en **Service manual**

Wheel loader

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Manufacturer: Liebherr-Werk Bischofshofen GmbH
Valid for: L 518-1655

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Symbol	Meaning
—	**List** Identifies individual items of a list.

Tab. 3: Symbols

010.1.2 Intended use

010.1.2.1 Laws, rules, guidelines and safety regulations

To ensure safe operation:
- Ask work site manager for safety regulations at place of use.
- Adhere to safety regulations at place of use.
- Adhere to traffic regulations.
- Adhere to valid guidelines from insurers (for example employers' professional liability insurance companies, accident insurance et cetera).
- Avoid working methods that can endanger safety.
- Adhere to all intervals specified for recurrent checks and inspections in this operator's manual.

010.1.2.2 Intended use

Wheel loader is used to pick up, move and dump following materials:
- Soil
- Stones
- Broken rocks
- Bulk materials

This applies to a standard machine in normal operating conditions. Special applications are described in a separate options operator's manual.

To ensure intended use:
- Adhere to operator's manual.
- Adhere to maintenance intervals.
- Observe inspection and maintenance tasks.
- Adhere to specifications in the technical data.
- When using machine on public roads, make sure it complies with applicable national regulations.
- Only lift loads with intended working attachments (fork prongs, crane boom), which must be fitted and functioning.
- Make sure that machines used underground (mining and tunnel construction) are fitted with systems to reduce exhaust emissions (such as diesel particulate filters).
- Adhere to individual country's requirements for underground operation.
- For special uses use special working attachments and if necessary special safety equipment.
- Exclusively mount and use special working attachments with approval and as per stipulations of manufacturer of basic machine.
- Only use approved tyres.
- A suitably equipped workshop is absolutely essential for performing repair work.

Note

▶ Any other use or use beyond the stated use is improper use.

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010.1.6.3 Transporting machine

Danger to life

Machine tipping

- Make sure that the transport vehicle is authorised for the machine weight and machine size.
- Do not manoeuvre while driving on ramps.
- Before driving on ramps, clean mud, snow and ice off tyres or travel gear.
- Make sure that a spotter is available if necessary.
- To load and unload machine, use only sturdy, stable loading ramps.
- Make sure that width and angle of ramps match the gauge and climbing ability of machine.

Incorrect transport

- Park machine on level ground during preparation for transport (disassembly, cleaning).
- Secure machine against rolling away.
- Apply parking brake.
- Pull out ignition key.
- Leave operator's cab.
- All doors, windows and service access points are closed.
- Make sure that nobody is on the machine during transport.
- If necessary, dismantle a portion of working attachment from machine for duration of transport.
- Make sure that the road to be travelled is known.
- Make sure that all applicable limitations for width, height and weight are known.
- Drive carefully under electric cables and bridges.
- Drive carefully through tunnels.

010.1.6.4 Access to machine

Injury

Incorrect entry and exit

- Clean dirt, oil, ice and snow from steps, ladders, anti-slip mats, handrails and handles.
- Enter and exit carefully on muddy roads, ice, snow, traffic on access roads and in narrow conditions.
- Regularly check steps, ladders, anti-slip mats, handrails and handles and have them repaired if necessary.
- Before entering machine, clean mud, grease, ice and snow from shoes and climbing aids.
- Put on gloves for secure grip.
- Do not climb up or down using tyres, wheel hubs or rims.
- When exterior influences (for example wind) make opening and closing the door more difficult: Always guide door with your hand.
- Make sure that the opened or closed door has engaged properly.
- If the machine is still moving: Do not stand up from the operator's seat.
- Never jump off machine.
- Enter and leave the machine exclusively using the access system.
- Do not use control elements as handles.
- Keep your face towards machine during entry and exit.

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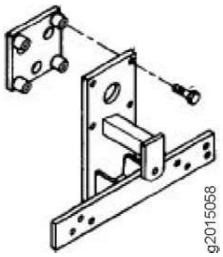
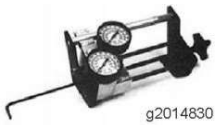
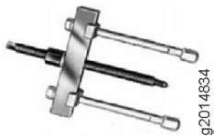
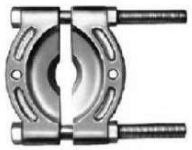
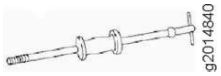
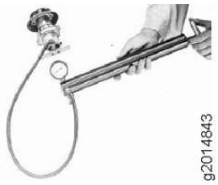
Designation	Item code	Remark	Fig.
Diagnostic data lead 3.0 m (Ethernet)	10513200	For Sculi diagnostic software (data connection between central control unit and laptop)	

Tab. 4: Special tools, general

010.2.2 Special tools for the engine

Designation	ID number	Remarks	Fig.:
Engine adapter	10652208	For attaching to an engine cranking device	 g2015058
Spring tension tester	7090992	For checking the tension of the valve springs For checking the spring force of the oil pressure control valve	 g2014830
Extractor	7091003	For removing the crankshaft gear from the crankshaft.	 g2014834
Extractor attachment	7091002	For removing the crankshaft gear from the crankshaft	 g2014837
Punch extractor	12205221	For removing the crankshaft bearing cover For removing the cylinder bushings	 g2014840
Cooling system pressure pump	7091005	For testing the pressure of the cooler cover and cooling system.	 g2014843
O-ring groove cleaning brush	12205227	For cleaning the O-ring groove of the cylinder bushing in the block.	 g2014848

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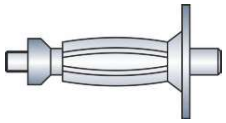
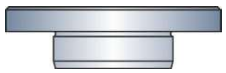
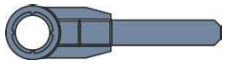
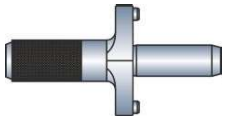
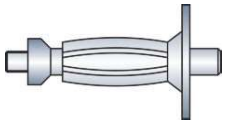
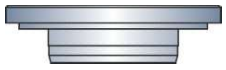
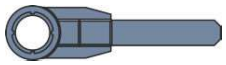
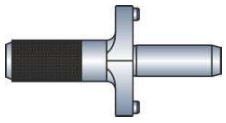
010.2.12 Special tools for front axle

Designation	Item code	Remark	Fig.
Handle for driver	10220624		
Driver 54.5 mm	10220631	For installing the shaft seal ring in the axle casing	
Driver 139.5 mm	10220623	For installing the shaft seal ring in the wheel hub	
Set of 5 spanners	10220617	For gripping while removing and installing the bevel gear shaft	
Slotted nut spanner	10220626	For removing and installing the bevel gear shaft	
Slotted nut spanner	10220633	For removing and installing the differential	

Tab. 15: Special tools for front axle

010.2.13 Special tools for rear axle

Designation	Item code	Remark	Fig.
Handle for driver	10220624		
Driver 54 mm	10220632	For installing the shaft seal ring in the axle	
Driver 139.5 mm	10220623	For installing the shaft seal ring in the wheel hub	
Set of 5 spanners	10220617	For gripping while removing and installing the bevel gear shaft	
Slotted nut spanner	10220626	For removing and installing the bevel gear shaft	
Slotted nut spanner	10220633	For removing and installing the differential	

Tab. 16: Special tools for rear axle

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Metric standard threads and fine threads				Metric standard threads and fine threads			
At least one element of the bolted joint (bolts, washers, nuts etc.) with the following surface: flZn = zinc flake coating (LH standard 10021432, LH standard 10215295 flZnnc-480h-L valid ≥M6)				All elements of the bolted joint (bolts, washers, nuts etc.) with the following surface: Black oxide or phosphated Galvanised (LH standard 10215295 Fe// ZnNi(12)5//Cn//T2)			
Minimum total coefficient of friction μ_G= 0.09				Minimum total coefficient of friction μ_G= 0.11			
Thread	**Strength class**	**Assembly prestressing forces F_M in kN**	**Tightening torques M_A in Nm**	**Thread**	**Strength class**	**Assembly prestressing forces F_M in kN**	**Tightening torques M_A in Nm**
M 33	8.8	370	1550	M 33	8.8	370	1800
	10.9	550	2250		10.9	540	2600
	12.9	640	2600		12.9	630	3100
M 33 x 1.5	8.8	430	1650	M 33 x 1.5	8.8	420	1950
	10.9	630	2450		10.9	620	2900
	12.9	740	2800		12.9	730	3400
M 33 x 2	8.8	420	1600	M 33 x 2	8.8	410	1900
	10.9	610	2400		10.9	600	2800
	12.9	720	2800		12.9	700	3300
M 36	8.8	440	1950	M 36	8.8	430	2300
	10.9	650	2900		10.9	630	3400
	12.9	760	3400		12.9	740	3900
M 36 x 1.5	8.8	520	2150	M 36 x 1.5	8.8	510	2600
	10.9	760	3200		10.9	750	3800
	12.9	890	3700		12.9	870	4400
M 36 x 3	8.8	470	2050	M 36 x 3	8.8	460	2400
	10.9	690	3000		10.9	680	3500
	12.9	810	3500		12.9	790	4100
M 39	8.8	530	2500	M 39	8.8	520	3000
	10.9	770	3700		10.9	760	4400
	12.9	910	4400		12.9	890	5100
M 39 x 1.5	8.8	610	2800	M 39 x 1.5	8.8	600	3300
	10.9	900	4000		10.9	880	4800
	12.9	1050	4700		12.9	1030	5600
M 39 x 3	8.8	560	2600	M 39 x 3	8.8	550	3100
	10.9	820	3900		10.9	810	4500
	12.9	960	4500		12.9	940	5300

Tab. 22: Bolt prestressing forces and tightening torques

*The tightening torques for flZn bolts <M10 are non-binding because no fixed friction coefficient window is defined in the LH10215295 standard. According to the

Description	Unit	Value
Protection class		IP67
Signal curve		Linear

020.2.4 Fuel pre-filter

Valid for: L518-1655;

Description	Unit	Value
Filtration grade	µm	10

020.2.5 Fuel fine filter

Valid for: L518-1655;

Description	Unit	Value
Filtration grade	µm	2

020.2.6 Clutch

Valid for: L518-1655;

Description	Unit	Value
Type		Bowex 65 FLE-PA
Screw locking		Loctite 241
Tightening torque of cheese-head screws on coupling	Nm	49
Tightening torque of gearwheel screw	Nm	86

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020.8.4 Spring accumulator cylinder for parking brake

Valid for: L518-1655;

Description	Unit	Value
Nominal stroke	mm	50
Maximum stroke	mm	65
Tractive force at nominal stroke (new condition)	N	2192
Minimum oil pressure for opening at nominal stroke (new condition)	bar	13.2
Weight	kg	2.7

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020.14 Lubrication system

020.14.1 Central lubrication pump EP1

Valid for: L518-1655;

Description	Unit	Value
Flow rate per stroke	mm^3	120
Pumped medium		Grease up to NLGI class 2
Maximum delivery pressure	bar	280
Operating temperature	°C	min. -35 max. +75
Supply voltage		12V to 24V
Protection class		IP 65
Z kinematics lubrication time (factory setting)	min	5
Z kinematic cycle time (factory setting)	h	1

020.14.2 Progressive distributor

Valid for: L518-1655;

020.14.2.1 MX-F

Description	Unit	Value
Maximum operating pressure at inlet	bar	300
Temperature range	°C	min. -35 max. +100
Pumped medium		Grease up to NLGI class 2

020.14.2.2 MX-F 25

Description	Unit	Value
Flow per outlet	mm^3	25
Flow per element	mm^3	50
Piston diameter	mm	3

020.14.2.3 MX-F 45

Description	Unit	Value
Flow per outlet	mm^3	45

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Specification
LH-00-FUEL

Tab. 40: Minimum quality requirement

030.3.6 Diesel exhaust fluid

Valid for: L518-1655;

030.3.6.1 Liebherr recommendation

Designation
AdBlue® in Europe
DEF (Diesel exhaust fluid) in the USA
AUS 32 (aqueous urea solution)

Tab. 41: Liebherr recommendation

030.3.6.2 Minimum quality requirement

Specification
DIN 70 070
ISO 22241
LH-00-UREA

Tab. 42: Minimum quality requirement

030.3.7 Engine oils

Valid for: L518-1655;

030.3.7.1 Liebherr recommendation

Cold-start temperature according to SAE J300	Designation	Changing interval
-30 °C	Liebherr engine oil 5W-30 low ash	Every 500 h, at least once a year
-25 °C	Liebherr engine oil 10W-40 low ash	Every 500 h, at least once a year

Tab. 43: Recommendation for engine oils

030.3.7.3 Minimum quality requirement

Specification
ACEA E6

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– Cooler cover

CAUTION
Poorly accessible maintenance point!
Risk of injury.

▶ Use suitable climbing aids.

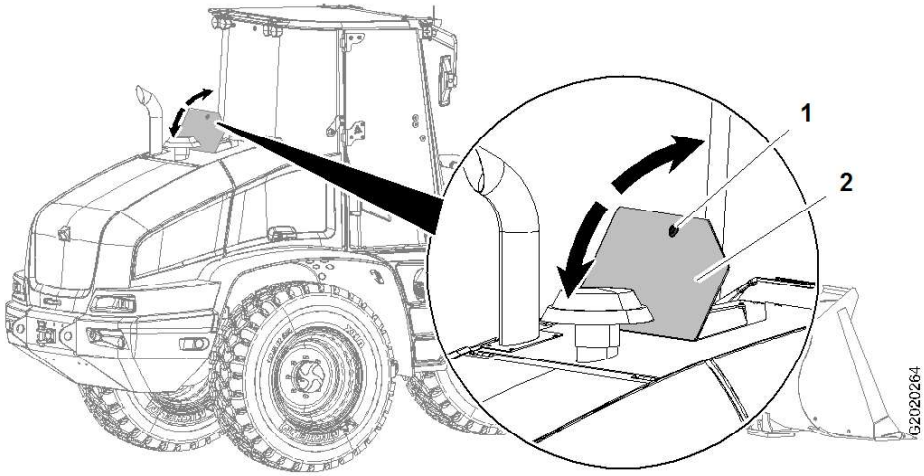

Fig. 94: Service cover

1 Locking mechanism **2** Service cover

▶ To open the service cover: Release the lock **1** and open the service cover **2**.

▶ To close the service cover: Close the service cover **2** and close the lock **1**.

030.4.2.3 Turning off the battery main switch

Valid for: L518-1655;

Note

For certain maintenance jobs, the battery main switch must first be turned off.

Read the descriptions of the maintenance tasks to find out whether the battery main switch must be turned on or off.

Turn on the battery main switch after completing these maintenance tasks.

NOTICE
Voltage fluctuations!
Damage to the electrical system.

▶ Never turn off the battery main switch when the engine is running.

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Sending oil samples

▶ Label the sample container with the barcode (the red laboratory number on the sample information form).
  ▷ This ensures that the form with the sample information is allocated to the correct sample.

▶ Carefully complete sample information form.
  ▷ The more information you provide on the machine and the oil, the more accurately the diagnosis can be carried out.

▶ Always identify subsequent samples for the same machine with an identical sample description.
  ▷ This ensures that the analysed values are logged on the printed laboratory reports. This makes it easier to identify trends. Only by studying tends is it possible to clearly identify changes of state caused by contamination, wear, ageing and mixing with other service fluids.

▶ Send the sample in the oil-proof plastic bag provided.
  ▷ Self-adhesive seal ensures that bag is firmly closed. Sample information form is protected in a separate plastic pocket on outside.

Assessing the analysis results

There is no single element or measured value that in itself necessitates a warning or a recommendation to change the oil. It depends on the overall analysis of the oil sample, from the zinc content to the purity class.

For bio hydraulic oils:
If the zinc content in the oil exceeds 300 mg/kg and other critical values are exceeded, the zinc may saponify and block the filter systems. The system may fail completely.

Purity class:

Contamination of the hydraulic fluid directly affects the lifetime of the components. Therefore, the following minimum purity classes are required for Liebherr earth-moving machines:
– ISO 4406 purity class: 21/17/14
– NAS 1638 purity class: 8

If values are slightly below these, they may be improved by using special filters systems (such as stationary filters) in consultation with manufacturer. If subsequent trend analyses do not show an improvement, there is no option but to change the oil. Note that not only the oil in the hydraulic tank has to be drained, but also as much oil as possible from the units and cylinders.

Taking oil samples

Samples can be taken from the following fluids:
– Hydraulic oil from the hydraulic system
– Engine oil from the diesel engine
– Lubricating oil from the axles
– Lubricating oil from the transmission
– Coolant from the cooling circuit

DANGER
Unauthorised starting up of the machine!
Risk of fatal injury.

▶ Secured the machine against being started unauthorisedly.

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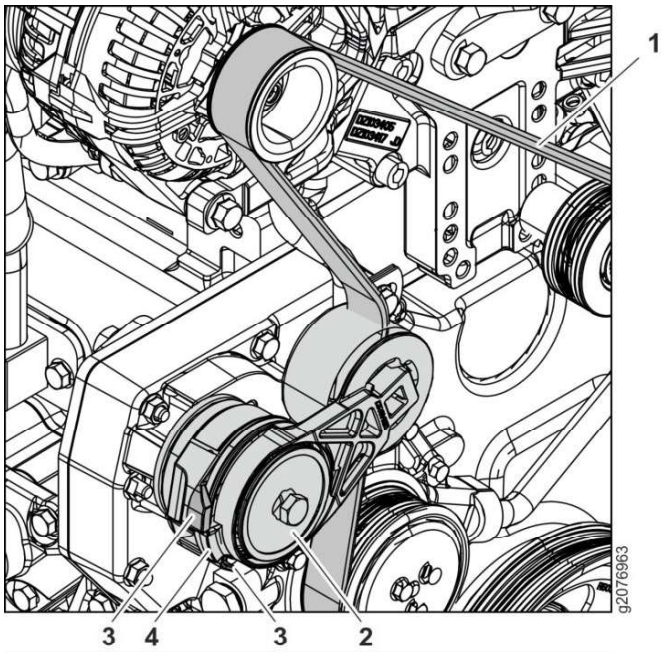

Fig. 111: Tensioning device stops

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

Following damage could occur on V-ribbed belt **1**:
- Broken ribs
- Cracks across several ribs
- Lumps of rubber on belt
- Accumulated dirt or grit
- Ribs coming loose from belt
- Cracks across back

▶ Check V-ribbed belt **1** for damage.

If damage is found:
▶ Replace V-ribbed belt.

The diesel engine has an automatic tensioning device for the V-ribbed belt.

▶ Conduct a visual inspection of the stops **3** and **4**.
  ▷ The tensioning device **4** stop must not be touching the cast stops **3**.

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. Replace component if necessary.

▶ Start diesel engine.

WARNING
Rotating parts!
Risk of injury.

▶ Do not touch rotating parts of the engine.

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

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

NOTICE
If the fuel and operating fluid does not run into the receptacle:
Risk of damage to the engine bearings.

▶ Avoid fuel and operating fluid coming into contact with the engine bearings.

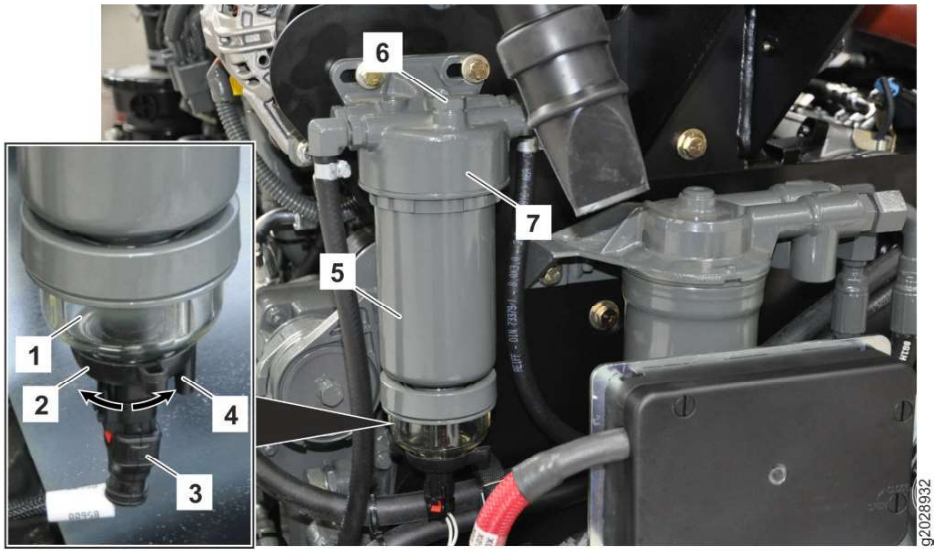

Fig. 123: Changing the fuel pre-filter

1	Water separator container	**5**	Filter element
2	Drain valve	**6**	Bleeder screw
3	Electric plug connector for water sensor B5600	**7**	Filter base
4	Drain hole		

▶ Carefully clean the fuel pre-filter housing and the area around it.

▶ Unplug the electrical connection **3**.

▶ Place a receptacle under the drain hole **4**.

▶ Open the bleeder screw **6**.
▷ The fuel system is bled.

▶ Open the drain valve **2**.
▷ Fuel flows through the drain hole **4** out of the filter element **5** until it is empty.

