en

Operating instructions

Hydraulic excavator
EP 954 C

from serial number 28 882

Document identification

ORIGINAL OPERATING INSTRUCTIONS

Order number: 10361868
Edition: 03 / 2013
Valid for: EP 954 C from serial number 28 882
Author: LFR - Technical documentation department

Product identification

Manufacturer: Liebherr-France SAS
Type: EP 954 C
Type no.: 1326 / 1431

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LFR/en/Edition: 03 / 2013

LIEBHERR

1.1.3 Uppercarriage

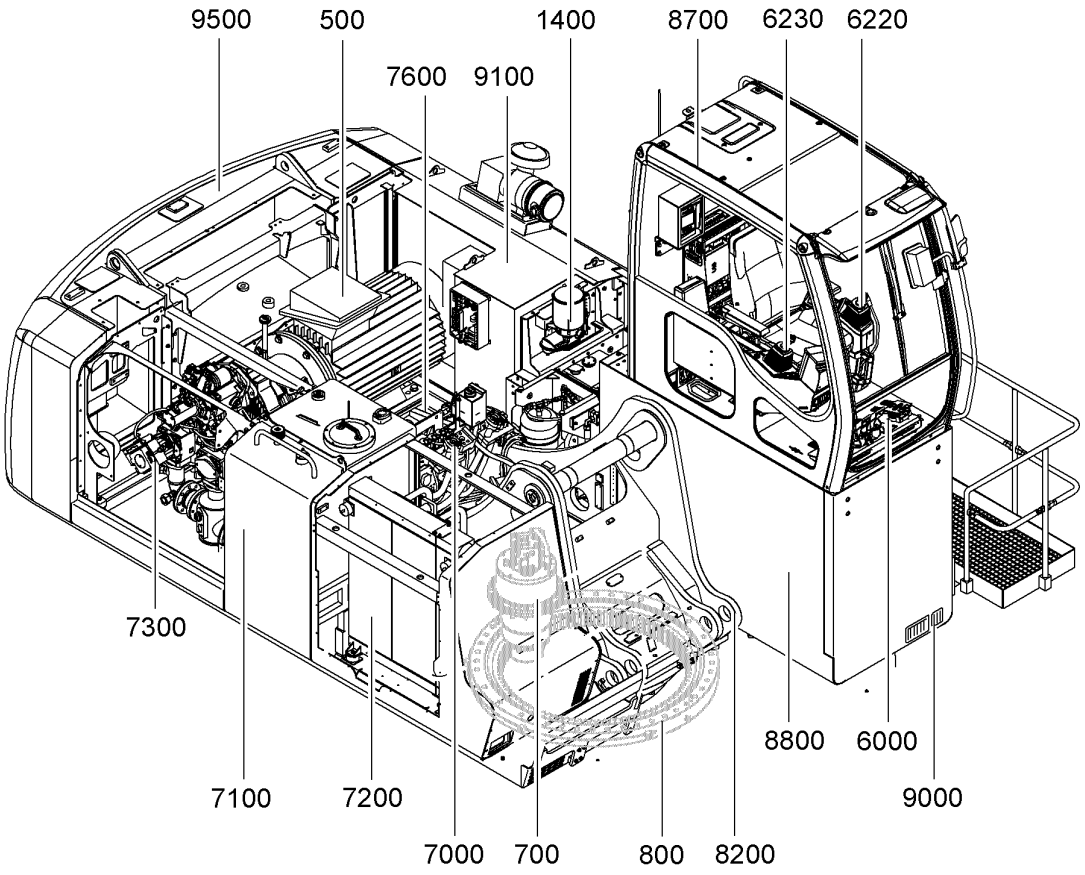

Fig. 1-3 *Uppercarriage*

500 Electrical motor
700 Swing gear installation
800 Swing ring installation
1400 Centralized lubrication system
6000 Control cab
6220 Control panel, left
6230 Control panel, right
7000 Hydraulic installation
7100 Hydraulic oil tank
7200 Radiator box
7300 Hydraulic pumps
7600 Control valve block
8200 Slewing platform
8700 Cab
8800 Cab elevation
9000 Electrical installation
9100 Electrical box
9500 Counterweight

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Reliability

Backed by more than 30 years experience in the construction of electrically powered excavators, Liebherr designed the new EP 934 C, EP 944 C and EP 954 C with the aim of providing top performance whatever the challenge might be. The structure of the excavator, using components from our own manufacture for the electric drive, has been completely rethought, and so moves away from simply being an adaptation of the diesel-engine excavator.
Being intended for key functions in the organization of industrial sites, Liebherr electric Material Handlers provide a very high level of reliability. The service life of the hydraulic components has also been increased thanks to the smoother movement of the electric drive.
The concept of the single actuator (one single electric motor for all the hydraulic functions) allows for the risk area associated with the low voltage at the electric cabinet to be reduced even further.

Electrical system

Totally integrated into the structure of the uppercarriages and accommodated in a metal container, the electric cabinet provides a three-fold level of protection to the components of the electrical system:
- Mechanical (insulation from vibrations and from the possible impact of falling objects)
- Heat (maintains a constant temperature thanks to the heating resistors which prevent corrosion from condensation)
- Electrical earthing of the structure and disconnection from current is controlled from the cab by way of a motorised circuit-breaker.

Protected electric cabinet

The electric cabinet, like the rotating joint, provides IP55 class protection. A double filtration system (accessible from the outside) places the cabinet under pressure, which avoids any dust penetration and, with permanent ventilation, ensures the thermal balance of all the components.

Electric motor

Liebherr electric excavators are equipped with motors especially designed for really tough applications. The dimensions of the motor allow for the full power to be drawn from the kinematic chain, and so maximises the performance of the machine. The motor can resist a momentary overload of up to +25 % of its rated capacities.
Protected against penetration by water and dust, its properties correspond to protection class IP55.
The temperature of the roller bearings and other bearing elements is constantly monitored, and, in the event of overheating, the operator is warned of malfunction on the console at the driving position.

Cooling system

- Generous dimensions for high cooling capacity
- Vertical arrangement for increased efficiency and minimal incursion of foreign bodies
- Powered by a thermostatically regulated hydraulic motor
- Hinged to allow for complete cleaning
- Reversible actuation of the fan (without time limit) as option

Elastic base

- Complete range of elastic bases especially designed for each model
- Absorption of mechanical stresses (normally transferred to the chassis of an excavator) if mounted on a rigid structure (anchored metal body, concrete body)
- Protection for the machine (in particular the elements of the rotation assembly), as well as for the load-bearing structure, against the axial and radial forces generated by the operating dynamics

Lift Capacities

with Industrial-Type Gooseneck Boom 9.60 m

Industrial Stick 9.00 m (Variant 3D)

