en

Operating manual

Hydraulic excavator
R 9400

from serial number 31279

Document identification

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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

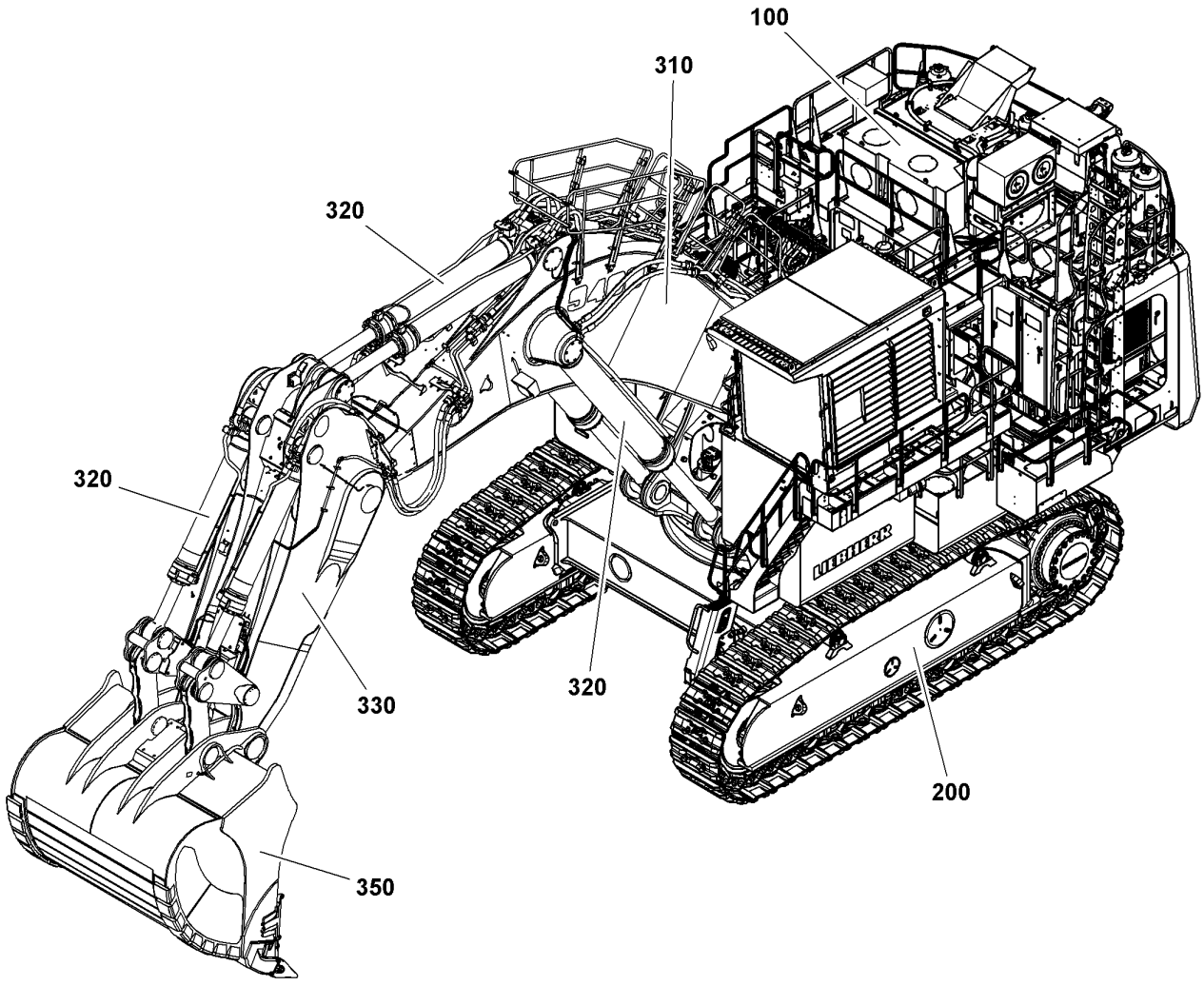

Fig. 1-1 *Machine and construction equipment - backhoe attachment*

100	Uppercarriage	**320**	Hydraulic cylinder
200	Undercarriage	**330**	Stick
310	Boom	**350**	Backhoe bucket

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Customer Service
World-Class Support,
Everywhere, Every Day

Safety
Protecting Your Most
Important Assets

Environment
Mining Responsibly

Safety-First Working Conditions

Safe Service Access
The R 9400 is fitted with ergonomic access for fast and safe maintenance. All service points are within reach from one side and at machine level. The R 9400's upperstructure is accessible via a robust fixed ladder or via an optional hydraulic actuated 45° stairway.

Secure Maintenance
All components have been located to allow for effortless inspection and replacement. Numerous service lights are strategically located in the service areas to sustain suitable maintenance conditions, day or night. Emergency stops have been strategically placed in the cab, engine compartment and at ground level. The R 9400 eliminates hazards to ensure a safe environment for the service staff during maintenance.

Efficient Machine Protection

Protection Against Fire Ignition
The engine compartment integrates a bulkhead wall that separates the engine from the hydraulic pumps. This reduces the risk of hydraulic oil entering the engine compartment. The turbochargers and exhaust systems are heat shielded, and all the hydraulic hoses are made from a fire resistant material.

Automatic Fire Suppression System
The R 9400 can be equipped with a fully integrated fire suppression, employing a dual agent solution to prevent and protect the machine. The fire suppression system has both automatic and manual release capabilities, emergency stop devices are strategically located on the machine to be easily accessible in any case by the operator.

User Friendly Maintenance
The machine is easily visible even by night or in extremely dusty working environments thanks to:
- 12 long-range working LED lights located on attachment, uppercarriage and counterweight
- Travel alarm system with light and buzzer

Machine Access
Designed for safe access on the machine upperstructure via:
- A 45° powered stairway and catwalks with handrails and perforated steps
- Walkways with slip-resistant surfaces
- Emergency egress with handrails in front of the excavator

Commitment to Employees Safety
- Safe and protected access to the components
- Major components centralized to be easily accessible
- E-stops located for the operator and maintenance staff
- Ground-level fluid maintenance hub
- Rear and side vision system

2 Safety instructions

Working with the machine holds dangers to which you as the owner, machine operator or maintenance expert could be exposed. If you regularly read and note the safety information, however, you can prevent danger and accidents. This is particularly true for those who are only occasionally in contact with the machine, e.g. for maintenance work. The following information comprises safety regulations which, if followed conscientiously, will contribute to your safety and that of other persons, as well as avoiding damage to the machine.

Following these precautions does not release you from the responsibility to take note of safety regulations which apply on site or of guidelines given by legal bodies or professional associations.

For EU countries, guideline 2009 / 104 / EC contains the minimum required safety information applicable to the owner.

2.1 Meaning of the symbols in this manual

Work processes and actions that could cause danger are accompanied by safety informations in these operating instructions. These safety informations describe various dangers which are emphasized by the terms **Danger**, **Caution** and **Note**.

These terms are identified by symbols in the operating instructions and have the following meaning:

Danger!
Warning relating to a danger that carries with it a high risk of death or serious injury if the appropriate preventative measures are not taken.

Caution!
Warning relating to dangers that could result in physical injury and/or damage to the machine if the appropriate preventative measures are not taken.

Note!
This symbol identifies user tips and operating and maintenance procedures whose use will guarantee a high degree of user-friendliness and longevity to the machine or which will considerably simplify working procedures.

– This symbol identifies a listing.
  • This symbol identifies a sub-listing.

❑ This symbol signifies the following: “The precondition must be fulfilled”.
The machine operator or the maintenance personnel must first fulfil the precondition described, i e. the machine must be brought into a particular work position in order to be able to carry out the actions subsequently described.

▶ This symbol identifies an action.
The machine operator or the maintenance personnel should be active at this location and carry out the action described.
↳ This symbol means “Carry out an activity".

– Do not drive at a right angle to the slope.

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.

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- Only charge the hydraulic accumulator with nitrogen. There is a RISK OF EXPLOSION if oxygen or air is used.
- The accumulator body can become hot during operation; there is a risk of burning.
- New hydraulic accumulators must be charged with the pressure required for the purpose of use before installation.
- The operating data (minimum and maximum pressure) are marked permanently on hydraulic accumulators. Ensure that this marking remains visible.

Hydraulic lines and hoses

- It is forbidden to carry out repair work on hydraulic lines and hoses!
- All lines, hoses and bolt connections must be checked regularly for externally visible damage and any possible damage must be immediately checked for leakage.
- Never check for leaks with your bare hands, use a sheet of paper or something else.
- Any damaged parts must be removed immediately! Spurting oil can lead to injury and burns.
- Even with correct storage and permitted load, lines and hoses are subject to the natural aging process. This restricts their duration of use.
  - Incorrect storage, mechanical damage and unauthorized load are the most common causes of failure.
  - In relation to duration of use, current norms, regulations and guidelines pertaining to lines and hoses at place of use must be adhered to.
  - Use at the limit range of permissible load can shorten duration of use (e.g. high temperatures, frequent movement cycles, extremely high pulse frequencies, multiple shift usage).
- Lines and hoses should be replaced if the following are found during inspection:
  - Damage to the outer sheath as far as the liner (e.g. chafing, cuts and cracks);
  - Brittleness of the outer sheath (fracture formation in hose material);
  - Deformations which do not correspond to the natural form of the line or hose, whether in a unpressurized or pressurized state or on bends e.g. sheath separation, blistering;
  - Unsealed areas;
  - Non-adherence to requirements during installation;
  - Damage or deformations to the hose fittings which reduce the tightness of the fittings or the hose / fitting connection;
  - Hoses working themselves out of the fittings;
  - Corrosion of the fittings which reduces function and tightness;
- When replacing lines and hoses, use only original replacement parts.
- Install and mount lines and hoses correctly. Do not mix up the connections.
- The following is to be noted when replacing lines and hoses:
  - Always ensure that the lines and hoses are installed free of torsion. For high-pressure hoses, the screws from the half-clamps or full flange must always be attached to both hose ends and should only be tightened afterwards.
  - When tightening the flange on high-pressure lines and hoses with bent fittings, the side with the bent fitting must always be tightened first and then the side with the straight fitting tightened afterwards.
  - Any mounting clamps which are located in the centre of the hose may only be attached and tightened subsequently.
  - Check daily to ensure that all clamps, covers and protective devices are properly fastened. Doing this will prevent vibration and damage during operation.
  - Install the lines and hoses in such a way that they cannot chafe on other lines, hoses or parts.
  - A minimum distance from other parts of approx. half the exterior diameter of the hose is recommended. The distance should not, however, be less than 10 to

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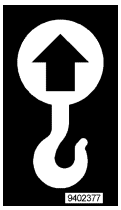

Plate 102: Lifting point label

Indicates the location of lifting points on the excavator.

Plate 103: Anchor point label

Indicates the location of anchor points on the excavator.

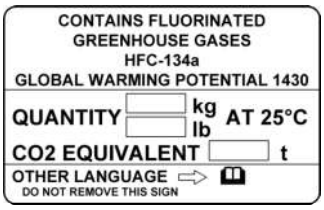

Plate 104: Label for the air conditioning system

This label is installed on the air conditioning compressor. It gives the following information about the material contained in the system:

- type
- designation
- quantity
- Global Warming Potential

* Estimated mass of the machine in its standard version (without optional equipment) according to its configuration: Diesel, electric, backhoe, shovel or pontoon.

Fig. 3-5 Control board

Standard functions

S100_1 Emergency stop
S122 Disable ladder or trap control lock
H38 Greasing system alarm
H81 Hydraulic valve closed
H91 Power reduced
H92 Fire alarm
H94 Fuel valve closed
P4 Engine RPM indicator
P8 Service batteries voltmeter
P9 Principal batteries voltmeter
H6 Clock
H93 Water in fuel indicator

S41 Cabin ceiling light
S126 Additional cabin lighting

Diesel engine monitoring system

H60 STOP indicator
H61 WARNING indicator
H62 MAINTENANCE indicator
H200 Indicator for level of the Diesel Exhaust Fluid (DEF)
H201 Indicator for Selective Catalytic Reduction (SCR) system cleaning
S82_1 Diagnostic increment
S82_2 Diagnostic decrement
S85 Monitoring ON/OFF

Safety operation engine

S23 Engine safety operation ON
R6 Engine RPM adjustment

Safety operation hydraulic pumps

S73 POWER pump control
S74 FLOW pump control

Optional functions

H103 Preheating indicator
S12-1 Side wiper
S12-2 Back wiper
S26 Dual air conditioning
S149 Ether control (cold starting aid)
S178 Shutdown timer reset

Disable ladder or trap control lock

▶ For further information about correct use of this function, refer to § "Access ladder" in section "Entering or leaving the cab" of this manual.

Diesel engine monitoring system

If an indicator **H60**, **H61** or **H62** goes on during operation, test switches **S82_1** and **S82_2** will allow the engine maintenance mechanics to ask system to indicate the registered default by giving a coded message via the control light.

▶ For further information, refer to the Cummins Operating and Maintenance Manual.

The indicator **H200** in combination with **H60** and **H61** gives alerts about critical levels of the level of the Diesel Exhaust Fluid (DEF).

▶ Refer to the section "Diesel Exhaust Fluid (DEF) level" in this manual.

The indicator **H201** in combination with **H60**, **H61** and **H62** tells when it is necessary to start the procedure for the automatic filter cleaning for the Selective Catalytic Reduction (SCR) system.