▶ Unscrew the water separator tank **1** from the filter element **5**.

▶ Unscrew the filter element **5** from the filter base **7**.

▶ Clean the filter base **7**.

▶ Screw the water separator tank **1** onto the new filter element **5** until the O-ring is tight.

▶ Close the drain valve **2**.

NOTICE
Beware of damage to the Common Rail system.

▶ Make sure no dirt gets into the clean side of the filter.

▶ Lubricate the sealing ring of the new filter element **5** with clean fuel.

▶ Screw the new filter element **5** tightly onto on the filter base **7**.

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Installing the main element

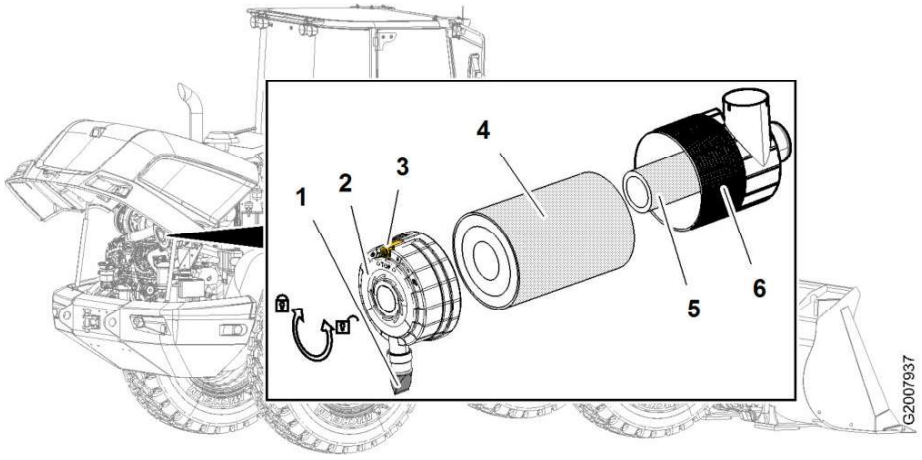

Fig. 135: Installing the main element

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

- ▶ Lightly oil the sealing face of the main element **4**.
- ▶ Install the main element **4**.
- ▶ Put the clean service cover **2**, with the dust discharge valve **1** facing down, on the filter housing **6**.
- ▶ Turn the service cover **2** clockwise until it catches.
- ▶ Close the lock **3**.

Note
If *air filter contamination* symbol lights up again a few operating hours after main element has been cleaned:

- ▶ Change main element.

Note
If *air filter contamination* symbol remains lit after main element has been changed:

- ▶ Change safety element.

030.4.4.19 Changing the safety element of the air filter system

Valid for: L518-1655;

NOTICE
Always carry out maintenance correctly.
Damage to the engine.

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

Make sure that the following requirements are fulfilled:
❑ The machine is in maintenance position 1.

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NOTICE
Inadequate corrosion protection!
Corrosion damage to the diesel engine.

▶ Ensure that proportion of anti-freeze and corrosion protection agent is between 50% and 60% year-round.

Make sure that following requirements are fulfilled:
❑ Machine is cold.
❑ Machine is in maintenance position 1.
❑ Service hatches are open.

Make sure that following tools are ready:
❑ Antifreeze tester
❑ Drain hose
❑ Receptacle

Fig. 145: Checking the antifreeze and corrosion inhibitor concentration

1 Water cooler

CAUTION
Hot. pressurised liquid!
Beware of burns.

▶ Let the engine cool down.

▶ Carefully open cap of water cooler **1**.

Checking antifreeze and corrosion inhibitor concentration

▶ Take a sample of the coolant with the antifreeze tester.

▶ Check whether the freezing point, in other words the concentration of antifreeze and corrosion inhibitor, is correct.

Description	Unit	Value
Freezing point	°C	min. -37 max. -50
Corresponds to antifreeze and corrosion inhibitor concentration	%	min. 50 max. 60

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CAUTION
Hot. pressurised liquid!
Beware of burns.

▶ Let the engine cool down.

If water cooler **3** is not completely filled with coolant:
▶ Carefully open cap of water cooler **3**.

▶ Completely fill the water cooler **3** with coolant **3**.

▶ Close cap of water cooler **3**.

030.4.6 Working hydraulics

030.4.6.1 Cleaning and lubricating the pilot control unit

Valid for: L518-1655;

Make sure that the following requirements are fulfilled:
❑ The machine is in maintenance position 1.

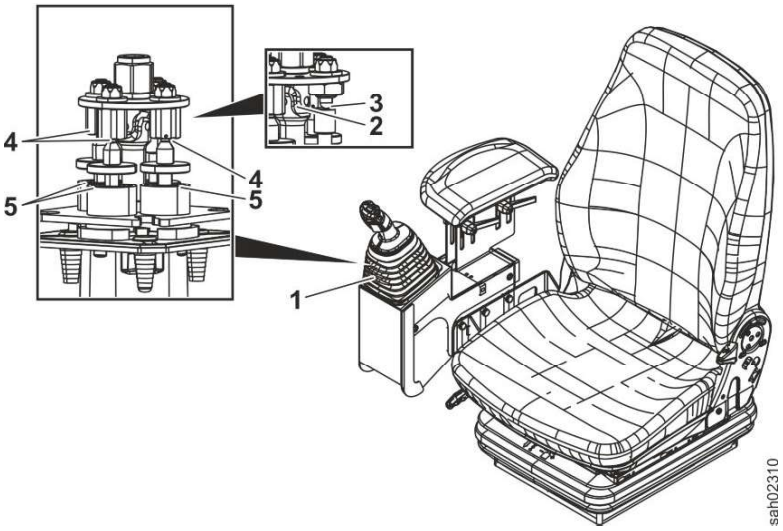

Fig. 155: Lubricating the solenoids, universal joints and tappets on the pilot control unit

1 Rubber sleeve
2 Universal joint
3 Tappet
4 Ball joint (3x)
5 Retaining solenoid (3x)

▶ Take the rubber sleeve **1** off the lever.

▶ Clean the retaining solenoids **5** with a brush.

▶ Clean and lubricate the universal joint **2**, tappet **3** and ball joints **4** with a brush.

▶ Attach the rubber sleeve **1**.

▶ Start the diesel engine.

▶ Test the retaining solenoids for float position, bucket return-to-dig (option) and lift kick-out (option).

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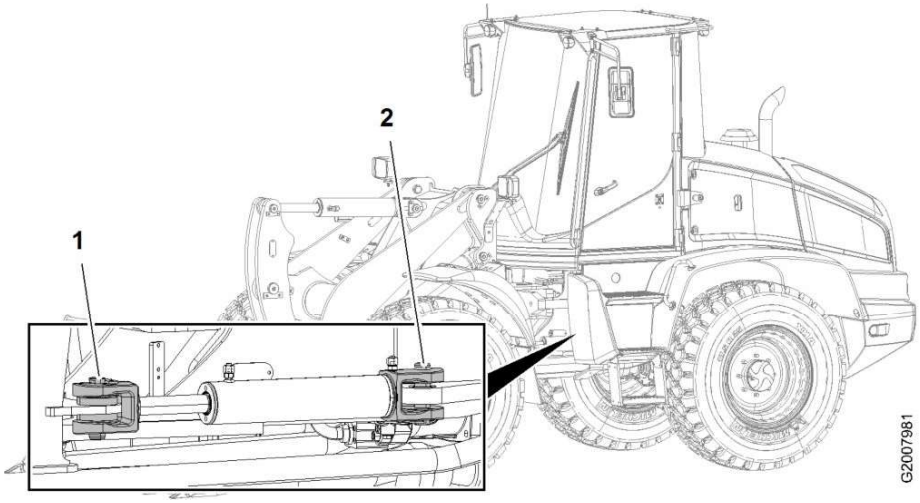

Fig. 164: Steering cylinder: lubricating bearing

1 Steering cylinder, ring side **2** Steering cylinder, piston side

▶ Take cap off grease fitting.

▶ Grease bearing of steering cylinder at lubrication points **1-2**.

▶ Put cap on grease fitting.

030.4.9 Brake system

030.4.9.1 Testing service brake and parking brake

Valid for: L518-1655/0-60066;

Valid up to software version 023 (Master4) or serial number 60066.

Make sure that following requirements are fulfilled:
❑ There is sufficient space for inspection.

WARNING
Persons in hazard zone!
Injury.

▶ Make sure there is nobody in hazard zone.

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- ❑ Terminal brush
- ❑ Refractometer (item code 11830573)
- ❑ Battery plug tool (item code: 11839123)

Make sure that the following equipment is ready:
- ❑ Distilled or demineralised water (DIN 43530)

Checking the acid level and terminals

Fig. 175: Battery arrangement

▶ Make sure the battery main switch is turned off.

WARNING
Gas forming in the batteries!
Explosion.

▶ Avoid naked lights and fire.

▶ Wear safety glasses and protective gloves.

▶ Use a terminal brush.

WARNING
Corrosive acid!
Risk of injury.

▶ Avoid skin contact with battery acid.

▶ Wear safety glasses and protective gloves.

▶ Wipe the battery with a clean cloth.

▶ Clean the terminals and clamps with a special terminal brush.

To ensure a good connection:

▶ Check that the connectors are well fastened to the terminals. Tighten them if necessary.

▶ Smear the terminals and clamps with acid-proof grease.

At very high temperatures, the acid level in the individual cells can drop due to different rates of evaporation.

▶ Open the plug of each battery cell.

▶ Check the acid level.
▷ The acid level must be 10 mm above the plates.

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- ▶ Place a receptacle under machine.
- ▶ Carefully open all the drain plugs **2** on the main housing of both axles.
  ▷ Oil drains off.
- ▶ Drain all the oil from both axles into the receptacles.
- ▶ Screw in all drain plugs **2** and tighten them to 45 $^{\pm 5}$ Nm.
- ▶ Fill oil through openings in filling plugs **1** on both axles until oil level is up to opening.
- ▶ On both axles, screw in filling plug **1** and tighten it to 45 $^{\pm 5}$ Nm.
- ▶ Change oil in wheel hubs.

Changing the oil in the wheel hubs

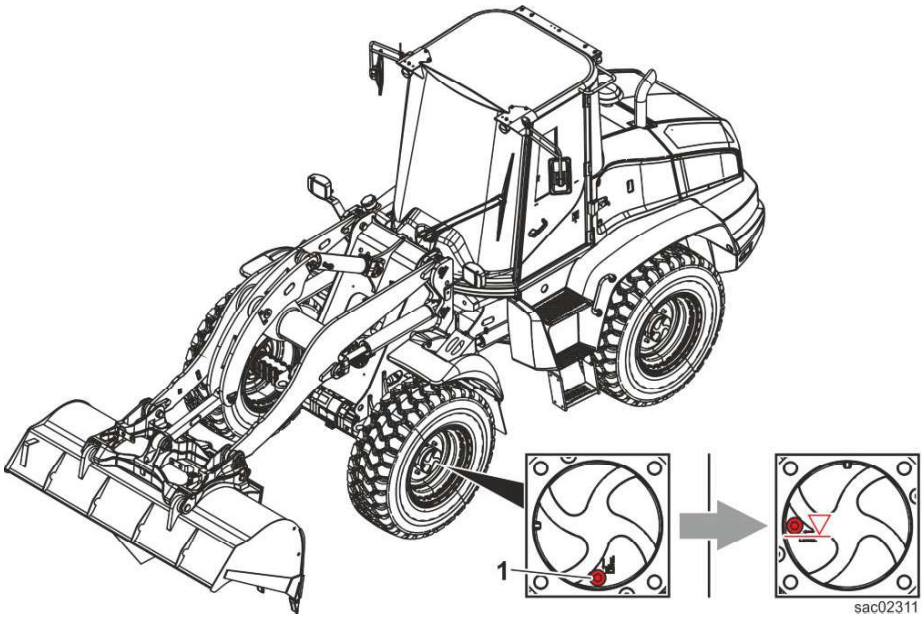

Fig. 184: Changing the oil in the wheel hubs

1 Maintenance plug (4x)

- ▶ Park machine so that oil level marking on left wheel hub of front axle is at lowest point (maintenance plug **1** at 6 o'clock).
- ▶ Put machine in maintenance position 2.
- ▶ Place a receptacle under the left wheel hub of the front axle.
- ▶ Carefully open maintenance plug **1** on left wheel hub of front axle.
  ▷ Oil drains off.
- ▶ Drain all the oil from the wheel up into the receptacle.
- ▶ Park machine so that oil level marking on left wheel hub of front axle is horizontal (maintenance plug **1** at 9 o'clock).
- ▶ Top up oil through opening in maintenance plug **1** until oil level reaches bottom of opening.
- ▶ Screw in maintenance plug **1** and tighten it to 45 $^{\pm 5}$ Nm.
- ▶ Repeat process for other wheel hubs.

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Lubricating the attachment

Note
Lubricate attachment

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

030.4.14.2 Checking the lift arm bucket bearing bushings

Valid for: L518-1655;

Make sure that the following requirements are fulfilled:
❑ The machine is secured against rolling away.

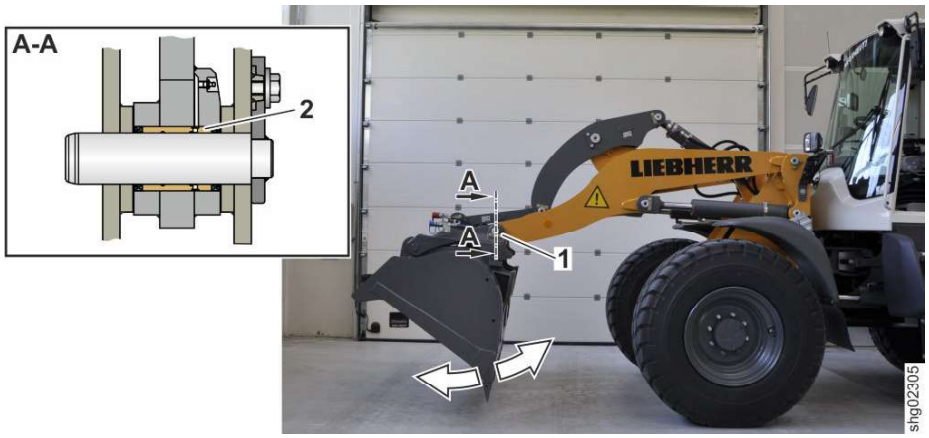

Fig. 197: Checking the lift arm bucket bearing bushings

1 Bucket bearing (2x) **2** Bucket bearing bushing (2x)

- ▶ Raise the lift arms so far that the bucket can be fully tilted out.
- ▶ Tilt the bucket out.
- ▶ Tilt the bucket in and out with short, fast movements.
- ▶ When doing so, listen out for noises and play in the bucket bearing bushes **2**.

If there are noises or play in the bucket bearing bushes **2**:

- ▶ Check the lubrication of the bucket bearing bushes **2**.
- ▶ Replace the bucket bearing bushes **2**.

030.4.14.3 Checking lift arm bucket stops

Valid for: L518-1655;

Note
This maintenance item applies to both direct attachment and quick coupler!

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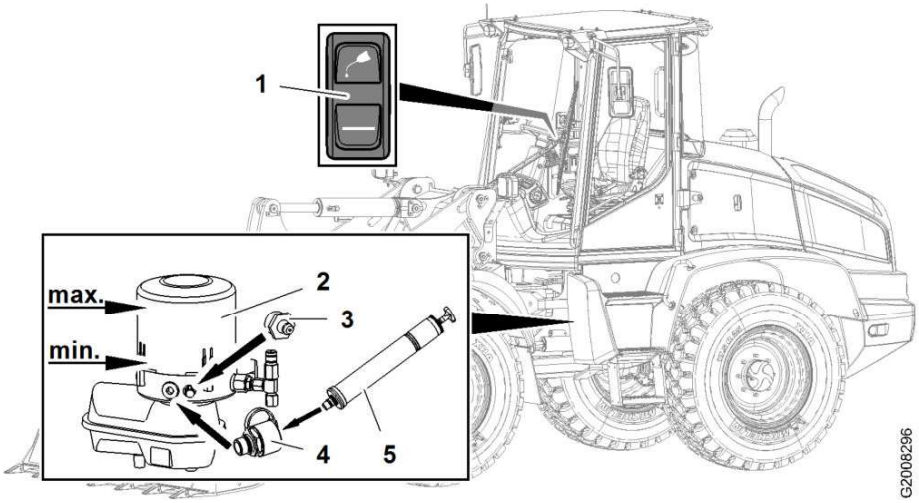

Fig. 208: Central lubrication system: checking level in grease reservoir

1 *Central lubrication system* button
2 Grease reservoir
3 Grease fitting
4 Filling coupling (fast filling)
5 Fast filling pump

▶ Visually check the level in the grease reservoir **2**.
▷ It must be within the minimum and maximum lubricant levels.

Note
Mixing of lubricant greases!
Malfunction in central lubrication system.

▶ Ensure proper miscibility of lubricant greases.

▶ If necessary, contact **Liebherr Lubricant Hotline**.

NOTICE
Dirty grease reservoir!
Damage to the central lubrication system.

▶ Pay attention to cleanliness when filling the grease reservoir.

To fill grease reservoir:
▶ Fill the grease reservoir via the grease fitting **3**.
or

For rapid filling, connect the fast filling pump **5** to the filling coupling **4**.

030.4.16.2 Central lubrication system: checking pipes, hoses and lubrication points for leaks and damage.

Valid for: L518-1655;

This equipment is optional.

Make sure the following preconditions are met:
❑ Machine is in maintenance position 2.

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▷ The service code is stored in the central control unit.

030.6.3 Drive group

030.6.3.1 Pedals: calibration

Valid for: L518-1655;

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

Make sure that following tools are ready:
❑ Laptop with Sculi diagnostic software

Preparations

▶ Switch on ignition.

▶ Connect Sculi diagnostic software to machine.

▶ In variables editor, select ***Pedal calibration*** folder.

Manual calibration of accelerator pedal

▶ Set ***MXThrottlePdlStartAdjust*** variable to ***1***.
▷ Calibration function is active for 8 seconds.

▶ Fully depress accelerator pedal within 8 seconds and then release it.

▶ Wait until variable ***MXThrottlePdlStartAdjust*** returns to ***0***.
▷ Calibration is completed.

▶ Check that calibration was successful.

Checking whether calibration is successful

▶ Check whether value ***PRThrottlePdlRequest*** is correct when accelerator pedal is not pressed, and when it is fully depressed.

Description	Unit	Value
Variable with accelerator pedal not pressed	%	0
Variable with accelerator pedal fully depressed	%	100

If a required value is not reached:
▶ Repeat calibration.

If required values are reached:
▶ Calibration was successful. Calibrate inching function.

Manual calibration of inching function

▶ Start diesel engine.

▶ Set ***MXInchPdlStartAdjust*** variable to ***1***.
▷ Calibration function is active for 8 seconds.

▶ Fully depress inching brake pedal within 8 seconds and then release it.

▶ Wait until variable ***MXInchPdlStartAdjust*** returns to ***0***.
▷ Calibration is completed.

▶ Check that calibration was successful.

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▶ Turn off diesel engine and take out ignition key.

▶ Turn adjusting screw on working hydraulics LS pressure relief valve **1**.

Note
To adjust LS pressure relief valve:

▶ Turn the adjusting screw clockwise to increase the high pressure.

▶ Turn the adjusting screw anticlockwise to reduce the high pressure.

▶ Repeat check and adjustment until required value is reached.

If required value is reached:

▶ Set bucket down on ground on its teeth or cutting edge.

▶ Turn off diesel engine and take out ignition key.

▶ Disconnect pressure gauge from working hydraulics high pressure test connection **PA**.

030.6.5.3 Stabilisation module (option), safety valve

Valid for: L518-1655;

Only check safety valve of stabilisation module if a malfunction has occurred in ride control system. Lift arms dropping can indicate a faulty safety valve.

Make sure that following requirements are fulfilled:

❑ Machine is in maintenance position for adjustment procedures.

❑ Service access is open.

Make sure that following special tools are ready:

❑ Pressure gauge (600 bar)

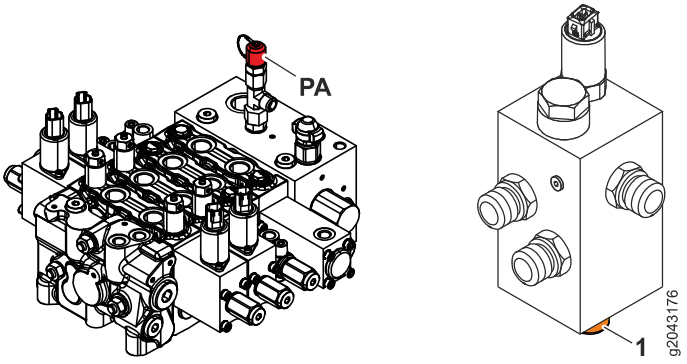

Fig. 221: Stabilization module: safety valve

1 Safety valve

PA Working hydraulics high pressure test connection

WARNING
Descending lift arms!
Injury.

▶ Make sure that the full weight of the lift arms rests on the ground.

▶ Connect a pressure gauge (600 bar) to working hydraulics high pressure test connection **PA**.

▶ Connect Sculi diagnostic software to the machine.

