en

Operating instructions

Hydraulic excavator / Material handler
R 906 Classic

from serial number 23145

Document identification

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Product identification

Manufacturer: LIEBHERR France S.A.S.

Type: R 906 Classic

Type no.: 1139 / 1141 / 1283

Conformity: CE

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1 Product description

1.1 Assembly - overview

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

1.1.1 Machine and construction equipment

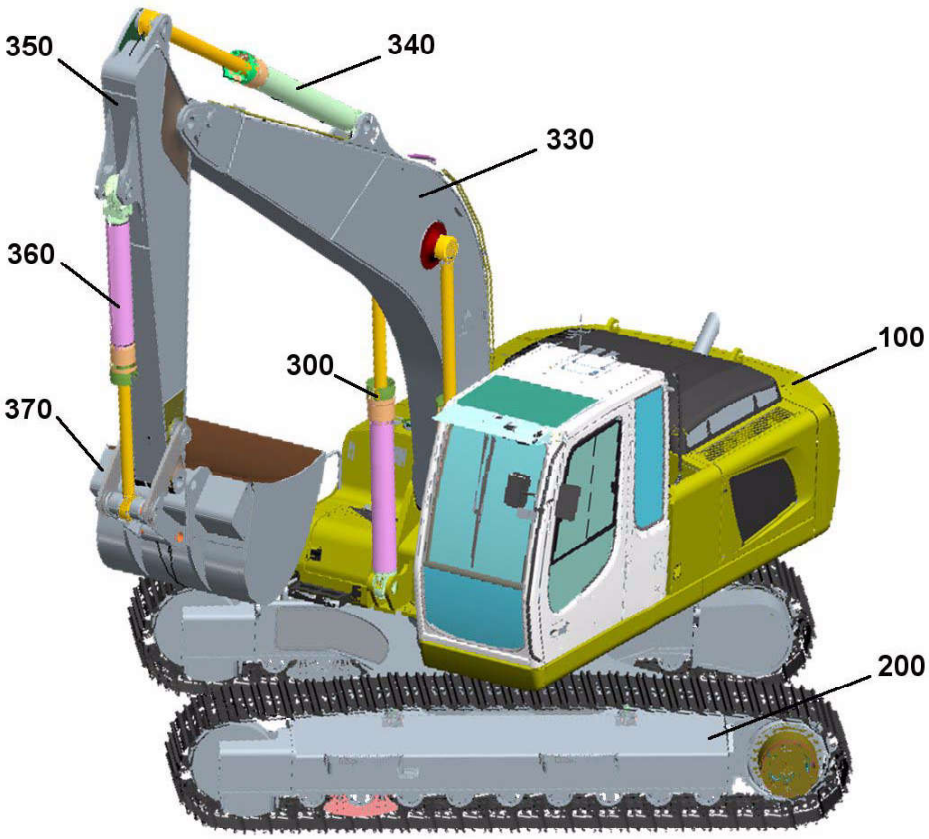

Fig. 1-1 *Machine with construction equipment*

100	Upper carriage	**330**	Boom	**360**	Tilt cylinder
200	Chassis	**340**	Stanchion cylinder	**370**	Bucket
300	Hydraulic jack	**350**	Shovel arm		

Technical Data Classic

Engine

Rating per ISO 9249	105 kW (143 HP) at 1800 RPM
Model	Liebherr D 934 S
Type	4 cylinder in-line
Bore/Stroke	122/136 mm
Displacement	6,36 l
Engine operation	4-stroke diesel unit pump system turbo-charged after-cooled and fuel cooled reduced emissions
Cooling	water-cooled and integrated motor oil cooler
Air cleaner	dry-type air cleaner with pre-cleaner, primary and safety elements
Fuel tank	380 l
Electrical system	
Voltage	24 V
Batteries	2 x 135 Ah/12 V
Starter	24 V/6,6 kW
Alternator	three phase current 28 V/80 A
Engine idling	sensor-controlled

Hydraulic System

Hydraulic system	Positive Control Classic. Dual circuit hydraulic system for independent and need-based quantity allotment via the hydraulic pumps
Hydraulic pump	Liebherr variable displacement pump built in transversal plate style, in parallel arrangement with integrated transfer box
Max. flow	2 x 214 l/min.
Max. pressure	350 bar
Pump regulation	electro-hydraulic with electronic engine speed sensing regulation, pressure compensation, flow compensation, automatic oil flow optimizer, swing circuit with priority and torque control. 2 independent circuits with hydraulic pump summation for individual equipment movements
Hydraulic tank	290 l
Hydraulic system	max. 500 l
Hydraulic oil filter	1 full flow filter (20 µm) in return line with integrated fine filter area (5 µm)
Hydraulic oil cooler	compact cooler, consisting of a water cooler, sandwiched with hydraulic oil cooler, fuel cooler and after-cooler cores and hydrostatically driven fan
MODE selection	adjustment of engine and hydraulic performance via amode pre-selector to match application, e.g. for especially economical and environmentally friendly operation or for maximum digging performance and heavy-duty jobs
Super-Finish	adjustable working speed for precision work
RPM adjustment	stepless adjustment of engine output via RPM at each selected mode
Liebherr Tool Control	10 preadjustable pump flows and pressures for add-on tools
Liebherr Tool Management	automatic tool recognition (unlimited number) and setting of the discharge and pressure; the operating hours of the attachment tool are recorded

Hydraulic Controls

The control of movements steered by joysticks demand are regulated by a hydraulic valve block.

Power distribution	via control valve with integrated safety valves
Servo circuit	
Attachment and swing	proportional via joystick levers
Travel	– with proportionally functioning foot pedals or adjusted with a plugable lever – speed pre-selection
Additional functions	via foot pedals or buttons

Swing Drive

Drive by	Liebherr swash plate motor
Transmission	Liebherr compact planetary reduction gear
Swing ring	Liebherr, sealed single race ball bearing swing ring, internal teeth
Swing speed	0 – 11 RPM stepless
Swing torque	71,1 kNm
Holding brake	wet multi-disc (spring applied, pressure released)

Operator's Cab

Cab	built from deep-drawn components, resiliently-mounted, sound-insulated, tinted windows, front window stores overhead, door with sliding window
Operator's seat	shock-absorbing suspension, adjustable to operator's weight, 6-way adjustable seat
Control system	integrated into the adjustable console panel in the operator's seat
Monitoring	menu driven query of current operating conditions via the display. Automatic monitoring, display, warning (acoustical and optical signal) and saving machine malfunction data, for example; engine overheating, low engine oil pressure or low hydraulic oil level
Air-conditioning	standard air conditioning, combined cooler/heater, additional dust filter in fresh air/recirculated
Noise emission	
ISO 6396	L_{pA} (inside cab) = 71 dB(A)
2000/14/EC	L_{WA} (surround noise) = 101 dB(A)

Undercarriage

Versions	
NLC	heavy duty, narrow gauge (2000 mm) with longer crawler length
LC	heavy duty, standard gauge (2250 mm) with longer crawler length
Drive	Liebherr swash plate motors with integrated brake valves on both sides
Transmission	Liebherr planetary reduction gears
Travel speed	low range – 3,7 km/h high range – 6,1 km/h
Net drawbar pull on crawler	184 kN
Track components	B 60, maintenance-free
Track rollers/Carrier rollers	8/2
Tracks	sealed and greased
Track pads	triple-grouser
Digging locks	wet multi-discs (spring applied, pressure released)
Brake valves	integrated into travel motor
Lashing eyes	integrated

Attachment

Type	combination of resistant steel plates and forged components
Hydraulic cylinders	Liebherr cylinders with special seal-system, shock absorbed
Pivots	sealed, low maintenance
Lubrication	semi-automatic central lubrication system (except link and tilt geometry)
Hydraulic connections	pipes and hoses equipped with SAE splitflange connections
Bucket	standard-equipped with 12 t safety hook for lifting and Liebherr tooth system

Lift capacities Advanced

with Adjustable Offset Boom 5,70 m and Heavy Counterweight

Stick 2,20 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m				m
9,0	NLC[1)]											
	LC											
7,5	NLC[1)]									3,7*	3,7*	5,56
	LC									3,7*	3,7*	
6,0	NLC[1)]					4,4	5,4*			3,4	3,5*	6,80
	LC					5,0	5,4*			3,5*	3,5*	
4,5	NLC[1)]			6,6	7,0*	4,1	5,8*	2,7	3,8*	2,7	3,6*	7,54
	LC			7,0*	7,0*	4,7	5,8*	3,2	3,8*	3,1	3,6*	
3,0	NLC[1)]			5,7	8,4*	3,7	6,3*	2,6	5,1	2,3	3,8*	7,92
	LC			6,7	8,4*	4,3	6,3*	3,0	5,2	2,7	3,8*	
1,5	NLC[1)]			5,0	9,5*	3,4	6,9*	2,4	4,9	2,1	4,2*	8,00
	LC			5,9	9,5*	4,0	6,9*	2,8	5,0	2,6	4,2*	
0	NLC[1)]	7,8*	7,8*	4,6	9,7*	3,1	6,7	2,3	4,8	2,1	4,5	7,80
	LC	7,8*	7,8*	5,6	9,7*	3,7	6,8	2,7	4,9	2,6	4,6	
-1,5	NLC[1)]	8,8	12,5*	4,6	9,2*	3,0	6,6			2,3	5,0	7,27
	LC	10,8	12,5*	5,5	9,2*	3,6	6,7			2,8	5,1	
-3,0	NLC[1)]	9,1	10,3*	4,7	7,8*	3,1	5,8*			2,9	5,3*	6,35
	LC	10,3*	10,3*	5,6	7,8*	3,7	5,8*			3,5	5,3*	
-4,5	NLC[1)]			5,0*	5,0*					4,7	4,7*	4,79
	LC			5,0*	5,0*					4,7*	4,7*	

Stick 2,40 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m				m
9,0	NLC[1)]											
	LC											
7,5	NLC[1)]									3,4*	3,4*	5,83
	LC									3,4*	3,4*	
6,0	NLC[1)]					4,4	5,2*			3,2*	3,2*	7,02
	LC					5,1	5,2*			3,2*	3,2*	
4,5	NLC[1)]			6,7	6,8*	4,1	5,6*	2,7	4,5*	2,6	3,2*	7,74
	LC			6,8*	6,8*	4,8	5,6*	3,2	4,5*	3,0	3,2*	
3,0	NLC[1)]	10,1	10,8*	5,8	8,2*	3,7	6,2*	2,6	5,2	2,2	3,4*	8,11
	LC	10,8*	10,8*	6,8	8,2*	4,4	6,2*	3,0	5,2*	2,6	3,4*	
1,5	NLC[1)]			5,0	9,4*	3,4	6,8*	2,4	4,9	2,1	3,8*	8,19
	LC			6,0	9,4*	4,0	6,8*	2,8	5,0	2,5	3,8*	
0	NLC[1)]	8,1*	8,1*	4,6	9,7*	3,1	6,7	2,2	4,8	2,0	4,4	7,99
	LC	8,1*	8,1*	5,6	9,7*	3,7	6,8	2,7	4,9	2,5	4,4*	
-1,5	NLC[1)]	8,6	12,4*	4,5	9,2*	3,0	6,6			2,2	4,8	7,48
	LC	10,7	12,4*	5,5	9,2*	3,6	6,7			2,7	4,9	
-3,0	NLC[1)]	8,9	10,7*	4,6	8,0*	3,1	5,9*			2,7	5,2*	6,59
	LC	10,7*	10,7*	5,6	8,0*	3,7	5,9*			3,3	5,2*	
-4,5	NLC[1)]			5,0	5,5*					4,2	4,7*	5,11
	LC			5,5*	5,5*					4,7*	4,7*	