▶ Refer to the section "Automatic filter cleaning for the Selective Catalytic Reduc-

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E 505 – Hydraulic oil overheat

This symbol appears if the hydraulic oil temperature in the tank exceeds a preset value. At the same time, the pump are automatically returned to minimum flow.

- ▶ Stop operation.
- ▶ Continue to let the engine run in high idle and wait until the symbol disappears.

If necessary:

- ▶ Turn the engine off.
- ▶ Find and correct the problem (oil cooler dirty, blower or thermostat defective, ...).

E 506 – Oil in splitterbox is overheating

This symbol appears if the oil temperature in the splitterbox exceeds 85°C (185°F).

- ▶ Turn the engine off.
- ▶ Find and correct the problem (splitterbox cooler dirty, ...).

E 511 – Battery overvoltage

E 515 – Greasing system failure

This symbol appears if the greasing system is defect.

- ▶ Find and rectify the problem.
- ▶ See also Lincoln servicing manual.

E 540 – Engine coolant pressure

This symbol appears simultaneously with the red indicator protection **H62** if the coolant pressure is too low.

- ▶ See Cummins Operation and Maintenance manual.
- ▶ Locate the reason for the trouble and get it repaired.

E 543 – Dual Lifetime sealing oil level low

This symbol appears if the oil level in the Lifetime sealing drops below minimal level.

- ▶ Stop operation and turn the engine off.
- ▶ Find and correct the problem.
- ▶ Add oil until correct level is reached.

E 544 – External swing teeth greasing

This symbol appears if the swing teeth greasing system is defect.

- ▶ Find and rectify the problem.
- ▶ See also Lincoln servicing manual.

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The present LR solenoid current (current value for power control) is showed on screen 3.

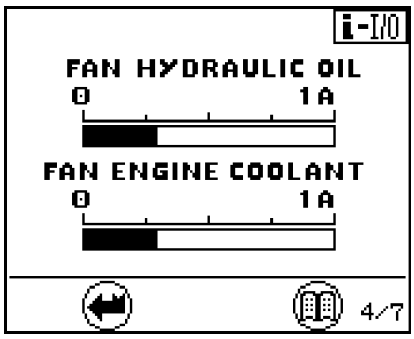

Fig. 3-20 *Fan speed current values menu*

▶ Press the **Menu** button again.
↳ Page 4 is displayed.

The screen 4 indicates for the fan pumps the amount of the momentary flow control signal.

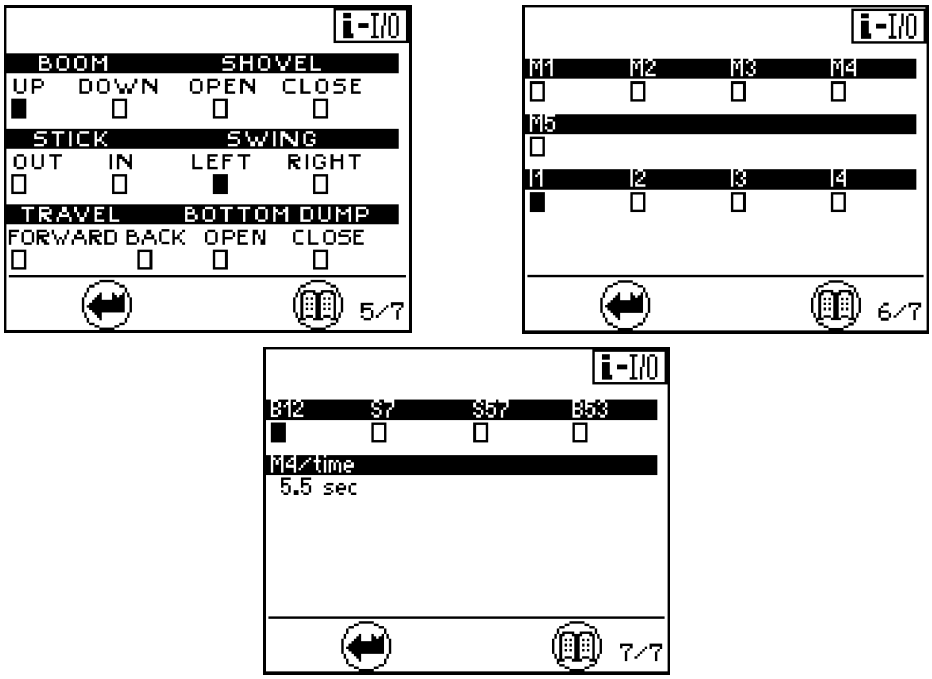

Fig. 3-21 *Electrical inputs*

▶ Press the **Menu** button again.
↳ Page 5 is displayed.

▶ Press the **Menu** button again.
↳ Page 6 is displayed.

▶ Press the **Menu** button again.
↳ Page 7 is displayed.

Pages 5, 6 and 7 provide an overview of the status of different electrical inputs.

A “□” means "Input not active".

A “■”means "Input active".

Access ladder

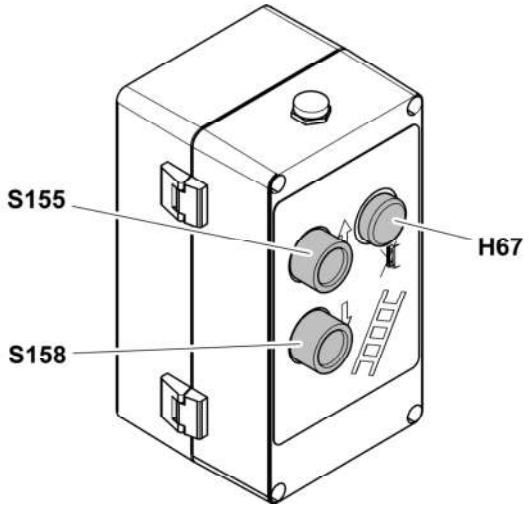

Fig. 3-31 *Access ladder control box* ***E1022-1***

H67 Control light red / ladder not up
S155 Push-button / access ladder up
S158 Push-button / access ladder down

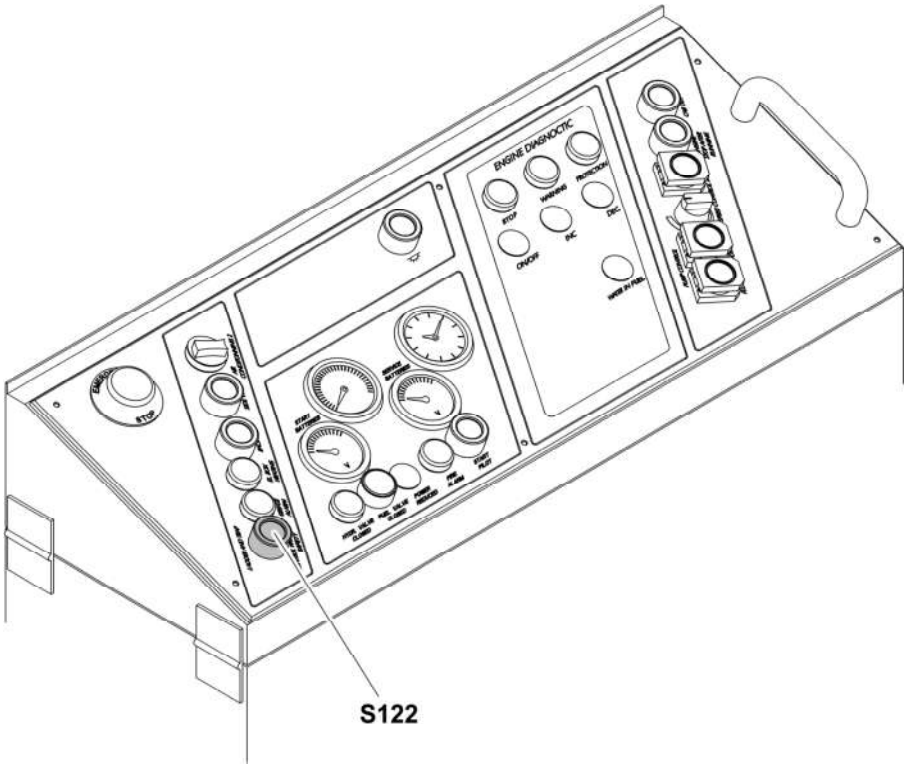

Fig. 3-32 ***S122*** *on control board*

The access ladder can be brought either to lower position to permit access to the upercarriage or to upper position during operation.

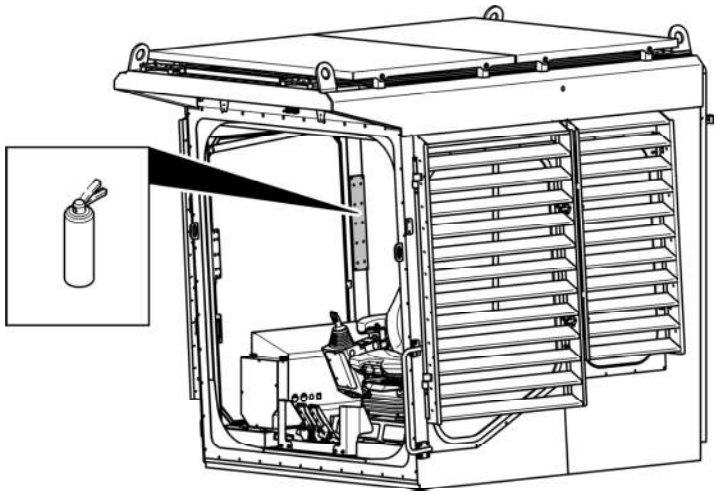

Fig. 3-44 *Fire extinguisher fixing location*

Note!
It is the responsibility of the owner of the machine to decide if it must be fitted with a fire extinguisher or not, considering the operating conditions and the regulations which apply in the country and at the point of use of the machine.

Caution!
If your machine is fitted with a fire extinguisher:

- ▶ Always comply with the operating guide on the body of the extinguisher,
- ▶ Make sure, all the inspections of the fire extinguisher which are prescribed by the regulations applicable to the operating place of the machine are accomplished.

3.2.9 Windscreen wiper

Windscreen wiper

When the ignition is switched on, pressing switch **S14** will activate the windscreen wiper.

- ▶ Press switch.
  - ↳ Intermittent switching
  - ↳ LED I in the switch illuminates.
- ▶ Press switch again.
  - ↳ Continuous operation.
  - ↳ LED C in the switch illuminates.
  - ↳ LED I in the switch goes out.
- ▶ Press switch again.
  - ↳ Windscreen wiper is switched off.
  - ↳ LED C in the switch goes out.

Setting the interval time for the intermittent switching

The interval time can be set when the ignition is on by pressing switch **S14**.

- 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.

Adjusting the operator's standing position

- Before starting the machine, adjust the seat, mirrors, armrests and operator's controls in such a way that you are able to work comfortably and safely.
- Acoustic insulation devices on the machine must be set to the insulation position throughout operation.

Protection from vibration - seat adjusting

- Keep the seat in good condition and adjust it as follows:
  - The seat and its damping action should be adjusted depending on the weight and height of the operator.
  - Check the seat's damping action and adjustment mechanisms regularly and ensure that these seat characteristics remain as per the seat manufacturer's instructions.

Utilisation in confined spaces

- Only operate combustion engines and fuel-operated heaters in adequately ventilated spaces. Before starting in closed areas, ensure adequate ventilation. Follow the regulations which apply for the particular area of use.

Starting the machine safely

- Before starting, check all control lamps and instruments for correct function, place all operator's controls in Neutral and tilt the safety lever up.
- Before starting, sound the horn briefly to alert people in the vicinity of the machine.
- Only start the machine from the driver's seat.
- In the absence of any other instructions, start the engine in accordance with the regulations given in the operating instructions.
- Tilt the safety lever down and then test all display and checking devices.
- In enclosed spaces, only allow the engine to run when there is adequate ventilation. If necessary, open doors and windows to ensure sufficient fresh air supplies.
- Bring the engine and hydraulic oil to operating temperature. Low oil temperatures make the control unit react sluggishly.
- Check that the attachment is operating correctly.
- Move the machine carefully to an open area and then check the function of the travel and swing gear brakes, the steering and the signalling and lighting devices. Lighting devices must always be clean.

Stopping the machine safely

- Only stop the machine on level, firm ground.
- If the machine has to be stopped on an incline, chocks should be used to secure it from rolling away.
- Before stopping the machine, each time it is possible, align the uppercarriage with

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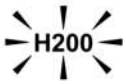
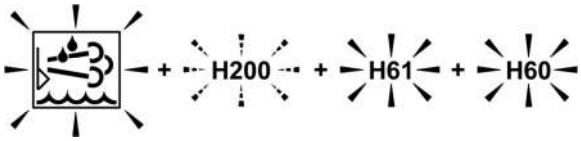
(DEF) level, the symbol and indicators stay on constantly or flash as follows:

Symbol and indicators	DEF level	Result / action
	Low (between 10% and 5%)	Normal operation
	Very Low (between 5% and 2,5%)	Last step before Diesel engine speed and torque limitation
	Reserve (between 2,5% and 0%)	Diesel engine speed and torque limitation Error code **E 407** stored
	Empty (0%)	Low idle lock of the Diesel engine Error code **E 407** stored ▶ Add Diesel Exhaust Fluid (DEF) until you get correct level.

Automatic filter cleaning for the Selective Catalytic Reduction (SCR) system

The Selective Catalytic Reduction (SCR) system must always be clean to make sure that the Diesel engine operates correctly. Thus, it is necessary to start an automatic filter cleaning procedure regularly to remove particles collected in the catalyst.

