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Operating manual

Hydraulic excavator
R 9600

from serial number 47001

Document identification

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Conformity:	CE

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1 Product description

1.1 Assembly - overview

This section comprises an overview of the machine and descriptions of the components shown.

1.1.1 Machine and construction equipment

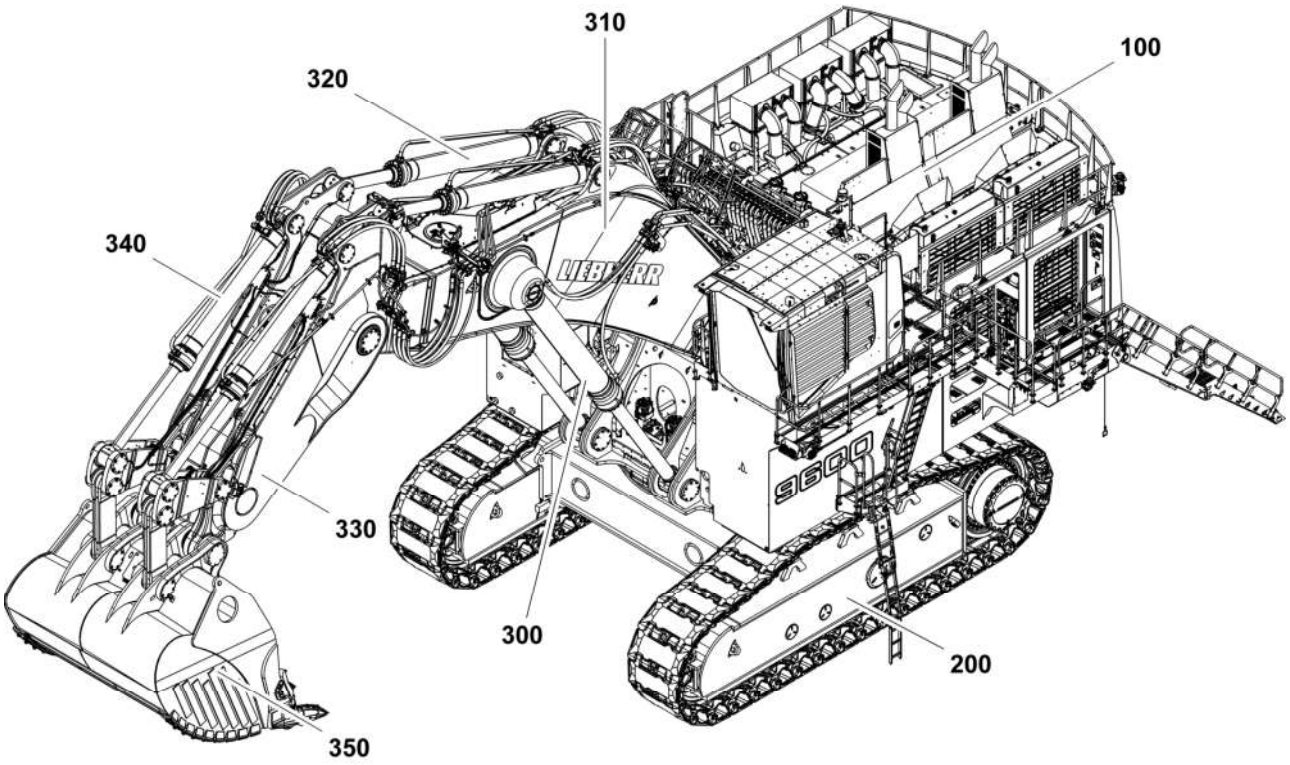

Fig. 1-1 *Machine and construction equipment*

100	Uppercarriage	**320**	Stick cylinder
200	Undercarriage	**330**	Stick
300	Boom cylinder	**340**	Bucket tilt cylinder
310	Boom	**350**	Bucket

- Do not use cold start materials (ether) in the vicinity of heat sources, naked flames or in inadequately ventilated areas.
- Do not use any starting aids containing flammable material to start diesel engines with preheating or flame glow systems. There is a risk of EXPLOSION.
- Familiarize yourself with the location and operation of fire extinguishers on the machine and with local fire warning and fire abatement options.
- It is possible to install an extinguisher into the driver's cab.
- All doors, covers and boxes locks have to be unlocked before operation in order to facilitate firefighting in case of fire. Only electrical boxes from and over 50V must remain locked during operation.

Bringing the machine safely into service

- Carry out a careful inspection tour around the machine each time before starting it.
- Ensure that no one, except an authorized person, is in the work and movement area of the machine.
- Check the machine for loose bolts, cracks, wear, leakage and damage.
- Never attempt to operate a damaged machine.
- Ensure that any damage is immediately rectified.
- Ensure that all hoods and covers are closed, but that locks are unlocked, to facilitate the fight against fire in case of.
- Ensure that all warning signs are present.
- Keep windows and interior and exterior mirrors clean. Secure doors and windows against unintended movement.
- Ensure that no one is working on or under the machine and warn personnel in the vicinity of the machine that it is about to start by sounding the horn.

Safely getting up

- Proceed with the same precautions to climb up or down onto the machine, as to install yourself at the operator's seat.
- When getting up or down, position the machine on even, horizontal ground. The upper structure should be positioned with the undercarriage in such a way that the steps and ladders are aligned with each other.
- Ensure that steps, ladders and hand-rails (grips) are in good condition. In particular, you should ensure that they are free of dirt, oil, ice and snow.
  NOTE: To ensure that the doors open properly in all weather conditions, the door seals must be dusted with talc or silicon at least every two months or more often if required. The door hinges and locks should be greased regularly.
- Face the machine when getting in or out and always use three-point support, i.e. two hands and one foot or two feet and one hand must always be in contact with the access system at the same time.
- If you are able to reach the door handle with your free hand, open the doors before you climb any higher. External influences, such as wind, can make it more difficult to open doors. Because of this, always use your hand for control when opening doors. Ensure that the door is latched open to prevent it slamming open and shut.
- In case of bad weather conditions, be particularly vigilant to realise the climbing and descent from the cab with the best safety conditions, and do or give the instructions to the execution of prior preparations to be accomplished, as enunciated above, in order to displace yourself safely.
- Be particularly vigilant with those prerequisites conditions.

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vices with sufficient load-carrying capacity.

- Park the machine on a flat surface and wedge the crawler or wheels securely.
- If required, detach a part of the machine's working attachment during transportation.
- The ramp used to drive the machine up onto the flatbed trailer should not exceed an inclination of the angle value indicated in the "Technical data" section of this manual (machine must be able to walk up unaided) and should have a wooden cover to prevent sliding back.
- The undercarriage should be swept clean, i.e. before driving up the ramp, clean any snow, ice and mud from the crawler / wheels of the machine.
- Align the machine precisely with the loading ramp.
- Attach the hand levers for fine-tune driving (crawler excavator) onto the travel pedals.
- Ensure that a spotter gives the machine operator the required signal.
- Prepare the placing block to ensure against rolling back when the machine is driving up onto the flatbed.
- Tilt the attachment up and drive up the loading ramp. While doing this, always hold the attachment securely over the loading area, drive very carefully up the ramp and onto the transportation vehicle.
- Rotate the uppercarriage carefully to the rear and lower the attachment. Due to restrictions during transport on hoe attachment, tilt the arm in and dismantle the bucket during transportation.
- After loading the machine onto the flatbed trailer, the upper structure must be secured facing the undercarriage using the stop bolts (only A devices).
- Secure the undercarriage and the remaining individual parts using chains and blocks to prevent slipping.
- Before you leave the machine, reduce pressure on all pressure lines, remove the ignition key and tilt up the safety lever.
- Lock all cab and panel doors.
- Before transportation, find out all details about the route to be travelled, particularly as they relate to width, height and weight restrictions.
- Pay particular attention when driving under electrical lines and bridges and through tunnels.
- When unloading the machine, take the same amount of care as was taken when it was loaded. Remove all chains and blocks. Start the engine as per the operating instructions. Drive carefully off the trailer's loading area and down the ramp. Hold the working attachment as securely as possible over the ground while doing this. Have a spotter guide you.

2.4 Servicing the machine safely

General safety instructions

- Maintenance and repair work may only be carried out by specially trained personnel.
- Observe statutory timetables or intervals given in the operating instructions for repeat tests / inspections. It is imperative that a suitably equipped workshop is available in order to carry out maintenance work.
- The inspection and maintenance schedule given at the end of these operating instructions defines precisely who is required / permitted to carry out what work.

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Powerpack signs

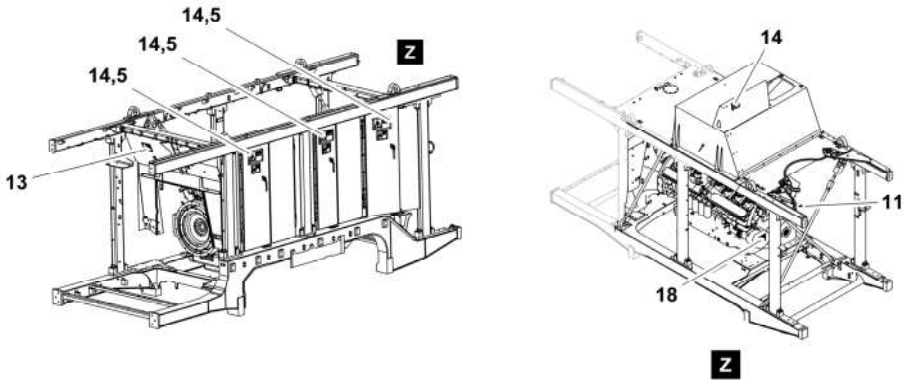

Fig. 2-2 *Powerpack signs arrangement*

5	Closed door label	**14**	Burn Hazard label
11	Rotation blade hazard label	**18**	Crush hazard label due to belts
13	Oil injection hazard label		

Cabin signs

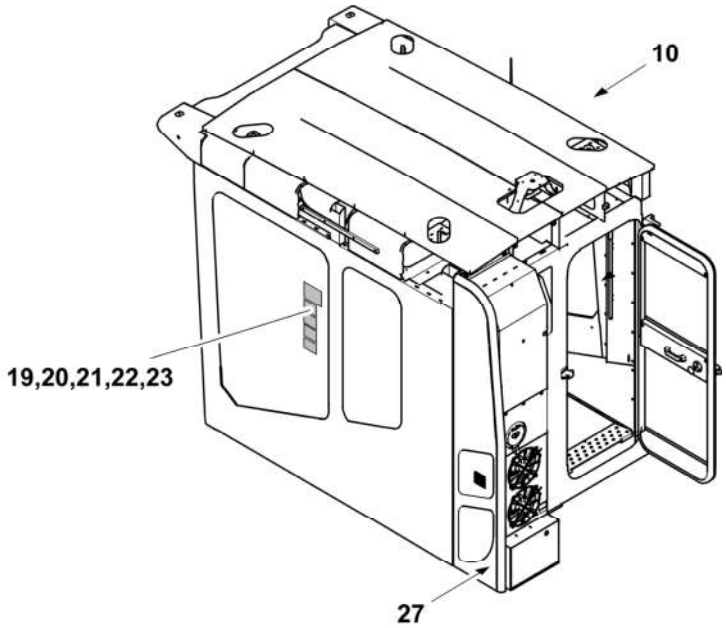

Fig. 2-3 *Cabin signs arrangement*

10	Emergency exit label	**21**	Safety belt label
19	Control symbols label	**22**	Operating manual label
20	Safety lever label	**23**	Operating manual label
27	Air conditioning system label		

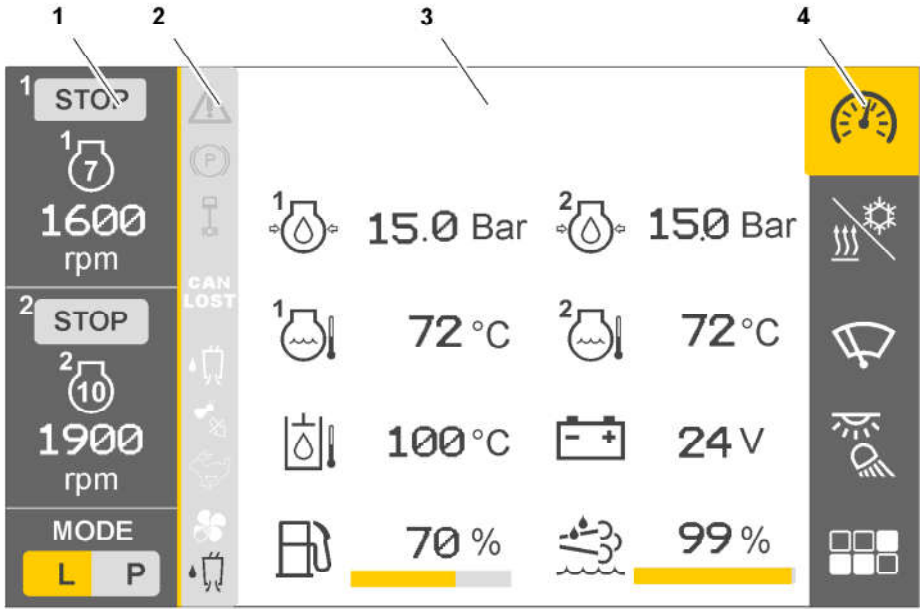

Fig. 3-5 *Page structure of the control unit*

1 Diesel engines information
2 Information bar
3 Page content
4 Navigation bar

Navigation bar

▶ Use the navigation bar **4** to navigate through the pages of the control unit:
– The dashboard,
– The heating and the air conditioning,
– The windscreen wiper,
– The lighting,
– And the "other" menu

Diesel engine information

The Diesel engine information area **1** gives information about the conditions and the setting of the two Diesel engines. You can also control some of these settings.

