

Service manual

Hydraulic excavator
R9350

from serial number 30617

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Type: R9350
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Conformity:



Address

Liebherr-Mining Equipment Colmar SAS
49 rue Frédéric Hartmann

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Beginning with a material thickness of $\frac{1}{4}$ " (8mm), butt welds must be made in several layers. The weld is applied in several beads. Wide butt welds are filled with several side beads, with the last layer covering the center. The electrode should melt evenly without creating burrs and peaks. The valley or crater, which is created when changing electrodes must be filled in and overlapped with the next electrode. To prevent cracks in those craters, care must be taken that they are properly filled.

If the crack extends towards the outer edge of the material (pos. C), slag may be trapped or burn holes may be created. To prevent this, the following aid may be used : tack a piece of sheet of metal to the outer edge of material.

The welding seam begins now at the sheet metal in the direction of the arrow (pos. C). After the welding is completed, the sheet metal is removed and the edge of the material is ground smooth. The weld must cool off slowly and should therefore be protected from rain and wind.

4.3.3 Reinforcement of the welding seam

If the crack of the material is due to an overload or abuse, a reinforcement plate should be welded over the crack. The selection of the correct reinforcement plate is based on the construction and load factors of the component to repair.

For this reason, only general recommendations can be made as to the size and shape of the reinforcement plates.

4.3.4 General application of reinforcement plates

Shape of reinforcement plates

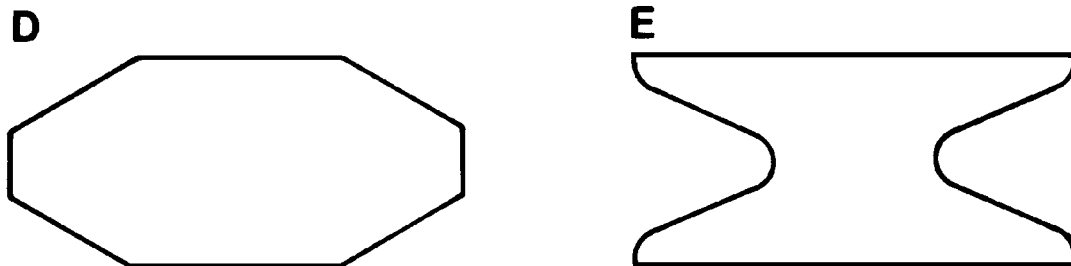


Fig. 5 *shape of reinforcement plates*

The crossover or connection between the reinforced and not reinforced part should be as gradual as possible. This means that the size of the plate should be selected in such a way that new or unacceptable high stress in the repaired parts are avoided. Plates with sharp corners (such as a rectangular plate) should not be used.

Suitable reinforcement plate with high tensile strenght (pos. D).

Suitable reinforcement plate against bending and alternating loads (pos. E).

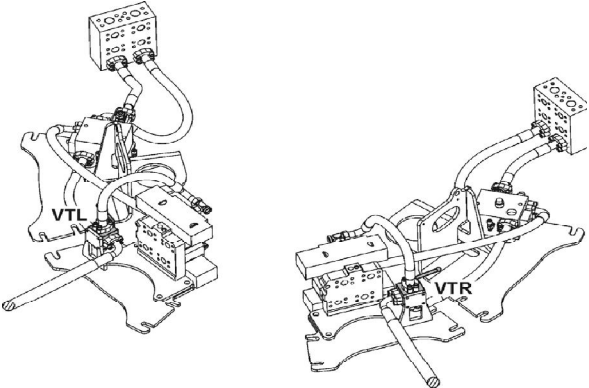
Plate thickness

The thickness of the reinforcement plate should be up to $\frac{2}{3}$ (66%) of the thickness of the material to be reinforced.

Plate quality

The yield and tensile strenght of the reinforcement plate should be equal to the material to be reinforced.

Plate installation

	Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
is n		Follow tag-out and lockout procedure		Out-of-service tag	☐
s r e n- uit s- p- -	May have confusion due to uppercarriage position Pressure remaining.	Activate both valves on both side to visually check which is correct. Make sure the hydraulic accumulator is depressurized after activating shut off valve SVTL or SVTR.			☐

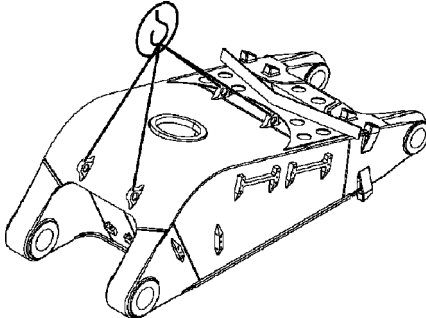
ment is large and heavy. It is mandatory that all work be done in a safe manner.
out a procedure, always check with your supervisor before proceeding.

Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
Weight Slipping Crushing fingers Stripping	Require help as needed. Lift the hose if needed Clean as you work Wear safety gloves, keep fingers clear Avoid letting the hose slide on the ground when moving it.		PPE	☐
	If the component may be under pressure again (still linked to the oil circuit), plug with steel cap and seals bolted to the right torque. Else a plastic plug will be sufficient to avoid oil leaks and dirt contaminating the inside of the component.			☐

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 procedure, always check with your supervisor before proceeding.

Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
Hydraulic and electric energy	Ensure hydraulic pressure released and isolator turned off		PPE Out-of-service tag	☐
Working at height falling object 	Use harness and manlift		Manlift Harness	☐
Personnel injury when attachment is moving 	Keep visual contact with operator			☐
Leaks	Keep personnel clear			☐
Personnel still working on machine Leaks Heavy attachment in movement 	Ensure ALL personnel clear Keep clear			☐
				☐

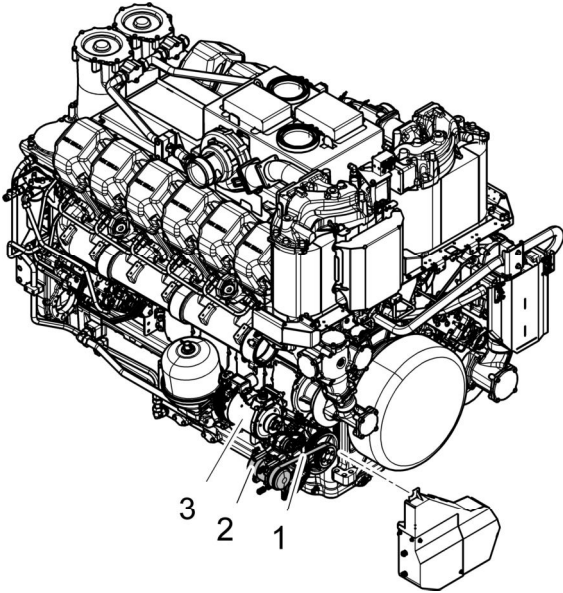
is large and heavy. It is mandatory that all work be done in a safe manner.
procedure, always check with your supervisor before proceeding.

	Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
on	Heavy attachment in movement Height Pinched fingers Crushing by crane in movement Weight of stick 	Keep clear Use harness and manlift Use correct lifting procedures and attachment See Service Manual, Technical Data for stick weight		Stick stands/wedges. Crane Slings Manlift Harness	☐
s-	Height Pinched fingers Suspended loads Pins falling Shims falling out Improper tool 	Use harness and manlift Keep fingers clear Use correct lifting procedures and attachment Keep clear See tool listing in service manual for LEC tool ident Ensure tool is in good condition		Crane Slings Pin-puller Manlift Harness	☐

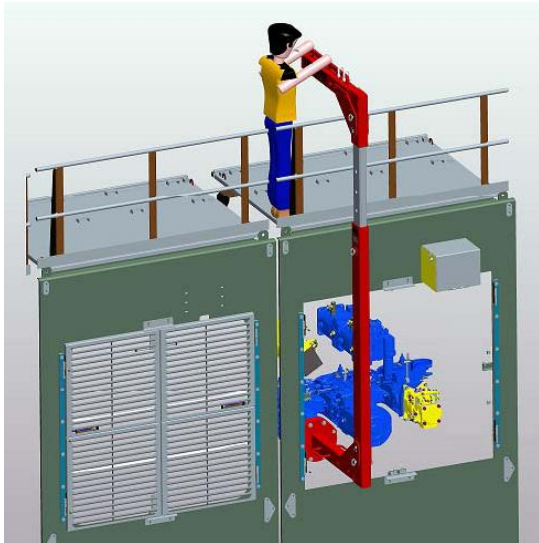
ment is large and heavy. It is mandatory that all work be done in a safe manner.
 out a procedure, always check with your supervisor before proceeding.

Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
Weight Weight Improper tool	Use harness and manlift See tool listing in service manual for LEC tool ident Ensure tool is in good condition		Harness Manlift Slings Crane Pin-puller support	☐
Lifting failing Weight Cylinder swinging Improper tool	Use correct lifting procedures and attachment Use rope guide to stabilize Use harness and manlift See tool listing in service manual for LEC tool ident Ensure tool is in good condition		Harness Manlift Pin-puller	☐

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procedure, always check with your supervisor before proceeding.

	Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
s- r- n- y.	Difficult access	Wear PPE			☐

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 out a procedure, always check with your supervisor before proceeding.

Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
Crushing Crushed fingers Falling Improper tool 	Keep clear of the tool Use harness Be careful Keep clear of the path of the tool when guiding it in position. Keep visual and/or radio contact with the crane operator. For tool configuration and use see Tool instruction manual It is mandatory to have read and understood the tool instruction manual before using it! See tool listing in service manual for LEC tool ident Ensure tool is in good condition		Pump Mounting Tool Tool in- struction manual PPE	☐

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procedure, always check with your supervisor before proceeding.

9 - Change main valve-bank

	Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
e-	Hydraulic and electric energy	Ensure hydraulic pressure released and isolator turned off		PPE Out-of-service tag	☐
	Weight Restricted area Residual pressure Oil spill Oil projection Slippery 	Require help as necessary Ensure pressure is exhausted Use oil spill kit Use safety glasses and safety gloves Clean as you work		PPE Spill kit	☐
o e es w-	Weight Oil spill Slippery 	Require help as necessary Clean as you work		Spill kit	☐

ment is large and heavy. It is mandatory that all work be done in a safe manner.
out a procedure, always check with your supervisor before proceeding.

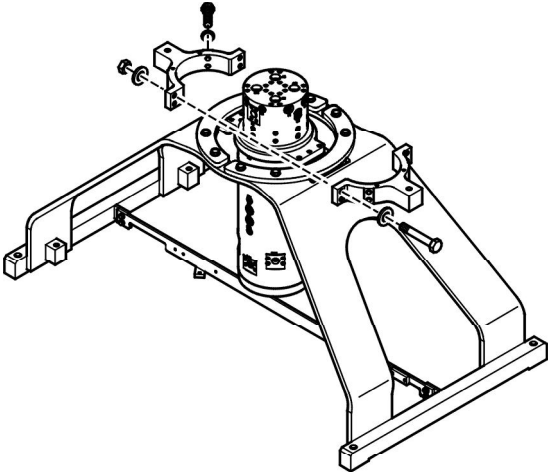
Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
				☐

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procedure, always check with your supervisor before proceeding.

9 - Travel-drive exchange

	Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
x-		If you only change the motors, it is not necessary to remove the track chain	   		☐
e-	Crane accessibility Falling objects Height High-pressure water Cleaning Fluid	Use scaffoldings Wear harness Use face mask and gloves	 	PPE	☐
26					☐

ment is large and heavy. It is mandatory that all work be done in a safe manner.
out a procedure, always check with your supervisor before proceeding.

Hazards identified	Precautions to be taken	Illustrations	Tools	Check Off
Restricted area Pinched fingers 	Wear PPE Keep fingers clear			☐
Oil projection Oil spill Slipping Height Weight	Ensure no pressure left Use oil spill kit Clean as you work Use harness Wear PPE Move the hoses with precaution			☐
Restricted area Pinched fingers Height 	Wear PPE Keep fingers clear		Crane Sling	☐

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procedure, always check with your supervisor before proceeding.

2 Component lifting

2.1 Lifting precautions

- ▶ Obey all lifting precautions given in the Operating manual (which is included in the chapter "Operating maintenance" of this Service manual).

2.2 Uppercarriage parts

2.2.1 Informations in Safe Work Procedures

For lifting information about the following parts, refer to the corresponding Safe Work Procedure in the chapter 2 of this Service Manual:

- diesel engine (6050kg wet),
- splitterbox (2150kg),
- hydraulic pumps;
 - double working pump (670kg),
 - combination swing pump (212kg),
 - double cooling pump (180kg),
- valve bank (3720kg complete with valve blocs, filters, accumulators and piping),
- swing gear (1175kg complete with motor and brake),
- battery box (complete with batteries).

2.2.2 Informations on transport drawings

For lifting information about the following parts, refer to the corresponding transport drawing given in the Operating manual (see chapter 4 "Operating maintenance" of this Service Manual):

- PowerPack,
- counterweight,
- rotating deck,
- hydraulic tank,
- fuel tank,
- cab,
- cab elevation.

2.2.3 Coupling

- outer member: 113kg / mass moment of inertia: 3,2kgm²
- inner member: 35kg / mass moment of inertia: 0,4kgm²
- ▶ Screw the lifting lungs in the threads indicated below.
- ▶ Do not lift total mass on one lifting appliance only.

Step	Description	Yes /No	Value	Tools and remarks
04	Check the B14 hydraulic oil level signal between pins 1 and 2 on X722 . Low level: 1000 Ohms.			Field Grade Capacitance Decade Box. X722 must be connected. If not, you have an error code.
05	Check and adjust air pressure sensor B38 at 0,2 bar with manual air outlet valve opened to atmosphere. Close valve when adjustment is completed.			Do this check only for sensor type of figure « B38 setting "1"». If B38 setting is "2", no check must be done.
06	Check the Y10_1 fan solenoid valve, with S23 and S74 on. Between pins 3 and 4 of X77 .			Multimeter You must read I=0mA on X77 , on A1019 in E1005 .
07	Check the Y10_2 fan solenoid valve, with S23 and S74 on. Between pins 1 and 2 of X77 .			S23 : «Manu» (control board) S74 : «Flow» (control board)

Hydraulic tank check	Check operated by	Signature
Date:		

3.6.6 Check of the service trap and the ladder



Caution!

As the service trap cylinder can contain air, the service trap can go down quickly.

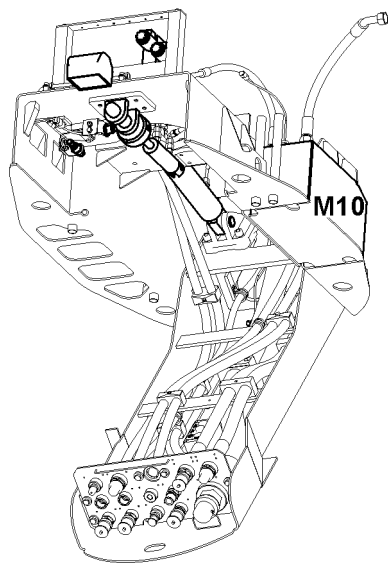


Fig. 15 Service trap

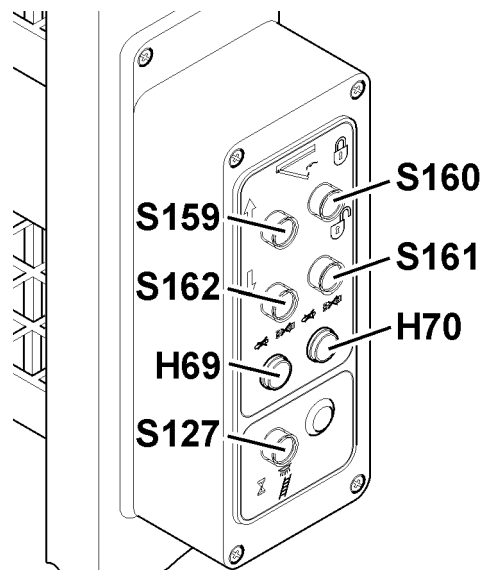


Fig. 16 E1022_2 connection box trap control

Step	Description	Yes /No	Value	Tools and remarks
01	Check the coding information displayed at ignition or in Menu «Info system».			It must match the machine model. Pay attention to the coding bridges on X1111 and to the coding plug.
02	Check the analog sensor values on the main screens: – B69/B71 (pressure P1/P2) – B50-1/B50-2 (level P1/P3) – B184 (pilot pressure)			Values must be between 3 and 21mA. If not, «- -» will be displayed. Precise values can be seen in Menu «Check» in service view.
03	Check the «Pause time» parameters for each pump.			Parameters can be adjusted in Menu «Set pause time» with green or red key.
04	Check «Set max pressure» parameters.			Parameters can be adjusted in Menu «Set max Press» with key (green or red) connected.
05	Check for active error codes and solve the errors.			Menu «Active error».
06	Check B69/B71 adjustment.			Refer to Fig. « B69/B71 adjustment for greasing system Version C».

Check of parameters Version C	Check operated by	Signature

Check of greasing function



Caution!

To do this check, diesel engine must run at least at 1400 RPM.

Step	Description	Yes /No	Value	Tools and remarks
01	Start a grease cycle for P1 .			Push « Cycle P1 » button. P1 state in «ON», on left display.
02	Check that the greasing time stops when pressure is at «max pressure».			Pressure must be at «max. pressure» before countdown is at 0s.
03	Check that P1 pause time is displayed.			P1 state is «OFF».
04	Make sure that there is no active error code.			Menu «Active error».
05	Do the steps 01 to 04 for P2 , if P2 is			

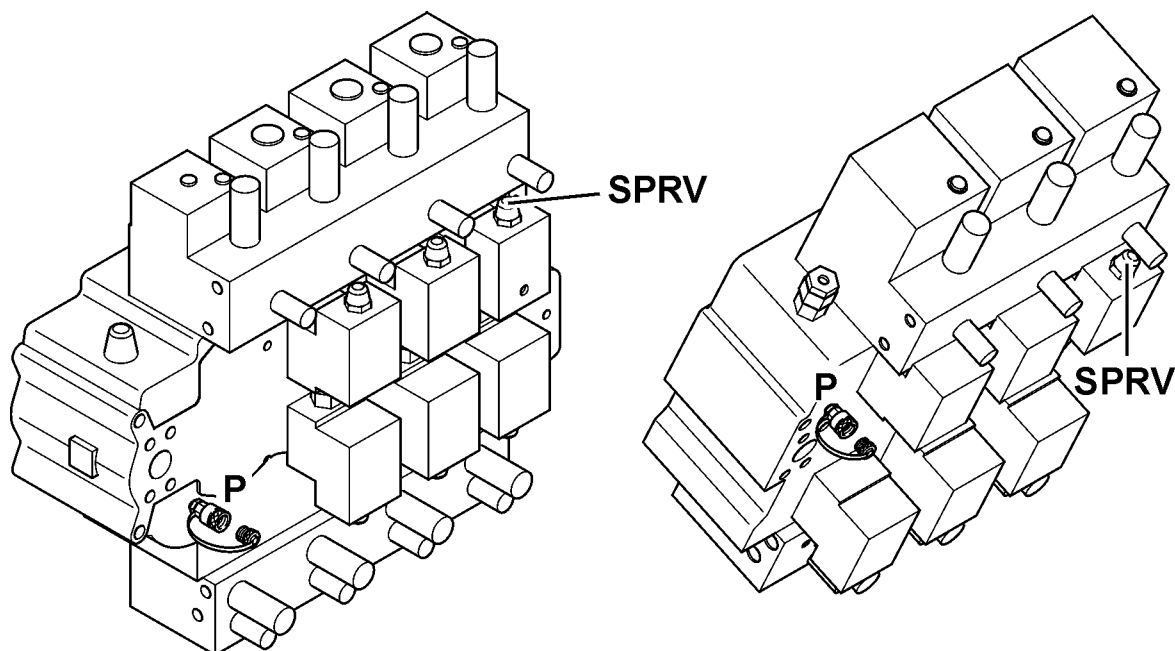


Fig. 46 Secondary valves adjustment on valve blocks **VBx**

To adjust the secondary valves on backhoe attachment:

- ▶ Install a 600 bar pressure gauge on the test point **P**.
- ▶ Disconnect the connector **X82** to deactivate the attachment proximity switches.
- ▶ Tighten completely the primary valve on the valve block and loosen by a quarter turn.
- ▶ Start the Diesel engine and set the engine speed to **1800 ±50 RPM**.
- ▶ Actuate the related movement and keep it actuated.
- ▶ Loosen the locknut and turn the adjustment screw **SPRV** until you get the correct pressure on **P**.
- ▶ Tighten the locknut.
- ▶ Connect back the connector **X82**.
- ▶ Adjust the primary valve again.

Standard adjustment

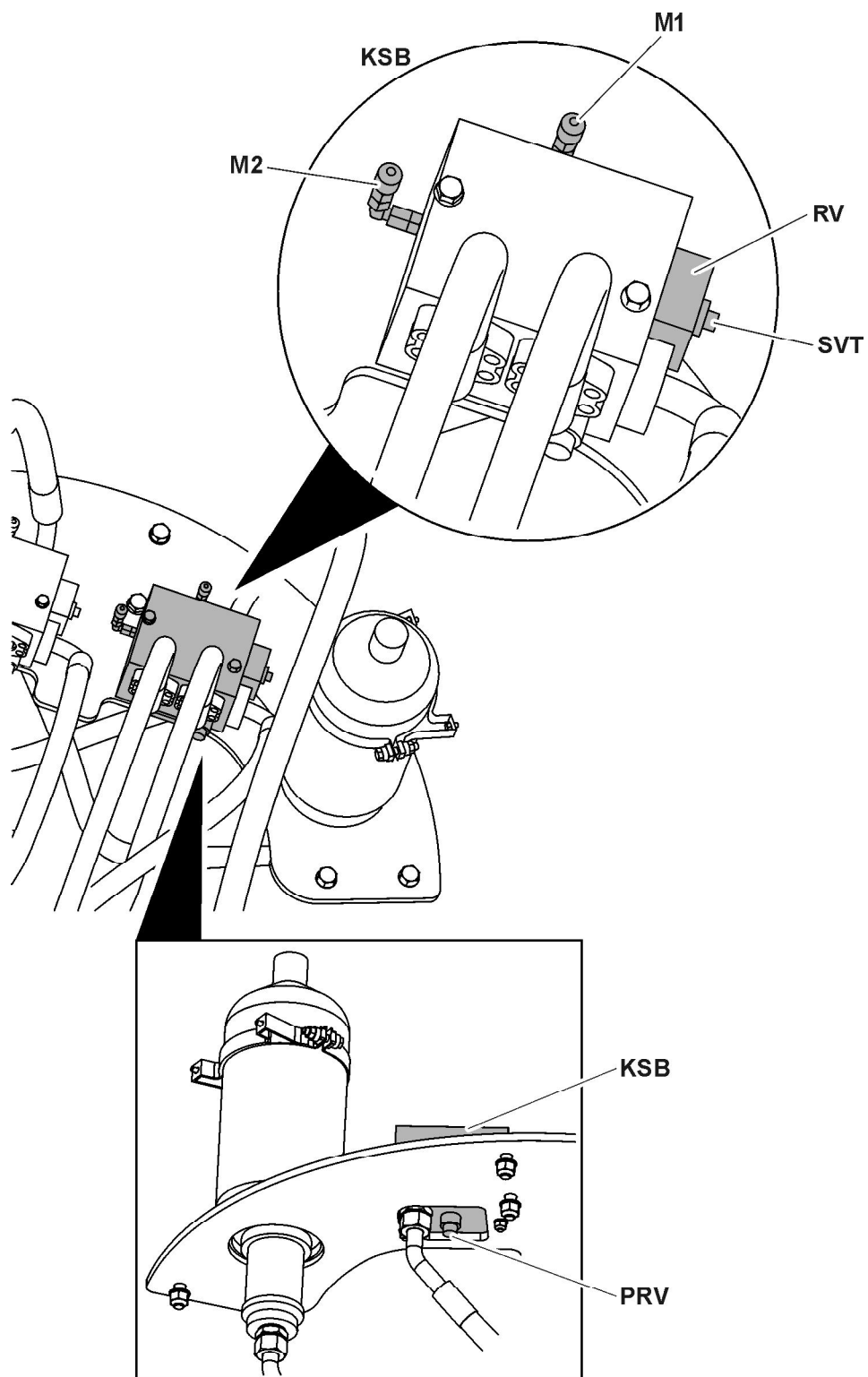
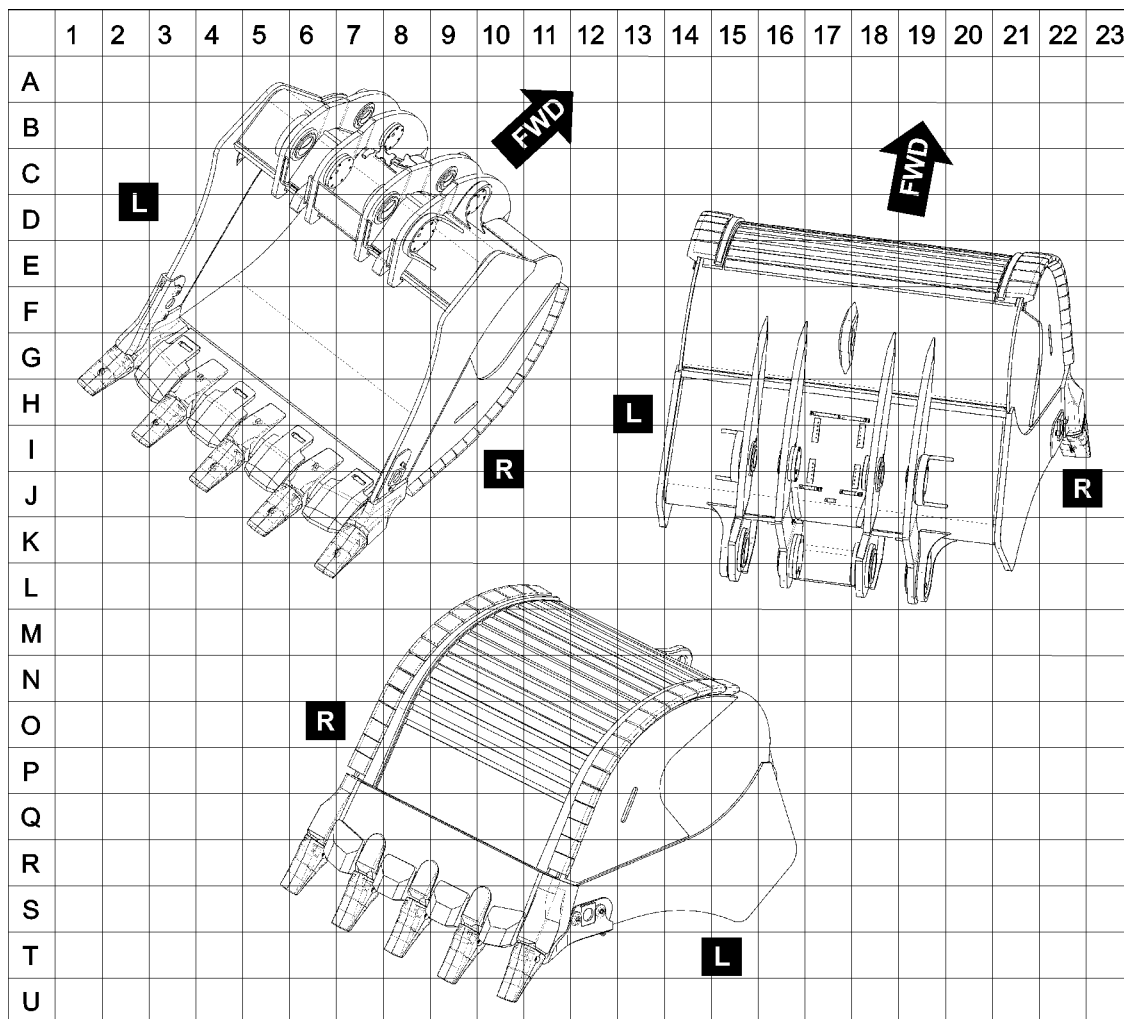


Fig. 71 Adjustment components on track tensioning block **KSB**

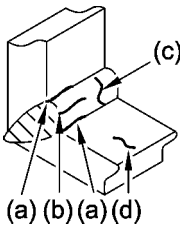
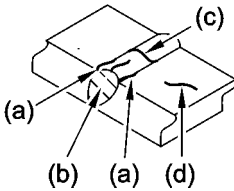
Structural inspection - Backhoe Attachment

Machine serial N°:	Machine hours:	Travel hours:	Completed by:	Date:
Bucket	Article N°:		Index N°:	
	Serial N°:		Component hours:	

► Find the defect coordinates on the grid and report them in the following table.