A symbol on the monitoring display and the indicator **H201** on the control board in combination with **H60**, **H61** and **H62** tell when the Selective Catalytic Reduction (SCR) system requires to be cleaned.

▶ Start the automatic filter cleaning as quickly as possible. If you wait too long before starting it, a long cleaning time can be necessary. It is not possible to operate the machine during the cleaning of the Selective Catalytic Reduction (SCR) system.

There are four levels of alarm. Depending on collected particles level, the symbol and indicators stay on constantly or flash as follows:

Symbol and indicators	Collected particles level	Result / action
	Low	Normal operation ▶ Start the automatic filter cleaning as soon as possible.

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- a buzzer in the cab beginns to sound.
- the error code E525 appears on the monitoring display.

Caution!
In case the warning light **H60** lights up, the operator must shut the engine down as soon as possible and recognize which error has occurred.
It's the operator's own responsibility to decide if the machine can be maintained operating or not!

In safety operation the following functions remain available:

- the automatic engine power reduction in case of overheating of the engine coolant or of the charge air.
- the memorization of the occurring engine faults into the inner error memory of the control box of the engine.

At the opposite, the following functions are no longer operative:

- the automatic engine shutdown in case of low lube oil pressure.
- the automatic engine shutdown when the maximum permitted coolant or charging air temperature has been exceeded.

Diesel engine RPM adjustment in safety mode

In normal operation, the desired value for the engine RPM is entered via the buttons **S86**, **S228** and **S229**, and the engine speed is controlled in consequence by the electronic system of the machine.

If the engine has been started in safety mode via the rocker switch **S71** so it can be operated only with two different RPM values. The commutation between the two values is achieved via the switch **S72**.

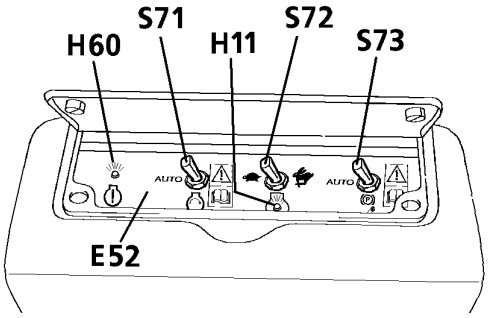

Fig. 3-64 *Emergency control of the engine RPM*

▶ Manually choose one of the values:
- with the switch **S72** tilted to the left, the engine runs at the lower safety RPM.
- with the switch **S72** tilted to the right, the engine runs at the upper safety RPM..

Note!
When the engine is switched automatically into safety operation, the current engine speed is maintained as long as the engine is not shutdown.

Safety operation of the servo control circuits

During normal operation, the servo pressure supply to the swing brake and to the joysticks and pedals is controlled over the electronic circuit of the machine.

While tilting the switch **S73** in safety position, this servo pressure supply can be enforced, and is maintained even in case of a trouble in the normal control circuit.

chine will thus be influenced persistently, e.g. through reduction of the dynamic stability.

– Due to the heightened centre of gravity, the machine must be aligned horizontally before use. In horizontal alignment, the centre of gravity of the uppercarriage is over the centre of the undercarriage, which reduces the risk of tilting.
– The machine can still sway and tilt despite being aligned!
  The following instructions are therefore to be observed at all times:

When moving the machine:
- Rotate the uppercarriage parallel to the undercarriage (transport position).
- Draw the attachment as close as possible to the machine.
- Only at this point may the support feet be retracted and the machine moved.
- Moving with loads is not permitted.
- Check the terrain to be covered to ensure that the ground is solid and even. Potholes and uneven surfaces jeopardize the stability of the machine.
- Adjust vehicle handling to suit the altered machine characteristics (high centre of gravity) and environmental conditions.
- Reduce your speed to prevent the need for sudden braking and steering manoeuvres.
- Avoid sudden speed changes, such as braking, accelerating and changing direction.
- Ascending gradients and obstacles may only be approached in the longitudinal direction in order to prevent unacceptable banking of the machine.
- Special care should be taken when driving through narrow passages - drive slowly!

When loading and unloading:
- The machine must be supported and aligned horizontally before moving (swing) the uppercarriage out of the transport position.
- It is imperative that you check the contact surface of the support (load carrying capacity of the substrate). A support subsiding would have disastrous consequences!
- Carry out all movements with increased care.
- To slew the load, move the attachment as close as possible to the machine **(Caution! swinging grab)** and hold the load close to the undercarriage and above the substrate.
- Avoid braking or accelerating the attachment or uppercarriage abruptly.
- Do not lift any loads which are heavier than those given in the load chart.

Protection from vibration

– Vibrational loads on mobile building machinery are mainly the result of the type and method of use. The following parameters in particular are decisive influences:
  - Terrain conditions: Uneven areas and potholes;
  - Operational techniques: Speed, steering, brakes, controlling the machine's control elements when driving and working.
– To a large extent, the machine operator determines the vibrational loads since he selects the speed, gearbox ratio, working method and route himself.
  This means that there is a wide range of different vibrational loads for the same machine type.

Whole-body vibrational load for the machine operator can be reduced if the following recommendations are observed:

– Select suitable machines, attachment parts and auxiliary devices for each part of the job.
– Use a machine that has a suitable seat (i.e. for earth-moving machinery such as hydraulic excavators, this should be a seat which corresponds with EN ISO 7096).

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Danger!
Insufficient support and machine damage.

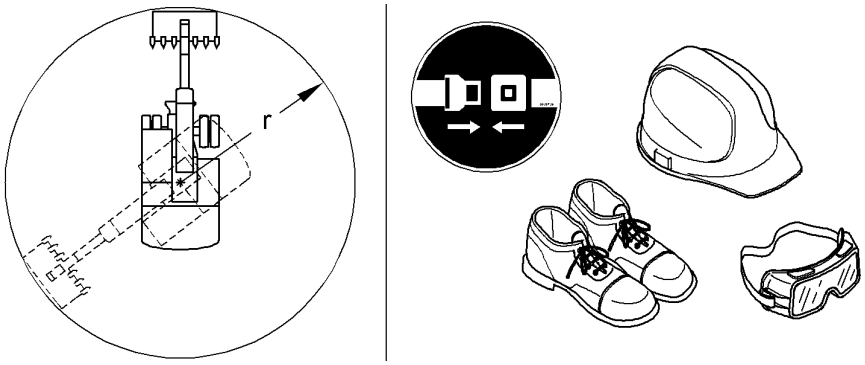


Fig. 3-79 *Hazard area*

Danger!
Risk of fatal injury due to rotating the machine.

- ▶ Ensure that nobody stands within the hazard area **r** of the machine.

Caution!
Risk of injury when working.

- ▶ Always wear safety shoes and, particularly when leaving the cab when demolition work is going on, a protective helmet and safety glasses.
- ▶ Always wear the seat belt.
- ▶ Use the horn to give a short warning signal before starting work.

3.5.3 Positioning of the machine

Setting up properly is a pre-requisite to safe efficient loading, and helps maintain stability, power and bench levels. It will also reduce operator fatigue. Position the excavator as close to the working face as safety permits.

Caution!
Always ensure there is sufficient clearance between the counterweight and the face, including allowing for any rocks or material that may fall down.

– 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.

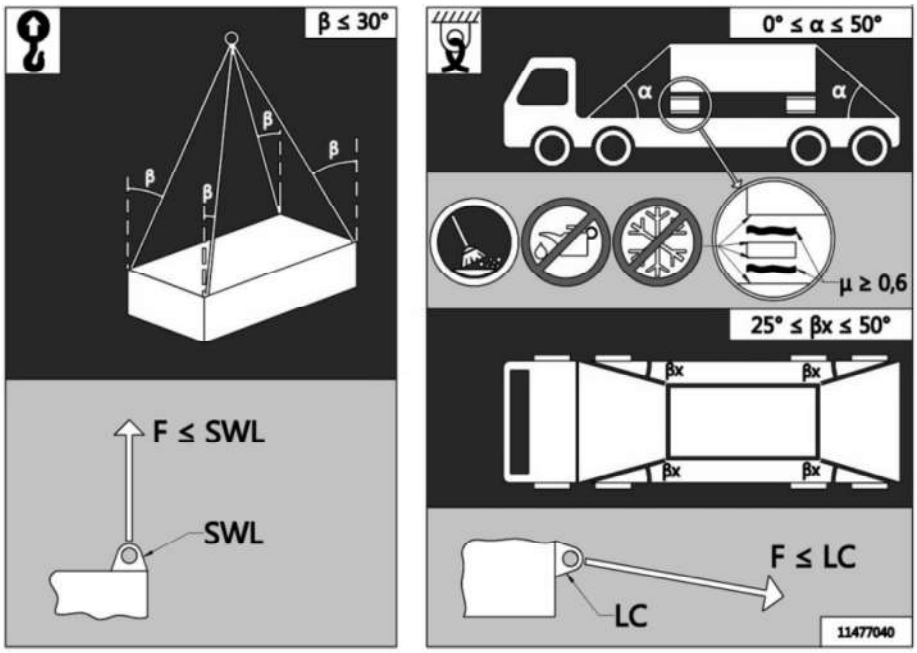
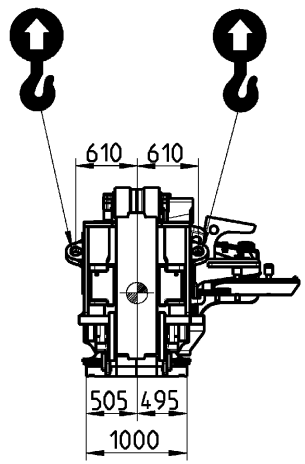
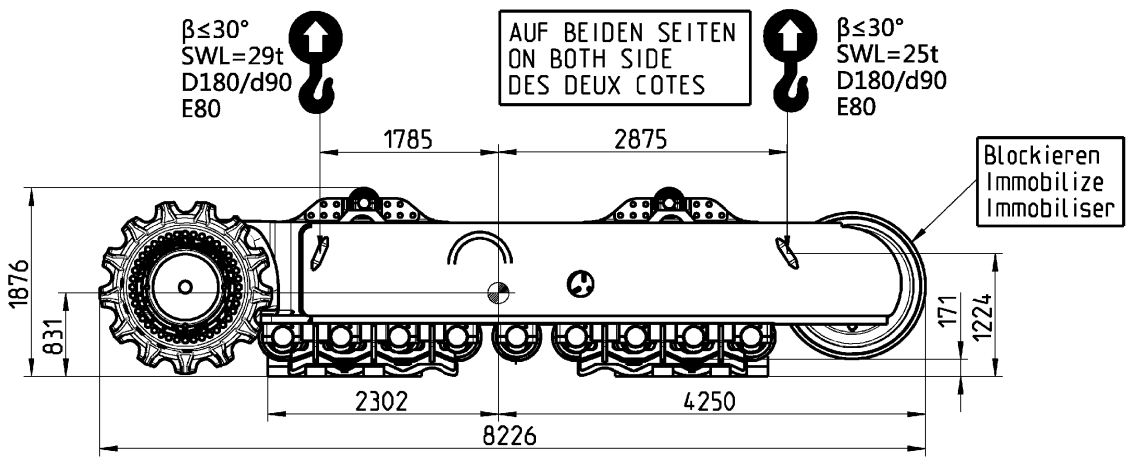
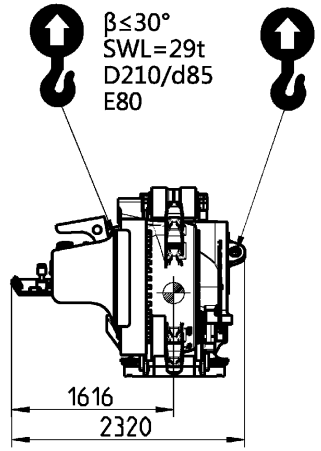


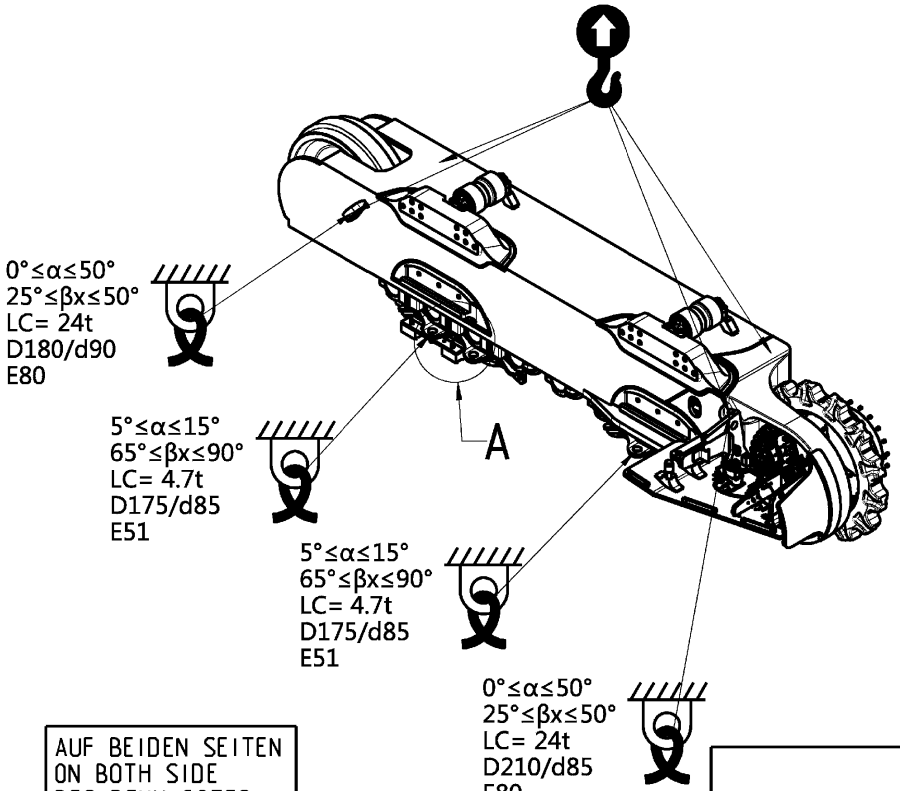
Fig. 3-89 *Sticker for lifting and lashing operations*

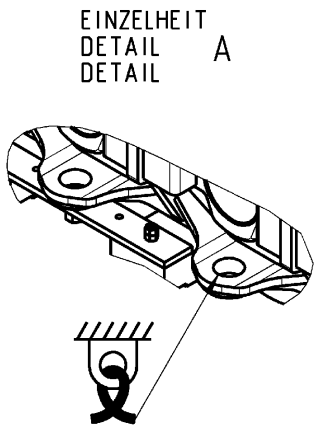
The Lashing Capacity **LC** is the maximum force that the lashing ring can hold in accordance with the angles given on the transport drawing.