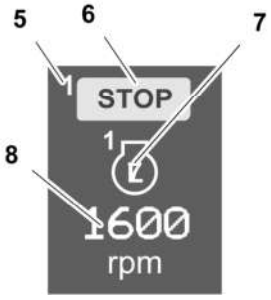

Fig. 3-6 *Diesel engine information*

5 Diesel engine 1 or Diesel engine 2
6 Start and stop button

Other menu

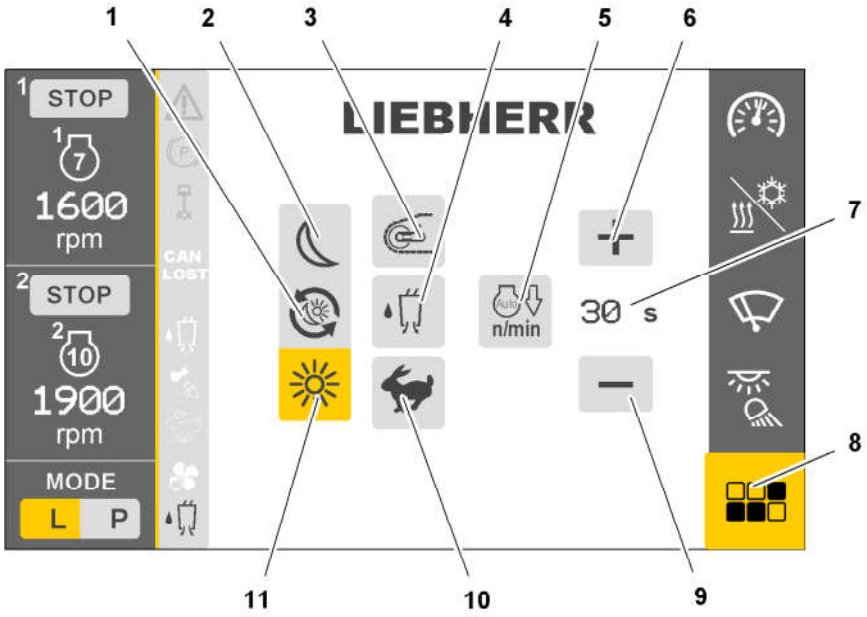

Fig. 3-12 *Other menu page*

1 Auto night / day
2 Night mode
3 Idler special mode for soft ground
4 Solenoid valves bleeding
5 Auto idle
6 Auto idle time up
7 Auto idle time
8 Other menu
9 Auto idle time down
10 High speed gear
11 Day mode

Other menu

▶ Tap button **8.**
  ↳ The screen to control different functions shows.
  ↳ The button comes yellow.

Auto night / day

To improve the visibility of the screen between day and night, you can change the combination of the colors of the screen.

▶ Tap button **1**.
  ↳ The switch to day mode and night mode is automatic, depending on whether the headlights are on.

Day mode

▶ Tap button **11**.
  ↳ The button comes yellow.
  ↳ The screen is always shown with bright colors.

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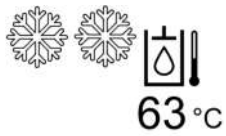


Fig. 3-21 *Example of symbol for extra cold mode*

- ▶ For more information, refer to the section "Indicator and error warning symbols".
- ▶ For more information on hydraulic oils, refer to the section "Hydraulic oil specifications" of the Operating manual of the machine.

Diesel engine indicators

The Diesel engine indicators **2** give information about the condition and the setting of the Diesel engines.

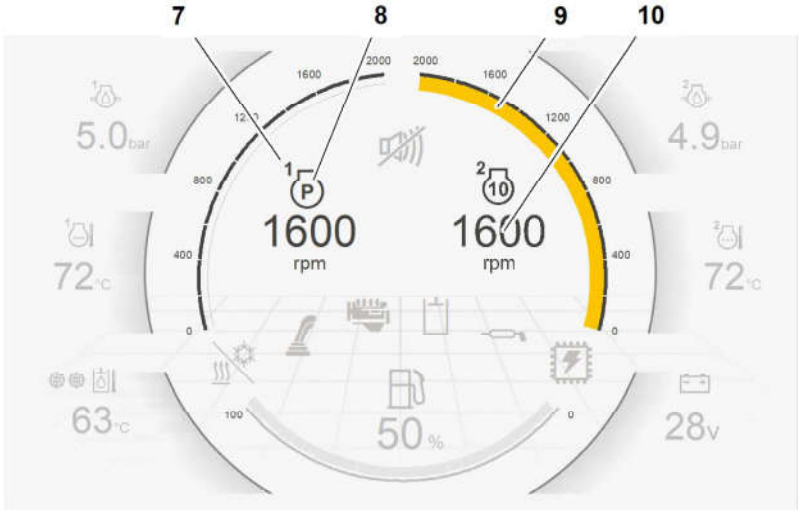


Fig. 3-22 *Diesel engine indicators*

7 Diesel engine 1 or 2
8 Speed step of the Diesel engine
9 Gauge
10 Diesel engine speed

For each Powerpack, you have:

- A smart symbol for the Diesel engine step **8**
- A gauge **9**
- A label for the Diesel engine speed **10.**

The information about the powerpack 1 is given on the left side of the screen. The information about the powerpack 2 is given on the right side of the screen.

Each information or error symbol is related to a category. Use the symbol to know which system of the machine is concerned by the error or the information.

Air-conditioning and heating system

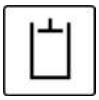
This symbol shows when there is an event on the air-conditioning system or the heating system.

Controls

This symbol shows when there is an event on control unit.

Diesel engines

This symbol shows when there is an event on the Diesel engine.



Hydraulic

This symbol shows when there is an event on the hydraulic system.

Centralized lubrication system

This symbol shows when there is an event on the centralized lubrication system.

Electrical and electronic system

This symbol shows when there is an event on the electrical and electronic system.

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3.2.2 Safety lever

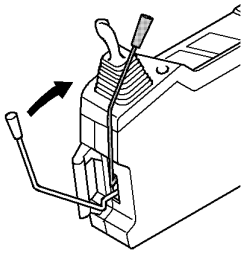

Fig. 3-37 *Safety lever*

For safety purposes, the left control panel is provided with a safety lever.

Caution!
The safety lever must always be pushed up into its highest position (see arrow) when entering or exiting the cab.

When the safety lever is pushed up, the pilot control circuit is disconnected. This means that:

- No work movements can be carried out when pilot control devices, e g. the joystick or foot pedals, are operated.
- The slewing gear brake is locked (LED in switch **S325 on the keyboard** illuminates).
- It is not possible to release the slewing gear brake using switch **S325**.

When the safety lever is pushed (push up / push down) to its lowest position, the slewing gear brake and the LED in switch **S325** will return to their original states and the pilot control devices will be active.

▶ Before the operator starts working, he must push the safety lever down into its lowest position while seated in the operator's seat.

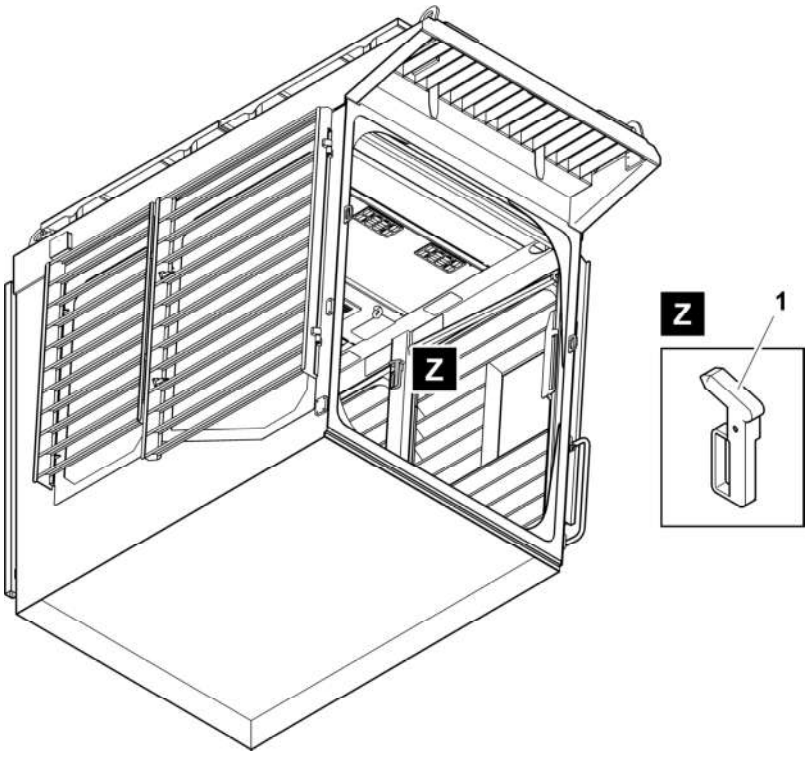

Fig. 3-48 *Emergency hammer for the lateral emergency exit*

3.2.7 Interior lightings

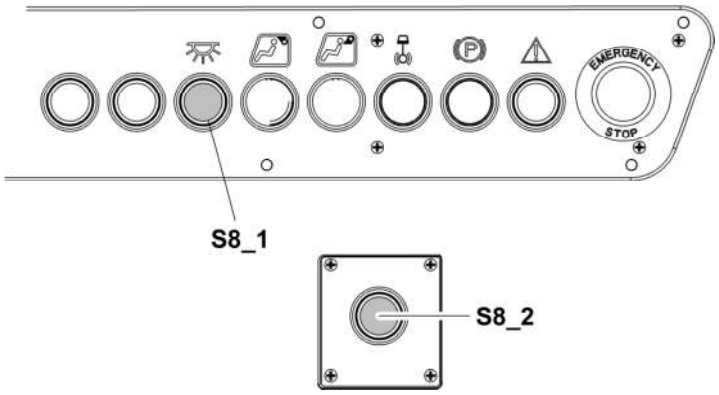

Fig. 3-49 *Interior lightings*

The interior lightings are switched on using the switches **S8_1** on the control board and **S8_2** on the left of the auxiliary seat.

- ▶ Press the switch **S8_1.**
  - ↳ The lights **E80_1** is switched on.
- ▶ Press the switch **S8_2.**
  - ↳ The lights **E80_2** is switched on.
- ▶ Press the switch **S8_1** again.
  - ↳ Interior lighting **E80_1** is switched off.

Turning on the electrical system

Ignition key switching positions

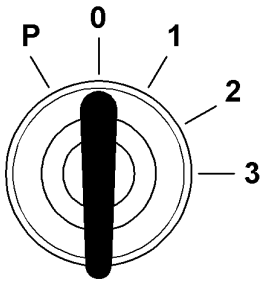

Fig. 3-56 *Ignition key*

P Parking position
0 Off
1 Contact position
2 Contact position
3 Contact position

Switching on the electrical system

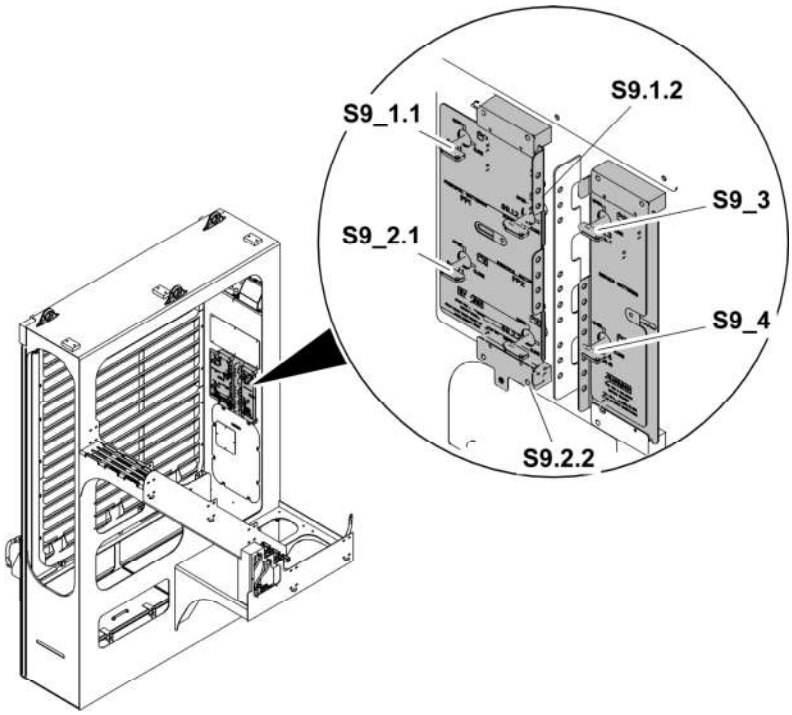

Fig. 3-57 *Battery switches*

1 Battery switch electrical box PP1 **S9_1.1**
2 Battery switch electrical box PP1 **S9_1.2**
3 Battery switch electrical box PP2 **S9_2.1**
4 Battery switch electrical box PP2 **S9_2.2**
5 Service batteries circuit breaker **S9_3**
6 Service batteries circuit breaker **S9_4**

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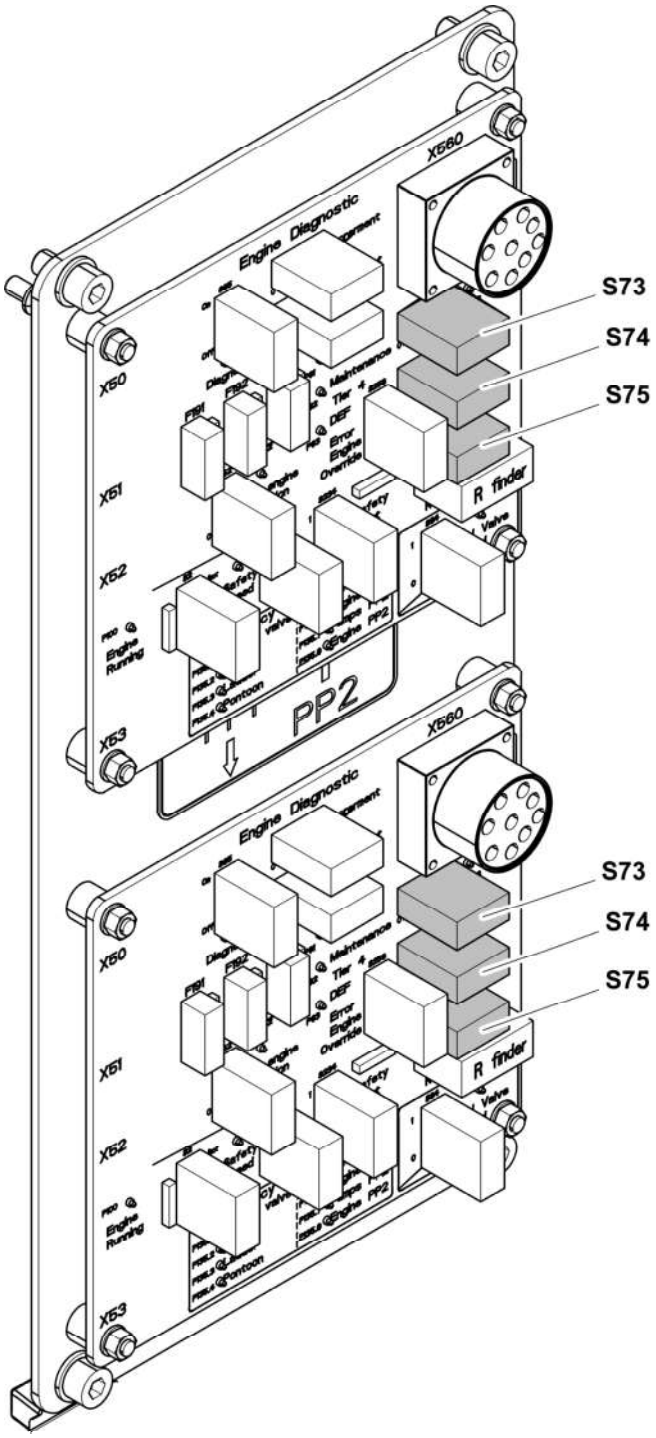

Fig. 3-62 *Safety controls for hydraulic pumps on* ***U1005***

S73 Pumps power safety control
S74 Pumps flow safety control
S75 Pumps fan safety control

Pumps power safety control

During normal operation of the excavator, the electronic horsepower control contin-

Incorrect use of the attachment or special tool used for demolition application

- Make sure that you use an attachment or special tool exclusively designed for the 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.

