en **Operator's manual**

Material handling machine

Document ID

ORIGINAL OPERATOR'S MANUAL

Order number: 12221169
Issued: 2020-09-02
Version: 01
Author: LHB / Technical Documentation Department

Product ID

Manufacturer: Liebherr-Hydraulikbagger GmbH
Type: LH 35 M Timber Litronic
Type no.: 1473
From Serial no.: 89796

Contact

Liebherr-Hydraulikbagger GmbH
Liebherrstraße 12
D – 88457 Kirchdorf/Iller

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:

.....

Commissioning date:

..... / ..... / .....

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LIEBHERR

EU DECLARATION OF CONFORMITY

Original Declaration of Conformity

We hereby declare that the machine designated below complies with the relevant fundamental health and safety criteria specified in the applicable EU Directive(s) in terms of its design and construction, and in the version sold by us. This declaration shall cease to be valid if alterations are made without prior approval from the manufacturer. The manufacturer of the machine accepts no liability for damage caused by alternations not approved by that manufacturer.

Designation/function:	**Hydraulic excavator**
Manufacturer/brand:	**Liebherr**
Trade name:	**xxx Litronic**
Type/serial number:	**WLHZXXXXXXXXXXXX**
Engine power:	**XXX kW at XXXX rpm**

1. Relevant regulations (in their most recent valid version):

1.1. 2006/42/EC
- 1.1.1. Designation and address of the manufacturer and the authorised representative: Liebherr-Hydraulikbagger GmbH, Liebherrstrasse 12, 88457 Kirchdorf/Iller, Germany
- 1.1.2. Submitted voluntarily for type examination at: DGUV Test, Testing and Certification Body, Expert Committee for the Construction Industry, identification no. 0515, Landsberger Straße 309, 80687 Munich, Germany

1.2. 2014/30/EU

1.3. 2000/14/EC
- 1.3.1. Sound power level measured on representative devices/machines: XXX dB(A)
- 1.3.2. Guaranteed sound power level: XXX dB(A)
- 1.3.3. Conformity assessment procedure applied as per Appendix VIII
- 1.3.4. Repository of technical documentation: Liebherr-Hydraulikbagger GmbH, Dpt. “Technisches Büro” (Technical Office)
- 1.3.5. Notified body: DGUV Test, Testing and Certification Body, Expert Committee for the Construction Industry, identification no. 0515, Landsberger Straße 309, 80687 Munich, Germany

2. Applied harmonised European standards:

2.1. EN 474-1
2.2. EN 474-5

3. Applied national standards and technical specifications:

Liebherr-Hydraulikbagger GmbH

D-88457 Kirchdorf/Iller

xxx

Kirchdorf/Iller DD/MM/YYYY

(Head of Quality Management)

Liebherr-Hydraulikbagger GmbH Liebherrstraße 12 D-88457 Kirchdorf/Iller www.liebherr.com

Fig. 1: Example of an EU Declaration of Conformity

Valid for countries in the European Economic Area (EEA): An EU Declaration of Conformity is supplied with the machine. Keep the EU Declaration of Conformity in a safe place.

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Preface

This operator's manual is intended for you as **operator** or **maintenance staff**. 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 malfunctions caused by incorrect operation.

Compliance with the operator's manual increases the reliability and service life of the machine.

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

Read the operator's manual before putting into service for the first time and subsequently at regular intervals. Everyone who carries out work with or on the machine must be familiar with and use this operator's manual.

Examples of this work:
- **Operation** including setup and fitting attachments, elimination of malfunctions, care, disposal of lubricants and fuels
- **Service** including maintenance, inspection and repair work
- **Transporting** or loading the machine

The owner is responsible for supplementing the operator's manual with instructions based on existing national regulations on accident prevention and environmental protection. In addition to this operator's 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 operator's manual do not apply to all machines.

Some illustrations in this operator's 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 improvement, which may result in changes to your machine that are not referred to in this operator's manual yet.

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

All documentation purchased for this machine (operator's manual, maintenance manual, spare parts catalogue,...) is available from MyLiebherr for the entire service life of a machine.

https://www.myliebherr.com

Liability and warranty

Due to the wide variety of products offered by other manufacturers (for example service products, lubricants, tool attachments and spare parts), Liebherr cannot

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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.

Third-party products are used in or on Liebherr machines at the user's own discretion. Liebherr does not offer any warranty or accept any liability for losses of any kind caused by failures of or damage to Liebherr machines attributable to the use of third-party products.

Furthermore, Liebherr will not recognise any warranty claims attributable to incorrect operation, inadequate maintenance or the failure to follow safety instructions.

Modifications, conditions, copyright

Liebherr reserves the right to make modifications in the course of technical development, without issuing prior notification.

Information and illustrations in these instructions are not allowed to be duplicated, distributed or used for the purposes of competition. All rights under copyright legislation are expressly reserved.

The aforementioned provisions do not extend the warranty and liability conditions in the general terms and conditions of business of Liebherr.

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Reply form

We need your help to continually improve our documentation. Please copy this page and fax it or e-mail it to us with your comments, ideas and suggestions for improvement.

To: Liebherr-Hydraulikbagger GmbH
Technische Dokumentation
Liebherr Straße 12
D-88457 Kirchdorf

Fax: +49 73 54 80 76 77

E-mail: info.lhb@liebherr.com

Ideas, comments (please state the page number):

Overall, how would you judge this document?

Excellent	
Very good	
Good	
Satisfactory	
Poor	

Your data:

Machine / serial number:

Company:

Last name:

Address:

Telephone number:

Dealer:

Thank you for your help.

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Notes:

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1 Product description

1.1 Technical description

1.1.1 General overview

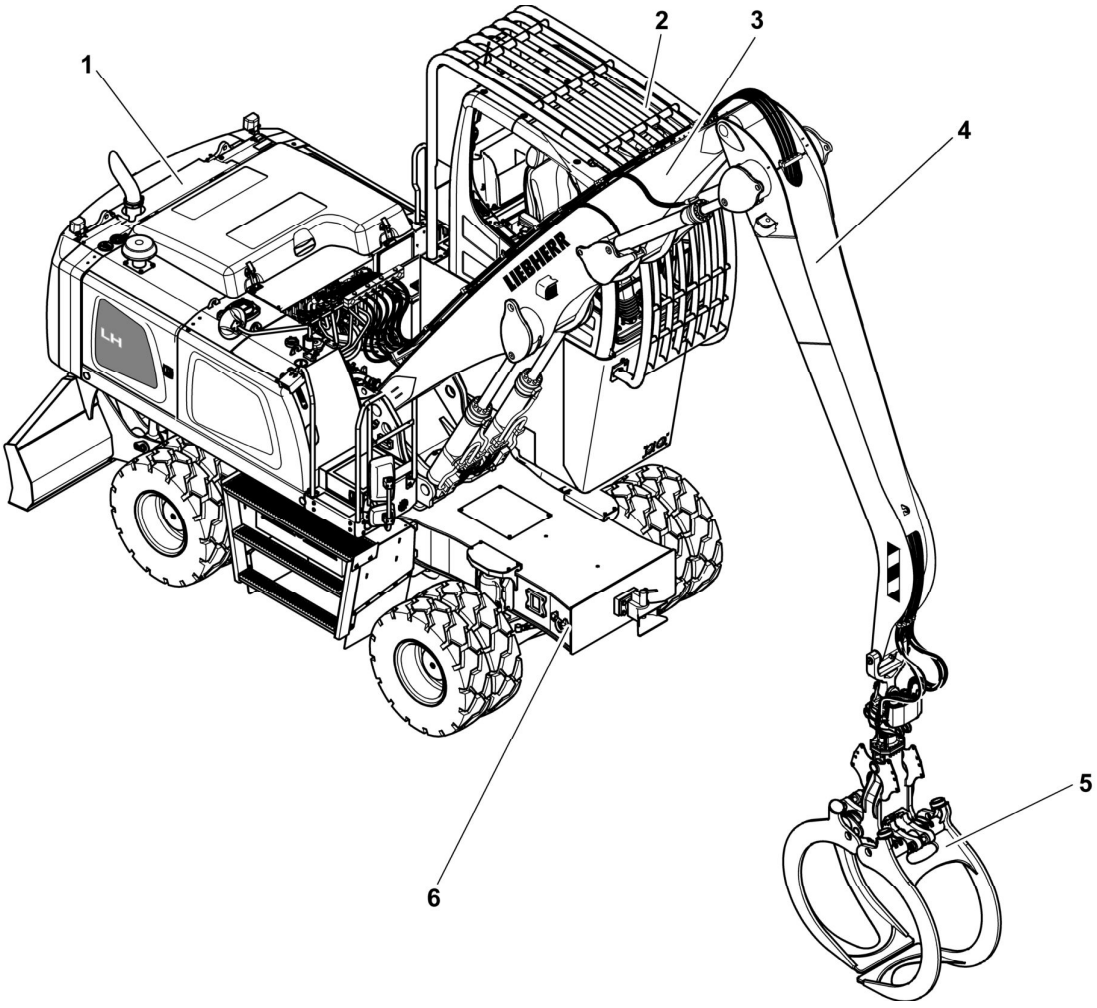

Fig. 2: General overview

1	Uppercarriage	**3**	Boom	**5**	Wood grapple
2	Operator's cab with guard	**4**	Stick	**6**	Undercarriage

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1.1.2 Uppercarriage

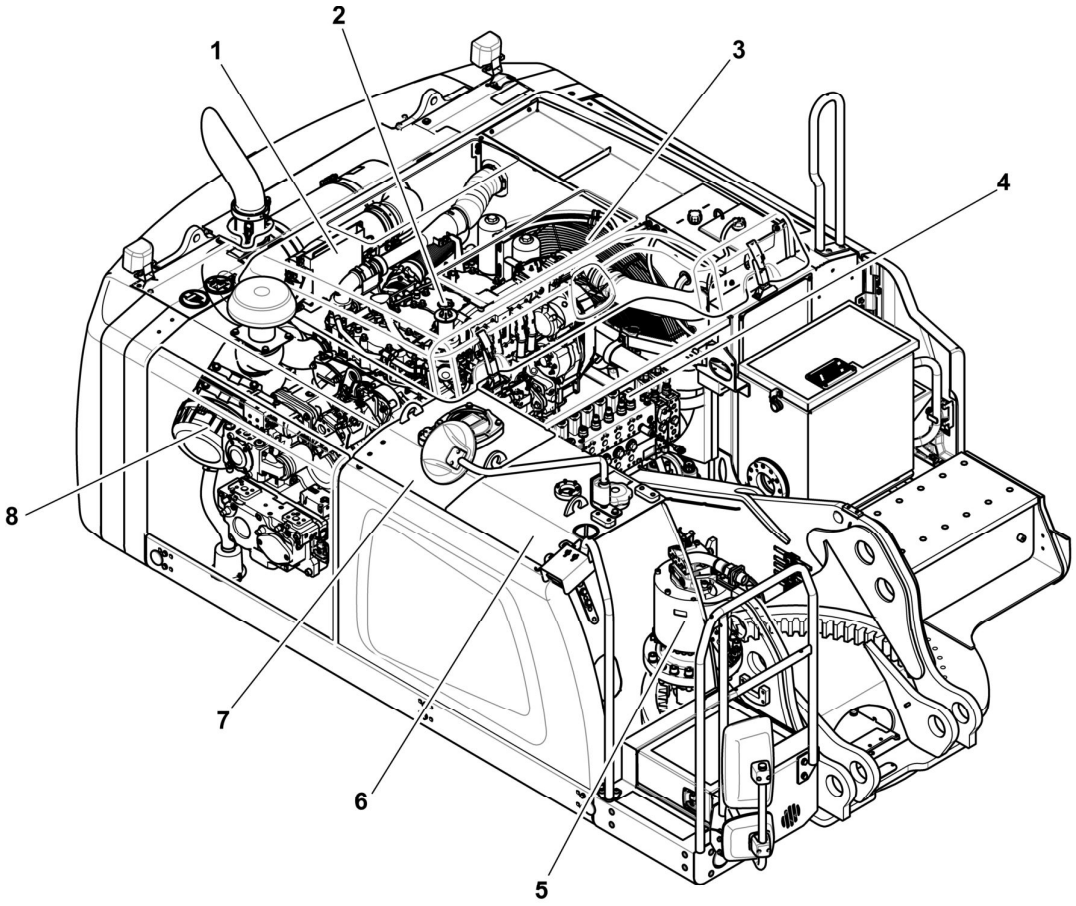

Fig. 3: Uppercarriage

1	Exhaust treatment system	**4**	Control valve block	**7**	Hydraulic tank
2	Diesel engine	**5**	Slewing gearbox	**8**	Engine air filter
3	Engine cooling	**6**	Fuel tank		

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1.1.3 Undercarriage

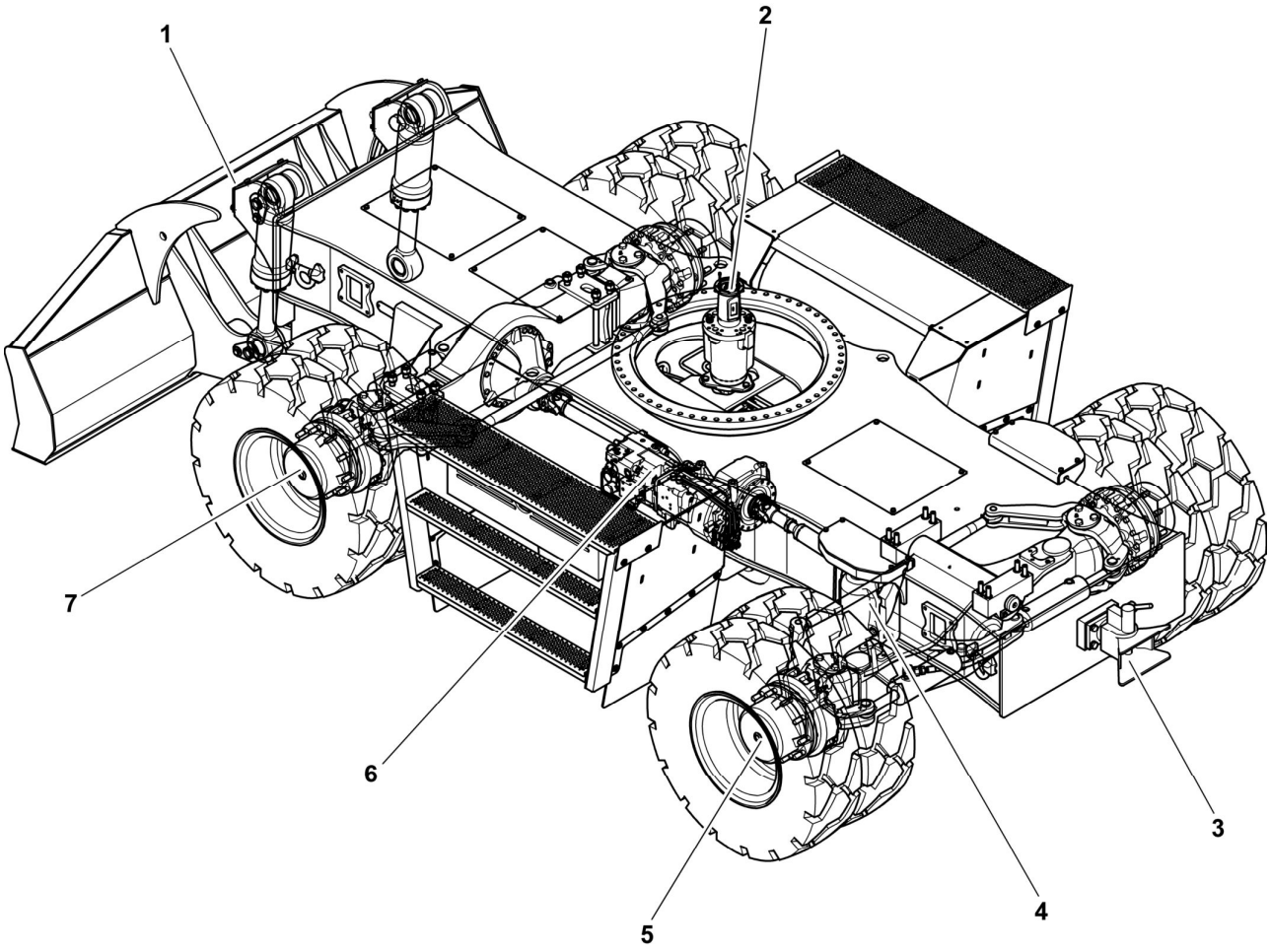


Fig. 4: Undercarriage

1	Support blade	**4**	Oscillating axle cylinder	**7**	Rigid axle
2	Rotary connection	**5**	Oscillating axle		
3	Trailer coupling [1)]	**6**	Travel motor		

[1)] Option

1.2 Technical data

1.2.1 Vibration emission

Designation	Unit	Value
Hand/arm vibrations	m/s^2	≤ 2.5
Whole-body vibrations	m/s^2	≤ 0.5

Tab. 1: Vibration emission

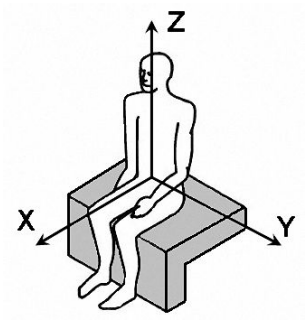
Operator's seat

– The operator's seat built into this machine by the manufacturer conforms to ISO 7096:2000, EM 6.

Hand/arm vibrations

– If the machine is operated as intended, the weighted (frequency-weighted) effective value of the hand/arm vibrations in accordance with ISO 5349- 1:2001 is less than 2.5 m/s^2.

Whole-body vibrations



– This value conforms to the details of technical report ISO/TR 25398:2006.
– The measuring inaccuracy is defined in standard EN 12096:1997.
– As the specified values are individual effective values for specific typical application areas, only a limited assessment of the load imposed on the operator by whole-body vibrations is possible.

1.2.2 CO_2 emissions of diesel engine

NOTICE
Incorrect operation!
High emission values.

▶ Operate and service diesel engine and exhaust treatment system according to operator's manual.

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NOTICE
Malfunctions in diesel engine and exhaust treatment system!
High emission values.

- ▶ Adhere to error messages.
- ▶ Rectify malfunctions in diesel engine and exhaust treatment system immediately.

If malfunctions are not rectified:
- ▶ Take machine out of service.

NOTICE
Incorrect operation!
Damage to machine.

- ▶ Make sure that diesel engine and exhaust treatment system are operated and serviced exclusively according to operator's manual.

This CO_2 measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine type (engine family) and shall not imply or express any guarantee of the performance of a particular engine.

Engine type	Nominal power	High idle rpm	Code	97/68/EC stage	CO_2 emissions during NRSC testing or RMC testing under standard laboratory conditions	CO_2 emissions during NRTC testing with warm start under standard laboratory conditions
D924 A7-04 SCRonly	129 kW	2200 min^{-1}	F4HFE413G*B	IV	653.45 g/kWh	640.45 g/kWh
D924 A7-14 SCRT	129 kW	2200 min^{-1}	F4HFE414G*B	IV	678.33 g/kWh	631.52 g/kWh
D934 A7-04	200 kW	1900 min^{-1}	R04LQ7103	IV	682.18 g/kWh	726.85 g/kWh
D934 A7-14	140 kW	1900 min^{-1}	R04LQ7102	IV	683.53 g/kWh	760.17 g/kWh
D934 A7-14	200 kW	1900 min^{-1}	R04LU7101	IV	671.94 g/kWh	709.80 g/kWh
D936 A7-04	320 kW	1900 min^{-1}	R06LQ7101	IV	650.74 g/kWh	694.60 g/kWh
D936 A7-14	320 kW	1900 min^{-1}	R06LU7101	IV	664.06 g/kWh	673.06 g/kWh
D944 A7-04	200 kW	1900 min^{-1}	R04KQ7102	IV	687.26 g/kWh	769.07 g/kWh
D944 A7-04	230 kW	1900 min^{-1}	R04KQ7101	IV	682.36 g/kWh	750.86 g/kWh
D944 A7-14	200 kW	1900 min^{-1}	R04KU7102	IV	686.43 g/kWh	731.46 g/kWh
D944 A7-14	230 kW	1900 min^{-1}	R04KU7101	IV	681.03 g/kWh	713.34 g/kWh
D946 A7-04	330 kW	1900 min^{-1}	R06KQ7102	IV	643.85 g/kWh	684.24 g/kWh
D946 A7-14	330 kW	1900 min^{-1}	R06KU7101	IV	669.65 g/kWh	684.04 g/kWh
D9508 A7-04	455 kW	1900 min^{-1}	V08MQ7102	IV	709.44 g/kWh	761.34 g/kWh
TCD 3.6 L4 DOConly / SCR	95 kW	2000 min^{-1}	CFXI95BU	IV	713.39 g/kWh	730.75 g/kWh

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Engine type	Nominal power	High idle rpm	Code	97/68/EC stage	CO_2 emissions during NRSC testing or RMC testing under standard laboratory conditions	CO_2 emissions during NRTC testing with warm start under standard laboratory conditions
TCD 3.6 L4 DOC-DPF / SCR	95 kW	2000 min^{-1}	CFVI95BU	IV	691.21 g/kWh	705.07 g/kWh

Tab. 2: CO_2 emissions of stage IV diesel engine

Engine type	Nominal power	High idle rpm	Code	97/68/EC stage	CO_2 emissions during NRSC testing or RMC testing under standard laboratory conditions	CO_2 emissions during NRTC testing with warm start under standard laboratory conditions
D924 A7-05	129 kW	2200 min^{-1}	F4HFE414F*V	V	685.00 g/kWh	692.15 g/kWh
D936 A7-25	300 kW	1900 min^{-1}	R06LW7105	V	677.80 g/kWh	697.15 g/kWh
D944 A7-25	200 kW	1900 min^{-1}	R04KW7102	V	718.49 g/kWh	753.40 g/kWh
D944 A7-25	220 kW	1900 min^{-1}	R04KW7101	V	713.58 g/kWh	742.31 g/kWh
D946 A7-25	330 kW	1900 min^{-1}	R06KW7101	V	675.80 g/kWh	674.52 g/kWh
D956 A7-05	340 kW	2100 min^{-1}	R06NW7104	V	704.788 g/kWh	758.30 g/kWh
D9508 A7-05	455 kW	1900 min^{-1}	V08MW7102	V	724.83 g/kWh	739.75 g/kWh
TCD 3.6 L4 EKZ 199	95 kW	2000 min^{-1}	C5VI95BU	V	697.15 g/kWh	742.95 g/kWh

Tab. 3: CO_2 emissions of stage V diesel engine

Test conditions:
- NRSC / RMC: Stationary test cycle for mobile machines and equipment not intended for road traffic / ramped mode cycle. “Stationary test cycle” refers to a test cycle where the speed and the torque of the engine assume a limited number of nominally constant values; stationary tests are either single-phase test cycles or ramped mode cycles.
- NRTC: Non-stationary test for mobile machines and equipment not intended for road traffic. “Non-stationary test cycle” refers to a test cycle where the standardised speed and torque values change every second.

1.2.3 Sound level

The sound values of the machine are specified in the technical data.

The guaranteed sound power level (L_{WA}) is measured according to Directive 2000/14/EC.

The sound pressure level (L_{pA}) is measured according to ISO 6396. The measuring inaccuracy is defined in this standard.

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1.2.4 Specifications

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

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Product Information Log Loader

LH 35 M Timber

Litronic®

Generation
6

Operating Weight
28,000 – 30,200 kg*

Engine
150 kW / 204 HP
Stage V
Stage IIIA (compliant)

* Without attachment

LIEBHERR

Performance
Power Plus Speed –
Redefined Performance

Economy
Good Investment –
Savings for Long-Term

Reliability
Durability and Sustainability –
Quality Down to the Last Detail

Comfort
Perfection at a Glance –
When Technology is Comfortable

Maintainability
Efficiency Bonus –
Even with Maintenance and Service

Technical Data

Diesel Engine

Rating per ISO 9249	150 kW (204 HP) at 1,700 RPM
Model	Liebherr D934
Type	4 cylinder in-line
Bore/Stroke	122/150 mm
Displacement	7.0 l
Engine operation	4-stroke diesel Common-Rail turbo-charged and after-cooled reduced emissions
Air cleaner	dry-type air cleaner with pre-cleaner, primary and safety elements
Engine idling	sensor controlled
Electrical system	
Voltage	24 V
Batteries	2 x 135 Ah/12 V
Alternator	three-phase current 28 V/140 A
Stage V	
Harmful emissions values	according to regulation (EU) 2016/1628
Emission control	Liebherr-SCRFilter technology
Fuel tank	330 l
Urea tank	46 l
Stage IIIA (compliant)	
Harmful emissions values	in accordance with ECE-R.96 Power Band H
Fuel tank	330 l

Cooling System

Diesel engine	water-cooled compact cooling system consisting cooling unit for water, hydraulic oil and charge air with steplessly thermostatically controlled fan

Hydraulic Controls

Power distribution	via control valves with integrated safety valves, simultaneous actuation of chassis and equipment. Swing drive in separate closed circuit
Servo circuit	
Equipment and swing	with hydraulic pilot control and proportional joystick levers
Chassis	electroproportional via foot pedal
Additional functions	via switch or electroproportional foot pedals
Proportional control	proportionally acting transmitters on the joysticks for additional hydraulic functions

Hydraulic System

Hydraulic pump	
for equipment and travel drive	2 Liebherr axial piston variable displacement pumps (double construction)
Max. flow	2 x 231 l/min.
Max. pressure	350 bar
for swing drive	reversible axial piston variable displacement pump, closed-loop circuit
Max. flow	140 l/min.
Max. pressure	420 bar
Hydraulic pump regulation and control	Liebherr-Synchron-Comfort-system (LSC) with electronic engine speed sensing regulation, pressure and flow compensation
Hydraulic tank	175 l
Hydraulic system	430 l
Hydraulic oil filter	1 main return filter with integrated partial micro filtration (5 µm)
MODE selection	adjustment of engine and hydraulic performance via a mode pre-selector to match application, e.g. for especially economical and environmentally friendly operation or for maximum material handling and heavy-duty jobs
S (Sensitive)	mode for precision work and lifting through very sensitive movements
E (Eco)	mode for especially economical and environmentally friendly operation
P (Power)	mode for high performance with low fuel consumption
P+ (Power-Plus)	mode for highest performance and for very heavy duty applications, suitable for continuous operation
Engine speed and performance setting	stepless alignment of engine output and hydraulic power via engine speed
Option	Tool Control: 20 preadjustable pump flows and pressures for add-on attachments

Swing Drive

Drive	Liebherr axial piston motor in a closed system, Liebherr planetary reduction gear
Swing ring	Liebherr, sealed race ball bearing swing ring, internal teeth
Swing speed	0 – 9.5 RPM stepless
Swing torque	76 kNm
Holding brake	wet multi-disc (spring applied, pressure released)
Operation holding brake	slewing gear brake Comfort

Operator's Cab

Cab	TOPS safety cab structure (tip-over protection) with individual windscreens or featuring a slide-in subpart under the ceiling, work headlights integrated in the ceiling, a door with a sliding window (can be opened on both sides), large stowing and depositing possibilities, shock-absorbing suspension, sounddamping insulating, tinted laminated safety glass, separate shades for the sunroof window and windscreen
Operator's seat Comfort	air cushioned operator's seat with 3D-adjustable armrests, headrest, lap belt, seat heater, adjustable seat cushion inclination and length, lockable horizontal suspension, automatic weight adjustment, adjustable suspension stiffness, pneumatic lumbar vertebrae support and passive seat climatisation with active coal
Operator's seat Premium (Option)	in addition to operator's seat comfort: active electronic weight adjustment (automatic re-adjustment), pneumatic low frequency suspension and active seat climatisation with active coal and ventilator
Control system	joysticks with control consoles and swivel seat, folding left control console
Operation and displays	large high-resolution operating unit, selfexplanatory, colour display with touchscreen, video-compatible, numerous setting, control and monitoring options, e.g. air conditioning control, fuel consumption, machine and attachment parameters
Air-conditioning	automatic air-conditioning, recirculated air function, fast de-icing and demisting at the press of a button, air vents can be operated via a menu; recirculated air and fresh air filters can be easily replaced and are accessible from the outside; heating-cooling unit, designed for extreme outside temperatures, sensors for solar radiation, inside and outside temperatures
Refrigerant	R134a
Global warming potential	1,430
Quantity at 25 °C*	1,400 – 1,500 g
CO_2 equivalent*	2.002 – 2.145 t
Vibration emission**	
Hand/arm vibrations	< 2.5 m/s²
Whole-body vibrations	< 0.5 m/s²
Measuring inaccuracy	according with standard EN 12096:1997

Undercarriage

Drive	oversized two speed power shift transmission with additional creeper speed, Liebherr axial piston motor with functional brake valve on both sides
Travel speed	
Joystick and wheel steering	0 – 3.5 km/h stepless (creeper speed + transmission stage 1) 0 – 7.0 km/h stepless (transmission stage 1) 0 – 13.0 km/h stepless (creeper speed + transmission stage 2) 0 – 20.0 km/h stepless (transmission stage 2)
Driving operation	automotive driving using accelerator pedal, cruise control function: storage of variable accelerator pedal positions
Axles	60 t drive axles; manual or automatic hydraulically controlled front axle oscillation lock
Four wheel steering	standard
Steering reversal control	standard
Service brake	two circuit travel brake system with accumulator; wet and backlash-free disc brake
Holding brake	wet multi-disc (spring applied, pressure released)
Stabilization	stabilizer blade rear
Option	stabilizer blade rear and front stabilizer blade rear + 2 point outriggers front

Equipment

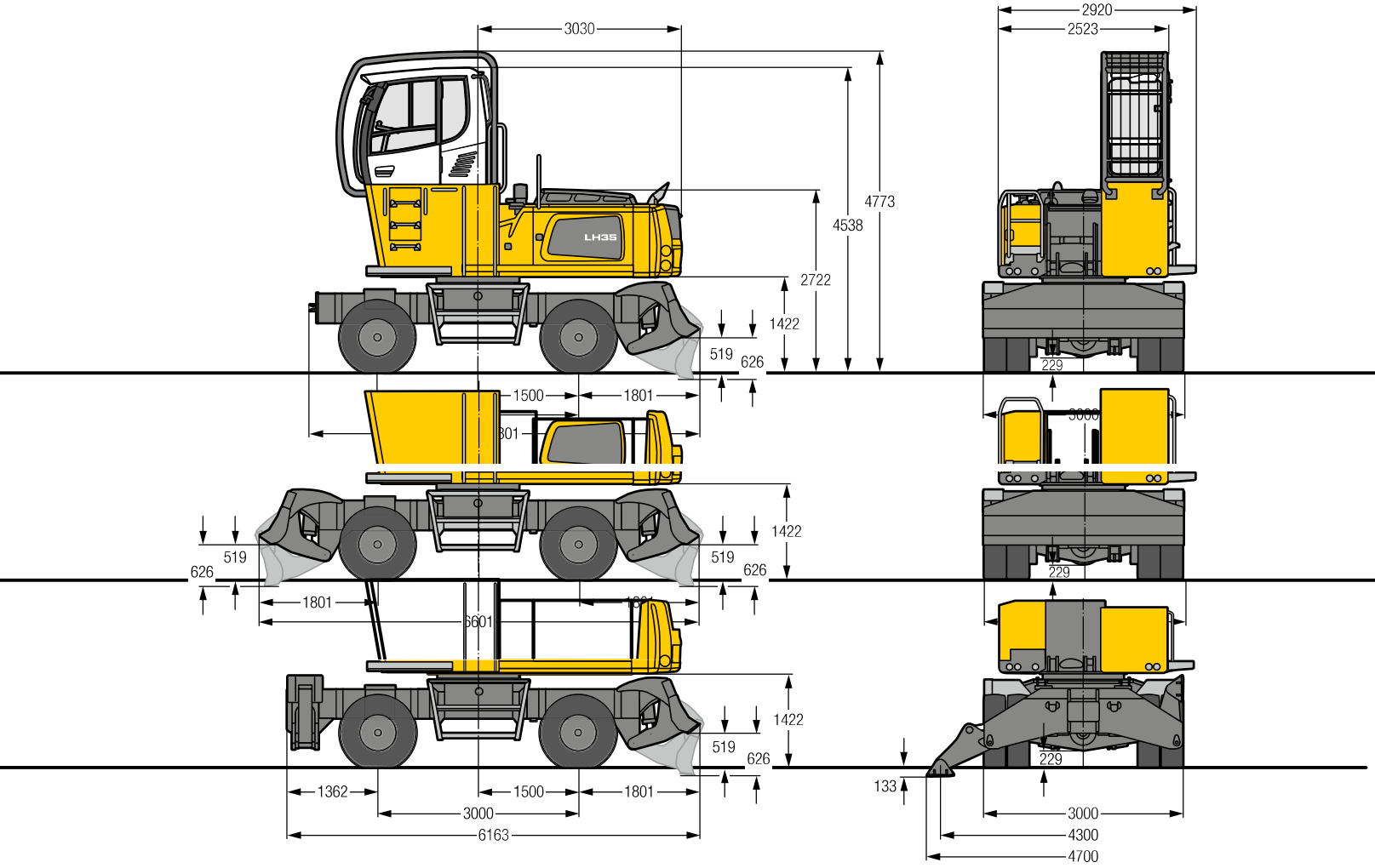
Type	high-strength steel plates at highlystressed points for the toughest requirements. Complex and stable mountings of equipment and cylinders
Hydraulic cylinders	Liebherr cylinders with special seal system as well as shock absorption
Bearings	sealed, low maintenance

Complete Machine

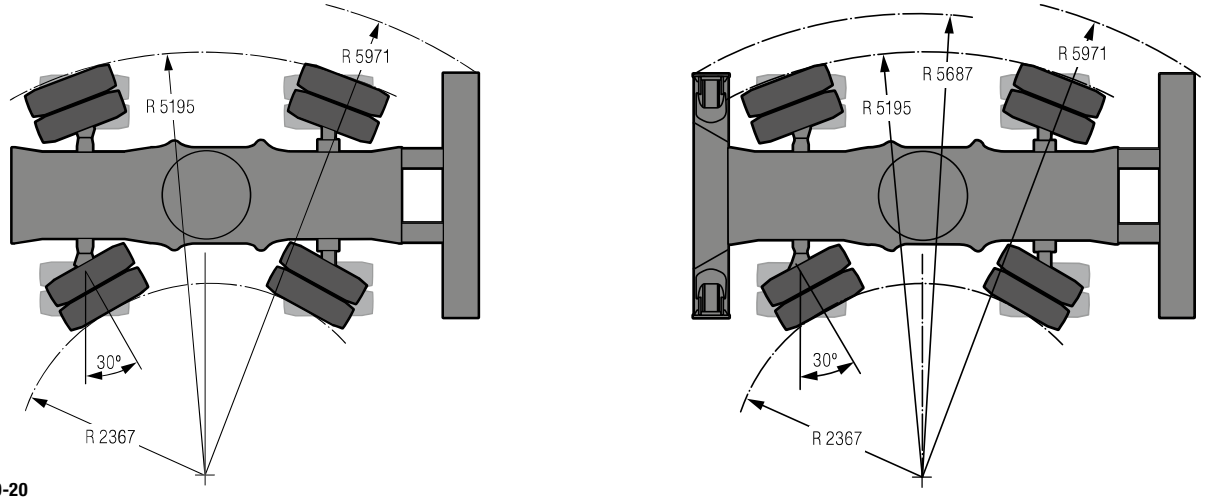
Lubrication	Liebherr central lubrication system for uppercarriage and equipment, automatically
Option	Liebherr central lubrication system for undercarriage, automatically
Steps system	safe and durable access system with anti-slip steps main components hot-galvanised
Noise emission	
ISO 6396	L_{pA} (inside cab) = 70 dB(A) (Stage V)
2000/14/EC	L_{WA} (surround noise) = 103 dB(A) (Stage V)
ISO 6396	L_{pA} (inside cab) = 71 dB(A) (Stage IIIA compliant)
2000/14/EC	L_{WA} (surround noise) = 103 dB(A) (Stage IIIA compliant)

* depending on configuration
** for risk assessment according to 2002/44/EC see ISO/TR 25398:2006

Dimensions



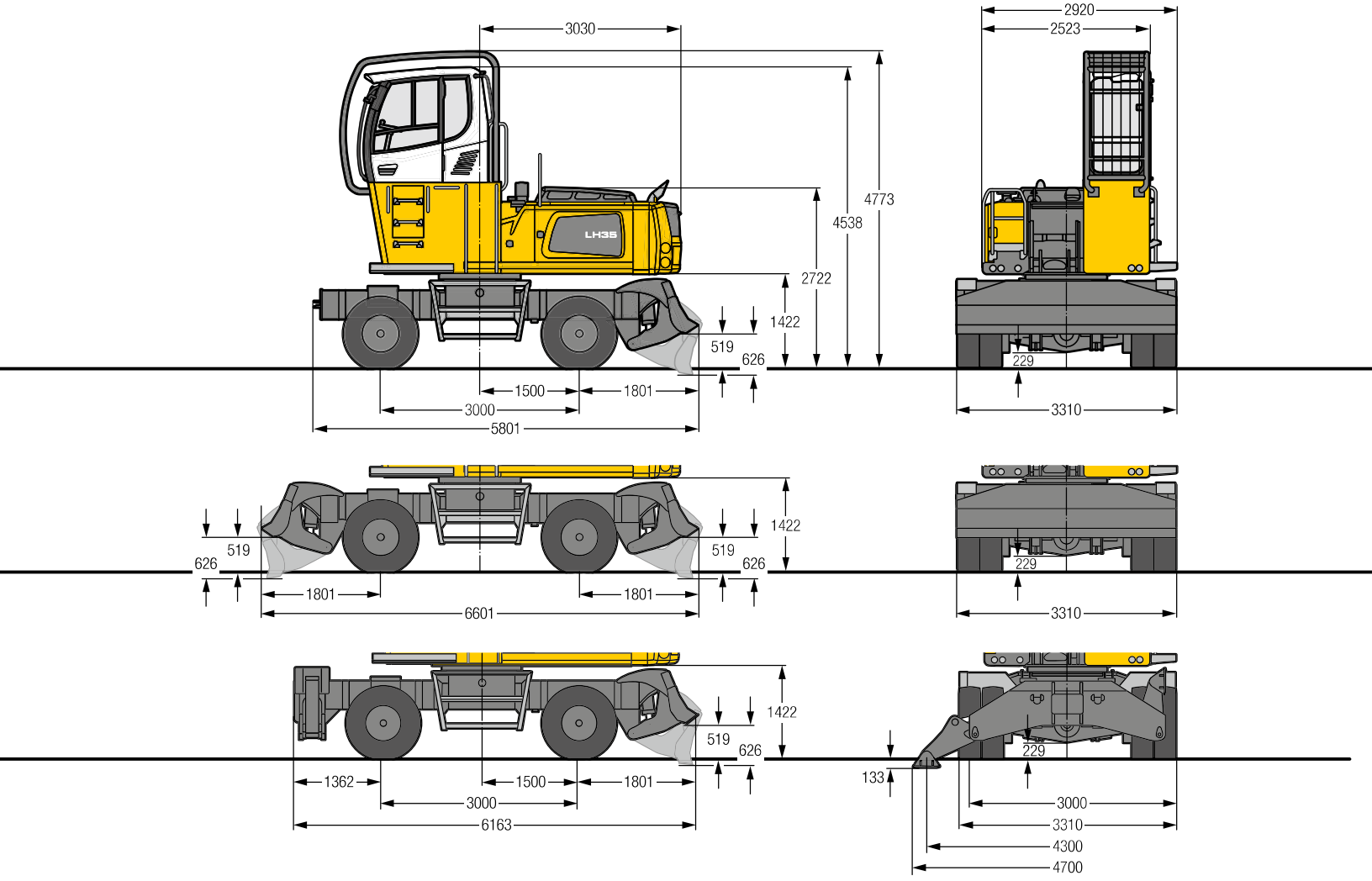
Turning Radiuses



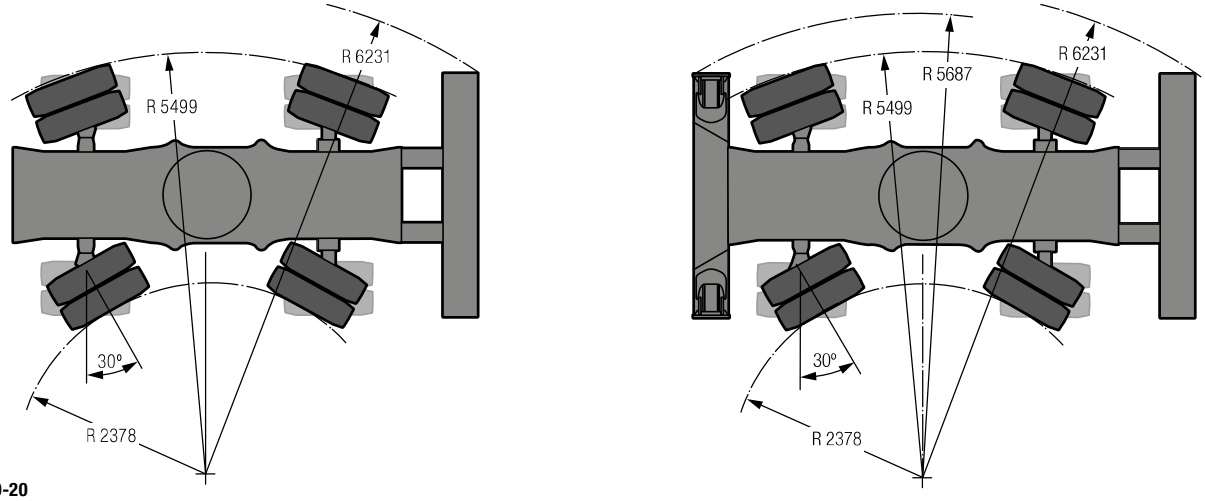
Tyres 12.00-20

Dimensions

EW-Undercarriage

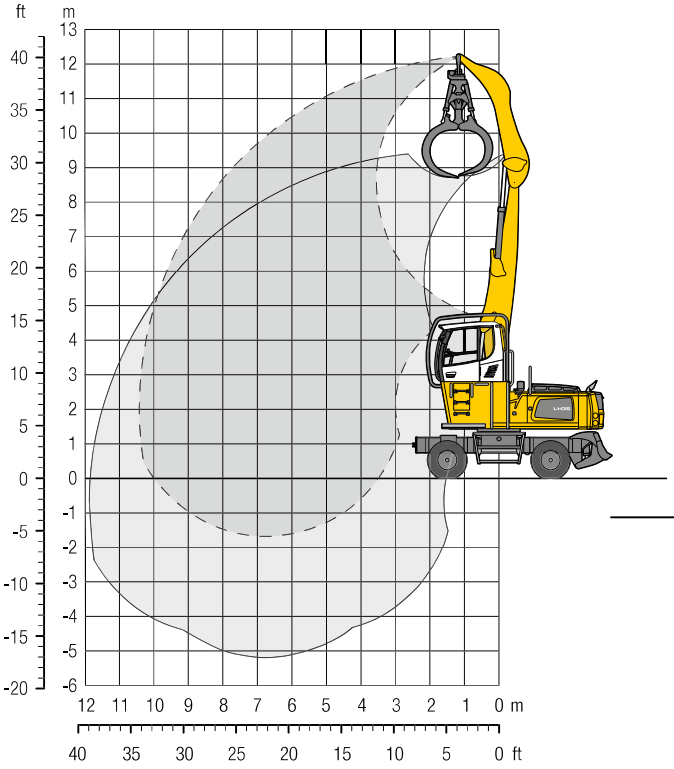


Turning Radiuses



Tyres 12.00-20

Equipment GA10

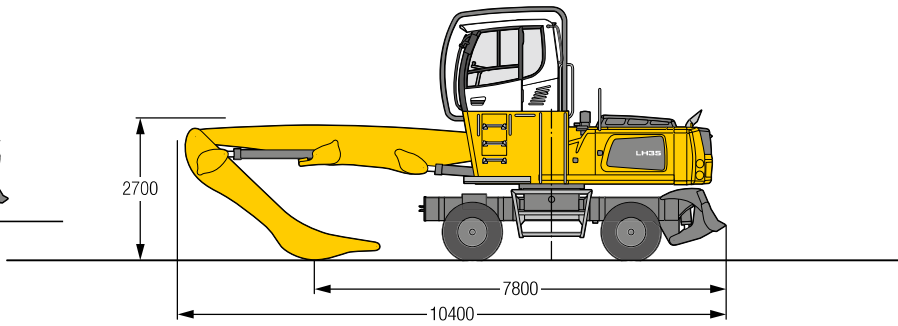


Operating Weight

The operating weight includes the basic machine with stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 4.00 m and wood grab GM 20B/ 1.70 m².

Weight	29,600 kg

Dimensions



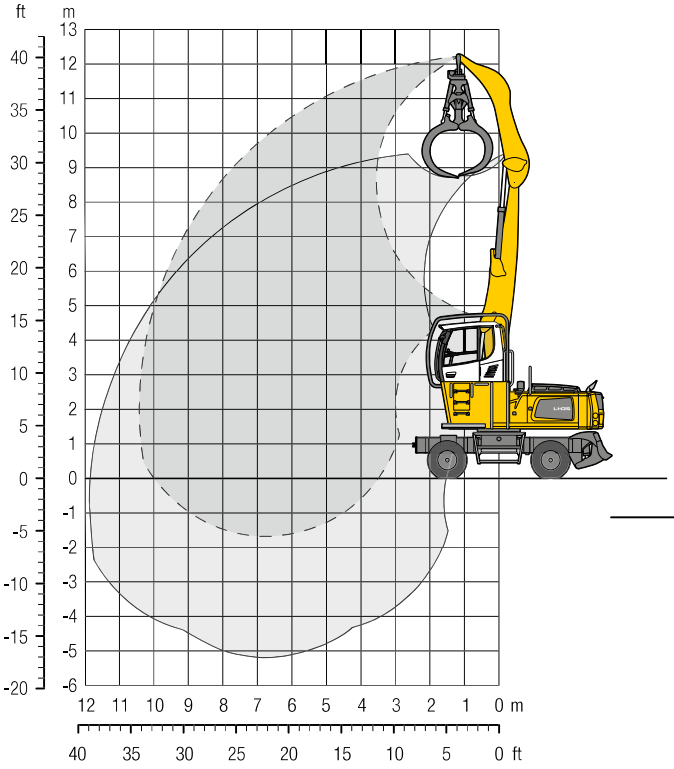
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		10.5 m				m
12.0	Stabilizers raised (drive operation)													10.7*	10.7*	2.5
	Stabilizers raised													10.7*	10.7*	
	Stabilizer blade down													10.7*	10.7*	
10.5	Stabilizers raised (drive operation)			8.9	10.0*									5.6	6.9*	6.0
	Stabilizers raised			10.0*	10.0*									6.9*	6.9*	
	Stabilizer blade down			10.0*	10.0*									6.9*	6.9*	
9.0	Stabilizers raised (drive operation)			9.0	10.2*	5.7	7.6	4.0	5.3					3.8	5.0	7.7
	Stabilizers raised			10.2*	10.2*	7.2	8.3*	5.0	6.6					4.7	6.0*	
	Stabilizer blade down			10.2*	10.2*	7.6	8.3*	5.3	6.8*					5.0	6.0*	
7.5	Stabilizers raised (drive operation)			8.9	10.3*	5.7	7.5	4.0	5.3					3.0	4.0	8.9
	Stabilizers raised			10.3*	10.3*	7.1	8.3*	5.0	6.6					3.8	5.0	
	Stabilizer blade down			10.3*	10.3*	7.6	8.3*	5.3	7.0*					4.0	5.5*	
6.0	Stabilizers raised (drive operation)	12.3*	12.3*	8.6	10.8*	5.6	7.4	3.9	5.2	2.9	3.9			2.6	3.5	9.6
	Stabilizers raised	12.3*	12.3*	10.8	10.8*	6.9	8.5*	4.9	6.5	3.7	4.9			3.3	4.4	
	Stabilizer blade down	12.3*	12.3*	10.8*	10.8*	7.4	8.5*	5.2	7.0*	3.9	5.9*			3.5	5.3*	
4.5	Stabilizers raised (drive operation)	15.4	17.5*	8.1	11.1	5.3	7.1	3.8	5.1	2.9	3.9			2.4	3.2	10.1
	Stabilizers raised	17.5*	17.5*	10.1	11.7*	6.6	8.9	4.8	6.3	3.6	4.8			3.0	4.0	
	Stabilizer blade down	17.5*	17.5*	10.8	11.7*	7.0	8.9*	5.1	7.1*	3.8	5.8*			3.2	4.8*	
3.0	Stabilizers raised (drive operation)	2.8*	2.8*	7.4	10.3	5.0	6.7	3.6	4.9	2.8	3.8			2.3	3.1	10.4
	Stabilizers raised	2.8*	2.8*	9.2	12.4*	6.2	8.4	4.5	6.1	3.5	4.7			2.8	3.8	
	Stabilizer blade down	2.8*	2.8*	9.9	12.4*	6.6	9.1*	4.9	7.1*	3.7	5.7*			3.0	4.3*	
1.5	Stabilizers raised (drive operation)	1.1*	1.1*	6.8	9.7	4.7	6.4	3.5	4.7	2.7	3.7			2.2	3.0	10.4
	Stabilizers raised	1.1*	1.1*	8.5	11.9*	5.9	8.0	4.4	5.9	3.4	4.6			2.8	3.7*	
	Stabilizer blade down	1.1*	1.1*	9.2	11.9*	6.3	8.8*	4.7	6.8*	3.6	5.3*			3.0	3.7*	
0	Stabilizers raised (drive operation)			6.6	9.4	4.5	6.2	3.4	4.6	2.7	3.6			2.3	3.2	10.0
	Stabilizers raised			8.2	9.6*	5.6	7.8	4.2	5.8	3.3	4.5			2.9	3.4*	
	Stabilizer blade down			8.9	9.6*	6.0	7.8*	4.5	6.1*	3.6	4.6*			3.1	3.4*	
–1.5	Stabilizers raised (drive operation)					4.4	6.1*	3.3	4.6					3.1	4.2	7.9
	Stabilizers raised					5.6	6.1*	4.2	4.8*					3.9	4.4*	
	Stabilizer blade down					6.0	6.1*	4.5	4.8*					4.2	4.4*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Equipment GA10

EW-Undercarriage

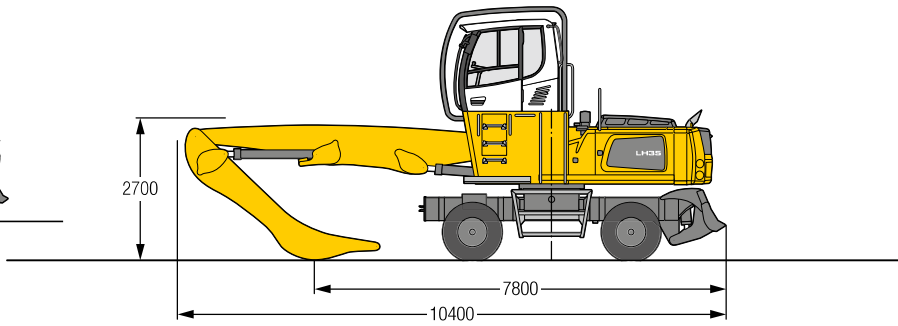


Operating Weight

The operating weight includes the basic machine with stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 4.00 m and wood grab GM 20B/ 1.70 m².

Weight	29,900 kg

Dimensions



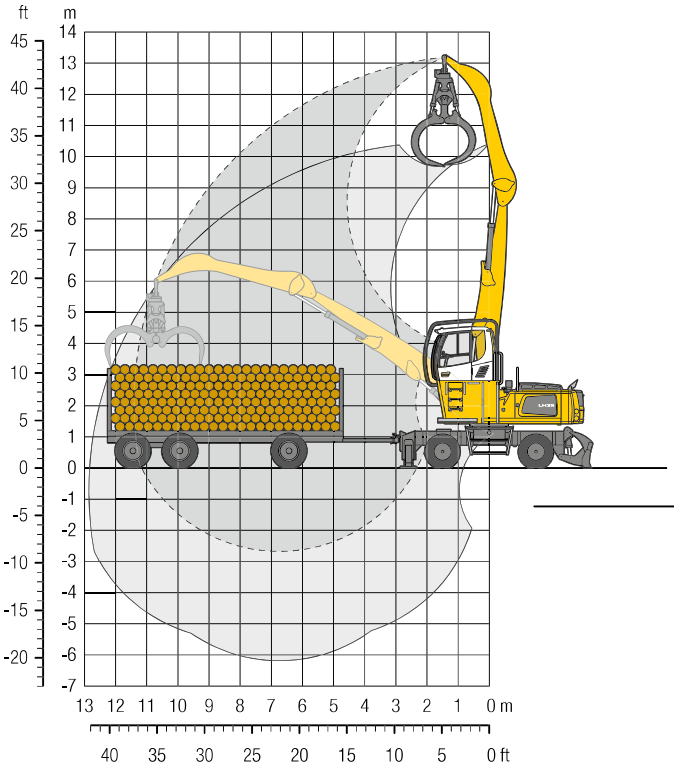
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		10.5 m				m
12.0	Stabilizers raised (drive operation)													10.7*	10.7*	2.5
	Stabilizers raised													10.7*	10.7*	
	Stabilizer blade down													10.7*	10.7*	
10.5	Stabilizers raised (drive operation)			10.0*	10.0*									6.4	6.9*	6.0
	Stabilizers raised			10.0*	10.0*									6.9*	6.9*	
	Stabilizer blade down			10.0*	10.0*									6.9*	6.9*	
9.0	Stabilizers raised (drive operation)			10.2*	10.2*	6.6	7.7	4.5	5.4					4.3	5.1	7.7
	Stabilizers raised			10.2*	10.2*	8.2	8.3*	5.7	6.7					5.4	6.0*	
	Stabilizer blade down			10.2*	10.2*	8.3*	8.3*	6.0	6.8*					5.8	6.0*	
7.5	Stabilizers raised (drive operation)			10.3*	10.3*	6.5	7.7	4.6	5.4					3.5	4.1	8.9
	Stabilizers raised			10.3*	10.3*	8.2	8.3*	5.7	6.8					4.3	5.2	
	Stabilizer blade down			10.3*	10.3*	8.3*	8.3*	6.1	7.0*					4.6	5.5*	
6.0	Stabilizers raised (drive operation)	12.3*	12.3*	10.0	10.8*	6.4	7.5	4.5	5.3	3.4	4.0			3.0	3.6	9.6
	Stabilizers raised	12.3*	12.3*	10.8*	10.8*	8.0	8.5*	5.6	6.7	4.2	5.0			3.8	4.5	
	Stabilizer blade down	12.3*	12.3*	10.8*	10.8*	8.5	8.5*	6.0	7.0*	4.5	5.9*			4.0	5.3*	
4.5	Stabilizers raised (drive operation)	17.5*	17.5*	9.4	11.3	6.1	7.2	4.4	5.2	3.3	4.0			2.8	3.3	10.1
	Stabilizers raised	17.5*	17.5*	11.7*	11.7*	7.6	8.9*	5.5	6.5	4.2	4.9			3.5	4.1	
	Stabilizer blade down	17.5*	17.5*	11.7*	11.7*	8.1	8.9*	5.8	7.1*	4.4	5.8*			3.7	4.8*	
3.0	Stabilizers raised (drive operation)	2.8*	2.8*	8.7	10.6	5.8	6.9	4.2	5.0	3.2	3.9			2.6	3.1	10.4
	Stabilizers raised	2.8*	2.8*	10.8	12.4*	7.2	8.6	5.3	6.3	4.0	4.8			3.3	3.9	
	Stabilizer blade down	2.8*	2.8*	11.7	12.4*	7.7	9.1*	5.6	7.1*	4.3	5.7*			3.5	4.3*	
1.5	Stabilizers raised (drive operation)	1.1*	1.1*	8.1	10.0	5.5	6.6	4.0	4.9	3.2	3.8			2.6	3.1	10.4
	Stabilizers raised	1.1*	1.1*	10.1	11.9*	6.8	8.2	5.1	6.1	3.9	4.7			3.2	3.7*	
	Stabilizer blade down	1.1*	1.1*	10.9	11.9*	7.3	8.8*	5.4	6.8*	4.2	5.3*			3.5	3.7*	
0	Stabilizers raised (drive operation)			7.8	9.6*	5.3	6.4	3.9	4.7	3.1	3.7			2.7	3.3	10.0
	Stabilizers raised			9.6*	9.6*	6.6	7.8*	4.9	5.9	3.9	4.6*			3.4	3.4*	
	Stabilizer blade down			9.6*	9.6*	7.1	7.8*	5.3	6.1*	4.1	4.6*			3.4*	3.4*	
–1.5	Stabilizers raised (drive operation)					5.2	6.1*	3.9	4.7					3.6	4.4	7.9
	Stabilizers raised					6.1*	6.1*	4.8*	4.8*					4.4*	4.4*	
	Stabilizer blade down					6.1*	6.1*	4.8*	4.8*					4.4*	4.4*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Equipment GA11

EW-Undercarriage

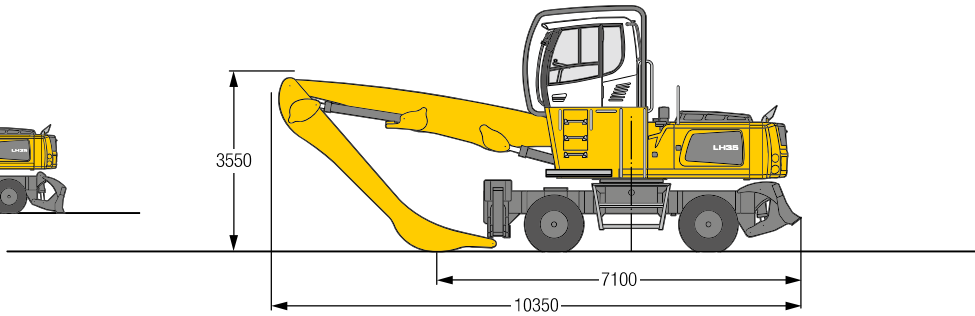


Operating Weight

The operating weight includes the basic machine with 2 point/stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 5.00 m and wood grab GM 20B/1.70 m².

Weight	31,700 kg

Dimensions



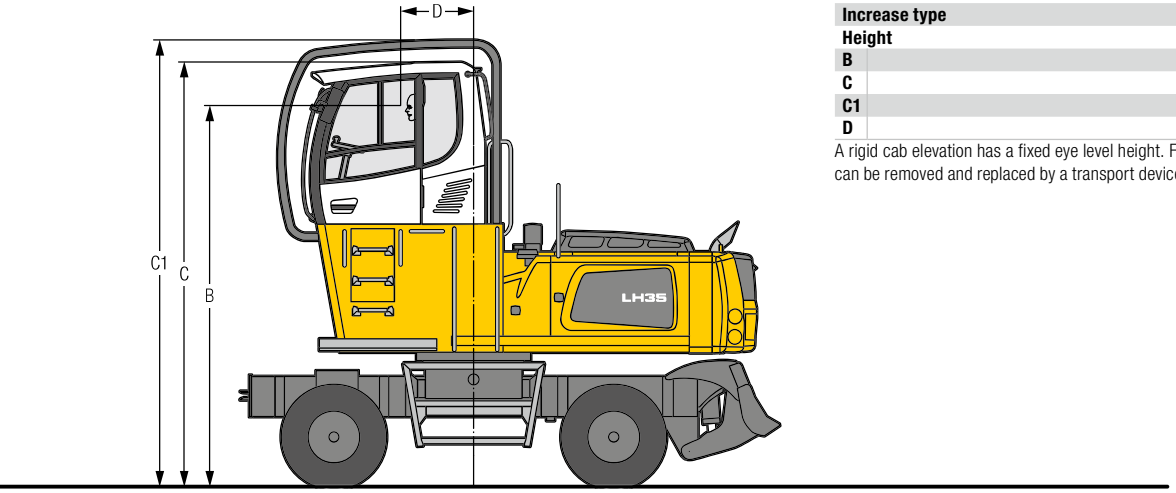
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		10.5 m				m
	Stabilizers raised (drive operation)			8.0*	8.0*									6.4*	6.4*	
12.0	Stabilizers raised			8.0*	8.0*									6.4*	6.4*	5.4
	2 pt. outriggers + blade down			8.0*	8.0*									6.4*	6.4*	
	Stabilizers raised (drive operation)			9.0*	9.0*	7.0	7.8	4.8	5.3					4.7	5.1*	
10.5	Stabilizers raised			9.0*	9.0*	7.8*	7.8*	5.4*	5.4*					5.1*	5.1*	7.6
	2 pt. outriggers + blade down			9.0*	9.0*	7.8*	7.8*	5.4*	5.4*					5.1*	5.1*	
	Stabilizers raised (drive operation)					7.1	7.7*	5.0	5.5	3.6	4.0			3.6	4.0	
9.0	Stabilizers raised					7.7*	7.7*	6.2	6.6*	4.5	4.6*			4.5	4.6*	9.0
	2 pt. outriggers + blade down					7.7*	7.7*	6.6*	6.6*	4.6*	4.6*			4.6*	4.6*	
	Stabilizers raised (drive operation)			9.3*	9.3*	7.1	7.7*	5.0	5.5	3.7	4.1			3.1	3.4	
7.5	Stabilizers raised			9.3*	9.3*	7.7*	7.7*	6.2	6.6*	4.6	5.1			3.8	4.2	10.0
	2 pt. outriggers + blade down			9.3*	9.3*	7.7*	7.7*	6.6*	6.6*	5.7*	5.7*			4.3*	4.3*	
	Stabilizers raised (drive operation)			9.7*	9.7*	6.9	7.6	4.9	5.4	3.6	4.0	2.8	3.1	2.7	3.0	
6.0	Stabilizers raised			9.7*	9.7*	8.0*	8.0*	6.1	6.7	4.6	5.0	3.5	3.9	3.4	3.8	10.7
	2 pt. outriggers + blade down			9.7*	9.7*	8.0*	8.0*	6.7*	6.7*	5.7*	5.7*	4.8*	4.8*	4.2*	4.2*	
	Stabilizers raised (drive operation)	9.1*	9.1*	10.3	10.8*	6.6	7.3	4.7	5.2	3.6	3.9	2.8	3.1	2.5	2.8	
4.5	Stabilizers raised	9.1*	9.1*	10.8*	10.8*	8.2	8.4*	5.9	6.5	4.4	4.9	3.5	3.8	3.2	3.5	11.1
	2 pt. outriggers + blade down	9.1*	9.1*	10.8*	10.8*	8.4*	8.4*	6.9*	6.9*	5.8*	5.8*	4.8*	4.8*	4.2*	4.2*	
	Stabilizers raised (drive operation)	18.3*	18.3*	9.5	10.8	6.2	6.9	4.5	5.0	3.4	3.8	2.7	3.0	2.4	2.7	
3.0	Stabilizers raised	18.3*	18.3*	11.9*	11.9*	7.8	8.7	5.6	6.2	4.3	4.8	3.4	3.8	3.0	3.3	11.4
	2 pt. outriggers + blade down	18.3*	18.3*	11.9*	11.9*	8.8*	8.8*	7.0*	7.0*	5.7*	5.7*	4.6*	4.6*	3.8*	3.8*	
	Stabilizers raised (drive operation)	3.5*	3.5*	8.8	10.0	5.8	6.5	4.3	4.8	3.3	3.7	2.7	3.0	2.4	2.6	
1.5	Stabilizers raised	3.5*	3.5*	10.9	12.2*	7.3	8.2	5.4	6.0	4.2	4.6	3.3	3.7	3.0	3.3	11.4
	2 pt. outriggers + blade down	3.5*	3.5*	12.2*	12.2*	8.9*	8.9*	6.9*	6.9*	5.5*	5.5*	4.3*	4.3*	3.4*	3.4*	
	Stabilizers raised (drive operation)	3.5*	3.5*	8.3	9.5	5.6	6.3	4.1	4.6	3.2	3.6	2.6	2.9	2.4	2.7	
0	Stabilizers raised	3.5*	3.5*	10.3	11.3*	7.0	7.8	5.2	5.8	4.0	4.5	3.3	3.6	2.9*	2.9*	11.2
	2 pt. outriggers + blade down	3.5*	3.5*	11.3*	11.3*	8.4*	8.4*	6.5*	6.5*	5.1*	5.1*	3.7*	3.7*	2.9*	2.9*	
	Stabilizers raised (drive operation)			8.1	9.2*	5.4	6.1	4.0	4.5	3.2	3.5			2.8	3.1	
–1.5	Stabilizers raised			9.2*	9.2*	6.8	7.2*	5.0	5.6*	4.0	4.2*			3.3*	3.3*	10.0
	2 pt. outriggers + blade down			9.2*	9.2*	7.2*	7.2*	5.6*	5.6*	4.2*	4.2*			3.3*	3.3*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Choice of Cab Elevation

Cab Elevation LFC (Rigid Elevation)

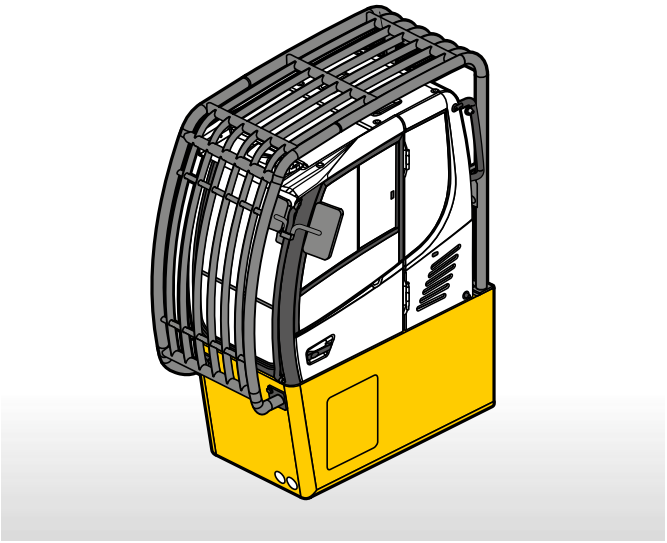


Increase type	LFC 120
Height	1,200 mm
B	4,074 mm
C	4,538 mm
C1	4,773 mm
D	788 mm

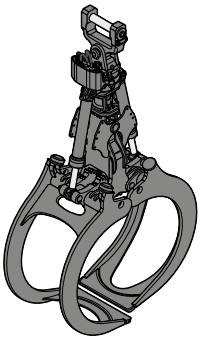
A rigid cab elevation has a fixed eye level height. For a lower transport height, the shell of the cab can be removed and replaced by a transport device. On this machine dimension C is 3,642 mm.