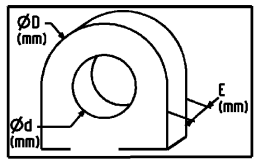






1029 UNTERWAGEN OHNE KETTE
1029 UNDERCARRIAGE WITHOUT CHAIN
CHASSIS 1029 SANS CHAINE

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	38 000 kg	
Gewicht mit Werkzeug und Verpackung Weight with tool and packaging Poids avec outillage et emballage	38 150 kg	

AUF BEIDEN SEITEN
ON BOTH SIDE
DES DEUX COTES

LIEBHERR

Bezeichnung / Description / Dénomination	Ident-Nr. / Ident No. N° d'ident	Index / Index Index	Blatt / Page Feuille
TRANSPORTPLAN LAENGSTRAEGER TRANSP.DRW.SIDE FRAME R9400 PLAN DE TRANSP.LONGERON 1029	11079678	001	1/1

4 Malfunctions

Warning messages and fault messages:

- Various faults are displayed on screen in the form of indicator lights or symbols (see chapter “Control and operating elements”).
- Warning functions can also be supported acoustically (buzzer).

Identifying and rectifying faults and errors:

- Faults can very often be traced back to incorrect operating or maintenance of the machine.
  For each fault, therefore, read the relevant chapter in the operating instructions carefully once more.
- Analyse the cause of the fault and rectify it immediately.
- Describe the fault and all accompanying circumstances as precisely as possible if you contact LIEBHERR customer service.
  Precise information makes it possible to find and rectify the cause of the fault quickly. Additionally, therefore, precise information on the type and serial number of the machine is also required.
- Do not carry out any work which you have not been trained to do.

Fig. 4-1 *LIEBHERR service*

If the cause of the fault cannot be recognised or rectified using the error codes and fault charts, please consult LIEBHERR customer service.

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Error code	Effect	Cause	Measure / remedy
E 404	Speed sensor B118_1 flap close	Analog signal detected, waiting for digital	Consult LIEBHERR customer service.
E 436	Pressure sensor on travel brake steering	Wire break, current >21mA or <3mA	Consult LIEBHERR customer service.
E 437	Pressure sensor bucket	Wire break, current >21mA or <3mA	Consult LIEBHERR customer service.
E 438	Pressure sensor boom	Wire break, current >21mA or <3mA	Consult LIEBHERR customer service.
E 439	Pressure sensor stick	Wire break, current >21mA or <3mA	Consult LIEBHERR customer service.
E 453	Swing speed B53 not being monitored	Accidental +	Consult LIEBHERR customer service.
E 455		Broken wire, accidental ground	
E 456	Fuel level transmitter B1 not being monitored	Accidental +	Consult LIEBHERR customer service.
E 458		Broken wire, accidental ground	
E 465	Pump 1 leak oil temperature B64_1 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 466		Accidental +	
E 468	Pump 2 leak oil temperature B64_2 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 469		Accidental +	
E 471	Pump 3 leak oil temperature B64_3 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 472		Accidental +	
E 474	Pump 4 leak oil temperature B64_4 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 475		Accidental +	
E 477	Swing pump 1 leak oil temp. B64_7/1 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 478		Accidental +	
E 480	Swing pump 2 leak oil temp. B64_7/2 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 481		Accidental +	
E 483	Splitterbox temperature B15 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 484		Accidental +	
E 486	Control pressure B84 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 487		Accidental +	
E 489	Splitterbox pressure B72 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 490		Accidental +	
E 492	Hydraulic tank pressure B38 not being monitored	Accidental ground	Consult LIEBHERR customer service.
E 493		Accidental +	
E 542	Gradient sensor passing over from threshold or parting of a cable		Consult LIEBHERR customer service.
E 599	Default test sensor attenuation		Consult LIEBHERR customer service.

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Fault / error	Cause	Solution
Only low air flow in cab	Outside air filter / recirculated air filter dirty	Clean air intake opening, replace outside air filter
	Air vent closed	Open air vent

4.2.6 Work equipment

Fault / error	Cause	Solution
Cylinder stretches when loaded	Piston seal in cylinder defective	Overhaul cylinder
Bearing clearance too high on equipment	Bearing points worn out	Replace bearing parts
Bucket does not move	Valve block on tilting cylinder incorrectly switched	Switch over valve block

4.3 Fuses and relays

Danger
Incorrect or bypassed fuses do not give the machine's operator or the electrical system the necessary degree of protection.

- ▶ Only use original fuses.
- ▶ Never bypass electrical fuses.

If necessary, order replacement fuses from LIEBHERR.

4.3.1 Power electric cabinet E1003

The power electric cabinet **E1003** is installed under the cabin in the cabin elevation.

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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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Welded anchor points

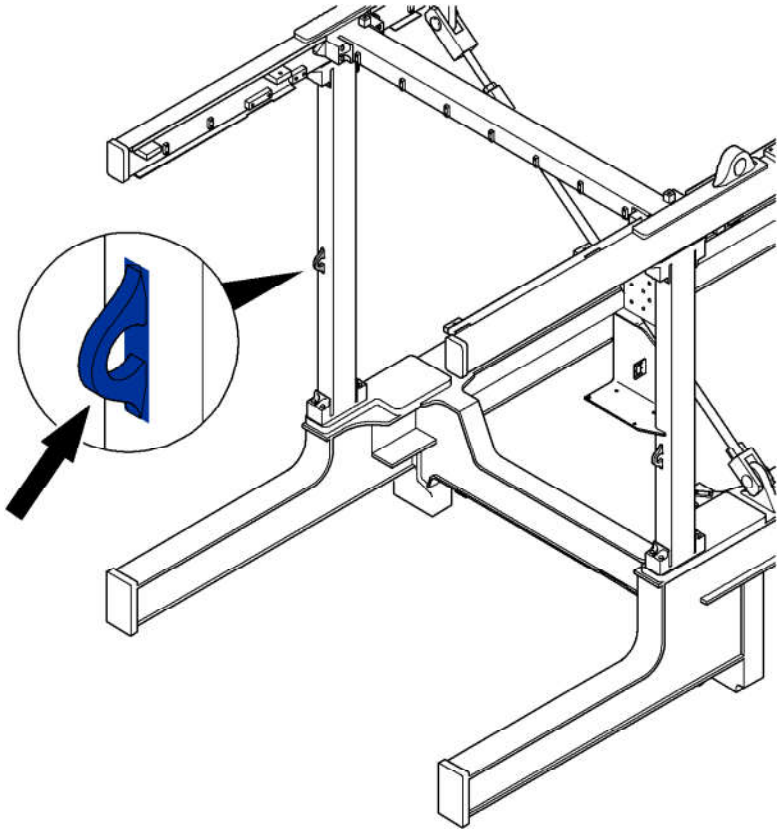

Fig. 5-3 *Welded anchor point (example)*

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However, this safety measure can be bypassed for as long as the button **S122** on the right front instrument panel is depressed.

5.5 Lubricating and operating material specifications

Liebherr-Mining Equipment Colmar SAS only gives approval for the Liebherr-branded lubricants and operating materials given in this manual.

For other lubricants, fluids or greases, Liebherr-Mining Equipment Colmar SAS gives technical specifications for their related applications. It is the responsibility of the lubricant, fluid or grease supplier to check, justify and ensure to the owner of the machine that the lubricant, fluid or grease obeys these specifications sustainably.

5.5.1 Lubricating oil for the Diesel engine

Standard or with the Oil reserve system (optional) or with the Centinel system (optional).

Refer to the Operation and Maintenance Manual for the CUMMINS Diesel engine.

5.5.2 Fuel

Refer to the Operation and Maintenance Manual for the CUMMINS Diesel engine.

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Specifications for standard applications (ambient temperature of more than -20 °C)

	Method	Unit	Specification	
			Swing ring bearings, attachment bushings, swing gear bearings	Swing ring teeth
Temperature range	-	°C	-20 to +120	
NLGI grade	-	-	2	
Base oil viscosity at 40 °C	ASTM D445 ISO 3104	cSt	> 200	> 400
Dropping point	IP 396 - ISO 2176 ASTM D566	°C	> 170	
Worked penetration P60	ASTM D217 ISO 2137	1/10 mm	265-295	
Mechanical stability P100,000 strokes - P60	ASTM D217 ISO 2137	1/10 mm	< 40	
Load carrying capacity[1)] 4 ball weld load	ASTM D2596 DIN 51350	kgf N	> 250 > 2300	> 600 > 5000
Wear protection - 4 ball wear	ASTM D2596 DIN 51350-5	mm	0,8 maximum	0,5 maximum
Water resistance[1)] Water spray-off loss at 40 psi and 79 °C	DIN 51807-1 ASTM D4049 ISO 110009	- %	1-90 < 30	
Water washout at 79 °C	ASTM D1264	%	-	< 5
Roller bearing test FE-9[2)]	DIN 51821-2 A/1500/6000/140 °C	-	F50 > 100	-
Oil bleeding[2)] 168 hours at 40 °C	DIN 51817 - IP 121	%	< 3	
SKF Emcor test distilled water[2)]	ISO 110007	rating	1 maximum	
Flow pressure at -20 °C[1)] Low temperature torque at -20 °C Starting torque	DIN 51805-2 ASTM D1478	mbar mNm	1400 maximum at -20 °C < 1000	

[1)] One of the two methods.

[2)] Or equivalent test under responsibility of the lubricant manufacturer.

Lubricating solids	Unit	Specification
Maximum particle size	micron	Graphite < 25 MoS2 < 15 Other solids < 15
Mean particle size	micron	Graphite ~10-15 MoS2 ~5-10 Other solids ~5-10
Maximum content	%	Maximum 10 total for solids additives Graphite < 8 MoS2 < 5

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Splitterbox

Component	Parameter	Action level value	Action
Splitterbox	Iron level	100 ppm	Change oil (get a sample again after 250 hours).
	Copper level	10 ppm	Change oil (get a sample again after 250 hours).
	Silicon level	20 ppm	Check component for entrance of dust (sealing, breathers...). Flush and change oil (get a sample again after 250 hours).
	Water content	0,10%	Change oil (get a sample again after 250 hours).
	Viscosity change (at 40°C and 100°C)	<15%(*)	Change oil (get a sample again after 250 hours).
	Additives change	±20%(*)	Change oil (get a sample again after 250 hours).

(*) Difference compared to new oil value.

Swing gear

Component	Parameter	Action level value	Action
Swing gear	Iron level	400 ppm	Change oil (get a sample again after 250 hours).
	Copper level	150 ppm	Change oil (get a sample again after 250 hours).
	Silicon level	15 ppm	Check component for entrance of dust (sealing, breathers...). Flush and change oil (get a sample again after 250 hours).
	Water content	0,10%	Change oil (get a sample again after 250 hours).
	Viscosity change (at 40°C and 100°C)	<15%(*)	Change oil (get a sample again after 250 hours).
	Additives change	±20%(*)	Change oil (get a sample again after 250 hours).

(*) Difference compared to new oil value.

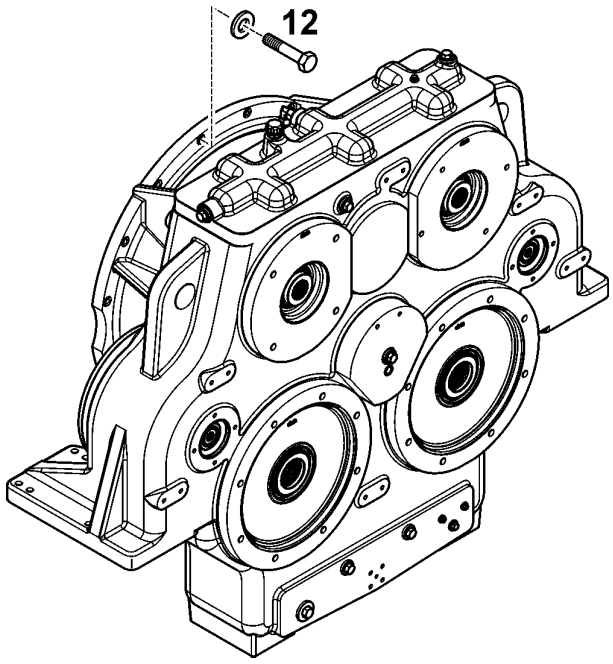

Fig. 5-28 *Mounting screws*

12 Hex. head screw 1/2" UNC x 2 3/4" 130 Nm

▶ Check the tightness of mounting screws **12** from the splitterbox to the diesel engine SAE housing regularly.