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▶ Push pedal **7b**.
↳ Shovel bucket will be closed.

Semi-automatic flap closing

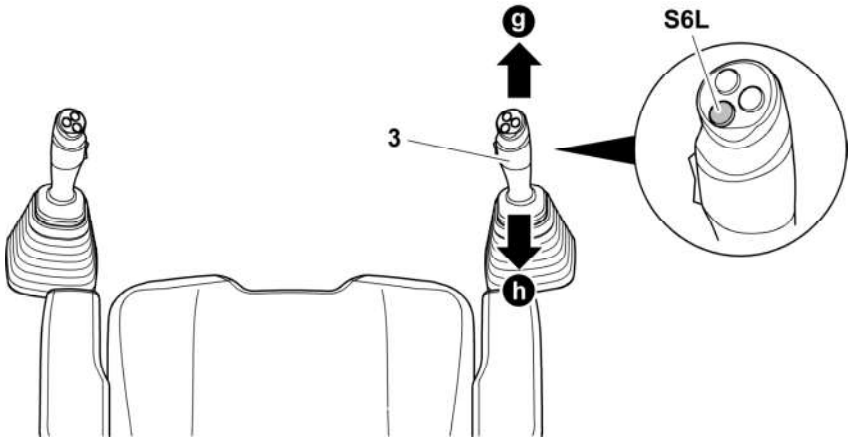

Fig. 3-76 *Semi-automatic flap closing*

▶ Push the button **S6L** on bottom of the right joystick.
↳ Shovel flap will be closed automatically with full speed.

▶ Push the button **S6L** again during semi-automatic flap movement.
↳ Shovel flap movement will be stopped.

Note!
If you keep the button **S6L** pushed, the semi-automatic flap closing movement will not start.
If you operate the shovel bucket pedal **7a** or **7b** during semi-automatic flap closing movement, the automatic movement will be stopped and flap control is switch to manual operation through pedals **7a** and **7b**.

Combined movements

Moving a joystick diagonally results in the work functions concerned being combined. This allows different attachment movements to be activated at the same time.

The operator can do the following movements without any additional manipulations.

When the swing movement is actuated, all working functions / movements are possible without affecting the swing movement.

During travel, every attachment movement is possible, but the swing movement has priority. In this case, the travel movement is reduced.

3.4.4 Lowering the work attachment when the engine is not running

In an emergency, the attachment can be lowered when the Diesel engine is not running.

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Danger!
During the movement of the machine, the person which is checking the temperature of the different rollers must always be out of the hazard area **r** of the machine and always be in the operator's sight and in radio contact with him.
For the checking of the temperature, the excavator should stop moving. And only when the excavator is stopped, the person could go in the hazard area **r** to check the temperature of the different rollers.
The machine could only start moving again when the driver has seen the operator out of the hazard area **r**.

- If temperature of any moving part is growing up about 20°C above ambient temperature, interrupt travel and only commence again after parts have sufficiently cooled.
- To prevent overheating during travelling or to speed up cooling procedure it is advisable to have a water truck standby, to hose the heating components during travelling or cooling break.
- Move with idler and attachment forwards. Whenever possible, and not to contravene with mine safety regulations, swing whilst travelling to equally load track rollers. However, always ensure that clear forward vision is maintained.

Travelling the machine down grades or upgrades

In addition to above mentioned guidelines, when moving the machine during loading operations or when walking the machine distances, the following procedures apply:

- When travelling down grades greater than 5,7° (10%), it would be better to walk the machine down with the track motor first, i.e. the machine is moved backwards.
- When travelling up an incline, the final drives must be at the rear of the excavator.
- When walking down from a bench, firstly prepare a ramp. Respect the angle value indicated in the "Technical data" section of this manual (machine must be able to walk up unaided). When moving down the ramp never allow the machine to fall down on the attachment. When walking up the ramp never use attachment to assist the movement by pushing with the hydraulic power of the bucket, stick or boom.

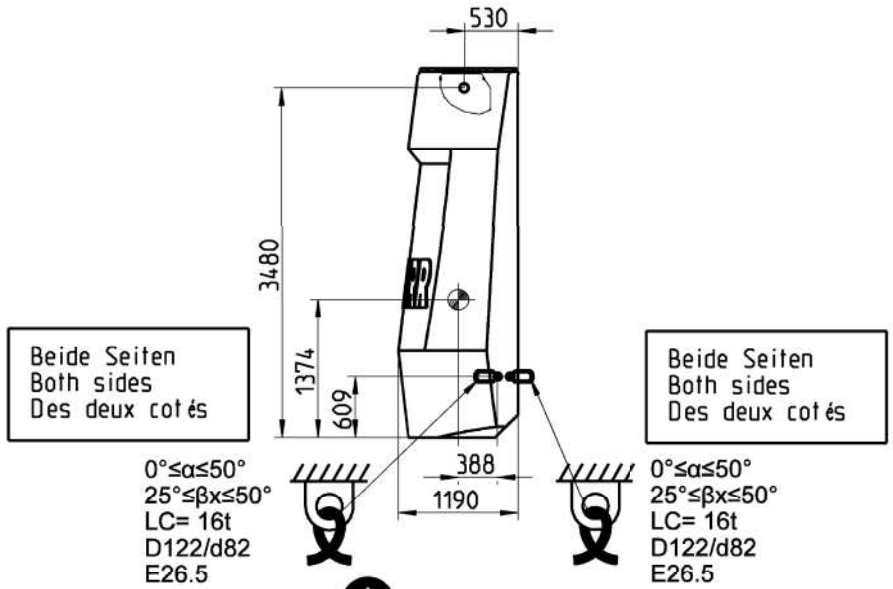
Travelling the machine first time

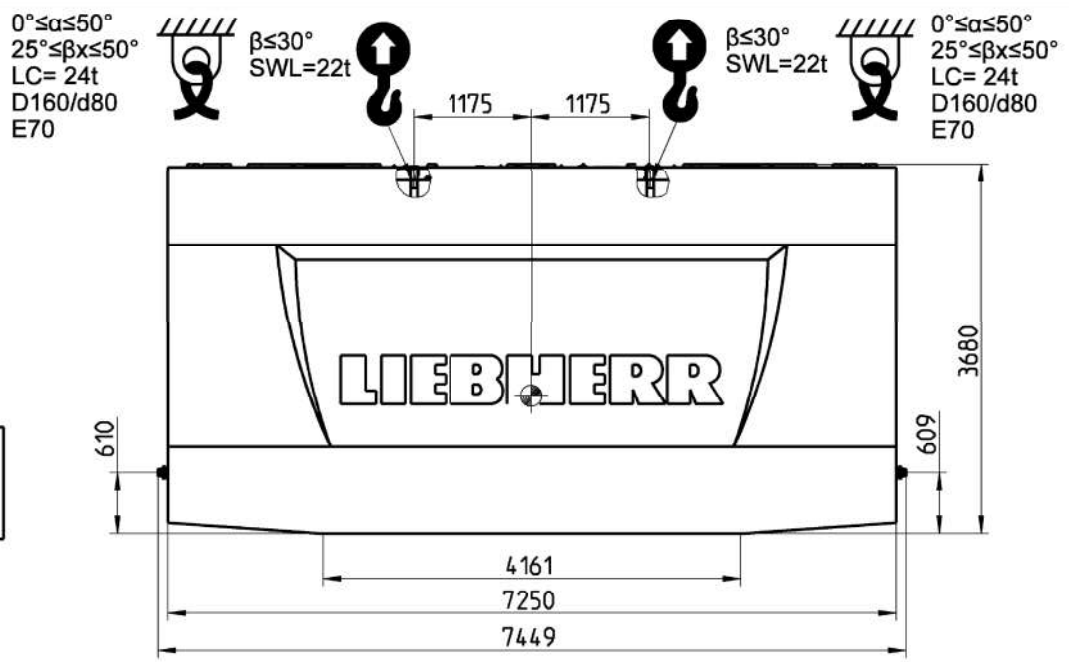
The slide bearing (friction bearing) of the track rollers needs some time for running-in. If the bearing becomes hot at an early stage of machine life, this may cause lubrication problems during further life. Therefore when travelling the machine the first time aside from all above mentioned guidelines it is strongly recommended to move carefully and at reduced speed.

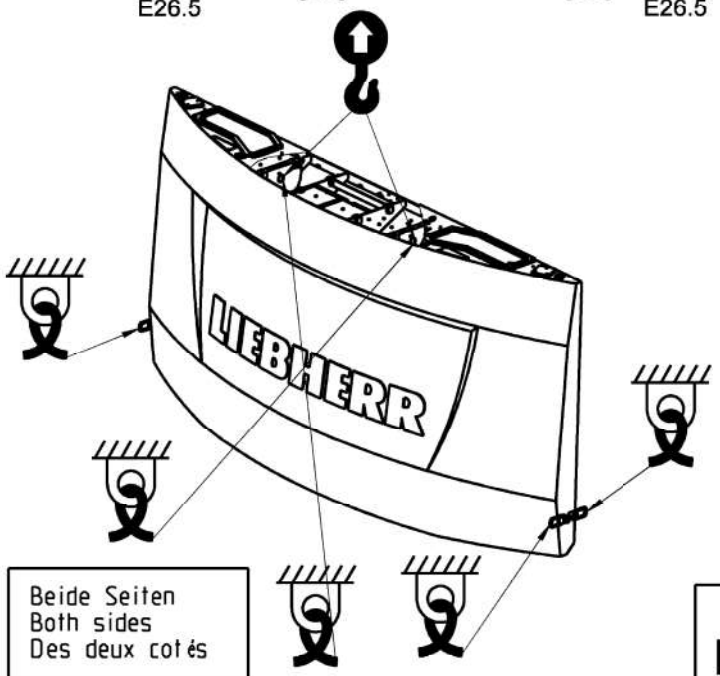
Note!
Warranty may become void if failure to recognize and comply with the recommended travel operating procedures, as outlined in this document, is noted.

3.6.2 Excavator lifting and lashing operations

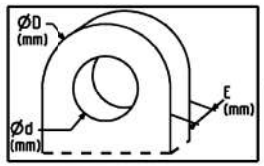
Danger!
For safety reasons, always consider the precautions given in this section.







SCHWERPUNKT
CENTER OF GRAVITY
CENTRE DE GRAVITE

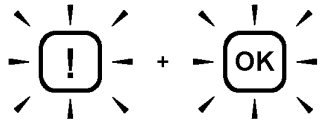
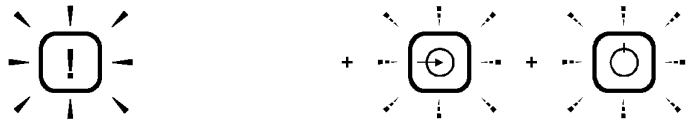
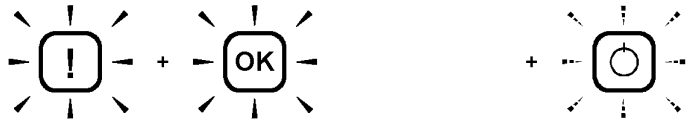
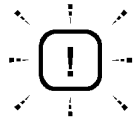
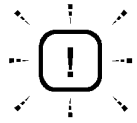


	Gerechnet Calculated Calculé	Gewogen Weighed Pesé
Gewicht ohne Werkzeug und Verpackung Weight without tool and packaging Poids sans outillage et emballage	31 000 kg	
Gewicht mit Werkzeug und Verpackung Weight with tool and packaging Poids avec outillage et emballage	31 000 kg	

LIEBHERR	Bezeichnung / Description / Dénomination	Ident-Nr. / Ident No. N° d'ident	Index / Index Index	Blatt / Page Feuille
	TRANSPORTPLAN BALLASTGEWICHT TRANSP.DRW.COUNTERWEIGHT R9600 PLAN DE TRANSP.CONTREPOIDS	12716029	000	1/1

4.1.7 Display

When an error occurs on the display, the related status indicators stay on constantly or flash as follows:

Fault / error	Cause	Solution
	Battery voltage too low	Contact Liebherr customer service
 (flashes slowly)	Input voltage too low	Contact Liebherr customer service
	Internal system temperature too low	Contact Liebherr customer service
 (flashes slowly) (flashes slowly)	Internal system temperature too high	Contact Liebherr customer service
 (flashes slowly)	Fan does not operate	Contact Liebherr customer service
 (slowly)	Overheating protection, the display brightness is dim	Contact Liebherr customer service
 (flashes quickly)	Overheating protection, the display is off	Contact Liebherr customer service

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5 Maintenance

5.1 Servicing the machine safely

General safety instructions

- Maintenance and repair work may only be carried out by specially trained personnel.
- Observe statutory timetables or intervals given in the operating instructions for repeat tests / inspections. It is imperative that a suitably equipped workshop is available in order to carry out maintenance work.
- The inspection and maintenance schedule given at the end of these operating instructions defines precisely who is required / permitted to carry out what work.
  Jobs listed as daily / weekly work may be carried out by the machine's driver or maintenance personnel when they have received appropriate instruction.
  The remaining work may only be carried out by specialist personnel with appropriate training.
- Replacement parts must correspond to the technical requirements determined by the manufacturer. Original replacement parts are always guaranteed to meet these criteria.
- Always wear safe work clothes when carrying out maintenance work. Avoid the wearing of rings, wrist watches, ties, scarves, open jackets, baggy clothing etc... There is a risk of injury from, for example, getting caught up or being drawn in.
  Protective goggles, safety helmets, safety shoes and gloves, reflective vests and ear protection etc. are required for specific jobs.
- Do not remain in direct proximity of the diesel engine while the diesel engine is running.
  Persons with pacemakers should not approach within 20 cm of the running diesel engine.
  Do not touch voltage-carrying parts on the electrical connection of the individual solenoid injection pumps (Unit Pumps UP) while the diesel engine is running.
- Do not permit unauthorised persons to approach the machine during maintenance work.
- Cordon off a wide maintenance area if required.
- Inform operational personnel before starting to carry out any special work and repair work. Designate persons in charge of supervision.
- In the absence of any other information in the operating instructions, carry out all maintenance work on the machine on level, firm ground with the working equipment set aside and the engine switched off.
- For some machines, the only one position which enables a secured access to every maintenance locations on the uppercarriage, is when the uppercarriage is aligned with the undercarriage so that the sprockets locate at the back-end.
  The ladder situated on the undercarriage only corresponds with the uppercarriage’s access when the excavator is in this configuration.
- Pull out the ignition key and shut off the main battery switch.
- Always tighten any loose screw connections during maintenance and repair work.
- The mounting bolts of the main components, of the hydraulic hoses and of the counterweight must be replaced after every removal.
- If safety devices have to be dismantled during set-up, maintenance and repair work, they must be immediately reinstalled and checked at the end of the work.