(Mark the following options: location a, b, c or d; defect longitudinal, perpendicular to the seam direction and/or on the plate or in another position.

Defect coordinates	Side of the defect(s) R or L	 	Details of the defect(s): (a),(b),(c),(d) or other	Picture N°

Do a description of the defect(s):

4.50: Operating manual



Reliability



Ready to Work When You Need It

With over 50 years of innovative thinking, engineering and manufacturing excellence, Liebherr sets the industry standard for advanced equipment design and technology tools to provide the most up-to-date product responding to the requirements of the mining customers.

task.

- Only use attachment or special tool approved by Liebherr.
- Only operate the attachment or the special tool with closed windshield and with a front protective grid.
- Only operate the attachment or the special tool with closed door.
- Do not clean the ground with the special tool.
- Make sure that the special tool works in its specified limits. For more information, also refer to the Operator's Manual of the tool manufacturer.

Safe use of a hydraulic hammer or a hydraulic ripper

- According to the severity of the application, the use of a hydraulic hammer or a hydraulic ripper can result in vibrations, shocks or stresses which are higher than in normal use. It may reduce the expected lifetime of structures and/or components.
- The hydraulic hammer or the hydraulic ripper must be selected with particular care. When using a hydraulic hammer or a hydraulic ripper not permitted by Liebherr, warranty for steel structures and machine components will be ceased.
- Before beginning breaking tasks, position the machine on firm and level ground.
- Use a hydraulic hammer or a hydraulic ripper designed exclusively for breaking stone, concrete and other breakable materials.
- Only operate the hydraulic hammer or the hydraulic ripper in the longitudinal direction of the machine and with the windshield closed or with a front protective grid.
- Ensure during hammer or ripper operation that no cylinder is entirely extended or retracted and that the stick is not in the vertical position.
- In order to avoid damages to the machine, try not to break stone or concrete while performing retraction and extension motions of the hydraulic hammer.
- Do not apply the hydraulic hammer uninterrupted for more than 15 seconds at a time to the same place. Change the breaking point. Too long uninterrupted operation of the hydraulic hammer leads to an unnecessary overheating of the hydraulic oil.
- Do not use the drop force of the hydraulic hammer or of the hydraulic ripper to break stone or other materials. Do not move obstacles with the hydraulic hammer. Misuse of this nature would damage both the hammer and the machine.
- Do not use the hydraulic hammer or the hydraulic ripper to lift objects.
- Before beginning breaking tasks, the pressure of the dampening accumulator of the hydraulic ripper must be adjusted depending on the nature of the ground and the excavator model.

Safe use of a ripper

- Rippers are generally used in applications where the use of a bucket is not efficient to break out rocks. Thus, these applications are more severe than in normal use.
- According to the severity of the application, the use of a ripper can result in vibrations, shocks or stresses which are higher than in normal use. It may reduce the expected lifetime of structures and/or components.
- Special hydraulic devices can be necessary. Contact the Liebherr customer service.
- The ripper must be selected with particular care. When using a ripper not permitted by Liebherr, warranty for steel structures and machine components will be ceased.



S14 – Windshield wiper

- ▶ Press button.
 - ↪ Intermittent setting is activated.
 - ↪ LED I in the button illuminates.
- ▶ Press button again.
 - ↪ Continuous operation is activated.
 - ↪ LED C in the button illuminates.
 - ↪ LED I in the button goes out.
- ▶ Press button again.
 - ↪ Windshield wiper is switched off.
 - ↪ LED C in the button goes out.

In addition, the break time for the intermittent setting can be adjusted:

- ▶ Select the intermittent setting and keep the button depressed.
 - ↪ After a few seconds, LED I in the button will start blinking rapidly.
- ▶ Release the button when the blinking duration has reached the desired break time. Adjustment is possible between 2 and 9 seconds.



S17 – Swing brake

- ▶ Press button.
 - ↪ Swing brake is engaged.
 - ↪ Upper carriage is locked.
 - ↪ LED in the button illuminates.
- ▶ Press button again.
 - ↪ Swing brake is released.
 - ↪ LED in the button goes out.



S18 – Overload warning device (optional)

- ▶ Press button.
 - ↪ Overload warning device is activated.
 - ↪ LED in the button illuminates.
- ▶ Press button again.
 - ↪ Overload warning device is disabled.
 - ↪ LED in the button goes out.
- ☐ No overload warning device is built in.
- ▶ Press button.
 - ↪ The symbol for "No overload warning device is present" appears on the monitoring screen.



- ↪ LED in the button illuminates.
- ▶ Press button again.
 - ↪ The symbol for "No overload warning device is present" goes out.
 - ↪ LED in the button goes out.



S19 – No function

IDLE TIME**Idle time setting menu**

In this menu, you can set the time interval for the automatic idling function.



Fig. 3-27 Idle time setting menu

To set the time interval:

- ▶ Press the **Down** or **Up** arrow key to set the time interval.

To exit the menu:

- ▶ Press the **Back** button to save the value and/or exit the menu.



Setting the evaporator blower speed manually

- ▶ Press button 5.
 - ↪ Blower speed manual setting is activated.
 - ↪ Indication bar 13 appears on display 19 and indicates currently set blower speed.
 - ↪ Automatic mode symbol 12 disappears from display 19.
 - ↪ Manual blower mode symbol 14 blinks on display 19 for 5 seconds.
- ▶ During these 5 seconds, evaporator blower speed can be increased with button 2 or decreased with button 3 in steps of 10%.
- ▶ Press button 5 twice.
 - ↪ Manual mode is deactivated.
 - ↪ Symbols 13 and 14 disappear from display 19.
 - ↪ Automatic mode is reactivated.
 - ↪ Symbol 12 reappear on display 19.



Switching ON/OFF the heating mode

- ▶ Press button 7.
 - ↪ Heating mode is activated.
 - ↪ Symbol 15 appears on display 19.
- ▶ Press button 7 again.
 - ↪ Heating mode is deactivated.
 - ↪ Symbol 15 disappear from display 19.



Fresh air / recirculated air mode

- ▶ Press button 8.
 - ↪ Control unit switches from fresh air to recirculated air mode.
 - ↪ Fresh air flap is closed.
 - ↪ Symbol 9 appears on display 19.
- ▶ Press button 8 again.
 - ↪ Control unit switches from circulated air to fresh air mode.
 - ↪ Fresh air flap is open.
 - ↪ Symbol 9 disappear from display 19.

Switching the temperature unit from °Celcius to °Fahrenheit

- ▶ Press and hold button 8.
- ▶ Press button 3 additionally.
 - ↪ Temperature unit indication 18 switches over into °Fahrenheit.
- ▶ Repeat same procedure to switch back temperature unit indication to °Celcius.

↪ The machine will be braked.

When the pedals for the drive units are in the neutral position, the hydrostatic drive prevents the machine from rolling off.

In the neutral position, the parking brake will be applied automatically after a few seconds. The work equipment can, however, still be moved.

Actuating a travel pedal again will disable the travel brake.



Caution!

Disengaging the pedals quickly causes the machine to halt abruptly.

- ▶ Before starting the machine, always fasten the safety belt.



The travel brake can also be directly actuated by using button **S354**.

- ▶ Press button.
 - ↪ Travel brake is engaged.
 - ↪ Undercarriage is locked.
 - ↪ LED in the button illuminates.
- ▶ Press button again.
 - ↪ Travel brake is disabled.
 - ↪ Undercarriage is unlocked.
 - ↪ LED in the button goes out.



Note!

If the travel brake has been activated by using the button **S354**, the only way to disable the travel brake is to press **S354** again. I.e. actuating the travel pedals won't have any effect.

3.4 Working with the machine

Working safely with the machine

- Before you start working, acquaint yourself with the special features of the job site and any special precautions and warning signals. Examples of particular work environments would be on-site or traffic obstructions, the load-carrying capacity of the ground and any requirements to make the job site safe from public use.
- Always maintain a safe distance from overhangs, edges, slopes and unsafe ground.
- Be particularly careful in conditions of reduced visibility and changeable ground conditions.
- Familiarize yourself with the location of power and gas lines on the job site and take particular care when working near them. If necessary, inform the responsible authorities.
- When working in areas with underground lines (gas, electricity), adhere to the laws, regulations and rules applicable at the place of use.
- Maintain a safe distance from electrical aerial lines. Do not allow the attachment to come near cables when working near electrical aerial lines. Risk of fatality! Inform yourself about required safety distances.
- The following actions must be carried out in the event of any transfer of electricity:
 - do not move the machine or its attachment
 - do not leave the driver's cab,
 - warn any personnel in the vicinity not to come close to the excavator and

- always ensuring that the contact surfaces between the flatbed trailer and the load carried are free of dirt, ice, snow, oil and grease.

Additional lashing precautions for backhoe buckets

When you lash the backhoe bucket, also obey the precautions that follow:

- Only use the lashing points shown in the stickers placed on the bucket.
- You can use the bucket teeth as lashing points.
- Be careful about the position of the center of gravity of the bucket.
- Wedge the bucket during transport.
- The bucket has two possible transport positions. The height B1 gives the correct transport position as shown in the transport drawing.
- If the height B1 is more than 3,6 m, turn over the bucket safely.

Additional lashing precautions for shovel buckets

When you lash the shovel bucket, also obey the precautions that follow:

- Only use the lashing points shown in the stickers placed on the bucket.
- You can use the bucket teeth as lashing points.
- Do not use the welded beam to lash the bucket.
- Be careful about the position of the center of gravity of the bucket.
- Wedge the bucket during transport.

Sticker for lifting and lashing operations

The following sticker is placed next to each transport drawing on the related part and package. It shows rules and precautions which you must obey for transport operations.

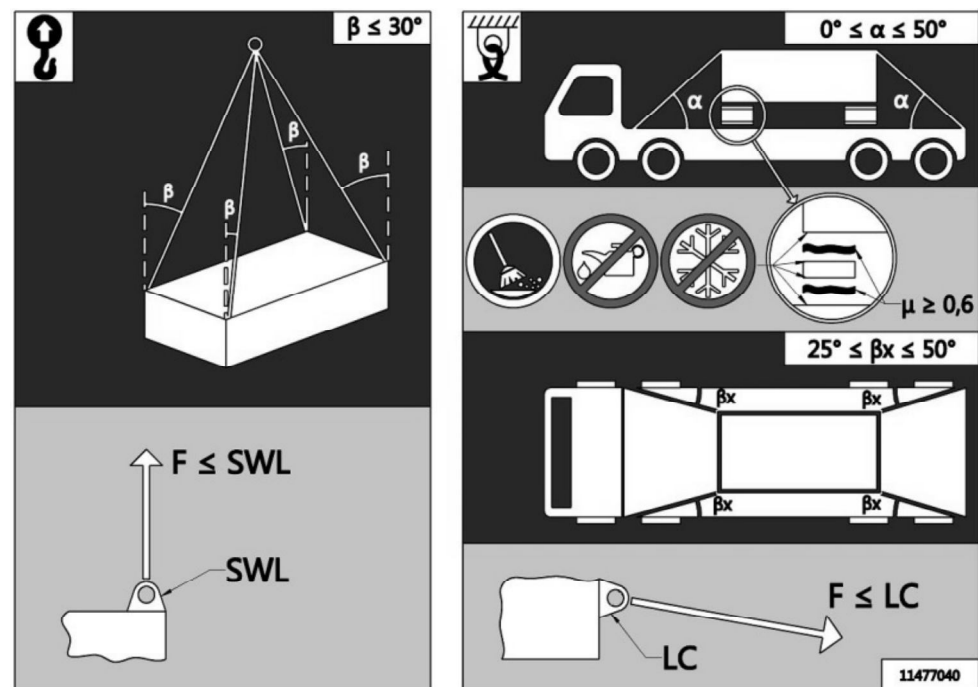


Fig. 3-89 Sticker for lifting and lashing operations

Error code	Possible cause	Measure
F11	Overheating sensor defective	Consult LIEBHERR customer service.
F12	Heater lock-out	Consult LIEBHERR customer service.
F13	Heater lock-out permanent	Consult LIEBHERR customer service.
F14	Blow out temperature sensor defective	Consult LIEBHERR customer service.
F15	Setpoint generator defective	Consult LIEBHERR customer service.
F16	Exhaust gas temperature exceeded	Consult LIEBHERR customer service.
F17	Exhaust gas temperature sensor defective	Consult LIEBHERR customer service.
F18	Setpoint sensor defective	Consult LIEBHERR customer service.
F19	Plausibility check for sensor not correct	Consult LIEBHERR customer service.

4.2 Faults and remedies

4.2.1 Diesel engine and fuel system

 Fault / error	 Cause	 Solution
Diesel engine does not start	Fuel tank almost or completely empty	Fill tank and vent fuel system
	Shut off valve closed	Open the shut off valve
	Fuel filter dirty	Clean or change filter and vent fuel system, drain fuel / clean tank
	Outside temperature below 0°C	For operation under specific climatic conditions, see operating instructions
	Starter motor not drawing through	Check line connections, overhaul starter motor
	Batteries have no power	Charge / replace

Designation	Medium	Symbol	Classification	Viscosity	Quantity*
Hinges, joints, locks	Engine oil	-	-	-	-
Rubber seal on doors and trim panels	Silicon spray or talc	-	-	-	-

Tab. 5-3 Lubricant chart

*The given quantities are only guidelines. Check fluid level after each change or refilling.

5.4.5 Operating material chart

Designation	Medium	Symbol	Quantity*
Fuel tank	See the Operation and Maintenance Manual for CUMMINS engine.		6908 l.
Engine coolant	Liebherr Antifreeze OS or see the Operation and Maintenance Manual for CUMMINS engine.		320 l.
Windshield washer system	Commercially available windshield washer fluid or denatured alcohol		75 l.
Standard air conditioning system	Refrigerating agent: R134a	-	7,5 kg
	Refrigerant oil in a new compressor: Sanden PAG SP-10	-	0,207 l.
	Refrigerant oil to add in the system after a compressor replacement: Sanden PAG SP-10	-	0,516 l.
	Refrigerant oil in the full system: Sanden PAG SP-10	-	0,723 l.
Additional air conditioning system (optional)	Refrigerating agent: R134a	-	4,8 kg
	Refrigerant oil in a new compressor: Sanden PAG SP-10	-	0,207 l.
	Refrigerant oil to add in the system after a compressor replacement: Sanden PAG SP-10	-	0,240 l.
	Refrigerant oil in the full system: Sanden PAG SP-10	-	0,447 l.

Tab. 5-4 Operating material chart

5.7 Diesel engine

- ▶ Refer to the CUMMINS operation and maintenance manual for detailed description of maintenance work to be performed.
- ▶ The engine manufacturer reserves the right to change information, specifications and maintenance guidelines in its manuals at any time. Thus, to make sure that you have the latest version of its documentation, contact your local representative of the engine manufacturer.
- ▶ In addition, accurately observe the following items and perform all maintenance work according to the intervals given in the control and maintenance chart.

5.7.1 Diesel engine oil level check

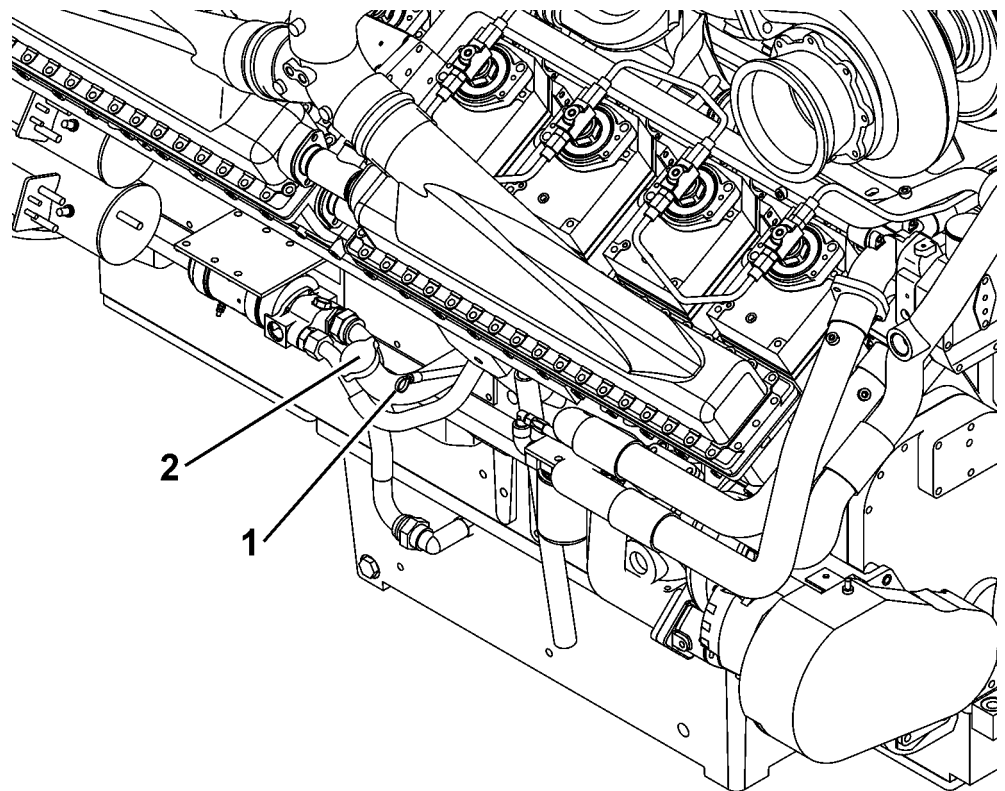


Fig. 5-20 Dipstick for engine oil level indication and oil filler neck

1 Dipstick

2 Oil filler neck



Danger!

Risk of burning.

The engine oil is hot when it is at operating temperature.

Avoid contact with hot oil and components containing oil, since it could cause severe burns.

- ☐ The machine must be standing level, parked in firm and level ground.

▶ Switch off the engine.

- ▶ Wait for a few minutes for the oil to drain to the oil pan.

Drain the air compartment

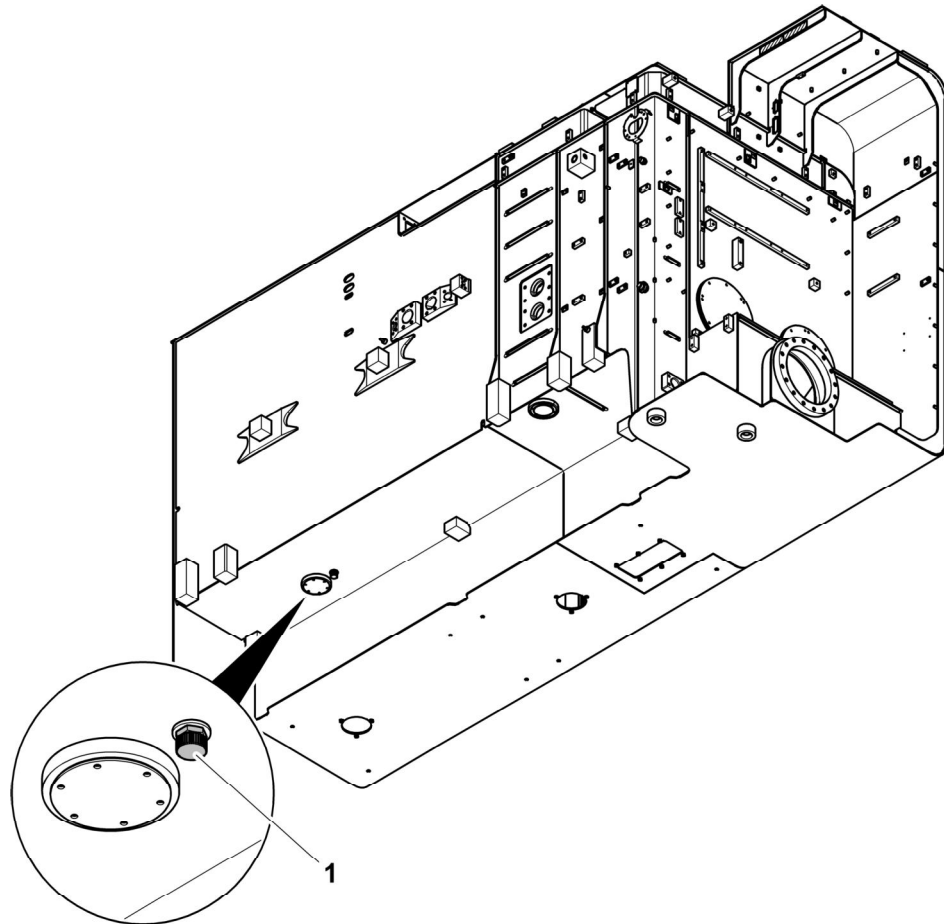


Fig. 5-46 Drain plug for the air compartment

1 Drain plug

- ▶ Stop the Diesel engine.
- ▶ Open the tank pressure release valve to release the pressure from the hydraulic system.
- ▶ Put an applicable container under the drain plug **1**.
- ▶ Remove the cap from the drain plug **1**.
- ▶ Attach a drain hose to the drain plug **1**.
- ▶ Drain the remaining oil from the air compartment into the container.
- ▶ Remove the drain hose.
- ▶ Install the cap back on the drain plug **1**.
- ▶ Remove the container.
- ▶ Close the tank pressure release valve.

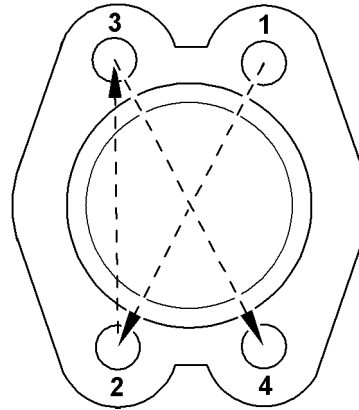


Fig. 5-72 Criss-cross tightening

- ▶ Make sure that all mounting surfaces have no damage, grease or contamination.
- ▶ Install the O-ring without grease in the groove of the hose fitting.
- ▶ Put the hose in position onto the mounting surface (be careful that you do not cause damage to the O-ring or remove the O-ring).
- ▶ Pre-install the flange and pre-tighten the mounting screws by hand.
- ▶ Tighten the screws progressively in a criss-cross pattern:
 - first to 50% of the prescribed torque value,
 - then to 100% of the prescribed torque value.
- ▶ Check the tightening torque clockwise.