▶ In the variables editor, select the ***Block curve calibration*** folder.
▷ The variable ***PRPumpHighPress*** shows the high pressure.

▶ Set the variable ***MXdrBlockMan*** to ***1***.
▷ Machine is in blocked condition.

Note
The variable ***MXdrBlockMan*** is automatically reset to its original value ***0*** when the ignition is switched **OFF**.

▶ If necessary, reset the value to ***1*** when repeating the test.

DANGER
Unintentional movement of the machine!
Fatal injury.

▶ Make sure there is nobody in danger area.

▶ Be ready to brake.

▶ Select forward travel direction.

▶ Carefully increase the engine speed to the maximum.

▶ Check whether the value of the ***PRPumpHighPress*** variable deviates from the value displayed by the pressure gauge **MH**.

Description	Unit	Value
Maximum deviation	bar	5

If the deviation is too great:
▶ Turn off diesel engine and take out ignition key.

▶ Repeat the test with a different pressure gauge.
▷ This excludes the possibility that the pressure gauge is defective.

If the deviation is still too great:
▶ Replace the travel pump high pressure sensor **1**.

▶ Repeat the test.

If the deviation is within the permitted range:
▶ Turn off diesel engine and take out ignition key.

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

030.6.7.2 Travel pump replenishing pressure relief valve

Valid for: L518-1655;

Make sure that following requirements are fulfilled:
❑ Hydraulic oil is at operating temperature.
❑ Machine is in maintenance position for adjustment procedures.
❑ Service access is open.

Make sure that following tools are ready:
❑ Pressure gauge (40 bar)
❑ Vacuum pump
❑ Receptacle
❑ Torque wrench

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- ❑ Pressure gauge (250 bar)
- ❑ Laptop with Sculi diagnostic software

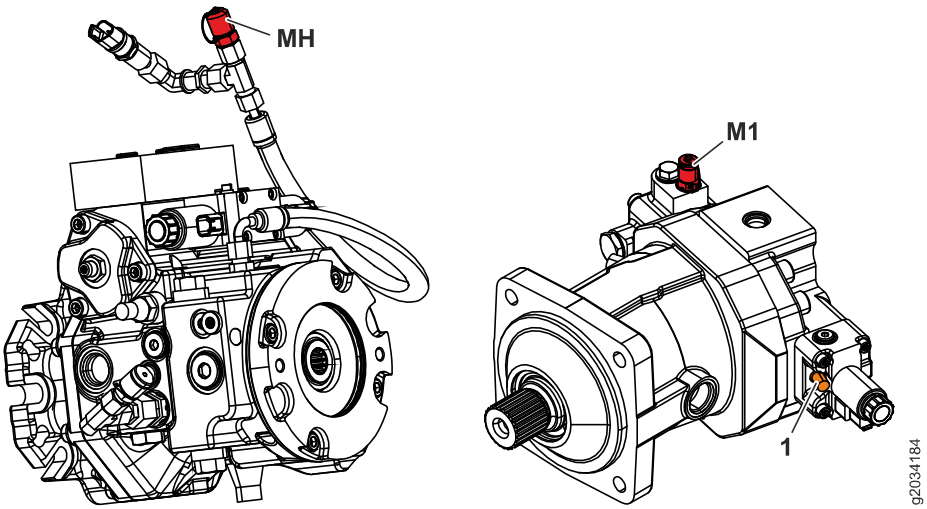

Fig. 235: Travel motor: manual calibration (maximum swivel angle)

1 Travel motor regulation adjusting screw
M1 Travel motor servo pressure test connection
MH Travel pump high pressure test connection

Preparations

- ▶ Connect a pressure gauge (600 bar) to the high pressure test connection **MH** on the travel pump.
- ▶ Connect a pressure gauge (250 bar) to servo pressure test connection **M1** on travel motor.
- ▶ Start diesel engine.
- ▶ Connect Sculi diagnostic software to machine.
- ▶ In variables editor, select ***Travel motor calibration*** folder.

Manual calibration of servo pressure proportional solenoid

- ▶ Set variable ***MXdrBlockMan*** to ***1***.
  - ▷ Machine is in blocked condition.

Note
Variable ***MXdrBlockMan*** is automatically reset to its original value ***0*** when ignition is switched **OFF**.

- ▶ If necessary, reset value to ***1*** when repeating test.

DANGER
Unintentional movement of the machine!
Fatal injury.

- ▶ Make sure there is nobody in danger area.
- ▶ Be ready to brake.

The software can be downloaded from the Liebherr service documentation.

The Liebherr service documentation contains an overview **1** of the machine types and corresponding software.

The software in the Liebherr service documentation is a compressed file. The file must be extracted and saved on the flash card.

▶ Select the “Run” command to save the software on a formatted memory card.
  ▷ The compressed file is extracted. The software is saved in the form of individual files on the memory card.

To ensure that no LiDAT files are lost when updating the software, the following files must be transferred from the existing card in the central control unit (slot CF1) to the new memory card:

▶ Copy the folder “lidat.buf” from the existing memory card to the new one.

▶ Copy the file “lidat_cnf.xml” from the existing memory card to the new one.

Carry out a software update

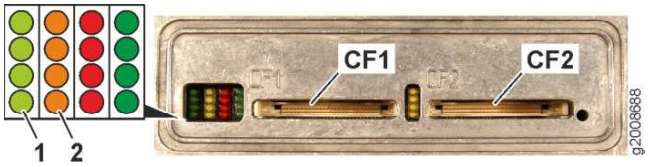

Fig. 250: Slots CF1 and CF2 on the central control unit

1 LED 1
2 LED 2
CF1 Slot CF1
CF2 Slot CF2

▶ Put the memory card with the software update and the LiDAT files into the slot CF1.

▶ Switch on the battery main switch.

▶ Switch on the ignition.
  ▷ The software update begins.
  ▷ The software update can take up to 15 minutes.

NOTICE
Interrupted power supply!
Damage to the electrical system.

▶ Do not interrupt the power supply to the electronic system during the software update.

▶ Do not switch off the ignition or the battery main switch until after the software update is completed.

▶ Wait until the software update has finished.
The software update is completed when the following conditions are met:
  ▷ The LED **1** flashes once a second.
  ▷ The LED **2** has gone out.
  ▷ The camera shows an image of the surroundings (the software update for the camera has been completed).

If the software update has finished.

▶ Calibrations according to the adjustment checklist

▶ Test the machine.

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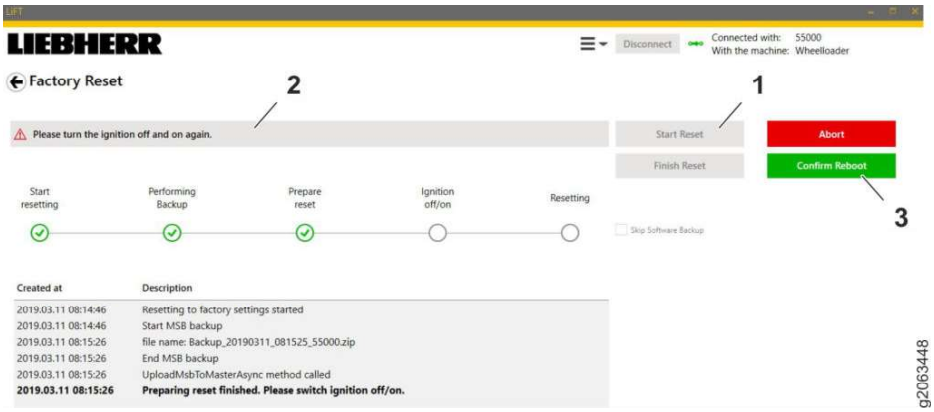

Fig. 262: Resetting to factory settings

1 “Start reset” function
2 Status display
3 “Confirm reboot” function

▶ Select “Start reset” function **1**.

If prompted in the status display **2**:
▶ Switch off ignition.

▶ Wait until all LEDs on the central control unit have gone out.

▶ Switch on ignition.

▶ Select “Confirm reboot” function **3**.
▷ The central control unit is reset to factory settings.

Fig. 263: Complete reset to factory settings.

1 “Complete reset” function

When operation is completed successfully:
▶ Select “Complete reset” function **1**.

▶ Switch off ignition and wait 30 seconds.

▶ Turn off battery main switch.
▷ Central control unit is reset to factory settings.

030.6.9.8 Central control unit (Master5): connecting Sculi diagnostic software

Valid for: L518-1655/60067-;

Connecting Sculi diagnostic software

Make sure that following requirements are met:
❑ Machine is in maintenance position 1.
❑ Connecting settings are checked. (For more information see: Checking connections settings, page 030-201)

Make sure that following special tools are ready:
❑ Ethernet diagnostic cable

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Fig. 277: Display with exit button

▶ Press *exit* button.

▶ Press *exit* button.
  ▷ The software is uploaded again from the central control unit (Master4). This process can take several minutes.
  ▷ If the standard screen reappears after uploading, the procedure has been performed successfully.

030.6.12 Options

030.6.12.1 LiDAT: connecting to LiDAT module

Valid for: L518-1655;

Make sure that following requirements are fulfilled:
❑ Ignition is switched off.

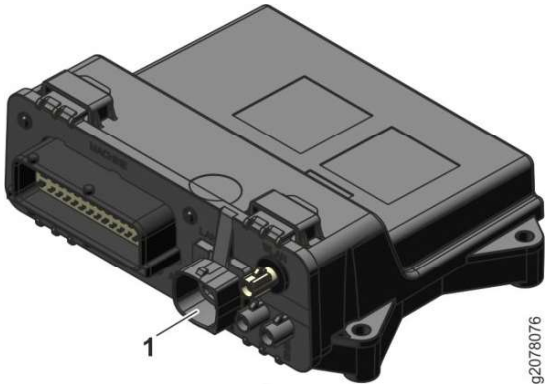

Fig. 278: Connection to LiDAT-module

1 LAN connection

▶ Connect laptop to LiDAT module via the LAN connection **1** using a data cable (Ethernet).

▶ Switch on ignition.

▶ Run the SCULi diagnostic software.

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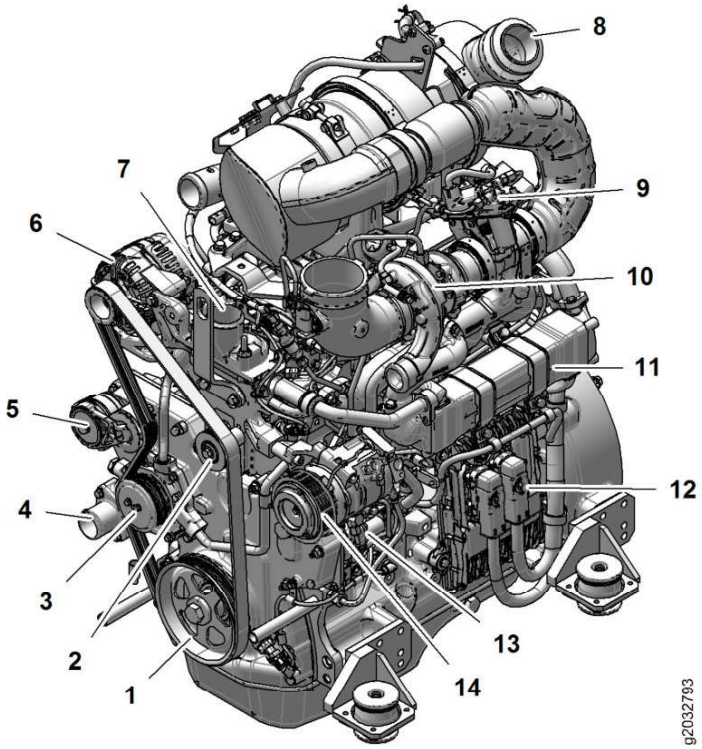

Fig. 292: Diesel engine

1	Crankshaft pulley	**8**	Exhaust outlet to SCR catalytic converter
2	Deflector roller	**9**	Exhaust throttle valve servo motor
3	Water pump pulley	**10**	Turbocharger with exhaust bypass valve
4	Coolant inlet	**11**	EGR cooler
5	Tensioning device	**12**	Engine control unit
6	Alternator	**13**	High-pressure fuel pump
7	Coolant outlet	**14**	Air conditioning compressor (option)

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2.10 Fuel pressure sensor in the common rail

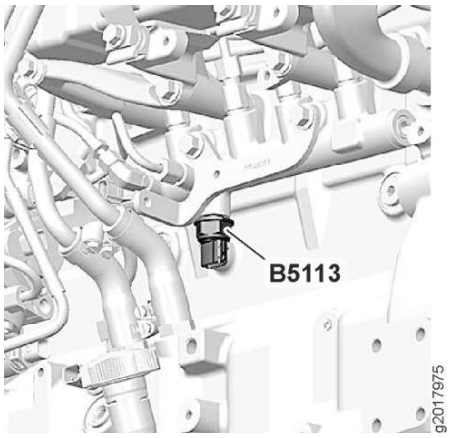

Fig. 305: Fuel pressure sensor in the common rail B5113

The fuel pressure sensor in the common rail **B5113** sends the engine control unit a signal corresponding to the pressure.

The engine control unit monitors the fuel pressure to regulate the quantity and setting of the fuel from the high pressure fuel pump to the common rail.

The engine control unit also uses this signal to determine whether the fuel pressure is appropriate for the current operating status.

By modifying the signal to the intake control valve, the engine control unit tells the high pressure fuel pump to deliver more or less fuel.

The engine control unit also uses this sensor to identify problems with the electronic injection system. This is achieved by the pressure drop in the common rail (Common-Rail-System) being measured for each fuel injection.

2.11 Crankshaft position sensor

Fig. 306: Crankshaft position sensor B5301

The crankshaft position sensor **B5301** is an inductive sensor which detects the teeth on the crankshaft spur gear. The engine control unit uses the crankshaft position sensor to determine the engine speed and the angle of the crankshaft in its rotation range (360°).

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Afterwards the cooled air enters the EGR mixer **6**. The air flows from there into the inlet manifold **7**. The pressure is measured there by the manifold air pressure sensor **8** and the temperature by the manifold air temperature sensor **9**.

The air then flows into the cylinder head **10**. The air flows from the cylinder head in the form of exhaust gas through the exhaust manifold **11**.

The exhaust gas from the exhaust manifold enters the turbine casing of turbocharger via the exhaust bypass valve. The exhaust gas flows up to the exhaust throttle valve **25**. The exhaust throttle valve is controlled via the servo motor for the exhaust throttle valve **26**.

The exhaust gas flows from the exhaust throttle valve to the diesel particulate filter.

2.2 Operation of exhaust gas recirculation system

Exhaust gas from a port in the exhaust manifold **11** flows through the EGR radiator **14** to the EGR valve **16**.

When the EGR valve is open, the exhaust gas flows through the Venturi pipe **20** to the EGR mixer **6**.

In the EGR mixer, the exhaust gases are mixed with the intake of fresh air. This reduces the combustion temperature. The emission of nitrogen oxides by the diesel engine is reduced.

2.3 Exhaust system cooling circuit

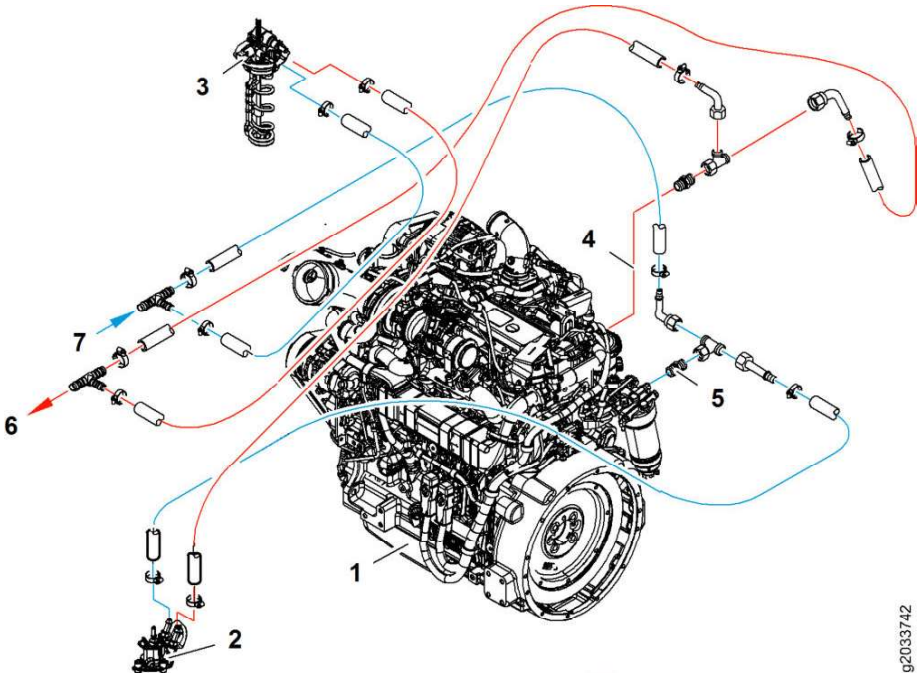

Fig. 318: Exhaust system cooling circuit

1 Diesel engine
2 Diesel exhaust fluid injection nozzle
3 Diesel exhaust fluid sampling module
4 Coolant forward flow
5 Coolant return line
6 Coolant forward flow to heating and air conditioning unit
7 Coolant return from heating and air conditioning unit

The diesel exhaust fluid tank is heated via the diesel exhaust fluid sampling module **3** with coolant from the diesel engine **1**.

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The sampling module is heated with coolant from the diesel engine. This means that diesel exhaust fluid can be obtained even at temperatures below the freezing point. The coolant flow is controlled by the coolant control valve **9**.

The sensor **7** measures the temperature of diesel exhaust fluid, the concentration and the filling level. The sensor **7** sends the measured data to the engine control unit.

The sensor **7** measures the filling level using ultrasound.

If the diesel exhaust fluid concentration is too low or too high, a service code appears on the display.

Filter **12** serves as additional protection for the diesel exhaust fluid system. If filter **12** is clogged, a service code will be displayed. In this case, renew filter **12**.

040.1.5.5 Diesel exhaust fluid pre-filter

Valid for: L518-1655/57749-;

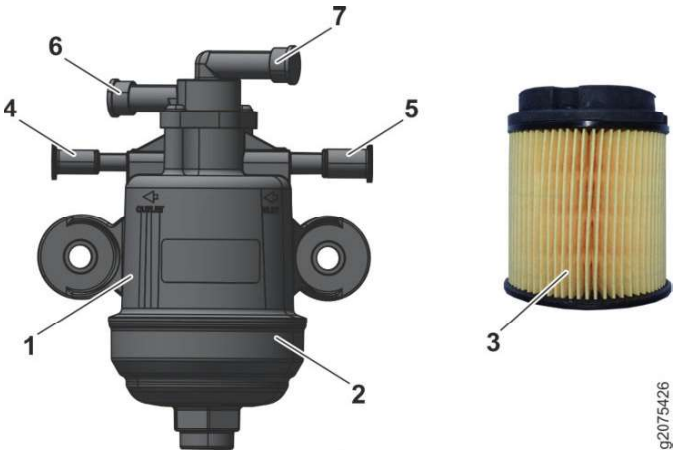

Fig. 328: Diesel exhaust fluid pre-filter

1 Filter housing
2 Filter cover
3 Filter cartridge
4 Diesel exhaust fluid to metering unit
5 Diesel exhaust fluid to sampling module
6 Coolant to return flow
7 Coolant from sampling module

2.1 Function

The diesel exhaust fluid pre-filter is installed between sampling module and metering unit.

The diesel exhaust fluid protects the diesel exhaust fluid system from contamination. The filter cartridge **3** must be renewed according to maintenance interval.

At low temperatures, the diesel exhaust fluid can freeze in the filter housing **1**. For this reason, coolant is transferred from heating circuit via connections **6** and **7** through filter housing **1**. This heats the filter housing **1**. The coolant flow is controlled by the coolant control valve Y5019 on the sampling module.

