

en

Operator's manual

R 920

From serial number 40104

Document ID

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Type:	R 920
Type no.:	1545
From Serial no.:	40104

Conformity:

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Machine data:

Enter the following information on taking delivery. *You will find the information on the type plate of the machine. This will also be useful when you order spares.

* Vehicle ID number:

WLHZ

* Year of manufacture:

..... CE

Commissioning date:

..... / /

Preface

This operating manual is intended for you as the **machine operator** or as a member of the **maintenance personnel**. It contains warnings, important information and tips for working with the machine. It simplifies the process of familiarisation and getting to know the machine, and helps to avoid faults caused by incorrect operation.

Compliance with the operating manual increases the reliability and service life of the machine.

The operating manual must be kept with the machine. Make sure that a copy is always kept close to hand at the workplace.

Read the operating manual before initial commissioning and subsequently at regular intervals. Everyone who carries out work with or on the machine must be familiar with and use this operating manual.

Examples of this work:

- **Operation** including setup and fitting attachments, elimination of faults, care, disposal of service products and consumables
- **Maintenance** including servicing, inspection and repair
- **Transporting** or loading the machine

The owner is responsible for supplementing the operating manual with instructions based on existing national regulations on accident prevention and environmental protection. In addition to this operating manual and the regulations on accident prevention applicable in the user's country and at the place of use, it is also necessary to comply with the recognised technical rules on safety and technically proficient working.

Some sections of this operating manual do not apply to all machines.

Some illustrations in this operating manual may show details and implements that are different from your machine.

In some illustrations, protective devices and covers have been removed to provide a clearer representation.

Liebherr machines are subject to continuous development and improvement. This may have resulted in modifications to your machine which are possibly not referred to in this operating manual.

If you require further explanations or information, please contact Liebherr customer service.

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Due to the wide variety of products offered by other manufacturers (e.g. service products, lubricants, tool attachments and spare parts), Liebherr cannot examine the general suitability and absence of defects in third-party products which are used in or on Liebherr products. The same applies to possible interactions between third-party products and Liebherr products.

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1 Product description

1.1 Technical description

1.1.1 Overview

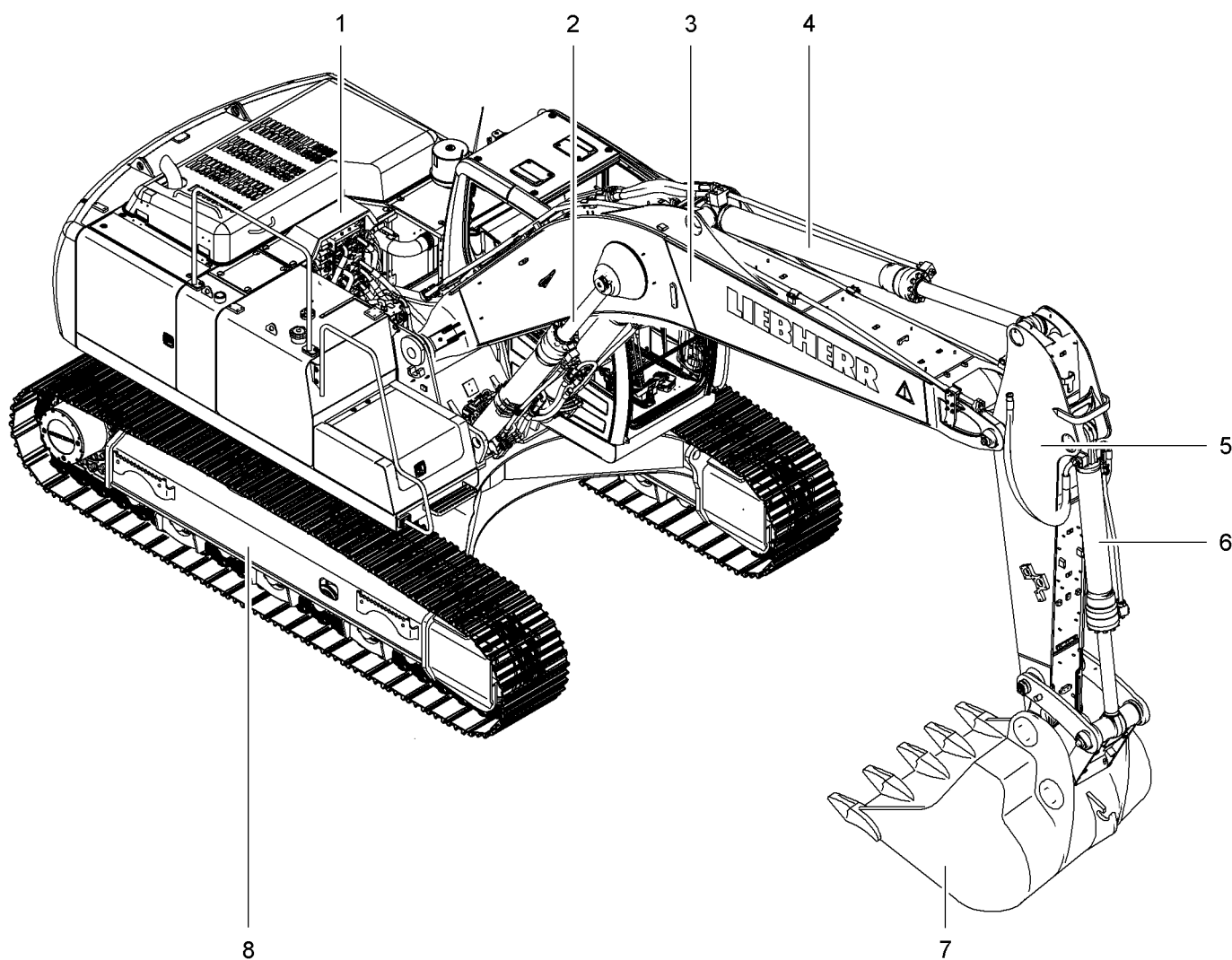


Fig. 1: Overview

- 1 Uppercarriage
- 2 Hoist cylinder
- 3 Boom

- 4 Stick cylinder
- 5 Stick
- 6 Bucket cylinder

- 7 Bucket
- 8 Undercarriage

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1.1.2 Uppercarriage

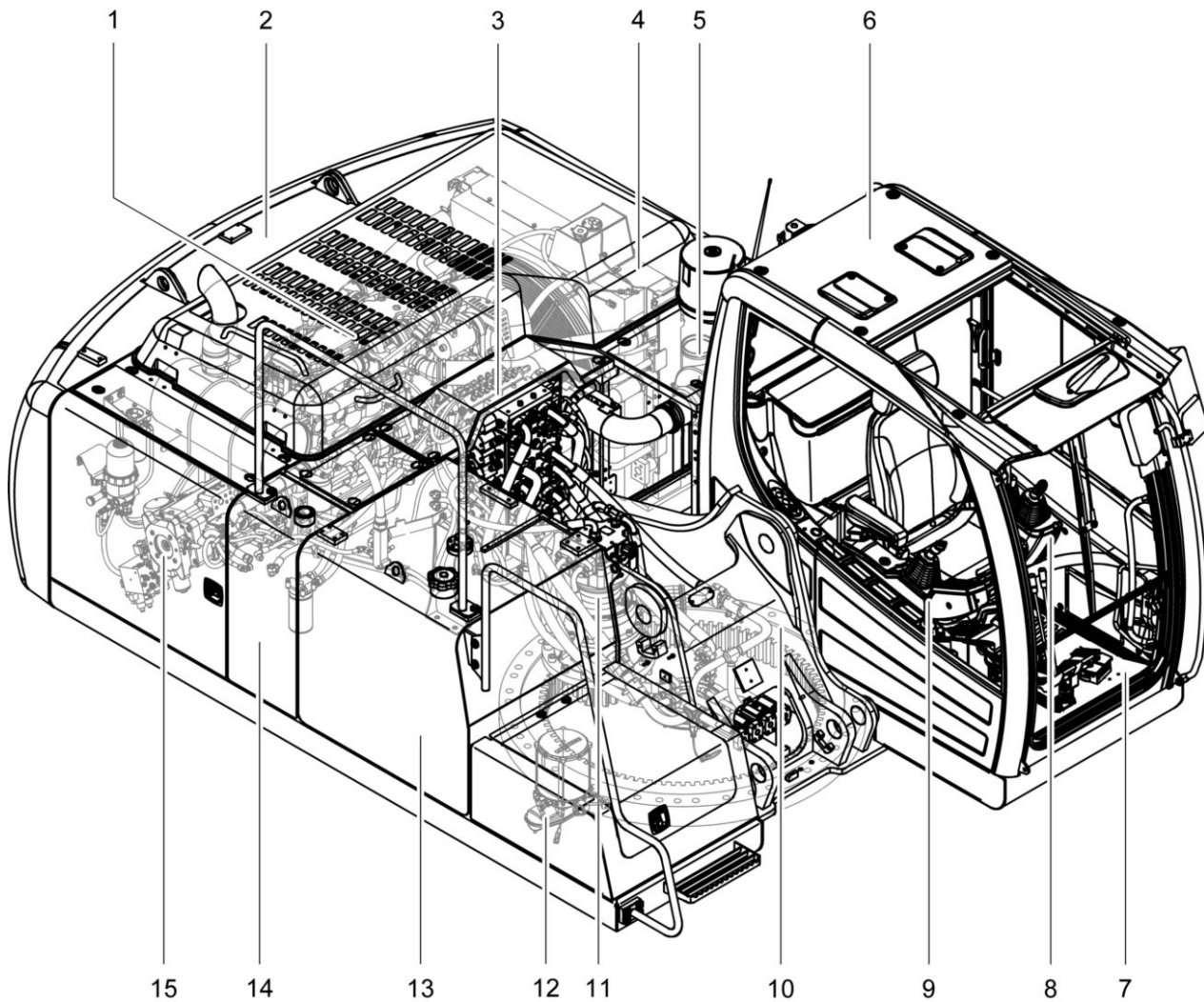


Fig. 2: Uppercarriage

- | | | |
|-----------------------|-----------------------|---|
| 1 Diesel engine | 6 Operator's cab | 11 Slewing gearbox |
| 2 Counterweight | 7 Operator's platform | 12 Central lubrication system ¹⁾ |
| 3 Control valve block | 8 Left console | 13 Fuel tank |
| 4 Radiator | 9 Right console | 14 Hydraulic tank |
| 5 Air filter | 10 Slewing ring | 15 Hydraulic pump |

¹⁾ Option

1.1.3 Undercarriage

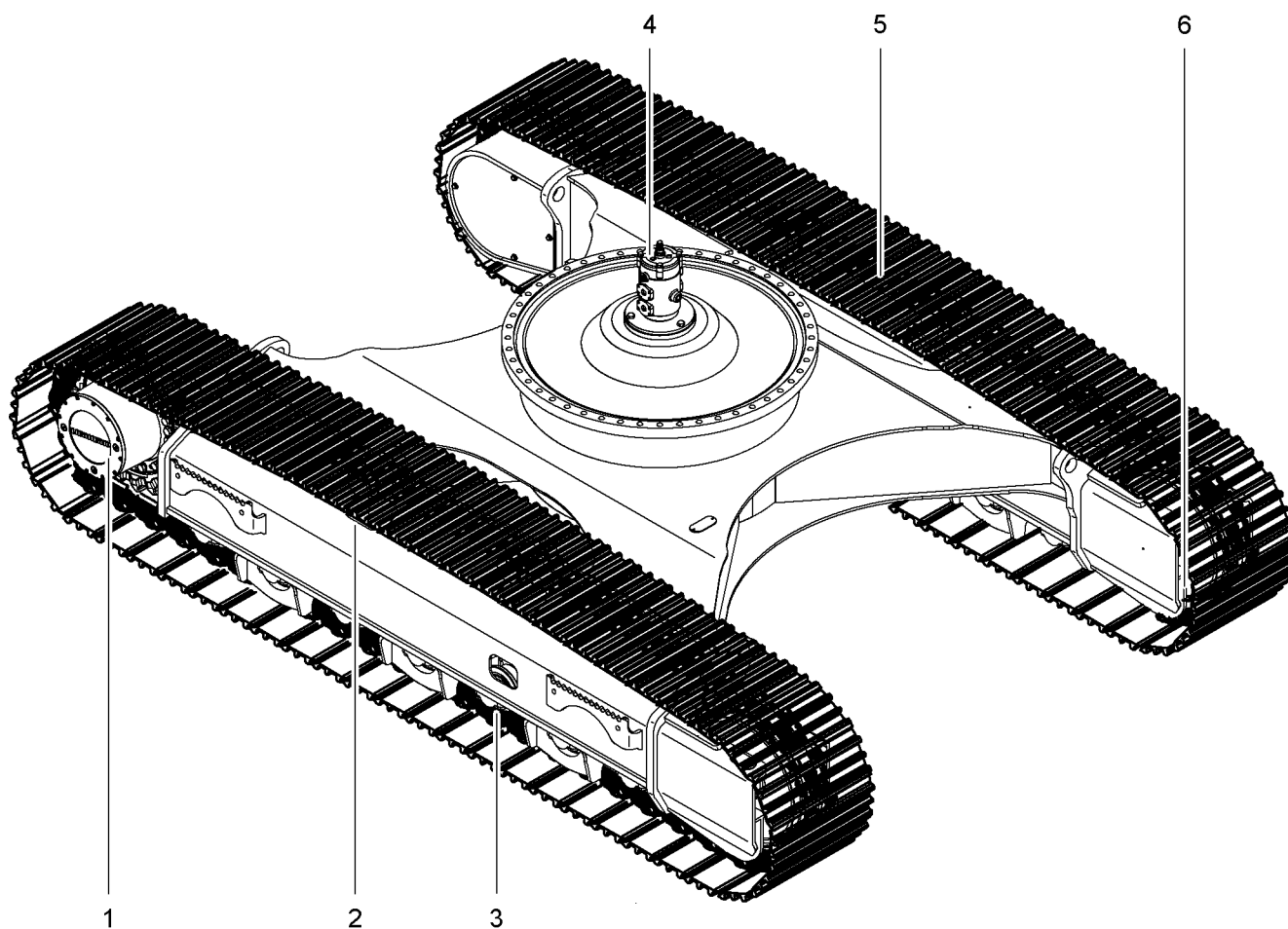


Fig. 3: Undercarriage

- | | | | | | |
|---|-----------------------------------|---|-------------------|---|-------------|
| 1 | Travel gearbox and sprocket wheel | 3 | Track roller | 5 | Track |
| 2 | Carrier roller | 4 | Rotary connection | 6 | Idler-wheel |

1.2 Technical data

1.2.1 Vibration emission

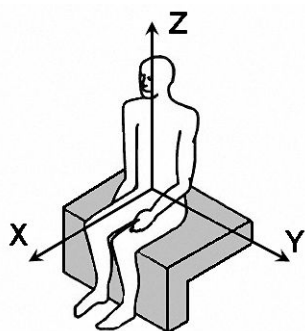
Operator seat

The operator seat built in to this machine by the manufacturer conforms to ISO 7096:2000, EM 6. If the operator seat is replaced, the new operator seat must also comply with this standard.

Hand/arm vibrations

Given designated use of the machine, the weighted (frequency-weighted) root-mean-square value of the hand/arm vibrations in accordance with ISO 5349-1:2001 is less than 2.5 m/s².

Whole-body vibrations



If the machine is used as designated, weighted (frequency-weighted) root-mean-square values for specific sample applications of the machine can result according to the table below. These values conform to the details of the technical report ISO/TR 25398:2006 "Earth-moving machinery – Guidelines for assessment of exposure to whole-body vibration of ride-on machines – Use of harmonized data measured by international institutes, organizations and manufacturers". The measurement procedure used in this case conforms to ISO 2631-1:1997. The listed root-mean-square values of representative machines are specified with deviations (standard deviation). These deviations are divided into light, normal and heavy-duty operating conditions. The subdivision of operating conditions must be undertaken by the user in accordance with the aspects of terrain conditions, construction site status, construction site organisation, material, machine equipment, working method and the training level of the operator.

The specified values are individual root-mean-square values for certain typical application areas, therefore it is only possible to assess the load imposed on the operator by whole-body vibrations to a limited extent. In order to accurately assess the daily exposure of an operator in the course of an 8-hour working day, refer to the Liebherr brochure concerning whole-body vibrations as well as the software that has been written for this purpose. Both these resources can be obtained from your Liebherr dealership or found on the documentation CD that is supplied with each new machine (Liebherr-Parts).

The measuring inaccuracy is defined in the EN 12096:1997 standard.

Machine type	Typical working cycles	Weighted root-mean-square values in m/s ² under light, normal and heavy-duty operating conditions								
		X-axis			Y-axis			Z-axis		
		Light	Normal	Heavy	Light	Normal	Heavy	Light	Normal	Heavy
Crawler excavators	Excavating	0.14	0.31	0.49	0.08	0.19	0.31	0.13	0.30	0.47
	with hydraulic hammer	0.16	0.38	0.59	0.09	0.22	0.35	0.27	0.55	0.83
	Use in extraction	0.31	0.46	0.61	0.19	0.30	0.41	0.29	0.61	0.93
	Delivery drive	0.21	0.34	0.48	0.09	0.23	0.37	0.56	0.79	1.02

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Machine type	Typical working cycles	Weighted root-mean-square values in m/s^2 under light, normal and heavy-duty operating conditions								
		X-axis			Y-axis			Z-axis		
		Light	Normal	Heavy	Light	Normal	Heavy	Light	Normal	Heavy
Wheeled excavators	Excavating	0.19	0.37	0.56	0.09	0.25	0.41	0.16	0.29	0.42
	Delivery drive	0.21	0.29	0.38	0.24	0.38	0.52	0.42	0.61	0.80

Tab. 1: Weighted root-mean-square values

1.2.2 Specifications

The specifications for this machine are contained in the following technical description.

Crawler Excavator

R 920

Litronic®

Motor:

110 kW / 150 HP

Stage IIIA/Tier 3

Operating Weight:

21,000 – 21,500 kg

Bucket Capacity:

0.60 – 1.25 m³



LIEBHERR

R 920 Litronic

Motor:

110kW/150HP
Stage IIIA/Tier 3

Operating Weight:

21,000 – 21,500 kg

Bucket Capacity:

0.60 – 1.25 m³

Performance

Performance, precision
and responsiveness



Efficiency

High level of productivity for a lower overall operating cost

Reliability

Result of ongoing improvements

Comfort

Spacious, ergonomic and with high-visibility

Maintainability

Simplified daily checks, longer maintenance intervals



Performance



**Performance, precision
and responsiveness**

Advanced techniques heighten performance

In its design offices, Liebherr combines the technological know-how of each area to create consistent and optimised integrated systems. Liebherr's electronics, positive control hydraulics, and even the travel motors are designed from the start to be interconnected and generate optimum operating power with fast and fluid movements.

Positive Control hydraulic system

Two working pumps for maximum excavation, travel or swing efficiency, provide power to the components involved. Thanks to the positive control system, the combined movements are optimised for each different work operation, whether this be levelling, extraction, loading or lifting, with or without travel.

Particularly fast work cycles

The work cycles of the R 920 are very fast thanks to the large sized transmission components. For example, the uppercarriage's swing drive can quickly reach its maximum speed with a high swing torque.

Operating pressure

Maximum digging and break-out forces can be reached thanks to the level of hydraulic pressure, without applying temporary overpressure. Maximum forces are therefore guaranteed continuously during the whole working phase to achieve a high level of production. To further improve the machine performances, the equipment speed is optimized through an integrated regeneration circuit.

Engine

- Cummins engine Stage IIIA/Tier 3
- Designed specifically for construction applications
- Automatic fuel-saving idling system
- "Wastegate" turbo for enhanced performances at low speed and reduced consumption



Undercarriage

- Robust design for greater resistance and a better distribution of forces
- Easy and safe transport thanks to integrated lashing eyes



Productivity and flexibility

- Higher digging and break-out forces for increase in productivity
- New optional pads available in 700 and 800 mm for more versatility
- New swing motor for higher swing torque and speed



Efficiency



**High level of productivity for
a lower overall operating cost**

Less fuel

Associated with the latest developments in technology and hydraulics, the tried-and-tested 6-cylinder Cummins engine consumes little fuel, both in terms of hours of operation and in terms of tons of material moved.

Increased productivity

Clearly enhanced performances and low consumption, combined with the largest fuel tank on the market, all in a comfortable and ergonomic work environment, lead to significant increases in productivity in all operating configurations.

Electronic power control

This control system allows the engine power to be effectively and optimally converted, from an energetic point of view, into hydraulic power. This results in greater forces, a faster working speed and a lower fuel consumption.



Liebherr Lubricants

- Liebherr offers you a full range of lubricants and coolants for your Liebherr machines
- Being designed especially for your Liebherr machines, Liebherr lubricants contribute significantly to lowering your operating and maintenance costs

Liebherr tools

- Wide range of tools suitable for every type of application
- Tools designed for maximum productivity and durability
- Shape of buckets designed to assist the filling and stability of bulky materials during the transport stages

Modular quick-change system made by Liebherr

- The suitable digging tool for every application
- The optional quick-change system pays for itself very quickly and your machine becomes a multifunctional tool carrier

Reliability



**Result of ongoing
improvements**

Quality in the smallest details

Robust and large-sized components, optimal fitting of electrical and hydraulic lines, or an exemplary level of finishing are just some of the many criteria that ensure a maximum quality of manufacture and operability.

A top-of-the-range anti-corrosion protection

A pre-assembly painting process guarantees that all painted parts are fully coated. The use of a high-quality paint provides resistance against extreme external conditions.

Perfect match

The individual components of the power train such as the diesel engine, gears, swing drive, working pumps and hydraulic cylinders are specifically dimensioned to work together. This means that they are all compatible with each other in a global system, guaranteeing higher reliability and a longer service life.

Automatic control of functionality

The operator can entirely focus on his job, because the integrated on-board electronic continuously performs a comparison with pre-determined target data. Eventual deviations from the target parameters are shown on the display.

Cummins engine

- Proven reliability
- Service and spare parts available worldwide
- Optimal utilisation even with high sulphur fuel
- Common rail injection system compatible with fuels containing a higher level of sulphur, for a worldwide use
- Bio-diesel compatibility



Key technologies – Made by Liebherr

- Perfect matching of the components to construction machine operations
- The electronic components, mastermind of the machine, are manufactured by Liebherr
- Main steel components, such as undercarriage, equipment modules, and slewing superstructure, all designed by Liebherr

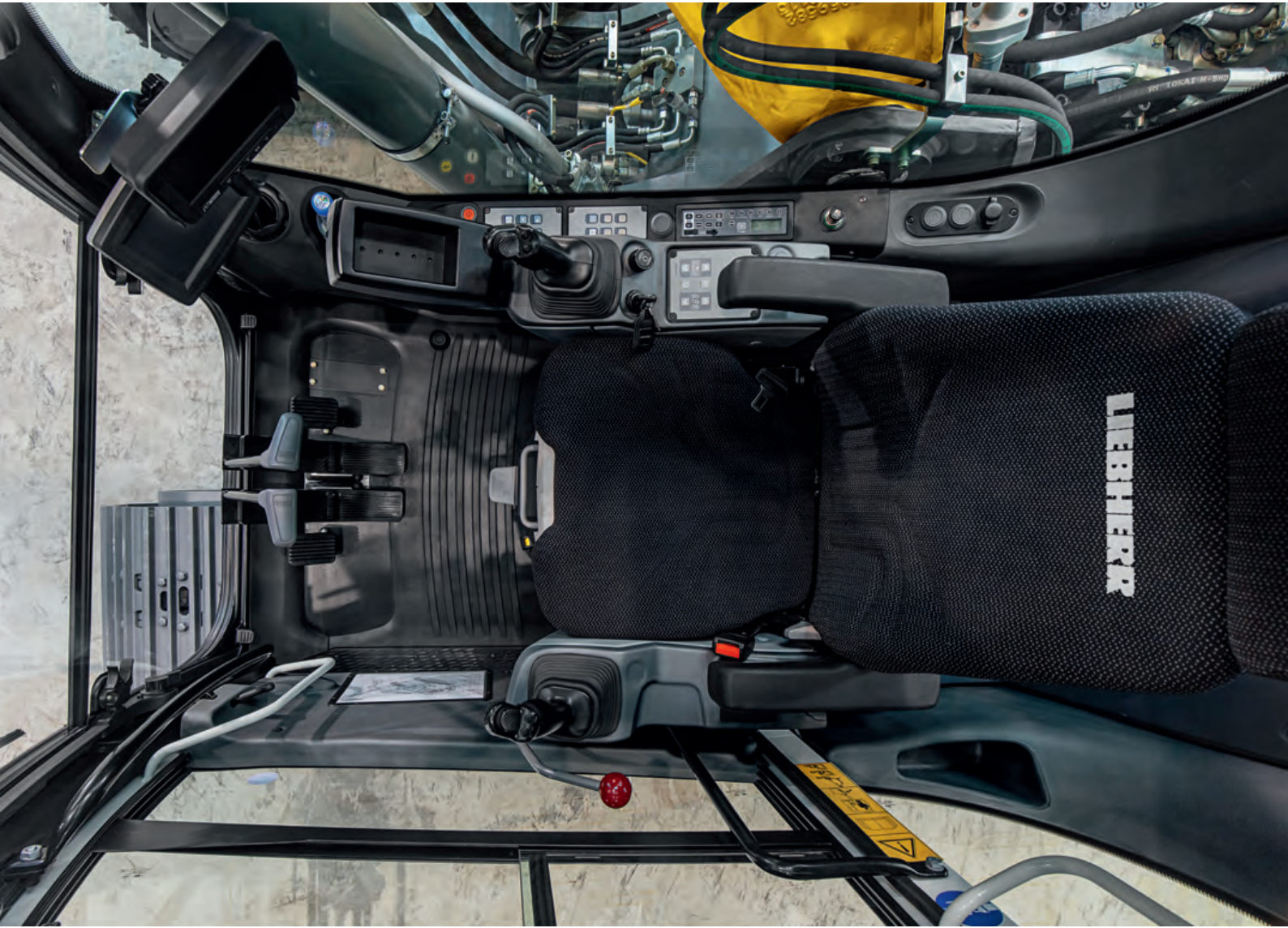


Spare parts service

- Any spare parts required are available worldwide within 24 hours. And that means high operational readiness of the machines, wherever, whenever
- Over 80,000 spare parts in stock at all times



Comfort



**Spacious, ergonomic
and with high-visibility**

A first class work space

In this cab, the operator benefits from a high-quality mechanical suspension seat, an enlarged space and a very comfortable working environment. Depending on the operator's needs, the "Comfort" seat can be selected as an option. This seat offers maximum comfort thanks to its air suspension, several horizontal and vertical settings, as well as its adjustable pneumatic lumbar support. It is especially designed to meet the most challenging comfort requirements of operators, in all working situations.

Low noise level and vibrations

To diminish fatigue at work and increase productivity, the acoustic power inside the operator's cab is one of the lowest on the market. The cab is mounted on viscoelastic rivets to fully absorb the excavator's vibrations. Furthermore, rubber flanges support the pipes and actively participate in reducing external noise.

Uncompromised visibility

The very large glazed surface area and minimal area of frames guarantee optimal visibility from the operator's platform, as well as a wide emergency exit from the rear window for the operator's safety and peace of mind.

Ergonomic proportional joysticks

The proportional joysticks are very finely tuned controls for the sensitive, accurate and fluid operation of the machine. This type of control is ideal for a machine used in a variety of applications.



Touch-screen display

- 7-inch touch-screen with colour display
- Wide range of adjustment, check, and monitoring possibilities
- Tough, reliable design (sealing tightness class IP 65)

Heightened visibility

- Optional rear view monitoring camera, for optimal visibility and heightened operating safety
- Optimized design of the whole uppercarriage providing the operator with an improved field of vision
- Front windshield fully retractable into the roof, with or without lower glass panel
- Secure emergency exit through the rear window

Optimal temperature

- Enhanced air-conditioning system, providing improved cooling performances
- Optional dark tinted windows

Maintainability



**Simplified daily checks,
longer maintenance intervals**

Ease of maintenance

All the walking areas of the uppercarriage are covered with anti-slip material to guarantee a safe and easy access. The swing gear is greased for life and requires no daily maintenance. The batteries, all filters and most centralized lubrication points are accessible from ground level, ensuring that daily maintenance and checks are quick and easily performed.

Simplified daily checks

The daily checks were taken into account from the start of the design, to make them simpler, more accessible and shorter. The optional automatic lubrication system reduces precious servicing time while guaranteeing optimal lubrication of the excavator.

Longer service intervals

The frequency of the service intervals is optimised to guarantee that each part is operating optimally and that the maintenance operations are only performed as necessary. Whether it is the interval for changing the hydraulic oil, which can be up to 3,000 hours, or the interval for changing the engine oil, every 500 hours, everything has been taken into account to reduce the frequency of interventions and thus limit the machine's downtime and reduce costs.

Expert advice and service provisions

Liebherr offers an expert advice service. Qualified personnel will help you make the appropriate decisions to meet your needs: sales discussion based on the application, service agreements, advantageous repair alternatives, original parts management, and remote data transfer for fleet management.

LiDAT data transfer system

- Complete fleet management, all from one source
- Optimized economical performance of the machine park thanks to detailed view of the distribution of operating states and times
- Reports on capacity commitment and the use of the machine park can be called up daily via the Web portal
- Precise location of the machine
- Regional delimitation and fixed service times increase safety and reliability

Accessibility to service areas

- Access to batteries and filters from ground level
- Access platform to engine oil dipstick

Central lubrication system

- The manual central lubrication system (3 points), fitted as standard, allows for daily lubrication of elements and reduction of machine downtimes
- The optional automatic lubrication system provides only the required amount of grease to the various components and increases their lifetime. It avoids spillage and waste, and quickly pays for itself



Long live progress with the R 920

Equipment

- High digging and breakout forces
- Integrated regeneration circuit
- Fast combined movements
- Cast steel elements
- Greater resistance to stresses
- Longer service life

Tools

- Large standard and HD buckets
- New bucket design
- Z-type Liebherr teeth for fast replacement
- Wide range of work tools

Undercarriage

- Special heat treatment for low wear and tear of drive sprockets
- Robust construction
- Redesigned and strengthened
- New travel motors for increased drawbar pull
- Integrated lashing eyes





Centralized lubrication

- Reduced maintenance time
- Longer service life thanks to better lubrication

Operator's cab

- Comfortable and ergonomic
- New 7" high resolution color touchscreen for heightened readability, easy to use and with more information available
- Large glazed surface area with secure emergency exit through the rear window
- Efficient air conditioning
- European Design

Engine

- Proven reliability
- Extra large fuel tank
- Low fuel consumption
- Longer autonomy
- On-demand hydrostatic driven fan

Uppercarriage

- New swing motor and gearbox for higher swing torque and speed
- Swing gear greased for life
- Steel doors and engine bonnet
- All walking areas covered with anti-slip material
- Ground level access to all filters and batteries
- Optimized design of the whole uppercarriage providing the operator with a better field of vision
- Optional rear view monitoring camera

Technical Data



Engine

Rating per SAE J1995/ISO 3046	110 kW (150 HP) at 1,800 RPM
Model	Cummins QSB 6.7
Type	6 cylinder in-line
Bore/Stroke	107/124 mm
Displacement	6.7 l
Engine operation	4-stroke diesel
	Common-Rail, turbo
Exhaust gas treatment	emission standard stage IIIA/Tier 3
Cooling system	water-cooled and integrated motor oil cooler, after-cooled and water-cooled
Air cleaner	dry-type air cleaner with pre-cleaner, primary and safety elements
Fuel tank	580 l
Fuel cleaner	pre-filter (7 µm) and fine filter (5 µm) for the fuel supply system
Electrical system	
Voltage	24 V
Batteries	2 x 135 Ah/12 V
Starter	24 V/7.8 kW
Alternator	three-phase current 24 V/70 A
Engine idling	sensor controlled
Motor management	connection to the integrated excavator system controlling via CAN-BUS to the economical utilisation of the service that is available



Hydraulic Controls

The controlling is conducted via the integrated excavator system technology, input and output modules, communicated via the CAN-BUS with the electronic central unit

Power distribution	via control valve with integrated safety valves
Flow summation	to boom and stick
Servo circuit	
Attachment and swing	proportional via joystick levers
Travel	– with proportionally functioning foot pedals and lever – speed pre-selection or automatic adjustment
Additional functions	proportional regulation via foot pedals or rocker



Hydraulic System

Hydraulic system	Positive Control dual circuit hydraulic system for independent and need-based quantity allotment via the hydraulic pumps; sensor-guided. Features high system dynamics and sensibility provided by integrated system controlling
Regeneration	integrated into the main hydraulic block
Hydraulic pump	variable double pump, in-line and swashplate
Max. flow	2 x 216 l/min.
Max. pressure	350 bar
Pump management	electronic pump management via the integrated system controlling (CAN-BUS) synchronous to the control block
Hydraulic tank	100 l
Hydraulic system	max. 300 l
Hydraulic oil filter	1 full flow filter (10 µm)
Cooling system	compact radiator, comprising cooling unit for water, hydraulic oil, after-cooler and hydrostatically driven fan
MODE selection	adjustment of engine and hydraulic performance via a 3-mode selector to match application, e.g. ECO mode for economical and environmentally friendly operation or POWER+ mode for maximum digging performance and heavy-duty jobs
RPM adjustment	stepless adjustment of engine output via RPM at each selected mode
Tool Control	10 preadjustable pump flows and pressures for add-on tools



Swing Drive

Drive	swashplate motor, shockless and antireaction
Transmission	compact planetary reduction gear
Swing ring	sealed race ball bearing swing ring, internal teeth
Swing speed	0 – 11.3 RPM stepless
Swing torque	73.3 kNm
Holding brake	wet multi-disc (spring applied, pressure released)



Operator's Cab

Cab	ROPS (option) safety cab structure with individual windscreens or featuring a slide-in subpart under the ceiling, work headlights integrated in the roof, a door with a side window (can be opened on both sides), large storing possibilities, shock-absorbing suspension, sounddamping insulating, tinted laminated safety glass, separate window shades for the sunroof window and windscreen, 24 V plug, 12 V optional, bottle holder
Operator's seat	Standard seat, air-sprung with mechanic weight adjustment, vertical seat damping including consoles and joysticks. Seat and armrests adjustable separately and in combination
Control system	arm consoles, moving with the seat
Operation and displays	large high-resolution colour display with selfexplanatory operation via touchscreen, versatile adjusting, control and monitoring facilities, e.g. implement and tool parameters
Air-conditioning	standard automatic air-conditioning, ambient air function, fast de-icing and demisting at the press of a button, air vents can be operated using special buttons. Filter for recycling and fresh air filter can be replaced and are accessible from the inside. Heating-cooling unit, designed for extreme outside temperatures



Undercarriage

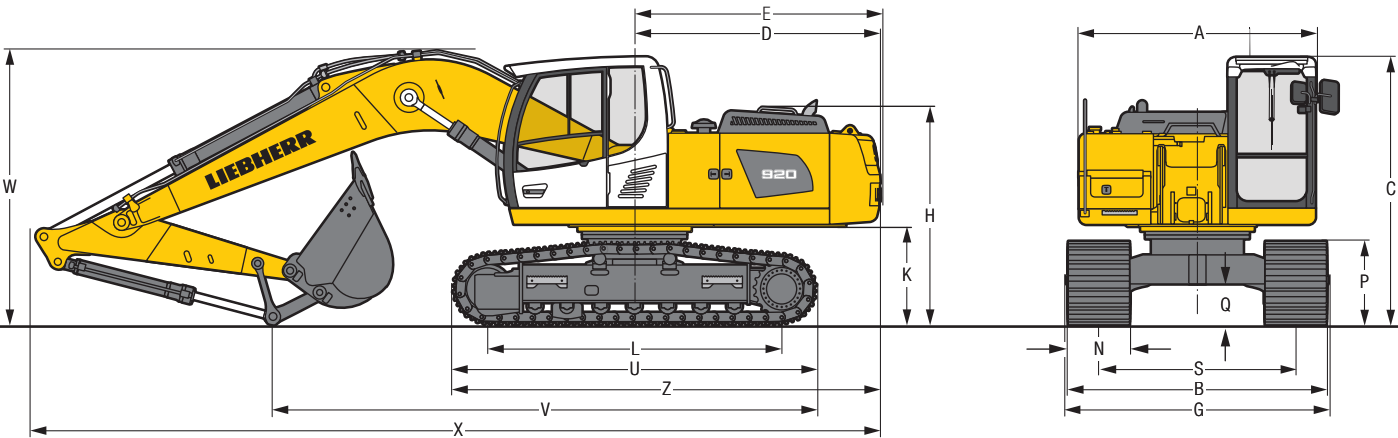
S	gauge 2,250 mm
Drive	Liebherr swashplate motors with integrated brake valves on both sides
Transmission	Liebherr planetary reduction gears
Travel speed	low range – 3 km/h high range – 5 km/h
Net drawbar pull on crawler	228 kN
Track components	B60, maintenance-free
Track rollers / Carrier rollers	7 / 2
Tracks	sealed and greased
Track pads	triple grouser
Holding brake	wet multi-disc (spring applied, pressure released)
Brake valves	integrated into travel motor
Lashing eyes	integrated



Attachment

Type	combination of resistant steel plates and cast steels components
Hydraulic cylinders	cylinders with special seal-system, shock protection
Bearings	sealed, low maintenance
Lubrication	manual central lubrication system or optional automatic central lubrication system (except link and tilt geometry)
Hydraulic connections	pipes and hoses equipped with SAE splitflange connections

Dimensions



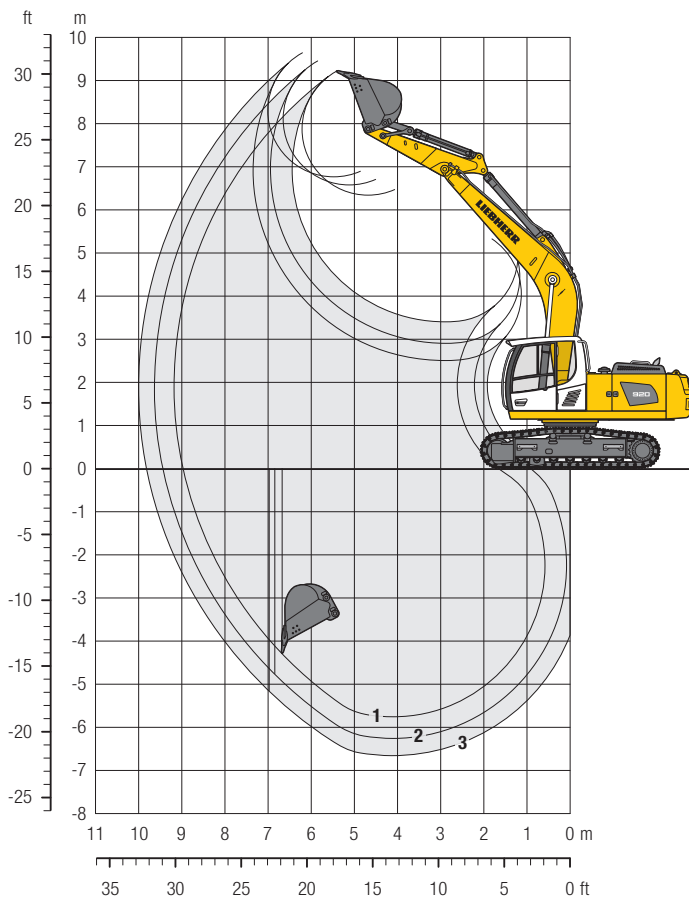
	mm		
A	2,700		
C	3,060		
D	2,800		
E	2,820		
H	2,490		
K	1,125		
L	3,355		
P	960		
Q	465		
S	2,250		
U	4,155		
N	600	700	800
B	2,850	2,950	3,050
G	2,790	2,990*	2,990*
Z	4,880		

* width with removable steps

	Stick length m	Mono boom 5.70 m mm
V	2.00	6,200
	2.50	5,700
	2.90	5,100
W	2.00	3,200
	2.50	3,250
	2.90	3,250
X	2.00	9,750
	2.50	9,750
	2.90	9,750

Backhoe Bucket

with Mono Boom 5.70 m and Counterweight 3.0 t



Digging Envelope

		1	2	3
Stick length	m	2.00	2.50	2.90
Max. digging depth	m	5.75	6.25	6.65
Max. reach at ground level	m	8.95	9.45	9.80
Max. dumping height	m	6.35	6.55	6.75
Max. teeth height	m	9.20	9.45	9.65

Digging Forces

		1	2	3
Digging force ISO	kN	146	126	113
	t	14.9	12.8	11.5
Breakout force ISO	kN	157	157	157
	t	16.0	16.0	16.0

Operating Weight and Ground Pressure

The operating weight includes the basic machine with counterweight 3.0 t, mono boom 5.70 m, stick 2.90 m and bucket 0.80 m³ (620 kg).

Undercarriage		S		
Pad width	mm	600	700	800
Weight	kg	21,000	21,250	21,500
Ground pressure	kg/cm ²	0.48	0.42	0.37

Buckets Machine stability per ISO 10567* (75% of tipping capacity)

					S-Undercarriage					
	Cutting width mm	Capacity ISO 7451 m ³	Weight ⁽³⁾ kg	Weight ⁽⁴⁾ kg	Stick length (m)					
					without quick coupler			with quick coupler		
					2.00	2.50	2.90	2.00	2.50	2.90
STD ⁽¹⁾	850	0.60	540	550	▲	▲	▲	▲	▲	▲
	1,050	0.80	620	630	▲	▲	▲	▲	▲	▲
	1,050	0.95	660	670	▲	▲	▲	▲	▲	■
	1,250	1.15	740	750	▲	■	▲	▲	▲	■
	1,250	1.25	850	870	■	▲	■	■	■	△
HD ⁽²⁾	850	0.60	600	610	▲	▲	▲	▲	▲	▲
	1,050	0.80	690	700	▲	▲	▲	▲	▲	▲
	1,050	0.95	750	760	▲	▲	▲	▲	▲	■
	1,250	1.15	840	850	▲	■	■	■	▲	■
	1,250	1.25	970	1,000	■	■	△	▲	△	△

* Indicated loads are based on ISO 10567, at maximum reach, and may be swung 360° on firm and even ground

⁽¹⁾ Standard bucket with teeth Z 35

⁽²⁾ HD bucket with teeth Z 35

⁽³⁾ Bucket for direct mounting

⁽⁴⁾ Bucket for mounting to quick coupler (SW48, 250 kg)

Other backhoes available on request

Max. material weight ▲ = ≤ 2.0 t/m³, ■ = ≤ 1.8 t/m³, ▲ = ≤ 1.65 t/m³, ■ = ≤ 1.5 t/m³, △ = ≤ 1.2 t/m³

Lift Capacities

with Mono Boom 5.70 m and Counterweight 3.0 t

Stick 2.00 m

 m	Under-carriage	3.0 m		4.5 m		6.0 m		7.5 m				
												m
7.5	S									5.6	6.5*	5.1
6.0	S					4.4	6.2*			3.9	5.6	6.4
4.5	S			6.5	8.1*	4.2	6.2			3.2	4.6	7.2
3.0	S			5.9	9.2	4.0	5.9	2.9	4.2	2.9	4.2	7.6
1.5	S			5.6	8.8	3.8	5.7	2.8	4.2	2.7	4.1	7.6
0	S			5.4	8.6	3.7	5.6			2.8	4.2	7.4
-1.5	S	10.5*	10.5*	5.5	8.7	3.7	5.6			3.1	4.7	6.8
-3.0	S	10.8	12.8*	5.6	8.8					4.0	6.0	5.8
-4.5	S											

Stick 2.50 m

 m	 Under-carriage	3.0 m		4.5 m		6.0 m		7.5 m				
											m	
7.5	S									4.7	5.8*	5.8
6.0	S					4.4	5.6*			3.4	5.0	7.0
4.5	S			6.6	7.3*	4.2	6.2*	3.0	4.3	2.9	4.2	7.7
3.0	S			6.0	9.3*	4.0	5.9	2.9	4.2	2.6	3.8	8.0
1.5	S			5.6	8.8	3.8	5.7	2.8	4.1	2.5	3.7	8.1
0	S			5.4	8.6	3.6	5.5	2.7	4.0	2.5	3.8	7.9
-1.5	S	9.9*	9.9*	5.4	8.6	3.6	5.5			2.8	4.2	7.3
-3.0	S	10.5	14.0*	5.5	8.7	3.7	5.6			3.4	5.1	6.4
-4.5	S			5.8	7.5*					5.2	6.8*	4.8

Stick 2.90 m

 m	Under-carriage	3.0 m		4.5 m		6.0 m		7.5 m				
7.5	S											
6.0	S					4.5	5.2*			4.1	5.2*	6.3
4.5	S					4.5	5.2*			3.1	4.5	7.4
3.0	S					4.5	5.2*			3.1	4.5	7.4
1.5	S					4.5	5.2*			3.1	4.5	7.4
0	S					4.5	5.2*			3.1	4.5	7.4
-1.5	S					4.5	5.2*			3.1	4.5	7.4
-3.0	S					4.5	5.2*			3.1	4.5	7.4
-4.5	S					4.5	5.2*			3.1	4.5	7.4

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

The load values are quoted in tons (t) at stick end (without bucket), and may be swung 360° on firm and even ground. Adjacent values are valid for the undercarriage when in the longitudinal position. Capacities are valid for 600 mm wide track pads. Indicated loads are based on ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity (indicated via *). Without bucket cylinder, link and lever the lift capacities will increase by 300 kg. Lifting capacity of the excavator is limited by machine stability and hydraulic capacity. 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 safety check valves on hoist cylinders and stick cylinder(s), when they are used for lifting operations which require the use of lifting accessories.

Standard Equipment

Undercarriage

Lashing eyes
Sprocket with dirt ejector
Track guide (one piece per track frame)
Track pads 600 mm
Track rollers, lifetime-lubricated
Tracks, sealed and greased

Uppercarriage

Anti-slid surfaces
Engine hood with gas spring opening
Handrails
Manual central lubrication system
Manual main switch
Storage box, lockable
Swing brake lock, maintenance-free
Tool set 33 pieces

Hydraulic System

Filter with integrated fine filter
Hydraulic pressure test ports
Liebherr hydraulic oil
Positive Control system
Pressure accumulators for controlled lowering of equipment with engine turned off
Work mode selector

Engine

Automatic engine idling
Common-Rail injection system
Conform with stage IIIA/Tier 3 emission standard
Fuel filter and water separator
Intercooler
Oil level
Stepless adjustable engine speed
Turbo charger

Operator's Cab

7" colour multifunction display with touchscreen
Air conditioning, automatic
Cigarette lighter and ashtray
Coat hook
Cup holder
Footrest
Front windshield fully retractable into the roof, with or without lower glass panel
Fuel consumption indicator on touchscreen
Headlights (two pieces, Halogen)
Interior light
Mechanical hour meters, readable from outside the cab
MP3 radio
Operator seat with mechanical damping
Rain hood over front window opening
Rearview mirrors
Rear window emergency exit
Retractable seat belt 51 mm
Roll-down sun blind
Roof window, right window and windshield with safety glass
Rubber floor mat
Sliding windows in cab door
Storage bin
Storage space
Tinted windows
Viscoelastic damping
Wiper/washer

Attachment

Boom cylinders oil regeneration
Headlight on boom (right, Halogen)
Load valve for hoist cylinders (on distributor)
Load valve for stick cylinder (on distributor)
Manual central lubrication system (except connecting link for bucket kinematics)
Stick cylinder oil regeneration

Non-exhaustive list, please contact us for further information.

Options

Undercarriage

Steps, wide version for 700 mm and 800 mm track pads
Track guides (three pieces per track frame)
Track guides (two pieces per track frame)
Track pads 700 mm, 800 mm

Uppercarriage

Automatic central lubrication system
Diesel refuelling pump (electric)
Electric socket for external start-up aid (24 V)
Fuel anti-theft device
Fuel tank cap lockable with padlock
Rearview mirror on counterweight
Right-hand rearview mirror



Hydraulic System

Liebherr hydraulic oil, adapted for extreme climate conditions



Engine

Air pre-filter with dust trap
Fuel preheating (24 V)



Operator's Cab

Additional front and/or rear cab headlights (Halogen or LED)
Amber beacon
Auxiliary heater (programmable)
Dark tinted windows
Electric socket (12 V)
Emergency stop button in cab
Falling objects protection structure (FOPS)
Front guard protection structure (FGPS)
Front headlights (two pieces, LED)
Handrest for joysticks
Liebherr proportional control (mini-joysticks 2 axis)
Operator seat "Comfort" with pneumatic damping and retractable seat belt
Preparation for LiDAT (Liebherr data transfer system)
Protection guard (front window and/or roof window)
Rear view monitoring camera
ROPS safety cab structure (ISO 12117-2)
Sun visor
Travel alarm



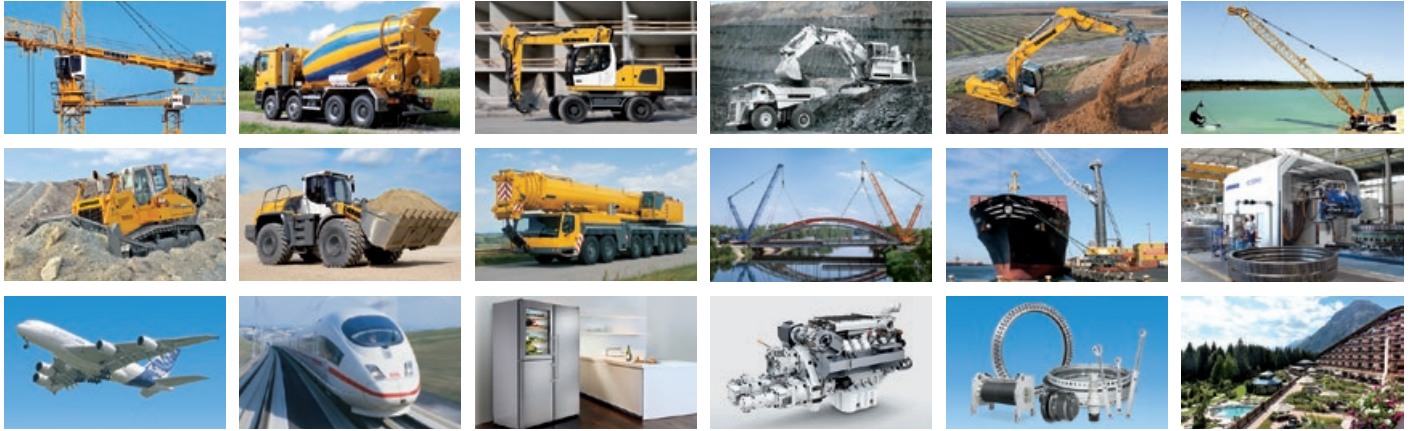
Attachment

Additional headlight on boom (left, Halogen or LED)
Automatic central lubrication system
Bottom protection for boom
Bottom protection for stick
Filter for hydraulic hammer return flow
Headlight on boom (right, LED)
High pressure circuit
Hydraulic or mechanical quick coupler
Liebherr bucket range
Liebherr tooth system
Medium pressure circuit
Overload warning device
Safety check valves for stick cylinder
Safety check valves on hoist cylinders
Tool Control, 10 tool adjustments selectable via display

Non-exhaustive list, please contact us for further information.

Options and/or special attachments, supplied by vendors other than Liebherr, are only to be installed with the knowledge and approval of Liebherr in order to retain warranty.

The Liebherr Group of Companies



Wide Product Range

The Liebherr Group is one of the largest construction equipment manufacturers in the world. Liebherr's high-value products and services enjoy a high reputation in many other fields. The wide range includes domestic appliances, aerospace and transportation systems, machine tools and maritime cranes.

Exceptional Customer Benefit

Every product line provides a complete range of models in many different versions. With both their technical excellence and acknowledged quality, Liebherr products offer a maximum of customer benefits in practical application.

State-of-the-art Technology

To provide consistent, top quality products, Liebherr attaches great importance to each product area, its components and core technologies. Important modules and components are developed and manufactured in-house, for instance the entire drive and control technology for construction equipment.

Worldwide and Independent

Hans Liebherr founded the Liebherr family company in 1949. Since that time, the enterprise has steadily grown to a group of more than 130 companies with over 41,000 employees located on all continents. The corporate headquarters of the Group is Liebherr-International AG in Bulle, Switzerland. The Liebherr family is the sole owner of the company.

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2 Safety warnings, signs

Working with the machine represents a risk of serious or fatal injury, which you as the owner, machine operator or a member of the maintenance personnel can counteract. You can avoid dangers and accidents by reading the various safety instructions attentively on a regular basis, and by following them at all times. This applies in particular to personnel who only work on the machine occasionally, e.g. for setup or maintenance work.

The safety instructions are listed below. If you comply with these instructions conscientiously, you can be sure to safeguard your own safety and the safety of other people, and you will avoid causing damage to the machine.

The descriptions of work in this publication describe the necessary safety precautions which must be taken to prevent people and the machine from being exposed to hazards.

2.1 Safety advices and symbols

2.1.1 Designation of safety advices



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Tab. 2

The safety alert symbol appears always together with one of the following signal words:

DANGER
WARNING
CAUTION

	DANGER	indicates a hazardous situation which, if not avoided, will result in death or serious injury
	WARNING	indicates a hazardous situation which, if not avoided, could result in death or serious injury
	CAUTION	indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
	NOTICE	indicates a hazardous situation which, if not avoided, could result in property damages

Tab. 3

2.1.2 Other designations

Symbol	Explanation
	Note indicates helpful advices and tips
	Precondition identifies a condition that must be met before the following steps can be taken
	Required action identifies steps than must be carried out
	Result identifies the result of a step
–	Enumeration identifies individual items in a list

Tab. 4: Symbols

2.2 Additional rules and guidelines

Following these notes does not invalidate the requirement to comply with additional rules and guidelines!

Additionally, it is necessary to comply with:

- The safety rules applicable in the place of use
- Statutory “rules of the road”
- Directives issued by employers' professional liability insurers

2.3 Designated use

The hydraulic excavator is a machine fitted with a tool attachment. The tool attachment is used for removing, picking up, transporting and tipping material. Material transport is mainly completed without machine travelling movement. Safety instructions must be followed when moving a loaded machine.

Machines used for lifting loads are subject to special regulations. The prescribed safety equipment must be fitted to these machines.

Machines used underground must be equipped with technologies for reducing exhaust emissions (e.g. diesel particulate filter). The relevant regulations applicable in the country of use must be adhered to.

Special applications require special equipment and possibly special safety devices in certain cases. This equipment can only be mounted and used with the approval of, and in accordance with the conditions, of the manufacturer of the hydraulic excavator.