5.15 Oil changes on components

5.15.1 General information

- ☐ The machine must be standing level.
- ▶ Switch off the engine.
- ▶ Wait briefly until the oil has collected in the oil sump.
- ▶ Drain off the oil (preferably when oil is at operating temperature)
- ▶ Add the oil.
- ▶ Check the oil level.

Oil quality and quantity: see lubricant chart.

Change intervals: see lubrication and maintenance chart.

The fans have to be free of dirt and damages.

5.18.4 Additional maintenance operations

- ▶ Check operation of evaporator blowers and condenser fans. All blowers have to be in working order in order to avoid air short circuit.
- ▶ Check electric installation.
- ▶ Check all hose fittings and couplings for leakage.
- ▶ Check setting and function of defrosting thermostat at the evaporator coil.
- ▶ Check compressor pressure switch. If the pressure at the compressor on the low pressure side is too high, the compressor pressure switch lights up an indicator lamps. This means that the compressor is not working well.

5.18.5 Additional cab heating system (optional)

Specific maintenance tasks are necessary for the additional cab heating system.

- ▶ For maintenance tasks description and maintenance intervals, refer to the control and maintenance chart.
- ▶ Start the additional cab heating system every month, independently of the season.

Air intake

The additional cab heating system has an air intake which is installed on the cab elevation.

The air intake has a protective grid to keep unwanted material out of the system.

WORK TO BE PERFORMED AT 250, 750, 1250 HOURS, ... Check ☐ for first and only interval or Check ☐ for repeat interval	Check	Initials	Comments
TRAVEL GEAR			
Do a visual check of the gear for leaks, if there are leaks, check oil level	☐		
UNDERCARRIAGE			
Do a visual check of all parts for damages and cracks If necessary fill out the "Structural Inspection" form in Service Manual - Chapter 4	☐		
ATTACHMENT			
Do a visual check of the bucket teeth and wear kit for wear	☐		
Do a visual check of the grease supply at each lube point	☐		
Do a visual check of cable harness and sensors for damage	☐		
Do a visual check of all parts for damages and cracks If necessary fill out the "Structural Inspection" form in Service Manual - Chapter 4	☐		
Do a visual check of the fastening of pin covers	☐		
Do a visual check of the non-slip surfaces for wear and damage	☐		
UPPERCARRIAGE			
Do a visual check of mirrors and cameras, clean and adjust if necessary	☐		
Do a visual check of the service trap for leaks or damage	☐		
Do a visual check of oil, grease or fuel for leaks	☐		
Do a visual check of the non-slip surfaces for wear and damage	☐		
SWING GEAR			
Do a visual check of the swing gears for leaks and oil level in expansion tanks	☐		
CENTRALIZED LUBRICATION SYSTEM			
Perform a complete daily maintenance given in the SKF / Lincoln Operating Instructions Manual	☐		
Do a check of the grease tank level	☐		
DIESEL ENGINE AND SPLITTERBOX			
Do a visual check in and around the engine compartment for leaks, contamination and damage	☐		
Check engine oil level	☐		
Sample and analyse engine oil (if the high-capacity oil pan is not installed)	☐		
Sample and analyse engine oil, change oil if necessary (if the high-capacity oil pan is installed)	☐		
Change oil in Diesel engine (if the high-capacity oil pan is not installed)	☐		
Replace engine oil filters (if the high-capacity oil pan is not installed)	☐		

WORK TO BE PERFORMED AT 2000, 4000, 6000 HOURS, ... Check ☐ for first and only interval or Check ☐ for repeat interval	Check	Initials	Comments
Do a visual check of the vacuum indicators for air filters clogging, clean or replace if necessary and reset the indicator	☐		
Do a visual check of the air channels in precleaner, clean if necessary	☐		
Replace primary element of the air cleaner (if necessary or at least once a year)	☐		
Replace safety element of the air cleaner if indicated (if necessary or at least once a year)	☐		
Do a sealing control of the air intake system	☐		
Do a visual check of the coupling for leaks	☐		
Check oil level in the splitterbox	☐		
Sample and analyse splitterbox oil	☐		
Change oil in the coupling	☐		
Change oil in splitterbox	☐		
Do a visual check of the splitterbox breather for clogging, replace if necessary	☐		
Replace filter in splitterbox breather	☐		
Do a visual check of the splitterbox input shaft seal or engine main rear seal for leaks	☐		
Do a detailed check of the engine and the splitterbox rubber buffers (replace if necessary and at least every 10000 hours)	☐		
Do a visual check of the starter motors, alternator and AC compressor for cables, and brackets	☐		
Do a visual check of the air intake hose for condition and leaks	☐		
Do a visual check of the coolers for clogging and damage, clean or replace if necessary	☐		
Do a visual Check of the radiator core and fan, clean if necessary	☐		
Do a visual check of the radiator cap for leaks, replace if necessary	☐		
Perform the complete "Daily" Maintenance Echelon given in the CUMMINS Operating and Maintenance Manual	☐		
Every 250hours or 6 months, perform a complete Maintenance Echelon given in the CUMMINS Operating and Maintenance Manual	☐		
See CUMMINS Operation and Maintenance Manual for other maintenance (Eliminator, Centinel, Fleetguard, valves and injectors adjustment)	☐		
Every 6000 hours or 2 years, perform a complete Maintenance Echelon given in the CUMMINS Operating and Maintenance Manual	☐		
Every 20000 hours, perform a complete "20000 hours" Maintenance Echelon given in the Geislinger (coupling manufacturer) Manual	☐		

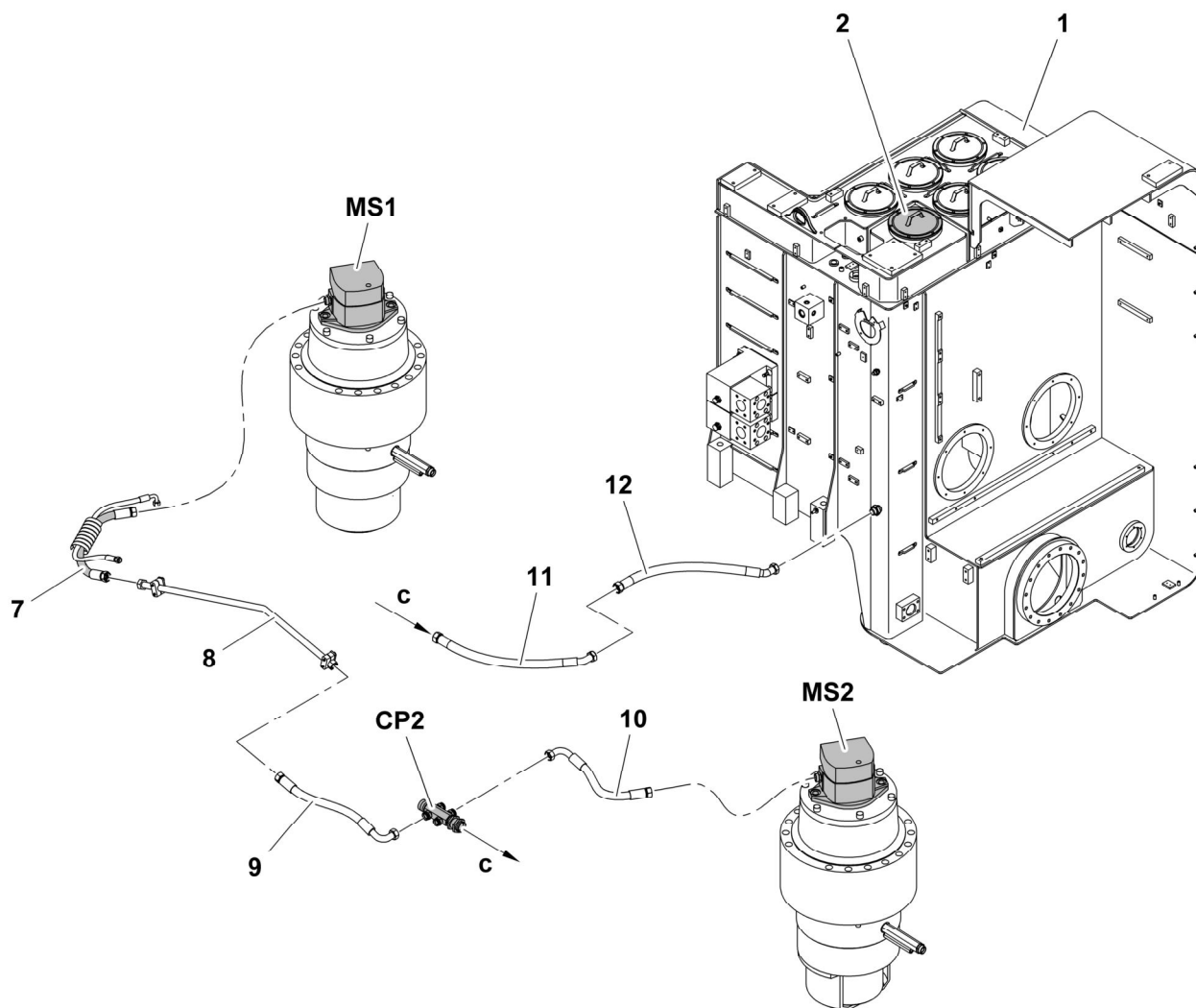


Fig. 6-14 Leak oil hoses on swing motors

1	Hydraulic tank	11	Hydraulic hose
2	Leak oil filter	12	Hydraulic hose
7	Hydraulic hose	CP2	Valve bank collecting pipe
8	Hydraulic pipe	MS1	Front swing motor
9	Hydraulic hose	MS2	Rear swing motor
10	Hydraulic hose		

- Disconnect, drain and clean the hoses **7**, **9**, **10**, **11**, **12** and the pipe **8**.
- Open, drain and clean the collecting pipe **CP2**.
- Move to next section about the working pressure circuit.

4	Hydraulic lines installed on the boom	15	Hydraulic pipe
5	Hydraulic hose	16	Hydraulic pipe
6	Hydraulic hose	17	Hydraulic pipe
7	Hydraulic hose	18	Hydraulic pipe
8	Hydraulic hose	19	Hydraulic pipe
9	Hydraulic hose	20	Hydraulic pipe
10	Hydraulic hose	DBB	Distribution block for boom cylinder
11	Hydraulic hose		

- ▶ Disconnect, drain and clean all the hydraulic hoses and pipes.
- ▶ Do the restart procedure before you put the machine in operation (refer to the related section).

6.2.9 Shovel cylinders lines

Circuit of shovel flap cylinders

For the shovel flap cylinders, the oil for the extension and retraction cylinder movement flows in the same hydraulic lines.

1.4 Manufacturer and Service addresses

Manufacturer	Customer Service
SKF Lubrication Systems Germany GmbH Heinrich-Hertz-Str. 2-8 DE - 69190 Walldorf	SKF Lubrication Systems Germany GmbH Heinrich Hertz Straße 2-8 DE - 69183 Walldorf +49 (0)6227-330
	SKF Lubrication Systems Germany GmbH 2. Industriestraße 4 DE - 68766 Hockenheim +49 (0)620527101
	SKF Lubrication Systems Germany GmbH Motzener Straße 35-37 DE - 12277 Berlin +49 (0)30-720020

1.5 Warranty

The installation instructions do not contain any information on the warranty. This can be found in our general terms and conditions.

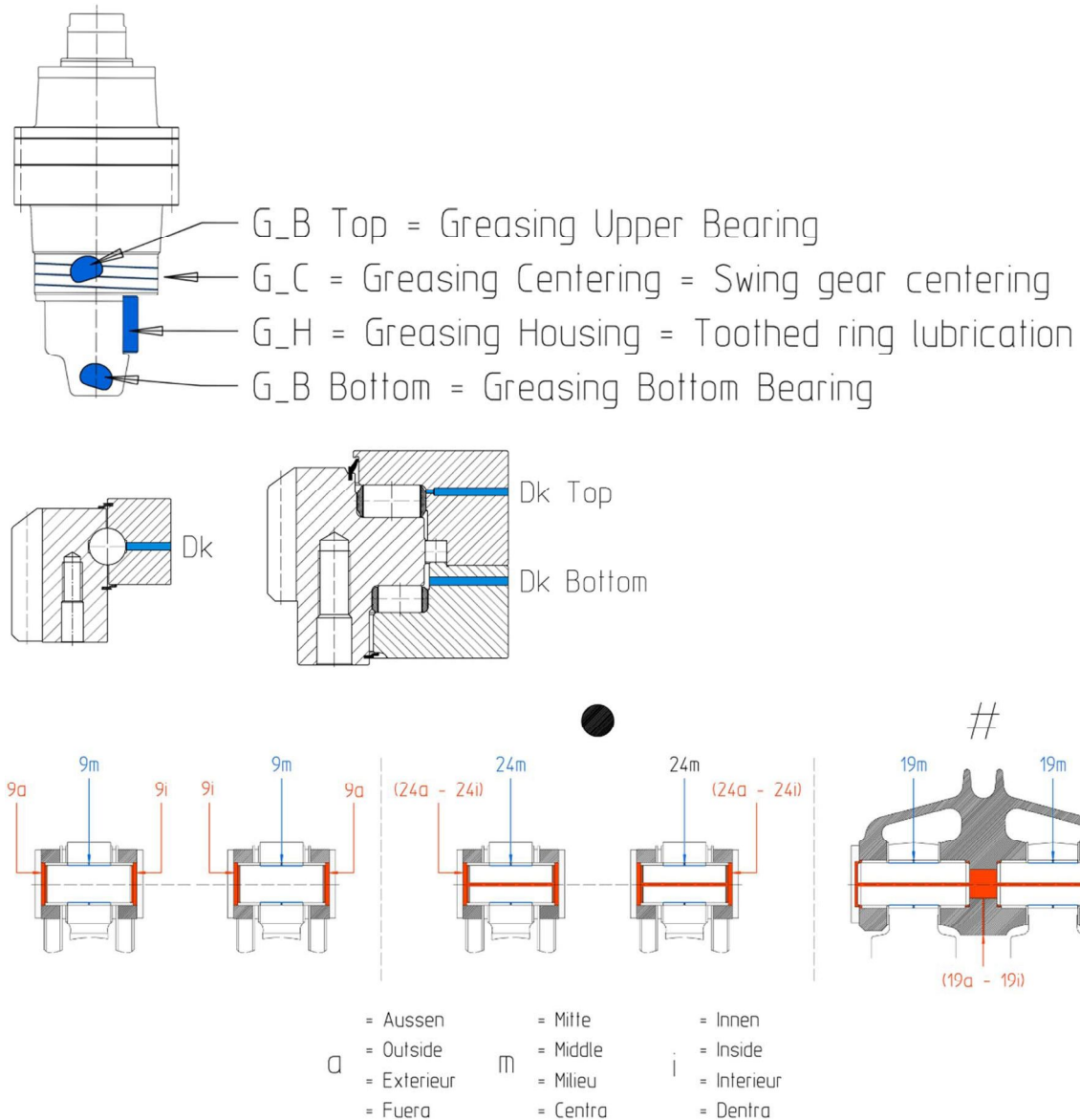
1.6 Copyright

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The integration of the content into the manufacturer's installation instructions of the machine, into which the pump shall be integrated, is expressly allowed.

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9.1.3 Characteristics of lubrication points on the excavator



All the necessary information regarding the greasing points and quantities are available in chapter 21 of the Liebherr Service Manual.

Error Codes, continuation

G	Fault	Cause	Display E__	Display G__ to:	Signalisation	Lubrication
28	Defect on solenoid valve reserve 1		E528		H138 lit H109 active Buzzer can be switched off	
29	Defect on solenoid valve reserve 2		E529		H138 lit H109 active Buzzer can be switched off	
30	Defect on transmitter control pressure 4-20mA (B184)	Earth fault	E530	P1	H138 lit H109 active Buzzer can be switched off LED Pilot flashes	Standard operation
31	Defect on transmitter control pressure 4-20mA (B184)	Failure during supply	E531	P1	H138 lit H109 active Buzzer can be switched off LED Pilot flashes	Standard operation
32	Defect on transmitter control pressure 4-20mA (B184)	Connection fault	E532	P1	H138 lit H109 active Buzzer can be switched off LED Pilot flashes	Standard operation
33	Grease filling level in P1/P2 barrel very low	Filling level LL	E533	P1 + P2	H138 lit Buzzer cannot be switched off LED LL for P1/P2 flashes	Lubrication P1 / P2 off
34	Grease filling level in P3 barrel very low	Filling level LL	E534	P3	H138 lit Buzzer cannot be switched off LED LL for P3 flashes	Lubrication P3 off
35	Defect on control pressure (B184)	During start (signal KI61) if pressure P<45 bar during more than 5 minutes	E535 P	1	H138 lit H109 active Buzzer can be switched off	Standard operation
36	Defect on control pressure (B184)	During operation, if pressure P<45 bar during 5 seconds	E536 P	1	H138 lit H109 active Buzzer can be switched off	Standard operation
37	Fault of pressure sensor for monitoring of falling edge (B150_1)	High-level lasting < 1 sec with falling edge within 2 lubrication cycles	E537 P	1	H138, Display X50_1 lit H109 active Buzzer can be switched off LED i3 flashes	Standard operation
38	Fault of pressure sensor for monitoring of falling edge (B150_2)	High-level lasting < 1 sec with falling edge within 2 lubrication cycles	E538 P	1	H138, Display X50_1 lit H109 active Buzzer can be switched off LED i4 flashes	Standard operation
39	Fault of pressure sensor for monitoring of falling edge (B150_1, B150_2)	High-level lasting < 1 sec with falling edge within 2 lubrication cycles on both sensors	E539 P	1	H138, Display X50_1 lit H109 active Buzzer cannot be switched off LED i3, i4 flashing	Standard operation
40	Defect on transmitter Res	Earth fault	E540	P1		Standard operation
41	Defect on transmitter Res	Connection fault	E541	P1		Standard operation
42	Defect on transmitter Res1	Earth fault	E542	P1		Standard operation
43	Defect on transmitter Res1	Connection fault	E543	P1		Standard operation
44	Defect on transmitter Res2	Earth fault	E544	P1		Standard operation
45	Defect on transmitter Res2	Connection fault	E545	P1		Standard operation

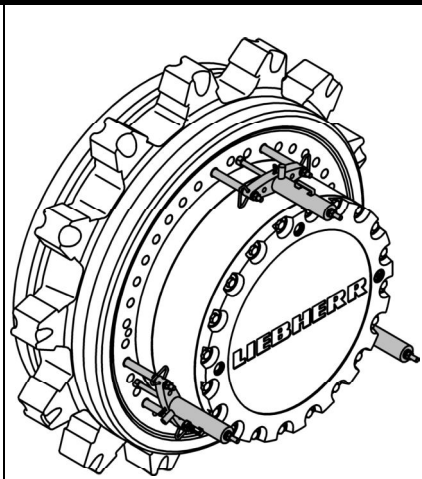


IMPORTANT NOTE

Sealings D... , F... , G... , X... and
"Y..." refer to the wiring diagram (see
annex).

6001 a02

Representation	No.	Description	Size	Order No.	Model								
					R9100	R984C	R9150	R994	R9200	R9250	R9400	R994B R9350	R995
	450	Hydraulic wrench Hytorc	3 - XLT	7373023	X	X	X	X	X	X	X		X
	452		5 - XLT	8502890	X	X	X	X	X	X	X		X
	454		10 - XLT	8503882							X		X
	455		25 - XLT	11693298									
	456		30 - XLCT	8503881									X
	457	Electro hydraulic pump module 230V-50Hz - 70/700 bar 5m hoses		10032006	X	X	X	X	X	X	X		X
	458			10032007	X	X	X	X	X	X		X	
	459		Hydraulic wrench Hytorc	25 - XLT	11693278								

Representation	No.	Description	Size	Order No.	Model						
					R9100	R984C	R9150	R994	R9200	R9250	R9350 R9400
	840	Hydraulic sprocket puller		11072548							

LEC / en / version: 04 / 2018

Representation	No.	Description	Size	Order No.	Model								
					R9100	R984C	R9150	R994	R9200	R9250	R9400	R994B R9350	R995
	1200	Frequency tension tester for belt compressor		11693877		X				X	X	X	X

7.00: Attachment / Travel systems

1 Schematic

Hydraulic valves		Hydraulic motors	
DBB1	Distribution bloc boom cylinder No. 1	MF1	Front oil fan motor
DBB2	Distribution bloc boom cylinder No. 2	MF2	Rear oil fan motor
DBCC	Charging distribution bloc	MF3	Water fan motor 1
DBF	Distribution bloc shovel flap cylinders	MF4	Water fan motor 2
DBS	Distribution bloc stick cylinder	MF5	Water fan motor 3
DBT	Distribution bloc shovel/bucket tilt cylinder	MF6	Water fan motor 4
DWD	Swing pilot bloc	MS1	Front swing motor
LV	Replenishing pressure limiting valve	MS2	Rear swing motor
LPRV1	Ladder pressure relief valve 1	MTL1	Front left travel motor
LPRV2	Ladder pressure relief valve 2	MTL2	Rear left travel motor
PRV	Service trap pressure relief valve	MTR1	Front right travel motor
RC	Rotary connection	MTR2	Rear right travel motor
RC-ADD	Rotary connection second part		
SU1	Servo oil unit	Hydraulic pumps	
UBV	Overspeed shut-off valve	P1	Working pump 1 (front right)
VB1	Control valve 1	P2	Working pump 2 (rear right)
VB2	Control valve 2	P3	Working pump 3 (rear left)
VB3	Control valve 3	P4	Working pump 4 (front left)
VB4	Control valve 4	P6.1	Water cooler fan pump (rear)
		P6.2	Oil cooler fan pump (front)
		P8	Splitterbox lubrication pump
		P9	Pilot oil pump
		P10.1	Rear replenishing oil pump
		P10.2	Front replenishing oil pump
		P11	Optional dual air-conditioning pump
		PL1	Lubrication pump attachment
		PL2	Lubrication pump swing ring
		PS1	Rear swing pump
		PS2	Front swing pump
Gears			
GS1	Front swing gear		
GS2	Rear swing gear		
GT1	Right travel gear		
GT2	Left travel gear		

Functional description

3.3.3 Logic system

On the hydraulic excavator, the spool valves are controlled electronically (joysticks, prinplates and solenoid valves).

A movements combination is possible but it is controlled by a switching logic which determines the priority for the movements in relation with the input (movement which are commanded from the operator through the joysticks pedals).

This switching logic is necessary to distribute equitably the oil flows of the different working pumps in the different receivers (cylinders, hydraulic motors).

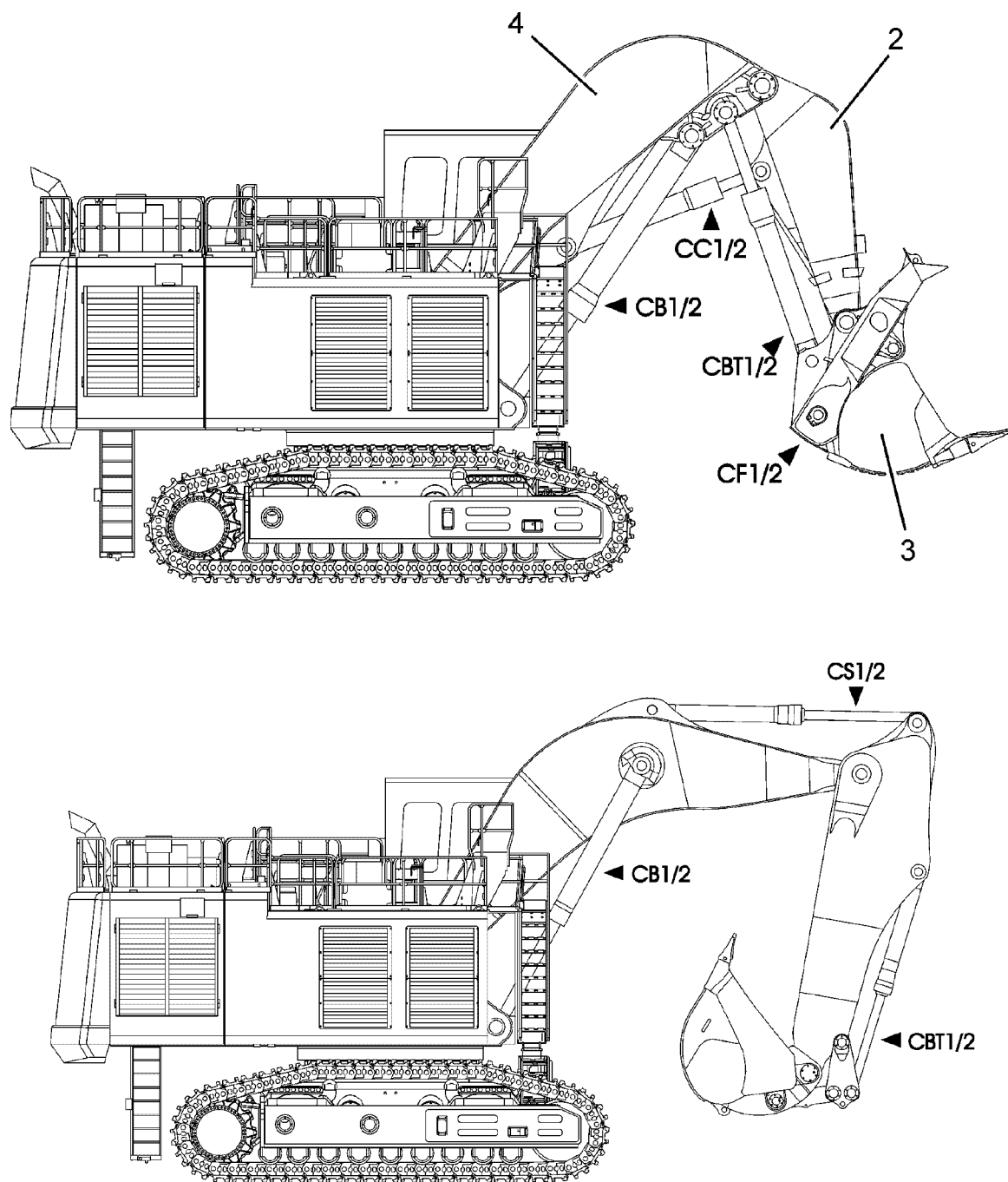
Without this switching logic, some movement combinations are impossible and the speeds of the movements are uncoordinated (for example : flow from 6 pumps for one movement and flow from 2 pumps for another).