Cab Protection

Integral Guard



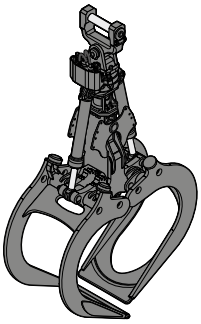
Attachments



Wood Grab

Grab model GM 20B round-shaped (complete overlapping, vertical cylinders)

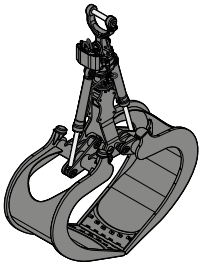
Size	m²	1.00	1.30	1.50	1.70	1.90
Cutting width	mm	810	810	810	810	810
Height of grab, closed	mm	2,572	2,675	2,720	2,812	2,897
Weight	kg	1,545	1,575	1,595	1,625	1,760



Wood Grab

Grab model GM 20B round-shaped (complete overlapping, straight design, vertical cylinders)

Size	m²	1.00	1.30	1.50	1.70
Cutting width	mm	810	810	810	810
Height of grab, closed	mm	2,551	2,638	2,729	2,786
Weight	kg	1,565	1,595	1,660	1,705



Wood Grab

Grab model GM 20C heart-shaped (tip-to-tip closing, straight design, vertical cylinders)

Size	m²	1.60	1.90
Cutting width	mm	870	870
Height of grab, closed	mm	2,903	3,052
Weight	kg	1,890	1,925

Product Information Log Loader

LH 35 M Timber

Litronic®

Operating Weight
29,600 – 31,600 kg

Engine
150 kW / 204 HP
Stage IV
Stage IIIA

LIEBHERR

Performance
Power Plus Speed –
Redefined Performance

Economy
Good Investment –
Savings for Long-Term

Reliability
Durability and Sustainability –
Quality Down to the Last Detail

Comfort
Perfection at a Glance –
When Technology is Comfortable

Maintainability
Efficiency Bonus –
Even with Maintenance and Service

Technical Data

Diesel Engine

Rating per ISO 9249	150 kW (204 HP) at 1,700 RPM
Model	Liebherr D934
Type	4 cylinder in-line
Bore/Stroke	122/150 mm
Displacement	7.0 l
Engine operation	4-stroke diesel Common-Rail turbo-charged and after-cooled reduced emissions
Air cleaner	dry-type air cleaner with pre-cleaner, primary and safety elements
Engine idling	sensor controlled
Electrical system	
Voltage	24 V
Batteries	2 x 135 Ah/12 V
Alternator	three-phase current 28 V/140 A
Stage IV	
Harmful emissions values	in accordance with 97/68/EG stage IV
Emission control	Liebherr-SCR technology
Fuel tank	330 l
Urea tank	46 l
Stage IIIA	
Harmful emissions values	in accordance with 97/68/EG stage IIIA
Fuel tank	330 l

Cooling System

Diesel engine	water-cooled compact cooling system consisting cooling unit for water, hydraulic oil and charge air with step-less thermostatically controlled fan

Hydraulic Controls

Power distribution	via control valves with integrated safety valves, simultaneous actuation of chassis and attachment. Swing drive in separate closed circuit
Servo circuit	
Attachment and swing	with hydraulic pilot control and proportional joystick levers
Chassis	electroproportional via foot pedal
Additional functions	via switch or electroproportional foot pedals
Proportional control	proportionally acting transmitters on the joy-sticks for additional hydraulic functions

Hydraulic System

Hydraulic pump	
for attachment and travel drive	2 Liebherr axial piston variable displacement pumps (double construction)
Max. flow	2 x 231 l/min.
Max. pressure	350 bar
for swing drive	reversible axial piston variable displacement pump, closed-loop circuit
Max. flow	140 l/min.
Max. pressure	420 bar
Hydraulic pump regulation and control	Liebherr-Synchron-Comfort-system (LSC) with electronic engine speed sensing regulation, pressure and flow compensation
Hydraulic tank	175 l
Hydraulic system	430 l
Hydraulic oil filter	1 main return filter with integrated partial micro filtration (5 µm)
MODE selection	adjustment of engine and hydraulic performance via a mode pre-selector to match application, e.g. for especially economical and environmentally friendly operation or for maximum material handling and heavy-duty jobs
S (Sensitive)	mode for precision work and lifting through very sensitive movements
E (Eco)	mode for especially economical and environmentally friendly operation
P (Power)	mode for high performance with low fuel consumption
P+ (Power-Plus)	mode for highest performance and for very heavy duty applications, suitable for continuous operation
Engine speed and performance setting	stepless alignment of engine output and hydraulic power via engine speed
Option	Tool Control: ten preadjustable pump flows and pressures for add on tools

Swing Drive

Drive	Liebherr axial piston motor in a closed system, Liebherr planetary reduction gear
Swing ring	Liebherr, sealed race ball bearing swing ring, internal teeth
Swing speed	0 – 9.5 RPM stepless
Swing torque	76 kNm
Holding brake	wet multi-disc (spring applied, pressure released)

Operator's Cab

Cab	TOPS safety cab structure (tip-over protection) with individual windscreens or featuring a slide-in subpart under the ceiling, work headlights integrated in the ceiling, a door with a sliding window (can be opened on both sides), large stowing and depositing possibilities, shock-absorbing suspension, sounddamping insulating, tinted laminated safety glass, separate shades for the sunroof window and windscreen
Operator's seat Comfort	air cushioned operator's seat with 3D-adjustable armrests, headrest, lap belt, seat heater, adjustable seat cushion inclination and length, lockable horizontal suspension, automatic weight adjustment, adjustable suspension stiffness, pneumatic lumbar vertebrae support and passive seat climatisation with active coal
Operator's seat Premium (Option)	in addition to operator's seat comfort: active electronic weight adjustment (automatic re-adjustment), pneumatic low frequency suspension and active seat climatisation with active coal and ventilator
Control system	joysticks with arm consoles and swivel seat, folding left arm console
Operation and displays	large high-resolution operating unit, selfexplanatory, colour display with touchscreen, video-compatible, numerous setting, control and monitoring options, e.g. air conditioning control, fuel consumption, machine and tool parameters
Air-conditioning	automatic air-conditioning, recirculated air function, fast de-icing and demisting at the press of a button, air vents can be operated via a menu; recirculated air and fresh air filters can be easily replaced and are accessible from the outside; heating-cooling unit, designed for extreme outside temperatures, sensors for solar radiation, inside and outside temperatures

Undercarriage

Drive	oversized two speed power shift transmission with additional creeper speed, Liebherr axial piston motor with functional brake valve on both sides
Travel speed	
Joystick and wheel steering	0 – 3.5 km/h stepless (creeper speed + transmission stage 1) 0 – 7.0 km/h stepless (transmission stage 1) 0 – 13.0 km/h stepless (creeper speed + transmission stage 2) 0 – 20.0 km/h stepless (transmission stage 2)
Driving operation	automotive driving using accelerator pedal, cruise control function: storage of variable accelerator pedal positions
Axles	60 t drive axles; manual or automatic hydraulically controlled front axle oscillation lock
Four wheel steering	standard
Steering reversal control	standard
Service brake	two circuit travel brake system with accumulator; wet and backlash-free disc brake
Holding brake	wet multi-disc (spring applied, pressure released)
Stabilization	stabilizer blade rear
Option	stabilizer blade rear and front stabilizer blade rear + 2 point outriggers front

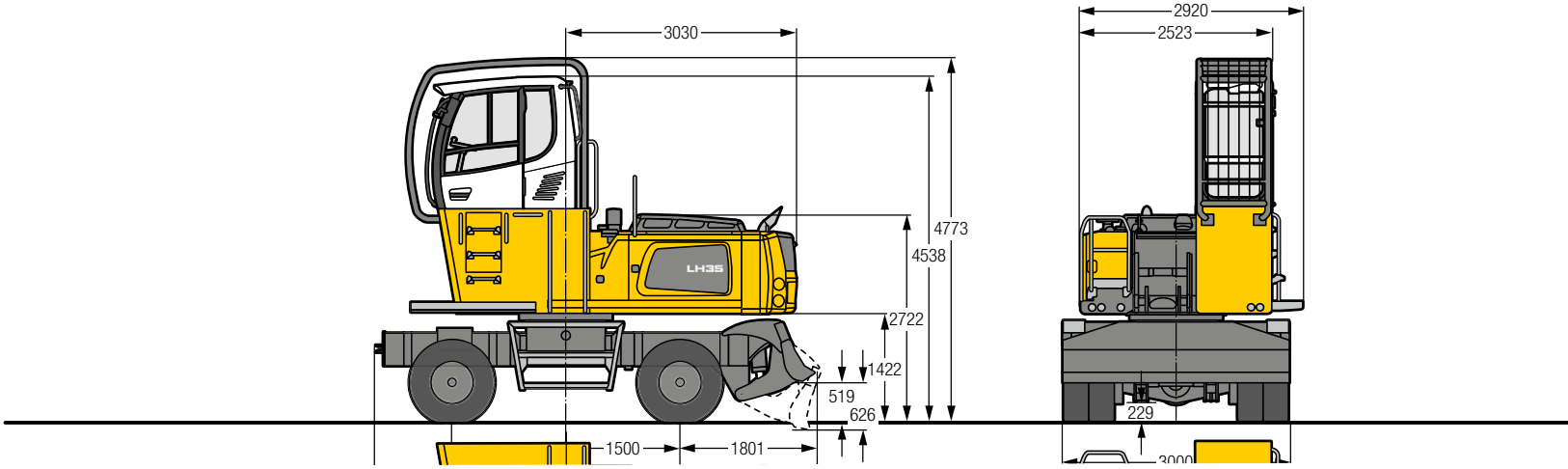
Attachment

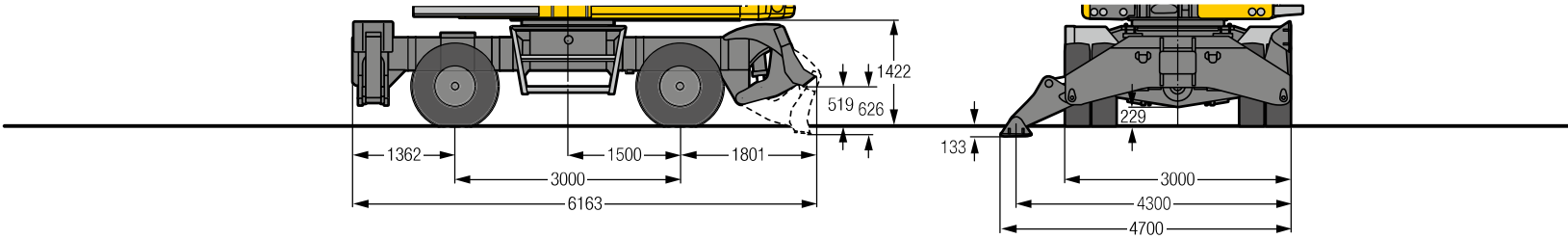
Type	high-strength steel plates at highlystressed points for the toughest requirements. Complex and stable mountings of attachment and cylinders
Hydraulic cylinders	Liebherr cylinders with special seal system as well as shock absorption
Bearings	sealed, low maintenance

Complete Machine

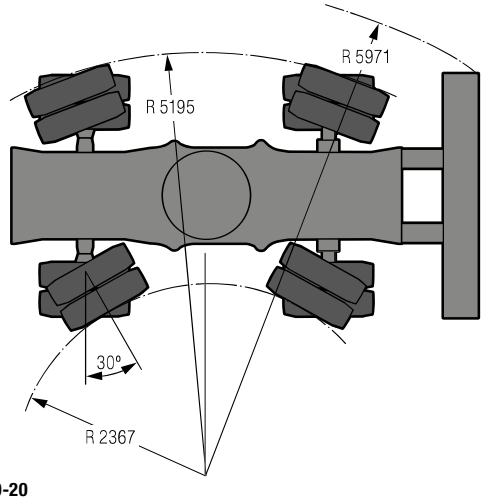
Lubrication	Liebherr central lubrication system for uppercarriage and attachment, automatically
Option	Liebherr central lubrication system for undercarriage, automatically
Steps system	safe and durable access system with anti-slip steps main components hot-galvanised
Noise emission	
ISO 6396	L_{pA} (inside cab) = 71 dB(A)
2000/14/EC	L_{WA} (surround noise) = 103 dB(A)

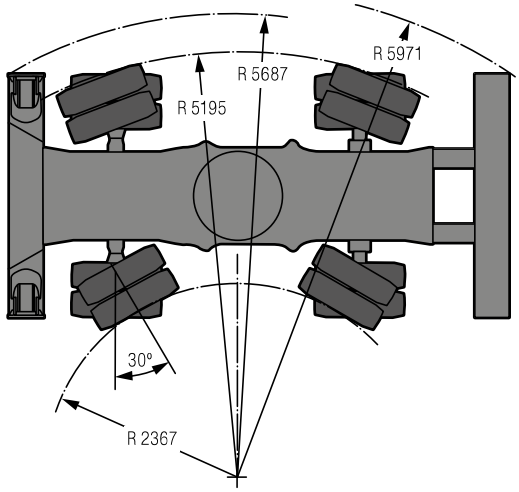
Dimensions





Turning Radiuses

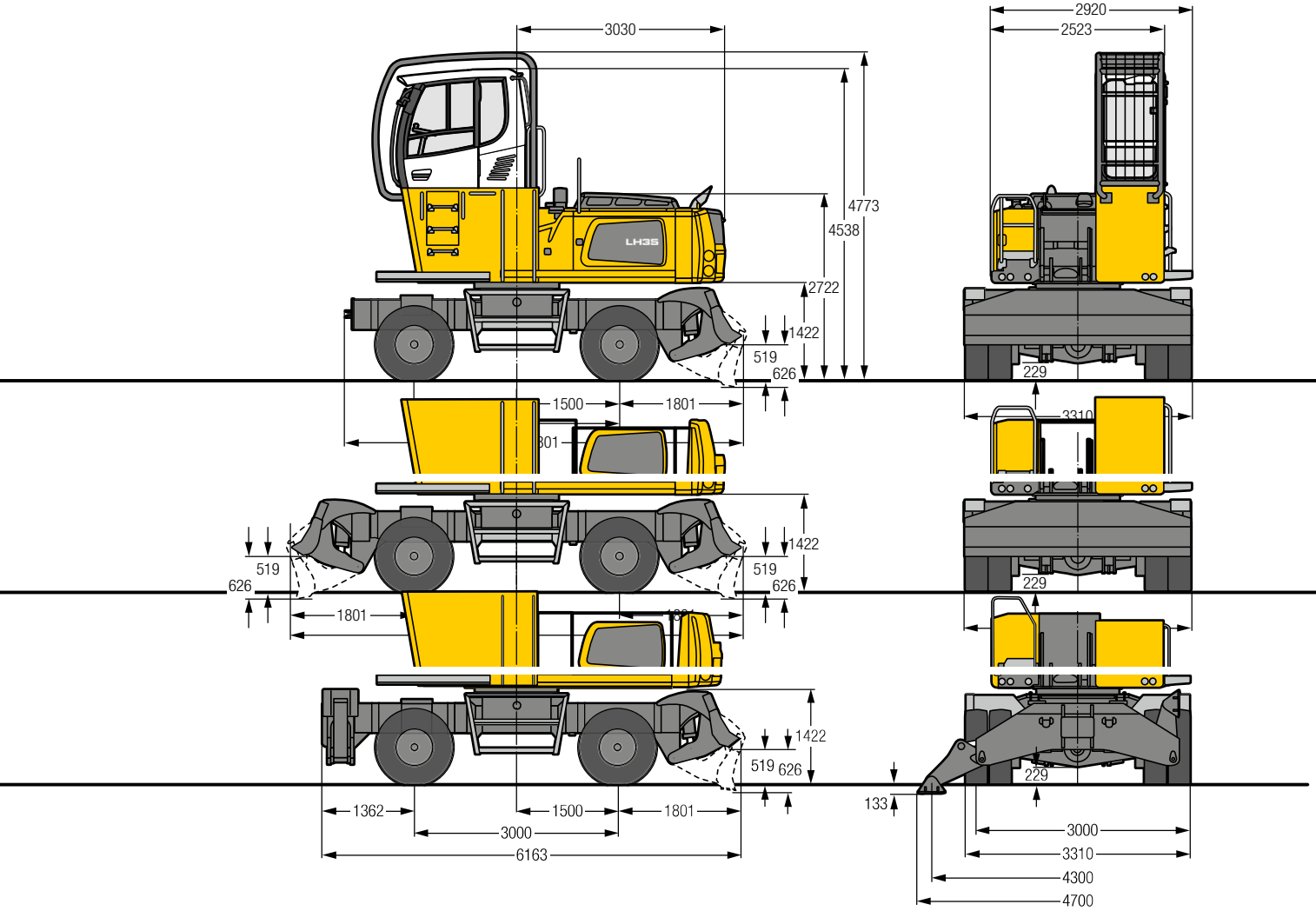




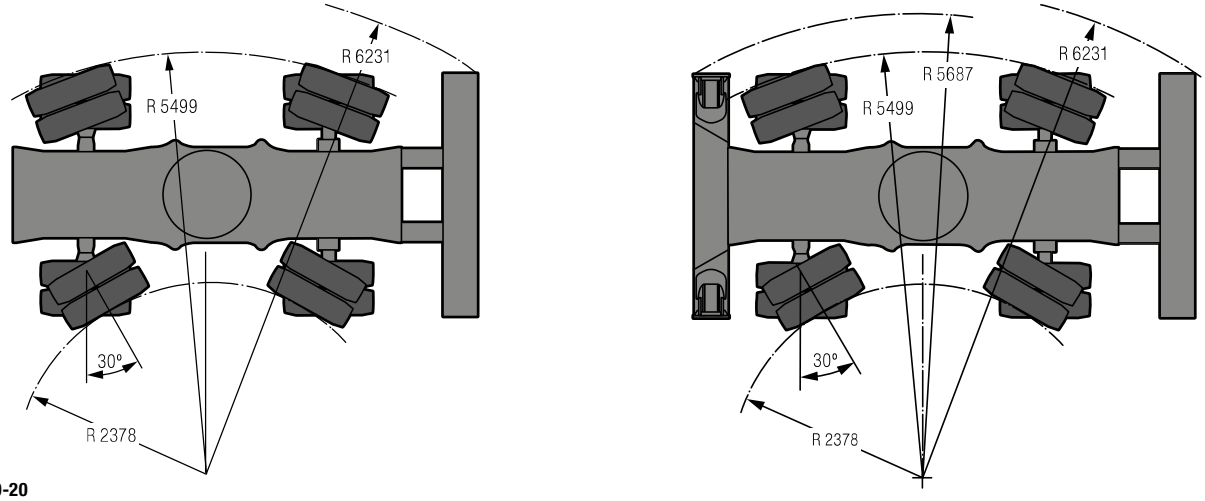
Tyres 12.00-20

Dimensions

EW-Undercarriage

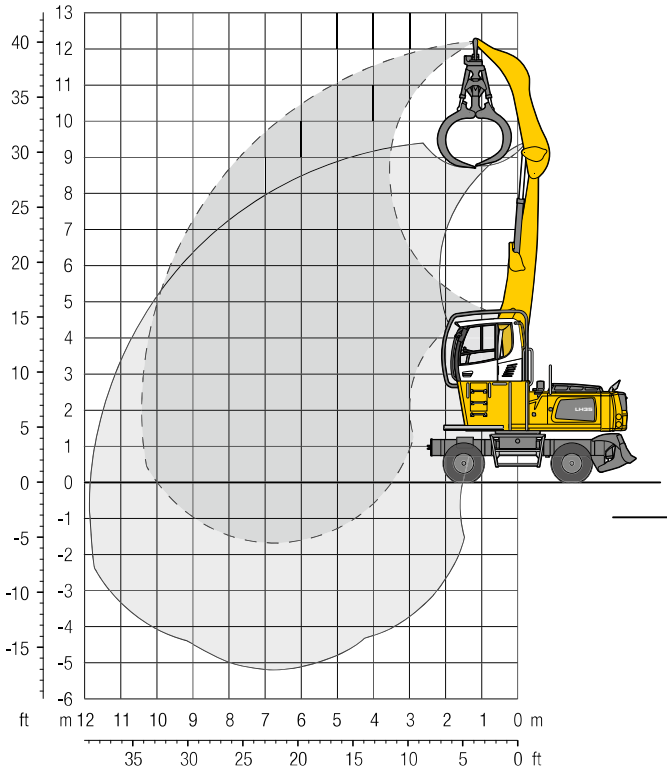


Turning Radiuses



Tyres 12.00-20

Attachment GA10

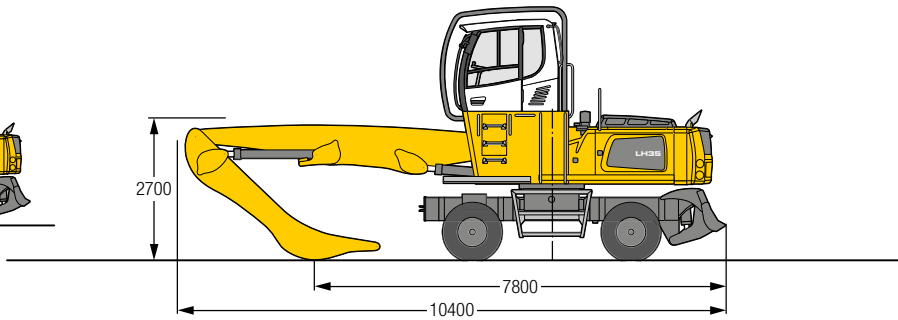


Operating Weight

The operating weight includes the basic machine with stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 4.00 m and wood grab GM 20B/ 1.70 m².

Weight	29,600 kg

Dimensions



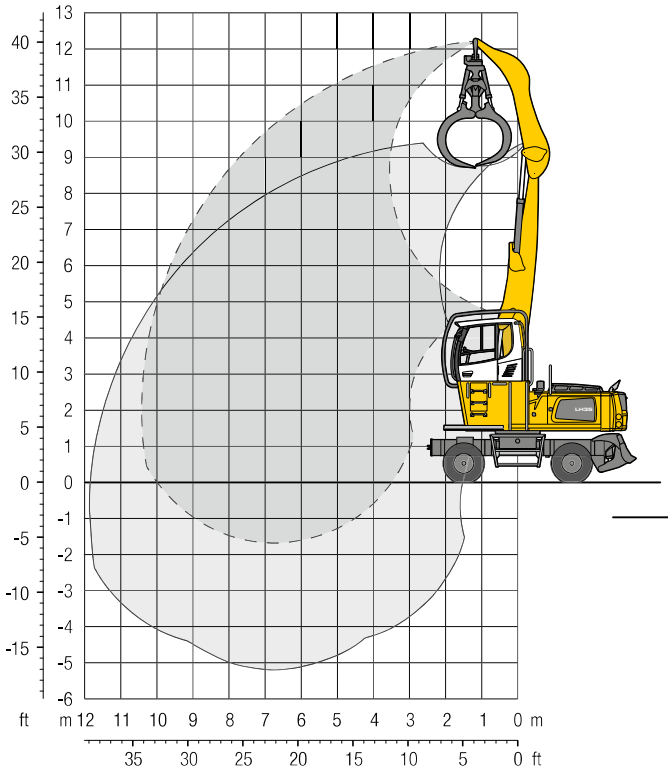
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m				m
12.0	Stabilizers raised (drive operation)											10.7*	10.7*	
	Stabilizers raised											10.7*	10.7*	2.5
	Stabilizer blade down											10.7*	10.7*	
10.5	Stabilizers raised (drive operation)			8.9	10.0*							5.6	6.9*	
	Stabilizers raised			10.0*	10.0*							6.9*	6.9*	6.0
	Stabilizer blade down			10.0*	10.0*							6.9*	6.9*	
9.0	Stabilizers raised (drive operation)			9.0	10.2*	5.7	7.6	4.0	5.3			3.8	5.0	
	Stabilizers raised			10.2*	10.2*	7.2	8.3*	5.0	6.6			4.7	6.0*	7.7
	Stabilizer blade down			10.2*	10.2*	7.6	8.3*	5.3	6.8*			5.0	6.0*	
7.5	Stabilizers raised (drive operation)			8.9	10.3*	5.7	7.5	4.0	5.3			3.0	4.0	
	Stabilizers raised			10.3*	10.3*	7.1	8.3*	5.0	6.6			3.8	5.0	8.9
	Stabilizer blade down			10.3*	10.3*	7.6	8.3*	5.3	7.0*			4.0	5.5*	
6.0	Stabilizers raised (drive operation)	12.3*	12.3*	8.6	10.8*	5.6	7.4	3.9	5.2	2.9	3.9	2.6	3.5	
	Stabilizers raised	12.3*	12.3*	10.8	10.8*	6.9	8.5*	4.9	6.5	3.7	4.9	3.3	4.4	9.6
	Stabilizer blade down	12.3*	12.3*	10.8*	10.8*	7.4	8.5*	5.2	7.0*	3.9	5.9*	3.5	5.3*	
4.5	Stabilizers raised (drive operation)	15.4	17.5*	8.1	11.1	5.3	7.1	3.8	5.1	2.9	3.9	2.4	3.2	
	Stabilizers raised	17.5*	17.5*	10.1	11.7*	6.6	8.9	4.8	6.3	3.6	4.8	3.0	4.0	10.1
	Stabilizer blade down	17.5*	17.5*	10.8	11.7*	7.0	8.9*	5.1	7.1*	3.8	5.8*	3.2	4.8*	
3.0	Stabilizers raised (drive operation)	2.8*	2.8*	7.4	10.3	5.0	6.7	3.6	4.9	2.8	3.8	2.3	3.1	
	Stabilizers raised	2.8*	2.8*	9.2	12.4*	6.2	8.4	4.5	6.1	3.5	4.7	2.8	3.8	10.4
	Stabilizer blade down	2.8*	2.8*	9.9	12.4*	6.6	9.1*	4.9	7.1*	3.7	5.7*	3.0	4.3*	
1.5	Stabilizers raised (drive operation)	1.1*	1.1*	6.8	9.7	4.7	6.4	3.5	4.7	2.7	3.7	2.2	3.0	
	Stabilizers raised	1.1*	1.1*	8.5	11.9*	5.9	8.0	4.4	5.9	3.4	4.6	2.8	3.7*	10.4
	Stabilizer blade down	1.1*	1.1*	9.2	11.9*	6.3	8.8*	4.7	6.8*	3.6	5.3*	3.0	3.7*	
0	Stabilizers raised (drive operation)			6.6	9.4	4.5	6.2	3.4	4.6	2.7	3.6	2.3	3.2	
	Stabilizers raised			8.2	9.6*	5.6	7.8	4.2	5.8	3.3	4.5	2.9	3.4*	10.0
	Stabilizer blade down			8.9	9.6*	6.0	7.8*	4.5	6.1*	3.6	4.6*	3.1	3.4*	
–1.5	Stabilizers raised (drive operation)					4.4	6.1*	3.3	4.6			3.1	4.2	
	Stabilizers raised					5.6	6.1*	4.2	4.8*			3.9	4.4*	7.9
	Stabilizer blade down					6.0	6.1*	4.5	4.8*			4.2	4.4*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Attachment GA10

EW-Undercarriage

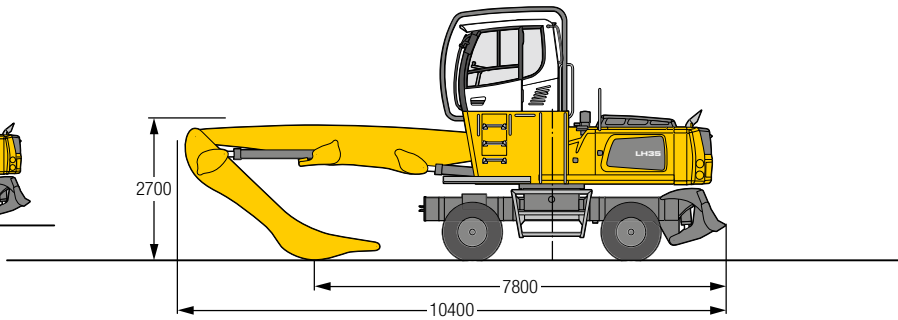


Operating Weight

The operating weight includes the basic machine with stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 4.00 m and wood grab GM 20B/ 1.70 m².

Weight	29,900 kg

Dimensions



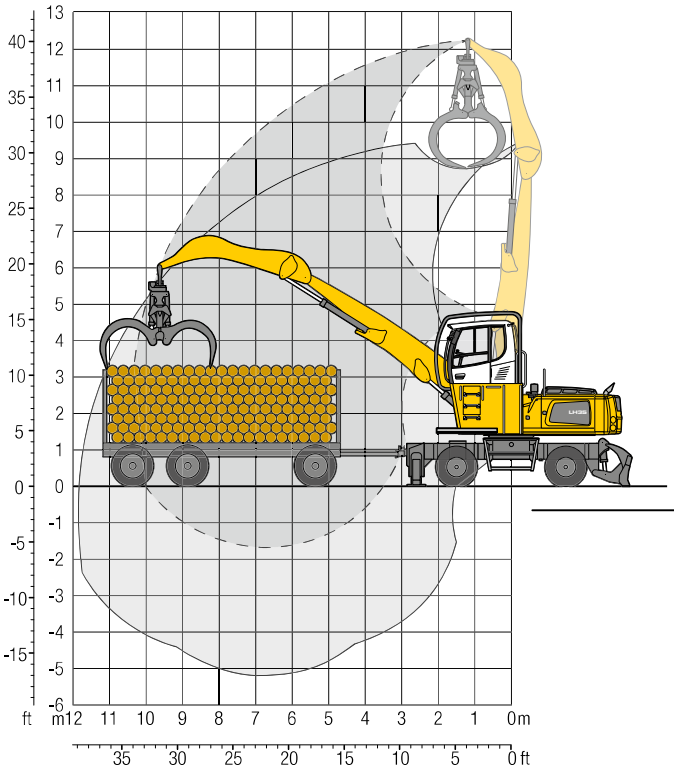
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m				m
12.0	Stabilizers raised (drive operation)											10.7*	10.7*	
	Stabilizers raised											10.7*	10.7*	2.5
	Stabilizer blade down											10.7*	10.7*	
10.5	Stabilizers raised (drive operation)			10.0*	10.0*							6.4	6.9*	
	Stabilizers raised			10.0*	10.0*							6.9*	6.9*	6.0
	Stabilizer blade down			10.0*	10.0*							6.9*	6.9*	
9.0	Stabilizers raised (drive operation)			10.2*	10.2*	6.6	7.7	4.5	5.4			4.3	5.1	
	Stabilizers raised			10.2*	10.2*	8.2	8.3*	5.7	6.7			5.4	6.0*	7.7
	Stabilizer blade down			10.2*	10.2*	8.3*	8.3*	6.0	6.8*			5.8	6.0*	
7.5	Stabilizers raised (drive operation)			10.3*	10.3*	6.5	7.7	4.6	5.4			3.5	4.1	
	Stabilizers raised			10.3*	10.3*	8.2	8.3*	5.7	6.8			4.3	5.2	8.9
	Stabilizer blade down			10.3*	10.3*	8.3*	8.3*	6.1	7.0*			4.6	5.5*	
6.0	Stabilizers raised (drive operation)	12.3*	12.3*	10.0	10.8*	6.4	7.5	4.5	5.3	3.4	4.0	3.0	3.6	
	Stabilizers raised	12.3*	12.3*	10.8*	10.8*	8.0	8.5*	5.6	6.7	4.2	5.0	3.8	4.5	9.6
	Stabilizer blade down	12.3*	12.3*	10.8*	10.8*	8.5	8.5*	6.0	7.0*	4.5	5.9*	4.0	5.3*	
4.5	Stabilizers raised (drive operation)	17.5*	17.5*	9.4	11.3	6.1	7.2	4.4	5.2	3.3	4.0	2.8	3.3	
	Stabilizers raised	17.5*	17.5*	11.7*	11.7*	7.6	8.9*	5.5	6.5	4.2	4.9	3.5	4.1	10.1
	Stabilizer blade down	17.5*	17.5*	11.7*	11.7*	8.1	8.9*	5.8	7.1*	4.4	5.8*	3.7	4.8*	
3.0	Stabilizers raised (drive operation)	2.8*	2.8*	8.7	10.6	5.8	6.9	4.2	5.0	3.2	3.9	2.6	3.1	
	Stabilizers raised	2.8*	2.8*	10.8	12.4*	7.2	8.6	5.3	6.3	4.0	4.8	3.3	3.9	10.4
	Stabilizer blade down	2.8*	2.8*	11.7	12.4*	7.7	9.1*	5.6	7.1*	4.3	5.7*	3.5	4.3*	
1.5	Stabilizers raised (drive operation)	1.1*	1.1*	8.1	10.0	5.5	6.6	4.0	4.9	3.2	3.8	2.6	3.1	
	Stabilizers raised	1.1*	1.1*	10.1	11.9*	6.8	8.2	5.1	6.1	3.9	4.7	3.2	3.7*	10.4
	Stabilizer blade down	1.1*	1.1*	10.9	11.9*	7.3	8.8*	5.4	6.8*	4.2	5.3*	3.5	3.7*	
0	Stabilizers raised (drive operation)			7.8	9.6*	5.3	6.4	3.9	4.7	3.1	3.7	2.7	3.3	
	Stabilizers raised			9.6*	9.6*	6.6	7.8*	4.9	5.9	3.9	4.6*	3.4	3.4*	10.0
	Stabilizer blade down			9.6*	9.6*	7.1	7.8*	5.3	6.1*	4.1	4.6*	3.4*	3.4*	
−1.5	Stabilizers raised (drive operation)					5.2	6.1*	3.9	4.7			3.6	4.4	
	Stabilizers raised					6.1*	6.1*	4.8*	4.8*			4.4*	4.4*	7.9
	Stabilizer blade down					6.1*	6.1*	4.8*	4.8*			4.4*	4.4*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Attachment GA10

EW-Undercarriage

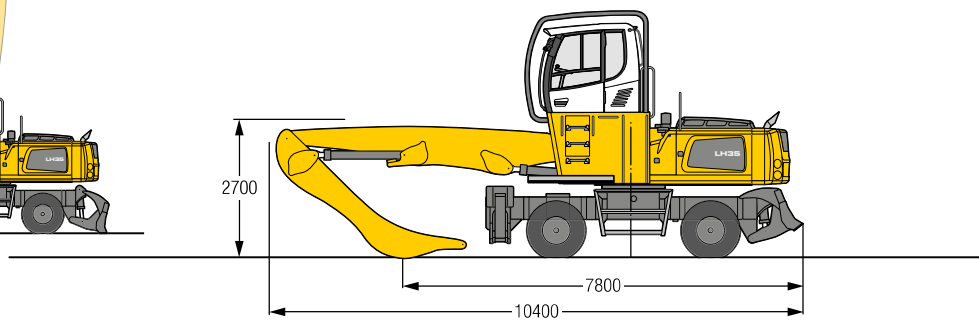


Operating Weight

The operating weight includes the basic machine with 2 point/stabilizer blade, rigid cab elevation, 8 pneumatic tyres, straight boom 6.50 m, angled stick 4.00 m and wood grab GM 20B/1.70 m².

Weight	31,600 kg

Dimensions



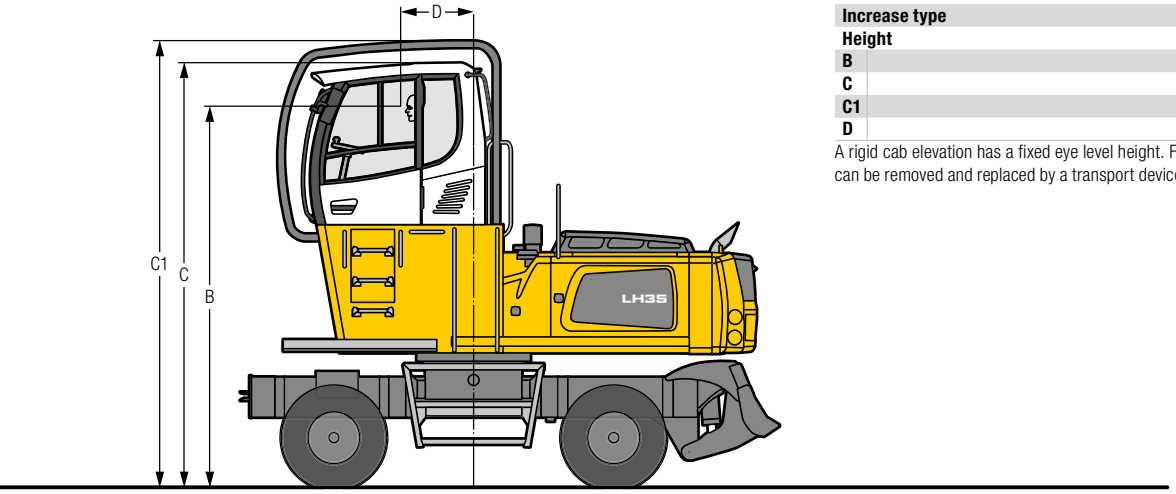
m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m				m
12.0	Stabilizers raised (drive operation)											10.7*	10.7*	
	Stabilizers raised											10.7*	10.7*	2.5
	2 pt. outriggers + blade down											10.7*	10.7*	
10.5	Stabilizers raised (drive operation)			10.0*	10.0*							6.7	6.9*	
	Stabilizers raised			10.0*	10.0*							6.9*	6.9*	6.0
	2 pt. outriggers + blade down			10.0*	10.0*							6.9*	6.9*	
9.0	Stabilizers raised (drive operation)			10.2*	10.2*	6.8	7.6	4.8	5.3			4.6	5.0	
	Stabilizers raised			10.2*	10.2*	8.3*	8.3*	6.0	6.6			5.7	6.0*	7.7
	2 pt. outriggers + blade down			10.2*	10.2*	8.3*	8.3*	6.8*	6.8*			6.0*	6.0*	
7.5	Stabilizers raised (drive operation)			10.3*	10.3*	6.8	7.6	4.8	5.3			3.7	4.0	
	Stabilizers raised			10.3*	10.3*	8.3*	8.3*	6.0	6.6			4.6	5.0	8.9
	2 pt. outriggers + blade down			10.3*	10.3*	8.3*	8.3*	7.0*	7.0*			5.5*	5.5*	
6.0	Stabilizers raised (drive operation)	12.3*	12.3*	10.4	10.8*	6.7	7.4	4.7	5.2	3.6	3.9	3.2	3.5	
	Stabilizers raised	12.3*	12.3*	10.8*	10.8*	8.3	8.5*	5.9	6.5	4.5	4.9	4.0	4.4	9.6
	2 pt. outriggers + blade down	12.3*	12.3*	10.8*	10.8*	8.5*	8.5*	7.0*	7.0*	5.9*	5.9*	5.3*	5.3*	
4.5	Stabilizers raised (drive operation)	17.5*	17.5*	9.8	11.1	6.4	7.1	4.6	5.1	3.5	3.9	2.9	3.2	
	Stabilizers raised	17.5*	17.5*	11.7*	11.7*	8.0	8.9	5.7	6.3	4.4	4.8	3.6	4.0	10.1
	2 pt. outriggers + blade down	17.5*	17.5*	11.7*	11.7*	8.9*	8.9*	7.1*	7.1*	5.8*	5.8*	4.8*	4.8*	
3.0	Stabilizers raised (drive operation)	2.8*	2.8*	9.1	10.3	6.0	6.8	4.4	4.9	3.4	3.8	2.8	3.1	
	Stabilizers raised	2.8*	2.8*	11.4	12.4*	7.6	8.4	5.5	6.1	4.3	4.7	3.5	3.8	10.4
	2 pt. outriggers + blade down	2.8*	2.8*	12.4*	12.4*	9.1*	9.1*	7.1*	7.1*	5.7*	5.7*	4.3*	4.3*	
1.5	Stabilizers raised (drive operation)	1.1*	1.1*	8.5	9.7	5.8	6.4	4.3	4.7	3.3	3.7	2.7	3.0	
	Stabilizers raised	1.1*	1.1*	10.7	11.9*	7.2	8.1	5.3	5.9	4.2	4.6	3.4	3.7*	10.4
	2 pt. outriggers + blade down	1.1*	1.1*	11.9*	11.9*	8.8*	8.8*	6.8*	6.8*	5.3*	5.3*	3.7*	3.7*	
0	Stabilizers raised (drive operation)			8.3	9.5	5.6	6.3	4.2	4.6	3.3	3.6	2.9	3.2	
	Stabilizers raised			9.6*	9.6*	7.0	7.8	5.2	5.8	4.1	4.5	3.4*	3.4*	10.0
	2 pt. outriggers + blade down			9.6*	9.6*	7.8*	7.8*	6.1*	6.1*	4.6*	4.6*	3.4*	3.4*	
–1.5	Stabilizers raised (drive operation)					5.5	6.1*	4.1	4.6			3.8	4.3	
	Stabilizers raised					6.1*	6.1*	4.8*	4.8*			4.4*	4.4*	7.9
	2 pt. outriggers + blade down					6.1*	6.1*	4.8*	4.8*			4.4*	4.4*	

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

The lift capacities on the stick end without attachment are stated in metric tons (t) and are valid on a firm, level supporting surface with blocked oscillating axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % (according to EN 474-5 in drive operation only 60 %) of tipping or 87 % of hydraulic capacity. The lift capacity of the unit is limited by its stability, the lifting capability of the hydraulic elements, or the maximum permissible lifting capacity of the load hook.
In accordance with the harmonised European Standard EN 474-5, hydraulic excavators used for lifting operations must be equipped with pipe fracture safety valves, an overload warning device, a load hook and a lift capacity chart.

Choice of Cab Elevation

Cab Elevation LFC (Rigid Elevation)

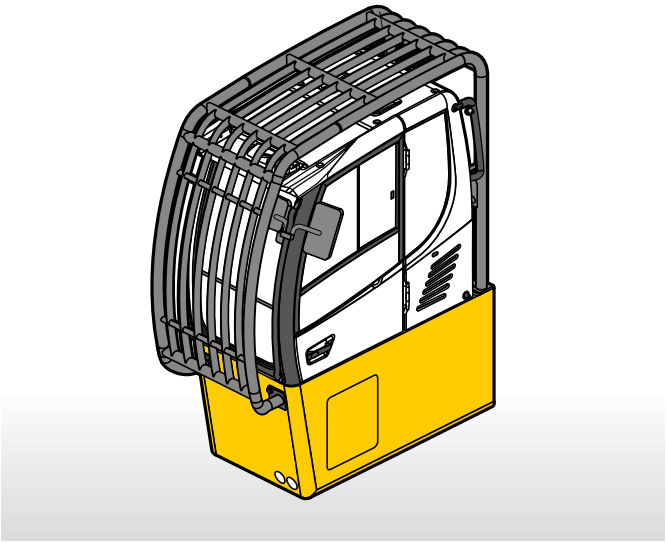


Increase type	LFC 120
Height	1,200 mm
B	4,074 mm
C	4,538 mm
C1	4,773 mm
D	788 mm

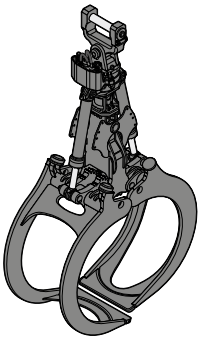
A rigid cab elevation has a fixed eye level height. For a lower transport height, the shell of the cab can be removed and replaced by a transport device. On this machine dimension C is 3,642 mm.

Cab Protection

Integral Guard



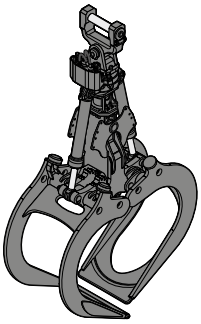
Working Tools



Wood Grab

Grab model GM 20B round-shaped (complete overlapping, vertical cylinders)

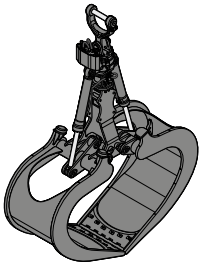
Size	m²	1.00	1.30	1.50	1.70	1.90
Cutting width	mm	810	810	810	810	810
Height of grab, closed	mm	2,572	2,675	2,720	2,812	2,897
Weight	kg	1,545	1,575	1,595	1,625	1,760



Wood Grab

Grab model GM 20B round-shaped (complete overlapping, straight design, vertical cylinders)

Size	m²	1.00	1.30	1.50	1.70
Cutting width	mm	810	810	810	810
Height of grab, closed	mm	2,551	2,638	2,729	2,786
Weight	kg	1,565	1,595	1,660	1,705



Wood Grab

Grab model GM 20C heart-shaped (tip-to-tip closing, straight design, vertical cylinders)

Size	m²	1.60	1.90
Cutting width	mm	870	870
Height of grab, closed	mm	2,903	3,052
Weight	kg	1,890	1,925

2 Safety warnings

2.1 Information on these instructions

2.1.1 Representation of warning messages

Warning symbol

	The warning symbol warns of potential dangers. Obey all measures marked with this symbol to avoid injury or death.

Tab. 4: Warning symbol

Grading of warning messages

The grading of warning messages is defined by following signal words:

DANGER
WARNING
CAUTION
NOTICE

Definition of warning levels

	**DANGER**	Indicates an immediately 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 damage.

Tab. 5: Warning levels

2.1.2 Graphic symbols in these instructions

Symbol	Meaning
	**Note** Identifies useful information and tips.

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Symbol	Meaning
☐	**Precondition** Identifies conditions for subsequent action steps.
▶	**Required action** Identifies action steps.
▷	**Result** Identifies results of one or more action steps.
–	**Enumeration** Identifies individual items of a list.

Tab. 6: Symbols

2.2 Intended use

2.2.1 Laws, rules, guidelines and safety regulations

To ensure safe operation:
- Ask work site manager for safety regulations at place of use.
- Adhere to safety regulations at place of use.
- Adhere to traffic regulations.
- Adhere to valid guidelines from insurers (for example employers' professional liability insurance companies, accident insurance et cetera).
- Avoid working methods that can endanger safety.
- Adhere to all intervals specified for recurrent checks and inspections in this operator's manual.

2.2.2 Intended use

The hydraulic excavator is used to remove, load, transport and unload various materials.

In addition, the tunnel excavator is used to clean the quarry face and mill crevices and shafts.

To ensure intended use:
- Adhere to operator's manual.
- Adhere to maintenance manual.
- Adhere to maintenance intervals.
- Adhere to specifications in the technical data.
- To work, install working tool (for example backhoe bucket, grapple, loading shovel).
- When moving machine with load, adhere to safety stipulations (For more information see: 2.7.9 Load-lifting work, page 57) .
- Exclusively lift loads with prescribed, attached and functioning safety equipment.
- Make sure that machines in underground operation (mining and tunnelling) are equipped with components for reducing exhaust emissions.
- Adhere to individual country's requirements for underground operation.
- For special uses use special working attachments and if necessary special safety equipment.

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– Exclusively mount and use special working attachments with approval and as per stipulations of manufacturer of basic machine.

Note

▶ Any other use or use beyond the stated use is improper use.

2.2.3 Foreseeable misuse

Do not use machine in following cases:
– Transport of persons without mounted and functioning safety equipment
– Lifting of persons without mounted and functioning safety equipment
– Work in explosive environment without corresponding and necessary equipment
– Work in contaminated environment without corresponding and necessary equipment
– Sweeping on side (with working attachment)
– Stamping
– Striking
– Lifting loads without suitable means
– Pulling and pushing of vehicles or objects without suitable towing attachments and brakes on machine

Note

▶ The manufacturer is not liable for damage caused by improper use.

2.2.4 Operating conditions

– Operate machine in an ambient temperature of -20 °C to 40 °C.
– In case of divergent ambient temperatures, contact Liebherr customer service.
– In case of deployments at below -10 °C, adhere to diesel fuel quality (For more information see: 5.3.2 Diesel fuels, page 280) .
– In case of deployments at below -10 °C, use preheatings or arctic diesel (for more information on arctic diesel qualities, see table 1 and DIN EN 590).
– Adhere to operating temperatures of diesel fuels.

Permitted diesel fuels as per DIN EN 590	Cloud point	Ambient temperature
Standard winter diesel	-7 °C	To -10 °C
Arctic class 0	-10 °C	To -13 °C
Arctic class 1	-16 °C	To -20 °C

Tab. 7: Operating temperatures of diesel fuels

Danger to life

Operation during thunderstorms or storms

– If possible stop operation before a thunderstorm or storm.
– Put working attachment on the ground in flattest position possible.
– Secure machine correctly.
– Close window.
– Shut off diesel engine.
– Set ignition key to **0**.
– Make sure there are no persons in area around machine.

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Lightning strike

- Remain in operator's cab.
- Do not leave machine until all components are voltage-free.

Contact with high voltage cable

- Do not move machine and working attachment.
- Remain in operator's cab.
- Do not leave machine until all components are voltage-free.
- Make sure that all persons stay away from the machine and the high voltage cable.
- Have voltage switched off.

Damage

Incorrect operation in operating conditions deviating from intended use

- Equip machine according to operating conditions.

Following operating conditions deviate from intended use:
- Dust intensive applications
- Contaminated areas
- Lower or higher ambient temperatures

Incorrect operation in corrosive environment or with corrosive material

- Regularly clean machine to remove corrosive materials (for example salt, phosphate, fertiliser).
- Treat metallic surfaces with conservation wax if necessary.
- Derust, prime and repaint damaged and corroded steel parts.
- Make sure that piston rods of hydraulic cylinders are coated completely with an oil film.
- If piston rods are not coated completely with an oil film: Retract and extend piston rods along the entire stroke.
- If it is not possible to retract and extend the piston rods along the entire stroke: Clean and conserve piston rods.

2.2.5 Disposal

Danger to life

Unapproved disposal of gas containers and pressure vessels

- Before disposal, completely depressurise pressure vessel.
- Before disposal, professionally empty pressure vessel.
- Adhere to safety instructions of pressure vessel manufacturer.

Unapproved disposal of refrigerant

- Have refrigerant disposed of by refrigerant recycling point.
- Adhere to safety data sheet of refrigerant during disposal.

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Environmental pollution

Unapproved disposal of machine

- Make sure that the individual elements of the machine are disposed of correctly after the service life.
- Dispose of elements of machine in line with valid country-specific waste disposal guidelines and relevant valid laws.
- Remove fuels, operating fluids and lubricants from all components before disposal.
- Collect and store fuels, operating fluids and lubricants in suitable containers before disposal.
- Adhere to instructions of relevant manufacturer when disposing of fuels, operating fluids and lubricants.
- Have fuels, operating fluids and lubricants disposed of by old oil recycling point.
- Have metal parts disposed of by metal recycling point.
- Have plastic parts disposed of by plastic recycling point.
- Have rubber parts disposed of by rubber recycling point.
- Have electronic components disposed of by electronics recycling point.

2.3 Description of staff

2.3.1 Personal protective equipment

Operators, assistants and maintenance staff are responsible for the following:
- Wearing personal protective equipment
- Regular cleaning and care of protective equipment
- Immediate replacement of damaged parts of protective equipment

The protective equipment consists of following elements:
- Protective helmet
- Safety glasses
- Hearing protection
- Breathing equipment
- Protective gloves
- Warning clothing (reflective, in signal colour)
- Safety boots
- Special protective clothing
  - To prevent burns
  - To prevent freezing
  - To prevent acid burns
  - To prevent stabbing and cutting injuries

2.3.2 Requirements for staff

Staff meet the following requirements:
- The machine is operated, maintained and repaired exclusively by authorised and trained persons.
- All persons operating, maintaining or repairing the machine have the required minimum age.
- Staff training involves theoretical information (technology and safety) and practical training on the machine.

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– Staff have read and understood the operator's manual and supplied documentation.
– Experienced staff continuously supervise following staff.
  • Staff undergoing training
  • Staff undergoing education
  • Staff undergoing instruction
  • Staff undergoing a general apprenticeship
– Staff agree to work in safety-aware and risk-aware manner.

2.3.3 Operating company

Responsibility

The operating company is responsible for the following:
– Make sure that exclusively trained staff operate the machine.
– Make sure that exclusively trained staff maintain the machine.
– If a machine with electric drive is used: Make sure that exclusively a qualified and competent person connects the machine to the supply network.
– Check qualification of persons in handling the machine.
– Authorise activities of persons in handling the machine.
– Define competences and responsibilities for all persons involved in handling the machine.
– Have following staff continuously supervised by an experienced person.
  • Staff undergoing training
  • Staff undergoing education
  • Staff undergoing instruction
  • Staff undergoing a general apprenticeship
– Provide all persons tasked with handling the machine with the necessary protective equipment.
– Check safety-aware work of staff at regular intervals.
– Check danger-aware work of staff at regular intervals.
– Make sure that machine is operated in flawless, safe condition.
– If flaws affecting safety occur: Immediately decommission machine.
– Perform inspections of machine prescribed by Liebherr punctually.
– Perform nationally mandated inspections of machine punctually.
– Adhere to national legal specifications on provision of machines and tools by the employer (hazard assessment and risk assessment conducted by the operator).
– Make sure that no retrofitting is performed on machine without consultation of the manufacturer.
– Make sure that operating location is correctly illuminated.
– Use original Liebherr spare parts wherever possible.

2.3.4 Operator

Responsibility

The operator is responsible for the following:
– Read operator's manual.
– Read supplied documentation.
  • Operator's manuals for components
  • Operator's manuals from third party manufacturers
  • Additional instructions
– Wear personal protective equipment.
– Operate machine as intended.
– Avoid working methods that can endanger safety.

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– Adhere to safety regulations at place of use.
– Report all changes to machine that affect safety to operating company.
– If it is no longer possible to work safely: Immediately stop operating machine.
– Exclusively perform retrofittings of machine after consultation with manufacturer.
– Use original Liebherr spare parts wherever possible.

Requirement

The operator has following qualification and skills:
– Has completed the legally specified minimum age.
– Is physically and mentally capable of operating the machine safely.
  • Satisfactory eyesight
  • Satisfactory hearing ability
  • Quick reactions
  • Is able to estimate distance, height and gaps.
– Has the necessary authorisation for operation of machine.
– The operator has the necessary education (theoretical and practical) for the following:
  • Handling the machine type
  • Attaching
  • Spotting
  • Handling fire extinguishing equipment
– Knows all means of escape in an emergency.
– Is not under any physical or mental impairment that limits one of the prescribed requirements.
– Is not under the influence of alcohol.
– Is not under the influence of drugs.

2.3.5 Maintenance staff

Responsibility

The maintenance staff are responsible for the following:
– Read operator's manual.
– Read supplied documentation.
  • Operator's manuals for components
  • Operator's manuals from third party manufacturers
  • Additional instructions
– Maintain machine for safe and reliable function.
– Execute all maintenance tasks specified for maintenance staff in the maintenance and inspection schedule.
– Wear personal protective equipment.
– Adhere to safety regulations at place of use.
– Report all changes to machine that affect safety to operating company.
– Exclusively perform retrofittings of machine after consultation with manufacturer.
– Use original Liebherr spare parts wherever possible.

Requirement

The maintenance staff has following qualification and skills:
– Has completed the legally specified minimum age.
– Is physically and mentally capable of maintaining the machine.
  • Satisfactory eyesight
  • Satisfactory hearing ability
  • Quick reactions
  • Is able to estimate distance, height and gaps.

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- Has the necessary authorisation for maintenance of machine.
- Knows the machine and the hazards.
- Knows all procedures and precautions for maintenance.
- Has knowledge of handling special tools for maintenance and repair.
- Is not under any physical or mental impairment that limits one of the prescribed requirements.
- Is not under the influence of alcohol.
- Is not under the influence of drugs.

2.3.6 Electrical engineer

Responsibility

The electrical engineer is responsible for the following:
- Read operator's manual.
- Read supplied documentation.
  - Operator's manuals for components
  - Operator's manuals from third party manufacturers
  - Additional instructions
- Maintain and repair machine for safe and reliable function.
- Execute all maintenance tasks and repair tasks specified for the electrical engineer in the maintenance and inspection schedule.
- Isolate main circuit breaker of power supply system and secure it against switching on again.
- Clearly define and label working position.
- Wear personal protective equipment.
- Use tools suitable for the work deployment.
- Adhere to safety regulations at place of use.
- Report all changes to machine that affect safety to operating company.
- Exclusively perform retrofittings of machine after consultation with manufacturer.
- Use original Liebherr spare parts wherever possible.

Requirement

The electrical engineer has following qualification and skills:
- Has completed the legally specified minimum age.
- Is physically and mentally capable of maintaining the machine.
  - Satisfactory eyesight
  - Satisfactory hearing ability
  - Quick reactions
  - Is able to estimate distance, height and gaps.
- The electrical engineer has completed training that complies with the country-specific laws, standards and guidelines.
- The electrical engineer has following skills:
  - Is able to assess work correctly.
  - Is able to recognise dangers.
  - Is able to take safety measures.
- Has knowledge and experience of the relevant field of activity.
- Knows the relevant national standards.
- Has the necessary authorisation for maintenance and repair of machine.
- Knows the machine and the hazards.
- Knows all procedures and precautions for maintenance.
- Has knowledge of handling special tools for maintenance and repair.
- Is not under any physical or mental impairment that limits one of the prescribed requirements.
- Is not under the influence of alcohol.
- Is not under the influence of drugs.

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2.3.7 Refrigeration technician

Responsibility

The refrigeration technician is responsible for the following:
- Read operator's manual.
- Read supplied documentation.
  - Operator's manuals for components
  - Operator's manuals from third party manufacturers
  - Additional instructions
- Maintain and repair machine for safe and reliable function.
- Execute all maintenance tasks and repair tasks specified for the refrigeration technician in the maintenance and inspection schedule.
- Isolate battery main switch of power supply system and secure it against switching on again.
- Clearly define and label working position.
- Wear personal protective equipment.
- Use tools suitable for the work deployment.
- Adhere to safety regulations at place of use.
- Report all changes to machine that affect safety to operating company.
- Exclusively perform retrofittings of machine after consultation with manufacturer.
- Use original Liebherr spare parts wherever possible.

Requirement

The refrigeration technician has following qualification and skills:
- Has completed the legally specified minimum age.
- Is physically and mentally capable of maintaining the machine.
  - Satisfactory eyesight
  - Satisfactory hearing ability
  - Quick reactions
  - Is able to estimate distance, height and gaps.
- The refrigeration technician has completed training that complies with the country-specific laws, standards and guidelines.
- The refrigeration technician has following skills:
  - Is able to assess work correctly.
  - Is able to recognise dangers.
  - Is able to take safety measures.
- Has knowledge and experience of the relevant field of activity.
- Knows the relevant national standards.
- Has the necessary authorisation for maintenance and repair of machine.
- Knows the machine and the hazards.
- Knows all procedures and precautions for maintenance.
- Has knowledge of handling special tools for maintenance and repair.
- Is not under any physical or mental impairment that limits one of the prescribed requirements.
- Is not under the influence of alcohol.
- Is not under the influence of drugs.

2.3.8 Slinger

Responsibility

The slinger is responsible for the following:
- Wear personal protective equipment.
- Choose correct and undamaged slinging gear.

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– Correctly attach slinging gear to load or lifting accessory.
– Correctly remove slinging gear from load or lifting accessory.
– Grant approval for movement or accompaniment.

Requirement

The slinger has following qualification and skills:
– Has completed the legally specified minimum age.
– Is physically and mentally capable of attaching loads.
  • Satisfactory eyesight
  • Satisfactory hearing ability
  • Quick reactions
  • Is able to estimate distance, height and gaps.
– The slinger has following skills:
  • Is able to estimate mass distribution and load distribution.
  • Is able to operate radio units.
  • Is able to give clear instructions on radio units.
  • Is able to guide a load.
– Has the necessary authorisation for attaching loads.
– The slinger has the necessary education (theoretical and practical) for the following:
  • Selecting the suitable slinging gear
  • Attaching slinging gear
  • Securing to prevent unintended disengaging of slinging gear
  • Avoiding damage to slinging gear
  • Spotting
  • Applying all necessary signal signs
– Is not under any physical or mental impairment that limits one of the prescribed requirements.
– Is not under the influence of alcohol.
– Is not under the influence of drugs.

2.3.9 Spotter

Responsibility

The spotter is responsible for the following:
– Wear personal protective equipment.
– Forward signals from slinger to operator.
– If the spotter is the only person for this purpose: Give instructions to operator.

Requirement

The spotter has following qualification and skills:
– Has completed the legally specified minimum age.
– Is physically and mentally capable of directing persons.
  • Satisfactory eyesight
  • Satisfactory hearing ability
  • Quick reactions
  • Is able to estimate distance, height and gaps.
– The spotter has following skills:
  • Is able to operate radio units.
  • Is able to give clear instructions on radio units.
  • Is able to guide a load.
  • Is able to ensure safe movement of load and machine.
– Has the necessary authorisation for giving signal signs.

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– The spotter has the necessary education (theoretical and practical) for the following:
  • Spotting
  • Applying all necessary signal signs
– Is not under any physical or mental impairment that limits one of the prescribed requirements.
– Is not under the influence of alcohol.
– Is not under the influence of drugs.

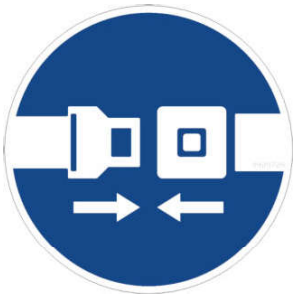
2.4 Signs on the machine

2.4.1 Warning signs

Note

▶ Make sure that all safety signs are in place on the machine and legible.

▶ Adhere to warning signs.

Sign	Description
	**Safety belt** Before putting machine into service, put on safety belt.
	**Safety glasses** Put on safety glasses before starting work.
	**Protective gloves** Put on protective gloves before starting work.

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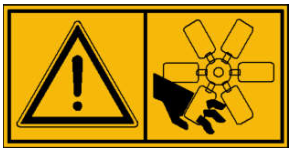
Sign	Description
	**Protective mask** Put on protective mask before starting work.
	**Danger zone** Make sure that no-one is in the danger zone around the machine during operation.
	**Entry prohibited** Do not enter marked areas.
	**Spraying with water prohibited** Do not spray marked areas with water.
	**Engine standstill** For machines with engine compartment: Exclusively enter engine compartment when diesel engine is stopped. For machines with engine bonnet: Exclusively open engine bonnet when diesel engine is stopped.
	**Steering** Valid for handling machines Steering is exclusively available when the diesel engine is running.

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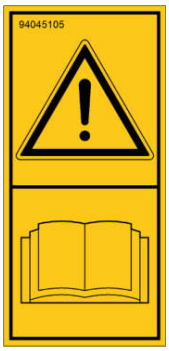
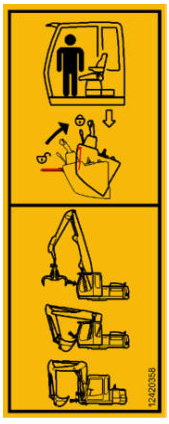
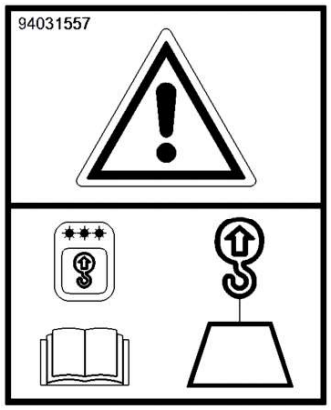
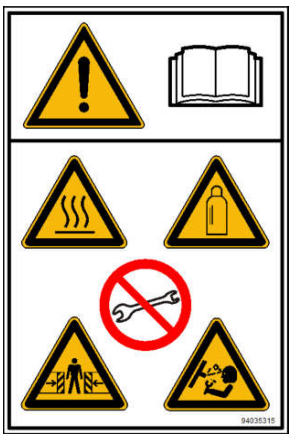
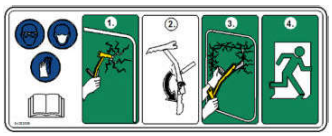
Sign	Description
	**Service brake and parking brake** Valid for wheeled excavators and handling machines with wheeled undercarriage. Do not apply service brake and parking brake at the same time when machine is in operation. Before leaving machine, block exclusively with parking brake.
	**Operator's manual** Read accident prevention instructions in operator's manual.
	**Accident prevention** Applies to machines with safety lever. Before leaving operator's seat pull up safety lever. Working attachment reaches as far as the operator's cab. Be careful when working attachment is retracted.
	**Accident prevention** Applies to machines with folding console. Move folding console up before leaving operator's seat. Working attachment reaches as far as the operator's cab. Be careful when working attachment is retracted.

Sign	Description
	**Service manual** Exclusively mount indicated screw connections in line with plant-side regulations. Read Liebherr installation instructions or Liebherr service manual.
	**Load moment limitation** Read instructions on load moment limitation in operator's manual.
	**Energy recuperation cylinder** Applies to machines with energy recuperation cylinder. Read safety instructions in operator's manual for operation and maintenance of energy recuperation cylinder. Energy recuperation cylinder develops heat. Energy recuperation cylinder is under gas pressure. Repairs to energy recuperation cylinder must be performed exclusively by authorised specialist staff. There is a crushing hazard at the energy recuperation cylinder. There is a risk of injury at the energy recuperation cylinder.
	**Emergency exit** Indicates location of emergency hammer and emergency exit. For machines LH120 and LH150: In an emergency, smash left side window with emergency hammer. For machines LH22 to LH110: In an emergency, smash rear window with emergency hammer.
	**Emergency exit in two-way height adjustable cab** In machines with a two-way height adjustable cab, the sign replaces the *emergency exit* sign. Indicates location of emergency hammer and emergency exit. Read notes in operator's manual. In an emergency, break left side window with hammer and cut out with saw.

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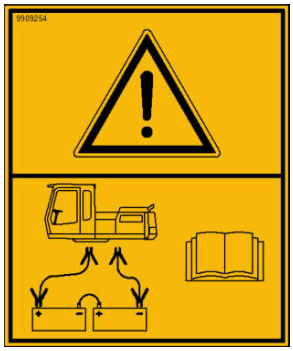
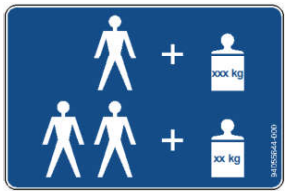
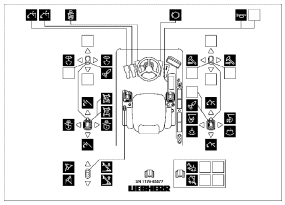
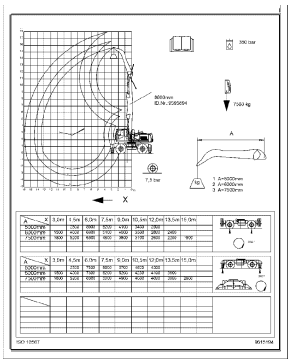
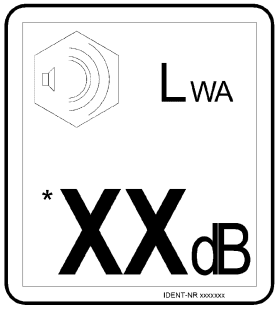
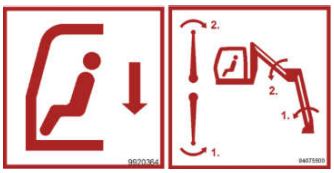
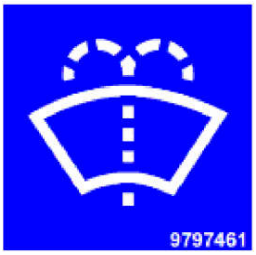
Sign	Description
	**Jump starting** Applies to machines with diesel engine. Before jump-starting machine, read instructions in the operator's manual.
 	**Load capacity** Indicate maximum load capacity value of height adjustable cab.
	**Closing upper windscreen** Applies to wheeled excavators. Indicates sequence for closing upper windscreen.
	**Speed 20 km/h** Applies to wheeled excavators. Indicates maximum permitted speed.

Tab. 8: Warning signs

2.4.2 Information signs

These signs contain information about:
- Machine operation
- Machine maintenance
- Machine characteristics

Sign	Description
	**Control description sticker** Indicates functions of unmarked control elements.
	**Control changeover** Indicates modified control elements by activating the “control changeover” option.
	**Load lift chart** Indicates approved load capacities at the end of the stick in dependence on the reach.
	**Sound power level L_{WA}** Shows sound power level of the machine in dB(A).
	**Emergency lowering of the operator's cab** Applies to machines with height adjustable cab. Identifies location of emergency lowering. Identifies position of the levers for emergency lowering of the operator's cab.
	**Windscreen washer tank** Indicates filler pipe for windscreen washer fluid.

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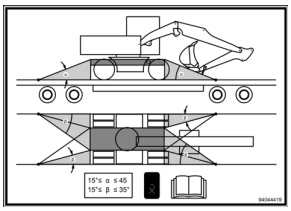
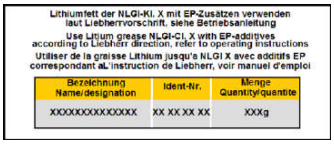
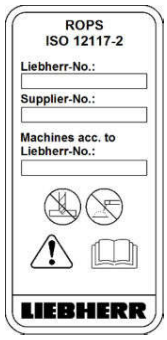
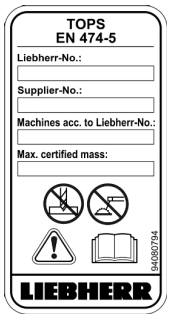
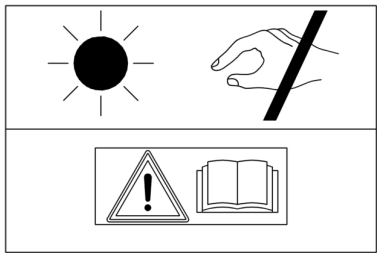
Sign	Description
	**Coolant** Identifies prescribed coolant. Read notes in operator's manual.
	**Hydraulic oil** Identifies prescribed hydraulic oil. Read notes in operator's manual.
	**Transport** Indicates machine-specific requirements for transport.
	**Tie-down point** Indicates tie-down points.
	**Lifting point** Indicates lifting points.
	**Lifting point** Applies to machines with indicated lifting points on counterweight and goose-neck boom. Indicates lifting points on counterweight. Indicates lifting points on gooseneck boom.

Sign	Description
	**Lifting angle** Applies to machines with indicated lifting points on counterweight and goose-neck boom. Indicates maximum angle between steel ropes on counterweight.
	**Grease specifications** Read notes in operator's manual. Indicates specified grease.
	**ROPS** Indicates ROPS equipment option of the operator's cab.
	**TOPS** Applies to machines with tip over protection structure. Indicates TOPS equipment of the operator's cab.
	**Battery main switch** Applies to machines with SCR system. Wait until indicator light of SCR system goes out.

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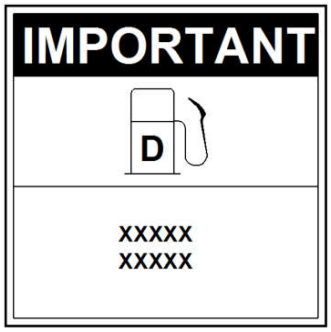
Sign	Description
	**Fuel tank** Read notes in operator's manual. Indicates maximum permitted sulphur content in fuel.
	**Diesel exhaust fluid tank** Applies to machines with SCR system. Read notes in operator's manual. Indicates prescribed diesel exhaust fluid.
	**Step lighting** Indicates step lighting button.

Tab. 9: Information signs

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2.4.3 Identification plate

Fig. 56: Identification plate

1 Identification number (PIN)
2 Type
3 Permitted gross weight
4 Permitted front axle load
5 Permitted rear axle load
6 Manufacturer's address
7 Maximum speed
8 Diesel engine rated power
9 Year of manufacture

2.5 Protective devices on the machine

2.5.1 Safety lever or folding console

Danger to life

Unwanted movements of machine

– Before leaving operator's seat pull up safety lever or folding console.
– Do not use safety lever as handle.
– Do not use control elements (for example folding console, joystick) as handle.

2.5.2 Operator's cab

Danger to life

Unapproved working method

– Put on safety belt before starting work.
– Make sure that changes in the operator's cab (for example installation of accessories) do not restrict the operator's workspace.

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Injuries

Objects in the operator's cab

- Remove objects that are not necessary for the work from the operator's cab.
- Stow and fasten objects that are necessary for the work before starting.
- Make sure that objects carried do not protrude into the operator’s workspace.

2.5.3 Height-adjustable operator's cab

Danger to life

Persons in the danger zone

- Make sure there are no persons in the danger zone under the operator's cab.
- Keep your distance from moving parts when the operator's cab is moving down.

Machine tipping

- On slopes, travel with lowered operator's cab.

Injuries

Falling from operator's cab

- Close cab door before raising and adjusting operator's cab.
- If operator's cab is raised: Make sure that cab door is closed.

Damage to operator's cab and machine

Collision with obstacles

- Make sure there are no obstacles in the range of movement of operator's cab.
- Exclusively adjust operator's cab when machine is at a standstill.
- Move operator's cab to upper park position before starting travel.
- Move slowly to end positions (upper or lower park position) using automatic mode.

2.5.4 Tip over protective structure (TOPS)

Danger to life

Damaged falling object protective structures

- Do not put machine into service with damaged falling object protective structures.
- Do not put machine into service with deformed falling object protective structures.
- Do not use falling object protective structures with structural changes.
- Do not use repaired falling object protective structures.
- Do not perform welding on falling object protective structures.
- Do not cut or saw falling object protective structures.
- Do not drill falling object protective structures.

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Exceeding of total weight

- Make sure that total weight of machine (see identification plate) is not exceeded.
- Make sure that the machine does not exceed the total weight with heavy working tools.
- Make sure that the machine does not exceed the total weight after changing the working attachment.
- Make sure that the machine does not exceed the total weight with add-ons or after retrofitting.

2.5.5 Roll over protective structure (ROPS)

Danger to life

Damaged falling object protective structures

- Do not put machine into service with damaged falling object protective structures.
- Do not put machine into service with deformed falling object protective structures.
- Do not use falling object protective structures with structural changes.
- Do not use repaired falling object protective structures.
- Do not perform welding on falling object protective structures.
- Do not cut or saw falling object protective structures.
- Do not drill falling object protective structures.

Exceeding of total weight

- Make sure that total weight of machine (see identification plate) is not exceeded.
- Make sure that the machine does not exceed the total weight with heavy working tools.
- Make sure that the machine does not exceed the total weight after changing the working attachment.
- Make sure that the machine does not exceed the total weight with add-ons or after retrofitting.

2.5.6 Falling object protective structures (FOPS and FGPS)

Danger to life

Damaged falling object protective structures

- Do not put machine into service with damaged falling object protective structures.
- Do not put machine into service with deformed falling object protective structures.
- Do not use falling object protective structures with structural changes.
- Do not use repaired falling object protective structures.
- Do not perform welding on falling object protective structures.
- Do not cut or saw falling object protective structures.
- Do not drill falling object protective structures.

