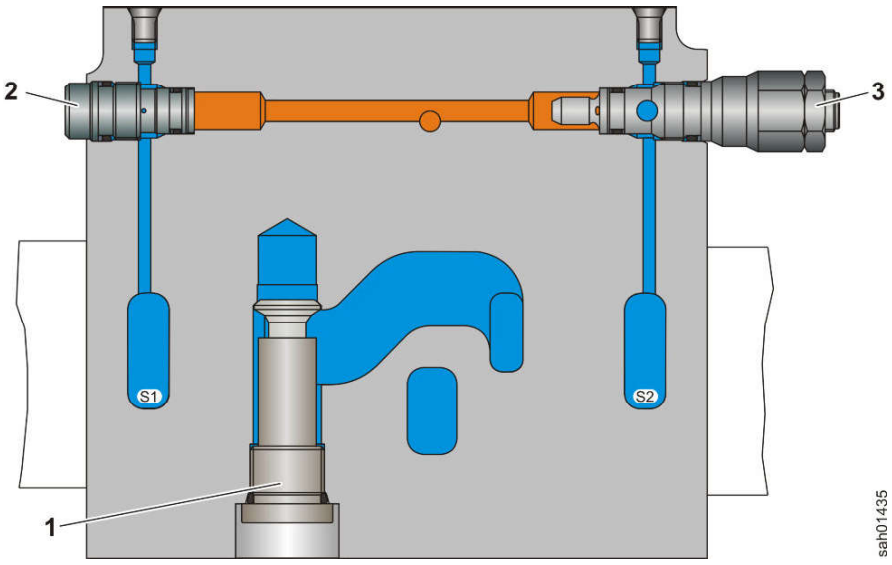

Fig. 268: Sectional view of LS valves

1	Tilt cylinder load retaining valve	**3**	LS working hydraulics pressure cut-off
2	Flow regulating valve		

– Working hydraulics lockout solenoid valve Y14 (For more information see: 060.6.3 Working hydraulics lockout solenoid valve, page 060-34)
– Pilot control hydro accumulator (For more information see: 060.6.4 Pilot control hydro accumulator, page 060-35)

2 Function

The spools in the control valve block are moved with the pilot control in proportion to the deflection of the control lever.

The replenishing pump in the travel pump extracts oil from the hydraulic tank and pumps it to the pilot control unit via the working hydraulics lockout solenoid valve.

The pilot control unit generates the servo pressure from the replenishing pressure that moves the spool in the control valve block. The servo pressure is thus proportional to the deflection of the control lever. The pilot control unit also controls the float position, lift kick-out (optional) and bucket return-to-dig functions.

060.6.2 Pilot control unit

Valid for: L538-1268/31321-;

1 Layout

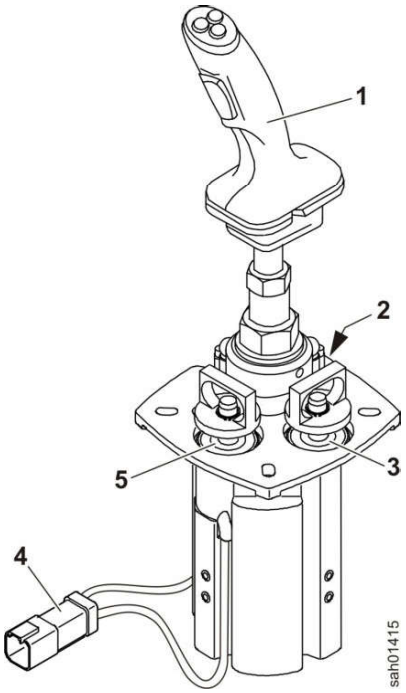

Fig. 278: Pilot control unit

1 Control lever
2 Lift kick-out retaining magnet Y17 (optional)
3 Bucket return-to-dig retaining magnet Y9
4 Retaining magnet power supply
5 Float position retaining magnet Y18

The pilot control unit is installed in the driver's cab.

The control lever **1** is attached to the pilot control unit.

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2 Function

2.1 Basic function

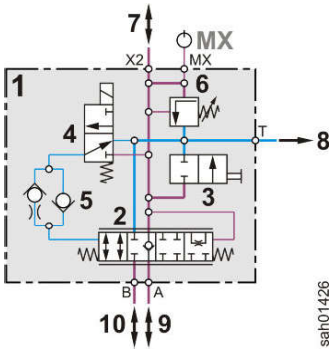

Fig. 292: Hydraulic diagram of the stabilisation module

1	Stabilisation module	**7**	Ride control hydro accumulator
2	Ride control valve spool	**8**	Hydraulic tank
3	Hydro accumulator relief valve	**9**	Lift cylinder piston side
4	Ride control solenoid valve Y20	**10**	Lift cylinder ring side
5	Restrictor check valve	**MX**	Ride control hydro accumulator charge pressure
6	Safety valve		

The stabilisation module fulfils the following tasks:
- Charges the ride control hydro accumulator and protects from high pressure spikes and excess pressure
- Connects the ring side of the lift cylinder with the hydraulic tank (ride control is activated)
- Connects the piston side of the lift cylinder with the ride control hydro accumulator (ride control is activated)

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3 Cylinder tube
4 Ring-side cylinder bearing
5 Bearing bushing
6 Piston rod bearing
7 Piston rod
8 Piston
9 Nut
12 Support rings
13 O-rings
14 Slide rings
15 Stepseal
16 Rimseal
17 Scraper ring

The piston-side cylinder bearing **1** and the ring-side cylinder bearing **4** are links with a bearing bushing.

The piston **8** is bolted to the piston rod **7** and secured with the nut **9**.

The piston rod bearing **6** is bolted to the cylinder tube **3**.

2 Function

2.1 Basic function

The tilt cylinder is a double-action hydraulic cylinder with a piston rod at one end.

The force depends on the oil pressure and the piston area. The piston area on the piston side is larger than on the ring side. This means a greater force is achieved when extending than when retracting.

2.2 Piston rod guide

The piston rod is guided by the slide rings on the piston and in the piston rod bearing.

2.3 Seals

The piston is sealed with a Glyd Ring seal.

The piston rod bearing is sealed with a Rimseal and a Stepseal. In addition, a scraper ring prevents dirt from penetrating.

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2 Function

2.1 Basic function

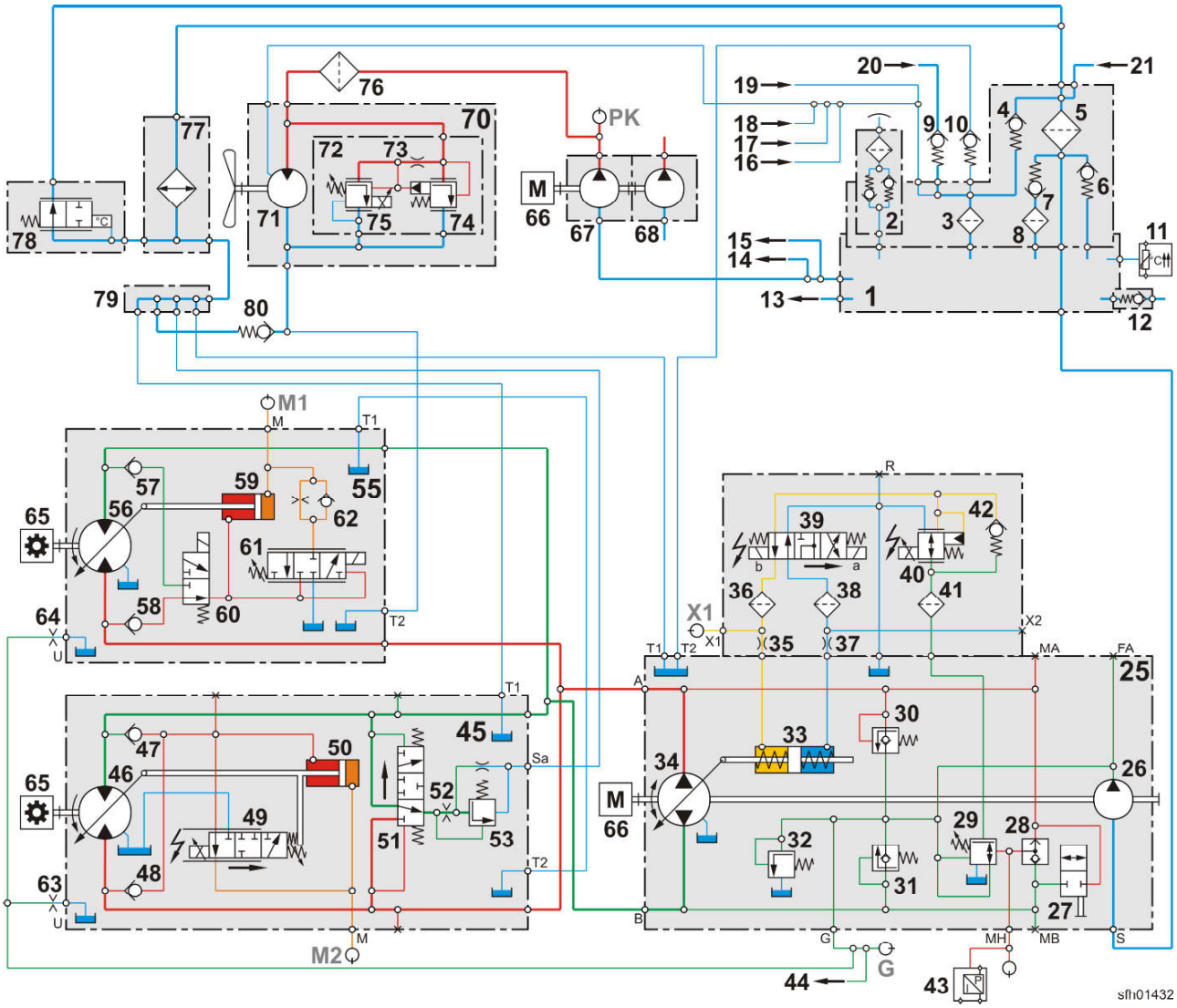

Fig. 303: Hydraulic diagram of the travel hydraulics

1	**Hydraulic tank**	**32**	Replenishing pressure relief valve	**59**	Servo piston
2	Breather filter	**33**	Servo cylinder	**60**	Travel direction solenoid valve Y26
3	Return strainer	**34**	Axial piston pump	**61**	Control piston with travel range 1 solenoid Y58
4	Bypass valve	**35**	Swivel restrictor Ø 1.8 mm	**62**	Swivel restrictor
5	Return suction filter	**36**	Fine strainer	**63**	Orifice Ø1.0 mm
6	Pre-tension valve	**37**	Swivel restrictor Ø 1.8 mm	**64**	Orifice Ø1.0 mm
7	Replenishing valve	**38**	Fine strainer	**65**	Transmission
8	Strainer	**39**	Travel direction valve	**66**	Engine
9	9 bar check valve	**39a**	Reverse travel direction solenoid Y3	**67**	Fan gear pump

See next page for continuation of the image legend

2.4 Variable displacement pump

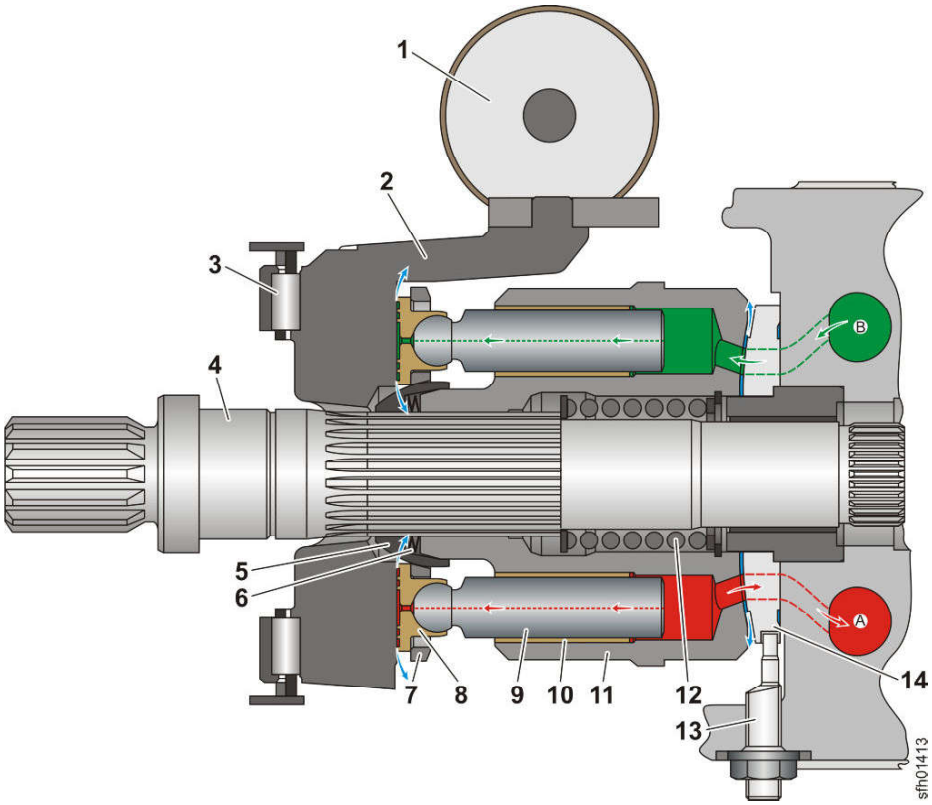

Fig. 312: Variable displacement pump

1	Servo cylinder	**8**	Glide shoe
2	Swivel plate	**9**	Piston
3	Swivel plate bearing	**10**	Sliding bushing
4	Drive shaft	**11**	Rotary group cylinder
5	Return ball	**12**	Compression spring
6	Cup spring	**13**	Eccentric adjusting screw
7	Return plate	**14**	Control lens

The variable displacement pump delivers oil to the travel motor. The returning oil flows directly to the suction side of the variable displacement pump (closed circuit).