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The cooling system hydraulics consist of the following components:
- Hydraulic tank (For more information see: 080.3.1 Overview of hydraulic tank, page 080-8)
- Fan pump (For more information see: 050.2.3 Fan pump, page 050-10)
- Fan motor (For more information see: 050.2.4 Fan motor, page 050-11)
- Hydraulic oil cooler

2 Function

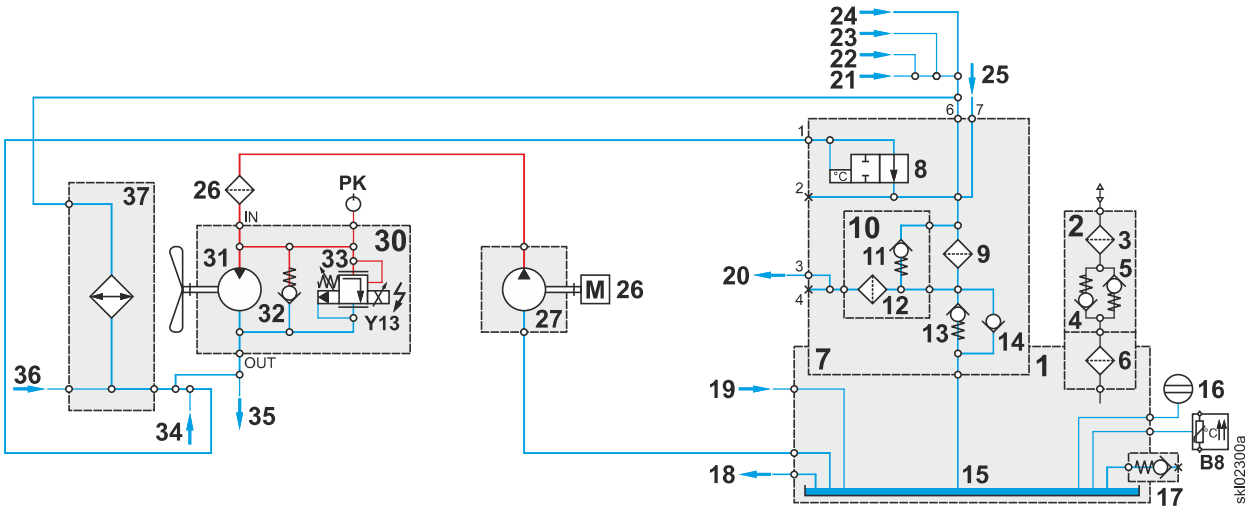

Fig. 336: Diagram of cooling system hydraulics (diesel engine is running)

1	**Hydraulic tank**	13	Preload valve 0.5 bar	25	Return flow from control valve block
2	**Breather filter**	14	Feeder valve	26	Diesel engine
3	Fine filter	15	Steel tank	27	Fan pump
4	Outlet valve 0.35 bar	16	Sight glass for hydraulic oil level	28	In-line filter 80 µm
5	Inlet valve 0.03 bar	17	Hydraulic oil drain valve	30	**Fan motor**
6	Filler strainer 800 µm	18	Working pump suction port	31	Gear motor
7	**Return suction filter**	19	Return flow from parking brake and for pilot control of additional functions (option)	32	Feeder valve
8	Temperature valve	20	Replenishing pump suction port	33	Fan speed proportional solenoid valve
9	Filter element 10 µm	21	Return flow from pilot control unit	34	Leak oil from travel pump
10	**Filter separator plate**	22	Return flow from inch/brake unit (Speeder only)	35	Travel motor housing flushing (cooling)
11	Bypass valve 2.0 bar	23	Return flow from pressure reducing and solenoid valve block for transmission control (Speeder only)	36	Leak oil from travel motor
12	Screen for replenishing pump 125 µm	24	Return flow from servostat	37	Hydraulic oil cooler

Name	Test point
PK	Cooling system high pressure

Tab. 93: Test points

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Temperature	Resistance	Temperature	Resistance
15 °C	4712.0 Ω	70 °C	525.6 Ω
20 °C	3747.0 Ω	75 °C	444.4 Ω
25 °C	3000.0 Ω	80 °C	377.4 Ω
30 °C	2417.0 Ω	85 °C	321.7 Ω
35 °C	1959.0 Ω	90 °C	275.3 Ω
40 °C	1598.0 Ω	95 °C	236.6 Ω
45 °C	1311.0 Ω	100 °C	204.0 Ω
50 °C	1081.0 Ω		

Tab. 106: Relationship of temperature to resistance

The engine control unit A700 measures the resistance of the temperature sensor and calculates the temperature from it. As the temperature increases, the sensor resistance decreases. (NTC characteristic)

The engine control unit sends the temperature value via CAN line 1 to the central control unit.

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BMK	Function	BMK	Function
Y13	Fan speed proportional solenoid	**Y50**	Fan reversal solenoid

Tab. 119: Equipment codes

The fan reversal valve block is installed underneath the diesel engine.

2 Function

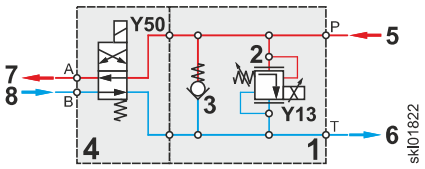

Fig. 356: Hydraulic diagram of fan reversal valve block (fan reversal disabled)

1 **Fan reversal valve block**
2 Fan speed proportional solenoid valve
3 Feeder valve
4 **Solenoid valve for fan reversal**
5 Oil supply via fan pump
6 Return flow to travel motor (housing flushing / cooling) and hydraulic oil cooler
7 Connection for fan motor (high pressure when fan reversal deactivated)
8 Connection for fan motor (high pressure when fan reversal activated)

BMK	Function	BMK	Function
Y13	Fan speed proportional solenoid	**Y50**	Fan reversal solenoid

Tab. 120: Equipment codes

The fan reversal valve block performs two functions:
– Controlling fan speed
– Reversing fan's direction of rotation

Since the oil flow through the fan motor depends on the desired direction of rotation, the fan speed proportional control solenoid valve **2** is not located on the fan motor but on the fan reversal valve block **1**. However, its function is the same as that of the fan speed proportional control solenoid valve in a standard fan motor arrangement.

To reverse the fan's direction of rotation, the central control unit energizes the fan reversal solenoid valve **4**. That reverses inflow and outflow on the fan motor and the fan motor rotates in the opposite direction.

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Name	Test point	Name	Test point	Name	Test point
G	Replenishing pressure	**LSL**	Load sensing signal for steering system	**PA**	Working hydraulics high pressure

Tab. 127: Test points

BMK	Function	BMK	Function	BMK	Function
Y9	Bucket return-to-dig retaining magnet (option)	**Y18**	Float position retaining magnet	**Y33b**	Proportional solenoid for 1st additional function B3 (option)
Y14	Solenoid for servo pressure	**Y20**	Magnet for ride control (option)	**Y34a**	Proportional solenoid for 2nd additional function A4 (option)
Y17	Lift kick-out retaining magnet (option)	**Y33a**	Proportional solenoid for 1st additional function A3 (option)	**Y34b**	Proportional solenoid for 2nd additional function B4 (option)

Tab. 128: Equipment codes

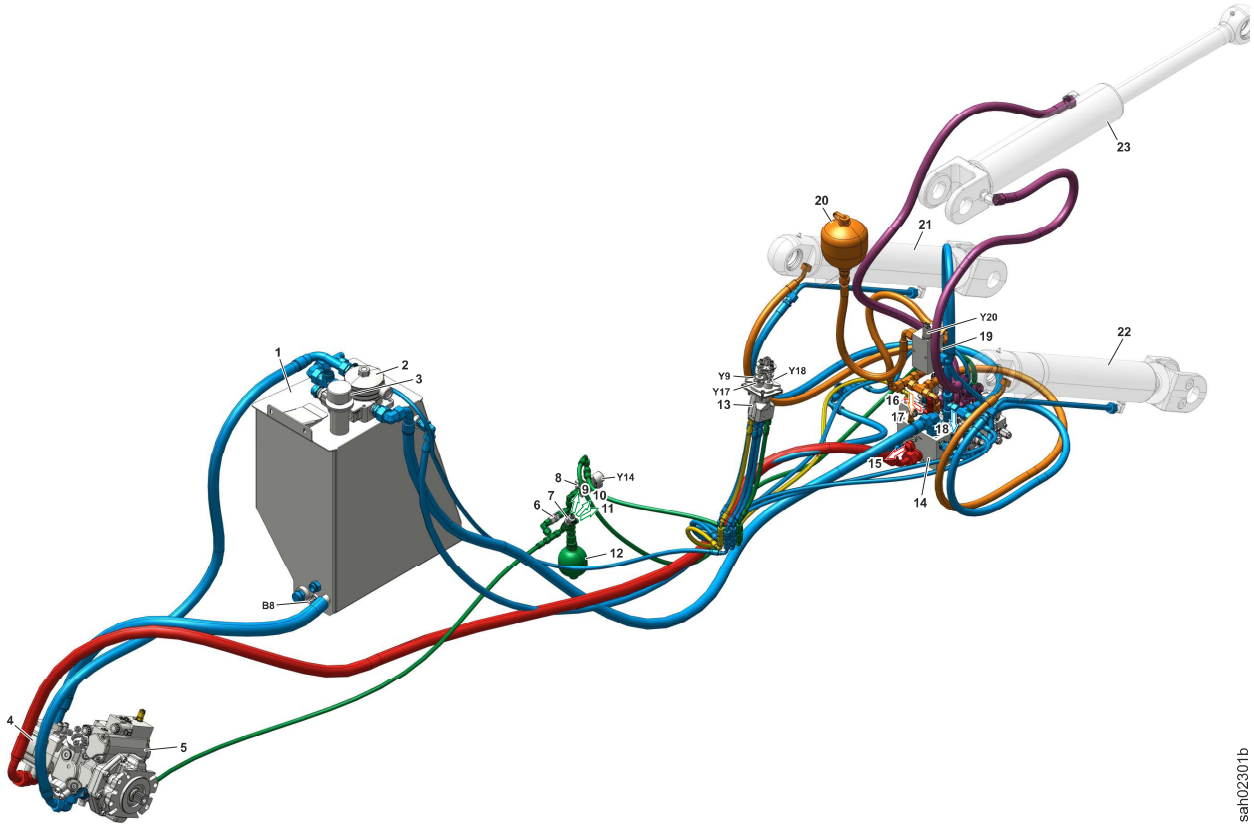

Fig. 361: Working hydraulics (lifting function actuated) (from rear right)

1 Hydraulic tank

2 Return suction filter

3 Breather filter

9 Oil supply for transmission control (Speeder only)

10 Oil for bearing flushing

11 Oils supply for parking brake

17 Load-sensing signal from valve block for quick coupler (option)

18 Return flow from valve block for quick coupler (option)

19 Stabilization module (option)

See next page for continuation of the image legend

2	Pressure circuit balance	**8**	Load sensing signal from servo-stat
3	Oil supply for valve block for quick coupler (option)	**9**	Priority valve
4	Return flow to return suction filter	**10**	Throttle 1.0 mm
5	Working hydraulics LS pressure relief valve	**11**	Oil supply from working pump
6	Load sensing signal for working hydraulics	**12**	Throttle 1.0 mm

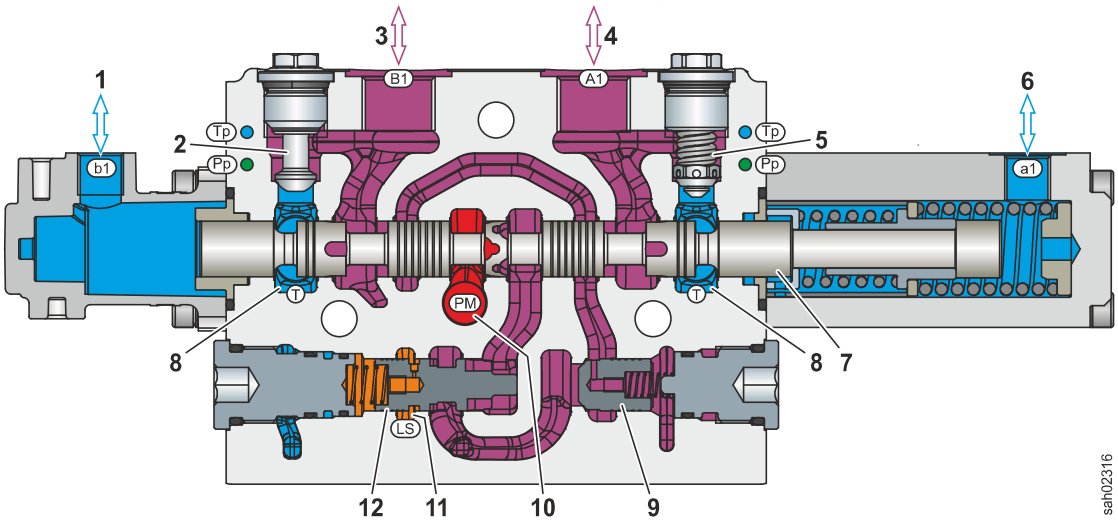

Fig. 368: Control valve block section for lift cylinder: sectional view

1	Pilot control connection for lowering	**5**	Secondary pressure relief valve for lifting	**9**	Lift cylinder load retaining valve
2	Feeder valve for lowering	**6**	Pilot control connection for lifting	**10**	Oil supply from working pump (via priority valve)
3	Connection to ring side of lift cylinder	**7**	Lift cylinder spool valve	**11**	Load sensing signal for working hydraulics
4	Connection to piston side of lift cylinder	**8**	Return flow to return suction filter (2x)	**12**	Lift cylinder pressure balance

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– Pilot pressure solenoid valve (For more information see: 060.5.3 Pilot pressure for solenoid valve, page 060-33)
– Hydro accumulator for pilot control

2 Function

2.1 Basic function

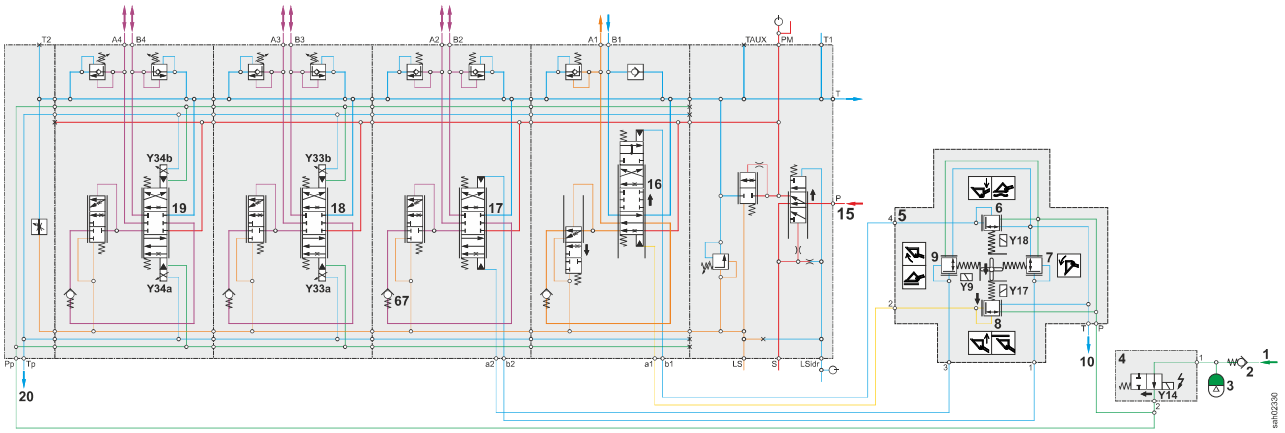

Fig. 375: Hydraulic diagram of the pilot control unit (lifting function actuated)

1	Oil supply from replenishing pump	**7**	Pilot control valve for tilting out	**17**	Tilt cylinder spool valve
2	Check valve	**8**	Pilot control valve for lifting	**18**	Spool for 1st additional function (option)
3	Pilot control hydro accumulator	**9**	Pilot control valve for tilting in	**19**	Spool for 2nd additional function (option)
4	Pilot pressure solenoid valve	**10**	Return flow to return suction filter	**20**	Control oil return flow to hydraulic tank
5	**Pilot control unit**	**15**	**Control block**		
6	Pilot control valve for lowering	**16**	Lift cylinder spool valve		

BMK	Function	BMK	Function	BMK	Function
Y9	Bucket return-to-dig retaining magnet (option)	**Y18**	Float position retaining magnet	**Y34a**	Proportional solenoid for 2nd additional function A4
Y14	Solenoid for servo pressure	**Y33a**	Proportional solenoid for 1st additional function A3	**Y34b**	Proportional solenoid for 2nd additional function B4
Y17	Lift kick-out retaining magnet (option)	**Y33b**	Proportional solenoid for 1st additional function B3		

Tab. 142: Equipment codes

The pilot control unit actuates the spool valves in the control valve block **15.** To do this, control oil pushes the spool valves against the force of the return springs. Oil flows from working pump to consumers via openings that spools have accordingly released.

Following spool valves are hydraulically actuated:
– Lift cylinder spool valve **16**
– Tilt cylinder spool valve **17**

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060.6.2 Stabilisation module

Valid for: L518-1655;

1 Layout

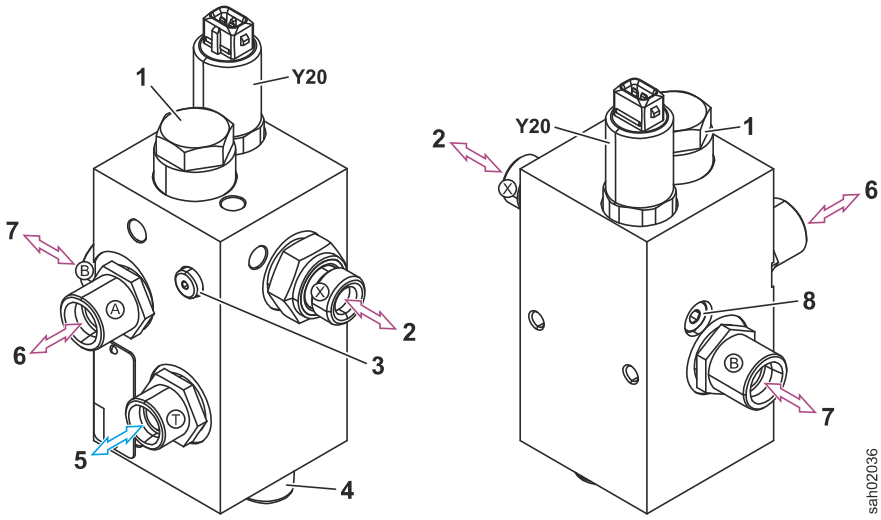

Fig. 383: Stabilisation module (from front left and from rear right)

1	Ride control valve spool	**5**	Return flow to the return suction filter (via the control valve block)
2	Ride control hydro accumulator connection	**6**	Connection to piston side of lift cylinder
3	Hydro accumulator relief valve	**7**	Connection to ring side of lift cylinder
4	Safety valve	**8**	Restrictor check valve

BMK	Function
Y20	Solenoid for ride control

Tab. 151: Equipment codes

The stabilisation module is fitted in the front section above the control valve block.

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070 Travel hydraulics

Contents

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11 Bypass valve 2.0 bar
12 Screen for replenishing pump 125 µm
13 Preload valve 0.5 bar
14 Feeder valve
15 Steel tank
16 Sight glass for hydraulic oil level
17 Hydraulic oil drain valve
18 Working pump suction port
19 Fan pump suction port
20 Return flow from parking brake and for pilot control of additional functions (option)
36 Reverse travel direction high pressure relief valve
37 Forward travel direction high pressure relief valve
38 Axial piston rotary group
39 Positioning piston
40 Fine strainer
41 Fine strainer
42 **Valve block for travel direction**
43 Travel direction valve
44 Swivel restrictor
45 **Control pressure valve block**
59 Check valve
60 Fine strainer
61 Servo pressure valve
62 Positioning piston
63 Discharge valve
64 Orifice
65 Pressure relief valve
66 Transmission
67 Fan motor return line (cooling)
68 Hydraulic oil cooler

Name	Test point	Name	Test point
G	Replenishing pressure	**M1**	Travel motor servo pressure
MH	Travel pump high pressure	**X2**	Control pressure for forward travel direction

Tab. 172: Test points

BMK	Function	BMK	Function	BMK	Function
B8	Hydraulic oil temperature sensor	**Y2**	Forward travel direction solenoid	**Y105**	Control pressure proportional solenoid (travel pump)
B102	Travel pump high pressure sensor	**Y3**	Reverse travel direction solenoid	**Y106**	Servo pressure proportional solenoid (travel motor)

Tab. 173: Equipment codes

Travel hydraulics is a closed circuit. This means that after leaving travel motor, oil flows directly back to travel pump.

Replenishing pump **31** draws up oil directly from return suction filter **7** and feeds it via high-pressure relief valves on low-pressure side of closed circuit. Axial piston rotary group **38** in travel pump **30** delivers oil to travel motor **55** to drive it. Oil returning from travel motor **55** flows back to axial piston rotary group **38** of travel pump **30**.

2.2 Travel direction

Travel direction is determined by flow direction of oil in closed circuit. To change travel direction, travel pump **30** exchanges high pressure and low pressure by moving axial piston rotary group **38** past zero position and into opposite direction.

2.3 Cooling

For cooling, travel motor **55** feeds oil from closed circuit. Oil is also lost from closed circuit due to leaks in rotary groups. Replenishing pump **31** replaces this oil with cooled oil from hydraulic tank.