m	Under-carriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		10.5 m		12.0 m		13.5 m		15.0 m		16.5 m		18.0 m		19.5 m		21.0 m				m
21.0	Ponton																													
19.5	Ponton																													
18.0	Ponton																													
16.5	Ponton																											3.8*	3.8*	9.96
15.0	Ponton											4.6*	4.6*															3.4*	3.4*	11.90
13.5	Ponton													4.3*	4.3*													3.2*	3.2*	13.39
12.0	Ponton													4.2*	4.2*	4.1*	4.1*											3.0*	3.0*	14.57
10.5	Ponton													4.2*	4.2*	4.0*	4.0*	3.6*	3.6*									2.9*	2.9*	15.51
9.0	Ponton													4.2*	4.2*	4.0*	4.0*	3.9*	3.9*									2.9*	2.9*	16.26
7.5	Ponton											4.6*	4.6*	4.3*	4.3*	4.1*	4.1*	3.9*	3.9*	3.4*	3.4*							2.9*	2.9*	16.84
6.0	Ponton											4.8*	4.8*	4.5*	4.5*	4.2*	4.2*	4.0*	4.0*	3.8*	3.8*							2.9*	2.9*	17.27
4.5	Ponton									5.7*	5.7*	5.2*	5.2*	4.7*	4.7*	4.4*	4.4*	4.1*	4.1*	3.8*	3.8*							2.9*	2.9*	17.56
3.0	Ponton					8.7*	8.7*	7.2*	7.2*	6.2*	6.2*	5.5*	5.5*	5.0*	5.0*	4.5*	4.5*	4.2*	4.2*	3.9*	3.9*							3.0*	3.0*	17.72
1.5	Ponton	8.3*	8.3*	13.7*	13.7*	10.1*	10.1*	8.1*	8.1*	6.8*	6.8*	5.9*	5.9*	5.2*	5.2*	4.7*	4.7*	4.3*	4.3*	4.0*	4.0*							3.1*	3.1*	17.75
0	Ponton	3.2*	3.2*	9.0*	9.0*	11.2*	11.2*	8.8*	8.8*	7.3*	7.3*	6.2*	6.2*	5.4*	5.4*	4.9*	4.9*	4.4*	4.4*	4.0*	4.0*							3.3*	3.3*	17.65
- 1.5	Ponton	3.1*	3.1*	6.0*	6.0*	12.0*	12.0*	9.3*	9.3*	7.6*	7.6*	6.5*	6.5*	5.6*	5.6*	5.0*	5.0*	4.5*	4.5*	4.0*	4.0*							3.4*	3.4*	17.42
- 3.0	Ponton	3.5*	3.5*	5.5*	5.5*	9.9*	9.9*	9.7*	9.7*	7.9*	7.9*	6.6*	6.6*	5.7*	5.7*	5.0*	5.0*	4.5*	4.5*	3.9*	3.9*							3.7*	3.7*	17.05
- 4.5	Ponton	4.0*	4.0*	5.7*	5.7*	9.0*	9.0*	9.7*	9.7*	8.0*	8.0*	6.7*	6.7*	5.8*	5.8*	5.0*	5.0*	4.4*	4.4*	3.7*	3.7*							3.7*	3.7*	16.54
- 6.0	Ponton			6.0*	6.0*	8.8*	8.8*	9.5*	9.5*	7.8*	7.8*	6.6*	6.6*	5.6*	5.6*	4.9*	4.9*	4.1*	4.1*									3.7*	3.7*	15.87
- 7.5	Ponton					9.1*	9.1*	9.0*	9.0*	7.4*	7.4*	6.3*	6.3*	5.3*	5.3*	4.5*	4.5*											4.4*	4.4*	13.69
- 9.0	Ponton																													
-10.5	Ponton																													

Height | Can be slewed through 360° | In longitudinal position of undercarriage | Max. reach | * Limited by hydr. capacity

The lift capacities are stated in metric tonnes (t) on the lifting gear's stick tip, and can be lifted 360° on firm, level supporting surface. Capacities are valid for 600 mm wide triple grouser pads. Indicated loads are based on ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity (indicated via *). Lifting capacity of the excavator is limited by machine stability, hydraulic capacity and maximum permissible load of the load hook.

According to European Standard, EN 474-5: In the European Union excavators have to be equipped with an overload warning device, a load diagram and automatic check valves on the hoist cylinders, when they are used for lifting operations which require the use of lifting accessories.

Lift Capacities

with Industrial-Type Straight Boom 10.50 m

Industrial Stick 7.80 m (Variant 3B)

m	Under-carriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		10.5 m		12.0 m		13.5 m		15.0 m		16.5 m		18.0 m		19.5 m		21.0 m				m
21.0	Ponton																													
19.5	Ponton																											16.6*	16.6*	4.46
18.0	Ponton							13.8*	13.8*																			11.8*	11.8*	8.51
16.5	Ponton							14.3*	14.3*	13.0*	13.0*	11.1*	11.1*															10.1*	10.1*	10.91
15.0	Ponton									12.4*	12.4*	11.5*	11.5*	10.9*	10.9*													9.2*	9.2*	12.68
13.5	Ponton									12.1*	12.1*	11.2*	11.2*	10.6*	10.6*	10.1*	10.1*											8.6*	8.6*	14.06
12.0	Ponton									12.1*	12.1*	11.2*	11.2*	10.5*	10.5*	9.9*	9.9*	8.9*	8.9*									8.2*	8.2*	15.16
10.5	Ponton									12.3*	12.3*	11.3*	11.3*	10.5*	10.5*	9.9*	9.9*	9.4*	9.4*									8.0*	8.0*	16.04
9.0	Ponton							14.2*	14.2*	12.8*	12.8*	11.6*	11.6*	10.7*	10.7*	10.0*	10.0*	9.4*	9.4*	8.9*	8.9*							7.9*	7.9*	16.74
7.5	Ponton							15.3*	15.3*	13.5*	13.5*	12.1*	12.1*	11.1*	11.1*	10.2*	10.2*	9.5*	9.5*	8.9*	8.9*							7.9*	7.9*	17.28
6.0	Ponton			16.9*	16.9*	19.9*	19.9*	16.6*	16.6*	14.4*	14.4*	12.7*	12.7*	11.5*	11.5*	10.5*	10.5*	9.7*	9.7*	9.0*	9.0*							7.9*	7.9*	17.67
4.5	Ponton			30.5*	30.5*	22.6*	22.6*	18.2*	18.2*	15.4*	15.4*	13.4*	13.4*	11.9*	11.9*	10.8*	10.8*	9.9*	9.9*	9.1*	9.1*							8.0*	8.0*	17.92
3.0	Ponton			6.0*	6.0*	25.3*	25.3*	19.8*	19.8*	16.4*	16.4*	14.0*	14.0*	12.3*	12.3*	11.1*	11.1*	10.0*	10.0*	9.2*	9.2*	8.3*	8.3*					8.1*	8.1*	18.05
1.5	Ponton			2.7*	2.7*	12.3*	12.3*	21.1*	21.1*	17.2*	17.2*	14.6*	14.6*	12.7*	12.7*	11.3*	11.3*	10.2*	10.2*	9.2*	9.2*	8.2*	8.2*					8.2*	8.2*	18.04
0	Ponton			3.0*	3.0*	8.7*	8.7*	21.9*	21.9*	17.8*	17.8*	15.0*	15.0*	13.0*	13.0*	11.5*	11.5*	10.2*	10.2*	9.1*	9.1*							8.1*	8.1*	17.91
- 1.5	Ponton			4.2*	4.2*	8.5*	8.5*	17.6*	17.6*	18.1*	18.1*	15.2*	15.2*	13.1*	13.1*	11.5*	11.5*	10.2*	10.2*	9.0*	9.0*							7.9*	7.9*	17.64
- 3.0	Ponton					9.2*	9.2*	16.4*	16.4*	17.9*	17.9*	15.1*	15.1*	13.0*	13.0*	11.3*	11.3*	9.9*	9.9*	8.5*	8.5*							8.4*	8.4*	16.61
- 4.5	Ponton							16.7*	16.7*	17.3*	17.3*	14.7*	14.7*	12.6*	12.6*	10.9*	10.9*											9.7*	9.7*	14.70
- 6.0	Ponton																													
- 7.5	Ponton																													
- 9.0	Ponton																													
-10.5	Ponton																													

Height | Can be slewed through 360° | In longitudinal position of undercarriage | Max. reach | * Limited by hydr. capacity

The lift capacities are stated in metric tonnes (t) on the lifting gear's stick tip, and can be lifted 360° on firm, level supporting surface. Capacities are valid for 600 mm wide triple grouser pads. Indicated loads are based on ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity (indicated via *). Lifting capacity of the excavator is limited by machine stability, hydraulic capacity and maximum permissible load of the load hook.

According to European Standard, EN 474-5: In the European Union excavators have to be equipped with an overload warning device, a load diagram and automatic check valves on the hoist cylinders, when they are used for lifting operations which require the use of lifting accessories.

- 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:
  - switch off the machine on firm, level ground
  - align the uppercarriage with the undercarriage so that the sprockets locate at the back-end
  - anchor the grab 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.
- Respect all danger and safety instructions.
- For special applications the machine must be equiped with specific safety equipments. Work only if they are mounted and functional.
- Do not carry out any modifications, alterations or conversions to the machine which may affect safety without the express permission of the manufacturer. This also applies for the installation of safety devices and valves and for welding work on load-bearing parts.
- It is forbiden to repair the structure of the cab.
- Not original equipment and component parts or such kind, wich has generaly not been validated by LIEBHERR for installation or extension, has not to be installed or added onto the excavator without previous written agreement of LIEBHERR. Wherefore the necessary technical documentations has to be at LIEBHERR's disposal.