The flow rate depends on:
– Plate angle
– Engine speed

2.4.1 Rotary group

The rotary group cylinder **11** is rigidly connected to the drive shaft **4**. The rotary group cylinder contains nine pistons **9**, which rotate along with it. The pistons slide up and down in the sliding bushings **10** and are guided by glide shoes **8** and the return plate **7**.

The swivel plate **2** and the control lens **14** do not move.

Oil is pumped through a hole in the pistons **9** into the space between the glide shoe and swivel plate. This means the slide shoe floats on a film of oil and slides over the swivel plate without mechanical contact.

The rotary group also slides on a film of oil. This is produced by the leakage between the control lens and the rotary group cylinder.

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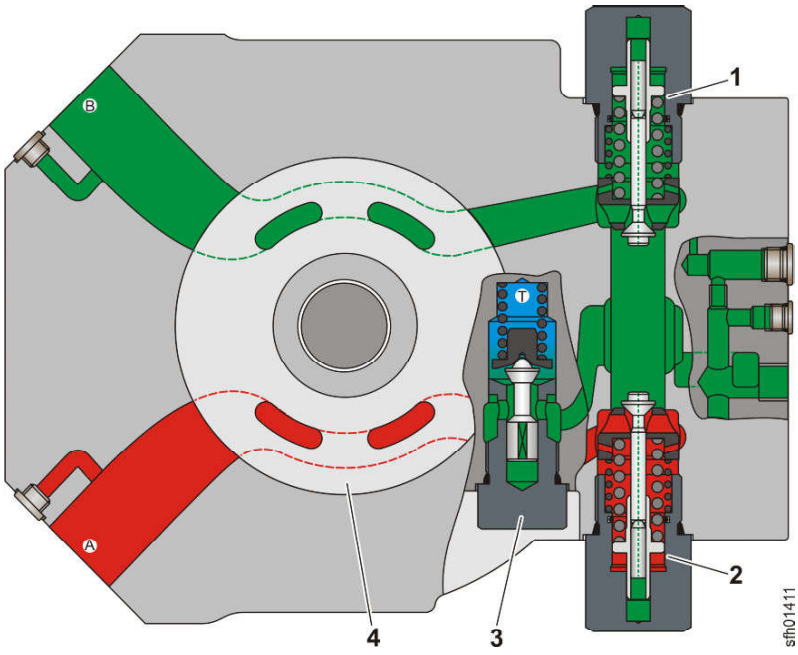

Fig. 323: Sectional view of front side

1	Reverse high pressure relief valve	**3**	Replenishing pressure relief valve
2	Forward high pressure relief valve	**4**	Control lens

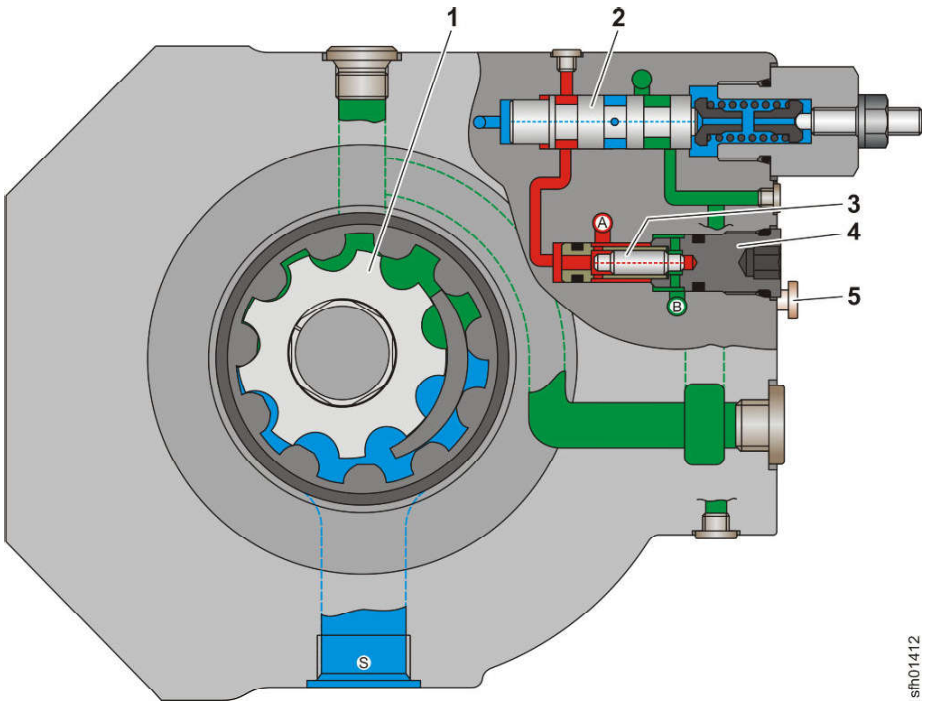

Fig. 324: Sectional view of replenishing pump

1	Replenishing pump	**4**	Towing bypass valve
2	Pressure cut-off valve	**5**	Stop bolt for towing bypass valve
3	Shuttle valve		

2.9 High pressure relief valve

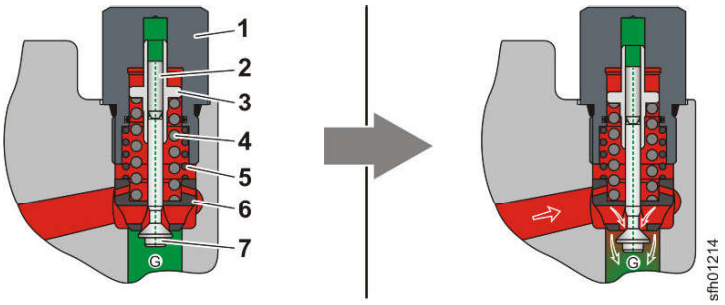

Fig. 334: High pressure relief valve closed / open (excess pressure)

1 Plug
2 Lock screw
3 Valve bearing
4 Pressure relief compression spring
5 Replenishing compression spring
6 Valve seat
7 Valve piston

The high pressure relief valves protect the closed circuit from excess pressure.

The high pressure relief valves always react faster than the pressure cut-off. They therefore primarily relieve pressure peaks such as those that arise when driving into a pile of material too quickly.

The valve piston **7** is pushed against the pressure relief compression spring **4**. Oil flows from the high pressure side through the replenishing pressure duct **G** to the low pressure side.

2.10 Replenishing function

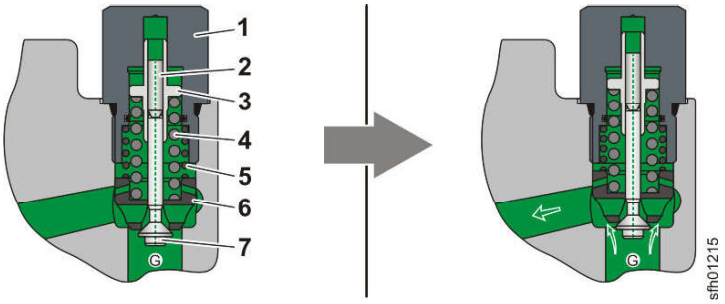

Fig. 335: High pressure relief valve closed / open (replenishing)

1 Plug
2 Lock screw
3 Valve bearing
4 Pressure relief compression spring
5 Replenishing compression spring
6 Valve seat
7 Valve piston

The replenishing function of the high pressure relief valve replaces lacking oil in the closed circuit with replenishing oil. The oil is supplied on the low pressure side.

Oil is lost from the closed circuit due to:
– Leakage in the variable displacement pump
– Leakages in the travel motors
– Discharge in travel motor 2 (cooling)

When replenishing, the valve plate **6** is pushed against the replenishing compression spring **5**. Oil flows from the replenishing pressure duct **G** to the low pressure side of the closed circuit.

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2.5 Travel range 1

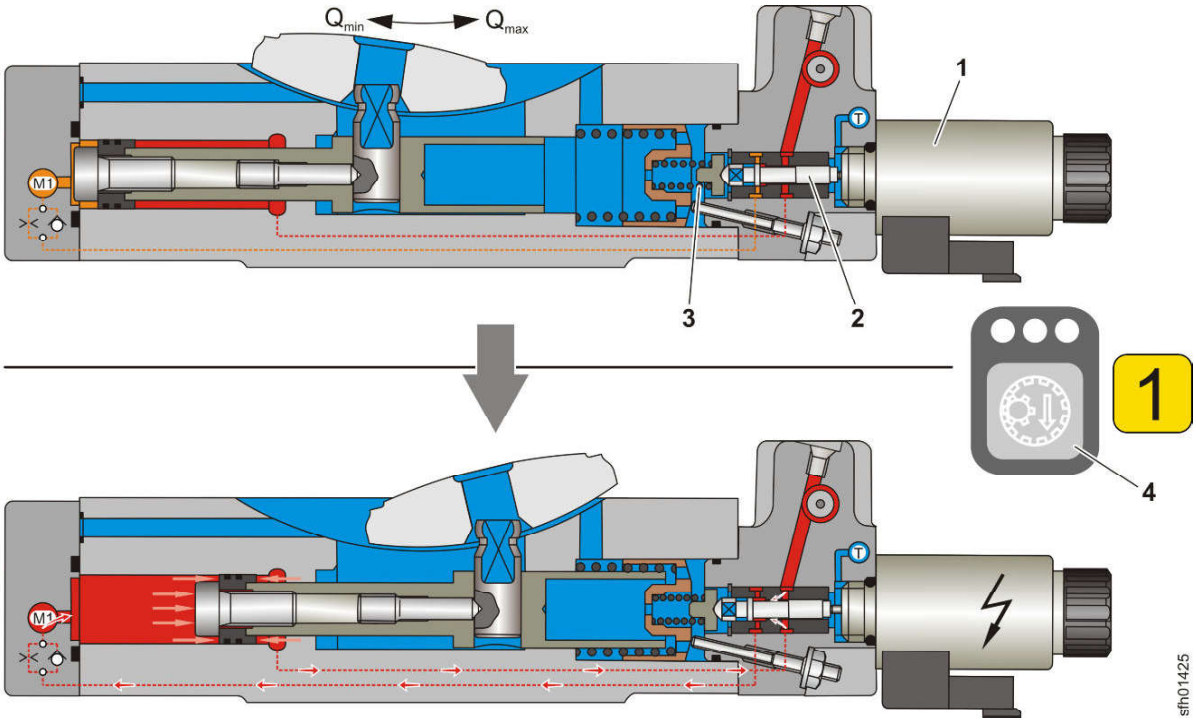

Fig. 344: Travel range 1 solenoid non-energised / energised

1 Travel range 1 solenoid Y58
2 Control piston
3 Regulating spring
4 *Travel range down* button

If travel range 1 is activated, both travel motors remain at the maximum angle. This means the maximum output torque is available.

On travel motor 1 the travel range 1 solenoid **1** is energised. The solenoid pushes the control piston **2** against the regulating spring **3** thereby connecting the high pressure to the servo pressure. The high pressure pushes the variable displacement motor to the maximum angle.

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2 Function

2.1 Basic function

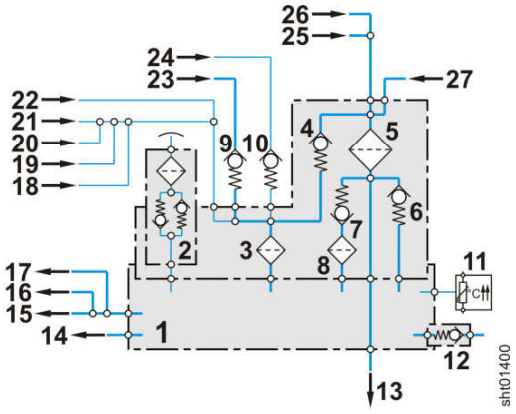

Fig. 352: Hydraulic diagram of the hydraulic tank

1	Hydraulic tank	**15**	Fan gear pump intake connection
2	Breather filter	**16**	Intake port of brake system gear pump
3	Return strainer	**17**	Emergency steering pump intake connection
4	Bypass valve	**18**	Transmission return flow
5	Return suction filter	**19**	Compact brake valve return flow
6	Pre-tension valve	**20**	Pilot control unit return flow
7	Feeding valve	**21**	Fan gear motor leak oil
8	Strainer	**22**	Working hydraulics pump leak oil
9	9 bar check valve	**23**	Servostat return flow
10	2.5 bar bypass valve	**24**	Travel pump leak oil
11	Hydraulic oil temperature sensor B8	**25**	Hydraulic oil cooler return flow
12	Drain valve	**26**	Hydraulic oil cooler bypass return flow
13	Replenishing pump intake connection	**27**	Control valve block return flow
14	Working hydraulics pump intake connection		

The hydraulic oil is stored in the hydraulic tank.

The hydraulic oil is cleaned in the integrated filter unit.

The breather filter compensates pressure fluctuations and maintains a slight preload pressure in the hydraulic tank.