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2.6 Emergency equipment on the machine

2.6.1 Emergency exit (standard)

Danger to life

Incorrect labelling

- Make sure that all information signs are present.
- Make sure that all information signs are legible.

Incorrect equipment

- Make sure that emergency hammer is present.
- Make sure that position of emergency hammer is known.

2.6.2 Fire extinguisher (option)

Danger to life

Incorrect behaviour

- Make sure that all fastening points of fire extinguishers on the machine are known.
- Make sure that everyone is able to operate the fire extinguishers.
- Make sure that everyone knows the local fire alarm possibilities.
- Make sure that everyone knows the local fire-fighting possibilities.
- Before starting machine, unlock all locks of hoods and doors of machine.
- Make sure that check and inspection are performed on time.

2.6.3 Emergency command devices of machine

Depending on equipment, machine has following emergency command devices:
- Emergency stop device
- Emergency cut-off device
- Emergency brake

Danger to life

Defective emergency command devices

- Make sure that all emergency command devices are functioning correctly.
- Regularly check all emergency command devices for function.
- Have defective emergency command devices repaired immediately.

Damage to machine

Incorrect use of emergency command devices

- Exclusively use emergency command devices if there is immediate danger.

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2.6.4 Emergency stop function of machine

Damage to diesel engine

Incorrect use of emergency stop equipment

– Exclusively use emergency stop equipment if there is immediate danger.
– If emergency stop equipment has been activated: Let diesel engine run in idle mode for a few minutes after next start.

2.7 Safe operation

2.7.1 Intoxicants

Danger to life

Physical and mental impairment

– Make sure that no persons working on or with the machine are under the influence of drugs.
– Make sure that no persons working on or with the machine are under the influence of alcohol.
– Make sure that no persons working on or with the machine are under the influence of medication.
– Make sure that no persons working on or with the machine are overtired.
– Make sure that no persons working on or with the machine are exhausted.

2.7.2 Dangerous fuels and operating fluids

Injury

Incorrect handling

– Adhere to safety instructions on handling oils, greases and chemical substances.
– In case of hot lubricants and fuels put on personal protective equipment.

Environmental damage

Incorrect disposal

– Dispose of lubricants and fuels safely and in eco-friendly manner.
– Adhere to guidelines applicable to disposal.

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2.7.3 Transporting machine

Danger to life

Machine tipping

- Make sure that the transport vehicle is authorised for the machine weight and machine size.
- Do not manoeuvre while driving on ramps.
- Before driving on ramps, clean mud, snow and ice off tyres or travel gear.
- Make sure that a spotter is available if necessary.
- Exclusively use load-bearing and stable loading ramps to load machine.
- Make sure that width and angle of ramps match the gauge and climbing ability of machine.

Incorrect transport

- Park machine on level ground during preparation for transport (disassembly, cleaning).
- Secure machine to prevent rolling away.
- Apply parking brake.
- Pull out ignition key.
- Leave operator's cab.
- Close all doors (for example operator's cab, trim).
- Make sure that nobody is on the machine during transport.
- Make sure that the road to be travelled is known.
- Make sure that all applicable limitations for width, height and weight are known.
- Drive carefully under electric cables and bridges.
- Drive carefully through tunnels.

2.7.4 Access to machine

Injury

Incorrect entry and exit

- Uppercarriage and undercarriage are positioned so that steps and ladders are aligned with each other.
- Clean dirt, oil, ice and snow from steps, ladders, anti-slip mats, handrails and handles.
- Enter and exit carefully on muddy roads, ice, snow, traffic on access roads and in narrow conditions.
- Regularly check steps, ladders, anti-slip mats, handrails and handles and have them repaired if necessary.
- Before entering machine, clean mud, grease, ice and snow from shoes and climbing aids.
- Put on gloves for secure grip.
- Do not climb up or down using tyres, wheel hubs or rims.
- When exterior influences (for example wind) make opening and closing the door more difficult: Always guide door with your hand.
- Make sure that the opened or closed door has engaged properly.
- If the machine is still moving: Do not stand up from the operator's seat.
- Never jump off machine.
- Enter and leave the machine exclusively using the access system.
- Do not use control elements as handles.

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– Keep your face towards machine during entry and exit.
– Make sure you always have two hands and a foot or two feet and one hand in contact with the access system.
– After entering the operator's cab, find out about emergency exit.

If the machine has a cab elevation:
– Climb until the door is reached.
– When you reach door handle with your free hand: Open door.
– Continue climbing.

Adhere to safety instructions on entry and exit in operator's manual of complete machine:
– If the uppercarriage is mounted on a support.
– If the machine is part of a system.
– If the uppercarriage is mounted on a pontoon or rail guide system.

2.7.5 Machine danger zone

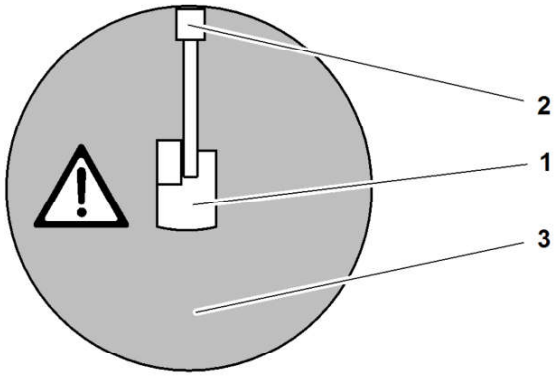

Fig. 57: Machine danger zone (view from above)

1 Machine
2 Reach of working attachment
3 Danger zone

Danger to life

Unapproved presence in danger zone

– Make sure there are no persons in danger zone.

2.7.6 Visibility

Danger to life

Insufficient visibility

– Make sure that persons approach machine from the front and within operator's field of vision.
– Make sure that persons contact the operator before approaching the machine.
– Make sure that no obstacles impair visibility in the working area.
– Use viewing devices to observe environment of machine if necessary.
– Use viewing devices if necessary to observe areas around the machine that cannot be seen directly.

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- Exclusively perform rotary motions if visibility is sufficient.
- Position working attachment so that sufficient visibility is ensured.
- Avoid travelling in reverse whenever possible.
- Work with spotter if visibility is restricted.
- Agree on which hand signs to use.
- If necessary communicate via radio.
- Make sure that spotter is outside danger zone.
- In conditions of poor visibility use illumination in accordance with the applicable regulations.
- Exclusively use sun visors if field of vision is not restricted.

Incorrect operation

- Comply with national regulations regarding sufficient visibility in the operator's cab.
- Before operation, check viewing devices for function, cleanliness and correct setting.
- Adjust mirrors so that the best possible all-round visibility is guaranteed.
- Immediately repair defective viewing devices or have them replaced.
- Clean dirty cab windows.
- Avoid covering of visual aids by working attachment.

Damage

Incorrect changes

- Make sure that modifications to the machine do not impair visibility.
- Perform risk analysis again.
- Test machine according to current standards.
- Test machine according to regulations applicable at place of use.
- Depending on test result, take appropriate action.
- Inform operator about modifications.

2.7.7 Protection against vibration

Injuries

Incorrect working method

- Use machine, working attachment and working tool adapted to the task.
- Check condition of machine (tyre pressure, brakes, steering, mechanical connections, ...).
- Make sure that operator's seat is functioning.
- Adjust operator's seat to weight and size of operator.
- Adjust shock absorption to weight and size of operator.
- Do not use jerky movements to steer, brake, accelerate and shift gears.
- Do not use jerky movements to move and load working attachment.

Incorrect travel

- Adapt speed to route.
- Travel slowly on rough terrain.
- Travel around obstacles and very rough terrain.
- Travel longer distances (for example on public roads) at an appropriate (moderate) speed.

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Incorrect path of machine

- Remove large rocks and obstacles.
- Fill up channels and holes.
- Keep machines to hand for creating and maintaining suitable terrain conditions and calculate sufficient time.

Damage

Increased travel mode

- If machine is driven a lot: Stipulate use of special auxiliary systems for travel mode.
- Regulate speed to prevent swaying.

2.7.8 Operation of machine

Danger to life

Incorrect place of use

- Make sure that load capacity value of ground is sufficient.
- Do not exceed maximum inclination angle of machine while working.
- Do not exceed maximum inclination angle of machine when driving on ramps (side inclination).
- Make sure that ground offers sufficient grip.
- Adhere to safety gap from live overhead cables.

Incorrect use

- When working in following areas, adhere to the laws, regulations and rules applicable at the place of use.
  - Explosive area
  - Flammable area
  - Areas with underground lines (gas, electricity)
- Make sure that machine is equipped with components for exhaust gas reduction when in closed spaces (for example tunnel, hall) in non-explosive environment.
- Clean machine regularly to remove flammable residues (for example dust, wood scraps).

Incorrect handling of electrical system

- Make sure there are no persons with a pacemaker in the vicinity of the running diesel engine.
- Before working on electrical system, make sure that affected parts are voltage-free.
- Before working on electrical system, make sure that neighbouring parts are isolated.
- Have work on electrical systems performed exclusively by a qualified electrician.

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Injuries

Incorrect protection

- If there is a risk of falling objects (particularly during log clamp operation): Exclusively use machines with suitable protective structures.
- If there is a risk of objects penetrating the operator's cab (particularly during log clamp operation): Exclusively use machines with suitable protective structures.
- If machine is used in toxic environment: Insert filters approved for the use in air conditioning.
- If machine is used in dust-intensive environment: Insert filters approved for the use in air conditioning.

Incorrect refuelling

- Do not touch fuels with your skin.
- Do not inhale fuel vapours.

Incorrect maintenance

- Make sure there is nobody in hazard zone.
- Park machine and secure to prevent rolling or driving away.
- Park machine on firm and level ground.
- Park machine with lowered working attachment.
- Put on protective gloves before searching for leaks in the hydraulic system.
- Exclusively search for leaks in the hydraulic system with cardboard or similar material.
- Do not weld or solder accumulators.
- Do not perform mechanical work on accumulators.
- Make sure that the permanent labelling of the accumulators (operating data) is kept visible.

Crushing injuries

Unexpected movements of machine

- Make sure there is nobody in hazard zone.
- Park machine and secure to prevent rolling or driving away.

Unintended closing of access doors

- Secure access doors by inserting the securing mechanisms.

Incorrect lifting accessories

- Exclusively use undamaged lifting accessories.
- Make sure that load capacity value of lifting accessories is sufficient.

Incorrect work clothing

- Put on protective gloves when handling wire ropes.

Incorrect work equipment

- Exclusively align bores with suitable pin.

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Burns

Incorrect maintenance

– Shut off engine before any maintenance or repair.

Hot pressurised engine cooling system

– Do not touch coolant and parts carrying coolant.
– Let the cover and parts carrying coolant cool down.

Incorrect heat protection

– Make sure that all holders and protective shields against vibration, chafing and heat build-up have been installed correctly.

Incorrect charging of battery

– Do not smoke.
– Avoid naked flames.
– Wear safety glasses.
– Put on protective gloves.

Incorrect handling of flammable liquids

– Exclusively transport flammable liquids on the machine in the designated tanks.
– Make sure that no oil squirts out of leaks.
– Regularly check lines, hoses and screwed connections for leaks and damage.
– Immediately seal leaks.
– Immediately replace damaged parts.

Incorrect refuelling

– Before refuelling, shut off diesel engine.
– Before refuelling, switch off auxiliary heater (option).
– Do not smoke.
– Avoid naked flames.
– Do not touch fuels with your skin.
– Do not inhale fuel vapours.

Damage to machine

– Before placing machine under heavy load, make sure that machine is at operating temperature.

Environmental pollution

– When working in following areas, adhere to the laws, regulations and rules applicable at the place of use.
  • Areas at risk of water (for example bodies of water)
  • Sound-sensitive areas
  • Emission-sensitive areas

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2.7.9 Load-lifting work

Danger to life

Machine tipping

- Make sure that machine is equipped for load-lifting work.
- Make sure that machine has safety equipment for load-lifting work.

Falling load

- Make sure that machine is equipped with line break safety valve on every hoist cylinder and stick cylinder.
- Make sure that the operator's cab contains a load chart.
- Exclusively use suitable slinging gear for load-lifting work.
- Exclusively tie down or loosen loads or stabilise them during transport with the help of another person.

2.8 Safe work

2.8.1 Machines with height adjustable cab

Danger to life

Persons in the danger zone

- Make sure there are no persons in the danger zone under the operator's cab.
- If operator's cab is being lowered: Keep distance from moving parts.

Machine tipping

- On slopes, exclusively travel with lowered operator's cab.

Injuries

Falling out of operator's cab

- Make sure that the cab door is closed during adjustment of operator's cab.
- Make sure that cab door is closed when in raised state.

Damage

Collision

- Make sure there are no obstacles in the range of movement of operator's cab.
- Exclusively adjust operator's cab when machine is stationary.
- Move operator's cab to park position before starting travel.
- Slowly approach park positions in automatic mode.
- Maintain sufficient distance from machine.
- Adjust operator's cab with caution.
- Exclusively switch off collision check in an emergency.

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2.9 Safe maintenance

2.9.1 Spare parts

Danger to life

Incorrect spare parts

- Use original Liebherr spare parts wherever possible.
- Make sure that the spare parts meet the technical requirements specified by the manufacturer.
- After replacing parts, tighten loosened screw connections with prescribed tightening torque.
- Find prescribed tightening torque in supplied documentation.
- If the tightening torque is not prescribed by the supplied documentation: Find prescribed tightening torque in Liebherr factory standard.
- If the tightening torque is not prescribed by the Liebherr factory standard: Find tightening torque in valid DIN standard, EN standard or ISO standard.

2.9.2 Heavy parts

Danger to life

Incorrect handling

- Exclusively use machine for load-lifting with sufficient loading capacity.
- Exclusively use suitable and functioning lifting accessories with sufficient loading capacity.
- Make sure there are no persons underneath raised loads.
- Exclusively task qualified and experienced persons with the attaching of loads.
- Exclusively task qualified and experienced persons with the directing of operators.
- Make sure that the spotter can be seen by the operator.
- Make sure that spotter and operator are in voice contact if necessary.

Injury

Incorrect protective equipment

- Put on gloves when handling wire ropes.

2.9.3 Regular checks

Danger to life

Incorrect performance of checks

- Make sure that safety checks are performed regularly on the machine.
- Make sure that all checks are performed by suitable, competent and authorised persons.
- Adhere to national regulations.

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2.10 Modifications to the machine

2.10.1 Modifications, add-ons and retrofittings

Danger to life

Incorrect changes to the machine

- Have changes, add-ons or retrofittings that could affect safety approved by the manufacturer.
- Have installation and adjustment of safety equipment and safety valves approved by the manufacturer.
- Have welding work on load-bearing parts approved by the manufacturer.
- If attachment parts and add-on parts are not approved generally by Liebherr for installation or attachment: Do not attach or install attachment parts and add-on parts to machine without written approval from Liebherr.
- Send all technical documents required for approval to Liebherr.

Damage

- If attachment parts and add-on parts are supplied via the machine's hydraulic system: Make sure that different oil types are not mixed.

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3 Control and operation

3.1 Control and operating elements

3.1.1 Overview of operator's platform

Note
Different machine configuration!

▶ Adhere to control description sticker.

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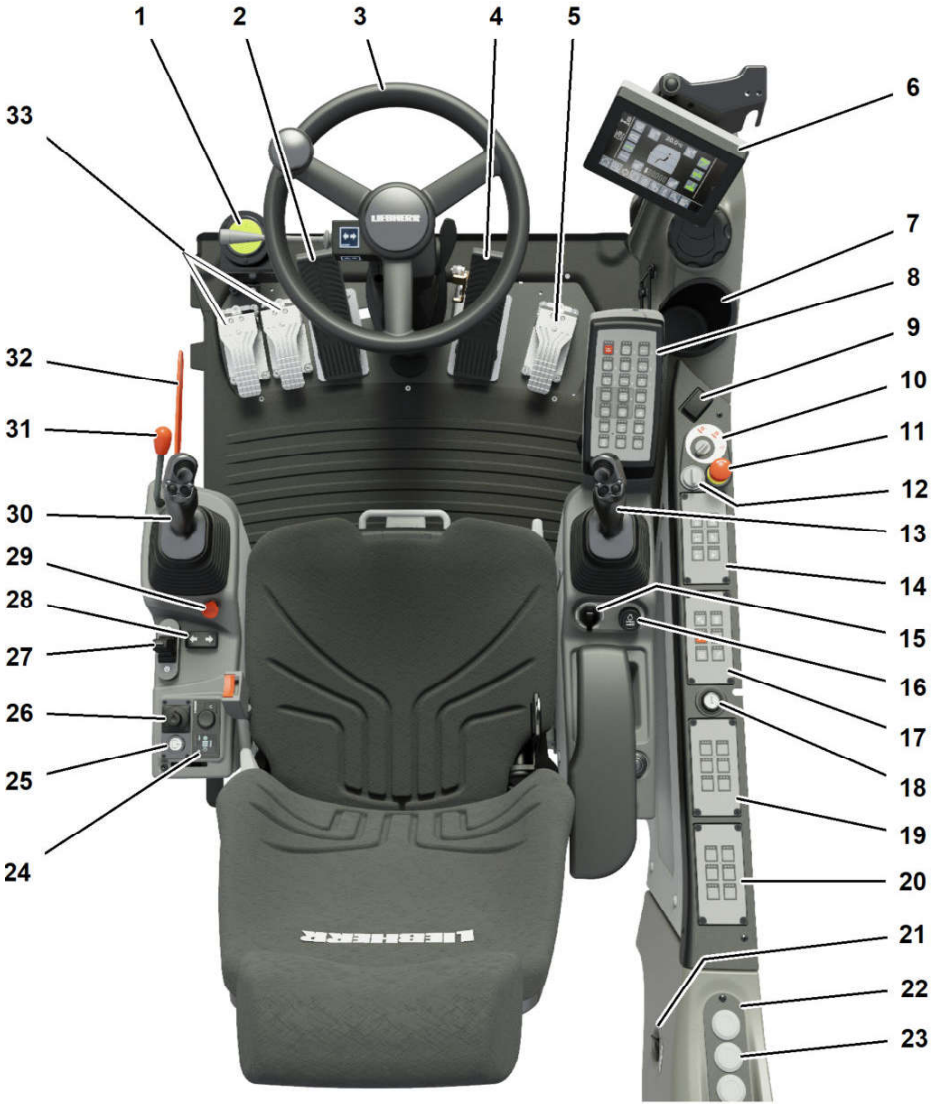

Fig. 58: Overview of operator's platform

1	Circular spirit level[2)]	**18**	Confirmation button
2	Slewing brake[2)]	**19**	Control unit D
3	Steering wheel[2)]	**20**	Control unit E
4	Service brake	**21**	Socket (12 V)
5	Accelerator pedal	**22**	Control unit F
6	Display	**23**	Key switch[2)]
7	Drink holder	**24**	Control unit of auxiliary heater [2)]
8	Control unit A	**25**	Mirror heater key [2)]
9	Adjusting lever for operator's cab (two-way adjustable cab)[2)]	**26**	Mirror adjuster joystick [2)]
10	Oscillating axle switch	**27**	Adjustment lever for operator's cab or support[2)]
11	Emergency cut-off switch or emergency stop button[2)]	**28**	Turn signal switch [2)]

See next page for continuation of the image legend

[2)] Option

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12 Control, magnetic crossbeam [2)]
13 Right joystick
14 Control unit B
15 Ignition key
16 Engine speed controller
17 Control unit C
29 Unlocking button for folding console
30 Left joystick
31 Console lever
32 Safety barrier
33 Double pedal[2)]

3.1.2 Control unit A

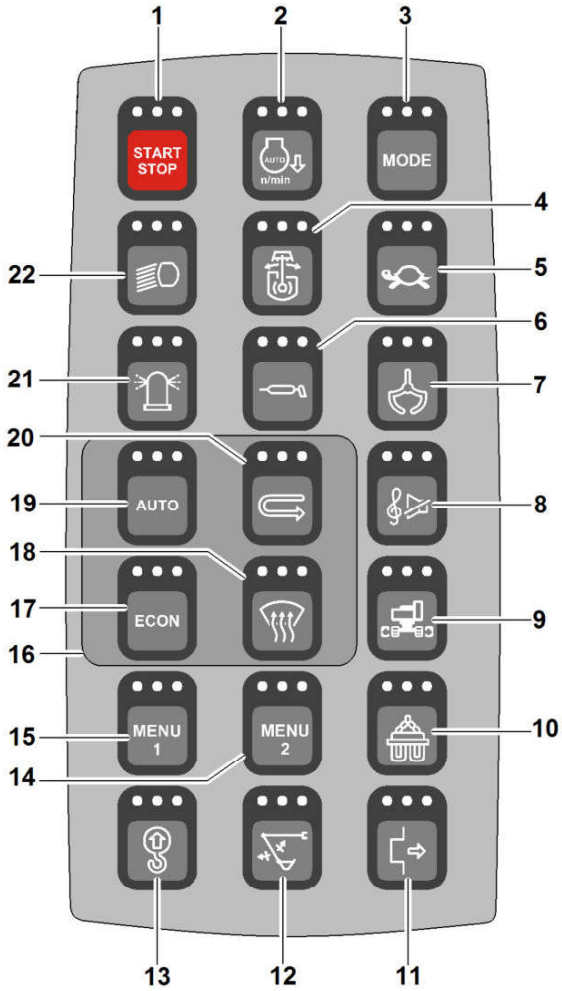

Fig. 59: Control unit A

1 *Engine start/stop* key
2 *Sensor-controlled low idle automatic* key
3 *MODE* key (option)
4 *Slewing brake* key
See next page for continuation of the image legend
12 *Bypassing stick cylinder shut-off* key
13 *Overload warning system* key (option)
14 *Menu 2* key
15 *Menu 1* key

[2)] Option

5 *Creeper gear* key
6 *Central lubrication system* key
7 *Grapple priority* key (option)
8 *Radio muting* key
9 No function assigned
10 *Magnet system* key (option)
11 *Quick coupler* key (option)
16 Keys of automatic heating and automatic ventilation, automatic air conditioning
17 *ECON* key
18 *Defrosting* key
19 *AUTO* key (option)
20 *Recirculated air* key
21 *Beacon* key (option)
22 *Travel light* key

3.1.3 Control unit B

Key assignment depends on the equipment variant.

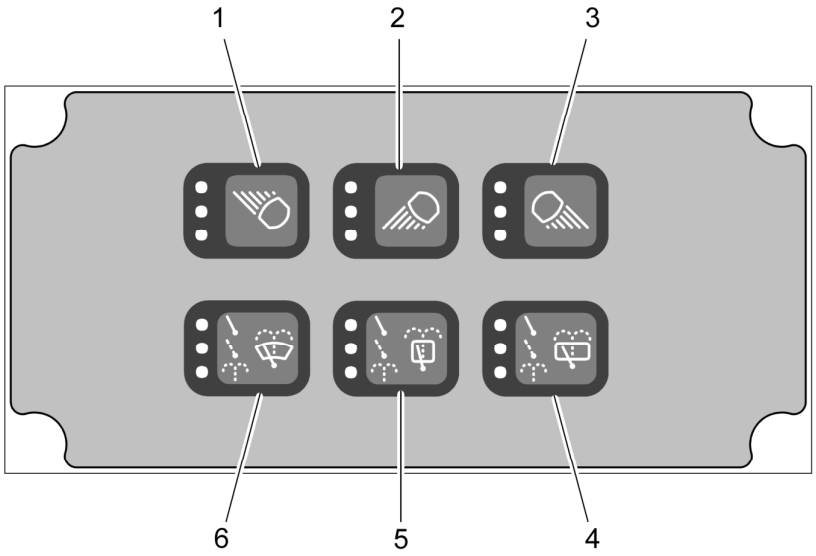

Fig. 60: Control unit B

1 *Working attachment headlight* key
2 *Front operator's cab headlight* key
3 *Rear operator's cab headlight* key
4 *Floor glass panel* key (without function for machines without floor glass panel)
5 *Roof glass panel* key (option)
6 *Windscreen* key

3.1.4 Further control units

The key assignment of further control units depends on the equipment variant of the machine.

The keys are shown and explained in the corresponding chapters.

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3.1.5 Symbols on control description sticker

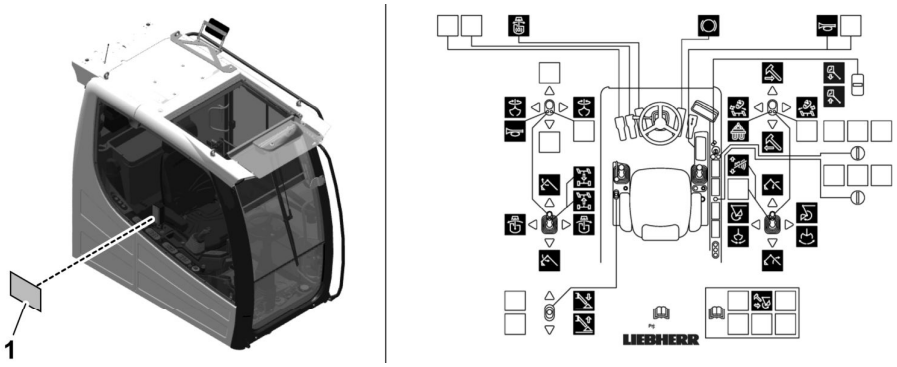


Fig. 61: Control description sticker in the operator's cab, example of control description sticker

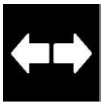
1 Control description sticker

The control description sticker indicates the function allocation of the following control elements:
- Joysticks
- Keys
- Switch
- Lever
- Pedals

The assignment of control elements differs depending on machine configuration.

The control description sticker corresponds to the machine configuration.

General symbols

Symbol	Description	Symbol	Description
	Scrolling on the display		Windscreen wiper
	Turn signal		Turning uppercarriage left
	Roof glass panel windscreen wiper		Turning uppercarriage right
	Activating voice radio		Unlocking oscillating axle
	Raising windscreen		Locking oscillating axle

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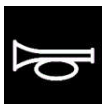
Symbol	Description	Symbol	Description
	Lowering windscreen		Positioning slewing brake
	Horn		SVAB
	Quick-selection button		Teach-in
	Activating motor cable drum manually		Deactivating travel alarm
	Speed controller		

Tab. 10: General symbols

Control changeover

Symbol	Description	Symbol	Description
	Changing over control of function 1 and function 2 on double pedal		Changing over control of mini-joystick and double pedal
	Changing over control of shovel flap to double pedal		Changing over control of two-piece boom to up or side
	Changing over control of high pressure circuit 1 and two-piece boom		Changing over control
	Changing over control of bucket and high pressure circuit 1		Changing over control of tiltrotator and high pressure circuit 1

Tab. 11: Control changeover

Optional equipment

Symbol	Description	Symbol	Description
	Watering device		Sanding equipment

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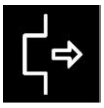
Symbol	Description	Symbol	Description
	Dust extraction		Air compressor

Tab. 12: Optional equipment

Working tools

Symbol	Description	Symbol	Description
	Quick coupler		Turning tiltrotator left
	Turning grapple		Tilting tiltrotator left
	Turning grapple left		Turning tiltrotator right
	Turning grapple right		Tilting tiltrotator right
	Opening grapple		Opening grapple of tiltrotator
	Closing grapple		Closing grapple of tiltrotator
	Tilting in bottom dump shovel		Uncoiling rope
	Tilting out bottom dump shovel		Coiling up rope
	Lifting bottom dump shovel		Pulling out pipe
	Lowering bottom dump shovel		Pushing pipe in
	Tilting bucket out		Activating pipe grapple

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Symbol	Description	Symbol	Description
	Tilting bucket in		Opening pipe grapple
	Magnet system		Closing pipe grapple
	Mowing bucket		Activating pipe-laying tool
	Chain saw		Turning pipe-laying tool left
	Mill		Turning pipe-laying tool right
	Turning mulcher		Lifting shear
	Reversing mulcher		Opening shear
	Pneumatic load lift hooks		Closing shear
	Tilting bucket		Lowering shear
	Activating tiltrotator		

Tab. 13: Working tools

Working attachment

Symbol	Description	Symbol	Description
	Lowering the boom actively		Four-part boom: Lowering part 4
	Raising boom		Extending telescopic boom

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Symbol	Description	Symbol	Description
	Lowering boom		Retracting telescopic boom
	Turning rotary stick left		Lifting telescopic boom
	Turning rotary stick right		Turning telescopic boom left
	High pressure circuit 1		Tilting telescopic boom upward
	High pressure circuit 1		Turning telescopic boom right
	High pressure circuit 2		Tilting telescopic boom downward
	High pressure circuit 2		Lowering telescopic boom
	Hoist cylinder protection		Telescopic boom: Tilting out working tool
	Hoist cylinder protection		Telescopic boom: Tilting in working tool
	Raising two-piece boom		Tilting swivel bearing left
	Lowering two-piece boom		Tilting swivel bearing right
	Four-part boom: Tilting bucket out		Adjusting lateral boom adjustment to left
	Four-part boom: Tilting bucket in		Adjusting lateral boom adjustment to right
	Four-part boom: Lifting part 2		Socket on stick

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Symbol	Description	Symbol	Description
	Four-part boom: Lowering part 2		Socket on stick - voltage 3
	Four-part boom: Lifting part 3		Extend stick
	Four-part boom: Lowering part 3		Retract stick
	Four-part boom: Lifting part 4		Bypassing stick cylinder shut-off

Tab. 14: Working attachment

Support

Symbol	Description	Symbol	Description
	Activating all outriggers		Raising blade
	Activating folding wing		Lowering blade
	Activating outrigger		Raising blade and outrigger
	Extending outrigger		Lowering blade and outrigger
	Retracting outrigger		Changing over control of support to additional function
	Unlocking outrigger		

Tab. 15: Support

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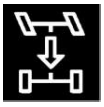
Height-adjustable cab

Symbol	Description	Symbol	Description
	Activating height-adjustable cab		Lowering operator's cab
	Raising operator's cab		Lowering operator's cab
	Raising operator's cab		Lifting hydraulically tiltable cab
	Raising operator's cab		Lowering hydraulically tiltable cab
	Lowering operator's cab		

Tab. 16: Height-adjustable cab

Wheeled excavator travel mode

Symbol	Description	Symbol	Description
	Travel brake		Travelling left
	Increasing traction in automatic mode		Turning left
	Travelling forward		Travelling right
	Travelling backwards		Turning right

Tab. 17: Wheeled excavator travel mode

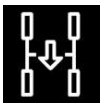
Crawler excavator travel mode

Symbol	Description	Symbol	Description
	Extending side frames		Travelling left

Symbol	Description	Symbol	Description
	Retracting side frames		Travelling right
	Travelling forward		Turning travel gear left on the spot
	Travelling forward and backward		Turning travel gear right on the spot
	Travelling backwards		

Tab. 18: Crawler excavator travel mode

Rail excavator travel mode

Symbol	Description	Symbol	Description
	Travelling forward		Travelling backwards

Tab. 19: Rail excavator travel mode

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3.2 Display

3.2.1 Display

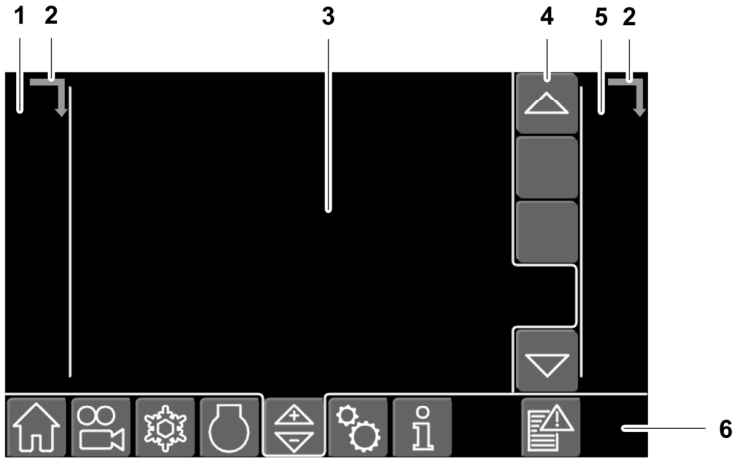

Fig. 213: Display

1	Status bar	**4**	Submenu bar
2	*Further symbols* arrow	**5**	Warning bar
3	Display field	**6**	Menu bar

Note

The arrow indicates that further symbols are available in the status bar or warning bar on the display.

The symbols are displayed alternately under the *Further symbols* arrow **2**.

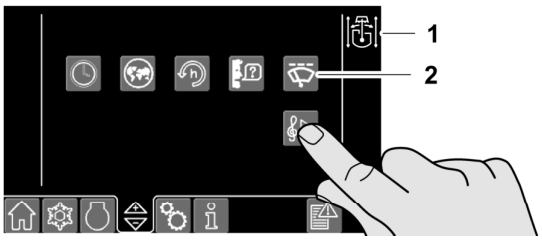

Fig. 214: Symbols with a grey background are buttons

1	Symbol	**2**	Button

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Selecting menu via menu bar

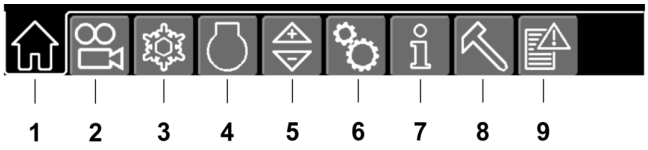


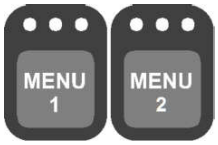
Fig. 215: Menu bar

1	*Start page* menu button	**6**	*Function settings* menu button
2	*Camera* menu button [3)]	**7**	*Information* menu button
3	*Automatic heating, automatic ventilation and automatic air conditioning system* menu button	**8**	*Tool Control* menu button
4	*Operating status* menu button	**9**	*Service codes* menu button
5	*System settings* menu button		

▶ Press menu button in menu bar.
  ▷ Symbol of selected menu has a black background.

Selecting menu via programmable keys

Programming key



▶ Select menu: Press menu button in menu bar.

▶ Press *MENU 1* key or *MENU 2* key until middle and right LEDs light up.

▶ Release key/button.
  ▷ Left LED lights up.
  ▷ Menu is saved to key.

Selecting menu via key

▶ Press *MENU 1* key or *MENU 2* key.
  ▷ Menu appears on the display.

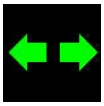
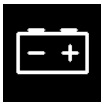
3.2.2 Status symbols

The symbols in the status bar indicate the operating status. The displayed symbols depend on model and equipment of machine.

General symbols

Symbol	Meaning
	Confirmation required; press confirmation button.
	Confirmation error; press confirmation button.

[3)] not valid for Rail machines.

Symbol	Meaning
	Turn signal active
	Charge indicator; battery not charging.
	Emergency stop button 1 pressed
	Emergency stop button 2 pressed Rail-road excavator: Emergency brake switch pressed in rail mode
	Emergency stop button 3 pressed
	Air flow reversal blocked
	Refuelling active
	Hydraulic system emergency mode switched on
	Valves blocked
	Maintenance due
	Maintenance of working tool due
	Servo control inoperative
	Control changeover
	Control pressure too low

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Symbol	Meaning
	Request denied
	Teleservice enabled
	Liebherr measuring system
	Socket on stick: Voltage 1
	Socket on stick: Voltage 2
	Socket on stick: Voltage 3
	Socket on stick; neutral position required for voltage 1

Tab. 20: General status symbols

Working attachment and working tools

Symbol	Meaning
	Lowering boom active
	Boom adjustment active
	Boom adjustment; neutral position required
	Lateral boom adjustment active
	Lateral boom adjustment; neutral position required

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Symbol	Meaning
	Working tool; neutral position required
	Rotary stick; neutral position required
	Grapple active
	Turn grapple; neutral position required
	Open grapple and close grapple; neutral position required
	Main movements of working attachment and slewing gear blocked
	Main movements of working attachment and slewing gear; neutral position required
	Hoist cylinder protection switched off
	Stick cylinder protection switched off
	Boom line break safety open
	Stick cylinder shut-off active
	Stick cylinder shut-off bypassed
	Stick cylinder shut-off for heavy working tool active
	Stick cylinder shut-off for heavy working tool bypassed

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Symbol	Meaning
	Hoist cylinder shut-off active
	Hoist cylinder shut-off bypassed
	Height limitation bypassed, height limitation switched off
	Height limitation; upper shut-off point reached
	Depth limitation; lower shut-off point reached
	Overload warning, permitted load level reached Load moment limitation; limitation initiated
	Overload warning system not active
	Load moment limitation bypassed; load moment limitation switched off
	Load moment limitation; shut-off initiated
	Backward Stability; shut-off initiated
	Magnet system blocked
	Air compressor
	Undefined sensor; neutral position required
	General hydraulic supplementary circuit; neutral position required

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Symbol	Meaning
	Control changed over

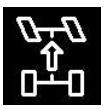
Tab. 21: Status symbols of working attachment and working tools

Brake

Symbol	Meaning
	Accumulator pressure of service brake
	Brake system inoperative
	Brake system inoperative, wire break

Tab. 22: Status symbols of brake

Travel mode

Symbol	Meaning
	Travel speed reduced
	Travel mode blocked
	Travel mode; neutral position of travel direction switch and accelerator pedal required
	Travelling backwards
	Travelling backwards with speed controller
	Travelling forward

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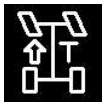
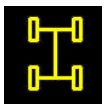
Symbol	Meaning
	Travelling forwards with speed controller
	Front steering axle
	Rear steering axle
	Crab steering
	Four-wheel steering
	Align axles straight.
	Axles aligned straight
	Travelling slowly
	Steering mode changeover blocked
	Joystick steering active
	Joystick steering blocked
	Joystick steering; neutral position required
	Travel mode blocked
	Travel mode; neutral position required

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Symbol	Meaning
	Ride control switched on

Tab. 23: Status symbols of travel mode

Slewing gear

Symbol	Meaning
	Slewing brake inoperative
	Slewing gear blocked
	Slew limitation active
	Slew limitation bypassed, slew limitation switched off
	Virtual left wall bypassed
	Virtual right wall bypassed
	Uppercarriage aligned parallel to undercarriage; machine in travel position
	Slewing gear; neutral position required
	Main movements of working attachment and slewing gear blocked
	Main movements of working attachment and slewing gear; neutral position required
	Slewing alarm deactivated

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Symbol	Meaning
	Backward Stability; shut-off initiated

Tab. 24: Status symbols of slewing gear

Height-adjustable cab

Symbol	Meaning
	Adjusting operator's cab blocked
	Lifting operator's cab blocked
	Lowering operator's cab blocked
	Automatic mode for upper park position
	Automatic mode for lower park position
	Operator's cab; neutral position required
	Boom line break safety open
	Hoist cylinder protection switched off
	Stick cylinder protection switched off
	Inclination cylinder protection switched off
	Adjusting cab inclination blocked

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Symbol	Meaning
	Hoist cylinder has reached maximum.
	Hoist cylinder has reached minimum.
	Stick cylinder has reached maximum.
	Stick cylinder has reached minimum.
	Automatic mode locked

Tab. 25: Status symbols of height-adjustable cab

Diesel engine

Symbol	Meaning
	Power reduction of diesel engine
	Power reduction of diesel engine
	Automatic engine stop
	Automatic engine stop blocked
	Delayed engine stop active or Automatic engine stop before long
	Engine start blocked
	Engine stop blocked

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Symbol	Meaning
	Diesel engine emergency mode active
	Preglowing

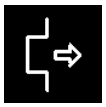
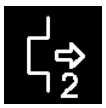
Tab. 26: Status symbols of diesel engine

Oscillating axle

Symbol	Meaning
	Oscillating axle support automatic; oscillating axle unlocked
	Oscillating axle support automatic; oscillating axle locked
	Oscillating axle locked
	Oscillating axle locked
	Oscillating axle locked
	Backward Stability locks oscillating axle.

Tab. 27: Status symbols of oscillating axle

Quick coupler

Symbol	Meaning
	Quick coupler active
	Quick coupler 2 active

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Symbol	Meaning
	Lock quick coupler.
	Lock quick coupler 2.
	Quick coupler locks.
	Quick coupler 2 locks.
	Quick coupler unlocks.
	Quick coupler 2 unlocks.
	Quick coupler is unlocked.
	Quick coupler 2 is unlocked.
	No working tool in locking position

Tab. 28: Status symbols of quick coupler

Support

Symbol	Meaning
	Pontoon actuation active
	Outrigger movement
	Outrigger movement blocked

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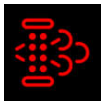
Symbol	Meaning
	Outrigger extension blocked
	Outrigger retraction blocked
	Support adjustment lever; neutral position required
	Outrigger support extended
	Support fully extended

Tab. 29: Status symbols of support

Diesel particulate filter

Symbol	Meaning
	Active regeneration
	Regeneration blocked
	Diesel particulate filter contaminated
	Diesel particulate filter heavily contaminated

Tab. 30: Status symbols of diesel particulate filter

SCR system

Symbol	Meaning
	Bleeding active

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Symbol	Meaning
	Pressure relief active
	Bleeding of cooling circuit active
	Heating circuit active

Tab. 31: Status symbols of SCR system

Rail guide system

Symbol	Meaning
	Rail guide system: Additional tyres blocked
	Automatic mode not active
	Neutral position required
	Rail guide system automatically blocked
	Sanding equipment active

Tab. 32: Status symbols of rail guide system

3.2.3 *Start page* menu

Menu call: 

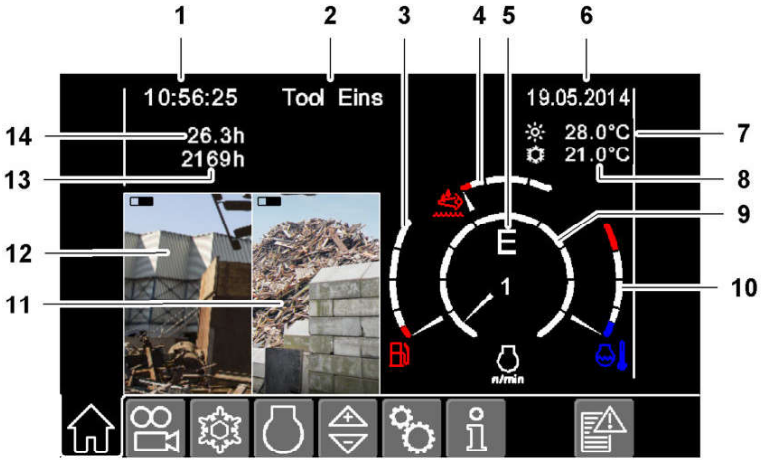

Fig. 373: Start page menu

1	Time	**8**	Selected cab temperature
2	Selected working tool	**9**	Rev counter
3	Fill level in fuel tank	**10**	Coolant temperature
4	Fill level in diesel exhaust fluid tank	**11**	Image of side area camera
5	Operating mode	**12**	Image of rear area camera
6	Date	**13**	Total operating hours
7	Outside temperature	**14**	Daily operating hours

If *servo control* key is switched off, following values appear on the display:
– Daily kilometres instead of daily operating hours **14**
– Total kilometres instead of total operating hours **13**
– Speedometer instead of rev counter **9**

3.2.4 *Camera* menu

Menu call: 

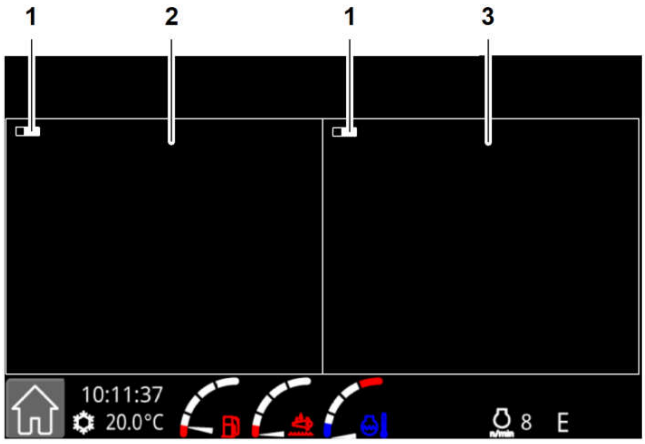

Fig. 375: Camera menu

1	Activity indicator		
2	Image of rear area camera	**3**	Image of side area camera

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Note

Camera menu appears if display is not operated after return time has elapsed.

Display automatically displays *camera* menu in following situations:
– Folding down of folding console
– Driving of machine (option)
– Turning of uppercarriage (option)

Checking activity indicator

Activity indicator **1** has following function:
– Confirm correct display of camera images.

▶ Make sure that camera image is displayed in real time.

If bar in activity indicator **1** does not move:
▶ Contact Liebherr customer service.

Checking layout of camera images

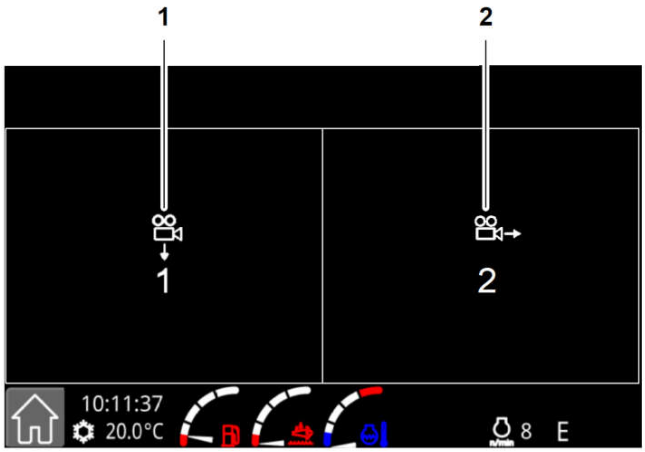

Fig. 376: Checking layout of camera images

1 *Rear area camera* symbol **2** *Side area camera* symbol

▶ Touch camera image on display.

3.2.5 Air conditioning

Menu call:

DANGER
Fogged windows!
Danger to life.

▶ Activate automatic mode.

▶ Do not switch on recirculated air mode for long periods.

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Operation via menu

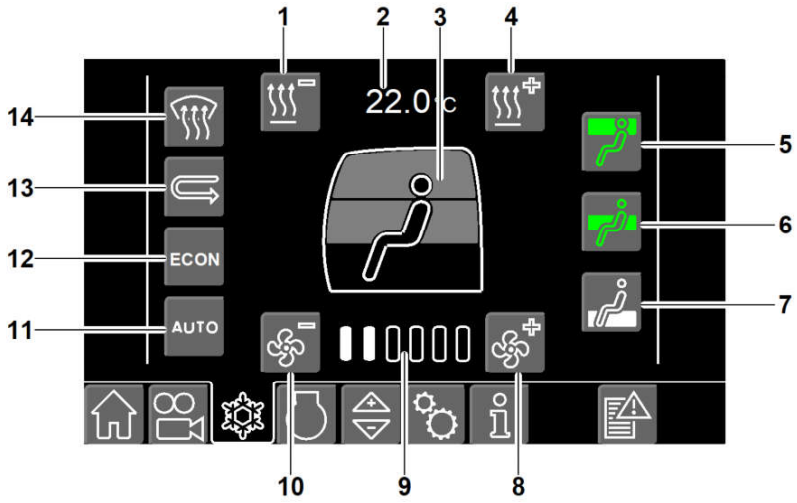

Fig. 377: Air conditioning menu

1 *Reducing temperature* button
2 Set temperature
3 Operating status of air outlets
4 *Increasing temperature* button
5 *Head area air outlets* button
6 *Chest area air outlets* button
7 *Foot area air outlets* button
8 *Increasing blower power* button
9 Bar chart display for blower power
10 *Reducing blower power* button
11 *Automatic air conditioning* button
12 *ECON* button
13 *Recirculated air* button
14 *Defrosting and defogging* button

Operation using control unit

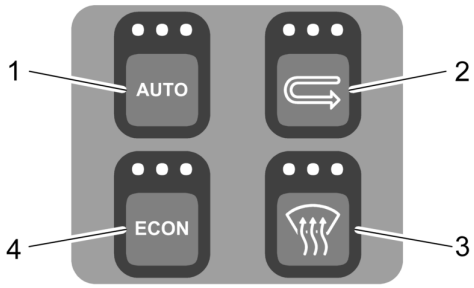

Fig. 378: Keys on control unit

1 *Automatic mode* key
2 *Recirculated air* key
3 *Defrosting and defogging* key
4 *ECON* key

Switching air conditioning unit on and off

▶ Press *ECON* button on the display.
or
Press *ECON* key on control unit.

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Replacing the display in case of sensor failure

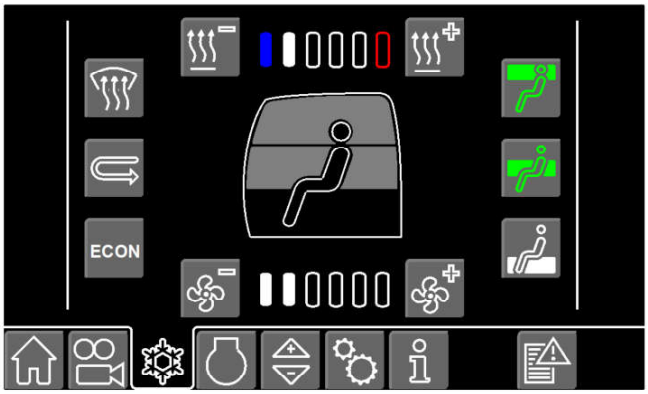

Fig. 379: Display in case of sensor failure

Sensor failure of air conditioning leads to following changes to the display:
– Functions are hidden.
– Set temperature is displayed as bar chart display.

If sensor of air conditioning has failed:
▶ Contact Liebherr customer service.

Sunshine sensor

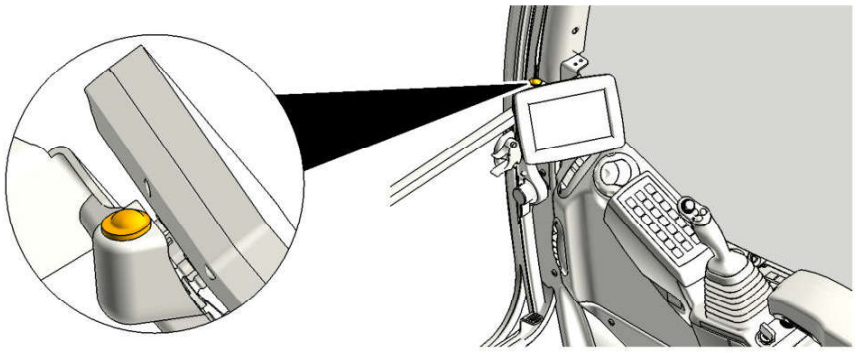

Fig. 380: Position of sunshine sensor

▶ Make sure that sunshine sensor is not covered.
▶ Make sure that sunshine sensor is not damaged.

3.2.6 *Operating status* menu

Menu call: 

The display of this submenu varies depending on machine configuration:

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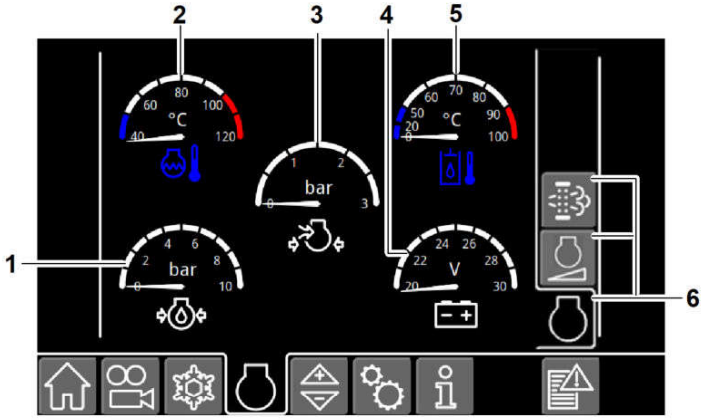

Fig. 381: Operating status menu

1 Engine oil pressure
2 Coolant temperature
3 Charging pressure
4 Battery voltage
5 Hydraulic oil temperature
6 Menu buttons

In normal mode, the symbols are displayed in white, for a warning, they are displayed in red.

Menu button	Designation
	Diesel particulate filter (For more information see: 3.2.7 *Diesel particulate filter* submenu (option), page 92)
	Sensor-controlled low idle automatic and automatic engine stop
	Measurement display

Tab. 33: Menu buttons

3.2.7 *Diesel particulate filter* submenu (option)

Menu call:  > 

The display of this submenu varies depending on machine configuration:

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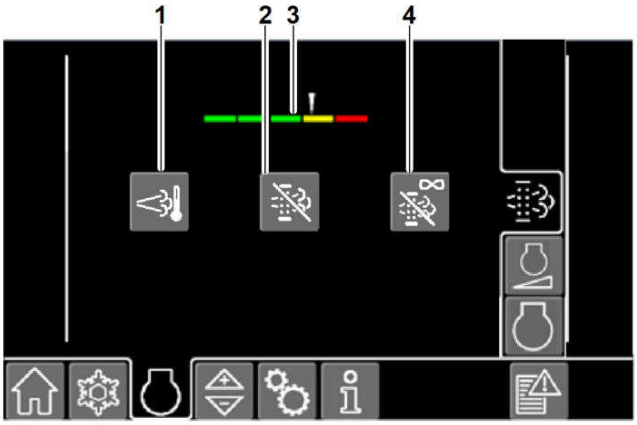

Fig. 385: Diesel particulate filter submenu

1 *Activating regeneration* button
2 *Blocking regeneration* button
3 Contamination level
4 *Blocking regeneration permanently* button

The regeneration can be activated or blocked depending on contamination level of the diesel particulate filter. (For more information see: 5.8.9 Diesel particulate filter: Activating and deactivating regeneration, page 320)

3.2.8 *Sensor-controlled low idle automatic and automatic engine stop* submenu (option)

Menu call: >

The display of this submenu varies depending on machine configuration:

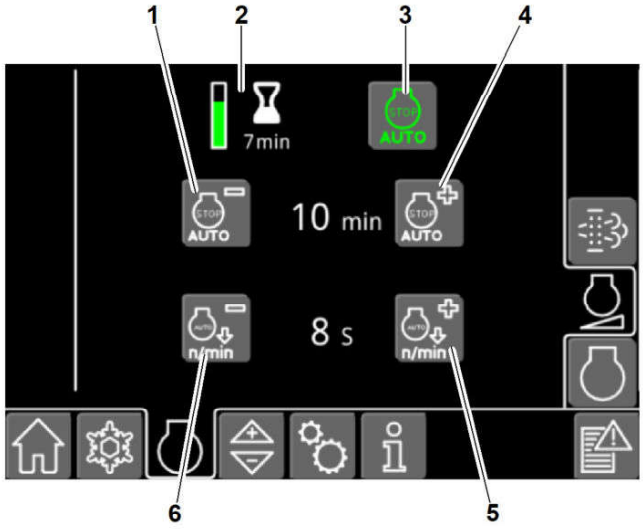

Fig. 386: Sensor-controlled low idle automatic and automatic engine stop submenu

1 *Reducing idling time until automatic engine stop* button
4 *Increasing idling time until automatic engine stop* button

See next page for continuation of the image legend

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2	Remaining time until automatic engine stop	**5**	*Increasing activation time for sensor-controlled low idle automatic* button
3	*Permanently deactivating automatic engine stop* button	**6**	*Reducing activation time for sensor-controlled low idle automatic* button

- ▶ Activate sensor-controlled low idle automatic: (For more information see: 3.4.14 Sensor-controlled low idle automatic, page 162)
- ▶ (For more information see: 3.4.15 Automatic engine stop after idling (option), page 162)

3.2.9 *System settings* menu

Menu call: 

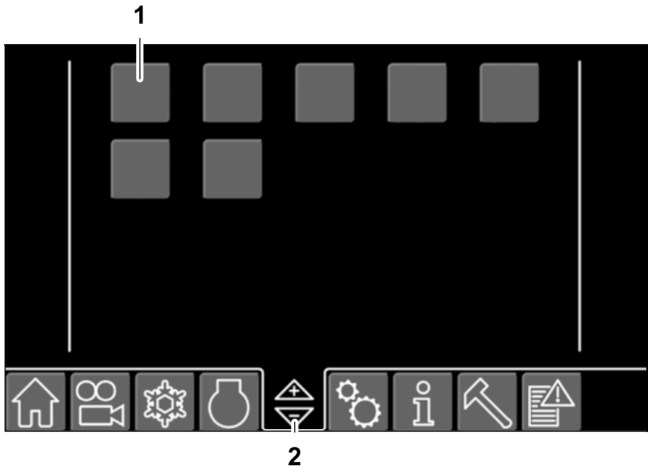

Fig. 387: System settings menu

1	Menu buttons	**2**	*System settings* menu

Quantity of menu buttons on the display depends on machine type and equipment.

Menu buttons	Description
	Operating hour meter and odometer (For more information see: 3.2.10 *Operating hour meter and odometer* submenu, page 95)
	Windscreen wiper interval (For more information see: 3.2.11 *Windscreen wiper interval* submenu, page 95)
	Radio remote control (For more information see: 3.2.12 *Radio remote control* submenu, page 96)
	Display settings (For more information see: 3.2.13 *Display settings* submenu, page 97)

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Menu buttons	Description
	Regional settings and system parameters (For more information see: 3.2.17 *Regional settings and system parameters* submenu, page 99)

Tab. 34: System settings menu

3.2.10 *Operating hour meter and odometer* submenu

Menu call:  > 

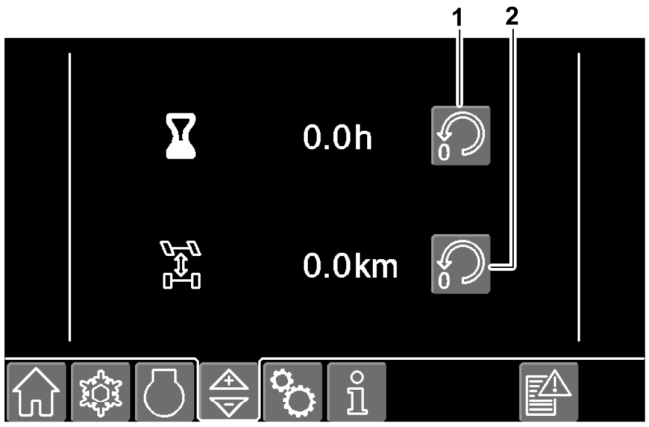

Fig. 393: Operating hour meter and odometer submenu

1 *Resetting daily operating hour meter* button

2 *Resetting daily odometer* button [5)]

3.2.11 *Windscreen wiper interval* submenu

Menu call:  > 

[5)] Applies to machines with wheeled undercarriage

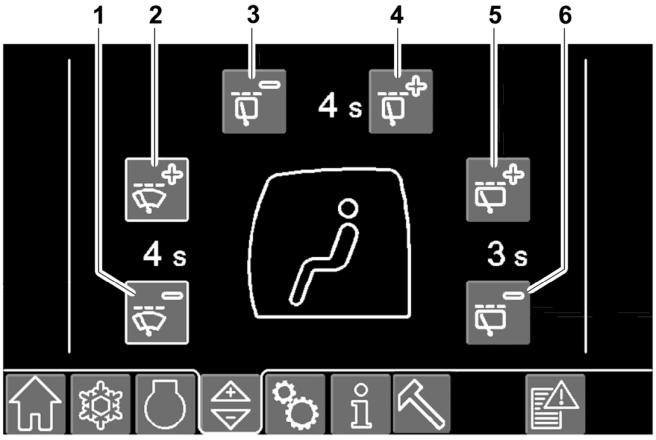

Fig. 394: Windscreen wiper interval submenu[6)]

1	*Reducing windscreen wiper interval* button	**4**	*Increasing roof glass panel windscreen wiper interval* button
2	*Increasing windscreen wiper interval* button	**5**	*Increasing rear windscreen wiper interval* button
3	*Reducing roof glass panel windscreen wiper interval* button	**6**	*Reducing rear windscreen wiper interval* button

3.2.12 *Radio remote control* submenu

Menu call:  > 

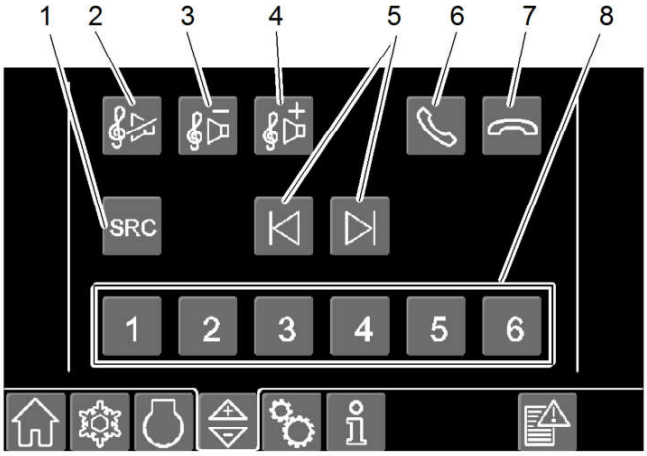

Fig. 395: Radio remote control submenu

1	*Selecting audio source* button	**5**	*Changing radio station or track* buttons
2	*Mute* button	**6**	*Answering phone call* button
3	*Volume down* button	**7**	*Ending phone call* button
4	*Volume up* button	**8**	*Selecting stored radio station* buttons

6) Quantity of windscreen wipers depending on machine type and equipment

3.2.13 *Display settings* submenu

Menu call:  > 

Menu button	Designation
	Return time (For more information see: 3.2.16 *Camera return time* submenu, page 98)
	Camera image contrast, side area camera (For more information see: 3.2.15 *Camera image contrast* submenu, page 98)
	Camera image contrast, rear area camera (For more information see: 3.2.15 *Camera image contrast* submenu, page 98)
	Display brightness and display volume (For more information see: 3.2.14 *Display brightness and display volume* submenu, page 97)

Tab. 35: Menu buttons

3.2.14 *Display brightness and display volume* submenu

Menu call:  >  > 

The display of this submenu varies depending on machine configuration:

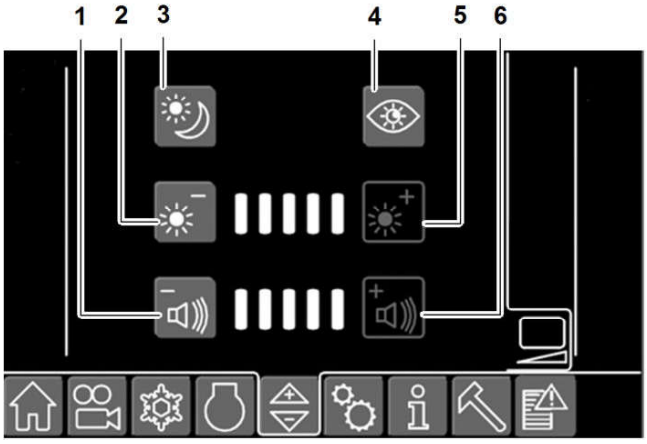

Fig. 400: Display brightness and display volume submenu

1 *Reducing display volume* button
2 *Reducing display brightness* button
3 *Day/night mode* button
4 *Night Shift mode* button
5 *Increasing display brightness* button
6 *Increasing display volume* button

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3.2.15 *Camera image contrast* submenu

Menu call: > > or > >

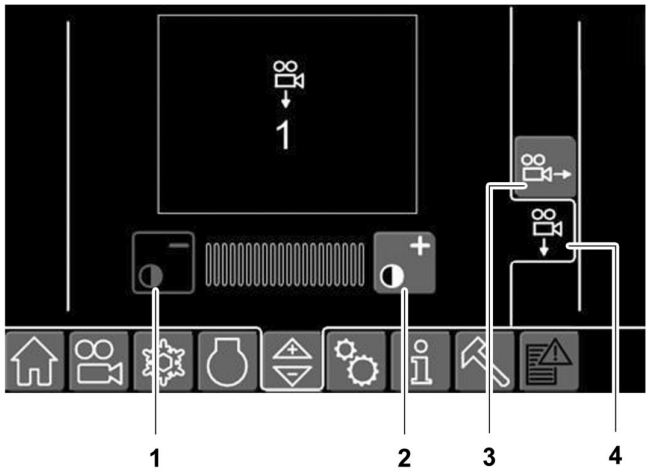

Fig. 401: Camera image contrast submenu

1 *Reducing camera image contrast* button
2 *Increasing camera image contrast* button
3 *Side area camera* menu button
4 *Rear area camera* menu button

3.2.16 *Camera return time* submenu

Menu call: > >

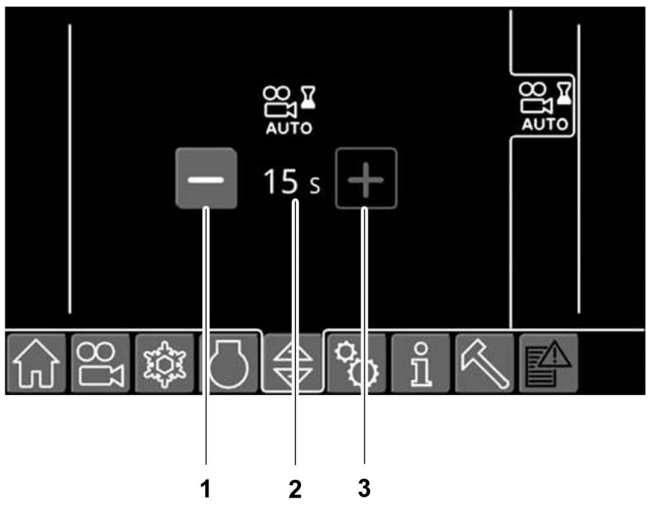

Fig. 402: Camera return time submenu

1 *Reducing return time* button
2 Return time
3 *Increasing return time* button

If the display is not used, it displays the *camera* menu after the return time has elapsed.

3.2.17 *Regional settings and system parameters* submenu

Menu call:  > 

Menu button	Designation
	Time format and date format (For more information see: 3.2.21 *Time format and date format* submenu, page 101)
	Time zone (For more information see: 3.2.20 *Time zone* submenu, page 100)
	Language selection (For more information see: 3.2.22 *Language selection* submenu, page 101)
	Unit selection (For more information see: 3.2.18 *Unit selection* submenu, page 99)
	Electrical inputs (For more information see: 3.2.24 *Electrical inputs* submenu, page 103)
	Electrical outputs (For more information see: 3.2.23 *Electrical outputs* submenu, page 102)
	System diagnosis (For more information see: 3.2.19 *System diagnosis* submenu, page 100)

Tab. 36: Menu buttons

3.2.18 *Unit selection* submenu

Menu call:  >  > 

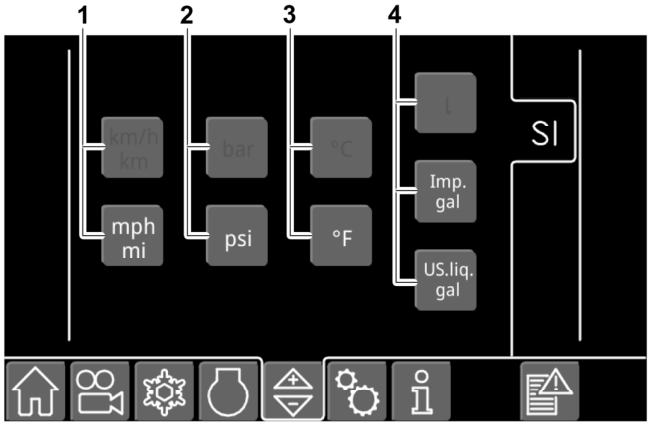

Fig. 410: Unit selection submenu

1 *Speed unit* buttons
2 *Pressure unit* buttons
3 *Temperature unit* buttons
4 *Volume unit* buttons

3.2.19 *System diagnosis* submenu

Menu call: > >

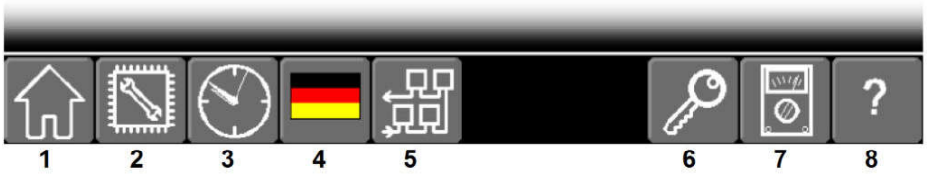

Fig. 411: System diagnosis menu bar

1 *Start page* menu button
2 *System diagnosis* menu button
3 *Time zone and time* menu button
4 *Language* menu button
5 *CAN-Bus information* menu button
6 *Access rights* menu button
7 *Test system* menu button
8 *Help* menu button

Following menus are exclusively for Liebherr customer service:
– *System diagnosis* submenu **2**
– *CAN-Bus information* submenu **5**
– *Access rights* submenu **6**
– *Test system* submenu **7**
– *Help* submenu **8**

3.2.20 *Time zone* submenu

Menu call: > >

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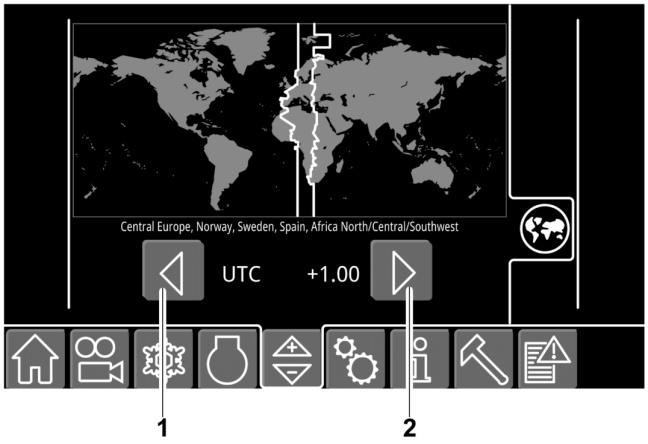

Fig. 412: Time zone submenu

1 *Moving time zone to west* button **2** *Moving time zone to east* button

3.2.21 *Time format and date format* submenu

Menu call: > >

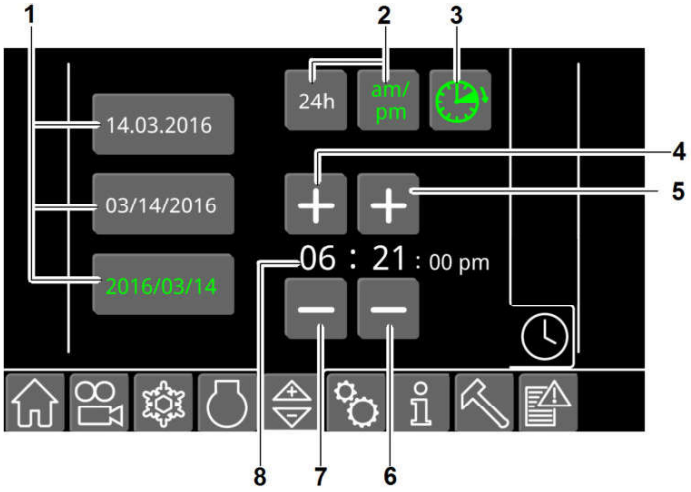

Fig. 413: Time format and date format submenu

1 *Date format* buttons
2 *Time format* buttons
3 *Summer time or winter time* button
4 *Setting hours forward* button
5 *Setting minutes forward* button
6 *Setting minutes backward* button
7 *Setting hours backward* button
8 Set time format

▶ Select time format and date format: Press corresponding buttons.
▷ Selected time format and date format are displayed in green.