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- Tilt the equipment up and drive up the loading ramp. While doing this, always hold the equipment securely over the loading area, drive very carefully up the ramp and onto the transportation vehicle.
- Rotate the upper structure carefully to the rear and lower the equipment. Due to restrictions during transport on hoe equipment, tilt the arm in and dismantle the bucket during transportation.
- After loading the machine onto the flatbed trailer, the upper structure must be secured facing the undercarriage using the stop bolts (only A devices).
- Secure the undercarriage and the remaining individual parts using chains and blocks to prevent slipping.
- Before you leave the machine, reduce pressure on all pressure lines, remove the ignition key and tilt up the safety lever.
- Lock all cab and panel doors.
- Before transportation, find out all details about the route to be travelled, particularly as they relate to width, height and weight restrictions.
- Pay particular attention when driving under electrical lines and bridges and through tunnels.
- When unloading the machine, take the same amount of care as was taken when it was loaded. Remove all chains and blocks. Start the engine as per the operating instructions. Drive carefully off the trailer's loading area and down the ramp. Hold the working equipment as securely as possible over the ground while doing this. Have a spotter guide you.

2.5 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.

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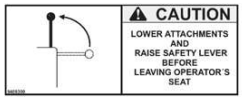
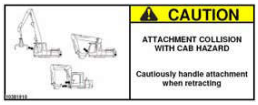
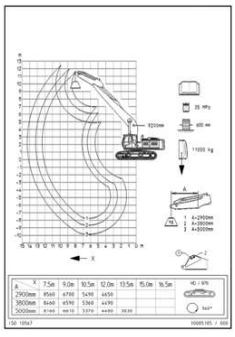
Signs (except for North America)	North America signs	
		**Plate 54: Accident prevention** The accident prevention regulations given in the operating instructions must be carefully followed.
		**Plate 55: Safety lever** Raise safety lever before leaving the operator's seat.
		**Plate 56: Equipment** Work equipment reaches as far as the cab! Caution – work equipment retracted.
		**Plate 60: Sound/power level [truck]** Indicates the sound/power level of the machine to the environment in dB(A). ***XX** = The applicable value for the machine is provided in the operator's cab.
		**Plate 65: Load chart*** Shows the permissible loads at the end of the stick depending on the working radius.
		**Plate 71: Explosion hazard** Indicates that it is vorbidden to smoke or to use an open flame. Explosion hazard is especially important near the batteries when they are being charged.

Caution!
With some specific combinations of optional equipments and/or at customer's wish, the functions may be different.
Always check the functions of special equipments before beginning to work with the machine.

b) optional execution from May 2010:
Joystick levers with proportional mini joystick for additional functions

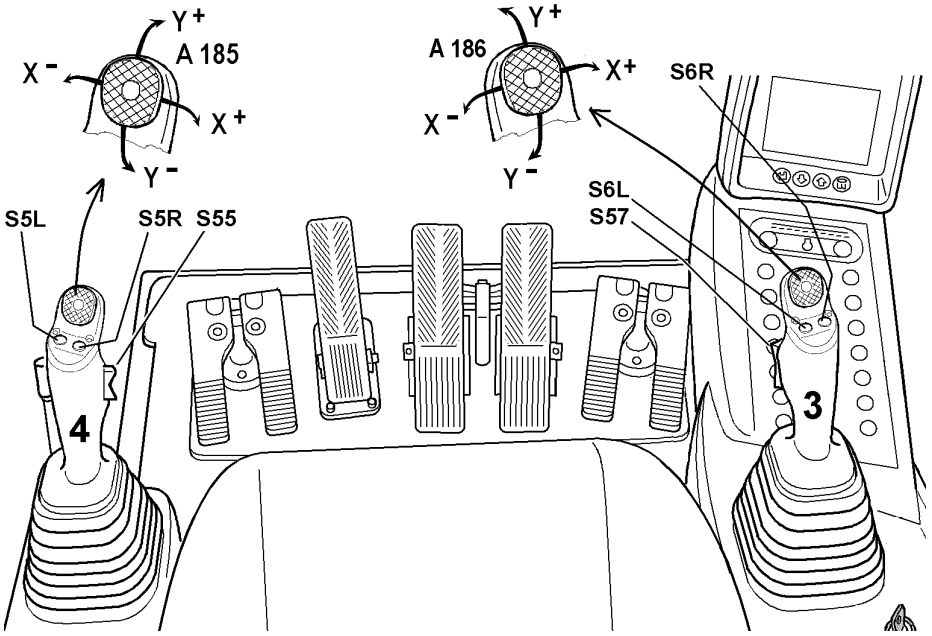


Fig. 3-4 *Control levers with push buttons, switches and mini joysticks*

Button -Switch	Function
Mini joystick **A185** Moved toward **X+**	Rotating device right See in this chapter " control of rotating device (rotating, tilting, locking and unlocking a working tool)".
Mini joystick **A185** Moved toward **X-**	Rotating device left See in this chapter " control of rotating device (rotating, tilting, locking and unlocking a working tool)".
Mini joystick **A185** Moved toward **Y+**	Reserve
Mini joystick **A185** Moved toward **Y-**	Reserve
Mini joystick **A186** Moved toward **X+**	Retraction of the cylinder of anAHS type additional user, actuation of hydraulic hammer.
Mini joystick **A186** Moved toward **X-**	Extension of the cylinder of anAHS type additional user, respec.
Mini joystick **A186** Moved toward **Y+**	Reserve
Mini joystick **A186** Moved toward **Y-**	Reserve
Push button **S5L**	Horn

See the list of the possible symbols in section "Warning symbols in the SY field", further in this chapter.

EC field

The EC window displays the error codes for electrical faults which occur in the excavator's electronics system (line errors, sensor errors etc.). A maximum of 7 error codes are displayed simultaneously. If there are more than these 7 errors present, an arrow which points to where the other error codes are located will be displayed next to the error code window.

▶ Press the **Up** or **Down** button.
  ↳ The error code list is shifted in the selected direction.

See the complete list of the error codes in section "Error codes charts", in chapter 4.

INF field

The INF field displays temporary information in graphic form.

If more than 3 symbols are to be displayed, the symbols will shift one symbol to the left approx. every 10 seconds.

The information is displayed in graphic or text form and indicates specific operating states on the machine (also see the section "Information symbols in the INF field", further in this chapter).

TI field

The machine operating hours and the daily operating hours counter are displayed in this field at the bottom right of the screen. During the start-up phase, the operator will be alerted about a possible up-coming service time, by a graphic symbol and an hour indication displayed instead of the machine hour-meter during about 8 seconds.

The symbol ® is displayed when an external flow limitation is activated (see the description of the menu "Info In/Outputs", further in this chapter).

The symbol "●" indicates that no external flow limitation is actually activated. But an internal flow limitation (travel, swing,...) may be activated.

In this field can also be indicated the denomination (for example HM2000) of the option which is actually assigned to the external flow limitation input I1 (see the description of the menu "Set option", further in this chapter).

Control of the screen at error recognition

In case a new operating fault displayed in the field SY is recognized, the presentation will return to the main screen, and the relevant symbol is displayed.

Depending on the fault (level of urgency), the buzzer will sound either continuously or in short consecutive bursts. At the same time the symbol "acknowledge error" will be displayed in the INF field.

Danger!
If the displayed fault is not remedied immediately, this could lead to persons sustaining injury or the machine being damaged.

▶ Immediately remedy the occured error or get it remedied.

▶ Press the **Back** key.
  ↳ The error will be acknowledged, this means that the buzzer signal alerting to the upcoming of this fault is stopped.

On the right picture, an internal limitation (Pressure increase) and an external limitation (Hardware input I1, option 1) are activated at the same time.
Due to the internal limitation, the flow of the pump P1 is limited to 50% of its maximum value via the solenoid valve EV1.
Due to the external limitation, the flow of the pump P2 is limited to 70% of its maximum value via the solenoid valve EV2 and the pressure in the hydraulic system to 60% of its maximal value via the solenoid valve EV6.

When several limitations are activated at the same time, only the one with the smallest percentage value is decisive for each regulating solenoid valve.

Note!
An external limitation becomes active for example when a pedal controlling an additional equipment is actuated.
The three internal limitations which are the most currently used are the followings:

- The internal limitation M1 is activated when travelling.
- The internal limitation M2 is activated when the pressure increase is actuated (button S56 on the control unit).
- The internal limitation M3 is activated when actuating the shovel flap on machines with shovel attachment.

▶ Press the **Menu** key again.
↳ The screen 2/... is displayed.

The screen 2 shows the instantaneous LR current (current flowing to the solenoid valve for power regulation).