The switching logic uses the logical outputs of the servo control units to commute the switching solenoid valve **Y**, which are mounted in series with the regulating solenoid valves **Yr**.

The priority list of the switching logic is programmed in the **FSG** plate **A1020**.

Proximity switches are installed on the attachment in order to amortise the end strokes of the cylinders.

5 Attachment function



5.1 Boom cylinders

One extremity of the both cylinders **CB1** and **CB2** is fixed on the uppercarriage, the other extremity is fixed on the boom. The complete attachment is raised or lowered via the boom. The boom movements are limited by proximity transmitters, which detect the cylinders end stroke (see § "Logic system" in this chapter).

The boom up movement is supplied with four working pumps through the four control valve blocks.

Troubleshooting

- a maximum permissible retraction speed of one cylinder with one spool valve of a control valve block **4MO40** of 3,9 mm / min.
- a maximum permissible extension speed of one cylinder with one spool valve of a control valve block **3MO40** of 14 mm / min.
- a maximum permissible extension speed of one cylinder with one spool valve of a control valve block **4MO40** of 7 mm / min.

The maximum permissible retraction speed of the cylinders is then:

$$(8 \times 2 + 3,9 \times 2) / 2 = 11,9 \text{ mm / min.}$$

The maximum permissible extension speed of the cylinders is then:

$$(14 \times 2 + 7 \times 2) / 2 = 21 \text{ mm / min.}$$

When a storing period longer than one year is requested, cylinders will be delivered with an oil filling of above mentioned quality.

However, the storing instructions as under paragraph 3 are prerequisites for any period.

In case the cylinders are meant to be stored for more than 2 years it is highly recommended to consult the manufacturer.

Sealing:

The anti-corrosion-protection is only effective when airtight closing of all ports is ensured : Four-bolt flanges are sealed with a synthetic plug retained by a metal plate; pipe- and thread connections are plugged with synthetic couplings or plug caps.

Cylinders, which cannot be, emptied completely (e.g. cylinders with hollow rods) and oil-filled cylinders (such as tele rams) will be plugged-off oiltight using plug screws with integrated seal rings for female threads and plug caps with spigot nuts for threaded pipe ends.

Surface protection:

External surfaces such as flange surfaces, bearings, untreated cylinder barrels and also the exposed rod end section, in case the rod has no other corrosion protection, are all treated with ARAL Resilan WA or ESSO Rustban 397.

In addition, when plunger cylinders are concerned, the plunger rod, its guiding parts and cylinder bore interior surface are treated with an anti-corrosion-protective. All hydraulic cylinders will be dispatched coated with a proven versatile primer, if not otherwise specified by the client.

Transportation

- In preparation for transportation the hydraulic cylinders must be handled and packaged carefully. Any kind of impact, including bumping against each other must be avoided by using adequate handling auxiliaries and methods and also suitable packaging materials.
- Rods are to be secured adequately against self-extending.
- All ports are to be plugged (acc. to 1.2).
- Whenever rods project out of the cylinder like on twin-rod-cylinders, the projecting rod end must be protected against any damage by using appropriate packaging materials. Any contact with acids, which may harm the chromium plating, must be strictly avoided.

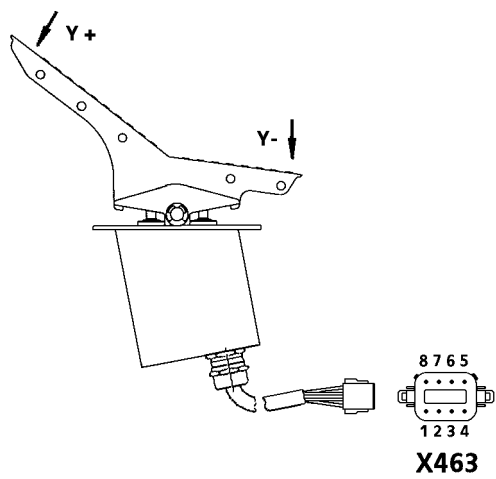
Storage

- Upon delivery the customer should check for any damage resulting from transportation. Damaged plugs are to be renewed and damaged coating is to be touched-up, immediately.
- Hydraulic cylinders should only be stored in a dry, dust- and steam-free room at a constant temperature ranging between 10 and 20°C.
- After the first year of storage the cylinders should be rotated (about 90°) in order to shift possible air bubbles and simultaneously re-oil these dried zones.

Installation

- In case hydraulic cylinders have been stored for longer than 2 years, the manufacturer should be contacted, because for some types it may be necessary to replace the seal kit prior to installation.
- In general, hydraulic cylinders may be installed in any desired position.
- In order to prevent premature wear or operational disturbances the hydraulic cylinders are to be installed tension-free and without lateral forces acting.
- Before connecting the hydraulic cylinders to the system all lines should be thoroughly flushed using suitable cleansing agents in order to remove any possible deposits.
- External preservatives are to be removed using benzine or petroleum ether.

9.11.5 Right travel pedal U23



	Type
Pedal	DFS - WE - i4.20 - RS232 / 128×58r
Connector X463	DT 06-8S-W8S

Connector / pin on control unit	Signal		Connector / pin on FSG plate A1020
X463			X101
1	+24V	24V supply right travel pedals	1
2	0V	Earthing travel pedals	2
3	Y	Output signal right travel pedal moved forward / backward	3
4, 5, 6		Not used	
7	Rxd	Not used	
8	Txd	Not used	

6 Component description

6.1 Swing pump A4 VG 180

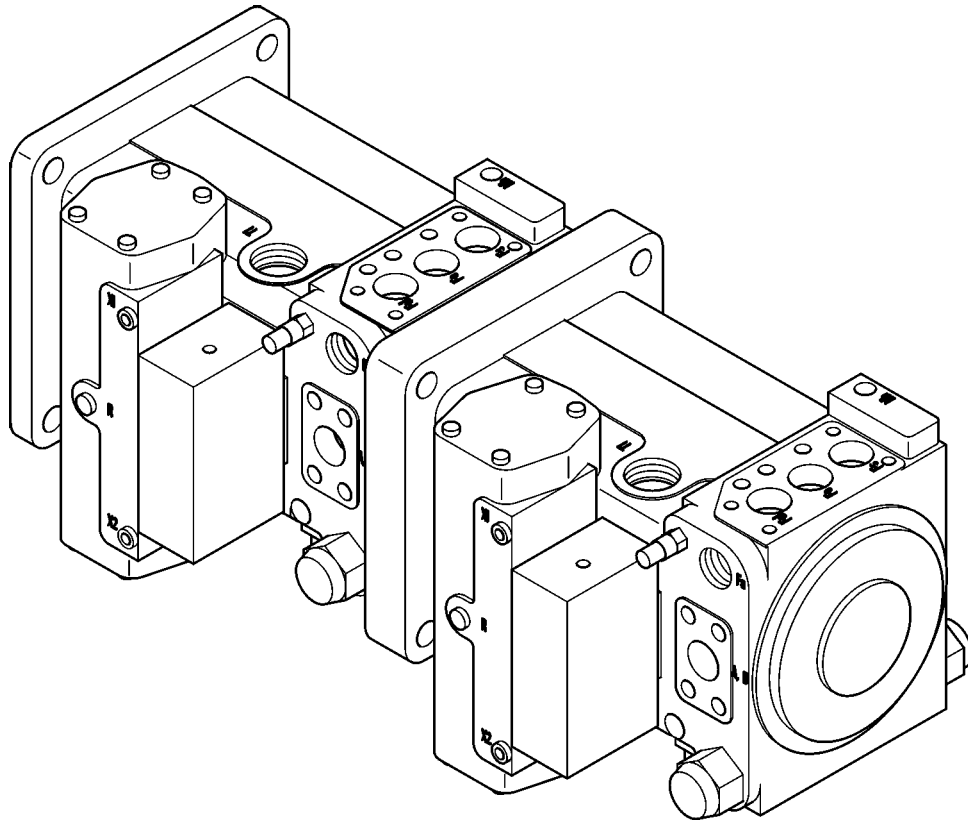


Fig. 8 *Combination pump A4 VG 180*

The swing pump is a variable displacement axial piston pump in swash plate design. It supplies the closed loop swing circuit.

The displacement volume is in proportion to the input RPM and infinitely variable. The flow increases as the pump is shifted from the «O» or neutral position to its maximum output.

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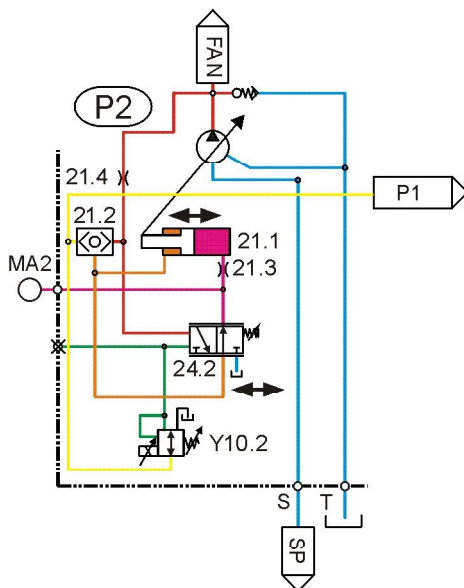


Fig. 10 Cooling pump hydraulic schematic

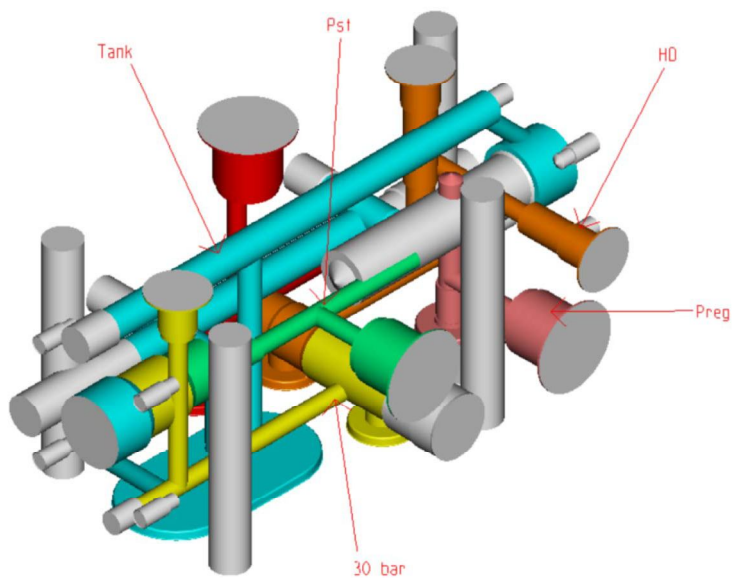


Fig. 11 Regulation channels

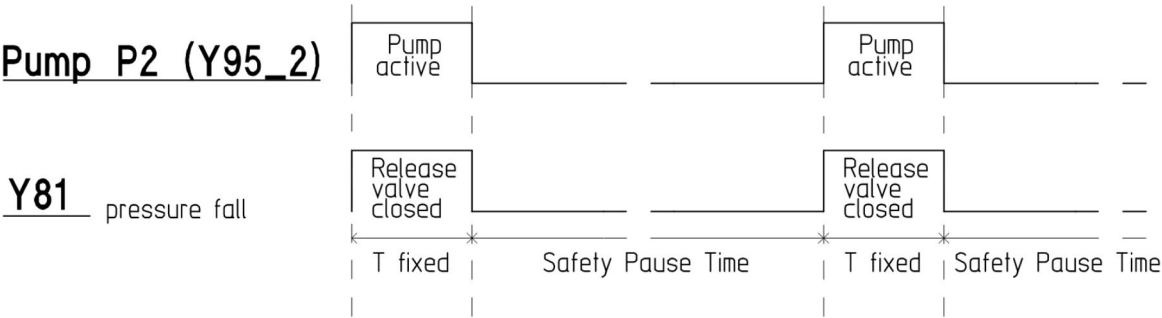
Nr.	Function	Components	Input	Output	Description	Note
2	Display Err_3	Error code		Type 3	CPU monitoring - no signal corresponds to an error	Current 1A
3	Display Err_2	Error code		Type 3	Barrel 1 or 2 low level - signal corresponds to an error	Current 1A
4	Display Err_1	Error code		Type 3	Malfunction - signal corresponds to an error	Current 1A
5	Winter operation	S177	Type 2		Input 24V electric	Current 1A
6	Alarm 2	H38		Type 1	Control lamp	Current 2A
7	Alarm 1	H109		Type 2	Blinking lamp	Current 5A
8	Ground	KI31			Supply ground electronic	
9	Ground	KI31			Supply ground electronic	
10	Enable		Type 2		Input 24V electronic	
11	24 volt	KI15			Supply 24V electronic	
12	24 volt	KI15			Supply 24V electronic	

Connector X113 assignment

Nr.	Function	Components	Input	Output	Description	Note
1	Display Err_1	Error code		Type 1	Malfunction - signal corresponds to an error	Current 2A
2	Motor P3	M21		Type 1	Motor	Current 5A
3	Winter operation P3	Y97		Type 1	Servo valve	Current 2A
4	Pump P3	Y93		Type 1	Servo valve	Current 2A
5	Switching P2	Y82		Type 1	Servo valve	Current 2A
6	Switching P1/P2	Y83		Type 1	Servo valve	Current 2A
7	Switching P1	Y80		Type 1	Servo valve	Current 2A
8	Pressure dump P2	Y81		Type 1	Servo valve	Current 2A
9	Pump P2	Y95_2		Type 1	Servo valve	Current 2A
10	Winter operation	Y114		Type 1	Servo valve	Current 2A
11	Pressure dump P1	Y76		Type 1	Servo valve	Current 2A

GREASE CIRCUIT P2

SAFETY CONTROL



This function is done without polling the sensors, as simple timing. The pumps and valves are controlled during fixed times "T fixed - Pause Time"

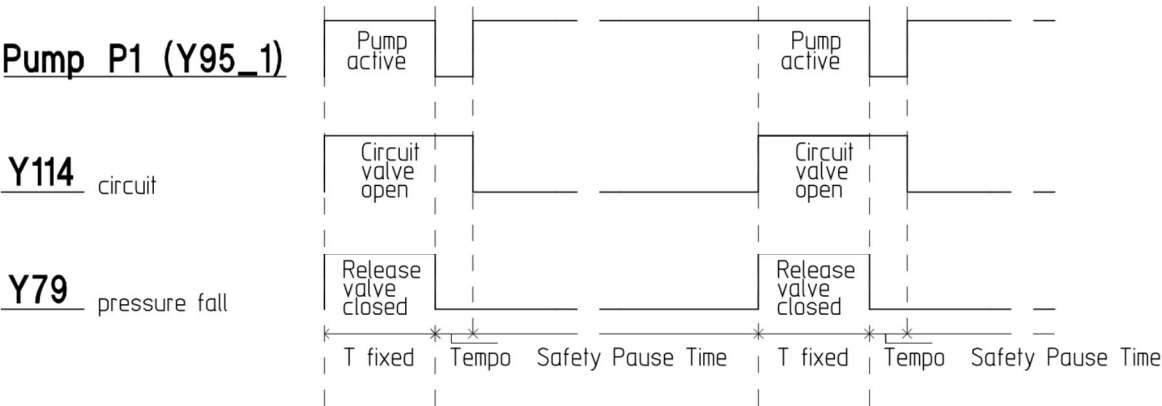
After three seconds the button „Cycle P1“/„Cycle P2“is on, the pump P1/P2 goes back to the normal mode. All the error codes from the pump are set again.

Safety mode pump P1 in winter operation - 1P/execution ≥ 2 low temp

This process is related to the safety mode for configuration1 pump in execution ≥ 2 with function winter operation on.

GREASE CIRCUIT P1

SAFETY CONTROL



This function is done without polling the sensors, as simple timing. The pumps and valves are controlled during fixed times "T fixed - tempo - pause time".

After three seconds the button „Cycle P1“ / „Cycle P2“is on, the pump P1/P2 goes back to the normal mode. All the error codes from the pump are set again.

Because of winter operation, the pump stays active during the pause time.

Safety mode pumps P1 and P2 in winter operation - 2P/execution ≥ 2 low temp

This process is related to the safety mode for configuration P1/P2 in execution ≥ 2 with function winter operation on.

LEC / en / Edition: 06 / 2017

```

/L4
G1 : 0- 3- 3
G2 : 0- 0- 0
G3 : 2- 3- 5
G4 : 0- 0- 0
G5 : 0- 0- 0
G14: 0- 0- 0
G17: 0- 0- 0
G28: 5- 3- 8
G29: 6- 1- 7
G33: 11- 4- 15
G34: 9- 3- 12
G36: 8- 12- 20
G37: 2- 1- 3
G38: 2- 1- 3

```

Fig. 12 Example of error codes history



Note!

- The first column displays the number of errors occurred in the last hour.
- The second column displays the number of errors occurred in the last 10 hours.
- The third column displays all errors which occurred before.

To know the error code description, go to the menu "error history", on the interface, see paragraph "menu" of software menus description.

3.5 Initial commissioning / daily start-up

Ensure that:

- The machine manufacturer's instructions regarding the lubricants to be used are observed.
- All safety devices are completely available and functional.
- All connections are correctly connected.
- All parts are correctly installed.
- All warning labels on the centralized lubrication system are completely available, highly visible and undamaged.
- Illegible or missing warning labels are to be replaced without delay.
- The system pressure specified for proper operation is adhered to and neither exceeding nor falling below specification.

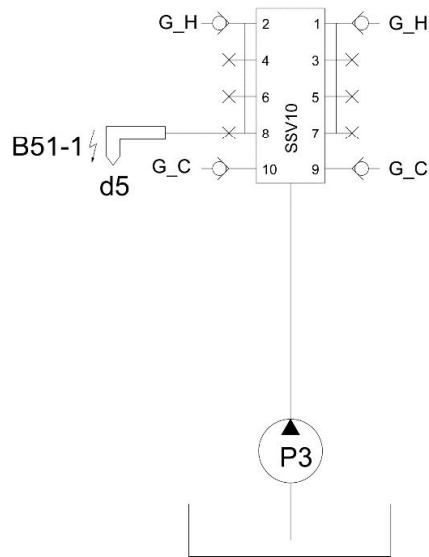
3.6 Cleaning

- Risk of fire and explosion when using inflammable cleaning agents. Only use non-flammable cleaning agents suitable for the purpose.
- Do not use any aggressive cleaning agents.
- Do not use steam jet or high pressure cleaners. Otherwise electrical components may be damaged. Observe the protection classes, e.g. IP (International Protection) and NEMA (National Electrical Manufacturers Association), required for proper operation.
- Cleaning work on energized components may be carried out by electrical specialists only.
- Do not touch cables or electrical components with wet or damp hands.
- Mark damp areas accordingly.

9.3 System P3: Swing ring and swing gear lubrication

In the automatic system P3, the central lubrication pump provides lubricant to the Progressive Metering Device (Progressive System) which distributes the lubricant to each lubrication point evenly (swing ring teeth and the swing gear centering seat).

Level I



Level II

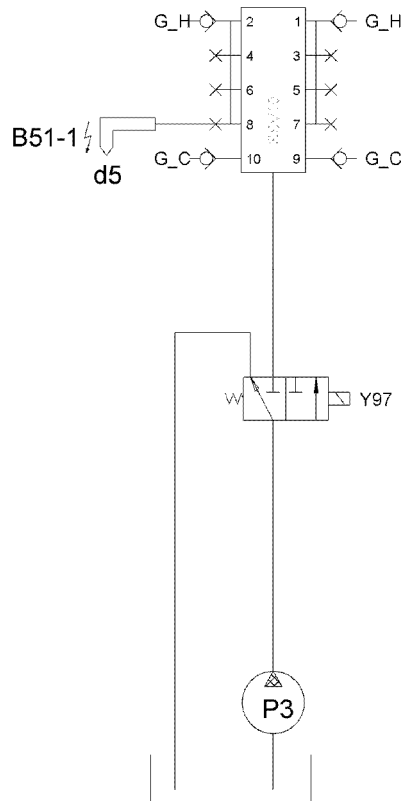
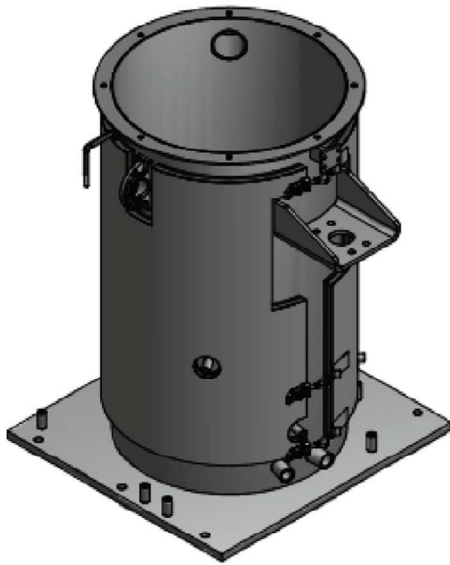


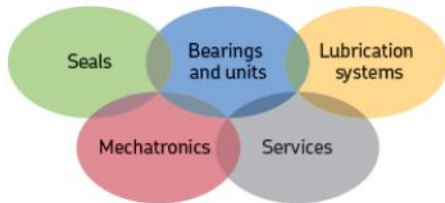
Fig. 6 Schematic of lubrication: Swing ring teeth and swing box centering

13.14.2 For 80L Reservoir – only for level III



Technical data:

Silicon heating jacket
 - Preformed -
 Form : Zylinder
 Diameter : 400 mm
 Mat size : approx. 1264 x 590 mm
 Recess: see drawing
 Thickness : 17 mm $\pm 0,5$
 Insulation : 12 mm silicone foam
 Nominal Voltage : 230 V AC
 Heating power : 1300 W $\pm 10\%$
 Outer jacket : Stainless steel jacket
 Inner jacket : Gl.Silicone
 Fastener type : quick release
 Temperature resistance: max. 200°C
 Temperature sensor : 1 x PT 100 conductor
 Power and sensor cable: 2,0 m
 Plug : no
 Crushing strength: max. 40 N/cm²
 Moisture proofed application
 Protecting earthing : yes
 A temperature control is necessary (thermostat)



The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry world-wide. These five competence areas include bearings and units, seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management systems. A global presence provides SKF customers uniform quality standards and worldwide product availability.

! Important information on product usage

All products from SKF may be used only for their intended purpose as described in this brochure and in any instructions. If operating instructions are supplied with the products, they must be read and followed.

Not all lubricants are suitable for use in centralized lubrication systems. SKF does offer an inspection service to test customer supplied lubricant to determine if it can be used in a centralized system. SKF lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1 013 mbar) by more than 0,5 bar at their maximum permissible temperature.

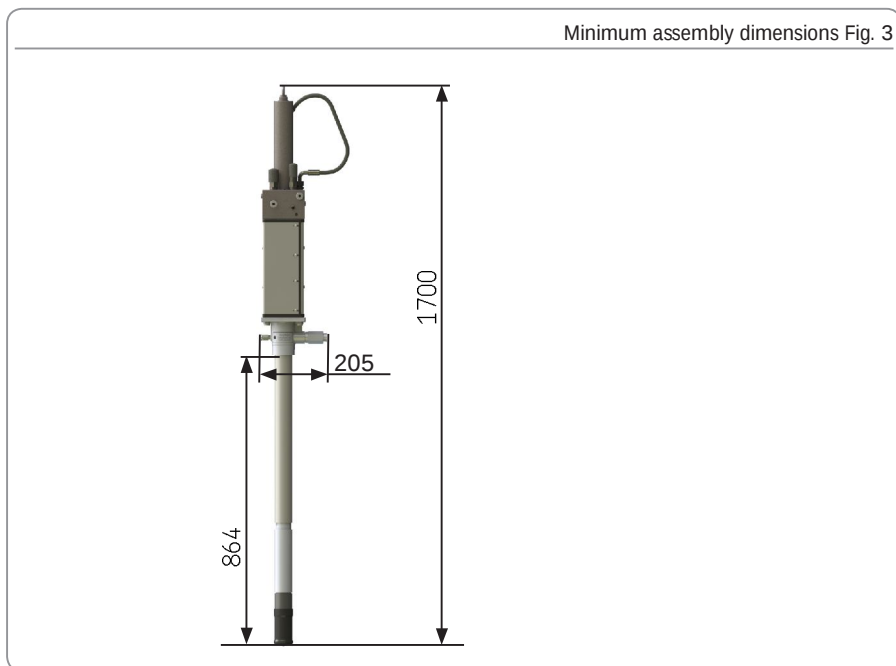
Hazardous materials of any kind, especially the materials classified as hazardous by European Community Directive EC 67/548/EEC, Article 2, Par. 2, may only be used to fill SKF centralized lubrication systems and components and delivered and/or distributed with the same after consulting with and receiving written approval from SKF.

