en

Operating manual

Hydraulic excavator
R 926 Classic

from serial number 27651

Document identification

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1 Product description

1.1 Assembly - overview

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

1.1.1 Machine and construction equipment

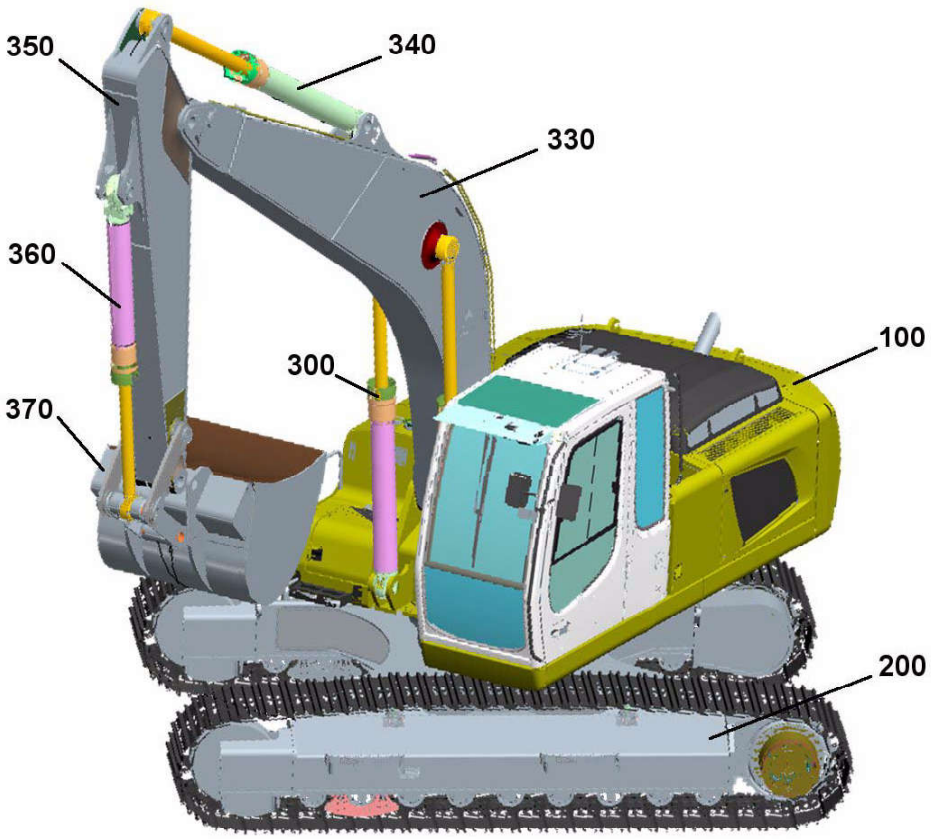

Fig. 1-1 *Machine with construction equipment*

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

Performance

Thanks to its innovative Advanced excavator system technology, the R 926 Advanced crawler excavator has performance features that are truly unique. Characteristic elements of this system technology include the particularly effective and energy-efficient Positive Control twin-circuit hydraulic system, which was specifically designed for machines with a high level of superimposed functions and operational movements. The electronic pump control arrangement sets this technology apart, creating a new standard for performance and quantity control that entirely matches the operator's needs.

Comfort

In the cab the driver can look forward to a workplace designed in accordance with the very latest findings in ergonomic science, with emphasis on comfort and ease of operation. The optimised arrangement of the hydraulic hoses means that the driver has en even wider field of vision, and the heating and climate control system fitted as standard means pleasant working conditions inside, whatever the weather. Liebherr crawler excavators are also particularly easy to service – maintenance tasks can be carried out easily and rapidly at readily accessible service points.

Reliability

Liebherr provides customers with solutions that lead the way for the future, solutions for maximum equipment reliability and availability, solutions which satisfy the most extreme demands for performance and quality. With more than 50 years experience in the construction of hydraulic excavators, we have an advantage in design and consultation that clearly sets us apart.

Economy

Crawler excavators from Liebherr guarantee maximum productivity. The optimum interplay of hydraulics and electronics means that individual movements and superimposed movements alike can be carried out particularly efficiently. And, perhaps last but by no means least, the perfect harmonisation of all the components means that energy expenditure during operation can be kept to an absolute minimum.

Fig. R 926 Advanced (ahead)
R 926 Classic (background)

Technical Data Classic

Engine

Rating per ISO 9249	130 kW (177 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 238 l/min.
Max. pressure	365 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	79 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) = 72 dB(A)
2000/14/EC	L_{WA} (surround noise) = 103 dB(A)

Undercarriage

Versions	
NLC	narrow gauge (2000 mm)
LC	wide gauge (2380 mm)
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	217 kN
Track components	B 60, maintenance-free
Track rollers/Carrier rollers	9/2
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

with Adjustable Offset Boom 5,70 m

Advanced

Stick 2,40 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m		9,0 m				m
10,5	NLC[1]													
	LC													
	WLC													
9,0	NLC[1]													
	LC													
	WLC													
7,5	NLC[1]											3,5*	3,5*	
	LC											3,5*	3,5*	5,84
	WLC											3,5*	3,5*	
6,0	NLC[1]					5,4	6,6*					3,4*	3,4*	
	LC					6,4	6,6*					3,4*	3,4*	7,03
	WLC					6,6*	6,6*					3,4*	3,4*	
4,5	NLC[1]			8,1	8,6*	5,1	7,2*	3,5	4,7*			3,3	3,4*	
	LC			8,6*	8,6*	6,2	7,2*	4,2	4,7*			3,4*	3,4*	7,74
	WLC			8,6*	8,6*	6,8	7,2*	4,7	4,7*			3,4*	3,4*	
3,0	NLC[1]	11,1*	11,1*	7,2	10,5*	4,7	8,0*	3,3	6,6			2,9	3,6*	
	LC	11,1*	11,1*	8,9	10,5*	5,8	8,0*	4,1	6,7			3,6	3,6*	8,11
	WLC	11,1*	11,1*	9,8	10,5*	6,3	8,0*	4,5	6,7*			3,6*	3,6*	
1,5	NLC[1]			6,4	12,0*	4,3	8,8*	3,1	6,4			2,7	4,0*	
	LC			8,0	12,0*	5,4	8,8*	3,9	6,5			3,4	4,0*	8,19
	WLC			9,0	12,0*	5,9	8,8*	4,3	6,5			3,7	4,0*	
0	NLC[1]	8,5*	8,5*	6,0	12,5*	4,1	8,7	3,0	6,2			2,7	4,6*	
	LC	8,5*	8,5*	7,6	12,5*	5,1	8,9	3,7	6,4			3,4	4,6*	7,99
	WLC	8,5*	8,5*	8,5	12,5*	5,7	8,9	4,1	6,4			3,8	4,6*	
-1,5	NLC[1]	11,1	13,0*	5,9	12,0*	4,0	8,6					3,0	5,9*	
	LC	13,0*	13,0*	7,5	12,0*	5,0	8,8					3,7	5,9*	7,47
	WLC	13,0*	13,0*	8,4	12,0*	5,5	8,8					4,1	5,9*	
-3,0	NLC[1]	11,4	14,1*	6,0	10,5*	4,0	7,8*					3,6	6,8*	
	LC	14,1*	14,1*	7,6	10,5*	5,0	7,8*					4,5	6,8*	6,58
	WLC	14,1*	14,1*	8,6	10,5*	5,6	7,8*					5,0	6,8*	
-4,5	NLC[1]			6,4	7,3*							5,4	6,3*	
	LC			7,3*	7,3*							6,3*	6,3*	5,09
	WLC			7,3*	7,3*							6,3*	6,3*	

Stick 2,70 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m		9,0 m				m
10,5	NLC[1]													
	LC													
	WLC													
9,0	NLC[1]													
	LC													
	WLC													
7,5	NLC[1]					3,9*	3,9*					3,1*	3,1*	
	LC					3,9*	3,9*					3,1*	3,1*	6,24
	WLC					3,9*	3,9*					3,1*	3,1*	
6,0	NLC[1]					5,4	6,2*					2,9*	2,9*	
	LC					6,2*	6,2*					2,9*	2,9*	7,36
	WLC					6,2*	6,2*					2,9*	2,9*	
4,5	NLC[1]					5,2	6,9*	3,5	5,2*			3,0*	3,0*	
	LC					6,2	6,9*	4,3	5,2*			3,0*	3,0*	8,04
	WLC					6,8	6,9*	4,7	5,2*			3,0*	3,0*	
3,0	NLC[1]	13,2	16,2*	7,3	10,1*	4,8	7,7*	3,3	6,6*			2,7	3,1*	
	LC	16,2*	16,2*	9,0	10,1*	5,8	7,7*	4,1	6,6*			3,1*	3,1*	8,40
	WLC	16,2*	16,2*	10,0	10,1*	6,4	7,7*	4,5	6,6*			3,1*	3,1*	
1,5	NLC[1]	6,8*	6,8*	6,5	11,8*	4,3	8,6*	3,1	6,4			2,6	3,4*	
	LC	6,8*	6,8*	8,1	11,8*	5,4	8,6*	3,9	6,5			3,2	3,4*	8,48
	WLC	6,8*	6,8*	9,1	11,8*	6,0	8,6*	4,3	6,5			3,4*	3,4*	
0	NLC[1]	8,7*	8,7*	6,0	12,5*	4,1	8,7	3,0	6,2			2,6	3,9*	
	LC	8,7*	8,7*	7,6	12,5*	5,1	8,9	3,7	6,3			3,2	3,9*	8,28
	WLC	8,7*	8,7*	8,6	12,5*	5,7	8,9	4,1	6,4			3,6	3,9*	
-1,5	NLC[1]	11,0	12,3*	5,9	12,1*	3,9	8,6	2,9	6,1			2,8	4,9*	
	LC	12,3*	12,3*	7,5	12,1*	4,9	8,7	3,6	6,3			3,5	4,9*	7,79
	WLC	12,3*	12,3*	8,4	12,1*	5,5	8,8	4,0	6,3			3,8	4,9*	
-3,0	NLC[1]	11,2	15,0*	5,9	10,8*	3,9	8,1*					3,3	6,6*	
	LC	14,8	15,0*	7,5	10,8*	5,0	8,1*					4,1	6,6*	6,93
	WLC	15,0*	15,0*	8,5	10,8*	5,5	8,1*					4,6	6,6*	
-4,5	NLC[1]	10,8*	10,8*	6,2	8,1*							4,7	6,3*	
	LC	10,8*	10,8*	7,8	8,1*							5,8	6,3*	5,54
	WLC	10,8*	10,8*	8,1*	8,1*							6,3*	6,3*	