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Danger!
Risk of falling when fall protection elements are removed.

The machine has anchor points for safe installation, maintenance and repair work.

Even if appropriate fall-arrest equipment is installed to the anchor points, fall-arrest equipment cannot prevent falls. Common sense and fall hazard awareness are important safety precautions for work that is done from above the ground.

5.3.1 Approved anchor points

There are four types of approved anchor points on the machine:

- welded anchor points
- drilled anchor points
- lifeline (optional)
- screwed anchor point (optional)

The welded and the drilled anchor points have a specific label (see § "Signs on the machine"). To be easily identified, the welded and the drilled anchor points are also painted in blue (in white if the excavator is blue).

The lifting points given in the section "Transport drawings" can also be used as anchor points.

The horizontal middle bar on handrails can also be used as anchor point (as illustrated below). The used handrail must have at least two vertical posts.

Designation	Medium	Symbol	Classification	Viscosity	Quantity*
Hydraulic tank			See section "Lubricating and operating material specifications".		6800 l. in hydraulic tank 9800 l. in whole circuit
Swing gear	Transmission oil		See section "Lubricating and operating material specifications".		4 x 55 l.
Travel gear	Transmission oil		See section "Lubricating and operating material specifications".		2 x 175 l.
Lifetime sealing interspace			Use same oil as used for hydraulic tank.		2 x 18 l.
Travel brake			Use same oil as used for hydraulic tank.		4 x 0,4 l.
Splitterbox	Transmission oil		API-GL-5	SAE 90 SAE 80W-90	2 x 90 l.
Elastic coupling (only for Geislinger coupling)	Lube oil for elastic coupling		Mercedes Benz 228.1	SAE15W-40	2 x 1,53 l.
Swing ring roller bearing races and general lubrication points	Lubricating grease		See section "Lubricating and operating material specifications".		600 l.
Swing ring teeth	Lubricating grease		See section "Lubricating and operating material specifications".		80 l.
Track roller	PANOLIN EP Gear Synth ISO 460				12 x 7,4 l.
Carrier roller	PANOLIN EP Gear Synth ISO 460				6 x 1,65 l.
Idler wheel	BP ALPHASYN EP460				2 x 11,5 l.
Hydraulic rotary connection	Lubricating grease		Standard neutral lithium grease formulated without resin, non-hygroscopic, resistant to ageing and compatible with the operating temperature.		

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A Mineral oils and PAO oils
h Operating hours

▶ Liebherr recommends that you sample the hydraulic oil every 500 operating hours (refer to the section "Condition monitoring with oil analysis").

▶ Change the hydraulic oil every 2000 operating hours.

Oil changes at optimized intervals

This procedure is applicable for mineral oils, PAO oils and HEES biodegradable oils.

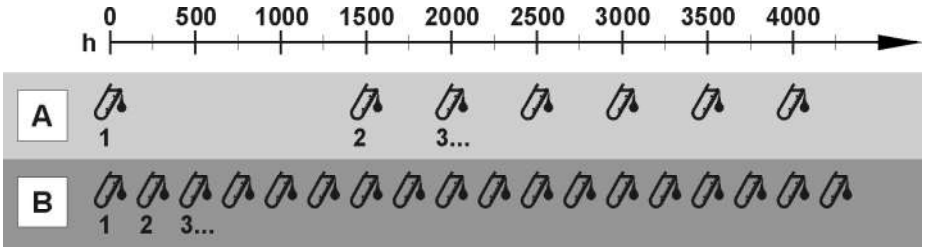

Fig. 5-15 *Oil changes at optimized intervals*

A Mineral oils and PAO oils
B HEES biodegradable oils
h Operating hours
1 First oil sample
2 Second oil sample
3 Next oil samples at regular intervals

You can extend the oil change intervals (up to 6000 operating hours and possibly even more) as long as the properties of the oil are satisfactory.

▶ Get a sample of the new hydraulic oil.

▶ If you use mineral oil or PAO oil, you must sample the hydraulic oil every 500 operating hours after the first 1500 operating hours.

▶ If you use HEES biodegradable oil, you must sample the hydraulic oil every 250 operating hours.

▶ Change the hydraulic oil immediately if the results of the analysis are not satisfactory (refer to the section "Condition monitoring with oil analysis").

5.5.5 Swing and travel gear oils

Note!
For a given machine operating temperature range, and if different viscosity grades are approved according to the following specifications, always choose the lubricant with the highest viscosity grade.

Caution!
Gears flushing is necessary when switching from mineral oil to synthetic oil.

▶ Use new oil to flush the gear when switching from mineral oil to synthetic oil.

Flushing with cleaning fluid or Diesel fuel is not permitted.

Oil sampling points

Splitterbox

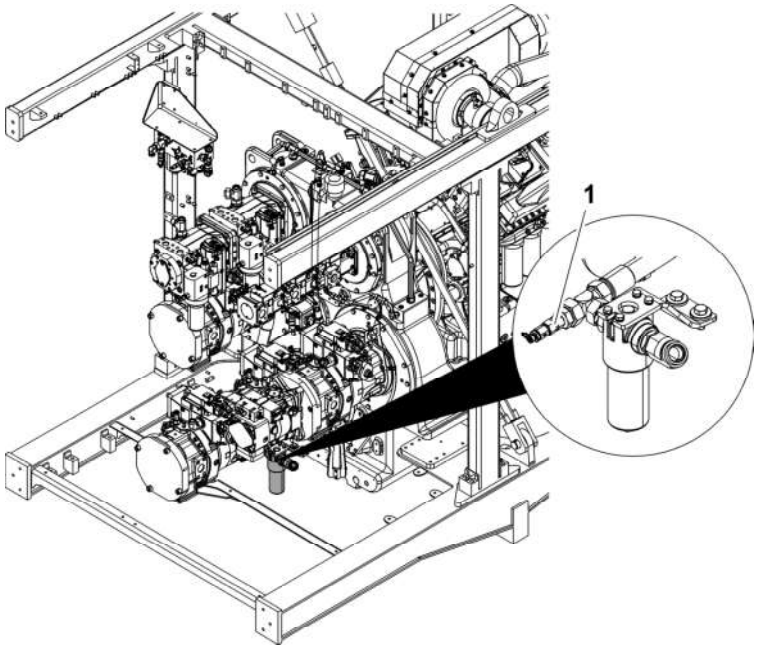

Fig. 5-19 *Sampling valve **1** for splitterbox oil*

To get a sample of the splitterbox oil:

Note!
Two sampling procedures are applicable for this component.

- ▶ Always use the same sampling point and the same sampling procedure for this component to make sure that the analysis records stay relevant.

- ▶ Use the sampling valve **1** which is installed next to the splitterbox.

or

- ▶ Use a sampling pump and get the oil sample through the dipstick tube of the splitterbox.

Swing gear

Without the oil filter for the swing gear

Front of the machine: left and right swing gears

▶ Check the oil level in the engine with the dipstick **1**.

5.7.2 Diesel engine oil change

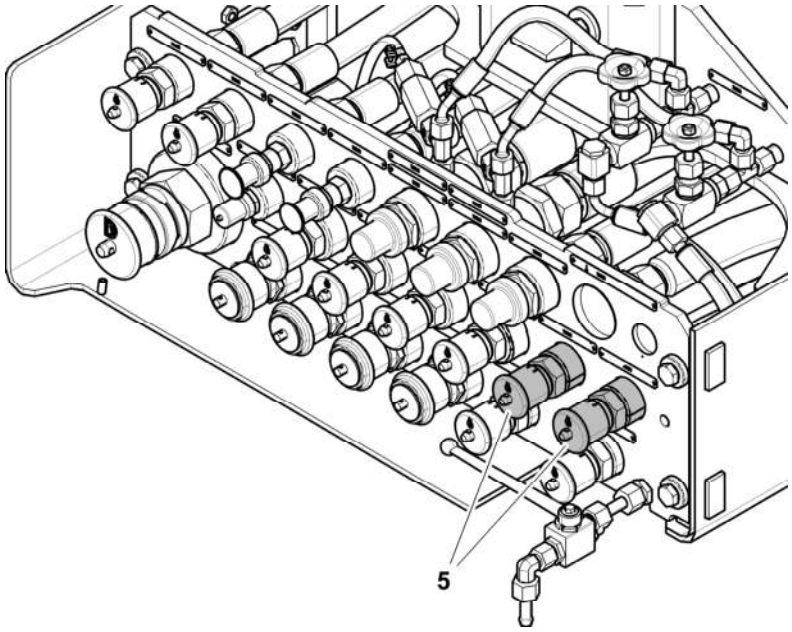

Fig. 5-27 *Coupling on service trap for diesel engine oil change*

5 Diesel engine oil change coupling

Note!
Only carry out the oil change when the engine is warm.

To drain the oil:

- ▶ Bring the engine to operating temperature.
- ▶ Turn off the engine.
- ▶ Drain the oil via the quick change coupling **5** of the service trap.
- ▶ As a help way, the oil can also be drained via the oil drain plug at the bottom of the oil pan of the diesel engine.
- ▶ To do so, remove oil drain plug, attach a drain hose and drain the oil into a suitable container.
- ▶ Remove the hose, check, clean and reinstall the oil drain plug.

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5.8 Splitterbox

5.8.1 Mounting screws

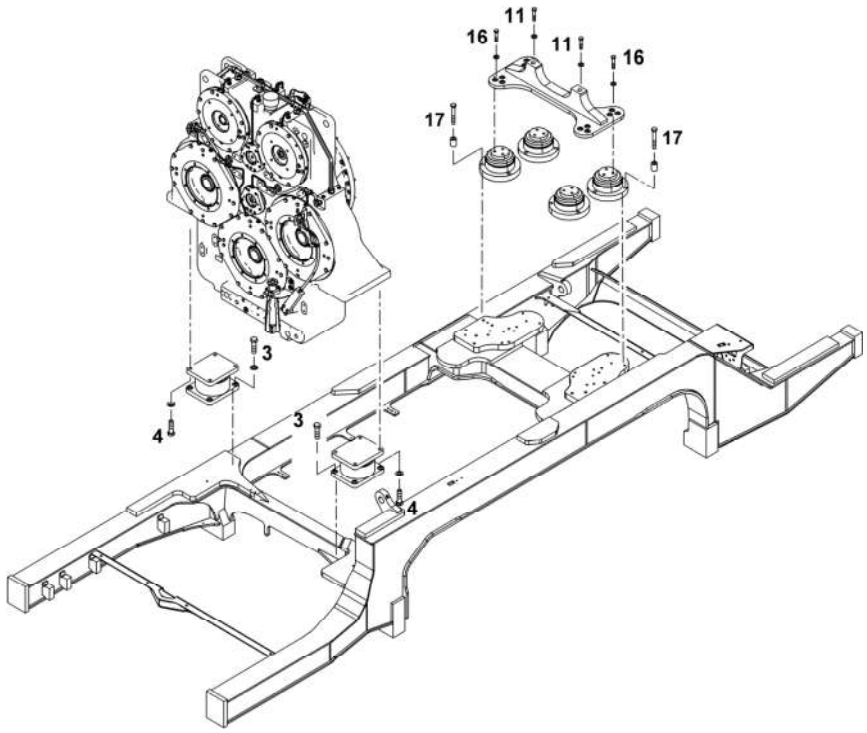

Fig. 5-35 *Mounting screws*

- ▶ Check the mounting screws on the splitterbox brackets regularly for tightness, re-torque if necessary.
- ▶ For maintenance intervals, see control and maintenance chart.

Any improper fastening would greatly reduce the expected life of the rubber mounts.

3 Lower Hex. hd. screw M20 560 Nm **4** Upper Hex. hd. screw M20 560 Nm

Caution!
Loctite (Ident 8503598) must be applied on mounting screws **3**, **4**, **11**, **16** and **17** when installing the screws in order to avoid possible damages on the parts.

The screws **3**, **4**, **11**, **16** and **17** shall only be tightened after the engine and the splitterbox as a complete unit has been positioned on the Powerpack frame, so that a pretentioning of the rubber mounting can be avoided.

