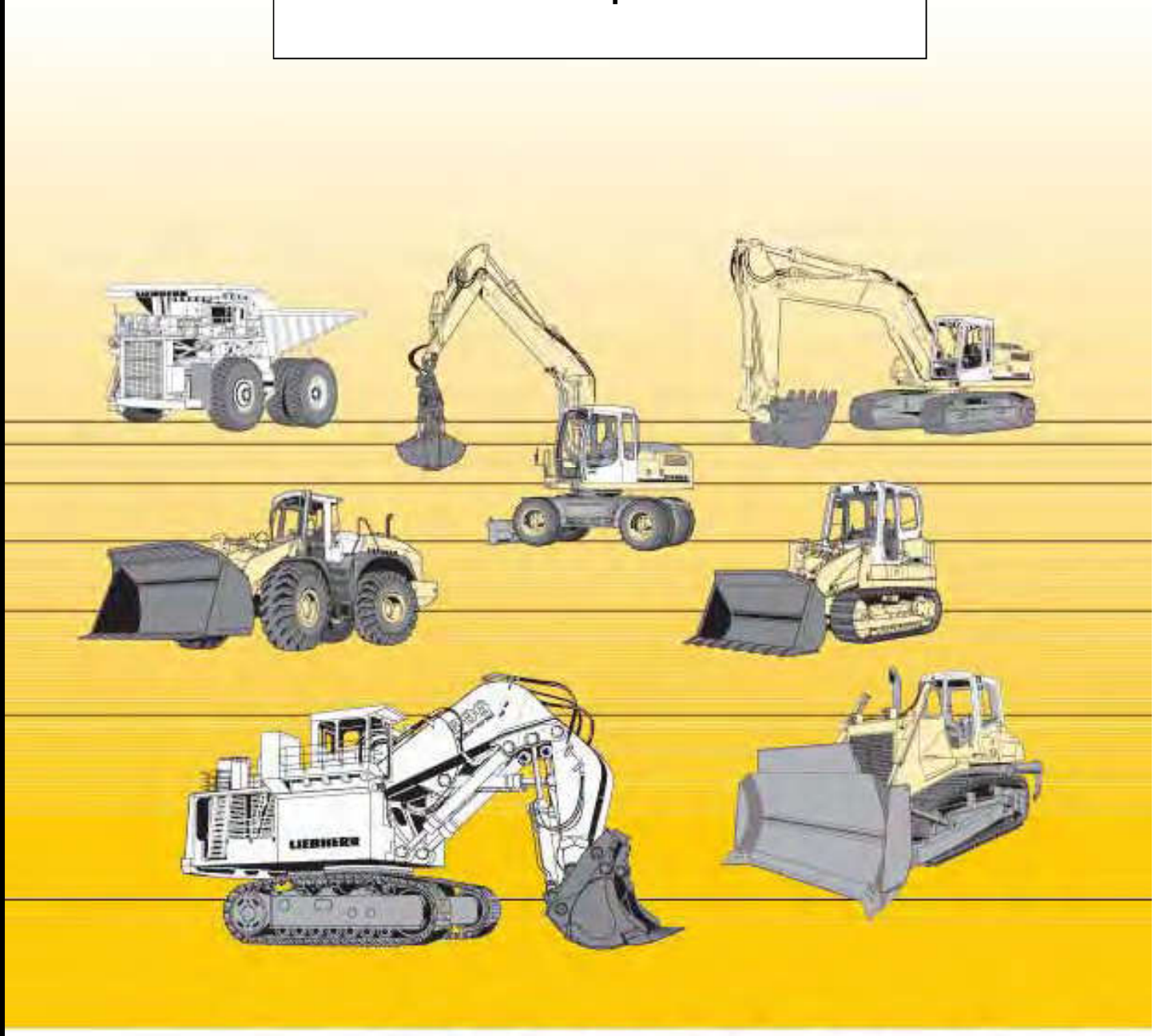
en

Service Manual

Wheel loader

L586 2plus2



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1.1 Safety regulations

Working on the machine poses safety risks to the operator, driver or maintenance engineers. You can prevent risks and accidents by regularly reading and observing the various safety instructions.

This is especially important for personnel who only occasionally work on the machine, for example, carrying out rigging or maintenance work. The safety regulations listed below, if conscientiously followed, will ensure your own safety and that of others, and will prevent the machine from being damaged.

All work must be carried out only by **qualified expert personnel** or under the guidance and responsibility of such personnel.

Qualified personnel are people, who:

– on the basis of their education, experience and training have sufficient knowledge of earth moving machinery and the technology,
– have in-depth knowledge of the regulations concerning the prevention of industrial accidents and of national regulations and guidelines,
– can assess the safe operating condition of earth moving machinery,

can carry out the required work without putting those carrying out the work, or other parties, into danger.

Whenever tasks which could cause danger to personnel or damage to the machine are described, the necessary safety precautions are explained in this manual.

These are indicated by the headings **Danger**, **Warning**, **Caution** or **Notice**.

1.1.1 Introduction

1. **The symbols below have the following meanings:**

DANGER
Denotes an urgent, dangerous situation.
Will result in death or serious injury.
► Actions to avert the danger.

WARNING
Denotes a dangerous situation.
Can result in death or serious injury.
► Actions to avert the danger.

CAUTION
Denotes a dangerous situation.
Can result in slight or moderate injury.
► Actions to avert the danger.

NOTICE
Denotes a dangerous situation.
Can cause material damage.
► Actions to avert the danger.

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Thread	Class	Assembly pre-loading forces F_M in N	Tightening torques M_A in Nm	Thread	Class	Assembly pre-loading forces F_M in N	Tightening torques M_A in Nm
		for avg. coefficient of friction μ_G= 0.10				for avg. coefficient of friction μ_G= 0.12	
M36x3	8.8	455 000	2200	M36x3	8.8	440 000	2 500
	10.9	650 000	3100		10.9	630 000	3 500
	12.9	760 000	3600		12.9	740 000	4 100
M39	8.8	510 000	2700	M39	8.8	490 000	3 000
	10.9	730 000	3800		10.9	700 000	4 300
	12.9	850 000	4500		12.9	820 000	5 100
M39x1,5	8.8	601 000	3140	M39x1,5	8.8	582 000	3 430
	10.9	857 000	4470		10.9	830 000	4 890
	12.9	1 002 000	5230		12.9	971 000	5 720
M39x3	8.8	550 000	2800	M39x3	8.8	530 000	3 200
	10.9	780 000	4000		10.9	750 000	4 600
	12.9	910 000	4700		12.9	880 000	5 300

Comments concerning this standard:

The tightening torques indicated on the drawings supersede the standard works values.

These must be observed and adhered to.

This standard only applies to Liebherr wheel loaders.

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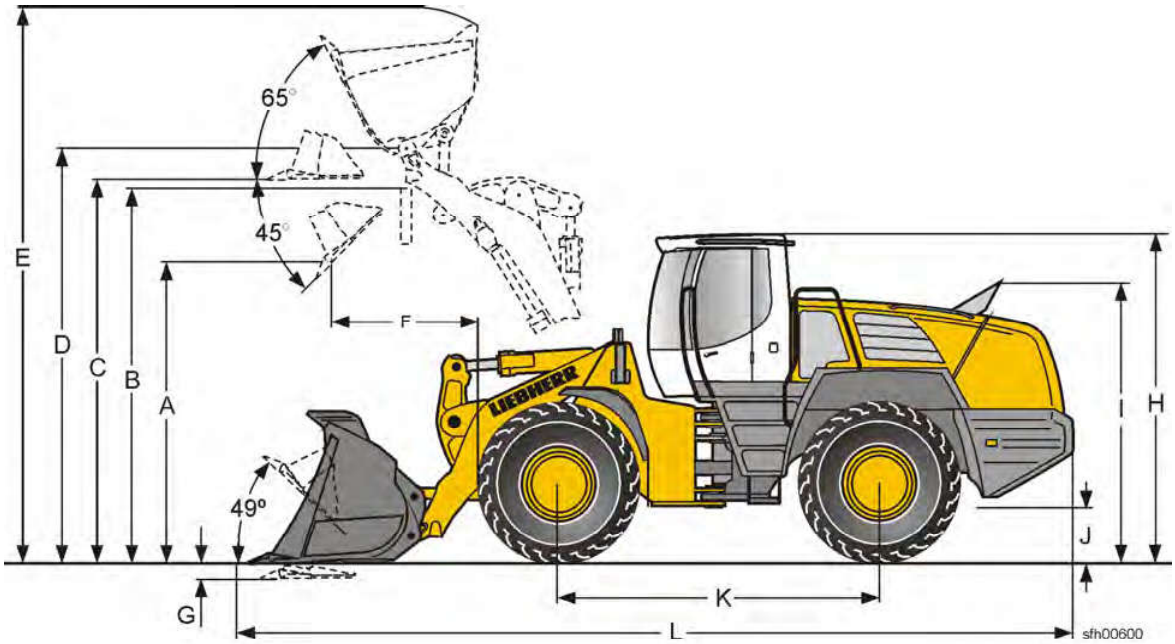
2.1 Technical data

2.1.1 Complete machine

Wheel loader with Z lift arms

The values stated refer to the standard version of the machine:

- With Z lift arms (3150 mm), without hydraulic quick-change device.
- With 29.5 R25 Michelin XHA tyres.
- Tipping loads and weights include all lubricants, full fuel tank, ROPS/ FOPS cab and driver.



Description	Value	Unit
Bucket capacity as per ISO 7546	5,5	m³
Bucket width	3400	mm
Specific material weight	1,8	t/m³
A Dump height at maximum lifting height and 45° tilt-out angle	3310	mm
B Dumping height	4150	mm
C Maximum bucket base height	4330	mm
D Maximum bucket pivot height	4640	mm
E Maximum bucket top edge height	6500	mm
F Reach at maximum lifting height and 45° tilt-out angle	1385	mm
G Digging depth	100	mm
H Height above cab	3740	mm
I Height above exhaust	3310	mm
J Ground clearance	575	mm
K Wheel base	3900	mm
L Overall length	9330	mm
Loader width across tyres	3250	mm

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Compact brake valve

Valid for: *Id. 1029 5965*

Description	Value	Unit
Accumulator charge valve activation pressure	180$^{\pm 5}$	bar
Accumulator charge valve deactivation pressure	210$^{\pm 5}$	bar
Parking brake solenoid valve current consumption	0.6	A
Parking brake solenoid valve resistance	40	Ohm
Maximum service brake pressure	70$^{\pm 5}$	bar
Pedal start angle	42°	
Pedal stop angle	15°	

Service brake hydro accumulator

Valid for: *ID 1003 8487*

Description	Value	Unit
Number of hydro accumulators	5	Qty.
Hydro accumulator volume	1400	cm³
Preload pressure (nitrogen filling)	95	bar

Brake light button

Valid for: *ID 6905 535*

Description	Value	Unit
Switch type	Normally open	
Switch point, rising	5$^{\pm 0.5}$	bar
Thread	M 12 x 1.5	mm

Accumulator charge pressure switch

Valid for: *ID 1035 3433*

Description	Value	Unit
Type	Electronic pressure switch	
Switch type	Normally open	
Switching point, falling	120 $^{\pm 5}$	bar
Thread	M 12 x 1.5	mm

Disc brake

Description	Value	Unit
Gap	1.0$^{\pm 0.5}$	mm
Brake lining thickness, NEW	4.5	mm
Minimum brake lining thickness	1.0	mm

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3 Maintenance

Chapter contents

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3.3 Testing and adjustment checklists

The testing and adjustment checklists contain all testing and adjustment tasks. You can find detailed descriptions of each activity in the section on testing and adjustment tasks.

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3.5 Maintenance tasks

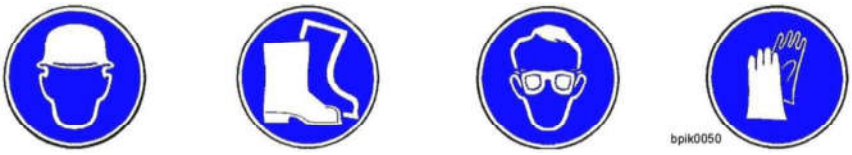
All work must be carried out only by **qualified expert personnel** or under the guidance and responsibility of such personnel.

Qualified personnel are people, who:

- on the basis of their education, experience and training have sufficient knowledge of earth moving machinery and the technology,
- have in-depth knowledge of the regulations concerning the prevention of industrial accidents and of national regulations and guidelines,
- can assess the safe operating condition of earth moving machinery,

can carry out the required work without putting those carrying out the work, or other parties, into danger.

3.5.1 Safety precautions for maintenance

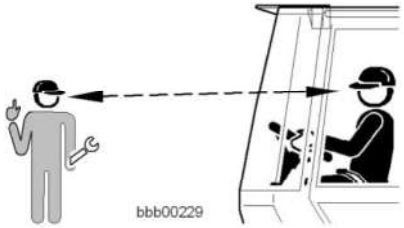


Make sure you are wearing safe working clothing.

Certain jobs not only require a hard hat and safety boots, but also goggles and safety gloves.

All relevant **safety guidelines** must be followed when carrying out all servicing, inspection or repair work. Regional work safety regulations, industrial accident prevention regulations and national legislation must be observed.

For further information please see the **safety regulations** in the **current edition** of the operating instructions**.** You will find the latest edition of the operating instructions in your Liebherr Service documentation.



Make sure that visual contact between the operator in the cab and maintenance personnel is always maintained.

DANGER

There is a risk of accidents for maintenance personnel.

The presence of unauthorised persons on the machine can place the maintenance personnel in extreme danger.

► Never enter a dangerous area of the machine without making your presence known.

- Make sure you can be clearly seen before entering one of the machine's danger areas.

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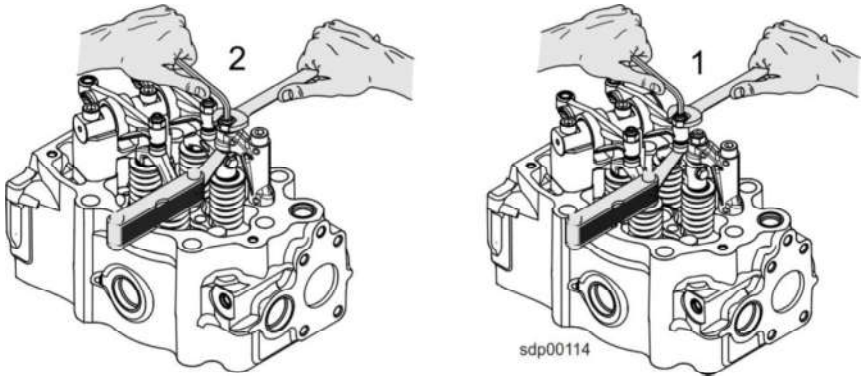


Checking and adjusting the outlet valve play

- Push a feeler gauge between the valve and the rocker arm and check the valve play.

Valve play	
Inlet valve (cold)	0.30 mm
Outlet valve (cold)	0.40 mm

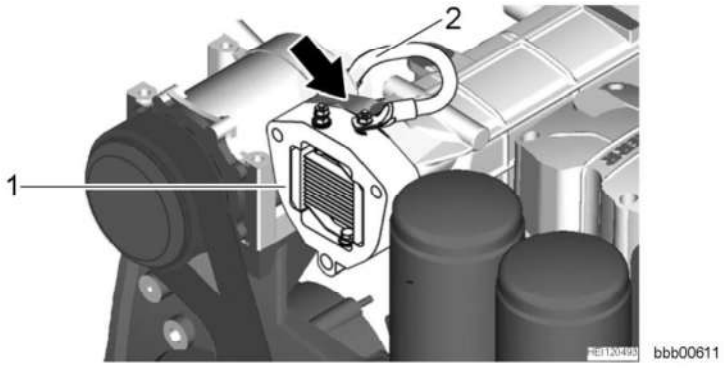
- If it is not correct:
  Loosen the nut on the adjusting bolt for the rocker arm and adjust it.
- Tighten the counter nut to 40 Nm.
- Check the adjustment again.
- After checking and adjusting all the valves, put on the cylinder head covers with new seals.
- Remove the cranking device.

3.5.12 Checking the diesel engine heating flange

Make sure that:

– The machine is in maintenance position 1.
– The engine compartment hood is open.
– You have an ohmmeter or a multimeter ready.

Procedure



- Turn off the battery main switch.
- Disconnect the electric connection cable **2** on the heating flange **1**.
- Connect the ohmmeter or multimeter to the terminal and check the resistance (0.25 Ohm +/-10% at 20°C).
- Disconnect the electric connection cable on the heating flange.
- Turn on the battery main switch

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- Ensure that all dirt is removed from the filter housing before inserting a new filter element.

The secondary element **1** should be replaced every third time the primary element **2** is replaced.

- Lightly oil the seal surfaces before installing the filter elements (for the primary element **2** this is on the inside, for the secondary element **1** on the outside). Re-insert filter elements **1** and **2** and make sure that they are correctly fitted.
- Clean the service cap **3** and put it on the filter housing with the dust extraction valve **5** facing down.

Only when the lid completely covers the filter housing can you close the fixing clips without excessive force.

- Close the fixing clips **4**.

3.5.25 Changing the air filter secondary element

If the air filter contamination symbol field remains lit after the primary element **2** has been serviced then the secondary element **1** must also be replaced.

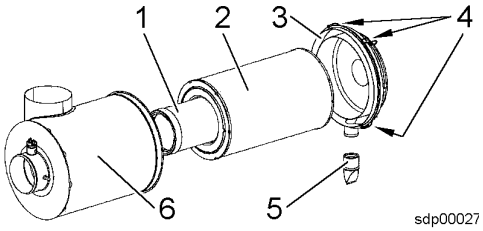
Change the secondary element:

– After replacing the primary element three times
– Otherwise, at least once a year

Make sure that:

– The machine is in maintenance position 1.
– The engine compartment door is open.
– The battery main switch is switched off and the main switch key is removed.

Procedure



Air filter

1 Secondary element
2 Primary element
3 Service cap
4 Fixing clips
5 Dust extraction valve
6 Air filter housing

- Open the fixing clips **4** on the service cap **3** and take the cap off.
- Remove the secondary element **1**.

  To loosen the seal: Pull or twist the element slightly up, down or sideways.
- Ensure that all dirt is removed from the filter housing before inserting a new or cleaned filter element.
- Lightly oil the seal surfaces before installing the filter elements (for the secondary element **1** this is the outside).
- Re-insert the filter elements **1** make sure that it is correctly fitted.
- Clean the service cap **3** and put it on the filter housing with the dust extraction valve **5** facing down.

Only when the lid completely covers the filter housing can you close the fixing clips without excessive force.

- Close the fixing clips **4**.

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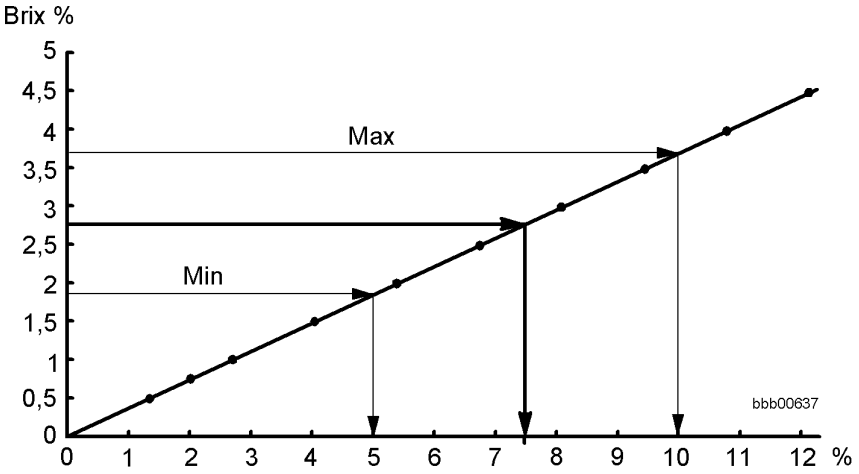
The fluid is distributed by closing the prism.

- Look through the eyepiece **2** against a light background and focus the scale.

The focus is set by turning the eyepiece **2**.

- Read off the value on the blue line in the eyepiece.



Conversion diagram from Brix to corrosion inhibitor concentration (%vol)

- Convert the Brix value using the conversion diagram to find the actual corrosion inhibitor concentration.

3.5.33 Cleaning the cooling system

Cooling system hood

1 Left cooling system hood
2 Right cooling system hood
3 Gas-filled springs

Clean the cooler whenever necessary in order to ensure proper cooling. In dusty environments, check the cooler every day and clean it if necessary.

Dirty cooler units result in overheating. The consequence is an audible and visual warning with simultaneous power reduction of the travel drive.

Dust and other contaminants can be removed from the cooling fins with water jets, steam or compressed air. Compressed air is preferable.

Make sure that:

– The machine is in maintenance position 1.
– The left and right cooling system hoods are open.

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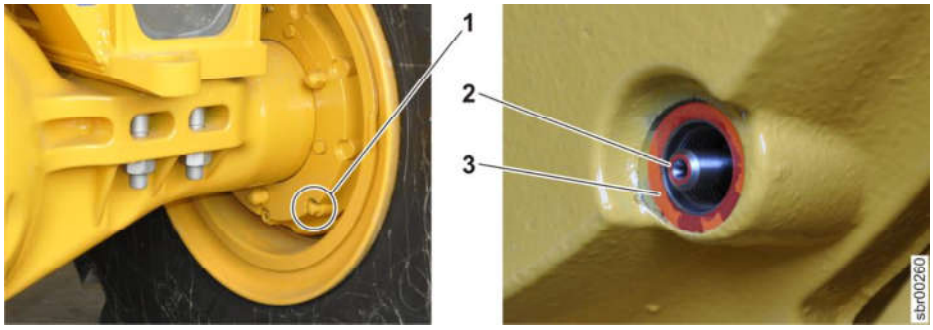

Wheel hub with indicator pin

1 Filler cap
2 Indicator pin
3 Measuring surface

► Unscrew the filler cap **1**.
► Have a **2nd** person push the brake pedal all the way down and hold it.
► Push the indicator pin **2** all the way into the wheel hub.
► Measure how far the indicator pin **2** projects out from the measuring surface **3**.

Troubleshooting

Measured value below minimum:

► Replace the brake plates on **both wheel hubs** (see Service documentation, Repair manual for Dana Hercules 53R axles).
► Perform a wear measurement on the rear axle.

► Screw on the filler cap **1**.
► Repeat the process on the right wheel hub.

Valid for: ***L586**-461 /from 33596*

Operating hours	Brake plates minimum thickness
Wear limit	4.0 mm
3,000 hrs	4.5 mm
6,000 hrs	4.4 mm
9,000 hrs	4.3 mm
12,000 and over	4.2 mm

Make sure that the following requirements are fulfilled:

❑ 1/2 inch ratchet ready
❑ Feeler gauge ready
❑ Two O-rings 21x2 (item code 7009141) ready

► Start the machine.
► Wait for 10 seconds.
▷ Brake system hydro accumulators are charged.
► Move the machine to maintenance position 2

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3.5.53 Checking the tightness of the wheels – Dana Spicer (once after 50, 100 and 250 h)

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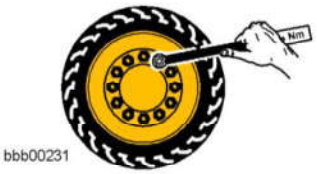
Make sure that:

– The machine is in maintenance position 1.

– A suitable torque wrench is available.

Procedure



Note

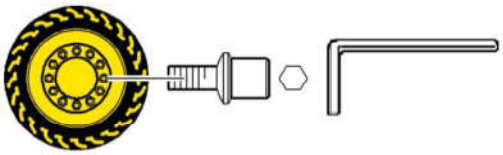
Check the tightness of the wheels according to the specified intervals.

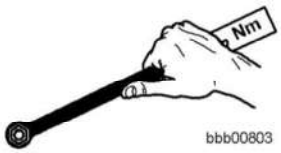
► This one-off maintenance task scheduled for 50, 100 and 250 service hours must be performed every time the wheels are changed.

Note

Installing or changing the working attachment or tyres.

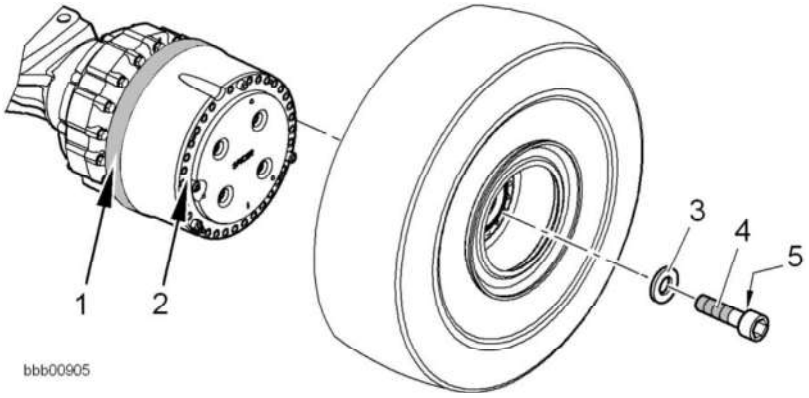
See the section on attachments and accessories in chapter 2.