Stick 3,00 m

m	Undercarriage	3,0 m		4,5 m		6,0 m		7,5 m		9,0 m				m
10,5	NLC[1]													
	LC													
	WLC													
9,0	NLC[1]													
	LC													
	WLC													
7,5	NLC[1]											2,7*	2,7*	
	LC											2,7*	2,7*	6,62
	WLC											2,7*	2,7*	
6,0	NLC[1]					5,5	5,8*	3,3*	3,3*			2,6*	2,6*	
	LC					5,8*	5,8*	3,3*	3,3*			2,6*	2,6*	7,68
	WLC					5,8*	5,8*	3,3*	3,3*			2,6*	2,6*	
4,5	NLC[1]					5,2	6,6*	3,5	5,3*			2,6*	2,6*	
	LC					6,3	6,6*	4,3	5,3*			2,6*	2,6*	8,34
	WLC					6,6*	6,6*	4,7	5,3*			2,6*	2,6*	
3,0	NLC[1]	13,8	14,9*	7,5	9,6*	4,8	7,5*	3,3	6,4*			2,6	2,7*	
	LC	14,9*	14,9*	9,2	9,6*	5,9	7,5*	4,1	6,4*			2,7*	2,7*	8,69
	WLC	14,9*	14,9*	9,6*	9,6*	6,5	7,5*	4,5	6,4*			2,7*	2,7*	
1,5	NLC[1]	8,4*	8,4*	6,6	11,4*	4,4	8,4*	3,1	6,4			2,4	3,0*	
	LC	8,4*	8,4*	8,2	11,4*	5,4	8,4*	3,9	6,5			3,0*	3,0*	8,76
	WLC	8,4*	8,4*	9,2	11,4*	6,0	8,4*	4,3	6,6			3,0*	3,0*	
0	NLC[1]	8,9*	8,9*	6,0	12,4*	4,1	8,8	2,9	6,2			2,4	3,4*	
	LC	8,9*	8,9*	7,6	12,4*	5,1	8,9	3,7	6,3			3,0	3,4*	8,57
	WLC	8,9*	8,9*	8,6	12,4*	5,7	8,9	4,1	6,3			3,4	3,4*	
-1,5	NLC[1]	10,9	11,8*	5,8	12,2*	3,9	8,6	2,9	6,1			2,6	4,2*	
	LC	11,8*	11,8*	7,4	12,2*	4,9	8,7	3,6	6,2			3,2	4,2*	8,10
	WLC	11,8*	11,8*	8,3	12,2*	5,5	8,7	4,0	6,2			3,6	4,2*	
-3,0	NLC[1]	11,1	15,7*	5,8	11,2*	3,9	8,3*					3,0	5,7*	
	LC	14,7	15,7*	7,5	11,2*	4,9	8,3*					3,8	5,7*	7,28
	WLC	15,7*	15,7*	8,4	11,2*	5,5	8,3*					4,2	5,7*	
-4,5	NLC[1]	11,6	11,9*	6,1	8,8*							4,1	6,2*	
	LC	11,9*	11,9*	7,7	8,8*							5,1	6,2*	5,98
	WLC	11,9*	11,9*	8,6	8,8*							5,7	6,2*	

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 375 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

2 Safety instructions

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

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

For EU countries, guideline 89 / 655 / EEC contains the minimum safety information applicable to the owner.

2.1 Meaning of the symbols in this manual

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

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

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

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

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

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

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

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

When moving the machine:

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

When loading and unloading:

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

Protection from vibration

– Vibrational loads on mobile building machinery are mainly the result of the type and method of use. The following parameters in particular are decisive influences:
  - Terrain conditions: Uneven areas and potholes;
  - Operational techniques: Speed, steering, brakes, controlling the machine's control elements when driving and working.

– To a large extent, the machine operator determines the vibrational loads since he selects the speed, gearbox ratio, working method and route himself.
  This means that there is a wide range of different vibrational loads for the same machine type.

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

– Select suitable machines, equipment parts and auxiliary devices for each part of the job.

– Use a machine that has a suitable seat (i.e. for earth-moving machinery such as hydraulic excavators, this should be a seat which corresponds with EN ISO 7096).

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

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2.5.2 Arrangement of signage

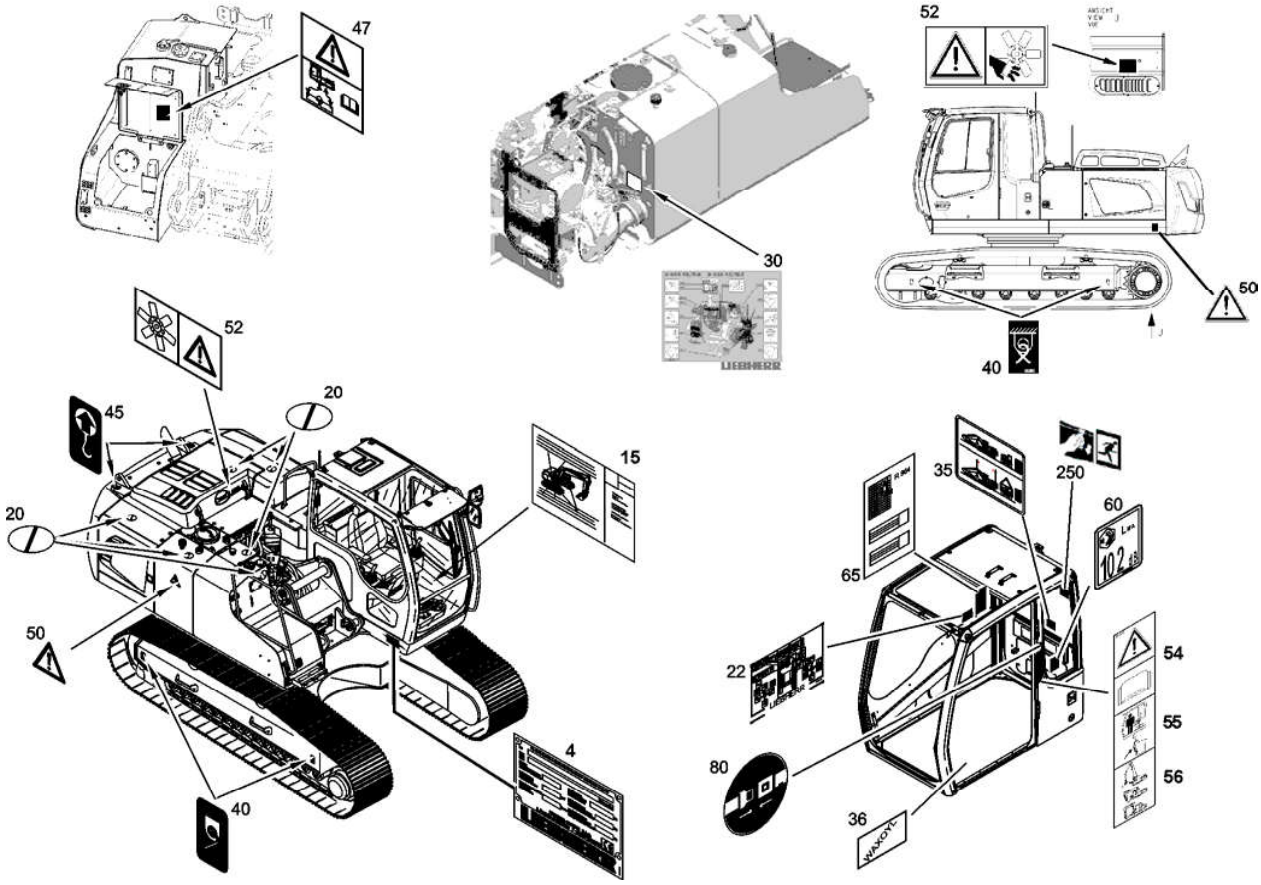


Fig. 2-1 *Arrangement of standard signage on the machine*

3 Control and operation

3.1 Operating and control elements

3.1.1 Controls in the operator's cab

1	Safety lever- Servo control	**S5L**	Push button for rotating device left (grapple, shear, ...), *or unlocking of cylinder cut-off (NA)*
3	Right joystick	**S5M**	Horn
4	Left joystick	**S5R**	Push button for rotating device right (grapple, shear, ...) *or travel alarm on/off (NA)*
5	Pedal for left travel gear	**S6L**	Push button for lifting magnet *or rotating device left (NA)*
6	Pedal for right travel gear	**S6M**	Push button - reserve
9	Pedal for special attachment control *	**S6R**	Push button –travel alarm on/off *or rotating device right (NA)*
10	Positioning swing brake *	**S55**	Switch – unlocking of cylinder cut-off *or lifting magnet (NA)*
15	Controls for optional equiments *	**S57**	Switch / reserve
		S71	Diesel engine emergency start
A3	Radio *	**S72**	RPM adjustment during emergency operation
E8	Cigarette lighter	**S73**	Safety mode of the servo circuits
H1	Monitoring display	**S84-1**	Push button / Central lubrication
H10	Buzzer		
P5	Hourmeter	**U38**	Control unit - air conditioner
S1	Ignition key		
S2	Control unit		

*	Optional equiments
(NA)	*This location only for North America*

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.