3.2.22 *Language selection* submenu

Menu call: > >

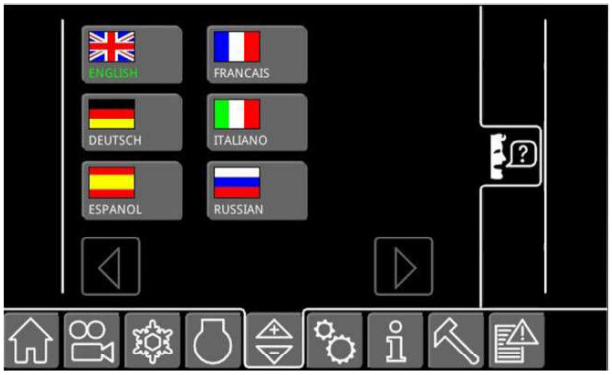

Fig. 414: Language selection submenu

- ▶ Press button for the desired language.
  - ▷ Button of selected language is framed in white.

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

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

3.2.23 *Electrical outputs* submenu

Menu call:  > >

The display of this submenu varies depending on machine configuration:

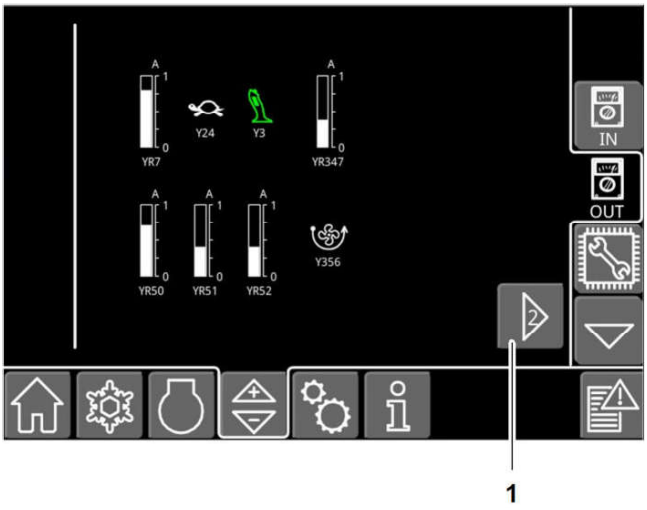

Fig. 415: Electrical outputs submenu

1 *Scroll* button

The *electrical outputs* submenu provides a quick overview for Liebherr customer service. It shows the operating status of the electrical outputs.

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3.2.24 *Electrical inputs* submenu

Menu call: > > IN

The display of this submenu varies depending on machine configuration:

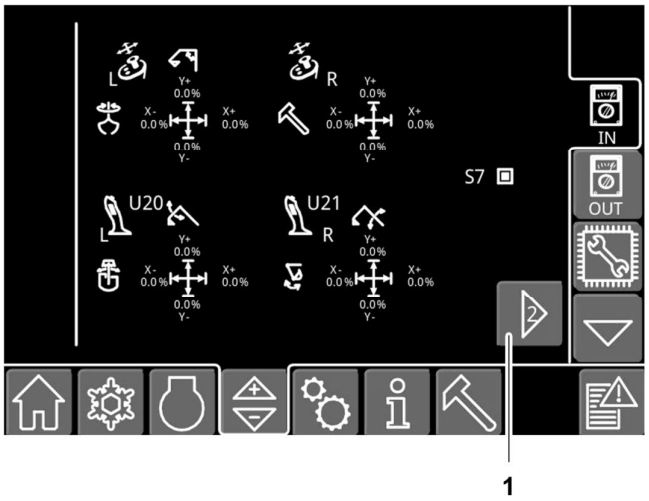

Fig. 416: Electrical inputs submenu

1 *Scroll* button

The *electrical inputs* submenu provides a quick overview for Liebherr customer service. It shows the operating status of the electrical inputs.

3.2.25 *Function settings* menu

Menu call:

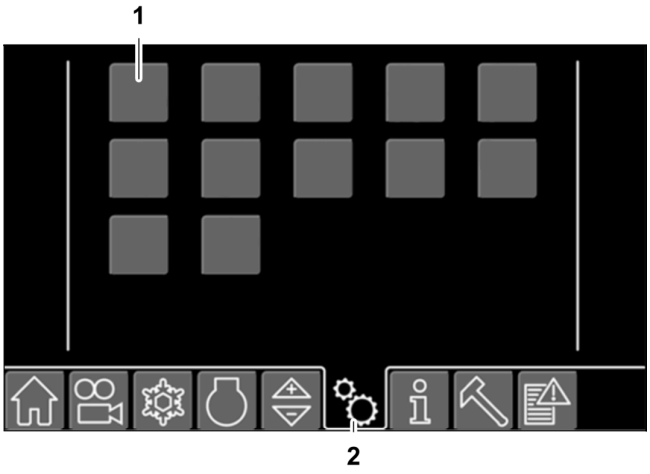

Fig. 417: Function settings menu

1 Menu buttons **2** *Function settings* menu

Quantity of menu buttons on the display depends on machine type and equipment.

Menu buttons	Description
	Central lubrication system (For more information see: 3.2.26 *Central lubrication system* submenu (option), page 105)
	Maintenance (For more information see: 3.2.27 *Maintenance* submenu, page 105)
	SF (For more information see: 3.2.28 *SF* submenu, page 107) User profile
	Auxiliary tank auxiliary heater
	Stick cylinder shut-off (For more information see: 3.2.30 *Stick cylinder shut-off* submenu (option), page 110)
	Hoist cylinder shut-off (For more information see: 3.2.31 *Hoist cylinder shut-off* submenu (option), page 110)
	Stick cylinder shut-off and hoist cylinder shut-off (For more information see: 3.2.32 Stick cylinder shut-off and hoist cylinder shut-off submenu (option), page 111)
	Workspace limitation (For more information see: 3.2.34 *Workspace limitation* submenu (option), page 112)
	Height-adjustable cab
	Wheeled undercarriage
	Rail undercarriage
	Automatic reversing fan drive (For more information see: 3.2.35 *Automatic reversible fan drive* submenu (option), page 113)
	Comfort slewing brake (For more information see: 3.2.36 *Comfort slewing brake* submenu (option), page 114)

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Menu buttons	Description
	Bleeding engine oil circuit Bleeding hydraulic circuit (For more information see: 3.2.37 *Bleeding hydraulic circuit* submenu, page 114)
	Contact pressure

Tab. 37: Function settings menu

3.2.26 *Central lubrication system* submenu (option)

Menu call:  > 

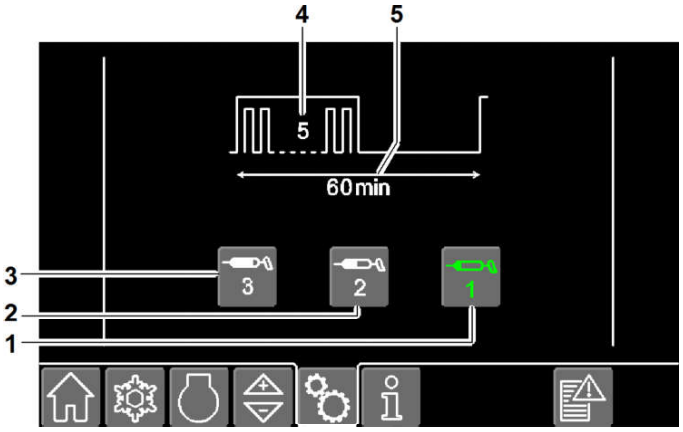

Fig. 433: Central lubrication system submenu

1 *Mode 1* button
2 *Mode 2* button
3 *Mode 3* button
4 Cycle rate of lubrication
5 Time period

If the central lubrication system is equipped with two lubricating pumps, the menu is shown in two columns.

Mode	Operating conditions	Lubrication
1	Light-duty operation	Low volume of grease
2	Medium-duty operation	Medium volume of grease
3	Heavy-duty operation	High volume of grease

Tab. 38: Lubricating modes

3.2.27 *Maintenance* submenu

Menu call:  > 

The display of this submenu varies depending on machine configuration:

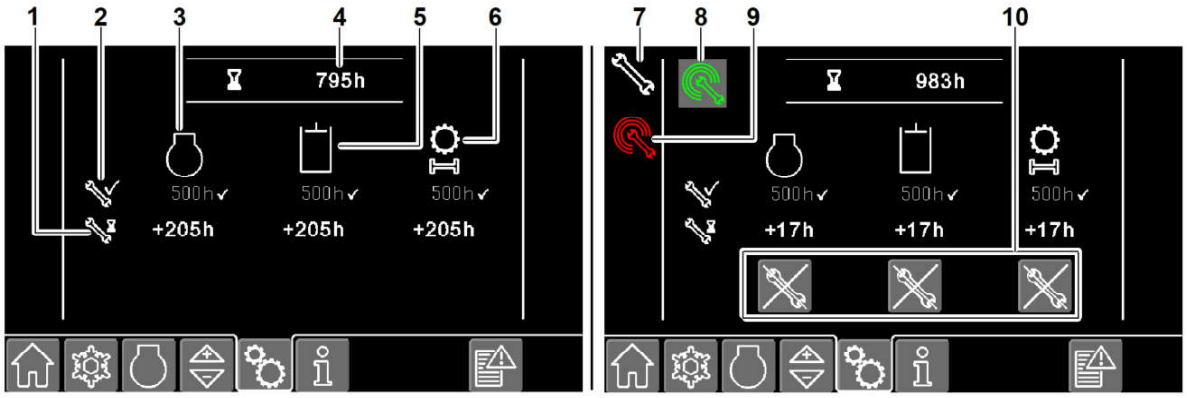

Fig. 434: Maintenance submenu

1	Remaining time to next maintenance	**5**	Hydraulic system maintenance	**9**	*Teleservice activated* status symbol
2	Operating hour meter at last maintenance	**6**	Transmission and axle maintenance[7)]	**10**	*Confirmation of maintenance due message* button
3	Maintenance of diesel engine	**7**	*Maintenance due* status symbol		
4	Total operating hours	**8**	*Teleservice* button		

Maintenance

If *maintenance due* status symbol **7** appears:

▶ Contact Liebherr customer service and have maintenance performed.

▶ Confirm display: Press *confirmation of maintenance due message* button **10**.
▷ *Maintenance due* status symbol **7** disappears.

Teleservice

Via Teleservice Liebherr customer service reads and modifies parameters of machine control online if necessary.

Activating write access

DANGER
Unexpected machine movement!
Danger to life.

▶ Make sure there are no persons in working area of machine.

Note
Malfunctions in machine control!

▶ Do not operate machine during write access by Liebherr customer service.

▶ Press *teleservice* button **8** when prompted by Liebherr customer service.
▷ *Teleservice* button **8** is displayed in green.
▷ *Teleservice activated* status symbol **9** appears.
▷ Online connection is enabled.

[7)] Applies to machines with wheeled undercarriage

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▷ Liebherr customer service has write access to machine control parameters.

Deactivating write access

Liebherr customer service deactivates write access.

Read access

Read access is always possible for Liebherr customer service. It is not necessary that the operator enables the online connection.

3.2.28 *SF* submenu

Menu call:  > 

Quick-selection button submenu

Menu call:  >  > 

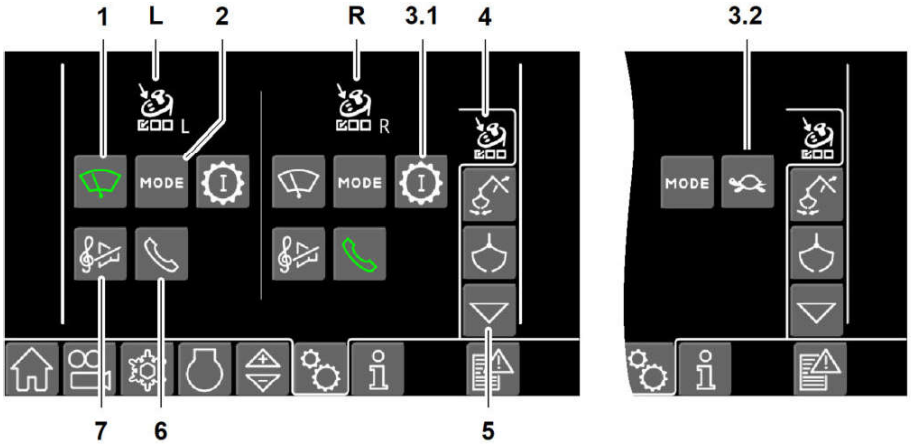

Fig. 436: Quick-selection button submenu

1	*Windscreen wiper* button	**4**	*Quick-selection button* menu button
L	*Left quick-selection button* symbol	**3.2**	*Creeper gear* button [9]
2	*MODE button* (Sensitive, ECO, Power, Power-Plus) (For more information see: 3.4.12 Engine speed and operating mode, page 159)	**5**	*Scroll* button
R	*Right quick-selection button* symbol	**6**	*Telephone* button
3.1	*Gear step* button [8]	**7**	*Radio muting* button

[9] Applies to machines with travel gear
[8] Applies to machines with transmission

LHB/12221169/01/2020-09-02/en

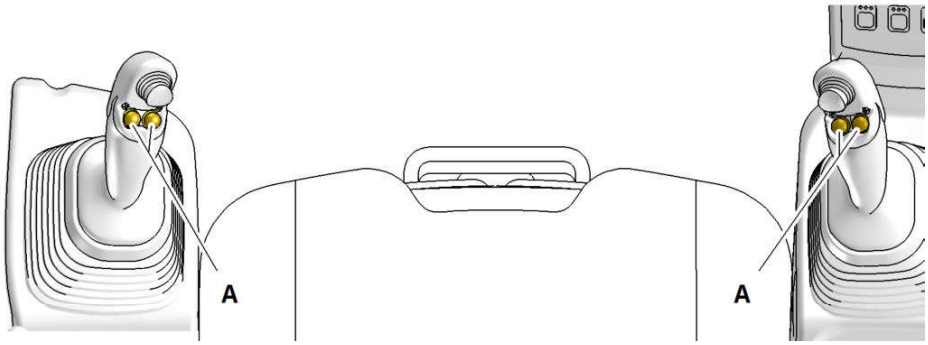

Fig. 437: Possible positions of quick-selection button

A Quick-selection button

Note
Different machine configuration!

▶ Adhere to control description sticker.

▶ Assign function to quick-selection button **A**: Press button (**1, 2, 3, 6, 7**).
▷ Setting is saved in active user profile.

▶ Accept phone call: Press quick-selection button **A** for less than 1 second.

▶ End or reject phone call: Press quick-selection button **A** for more than 1.5 seconds.

▶ Activate windscreen wiper: Press quick-selection button **A** for less than 1 second.

▶ Activate windscreen wiper with windscreen washer fluid: Press quick-selection button **A** for more than 1 second.

Fine adjustment submenu

Menu call: > >

User profile menu button

Individual user settings of a user profile

(For more information see: 3.2.29 *User profile* submenu, page 109)

AutoLift fine adjustment menu button[10)]

Fine adjustment of speed of automatic lifting of boom while the grapple is closing.
(For more information see: 3.4.38 AutoLift (Option), page 188)

Grapple fine adjustment menu button

Fine adjustment of speed and force[11)] for *closing grapple* and *turning grapple*

Servo control fine adjustment menu button[12)]

Fine adjustment of speed as upper limit for all SuperFinish functions

[10)] Applies to machines with AutoLift
[11)] Option LH 110 and LH 150
[12)] Applies to machines with adjustable control pressure limitation

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Slewing gear fine adjustment menu button

Fine adjustment of rotating speed of uppercarriage

Travel gearbox fine adjustment menu button[13)]

Fine adjustment of speed of travel gearbox

Travel gear fine adjustment menu button[14)]

Fine adjustment of speed of travel gear

Boom and stick fine adjustment menu button

Fine adjustment of speed of boom and stick

Adjustable boom fine adjustment menu button[15)]

Fine adjustment of speed of adjustable boom

Laterally adjustable boom fine adjustment menu button[16)]

Fine adjustment of speed of laterally adjustable boom

Rotary stick fine adjustment menu button[17)]

Fine adjustment of speed of rotary stick

3.2.29 *User profile* submenu

In the *user profile* submenu it is possible to save the fine adjustment of control elements. The most recently saved conditions are restored when a user profile is activated.

Menu call: > >

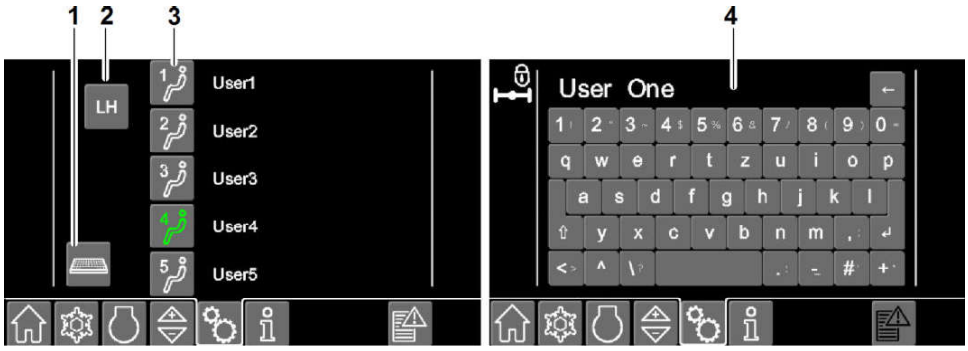

Fig. 449: User profile submenu and on-screen keyboard submenu

1 *On-screen keyboard* menu button
2 *Factory settings* button
3 *User profile* button
4 *On-screen keyboard* submenu

▶ Rename user profile: Press *on-screen keyboard* menu button **1**.
▷ *On-screen keyboard* submenu **4** appears.

[13)] Applies to wheeled excavators
[14)] Applies to machines with travel gear
[15)] Applies to machines with adjustable boom
[16)] Applies to machines with laterally adjustable boom
[17)] Applies to machines with rotary stick

- ▶ Rename user profile.
- ▶ Reset adjustments: Press *factory settings* button **2**.
  - ▷ Machine operates with basic settings.
  - ▷ User profiles remain saved.

3.2.30 *Stick cylinder shut-off* submenu (option)

Menu call:  > 

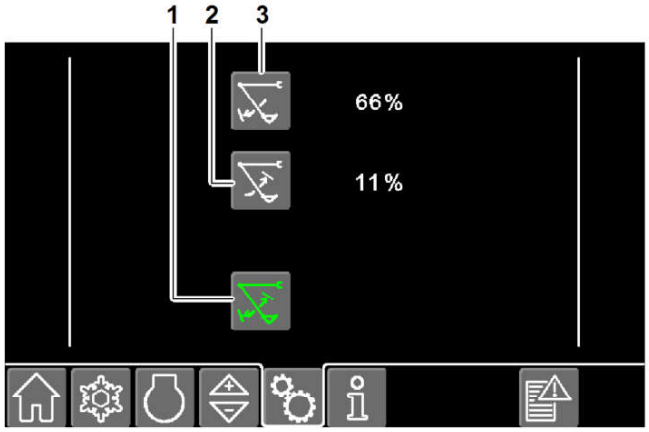

Fig. 450: Stick cylinder shut-off submenu

1 *Activating stick cylinder shut-off* button
2 *Upper shut-off point* button
3 *Lower shut-off point* button

In machines without *activating stick cylinder shut-off* button **1** the stick cylinder shut-off is always activated.

- ▶ Activate stick cylinder shut-off: (For more information see: 3.5.1 Stick cylinder shut-off (option), page 191)

3.2.31 *Hoist cylinder shut-off* submenu (option)

Menu call:  > 

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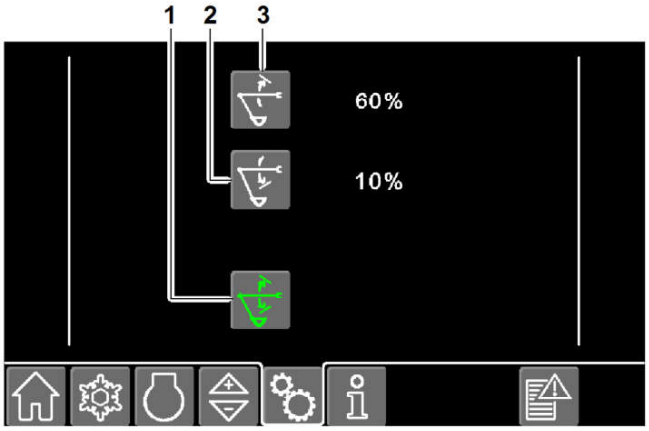

Fig. 451: Hoist cylinder shut-off submenu

1 *Activating hoist cylinder shut-off* button
2 *Lower shut-off point* button
3 *Upper shut-off point* button

▶ Activate hoist cylinder shut-off: (For more information see: 3.5.2 Hoist cylinder shut-off (option), page 194)

3.2.32 Stick cylinder shut-off and hoist cylinder shut-off submenu (option)

Menu call:  > 

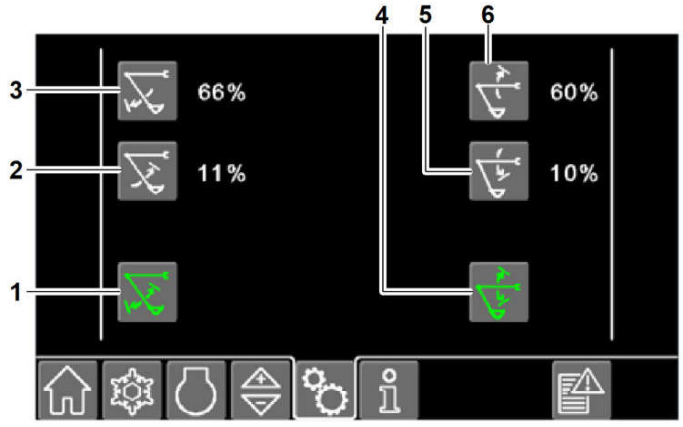

Fig. 452: Stick cylinder shut-off and hoist cylinder shut-off submenu

1 *Activating stick cylinder shut-off* button
2 *Upper shut-off point* button
3 *Lower shut-off point* button
4 *Activating hoist cylinder shut-off* button
5 *Lower shut-off point* button
6 *Upper shut-off point* button

The display of symbols varies depending on machine configuration.

In machines without *activating stick cylinder shut-off* button **1** the stick cylinder shut-off is always activated.

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- ▶ Activate stick cylinder shut-off: (For more information see: 3.5.1 Stick cylinder shut-off (option), page 191)
- ▶ Activate hoist cylinder shut-off: (For more information see: 3.5.2 Hoist cylinder shut-off (option), page 194)

3.2.33 *Stick cylinder speed and hoist cylinder speed* submenu (option)

Menu call:  > 

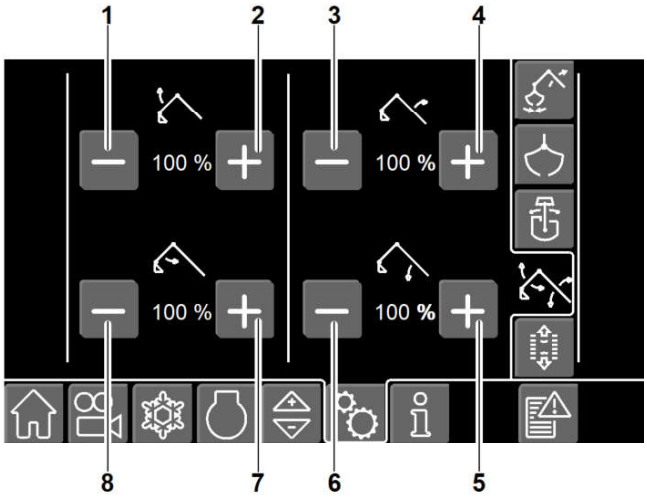

Fig. 453: Setting stick cylinder speed and hoist cylinder speed

1	Reducing stick cylinder extension speed	**5**	Increasing hoist cylinder retraction speed
2	Increasing stick cylinder extension speed	**6**	Reducing hoist cylinder retraction speed
3	Reducing hoist cylinder extension speed	**7**	Increasing stick cylinder retraction speed
4	Increasing hoist cylinder extension speed	**8**	Reducing stick cylinder retraction speed

3.2.34 *Workspace limitation* submenu (option)

Menu call:  > 

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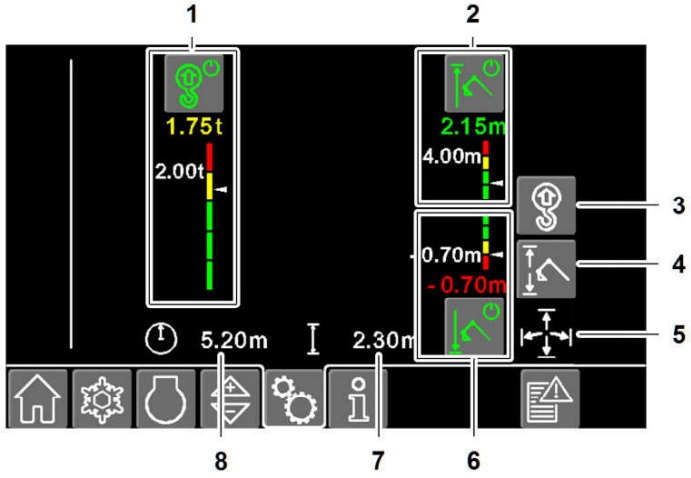

Fig. 454: Workspace limitation submenu

1	Load moment limitation	**5**	*Workspace limitation* menu button
2	Height limitation	**6**	Depth limitation
3	*Load moment limitation* menu button	**7**	Height of loading point
4	*Height limitation and depth limitation* menu button	**8**	Reach of loading point

▶ Activate load moment limitation: (For more information see: 3.5.7 Load moment limitation (option), page 213)

▶ Activate height limitation:

▶ Activate depth limitation:

3.2.35 *Automatic reversible fan drive* submenu (option)

Menu call:  > 

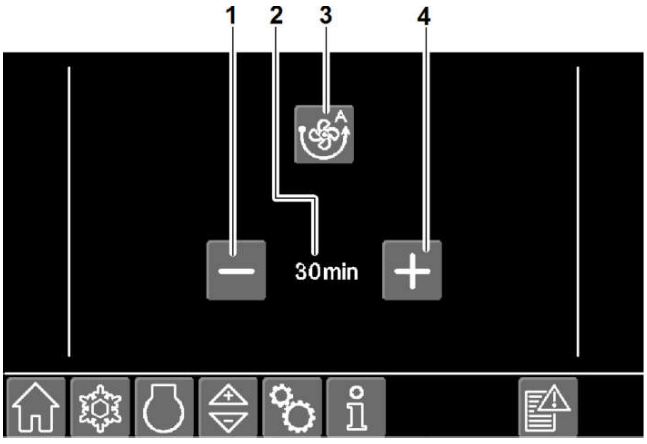

Fig. 455: Automatic reversible fan drive submenu

1	*Reducing time interval* button	**3**	*Automatic reversible fan drive* button
2	Time interval	**4**	*Increasing time interval* button

▶ Activate automatic reversible fan drive: (For more information see: 3.4.39 Reversible fan drive for radiator cleaning (option), page 188)

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3.2.36 *Comfort slewing brake* submenu (option)

Menu call:  > 

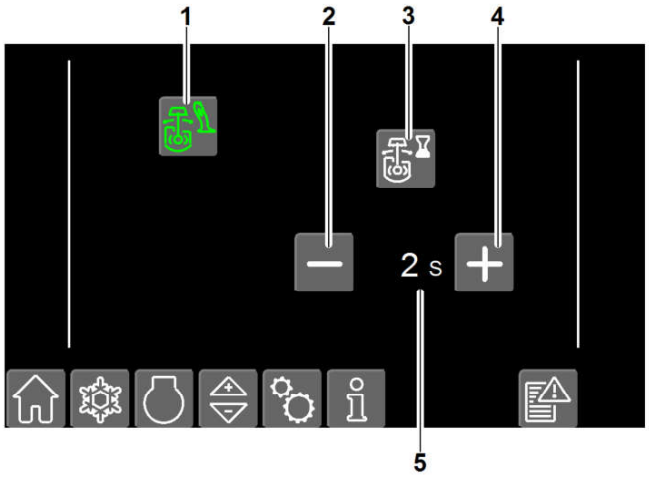

Fig. 456: Comfort slewing brake submenu

1 *Semi-automatic* button
2 *Reducing closing time* button
3 *Automatic* button
4 *Increasing closing time* button
5 Locking time

▶ Lock uppercarriage with comfort slewing brake:

3.2.37 *Bleeding hydraulic circuit* submenu

Menu call:  > 

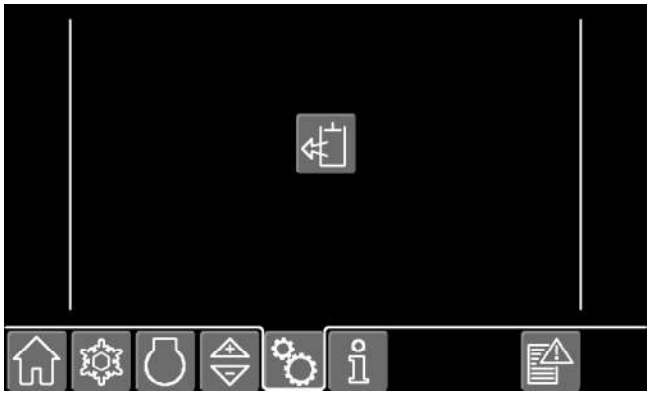

Fig. 457: Bleeding hydraulic circuit submenu

When function is activated, no fuel is injected. The starter rotates the diesel engine without starting. By rotating flange mounted pumps it is possible to bleed hydraulic circuits.

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3.2.38 *Information* menu

Menu call: 

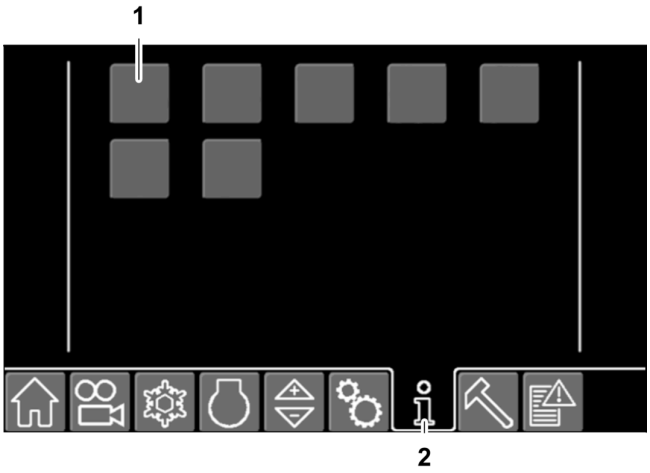
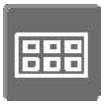


Fig. 458: Information menu

1 Menu buttons **2** *Information* menu

Quantity of menu buttons on the display depends on machine type and equipment.

Menu buttons	Description
	Operating time (For more information see: 3.2.39 *Operating time* submenu, page 116)
	Fuel consumption (For more information see: 3.2.40 *Fuel consumption* submenu, page 116)
	Power consumption
	Key assignment (For more information see: 3.2.41 *Key assignment* submenu, page 117)
	Rail operation odometer
	Road travel position

Tab. 39: Information menu

3.2.39 *Operating time* submenu

Menu call:  >

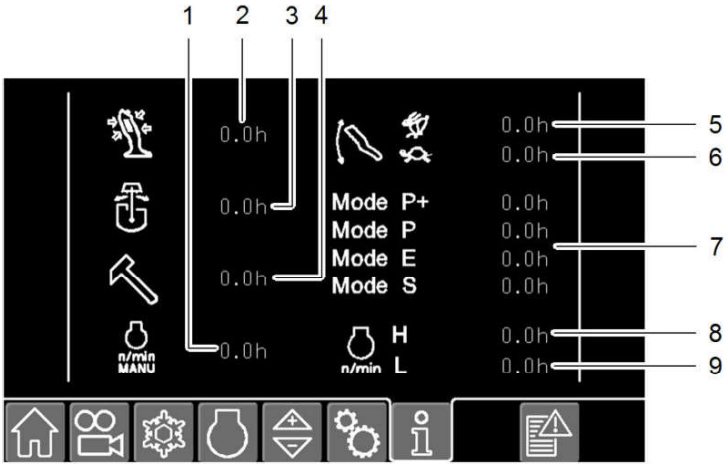


Fig. 465: Operating time submenu

1 No function assigned
2 Joysticks
3 Slewing gear
4 Working tool
5 Travelling in high gear
6 Travelling in creeper gear
7 Modes
8 Maximum engine speed
9 Minimum engine speed

3.2.40 *Fuel consumption* submenu

If machine is equipped with an SCR system, the *fuel consumption* menu additionally displays the values for the consumption of diesel exhaust fluid.

Menu call:  >

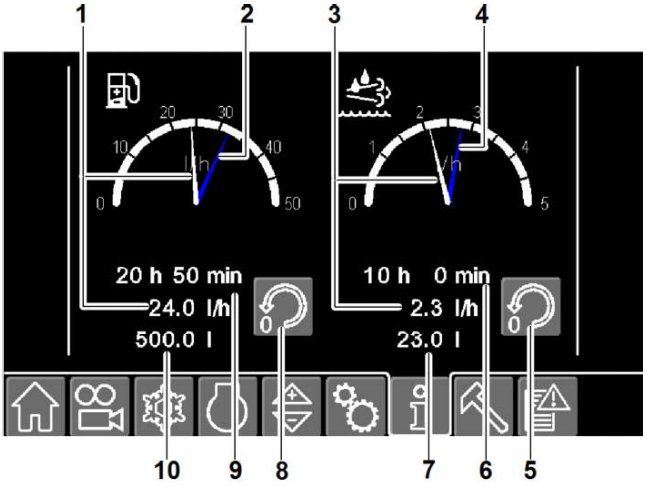


Fig. 466: Fuel consumption submenu

1 Average fuel consumption
6 Measurement period

See next page for continuation of the image legend

2	Current fuel consumption	**7**	Consumed diesel exhaust fluid
3	Average diesel exhaust fluid consumption	**8**	*Resetting counter* button
4	Current diesel exhaust fluid consumption	**9**	Measurement period
5	*Resetting counter* button	**10**	Consumed fuel

3.2.41 *Key assignment* submenu

Menu call:  > 

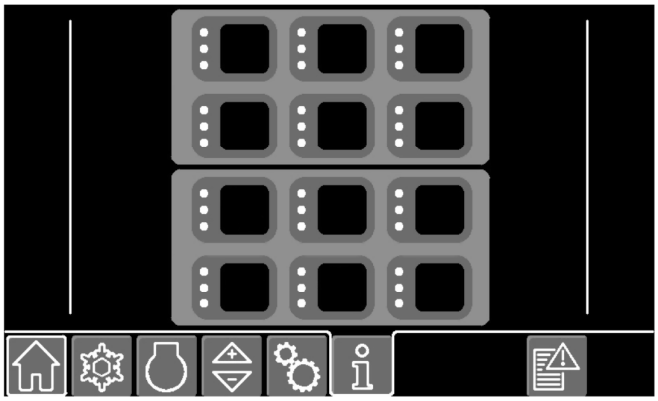


Fig. 467: Key assignment submenu

The submenu shows the key assignment of two control units depending on the equipment.

3.2.42 *Tool Control* menu

Menu call: 

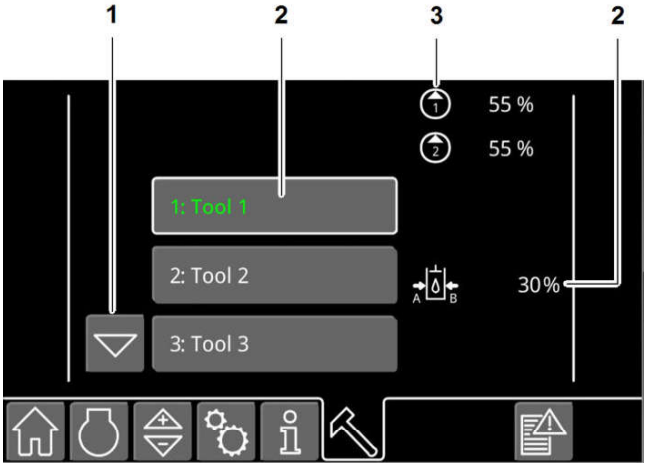


Fig. 468: Tool Control menu

1	*Scroll* buttons	**3**	Flow rate setting for working tool
2	*Working tool* button	**4**	Pressure setting for working tool

The *Tool Control* menu contains hydraulic settings for working tool:
– Flow rate setting for working tool
– Pressure setting for working tool
– Designation of working tools

NOTICE
Incorrect settings!
Damage to working tool.

▶ Have hydraulic settings for working tool programmed exclusively by Liebherr customer service.

▶ Pre-select working tool: Press *scroll* button **1**.
▷ Pre-selection is outlined.
▷ Stored working tool settings appear on the display.

▶ Activate working tool: Press *working tool* button **2**.
▷ Working tool is activated.
▷ Name of working tool is displayed in green.

3.2.43 *Service codes* menu

The *service codes* menu lists information and error messages in form of text messages.

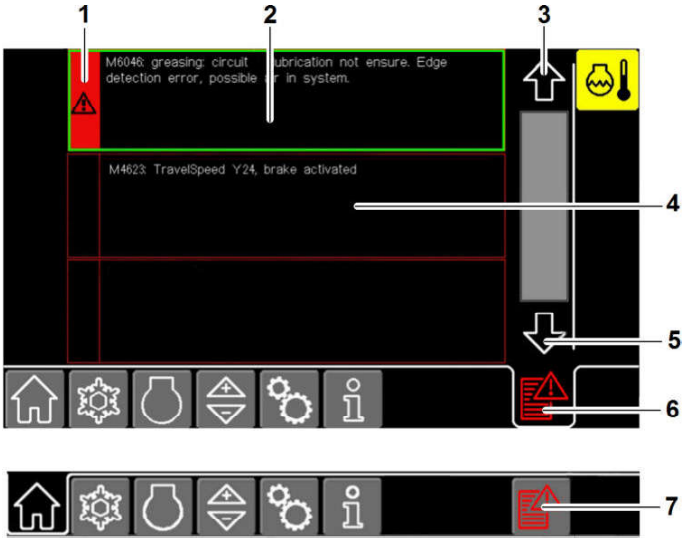


Fig. 469: Service codes menu

1	*New service code* button	**5**	*Scroll-down* button
2	Text field	**6**	*Service codes* menu
3	*Scroll-up* button	**7**	*Service codes* button
4	Text message		

If exclusively a text message **4** appears in *service codes* menu **6**:
– Message is not up to date.
– Message is not confirmed.

If *service codes* button **7** flashes red:
▶ Open *service codes* menu **6**: Press *service codes* button **7**.
▷ *New service code* button **1** appears in red:

▶ Read message in text field **2**.

▶ Confirm message: Press *new service code* button **1**.
▷ *New service code* button **1** appears in white:

▷ *Service codes* button **7** flashes white:

▶ Rectify fault.

If it is not possible to rectify fault:
▶ Contact Liebherr customer service.

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3.3 Control

3.3.1 Battery main switch

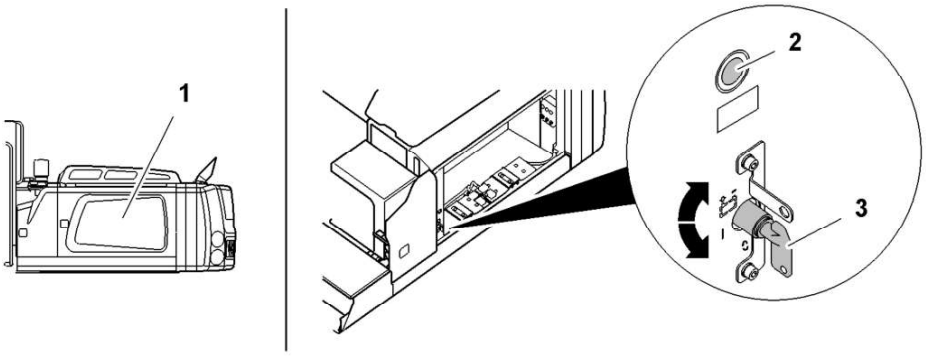

Fig. 474: Battery main switch

1 Service hatch
2 Indicator light of SCR system
3 Battery main switch

Symbol	Switch position	Function
	0	Off
	I	On

Tab. 40: Battery main switch

Switching on power supply

▶ Open service hatch **1**.

▶ Turn battery main switch **3** to I.
▷ Machine's electrical system is supplied with voltage.

▶ Close service hatch **1**.

Switching off power supply

NOTICE
Unapproved switch-off of power supply!
Damage to machine.

▶ Make sure that preconditions for switching off power supply are met.

Make sure that following preconditions are met before switching off power supply:
❑ 1 minute waiting time after diesel engine shut-off is adhered to.
❑ Auxiliary heater is not active.
❑ Indicator light of SCR system **2** is off.

▶ Open service hatch **1**.

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▶ Turn battery main switch **3** to 0.
▷ Machine's electrical system is voltage-free.

▶ Close service hatch **1**.

3.3.2 Entering and exiting machine

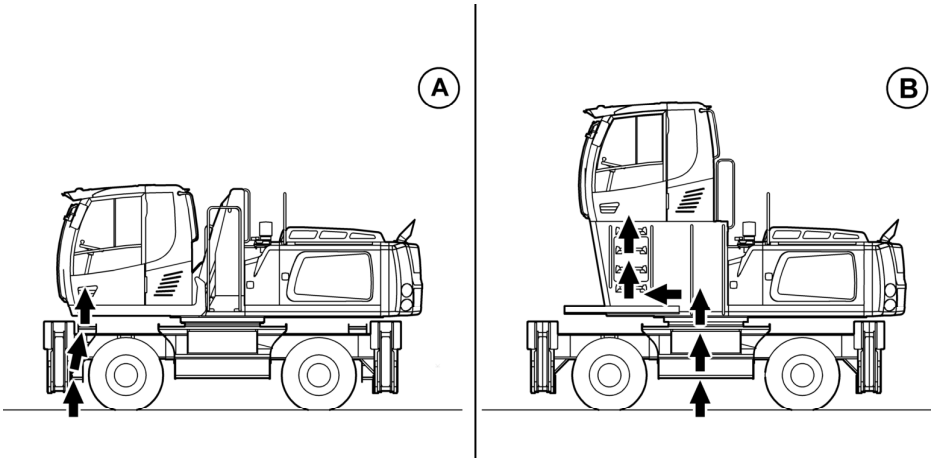

Fig. 477: Getting in using climbing aids

A Access without platform or walkway

B Access with platform or walkway

WARNING
Incorrect entry and exit!
Injuries.

▶ Enter and leave machine exclusively using climbing aids.

▶ Do not use control elements as handles.

▶ Do not jump from machine.

▶ When using the ladder, make sure you always have two hands and a foot, or two feet and one hand in contact with the ladder.

Entering machine

▶ Climb up facing the machine.

▶ Open door and enter operator's cab.

▶ Close door.

▶ Sit on operator's seat.

▶ Adjust operator's seat.

Exiting machine

▶ Park machine. (For more information see: 3.8 Parking machine, page 231)

▶ Align uppercarriage parallel to undercarriage.

If machine is not equipped with platform or walkway:
▶ Slowly swivel uppercarriage to the right until climbing aid is visible.

▶ Open door and leave operator's cab.

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- ▶ Close door.
- ▶ Climb down facing the machine.

3.3.3 Step lighting (option)

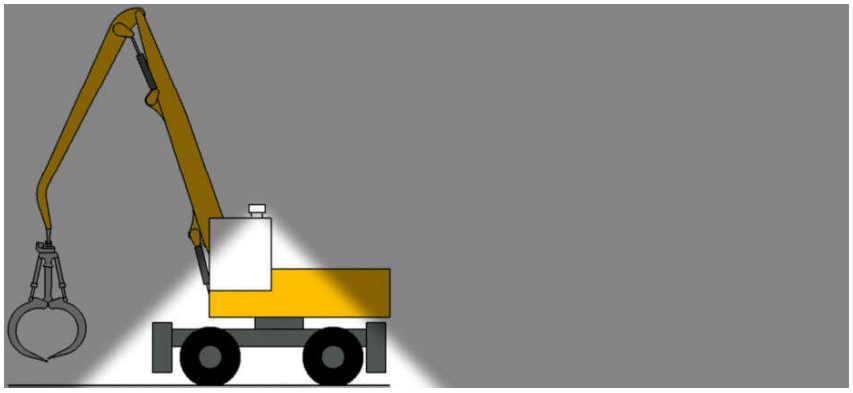

Fig. 478: Step lighting

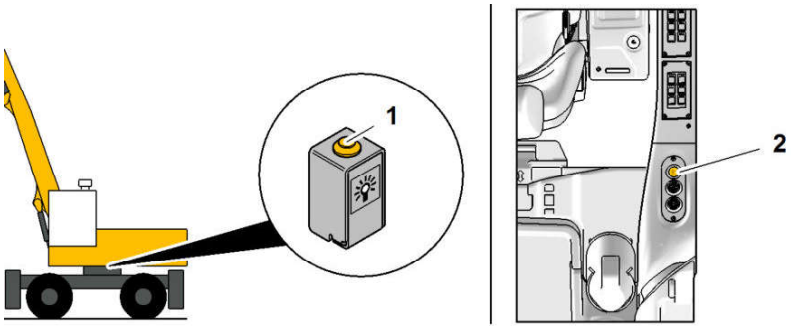

Fig. 479: Step lighting button

1 *Step lighting* button on ladder

2 *Step lighting* button in operator's cab

Note

Headlights of step lighting go out after a preset time.

3.3.4 Emergency exit

Fig. 480: Information sign: emergency exit / emergency hammer

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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 cab door under the cab roof.

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

3.3.5 Fire extinguisher (option)

DANGER
Incorrect use of fire extinguisher!
Danger to life.

▶ Use fire extinguisher exclusively to extinguish blocked escape routes.

▶ Do not use fire extinguisher on electrical systems exceeding 1000 V.

▶ Adhere to instructions on fire extinguisher.

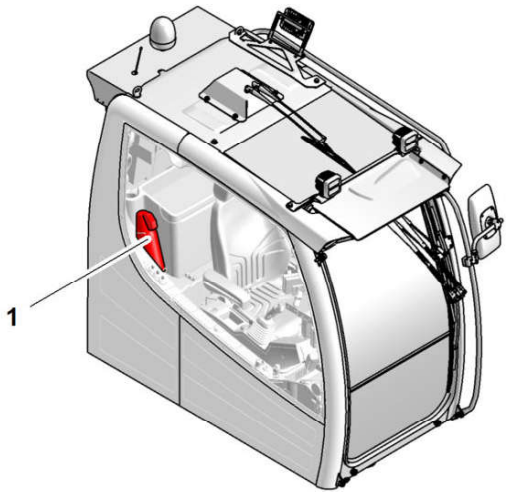


Fig. 481: Fire extinguisher

1 Fire extinguisher

3.3.6 Folding console

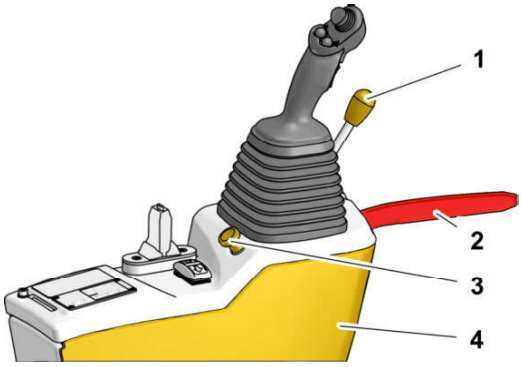
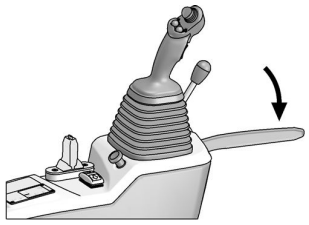
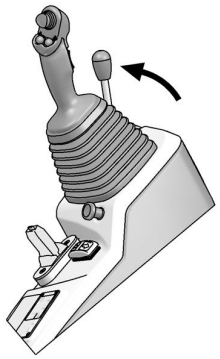


Fig. 482: Folding console

1 Console handle
2 Safety barrier
3 Unlocking button
4 Folding console

Position of folding console	State of servo control	Functions
	Servo control is activated.	Selected brake function is activated again.
	Servo control is deactivated.	Parking brake is applied. Slewing brake is applied. Diesel engine can be started.

Tab. 41: Positions of folding console

Activating servo control

DANGER
Unexpected machine movement!
Danger to life.

▶ Exclusively move folding console down with console handle.

Note

Servo control is activated 1 second after folding down folding console.

▶ Move folding console **4** down with console handle **1** until folding console **4** engages audibly.
  ▷ Safety barrier **2** unfolds.

Deactivating servo control

NOTICE
Incorrect operation!
Damage to folding console.

▶ Exclusively unlock folding console with unlocking button.

DANGER
Defective folding console!
Danger to life.

▶ Contact Liebherr customer service immediately.

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▶ Press unlocking button **3**.
  ▷ Folding console **4** moves upwards.
  ▷ Safety barrier **2** retracts.

If folding console does not properly fold up after being unlocked:
▶ Contact Liebherr customer service.

3.3.7 Operator's seat

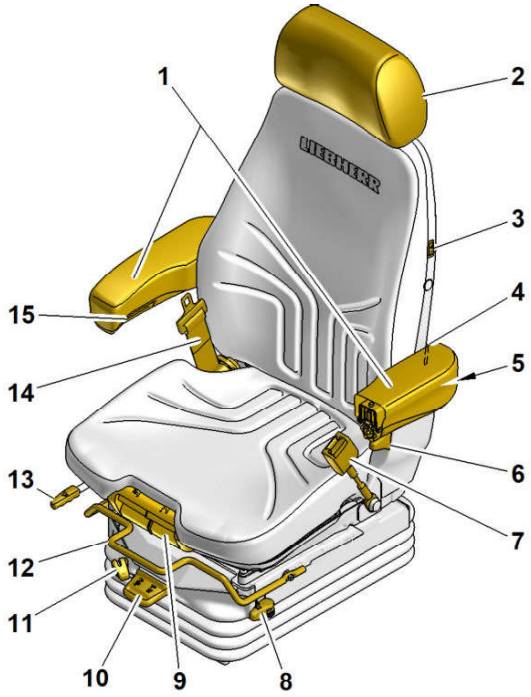

Fig. 485: Operator's seat

1	Armrest	**9**	Adjusting seat cushion
2	Head restraint	**10**	Adjusting seat height [18)]
3	Seat heating, seat air conditioning[18)]	**11**	Shock absorption
4	Lumbar support[18)]	**12**	Adjusting seat position with armrests
5	Adjusting armrest height	**13**	Adjusting seat position
6	Adjusting backrest	**14**	Safety belt
7	Belt buckle	**15**	Adjusting armrest angle
8	Horizontal suspension[18)]		

DANGER
Unexpected machine movement!
Danger to life.

▶ Exclusively adjust operator's seat when safety lever or folding console is in upper position.

[18)] Option

Adjusting seat position

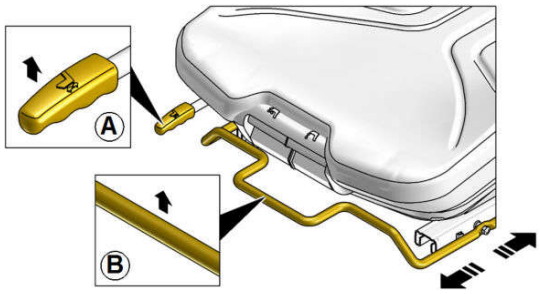

Fig. 486: Adjusting seat position

A Adjusting seat position without armrests

B Adjusting seat position with armrests

Adjusting armrests

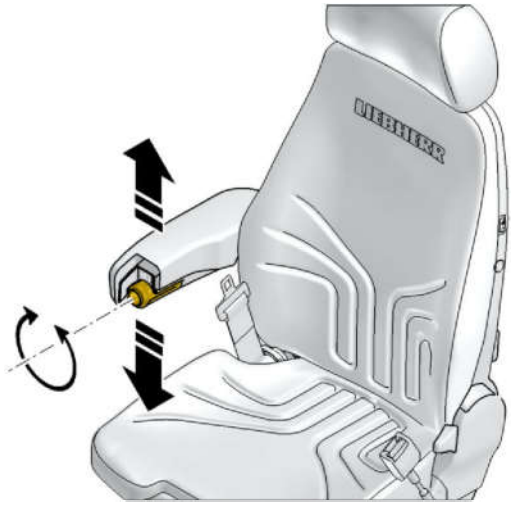

Fig. 487: Adjusting armrest angle

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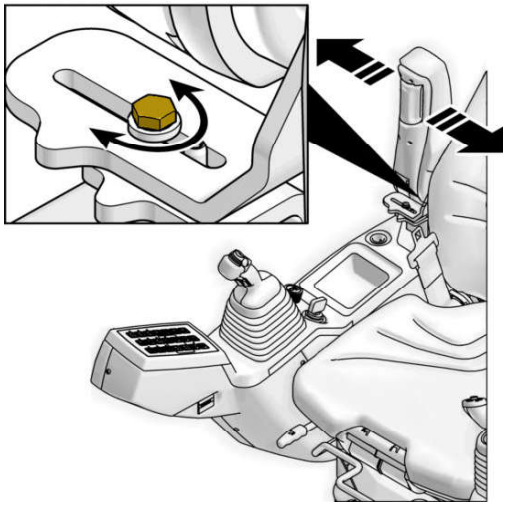

Fig. 488: Adjusting armrest laterally

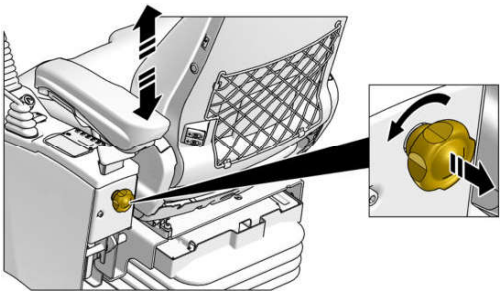

Fig. 489: Adjusting armrest height

▶ Make sure that armrest does not touch control unit of auxiliary heater.

Adjusting seat cushion

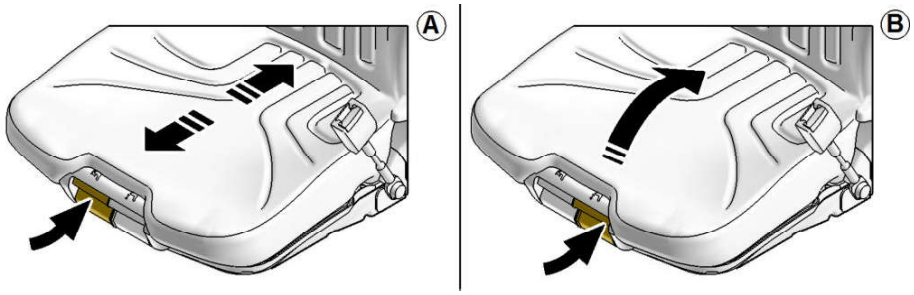

Fig. 490: Adjusting seat cushion

A Adjusting seat cushion depth

B Adjusting seat cushion angle

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Adjusting backrest

Fig. 491: Adjusting backrest

Adjusting head restraint

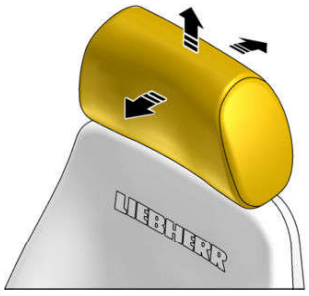

Fig. 492: Adjusting head restraint

Adjusting shock absorption (option)

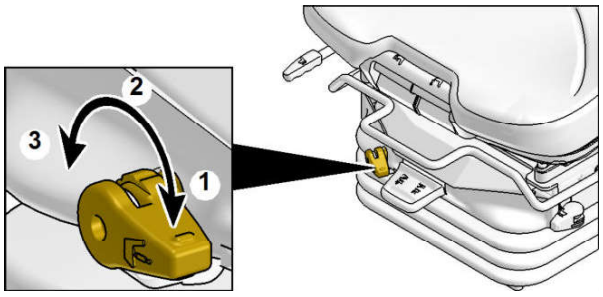

Fig. 493: Adjusting shock absorption

1 Shock absorption “hard”
2 Shock absorption “medium”
3 Shock absorption “soft”

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Adjusting horizontal suspension (option)

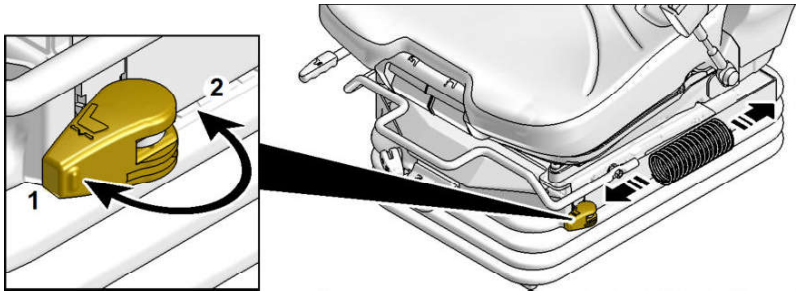

Fig. 494: Adjusting horizontal suspension

1 Horizontal suspension inactive **2** Horizontal suspension active

Adjusting seat height and adapting operator's seat to body weight

Adjusting operator's seat manually

Standard seat

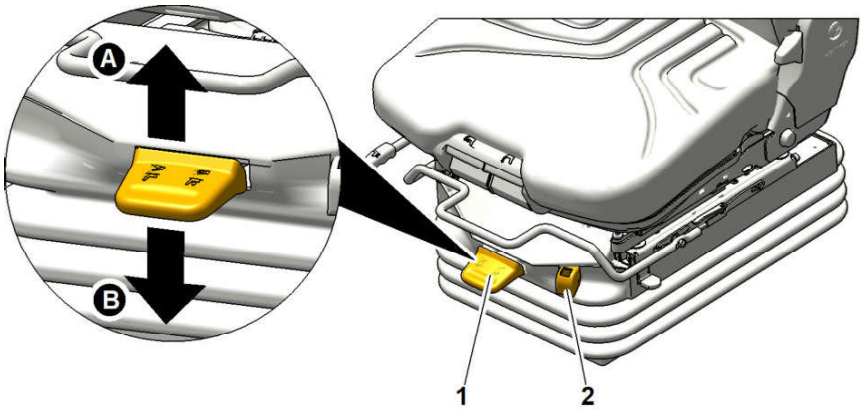

Fig. 495: Standard seat

A Increase
B Reduce
1 Adjustment lever
2 Display

▶ Sit on operator's seat.

▶ Adjust with adjustment lever **1** until display **2** is green.

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Mechanically adjustable operator's seat (option)

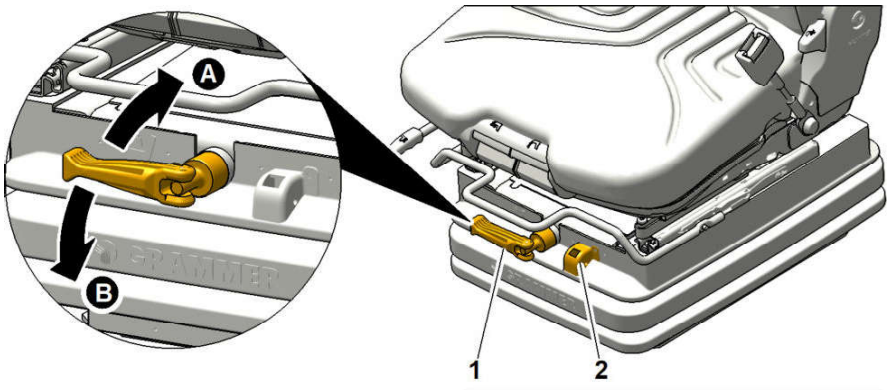

Fig. 496: Mechanically adjustable operator's seat

A	Increase	**1**	Adjustment lever
B	Reduce	**2**	Display

▶ Sit on operator's seat.

▶ Adjust with adjustment lever **1** until display **2** is green.

Automatically adjusting operator's seat

Operator's seat with mechanical adjustment (option)

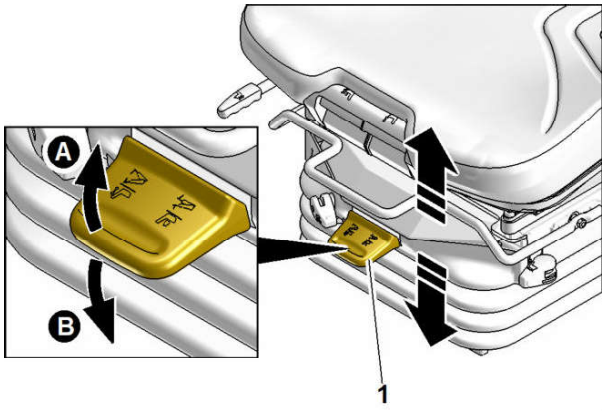

Fig. 497: Operator's seat with mechanical adjustment

A	Increase	**1**	Adjustment lever
B	Reduce		

▶ Sit on operator's seat.

▶ Turn ignition key to **I**. (For more information see: 3.3.10 Ignition key, page 134)
▷ Operator's seat adjust automatically.

▶ Ensure that automatic adjustment is completed.

▶ If necessary, adjust operator's seat with adjustment lever **1**.

▶ If operator changes, adjust operator's seat with adjustment lever **1**.

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Operator's seat with pneumatic adjustment (option)

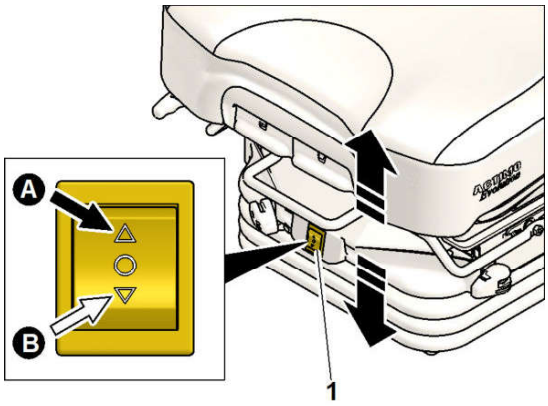

Fig. 498: Adjusting operator's seat with pneumatic adjustment

A Increase
B Reduce
1 *Adjust operator's seat* button

NOTICE
High load on compressor!
Damage to compressor.

▶ Do not press button for longer than 1 minute.

▶ Sit on operator's seat.

▶ Turn ignition key to **I**. (For more information see: 3.3.10 Ignition key, page 134)
▷ Operator's seat automatically adjusts to body weight.
▷ Setting is stored for 5 minutes after leaving operator's seat.

▶ Ensure that automatic adjustment is completed.

▶ If necessary, adjust operator's seat with *Adjust operator's seat* button **1**.

▶ When operator changes, sit on operator's seat.
▷ Operator's seat automatically adjusts to body weight.
▷ Setting is stored for 5 minutes after leaving operator's seat.

Adjusting lumbar support

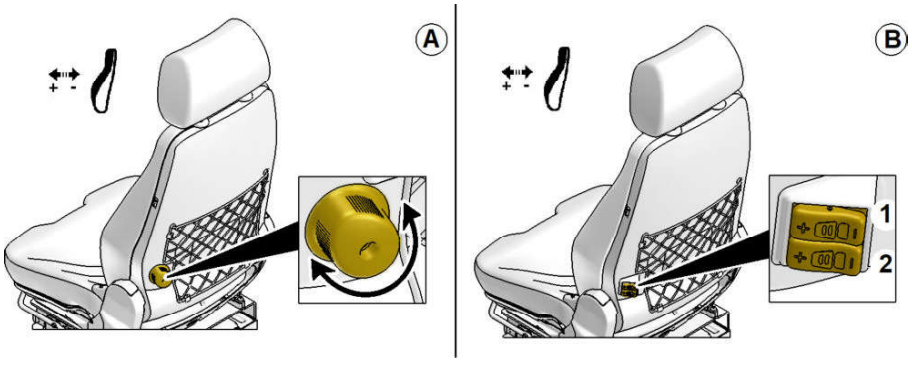

Fig. 499: Adjusting lumbar support

A Manual adjustment
B Pneumatic adjustment[18)]
1 *Upper back cushion* button
2 *Lower back cushion* button

Switching seat heating on and off (option)

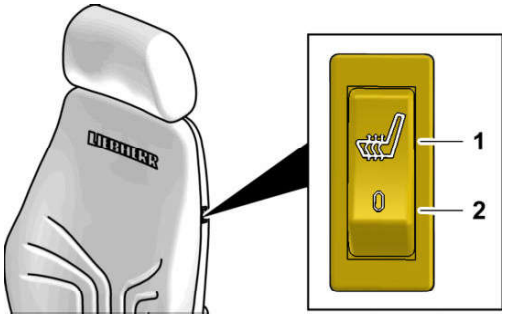

Fig. 500: Seat heating

1 Switch on seat heating
2 Switch off seat seating

Switching seat heating with seat air conditioning on and off (option)

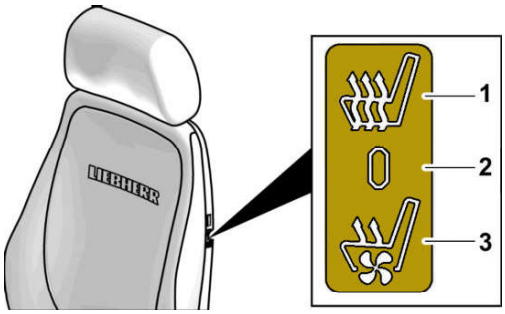

Fig. 501: Seat heating with seat air conditioning

1 Switch on seat heating
2 Switch off seat heating and seat air conditioning
3 Switch on seat air conditioning

3.3.8 Safety belt

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

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[18] Option

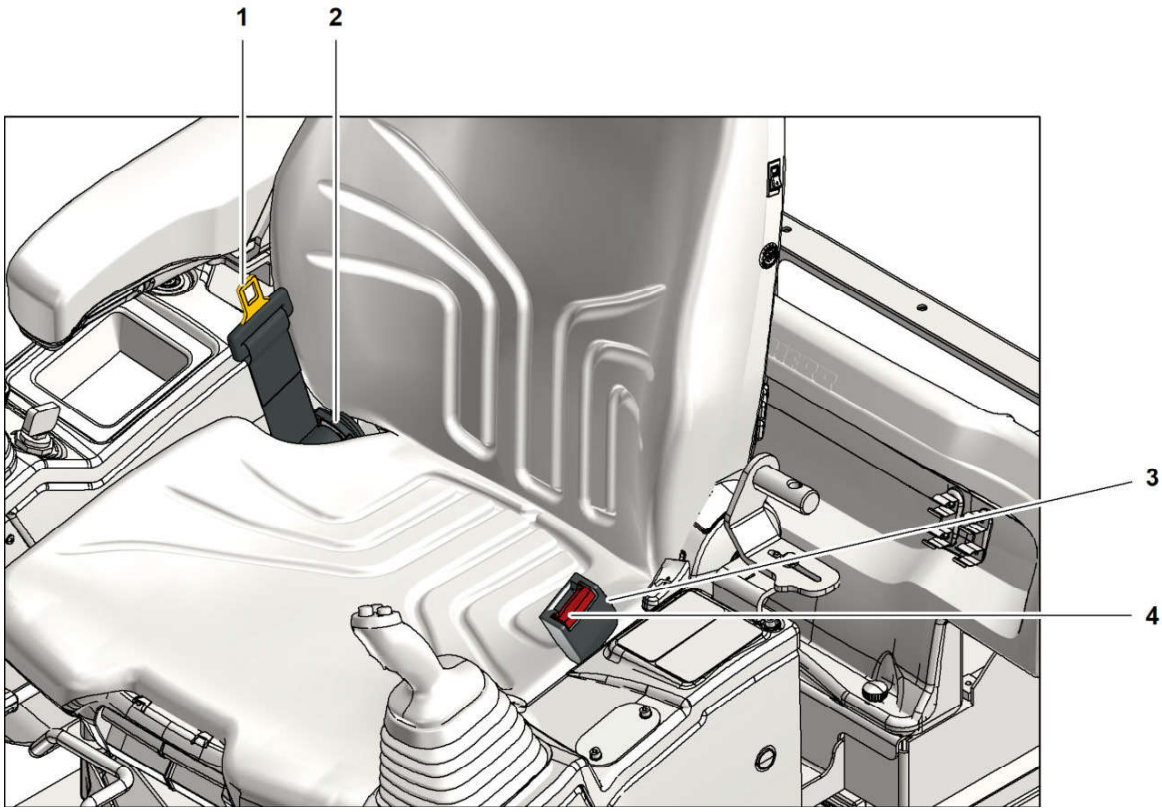

Fig. 502: Safety belt

1	Belt buckle latch	**3**	Belt buckle
2	Belt reel	**4**	Unlocking button

DANGER
Defective safety belt!
Danger to life.

- ▶ Check condition and function of safety belt.
- ▶ Immediately replace damaged parts.

Putting on safety belt

- ▶ Unroll safety belt from belt reel **2**.
  - ▷ Safety belt can lock in case of sudden unrolling.
- ▶ Insert belt buckle latch **1** in belt buckle **3**.

Releasing safety belt

- ▶ Press unlocking button **4**.
  - ▷ Safety belt is wound onto belt reel **2**.

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3.3.9 Steering wheel

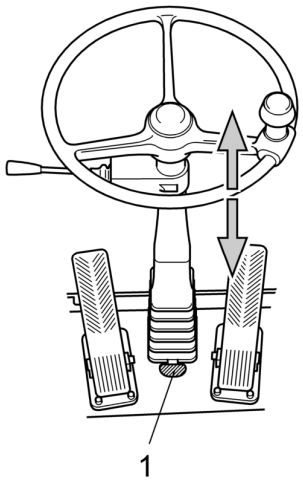

Fig. 503: Adjust steering column

The position of the steering wheel can be adjusted to the body by moving the steering column.

- ▶ *Release lever* **1** Push the lever down with your foot
- ▶ Set desired position by pulling or pressing the steering wheel.
- ▶ Disengage *release lever*.
  ▷ Steering column is set in selected position.

3.3.10 Ignition key

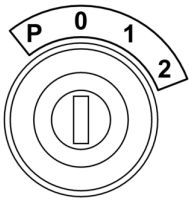

Fig. 504: Ignition key positions

P Park position
0 0 position
1 Start position
2 Emergency start

Ignition key positions	Function
Park position	Cab lighting system, radio, socket (12 V)
0 position	-
Start position	Control system autocheck, preglowing, starting diesel engine
Emergency start	Emergency starting of diesel engine

Tab. 42: Ignition key positions

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Note
Extended downtimes!
Discharged battery.