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Drain the coolant with the valve for coolant change (optional)

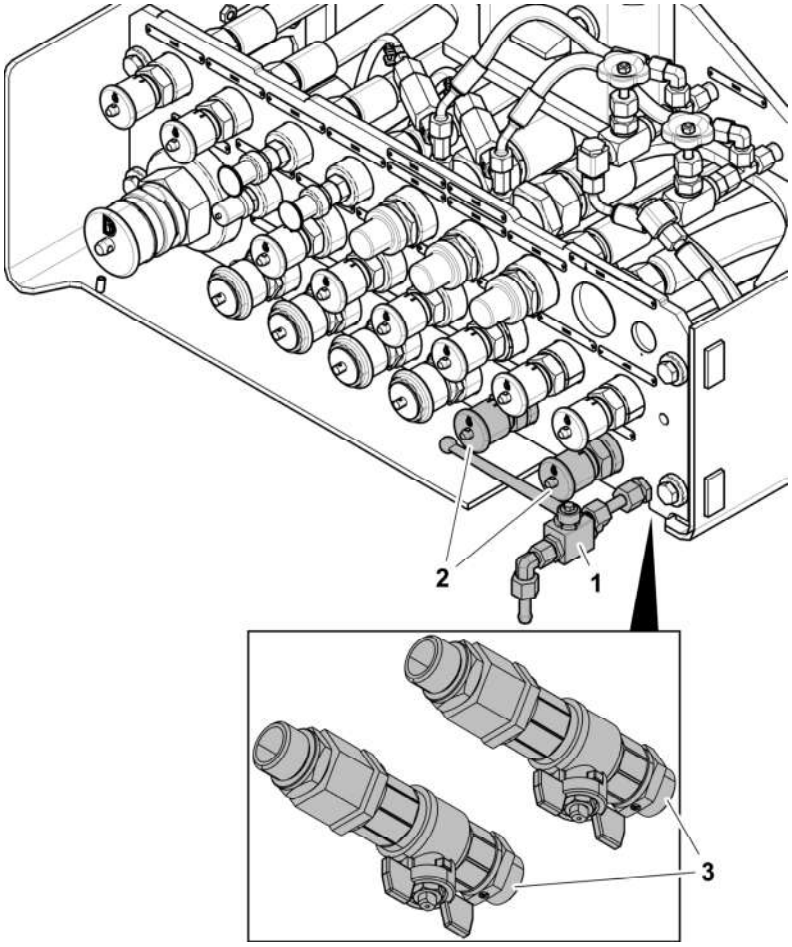

Fig. 5-46 *Pressure release valve and quick change coupling for coolant*

1 Pressure release valve
2 Quick change coupling
3 Shutoff valve

❑ Make sure that the Diesel engines are at operating temperature.

▶ Stop the Diesel engines.

Danger!
Hot coolant!
Risk of burning.

▶ Always wear the applicable Personal Protective Equipment (PPE).

▶ Wait for the Diesel engines and the coolant to cool down.

▶ Do not touch hot engine oil or hot surfaces.

▶ Turn the pressure release valve **1** to release the pressure from the cooling system. The pressure release valve **1** is installed on the service trap.

sor on and off.

To check that the system operates correctly:

- ▶ Operate the horn until the air pressure drops to approximately 4 bar.
  - ↳ The pressure regulator **3** must now start the air compressor.
- ▶ Stop operating the horn.
  - ↳ When the pressure reaches 5,5 bar, the pressure regulator **3** must stop the air compressor.
- ▶ If necessary, adjust the pressure regulator until both pressures are correct.
- ▶ For maintenance intervals and for further information, refer to the control and maintenance chart and to the EMS Concept User manual for compressor PTO250 at the end of this manual.

5.12.2 Air tank

To drain the air tank:

- ❑ If the machine has the automatic water drain with a solenoid valve:
  - ↳ The solenoid valve **5** drains water from the air tank regularly and automatically.
- ❑ If the machine has the automatic water drain with automatic drain valve:
  - ↳ Condensation in the air tank **4** is automatically discharged via the automatic drain valve **6** when the pressure in the system drops.
  - ↳ However, we still recommend to drain condensation manually:
- ▶ Push the pin on the bottom of the drain valve **6** regularly as specified in the control and maintenance chart.

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▶ Turn over the locking plate **2** and put it on the valves to lock them. Make sure that the counter nuts are unscrewed.

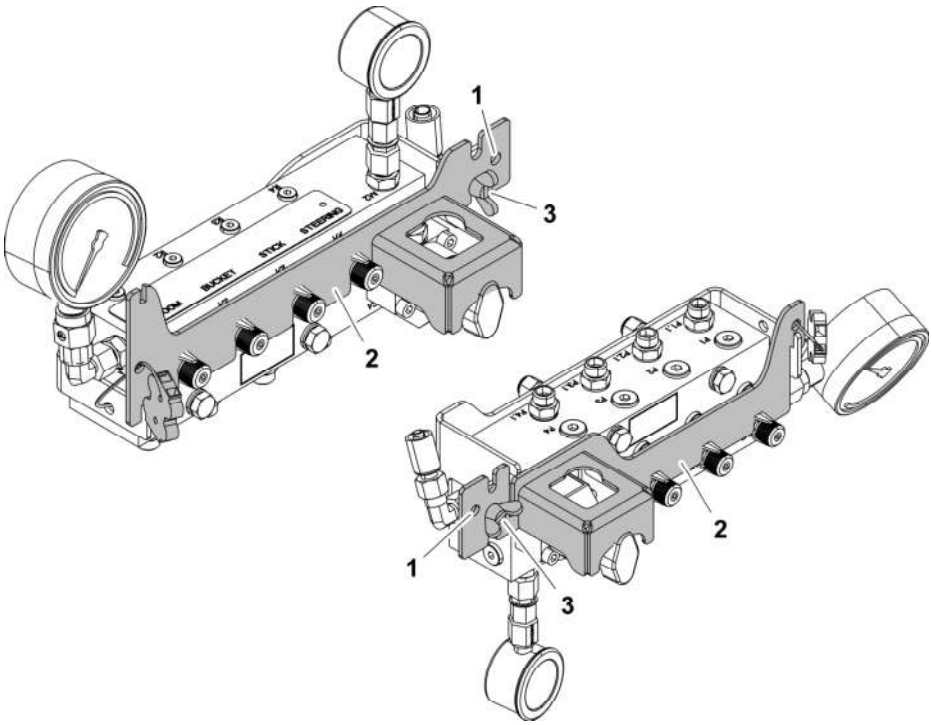

Fig. 5-65 *Valves locking on pressure release blocks*

1 Padlock hole
2 Locking plate
3 Wing screw

▶ Tighten the wing screw **3**.

▶ Put a padlock on the padlock hole **1**.

When the maintenance work on the main hydraulic circuits is completed:

▶ Remove the padlock from the hole **1**.

▶ Loosen the wing screw **3**.

▶ Turn over the locking plate **2** and put it off the valves to unlock them.

▶ Tighten the wing screw **3**.

▶ Keep the main valve **V5** open and close **V1** to **V4**.

▶ Close **V5**, make sure to close **V1** to **V4** correctly.

Check the pressure in the hydraulic circuit of the swing ring

▶ The machine must be in the check position described above.

▶ Move the swing joystick in all directions.

▶ Put the safety lever in its up position.

▶ Switch off the batteries, refer to the chapter "turning on the electrical system".

5.14.6 Oil filters in Powerpacks

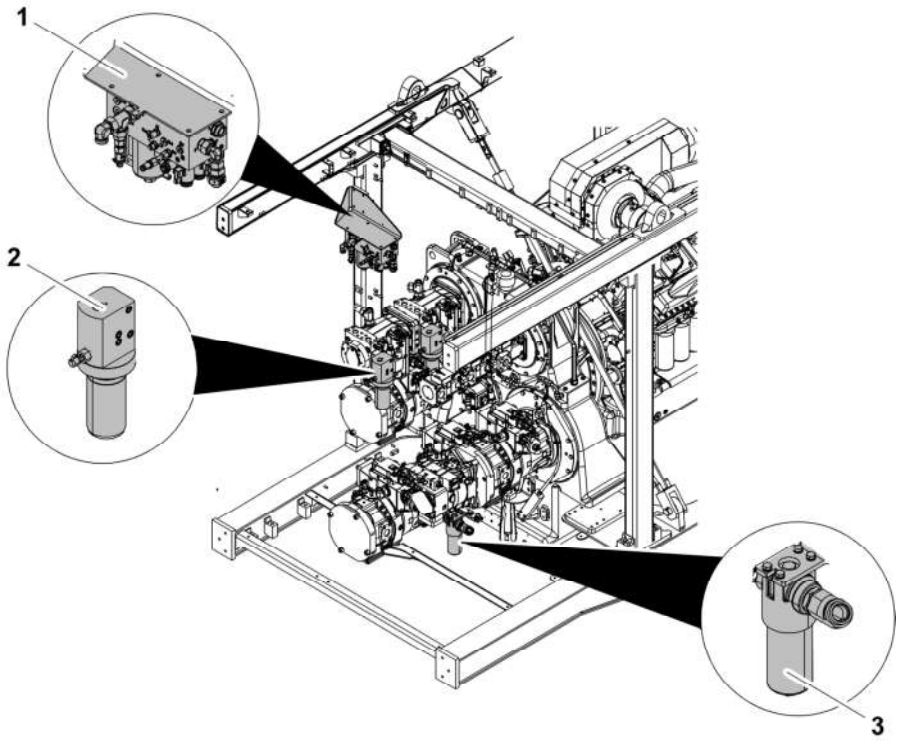

Fig. 5-74 *Filters in each powerpack*

1 Oil filter on servo oil unit
2 Replenishing oil filters
3 Bearing flush oil filter

Note!
It is not permitted to clean the filter element.

▶ Change the filter element each time you open the filter housing.

For each Powerpack three hydraulic filters ensure filtration of the auxiliary circuits:

– One servo oil filter **1**,
– Two replenishing oil filters **2**,
– One bearing flush oil filter **3**.

The servo oil filter **1** is installed on the frame above the hydraulic pumps.

The two replenishing oil filters **2** for the closed swing circuit are located on the swig pumps.

The bearing flush oil filter **3** is installed below the working pump.

▶ Change these filters at regular intervals as indicated in the control and maintenance chart.

When replacing a filter element:

▶ Make sure the filter head and housing are proper.

▶ Make sure the sealings such as o-ring are correctly installed.

- ▶ Remove the filter housing **6**.
- ▶ Remove the filter element **2**, check it and clean it with non flammable cleaning fluid, or replace it if necessary with a new element.

Note!
The filter element **2** can be cleaned up to three times. Then it must be replaced by a new one.

- ▶ Clean the filter housing **6** and the filter head **1** and reinstall, making sure the o-rings **4** and **5** are seated properly and the compression spring **3** installed correctly.
- ▶ Turn the filter housing **6** in the filter head **1** up to the stop.
- ▶ Loosen the filter housing **6** by 1/6 turn.

Note!
Any time the filter element is inspected or replaced, check for leaks.

- ▶ To check for leaks, start the engine, operate the machine for a short period, and check for leaks between the filter housing **6** and the filter head **1**.

5.14.14 Bypass filter for hydraulic oil (optional equipment)

Working environment humidity may be responsible for possible water presence in the hydraulic system.

A bypass filter made of two filter elements **6** mounted on top of the right catwalk (next to the exhaust end pipes) allows to separate this water from the hydraulic system.

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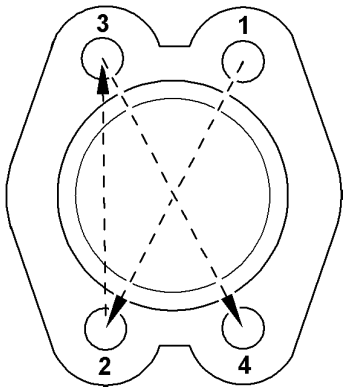

Fig. 5-91 *Criss-cross tightening*

- ▶ Make sure that all mounting surfaces have no damage, grease or contamination.
- ▶ Install the O-ring in the groove of the hose fitting.
  You can use grease to hold the O-ring in position into the groove.
  Be careful not to apply too much grease because it could look like a leak during operation.
- ▶ 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,
- – do it again until the flange is tightened equally: the screw heads must not turn when you apply 100% of the prescribed torque value.

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.

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5.15.5 Splitterbox – oil change

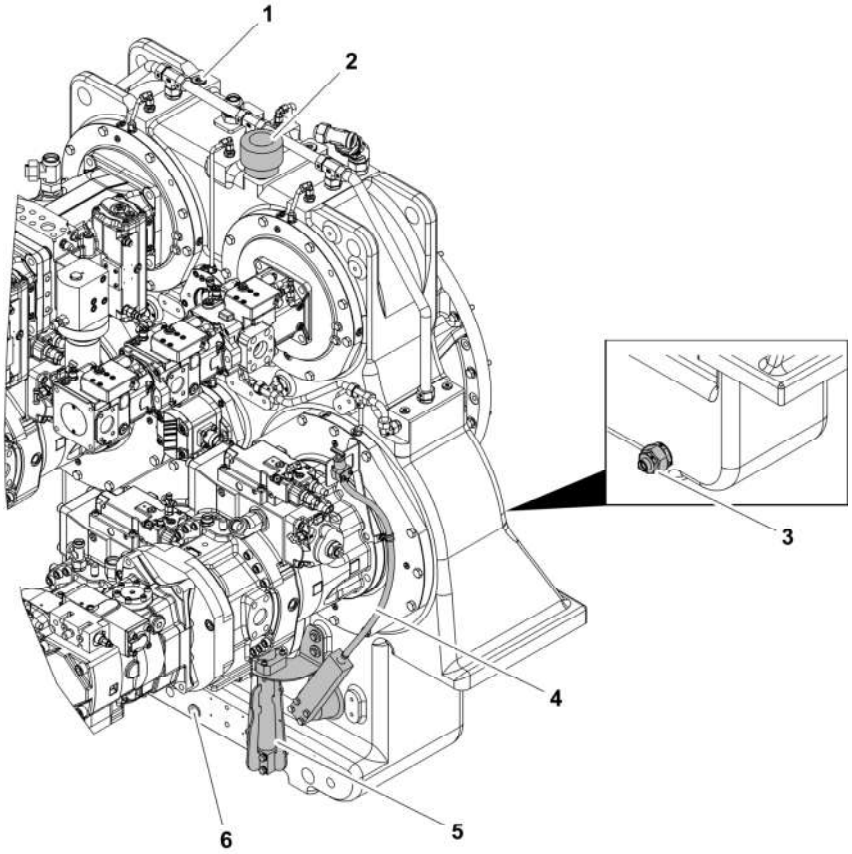

Fig. 5-98 *Oil change on splitterbox*

1 Oil inlet cap
2 Breather cap
3 Drain valve
4 Dipstick
5 Level transmitter tube

Danger!
Risk of injury due to formation of sparks.