The hydraulic tank supplies the following systems with oil:
- Cooling system (fan drive) (For more information see: 050.2.1 Overview of the hydraulics cooling system, page 050-4)
- Working hydraulics (For more information see: 060.1 Overview of z kinematics working hydraulics, page 060-3) (For more information see: 060.2 Overview of working hydraulics for p kinematics, page 060-8)
- Travel hydraulics (For more information see: 070.1 Travel hydraulics overview, page 070-2)
- Steering system (For more information see: 090.1 Steering system overview, page 090-2)
- Brake system (For more information see: 100.1 Overview of the brake system, page 100-2)

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3 Working hydraulics pump
4 Control valve block
5 Compact brake valve (housing preheating)
8 Left steering cylinder
9 Right steering cylinder
10 Servostat
LS Load sensing pressure test connection

The steering system consists of the following components:
- Hydraulic tank (For more information see: 080.1.1 Overview of the hydraulic tank, page 080-2)
- Working hydraulics pump (For more information see: 060.3 Working hydraulics pump, page 060-13)
- Control valve block with priority valve (For more information see: 060.4 Control valve block for Z-bar kinematics, page 060-17)
- Servostat (For more information see: 090.3 Servostat, page 090-10)
- Steering cylinder (For more information see: 090.4.1 Steering cylinder overview, page 090-14)
- Emergency steering (For more information see: 090.5.1 Emergency steering overview, page 090-19)

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The servostat is supplied with oil by the working hydraulics pump via the priority valve in the control valve block **9**.

The servostat directs the oil from the working hydraulics pump to the steering cylinders. While doing this, the servostat regulates the amount of oil depending on the steering speed.

The servostat also generates a load sensing signal **10** which regulates the working hydraulics pump.

2.2 Flow booster

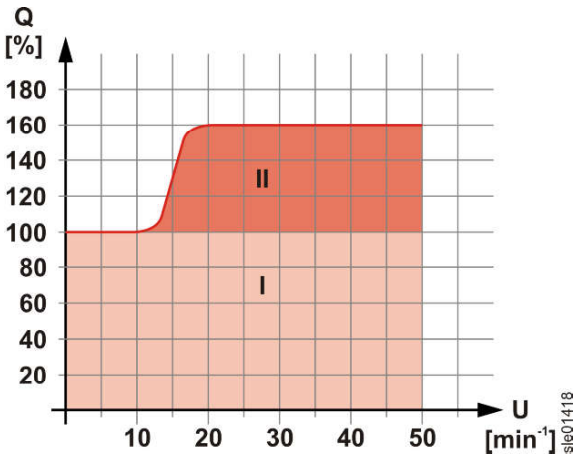

Fig. 372: Flow booster

Q	Pump capacity in %	**I**	Flow rate via metering pump
U	Turns of steering wheel per minute	**II**	Flow rate via valve spool

The valve spool consists of a inner spool and an outer spool. Both spools are kept in position by leaf springs.

At less than ten turns of the steering wheel per minute, the inner spool and the outer spool turn together and deliver the oil to the metering pump. The metering pump delivers the oil to the steering cylinders.

At more than ten turns of the steering wheel per minute, the valve spools shift against each other due to the greater force. This causes the valve spools to make an additional opening through which the oil flows directly to the steering cylinders. Up to 60% more oil flows to the steering cylinders from fast steering manoeuvres.

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symbol field or the *emergency steering pressure check* symbol field depending on the defective pressure switch.

2.3 Testing the emergency steering pump

After starting the engine, the central control unit **3** activates the emergency steering pump for 3 seconds. Within these 3 seconds, the emergency steering pressure check switch **8** must be subject to a pressure of $16^{\pm 2}$ bar.

During the test, the *emergency steering check* symbol field lights up.

Once the pressure is reached, the *emergency steering check* symbol field goes out. The emergency steering system is ready for operation.

If the pressure is not reached, the *emergency steering check* symbol field stays lit until the ignition is switched off. The emergency steering system is not fully functional. The machine must not be put into operation.

090.5.3.2 Emergency steering pressure switch

Valid for: L538-1268/31321-;

1 Layout

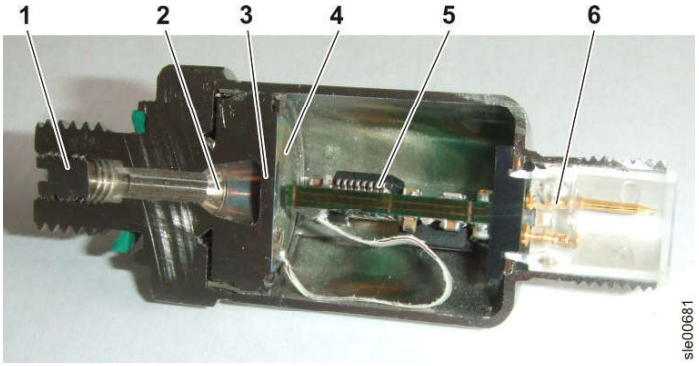

Fig. 386: Emergency steering pressure switch

1	Restrictor	**4**	Thin-film sensor (DMS)
2	Pressure chamber	**5**	Electronics
3	Metal surface	**6**	3-pin plug

The emergency steering pressure switch B3 is mounted on the valve block.

The emergency steering pressure switch is N/O (normally open).

2 Function

2.1 Basic function

Oil flows into the pressure chamber **2** via the restrictor **1**. Pressure peaks are absorbed by the restrictor **1**.

The thin-film sensor **4** changes its resistance according to the curvature of the metal surface **3**. When a specific resistance is reached, the electronics **5** close the electrical contact.

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8 Pressure balance pilot valve
9 Pilot valve regulating spring
17 Pressure regulator spring
18 Inching compression spring

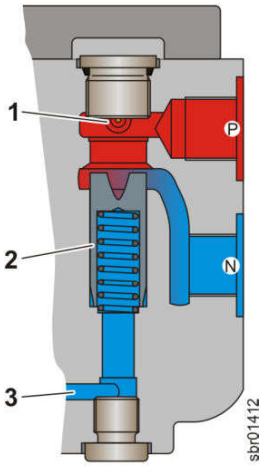

Fig. 399: Sectional view of the accumulator charge valve

1 Inlet restrictor
2 Accumulator charge valve
3 To the pressure balance pilot valve

2 Function

2.1 Basic function

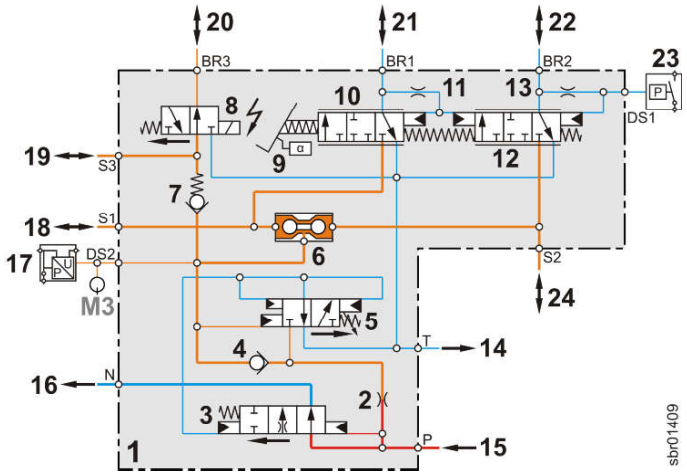

Fig. 400: Hydraulic diagram of the compact brake valve

1 **Compact brake valve**
2 Inlet restrictor
3 Accumulator charge valve
4 Inlet check valve
5 Pressure balance pilot valve
6 Inverted shuttle valve
7 Parking brake check valve
14 Compact brake valve return flow
15 Brake system high pressure gear pump
16 Control valve block (housing preheating)
17 Accumulator charge pressure switch B19
18 Service brake hydro accumulator (front axle)
19 Parking brake hydro accumulator
20 Parking brake

See next page for continuation of the image legend

100.3.4 Accumulator charge pressure switch

Valid for: L538-1268/31321-;

1 Layout

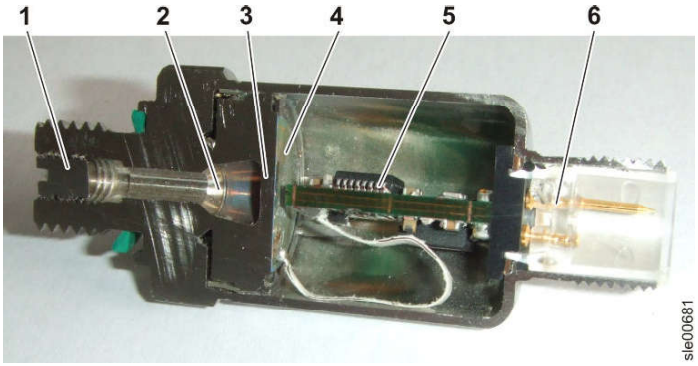

Fig. 408: Accumulator charge pressure switch

1	Restrictor	**4**	Thin-film sensor (DMS)
2	Pressure chamber	**5**	Electronics
3	Metal surface	**6**	3-pin plug

The accumulator charge pressure switch B19 is fitted to the compact brake valve.

The accumulator charge pressure switch is N/O (normally open).

2 Function

2.1 Basic function

Oil flows into the pressure chamber **2** via the restrictor **1**. Pressure peaks are absorbed by the restrictor **1**.

The thin-film sensor **4** changes its resistance according to the curvature of the metal surface **3**. When a specific resistance is reached, the electronics **5** close the electrical contact.

2.2 Accumulator charge pressure monitoring

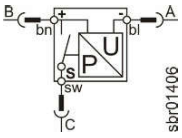

Fig. 409: Equivalent diagram of accumulator charge pressure switch

The accumulator charge pressure switch monitors the pressure in the service brake hydro accumulators.

If the service brake is engaged when the engine is not running, the pressure in the service brake hydraulic accumulators is reduced without these being recharged by the brake system gear pump.

If the brake pressure falls below a set value, the electronics open the contact. The *brake system accumulator pressure* symbol field appears in the display. If the engine is running, a warning buzzer sounds in addition.

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Item number	BMK	Installation location
5	MP1_c	Rear section, behind the battery main switch
6	MP4_c	Right of rear section, under the diesel engine
7	MP6_a	Driver's cab, on the fuse and relay board

Tab. 80

2.2 Other electrical components

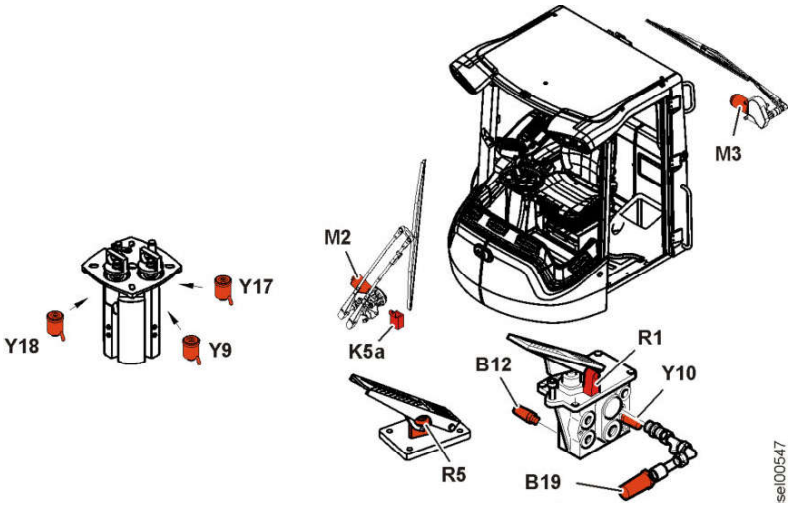

Fig. 419: Overview of the other electrical components

BMK	Function	BMK	Function
B12	Brake light pressure switch	R5	Accelerator pedal angle sensor
B19	Accumulator charge pressure switch	Y9	Retaining solenoid for bucket return-to-dig
K5a	Front windscreen wiper motor interval relay	Y10	Parking brake solenoid valve
M2	Front windscreen wiper motor	Y17	Retaining solenoid for lift kick-out
M3	Rear windscreen wiper motor	Y18	Float position retaining solenoid
R1	Inching-brake pedal angle sensor		

Tab. 81: Other electrical components

The accelerator pedal with the accelerator pedal angle sensor **R5** is located in the driver's cab.

The brake light pressure switch **B12** and the brake accumulator pressure switch **B19** are located under the driver's cab on the compact brake valve.

The windscreen wiper motors **M2** and **M3** are installed in the driver's cab.

The retaining solenoids for the float position **Y18**, bucket return-to-dig **Y9** and lift kick-out **Y17** are located on the pilot control unit.

