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

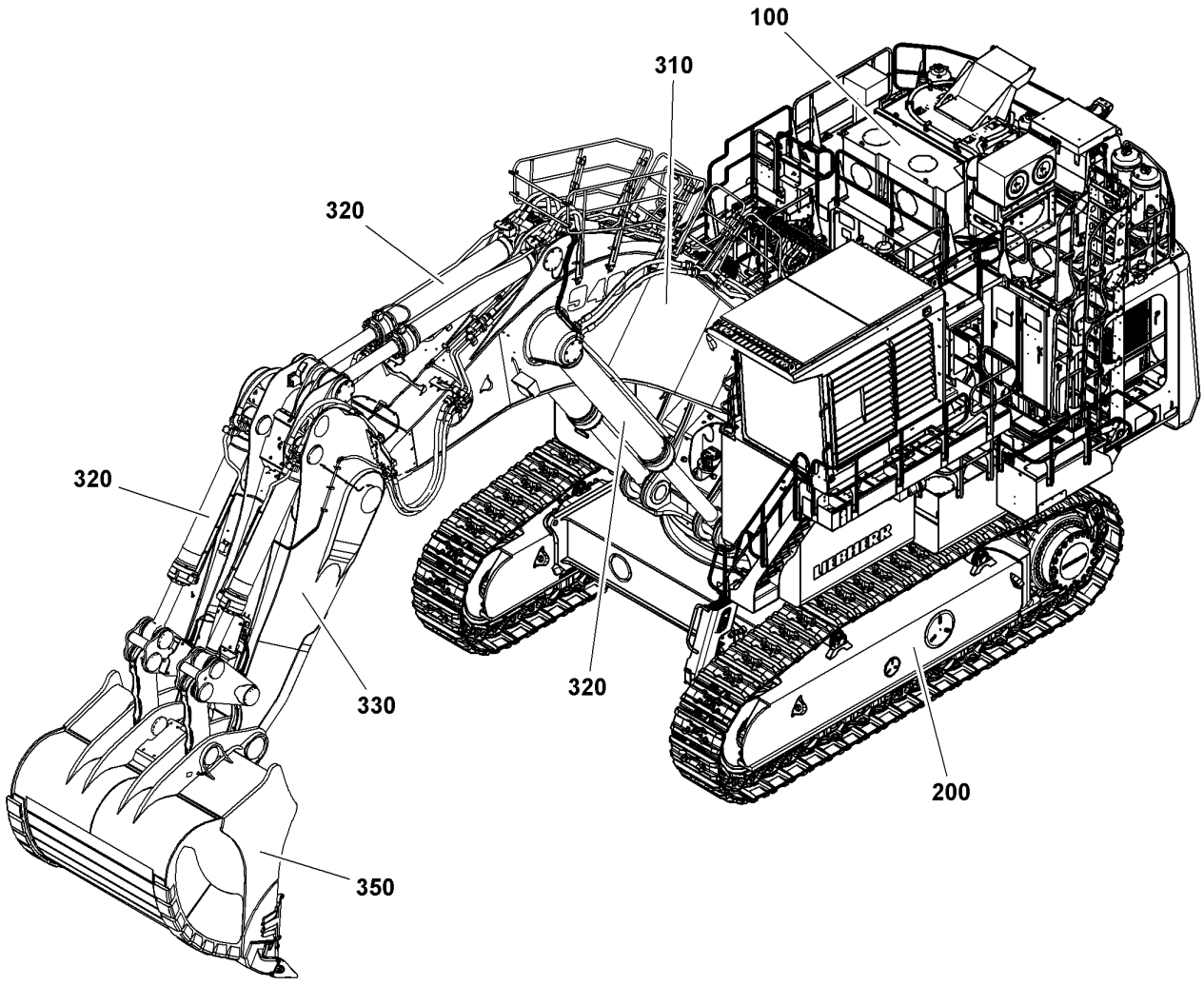

Fig. 1-1 *Machine and construction equipment - backhoe attachment*

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

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Fast and Precise Movement

Powerful Drive System
The R 9400 is equipped with a Cummins diesel engine which has been specifically adapted to withstand the most extreme environments and to reach the highest uptime performance for maximum productivity. The electric drive system provides superior performance when the machine is used in the toughest of conditions.

Fast Cycle Time
Rather than using a standard open hydraulic circuit, the R 9400 employs a closed-loop swing circuit, enabling maximum swing torque while retaining the full oil flow for the working circuit. The independent swing circuit in combination with the powerful drive system leads to fast arm motion, contributing to faster cycle times.

Precise Machine Motions
The R 9400 design integrates the Litronic Plus electronic control system allowing for easy control even when simultaneous movements are required. The patented Liebherr electronic damping system provides controlled end-cushioning for smooth attachment motions.

High Digging and Lifting Capabilities

High Digging Forces
Designed for the best mechanical force distribution, the production-tailored attachment delivers increased digging and lifting forces. Integrating Liebherr-made cylinders and a wide range of buckets with mining-optimized GET, the R 9400's attachment ensures the highest forces, easy bucket penetration and high fill factor to perform even in the most demanding conditions.

Power-Oriented Energy Management
The R 9400's attachment is equipped with pressureless boom-down function to enable fast cylinder retraction without the need for pump energy. Intelligent energy management diverts the pump flow during boom lowering, allowing other cylinder motions to operate unimpeded.

Engine / Motor Options
Diesel engine:
- Cummins QSK 50
- US EPA Tier 2, US EPA Tier 4f / EU Stage V compliant
- Fuel consumption optimized version (optional)

Electric drive (optional):
- 3 phase AC squirrel cage motor
- Voltage on request
- 50 or 60 Hz frequency

Electronic Cylinder Damping System
- Patented system based on electronic control
- Controlled end-cushioning for smooth attachment motions
- Allows the operator to focus on loading
- Intelligent energy management
- Increase of cylinders reliability

High Performance Execution
An innovative attachment solution to improve cost per tonne, maximize machine productivity / truck utilization without any compromise in structural / component life and cycle time:
- Use of Smart Components Design to reduce total weight, increasing bucket payload and reinforcing bucket wear protection for extended lifetime
- Maximized loading capacity thanks to Liebherr Bucket Solution and patented EVO design

Minimized Impact on Life

Optimized Energy Consumption, Fewer Emissions
The intelligent energy management system facilitates interaction between the hydraulic system and engine output with the goal of maximum performance with minimum consumption. In “Eco-Mode” setting, the machine is set up to reduce engine load, significantly improve fuel consumption and reduce emissions.

Controlled Emission Rejection
The R 9400 is powered by a high horsepower diesel engine which complies with the US EPA Tier 2 or US EPA Tier 4f / EU Stage V emission limits. This power drive makes the R 9400 cost effective without compromising productivity and reduces the machines impact on the environment.

Sustainable Design and Manufacturing Process

Certified Environment Management Systems
Subject to the stringent European program for the regulation of the use of chemical substances in the manufacturing process (REACH*), Liebherr undertakes a global evaluation to minimize the impacts of hazardous material, pollution control, water conservation, energy and environmental campaigns.

Extended Components and Fluids Lifetime
Liebherr is constantly working on ways to extend component life. Through the Exchange Components program, superior lubrication systems and the reinforcement of parts under stress, Liebherr can reduce frequency of part replacement. The result minimizes environmental impact and lowers the overall total cost of ownership.

*REACH is the European Community Regulation on chemicals and their safe use (EC 1907 / 2006)
It deals with the Registration, Evaluation, Authorization and Restriction of Chemical Substances.

The Liebherr-Mining Remanufacturing Program
- Second life for your components
- Liebherr certified workshops
- Reduced environmental impact
- Reduced costs and investment
- Alternative to purchase brand-new replacement components

Sound Attenuation Package (optional)
Developed with the latest noise measurement technologies, this approach is based on both removal of noise at the source and passive sound attenuation:
- Noise-optimized fan regulation
- Larger and additional mufflers with tail pipe absorbers
- Sound attenuation on louvers, doors and walls
- Additional high volume sound attenuation boxes

Electric Drive Version
The electric drive system is an efficient alternative to diesel engine allowing:
- Less vibration resulting in higher component lifetime
- Lower maintenance costs
- Less noise pollution
- High motor efficiency
- Maximum efficiency in cold climate conditions when combined with the Arctic Kit

2.3 Safety Instructions

General safety instructions

- Please familiarize yourself with the operating instructions before starting up the machine.
- Ensure that you have obtained, read and understood any additional instructions relating to special accessories for the machine.
- Only specifically authorized persons may operate, maintain or repair the machine. The legal minimum age is to be adhered to.
- Only employ trained or appropriately instructed personnel. Clearly establish which personnel are responsible for operating, setting up, maintaining and repairing the machine. Give personnel the power to refuse to carry out unsafe instructions. This also applies in relation to traffic regulations.
- Only permit apprentices and personnel who are in training or who have only general training to operate on the machine under the constant supervision of an experienced member of staff.
- As far as possible, monitor personnel to ensure that they are adhering to safe working practices, are aware of risks and are observing the operating instructions.
- Always wear safe work clothes when you are working on or with the machine. Avoid wearing 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.
- Wear individual protective equipment (protective goggles, safety helmets, safety shoes and gloves, reflective vests and ear protection etc....).
- Ensure that you obtain information on any special safety regulations for the job site from the site foreman.
- Always tilt up the safety lever before leaving the operator's seat.
- When getting in and out, do not hold on to the steering column, control panel or joystick. Doing this could cause unintentional movement, which could result in an accident.
- Never jump from the machine; use the steps, ladders, gangplanks and supporting straps provided for this purpose.
- 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.
- Familiarize yourself with the location of the emergency exit.
- In the absence of any other instructions, proceed as follows for all maintenance and repair work:
  - park the machine on firm, level ground
  - align the uppercarriage with the undercarriage so that the sprockets locate at the back-end
  - anchor the bucket in the ground.
  - place all operating levers into neutral and tilt the safety lever up.
  - switch off the engine and remove the start key.
- Before touching any parts of the hydraulic circuits, you must also operate all pilot control devices (joystick and pedals) in all directions with the start key in contact position and with the security lever lowered, in order to reduce the actuating and dynamic pressures in the work circuits. You must then reduce the internal tank pressure as described in these operating instructions.
- Secure all loose parts on the machine.
- Never operate a machine before carrying out a careful inspection tour and checking whether any warning signs are missing or illegible.

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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).
– 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.
– Check the maintenance status of the machine, particularly with respect to: tyre

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Danger!
Non-observance of **safety plates** can result in serious injury or death.

- ▶ Check warning plates regularly to ensure that they are complete and clearly legible.
- ▶ Replace missing or illegible safety and information plates immediately. You will find the ordering numbers of these plates in the spare parts book of the excavator.

2.5.2 Arrangement of signs

Uppercarriage signs

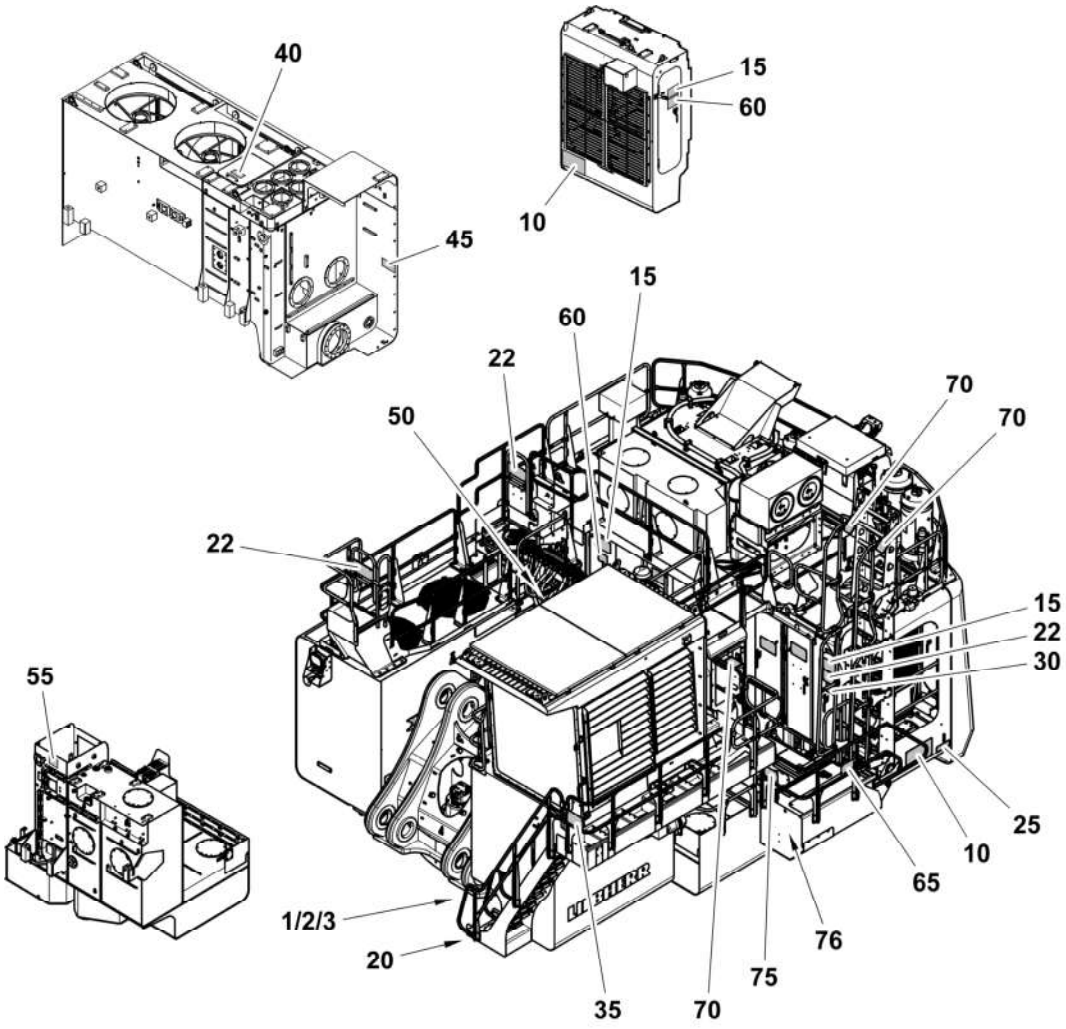

Fig. 2-1 *Uppercarriage signs arrangement*

1	Typeplate LEC "CE"	**40**	Rotation blade hazard label
2	Typeplate Liebherr America	**45**	Hydraulic valve position label
3	Typeplate LEC	**50**	Hydraulic tank pressure label