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).

.

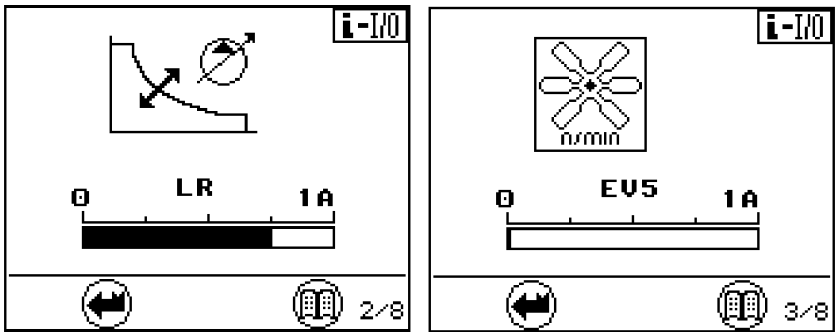


Fig. 3-19 *Menu "Info In/Outputs"- Currents to the solenoid valves LR and EV5*

▶ Press the **Menu** key again.
↳ The screen 3/8 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 screens 4 to 8 are successively displayed.

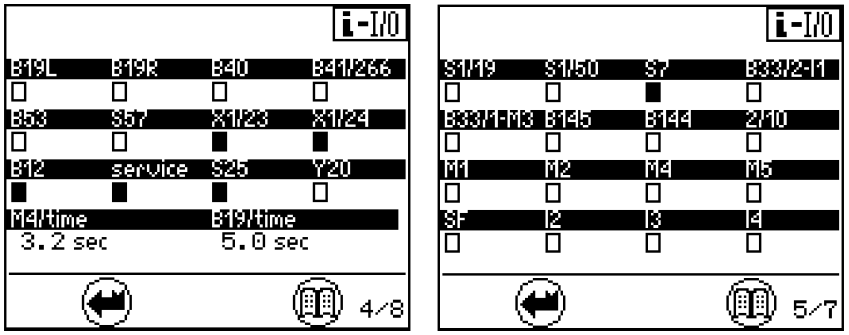


Fig. 3-20 *Menu "Info In/Outputs"- Status of electrical inputs and outputs*

The screens 4 to 8 provides an overview of the status of the different electrical inputs and outputs.

A "□" means "Input not active".

A "■"means "Input active".

An "NC" beneath the terminal designation means that the corresponding input has 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.

S422 - Radio muting

3.1.7 Display for LIEBHERR particle filter (optional).

The particle filter replacing the normal silencer in the exhaust line reduces the hydrocarbon, carbon monoxide and soot particles emissions.

The particle filter regenerates itself if the exhaust temperature is over 250°C, the use of Diesel additive to improve the regeneration is not necessary.

The control unit **A175** in the operator 's cab allows to monitor the particle filter system. The indications of exhaust back-pressure, Diesel engine RPM. and exhaust gas temperature show the charge conditions of the particle filter. Warning signals are optic and acoustic. The operator can thereby react to possible disturbance cases in the filter system and avoid any imminent damage to the filter and to the Diesel engine.

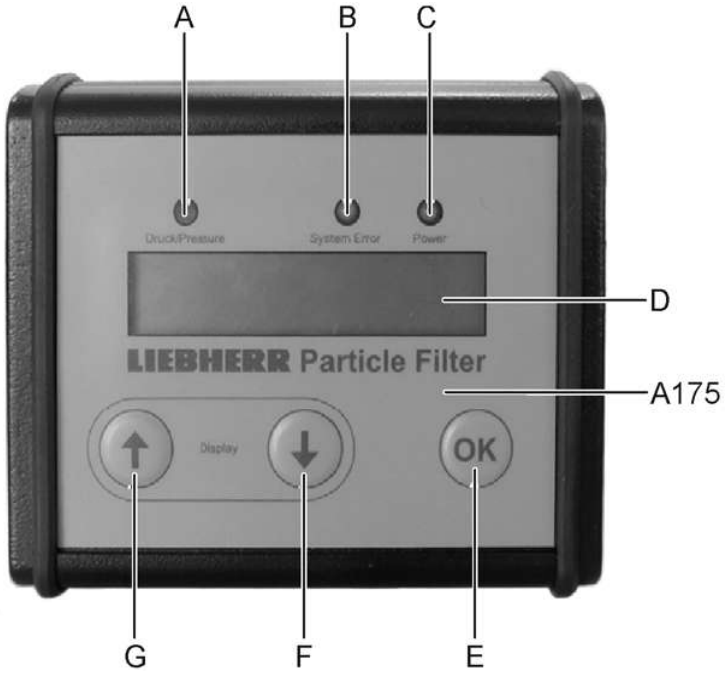


Fig. 3-29 *Control unit A175*

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.

Caution!
It is not allowed to work with the machine when the windscreen is in an intermediate position!

To change the position of the windscreen

- ▶ Pull the lever **1** in and down to unlock the windscreen.
- ▶ Move the windscreen using the handle **2**, secure it in one of the two positions **a** or **b** and relock using the lever **1**.

3.2.5 Sunshade

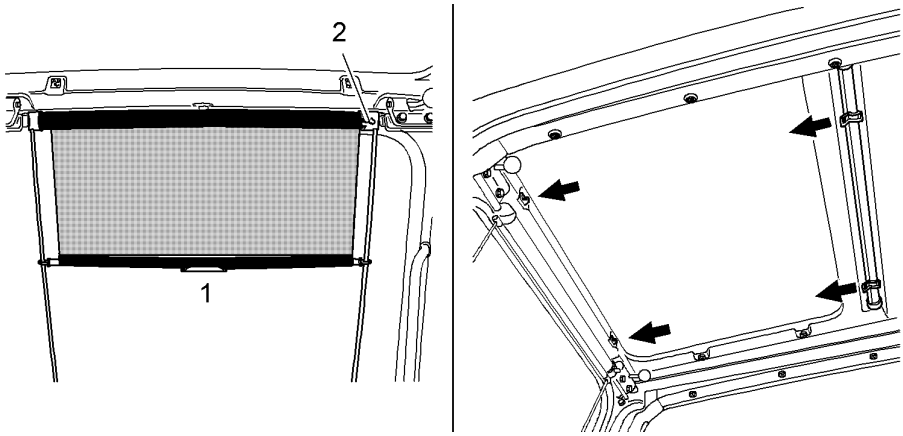


Fig. 3-42 *Sunshades at windscreen and at cab roof*

The cab is provided with two sunshades, located at the windscreen and at the cab roof window.

Maneuvering the sunshade at the windscreen

- ▶ Using the strengthening tongue **1**, pull the sunshade down to the desired position.
- ▶ Press the red button **2**, the sunshade will roll itself up.

Maneuvering the sunshade at the cab roof

- ▶ Pull out the sunshade and secure it in the holders designed for the purpose.
- ▶ To retract the sunshade, take it out of the holders and let it roll up slowly.

To reach a maximal feeling of comfort:

- For **heating** the air flow must be blown into the cab via the louvers **8a**, **8b** and eventualy **8c**. This is obtained while actuating the keys **10**, **11** and eventualy **12** .
- For **air conditioner operation** the air flow must be blown into the cab via the louvers **8d** and eventualy **8b**. This is obtained while actuating the keys **9** and eventualy **12**.

Note!
To defrost or dehumidify the windshield quickly, blow the whole air flow only out of the louvers 8c at the front windshield and 8b on the right control panel.

- In case of very high outside temperature, preferably close the louvers 8c to avoid an unnecessary warming up of the inside air along the windshield.

Changing the temperature from °Celsius to °Fahrenheit

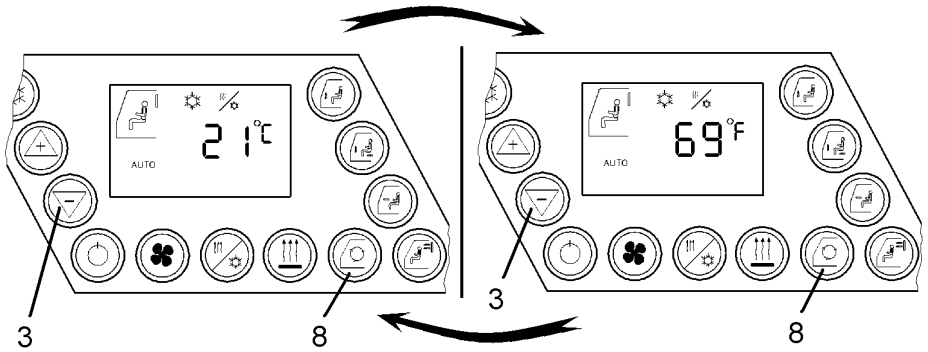


Fig. 3-54 *Switching over °Celsius - °Fahrenheit*

- Press the key **8** and keep it depressed. Press the key 3 at the same time.
  ↳ the display of the adjustet cab temperature is changed from °Celsius into °Fahrenheit.
- Pressing again the keys 8 and 3 at the same time will cause the temperature to change back into °Celsius.