- Check that the nuts on all four wheels have been tightened with the required torque of **450 Nm** (Hex socket 17 mm).

Wheel change procedure



1 Wheel centering
2 Front mounting face
3 Washer
4 Cheese-head screw thread
5 Screw head base

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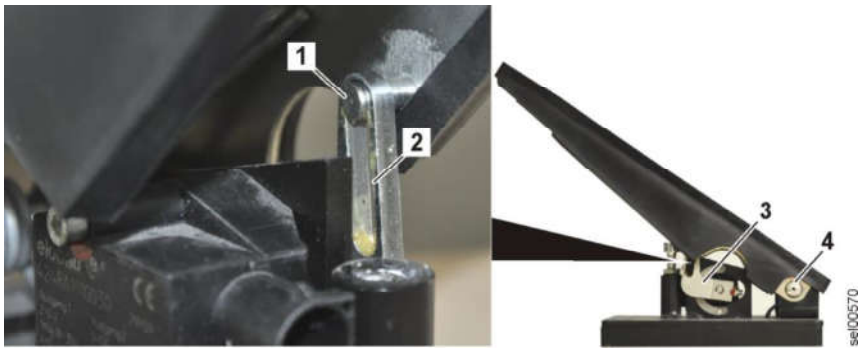
3.5.69 Lubricating the elongated hole on the accelerator pedal and checking the bearing

Make sure that the machine is in maintenance position 1.



Accelerator pedal

1	Flight pin	3	Linkage
2	Elongated hole	4	Bearing

- Clean the accelerator pedal.
- Clean the bearing 4.
- Clean the flight pin 1 and the elongated hole 2.
- Lubricate the flight pin and the elongated hole.
- Check that the bearing 4 moves easily.
  If the bearing is stiff: Replace the accelerator pedal.
- Check that the bearing is not loose.

If the bearing has too much play, the tolerance range of the angle sensor on the accelerator pedal is exceeded. This triggers service codes that are saved in the Analyzer.

If you notice any play:

- Connect the Sculi diagnostic software to the machine.
- Use the Analyzer to check whether it contains any service codes indicating a fault with the accelerator pedal.

If service codes indicating a fault with the accelerator pedal have been stored:

- Replace the accelerator pedal.

3.5.70 Lubricating the door hinges

Procedure

- Lubricate the door hinges with a grease gun.

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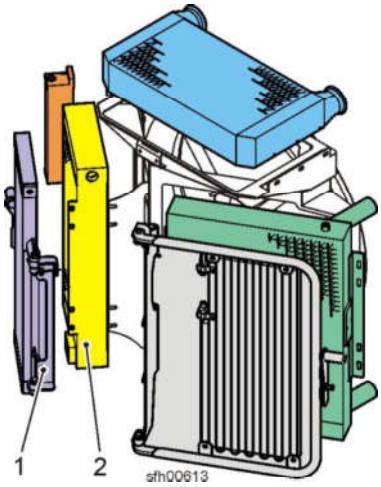
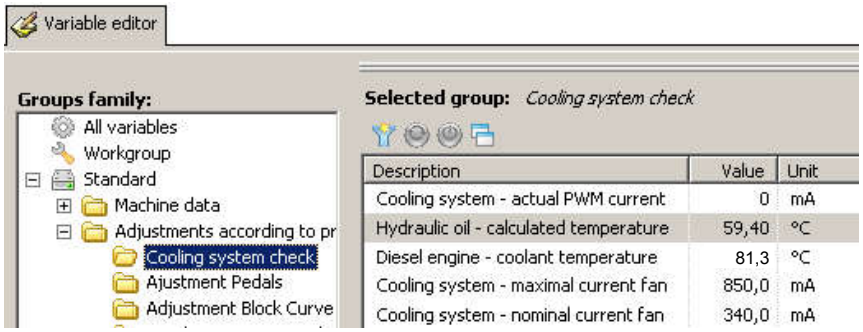
3.6.3 Bringing the machine up to operating temperature



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

Procedure

- Insert a piece of card or similar material between the fuel cooler **1** and the hydraulic oil cooler **2**.
- Connect your laptop, start the engine and run the SCULI program.
- In the variables editor in the group structure, select the ***Cooling system check*** folder.
- The ***Hydraulic oil - calculated temperature*** variable shows the hydraulic oil temperature during the adjustment.



Bring the machine up to operating temperature as follows:

– Run the engine at around 2000 rpm^{-1}.
– Activate the tilt-in function as far as it will go and hold the control lever in this position.
– At the same time, lower the lift arms and hold the control lever in the “float position” function.
– Operate the travel hydraulics in fixed gear 1.

- Bring the machine up to operating temperature until the hydraulic oil temperature is 58 $^{\pm 5}$°C.

When working on the hydraulic system, the hydraulic oil temperature must be within the prescribed range.

- After finishing the adjustment, take the piece of card out of the oil cooler.

3.6.4 Checking the engine speed

The engine speed cannot be mechanically adjusted; it is determined directly by the engine control unit.

Procedure

- Start up the engine.
- Check that the top and bottom engine speeds are correct.
- If it is not correct:
  Calibrate the gas pedal using the SCULI program and service the engine.
- Check the top and bottom idle speeds again.

Description	Value	Unit
Lower idle speed	900 $^{\pm 10}$	min^{-1}
Upper idle speed	2065 $^{\pm 10}$	min^{-1}

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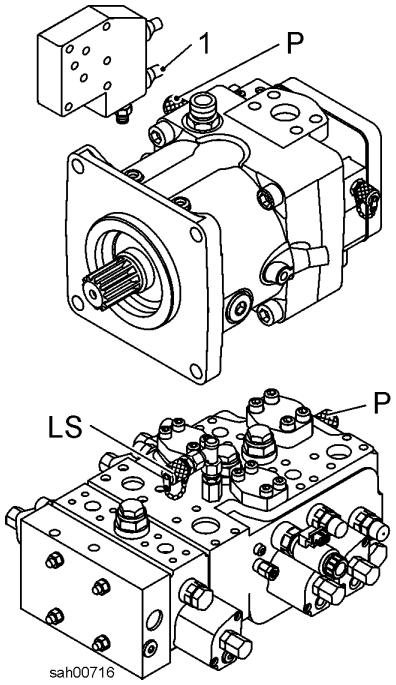
Description	Value	Unit
High pressure	310 ±10	bar
Diesel engine speed	1960 ±60	min^{-1}

3.6.15 Checking the flow controller (delta p) of the working hydraulics pump



Make sure you have a differential pressure gauge and two pressure sensors for the range up to 600 bar.

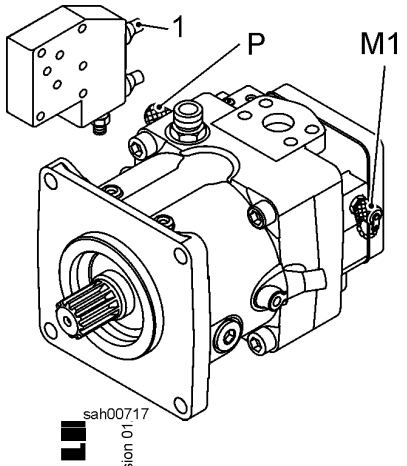
Measure the difference in pressure between the test connections **P** and **LS**. You can test the differential pressure in the float position. A defined amount of oil flows through the spool valve for lowering.

Procedure

- Connect 600 bar pressure sensors to test connection **P** and connection **LS**.
- Start the engine and let^{-1} it run at around 1500 rpm.
- Lower the lift arms and hold the control lever in the float position. Check that the differential pressure on the pressure gauge is correct.
- If it is not correct:
  Turn the adjusting screw on the flow controller **1** until the differential pressure is correct.

Description	Value	Unit
Differential pressure	23 ±2	bar

3.6.16 Checking the flow controller (start of delivery) of the working hydraulics pump



The flow controller determines the maximum output of the variable displacement pump. At the start of delivers, the indicator on the manometer **M1** moves away from 0 bar. The set value on the manometer **P** should be reached.

Procedure

- Connect a manometer (600 bar) to the variable displacement pump at test connections **M1** and **P**.
- Start the engine, tilt the bucket all the way out and move the lift arms to the bottom position.
- At idle speed, pull the joystick for the function “lift arms” all the way and check that the start of delivery shown on the manometer **M1** is correct.
- If it is not correct:
  Turn the adjusting screw on the power controller **1** until the pressure is correct.

Description	Value	Unit
Start of regulation	180 ±10	bar

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4 Diesel engine and pump distributor gear

Chapter contents

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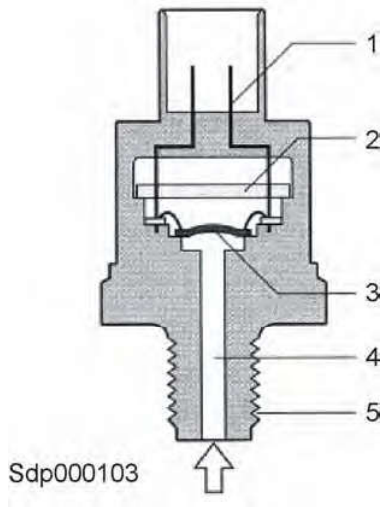
4.1.6 Charge air pressure sensor – B703

The charge air pressure sensor B703 is attached to the air intake pipe of the engine and has the task of signalling the charge air pressure to the engine control unit (ECU) in the form of an electrical voltage. The ECU uses this signal for:

– Engine power limiting control

Power reduction (%)		Speed (rpm)				
		1000	1300	1600	1900	2100
Atmospheric pressure (mbar) Height above sea level* (m)	550 4850*	23.1	24.1	24.4	24.4	23.3
	620 3950*	19.5	19.6	19.1	19.1	18.0
	690 3100*	14.2	14.8	13.9	13.6	12.6
	770 2250*	10.0	10.1	8.9	8.4	7.2
	840 1550*	0.0	0.0	0.0	0.0	0.0



Cross section of the pressure sensor

Design

The charge air pressure sensor is an absolute pressure sensor with a membrane and an evaluation circuit. At atmospheric pressure, an absolute pressure sensor is subject to approximately 1 bar (at sea level 1030 mbar).

1 Electrical connections
2 Evaluation circuit
3 Membrane with sensor element
4 Pressure port
5 Fixing thread

Function description

Basic function

The electrical resistance varies on the layers applied to the membrane as they change shape. This deformation due to the accumulating system pressure alters the electrical resistance and causes a change in the voltage of the resistance bridge, which has a 5 V supply.

This voltage is in the range of 0 to 70 mV (depending on the pressure) and is amplified in the evaluation circuit to between 0.5 and 4.5 V.

Note
Never measure resistance on a pressure sensor.

! Malfunctions are indicated by service codes in the display.

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Function description

Basic function

The coupling is an elastic connection which also absorbs torque peaks between the engine and the driven splitter box.

The coupling transmits the engine torque to the splitter box.

Power transmission

The following components transmit the engine torque to the splitter box:

- Flywheel 8
- Fixing screws 6
- Discs 4 and 5
- Pressure springs 3
- Hub 2

Damping

The springs 3 absorb load fluctuations and torque peaks on the engine crankshaft. The vibrations of the crankshaft are greatly reduced as torque is transmitted to the splitter box.

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Function description

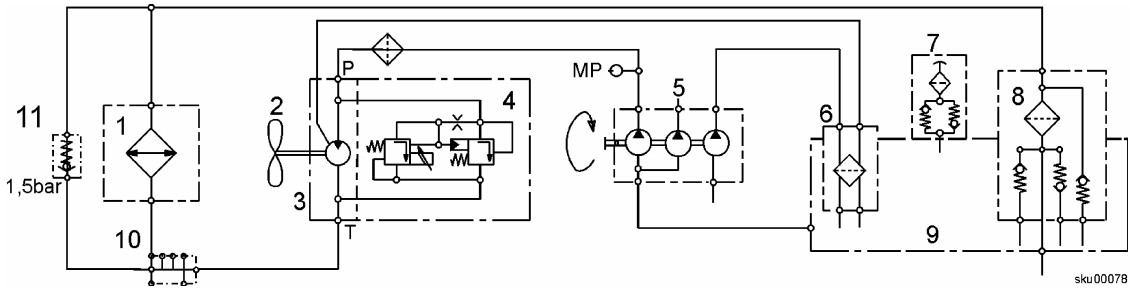
Basic function

The fan takes in air from the outside of the cooler units, and blows it over the cooling fins of the cooler units, through the engine and out again.

The cooler system cools:

- The engine coolant
- The hydraulic oil
- The engine charge air
- The air conditioning condenser
- The gear oil.
- The diesel fuel

Hydraulic fan speed control



Hydraulic plan of fan drive

1 Cooler unit
2 Fan
3 Gear motor
4 Proportional pressure relief valve assembly
5 Triple pump
6 Return strainer
7 Ventilation and bleeder filter
8 Suction and return filter
9 Hydraulic tank
10 Collector pipe
11 Safety valve

The speed of the hydrostatically driven fan depends on the engine speed (pump flow) and the fluid temperatures or the status of the air conditioning system.

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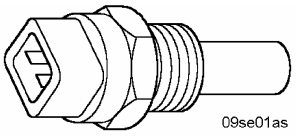
5.3 Temperature sensor

(ID 10043264)

Technical data

See section 2.1

The temperature sensor is used for measuring the temperature of the hydraulic oil.



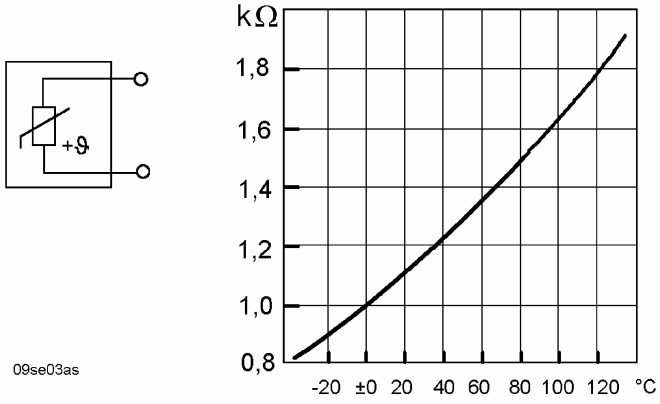
Temperature sensor

Design

The sensor element of the temperature sensor consists of an encapsulated thin-layer nickel resistor.

Function description

Temperature measurement



Temperature/resistance curve

The sensor is a temperature sensor with an NTC characteristic.

This means, the resistance in the sensor rises along with the temperature.

The resistance curve of the temperature sensor is almost linear.

For the **coolant** and **charge air** temperature sensors, see the section on the engine.

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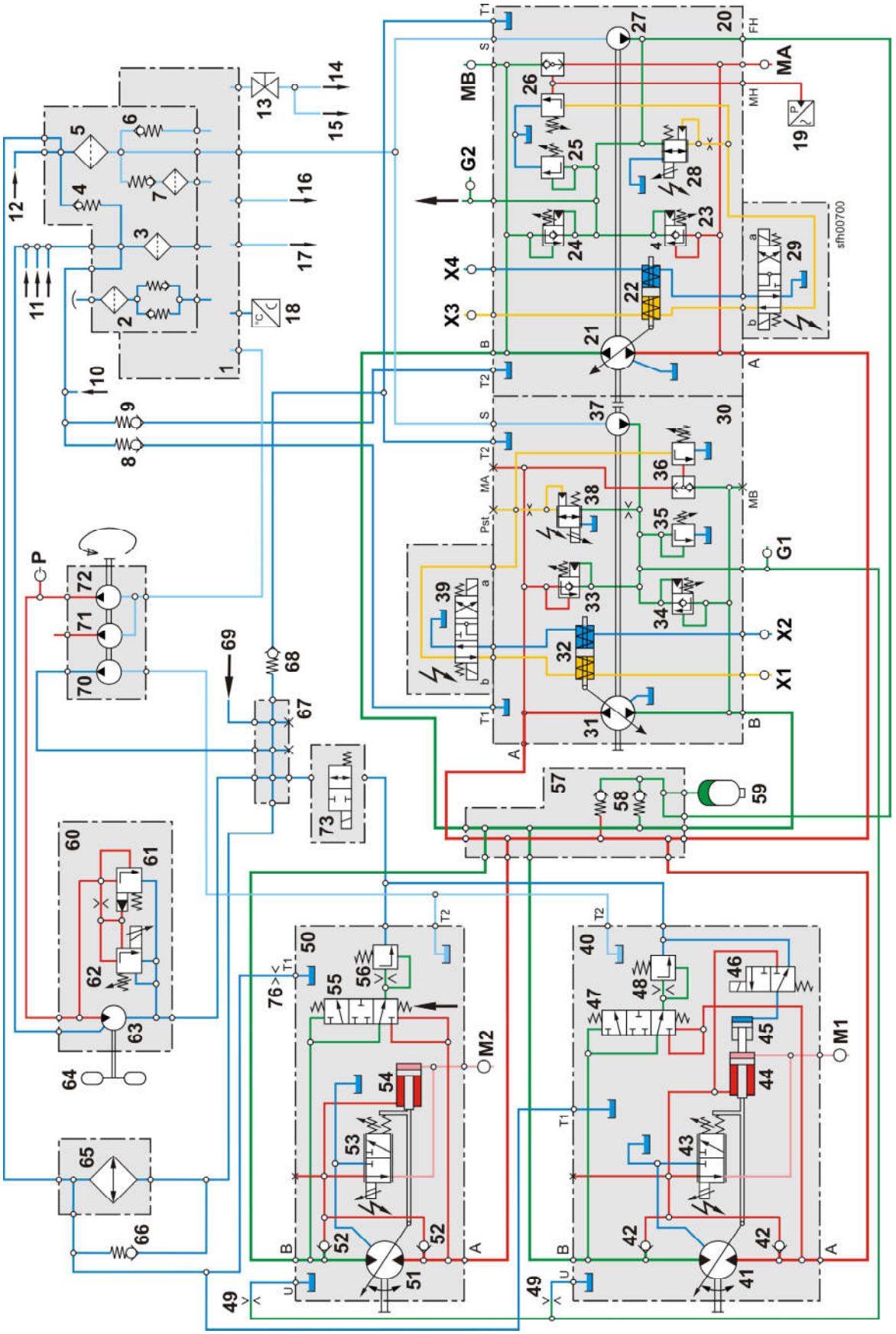
Valid for: ***L586*** *- 461 / 24750 - 36341;*



Hydraulic plan of the travel hydraulics

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6.1 Variable displacement pumps

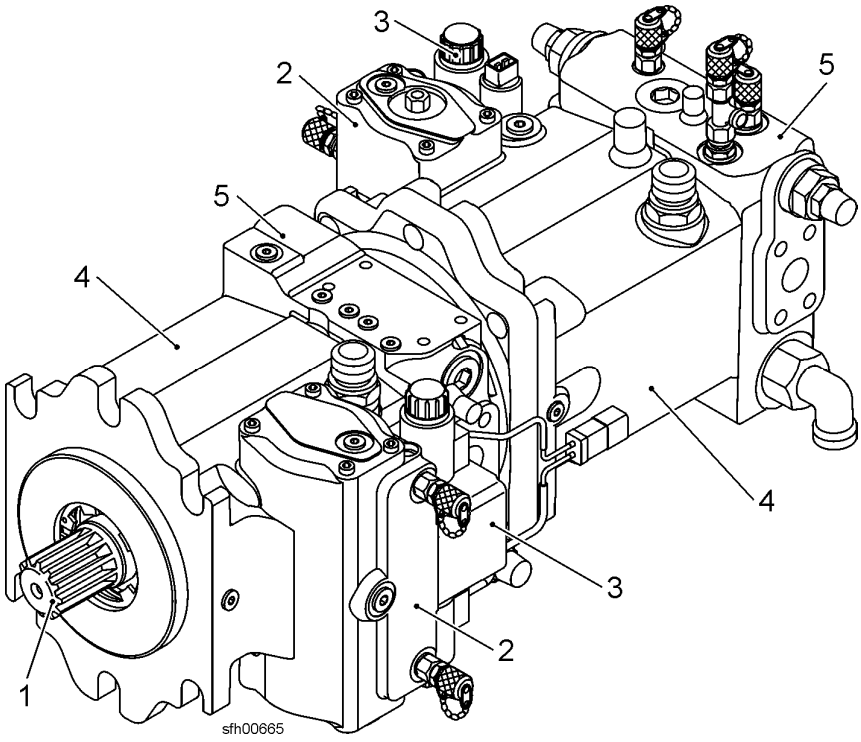
6.1.1 Variable displacement pumps up to serial no. 23914

Valid for: ***L586*** *- 461 / 17650 - 23914;*

Technical data

See section 2.1

Design



Main components of the variable displacement pumps

1 Drive shaft
2 Servo cylinder
3 Travel direction valve
4 Pump housing
5 Connection housing

The variable displacement pumps are flange-mounted to the splitter box and are driven by the diesel engine via this unit.

The variable displacement pumps are axial piston pumps with a swash plate design. The variable displacement pumps contain proportional valves for the servo pressure and pressure cut-off, as well as a replenishing pressure valve, pressure relief and replenishing valve, and a replenishing pump.

The following diagrams illustrate the design of the variable displacement pumps: Because the pumps are almost identical, the diagrams only show one pump.

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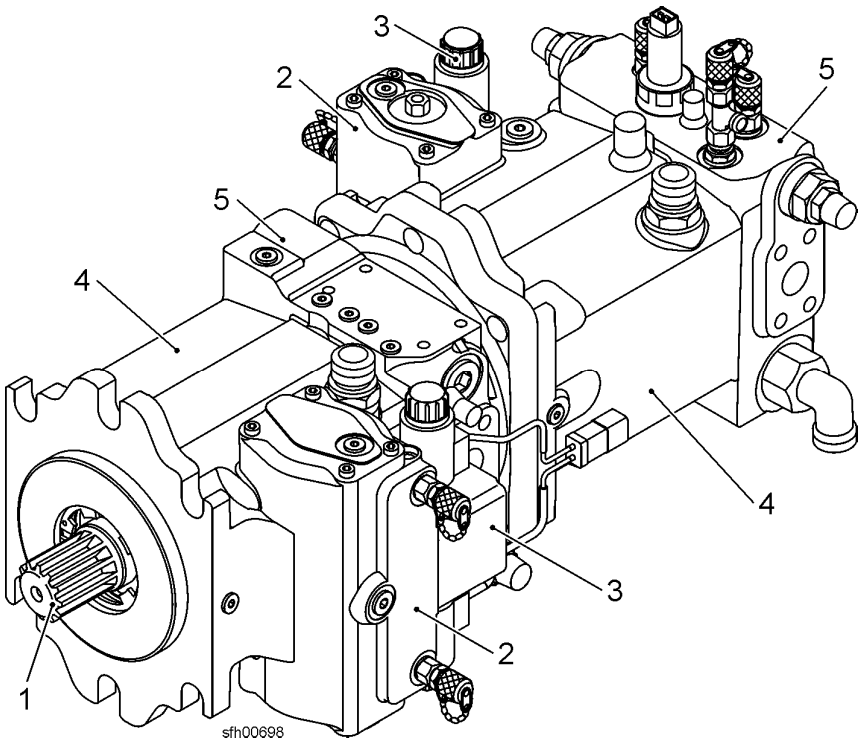
6.1.2 Variable displacement pumps from serial no. 23915

Valid for: ***L586*** *- 461 / from 23915;*

Technical data

See section 2.1

Design



Main components of the variable displacement pumps

1 Drive shaft
2 Servo cylinder
3 Travel direction valve
4 Pump housing
5 Connection housing

The variable displacement pumps are flange-mounted to the splitter box and are driven by the diesel engine via this unit.

The variable displacement pumps are axial piston pumps with a swash plate design. The variable displacement pumps contain proportional valves for the servo pressure and pressure cut-off, as well as a replenishing pressure valve, pressure relief and replenishing valve, and a replenishing pump.

The following diagrams illustrate the design of the variable displacement pumps: Because the pumps are almost identical, the diagrams only show one pump.