Compliance with the operating manual forms an essential part of the designated use.

Any use outside the prescribed framework, e.g. transporting people or working in a potentially explosive atmosphere or a contaminated area, is outside designated use.

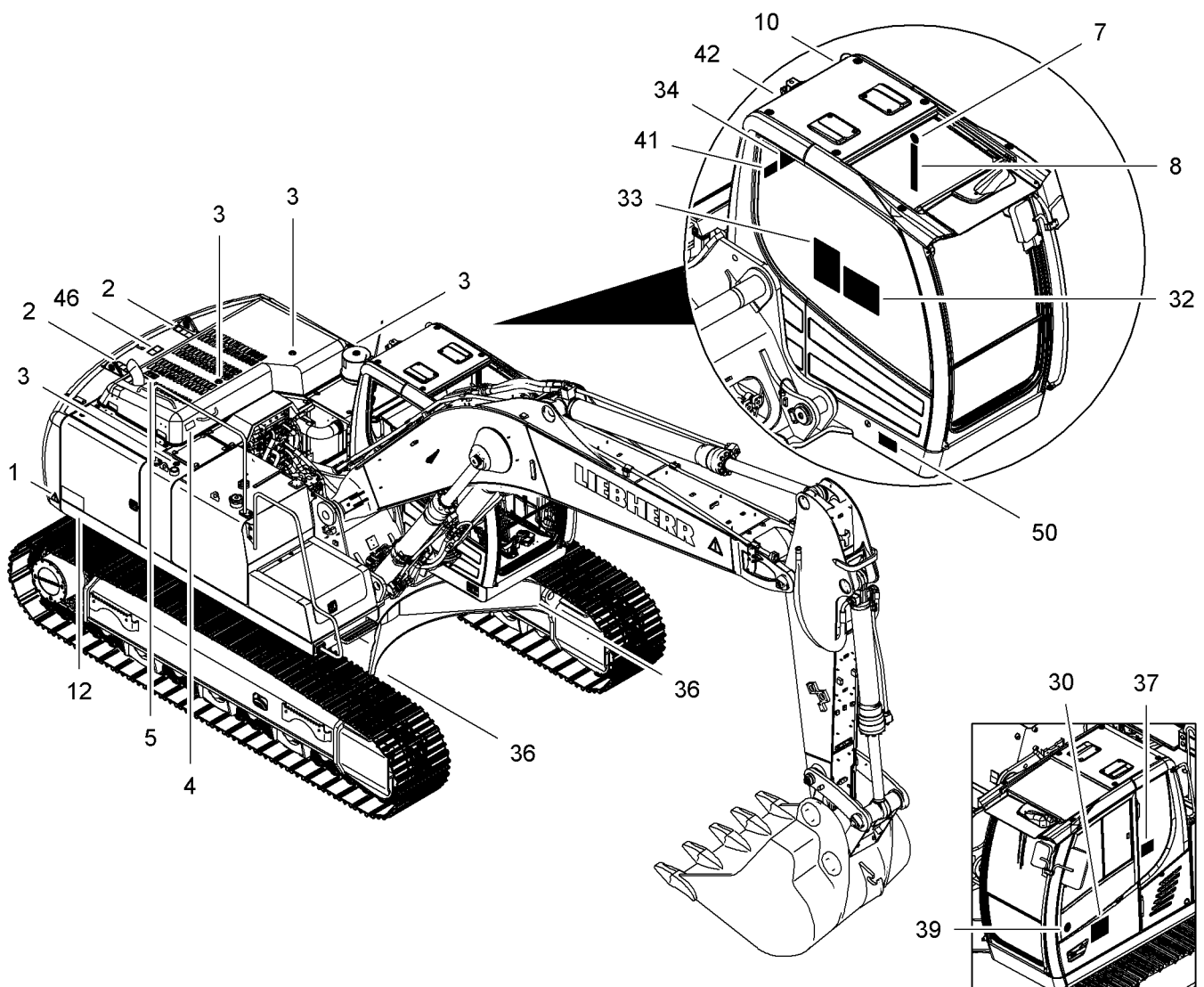
The manufacturer is not liable for damage attributable to use not in accordance with the designated use. The user bears sole responsibility.

2.4 Signs on the machine

2.4.1 Locations of signs

The machine is equipped with the following signs:

- Warning signs
- Information signs
- Identification tag



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Fig. 13: Locations of signs

2.4.2 Warning signs

Warning signs warn against accident hazards.

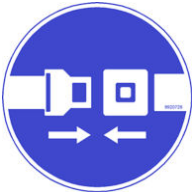
Certain information signs are not present on all machines.

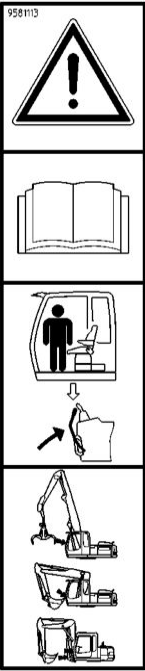
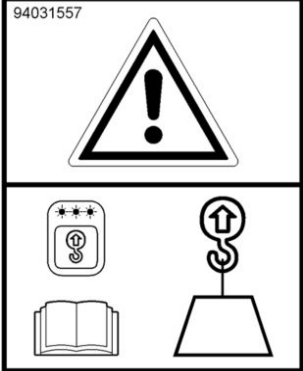


DANGER

Failure to comply with the warning signs!
Death, injuries, damage.

- ▶ Regularly check condition of the warning signs.
- ▶ Immediately replace any incomplete, illegible or missing warning signs.

Sign	Description
1 	Danger! Danger of crushing, impacts and piercing during machine operation. Remaining in the working area of the machine is prohibited.
2 	Lifting prohibited The specified attachment point for lifting is unsuitable for lifting the complete machine. Do not lift the machine on this attachment point for lifting. Observe the instructions in the operator's manual on lifting the machine.
3 	Prohibited zone Risk of falling. Entering the indicated areas is prohibited.
4 	Engine shut-off Risk of injury. Only open hood with diesel engine shut off.
5 	Risk of burns Danger of burns in the event of contact, particularly in the area of the exhaust pipe silencer
7 	Safety belt Put on the safety belt before working with machine.

	Sign	Description
8		Avoiding accidents When working with machine, follow instructions in the operator's manual on accident prevention. Safety lever Move safety lever up before leaving the operator's seat. Danger of collision Working attachment can hit operator's cab. Control attachment with caution.
9		Jump starting Observe operator's manual before jump starting.
10		Emergency exit In an emergency, smash window with emergency hammer and leave operator's cab.
11		Activating overload warning system Before material handling, switch on overload warning system. More information can be found in the operator's manual.

Sign	Description
12 	Collision with uppercarriage Observe safety distance from uppercarriage.

Tab. 5: Warning signs

2.4.3 Information signs

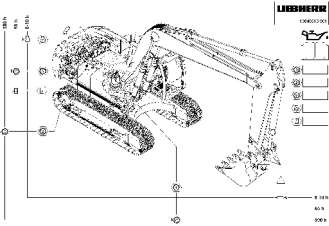
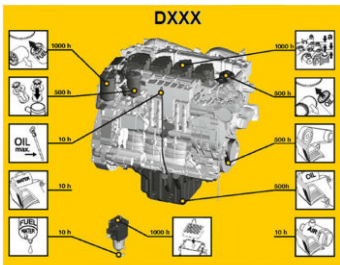
Information signs relate to operation, maintenance or properties of the machine.
Certain information signs are not present on all machines.

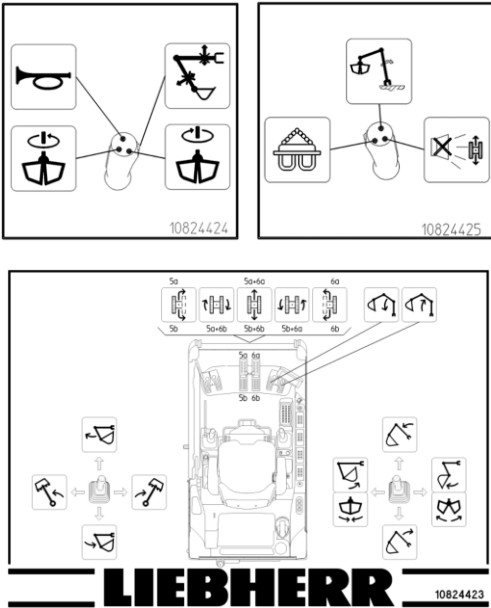
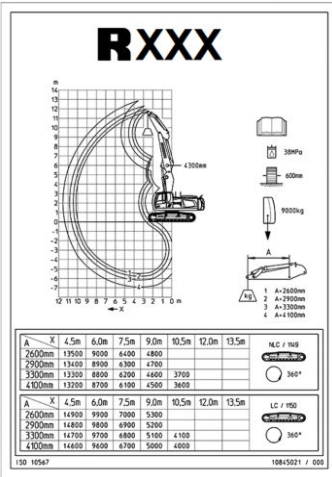
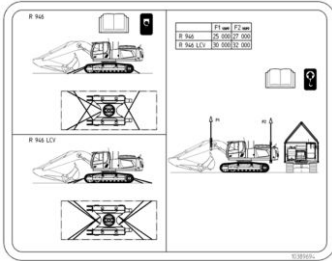


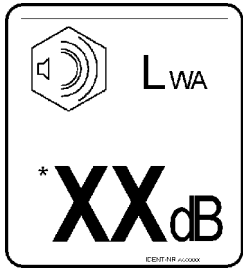
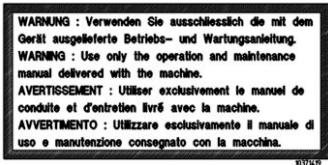
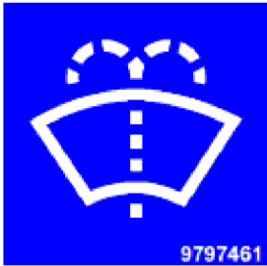
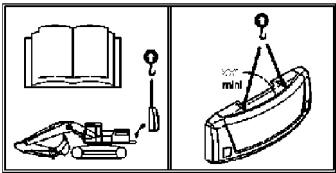
WARNING

Failure to observe the information signs!
Death, injuries, damage.

- Regularly check the condition of the information signs.
- Immediately replace any incomplete, illegible or missing information signs.

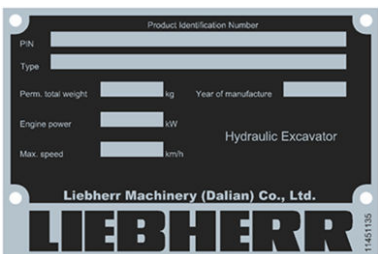
Sign	Description
30 	Lubrication chart Shows lubrication tasks.
31 	Engine lubrication chart Shows maintenance tasks on the diesel engine.

	Sign	Description
32		Description of the control elements Describes the control elements relating to joysticks and pedals.
33		Load lift chart States permissible loads that can be lifted at the end of the stick, depending on the reach.
34		Attachment points for lifting and tie-down points Shows attachment points for lifting and tie-down points on the machine. Read operator's manual before lifting or transporting the machine.
36		Tie-down points Shows tie-down points of the machine. Read operator's manual before transporting the machine.

	Sign	Description
37		Sound power level (Lwa) Shows sound power level of the machine in dB. *XX: Machine-specific value.
39		Waxoyl Shows presence of corrosion protection.
41		Operator's manual Only use operator's manual supplied with machine.
42		Windscreen washer tank Shows position of the windscreen washer tank.
44		Coolant Shows that the cooling system is filled with Liebherr Antifreeze OS coolant. More information can be found in the operator's manual.
46		Disassembling the counter-weight Indicates the minimum angle between lifting tackle and bolts of the lifting eyelets.

Tab. 6: Information signs

2.4.4 Type plates

	Sign	Description
50	 The image shows a white rectangular type plate with black text and fields. At the top, it says '产品识别号 Product Identification Number' followed by a blank line. Below this, 'PIN' is written next to another blank line. Then '型号 Type' is written next to a third blank line. Further down, '额定重量 Perm. total weight' is written next to a blank line with 'kg' to its right. To the right of this is '液压挖掘机 Hydraulic Excavator'. Below that, '发动机功率 Engine power' is written next to a blank line with 'kW' to its right. Then '最大行驶速度 Max. speed' is written next to a blank line with 'km/h' to its right. At the bottom, it says '利勃海尔机械(大连)有限公司 Liebherr Machinery (Dalian) Co., Ltd.' and the 'LIEBHERR' logo in large, bold letters.	Type plate (exclusive to Chinese sales area) Contains the following information: - Machine identification number (PIN) - Type - Year of manufacture - Rated output of the diesel engine - Maximum speed - Operating weight - Manufacturer's address
50	 The image shows a black rectangular type plate with white text and fields. At the top, it says 'Product Identification Number' followed by a blank line. Below this, 'PIN' is written next to another blank line. Then 'Type' is written next to a third blank line. Further down, 'Perm. total weight' is written next to a blank line with 'kg' to its right. To the right of this is 'Year of manufacture' followed by a blank line. Below that, 'Engine power' is written next to a blank line with 'kW' to its right. Then 'Max. speed' is written next to a blank line with 'km/h' to its right. To the right of this is 'Hydraulic Excavator'. At the bottom, it says 'Liebherr Machinery (Dalian) Co., Ltd.' and the 'LIEBHERR' logo in large, bold letters.	Type plate (international sales area) Contains the following information: - Machine identification number (PIN) - Type - Year of manufacture - Rated output of the diesel engine - Maximum speed - Operating weight - Manufacturer's address - EAC identification²⁾

Tab. 7: Type plates

2.5 Safety warnings

2.5.1 General safety instructions

Qualification of the operating personnel

Only expressly authorised and trained people are allowed to operate, maintain or repair the machine. The statutory minimum age shall be complied with.

Training of the personnel should include theoretical information about technology and safety as well as practical training on the machine.

It is essential to make sure that the operating personnel have read and understood the operator's manual and any other additional instructions which may be provided.

²⁾ In accordance with requirements of target country

Personnel who are undergoing training or instruction or are taking part in a general apprenticeship are only allowed to work on the machine if permanently supervised by an experienced person.

The owner must check regularly that the personnel are working safely, with awareness of the potential dangers and in accordance with the operating manual.

The responsibility of the personnel for operation or setup, maintenance and repair must be clearly defined.

Personal protective equipment

Wear safe working clothes when you are working on or with the machine.

For certain work, it is mandatory to wear safety glasses, safety boots, a protective helmet, working gloves, a high-visibility tabard, ear defenders and additional protective equipment.

Avoid wearing rings, wristwatches, ties, scarves, open jackets and loose-fitting clothing. Risk of injury, for example by getting snagged or pulled in.

Safety instructions at the place of use

Find out from the construction site manager whether there are special safety instructions applicable on the construction site, and comply with them.

Do not work in any way which represents a safety risk. Refuse to comply with instructions from third parties which contravene safety instructions. This also applies with regard to the rules of the road.

2.5.2 Avoiding crushing and burning injuries

Never work under an attachment that is not on the ground or firmly supported.

Never use damaged or insufficiently strong cable or slings.

Always wear protective gloves when handling wire ropes.

When working on an attachment, never align the bores with your bare hands. Use suitable adjustment spike.

Make sure no objects fall down or are sucked up by the fan when the engine is running. The fan can be damaged by these objects or throw them out.

At the operating temperature, the coolant or hot oil can cause burns. Avoid all contact with parts carrying coolant, oil or hot liquids.

Before checking the coolant level, make sure the cover of expansion tank has cooled down enough to be handled. Then carefully unscrew the cap to let excess pressure escape.

Wear safety glasses and protective gloves when working on the battery. Avoid any sparks caused by naked flames.

Never let a third party guide the grapple by hand.

2.5.3 Avoid fire and explosions

Fire extinguisher

Familiarise yourself with the attachment points and operation of fire extinguishers on the machine as well as with the fire alarm and fire-fighting possibilities on site.

The source of a fire can only be extinguished if it is accessible.

Before starting, close all locks for the covers on the machine. In case of a fire, the covers can be opened immediately and the fire extinguished.

Electrical system

Regularly check the electrical system and have all faults repaired without delay.

Examples:

- Loose connections
- Blown fuses
- Defective bulbs
- Charred or chafed cables

When charging batteries, do not smoke or use naked flames. Wear safety glasses and protective gloves when you are working on the battery.

Diesel engine

Do not use any ether starting aids to start diesel engines with a pre-heat system or flame glow unit.

Always start the diesel engine as described in the operating manual.

Refuelling

Prior to refuelling, shut down the diesel engine and switch off the auxiliary heater (option).

When refuelling, do not smoke or use naked flames.

Avoid contact with fuels. Contact with the skin or inhalation of vapours can result in impairments to health.

Refuelling with the wrong fuel will result in damage to the fuel system and engine. Do not start the engine if the wrong fuel has been filled by mistake. The tank and the fuel lines will then have to be drained. Notify a qualified specialist workshop. Have the tank and the fuel lines drained fully.

Flammable liquids

Do not carry any flammable liquids on the machine, except for in the tanks intended for such.

Oil spraying out of leaks can easily cause fires. Regularly check all lines, hoses and fittings for leaks and damage. Have all leaks repaired immediately, and renew the damaged components.

Protection against heat

Make sure that all holders and protective shields have been installed correctly and are protected against vibration, chafing and heat buildup.

2.5.4 Seeing and being seen

Field of vision and viewing devices

You can only avoid possible dangers providing you have adequate visibility whilst you are travelling and working. The operator's field of vision is measured according

to ISO 5006 and in the standard configuration of the machine. Necessary viewing devices (for example mirrors and cameras) are positioned accordingly.

- Comply with national regulations regarding visibility in the operator's cab.
- Check the viewing devices are functioning, clean and set correctly.
- Set mirrors so that the best possible all-round visibility is guaranteed.
- Immediately repair defective viewing devices or have them replaced.
- Clean dirty windows of the operator's cab.

Modifications to the machine

If modifications to the machine impair the field of vision:

- Carry out a test according to ISO 5006 or the regulations applicable in the place of use.
- Take corresponding measures to comply with ISO 5006, depending on the test result.
- Inform the operator about the modifications.
- Be careful when the field of view is restricted and watch out for blind spots.
- Work with a spotter, if necessary.

Measures during operation

- Make sure that people contact the operator before approaching the machine.
- Always observe the area around the machine. Use viewing devices to observe the areas around the machine that cannot be seen directly.
- Do not use sun visors if they impair visibility.
- Avoid travelling in reverse whenever possible.
- Set up the working area so that no obstacles restrict visibility.
- Always work with a spotter if undertaking activities involving restricted visibility. Agree on which hand symbols to use. Establish voice contact via radio for difficult tasks.
- Use illumination in conditions of poor visibility, and in accordance with the applicable regulations.

2.5.5 Protection against vibration

The dynamic load in construction machines is chiefly the result of the way they are used. The following parameters have a major influence:

- Ground conditions: Rough surface and potholes
- Application parameters during travel and operation: Speed, steering, braking, handling the control elements of the machine.

The machine operator has a considerable influence on the vibration level as he/she sets the following parameters:

- Speed of machine
- Route
- Gear ratio
- Working method

Consequently, the vibration level in machines of similar types can vary greatly.

The machine operator can reduce the vibration load if he/she complies with the following recommendations:

- Select the suitable machine, suitable attachment components and additional equipment.
- Keep the operator seat in good condition. Set the operator's seat according to weight and height of the machine operator. Regularly check the shock absorbers and control elements and make sure the features of the operator's seat correspond with the seat manufacturer's instructions.

Make sure the machine is well maintained. Carry out all necessary inspections.

Avoid jerky steering, braking, speeding up and manoeuvring with the machine.

Adjust the speed of the machine to the route taken in order to reduce the vibration load.

- Cut your speed when you are travelling over rough ground.
- Drive round obstacles. Avoid rough ground.

Make sure the sites where the machine is working and travelling are kept in good condition:

- Remove obstacles.
- Fill in channels and holes.
- Keep the materials required to create and maintain suitable ground conditions available. Allow for enough time.

Travel longer distances at a suitable speed.

If the machine is often driven, use special auxiliary systems in driving mode and regulate the speed. This prevents the development of noise.

2.5.6 Before taking into operation

Always carry out a thorough inspection tour all round the machine before taking it into operation. Check that all warning signs are in place and are legible. Check the machine for leaks of fuel, coolant, hydraulic oil and gear oil. Check the machine is functioning correctly.

Notify your manager immediately if you notice any defects. Have the defects repaired without delay. When there is a change of personnel, make sure that the subsequent user of the machine is also informed.

Do not take the machine into operation if it is damaged.

Adjust the operator seat, the mirrors and other viewing devices. Put on the safety belt.

Keep the operator's cab free from objects that you do not need during work with the machine. Stow away and secure all other objects before starting.

Make sure that all caps, covers and doors are closed but that the locks are not activated.

Secure the doors and windows against inadvertent movements.

Check whether there is anyone close to the machine. Ask these people to move away from the machine, if necessary.

2.5.7 Getting in and out

Avoid any risk of accidents posed by muddy paths, ice, snow, traffic on the access ways and constrained space in the parking area.

The uppercarriage must be positioned in relation to the undercarriage so that the steps and ladders are in line with one another.

Keep steps, ladders, anti-slip mats, hand rails and handles free from dirt, oil, ice and snow and check regularly that they are in perfect condition. Have defective parts renewed without delay.

Clean mud, grease, ice and snow off your shoes and any equipment used for climbing before you step onto the machine. Use gloves to provide you with a secure hold.

Climbing on and off using tyres, wheel hubs, rims or caterpillar tracks is prohibited.

Remember that external influences (e.g. wind) can make it difficult to open and close the door. Therefore, always guide the door with your hand. Make sure that the opened or closed door has engaged correctly.

Machine with operator's cab elevation: You may have to climb up a little before you reach the door. When you can reach the door with your free hand, first open the door before climbing up any further.

When climbing up or down, face the machine and always use the three-point support (always two hands and one foot or two feet and one hand are in contact with the access system).

Do not hold the steering column or the operating levers when climbing in and out. This can result in inadvertent movements of the machine and lead to accidents.

Never leave the operator seat while the machine is still moving.

Never jump down from the machine. Instead, use the steps, ladders, hand rails and handles provided for climbing in and out.

Familiarise yourself with the emergency exit.

In the following circumstances, comply with the safety instructions for climbing in and out as given in the operating manual for the overall machine:

- If the uppercarriage is mounted on a support.
- If the machine is being used as part of a system.
- If the uppercarriage is mounted on a pontoon, roller trolley or the like.

2.5.8 Starting the machine

Move all control elements to their neutral position and move the safety lever upwards.

Only start the machine from the operator seat.

Check the indications as well as the warning and indicator lights before and after starting the engine. Make sure the engine is running at a smooth low idle, pay attention to unusual smoke and noise from fans, the diesel engine and hydraulic system.

Do not run the diesel engine in enclosed rooms unless there is adequate ventilation. If necessary, open the doors and windows of the building in order to ensure an adequate fresh-air supply.

Bring the diesel engine and the hydraulic oil to operating temperature. Low oil temperatures have the effect of the control system operating sluggishly.

Carefully drive the machine onto open ground and check all operating functions.

Check the brakes and the steering system. Make sure that all functions are working correctly before you start work.

2.5.9 Working

General notes

Before starting work, familiarise yourself with the special features of the construction site and the locally applicable regulations. These include: obstacles in the working and travel area, load-bearing capacity of the ground and necessary protection for people and machinery against public roadways.

Before starting work, check whether there are any special hazards which require particular precautionary measures to be taken, e.g. toxic, explosive gases, bad

condition of driveways, unstable ground. Take suitable measures to ensure safe operation.

Convince yourself that no-one is in the working area before you set the machine in motion.

Only work when sitting down, and with the safety belt fastened.

Never leave the machine unsupervised with the engine running.

Use the machine in such a way that its stability is assured. Do not exceed the permissible load lift. The figures in this operating manual relate to level ground with a sufficient load-bearing capacity. Pay attention to influences due to different operating conditions, e.g. application on soft or uneven ground, on a slope or if loads could slip.

Find out what is the size of the loads to be lifted. Consider what effects these loads could have on the stability of the machine.

Position the uppercarriage parallel with the undercarriage when travelling. Keep the load close to ground level.

The maximum permissible incline and lateral slope that can be driven on depend on the attachments fitted and on the ground.

Keep the machine sufficiently far from pits and bank edges to make sure that there is no risk of falling.

Familiarise yourself with the position of underground utility lines on the construction site before you start digging. Maintain the required safety clearances from these utility lines.

Familiarise yourself with the position of electrical overhead lines (high voltage cables) and work with care in the vicinity of them. Maintain the required safety clearances from high voltage cables.

In case of contact with a high voltage cable despite these precautions:

- Do not move the machine and working attachment
- Remain in the operator's cab. Touching the machine and the ground at the same time is fatal
- Make sure that other people stay away from the machine and the hanging cable
- Arrange for the electricity to be switched off

Adjust your travel speed to match local conditions.

Avoid working movements which could result in the machine tipping over.

When working on a slope, if at all possible make sure the undercarriage is not moved or parked at a sideways angle to the slope.

Do not exceed the permissible speed when travelling downhill, otherwise you could lose control of the machine. Shift to the lowest gear step in order to allow the engine braking effect to restrict the maximum speed.

When loading a truck, insist that the truck driver leaves the truck cab, even if rock protection is fitted.

During demolition work, ground clearing, working with lifting tackle, etc., always use the protective devices appropriate for the specific application.

Get a guide to assist you when working on ground with poor visibility and whenever such assistance is necessary. In this case, always arrange for only one person to give you instructions.

Only entrust experienced persons with the job of attaching loads and guiding machine operators. The spotter must be in the field of view of the operator or have voice contact with the operator.

The working attachment can cause serious or even fatal injuries. Never allow someone to remain in the danger zone. Never allow someone to guide the tool attachment with their hand.

If a large or wide tool attachment is moved in the vicinity of the operator's cab, it can touch or penetrate the cab and thereby endanger the machine operator. Move the tool attachment at sufficient distance from the operator's cab.

Depending on the equipment combination, there may be a risk of collision between the working tool and undercarriage, operator's cab, operator's cab protection, hydraulic cylinders and other attachment parts. Take the greatest of care when a working tool is moved in the vicinity of the named components, in order to avoid damage.

Transfer loading

Lifting a load with the machine causes the centre of gravity of the machine to shift. This imposes a sustained effect on the travelling properties of the machine, for example reducing its dynamic stability.

Adjust your conduct to the changed machine properties:

- Reduce the travel speed
- Avoid sudden speed changes and changes of direction

Only swivel the uppercarriage once the machine is at a standstill and you have lifted the load.

Do not travel until the load has been lifted and the uppercarriage swivelled into the travel position, see the "Travelling" chapter.

When working with grapples and during transfer loading of wood, centre the load in the working tool.

The weight of absorbent material, for example tree trunks, depends on their length, diameter and specific weight. Pay attention to the factors which influence natural products, such as moisture.

Attach a protective device (front guard) according to ISO 10262 on the front of the operator's cab if there is a danger of objects striking the operator's cab from the front.

Attach a protective device (falling object protective structure, FOPS) according to ISO 10262 to the operator's cab if there is a danger of falling objects.

2.5.10 Shutting down the machine

Park the machine on level and firm ground. Avoid parking on a slope. If the machine must be parked on a slope, secure it with wedges to prevent it from rolling away.

Swivel the uppercarriage in the front-to-back direction in relation to the undercarriage: In wheeled excavators, the steering axle is located at the front in the travel direction, whereas in crawler excavators the travel drives are at the rear. It is possible to climb in and out safely in this position.

Lower the working attachment so it is lying on the ground.

Move all control elements to their neutral position. Apply the parking brake and slewing gear brake.

Move the safety lever upwards and shut down the diesel engine as described in the operating manual before you leave the operator seat.

Lock all caps, covers and doors. Pull out all keys and secure the machine to prevent unauthorised use.

2.5.11 Transporting the machine

Research the route to be taken before organising the transport. Observe limitations for width, height, length and weight.

Pay particular attention when passing under power lines and bridges, as well as when passing through tunnels.

Make sure the transport vehicle and the levering and securing tools are approved for use with the weight and size of the machine and their components.

Before removing components or cleaning the machine, place the machine on level ground and secure by placing wheel blocks under the tracks.

Be careful when loading or unloading.

Only use load-bearing and stable loading ramps when loading the machine. Make sure the angle of the loading ramp is under the permissible inclination of the machine. The ramp must be wide enough.

Make sure the machine operator receives guidance from third party during the manoeuvre.

Make sure nobody is in the danger area when the machine is tipped or slides away.

Secure the machine and all removed components with slings and wheel blocks. National regulations must be complied with when transporting the machine.

Make sure nobody is on the machine during transport.

2.5.12 Towing

The machine is only allowed to be towed under exceptional circumstances, e.g. in order to remove the machine from a place of danger in order to take it for repair.

Damage or accidents which occur during towing will never be covered by the manufacturer's warranty.

Before pulling or towing, check that all attachment and towing devices are safe and secure.

Only secure attachment and towing devices to the points provided on the machine for this purpose.

When towing, comply with the prescribed transport position, permitted speed and distance.

When towing, comply with the information given in the operating manual.

2.5.13 Maintenance and repair

Qualification of the personnel

Maintenance and repair work is only allowed to be performed by trained specialist personnel.

Make sure that a sufficiently equipped workshop is available to carry out this work, and that the responsible personnel have the necessary qualifications.

The inspection and maintenance schedule defines precisely who is allowed to or who must perform which jobs.

Following instruction, it is permitted for the machine operator or the maintenance personnel to carry out the work listed under "Every 8-10 hours/every 50 hours". The remaining work is only allowed to be performed by specialist personnel who have been trained accordingly.

Work on travel gears, brake systems and steering systems is only allowed to be performed by trained specialist personnel.

Only personnel with special knowledge and experience are allowed to work on hydraulic equipment.

Safety in the workplace.

Keep unauthorised people away from the machine during maintenance or repair.

Cordon off a large area around the maintenance zone if necessary.

Inform the operating personnel before starting to undertake special and maintenance work. Appoint a supervisor.

Swivel the uppercarriage in the front-to-back direction in relation to the undercarriage: In wheeled excavators, the steering axle is located at the front in the travel direction, whereas in crawler excavators the travel drives are at the rear. Safe access to the usual maintenance points on the uppercarriage is possible in this position.

Unless specified otherwise in the operating manual, all maintenance work on the machine must be performed on level, firm ground with the working attachment lowered and the diesel engine switched off.

During maintenance work, particularly involving work under the machine, affix a warning sign with the message "Do not switch on!" in a clearly visible location on the starter lock. Pull out the starter key and turn off the battery main switch.

When working above head height, use safe ladders and working platforms intended for this purpose. Do not climb on parts of the machine if they are not intended for this purpose. Wear safety harnesses when working at height. Keep all handles, steps, railings, pedestals, gantries and ladders free from dirt, snow and ice.

Always support the machine so that possible shifts of weight will not endanger its stability, and avoid metal-on-metal contact when doing this.

Never go under a raised machine unless it has been supported in a proficient and stable manner.

When working in enclosed rooms with the diesel engine running, channel the exhaust gases outside and ensure that the rooms are well ventilated.

Diesel engine

Only perform maintenance work on the diesel engine with the engine stopped and the ignition key pulled out.

Hydraulic system

Do not search for hydraulic leaks using your hand. Use cardboard or a similar material in order to locate leaks. Wear protective gloves when doing so.

Do not unfasten lines and fittings of the hydraulic system unless the following conditions have been met:

- The diesel engine is switched off.
- The pressure in the hydraulic system has been dissipated.

- The internal tank pressure of the hydraulic tank has been dissipated.

Pressure accumulator

Pressure accumulators contain stored energy and operate under high pressures. All work on pressure accumulators (e.g. repair, replacement, filling, pressure checking) is only allowed to be performed by specialist personnel who have been trained to do so.

Do not take any damaged pressure accumulators into operation.

Do not perform welding or brazing work on pressure accumulators, and do not carry out any mechanical work on them either.

Pressure accumulators can become hot during operation, danger of burns.

Pressure accumulators are indelibly marked with the operating data (minimum and maximum pressure). Make sure that the marking remains visible.

Hydraulic hoses and hose lines

Repairs to hydraulic hoses and hose lines are prohibited!

All hoses, hose lines and fittings must be checked for leaks and externally visible damage every two weeks.

Damaged parts must be renewed without delay. Remember that oil spraying out under high pressure can penetrate the skin. In addition, leaking oil can cause fires.

Even when stored and used correctly, hoses and hose lines are subject to natural ageing. This restricts their service life. Incorrect storage, mechanical damage and impermissible loading are the most frequent causes of accidents. Use at the limits of the permissible load can shorten the service life (e.g. high temperatures, frequent movement cycles, extremely high pulse frequencies, multi-shift working).

Hoses and hose lines must be replaced if an inspection reveals the following circumstances:

- Damage to the outer layer down as far as the insert (e.g. chafe marks, cuts and tears).
- Embrittlement of the outer layer (crack formation in the hose material)
- Deformation that does not correspond to the natural shape of the hose or hose line, both in depressurised and in pressurised condition or in the case of bends, e.g. delamination, blister formation
- Leaks
- Failure to comply with the installation requirements
- Damage or deformation to the hose fitting which reduces the strength of the fitting or of the connection between the hose and the fitting
- Dislocation of the hose from the fitting
- Corrosion on the fitting which impairs function and strength

Note the following when renewing hoses and hose lines:

- Exclusively use genuine spare parts.
- Install and fit the hoses and lines proficiently, and make sure that the correct connections are used.
- Always make sure that the hoses and hose lines are installed without torsion. With high-pressure hoses, it is always necessary to attach the bolts of the half clamps or full flanges at both hose ends, and only having done this should they be tightened.
- For high-pressure hoses and hose lines with an elbow fitting, always first tighten the flange at the end with the elbow fitting, and only subsequently at the end with the straight fitting.

- Any fastening clamps in the middle of the hose are not allowed to be fitted and tightened until afterwards.
- Check every day that all clamps, covers and protective devices have been fastened correctly. This will avoid vibration and damage during operation.
- Install the hoses and hose lines so as to avoid any possibility of chafing on other hoses, hose lines or other parts.
- A minimum distance from the other parts of approx. 1/2 the external diameter of the hose is recommended. However, the distance should not be less than 10 mm to 15 mm.
- When renewing hoses and hose lines on moving parts, check that there are no restrictions, chafe marks or overlapping lines anywhere along the entire range of movement.

Safety devices

If it is necessary to remove safety devices, the safety devices must be re-attached and checked immediately on completion of the work.

Electrical and electronic systems

Avoid standing near the running diesel engine. People with pacemakers must not stand near the running diesel engine (minimum distance 50 cm).

When the diesel engine is running, do not touch any live parts on the electrical connection of the injection pumps which are controlled by solenoid valves.

Check the electrical system regularly. Any faults such as loose connections, blown fuses and bulbs, charred or chafed cables must be repaired by specialist personnel without delay.

Only use genuine fuses with the prescribed amp ratings.

Only a qualified electrician is allowed to work on high-voltage modules.

Do not work on live components.

When working on medium and high-voltage modules, switch the voltage off and ground the power cable in order to discharge any remaining charge.

First check the parts are no longer live, ground and then short-circuit them. Provide insulation against adjacent live parts.

Disconnect the battery before you start work on the electrical system or conduct arc welding work on the machine.

Heavy parts

Do not attempt to lift heavy parts. Use lifting devices with sufficient load-carrying capacity. Use suitable and functional lifting tackle with a corresponding load-carrying capacity to replace individual parts or large assemblies. This is in order to guarantee safe movement during installation.

Never stand under suspended loads, and do not work under such loads either.

Wear protective gloves when handling wire ropes.

Only entrust experienced persons with the job of attaching loads and guiding crane operators. The spotter must be in the field of view of the operator or have voice contact with the operator.

Lubricants and service products

When handling oils, greases and other chemical substances, comply with the safety instructions applicable to the product in question.

Make sure that service products, consumables and replaced parts are disposed of in a safe and environmentally acceptable manner.

Take care when working with hot lubricants and service products (danger of burns and scalds).

Spare parts

Spare parts must correspond to the technical requirements defined by the manufacturer. This is always assured when genuine spare parts are used. Spare parts that do not correspond to the technical requirements of the manufacturer can impair the safety and function of the machine.

When replacing parts, re-secure unscrewed bolt-connections with the correct torque.

Maintenance intervals

The intervals specified for recurrent checks and inspections in this operating manual must be complied with.

2.5.14 Modifications, add-ons and conversions

Do not undertake any modifications, add-ons and conversions on the machine without the approval of the manufacturer, if such modifications, add-ons and conversions could impair safety. This also applies to the installation and adjustment of safety devices and safety valves, as well as to welding on load-bearing parts.

Third-party attachments and add-on parts, or parts which do not have a general approval from Liebherr for installation or attachment, are not allowed to be fitted to or in the machine without the written approval of Liebherr. The necessary technical documents must be provided to Liebherr for this purpose.

When equipment and attachments are fitted that obtain their power from the machine's hydraulic system, make sure that different types of oil are not mixed together.

2.5.15 Removal and installation of the attachment pins

Never align the holes using your fingers.

If possible, use a hydraulic pin press in order to push pins out of the attachment.

If you have to drive out a pin using a sledgehammer: use a drift and a guide tube that is held by another person.

In order to drive in a pin, you must screw the impact bolt supplied in the tool kit into the threaded hole of the pin. Only strike this bolt in order to drive in the pin.

When installing pins that are secured using a crown nut and cotter pin, first drive in the pin as far as the stop. Then screw on the crown nut by hand until it makes contact, and only tighten it further until the cotter pin can be inserted.

2.5.16 Falling object protective structures (FOPS and FGPS)

For machine applications where there is a danger of falling objects, Liebherr offers optional protective structures for the machine operator in various versions as defined in ISO 10262:

- Falling Objects Protective Structure (FOPS): Falling object protective structure
- Front Guard Protective Structure (FGPS): Falling object protective structure at front

The following falling object protective structures are available:

- operator's cab protection extending over the entire cab roof and front, and bolted onto the uppercarriage
- operator's cab protection extending over the entire cab roof and windshield, and bolted onto the operator's cab
- front and upper guards which are bolted onto the operator's cab either individually or combined

If the falling object protective structures are bolted onto the operator's cab, the operator's cab is an integral part of the protective structure.

Do not operate the machine if the falling object protective structure is damaged.

The falling object protective structure can be functionally impaired by the following types of work and events:

- Welding work
- Parts are cut off
- Holes are drilled
- Additional brackets are attached
- Deformations after an accident
- Heavy falling objects

Structural changes or repairs of any kind to the protective structures are prohibited.

2.5.17 Checking machine for cracks

Machines are subjected to different loads depending on intended use, site of operation, length of operation and operating conditions. The different collective loads lead to variable lengths of service life for the different machine components. This can cause cracks and loose connections particularly to load-bearing parts. In order to maintain performance reliability, the machine should regularly be checked for cracks, loose connections or other visible damage.

To check for cracks it is essential that the machine is kept tidy and regularly cleaned.

The checks are to be performed in accordance with the maintenance and inspection plan.

It is advisable to carry out such tests with the machine supported on solid and horizontal ground. The tests should involve the front-to-back and side-to-side directions if there is an alternating load due to the attachments. The relevant accident prevention instructions must be complied with.

Pay particular attention to the following points:

- Steel structure of undercarriage with axle and gearbox mountings, outriggers, lower slewing ring support with tower and slewing ring
- Steel structure of uppercarriage with bearing block for boom and hoist cylinder, upper slewing ring support, cab suspension, mounting of slewing gear mechanism and counter weight
- Steel components of the working attachments, e.g. boom, stick, quick change adapter, digging tool and grapple

- Hydraulic cylinders, axles, steering, pins and pin connections, steps, ladders and fastening elements

A visual inspection for cracks is to be carried out. A dye penetrant examination should be used for the crack inspection if a cracks are suspected or in areas that are difficult to see (e.g. on the rotating assembly base).

Identified damage should be remedied immediately. Welding work on load-bearing parts are only to be performed by qualified welders in accordance with the recognised principles of welding technology. Consult Liebherr customer services to determine appropriate measures.

2.5.18 Regular checks

The machine must be subjected to a regular safety check. Records must be kept of these checks. The checks must be performed by suitable and technically proficient personnel who have been authorised to do so. National regulations must be complied with.

3 Control and operation

3.1 Control and operating elements

3.1.1 Overview of operator's platform

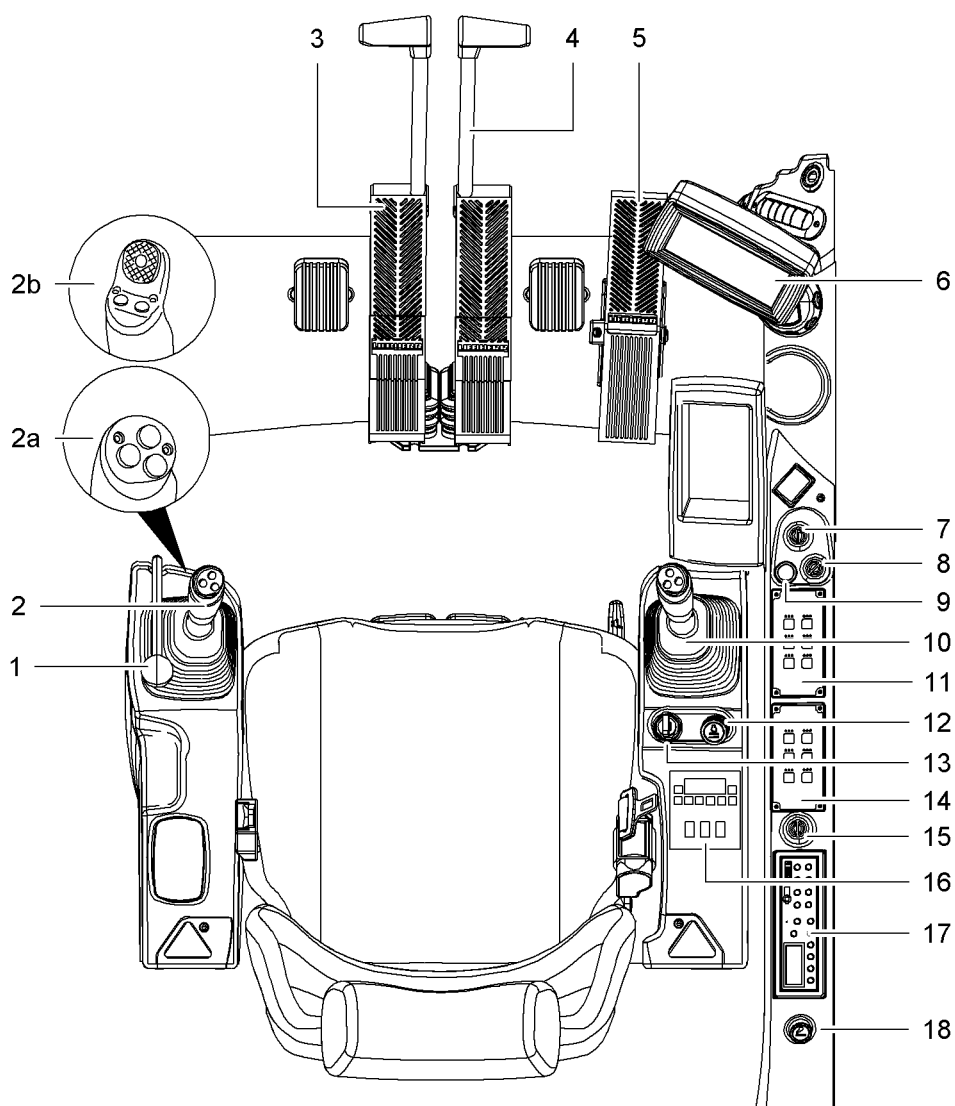


Fig. 41: Overview of operator's platform

1 Safety lever

9 Confirmation button³⁾

[See next page for continuation of the image legend](#)

³⁾ Option

- | | | | |
|----|--|----|---|
| 2 | Left joystick | 10 | Right joystick |
| 2a | Joystick | 11 | Control unit B |
| 2b | Joystick with mini-joystick ³⁾ | 12 | Engine speed controller |
| 3 | Travelling pedals | 13 | Starting switch |
| 4 | Travel lever | 14 | Control unit C ³⁾ |
| 5 | Control pedal for special working attachment ³⁾ | 15 | Emergency stop button ³⁾ |
| 6 | Display | 16 | Control unit for <i>heating and air conditioning unit</i> |
| 7 | Central lubrication system ³⁾ | 17 | Radio ³⁾ |
| 8 | Diesel engine control lamp | 18 | Cigarette lighter |

3.1.2 Control unit B

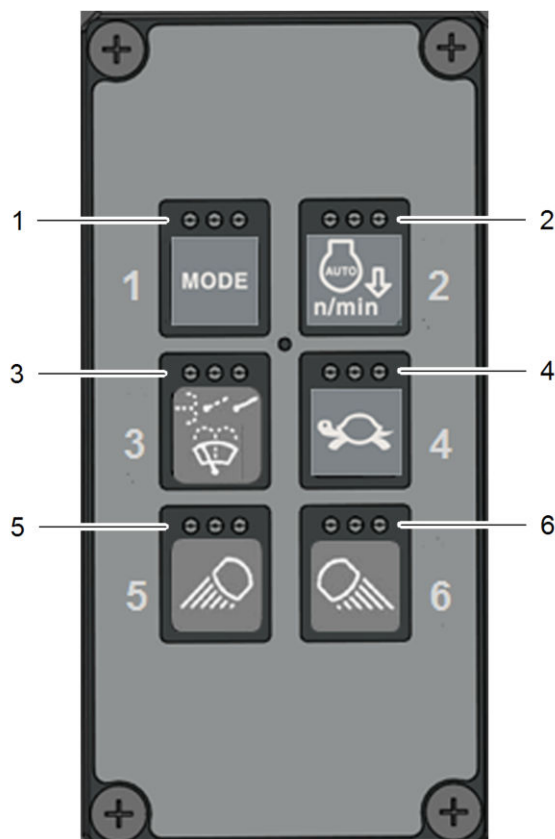


Fig. 42: Control unit B

- | | | | |
|---|--|---|--|
| 1 | Operating mode | 4 | Creeper gear |
| 2 | Sensor-controlled low idle automatic | 5 | Roof lights and uppercarriage headlights ⁴⁾ |
| 3 | Front windscreen wiper and rear windscreen wiper | 6 | Rear roof light ⁴⁾ |

³⁾ Option

⁴⁾ Option

3.2 Control

3.2.1 Battery main switch

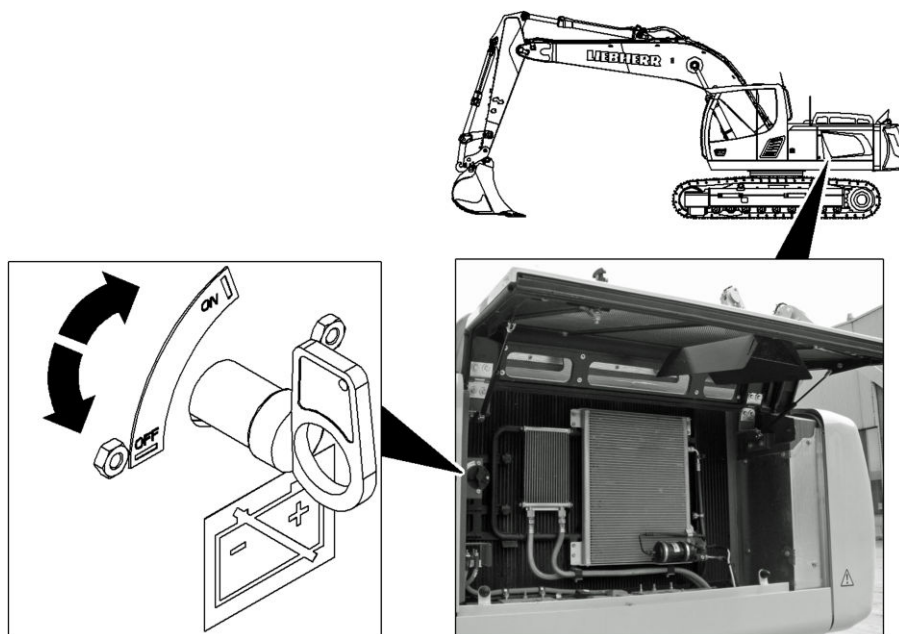


Fig. 43: Battery main switch

The battery main switch is in front of the radiator.

The battery main switch connects the battery to the electrical system of the machine.

When battery main switch is in **OFF** position, machine cannot be started.

Position of battery main switch	Electrical system
ON	Switched on
OFF	Switched off

Tab. 8: Battery main switch

3.2.2 Entering and exiting the machine

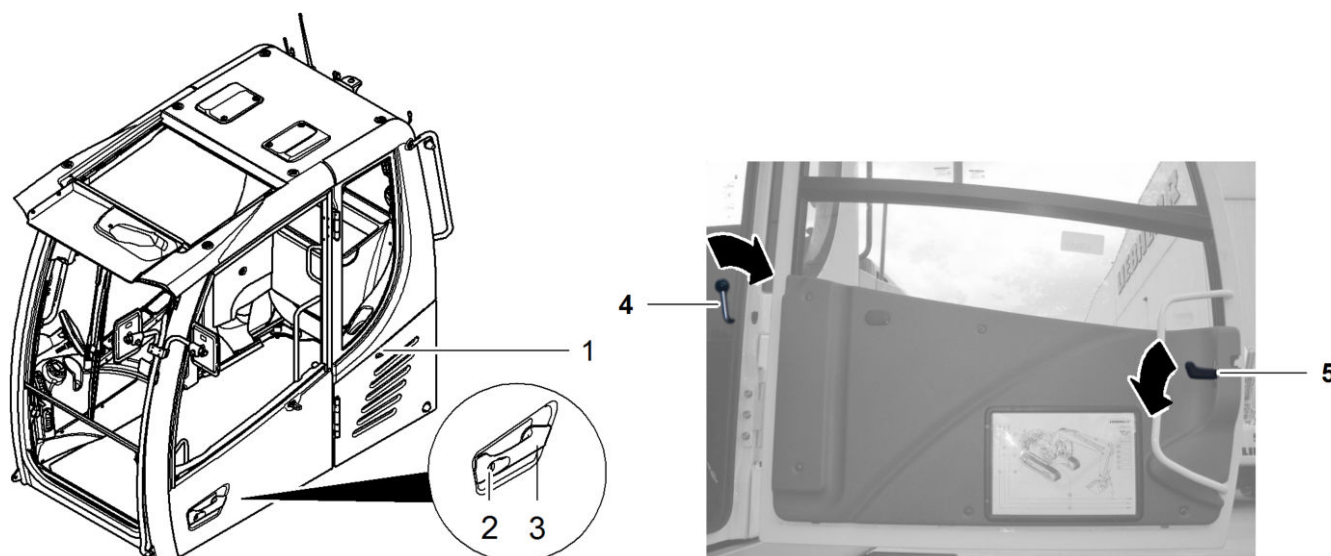


Fig. 44: Cab door

- 1 Locking mechanism
2 Lock

- 3 Handle
4 Release lever

- 5 Handle



DANGER

Falling from the operator's cab!
Fatal or serious injuries.

- ▶ When entering and exiting the machine: use the steps and hand rails.
- ▶ When climbing in and out, keep facing the machine and always use the three-point support method, i.e. two hands and one foot, or two feet and one hand, are always in contact with the access system.
- ▶ Do not use the control elements as grab handles.
- ▶ Never jump down from the machine.
- ▶ Keep the cab door closed while the machine is in operation.
- ▶ Follow the safety instructions for entering and exiting the machine. ([For more information see: 2.5.7 Getting in and out, page 31](#))

Entering the machine

- ▶ Climb up with your face towards the machine.
- ▶ Press the lock 2.
- ▶ Open the cab door and engage it in the locking mechanism 1.
- ▶ Enter the operator's cab and sit in the operator seat.
- ▶ Move the release lever 4 outwards.
- ▶ Close the door.

Exiting the machine

- ▶ Align the steps and hand rails of the operator's cab: align the uppercarriage flush with the undercarriage.

- ▶ Shut off the diesel engine.
- ▶ Move the safety lever to the upper position.
- ▶ Push the handle **5** downwards.
- ▶ Open the cab door and engage it in the locking mechanism **1**.
- ▶ Climb out with your face towards the machine.
- ▶ Move the release lever **4** outwards.
- ▶ Close the door.

3.2.3 Emergency exit



Fig. 45: Information sign: emergency exit / emergency hammer

An information sign on the rear window identifies the rear of the operator's cab as the emergency exit. The emergency hammer is located next to the operator door under the cab roof.

- ▶ In an emergency, break the rear window with the emergency hammer.

3.2.4 Fire extinguisher (option)

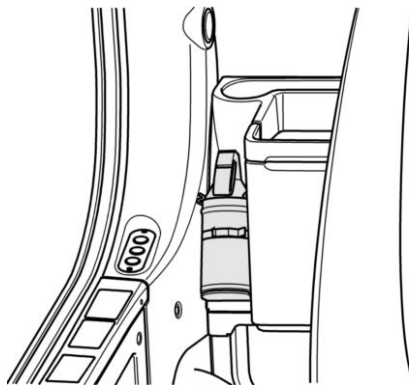


Fig. 46: Fire extinguisher

The fire extinguisher is in the operator's cab.

- ▶ Have fire extinguisher inspected according to the regulations in force where the machine is used.
- ▶ Observe operating instructions on fire extinguisher.

**Note**

The operator is responsible for installing the fire extinguisher.

- ▶ Observe regulations in force where machine is used.
- ▶ Estimate requirement in relation to operational conditions.
- ▶ Order fire extinguisher and holder: Contact Liebherr customer service.

3.2.5 Safety lever

The safety lever:

- interrupts all hydraulic functions,
- makes it possible to avoid all unintentional movements of the machine.

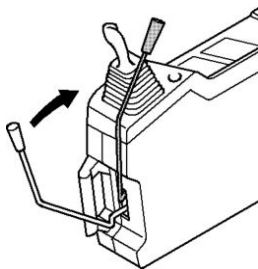
The engine can only be started when the safety lever is in the upper position.

Before starting work:

- ▶ Sit in the operator seat.
- ▶ Start the engine.
- ▶ Move the safety lever to the down position.
 - ▷ The joysticks and the pedals are working.
 - ▷ The slewing gear brake returns to its previous state.

Before you stand up:

- ▶ Move the safety lever to the upper position.
 - ▷ The joysticks and the pedals are not working any more.
 - ▷ The slewing gear brake is activated and locked.