Stick 2,70 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m				m
9,0	NLC[1)]											
	LC											
7,5	NLC[1)]					3,7*	3,7*			3,0*	3,0*	6,23
	LC					3,7*	3,7*			3,0*	3,0*	
6,0	NLC[1)]					4,5	5,0*			2,8*	2,8*	7,35
	LC					5,0*	5,0*			2,8*	2,8*	
4,5	NLC[1)]					4,2	5,4*	2,8	4,8*	2,4	2,8*	8,04
	LC					4,8	5,4*	3,2	4,8*	2,8	2,8*	
3,0	NLC[1)]	10,8	12,7*	5,9	7,9*	3,8	6,0*	2,6	5,1*	2,1	3,0*	8,40
	LC	12,7*	12,7*	6,9	7,9*	4,4	6,0*	3,0	5,1*	2,5	3,0*	
1,5	NLC[1)]	6,5*	6,5*	5,1	9,1*	3,4	6,6*	2,4	4,9	1,9	3,3*	8,48
	LC	6,5*	6,5*	6,1	9,1*	4,0	6,6*	2,8	5,0	2,3	3,3*	
0	NLC[1)]	8,3*	8,3*	4,6	9,6*	3,1	6,7	2,2	4,8	1,9	3,8*	8,28
	LC	8,3*	8,3*	5,6	9,6*	3,7	6,8	2,7	4,9	2,3	3,8*	
-1,5	NLC[1)]	8,5	11,8*	4,5	9,4*	3,0	6,5	2,2	4,7	2,1	4,4	7,79
	LC	10,5	11,8*	5,4	9,4*	3,6	6,7	2,6	4,8	2,5	4,5	
-3,0	NLC[1)]	8,8	11,5*	4,5	8,3*	3,0	6,1*			2,5	5,0*	6,94
	LC	10,8	11,5*	5,5	8,3*	3,6	6,1*			3,0	5,0*	
-4,5	NLC[1)]	8,1*	8,1*	4,8	6,1*					3,6	4,7*	5,56
	LC	8,1*	8,1*	5,8	6,1*					4,3	4,7*	

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

The lift capacities on the load hook of the Liebherr quick change adapter 48 without attachment are stated in metric tonnes (t), and can be lifted 360° on firm, level supporting surface. Adjacent values are valid for the undercarriage when in the longitudinal position. 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 by *) or are limited through the allowed lift capacity of the load hook on the quick change adapter (12 t). Without quick change adapter the lift capacities will increase by 250 kg, without bucket cylinder, link and lever they increase by an additional 365 kg.
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.
[1)] Values are calculated with 500 mm wide triple-grouser pads for the NLC-Undercarriage

Option Packages Advanced/Classic

	Advanced	Classic
Anti-Theft Package	+	+
Electronic immobilizer with key		
Fuel anti-theft device		
Environmentally-friendly Hydr. Fluid Package	+	+
Environmentally-friendly hydraulic fluid		
Secondary circuit filter		
Travel-Safety Package	+	+
Add-on right-hand rear view mirror		
Beacon		
Travel-Safety Package Plus	+	+
Back-up alarm		
Add-on right-hand rear view mirror		
Beacon		
Add-On Package – Hammer	+	+
Security for hoist cylinders (not switchable))		
Return filter for hammer operation		
Add-On Plus Package – Hammer	+	+
Armored glass for windshield		
Security for hoist cylinders (not switchable)		
Return filter for hammer operation		
Heavy Duty Package Classic	–	+
Protection for stick		
3-piece track guide		
Heavy Duty Package Plus Classic	–	+
D6C conversion kit with 3-piece track guide		
Protection for stick		
Heavy Duty Package Advanced	+	–
Protection for stick		
Piston rod cover bucket cylinder		
Renforced floor plate		
Cab with armored glass sunroof windscreen and with wiper		
Three-piece track guide		
Heavy Duty Package Plus Advanced	+	–
Protection for stick		
Piston rod cover bucket cylinder		
D6C conversion kit with 3-piece track guide		
Renforced floor plate		
Cab with armored glass sunroof windscreen and with wiper		
Protective grid up FOPS		
Protective grid front FGPS		

	Advanced	Classic
Cold Climate Start Package	+	+
Auxiliary heating with clock timer		
Fuel pre-heating		
Comfort Package	+	+
Extended tool kit		
MP3-Radio		
Electric cool box		
Comfort Package Plus Classic	–	+
Extended tool kit		
MP3-Radio		
Electric cool box		
Air pressure operator seat		
Sun visor		
Foot support		
Comfort Package Plus Advanced	+	–
Extended tool kit		
MP3-Radio		
Electric cool box		
Premium operator seat		
Sun visor		
Foot support		
Add-On Light Package	+	+
Additional rear headlights		
Working headlight on boom		
Add-On Light Package Plus	+	+
2 additional headlights on cab		
2 additional rear headlights		
1 additional working headlights on boom		
Light Package Xenon	+	–
2 Xenon additional roof headlights		
2 additional rear headlights		
EU Lift Capacity Package	+	+
Hoist cylinder load holding valves		
Lift capacity table		
Overload warning device		
Adjustable Boom Package	+	–
Adjustable attachment		
Hoist limitation in depth		

Advanced

Classic

• = Standard, + = Option, – = not available

- Stop the swinging motion of the uppercarriage when lowering the attachment into a ditch without striking the attachment on the ditch walls.
- Inspect the machine for damage if the attachment has been swung into a wall or any other obstacles.
- Applications in which the attachment is to be used to strike the material being extracted are not permitted, even when working in a longitudinal direction.
- Repeated strikes against an object leads to damage to the steel structures and machine components.
- Please refer to your LIEBHERR dealer if special teeth for heavy-duty or special applications are required.
- Do not attach too large bucket or bucket with side cutters or that are during operations with rocky material. This would prolong the work cycles and may lead to damage to the bucket as well as further machine components.
- With the 2x45° offset articulation, the offset position may only be employed if the working tool or the attachment does not touch the material.
- Operation of the offset articulation to drill into the material is not permitted.
- Do not lift the machine during operation. Should this happen, lower the machine slowly back to the ground.
- Do not let the machine fall heavily on the ground and do not hold it back with the hydraulics. This would damage the machine.
- During operation with the attachment it is forbidden to raise the machine with the dozing blade (e.g. carving at the ceiling when tunnelling).

Safe use with a hydraulic hammer

- The hydraulic hammer must be selected with particular care. When using a hydraulic hammer not permitted by LIEBHERR, steel structures or the other machine components can become damaged.
- Before beginning breaking tasks, position the machine on firm and level ground.
- Use a hydraulic hammer designed exclusively for breaking stone, concrete and other breakable materials.
- Only operate the hydraulic hammer in the longitudinal direction of the machine and with the windshield closed or with a front protective grid.
- Ensure during hammer operation that no cylinder is entirely extended or retracted and that the stick is not in the vertical position.
- In order to avoid damages to the machine, try not to break stone or concrete while performing retraction and extension motions of the hydraulic hammer.
- Do not apply the hydraulic hammer uninterrupted for more than 15 secs. at a time to the same place. Change the breaking point. Too long uninterrupted operation of the hydraulic hammer leads to an unnecessary overheating of the hydraulic oil.
- Do not use the drop force of the hydraulic hammer to break stone or other materials. Do not move obstacles with the hydraulic hammer. Misuse of this nature would damage both the hammer and the machine.
- Do not use the hydraulic hammer to lift objects

Safe use when loading and unloading (particularly when loading and unloading wood)

- According to use, it can be necessary when working with a grab to move with the equipment raised and the load lifted up; this applies, for example, when loading and unloading wood.

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Hydraulic hoses and sheathed cables.

- It is forbidden to carry out repair work on hydraulic hoses and sheathed cables!
- All hoses, sheathed cables and bolt connections must be checked regularly every 2 weeks for externally visible damage and any possible damage must be immediately checked for leakage.
- Never check for leaks with your bare hands, use a sheet of paper or something else.
- Any damaged parts must be removed immediately! Spurting oil can lead to injury and burns.
- Even with correct storage and permitted load, hoses and sheathed cables are subject to the natural aging process. This restricts their duration of use.
  - Incorrect storage, mechanical damage and unauthorized load are the most common causes of failure.
  - In relation to duration of use, current norms, regulations and guidelines pertaining to hoses and sheathed cables at place of use must be adhered to.
  - Use at the limit range of permissible load can shorten duration of use (e.g. high temperatures, frequent movement cycles, extremely high pulse frequencies, multiple shift usage).
- Hoses and sheathed cables should be replaced if the following are found during inspection:
  - Damage to the outer sheath as far as the liner (e.g. chafing, cuts and cracks);
  - Brittleness of the outer sheath (fracture formation in hose material);
  - Deformations which do not correspond to the natural form of the hose or sheathed cable, whether in a unpressurized or pressurized state or on bends e.g. sheath separation, blistering;
  - Unsealed areas;
  - Non-adherence to requirements during installation;
  - Damage or deformations to the hose fittings which reduce the tightness of the fittings or the hose / fitting connection;
  - Hoses working themselves out of the fittings;
  - Corrosion of the fittings which reduces function and tightness;
- When replacing hoses and sheathed cables, use only original replacement parts.
- Install and mount hoses and sheathed cables correctly. Do not mix up the connections.
- The following is to be noted when replacing hoses and sheathed cables:
  - Always ensure that the hoses and sheathed cables are installed free of torsion. For high-pressure hoses, the screws from the half-clamps or full flange must always be attached to both hose ends and should only be tightened afterwards.
  - When tightening the flange on high-pressure hoses and sheathed cables with bent fittings, the side with the bent fitting must always be tightened first and then the side with the straight fitting tightened afterwards.
  - Any mounting clamps which are located in the centre of the hose may only be attached and tightened subsequently.
  - Check daily to ensure that all clamps, covers and protective devices are properly fastened. Doing this will prevent vibration and damage during operation.
  - Install the hoses and sheathed cables in such a way that they cannot chafe on other hoses, sheathed cables or parts.
  - A minimum distance from other parts of approx. half the exterior diameter of the hose is recommended. The distance should not, however, be less than 10 to 15 mm.
  - When replacing the hoses or sheathed cables on moving parts (e.g. from the boom to the stay), check before initial start-up that there are no chafing areas in the entire area of movement.