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2.4 Variable displacement pump

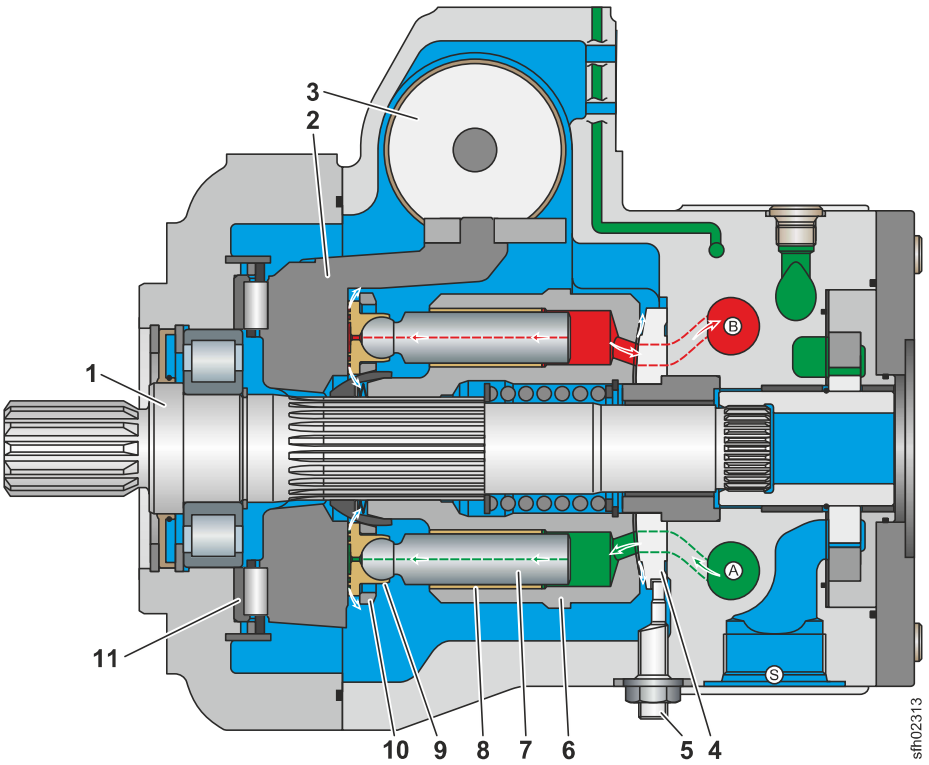

Fig. 409: Variable displacement pump (forward travel direction)

1	Drive shaft	**7**	Piston
2	Swivel plate	**8**	Sliding bushing
3	Positioning piston	**9**	Glide shoe
4	Control plate	**10**	Return plate
5	Eccentric adjusting screw	**11**	Swivel plate bearing
6	Rotary group cylinder (9x)		

2.4.1 Rotary group

Rotary group cylinder **6** is rigidly connected to the drive shaft **1** via a gear. The rotary group cylinder **6** contains the pistons **7**, which rotate along with the rotary group cylinder **6**. The pistons **9** slide up and down in the sliding bushings **8** and are guided by glide shoes **9** and the return plate **10**.

Swivel plate **2** and control plate **4** do not move.

Oil is pumped through a hole in the pistons **7** into the glide shoe **9**. This means the glide shoe **9** floats on a film of oil and slides over the swivel plate **2** without mechanical contact.

The rotary group cylinder **6** also slides on a film of oil. This is produced by the leakage between control plate **4** and rotary group cylinder **6**.

2.4.2 Servo positioning piston and swivel plate

The swivel plate **2** lies on the swivel plate bearing **10**, and is connected by a lever to the positioning piston **3**.

If no travel direction is selected, the positioning piston **3** holds the swivel plate **2** in the zero position. If a travel direction is selected, the positioning piston **3** swivels the swivel plate **2** up to -20° or +20° (depending on the travel direction).

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Name	Test point
M1	Travel motor servo pressure

Tab. 189: Test points

BMK	Function
Y106	Servo pressure proportional solenoid (travel motor)

Tab. 190: Equipment codes

The travel motor is driven with oil from the travel pump.

To change the direction of rotation, the high pressure side and low pressure side are swapped.

2.2 Output speed and output torque

The output speed depends on the following factors:
– Oil quantity supplied by the travel pump
– Swivel plate angle

The output torque depends on the following factors:
– High pressure
– Swivel plate angle

At a small angle, the axial piston rotary group **2** has a low displacement. The output speed is high, because exclusively a little oil is required for each revolution. At the same time, the output torque is low, due to the shallow angle of pistons to the output shaft.

At a large angle, the axial piston rotary group **2** has a high displacement. The output speed is low, because a lot of oil is required for each revolution. At the same time, the output torque is high, due to the large angle of pistons to the output shaft.

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11 Travel pump
12 Valve block for travel direction
13 Control pressure valve block
14 Diesel engine
15 Travel motor
16 Orifice 1.0 mm
17 Transmission
18 Fan pump
19 In-line filter 80 µm
28 Control valve block section for lift cylinder
29 Control valve block section for tilt cylinder
30 Control block section for 1st additional function (option)
31 Control block section for 2nd additional function (option)
32 End section
33 Orifice 0.6 mm
34 Right lift cylinder
35 Left lift cylinder
36 Stabilization module (option)
45 Servostat
46 Steering cylinder
47 Parking brake solenoid valve
48 Drum brake
49 Spring accumulator cylinder for parking brake
50 Inch/brake unit
51 Main brake cylinder
52 Equalising reservoir
53 Filler strainer

Name	Test point	Name	Test point	Name	Test point
G	Replenishing pressure	**MH**	Travel pump high pressure	**X2**	Control pressure for forward travel direction
LSL	Load sensing signal for steering system	**PA**	Working hydraulics high pressure		
M1	Travel motor servo pressure	**PK**	Cooling system high pressure		

Tab. 195: Test points

BMK	Function	BMK	Function	BMK	Function
B8	Hydraulic oil temperature sensor	**Y10**	Parking brake solenoid	**Y33b**	Proportional solenoid for 1st additional function B3 (option)
B12	Brake light pressure switch	**Y13**	Fan speed proportional solenoid	**Y34a**	Proportional solenoid for 2nd additional function A4 (option)
B102	Travel pump high pressure sensor	**Y14**	Solenoid for servo pressure	**Y34b**	Proportional solenoid for 2nd additional function B4 (option)
R1	Inching function angle sensor	**Y17**	Retaining magnet for auto lift arm position (option)	**Y53**	Solenoid for opening quick coupler (option)
Y2	Forward travel direction solenoid	**Y18**	Float position retaining magnet	**Y53a**	Quick coupler load sensing signal solenoid (option)
Y3	Reverse travel direction solenoid	**Y20**	Magnet for ride control (option)	**Y105**	Control pressure proportional solenoid (travel pump)
Y9	Bucket return-to-dig retaining magnet (option)	**Y33a**	Proportional solenoid for 1st additional function A3 (option)	**Y106**	Servo pressure proportional solenoid (travel motor)

Tab. 196: Equipment codes

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When the diesel engine is off, the oil flows through a small hole in the preload valve **7** from the filter casing to the steel tank **8**. This makes it easier to change the filter element **5**.

2.4 Bypass valve

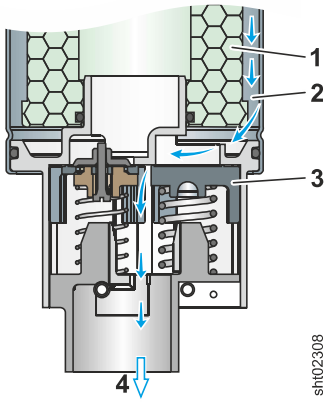

Fig. 432: Bypass valve

1	Filter element 10 µm	**3**	Bypass valve
2	Filter casing	**4**	Connection to steel tank

Bypass valve **3** protects system from excessive pressure.

If not enough hydraulic oil passes through filter element because oil is cold or filter element **1** is clogged, some of oil flows unfiltered via bypass valve **3** directly into steel tank **4**. This prevents hydraulic components being damaged.

2.5 Temperature valve

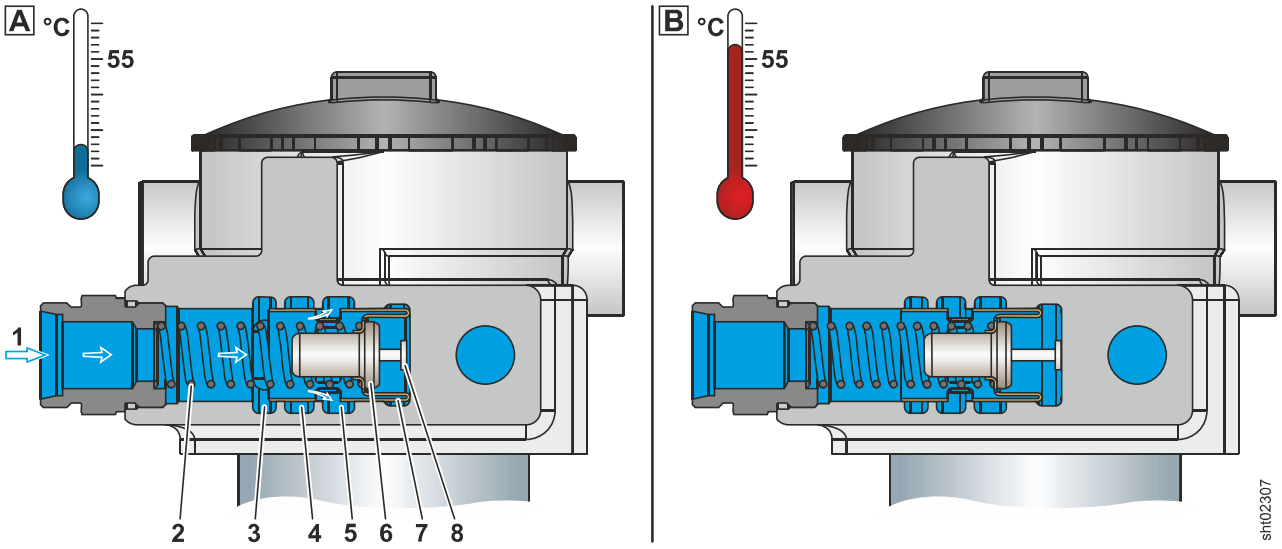

Fig. 433: Temperature valve with cold hydraulic oil / temperature valve with hot hydraulic oil.

1	Leak oil from travel pump and travel motor	**4**	Bypass channel (closed at one end)	**7**	Valve sleeve
2	Compression spring	**5**	Connection to filter casing	**8**	Pin
3	Bypass channel with throttle (closed at one end)	**6**	Temperature element		

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090 Steering system

Contents

LBH/12204903/12/211-20210128_104143/en

2 Function

2.1 Basic function

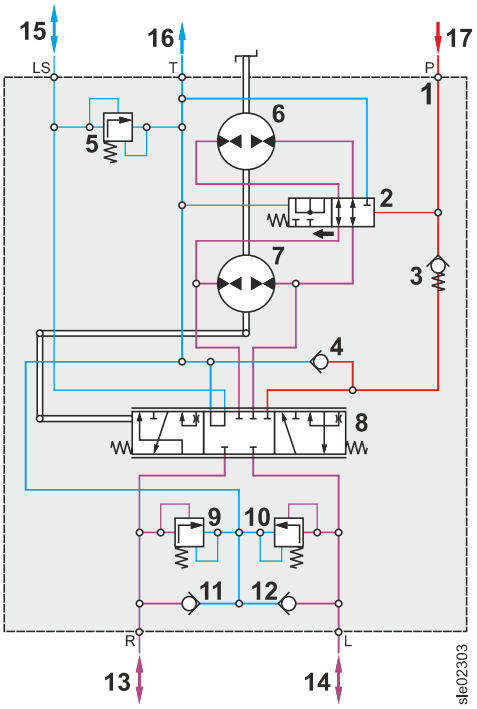

Fig. 452: Servostat: hydraulic diagram (diesel engine is running)

1	**Servostat**	**10**	Secondary pressure relief valve for steering to left
2	Cut-off valve for 2nd metering pump (emergency steering function)	**11**	Replenishing valve for steering to the right
3	Check valve	**12**	Replenishing valve for steering to left
4	Emergency steering replenishing valve	**13**	Connection for steering to the right
5	Steering system LS pressure relief valve	**14**	Connection for steering to left
6	2nd metering pump	**15**	Load sensing signal to priority valve (control block)
7	1st metering pump	**16**	Return flow to return suction filter
8	Valve spool	**17**	Oil supply from working pump (via control valve block)
9	Secondary pressure relief valve for steering to right		

The working pump **17** supplies oil to the servostat **1** via the priority valve in the control valve block. When the steering wheel is turned, the valve spool **8** directs oil to the metering pumps **7** and **6**. The amount of oil directed depends on how fast the wheel is turned. The metering pumps act like a gear pump and deliver a specific quantity of oil to the steering cylinder with each turn of the steering wheel.

Servostat **1** also generates a load sensing signal **15** which regulates priority valve.

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BMK	Function	BMK	Function	BMK	Function
B12	Brake light pressure switch	**R1**	Inching function angle sensor	**Y10**	Parking brake solenoid

Tab. 218: Equipment codes

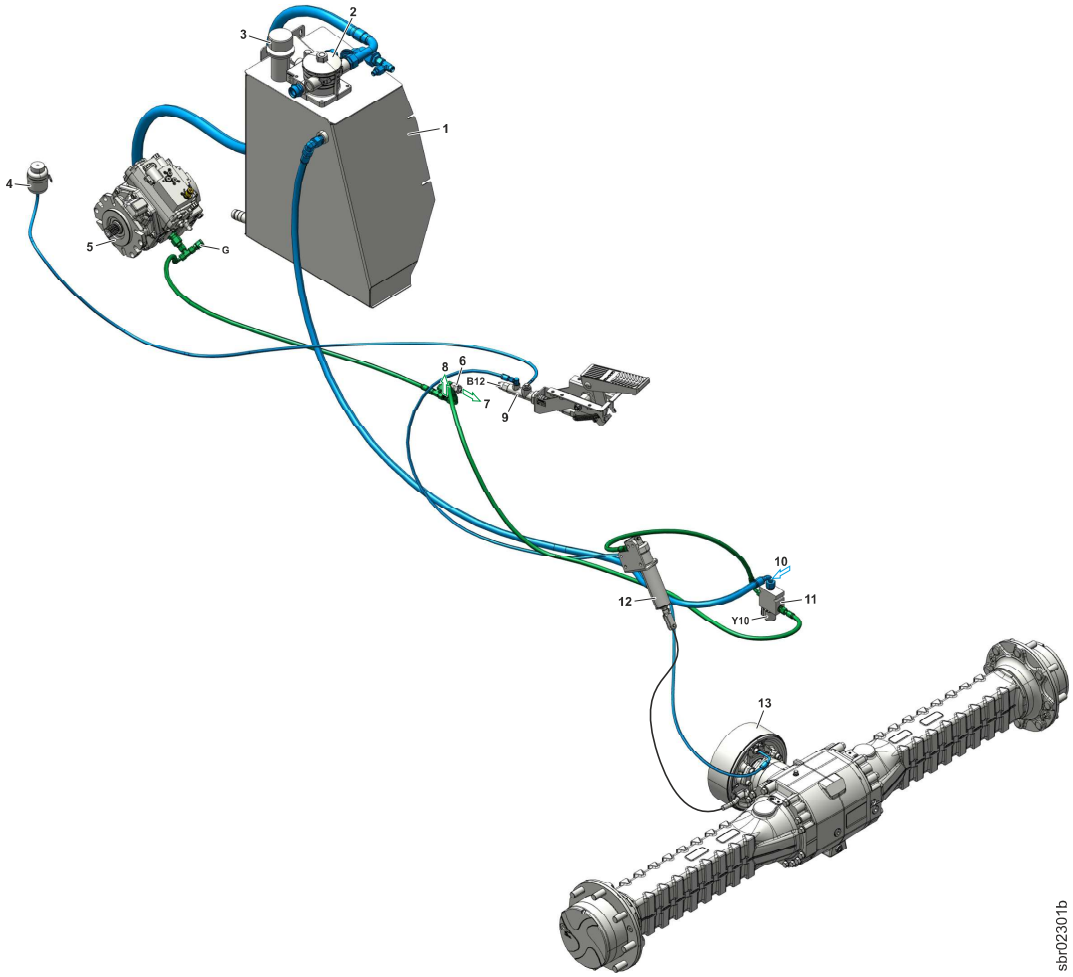

Fig. 458: Brake system (parking brake deactivated) (from front right)

1 Hydraulic tank
2 Return suction filter
3 Breather filter
4 Equalising reservoir
5 Travel pump
6 Check valve
7 Oil supply for pilot control
8 Oil for bearing flushing
9 Inch/brake unit
10 Return flow from pilot control of additional functions (option)
11 Parking brake solenoid valve
12 Spring accumulator cylinder for parking brake
13 Drum brake

Name	Test point
G	Replenishing pressure

Tab. 219: Test points

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2 Function

NOTICE
Sensor may be damaged by resistance measurement!

▶ Do not carry out any resistance measurements on the sensor.

the inching function angle sensor **R1** contains Hall effect sensors.

The angle sensor measures the current position of the inching brake pedal.

The signals from the angle sensor are sent via the compact module A27 to the central control unit.

The angle sensor enables the central control unit to register that the inching function is actuated. The current at the control pressure proportional solenoid Y105 is reduced according a defined characteristic. This pivots the travel pump to a smaller angle. The machine is hydrostatically braked.

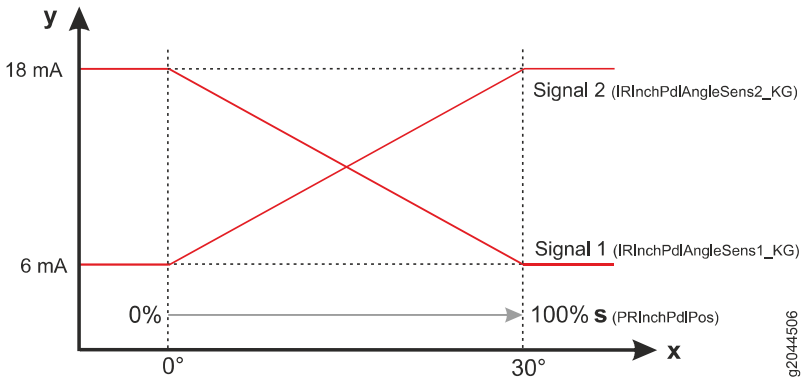

Fig. 470: Current signal characteristics

s Pedal displacement in %
x Operating area in degrees (angle)
y Output current in mA

The inching function angle sensor emits two mixed current signals.

When not active, the output for signal 1 is around 18 mA. When not active, the output for signal 2 is around 6 mA. The two signals add up to 24 mA in every position.

For safety reasons, both signals are monitored by the central control unit. This prevents accidental inching if there is a malfunction with the angle sensor.

If the signals deviate or if the angle sensor fails, a service code appears in the display.

If the inching function angle sensor is replaced, it has to be calibrated.

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2.1 Fuse board and fuses

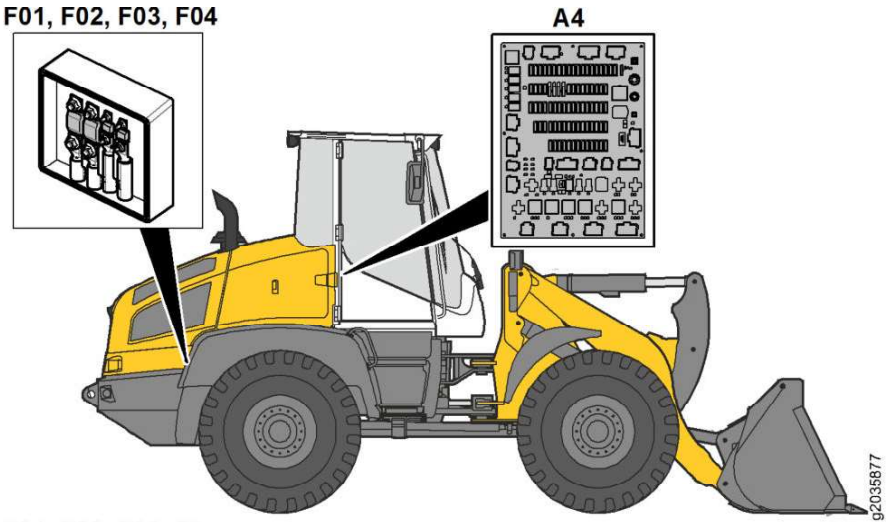

Fig. 480: Fuse board and fuses

Fuse board **A4** is mounted on rear wall of operator's cab.

The fuses **F** are installed in the right ballast weight.