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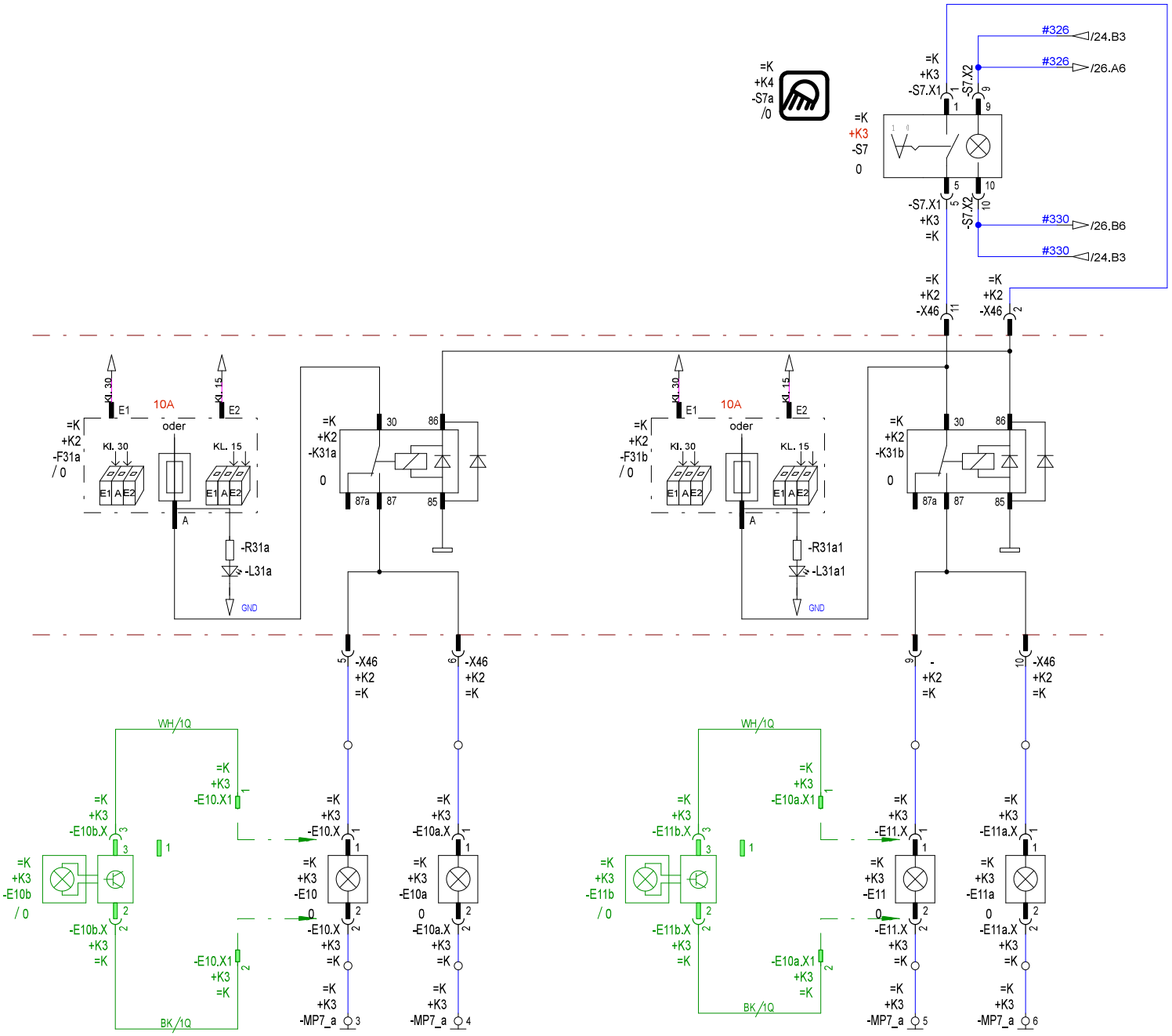
BMK	SYSTEM	PLACE	FUNCTION	SHEET
-1 *	=K	+K	CONNECTION RESISTANCE	/81.D5
-5 *	=H	+H	CONNECTION REVERSING OBSTACLE DETECTOR	/75.E5
-6 *	=H	+H	CONNECTION REVERSING OBSTACLE DETECTOR	/75.E5
-7 *	=H	+H	CONNECTION REVERSING OBSTACLE DETECTOR	/75.E5
-92 *	=K	+K2	LINE END	/86.D3
-93 *	=K	+K2	LINE END	/86.D3
-A3	=K	+K3	RADIO	/35.D3
-A3.X1	=K	+K3	PLUG RADIO	/35.D4
-A3.X2	=K	+K3	PLUG RADIO	/35.E3
-A9 *	=K	+K	IMMOBILISER	/72.E3
-A9.X *	=K	+K	PLUG IMMOBILISER	/72.D2
-A11	=K	+K4	MAIN KEYPAD	/50.A1
-A11.X1	=K	+K4	PLUG MAIN KEYPAD	/28.D6
-A11.X1_7 *	=K	+K4	PLUG CAN IMMOBILISER	/28.C7
-A11.X1_8 *	=K	+K4	PLUG CAN IMMOBILISER	/28.C6
-A13	=K	+K1	DISPLAY UNIT	/28.B5
-A13.a *	=K	+K3	TOUCH DISPLAY UNIT	/71.A2
-A13.X1	=K	+K1	PLUG DISPLAY UNIT	/28.B6
-A13.X2	=K	+K1	PLUG DISPLAY UNIT	/28.B8
-A13a.X *	=K	+K3	PLUG SUPPLY PME DISPLAY	/71.B3
-A13b.X *	=K	+K3	ETHERNET PLUG DISPLAY	/71.C2
-A15	=K	+K	MASTER CONTROL	/45.A1
-A15.CAN.X	=K	+K	PLUG MASTER CONTROL	/27.A3
-A15.COM1.X	=K	+K	PLUG MASTER CONTROL COM 1	/82.E2
-A15.COM4.X	=K	+K	PLUG MASTER CONTROL COM 4	/29.B7
-A15.PWR.X	=K	+K	PLUG MASTER CONTROL	/30.E2
-A16a	=H	+H	INPUT MODULE 1	/46.A1
-A16a.X1	=H	+H	PLUG INPUT MODULE 1	/19.B1
-A16a.X1.43.B	=H	+H	PLUG OPTION CAN WIRING	/55.D6
-A16a.X1.43.S	=H	+H	PLUG OPTION CAN WIRING	/55.B6
-A16a.X1.44.B	=H	+H	PLUG OPTION CAN WIRING	/61.B7
-A16a.X1.44.S	=H	+H	PLUG OPTION CAN WIRING	/61.D7
-A16a.X1.57.B	=H	+H	PLUG OPTION CAN WIRING	/55.D7
-A16a.X1.57.S	=H	+H	PLUG OPTION CAN WIRING	/55.B7
-A16a.X1.58.B	=H	+H	PLUG OPTION CAN WIRING	/61.B8
-A16a.X1.58.S	=H	+H	PLUG OPTION CAN WIRING	/61.D8

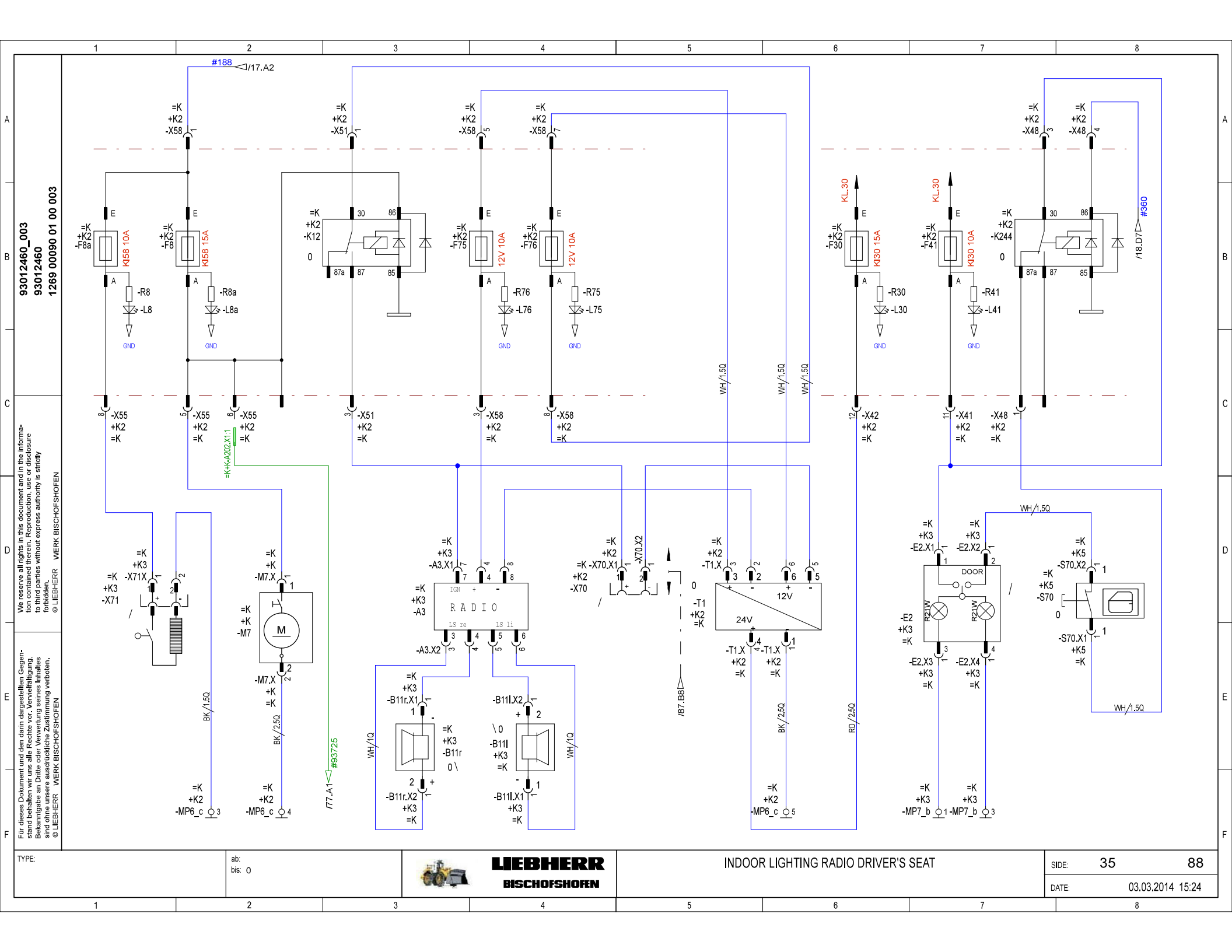
BMK	SYSTEM	PLACE	FUNCTION	SHEET
-A16b	=H	+H	ADDITIONAL MODULE INPUT 1	/54.A1
-A16b.X1	=H	+H	PLUG ADDITIONAL MODULE INPUT 1	/62.B5
-A16c	=H	+H	ADDITIONAL MODULE INPUT 2	/58.A1
-A16c.X1	=H	+H	PLUG ADDITIONAL MODULE INPUT 2	/59.E2
-A17a	=H	+H	AUSGANGSMODUL 1	/47.A1
-A17a.X1	=H	+H	PLUG OUTPUT MODULE 1	/19.B6
-A17a.X1.43.B	=H	+H	PLUG OPTION CAN WIRING	/57.D7
-A17a.X1.43.S	=H	+H	PLUG OPTION CAN WIRING	/57.B7
-A17a.X1.44 *	=H	+H	PLUG CAN WIRING	/84.E7
-A17a.X1.44.58.*	=H	+H	PLUG CAN WIRING	/84.B6
-A17a.X1.44.B	=H	+H	PLUG OPTION CAN WIRING	/59.B7
-A17a.X1.57.B	=H	+H	PLUG OPTION CAN WIRING	/57.D8
-A17a.X1.57.S	=H	+H	PLUG OPTION CAN WIRING	/57.B8
-A17a.X1.58 *	=H	+H	PLUG CAN WIRING	/84.E6
-A17a.X1_9	=H	+H	PLUG ADAPTOR	/87.B2
-A17b	=H	+H	ADDITIONAL MODULE OUTPUT 1	/56.A1
-A17b.X1	=H	+H	PLUG ADDITIONAL MODULE OUTPUT 1	/62.B3
-A17c *	=H	+H	ADDITIONAL MODULE OUTPUT 2	/60.A1
-A17c.X1 *	=H	+H	PLUG ADDITIONAL MODULE OUTPUT 2	/61.E2
-A21	=K	+K4	HEAT AIR CONDITIONING SYSTEM	/49.A1
-A21.X1	=K	+K4	PLUG HEAT AIR CONDITIONING SYSTEM	/28.D2
-A23 *	=V	+V1	CONTROL DEVICE WEIGHING DEVICE	/83.C3
-A23.X1 *	=V	+V1	PLUG WEIGHING DEVICE	/81.B1
-A23.X2	=V	+V1	PLUG WEIGHING DEVICE	/82.E7
-A23.X2_8 *	=V	+V1	PLUG CAN END	/84.B8
-A24.X *	=K	+K1	PLUG DISPLAY UNIT WEIGHING DEVICE	/81.C6
-A25	=K	+K1	DRUCKER WEIGHING DEVICE	/82.A3
-A25.X1	=K	+K1	PLUG DRUCKER	/82.B2
-A50 *	=K	+K2	NETWORK SUPPLY MODULE	/71.E6
-A50.X1 *	=K	+K2	ETHRNET PLUG LAN2	/71.E5
-A50.X2 *	=K	+K2	ETHERNET PLUG LAN2	/71.D6
-A50.X3 *	=K	+K2	PLUG SUPPLY ETHERNET	/71.D6
-A202 *	=K	+K	PRESELECTOR CLOCK AUXILIARY HEATER	/77.C2
-A202.X1 *	=K	+K	CONNECTION PRESELECTOR CLOCK	/77.B1
-A203 *	=M	+M	AUXILIARY HEATER	/77.D4
-A203.X1 *	=M	+M	PLUG AUXILIARY HEATER	/77.C7