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2.6.4 Nameplates on the machine

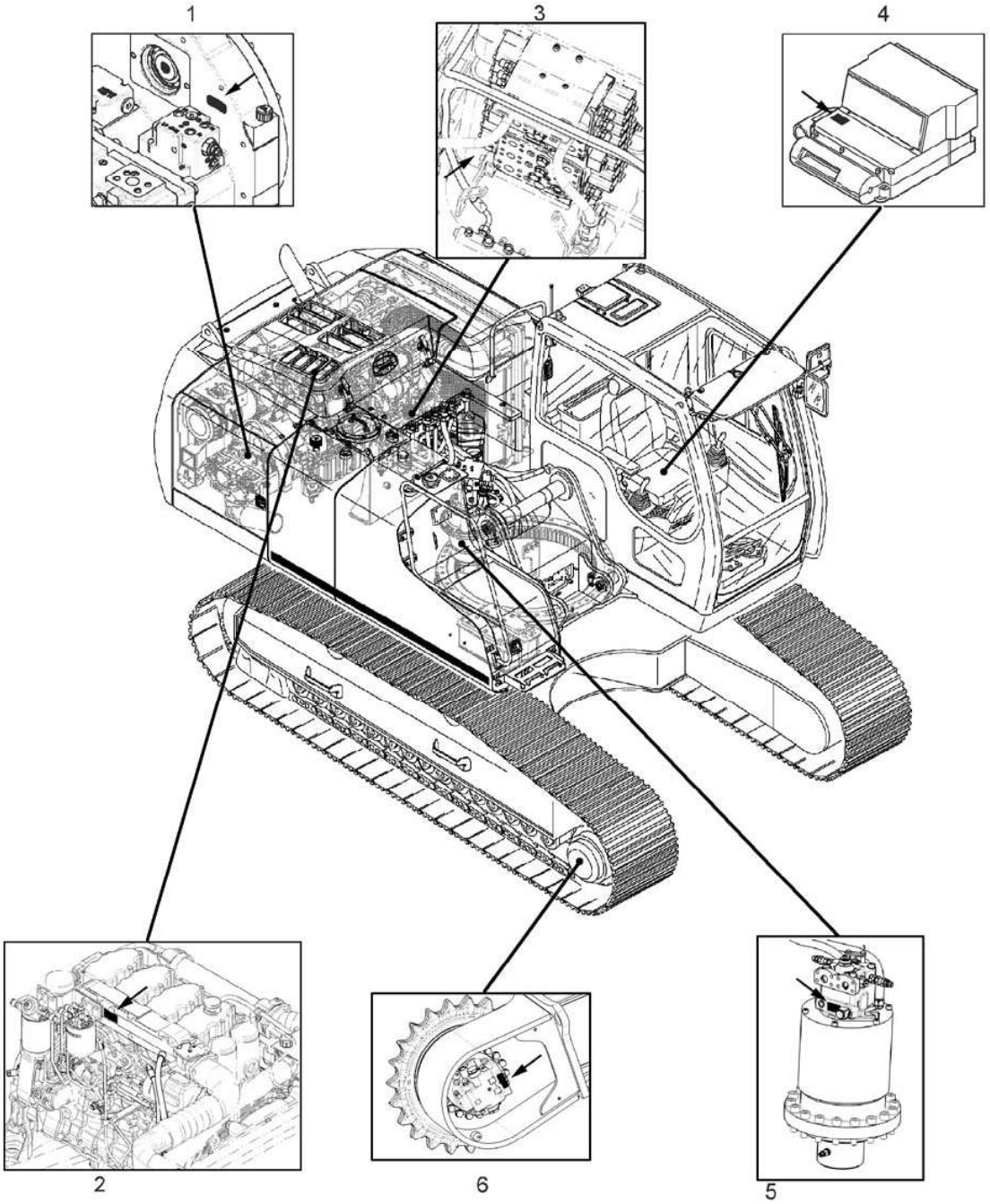

Fig. 2-3 *Important nameplates on the machine*

1	Hydraulic pump	**3**	Control block	**5**	Slewing gear transmission
2	Diesel engine	**4**	Heating/air conditioning device	**6**	Drive transmission

S20 – Engine low idle automatic

- ▶ Press the touch:
  - ↳ LED in the touch illuminates,
  - ↳ The low idle automatic is activated.
- ▶ Press the touch again:
  - ↳ LED in the touch goes out,
  - ↳ The low idle automatic is deactivated.

Adjustment of the time lag for low idle automatic

The time lag between the return to neutral of all joysticks and pedals and the automatic reduction of the engine RPM to low idle can be adjusted using the touch S20 as follows:

- ▶ press the touch to activate the low idle automatic and keep the touch depressed.
  - ↳ after a few seconds the LED starts blinking rapidly,
- ▶ release the touch as soon as the blinking duration has reached the desired time lag for low idle automatic (settings from 2 - 9 seconds).

S21 – Travel speed increase

- ▶ Press the touch:
  - ↳ LED 1 in the touch illuminates,
  - ↳ the automatic shifting from normal to increased travel speed is activated.

During travel, the oil motors mounted to the travel gears now change automatically from normal speed to increased speed each time the terrain conditions allow it, and inversely, they return to normal travel speed when ground conditions become difficult.

- ▶ Press the touch again:
  - ↳ LED 1 in the touch goes out,
  - ↳ the automatic shifting between normal and increased travel speed is deactivated. The travel motors remain permanently in the normal travel speed position.

S22 – Auxiliary floodlights (optional equipment)

- ▶ Press the touch:
  - ↳ LED in the touch illuminates,
  - ↳ the auxiliary floodlights are turned on.
- ▶ Press the touch again:
  - ↳ LED in the touch goes out,
  - ↳ the auxiliary floodlights are switched off.

S36 – No function

S41 – Rotating beacon (optional equipment)

- ▶ Press the touch:
  - ↳ LED in the touch illuminates,
  - ↳ the rotating beacon is turned on.
- ▶ Press the touch again:
  - ↳ LED in the touch goes out,
  - ↳ the rotating beacon is switched off.

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E 537 – Low fuel pressure into Rail 1 - Safety stage

This symbol appears if the fuel pressure into rail 1 is under the safety limit.

E 538 – Low fuel pressure into Rail 2 - Warning stage

This symbol appears if the fuel pressure into rail 2 is under the warning limit.

E 539 – Low fuel pressure into Rail 2 - Safety stage

This symbol appears if the fuel pressure into rail 2 is under the safety limit.

E 597 – Boost air overheat - Warning stage

This symbol appears if the boost air temperature exceeds 75°C during at least 3 seconds. The buzzer sounds simultaneously and the engine power is reduced.

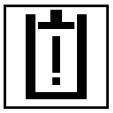
If the temperature increases some more, the symbol E524 will also be displayed

Quick change adapter (optional equipment)

This symbol appears during the unlocking procedure or when the locking pins of the quick change adapter are not completely out.
No error code is corresponding to this symbol.

Information symbols in the INF field

System error



This symbol, showing that the excavator is working in a degraded mode, appears on following system errors :

E150, E151 : stick pressure pick off B159.

E153, E154 : hoist pressure pick off B160.

E156, E157 : left swing gear pressure pick off B167.

E159, E160 : translation pressure pick off B162.

E162, E163 : bucket pressure pick off B163.

E165, E166 : right swing gear pressure pick off B168.

E168, E169 : Dozer blade pressure pick off B85.

On same time the mechanical shovel drives degradet.

- ▶ Switch the engine off.
- ▶ Check the corresponding cable state and anchor.
- ▶ Localise the leak and carry out repairs.

Preheating

This symbol appears as long as the preheating of the air in the intake manifold is activated (preglow process).

been deactivated in the software.

The durations indicated in the last line of the screen 4, under M4/Time repectively B19/Time correspond to the pause time for the windshield wiper in intermittent mode, respectively to the delay time for the engine low idle automatic system.

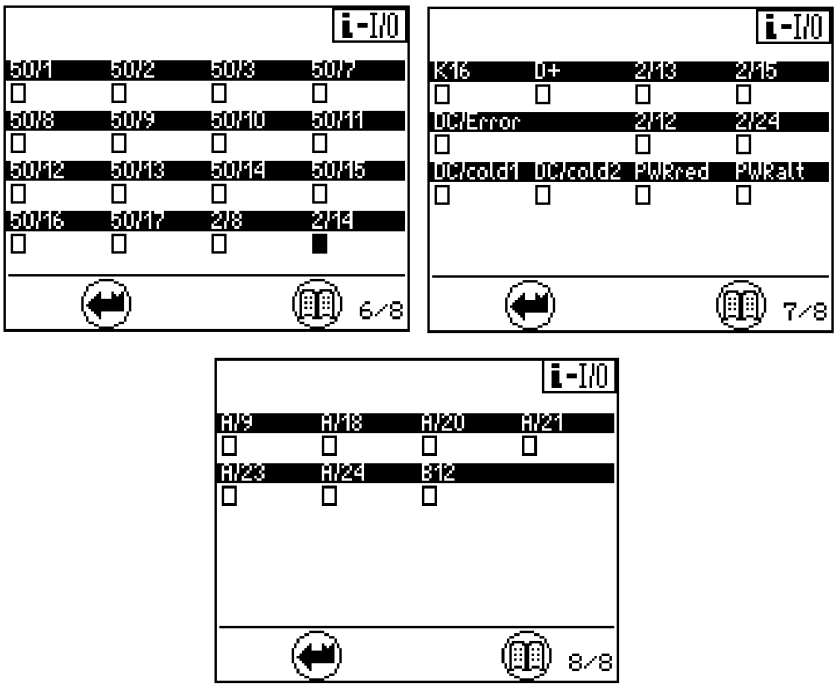


Fig. 3-20 *Menu "Info In/Outputs"- Status of electrical inputs and outputs*

The screens 7 and 8 give information concerning the PLD control system of the Diesel engine (Pump line nozzle injection system):

- Input K16 controls the starter operation.
- Input D+ indicates if the generator delivers current.
- Input X2/13 refers to operation of the Diesel engine with standard power curve.
- Input X2/15 refers to external commutation of hydraulic power.
- Input DC/Error indicates if an error is detected in the function of the Diesel engine monitoring system.
- Input A/21 indicates if the "translation" movement is activ (pressure > 7 bars)
- Input X2/24 indicates if the engine control is in safety mode.
- Input X2/12 indicates if an operating fault is detected in the engine monitoring circuit when the engine is in safety mode.
- Input DC/cold1 controls the function of the preglow of the Diesel engine.
- Input DC/cold2 controls the function of the postglow of the Diesel engine.
- PWRred refers to power reduction of the diesel engine in case of an intake air, engine coolant or fuel overheating.
- Input PWRalt controls the Diesel engine power limitation in accordance with the atmosphéric pressure.
- Input A/9 indicates if the stick movement is activ (pressure > 7 bars)
- Input A/18 indicates if the hoist movement is activ (pressure > 7 bars)
- Input A/20 indicates if the left swing gear movement is activ (pressure > 7 bars)

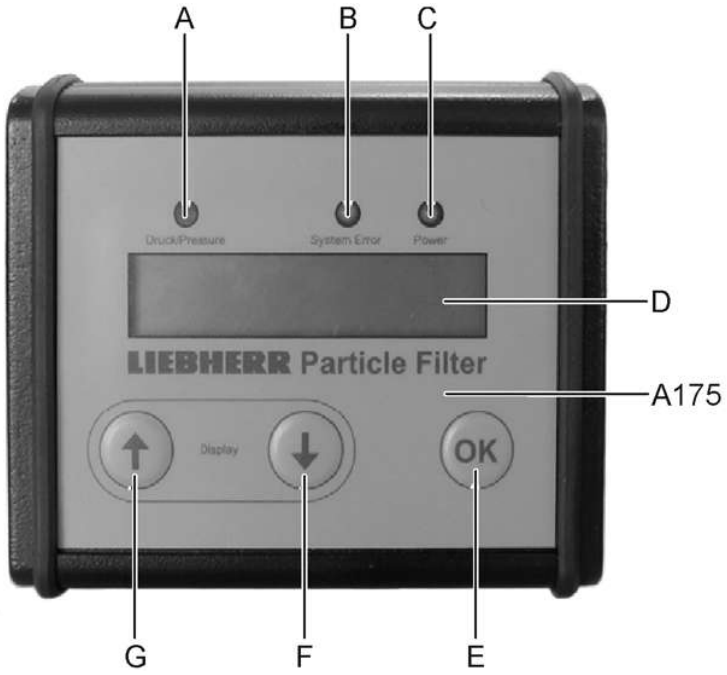


Fig. 3-28 *Control unit A175*

A	Red LED (pressure)	**B**	Orange LED (system error)
C	Green LED (power)	**D**	LCD Display
E	Acknowledge key	**F**	Menu key
G	Without function	**A175**	Control unit for particles filter

Use / monitoring of the particle filter system

After turning the igition key to contact position, the LCD display shows "Data Logger ready for use" (or "Datenlogger betriebsbereit").