3 Control and operation

3.1 Operating and control elements

3.1.1 Overview of the control cab

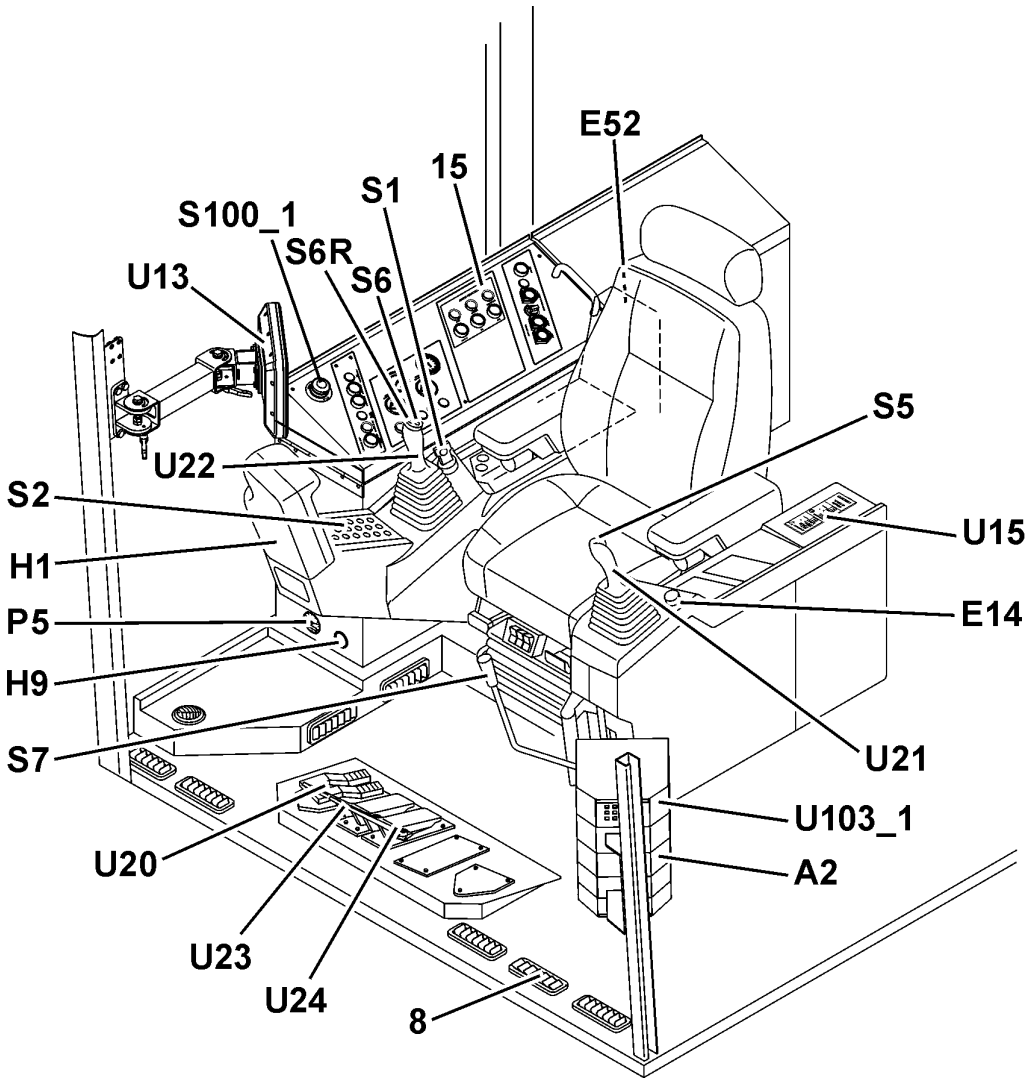

Fig. 3-1 Control cab

8 Heater vent
15 Control board
A2 Radio
E14 Cigarette lighter
S6R Switch / semi-automatic flap closing (shovel attachment only)
S7 Safety lever
S100_1 Emergency stop
U13 Display for monitoring cameras

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Area A: Diesel engine monitoring

P2 – Diesel engine coolant temperature display

The display must be in the green area when operating the machine.

In the event of overheating (over 98 ºC = 204°F), the red LEDs **P2.1** at the end of indicator **P2** will flash.

The buzzer in the cab also sounds.

When this Indicator light illuminates, the error will be saved as error code **E 503**.

- ▶ The red indicator protection **H62** on the control board will light up.
- ▶ The Quantum system will cause an engine shutdown.
- ▶ Find and rectify the cause of the problem.

P3 – Fuel level display

The LED indicator lights show the fuel level. When the both red light **P3.1** light up, about 10% to 20% fuel are left in the tank as reserves.

Area B: Indicator lights

H2 – Indicator light, low engine oil pressure

The Indicator light illuminates if the engine oil pressure drops below a given value when the machine is operating.

The buzzer in the cab also sounds.

When this Indicator light illuminates, the error will be saved as error code **E 501**.

- ▶ The red indicator protection **H62** on the control board will light up.
- ▶ The Quantum system will cause an engine shutdown.
- ▶ Find and rectify the cause of the problem.

H12 – Indicator light, battery charge

The Indicator light illuminates if the ignition key is placed in the contact position.

The Indicator light goes out as soon as the engine is started.

When the machine is operating, this Indicator light illuminates if the V-belt alternators or the electrical charging system are defective.

- ▶ Bring the engine to a low idle immediately.
- ▶ Allow the engine to idle for approximately 5 seconds.
- ▶ Switch off the engine.
- ▶ Rectify the error.

H19 – No function

H20 – No function

H23 – No function

E 584 - E 585 – Swing pumps overheat

This symbol appears if the temperature on one of the swing pumps exceeds a preset value (the pump number appears in the top corner of the symbol).

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

E 590 – Low hydraulic tank pressure

This symbol appears if the hydraulic tank pressurization drops below 0,15 bar.

- ▶ Stop operation and turn the engine off.
- ▶ Find and correct the problem (check the air pressure system).

E 591 – Splitterbox oil pressure low

This symbol appears if the splitterbox oil pressure drops below 0.2 bar.

- ▶ Stop operation and turn the engine off.
- ▶ Find and correct the problem.

E 592 – Low oil level in the Centinel system (optional)

This symbol appears if the oil level in the Centinel tank drops below the minimum level.

- ▶ See Cummins Operation and Maintenance manual.
- ▶ Fill the Centinel tank as soon as possible.

E 593 – High fuel temperature

This symbol appears simultaneously with the red indicator protection **H62** if the fuel temperature is too high (above 104°C=220°F).

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

E 594 – High fuel rail pressure

This symbol appears simultaneously with the red indicator protection **H62** if the fuel rail pressure exceeds a normal limit.

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

E 595 – High blow-by pressure

This symbol appears simultaneously with the red indicator protection **H62** if the blow-by pressure exceeds a normal limit .

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

E 596 – Low engine oil level

This symbol appears simultaneously with the red indicator protection **H62** if the engine oil level drops below the minimum level.

- ▶ See Cummins Operation and Maintenance manual.
- ▶ Full the engine oil tank.

Machine error list Exxx:

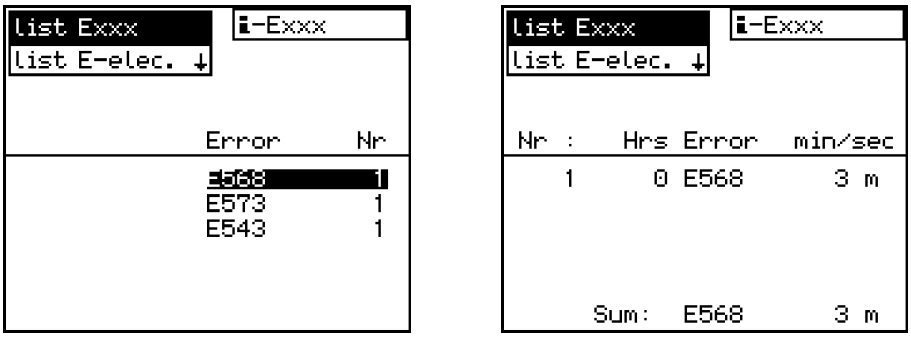


Fig. 3-23 *Error list (Fig. left) and Error occurrence (Fig. right) menu*

▶ Select **list Exxx**.

▶ Press the **Menu** button.
↳ The first page of the submenu appears.

All errors and their error codes are listed on the first page.

▶ Use the **Down** or **Up** arrow key to select the error code desired.

▶ Press the **Menu** button again.
↳ The second page of the submenu appears.

Operating hours and the duration of the first and last ten occurrences of the error selected will be listed on the second page.

▶ Press the **Back** button.
↳ The first page of the submenu appears.

▶ Press the **Back** button again to select another error type or press the **Down** or **Up** arrow key to select a new error code.

s*: Error was indicated by a buzzer and was acknowledged using the **Back** button. The duration is given in seconds.

m*: Error was indicated by a buzzer and was acknowledged using the **Back** button. The duration is given in minutes.

Note!
Only operating errors with an error code **E 5xx** will be displayed in the **list Exxx** menu.

Cable error list E-elec.:

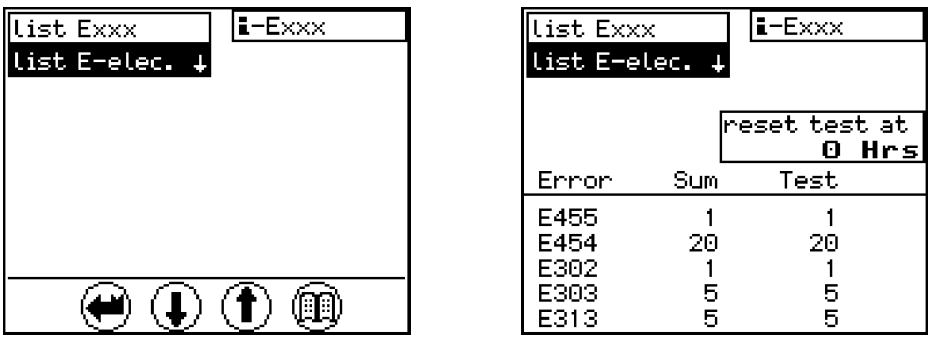


Fig. 3-24 *Occurrence of electrical error (Fig. left) and Error statistics (Fig. right)*

▶ Select **Cable error list E-elec.**:

avoiding the regular lowering procedure of the ladder,

▶ Open valves **V1** and **V2** to lower the ladder.

If an emergency stop is operated, the ladder is lowered automatically.

3.2.2 Safety lever

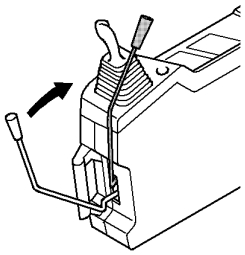


Fig. 3-33 *Safety lever*

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 **S17** illuminates).
– It is not possible to release the slewing gear brake using switch **S17**.

When the safety lever is pushed (push up / push down) to its lowest position, the slewing gear brake and the LED in switch **S17** 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.

3.2.10 Field of view

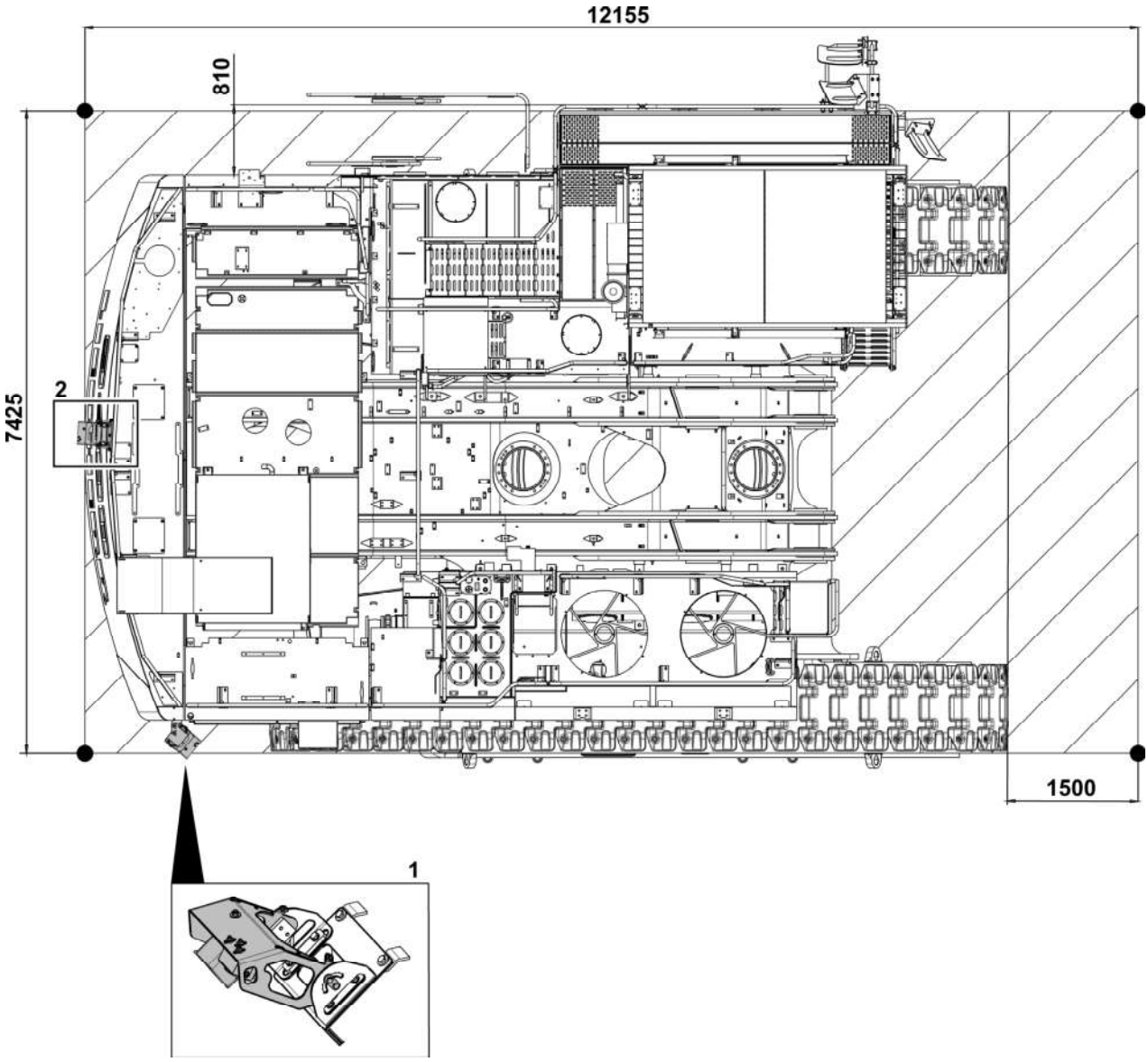


Fig. 3-46 *Field of view*

1 Camera 1: opposite side of the cab **2** Camera 2: counterweight

Monitoring cameras are installed on the excavator as follows in order to extend the operator's field of view with the operating environment:

– camera 1: on the opposite side of the cab,
– camera 2: on the counterweight.