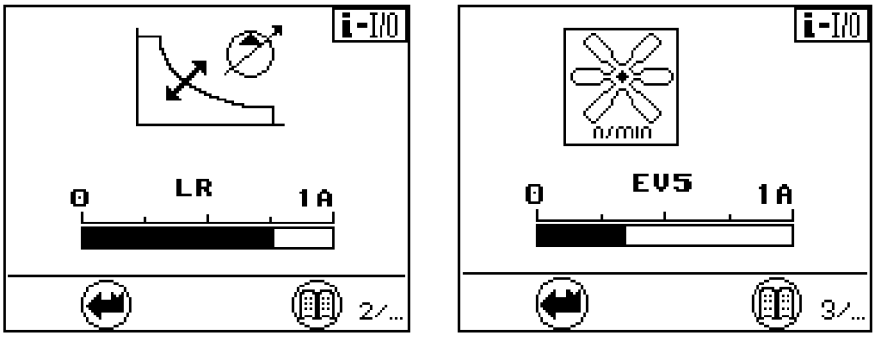


Fig. 3-20 *Menu "Info In/outputs" Currents to the solenoid valves LR and EV5*

▶ Press the **Menu** key again.
↳ The screen 3/... is displayed.

This screen shows the instantaneous current flowing to the regulation solenoid valve EV5 which determines the RPMs of the hydrostatic driven cooler fan.

▶ Press the **Menu** key again.
↳ The screen 4/... is displayed.

This screen shows the instantaneous current flowing to the regulation solenoid valve EV3, which determines the power reduction for the swing movement.
Notice: this screen is displayed only since the software version V4.4 of the display.

3.2 Access and equipment of the cab

3.2.1 Safe access to stationary machines mounted on mobile gantry cranes (option)

Note

See operating instructions of the mobile gantry crane for further information.

Safety instructions

Danger!

- To work with the machine, always access the machine alone.
- Only access the cab through the appropriate accesses.
- Make sure no person is on the machine or tries to access the machine when the machine is in operation.
- Do not try to access an operating machine.
- Make sure that there is only one access key to the machine. This unique key must be passed on between the eventual successive drivers.
- Before leaving the cab, make sure that the safety lever is in upper position.
- Do not use controls for grip.

General overview

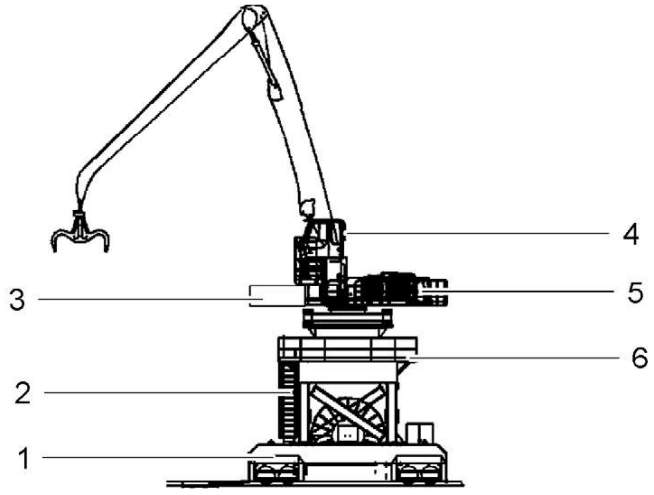


Fig. 3-30 *General overview of the uppercarriage on the mobile gantry crane*

1 Mobile gantry crane
2 Emergency access ladder
3 Exit bridge
4 Cab
5 Machine uppercarriage
6 Intermediate platform

3.2.8 Emergency exit – rear window

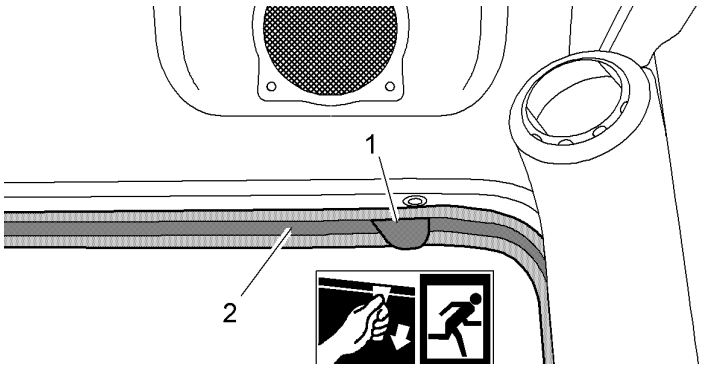


Fig. 3-39 *Emergency exit – rear window*

- In case of emergency, remove the rubber seal **2** from all around the rear window by pulling the clip **1** on the inner side of the rear window. Thereafter push the window out.

Note!
For the machines equipped with a cab elevation, steps, ladders and hand-rails (grips) are installed to secure the descent.

3.2.9 Interior lighting

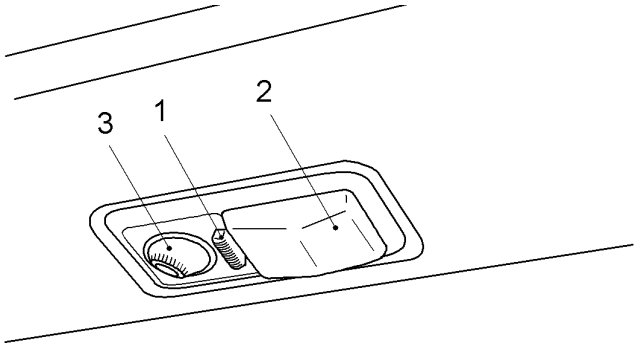


Fig. 3-40 *Dome light for cab interior lighting*

The dome light is controlled via the button **1**.

- Push the button **1** to the right to switch on the light **2**.
- Push the button **1** to the left.to switch on the spot **3**.
- Push the button **1** into central position to switch the dome light off.

3.2.10 Fire extinguisher

The interior of the cab of your machine is fitted with fixing points allowing the mounting of a fire extinguisher. These fixing points are on the right side wall of the cab, in the front area for machine models up to R954C, or in the rear corner for machine models R964C and above.

Other checking

- After commissioning and then again after approx. 50 operating hours, check the mounting bolts of the motor and the coupling element for correct tightening (see chapter 5 "Checking mounting bolts for proper fixture").
- Check that the emergency off switch is operating correctly.
- Immediately after starting, check that no abnormal vibrations are occuring at the bearings of the motor. Make sure that the ball bearings of the electrical motor have been properly greased. If necessary, complete the grease charge of the bearings, following the lubrication procedure in the manufacturer maintenance manual.

Tasks to be completed prior to machine start

Caution!
A fire can only be extinguished, if it is accessible.

- Before starting the machine, open all locks of the hydraulic excavator panels.
  ↳ In the event of a fire, these doors can than be opened without delay to extinguish the fire.

Positions of the locks: see chapter "Maintenance".

Caution!
When the tasks listed below are completed while the machine is already at operating temperature, there is risk of injury from scalding by hot oil.

- Before completing the tasks described here, read the respective sections in chapter "Maintenance".

Daily before starting the machine

- Check the oil level in the hydraulic tank, see the chapter "Maintenance".
- If required, remove any ice and snow from the motor hood, from the grate above the hydraulic oil cooler and from the cooling air aspiration mouth of the electric motor.
- Check that all doors and covers are correctly closed, but not locked.
- Check that the doors of the electrical enclosures are closed.

Before first start after a longer standstill of the machine

- Check the insulation resistance values of the stator windings of the electric motor as described in the chapter "Maintenance".

Before first start after the machine was diconnected from the power supply, resp. after important repairs at the machine

- Immediately after starting, check that the sense of rotation of the motor is correct, this means that it coincides with the sense of the arrows on the motor housing. Otherwise the motor must be stopped immediately.

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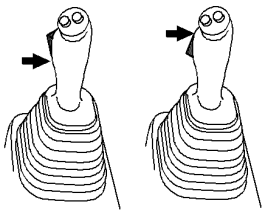


▶Tilt down the rocker switch **S57** on the joystick handle,
↳the brake is applied when the uppercarriage is at standstill, respectively it applies as soon as the uppercarriage speed gets lower than a limit value.

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

Note!
The red LED beside the touch S17 is lighting in any case when the brake is applied. If this light does not go out when the rocker switch S57 is tilted up, the button S17 must first be pushed to pre-select the semi-automatic mode.

Caution!
The brake only applies when the uppercarriage is near standstill and if no swing motion is actuated via the joystick!
In order to stop the uppercarriage when working on a slope, tilt the switch S57 down and reduce the uppercarriage speed by braking with joystick 4.
Move the joystick 4 back to «0» position only after the brake has applied.

Ermergency stop of the uppercarriage swing motion

The swing brake can be applied independently of the uppercarriage RPM by switching the button S17 from position «semi-automatic» into position «applied».