3.2.6 Operator seat

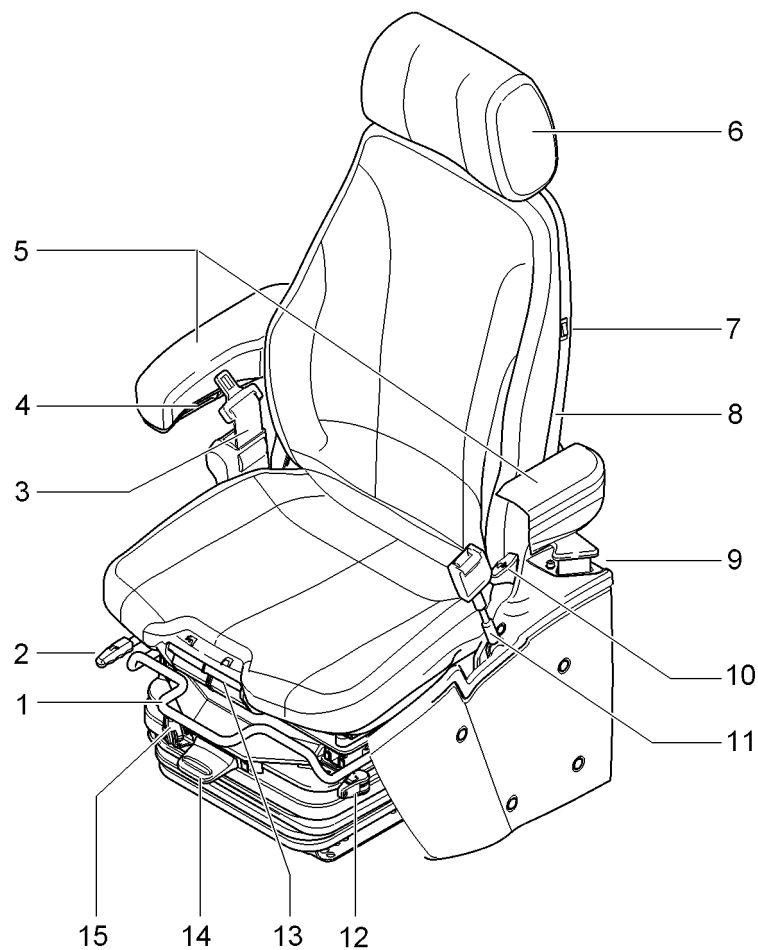


Fig. 48: Operator seat

- | | | | |
|----------|---|-----------|--|
| 1 | Adjustment of seat position with arm rests | 9 | Adjustment of height of arm rests |
| 2 | Adjustment of seat position | 10 | Adjustment of back rest |
| 3 | Safety belt | 11 | Safety belt buckle |
| 4 | Adjustment of arm rest inclination | 12 | Horizontal suspension ⁵⁾ |
| 5 | Arm rest | 13 | Adjustment of seat |
| 6 | Head restraint | 14 | Adjustment for body weight and seat height ⁵⁾ |
| 7 | Seat heater, air conditioning ⁵⁾ | 15 | Shock absorption |
| 8 | Lumbar support mechanical / pneumatic ⁵⁾ | | |

⁵⁾ Model variant, option

**DANGER**

The machine can move unexpectedly if control elements are actuated accidentally when adjusting the seat.
Accident hazard!

- ▶ Do not adjust the seat during operation.
- ▶ Park the machine and apply the parking brake.
- ▶ Move the safety to the upper position.

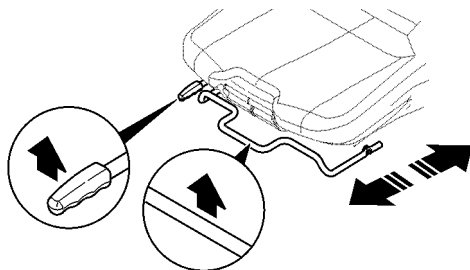
Adjusting the seat position

Fig. 49: Adjusting the seat position

- ▶ Move the operator seat together with the arm rests: Pull the middle lever up.
- ▶ Move the seat, release the lever.
- ▶ Move the seat without arm rests: Pull the outer lever up.
- ▶ Move the seat, release the lever.
 - ▷ The lever must audibly click into the required position.
 - ▷ After locking into position it should not be possible to move the seat.

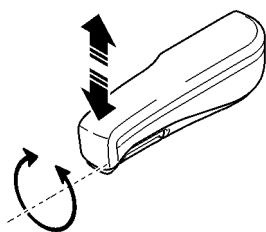
Adjusting the inclination of arm rests

Fig. 50: Adjusting the inclination of arm rests

- ▶ Turn the hand wheel at the bottom to the right or left.
 - ▷ The arm rest will move up or down.

Adjusting the height of arm rests

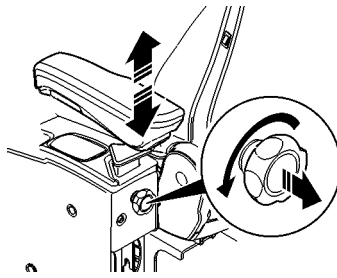


Fig. 51: Adjusting the height of arm rests

- ▶ Unlock the push-button (one turn to the left).
- ▶ Pull out the push-button and hold in this position.
- ▶ Push the arm rest up or down.
- ▶ Release the push-button.
- ▶ Push the arm rest to the next stop.
 - ▷ The push-button must audibly click into the required position.
- ▶ Tighten the push-button (turn to right).
 - ▷ After locking into position it should not be possible to move the arm rest.

Adjusting the seat surface

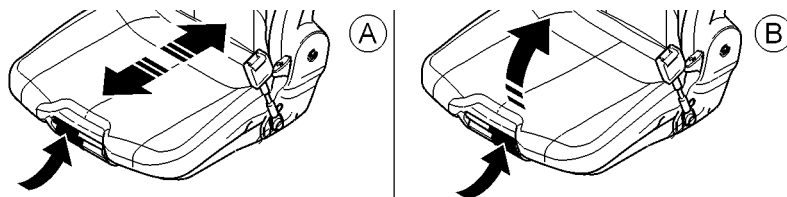


Fig. 52: Adjusting the seat surface

- | | |
|---|--|
| <p>A Adjusting the height of seat surface</p> <ul style="list-style-type: none"> ▶ Adjust the height of the seat surface: Raise the right push-button and push the seat surface to the required position. | <p>B Adjusting the inclination of seat surface</p> <ul style="list-style-type: none"> ▶ Adjust the inclination of the seat surface: Raise the left push-button and push the seat surface to the required position. |
|---|--|

Adjusting the back rest

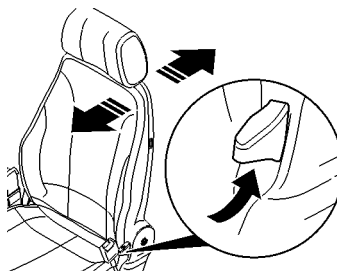


Fig. 53: Adjusting the back rest

- ▶ Pull the lever up.
- ▶ Apply or remove pressure on the back rest to move it to the required position.
- ▶ Let go of the lever.
 - ▷ The lever must audibly click into the required position.
 - ▷ After locking into position it should not be possible to move the back rest.

Adjusting the head restraint



Fig. 54: Adjusting the head restraint

- ▶ Change the height: Push the head restraint down or pull it up over perceptible stop clicks.
- ▶ Change the inclination: Push the head restraint forwards or backwards.
- ▶ Remove the head restraint: Pull the head restraint up and pull hard to slide it over the final stop.

Adjusting the shock absorption

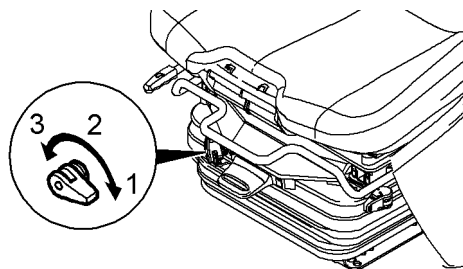


Fig. 55

Suspension can be adapted to individual operational conditions.

- 1 = hard
- 2 = medium
- 3 = soft
- ▶ Turn the handle to the required position and let go.

Adjusting the horizontal suspension

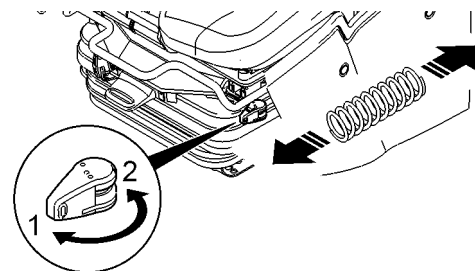


Fig. 56: Adjusting the horizontal suspension

Under certain operating conditions it is preferable to activate the horizontal suspension. This means impacts in the direction of travel can be better absorbed by the operator seat.

- 1 = horizontal suspension OFF
- 2 = horizontal suspension ON
- ▶ Turn the handle to the required position.
- ▶ On setting position 1 the lever must click into position: Move the seat backwards until it clicks into position audibly.

Adjusting the height / seat to body weight

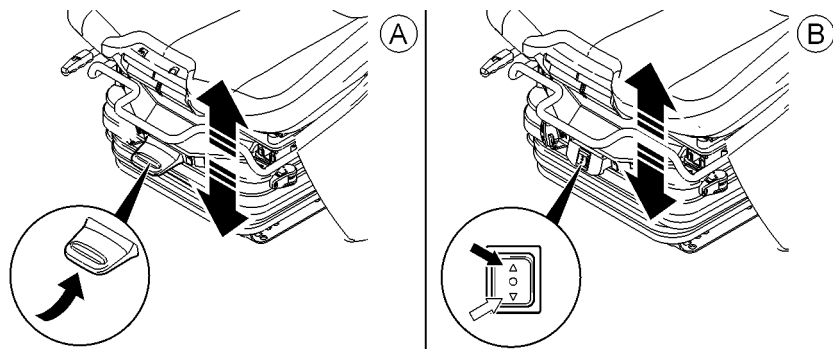


Fig. 57: Adjusting the height / seat to body weight

A Manual adjustment

B Pneumatic adjustment⁵⁾

Manual adjustment

During adjustment to your body weight remain seated calmly.

- ▶ Set the shock absorption of the seat to “soft”.

NOTICE

The compressor can be damaged by permanent use of the height adjustment.

- ▶ Do not operate the lever for more than 1 minute without interruption.

- ▶ Adjust the seat to body weight: Pull the lever up briefly.
 - ▷ The seat will adjust to your body weight.
- ▶ Adjust the height: Pull the lever fully upwards or push downwards and keep it in this position.

When the seat is at the required height:

- ▶ Let go of the lever.
 - ▷ The seat will remain in the new position.
 - ▷ If the final stop (top or bottom) is reached during adjustment: The seat will automatically adjust the height to ensure minimum spring travel.

Pneumatic adjustment⁵⁾

- ▶ Set the shock absorption of the seat to “soft”.
 - ▷ The operator seat automatically adjusts to the body weight.

⁵⁾ Model variant, option

- Wait for the seat to adjust automatically to your body weight.

NOTICE

The compressor can be damaged by permanent use of the height adjustment.

- Do not press the switch for more than 1 minute without interruption.

- Set the height: Press and hold the top or bottom of the switch.

When the seat is at the required height:

- Release the switch.
 - ▷ The seat will remain in the new position.
 - ▷ If the final stop (top or bottom) is reached during adjustment: The seat will automatically adjust the height to ensure minimum spring travel.

Adjusting the lumbar support

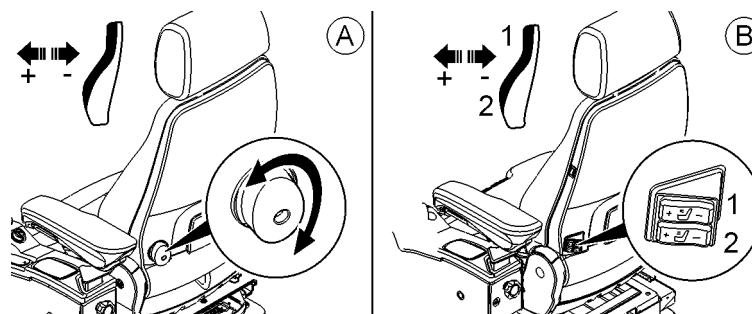


Fig. 58: Adjusting the lumbar support

A Mechanical adjustment

B Pneumatic adjustment⁵⁾

Mechanical adjustment

Use the hand wheel to adjust the bulge of the back cushion.

- Turn the hand wheel to the right or left in order to adjust the bulge of the back cushion.

Pneumatic adjustment⁵⁾

Use switches 1 and 2 to adjust the bulge of the back cushion in the upper and lower section. Press plus (+) to increase the bulge, press minus (–) to reduce the bulge.

- Use switches 1 and 2 to adjust the bulge of the back cushion.

Seat heating



The seat heating is switched on and off using the switch.

- 0 = seat heating OFF
- 1 = seat heating ON

⁵⁾ Model variant, option

Seat heating with climatisation⁵⁾



Active seat climatisation ensures a dry seat surface. Body moisture is extracted by the integrated ventilation system.

The seat heating and air conditioning are switched on and off using the switch.

- 0 = seat heating and climatisation OFF
- 1 = seat heating ON (climatisation OFF)
- 2 = climatisation ON (seat heating OFF)

3.2.7 Safety belt

The safety belt is an automatic safety belt. The safety belt does not need to be adjusted.

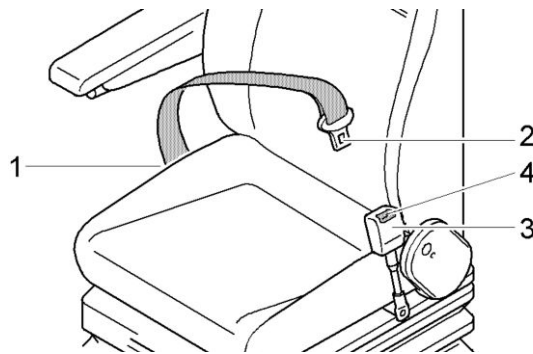


Fig. 61: Safety belt

- | | |
|----------------------|------------------------|
| 1 Belt reel | 3 Belt buckle assembly |
| 2 Safety belt tongue | 4 Release tab |



DANGER

Safety belt not engaged!
Fatal or serious injuries.

- ▶ Put on the safety belt before starting.
- ▶ Make sure the safety belt is not twisted.
- ▶ Regularly check the condition, function and attachment of the safety belt. Have damaged parts renewed immediately.

Putting on the safety belt

- ▶ Pull the safety belt out of the belt reel 1.
 - ▷ Pulling sharply can cause the belt to be blocked.
- ▶ Insert the belt tongue 2 into the belt buckle 3.

Releasing the safety belt

- ▶ Press the release tab 4.
 - ▷ Safety belt is pulled into the belt reel 1.

⁵⁾ Model variant, option

3.2.8 Horn

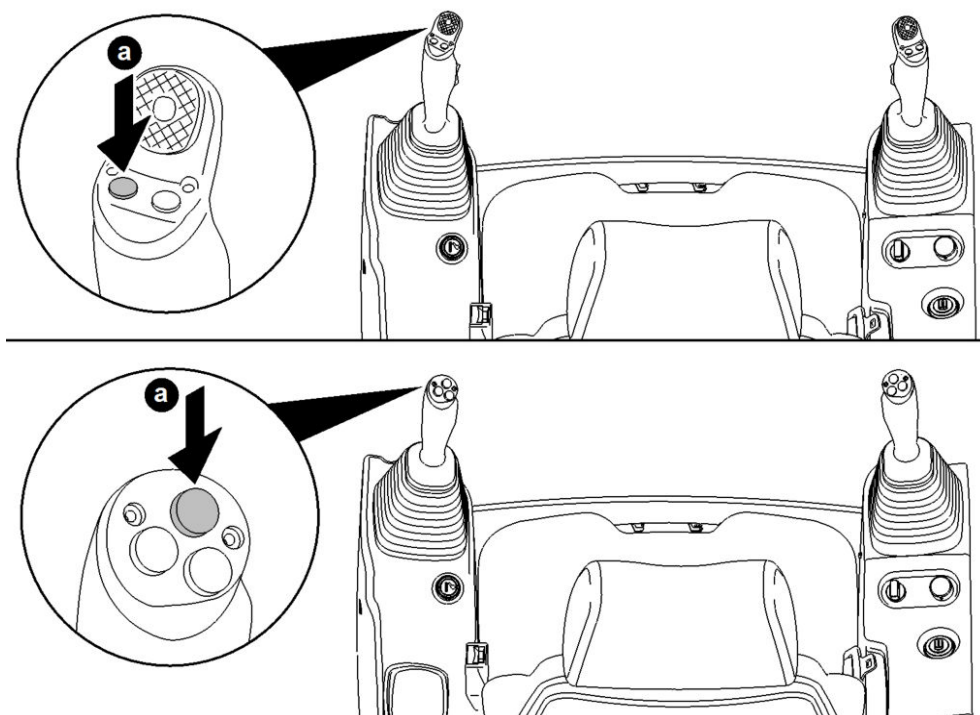


Fig. 62: Horn

Activating horn

- Press and hold button a.

Deactivating horn

- Release button a.

3.2.9 Windscreen



DANGER

Restricted visibility!
Death, injuries, damage.

If one of the windscreens is in intermediate position:

- Do not work with machine.

Lower windscreen

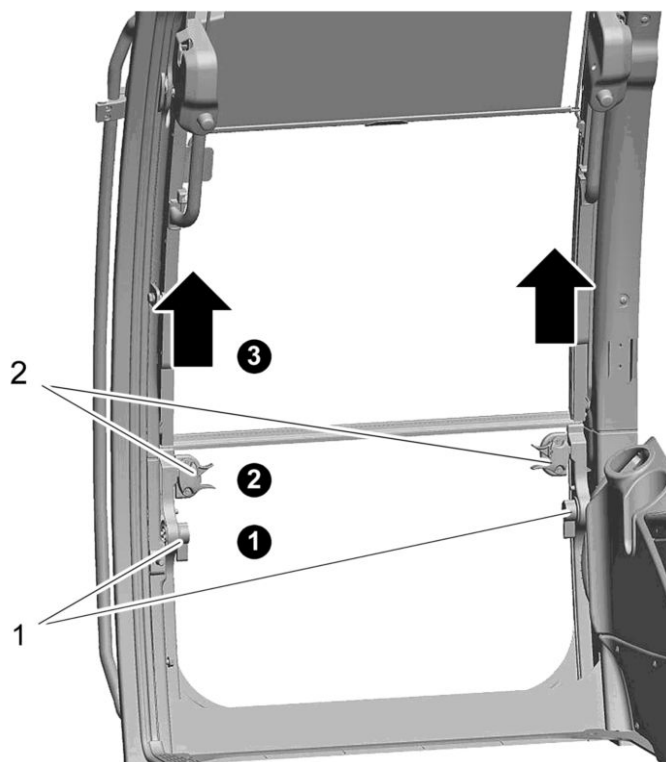


Fig. 63: Lower windscreen

1 Extender wheel

2 Locking mechanism

Opening lower windscreen

- ▶ Turn extender wheels **1** upwards simultaneously.
- ▶ Press levers of the locking mechanisms **2** together while simultaneously lifting lower windscreen until it engages.

Closing lower windscreen

- ▶ Press levers of the locking mechanisms **2** together while simultaneously lowering lower windscreen until it engages.
- ▶ Turn extender wheels **1** downwards simultaneously.

Upper windscreen

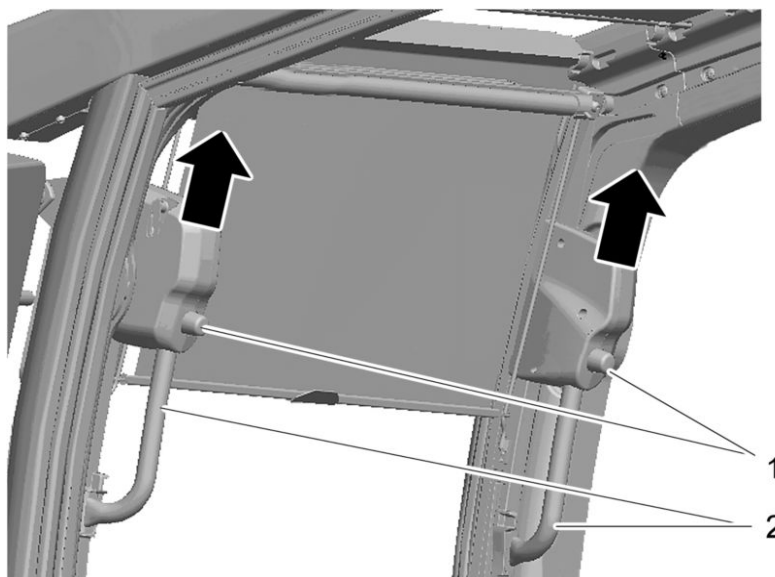


Fig. 64: Upper windscreen

1 Knob

2 Handle

Opening upper windscreen

- ▶ Press knobs **1** simultaneously.
- ▶ Push upper windscreen upwards with handles **2** and pull back at the same time until it engages in the roof of the operator's cab.

Closing upper windscreen

- ▶ Press knobs **1** simultaneously.
- ▶ Pull upper windscreen downwards with handles **2** and push forwards at the same time until it engages in the roof of the operator's cab.

Complete windscreen

Opening complete windscreen

- ▶ Open lower windscreen.
- ▶ Open upper windscreen.

Closing complete windscreen

- ▶ Close upper windscreen.
- ▶ Close lower windscreen.

3.2.10 Sun blind

Sun blind on windscreen

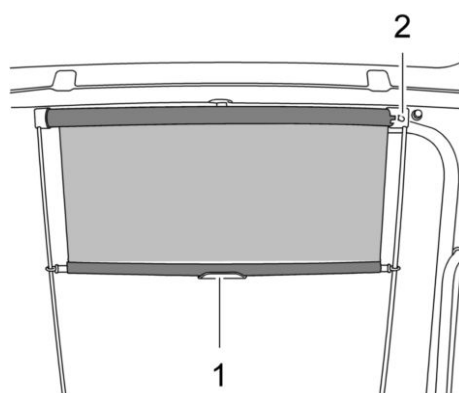


Fig. 65: Sun blind on windscreen

1 Tab

2 Roll up button

Rolling out sun blind on the windscreen

- Pull sun blind on windscreen down to desired position using tab 1.

Rolling up sun blind on the windscreen

- Push roll up button 2 upwards.

Sun blind on the roof glass panel

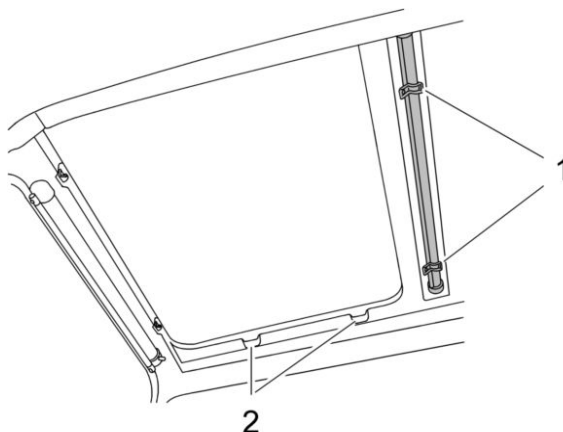


Fig. 66: Sun blind on the roof glass panel

1 Handle

2 Groove

Rolling out sun blind on the roof glass panel

- Pull sun blind forward on the roof glass panel using handles 1.
- Clip sun blind into grooves 2 on the roof glass panel.

Rolling back sun blind on the roof glass panel

- Lift sun blind out of grooves **2** carefully and let it roll back carefully.

Sun visor in the operator's cab (option)

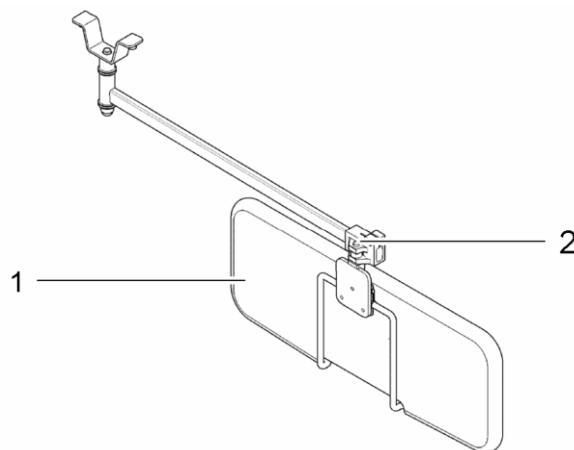


Fig. 67: Sun visor in the operator's cab

- 1** Sun visor **2** Knurled screw

- Adjust sun visor **1**.
- Move sun visor **1**: Loosen knurled screw **2**.

3.2.11 Side windows

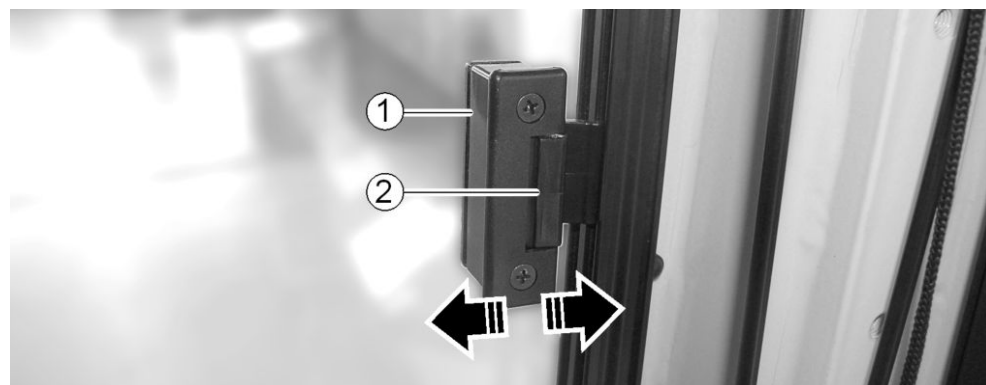


Fig. 68: Window handle in the side window

- 1** Handle **2** Hand lever

- Press the hand lever on the handle and move the side window.
- When closing the side window, make sure that the hand lever engages.

3.2.12 Exterior mirrors

The exterior mirrors are aligned on delivery so that optimum visibility from the operator's cab is guaranteed.

- Do not change the alignment of exterior mirrors.

- Look out for changes to the machine that can affect the field of view.
- Follow the safety instructions on field of view.

3.2.13 Lighting

Roof light and headlights of the working attachment

Key	Status of LEDs	Function
	○ ○ ○	Headlight switched off
	● ○ ○	Front roof light switched on
	● ● ●	Roof light and headlights of the working attachment switched on

Tab. 9: Key functions

- Press key until required function is selected. (see: tab. 9, page 61)

Rear roof light and beacon

Key	Function
	Rear roof light ⁶⁾
	Beacon ⁶⁾

Tab. 10: Key functions

Switching on rear roof light and beacon

- Press corresponding key. (see: tab. 10, page 61)
 - ▷ LEDs in the key light up.

Switching off rear roof light and beacon

- Press corresponding key. (see: tab. 10, page 61)
 - ▷ LEDs in key go out.

⁶⁾ Option

3.2.14 Cab lighting system

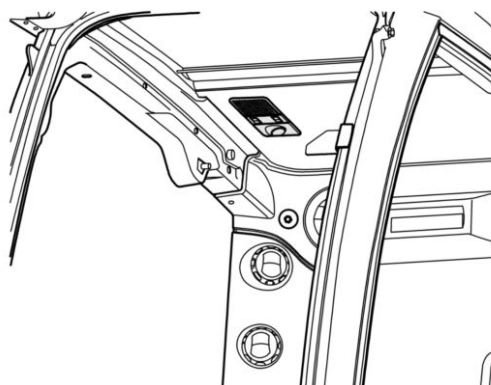


Fig. 75: Cab lighting system

The reading light and cab lighting system can be used even when the ignition key is in the 0 position.

3.2.15 Windscreen wipers

Key	Status of LEDs	Operating mode
	○ ○ ○	Switched off
	○ ● ○	Intermittent operation
	○ ○ ●	Continuous operation
	● ○ ●	Windscreen washer system switched on

Tab. 11: Operating modes

Selecting operating mode

- Press key until required operating mode is selected. (see: tab. 11, page 62)

Switching on windscreen washer system

- Press and hold key. (see: tab. 11, page 62)

3.2.16 Display

The display is the central source of information for machine operation. The machine can be adjusted, monitored and operated on the display of the display.

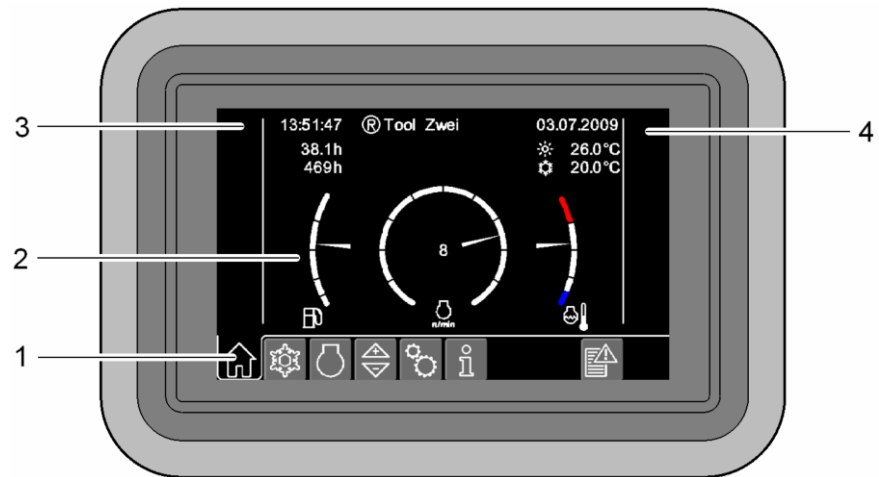
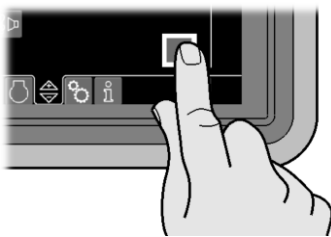


Fig. 81: Display, main menu

- | | | | |
|---|--------------------------|---|----------------------------|
| 1 | Menu bar | 3 | Display of status symbols |
| 2 | Display and control area | 4 | Display of warning symbols |

Touchscreen



Symbols with a grey background are function buttons or menus, which can be selected by touching the surface of the display.

- Confirm, activate, select elements: Press buttons.

Menu bar

Menu bar is permanently displayed along the bottom edge of the display. A symbol with a black background indicates the displayed menu.

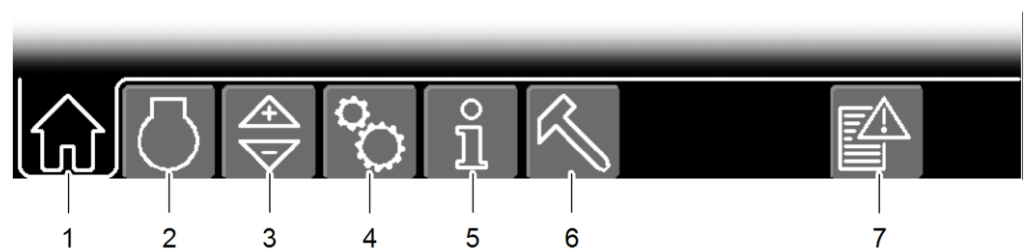


Fig. 83: Menu bar

- | | | | |
|---|---------------------------|---|----------------------------|
| 1 | Main menu | 5 | Information |
| 2 | Operating status | 6 | Tool Control ⁷⁾ |
| 3 | General settings | 7 | Messages |
| 4 | Machine-specific settings | | |

- Select menu: Press relevant button on the display.

⁷⁾ Option

Programmable keys

The *MODE* and *rear roof light*⁷⁾ keys can be used to program quick access to frequently used menus.

Programming quick access



- ▶ Select required menu on the display.
- ▶ Press and hold *MODE* or *rear roof light*⁷⁾ key for 3 seconds.
- ▶ Release *MODE* or *rear roof light*⁷⁾ key.
 - ▷ LEDs in the key light up.

Using quick access

- ▶ Release *MODE* or *rear roof light*⁷⁾ key.
 - ▷ Menu of programmed quick access is shown on the display.

3.2.17 Status symbols

Symbol	Meaning
	Engine preglowing activated
	Engine start blocked: Safety lever in lower position
	Engine shut-off activated: Less than 20 seconds until automatic shut-off
	Engine shut-off locked: Other function dependent on the engine is switched on.
	Limited function of the special attachment or special working tool
	Emergency stop button pressed on uppercarriage
	Confirmation required

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⁷⁾ Option

Symbol	Meaning
	Confirmation fault
	Deactivation of warning sound in operator's cab
	Overload warning system: Overload detected
	Overload warning system not available
	Height-adjustable boom
	Laterally adjustable boom
	Slewing gear brake released
	Slewing gear brake released and uppercarriage rotating speed sensor defective
	Maintenance due
	Element of safety shut-off defective
	Diesel engine in emergency operation
	Servo control in emergency operation
	Quick coupler activated
	Second quick coupler activated

Symbol	Meaning
	Quick coupler unlocking
	Second quick coupler unlocking
	Quick coupler locking
	Second quick coupler locking
	Quick coupler unlocked
	Second quick coupler unlocked
	No working tool found when quick coupler is locked

Tab. 12: Status symbols

3.2.18 Main menu

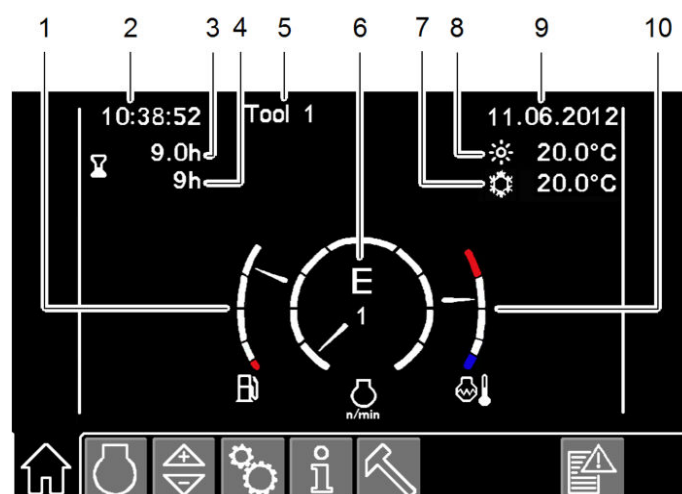


Fig. 113: Main menu

- | | |
|---------------------------------|---|
| 1 Fuel level in tank | 6 Operating mode and engine speed level |
| 2 Clock | 7 Selected interior temperature |
| 3 Daily operating hours counter | 8 Outside temperature |

See next page for continuation of the image legend

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- | | | | |
|----------|-------------------------------------|-----------|---------------------|
| 4 | Total operating hours counter | 9 | Date |
| 5 | Selected special working attachment | 10 | Coolant temperature |

3.2.19 Heating and air conditioning unit



Fig. 114: Control unit for heating and air conditioning unit

- | | | | |
|----------|-------------------------|----------|--|
| 1 | Reducing blower power | 5 | Air supply in foot area |
| 2 | Increasing blower power | 6 | Air supply in torso area and head area |
| 3 | Increasing temperature | 7 | Air supply in windscreen area |
| 4 | Reducing temperature | | |



Note

Settings are stored when the engine is switched off.

- Functions are reactivated when the engine is switched on again.

Setting blower power

- Reduce blower power: Press reducing blower power **1** key.
- Increase blower power: Press increasing blower power **2** key.

Setting temperature

- Increase temperature: Press increasing temperature **3** key.
- Reduce temperature: Press reducing temperature **4** key.

Setting air supply

Setting air supply in foot area

- ▶ Activate air supply in foot area: Set air supply in foot area **5** switch to position **I**.
- ▶ Deactivate air supply in foot area: Set air supply in foot area **5** switch to position **0**.

Setting air supply in torso area and head area

- ▶ Activate air supply in torso area and head area: Set air supply in torso area and head area **6** switch to position **I**.
- ▶ Deactivate air supply in torso area and head area: Set air supply in torso area and head area **6** switch to position **0**.

Setting air supply in windscreen area

- ▶ Activate air supply in windscreen area: Set air supply in windscreen area **7** switch to position **I**.
- ▶ Deactivate air supply in windscreen area: Set air supply in windscreen area **7** switch to position **0**.

3.2.20 Operating status menu

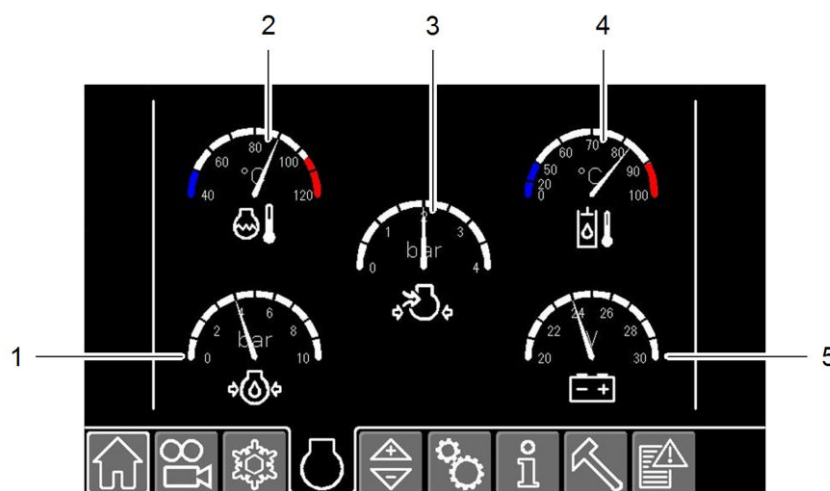


Fig. 115: Operating status menu

- | | |
|------------------------------|------------------------------------|
| 1 Engine oil pressure | 4 Hydraulic oil temperature |
| 2 Coolant temperature | 5 Electrical system voltage |
| 3 Charge air pressure | |

In normal operation, the symbols are displayed in white; they are shown in red if there is a warning.

3.2.21 General settings menu

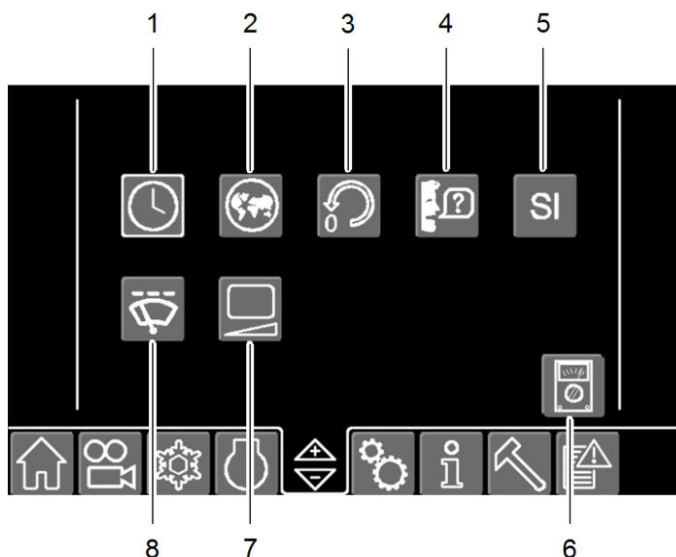


Fig. 116: General settings menu

- | | | | |
|---|---|---|-------------------------------|
| 1 | Setting time | 5 | Selecting units ⁹⁾ |
| 2 | Selecting time zone | 6 | Test system |
| 3 | Resetting daily operating hours counter | 7 | Setting display contrast |
| 4 | Selecting language | 8 | Setting windscreen wipers |

Setting clock menu

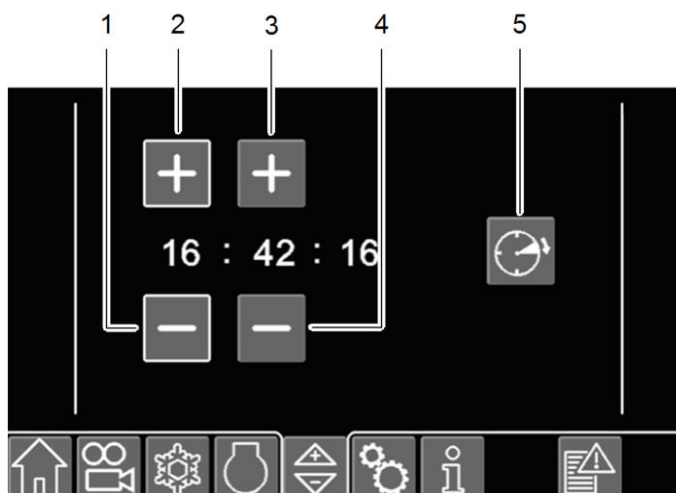


Fig. 117: Setting clock menu

- | | | | |
|---|------------------------------|---|-----------------------------|
| 1 | Reducing number of hours | 4 | Reducing number of minutes |
| 2 | Increasing number of hours | 5 | Daylight saving time on/off |
| 3 | Increasing number of minutes | | |
- Set time: Press buttons 1 to 5.
 ▷ Change is saved automatically.

⁹⁾ Option

Setting time zone menu

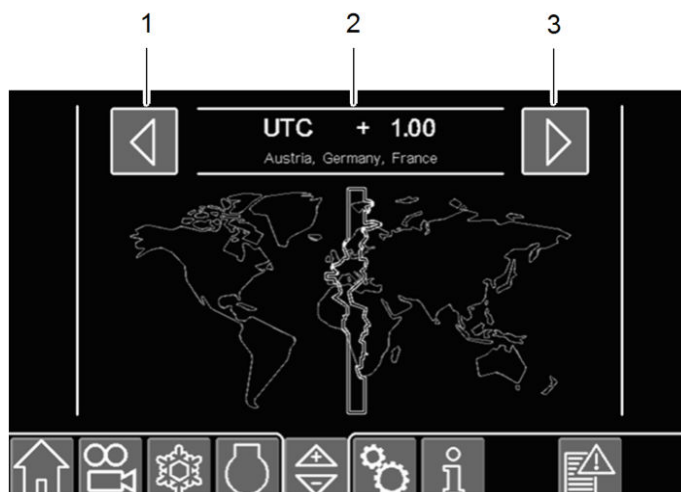


Fig. 118: Setting time zone menu

- 1 Moving time zone to the west
- 2 Selected time zone
- 3 Moving time zone to the east

- ▶ Select time zone: Press buttons 1 and 3.
 - ▷ Change is saved automatically.

Resetting daily operating hours counter menu

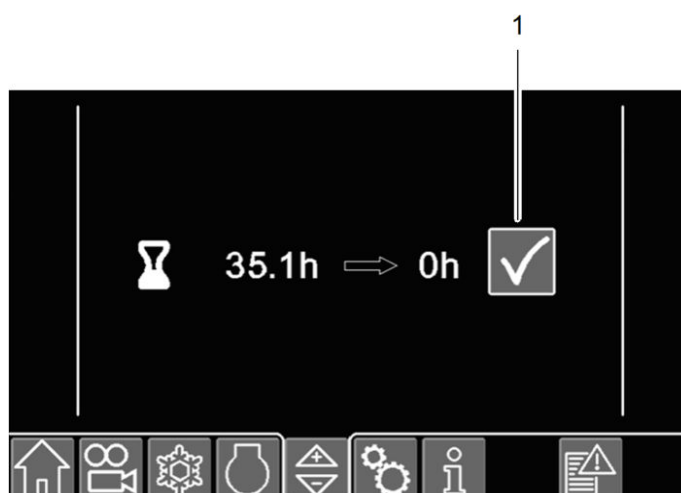


Fig. 119: Resetting daily operating hours counter menu

- 1 Accept
- ▶ Press button 1.
 - ▷ Daily operating hours counter is reset.
 - ▷ *Main menu* menu appears.
 - ▷ Daily operating hours counter starts to count again.

Selecting language menu

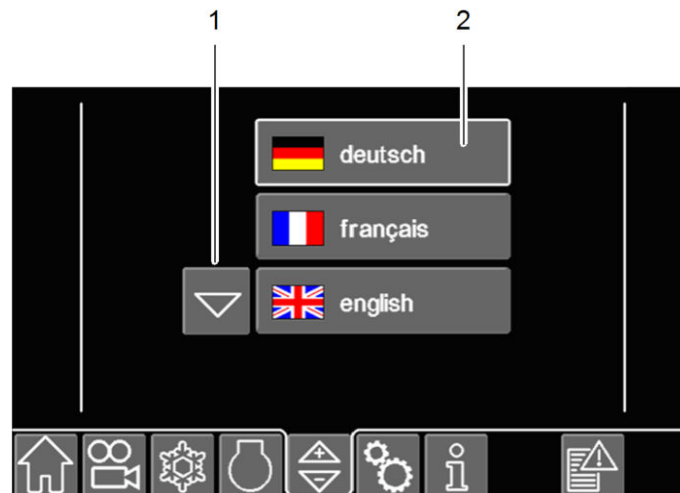


Fig. 120: Selecting language menu

1 Scroll

2 Selected language

The display language can be selected in the *selecting language* menu. The selected language **2** is framed in white.

► Display available languages: Press button 1.



Fig. 121: Selecting language menu

When the required language appears on the display:

- Press button for the desired language.
 - ▷ Selected language **2** button is framed in white.
 - ▷ *Restart necessary* symbol flashes green.

The change of language only takes effect after the system data are stored.

- Turn ignition key to position **0**.
- Wait 40 seconds.
- Turn ignition key to position **1**.
 - ▷ Change of language takes effect.

Selecting units menu (option)

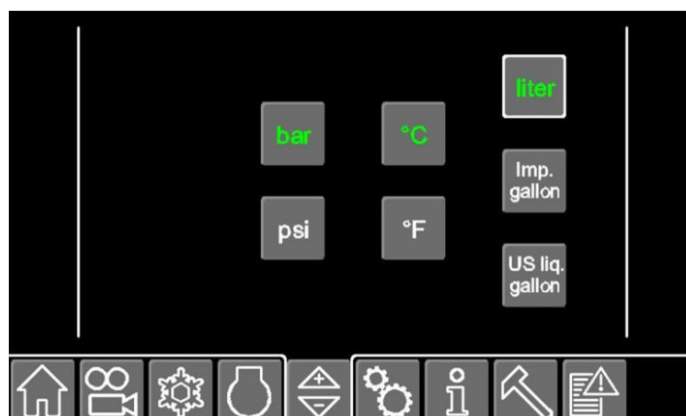


Fig. 122: Selecting units menu

Following units can be selected:

- Pressure: bar (*bar*) or pounds per square inch (*psi*)
- Temperature: Degrees Celsius ($^{\circ}\text{C}$) or degrees Fahrenheit ($^{\circ}\text{F}$)
- Volume and flow: Litres (*liter*), imperial gallons (*Imp. gallon*) or US gallons (*US liq. gallon*)

- ▶ Select unit: Press corresponding key.
 - ▷ Selected button is displayed in green.

Test system menu

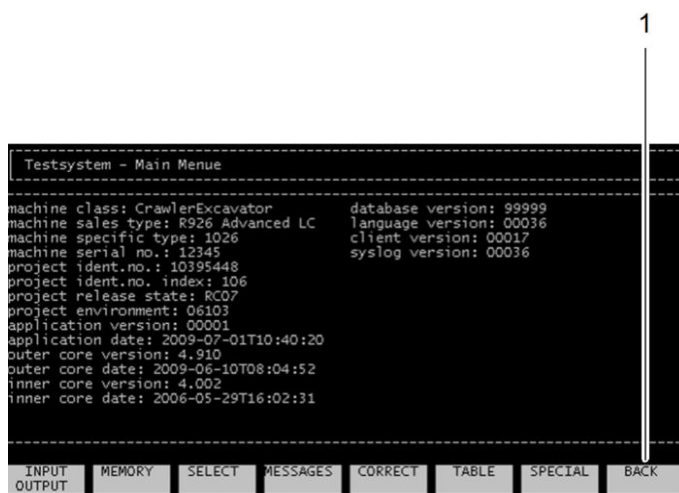


Fig. 123: Test system menu

- 1 Back

Various data can be displayed in the *test system* menu, for example:

- Type and serial number of the machine
- Versions of the various software components

- ▶ Quit *test system* menu: Press button 1.
 - ▷ *General settings* menu is displayed.

Setting display contrast menu

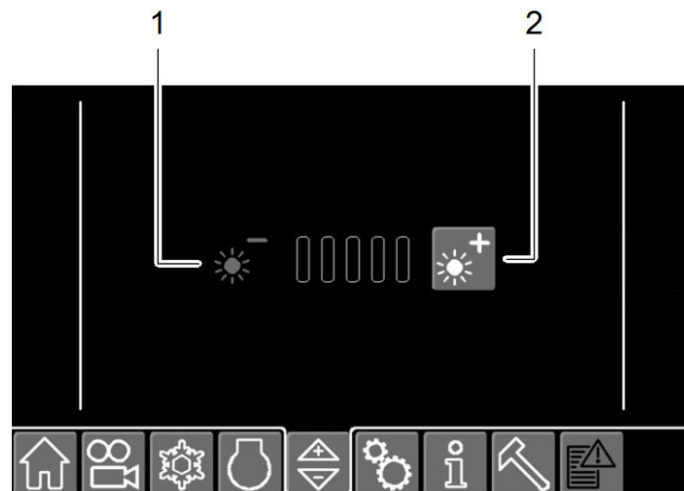


Fig. 124: Setting display contrast menu

- 1** Reducing contrast **2** Increasing contrast

- Set display contrast: Press buttons **1** and **2**.
- ▷ Change is saved automatically.

Setting windscreen wipers menu

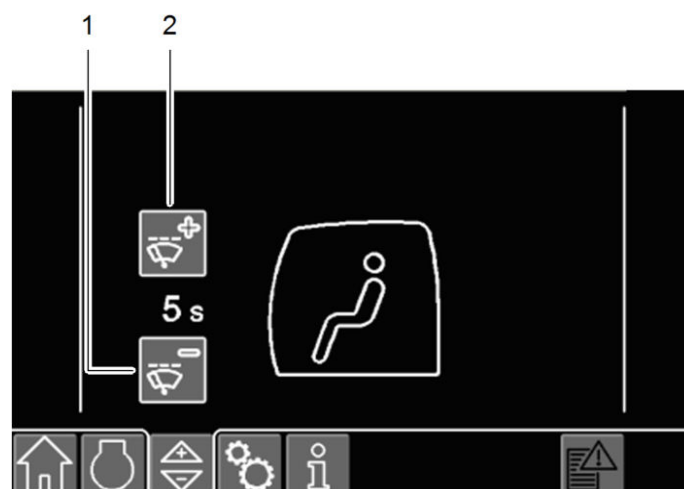


Fig. 125: Setting windscreen wipers menu

- 1** Reducing windscreen wiper interval **2** Increasing windscreen wiper interval

The *setting windscreen wipers* menu enables the wiper interval of the windscreen wiper during intermittent operation to be set.

The wiper interval is displayed between buttons **1** and **2**. It can be set between 3 and 60 seconds.

- Set wiper interval of windscreen wiper: Press buttons **1** and **2**.
- ▷ Change is saved automatically.

3.2.22 Machine-specific settings menu

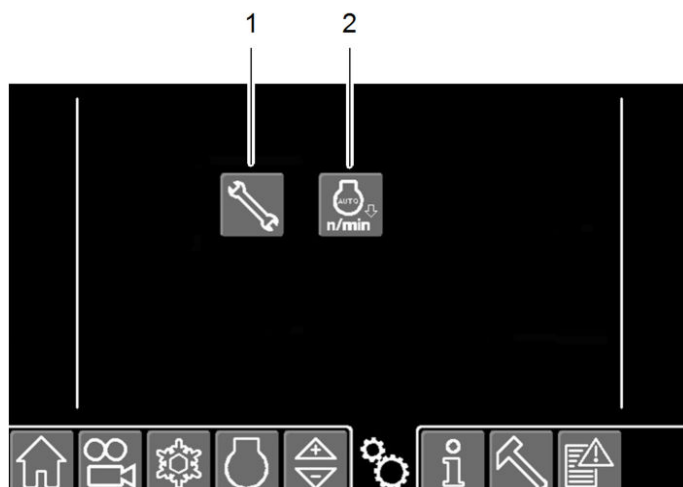


Fig. 126: Machine-specific settings menu

1 Maintenance

2 Activation time for sensor controlled low idle automatic

Maintenance menu

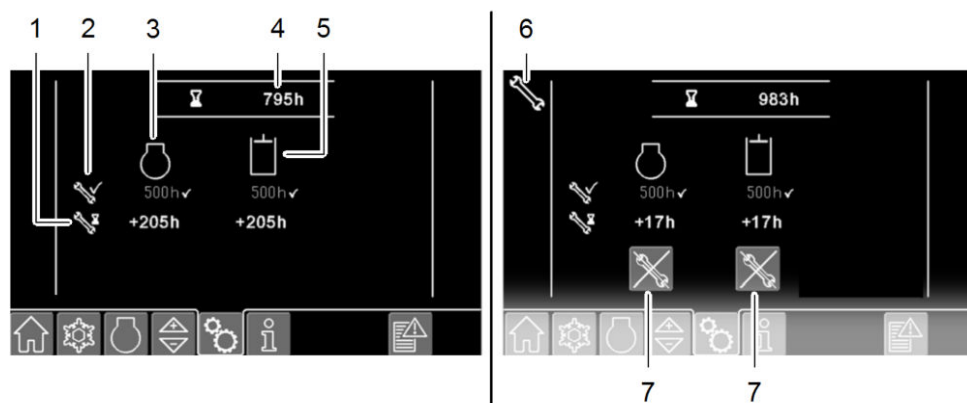


Fig. 127: Maintenance menu

- | | | |
|---|-----------------------------------|---|
| 1 Remaining time to next maintenance | 4 Total operating hours counter | 7 Confirmation of maintenance due message |
| 2 Operating hours counter at last maintenance | 5 Maintenance of hydraulic system | |
| 3 Maintenance of diesel engine | 6 Maintenance due | |

If next maintenance is due in less than 20 hours or deadline has been exceeded by 50 hours, the following elements are displayed:

- *Maintenance due 6* status symbol
- *Confirmation of maintenance due message 7* button

► Hide *maintenance due* message: Press *confirmation of maintenance due message 7* button.

▷ *Maintenance due 6* status symbol is hidden.

► Have maintenance carried out at set time: Contact Liebherr customer service.