2.2 Electrical wiring in the right ballast weight

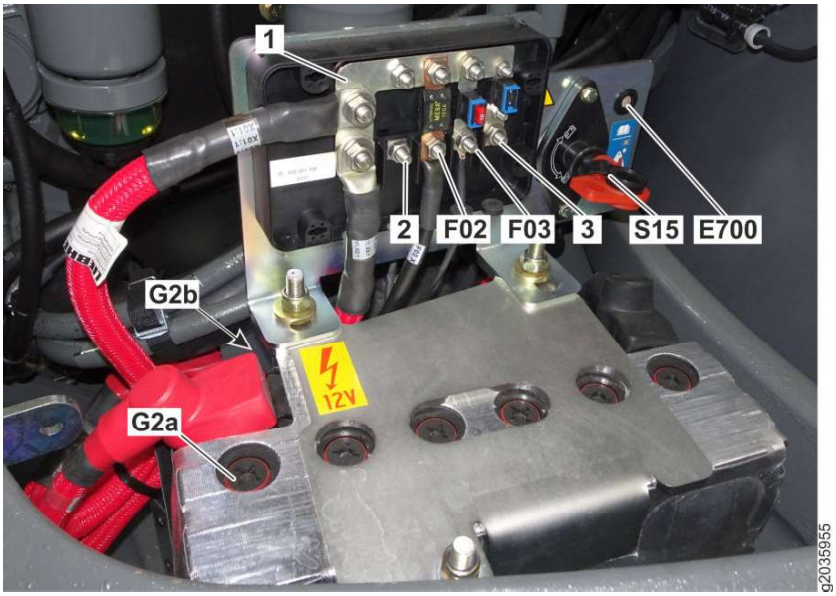

Fig. 481: Electrical wiring in the right ballast weight

Position	Component	Position	Component
1	Busbar	F03	Fuse for hazard warning system
2	Spare	G2a	Batteries
3	Spare	G2b	Batteries

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BMK	SYSTEM	LOCATION	FUNCTION	PAGE
-1	=K	+K9	RESISTANCE CAN	/85.D3
-4	=K	+K	CONNECTION MATCHING RESISTOR	/33.D2
-5	=M	+M	CONNECTION RESISTANCE	/93.E3
-A3	=K	+K3	RADIO	/41.D4
-A3.X1	=K	+K3	PLUG RADIO	/41.D4
-A3.X2	=K	+K3	PLUG RADIO	/41.D4
-A4.X40	=K	+K2	PLUG FUSE AND RELAY BOARD	/64.D7
-A4.X41	=K	+K2	PLUG FUSE AND RELAY BOARD	/22.C7
-A4.X42	=K	+K2	PLUG FUSE AND RELAY BOARD	/43.C3
-A4.X43	=K	+K2	PLUG FUSE AND RELAY BOARD	/41.C7
-A4.X44	=K	+K2	PLUG FUSE AND RELAY BOARD	/43.C5
-A4.X46	=K	+K2	PLUG FUSE AND RELAY BOARD	/42.C3
-A4.X46_14	=K	+K2	AUXILIARY HEATER (OPTION)	/26.C2
-A4.X46_17	=K	+K2	AUXILIARY HEATER (OPTION)	/26.C2
-A4.X47	=K	+K2	PLUG FUSE AND RELAY BOARD	/28.D6
-A4.X48	=K	+K2	PLUG FUSE AND RELAY BOARD	/16.C4
-A4.X49	=K	+K2	PLUG FUSE AND RELAY BOARD	/16.C3
-A4.X50	=K	+K2	PLUG FUSE AND RELAY BOARD	/62.C5
-A4.X51	=K	+K2	PLUG FUSE AND RELAY BOARD	/87.C2
-A4.X52	=K	+K2	PLUG FUSE AND RELAY BOARD	/17.B3
-A4.X53	=K	+K2	PLUG FUSE AND RELAY BOARD	/42.C3
-A4.X54	=K	+K2	PLUG FUSE AND RELAY BOARD	/48.C2
-A4.X55	=K	+K2	PLUG FUSE AND RELAY BOARD	/65.B4
-A4.X56	=K	+K2	PLUG FUSE AND RELAY BOARD	/19.C5
-A4.X56a	=K	+K2	DIODE AUXILIARY HEATER (OPTION)	/26.C4
-A4.X56b	=K	+K2	DIODE AUXILIARY HEATER (OPTION)	/26.D4
-A4.X57	=K	+K2	PLUG FUSE AND RELAY BOARD	/18.B5
-A4.X57_6	=K	+K2	PLUG AUXILIARY HEATER	/18.B7
-A9	=K	+K9	OPTION IMMOBILISER	/73.D2
-A9.X	=K	+K9	PLUG OPTION IMMOBILISER	/73.D2
-A13	=K	+K3	DISPLAY	/32.A6
-A13.X	=K	+K3	ETHERNET PLUG DISPLAY	/32.C6
-A13a.X	=K	+K3	PLUG SUPPLY DISPLAY	/32.B5
-A15	=K	+K	MASTER 5 MINI	/55.A1
-A15.CAN.X2	=K	+K	CONNECTOR MASTER 4	/57.B7
-A15.PWR.X2	=K	+K	PLUG MASTER 4	/57.B3

BMK	SYSTEM	LOCATION	FUNCTION	PAGE
-A15.X1	=K	+K	PLUG MASTER 5 MINI	/61.E4
-A15.X1_1	=K	+K	PLUG MASTER 5	/57.D5
-A15.X2	=K	+K	PLUG MASTER 5	/57.C5
-A15.Xa	=K	+K	ADAPTOR MASTER 4	/56.E6
-A15.Xb	=K	+K4	PLUG MASTER 5	/57.E5
-A15a	=K	+K	MASTER 4	/58.A1
-A15a.CAN.X	=K	+K	CAN PLUG MASTER 4	/56.B5
-A15a.PWR.X	=K	+K	PLUG MASTER 4	/56.B2
-A27	=K	+K2	COMPACT MODULE A27	/53.B5
-A27.X1	=K	+K2	PLUG COMPACT MODULE A27	/19.B1
-A27.X2	=K	+K2	PLUG COMPACT MODULE A27	/48.B3
-A27.X3	=K	+K2	PLUG COMPACT MODULE A27	/42.B8
-A28	=K	+K2	COMPACT MODULE 2 (OPTION)	/54.B5
-A28.X1	=K	+K2	PLUG OPTION COMPACT MODULE A28	/38.E3
-A28.X2	=K	+K2	PLUG OPTION COMPACT MODULE A28	/45.E6
-A28.X3	=K	+K2	PLUG OPTION COMPACT MODULE A28	/38.E5
-A30	=K	+K2	TELEMETRY SYSTEM	/68.B1
-A30.a	=K	+K2	OPTION DIAGNOSTIC PLUG CLAAS	/83.B1
-A30.a.X1	=K	+K2	OPTION CONNECTOR TELEMATICS SYSTEM (CLAAS)	/84.E2
-A30.X1	=K	+K2	PLUG TELEMETRY SYSTEM	/69.E3
-A35	=K	+K9	CLAAS IMMOBILISER	/85.B2
-A35.X1	=K	+K9	PLUG CLAAS IMMOBILISER	/85.C2
-A700	=M	+M	MOTOR CONTROL	/89.A1
-A700.X3	=M	+M	PLUG MOTOR CONTROL	/87.E1
-A700/2	=M	+M	MOTOR CONTROL	/95.A1
-A700/2.X2	=M	+M	PLUG MOTOR CONTROL	/90.B1
-A5505	=M	+M	ENGINE CONTROL UNIT	/97.D5
-B8	=H	+H4	TEMPERATURE SENSOR HYDRAULIC OIL	/20.D2
-B8.X	=H	+H4	PLUG TEMPERATURE SENSOR HYDRAULIC OIL	/20.D2
-B10	=H	+H2	HORN	/39.B1
-B10.X1	=H	+H2	PLUG HORN	/39.B1
-B10.X2	=H	+H2	PLUG HORN	/39.C1
-B11l	=K	+K3	LOUDSPEAKER LEFT	/41.E5
-B11l.X1	=K	+K3	PLUG LOUDSPEAKER LEFT	/41.E5
-B11l.X2	=K	+K3	PLUG LOUDSPEAKER LEFT	/41.E5
-B11r	=K	+K3	LOUDSPEAKER RIGHT	/41.E4

PROJECT SERIE_L514-L518
DRAWING NUMBER 1583 00090 01 00
ITEM CODE 13434870
DRAWING INDEX 100

MACHINE TYPE
LIDOS UNIT

SERIAL NUMBER
XXXXX

LIEBHERR
FACTORY LBH

BMK-INDEX
E PLAN

BMK	SYSTEM	LOCATION	FUNCTION	PAGE
-Y3.DT	=H	+H	PLUG MAGNET TRAVELLING DIRECTION BACKWARDS	/19.E1
-Y9	=K	+K	MAGNET BUCKET RETURN-TO-DIG	/23.E4
-Y10	=H	+H	MAGNET PARKING BRAKE	/25.D4
-Y10.X	=H	+H	PLUG MAGNET PARKING BRAKE	/25.D4
-Y11	=V	+V2	MAGNET BAYPASS PARKING BRAKE	/25.D5
-Y11.X	=V	+V2	PLUG MAGNET BAYPASS PARKING BRAKE	/25.D5
-Y12	=V	+V2	MAGNET RESERVE	/36.D3
-Y12.X	=V	+V2	PLUG MAGNET RESERVE	/36.D3
-Y13	=H	+H	MAGNET VENTILATOR	/21.D2
-Y13.a.X	=H	+H	PLUG MAGNET VENTILATOR	/21.B8
-Y13.X	=H	+H	PLUG MAGNET VENTILATOR	/21.D2
-Y13.X.S	=H	+H	PLUG MAGNET VENTILATOR	/21.D8
-Y14	=H	+H3	MAGNET WORKING HYDRAULICS LOCKOUT	/22.D5
-Y14.X	=H	+H3	PLUG MAGNET WORKING HYDRAULICS LOCKOUT	/22.D5
-Y17	=K	+K	MAGNET LIFT KICK-OUT	/23.E4
-Y18	=K	+K	MAGNET FLOAT POSITION	/23.E4
-Y20	=V	+V	MAGNET RIDE CONTROL	/24.E8
-Y20.X	=V	+V	PLUG MAGNET RIDE CONTROL	/24.E8
-Y21	=V	+V2	SOLENOID VALVE PIPE BREAK PROTECTION LOWER	/25.D7
-Y21.X	=V	+V2	PLUG SOLENOID VALVE PIPE BREAK SAFETY DEVICE LOWERING	/25.D7
-Y22	=M	+M	AIR CONDITIONING COMPRESSOR	/26.D6
-Y22.X	=M	+M	PLUG AIR CONDITIONING COMPRESSOR	/26.D6
-Y33a	=V	+V2	VALVE PROPORTIONAL SOLENOID 3.STEUERKREIS A	/36.D6
-Y33a.X	=V	+V2	PLUG VALVE PROPORTIONAL SOLENOID 3.STEUERKREIS A	/36.D6
-Y33b	=V	+V2	VALVE PROPORTIONAL SOLENOID 3.STEUERKREIS B	/36.D5
-Y33b.X	=V	+V2	PLUG VALVE PROPORTIONAL SOLENOID 3.STEUERKREIS B	/36.D5
-Y34a	=V	+V2	VALVE PROPORTIONAL SOLENOID 4.STEUERKREIS A	/36.D8
-Y34a.X	=V	+V2	PLUG VALVE PROPORTIONAL SOLENOID 4.STEUERKREIS A	/36.D8
-Y34b	=V	+V2	VALVE PROPORTIONAL SOLENOID 4.STEUERKREIS B	/36.D7
-Y34b.X	=V	+V2	PLUG VALVE PROPORTIONAL SOLENOID 4.STEUERKREIS B	/36.D7
-Y50	=M	+M	MAGNET FAN REVERSAL	/21.C7
-Y50.X	=M	+M	PLUG MAGNET FAN REVERSAL	/21.C7
-Y53	=V	+V2	MAGNET QUICK-CHANGE DEVICE UNLOCKING	/63.D8
-Y53.X	=V	+V2	PLUG MAGNET QUICK-CHANGE DEVICE UNLOCKING	/63.D8
-Y53a	=V	+V2	MAGNET QUICK-CHANGE DEVICE ACTIVE	/63.D8
-Y53a.X	=V	+V2	PLUG MAGNET QUICK-CHANGE DEVICE ACTIVE	/63.D8

BMK	SYSTEM	LOCATION	FUNCTION	PAGE
-Y55	=M	+M	MAGNET 100% DIFFERENTIAL LOCK	/19.E8
-Y55.X	=M	+M	PLUG MAGNET 100% DIFFERENTIAL LOCK	/19.D8
-Y100	=F	+F3	MAGNET GEAR 1	/46.D2
-Y100.X	=F	+F3	PLUG MAGNET GEAR 1	/46.D2
-Y101	=F	+F3	MAGNET GEAR 2	/46.D3
-Y101.X	=F	+F3	PLUG MAGNET GEAR 2	/46.C3
-Y102	=F	+F3	MAGNET HIGH PRESSURE BYPASS	/46.D4
-Y102.X	=F	+F3	PLUG MAGNET HIGH PRESSURE BYPASS	/46.D4
-Y103	=F	+F3	HALL SENSOR GEAR 1 / GEAR2	/46.C5
-Y103.X1	=F	+F3	PLUG HALL SENSOR GEAR 1 / GEAR 2	/46.C5
-Y104	=F	+F3	MAGNET EXTERNAL SERVO PRESSURE	/46.D8
-Y104.X	=F	+F3	PLUG MAGNET EXTERNAL SERVO PRESSURE	/46.D8
-Y105	=F	+F3	PROPORTIONAL SOLENOID TRAVEL PUMP	/47.D1
-Y105.X	=F	+F3	PLUG PROPORTIONAL SOLENOID TRAVEL PUMP	/47.D1
-Y106	=F	+F3	PROPORTIONAL SOLENOID TRAVEL MOTOR	/47.D2
-Y106.X	=F	+F3	PLUG PROPORTIONAL SOLENOID TRAVEL MOTOR	/47.D2
-Y5002	=M	+M	VALVE SUCTION CONTROL	/98.A3
-Y5004	=M	+M	FUEL PUMP	/98.E1
-Y5017	=M	+M	STARTER SOLENOID	/102.B2
-Y5019	=M	+M	VALVE COOLING WATER UREA TANK	/92.F5
-Y5020	=M	+M	UREA DOSING NOZZLE	/93.E2
-Y5020.X	=M	+M	PLUG DEF UREA DOSING NOZZLE	/93.E2
-Y5021	=M	+M	INJECTION VALVES	/97.E7
-Y5024	=M	+M	VALVE PRESSURE DROP DISTRIBUTION RAIL	/98.A4
-Y5400	=M	+M	VALVE EXHAUST RETURN	/97.E5
-Y5402	=M	+M	SERVOMOTOR EXHAUST FLAP	/98.A7