Caution
Perform this braking via button **S17** only exceptionaly, i. e. in emergency cases, since it causes fast abrasion of the brake discs.

To check the mechanical swing gear brake:

❑ When the uppercarriage is stationary.

▶ Press the touch **S17**.
↳ the swing brake is applied.
↳ the LED in the touch is lighting.

▶ Push the left joystick **4** 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.

The positioning swing brake (option)

The positioning swing brake is used for progressive and sensitive braking of the upper carriage.

Standard control

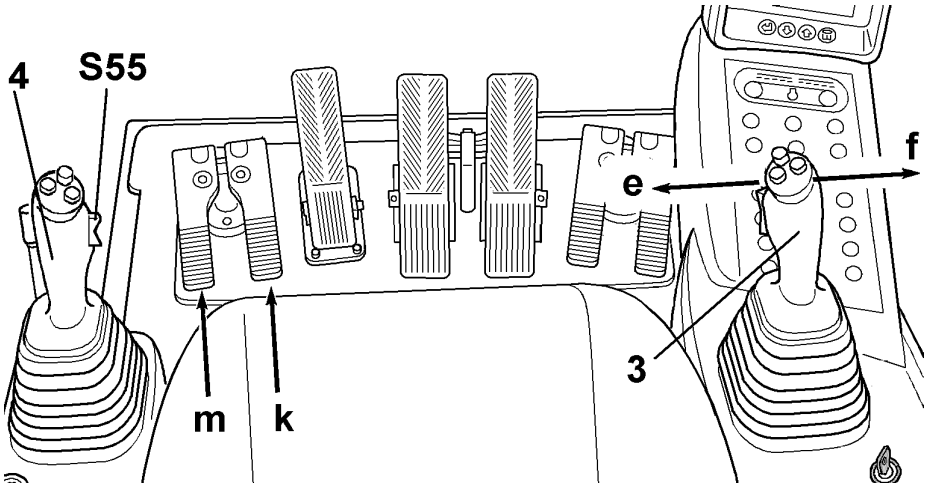
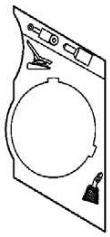


Fig. 3-72 *Commutation of standard control for an additional attachment*

The additional attachment can be operated alternatively with the left double pedal or with the right joystick. The commutation of control can be activated with the key switch **S114** on the rear right control desk.



- ▶ Turn the key switch **S114** to select the **joystick position**.
  - The additional attachment is now operated with the right joystick (movements to **e** and **f**).
  - The bucket tilt function is now operated with the left double pedal (**m**-**k**).
  - The key is locked in the switch **S114**.
- ▶ Turn the key switch **S114** to select the **foot pedal position**.
  - The additional attachment is now operated with the left double pedal again.
  - The key can be removed from the switch **S114**.

Proportional control

Mini joystick / Joystick

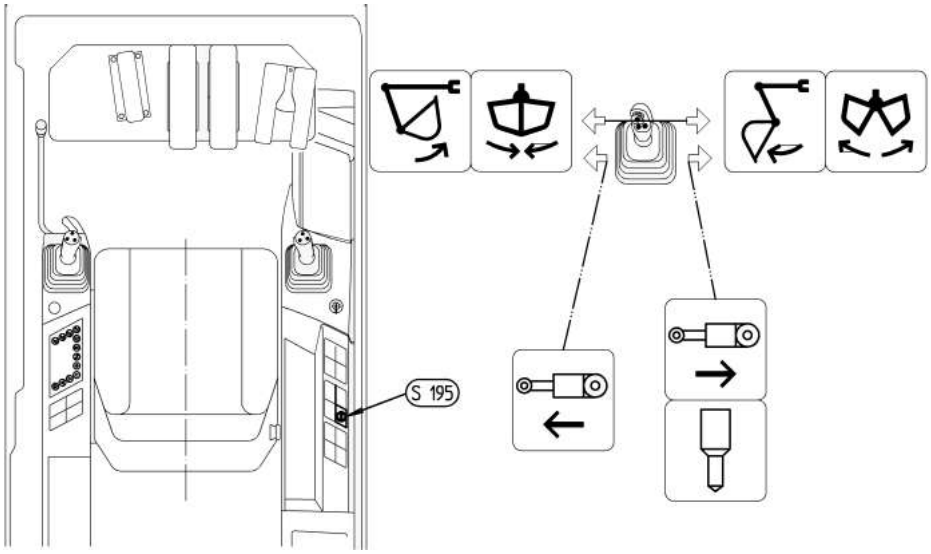


Fig. 3-73 *Commutation of proportional control for an additional attachment*

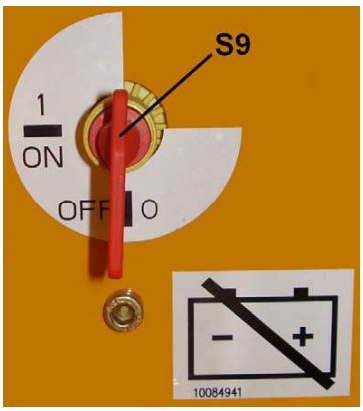


Fig. 3-81 *Battery main switch **S9** on the heating box*

In normal operating mode, the control electronics of the machine release the control system 24V. In the event of a fault in the electronics, the control system can be released manually by tilting the switch **S_b** to its emergency position.

▶ Move the safety lever down.

▶ Actuate the rocker switch **S_b** to set the machine to emergency mode.
  ↳ The indicator light **H_b** is on.
  ↳ The control system is powered on.

Emergency switching of servo pressure circuits

In normal operating mode, the control electronics of the machine release the servo pressure to the pilot control units and the slewing gear brake.

In the event of a fault in the electronics, the servo pressure can be released manually by tilting the switch **S73** to its emergency position.

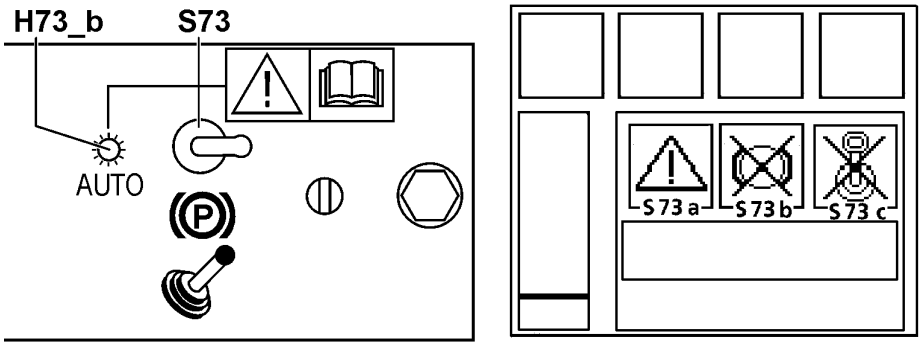


Fig. 3-82 *Emergency switching of servo circuits - emergency switch and warning symbols on display*

▶ Move the safety lever down.

▶ Actuate the rocker switch **S73** to set the machine to emergency mode.
  ↳ The three symbols S73a, S73b and S73c are displayed on the screen.
  ↳ The indicator light **H73_b** is on.
  ↳ The pilot control units are pressurised with servo pressure.
  ↳ The slewing gear brake is released.

- ▶ Turn off the engine and, with the ignition key in the contact position, push the right joystick briefly to the left and then to the right in order to remove the pressure in the hydraulic circuits.
- ▶ To relieve the grab's torsional mechanism, press the two push buttons in the left (or left and right – optional extras) joystick for "Turn grab".
- ▶ Turn the lever of each valve block **15** in position **A** (Position **A**, bucket operation) and push the right joystick briefly to the left and then to the right in order to remove the pressure in the hydraulic circuits.
- ▶ Push the safety lever up.
- ▶ Separate hydraulic hose **11**, hydraulic hose **12** and, if present, hydraulic hoses **13** and **14** from the pipes on the stick.
- ▶ Close open lines immediately to prevent any dirt entering.
- ▶ Support the grab so that it is stable.
- ▶ Remove the plate **6**. Drive out the pin **4** and remove the pin bearing sealings **25**. If necessary, start the engine and lift the attachment slightly to remove the pin **4**.