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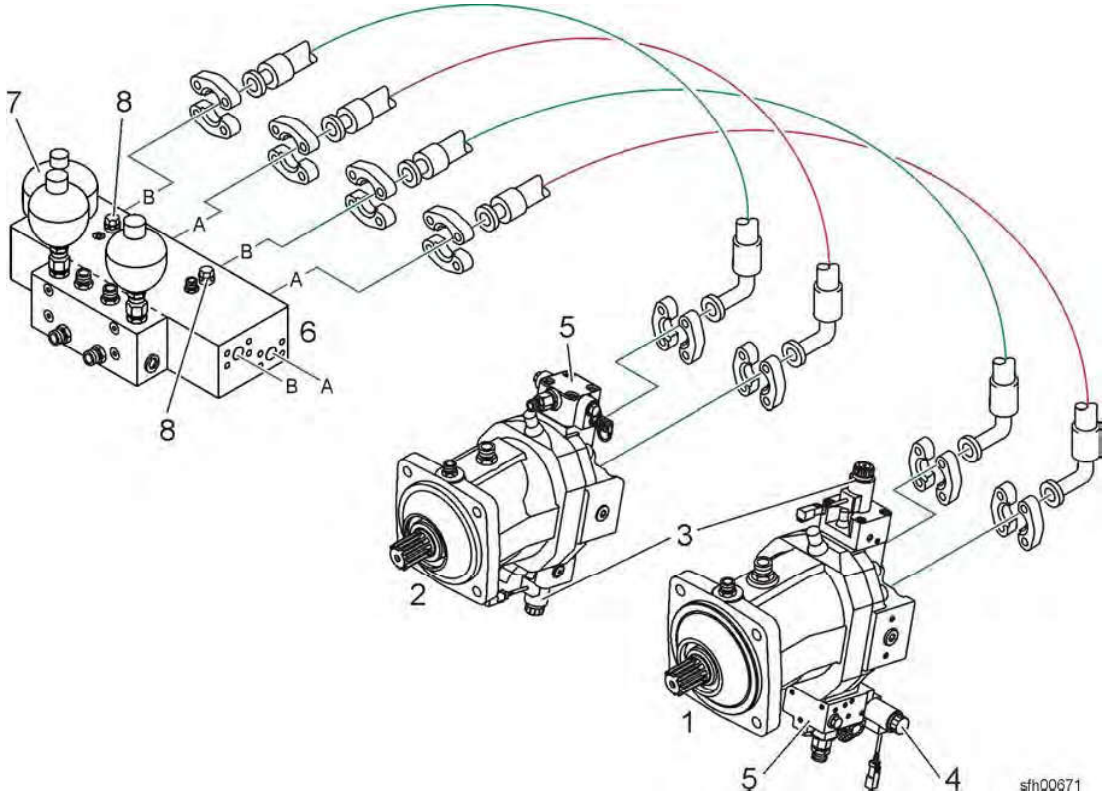
6.2 Variable displacement motors

Function description

Basic function



Variable displacement motor arrangement

1 Variable displacement motor 1
2 Variable displacement motor 2
3 Variable displacement motor proportional valve
4 Swivel angle restrictor solenoid valve
5 Discharge valve
6 Variable displacement motor distributor block
7 Replenishing hydro accumulator
8 Replenishing valves

The variable displacement motors drive the transmission. A higher or lower torque is transferred to the transmission, depending on the pivot angle and pressure.

The main electronics (master) control the motors. Depending on the operating state of the machine, the proportional valves 3 on the variable displacement motors are activated by the main electronics. This adjusts the pivot angle and displacement to the current operating condition.

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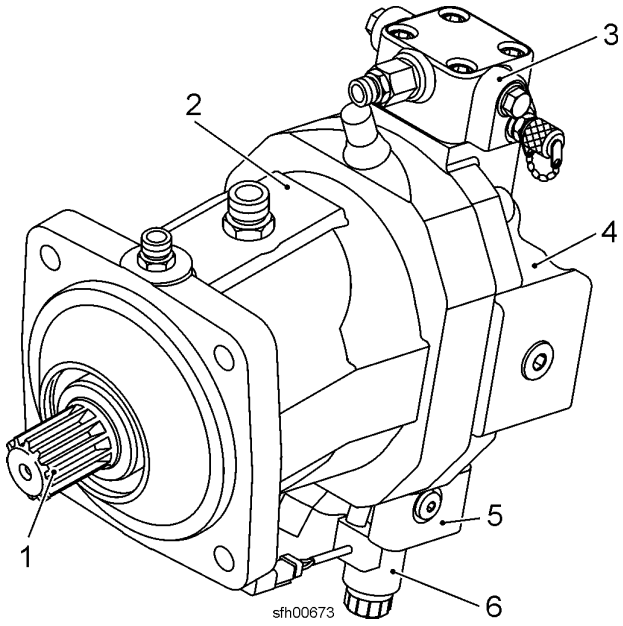
6.2.2 Variable displacement motor 2

Technical data

See section 2.1

Design



Main components of the variable displacement motor

1 Drive shaft
2 Housing
3 Discharge valve
4 Control unit
5 Regulating unit
6 Proportional valve

The variable displacement motor is flange-mounted on the transfer gear. The inclined axial tapered piston rotary group and the variable displacement are all integrated in the variable displacement motor.

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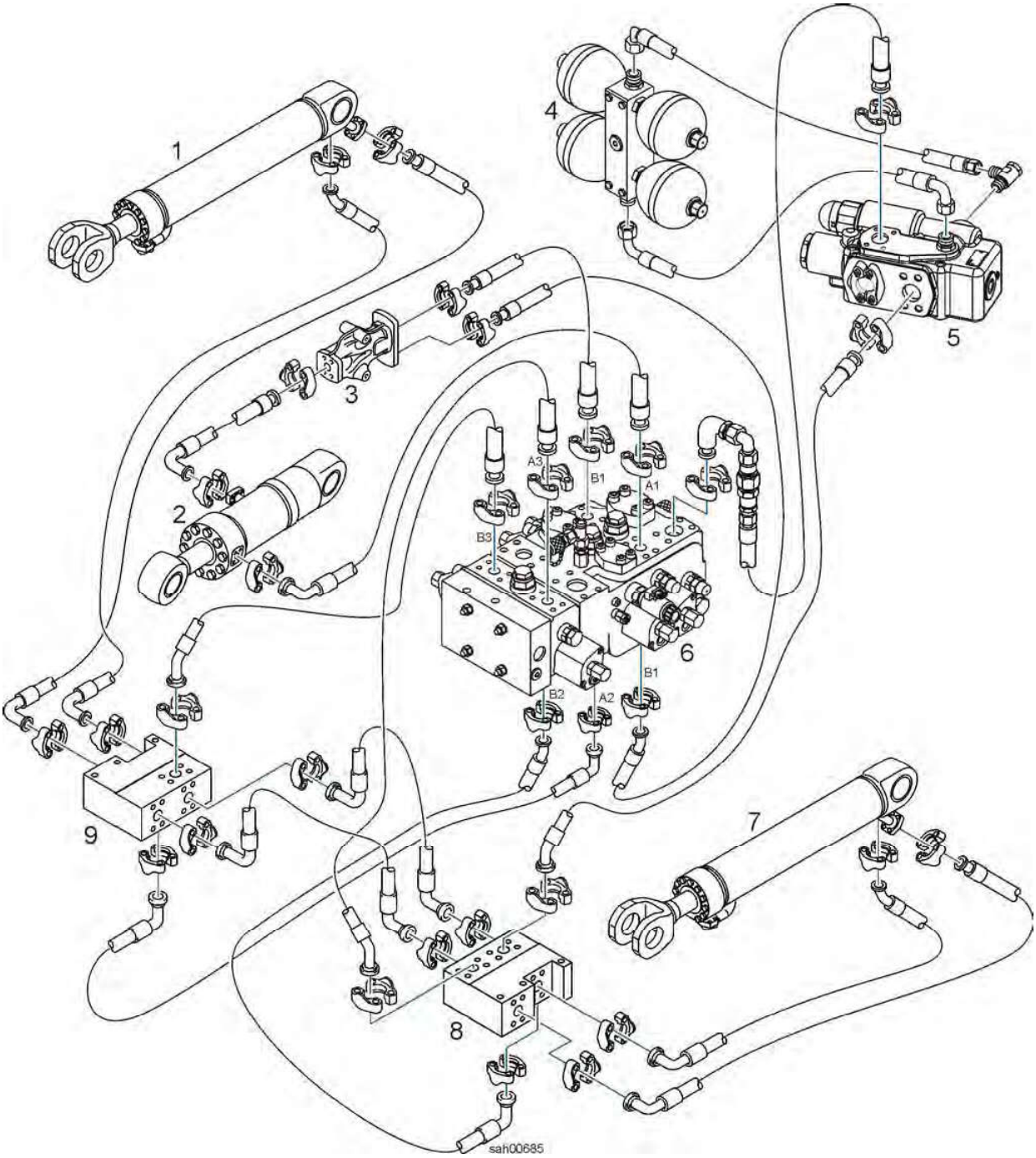
7.0 Working hydraulics

Design



Main components of the working hydraulics (Fig. 1)

1 Right lift cylinder
2 Tilt cylinder
3 Tilt cylinder distributor block
4 Hydro accumulator unit
5 Stabilisation module
6 Control block
7 Left lift cylinder
8 Left lift cylinder distributor block
9 Right lift cylinder distributor block

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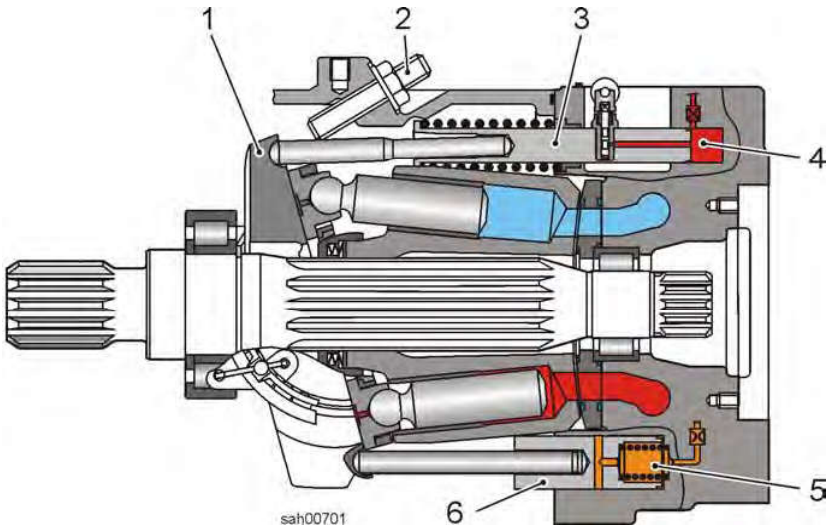

Working hydraulics pump with control unit

The working hydraulics pump flow is controlled by the following governors:

– Flow controller
– Power regulator

The operating state of the working hydraulics system governs which governor is currently activated.

If the working hydraulics demand only a small amount of oil or none at all, the flow regulator restricts the working hydraulics pump to the required amount.

If the set power limit is reached at a certain flow and increasing pressure, the flow regulator reduces the working hydraulics pump flow.

Flow regulation

The load sensing system ensures that the working hydraulics pump only delivers as much oil from the hydraulic tank as the working hydraulics currently need.

When the working hydraulics are not in use, the oil flow is blocked by the spool valves in the control block and the working hydraulics pump is reduced to minimum flow (leak flow). Connection 3 is depressurised. The standby pressure pushes the valve piston 2 against the regulating spring 4 which determines the standby pressure in the system. The valve piston 3 opens the high pressure duct 6 to the duct 5 and the return cylinder reduces the pump to leak flow.

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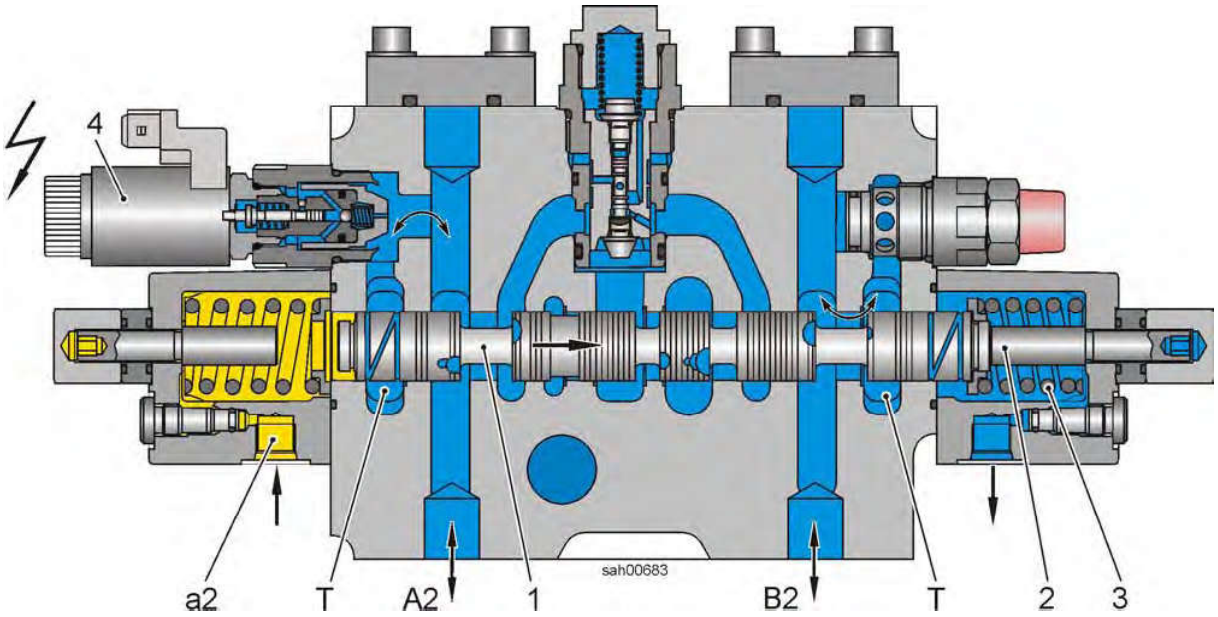
Working hydraulics in float position

In the float position, the working attachment lies on the ground under its own weight. The lift arms can move up and down freely to compensate for uneven ground.



Control block in float position

At the maximum deflection of the LH control lever for lowering the lift arms, there is maximum control pressure at the connection a2. This pushes the spool valve 1 all the way to the right against the regulating spring 3 and the limit screw 2.

When the spool valve 1 is in this position, the base end B2 of the lift cylinder is connected to the tank channel T.

The float position solenoid valve 4 is also energised. The rod end of the lift cylinder A2 is also connected to the tank duct T. The lift arms can now move up and down freely.

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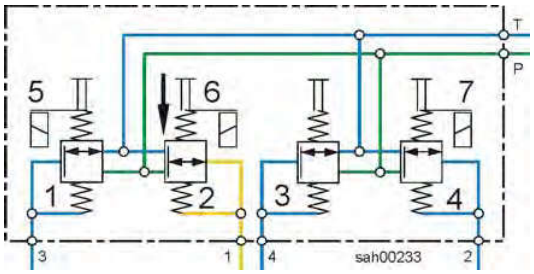
Function description

Basic function



Hydraulic plan of the pilot control unit

1 Lowering valve
2 Lifting valve
3 Tilt-out valve
4 Tilt-in valve
5 Float position solenoid
6 Lift kick-out solenoid
7 Bucket return-to-dig solenoid

The pilot control device activates the pistons in the control block hydraulically. It works on the basis of directly controlled pressure relief valves. When the control lever is moved, it supplies oil to the appropriate connection.

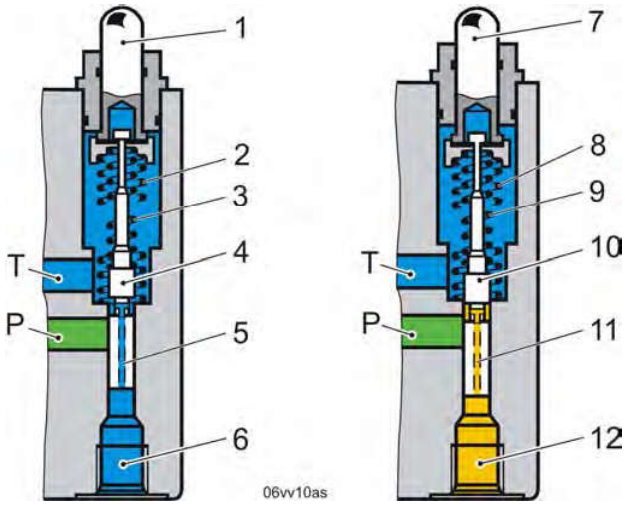
The pressure regulation of the valves in the pilot control device depends on:

– The position of the control lever
– The properties of the individual regulating springs

The retaining solenoids allow each function to be electromagnetically locked. Its magnetic force holds the control lever in its end position.

Idle state

In the idle state, the control lever is held in the zero position by the return spring 2. The connection 6 is connected via the hole 5 to the tank connection T.



Control valve in idle state / Control valve in active state

Regulating phase

When the control lever is moved, the tappet 7 pushes against the return spring 8 and the regulating spring 9. The regulating spring 9 pushes down the regulating piston 10 and closes the connection of the port 12 and the tank connection T. At the same time, the connection 12 is connected to the connection P via the hole 11.

The control phase begins as soon as the force of the regulating spring 9 and the force of the hydraulic pressure at the connection 12 are equal. The regulating piston 10 is in equilibrium.

The interaction of the regulating piston 10 and the regulating spring 9 means that the pressure at the connection 12 is proportional to the stroke of the

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Ride control activated

Ride control can only be activated when:

– The ride control button is activated
– At a travel speed above 9,1 km/h (adjustable)
– The contact on the ride control pressure switch is closed

When ride control is activated, the float position/ride control solenoid valve 10 and the ride control solenoid valve 2 are energised.

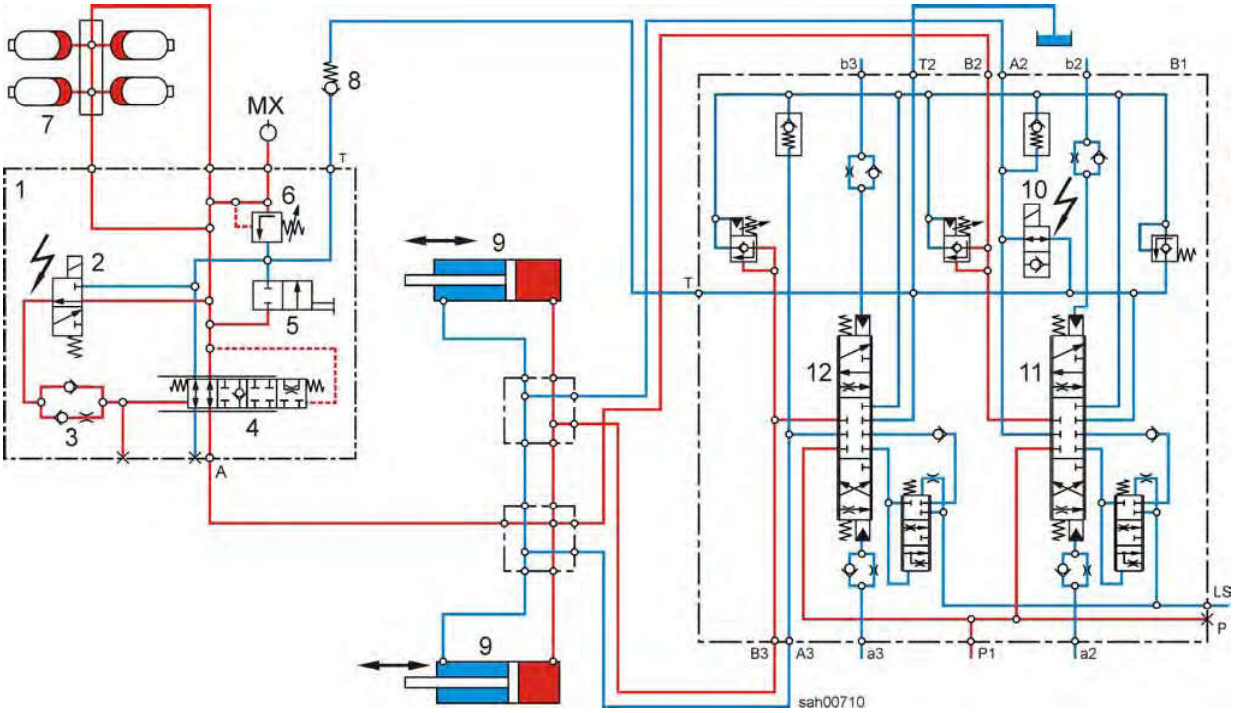
The float position/ride control solenoid valve 10 opens the lift cylinder rod end to the hydraulic tank.

The ride control solenoid valve 2 directs the pressure of the hydro accumulator to the left side of the spool valve 4. This pushes the spool valve 4 right, fully opening the connection to the hydro accumulators 7.

The safety valve 6 is installed to relieve the pressure. If there are excess pressure peaks, the safety valve opens to the hydraulic tank.

If the speed falls below 9.1 km/h the two solenoid valves are switched off again. The lift arms can no longer vibrate.

The activation speed of 9.1 km/h can be adjusted using the SCULI software.



Hydraulic diagram with ride control activated

1 Stabilisation module
2 Ride control solenoid valve
3 Restrictor check valve
4 Ride control spool valve
5 Relief valve
6 Safety valve
7 Hydro accumulator unit
8 Check valve
9 Lift cylinder
10 Float position / ride control solenoid valve
11 1. Lift cylinder spool valve
12 2. Lift cylinder spool valve

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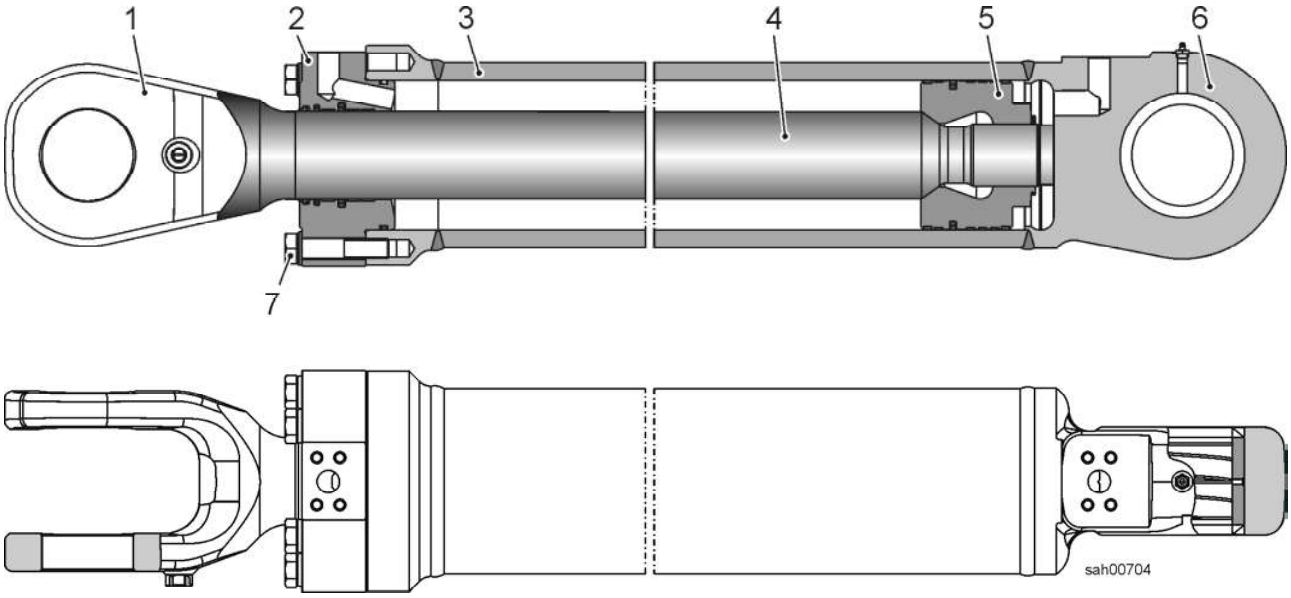
7.5 Lift and tilt cylinders

7.5.1 Lift cylinder

Technical data

See section 2.1

Design



Main components of the lift cylinder

1 Rod-end cylinder bearing
2 Piston rod bearing
3 Cylinder tube
4 Piston rod
5 Piston
6 Base-end cylinder bearing
7 Hex screw

The cylinder base is welded to the cylinder tube 3.

The rod-end cylinder bearing 1 is forked.

The base-end cylinder bearing 6 is a lug with a bearing bushing.

The piston rod bearing 2 is pushed on and screwed to the cylinder tube 3.

The piston 5 and the piston rod bearing 2 are fitted with Glyd Seal, Rimseal and Stepseal sealing rings.

The O rings are equipped with support rings.

Function description

Extension and retraction

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

The maximum forces in the cylinder depend on the maximum operating pressure and the active surfaces.

When extending, the piston face is active; when retracting, the smaller ring face is active.

This means the force when extending is greater than when retracting.

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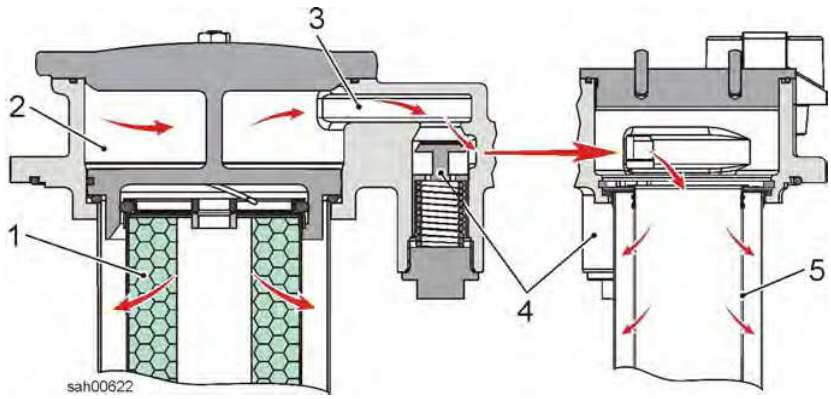
Bypass valve for pressure relief

The bypass valve 4 prevents excess pressure in the return system. Excess pressure can arise if the filter element 1 is dirty or if the oil is not sufficiently viscous.