▶ Disconnect the negative terminal (-) first and connect it last.

5.18.2 Principal batteries switches and Engine Control Unit (ECU) connectors

Caution!
Take particular care with machines with built-in independent heating.

▶ Only switch off the principal batteries switches when the independent heating's run-on is over.

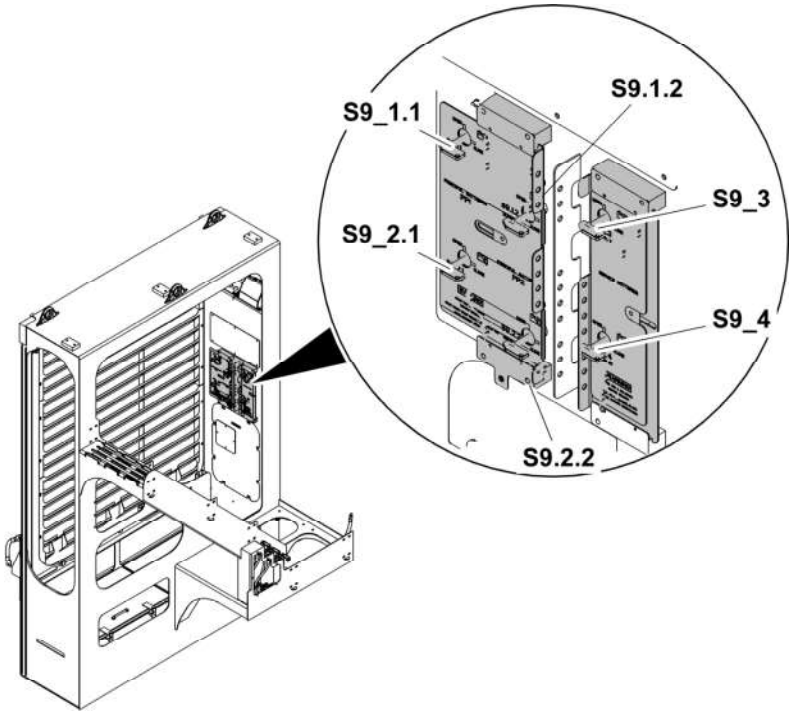

Fig. 5-108 *Battery switches*

1 Battery switch electrical box PP1 **S9_1.1**
2 Battery switch electrical box PP1 **S9_1.2**
3 Battery switch electrical box PP2 **S9_2.1**
4 Battery switch electrical box PP2 **S9_2.2**
5 Service batteries circuit breaker **S9_3**
6 Service batteries circuit breaker **S9_4**

Fans check

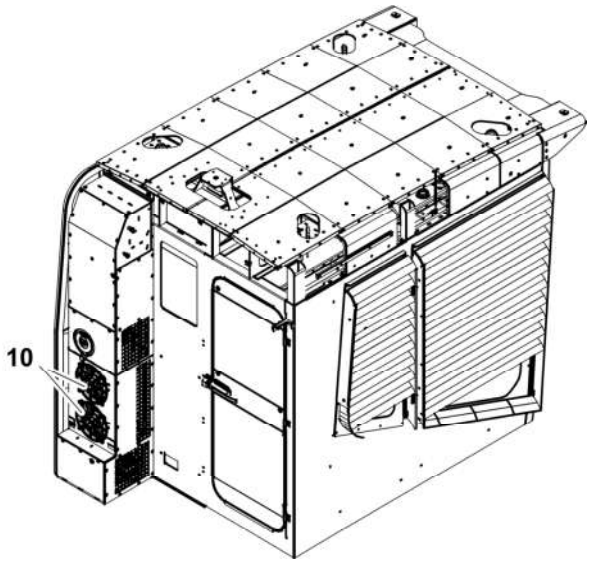

Fig. 5-119 *Fans on air conditioning unit*

▶ Check condition of fans **10**. If one fan **10** is defective, it has to be replaced. The fans have to be free of dirt and damages.

5.19.3 Dual air-conditioning system (optional)

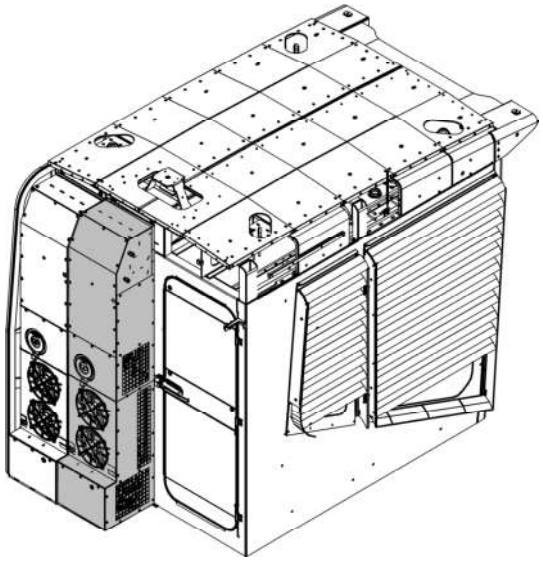

Fig. 5-120 *Dual air-conditioning option*

▶ Also switch on the second air-conditioning system for approx. 10 minutes every 2 or 3 weeks, regardless of the season.

▶ During the warm season, perform the same following checks and maintenance works as for standard air-conditioning system concerning:

– evaporator filter installed above the cab electrical cabinet **U1005,**

5.21.9 Driver's cab mounting bolts

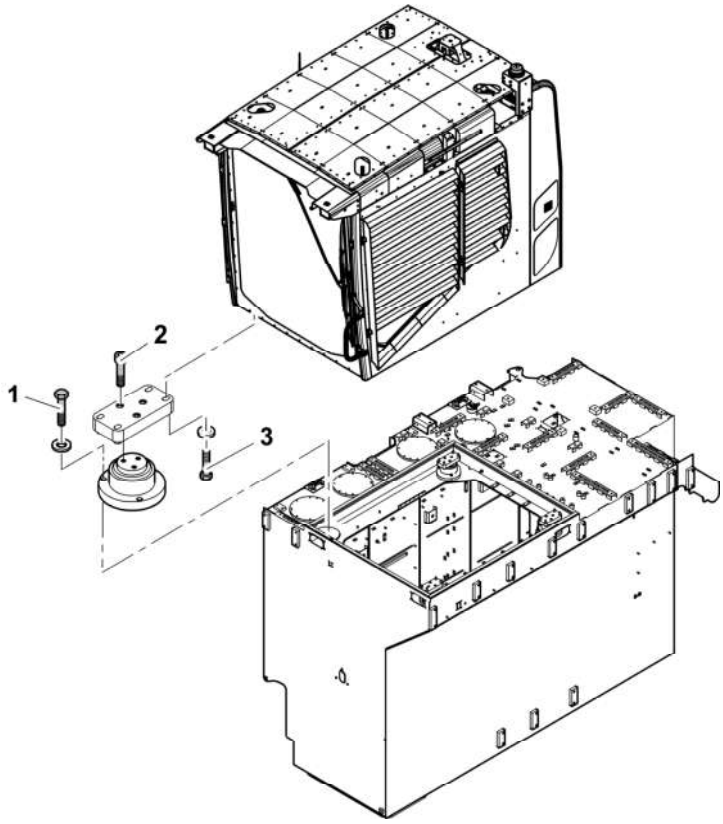

Fig. 5-129 *Driver's cab bolts*

		Torque	Quantity
1	Hexagonal head screw M16x65	270 Nm	12
2	Socket head screw M16x45	270 Nm	12
3	Hexagonal head screw M16x80	270 Nm	16

5.22 Drive unit brakes and swing gear brakes

Both the drive unit brakes and the swing gear brakes are spring-applied, pressure-released multi-plate brakes. They are ventilated hydraulically and are fully sealed and integrated in the travel gear or swing gear transmission.

Their usage purely as parking brakes makes them wear-free and therefore maintenance free.

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5.24.4 250 Hours Maintenance Schedule - R 9600

Serial Number: **Fleet Number:** **SMU Hours:** **Travel Hours:**	**Completed by:** **Date and Signature:**

WORK TO BE PERFORMED AT 250, 750, 1250 HOURS, ... **Check ❑ for first and only interval *or* Check ❍ for repeat interval**	**Check**	**Initials**	**Comments**
GENERAL HYDRAULIC SYSTEM			
Do a visual check of all hoses, pipes and fittings for any external damage or leakage	❍		
Do a detailed check for good condition of pipes, hoses, clamps and fittings for damage and leakage	❍		
Do a visual check of the hydraulic components for leaks and/or damages	❍		
Do a visual check of the hydraulic cylinder rods for leaks and good condition	❍		
GENERAL FASTENING			
General hydraulic: Do a visual check for missing, broken or loosen mounting screws of all hoses, pipes, fittings and clamps, tighten if necessary	❍		
Track components: Do a visual check for missing, broken or loosen mounting screws of the sprockets, rollers, idlers, track guides, track pads, protection covers and final drives, tighten if necessary	❍		
Undercarriage: Do a visual check for missing, broken or loosen mounting screws of the side frames, tighten if necessary	❍		
Undercarriage: Do a visual check for missing, broken or loosen mounting screws of all parts, tighten if necessary	❍		
Attachment: Do a visual check for missing, broken or loosen mounting screws of the handrails, pin covers fastening and greases connections, tighten if necessary	❍		
Uppercarriage: Do a visual check for missing, broken or loosen mounting screws of the counterweight, tanks, Powerpack, control valve console, cab, cab elevation, catwalks, handrails, grease box, ladder, tighten if necessary	❍		
Swing gear: Do a visual check for missing, broken or loosen mounting bolts of the swing gear and hydraulic motors, tighten if necessary	❍		
Diesel engine: Do a visual check for missing, broken or loosen mounting screws of the thermic protection on exhaust manifold fastening, tighten if necessary	❍		

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WORK TO BE PERFORMED AT 500, 1500, 2500 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
Drain water sediment from hydraulic tank	❍		
Check oil level in hydraulic tank	❍		
Sample and analyse hydraulic oil and change oil if necessary	❍		
Clean magnetic rods of all the return filters	❍		
Clean magnetic rods of the leak oil filter	❍		
Clean magnetic rods of bypass filter	❍		
Replace filters on the rotary connection	❑		
Replace filter element of the return filters	❑		
Replace filter element of the leak oil filter	❑		
Replace control oil filter element	❑		
Replace swing pumps replenishing oil filter elements	❑		
Do a visual check of the oil cooler protection filters, clean or replace if necessary (optional equipment)	❑		
Replace filter elements of bypass filter	❑		
ELECTRICAL SYSTEM			
Press to open dust discharge valve on aeration devices for cabin and electrical boxes	❍		
Replace main element on aeration devices for cabin and electrical boxes (at least once a year)	❍		
Replace safety element on aeration devices for cabin and electrical boxes, after 3 services of main element	❍		
Do a visual check of the head and floodlights, clean and adjust if necessary	❍		
Do a visual check of electric harness, sensors for damage and/or rubbing zone	❍		
Do a detailed check of fuses and circuit breakers	❍		
Do a visual check of wiring system damage	❍		
Check battery electrolyte level (refill if necessary) and clean battery terminals	❍		
AIR PRESSURE SYSTEM			
Drain air tanks	❍		
For air compressor unit PTO250, refer to the EMS Concept User manual	❍		
CABIN			
Do a visual check of the cabin for oil/fluids leaks	❍		

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WORK TO BE PERFORMED AT 1000, 3000, 5000 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
Replace if necessary the air conditioner filter/dryer (at least once a year)	❍		
Yearly check condition of the refrigerant receiver, if necessary replace it	❍		
Perform maintenance for the second air-conditioning system (optional equipment)	❍		
Lubricate all doors seals with silicone or talc (before cold season)	❍		
Do a visual check of the AC for leaks or rubbing hoses or pipes	❍		
Do a visual check of the locks and hinges on doors and windows (lubricate if necessary)	❍		
Do a detailed check of the cabin rubber mounts	❍		
FIRE FIGHTING SYSTEM			
Do a visual check of the fire fighting system condition (optional equipment, refer to the fire fighting system documentation) - If any issue contact the fire fighting local dealer	❍		
Follow the inspection intervals recommended by the specific Health and Safety rules existing in country and/or on mine site	❍		
START THE ENGINE TO CHECK THE FOLLOWING ACTIONS			
General: Maintenance work must include the check of the correct functions of hydraulic and electric systems before starting operation	❍		
Attachment: Check function of the working attachment lubrication system during operation	❍		
Attachment: Check if the damping system on equipment is working correctly	❍		
Uppercarriage: Check position of the hydraulic shut-off valve	❍		
Uppercarriage: Check movement and locking of the access ladder	❍		
Uppercarriage: Check that the swing movement of the uppercarriage is locked when the access ladder is lowered	❍		
Swing gear: Check function and operation of the swing brake	❍		
Swing ring: Check function of the swing ring bearing lubrication system during operation	❍		
Swing ring: Check function of the swing ring teeth lubrication system during operation	❍		
Diesel engine: Check speed on RPM gauge	❍		
Diesel engine: Check running noises	❍		
Diesel engine: Check exhaust gas colour	❍		
Diesel engine: Check oil pressure and coolant temperature during operation	❍		
Diesel engine: Check if the prelub system is working properly	❍		

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 electric harness, sensors for damage and/or rubbing zone	❍		
Do a detailed check of fuses and circuit breakers	❍		
Do a visual check of wiring system damage	❍		
Check battery electrolyte level (refill if necessary) and clean battery terminals	❍		
Do a test of all emergency stops (engine stop only) Make sure that the display goes off after each test	❍		
AIR PRESSURE SYSTEM			
Drain air tanks	❍		
Replace filter cartridge of air dryers	❍		
For air compressor unit PTO250, refer to the EMS Concept User manual	❍		
CABIN			
Do a visual check of the cabin for oil/fluids leaks	❍		
Operate air conditioner every week for 10 minutes	❍		
Do a visual check of the condenser unit and evaporator filter	❍		
Do a visual check of the refrigerant level, if necessary refill circuit	❍		
Replace if necessary the air conditioner filter/dryer (at least once a year)	❍		
Yearly check condition of the refrigerant receiver, if necessary replace it	❍		
Perform maintenance for the second air-conditioning system (optional equipment)	❍		
Lubricate all doors seals with silicone or talc (before cold season)	❍		
Do a visual check of the AC for leaks or rubbing hoses or pipes	❍		
Do a visual check of the locks and hinges on doors and windows (lubricate if necessary)	❍		
Do a detailed check of the cabin rubber mounts	❍		
Do a detailed check of the heater exchanger and filter for leaks	❍		
FIRE FIGHTING SYSTEM			
Do a visual check of the fire fighting system condition (optional equipment, refer to the fire fighting system documentation) - If any issue contact the fire fighting local dealer	❍		
Follow the inspection intervals recommended by the specific Health and Safety rules existing in country and/or on mine site	❍		
START THE ENGINE TO CHECK THE FOLLOWING ACTIONS			

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Serious damage

If you find a serious damage:

Immediately	▶ Inform formally the responsible Maintenance Manager about the condition of the hose assembly. ▶ Make sure that you have the correct replacement part in stock.
Daily	▶ Examine the hose assembly. Monitor if the deterioration increases. ▶ If the deterioration of the hose assembly increases in a small number of days, refer to next section "Major damage" for the actions to do.
One of the next services, but not later than 250 hours	▶ Replace the hose assembly.