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– If the buzzer and telltale light are activated without a deliberate locking or unlocking procedure being carried out, stop all work at once. If the buzzer and telltale light are not activated while a deliberate locking or unlocking procedure is being carried out, stop all work at once.
  This could be caused by an unmonitored position change of the locking pins due to mechanical or hydraulic damage. A defect may also be present in the electrical system (eg. proximity switch or buzzer).
  Only resume working once defective parts have been repaired or replaced.
– The quick-change adapter unlocks as soon as the switch / button designed for the purpose is pressed.
  Always keep the work tool as close to the ground as possible when unlocking to avoid creating conditions which may lead to danger. Only activate the quick-change adapter to carry out a deliberate locking or unlocking procedure.
– Each time a work tool is changed, the machine's operator must ensure that the locking pins for the quick-change adapter insert in the bore holes on the work tool which are designed for the purpose and that the work tool raises correctly. A direct visual check must be made to ensure that the work tool is correctly positioned.
– A working cycle should also be carried out with the work tool ,where the work tool is only raised to the point where the correct position of, for example, the pin in the pin eye can be tested by tilting in and out.
– The load carrying capacity of the quick-change adapter or the integrated lifting hook can exceed or fall short of the load carrying capacity of the carrier device. When operating, it should be ensured that the values provided in the load chart and the technical data for the carrier device are adhered to.

Overview

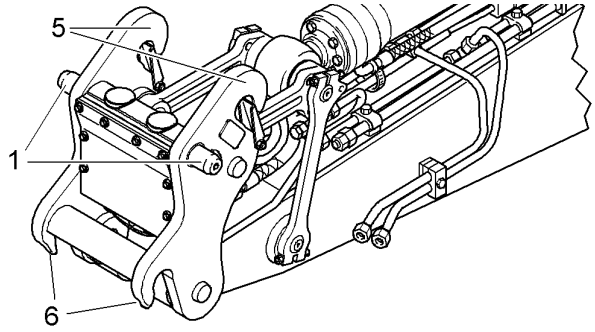

Fig. 3-97 *Hydraulic quick-change adapter*

1 Locking pin (extended)
5 Lifting hook
6 Take-up hook for work tool

Danger!
Insufficient support and machine damage.
Do **not** use a skimming shield to support the machine.

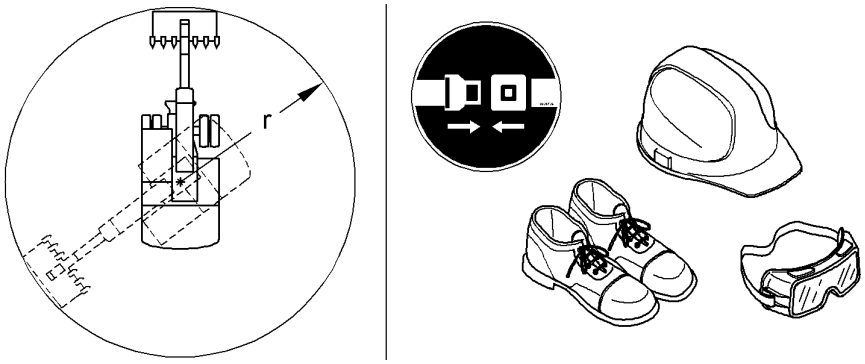

Fig. 3-110 *Safe working*

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

- ▶ Ensure that nobody stands within the danger 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 goggles.
- ▶ Always wear the seat belt.
- ▶ Use the horn to give a short warning signal before starting work.

3.7.3 Using a backhoe bucket

Danger!
Risk of fatal injury and damage to the machine when moving the backhoe bucket.

- ▶ Ensure that the backhoe bucket is not slewed too close to the cab.
  - ↳ The backhoe bucket could damage the cab and injure the machine's operator.
- ▶ Ensure that nobody is standing within the danger area of the backhoe bucket.

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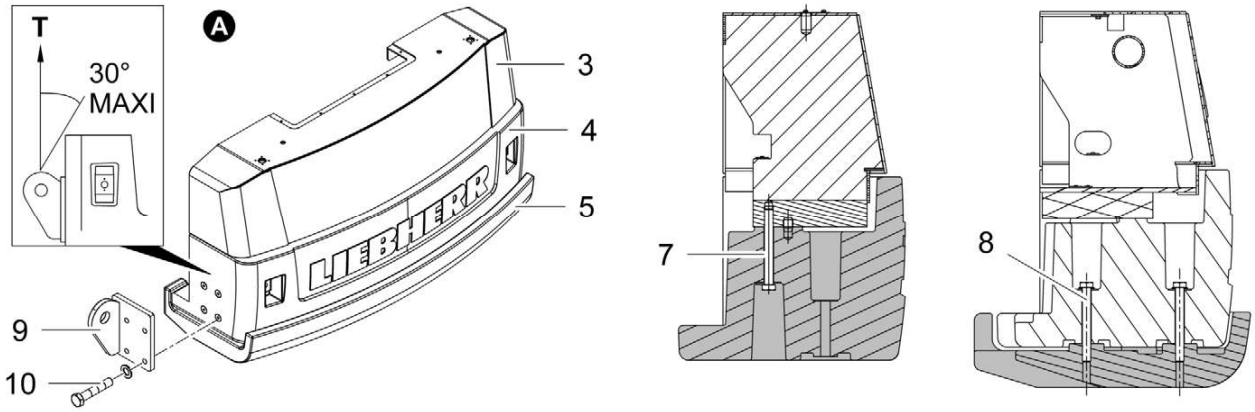
- ▶ Lift the counterweight and place it on the uppercarriage. If mounted, check the correct insertion of the centring pins in the bores of the uppercarriage.
- ▶ Engage and tighten the mounting bolts. (M36 - 10.9; tightening torque 3300 N.m / 2430 ft.lbs).
- ▶ Remove the lifting slings from the lifting points of the counterweight.

3.8.2 Multi-parts counterweight removal

CASE A:



3 Counterweight shell
4 Counterweight
5 Additional counterweight
7 Mounting bolt
8 Mounting bolt
9 Lifting plate
10 Mounting bolt

- ▶ Determine the lifting device considering the:
- – Lifting force: **T**=56 kN
- – Angle of 30° maximum between the counterweight side face and each lifting slings.
- ▶ Fix the lifting plate **9** with the mounting bolts **10** on the counterweight **4**. Fix the lifting slings on them.
- ▶ Loose the mounting bolt **7** of the counterweight **4**.
- ▶ Remove the counterweight **4** (with the additional counterweight **5** if mounted).
- ▶ If your machine is fitted with an additional counterweight **5**:
- – Loose the mounting bolt **8** of the additional counterweight **5**.
- – Move the counterweight **4**.

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1 Front lifting gear
2 Shackle
3 Rear lifting gear
4 Nut-screw drive

Front lifting gear

▶ Position the front lifting gear **1** on both sides to the bearing bores of the boom cylinders.

▶ Attach the front lifting gear **1** with the boom cylinder pins.

▶ Attach and secure shackles **2**.

Rear lifting gear

▶ Position the rear lifting gear **3** at the rear of the uppercarriage.

▶ Attach the rear lifting gear **3** with the nut-screw drive **4** (M36 - 10.9, tightening torque 3300 N.m).

Lifting the machine

The table below shows the forces that must be considered when choosing lifting gear for a standard machine, without counterweight nor attachment:

Model	F1 [daN]	F2 [daN]	L [mm]	H1 [mm]	Order number of fifting kit
R 954 C	37 500	15 800	4 330	4 000	10383209
EP 954 C (with a cabine elevation of 2m)	19 700	12 700	4 380	4 000	10383209
ER 954 C (without cable reel)	37 500	15 800	4 380	4 000	10383209
R 956 - R 960	37 500	15 800	4 330	4 000	10383209

Note
Distance **L** aims that the lifting cables are vertical when seen from the machine side. Length **H1** ensure an horizontal lifting position of the machine.

▶ Connect the shackles of the lifting gear with the lashing points of the lifting crane.

▶ On machine fitted with removable side frames:

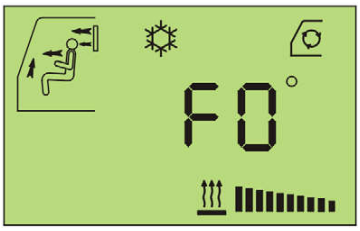
– Disconnect all hydraulic lines of the travel motors at the travel motors.
– Remove the mounting bolts between side frames and undercarriage central part.

Note

▶ After 10 dismountings, replace the mounting bolts of the side frames by new ones.

▶ Carefully lift the machine with the crane to pretension the slings.

▶ Load the machine on the trailer.