BMK	SYSTEM	PLACE	FUNCTION	SHEET
-X200	=H	+H	SPLICE	/22.C2
-X201	=K	+K	SPLICE	/24.C7
-X202	=H	+H	SPLICE	/29.D2
-X202.B *	=K	+K2	PLUG JOYSTICK	/74.B2
-X202.S *	=K	+K2	PLUG JOYSTICK	/74.B2
-X203	=H	+H	SPLICE	/29.D3
-X203.B *	=K	+K	PLUG REVERSING OBSTACLE DETECTOR	/75.C3
-X203.S *	=K	+K	PLUG REVERSING OBSTACLE DETECTOR	/75.D3
-X204	=H	+H	SPLICE	/44.D1
-X205	=K	+K	SPLICE	/29.C2
-X206	=K	+K	SPLICE	/29.C3
-X300 *	=K	+K2	CONNECTION KL.15	/55.A1
-X301	=K	+K2	CONNECTION KL.15	/57.A1
-X302 *	=K	+K2	CONNECTION KL.15	/59.A1
-X303 *	=K	+K2	CONNECTION KL.15	/61.A1
-X306	=K	+K2	PLUG RELAY BOARD	/63.B4
-X306.B *	=H	+H	PLUG FLASHING WARNING LIGHT	/63.D4
-X306.S *	=H	+H	PLUG FLASHING WARNING LIGHT	/63.D4
-X306_A *	=H	+H5	SPLICE	/63.C3
-X306_B *	=H	+H5	SPLICE	/63.C4
-X306_C *	=H	+H5	SPLICE	/63.D3
-X307 *	=K	+K	SPLICE	/64.D5
-X308 *	=K	+K2	CONNECTION KL.15	/65.A5
-X309 *	=K	+K2	CONNECTION KL.15	/66.B3
-X311a.B *	=K	+K3	PLUG WORKING PROJECTOR REAR OPTIONAL	/26.A4
-X311a.S *	=K	+K3	PLUG REAR AREA MONITORING OPTIONAL	/26.A4
-X311b.B *	=K	+K3	PLUG ADAPTOR	/36.D7
-X311b.S *	=K	+K3	PLUG ADAPTOR	/36.D7
-X311c.B *	=K	+K4	PLUG OPTION	/63.C6
-X311c.S1 *	=K	+K4	PLUG FLASHING WARNING LIGHT OPTIONAL	/63.A7
-X311c.S2 *	=K	+K4	SHORT-CIRCUIT PLUG	/63.D7
-X312 *	=K	+K2	CONNECTION KL.15	/70.B4
-X313.KL15 *	=K	+K2	CONNECTION KL.15	/72.A3
-X313.KL30 *	=K	+K2	CONNECTION KL.30	/72.A5
-X313_a *	=K	+K4	SPLICE	/72.C6
-X313_b *	=K	+K4	SPLICE	/72.C7

BMK	SYSTEM	PLACE	FUNCTION	SHEET
-X314.KL.15 *	=K	+K2	CONNECTION KL.15	/75.A3
-X315_1 *	=K	+K3	SPLICE	/36.D1
-X315_2 *	=K	+K3		/36.D2
-X315_3 *	=K	+K3	SPLICE	/36.E1
-X315_4 *	=K	+K3	SPLICE	/36.E2
-X318.B *	=K	+K	PLUG CAB FLOOR	/77.C5
-X318.S *	=K	+K	PLUG CAB FLOOR	/77.C5
-X318_a *	=K	+K2	CONNECTION KL.30	/77.A4
-X318_b *	=K	+K2	CONNECTION KL.30	/77.A6
-X321_Kl.15 *	=K	+K2	CONNECTION KL.15	/78.A4
-X321_MP *	=K	+K2	MASS GROUPING BLOCK	/78.A5
-X321a *	=V	+V	ELECTRICAL SOCKET LEFT	/67.C7
-X321b *	=V	+V	ELECTRICAL SOCKET RIGHT	/67.C3
-X323 *	=V	+V1	ELECTRICAL SOCKET SWEEPING MACHINE	/85.B3
-X323.B *	=K	+K2	PLUG CAB FLOOR	/85.C3
-X323.S *	=K	+K2	PLUG CAB FLOOR	/85.C3
-X323_KL.15 *	=K	+K2	CONNECTION KL.15	/85.B7
-X325 *	=K	+K2	SPLICE	/86.B5
-X325.B *	=K	+K2	PLUG WORKING BASKET	/86.D5
-X325.S *	=K	+K2	PLUG WORKING BASKET	/86.D5
-X325_KL15 *	=K	+K2	CONNECTION KL.15	/86.A1
-X5002.B	=M	+M	PLUG TRANSFER ENGINE	/38.D5
-X_KL.15	=K	+K2	KL.15 RELAY BOARD BOLT M8	/17.C2
-X_KL.15_W3+ *	=K	+K2	CONNECTION KL.15	/76.A3
-X_KL.30	=K	+K2	KL.30 RELAY BOARD BOLT M10	/17.D2
-X_EARTH	=K	+K2	MASS GROUPING BLOCK RELAY BOARD BOLT M6	/17.D3
-X_Y5	=K	+K2	KL.Y5 RELAY BOARD BOLT M5	/17.D6
-XMSP6. *	=K	+K	MASS GROUPING BLOCK	/82.C8
-Y2	=H	+H	SOLENOID VALVE FORWARD	/19.C6
-Y2.X	=H	+H	PLUG SOLENOID VALVE FORWARD	/19.D6
-Y3	=H	+H	SOLENOID VALVE BACKWARDS	/19.C7
-Y3.X	=H	+H	PLUG SOLENOID VALVE BACKWARDS	/19.D7
-Y9	=K	+K4	BUCKET RETURN-TO-DIG	/39.E4
-Y10	=H	+H	SOLENOID VALVE PARKING BRAKE	/40.C7
-Y10.X	=H	+H	PLUG SOLENOID VALVE PARKING BRAKE	/40.C7
-Y11	=V	+V	ADDITIONAL EQUIPMENT 1	/20.C7



TYPE:	ab: bis: 0	LIEBHERR BISCHOFSHOFEN	WORKING PROJECTOR FRONT	SIDE: 25 88 DATE: 03.03.2014 15:24



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TYPE:

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bis: O

LIEBHERR
BISCHOFSHOFEN

INDOOR LIGHTING RADIO DRIVER'S SEAT

SIDE: 35 88

DATE: 03.03.2014 15:24

=K -A15 Modul Nr.:
+K Modulname: PME_MASTER

Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin
A115.GND	/30.F2		EARTH	0	1
A115.DIGIN0	/30.F6		Kl. 15	0	2
A115.DIGIN1			DIGITAL 1	0	3
A115.DIGIN2			DIGITAL 2	0	4
A115.Shield	/30.F3		HOUSING MASTER	0	5
A115.VBat	/30.F4		Kl. 30	0	6
A115.CAN4L	/29.B4		CAN LOW 4	0	1
A115.CAN3L	/28.A3		CAN LOW 3	0	2
A115.CAN2L			CAN LOW 2	0	3
A115.CAN1L	/27.A2		CAN LOW 1	0	4
A115.CAN1H	/27.A4		CAN HIGH 1	0	5
A115.CAN2H			CAN HIGH 2	0	6
A115.CAN3H	/28.A2		CAN HIGH 3	0	7
A115.CAN4H	/29.B2		CAN HIGH 4	0	8
A115.DCD	/82.F5		Data Carrier Detect (DCD)	0	1
A115.RXD	/82.F1		Receive (RXD)	0	2
A115.TXD	/82.F2		Transmit (TXD)	0	3
A115.DTR	/82.F3		Data Derminal Ready (DCD)	0	4
A115.GND	/82.F4		SIGNAL Ground (S-GND)	0	5
A115.n.c.			NOT USED	0	6
A115.RTS			Request to send (RTS)	0	7
A115.CTS			Clear to send (CTS)	0	8
A115.n.c.			NOT USED	0	9
A115.DCD			Data Carrier Detect (DCD)	0	1
A115.RXD			Receive (RXD)	0	2
A115.TXD			Transmit (TXD)	0	3
A115.DTR			Data Derminal Ready (DCD)	0	4
A115.GND			SIGNAL Ground (S-GND)	0	5
A115.n.c.			NOT USED	0	6
A115.RTS			Request to send (RTS)	0	7
A115.CTS			Clear to send (CTS)	0	8
A115.n.c.			NOT USED	0	9
A115.DCD			Data Carrier Detect (DCD)	0	1
A115.RXD			Receive (RXD)	0	2
A115.TXD			Transmit (TXD)	0	3
A115.DTR			Data Derminal Ready (DCD)	0	4
A115.GND			SIGNAL Ground (S-GND)	0	5
A115.n.c.			NOT USED	0	6
A115.RTS			Request to send (RTS)	0	7
A115.CTS			Clear to send (CTS)	0	8
A115.n.c.			NOT USED	0	9

Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin
A115.DCD			Data Carrier Detect (DCD)	0	1
A115.RXD	/29.B6		Receive (RXD)	0	2
A115.TXD	/29.B7		Transmit (TXD)	0	3
A115.DTR			Data Derminal Ready (DCD)	0	4
A115.GND	/29.B6		SIGNAL Ground (S-GND)	0	5
A115.n.c.			NOT USED	0	6
A115.RTS			Request to send (RTS)	0	7
A115.CTS			Clear to send (CTS)	0	8
A115.n.c.			NOT USED	0	9
A115.TXD +			Transmit Data +	0	1
A115.TXD -			Transmit Data -	0	2
A115.RXD +			Receive Data +	0	3
A115.n.c.			NOT USED	0	4
A115.n.c.			NOT USED	0	5
A115.RXD -			Receive Data -	0	6
A115.n.c.			NOT USED	0	7
A115.n.c.			NOT USED	0	8
A115.TXD +			Transmit Data +	0	1
A115.TXD -			Transmit Data -	0	2
A115.RXD +			Receive Data +	0	3
A115.n.c.			NOT USED	0	4
A115.n.c.			NOT USED	0	5
A115.RXD -			Receive Data -	0	6
A115.n.c.			NOT USED	0	7
A115.n.c.			NOT USED	0	8
A115.TXD +			Transmit Data +	0	1
A115.TXD -			Transmit Data -	0	2
A115.RXD +			Receive Data +	0	3
A115.n.c.			NOT USED	0	4
A115.n.c.			NOT USED	0	5
A115.RXD -			Receive Data -	0	6
A115.n.c.			NOT USED	0	7
A115.n.c.			NOT USED	0	8

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TYPE:
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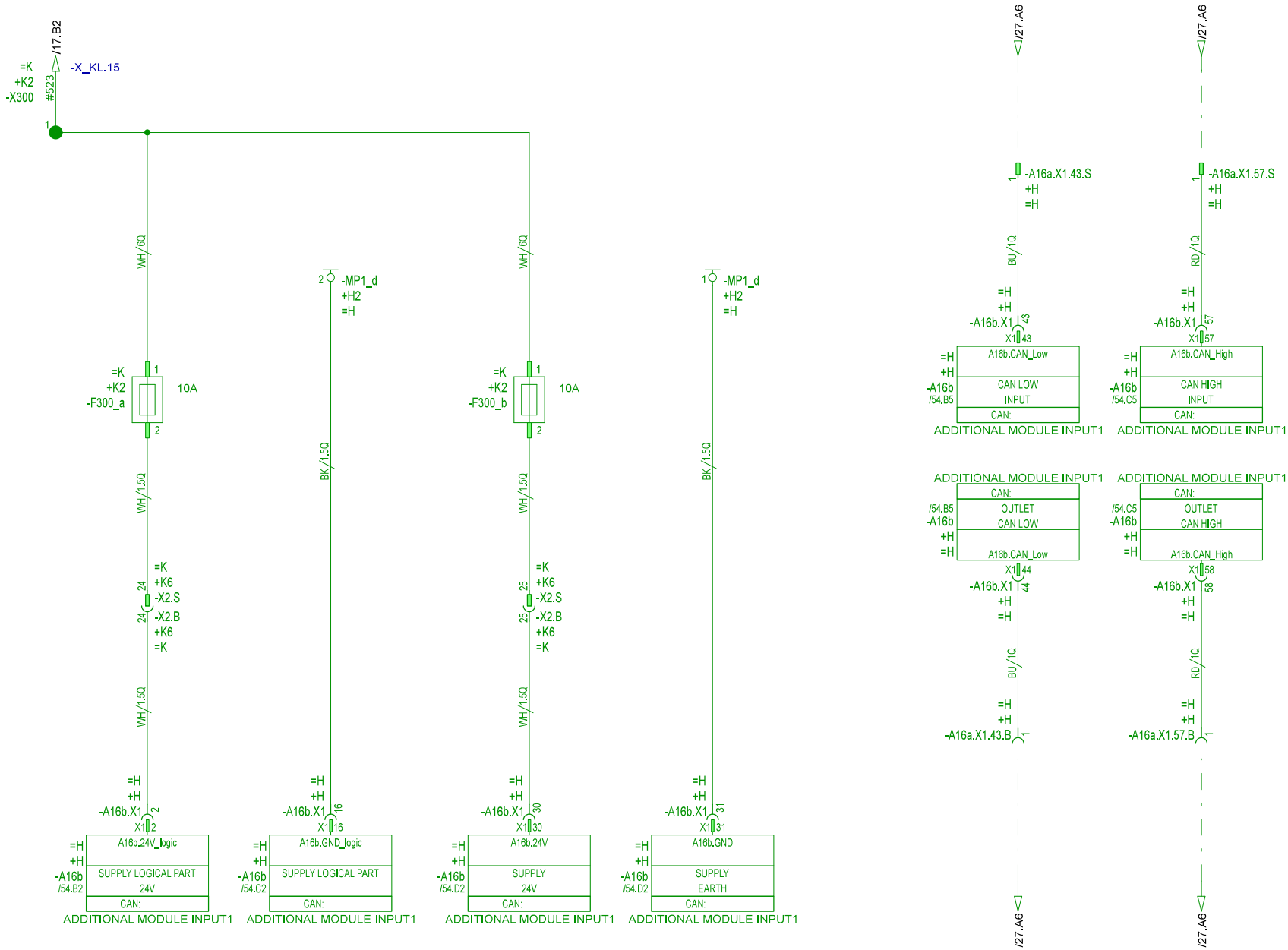
bis: 0