After starting the Diesel engine, the last consulted menu appears.

The key **F** is used to change between the LCD display menus.

▶ Hold key **F** depressed for approx. 2 seconds to change to the next menu.

Following menus could be displayed:

– **"Exhaust back pressure (mbar)"** (or "Abgasgegendruck (mbar)") .
Shows the exhaust gas back pressure - only.

– **"Exhaust back pressure (mbar) / Exhaust temperature 1 (°C)**
(or "Abgasgegendruck (mbar) / Abgastemperature 1 (°C)")
Shows in addition the exhaust gas temperature before the filter (engine side)

– **"Exhaust back pressure (mbar) / Exhaust temperature 2 (°C)**
(or "Abgasgegendruck (mbar) / Abgastemperature 2 (°C)")
Shows in addition the exhaust gas temperature after the filter (exhaust side)

– **"Exhaust back pressure (mbar) / Speed (rpm)**
(or "Abgasgegendruck (mbar) / Drehzahl (U/min)")
Shows in addition the Diesel engine RPM.

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Setting the seat springs

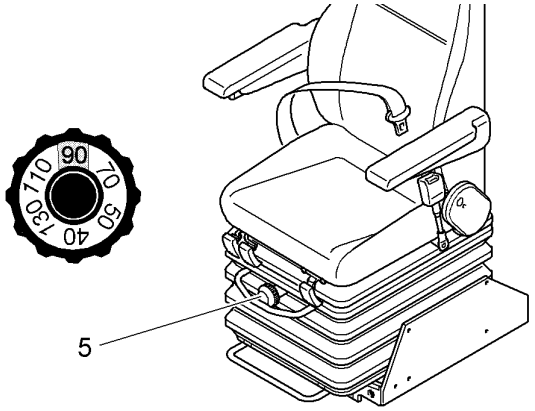

Fig. 3-40 *Setting the seat springs*

▶ Use the rotary knob **5** to set the seat springs to match the body weight.

Options setting (optional extras)

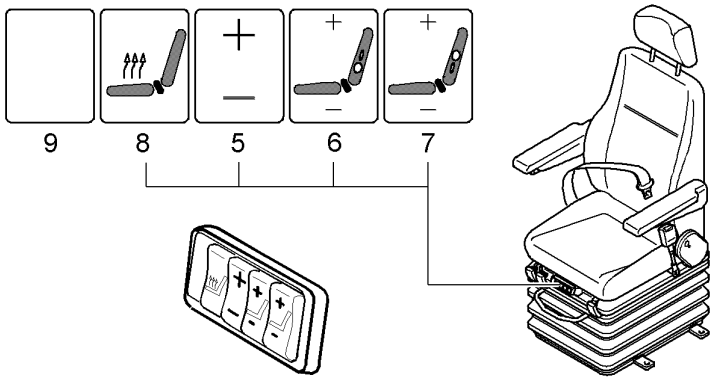

Fig. 3-41 *Switch bar on the air-cushioned operator's seat*

To set the vibration damping:

▶ Press button **5** (**+** or **-**) and set the vibration system according to body weight.

To set the lumbar support:

▶ Press button **6** (**+** or **-**) to inflate or deflate the lower lumbar chamber.

▶ Press button **7** (**+** or **-**) to inflate or deflate the upper lumbar chamber.

To set the seat heating:

▶ Use switch **8** to switch the seat heating on or off.

The seat heating switches off automatically when the temperature set is reached.

Note!
In case of high outside temperature, and especially if the cab has been heated up by the sun, decrease the temperature inside the cab as far as possible before turning on the air conditioner.

▶ Open the windows and the door for a few minutes and adjust the blower fan to maximum RPM via the keys 5 and 2.

Reheat-operation

In order to achieve a quick dehumification of the cab, as an example on morning, when setting the machine into operation, it may be advisable to briefly turn on the air conditioning operation even when the heater is allready operative.

▶ Press the REHEAT-key **6**:
  ↳ the symbol **14** is displayed,
  ↳ the compressor is constantly working,
  ↳ the fan of the heater and airconditioner is running at maximum RPM,
  ↳ the air flaps at the front window and at the legroom are open,
  ↳ as necessary the control unit switches on the heating so to maintain the adjusted cab temperature.

▶ As soon as the windows are completely demisted, the Reheat-operation may be exited while pressing the REHEAT-key **6** again.

Note!
To avoid overloading the starter motor and the batteries, turn on the air conditioning operation and the REHEAT-operation only after the Diesel engine is running.

The REHEAT-operation is turned off automatically after 10 minutes.

▶ If the machine is used for a longer period of time without using the air conditioner, press the REHEAT key **6** about every 2 weeks so to turn on the airco compressor.

Recirculated air and fresh air operation

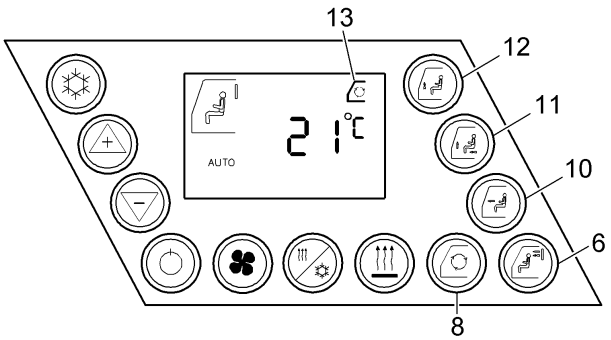

Fig. 3-54 *Recirculated air and fresh air operation*

The heating and air conditioning system can work either in recirculated air operation or in fresh air operation.

▶ Pressing the key switch **8** will alternately change from recirculated air operation into fresh air operation:
  ↳ in recirculated air operation:
  • the symbol **13** is displayed,
  • the fresh air flap 33 in the rear cab wall is closed.
  ↳ in fresh air operation:

3.3.1 Starting / stopping the machine

General information

Note!
When using the machine at a specific height above sea level and in connection with coolant and boost air temperatures, the performance and service life of the diesel engine with turbocharging is decisively affected.
Under these conditions, there is also an increased risk of the codant circuit and the hydraulic oil overheating.

The power electronic regulator **LIDEC DC 5-00** is used for regulation, surveillance and protection of LIEBHERR diesel engines.

In the following environmental conditions (sea level and athmospheric pressure) the engine power is automaticaly reduced :

- 4.850 m and an atmospheric pressure up to 550 mbar
- 3.950 m and an atmospheric pressure up to 620 mbar
- 3.100 m and an atmospheric pressure up to 690 mbar
- 2.250 m and an atmospheric pressure up to 770 mbar
- 1.550 m and an atmospheric pressure up to 840 mbar

Pay attention to both the coolant circuit and the hydraulic oil cooling simultaneously.

Two advertising stages are present for the coolant and boost air temperatures (see chapter "Warning symbols in the SY field".

- The first stage, as warning, the engine power is reduced and an acoustic signal sounds.
- The second stage, as safety, stops the engine automaticaly and an acoustic signal sounds.

Attention !
In the time between warning and safety stage, a potential engine damage is possible. For that reason from first signal of warning stage :

▶ Stop the engine, localise and rectify the error immediately.

Activities before starting

Caution!
It is only possible to extinguish a source of fire if it is accessible.

▶ Before starting, unlock all locks on the panelling of the hydraulic excavator.
↳ In the event of fire, the doors can be opened immediately and the fire extinguished.

Arrangement of locks: see Maintenance chapter

Caution!
With the activities referred to below, a machine that is already warm from operating, there is a risk of scalding or burning from hot coolant or oil.

▶ Please ensure that you read the information provided in the Maintenance chapter on carrying out these activities.

3.3.9 Anti-theft device with code key (option)

The machine can be equipped with an electronic anti-theft device.

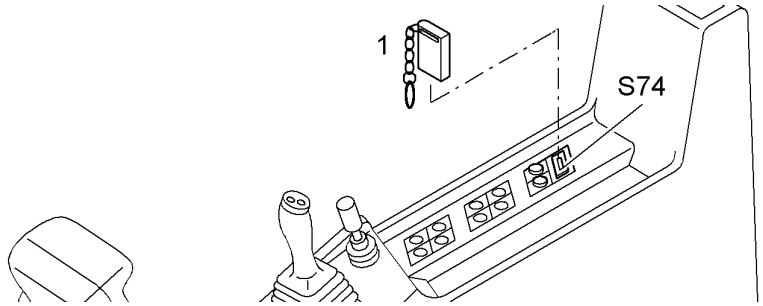

Fig. 3-65 *Electronic anti-theft device*

- ▶ Insert the code key **1** in the code lock **S74** and then remove.
  - ↳ The LED goes out.
  - ↳ A signal tone sounds.
- ▶ The anti-theft device is activated.
- ▶ You have 9 seconds to start the electrical system with the ignition key.

If the ignition is not switched on within 9 seconds, the code key will have to be reinserted in the code lock.

When the ignition is switched off, the anti-theft device activates itself automatically after 30 seconds.

- ▶ To reorder the code key, give the code number entered on the accompanying code card (credit card format).

3.3.10 Immobilizer with electronic ignition key (option)

System description

The system consists of a mechanical locking system and an independently functioning, electronically coded, immobilizer.
When activated, the electronically coded immobilizer disconnects the starting and main control circuits of the machine.
The control of the immobilizer is microcomputer based. The electronic key of the immobilizer is a transponder, which is securely integrated into the key handle.

Activation of the immobilizer

- ▶ Turn the key in "0" position.
  - ↳ the immobilizer will be automatically activated after 5 seconds.
- ▶ Pull the key away from the ignition switch.

Note!
The immobilizer is activated and will stay activated, as long as the key stays in position '0', no matter if the key remains inserted or is pulled out of the switch.

Deactivation of the immobilizer

- ▶ Insert the key into the ignition switch and turn it to the contact position "1".
  - ↳ the immobilizer is deactivated.

Danger!
The safety mode must be turned on only temporarily and in order to move the machine for emergency reasons and when, due to a trouble in the normal control circuit, releasing the swing brake or supplying the pilot controls is hindered.

In safety mode, the swing brake will be released as soon as the ignition key is turned to contact position, and the normal brake control is out of function.