The combination of the cameras and the outside mirrors allows to see a person standing out of the hatched area illustrated on the fig. above.

– Check the Selective Catalytic Reduction (SCR) system and the Diesel Exhaust Fluid (DEF) level*.
– Check fuel system and fuel level.
– Check the oil in the hydraulic system.
– Check that the cameras and the outside mirrors are correctly adjusted.
– If required, remove any ice and snow from the engine hood in the area of the cooling and combustion air intake.

* Refer to the maintenance chapter for further informations about the procedure to follow.

Turning on the electrical system

Ignition key switching positions

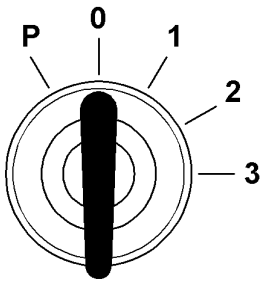


Fig. 3-50 *Ignition key* ***S1***

P Parking position
0 Off
1 Contact position
2 Not used
3 Start position

Switching on the electrical system

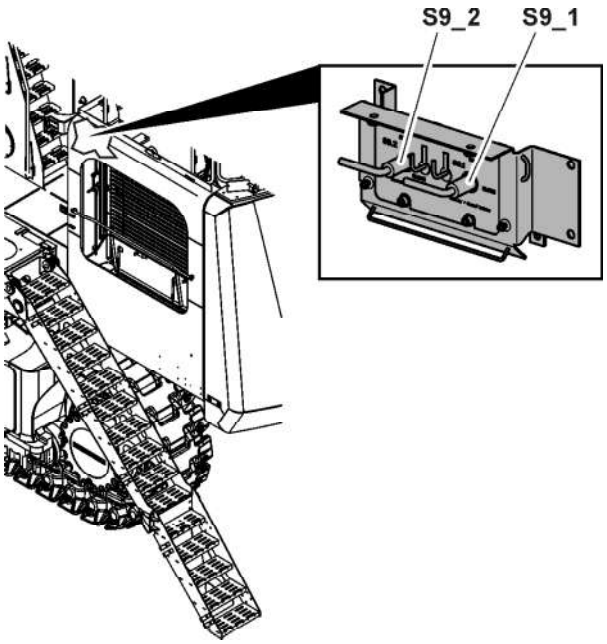


Fig. 3-51 *Batteries switches*

❑ The batteries switches **S9_1** and **S9_2** must be in position "on". These are in-

3.3.3 Starting aids (optional)

Functional description

The excavator can be fitted with an optional preheating kit (required according to the ambient temperature of the work environment) supplied by an external electric power supply.

Preheating devices are installed on different components of the excavator. These devices are supplied by 2 electric modules (refer to § "Preheating components").

These 2 modules are installed in an additional electric cabinet in the cabin elevation. In order to be supplied externally, this cabin elevation has a socket for a generator set (Gen-Set).

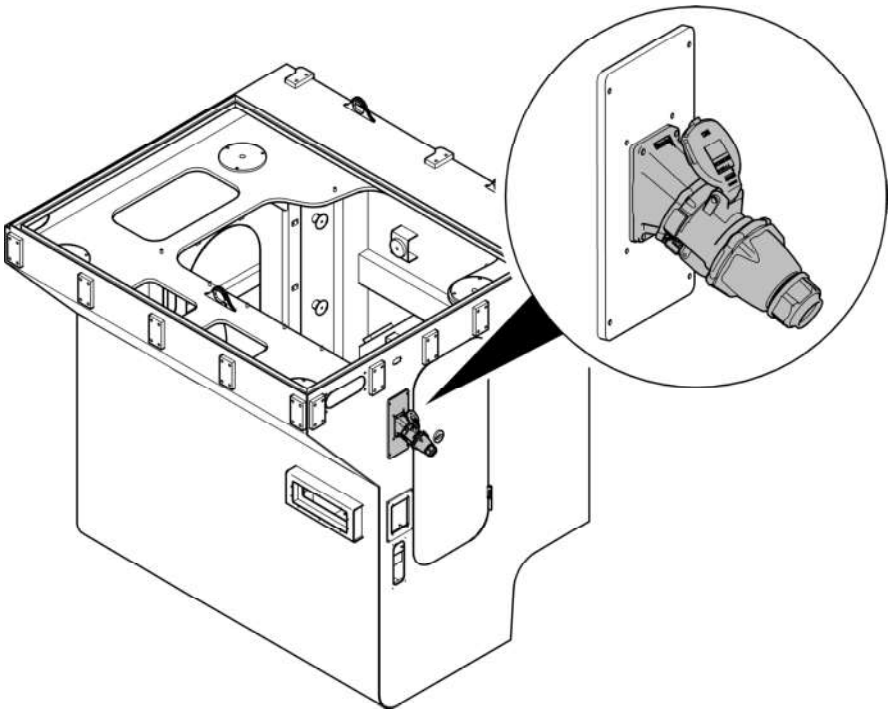


Fig. 3-58 *Socket for Gen-Set on cabin elevation*

When the Get-Set is connected, the 2 modules are supplied one after the other (refer to § "Preheating procedure").

Caution!
The Diesel engine can be started during the preheating but travel and swing movements are not allowed.

The preheaters are monitored and a warning light **H104** on the control board will come up if a default is detected.

A warning symbol on the Display stays on during the preheating cycle until the Diesel engine can be started.

3.3.7 Driving

Driving straight ahead

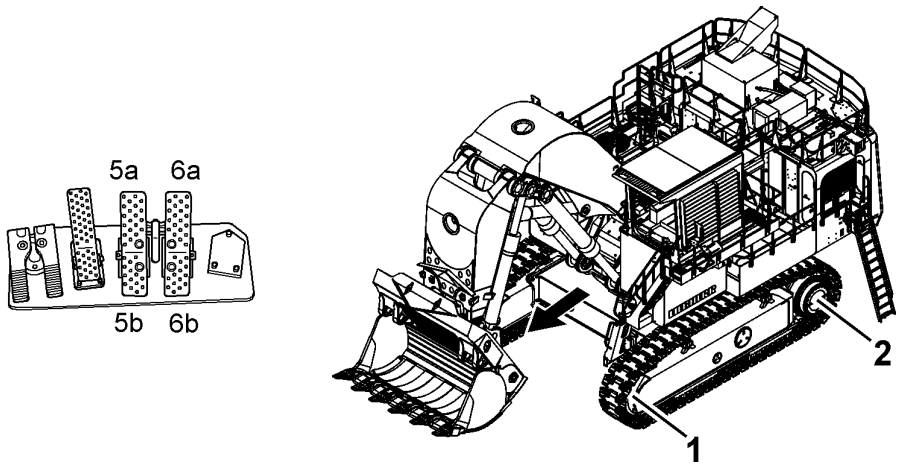


Fig. 3-66 *Driving straight ahead*

1 Idler
2 Sprocket wheel
5a / 5b Pedal for left drive unit
6a / 6b Pedal for right drive unit

Caution!
When driving, the uppercarriage must be rotated to the undercarriage in such a way that when driving forwards, the idler **1** is in front and the sprocket wheel **2** is at the rear.

Driving forwards:

▶ Push both pedals forward (**5a** and **6a**).

Reversing:

Caution!
Before reversing, ensure that the area behind you can be safely entered.

▶ Push both pedals down (**5b** and **6b**).

The hydraulic swing brake

▶ Let the left joystick move back to neutral position.
  ↳ The hydraulically swing braking of the uppercarriage takes place. In normal working conditions, the braking efficiency is sufficient to bring the uppercarriage to a standstill rapidly.

▶ Move the left joystick in the opposite direction.
  ↳ The maximum hydraulic braking action of the uppercarriage is achieved.

The mechanical swing brake

The mechanical brake is a negatively acting multidisc brake which is integrated in the swing gear. It allows to stop the uppercarriage in any desired position (for parking, when working on a slope, ...)

▶ Press "Swing brake" button **S17**.
  ↳ Swing brake is applied.
  ↳ LED in the button illuminates.

▶ Press button again.
  ↳ Swing brake is released.
  ↳ LED in the button goes out.

Caution!
The brake only applies when the uppercarriage is near standstill and if no swing motion is actuated with the joystick.

To stop the uppercarriage when working on a slope:

▶ Use the joystick to reduce the uppercarriage speed.

▶ Press button **S17** to operate the swing brake.

▶ Move the joystick back to "0" position only after the brake operates.

To check the mechanical swing gear brake:

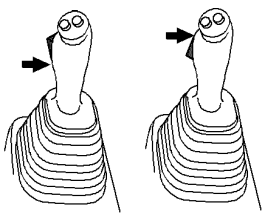
❑ When the uppercarriage is stationary.

▶ Press button **S17** to apply the mechanical swing brake.

▶ Push the left joystick to the right and then to the left as far as the stop.
  ↳ If the swing brake function is OK, the uppercarriage does not start swinging.

Semi-automatic swing brake control (optional equipment)

▶ Press button **S17 to release the swing brake.**
  ↳ LED in the button goes out.
  ↳ The swing gear brake is in mode semi-automatic and can now be controlled as follows by the rocker switch **S57**:



▶ Tilt down the rocker switch **S57** on the joystick handle.
  ↳ The brake is applied when the uppercarriage is at standstill, respectively it applies as soon as the uppercarriage speed gets lower than a limit value.

▶ Tilt up the rocker switch **S57.**
  ↳ The brake remains released permanently.

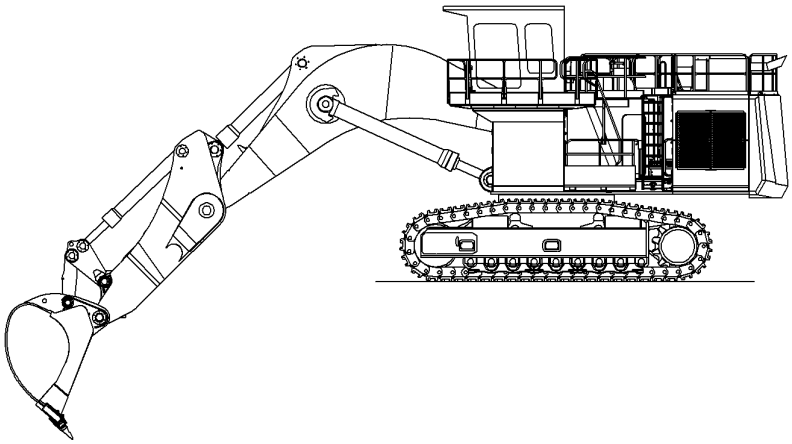


Fig. 3-82 *30° forward to the vertical.*

- ▶ Align the shovel arm in such a way that its underside is at an angle of approx. 30° forward to the vertical.
- ▶ Align the backhoe bucket in such a way that its underside can enter the ground at an angle with the axle of the shovel arm between 10° and 20°.

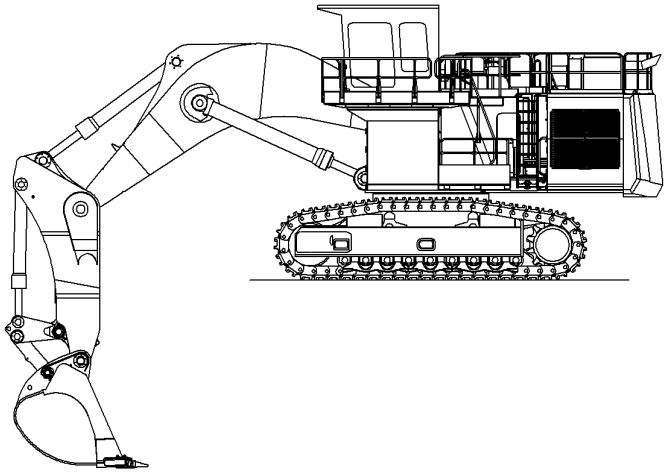


Fig. 3-83 *Taking up grab material*

- ▶ To lift out the grab material, slowly and evenly slew in the shovel arm.