▶ For maintenance intervals, see control and maintenance chart.

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▶ Close covers and access door again.

5.11.4 Fuel filtering system

The fuel filtering system has a preliminary filter **1** and fuel filters **2**.

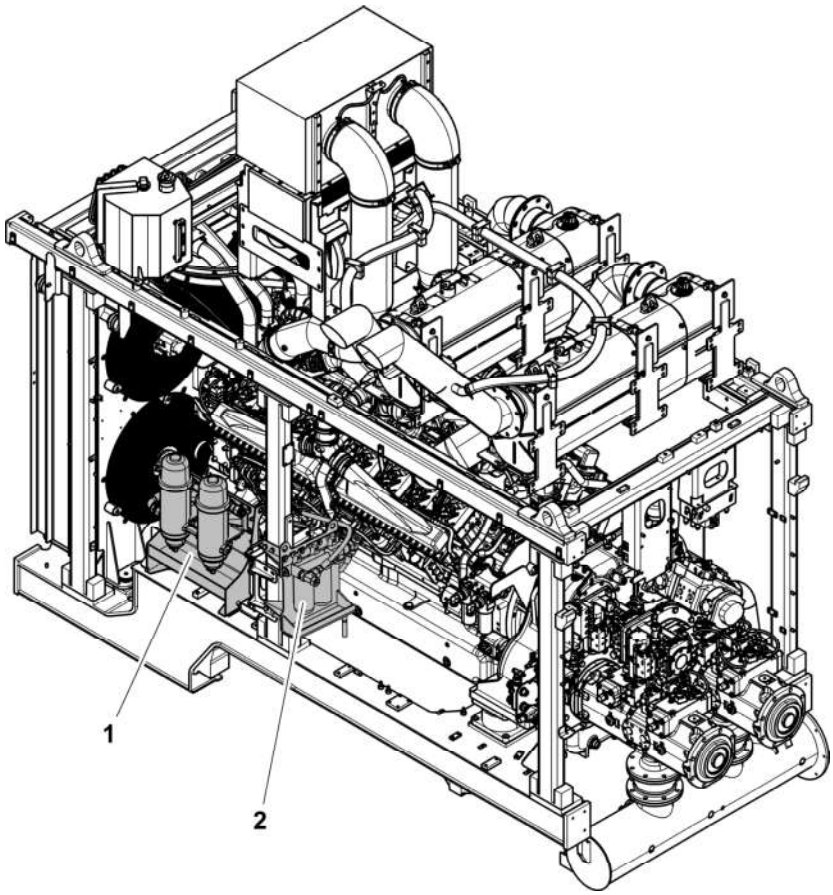

Fig. 5-38 *Fuel filters system*

1 Preliminary filter
2 Fuel filters

▶ Drain the preliminary filters every day.

▶ Replace all preliminary filters and fuel filters immediately when the fuel level reaches the red mark on the bell of the preliminary filters **1**.

▶ For preliminary and fuel filters replacement intervals, refer to the control and maintenance chart.

5.13 Compressed air system

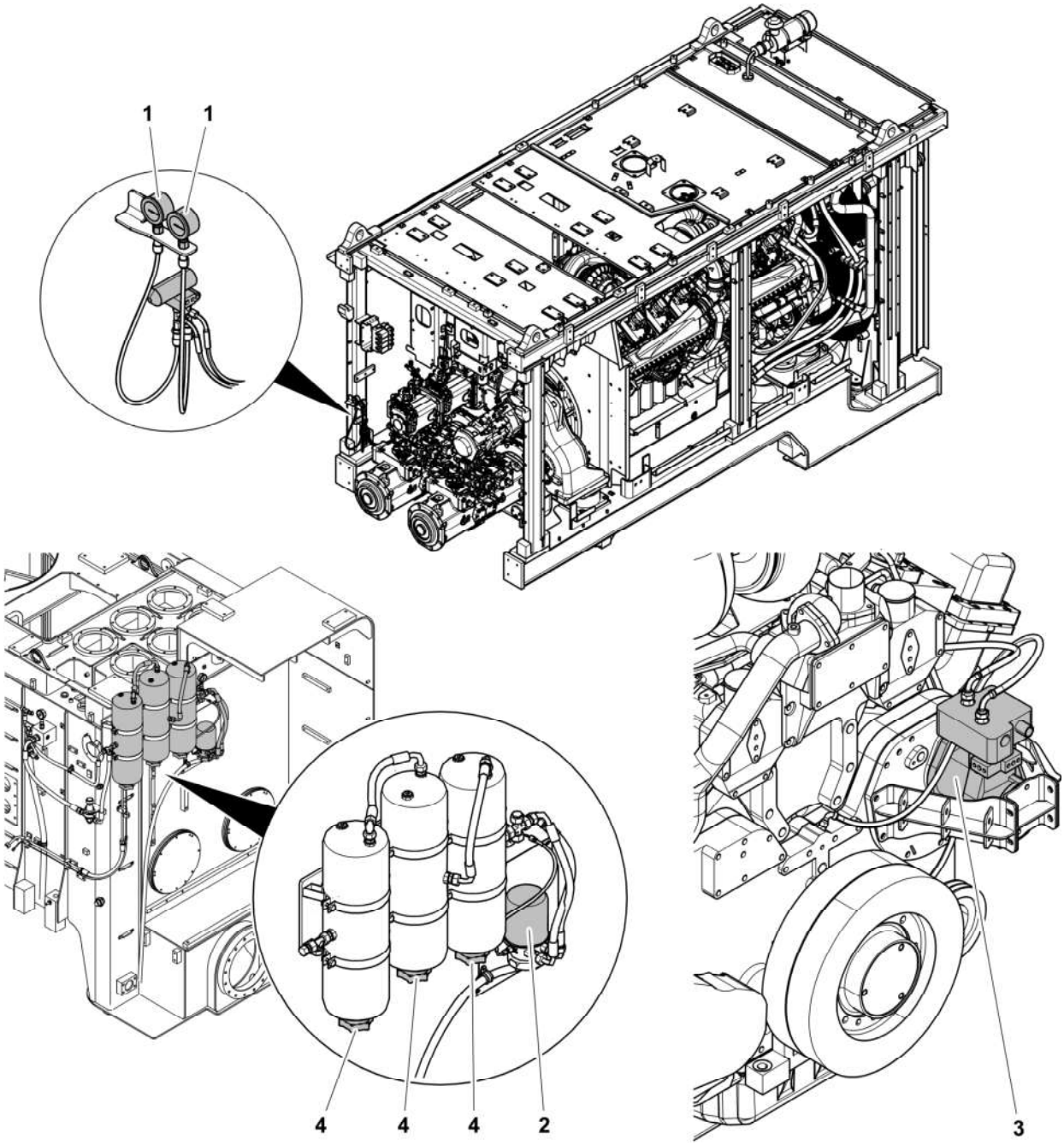

Fig. 5-48 *Compressed air system*

1 Pressure gauge
2 Air dryer
3 Air compressor
4 Drain valve

- ▶ Open hydraulic tank pressure release valve.
- ▶ Use the quick change coupling **8** of the service trap to drain and refill hydraulic oil until oil level reaches the center mark of the inspection window.
- ▶ Close hydraulic tank pressure release valve.

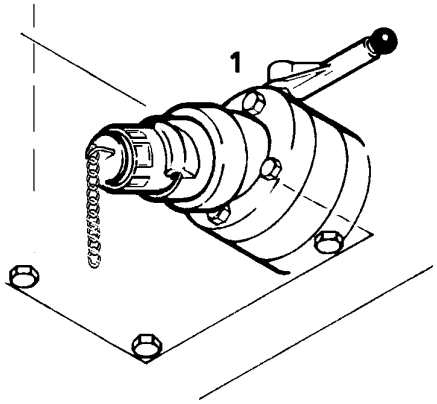

Fig. 5-59 *Hydraulic tank shut-off valve*

- ▶ As a help way, the hydraulic system can be drained using a drain hose via the drain coupling and the shut-off valve **1** at the bottom of the tank.

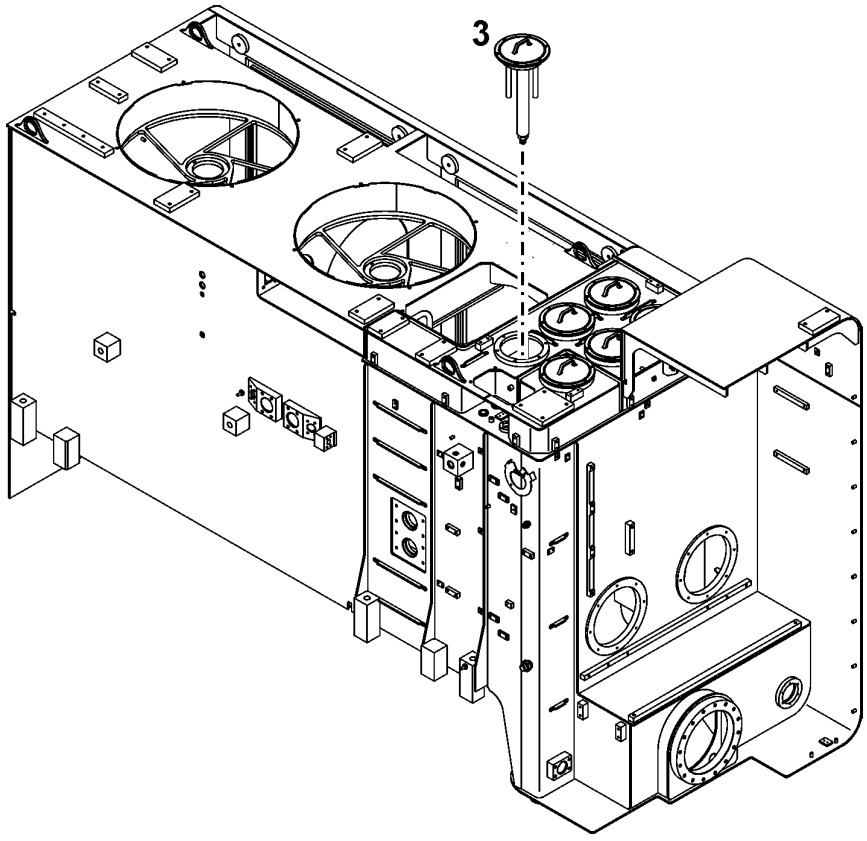

Fig. 5-60 *Return filter on hydraulic tank*

As a help way, or for small quantities oil can also be added via the cover of a return filter:

Danger!
If the cylinder is not properly bled, gas bubbles might form in the system (mixture of air and hydrocarbon). At high operating pressures in the cylinder, these gases might explode (Diesel effect).

5.15.12 Hydraulic pumps intake hoses removal

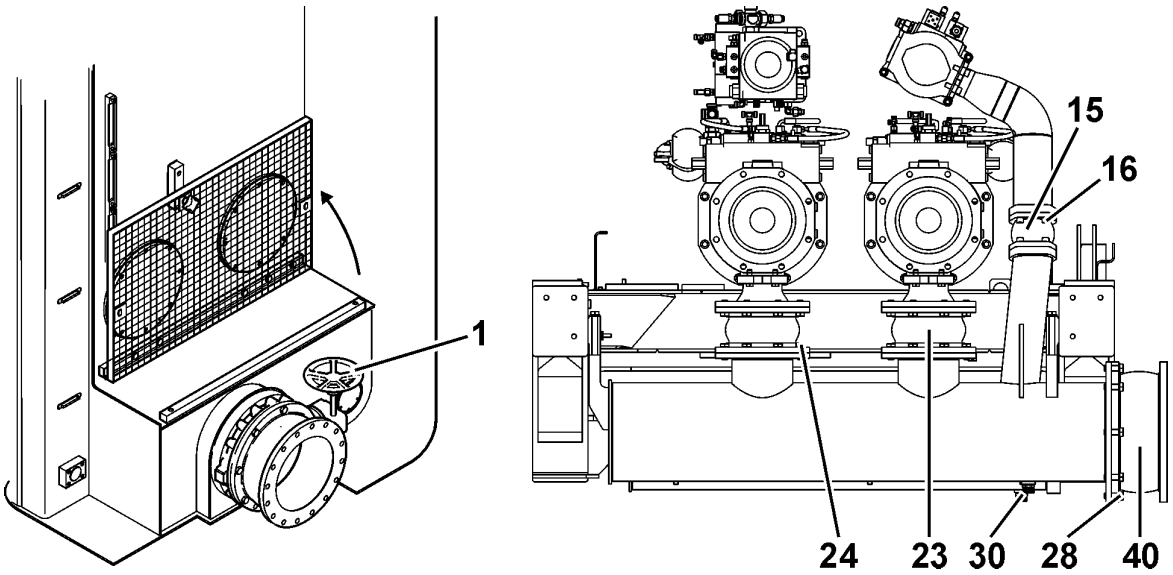

Fig. 5-69 *Hydraulic shut-off valve and oil suction pipe*

1	Hydraulic tank shut-off valve	**16**	Socket head screw M16	35^{+17} Nm
15	Compensator	**24**	Hex. head screw M20	60^{+30} Nm
23	Compensator	**28**	Hex. head screw M20	55^{+27} Nm
40	Compensator	**30**	Oil drain plug M30	

If an expansion joint on an hydraulic pump or on the main collector must be exchanged:

- ▶ Close the shut-off valve **1** on the hydraulic tank.
- ▶ Release the tank pressure.
- ▶ Remove the cover on the leak oil filter, so to prevent the oil return via this filter and hydraulic pumps.
- ▶ Mounting bolts **16, 24** and **28** for the compensators must be torqued at prescribed value and coated with Loctite 243 (Id. 8503598).
- ▶ After repair, reinstall the leak oil filter cover.
- ▶ Pressurize the hydraulic tank.
- ▶ Return the shut-off valve **1** in open position.