▶ Pull out key.

3.3.11 Confirmation button

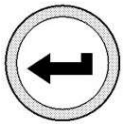

Fig. 505: Confirmation button

Several functions of machine require a confirmation (for example for functions of shut-offs and limitations):
– Activating functions
– Deactivating functions
– Changing the settings of functions

Activating function via key on control unit

▶ Preselect function: Press corresponding key on control unit.
▷ *Confirmation required* status symbol appears on the display:

▷ LEDs in key flash.

▶ Activate function: Press confirmation button within 5 seconds.
▷ LEDs in key light up.

If function is not activated:
▶ Preselect and confirm function again.

Deactivating function via key on control unit

▶ Preselect function: Press corresponding key on control unit.
▷ *Confirmation required* status symbol appears on the display:

▷ LEDs in key flash.

▶ Deactivate function: Press confirmation button within 5 seconds.
▷ LEDs in key go out.

If function is not deactivated:
▶ Preselect and confirm function again.

Activating function via button on the display

▶ Preselect function: Press corresponding button on the display.
▷ *Confirmation required* status symbol appears on the display:

▷ Corresponding symbol on button is yellow.

▶ Activate function: Press confirmation button within 5 seconds.
▷ Corresponding symbol on button is green.

If function is not activated:
▶ Preselect and confirm function again.

Deactivating function via button on the display

▶ Preselect function: Press corresponding button on the display.
▷ *Confirmation required* status symbol appears on the display:

▷ Corresponding symbol on button is yellow.

▶ Deactivate function: Press confirmation button within 5 seconds.
▷ Corresponding symbol on button is white.

If function is not deactivated:
▶ Preselect and confirm function again.

3.3.12 Horn

Note
Different machine configuration!

▶ Observe control description sticker.

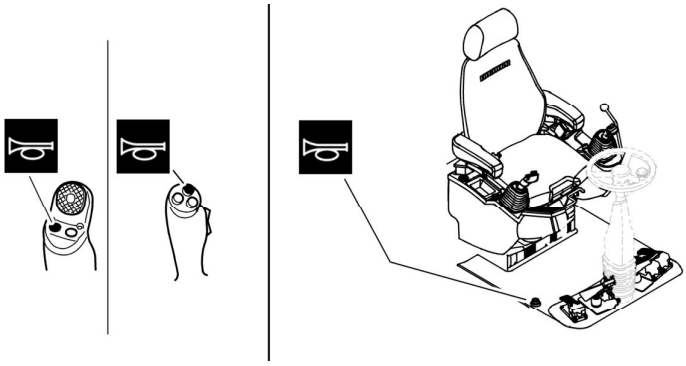

Fig. 518: Horn button

▶ Press *horn* button.
▷ Acoustic warning signal sounds.

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3.3.13 Raising and lowering operator's cab (option)

DANGER
Unapproved presence in hazard zone!
Danger to life.

- ▶ Make sure there are no persons in the hazard zone under the operator's cab.
- ▶ Keep your distance from moving parts when the operator's cab is moving down.

WARNING
Falling out of operator's cab!
Injuries.

- ▶ Close cab door before adjusting operator's cab.
- ▶ Make sure that cab door is always closed when cab is raised.

NOTICE
Incorrect adjustment of operator's cab!
Damage to operator's cab and machine.

- ▶ Make sure there are no obstacles in the range of movement of operator's cab.
- ▶ Exclusively adjust operator's cab when machine is at a standstill.

Raising and lowering operator's cab

Note
Different machine configuration!

- ▶ Adhere to control description sticker. (For more information see: 3.1.5 Symbols on control description sticker, page 65)

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Raising and lowering operator's cab with cab adjustment lever

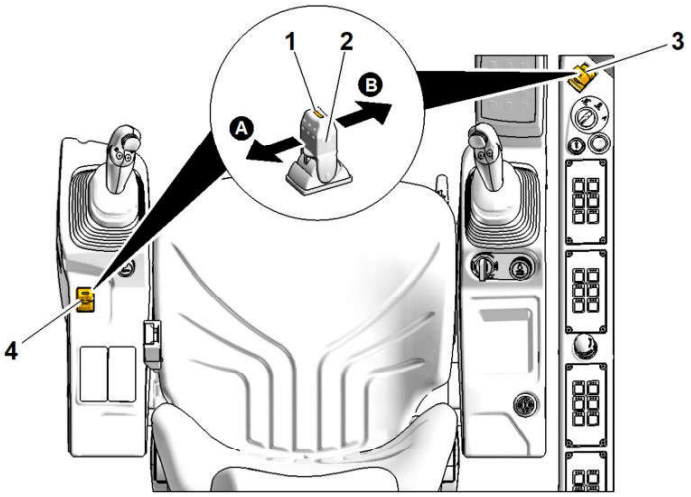

Fig. 519: Raising and lowering operator's cab

1 Unlocking button
2 Cab adjustment lever
3 Cab adjustment lever in right cab trim (control description sticker)
4 Cab adjustment lever in left control console (control description sticker)
A Raising operator's cab
B Lowering operator's cab

▶ Press and hold unlocking button **1**.

▶ Use cab adjustment lever **2** to raise or lower operator's cab.

Raising and lowering operator's cab with mini-joystick

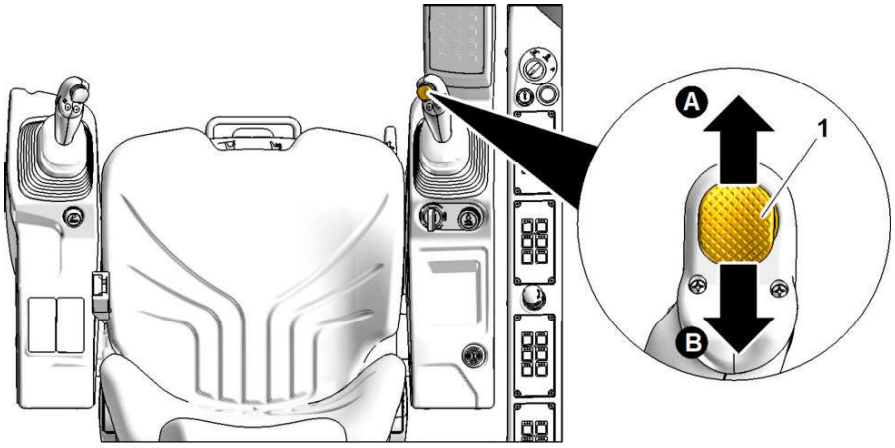

Fig. 520: Raising and lowering operator's cab with mini-joystick

1 Right mini-joystick
A Lowering operator's cab
B Raising operator's cab

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Putting operator's cab in park position

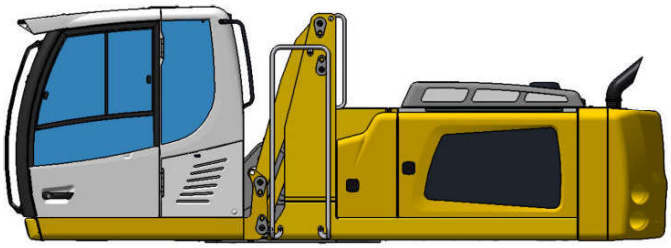

Fig. 521: Operator's cab in park position

▶ Put operator's cab in park position.

3.3.14 Windscreen

DANGER
Limited visibility!
Injuries.

▶ Make sure that windscreen is not in intermediate position during work.

Lower windscreen

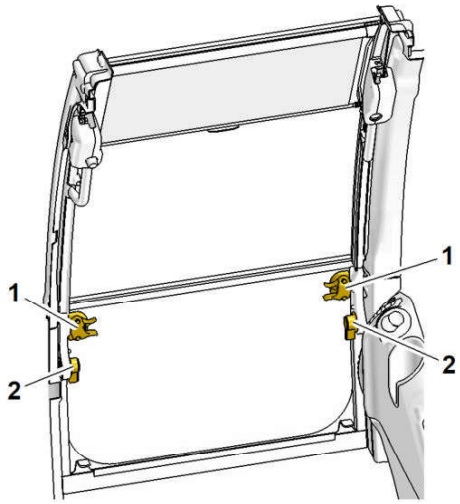

Fig. 522: Lower windscreen

1 Locking mechanism **2** Extender wheel

Opening lower windscreen

▶ Turn extender wheels **2** upwards simultaneously.

▶ Unlock lower windscreen: Press levers of locking mechanism **1** together simultaneously.

▶ Push lower windscreen upwards until it engages.

Closing lower windscreen

▶ Unlock lower windscreen: Press levers of locking mechanism **1** together simultaneously.

▶ Pull lower windscreen downwards until it engages.

▶ Simultaneously turn extender wheels **2** downwards.

Upper windscreen

NOTICE
Collision between windscreen and steering wheel!
Damage to operator's cab.

▶ Make sure that steering column is swivelled away during opening and closing of windscreen.

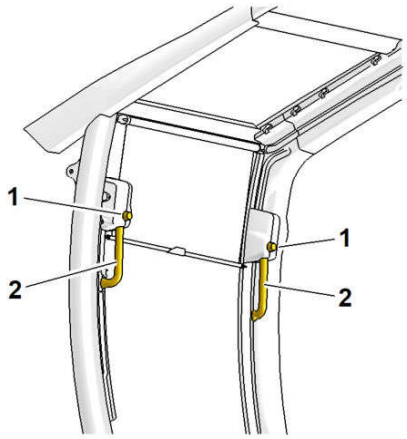

Fig. 523: Upper windscreen

1 Knob **2** Handle

Opening upper windscreen

Make sure following requirements are fulfilled:
❑ Steering column is swivelled away from windscreen.
❑ Windscreen wiper is switched off.

▶ Unlock upper windscreen: Press knobs **1** simultaneously.

▶ Push upper windscreen upwards with handles **2** and pull back until it engages in roof of operator's cab.

▶ Swivel steering column into working position.

Closing upper windscreen

Make sure the following precondition is met:
❑ Steering column is swivelled away from windscreen.

▶ Unlock upper windscreen: Press knobs **1** simultaneously.

▶ Pull upper windscreen forwards and downwards with handles **2** until it engages in front in operator's cab.

▶ Swivel steering column into working position.

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Complete windscreen

Opening complete windscreen

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

Closing complete windscreen

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

3.3.15 Sun blind

Windscreen sun blind

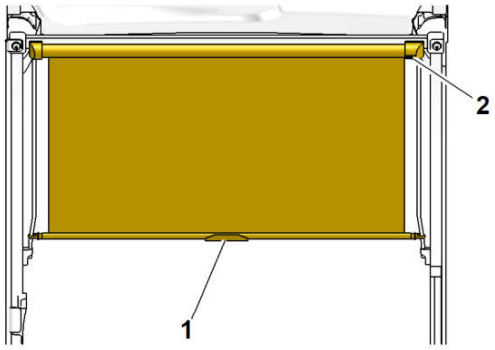

Fig. 524: Windscreen sun blind

1 Tab **2** Roll up button

Roof glass panel sun blind

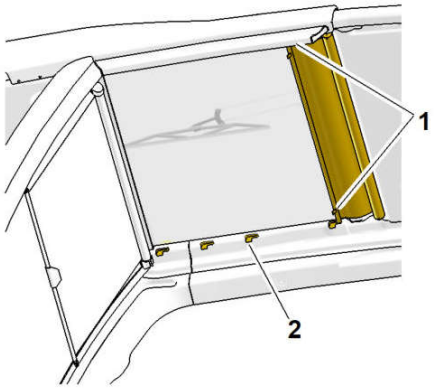

Fig. 525: Roof glass panel sun blind

1 Handle **2** Notch

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Sun visor (option)

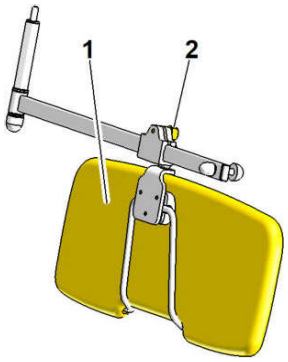

Fig. 526: Sun visor

1 Sun visor **2** Knurled screw

3.3.16 Viewing devices

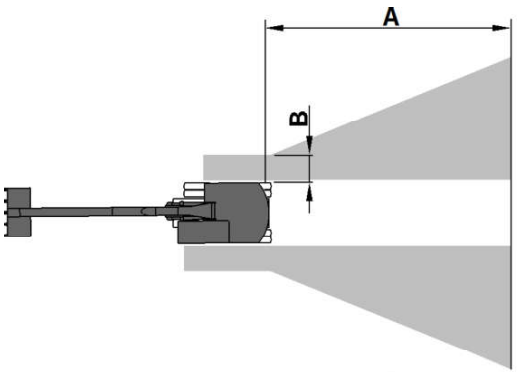

Fig. 527: Example schematic illustration of field of vision

A Rear field of vision **B** Side field of vision

Adjust mirrors so that following fields of vision are guaranteed:
– Rear field of vision at least 30 m
– Side field of vision at least 1 m

DANGER
Incorrectly adjusted mirrors!
Danger to life.

▶ Before starting work and starting driving, check field of vision of mirrors.

If mirrors collide with an obstacle:
▶ Check adjustment of mirrors.

DANGER
Defective mirrors!
Danger to life.

▶ Replace defective mirrors.

Adjusting mirrors mechanically

Make sure the following preconditions are met:
❑ Machine is standing on level ground.

If no helper is present:
▶ Lower working attachment to the ground.
▶ Move travel direction switch to neutral position.
▶ Move folding console up.
▶ Shut off diesel engine.
▶ Adjust mirrors.

Adjusting mirrors electrically (option)

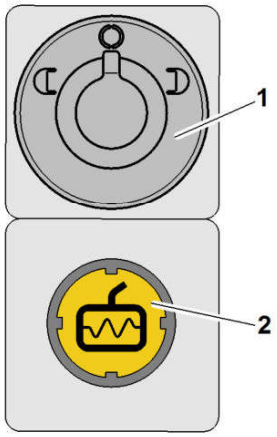

Fig. 528: Control unit for electrical mirrors

1 *Mirror adjuster* joystick **2** *Mirror heater* button

Make sure the following preconditions are met:
❑ Machine is standing on level ground.

Adjusting right mirror

▶ Turn *mirror adjuster* joystick **1** right.
▶ Move *mirror adjuster* joystick **1** and adjust mirror.

Adjusting left mirror

▶ Turn *mirror adjuster* joystick **1** left.
▶ Move *mirror adjuster* joystick **1** and adjust mirror.

Mirror heater (option)

▶ Switch on mirror heater: Press *mirror heater* button **2**.
▷ *Mirror heater* button **2** lights up.
▶ Switch off mirror heater: Press *mirror heater* button **2**.
▷ *Mirror heater* button **2** goes out.

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3.3.17 Lighting

Working attachment headlight

Key	Status of LEDs	Function
	○ ○ ○	Switched off
	○ ○ ✹	Boom headlight switched on
	✹ ✹ ✹	Boom headlight and stick headlight switched on
	○ ✹ ○	Stick headlight switched on

Tab. 43: Working attachment headlight

▶ Switch on and switch off working attachment headlight: Press *working attachment headlight* key.

Operator's cab headlight

Key	Status of LEDs	Function
	○ ○ ○	Front operator's cab headlight switched off
	✹ ✹ ✹	Front operator's cab headlight switched on
	○ ○ ○	Rear operator's cab headlight (option) switched off
	✹ ✹ ✹	Rear operator's cab headlight (option) switched on

Tab. 44: Operator's cab headlight

▶ Switch on and switch off front operator's cab headlight: Press *front operator's cab headlight* key.

▶ Switch on and switch off rear operator's cab headlight: Press *rear operator's cab headlight* key.

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Beacon (option)

Key	Status of LEDs	Function
	○ ○ ○	Beacon switched off
	☀ ☀ ☀	Beacon switched on

Tab. 45: Beacon

▶ Switch on and switch off beacon: Press *beacon* key.

3.3.18 Cab lighting system

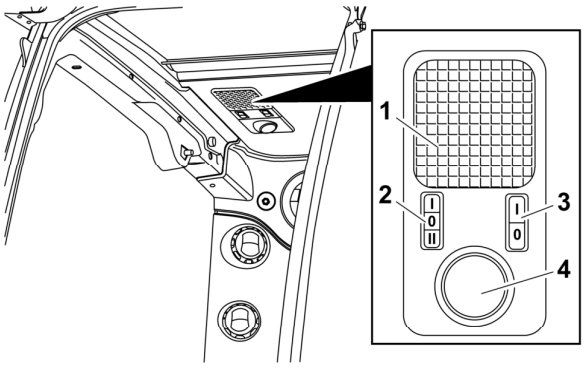


Fig. 543: Cab lighting system

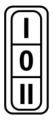
1 Cab lighting system
2 Switch for cab lighting system
3 Switch for reading lamp
4 Reading lamp

Note
Discharged battery.

▶ Make sure that cab lighting system is switched off when exiting machine.

Cab lighting system

▶ Make sure that ignition key is set to 1.

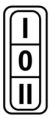


▶ Switch on cab lighting system: Set switch for cab lighting system **2** to I.

▶ Switch off cab lighting system: Set switch for cab lighting system **2** to 0.

Cab lighting system for entry and exit

The cab lighting system for entry and exit is independent of the position of the ignition key.



- ▶ Switch on cab lighting system: Set switch for cab lighting system **2** to II.
  - ▷ Cab lighting system switches on automatically when cab door is opened.
  - ▷ Cab lighting system switches off automatically when cab door is closed.
- ▶ Switch off cab lighting system: Set switch for cab lighting system **2** to 0.

Reading lamp

- ▶ Make sure that ignition key is set to 1.

- ▶ Switch on reading lamp: Set switch for reading lamp **3** to I.
- ▶ Switch off reading lamp: Set switch for reading lamp **3** to 0.

3.3.19 Beacon (option)

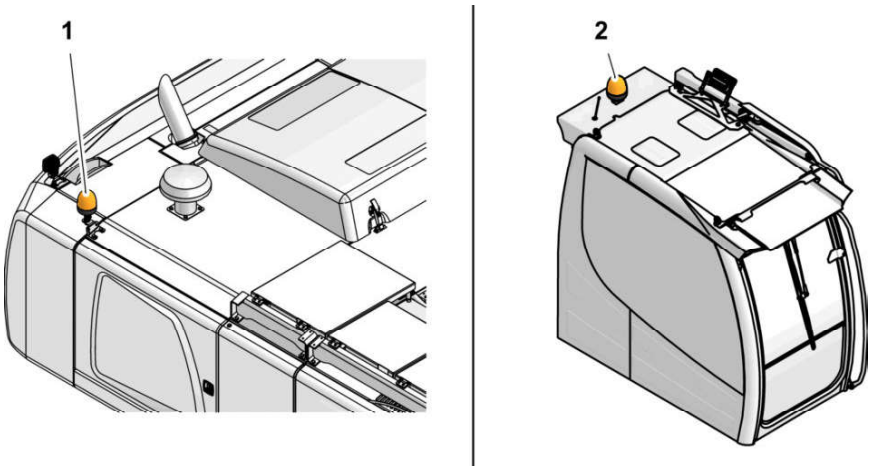


Fig. 547: Beacons

1 Beacon on uppercarriage

2 Beacon on operator's cab

Manual beacon (option)

- ▶ Switch on beacon: Press *beacon* key.
  - ▷ LEDs in key light up.
  - ▷ Beacon is lit.

Automatic beacon (option)

- ▶ Switch off beacon: Fold down folding console.
  - ▷ LEDs in *beacon* key light up.
  - ▷ Beacon is lit.

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3.3.20 Windscreen wipers

Key		Status of LEDs	Operating mode
Windscreen		○ ☀ ○	Intermittent operation: Press once.
		○ ○ ☀	Continuous operation: Press twice.
Roof glass panel		○ ☀ ○	Intermittent operation: Press once.
		○ ○ ☀	Continuous operation: Press twice.
Floor glass panel (without function for machines without floor glass panel)		○ ☀ ○	Intermittent operation: Press once.
		○ ○ ☀	Continuous operation: Press twice.

Tab. 46: Operating mode

3.3.21 Windscreen washer system

Windscreen washer system for windscreen

▶ Switch on windscreen washer system: Press and hold *windscreen* key.
  ▷ Windscreen wiper is in continuous operation.
  ▷ Washer fluid is sprayed onto the window.

Windscreen washer system for roof glass panel

▶ Switch on windscreen washer system: Press and hold *roof glass panel* key.
  ▷ Windscreen wiper is in continuous operation.
  ▷ Windscreen washer fluid is sprayed onto the glass panel.

Windscreen washer system for floor glass panel

In machines without floor glass panel, the *floor glass panel* key is without function.

▶ Switch on windscreen washer system: Press and hold *floor glass panel* key.
  ▷ Windscreen wiper is in continuous operation.
  ▷ Washer fluid is sprayed onto the window.

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3.3.22 Auxiliary heater (option)

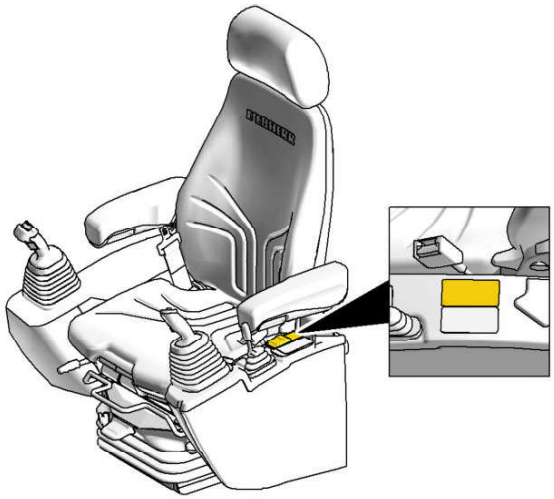

Fig. 561: Position of control module

Note

If auxiliary heater is activated:

- Heating system of operator's cab is activated.
- *Lowering temperature* button and *increasing temperature* button are inactive.
- *Automatic mode* button is inactive.
- Cooling is not possible.

Note

Auxiliary heater improves starting of diesel engine.

Liebherr recommends switching on auxiliary heater at very low temperatures.

▶ For more information adhere to manufacturer's operator's manual.

3.3.23 LiDAT (option)

LiDAT is a data transfer and tracking system for Liebherr machines and machines from other manufacturers.

Based on the latest data transfer technology, LiDAT provides tracking information as well as data about the operation of the machines. As a result, it permits efficient machine management, optimised application planning and remote monitoring.

LiDAT means that all important machine data can be viewed at any time. Depending on the subscription, data is updated several times a day and can be called up at any time using a web browser. It is also possible to call up particularly important information such as when the machine exits a predefined zone, or messages relating to certain operating statuses and application parameters.

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3.4 Operation

3.4.1 Inspection tour before putting into service

- ▶ Before putting machine into service, always perform inspection tour.
- ▶ Secure the machine before the inspection tour to prevent rolling away.
- ▶ Make sure there is free access to areas that have to be checked.
- ▶ Carry out inspection tour according to the following schedule.

Checkpoint	Activity
Overall status	Check the machine for loose pins, cracks, wear, damage and tightness. Never put defective machine into service. Have damage repaired immediately.
Warning signs	Check the warning signs for completeness and readability. Replace damaged signs. Replace unreadable signs.
Protective devices and safety devices	Check completeness and function of protective devices and safety devices (for example safety belt, mounting of pressure sensors and angle sensors).
Intake area	Clean engine bonnet and uppercarriage in the area of cooling air and combustion air intake to remove dirt, ice and snow.
Window panes and mirrors	Clean contaminated window panes and mirrors. Adjust mirrors.
Windscreen washer system	Check fill level. Check antifreeze concentration. Make sure that lines of windscreen washer system contain windscreen washer fluid.
Doors and covers	Close all hoods, covers and doors. Do not lock hoods, covers and doors, so that the source of any fire can be accessed quickly. Secure windows against inadvertent movements.
Diesel engine	Check oil level.
Cooling system	Check coolant level. Check radiator for damage. Clean contaminated radiator.
Fuel system	Check fuel lines for damage and tightness. Drain water from fuel pre-filter.
Hydraulic system	Check oil level. Check hydraulic lines for damage and tightness.
Tyres[A)]	Check tyres for damage. Check wheel nuts for completeness and mounting. Check tyre pressure. Check tread depth. Have defects repaired immediately.
Travel gear[A)]	Check the travel gear for damage, missing or loose parts. Have defects repaired immediately.
Persons in the danger zone	Make sure no-one is working on machine in the danger zone of the machine. Sound horn to warn bystanders before starting machine. Do not start operation if people do not leave danger zone in spite of being warned.
Climbing facilities	Have missing steps, railings and handles renewed. Have defective steps, railings and handles replaced. Clean contaminated, slippery climbing facilities.

Tab. 47: Inspection tour

A) depending on travel gear type

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3.4.2 Refuelling

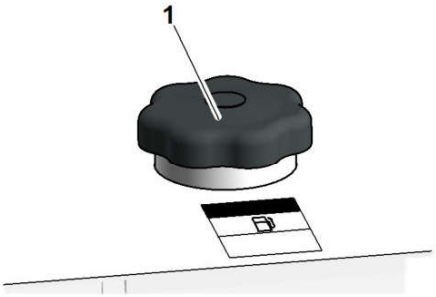

Fig. 562: Fuel tank

1 Tank lid

DANGER
Explosion of highly flammable fuel!
Danger to life.

- ▶ Avoid naked flames.
- ▶ Do not smoke.

Note
Sulphur content of fuel affects change interval of engine oil and oil filter.

- ▶ Adhere to sulphur content of fuel and change intervals of engine oil. (For more information see: Difficulty factors, page 283)

If sulphur content of fuel is not known:

- ▶ Determine sulphur content with oil analysis set.

3.4.3 Refuelling with electric refuelling pump (option)

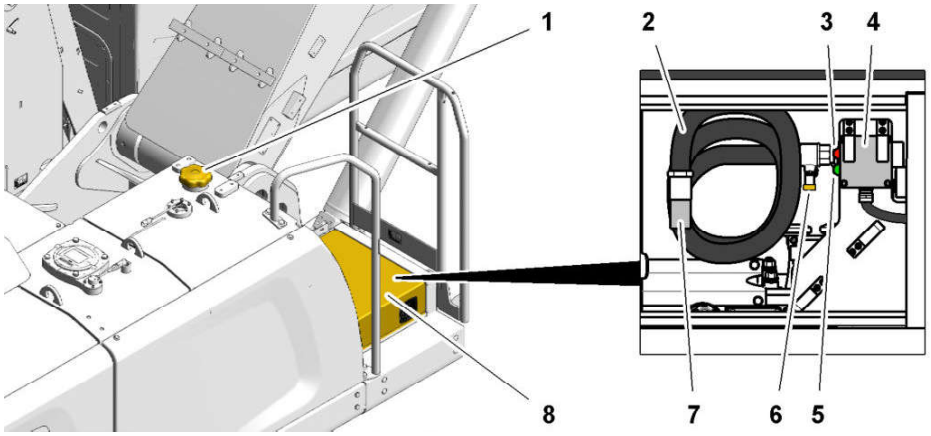

Fig. 563: Electric refuelling pump

1 Tank lid
2 Suction hose
3 *Switching off refuelling pump* button
4 Remote control
5 *Switching on refuelling pump* button
6 Stop cock
7 Protective cap
8 Hatch

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DANGER
Explosion of highly flammable fuel!
Danger to life.

- ▶ Avoid naked flames.
- ▶ Do not smoke.

Note
Sulphur content of fuel affects change interval of engine oil and oil filter.

- ▶ Adhere to sulphur content of fuel and change intervals of engine oil. (For more information see: 5.3.4 Engine oils, page 282)

If sulphur content of fuel is not known:
- ▶ Determine sulphur content with oil analysis set.

Make sure the following preconditions are met:
- ❑ Diesel engine is shut off.
- ❑ Auxiliary heater is switched off.

- ▶ Set starting switch to 1.
- ▶ Open tank lid **1**.
- ▶ Move hatch **8** up.
- ▶ Pull off protective cap **7**.
- ▶ Insert suction hose **2** in external fuel tank.
- ▶ Remove remote control **4** if necessary.
- ▶ Open stop cock **6**.

NOTICE
Dry operation of refuelling pump!
Damage to refuelling pump.

- ▶ Make sure that suction hose is immersed in fuel during operation of refuelling pump.
- ▶ Switch off refuelling pump before external fuel tank is completely empty.

Note

Refuelling pump switches off when fuel tank is full.

- ▶ Start refuelling process: Press *switching on refuelling pump* button **5**.

Troubleshooting
Refuelling pump does not aspirate automatically?

- ▶ Press *switching off refuelling pump* button **3**.
- ▶ Raise external fuel tank.
- ▶ Press *switching on refuelling pump* button **5**.

- ▶ End refuelling process: Press *switching off refuelling pump* button **3**.
- ▶ Close stop cock **6**.
- ▶ Remove suction hose **2** from external fuel tank.

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- ▶ Put on protective cap **7**.
- ▶ Stow suction hose **2** in box.
- ▶ Close hatch **8**.
- ▶ Close tank lid **1**.

3.4.4 Filling with diesel exhaust fluid

Diesel exhaust fluid tank is exclusively installed in machines with SCR system.

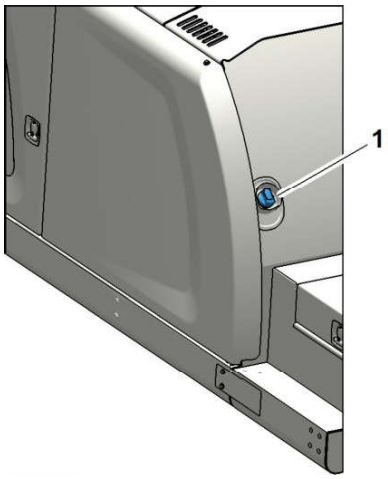

Fig. 564: Diesel exhaust fluid tank

1 Tank lid

CAUTION
Corrosive diesel exhaust fluid!
Injuries.

- ▶ Do not inhale vapours.

If skin comes into contact with diesel exhaust fluid:
- ▶ Clean affected areas with plenty of water and soap.

If eyes come into contact with diesel exhaust fluid:
- ▶ Rinse eyes under running water for at least 15 minutes.
- ▶ Consult a doctor if irritation persists.

If diesel exhaust fluid was swallowed:
- ▶ Do not vomit.
- ▶ Rinse mouth and drink plenty of water.
- ▶ Consult a doctor immediately.
- ▶ Adhere to safety data sheet of diesel exhaust fluid.

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NOTICE
Corrosive diesel exhaust fluid!
Damage to machine.

- ▶ After contact with diesel exhaust fluid clean affected areas with plenty of water and soap.
- ▶ Adhere to safety data sheet of diesel exhaust fluid.

Make sure the following preconditions are met:
- ❑ Diesel exhaust fluid used is approved. (For more information see: 5.3.3 Diesel exhaust fluids, page 281)

3.4.5 Preheating system for fuels and operating fluids (option)

Following fuels and operating fluids can be preheated or kept at a steady temperature with electric heating:
- Coolant
- Engine oil
- Hydraulic oil

The control unit with power supply is installed at different locations for different machine types.

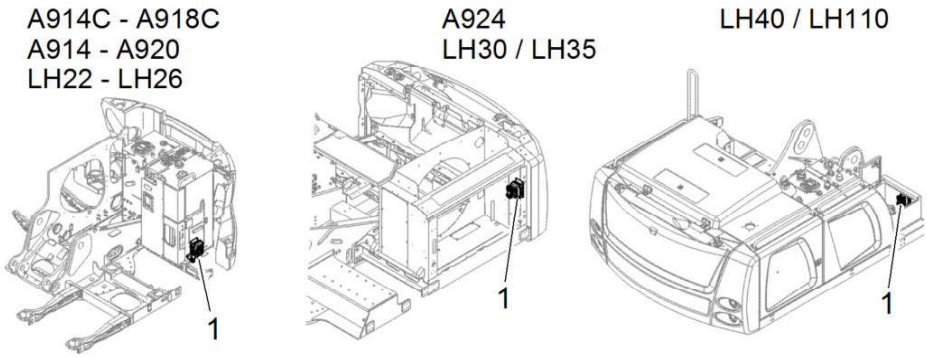

Fig. 565: Position of control unit with power connection for different machine types

1 Control unit

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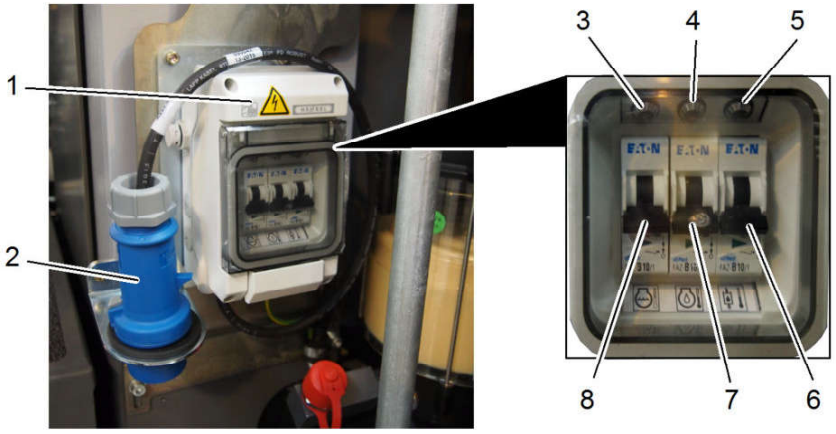

Fig. 566: Control unit for preheating fuel and operating fluid

1	Control unit	**5**	*Hydraulic oil preheating* indicator light
2	Power connection	**6**	*Hydraulic oil preheating* switch
3	*Coolant preheating* indicator light	**7**	*Engine oil preheating* switch
4	*Engine oil preheating* indicator light	**8**	*Coolant preheating* switch

Make sure the following preconditions are met:
- ❑ Stationary power connection is protected with residual current circuit breaker 30 mA.
- ❑ Stationary power connection is protected with a 16 A fuse.
- ❑ Cross-section of electric cable is at least 1.5 mm^2 .
- ❑ Cable is completely unwound from the cable drum.

Connecting preheating

▶ Connect electric cable to power connection **2**.

▶ Connect electric cable to stationary connection.

Preheating hydraulic oil

▶ Put *hydraulic oil preheating* switch **6** into top position.
  ▷ *Hydraulic oil preheating* indicator light **5** lights up.
  ▷ Hydraulic oil preheating switches off at set temperature.

Preheating coolant

▶ Put *coolant preheating* switch **8** into top position.
  ▷ *Coolant preheating* indicator light **3** lights up.

Preheating engine oil

▶ Put *engine oil preheating* switch **7** into top position.
  ▷ *Engine oil preheating* indicator light **4** lights up.
  ▷ Engine oil preheating switches off at set temperature.

Ending preheating

▶ Put *hydraulic oil preheating* switch **6** into bottom position.

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- ▶ Put *coolant preheating* switch **8** into bottom position.
- ▶ Put *engine oil preheating* switch **7** into bottom position.
- ▶ Unplug electric cable.

Checking electrical system

- ▶ Have an annual inspection of electrical system performed by electrician according to relevant national regulations.

3.4.6 Immobiliser (option)

The machine is supplied with two blue ignition keys and one red master key. Before starting, the machine's electrical system checks the ignition key for correct coding.

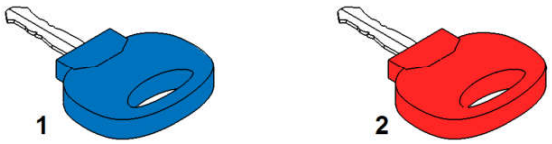


Fig. 567: Blue ignition key and red master key

1 Blue ignition key **2** Red master key

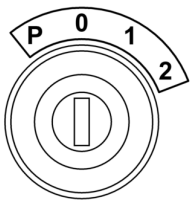
Note
The red master key is used exclusively to teach in or delete blue ignition keys.

- ▶ Keep red master key in safe place (for example with operator).
- ▶ Hand blue ignition keys to operator.

Teaching in ignition keys

A maximum of 10 ignition keys can be taught in.

To create a general key (for example for a fleet), an ignition key can be taught in on multiple immobilisers.



- ▶ Use red master key **2** to set starting switch to 1.
- ▶ Wait 5 seconds.
- ▶ Use red master key **2** to set starting switch to 0.
- ▶ Pull out red master key **2**.
  ▷ Blue ignition keys **1** can be taught in for 20 seconds.
- ▶ Use blue ignition key **1** to set starting switch to 1.
- ▶ Wait 1 second.
  ▷ Blue ignition key **1** is taught in.

Troubleshooting
Blue ignition key is not taught in?
Too many invalid blue ignition keys actuated in starting switch.

- ▶ Wait 15 minutes.
- ▶ Teach in blue ignition key **1** again.

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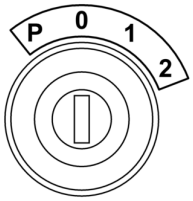
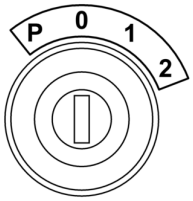
- ▶ Use blue ignition key **1** to set starting switch to 0.
- ▶ Pull out blue ignition key **1**.
- ▶ Teach in additional blue ignition key: Repeat last four steps.

Activating immobiliser



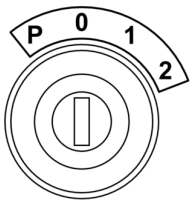
- ▶ Use blue ignition key **1** to set starting switch to 0.
  ▷ Immobiliser is activated.

Deactivating immobiliser



- ▶ Use taught-in blue ignition key **1** to set starting switch to 1.
  ▷ Immobiliser is deactivated.

Deleting ignition key



- ▶ Use red master key **2** to set starting switch to 1.
- ▶ Wait 20 seconds.
  ▷ All taught-in blue ignition keys are deleted.

3.4.7 Preparing machine for dust intensive application

NOTICE
Contaminated hydraulic oil!
Damage to machine.

- ▶ Observe maintenance intervals.
- ▶ Make sure that machine is equipped with 15/5 µm filter cartridges.

- ▶ Equip machine with bypass filters.
- ▶ Equip machine with attachment for “flow reversal for radiator cleaning”. (For more information see: 3.4.39 Reversible fan drive for radiator cleaning (option), page 188)

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3.4.8 Preparing machine for use in biologically sensitive areas

The machine can be operated with biodegradable Liebherr hydraulic oils or biodegradable hydraulic oils from other manufacturers. (For more information see: 5.3.7 Hydraulic oils, page 285)

If biodegradable hydraulic oil is used:

▶ Use bypass filter.

During an oil change, residues of old hydraulic oil remain in the hydraulic system and mix with the new hydraulic oil.

▶ Have hydraulic oil changed by authorised specialist staff.

▶ Have oil analysis performed by authorised specialist staff.

▶ Repeat hydraulic oil change if necessary.

3.4.9 Operator code (option)

The allocation of operator codes prevents use of the machine by unauthorised persons.

An authorised person programs operator codes into the machine and allocates the operator codes to authorised persons.

If operator codes have been programmed, machine can be enabled for starting only with the operator codes.

Enabling machine for starting

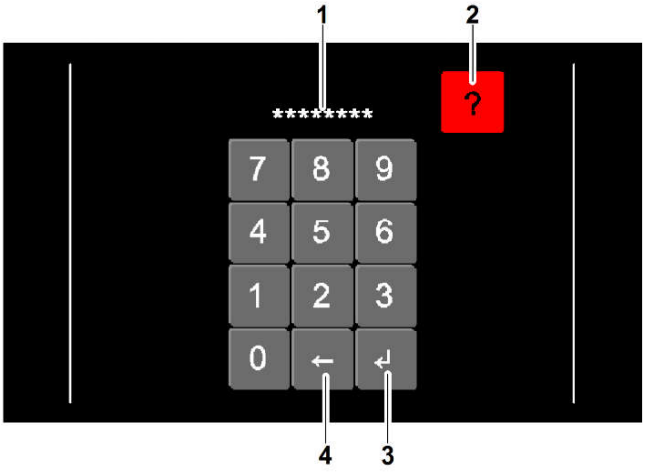

Fig. 572: Display keyboard for operator code

1	Display for operator code	**3**	*Accept* button
2	*Operator code incorrect* symbol	**4**	*Delete* button

Make sure the following preconditions are met:

❑ Battery main switch is switched on.

❑ Folding console is up.

❑ Ignition key is in position 1.

If no operator code has been programmed:

▶ Enter any 8-digit number via display keyboard.

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If operator code has been programmed:
▶ Enter operator code via display keyboard.
▷ Operator code is displayed as asterisks on display for operator code **1**.
▶ Confirm entry: Press *accept* button **3**.

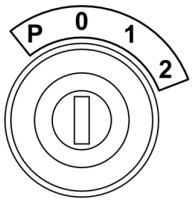
If operator code was entered incorrectly:
▶ Enter operator code again.
▷ Operator code is displayed as asterisks on display for operator code **1**.
▶ Confirm entry: Press *accept* button **3**.
▷ *Operator code incorrect* symbol **2** disappears:

3.4.10 Starting diesel engine

NOTICE
Insufficient oxygen content!
Damage to diesel engine.

If machine is operated above 2000 m:
▶ Contact Liebherr customer service before starting the diesel engine.

Make sure the following preconditions are met:
❑ Battery main switch is set to **I**.
❑ Folding console is in upper position.



▶ Set ignition key to 1.
▷ Control system autocheck starts.

Note

If machine is being continuously operated in temperatures below -10 °C:
▶ Equip machine with preheatings.

▶ Press *Start/Stop* key.
▷ Diesel engine starts.
▶ Run diesel engine to warm it up. (For more information see: 3.4.11 Bringing machine to operating temperature, page 159)

Troubleshooting
Diesel engine does not start?

▶ Wait at least 1 minute before next starting.
▶ Start diesel engine again.

If diesel engine does not start after two attempts:
▶ Contact Liebherr customer service.

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3.4.11 Bringing machine to operating temperature

Make sure the following preconditions are met:
- ❑ Hydraulic oil is approved for ambient temperature range. (For more information see: 5.3.7 Hydraulic oils, page 285)

▶ Move folding console up.

▶ Start machine and run at idle speed for 15 seconds.

▶ Move folding console down.

▶ Set engine speed no higher than half the maximum engine speed.

▶ Maintain speed and activated working hydraulics.

▶ Wait until operating temperature for hydraulic oil and coolant has been reached.
  ▷ Machine is ready for operation.

3.4.12 Engine speed and operating mode

Engine speed and operating mode depend on each other:
- – Changing the operating mode automatically results in a change to the matching speed step.
- – Changing the speed step automatically results in a change of operating mode.

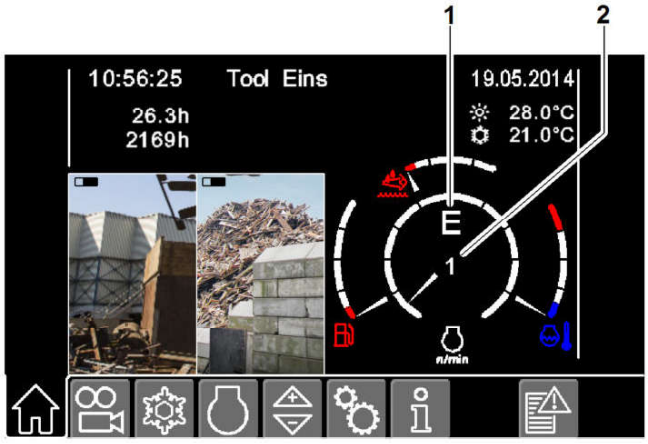

Fig. 577: Engine speed and operating mode

1 Operating mode **2** Speed step

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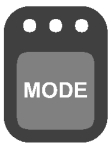
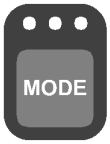
Operating mode			Application
Key	Status of LEDs	Mode	
	☀ ○ ○	S (SENSITIVE)	For especially precise work or lifting loads.
	○ ☀ ○	E (ECO)	For particularly economical and environmentally friendly work.
	○ ○ ☀	P (POWER)	For high transfer loading performance and heavy-duty applications.
	☀ ☀ ☀	P+ (POWER PLUS)	For maximum load handling performance and heavy-duty applications.

Tab. 48: Operating modes

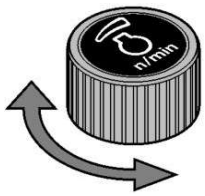
Operating mode S, E and P

Selecting operating mode with *MODE* key



▶ Press *MODE* key until required operating mode is active.
  ▷ Control selects speed step for selected operating mode.
  ▷ Operating mode appears on the display.
  ▷ LEDs in *MODE* key display selected operating mode.

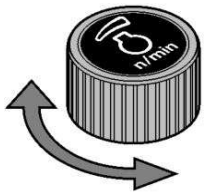
Selecting operating mode with engine speed controller



▶ Turn engine speed controller to right or left.
  ▷ Control selects operating mode for selected speed step.
  ▷ Operating mode appears on the display.
  ▷ LEDs in *MODE* key display selected operating mode.

Operating mode P+

Operating mode P+ corresponds to speed step 10+. Operating mode P+ can exclusively be selected with engine speed controller.



▶ Select operating mode P+: Turn engine speed controller to right.
  ▷ Operating mode appears on the display.
  ▷ LEDs in *MODE* key display selected operating mode.

▶ Exit operating mode P: Press *MODE* key.
  or

  Turn engine speed controller to left.

Engine speed and operating mode after starting machine

After starting the machine speed step 1 is preset.

In *Mode* key LEDs for the most recently activated operating mode flash.

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▶ Assume last active operating mode: Press *MODE* key.

or

Select operating mode S, E and P: Press *MODE* key until required operating mode is active.

or

Select operating mode P+: Turn engine speed controller.

3.4.13 After starting

Operating machine

DANGER
Exhaust gases!
Danger to life.

▶ Exclusively run diesel engine in enclosed rooms if there is adequate ventilation.

▶ Ensure sufficient fresh air supply.

DANGER
Sluggish control!
Danger to life.

▶ Before putting load on machine, bring diesel engine and hydraulic oil to operating temperature.

▶ Carefully move machine to open ground.

▶ Before starting work, check all safety relevant functions.

During operation, check following points:
– Oil pressure is constant.
– Output and speed are constant.
– Exhaust gas is colourless.
– Coolant temperature is constant.
– Diesel engine sounds are normal.

▶ Plan a warm-up phase.

▶ Plan work so that the diesel engine can run at operating temperature for as long a period as possible.

▶ Monitor diesel engine during operation.

▶ Adhere to error messages and status symbols on the display.

If malfunctions occur in diesel engine:

▶ Shut off diesel engine immediately.

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3.4.14 Sensor-controlled low idle automatic

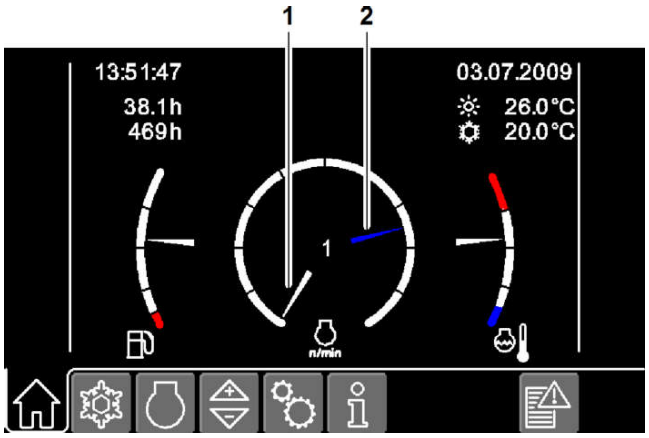

Fig. 586: Sensor-controlled low idle automatic

1 Speed step 1 **2** Saved speed step

Control element	LED	Function
	✳ ✳ ✳	Sensor-controlled low idle automatic activated.
	○ ○ ○	Sensor-controlled low idle automatic deactivated.

Tab. 49: Sensor-controlled low idle automatic key

Sensor-controlled low idle automatic lowers engine speed to speed step 1 **1** if following preconditions are met:
– Folding console is up.
– Joysticks are not touched.
– Travel control is not actuated.

Engine speed increases to saved speed step **2** if one of the following preconditions is met:
– Joysticks are touched.
– Travel control is actuated.

3.4.15 Automatic engine stop after idling (option)

Diesel engine stops automatically if following preconditions are met:
– Diesel engine is idling.
– Set idling time is reached.

The machine lowers the engine speed to idle if one of the following preconditions are met:
– Folding console is up.
– Joysticks and travel control are not actuated.

The machine does not automatically shut off the diesel engine if one of the following preconditions are met:
– Magnet system is activated.
– Regeneration of diesel particulate filter is running.
– Coolant temperature is below 50 °C.

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Status symbol	Warning sound	Meaning
	Intermittent warning sound	Automatic engine stop before long.
		Automatic engine stop active. Diesel engine is shut off.
		Automatic engine stop is blocked.

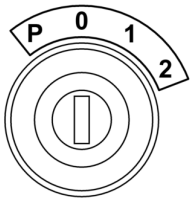
Tab. 50: Status symbols and warning sounds

- ▶ Set shut-off period for automatic engine stop. (For more information see: 3.2.8 *Sensor-controlled low idle automatic and automatic engine stop* submenu (option), page 93)
- ▶ Activate automatic engine stop. (For more information see: 3.2.8 *Sensor-controlled low idle automatic and automatic engine stop* submenu (option), page 93)

  - ▷ LEDs in *sensor-controlled low idle automatic* key light up.
  - ▷ *Sensor-controlled low idle automatic* key does not function.
- ▶ Start diesel engine after automatic engine stop: Move folding console up.
- ▶ Press *start/stop* key.

3.4.16 Shutting off diesel engine

- ▶ Make sure that all control elements are in neutral position.
- ▶ Press *start/stop* key.



- ▶ Set ignition key to **0**.
- ▶ Pull out ignition key.

3.4.17 Shutting off diesel engine in an emergency

Emergency stop with ignition key

- ▶ Set ignition key to **0**.

Emergency stop with emergency stop button (option)

Emergency stop has following functions:
– Stop working movements.
– Block working movements.
– Shut off diesel engine.

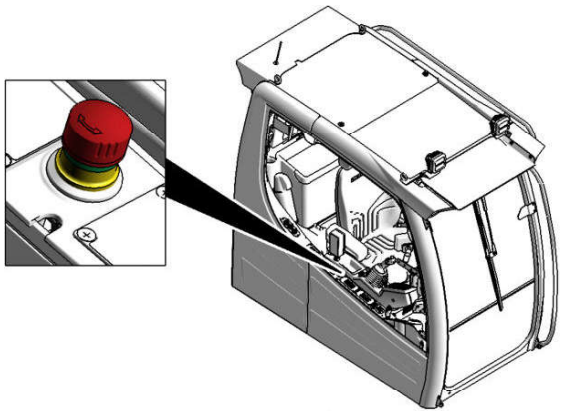


Fig. 596: Example of position of emergency stop button

Activating emergency stop

▶ Press emergency stop button.

Releasing emergency stop button

▶ Turn emergency stop button.
▶ Set ignition key to **0**.
▶ Set ignition key to **I**.

3.4.18 Travelling and braking

Selecting gear step

Selecting gear[20)]

Note

The gear change from second gear to first gear takes place when travel speed is sufficiently reduced.

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[20)] Machines with transmission

Button	Status of LEDs	Travel speed
	✷ ✷ ✷	First gear: Low travel speed
	○ ○ ○	Second gear: High travel speed

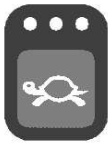
Tab. 51: Gear step key

Selecting creeper gear

Creeper gear has following properties:
– Sensitive driving at low speeds
– Improved driving behaviour on inclines and difficult terrain

WARNING
Braking too hard and abruptly!
Injuries.

▶ Switch to creeper gear exclusively if machine is stationary.

Button	Status of LEDs	Travel speed
	○ ○ ○	Normal travel
	✷ ✷ ✷	Creeper gear

Tab. 52: Creeper gear key

Travelling

Steering variants of machine:
– Steering wheel steering
– Joystick steering (For more information see: 3.4.20 Joystick steering, page 168)

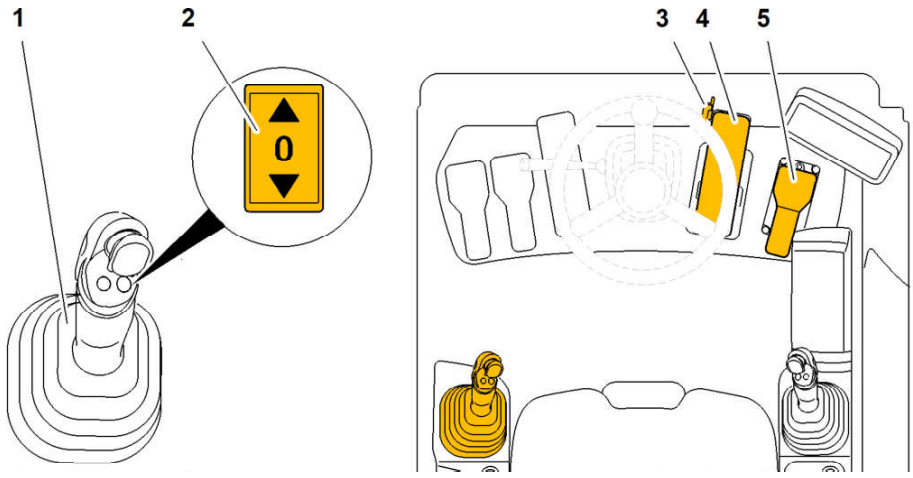
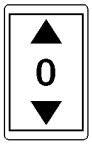


Fig. 603: Example position of control elements

1 Joystick
2 Travel direction switch
3 Retainer
4 Pedal of service brake
5 Accelerator pedal

Switch position		Symbol	Travel direction
	Top		Reverse
	0		Neutral
	Bottom		Forward

Tab. 53: Travel direction switch and status symbols

Note
Different machine configuration!

▶ Adhere to control description sticker in operator's cab.

If parking brake is applied:
▶ Press *parking brake* key.

If service brake is applied:
▶ Press retainer **3** downward.

▶ Select travel direction.

▶ Press accelerator pedal **5** slowly.

(For more information see: 3.6.3 Travelling at operating location, page 221)

(For more information see: 3.6.4 Travelling with load at operating location, page 222)

(For more information see: 3.6.5 Travelling under obstacles, page 223)

Braking

WARNING
Braking too hard and abruptly!
Injuries.

▶ Brake carefully.

▶ Carefully press pedal of service brake **4**.

Emergency brake

CAUTION
Maximum braking effect!
Injuries.

▶ Operate emergency brake exclusively in an emergency.

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- ▶ Apply emergency brake: Press *parking brake* key until machine is stationary.
  - ▷ LEDs in key light up.
- ▶ Release emergency brake: Press *parking brake* key.
  - ▷ LEDs in key go out.

3.4.19 Automatic service brake (option)

The automatic service brake is suitable for following situations:
- Working with frequent starting and braking
- Pulling away on a slope
- On-road travel

Note

The automatic service brake is independent from the position of the folding console. It remains activated after the diesel engine is shut off.

The function of the brake pedal is not affected.

Activating automatic service brake

- ▶ Press *automatic service brake* button.
- ▶ Press confirmation button.
  - ▷ LEDs in *automatic service brake* key light up.

Deactivating automatic service brake

- ▶ Press *automatic service brake* button.
- ▶ Press confirmation button.
  - ▷ LEDs in *automatic service brake* key go out.

Travelling with automatic service brake

Make sure following requirements are fulfilled:
- ❑ Automatic service brake is activated.
- ❑ Travel direction is selected.
- ❑ Folding console is down.

When the machine is stationary, the service brake is applied automatically. *Automatic service brake* symbol is displayed.

- ▶ Press accelerator pedal.
  - ▷ Service brake is released automatically.
  - ▷ *Automatic service brake* symbol disappears.
- ▶ Release accelerator pedal and bring machine to a standstill.
  - ▷ Service brake is applied automatically.
  - ▷ *Automatic service brake* symbol is displayed.

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Travelling with oscillating axle support automatic and automatic service brake

DANGER
Machine tipping over!
Danger to life!

▶ Lock oscillating axle when travelling with attached load.

Make sure following requirements are fulfilled:
❑ Oscillating axle support automatic is activated.
❑ Automatic service brake is activated.
❑ Travel direction is selected.
❑ Folding console is down.

When the machine is stationary, the service brake is applied automatically and the oscillating axle is locked automatically. The *automatic service brake* and *oscillating axle locked automatically* symbols are displayed.

▶ Press accelerator pedal.
  ▷ Service brake is released automatically.
  ▷ Oscillating axle is released automatically.
  ▷ *Automatic service brake* and *oscillating axle locked automatically* symbols disappear.

▶ Release accelerator pedal and bring machine to a standstill.
  ▷ Service brake is applied automatically.
  ▷ Oscillating axle is locked automatically.
  ▷ *Automatic service brake* and *oscillating axle locked automatically* symbols are displayed.

3.4.20 Joystick steering

Machine with steering wheel	Machine without steering wheel
Joystick steering supplements steering wheel.	Joystick steering replaces steering wheel.
Steering wheel remains functional when joystick steering is switched on.	Joystick steering is always switched on.
Steering wheel has priority over joystick steering.	

Tab. 54: Joystick steering

Note

Travel speed is reduced when joystick steering is switched on.

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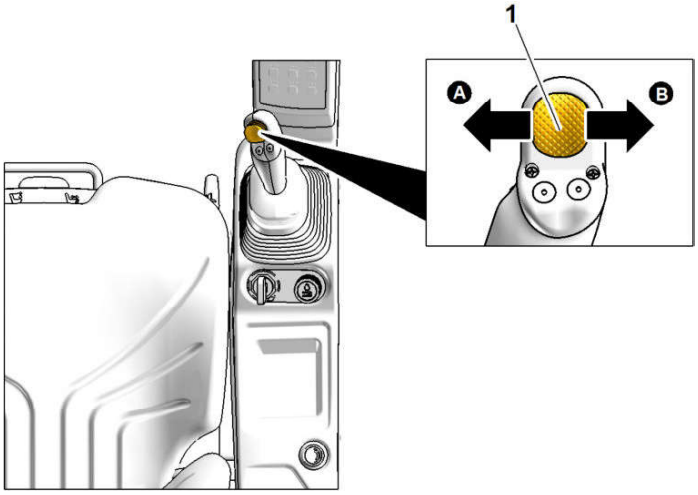

Fig. 614: Joystick steering

1 Right mini-joystick
A Turning left
B Turning right

DANGER
Delayed machine movement!
Danger to life.

▶ Make sure that machine is at operating temperature.

When joysticks are moved:
▶ Check reaction of machine.

▶ Make sure that machine reacts correctly to joystick movements while driving.

Note
Not licensed for public roads!

▶ On public roads, steer exclusively with steering wheel.

Switching on and switching off joystick steering

Make sure the following preconditions are met:
❑ Ignition key is set to 1.
❑ Machine is stationary.
❑ Joysticks are in neutral position.

Button	Status of LEDs	Symbol on the display	Function
	○ ○ ○		Joystick steering switched off: Machine is exclusively steerable with steering wheel.
	☀ ☀ ☀		Joystick steering switched on: Machine is steerable with right mini-joystick.

Tab. 55: Function of joystick steering key

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If there is an error in the control system:
- ▶ Make sure that machine is stationary.
- ▶ Do not move joysticks.
- ▶ Move folding console up and then down again.

3.4.21 Four wheel steering (option)

DANGER
Unexpected steering behaviour!
Danger to life.

- ▶ Check preselected steering type when starting machine.
- ▶ Check whether four wheel steering is activated or deactivated.
- ▶ Activate or deactivate steering reversal as required.

Key	Status of LEDs	Function
	○ ○ ○	Four wheel steering deactivated: Exclusively wheels on front axle are steered. Rear axle wheels remain rigid.
	☀ ☀ ☀	Four wheel steering activated: Wheels on front axle and rear axle turn in respective opposite directions.

Tab. 56: Function of the four wheel steering key

Activating four wheel steering

Make sure the following preconditions are met:
- ❑ Machine is stationary.
- ❑ Wheels are aligned straight ahead.

- ▶ Press *four wheel steering* key.
- ▶ Press confirmation button.
  - ▷ LEDs in *four wheel steering* key light up.
  - ▷ *Four wheel steering* symbol appears on the display:

Deactivating four wheel steering

Make sure the following preconditions are met:
- ❑ Machine is stationary.
- ❑ Wheels are aligned straight ahead.

- ▶ Press *four wheel steering* key.
- ▶ Press confirmation button.
  - ▷ LEDs in *four wheel steering* key go out.
  - ▷ *Four wheel steering* symbol disappears:

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3.4.22 Steering reversal (option)

Steering reversal facilitates steering with the uppercarriage swivelled.

DANGER
Unexpected steering behaviour!
Danger to life.

- ▶ Check whether steering reversal is activated or deactivated.
- ▶ Activate or deactivate steering reversal as required.

Key	Status of LEDs	Operating mode	Function
	○ ○ ○	Steering reversal deacti-vated	Steering functions in the same way throughout the slewing range of the uppercarriage.
	☀ ☀ ☀	Steering reversal acti-vated	Steering direction is reversed if uppercarriage is slewed over 90°.

Tab. 57: Function of the steering reversal key

Switching on steering reversal

- ▶ Press *steering reversal* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key light up.
  - ▷ *Steering reversal* status symbol appears on the display:

Switching off steering reversal

- ▶ Press *steering reversal* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key go out.
  - ▷ *Steering reversal* status symbol disappears:

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3.4.23 Travel alarm (option)

Note
Different machine configuration!

▶ Observe control description sticker.

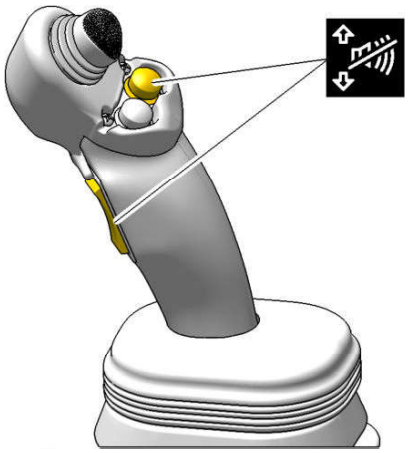

Fig. 633: Switching off travel alarm

▶ Push *switching off travel alarm* switch.
or

Press *deactivating travel alarm* button.
▷ Warning sound stops after 10 s.

3.4.24 Trailer coupling (option)

The machine can optionally be fitted with a trailer coupling for towing an unbraked steerable drawbar trailer.

Liebherr machines do not have a brake system for trailers. The use of braked trailers is therefore not approved.

Note
Operating the machine with trailer on public roads is not approved.

▶ Exclusively operate machine with trailer on the premises.

Design

The trailer coupling is installed on undercarriage or support blade.

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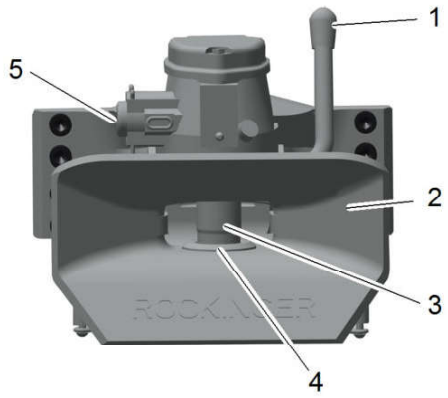


Fig. 634: Trailer coupling

1 Lever
2 Coupling jaw
3 Pin
4 Support ring
5 Control pin

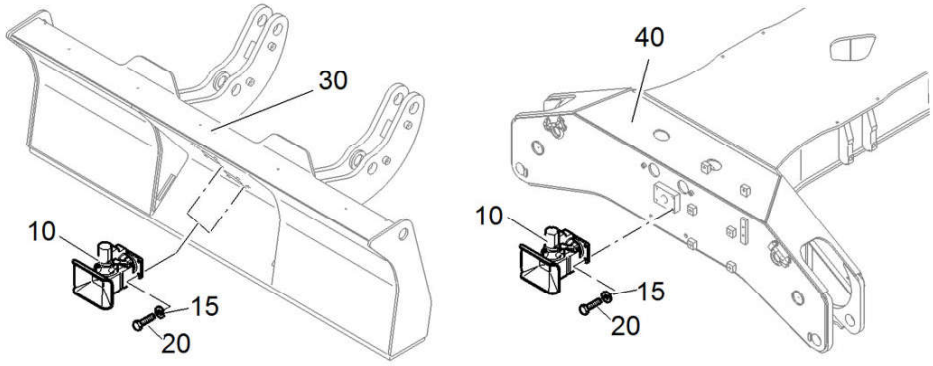


Fig. 635: Installation of trailer coupling on blade and undercarriage (examples)

10 Trailer coupling
15 Shim
20 Screw
30 Blade
40 Undercarriage

Note
The trailer coupling is approved exclusively for unbraked steerable drawbar trailers!

- ▶ For travel mode exclusively use the first gear.
- ▶ Adhere to maximum speed of 5 km/h.
- ▶ Vertically load coupling with maximum of 500 kg steerable drawbar weight.
- ▶ Do not use braked trailers.

DANGER
Machine tipping over!
Danger to life.

- ▶ Do not drive on inclines or slopes.
- ▶ Use traction aids on slippery roads.

Coupling trailer

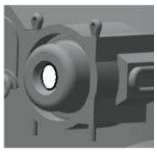
DANGER
Fast movements by steerable drawbar!
Danger to life.

- ▶ Park steerable drawbar trailers exclusively on even ground.
- ▶ Secure trailer with parking brake or chocks to prevent it rolling away.
- ▶ Carefully release parking brake on front axle.

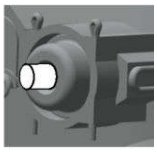
DANGER
Restricted visibility!
Danger to life.

- ▶ Make sure that no one is between machine and trailer.
- ▶ Work with help of spotter during coupling.
- ▶ Turn uppercarriage to trailer coupling.

- ▶ Move trailer coupling of machine until 1 m away from towing eye of trailer.
- ▶ Move folding console (safety lever) of machine upwards.
- ▶ Activate parking brake of machine.
- ▶ Use a height adjustment device to adjust towing eye to the centre of the coupling jaw **2**.
- ▶ Push lever **1** on the trailer coupling upward until it engages.
  ▷ Pin **3** of trailer coupling is open.
- ▶ Move trailer coupling towards towing eye until the pin automatically locks the towing eye.
- ▶ Check position of control pin **5**.



▷ Control pin **5** is retracted: Towing eye is correctly coupled.



▷ Control pin **5** protrudes: Towing eye is not correctly coupled.

If towing eye is not correctly coupled:
- ▶ Do not travel with trailer.
- ▶ Repeat coupling process.

Uncoupling trailer

- ▶ Move trailer to an even surface.

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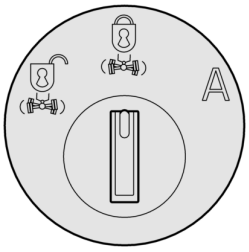
- ▶ Secure trailer with parking brake or chocks to prevent it rolling away.
- ▶ Move folding console (safety lever) of machine upwards.
- ▶ Activate parking brake of machine.
- ▶ Push lever **1** on trailer coupling upwards until it engages.
  ▷ Pin **3** of trailer coupling releases towing eye.
- ▶ Slowly drive machine away from trailer.

3.4.25 Locking and unlocking oscillating axle

Setting operating mode

Switch position		Operating mode
		Oscillating axle is unlocked.
		Oscillating axle is locked.
	A	Oscillating axle support automatic, locking mechanism of service brake automatically locks oscillating axle.

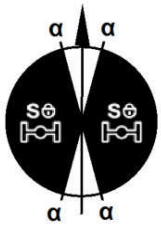
Tab. 58: Oscillating axle switch switch position

- ▶ Set operating mode according to driving situation. (For more information see: 3.6.3 Travelling at operating location, page 221) (For more information see: 3.6.4 Travelling with load at operating location, page 222)

or

Set operating mode according to working situation. (For more information see: Putting machine with wheeled undercarriage with two axles in working position, page 220)

Locking and unlocking oscillating axle according to angle of rotation



The behaviour of the oscillating axle corresponds to the operating mode selected on the oscillating axle switch within the white slewing area (±α).

Within the black area the oscillating axle is locked.

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Oscillating axle switch and service brake		Angle of rotation of uppercarriage	Effect on oscillating axle	Symbol on the display
Unlocked		α < 15°	Oscillating axle is unlocked.	-
		α > 15°	Oscillating axle is locked by angle-controlled oscillating axle locking.	
Locked		All angles	Oscillating axle is locked, irrespective of the position of uppercarriage and service brake.	
Automatic system active and service brake closed		α < 15°	Oscillating axle is locked by oscillating axle support automatic.	
		α > 15°	Oscillating axle is locked by angle-controlled oscillating axle locking.	
Automatic system active and service brake open		α < 15°	Oscillating axle is unlocked.	-
		α > 15°	Oscillating axle is locked by angle-controlled oscillating axle locking.	

Tab. 59: Locking and unlocking oscillating axle according to angle of rotation

▶ Set operating mode according to driving situation. (For more information see: 3.6.3 Travelling at operating location, page 221) (For more information see: 3.6.4 Travelling with load at operating location, page 222)

or

Set operating mode according to working situation. (For more information see: Putting machine with wheeled undercarriage with two axles in working position, page 220)

3.4.26 Supporting machine

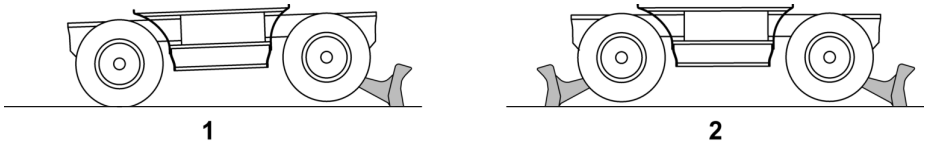

Fig. 652: Support variants

1 Rear support blade

2 Rear and front support blade

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DANGER
Machine tipping over!
Danger to life.

- ▶ Make sure that ground is sufficiently stable.
- ▶ Make sure that support is fully in contact with solid, non-slip and level ground.
- ▶ Make sure that support is not fully extended.
- ▶ Make sure that wheels do not have ground contact.

Note
Different machine configuration.

- ▶ Adhere to control description sticker in operator's cab.