Rubber cover has many cuts or cracks - Reinforcement layer is not corroded or not cut - No sign of oil



Rubber cover is rubbed - Reinforcement layer is uncovered but not corroded - No sign of oil

Hoses and fittings are visually wet - Oil propagates
There is a surface of remaining oil which is visually wet and results in the formation of non-falling or falling drop.



24	Hydraulic hose	**36**	Hydraulic hose
25	Hydraulic hose	**37**	Hydraulic hose
26	Hydraulic hose	**38**	Oil cooler protection filters (optional)
27	Hydraulic hose	**CP1**	Internal collecting pipe of the hydraulic tank, after the oil coolers
28	Hydraulic hose	**CP5**	Internal collecting pipe of the hydraulic tank, before the oil coolers
29	Hydraulic hose		

- ▶ Disconnect, drain and clean all the hydraulic hoses.
- ▶ If installed, check and clean or replace if necessary the optional filters **38**.
- ▶ Drain and clean the collecting pipes in the hydraulic tank.
- ▶ Move to next section about the leak oil circuit.

Leak oil circuit

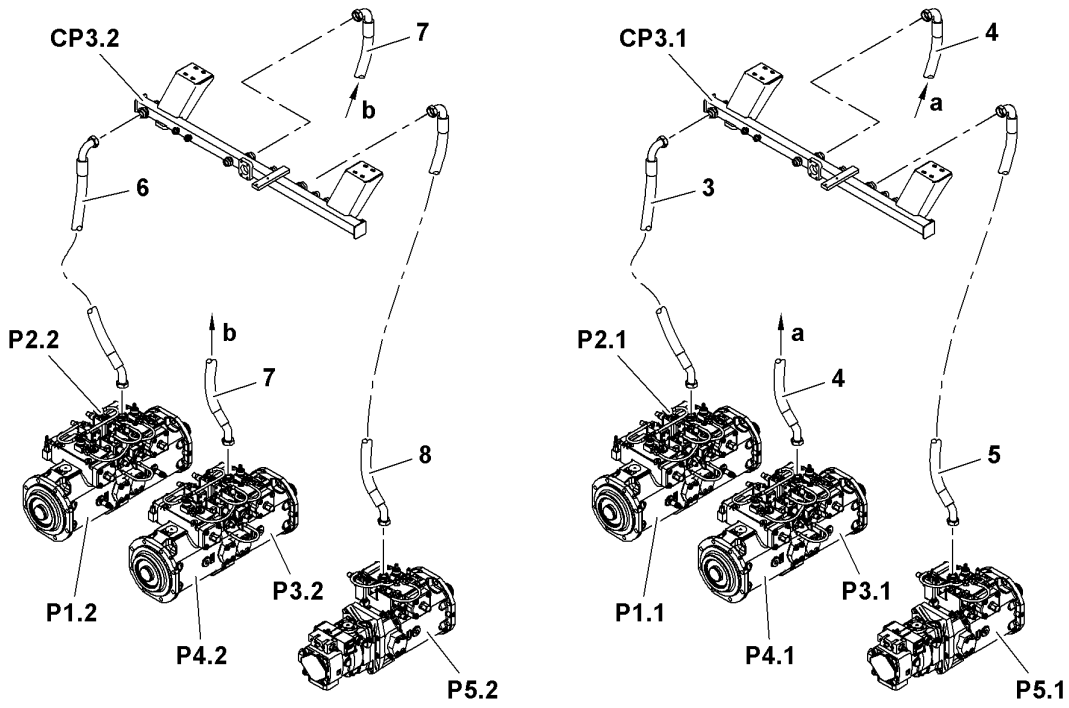

Fig. 6-12 *Leak oil circuit of working pumps*

3	Hydraulic hose PowerPack 1	**P2.1**	Working pump 2 PowerPack 1
4	Hydraulic hose PowerPack 1	**P3.1**	Working pump 3 PowerPack 1
5	Hydraulic hose PowerPack 1	**P4.1**	Working pump 4 PowerPack 1
6	Hydraulic hose PowerPack 2	**P5.1**	Working pump 5 PowerPack 1
7	Hydraulic hose PowerPack 2	**P1.2**	Working pump 1 PowerPack 2
8	Hydraulic hose PowerPack 2	**P2.2**	Working pump 2 PowerPack 2
CP3.1	PowerPack 1 collecting pipe	**P3.2**	Working pump 3 PowerPack 2

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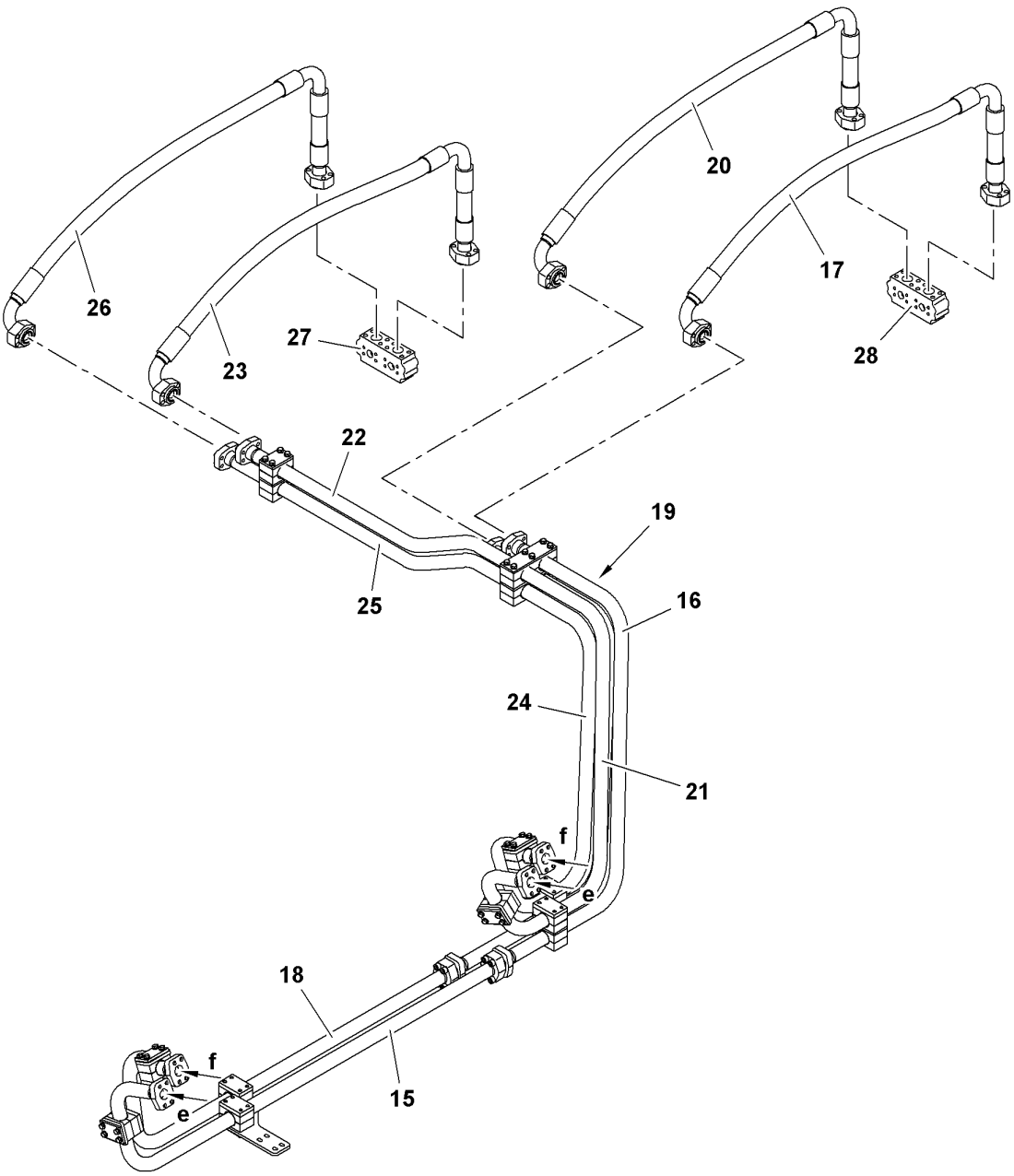

Fig. 6-21 *Working pressure hoses*

15	Hydraulic pipe PowerPack 2	**22**	Hydraulic pipe PowerPack 1
16	Hydraulic pipe PowerPack 2	**23**	Hydraulic hose PowerPack 1
17	Hydraulic hose PowerPack 2	**24**	Hydraulic pipe PowerPack 1
18	Hydraulic pipe PowerPack 2	**25**	Hydraulic pipe PowerPack 1
19	Hydraulic pipe PowerPack 2	**26**	Hydraulic hose PowerPack 1
20	Hydraulic hose PowerPack 2	**27**	Distribution block PowerPack 1
21	Hydraulic pipe PowerPack 1	**28**	Distribution block PowerPack 2

▶ Disconnect, drain and clean all the hydraulic hoses and pipes.

26	Hydraulic hose	**MF4**	Oil fan motor 4
27	Hydraulic hose	**MF5**	Oil fan motor 5
28	Hydraulic pipe	**MF6**	Oil fan motor 6
29	Hydraulic hose	**P60.3.1**	Oil cooler fan pump Power-Pack 1
30	Hydraulic hose	**P60.3.2**	Oil cooler fan pump Power-Pack 2

- ▶ Disconnect, drain and clean all the hoses and pipes.
- ▶ Move to next section about the oil intake circuit.