3.2.12 Additional standstill heater (Option)

As an option, Your machine can be fitted with an additional heater mounted to the uppercarriage structure, out of the cabin. This heater is aimed to improve the starting ability of the Diesel engine and the working possibilities of the machine at very low temperatures.

This heater works with Diesel fuel and is used with the machine stopped to preheat the coolant circuit of the Diesel engine and thus the warm water circuit of the air conditioner serially installed in driver's cab.

In addition, and depending on the low temperature range planned for the machine operation, the additional standstill heater can also serve to heat various components on the machine via water to oil or water to air heat exchangers (such as splitterbox, fuel tank, batteries compartment, ...).

- All control lamps must illuminate for a brief period with the exception of the LED of switch **S22** (auxiliary light).
- The LIEBHERR logo appears on the monitoring screen.

Service interval display

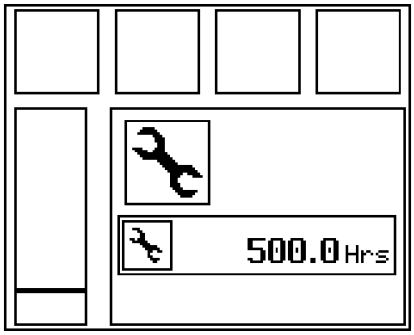


Fig. 3-58 *Service interval request*

After the automatic check, any service interval that may be due will be indicated by a graphic symbol.

In place of the operating hours information, the number of hours relating to the service interval required will now be displayed.

The service interval request will go out after approx. 8 seconds.

3.3.2 Starting the engine

Note !
A wrong start can cause damages for the diesel engine !

- ▶ Only operate the starter motor when the Diesel engine is off.
- ▶ Do not operate the starter more than 20 seconds.
- ▶ If the engine does not start after 20 seconds, wait at least 1 minute before attempting to restart.
- ▶ First turn the ignition key back to position **0** before restarting the engine.
- ▶ If the engine does not start after three attempts, find the problem and correct it.

Starting procedure

- ▶ Turn the ignition key to start position **3**.
- ▶ Release the ignition key as soon as the engine starts.
  - Control lamps H2 and H12 must go out.
  - The buzzer will sound briefly when the engine starts until the engine oil pressure builds up.

Starting procedure for low temperatures

For low temperatures, the intake air is preheated automaticaly by flame glow plugs situated in the intake manifolds so, to improve the starting of the engine.

When the symbol "**Preheating ON**" appears on the screen, the ignition key must be maintained in position **1** until the symbd "**Preheating END**" appears. Then the diesel engine can be started.

Deleting imprinted operating keys

❑ Deleting imprinted operating keys may be necessary after the loss of animprinted key.

During the deletion procedure, all imprinted keys will be deleted. After all keys have been deleted, they must be re-imprinted to recover validity.

▶ Insert the master key into the ignition switch, turn it to the contact position "1"and keep it for at least 20 seconds in this position.
  ⇩ all imprinted operation keys for this master key are deleted.
  ⇩ all existing operation keys may be reimprinted .

Note!
The code of the master key will not be deleted during the deletion procedure.

Operation security

Should more than 5 invalid keys be used in the ignition switch within 1 minute, so the immobilizer will be activated for 15 minutes and will not accept any valid keys during this period.
This procedure will prevent the 'trying out' of multiple keys and accidentally finding the correct key.

If several invalid keys are recognized without the ignition switch having been brought into the position '0', the immobilizer stays activated for 15 minutes and will not accept any valid keys during this period.
Only after those 15 minutes have expired, and after the ignition switch has recognized the position '0', will valid keys be accepted again. This will prevent keys from being tested without using the mechanical ignition switch, e.g. when the ignition switch is forcefully brought into position '1'..

Function security

An interruption of the supply line or other control lines will not deactivate the immobilizer or delete data (e.g. data codes).. All relevant data are stored in a non-volatile memory. Magnetic fields will not deactivate the immobilizer.

3.3.11 Travel functions

Straight travel

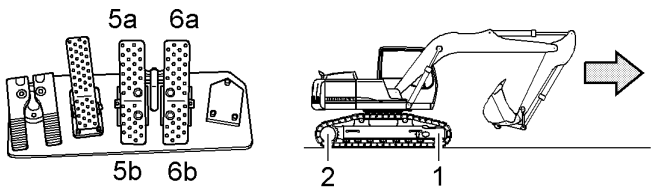


Fig. 3-65 *Travelling straight ahead*

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

As a basic rule, when travelling, the upper carriage must be rotated to the under carriage in such a way that when travelling forwards, the idler wheel **1** is in front and the sprocket wheel **2** is at the rear.

Caution !
While towing the machine, the multi-plate brake in the drive transmissions must be released.
This means that the engine will have to be started so that the pressure in the hydraulic lines can be removed.
If the engine cannot be restarted or if there is a defect in the hydraulic system, the drive transmissions can also be manually depressurized. For more information on this, consult LIEBHERR customer service.

- ▶ Check the equipment position properly, means boom, stick and bucket cylinders out in order to position the bucket about 20 - 30 cm over earth level.
- ▶ If present, lift up the dozer blade.

Caution !
To position the equipment / dozer blade properly, the engine must be started so that the pressure in the hydraulics lines is effective.
If the engine cannot be restarted or if there is a defect in the hydraulic system, the dozer blade cylinders can also be manually depressurized. For more information on this, consult LIEBHERR customer service.

- ▶ Mount the towing equipment around the crown base. Place a protection between crown and towing equipment, to avoid any damages on both.

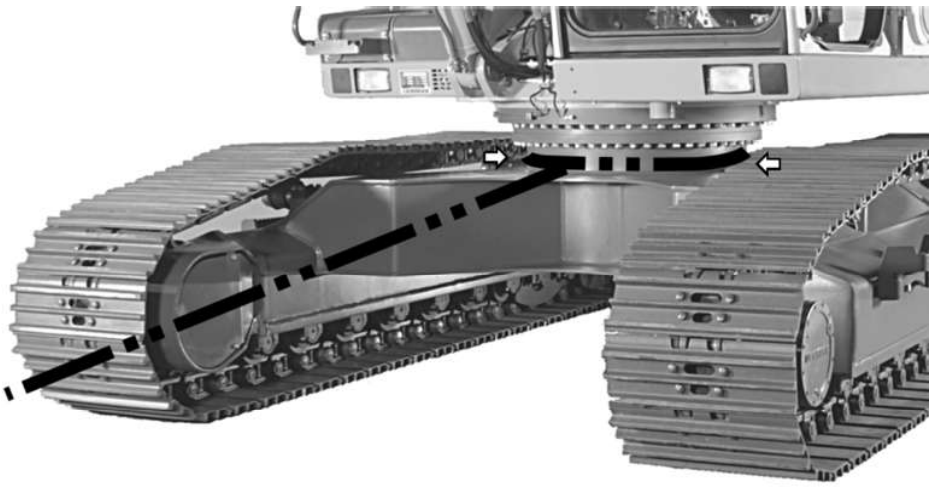


Fig. 3-75 *Towing equipment around the crown base.*

- ❑ Staying near the tow-bars, cables or ropes is vorbiden.

Danger !
Risks of injuries due to rope wrench. Staying near the tow-bar rope is vorbiden.

- ▶ Start slowly. Tight the rope / bar carefully and hold it.
- ▶ Tow the machine without shocks out of the dangerous area, .
- ▶ To the wokshop, load and carry the machine according to chapter "Transport".

3.6.4 Working position

- ❑ Every time it is possible, work on a level, flat and firm ground.
  If necessary arrange the working place and free it of obstacles.
- ❑ As a general rule, work with the attachment over the idler wheels.

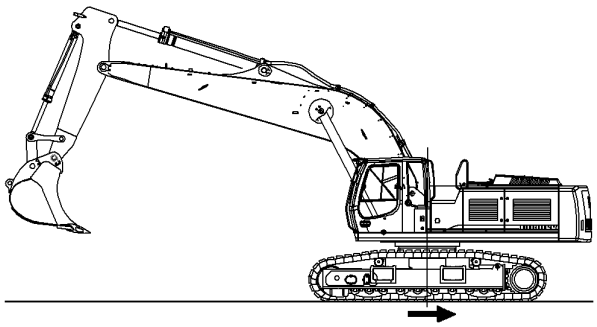


Fig. 3-79 *Working position of the machine*

Note!
Drive backwards when you are working lengthwise with a backhoe bucket attachment.

3.6.5 Working attachment control

Caution!
The joystick functions described below refer to the **normal control,** fitting out the machine at delivery.and **according to ISO-standards**,
On machines equiped in addition with a special control system, and if this special control system is activated by the operator, the joystick functions correspond to the information on the label which is sticked on the side window of the cab and is specific to the installed special control system.

Control of the stick cylinder

The stick cylinder is operated using the left joystick **4**.