Depending on the equipment the support is moved with one of the following control elements:
– Left mini-joystick **1**
– *Support* adjusting lever **2**

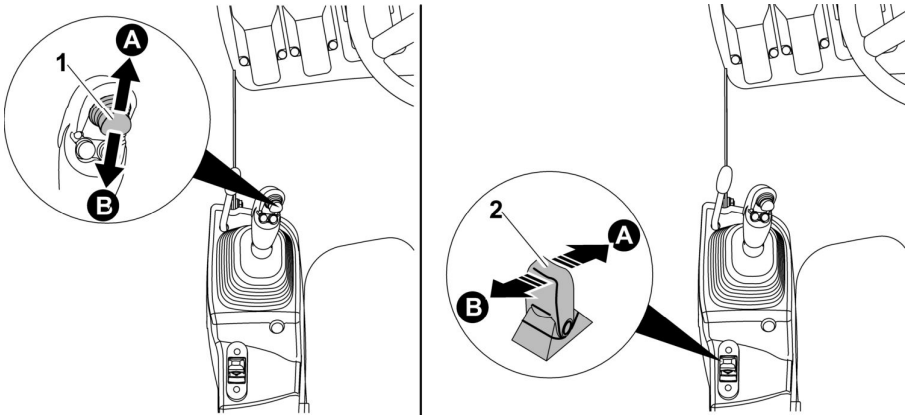
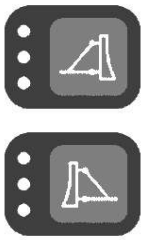


Fig. 653: Control elements

1 Left mini-joystick **2** *Support* adjusting lever

Keys	Status of LEDs	Support
	○ ○ ○	Deactivated: Control not possible
	✺	Activated: Control possible

Tab. 60: Support blade key

Lifting machine

- ▶ Press *support blade* key.
  ▷ LEDs in *support blade* key light up.

- ▶ Lift machine: Move control element in direction **A** until tyres lose ground contact.
- ▶ Make sure that parking brake and service brake are released.
- ▶ Check tyre ground contact: Carefully press travelling pedal briefly.
- ▶ Press active *support blade* key.
  - ▷ LEDs in key go out.
  - ▷ Machine is ready for material handling mode.

Lowering machine

- ▶ Press *support blade* key.
  - ▷ LEDs in *support blade* key light up.
- ▶ Lower machine: Pull control element backwards until support blade is fully retracted.
- ▶ Press *support blade* key.
  - ▷ LEDs in key go out.
  - ▷ Machine is ready to travel.

3.4.27 Controlling working attachment

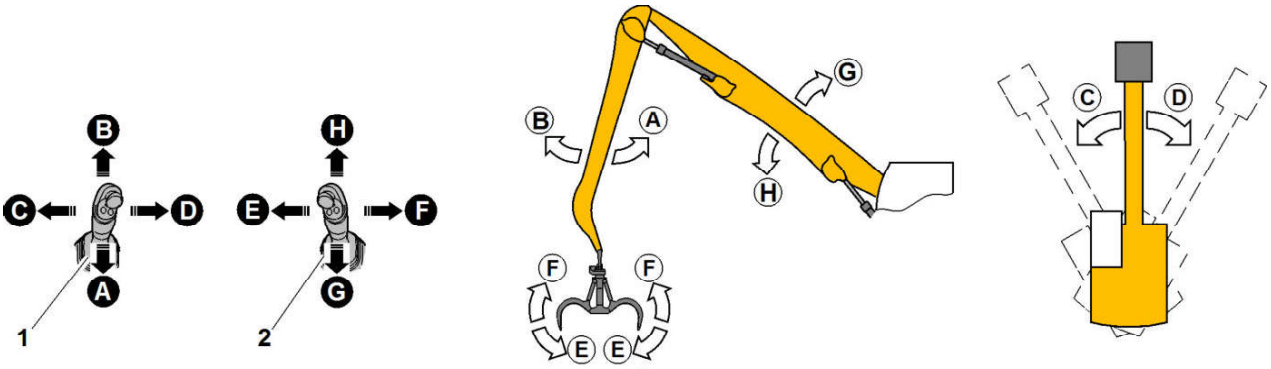


Fig. 658: Controlling working attachment with monoblock

1	Left joystick	**C**	Turning uppercarriage left	**G**	Raising boom
2	Right joystick	**D**	Turning uppercarriage right	**H**	Lowering boom
A	Retracting stick	**E**	Closing grapple		
B	Extending stick	**F**	Opening grapple		

Note
Different machine configuration!

- ▶ Observe control description sticker.

Left joystick

Function	Operation
Retract stick.	Move in direction retracting stick **A**.
Extend stick.	Move in direction extending stick **B**.
Turn uppercarriage left.	Move in direction turning uppercarriage left **C**.

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Function	Operation
Turn uppercarriage right.	Move in direction turning uppercarriage right **D**.

Tab. 61: Left joystick

Right joystick

Function	Operation
Close grapple.	Move in direction closing grapple **E**.
Open grapple.	Move in direction opening grapple **F**.
Raise boom.	Move in direction raising boom **G**.
Lower boom.	Move in direction lowering boom **H**.

Tab. 62: Right joystick

3.4.28 Turning and braking uppercarriage

Turning uppercarriage

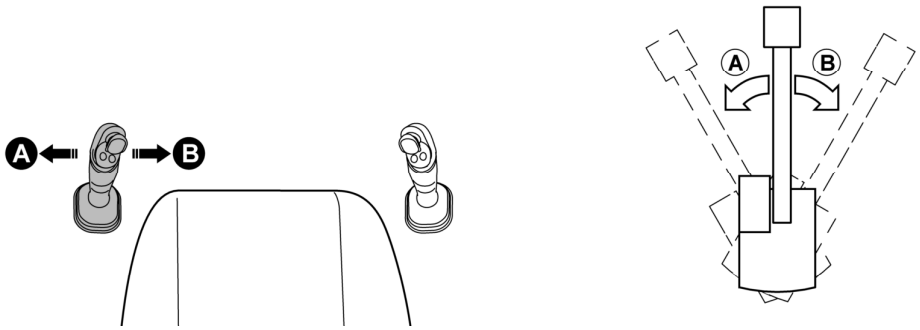

Fig. 659: Turning uppercarriage

Make sure the following preconditions are met:
- ❑ Slewing brake is released. (For more information see: 3.4.29 Slewing brake, page 180)

▶ Move joystick in direction **A**.
▷ Uppercarriage turns to the left.

▶ Move joystick in direction **B**.
▷ Uppercarriage turns to the right.

Braking uppercarriage

▶ Release joystick.
▷ Uppercarriage is braked hydraulically.

▶ Move joystick in opposite direction.
▷ Uppercarriage is braked hydraulically to maximum extent.

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3.4.29 Slewing brake

Key	Status of LEDs	Switch in joystick	Slewing brake
	☀ ○ ○	Activated	Released
	☀ ☀ ○	Activated	Applied
	☀ ☀ ☀	Deactivated	Applied
	○ ○ ○	Deactivated	Released
	☀ ☀ ○	Activated	Slewing brake is applied as soon as uppercarriage is stationary.

Tab. 63: Status of slewing brake

Locking uppercarriage with slewing brake

Activating locking mechanism

NOTICE
Incorrect use!
Damage to slewing brake.

▶ Lock uppercarriage exclusively when stationary.

▶ Press *slewing brake* key.
▷ LEDs in *slewing brake* key light up.
▷ Uppercarriage is locked.

Deactivating locking mechanism

▶ Press *slewing brake* key.
▷ LEDs in *slewing brake* key go out.
▷ Uppercarriage can be turned.

Locking uppercarriage with slewing brake with switch in joystick (option)

Note
Different machine configuration.

▶ Adhere to control description sticker in operator's cab.

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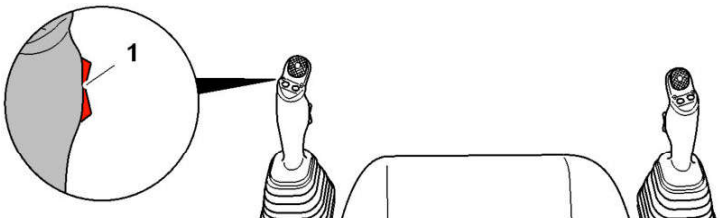

Fig. 668: Slewing brake switch (example of switch on left joystick)

1 *Slewing brake* switch

Activating switch in joystick

▶ Press *slewing brake* key in control unit A several times until one LED lights up or two LEDs light up.
▷ Steering via *slewing brake* switch **1** is activated.

Activating locking mechanism

▶ Put *slewing brake switch* **1** in bottom position.

If two LEDs in *slewing brake* key flash:
▶ Wait until LEDs in *slewing brake* key light up.
▷ Uppercarriage is locked.

Deactivating locking mechanism

▶ Put *slewing brake switch* **1** in neutral position.
▷ One LED in *slewing brake* key lights up.
▷ Uppercarriage can be turned.

Deactivating switch in joystick

▶ Press *slewing brake* key in control unit A several times until no LED lights up or three LEDs light up.
▷ Steering via *slewing brake* switch **1** is deactivated.

3.4.30 Positioning slewing brake

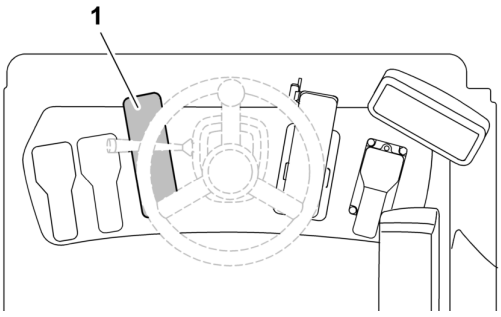

Fig. 671: Positioning slewing brake

1 Brake pedal

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NOTICE
Incorrect use!
Wear on brake discs.

▶ Exclusively hold stationary uppercarriage in position.

▶ Press brake pedal **1**.
▷ Uppercarriage remains in position.

3.4.31 Selecting boom or working tool

NOTICE
Incorrect settings!
Damage to working tool, functional impairment of working tool.

▶ Select settings appropriate for technical data of working tool.

▶ Observe maximum permitted values for pressure.

▶ Observe maximum permitted values for oil quantity.

▶ Observe technical data for the working tool.

Note
Boom and working tool (for example grapple, scrap shear, hydraulic hammer) cannot be operated at the same time.

▶ Change over control.

▶ Adhere to control description sticker in operator's cab.

Changing over control

▶ Press *changeover of adjustable boom cylinder to working tool* key.

▶ Press confirmation button.
▷ *Changeover of adjustable boom cylinder to working tool* status symbol appears on the display:

▷ LEDs in *changeover of adjustable boom cylinder to working tool* key are flashing.

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3.4.32 Adjusting boom vertically

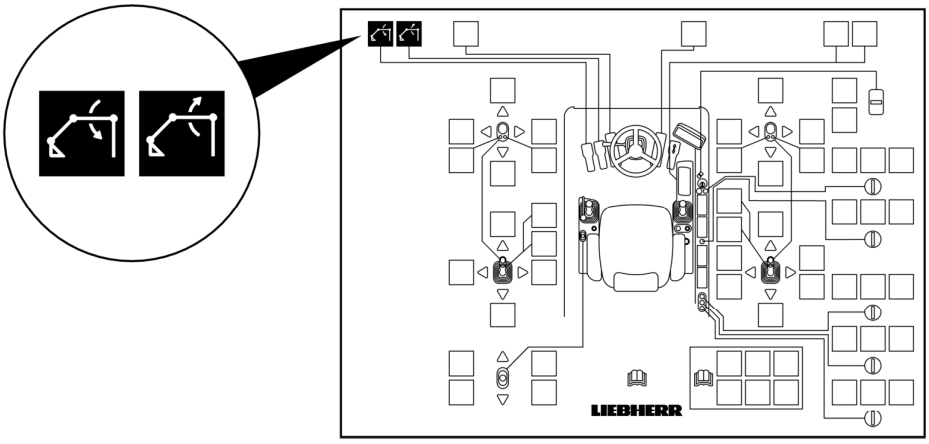

Fig. 674: Control description sticker: Adjusting boom with foot pedals

Note
The way the control elements are assigned depends on the machine equipment.

▶ Adhere to control description sticker in operator's cab.

Note
Boom and working tool (for example grapple, scrap shear, hydraulic hammer) cannot be operated at the same time.

▶ Select boom. (For more information see: 3.4.31 Selecting boom or working tool, page 182)

Adjusting boom with foot pedals

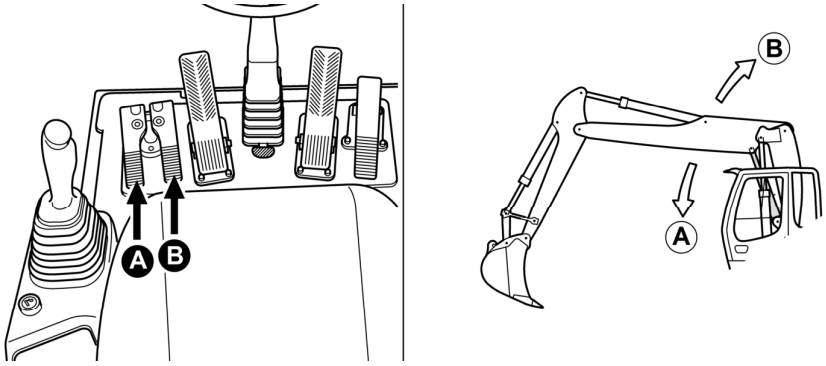

Fig. 675: Adjusting boom with foot pedals

▶ Press foot pedal **A**.
▷ Attachment is moved downwards.

▶ Press foot pedal **B**.
▷ Attachment is moved upwards.

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3.4.33 Hoist cylinder protection

The hoist cylinder protection reduces the pressure in the hydraulic circuit for moving in the hoist cylinders in order to restrict the pushing forces of the working attachment and the material.

For industrial machines (LH 22 to LH 35) the hoist cylinder protection is installed as standard, for example for following purposes:
– Protection of working attachment
– Protection of ship floor when loading or unloading a ship
– Protection of loading surface of a vehicle

As an option, the hoist cylinder protection can be deactivated. The working attachment is then lowered with high pressure, for example to compress material.

With the hoist cylinder protection deactivated, the movement of the working attachment is slowed down.

Deactivating hoist cylinder protection (option)

Make sure following requirements are fulfilled:
❑ Diesel engine or electric motor is running.
❑ *Servo* key is switched on.
❑ Folding console is down.

▶ Press *deactivate hoist cylinder protection* key.
▷ LEDs in key light up.
▷ Working attachment is lowered with high pressure.
▷ Movement of working attachment is slowed down.
▷ *Super Finish SF* symbol appears on the display:

Note
While the hoist cylinder protection is deactivated, the settings of the function Super Finish cannot be modified.

▶ Use Super Finish function: Activate hoist cylinder protection.

Activating hoist cylinder protection

Make sure following requirements are fulfilled:
❑ Diesel engine or electric motor is running.
❑ *Servo* key is switched on.
❑ Folding console is down.

DANGER
Unexpected lowering of machine!
Danger to life.

If machine is raised with working attachment:
▶ Do not activate hoist cylinder protection.

▶ Press *deactivate hoist cylinder protection* key again.
▷ LEDs in key go out.
▷ Hoist cylinder protection is activated.
▷ Movement of working attachment is normal.

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▷ *Super Finish SF* symbol disappears from the display.

3.4.34 Selecting the working tool

The machine can move working tools with various pressure settings and flow settings. The settings for working tools are listed in the *Tool Control* menu.

NOTICE
Incorrect settings!
Damage to the working tool.

▶ Make sure that the correct working tool is selected in the *Tool Control* menu.

▶ Select the working tool in the *Tool Control* menu.

3.4.35 Controlling special working attachment with mini-joystick

Note
Different machine configuration!

▶ Adhere to control description sticker.

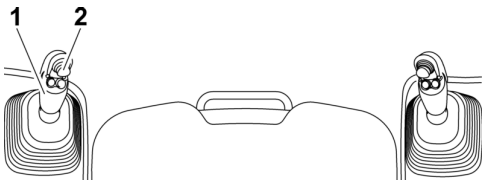

Fig. 681: Left joystick

1 Left joystick **2** Left mini-joystick

Working tool with rotary actuator

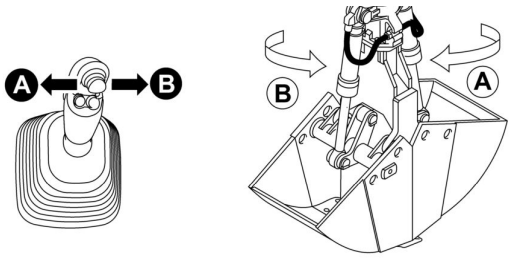

Fig. 682: Working tool with rotary actuator

▶ Turn working tool in direction **A**: Move mini-joystick in direction **A**.

▶ Turn working tool in direction **B**: Move mini-joystick in direction **B**.

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Swivelling working tool

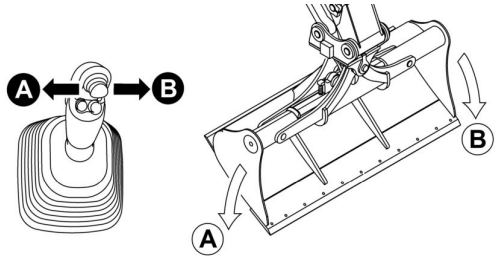

Fig. 683: Swivelling working tool

- ▶ Swivel working tool in direction **A**: Move mini-joystick in direction **A**.
- ▶ Swivel working tool in direction **B**: Move mini-joystick in direction **B**.

Quick coupler

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

3.4.36 Changing over control of right mini-joystick (option)

The option can be used to assign the control of the working tool from mini-joystick to the joystick.

Note
It is not possible to control the tipping mechanism if the control of the working tool is switched to the right joystick.

- ▶ Change control of working tool to right mini-joystick.

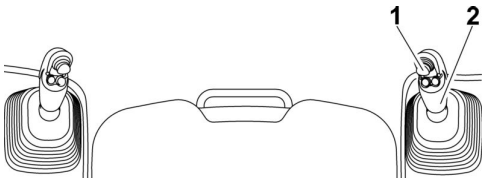

Fig. 684: Right joystick

1 Right mini-joystick **2** Right joystick

Controlling working tool with right joystick

Changing over control

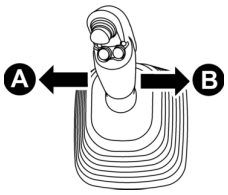

Fig. 685: Controlling working tool with joystick

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- ▶ Press *control changeover* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key light up.
  - ▷ *Control changed over* status symbol appears on the display:

Controlling working tool

- ▶ Move right joystick **2** in direction **A** or **B**.

Controlling working tool with right mini-joystick

Changing over control

- ▶ Press *control changeover* key.
- ▶ Press confirmation button.
  - ▷ LEDs in key go out.

Controlling working tool

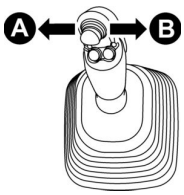

Fig. 689: Controlling working tool with mini-joystick

- ▶ Move right mini-joystick **1** in direction **A** or **B**.

3.4.37 Grapple priority (option)

For reduced grapple priority adhere to following points:
- Control limits hydraulic pressure of grapple.
- Closing force of grapple is reduced.
- Hydraulic system has sufficient oil flow for fast and smooth working attachment movements.

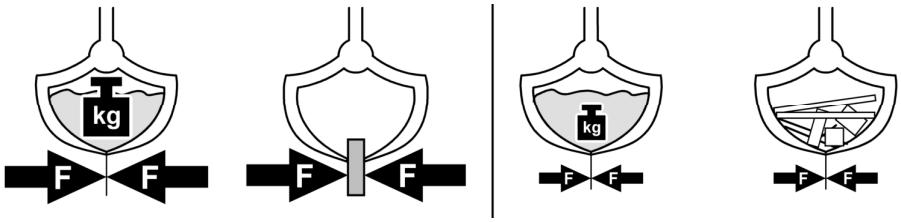

Fig. 690: Differently powerful closing forces for loads of different weights

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WARNING
Falling load!
Danger to life.

- ▶ Make sure there are no persons in danger zone
- ▶ Deactivate grapple priority before picking up heavy loads.

Key	Status of LEDs	Function
	○ ○ ○	Grapple priority: Suitable for loads that require a significant closing force from the grapple. Working attachment movements are slower.
	✳ ✳ ✳	Reduced grapple priority: Suitable for loads that require a low closing force from the grapple. Working attachment movements remain fast and smooth.

Tab. 64: Grapple priority key

Make sure the following preconditions are met:
- ❑ Grapple is selected in *Tool Control* menu.
- ❑ *Grapple* status symbol appears on the display.

- ▶ Press *grapple priority* key.
  - ▷ LEDs in key light up.

3.4.38 AutoLift (Option)

The “ AutoLift ” function raises the working attachment when the grapple closes. This reduces the danger of the grapple damaging the loading surface.

NOTICE
Careless movement of working attachment!
Damage to loading surface.

- ▶ Move working attachment carefully.

- ▶ Select AutoLift speed in *SuperFinish* menu.
- ▶ Press *AutoLift* key.
  - ▷ LEDs in key light up.
  - ▷ Working attachment is raised when grapple closes.

3.4.39 Reversible fan drive for radiator cleaning (option)

NOTICE
Incorrect use of reversible fan drive for radiator cleaning!
Damage to machine.

- ▶ Check air intake area before starting work and remove stubborn contamination.

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Status symbol	Meaning
	Reversible fan drive blocked: Time distance for repeated switching on is too short.
	Reversible fan drive blocked: Coolant temperature is too high.

Tab. 65: Reversible fan drive blocked status symbol

Switching on reversible fan drive manually

Key	Status of LEDs	Function
		Fan changes from normal mode to stationary.
		Fan turns in opposite direction of rotation.
		Fan changes from opposite direction of rotation to stationary.

Tab. 66: Switching on reversible fan drive manually

▶ Make sure that air intake area is free from persistent soiling (For more information see: 5.9.2 Checking cooling system and heat exchanger for contamination and cleaning, page 328) .

Automatic reversible fan drive (option)

Menu call:  > 

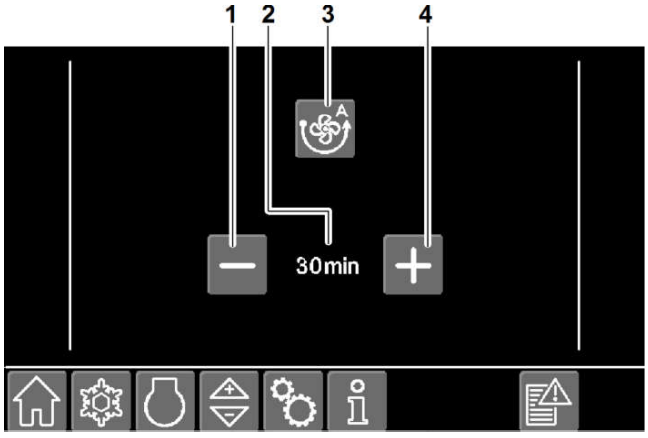

Fig. 702: Automatic reversible fan drive menu

1 *Reducing time interval* button
2 Set time interval
3 *Automatic reversible fan drive* button
4 *Increasing time interval* button

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Key	Function
	Automatic reversible fan drive is switched off.
	Automatic reversible fan drive is switched on.

Tab. 67: Automatic reversible fan drive button

▶ Make sure that air intake area is free from persistent soiling (For more information see: 5.9.2 Checking cooling system and heat exchanger for contamination and cleaning, page 328) .

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3.5 Shut-off functions

3.5.1 Stick cylinder shut-off (option)

Stick cylinder shut-off prevents collision between the working attachment and the operator's cab and obstacles in front of the machine.

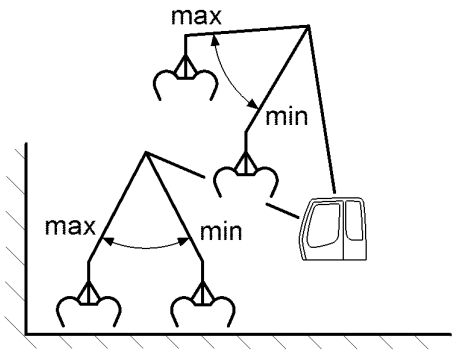

Fig. 705: Shut-off points: Retracting stick (min), extending stick (max)

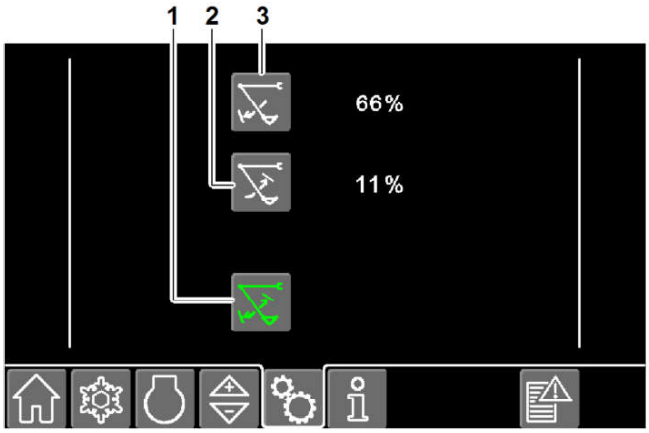

Fig. 706: Stick cylinder shut-off menu

1 *Stick cylinder shut-off* button
2 *Inner shut-off point* button
3 *Outer shut-off point* button

Key	Meaning
	Stick cylinder shut-off is switched on.
	It is possible to move the stick between the shut-off points.
	It is exclusively possible to set new shut-off points within the permitted working range.
	It is possible to bypass the shut-off points for 10 seconds.

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Key	Meaning
	Stick cylinder shut-off is switched off.
	It is possible to set new shut-off points without restrictions.
	It is possible to move the stick without restrictions.
	Button is black. Teaching in shut-off point function is not available.

Tab. 68: Keys

Status symbol	Meaning
	Shortly before the shut-off point is reached the speed of the stick movements is automatically reduced.
	When a shut-off point is reached, the stick movement stops.
	When a shut-off point is reached, it is exclusively possible to move the stick to the other shut-off point.
	Stick cylinder shut-off is bypassed.
	It is possible to move the stick without restrictions.

Tab. 69: Status symbols

DANGER
Unexpected settings!
Danger to life.

- ▶ Inform all operators of machine about changes.
- ▶ Set shut-off points again after every working tool change.

Switching on stick cylinder shut-off

- ▶ Press *function settings* menu button.
- ▶ Press *stick cylinder shut-off* menu button.

- ▶ Press *stick cylinder shut-off* button **1**.
- ▶ Press confirmation button.
  ▷ *Stick cylinder shut-off* button lights up green:

Switching off stick cylinder shut-off

- ▶ Press *function settings* menu button.
- ▶ Press *stick cylinder shut-off* menu button.

- ▶ Press *stick cylinder shut-off* button **1**.
- ▶ Press confirmation button.
  ▷ *Stick cylinder shut-off* button lights up white:

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Setting stick cylinder shut-off

DANGER
Swinging working tool!
Danger to life.

▶ Set shut-off points with adequate safe distance (swinging working tool, long stopping distance for working attachment).

Teaching in the outer shut-off point

▶ Put machine in working position.

If machine is equipped with 4-point support:
▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
▶ Extend support and move working attachment over support.

▶ Extend stick to required maximum reach.

▶ Press *outer shut-off point* button **3**.

▶ Press confirmation button.
▷ Outer shut-off point is saved.

Teaching in the inner shut-off point

If stick cylinder shut-off is switched on, new shut-off points are exclusively possible within approved movement range.

▶ Put machine in working position.

If machine is equipped with 4-point support:
▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
▶ Extend support and move working attachment over support.

▶ Retract stick to required minimum reach.

▶ Press *inner shut-off point* button **2**.

▶ Press confirmation button.
▷ Inner shut-off point is saved.

Checking stick cylinder shut-off

▶ Put machine in working position.

If the machine is equipped with 4-point support:
▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
▶ Extend support and move working attachment over support.

▶ Switch on stick cylinder shut-off.

▶ Extend and retract stick cylinder until stick cylinder shut-off is switched off.

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- ▶ Measure reaches.
- ▶ Make sure that the set minimum and maximum values are not exceeded.

Bypassing stick cylinder shut-off

- ▶ Press *bypassing stick cylinder shut-off* button.
- ▶ Press confirmation button.
  - ▷ *Stick cylinder shut-off bypassed* status symbol appears.

  - ▷ Warning sound sounds.
  - ▷ Shut-off points are bypassed for 10 seconds.
  - ▷ It is possible to move the stick without restrictions.

3.5.2 Hoist cylinder shut-off (option)

Hoist cylinder shut-off prevents collision between working attachment and obstacles in workspace.

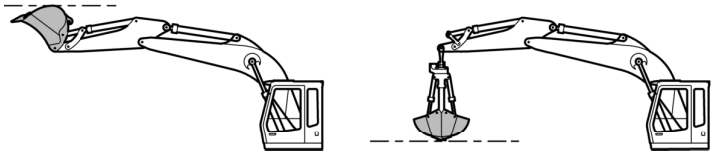

Fig. 720: Maximum height with bucket, minimum height with grapple

Depending on constellation of working tool and working attachment, the actual highest or lowest point is above or below the shut-off point of the hoist cylinders.

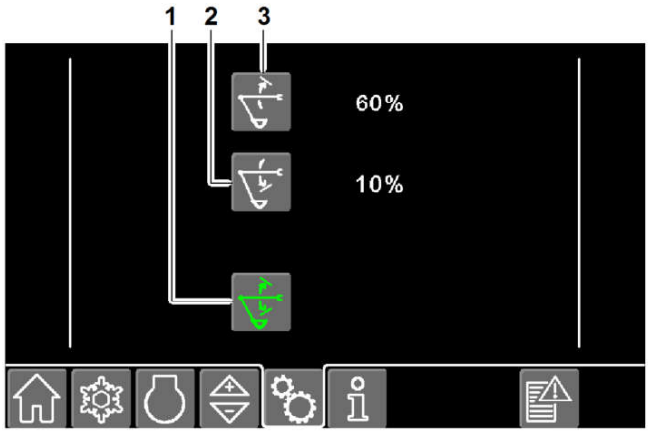

Fig. 721: Hoist cylinder shut-off menu

1 *Hoist cylinder shut-off* button
2 *Lower shut-off point* button
3 *Upper shut-off point* button

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Key	Meaning
	Hoist cylinder shut-off is switched on
	It is possible to move the boom between the shut-off points.
	It is exclusively possible to set new shut-off points within the permitted working range.
	It is possible to bypass the shut-off points for 10 seconds.
	Hoist cylinder shut-off is switched off
	It is possible to set new shut-off points without restrictions.
	It is possible to move the boom without restrictions.
	Button is black. Teaching in shut-off point function is not available.

Tab. 70: Keys

Status symbol	Meaning
	Shortly before the shut-off point is reached, the speed of the boom movement is reduced automatically.
	When a shut-off point is reached, the boom movement stops.
	When a shut-off point is reached, it is exclusively possible to move the boom to the other shut-off point.
	Hoist cylinder shut-off is bypassed.
	It is possible to move the boom without restrictions.

Tab. 71: Status symbols

CAUTION
Unexpected settings!
Danger to life.

- ▶ Inform all operators of machine about changes.
- ▶ Set shut-off points again after every working tool change.

Switching on hoist cylinder shut-off

- ▶ Press *function settings* menu button.
- ▶ *Hoist cylinder shut-off* menu button.

- ▶ Press *hoist cylinder shut-off* button **1**.
  - ▷ *Confirmation required* status symbol appears on the display:

- ▶ Press confirmation button within 5 seconds.
  - ▷ *Hoist cylinder shut-off* button lights up green:

Switching off hoist cylinder shut-off

- ▶ Press *function settings* menu button.
- ▶ *Hoist cylinder shut-off* menu button.

- ▶ Press *hoist cylinder shut-off* button **1**.
  - ▷ *Confirmation required* status symbol appears on the display:

- ▶ Press confirmation button within 5 seconds.
  - ▷ *Hoist cylinder shut-off* button lights up white:

Setting hoist cylinder shut-off

DANGER
Swinging working tool!
Danger to life.

- ▶ Set shut-off points with adequate safe distance (swinging working tool, long stopping distance for working attachment).

Teaching in upper shut-off point

If hoist cylinder shut-off is switched on, new shut-off points are exclusively possible within approved movement range.

- ▶ Put machine in working position.

If machine is equipped with 4-point support:
- ▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
- ▶ Extend support and move working attachment over support.
- ▶ Move boom up to required maximum working height.

- ▶ Press *upper shut-off point* button **3**.
  - ▷ *Confirmation required* status symbol appears on the display:

- ▶ Press confirmation button within 5 seconds.
  - ▷ Upper shut-off point is saved.

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Teaching in lower shut-off point

If hoist cylinder shut-off is switched on, new shut-off points are exclusively possible within approved movement range.

▶ Put machine in working position.

If machine is equipped with 4-point support:
▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
▶ Extend support and move working attachment over support.

▶ Move boom down to required minimum working height.

▶ Press *lower shut-off point* button **2**.
▷ *Confirmation required* status symbol appears:

▶ Press confirmation button within 5 seconds.
▷ Upper shut-off point is saved.

Checking hoist cylinder shut-off

▶ Put machine in working position.

If machine is equipped with 4-point support:
▶ Extend support.

If the machine is equipped with 2-point support or a support blade:
▶ Extend support and move working attachment over support.

▶ Switch on hoist cylinder shut-off.

▶ Extend and retract hoist cylinder until hoist cylinder shut-off switches off.

▶ Measure heights.

▶ Make sure that the set minimum and maximum values are not exceeded.

Bypassing hoist cylinder shut-off

▶ Press *bypassing hoist cylinder shut-off* button.
▷ *Confirmation required* status symbol appears.

▶ Press confirmation button within 5 seconds.
▷ *Hoist cylinder shut-off bypassed* status symbol appears on the display:

▷ Warning sound sounds.
▷ Shut-off points are bypassed for 10 seconds.
▷ It is possible to move the boom without restrictions.

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3.5.3 Stick cylinder shut-off for heavy working tool (option)

Stick cylinder shut-off for heavy working tool has the following advantages:
– Limits the movement of the working attachment.
– Machine stability is increased.

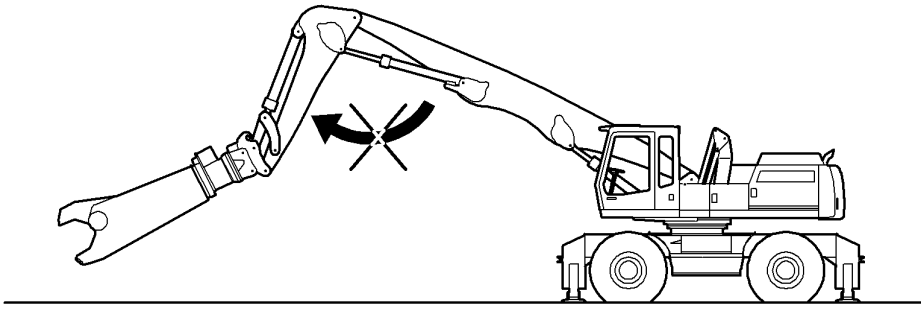

Fig. 745: Stick cylinder shut-off for heavy working tool

Automatic activation of stick cylinder shut-off for heavy working tool

The stick cylinder shut-off for heavy working tool is activated automatically when one of the following actions is performed:
– Turn ignition key to position 1.
– Activate safety lever.
– Activate quick coupler.

Display

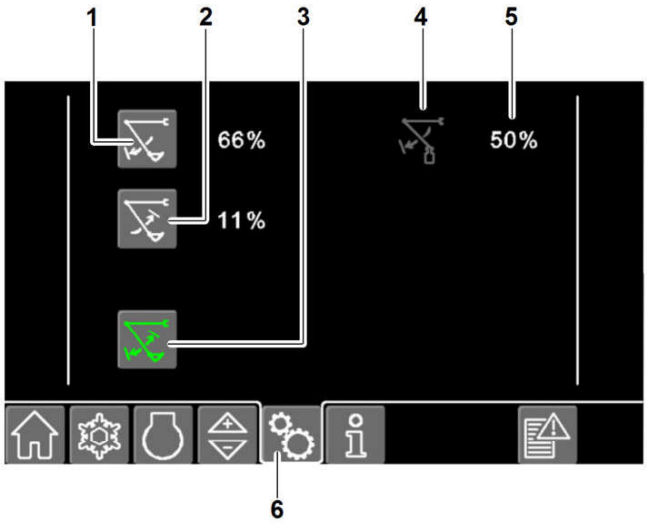

Fig. 746: Stick cylinder shut-off menu

1 Shut-off point for extending stick

2 Shut-off point for retracting stick

4 *Stick cylinder shut-off for heavy working tool* symbol

5 Value to stick cylinder shut-off for heavy working tool

See next page for continuation of the image legend

3	Stick cylinder shut-off ON and OFF	**6**	*Machine-specific settings* menu

Active stick cylinder shut-off for heavy working tool

DANGER
Working tool not approved!
Danger to life.

▶ Exclusively use working tool approved for set shut-off point.

If operating heavy working tool by a different manufacturer:
▶ Contact Liebherr customer service.

▶ Make sure there are no persons in working area of machine.

NOTICE
Maximum permitted hydraulic pressure exceeded!
Damage to machine.

▶ Exclusively use working attachment as intended.

DANGER
Working attachment sinks in uncontrolled manner!
Danger to life.

▶ Make sure there are no persons in working area of machine.

Note

When the maximum movement of the stick is reached, the stick cylinder shut-off for heavy working tool stops the movement of the attachment.
▶ Reduce movement of attachment.

3.5.4 Bypassing stick cylinder shut-off for heavy working tool

Activating bypass

If the hydraulic excavator is operated with standard working tools (for example a grapple), it is possible to bypass the stick cylinder shut-off for heavy working tool.

The stick can be retracted or extended without restriction in the approved working area of the stick cylinder shut-off.

DANGER
Stick cylinder shut-off for heavy working tool is bypassed!
Machine tips.

▶ Bypass stick cylinder shut-off for heavy working tool exclusively in exceptions.

▶ Carefully move working attachment.

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▶ Press *bypass stick cylinder shut-off for heavy working tool* key.
▷ *Confirmation required* symbol appears on the display.

▶ Press confirmation button within 5 seconds.
▷ *Stick cylinder shut-off for heavy working tool active* symbol goes out:

▷ *Stick cylinder shut-off for heavy working tool bypassed* symbol appears:

▷ LEDS in *bypass stick cylinder shut-off for heavy working tool* key light up.
▷ Stick can be retracted without restriction in the approved working area of the stick cylinder shut-off.
▷ Stick can be extended without restriction in the approved working area of the stick cylinder shut-off.

Troubleshooting
Bypass is not activated?
If confirmation button is not pressed within 5 seconds, bypass is not activated.

▶ Activate bypass again.

Automatic deactivation of bypass

The stick cylinder shut-off for heavy working tool bypass is deactivated automatically when one of the following actions is performed:
– Shut off diesel engine.
– Activate safety lever.
– Activate quick coupler.

Deactivating bypass

▶ Press *bypass stick cylinder shut-off for heavy working tool* key.
▷ LEDS in *bypass stick cylinder shut-off for heavy working tool* key go out.
▷ *Stick cylinder shut-off for heavy working tool bypassed* symbol goes out:

▷ *Stick cylinder shut-off for heavy working tool active* symbol appears:

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3.5.5 Height limitation

Height limitation menu

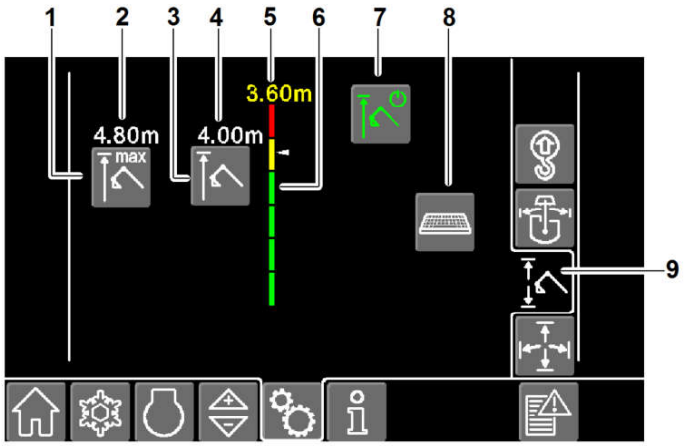
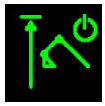


Fig. 755: Height limitation menu

1 *Maximum working height* button
2 Limit value set for maximum working height
3 *Reduced working height* button (option)
4 Limit value set for reduced working height
5 Current height of working attachment
6 Scale
7 *Height limitation* button
8 *Showing keyboard* button
9 *Depth limitation and height limitation* menu button

Button	Meaning
	Settings for height limitation are enabled. Height limitation is switched off.
	Settings for height limitation are enabled. Height limitation is switched on.
	Settings for height limitation are locked. Height limitation is switched on.

Tab. 72: Status of height limitation button

Enabling settings for height limitation

A supervisor is authorised to enable following settings for the operator:
– Switch off height limitation.
– Switch on height limitation.
– Change maximum working height limit value.

Make sure the following precondition is met:
❑ Supervisor is present with authorisation key.

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▶ Turn key to right into enabled position for authorisation.

▶ Press *height limitation* button.

▶ Press confirmation button.
▷ *Height limitation* button lights up white:

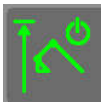
▶ Turn key to left for authorisation.

Switching on height limitation

Make sure the following precondition is met:
❑ Settings for height limitation are enabled.

▶ Press *height limitation* button.

▶ Press confirmation button.
▷ *Height limitation* button lights up green:



Switching off height limitation

Make sure the following precondition is met:
❑ Settings for height limitation are enabled.

▶ Press *height limitation* button.

▶ Press confirmation button.
▷ *Height limitation* button lights up white:

Locking settings for height limitation

Note
After height limitation is locked, switched-on load moment limitation is locked.

▶ Make sure that load moment limitation is switched off.

Note
After height limitation is locked, switched-on slew limitation is locked.

▶ Make sure that slew limitation is switched off.

Note
After height limitation is locked, switched-on virtual wall is locked.

▶ Make sure that virtual wall is switched off.

A supervisor is authorised to lock following settings for the operator:
– Switch off height limitation.

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– Change maximum working height limit value.

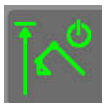
If settings of height limitation are locked, it is possible to change the limit value of the reduced working height (option). (For more information see: Maximum working height, page 204)

Make sure the following precondition is met:
❑ Supervisor is present with authorisation key.

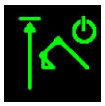
▶ Turn key to right into enabled position for authorisation.

▶ Press *height limitation* button.

▶ Press confirmation button.
▷ *Height limitation* button lights up green:



▶ Turn key to left.
▷ *Height limitation* button is not active:



▷ Height limitation is switched on.
▷ Height limitation is locked.

Setting height limitation

DANGER
Geometry data settings incorrect!
Danger to life.

▶ After changing working attachment, make sure that Liebherr customer service reprograms geometry data.

DANGER
Incorrectly set limitation!
Danger to life.

▶ Make sure that working attachment does not exceed maximum working height in entire working area.

▶ Make sure that oscillating working tools do not collide with obstacles.

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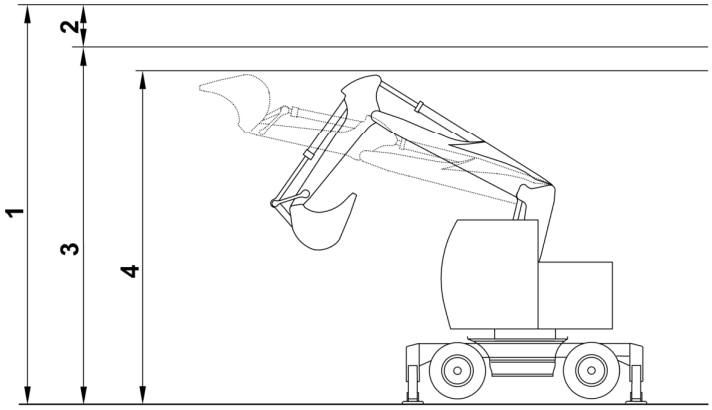

Fig. 764: Height limitation

1	Restricting height	**3**	Maximum working height
2	Prescribed safe distance	**4**	Reduced working height (option)

The height limitation calculation is based on the maximum radius of largest Liebherr bucket (1.75 m). If the Tool Management option is activated, the maximum radius of working tool is determined by settings in Tool Management.

Maximum working height

The limit value of maximum working height depends on following factors:
- Position of working attachment
- Machine is working on a slope.
- Machine is working on uneven ground.
- Lowest point of restricting height
- Type of support
- One-sided support

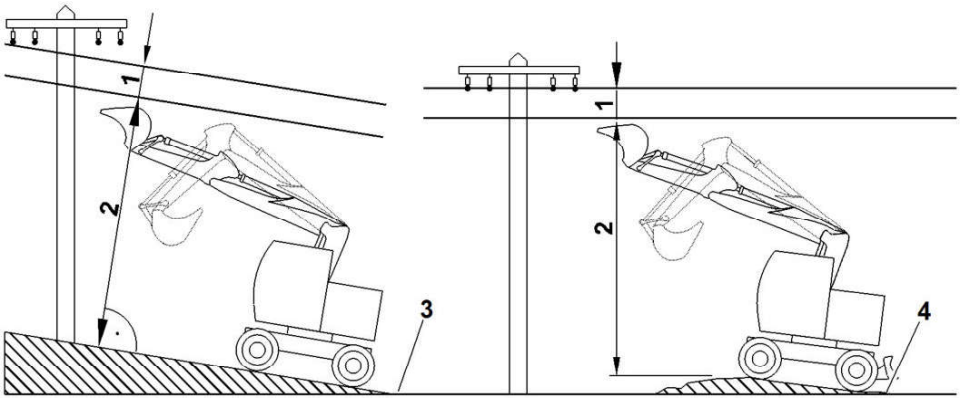

Fig. 765: Example factors for setting maximum working height

1	Safe distance	**3**	Pitch
2	Maximum working height	**4**	Uneven ground

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Teaching in maximum working height

DANGER
High voltage!
Danger to life.

If an overhead power line restricts the height:
▶ Set maximum height limit value exclusively by hand.

Make sure the following preconditions are met:
❑ Supervisor supervises the setting of limit value.
❑ Settings for height limitation are enabled.
❑ Height limitation is switched on.
❑ Machine is in working position.
❑ Working tool operating mode is selected.

If new maximum working height is higher than previously set maximum working height:
▶ Bypass height limitation. (For more information see: Bypassing height limitation, page 209)

▶ Move working attachment up to limit value of maximum permitted working height.

▶ Press *maximum working height* button.

▶ Press confirmation button.
▷ Limit value of maximum working height value is saved.

Entering maximum working height

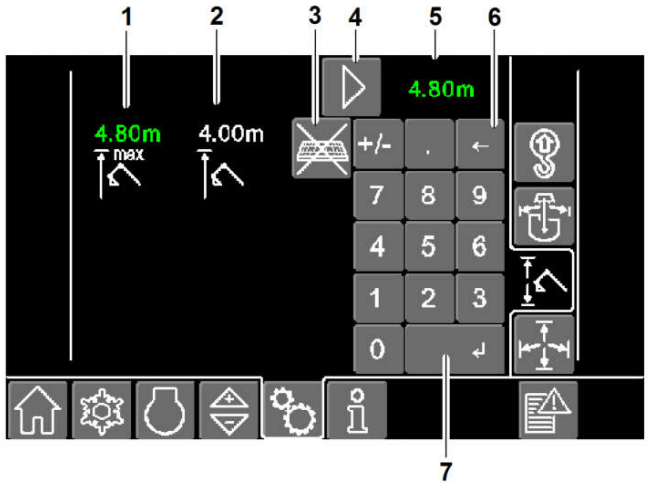

Fig. 768: Entering limit value manually menu

1	Limit value of maximum working height	**5**	Manually set limit value
2	Limit value of reduced working height	**6**	*Delete* button
3	*Hiding keyboard* button	**7**	*Accept* button
4	*Changeover* button		

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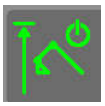

Make sure the following preconditions are met:
- ❑ Supervisor supervises the setting of limit value.
- ❑ Settings for height limitation are enabled.
- ❑ Height limitation is switched on.
- ❑ Machine is in working position.
- ❑ Working tool operating mode is selected.

▶ Press *showing keyboard* button.
  ▷ *Entering limit value manually* menu appears on the display.

If limit value of reduced working height **2** appears in green:
▶ Press *changeover* button **4**.
  ▷ Limit value of maximum working height **1** appears in green.

If limit value of maximum working height **1** appears green:
▶ Enter limit value of maximum working height **1**.

▶ Press *accept* button **7**.

▶ Press confirmation button.
  ▷ Limit value of maximum working height **1** value is saved.

▶ Press *hiding keyboard* button **3**.
  ▷ *Height limitation* menu appears on the display.

Reduced working height (option)

Teaching in reduced working height

Make sure the following preconditions are met:
- ❑ Height limitation is switched on.
- ❑ Machine is in working position.
- ❑ Working tool operating mode is selected.

If new limit value for reduced working height is higher than limit value set previously:
▶ Bypass height limitation. (For more information see: Bypassing height limitation, page 209)

▶ Move working attachment up to required limit value of reduced working height.

▶ Press *reduced working height* button.

▶ Press confirmation button.
  ▷ Upper shut-off point limit value is saved.

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Entering reduced working height

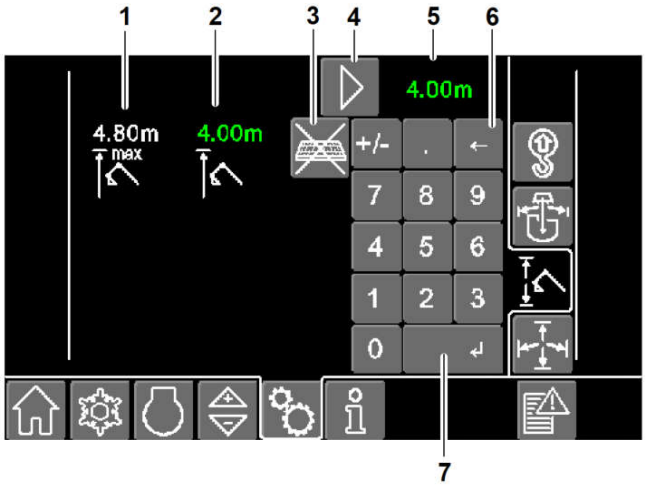

Fig. 772: Entering limit value manually menu

1	Limit value of maximum working height	**5**	Manually set limit value
2	Limit value of reduced working height	**6**	*Delete* button
3	*Hiding keyboard* button	**7**	*Accept* button
4	*Changeover* button		

Make sure the following preconditions are met:
- ❑ Height limitation is switched on.
- ❑ Machine is in working position.
- ❑ Working tool operating mode is selected.

▶ Press *showing keyboard* button.
▷ *Entering limit value manually* menu appears on the display.

If limit value of maximum working height **1** appears green:
▶ Press *changeover* button **4**.
▷ Limit value of reduced working height **2** appears in green.

If limit value of reduced working height **2** appears in green:
▶ Enter limit value of reduced working height **2**.

▶ Press *accept* button **7**.

▶ Press confirmation button.
▷ Limit value of reduced working height **2** is saved.

▶ Press *hiding keyboard* button **3**.
▷ *Height limitation* menu appears on the display.

Working with height limitation

DANGER
Incorrectly set limit values!
Danger to life.

If working tool has been changed:
▶ Set limit values.

▶ Make sure that correct operating mode is selected.

Note
Moving contour stops the movement of working attachment!

▶ Enable stick movement: Lower working attachment.

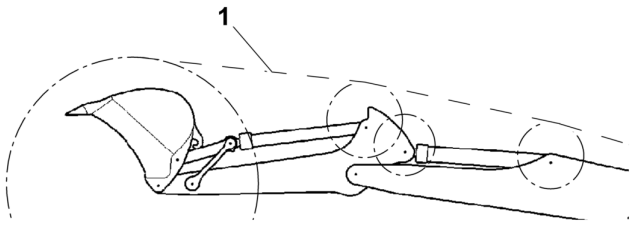

Fig. 774: Moving contour

1 Moving contour

The moving contour considers the arrangement of the working attachment:
– Hydraulic lines
– Electrical cables
– Hydraulic cylinders
– Line break safeties
– Movement radii of working attachment
– Movement radius 1.75 m of largest Liebherr bucket

Note

If change to movement radius is necessary:
▶ Contact Liebherr customer service.

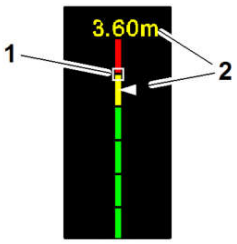

Fig. 775: Scale in height limitation menu

1 Set limit value

2 Current height of working attachment

Scale	Status symbol	Meaning
Font colour of current height of working attachment **2** is green. Arrow is in green area of scale.		Working attachment is moving in safe area.
Font colour of current height of working attachment **2** is yellow. Arrow is in yellow area of scale.		Working attachment is moving close to set limit value. Speed of movement of working attachment is reduced.

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Scale	Status symbol	Meaning
Font colour of current height of working attachment **2** is red. Arrow is at set limit value.		Movement of working attachment has stopped. Exclusively movement into safe area possible.
Font colour of current height of working attachment **2** is red. Arrow is in red area of scale.		Height limitation is bypassed.

Tab. 73: Height limitation function

DANGER
Collision between working attachment and obstacles!
Danger to life.

▶ Move working attachment slowly.

DANGER
Collision between working attachment and obstacles!
Danger to life.

When height limitation stops movement of working attachment:
▶ Do not change position of support.
▶ Exclusively move laterally adjustable boom into safe area.

▶ Make sure that operator is informed of changed limit values.
▶ Checking height limitation. (For more information see: Checking height limitation, page 210)

Bypassing height limitation

It is possible to bypass the height limitation temporarily. After 10 seconds, the working attachment can exclusively be moved downward.

DANGER
Collision between working attachment and obstacles!
Danger to life.

▶ Bypass height limitation exclusively in exceptional cases.
▶ Carefully move working attachment.

▶ Press *bypassing height limitation* key.
▶ Press confirmation button.
▷ *Height limitation bypassed* status symbol appears on the display:

▷ Height limitation is bypassed for 10 seconds.
▷ Intermittent warning sound sounds.

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Checking height limitation

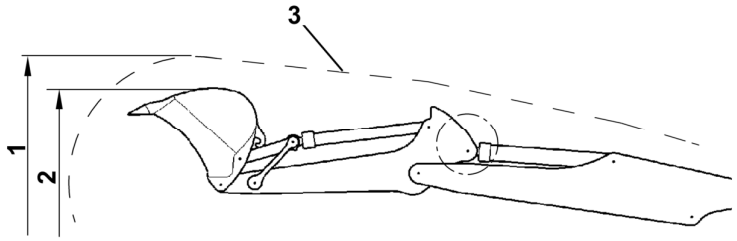

Fig. 780: Checking height limitation

1 Set limit value
2 Working height
3 Moving contour

Make sure the following preconditions are met:
- ❑ Machine is on level and firm ground.
- ❑ Uppercarriage is aligned parallel to undercarriage.
- ❑ Working tool operating mode is selected.
- ❑ Height limitation is switched on.

▶ Make sure that height limitation is not checked under restricting height.

▶ Fully extend working attachment forward.

▶ Retract bucket cylinder until working tool is fully tilted.

▶ Move boom upward until height limitation stops movement.

▶ Measure working height **2**.

▶ Compare measured working height **2** with limit value on the display.

Note
Moving contour stops movement of working attachment!

▶ Make sure that measured working height is smaller than set limit value.

DANGER
Measured working height exceeds set limit value.
Danger to life.

▶ Do not work under restricting heights.

If measured working height exceeds set limit value:
▶ Contact Liebherr customer service.

3.5.6 Overload warning system (option)

Note

The overload warning system warns during work before maximum permitted load is exceeded.

Load-increasing movements do not stop.

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Activating overload warning system

DANGER
Machine tipping over!
Danger to life.

▶ Make sure that oscillating axle is locked.

An activated overload warning system is active after machine is started again.

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

Deactivating overload warning system

▶ Press *overload warning system* key.

▶ Press confirmation button.
▷ LEDs in key go out.

Working with overload warning system

The load lift values depend on following factors:
– Type of support
– Support via steering axle or rigid axle
– Reach of working attachment
– Counterweight

The load capacity values are changed by installation and removal of attachment components and working tools:
– For backhoe bucket attachment (including bucket cylinder, change lever and joint plate) the values at the tip of stick apply.
– If a quick coupler is used, the load lift values are reduced by approx. 240 kg.

The uppercarriage can be turned through 360° on firm and level ground with oscillating axle closed.

DANGER
Machine tipping over!
Danger to life.

▶ Do not exceed maximum permitted load.

▶ Move working attachment slowly.

▶ Make sure that oscillating axle is locked.

▶ Make sure that overload warning system is functioning correctly. (For more information see: Checking the overload warning system, page 212)

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DANGER
Machine tipping over!
Danger to life.

If warning sound sounds and *overload warning* status symbol appears on the display:
▶ Exclusively perform load-reducing movements.

If warning sound sounds and *overload warning system* status symbol appears on the display:
▶ Reduce reach.

Checking the overload warning system

According to regulations the overload warning system must be checked in following situations:
– After starting the machine
– Before lifting a load

Make sure the following preconditions are met:
❑ Machine is on level and firm ground.
❑ Uppercarriage is aligned parallel to undercarriage.
❑ Oscillating axle is locked.

▶ Raise boom to the stop.

▶ When the stop is reached, continue to steer boom in lifting direction.
  ▷ Overload warning system status symbol appears on the display.
  ▷ Warning sound sounds.

If no warning sound sounds of *overload warning system* status symbol does not appear on the display:
▶ Do not perform any load lifting work.

▶ Contact Liebherr customer service.

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3.5.7 Load moment limitation (option)

Load moment limitation menu

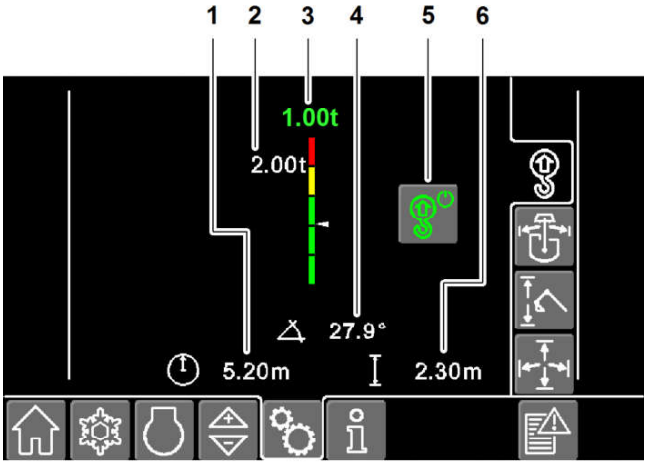

Fig. 783: Load moment limitation menu

1	Reach of loading point	**4**	Angle of uppercarriage to undercarriage
2	Maximum permitted load on hook	**5**	*Load moment limitation* button
3	Current load on hook	**6**	Height of loading point

Button	Meaning
	Load moment limitation is enabled. Load moment limitation is switched off.
	Load moment limitation is enabled. Load moment limitation is switched on.
	Load moment limitation is locked. Load moment limitation is switched on.

Tab. 74: Status of load moment limitation button

Enabling load moment limitation

A supervisor is authorised to enable following settings for the operator:
– Switch off load moment limitation.
– Switch on load moment limitation.

Make sure the following precondition is met:
❑ Supervisor is present with authorisation key.

▶ Turn key to right into enabled position for authorisation.

▶ Press *load moment limitation* button.

▶ Press confirmation button.
▷ *Load moment limitation* button lights up white:

▶ Turn key to left for authorisation.

Switching on load moment limitation

If activated, load moment limitation is switched on when machine is started again. The signal lamp lights up.

DANGER
Machine tipping over!
Danger to life.

▶ Make sure that oscillating axle is locked.

Make sure the following preconditions are met:
❑ Load moment limitation is enabled.

Switching on load moment limitation using the display

▶ Press *load moment limitation* button **5**.

▶ Press confirmation button.
▷ LEDs in *load moment limitation* key on control unit A light up.
▷ *Load moment limitation* button lights up green:

▷ Warning buzzer sounds briefly.
▷ Signal lamp lights up.

Switching on load moment limitation using control unit A

▶ Press *load moment limitation* key on control unit A.

▶ Press confirmation button.
▷ LEDs in *load moment limitation* key on control unit A light up.
▷ *Load moment limitation* button lights up green:

▷ Warning buzzer sounds briefly.
▷ Signal lamp lights up.

Switching off load moment limitation

Make sure the following precondition is met:
❑ Load moment limitation is enabled.

Switching off load moment limitation using display

▶ Press *load moment limitation* button **5**.

▶ Press confirmation button.
▷ LEDs in *load moment limitation* key on control unit A go out.

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▷ *Load moment limitation* button lights up white:

▷ Signal lamp goes out.
▷ *Load moment limitation not active* status symbol appears on the display:

Switching off load moment limitation using control unit A

▶ Press *load moment limitation* key on control unit A.

▶ Press confirmation button.
▷ LEDs in load moment limitation key on control unit A go out.
▷ *Load moment limitation* button lights up white:

▷ Signal lamp goes out.
▷ *Load moment limitation not active* status symbol appears on the display:

Locking load moment limitation

Note
After load moment limitation is locked, switched-on height limitation is locked.

▶ Make sure that height limitation is switched off.

Note
After load moment limitation is locked, switched-on depth limitation is locked.

▶ Make sure that depth limitation is switched off.

Note
After load moment limitation is locked, switched-on slew limitation is locked.

▶ Make sure that slew limitation is switched off.

A supervisor is authorised to lock following settings for the operator:
– Switch off load moment limitation.
– Switch on load moment limitation.

▶ Turn key to right into enabled position for authorisation.

▶ Press *load moment limitation* button.

▶ Press confirmation button.
▷ Load moment limitation button lights up green:

▶ Turn key to left for authorisation.
▷ *Load moment limitation* button is not active:

▷ LEDs in *load moment limitation* key on control unit A light up.
▷ Load moment limitation is switched on.
▷ Load moment limitation is locked.

Maximum permitted load

The machine control determines the maximum permitted load.

Note

The machine control does not take into account the support provided by blade.

The maximum permitted load capacity depends on following factors:
– Support by tyres
– Support by outriggers
– Reach of working attachment
– Undercarriage inclination

Working with load moment limitation

DANGER
Machine tipping over!
Danger to life.

▶ Make sure that load moment limitation is functioning correctly.

▶ Make sure that machine is on load-bearing and level ground.

▶ Make sure that machine does not build up vibrations.

▶ Do not change machine support when working with load moment limitation (for example raising outriggers).

▶ Adhere to load lift chart.

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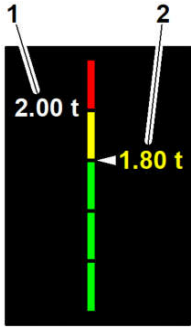

Fig. 798: Scale in load moment limitation menu

1 Maximum permitted load on hook **2** Current load on hook

Scale	Status symbol	Meaning
Font colour of current load on hook **2** is green. Arrow is in green area of scale.		Working attachment is moving in safe area.
Font colour of current load on hook **2** is yellow. Arrow is in yellow area of scale.		Working attachment moving close to maximum permitted load on hook **1**. Speed of working attachment is reduced. Intermittent warning sound sounds.
Font colour of current load on hook **2** is red. Arrow is in red area of scale.		Movement of working attachment has stopped. Exclusively movement into safe area possible. Continuous warning sound sounds.

Tab. 75: Function of load moment limitation

DANGER
Machine tipping over!
Danger to life.

When movement of working attachment stops:
▶ Do not move machine.

When warning sound sounds:
▶ Reduce reach.
▶ Put down load without increasing the reach.

Bypassing load moment limitation

DANGER
Beware of machine tipping!
Danger to life.

▶ Bypass load torque limitation in exceptional situations only.
▶ Move working attachment carefully.

▶ Press *bypassing load moment limitation* key.
▶ Press confirmation button.
▷ *Load moment limitation bypassed* status symbol appears on the display:

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▷ Load moment limitation is bypassed for 10 seconds.
▷ Intermittent warning sound sounds.

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3.6 General working methods

3.6.1 Working without damaging the machine

Comply with the following points in order to increase the service life of the machine and to avoid unnecessary damage and the need to carry out repairs as a result:

- Repeated striking of the working attachments against hard material will lead to damage to the machine. Do not use the working attachment to strike against material or objects to be demolished.
- Certain combinations of boom, stick and working tool mean that the working tool can strike against or penetrate the operator's cab. This can damage the operator's cab and injure the machine operator.
- The slewing gear can be damaged if the rotary motion is obstructed by an opposing force. Do not use the slewing gear to force the working attachment to penetrate material.
- The machine can be damaged by being raised using the working attachment. Do not lift the machine using the working attachment. If this does happen inadvertently nevertheless, lower the machine slowly onto the ground. Do not allow the machine to drop quickly, and do not attempt to cushion the drop using the hydraulics.

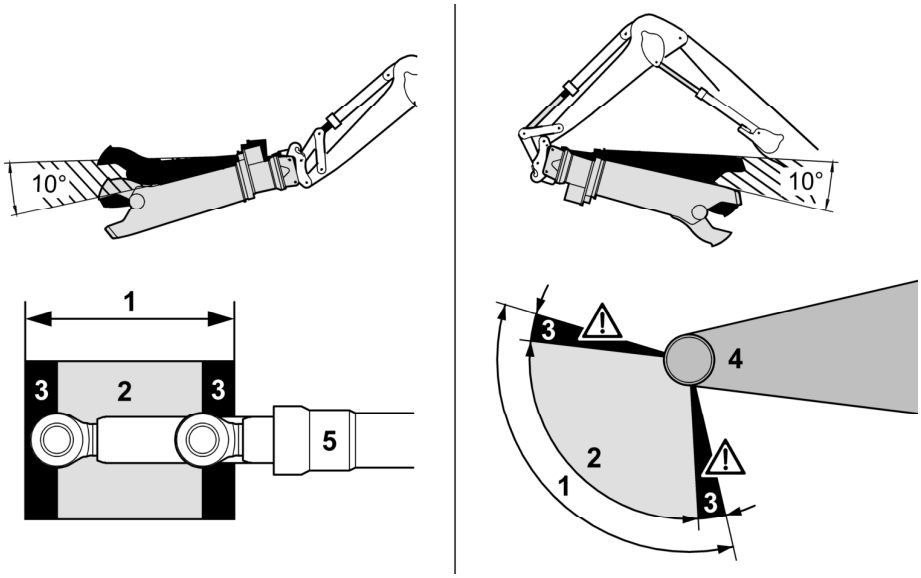

Fig. 803: Permissible working range for hydraulic cylinders

1 Possible slewing range
2 Permissible working range with 10° distance from the limit position
3 Boundary area
4 Boom or stick
5 Hydraulic cylinder

NOTICE
Damage to the machine due to incorrect handling of the tool attachment!
High pressures, torques and stresses can build up in the working attachment when working tools are used. The load is at its greatest when the hydraulic cylinders are completely extended or retracted (limit position) or the attachment is fully extended. Incorrect handling of the working tool can exceed the load limit. Attachment components, hydraulic cylinders and machines can be damaged!

- ▶ Do not move the hydraulic cylinders in or out all the way.
- ▶ Move the hydraulic cylinders carefully and slowly in the area of the limit positions (boundary area).
- ▶ When turning working tools, maintain a distance of at least 10° from the limit position of the bucket cylinder.

NOTICE
Damage to ballcocks!
Ballcocks are not used for controlling fluid flows, but for shutting off pipelines. Ballcocks must always be completely opened or closed. If the lever is in an intermediate position, the seals in the ballcock can be damaged.

- ▶ Always turn the lever of the ballcock all the way to the stop. The ballcock must be completely opened or closed.

3.6.2 Putting machine in working position

NOTICE
Unapproved use of parking brake!
Damage to travel gearbox.

- ▶ During work exclusively use service brake.

Putting machine with wheeled undercarriage with two axles in working position

- ▶ Make sure that travel direction switch is in neutral position.
- ▶ Make sure that parking brake is released.
- ▶ Lock service brake.
- ▶ Lock oscillating axle.
- ▶ Support machine.

Putting machine with wheeled undercarriage with more than two axles in working position

- ▶ Extend folding wings.
- ▶ Support machine.

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Putting machine with travel gear in working position

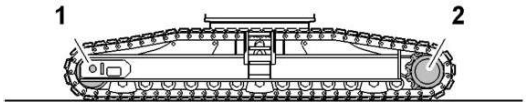

Fig. 804: Travel gear

1 Idler-wheel **2** Travel gearbox

▶ Perform work using idler-wheel.

3.6.3 Travelling at operating location

Basic travel position

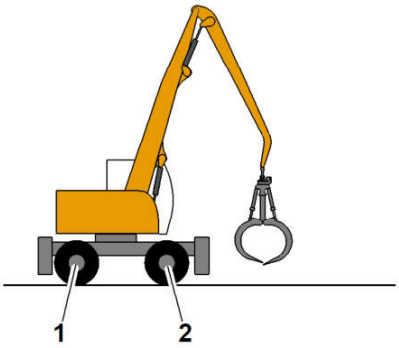

Fig. 805: Basic travel position

1 Rigid axle **2** Oscillating axle

▶ Empty working tool.

▶ Turn operator's cab over oscillating axle **2**.

▶ Move to basic travel position.

▶ Position working tool correctly: Make sure that working tool does not knock against machine during oscillating motions.

Travelling

DANGER
Poor visibility!
Danger to life.

▶ Illuminate section.

▶ Work with spotter.

▶ Make sure there is nobody in danger area.

Make sure following requirements are fulfilled:
❑ Driveway is clear.
❑ Travel without danger is possible.
❑ Basic travel position has been assumed.
❑ Oscillating axle is unlocked.
❑ Support is retracted.

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❑ Viewing devices have been adjusted.

▶ Warn persons in the area: Sound horn.

▶ Press accelerator pedal slowly.

If machine is equipped with solid rubber tyres:
▶ Make sure that solid rubber tyres do not overheat.

Following conditions lead to overheating of solid rubber tyres:
– Long paths of machine
– High speeds
– High outside temperature
– Condition of ground

▶ Maintain basic travel position while travelling.

If travel is exclusively possible with camera for rear area monitoring:
▶ Slowly move machine over short distances.

▶ Make sure that camera image is displayed in real time. (For more information see: Checking activity indicator, page 89)

3.6.4 Travelling with load at operating location

Note

Liebherr recommends travelling without load.

Basic travel position with load

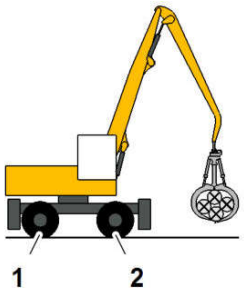

Fig. 806: Basic travel position with load

1 Oscillating axle **2** Rigid axle

▶ Turn operator's cab over rigid axle **2**.

▶ Draw working attachment in close to machine and simultaneously move load close to the ground.

▶ Position working tool correctly: Make sure that working tool does not knock against machine during oscillating motions.