Status of information:
07/2014

Manufacturer:
SKF Lubrication Systems Germany GmbH
Werk Walldorf
Heinrich Hertz-Str. 2-8
D-69190 Walldorf
Tel. +49(0) 6227 33-0
Fax: +49 (0) 6227 33-259
E-Mail: Lubrication-germany@skf.com

6.3 Minimum assembly dimensions

Ensure sufficient space for maintenance work or for attachment of further components by leaving a free space of at least 100 mm into each direction in addition to the stated dimensions.



A full-page sheet of graph paper. The background is a solid light blue color. Overlaid on this background is a uniform grid of thin, dark gray lines. The grid consists of small squares that cover the entire area of the page, leaving no margins or unlined sections.

Input

Measured variable	Continuous measurement of change in capacitance between probe rod and container wall or ground tube, depending on the level of a liquid. Probe covered => high capacitance Probe not covered => low capacitance	
Measuring range	- Measuring frequency: 500 kHz - Span: $\Delta C = 25$ to 4000 pF recommended (2 to 4000 pF possible) - Final capacitance: $C_E = \text{max. } 4000 \text{ pF}$ - Adjustable initial capacitance: $C_A = 0$ to 2000 pF (<6 m probe length) $C_A = 0$ to 4000 pF (>6 m probe length)	
Measuring condition	- Measuring range L1 possible from the tip of the probe to the process connection. - Particularly suited for small containers. Note! When installing in a nozzle, use inactive length (L3). The 0 %, 100 % adjustment can be inverted.	100=FMI5xxxx=15=05=xx=xx=302 <i>Dimensions mm (in)</i>

Output

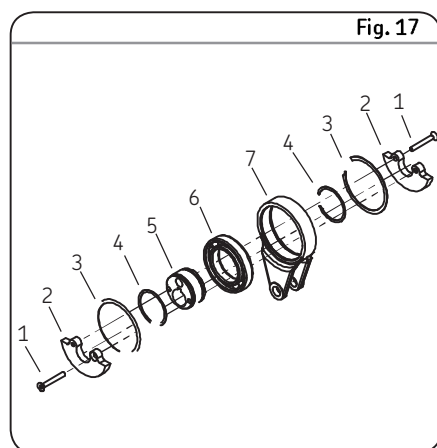
Output signal	FEI50H (4 to 20mA/HART Version 5.0) 3.8 to 20.5 mA with HART protocol FEI57C (PFM) The transmitter superimposes current pulses (PFM signal 60 to 2800 Hz) with a pulse width of approx. 100 μs and a current strength of approx. 8 mA on the supply current (approx. 8 mA).	
Signal on alarm	FEI50H Fault diagnosis can be called up as follows: - Via the local display: Red LED - Via the local display showing: - Error symbol - Plain text display - Via the current output: 22 mA (in accordance with NE43) - Via the digital interface (HART status error message) FEI57C	

- Via the local display: Red LED
- Local display at switching unit

Assembly

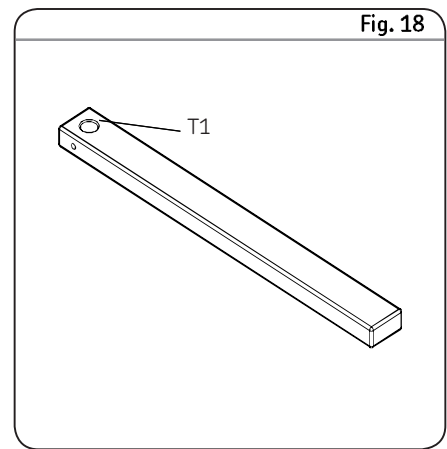
Crankrod and eccentric assembly

- 1 Place the crank rod (7) on the 2 1/2 in. (62 mm) diameter steel pipe, provided in tool kit (276275).
- 2 Refer to **fig. 17** and install the ball bearing assembly (6) into the crank rod (7).
- 3 Place the eccentric (5) in the ball bearing (6).
- 4 Place one end of the inner retaining ring (4) on top of the eccentric (5).
- 5 Squeeze the other end of the retaining ring (4) toward the center and slide retaining ring (4) into place.
- 6 Place one end of the outer retaining ring (3) on top of the inner retaining ring (4).
- 7 Squeeze the other end of the retaining ring (4) toward the center and slide retaining ring (4) into place.
- 8 Align the holes of the counter-balance weights (2) with the threaded holes of the eccentric (5) and place on the eccentric (5).
- 9 Insert the flat head screws (1) into the counter-balance weight (2) and torque the flat head screws (1) to a torque of 100–110 in.lbf (11,3–12,4 Nm).

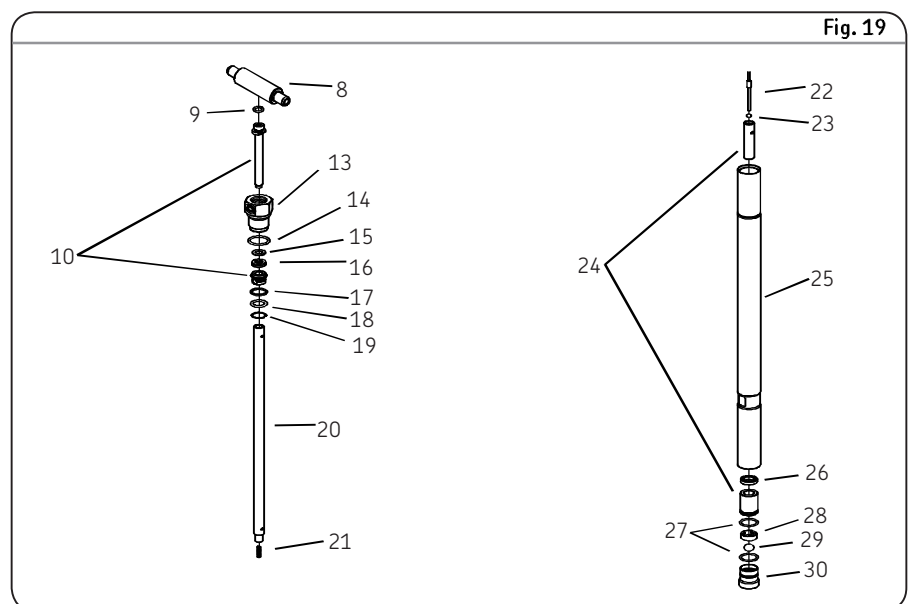


Pump

- 1 Install the ball (23) into the lower bushing and plunger (24). Refer to **fig. 19**.
- 2 Insert the check rod (22) into the pump plunger (23).
- 3 Place the spring (21) onto the check rod (22).
- 4 Thread the plunger link rod (20) into the pump plunger (24).
- 5 Insert the lower bushing pump plunger (24) into the tool (T1).
- 6 Align the hole in the lower bushing pump plunger (24) with the hole in the tool (T1).
- 7 Insert the pin provided in tool kit 276275 into the hole of the tool (T1) and into the lower bushing pump plunger (24).
- 8 Torque the lower bushing pump plunger (24) to a torque of 110–125 in.lbf (12,4–14,1 Nm).
- 9 Install the steel back up ring (17) onto the threads of upper bushing and plunger end (10).
- 10 Slide the o-ring (18) onto the upper bushing and plunger end (10).
- 11 Install the retaining clip (19) on the upper bushing and plunger end (10).
- 12 Install the o-ring (9) on the upper bushing and plunger end (10).
- 13 Place the outlet pin (8) into a vise.



- 14 Apply Loctite 242 to the threads of the upper bushing and plunger end (10).
- 15 Thread the upper bushing and plunger end (10) into the outlet pin (8).
- 16 Torque to 110–125 in.lbf (12,4–14,1 Nm).
- 17 Install the back-up washer (15) in the wrist pin anchor (13).
- 18 Place a new cup seal (16) inside the wrist pin anchor (13).
- 19 Clean the threads of the wrist pin anchor (13).
- 20 Install the o-ring (14) on the wrist pin anchor (13). See **fig 19**.
- 21 Insert the upper bushing and plunger end (10) into the wrist pin anchor (13) and tighten.



Injector No. 81713, No. 81713A & No. 81770-1 thru 81770-6

Note: Before operating the machine, for example after installation works or repairs:

- Main supply line / branch lines and injectors must be filled with lubricant and vented.
 - Feed lines must be filled with lubricant and connected with lube points.
 - The function of all injectors must have been checked.
 - All injectors and the system control for the lubricating intervals must have been adjusted in compliance with the specifications.
- ⇒ See specific instructions of the machine manufacturer.

Functional check of injectors

The recommended system operating pressure is 173 bar; adjust pump and control system accordingly.

⇒ See User Manual of the relevant central lubrication pump / control system and injectors.

- Initiate manual starting of the lubricating cycle.
- After the rising of the pressure to ~ 128 bar the indicator stem of the injector must be retracted; after pressure relief < 41 bar the indicator stem must return, back to rest position. Insufficient venting of the supply line system may impair the function of injectors.

Note: When used together with injectors type SL-32 & SL-33 in a system, the pressure relief must be < 13 bar.

When all injectors of the system have been checked and function properly:

Fill feed lines with lubricant.

Before connecting the feed lines to the lubricating points:

- Fill feed lines with lubricant.
- Use only lubricant specified by the machine manufacturer for pre-filling.

– Fill lines with lubricant by means of a grease gun.

The feed line can be filled via the alternate outlet port in the injector body.

- Check feed line outlet for evidence of lubricant flow.
- Collect emerging lubricant at the end of the line.

When all lines have been filled:

- Connect feed lines.

Operation

During operation of the central lubrication system

- all injectors must have been set to the lubricant output specified by the machine manufacturer.
 - the lubrication system controller must have been set to pause time as specified by the machine manufacturer.
 - the required operating pressure (fluid pressure) for operating the injectors (lubricant discharge) as well as the subsequent pressure relief of the lubricant supply line for re-charge of the injectors have to be observed.
- When the machine is put out of operation
- the central lubrication system must be switched off.

CAUTION

Excess lubrication or insufficient lubrication may result in machine damages.

Do not use contaminated lubricants.



Warning
Never exceed the admissible working pressure of the central lubrication system.
Switch off pump immediately in case of defects or abnormal operating performance.

Inspection and maintenance



Warning

Never attempt to disassemble the equipment while pump is in operation or system is pressurized.
Do not perform adjustment of injectors while the system is pressurized.

- Check all lubricant lines and injectors regularly for leakproof and proper condition.
- Check function of the central lubrication equipment (pump/controller/injectors) regularly.
- Eliminate defects immediately.

Maintenance



Warning

Never attempt to disassemble the equipment while pump is in operation or system is pressurized.
Before performing any works the machine must be out of operation.

Heed safety instructions of the machine manufacturer.

If machine components being also part of the central lubrication system were removed for service, they shall be properly reassembled before the machine is operated again. Then check the function of the centralized lubrication system as specified. The same applies to maintenance work performed on parts of the *Centro-Matic* central lubrication system.

Avoid contamination of the indicator stem in order to prevent premature wear of the injector seal. If necessary, provide protective injector cover cap;

No. 83272 Cover Cap, Vinyl plastic material.

Trouble shooting

⇒ See User Manual of the relevant central lubrication pump.

⇒ See User Manual of the relevant system control & monitoring equipment and instructions of the manufacturer of the machine.

CAUTION

Operation of the machine with inactive or defective central lubrication system will cause damages to the machine.

⇒ See instructions of the machine manufacturer.

Malfunction of individual lubricant metering devices or damaged lubricant feed lines will cause damage of parts connected to because of lack of lubrication.

6. Repair

Repairs must be carried out by qualified, trained personnel only.



Warning

Do not disassemble injectors when pump/central lubrication system are pressurized.

Before performing any works the machine must be out of operation.

Before servicing shut off pump/central lubrication system and perform pressure relief procedure. Depressurize pump and supply line system.

Always collect lubricant in a can.

After repair of injectors:

- Check function of injectors.
- Replacement Injector no. 81713A recommended for service parts inventory. Permits change of injector without remove of the injector manifold.

After repair, before restart of normal operation of the machine/central lubrication system:

- Adjust output of the relevant injectors as described.

Vent lubrication line system and check function of the central

- Check function of the central lubrication system.

References, continuation

Displays, functions of the user interface, continued

7-segment displays for time/pressure

The 7-segment display shows the pressure respectively the remaining pause time. To identify the pause time the LED point in the first 7-segment display is lit. In the set-up mode the display flashes every second and shows the adjusted pause time. While the display is flashing, pressing a pushbutton for a longer period of time will increment the pause time, even though the display may be off.

7-segment display for errors

The 7-segment display shows the error/failure which occurred. If there occur different errors at a time, these will be switched through one after the other every 2 seconds. If the same error arises consecutively several times, it will be displayed once only.

Pushbutton Time-Px

Pressing this pushbutton is detected when releasing the pushbutton.

Pressing the pushbutton < 5 seconds will change from the remaining pause time display to the pressure display.

Pressing the pushbutton > 5 seconds will result in a change into the set-up mode. The adjusted pause time will be displayed in a flashing mode.

Pressing the pushbutton in the set-up mode < 5 seconds will increase the pause time in increments of 1 second.

Pressing the pushbutton in the set-up mode > 5 seconds will increase the pause time by 5 seconds in increments of 300 milliseconds.

If there is no pushbutton pressed in the set-up mode during 20 seconds, the old pause time will be reassumed and the set-up mode will be quit.

By pressing the ENTER key the newly adjusted pause time will be confirmed and the set-up mode will be quit.

When pressing Time P1 and Time P3 at the same time, the P1 display will show the software version.

Pushbutton CYCLE-Start Px

Pressing this pushbutton is detected when releasing the pushbutton.

Pressing this pushbutton will trigger a lubrication cycle in the standard mode of the respective lubrication circuit. However, this will happen only, if pressure in the respective lubrication circuit has fallen below 40 bar (parameter: lubrication circuit pressure Px lower limit) and the circuit is in the pause time. As soon as pressure in the lubrication circuit P1/P2 during a lubrication cycle triggered such way rises to 220 bar (parameter: lubrication circuit pressure Px upper limit), the respective lubrication circuit operates in the standard mode, even though before it was in the emergency operation mode. If a lubrication pulse is detected by the B51 sensor in the P3 lubrication circuit during a lubrication cycle triggered via CYCLE start, this lubrication circuit will be shifted to standard operating mode, although the circuit was in the emergency operation mode before.

This means, the CYCLE start is seen as a confirmation in the case of an emergency operation.

Pushbutton Safety Pump

Pressing this pushbutton is detected when releasing the pushbutton.

This pushbutton is activated only, if the type of excavator contains a 2-pump system (P1 and P2) and if there is at least one sensor or actuator defective.

When the pushbutton is pressed for the first time, lubrication will be carried out via P1. Thereby the solenoid valves Y83 and Y82 are actuated and the P2 pump is switched off. The digital display for P2 is switched off, too.

When the pushbutton is pressed for the second time, lubrication will be carried out via P2. Thereby the solenoid valves Y80 and Y83 are actuated and the P1 pump is switched off. The digital display for P1 is switched off, too.

Pressing the pushbutton for the third time will result in the standard operation of the P1 and P2 pumps.

Pushbutton ENTER

Pressing ENTER will confirm inferior faults and switch off the buzzer. When pressing ENTER in the set-up mode (pause time setting), the adjusted pause time will be confirmed and memorized and the set-up mode will be quit.

If the buzzer is active during the set-up mode, pressing ENTER will first switch off the buzzer, and pressing ENTER again will then confirm the settings of the pause time.

Troubleshooting

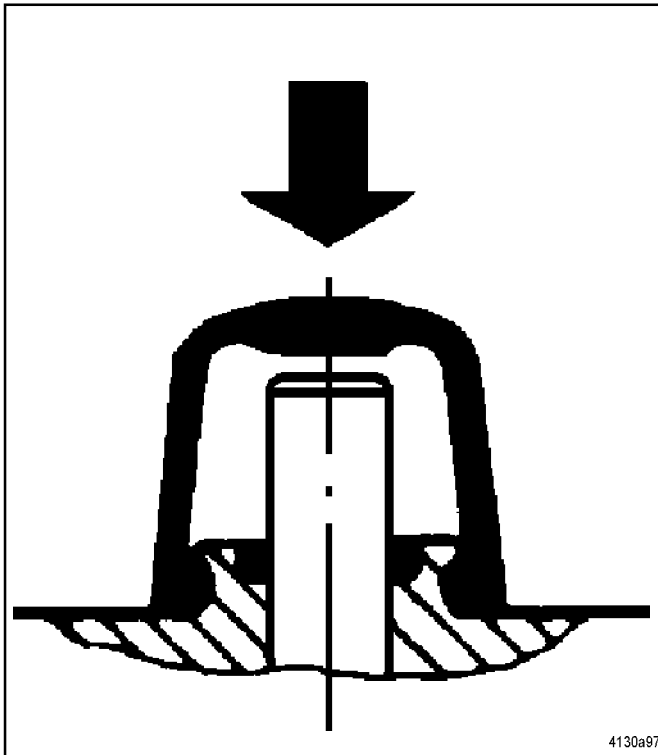


Fig. 5 - Manual Emergency button: Press on the Magnetic pin

Troubleshooting

- * For all faults, first check the electrical voltage supply.
- * If no fault is found, replace the complete valve.
- * Manual emergency button: For checking the valve, press on the magnetic pin (standing out under the rubber cap, see fig. 5). This will release a manual impulsion.

Technical Datas

Valve model:	2/2 - way valve	3/2 - way valve
Threaded connection:	G 1/2"	G 3/8"
Pressure range:	0 - 400 bar	0 - 400 bar
Max flow rate.:	2,4 dm ³ /min	2,4 dm ³ /min
Weight:	1,7 kg	1,2 kg
Mounting position:	any	any
Flow direction:	any	any
Temperature range:	- 20° C bis 60° C	- 20° C bis 60° C

Electrical Datas

Supply voltage:	24 VDC	110 VAC 50/60 Hz	230 VAC 50/60 Hz
Solenoid voltage:	24 VDC	98 VDC	205 VDC
Current consumption (max.):	0.83 A	0.2 A	0.1 A
Nominal power (approx.):	20 W	20 W	20 W
Operations/h, (approx.):	2000	2000	2000
Isulation class:	F	F	F
Type of protection:	IP 54	IP 54	IP 54
Operating time:	100 %	100 %	100 %
Included in scope of supply:			
Socket	Part no. 236-13868-1	P. no. 236-13868-3 with rectifier	P. no. 236-13868-3 with rectifier

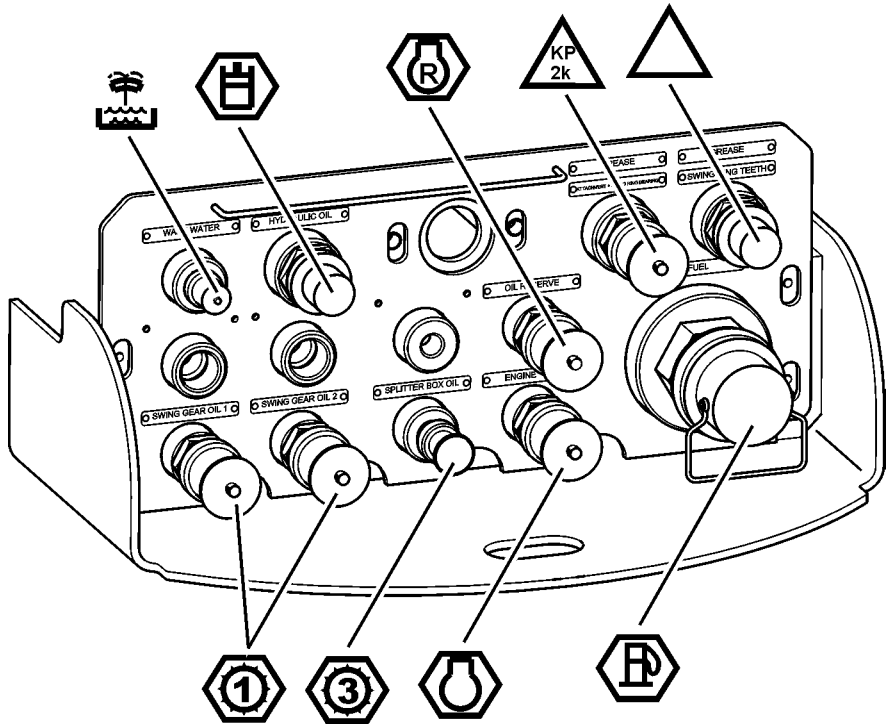


Fig. 4 Service tap

-  Fuel tank
-  Engine oil
-  Optional engine oil system
-  Hydraulic oil tank
-  Swing gears
-  Splitterbox

7 Components description

7.1 Electro-hydraulic gear pump

The electro-hydraulic gear pump **P12** supplies the ladder circuit and the service trap circuit.

7.1.1 Description

The electro gear pump consists in two main parts :

- The direct current motor.
- The geared pump.

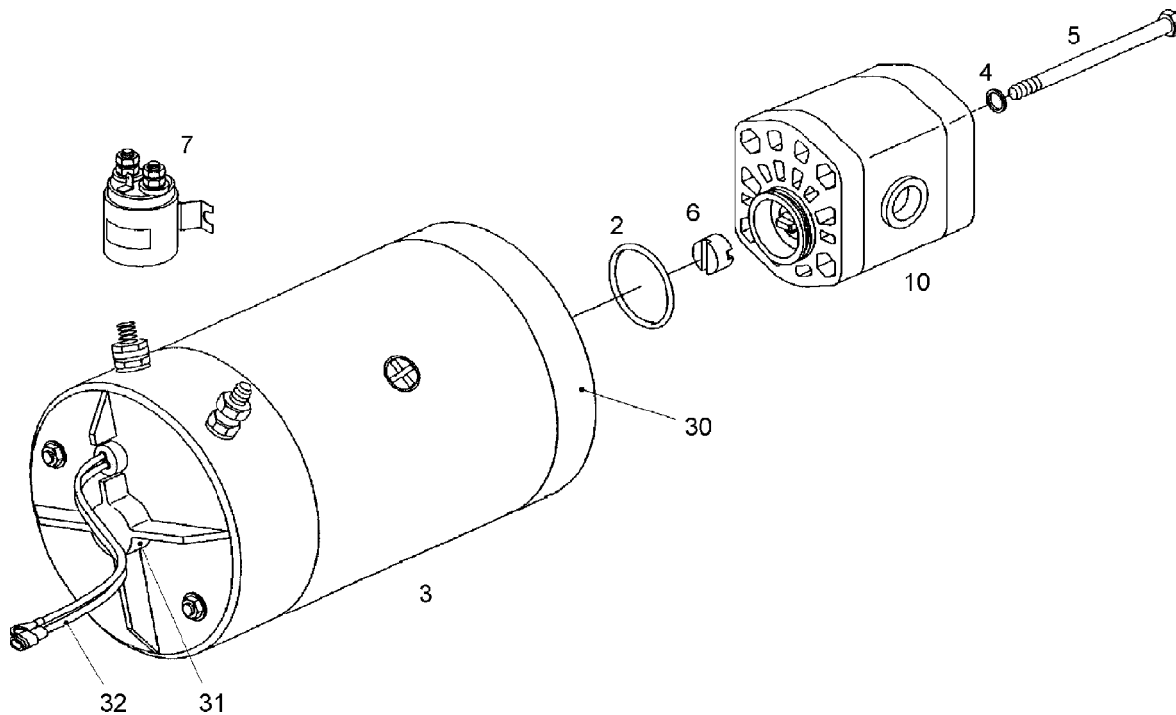


Fig. 12 Electro-hydraulic gear pump **P12**

2	O-ring	7	High current relay
3	Direct current motor	10	Hydraulic gear pump
4	Plain washer	30	Radial-lip-type oil seal
5	Hex. screw	31	Carbon-brush set
6	Driver	32	Temperature switch

Components description

- | | |
|-------------|-----------------|
| 1 Gas valve | 5 Oil valve |
| 2 Lock nut | 6 O-ring |
| 3 Body | 7 Nut |
| 4 Membrane | 8 Bleeder screw |

7.2 Pressure regulator valve

Pressure regulator valves are used to limit the hydraulic pressure in the track tensioning system (220 bar for **LVTL** and **LVTR**).