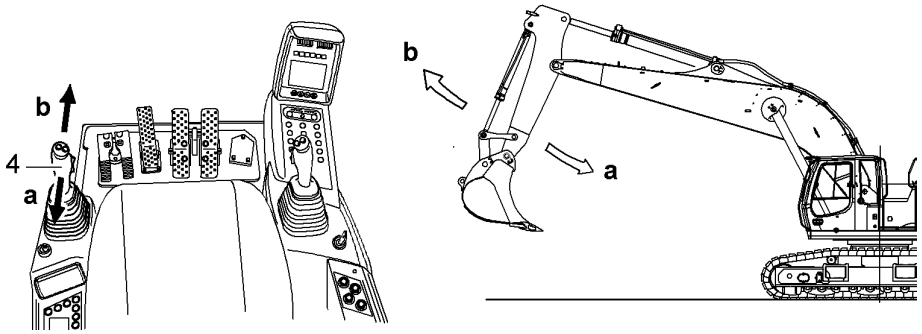


Fig. 3-80 *Stick cylinder control*

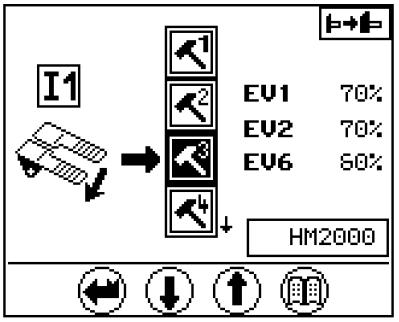
▶ Pull the joystick **4** back **(a)**.
  ↳ The stick is moved in.

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 ofthe 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.

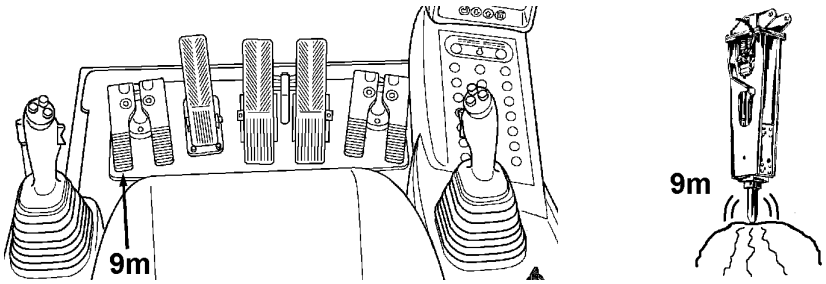


Fig. 3-93 *Control of a hydraulic hammer*

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.

▶ 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.

Note !
The distance between the proximity switch and the reflector must be short enough so that the detection occurs. If the switch does not detect the reflector when it is in front of the switch, slightly approach the switch and the reflector.

Note !
Should in the cut off position, the slide and the limit switch be in a difficult to reach raised position, then the adjustment can also be done with the equipment in a stretched and close to the ground position, first in an approximate way and afterwards while correcting by successive approaches this adjustment until the point of cut off matches exactly.

Unlocking of movements cut off

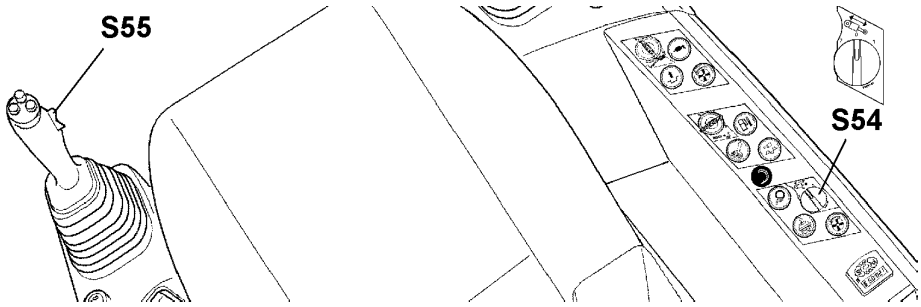
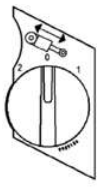


Fig. 3-103 *Switch for the unlocking of attachment movements cut off*

An attachment movement cut off can be unlocked while turning the key switch **S54** in the rear right control desk. Thus it remains possible to move a disconnected attachment part beyond the cut off point.

❑ Unlocking of a movement is possible only if the movement has already been cut off by the end switch.

Danger!
The displacement of attachment parts within a range normally prohibited by a cylinder cut off can bring to a situation presenting a danger for injury of persons and/or damage of material.
The operator is in all the cases responsible for the accidents which can occur when the attachment is working inside the zone of danger while keeping unlocked a cylinder movement cut off.



▶ Turn the key switch **S54** turned to the right (position **I**).

▶ Tilt up or down the rocker switch **S55** mounted to the left joystick handle.
↳ the movement cut off is unlocked, it remains possible to move the attachmrent inside the prohibited zone as long as the switch **S55** is kept depressed.

3.7.3 Attaching and dismounting the grab on stick

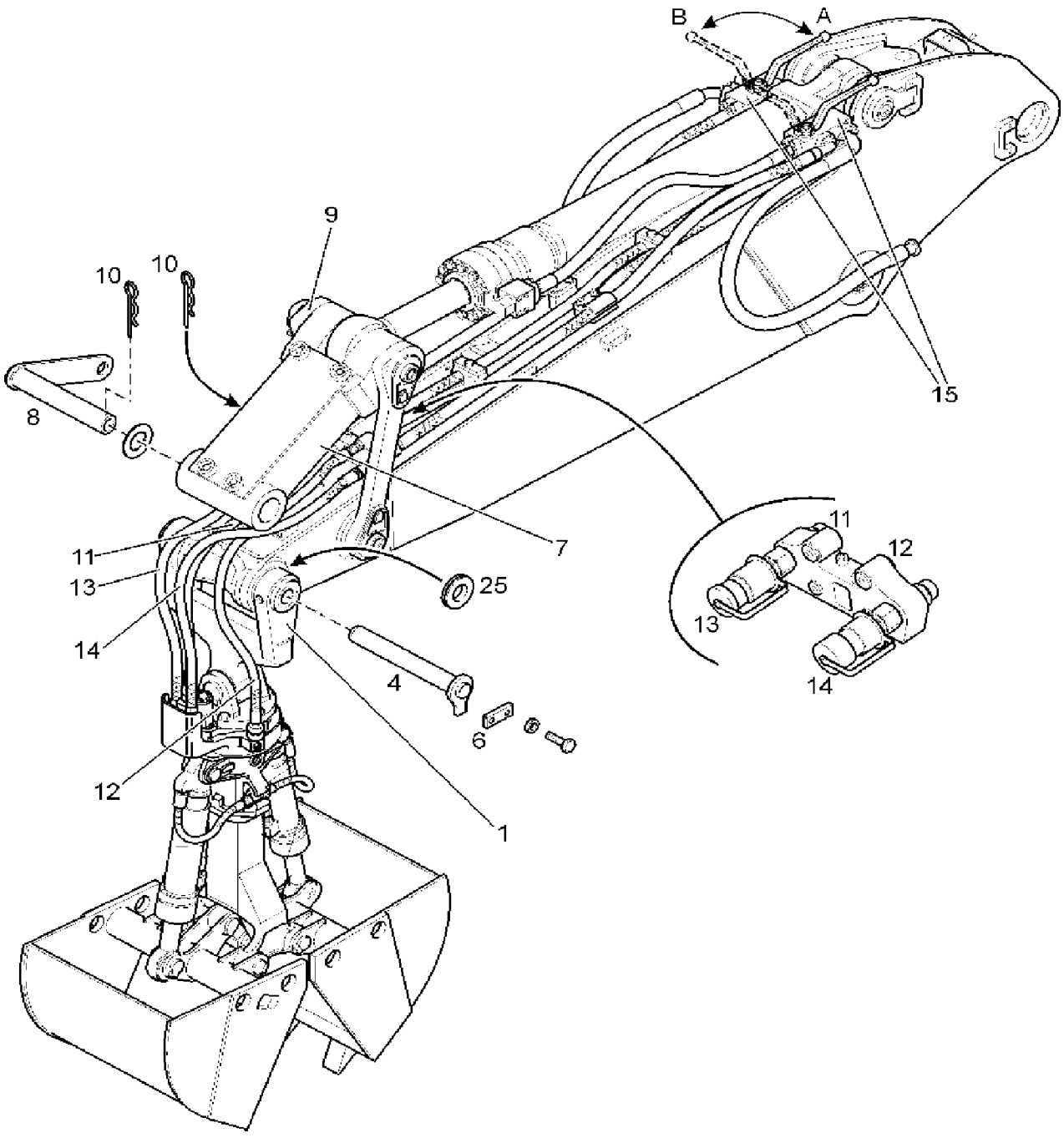


Fig. 3-106 *Attaching and dismounting the grab on the stick*

1	Grab mounting	**11**	Hose
4	Pin	**12**	Hose
6	Locking plate	**13**	Hose
7	Connecting link	**14**	Hose
8	Carrier bracket	**15**	Valve blocks
9	Reversing lever	**25**	Pin bearing sealing
10	Cotter pin		

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Detaching a work tool

To move the equipment into position:

Caution!
Hydraulic lines are pressurized!

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

- ▶ Disconnect hydraulic lines or electrical lines, if necessary (eg. when dismounting a grab).
- ▶ Extend the shovel tilting cylinder fully.