Travelling with load

Make sure the following preconditions are met:
❑ Driveway is clear.
❑ Travel without danger is possible.
❑ Basic travel position with load has been assumed.
❑ Oscillating axle is unlocked.
❑ Support is retracted.

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WARNING
Steering directions reversed!
Injuries.

- ▶ Adhere to changed driving behaviour.
- ▶ Always travel with circumspection and caution.

- ▶ Warn persons in the area: Sound horn.
- ▶ Adhere to maximum speed of 4.0 km/h (walking speed). [21)]
- ▶ Press accelerator pedal slowly.
- ▶ Maintain basic travel position with load while travelling.
- ▶ Avoid abrupt travel movements.

3.6.5 Travelling under obstacles

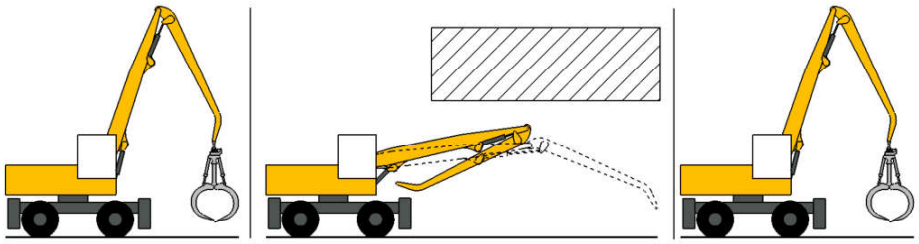

Fig. 807: Travelling under obstacles

- ▶ Drive up to obstacle in basic travelling position.
- ▶ Remove working tool.
- ▶ Lower and retract working attachment.

If it is not possible to travel under the obstacle with lowered and retracted working attachment:

- ▶ Lower and extend working attachment.
- ▶ Travel under obstacle.
- ▶ Install working tool.
- ▶ Move to basic travelling position.

[21)] Not valid for Timber

3.6.6 Handling loads

Handling loads

DANGER
Machine tipping over!
Danger to life.

- ▶ Make sure there are no persons in hazard zone.
- ▶ Make sure that ground has sufficient load-bearing capacity.
- ▶ Carry out all movements steadily.
- ▶ Draw working attachment in close to machine and move load close to the ground.

WARNING
Incorrect handling of grapple!
Injuries.

- ▶ Make sure that grapple and load do not swing close to operator's cab.
- ▶ Prevent grapple and load from swinging: Move joystick carefully and slowly.

- ▶ Adhere to load lift chart.
- ▶ Carefully take up load.
- ▶ Carefully swivel load over unloading point.
- ▶ Put down load.

or

Empty grapple.

Travelling with load

- ▶ Observe instructions about travelling.
- ▶ Align uppercarriage parallel to undercarriage.

3.6.7 Loading transport vehicle

DANGER
Falling load!
Danger to life.

- ▶ Make sure there are no persons in danger zone.
- ▶ Make sure that there are no persons in transport vehicle.
- ▶ Do not slew working attachment over operator's cab of transport vehicle.

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DANGER
Unapproved load!
Danger to life.

- ▶ Make sure there are no persons in danger zone.
- ▶ Exclusively load transport vehicle up to permitted height.
- ▶ Adhere to permitted dimensions and axle loads of transport vehicle.

- ▶ Approach transport vehicle from the rear or the side.
- ▶ Slew working attachment over loading area of transport vehicle.
- ▶ Distribute load evenly over loading area.
- ▶ Secure load correctly.

3.6.8 Lifting loads

For load-lifting work, loads are attached to the working attachment with lifting tackle for the following work:
– Lifting and lowering loads
– Transporting loads

DANGER
Machine tipping over!
Danger to life.

- ▶ Make sure that maximum load capacity of machine is not exceeded.
- ▶ Exclusively operate machine with prescribed and functional safety devices for load-lifting work in line with EN 474-5 (Europe) or ISO 20474-5 (international).

DANGER
Falling loads!
Danger to life.

- ▶ Make sure that maximum load capacity of lifting accessory is not exceeded.

Make sure for load-lifting work that following safety devices in line with EN 474-5 (Europe) and ISO 20474-5 (international) on the machine are in place and functional:
- ❑ **Lifting tackle for securely attaching a load**, for example load lift hooks or lifting eye on the working attachment or instead of the working tool.
- ❑ **Overload warning system** that indicates to the operator by visible and audible means when maximum permitted load lift is exceeded.
- ❑ **Line break safeties** on cylinders of working attachment as per ISO 8643.
- ❑ **Load lift chart in the operator's cab** with maximum load lifts without consideration of weights of quick coupler and working tool.

- ▶ Determine maximum load lift from load lift chart.

If quick coupler or working tool is installed on working attachment:
- ▶ Deduct weight of quick coupler and working tool from maximum load lift.
- ▶ Make sure that maximum load capacity is not exceeded.
- ▶ Make sure that exclusively the rigger attaches and releases loads.
- ▶ Make sure that rigger leaves the danger zone after attaching and releasing of load.

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- ▶ Exclusively raise and lower loads vertically.
- ▶ Move loads close to the ground.

3.6.9 Use of banksmen

Make sure the following preconditions are met:
- ❑ Banksman can be seen from the operator's platform.
- ❑ Banksman is aware of his task.
- ❑ Banksman knows hand gestures.
- ❑ Banksman wears high visibility clothing.
- ❑ In the dark or if visibility is poor, banksman works with signal lights.

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3.7 Installing and removing working attachment

3.7.1 Using quick coupler

WARNING
Pressurised hydraulic lines!
Injuries.

▶ Before installing and removing depressurise hydraulic system.

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

3.7.2 Installing and removing grapple on industrial stick

WARNING
Incorrect work on working attachment!
Injuries.

▶ Make sure that person by working tool is prepared for movements of working attachment.

▶ Make sure that no persons are in danger zone during movement of working attachment.

▶ Carefully move working attachment.

There are two ways to attach the grapple to the industrial stick of the machine.

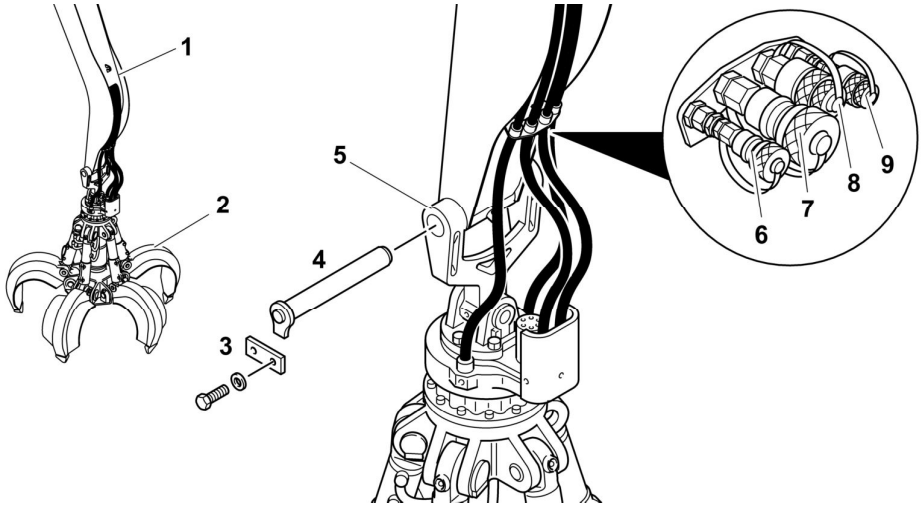

Fig. 808: Grapple on industrial stick, variant 1

1	Stick	**6**	Connection for turning grapple
2	Grapple	**7**	Connection for opening or closing grapple
3	Pin retention	**8**	Connection for opening or closing grapple

See next page for continuation of the image legend

4 Pin
5 Grapple suspension
9 Connection for turning grapple

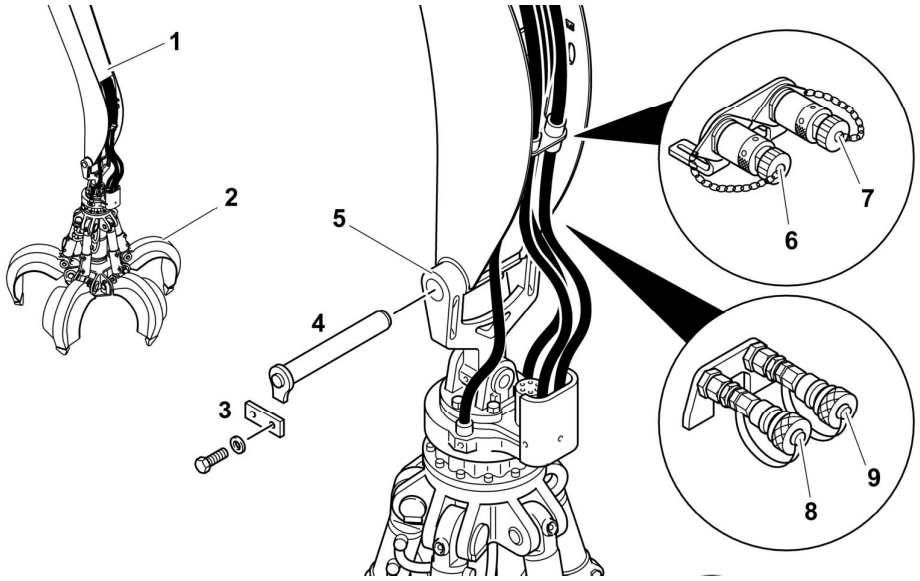

Fig. 809: Grapple on industrial stick, variant 2

1 Stick
2 Grapple
3 Pin retention
4 Pin
5 Grapple suspension
6 Connection for opening or closing grapple
7 Connection for opening or closing grapple
8 Connection for turning grapple
9 Connection for turning grapple

Installing grapple

CAUTION
Pressurised hydraulic lines!
Injuries.

▶ Before coupling and uncoupling depressurise hydraulic system.

NOTICE
Incorrect mixture of hydraulic oils!
Damage to hydraulic system.

▶ Do not mix hydraulic oils.

Make sure the following preconditions are met:
❑ Second person is available for support.
❑ Required hydraulic hoses for grapple operation are mounted on industrial stick.
❑ Tines of grapple are fully opened.
❑ Grapple stands safely on even surface.

▶ Depressurise hydraulic hoses. (For more information see: 5.10.1 Depressurising hydraulic system, page 330)

▶ Position bearings of industrial stick for grapple between bearings of grapple suspension.

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▶ Move folding console upwards.

▶ Insert pin.

▶ Secure pin with pin retention.

▶ Connect hydraulic hoses to pipes.

If grapple is equipped with rotary actuator:

▶ Connect rotary actuator device to pipes for auxiliary equipment with hydraulic hoses.

▶ Close and open grapple claws slowly several times.
▷ Hydraulic lines have been depressurised.

If grapple is equipped with rotary actuator:

▶ Turn grapple to the left and right through three turns.

▶ Swivel grapple to the left and right several times.
▷ Hydraulic lines have been depressurised.

Removing grapple

CAUTION
Pressurised hydraulic lines!
Injuries.

▶ Before coupling and uncoupling depressurise hydraulic system.

Make sure the following preconditions are met:

❑ Second person is available for support.
❑ Tines of grapple are fully opened.
❑ Grapple stands safely on even surface.

▶ Depressurise hydraulic hoses.

▶ Move folding console upwards.

▶ Disconnect hydraulic hoses from pipes on industrial stick.

▶ Prevent penetration of dirt: Immediately close open lines.

▶ Support grapple securely.

Note
Interlocked grapple suspension!
Stiff pin.

▶ Slightly raise working attachment.

▶ Remove pin retention.

▶ Carefully drive out pin.
▷ Grapple is removed.

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3.7.3 Installing and removing boom

DANGER
Machine tipping over!
Danger to life.

▶ Make sure that uppercarriage is aligned parallel to undercarriage.

If boom is removed:
▶ Do not turn uppercarriage.

▶ Contact Liebherr customer service.

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3.8 Parking machine

- ▶ Park machine on firm and level ground.
- ▶ Lower working attachment to the ground.
- ▶ Put control elements in neutral position.

If machine is equipped with wheeled undercarriage:
- ▶ Apply parking brake.

If machine is equipped with wheeled undercarriage:
- ▶ Release service brake.
- ▶ Move folding console up.
- ▶ Shut off diesel engine.
- ▶ Pull out ignition key.

If machine is equipped with wheeled undercarriages
- ▶ Secure machine with chocks to prevent it rolling away.

If machine is equipped with energy recuperation cylinder and block type ball valves on hoist cylinders:
- ▶ Close block type ball valves on hoist cylinders.
- ▶ Lock all doors and flaps and remove key.

If machine will not be used for a long time:
- ▶ Set battery main switch to **0**.

Note
Extended downtimes!
Discharged battery.

- ▶ Check charging state of battery.

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3.9 Transport

3.9.1 Preparatory work

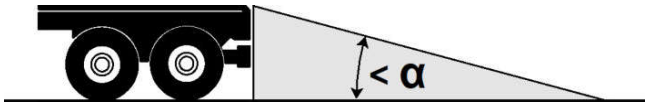

Fig. 810: Loading ramp

Make sure the following preconditions are met:
- ❑ Loading ramp is designed for required load capacity.
- ❑ Inclination angle α of loading ramp is smaller than 10°.
- ❑ Loading ramp is clean, free from snow and free from ice.
- ❑ Loading surface of low-loader is clean, free from snow and free from ice.

▶ Make sure that machine is clean, free from snow and free from ice.

▶ Make sure that machine is free from loose objects.

If machine exceeds permitted dimensions for transport:

▶ Contact Liebherr customer service.

▶ Place non-slip mats as per EN 12195-1 on loading surface of low-loader.

▶ Observe national regulations on transport.

Note

If it is not clear whether machine is suitable for transport:

▶ Contact Liebherr customer service.

3.9.2 Driving machine onto low-loader

Make sure the following precondition is met:
- ❑ Low-loader is suitable for transport and approved.

Note

Different machine configuration!

▶ Adhere to control description sticker in operator's cab. (For more information see: 3.1.5 Symbols on control description sticker, page 65)

DANGER

Machine tipping over!
Danger to life.

▶ Work with spotter.

▶ Adhere to swapped steering directions.

If working attachment is too large for transport:

▶ Have working attachment removed by Liebherr customer service. (For more information see: 3.7.3 Installing and removing boom, page 230)

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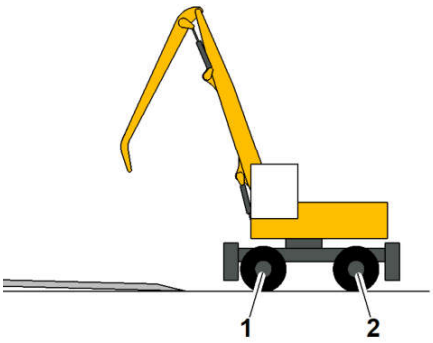

Fig. 811: Turning operator's cab over rigid axle

1 Rigid axle **2** Oscillating axle

- ▶ Align machine with low-loader.
- ▶ Turn operator's cab over rigid axle **1**.
- ▶ Drive slowly onto low loader with rigid axle **1** first.

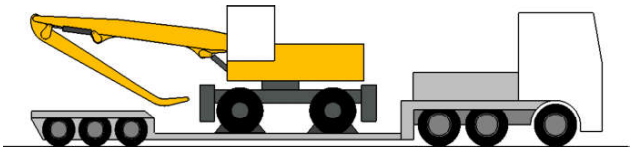

Fig. 812: Transport position on transport vehicle

- ▶ Align counterweight of machine with towing machine.
- ▶ Lower working attachment.

- ▶ Apply parking brake: Press *parking brake* button.
- ▶ Shut off diesel engine.
- ▶ Depressurise hydraulic system. (For more information see: 5.10.1 Depressurising hydraulic system, page 330)
- ▶ Move folding console up.
- ▶ Lock all doors and flaps and remove key.
- ▶ Fold in mirrors.
- ▶ Protect exhaust system from water penetration.
- ▶ Adhere to all permitted dimensions for transport.

If hydraulic hoses exceed permitted total height:

- ▶ Tie hydraulic hoses to working attachment with belts.

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3.9.3 Tying down machine

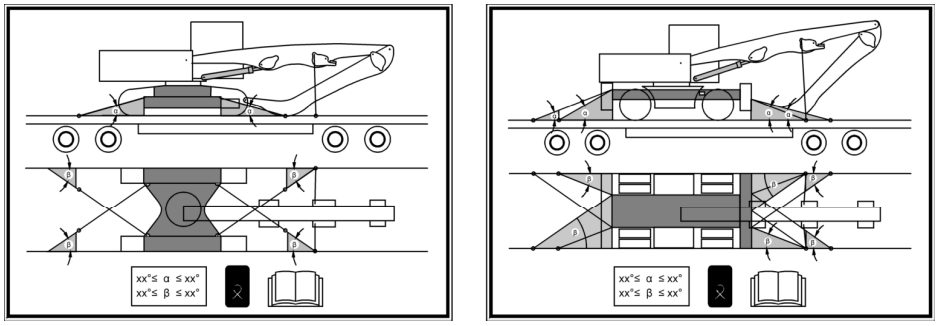

Fig. 814: Signs (example) in operator's cab

Make sure the following preconditions are met:
- ❑ Slip-resistant mats as per EN 12195-1 with a friction coefficient μ above 0.4 are designed for low-loaders.
- ❑ Lashing chains ensure lashing force as per EN 12195-3.

Maximum total weight of machine	Lashing force of lashing chain as per EN 12185-3
Up to 20 t	5000 daN
Up to 30 t	8000 daN
Up to 55 t	13400 daN
Up to 80 t	20000 daN
Over 80 t	32000 daN

Tab. 76: Lashing force of lashing chain as per EN 12185-3

DANGER
Machine slipping!
Danger to life.

- ▶ Secure machine adequately against slipping.
- ▶ Exclusively use suitable cables and chains.

- ▶ Determine maximum total weight of machine. (For more information see: 2.4.3 Identification plate, page 46)
- ▶ Select lashing chains according to maximum total weight of machine.
- ▶ Attach lashing chains to marked tie-down points of undercarriage.
- ▶ Arrange lashing chains crosswise.
- ▶ Attach lashing chains to tie-down points of low-loader.

If components have been removed:
- ▶ Tie down removed components.
- ▶ Make sure that lashing specifications on sign in operator's cab are adhered to.

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3.9.4 After transport

If stick has been removed:
▶ Contact Liebherr customer service.

Note
Different machine configuration!

▶ Adhere to control description sticker in operator's cab. (For more information see: 3.1.5 Symbols on control description sticker, page 65)

DANGER
Machine tipping over!
Danger to life.

▶ Work with spotter.

▶ Adhere to swapped steering directions.

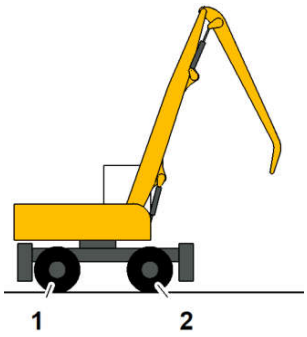

Fig. 816: Basic travel position

1 Rigid axle **2** Oscillating axle

▶ Remove protective devices attached for transport.

▶ Make sure that operator's cab is pointing in direction of oscillating axle.

▶ Move to basic travel position.

If hydraulic hoses are attached to working attachment:
▶ Remove straps of hydraulic hoses.

▶ Drive machine carefully off low-loader.

▶ Install removed parts.

▶ Adjust mirrors.

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3.10 Emergency operation

3.10.1 Jump starting

WARNING
Escaping corrosive acid and flammable gases!
Injuries.

- ▶ Wear safety glasses and protective gloves.
- ▶ Avoid naked flames.
- ▶ Avoid sparks.
- ▶ Do not smoke.

Connecting battery

- ▶ Connect red jump starting cable to positive pole (+) of empty battery.
- ▶ Connect red jump starting cable to positive pole (+) of external battery.
- ▶ Connect black jump starting cable to negative pole (-) of empty battery.
- ▶ Connect black jump starting cable to negative pole (-) of external battery.
- ▶ Start machine.

Disconnecting the battery

NOTICE
High voltage in on-board power supply!
Damage to electronic system of power-supplying machine.

- ▶ Switch on electrical users of power-supplying machine.

- ▶ Disconnect black jump cable from negative pole (-) of external battery.
- ▶ Disconnect black jump cable from negative pole (-) of empty battery.
- ▶ Disconnect red jump cable from positive pole (+) of external battery.
- ▶ Disconnect red jump cable from positive pole (+) of empty battery.
- ▶ Check electrical functions of machine.

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3.10.2 Lowering working attachment when engine is shut off

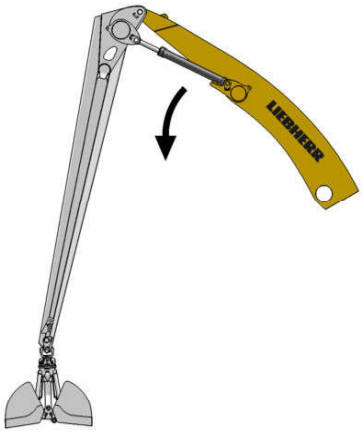
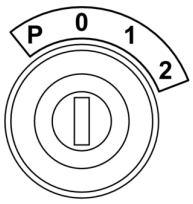


Fig. 817: Lowering working attachment when engine is shut off

Note
Limited pressure reserve!

- ▶ When engine is shut off, move joysticks exclusively to lower working attachment.
- ▶ When engine is shut off, press pedals exclusively to lower working attachment.



- ▶ Set ignition key to 1.
- ▶ Move folding console down.
- ▶ Lower working attachment: Operate joystick or pedal.

3.10.3 Lowering operator's cab in an emergency (option)

DANGER
Unapproved presence in danger zone!
Danger to life.

- ▶ Make sure no-one is in the danger zone under the operator's cab.
- ▶ Keep your distance from moving parts when the operator's cab is moving down.

NOTICE
Incorrect adjustment of operator's cab!
Damage to operator's cab and machine.

- ▶ Make sure there are no obstacles in the range of movement of operator's cab.
- ▶ Exclusively adjust operator's cab when machine is at a standstill.

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Emergency lowering lever in operator's cab

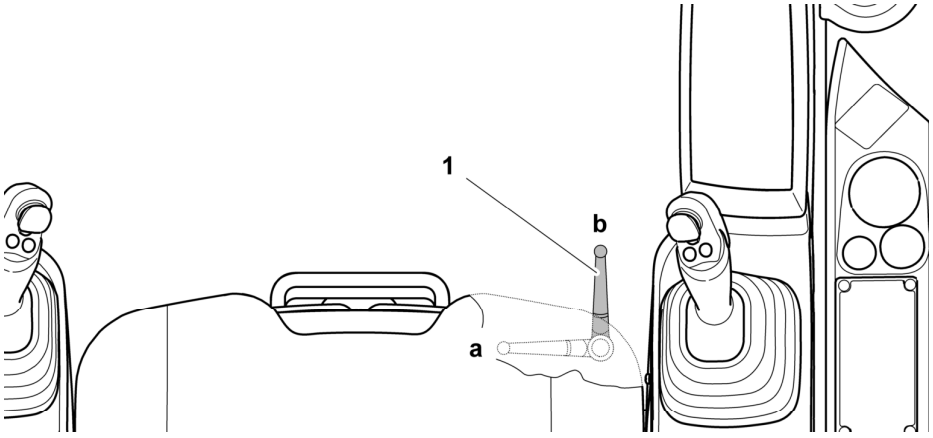

Fig. 819: Emergency lowering lever in operator's cab

1 Emergency lowering lever
a Cab adjustment mode position
b Emergency lowering position

▶ Move emergency lowering lever **1** to emergency lowering position **b**.
▷ Operator's cab is lowered.

▶ Stop lowering of operator's cab: Move emergency lowering lever **1** to cab adjustment mode position **a**.

Emergency lowering lever on pillar of cab lift frame

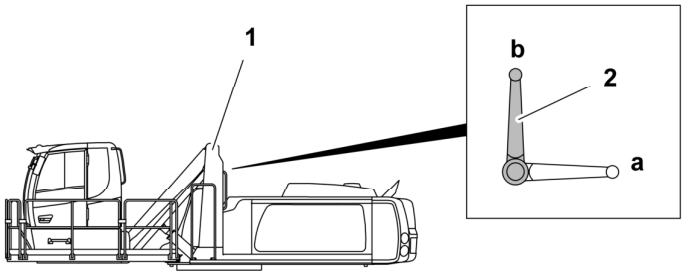

Fig. 820: Emergency lowering lever on pillar of cab lift frame

1 Pillar of cab lift frame
2 Emergency lowering lever
a Cab adjustment mode position
b Emergency lowering position

▶ Move emergency lowering lever **2** to emergency lowering position **b**.
▷ Operator's cab is lowered.

▶ Stop lowering of operator's cab: Move emergency lowering lever **2** to cab adjustment mode position **a**.

3.10.4 Towing

Towing is a stopgap measure and exclusively permitted in following situations:
– Tow machine out of danger area.
– Tow machine for repair.

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Towing machine out of danger area

If one of the following conditions applies, it is exclusively permitted to tow the machine from a danger area:
– Diesel engine is not running.
– Steering is not functional.
– Service brake is not functional.
– It is not possible to uncouple the transmission. (For more information see: 3.10.5 Transmission, page 241)
– No coupling on undercarriage in travel direction. (see: fig. 821, page 240)

DANGER
No braking effect!
Danger to life.

If service brake is not functional and simultaneously the transmission is uncoupled:
▶ Exclusively tow machine out of danger area with towing rod.

▶ Secure machine to prevent rolling away.

▶ Tow machine out of danger area.

Towing machine for repair

NOTICE
Incorrect towing!
Damage to drive train.

▶ Uncouple transmission.

▶ Do not exceed towing speed of 10 km/h.

If towing distance is greater than 5 km:
▶ Load machine on transporter.

Make sure the following preconditions are met:
❑ Diesel engine is running.
❑ Steering is functional.
❑ Service brake is functional.

▶ Tow machine for repair.

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Towing

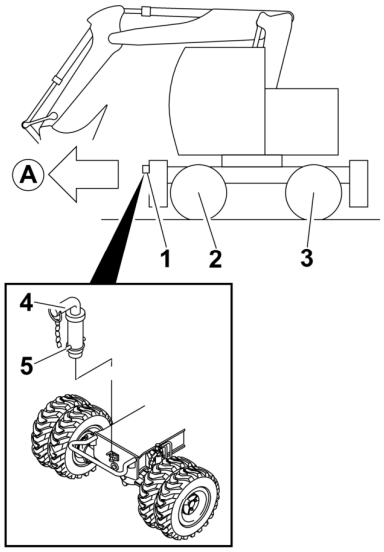

Fig. 821: Towing

A	Travel direction	**3**	Rigid axle
1	Coupling	**4**	Pin
2	Oscillating axle	**5**	Securing pin

- ▶ Switch on hazard light system: Press *hazard light system* key.
- ▶ Switch on vehicle illumination.
- ▶ Make sure that involved persons wear warning clothing.
- ▶ Secure accident area.
- ▶ Secure machine with chocks to prevent it rolling away.
- ▶ Uncouple transmission. (For more information see: 3.10.5 Transmission, page 241)

DANGER
Machine rolling away!
Danger to life.

- ▶ Exclusively use suitably dimensioned towing devices.

- ▶ Mount towing device with pin **4** and securing pin **5** to coupling **1** of undercarriage.
- ▶ Connect towing device to towing machine.
- ▶ Store chocks.
- ▶ Make sure that no one is between machine and towing vehicle.
- ▶ Turn uppercarriage in travel direction.
- ▶ Position working attachment in travel position.
- ▶ Tow machine with caution and circumspection.

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Parking machine with uncoupled transmission

DANGER
Insufficient braking effect!
Danger to life.

If transmission is uncoupled:
- ▶ Make sure that no unauthorised persons are in the danger area.
- ▶ Secure machine to prevent use.

Note
When transmission is uncoupled, the parking brake does not function!
- ▶ Use warning sign to draw attention to insufficient braking effect.

- ▶ Park machine on level and firm ground.
- ▶ Secure machine with chocks to prevent it rolling away.

3.10.5 Transmission

Uncoupling transmission

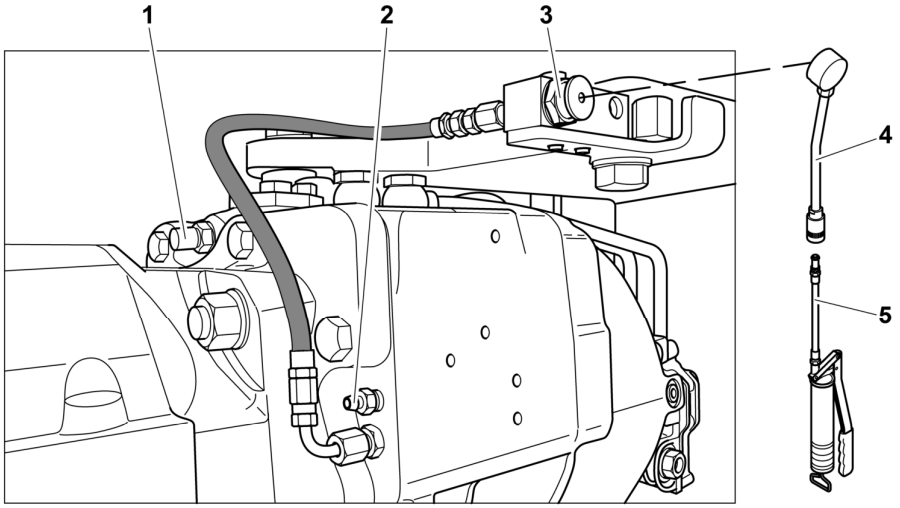

Fig. 823: Uncoupling transmission

1	Pressure relief valve	**4**	Adapter
2	Drain plug	**5**	Grease gun
3	Emergency release connection		

Adapter **4** and grease gun **5** are located in tool box.

DANGER
Service brake and parking brake inoperative!
Danger to life.
- ▶ Secure machine before uncoupling transmission to prevent it rolling away.

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NOTICE
Not approved load!
Damage to transmission.

- ▶ Do not switch gears in uncoupled state.
- ▶ Do not operate travelling pedal in uncoupled state.

- ▶ Mount adapter **4** on grease gun **5**.
- ▶ Connect adapter **4** to emergency release connection **3**.
- ▶ Inject grease until grease emerges from the pressure relief valve **1**.
  ▷ Transmission is uncoupled.

Connecting transmission

- ▶ Loosen drain plug **2** with wrench and unscrew until grease emerges.
- ▶ Start diesel engine.
- ▶ Operate service brake (pedal).
- ▶ Press *parking brake* key.

- ▶ Press *gear step* key several times.
  ▷ Grease emerges from drain plug **2**.

- ▶ Observe drain plug **2**.

If no more grease emerges:
- ▶ Shut off diesel engine.
- ▶ Tighten drain plug **2**.
  ▷ Transmission is coupled.

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4 Malfunctions

Machine reports machines through following warnings:
- Warning symbols on the display
- Messages on the display
- Warning sounds in the operator's cab

Rectify malfunction:
- Identify meaning of warning.
- Identify effects and property of malfunction.
- Rectify cause of malfunction.

Contact Liebherr customer service:
- Specify machine type.
- Specify serial number.
- Specify year of manufacture.
- When work is performed on the machine:
  Make sure that the work is performed exclusively by trained staff.

4.1 Service code tables

4.1.1 Warning symbols

Symbol	Meaning	Effect, characteristic	Remedy
	Battery voltage is too high. Alternator is defective.	Electrical system is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Battery voltage is too low. Alternator is defective. Battery is defective.	Functionality is restricted.	
	Hydraulic oil level is too low. Hydraulic system leaks, oil loss.	Hydraulic system is damaged. Hydraulic output is reduced automatically.	Shut off diesel engine. Fill with hydraulic oil. If symbol is still displayed: Contact Liebherr customer service.
	Prewarning: Hydraulic oil temperature is high.	Hydraulic system is damaged. Hydraulic output is reduced automatically.	Shut off diesel engine. Check hydraulic oil cooler for contamination. Clean if necessary. If symbol is still displayed: Contact Liebherr customer service.
	Hydraulic oil temperature is too high. Hydraulic oil cooler is contaminated. Fan drive of hydraulic oil cooler is defective.		

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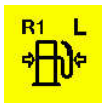
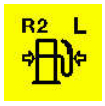
Symbol	Meaning	Effect, characteristic	Remedy
	Fuel level is too low.	Air is entering fuel system. Diesel engine will not start.	Refuel. Bleed fuel system if necessary.
	There is water in the fuel filter. There is water in the fuel tank.	Diesel engine does not reach full speed. Exhaust gas is white. Diesel engine is damaged.	Drain water from fuel filter. Drain water from fuel tank. If symbol is still displayed: Shut off diesel engine and contact Liebherr customer service.
	Prewarning: Fuel pressure is high or low. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Have fuel filter cleaned or replaced by authorized specialist personnel. If symbol is still displayed: Contact Liebherr customer service.
	Fuel pressure is too high or too low. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.		
	Prewarning: Fuel pressure is high. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Have fuel filter cleaned by authorized specialist personnel or replaced if necessary. If symbol is still displayed: Contact Liebherr customer service.
	Fuel pressure is too high. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.		
	Prewarning: Fuel pressure is low. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Have fuel filter cleaned by authorized specialist personnel or replaced if necessary. If symbol is still displayed: Contact Liebherr customer service.
	Fuel pressure is too low. Fuel filter is contaminated. Fuel filter is defective. Fuel lines are blocked or damaged.		
	Prewarning: Fuel pressure in Common Rail system 1 is low.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Contact Liebherr customer service.
	Fuel pressure in Common Rail system 1 is too low.		
	Prewarning: Fuel pressure in Common Rail system 2 is low.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Contact Liebherr customer service.
	Fuel pressure in Common Rail system 2 is too low.		

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Symbol	Meaning	Effect, characteristic	Remedy
	Prewarning: Fuel pressure in Common Rail system is high or low.	Diesel engine is running unevenly. Diesel engine output is reduced automatically.	Shut off diesel engine. Have fuel filter cleaned by authorized specialist personnel or replaced if necessary; If symbol does not disappear: Contact Liebherr customer service.
	Fuel pressure in Common Rail system is too high or too low.		
	Prewarning: Fuel temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Clean fuel cooler. If symbol is still displayed: Contact Liebherr customer service.
	Fuel temperature is too high.		
	Prewarning: Coolant level is low.	Diesel engine is damaged.	Shut off diesel engine. Fill with coolant. If symbol is still displayed: Contact Liebherr customer service.
	Coolant level is too low.		
	Prewarning: Coolant temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Reduce load. Fill with coolant. Clean engine cooler. If symbol is still displayed: Contact Liebherr customer service.
	Coolant temperature is too high.		
	Prewarning: Air filter is contaminated. Dust collecting tank is full.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Empty dust collecting tank. Replace air filter.
	Air filter is contaminated. Dust collecting tank is full.		
	Prewarning: Charge air temperature is high.	Diesel engine output is reduced automatically. Diesel engine is damaged.	Shut off diesel engine. Clean intercooling air circuit. If symbol is still displayed: Contact Liebherr customer service.
	Charge air temperature is too high.		
	Prewarning: Diesel engine speed is high.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Diesel engine speed is too high.		

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Symbol	Meaning	Effect, characteristic	Remedy
	Prewarning: A control error occurred while actuating diesel engine.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Control errors occurred while actuating diesel engine.		
	Prewarning: Oil pressure in diesel engine is low. Oil level of diesel engine is low.	Diesel engine is damaged.	Shut off diesel engine. Fill with diesel engine oil. If symbol is still displayed: Contact Liebherr customer service.
	Oil pressure in diesel engine is too low. Oil level of diesel engine is too low.		
	Prewarning: Oil level of diesel engine is low.	Diesel engine is damaged.	Shut off diesel engine. Fill with diesel engine oil. If symbol is still displayed: Contact Liebherr customer service.
	Oil level of diesel engine is too low.		
	A control error occurred while actuating diesel engine.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Control unit of diesel engine is defective.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Engine speed sensor is defective.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	An error occurred in the injection system of diesel engine.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Prewarning in case of control error of diesel engine: Emergency shut-off of diesel engine is recommended.	Diesel engine runs in emergency mode. Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Control error of diesel engine: Emergency shut-off of diesel engine is recommended.		
	A synchronisation error occurred while actuating the diesel engine.	Diesel engine is damaged.	Shut off diesel engine. Contact Liebherr customer service.

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Symbol	Meaning	Effect, characteristic	Remedy
	Control circuit of hydraulic system is depressurised.	Control of working attachment and uppercarriage is not possible.	Shut off diesel engine and restart. If symbol is still displayed: Contact Liebherr customer service.
	A general control error has occurred.	Functionality is restricted. Machine is damaged.	Shut off diesel engine. Contact Liebherr customer service.
	Software parameters missing after software update.	Diesel engine does not start.	Contact Liebherr customer service.
	Machine and attachment parameters do not match.	Diesel engine output is reduced automatically.	Contact Liebherr customer service.
	Prewarning: Exhaust system is heavily contaminated.		Start manual filter regeneration (see Maintenance).
	Exhaust system is excessively contaminated.	Diesel engine output is reduced automatically.	Contact Liebherr customer service (see Maintenance).
	Prewarning: DPF: Diesel exhaust fluid level is low.		Fill with diesel exhaust fluid.
	DPF: Diesel exhaust fluid level is too low.	Diesel engine output is reduced automatically.	Fill with diesel exhaust fluid.
	SCR: Diesel exhaust fluid level is too low.	Diesel engine output is reduced automatically.	Fill with diesel exhaust fluid.
	Malfunction of oscillating axle.	Machine stability is at risk.	Shut off diesel engine. Contact Liebherr customer service.
	Oil temperature of pump distributor gear is too high.	Pump distributor gear is damaged.	Shut off diesel engine. Reduce load. Clean hydraulic oil cooler. If symbol is still displayed: Contact Liebherr customer service.

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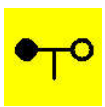
Symbol	Meaning	Effect, characteristic	Remedy
	Grease container of central lubrication system is empty.	Bearings are damaged.	Fill with grease.
	Grease container 1 of central lubrication system is empty.		
	Grease container 2 of central lubrication system is empty.		
	While diesel engine is running: Pump defective. Necessary accumulator pressure is not reached.	No braking effect	Shut off diesel engine and contact Liebherr customer service.
	While switching on ignition: Necessary accumulator pressure is not reached.		Start diesel engine and wait 60 seconds. If symbol remains displayed: Contact Liebherr customer service
	Pressure sensor defective, wire break, failure of a brake circuit	Reduced braking effect	Contact Liebherr customer service.
	Parking brake is applied.	Damage to travel gearbox	Release parking brake during work. During work brake with service brake.
	Windscreen washer fluid level is too low.	Windscreen wiping is limited.	Fill with windscreen washer fluid.
	Fuel level of auxiliary heater is too low.	Auxiliary heater is not working.	Fill with fuel for auxiliary heater.
	Hoist cylinder protection is defective.	Hoist cylinder is damaged.	Contact Liebherr customer service.
	Stick cylinder shut-off is defective.	Stick cylinder is damaged.	Contact Liebherr customer service.
	Movement restrictions are switched off.	Working attachment is damaged.	Carefully move working attachment.
	Movement restrictions are switched off.	Working attachment is damaged.	Carefully move working attachment.
	Increased wind speed.	Working area is restricted.	Park and secure machine.

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Symbol	Meaning	Effect, characteristic	Remedy
	Wind speed too high.	Working area is restricted.	Park and secure machine.
	Operator code is incorrect.	Machine is blocked.	Use correct operator code.

Tab. 77: Warning symbols

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4.2 Fault - Cause - Remedy

4.2.1 Diesel engine and fuel system

Malfunction / error	Cause	Remedy
Starter does not turn.	Main fuse is defective.	Replace fuse.
	Battery connections are loose.	Attach battery connections.
	Battery connections have oxidised.	Clean battery connections.
	Battery voltage is too low.	Charge or replace the battery.
	Starter power circuit is interrupted.	Contact Liebherr customer service.
	Starter is defective.	Contact Liebherr customer service.
Starter turns slowly.	Battery voltage is too low.	Charge or replace the battery.
	Battery connections are loose.	Attach battery connections.
	Battery connections have oxidised.	Clean battery connections.
	Outside temperature is too low.	Observe measures for winter operation.
Diesel engine does not start or stops again.	Outside temperature below 0 °C.	Comply with instructions on starting at low outside temperatures.
	Pre-heat system is defective.	Contact Liebherr customer service.
	Excessively viscous engine oil is used at low ambient temperature.	Use engine oil with suitable viscosity class.
	Heating flange is defective (at cold temperatures).	Contact Liebherr customer service.
	Starter does not turn.	See above.
	Fuel tank is empty.	Refuel and bleed fuel system.
	Underpressure in fuel tank	Remove tank fuel cap.
	Underpressure in fuel tank	Bleed fuel system.
	There is air in the fuel system.	Bleed fuel system.
	Ventilation on fuel tank is blocked.	Clean ventilation.
	Fuel line or tank filter is soiled.	Clean fuel line and tank filter.
	Fuel line is kinked.	Contact Liebherr customer service.
	Fuel fine filter is contaminated.	Have fuel fine filter cleaned or replaced by authorized specialist personnel.
	Air filter is contaminated.	Clean or replace air filter.

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Malfunction / error	Cause	Remedy
Diesel engine has difficulty starting.	Fuel low pressure circuit leaks or its pressure is too low.	Have leak test performed by Liebherr customer service.
	Diesel engine compression is too low.	Contact Liebherr customer service.
	Heating flange is defective (at cold temperatures).	Contact Liebherr customer service.
	Malfunction exists in electrical system.	Have error memory read by Liebherr customer service.
Diesel engine stops.	Power supply is interrupted.	Contact Liebherr customer service.
	Fuel low pressure circuit leaks or its pressure is too low.	Have leak test performed by Liebherr customer service.
Diesel engine performance too low (underperformance).	Fuel system is defective (clogged, leaking).	Performing visual inspection for leaks. Replace filter. Contact Liebherr customer service.
	Charging pressure is too low.	Tighten loose clamps. Replace defective seals and hoses. Clean air filter. Repair turbocharger.
	Charge air temperature is too high (automatic power reduction by engine control unit).	Clean intercooling air circuit. Lower ambient temperature. Contact Liebherr customer service.
	Fuel temperature is too high (automatic power reduction by engine control unit).	Contact Liebherr customer service.
	Coolant temperature is too high (automatic power reduction by engine control unit).	Check radiator for damage. Check fan and thermostat. Check coolant level. Contact Liebherr customer service.
	Area of deployment more than 1800 m above sea level.	No remedy
	Injectors get stuck or do not atomize.	Contact Liebherr customer service.
	Diesel engine compression is too low.	Contact Liebherr customer service.
	Malfunction exists in electrical system.	Contact Liebherr customer service.
	Exhaust -treatment system is clogged.	Contact Liebherr customer service.
Diesel engine has inadequate engine braking power.	Diesel engine brake flap not functional.	Contact Liebherr customer service.
	Malfunction exists in electrical system.	Contact Liebherr customer service.

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Malfunction / error	Cause	Remedy
Coolant temperature is too high.	There is too little coolant.	Fill with coolant.
	Radiator is soiled on the outside.	Clean radiator.
	Radiator is contaminated from inside or calcified.	Contact Liebherr customer service.
	Thermostat is defective.	Check thermostat. If thermostat is defective, contact Liebherr customer service.
	Transducer of coolant temperature is defective.	Check transducer. If transducer is defective, contact Liebherr customer service.
	Fan speed too low (hydrostatic fan drive).	Check fan drive. If fan drive is defective, contact Liebherr customer service.
Diesel engine does not reach full speed.	Engine speed is not set to maximum value.	Select higher speed step or different operating mode.
	Injection system is not set correctly.	Contact Liebherr customer service.
	Air filter is contaminated.	Clean or replace air filter.
	Fuel supply is too low.	Clean or replace fuel fine filter. Check fuel lines.
	There is water in the fuel.	Drain water from the fuel tank.
Charge indicator symbol is displayed when the diesel engine is running.	Tension of ribbed V-belt is inadequate.	Check tension of ribbed V-belt. Tension ribbed V-belt if necessary.
	Cable connections are loose.	Attach cables.
	Cable connections are disconnected.	Connect or replace cables.
	Generator, rectifier or controller is defective.	Contact Liebherr customer service.
Engine oil pressure is too low.	Oil level is too low.	Shut off diesel engine immediately and fill in engine oil.
	Oil pressure switch is defective.	Shut off diesel engine immediately and contact Liebherr customer service.
Diesel engine is losing oil.	Diesel engine has a leak.	Contact Liebherr customer service.
Diesel engine oil consumption is too great.	Compression is inadequate.	Contact Liebherr customer service.
Smoke development: Exhaust is grey or black.	Air filter is contaminated.	Clean or replace air filter.
	Injection nozzles are defective.	Contact Liebherr customer service.
	Turbocharger is defective.	Contact Liebherr customer service.
Smoke development: Exhaust gases are white (water vapour).	Water is entering the combustion chamber.	Contact Liebherr customer service.
	Injection system is not set correctly.	Contact Liebherr customer service.
	Pre-heat system is defective.	Contact Liebherr customer service.

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Malfunction / error	Cause	Remedy
Smoke development: Exhaust gas is blue.	Oil level is too high.	Correct oil level.
	Engine oil is entering the combustion chamber.	Contact Liebherr customer service.
	Compressor-side seal on the exhaust turbocharger is defective.	Contact Liebherr customer service.
	Crankcase ventilation is defective.	Contact Liebherr customer service.
Diesel engine is knocking.	Combustion process is malfunctioning.	Contact Liebherr customer service.
Diesel engine is pinging.	Valve clearance is excessive.	Contact Liebherr customer service.
	Injection nozzles are damaged or contaminated by carbon deposits.	Contact Liebherr customer service.
	There is bearing damage.	Contact Liebherr customer service.
	Piston rings are worn or broken.	Contact Liebherr customer service.
Unusual noises or noise emissions can be heard from the exhaust system.	Exhaust system has a leak.	Contact Liebherr customer service.
Diesel engine performance too low (underperformance).	Fill level in diesel exhaust fluid tank is too low.	Fill with diesel exhaust fluid.

4.2.2 Hydraulic system

Malfunction / error	Cause	Remedy
Unusual noises or noise emissions can be heard. Hydraulic pumps draw in air.	Stop valve on hydraulic tank is closed. Hydraulic oil level is too low.	Shut off diesel engine or electric motor immediately. Check stop valve and fill level.
Machine movements are too slow.	Selected speed step too low.	Select higher speed step or different operating mode.
Power modes do not achieve required performance.	Control is defective.	Contact Liebherr customer service.
Hydraulic oil temperature is too high.	Radiator is contaminated.	Clean radiator.
	Fan drive is defective.	Shut off diesel engine or electric motor. Contact Liebherr customer service.
Hydraulic oil level is too low.	Hydraulic system is leaking and losing oil.	Contact Liebherr customer service.
No function assigned to control elements.	Servo control is switched off. Folding console is up.	Switch on servo control. Move folding console down.
	Control is defective.	Contact Liebherr customer service.

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4.2.3 Electrical system

Malfunction / error	Cause	Remedy
Charge indicator symbol is displayed after the engine starts.	V-belt is loose.	Tighten v-belt.
	V-belt has torn.	Replace v-belt.
	Alternator is defective.	Contact Liebherr customer service.
Batteries are not charged, or not charged sufficiently.	Batteries are faulty.	Replace batteries.
	Battery connections are loose.	Attach battery connections.
	Battery connections have oxidised.	Clean battery connections.
	Cables are loose.	Connect cables.
	Cables are damaged.	Replace cables.
Malfunction of control elements and display elements has occurred.	Cables are loose or damaged. Control is defective.	Contact Liebherr customer service.
	Fuse is defective.	Replace 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 is not working. Engine speed does not drop automatically.	Control signal is faulty.	Contact Liebherr customer service.

4.2.4 Heating, ventilation and air conditioning unit

Malfunction / error	Cause	Remedy
Heating does not provide warm air.	Heat supply is interrupted. Control is defective.	Contact Liebherr customer service.
Blower is not working.	No power supply present. Blower motor is defective.	Contact Liebherr customer service.
Blower output is too low.	Filter is contaminated.	Replace filter.
	Air outlets are closed.	Open air outlets.
Air conditioning unit is not cooling.	Air conditioning condenser is contaminated.	Clean air conditioning condenser.
	Temperature sensor, air conditioning compressor or other parts of air conditioning unit are defective.	Contact Liebherr customer service.

4.2.5 Working attachment

Malfunction / error	Cause	Remedy
Hydraulic cylinder yields under load.	Piston seal is defective. Hydraulic line is broken.	Contact Liebherr customer service.
Working attachment has too much bearing play.	Bearings are badly worn.	Contact Liebherr customer service.

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Malfunction / error	Cause	Remedy
Working attachment cannot be moved.	Limitation of working attachment has been initiated.	Bypass limitation. (For more information see: 3.5 Shut-off functions, page 191)
	Angle sensors of working attachment are defective.	Switch off limitation or shut-off (For more information see: 3.5 Shut-off functions, page 191) . Contact Liebherr customer service.
Working tool cannot be used.	Function is not switched on.	Switch on function.
	Hydraulic lines are not connected.	Connect hydraulic lines.

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4.3 Problem remedy

4.3.1 Fuses and relays in the uppercarriage

DANGER
Components under voltage!
Danger to life.

▶ Before working on electrical system, switch off power supply.

DANGER
Bypassed fuses!
Danger to life.

▶ Replace defective fuses.

▶ Exclusively use genuine fuses.

▶ Do not bypass defective fuses.

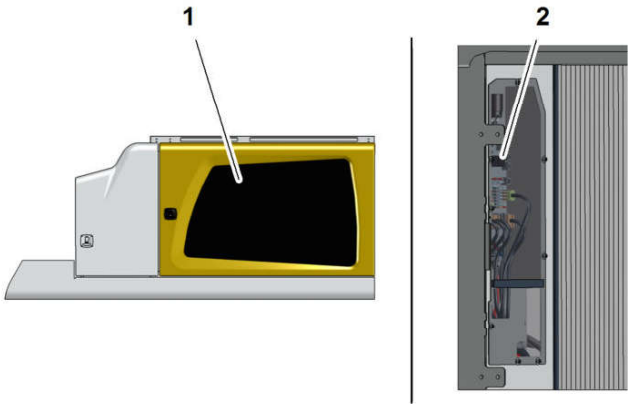

Fig. 896: Fuses and relays in the uppercarriage

1 Rear left side door

2 Electric cabinet A214

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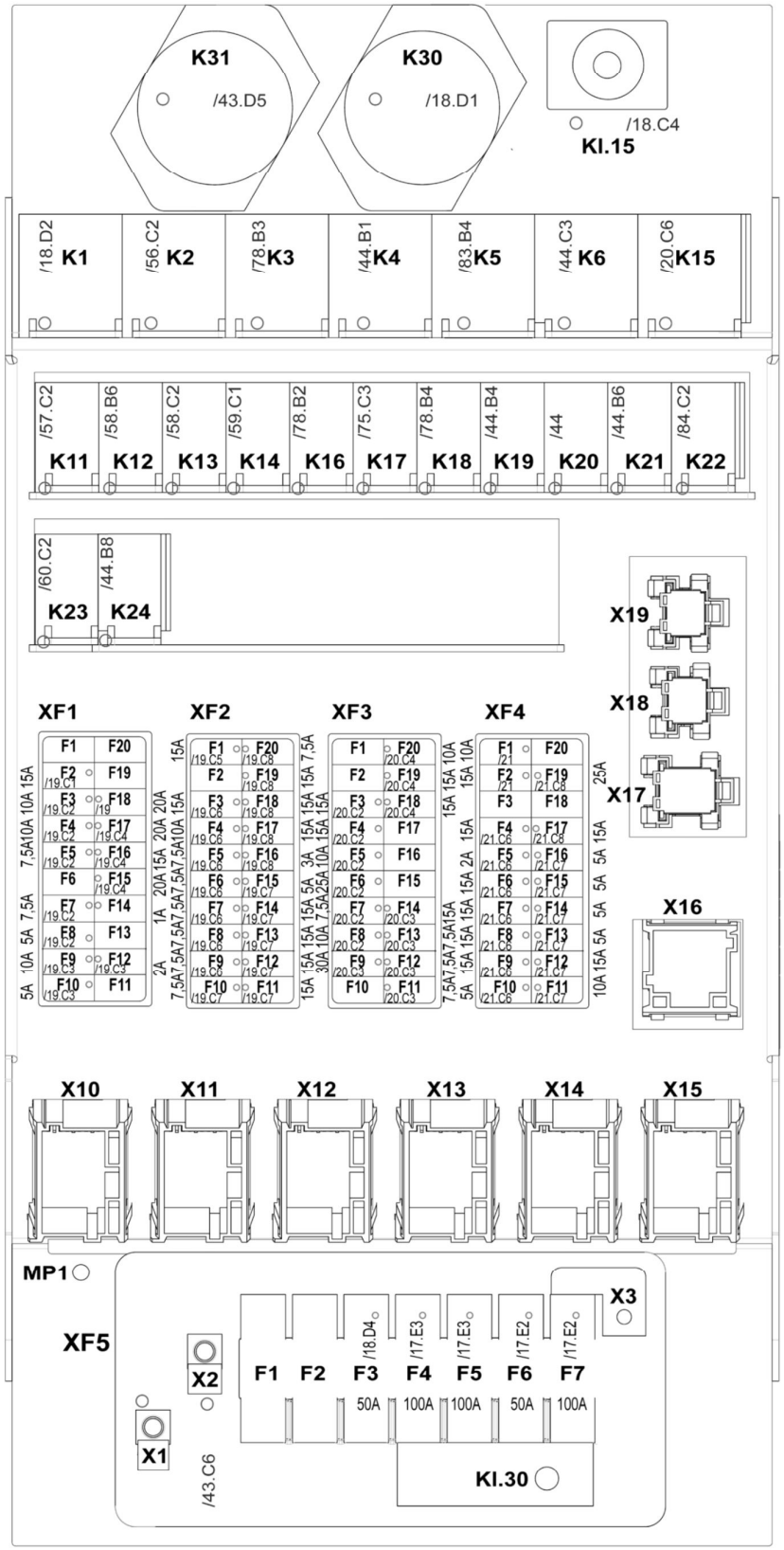

Fig. 897: Electric cabinet A214

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Fuse	Consumer	Rating [A]
F1	Not occupied	
F2	Counterweight working headlight	15
F3	Horn	10
F4	Beacon rotary stage	10
F5	Refuelling pump control voltage	7.5
F6	Not occupied	
F7	Right headlight	7.5
F8	Trailer brake light	5
F9	Switchable socket	10
F10	Engine control unit, terminal 15	5
F11	Not occupied	
F12	Magnet system ON	2
F13	Not occupied	
F14	Safety lever, inverse or folding console, inverse	1
F15	Auxiliary heater	20
F16	Step lighting	15
F17	Working headlight of working attachment, left	20
F18	Working headlight of working attachment, right	20
F19	Not occupied	
F20	Not occupied	

Tab. 78: Fuse strip A214.XF1

Fuse	Consumer	Rating [A]
F1	Supply voltage: Y6 parking brake, Y55 1st gear, Y56-1 front blade, Y56-2 rear blade, Y60 2nd gear, Y 66 oscillating axle locking, Y215 front left outrigger, Y216 front right outrigger, Y217 rear left outrigger, Y218 rear right outrigger	15
F2	Not occupied	
F3	Supply voltage: Y3 servo control, Y28-1 or Y28-2 quick coupler, Y200 lift frame up, Y201 lift frame down, Y554 joystick steering, B387-1 or B387-2 pressure relief high pressure circuit lines	15
F4	Power supply Y410 mower rake	10
F5	Reserve	7.5
F6	Reserve	7.5
F7	Reserve	7.5
F8	Supply voltage: Y563-1 or Y564 ride control	7.5
F9	Reserve, terminal 15	7.5
F10	Reserve, terminal 15	7.5

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Fuse	Consumer	Rating [A]
F11	Supply voltage: Y50 power reduction pump 1, Y103 power reduction slewing gear, Y414 pressure reduction A-side, Y414-2 pressure reduction B-side, Y417-1 flow reduction A-side, Y417-2 flow reduction B-side, Y447 lowering of control pressure, Y546 adjustable boom cylinder, proportional	15
F12	Supply voltage: Y353 or Y24 driving, proportional, Y545 high pressure circuit, proportional, Y547 turning grapple, proportional, Y548 lift frame lateral boom adjustment, proportional, Y552 joystick steering A-side, Y553 joystick steering B-side	15
F13	Supply voltage: E178 beacon, rotary stage, E1.1-E1.4 headlights, working attachment	15
F14	Supply voltage: H9 horn, M8 central lubrication system	15
F15	Supply voltage: Outputs A201	5
F16	Power supply sensors A201	3
F17	Supply voltage: Y7 slewing brake, Y212 shut-off, retracting stick, Y480 retracting adjustable boom cylinder, Y481 extending adjustable boom cylinder, E4 driving headlight right, E151 working headlight, counterweight, E191 brake light right, E192 brake light left, H33 acoustic warning	15
F18	Supply voltage: Y62 forward travel, Y63 reverse travel, Y385-1 changeover high pressure circuit, Y385-2 tilting bucket in	15
F19	Supply voltage: Y22 turning grapple left, Y23 turning grapple right, Y237 shut-off lift up, Y524 shut-off lift down, Y484 high pressure circuit A-side, Y485 high pressure circuit B-side	15
F20	Reserve, terminal 15	7.5

Tab. 79: Fuse strip A214.XF2

Fuse	Consumer	Rating [A]
F1	Not occupied	
F2	Not occupied	
F3	SCR heating tank line	15
F4	SCR heating injector	15
F5	SCR air pump	10
F6	Refuelling pump	25
F7	Hazard light	7.5
F8	Engine control unit controller	10
F9	Engine control unit power supply	30
F10	Not occupied	
F11	Reserve, terminal 30	7.5
F12	Reserve, terminal 30	7.5
F13	Reserve, terminal 30	7.5
F14	Step lighting	15

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Fuse	Consumer	Rating [A]
F15	Not occupied	
F16	Not occupied	
F17	Not occupied	
F18	NH3 sensor	15
F19	Tank sensor, diesel exhaust fluid tank	15
F20	Exhaust flap	10

Tab. 80: Fuse strip A214.XF3

Fuse	Consumer	Rating [A]
F1	Supply voltage: Y420 pre-shut-off lift up, K22 switchable socket	10
F2	Supply voltage: Y482 high pressure circuit B-side, Y483 high pressure circuit A-side, Y509-1 or Y509-2 changeover cylinder, external, Y551 pre-shut-off extending stick, Y563-2 ride control, Y576 pre-shut-off lift down	15
F3	Not occupied	
F4	Supply voltage: Y566 Euro control, Y567 special control	15
F5	Power supply output module A215	2
F6	Supply voltage: Y333 lift boom, Y356 fan stop, Y357 fan, reverse direction of rotation, Y514 close grapple, LS signal suppressed, A152, magnet on, S504 unlocking seatbelt cab door	15
F7	Supply voltage: Y462 generator On or Off, Y488 generator standstill, Y549 lowering speed of boom, Y550 lowering speed of stick, Y572 high pressure circuit 2, proportional, Y577 pre-shut-off retract stick	15
F8	Power supply Y160 pressure connection	15
F9	Not occupied	15
F10	Power supply output module A218	5
F11	Supply voltage: Y56 dozer blade, Y229 four wheel steering, Y391 steering changeover, Y543 pivoting angle travel motor, Y607 front active brake, Y608 rear active brake	10
F12	Power supply M8-1 central lubrication system undercarriage	15
F13	Supply voltage: Output module A63, input module A64	5
F14	Supply voltage: B202-1 front left switchable overload warning system, B202-2 front right switchable overload warning system, B202-3 rear left switchable overload warning system, B202-4 rear right switchable overload warning system, B208-1 front left outrigger monitoring system, B208-2 front right outrigger monitoring system, B208-3 rear left outrigger monitoring system, B208-4 rear right outrigger monitoring system	5

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Fuse	Consumer	Rating [A]
F15	Supply voltage: B314 angular transmitter slip ring transmitter signal 2, B315 angle sensor swivel arm signal 1, B316 angle sensor boom signal 1, B317 angle sensor stick signal 1, B347 bucket cylinder lift or stick, B372 height-adjustable operator's cab down, B373 height-adjustable operator's cab up, socket monitoring	5
F16	Supply voltage: B1 tank sensor, B8 sensor hydraulic oil temperature, B14 sensor hydraulic oil level, B26 quick coupler proximity switch 1, B44 pressure switch air conditioning condenser, B53 speed sensor slewing gear, B314 angle sensor slip ring transmitter signal 1, B315 angle sensor swivel arm signal 2, B316 angle sensor boom signal 2, B317 angle sensor stick signal 2, B318 pressure sensor hoist cylinder, left, B319 pressure sensor hoist cylinder, right, B335 servo pressure slewing gear, B378 quick coupler proximity switch 2, B379 pressure sensor system pressure, pressure sensor hoist cylinder, reserve, cycle lubrication system	5
F17	Not occupied	15
F18	Not occupied	
F19	Fuel pre-heating	25
F20	Not occupied	

Tab. 81: Fuse strip A214.XF4

Fuse	Consumer	Rating [A]
F1	Not occupied	
F2	Not occupied	
F3	Operator's cab, terminal 15	50
F4	Heater flange	100
F5	Terminal 15	100
F6	Terminal 30	50
F7	Operator's cab, terminal 30	100

Tab. 82: Fuse strip A214.XF5

Relay	Consumer
K1	Terminal 15, safety lever or folding console
K2	Working headlight of working attachment
K3	Auxiliary heater
K4	Not used
K5	Step lighting
K6	Not used
K11	Counterweight working headlight
K12	Horn

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Relay	Consumer
K13	Beacon rotary stage
K14	Right headlight
K15	Diesel engine sensors power supply
K16	Auxiliary heater
K17	Magnet system ON
K18	Power supply auxiliary heater
K19	Not used
K20	Not used
K21	Not used
K22	Switchable socket
K23	Brake light
K24	Not used
K30	Main relay, terminal 15
K31	Heater flange

Tab. 83: Electric cabinet A214

4.3.2 Operator's platform fuses and relays

DANGER
Components under voltage!
Danger to life.

▶ Before working on electrical system, switch off power supply.

DANGER
Bypassed fuses!
Danger to life.

▶ Replace defective fuses.

▶ Exclusively use genuine fuses.

▶ Do not bypass defective fuses.

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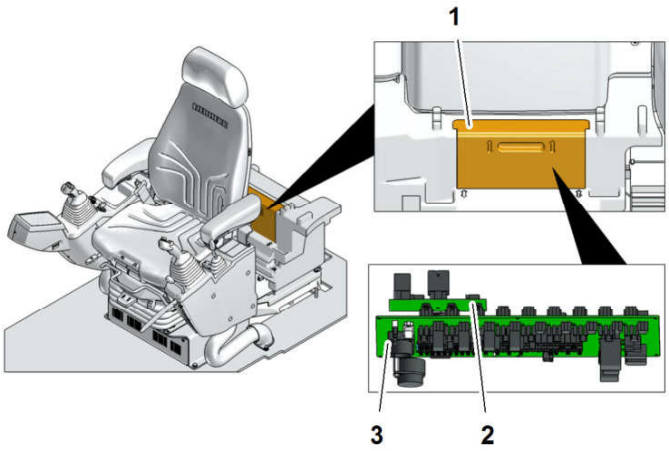

Fig. 898: Operator's platform fuses and relays

1 Cover
2 Additional printed circuit board A166
3 Main circuit board A161

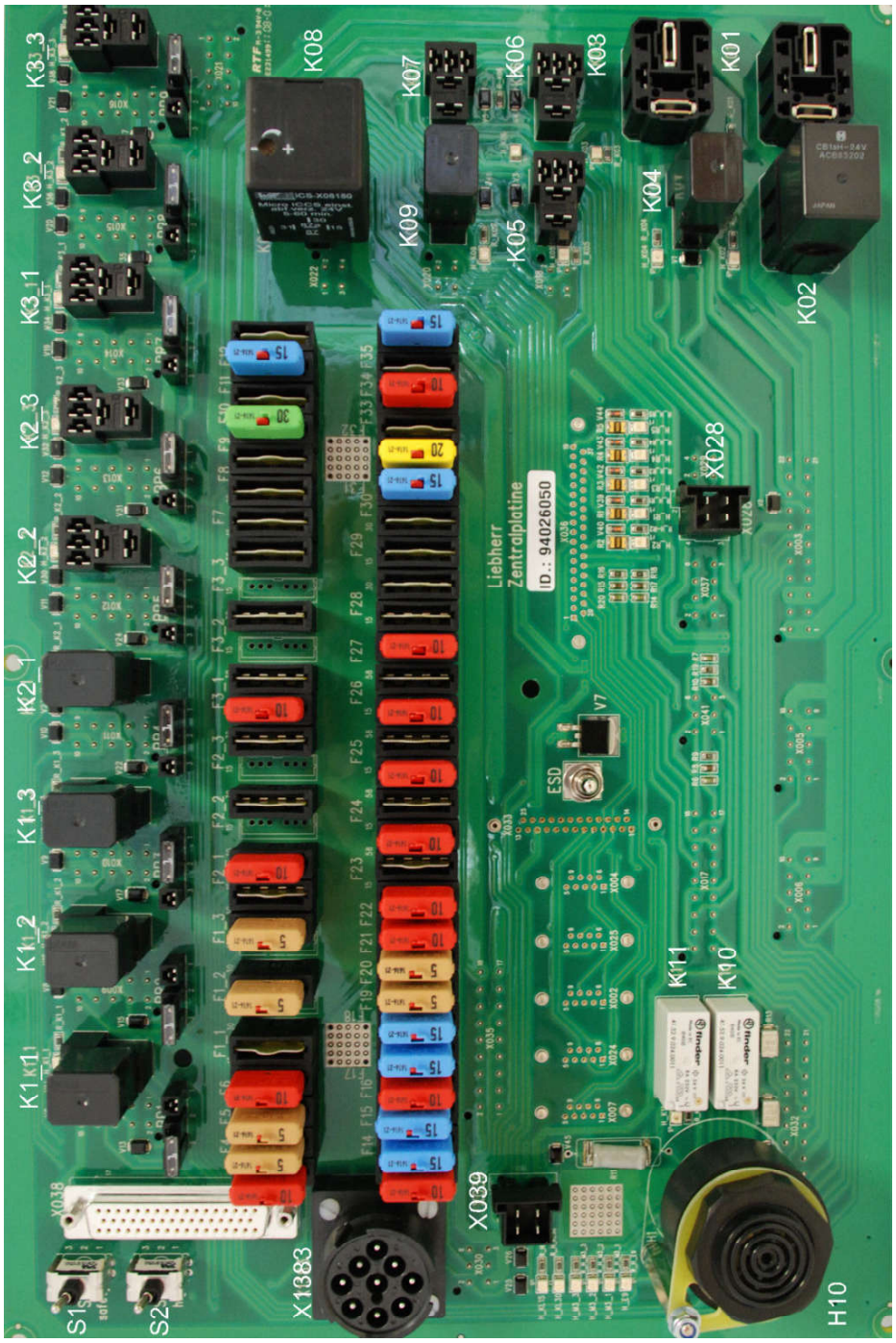

Fig. 899: Main circuit board A161

Fuse	Consumer	Rating [A]
F1_1	Turn indicator	10
F1_2	K1_2, parking light left, reversing light left, licence plate lighting left	5
F1_3	K1_3, parking light right, reversing light right, licence plate lighting right	5

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Fuse	Consumer	Rating [A]
F2_1	K2_1, travel light left	10
F2_2	K2_2, beacon	10
F2_3	LiDAT, data interface option	5
F3_1	Reversing camera, side camera	10
F3_2	Not used	
F3_3	Door strap system, height adjustable cab	15
F4	Cigarette lighter	10
F5	Interior lighting triggered by door contact	5
F6	Interior lighting, mirror heater	5
F7	Option circuit board power supply	10
F8	Condenser fan	30
F9	K02, front roof light	30
F10	K07, rear window wiper	10
F11	K08, terminal 58	15
F12	K03, rear roof light	15 , 30
F14	Air-sprung operator's seat	10
F15	Terminal 15 air conditioning control	15
F16	Control unit A	15
F17	S7 safety lever or folding console	10
F18	Not used	15
F19	+24V input sensor for input modules FAP, A163, A164, A165	10
F20	Input logic for input modules FAP power supply	5
F21	Display, data interface J1939	5
F22	Terminal 15, master power supply	10
F23	A169, control unit	10
F24	A170, control unit	10
F25	A171, control unit, Tool Management	10
F26	A172, control unit	10
F27	Terminal 30, master power supply	10
F28	Not used	10
F29	Not used	10
F30	Starting switch	10
F31	Terminal 30 air conditioning control	20
F32	K05, roof wiper	10
F33	K04, windscreen wiper top	10
F34	K06, windscreen wiper bottom	10
F35	K09, Tool Management, voltage transformer, radio	15

Tab. 84: Main circuit board A161

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Relay	Consumer
K1_1	Hazard warning light
K1_2	Parking light left
K1_3	Parking light right
K2_1	Travel light left
K2_2	Beacon
K2_3	LiDAT
K3_1	Reversing camera, side camera
K3_2	Auxiliary heater
K3_3	Door strap system, height adjustable cab
K01	Condenser fan
K02	Front roof light
K03	Rear roof light
K04	Windscreen wiper top
K05	Roof wiper
K06	Windscreen wiper bottom
K07	Rear window wiper
K08	Terminal 58
K09	Radio voltage transformer
K10	Warning buzzer
K11	Emergency operation

Tab. 85: Main circuit board A161

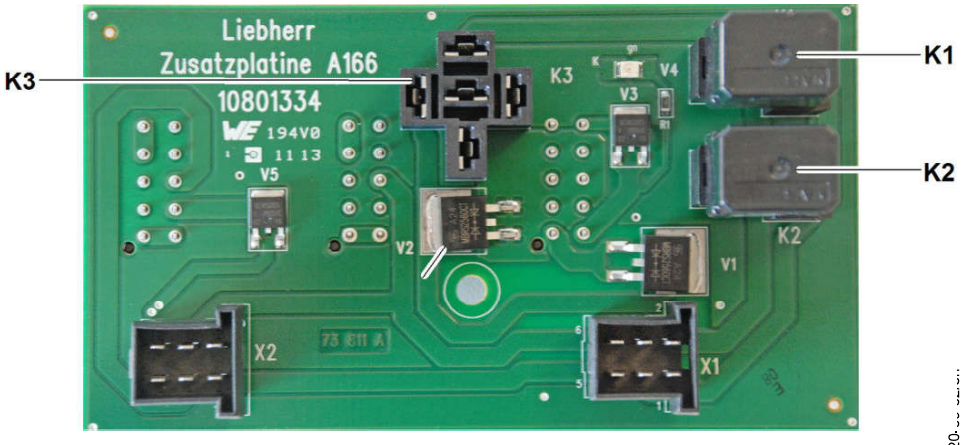

Fig. 900: Additional printed circuit board A166

Relay	Consumer
K1	Turn signal left
K2	Turn signal right

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Relay	Consumer
K3	Turn indicator

Tab. 86: Additional printed circuit board A166

Make sure the following preconditions are met:
- ❑ Battery main switch is set to **OFF**.