They carry on a security function: as long as the input pressure P is under the defined switch pressure P_r , the valve remains in its position. When the pressure increases ($P > P_r$) the valve lifts and oil can flow to the tank.

7.3 Non return valve

The non return valve allows the fluid to flow in one direction only as it stops the oil flow in the other direction.

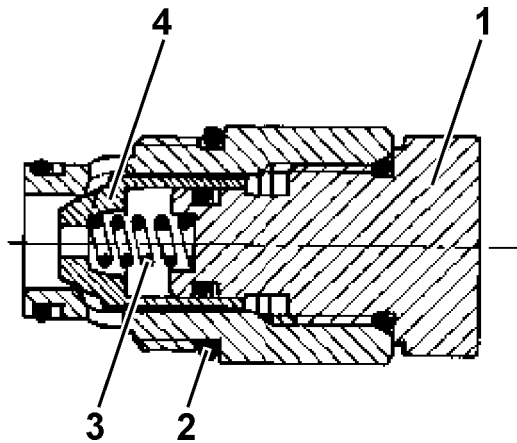


Fig. 7 Non return valve

- | | |
|-----------------|----------------------|
| 1 Locking screw | 3 Compression spring |
| 2 O-ring | 4 Cone |

3.7.2 Components location

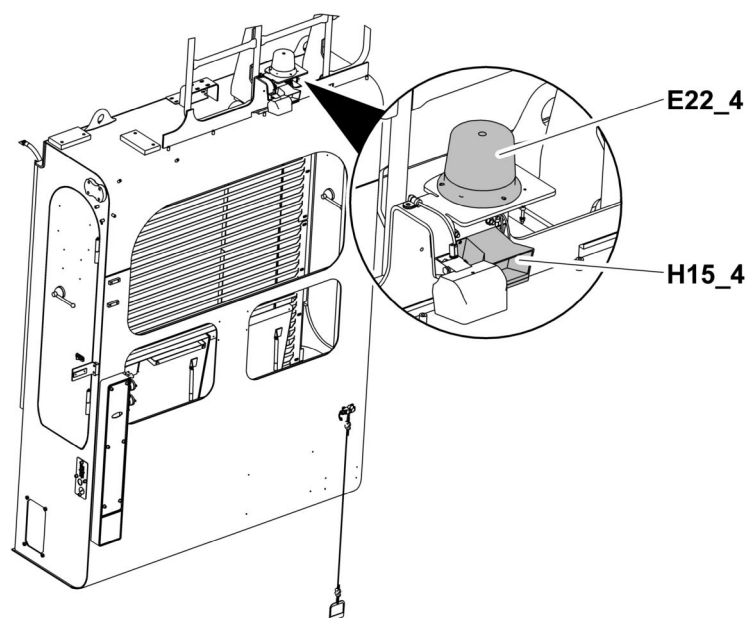


Fig. 35 Warn light **E22_4** and horn **H15_4**

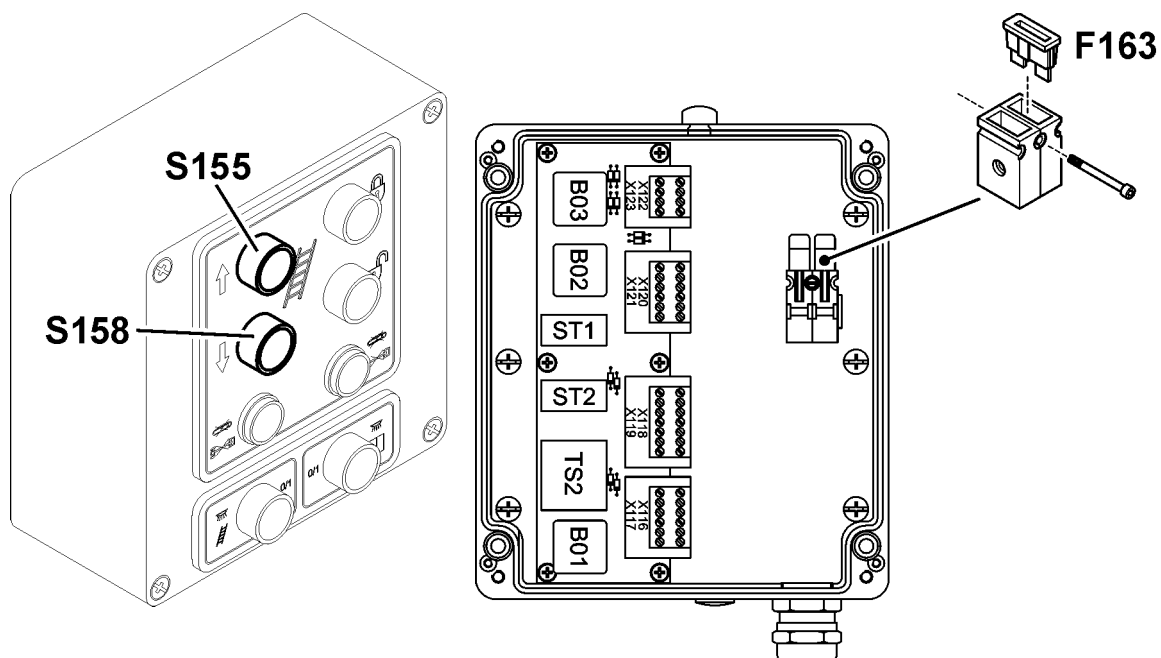


Fig. 36 Switches **S155** and **S158** and fuse **F163** in **E1022_1**

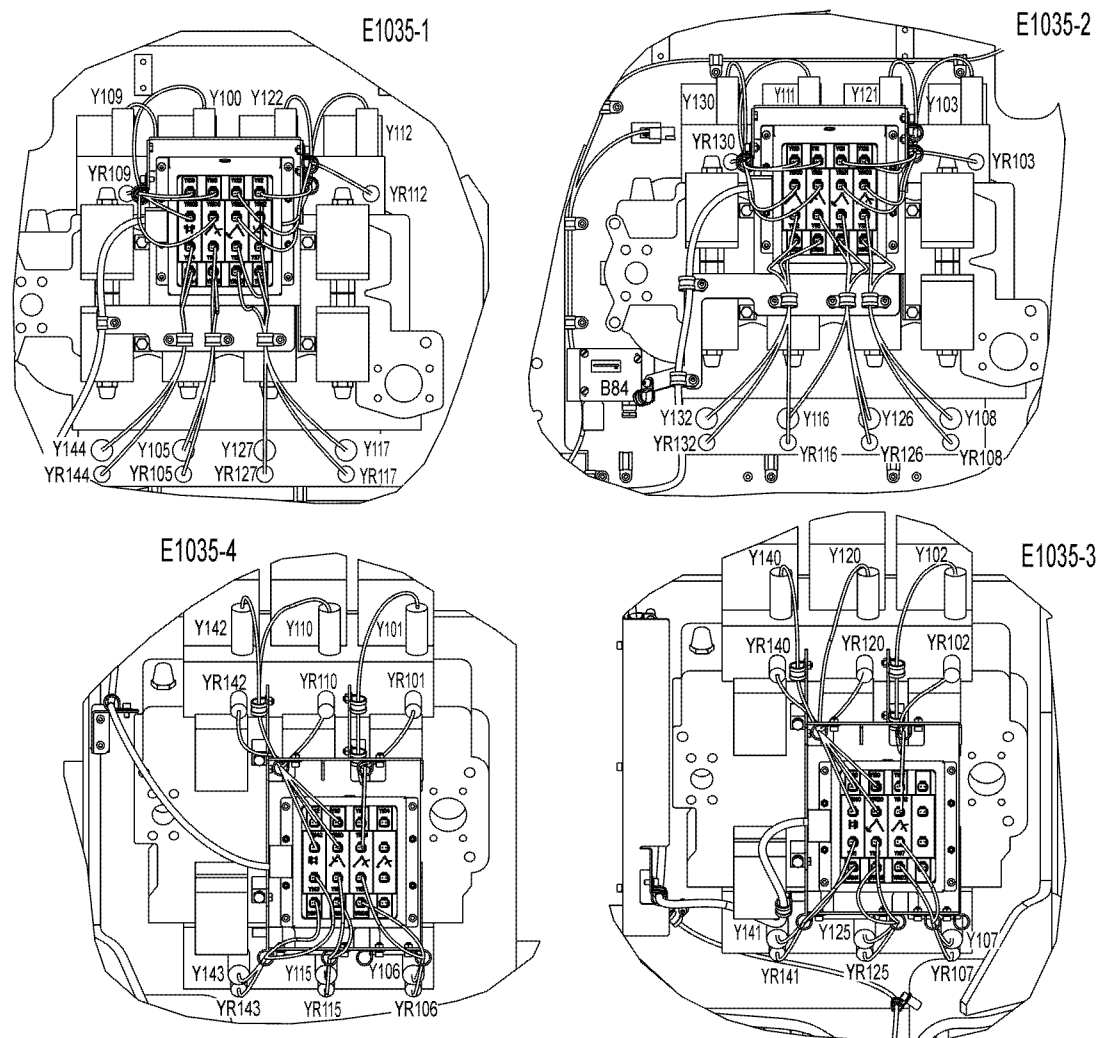


Fig. 60 Solenoid valves on valve blocks

E1035_1	Connection box control valve 1	E1035_2	Connection box control valve 2
VB1	Valve block 1	VB2	Valve block 2
Y100	Solenoid valve boom extend 1	B84	Sensor / control pressure
Y105	Solenoid valve boom retract 1	Y103	Solenoid valve boom extend 4
YR105	Adjust. solenoid valve boom retract 1	Y111	Solenoid valve crowd extend 2
Y109	Solenoid valve pressureless fall	Y108	Solenoid valve boom retract 4
YR109	Adjust. solenoid valve pressureless fall	YR108	Adjust. solenoid valve boom retract 4
Y112	Solenoid valve crowd extend 3	Y111	Solenoid valve crowd extend 2
YR112	Adjust. solenoid valve crowd extend 3	Y116	Solenoid valve crowd retract 2
Y117	Solenoid valve crowd retract 3	YR116	Adjust. solenoid valve crowd retract 2
YR117	Adjust. solenoid valve crowd retract 3	Y121	Solenoid valve shovel tilt extend 2
Y122	Solenoid valve shovel tilt extend 3	Y126	Solenoid valve shovel tilt retract 2
Y127	Solenoid valve shovel tilt retract 3	YR126	Adjust. solenoid valve shovel tilt retract 2
YR127	Adjust. solenoid valve shovel tilt retract 3	Y130	Solenoid valve shovel flap in
Y144	Solenoid valve sum travel forward	YR130	Adjust. solenoid valve shovel flap in
YR144	Adjust. solenoid valve sum travel forward	Y132	Solenoid valve shovel flap out

**1852 – Water in fuel high level**

This symbol appears if what is detected in fuel with high quantity.

- ▶ Turn the engine off.
- ▶ Drain fuel filters.
- ▶ Find and correct the problem.
- ▶ See also Cummins Operation and Maintenance manual.

**D 441 – Battery voltage low**

This symbol appears if the battery voltage drops below minimum value.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.

**D 442 – Battery voltage high**

This symbol appears if the battery voltage exceeds maximum value.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.

**D 449 – Rail overpressure**

This symbol appears if the fuel rail pressure exceeds maximum value.

↳ Engine will undergo power and/or speed derate.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.
- ▶ See also Cummins Operation and Maintenance manual.

**1362 – Engine oil filter differential pressure**

This symbol appears if the engine oil filter is defective.

↳ Engine will derate and/or stop.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.
- ▶ See also Cummins Operation and Maintenance manual.

**E 460 – Exhaust gas temperature deviation**

This symbol appears if the exhaust gas temperature deviates from normal range.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.
- ▶ See also Cummins Operation and Maintenance manual.

**E 464 – Exhaust gas temperature too high**

This symbol appears if the exhaust gas exceeds maximum temperature.

- ▶ Turn the engine off.
- ▶ Find and correct the problem.
- ▶ See also Cummins Operation and Maintenance manual.

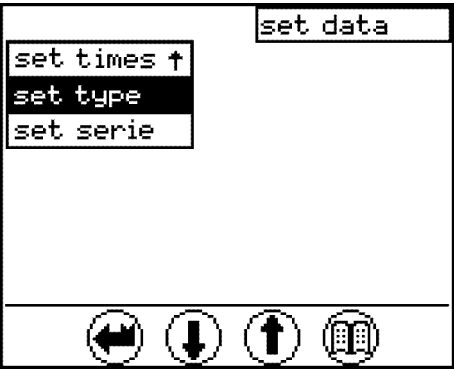


Fig. 104 "set type" function selection in "set data" menu

- ↳ After selecting the function, the presently Type No. will appear in the lower section of the screen.
- ↳ After function start, the first digit is shown inversely.
- ▶ Use the arrow key to change the inversely displayed position.
- ▶ Use the "Menu" key to change the inversely displayed number to the next higher number.
 - ↳ When the highest number has been reached, it will start over with the lowest number.
- ▶ After setting the numbers, press the "Return" key to leave the function and to store the set number.
 - ↳ The confirmation "update xxxx" will appear momentarily on the screen.

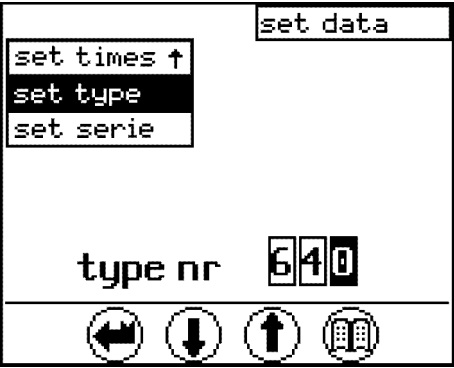


Fig. 105 Type number setting

- "set serie"

This function permits to give an identification number to the excavator.



Fig. 106 "set serie" function selection in "set data" menu

Components

- Close the battery compartment door.

**Danger!**

Wear protective gloves and safety glasses when handling batteries!
Keep sparks and open flame away from battery. Battery fumes are highly flammable and explosive.
Batteries contain acid, which should not be touched. In case of contact, flush with water and get medical attention.

Chapter 15 - Uppercarriage - Mechanical

Uppercarriage - Mechanical.....	15.00
1 Coupling.....	15.00.3
1.1 Function / operation.....	15.00.3
1.2 Installation / removal.....	15.00.3
2 Splitterbox.....	15.00.5
2.1 Technical data.....	15.00.5
3 Swing gear.....	15.00.7
3.1 Technical data.....	15.00.7
3.2 Function and operation.....	15.00.7
3.3 Installation / removal of the swing gear.....	15.00.11
3.4 Axial play of the output shaft bearing.....	15.00.13
3.5 Sealing of the swing brake.....	15.00.14
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4 Swing bearing.....	15.00.17
4.1 Component location.....	15.00.17
4.2 Technical data.....	15.00.18
4.3 Function / operation.....	15.00.18
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4.5 Inspection / wear reporting.....	15.00.23
5 Engine / splitterbox mounting.....	15.00.25
5.1 Components location.....	15.00.25
5.2 Function / operation.....	15.00.25
5.3 Installation / removal.....	15.00.26
5.4 Inspection wear reporting.....	15.00.27
6 Preassembled modules.....	15.00.31
6.1 Transport / lifting.....	15.00.31
6.2 Mounting / dismounting modules.....	15.00.32

12.2.4. Oil change procedure

It is best to use the same oil pump as described in the previous chapter (12.2.3) for the oil change procedure.

- Turn the motor until the oil connection couplings (907) are accessible.
- Connect the filling hose from the filling pump to the connection coupling (907) of the inner star (9).
- Immerse the intake tube of the filling pump in an oil container with the specified amount of flushing oil (6 liter).
- Connect the return line to the connection coupling (907) of the flange (5).
- Feed the return line into a receptacle for old oil.
- Switch on the pump and press an amount of flushing oil into the coupling.

CAUTION: Do not suck in any air!

- Switch off the oil pump and pull the filling hose off the inner star (9).
- Leave the return hose connected until no more oil emerges, i.e. until the filling pressure has sunk to the ambient pressure again.
- Pull off the return hose.

1. Einleitung • 1. Preliminary Notes

Gefahren können insbesondere dann auftreten:

- wenn unzureichend ausgebildetes Personal am Produkt tätig ist,
- wenn das Produkt unsachgemäß installiert, bedient und instand gehalten wird,
- wenn das Produkt zu nicht bestimmungsgemäßem Gebrauch eingesetzt wird.

Alle Personen, die mit dem Betrieb der Anlage oder des Produktes befaßt sind, müssen:

- unbedingt das Kapitel "Sicherheitshinweise" gelesen und verstanden haben,
- diese Betriebsanleitung zumindest in den Teilen kennen, in denen die jeweilige Tätigkeit und zugehörige Gefahrenhinweise beschrieben sind,
- mit Abschaltprozeduren, z.B. "NOT-AUS", der ganzen Anlage oder den für die jeweilige Tätigkeit wichtigen Teilen der Anlage vertraut sein,
- technisch ausreichend ausgebildet und zu der jeweiligen Tätigkeit befugt sein,
- ihre Aufgaben und Befugnisse kennen.

Sie müssen unbedingt:

- alle Handlungen unterlassen, die Gefahren für Körper und Gesundheit, Gefahren für das Produkt oder Gefahren für andere Werte bedeuten könnten,
- alle an dem Produkt vorgenommenen Veränderungen dem zuständigen Vorgesetzten oder Betreiber mitteilen,
- alle Veränderungen beim Betrieb des Produkts, z.B. unübliche Laufgeräusche, dem zuständigen Vorgesetzten oder Betreiber mitteilen.

An dem Produkt dürfen keine Veränderungen vorgenommen werden, die nicht zuvor von der ZF Industrieantriebe Witten GmbH genehmigt worden sind.

Der Anwender verpflichtet sich:

- am und um das Produkt für Sauberkeit und Ordnung zu sorgen,
- das Produkt nur in einwandfreiem Zustand zu betreiben,
- das Produkt nur zum bestimmungsgemäßen Gebrauch einzusetzen,
- das Produkt nur im Rahmen der unter 2.4 aufgeführten technischen Daten einzusetzen,
- umlaufende Teile durch geeignete Schutzvorrichtungen abzusichern,
- das Personal soweit wie nötig zum Tragen von Schutzkleidung zu verpflichten,
- dem zuständigen Personal diese Betriebsanleitung auszuhändigen.

Zum bestimmungsgemäßen Gebrauch gehört auch die Beachtung aller Angaben dieser Betriebsanleitung.

Beachten Sie ergänzend zur Betriebsanleitung alle allgemein gültigen gesetzlichen und sonstigen Regelungen

In particular, hazards may occur:

- if insufficiently trained personnel manipulates the product,
- if the product is inexpertly installed, operated and serviced,
- if the product is used for other than the intended purposes.

All persons responsible for the operation of the plant or product must:

- have definitely read and understood the chapter "Notes on Safety",
- know these Operating Instructions or at least be familiar with those parts where the respective activity and associated dangers are described,
- be familiar with shut-down procedures, e.g. "Emergency-OFF", relating to the entire plant or to plant items important to the relevant activity,
- have adequate technical qualifications and be authorized to perform the relevant activity,
- know their specific duties and authority.

Moreover, it is mandatory that these persons:

- refrain from doing anything that might cause bodily harm or constitute a danger to health, the product or other assets,
- inform their superiors in charge or the Operator of any modifications made to the product,
- inform their superiors in charge or the Operator of any changes detected in the operational behaviour of the product, e.g. unusual running noise.

No modifications to the product are permitted unless the prior approval of ZF Industrieantriebe Witten GmbH has been obtained.

The User shall undertake to:

- ensure that the product and its surroundings are kept clean and in good order,
- operate the product only when in perfect condition,
- use the product exclusively for the intended purpose,
- use the product only in the framework of the technical characteristics listed under 2.4,
- safeguard rotating parts by means of suitable protective systems,
- instruct the personnel to wear protective clothing, to the extent deemed necessary,
- distribute these operating instructions among the personnel in charge.

Using the equipment for the intended purpose as set out above also includes observing the instructions given in this operating manual.

In addition to the procedures and instructions outlined in this operating manual all generally applicable statutory be observed.

Die Produktverantwortung für die aufgelisteten Öle liegt ausschließlich beim Ölhersteller.
Nach Angaben der Schmierstoffhersteller sind die in der Tabelle 1 der Anhänge 1 bis 8 aufgeführten Produkte weltweit unter demselben Handelsnamen verfügbar und weisen vergleichbare technologische Eigenschaften auf.

5.2 Sicherheitshinweise

Von Getriebeölen und sonstigen Schmierstoffen können Gefährdungen für Mensch und Umwelt ausgehen. Sicherheitshinweise und Gefährdungen werden in den Sicherheitsdatenblättern beschrieben. Der Betreiber ist dafür verantwortlich, dass ein aktuelles, den länderspezifischen Anforderungen entsprechendes Sicherheitsdatenblatt des verwendeten Getriebeöls vorliegt und die darin geforderten Maßnahmen umgesetzt sind.

5.3 Umwelt und Entsorgung

Getriebeöle werden, unabhängig des Grundöltyps: Mineralöl, synthetische Kohlenwasserstoffe wie Polyalphaolefine (PAO), Polyglykole (PG) oder synthetische Ester pauschal in die Gruppe der umweltgefährdenden Flüssigkeiten eingestuft.

Die jeweiligen Hersteller von Getriebeölen machen Vorgaben zur umweltgerechten Handhabung und Lagerung. Es ist darauf zu achten, dass ausgelaufene oder verspritzte Flüssigkeiten mit geeigneten Bindemitteln oder technischen Einrichtungen aufgenommen werden und nicht in ein Gewässer, den Boden oder in die Abwasserkanalisation gelangen.

Für die Entsorgung der jeweiligen Flüssigkeit sind die jeweiligen nationalen Bestimmungen zu beachten.

6 Auswahl des Getriebeöls

Die in der Tabellen 1 der Anhänge 1 bis 5 aufgelisteten Mineralöle (MIN) und synthetischen Öle (PAO) enthalten Wirkstoffe zur Erhöhung des Korrosionsschutzes und der Alterungsbeständigkeit sowie Wirkstoffe zum Herabsetzen des Verschleißes im Mischreibungsgebiet und erfüllen somit die Anforderungen an ein CLP-Schmieröl. Neben den Mindestanforderungen nach DIN 51517-3 erfüllen diese Öle auch die für Industrie-, Fahr- und Schwenkgetriebe der ZF Industrieantriebe Witten GmbH vorgeschriebenen, zusätzlichen Anforderungskriterien nach ZN 32010.

Die Auswahl des Grundöltyps (Mineralöl oder synthetische Öle) und auch der Hersteller wird primär durch den Anwender vorgenommen. Eine qualitative Bewertung der gelisteten Öle kann nicht abgeleitet werden.

Die in den Anhängen 6 und 7 aufgelisteten KFZ-Getriebeöle kommen in einigen Getrieben der Mining- und Baubranche zur Anwendung. Diese Öle unterliegen nicht den Mindestanforderungen nach DIN 51517-3. Die relativ geringe Auswahl an Ölen beruht auf die Einhaltung einer definierten Ist-Viskosität (ISO-Viskosität).

Getriebeöle mit der allgemeine Angabe SAE 80W-90 oder SAE 85W-90 können mehrere ISO-Viskositätsklassen abdecken und sind somit nicht eindeutig definiert (*siehe Abschnitt 8, Bild 1*).

Der Anhang 8 beinhaltet KFZ-Getriebeöle der SAE-Viskositätsklasse 140 und ist ausschließlich für Getriebe ohne nasslaufende Bremsen vorgesehen.

Bei Einsatz von Mineralölen sollte eine Öldauertemperatur von 85 °C nicht überschritten werden. Die gelisteten synthetischen Öle (PAO) können bis 100 °C Öldauertemperatur eingesetzt werden.

Eine kurzzeitige Überschreitung um 10 K ist zulässig.

Höhere Dauertemperaturen führen zu einer erheblichen Herabsetzung der Betriebsviskosität und zum frühzeitigen Altern des Schmierstoffes.

Eine grobe Regel besagt: Eine Temperaturerhöhung um 10 K halbiert die Gebrauchsdauer und eine Absenkung um 10 K verdoppelt die Gebrauchsdauer der Ölfüllung.



Der Einsatz synthetischer Öle auf Basis von Polyglykolen (PG) und biologisch abbaubare Öle auf Basis synthetischer Ester sind auf Grund möglicher Materialunverträglichkeiten von ZF Industrieantriebe Witten GmbH nicht zugelassen!

Sollte eine dieser Öltypen in Betracht gezogen werden, ist eine vorherige, schriftliche Anfrage an ZF Industrieantriebe Witten GmbH zu stellen.

Anwendungstechnische Aspekte sind zwischen dem Systemhersteller oder dem Betreiber der Anlage und dem Schmierstoffhersteller abzustimmen.