- ▶ Inform all personnel involved in the operation or maintenance of the machine that the safety mode has been turned on and that, by the fact, the control of the swing brake is modified.
- ▶ Locate the trouble which makes the operation in safety mode necessary and get it repaired as quickly as possible.

Note !

- ▶ Even with the switch S73 in safety position, the servo pressure supplying the joysticks and pedals is interrupted when tilting up the safety lever .

3.4.2 Safety operation of the main working pumps

During normal operation of the excavator, the electronic horsepower control continuously adjusts the pumps flow to the pressure level of the working circuits

If a trouble occurs in the circuit of the regulator, the pumps stay in maximum angle and therefore the engine is overloaded.

- ▶ Locate the trouble and get it repaired as quickly as possible.

3.5 Recovering, towing the machine

Towing the machine safely

- – Always follow the correct procedure: see chapter “Towing the machine” in these operating instructions.
- – The machine may only be towed in exceptional circumstances, e.g. in order to move the machine away from an area where it is at risk.
- – Before towing, check all attachments and towing devices for safety and stability.
- – Towing devices such as bars, cables or ropes must have adequate tensile strength and should be secured around the undercarriage tower.
  Any damage or accidents which occur while towing the machine are not covered by the manufacturer’s guarantee.
- – Ensure that there is no one in the vicinity of the towing devices when towing.
- – Stretch safely and hold the towing devices. Avoid kinks on cables or ropes.
- – When towing, maintain the correct transport position, permitted speed and route, and avoid lurching.
- – After towing, return the machine to correct operational status.
- – When restarting the machine, be sure only to proceed in accordance with the operating instructions.

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

▶ Press the touch **S17** again.
  ↳ the red LED beside the touch goes out.
  ↳ The swing gear brake is in automatic operating mode :
    ↳the swing brake releases as soon as a swing hydraulic control is actuated.
    ↳the swing brake is applied as soon as the uppercarriage speed gets lower than a limit value and no swing hydraulic control is actuated.

Note!
If the red LED beside the touch **S17** is lighting, the brake remains applied, whatever happens.

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, 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 «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** to apply the mechanical swing brake.
  ↳ the red LED beside the touch is lighting.
  ↳ the swing brake is applied.

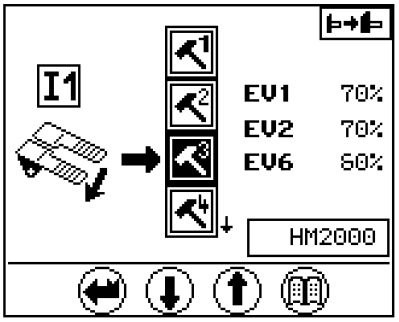
▶ Push the left joystick **4** to the right and then to the left as far as the stop.
  ↳ If the swing brake function is OK, the uppercarriage does not start swinging.

Notice!
The choice of an option does neither have an influence upon the allocation of the pedals, nor lead to the switching-off of pedal function.

Control of the hydraulic hammer

The hydraulic hammer is always controlled by the pedal 9m.

The operation of a hydraulic hammer requires the previous selection of the correct pump parameters option which has been allocated to this hammer, using the menu "Set Option" of the display.
Normally the designation appearing in the lower right corner of the screen must correspond to the definition of the installed hammer.
In case of a doubt, contact your supervisor to obtain this information.



▶ Push down the foot pedal 9**m**.
  ↳ The hydraulic hammer is activated.

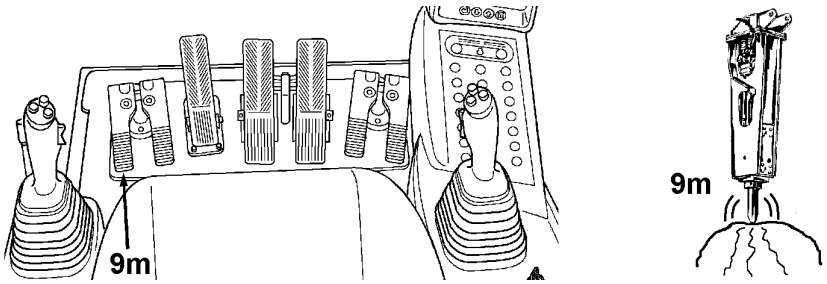


Fig. 3-93 *Control of a hydraulic hammer*

Note!
If the machine is used frequently or for long periods for hammer work, there is a risk that the hydraulic oil is contaminated more than in usual conditions.

▶ Reduce the maintenance intervals for hydraulic oil and return filter cartridges changes to suit the recommendations for working in heavy dust conditions.

Control of a bottom dump shovel

▶ Push down the foot pedal 9**n**.
  ↳ The shovel flap closes.

▶ Push down the foot pedal 9**p**.
  ↳ The shovel flap opens.

Case no. 1 : the position of the proximity switch is adjustable on a rail

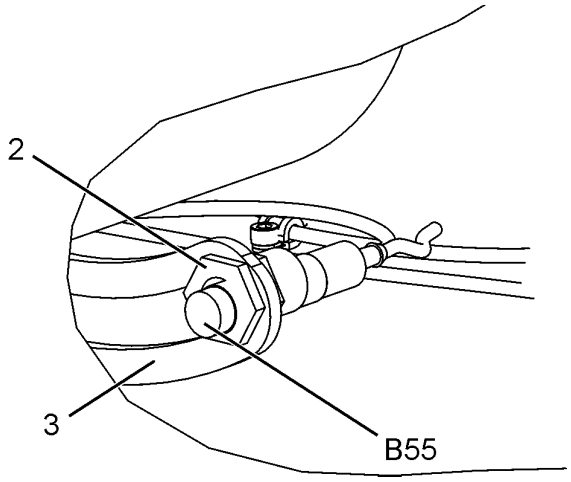


Fig. 3-102 *Example of a proximity switch whose position is adjustable*

2 nut **3** rail **B55** switch B55

- ▶ Loosen the nut **2** of the proximity switch **B55**.
- ▶ Shift the proximity sensor **B55** and position it so that it is right in front of the extremity of the reflector.
- ▶ Retighten the nut **2** to secure the proximity switch **B55**.
- ▶ Check the position for which the cut off of the cylinder movement occurs.
- ▶ If necessary repeat the adjustment procedure and check the cut off position again.

Case no. 2 : the proximity switch is fixed and the position of the reflector is adjustable

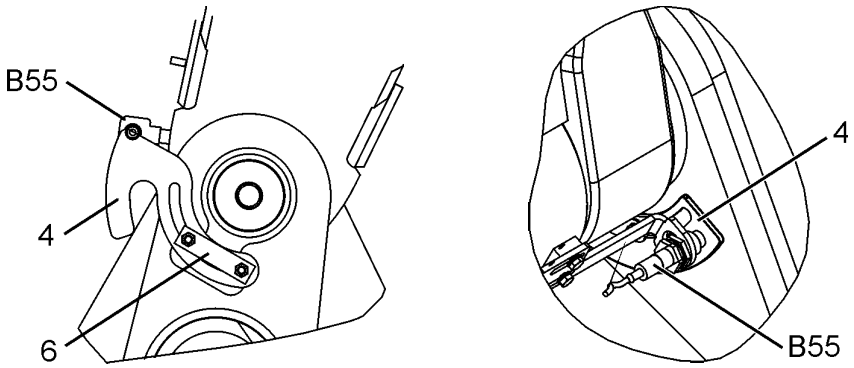


Fig. 3-103 *Examples of proximity switch whose position is fixed*

4 Reflector **6** Fixing system of the reflector

- ▶ Loosen the fixing screws of the reflector **4**.
- ▶ Shift the reflector **4** so that its extremity is right in front of the proximity sensor **B55**.
- ▶ Retighten the fixing screws of the reflector **4**.

Dismounting a bucket

- Position the bucket to be attached in such a way that its entire lower part is laying on the ground.
- Remove the covers **5** and **6**.
- Remove the protection rings **8** of all the bearing points and draw the O-rings **9** up onto the bushing **1.1** on the bucket side.
- Drive out the pins **3** and **4**.
- If necessary, lift the attachment slightly to remove the pin **4**.
- Take off the O-rings **9** and if necessary replace them.

Attaching a new bucket

- Position the bucket **1** so that the flat part of the bucket rests on the ground.
- Draw the O-rings **9** up onto the bushing **1.1** of the digging bucket, as well on bearings bucket to stick as on bearings bucket to connecting link **7**.
- Start the engine and move the attachments until the stick and bucket bore holes **A** align.
- Insert pin **4** and reinstall the covers **6** with O-rings.
- Slowly extend the stick cylinder until the bore of the connecting link **7** is exactly between bore holes **B**.
- Insert pin **3** and reinstall the covers **5** with O-rings.
- Slip the O-rings **9** laterally until they are in the grooves between bushings **1.1** and **2.1** (see detail **D**) and install the two piece protection rings **8**.
- Lubricate all greasing points of pins **3** and **4** directly or with the automatic grease system (if mounted) until clean grease comes out of the greasing points.

Note!

After installation of a new digging bucket, the restrictor check valves **222** and **232** for stick, respectively bucket tilt cylinders must be eventually readjusted so to have the correct velocity of the working attachment (due to weight differences of the digging bucket).If necessary, consult a LIEBHERR mechanic.

In particular on machines, which are delivered without digging bucket or grapple, this restrictor check valves must be (if mounted) adjusted after installation of the digging tool, so to avoid uneven or jerky movements of the attachment parts.

To lock the quick-change adapter:

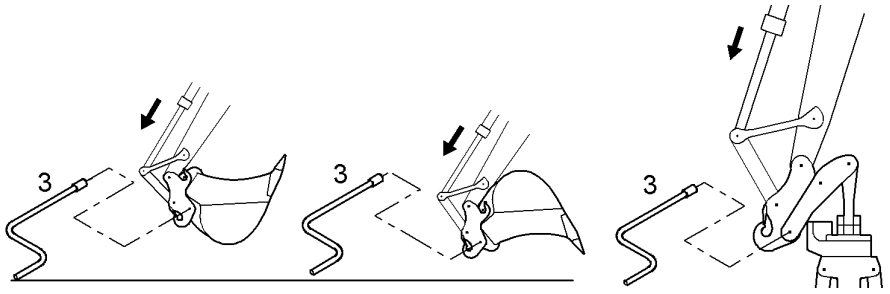


Fig. 3-113 *Locking the quick-change adapter*

Danger!
Before locking, there is no fixed connection between the work tool and the quick-change adapter. The work tool could under certain circumstances fall out and injure people.

- ▶ Approach the quick-change adapter with the utmost care.
- ▶ Push the safety lever up to secure the work equipment against unintentional movement.
  - ↳ No work movements can be carried out when pilot control devices, eg. the joystick or foot pedals, are operated.

- ▶ Insert the crank **3** in the locking pin **1** and turn to the right (clockwise), until both locking pins **1** are extended as far as the stop.
  - ↳ The work tool is bolted on when taking up normally.
- ▶ Screw the locking screw **2** into the locking pin.

Danger!
An incorrectly locked quick-change adapter could open when operating!

- ▶ Ensure that the locking pins are always locked by the sealing plug **4** on the one side and by the locking screw **2** on the other side.
- ▶ Check daily to ensure that the locking screw **2** is correctly positioned.

Caution!
Hydraulic lines are pressurized!

- ▶ Remove the pressure using the joystick before connecting the hydraulic lines (switch off the diesel engine, turn the ignition key into the contact position, operate the joystick).