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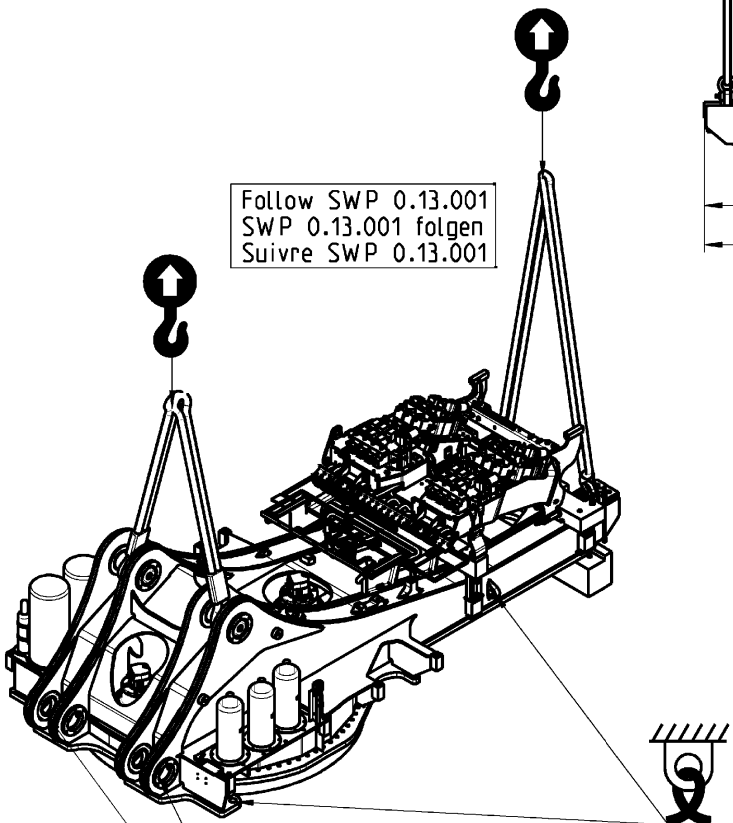
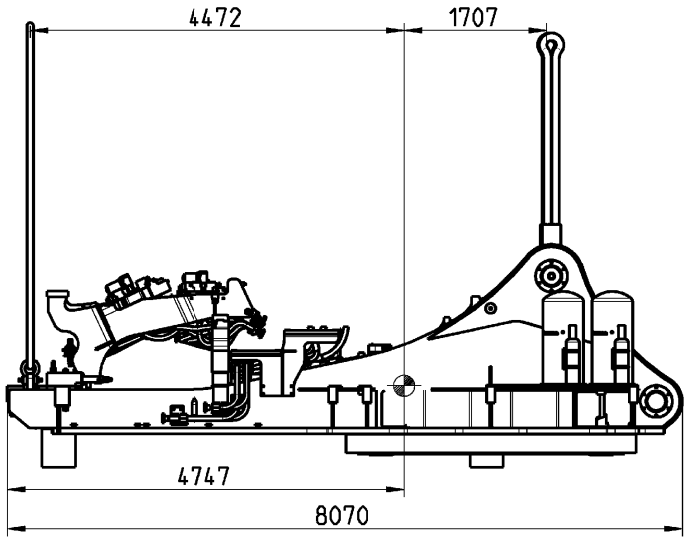
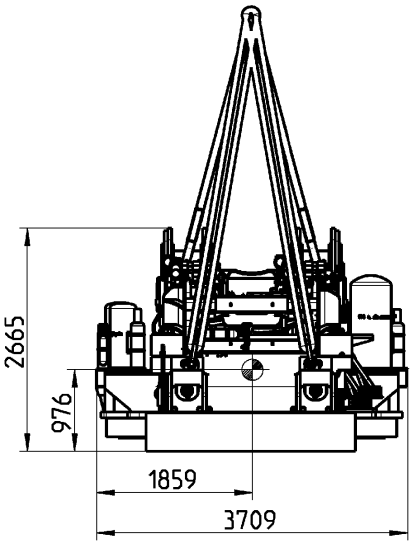


AUF BEIDEN SEITEN
ON BOTH SIDE
DES DEUX COTES

Fläche schützen
Protect surfaces
Protéger les surfaces





SCHWERPUNKT
CENTER OF GRAVITY
CENTRE DE GRAVITE

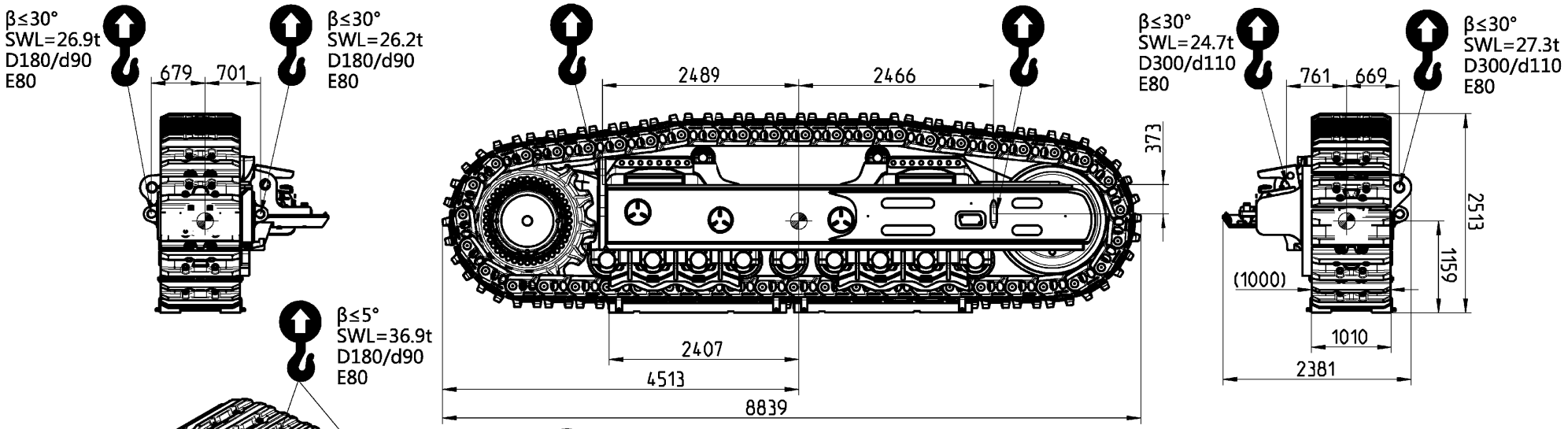
Mit Feuerloeschanlage With fire suppress system Avec dispositif anti feu	+1 500 kg

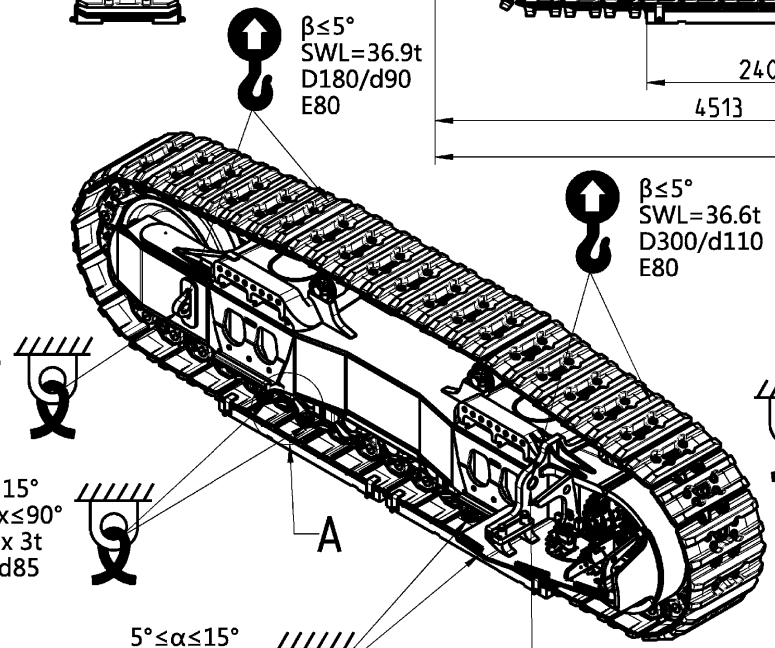
	Gerechnet Calculated Calculé	Gewogen Weighed Pesé
Gewicht ohne Werkzeug und Verpackung Weight without tool and packaging Poids sans outillage et emballage	43 685 kg	
Gewicht mit Werkzeug und Verpackung Weight with tool and packaging Poids avec outillage et emballage	45 000 kg	

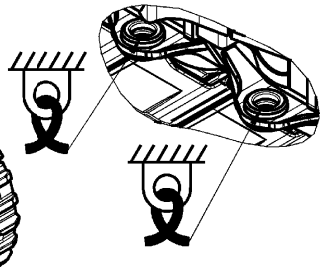
LIEBHERR

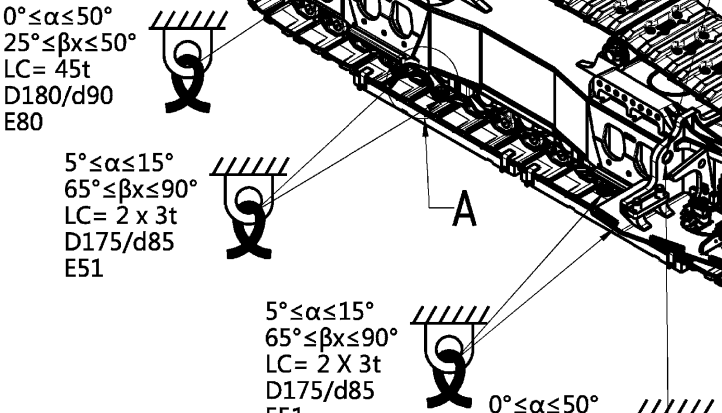
Bezeichnung / Description / Dénomination	Ident-Nr. / Ident No. N° d'ident	Index / Index Index	Blatt / Page Feuille
TRANSPORTPLAN DREHBUEHNE TRANSP.DRW ROTATING DECK R9400 PLAN DE TRANSPORT TOURELLE	10404924	001	1/1

Zum Heben sind entweder zwei Krane oder eine Traverse von 4 bis 6 m Länge obligatorisch
Requires two cranes for lifting or a spreaderbeam with a length of 4 to 6 m
Levage à deux grues obligatoire ou avec un palonnier de longueur 4 à 6 m

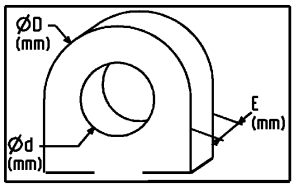








Die Raupenkette muss gespannt und gebremst sein.
The crawler chain shall be tensed and braked.
La chaine du longeron doit être tendue et freinée.



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	59 810 kg	
Gewicht mit Werkzeug und Verpackung Weight with tool and packaging Poids avec outillage et emballage	59 950 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 1407	11069443	001	1/1

Error code	Description
1696	Sensor Supply 5 Circuit - Voltage Below Normal or Shorted to Low Source
1712	After-treatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Below Normal Operating Range - Moderately Severe Level
1713	After-treatment 1 Diesel Exhaust Fluid Tank Heater - Data Valid But Above Normal Operating Range - Moderately Severe Level
1714	After-treatment Diesel Exhaust Fluid Quality - Out of Calibration
1715	After-treatment Diesel Exhaust Fluid Quality - Root Cause Not Known
1843	Crankcase Pressure Circuit - Voltage Above Normal or Shorted to High Source
1844	Crankcase Pressure Circuit - Voltage Below Normal or Shorted to Low Source
1885	After-treatment 1 Intake NOx Sensor Circuit - Voltage Below Normal or Shorted to Low Source
1887	After-treatment 1 Outlet NOx Sensor Circuit - Voltage Below Normal or Shorted to Low Source
2185	Sensor Supply 4 Circuit - Voltage Above Normal or Shorted to High Source
2186	Sensor Supply 4 Circuit - Voltage Below Normal or Shorted to Low Source
2195	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions
2242	Injector Solenoid Driver Cylinder - Out of Calibration
2249	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Most Severe Level
2265	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Above Normal or Shorted to High Source
2266	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Below Normal or Shorted to Low Source
2311	Electronic Fuel Injection Control Valve Circuit - Condition Exists
2377	Fan Control Circuit - Voltage Above Normal or Shorted to High Source
2557	Auxiliary PWM Driver 1 Circuit - Voltage Above Normal or Shorted to High Source
2558	Auxiliary PWM Driver 1 Circuit - Voltage Below Normal or Shorted to Low Source
2619	Auxiliary Input 1 Active - Condition Exists
2771	After-treatment 1 Outlet NOx Sensor - Abnormal Update Rate
3131	Engine Crankshaft Speed/Position - Special Instructions
3139	Engine Air Shutoff Circuit - Voltage Above Normal or Shorted to High Source
3141	Engine Air Shutoff Circuit - Voltage Below Normal or Shorted to Low Source
3142	After-treatment 1 SCR Intake Temperature Sensor Circuit - Voltage Above Normal or Shorted to High Source
3143	After-treatment 1 SCR Intake Temperature Sensor Circuit - Voltage Below Normal or Shorted to Low Source
3144	After-treatment 1 SCR Intake Temperature Sensor - Data Erratic, Intermittent, or Incorrect
3146	After-treatment 1 SCR Outlet Temperature Sensor Circuit - Voltage Above Normal or Shorted to High Source
3147	After-treatment 1 SCR Outlet Temperature Sensor Circuit - Voltage Below Normal or Shorted to Low Source
3148	After-treatment 1 SCR Outlet Temperature Sensor - Data Erratic, Intermittent, or Incorrect
3151	After-treatment 1 SCR Catalyst System Missing - Condition Exists
3232	After-treatment 1 Intake NOx Sensor - Abnormal Update Rate
3543	NOx Limits Exceeded Due to Insufficient Reagent Quality - Condition Exists
3545	After-treatment 1 Outlet NOx Sensor - Abnormal Rate of Change

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Error code	Effect	Cause	Measure / remedy
E 062	BST	Frequency range	Consult LIEBHERR customer service.
E 063		Memory error	
E 064		Power supply	
E 070		CAN communication	
E 601	ESP01 CAN 2 failure	CAN communication	Consult LIEBHERR customer service.

4.1.5 Display

Error code	Effect	Cause	Measure / remedy
E 308	No CAN 2 connection between control unit S2 and display or no function of the control unit	No CAN bus connection	Consult LIEBHERR customer service.

4.1.6 Coding error

Error code	Effect	Cause	Measure / remedy
E 319	Coding BST not compatible with coding control unit S2	Coding error	Consult LIEBHERR customer service.
E 321	Unknown excavator type from BBT	Coding error	Consult LIEBHERR customer service.
E 322	Unknown hardware coding from BST	Coding error	Consult LIEBHERR customer service.
E 435	A1020	Unknown A1020 coding plug	Consult LIEBHERR customer service.

4.1.7 Connection box pump transmitters

Error code	Effect	Cause	Measure / remedy
E 311	No CAN 1 connection on E1036 (connection box pump transmitters)		Consult LIEBHERR customer service.
E 320	No CAN 1 connection between E1036 (connection box pump transmitters) and translater J1939		Consult LIEBHERR customer service.