If a certain pressure is reached, the bypass valve 4 opens. The oil then flows through the duct 3, the bypass valve 4 and the return strainer 5 to the hydraulic tank.



Return suction filter with bypass valve and return strainer

1 Return and suction filter
2 Connections to the filter unit
3 Duct to bypass valve
4 Bypass valve
5 Return strainer

The return strainer 5 catches dirt particles. This prevents soiling of the hydraulic tank.

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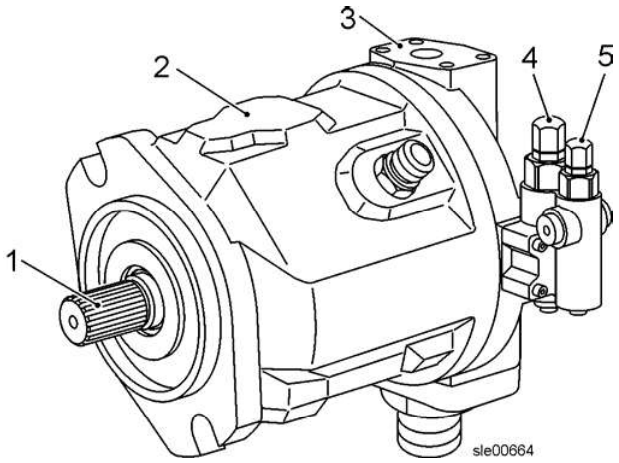
8.1 Steering pump

Technical data

See section 2.1

Design



Main components of the steering pump

1 Drive shaft
2 Pump housing
3 Connection housing
4 Flow controller
5 Pressure cut-off

The steering pump is an axial piston pump with a swash plate design. The steering pump is flange-mounted to the working hydraulics pump and is driven by the diesel engine via this unit.

The pressure and flow controller attached to pump housing affect the control unit of the pump.

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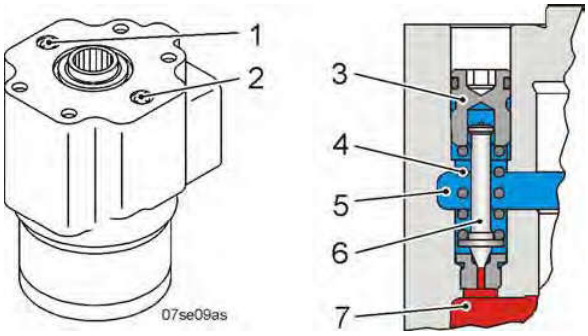
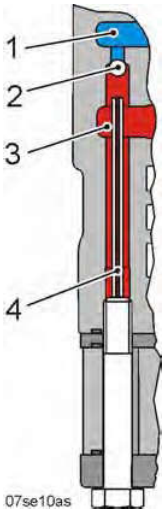


When the set pressure is reached, the valve cone 6 opens against the pressure spring 4. Oil flows from the consumer unit 7 to the tank connection 5.

The opening pressure of the pressure relief valve can be set using the adjusting screw 3.

Replenishing function



The servostat has two replenishing valves: one for steering to the left and one for steering to the right.

The replenishing valves prevent vacuums from forming in the steering cylinder under certain operating conditions. Oil flows through the check valve 2 from the tank duct 1 to the steering cylinder (duct 3). The pin 4 prevents the check valve 2 from moving too far from the valve insert.

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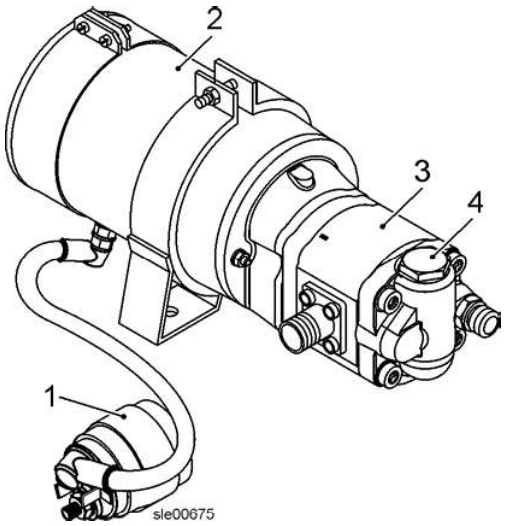
8.4.1 Emergency steering pump

Technical data

See section 2.1

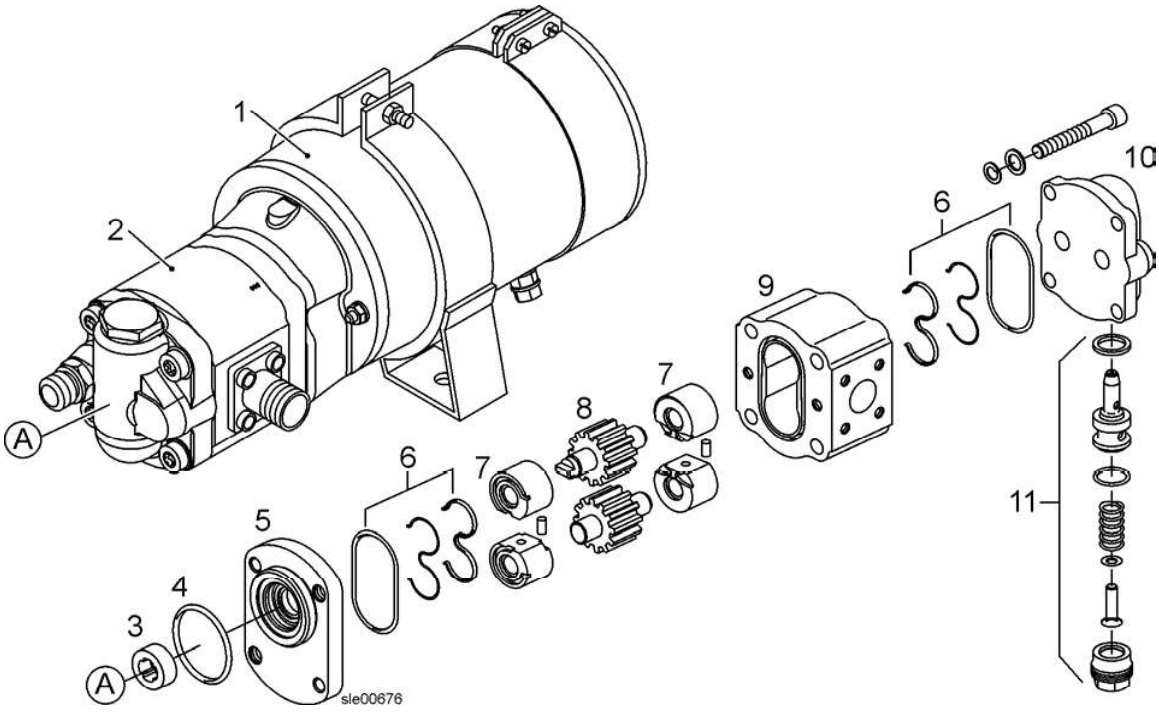
Design



Main components of the emergency steering pump

1 Relay
2 Electric motor
3 Gear pump
4 Pressure relief valve

The emergency steering pump is mounted on the back of the rear section.



Components of the emergency steering pump

1 Relay
2 Gear pump
3 Connector piece
4 Sealing ring
5 Flange
6 Seals
7 Bushing
8 Gears
9 Housing
10 Valve housing
11 Pressure relief valve

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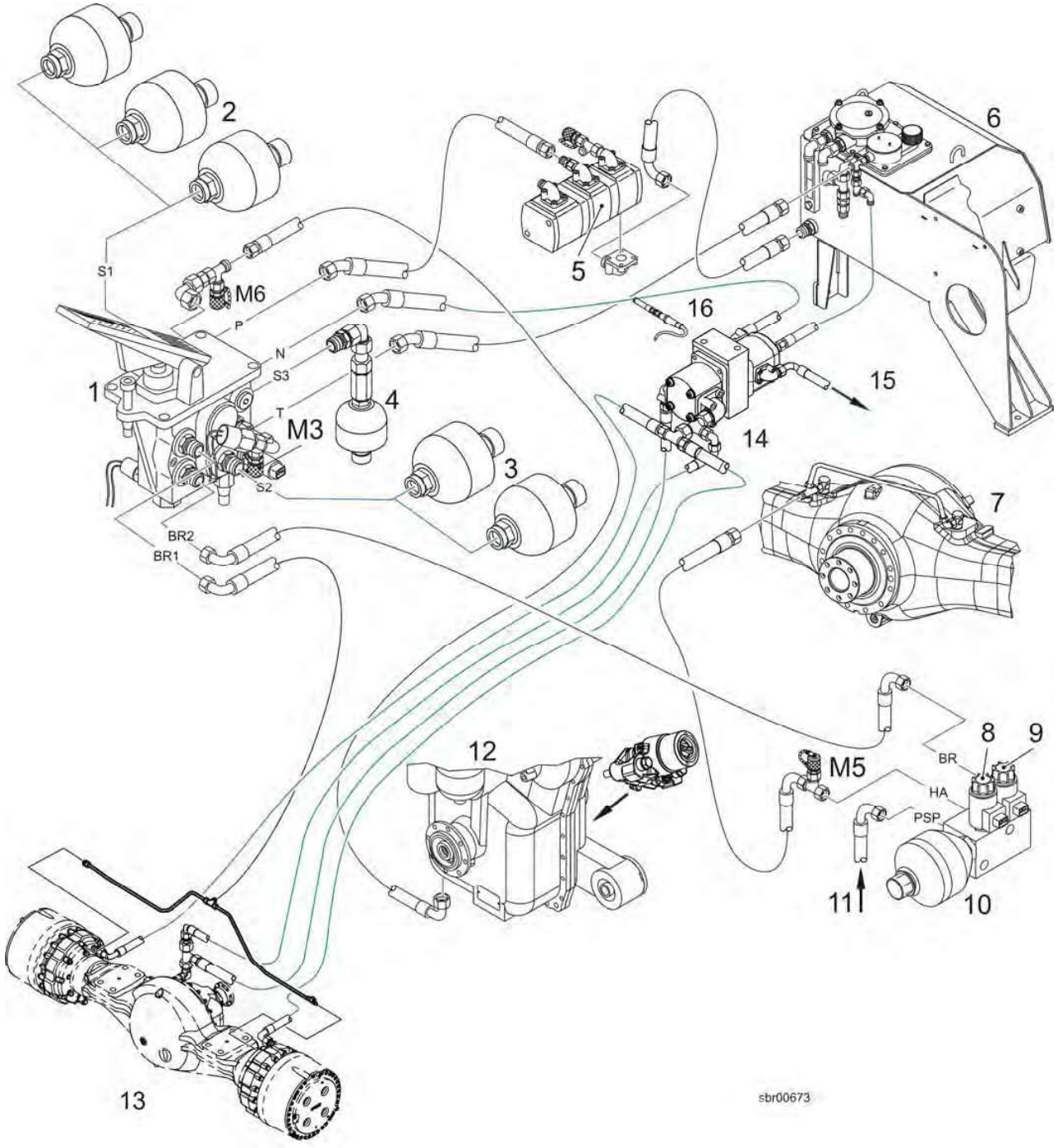
9.1 Brake system

Design



Main components of the brake system

1 Compact brake valve
2 Front axle service brake hydro accumulator
3 Rear axle service brake hydro accumulator
9 Overspeed protection solenoid valve
10 Pilot control hydro accumulator
11 Oil from the replenishing pump
12 Transmission with parking brake
15 Control block pre-heating connection (working hydraulics)
16 Sensor Flushing circuit gear pump/motor

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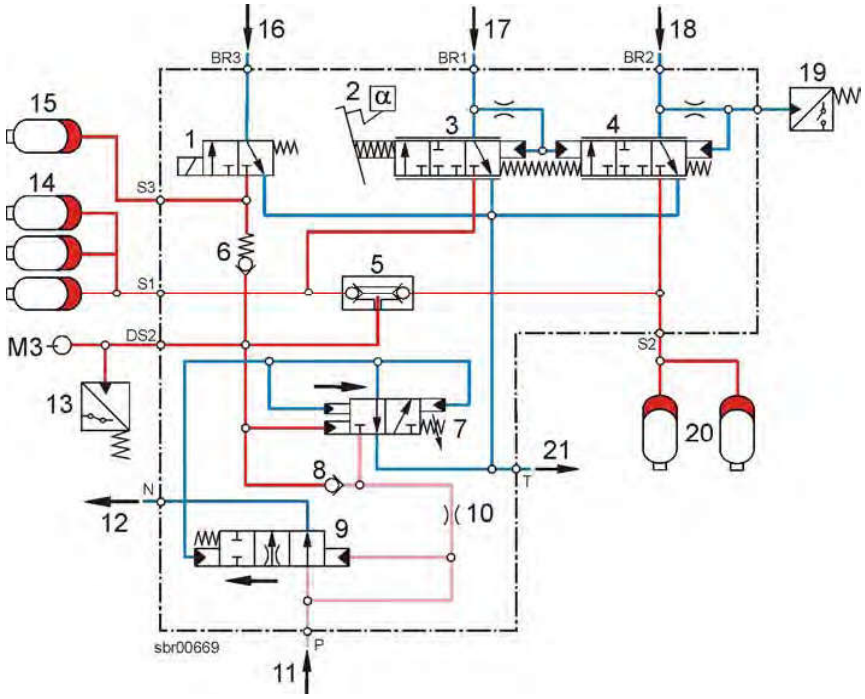
Function description

Basic function



Hydraulic diagram of the compact brake valve

1 Parking brake solenoid valve
2 Inching angle sensor
3 Pressure control piston for 1st circuit
4 Pressure control piston for 2nd circuit
5 Inverted shuttle valve
6 Check valve
7 Pressure balance pilot valve
8 Check valve
9 Accumulator charge valve
10 Flow control nozzle
11 Gear pump P connection
12 Flushing circuit
13 Accumulator charge pressure switch
14 Front axle hydro accumulator
15 Parking brake hydro accumulator
16 Parking brake connection
17 Front axle connection
18 Rear axle connection
19 Brake light pressure switch
20 Rear axle hydro accumulator
21 Hydraulic tank connections
M3 Accumulator charge pressure test connection

The compact brake valve is supplied with oil by a gear pump. The integrated accumulator charge valve 9 and the pilot valve 7 fill the hydro accumulator with pressure oil.

If the accumulator charge cut-off pressure is reached, the accumulator charge valve 9 switches the pump flow to circulate to the connection N. The hydraulic oil flowing out of the connection N drives the flushing circuit gear motor. The hydraulic oil then flows through the control block back to the tank.

If braking causes the accumulator pressure to fall to the accumulator charge cut-in pressure, the accumulator charge valve 9 switches to accumulator charging.

The brake circuits of the front and rear axles are separated by the inverted shuttle valve 5.

The parking brake solenoid valve 1 provides pressure oil to the disc brake.

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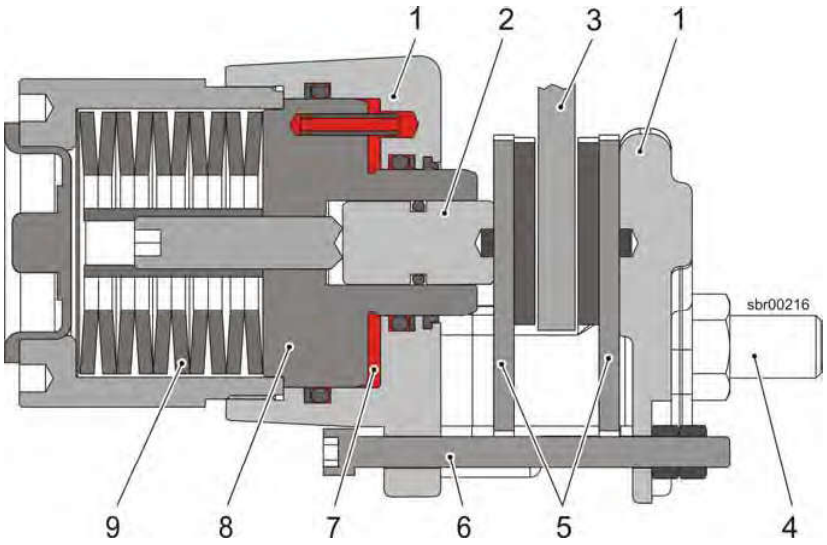
Function description

Basic function of the disc brake



Disc brake in open position

The two identical brake pads 5 and the brake calliper 1 slide freely on the guide pins 4, which are fastened in the transmission housing.

When the brake is applied, it clamps the brake pads 5, creating a braking torque on the brake disk 3.

The clamping force is generated by the cup springs 9. The piston 8 is pushed together with the pressure pin 2 and the front brake pad 5 towards the brake disc 3.

When the front brake pad 5 comes into contact with the brake disc 3, the reactive force pushes the brake callipers 1 along the guide pin 4 until the rear brake pad 5 is also pressed against the brake disc 3.

The parking brake is released by tensioning the entire cup spring set 9. Oil in the pressure chamber 7 pushes the piston 8 all the way back against the force of the cup springs 9.

Rubber fittings on the guide pin 4 push the entire brake calliper to the right until the adjusting screw 6 touches the transmission housing. This moves the rear brake pad 5 away from the brake disc 3.

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10.0.1 Electrical system with circuit diagrams

Design

The operating voltage of the machine is 24 volts. The batteries (2 x 12 V) are connected in series.

The two batteries are installed in the right ballast weight.

Components of the electrical system

The table below lists all the components of the electrical system. The entry in the step column helps you locate the component in the circuit diagrams.

Abbreviations:

WH = Wiring harness

LFD = Liebherr ride control

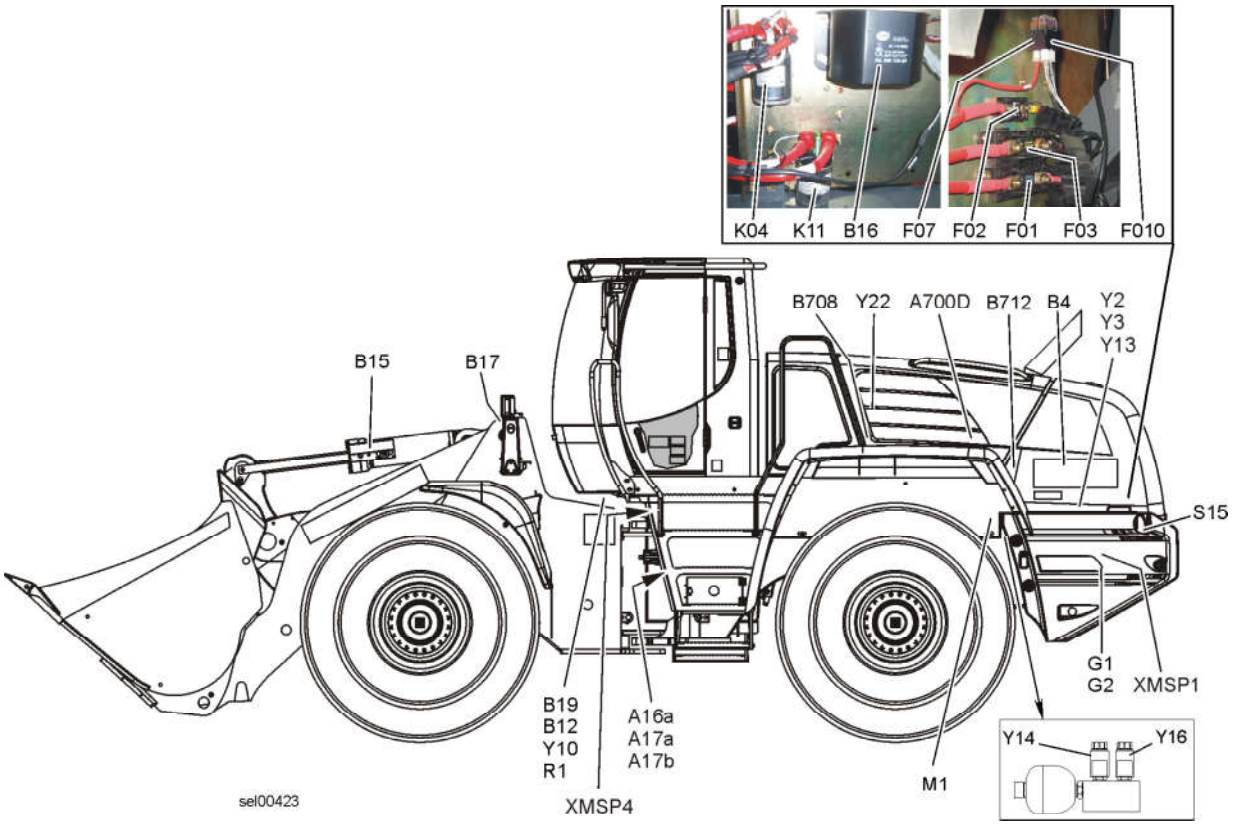
SV = Solenoid valve

PSV = Proportional solenoid valve

LED = Light-emitting diode

SH = Service hours

* Options



Machine view 1, left

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BMK	SYSTEM	PLACE	FUNCTION	SHEET
-B11r	=K	+K3	LOUDSPEAKER RIGHT	/34.F8
-B11r.X1	=K	+K3	PLUG LOUDSPEAKER RIGHT	/34.F8
-B11r.X2	=K	+K3	PLUG LOUDSPEAKER RIGHT	/34.E8
-B12	=H	+H3	PRESSURE SWITCH BRAKE LIGHT	/25.E1
-B12.X	=H	+H3	PLUG PRESSURE SWITCH	/25.E1
-B13	=H	+H	COOLING WATER LEVEL	/23.C4
-B13.X	=H	+H	PLUG COOLING WATER LEVEL	/23.C4
-B14	=F	+F3	TRANSMISSION TEMPERATURE	/23.C5
-B14.X	=F	+F3	PLUG TRANSMISSION TEMPERATURE	/23.C5
-B15	=V	+V3	INDUCTIVE SWITCH BUCKET RETURN-TO-DIG	/58.C2
-B15.X	=V	+V3	PLUG INDUCTIVE SWITCH	/58.C2
-B16	=H	+H5	BACK-UP ALARM	/45.C5
-B16.X	=H	+H5	PLUG BACK-UP ALARM	/45.D5
-B16a *	=H	+H5	ALARM	/80.E5
-B16a.X *	=H	+H5	CONNECTOR ALARM	/80.E5
-B16a.X1 *	=H	+H5	PLUG REVERSING OBSTACLE DETECTOR CAN BE SWITCHED OFF	/45.D5
-B16b.X *	=H	+H5	PLUG REVERSING OBSTACLE DETECTOR CAN BE SWITCHED OFF	/45.C6
-B17	=V	+V	INDUCTIVE SWITCH LIFT KICK-OUT	/58.C4
-B17.B	=V	+V	PLUG LIFT KICK-OUT	/58.B4
-B17.X	=V	+V	PLUG LIFT KICK-OUT	/58.B4
-B17.X_1	=V	+V	PLUG INDUCTIVE SWITCH	/58.C4
-B19	=K	+K6	PRESSURE SWITCH BRAKE ACCUMULATOR	/23.C3
-B19.X	=K	+K6	PLUGPRESSURE SWITCH	/23.C3
-B25	=H	+H2	TANK PIPE SENSOR	/23.C1
-B25.X	=H	+H2	PLUG TANK PIPE SENSOR	/23.C1
-B26	=K	+K4	TEMPERATURE SENSOR ICE UP PROTECTION	/65.D5
-B26a	=K	+K4	TEMPERATURE SENSOR ICE UP PROTECTION	/65.D7
-B27	=H	+H	PRESSURE SWITCH AIR CONDITIONING SYSTEM	/64.C4
-B27.X	=H	+H	PLUG PRESSURE SWITCH	/64.C4
-B28	=K	+K	PRESSURE SWITCHRIDE CONTROL	/24.C6
-B28.X	=K	+K	PLUG PRESSURE SWITCH	/24.C6
-B32	=K	+K4	PRESSURE SWITCH FLOAT POSITION	/58.C1
-B32.X	=K	+K4	PLUG PRESSURE SWITCH	/58.C1
-B39	=K	+K6	AIR CON AMBIENT TEMPERATURE SENSOR	/64.D5
-B39.X	=K	+K6	PLUG AMBIENT TEMPERATURE SENSOR	/64.D6
-B40 *	=K	+K4	INTERIOR TEMPERATURE SENSOR	/68.E4