LIEBHERR BISCHOFSHOFEN

GENERAL OUTLAY MASTER

DATE: 03.03.2014 15:24



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TYPE:

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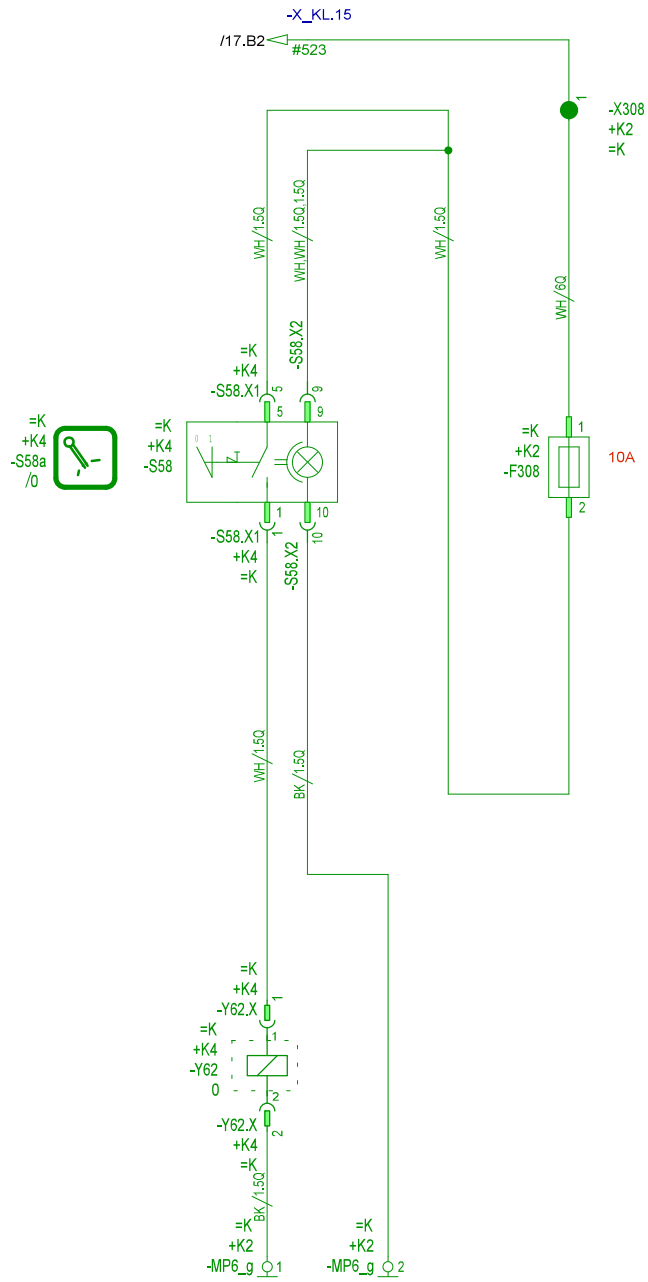
bis: 0

LIEBHERR
BISCHOFSHOFEN

SUPPLY ADDITIONAL MODULE INPUT 1

SIDE: 55 88

DATE: 03.03.2014 15:24



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TYPE:

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LIEBHERR
BISCHOFSHOFEN

OSCILLATING CYLINDER
PILOT CONTROL UNIT

SIDE: 65 88

DATE: 03.03.2014 15:24

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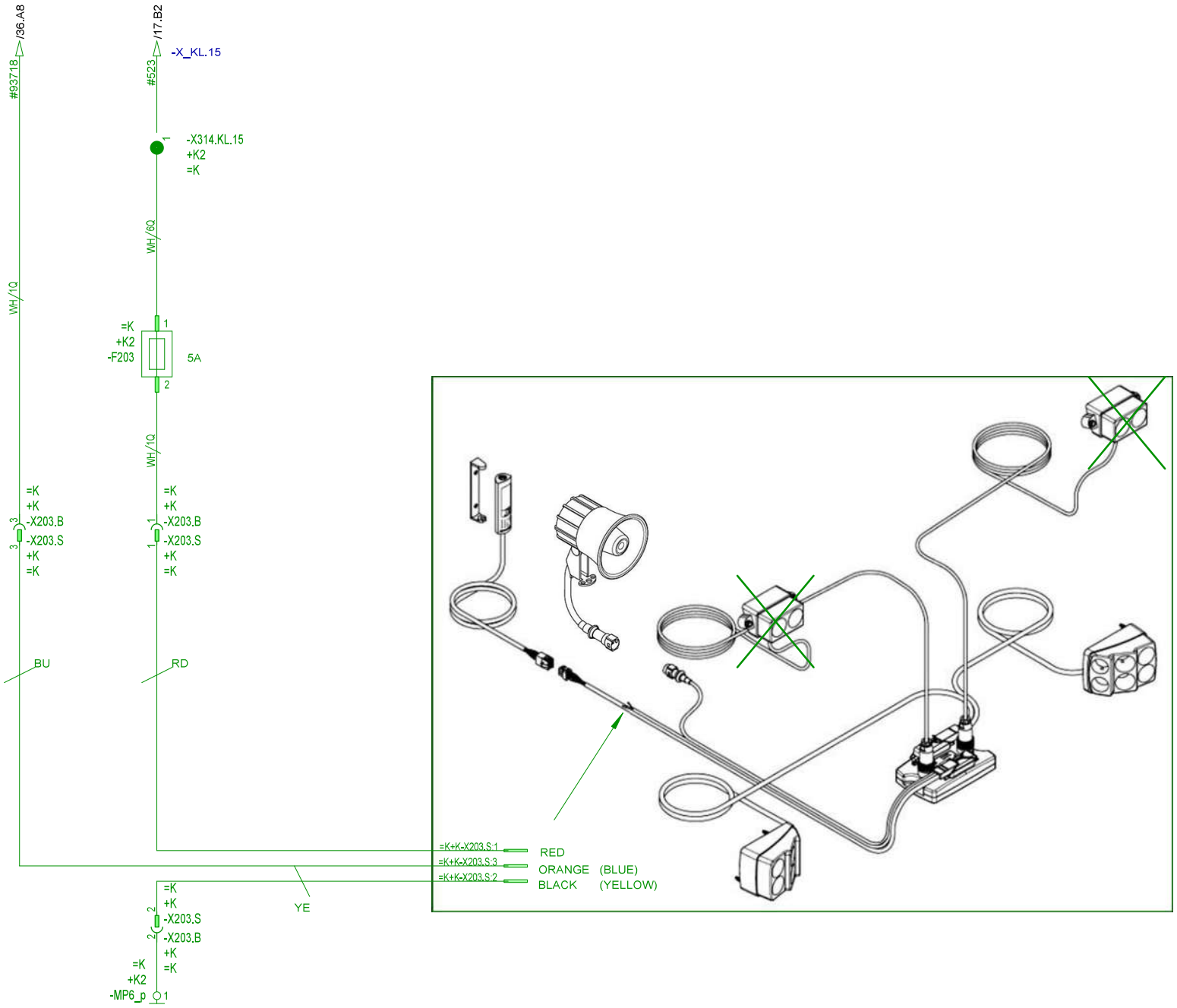
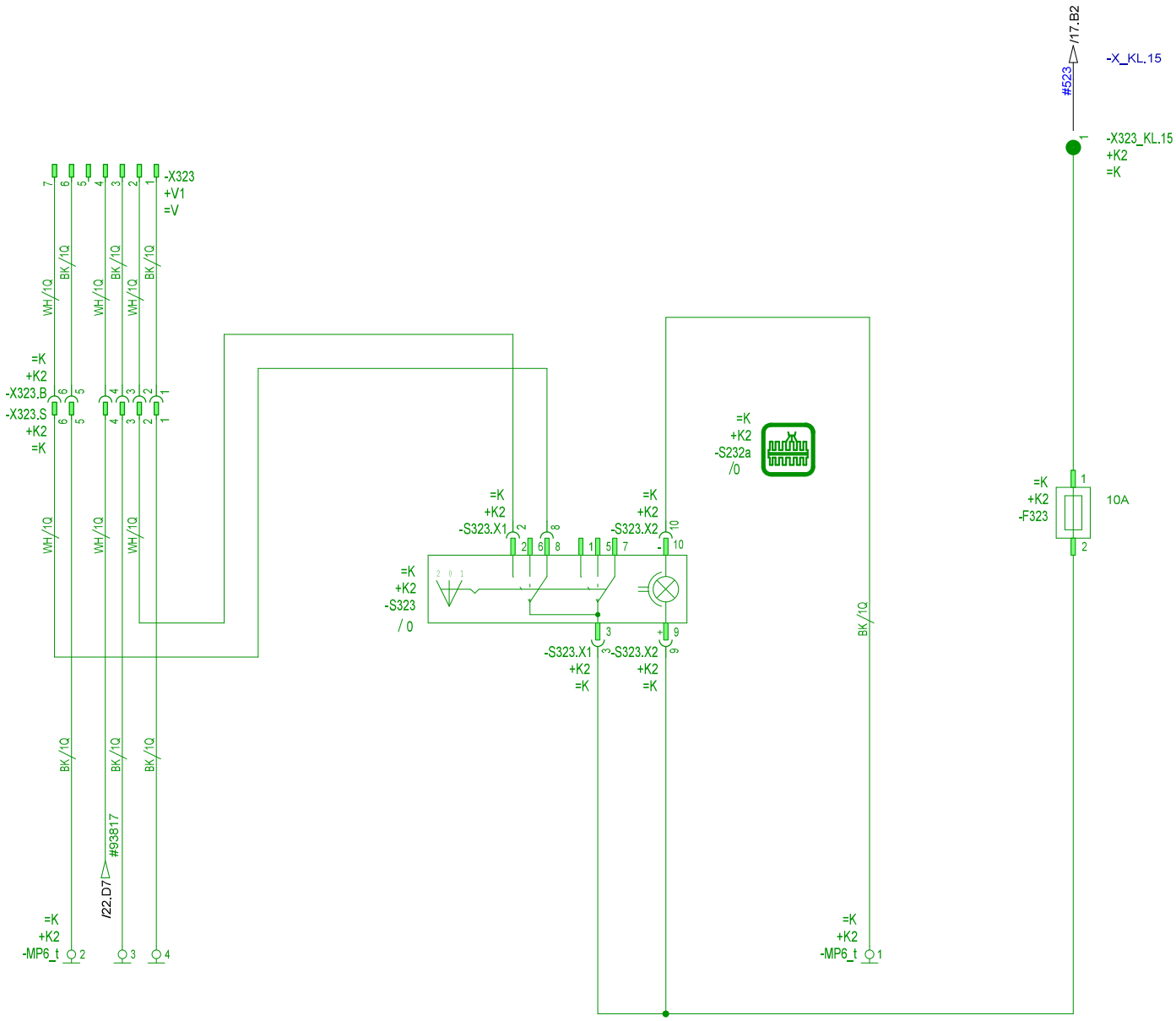


TYPE:	ab: bis: O	LIEBHERR BISCHOFSHOFEN	REVERSING OBSTACLE DETECTOR	SIDE: 75 88 DATE: 03.03.2014 15:24



TYPE:	ab: bis: O	LIEBHERR BISCHOFSHOFEN	SWEEPING MACHINE	SIDE: 85 88 DATE: 03.03.2014 15:24

ENGINE CONTROL UNIT ECU2

=MM -A5502 Modul Nr.:
+M Modulname: JD MOTOR ECU Stufe3B

Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin	Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin
A5502.1				0	1	A5502.41	/10.A3		DPF SENSORS	0	41
A5502.2				0	2	A5502.42				0	42
A5502.3	/10.A3		DPF DIFFERENTIAL PRESSURE	0	3	A5502.43				0	43
A5502.4	/6.A7		MANIFOLD PRESSURE	0	4	A5502.44				0	44
A5502.5				0	5	A5502.45				0	45
A5502.6				0	6	A5502.46				0	46
A5502.7	/6.A2		ENGINE OIL PRESSURE	0	7	A5502.47				0	47
A5502.8	/6.A5		RAIL PRESSURE SENSOR	0	8	A5502.48	/7.A7		COOLANT TEMPERATURE	0	48
A5502.9	/7.A3		EGR TEMPERATURE	0	9	A5502.49	/10.A6		ACKNOWLEDGEMENT PREHEAT	0	49
A5502.10				0	10	A5502.50				0	50
A5502.11				0	11	A5502.51				0	51
A5502.12	/11.A3		THROTTLE VALVE	0	12	A5502.52	/6.A3		ABGAS MANIFOLD PRESSURE	0	52
A5502.13	/11.A6		EGR FLOW	0	13	A5502.53	/6.A6		MANIFOLD PRESSURE	0	53
A5502.14				0	14	A5502.54	/6.A8		CRANKCASE PRESSURE	0	54
A5502.15				0	15						
A5502.16				0	16						
A5502.17				0	17						
A5502.18	/11.A1		EGR VALVE POSITION	0	18						
A5502.19	/7.A4		CHARGE AIR TEMPERATURE	0	19						
A5502.20				0	20						
A5502.21	/10.A7		EARTH ECU	0	21						
A5502.22	/6.A4		RAIL PRESSURE SENSOR	0	22						
A5502.23	/7.A5		MANIFOLD AIR TEMPERATURE	0	23						
A5502.24				0	24						
A5502.25	/6.F6		MANIFOLD PRESSURE	0	25						
A5502.26	/7.F7		SENSOR	0	26						
A5502.27				0	27						
A5502.28	/7.F4		SENSOR	0	28						
A5502.29				0	29						
A5502.30	/6.F5		RAIL PRESSURE SENSOR	0	30						
A5502.31	/10.F1		DPF SENSORS	0	31						
A5502.32				0	32						
A5502.33				0	33						
A5502.34				0	34						
A5502.35				0	35						
A5502.36				0	36						
A5502.37				0	37						
A5502.38				0	38						
A5502.39				0	39						
A5502.40	/7.A8		FUEL TEMPERATURE	0	40						

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Every CAN node has its own CAN address. The system is able to identify the individual components through this address. The addresses are preset and must normally only be changed if the input modules or the output modules are exchanged.