Activation time for sensor controlled low idle automatic menu

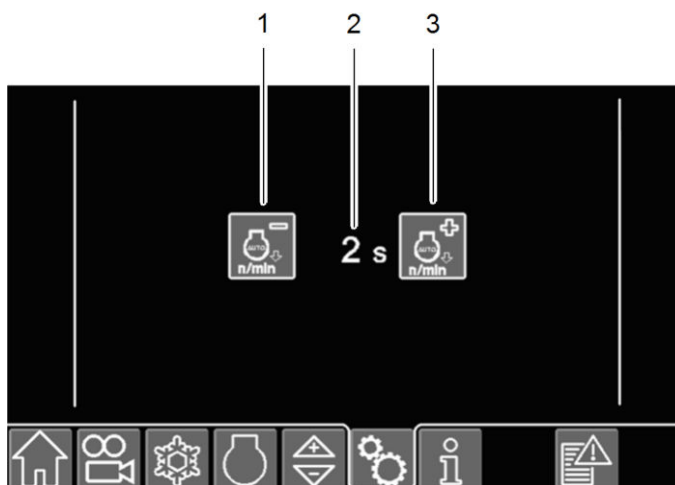


Fig. 128: Activation time for sensor controlled low idle automatic menu

- | | | | |
|---|--|---|----------------------------|
| 1 | Reducing activation time | 3 | Increasing activation time |
| 2 | Activation time for sensor controlled low idle automatic | | |

3.2.23 Information menu

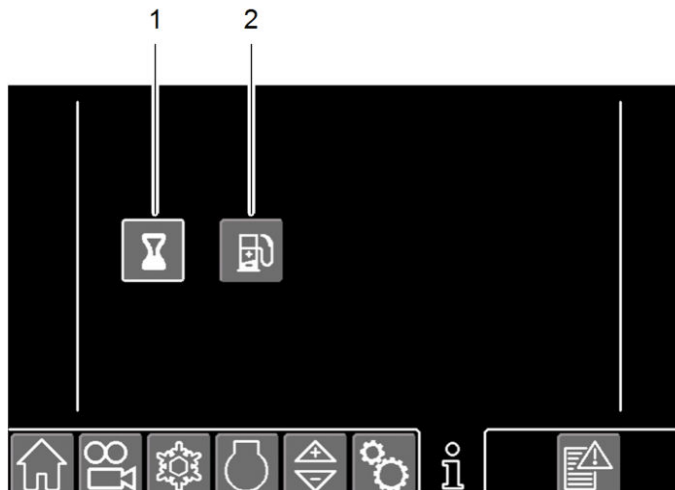


Fig. 129: Information menu

- | | | | |
|---|-----------------|---|------------------|
| 1 | Operating hours | 2 | Fuel consumption |
|---|-----------------|---|------------------|

Operating hours menu

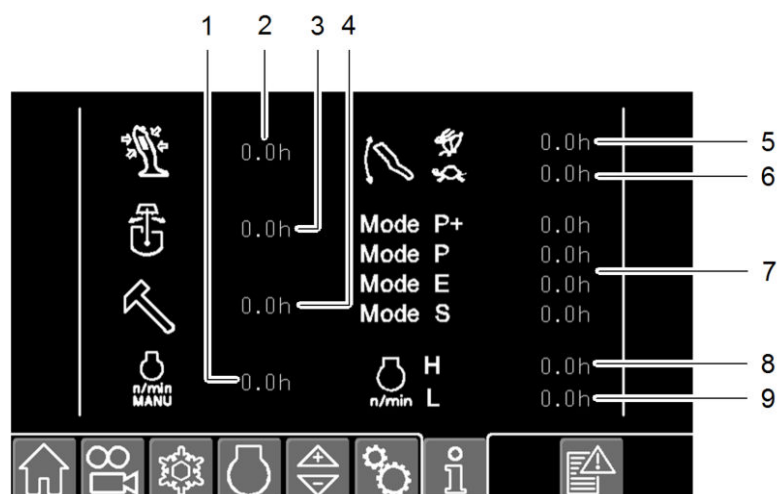


Fig. 130: Operating hours menu

- | | | | |
|---|----------------------|---|--------------------------|
| 1 | Emergency operation | 6 | Driving in creeper gear |
| 2 | Joysticks | 7 | Operating modes P+/P/E/S |
| 3 | Slewing gear | 8 | Maximum engine speed |
| 4 | Optional pedals | 9 | Engine idling speed |
| 5 | Driving in high gear | | |

Fuel consumption menu

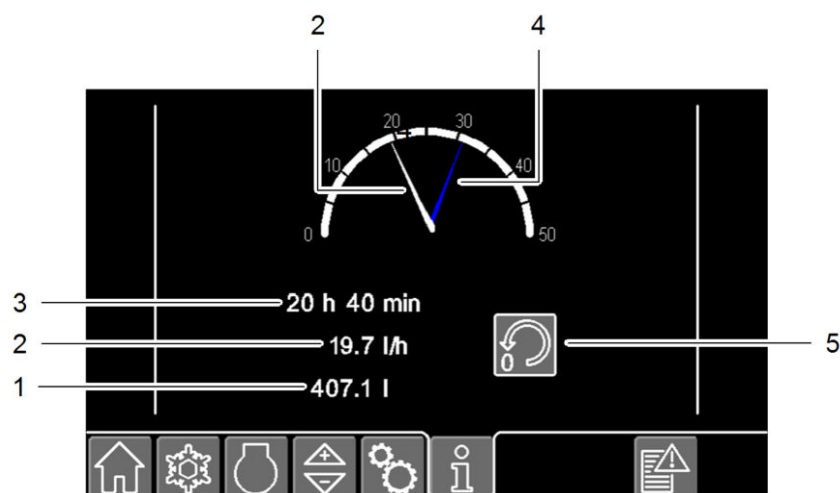


Fig. 131: Fuel consumption menu

- | | | | |
|---|------------------------------------|---|--|
| 1 | Consumed fuel ¹⁰⁾ | 4 | Average consumption in past 60 seconds |
| 2 | Average consumption ¹⁰⁾ | 5 | Reset hour meter |
| 3 | Measurement period ¹⁰⁾ | | |

¹⁰⁾ Since the last meter reset

3.2.24 Tool Control menu

The *Tool Control* menu can be used to select a working tool or a working attachment and activate the corresponding parameters for the oil flow rate and oil pressure.

A maximum of ten working tools or working attachments can be programmed. Contact Liebherr customer service regarding setting and saving the parameters for the working tools or working attachment.

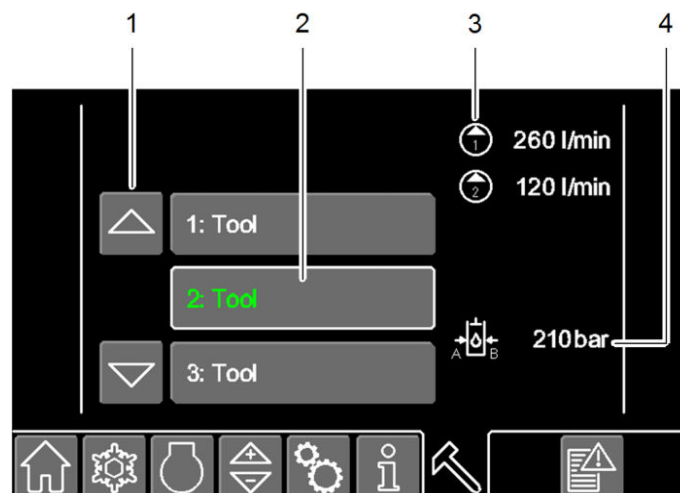


Fig. 132: Tool Control menu

- | | |
|--|---|
| <p>1 Scroll</p> <p>2 Selected working tool or working attachment</p> | <p>3 Maximum flow of used working tool or working attachment</p> <p>4 Maximum pressure of used working tool or working attachment</p> |
|--|---|

NOTICE

Unsuitable parameters!

Damage to working tool or working attachment.

- ▶ Select suitable parameters for the working tool or working attachment.
 - ▶ Comply with the maximum permitted values for pressure and flow.
-
- ▶ Press the *scroll* 1 key until the key of the desired working tool or the desired working attachment is framed in white.
 - ▶ Press the key of the desired working tool or the desired working attachment.
 - ▷ The name of the selected working tool or working attachment 2 is displayed in green.
 - ▷ The working tool or working attachment is selected.
 - ▷ The parameters of the selected working tool or working attachment 2 are activated.

3.2.25 Messages menu

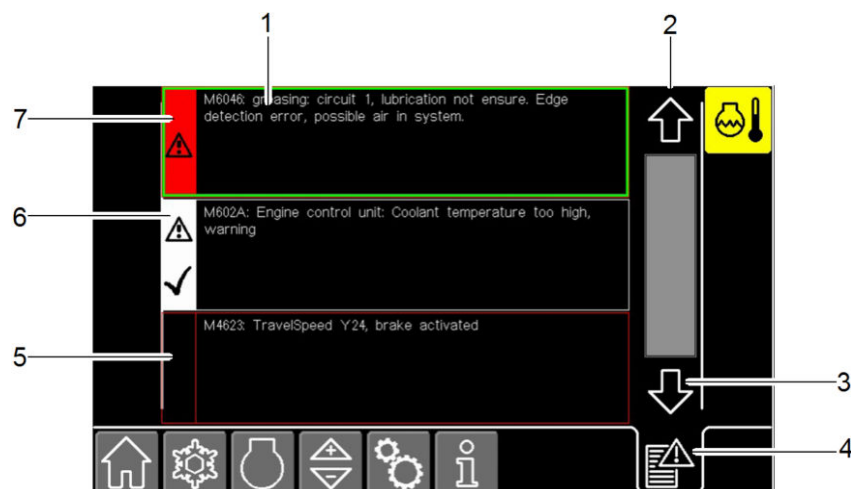


Fig. 133: Messages menu

- | | | | |
|---|---------------|---|--------------------------------------|
| 1 | Message text | 5 | unconfirmed message, no longer valid |
| 2 | Page up | 6 | confirmed message |
| 3 | Page down | 7 | unconfirmed message |
| 4 | Messages menu | | |

The *messages* menu lists error codes.

The *messages* 4 symbol appears in various colours, depending on the content of the menu:

- White: acknowledged messages
- Flashing red: queued messages

If the *messages* 4 symbol flashes red:

- ▶ Select the *messages* 4 symbol.
 - ▷ The *messages* menu is displayed.
- ▶ Read the new messages carefully.
- ▶ Select the *page up* 2 and *page down* 3 symbols to read all the messages.
- ▶ Select the symbols of the unacknowledged messages.
 - ▷ The messages are displayed with a white border.
 - ▷ The messages are acknowledged.
- ▶ Perform the necessary measures to remedy errors.

Where required:

- ▶ Contact Liebherr customer service.

3.3 Operation

3.3.1 Inspection tour before putting into service

General information

- ▶ Before putting into service, perform a thorough inspection tour around machine.
- ▶ Never put defective machine into service.
- ▶ Make sure no-one is working on or under machine.
- ▶ Make sure no-one is in the danger zone of the machine.

Complete machine

- ▶ Check general condition and tightness of the machine. Have damage repaired immediately.
- ▶ Make sure all falling object protective structures on the machine are in place and functioning correctly. For example: Safety belt, steps, rails, handles.
- ▶ Make sure that all safety signs of the machine are in place and legible. Replace as required.
- ▶ Clean contaminated or slippery cab accesses on the machine.
- ▶ Remove dirt, ice and snow from the air inlet.
- ▶ Clean and adjust interior mirror.
- ▶ Clean windows and secure against unintended movements.
- ▶ Close all hoods, covers and doors. To facilitate access in case of emergency: Do not lock door locks.

Drive group

- ▶ Check oil level of the diesel engine. (For more information see: [5.7.2 Diesel engine: Checking oil level, page 178](#))
- ▶ Check general condition, tightness and cleanliness of diesel engine by means of visual inspection.
- ▶ Drain water from fuel pre-filter. (For more information see: [5.7.3 Fuel pre-filter: Draining water, page 179](#))

Cooling system

- ▶ Check coolant level. (For more information see: [5.8.1 Checking coolant level, page 183](#))
- ▶ Check cleanliness of radiator and fan. Clean as required. (For more information see: [5.6.6 Cleaning fan and radiator, page 177](#))

Electrical system

- ▶ Check warning lights and display units.

Travel gear

- ▶ Check track tension. (For more information see: 5.11.1 Checking track tension, page 193) Re-tighten if necessary. (For more information see: 5.11.2 Tightening the track, page 194)

Working attachment

- ▶ Lubricate working tool.
- ▶ Check pin connections.
- ▶ Check steel components for cracks.

If quick coupler is installed:

- ▶ Check that warning sound sounds and display status symbols appear.
- ▶ Check condition of locking pins, hydraulic hoses, electric cables and safety flaps.

3.3.2 Refuelling

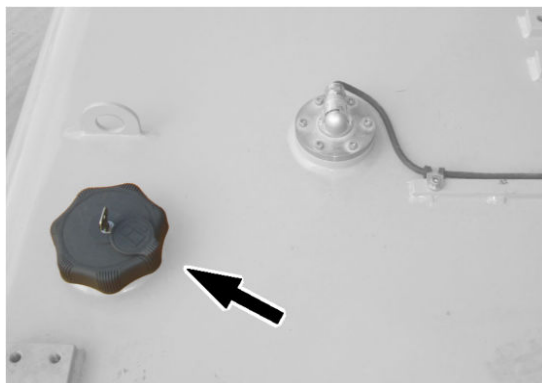


Fig. 134: Fuel tank cap



DANGER

Explosion!
Death, injuries, damage.

- ▶ Do not smoke.
- ▶ Keep all heat sources away from machine.

NOTICE

Condensation build-up in the fuel tank!
Damage.

- ▶ Fill fuel tank after finishing work.

NOTICE

Air admission into the fuel system when the diesel engine is running!
Damage.

- ▶ Fill fuel tank before it is empty.

Make sure the following preconditions are met:

- ☐ Diesel engine is shut off.
- ☐ Fuel used is approved.
- ▶ Unscrew fuel tank cap.
- ▶ Check condition of strainer and replace if necessary.
- ▶ Fill with fuel through strainer.
- ▶ Screw on fuel tank cap.
- ▶ Lock fuel tank cap¹¹⁾.

3.3.3 Starting diesel engine

Starting

NOTICE

Starting diesel engine at altitude above 2000 m!
Damage to the diesel engine.

- ▶ Contact Liebherr customer service before starting the diesel engine.
-

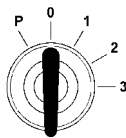
NOTICE

Incorrect cold start of the diesel engine!
Damage to the diesel engine.

- ▶ Start diesel engine.
 - ▶ Let diesel engine run at idle speed for 15 seconds.
 - ▶ Slowly warm diesel engine up by running it at medium load and medium speed.
-

Make sure the following preconditions are met:

- ☐ Fuel tank is full.
 - ☐ Battery main switch is in the **ON** position.
 - ☐ Safety lever is in upper position.
 - ☐ Joysticks and pedals are in neutral position.
 - ▶ Warn bystanders before starting the machine: Sound horn. ([For more information see: 3.2.8 Horn, page 56](#))
 - ▷ Everyone must leave danger zone.
 - ▶ Turn ignition key to position **1**.
 - ▷ Autocheck begins.
 - ▷ All LEDs briefly light up.
 - ▶ During autocheck, check that the LEDs are functioning correctly.
- If LEDs are defective:
- ▶ Have LEDs replaced.
 - ▶ Turn ignition key to position **3** and hold position until diesel engine starts.



¹¹⁾ Option

Troubleshooting

Diesel engine does not start?

If two attempts to start fail, there is probably a malfunction of the diesel engine.

- ▶ Do not leave ignition key in position **3** for more than 20 seconds.
- ▶ Wait for at least 1 minute before the next attempt to start the diesel engine.
- ▶ Before starting the diesel engine, always turn ignition key to position **0**.
- ▶ If there are two unsuccessful attempts to start the diesel engine, establish the cause of the fault and eliminate it.

Starting at low temperatures

At low outside temperatures, preglowing of the diesel engine is activated.



Engine preglowing activated symbol is shown on the display during preglowing of the diesel engine.

When preglowing of the diesel engine is in progress:

- ▶ Do not start diesel engine.

When preglowing of the diesel engine has finished:

- ▶ Start diesel engine.

Starting at temperatures below -18 °C

- ▶ Equip machine with one or more starting aids optionally available from Liebherr.

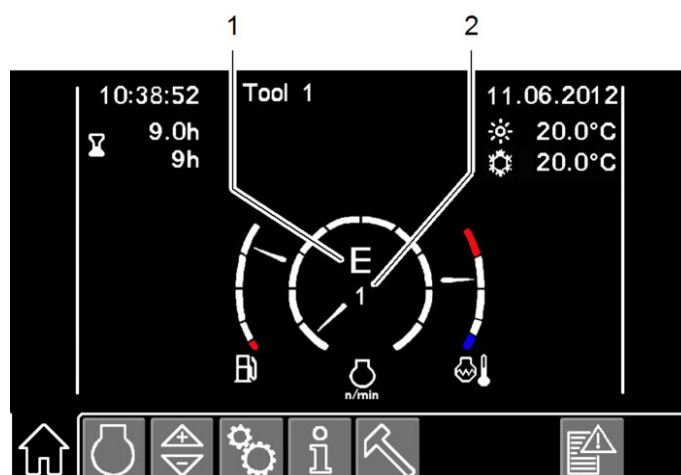
3.3.4 Engine speed and operating mode

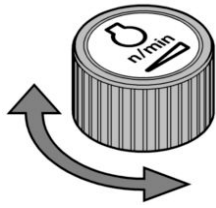
Fig. 137: Display of engine speed level and operating mode in the main menu

1 Operating mode

2 Engine speed level

Engine speed

Ten engine speed levels can be selected.



- Increase engine speed level: Turn turning knob for adjusting the engine speed in clockwise direction.
- Reduce engine speed level: Turn turning knob for adjusting the engine speed in anti-clockwise direction.

Operating mode

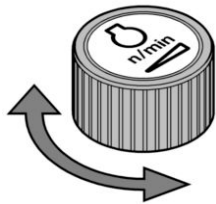
The four operating modes permit optimum use of the machine according to the work to be done.

Operating mode			Operation	Engine speed level	Hydraulic power
Key	Status of LEDs	Mode			
	 ○ ○	S (SENSITIVE)	Precise work or lifting loads	7	Limited
	○  ○	E (ECO)	Light to medium work	8	Slightly limited
	○ ○ 	P (POWER)	Heavy work	9	Unlimited
	  	P+ (POWER PLUS)	Very heavy work	10	Unlimited

Tab. 13: Operating modes



- Activate operating mode E, P or S: Press *MODE* key repeatedly until corresponding LED is lit. ([see: tab. 13, page 83](#))



- Activate operating mode P+: Turn turning knob for adjusting the engine speed to level 10.

3.3.5 After starting

Precautions related to conditions of machine use

Altitude and outside temperature

Altitude and outside temperature affect the performance capacity and service life of the diesel engine.

The performance of the diesel engine is automatically adjusted according to the altitude and the outside temperature.

NOTICE

Cooling circuit overheating at high altitude or low outside temperature!
Damage to the diesel engine.

- ▶ Constantly monitor coolant temperature and hydraulic oil temperature.

Confined spaces**DANGER**

Suffocation from exhaust gases!
Death.

- ▶ Only run diesel engine when area is sufficiently ventilated.
- ▶ Ensure sufficient ventilation: Open doors and windows of buildings.

Checking function of control elements

Low hydraulic oil temperatures lead to slower reaction times of the control elements.

Make sure the following preconditions are met:

- ☐ Coolant is at operating temperature.
- ☐ Hydraulic oil is at operating temperature.
- ▶ Drive machine onto open space.
- ▶ Carefully operate joysticks and pedals.
- ▶ Check function of slewing gear brake.

Checking function of diesel engine

- ▶ Check that coolant is at operating temperature. (For more information see: [3.2.20 Operating status menu, page 68](#))
- ▶ Check that engine oil pressure remains constant. (For more information see: [3.2.20 Operating status menu, page 68](#))
- ▶ Check that power and speed of diesel engine remain constant.
- ▶ Check that noise of diesel engine is normal.
- ▶ Check that exhaust gas is colourless.

If the diesel engine is not functioning correctly:

- ▶ Shut off diesel engine immediately.

3.3.6 Sensor-controlled low idle automatic

The sensor controlled low idle automatic offers the following advantages:

- Automatic reduction of the engine speed when the safety lever is raised up or when neither joysticks nor pedals are operated
- Savings in fuel consumption
- Noise reduction

With sensor-controlled low idle automatic activated the *main menu* shows two engine speed levels:

- Current engine speed level **1**, displayed with a white pointer
- Stored engine speed level **2** with sensor controlled low idle automatic switched on, displayed with a blue pointer

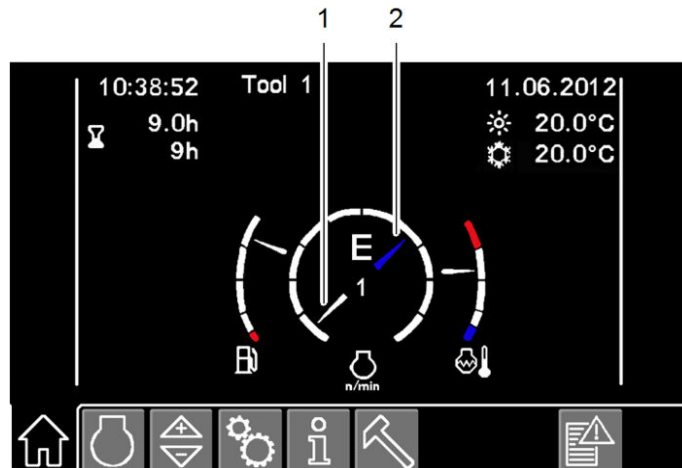


Fig. 146: Main menu, sensor-controlled low idle automatic

- 1 Current engine speed level 2 Stored engine speed level

Activating sensor controlled low idle automatic

NOTICE

Incorrect use!

Death, injuries, damage.

- ▶ Do not activate the sensor controlled low idle automatic when taking the diesel engine into operation.
- ▶ Do not activate sensor controlled low idle automatic when driving on gradients.



- ▶ Press *sensor-controlled low idle automatic* key.
 - ▷ LEDs in *sensor controlled low idle automatic* key light up.
 - ▷ Sensor-controlled low idle automatic is activated immediately once the safety lever is raised.
 - ▷ Sensor-controlled low idle automatic is activated after a period of time with the safety lever lowered.
- ▶ Restore stored engine speed 2: Activate joysticks or pedals.

Deactivating sensor controlled low idle automatic

- ▶ Press *sensor-controlled low idle automatic* key.
 - ▷ LEDs in *slewing brake* key go out.

Setting time period for sensor controlled low idle automatic

The time period for the sensor controlled low idle automatic is set to 5 seconds by default.

- ▶ Adjust time period for the sensor controlled low idle automatic to between 2 and 10 seconds: Use *time period for sensor controlled low idle automatic* menu.

3.3.7 Automatic engine stop after idling (option)

The engine switches off automatically when the engine is at idling speed and if none of the control elements are operated during the shut-off delay.

The shut-off delay is set to 5 minutes as standard.



20 seconds before the automatic engine shut-off:

- The acoustic warning in the operator's cab sounds discontinuously
- The *engine shut-off activated* status symbol appears on the display

Deactivating automatic engine shut-off

- ▶ Activate a control element.

Stopping automatic engine shut-off

- ▶ Contact Liebherr customer service.

3.3.8 Shutting off diesel engine

NOTICE

Interruption to system data storage!
Damage to the diesel engine.

- ▶ After shutting off the diesel engine, wait for at least 1 minute before turning the battery main switch to position **OFF**.

NOTICE

Interruption to auxiliary heater operation¹²⁾!
Damage to auxiliary heater.

- ▶ After shutting off the diesel engine, wait for the auxiliary heater to be switched off automatically before turning the battery main switch to position **OFF**.

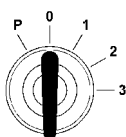
NOTICE

Storing the machine for longer periods!
Damage to the diesel engine.

- ▶ After shutting off the diesel engine, turn battery main switch to **OFF** position.

Shutting off diesel engine normally

- ▶ Move all control elements to their neutral position.
- ▶ Bring diesel engine to idle speed.
- ▶ Let diesel engine run at idle speed for 30 seconds.
- ▶ Turn ignition key to position **0**.
- ▶ Pull out ignition key.



¹²⁾ Option

Shutting off diesel engine in an emergency

- Turn ignition key to position 0.

3.3.9 Travelling



DANGER

Reverse travel direction!
Death, injuries, damage.

If sprocket wheels are at front of the machine:

- Drive carefully.

Travelling in straight line

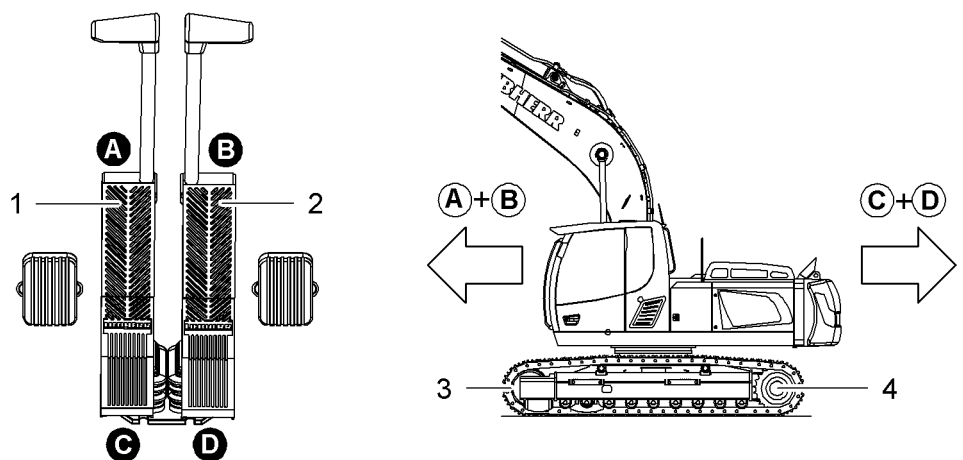


Fig. 150: Travelling in straight line

- | | |
|--------------------------|------------------|
| 1 Left travelling pedal | 3 Idler-wheel |
| 2 Right travelling pedal | 4 Sprocket wheel |

Make sure the following preconditions are met:

- ☐ Sprocket wheel 3 is at front of the machine.

- Travel forwards in straight line: Press left travelling pedal 1 forwards A and right travelling pedal 2 forwards B.
- Travel backwards in straight line: Press left travelling pedal 1 backwards C and right travelling pedal 2 backwards D.

Travelling around bends

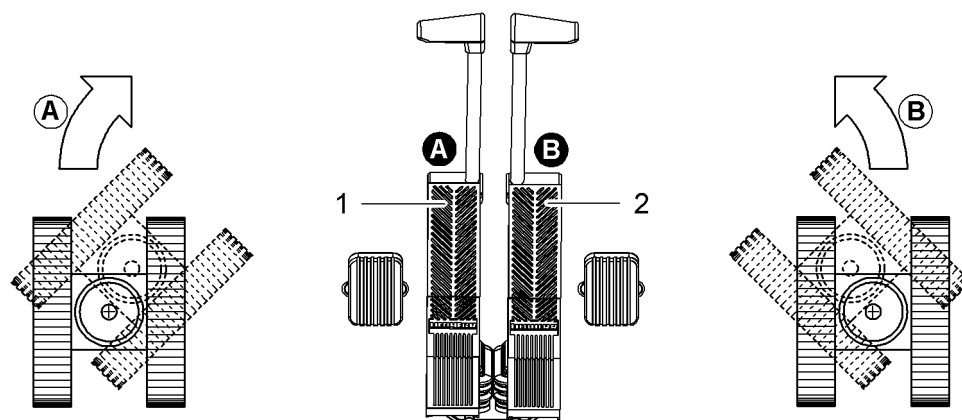


Fig. 151: Travelling around bends

1 Left travelling pedal

2 Right travelling pedal

- Travel around a right-hand bend: Press left travelling pedal 1 forwards A.
- Travel around a left-hand bend: Press right travelling pedal 2 forwards in direction B.

Turning on the spot

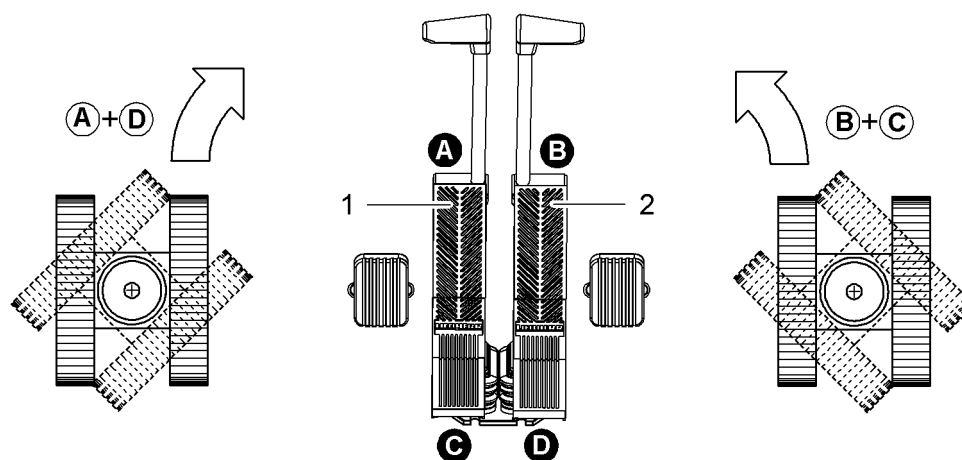


Fig. 152: Turning on the spot

1 Left travelling pedal

2 Right travelling pedal

- Turn right: Press left travelling pedal 1 forwards A and simultaneously press right travelling pedal 2 backwards D.
- Turn left: Press right travelling pedal 2 forwards B and simultaneously press left travelling pedal 1 backwards C.

Travelling sensitively

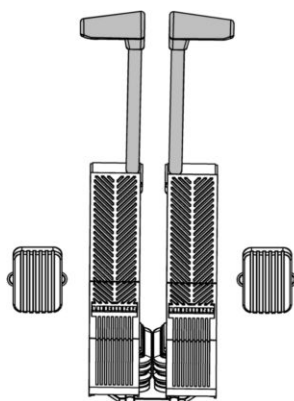


Fig. 153: Travel lever

When travelling sensitively is required:

- Insert travel levers in travelling pedals.

At the end of work:

- Pull out travel levers and stow in operator's cab.

Travelling in creeper gear and in automatic travelling

The creeper gear permits sensitive travelling and improves travelling behaviour on difficult ground.

In automatic driving mode, the travel speed is adjusted to the ground conditions.

Key	Status of LEDs	Travelling	Travel speed
	○ ○ ○	Manual	Fast
	● ● ●		Slow
	● ● ○	Automatic	Slow
	● ○ ○		Fast

Tab. 14: Driving modes

- Select driving mode: Press *creeper gear* key.

3.3.10 Braking



DANGER

Impairment of stability of the machine!
Death, injuries, damage.

- Always release travelling pedals slowly.

Hydraulic braking

When moving downhill, hydraulic brake valves prevent the travel motors over-revving.

- ▶ Release travelling pedals.
 - ▷ Travelling pedals return to neutral position.
 - ▷ Machine is braked hydraulically.
 - ▷ Machine stops.

Braking mechanically

Machine can be brought to a standstill through mechanical braking. Every travel gearbox is equipped with a brake.

The attachment can be used while the mechanical brake is activated.

- ▶ Release a travelling pedal.
 - ▷ Mechanical brake brakes relevant gearbox after a few seconds.

3.3.11 Travel alarm (option)

The travel alarm is an acoustic warning signal. It sounds outside the machine.

Activating travel alarm

The travel alarm is activated automatically at the start of travel.

Deactivating travel alarm

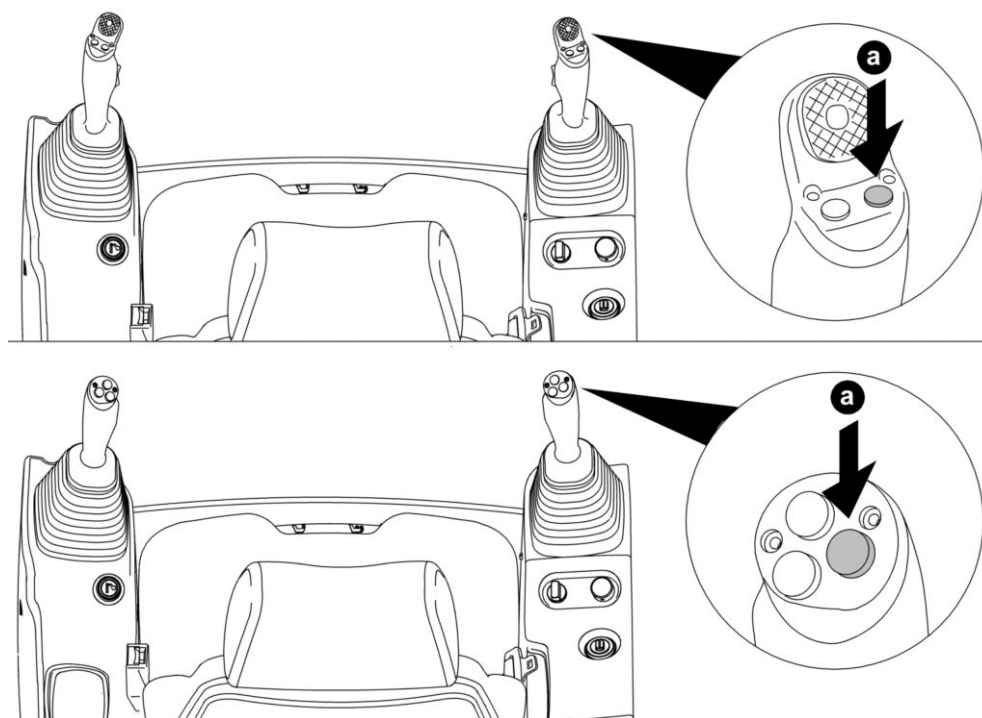


Fig. 159: Deactivating travel alarm

- ▶ Wait 10 seconds after activation of the travel alarm.
- ▶ Press the right button of the right joystick.

3.3.12 Driving on slopes

Maximum inclination angle when travelling is 35°.

Maximum inclination angle when travelling does not apply to working on slopes.

Maximum inclination angle when travelling applies exclusively if all the following conditions are met:

- Machine moves in a straight line to the slope.
- Uppercarriage is aligned parallel to the undercarriage.
- Ground has suitable grip and strength.
- Machine is standard version with standard attachment.

Maximum inclination angle for working on slopes depends on machine configuration.



DANGER

Machine tipping over!
Death, injuries, damage.

- Observe maximum inclination angle.
 - Define maximum approved inclination angle for working on slopes: Contact Liebherr customer service.
-

Driving on upward slopes

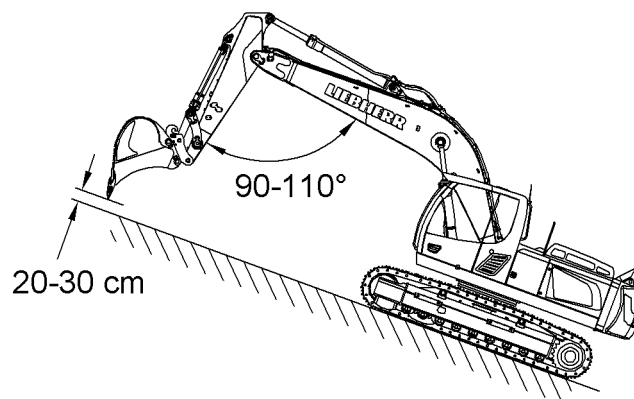


Fig. 160: Driving on upward slopes

- Position attachment as follows:
 - Angle between boom and stick is between 90° and 110°
 - Bucket teeth are aligned downwards
 - Bucket teeth are between 20 and 30 cm above the ground
- Start travel.

Driving on downward slopes

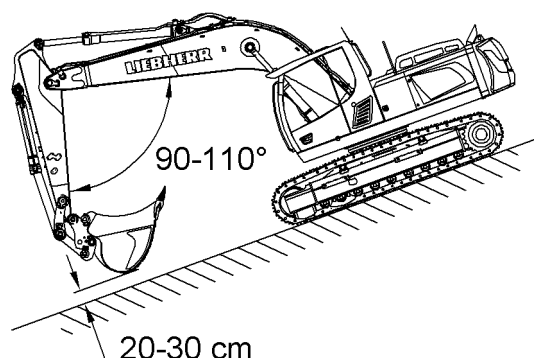
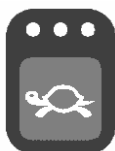


Fig. 161: Driving on downward slopes

- ▶ Position attachment as follows:
 - Angle between boom and stick is between 90° and 110°
 - Bucket teeth are aligned upwards
 - Bucket floor is between 20 and 30 cm above the ground
- ▶ Press *creeper gear* key.
 - ▷ LEDs in the *creeper gear* key light up.
 - ▷ Creeper gear is activated.
- ▶ Start travel.



3.3.13 Controlling the working attachment

An information sticker on the side window of the operator's cab explains the operating principle of the controls.

The controls described below meet the **ISO standard for controllers** and are part of the standard equipment of the machine.

In a machine with a control variant:

- It is the operator who decides how the control variant is activated.
- Controls are specific to the options.

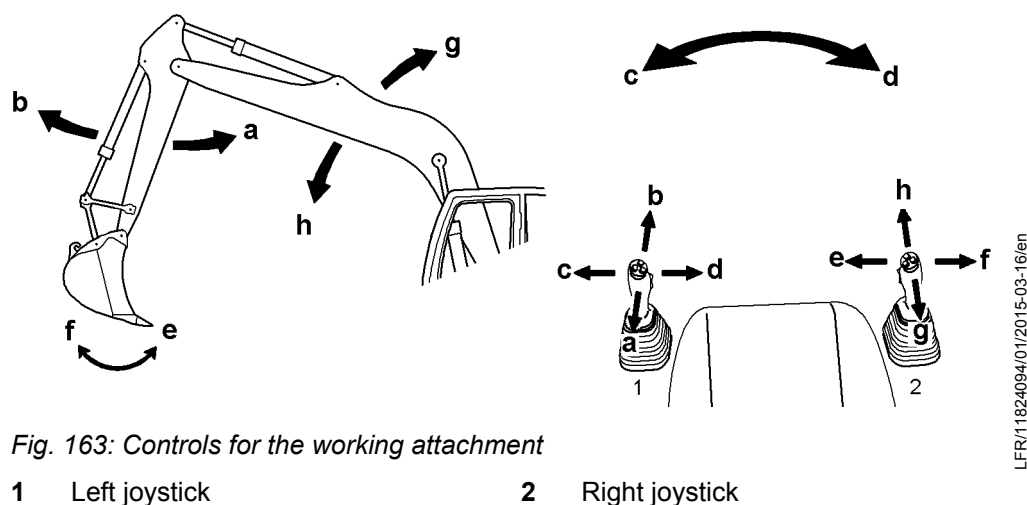


Fig. 163: Controls for the working attachment

1 Left joystick

2 Right joystick

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Controlling the boom

- ▶ Raise the boom: move the right joystick **2** in direction **g**.
- ▶ Lower the boom: move the right joystick **2** in direction **h**.

Controlling the stick

- ▶ Retract the stick: move the left joystick **1** in direction **a**.
- ▶ Extend the stick: move the left joystick **1** in direction **b**.

Controlling the bucket or grapple



DANGER

Guiding the bucket or grapple by hand!
Fatal or serious injuries.

- ▶ Do not allow anyone to guide the bucket or grapple by hand.
- ▶ Tilt the bucket in or close the grapple: move the right joystick **2** in direction **e**.
- ▶ Tilt the bucket out or open the grapple: move the right joystick **2** in direction **f**.

Combining the controls

- ▶ Operate the joysticks diagonally.

3.3.14 Turning and braking uppercarriage

Turning uppercarriage

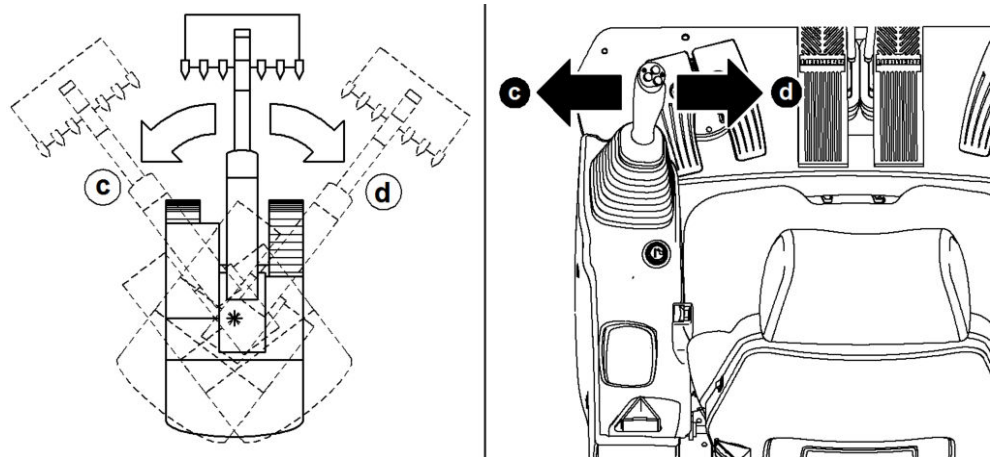


Fig. 164: Turning uppercarriage

- ▶ Turn uppercarriage to the left: Move left joystick in direction **c**.
- ▶ Turn uppercarriage to the right: Move left joystick in direction **d**.

Braking uppercarriage

- ▶ Brake uppercarriage: Release left joystick.
- ▶ Brake uppercarriage by maximum amount: Move left joystick in opposite direction.

Automatic locking of uppercarriage

Slewing brake is closed when engine is switched on again.

Slewing gear brake closes when uppercarriage is stationary or is just about to stop.

Slewing gear brake opens as soon as left joystick is moved.

3.3.15 Overload warning system (option)



The overload warning system warns the operator when the maximum permitted load is reached or exceeded:

- *Overload warning system* status symbol appears on the display.
- Acoustic warning signal sounds in operator's cab.
- Control elements of the machine remain operational.

The permitted maximum load depends on the machine configuration (undercarriage, working attachment). The permitted maximum load is shown in the load lift chart in the operator's cab. (For more information see: [2.4.3 Information signs, page 24](#))

According to ISO 10567 the specified loads correspond to 75 % of the static tip load of 87 % of the hydraulic limit.

The load capacity changes in dependence on the following points:

- Installation of parts of the working attachment
- Removal of parts of the working attachment
- Changing of the working tool

The overload warning system does not release the operator from the responsibility for exclusively lifting loads that are known and approved according to machine load lift chart.

Checking function of the overload warning system

Every time the machine is started and before loads are lifted, the function of the overload warning system must be checked.



DANGER

Failure of overload warning system!
Death, injuries, damage.

- ▶ Do not lift any loads.
 - ▶ Have overload warning system repaired.
-
- ▶ Slowly extend hoist cylinder up to stop.
 - ▶ Continue to operate hoist cylinder when stop is reached.
 - ▷ *Overload warning* status symbol appears on the display.
 - ▷ An acoustic warning signal sounds in the operator's cab.

Activating overload warning system

The overload warning system is activated by default.



- ▶ Press *overload warning system* key.
 - ▷ LEDs in *overload warning system* key light up.

Working with activated overload warning system



Note

Earth-moving operations create increased pressure on the machine. If overload warning system is activated, it can trigger repeatedly.

- ▶ Deactivate overload warning system for earth-moving operations.

If overload warning system triggers:

- ▶ Reduce reach.

or

Lower load to the ground without increasing reach.

Deactivating overload warning system



- ▶ Press *overload warning system* key.
 - ▷ *Confirmation required* symbol is shown on the display.
 - ▷ LEDs in *overload warning system* key flash.
 - ▷ *Confirmation required* status symbol appears on the display.



- ▶ Press confirmation button within 5 seconds.
 - ▷ *Confirmation required* status symbol is hidden.
 - ▷ LEDs in *overload warning system* key go out.

3.3.16 Controlling special working attachment without mini-joystick (option)

Selecting special working attachment

If available:

- ▶ Select special working attachment from *Tool Control* menu on the display. (For more information see: [3.2.24 Tool Control menu, page 77](#))

Controlling special working attachment with double pedal

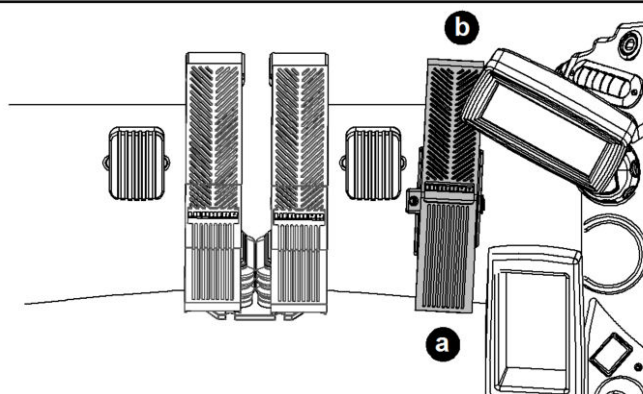
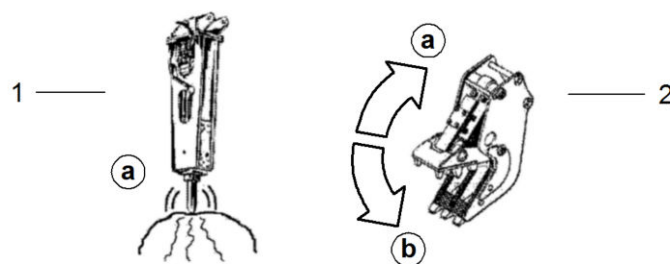


Fig. 169: Controlling special working attachment with double pedal

1 Hydraulic hammer

2 Concrete shear or pulveriser

The *description of control elements* information sign describes control with the double pedal. (For more information see: [2.4.3 Information signs, page 24](#))



DANGER

Unintended movements of the machine!
Death, injuries, damage.

- Before working with machine, check function of control elements.

Controlling cylinder of the special working attachment

- Retract cylinder of the special working attachment: Press pedal **a**.
- Extend cylinder of the special working attachment: Press pedal **b**.

Controlling hydraulic hammer

- Press pedal **a**.

Controlling special working attachment with left joystick

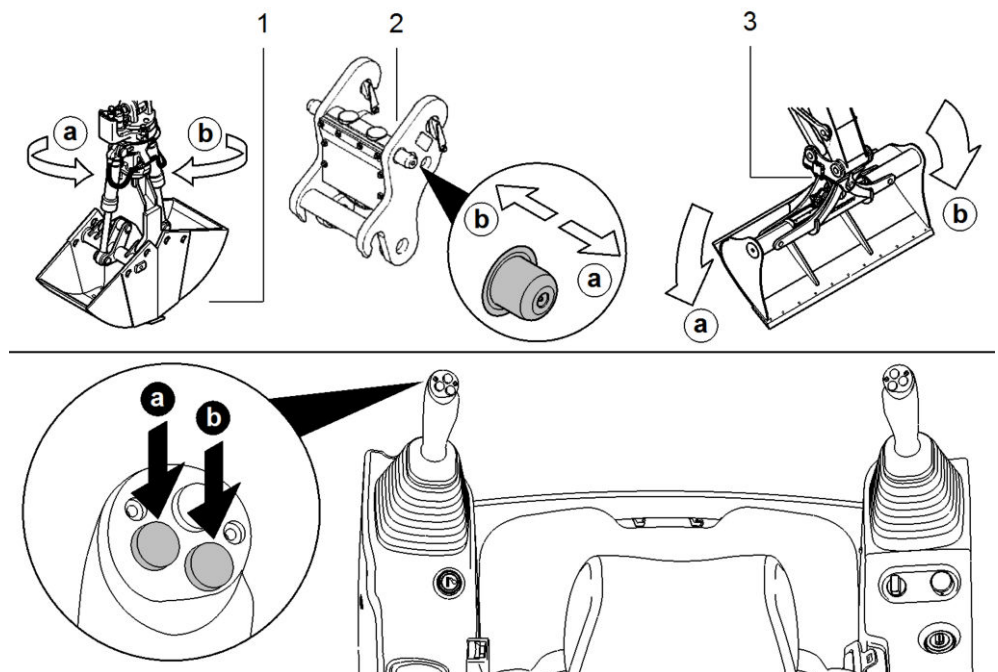


Fig. 170: Controlling special working attachment with left joystick

- | | | | |
|---|------------------------------|---|----------------------------------|
| 1 | Grapple with rotary actuator | 3 | Swivelling ditch-cleaning-bucket |
| 2 | Hydraulic quick coupler | | |

Swivelling special working attachment

- Swivel special working attachment to left **a**: Press and hold down button **a** on the left joystick.
- Swivel special working attachment to right **b**: Press and hold down button **b** on the left joystick.

Controlling locking pins of the hydraulic quick coupler

- Extend locking pins of the hydraulic quick coupler **2**: Press and hold down button **a** on the left joystick.
- Retract locking pins of the hydraulic quick coupler **2**: Press and hold down button **b** on the left joystick.

3.3.17 Controlling special working attachment with mini-joystick (option)

Selecting special working attachment

If available:

- Select special working attachment from *Tool Control* menu on the display. (For more information see: [3.2.24 Tool Control menu, page 77](#))

Controlling special working attachment with right mini-joystick

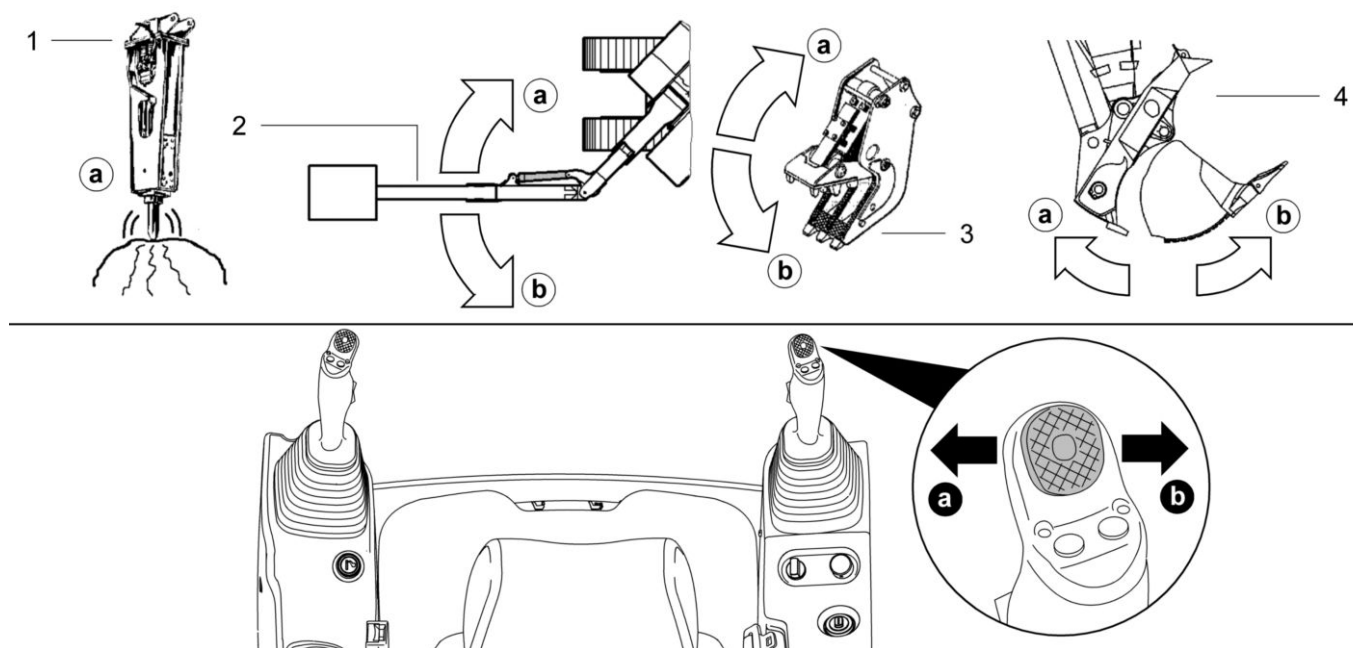


Fig. 171: Controlling special working attachment with right mini-joystick

- | | | | |
|---|---------------------------|---|------------------------------|
| 1 | Hydraulic hammer | 3 | Concrete shear or pulveriser |
| 2 | Laterally adjustable boom | 4 | Bottom dump shovel |

Controlling cylinder of the special working attachment

- ▶ Retract cylinder of the special working attachment: Move right mini-joystick in direction **a**.
- ▶ Extend cylinder of the special working attachment: Move right mini-joystick in direction **b**.

Controlling hydraulic hammer

- ▶ Move right mini-joystick in direction **a**.

Controlling flap of a bottom dump shovel

- ▶ Close flap of the bottom dump shovel **4**: Move right mini-joystick in direction **a**.
- ▶ Open flap of the bottom dump shovel **4**: Move right mini-joystick in direction **b**.

Controlling special working attachment with left mini-joystick

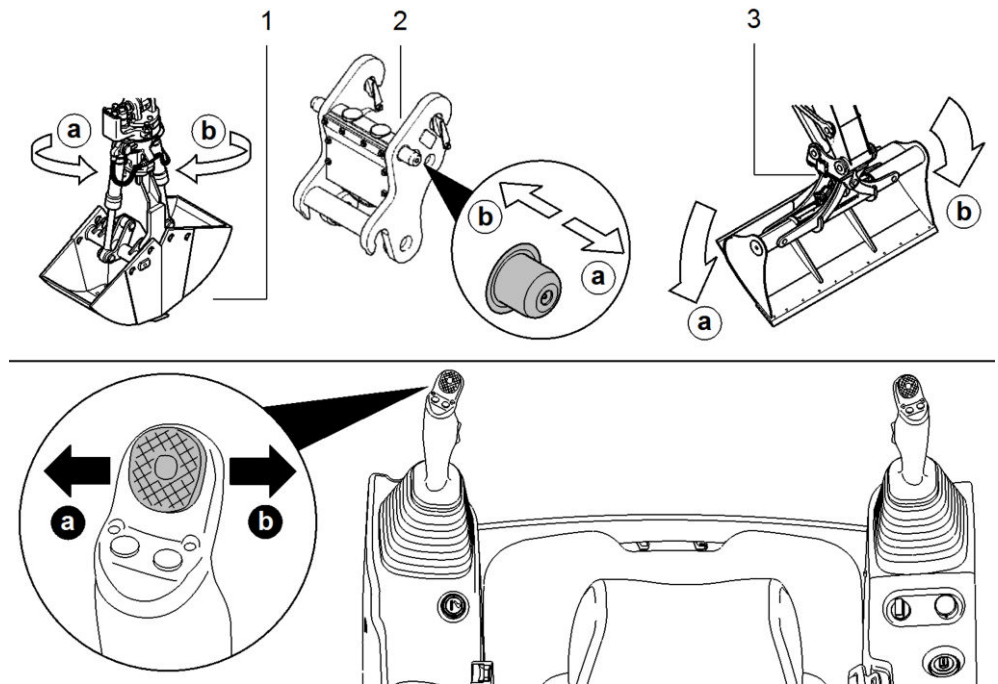


Fig. 172: Controlling special working attachment with left mini-joystick

- | | |
|--------------------------------|------------------------------------|
| 1 Grapple with rotary actuator | 3 Swivelling ditch-cleaning-bucket |
| 2 Hydraulic quick coupler | |

Swivelling special working attachment

- Swivel special working attachment to left **a**: Move left mini-joystick in direction **a** and hold position.
- Swivel special working attachment to right **b**: Move left mini-joystick in direction **b** and hold position.