BMK	SYSTEM	PLACE	FUNCTION	SHEET
-B41 *	=K	+K4	OUTFLOW TEMPERATURE SENSOR	/68.E7
-B42	=K	+K1	SUN SENSOR AIR CONDITIONING SYSTEM	/64.D7
-B42.X	=K	+K1	PLUG SUN SENSOR AIR CONDITIONING SYSTEM	/64.D7
-B43	=H	+H5	INDUCTIVE SWITCH DISTRIBUTOR LH	/78.C7
-B44	=H	+H5	INDUCTIVE SWITCH LEVEL LH	/78.C4
-B45	=H	+H4	PRESSURE SENSOR HIGH PRESSURE TRAVEL PUMP	/53.C7
-B45.X	=H	+H4	PLUG PRESSURE SENSOR HIGH PRESSURE TRAVEL PUMP	/53.C7
-B47	=V	+V1	PRESSURE SWITCH FLUSHING AXLE	/59.C8
-B47.X	=V	+V1	PLUG PRESSURE SWITCH FLUSHING AXLE	/59.D8
-B48	=V	+V1	PRESSURE HIGH PRESSURE TRAVEL PUMP 2	/59.C7
-B48.X	=V	+V1	PLUG PRESSURE HIGH PRESSURE TRAVEL PUMP 2	/59.D7
-B50 *	=H	+H1	CAMERA	/35.A7
-B50 *	=H	+H	CAMERA	/36.C5
-B50.X1 *	=H	+H1	PLUG Vcc CAMERA	/35.C7
-B50.X1 *	=H	+H	CONNECTOR CAMERA 1	/36.C5
-B50.X2 *	=H	+H	CONNECTOR CAMERA	/36.C6
-B50.X2 *	=H	+H1	PLUG CAMERA ETHERNET	/35.C8
-B51 *	=K	+K	CAMERA	/36.C8
-B51 *	=V	+V	PROXIMITY SWITCH WEIGHING DEVICE	/76.C2
-B51.X1 *	=K	+K	CONNECTOR CAMERA	/36.C8
-B52 *	=V	+V	PROXIMITY SWITCH WEIGHING DEVICE	/76.C3
-B200 *	=K	+K4	INDUCTIVE SWITCH JOYSTICK STEERING	/72.C4
-B200.X *	=K	+K4	PLUG INDUCTIVE SWITCH	/72.C4
-B201 *	=H	+H3	PRESSURE SWITCH JOYSTICK STEERING	/72.C2
-B201.X *	=H	+H3	PLUG PRESSURE SWITCH	/72.C2
-B202 *	=K	+K4	PUSH-BUTTON SWITCH JOYSTICK STEERING	/71.C6
-B202.X *	=K	+K4	PLUG SIGNAL TRANSMITTER JOYSTICK STEERING	/71.C6
-B203 *	=V	+V1	PRESSURE SWITCH CENTRAL LUBRICATION SYSTEM	/79.D5
-B203.X *	=V	+V1	PLUG PRESSURE SWITCH	/79.E5
-B213 *	=V	+V2	INDUCTIVE SWITCH CUTOFF TILT CYLINDER	/63.C6
-B213.X *	=V	+V2	PLUG INDUCTIVE SWITCH	/63.C6
-B.X6 *	=B	+B2	PLUG AUXILIARY HEATER DBW2010	/84.D5
-C.X1 *	=B	+B2	PLUG CIRCULATING PUMP DBW2010	/84.E6
-E1	=B	+B1	REAR LAMP LEFT	/25.E2
-E2	=K	+K3	INDOOR LIGHTING	/21.E7
-E2.X1	=K	+K3	PLUG INDOOR LIGHTING	/21.E7

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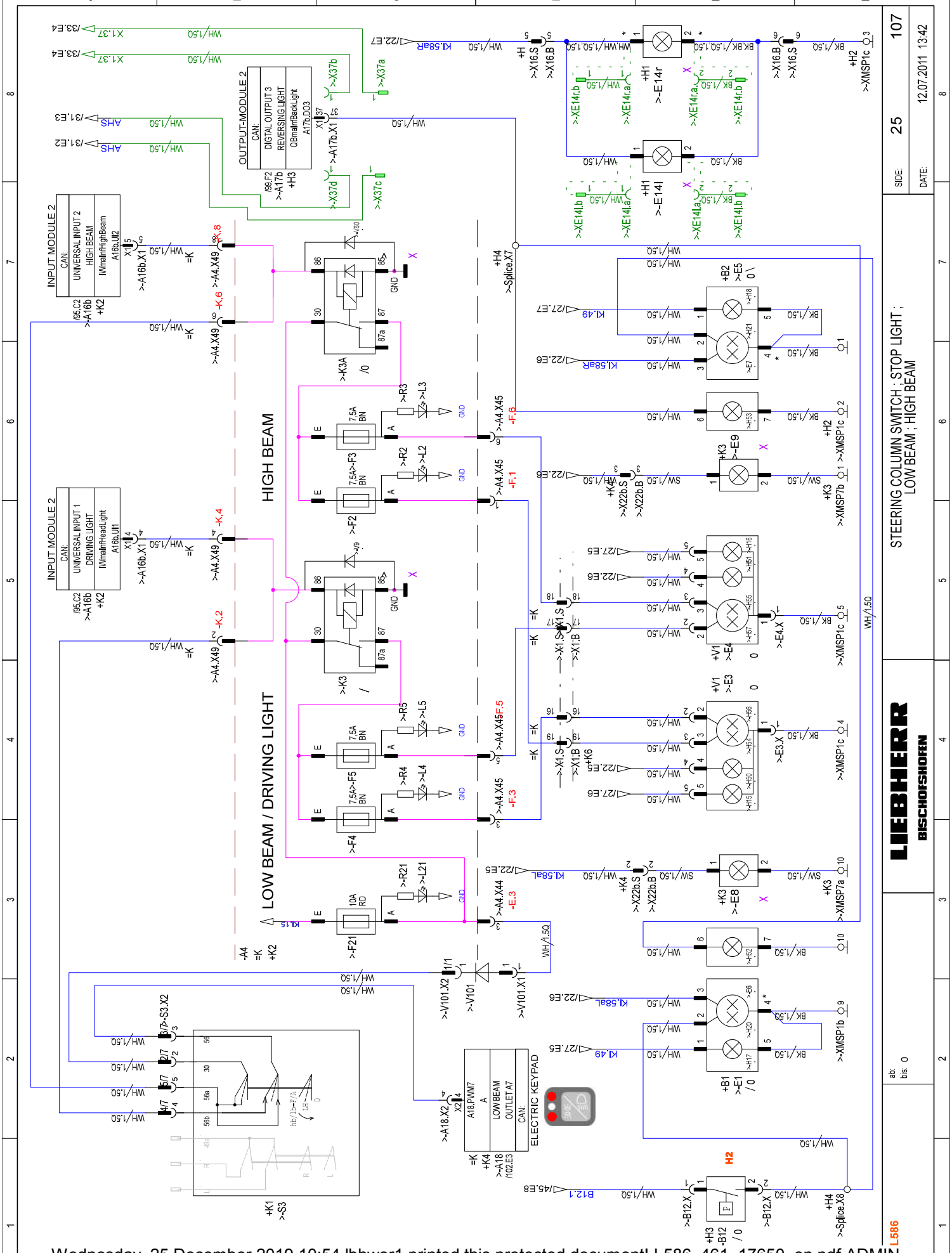
BMK	SYSTEM	PLACE	FUNCTION	SHEET
-W1	=K	+K3	ANTENNA	/34.D8
-X1.B	=K	+K6	PLUG CAB FLOOR	/22.E3
-X1.B.25a *	=K	+K	PLUG HORN OPERATION ÜBER PUSH-BUTTON SWITCH	/29.C5
-X1.J	=K	+K2	HAZARD WARNING LIGHTS EU	/27.C5
-X1.S	=K	+K6	PLUG CAB FLOOR	/22.D3
-X1.S.25a *	=K	+K	PLUG HORN OPERATION ÜBER PUSH-BUTTON SWITCH	/29.B5
-X2.B	=K	+K6	PLUG CAB FLOOR	/64.C5
-X2.J	=K	+K2	HAZARD WARNING LIGHTS EU	/27.C6
-X2.S	=K	+K6	PLUG CAB FLOOR	/64.C5
-X3 *	=K	+K4	PLUG PRESELECTION DIAL THERMO 90	/85.B1
-X3.J	=K	+K2	HAZARD WARNING LIGHTS USA	/27.C8
-X4 *	=K	+K4	PLUG PRESELECTION DIAL DBW2010	/84.B1
-X5 *	=B	+B2	PLUG NOZZLE STICK PREHEATER DBW2010	/84.E3
-X5.J *	=K	+K2	JUMPER NOT USED	/22.C2
-X6.J	=K	+K2	JUMPER GG6	/22.C2
-X11.ST1 *	=B	+B2	PLUG AUXILIARY HEATER THERMO 90	/85.D5
-X12.ST2 *	=B	+B2	PLUG AUXILIARY HEATER THERMO 90	/85.C6
-X13.ST3 *	=B	+B2	PLUG AUXILIARY HEATER THERMO 90	/85.D7
-X16.B	=H	+H	PLUG LIGHTING REAR HATCH	/31.D4
-X16.S	=H	+H	PLUG LIGHTING REAR HATCH	/31.D4
-X22a.B	=K	+K4	PLUG CABIN	/30.D4
-X22a.S	=K	+K4	PLUG CABIN	/30.D4
-X22b.B	=K	+K4	PLUG WIRING HARNESS CABIN	/21.D7
-X22b.S	=K	+K4	PLUG WIRING HARNESS CAB	/21.D7
-X26.B	=K	+K3	PLUG E12	/32.D3
-X26.S *	=K	+K3	PLUG E12	/32.E3
-X26a.S *	=K	+K3	PLUG E12b	/32.E4
-X27.B	=K	+K3	PLUG E12a	/32.D4
-X27.S *	=K	+K3	PLUG E12a	/32.D4
-X28.B	=H	+H	PLUGFAN MOTOR	/23.B7
-X28.B	=K	+K3	PLUG E13	/32.D6
-X28.S	=H	+H	PLUG FAN MOTOR	/23.B7
-X28.S *	=K	+K3	PLUG E13	/32.D6
-X28a.S *	=K	+K3	PLUG E13b	/32.E7
-X29.B	=K	+K3	PLUG E13a	/32.D7
-X29.S *	=K	+K3	PLUG E13a	/32.D7

BMK	SYSTEM	PLACE	FUNCTION	SHEET
-X31	=H	+H5	PLUG INDUCTIVE SWITCH	/78.C5
-X33	=K	+K4	PLUG MAGNETICS PILOT CONTROL UNIT	/58.C7
-X33.X	=K	+K4	PLUG MAGNETICS PILOT CONTROL UNIT	/58.C7
-X37a *	=H	+H3	PLUG RFWEOOPTIONAL	/25.C8
-X37b *	=H	+H3	PLUG RFWEO OPTIONAL	/25.C8
-X37c *	=H	+H3	CONNECTOR WORKING FLOODLIGHT OPTIONAL	/25.C8
-X37d *	=H	+H3	CONNECTOR WORKING FLOODLIGHT OPTIONAL	/25.C8
-X43	=V	+V1	PLUG INDUCTIVE SWITCH	/78.C7
-X44 *	=K	+K2	PLUG RELAY BOARD DIESEL PREHEATING	/86.B5
-X48.B *	=H	+H	PLUG EMERGENCY OFF 2 WORKING BASKET	/61.C8
-X48.S *	=H	+H	PLUG EMERGENCY OFF 2 WORKING BASKET	/61.C8
-X50.B *	=H	+H3	PLUG CENTRAL LUBRICATION SYSTEM GROENEVELD	/79.C2
-X50.S *	=H	+H3	PLUG CENTRAL LUBRICATION SYSTEM GROENEVELD	/79.C2
-X51.B *	=K	+K	PLUG EMERGENCY OFF;	/61.A7
-X51.S *	=K	+K	PLUG EMERGENCY OFF;	/61.A7
-X52.B *	=K	+K2	PLUG REVERSING OBSTACLE DETECTOR	/73.D4
-X57.B *	=H	+H1	PLUG CAMERA	/35.C7
-X57.S *	=H	+H1	PLUG CAMERA	/35.C7
-X60	=K	+K2	DIAGNOSTIC PLUG	/40.F6
-X60a	=M	+M	DIAGNOSTIC PLUG ENGINE CONTROL UNIT	/70.E2
-X60b	=K	+K2	ETHERNET DIAGNOSTIC PLUG	/40.E5
-X70	=K	+K5	12V ELECTRICAL SOCKET	/34.E4
-X70.X1	=K	+K5	PLUG 12V ELECTRICAL SOCKET	/34.E4
-X70.X2	=K	+K5	PLUG 12V ELECTRICAL SOCKET	/34.E4
-X71	=K	+K4	ELECTRICAL SOCKET CIGARETTE LIGHTER	/34.E3
-X71.X	=K	+K4	PLUG CIGARETTE LIGHTER	/34.E3
-X72 *	=H	+H2	ELECTRICAL SOCKET	/54.C2
-X73	=K	+K4	CIGARETTE LIGHTER	/34.F3
-X75.B *	=K	+K4	PLUG INTERIOR TEMPERATURE SENSOR	/68.C4
-X75.S	=K	+K4	PLUG INTERIOR TEMPERATURE SENSOR	/68.C4
-X95 *	=K	+K4	CONNECTOR WORKING FLOODLIGHT OPTIONAL	/31.E1
-X100 *	=H	+H	CONNECTORSENSOR	/90.D7
-X223.B *	=K	+K2	PLUG DIESEL PREHEATING -40°	/84.F3
-X223.S *	=K	+K2	PLUG DIESEL PREHEATING -40°	/86.B6
-X261.B *	=K	+K	PLUG HORN OPERATION ÜBER PUSH-BUTTON SWITCH	/29.C2
-X261.S *	=K	+K	PLUG HORN OPERATION ÜBER PUSH-BUTTON SWITCH	/29.C2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HIGH BEAM
LOW BEAM / DRIVING LIGHT
INPUT MODULE 2
CAN:
UNIVERSAL INPUT 2
HIGH BEAM
IWmaInfHighBeam
A16b.UI2
INPUT MODULE 2
CAN:
UNIVERSAL INPUT 1
DRIVING LIGHT
IWmaInfHeadLight
A16b.UI1
OUTPUT-MODULE 2
CAN:
DIGITAL OUTPUT 3
REVERSING LIGHT
QBmaInfBackLight
A17b.DO3
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CAN:
LOW BEAM
OUTLET A7
A18.PWM7
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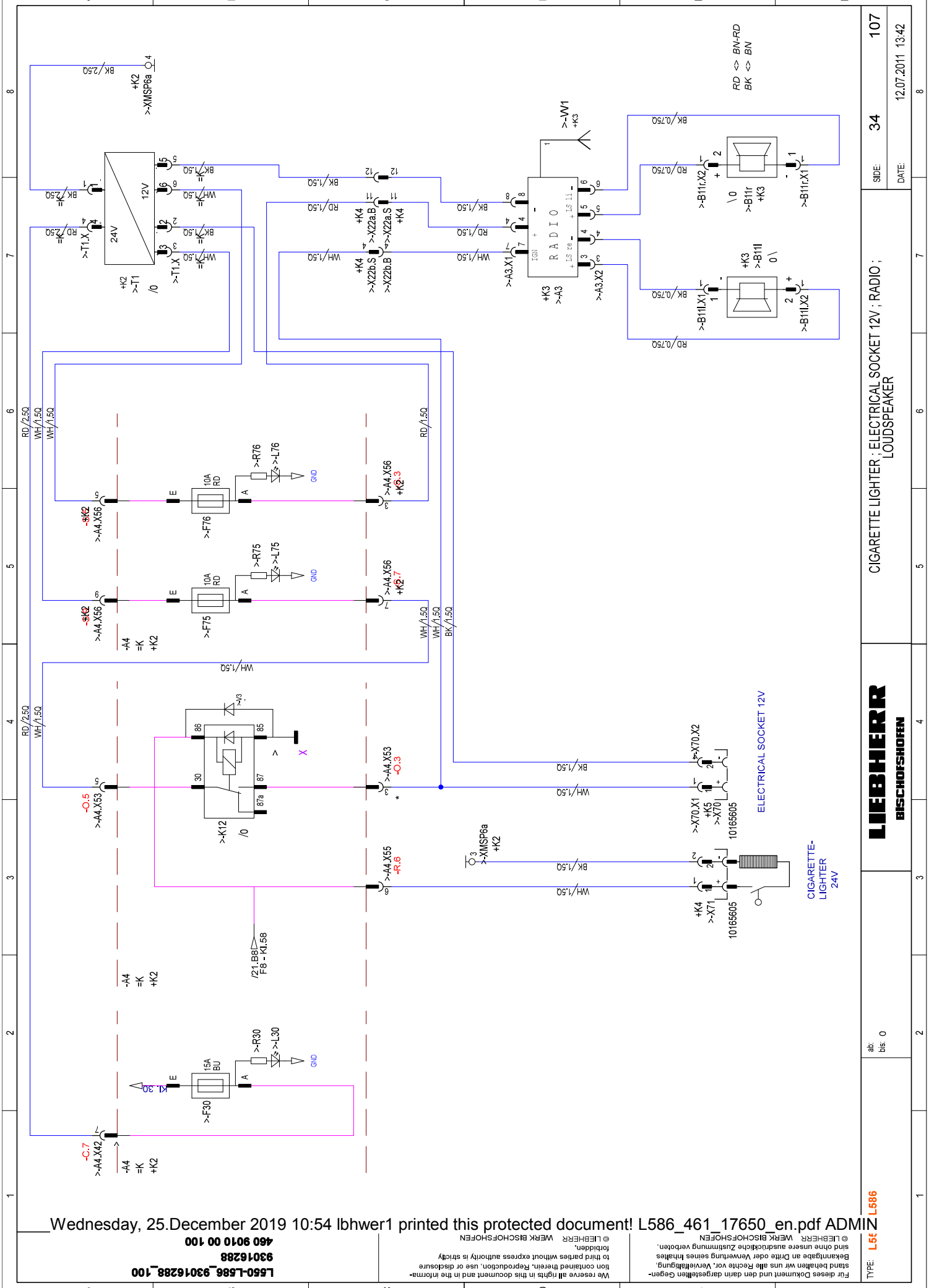

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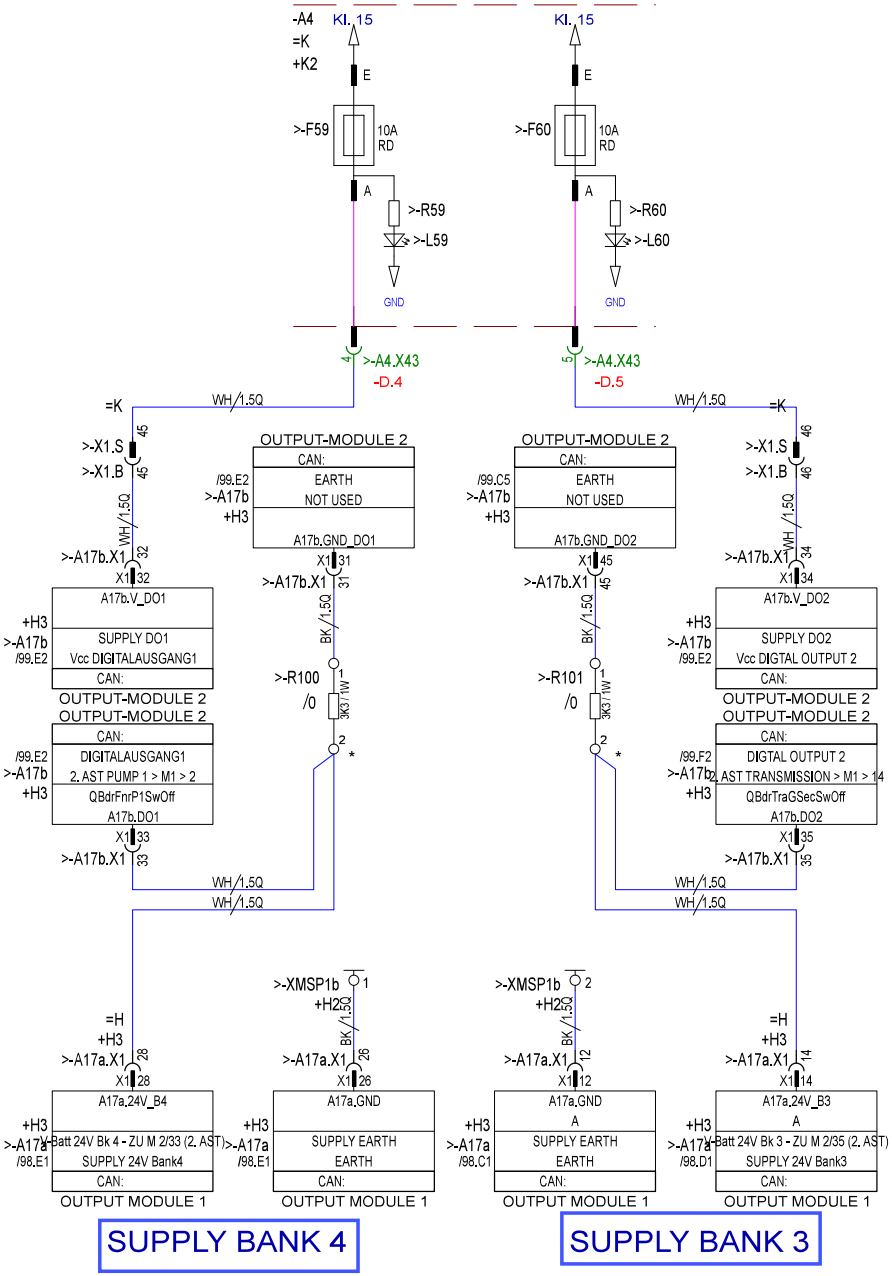
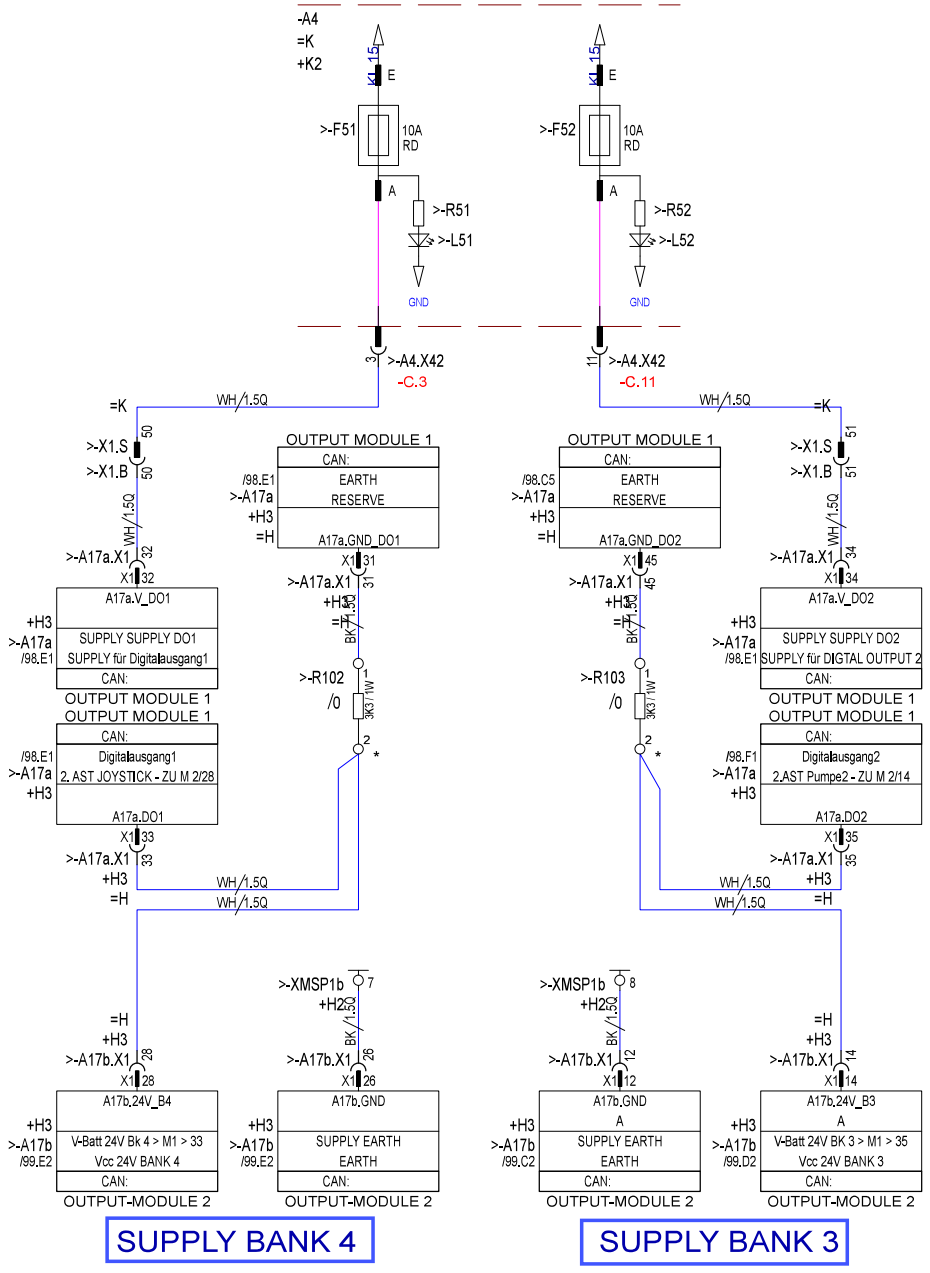
SUPPLY OUTPUT MODULE 1