The CAN addresses can be called up in the Sculi diagnostic software with the *INFO* button.

For more information see: Addressing CAN modules (For more information see: Addressing the CAN module and checking the system information, page 030-193)

2.2 Diagnostic plug

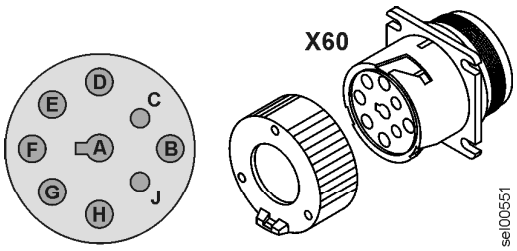

Fig. 425: Diagnostic plug

Pin assignment of diagnostic plug X60	
Pin	**Description**
A	Earth (Mp6_b)
B	Power supply (terminal 30, fuse F26)
C	Connected to CAN High of CAN line 4
D	Connected to CAN Low of CAN line 4
E	Spare
F	Spare
G	Earth (connection RS232 COM4.5 of the central control unit A15)
H	Received data (connection RS232 COM4.2 of the central control unit A15)
J	Transmission data (connection RS232 COM4.3 of the central control unit A15)

Tab. 87: Pin assignment of diagnostic plug X60

The diagnostic plug **X60** is connected to the central control unit **A15** via the COM4 (RS232) connection. Data can be evaluated with the Sculi diagnostic software via this connection.

The diagnostic plug **X60** is connected to CAN line 4. The data from the diesel engine can be evaluated with the Service Advisor diagnostic software via this connection.

The diagnostic plug is not an active CAN node.

LBH/11657125/09/211-20181119_145053/en

1 Layout

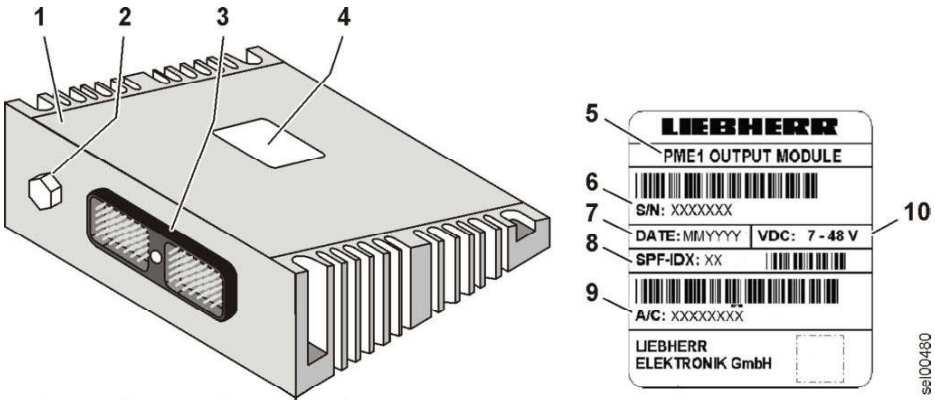

Fig. 439: Output module with type plate

1	Housing made of die-cast aluminium	**6**	Serial number
2	Goretex membrane	**7**	Date of manufacture
3	Connector	**8**	Specification index
4	Type plate	**9**	Article code
5	Device designation	**10**	Voltage range

Output modules consist of various electronic components, fitted in a die-cast aluminium housing. Depending on the device type, up to 4 output modules can be installed.

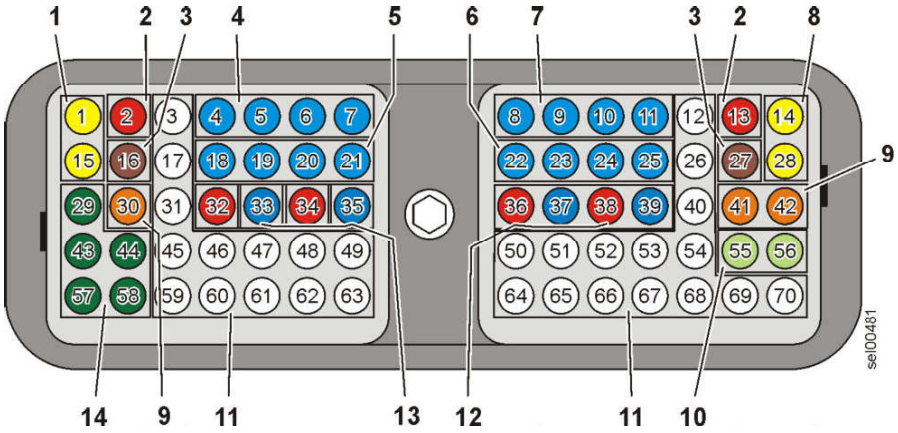

Fig. 440: Plug assignment of output modules

1	Power supply for bank 1 and 2	**8**	Power supply for bank 3 and 4
2	Power supply for logic	**9**	Encoder supply voltage 24 V
3	Earth for logic	**10**	Frequency measurement inputs
4	Power outputs 1.3 A, bank 1	**11**	Common earth
5	Power outputs 1.3 A, bank 2	**12**	Power supply 8 A, switching output
6	Power outputs 1.3 A, bank 4	**13**	8 A, switching output
7	Power outputs 1.3 A, bank 3	**14**	CAN interface

2 Function

The output module is part of the control system and is linked to the central control unit via a CAN bus interface. The central control unit can specify the current from the outputs via the CAN bus. The module regulates what currents are required

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– Hazard warning system fuse F07a (10 A)
– Alternator G1
– Starter M1

2.2 Battery

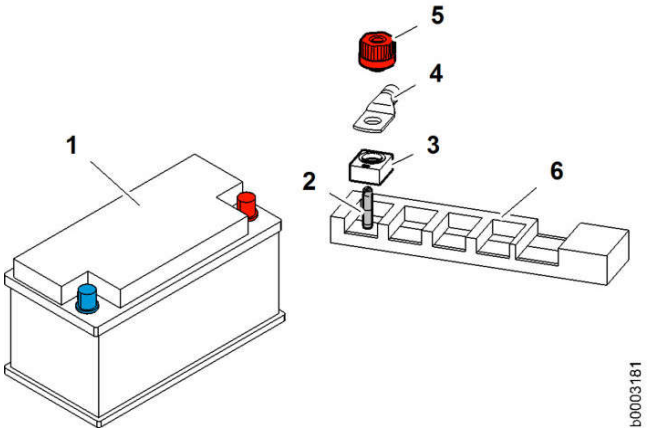

Fig. 447: Battery and fuse holder

1	Battery	**4**	Electrical line
2	Threaded pin	**5**	Insulating nut
3	Fuse insert	**6**	Fuse carrier

The battery **1** consists of six cells, each with 2 volts. Two batteries are installed in the machine. These are connected in series and can produce an operating voltage of 24 volts.

The batteries are connected to the electrical lines through the fuse holder **6**. The electric lines are attached to the fuse holder with insulating nuts **5** (tightening torque 12 Nm).

The insulating nut **5** fastens the electrical cable via a threaded pin **2** to the fuse. At the same time, the insulating nut separates the electrical cable from the threaded pin. This separation is necessary, as otherwise, the function of the fuse is disabled.

Note
The insulating nut ensures that the electrical cable is separated from the threaded pin. Without this separation, the electrical cable would be directly connected to the positive terminal of the battery. The fuse would be bypassed and therefore useless.

▶ Always fasten electrical cables to the fuse carrier with the appropriate insulating nuts.

▶ Check the insulating nuts for damage and replace them if necessary.

Charge levels				
Acid density at 27 °C	**Charge level**	**Battery voltage**	**Voltage per cell**	**Remark**
1.28 – 1.26	100%	over 12.60	over 2.10	Battery OK
1.25 – 1.24	75%	12.54 – 12.40	2.10 – 2.07	
1.24 – 1.18	50%	12.40 – 12.18	2.07 – 2.03	Charge battery

120.3 Transmission hydraulics

120.3.1 Overview of the hydraulic control system

Valid for: L538-1268/31321-;

1 Layout

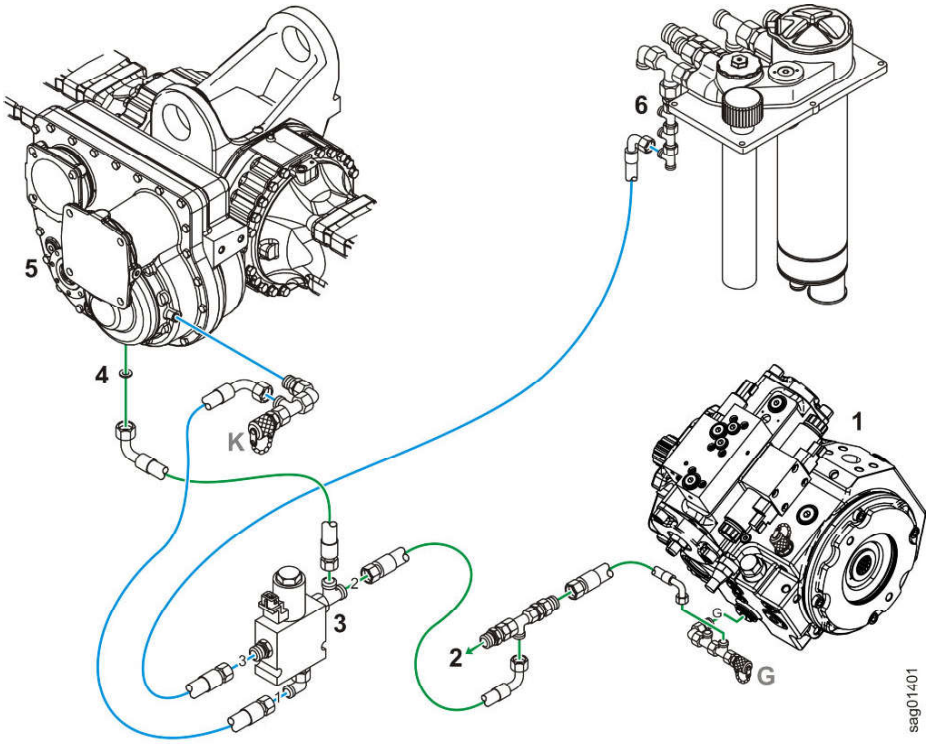

Fig. 455: Transmission - hydraulic control

1	Travel pump	**5**	Filter unit
2	Pilot control	**G**	Replenishing pressure test connection
3	Clutch proportional solenoid valve Y60	**K**	Clutch shift pressure test connection
4	Transmission		

The clutch proportional solenoid valve **3** is fitted in the frame of the rear section.

2.3 Service brake (wet disc brake)

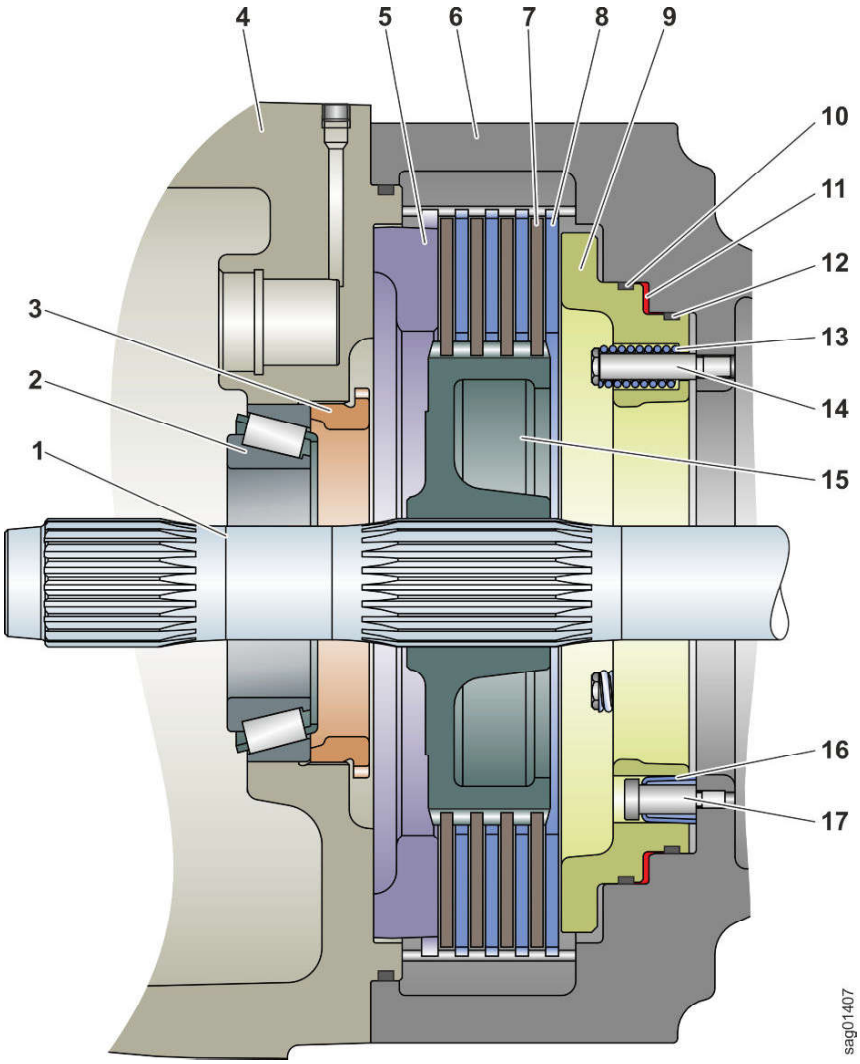

Fig. 463: Sectional view of disc brake

1	Output shaft	**10**	Pressure chamber sealing ring
2	Differential housing tapered roller bearing	**11**	Pressure chamber
3	Preload nut	**12**	Pressure chamber sealing ring
4	Main housing	**13**	Return spring
5	Pressure plate	**14**	Return pin
6	Axle casing	**15**	Actuator ring
7	Inner disc	**16**	Adjusting spring
8	Outer disc	**17**	Adjusting screw
9	Brake piston		

The service brake is a wet disc brake. A braking unit is built into both axle casings.