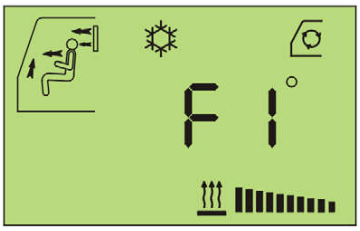


Error code "F0": fault at room temperature sensor:

The control system has detected a fault at the room temperature sensor, and regulation is disabled.

Cause of fault: Short circuit, sensor cable break, loose connection at sensor or control unit, temperature sensor defective.

Eliminate the fault. The sensor is again ready for operation, and the error code disappears.
After a fault, the regulator is operated with the settings as entered before the fault.

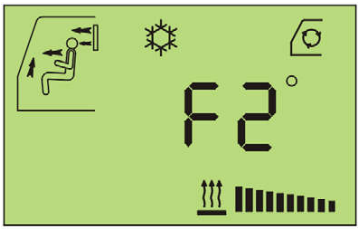


Error code "F1": fault at blow-out temperature sensor:

The control system has detected a fault at the blow-out temperature sensor, and regulation is disabled.

Cause of sensor fault: Short circuit, sensor cable break, loose connection at sensor or control unit, temperature sensor defective.

Eliminate the fault. The sensor is again ready for operation, and the error code disappears.
After a sensor fault, the regulator is operated with the settings as entered before the fault.



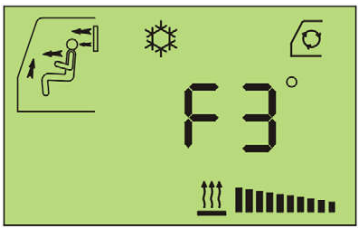
Error code "F2": fault at reserve temperature sensor:

The control system has detected a fault at the reserve temperature sensor, and regulation is disabled.

Cause of fault: Short circuit, sensor cable break, loose connection at sensor or control unit, temperature sensor defective.

Eliminate the fault. The sensor is again ready for operation, and the error code disappears.

After a sensor fault, the regulator is operated with the settings as entered before the fault.

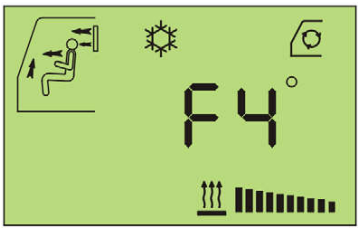


Error code "F3": fault at legroom/windscreen ventilation flap:

The control system has detected a fault at the legroom/windscreen ventilation flap. Regulation remains operational.

Cause of fault: Short circuit, cable break, loose connection at the ventilation flap motor or control unit, flap motor defective.

Eliminate the fault. The error code disappears.
In the event of a flap fault, the regulator continues working as normal, although the centre position of the air flap cannot be used.



Error code "F4": pressure fault / fault at magnetic clutch:

The control unit has detected a fault at the pressure switch or the magnetic clutch.

Cause of fault: Short circuit, cable break to magnetic clutch, loose connection at the clutch or control unit, overpressure or underpressure (insufficient refrigerant) in cooling circuit of the a/c system.

Eliminate the fault. The error code disappears.

The regulator is not affected by a pressure fault / magnetic clutch fault, and only the magnetic clutch output is interrupted.

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* Guide values

Recommended fuels and process chemicals

Designation	Recommended fuels and process chemicals	Symbol	Quantity [Litres]*
Heating system fluid	Liebherr Antifreeze Mix Liebherr Antifreeze Concentrate		20
Windscreen washing system	Standard windscreen cleaning agent or denatured alcohol	-	5

* Guide values

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Warm-up instruction

The black bar **B** indicates ambient temperatures that are up to 20 °C below the operating range **C**.

For cold starting at an ambient temperature below range **B**, the following warm-up instruction for the hydraulic oil applies:

- ▶ **1.** Start the electrical motor.
- ▶ **2.** Carefully activate the working hydraulics. Operate the hydraulic cylinders and move them briefly to the stop.
- ▶ **3.** After approx. 5 minutes, actuate the travel hydraulics. Total warm-up time: approx. 10 minutes.

For cold starting at lower ambient temperatures, follow the warm-up instruction below: Before starting the motor, warm up the hydraulic oil tank. Then proceed according to the warm-up instruction in **1**.

Biodegradable hydraulic oils

Caution!
Do not mix hydraulic oil products!
When mixing different ester-based biodegradable hydraulic oils or mixing such products with mineral oils, aggressive chemical reactions might occur, causing damage to the hydraulic system.

- ▶ Therefore never mix biodegradable hydraulic oils from different producers, and never mix bio hydraulic oils with mineral oils!

LIEBHERR recommends using the following hydraulic oils in its machines (depending on the temperature range):
Liebherr Hydraulic Plus or **Liebherr Hydraulic Plus Arctic**

These products are polyalphaolefins (HEPR) conforming to CEC-L-33-A-93, and are biodegradable.

When using these hydraulic oils, bypass filtration might be omitted.

If these oils are not available locally, use a fully saturated hydraulic environmental ester synthetic oil (HEES fluid) (before choosing an oil, contact the respective customer service department).

Caution!
The use of synthetic ester-based oils without bypass filter causes damage to the hydraulic system!
If synthetic ester-based oils are to be used, bypass filtration is mandatory, as the water concentration in the oil must be kept below 1000 ppm (0.1%).

- ▶ Always use a bypass filter (optional equipment).

For such oils, we recommend replacing the hydraulic hoses every 4000 operating hours or at least every 4 years.

Do not use vegetable oils, as they do not possess the necessary thermal stability.

The use of polyglycols is not permissible, as they cause damage to paintwork.

When using third-party products, we advise customers to request a certificate from the oil manufacturer, confirming that the product meets the above specifications.

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- ▶ Shut off the engine.
- ▶ Wait until the fan does not turn any more.
- ▶ Check the condition of the cooler.
- ▶ If necessary, repeat the cleaning procedure.

5.7 Hydraulic system

Maintenance work on the hydraulic system is generally limited to the hydraulic tank.

All other components of the system do not require any special maintenance or servicing.

The network of pipes and hoses must however be inspected regularly for leaks.

Note!
Cleanliness is of particular importance for the proper working of the hydraulic system.

For this reason, the prescribed intervals for

- change of the return filters
- cleaning of the oil cooler
- oil change must be strictly adhered to.

5.7.1 Depressurising the hydraulic system

Before carrying out any work on the hydraulic system, you must fully depressurise it.

Danger!

Do not use your bare hands to check the system for leaks.

Fine jets of fluid escaping under high pressure can penetrate the skin and result in serious injury.

Observe the following:

- ❑ Park the machine on level firm ground and place the attachment on the ground.

Depressurise the high-pressure circuits.

- ▶ Shut down the motor.
- ▶ Operate the pilot control units (joystick and pedals) in all directions (while the start key is in contact position and the safety lever is folded down).

Depressurise the pilot control circuits.

- ▶ Operate the pilot control units (joystick and pedals) several times in all directions (while the start key is in contact position and the safety lever is folded down).

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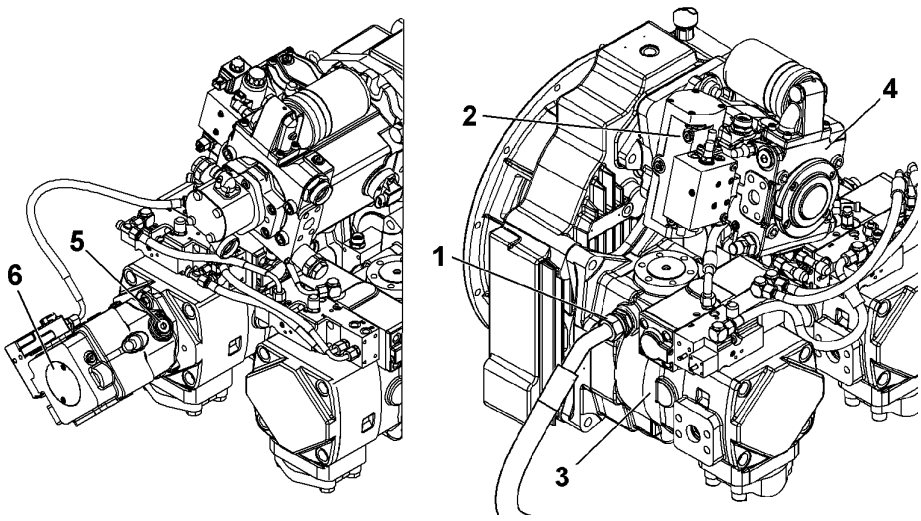

Fig. 5-26 *Hydraulic pumps*

1 Fitting / bleeding of working pump
2 Screw plug / bleeding of slewing gear pump
3 Working pump
4 Slewing gear pump
5 Screw plug / bleeding of fan drive pump
6 Fan drive pump

▶ To bleed a working pump **3**, loosen the fitting **1** and allow the air to escape. Tighten the fitting **1** as soon as the oil escaping at the opening is free of air bubbles.