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nected to the upper section of a swing gear via two hoses).

▶ When correct oil level is reached, reinstall the sealing cap **4**.

For larger amount:

▶ Remove the sealing cap **4** on the expansion tank **7**.

▶ Add oil via the quick-change coupling **6**.

▶ When correct oil level is reached, reinstall the sealing cap **4**.

Oil level:

The oil level must reach the middle of the lower sight gauge "**L**" of the expansion tank **7** when the oil is cold, and must not overpass the upper sight gauge "**H**" when the oil is hot.

5.16.3 Lifetime Travel gear – oil change

Caution!

▶ The following travel gear elements are filled with protective oil on delivery. They have to be drained and refilled with the same oil as used for the hydraulic tank before first start of the excavator:

– four travel brakes (two on each travel gear),

– two Lifetime sealing interspaces (one on each travel gear).

▶ The following travel gear elements have to be filled with the same oil as used for the hydraulic tank before first start of the excavator as well:

– expansion tank chamber connected to the Lifetime sealing interspaces (see § "Oil change on Lifetime sealing interspace" below),

– hydraulic lines between interspaces oil expansion tank and the interspaces themselves.

Danger!
When the oil is hot, the travel gear elements may be under pressure.

▶ Before draining the oil, carefully loosen the oil filling plugs to allow the internal pressure to escape.

Note!
For oil specification and oil quantity, refer to the lubrication chart.
For oil changing-intervals, refer to the maintenance schedule.
If possible, drain the oil when the oil is at operating temperature.

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- ▶ Fill the oil container of the tool (on pump side) with 6 liters of flushing oil
- ▶ Connect the filling hose 1 of the filling pump to the connector 907 of the inner star 9.
- ▶ Connect the return line 2 of the tool to the connector 909 of the flange 5.
- ▶ Switch on the pump and press an amount of flushing oil into the coupling (approx. 6 liter: approx. 1,6 liter to fill the coupling and the holdover to rince the coupling)

Caution!
Do not suck in any air

- ▶ Switch off the oil pump and pull the filling hose 1 of the inner star 9, plug connector 907.
- ▶ 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 2 and plug connector 909.

5.17 Hydraulic rotary connection

The hydraulic rotary connection must be greased regularly.

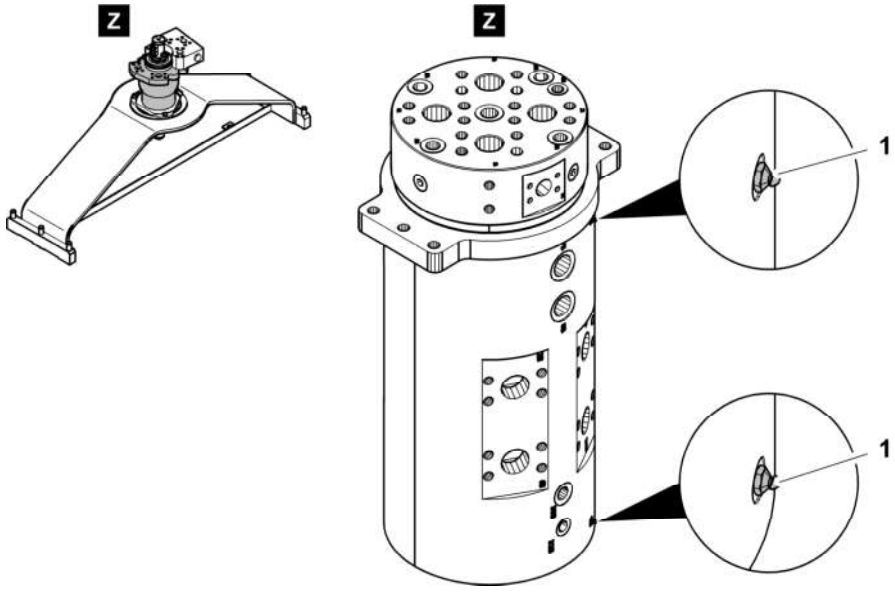

Fig. 5-84 *Grease nipple on hydraulic rotary connection*

1 Grease nipple M10 x 1,5

To grease the hydraulic rotary connection:

- ▶ Use the grease nipple **1**.
- ▶ For maintenance intervals, refer to the control and maintenance chart.
- ▶ For grease specifications, refer to the lubricant chart.

▶ When cleaning the engine with a water / steam jet, do not subject electrical measured value sensors such as oil pressure switches to any direct jets.
  ↳ If this happens, moisture could penetrate and lead to contact corrosion and the failure of the measuring function.
  ↳ Oil pressure switches are not watertight due to the necessary presence of membrane ventilation.

Note!
Batteries can become flat if the machine is out of service for longer periods.

▶ Before laying up the machine for longer periods, switch the principal batteries switches to position "off".

5.19.3 Battery care

The batteries must always be kept clean to ensure that it is able to function perfectly.

▶ Particular care should be taken to clean the pole ends and cable terminals **1** regularly and to then cover them with a thick layer of acidproof grease.

Danger!
Bent rubber hoses on the central gas outlet increase the risk of explosion!
The hydrogen contained in the batteries should not be allowed to build up in the accumulator box and must be able to escape via the rubber hoses. The central gas outlet hoses must be routed without kinks.

▶ Check the condition of the hoses regularly, particularly after installing a battery.

The fluid level in the cells should be 10 to 15 mm above the top of the plate. Only distilled water is to be used for any refilling.

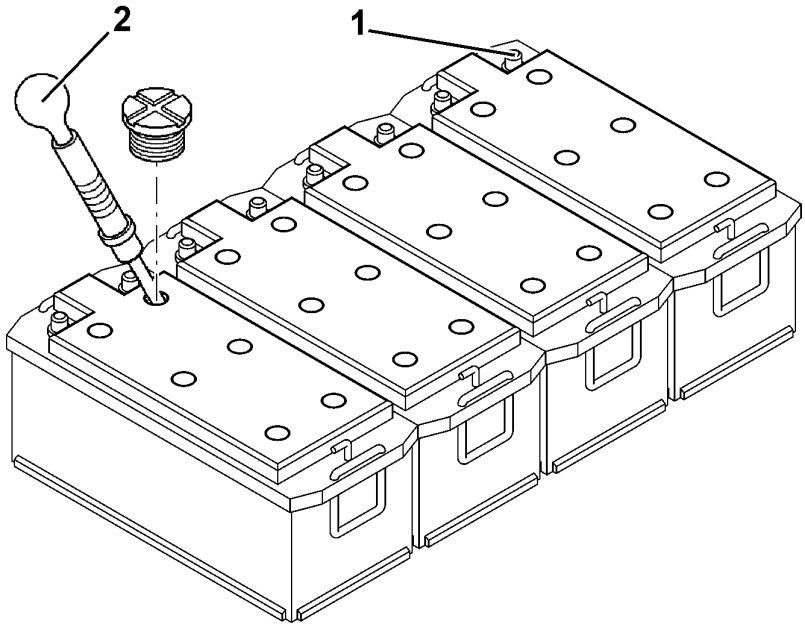

Fig. 5-95 *Battery care*

1 Cable terminal **2** Acid tester

5.21.1 Counterweight mounting bolts

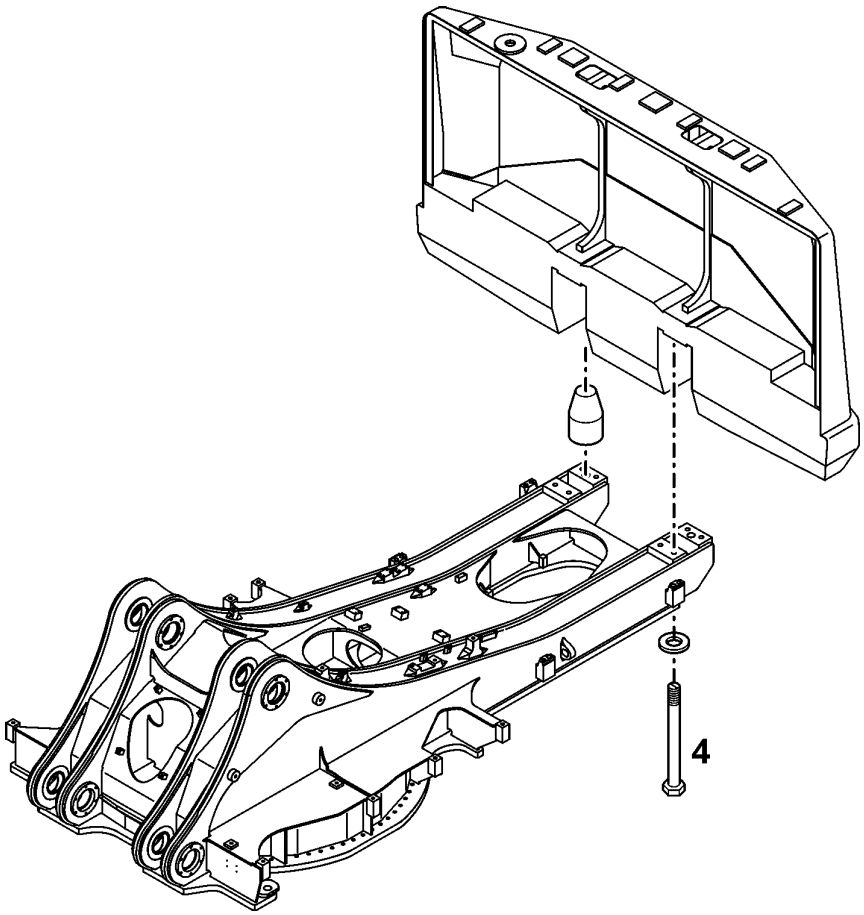

Fig. 5-105 *Counterweight bolts*

		Torque	Quantity
4	Bolt M42x440	4810 Nm	8

5.23 General maintenance points

5.23.1 Replacing working parts

In addition to the normal maintenance and repair work that is to be carried out at the given intervals, the machine operator and maintenance personnel can also carry out the repairs referred to below:

- Replacing defective sealing material on the pipe and hose system and on the hydraulic unit connections (not, however, on pressure relief valves which are lead sealed at the works).
- In addition, high pressure hoses, hydraulic lines and bolt connections on the hydraulic system can be replaced.

It should be noted that only original Liebherr replacement parts are to be used.

This is particularly relevant for hoses and hydraulic lines, which must be preassembled at the works. For all other repairs, particularly when dismounting the counterweight, works and dealership fitters are to be consulted.

5.23.2 Welding work on the machine

Welding work on all main components serving the power transmission (such as the chassis frame, rotating platform, equipment parts etc.) may only be carried out by the manufacturer or by an authorized workshop.

- ▶ Disconnect the batteries before starting any electric arc welding work on the machine.
- ▶ Disconnect the connectors of the engine control unit.
- ▶ Always disconnect the negative terminal (-) first and reconnect it last.
- ▶ Switch off the main battery switch!

Nevertheless if welding repair should be done on components which may contain inflammable gases (welded counterweight, hydraulic tank, fuel tank, ...) these components must be previously and sufficiently ventilated with pressurized air to avoid all fire or explosion hazard.

Caution!
If high currents flow through the bearings or sealing elements, these could be burnt.

- ▶ Move the earthing cable of the welding tool as close as possible to the welding surface so that the welding current cannot flow over parts like the swing ring, rotary connection, gears, bushings, bearings, hinges, joints, hydraulic hoses, sockets, rubber parts or seals.

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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	❍		
Check coolant level	❍		
Check Diesel Exhaust Fluid (DEF) level	❍		
Do a visual check of the engine and external pipework for leaks	❍		

WORK TO BE PERFORMED AT 500, 1500, 2500 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
Do a visual check of the oil cooler protection filters, clean or replace if necessary (optional equipment)	❑		
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	❍		
CABIN			
Do a detailed check of the V-belt tension for air conditioner	❍		
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	❍		
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 fire fighting local dealer	❍		
Follow the inspection intervals recommended by the specific Health and Safety rules existing in country and/or on mine site	❍		

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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
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	❍		
Electrical system: Clean and check LCD screen of the display for proper function when starting	❍		
Electrical system: Check indicator lights and gauges on the control panel when starting	❍		
Electrical system: Check for warning and fault messages on display (monitoring, grease, air conditioning, ...). If necessary refer to chapter 4 in the Operating Manual to identify and rectify faults and errors.	❍		
Air pressure system: Do a visual check of cut in and cut out pressure of air pressure regulator	❍		
Air pressure system: Do a visual check of hydraulic tank pressure	❍		
Cabin: Check if the safety lever is working properly	❍		
Cabin: Check the horn	❍		
Cabin: Check for green flash light on control module if fire fighting system is installed	❍		

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WORK TO BE PERFORMED AT 2000, 4000, 6000 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
Air pressure system: Do a visual check of hydraulic tank pressure	❍		
Cabin: Check if the safety lever is working properly	❍		
Cabin: Check the horn	❍		
Cabin: Check for green flash light on control module if fire fighting system is installed	❍		

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.