Controlling locking pins of the hydraulic quick coupler

- Extend locking pins of the hydraulic quick coupler **2**: Move left mini-joystick in direction **a** and hold position.
- Retract locking pins of the hydraulic quick coupler **2**: Move left mini-joystick in direction **b** and hold position.

3.4 General working methods

3.4.1 Safety belt

The probability of surviving an accident increases if the safety belt is fastened. The safest place in an accident is the protective operator's cab, with the safety belt fastened.

Many severe and fatal injuries are due to the operator not having the seat belt fastened and attempting to jump out of the operator's cab in case of an accident. In the majority of cases, it is better to remain in the operator's cab.

The accident prevention instructions demand that a safety belt must be fastened, and that it must be serviced and checked regularly.

3.4.2 Drugs and alcohol

Safe operation of large and powerful machinery is significantly dependent on the performance of the operator. Alcohol and drugs affect sensory perception. They slow reaction times, reduce attentiveness and make it more difficult to detect problematic situations.

The consumption of alcohol and drugs not only endangers the operator himself, but also everyone else at the place of use. Misuse of alcohol and drugs can have severe or fatal consequences and lead to damage. Do not work under the influence of alcohol or drugs.

3.4.3 Working without damaging the machine

Slewing gear

- ▶ Do not force the rotation if resistance can be felt.

Impact against hard material

- ▶ Do not knock the working attachment against hard material.

Working with a suitable bucket

- ▶ Do not use buckets with too great a capacity or side blades when working on rocks.

Opening and closing the ball valves

- ▶ Open and close ball valves: move the levers of the ball valves to the stop.

Extending and retracting the hydraulic cylinders

This applies to the hydraulic cylinders from the following working attachments:

- Stick
- Hydraulic hammer
- Concrete shears or pulveriser
- Scrap shears
- Revolving working tools

- Additional stick

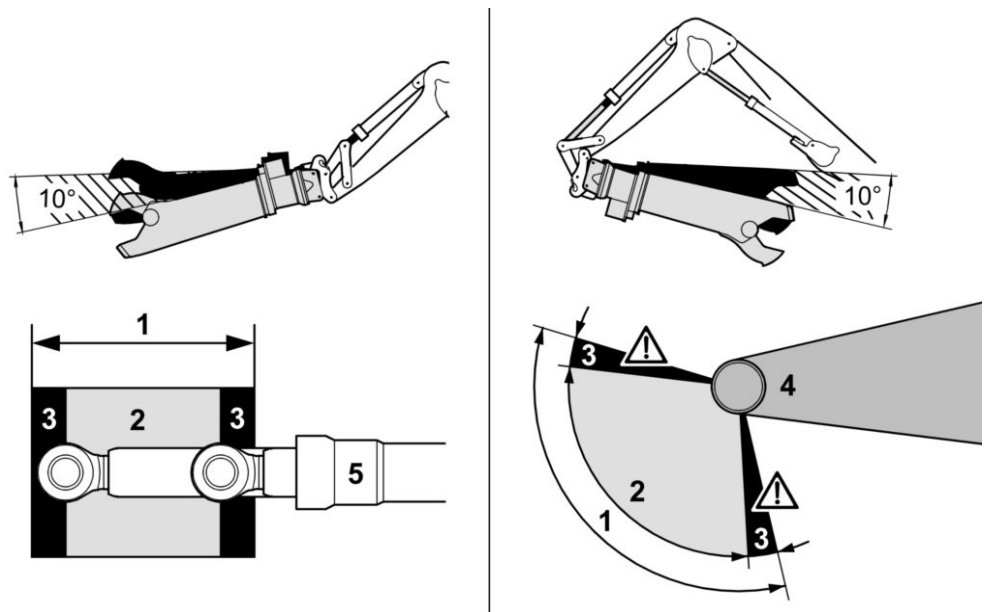


Fig. 173: Range of movement of the hydraulic cylinders

- | | | | |
|---|---|---|--------------------|
| 1 | Possible range of movement | 4 | Boom or stick |
| 2 | Permissible working range with 10° safety angle to the limit position | 5 | Hydraulic cylinder |
| 3 | Prohibited range of movement | | |

- ▶ Do not fully retract or extend the hydraulic stick cylinders.
- ▶ Observe the working range 2 with a safety angle of 10° to the limit position.
- ▶ Extend and retract the hydraulic cylinders slowly near the end stops.

Raising the machine

- ▶ Do not raise the machine using the working attachment.

In case of inadvertent raising:

- ▶ Do not use the working attachment for bracing the falling movement.
- ▶ Lower the machine to the ground slowly.

Diesel engine

- ▶ Do not let the diesel engine run at idle speed for long periods.
- ▶ Shut off the diesel engine when the machine is not in use.

Tracked travel gear

- ▶ Keep the sprocket wheel in the rear area of the machine in the following cases:
 - when driving over longer distances
 - when laying pipelines
- ▶ Position the working attachment above the idler-wheels for reversing during lengthwise earth moving, for example when excavating a ditch.

3.4.4 Preparatory work

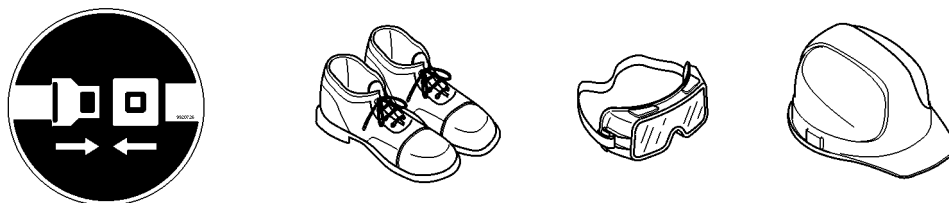


Fig. 174: Protect yourself



WARNING

Risk of injury during work!

- ▶ Wear safety boots. If required for certain jobs, wear a protective helmet and safety glasses.
- ▶ Put on the safety belt before starting work.
- ▶ Give a warning signal with the horn before starting work.

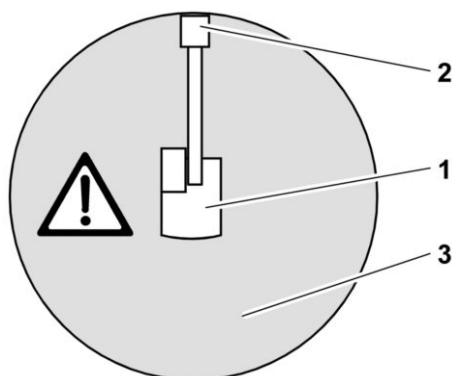


Fig. 175: Plan view of the danger zone of the machine

- | | | | |
|---|---------------------------------|---|-------------|
| 1 | Machine | 3 | Danger zone |
| 2 | Reach of the working attachment | | |



DANGER

Risk of fatal injury within the reach of the working attachment!

- ▶ Make sure that no-one is in the danger zone.
- ▶ Position the transport vehicle and machine so that the machine operator can easily see the load which is to be moved.

3.4.5 Putting machine in working position

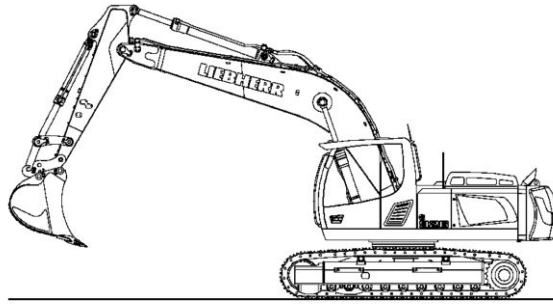


Fig. 176: Putting machine in working position

- Position machine on level and firm ground.
- Position working attachment above idler-wheel.

3.4.6 Working with a backhoe bucket

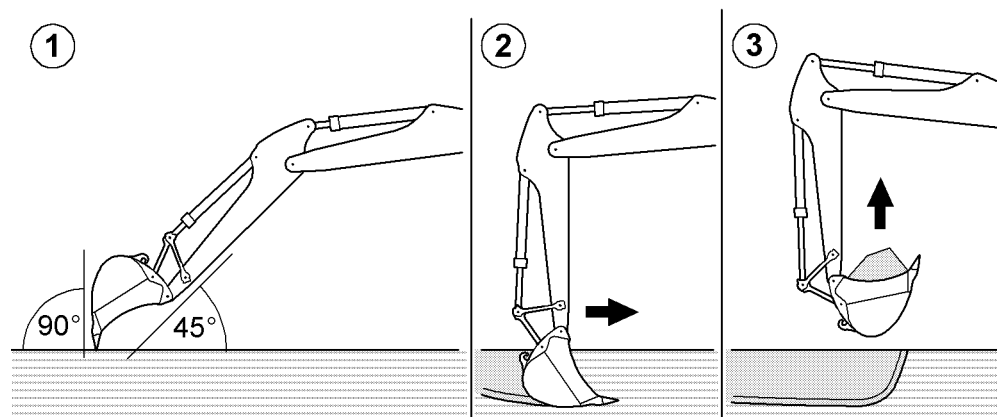


Fig. 177: Working with a backhoe bucket

- | | |
|---|----------------------------------|
| <p>1 Aligning the stick and backhoe bucket</p> <p>2 Picking up the material</p> | <p>3 Lifting up the material</p> |
|---|----------------------------------|



DANGER

Unsuitable movements of the working attachments!
Fatal or serious injuries, damage.

- Make sure that the backhoe bucket is not positioned close to the operator's cab.
- Carry out movements slowly and steadily.
- Note the load lift chart¹³⁾.

If the boom and stick are extended too far:

- Do not lift heavy loads.

¹³⁾ The load lift chart indicates the permitted load at the end of the stick depending on reach.

Make sure that the following preconditions are met:

- ❑ Machine is in working position. (For more information see: 3.4.5 Putting machine in working position, page 103)

Picking up material

- ▶ Align the stick so that its underside is at an angle of about 45° in relation to the ground.
- ▶ Align the teeth of the backhoe bucket so that the teeth can penetrate the ground at an angle of about 90°.
- ▶ Slowly and steadily retract the stick, and at the same time tilt the backhoe bucket inward.

If the stick is at right angles to the ground:

- ▶ Slowly and steadily raise the boom, and at the same time retract the stick and backhoe bucket.

If the backhoe bucket is full or the stick can no longer be retracted:

- ▶ Raise the boom and tilt the backhoe bucket in until the filling surface is parallel to the ground.

Dumping the material

- ▶ Position the working attachment at the dumping point.
- ▶ Slowly tilt the backhoe bucket outwards.

If material is left behind in the backhoe bucket:

- ▶ Tilt the backhoe bucket inwards and outwards.

3.4.7 Ground surface grading

A backhoe bucket or a dozer blade can be used for grading the ground surface.

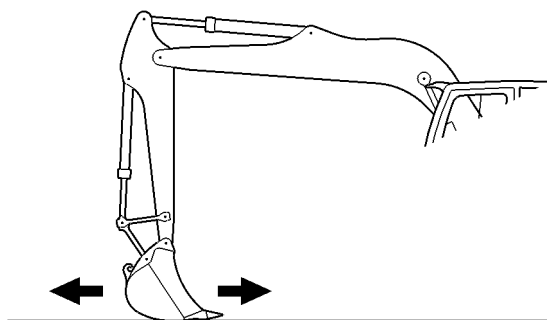


Fig. 178: Ground surface grading

NOTICE

Moving the machine with a working tool anchored in the ground!
Damage to the machine.

- ▶ Do not move the machine if a working tool is anchored in the ground.

Make sure that the following preconditions are met:

- ❑ Machine is in working position. (For more information see: 3.4.5 Putting machine in working position, page 103)

Grading with a backhoe bucket

- ▶ Lay the backhoe bucket flat on the ground.
- ▶ Compensate for the vertical movement of the stick: slowly retract or extend the stick and progressively raise or lower the boom.

Grading with a dozer blade

- ▶ Lower the dozer blade onto ground.
- ▶ Drive the machine forwards and backwards.

3.4.8 Working with a hydraulic hammer

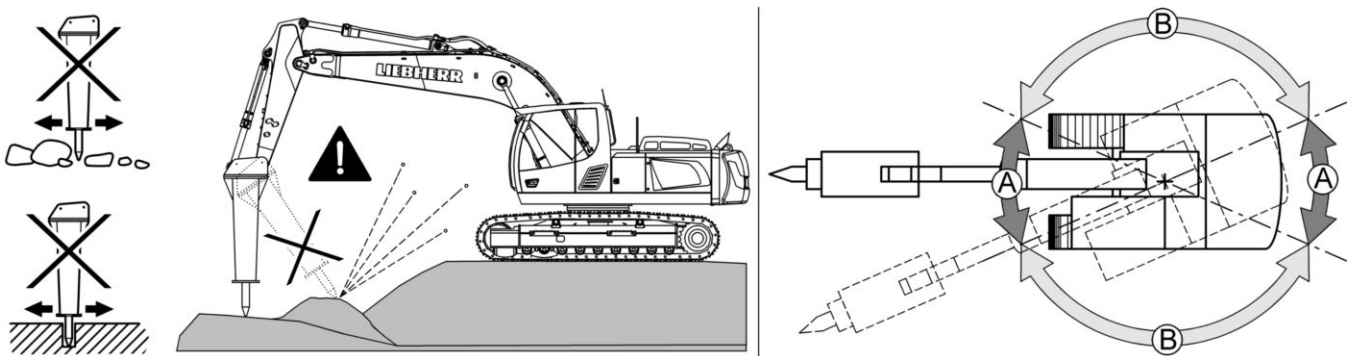


Fig. 179: Working with a hydraulic hammer

A Approved work area

B Work area not approved

NOTICE

Incorrect use of the hydraulic hammer!
Damage to the hammer and the machine.

- ▶ Work only with a hydraulic hammer approved by Liebherr.
- ▶ Follow the operator's manual of the hydraulic hammer manufacturer.
- ▶ Break only the approved materials.
- ▶ Do not use the hydraulic hammer as a lever.
- ▶ Do not break materials with the weight or inertia of the hydraulic hammer.
- ▶ Do not use the hydraulic hammer to move objects.
- ▶ Do not use the hydraulic hammer as a support to lift the machine.
- ▶ Do not operate hydraulic cylinders as far as the end stop.
- ▶ Close all cab windows.

Make sure that the following preconditions are met:

- ❑ Machine is in working position. (For more information see: 3.4.5 Putting machine in working position, page 103)
- ▶ Position the uppercarriage only in the approved work areas **A**.

**DANGER**

Rockfall!
Death.

- ▶ Do not work with the hydraulic hammer towards the machine.
- ▶ Use the hydraulic hammer at right angles to the ground.

- ▶ Operate the hydraulic hammer.
- ▶ Do not work for more than 15 seconds on the same striking point.

If the material to be broken does not give way:

- ▶ Change point of impact and use the hydraulic hammer again.

3.4.9 Working with the grapple

**DANGER**

Danger of fatal injury due to a swinging grapple!

The grapple can damage the operator's cab and injure the machine operator. The grapple can injure people standing in the vicinity. The stability of the machine can be endangered.

- ▶ Never allow anyone to remain within the danger zone.
- ▶ Make sure that the grapple does not swing too close to the operator's cab.
- ▶ Position the stick so that the grapple cannot swing against the operator's cab during movement or braking.
- ▶ Prevent the grapple from swinging: move the joystick carefully and slowly.
- ▶ Do not raise heavy loads with the boom and stick moved too far out.
- ▶ Note the load lift chart¹⁴⁾.

3.4.10 Working with the clamshell

**DANGER**

Collision between the clamshell and the operator's cab!

Fatal or serious injuries, damage.

- ▶ Make sure that the clamshell does not swing too close to the operator's cab.
- ▶ Carry out movements slowly and steadily.

Make sure that the following preconditions are met:

- ☐ Machine is in working position. (For more information see: 3.4.5 Putting machine in working position, page 103)

¹⁴⁾ The load lift chart states the permissible loads that can be lifted at the end of the stick, depending on the reach.

Picking up material

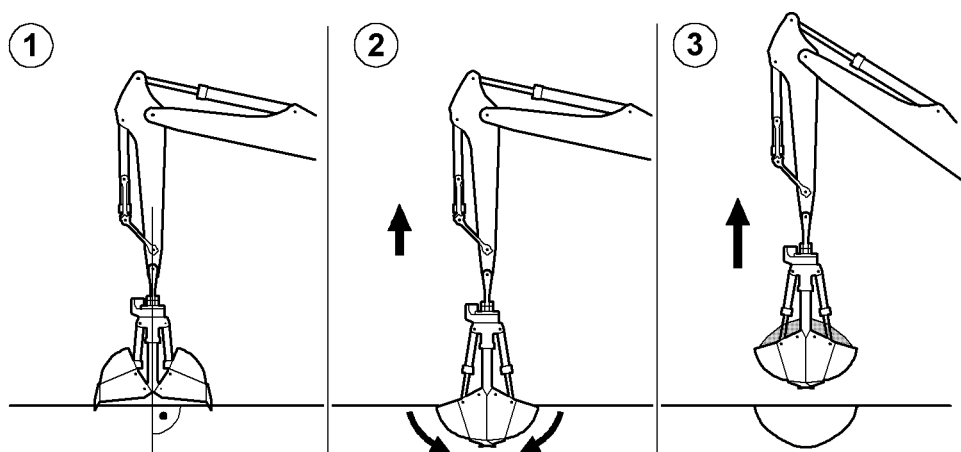


Fig. 180: Picking up material

- | | | | |
|---|----------------------------------|---|---------------------|
| 1 | Aligning the stick and clamshell | 3 | Lifting up material |
| 2 | Closing the clamshell | | |

- ▶ Align the stick at right angle to the ground.
- ▶ Completely open the clamshell buckets.
- ▶ Set the clamshell down at right angle to the ground.
- ▶ Close the clamshell buckets. Raise the boom at same time.
- ▶ Completely close the clamshell buckets.
- ▶ Raise the boom.

Dumping the material

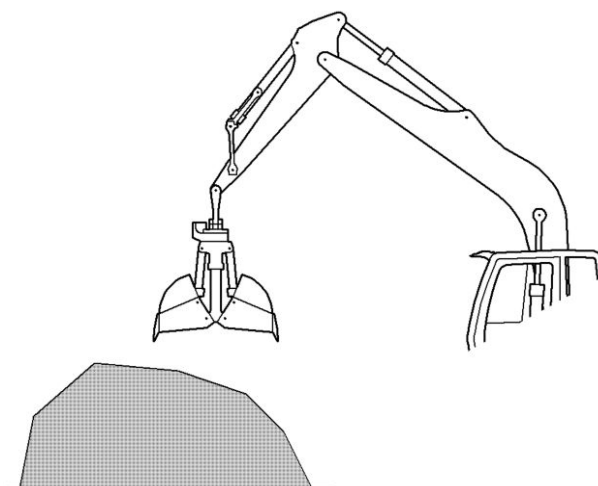


Fig. 181: Dumping the material

**DANGER**

Stability is at risk!
Fatal or serious injuries, damage.

- ▶ Do not extend the boom and stick too far.
 - ▶ Do not swing heavy loads too far to the right or left.
-
- ▶ Position the working attachment at the dumping point.
 - ▶ Open the clamshell.

3.4.11 Transferring loads

**DANGER**

Incorrect operation and unsuitable ground endanger the stability of the machine!
The machine can rock or tip over! The travel gear can sink into the ground!

- ▶ Check the ground has a sufficient load-bearing capacity.
 - ▶ Carry out all movements with increased care.
 - ▶ Move the attachment as close as possible to the machine and carry the load close to the ground if possible.
 - ▶ Note the load lift chart.
-
- ▶ Pick up the load carefully.
 - ▶ Keep the load close to the machine and move it close to the ground if possible.
 - ▶ Make sure there is adequate safety clearance to the machine and the operator's cab (swinging grapple!).
 - ▶ Carefully swing the attachment over the loading area of the transport vehicle or the unloading point.
 - ▶ Put down the load (empty the grapple).

3.4.12 Loading a transport vehicle

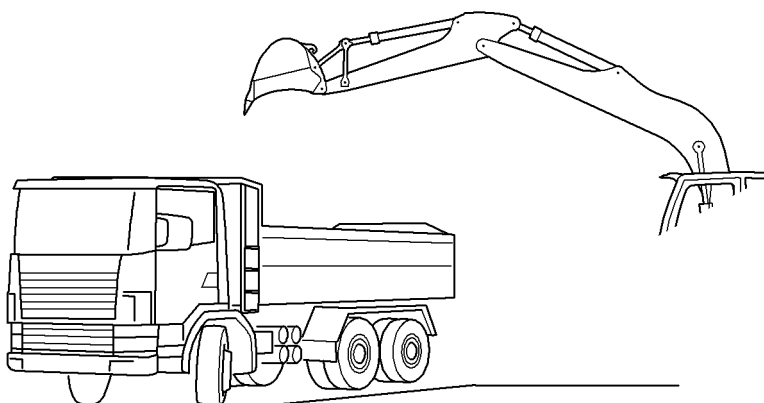


Fig. 182: Loading a transport vehicle

**DANGER**

Falling material!
Fatal or serious injuries, damage.

- ▶ Make sure that no one is in the transport vehicle during the loading process.
- ▶ Do not overload the transport vehicle.
- ▶ Do not swing the working attachment over the operator's cab of the transport vehicle.

- ▶ Do not raise the material unnecessarily: if possible, bring the machine to a raised position relative to the transport vehicle.
- ▶ Position the transport vehicle so that it can either be loaded from the rear or the side.
- ▶ Slew the working attachment over the loading area of the transport vehicle.
- ▶ Distribute the material evenly over the loading area.

3.4.13 Lifting loads

Load-lifting work refers to vertical lifting, transporting and lowering loads with the help of lifting accessories (cable, chain and so on). The assistance of other persons is required in order to attach and release the load. This includes, for example, lifting out and lowering pipes, manhole rings or containers.

**DANGER**

Missing or non-operative safety devices for load-lifting operation!
Death or injuries, falling load, exceeding the permitted load lift or damage to hydraulic cylinders.

- ▶ Only operate the machine in load-lifting work if the prescribed safety devices are present and functional.

In accordance with ISO 20474-5, machines for load-lifting operation must be equipped with the following safety devices:

- **Lifting accessory for safe attachment of a load**
Safe load accessories are regarded as, for example, load lift hooks that are mounted in place of the working tool. Load lift hooks can also be replaced by safety hooks that are welded onto the working tool.
- **Overload warning system**
The overload warning system must indicate to the operator by visible and audible means when the maximum permitted load lift is exceeded.
- **Pipe fracture safety valve on the hoist cylinders and the stick cylinders**
The pipe fracture safety valve must meet the requirements of ISO 8643.
- **Load lift chart in the operator's cab**

If the aforementioned points are not complied with, or not complied with in full, then no loads may be lifted.

3.4.14 Lifting loads with quick coupler

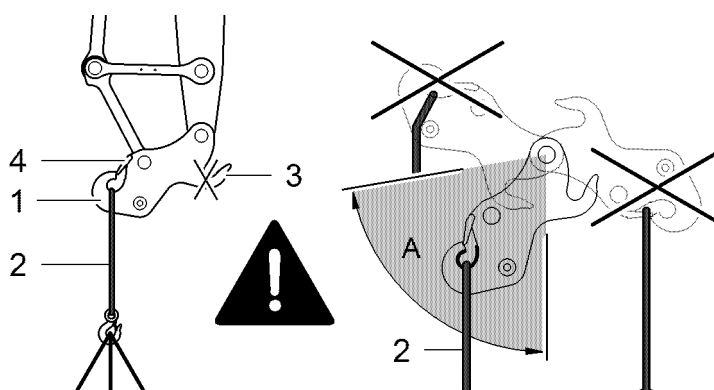


Fig. 183: Lifting loads with quick coupler

- | | | | |
|---|-------------------------------|---|-------------------------|
| 1 | Load hook | 4 | Safety flap |
| 2 | Lifting accessory | A | Permitted slewing range |
| 3 | Pick-up hook for working tool | | |

The quick coupler has two load lift hooks **1** for load-lifting work.

The maximum load capacity value of each load lift hook **1** is specified on the quick coupler.

Preparing load-lifting work

- ▶ Remove working tool from quick coupler and secure it.
- ▶ Fully retract locking pin.
- ▶ Align opening of the load lift hooks **1** upward.
- ▶ Check function of the safety flaps **4**.

Lifting loads



DANGER

Machine tipping over or falling loads!
Danger to life.

- ▶ Make sure that no-one is in danger zone.
 - ▶ Have load-lifting work carried out exclusively by trained personnel.
 - ▶ Exclusively move quick coupler within the permitted slewing range **A**.
-
- ▶ Exclusively attach loads to load lift hooks **1**.
 - ▶ Do not put load on safety flaps **4**.
 - ▶ Observe maximum load lift of the load lift hooks **1**.
 - ▶ Observe load lift chart in the operator's cab.
 - ▶ Lift loads safely.

3.4.15 Lifting loads using working tool with load lift hook

If the working tool is equipped with a load lift hook¹⁵⁾, this allows load lifting work to be performed, for example lifting manhole rings or pipelines. The maximum load lift of the load lift hook is specified on the identification tag.

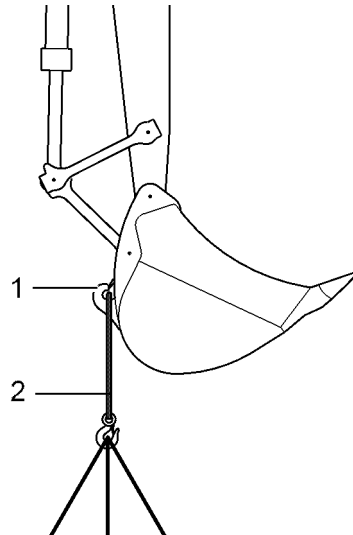


Fig. 184: Load-lifting work with load lift hook

1 Load lift hook

2 Lifting accessories



DANGER

Incorrectly lifted load!

Fatal or serious injuries. Lifted loads falling.

- ▶ Make sure no-one is in the danger zone.
 - ▶ Only personnel who have been trained in lifting loads are allowed to perform this work.
 - ▶ Do not use pick-lift hooks or safety flaps for lifting loads.
 - ▶ Only attach lifting accessories to the load lift hook.
 - ▶ Comply with the notes in the "Lifting loads" chapter.
-
- ▶ Comply with the load lift chart in the operator's cab and the maximum load lift of the load lift hook.
 - ▶ Tilt in the backhoe bucket until the lifting accessory can be securely attached to the load lift hook.
 - ▶ Attach lifting accessories specifically as shown in the illustration.
 - ▶ Make sure that the lifting accessory hangs downwards freely and does not slide or swing over the body of the backhoe bucket.

¹⁵⁾ Option

3.5 Installation and removal of attachment parts

3.5.1 Installing and removing bucket

The affected working tools are:

- Backhoe bucket
- Ditch-cleaning bucket
- Ripper teeth

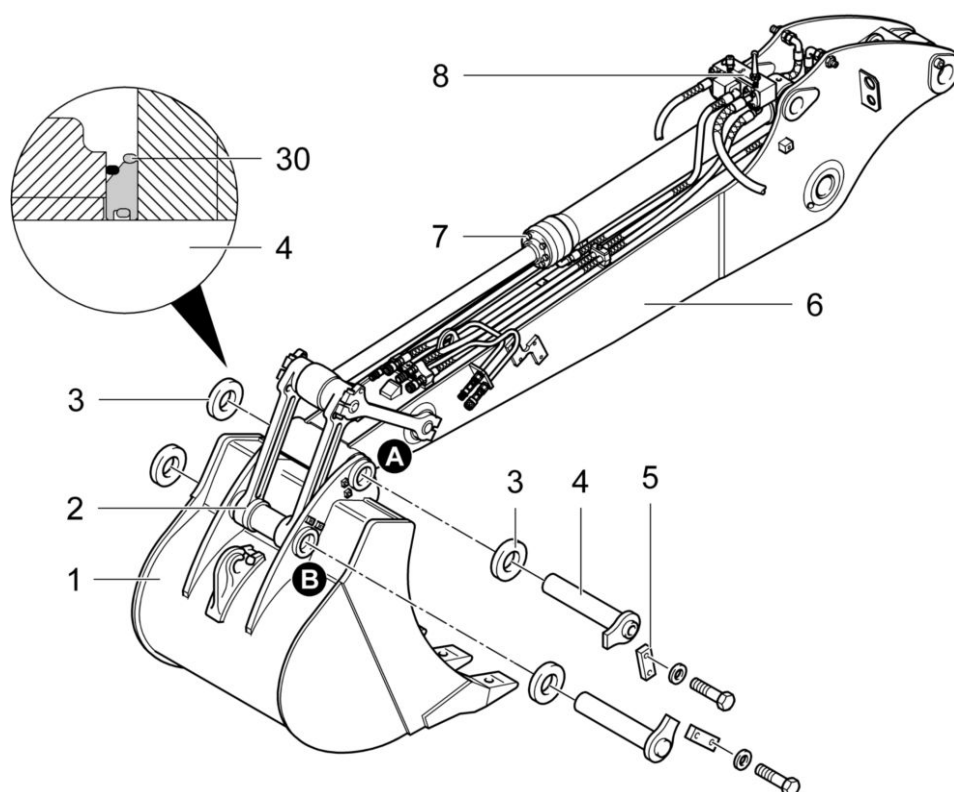


Fig. 185: Installing and removing bucket

- | | | | |
|-----------|-------------------------------|----------|------------------------|
| A | Bearing (stick side) | 4 | Pin |
| B | Bearing (connecting rod side) | 5 | Locking plate |
| 1 | Bucket | 6 | Stick |
| 2 | Connecting rod | 7 | Restrictor check valve |
| 3 | Sealing ring | 8 | Stop cock |
| 30 | O-ring | | |

Make sure the following preconditions are met:

- ☐ Bottom part of bucket **1** is resting fully on ground.

Installing bucket



Note

Buckets can have different weights. Restrictor check valves of the stick cylinder and the bucket cylinder must be adjusted to minimise vibration and impact loads on attachment.

- ▶ Contact Liebherr customer service after installing a new bucket or after first installation.

Make sure the following preconditions are met:

- ☐ Grease used is approved. (For more information see: [5.3.8 Greases, page 166](#))
- ▶ Position attachment so that bearings of the stick **6** are aligned with bearings (stick side) **A** of the bucket **1**.
- ▶ Insert pin **4** and sealing rings **3** in bearings (stick side) **A** of the bucket **1**. Note installation direction of the sealing rings **3**.
- ▶ Push O-rings **30** inwards.
- ▶ Lock pin **4**: Attach locking plate **5**.
- ▶ Position attachment so that hole of the connecting rod **2** is aligned with bearings (connecting rod side) **B** of the bucket **1**.
- ▶ Proceed in the same way as for inserting pin **4** in bearings (stick side) **A** of the bucket **1** in the same way.
- ▶ Lubricate pins **4** via grease fitting until clear grease emerges from bearings.
- ▶ Turn shut-off valves **8** of the attachment to position **0**. This does not apply to machines with Likufix hydraulic coupling or machines without grapple hoses.

Removing bucket

- ▶ Remove locking plate **5**.
- ▶ Pull pins **4** and sealing rings **3** from bearings. If necessary, make it easier to pull the pin **4** out of bearings (stick side) **A** of the bucket **1**: Slightly raise attachment.

3.5.2 Installing and removing bucket with special seal

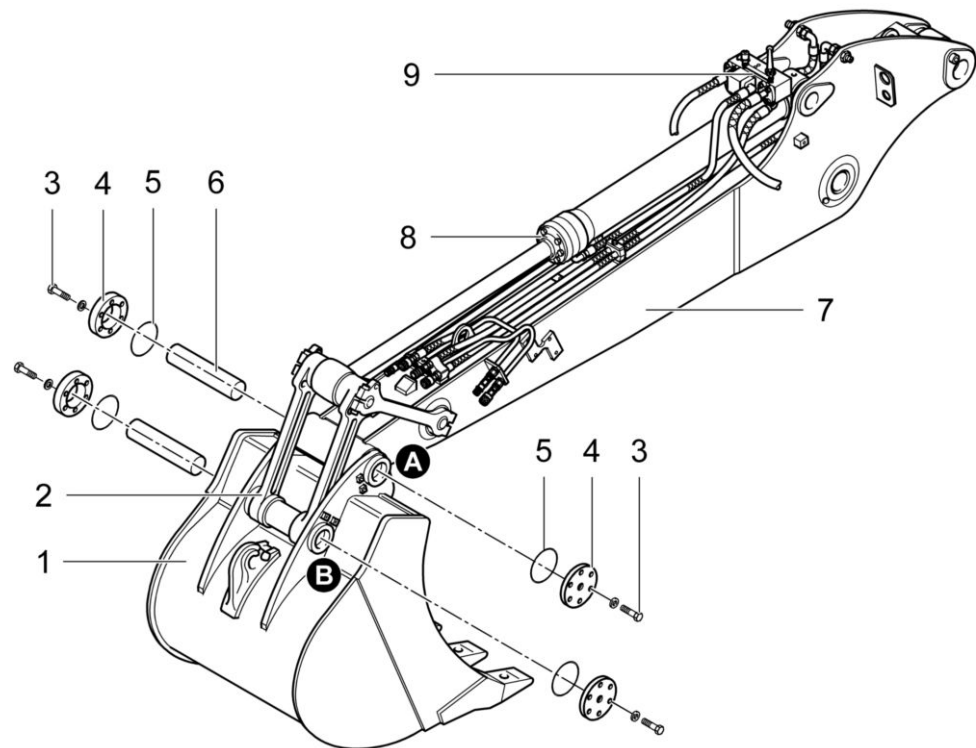


Fig. 186: Installing and removing bucket with special seal

A	Bearing (stick side)	5	O-ring
B	Bearing (connecting rod side)	6	Pin
1	Bucket	7	Stick
2	Connecting rod	8	Restrictor check valve
3	Screw and nut system	9	Stop cock
4	Cover		

Make sure the following preconditions are met:

- ☐ Bottom part of bucket **1** is resting fully on ground.

Installing bucket with special seal



Note

Buckets can have different weights. Restrictor check valves of the stick cylinder and the bucket cylinder must be adjusted to minimise vibration and impact loads on attachment.

- Contact Liebherr customer service after installing a new bucket or after first installation.

Make sure the following preconditions are met:

- ☐ Grease used is approved. (For more information see: 5.3.8 Greases, page 166)
- Position attachment so that bearings of the stick **7** are aligned with bearings (stick side) **A** of the bucket **1**.
- Insert pin **6** and sealing rings in bearings (stick side) **A** of the bucket **1**.
- Insert O-rings **5** and covers **4**.

- ▶ Position attachment so that hole of the connecting rod **2** is aligned with bearings (connecting rod side) **B** of the bucket **1**.
- ▶ Proceed in the same way as with inserting pin **6** in bearings (stick side) **A** of the bucket **1**.
- ▶ Lubricate pins **6** via grease fitting until clear grease emerges from bearings.
- ▶ Turn shut-off valves **9** of the attachment to position **0**. This does not apply to machines with Likufix hydraulic coupling or machines without grapple hoses.

Removing bucket with special seal

- ▶ Remove covers **4** and O-rings **5**.
- ▶ Pull pins **6** out of bearings. If necessary, make it easier to pull the pin **6** out of bearings **A** of the bucket **1**: Slightly raise attachment.

3.5.3 Using quick coupler

- ▶ Follow operator's manual of the quick coupler manufacturer.

3.5.4 Installing and removing grapple on the stick

The installation and removing of a grapple must be performed by two persons.

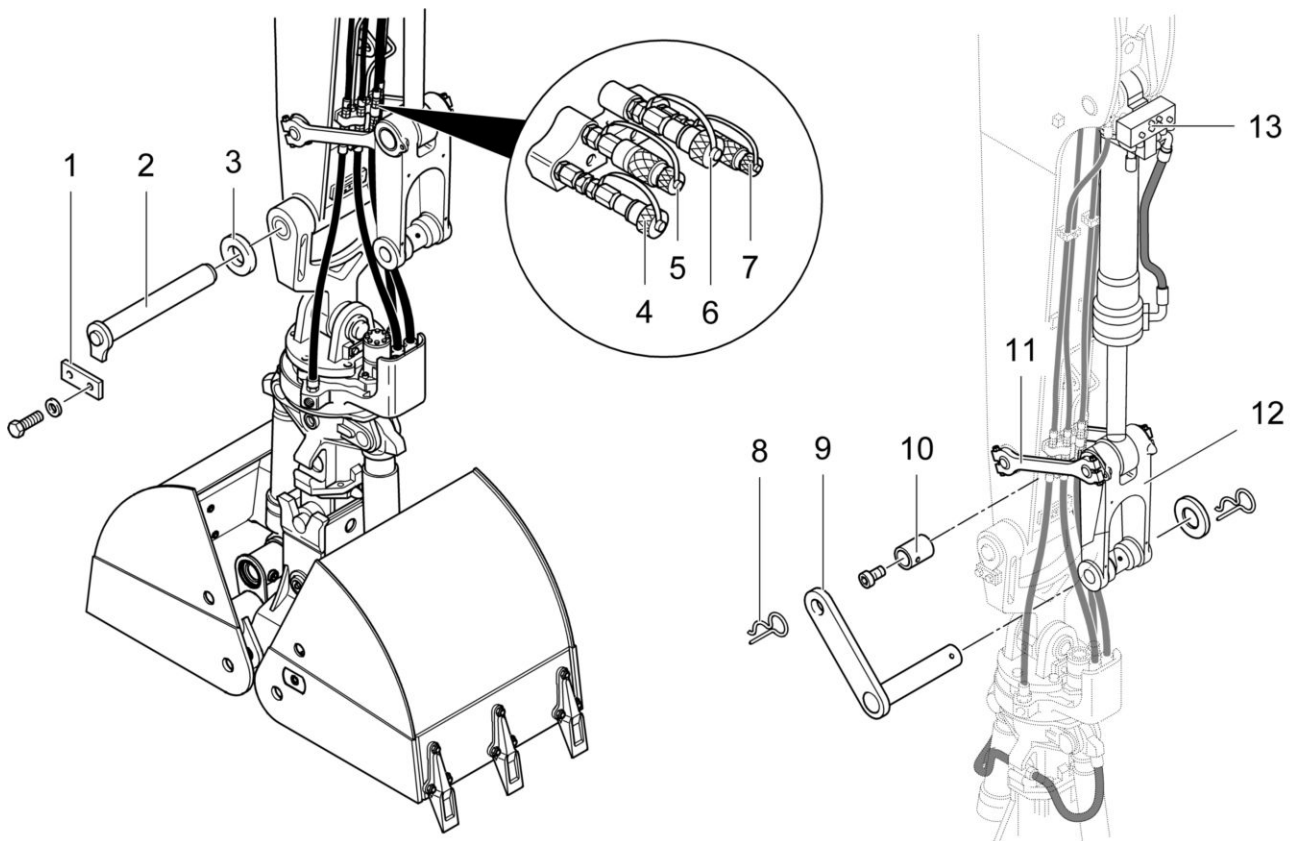


Fig. 187: Installing and removing grapple on the stick

- | | | |
|----------------|---------------------|--------------------------|
| 1 Plate | 6 Connection | 11 Change lever |
| 2 Pin | 7 Connection | 12 Connecting rod |
| 3 Seal | 8 Cotter pin | 13 Stop cock |

See next page for continuation of the image legend

- 4 Connection
- 5 Connection

- 9 Securing pin
- 10 Holder

**DANGER**

Swinging grapple!
Death, injuries, damage.

- ▶ Always keep eye contact with the spotter.

Make sure the following preconditions are met:

- ☐ Hydraulic hoses required for grapple operation are installed on stick.
- ☐ Grapple is on the ground in upright position and with fully opened tines.

Installing grapple on stick

Locking connecting rod

- ▶ Retract bucket cylinder to the stop.
- ▶ Attach holder **10** to the change lever **11**.
- ▶ Insert locking pin **9** into bearing of the connecting rod **12** and into holder **10**.
- ▶ Secure with cotter pins **8** on both sides of the locking pin **9**.

Installing grapple

- ▶ Position attachment so that bearing of the stick is aligned with bearings of the grapple.
- ▶ Insert pin **2** and secure with plate **1**.
- ▶ Depressurise hydraulic system. ([For more information see: 5.9.1 Depressurising hydraulic system, page 188](#))
- ▶ Move safety lever up.
- ▶ Connect hydraulic hoses of the opening cylinders and closing cylinders of the grapple to connection **4** and connection **6**.
- ▶ For grapple with rotary actuator, connect hydraulic hoses of the grapple rotator to connection **5** and connection **7**.
- ▶ Turn shut-off valves **13** of attachment to position **1**. This does not apply to machines with Likufix hydraulic coupling.

Removing grapple

- ▶ Retract bucket cylinder to the stop.
- ▶ Pull locking pin **9** from connecting rod **12**.
- ▶ Depressurise hydraulic system. ([For more information see: 5.9.1 Depressurising hydraulic system, page 188](#))
- ▶ Move safety lever up.
- ▶ Separate hydraulic hoses of the opening cylinders and closing cylinders of the grapple from connection **4** and connection **6**.
- ▶ For grapple with rotary actuator, separate connect hydraulic hoses of the grapple rotator from connection **5** and connection **7**.
- ▶ Prevent penetration by dust: Close all free openings.

- ▶ Wedge grapple.
- ▶ Remove plate **1** and pull pin **2** from bearing. If necessary, make it easier to pull the pin **2** out: Slightly raise attachment.

3.6 Transport

3.6.1 Driving machine onto low-loader

Preparing loading ramp



Fig. 188: Preparing loading ramp

Make sure the following preconditions are met:

- ☐ Loading ramp is clean.
- ☐ Angle of the loading ramp **W** is less than maximum permitted angle of the machine ($W < 15^\circ$).

- Place blocks under loading ramp.

If loading ramp is made of metal:

- Position wooden bars or boards and attach securely.

Driving machine

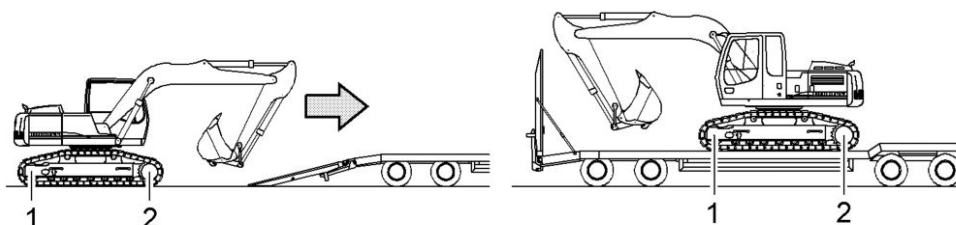


Fig. 189: Driving machine

1 Idler-wheel

2 Sprocket wheel



DANGER

Reverse travel direction!
Death, injuries, damage.

If sprocket wheel **2** is at front of the machine:

- Drive carefully.

Make sure the following preconditions are met:

- ☐ Chains are clean.
- ☐ Low-loader is clean.
- ☐ Third person to instruct driver.
- Place on tear-resistant, non-slip straps with a friction coefficient μ over 0.6 in accordance with standard EN 12195-1 on low-loader platform.
- Position machine with sprocket wheel **2** in the forward travel direction.
- Travel sensitively: Use travel lever.

- ▶ Align machine parallel with the loading ramp.
- ▶ Drive at loading ramp in a straight line without manoeuvring and move machine onto low-loader.

Positioning machine

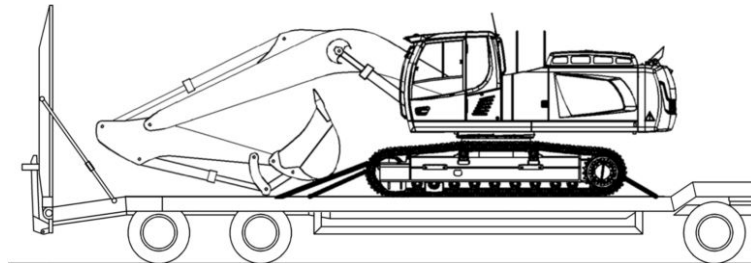


Fig. 190: Positioning machine

- ▶ Swivel uppercarriage by 180°.
- ▶ Lower attachment to low-loader platform.
- ▶ Retract stick to the stop.

Preparing machine

- ▶ Depressurise hydraulic hoses. ([For more information see: 5.9.1 Depressurising hydraulic system, page 188](#))
- ▶ Turn ignition key to position **0**.
- ▶ Pull out ignition key.
- ▶ Move safety lever up.
- ▶ Close and lock all doors, covers and hoods on the machine.

3.6.2 Tying down the machine

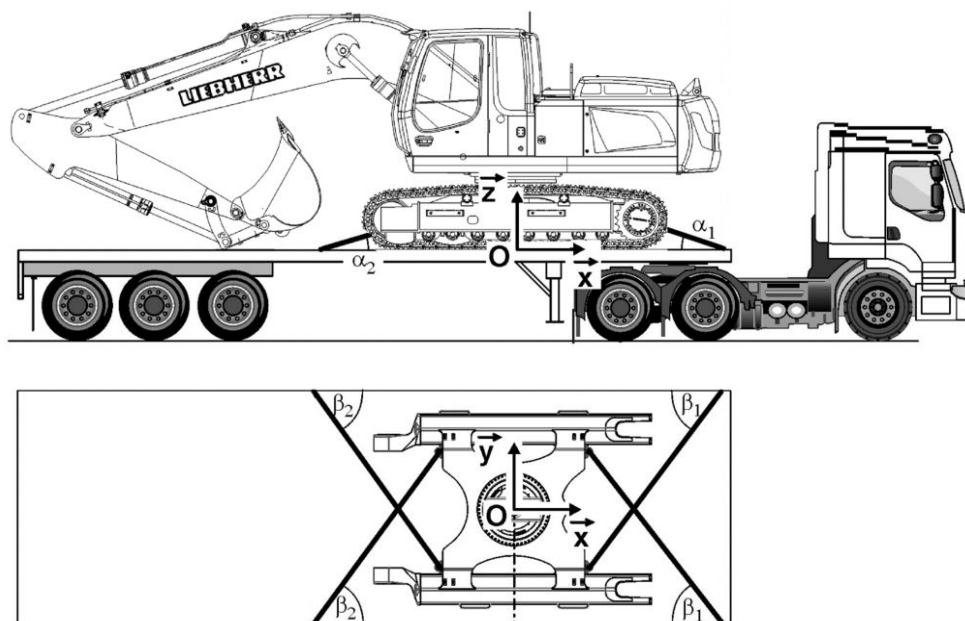


Fig. 191: Tying down the machine

α Angle between lashing chain and horizontal level Oxy

β Angle between lashing chain and vertical level Oxy

Tie-down angle α	Tie-down angle β
$5^\circ < \alpha_1, \alpha_2 < 30^\circ$	$20^\circ < \beta_1, \beta_2 < 60^\circ$

Tab. 15: Tie-down angle



DANGER

Slipping or falling of the machine!
Death, injuries, damage.

- ▶ Tie down the machine and any attached components securely before transport.
- ▶ Avoid metal-on-metal contact: Place on tear-resistant, non-slip straps with a friction coefficient μ over 0.6 in accordance with standard EN 12195-1 on low-loader platform.

Make sure the following preconditions are met:

- ☐ Tie-down chains ensure a lashing capacity of 10000 daN in accordance with standard EN 12195-3.
- ☐ Tie-down angles are observed. (see: tab. 15, page 120)
- ▶ Attach tie-down chains to machine undercarriage and at the tie-down points indicated on the *tie-down point* information sign.
- ▶ Attach tie-down chains crosswise.
- ▶ Attach tie-down chains to tie-down points of low-loader.

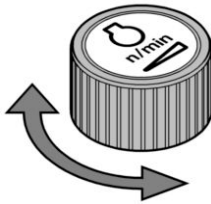


3.7 Emergency operation

3.7.1 Using emergency operation

Exclusively use emergency operation to perform the following measures:

- Starting diesel engine in the event of an electronic error
- Releasing slewing brake
- Forcing all machine movements

Status symbol	Inactive control element		Status
			Diesel engine in idle
			Slewing gear brake released
			Machine movements slowed

Tab. 16: Properties of emergency operation

Using emergency operation

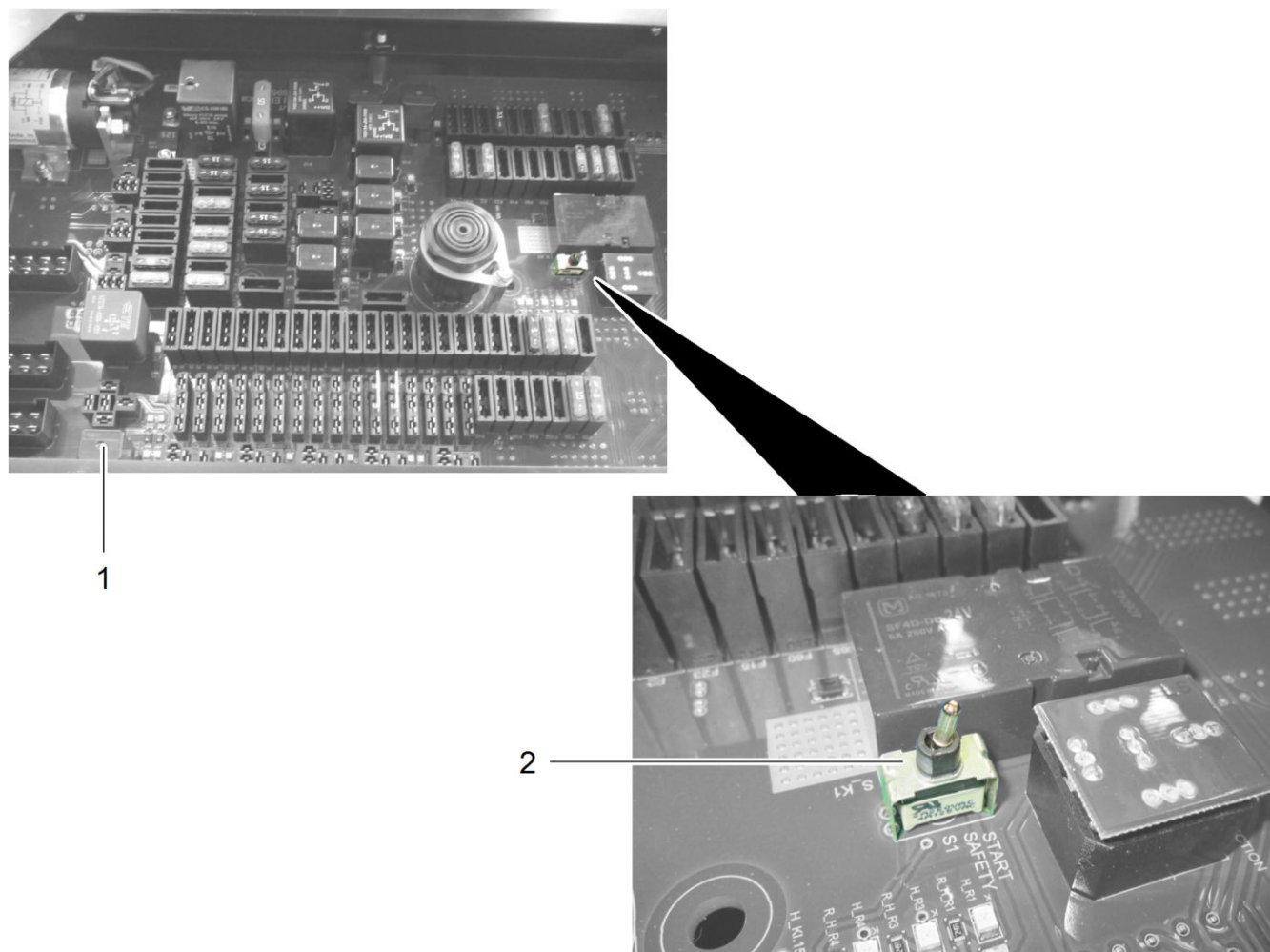


Fig. 199: Main circuit board

1 Main circuit board

2 Switch



DANGER

Slewing brake in emergency operation!
Crushing, impact.

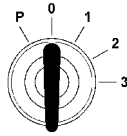
- Make sure that no-one is in danger zone.
- Inform staff that machine is in emergency operation.
- Reduce machine movements to a minimum.
- Have malfunctions that lead to use of emergency operation remedied immediately.



Note

In emergency operation there is no connection between the diesel engine control unit and the machine's electronics.
The display no longer shows any engine error messages from the diesel engine.

- Have malfunctions that lead to use of emergency operation remedied immediately.



Make sure the following preconditions are met:

- ☐ Battery main switch is in the **ON** position.
- ☐ Safety lever is up.

- ▶ Turn ignition key to position **1**.
- ▶ Activate switch **2** of main circuit board **1** behind operator's seat.
- ▶ Turn ignition key to position **3**.
 - ▷ Diesel engine starts.
- ▶ Push down safety lever.
- ▶ Move machine into open area and have malfunctions remedied immediately.

Switching off emergency operation

- ▶ Turn ignition key to position **1**.
- ▶ Move safety lever up.
- ▶ Turn ignition key to position **0**.

3.7.2 Jump start



DANGER

Risk of explosion due to hydrogen escaping from the battery!

- ▶ Wear safety glasses and protective gloves.
- ▶ Remove all sources of ignition. Avoid causing sparks near the battery.
- ▶ Avoid causing sparks near empty batteries.
- ▶ Use jump leads with sufficient diameter.

Connecting the battery

Required material:

- A donor battery
- Two jump leads
- ▶ First jump leads: Connect jump lead to the positive terminal (+) on the flat battery. Connect the other end to the positive terminal (+) on the donor battery.
- ▶ Second starter cable: Connect to negative terminal (-) on the flat battery. Connect the other end to the negative terminal (-) on the donor battery.
- ▶ Start the diesel engine.