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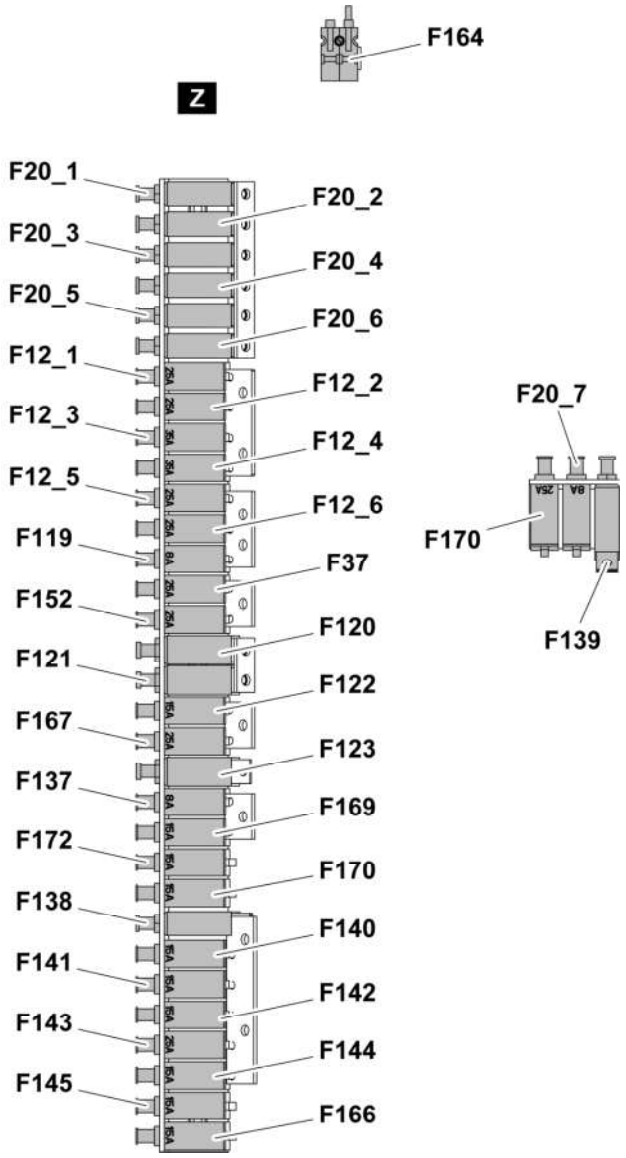

Fig. 4-3 *Fuses in power electric cabinet* ***E1003***

F12_1	25A / working light	**F123**	35A / A1006
F12_2	25A / working light	**F137**	100A
F12_3	25A / working light	**F138**	80A
F12_4	25A / working light	**F139**	Engine control system
F12_5	25A / working light	**F140**	Radio box
F12_6	25A / working light	**F141**	Cigar lighter
F20_1	100A / principal fuse engine	**F142**	Service socket
F20_2	100A / principal fuse engine	**F143**	Service lighting
F20_3	100A / principal fuse engine	**F144**	Ladder control system
F20_4	100A / principal fuse engine	**F145**	Service light ladder
F20_5	100A / KI30 counterweight floodlight	**F152**	25A / Quantum

correctly adjusted.

- Control the surroundings, and particularly the nearness area of the machine, during operation or when travelling.
- Mirrors are installed on the machine:
  - on the left to check the left side of the machine.
  - on the front to check the front side of the machine.
  - on the right to check the right side of the machine.
  - above the counterweight to check the rear side of the machine.
- On some machines, some mirrors may be replaced with cameras.
- At each extension, construction or change on the machine, the sight conditions must be maintained. These conditions must otherwise be checked according to ISO 5006.
- Mirrors and cameras must always be clean.
- Damaged mirrors and cameras must be immediately replaced.
- The site has to be organised so that the dangers due to a restricted field of view are minimized, particularly for machines with an operating weight which is superior to 40 tons.

Crack testing

- Even when the machine is operated carefully, there is a possibility of individual cases of overloading occurring, which could lead to cracks or loose connections. The machine should therefore be checked regularly for cracks, loose connections or other visible damage to maintain operational safety.
- In order to be able to check for cracks, it is essential that the machine is kept clean and cleaned regularly.
- The tests should be carried out in accordance with the monitoring and maintenance plan:
  - every 250 operating hours by the machine owner's maintenance personnel.
  - every 500 operating hours by authorised specialist personnel.
- It is advisable to carry out these tests: supported, on firm, horizontal substrate, with the equipment in longitudinal and cross direction for variable loads. Current accident prevention regulations must be adhered to.
- Especially check the supporting components, in particular:
  - framed construction undercarriage with axle and gearbox storage, support outriger, lower slewing ring support with tower and slewing ring.
  - framed construction uppercarriage with bearing for boom and hoist cylinder, upper slewing ring support, cab suspension, mounting for slewing gear and counter weight.
  - framed construction components of attachments, e.g. boom, stick, quick change adapter, digging tool and grapple.
  - hydraulic cylinders, axles, steering, pins and pin connections, ascents, ladders and mounting elements.
- The crack test should be carried out visually. If a crack is suspected, the dye penetration test should be carried out as a crack test on areas which do not have good visibility, such as the ring bearing support, in order to increase testing safety.
- Any damage found must be rectified immediately. Welding work on load-bearing parts of the earth-moving machinery, loading devices and transport devices may only be carried out by trained specialist personnel and only in accordance with the accepted rules of welding engineering. In case of doubt, contact the LIEBHERR customer support service to discuss suitable remedies.

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5.4 Lubricants and operating fluids

5.4.1 General information on changing lubricants and operating fluids

Note
The quantities given in the lubrication and operating material chart and on the lubrication chart in the cab are only guide values.

▶ After each oil change or refill, check the level in the relevant unit.

Note!
Adhering to regulations for lubrication, level checks and operating material changes guarantees a high degree of reliability and a long service life for the machine.
It is particularly important to adhere to the oil change intervals and use the specified type of lubricant.

▶ Observe the following when using and checking lubricants and operating fluids:
– see "Lubricants and operating fluids"
– see "Inspection and maintenance schedule"

Note!
Cleanliness is of the utmost importance when changing oil.

▶ Clean all filler plugs, filler covers and drain plugs and their surroundings before opening.

▶ For preference, drain off oil when it is at operating temperature.

▶ Ensure that old oils are collected and disposed of in an environmentally acceptable manner using the removable oil filter cartridges.

Danger!
When checking and changing lubrication and operating materials, ensure that the following precautions are adhered to:

▶ Unless otherwise indicated, carry out all work on the machine on level, solid ground and with the engine switched off.

▶ Whenever you reach into the engine compartment, always secure the cover and side doors against accidentally falling back or closing.

▶ Only refuel the machine when the engine is switched off, do not smoke and avoid naked flame.

▶ Turn the main battery switch to position **0** (off) and remove the ignition key.

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LIEBHERR oils for hydraulic system

Requirements

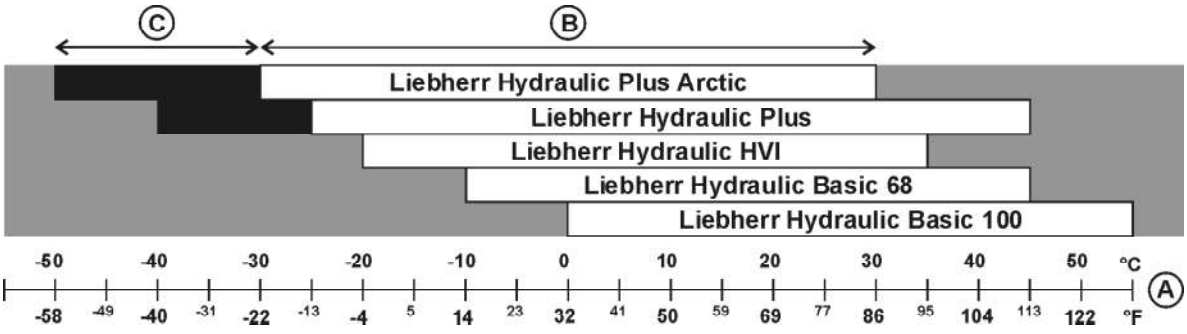

Fig. 5-8 *LIEBHERR oils for hydraulic system*

A Ambient air temperature
B Operating range
C Extra-cold start range if excavator fitted with operating Liebherr arctic kit (with warm-up instruction)

Fans speed regulation settings

LIEBHERR oil	fans speed regulation setting
Liebherr Hydraulic Plus	"**STANDARD**"
Liebherr Hydraulic Basic 68	"**STANDARD**"
Liebherr Hydraulic Basic 100	"**STANDARD**"
Liebherr Hydraulic HVI	"**COLD**"
Liebherr Hydraulic Plus Arctic	"**EXTRA-COLD**"

Engine oils for hydraulic system

Requirements

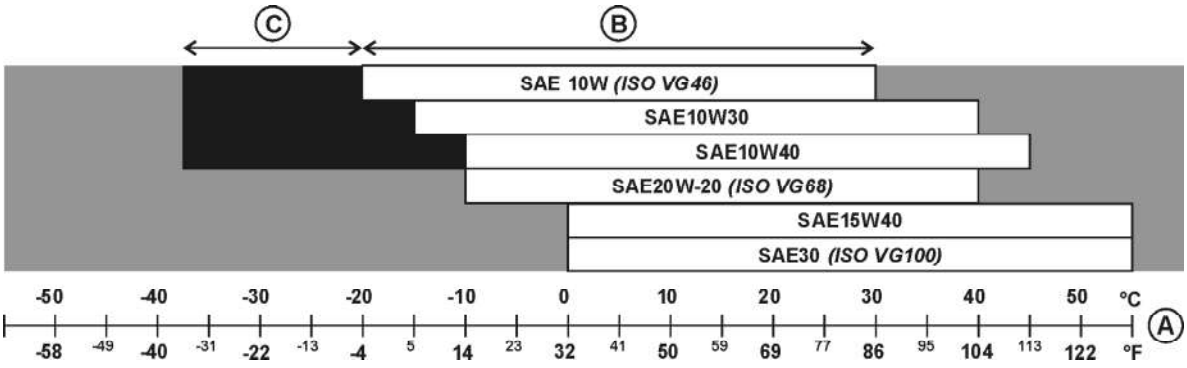

Fig. 5-9 *Engine oils for hydraulic system*

Lubricant	Description / manufacturer
Anti-corrosion grease for open piston rods (cylinders that do not move often or transportation)	Liebherr Cylinder Protect

5.6 Condition monitoring with oil analysis

5.6.1 General information

Oil analysis helps to monitor the main components condition by observing oil chemical and physical properties which can show either the oil contamination by foreign or wear particles, or the degradation of its properties.

Component oil analysis in accordance with the recommended procedures, intervals and specifications and the records of a component oil analysis are strongly recommended because this will support any warranty claim raised upon LIEBHERR.

By comparing the oil properties and contaminants to reference levels and even more by observing their trends over a period of operation, it is possible to optimize the component lifetime, possibly to prevent further damage (preventive exchange) and potentially to reduce rebuild and maintenance costs.
An oil analysis will give an indication of the component condition. But the measured values and their trend over a period of operation need always to be interpreted in relation to the machine operating conditions and to events such as services, top-up, component change-out, etc.
The interpretation of the analysis results need also to be compared to samples of the new oil. Therefore, new oil needs to be analysed twice a year and when changing to another oil supplier.

This procedure is applicable for these components:

- splitterbox(es)
- swing gears
- travel gears (not on pontoon machines)
- hydraulic oil
- Diesel engine(s) (not on electrical machines)

These parameters must be monitored:

- iron level
- copper level
- silicon level
- water content
- viscosity change
- additives change (e.g. Ca, Mg, B, Zn, P, Ba or S)

5.6.2 Oil sampling

Sampling intervals

- For each component, get an oil sample according to the Control and maintenance

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Hydraulic oil

Component	Parameter	Action level value	Action
Hydraulic oil	Silicon level	15 ppm	Check for entrance of dust (cylinders, breathers...) (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).
	Water content	0,10%	1. If the machine has a bypass filter element with water separator installed, replace the filter. – If not available, use an external filtration system until you get a satisfactory range. – If not available, change oil. 2. Get a sample again after 250 hours. If the results are still out-of-range: – Use an external filtration system until you get a satisfactory range. – If not available, change oil.
	Particle Quantification (PQ Index)	50	1. Change the return filters, pilot oil filters, leak oil filters and replenishing filters. 2. Get a sample again after 250 hours. If the results are still out-of-range: – Use an external filtration system until you get PQ Index < 20 or less. – If not available, change oil.
	Cleanliness level (ISO 4406)	21/19/16	1. Change the return filters, pilot oil filters, leak oil filters and replenishing filters. 2. Get a sample again after 250 hours. If the results are still out-of-range: – Use an external filtration system until you get contaminant code 20/18/15 or less. – If not available, change oil.

(*) Difference compared to new oil value.

Diesel engine

Component	Parameter	Action level value	Action
Diesel engine	Please contact your engine manufacturer local representative.		

5.8.3 Air filter

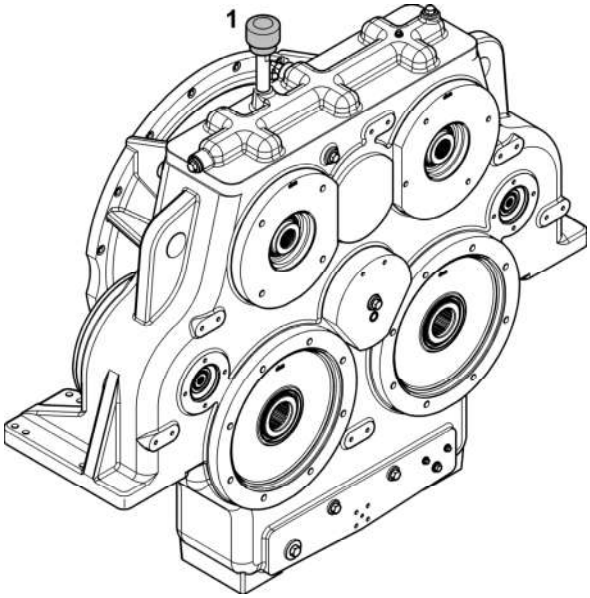

Fig. 5-30 *Breather on splitterbox*

The air filter in the splitterbox breather **1** must be checked, cleaned and changed regularly.

To clean the air filter:

- ▶ Open breather **1** by pushing it and turning it ¼ turn.
- ▶ Remove filter from breather housing.
- ▶ Check filter condition and clean it with fuel.
- ▶ Reinstall filter in breather housing.
- ▶ Close breather **1**.
- ▶ For check, clean and change intervals, see maintenance schedule.