- ▶ Connect hydraulic lines or electrical lines, if necessary (eg. when attaching a grab).

Attaching and dismounting work tools

Attaching and dismounting is carried out as described in the chapter “Hydraulic quick-change adapter”.

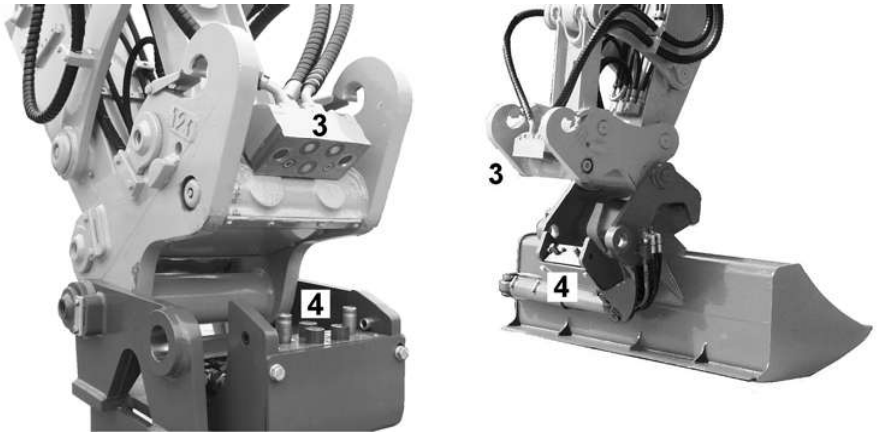


Fig. 3-125 *Connecting LIKUFIX*

Please also note:

- ▶ Before attaching, remove the protective coverings on the quick-change adapter **1** and the work tool **2**.
- ▶ Always keep hydraulic couplings **3** and **4** clean.
- ▶ Perform a visual check for cleanliness before attaching. If necessary, clean all coupling parts and the sealing surfaces with a clean, oil-soaked cloth.
- ▶ Connect or separate the hydraulic coupling slowly as with any change of work tool.
- ▶ When attaching the quick-change adapter, tilt until the coupling disks are connected as a result of the self weight of the work tool.
- ▶ Remove the locking pins.
- ▶ If the disks do not connect as a result of self weight, foreign matter (such as stones) may be the cause. In this case, clean all coupling parts to prevent damage occurring when connecting.
- ▶ Oil quantity and pressure must be adapted to suit the work device concerned.
- ▶ When the work is completed, and particularly before transportation, put the protective coverings **1** and **2** back on.

Attaching LIKUFIX work tools to a quick-change adapter wi-

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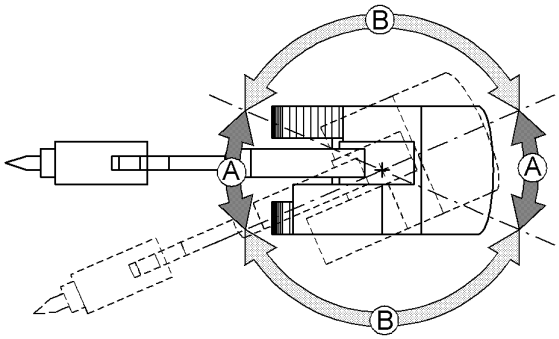

Fig. 3-141 *Permissible **A** and not permissible **B** work areas of the machine with hydraulic hammer*

Danger!
The stability of the machine could be affected.
When using a hydraulic hammer, only work with the machine in area **A**.

Note!
On request, the machine can be equipe with the option "hoist cylinders security". With this option, while hydraulic hammer utilization, the pressure protection value for lowering the attachment (circuit for retraction of the hoist cylinders) is reduced, so to limit the possible downward thrust exerted by the working attachment onto the materials to be dug out.

3.8.9 Working with large and heavy attachments.

Large (heavy) attachments* put a considerably higher load onto the working equipment, as the levers are longer.

To prevent damage to the machine, the following instructions must be strictly ad-hered to..

* Examples: concrete crusher, scrap shears, hydraulic hammer, swivel rotator, stick extension.

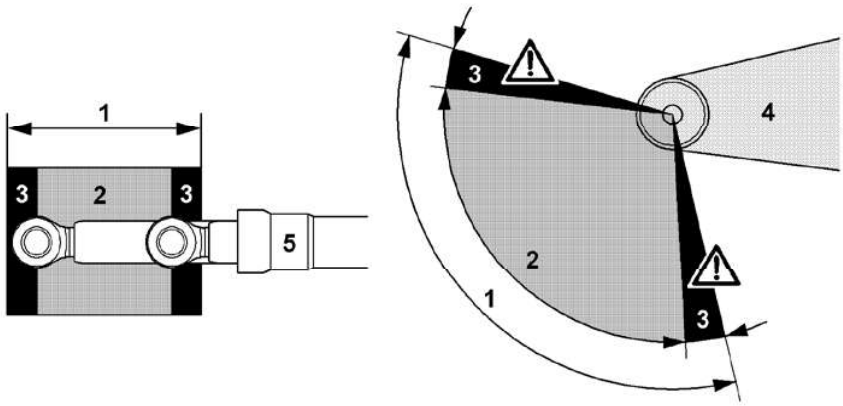

Fig. 3-142 *Permitted working range for large attachments*

1 Possible swivel range

2 Permissible working range with 10° dis-tance to end position

Error code	Effect	Cause	Measure / remedy
E 113		Injector A2 default	Consult LIEBHERR customer service.
E 114		Injector A2 error BIP / FZM	
E 115		Injector A3 default	Consult LIEBHERR customer service.
E 116		Injector A3 error BIP / FZM	
E 117		Injector A4 default	Consult LIEBHERR customer service.
E 118		Injector A4 error BIP / FZM	
E 119		Injector B1 default	Consult LIEBHERR customer service.
E 120		Injector B1 error BIP / FZM	
E 121		Injector B2 default	Consult LIEBHERR customer service.
E 122		Injector B2 error BIP / FZM	
E 123		Injector B3 default	Consult LIEBHERR customer service.
E 124		Injector B3 error BIP / FZM	
E 125		Injector B4 default	Consult LIEBHERR customer service.
E 126		Injector B4 error BIP / FZM	
E 127		Parameter default bank A	Consult LIEBHERR customer service.
E 128		Parameter default bank B	
E 129	Fuel pressure in rail 1 not being monitored.	Cable break	Consult LIEBHERR customer service.
E 130		Short circuit + 24 V	
E 131		Incoherent signal	
E 132	Fuel pressure in rail 2 not being monitored.	Short circuit to earth or cable break	Consult LIEBHERR customer service.
E 133		Short circuit + 24 V	
E 134		Incoherent signal	
E 135		Circuit 5 Volt - REF1	Consult LIEBHERR customer service.
E 136		Circuit 5 Volt - REF2	
E 137		Circuit 5 Volt - REF3	
E 138		Circuit 5 Volt - REF4	

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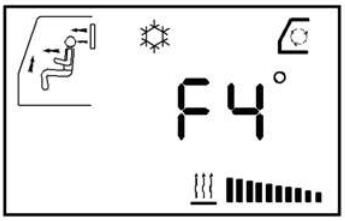
4.1.3 Keypad

Error code	Effect	Cause	Measure / remedy
E 302	No entry possible using keypad	No coding plug	Consult LIEBHERR customer service.

Error code “F4“ pressure fault and faulty magnetic coupling:

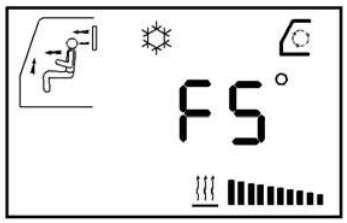


The control unit has recognised a faulty vent flap room area and front window, the regulation is once again ready for operation.

Cause of flap fault: short-circuit or interruption of the power supply line, plug connection on fan flap motor or control unit, flap motor faulty.

After remedying of the fault, the fault is no longer displayed!
Should a pressure fault or faulty magnetic coupling occur, the regulator carries on working as usual, only the magnetic coupling output is interrupted

Error code “F5“ faulty data transmission operating feature / control unit:



Data transmission from the operating feature to the control unit is faulty.

Cause of the fault: short-circuit or interruption of the data line to control unit, plug connection on operating feature or control unit.

The operating feature continues to try to establish data connection to the control unit, if the connection is once again OK, “F5“ – fault will no longer be displayed.
If the data transmission from the operating feature can not be established again, the ignition must be switched off, and RESET will be carried out following the restart.

4.2.7 LIEBHERR particles filter system

Chart of errors on particle filter control unit A175.

LCD display message	LED	Cause	Remedy
"Themo element 1 (or 2) is defective" (or "Thermoelement 1 (oder 2) defekt") Buzzer (H) is activated.	orange + green	Defektive or interruption ot a temperature sensor	Press key **E**: Deactivation of the acoustic alarm (buzzer). Check temperature sensor, connect or, if necessary, replace.
"ERROR idling / Temp. ignition block active" (or "Fehler Leerlauf / Temp. Zündungssperre aktiv") Buzzer (H) is activated.	orange + green	Too long operation with low exhaust gas temperature (low engine load)	Press key **E**: Deactivation of the acoustic alarm (buzzer). Increase engine load (full load operation)
		Idling operation too long	Operate machine with higher speed.
"Error interrupt. Terminal W" (or "Fehler Unterbr. Klemme W") Buzzer (H) is activated.	orange + green	Interruption of the of the speed logging.	Press key **E**: Deactivation of the acoustic alarm (buzzer). Check the circuit for speed logging and, if necessary, replace.

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- 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.
- Special care must be taken when testing load-bearing components, particularly:
  - the steel chassis members and axle and transmission mountings, the support, the lower rim bearing support and tower and ball rim bearing.
  - the steel upper structure members and bearing block for boom and boom cylinder, the upper rim bearing support, the cab mount and the mount for swing gear and ballast.
  - the steel components of the working equipment, e. g. the boom, stay, quick change adaptor, and bucket.
  - hydraulic cylinders, axles, steering, bolts and bolt connections, steps, 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 rim 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.

Welding, drilling, firing and grinding work

- Any welding on structural parts (as undercarriage, uppercarriage, equipment parts,…) may only be done the manufacturer, or authorized official dealer. If this rule is neglected, the warranty is voided.
- Only carry out welding, drilling, firing and grinding work on the machine with express authorization. Clean dust and combustible materials off the machine and its surrounding areas before welding, drilling, firing or grinding.
  Ensure adequate ventilation. Risk of fire or explosion.
- Before welding repairs on other parts, always disconnect the battery. Always remove the negative terminal first and reconnect it last.
- Nevertheless if welding repair should be done on components which may contain inflammable gases (welded counterweight, hydraulic tank, fuel tank, …), these components must be previously and sufficiently ventilated with pressurized air to avoid all fire or explosion hazard
- Before welding, connect the ground cable as close as possible to the welding point, so the welding current will not run through the swing ring, joints, gears, bushings, rubber parts and seals

Process materials

- When working with oils, greases and other chemical substances, observe the appropriate current safety regulations for the product.
- Ensure that process materials and replacement parts are disposed of in a safe and environmentally acceptable manner.
- Take care when handling hot process materials
  (Risk of burning and scalding).