To unlock the quick-change adapter:

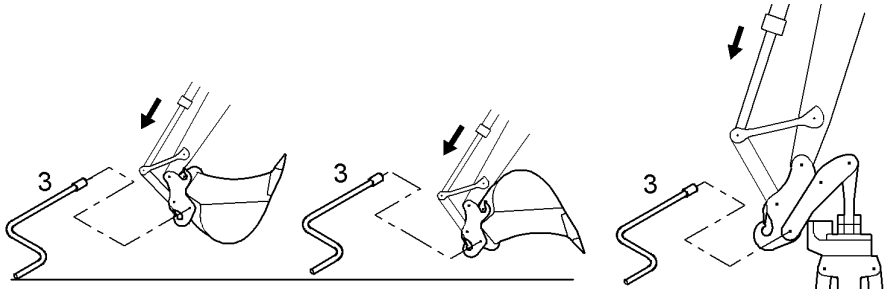

Fig. 3-113 *Unlocking the quick-change adapter*

Danger!
Risk of injury.
Once unlocked, there is no fixed connection between the adapter and the work tool. The work tool could work itself out independently.

- ▶ Ensure that the work equipment cannot be moved by others when this action is being carried out.
- ▶ Always keep the work tool as close to the ground as possible when unlocking to avoid creating conditions which may lead to danger.

- ▶ Approach the quick-change adapter from the side and unscrew the locking screw **2** using the crank **3** from the locking pin **1**.
- ▶ Insert the crank **3** in the locking pin **1** and turn to the left (anti-clockwise), until both locking pins **1** are inserted as far at the stop.

To put down the work tool:

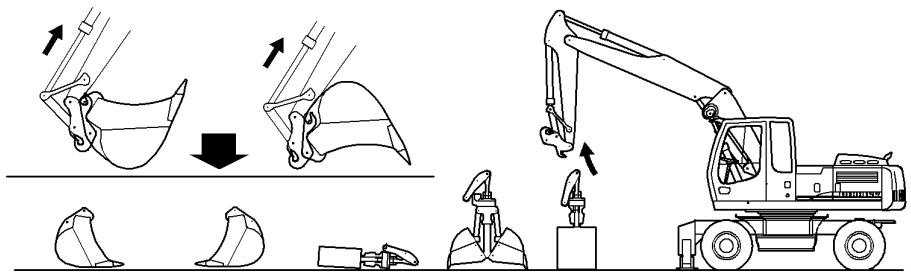

Fig. 3-114 *Putting down the work tool*

thout LIKUFIX

It is possible to attach a work tool with a LIKUFIX hydraulic coupling to a machine with a quick-change adapter (mechanical or hydraulic) at any time.

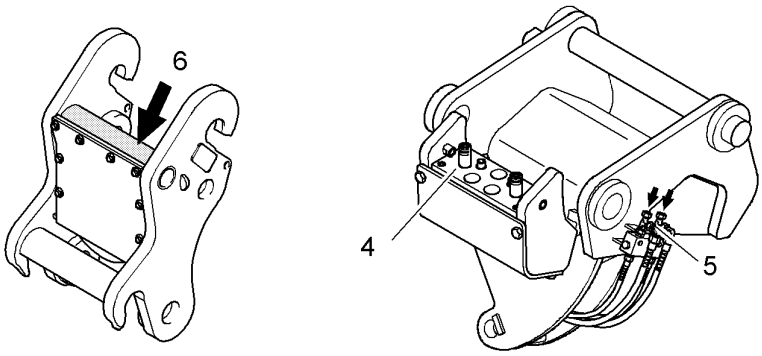

Fig. 3-125 *LIKUFIX work tool on quick-change adapter without LIKUFIX*

Caution!
The LIKUFIX hydraulic coupling could be damaged.

- ▶ Do not use a quick-change adapter with a reinforcement kit since the reinforced steel part **6** could damage the LIKUFIX hydraulic coupling on the work tool.
- ▶ In this case, ensure that you have the quick-change adapter reworked at the LIEBHERR customer service centre.

For attachment without LIKUFIX hydraulic coupling, LIEBHERR work tools usually have an alternative connection option.

Example:

On the ditcher bucket, hydraulic lines are either connected using LIKUFIX **4** or using an auxiliary hydraulic connection **5**.

3.8 General working methods

3.8.1 Minimum impact working methods for your machine

To increase the service life of the machine and avoid unnecessary damage and the resulting repairs, please note the following points:

- – Do not stop the rotary motion of the upper carriage when slewing into a ditch by stopping the equipment on the walls of the ditch.
- – Using the machine for applications where the equipment is knocked against the material to be removed, in the longitudinal direction too, is not permitted. Repeatedly hitting the work equipment against rock or other hard material will damage steel parts and machine components.
- – With specific combinations of boom, stick and work tool, the work tool could hit or break through into the cab. This could damage the cab and injure the machine's operator.
- – Do not attach buckets which are too big or side cutters when using the machine in rocky material. This will extend the work cycles and could result in damage to the bucket and other machine components.

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3 Locked range **4** Boom or stick.
5 Hydraulic cylinder

Caution !
The load on the working equipment is greatest, if the hydraulic cylinders are at their end positions (fully extended or retracted).
When using large (heavy) attachments, the stress can result in serious damage to the cylinders or the deflection mechanism.

- ▶ Move the attachment only within the working range2 and not in the locked range3.
- ▶ At all times, maintain a distance of approx. 10° to the end position of the hydraulic cylinder.

3.9 Transport

Transporting the machine safely

- – Due to transport restrictions, use only suitable means of transport and lifting devices with sufficient load-carrying capacity.
- – Park the machine on a flat surface and wedge the crawler or wheels securely.
- – If required, detach a part of the machine's working equipment during transportation.
- – The ramp used to drive the machine up onto the flatbed trailer should not exceed an inclination of 30° and should have a wooden cover to prevent sliding back.
- – The undercarriage undercarriage should be swept clean, i.e. before driving up the ramp, clean any snow, ice and mud from the crawler / wheels of the machine.
- – Align the machine precisely with the loading ramp.
- – Attach the hand lever for fine-tune driving (crawler excavator) onto theaccelerator pedals.
- – Ensure that a spotter gives the machine operator the required signal.
- – Prepare the placing block to ensure against rolling back when the machine is driving up onto the flatbed.
- – Tilt the equipment up and drive up the loading ramp. While doing this, alwayshold 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.

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Error code	Effect	Cause	Measure / remedy
E 096	Fuel pressure in rail 2 not being monitored.	Short circuit + 24 V	Consult LIEBHERR customer service.
E 097		Short circuit to earth or cable break	
E 098		D+ default on the alternator	Consult LIEBHERR customer service.
E 099		Alternator default	
E 100	Engine RPM not being monitored.	The value registered by the transmitter B12-1 is impossible.	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 101	Engine RPM not being monitored.	The value registered by the transmitter B12-2 is impossible.	Switch to emergency control speed adjustment **S71** and **S72** and emergency operation work pumps **Y50**, consult LIEBHERR customer service.
E 102	Engine can not be started.	Cranckshaft synchronisation default	Consult LIEBHERR customer service.
E 103		Camshaft transmitter default	Consult LIEBHERR customer service.
E 104		The value registered by the camshaft transmitter is impossible.	Consult LIEBHERR customer service.
E 105	Engine can not be started.	Camshaft synchronisation	Consult LIEBHERR customer service.
E 106	Cold start command default	Unit 2 of cold start command default	Consult LIEBHERR customer service.
E 107		Open load for Unit 2 of cold start command	
E 108		Unit 2 of cold start command over current	
E 109		Hardware CAN1 default	Consult LIEBHERR customer service.
E 110		CAN1 data impossible or time out	
E 111		Injector A1 default	Consult LIEBHERR customer service.
E 112		Injector A1 error BIP / FZM	
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	

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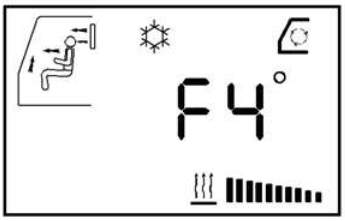
Error code “F4“ pressure fault and faulty magnetic coupling:

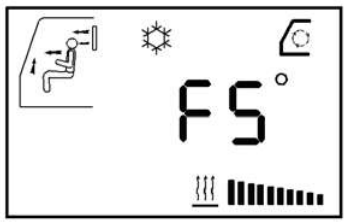


The control unit has recognised a faulty vent flap room area and front window, the regulation is once again ready for operation.

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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  - above the counterweight to check the rear side of the machine; on some machines, this mirror is replaced or completed with a camera.
- At each extension, construction or change on the machine, the sight condtions must be maintained. These conditions must otherwise be checked according to ISO 5006.
- Mirrors must be cleaned at least at daily intervals.
- Damaged mirrors must be immediately replaced.
- The site has to be organised so that the dangers due to a restricted sight field are minimized, particularly for machines with an operating weight which is superior to 40 tons.

Crack testing

- Even when the machine is operated carefully, there is a possibility of individual cases of overloading occurring, which could lead to cracks or loose connections. The machine should therefore be checked regularly for cracks, loose connections or other visible damage to maintain operational safety.
- In order to be able to check for cracks, it is essential that the machine is kept clean and cleaned regularly.
- The tests should be carried out in accordance with the monitoring and maintenance plan:
  - every 250 operating hours by the machine owner's maintenance personnel.
  - every 500 operating hours by authorised specialist personnel.
- It is advisable to carry out these tests: supported, on firm, horizontal substrate, with the equipment in longitudinal and cross direction for variable loads. Current accident prevention regulations must be adhered to.
- 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.