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Replace the filter elements

On the preliminary filter

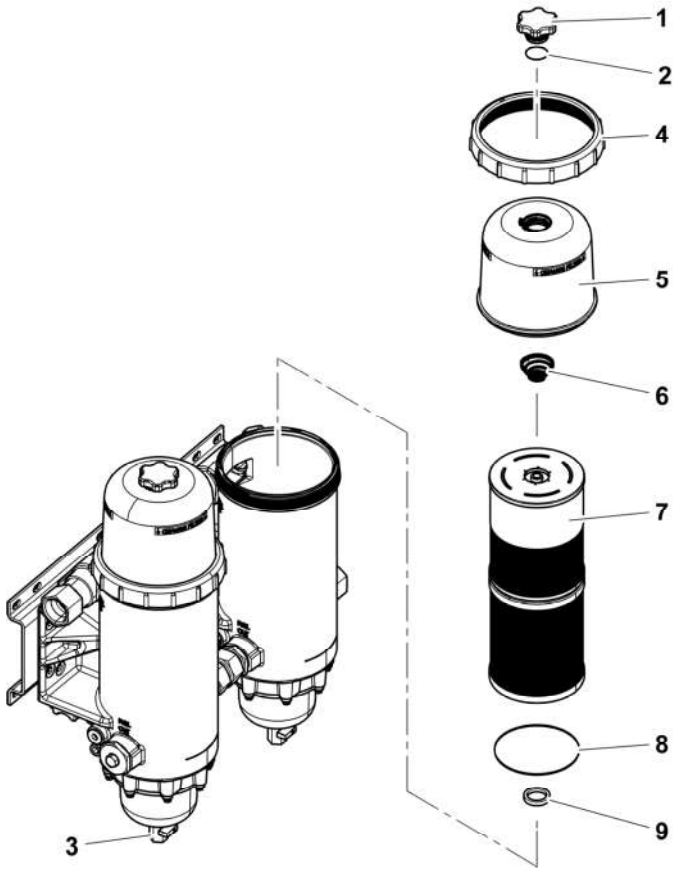

Fig. 5-40 *Filter element on preliminary filter*

1 Vent cap
2 O-ring
3 Drain valve
4 Collar
5 Bell
6 Spring
7 Filter element
8 O-ring
9 Seal

- ▶ Stop the Diesel engine.
- ▶ Close the fuel shutoff valve.
- ▶ Put an applicable container under the filter.
- ▶ Remove the vent cap **1**.
- ▶ Remove the vent cap O-ring **2** and discard it.
- ▶ Open the drain valve **3** and drain the fuel into the container.
- ▶ Close the drain valve **3**.
- ▶ Loosen the collar **4** and remove it.
- ▶ Remove the bell **5**, the spring **6** and the filter element **7**.
- ▶ Remove the O-ring **8** and the seal **9** and discard them.

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Drain the air tanks

▶ Push the pin at the bottom of the drain valve **4**.

5.13.4 Air compartment

The hydraulic tank has an air compartment which increases the air volume available for the compressed air system. Remaining oil can condense in this air compartment.

The remaining oil must be drained from the air compartment at regular intervals.

▶ For maintenance intervals, refer to the control and maintenance chart.

Drain the air compartment

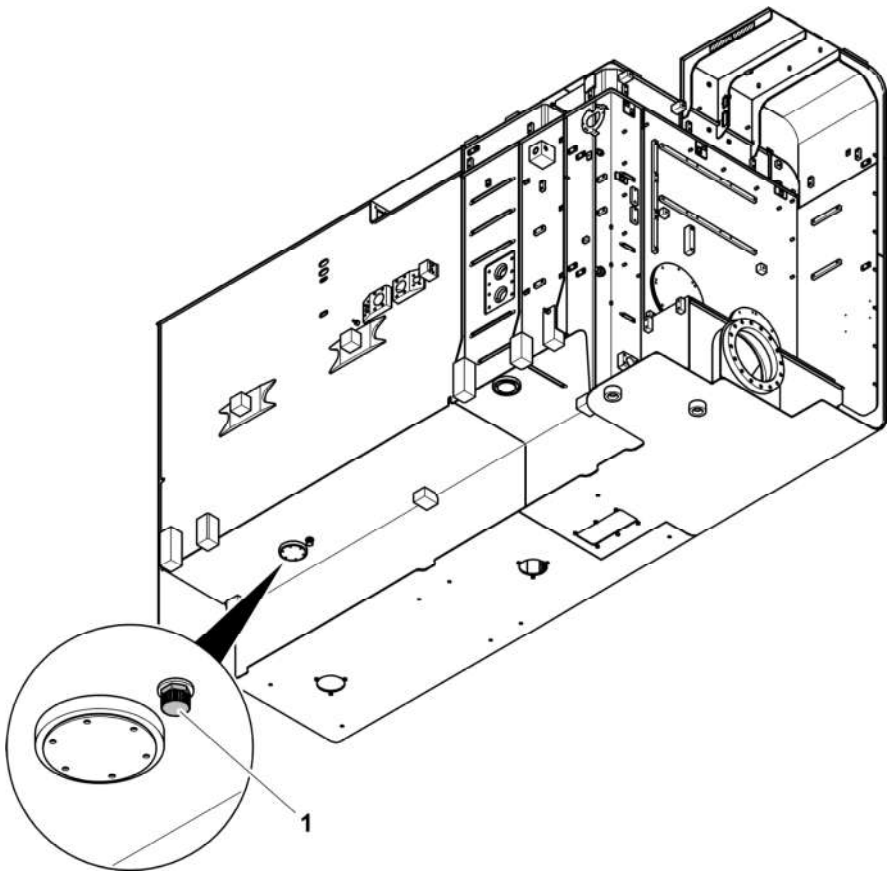

Fig. 5-49 *Drain plug for the air compartment*

1 Drain plug

▶ Stop the Diesel engine.

▶ Open the tank pressure release valve to release the pressure from the hydraulic system.

▶ Put an applicable container under the drain plug **1**.

▶ Remove the cap from the drain plug **1**.

1 Return-line filters
11 Leak oil filter

▶ Clean the magnetic rods of the filters according to intervals given in the control and maintenance chart.

▶ Change the filter insert according to intervals given in the control and maintenance chart.

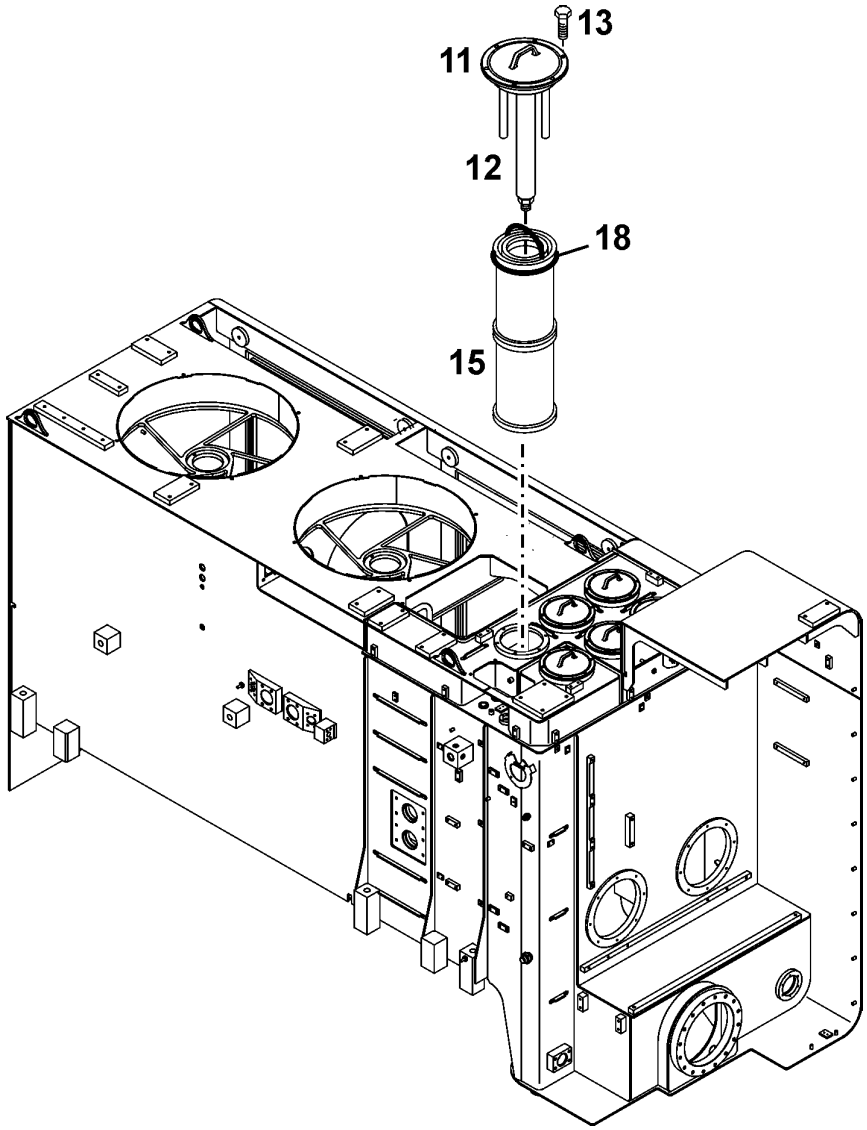

Fig. 5-62 *Filter assembly*

11 Cover
12 Magnetic rod
13 Fixing parts
15 Filter element
18 O-ring

To clean the magnetic rod and replace the filter element:

▶ Loosen the fixing parts **13** and lift out cover **11** and magnetic rod **12**.

▶ Carefully clean off any dirt sticking to the magnetic rod **12**.

5.15.14 Oil cooler protection filters (optional)

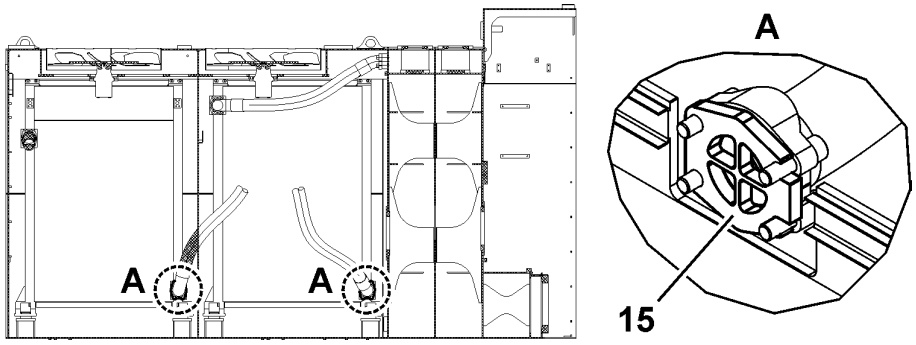

Fig. 5-71 Oil cooler protection filter

Protection filters **15** can be installed between the valve bank and the oil cooler in order to reduce the impact on the operating conditions of the excavator in case of possible hydraulic component failure.

- ▶ Check and clean filters regularly.
- ▶ Check filters in case of hydraulic component failure.
- ▶ Change filter in case of impact or mesh rupture.
- ▶ For maintenance intervals, see control and maintenance chart.

Caution!
If filters maintenance isn't correctly carried out, filters clogging due to regular operation of the excavator could lead to following risks:

- cooling capacity drop,
- negative impact on oil quality.

To check or change a filter:

- ❑ Shutoff valve between hydraulic tank and pumps must be closed.
- ▶ Use a vacuum pump connected to the hydraulic tank in order to minimize oil loss.

Note!
During maintenance operation, if one or several filter(s) is/are defective and if no replacement filter is available, the excavator can still be operated with one or several filter(s) missing. This until delivery of a new filter.

- ❑ Make sure to always have sufficient operational filter in order to reduce maintenance time.

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Oil change on Lifetime sealing interspace

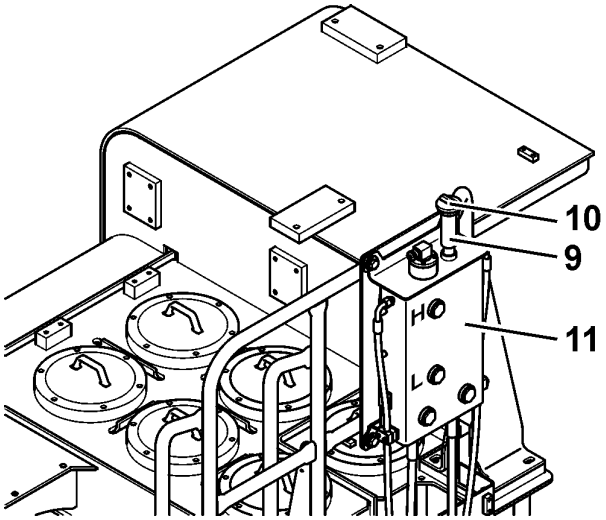

Fig. 5-79 *Interspaces oil expansion tank*

9 Filler tube
10 Sealing cap
11 Expansion tank

Caution!
For the Lifetime sealing interspaces and related expansion tank, always use the same oil as used to fill the hydraulic tank.

To drain the oil:

- ❑ Make sure you have a suitable oil drain container at your disposal.
- ▶ Remove sealing cap **10**.
- ▶ Remove drain plug **3**.
- ▶ Drain the oil into a suitable container.
- ▶ Reinstall both plug **3** and cap **10**.

To flush the Lifetime sealing interspace:

- ❑ Make sure that you have an used oil container.
- ❑ Make sure that you have a hand pump.
- ❑ Make sure that you have a flushing device.
  Liebherr recommends that you use the Lifetime Interspace Flushing Device (contact the Customer service).

Caution!
Use of an incorrect tool!
Risk of damage to the travel gear.

The flushing device must have a safety valve which must be set to 3 bar.

The flushing device must have a 10 µm filter for the filling with new oil.