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Getriebeöle, denen VI-Verbesserer zugegeben wurde, können während der Einsatzzeit ohne äußere Einflüsse zum Abbau der vorgesehenen Schmierstoffviskosität führen. VI-Verbesserer sind mehr oder weniger scherempfindlich und reagieren unterschiedlich stark auf mechanische

MatNr.:	R916000625
Produkt:	GFC 380/1003 KDN-K
Zeichnungs-Nr.:	0 6094/1003 8

Menge	Pos.	Benennung	Bestell-Nr.
1,000	E029	RILLENKUGELLAGER	R916565312
1,000	E030	ZYL-ROLLENLAGER	R916411318
2,000	E032	RADIALDICHTRING	R916461362
2,000	E033	RADIALDICHTRING	R913008898
2,000	E034	O-RING	R916463270
2,000	E036	RADIALDICHTRING	R916461383
2,000	E038	O-RING	R916463600
1,000	E039	O-RING	R916463541
2,000	E040	O-RING	R916463542
1,000	E042	O-RING	R916463326
1,000	E044	O-RING	R916463544
4,000	E045	ZYLINDERSCHRAUBE	R916445094
16,000	E046	SECHSKANTSCHRAUBE	R916441367
4,000	E047	SECHSKANTSCHRAUBE	R916441194
8,000	E048	SECHSKANTSCHRAUBE	R916441277
34,000	E049	SECHSKANTSCHRAUBE	R916441197
4,000	E050	SECHSKANTSCHRAUBE	R916441200
1,000	E051	VERSCHLUSSSCHRAUBE	R909151694
17,000	E053	VERSCHLUSSSCHRAUBE	R916444267
1,000	E055	VERSCHLUSSSCHRAUBE	R916444189
1,000	E056	ENTLUEFTER	R916432125
4,000	E057	VERSCHLUSSSCHRAUBE	R909151979
1,000	E058	VERSCHLUSSSCHRAUBE	R916444164
2,000	E059	VERSCHLUSSSCHRAUBE	R916436156

Swing bearing

- ▶ With hydraulic jacks, lift the uppercarriage evenly until the undercarriage is free. To prevent the uppercarriage from sinking, additional shim must be inserted.
- ▶ Carefully pull the undercarriage out and remove the bolts **11** with the tensioning cylinder from the undercarriage to the swing ring.
- ▶ Lift off the swing ring and set it down on a prepared surface.

4.4.3 Mounting the bolts of the swing ring

- ▶ For information about the bolt tensioning cylinder, see chapter 5.



Danger!

The special tool may only be operated by qualified personnel, especially trained for the use of this high pressure tensioning device and aware of the operating instructions as well of the recommendations for accident and damage prevention concerning this tool.

- ▶ Use appropriate working platforms and lifting devices to install and hold in position the special tool while tensioning the bolts.

4.4.4 Swing ring bolts tensioning procedure

- ▶ Coat the bolts with grease.
- ▶ Screw the bolt in the swing ring thread. The distance between the swing ring and the end of bolt must be as stated in the general data chart.
- ▶ Install the washer and screw the nut onto the bolt by hand down to the support surface.
- ▶ Check that there is no play between the swing ring and the uppercarriage and the undercarriage.
- ▶ If necessary, use hexagonal screw for preassembly.
- ▶ Screw the bolt tensioning cylinder onto the bolt with an Allen wrench (approximately 30 - 50 Nm) down to the support surface.
- ▶ If necessary, use the inspection hole in the change bushing to ensure that the unit is screwed on far enough.
- ▶ Connect the pressure hose to the bolt tensioning cylinder and the high pressure pump unit.
- ▶ Generate the required pressure (see general data chart) with the high pressure unit.
- ▶ When the joint is under pressure, use a ratchet to screw the nut onto the bolt (approximately 60 - 100 Nm).
- ▶ Open the stop valve on the high pressure pump unit to release pressure on bolt tensioning cylinder.
- ▶ Do not re-close the stop valve until the piston have returned to their lower end position.
- ▶ Remove unit from joint in the opposite order of succession described above.
- ▶ When all the bolts have been tightened, the first bolt should be re-tensioned. This is necessary because in the process of tensioning the load on the first (or next) bolt is slightly reduced.
- ▶ Tighten the second nut (it isn't a conternut but rather a thread protection) on the bolt respecting the tightening value.

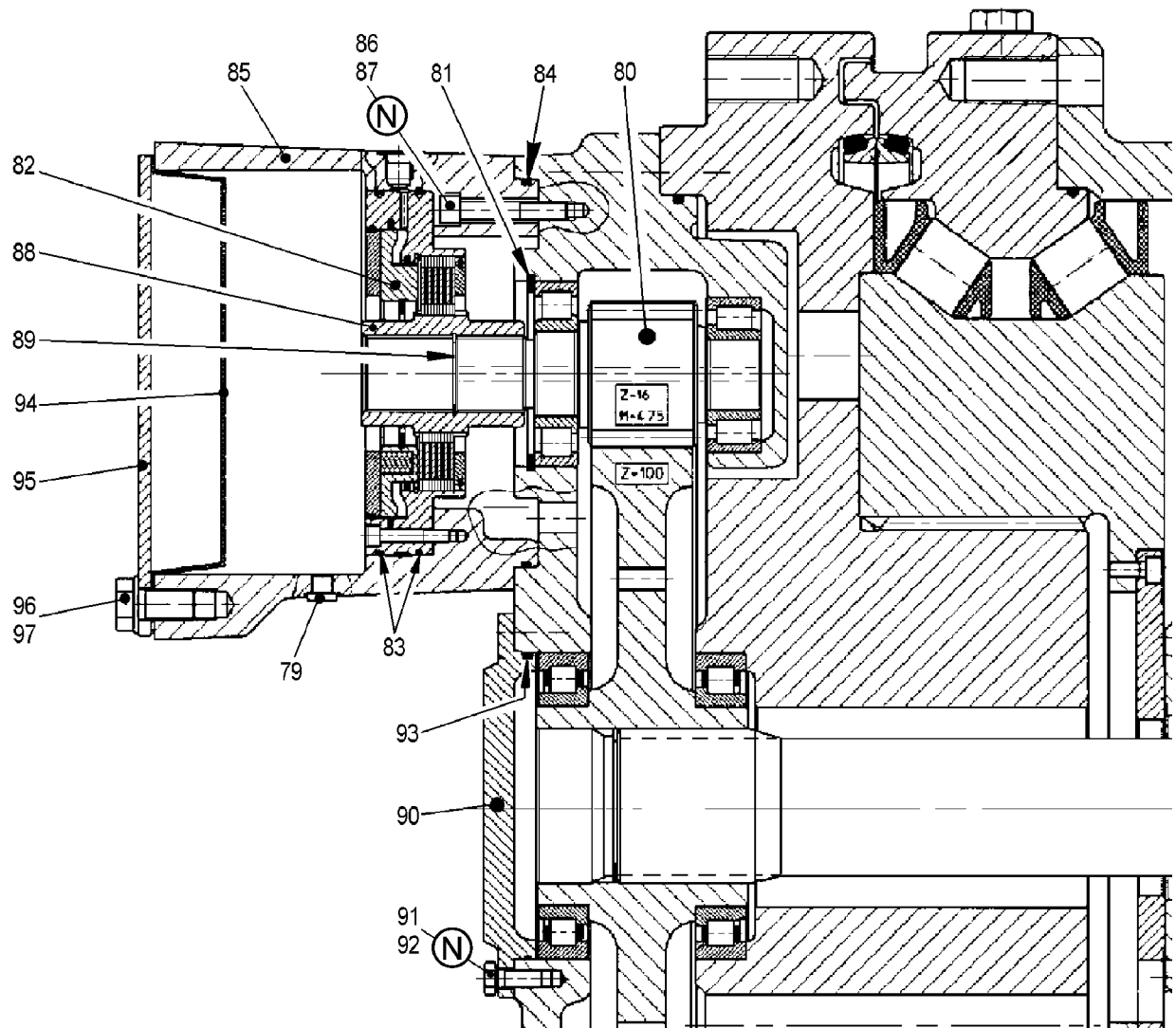


Fig. 6 Travel gear

79	Screw plug	89	Locking ring
80	Primary shaft	90	Alu caps
81	Locking ring	91	Hex. Head screw M12x30
82	Spring loaded multidisc brake	92	Lock washer
83	O-ring	93	O-ring
84	O-ring	94	Taper plug
85	Motor flange	95	Alu caps
86	Allen head screw	96	Hex. Head screw M20x40
87	Lock washer	97	Washer
88	Plate carrier		

Track components

8	New : 8n mm (inch)	125 (4.92)	130 (5.12)
	Max. wear limit : 8w mm (inch)	100 (3.94)	105 (4.13)

2.8.4 Idler

Ultrasonic and classic measurement

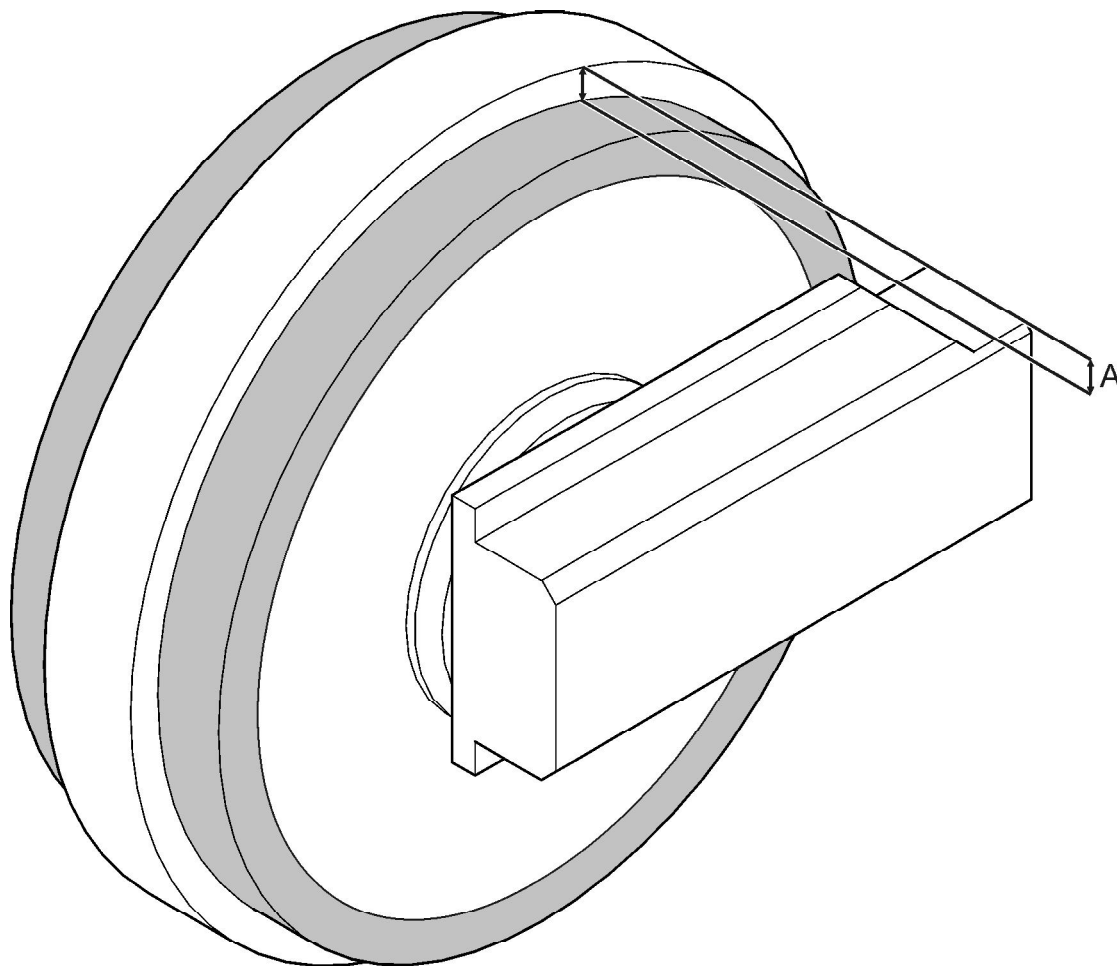


Fig. 24 Idler

	5617382	10016673
New : A mm (inch)	47,5 (1.87)	45 (1.77)
Max. wear limit : A mm (inch)	56,5 (2.22)	54 (2.13)

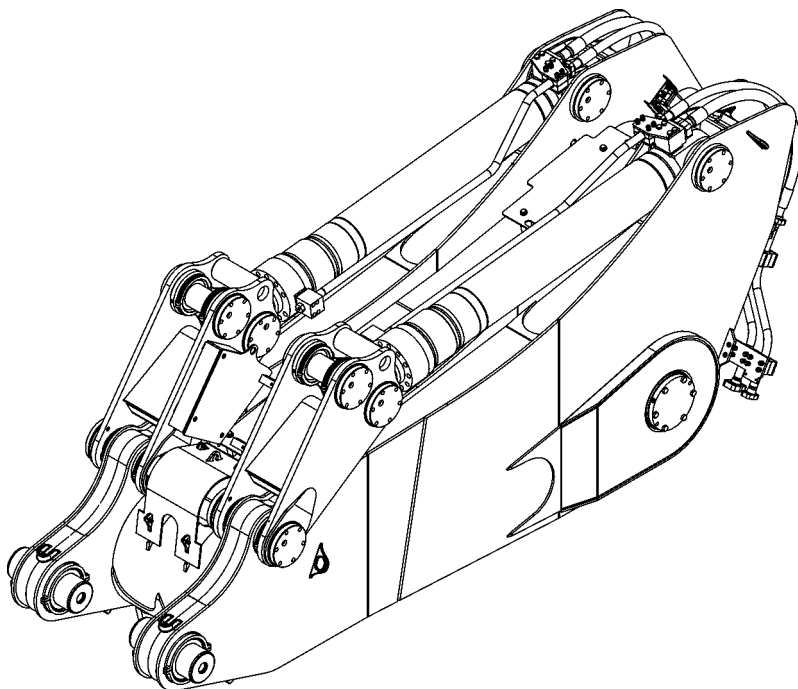


Fig. 6 *Stick for backhoe attachment*

Technical data

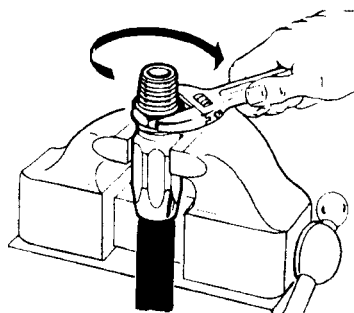
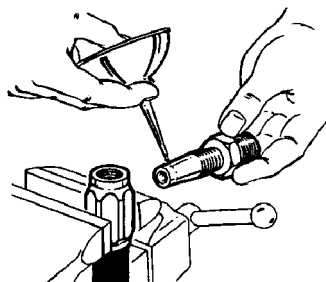
Evaporator		
Type		VD5010/4
Weight	kg	38
Cooling capacity	W	11600
Air volume	m ³ /h	3490
Condenser		
Type		UKD 512/4
Weight	kg	38
Cooling capacity	W	17000
Air volume	m ³ /h	3490
Compressor		
Type		SANDEN SD7 H15
Weight	kg	7,3
Oil type		See Operating manual
Oil quantity in compressor / in full circuit	cm ³	See Operating manual

- For further information about oil filling and oil level check, refer to the Konvekta documentation at the end of this chapter:
- "Konvekta From A to Z" (general information about the full air conditioning circuit),
 - "Start-up and installation guideline for Sanden compressors" (oil level measurement),
 - "Compressors with PAG-oil-filling" (compressor and full circuit oil filling).

Contents

1. Description of abbreviations used for KONVEKTA products
2. Compressor
3. Magnetic Clutch
4. Condenser Coil
5. Liquid Receiver
6. Filter Drier
7. Sight Glass
8. Expansion Valve
9. Evaporator Coil
10. Pressure Switch
11. Manual Shut-off valve
12. Refrigeration Scheme
13. Oil Separator
14. Additives
15. Refrigerant Oils
16. Refrigerant
17. Leakage Test
18. Drying and Evacuation
19. Function of Drying Process
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21. Charging and Evacuation of Cooling Machines
22. Function of Compressor Lubricants
23. Installation Instructions
24. Air Distribution
25. General Instructions for Repair and Maintenance Service and maintenance
26. Instructions for Charging Air Conditioners with R134a
27. Conversion Instructions from R12 to R134a for A/C's with BOCK compressors
28. Mounting Instructions
29. Inspection Report
30. Security During Repair and Maintenance
31. O-Ring Fittings
32. Bending Radii of KONVEKTA refrigerant hose pipes
33. Pressure Switch
34. Defrosting Thermostat
35. Compressor Detail
36. Conversion Table (psi ; Bar ; °C ; °F)
37. GWP and ODP

3. Screw nipple at hexagon into support and hose in clockwise direction until nipple comes slightly to a rest in the support. Do **NOT** tighten!



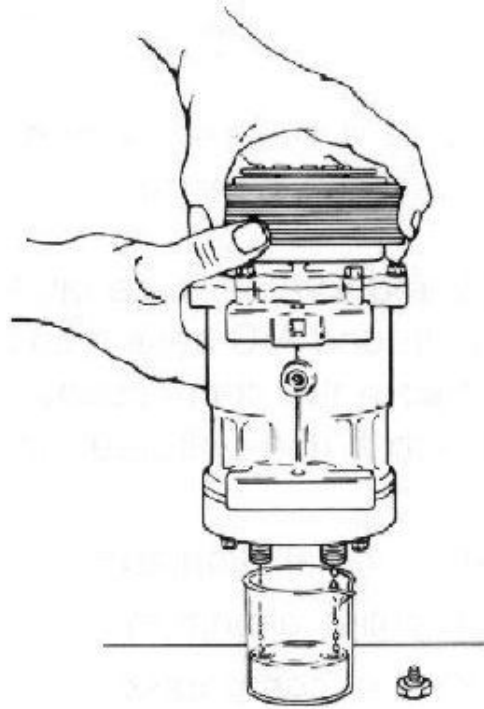
4. Check all hose pipes and clean.

Demounting is in reverse sequence.

- 10) Addieren Sie **15cc** (0.5 fl. Oz.). Das Ergebnis ist die berechnete Ölmenge im Kompressor. Ca. **15cc** (0.5 fl. Oz.) haften an den internen Oberflächen und verbleiben im Kompressor.

*Add **15cc** (0.5 fl. Oz.). This is the calculated amount of oil in the compressor.*

*Approximately **15cc** (0.5 fl. Oz.) will remain in the compressor as a film coating the internal surfaces.*



- 11) Die Ölmenge im Kompressor nach der Laufzeit von 10-15 Minuten sollte der nebenstehenden Tabelle entsprechen, vorausgesetzt die Ölmenge im System war korrekt. Bestimmen Sie anhand der nebenstehenden Tabelle, welches die korrekte Ölmenge für die jeweilige Geschwindigkeit sein sollte. (Die Tabelle bezieht sich auf SD5H14 Kompressoren. Bei anderen Kompressortypen kommt eine geringere Ölmenge, abhängig vom jeweiligen Typ, zur Anwendung. Es ist wichtig, dass nach dem Test eine gewisse Ölmenge im Kurbelgehäuse verbleibt.)

Comp. RPM	Oil in compressor	
	cc	fl. oz
1,000	100	3,4
2,000	75	2,5
3,000	50	1,7
4,000	40	1,3
5,000	35	1,2

The amount of oil in the compressor after running for 10-15 minutes should be according to the table at right, if the proper amount of oil was in the system. Determine from the table what the correct amount of oil should be for the particular speed. (The table applies to SD5H14 compressors. Other compressors will need less oil, dependent upon type. It is important that a quantity of oil remains in the crankcase after the test.)

- Fhz.-Türen offen / *Vehicle doors open*
- Max. Gebläseleistung / *Maximum Power Speed*
- Umgebungstemp. Mindestens 24°C (75°F)
/ *Ambient temperature at least 24°C (75°F)*

SECTION II – SYSTEM DESCRIPTION

6-30-05 Page 2-2

REV. 2

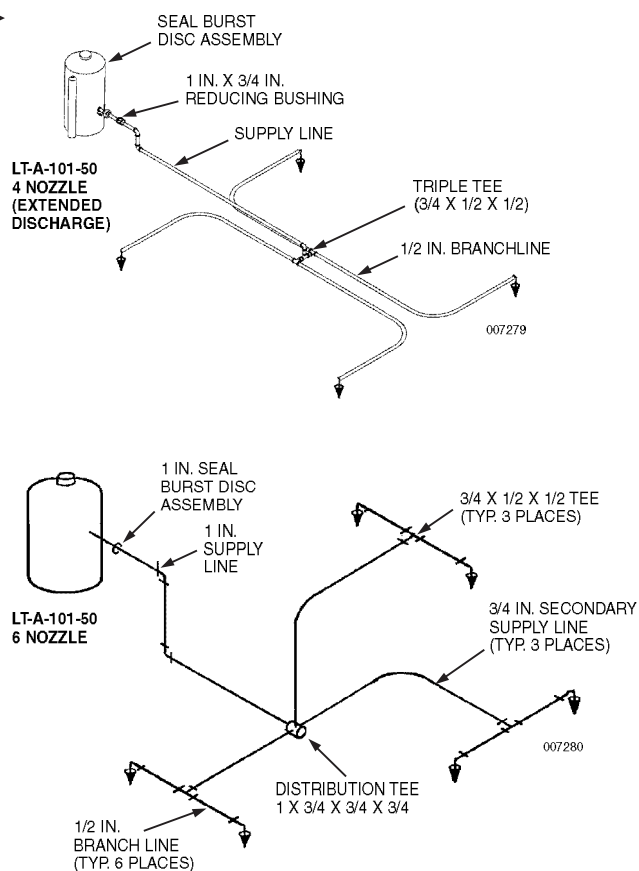


FIGURE 1 – Continued

System Size/Nozzle Quantity Chart

	4	6	8	12	16	24
LT-A-101-50	X	X	X			
LT-A-101-125			X	X	X	
LT-A-101-250			X	X	X	X

DETECTION

- Several types of electric automatic detection systems with various detector options are available for the LT-A-101-50/125/250 systems.

Electric

Electric detection systems (CHECKFIRE SC-N, Series I, and MP-N) are available to provide rugged, automatic detection for vehicle protection. These systems are either powered by the vehicle battery or by the internal module battery or both.

- The electric detection systems can use either linear heat detection, spot detectors, pneumatic linear detectors, or can be combined with optional flame detection in certain applications.

The following are typical industrial type hazards which can be protected by using the total flooding method: flammable liquid storage, dip tanks, solvent cleaning tanks, transformer vaults, quench tanks, and furnace rooms.

HAZARD ANALYSIS

A thorough hazard analysis is required to determine the type and quantity of protection required.

Review each of the following requirements when doing a hazard analysis:

1. Hazard Type

Record the size of the hazard, any obstructions, unclosable openings, size and location of external ductwork or anything else which would concern system performance. Briefly describe the type of hazard being protected. If protecting pre-fabricated booths, record the manufacturer model number and anything unique about the hazard.

2. Hazard Atmosphere

- ▶ The LT-A-101-50/125/250 system can be used in most industrial environments. If the hazard atmosphere is considered corrosive, such that the solvents, chemicals, or gases present are damaging to the LT-A-101-50/125/250 system tank or actuators, the hardware should not be located in the hazard. When protecting an area defined as hazardous per NFPA 70 National Electric Code, Article 500, only equipment that has been listed or approved for the hazardous location, may be located in that area.

3. Hazardous Materials

- ▶ The LT-A-101-50/125/250 system uses FORAY (ABC) dry chemical as the extinguishing agent. The agent effectiveness and limitation is based on its ability to suppress the fire with the design parameters of the pre-engineered system.

- a. FORAY dry chemical is effective on the following types of fire materials:

Class A – Surface Fires: These fires involve ordinary combustible materials such as cloth, paper, rubber, and many plastics.

Class B – Flammable Liquid and Gas Fires: These fires involve such materials as oils, grease, tars, oil-based paints, lacquers, and gasoline.

Class C – Energized Electrical Equipment Fires: Common Class C devices include control rooms, transformers, oil switches, circuit breakers, rotating equipment, pumps, and motors

- b. FORAY dry chemical is **NOT** effective on the following types of fire materials:

Deep-seated Class A Materials: Deep-seated or burrowing fires in ordinary combustibles where the FORAY dry chemical cannot reach the point of combustion.

Class D – Combustible Metals: Class D type materials are reactive such as sodium, potassium, magnesium, and titanium.

Chemicals Capable of Rapid Oxidation: Chemicals or mixtures of chemicals such as cellulose nitrate.

4. Ventilation Considerations

The hazard ventilation system is very important when considering total flooding application, but should also be considered for local application overhead and tankside.

The ventilation system should be shut down and/or dampered before or simultaneously with the start of the LT-A-101-50/125/250 system discharge.

5. Electrical Considerations

It is recommended that all electrical power sources associated with the protected hazard be shut down before system discharge. This eliminates the potential of a fire being electrically-reignited.

6. Temperature Range

The following temperature ranges must be determined and noted to ensure proper placement and operation of the A-101 system:

Hazard Area: Determine the minimum and maximum temperature of the hazard to be protected. This temperature may be any temperature that the distribution piping and detectors can withstand – only if the agent tank and accessories are located outside of the hazard area.

Agent Tank: The temperature range for all applications is –65 °F to +130 °F (–54 °C to +54 °C).

DISTRIBUTION SYSTEM REQUIREMENTS

The distribution system for industrial hazards must follow the same requirements as listed for vehicle systems. See Section IV, SYSTEM DESIGN – VEHICLE, for detailed hose requirements for agent distribution and actuation/expellant gas lines.