▶ To bleed the slewing gear pump **4**, loosen the screw plug **2** and allow the air to escape. Tighten the screw plug **2** as soon as the oil escaping at the opening is free of air bubbles.

Bleeding the fan drive pump

E944C and E954C

▶ To bleed the fan drive pump **6**, loosen the screw plug **5** and allow the air to escape. Tighten the screw plug **5** as soon as the oil escaping at the opening is free of air bubbles (see picture before).

E934C

LFR/en/Edition: 03 / 2013

1 Oil reservoir
2 Cover
3 Drain valve
4 Drain hose

To check the oil level:

When the gear oil is cold, the level in the expansion reservoir **1** should not be below the marking **Min.**

▶ Otherwise add oil until the level reaches the marking **Max.**

To drain the oil:

▶ Remove the cover **2**.

▶ Unscrew the cover of the drain valve **3** via the opening on the upperdeck.

▶ Screw the drain hose provided **4** to the drain valve **3** and let the oil flow out into a suitable container.

▶ Remove the hose **4**.

▶ Screw the cover of the drain valve **3** back on.

To add the oil:

▶ Add the oil in the reservoir until the level reaches the **Max.** marking.

▶ Screw the cover **2** back on.

5.8.3 Pump distributor gear - oil change

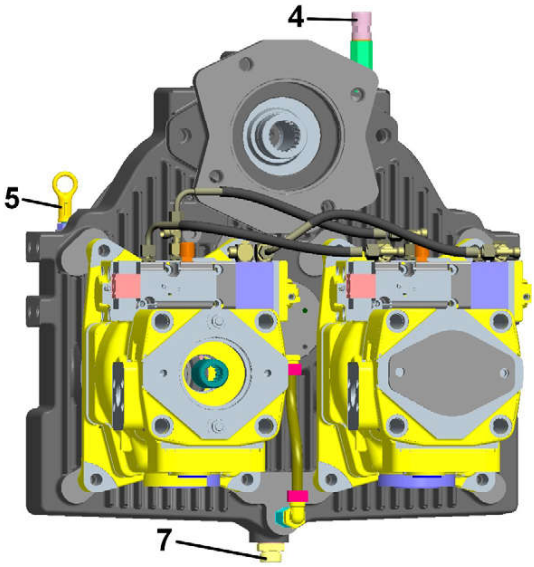

Fig. 5-37 *Oil change in the pump distributor gear*

4 Lid
5 Oil level gauge
7 Drain valve

4	Washer	**8**	Sleeve
5	Hex nut	**10**	Compressor

▶ Inspect the condenser **2** for dirt.

▶ If necessary, fold the condenser **2** down and clean it from the inside (blower side), using compressed air.

▶ Ensure that the condenser fins are clean.

Dirt on the condenser might lead to excessive pressure in the coolant circuit, so that the air-conditioning system is automatically switched off.

Inspecting a/c compressor:

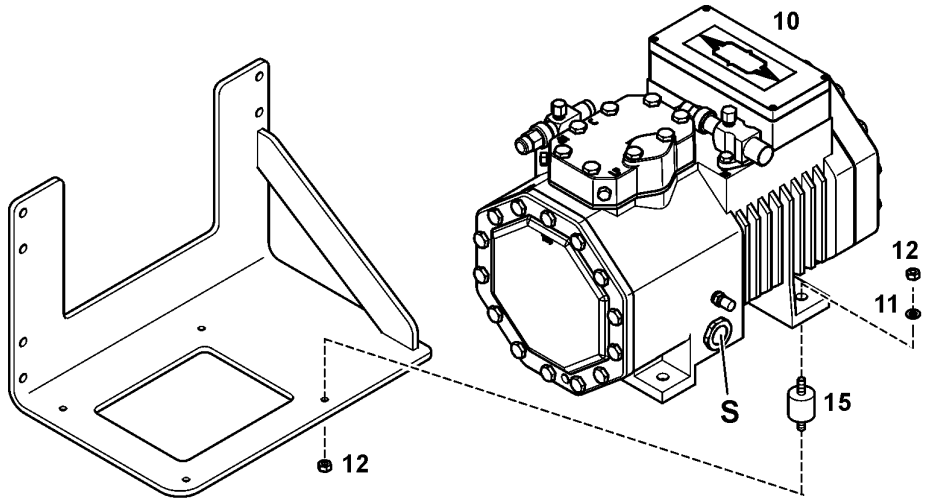

Fig. 5-45 *A/c compressor*

10	A/c compressor	**12**	Hex nut
11	Washer	**15**	Metal-rubber buffer

▶ Tighten the hex nut **12** of the a/c compressor (24 Nm / 17 ft.lbs).

Maintenance of a/c compressor:

Regularly inspect the unit according to the applicable regulations and standards: Check the following:

– Electrical cable connections and fittings for proper fixture.

– Coolant level, leakage

▶ Check coolant circuit (assembly) and its parts for leakage.

– Immediately after start-up of the lubrication of the compressor, check the following:

▶ Oil level 1/4 to 3/4 of sight glass height **S** (see Fig. 5-45) (repeat check several times during the first few operating hours).

– Other maintenance tasks: See operating manual KB-100-5 of Bitzer.

5.12 Quick-change systems

5.12.1 Greasing the mechanical quick-change adapter (option)

The mechanical quick-change adapter is not lubricated via the central greasing system. The bearing points must be greased using the grease gun.

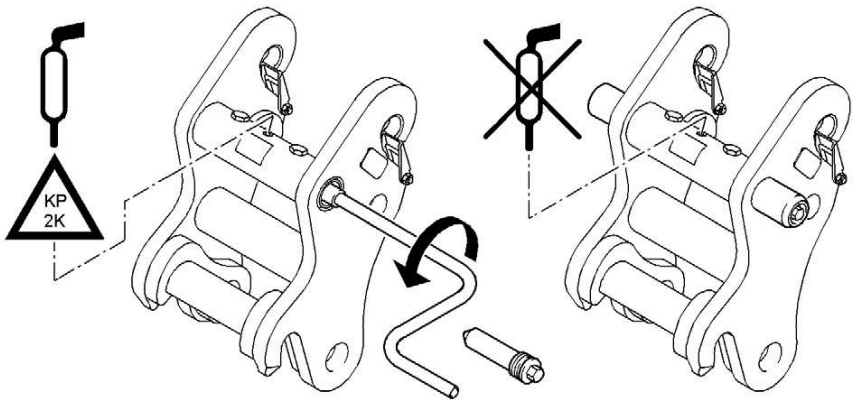

Fig. 5-56 *Greasing the mechanical quick-change adapter*

▶ Grease the bearing points via the lubricating nipple using a grease gun.

Grease quality: see “Lubricating and operating materials”

Note!
If the mechanical quick-change adapter is greased when the pin is drawn out, the hollow area between the locking pins fills with grease and the pins can no longer be reinserted.

▶ Ensure that the locking pins are inserted when greasing.

5.12.2 Hydraulic quick-change adapter (option)

Greasing the quick-change adapter

The hydraulic quick-change adapter is not lubricated via the central greasing system. The bearing points must be greased using the grease gun.

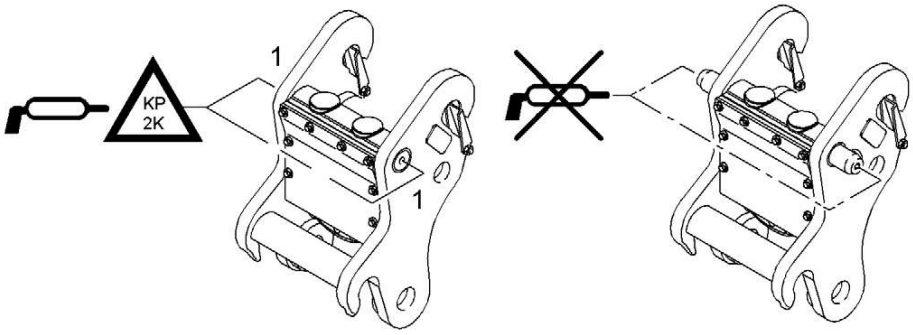

Fig. 5-57 *Greasing the quick-change adapter*