SUPPLY OUTPUT MODULE 2



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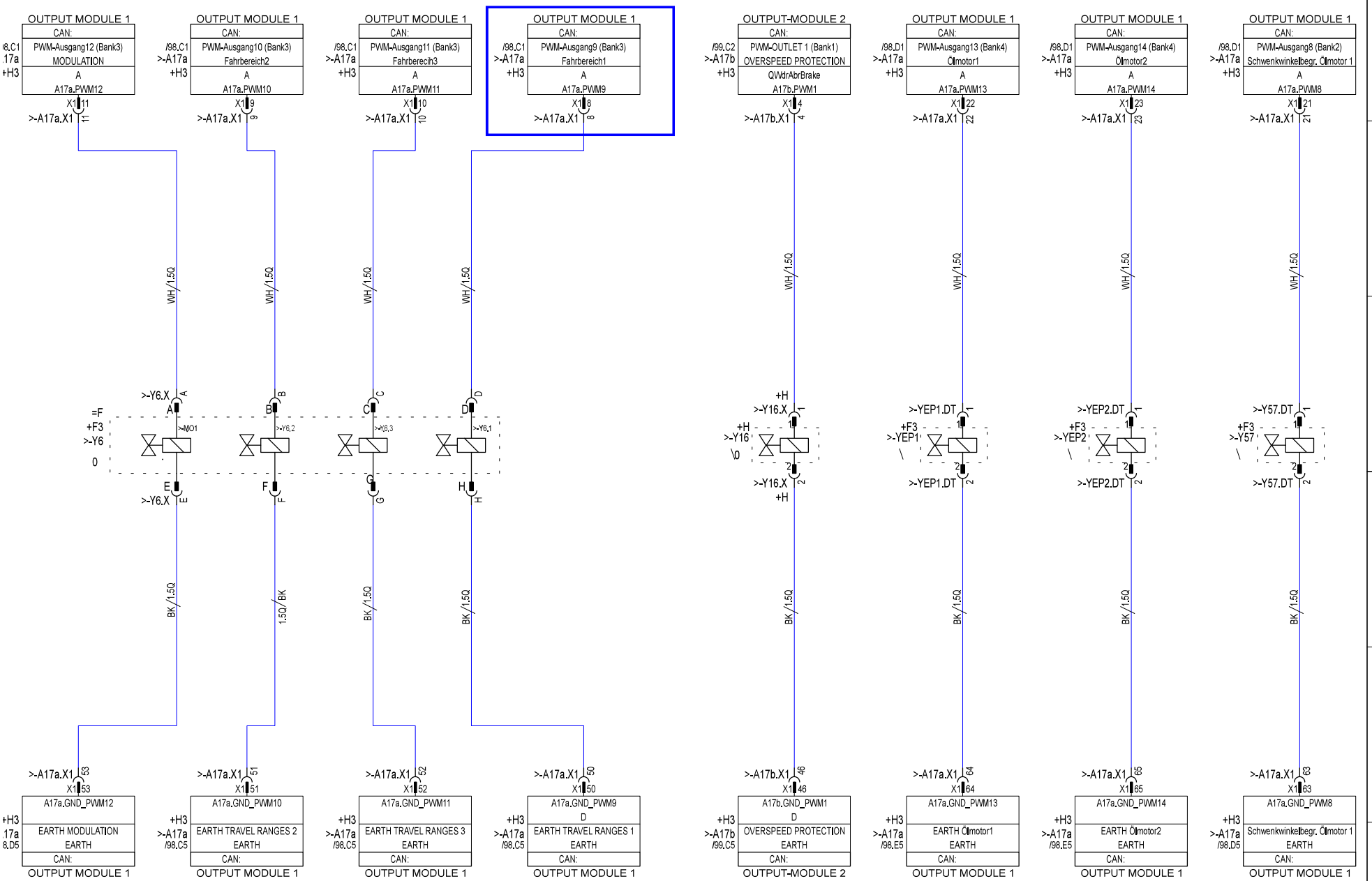

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TRAVEL RANGES ; SWIVEL ANGLE HYDRO MOTORS
OVERSPEED PROTECTION

SIDE: 52 107

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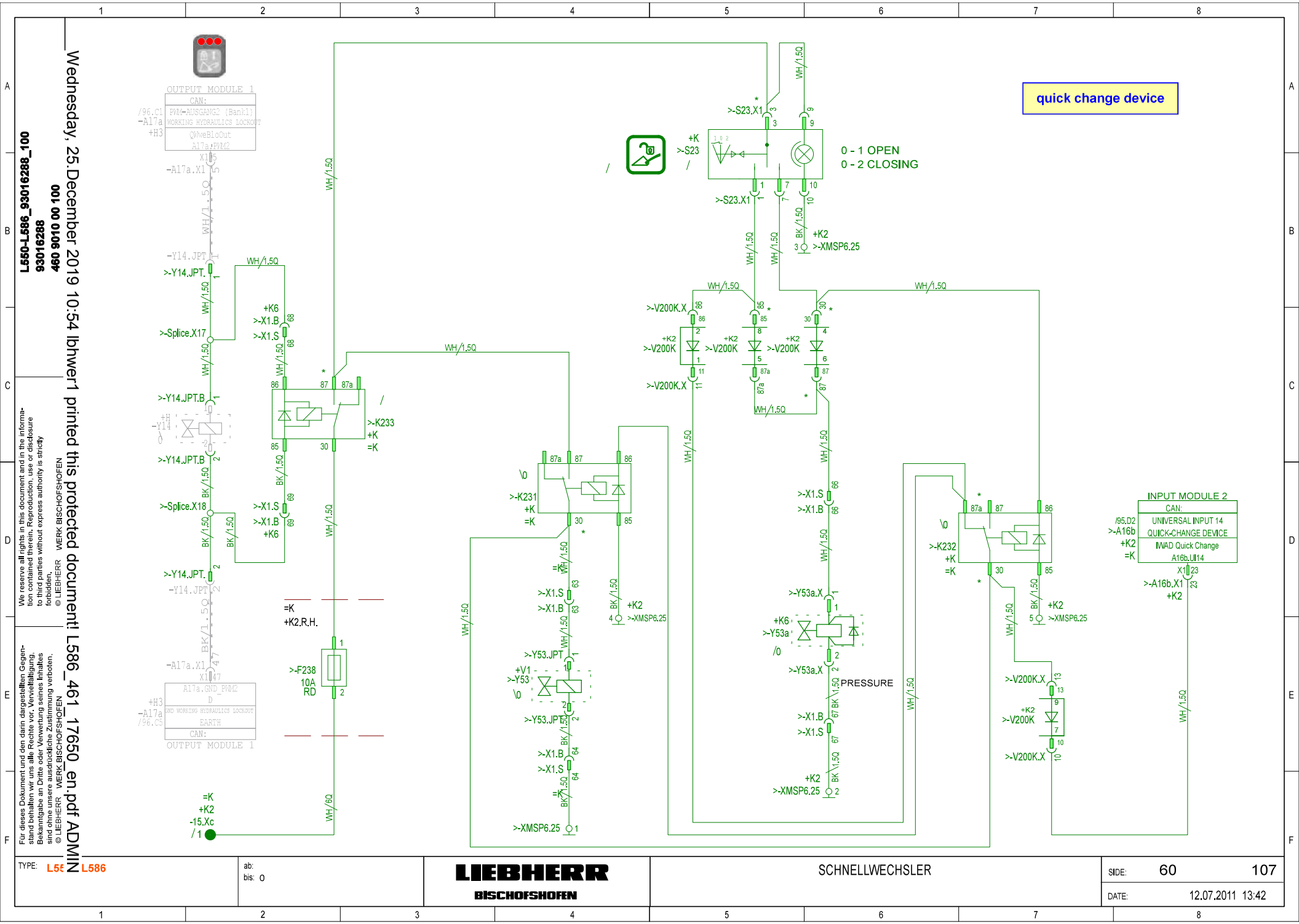

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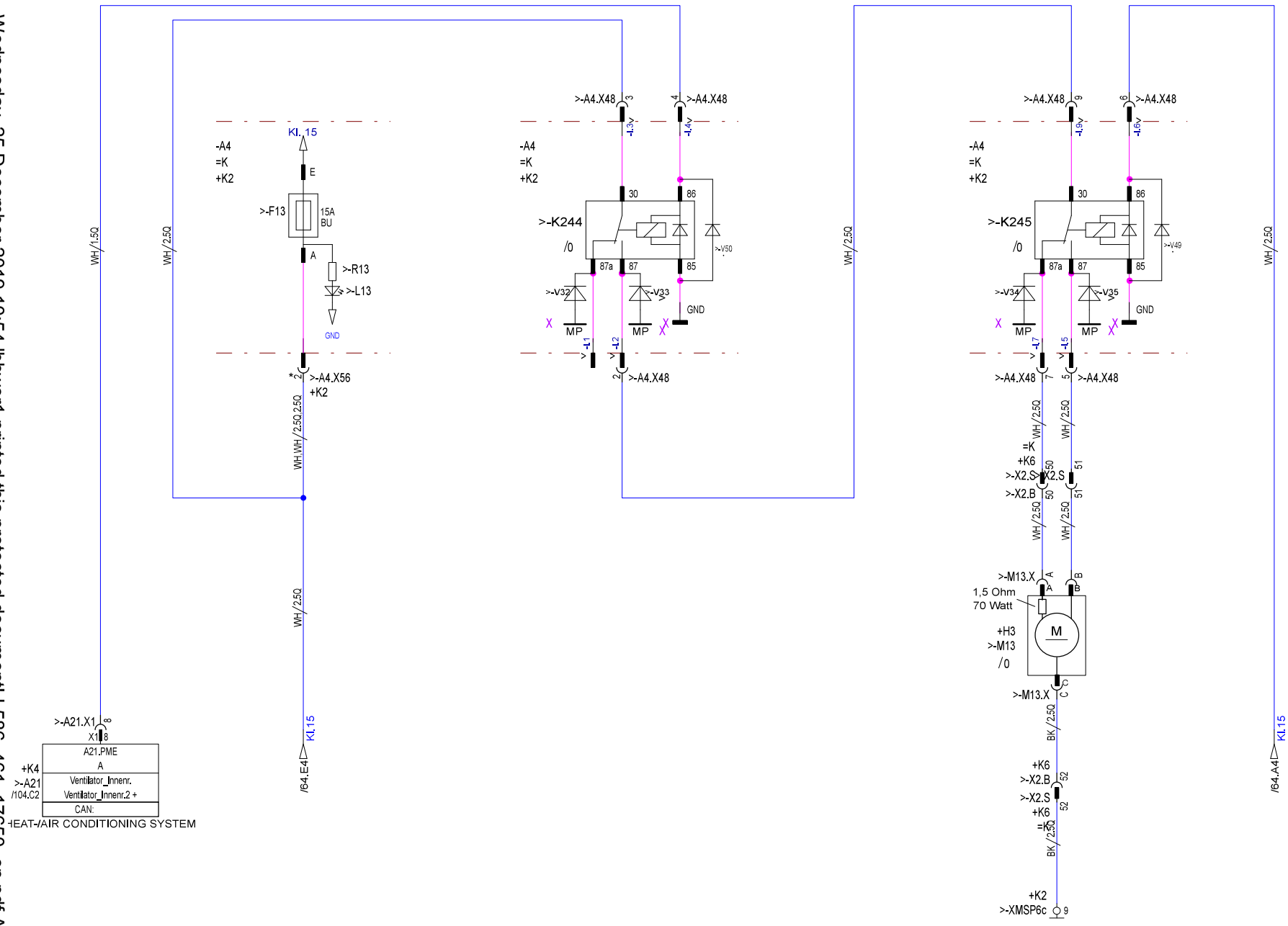

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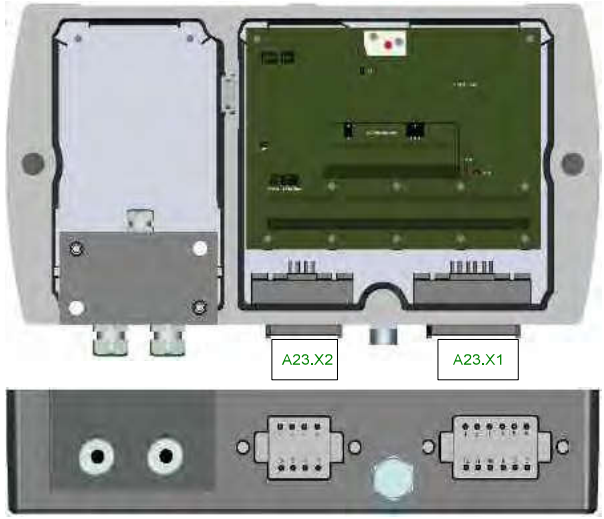
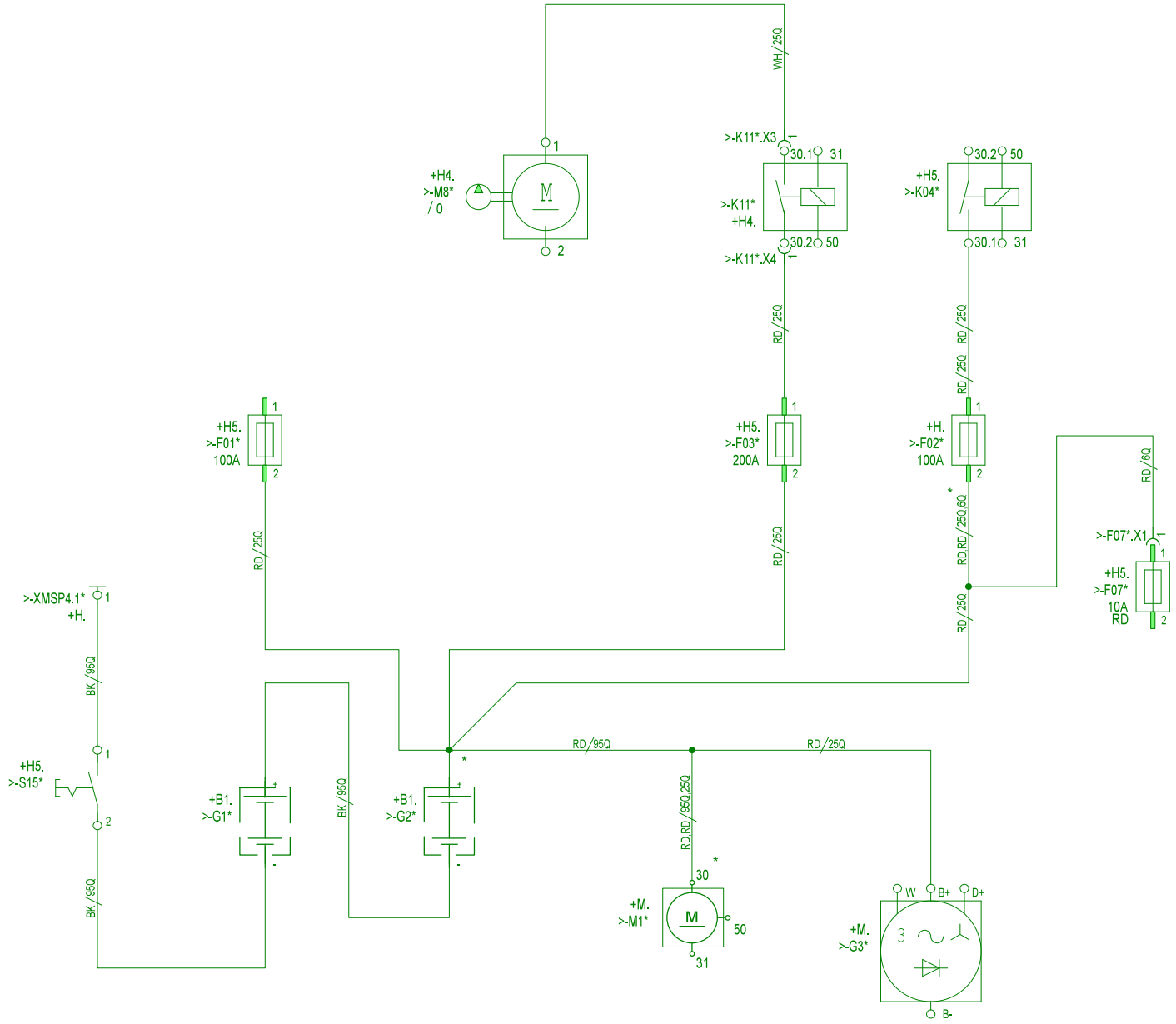


=V
+V1
>-A23

WIEGEINRICHTINGT BASIC pBASE

Phys. Addr.	TYP	BLATT	BESCHREIBUNG		STECKER	PIN
A23.VOUT+	A		Vcc pMini	SUPPLY Eichdisplay	X1	1
A23.VOUT-	A		GND pMini/DIAGNOSIS	EARTH Eichdisplay/&#292	X1	2
A23.n.c.	A		RESERVE	RESERVE	X1	3
A23.GND	A		GND SENSOR 1	GND SENSOR 1	X1	4
A23.V+	A		Vcc SENSOR 1	Vcc SENSOR 1	X1	5
A23.N1	A		SIGNAL SENSOR 1	SIGNAL SENSOR 1	X1	6
A23.N2	A		GND SENSOR 2	GND SENSOR 2	X1	7
A23.V+	A		Vcc SENSOR 2	Vcc SENSOR 2	X1	8
A23.GND	A		SIGNAL SENSOR 2	SIGNAL SENSOR 2	X1	9
A23.+UB	A		Vcc DIAGNOSIS	Vcc pMini	X1	10
A23.CAN_H	A		CAN_High pMini	CAN_High pMini	X1	11
A23.CAN_L	A		CAN_Low pMini	CAN_Low pMini	X1	12
A23.+UB	A		Vcc pBase	Vcc pBase	X2	1
A23.GND	A		EARTH pBase	EARTH pBase	X2	2
A23.n.c.	A		RESERVE	RESERVE	X2	3
A23.CAN_RES	A		CAN END	CAN END	X2	4
A23.CAN_H2	A		CAN HIGH 2	CAN HIGH 2	X2	5
A23.CAN_L2	A		CAN LOW 2	CAN LOW 2	X2	6
A23.CAN_H1	A		CAN HIGH 1	CAN HIGH 1	X2	7
A23.CAN_L1	A		CAN LOW 1	CAN LOW 1	X2	8

VERSION BATTERY WIRING HARNESSES COLD WEATHER KIT -40°C



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TYPE: L55 L586	ab: bis: 0	LIEBHERR BISCHOFSHOFEN	VERSION BATTERY WIRING HARNESSES -40°	SIDE: 87 107 DATE: 12.07.2011 13:42

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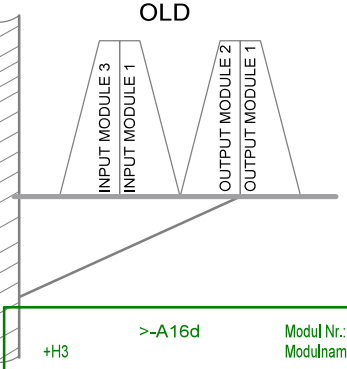
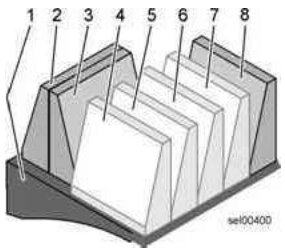
OLD

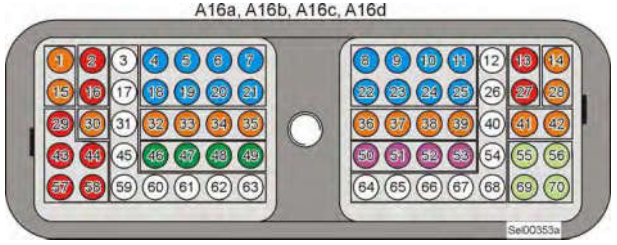


NEW



1 CONSOLE
2 OUTPUT MODULE 1 A17a
3 OUTPUT MODULE 2 A17b
4 INPUT MODULE 4 A16d (OPTION)
5 OUTPUT-MODULE 4 A17d (OPTION)
6 INPUT MODULE 3 A16c (OPTION)
7 OUTPUT MODULE 3 A17c (OPTION)
8 INPUT MODULE 1 A16a

A16a, A16b, A16c, A16d



INPUT MODULE 4 ON- / OUTLETS

+H3 >-A16d Modul Nr.:
Modulname: PME1_EINGANGSMODUL

Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin	Phys. Adr.	Blatt	EA	Beschreibung	Stecker	Pin
A16d.24V			NOT USED	0	1	A16d.24V			NOT USED	0	41
A16d.24V_logic	/49.E1		SUPPLY LOGICAL PART	0	2	A16d			NOT USED	0	42
A16d.GND			NOT USED	0	3	A16d.CAN_Low	/38.D1		CAN LOW > CAN &#	0	43
A16d.UI1	/62.A2		GRIP SENSOR	0	4	A16d.CAN_Low	/38.D1		CAN LOW	0	44
A16d.UI2	/62.B7		3 CONTROL CIRCUIT ACTIVE	0	5	A16d.GND			NOT USED	0	45
A16d.UI3	/62.A5		SENSOR 1	0	6	A16d.RI1			NOT USED	0	46
A16d.UI4	/62.A4		CONTROL 5V	0	7	A16d.RI1			NOT USED	0	47
A16d.UI9	/62.B7		OPTION	0	8	A16d.RI2			NOT USED	0	48
A16d.UI10			NOT USED	0	9	A16d.RI2			NOT USED	0	49
A16d.UI11	/62.A6		SENSOR 2	0	10	A16d.5V	/62.A3		Vcc CONTROL LEVER	0	50
A16d.UI12			NOT USED	0	11	A16d.5V			NOT USED	0	51
A16d.GND			NOT USED	0	12	A16d.5V			NOT USED	0	52
A16d			NOT USED	0	13	A16d.5V			NOT USED	0	53
A16d.24V			NOT USED	0	14	A16d.GND	/62.A8		GND CONTROL LEVER	0	54
A16d.24V			NOT USED	0	15	A16d.FI1			NOT USED	0	55
A16d.GND_logic	/49.E2		SUPPLY LOGICAL PART	0	16	A16d.FI2			NOT USED	0	56
A16d.GND			NOT USED	0	17	A16d.CAN_High	/38.D2		CAN HIGH > CAN &	0	57
A16d.UI5			NOT USED	0	18	A16d.CAN_High	/38.D2		CAN HIGH	0	58
A16d.UI6			NOT USED	0	19	A16d.GND	/62.A3		GND GRIP SENSOR	0	59
A16d.UI7			NOT USED	0	20	A16d.GND			NOT USED	0	60
A16d.UI8			NOT USED	0	21	A16d.GND			NOT USED	0	61
A16d.UI13			NOT USED	0	22	A16d.GND			NOT USED	0	62
A16d.UI14			NOT USED	0	23	A16d.GND			NOT USED	0	63
A16d.UI15			NOT USED	0	24	A16d.GND			NOT USED	0	64
A16d.UI16			NOT USED	0	25	A16d.GND			NOT USED	0	65
A16d.GND			SUPPLY EARTH	0	26	A16d.GND			NOT USED	0	66
A16d			NOT USED	0	27	A16d.GND			NOT USED	0	67
A16d.24V			NOT USED	0	28	A16d.GND			NOT USED	0	68
A16d.CAN_Res			CAN END > PIN 43	0	29	A16d.GND_FI1			NOT USED	0	69
A16d.24V	/49.E3		SUPPLY	0	30	A16d.GND_FI2			NOT USED	0	70
A16d.GND	/49.E4		SUPPLY EARTH	0	31						
A16d.24V V_DO1			SUPPLY DO1	0	32						
A16d.24V DO1			NOT USED	0	33						
A16d.24V			NOT USED	0	34						
A16d.24V			NOT USED	0	35						
A16d.24V V	/62.A1		Vcc GRIP SENSOR	0	36						
A16d.24V			NOT USED	0	37						
A16d.24V			NOT USED	0	38						
A16d.24V			NOT USED	0	39						
A16d.GND			NOT USED	0	40						