Exception: For industrial hazards, only F-1/2 nozzles, Part No. 16449, are approved for total flood.

NOZZLE COVERAGE

- ▶ The only nozzle approved for use with LT-A-101-50/125/250 industrial total flooding protection is the F-1/2 nozzle.

Single System Capabilities – Total Flooding

- ▶ **LT-A-101-50/125/250**
 - Each set of (4) four nozzles will protect a 1000 cu. ft. (28.3 cu m) maximum hazard utilizing either a 4, 8, 12, 16, or 24 nozzle system.
 - Maximum linear hazard size for each set of (4) four nozzles is 10 ft x 10 ft x 10 ft (3.0 x 3.0 x 3.0 m) utilizing either a 4, 8, 12, 16, or 24 nozzle system.
- ▶ See Figure 1 for nozzle layouts.

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SECTION IV – SYSTEM DESIGN

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REV. 7

ACTUATION SYSTEM REQUIREMENTS

The following requirements must be followed:

1. Any combination of A-101-10/20/30, LT-A-101-10/20/30, LT-A-101-50/125/250, and/or LVS-5, LVS-15 and LVS-30 actuators, the maximum number of pneumatic actuators allowed is ten.

NOTICE

If more than ten pneumatic actuators are required, a booster actuator (LT-A-101-30 Cartridge Bracket Assembly (Part No. 24883)) will have to be added in the actuation line. When the LT-A-101-30 Cartridge Assembly is utilized as a booster actuator, it must be counted as one of the maximum allowable ten pneumatic actuators in the line.

2. All remote manual/automatic actuators must use the LT-10-R cartridge (Part No. 423423: Right Hand Threads, or Part No. 423425: Left Hand Threads).

NOTICE

If more than 100 ft (30.5 m) of pressurized actuation line is required, for any combination of LT-A-101-10/20/30, LT-A-101-50/125/250, and/or LVS-5, LVS-15, and LVS-30 tanks from one remote manual/automatic actuator, a booster actuator (LT-A-101-30 Cartridge Bracket Assembly (Part No. 24883)) will have to be added in the actuation line.

3. The maximum length of 1/4 in. actuation hose that may become pressurized from any manual/automatic actuator must not exceed 100 ft (30.5 m), including pressurized line lengths connecting to pneumatically operated auxiliary devices, such as pressure switches and shut down valves.

4. When the LT-A-101-30 Cartridge Assembly is utilized as a booster actuator, it must be counted as one of the maximum allowable ten pneumatic actuators in the primary actuation line.
5. The bottom port of the pneumatic actuator in the LT-A-101-30 (booster actuator) assembly is used to create a secondary actuation line that can utilize up to another 100 ft (30.5 m) of 1/4 in. actuation line.
6. An additional safety vent relief valve (Part No. 15677) is required at the end of the secondary actuation line.

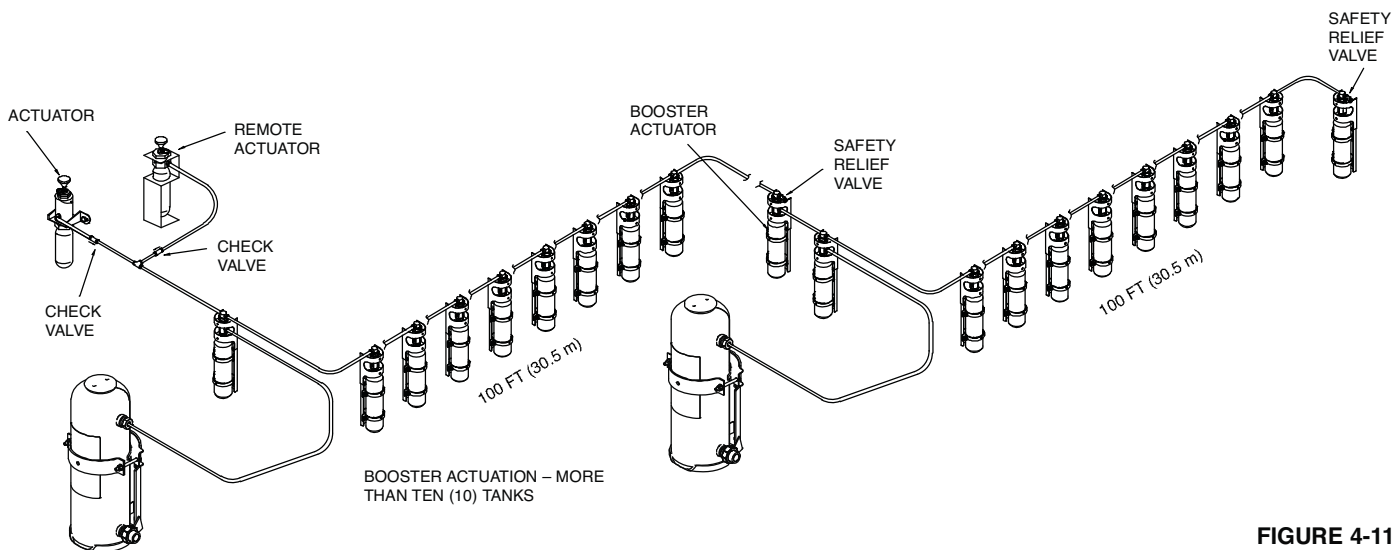


FIGURE 4-11
008758

This manual is intended for use with the CHECKFIRE® SC-N Electric Detection and Actuation System.

Those who install, operate, inspect, or maintain this system should read this entire manual. Specific sections will be of particular interest depending upon one's responsibilities.

As with all electro-mechanical equipment, the electric detection and actuation system needs periodic care to provide maximum assurance that it will operate effectively and safely. Inspection frequency shall be performed monthly, or sooner, depending on operating and/or environmental conditions. Maintenance shall be performed semi-annually, or sooner, depending on operating and/or environmental conditions.

The application and use of the CHECKFIRE SC-N system is limited to the application and uses described in this manual. For other applications, contact your local ANSUL distributor or the ANSUL technical representative in your area.

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FUNCTION TEST (Continued)

Detection Circuit Functional Test (Continued)

► The following will take place while the jumper wire is being held on the terminals:

- The RED Alarm LED and sounder will pulse at a rate of two times per second
- The first time delay cycle will start
- The alarm relay will transfer (non-latching)

After verifying the above, remove the jumper wire. The control module will reset to normal (as long as the cycle for Time Delay No. 1 has not been exceeded). Normal is when only the GREEN Power LED is pulsing and no other LEDs or the Audio Alarm are operating. Also, the alarm relay will return to normal.

2. This next test will verify the settings of the time delays. Again, hold the jumper wire on Terminals 3 and 4. Continue to hold the jumper wire on these terminals until the second time delay has started. Once the second time delay has started, the jumper wire can be removed.

The following will take place while the jumper wire is being held on the terminals:

- The RED Alarm LED and sounder will pulse at a rate of two times per second
- The first time delay cycle will start and time through its cycle
- The alarm relay will transfer (non-latching)

After the first time delay has completed its cycle, the following will take place:

- The RED Alarm LED and sounder will pulse at a rate of four times per second
- The second time delay cycle will start and time through its cycle
- The alarm relay will transfer
- The shut-down relay will transfer, causing vehicle shutdown
- At the end of the second time delay cycle, the release circuit will activate, causing the GREEN LED on the test module to illuminate.

-
-
- 3. After the jumper wire has been removed, reset test module by pressing the reset button on the tester.
- 4. Disconnect the actuation cable from the test module and verify that the module is indicating both a RED alarm LED and a YELLOW release fault LED.
- 5. Reconnect the actuation cable to the test module and push the "RESET" button on the CHECKFIRE SC-N control module. The module will return to the normal condition.
6. If required, make certain to reset any auxiliary shutdown devices.

Pressure Switch/Manual Pull Initiating Circuit

During the programming requirements of the pressure switch/manual pull circuit, two options are available. The first option allows the circuit to be programmed for immediate release and the second option allows for shutdown/time delay/release. If choosing the shutdown/time delay/release option, the programming will also require a length of time delay to be chosen.

Immediate Release Option

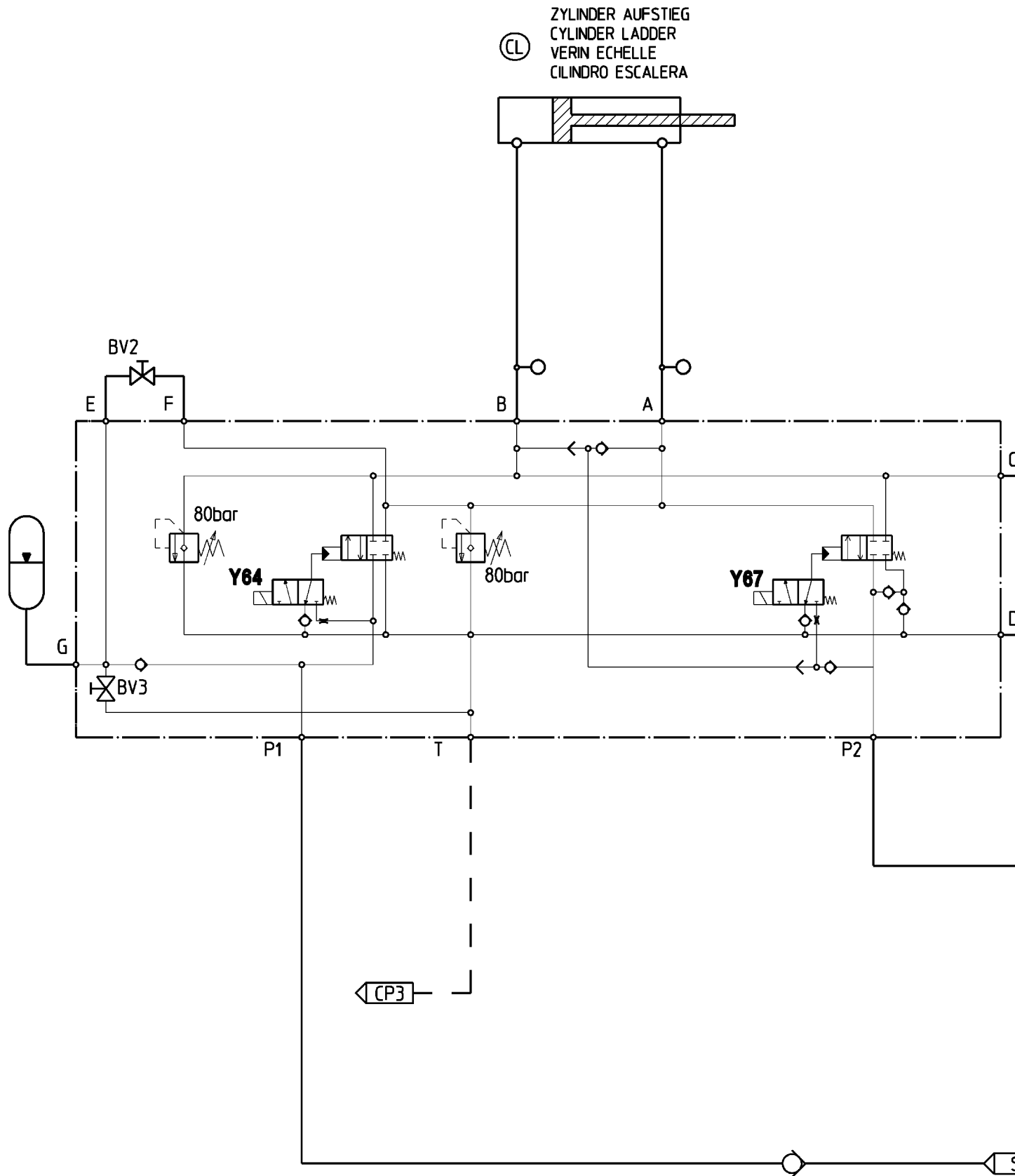
1. Using the jumper wire, hold the wire on Terminals 5 and 6. This is the pull station circuit. If the circuit was programmed for immediate release, the following will take place:
 - The RED Alarm LED and the sounder will pulse at a rate of four times per second
 - The alarm relay will transfer
 - The shutdown relay will transfer
-
-
- 2. The release circuit will activate, causing the GREEN LED on the test module to illuminate
- 2. Reset test module by pressing the reset button on the tester. **Do not disconnect the test module at this time.**
3. Push the "RESET" button on the CHECKFIRE SC-N Control Module and the module will return to the normal condition.
4. If required, make certain to reset any auxiliary shutdown devices.

Shutdown/Time Delay/Release Option

1. Using the jumper wire, hold the wire on Terminals 5 and 6. This is the pull station circuit. If the circuit was programmed for shutdown/time delay/release, the following will take place:
 - The RED Alarm LED and sounder will pulse at a rate of four times per second
 - The alarm relay will operate immediately (transfer)
 - The shutdown relay will operate immediately (transfer)
 - A single time delay cycle will start (during test, verify length of delay)
-
-
- After the single time delay cycle is completed, the release circuit will actuate, causing the GREEN LED on the test module to illuminate.
2. Reset squib test module by pressing the reset button on the tester. **Do not disconnect the test module at this time.**
3. Push the "RESET" button on the CHECKFIRE SC-N Control Module and the module will return to the normal condition.
4. If required, make certain to reset any auxiliary shutdown devices.

Pressure Switch Option

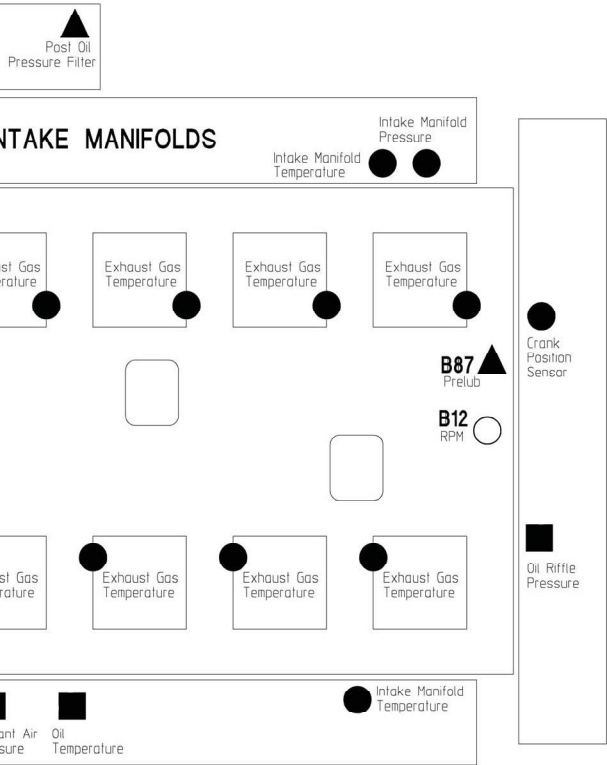
1. Using the jumper wire, hold the wire on Terminals 5 and 6. This is the pressure switch circuit. The following will take place:
 - The alarm relay will transfer
 - The shutdown relay will transfer
 - The RED alarm LED and the sounder will pulse at a rate of four times per second.
2. Push the "RESET" button on the CHECKFIRE SC-N Control Module and the module will return to the normal condition.
3. If required, make certain to reset any auxiliary shutdown devices.



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Regel Magnet Ventil Kipp ausfahren 1
Magnet Ventil Kipp ausfahren 2
Regel Magnet Ventil Kipp ausfahren 2
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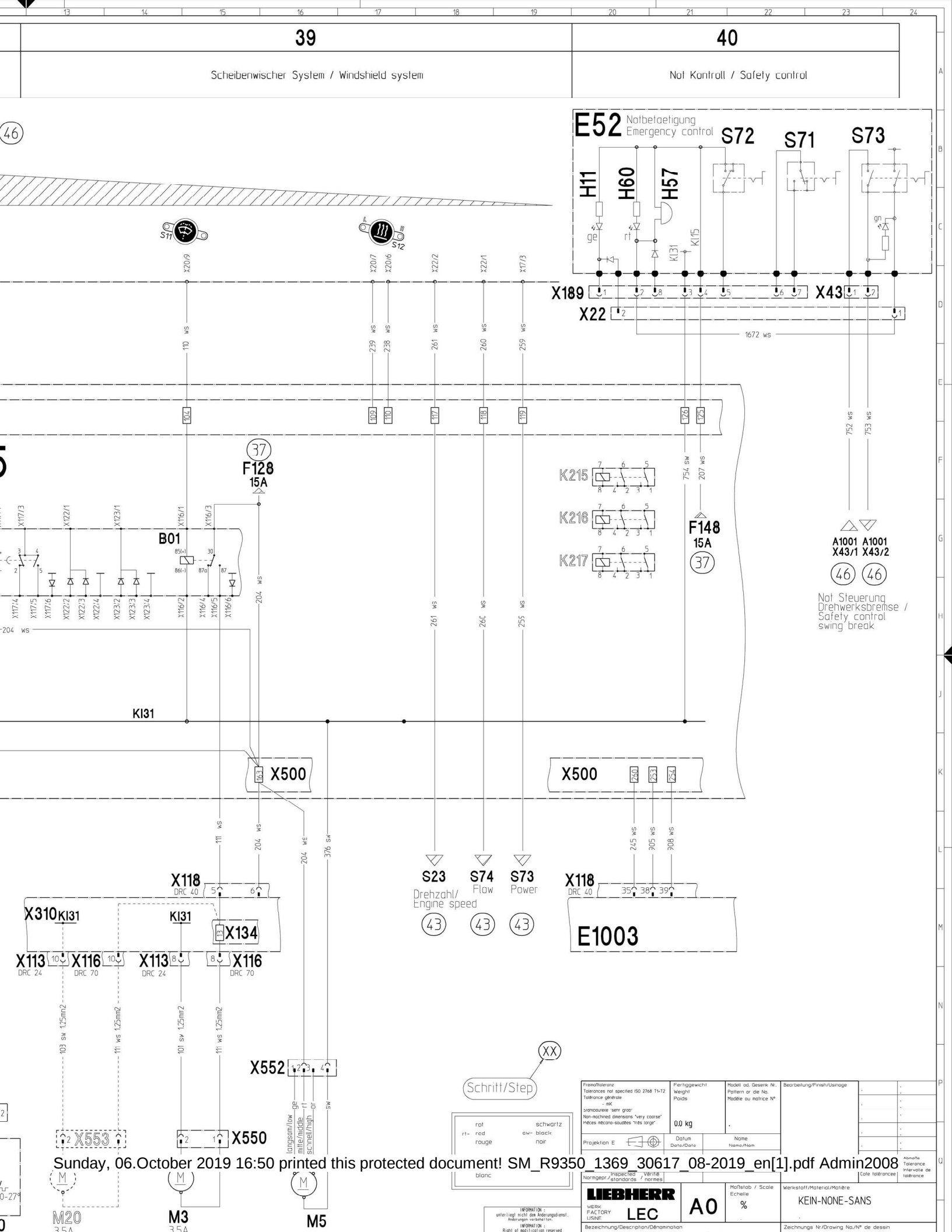
Fertigtoleranz Tolerances not specified ISO 2768 TsT2 Tolérance générale - mK Dimensiones "sans grain" Non-machined dimensions "very coarse" Pièces mécanisées "très large"		Fertiggewicht Weight Poids 0.0 kg	Modell od. Gewerk N° Pattern or die No. Modèle ou matrice N° .	Bearbeitung/Finish/Usinage		-	-
Projektion E		Datum Date/Date	Name Name/Nom			-	-
Norme/géométrie / standards / normes		LIEBHERR WEGE FACTORY USINE		A0		Echelle %	
Bezeichnung/Description/Dénomination		Werkstoff/Material/Matière		Zeichnungs-Nr./Drawing No./N° de dessin		Toleranz intervalle de tolérance	

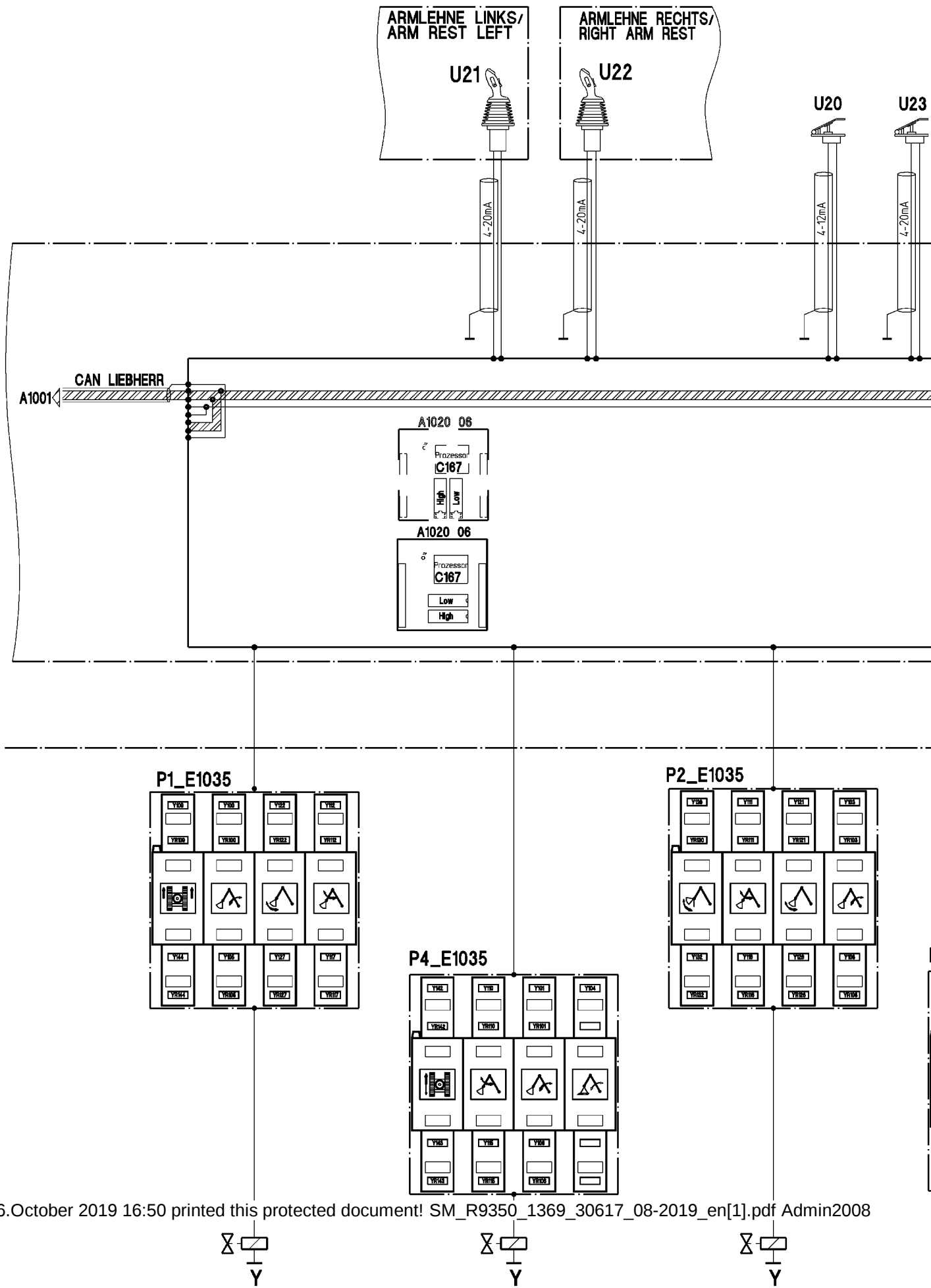
	TORQUE DERATE	SPEED DERATE	SHUTDOWN
Coolant temperature	X After 5 sec at 101°C start derate till 110°C (derate max)		X Start to shutdown at 110°C and after 5 sec allow 10 sec before shutting down
Intake manifold temperature	X After 5 sec at 93°C start derate till 99°C (derate max)		X At 99°C allow 10 sec before shutting down
Oil pressure	X Threshold defined by table 1 Start derate after 5 sec Reach max derate by 2 sec	X Threshold defined by table 1 Start derate after 5 sec Reach max derate by 20 sec	X Threshold defined by table 1 for 5 sec, then allow 10 sec before shutting down
Coolant level	X After 30 sec start derate		
Oil temperature	X After 5 sec at 121°C start derate till 125°C (derate max)		
Coolant pressure	X Threshold defined by table 2a Start derate after 30 sec Reach max derate by 51 sec		X Threshold defined by table 2b for 5 sec, then allow 10 sec before shutting down
Crankcase pressure	X After 5 sec at 4,5 kPA start derate. Reach max derate by 51 sec		X Start shutdown at 4,5 kPA after 5 sec, allow 10 sec before shutting down



Finestoleranz Tolerances not specified ISO 2768 Ts-T2 Tolérance générale - mK Dimensiones "sans grain" Non-machined dimensions "very coarse" Pièces mécaniques "très large"	Poids 0,0 kg	Modell od. Gerüst Nr. Pattern or die No. Modèle ou matrice N°	Bearbeitung/Finish/Usinage	-	-
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Normengebiet / standards / normes	Maßstab / Scale Echelle	Werkstoff/Material/Matière
LIEBHERR FACTORY USINE LEC	A0 %	KEIN-NONE-SANS
Bezeichnung/Description/Dénomination	Zeichnungs-Nr./Drawing No./N° de dessin	





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