Oil intake circuit

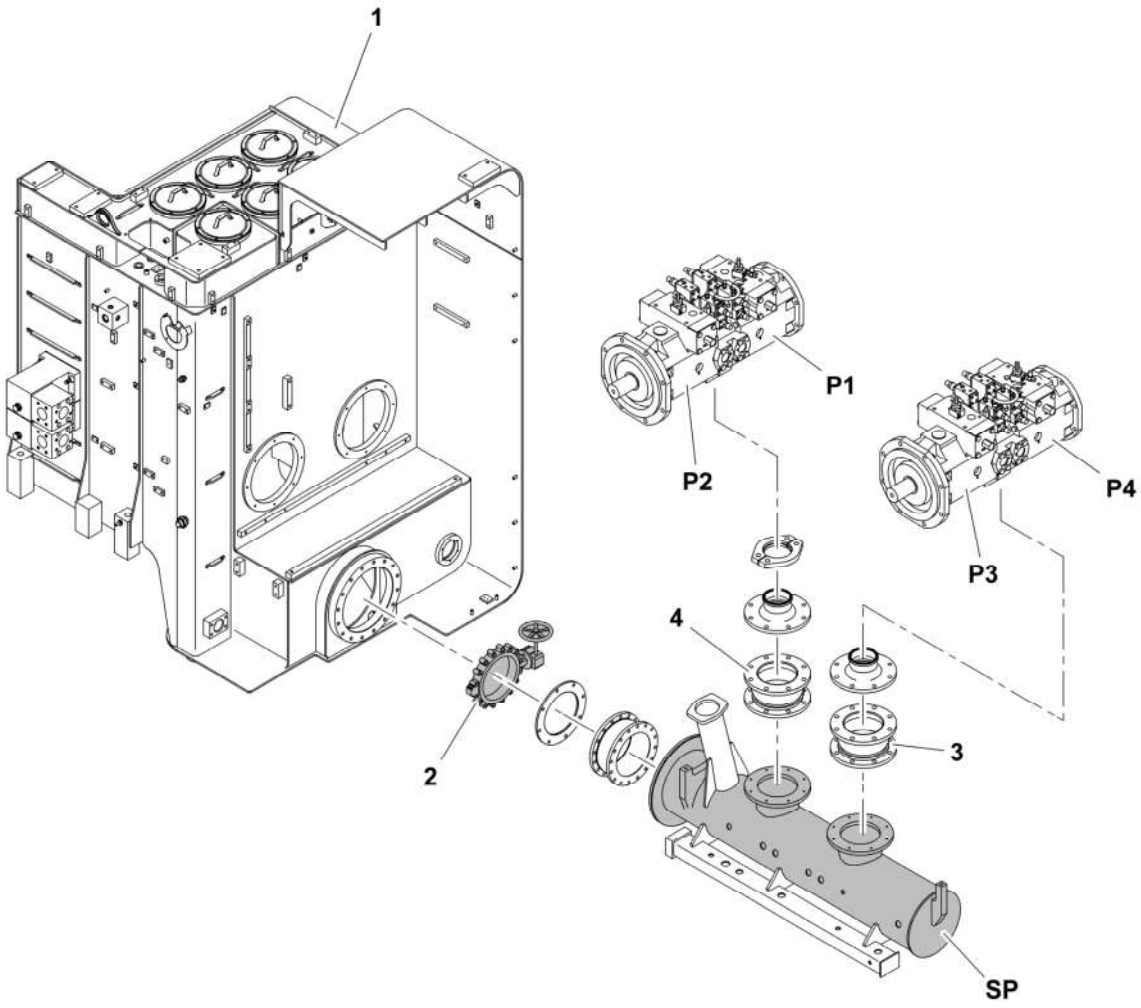

Fig. 6-12 *Intake hoses of working pumps*

1	Hydraulic tank	**P1**	Working pump 1
2	Shutoff valve	**P2**	Working pump 2
3	Compensator	**P3**	Working pump 3
4	Compensator	**P4**	Working pump 4
SP	Suction pipe		

- ▶ Disconnect, drain and clean the compensators **3** and **4**.
- ▶ Clean the shutoff valve **2**.
- ▶ Open, drain and clean the suction pipe **SP**.
- ▶ Clean the hydraulic tank **1** (refer to the related section).
- ▶ Do the restart procedure before you put the machine in operation (refer to the related section).

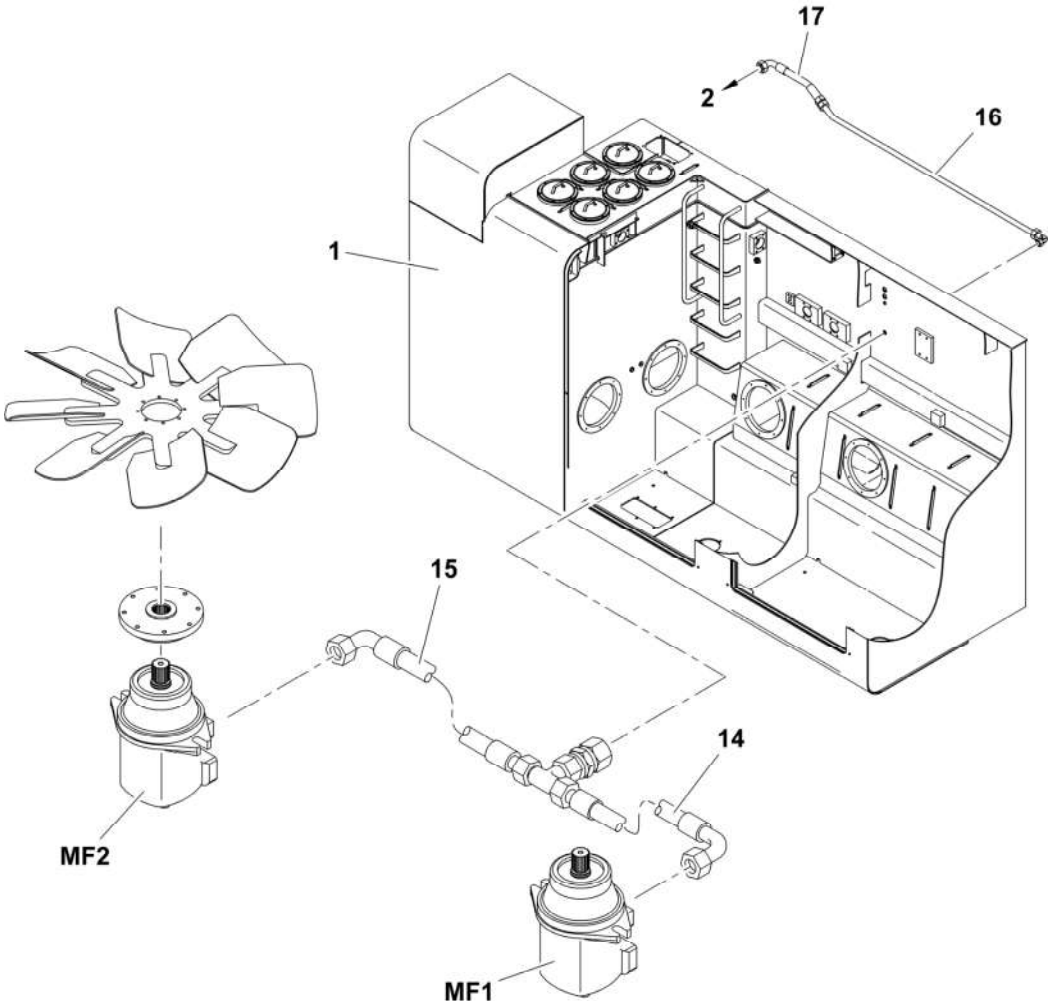

Fig. 6-22 *Leak oil hoses on oil fan motors*

1	Hydraulic tank	**16**	Hydraulic pipe
2	Leak oil filter	**17**	Hydraulic hose
14	Hydraulic hose	**MF1**	Oil fan motor 1
15	Hydraulic hose	**MF2**	Oil fan motor 2

▶ Disconnect, drain and clean all the hoses and pipe.

▶ Move to next section about the working pressure circuit.

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▶ Disconnect, drain and clean all the hydraulic hoses.

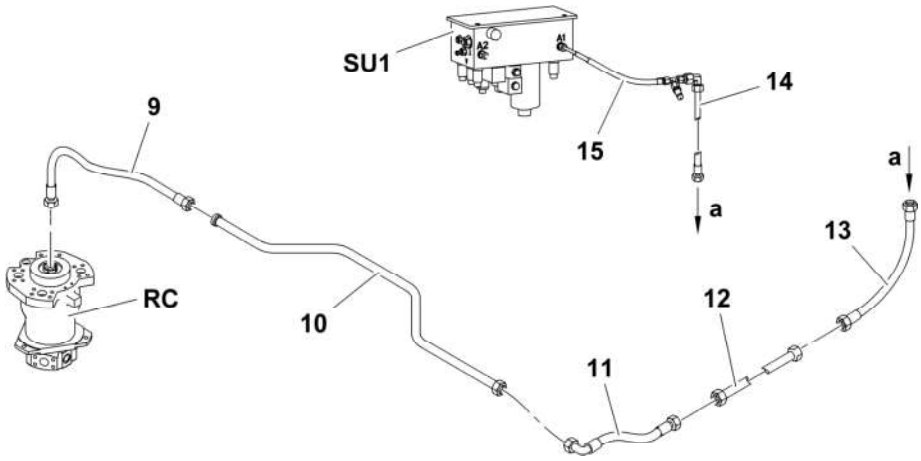


Fig. 6-33 *Hydraulic hoses of overspeed pressure circuit on uppercarriage*

9	Hydraulic hose	**14**	Hydraulic pipe
10	Hydraulic pipe	**15**	Hydraulic hose
11	Hydraulic hose	**RC**	Rotary connection
12	Hydraulic pipe	**SU1**	Servo oil unit
13	Hydraulic hose		

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

▶ Clean the hydraulic tank **1** (refer to the related section).

▶ Do the restart procedure before you put the machine in operation (refer to the related section).