PROJECT SERIE_L514-L518
DRAWING NUMBER 1583 00090 01 00
ITEM CODE 13434870
DRAWING INDEX 100

MACHINE TYPE
LIDOS UNIT

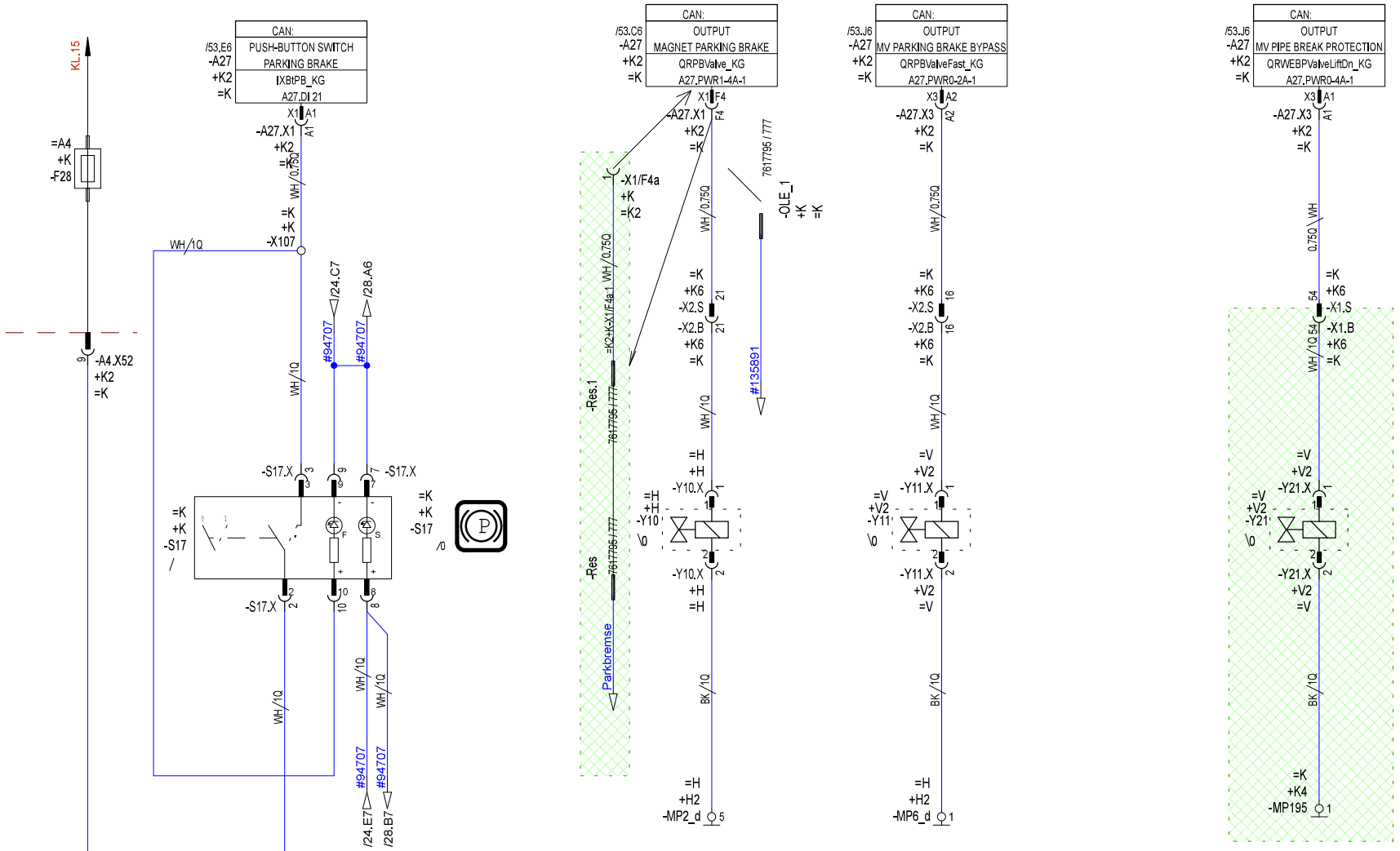
SERIAL NUMBER
XXXXX

LIEBHERR
FACTORY LBH

BMK-INDEX
E PLAN

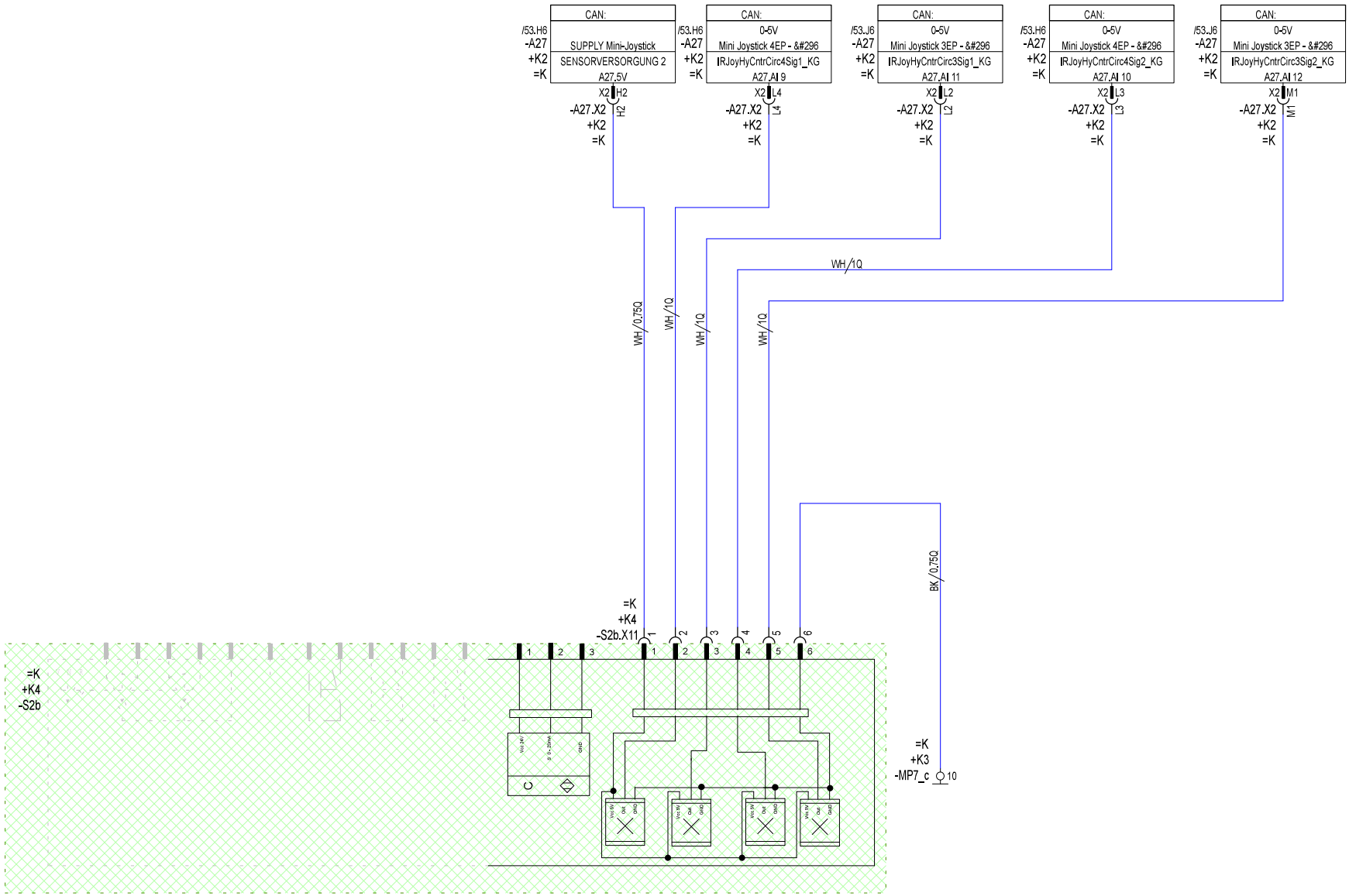
PARKING BRAKE

OPTION PIPE BREAK SAFETY DEVICE



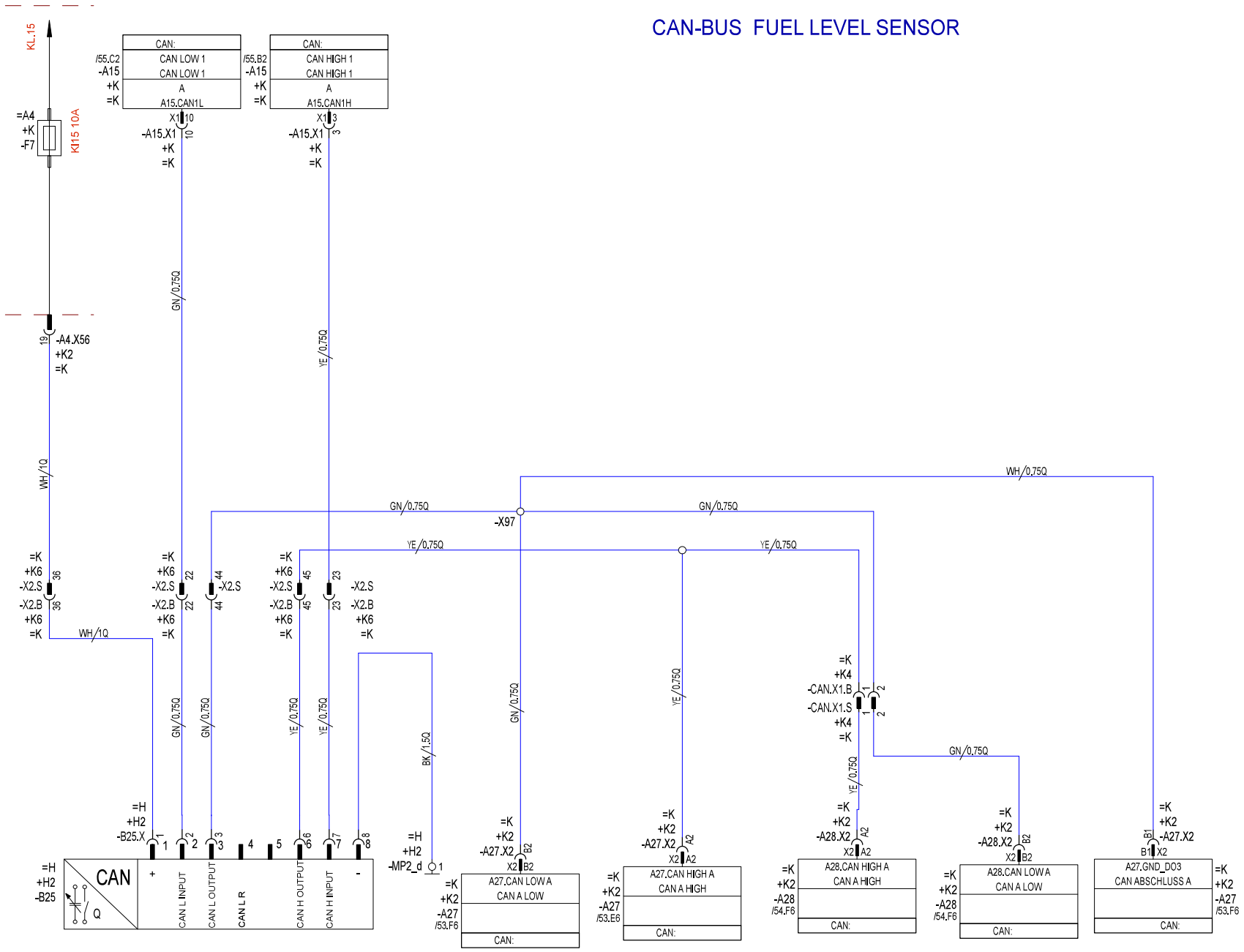
MACHINE TYPE	SERIAL NUMBER			
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	PARKING BRAKE OPTION PIPE BREAK SAFETY DEVICE E PLAN	PAGE 25 OF
				CREATION DATE 16.07.2020 09:40

PROJECT SERIE_L514-L518 | ITEM CODE 13434870
DRAWING NUMBER 1583 00090 01 00 | DRAWING INDEX 100



MACHINE TYPE	SERIAL NUMBER			PAGE 35 OF
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	OPTION MINI JOYSTICK E PLAN	CREATION DATE 16.07.2020 09:40

CAN-BUS FUEL LEVEL SENSOR



PROJECT SERIE_L514-L518 ITEM CODE 13434870
DRAWING NUMBER 1583 00090 01 00 DRAWING INDEX 100

MACHINE TYPE	SERIAL NUMBER			
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	CAN-BUS FUEL LEVEL SENSOR E PLAN	PAGE 45 OF
				CREATION DATE 16.07.2020 09:40

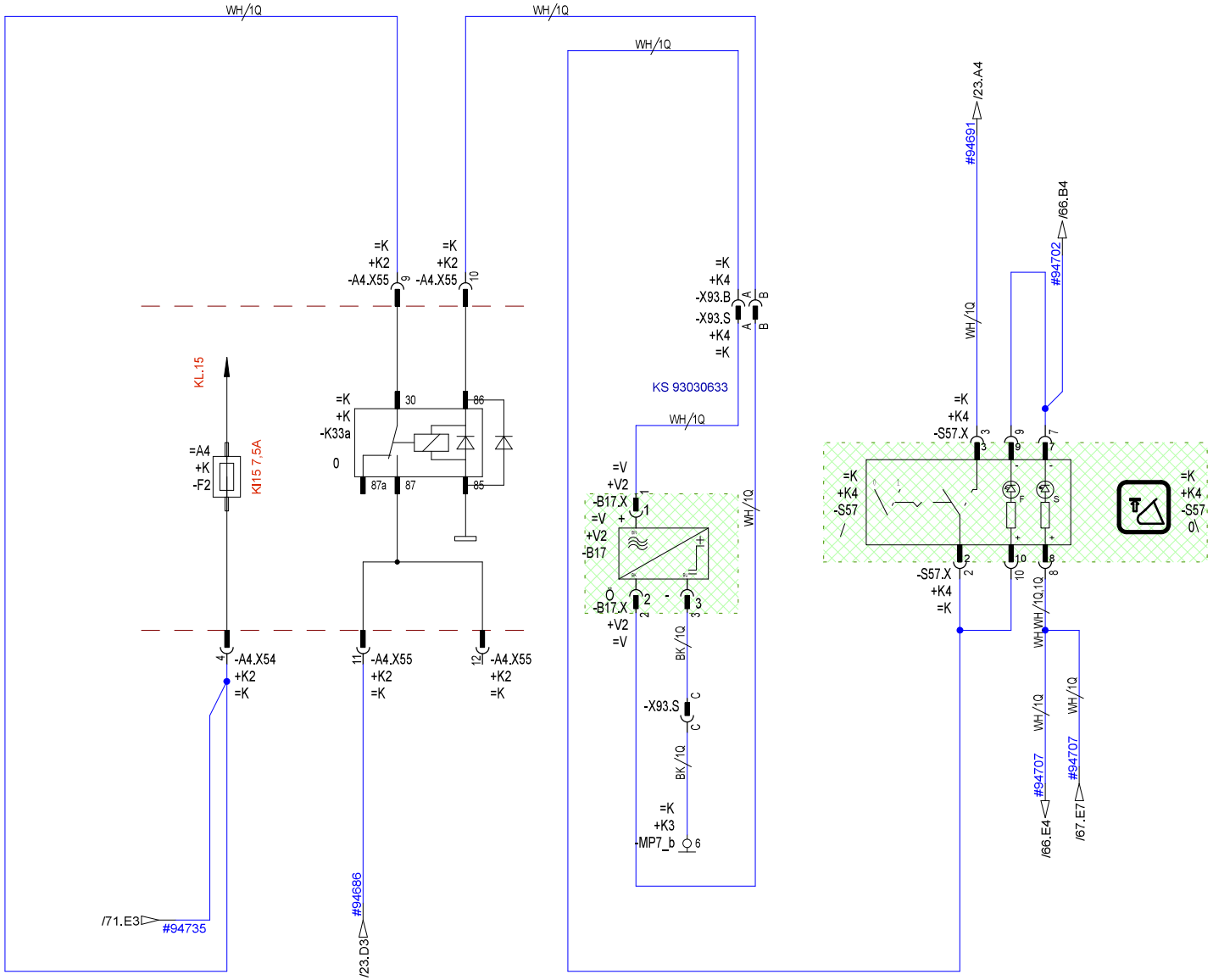
GENERAL OUTLAY MASTER 5 MINI

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

Phys. Adr.	SHEET	EA	DESCRIPTION	PLUG	Pin
A15.KI.30	/61.F4		KI.30	0	1
A15.LAN 1-4	/16.A1		VOLTAGE	0	2
A15.CAN1H	/45.A3		CAN HIGH 1	0	3
A15.CAN2H	/33.A3		CAN HIGH 2	0	4
A15.CAN3H			CAN HIGH 3	0	5
A15.CAN4H			CAN HIGH 4	0	6
A15.CAN4L			CAN LOW 4	0	7
A15.CAN3L			CAN LOW 3	0	8
A15.CAN2L	/33.A2		CAN LOW 2	0	9
A15.CAN1L	/45.A2		CAN LOW 1	0	10
A15.DIGINO	/61.F6		DIGINO KI.15	0	11
A15.GND	/61.F3		EARTH	0	12

PROJECT SERIE_L514-L518 | ITEM CODE 13434870
DRAWING NUMBER 1583 00090 01 00 | DRAWING INDEX 100

OPTION AUTOMATIC LIFT KICK-OUT

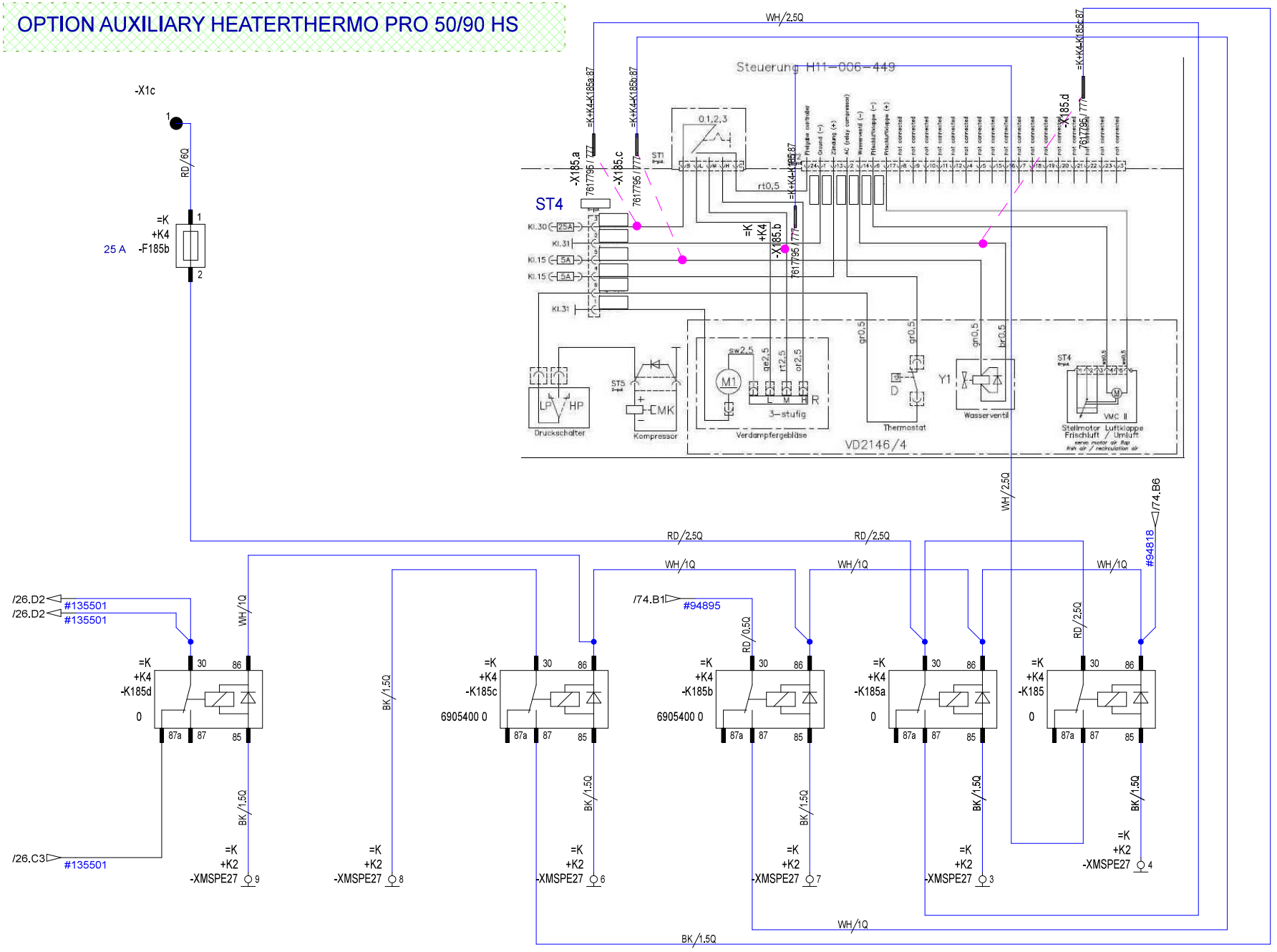


PROJECT SERIE_L514-L518 ITEM CODE 13434870

DRAWING NUMBER 1583 00090 01 00 DRAWING INDEX 100

MACHINE TYPE	SERIAL NUMBER			PAGE 65 OF
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	OPTION AUTOMATIC LIFT KICK-OUT E PLAN	CREATION DATE 16.07.2020 09:40

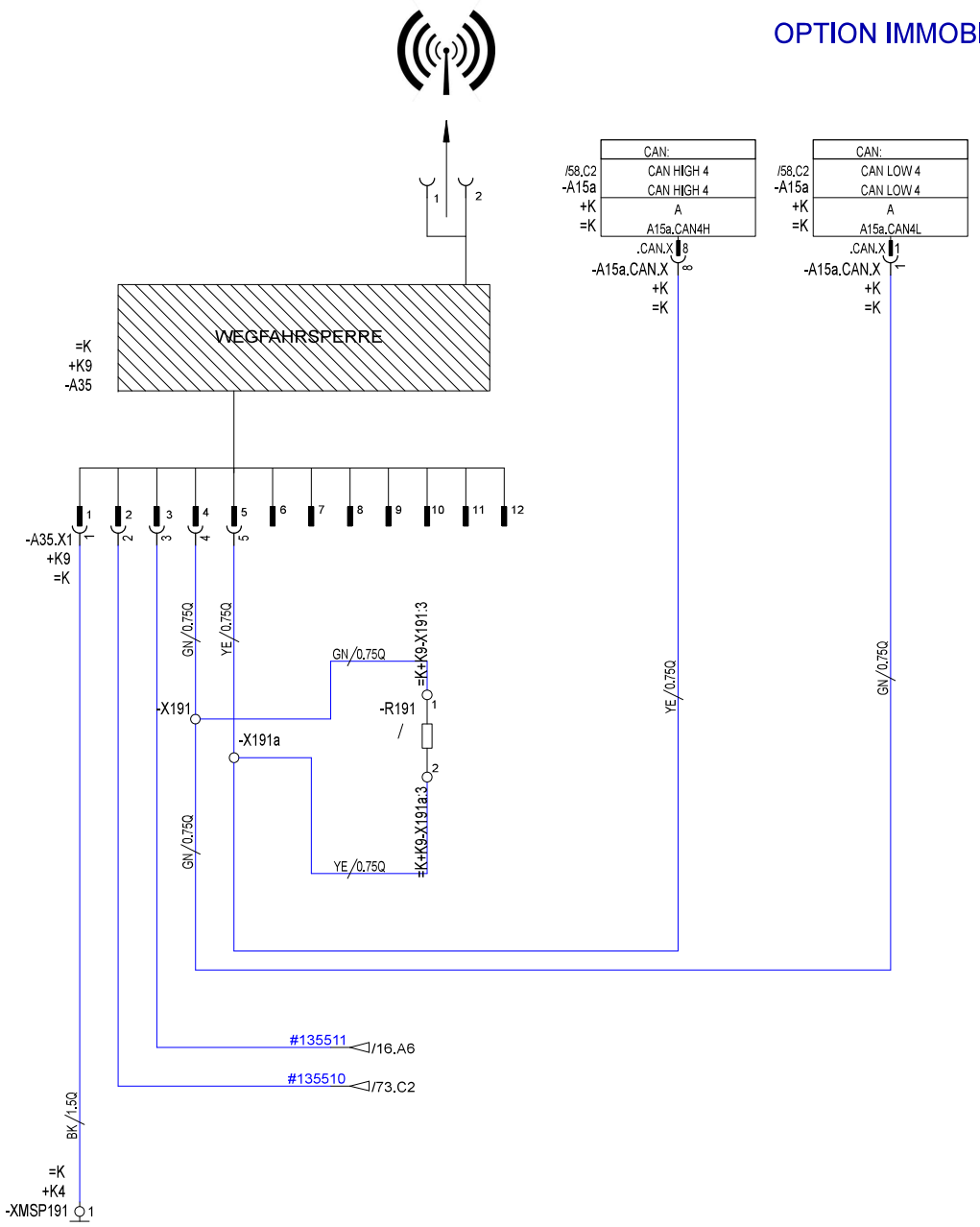
OPTION AUXILIARY HEATERTHERMO PRO 50/90 HS



PROJECT	SERIE_L514-L518
DRAWING NUMBER	1583 00090 01 00
ITEM CODE	13434870
DRAWING INDEX	100

MACHINE TYPE	SERIAL NUMBER			
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	OPTION AUXILIARY HEATER E PLAN	PAGE 75 OF
				CREATION DATE 16.07.2020 09:40

OPTION IMMOBILISER (CLAAS)



PROJECT SERIE_L514-L518 ITEM CODE 13434870
DRAWING NUMBER 1583 00090 01 00 DRAWING INDEX 100

MACHINE TYPE	SERIAL NUMBER			PAGE 85 OF
LIDOS UNIT	XXXXX	LIEBHERR FACTORY LBH	OPTION IMMOBILISER (CLAAS) E PLAN	CREATION DATE 16.07.2020 09:40

=M -A700/2 Modul Nr.:
+M Modulname:

Phys. Adr.	Blatt	EA	Beschreibung		Stecker	Pin	Phys. Adr.	Blatt	EA	Beschreibung		Stecker	Pin
A700/2.1	/93.A2		INJ. LOW	SCR	0	1	A700/2.41	/91.A6		LH3-	DEF	0	41
A700/2.2					0	2	A700/2.42	/91.A4		LH2+	DEF	0	42
A700/2.3					0	3	A700/2.43	/90.C3			SENSOR RET 13	0	43
A700/2.4					0	4	A700/2.44	/93.A6		CAN LOW	AT	0	44
A700/2.5					0	5	A700/2.45					0	45
A700/2.6	/94.A6			EXCITATION 8a+	0	6	A700/2.46	/90.A2		PD150K	ANALOG IN	0	46
A700/2.7	/90.C3			EXCITATION 8b+	0	7	A700/2.47	/94.A7		PD150K	ANALOG IN	0	47
A700/2.8					0	8	A700/2.48			RET 14		0	48
A700/2.9					0	9	A700/2.49			PUK1K	SENSOR	0	49
A700/2.10	/91.A3		LH1 +	DEF	0	10	A700/2.50	/93.A4		SENSOR PWR+	ANALOG IN	0	50
A700/2.11	/91.A5		LH2+	DEF	0	11	A700/2.51	/92.A6		COOLANT-	SW BATT	0	51
A700/2.12	/91.A7		LH3+	DEF	0	12	A700/2.52	/90.A3			DEF	0	52
A700/2.13	/93.A3		INJ. HIGH	SCR	0	13	A700/2.53	/90.A5			SM HTR-	0	53
A700/2.14					0	14	A700/2.54	/90.A3			RW+	0	54
A700/2.15					0	15					SM HTR+		
A700/2.16	/93.A5			EXCITATION 8-	0	16							
A700/2.17					0	17							
A700/2.18					0	18							
A700/2.19			PU 1K	ANALOG IN	0	19							
A700/2.20	/92.A7		COOLANT+	DEF	0	20							
A700/2.21	/90.A7		PUMP +	SCR	0	21							
A700/2.22					0	22							
A700/2.23					0	23							
A700/2.24	/94.A4			EXCITATION 7-	0	24							
A700/2.25	/90.A8		CTRL	SCR	0	25							
A700/2.26					0	26							
A700/2.27					0	27							
A700/2.28	/94.A5		SUPPLY	12V SENSOR	0	28							
A700/2.29					0	29							
A700/2.30					0	30							
A700/2.31	/90.A6		PUMP -	SCR	0	31							
A700/2.32					0	32							
A700/2.33					0	33							
A700/2.34					0	34							
A700/2.35	/93.A7		CAN HIGH	AT	0	35							
A700/2.36					0	36							
A700/2.37					0	37							
A700/2.38	/94.A5		TX RX	LIN	0	38							
A700/2.39	/91.A2		LH1 -	DEF	0	39							
A700/2.40	/90.A4			RW-	0	40							