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Symbol	Display
	Diesel engine
	Hydraulic system
	Slewing gear transmission
	Travelling gear transmission
	Splitterbox
	General oiling points
	Check gear oil level
	Check engine oil level
	Check hydraulic oil level
	Oil change
	First oil change
	Semi-automatic lubrication
	Manual lubrication
	Operating instructions

Tab. 5-2 *Lubrication chart key*

ze fluid available, a mixture of **water and water soluble anti-corrosion fluid** may be used as **coolant**.

Chart of approved water soluble anti-corrosion fluids

Product description	Manufacturer	Country
DCA 4 Diesel Coolant Additives	Fleetguard / Cummins Filtration	*
Caltex CL Corrosion Inhibitor Concentrate	Chevron Texaco	*
Chevron Texaco Heavy Duty Extended Life Corrosion Inhibitor Nitrite Free	Chevron Texaco	*
Havoline Extended Life Corrosion Inhibitor (XLI)	Chevron Texaco	*
Total WT Supra	Total, Paris	F
* = global		

Note!
Completely drain the coolant when changing from anti-corrosion / anti-freeze fluids to anti-corrosion products or vice-versa.
The use of emulsifiable corrosion inhibitor oils is not permitted.

Using DCA 4 without anti-corrosion / anti-freeze fluid

Check and (if necessary) correct the DCA 4 concentration level during maintenance.

Note!
- The coolant must be changed **annually**.
- The DCA 4 concentration must be between **0.6** and **1.06** units per litre.
- It is recommended that testing kit CC 2602 M by Fleetguard is used.

Using other water soluble anti-corrosion fluids

IWhen using Caltex / Chevron Texaco /Havoline / Total, check and (if necessary) correct the mixing ratio as part of the regular maintenance.

Note!
- The coolant must be changed **annually**.
- The mixture ratio must consist of **7.5 %** anti-corrosion fluid and **92.5 %** water.
- It is recommended that refractometer type Gefo 2710 is used for testing.

and deflection pulley with the tensioning device rotated back.

▶ Move the tensioning device clockwise back into the tensioned position.

5.5.4 Lubricating starter ring gear

The starter ring gear must be lubricated following the intervall given in the maintenance chart.

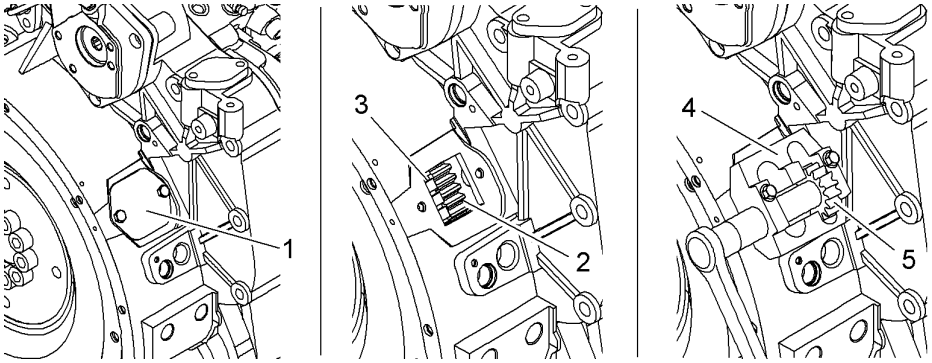


Fig. 5-16 *Starte ring gear*

1 Maintenance cover
2 Starter ring gear
3 Sensor ring gear
4 Manual engine barring device
5 Gear

Note!
When greasing, the sensor ring gear **3** must keep free of grease.

The maintenance cover is mounted on the right-hand side of the diesel engine on flywheel housing.

❑ It must be ensured that the diesel engine is in the maintenance position.

▶ Unscrew the maintenance cover **1** from the flywheel housing.

▶ Mount the manual engine barring device **4** on the flywheel housing.

▶ Make the flywheel turn with the manual engine barring device **4** and grease the starter ring gear **2** thanks to the gear **5**.

▶ Dismount the manual engine barring device **4** of the flywheel housing.

▶ Screw on the maintenance cover **1** again.

Draining the coolant

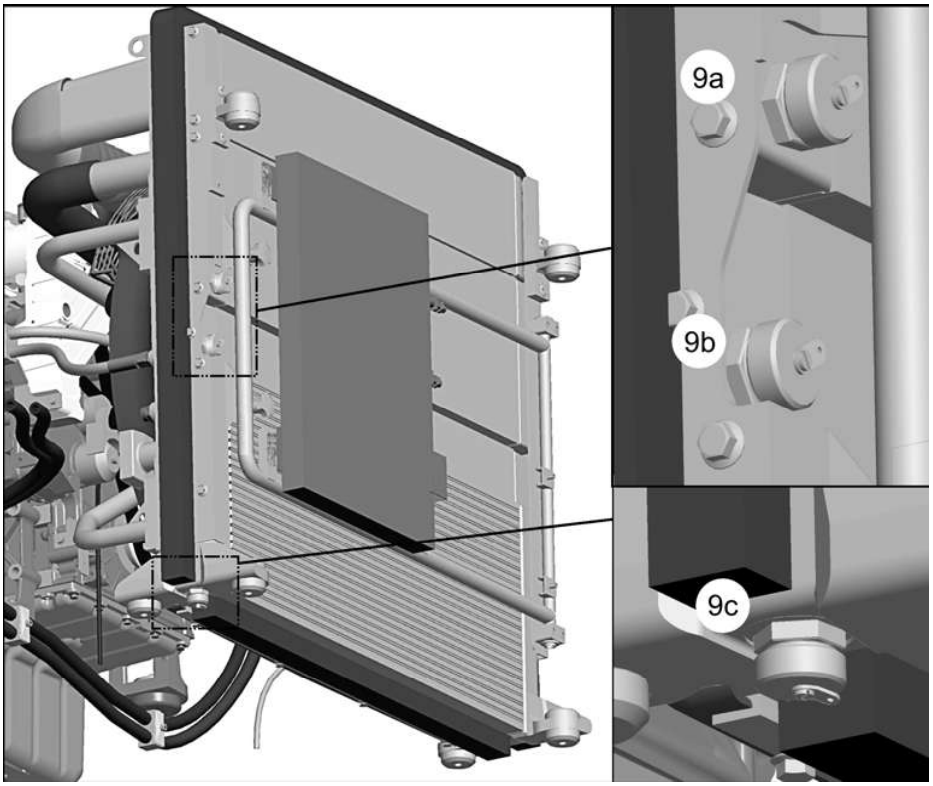


Fig. 5-28 *Draining the coolant*

9a Drain valve on the coolant cooler
9b Drain valve on the fuel coolant
9c Drain valve on the diesel engine

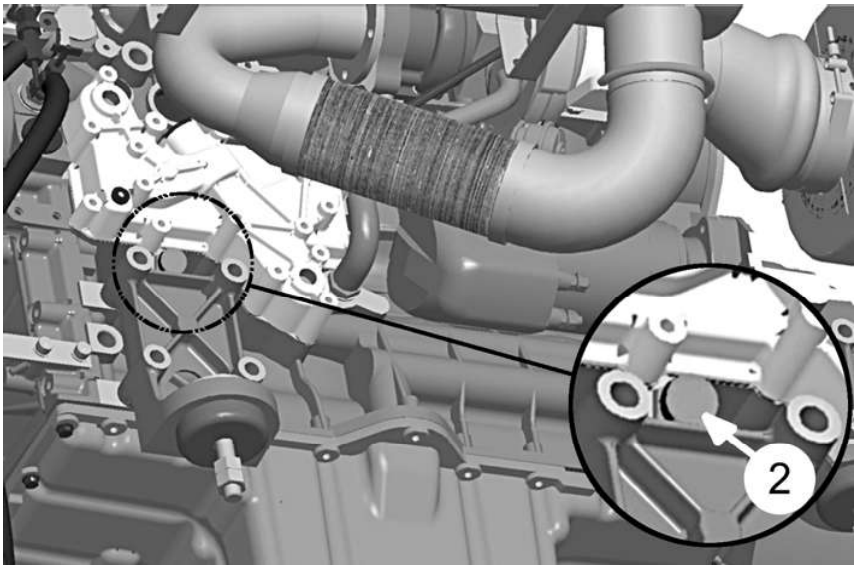


Fig. 5-29 *Draining the engine*

2 Drain valve on the engine

To bleed the fuel fine filter

- ▶ Loosen the bleeder screw **13** on the filter head and unscrew 2 to 3 turns of thread.
- ▶ Actuate the hand pump **2**.
- ▶ When bubble-free fuel flows out of the bleed screw tighten bleeder screw **13** again.
- ▶ Continue to actuate the hand pump **2** until resistance becomes intense.

To bleed the fuel canal on the crankcase

- ▶ Loosen the bleeder screw **14** on the filter head and unscrew 2 to 3 turns of thread.
- ▶ Actuate the hand pump **2**.
- ▶ When bubble-free fuel flows out of the bleed screw tighten bleeder screw **14** again.
- ▶ Continue to actuate the hand pump **2** until resistance becomes intense.

Bleeding the high pressure fuel system

The bleeding operation of the high pressure fuel system consists in bleeding the air in the injection lines.