TYPE: L58 L586
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LIEBHERR BISCHOFSHOFEN
GENERAL OUTLAY INPUT MODULE 4
SIDE: 97 107
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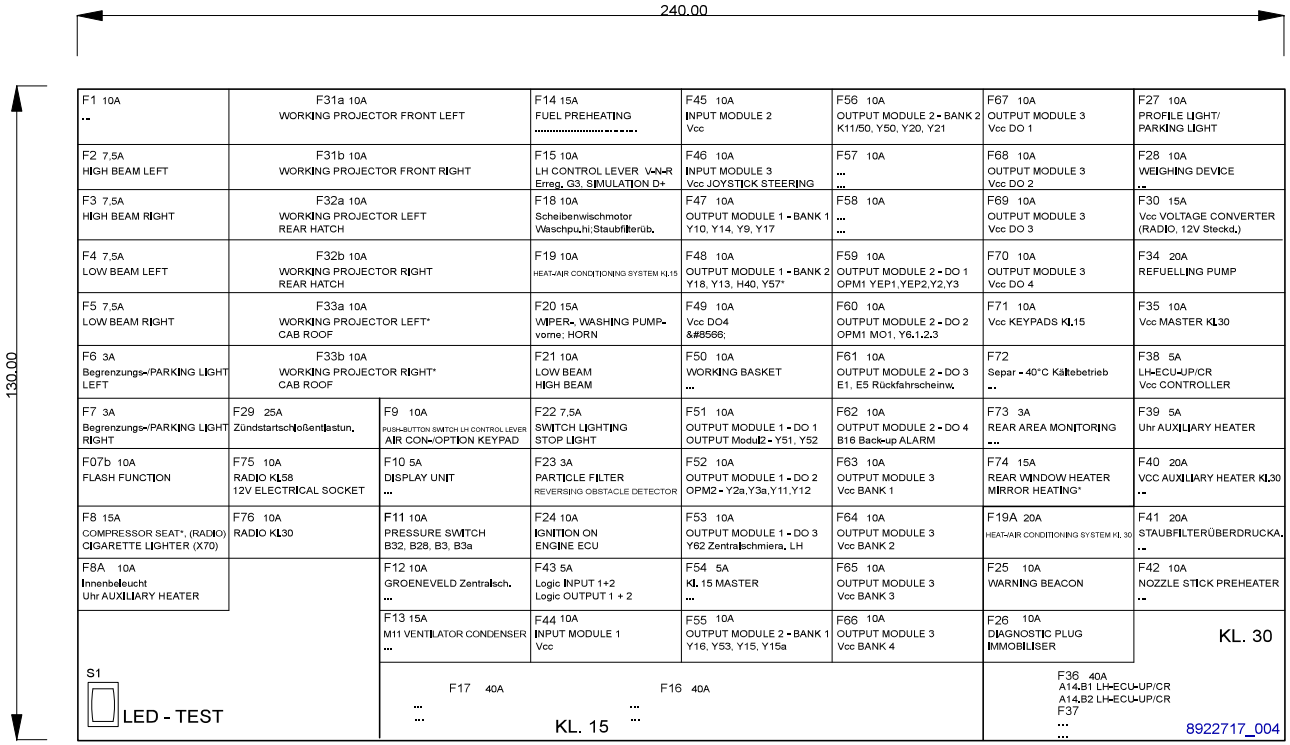
TEXT: BLACK RAL 9005
BASE: WHITE RAL 9002

MATERIAL: ADHESIVE FOIL nach DELIVERY INSTRUCTION

DELIVERY INSTRUCTION 10020148

DIMENSIONS: 240 mal 130

ID 8922717
ZNG 460 6300 70 004



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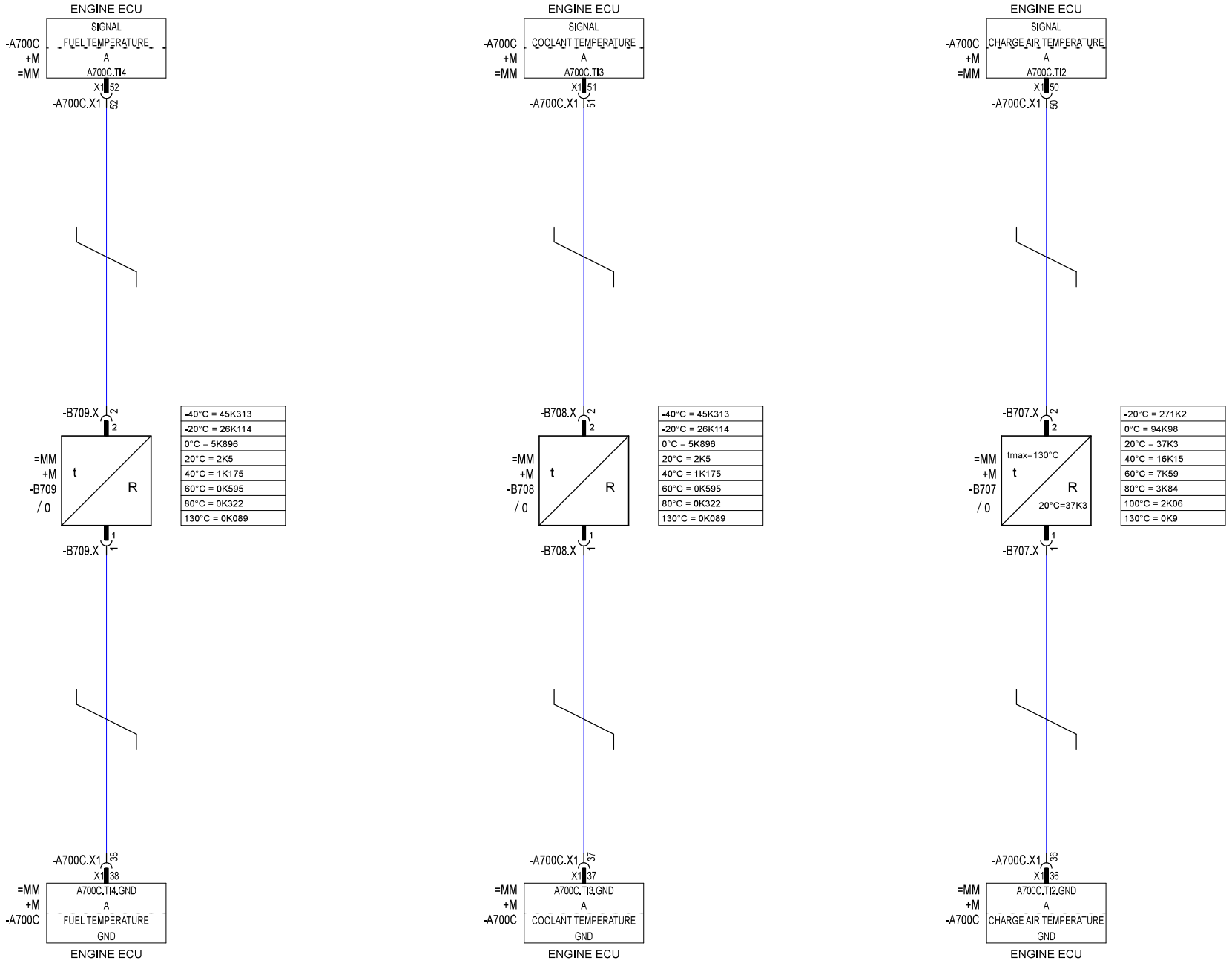

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10.1 Electrical components

10.1.1 Electrical components in the cab

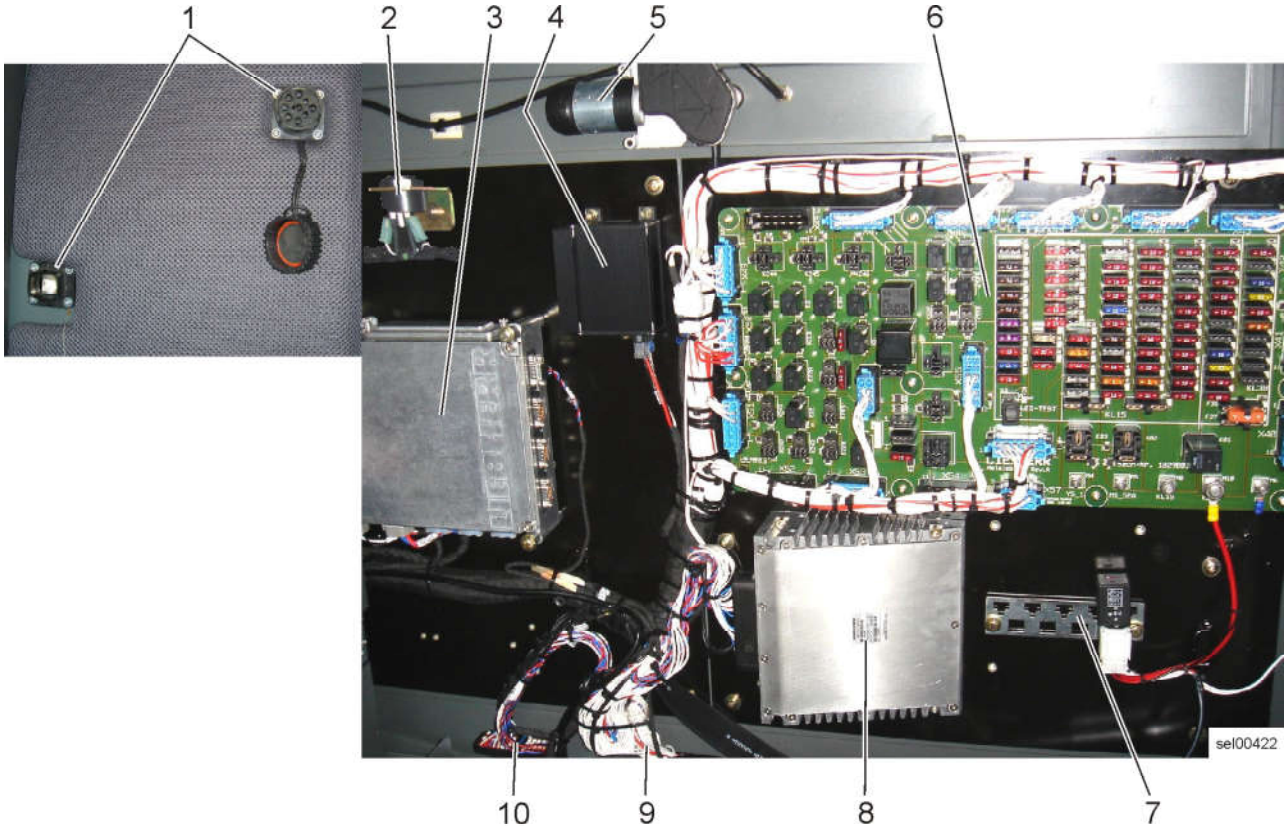
The main electrical/electronic components are located on the cab rear wall

Design

The following components are fitted on the cab rear wall:

- Fuse and relay board
- Voltage converter
- Main electronics (master)
- Input module
- Warning buzzer
- Diagnostic plug
- Optional components

The electrical and electronic components are mounted under the covering on the cab rear wall.



Components on the rear cab wall

1 Diagnostic plug
2 Warning buzzer H40 (behind cover)
3 Main electronics (master) A15
4 Voltage transformer T1
5 Rear wiper motor M3
6 Relay and fuse board A4
7 Relay base fixing (optional)
8 Input module 2 A16b
9 Connector X1
10 Connector X2

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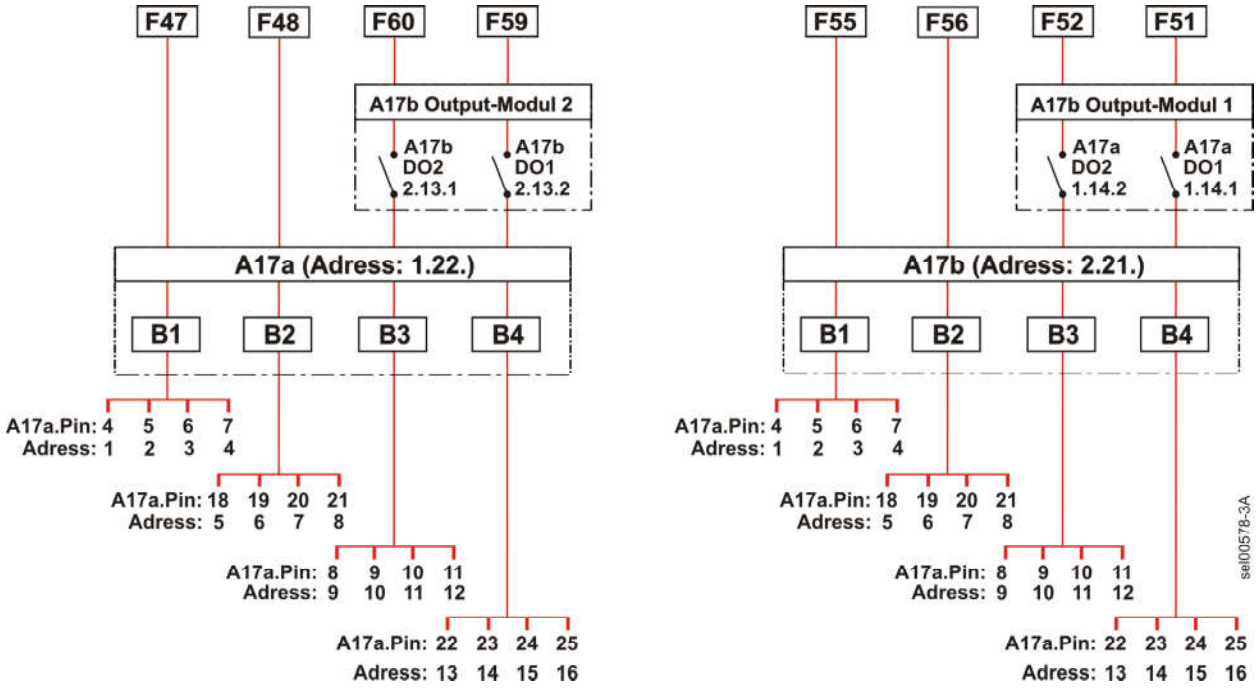
Supply to the banks

Each bank supply is designed so that it can withstand a permanent load of 13 A. Each bank is protected by a 10 A safety fuse.

Each output module has four banks. Each bank consists of four output stages for actuating the consumers



Supply to the banks

BMK	Description
Address	Address as per machine software
A17a	Output module 1
A17b	Output module 2
B1	Bank 1
B2	Bank 2
B3	Bank 3
B4	Bank 4
D01	Digital output 1 of output module
D02	Digital output 2 of output module

BMK	Status
F47	Supplying bank 1 fuse (A17a)
F48	Supplying bank 2 fuse (A17a)
F60	Supplying bank 3 fuse (A17a)
F59	Supplying bank 4 fuse (A17a)
F55	Supplying bank 1 fuse (A17b)
F56	Supplying bank 2 fuse (A17b)
F52	Supplying bank 3 fuse (A17b)
F51	Supplying bank 4 fuse (A17b)

Bank 3 **B3** and bank 4 **B4** of output module 1 **A17a** and Bank 3 **B3** and bank 4 **B4** of output module 2 **A17b** are monitored for reasons of safety. Banks 3 and 4 are supplied with power by a preset output module. This circuit ensures the power supply is interrupted if one of the banks malfunctions.

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11 Transmission

Chapter contents

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11.2 Electronic control unit

11.2.1 Main electronics (master)

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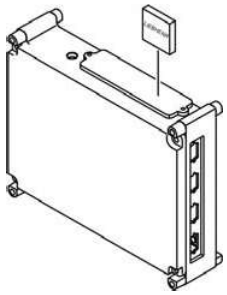

Main electronics (master)

For a detailed description of the main electronics (master), see section 10.1.3.

Design

The main electronics (master) are attached to the rear trim of the cab under a plastic cover and contains a flash card with the current machine software.

Function description

Basic function

The main electronics (master) is the “brain” of the machine control system.

The main electronics (master) controls and monitors all connected CAN or external modules.

The application software in the main electronics (master) strictly follows the following time cycles:

– Fetch all input data from the CAN/external modules
– Perform all calculations in the application software with the input data; calculate the output data
– Generate output data for connected external/CAN modules, which convert the commands into actions (for example activating a solenoid valve via one of the output modules)

A laptop can be connected to the master via a serial interface.

Using the SCULI software, the service engineer can make settings, perform diagnosis and view operating data in the main electronics.

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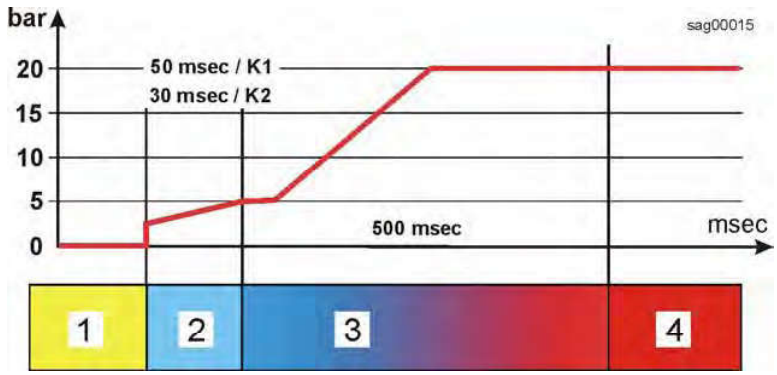


Increase in coupling pressure during gear shifting

1 Travel range preselection
2 Rapid fill phase
3 Modulation phase
4 Shifting complete

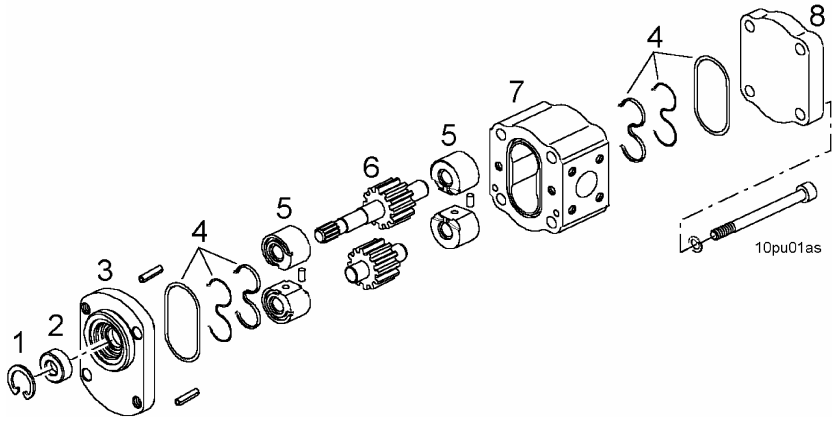
The above graph shows how the pressure changes during a gearshift. The complete shifting operation only takes around 200 milliseconds, and can therefore not be recorded using conventional test equipment.

11.3.2 Gear pump

Technical data

See section 2.1

Design



Components of the gear pump

1 Snap ring
2 Shaft seal ring
3 Flange
4 Seals
5 Bearing bushings
6 Gears
7 Housing
8 Housing cover

The gear pump is attached to the front of the engine. It is driven at a set ratio via the spur gear transmission of the engine.

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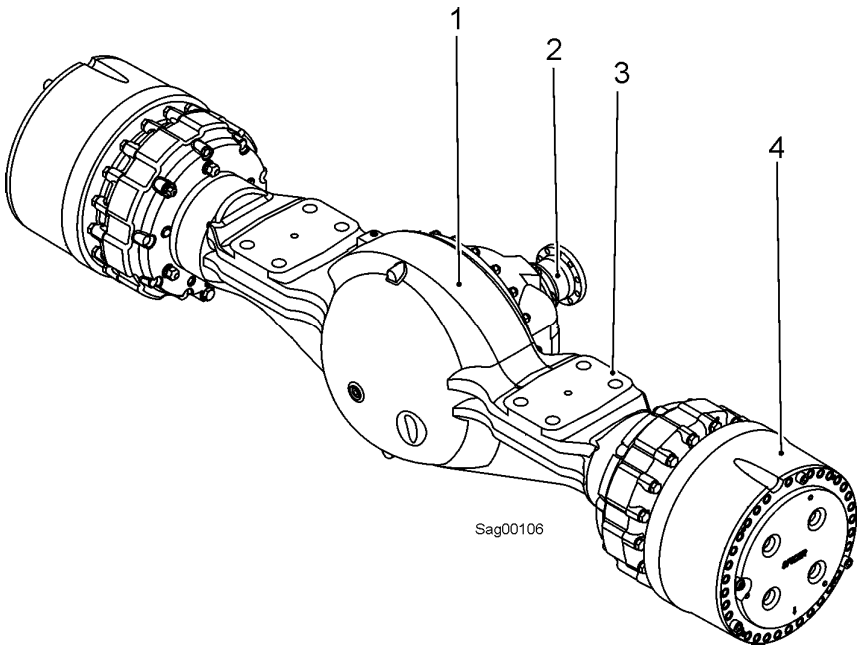
12.2 Front axle

Valid for: ***L586****-461 / 17650 – 33595*

Technical data

See section 2.1

Design



Main components of the axle

1 Self-locking differential
2 Drive shaft flange
3 Axle casing
4 Wheel hub

The axle consists of the differential with the tapered gear and self-locking differential **1**, the axle casing **3** and the planetary drive in the wheel hub **4**. The wheel hub also contains the service brake, which is a wet disc brake. The axle casing **3** contains the tapered roller bearing for the wheel hubs.

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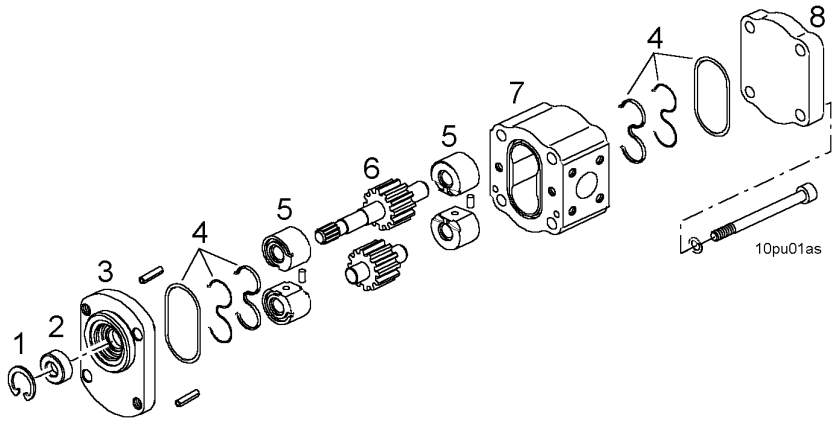
12.4.1 Flushing circuit gear motor

Technical data

See section 2.1

Design



Flushing circuit gear motor components

1 Snap ring
2 Shaft seal ring
3 Flange
4 Seals
5 Bearing bushings
6 Gears
7 Housing
8 Housing cover

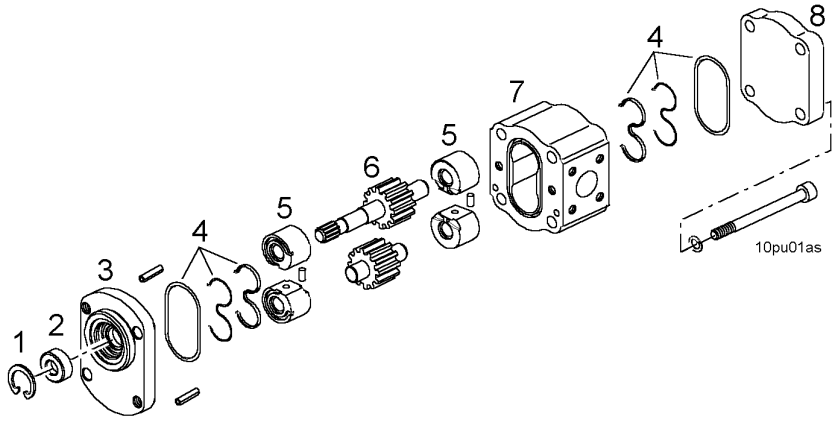
The flushing circuit gear pump is driven by the oil returning from the compact brake block. It drives the flushing circuit gear pump of the front axle via a mechanical connection.

12.4.2 Flushing circuit gear pump

Technical data

See section 2.1

Design



Flushing circuit gear pump components

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13 Machine frame, Ballast weight

Chapter contents

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13.5 Ballast weight

Technical data

See section 2.1

Design

The ballast weight consist of two parts. They are bolted on the left and right sides on the back of the rear section.

Ballast weight layout

1 Left rear section

2 Right rear section

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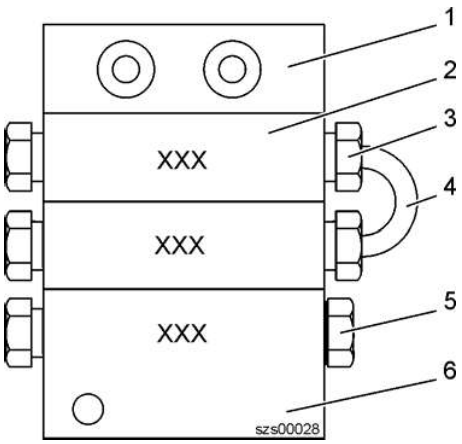


Secondary progressive distributor

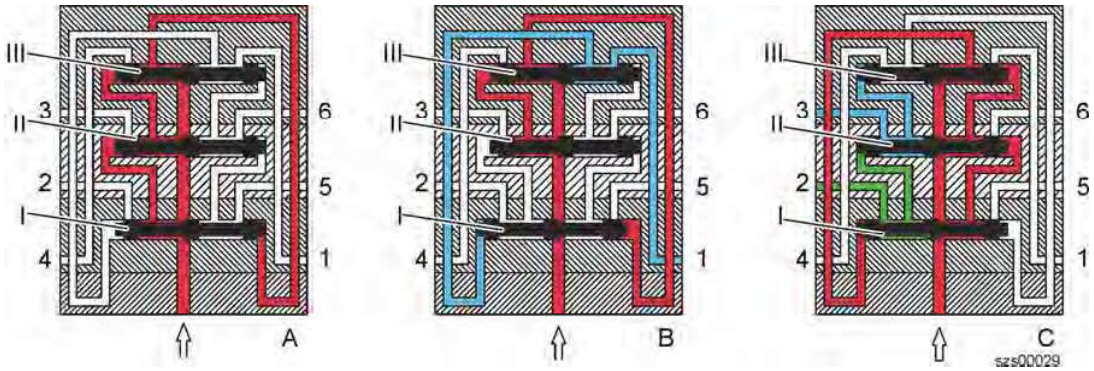
1 Start element (without piston)
2 Middle element with flow engraved
3 Screw connection
4 Connecting line
5 Dummy plug
6 End element

Linkage with gears connects the elements to the distributor blocks.