110.4.2 General overview of electronic control system

Valid for: L518-1655/60067-;

1 Layout

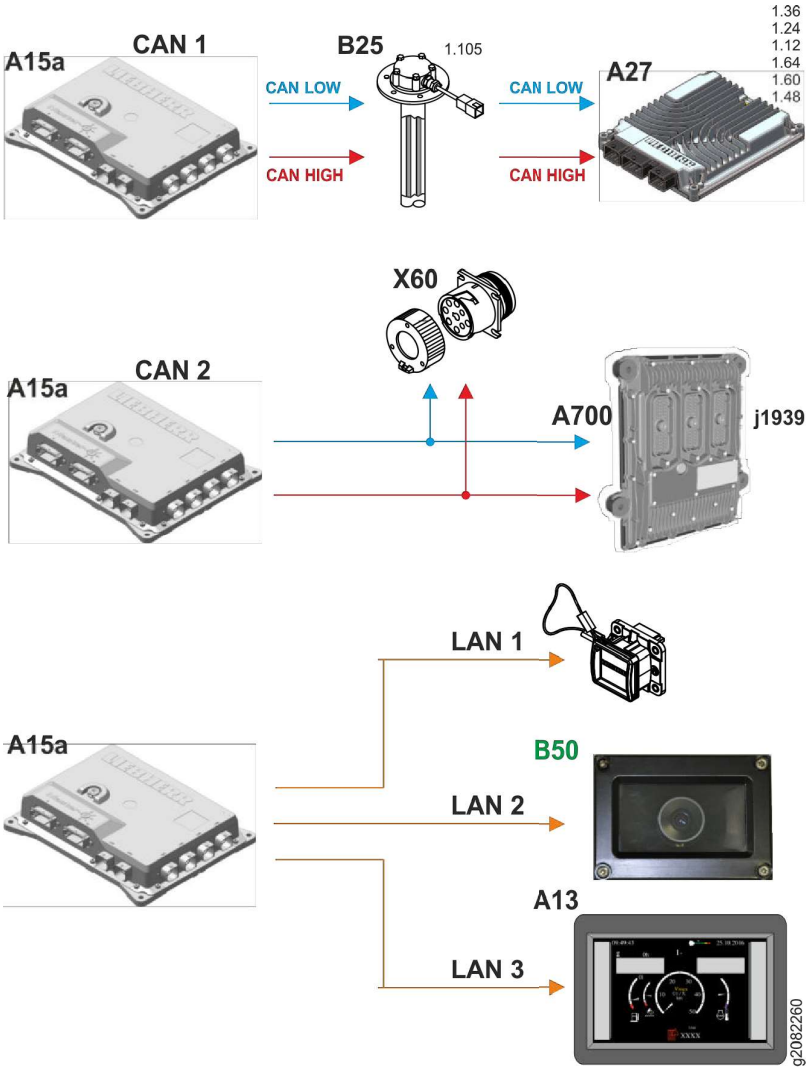


Fig. 488: General overview of electronic control system

BMK	Component	CAN line / LAN
A13	Display	LAN 3
A15a	Central control unit (Master5)	
A27	Compact module A27	CAN 1 (36, 24, 12, 64, 60, 48)
A700	Engine control unit	CAN 2 (j1939)
B25	Fuel level sensor	CAN 1 (105)
B50	Reversing camera (option)	LAN 2

LBH/12204903/12/211-20210128_104143/en

110.4.5.2 Compact module

Valid for: L518-1655;

1 Layout

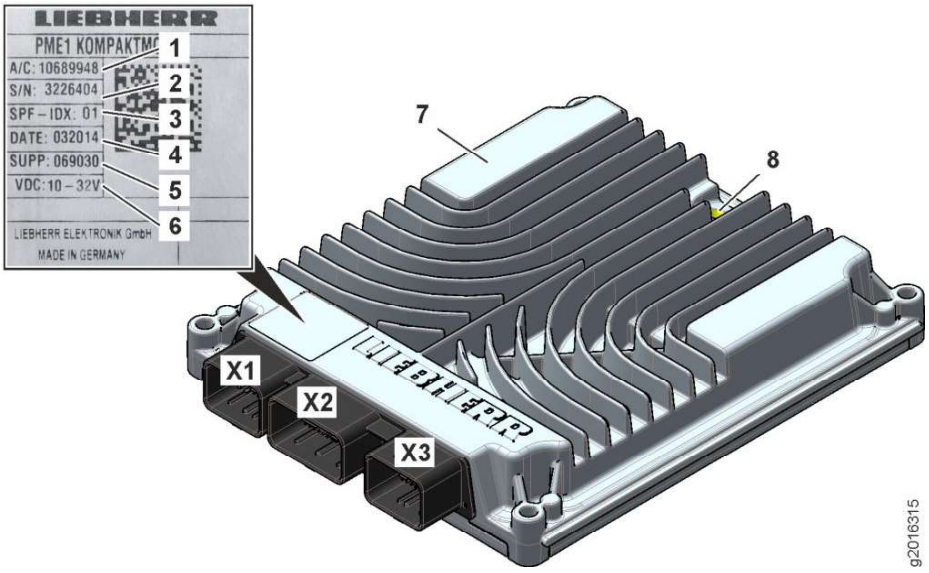


Fig. 502: Compact module with identification plate

1	Item code	**7**	Aluminium housing
2	Serial number	**8**	Goretex membrane
3	Specification index	**X1**	Plug connection
4	Date of manufacture	**X2**	Plug connection
5	Manufacturer number	**X3**	Plug connection
6	Power supply section		

Compact modules consist of various electronic components, fitted in a die-cast aluminium housing.

2 Function

Compact modules are part of control system and are connected linked to central control unit via a CAN bus interface. Measurements from sensors are read and evaluated. Actions are controlled via compact modules.

Logic of a compact module is powered from terminal 15 via pin X1.A4. It is earthed via pins X1.G1, X1.G2, X1.G3, X3.G2, X3.G3 and X3.G4

Compact modules only differ in their address. Hardware remains same. If a compact module is replaced or repaired, it may have to be addressed.

Compact modules have following tasks:
- Supplying power to actuators and sensors.
- Recording and evaluating analogue and digital input signals and forwarding them via CAN bus to the central control unit.
- Converting digital signals from the central control unit into analogue or digital output signals.
- Controlling the required consumer units via output stages.

LBH/12204903/12/211-20210128_104143/en

110.5.3 Door contact switch

Valid for: L518-1655;

1 Layout

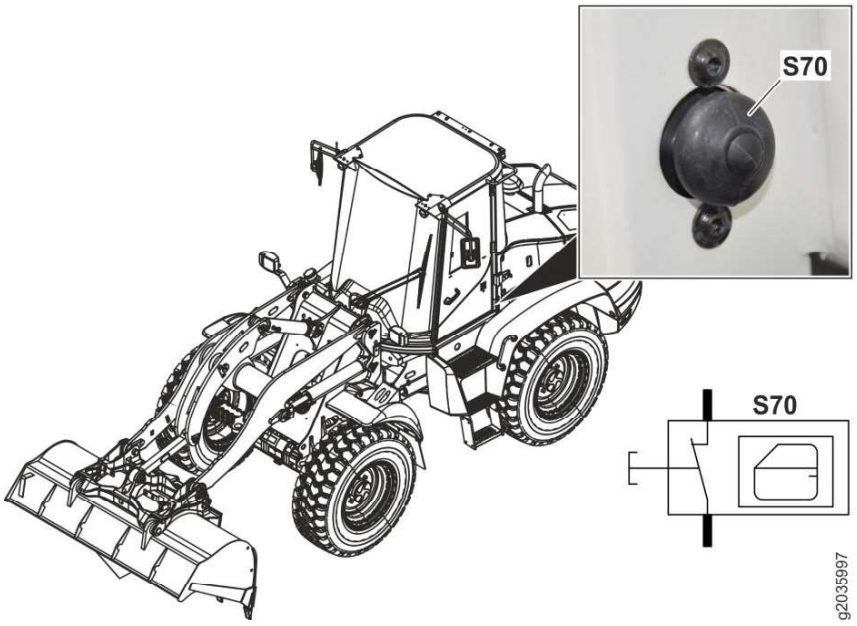


Fig. 511: Door contact switch

The door contact switch **S70** is installed in the door frame.

2 Function

The door contact switch **S70** activates the interior lighting E2 via the relay K8.

Condition for activating the interior lighting E2 via the door contact switch **S70**:
- The cab door is open.
- Turn the ignition on.
- The switch for the interior lighting E2 is in the “Activate via door contact switch” position.

LBH/12204903/12/211-20210128_104143/en

120.2 Transmission electronics

120.2.1 Output speed sensor

Valid for: L518-1655;

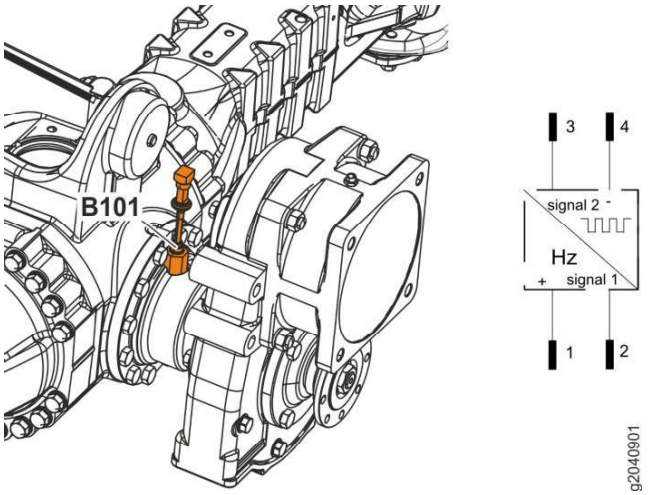


Fig. 518: Output speed sensor

NOTICE
Sensor may be damaged by resistance measurement!

▶ Do not carry out any resistance measurements on the sensor.

The output speed sensor **B101** is on the output shaft between the rear axle and the gearbox.

The output speed sensor **B101** is a Hall effect sensor. The sensor transmits two frequency sensors to the compact module A27. The two sensors are each offset by 90°. This is how the travel direction of the machine is detected.

The two frequency signals are read by the compact module A27 and converted to the signals ***IDFreqOutSpdIF04In1_KG*** and ***IDFreqOutSpdIF04In2_KG***. The converted signals are sent on to the central control unit.

The signal ***IDFreqOutSpdIF04In1_KG*** is a counter signal. This signal corresponds to the total of the two frequency signals of the speed sensor. This signal is used to detect the travel speed.

The signal ***IDFreqOutSpdIF04In2_KG*** is a counter control signal. This signal corresponds to the difference between the two frequency signals of the speed sensor. Normally, the two signals of the speed sensor supply the same frequency. This means the value of the control counter stays at 0. If the value of the counter control signal goes above a predefined threshold, a service code is displayed.

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11 Bypass valve 2.0 bar
12 Screen for replenishing pump 125 µm
13 Preload valve 0.5 bar
14 Feeder valve
15 Steel tank
16 Sight glass for hydraulic oil level
30 **Travel pump**
31 Replenishing pump
32 Replenishing pressure relief valve
33 Axial piston rotary group
34 Diesel engine
35 Check valve
46 Return flow from pilot control of additional functions (option)
47 Oils supply for parking brake
50 **Front axle**
51 Selectable 100% differential lockout

Name	Test point
G	Replenishing pressure

Tab. 260: Test points

BMK	Function	BMK	Function	BMK	Function
B8	Hydraulic oil temperature sensor	Y10	Parking brake solenoid	Y55	Solenoid for differential lockout

Tab. 261: Equipment codes

When the differential lockout is engaged, the central control unit energises the differential lockout solenoid **Y55** via the compact module. The differential lockout solenoid valve **45** then directs oil from the replenishing pump **31** to the 100% locking differential **51** in the front axle **50**.

130.1.3.3 Valve block for parking brake and differential lockout

Valid for: L518-1655;

1 Layout

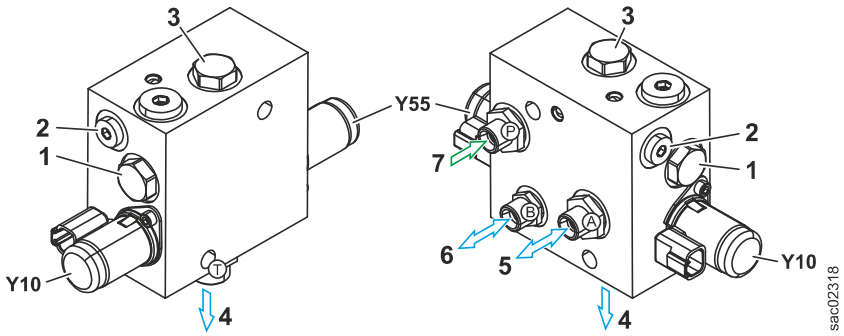

Fig. 524: Valve block for parking brake and differential lockout (from front left and from front right)

1 Check valve 1
2 Flushing throttle 1.5 mm
3 Check valve 2
4 Return flow to hydraulic tank
5 Parking brake connection
6 Differential lockout connection
7 Oil supply from replenishing pump

2 Function

Advantages of Z kinematics:
- Very high torque in the loading position, therefore very high breakout force.
- Tilted-out bucket goes into loading position when lowered.
- Fewer moving parts, so requires less maintenance.
- Low weight, therefore high tipping load.

Drawbacks of Z kinematics:
- Low torque at upper lift arm position. Heavy working attachments (such as a timber grabber) can pull out the tilt cylinder or prevent the equipment from being tilted in again.
- No parallel movement. The bucket tilts out slightly when lifting.

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10 Heating, ventilation, air conditioning control unit (optional)
11 Display A13
12 Diagnostic plug X60a X60b
22 Operator's seat
23 Fuse board A4
24 Storage compartment

2.1 Basic function

The operator's cab is mounted on a flexible bearing on the rear section.

The operator's cab is equipped with warm water heating. Optionally, an air conditioning system can be also installed.

The entry to the operator's cab is via the access and the door on the left.

The right window is an emergency exit.

2.2 Strength according to ROPS/FOPS

The operator's cab is a safety cab which is tested and approved in accordance with ROPS/FOPS.

ROPS (roll over protective structure) refers to mechanical rigidity in the event of the vehicle falling over.

FOPS (falling object protective structure) refers to the rigidity of the cab on the event of objects falling onto it.

For more information on the ROPS/FOPS regulations:

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Malfunction	Cause	Remedy
Bubbles in sight glass	Too much refrigerant in air conditioning circuit	Correct refrigerant level
	Not enough refrigerant in air conditioning circuit	Correct refrigerant level
Not enough cooling	Not enough refrigerant in air conditioning circuit	Correct refrigerant level
	Air in air conditioning circuit	Evacuate and refill air conditioning system
	Expansion valve blocked	Check expansion valve
	Condenser blocked	Check condenser
	Valve plates in air conditioning compressor are defective	Check valve plates

Tab. 273: Air conditioning troubleshooting table

2.4 Cab air filter

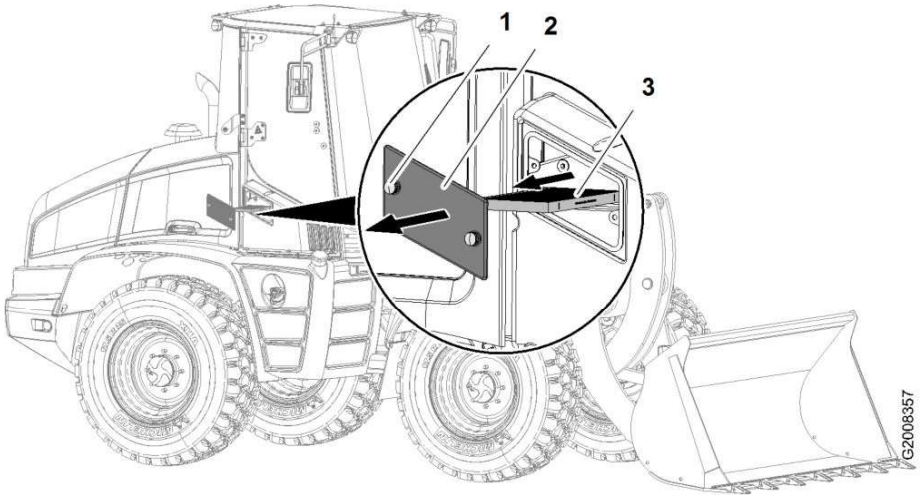

Fig. 546: Cab air filter

1 Screws
2 Cover
3 Cab air filter

The cab air filter **3** is on the right, on the outside of the operator's cab.

The cab air filter **3** acts as a fresh air filter and a recirculated air filter.

The filter must be regularly replaced or cleaned. (See maintenance and inspection schedule.)

160.3.2 Heating and air conditioning unit

Designation	Unit	Value
Low pressure OFF	bar	$1.5^{\pm 0,5}$
Low pressure ON	bar	$3.4^{\pm 0,3}$
High pressure OFF	bar	$26^{\pm 2}$
High pressure ON	bar	$18^{\pm 2}$

Tab. 274: Switch pressures

2.2 Monitoring high and low pressure

The high and low pressure monitor pressure switch **A** at pins **3** and **4** protects the air conditioning circuit from pressure that is too high or too low.

Monitoring low pressure:

If the pressure falls below $1.5^{\pm 0,5}$ bar, the pressure switch opens. Magnetic coupling is deactivated. Central control unit detects opening of pressure switch.

When pressure rises back above $3.5^{\pm 0,5}$ bar, pressure switch is reset and contact is closed again.

Insufficient pressure may be caused by:
- A leakage in the air conditioning circuit
- Not enough refrigerant
- Moisture in the air conditioning circuit
- etc.

Monitoring high pressure:

If the pressure rises above $25^{\pm 2}$ bar, the pressure switch opens. Magnetic coupling is deactivated. Central control unit detects opening of pressure switch.

When pressure falls back below $18^{\pm 1,5}$ bar, pressure switch is reset and contact is closed again.

Excess pressure may be caused by:
- Air in the air conditioning circuit
- Too much refrigerant in the air conditioning circuit
- Insufficient cooling at the condenser (dirt, defective fan control)
- The filter in the dryer is dirty or saturated
- The expansion valve may be iced up (too much moisture in the refrigerant) or dirty (blocked)
- etc.

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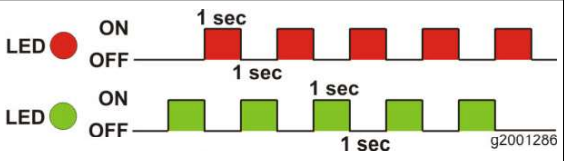
Operating status	Signal description	LEDs
Continuous lubrication (if the lubrication time is set longer than the cycle time)	The red and green LEDs flash alternately every second.	

Tab. 277: Operating statuses

170.1.3 Progressive distributor MX-F

Valid for: L518-1655;

1 Layout

The progressive distributors are manufactured in a variable disc design. The advantage of this is that the distributor can be extended or reduced according to the number of lubrication points.

The flow rate depends on the piston diameter. Each progressive distributor requires at least three pumping elements to work properly.

The progressive distributors of the entire system are coordinated with each other according to the machine type. If a change is made to the combination of the progressive distributors, this can have negative consequences for the entire central lubrication system.

The distributors must always be installed in a horizontal position.

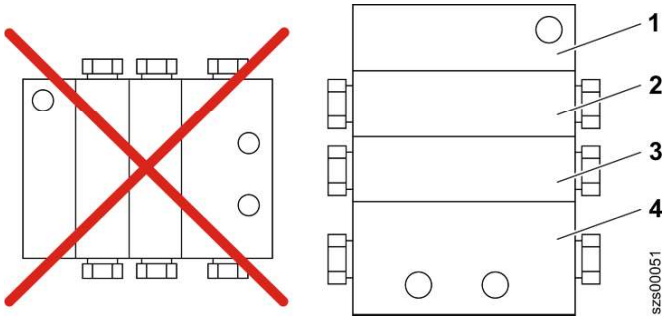


Fig. 568: Installation position of the progressive distributor

1 Initial element
2 Middle element
3 Middle element
4 End element

190.1.4 LiDAT module (LiTU2)

Valid for: L518-1655/0-50943;

1.1 Function

Fig. 576: LiDAT module (LiTU2)

1	LiDAT module A30	**5**	Connector A30.X1
2	“RADIO” antenna connection for GSM/GPRS signal	**6**	Antenna cable for GSM/GPRS signal
3	Antenna connection “GPS”	**7**	Antenna cable for GPS signal
4	ETHERNET connection		

The LiDAT module **1** is connected to the central control unit and the fuse and relay board via the plug A30.X1 **5**.

The antenna cables **6** and **7** are connected to the antenna connections **2** and **3**.

The ETHERNET connection **4** is for connecting to the Sculi diagnostic software.

The Sculi diagnostic software is used to carry out functions such as the following on the LiDAT module:
– Updating software
– Reading service codes
– Creating a service file

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