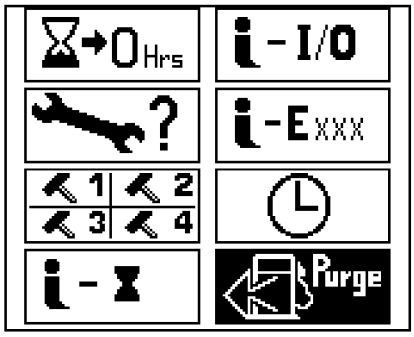
A) Since the software version 36 of the engine control unit

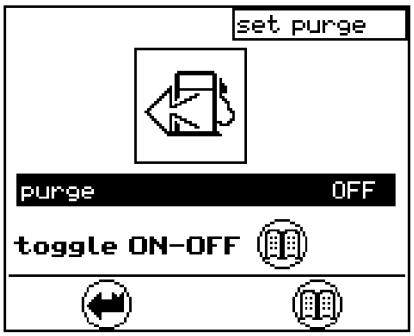
Since the software version 36.0 of the engine control unit and the software version V4.4 of the monitoring display, it is possible to start the engine in bleeding mode.

Notice!
The engine control unit software version can be read on the company nameplate of the engine control unit.

- ▶ Make sure a bleeding of the low pressure fuel system has been correctly carried out.

Select the menu "set purge" at the screen of the display.





- ▶ In the menu "set purge" set the choice "purge" to "ON" using the "menu" touch.
- ▶ Start the Diesel engine

- ▶ Screw the drain hose to the drain valve **6** on the collecting compartment;
- ▶ Let the oil flow out into a suitable container.

To refill the hydraulic oil:

- ▶ Unscrew the vent filter **1** by a maximum of one turn.
  ↳ The hydraulic system will depressurize.
- ▶ Remove the cover of the return-line filter **2**.
- ▶ Refill the oil through the filter cartridge **2** on collecting compartment until the level reaches precisely the central marking on the inspection window (see Fig. 5-45).
- ▶ Tighten the vent filter **1**.
- ▶ Refill the tank up to the top. If refilling through the filter cartridge **2**, be sure to refill also completely the collecting compartment **R** around the filter centering tube **7**.
- ▶ Screw on the cover of return-line filter **2**.

Caution!

- ▶ After each hydraulic oil change, vent the hydraulic pumps.

To drain off condensate water

Drain off the condensate regularly following the interval specified in the maintenance chart.

- ▶ Place a suitable container underneath.
- ▶ Keep the drain hose on the drain valves **5** and **6** (see Fig. 5-46) until oil without water flows.

Intervals: see maintenance chart

Note!

When using "environmentally friendly hydraulics fluids" and after machine diwn time (after about 24 hours), we recommend to drain off any moisture in the hydraulic tank before operating the machine.

5.10.12 Return oil filter for hydraulic hammer (option)

In case of use of an hydraulic hammer, it is strongly advised to install an extra return oil filter.

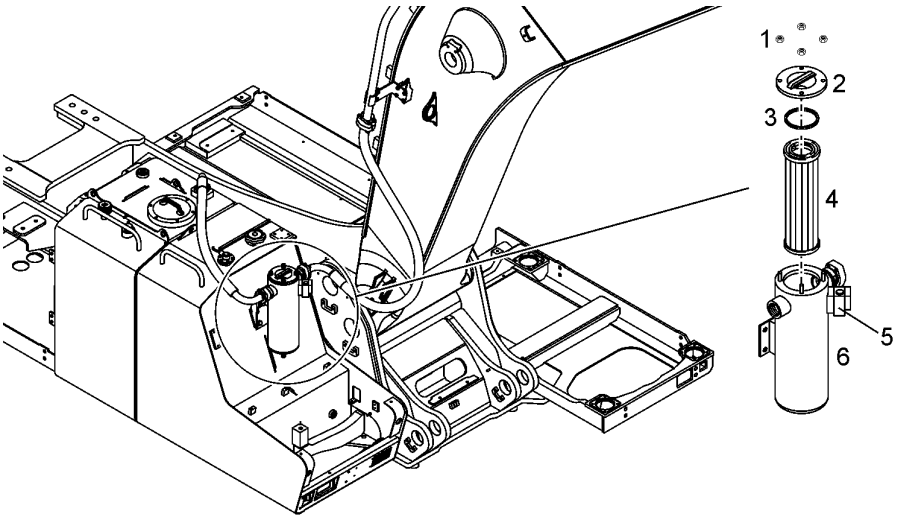


Fig. 5-56 *Return oil filter for hydraulic hammer*

1	Nuts	**3**	Seal kit	**5**	Contamination indicator
2	complete cover	**4**	Filter cartridge	**6**	Filter housing

The return oil filter for hydraulic hammer is mounted on the fuel tank. The intervall of maintenance depends on the indication given by the contamination indicator **5**.

If the indicator is green, the filter works correctly.

If the indicator is red, the filter is clogged and the filter unit has to be replaced.

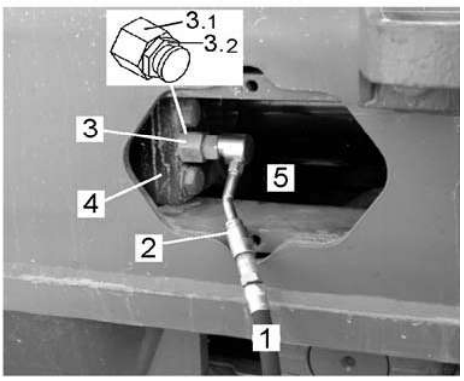
Replacement of the filter cartridge

- ❑ The hydraulic system must be depressurized.
- ▶ Unscrew the four nuts **1** on the filter cover and lift out cover **2**.
- ▶ Remove the used filter cartridge **4**.
- ▶ Check the seal **3** and replace it if necessary.
- ▶ Carefully clean off any dirt sticking to the magnetic plug.
- ▶ Insert a new filter cartridge **4**.
- ▶ Put the seal **3** and the cover **2**.
- ▶ Coat the stud bolts of the filter housing **6** with anti-corrosion grease and tighten the nuts **1**.

▶ Carefully unscrew lubricating nipple **3** (see Fig. 5-66) by several thread pitches until the grease escapes out of the releasing groove of the nipple.

Danger!

❑ Machines delivered up to september 2008 are possibly fitted with a lubricating nipple **3** showing two distinct hexagonal bearing areas.



▶ To screw the grease nipple **3** in or out, always catch it at its rear part **3.1** (use a **27 mm** wrench) and never at its front part **3.2**.
Loosening the nipple at its front hexagonal bearing area could cause the front part **3.2**, to loosen and to be powerfully thrown out.

▶ Tighten lubricating nipple **3** as soon as the desired track tension is obtained.

▶ After the adjustment procedure, drive the machine forwards and backwards and check the track tension again as described above.

5.12.5 Cleaning the track components

Before working

Do not operate the machine if larger stones, pieces of wood or metal, wires or cables are wedged into the track components.

Dried or frozen mud and stones or other foreign bodies in track 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 wooden planks or logs to prevent the tracks becoming frozen to the ground.

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

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

At the end of a workday

▶ Always clean the track components from dirt accumulation before stopping the machine.

▶ Clean the gliding surfaces of the tension units from clinging dirt or sand and apply grease.

Notice!

The standard undercarriages of crawler excavators do not require daily lubrication.

On undercarriages with special design necessitating regular lubrication (undercarriages with adjustable track width, ...) the lubrication points are not connected to the centralized lubrication. For description of the corresponding lubrication works, see the subgroups related to the special maintenance for these undercarriages.

5.15.2 Semi automatic and full automatic systems

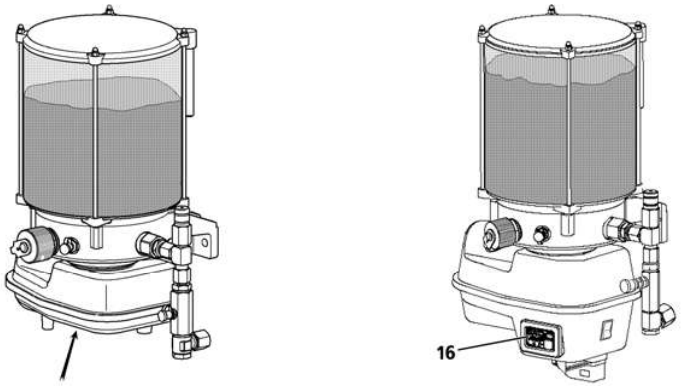


Fig. 5-78 *Semi automatic system* *Full automatic system*

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.

Closing the quick change coupler :

▶ Depress and keep the push button switch **S47**.

▶ Press left button **S5L**.
↳ The quick change coupler locking pins must come out.

❑ Befor the locking pins are fully out :
↳ Symbol "Locking pins retracted" must light off at the display.
↳ The buzzer in the cab must stop.

▶ Press touch **S19**,
↳ The warning light integrated in the touch must light off.

▶ Stop the Diesel engine.

Daily visual check out

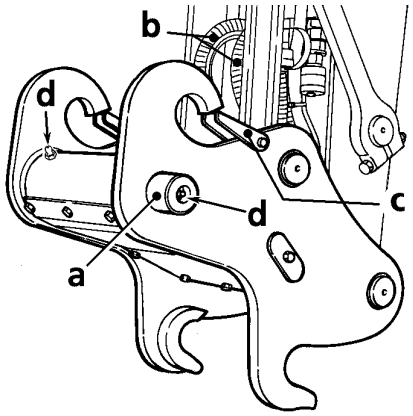


Fig. 5-90 *Functional check out of quick change adapter*

❑ 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.