Disconnecting the battery

NOTICE

Risk of excessive voltage!

- ▶ Activate attachment components with high electricity consumption (e. g. work headlights, uppercarriage lighting).
- ▶ Run the diesel engine at low idle.

- ▶ Disconnect the jump lead from negative terminal (-) on the donor battery.
Disconnect the jump lead from negative terminal (-) on the flat battery.
- ▶ Disconnect the jump lead from positive terminal (+) on the donor battery.
Disconnect the jump lead from positive terminal (+) on the flat battery.

3.7.3 Central lubrication system (option)

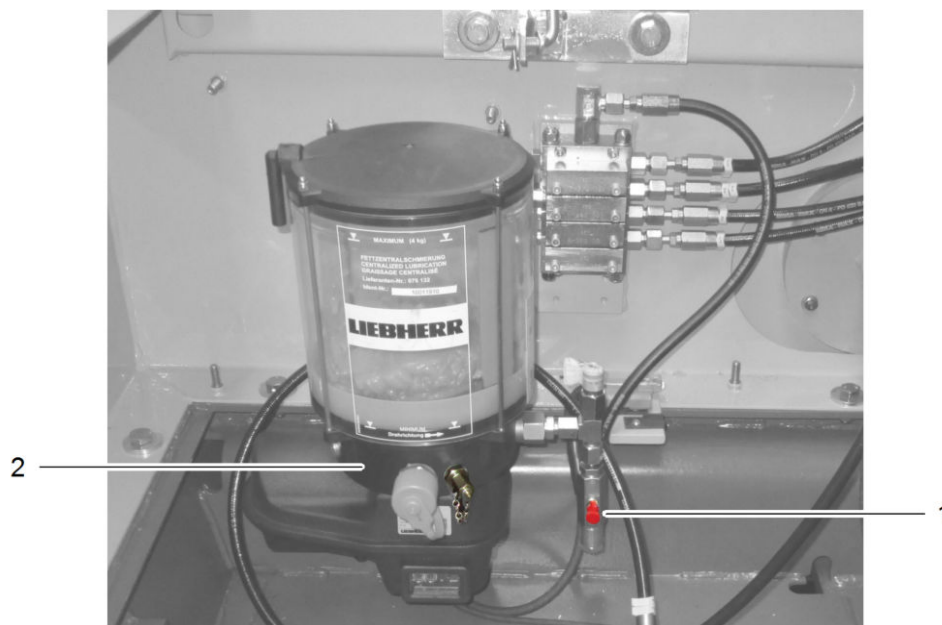


Fig. 201: Central lubrication system

1 Grease fitting

2 Lubricating pump

- ▶ Lubricate all bearings if lubricating pump 2 fails: Once a day or once per shift, fill around 200 cm³ of grease into grease fitting 1.

3.7.4 Towing

Towing the machine

If the diesel engine does not start or if the hydraulic system is defective:

- ▶ Do not tow the machine.
- ▶ Contact Liebherr customer service.

Towing small loads with the machine



DANGER

Risk of injury!

- ▶ Exclusively use a correctly sized towing device in perfect condition.
- ▶ Make sure nobody is in the close vicinity of the towing device.
- ▶ Make sure the current traffic and safety regulations are adhered to.

NOTICE

Risk of damage!

- ▶ Exclusively use the bottom part of the slewing ring.
- ▶ Never use tie-down eyes that are marked with the *tie-down point* information sign.
- ▶ Exclusively tow light loads such as compressors, generators or welding machines.
- ▶ Prevent the towing device from getting tangled.
- ▶ Travel straight ahead to avoid the towing devices touching the chains.

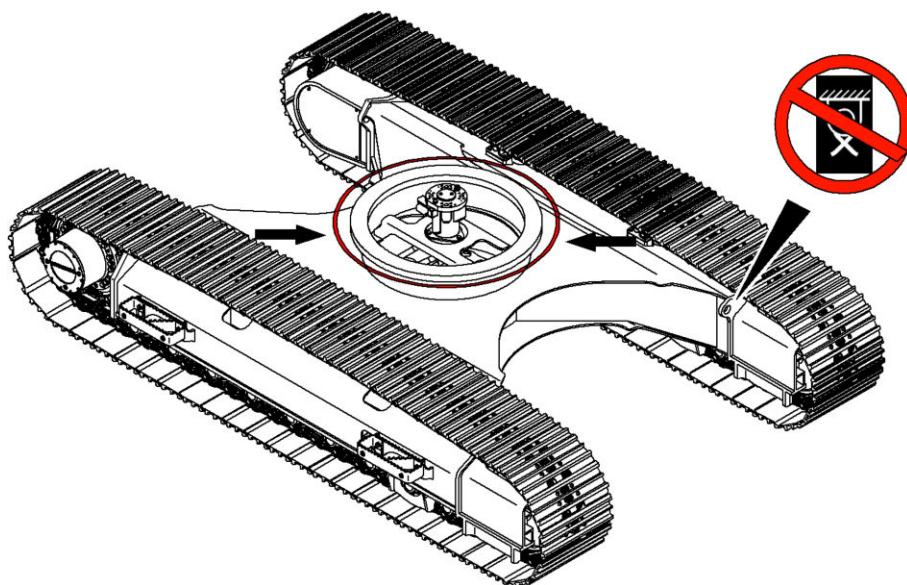


Fig. 202: Lower part of the slewing ring for towing light loads

- ▶ Depending on which towing device is used, install protection between the lower part of the slewing ring and the towing device.
- ▶ Fit the towing device around the lower part of the slewing ring.
- ▶ Move off slowly in order to preload the towing device.
- ▶ Jerk-free travel to the destination.

4 Malfunctions

The indicating unit signals operating faults by means of symbols and messages, possibly in conjunction with a warning sound. The messages facilitate fault diagnosis.

Operating faults are often due to the machine not being operated or maintained correctly.

If there is a fault, re-read the corresponding chapter in the operating manual. Attempt to find the cause of the fault and have it rectified without delay.



Fig. 203



Note

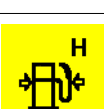
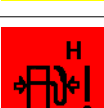
Contact Liebherr customer service if the cause of the operating fault cannot be detected or rectified.

- ▶ Only perform work that you are qualified for or have been instructed in.
- ▶ Describe the operating fault and all associated circumstances as accurately as possible.
- ▶ State the machine type, serial number and year of manufacture.

4.1 Service code tables

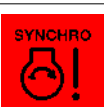
4.1.1 Warning symbols

Warning symbols can be shown in any display menu.

Symbol	Meaning	Effect	Remedy
	Hydraulic oil level too low	Damage to hydraulic system. Automatic reduction of hydraulic power	Shut off diesel engine. Fill with hydraulic oil via collecting pipe. If symbol remains on display: Contact Liebherr customer service.
	Warning threshold: Hydraulic oil temperature too high	Damage to hydraulic system. Automatic reduction of hydraulic power	Shut off diesel engine. Check contamination level of hydraulic oil cooler, clean if necessary. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Hydraulic oil temperature too high		
	Fuel tank almost empty	-	Fill fuel tank.
	Water in fuel pre-filter. Water in fuel tank	Possible malfunction of the diesel engine	Drain water from the fuel pre-filter and fuel tank.
	Warning threshold: Fuel temperature too high	Possible malfunction of the diesel engine. Automatic reduction of diesel engine power	Shut off diesel engine. Clean radiator. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Fuel temperature too high		
	Warning threshold: Fuel pressure in fuel low-pressure circuit too high	Possible malfunction of the diesel engine. Automatic reduction of diesel engine power	Shut off diesel engine. Contact Liebherr customer service.
	Safety threshold: Fuel pressure in fuel low-pressure circuit too high		
	Warning threshold: Fuel pressure in fuel low-pressure circuit too low	Possible malfunction of the diesel engine. Automatic reduction of diesel engine power	Shut off diesel engine. Contact Liebherr customer service.
	Safety threshold: Fuel pressure in fuel low-pressure circuit too low		
	Coolant level too low	Damage to the diesel engine	Shut off diesel engine. Fill with coolant. If symbol remains on display: Contact Liebherr customer service.

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Symbol	Meaning	Effect	Remedy
	Warning threshold: Coolant temperature too high	Damage to the diesel engine. Automatic reduction of diesel engine power	Shut off diesel engine. Reduce load. Fill with coolant. Clean radiator. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Coolant temperature too high		
	Warning threshold: Air filter contaminated. Dust collecting tank full	Damage to the diesel engine. Automatic reduction of diesel engine power	Empty dust collecting tank. Replace main filter cartridge of the air filter.
	Safety threshold: Air filter contaminated. Dust collecting tank full		
	Warning threshold: Charging air temperature too high	Damage to the diesel engine. Automatic reduction of diesel engine power	Clean radiator. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Charging air temperature too high		
	Warning threshold: Engine speed too high	Damage to the diesel engine	Shut off diesel engine. Contact Liebherr customer service.
	Safety threshold: Engine speed too high	Automatic shut-off of the diesel engine	Contact Liebherr customer service.
	Warning threshold: Oil pressure of diesel engine too low	Damage to the diesel engine	Shut off diesel engine. Fill with diesel engine oil. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Oil pressure of diesel engine too low		
	Warning threshold: Oil level of diesel engine too low	Damage to the diesel engine	Shut off diesel engine. Fill with diesel engine oil. If symbol remains on display: Contact Liebherr customer service.
	Safety threshold: Oil level of diesel engine too low		
	Safety threshold: Malfunction of diesel engine in emergency operation	Damage to the diesel engine	Shut off diesel engine. Contact Liebherr customer service.

Symbol	Meaning	Effect	Remedy
	Safety threshold: Diesel engine shut-off triggered by engine control unit. Diesel engine in emergency operation	Damage to the diesel engine	Shut off diesel engine. Contact Liebherr customer service.
	Engine speed sensors defective	Damage to the diesel engine	Shut off diesel engine. Contact Liebherr customer service.
	Voltage for diesel engine control unit too high	Damage to electrical system. Possible malfunction	Shut off diesel engine. Contact Liebherr customer service.
	Voltage for diesel engine control unit too low	Possible malfunction	
	Synchronisation fault during starting of the diesel engine	Automatic shut-off of the diesel engine	Contact Liebherr customer service.
	Diesel engine control unit defective	Automatic shut-off of the diesel engine	Contact Liebherr customer service.
	Fault in the injection system	Automatic shut-off of the diesel engine	Contact Liebherr customer service.
	Grease container empty	Possible bearing damage	Fill grease container.
	Windscreen washer tank empty	Limited windscreen washing	Fill windscreen washer tank.
	Servo pressure switched off	Control of attachment and uppercarriage not possible	Contact Liebherr customer service.
	Parameter setting error in the software	Starting of diesel engine not possible	Contact Liebherr customer service.
	Incorrect combination of machine and attachment parameters	Limited machine function	Contact Liebherr customer service.

Tab. 17: Warning symbols

4.2 Fault - Cause - Remedy

4.2.1 Diesel engine and fuel system

Malfunction / error	Cause	Remedy
Starter does not turn	Main fuse defective	Renew the fuse
	Battery connections loose or corroded	Clean the battery connections and secure them
	Battery voltage too low	Charge or renew the battery
	Starter circuit discontinuity or contact corrosion	Contact Liebherr customer service
	Starter defective	Contact Liebherr customer service
Starter turns slowly	Battery voltage too low	Charge or renew the battery
	Battery connections loose or corroded	Clean loose battery connections and secure them
	Ambient temperature too low	Observe measures for winter operation
Diesel engine does not start or stops again	Fuel tank empty	Refuel; bleed the fuel system
	Fuel fine filter clogged	Renewing the fuel fine filter
	Fuel line, fuel pre-filter or screen plate of the fuel tank clogged	Clean fuel line, fuel pre-filter or screen plate of the fuel tank; bleed the fuel line
	Fuel system or fuel fine filter leaking	Repair leakages and bleed the fuel system
	Air in the fuel system	Bleed the fuel system
	Fuel not resistant to cold	Observe measures for winter operation
	Ambient temperature too low	Comply with the information for starting at low ambient temperatures
	Heating flange defective (at cold temperatures)	Have the heater flange checked and renew it if necessary
Engine has difficulty in starting	Leak or very low pressure in the fuel low pressure circuit	Have a leak test performed
	Diesel engine compression too low	Contact Liebherr customer service
	Heating flange defective (at cold temperatures)	Have the heater flange checked and renew it if necessary
	Failure of the electronics	Read out the error memory of the diesel engine control unit; contact Liebherr customer service

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Malfunction / error	Cause	Remedy
Diesel engine switches off inadvertently	Power supply interrupted	Contact Liebherr customer service
	Leak or very low pressure in the fuel low pressure circuit	Have a leak test performed
	Failure of the electronics	Read out the error memory of the diesel engine control unit; contact Liebherr customer service
Low diesel engine power (reduced power)	Defect in the fuel system (clogged, leaking)	Visual inspection for leaks; renew fuel fine filter; contact Liebherr customer service
	Charging pressure too low	Tighten loose clamps; replace defective seals and hoses; clean air filter; repair turbocharger
	Charge air temperature too high (automatic power reduction by diesel engine control unit)	Clean the intercooler; check the fan power; reduce the ambient temperature; contact Liebherr customer service
	Coolant temperature too high (automatic power reduction by diesel engine control unit)	Check the radiator for cleanliness; check the fan and thermostat; check the coolant level; contact Liebherr customer service
	Fuel temperature too high (automatic power reduction by diesel engine control unit)	Contact Liebherr customer service
	Operational area over 1800 m above sea level	No remedy; power of the diesel engine is automatically reduced.
	Injectors stuck or do not atomize	Contact Liebherr customer service
	Diesel engine compression too low	Contact Liebherr customer service
	Failure of the electronics	Read out the error memory of the diesel engine control unit; contact Liebherr customer service
	Clogged exhaust after-treatment system	Contact Liebherr customer service
Poor diesel engine braking power	Failure of the electronics	Contact Liebherr customer service
Diesel engine becomes too hot (according to the coolant temperature display)	Very low coolant level	Top up coolant
	Radiator contaminated on inside or buildup of limescale; radiator contaminated on outside	Clean or de-lime the radiator
	Thermostat defective	Check the thermostat, renew if necessary; contact Liebherr customer service
	Coolant temperature transmitter defective	Check the transducer, renew if necessary; contact Liebherr customer service
	Fan speed too low (only hydrostatic fan drive)	Check the fan drive, renew if necessary; contact Liebherr customer service

Malfunction / error	Cause	Remedy
Battery charge problem symbol lights up when the diesel engine is running	Belt tension inadequate	Check the belt tension; renew the belt tensioner if necessary.
	Belt cracked	Replace the belt
	Cable connections loose or separated	Affix or replace cable
	Generator, rectifier or controller defective	Contact Liebherr customer service
Black smoke coming from diesel engine	Exhaust after-treatment system defective	Contact Liebherr customer service
Blue exhaust gases	Oil level in diesel engine too high	Correct the oil level
	Engine oil is entering the combustion chamber and being burned	Contact Liebherr customer service
	Compressor-side seal on the exhaust turbocharger defective	Contact Liebherr customer service
	Crankcase ventilation defective	Check the bleeder, renew if necessary
Exhaust gases are white	Start of injection too late	Contact Liebherr customer service
	Heating flange defective (at cold temperatures)	Have the heater flange checked and renew it if necessary
Diesel engine knocking	Combustion is incorrect	Contact Liebherr customer service
Diesel engine pinging	Excessive valve lash	Set the valve clearance
	Injection nozzles damaged or contaminated by carbon deposits	Contact Liebherr customer service
	Bearing damage	Contact Liebherr customer service
	Piston rings worn or broken; pistons seized	Contact Liebherr customer service
Unusual noises	Leakage on induction and exhaust hoses generate whistling noises	Eliminate leakages and change seals if necessary
	Turbine or compressor wheel rubs on the housing; foreign particles in compressor or turbine; bearings of rotating parts seized	Contact Liebherr customer service
Diesel engine oil pressure too low	Oil level in the oil pan too low	Replenish with oil up to the mark on the dipstick
	Oil too thin (oil diluted with fuel)	Drain oil and fill with the prescribed oil
	Oil pressure switch defective	Check the oil pressure and renew the defective oil pressure switch; contact Liebherr customer service
	Oil pressure regulating valve defective or contaminated	Contact Liebherr customer service
	Wear on the bearings leads to excessive play or damaged bearings	Contact Liebherr customer service

Malfunction / error	Cause	Remedy
Engine oil in the cooling system	Oil cooler of the engine or oil cooler housing of the engine leaking	Contact Liebherr customer service
Coolant in the oil of the diesel engine	O-rings of the cylinder liner leaking	Contact Liebherr customer service
	Oil cooler of the diesel engine or oil cooler housing of the diesel engine leaking	Contact Liebherr customer service

4.2.2 Hydraulic system

Malfunction / error	Cause	Remedy
Unusual noises, noise emissions, hydraulic pumps are drawing in air	Stop valve on hydraulic tank closed, hydraulic oil level too low	Shut down the engine immediately, check the stop valve and fill level
Machine is moving too slowly	Selected speed step is too low	Select a higher speed step or a different operating mode
Power modes do not achieve the required performance	Control defective	Contact Liebherr customer service
Hydraulic oil temperature too high	Radiator contaminated	Clean the radiator
	Fan drive defective	Shut down the engine, contact Liebherr customer service
Hydraulic oil level too low	Oil loss, leakage on the hydraulic system	Contact Liebherr customer service
Control elements inoperative	Servo control off, safety lever in the upper position	Switch on the servo control, move the safety lever down
	Brake (slewing gear, travel drive) engaged	Release the brake
	Control defective	Contact Liebherr customer service

4.2.3 Travel gear

Malfunction / error	Cause	Remedy
Oil leak on travel drive, track rollers, carrier rollers or idler	Seal damaged	Contact Liebherr customer service
Track guide defective, track sagging substantially, track jumps off or over	Excessive play in idler guide	Contact Liebherr customer service
	Inadequate track tension	Adjust the track tension
	Idler or sprocket wheel worn	Contact Liebherr customer service
Correctly tensioned track quickly loses tension during operation	Track tensioning cylinder defective	Contact Liebherr customer service
	Lubrication nipple leaking	Contact Liebherr customer service
Travel gear blocked	Travel gear heavily contaminated	Clean the travel gear

4.2.4 Electrical system

Malfunction / error	Cause	Remedy
Charge indicator symbol is displayed after the engine starts	V-belt loose or torn	Tension or change V-belt
	Alternator defective	Contact Liebherr customer service
Batteries are not charged, or not charged sufficiently	Batteries faulty	Renew batteries
	Battery connections loose or corroded	Clean the battery connections and secure them
	Loose or damaged cables	Connect or renew cables
Malfunction of control and indicating elements	Detached or damaged cables, control defective	Contact Liebherr customer service
	Fuse defective	Renew fuse
Engine speed cannot be changed	Sensor-controlled low idle automatic is switched on	Switch off sensor-controlled low idle automatic or touch joystick
Sensor-controlled low idle automatic does not function, engine speed does not drop automatically	Incorrect control signal	Contact Liebherr customer service

4.2.5 Heating, ventilation, air-conditioning unit

Malfunction / error	Cause	Remedy
Heating does not provide warm air.	Stop valves of the heating circuit on the diesel engine are shut.	Contact Liebherr customer service.
	Diesel engine is not at operating temperature.	Bring engine to operating temperature.
Fan is not working.	Power supply is interrupted.	Contact Liebherr customer service.
	Fan motor is defective.	Contact Liebherr customer service.
Air circulation in operator's cab is weak.	Blower output is too low.	Set blower output to a higher level.
	Ventilation flaps are closed.	Open ventilation flaps.
	Cab air filter is contaminated.	Clean air inlets, replace cab air filter.
	Temperature sensor is defective.	Clean air inlets, replace cab air filter.
No fresh air supply exists in operator's cab.	Malfunction in cooling circuit has occurred.	Contact Liebherr customer service.
Unusual operating noise detected.	Compressor is defective.	Contact Liebherr customer service.

4.2.6 Working attachment

Malfunction / error	Cause	Remedy
Hydraulic cylinder yields under load	Piston seal damaged, hydraulic line broken	Contact Liebherr customer service
Excessive bearing play on the working attachment	Bearings worn	Contact Liebherr customer service

Fault - Cause - Remedy

Malfunction / error	Cause	Remedy
Tool attachment cannot be operated	Function is not switched on	Switch function on
	Hydraulic lines are not connected	Connect hydraulic line

4.3 Problem remedy

4.3.1 Fuses and relays

Replacing fuse

A fuse is a safety device which protects components of the electrical system from short circuits, high voltage and faults.

If the electrical system fails, the problem must be identified and solved, and the relevant fuse must be replaced.



WARNING

Fire in electrical system!
Death, injuries, damage.

- ▶ Makes sure all fuses are correctly connected and in good condition.
-



DANGER

Live components of the electrical system!
Death, injuries, damage.

- ▶ Work on the electrical system must be exclusively performed by sufficiently qualified persons.
 - ▶ Make sure electrical system is not live.
-

- ▶ Turn battery main switch to *OFF*.
 - ▶ Disconnect batteries.
 - ▶ Identify cause of power failure.
 - ▶ Repair or replace defective electrical components.
 - ▶ Check condition of fuse.
- or**

If fuse is defective:

Replace fuse with identical fuse of the correct current value.

- ▶ Connect batteries.
- ▶ Turn battery main switch to *ON*.

Main circuit board

The main circuit board is behind the operator's seat.

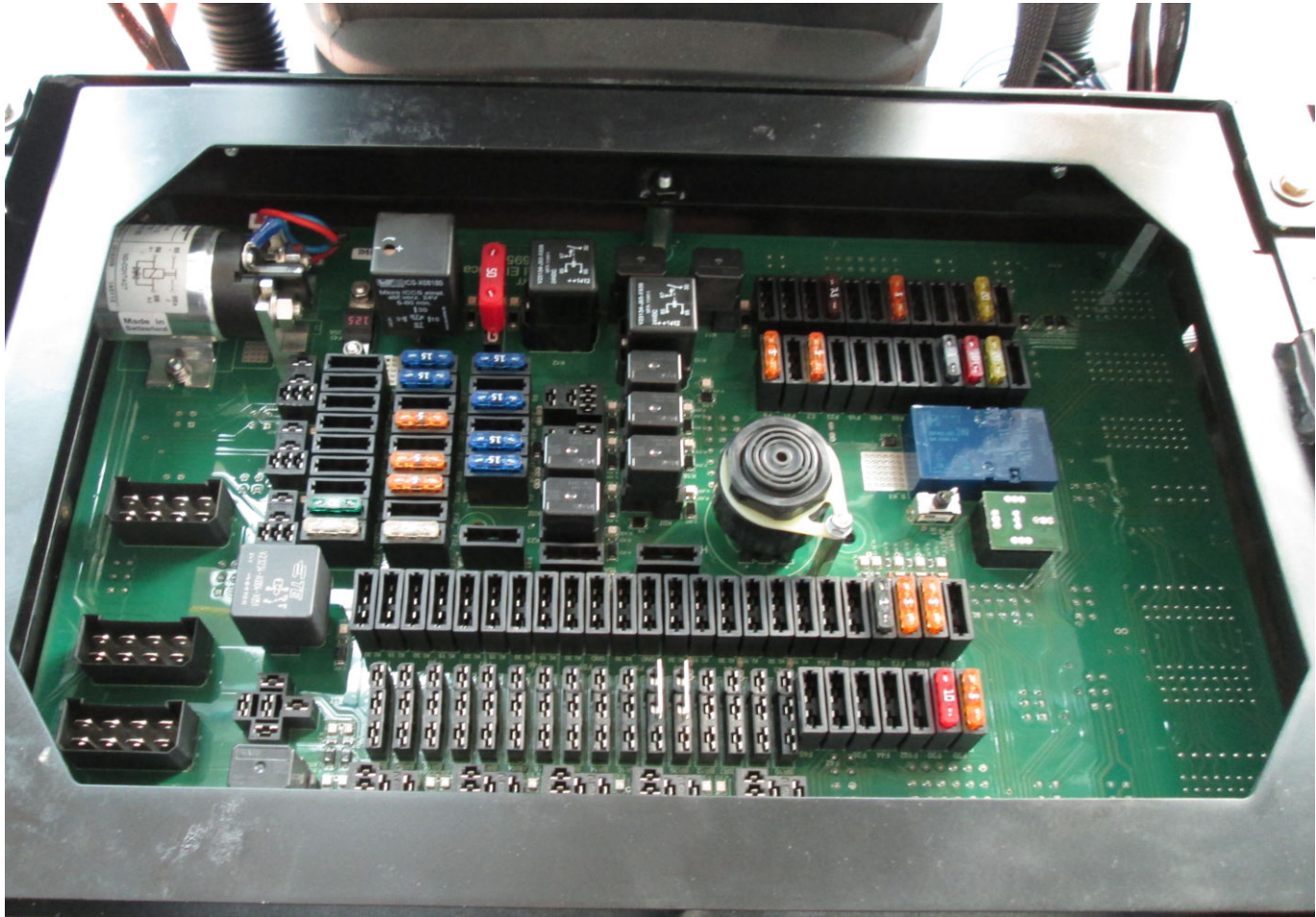


Fig. 241: Main circuit board

	Current value [A]	Function
Fuses on terminal 15 (KL15)		
F2	5	Auxiliary headlight
F8	5	Engine diagnosis
F9	7.5	Electric refuelling pump
F11	15	Diesel engine control lamp
F13	5	GPS
F14	20	Option
F15	1	Option
F16	20	Option
F19	5	Auxiliary heater
F22	5	Emergency shut-off of the diesel engine
F23	5	Camera
F25	20	Option
F28	20	Option
F30	10	Control unit B

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	Current value [A]	Function
F31	10	Operator's seat
F32	1	Option
F33	20	Module A164
F34	1	Module A164
F35	20	Option
F36	7.5	Air conditioning unit
F39	5	Display
F40	10	Master
F42	10	Control unit C
F44	20	Option
F45	15	Travel alarm
F46	15	Reserve
F47	15	Reserve
F48	25	Reserve
F57	5	LITU
F59	1	Sensors for Positive Control
F60	5	Confirmation button
F61	20	Servo control
F62	1	Option
F64	5	Overload warning system
F65	5	Reserve
F67	30	Fuel pre-heating
F71	10	Reserve
F73	5	Sensor B9/B53
F102	5	Option
F104	10	Immobiliser
Fuses on terminal 30 (KL30)		
F1	25	Working attachment headlights
F3	5	Auxiliary headlight
F4	15	Front roof light
F5	15	Rear roof light
F6	15	Front windscreen wiper
F10	20	Electric refuelling pump
F12	15	Reserve
F17	15	Beacon
F18	5	Auxiliary heater
F20	5	GPS

	Current value [A]	Function
F21	30	Engine control unit
F24	10	Horn
F26	15	Radio
F27	15	Starting switch
F29	20	Heating
F37	25	Air conditioning unit
F38	5	Cigarette lighter
F41	10	Master
F43	125	Diesel engine preglowing
F49	15	Front windscreen wiper
F50	15	Reserve
F51	15	Reserve
F52	5	LITU
F53	15	Reserve
F54	15	Reserve
F55	15	Reserve
F56	25	Reserve
F58	5	Travel alarm
F63	50	Emergency operation
F70	5	Warning sound in operator's cab
F72	10	Reserve
F100	15	Auxiliary headlight
F101	15	Auxiliary headlight
F103	10	Immobiliser
Relay		
K01	25	Working attachment headlights
K02	15	Front roof light
K03	15	Rear roof light
K04	15	Front windscreen wiper
K05	15	Reserve
K06	15	Beacon
K07	15	Horn
K08	5	Emergency shut-off of the diesel engine
K09	15	Radio
K10	50	LMD modem
K11	5	LMD modem
K12	50	Emergency operation

	Current value [A]	Function
K13	120	Diesel engine preglowing
K14	15	Travel alarm
K15	15	Reserve
K16	15	Reserve
K17	25	Reserve
K18	15	Windscreen wipers
K19	15	Reserve
K20	15	Reserve
K22	5	LMD modem
K23	5	Warning sound in operator's cab
K100	15	Auxiliary headlight
K101	15	Auxiliary headlight

Tab. 18: Fuses and relays of the main circuit board

Main fuses

The main fuses are under a protective plate behind the left middle side door.

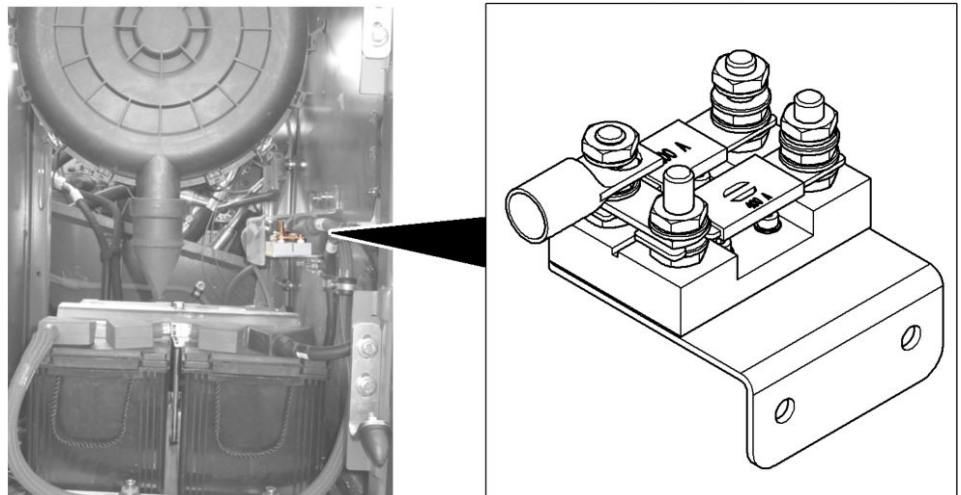


Fig. 242: Main fuses

	Current value [A]	Function
Main fuses		
F156	150	Supply
F157	400	Power supply for starter circuit

Tab. 19: Main fuses

- When replacing main fuses, tighten nut and lock nut to 16 Nm.

5 Maintenance

5.1 Inspection and maintenance schedule

General information

Shorten the maintenance intervals according to the operating conditions, for example:

- Dusty environment
- Oil quality
- Fuel quality

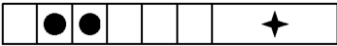
Always make sure lubricants, fuel, other liquids and replaced parts are disposed of in a safe and environmentally acceptable manner. The environmental regulations applicable in the country of use must be adhered to.

Consult the “service package” in the spare parts catalogue. This contains the list of spare parts required for maintenance work.

Abbreviation

h = hours = operating hours

Meaning of symbols

Symbols	Maintenance intervals	Qualification of the personnel
Filled-in symbols: 	- every 8-10 hours - every 50 hours - other intervals	Machine owner or its maintenance personnel
Empty symbols: 	- on handover - every 500 hours - every 1000 hours - every 2000 hours - every 3000 hours - other intervals	Trained personnel authorised by Liebherr

Tab. 20: Meaning of symbols in the maintenance schedule

The “As necessary” symbol is used when a warning symbol appears on the display for this maintenance work.

Inspection and maintenance schedule

Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

Maintenance / inspection after service hours							Tasks to be performed				
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	By maintenance staff ■ Once-only activity ● Repeat interval ✦ If necessary ❄ Annually before the winter	with authorised specialist staff □ Once-only activity ○ Repeat interval ✧ If necessary	Confirm tasks	See page
Complete machine											
☐	●	●	○	○	○			Checking machine for proper condition and tightness.		☐	
	●	●	○	○	○			Lubricating bearings on machine and working attachment.		☐	
			○	○	○	●250h		Checking components for cracks.		☐	
☐			○	○	○			Checking that line and screw connections are firmly seated.		☐	
☐			○	○	○			Counterweight: Checking mounting.		☐	
			○	○	○			Checking and adjusting the primary pressure, secondary pressure and pilot pressure according to the testing and adjustment check-list.		☐	
			○	○	○			Lubricating hinges, locks and gas pressure springs of doors, hoods and windows.		☐	
						❄		Cleaning rubber seals on doors and bonnets, treat with silicone, talcum or deer tallow.		☐	
☐								Informing operator about operator's manual and safety instructions.		☐	
☐								Informing operator about intended use of attachment.		☐	
☐								Informing operator about maintenance and lubrication according to lubrication chart.		☐	
Drive group											
☐	●	●	○	○	○	✦		Diesel engine: Check oil level.		☐	178
	●	●	○	○	○			Diesel engine: Checking condition, tightness and cleanliness.		☐	
			○	○	○			Diesel engine: Checking condition and mounting of the control unit.		☐	
			○	○	○			Diesel engine: Checking condition of sensors and cable connections.		☐	
			○	○	○			Diesel engine: Change oil (at least every 6 months). (For more information see: 5.3.4 Lubricants for the diesel engine, page 155)		☐	
			○	○	○			Diesel engine: Replace oil filter (at least every 6 months).		☐	
			○	○	○	○250h		Diesel engine: Check belt drive and replace belt as required.		☐	
☐			○	○	○			Diesel engine: Checking intake system and exhaust system for damage, mounting and leak tightness.		☐	
			○	○	○			Diesel engine - checking the oil pan and engine mounting for secure fastening		☐	
			○	○	○			Diesel engine: Checking and adjusting valve play.		☐	
			○	○	○			Diesel engine: Check vibration damper for deformation.		☐	

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Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

Maintenance / inspection after service hours							Tasks to be performed				
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	By maintenance staff ■ Once-only activity ● Repeat interval ✦ If necessary ✱ Annually before the winter	with authorised specialist staff □ Once-only activity ○ Repeat interval ◇ If necessary	Confirm tasks	See page
								Additional labelling ‡ Assistance required ⚡ Have this task carried out exclusively by a certified electrician			
			○	○	○			Diesel engine: Check condition of the silent blocks.			
	●	●	○	○	○	✦		Fuel pre-filter: Drain water.			179
		●	○	○	○	✦		Fuel tank: Drain water and sediments.			180
			○	○	○			Fuel system and lubricating oil system: checking for tightness and condition.			
			○	○	○			Fuel pre-filter: Replace filter element (every 6 months or when power is lost).			
			○	○	○			Fuel fine filter: Replace filter element (at least every 6 months).			
						◇		Bleed fuel system.			
□			○	○	○			Fuel tank: Checking mounting.			
		●	○	○	○	✦		Air filter: Emptying dust collecting tank.			180
			○	○	○	✦ ○250h		Air filter: Replace main filter cartridge (at least once per year).			181
					○			Air filter: Replace safety filter cartridge (at least once a year).			
						◇		Air filter and air lines: Check tightness and condition (when replacing filter cartridges).			
Cooling system											
□	●	●	○	○	○	✦		Check coolant level.			183
			○	○	○			Checking cooling system and heating system for tightness and condition.			
					○	✱		Coolant: Checking concentration (at least once a year).			184
					○6000h			Cooling system: Change coolant (at least every 4 years).			
						◇		Greasing cooling system.			
Working hydraulics system											
□		●	○	○	○	✦		Hydraulic tank: Check oil level.			188
			○	○	○			Hydraulic tank: Drain water and sediments.			
□			○	○	○			Hydraulic tank: Checking mounting.			
				○	○			Hydraulic tank: Performing oil analysis (at least once a year). (For more information see: 5.3.6 Hydraulic oils, page 159)			
					○3000h			Hydraulic tank: Change oil. (For more information see: 5.3.6 Hydraulic oils, page 159)			
					○			Hydraulic tank: Replace breather filter.			

Inspection and maintenance schedule

Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

Maintenance / inspection after service hours							Tasks to be performed				
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	By maintenance staff ■ Once-only activity ● Repeat interval ✦ If necessary ✱ Annually before the winter	with authorised specialist staff □ Once-only activity ○ Repeat interval ✧ If necessary	Confirm tasks	See page
☐		☒	☐	☐	☐			Additional labelling ⚠ Assistance required ⚡ Have this task carried out exclusively by a certified electrician			
☐		☒	☐	☐	☐			Return filter: Check and clean magnetic rod (once a week for the first 300 operating hours).			191
			☐	☐	☐	✧		Return filter: Replace filter cartridge (in dust intensive applications every 500 hours and whenever oil in hydraulic tank is changed). (For more information see: 5.3.6 Hydraulic oils, page 159)			
			☐	☐	☐	✧		Return leakage oil filter: Replace filter cartridge (in dust intensive applications every 500 hours and whenever oil in hydraulic tank is changed). (For more information see: 5.3.6 Hydraulic oils, page 159)			
			☐	☐	☐			Control oil unit: Replace filter cartridge.			
			☐	☐	☐			Hydraulic hammer return filter (option): Checking level of contamination and replacing filter cartridge if necessary.			
			☐	☐	☐			Hydraulic components: Checking mounting.			
				☐	☐			Hydraulic components: Checking condition and tightness.			
						○4000h		Hydraulic hoses: Replacing when using synthetic esters (at least every 4 years).			
Electrical system											
☐	☒	☒	☐	☐	☐			Checking warning lights and indicating units when putting into service.			
☐			☐	☐	☐			Checking internal and external lighting of the machine.			
			☐	☐	☐			Batteries: Checking acid density and acid level in the battery cells.			
			☐	☐	☐			Batteries: Checking and cleaning wire terminals and terminal posts.			
			☐	☐	☐			Batteries: Check condition and correct installation of degassing hoses.			
			☐	☐	☐			Rotary connection: Maintaining slip rings (if present) with Cramolin contact spray.			
☐				☐	☐			Checking entire electrical system and its components.			
Travel gear mechanism											
☐			☐	☐	☐			Travel gear mechanism: checking oil level and tightness.			
			☐		☐			Travel gear mechanism: changing the oil (at least every 2 years). In dust-intensive applications or if the travelling proportion is greater than 20 %: change the oil every 1000 hours.			
				☐	☐			Hydraulic motor and travel gearbox: Check mounting.			
				☐	☐			Checking the brake function.			

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Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

Maintenance / inspection after service hours							Tasks to be performed						
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	By maintenance staff	with authorised specialist staff	Confirm tasks	See page		
								■ Once-only activity ● Repeat interval ✦ If necessary ❄ Annually before the winter	□ Once-only activity ○ Repeat interval ✧ If necessary				
								Additional labelling 🚑 Assistance required ⚡ Have this task carried out exclusively by a certified electrician					
Tracked travel gear													
☐	●	●	○	○	○			Checking track tension, tightening if required.					193
		●	○	○	○			Track pads and sprocket wheels: Check mounting.					196
		●	○	○	○			Checking tracks, sprocket wheels, idler-wheels, carrier rollers and track rollers for wear.					
			○	○	○			Checking the condition of track guides.					
			○	○	○			Checking the idlers, carrier rollers, track rollers, and lubrication nipple for tightness.					
			○	○	○			Checking whether steps, catwalks and ladders are present.					
Working attachment													
	●	●	○	○	○			Lubricating working tool.					198
	●	●	○	○	○			Checking the pin connections for secure seating.					
	●	●	○	○	○			Checking the steel structure for cracks.					
		●	○	○	○			Pin bearing: checking for wear.					
		●	○	○	○			Bucket teeth: Checking for wear.					
						✦		Changing bucket teeth with Z system.					199
☐						✧		Checking the overload warning system (option) according to the regulations in force in the country where the machine is used.					
Operator's cab, heating, air conditioning system													
		●	○	○	○	✦		Filling with windscreen washer fluid.					200
				○	○			Heating: Checking tightness.					
						✧		Checking and cleaning the solenoid valve for the hot water feed.					
☐				○	○	❄		Heating: Checking function.					
		●	○	○	○			Switching on air conditioning unit.					200
		●	○	○	○			Clean cab air filter.					200
			○	○	○			Replace filter cassette.					
			○	○	○			Checking and cleaning condenser.					
			○	○	○			Compressor: Checking mounting.					
				○				Checking condition of electrical cables and tightness of plug connections.					
						✧		Checking cold output after starting air conditioning system or after repair.					

Inspection and maintenance schedule

Customer:..... Machine type:..... Serial no.:..... Operating hours:..... Date:.....

Maintenance / inspection after service hours							Tasks to be performed				
On handover	All 8-10 h	All 50 h	All 500 h	All 1000 h	All 2000 h	Other intervals	Additional labelling	By maintenance staff ■ Once-only activity ● Repeat interval ✦ If necessary ✱ Annually before the winter	with authorised specialist staff □ Once-only activity ○ Repeat interval ✧ If necessary	Confirm tasks	See page
								Additional labelling ‡ Assistance required ⚡ Have this task carried out exclusively by a certified electrician			
						✧		Replacing dryer collector unit after opening air conditioning system.			
						✧		Having a refrigeration technician check the function of air flaps, pressure switches and defrost thermostat.			
Lubrication system											
□	●	●	○	○	○	✦		Manually lubricate machine.			203
□		●	○	○	○	✦		Lubrication system: Filling grease.			206
□		●	○	○	○			Checking lubrication of bearings (grease collar).			
□			○	○	○			Check permanent lubrication of the slewing ring.			
□		●	○	○	○			Pipes, hoses and lubricating points: Checking tightness and condition.			
						✧		Checking function of entire system, pumps and control (at least once a year).			
Slewing gear mechanism, slewing ring											
□			○	○	○			Slewing ring, slewing gearbox and slewing gear motor: Checking mounting.			
□		●	○	○	○			Slewing gearbox: Checking oil level.			207
			□	○	○			Slewing gearbox: Changing oil.			
				○	○			Slewing gear brake: Checking function.			
				○	○			Slewing ring: Checking meshing of slewing gear pinion.			

5.2 Filling quantities and lubrication chart

5.2.1 Recommended lubricants

Designation	Recommended lubricant	Symbol	Quantity ¹⁶⁾
Diesel engine	Liebherr Motoroil 10W-40 Liebherr Motoroil 5W-30		26.4 l
Hydraulic system (system content/oil change volume/tank content)	Liebherr Hydraulic Basis 100		330 l/108 l/139 l
	Liebherr Hydraulic HVI		
	Liebherr Hydraulic Plus Arctic		
Slewing gearbox	Liebherr Gear Basic 90 LS		4.6 l
Travel gearbox	Liebherr Gear Basic 90 LS		2 x 4.3 l
Raceways and slewing ring toothing, attachment bearing	Liebherr Universalfett 9900		-

Tab. 21: Recommended lubricants

5.2.2 Recommended fuels and operating fluids

Designation	Recommended fuels and operating fluids	Symbol	Quantity ¹⁷⁾
Fuel tank	Diesel fuel according to specification		593 l
Coolant	Liebherr Antifreeze OS Mix		47 l
	Liebherr Antifreeze OS Concentrate		
Windscreen washer fluid	Windscreen washer fluid	-	8.6 l

Tab. 22: Recommended fuels and operating fluids

¹⁶⁾ Guidance values

¹⁷⁾ Guidance values

5.2.3 Lubrication chart

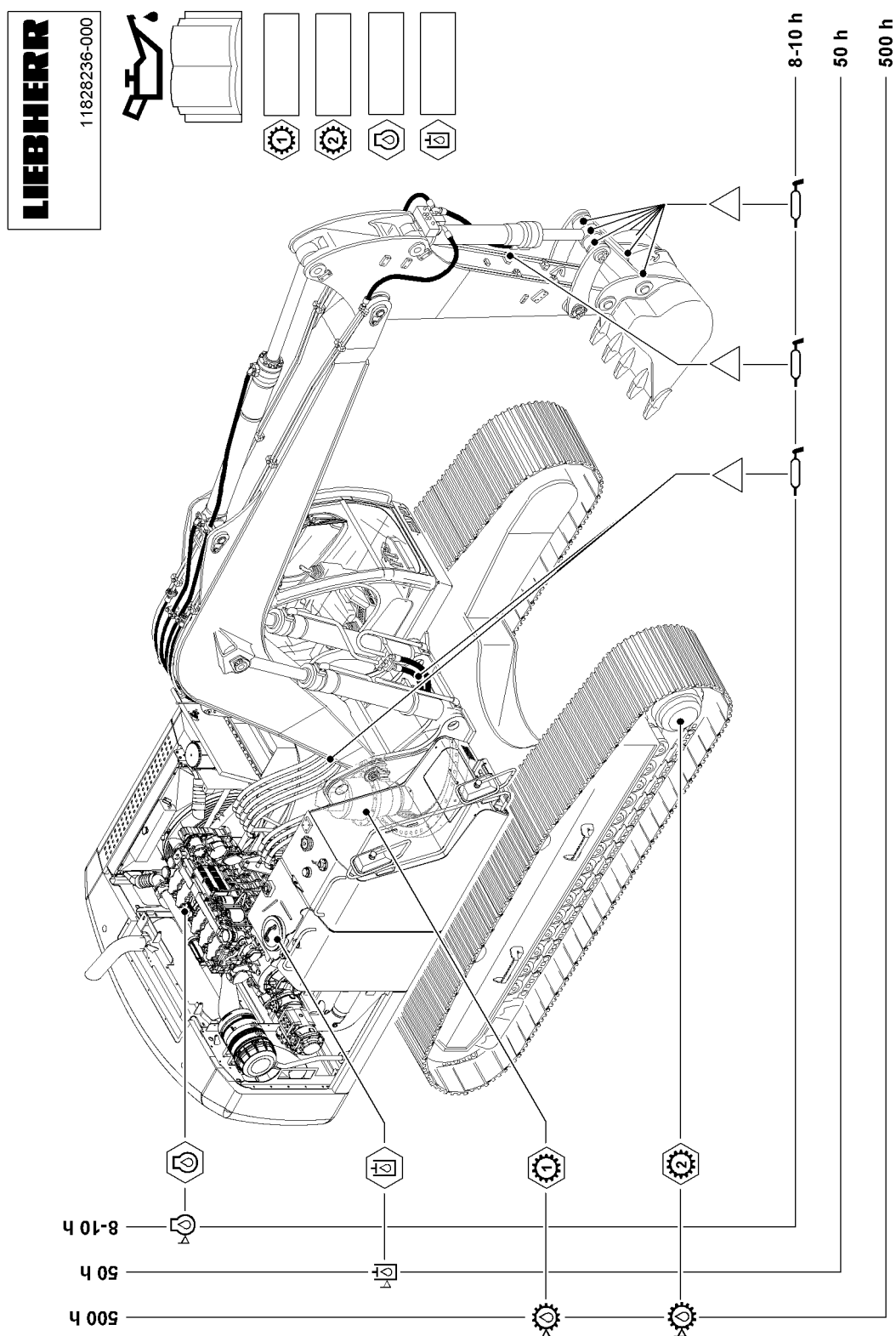


Fig. 252: Lubrication chart for manual lubrication

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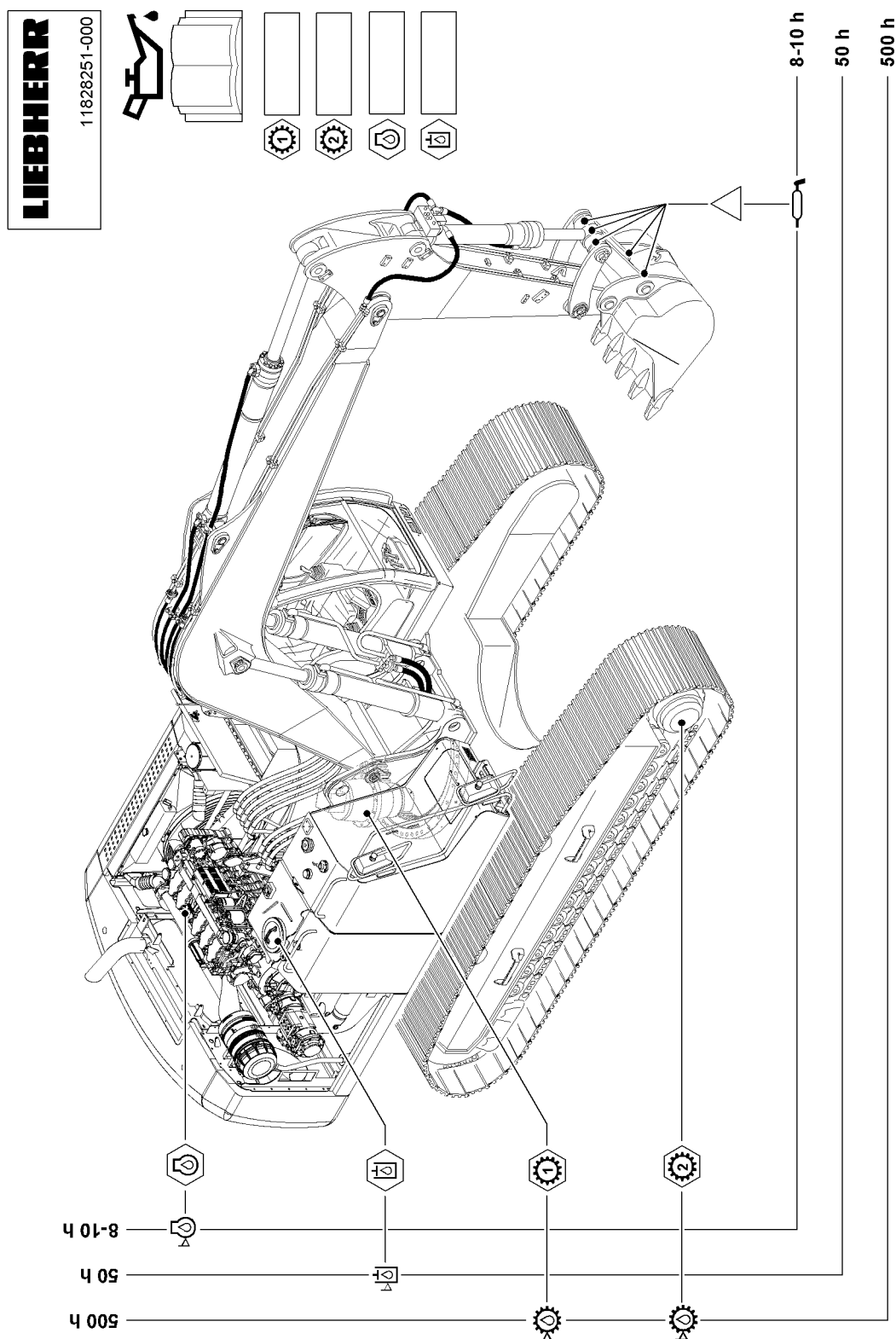


Fig. 253: Lubrication chart for central lubrication system¹⁸⁾

¹⁸⁾ Option

Filling quantities and lubrication chart

Symbol	Meaning
	Hydraulic system
	Check oil level of the hydraulic tank
	Diesel engine
	Check oil level of the diesel engine
	Gearbox
	Check oil level of the gearbox
	Lubricating points
	Lubrication
h	Operating hours
	Observe instructions in the operator's manual

Tab. 23: Key to lubrication chart

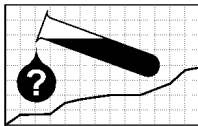
5.3 Fuels, lubricants and operating fluids

5.3.1 General information

Observe the information relating to lubricants and service materials. Lubricate the machine and change the oils within the specified time intervals. For more information refer to: "Lubricating chart" and "Inspection and maintenance schedule". Keep the workplace clean when performing these activities. This increases the reliability and service life of the machine.

- Carry out all work on the machine on level and firm ground.
- Switch off the diesel engine, pull out the starter key and turn off the battery main switch.
- Clean the lubrication nipple before lubricating.
- Clean all filler points including the surrounding area before opening.
- It is recommended to change the oil when it is at operating temperature.
- After each oil change or topping-up, check the fill level in the unit in question (the specified capacities are guidance values).
- Collect used oil and service materials in suitable containers, and dispose of them in an environmentally responsible manner in accordance with the applicable regulations.

5.3.2 Oil analysis



Liebherr recommends having the oils used in the machine analysed at regular intervals.

The oil analysis makes it possible to draw conclusions about the condition of the oil and the progress of wear on the components. Detecting potential damage at an early stage makes it possible to take preventative measures, and increases the availability of the machine.

The analysis of the hydraulic oil, together with the laboratory report, make it possible to determine when to change the hydraulic oil depending on the condition of the oil. The oil change intervals are extended and the oil is changed at the optimum moment. In addition, there is less waste oil to pollute the environment.

Oil analyses must be carried out by authorised specialist personnel according to the inspection and maintenance schedule. If the number of operating hours specified in the inspection and maintenance schedule is not achieved within 2 years: carry out an oil analysis for the identified oil circuits after 2 years at most.

5.3.3 Diesel fuels

Specification



Diesel fuels must meet the minimum requirements of the following fuel specifications.

Approved specifications:

- DIN EN 590
- ASTM D 975 (89a) - 1D and 2D

A confirmation must be provided by the fuel supplier (fuel specification, sulphur content, lubrication properties, cetane number).

Sulphur content, lubrication properties

The following restrictions apply:

- Diesel fuels with a sulphur content of more than 0.5 % (5000 mg/kg) are not approved.
- For use of engine oil with specification E6 and standard oil change intervals (every 500 operating hours): Diesel fuels with a sulphur content of more than 0.0015 % (15 mg/kg) are not approved.
- If exhaust purification systems (particulate filters) are in use: Diesel fuels with a sulphur content of more than 0.0015 % (15 mg/kg) are not approved.
- Diesel engine with external exhaust gas return: Diesel fuels with a sulphur content of more than 0.0015 % (15 mg/kg) are not recommended.

Further information: See oil change intervals depending on difficulty factors.

DIN EN 590 prescribes lubricating properties of the diesel fuel according to HFRR test (lubricity, corrected "wear scar diameter" [wsd 1.4] at 60 °C): maximum 520 µm.

Fuel standard ASTM D 975 does not require the fuels to pass a fuel lubricity test. The required additives should be incorporated by the supplier - as the party responsible for the quality of the fuel.

Cetane number

A cetane number of at least 40 is required for fuels according to ASTM D 975. A cetane number above 45 must be preferred, especially at temperatures below 0 °C.

Low temperatures (winter operation)

Diesel fuel produces paraffin crystals at low outside temperatures, which increase the flow resistance in the fuel filter to such an extent that an adequate fuel supply to the diesel engine is no longer guaranteed.

NOTICE

Incorrect fuel damages the diesel engine. Admixture of paraffin, normal petrol or other substances will cause damage to the injection system!

- ▶ Do not admix paraffin, normal petrol or other additives to the diesel fuel.
- ▶ If the outside temperature falls below -15 °C: Use start-up aid (e.g. fuel filter heating).
- ▶ If the machine is used in an Arctic climate: Use special diesel fuels with adequate flow properties.