Repair work

- Do not attempt to lift heavy parts. Use devices which are suitable for this purpose and which have sufficient load capacity. When replacing single parts and larger subassemblies, carefully secure them on lifting devices them so that they do not

LFR/en/Edition: 07 / 2009

5.3.3 Lubricant chart

Designation	Medium	Symbol	Classification	Viscosity
Diesel engine	Engine oil		API-CI-4, CH-4, ACEA E4, E6, E7	SAE 5W40 SAE 10W30 SAE 10W40 SAE 15W30 SAE 15W40
Hydraulic tank	Engine oil		API-CD / ACEA E1 (MB 226.0 und 227.0) API-CD, CE, CF ACEA - E2, E3, E4 (MB 227.5, 228.1, 228.3 und 228.5)	SAE 10W SAE 10W-30 SAE 10W-40 SAE 15W-40 SAE 20W-20 SAE 30W
	Hydraulic oil		DIN 51524 T2/T3 ISO11158 HM/HV ASTM D6158 HM/HV	ISO VG 32 ISO VG 46 ISO VG 68 ISO VG 100
			LAV < 10 min (air separation charcteristics at 50°C, DIN 51381) KLR < 15% (viscosity drop after 20 h at 100°C, DIN 51350-6, CEC L 45-A-99)	
Swing gear (as parking brake)	Transmission oil		API-GL-5 MIL-L 2105 B, C or D	SAE 80W-90 or SAE 90 LS
Swing gear (as positioning swing brake)	Transmission oil		API-GL-5 MIL-L 2105 B, C or D	SAE 90 LS
Travel gear	Transmission oil		API-GL-5 MIL-L 2105 B, C or D	SAE 90 SAE 80W-90
Splitterbox	Transmission oil		API-GL-5 MIL-L 2105 B, C or D	SAE 90
Tracks and corresponding gearing of swing ring, equipment mounting	Lubricating grease		High pressure grease KP2k or EP2	Consistency 2 NLGI Class
Hinges, joints, locks	Engine oil	-	-	-
Rubber seal on doors and trim panels	Silicon spray or talc	-	-	-

Tab. 5-4 *Lubricant chart*

Use a refractometer to check the mixing ratio

Fig. 5-7 Refractometer Gefo 2710

Refractometer:

- Adjustment screw for setting the 0-line (water line)
- Adjust the focus by turning the eyepiece
- soft eye guard on eyepiece
- rigid metal housing
- good grip provided by rubber casing

Measurement procedure:

▶ Carefully clean the cover and prism

▶ Apply 1 or 2 drops of testing fluid to the prism

▶ Close the flap
↳ The fluid will distribute itself.

▶ Look at a light background through the eyepiece.

▶ Focus the scale and read off the value on the blue line.

Conversion diagram:

Note!
Concentration measured using a Brix refractometer for Caltex / Chevron Texaco / Havoline / Total.

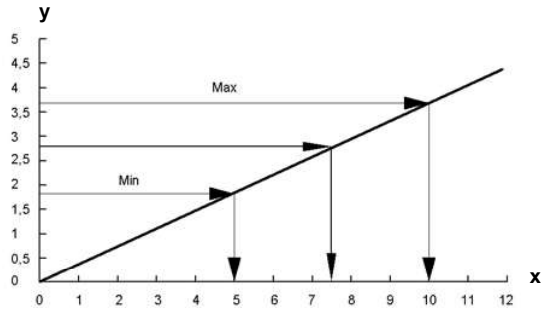

Fig. 5-8 Conversion diagram

x Concentration (vol%)
y Read off refractometer in 0-10% Brix

5.5.5 Vibration damper

The vibration damper must be checked for leaks and distorsion following the interval given in the maintenance chart.

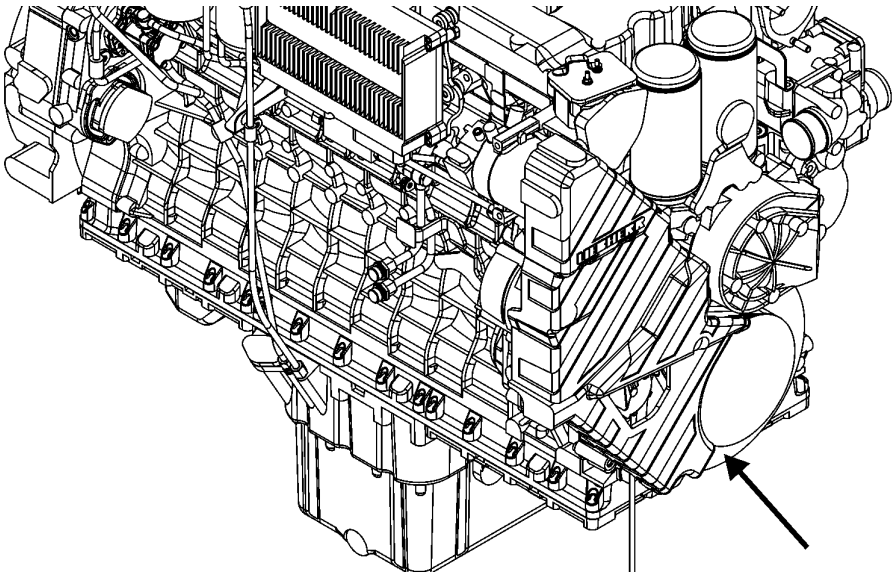

Fig. 5-17 *Vibration damper*

5.5.6 Checking mounting screws

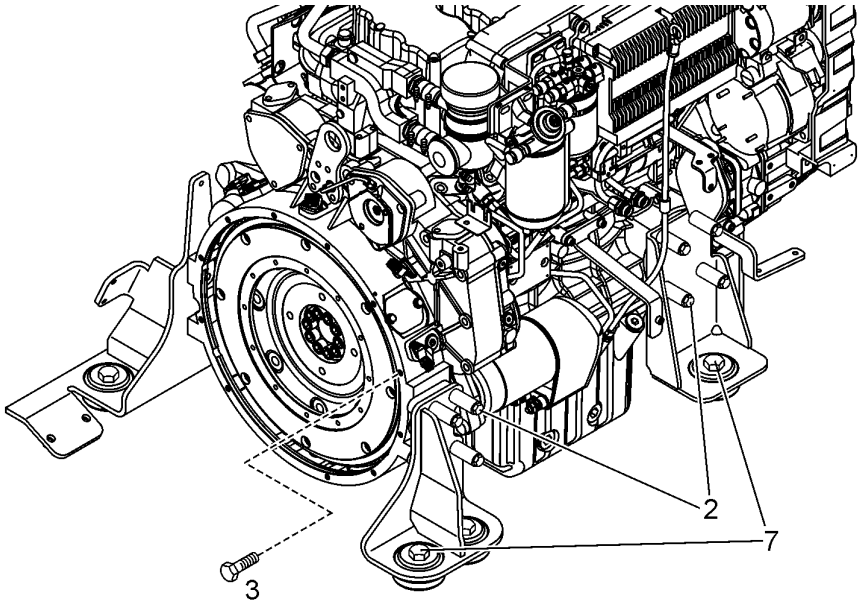

Fig. 5-18 *Checking mounting screws*

2 Mounting screws of engine supporting brackets mounts
3 Mounting screws of splitterbox on diesel engine SAE housing
7 Mounting screws of engine rubber mounts

❑ **Shutoff valves for the heating circuit must be closed.**

To drain the coolant at the cooler:

▶ Open cap **90** and unscrew the protection cap of the drain valve **9a** on the coolant cooler.

▶ Screw the drain hose supplied to the drain valve.

▶ Let the coolant drain into a suitable container.

To drain the coolant at the diesel engine:

▶ Unscrew the protection cap of the drain valve **2** on the engine's oil cooler plate.

▶ Screw the drain hose supplied to the drain valve.

▶ Let the coolant drain into a suitable container.

Refilling the coolant and bleeding the coolant circuit

❑ **Shutoff valves for the heating circuit must be closed.**

▶ Close drain valve **9a** on the coolant cooler.

▶ Close drain valve **2** on the engine.

▶ Add coolant up to the upper edge of the filler neck of expansion reservoir **90**.

▶ Close the cap again.

▶ Open the valve for heating circuit and adjust the heating system of the cab at maximal temperature.

▶ Let the engine run at a low idle for approx. one minute.

▶ Open the cap.

▶ If necessary, add coolant up to the upper edge of the filler neck of expansion reservoir **90**.

▶ Close the cap again.

If the coolant level sensor actuates, check the coolant level (refill if necessary).

Caution!
The engine could be damaged.

▶ If the temperature or level display for the coolant level illuminates, bring the engine to a low idle immediately.

▶ Switch off the engine.

▶ Check the coolant level and refill with coolant if necessary.

Notice!
During a start procedure in bleeding mode, the engine control unit prolongs the fuel injection times until it recognises that the engine has started (i. e .runs at at least low idle RPM).
During a starting procedure in bleeding mode an increased amount of smoke is generated.

- ❑ If the engine has not started within a pre-specified time:
  ↳ the bleeding mode will be interrupted automatically.
- ▶ wait for at least one minute, and then initiate a starting procedure in bleeding mode again.

B) up to the software version 35 of the engine control unit

- ▶ Loosen the injection line **15** of cylinder 1 on the injector side, at the fitting of the pressure tube (ensure that the tube does not also turn simultaneously!).
- ▶ On the 4 cylinder in-line engine D934 loosen the injection line from cylinder 4 on the pump side (nut 17).
- ▶ On the 6 cylinder in-line engine D936 loosen the injection line **16** of cylinder 6 on the injector side, at the fitting of the pressure tube (ensure that the tube does not also turn simultaneously!).

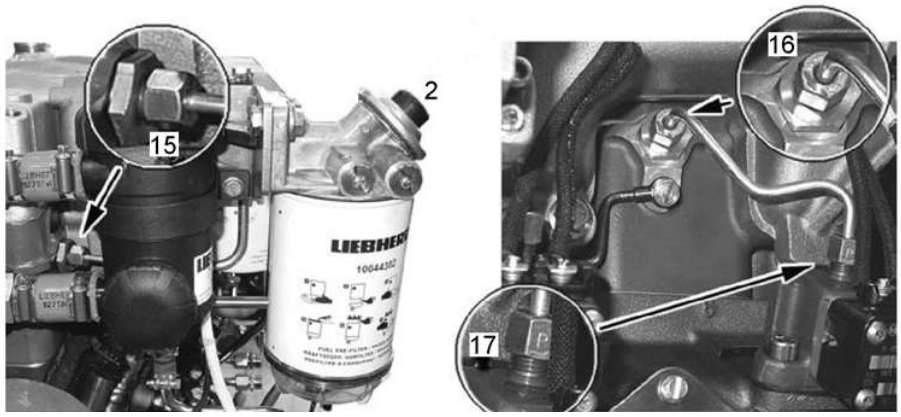

Fig. 5-38 *Bleeding the injection lines*

2 Hand pump
15 Bleeder screw nozzle side (Cylinder 1)
16 Bleeder screw nozzle side (Cylinder 6)
17 Bleeder screw pump side (Cylinder 4)

Notice !
The injection lines must be marked each time they are opened! Following the third time of opening (markings) the injection lines must be replaced.

- ▶ Actuate the hand pump **2** untill bubble-free fuel flows out of the injection lines.
- ▶ Retighten the injection lines**15** and **16** on the injector side or **17** on the pump side with a tightening torque of 25-30 Nm.
- ▶ Continue actuating the hand pump **2** until a stronger resistance can be felt.
- ▶ Start the Diesel engine.