- ▶ Remove the hydraulic hose from the filling plug **4** and put a plug on the open end

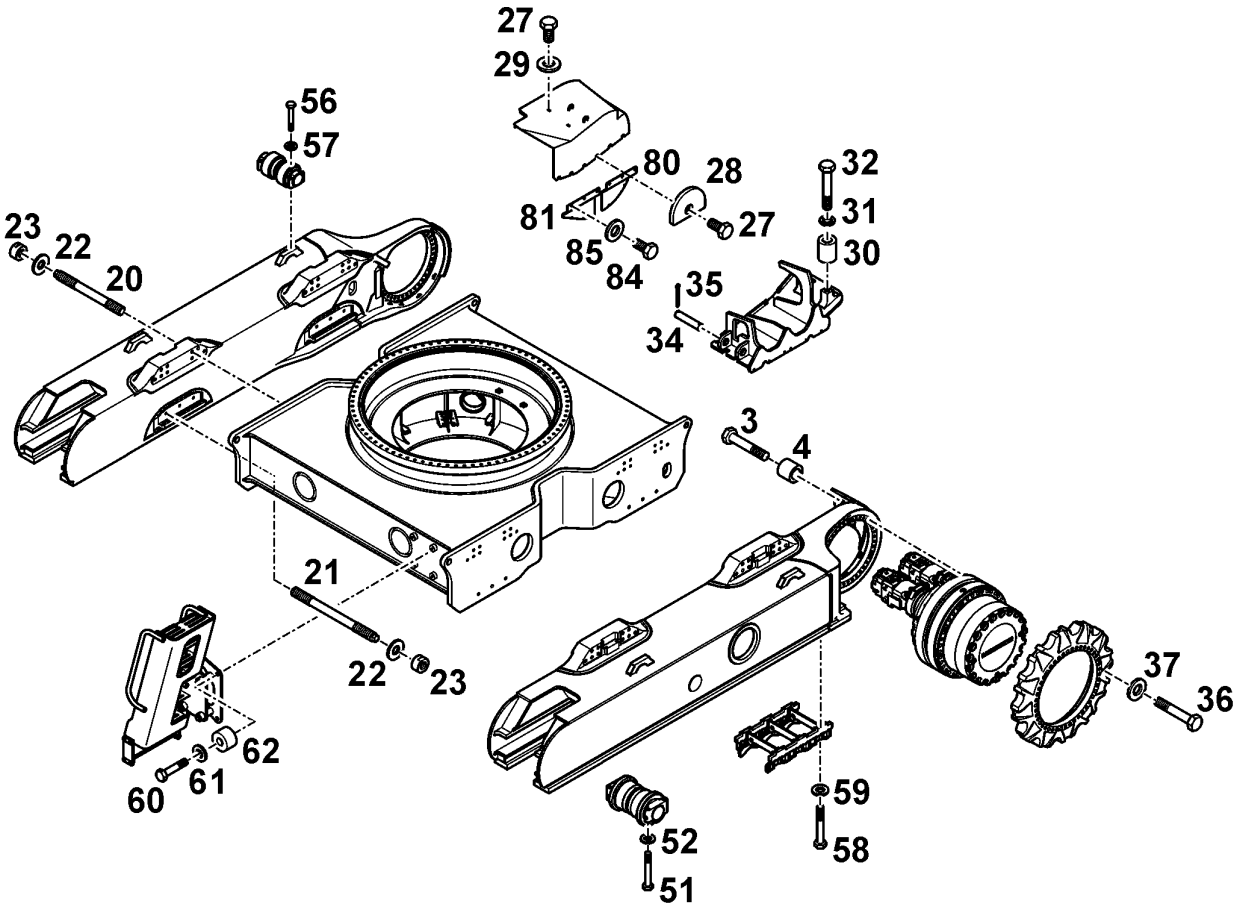

Fig. 5-86 *Undercarriage mounting screws*

3	Hex. head screw M36 3340 Nm	**37**	Washer
4	Space sleeve	**51**	Hex. head screw M36 3340 Nm
20	Stud	**52**	Washer
21	Stud	**56**	Hex. head screw M30 1920 Nm
22	Washer	**57**	Washer
23	Protection nut	**58**	Hex. head screw M33 2575 Nm
27	Hex. head screw M20 560 Nm	**59**	Washer
28	Washer	**60**	Hex. head screw M24 965 Nm
29	Washer	**61**	Washer
30	Bushing	**62**	Bushing
31	Washer	**80**	Cover
32	Hex. head screw M42 4975 Nm	**81**	Cover
34	Pin	**84**	Hex. head screw M20 560 Nm
35	Split pin	**85**	Washer
36	Hex. head screw M36 3340 Nm		

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5.19.4 Electrical components location

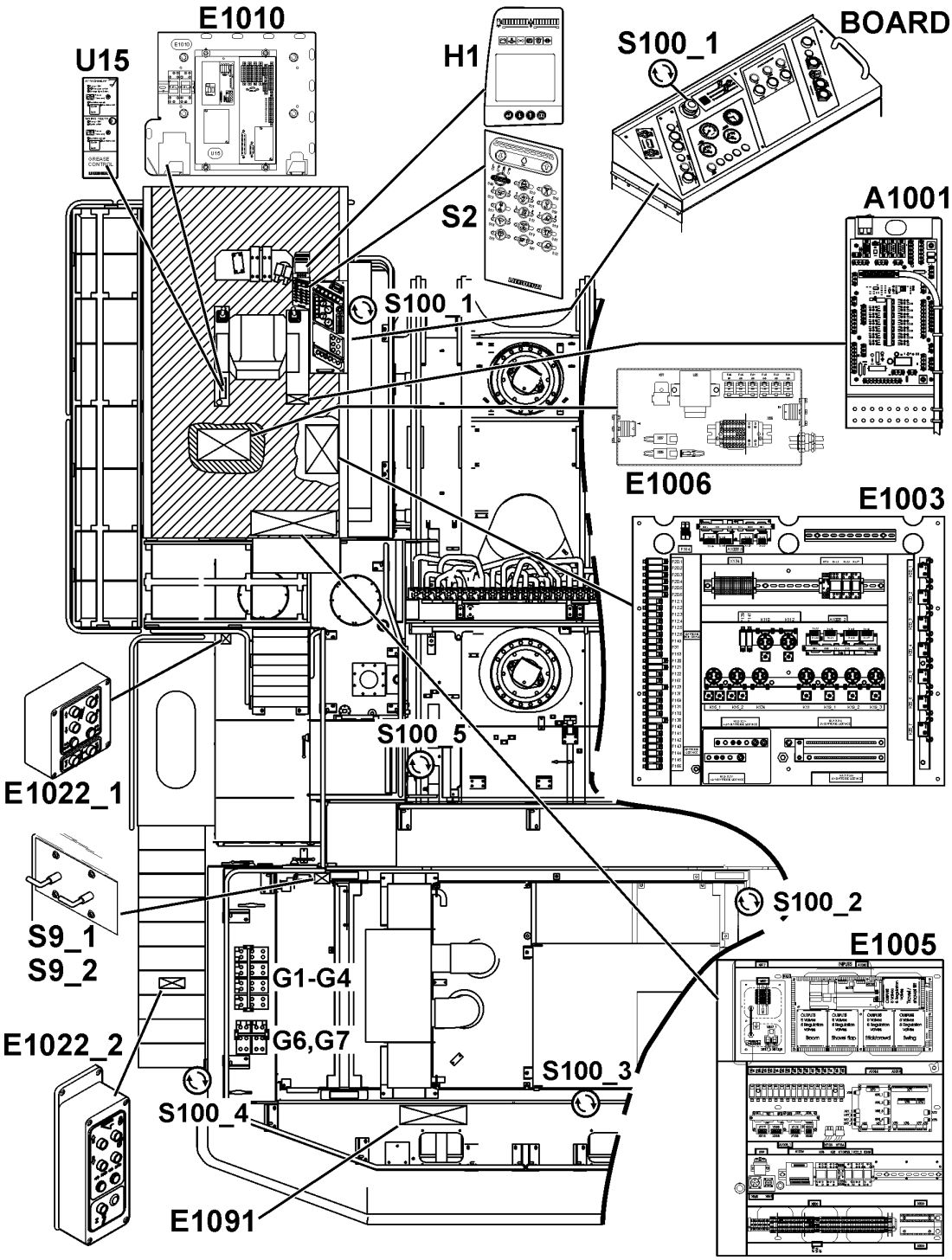

Fig. 5-96 *Electrical components location*

A1001 ESP01 Platine
E1003 Power connection box
E1005 Cabin connection box
H1 Display
S2 Keyboard
S9_1 Engine battery switch

5.21.3 Fuel tank mounting bolts

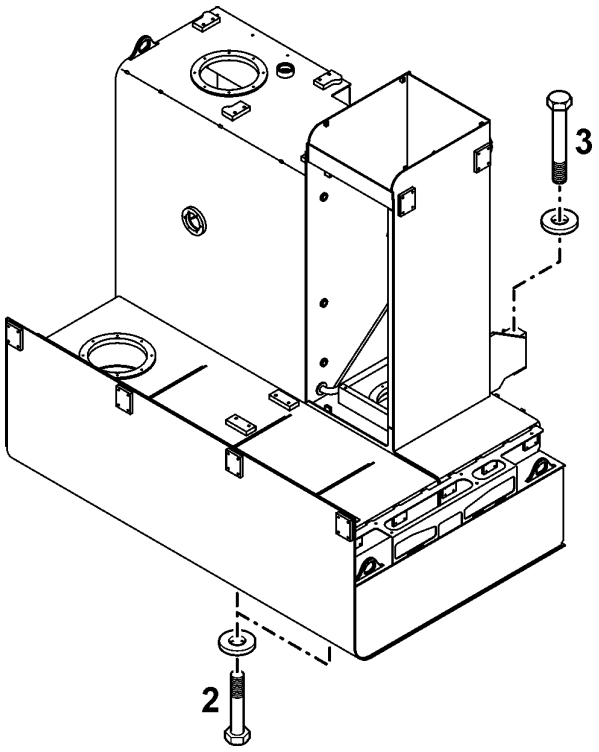

Fig. 5-107 *Fuel tank bolts*

		Torque	Quantity
2	Bolt M30x240	1920 Nm	4
3	Bolt M30x300	1920 Nm	3

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Detailed Check

– An intensive examination of a specific item, installation or assembly to detect damage, failure or irregularity. This examination may require the use of specialized inspection techniques and/or equipment. Surface cleaning and elaborate access may also be required.

5.24.2 How to use the maintenance chart

The following maintenance chart is split in 5 individual check lists:

– a daily,
– a 250 hours,
– a 500 hours,
– a 1000 hours,
– and a 2000 hours.

Intervals:

– daily,
– 250 hours, 750 hours, 1250 hours, 1750 hours, ...
– 500 hours, 1500 hours, 2500 hours, 3500 hours, ...
– 1000 hours, 3000 hours, 5000 hours, 7000 hours, ...
– 2000 hours, 4000 hours, 6000 hours, 8000 hours, ...

Examples:

At 750 hours you must follow the 250 hours maintenance chart.

At 2500 hours you must follow the 500 hours maintenance chart.

At 3000 hours, you must follow the 1000 hours maintenance chart.

At 6000 hours, you must follow the 2000 hours maintenance chart.

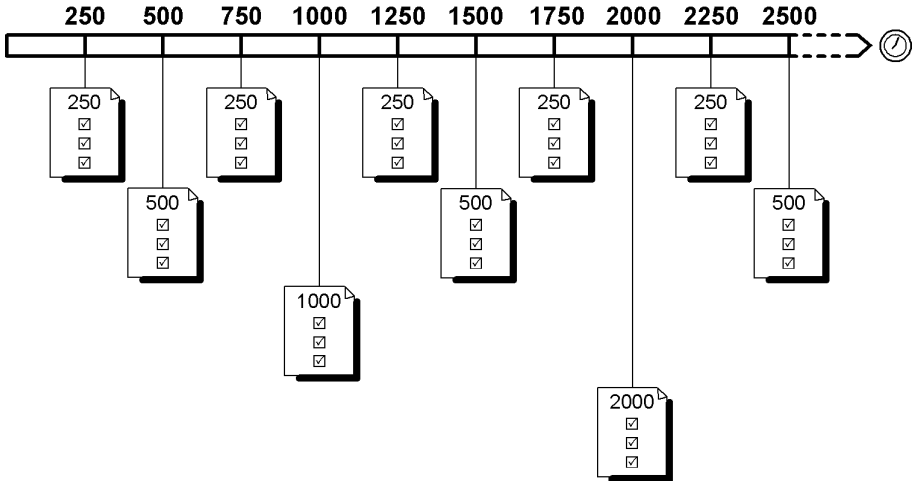

Fig. 5-115 *How to use the check lists (in addition to the daily maintenance)*

WORK TO BE PERFORMED AT 250, 750, 1250 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
Clean magnetic rods of all return filters	❍		
ELECTRICAL SYSTEM			
Press to open dust discharge valve on aeration devices for cabin and electrical boxes	❍		
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	❍		
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	❍		
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	❍		
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 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	❍		

WORK TO BE PERFORMED AT 500, 1500, 2500 HOURS, ... Check ❑ for first and only interval *or* Check ❍ for repeat interval	Check	Initials	Comments
General comments:			

Tab. 5-12 *500 Hours maintenance schedule - R 9400*

5.24.7 2000 Hours Maintenance Schedule - R 9400

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

WORK TO BE PERFORMED AT 2000, 4000, 6000 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	❍		
Track components: Do a detailed check for missing, broken or loosen mounting screws of the rollers, pins locking and track guides, tighten the screws	❍		
Track components: Do a detailed check for missing, broken or loosen mounting screws of the idler axis locking keys, tighten the screws	❍		
Track components: Do a detailed check for missing, broken or loosen mounting screws of the track pads, tighten the screws	❍		
Travel gear: Do a detailed check for missing, broken or loosen mounting screws of the gears, sprocket wheels and hydraulic motors, tighten the screws	❍		
Undercarriage: Do a detailed check for missing, broken or loosen mounting screws of the side frames, tighten the screws	❍		
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	❍		
Attachment: Do a detailed check for missing, broken or loosen mounting screws of the handrails, pin covers fastening and greases connections, tighten the screws	❍		
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	❍		

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6.2 Cleaning procedure for hydraulic circuits

This section gives the procedures to drain and clean the different hydraulic circuits of the machine after a repair and before you put the machine back in operation.

6.2.1 Preface

Note!
These instructions have been written for the **maintenance personnel** of the machine.
The activities described in this section may only be carried out by specially trained personnel.

The instructions are to be read and used carefully by all persons who carry out work with or on the machine before putting the machine into service for the first time and later, at regular intervals or after a repair.

The instructions must be completed by information on current national regulations for accident prevention and protection. In addition, authorized specialist rules for safe and correct working procedures are also to be observed.

However, should you require any further explanations or information, LIEBHERR technical documentation, sales school and customer service departments are available for your convenience.

Danger!
Fluid injection injuries have to be treated immediately!

- Fluid under pressure can cause serious injury. It can be almost invisible when it escapes from a pinhole and it can go through the skin and contaminate the blood.
- Do not touch a pressurized hydraulic hose assembly with any part of your body.
- If a fluid-injection accident occurs, medical treatment is necessary immediately.
- Stay out of hazardous areas while testing hose assemblies under pressure. Use available safety protection.
- Refer to "Isolate machine for hydraulic repair" safe work procedure in the Service Manual.

6.2.2 General information about hydraulic oil contamination

Hydraulic oil contamination

Hydraulic oil contamination is unwanted liquid or solid material and/or particles in the hydraulic circuit. It can be caused by:

- The failure of components like pumps, hydraulic motors or cylinders
- Too much wear of a component
- Material/particles introduced during:
  - The general maintenance
  - A repair work
- Hydraulic circuit not cleaned on previous maintenance work (too much remaining contamination in the hoses and pipes).

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▶ Open, drain and clean the collecting pipe **CP3**.