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Stick cylinders circuit

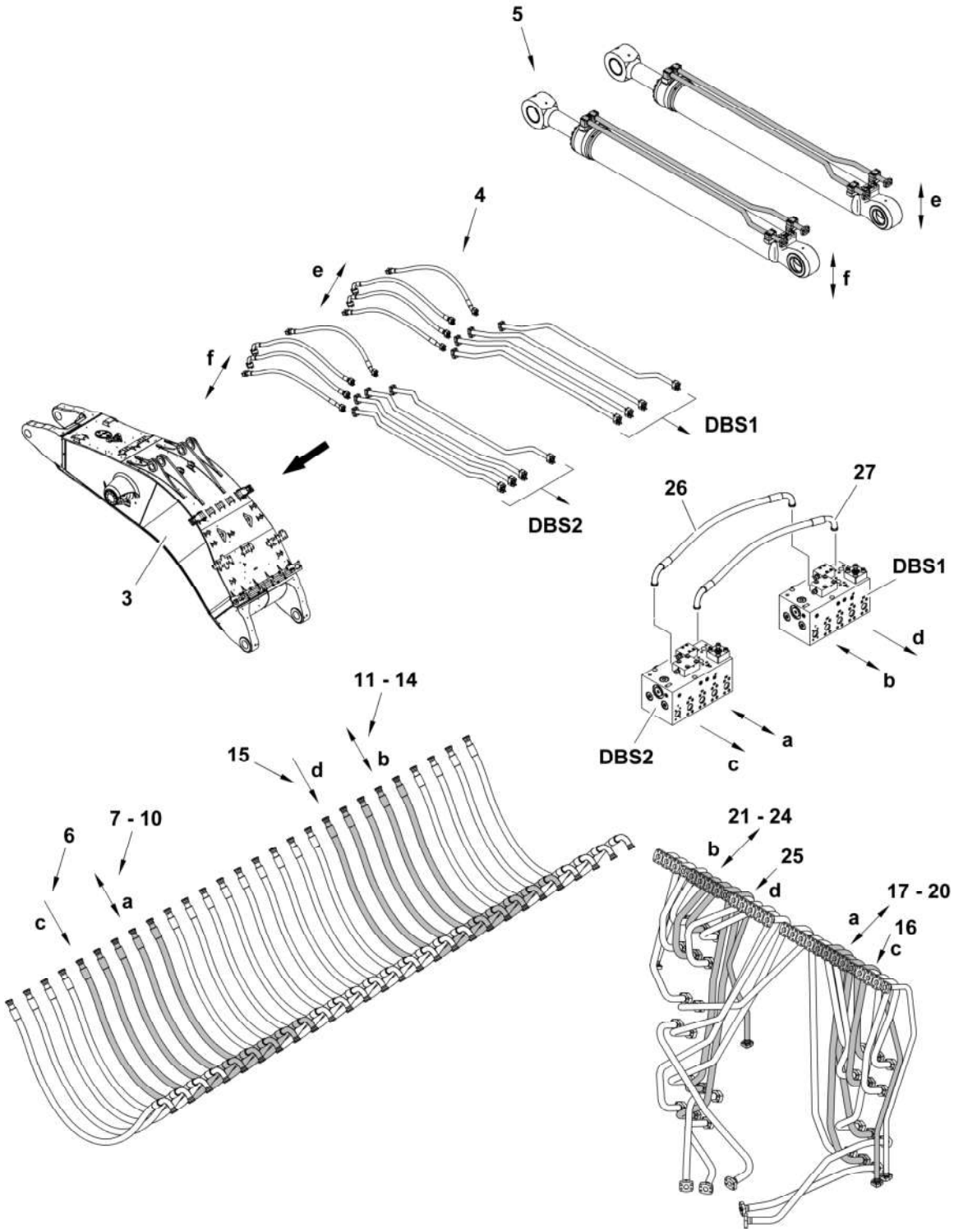


Fig. 6-38 *Hydraulic lines of the stick cylinders*

3	Boom	**16**	Hydraulic pipe

Boom cylinders circuit

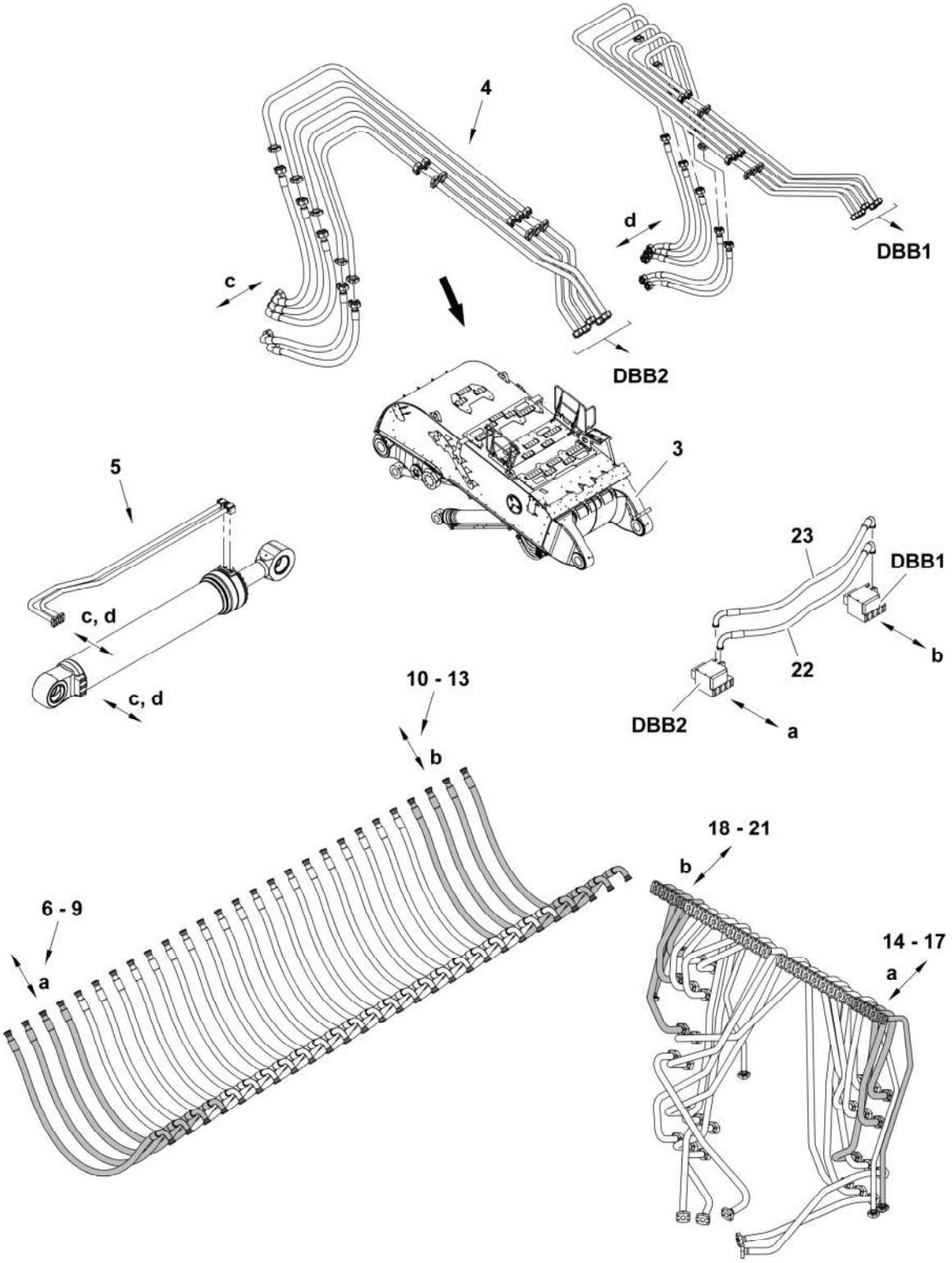
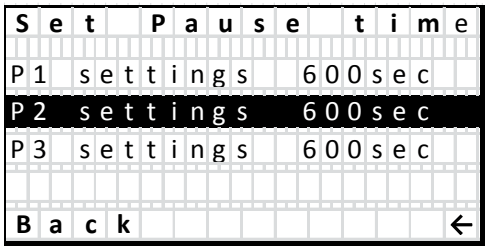
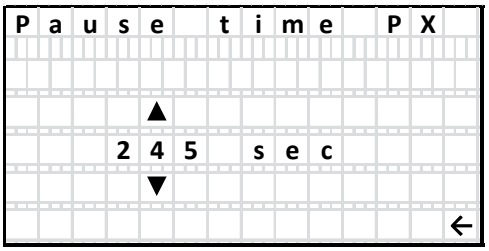


Fig. 6-43 *Hydraulic lines of the boom cylinders*

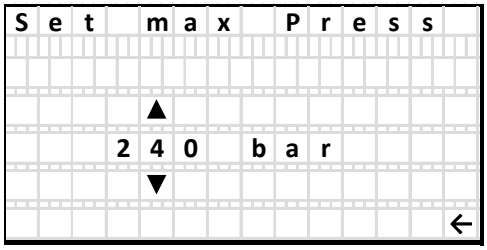
3	Boom	**15**	Hydraulic hose

- **Set Pause Time :**





- **Set max Press :**



1.4 Manufacturer and service addresses

Manufacturer	Customer Service
SKF Lubrication Systems Germany GmbH Heinrich-Hertz-Str. 2-8 69190 Walldorf, Germany	**SKF Lubrication Systems Germany GmbH** Heinrich-Hertz-Straße 2-8 69183 Walldorf, Germany +49 (0)6227-330 **SKF Lubrication Systems Germany GmbH** 2. Industriestraße 4 68766 Hockenheim, Germany +49 (0)620527101 **SKF Lubrication Systems Germany GmbH** Motzener Straße 35-37 12277 Berlin, Germany +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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3 Safety recommendations to be observed

3.1 General behavior when working with the system

- The centralized lubrication system, pump, or individual components may only be used in awareness of the potential dangers, in proper technical condition, and according to the information in these installation instructions.
- Familiarize yourself with the functions and operation of the product. The specified assembly and operating steps and their sequences must be observed.
- Any unclear points regarding proper condition or correct assembly and operation must be clarified. Operation is prohibited until issues have been clarified.
- Unauthorized persons must be kept away from the centralized lubrication system.
- All safety regulations and in-house instructions relevant to the particular activity must be observed.
- Responsibilities for different activities must be clearly defined and observed. Uncertainty seriously endangers safety.
- Protective and safety mechanisms cannot be removed, modified, nor disabled during operation and must be checked for proper function and completeness at regular intervals.
- Any malfunctions that occur must be resolved according to responsibility. The supervisor must be notified immediately in case of malfunctions outside one's individual scope of responsibility.
- Do reach into the system during operation.
- Wear personal safety equipment.
- Observe the respective safety data sheets and operating instructions from the lubricant manufacturer or supplier when handling lubricants.
- Do not use any part of the centralized lubrication system or the machine as a stand or for climbing.

3.2 Explosion protection

- Always behave so as to avoid fire and explosion hazards.
- A written work authorization from the operator is necessary prior to initiating work in potentially explosive atmospheres.
- There must be no indication that parts of the explosion protection are missing or not functioning. If such indications do exist, the machine must be switched off and a supervisor informed immediately. Unauthorized persons must be kept away.
- Explosion protection measures must never be deactivated, changed, or bypassed.
- The introduction of ignition sources such as sparks, open flames, and hot surfaces into potentially explosive atmospheres is prohibited.
- Inspect the machine at regular intervals for damage that may present an ignition hazard.
- The lubricant’s ignition temperature must be at least 50 kelvin above the maximum permissible surface temperature.
- Use only tools and clothing approved for use in potentially explosive atmospheres (ESD).
- Electrical components may only be transported, installed, repair, and serviced if it has been ensured that the atmosphere is not potentially explosive.

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6 Normal operation

6.1 Daily start-up

See the activities to be performed in normal operation below.

6.2 Inspections

The operator must define suitable inspection periods for the activities listed in “Inspections before first start-up” depending on the specific situation in which the pump or centralized lubrication system is operated.

6.3 Filling the reservoir during operation

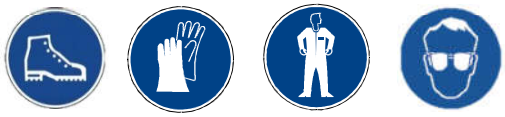
The reservoir is filled according to the description in Chapter “Installation and first start-up.”

6.4 Cleaning

Execution, required protective gear, and cleaning agents and equipment are in accordance with the applicable operating rules of the operator.

DANGER

Risk of death
Fire and explosion hazard from using flammable cleaning agents. Do not use steam-jet equipment or high-pressure cleaners. This may damage electrical components. Do not touch cables or electrical components with wet or moist hands. Cleaning work on electrical components may be performed only by qualified electricians. Wear personal safety equipment.



Exterior cleaning

- Thoroughly clean all surfaces.
- Mark and secure wet areas.

Interior cleaning

- Interior cleaning is not normally required.

IMPORTANT NOTE

Possible damage to the machine
If solvents are used for cleaning, ensure they are compatible with plastic parts and finishes. Do not use any polar organic solvents such as alcohol, methanol, or acetone.

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9.2.3 Single-line lubrication system

The single-line lubrication system consists of a pump for the pressurized supply of lubricant to the injectors via the delivery line. The injectors dispense lubricant to a secondary metering device or the bearing via supply lines.

The lubrication cycle is started by an automated pump. The control shafts moving in and out on the injectors indicate that the injectors have completed the cycle.

A control unit controls the automated system.

The time between on cycles and the duration of off cycles can be adjusted. The control unit includes the aforementioned timer function with monitoring and alarm functions. A pressure switch is used to indicate that the system pressure to switch off the pump has been reached and to check whether a lubrication cycle has been completed. If the pressure switch does not detect full pressure within a defined period of time, the control unit will enter alarm mode.

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10.2 System P1: Automatic lubrication

	**CAUTION**
	May be operated only by authorized and trained personnel! Never exceed the permissible system pressures! Refill in good time using clean lubricant!

	**CAUTION**
	The power supply (main switch on the battery) must not be interrupted during pump operation.

When starting the excavator, the centralized lubrication systems are automatically supplied with power. Each lubrication pump then commences a complete lubrication cycle and is stopped only during the preset interval time, etc.

Pump P1 supplies the lubrication points with lubricant via a single-line lubrication system according to Chapter 9.2.1 “Configuration.”

See Chapter 9.2 for details on control and monitoring of the system. Cabin lubrication module U4-1 for electronic control unit

If necessary, the operator can force the lubrication cycle. See the corresponding data sheets for details.

See the features of each lubrication point: Features of lubrication points on the excavator.

Further details:

- Chapter 9.2 Lubrication cycle

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1.2. Operation

1. Flexible air connections should be of the correct diameter and appropriate for the service pressure. Never use flexible hosing that is scratched on the surface, deteriorated or damaged in any other way. Use only connections and sleeves of a suitable type and size. When applying an air supply connection to flexible hosing or an air line, check that the free end is firmly held. A free end can whip round dangerously and cause bodily injury. Check that the piping is fully decompressed before disconnecting.

2. Never play around with compressed air. Do not direct compressed air towards your skin or a person. Never use compressed air to clean any clothing that you or other people may be wearing. Take the greatest care when using compressed air for cleaning any equipment. Wear protective eye-glasses.

3. The compressor is not designed to produce breathable air. To obtain air of breathable quality, the compressed air should be duly filtered in line with local legislation and standards.

4. Never use the unit when there is a risk of inhaling toxic smoke or inflammable fumes.

5. Never make the unit run at pressures lower or higher than the nominal limits indicated on the "main specifications" sheet.

6. Periodically check that :

    a. All protective devices are in place and firmly attached.
    b. All hosing and other pipework is in good condition, fixed or tied down and is not rubbing.
    c. Sealing is perfect.
    d. Bolt work and collars are securely tightened.
    e. Safety valves and other decompression devices are not clogged with dirt or paint.
    f. The air output valve and air circuits, i.e., pipework, connectors, collectors, valves and hosing are in good condition and are not worn or damaged.

7. Take precautionary measures against the air being polluted - and breathable air being contaminated - when recovering hot cooling air from the compressors for use with any heating installation such as for a workshop.

8. Do not remove or modify any sound insulating material.

1.3. Maintenance

Any maintenance and repair work should be done under the surveillance of a competent person.

1. Use only the correct tooling to carry out maintenance and repair work.

2. Use only original and genuine spare parts.

3. Carry out any maintenance work outside routine checks only if the unit has been shut down. Take all necessary precautions against the unit starting up unexpectedly. Furthermore, display a **"Work in progress! Do not start!"** sign near the start control box.

4. Before putting any piece of equipment under pressure, effectively isolate the unit from any pressure source and fully decompress the system.

5. Do not use any inflammable solvent or carbon tetrachloride for cleaning parts. Take precautions against toxic vapor coming from detergents.

6. Cleanliness must be strictly observed when doing any maintenance or repairs. Avoid any dirt getting in by covering up any detached parts and any openings using clean cloths, paper or adhesive strip.

7. Never carry out any welding or other work that might create a heat source near the oil circuit. If there is a heat source, completely purge oil reservoirs - using steam for example - before undertaking such work. Never weld or modify a pressure vessel in any way. If there is any sign or fear of overheating of a machine internal part, stop machine and **open up inspection covers only after a reasonable cooling period.**

    These precautions will help prevent the risk of spontaneous explosion of any oil vapor coming into contact with air. Never use a naked flame to inspect the inside of the machine, pressure vessel etc.

8. Make sure you don't lose any tools, objects or cloths in or on the unit.

9. Before the unit is authorized for use following a maintenance or servicing procedure, check that the service pressures, temperatures and time delay settings are correct, and check whether the control console and the emergency stop system operates correctly.

10. After any replacement of a separator element, check for any carbon deposits in the backflow pipework and inside the oil separator tank if there is one. Remove any carbon deposits if they are significant.

11. Protect motor, air filter and regulatory devices against water ingress, when carrying out steam cleaning for example.

12. Check the condition of the sound insulation material around the unit, and around the compressor intake and output systems.