5.10.3 Return-line filter

The return-line filter is located on the top of the hydraulic tank.

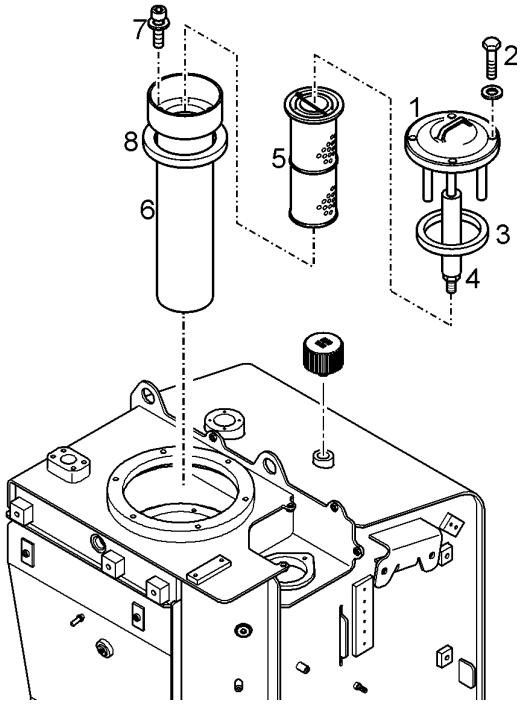

Fig. 5-47 *Return-line filter*

1 Cover
2 Screw
3 Sealing
4 Magnetic rod
5 Filter unit

The magnetic rod **4** of the return-line filter must be cleaned at fixed intervals (see maintenance chart) and the glass fibre filter unit **5** replaced.

Note

▶ When working in heavy dust conditions, please note the special regulations for changing the filter.

To clean the magnetic rod and replace the filter element:

❑ The hydraulic system must be depressurized.

▶ Unscrew the four screws on the filter cover and lift out cover **1** and magnetic rod **4**.

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

▶ Remove the used filter cartridge **5** on the bracket.

▶ Insert the new filter cartridge on the bracket vertically into the tank and press down lightly. Then lay the clamp to the side on the tank ring.

Caution!

▶ Ensure that the filter cartridge is standing vertical in the tank and that the O-ring **8** is not damaged.

5.10.13 Servicing the hydraulic cylinder

Checking the condition of the piston rod mount

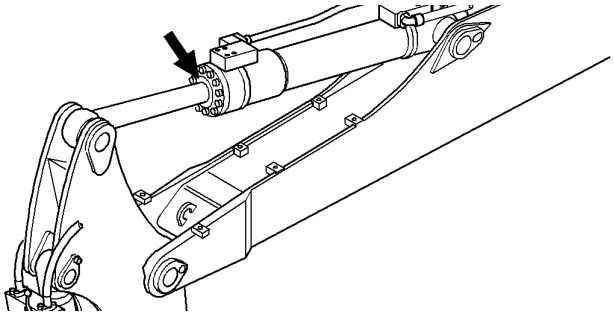

Fig. 5-57 Piston rod mount

Note
When a leak appears on the piston rod mount of a hydraulic cylinder (see arrow), the sealing kit must be replaced by a LIEBHERR fitter.

Protecting the piston rods

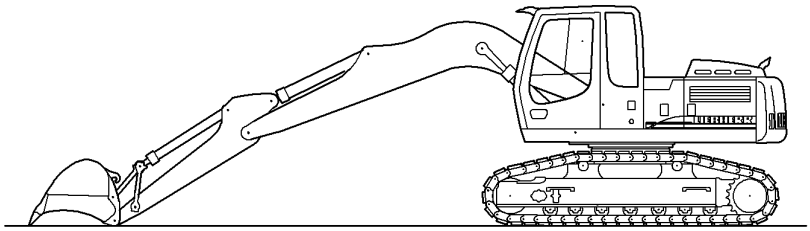

Fig. 5-58 Machine with piston rods drawn in

When the machine is out of service for more than 4 weeks and particularly for transportation by sea, the following measures must be taken:

- ▶ Position or transport the machine in such a way that the piston rods are fully drawn into the cylinders.
- ▶ Cover any loose piston rods with a thick layer of non-corrosive anti-corrosion fluid.

Grease quality: see “Lubricating and operating materials”

- ▶ For sea transportation, check the condition of the piston rods once more after loading.
- ▶ Additionally, cover piston rods with anti-corrosion fluid if a cylinder only has a low stroke for certain work, meaning that the piston rod is not regularly moistened with hydraulic oil (eg. cylinder on slewing arm when working over ground).
- ▶ Check the condition of hydraulic cylinders which are not moved a great deal regularly.

- ▶ Screw a complete new piece (lubricating nipple **3** and lubricating nipple extension **7**). Tighten the lubricating nipple extension **7** with a 27mm spanner.
- ▶ Retension the track chain, as described in the previous paragraph (see 5.12.3).

5.12.6 Cleaning the running carriage

Do not operate the machine if larger stones, pieces of wood or metal, wires or cables are trapped in the running carriage.

Dried or frozen mud and stones or other foreign bodies in the running carriage parts could result in considerable damage to the machine if the machine is operated or an attempt is made to free the machine using engine power.

- ▶ In sub zero temperatures, set the machine on boards to prevent the track chains becoming frozen to the subsoil.

Caution!
To avoid causing considerable damage to the frozen machine, never use force to tear it free.

- ▶ A frozen crawler can be freed by carefully heating the track pads.

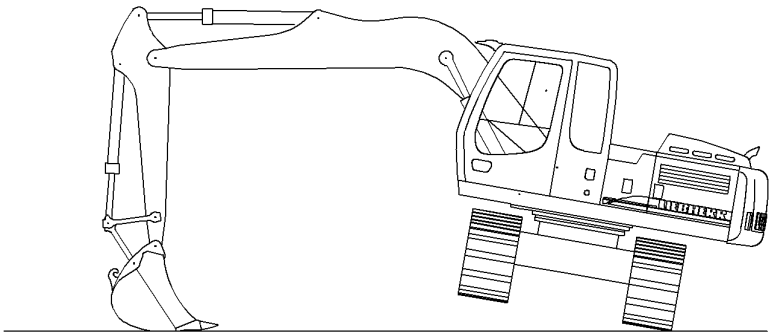

Fig. 5-70 *Raising the machine*

Caution!
The machine could slide away or back.

- ▶ Once you have supported the machine, prop it securely with wooden beams.

- ▶ Before setting down the machine, clean any very dirty parts of the track pads.
- ▶ Clean sand and dirt off the sliding surfaces of the tensioning units and grease.
- ▶ A latéral shoring thanks to the work equipment, enables to raise one side of the travelling mecanism in order to clean the track chain (see Fig. 5-70).

5.15.2 Semi automatic and full automatic systems

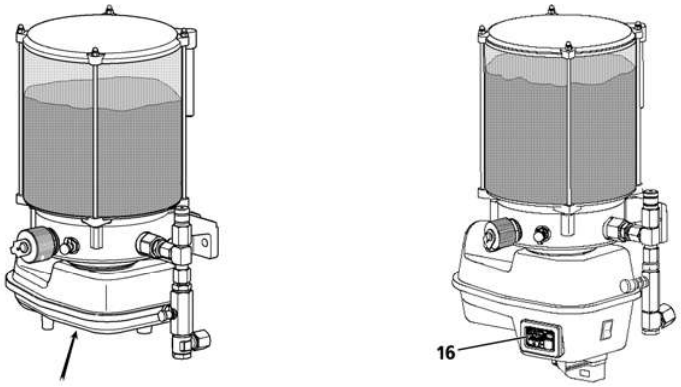

Fig. 5-81 *Semi automatic system Full automatic system*

The serially installed lubrication pump must be turned on and off via a switch in the cab by the operator (half automatic system) The lube pump is without control unit.

16 Integrated control unit

The electric motor of the optional mounted full automatic system comprises an electronic control unit 16, which triggers the lubrication cycles on and off during the operation of the machine.

5.15.3 Operation of the semi automatic system

In the semi – automatic system, the pump is controlled by the push button **S84** on the rear control desk of the driver's cab.

❑ With the Diesel engine running,

▶ Depress the button **S84**.
  ↳ The control light in the button lights up.
  ↳ The lubrication procedure is started.

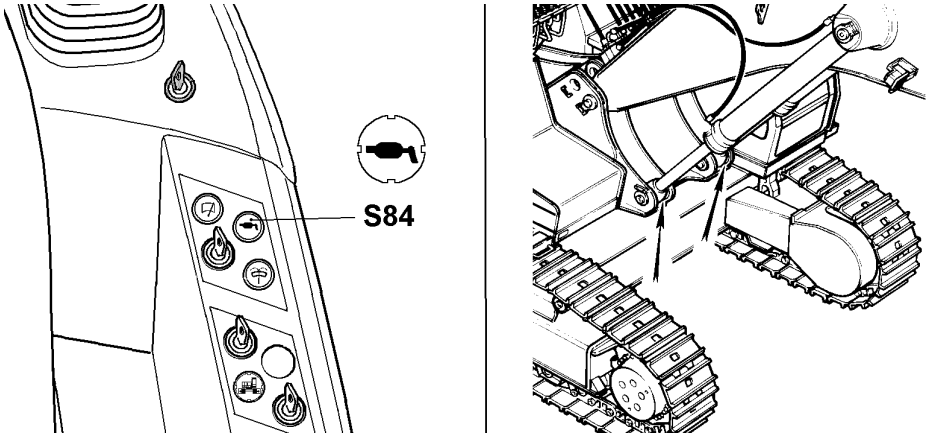

Fig. 5-82 *Centralized lubrication*

▶ Keep the lube pump running until clean grease runs out of the bearing points boom cylinders to upper carriage, then depress the button **S84** again.

Daily visual check out

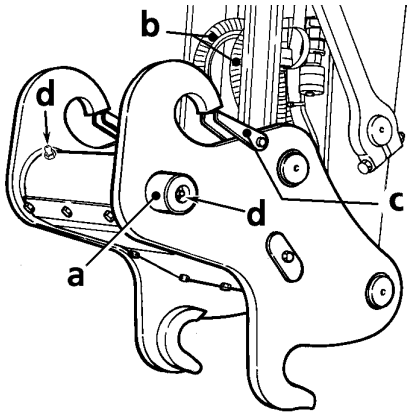

Fig. 5-93 *Functional check out of quick change adapter*

- ❑ After above described function verification,
- ▶ Control if locking pins **A** are in fully extended position, that means the tool's attachment bore holes must be flush with locking pins.
- ▶ Check also the good condition of the hydraulic hoses **B** and of the electrical supply bundle between end of stick and quick change coupler.
- ▶ Check that the safety latches **C** on the load hooks are in good working order.

5.17 Check mounting bolts for tightness

The mounting bolts listed below must be regularly checked and retighten if necessary. See maintenance chart for the checks intervals.

Caution!
The mounting bolts for all the main components (especially those listed below), and for the hydraulic hoses and pipes must be replaced after every removal.

Notice : when installing bolts of size bigger than M40 the thread of the screw must be slightly coated with a MoS2 based grease. For these bolt sizes also grease the supporting surface of the bolt head, unless hereafter otherwise specified.