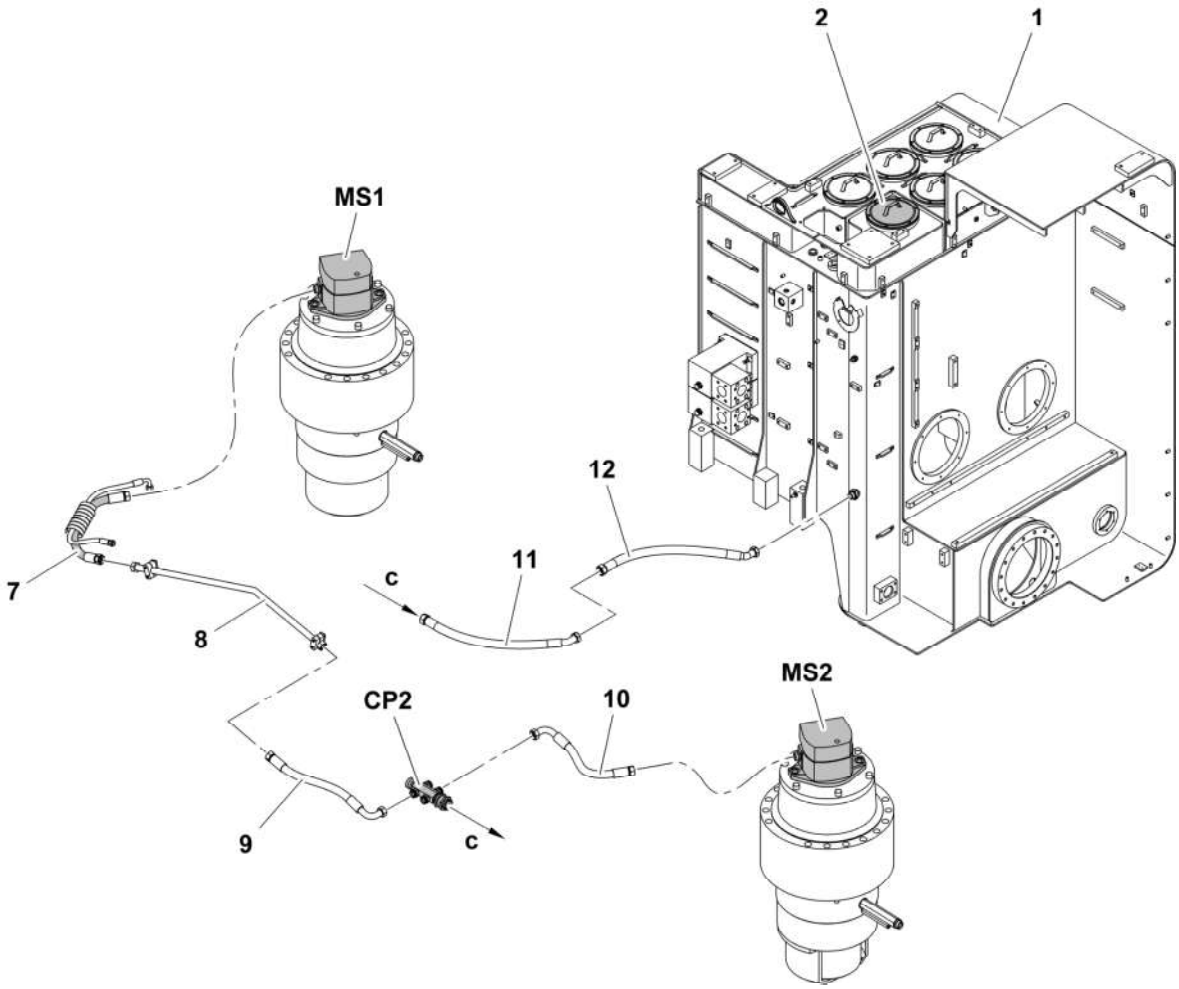

Fig. 6-14 *Leak oil hoses on swing motors*

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

▶ Disconnect, drain and clean the hoses **7**, **9**, **10**, **11**, **12** and the pipe **8**.

▶ Open, drain and clean the collecting pipe **CP2**.

▶ Move to next section about the working pressure circuit.

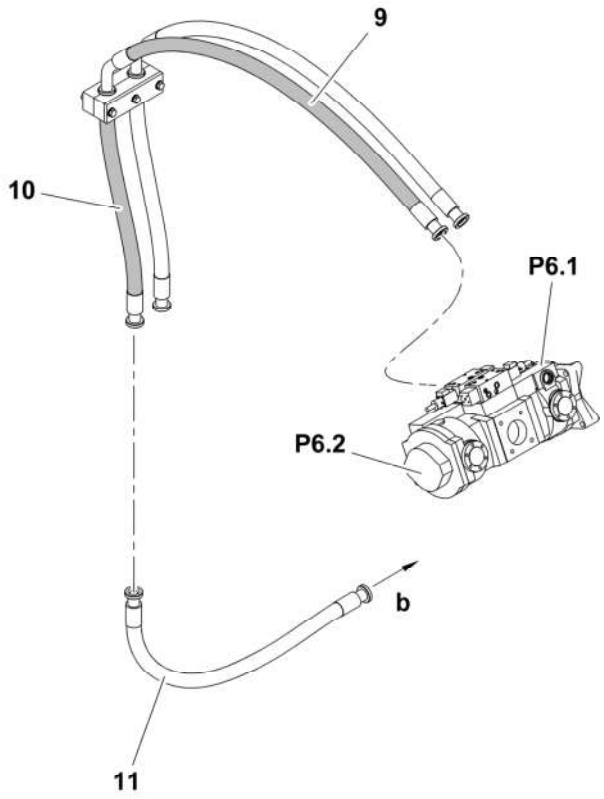

Fig. 6-24 *Working pressure lines for oil fan motors*

9	Hydraulic hose	**P6.1**	Water cooler fan pump
10	Hydraulic hose	**P6.2**	Oil cooler fan pump
11	Hydraulic hose		

▶ Disconnect, drain and clean the hydraulic hoses **9**, **10**, **11**.

3	Hydraulic pipes installed on the bucket 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
8	Hydraulic hose	**DBT**	Distribution block for bucket tilt cylinders
9	Hydraulic hose		

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

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2	Valve bank	**13**	Hydraulic pipe
3	Hydraulic pipes installed on the boom cylinders	**14**	Hydraulic pipe
4	Hydraulic lines installed on the boom	**15**	Hydraulic pipe
5	Hydraulic hose	**16**	Hydraulic pipe
6	Hydraulic hose	**17**	Hydraulic pipe
7	Hydraulic hose	**18**	Hydraulic pipe
8	Hydraulic hose	**19**	Hydraulic pipe
9	Hydraulic hose	**20**	Hydraulic pipe
10	Hydraulic hose	**DBB**	Distribution block for boom cylinder
11	Hydraulic hose		

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

6.2.10 Hydraulic tank

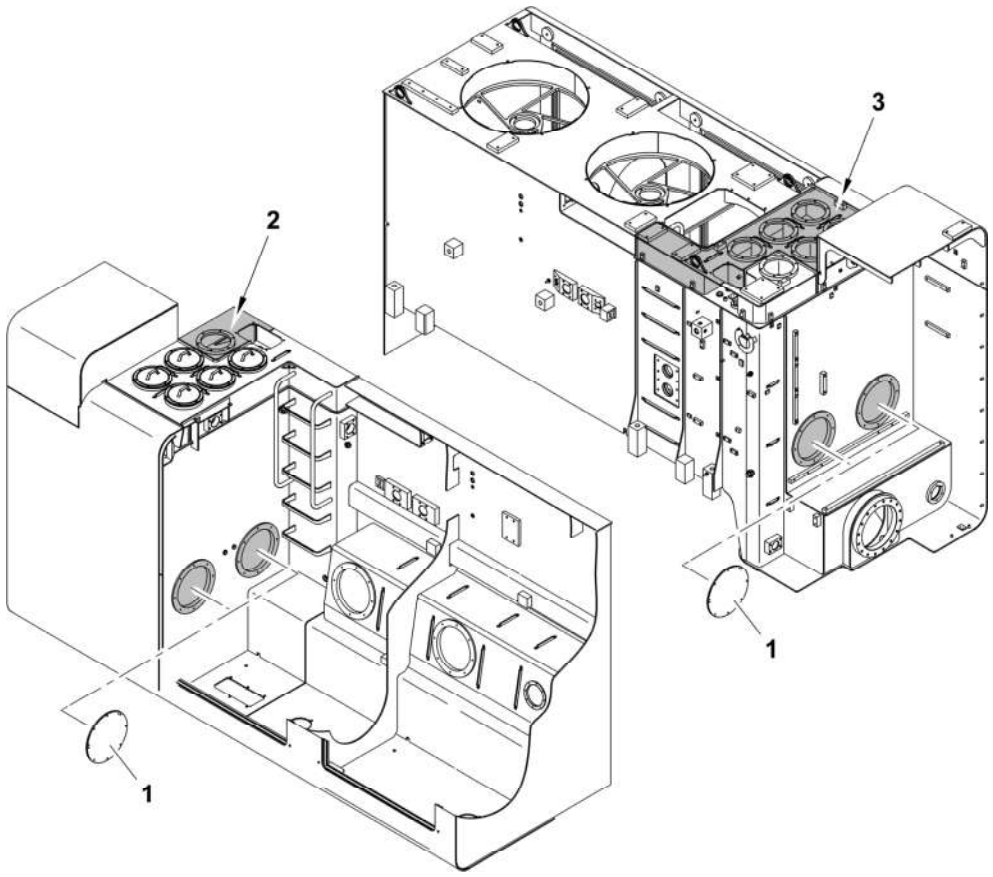
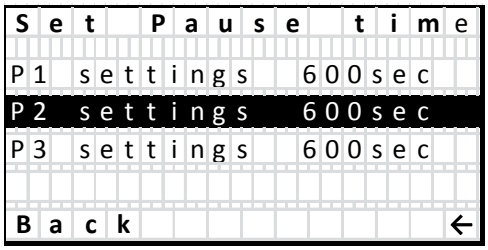
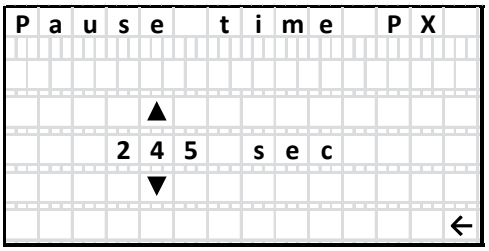


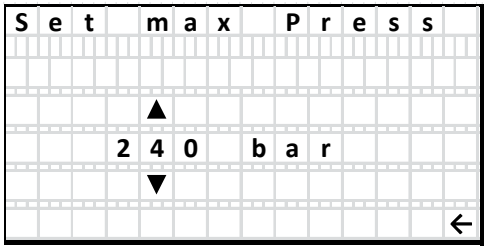
Fig. 6-41 *Hydraulic tank cleaning*

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

1.5 Warranty

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

1.6 Copyright

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3 Safety recommendations to be complied with

3.1 General behaviour when handling the system

- The centralized lubrication system, pump or single components may be used only 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/ operation must be clarified. Operation is prohibited until issues have been clarified.
- Keep unauthorized persons away from the centralized lubrication system.
- Precautionary operational measures and instructions for the respective work must be observed.
- Responsibilities for different activities must be clearly defined and observed. Uncertainty seriously endangers safety.
- Safety-related protective and emergency devices must not be removed, modified or affected otherwise in their function and are to be checked at regular intervals for completeness and function.
- Remedy occurring faults in the frame of responsibilities. Immediately inform your superior in the case of faults beyond your competence.
- Do not reach into the system during operation.
- Wear personal protective equipment always.
- When handling lubricants observe the relevant safety data sheets and operating instructions by the lubricant manufacturer or supplier.
- Never use parts of the centralized lubrication system or of the machine as standing or climbing aids.

3.2 Explosion protection

- Always behave so that fire and explosion hazards are avoided.
- A written work approval from the operator is required prior to working in potentially explosive areas.
- There must be no indications that parts of the explosion protection are missing or are not working. Should such indications become apparent, switch off the machine and inform a superior without delay. Keep unauthorized persons away.
- Measures for explosion protection must never be deactivated, modified or bypassed.
- It is forbidden to bring in ignition sources such as sparks, open flames and hot surfaces in potentially explosive areas.
- Check the machine at regular intervals for damage which may represent an ignition risk.
- The ignition temperature of the lubricant must lie at least 50 K over the maximum admissible surface temperature of the components.
- Only use tools and clothing which are permitted for use in potentially explosive areas (ESD).
- Transport, installation, repairs and work on electrical components may only be carried out, if it has been ensured that the atmosphere is not potentially explosive.

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6 Standard operation

6.1 Daily start-up

Below find the activities to be carried out in case of standard operation.

6.2 Inspections

With regard to the actions listed below "Inspections prior to commissioning" the operator has to determine adequate control intervals depending on the respective operating situation of the pump or centralized lubrication system.

6.3 Filling of the reservoir during operation

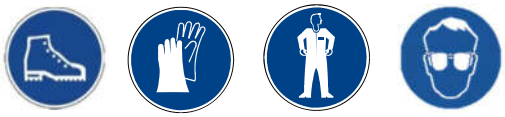
Fill the reservoir as described in chapter "Installation and commissioning".

6.4 Cleaning

Execution, required protective clothes, cleaning agents and devices following the valid operational regulations of the operator.

DANGER

Danger to life
Risk of fire and explosion when using inflammable cleaning agents. Do not use steam jet or high pressure cleaners. 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. Wear personal protective equipment always.



Exterior cleaning

- Thorough cleaning of all surfaces.
- Mark and secure wet areas.

Interior cleaning

- Normally, interior cleaning is not required.

ATTENTION

Risk of damage to the machine
If using solvents for cleaning, ensure compatibility with plastic parts and painting. Do not use polar organic solvents such as alcohol, methanol or acetone.

9.2.3 Single-line system

The single-line system consists of a pump to supply lubricant under pressure to the injector metering devices via the supply line. The injector metering devices deliver lubricant to a secondary (progressive) metering device or to the bearing through feed lines.

The lubrication cycle is initiated by an automated pump. The injectors have indicator stems, which move in and out to indicate that they have been cycled.

A controller will control the automated system.

The time between on cycles and the length of off cycles is adjustable. The controller includes the timer function above with a monitor function and alarm capability. A pressure switch is used to indicate when system pressure has been reached to turn off the pump and verify that a lube cycle has been completed. If the pressure switch does not detect full pressure within a preset period of time, the controller goes into alarm state.

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