Crowd cylinders circuit

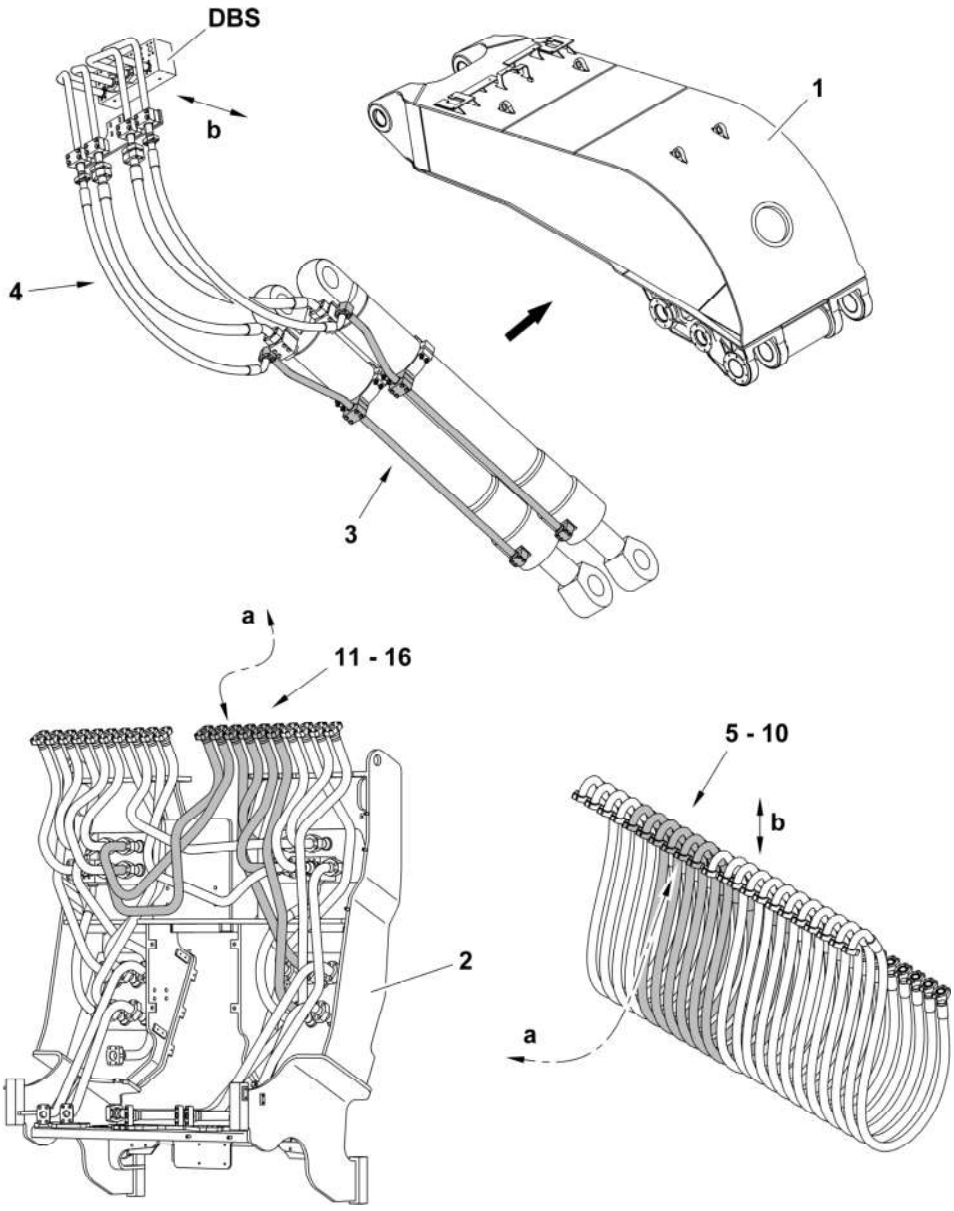
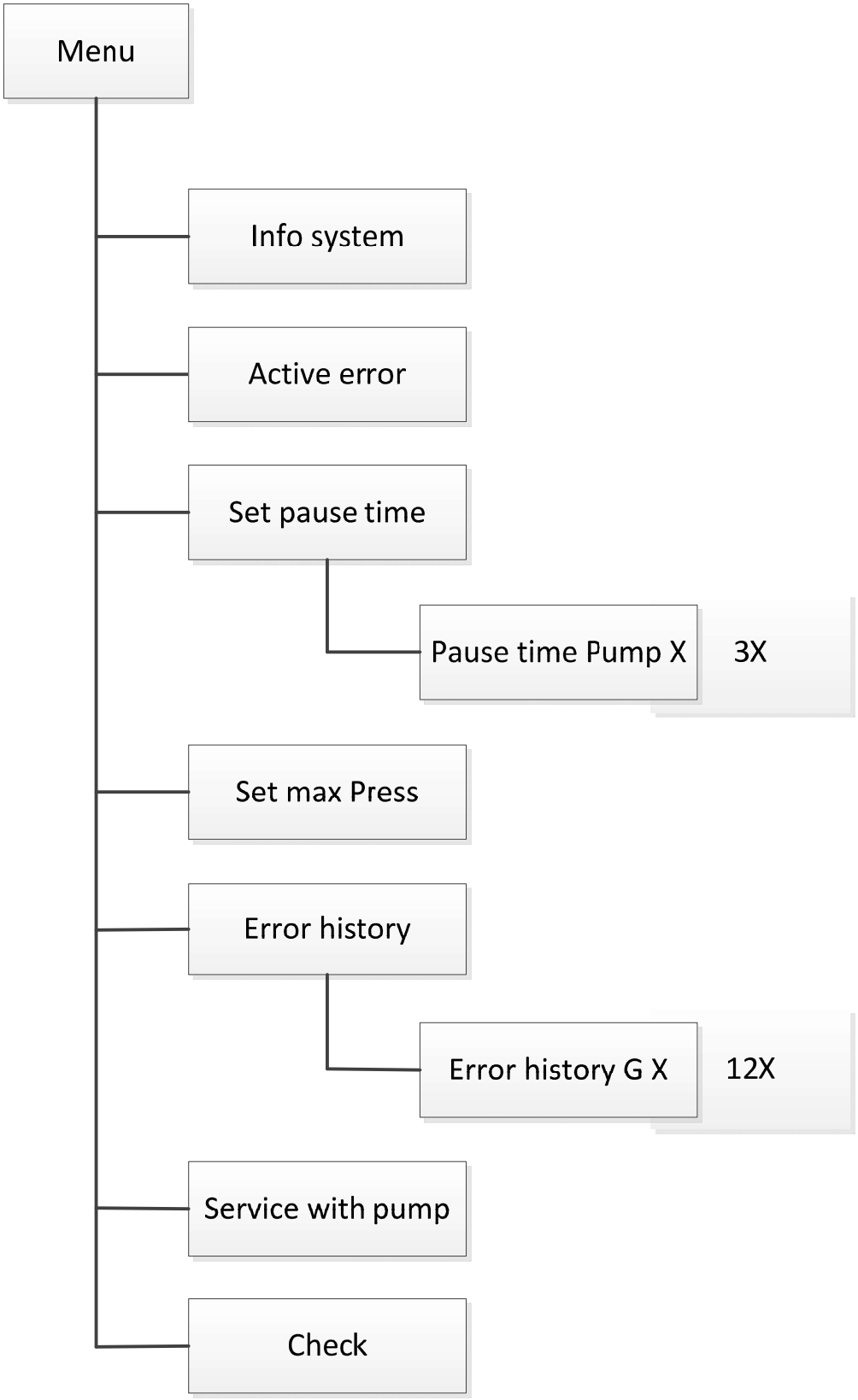


Fig. 6-39 *Hydraulic lines of the crowd cylinders*

1	Boom	**10**	Hydraulic hose
2	Valve bank	**11**	Hydraulic pipe
3	Hydraulic pipes installed on the shovel crowd cylinders	**12**	Hydraulic pipe
4	Hydraulic lines installed on the boom	**13**	Hydraulic pipe
5	Hydraulic hose	**14**	Hydraulic pipe
6	Hydraulic hose	**15**	Hydraulic pipe
7	Hydraulic hose	**16**	Hydraulic pipe

4. Architecture of Menus



Symbol	Meaning
	**General warning** Activities which generate actual hazards (to life and limb or possible damage to the material)
	**Warning of suspended load**
	**Risk of explosion** Carry out work on electrical parts only if the atmosphere is not potentially explosive. Work has to be carried out by a specialist for maintenance and repairs in potentially explosive atmospheres.
	**Electrical component hazard, electrical shock hazard** Make sure to disconnect the system or component from the power supply before carrying out works on electrical parts. Do not use steam jet or high pressure cleaners for cleaning. Otherwise electrical components may be damaged. Do not touch cables or electrical components with wet or damp hands. Cleaning work on energized components may be carried out by electrical specialists only.
	**Risk of fire** Risk of fire and explosion when using inflammable cleaning agents.
	**Health hazard** Hazard due to spouting lubricant / pressure injection due to a leakage (defective fitting, too high system pressure or other damages).
	**Crushing hazard**
	**Slipping hazard**
	**Hot surfaces**
Symbol	**Meaning**
	**Disposal** Environmentally sound disposal and recycling

Fault lifecycle	
Lubricant spraying out due to incorrect screw connection of components or lines.	Tighten all parts with appropriate tightening torques. Use suitable hydraulic screw connections and lines for the stated pressures. Check these prior to commissioning for correct connection and damage.

Disposal lifecycle	
Contamination of the environment with lubricant and wetted parts	Dispose of the parts following the valid legal and company regulations.
People slipping due to floor contamination with spilled or leaked lubricant.	Exercise caution when disconnecting the lines. Promptly apply suitable binding agents to remove the leaked or spilled lubricant. Follow the operational instructions for handling lubricants and contaminated parts.
Contamination of the environment due to used batteries on control printed circuit boards	Dispose of used batteries following the valid legal and company regulations. Until disposal, store used battery, e.g. in a closed polyethylene bag , in order to avoid any damages.

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5.1 Filling of the reservoir

WARNING

Risk of hand injuries caused by the stirring paddle or shovel foot

- Fill lubricant via the lid only when pump is idle. Never reach into the reservoir or grease barrel while the pump is running.

- Lines are pressurized. Be careful when decoupling.
- Observe extreme cleanliness when topping up the grease reservoirs.
- Contaminated lubricant causes malfunctions and premature wear of the grease pump and other components of the system.
- Clean surroundings before exchanging or topping up
- Switch off centralized lubrication system

Filling of the container through service-plate

- Remove dust protective cap at the filling coupling and the dust protective cap at the filling nipple
- Couple the filling hose for P1 resp. P2 and switch on the filling pump
- When the reservoir is full, the sensor transmits an electric signal to the control unit. Visual control is possible by using the dipstick
- When the filling pump is switched off
  Disconnect the filling coupling and reinstall the dust protective caps

5.2 Inadvertent filling with incorrect lubricant

Should incorrect lubricant have been filled, please proceed as follows:

- Switch off the pump or centralized lubrication system and secure it against being switched on.
- Remove lubricant.
- Clean the entire centralized lubrication system (lubricant reservoir, pump housing, metering devices and line systems).
- Fill in lubricant of correct specification.
- Switch the system or pump on.
- Vent lubrication system.
- Inform your superior to ensure that the error won't occur again.

5.3 Inspections prior to initial start-up

ATTENTION

Risk of damage to the machine

Fill the feed lines and bearing housings with lubricant to specification and lubricate the lubrication points by hand. Otherwise the bearing points may become damaged due to a lack of lubricant.

Check the entire system for accordance with the intended purpose and the planning documentation. Ensure that all parameters, characteristic values and means of operation are present and have been correctly adjusted. If deviations are detected, they must be remedied without delay.

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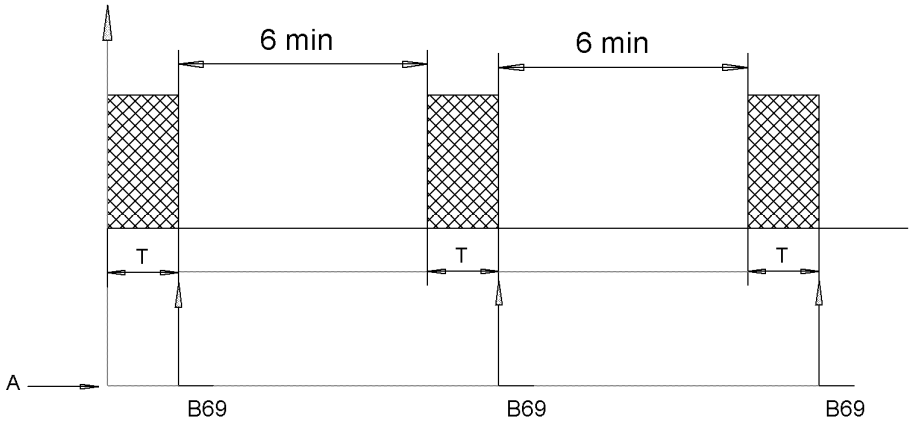
9.2.2 Greasing cycle

When the pause time has lapsed, the pump starts operating and supplies the lubricant via the main line to the LM5 injectors. The pistons inside the injectors are operated via lubricant pressure. A pre-metered amount of lubricant is dispensed to the connected SSV.

After all injectors have operated, the pressure in the main line rises until the preset pressure on the pump is reached 240 bar. The control unit stops the pump via the pressure switch B69. The pump stops running and the relief valve is deactivated at the same time. The compressed lubricant in the main line can flow back into the reservoir, the pressure drops. When the pressure has fallen below 80 bar the pistons inside the LM5 injectors return to their initial positions by means of spring force and reload the adjustable amount of lubricant by this action.

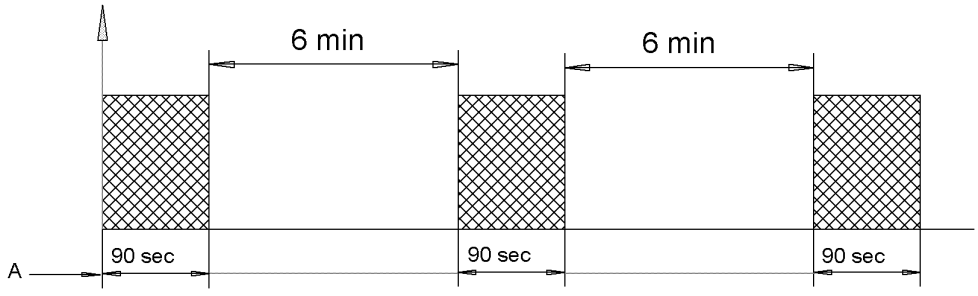
The pause time can start and the system is now ready for another lubrication cycle.

Level I
P1 with pressure control



Legend : T: running time
Pause time: 4min-10min
A: pressure control device

P1 safety mode, without pressure control



Legend : T: running time 10sec – 250 sec
Pause time: 4min-10min
A: time control device, pressure switch off

9.3.1 Grease cycle

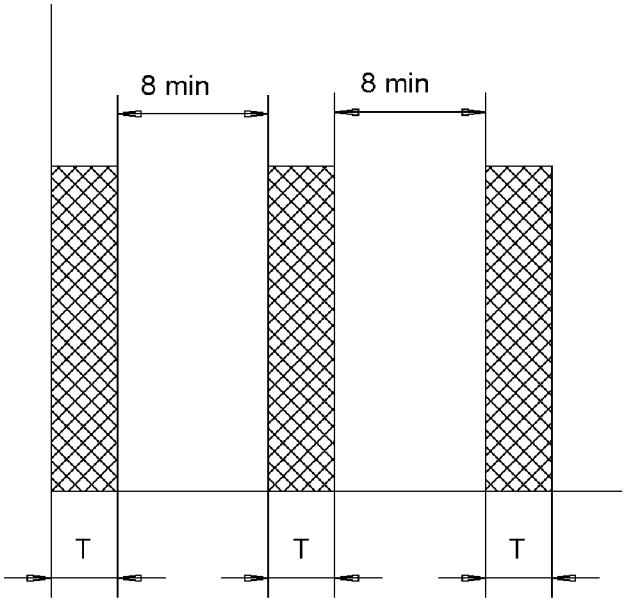


Fig. 7 Grease cycle

When the pause time has lapsed, the pump P3 supplies lubricant to the connected progressive metering device. A progressive metering device type SSV 6 is provided with the proximity switch B51 for control and monitoring purposes. After three cycles of the SSV 6, which correspond to a full lubrication cycle, the pump P3 is switched off thanks to the proximity switch B51.

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