O-rings are installed as seals between the elements.

Function description

Basic function



Piston positions of the progressive distributor MX-F

A - C Piston positions
I - III Pistons
1 - 6 Grease duct outlets

The progressive distributors act hydraulically and distribute the lubricant in series to each outlet.

The lubricant flows via the entrance of the distributor through all the distributor discs to the piston I (piston position A). The piston pushes to the left and presses the lubricant out of the left pressure chamber of the piston to the outlet 1 (piston position B). Pistons II and III then pump the lubricant to the outlets 2 and 3.

After piston III moves, the lubricant flows to the left side of piston I (piston position C). The piston I pushes to the right and presses the lubricant out of the right pressure chamber of the piston to the outlet 4.

Pistons II and III then pump the lubricant to the outlets 5 and 6.

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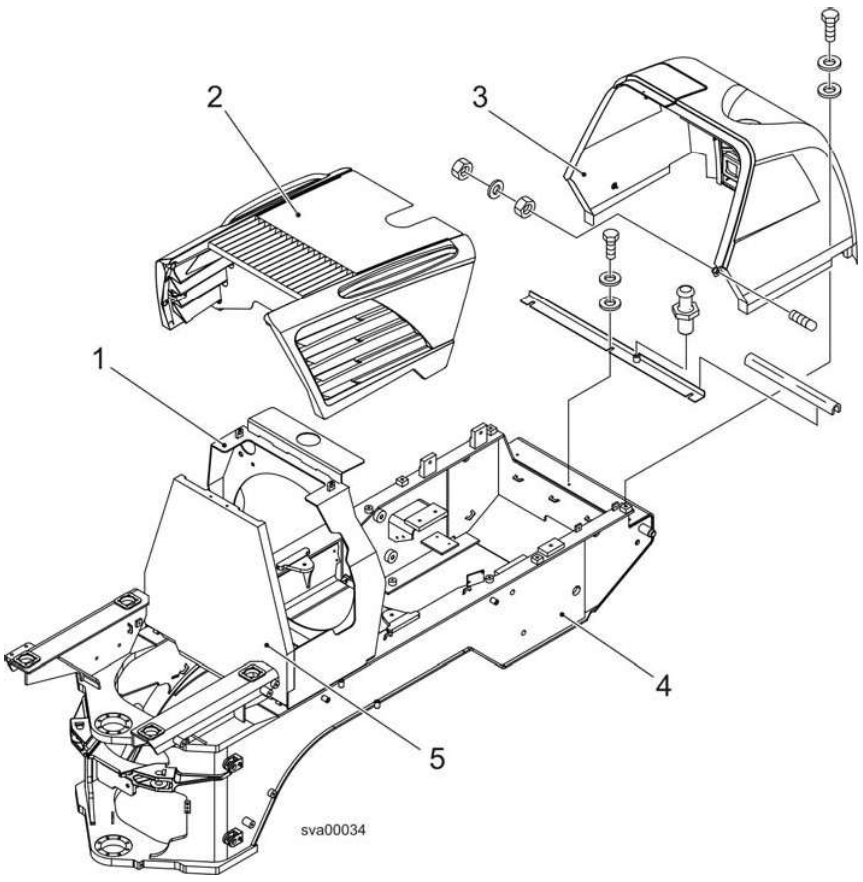
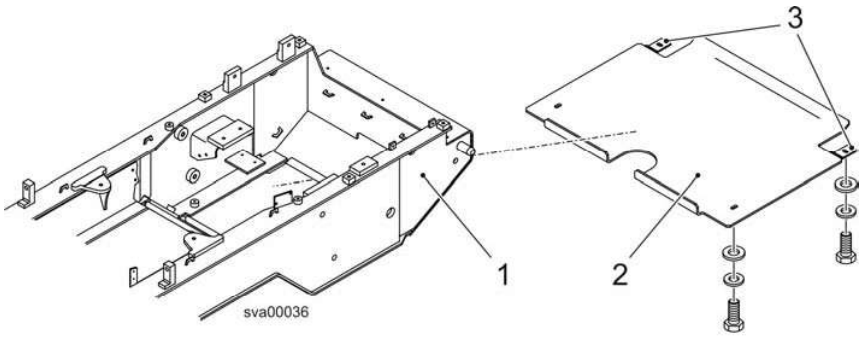


Engine hood and rear section

1 Cooler support
2 Engine hood
3 Rear cover
4 Rear section
5 Cooler panel

The engine hood 2 is fastened to the cooler support 1 with two screws. The hood can be lifted up with the aid of two gas-filled springs. The rear cover 3 is fastened to the rear section of the machine 4 with four bolts.



Rear lower covering

1 Rear section
2 Cover
3 Hinge

The cover 2 is fastened to the underside of the rear section 1 with four bolts and can be opened downward via the hinge 3.

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16.1 Display unit A13 (LCD)

All important operating, display and control elements are arranged ergonomically on the instrument panel.

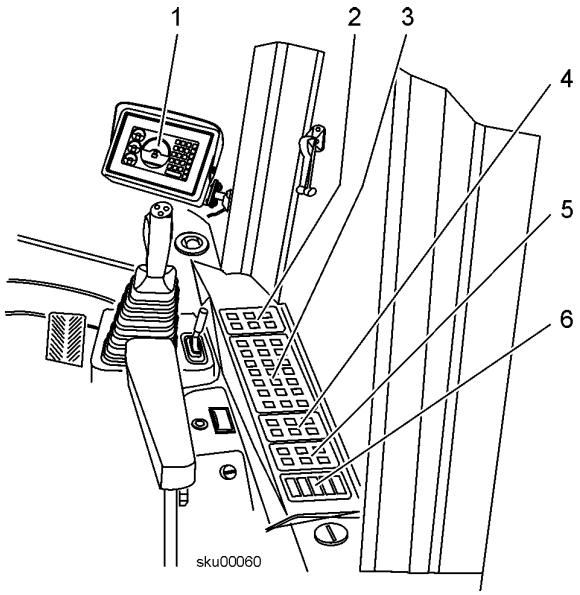
The display unit 1, which indicates the operating condition of the wheel loader, is located in the upper field of view, slightly to the right of centre.

The LH control lever is in a separate console, which can be adjusted back and forth using a foot pedal.

The controls are arranged in the right-hand control panel.

The fuses are on the left behind the driver's seat.

Design



Instrument panel

1 Display unit A13 (LCD)
2 Electrical control unit A18
3 Main control unit CAN bus A11
4 Air conditioning control unit CAN bus A22
5 Additional functions control unit CAN bus (optional) A19
6 Switch for additional options

16.1.1 Display unit A13 (LCD)

The display unit A13 is on the front right A pillar.

Design

The display unit A13 consists of:

– LCD indicators
– Symbol fields
– Segment displays

The LCD display 21 contains segment displays for:

– Clock
– Service codes
– Engine speed
– Service hours

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Both are indicated by the LC display (H34) and the symbol field N (H32).

The travel direction switch 5 must be moved to neutral N after the parking brake is released before a travel direction can be preselected.

Switching travel direction

You can switch travel direction using the button 5 on the LH control lever.

The solenoid valves for forward and reverse travel direction can only be activated after the parking brake is released.

The travel direction is shifted to neutral by closing the parking brake or shifting the travel direction switch to neutral N (middle position).

Kick-down shifting

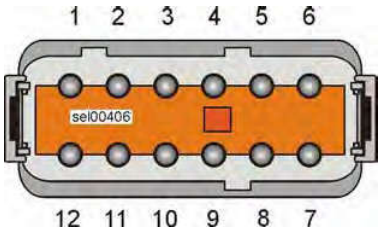
Briefly touch the Up button 2 to trigger the command to shift to 1st gear.

The gear can shift up 10 seconds after the kick-down button is released.

Additional function buttons (optional)

If an option is installed or retrofitted, the buttons 3 and 4 can be used to operate it.

Plug assignment



Connector S2

12-pin Deutsch

1 Power supply (+) F15
2 Reverse travel direction constant signal
3 Reverse travel direction switching signal
4 Forward travel direction switching signal
5 Forward travel direction constant signal
6 Earth
7 Kick-down switching signal
8 Kick-down power supply (+) F9
9 Additional equipment power supply (+) F9
10 Additional equipment switching signal
11 Additional equipment power supply (+) F9
12 Additional equipment switching signal

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Function description

How the heater works

The heating and air conditioning control electronics (A21) are connected via CAN bus to the heating/air conditioning control unit.

The heat exchanger is supplied with hot water from the engine cooling system.

It is regulated using an electrically controlled water valve.

The water valve controls the heating power.

The intake air can be controlled using the fresh/recirculated air flap.

The airflow is regulated using the various blower speed levels on the heating/ air conditioning system.

When the air conditioning is in automatic mode, the speed levels are automatically controlled by the heating/air conditioning control electronics.

Flap control

The driver can set the flaps manually as required, using the heating/air conditioning control unit.

When the air conditioning is in automatic mode, the flaps are automatically controlled by the heating/air conditioning control electronics.

16.3.2 Blower

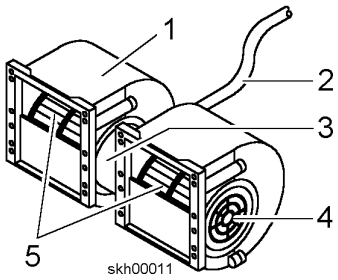
The blower is part of the heating and ventilation unit.

Design

The blower is a 6-speed radial fan for ventilation, heating and air conditioning in the cab.

Function description

Basic function



The blower sucks air (axial intake) 4 through the fresh/recirculated air duct and blows it out of the radial outlet 5 to the evaporator and through the heat exchanger.

The air flow is regulated by changing the blower speed.

It is operated and regulated using the air conditioning control unit. At level 0 the blower is switched off. Level 6 is maximum air flow.

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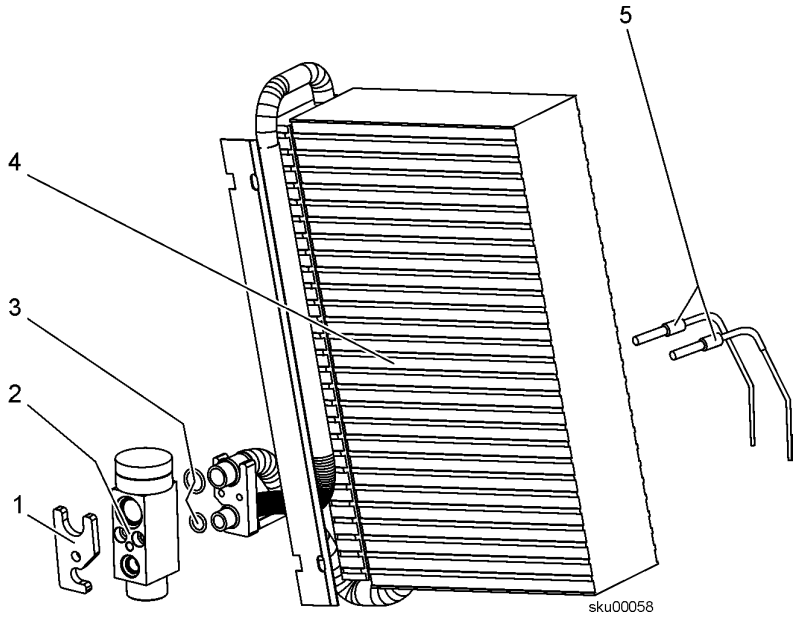
16.4.5 Evaporator

Technical data

See section 2.1

Design



Evaporator with expansion valve

1 Hose fitting holder
2 Expansion valve
3 Air conditioning system sealing rings
4 Evaporator
5 Temperature sensors B26, B26a heat exchanger (anti-icing mechanism)

The evaporator is fitted in the heater/air conditioner and is part of the refrigerant circuit. The heating/air conditioning unit is housed in the right side of the cab.

Function description

Basic function

The evaporator is a heat exchanger which cools the cab air.

The pressurised refrigerant, which is cooled and liquefied by the condenser, is sprayed through the expansion valve 2 into the evaporator 4, where there is a vacuum.

The drop in pressure allows the refrigerant to expand. The expansion causes a great drop in the thermal energy. The refrigerant is cooled.

The thermal energy taken from the cab air via the fins on the evaporator 4 evaporates the refrigerant.

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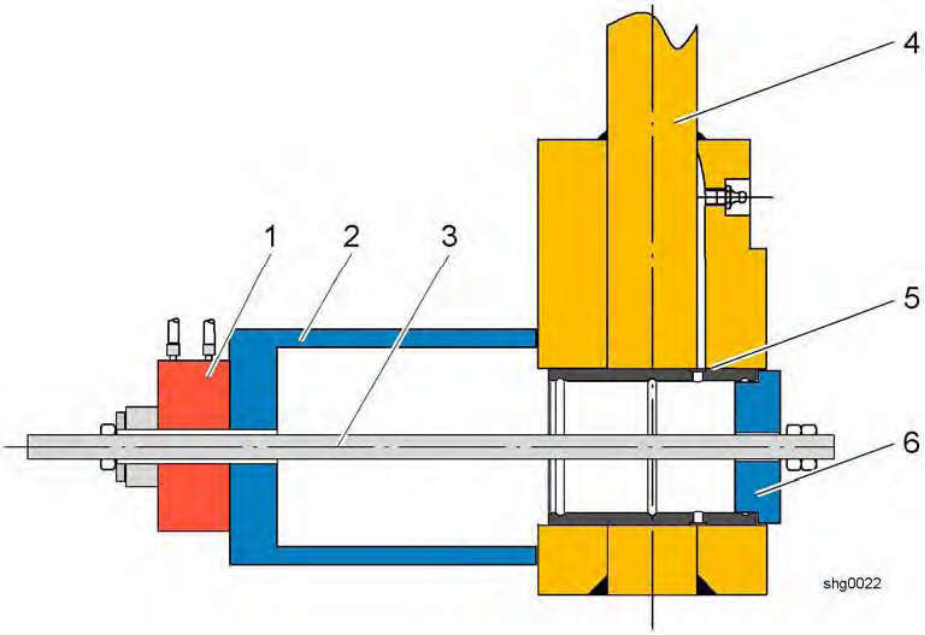
Pushing out the bushing using the extraction device

You can push out all the bushings on the lift arms using the appropriate pushing tool. Position a steel washer in the bushing, flush and slightly below centre. Use a threaded rod and a hydraulic ram to push the bushing out of the hole.

Procedure

- Assemble the hydraulic ram 1, the pusher 2, the threaded rod 3 and the pushing washer 6 (illustrated).



Pushing tool

- Fix the threaded rod with a nut.
- Carefully push the bushing out of the hole.

There are two ways to fit a new bushing:

– Using a press
– By shrinking it using liquid nitrogen

Caution

Be very careful when handling liquid nitrogen.

If using liquid nitrogen, carefully follow the safety instructions for handling it.

! Read and follow the safety instructions.

17.2.5 Assembling the bucket bearing

Make sure that:

– The holes in the bucket are lined up with the holes in the arm
– All parts to be assembled are clean

Procedure

- Prepare the pin bearing seal.

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19 Service Codes, Diagnose

Chapter contents

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CRITICAL This kind of malfunction is accompanied by a 1-second warning tone

Service code	Effect	Cause	Remedy
CA02C	The entire control system has been shut down due to a critical error.	Invalid correction values found in the memory.	Turn the ignition off and on again; the correction check sum is automatically corrected.
CA047	The entire control system has been shut down due to a critical error.	Invalid correction check sum	Turn the ignition off and on again; the correction check sum is automatically corrected.
CA048	The entire control system has been shut down due to a critical error.	Invalid retain value check sum	Turn the ignition off and on again; the retain variable check sum is automatically corrected.
C205A	The entire control system has been shut down due to a critical error.	A critical error in a CAN module caused the system to shut down.	Turn the ignition off and on again; if the problem persists, replace the CAN module according to the error stack.
C205C	The entire control system has been shut down due to a critical error.	A critical error in a CAN module caused the system to shut down.	Turn the ignition off and on again; if the problem persists, replace the CAN module according to the error stack.

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ERROR This kind of malfunction is accompanied by a 1-second warning tone

Service code	Effect	Cause	Remedy
E4035	No fan reversal available	Fan reversal: interruption at output	Fan reversal solenoid valve Y50, check wiring, output module 2 or fuse F56
E4036	No ride control available	Ride control: short circuit at output	Ride control solenoid valve Y20, check wiring, output module 2 or fuse F56
E4037	No ride control available	Ride control: interruption at output	Ride control solenoid valve Y20, check wiring, output module 2 or fuse F56
E4038	No ride control and float position available	Float position / ride control: short circuit at output	Float position/ride control solenoid valve Y21, check wiring, output module 2 or fuse F56
E4039	No ride control and float position available	Float position / ride control: interruption at output	Float position/ride control solenoid valve Y21, check wiring, output module 2 or fuse F56
E403A	Only reverse travel possible	Forward travel direction (pump 2): short circuit at output	Forward travel solenoid valve Y2a, check wiring, output module 2 or fuse F52
E403B	Only reverse travel possible	Forward travel direction (pump 2): interruption at output	Forward travel solenoid valve Y2a, check wiring, output module 2 or fuse F52
E403C	Only forward travel possible	Reverse travel direction (pump 2): short circuit at output	Reverse travel solenoid valve Y3a, check wiring, output module 2 or fuse F52
E403D	Only forward travel possible	Reverse travel direction (pump 2): interruption at output	Reverse travel solenoid valve Y3a, check wiring, output module 1 or fuse F52
E403E	Additional equipment 1 cannot be activated	Additional equipment 1: short circuit at output	Additional equipment 1 solenoid valve Y11, check wiring, output module 2 or fuse F52
E4040	Additional equipment 2 cannot be activated	Additional equipment 2: short circuit at output	Additional equipment 2 solenoid valve Y12, check wiring, output module 2 or fuse F52
E4042	No joystick steering available	Joystick steering, left: short circuit at output	Joystick steering left proportional valve Y51, check wiring, output module 2 or fuse F51
E4044	No joystick steering available	Joystick steering, right: short circuit at output	Joystick steering right proportional valve Y52, check wiring, output module 2 or fuse F51
E4046	No Gyrator steering (2-in-1) available	Gyrator steering (2-in-1): short circuit at output	Gerotor steering solenoid valve Y63, check wiring to output module 2 or fuse F51
E4047	No Gyrator steering (2-in-1) available	Gyrator steering (2-in-1): interruption at output	Gerotor steering solenoid valve Y63, check wiring to output module 2 or fuse F51
E4048	No joystick gyrator steering (2-in-1) function	Output module 1: return voltage measured at control output bank 4 although it is not activated - wiring or module 2 defective	Output module 1 pin 33, check wiring to module 2, output module 2 or fuse F47

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ERROR Motor This kind of malfunction is accompanied by a 1-second warning tone

Service code		Effect	Cause	Remedy
A700	Master 4			
3010.06	E497CE	The error that occurred cannot be displayed	Internal error – error index too high	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.00	E4982C	Engine cannot be started, or engine shut down	Error accessing EEPROM Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.01	E4982D	Engine cannot be started, or engine shut down	Parameter memory check sum fault Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.02	E4982E	Engine cannot be started, or engine shut down	Invalid parameter memory in EEPROM Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.03	E4982F	No direct effect	ECU page check sum fault Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.04	E49830	No direct effect	NMI page check sum fault Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.05	E49831	No direct effect	Work data page check sum fault Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.06	E49832	No direct effect	Load collective check sum fault Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.07	E49833	No direct effect	Load collective structure value has changed Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.08	E49834	No direct effect	EEPROM does not have enough space for the load collective Internal engine control unit error	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3011.09	E49835	No direct effect	Permanent data check sum fault	Turn the ignition off and on again; if the problem persists, replace the ECU A700D engine control unit.
3012.00	E49890	Engine cannot be started, or engine shut down	Supply voltage too low (<9V)	Check the on-board circuit (battery, alternator, wiring, connectors)
3012.01	E49891	Engine cannot be started, or engine shut down Communication only possible with diagnostic tools	Supply voltage too high (>33V)	Check the on-board circuit (battery, alternator, wiring, connectors)

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ERROR Motor This kind of malfunction is accompanied by a 1-second warning tone

Service code		Effect	Cause	Remedy
A700	Master 4			
3069.02	E4AED6	Engine shutdown	Injection system fault Injection overlap to bank B Distance between the current tooth and the next tooth on bank A is more than 540° crankshaft angle	Check the start and duration of injection
3069.03	E4AED7	No direct effect	Injection system fault High side short circuit to earth on bank A Excess high side PWM current on all injectors on bank A	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.04	E4AED8	No direct effect	Injection system fault High side short circuit to earth on bank B Excess high side PWM current on all injectors on bank B	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.05	E4AED9	No direct effect	Injection system fault High side short circuit to supply voltage on bank A Excess high side FREEcurrent on all injectors on bank A	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.06	E4AEDA	No direct effect	Injection system fault High side short circuit to supply voltage on bank B Excess high side FREEcurrent on all injectors on bank B	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.07	E4AEDB	No direct effect	Injection system fault Low side short circuit to earth on bank A On at least one injector on bank A Rise time too long or cannot be measured	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.08	E4AEDC	No direct effect	Injection system fault Low side short circuit to earth on bank B On at least one injector on bank B Rise time too long or cannot be measured	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.09	E4AEDD	No direct effect	Injection system fault Low side short circuit to supply voltage on bank A On at least one injector on bank A Excess low side current, excess high side free current on all other injectors in this bank	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.11	E4AEDF	No direct effect	Injection system fault Low side short circuit to supply voltage on bank B On at least one injector on bank B Excess low side current, excess high side free current on all other injectors in this bank	Check the wiring harness, connectors, solenoid valve, ECU A700D engine control unit
3069.39	E4AEFB	Engine shutdown	Overspeed fault Overspeed from speed sensor 2 – safety limit exceeded	Check engine operation (overspeed due to thrust mode), check ECU A700D engine control unit

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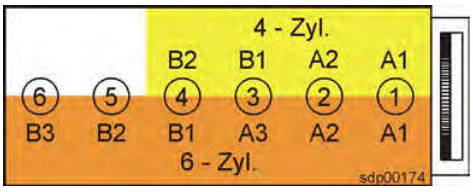
ERROR Motor This kind of malfunction is accompanied by a 1-second warning tone

Service code		Effect	Cause	Remedy
A700	Master 4			
3098.04	E4BA2B	Reduced power or no reaction, depending on the configuration and sensor	Coolant temperature sensor fault Monitoring threshold 1 exceeded or fallen below; medium no longer in normal operating state	Check the medium for range violation; repair any mechanical problems
3098.05	E4BA2C	Reduced power or no reaction, depending on the configuration and sensor	Coolant temperature sensor fault Monitoring threshold 2 exceeded or fallen below; medium no longer in normal operating state	Check the medium for range violation; repair any mechanical problems
3099.00	E4BA8C	Replacement sensor value is used. The error disappears when the measured value is in the defined range	Internal temperature sensor fault Signal line shorted to earth	Check the wiring and the ECU A700D engine control unit / sensor
3099.01	E4BA8D	Replacement sensor value is used. The error disappears when the measured value is in the defined range	Internal temperature sensor fault Short circuit to supply voltage or signal line broken.	Check the wiring and the ECU A700D engine control unit / sensor
3099.02	E4BA8E	Replacement sensor value is used. The error disappears when the measured value is in the defined range	Internal temperature sensor fault Signal line shorted to supply line	Check the wiring and the ECU A700D engine control unit / sensor
3099.03	E4BA8F	Replacement sensor value is used. The error disappears when the measured value is in the defined range	Internal temperature sensor fault Signal line shorted to supply line voltage	Check the wiring and the ECU A700D engine control unit / sensor
3099.04	E4BA90	Reduced power or no reaction, depending on the configuration and sensor	Internal temperature sensor fault Monitoring threshold 1 exceeded or fallen below; medium no longer in normal operating state	Check the medium for range violation; repair any mechanical problems
3099.05	E4BA91	Reduced power or no reaction, depending on the configuration and sensor	Internal temperature sensor fault Monitoring threshold 2 exceeded or fallen below; medium no longer in normal operating state	Check the medium for range violation; repair any mechanical problems

4- and 6-cylinder engines - Cylinder description:



Cylinder description

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