Flow improver at low temperatures

Approved flow improvers:

- AutoI TP10
- AVIA Flow Plus
- FLOW Guard
- MB Fließverbesserer A0009892845 - Daimler AG, Stuttgart

Mixing ratio: 1:1000

5.3.4 Lubricants for the diesel engine

Quality



Only high-alloy lubricants are used nowadays in modern diesel engines. They consist of base oils mixed with additives.

The lubricant instruction for Liebherr diesel engines is based on the following specifications and regulations:

Description	Specification
ACEA - classification (Association des Constructeurs Européens de l'Automobile)	E4, E6, E7; notice: use of a particle filter only permissible with E6
API - classification (American Petroleum Institute)	CH-4, CI-4; notice: note the reduced oil change intervals

Tab. 24: Lubricating oil specifications

If Liebherr oils are not available locally, oils compliant with the specification must be used (after checking with customer service).

Viscosity

Lubricating oil viscosity must be selected in accordance with the SAE classification (Society of Automotive Engineers). The SAE class does not provide any information about the quality of a lubricating oil. The SAE class must be determined in accordance with the ambient temperature.

A viscosity that is too high may cause problems with starting. A viscosity that is too low can impair lubrication.

The temperature ranges shown in the diagram are guidelines; these can be exceeded or undercut briefly.

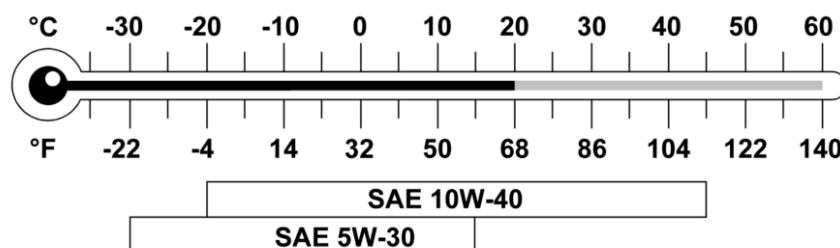


Fig. 266: Temperature-dependent selection of SAE class

The following **diesel engine oil** is recommended for ambient temperatures from -20 °C to 45 °C:

- **Liebherr Motoroil 10W-40**, specification ACEA E4
- **Liebherr Motoroil 10W-40 low ash**, specification ACEA E6

The following diesel engine oil is recommended for ambient temperatures from -30 °C to 15 °C:

- **Liebherr Motoroil 5W-30**, specification ACEA E4
- **Liebherr Motoroil 5W-30 low ash**, specification ACEA E6

Aggravating factors also impact oil change

Change intervals: see the "Inspection and maintenance schedule" chapter

Oil change intervals depend on climatic zone, sulphur content in the fuel and oil quality according to the following table.

Even if the number of operating hours (h) is not reached per year, the lubricant for the diesel engine must be changed at least once a year.

Different **aggravating factors** (difficult operating conditions) affect maintenance intervals.

Possible aggravating factors:

- frequent cold starts
- sulphur content in fuel
- operating temperature

If aggravating factors come into play, the oil and filter changes must be performed as shown in the tables below.

Aggravating factor		Interval acc. to oil quality	
Operating conditions	Sulphur content in the fuel	CH-4, CI-4	E4 / E7 ^{A)}
Normal climate down to -10 °C	up to 0.5%	250 h	500 h
	more than 0.5% up to 1%	125 h	250 h
Climate below -10 °C	up to 0.5%	125 h	250 h
	more than 0.5% up to 1%	not permissible	125 h

Tab. 25: Oil change intervals depending on aggravating factors

A) TBN at least 13 mg KOH/g

Aggravating factor		Interval acc. to oil quality
Operating conditions	Sulphur content in the fuel	E6
Normal climate down to -10 °C	up to 0.005%	500 h
	more than 0.005% up to 0.05%	250 h
	more than 0.0501% up to 0.1%	125 h
Climate below -10 °C	up to 0.005%	250 h
	more than 0.005% up to 0.05%	125 h
	more than 0.0501% up to 0.1%	not permissible

Tab. 26: Oil change intervals depending on aggravating factors

5.3.5 Coolant for the diesel engine

General recommendations



The cooling system only functions reliably if it is operating under pressure. It is therefore essential that it is kept clean and leak-tight, that the radiator cap and service valves function correctly, and that the required coolant level is maintained.

Liebherr-approved anti-freeze and corrosion protection agents guarantee adequate protection against low temperatures, corrosion and cavitation, do not attack seals and hoses, and do not foam.

Coolants containing unsuitable anti-freeze and corrosion protection agents, or coolants that have been prepared inadequately or incorrectly, can cause the failure of aggregates and components in the coolant circuit as a result of cavitation or corrosion damage. In addition, deposits with thermal insulation properties can build up on components that conduct heat, leading to overheating and ultimately to failure of the engine.

Fresh water

Colourless, clear water which is free from mechanical impurities and is suitable for drinking can be used, subject to the following restrictive analysis values.

Sea water, brackish water, brine and industrial process water are not suitable.

Description	Value and unit
Total alkaline earths (water hardness)	0.6 to 3.6 mmol/l (3 to 20 °dH)
pH value at 20 °C	6.5 to 8.5
Chloride ion content	max. 80 mg/l
Sulphate ion content	max. 100 mg/l

Tab. 27: Fresh water quality

Description	Value and unit
Total alkaline earths (water hardness)	0.6 to 2.6 mmol/l (3 to 15 °dH)
pH value at 20 °C	6.5 to 8.0
Chloride ion content	max. 80 mg/l
Sulphate ion content	max. 80 mg/l

Tab. 28: Fresh water quality when using DCA 4²⁰⁾

Results for water analyses can be obtained from the responsible authorities.

²⁰⁾ DCA = Diesel Coolant Additives

Coolant mixing ratio

Ambient temperature up to	Coolant mixing ratio	
	Water	Anti-freeze and corrosion protection agent
-37 °C	50 %	50 %
-50 °C	40 %	60 %

Tab. 29: Mixing ratio

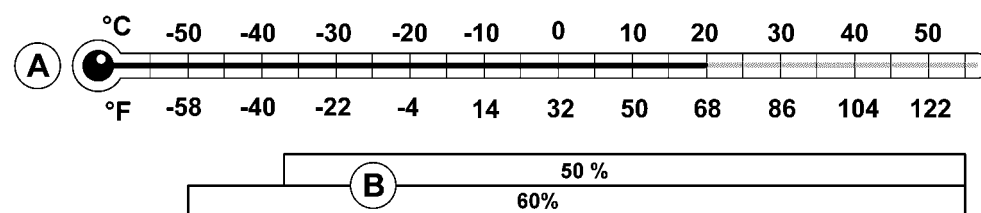


Fig. 268: Temperature-dependent selection of the mixing ratio of water, anti-freeze and corrosion protection agent

A Ambient temperature

B Proportion of anti-freeze and corrosion protection agent in the coolant

The coolant must contain at least 50% anti-freeze and corrosion protection agent all year round.

Approved anti-freeze and corrosion protection agents

NOTICE

Unsuitable mixtures of different anti-freeze and corrosion protection agents! Damage to the diesel engine and the cooling system.

- Exclusively use approved products; do not mix different products.
- Do not mix products containing silicate with those that are silicate-free.

If the Liebherr product is not available locally:

- Contact Liebherr customer service. Use products listed in the "Coolant specification for Liebherr diesel engines".

Type	Description
Concentrate	Liebherr Antifreeze OS Concentrate
Premix ²¹⁾	Liebherr Antifreeze OS Mix

Tab. 30: Approved anti-freeze and corrosion protection agents from Liebherr containing silicate

²¹⁾ Premix = ready mix (50% water and 50% anti-freeze and corrosion protection agent)

Approved corrosion inhibitors (inhibitors) without anti-freeze

NOTICE

Unsuitable mixtures of different corrosion inhibitors!
Damage to the diesel engine and the cooling system.

- ▶ Exclusively use approved products; do not mix different products.
- ▶ Do not mix products containing silicate with those that are silicate-free.

If the Liebherr product is not available locally:

- ▶ Contact Liebherr customer service. Use products listed in the "Coolant specification for Liebherr diesel engines".
-

In exceptional circumstances and with ambient temperatures constantly above the freezing point, for example in the tropics, where it can be demonstrated that no approved anti-freeze and corrosion protection agent is available, the coolant must be made up by mixing water with the following inhibitors:

- Product DCA 4 (Diesel Coolant Additives 4) made by manufacturer Fleetguard / Cummins Filtration

In this case the coolant must be changed annually.

The concentration must be checked during maintenance work and corrected if necessary.

5.3.6 Hydraulic oils

NOTICE

Control problems will arise on the machine when using oils outside their specified operating temperatures!

Risk of accidents due to uncontrollable movements of the working attachment!

- ▶ Only use approved oils according to the application conditions.
-



Oils can be used as hydraulic oil if they comply with the details below.

Maximum water content of the hydraulic oil: < 0.1%

Liebherr hydraulic oil

Liebherr recommends the following hydraulic oils for the machine depending on the temperature range:

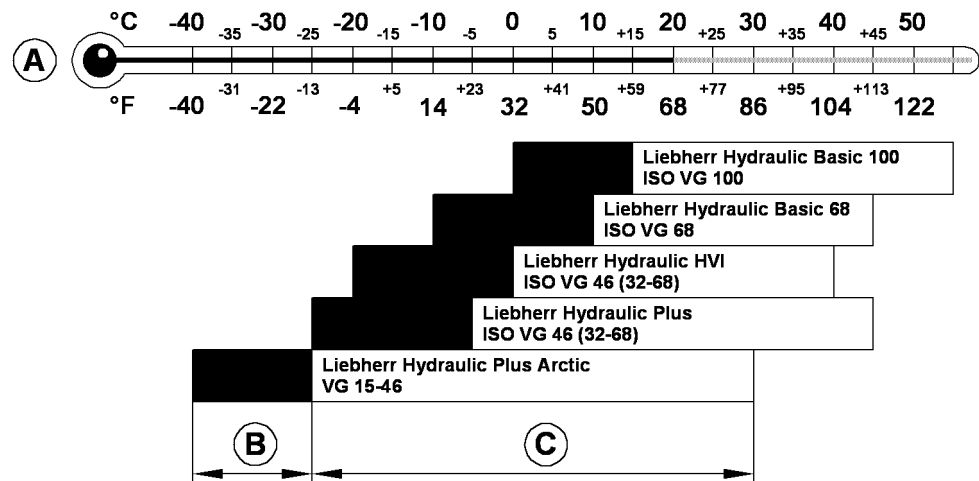


Fig. 270: Liebherr hydraulic oil, selection of viscosity class dependent on temperature

- | | | | |
|----------|--|----------|-----------------|
| A | Ambient temperature | C | Operating range |
| B | Cold start range with prescribed warm-up phase | | |

Liebherr Hydraulic Plus and **Liebherr Hydraulic Plus Arctic** are suitable for both eco-friendly and long-term use.

If it is not possible to obtain Liebherr oils locally, engine oils must be used according to the following paragraph "Engine oil as hydraulic oil", following consultation with the competent customer service.

Engine oil as hydraulic oil

If using engine oils (third-party products), we recommend first checking with the oil manufacturer that the third-party product meets the required specifications indicated below.

Engine oils to be used as hydraulic oil must be selected according to the following specifications:

Single grade oils (1)	API - CD / ACEA - E1
	(MB 226.0 and 227.0)
Multigrade oils (2)	API - CD, CE, CF / ACEA - E2, E3, E4
	(MB 227.5, 228.1, 228.3 and 228.5)

Tab. 31: Classification, engine oil for use as hydraulic oil

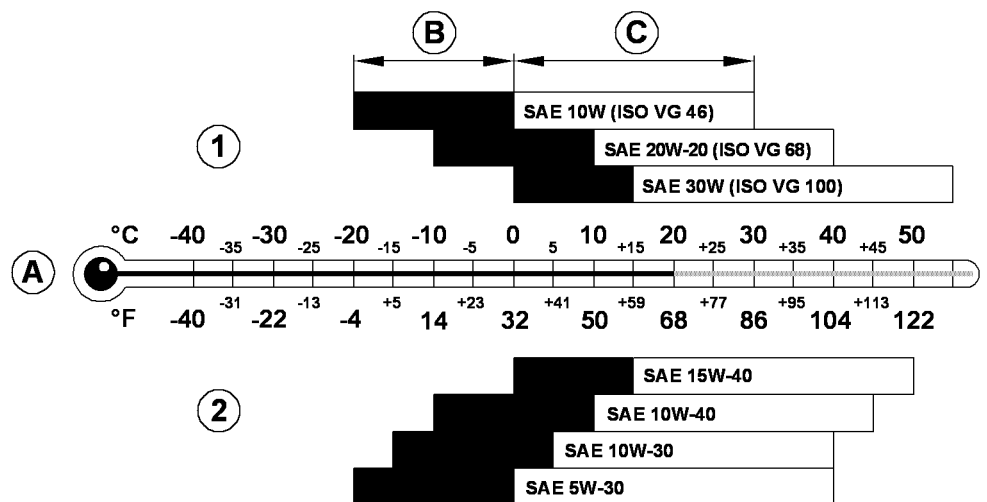


Fig. 271: Engine oil for use as hydraulic oil, temperature-dependent selection of the viscosity class²²⁾

- | | | | |
|----------|--|----------|-------------------|
| A | Ambient temperature | 1 | Single range oils |
| B | Cold start range with prescribed warm-up phase | 2 | Multi-range oils |
| C | Operating range | | |

Warm-up instruction

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

If a cold start is performed at ambient temperatures within range **B**, the following warm-up instruction applies for the hydraulic oil:

1. After starting the diesel engine, set it to average engine speed (half of the maximum engine speed at most).
2. Carefully start operating hydraulic system. Actuate hydraulic cylinder and move it to the stop briefly.
3. Also operate the travel hydraulics after about 5 minutes. The total warming up period is approximately 10 minutes.

If a cold start is performed at even lower ambient temperatures, the following warm-up instruction applies: Pre-heat the hydraulic tank before starting the engine. Then start the warm-up instructions at no. 1.

Biodegradable hydraulic oils

Eco-friendly application means that the use of biodegradable or environmentally friendly hydraulic oil is specified at the location where the machine is used.

NOTICE

Incorrect mixture of hydraulic oils!

Intermixing biodegradable hydraulic oils with an ester base, or mixing such oils with mineral oils can lead to aggressive reactions. This will cause damage to the hydraulic system.

- Do not intermix biodegradable hydraulic oils from different manufacturers and do not mix such oils with mineral oils.

²²⁾ With divergent viscosity class: check with customer service

Liebherr oils

Liebherr recommends the following for the machine depending on the temperature range: **Liebherr Hydraulic Plus** or **Liebherr Hydraulic Plus Arctic**.

Bypass-flow filtering is not mandatory if these hydraulic oils are used.

Third-party oils

If the Liebherr oils cannot be obtained locally, it is only permitted for oils on the basis of completely saturated synthetic esters (Hydraulic Environmental Ester Synthetic, HEES) to be used, following consultation with the responsible customer service.

NOTICE

If using synthetic esters: the hydraulic system will be damaged if operated without bypass filter! If using synthetic esters, bypass filtering is mandatory in order to maintain a water content in the oil of less than 1000 ppm (0.1%).

► Use the bypass filter (option).

When synthetic esters are used, we recommend renewing the hydraulic hoses after 4000 operating hours or four years at most.

Vegetable-based oils are not to be used because of their inappropriate temperature resistance.

Oil change, oil analysis, filter change

Oil change



Note

Liebherr recommends analysing the oil regularly in the course of operation.

► (For more information see: [Oil analysis, page 163](#))

Oil grade	Oil change		
	No eco-friendly application		Eco-friendly application (only permissible with oil analysis ^{A)})
	without oil analysis	with oil analysis ^{A)} (optional)	
Liebherr mineral oil	every 3000 h	every 6000 h	-- ^{C)}
Liebherr Hydraulic HVI			
Liebherr Hydraulic Basic 68			
Liebherr Hydraulic Basic 100			
Liebherr-PAO^{B)}	every 4000 h	every 8000 h	every 8000 h
Liebherr Hydraulic Plus			
Liebherr Hydraulic Plus Arctic			
Third-party product - mineral oil	every 2000 h	every 2000 h	-- ^{C)}

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Oil grade	Oil change		
	No eco-friendly application		Eco-friendly application (only permissible with oil analysis ^{A)})
	without oil analysis	with oil analysis ^{A)} (optional)	
Third-party product - completely saturated synthetic ester	--C)	--C)	every 2000 h

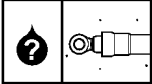
Tab. 32: Oil change intervals

A) If the result of the oil analysis is positive, then the oil may be used for an extended period. If the result of the oil analysis is negative, the oil must be changed immediately

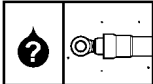
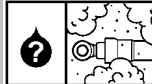
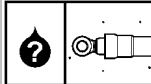
B) PAO = Polyalphaolefin

C) not permissible

Oil analysis

Oil sampling / application condition	
	Oil sampling on machines in normal use
	Oil sampling on machines in dust-intensive operation
The frequency of oil sampling depends on the application conditions. (For more information see: High-dust operating conditions, reduction of soiling, page 164)	

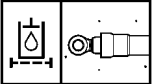
Tab. 33: Legend: oil sampling according to application condition

Oil grade	Oil sampling			
	No eco-friendly application (oil analysis optional)		Eco-friendly application (oil analysis prescribed)	
				
Liebherr mineral oil	every 1000 h	every 250 h	--B)	--B)
Liebherr Hydraulic HVI				
Liebherr Hydraulic Basic 68				
Liebherr Hydraulic Basic 100				
Liebherr-PAO^{A)}	every 1000 h	every 250 h	First at 0 h, then every 1000 h	First at 0 h, then every 250 h
Liebherr Hydraulic Plus				
Liebherr Hydraulic Plus Arctic				
Third-party product - mineral oil	First at 1000 h, then every 500 h	every 250 h	--B)	--B)
Third-party product - completely saturated synthetic ester	--B)	--B)	First at 0 h, then every 500 h	First at 0 h, then every 250 h

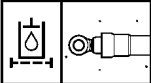
Tab. 34: Oil sampling according to operating condition

- A) PAO = Polyalphaolefin
B) not permissible

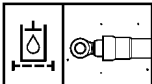
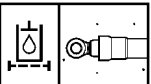
Filter change

Filter change / operating conditions	
	Changing the filter in machines in normal operating conditions
	Changing the filter in machines in high-dust operating conditions
The frequency of filter changes is determined by the operating conditions. (For more information see: High-dust operating conditions, reduction of soiling , page 164)	

Tab. 35: Legend: Filter change according to operating conditions

Return filter renewal (only Liebherr filters are permissible)	
	
every 1000 h	every 500 h

Tab. 36: Filter renewal depending on operating conditions

Change of oil bypass filter			
Liebherr filters		Filter from other manufacturers	
			
every 2,000 h or according to indication		every 500 h	every 250 h

Tab. 37: Filter change according to operating conditions

High-dust operating conditions, reduction of soiling

If the machine is operated generally with a hydraulic hammer or comparable conditions (heavy dust generation), there is a risk that the hydraulic oil becomes contaminated more than usual.

To avoid premature wear to the hydraulic components, it is necessary to reduce the oil change intervals as well as the intervals for taking oil samples.

The following instructions should be noted:

- Filter elements in the return filter must be renewed every 500 operating hours and every time the hydraulic oil is changed.
- The 2 µm breather filter must be renewed every 500 operating hours and every time the hydraulic oil is changed.

A machine equipped ex-works with the hydraulic hammer accessory kit as well as a retrofitted installation kit for hydraulic hammers has 5 µm filter cartridges in the return filter. Bear this in mind when ordering spare parts.

5.3.7 Lubricating oil for gearboxes

Quality

Recommended oil	Specifications
Liebherr Gear Basic 90 LS	API: GL-5
	MIL-L: 2105 D
	ZF: TE-ML 05C, 12C, 16E, 21C
Liebherr Gear Plus 20W-40	API: GL4 requirements
	ZF: TE-ML 05F, 06K, 17E
Liebherr Gear Hypoid 90 EP	API: GL-5
	MIL-L: 2105 B, C, D
	ZF: TE-ML 05A, 12A, 16C, 17B, 19B
Liebherr Hypoid 85W-140 EP	API: GL-5
	MIL-L: 2105 D, PRF-2105 E
	ZF: TE-ML 05A, 07A, 16D, 21A
Liebherr Syntogear Plus 75W-90	API: GL-4, GL-5, MT-1
	MIL-L: 2105 D, PRF-2105 E
	ZF: TE-ML 02B, 05B, 07A, 12B, 16F, 17B, 19C, 21B

Tab. 38: Lubricating oil specifications



Note

Recommended oil not available on site!

► Contact Liebherr customer service.

Viscosity

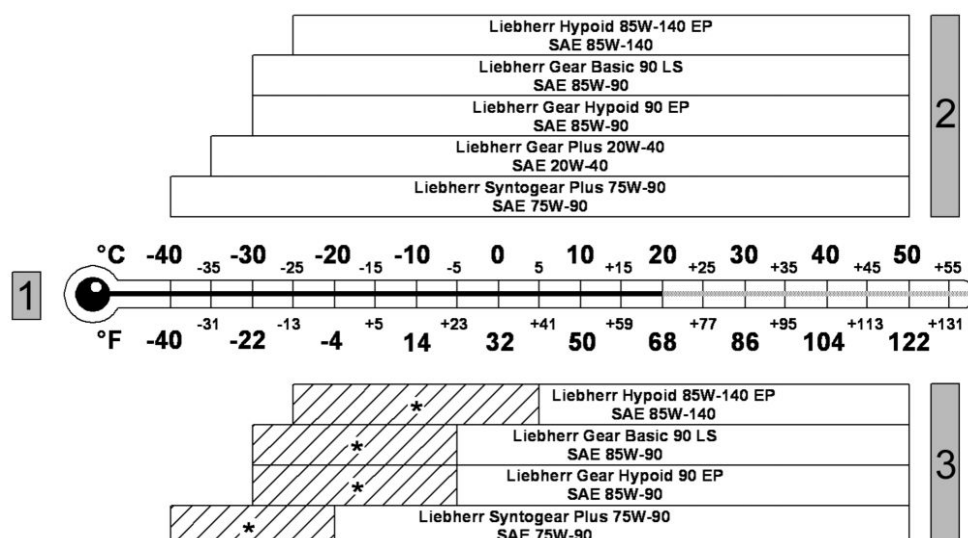


Fig. 286: Choice of SAE classification depends on operating temperature

- 1 Operating temperature
- 2 Use in gearboxes
- 3 Use in pump distributor gears

The oil must correspond to the SAE classification²⁸⁾. The choice of SAE classification is determined by operating temperature 1.

The oil is not suitable for the hatched temperature range if the pump distributor gear has a hydraulic oil cooler.

The temperature ranges are given as a guideline and can be briefly exceeded.

5.3.8 Greases



The grease is used for automatic or manual lubrication of the machine. The grease reaches the lube points via the central lubrication system or lubrication nipples.

Examples:

- Slewing ring bearings
- Sprockets, gears
- Pins, axles and bolts
- Working tools



Note

The grease must have good pumping properties over the entire ambient temperature range!

- Only use approved greases.
- In retrofitted central lubrication systems, comply with the specifications regarding the suitability of greases for pumping.

Minimum quality requirements

Greases must comply with the following minimum quality requirements.

²⁸⁾ Society of Automotive Engineers

Range of applications	Specification	Identification
Standard	Saponified basis (lithium complex)	KP 2 K (DIN 51502)
		NLGI class: 2 (DIN 51818)
		VKA welding force: ≥ 2300 N (DIN 51350 / 4 – ASTM D 2596)
Low temperature	Saponified basis (lithium complex)	KP 1 K (DIN 51502)
		NLGI class: 1 (DIN 51818 / ASTM D 2596)
		VKA welding force: ≥ 2300 N (DIN 51350 / 4 – ASTM D 2596)

Tab. 39

Liebherr grease

Liebherr recommends the following greases in order to achieve optimum lubricating results and to provide additional corrosion protection.

Range of applications	Recommended lubricant	Specification	Identification
Standard	Liebherr Universalfett 9900	Saponified basis (lithium complex)	KPF 2 N - 25 (DIN 51502)
			NLGI class: 2 (DIN 51818)
			VKA welding force: ≥ 5500 N (DIN 51350 / 4)
			with vapour phase corrosion protection
Low temperature	Liebherr Universalfett Arctic	Saponified basis (lithium complex)	KPFHC 1 N - 60 (DIN 51502)
			NLGI class: 1 (DIN 51818)
			VKA welding force: ≥ 5500 N (DIN 51350 / 4)

Tab. 40

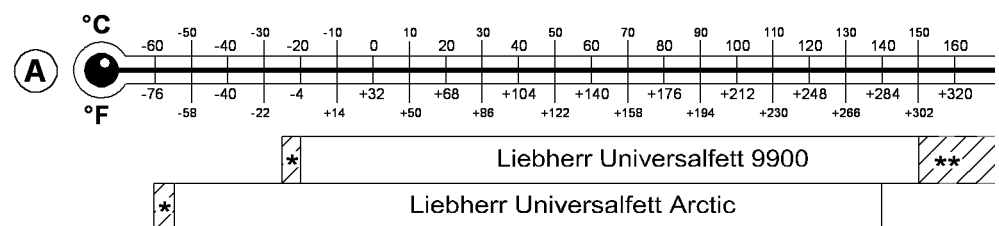


Fig. 288: Usage temperature of Liebherr greases

- A** Temperature of the grease
- **** Intermittent temperature peaks up to max. 200 °C are possible.
- *** Not when used in central lubrication systems

5.3.9 Screenwash

Pure water is not sufficient for use in the windscreen washer system. Use water with a commercially available cleaning additive for windscreen washer systems in

motor vehicles (with antifreeze in winter). Alternative: Mixture of water and denatured alcohol.

5.3.10 Lubricants and care products for electrical and mechanical systems

Medium, application	Product (manufacturer)
Contact spray for slip rings	Cramolin
Lubricant for pistons, piston nuts and piston bearing installation on the hydraulic cylinders	Gleitmo 800
Special corrosion inhibitor for installation spaces of sealing elements on hydraulic cylinders	Rostilo Tarp CFX

Tab. 41: Lubricants and care products

5.4 Access points for maintenance work

5.4.1 Access points on uppercarriage

Overview

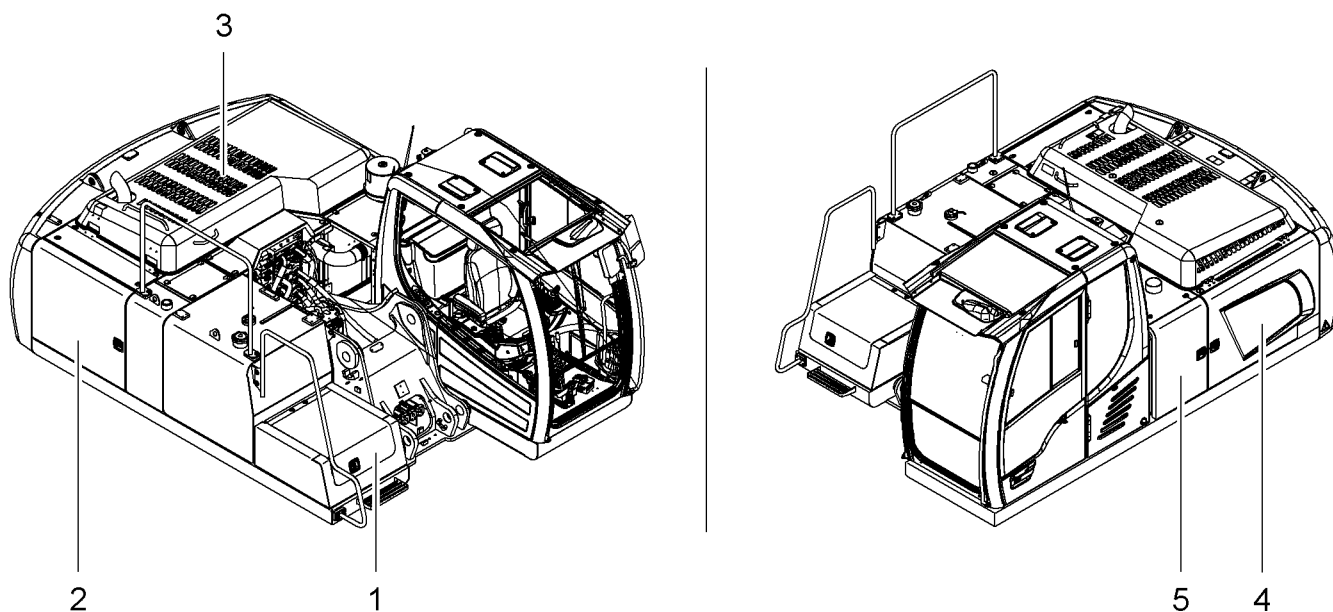


Fig. 289: Access points on uppercarriage

No.	Access point	Access to
1	Door to the fuel tank	Grease container, tool box, storage compartment
2	Right side door	Fuel fine filter, fuel pre-filter, hydraulic pumps, control oil unit
3	Engine bonnet	Diesel engine, radiator, coolant container
4	Side door rear left	Battery main switch, radiator
5	Side door centre left	Air filter, main fuses, batteries

Tab. 42: Access points on uppercarriage

Locking the access points

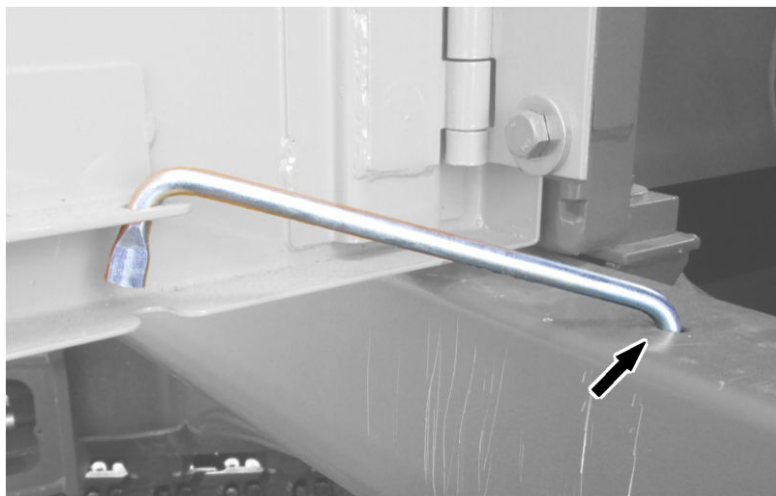


Fig. 290: Locking mechanism



DANGER

Access points may close inadvertently!
Death, injuries, damage.

- ▶ Secure access points with locking mechanism.
- ▶ Completely open access point.
- ▶ Click locking mechanism into place.

5.4.2 Access points under the uppercarriage

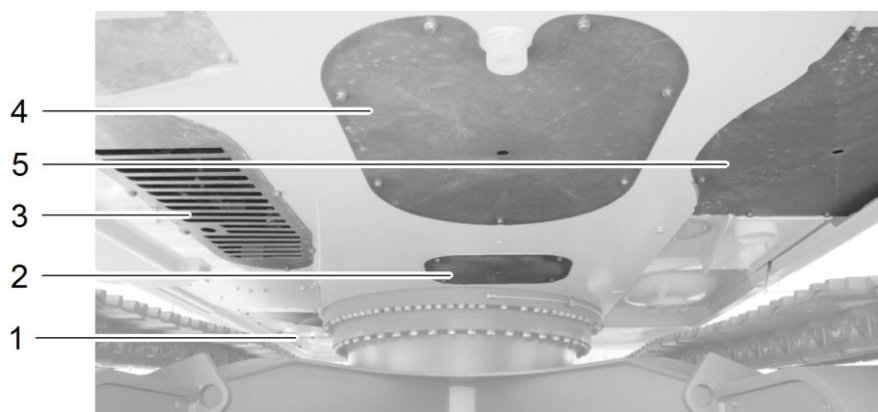


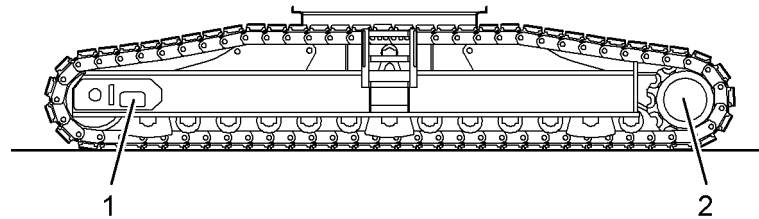
Fig. 291: Access points under the uppercarriage

No.	Access to
1	Hydraulic hoses of the operator's cab
2	Main distributor
3	Radiator drain valve
4	Diesel engine drain valve

No.	Access to
5	Hydraulic pumps

Tab. 43: Access points under the uppercarriage

5.4.3 Access points on the undercarriage

*Fig. 292: Access points on the undercarriage***1** Track tensioner**2** Travel gear

5.5 Safety measures

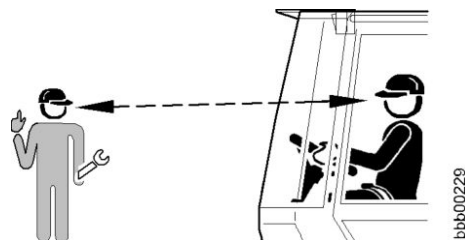


Fig. 293: Eye contact



WARNING

The operator cannot see maintenance personnel!
Fatal injury, crushing.

- ▶ Provide a signal when in the working area of the machine.

- ▶ Always keep maintenance staff in view.



bplk0050

Fig. 294: Personal protective equipment

- ▶ Wear suitable working clothes.
- ▶ Wear the following personal protective equipment:
 - Protective helmet
 - Safety boots
 - Safety glasses
 - Working gloves
- ▶ Block the machine using chocks.
- ▶ Comply with the safety instructions for maintenance and repair.

5.6 General maintenance

5.6.1 Welding

Welding on any main load-bearing or power-transmitting components must only be done by the manufacturer or a dealership authorised by the manufacturer. This applies irrespective of the welding process and the scope of the repair required.

NOTICE

Heating by powerful welding currents!
Bearings and sealing elements can burn.

- ▶ Attach the earth cable of the welding equipment close to the welding point.
 - ▶ Avoid electrical current flowing through electronic components and parts such as the slewing ring, joints, bearings, bushings, rubber elements or seals.
-

Before starting electric welding:

- ▶ Switch off the battery main switch.
- ▶ Disconnect the negative (-) terminal on the battery.
- ▶ Disconnect the electronic components.

After electric welding:

- ▶ Connect the electronic components.
- ▶ Connect the negative (-) terminal on the battery.
- ▶ Switch on the battery main switch.

5.6.2 Bleeding hydraulic cylinders

Cylinders must be bled in following cases:

- After maintenance work on cylinder
- After replacing cylinder
- After maintenance work on hydraulic system for supplying cylinder, for example after replacing a hose

Bleeding hydraulic cylinder with vent plugs

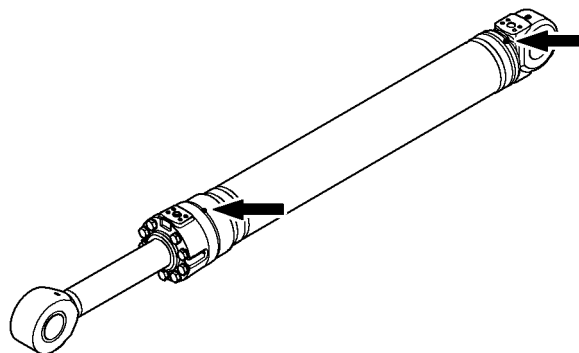


Fig. 295: Vent plugs of cylinder

Make sure the following preconditions are met:

- ❑ Diesel engine is shut off.
- ▶ Unscrew vent plugs of cylinder.
- ▶ Screw on pressure ports in place of vent plugs.
- ▶ Fasten hydraulic hoses to pressure ports.
- ▶ Run diesel engine at idle speed.
- ▶ Position attachment so that the cylinder to be bled is at the stop.
- ▶ Operate carefully and hold cylinder at stop until oil flows out without any air bubbles.
- ▶ Apply same procedure on the other side of the cylinder.
- ▶ Shut off diesel engine.
- ▶ Remove hydraulic hoses and unscrew pressure ports.
- ▶ Screw in vent plugs of cylinder.
- ▶ Follow procedure for bleeding cylinders without vent plugs. (For more information see: [Bleeding hydraulic cylinder without vent plugs, page 174](#))

Bleeding hydraulic cylinder without vent plugs

- ▶ Run diesel engine at idle speed.
- ▶ Carefully extend cylinder to the stop.
- ▶ Carefully retract cylinder again.
- ▶ Repeat this procedure five times.

5.6.3 Applying corrosion protection to piston rods

Applying corrosion protection to piston rods prevents corrosion.

Piston rods are covered with a thin protective film of hydraulic oil when they move into the hydraulic cylinders. This protective film protects the piston rods against corrosion. This protective film may decrease in case of longer downtimes.

Liebherr recommends preventive maintenance of rarely moved hydraulic cylinders.

Recommended corrosion inhibitor: "Liebherr Chrome Protect".

NOTICE

Corrosion!
Damage to the machine.

- ▶ Check the corrosion protection every day.
 - ▶ If required, apply corrosion inhibitor.
-



Note

In maritime areas, corrosion protection with a corrosion inhibitor spray might not be sufficient!

- ▶ Apply a coat of acid-free corrosion protection grease to exposed piston rods.
 - ▶ Remove grease before retracting the piston rods.
-

- ▶ Fully retract all piston rods every day.

- ▷ The piston rods are covered with a thin protective film of hydraulic oil.

If it is not possible to retract all piston rods completely:

- ▶ Apply corrosion inhibitor on the exposed piston rods.
- ▶ As far as possible, park and transport the machine with the piston rods completely retracted into the cylinders.

If it is only possible to park or transport the machine with exposed piston rods:

- ▶ Apply corrosion inhibitor on the exposed piston rods.
- ▶ Check the corrosion protection of the piston rods again after loading or manoeuvring the machine.

If anticipated that despite the machine being used, a hydraulic cylinder has not been moved for a long time:

- ▶ Apply corrosion inhibitor on the exposed piston rods as a precaution.
- ▶ Check the corrosion protection every day on hydraulic cylinders which are not moved regularly.

If there is to be a downtime of more than 4 weeks:

- ▶ Apply corrosion inhibitor to all exposed piston rods.

5.6.4 Cleaning the machine

In the following situations, thoroughly clean machine to remove all traces of contamination and dirt deposits:

- After each work deployment
- Before maintenance work
- Before repair work

NOTICE

Aggressive materials and working environment!
Corrosion damage to machine or impairment of function.

If machine has come into contact with aggressive materials or has been working in an aggressive working environment:

- ▶ Clean machine at end of work.
-

Regular cleaning prevents dirt and foreign particles from penetrating machine.

Clean machine immediately after following deployments:

- Working in salty environments (for example in contact with road salt, or by the sea)
- Working with alkalis or acids
- Working with aggressive materials (for example calcium compounds, cement)

NOTICE

Incorrect cleaning with high pressure water or steam cleaning!
Damage to electrical systems, cables and wire harnesses.

- ▶ Clean electrical systems, cables and wire harnesses with low pressure.
 - ▶ Observe instructions of high pressure cleaner manufacturer.
-

NOTICE

Incorrect cleaning with high pressure water or steam cleaning!
Damage to paint.

- ▶ Do not clean machine with a high pressure cleaner for two months after first putting it into service (or after respraying).
 - ▶ Observe instructions of high pressure cleaner manufacturer.
-

Cleaning outside of machine

Before cleaning

Before cleaning with water or a high-pressure cleaner, perform following activities in order to avoid water penetration.

- ▶ Turn ignition button to position **0**.
- ▶ Lubricate all bearings, pin connections and slewing ring, using central lubrication system, if available.
- ▶ Clean away oil, fuel or care products off connections and fittings.

If sensitive parts behind openings have to be protected from penetrating water:

- ▶ Cover or mask off openings.

Parts particularly at risk are:

- Electric motors
- Electric components
- Switch cabinets
- Plug connections
- Transmitters
- Air filters

Cleaning

- ▶ Use lint-free cleaning cloths.
- ▶ Do not clean machine with aggressive cleaning agents or flammable liquids.
- ▶ Soften up dirt with water.
- ▶ Rinse off softened dirt with water.

If fire warning and extinguishing system is fitted:

- ▶ Make sure that there is no possibility of the temperature sensors coming into contact with hot liquids during cleaning of the engine compartment.

After cleaning

- ▶ Check all fuel lines, engine oil lines and hydraulic lines (leaks, loose connections, chafe marks and damage).
- ▶ Immediately rectify any defects that are detected.
- ▶ Remove water that has penetrated: Lubricate all bearings, pin connections and slewing ring again.
- ▶ If necessary, refresh corrosion protection (inhibitor) on components or surfaces.

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Cleaning inside of operator's cab



Note

Inappropriate cleaning agents!
Damaged plastic surfaces.

- ▶ Clean interior equipment of operator's cab with warm water, without any cleaning additives.

- ▶ Wipe down surfaces with moist, soft cloth.

5.6.5 Cleaning the travel gear

NOTICE

Dirt, ice and trapped foreign materials can block the drive!
Breaking loose a blocked travel gear by using engine power alone can cause damage to the travel gear!

- ▶ Never break frozen or blocked drives loose by exerting force.

If larger foreign particles (for example stones, wood, pieces of metal, cables) are trapped in the tracked travel gear:

- ▶ Remove the foreign materials before commissioning.

If the drive has frozen onto the ground:

- ▶ Carefully heat up the track pads and melt the ice, move off carefully.
- ▶ After shutting down the machine, clean the severely soiled parts of the tracked travel gear.
- ▶ Clean the sliding surfaces of the track tensioners.
- ▶ Park the machine on boards at temperatures below zero, to avoid freezing onto the ground.

5.6.6 Cleaning fan and radiator



DANGER

Moving parts!
Death, injuries, damage.

- ▶ Shut off diesel engine.
- ▶ Wait until all parts have stopped before starting work.
- ▶ Wait until the diesel engine has cooled down before starting work.

- ▶ Clean radiator fins and fan impeller: Blow from the inside of the machine to the outside.

5.7 Drive group

5.7.1 Diesel engine: Bringing into maintenance position

The diesel engine must be in maintenance position for all maintenance tasks except when the description of the work involves different instructions.

Make sure the following preconditions are met:

- ☐ Diesel engine is level.
- ☐ Diesel engine is shut off.
- ☐ Diesel engine has cooled down.
- ☐ Battery main switch is in **OFF** position.

5.7.2 Diesel engine: Checking oil level

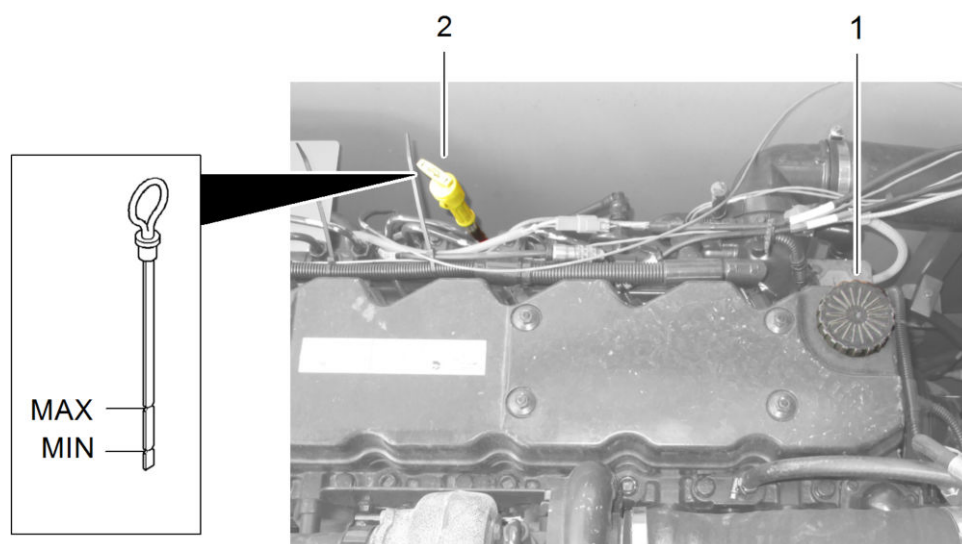


Fig. 296: Diesel engine: Checking oil level

1 Oil filler hole

2 Dipstick



CAUTION

Hot engine oil!
Burns.

- Wear protective gloves.
- Avoid skin contact with hot oil or parts carrying oil.

Make sure the following preconditions are met:

- ☐ Diesel engine is in maintenance position. (For more information see: [5.7.1 Diesel engine: Bringing into maintenance position, page 178](#))

Checking oil level

- Pull out dipstick 2 and wipe with clean lint-free cloth.
- Insert dipstick 2 fully.

- Pull out dipstick **2** again and check that oil level is between *MIN* and *MAX* marks.

If oil level is below *MIN* mark:

- Fill with oil. (For more information see: [Filling with oil, page 179](#))
- Put in dipstick **2**.

Filling with oil

Make sure the following preconditions are met:

- ☐ Approved oil is used. (For more information see: [5.3.4 Lubricants for the diesel engine, page 155](#))
- Take off cover cap from oil filler hole **1**.
- Fill with oil via oil filler hole **1** until oil level is between *MIN* and *MAX* markings.
- Clean cover cap of oil filler hole **1**.
- Put on cover cap of oil filler hole **1**.

5.7.3 Fuel pre-filter: Draining water

The fuel pre-filter is behind the right side door.



Fig. 297: Fuel pre-filter

- 1** Water drain tap



DANGER

Fire! Explosion!
Death, injuries, damage.

- Only work with the diesel engine shut off.
 - Do not smoke.
 - Avoid flames.
-
- Put suitable receptacle under fuel pre-filter.

- ▶ Open water drain tap **1**.
- ▶ Drain water until pure fuel emerges.
- ▶ Close water drain tap **1**.

5.7.4 Fuel tank: Draining water and sediments

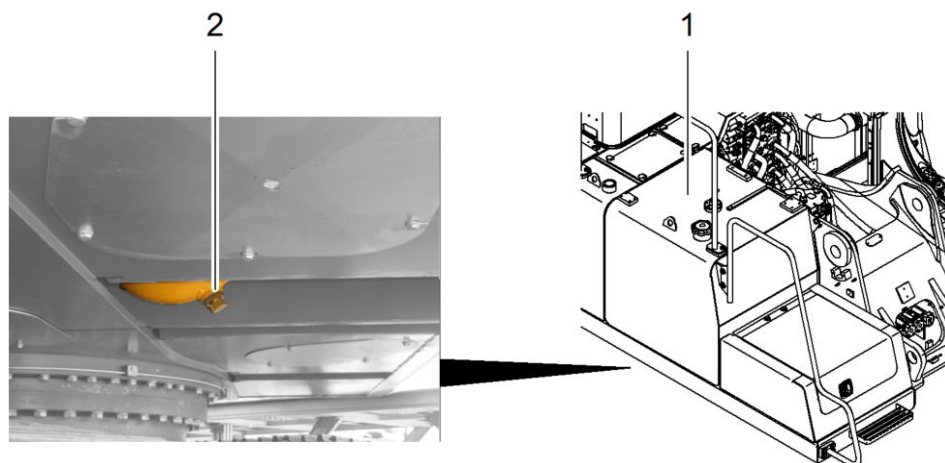


Fig. 298: Fuel tank: Draining water and sediments

1 Fuel tank

2 Drain screw



DANGER

Fire! Explosion!
Death, injuries, damage.

- ▶ Only work with the diesel engine shut off.
 - ▶ Do not smoke.
 - ▶ Avoid flames.
-
- ▶ Place suitable receptacle under drain screw **2** below fuel tank **1**.
 - ▶ Unscrew drain screw **2**.
 - ▶ Drain water and sediments until clean fuel escapes.
 - ▶ Tighten drain screw **2**.

5.7.5 Air filter: Emptying dust collecting tank

Some of the dust drawn in is separated in the air filter housing and falls into the dust collecting tank before the dust reaches the filter cartridge.



Fig. 299: Dust dump valve on air filter housing

- ▶ Hold a suitable container under the dust dump valve.
- ▶ Press the dust dump valve together by hand so that the slit on its underside opens.

5.7.6 Air filter: Replacing main filter cartridge

The cab air filter filters the intaken combustion air and protects the diesel engine from wear through dust particles.

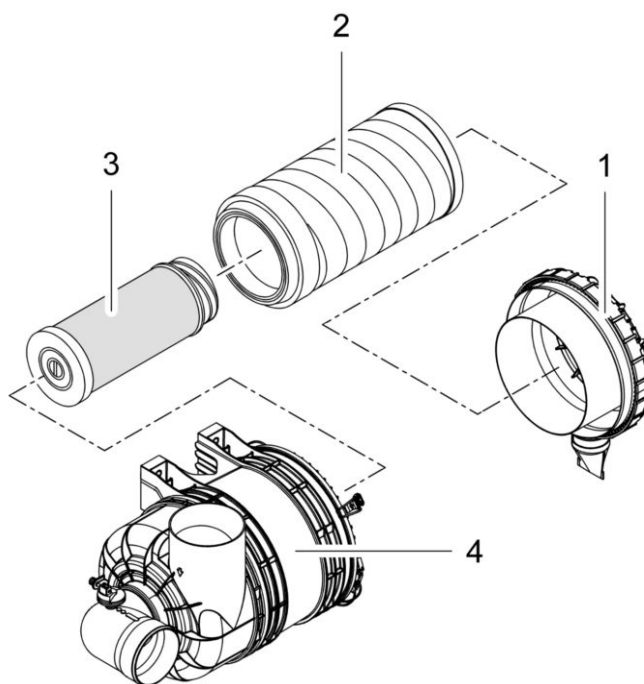


Fig. 300: Air filter

- | | | | |
|---|-----------------------|---|-------------------------|
| 1 | Cover | 3 | Safety filter cartridge |
| 2 | Main filter cartridge | 4 | Filter housing |

NOTICE

Cleaning with compressed air!
Damage to air filter.

- ▶ Do not clean inside of filter housing **4** with compressed air.
-

Make sure the following preconditions are met:

- ☐ Diesel engine is shut off.
- ▶ Remove cover **1**.
- ▶ Remove main filter cartridge **2**.
- ▶ Clean inside of the filter housing **4**, seal and sealing surfaces with a damp, lint-free cloth.
- ▶ Insert new main filter cartridge **2**.
- ▶ Make sure that new main filter cartridge **2** is correctly flush with sealing surfaces.
- ▶ Put on cover **1**.

5.8 Cooling system

5.8.1 Checking coolant level

Filling with coolant

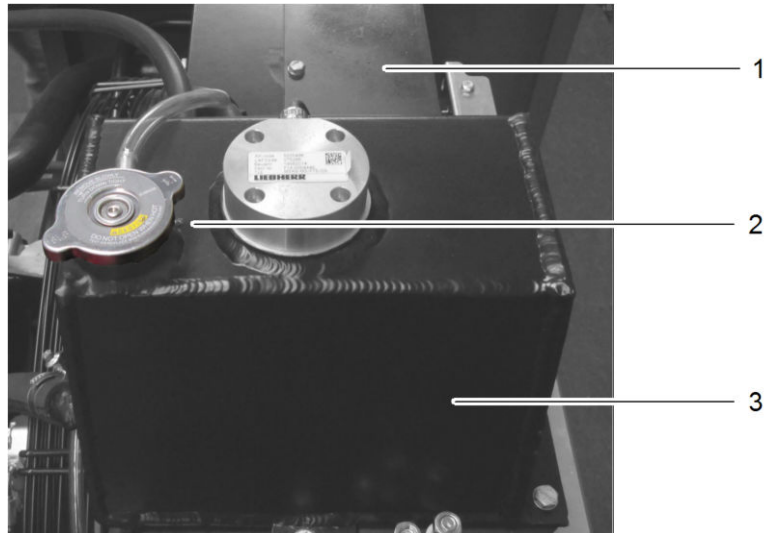


Fig. 301: Filling with coolant

- 1 Radiator
2 Filler cap

- 3 Coolant container



DANGER

Hot surfaces! Hot coolant spraying out!
Severe burns.

- ▶ Wear protective gloves and safety glasses.
- ▶ Do not touch parts carrying coolant.



CAUTION

Corrosive coolant!
Allergic reactions.

- ▶ Avoid skin contact with coolant.
- ▶ Thoroughly rinse with water if skin comes into contact with coolant.

Make sure the following preconditions are met:

- ☐ Diesel engine has cooled down.
- ☐ Filler cap 2 is cold.
- ☐ Approved coolant is used for filling.
- ▶ Relieve any excess pressure: Unscrew filler cap 2 by half a turn.
- ▶ Slowly and completely unscrew filler cap 2.
- ▶ Fill coolant container 3 up to rim.
- ▶ Screw in filler cap 2.

5.8.2 Coolant: Checking concentration

Checking concentration of anti-freeze and corrosion protection agent in coolant

Checking temperature of anti-freeze and corrosion protection agent

- ▶ Take coolant sample.
- ▶ Use a suitable method to test whether the temperature of the applicable is -37 °C.