The inner discs **7** have a non-twisting tooth connection with the actuator ring **15** but can move axially. The actuator ring **15** is connected to the output shaft **1**.

The outer discs **8** have a non-twisting tooth connection with the axle casing **6** but can move axially.

When braking, oil is directed to the pressure chamber **11**. The oil pressure moves the brake piston **9** against the readjusting springs **13** and clamps the brake plates

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150.1.2.1 Z kinematics standard pin bearing

Valid for: L538-1268/31321-;

1 Layout

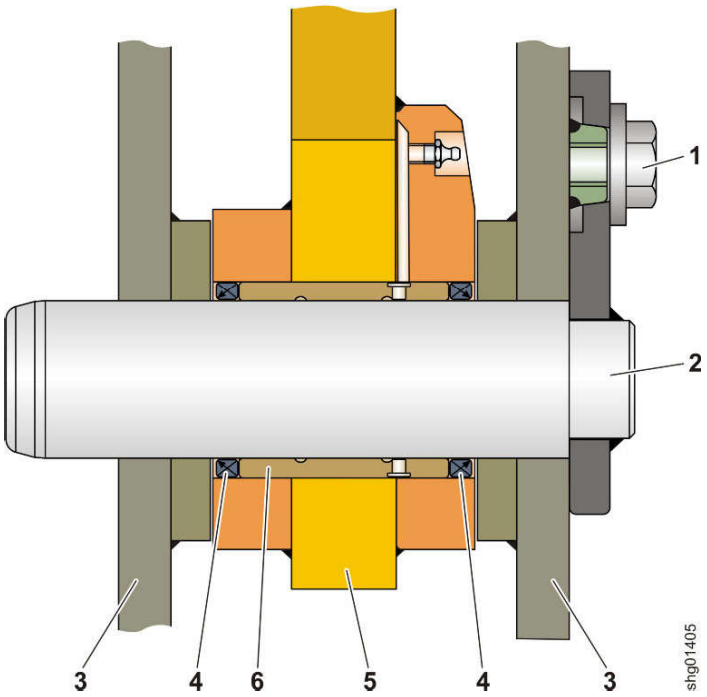

Fig. 470: Z kinematics standard pin bearing

1	Bearing pin retainer	**4**	Radial seal
2	Bearing pin with securing lug	**5**	Lifting arm
3	Counter bearing	**6**	Bearing bushing

2 Function

The lift arms are connected by a pin bearing to the following components:
- Front section
- Lift cylinder
- Linkage

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160 Operator's cab, heating and air conditioning

Contents

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2 Function

2.1 Symbols in the display

For further information on the symbols in the display, see: Operating manual

2.2 Plug assignment

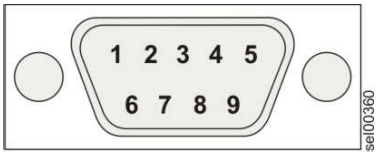

Fig. 485: Plug assignment (plug A13.X1 / SUB-D)

The display (A13) is linked to the central control unit via 9-pin plug connector (plug A13.X1 / SUB-D).

Pin	Function	Pin	Function
1	Earth	6	No function
2	Supply voltage (terminal 15, fuse F10)	7	Supply voltage (terminal 30, fuse F39)
3	CAN-Low	8	Terminating resistor
4	CAN-High	9	Terminating resistor
5	No function		

Tab. 110: Plug assignment

At the back of the display, there is a plug connector (plug A13.X2) for the earth connection to the housing.

160.2.3 Touch screen display

Valid for: L538-1268/31321-;

The display A13a (monitor with touch screen function) is fitted at the front, on the right.

2.6 Air filters in the driver's cab

The air drawn in is filtered by the pre-filter, the fresh air filter and the recirculated air filter. The heating and air conditioning unit distributes the filtered air through the outlet nozzles into the interior of the cab.

2.6.1 Pre-filter and fresh air filter

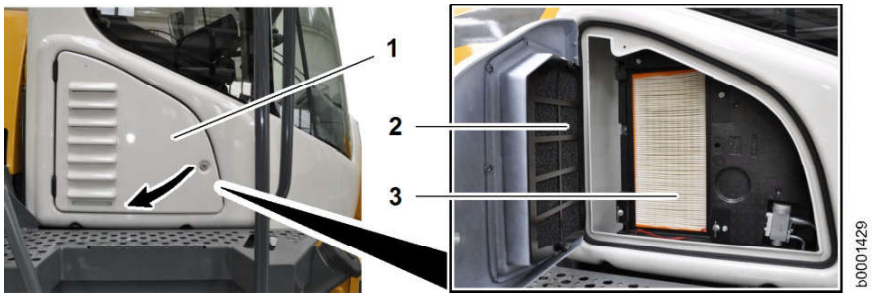

Fig. 494: Pre-filter and fresh air filter

1 Maintenance access
2 Pre-filter
3 Fresh air filter

The pre-filter **2** and the fresh air filter **3** are located on the right, on the outside of the driver's cab.

Both filters must be replaced or cleaned regularly. (See the maintenance schedule)

2.6.2 Recirculated air filter

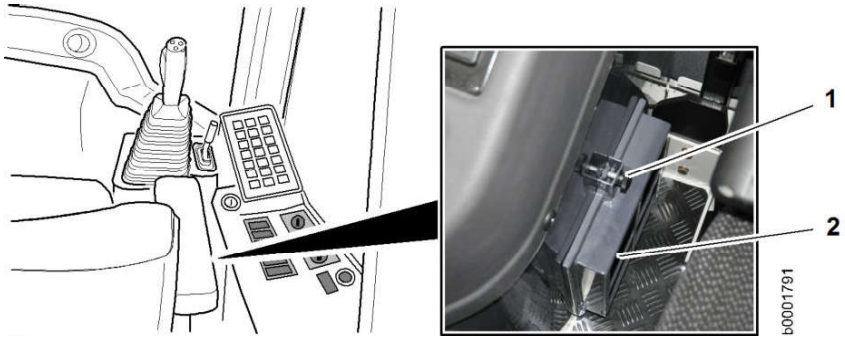

Fig. 495: Recirculated air filter

1 Screw on holder for recirculated air filter
2 Recirculated air filter

The recirculated air filter **2** is on the right, inside the driver's cab.

In recirculation mode, the air is drawn in through the recirculated air filter.

The recirculated air filter must be replaced or cleaned regularly. (See the maintenance schedule)

160.3.2 Heating and air conditioning unit

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The refrigerant expands. The expansion reduces the pressure energy in the refrigerant and quickly cools the evaporator.

The evaporator **10** is exposed to hot air from the cab and transfers the heat to the refrigerant. This thermal exchange cools the cab air and heats the refrigerant.

The heated refrigerant evaporates and turns to gas. This change of state requires additional energy from the (warm) evaporator, which further reduces the temperature.

The warmed, gaseous refrigerant is drawn in by the air conditioning compressor **1** again.

160.4.2 Air conditioning compressor

Valid for: L538-1268/31321-;

1 Layout

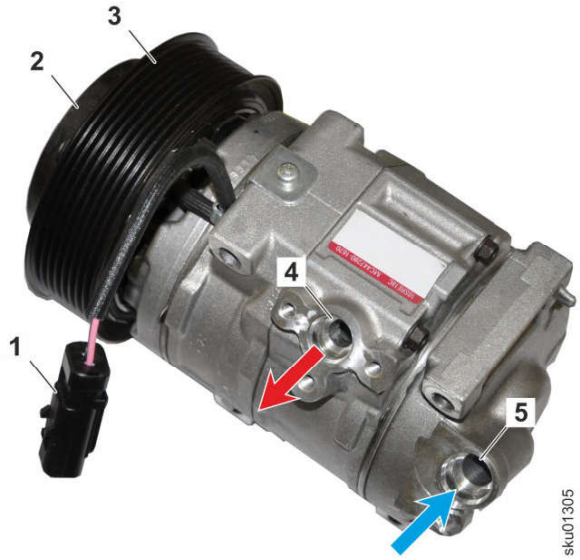

Fig. 506: Air conditioning compressor

1 Connector for magnetic coupling
2 Magnetic coupling Y22
3 Pulley
4 Outlet port
5 Intake port

The air conditioning compressor with magnetic coupling **2** is attached to the diesel engine and driven by a V-ribbed-belt.

2 Function

The air conditioning compressor acts as a pump, drawing in refrigerant in a gaseous condition from the evaporator, compressing it and delivering it to the condenser.

2.2 Purpose of the compressor oil

The main functions of the compressor oil are:
- Reducing friction, wear and noise
- Hydrostatic transmission of force to the various components of the air conditioning compressor.
- Dissipating heat

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2 Function

The temperature sensor is on the right, on the outside of the driver's cab.

The resistance from the temperature sensor depends on the temperature measured. This signal is sent to the heater/air conditioning control electronics.

160.4.8.4 Sun sensor

Valid for: L538-1268/31321-;

1 Layout

Fig. 517: Sun sensor

2 Function

The sun sensor is in the central console.

The sun sensor records the intensity and angle of incidence of sun shining on the vehicle. The sun sensor consists of a photoelectric diode. The photoelectric diode sends a voltage signal to the heater/air conditioning control electronics.

The voltage increases along with the light intensity.

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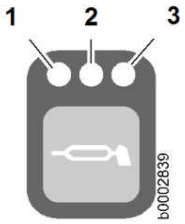

2.5 Non-scheduled lubrication intensity (cycle settings)

You can use the *central lubrication system* button to make the following settings:
– Setting the lubrication intensity (75%, 100%, 125%)
– Non-scheduled lubrication

The LEDs indicate the following conditions when the ignition is switched on:
– LED 1 lights up: 75% lubrication intensity set (for light duty)
– LED 2 lights up: 100% lubrication intensity set (for medium duty)
– LED 3 lights up: 125% lubrication intensity set (for heavy duty)
– LED 1 or 2 or 3 flashes: lubrication cycle in progress
– LEDs 1 + 2 + 3 lights up: grease has reached low level
– LEDs 1 + 2 + 3 flash and service code: system fault

2.6 Setting the lubrication intensity

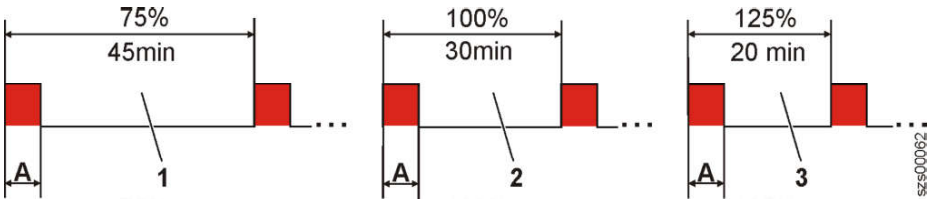

Fig. 526: Lubrication processes

A Lubrication cycle (strokes)
1 Lubrication for light duty
2 Lubrication for medium duty
3 Lubrication for heavy duty

Press and hold the *central lubrication system* button (>2 s) to switch to setting mode.

Each time you press the button, the mode changes to the next one up and after the highest mode switches back to the first (i.e. 75% - 100% - 125% - 75% - ... etc.)

The cycle time for medium-duty operation (mode 2) can be altered in the Sculi diagnostic software using the ***CWadCGrTimeMode2*** parameter.

During the lubrication cycle **A** the number of set strokes are performed. The shorter the pauses between the lubrication cycles, the more grease is supplied to the lubricating points.

2.7 Non-scheduled lubrication

Briefly press the *central lubrication system* button (<2 s) to trigger a non-scheduled lubrication at any time. The ignition must be switched on but the parking brake can be engaged (lubrication and cycle time according to setting)

The pump motor switches off after the set number of strokes and the cycle time begins again.

2.8 System fault (stroke error)

The strokes are tested with a specified time.

Each executed stroke resets this time. If no stroke is performed in this time, the system is stopped, LEDs 1 + 2 + 3 flash and the service code E2017 appears.

2.9 Grease level in reservoir too low

If the grease level in the reservoir is too low, all the LEDs on the *central lubrication system* button light up and a service code is displayed. When the grease has been refilled, the LEDs go out.

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LED GPS (orange)	Operating status
OFF	GPS system does not work

Tab. 119: LED GPS

LED RADIO (yellow)	Operating status
ON	All LEDs light up during the boot process
Flashes	GSM/GPRS subsystem is looking for a network
Blinks slowly	GSM/GPRS system is logged into a network, no data is being transmitted
ON	GSM/GPRS system is transmitting data
Blinks rapidly	Connection error, GSM/GPRS error
OFF	GSM/GPRS system does not function

Tab. 120: LED RADIO

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