If the temperature of the anti-freeze and corrosion protection agent is higher than -37 °C:

- ▶ Correct concentration of anti-freeze and corrosion protection agent. ([For more information see: Correcting concentration of anti-freeze and corrosion protection agent, page 185](#))

Correcting concentration of anti-freeze and corrosion protection agent

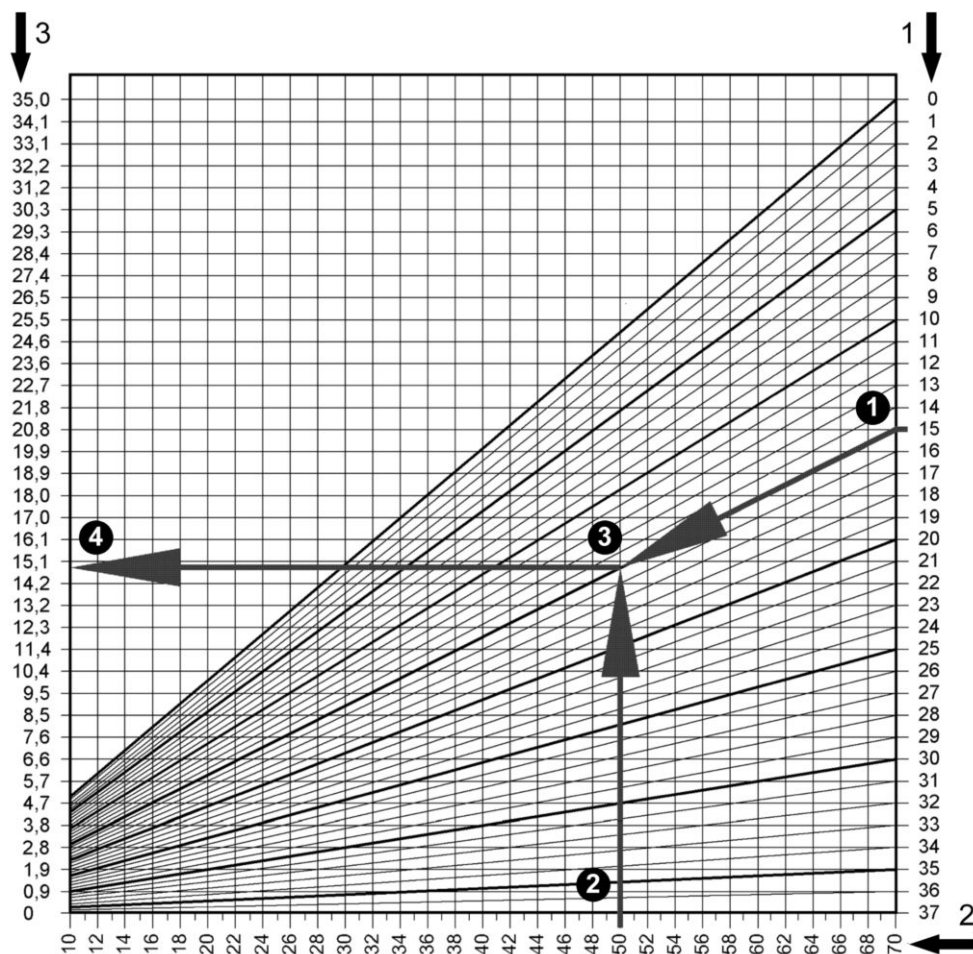


Fig. 302: Diagram

- | | |
|--|--|
| <p>1 Temperature of anti-freeze and corrosion protection agent (°C in negative range)</p> <p>2 Volume of coolant in cooling system (l)</p> | <p>3 Volume of anti-freeze and corrosion protection agent to add (l)</p> |
|--|--|

NOTICE

Inappropriate correction of anti-freeze and corrosion protection agent concentration!

Damage to diesel engine and cooling system.

- Use suitable anti-freeze and corrosion protection agent.
- Do not top up more than 60 % anti-freeze and corrosion protection agent.

Example of how to read diagram (see: fig. 302, page 185) :

- Temperature of anti-freeze and corrosion protection agent: -15 °C
- Volume of coolant in cooling system: 50 l

- Take temperature of -15 °C as starting point and go along line to vertical line corresponding to 50 l of coolant.

- ▶ From this point of intersection, follow the horizontal line to the volume of anti-freeze and anti-corrosion agent to be added.
 - ▷ Volume of anti-freeze and corrosion protection agent to add is 14.8 l.
- ▶ Drain calculated volume from cooling system.
- ▶ Top up required quantity of anti-freeze and corrosion protection agent and check coolant level.

Checking concentration of corrosion inhibitor in coolant (without anti-freeze)

Checking concentration of DCA 4 in coolant

- ▶ Take coolant sample.
- ▶ Using the CC2602M test kit from Fleetguard, check whether the DCA 4 concentration is between 6 % and 10.6 %.

If the DCA 4 concentration is different:

- ▶ Correct DCA 4 concentration in coolant.

Checking concentration of water-soluble corrosion inhibitor in coolant

Checking concentration of water-soluble corrosion inhibitor

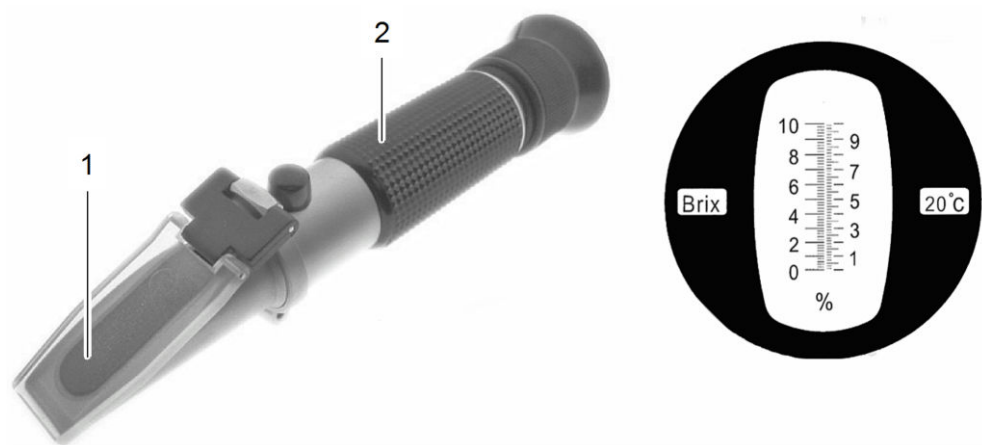


Fig. 303: Gefo 2710 refractometer

1 Prism

2 Eyepiece

- ▶ Carefully clean prism 1 and cover.
- ▶ Add one or two drops of coolant to the prism 1.
- ▶ Spread coolant over the prism 1: Close cap.
- ▶ Look into the eyepiece 2 against a light background. Adjust focus by turning eyepiece 2.
 - ▷ Brix value is shown on the blue line.
- ▶ Check whether the concentration of water-soluble corrosion inhibitor is between 1.9 % Brix and 3.7 % Brix, which means between 5 % and 10 % with 90 % to 95 % water.

If the concentration of water-soluble corrosion inhibitor is different:

- Correct concentration of water-soluble corrosion inhibitor. (For more information see: [Correcting concentration of water-soluble corrosion inhibitor, page 187](#))

Correcting concentration of water-soluble corrosion inhibitor

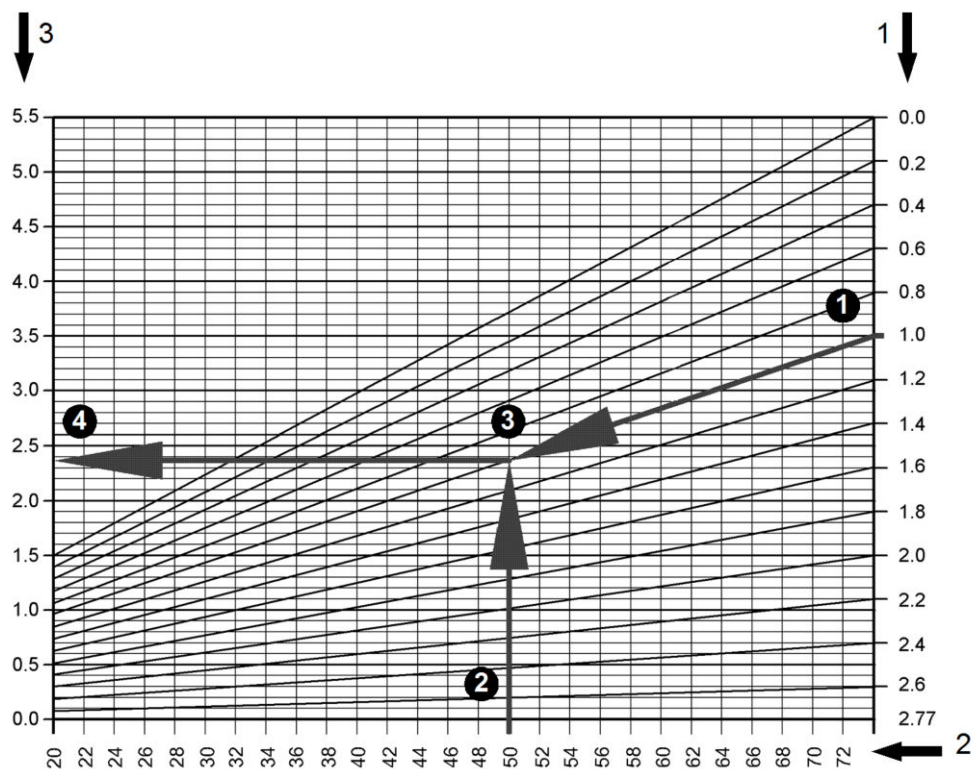


Fig. 304: Diagram

- | | |
|---|--|
| <p>1 Concentration of water-soluble corrosion inhibitor (% Brix)</p> <p>2 Volume of coolant in cooling system (l)</p> | <p>3 Volume of water-soluble corrosion inhibitor to add (l)</p> |
|---|--|

NOTICE

Inappropriate correction of water-soluble corrosion inhibitor!
Damage to diesel engine and cooling system.

- Use approved water-soluble corrosion inhibitor.

Example of how to read diagram (see: [fig. 304, page 187](#)) :

- Concentration of water-soluble corrosion inhibitor: 1 % Brix
- Volume of coolant in cooling system: 50 l
- Take concentration of water-soluble corrosion inhibitor of 1 % Brix as starting point and go along line to vertical line corresponding to 50 l of coolant.
- From this point of intersection, follow the horizontal line to the volume of water-soluble corrosion inhibitor to be added.
 - ▷ Volume of water-soluble corrosion inhibitor to add is 2.4 l.
- Drain calculated volume from cooling system.
- Top up required quantity of water-soluble corrosion inhibitor and check coolant level.

5.9 Working hydraulics system

5.9.1 Depressurising hydraulic system

Depressurising hydraulic hoses

- ▶ Lower working attachment to ground.
- ▶ Shut off diesel engine.
- ▶ Turn ignition key to position 1.
- ▶ Push down safety lever.
- ▶ Carefully operate joysticks and pedals in all directions.

Depressurising hydraulic tank

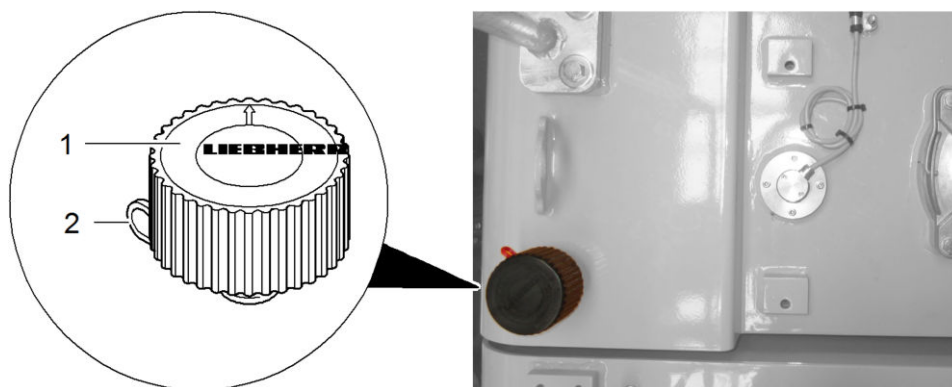


Fig. 305: Depressurising hydraulic tank

1 Breather filter

2 Securing pin

- ▶ Put in securing pin 2.
- ▶ Unscrew breather filter 1 by hand by a maximum of one rotation. Use open-end spanner if required.
- ▶ Screw in breather filter 1.
- ▶ Pull out securing pin 2.

5.9.2 Hydraulic tank: Checking oil level

Maintenance position of machine

Make sure the following preconditions are met:

- ☐ Machine is on level and firm ground.
- ☐ Stick and bucket are retracted as far as they will go.
- ☐ Working attachment is resting on ground.
- ☐ Diesel engine is shut off.

Checking hydraulic oil level

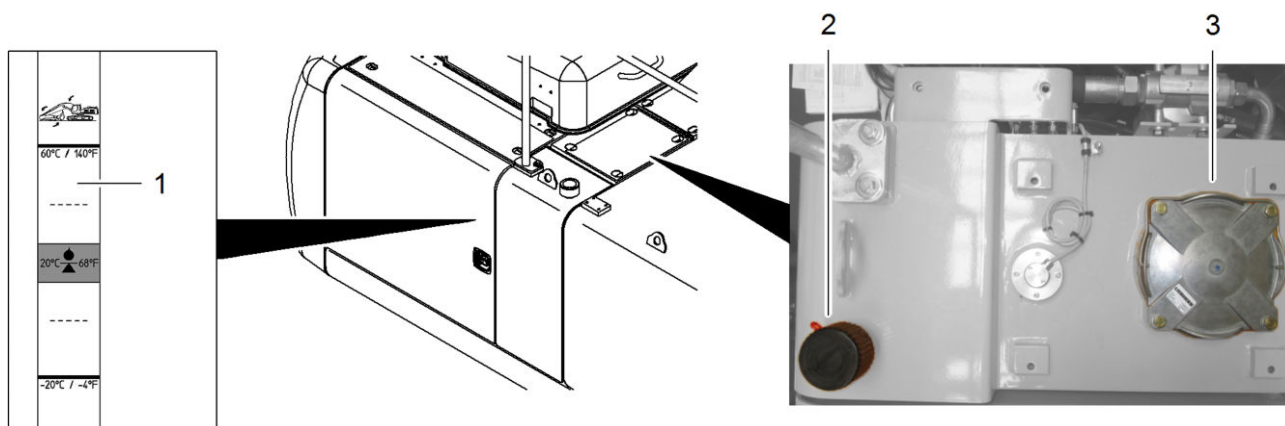


Fig. 306: Hydraulic tank

1 Oil sight glass

2 Breather filter

3 Return filter

Oil sight glass	Hydraulic oil temperature	Required hydraulic oil level
	Approximately 20 °C	In blue area A
	Between 20 °C and 60 °C	In area B
	Between 0 °C and 20 °C	In area C
	Below zero	Above D

Tab. 44: Required hydraulic oil level

Make sure the following preconditions are met:

- ☐ Machine is in maintenance position. (For more information see: [Maintenance position of machine, page 188](#))

Hydraulic oil temperature of around 20 °C is recommended for checking the hydraulic oil level. If hydraulic oil temperature is different, use guide values in table (see: [tab. 44, page 189](#)) .

- ▶ Check hydraulic oil temperature shown on the display. (For more information see: [3.2.20 Operating status menu, page 68](#))
- ▶ Check that hydraulic oil level in oil sight glass **1** corresponds to required hydraulic oil level (see: [tab. 44, page 189](#)) .

If hydraulic oil level does not correspond to required hydraulic oil level:

- ▶ Fill with hydraulic oil. (For more information see: [Filling with hydraulic oil, page 190](#))

Filling with hydraulic oil

NOTICE

Incorrect filling with hydraulic oil!
Damage.

- ▶ Fill hydraulic tank via return filter **3**.
-

Make sure the following preconditions are met:

- ☐ Machine is in maintenance position. (For more information see: [Maintenance position of machine, page 188](#))
- ☐ Hydraulic oil used is approved. (For more information see: [5.3.6 Hydraulic oils, page 159](#))
- ▶ Check hydraulic oil temperature shown on the display. (For more information see: [3.2.20 Operating status menu, page 68](#))
- ▶ Depressurise hydraulic system. (For more information see: [5.9.1 Depressurising hydraulic system, page 188](#))
- ▶ Remove cover of return filter **3**.
- ▶ Fill hydraulic tank via return filter **3** until required hydraulic oil level is reached (see: [tab. 44, page 189](#)) .
- ▶ Screw in breather filter **2**.
- ▶ Fill return filter **3** to the brim.
- ▶ Put on cover of return filter **3**.
- ▶ When hydraulic oil temperature is roughly 20 °C, check hydraulic oil level. (For more information see: [Checking hydraulic oil level, page 189](#))

5.9.3 Return filter: Checking and cleaning magnetic rod

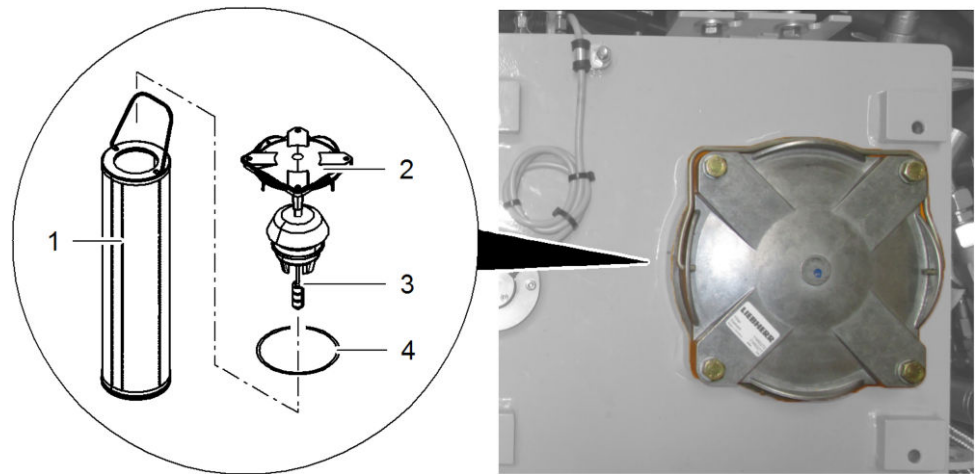


Fig. 308: Return filter

- 1 Filter cartridge
- 2 Cover

- 3 Magnetic rod
- 4 O-ring

- ▶ Depressurise hydraulic system. ([For more information see: 5.9.1 Depressurising hydraulic system, page 188](#))
- ▶ Remove cover **2** of return filter with magnetic rod **3**.
- ▶ Clean magnetic rod **3** with lint-free cloth.
- ▶ Correctly position O-ring **4**.
- ▶ Put on cover **2** of return filter with magnetic rod **3**.

5.10 Electrical system

5.10.1 General information

Preparatory work

Before any intervention in electrical system:

- ▶ Wear safety glasses and protective gloves.
- ▶ Turn battery main switch to **OFF**.
- ▶ Disconnect batteries: Disconnect negative terminal (-) first and connect it last.

General maintenance work

- ▶ Regularly check flawless condition of the electrical system.
- ▶ Remedy malfunctions immediately.

Malfunctions could be, for example:

- Loose connections
- Damaged cables
- Inadequately attached clamps

If fuse or bulb is damaged:

- ▶ Remedy cause.
- ▶ Replace damaged fuse or bulb immediately.

5.11 Tracked travel gear

5.11.1 Checking track tension

Normal wear on the travel gear causes the track tension to slacken over time. The track tension must be checked regularly and increased if necessary.

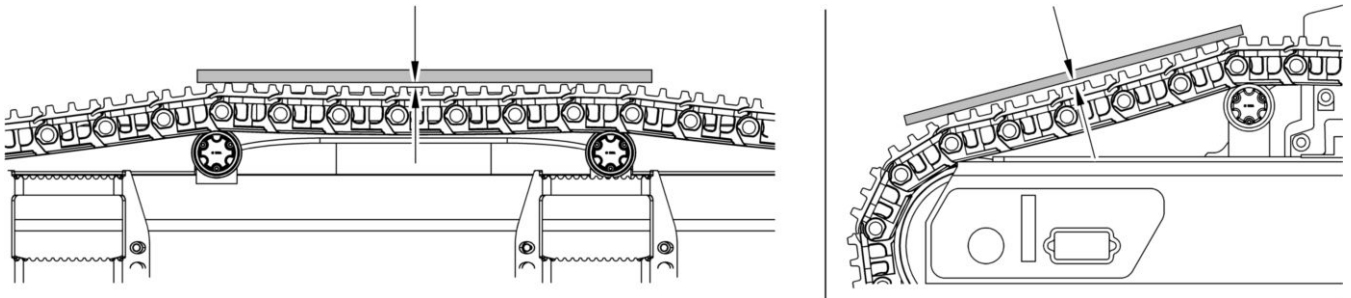


Fig. 309: Checking track tension

Make sure the following preconditions are met:

- ☐ Machine is secured to prevent it rolling.
- ▶ Move machine forwards and backwards to release tension in tracks.
- ▶ Measure centre-to-centre distance between two carrier rollers.
- ▶ Measure centre-to-centre distance between idler-wheel and the first carrier roller.
- ▶ Place measuring bar on the section of the track with the biggest centre-to-centre distance.
- ▶ Measure distance between bottom of measuring bar and top of track pad.
 - ▷ In normal conditions the track should sag by 25^{+5} mm.
- ▶ If necessary: Tighten track. ([For more information see: 5.11.2 Tightening the track, page 194](#))
- ▶ Repeat procedure for the second track.

5.11.2 Tightening the track

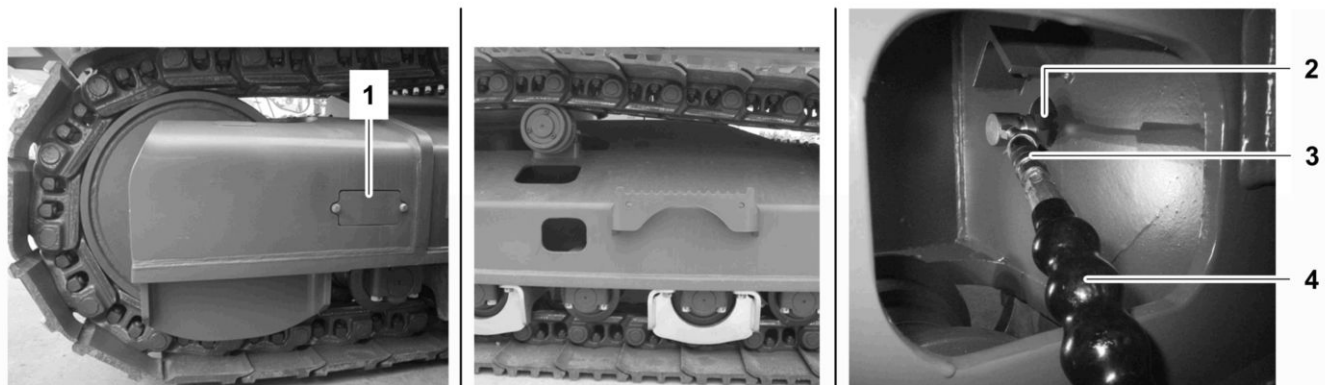


Fig. 310: Tensioning unit, tightening the track

- | | | | |
|---|-----------------------|---|-----------------------------|
| 1 | Cover (model variant) | 3 | Lubrication nipple adapter |
| 2 | Lubrication nipple | 4 | Hose of the hand grease gun |

The tensioning unit presses against the idler with a spring and a grease-filled hydraulic cylinder. The force maintains the track tension. The track tension can be increased by pressing grease into the tensioning unit.

- ☐ Make sure the machine is secured against rolling away.
- ▶ Remove the cover if necessary.
- ▶ Clean the lubrication nipple.
- ▶ Connect the hand grease gun to the supplied lubrication nipple adapter.
- ▶ Attach the lubrication nipple adapter to the lubrication nipple.
- ▶ Press in grease until the track is sufficiently tensioned.
- ▶ Check the track tension.
- ▶ Install the cover if necessary.

Troubleshooting

You cannot establish the necessary pressure using the hand grease gun? The track cannot be tensioned?

The lubrication nipple or the tensioning unit might be damaged.

- ▶ Do not remove the lubrication nipple.
- ▶ Contact Liebherr customer service.

5.11.3 Slackening the track

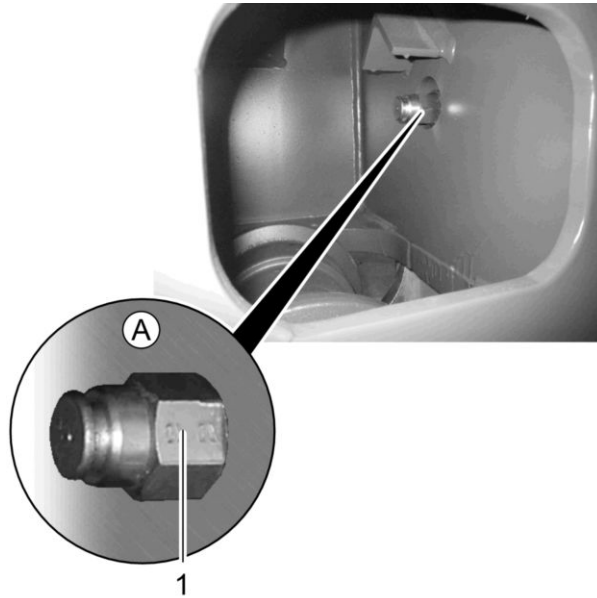


Fig. 311: Tensioning unit, slackening the track

A Lubrication nipple

1 Hexagon profile



DANGER

The track can sag suddenly if it is not slackened correctly! Grease can squirt out under high pressure! The lubrication nipple can be fired out explosively! Risk of injury!

- ▶ Wear safety glasses and working gloves.
- ▶ Keep your head and hands away from the track and from the lubrication nipple.
- ▶ Use a hex wrench. Do not turn the slackened hexagon profile any further by hand.
- ▶ Do not unscrew the hexagon profile fully.

- ☐ Make sure the machine is secured against rolling away.
- ▶ Clean the track and remove any trapped objects.
- ▶ Unscrew the hexagon profile by two or three turns until grease emerges from the threaded hole.

Once the required track tension is reached:

- ▶ Tighten the hexagon profile.
- ▶ Move the machine forwards and backwards and then check the track tension again.

5.11.4 Track pads and sprocket wheels: Checking mounting

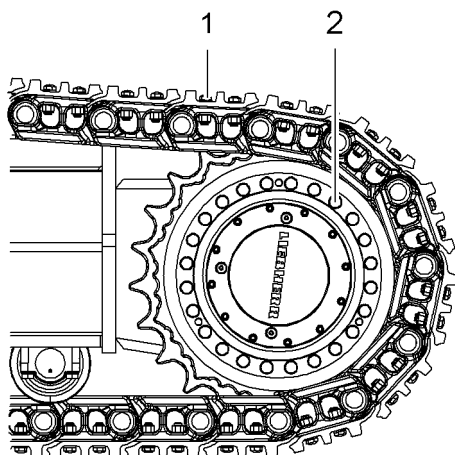


Fig. 312: Track pads and sprocket wheels: Checking mounting

- 1 Mounting bolts of the track pad 2 Mounting bolts of the sprocket wheels

Mounting bolt	Component	Characteristics of the mounting bolt	Test torque	Pre-tightening torque and turning angle
Mounting bolts of the track pad 1	Track pad B60	M20 x 1.5 x 57 – strength class 12.9	750 Nm	360 Nm + 120°
Mounting bolts of the sprocket wheels 2	Sprocket wheel	M20 x 60 — strength class 10.9	490 Nm	100 Nm + 80°

Tab. 45: Tightening torque of mounting bolts of track pads and sprocket wheels

Make sure the following preconditions are met:

- ☐ Machine is on level and firm ground.

Checking mounting of track pads

- Check **test torque** of ten mounting bolts of the track pads 1 on the top side of a chain.

If the **test torque** of a mounting bolt of a track pad 1 is not correct:

- Check **test torque** of all mounting bolts of the track pads 1.

If **test torque** is not correct:

- Unscrew mounting bolts of the track pads 1 by two or three turns.
- Tighten mounting bolts of the track pads 1 with **pre-tightening torque and turning angle**.

Checking mounting of sprocket wheels

NOTICE

Unsuitable mounting!

Damage.

- ▶ Do not retighten mounting bolts of sprocket wheels.
 - ▶ Replace mounting bolts of the sprocket wheels.
-

- ▶ Check **test torque** of all mounting bolts **2** on the sprocket wheels.

If **test torque** is not correct:

- ▶ Replace mounting bolts of the sprocket wheels **2**.
- ▶ Tighten new mounting bolts of the sprocket wheels **2** with **pre-tightening torque and turning angle**.

5.12 Working attachment

5.12.1 Lubricating working tool

The centralised lubrication system of the machine does not lubricate the bearings of the working tool. The working tool must be lubricated manually.

Make sure the following preconditions are met:

- ❑ The correct grease is used. (For more information see: 5.3.8 Greases, page 166)

Lubricating standard working tool

The lubricating points of the working tool are indicated at the following locations:

- On the lubrication chart for the bucket
- On the following illustration for the multiple tine grapple or clamshell

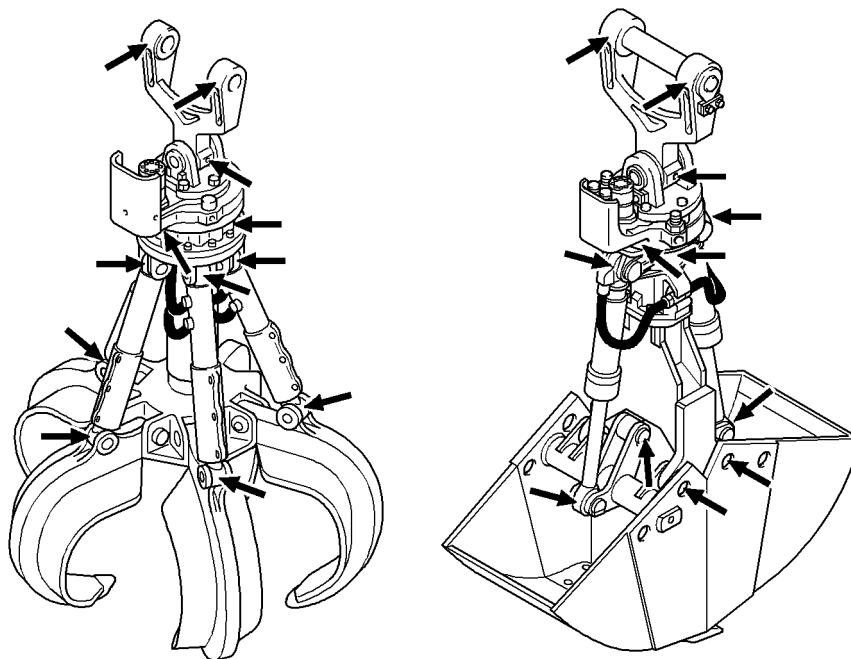


Fig. 313: Lubricating points on multiple tine grapple and clamshell

- ▶ Connect grease gun to the lubricating points.
- ▶ Lubricate until clean grease comes out of the bearing.

Lubricating special working tool

- ▶ Follow the manufacturer's instructions.

5.12.2 Changing bucket teeth with Z system

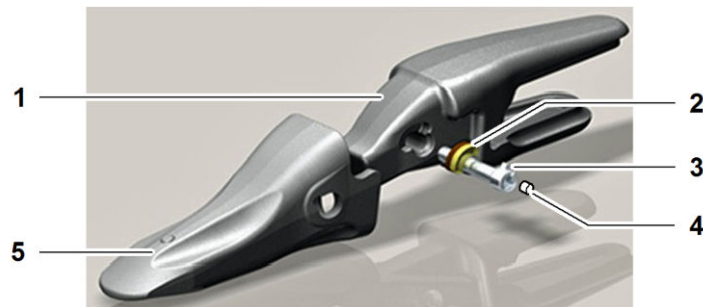


Fig. 314: Changing bucket teeth with Z system

- | | | | |
|---|---------------|---|-------|
| 1 | Tooth adapter | 4 | Plug |
| 2 | Bolt | 5 | Tooth |
| 3 | Securing pin | | |

NOTICE

Badly worn teeth **5**!
Damage to tooth adapters **1**.

- ▶ Do not use a bucket without teeth **5** or with badly worn teeth **5**.
-

Removing tooth

- ▶ Clean off dirt.
- ▶ Remove plug **4**.
- ▶ Turn securing pin **3** with a square wrench approximately 30° towards tooth **5**.
 - ▷ Nose of securing pin **3** slips out of bolt **2**.
- ▶ Use the hammer and punch to knock out securing pin **3**.
- ▶ Remove tooth **5**.
- ▶ Remove bolt **2**.
- ▶ Clean tooth adapter **1**.
- ▶ Check that tooth adapter **1** is not worn.

If tooth adapter **1** is worn:

- ▶ Replace tooth adapter.

Installing tooth

- ▶ Insert bolt **2**.
- ▶ Place new tooth **5** on tooth adapter **1**.
- ▶ Push securing pin **3** all the way in.
- ▶ Turn securing pin **3** with a square wrench approximately 30° towards bucket.
 - ▷ Nose of securing pin **3** engages in bolt **2**.
- ▶ Insert plug **4** onto outer end of securing pin **3**.

5.13 Operator's cab, heating, air conditioning system

5.13.1 Filling with windscreen washer fluid

The windscreen washer fluid tank is located on the rear of the operator's cab.

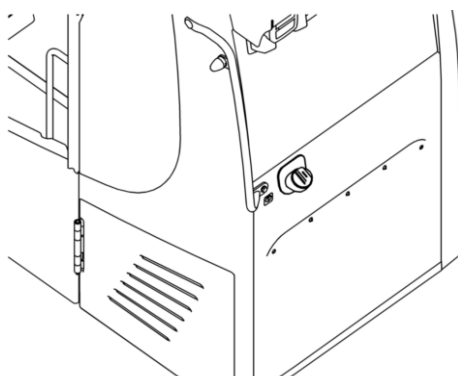


Fig. 315: Windscreen washer fluid tank

- ▶ Unscrew cover of windscreen washer fluid tank.
- ▶ Filling with windscreen washer fluid.
- ▶ Screw cover back onto windscreen washer fluid tank.

5.13.2 Switching on air conditioning unit

NOTICE

Long downtime of air conditioning unit!
Damage.

- ▶ Switch on air conditioning system in winter too.
-

Make sure the following preconditions are met:

- ☐ Diesel engine is started.
- ▶ Activate AUTO operating mode.
- ▶ Wait approximately 15 minutes.
- ▶ Deactivate AUTO operating mode.

5.13.3 Cleaning cab air filter

The cab air filter **6** is behind the operator's seat.

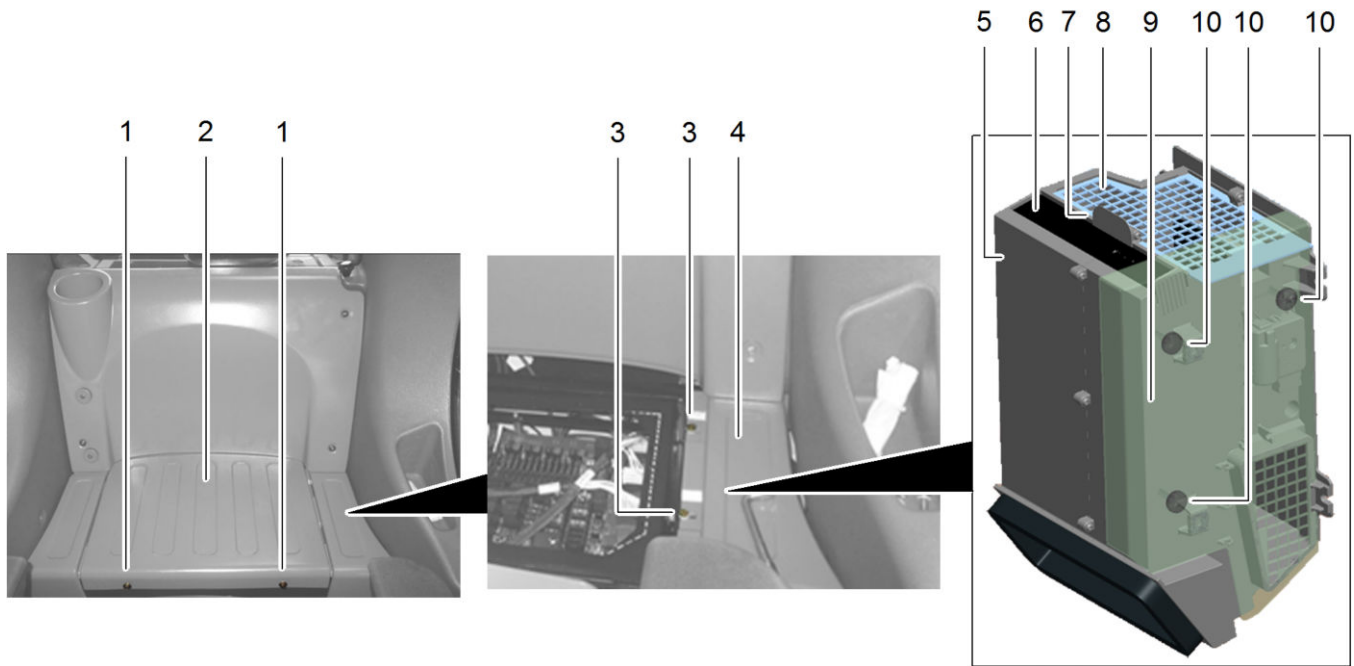


Fig. 316: Cleaning cab air filter

- | | | | | | |
|---|-------|---|------------------|----|-------------|
| 1 | Screw | 5 | Filter cartridge | 9 | Front panel |
| 2 | Hood | 6 | Cab air filter | 10 | Screw |
| 3 | Screw | 7 | Tab | | |
| 4 | Hood | 8 | Grille | | |

Removing hood

- ▶ Unscrew screws 1.
- ▶ Take off hood 2.
- ▶ Unscrew screws 3.
- ▶ Take off hood 4.

Removing cab air filter

- ▶ Unscrew screws 10.
- ▶ Take off front panel 9.
- ▶ Take off grille 8.
- ▶ Take out cab air filter 6: Pull tab 7.

Cleaning cab air filter

- ▶ Clean cab air filter 6 with compressed air.

Installing cab air filter

- ▶ Insert cab air filter 6 in filter cartridge 5.
- ▶ Install grille 8.
- ▶ Put on front panel 9.
- ▶ Screw in screws 10.

Installing hood

- ▶ Put on hood **4**.
- ▶ Screw in screws **3**.
- ▶ Put on hood **2**.
- ▶ Screw in screws **1**.

5.14 Lubrication system

5.14.1 Manually lubricating machine

Lubricating points and areas containing multiple lubricating points are specified in the lubrication chart. (For more information see: 5.2.3 Lubrication chart, page 150)

Make sure the following preconditions are met:

- ☐ Grease used is approved. (For more information see: 5.3.8 Greases, page 166)

Lubricating slewing ring

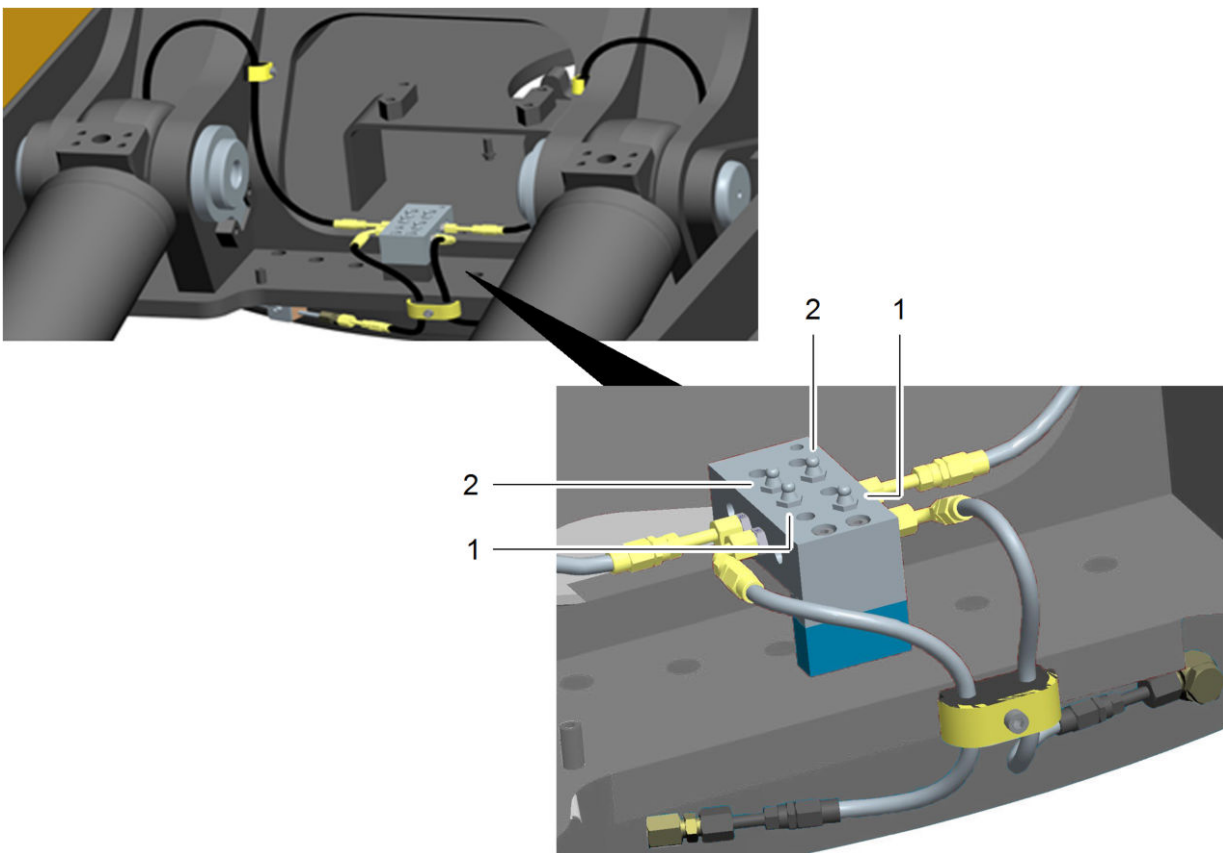


Fig. 317: Lubricating slewing ring and hoist cylinder bases

1 Lubricating points of the slewing ring

2 Lubricating points of the hoist cylinder bases

- Connect grease gun to lubricating points of the slewing ring **1** (see: fig. 317, page 203) .
- Grease lubricating points of the slewing ring **1** (see: fig. 317, page 203) with 20 grease gun thrusts.

Lubricating working attachment

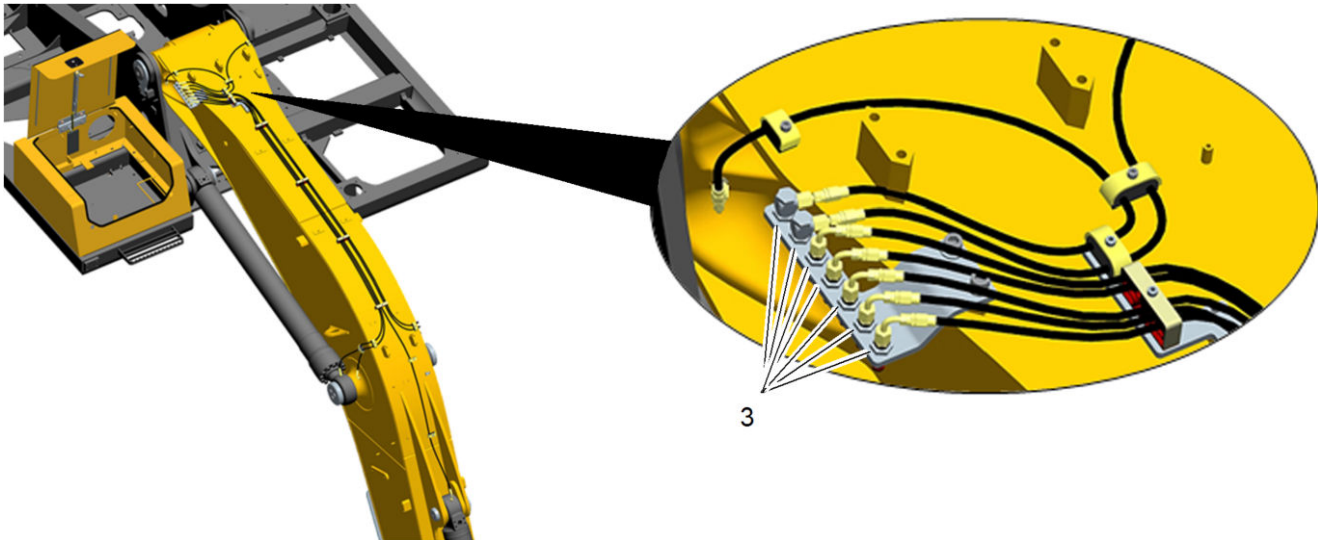


Fig. 318: Lubricating boom

- 3** Lubricating points of the boom

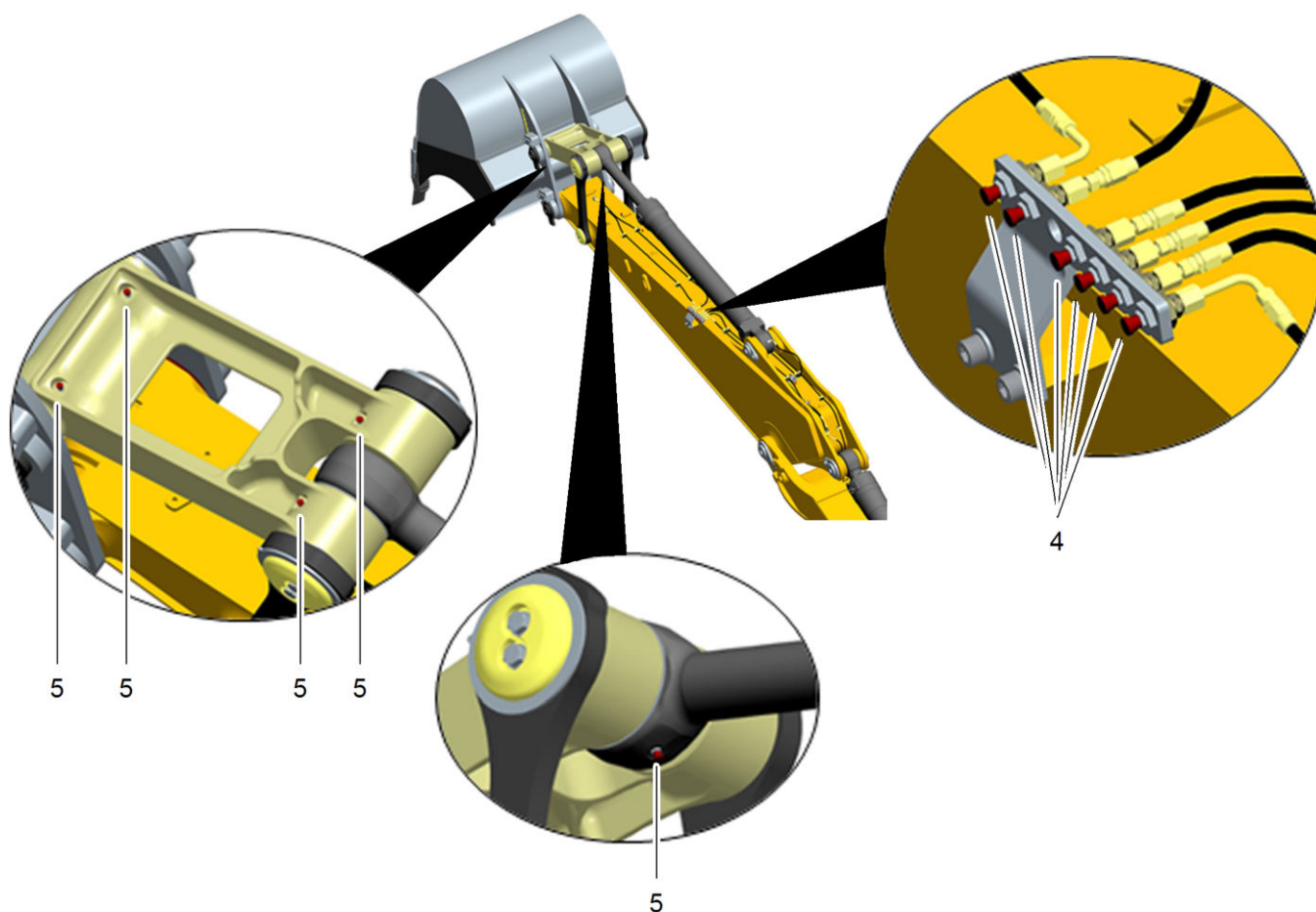


Fig. 319: Lubricating stick and bucket

4 Lubricating points of the stick

5 Lubricating points of the bucket

- Lubricate lubricating points of the hoist cylinder bases **2** (see: [fig. 317, page 203](#)), lubricating points of the boom **3** (see: [fig. 318, page 204](#)), lubricating points of the stick **4** (see: [fig. 319, page 205](#)) and lubricating points of the bucket **5** (see: [fig. 319, page 205](#)) until clean grease emerges from the corresponding bearing.

5.14.2 Lubrication system: Filling grease

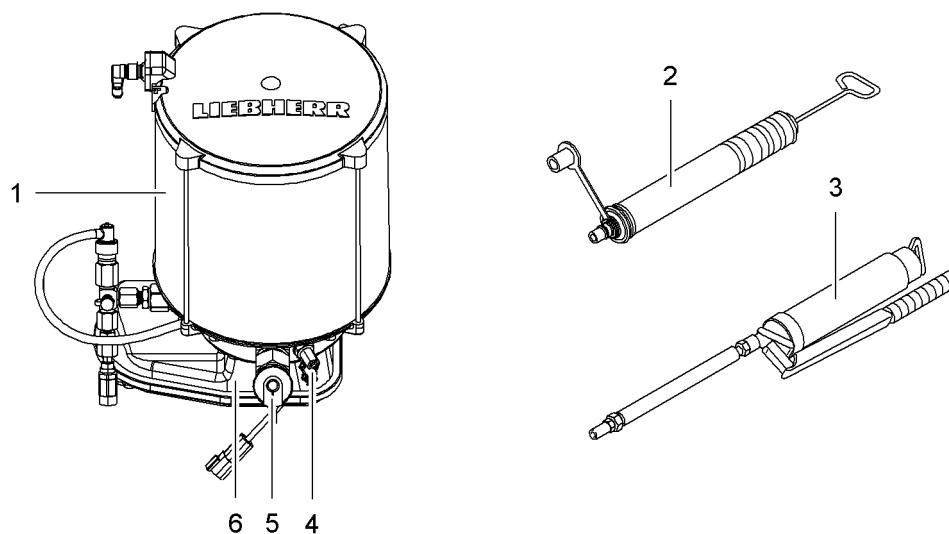


Fig. 320: Filling grease

- | | | | |
|---|------------------|---|----------------------|
| 1 | Grease container | 4 | Grease fitting |
| 2 | Filling pump | 5 | Filling pump adapter |
| 3 | Grease gun | 6 | Lubricating pump |

NOTICE

Unsuitable grease filling!
Damage.

- ▶ Regularly check filling level of grease container 1.
- ▶ Use suitable grease. ([For more information see: 5.3.8 Greases, page 166](#))
- ▶ Only fill grease via the filling pump adapter 5 or the grease fitting 4.

- ▶ Insert grease cartridge in filling pump 2.
- ▶ Connect filling pump 2 to filling pump adapter 5.
- ▶ Press content of grease cartridge into grease container 1.

If no filling pump 2 is available:

- ▶ Fill grease with grease gun 3 via grease fitting 4.

5.15 Slewing gear mechanism, slewing ring

5.15.1 Slewing gearbox: Checking oil level

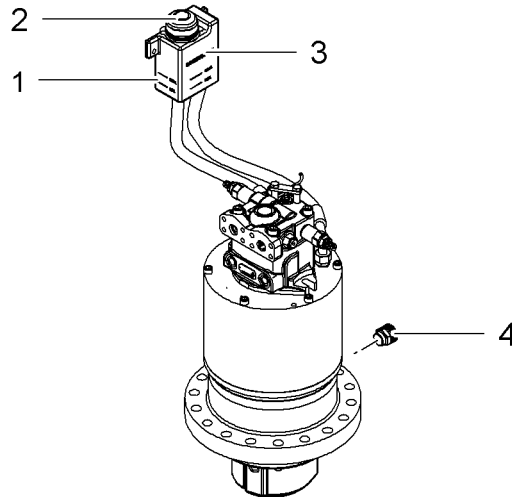


Fig. 321: Slewing gearbox

- | | | | |
|---|-----------------|---|-------------|
| 1 | Oil level gauge | 3 | Oil tank |
| 2 | Plug | 4 | Drain valve |

Make sure the following preconditions are met:

- ☐ Oil in the slewing gearbox has cooled down.

Checking oil level

- Check that the oil level on the oil level gauge 1 is above the *Min* mark.

If the oil level is below the *Min* mark:

- Add oil. ([For more information see: Filling oil, page 207](#))

Filling oil

NOTICE

Unsuitable oil filling!
Damage.

- Use suitable oil. ([For more information see: 5.3.7 Lubricating oil for gearboxes, page 165](#))
-
- Open plug 2.
 - Fill oil tank 3 until the oil level is between the *Min* and *Max* marks on the oil level gauge 1.
 - Close plug 2.

Slewing gear mechanism, slewing ring

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6 Appendix

If your machine has special attachments, you can find relevant information on the subsequent pages.

6.1 Initial torque and tightening angle

The mounting bolts of the following components are tightened with an exactly set tightening angle:

- Track pads of the drive
- Sprocket
- Travel gear mechanism
- Travel motor

6.1.1 Procedure

The values of the initial torque and the tightening angle are listed in the operating manual.

- Tighten the mounting bolt with the set initial torque.

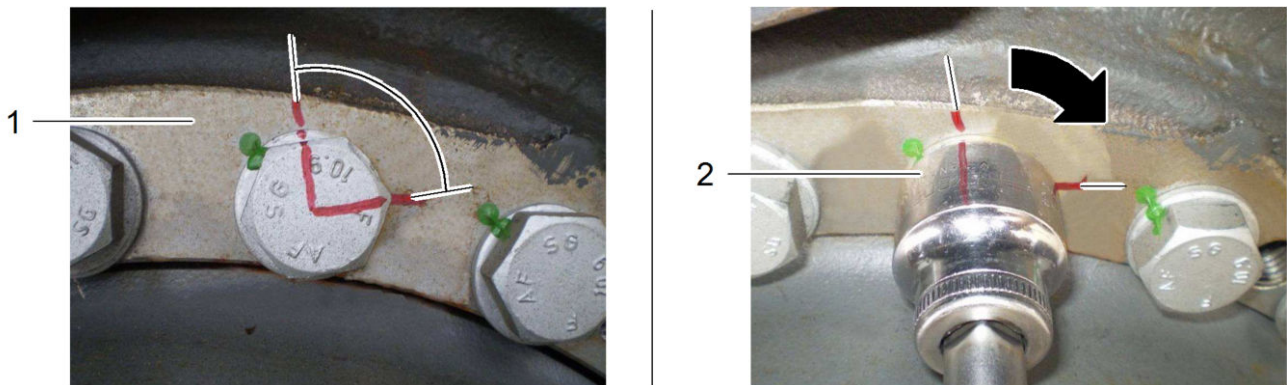


Fig. 322: Tightening angle

1 Components

2 Socket wrench of torque wrench

- Write the set tightening angle on the screw head and components **1**. A screw edge corresponds to 60°.
- Mark the start position with a line on the socket wrench of torque wrench **2**, which is aligned with the mark on the components **1**.
- Using the torque wrench, tighten clockwise so that the line on the starting position is aligned with the second line on the components **1**.
- Repeat the process for the other screws. Tighten the screws crosswise.

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