▶ Fold backrest forwards.

▶ Open cover **1**.

▶ Replace fuse.

▶ Close cover **1**.

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Problem remedy

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5 Maintenance

5.1 Inspection and maintenance schedule

General information

Abbreviations used in this section: h = operating hours

Shorten maintenance intervals according to operating conditions, for example:
- Dust intensive application
- Oil quality
- Fuel quality

Make sure lubricants, fluids and replaced parts are disposed of safely and in eco-friendly manner. Adhere to country-specific directives applicable in country of use and to relevant applicable laws.

The service packages in the spare parts catalogue contain the spare parts required for maintenance tasks.

Symbols	Affected employees
Filled-in symbols	Machine owner or their maintenance staff that perform maintenance tasks independently
Empty symbols	Trained staff authorised by Liebherr

Tab. 87: Meaning of symbols

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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 **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
Complete machine										
	●	●	❍	❍	❍			Check machine for proper condition and tightness.		303
		●	❍	❍	❍			Lubricate bearings on machine and working attachment.		307
		●	❍	❍	❍			Check components for cracks.		309
			☐			✧		Adjust machine as per adjustment checklist.		
			❍	❍	❍	✦		Lubricating hinges, locks and gas pressure springs of doors, hoods and windows.		310
				❍	❍			Analysis of engine oil: Generally recommended (at least every 2 years); mandatory if a service agreement, additional warranty or powerline warranty exists.		
			❍	❍	❍			Analysis of biodegradable hydraulic oil: Generally recommended (at least every 2 years); mandatory if a service agreement, additional warranty or powerline warranty exists.		
				❍	❍			Analysis of mineral oil hydraulic oil: Generally recommended (at least every 2 years); mandatory if a service agreement, additional warranty or powerline warranty exists.		
				❍	❍			Analysis of wheel hub gear oil: Generally recommended (at least every 2 years) for travelling proportion above 30 % of overall operating hours; mandatory if a service agreement, additional warranty or powerline warranty exists.		
						✧		Optional fuel and operating fluid analyses: Exclusively recommended.		
Drive group										
	●	●	❍	❍	❍			Diesel engine: Check oil level.		311
					❍			**If Liebherr motor oil 5W30 or Liebherr motor oil 5W30 low ash is used in machines with stage IV or Tier 4f and stage V:** Diesel engine: Change oil. (at least every 2 years) (For more information see: Difficulty factors, page 283)		
				❍	❍			**If Liebherr motor oil 10W40 or Liebherr motor oil 10W40 low ash is used in machines with stage IV or Tier 4f and stage V:** Diesel engine: Change oil. (at least once a year) (For more information see: Difficulty factors, page 283)		
			❍	❍	❍			**If engine oil as per minimum requirement of specification LH-00ENG3A or LH-00ENG3A LA is used for machines with stage IV or Tier 4f and stage V:** Diesel engine: Change oil. (at least once a year) (For more information see: Difficulty factors, page 283)		

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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 **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
						✧		**For machines for other emission stages:** Diesel engine: Change oil. (at least once a year) (For more information see: Difficulty factors, page 283)		
						✧		Diesel engine: Replace oil filter. (at least during every engine oil change)		
						✧		Diesel engine: Replace oil separator filter cartridge. (at least during every engine oil change)		
			❍	❍	❍			Diesel engine: Check belt drive.		
						❍5000 h		Diesel engine: Replace belt.		
					☐	❍4000 h		Diesel engine: Check and adjust valve clearance.		
						❄		Diesel engine: Check heater flange.		
						❍10000 h		Diesel engine: Replace heater flange.		
	●	●	❍	❍	❍	✦		Fuel pre-filter: Drain water.		312
		●	❍	❍	❍			Fuel tank: Drain water and sediments.		313
				❍	❍	✧		Fuel pre-filter: Replace filter cartridge.		
				❍	❍	✧		Fuel fine filter: Replace filter element.		
						✧		Bleed fuel system.		
			❍	❍	❍	✧		Air filter: Check contamination level.		
		●	❍	❍	❍	✦		Air filter: Emptying dust collecting tank.		315
			❍	❍	❍	✦		Air filter: Replace main filter cartridge (when service indication appears / once a year).		316
					❍	✦		Air filter: Replace safety filter cartridge (on every third replacement of main filter cartridge / once a year).		318
		●	❍	❍	❍			Pump distributor gear: Check oil level.		319
			❍	❍	❍			Pump distributor gear: Change oil.		
						✦		Diesel particulate filter: Activate and deactivate regeneration.		320
						✧ ❍5000 h		Diesel particulate filter: Replace filter module and send used filter module to authorised Liebherr service partner for cleaning.		
						✧		Diesel exhaust fluid tank: Clean sieve.		
Cooling system										
	●	●	❍	❍	❍	✦		Check coolant level.		327
	●	●	❍	❍	❍	✦		Check cooling system and heat exchanger for contamination and cleaning.		328

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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 **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
						❄		Coolant: Check the concentration (at least once a year).		
						❍6000 h		Cooling system: Change coolant Liebherr Antifreeze OS (at least every four years).		
Working hydraulics										
		●	❍	❍	❍	✦		Hydraulic tank: Check oil level.		330
			❍	❍	❍	✦		Hydraulic tank: Drain water and sediments (after stationary time of over 6 months).		333
						✧		Hydraulic tank: Change oil. (For more information see: Oil change, page 287)		
					❍			Hydraulic tank: Replace breather filter. (additionally at every hydraulic oil change (For more information see: Filter replacement, page 286))		
		■	❍	❍	❍			Return filter: Check and clean magnetic rod. (once a week for the first 300 operating hours)		335
			☐	❍	❍	✧		Return filter: Replace filter cartridge. (additionally at every hydraulic oil change (For more information see: Filter replacement, page 286))		
		●	❍	❍	❍			Bypass filter (option): Check degree of contamination of filter cartridge.		336
						✧		Bypass filter (option): Replace filter cartridge. (For more information see: Filter replacement, page 286)		
						✧		Bypass filter (option) integrated in return filter: Replace filter cartridge. (For more information see: Filter replacement, page 286)		
			❍	❍	❍			Control oil unit: Replace filter cartridge.		
			❍	❍	❍			Supply pump: Replace filter cartridge.		
						❍3000 h		High-pressure filter: Replace filter cartridge.		
						✧		Replace hydraulic hoses.		
Steering system										
☐				❍	❍			Steering: Check function and tightness.		
				❍	❍			Steering: Check condition and mounting.		
Brake system										
			❍	❍	❍			Service brake and parking brake: Check function and effect.		
			❍	❍	❍			Brake system: Check tightness.		

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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 **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
								Electrical system		
			❍	❍	❍			Check lighting of machine.		
			❍	❍	❍			Batteries: Check acid density and acid level in the battery cells.		
			❍	❍	❍			Batteries: Check and clean wire terminals and terminal posts.		
			❍	❍	❍			Batteries: Check condition and correct installation of degassing hoses.		
								Transmission		
			❍	❍	❍			Transmission: Check oil level and tightness.		
			☐	❍	❍			Transmission: Change oil.		
					❍			Check function of parking brake.		
								Axles		
			❍	❍	❍			Axles: Check oil levels.		
			☐	❍	❍			**If driving makes up less than 30 % of the overall operating hours:** Axles: Change oil.		
			❍	❍	❍			**If driving makes up more than 30 % of the overall operating hours:** Axles: Change oil.		
		●	❍	❍	❍			Lubricate axles (every week or every month, depending on the application).		338
						✧		Multi-disc brake: Check wear. (at least once a year)		
			❍	❍	❍	✦		Tyres: Check tyre pressure.		340
			❍	❍	❍	✦		Check tightening torque of the wheel nuts (when the machine is new, each time a wheel is changed or the wheel nuts are loosened, and once after 50, 100 and 250 operating hours).		341
								Working attachment		
	●	●	●	❍	❍			Lubricate working tool (follow manufacturer's instructions if working tool is not from Liebherr).		343
		●	●	❍	❍			Check pin bearings for wear.		343
						✧		Check overload warning system (option) in line with the regulations in force in the country of machine operation.		
								Operator's cab, heating and air conditioning		
		●				✦		Fill with windscreen washer fluid.		344
						❄		Heating: Check function.		344
				❍	❍	❄		Auxiliary heater (option): Check function.		346

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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 **By authorised specialist staff** ☐ Once-only activity ❍ Repeat interval ✧ If necessary **Additional labelling** Assistance required Have this task carried out exclusively by a certified electrician	Confirm tasks	See page
		●				✧		Switch on air conditioning unit.		346
			❍	❍	❍	✧		Clean pre-filter.		
				❍	❍			Replace filter cassette (shorten interval accordingly in dust intensive application).		
		●	❍	❍	❍			Check condenser for contamination and clean if necessary.		347
			❍	❍	❍			Check whether safety belt is available and functioning.		
Lubrication system										
		●	❍	❍	❍	✦		Lubrication system: Fill with grease.		349
		●	❍	❍	❍			Check lubrication of bearings (grease collar).		350
Slewing gearbox and slewing ring										
		●	❍	❍	❍			Slewing gearbox: Check oil level.		351
			☐	❍	❍			Slewing gearbox: Change oil.		
				❍	❍			Slewing gear brake: Check function.		

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5.2 Filling quantities and lubrication chart

5.2.1 Filling quantities

Lubricants

Description	Quantity[22)]
Diesel engine	31.0 l
Hydraulic system: System capacity	430.0 l
Hydraulic system: Oil change volume	260.0 l
Hydraulic system: Tank capacity	190.0 l
Slewing gearbox	6.0 l
Pump distributor gear	1.9 l
Transmission	3.0 l
Steering axle	31.0 l
Wheel hubs of steering axle	each 2.6 l
Rigid axle	31.5 l
Wheel hubs of rigid axle	each 3.2 l

Tab. 88: Filling quantities, lubricants

Fuels and operating fluids

Description	Quantity[22)]
Fuel tank	480.0 l
Diesel exhaust fluid tank	48.0 l
Cooling system	41.0 l
Air conditioning unit	1.26 kg[23)]
Windscreen washer system	8.0 l

Tab. 89: Filling quantities, fuels and operating fluids

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[22)] Guidance values

[23)] With operator's cab elevation LFC 120

5.2.2 Lubrication chart

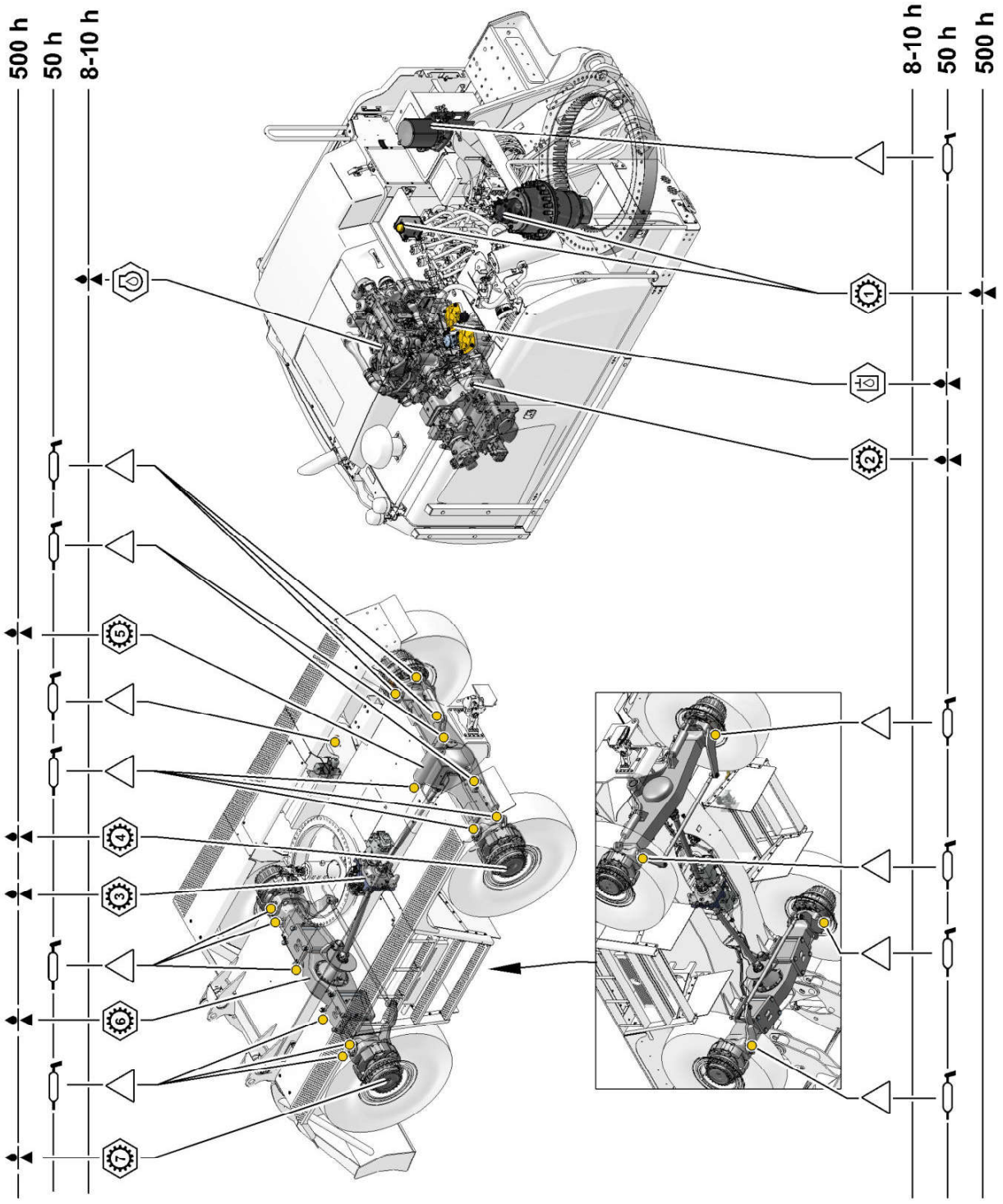

Fig. 901: Lubrication chart for uppercarriage and undercarriage

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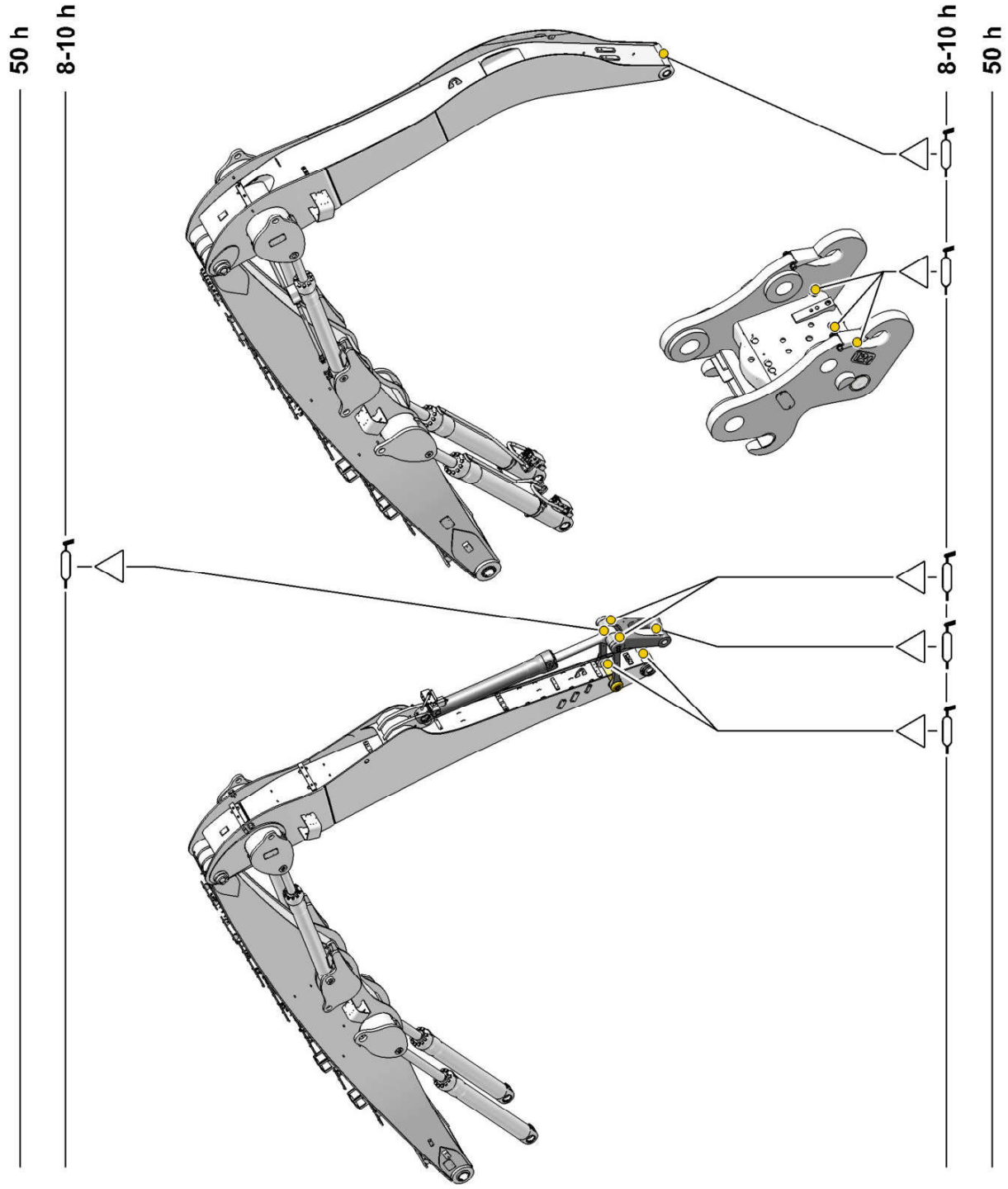

Fig. 902: Lubrication chart for working attachment

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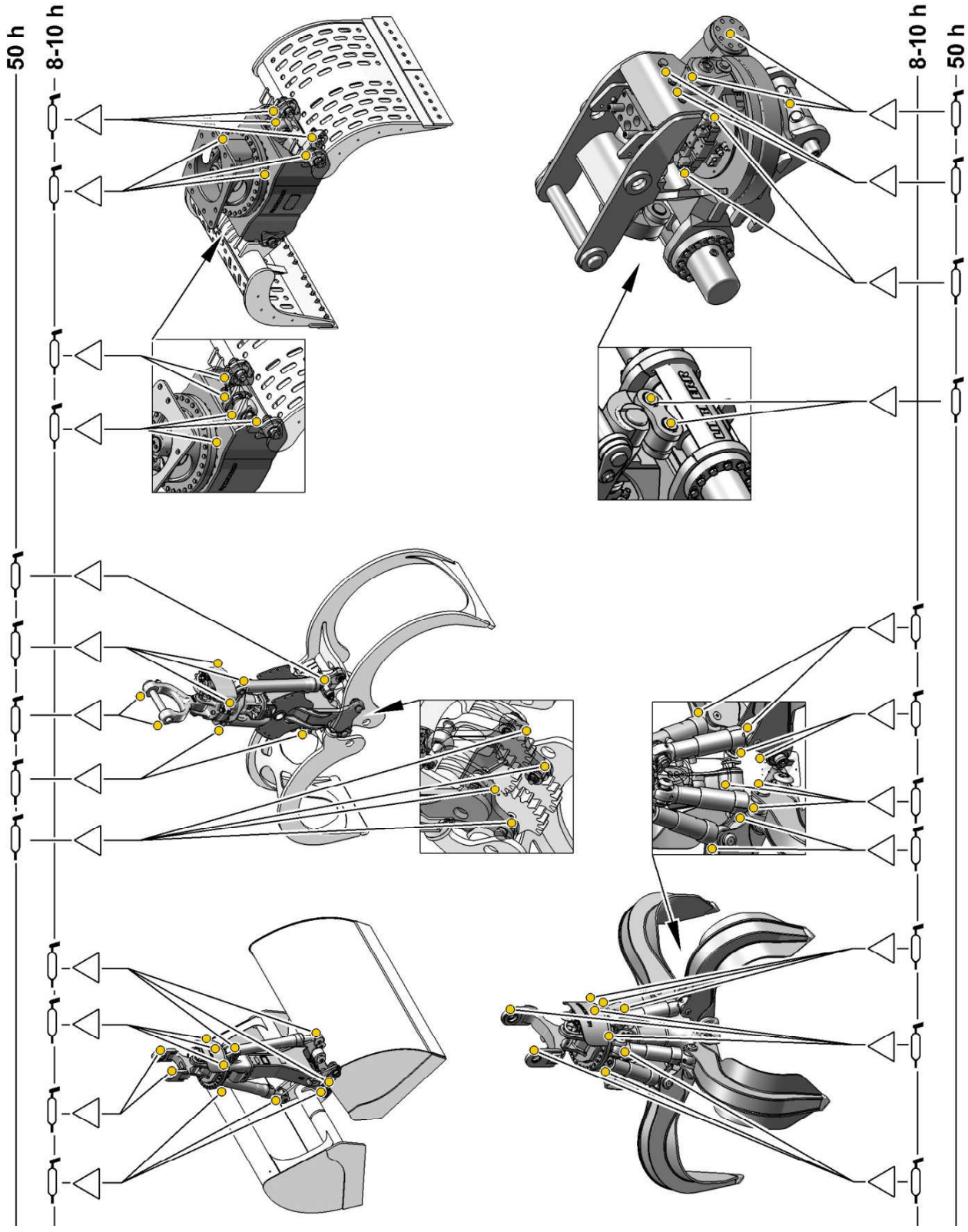

Fig. 903: Lubrication chart for working tools

Symbol	Meaning
	Hydraulic system
	Gearbox
	Check oil level.
	Lubricating points
	Lubrication
h	Operating hours (interval)
	Adhere to operator's manual.

Tab. 90: Meaning of the symbols on the lubrication chart

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5.3 Fuels, lubricants and operating fluids

5.3.1 General information about lubricants and fuels

General questions

General questions can be addressed to the Liebherr Lubricant Hotline via email.

Liebherr Lubricant Hotline (email): https://lubricants.liebherr.com

Safety data sheets

Safety data sheets for lubricants and fuels are available online from the Liebherr lubricants portal.

Liebherr lubricants portal: https://lubricants.liebherr.com

Technical data sheets

Technical data sheets for lubricants and fuels are available online from the Liebherr lubricants portal.

One-time registration is required in order to access technical data sheets.

Liebherr lubricants portal: https://lubricants.liebherr.com

Specific Liebherr standards

Specific Liebherr standards for lubricants and fuels are available from the technical customer service at the relevant manufacturing plant.

5.3.2 Diesel fuels

Liebherr recommendation

Approved diesel fuels in line with DIN EN 590, ASTM D 975 1–D/2–D	Diesel engine stage V	Diesel engine stage IV or Tier 4f	Power band I/H as per Regulation ECE-R.96 (stage 3A, TIER III, CHINA III equivalent)
Maximum sulphur content	Up to 10 ppm	Up to 15 ppm	Up to 5000 ppm[24)]
Lubrication properties at 60 °C	400 µm	460 µm	
Minimum cetane number	45	45	

Tab. 91: Minimum quality requirements

Do not mix diesel fuel with fuel additives.

[24)] The sulphur content in the fuel determines the change interval in dependence on the quality of the engine oil.

Operating temperatures of diesel fuels[25)]

Permitted diesel fuels as per DIN EN 590	Cloud point	Ambient temperature
Standard class	-7 °C	To -10 °C
Arctic class 0	-10 °C	To -13 °C
Arctic class 1	-16 °C	To -20 °C

Tab. 92: Operating temperatures of diesel fuels

Minimum quality requirements

Specification
LH-00-FUEL

Tab. 93: Minimum quality requirements

5.3.3 Diesel exhaust fluids

Liebherr recommendation

Description
AdBlue® in Europe
DEF (Diesel exhaust fluid) in USA
AUS32 (aqueous urea solution)

Tab. 94: Liebherr recommendation

Minimum quality requirements

Specification
DIN 70 070
ISO 22241
LH-00-UREA

Tab. 95: Minimum quality requirements

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25) In case of deployments at below -10 °C, use preheatings or arctic diesel. For more information on arctic diesel qualities, see operating temperatures table and DIN EN 590.

5.3.4 Engine oils

Liebherr recommendation for stage IV / Tier 4f and stage V diesel engines

Description
Liebherr Motoroil 5W-30
Liebherr Motoroil 5W-30 low ash [26)]

Tab. 96: Liebherr recommendation

Other approved engine oils[27)]

Description
Liebherr Motoroil 10W-40
Liebherr Motoroil 10W-40 low ash [26)]

Tab. 97: Other approved engine oils

Minimum quality requirements

Specification
LH-00–ENG3A LA[26)]
ACEA E6, ACEA E9, API CJ-4

Tab. 98: Minimum quality requirements

If engine oils from a third party manufacturer are used, information on change intervals must be obtained from respective manufacturer or supplier.

Liebherr recommendation for other emission stages

Diesel engine power	Performance category
To 129 KW	Power band I as per Regulation ECE-R.96 (stage 3A, TIER III, CHINA III equivalent)
From 130 KW	Power band H as per Regulation ECE-R.96 (stage 3A, TIER III, CHINA III equivalent)

Tab. 99: Liebherr recommendation for other emission stages

Description
Liebherr Motoroil 10W-40

Tab. 100: Liebherr recommendation

[26)] For machines with diesel particulate filter use low ash engine oil.
[27)] Adhere to change interval.

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Minimum quality requirements

Specification
LH-00–ENG3A
ACEA E4, API CH-4, API CI-4

Tab. 101: Minimum quality requirements

If engine oils from a third party manufacturer are used, information on change intervals must be obtained from respective manufacturer or supplier.

Difficulty factors

Difficulty factors have influence on the change interval of engine oil.

Adapt change interval of engine oil.

Difficulty factors are:
– Frequent cold starts
– Sulphur content in fuel
– Environmental influences
  • Operating temperature
  • Dust
  • High humidity

The sulphur content in the fuel determines the change interval in dependence on the quality of the engine oil.

Sulphur content of fuel	LH-00ENG3A LH-00ENG3A LA[26)]	Liebherr Motoroil 10W-40 Liebherr Motoroil 10W-40 low ash [26)]	Liebherr Motoroil 5W-30 Liebherr Motoroil 5W-30 low ash [26)]
Up to 15 ppm	500 h	1000 h	2000 h
15 ppm to 300 ppm	500 h	1000 h	1000 h
300 ppm to 2000 ppm	250 h	500 h	500 h
2000 ppm to 5000 ppm	125 h	250 h	250 h

Tab. 102: Change interval of engine oil

5.3.5 Refrigerant

The air conditioning contains fluorinated greenhouse gases.

Designation	Air conditioning unit
Refrigerant	R134a
Global warming potential	1430
CO_2 equivalent of 1 kg R134a at 25 °C	1.43 t

Tab. 103: Refrigerant

[26)] For machines with diesel particulate filter use low ash engine oil.

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Adhere to machine-specific filling quantity of air conditioning.

5.3.6 Coolant

Requirements for water used

Make sure that water used meets the following requirements:
– In accordance with directive on drinking water of the World Health Organisation (WHO) from 2006

Corrosion inhibitors

Liebherr recommendation

Description	Manufacturer
Caltex XL Corrosion Inhibitor Concentrate	Chevron Texaco
Chevron Heavy Duty Extended Life Corrosion Inhibitor Nitrite Free (ELC)	Chevron Texaco
Havoline Extended Life Corrosion Inhibitor (XLI)	Chevron Texaco
Total WT Supra	Total, Paris

Tab. 104: Liebherr recommendation with mixing ratio 50:50

Anti-freeze and corrosion protection agent

Liebherr recommendation

Type	Description
Concentrate	Liebherr-Antifreeze OS Concentrate
Premix A)	Liebherr-Antifreeze OS Mix

Tab. 105: Liebherr recommendation

Ambient temperature	Mixing ratio
Down to -50 °C	40 % water 60 % anti-freeze and corrosion protection agent
Down to -37 °C	50 % water 50 % anti-freeze and corrosion protection agent

Tab. 106: Mixing ratio

A) Premix = ready-mixed product (50% water and 50% anti-freeze and corrosion protection agent)

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Minimum quality requirements

Specification
LH-01–COL3A

Tab. 107: Minimum quality requirements

If coolants from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuel and operating fluids that only meet the minimum requirements, it is possible that the oil service life may differ from that of the Liebherr recommendation.

5.3.7 Hydraulic oils

Liebherr recommendation

Ambient temperature	Description
	Liebherr mineral oil
15 to 55 °C	Liebherr Hydraulic Basic 100
10 to 45 °C	Liebherr Hydraulic Basic 68
-20 to 40 °C	Liebherr Hydraulic HVI
	Liebherr-PAO [29] biodegradable
-25 to 45 °C	Liebherr Hydraulic Plus
-40 to 30 °C	Liebherr Hydraulic Plus Arctic

Tab. 108: Liebherr recommendation

Minimum quality requirements

Specification
EMT LH-00-Minimum-HYE

Tab. 109: Minimum quality requirements

If hydraulic oils or filters from other manufacturers are used, information on change and replacement intervals must be obtained from respective manufacturer or supplier.

For fuels and operating fluids that exclusively meet the minimum requirement, it is possible that the oil service life may differ from that of the Liebherr recommendation.

[29] PAO = poly-alpha-olefin

Oil analysis

		Dust intensive application	Normal operation
Normal application (oil analysis optional)	**Liebherr mineral oil**	Every 250 h, at least once a year	Every 1000 h, at least once a year
	Liebherr Hydraulic Basic 68		
	Liebherr Hydraulic Basic 100		
	Liebherr Hydraulic HVI		
Eco-friendly application (oil analysis mandatory)	**Liebherr-PAO biodegradable**	Upon handover, then every 250 h, at least once a year	Upon handover, then every 1000 h, at least once a year
	Liebherr Hydraulic Plus		
	Liebherr Hydraulic Plus Arctic		

Tab. 110: Oil analysis

Filter replacement

	Dust intensive application	Normal operation
Liebherr return filter	Every 250 h, also during every hydraulic oil change	Once after 500 h, then every 1000 h, also during every hydraulic oil change
Liebherr breather filter	Every 500 h, also during every hydraulic oil change	Every 2000 h, also during every hydraulic oil change
Liebherr bypass filter (option) [30)]	If necessary, every 2000 h	
Liebherr bypass filter (option) integrated in return [30)]	If necessary, every 2000 h	

Tab. 111: Filter replacement

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30) A bypass filter is mandatory for eco-friendly application.

Oil change

	Without oil analysis	With oil analysis[31)]
Liebherr mineral oil	Every 3000 h	Every 6000 h
Liebherr Hydraulic Basic 68		
Liebherr Hydraulic Basic 100		
Liebherr Hydraulic HVI		
Liebherr-PAO biodegradable	Every 4000 h[32)]	Every 10000 h
Liebherr Hydraulic Plus		
Liebherr Hydraulic Plus Arctic		

Tab. 112: Oil change

5.3.8 Axle oils

Note
Machine with Kessler axles LT-D!

▶ Use gear oil Liebherr Gear Basic 90 LS or gear oils in line with specification API GL-5 and MIL-L_2105 D.

Liebherr recommendation

Ambient temperature	Description
-30 to 50 °C	Liebherr Gear Basic 90 LS
-35 to 50 °C	Liebherr Gear Plus 20W-40
-35 to 50 °C	Liebherr Gear MF80W

Tab. 113: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D
ZF: TE-ML 05C, 05D

Tab. 114: Minimum quality requirements

If axle oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuels and operating fluids that exclusively meet the minimum requirement, it is possible that the oil service life may differ from that of the Liebherr recommendation.

31) Change oil after negative oil analysis.
32) Oil analysis is mandatory for eco-friendly application.

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5.3.9 Gear oils

Gear oils specified in the table are not suitable for following gearboxes:
- Transmission (For more information see: 5.3.10 Transmission oils, page 288)
- Pump distributor gear (For more information see: 5.3.11 Pump distributor gear oils, page 289)
- Automatic transmission

Liebherr recommendation

Ambient temperature	Description
-30 to 50 °C	Liebherr Gear Basic 90 LS
-35 to 50 °C	Liebherr Gear Plus 20W-40
-30 to 50 °C	Liebherr Gear Hypoid 90 EP
-25 to 50 °C	Liebherr Hypoid 85W-140 EP
-40 to 50 °C	Liebherr Syntogear Plus 75W-90

Tab. 115: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D or E, PRF-2105 D or E

Tab. 116: Minimum quality requirements

Adhere to device specifications according to ZF approvals.

If gear oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuel and operating fluids that only meet the minimum requirements, it is possible that the oil service life may differ from that of the Liebherr recommendation.

5.3.10 Transmission oils

Liebherr recommendation

Description	Ambient temperature
Liebherr Motoroil 5W-30	To -40 °C
Liebherr Motoroil 5W-30 low ash	To -40 °C
Liebherr Motoroil 10W-40	To -35 °C
Liebherr Motoroil 10W-40 low ash	To -35 °C

Tab. 117: Liebherr recommendation

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Minimum quality requirements

Specification
LH-00–ENG3A
LH-00–ENG3A LA
ZF: TE-ML 07B, 07D, 07E, 07F

Tab. 118: Minimum quality requirements

If gear oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuels and operating fluids that exclusively meet the minimum requirement, it is possible that the oil service life may differ from that of the Liebherr recommendation.

5.3.11 Pump distributor gear oils

Machine without pump distributor gear oil cooler

Liebherr recommendation

Ambient temperature	Description
-25 to 50 °C	Liebherr Hypoid 85W-140 EP
-30 to 50 °C	Liebherr Gear Basic 90 LS
-30 to 50 °C	Liebherr Gear Hypoid 90 EP
-40 to 50 °C	Liebherr Syntogear Plus 75W-90

Tab. 119: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D or E, PRF-2105 D or E

Tab. 120: Minimum quality requirements

If gear oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuel and operating fluids that only meet the minimum requirements, it is possible that the oil service life may differ from that of the Liebherr recommendation.

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Machine with pump distributor gear oil cooler

Liebherr recommendation

Ambient temperature	Description
5 to 50 °C	Liebherr Hypoid 85W-140 EP
-5 to 50 °C	Liebherr Gear Basic 90 LS
-5 to 50 °C	Liebherr Gear Hypoid 90 EP
-20 to 50 °C	Liebherr Syntogear Plus 75W-90

Tab. 121: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D or E, PRF-2105 D or E

Tab. 122: Minimum quality requirements

Make sure following requirements are fulfilled:
– Oil viscosity is approved for hydraulic oil cooler

If gear oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

For fuel and operating fluids that only meet the minimum requirements, it is possible that the oil service life may differ from that of the Liebherr recommendation.

5.3.12 Greases

Liebherr recommendation

Ambient temperature	Description
Down to -20 °C	Liebherr Universalfett 9900
Down to -55 °C	Liebherr Universalfett Arctic

Tab. 123: Liebherr recommendation

Minimum quality requirements

Thickener	Shelf life	Specification
Soap-based (lithium complex)	At least 3 years	Pumpable according to KP 2 K (DIN 51502)
		VKA welding force: ≥ 2300 N (DIN 51350/4, ASTM D 2596)

Tab. 124: Minimum quality requirements

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5.3.13 Windscreen washer fluid

Liebherr recommendation

Liebherr recommends commercial washer fluid with anti-freeze.

Minimum quality requirements

Use mixture of water and denatured alcohol.

5.3.14 Lubricants and care products for electrical and mechanical systems

Liebherr recommendation

Application	Product
Contact care agent for electrical contacts	Cramolin Schutz Protection
Humidity protection for electrical plug connections	Liqui-tech Basic humidity protection
Lubricant for pistons, piston nuts and piston bearing installation on hydraulic cylinders	Gleitmo 800
Special corrosion inhibitor for installation spaces of sealing elements on hydraulic cylinders	Rostilo Tarp CFX Fuchs Lubritech
Assembly paste for installation of pumps and coupling	Optimol Paste White T

Tab. 125: Liebherr recommendation

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5.4 Access points for maintenance work

5.4.1 Access points on uppercarriage

General overview

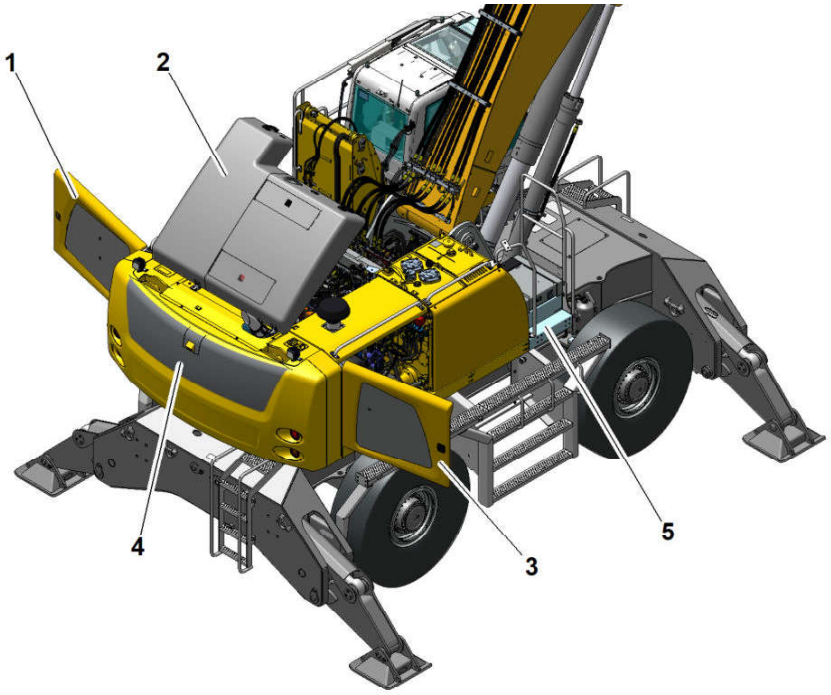

Fig. 910: Access points on uppercarriage

No.	Access point	Access to
1	Left side door	Battery main switch, batteries, fuse box, electric cabinet, radiator, condenser
2	Engine bonnet	Diesel engine, coolant container, fuel pre-filter, fuel fine filter, oil filter
3	Right side door	Hydraulic pumps, servo control unit, air filter
4	Cover plate	Exhaust muffler, diesel particulate filter, SCR module
5	Cab access	Fuel tank, diesel exhaust fluid tank, cab access, hydraulic tank, grease container, engine bonnet

Tab. 126: Access points on uppercarriage

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Locking mechanism of access points

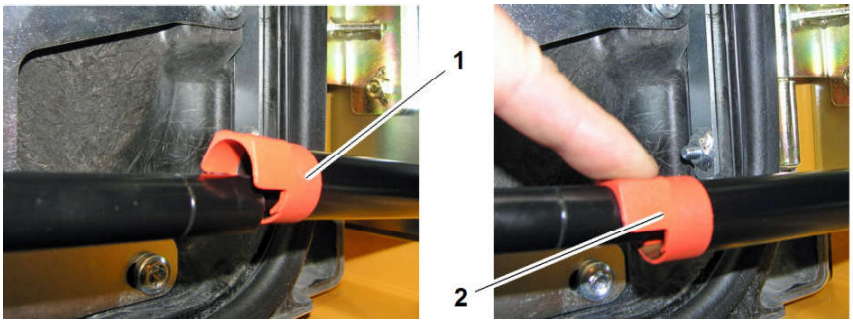

Fig. 911: Locking mechanism of access points

1 Locked position **2** Unlocked position

▶ Completely open access point.
▷ Locking mechanism is in locked position **1**.

▶ Put locking mechanism into unlocked position **2** and close access point.

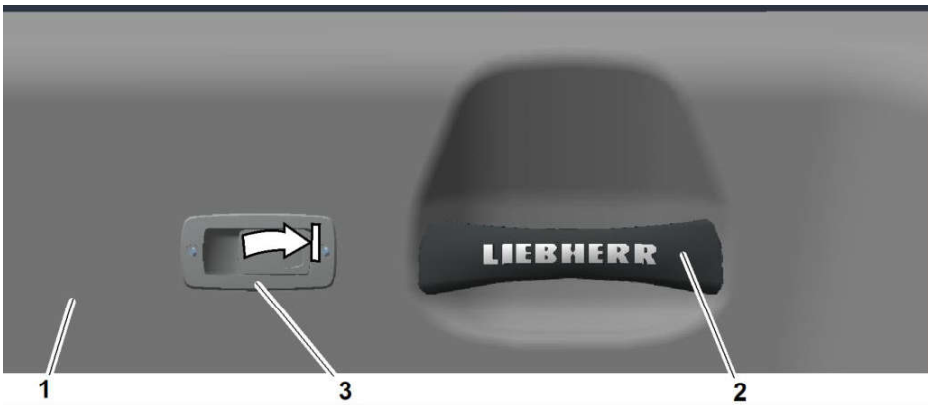

Fig. 912: Locking engine bonnet in place

1 Engine bonnet **3** Remote unlocking
2 Handle

▶ Fully open engine bonnet **1**.
▷ Engine bonnet **1** is locked into place.

▶ Release locking mechanism with remote unlocking **3** and close engine bonnet **1**.

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5.4.2 Access points under the uppercarriage

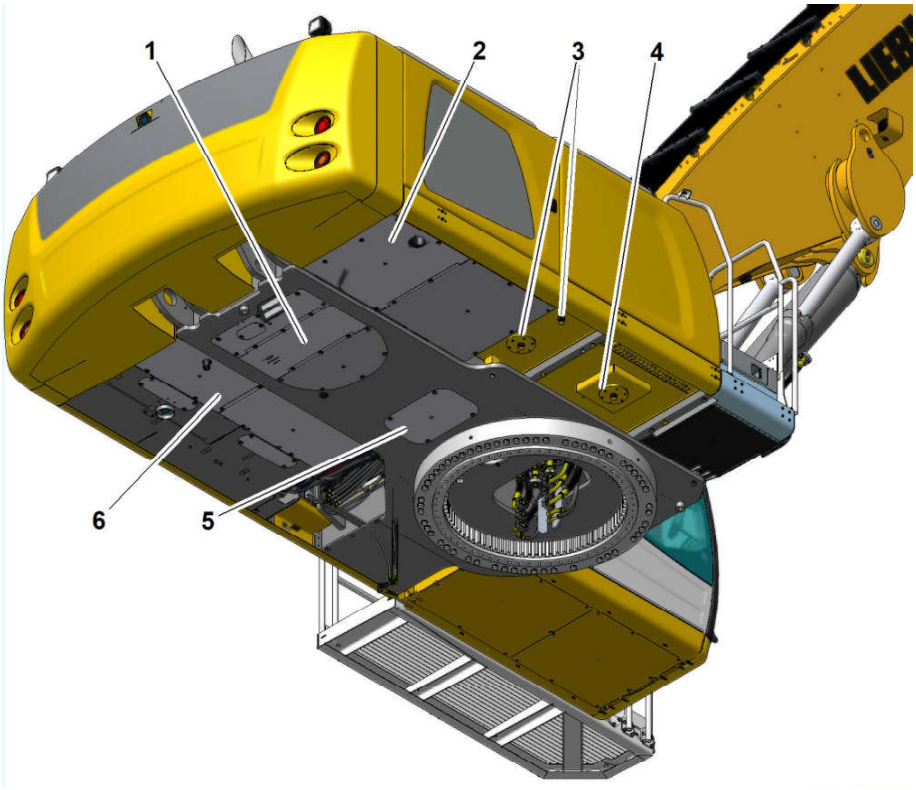

Fig. 913: Access points under the uppercarriage

No.	Access to
1	Engine oil discharge
2	Pump distributor gear discharge
3	Hydraulic tank discharge
4	Fuel tank discharge
5	Slewing gearbox discharge
6	Coolant discharge

Tab. 127: Access points under the uppercarriage

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5.5 Preparing for maintenance

5.5.1 Maintenance procedures

Definition of maintenance tasks

Note

Put machine in maintenance position before beginning maintenance tasks.

Following maintenance tasks are defined:
- Lubricate complete machine.
- Check complete machine for cracks.
- Change fuels and operating fluids.
- Replace filter.
- Clean components.
- Check hydraulic system.
- Perform visual inspection for defects.

Definition of visual inspection

Symbol	Meaning
	**Visual inspection** Indicates places to be examined by visual inspection.

Tab. 128: Symbol of visual inspection

Visual inspection is a visual inspection process of the complete machine and individual components.

The legal basis for visual inspection is provided by DIN EN 13018 or country-specific standards, ordinances and regulations.

Visual inspection without aids

Criteria for the visual inspection without aids are:

- An uninterrupted optical path between the eyes of the inspector and the inspected surface.
- Examination of the complete machine and individual components with the naked eye.

Visual inspection with aids

Criteria for the visual inspection with aids are:

- An interrupted optical path between the eyes of the inspector and the inspected surface.
- Examination of the complete machine and individual components with suitable aids such as mirrors, magnifiers and lighting.

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Objectives of visual inspection

If conducted correctly as per the specifications of the maintenance manual, the visual inspection prevents longer and unplanned outage times through early detection and removal of defects.

Advantages of a correctly performed visual inspection are:
– Conservation of value of machine.
– Quality assurance of maintenance process.
– Preventing subsequent damage
– Safe operation of machine

Make sure that following defects are detected:
– Contamination
– Damage
– Cracks
– Warping
– Leaks
– Loosened connections
– Chafe marks
– Wear
– Incorrect changes to the machine.

Requirements for staff and operating company

– Make sure that the staff is familiar with the design of the complete machine and components.
– Make sure that the staff is familiar with the prescribed inspection technology.
– Make sure that the staff has sufficient visual ability.

Application of visual inspection

Make sure the following preconditions are met:
❑ Complete machine has been cleaned carefully.
❑ Lighting conditions are sufficient.
❑ Accessibility and field of vision of complete machine is present.
❑ Inspection position and suitable distance assumed.

▶ Perform intervals and inspection scope as per maintenance and inspection schedule.

▶ Evaluate visual inspection.

▶ Create defect report if necessary.

5.5.2 Preparing for maintenance

Maintenance instructions

The sequence of maintenance work is based on the maintenance and inspection schedule. The ideal sequence for maintenance work is not allowed for.

▶ Clean machine carefully before starting maintenance work.

▶ Observe maintenance intervals.

Safety instructions

▶ Make sure that no persons are in the hazard zone during maintenance and repair work.

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▶ If necessary, secure a large area.

▶ Inform operating before starting maintenance and repair work.

▶ Appoint a supervisor.

If no other instructions have been made:
▶ Maintain machine on even, firm ground with working attachment lowered and diesel engine or electric motor switched off.

If rail-road excavator is being serviced:
▶ Change rail-road excavator over to road.

▶ Exclusive service rail-road excavator outside track area.

When working under machine:
▶ Hang warning sign stating "Do not switch on!" on ignition lock so it is clearly visible.

▶ Pull out ignition key.

▶ Switch off power supply.

If working above head height:
▶ Exclusively use approved safe ladders and working platforms.

▶ Exclusively use designated machine components as climbing aids.

Put on personal protective equipment against falling:
– When working with one hand on the machine at a height above 2 m without a possibility of standing with your feet sufficiently far apart to ensure firm standing
– When working with two hands on the machine at a height above 2 m without fall protection constructions

▶ Wear safety harnesses when working at height.

▶ Clean dirt, oil, ice and snow from steps, ladders, anti-slip mats, hand rails, pedestals, platforms and handles.

If machine is equipped with height adjustable cab:
▶ Lower operator’s cab to bottom position.

If maintenance work or repair work requires operator's cab in top position:
▶ Make sure that operator’s cab is supported in proper and secure manner.

When working under a raised machine:
▶ Make sure that machine is supported in a proper and secure manner.

▶ Avoid metal on metal contact.

▶ Make sure that changes to weight distribution do not endanger stability of machine.

If machine is equipped with adjustable undercarriage width:
▶ Retract side frames.

When work is performed with diesel engine running:
▶ Avoid contact with hot exhaust system and hot exhaust fumes.

When work is performed in area of exhaust system:
▶ Let exhaust system cool down.

When work is performed in closed rooms with diesel engine running:
▶ Divert exhaust fumes outside.

▶ Make sure the room is well ventilated.

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5.5.3 Putting machine in maintenance position

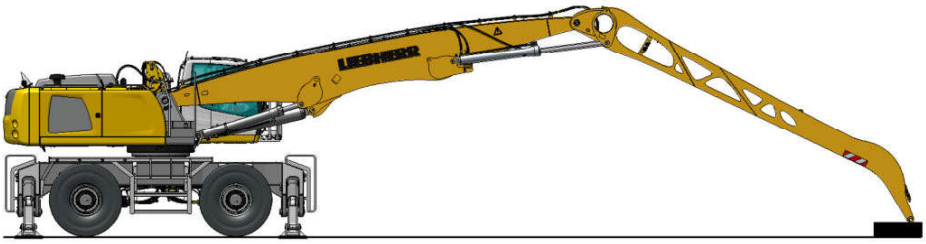

Fig. 915: Putting machine in maintenance position

- ▶ Park machine on firm and level ground.
- ▶ Place working attachment on firm ground.
- ▶ Switch off the diesel engine and let it cool.
- ▶ Pull out ignition key.
- ▶ Switch off battery main switch.

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5.6 General maintenance

5.6.1 Welding

- ▶ For procedure on repair welding, refer to service manual under Chapter 140.
- ▶ Document repair case in repair report, refer to service manual under Chapter 140.
- ▶ Only have repair welding performed by certified specialist welding operation.

5.6.2 Corrosion-proofing piston rods

Corrosion-proofing piston rods prevents corrosion.

Note
Liebherr recommends:

- ▶ Use Liebherr Chrome Protect.

NOTICE
Corrosion!
Damage to piston rods.

- ▶ Check corrosion-proofing daily.
- ▶ Where necessary, apply corrosion inhibitor.

Note
Corrosion in maritime areas or corrosive environments!

- ▶ When in storage, use acid-free corrosion inhibitor grease as corrosion inhibitor.
- ▶ For non-moved piston rods, use acid-free corrosion inhibitor grease as corrosion inhibitor.
- ▶ Remove grease before retracting the piston rods.
- ▶ For moved piston rods, use Liebherr Chrome Protect as the corrosion inhibitor.
- ▶ Replace corrosion inhibitor at susceptible areas after each cleaning.

Machine in operation

- ▶ Fully retract all piston rods every day.
  - ▷ Piston rods are covered with a protective film of hydraulic oil.

If it is not possible to retract piston rods fully into cylinders:

- ▶ Apply corrosion inhibitor to exposed areas of piston rods.

If hydraulic cylinder is not moved for a long time:

- ▶ Apply corrosion inhibitor to exposed areas of piston rods.
- ▶ Check corrosion protection on little-moving hydraulic cylinders every day.

Parking or transporting machine

- ▶ Retract piston rods fully into cylinders.

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If it is not possible to retract piston rods fully into cylinders:
▶ Apply corrosion inhibitor to exposed areas of piston rods.
▶ After loading the machine check corrosion protection of the piston rods.
▶ After reparking the machine check corrosion protection of the piston rods.

5.6.3 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.

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▶ 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.

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.

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5.6.4 Cleaning fan and radiator

DANGER
Explosion of highly flammable gases!
Danger to life.

- ▶ Make sure that degassing hoses are laid correctly.
- ▶ Do not clean battery area with compressed air.
- ▶ Avoid naked flames.
- ▶ Do not smoke.

WARNING
Hot parts!
Burns.

- ▶ Make sure that diesel engine has cooled down before starting work.

WARNING
Moving parts!
Injuries.

- ▶ Make sure that all parts have stopped moving before starting work.

- ▶ Shut off diesel engine.
- ▶ Clean radiator fins and fan wheel with compressed air.
- ▶ Blow from the inside of the machine to the outside.

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5.7 Complete machine

5.7.1 Checking machine for proper condition and tightness

NOTICE
Incorrect check!
Damage to machine.

- ▶ Perform visual inspections as per maintenance and inspection schedule.
- ▶ Check machine for proper condition.
- ▶ Check machine for tightness.
- ▶ Check machine for damage.

Make sure the following preconditions are met:
- ❑ Machine is in maintenance position.

Visual inspection before putting into service

- ▶ Before putting machine into service, always perform inspection tour.
- ▶ Perform maintenance tasks as per maintenance and inspection schedule every 8-10 h and 50 h.

Visual inspection during maintenance tasks

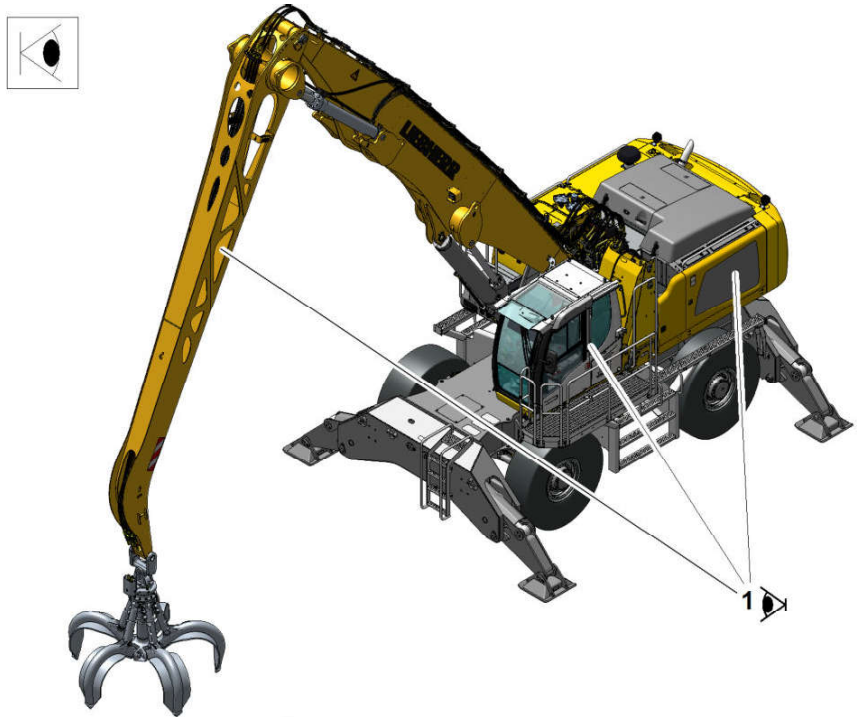

Fig. 916: Visual inspection of complete machine

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Position	Assembly	Visual inspection for defects
1	Complete machine: Uppercarriage, undercarriage, support, working attachment and operator's cab	Check for proper condition, damage and cleanliness.

Tab. 129: Visual inspection

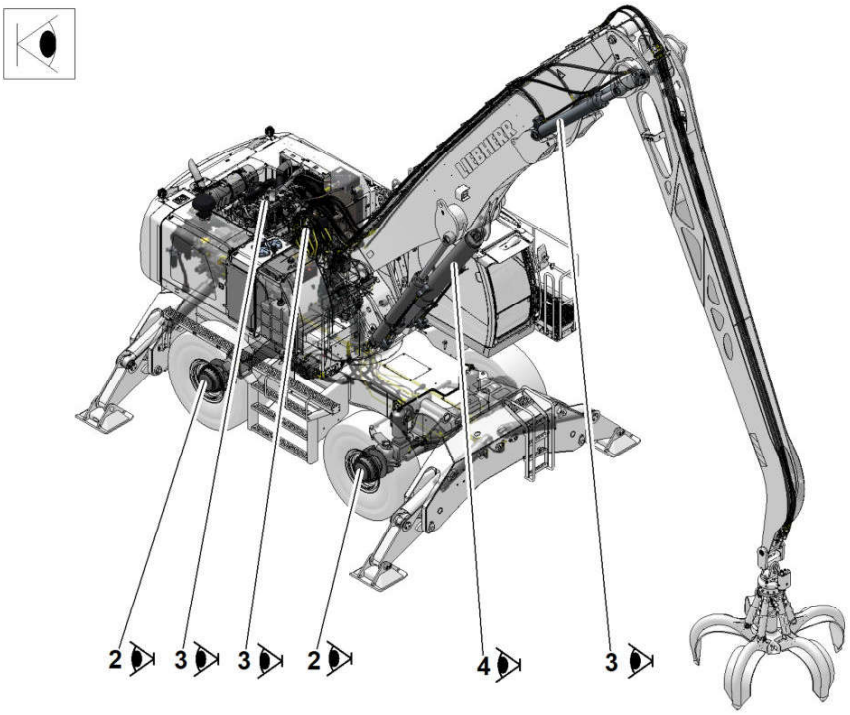

Fig. 917: Visual inspection of drive group and hydraulic system

Position	Assembly	Visual inspection for defects
2	Drive group	Check for proper condition and tightness.
3	Hydraulic system	Check hydraulic hoses and pipes for proper condition and tightness.
4	Energy recuperation cylinder	Check for proper condition, damage and cleanliness.

Tab. 130: Visual inspections

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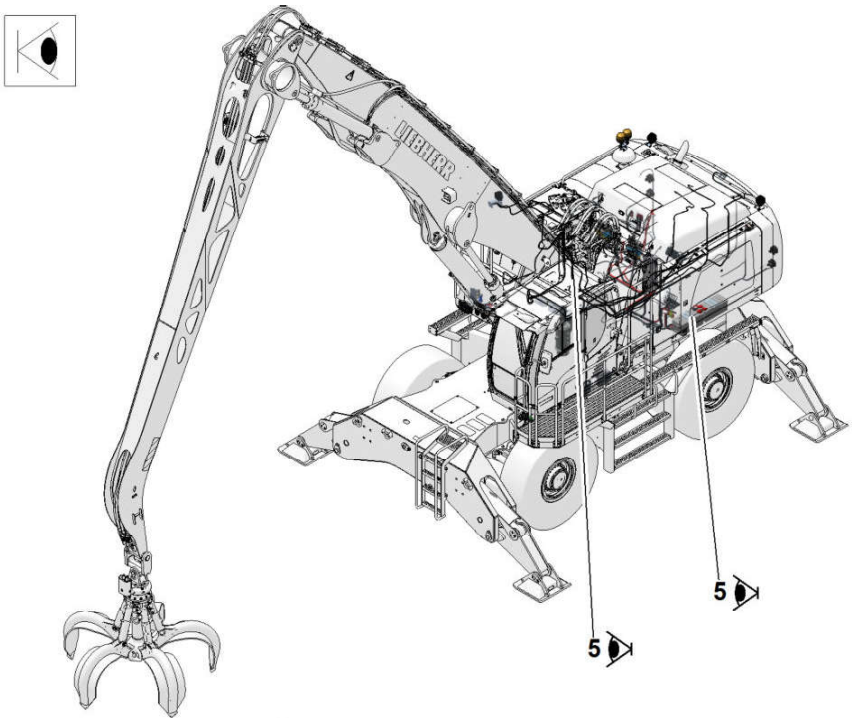

Fig. 918: Visual inspection of electrical system

Position	Assembly	Visual inspection for defects
5	Electrical system	Check cables and plug connections for damage. Check error messages on the display.

Tab. 131: Visual inspection

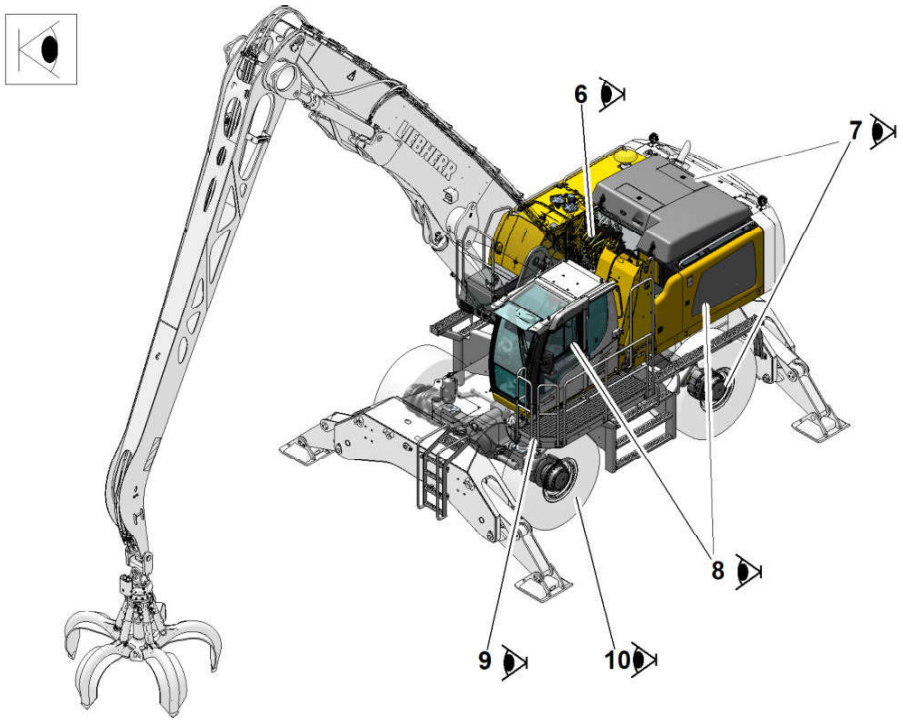

Fig. 919: Visual inspection of components, operator's cab, undercarriage, climbing aids and lubrication system

Position	Assembly	Visual inspection for defects
6	Lubrication system	Check pipes and hoses for damage and tightness.
7	Components, slewing ring and counterweight	Check for proper condition and for missing and loose connections.
8	Operator's cab, hydraulic cab elevation, trim and folding console	Check for proper condition, damage and cleanliness.
9	Climbing aids, ladders, hand rails, cab accesses, handrails, handles and platforms	Check for presence and damage.
10	Tyres	Check tyre and rim for proper condition, damage, foreign particles and cleanliness.

Tab. 132: Visual inspections

▶ Perform visual inspection. (For more information see: Definition of visual inspection, page 295)

If defects occur in machine:

▶ Record any identified defects.

▶ Inform operating company of defects affecting safety.

▶ Repair identified defects. See service manual for procedure.

If service manual cannot be accessed:

▶ Have repairs performed by Liebherr customer service.

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5.7.2 Lubricating bearings on machine and working attachment

Lubricating bearings through central lubrication system

The following lubricating points are connected to central lubrication system:
– Lubricating points on basic boom
– Lubricating points on boom
– Lubricating points on stick

The lubricant quantity depends on the following factors:
– Viscosity of grease
– Connected components

NOTICE
Too little lubrication!
Damage to bearings.

▶ Make sure that grease emerges at all lubricating points.

If no grease emerges:
▶ Change lubrication mode.

▶ Check lubrication lines.

If an intermediate lubrication is necessary:
▶ Press *central lubrication system* key on control unit A.
  ▷ LEDs in key light up.
  ▷ Central lubrication system distributes grease to connected bearings.

If grease emerges on the piston side of the hoist cylinder bearings:
▶ Stop lubrication process.

▶ Press active *central lubrication system* key.
  ▷ LEDs in key go out.
  ▷ Lubrication process has ended.

Manually lubricating bearings

Lubricate following lubricating points manually:
– Lubricating points on change lever
– Lubricating points on quick coupler
– Lubricating points on working tools
– Lubricating points on undercarriage
– Lubricating points on uppercarriage

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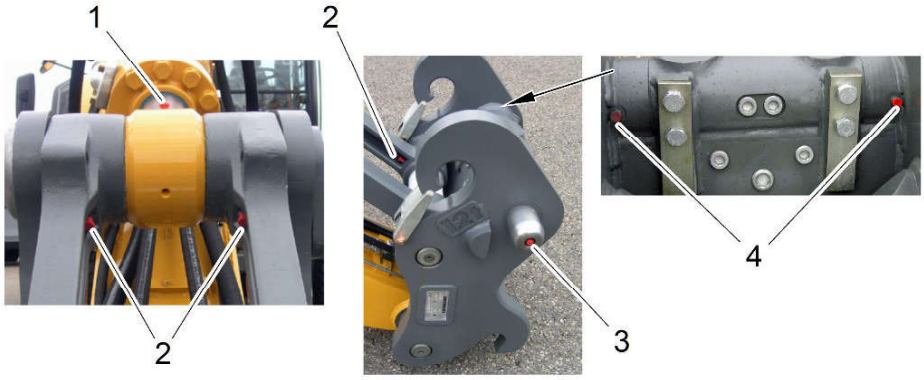

Fig. 922: Lubricating points

1	Bearings of piston rod	**3**	Bearing for pin of quick coupler
2	Bearings of change levers	**4**	Bearing for pin of quick coupler

NOTICE
Too little lubrication!
Damage to bearings.

- ▶ Check grease fitting for damage.
- ▶ Check lubricating bores for blockages.
- ▶ Check viscosity of grease.

Note
Reduce effort when lubricating with grease gun.

- ▶ Inject grease slowly.

- ▶ Prepare hand lever grease gun from on-board tool kit or commercially available grease gun.
- ▶ Observe lubrication chart.
- ▶ Remove protective cap before lubrication.
- ▶ Inject grease into grease fitting until grease emerges from bearings.
- ▶ Put on protective cap after lubricating.

If quick coupler bearings are lubricated:

- ▶ Fully retract bearing pin of quick coupler.
- ▶ Lubricate bearing for pin of quick coupler **3**.
- ▶ Lubricate bearing for pin of quick coupler **4**.

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5.7.3 Checking components for cracks

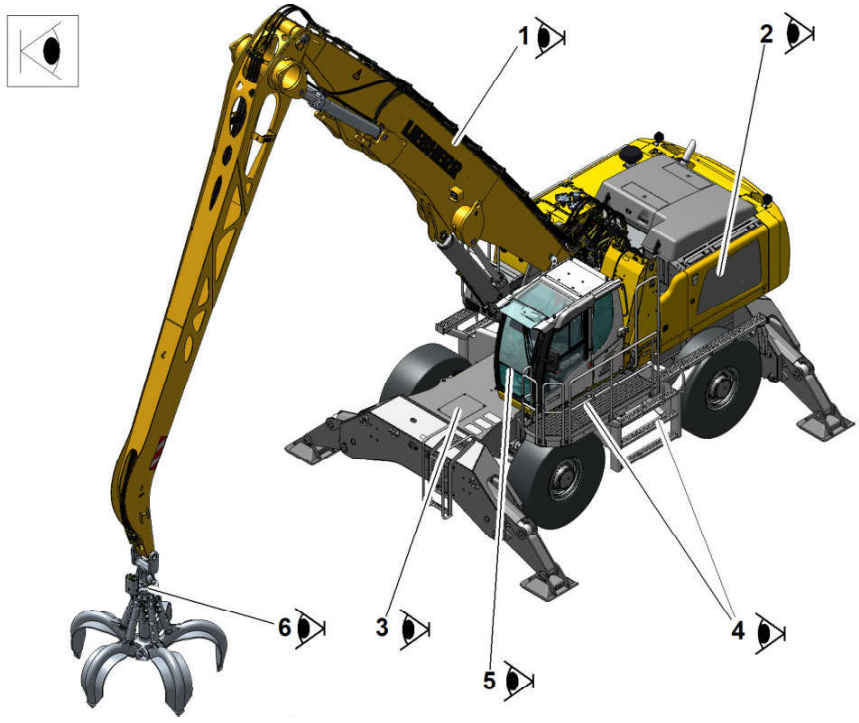

Fig. 923: Checking components for cracks

Visual inspection during maintenance tasks

NOTICE
Incorrect check!
Damage to machine.

▶ Perform visual inspections as per maintenance and inspection schedule.

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Position	Assembly	Visual inspection for defects
1	Steel frame of working attachment	Check bearing points, supports, holders, fastening elements, connections for damage, warping and cracks.
2	Steel frame of uppercarriage	
3	Steel frame of undercarriage and turret	
4	Steel frame of climbing aids and hand rails	
5	Steel frame of operator's cab	
6	Steel frame of quick coupler and working tool	

Tab. 133: Visual inspection for defects

▶ Perform visual inspection. (For more information see: Definition of visual inspection, page 295)

If defects occur in machine:

▶ Record any identified defects.

▶ Inform operating company of defects affecting safety.

▶ Repair identified defects. See service manual for procedure.

If service manual cannot be accessed:

▶ Have repairs performed by Liebherr customer service.

5.7.4 Lubricating hinges, locks and gas pressure springs of doors, hoods and windows

▶ Lubricate hinges regularly with oil or grease.

▶ Regularly lubricate locks with resin-free oil or commercially available door lock care product (with graphite or MoS2 compounds).

▶ Lubricate the joints of the gas pressure springs regularly with oil or grease.

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5.8 Drive group

5.8.1 Diesel engine: Bringing into maintenance position

- ▶ Make sure diesel engine is standing horizontally.
- ▶ Shut off diesel engine.
- ▶ Let diesel engine cool down.
- ▶ Switch off battery main switch.
- ▶ Observe diverging instructions in description of the work steps.

5.8.2 Diesel engine: Checking oil level

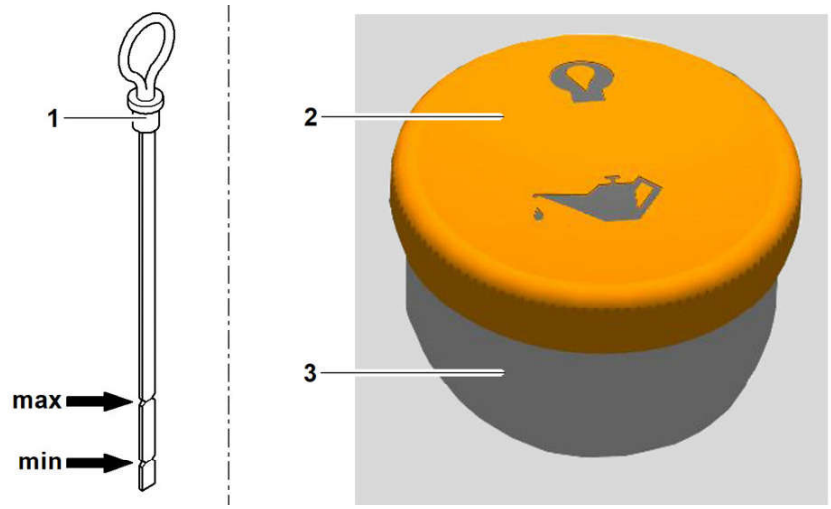

Fig. 924: Diesel engine: Checking oil level

1 Dipstick
2 Oil fill cover
3 Oil fill pipe

WARNING
Hot diesel engine and hot engine oil!
Burns.

- ▶ Let diesel engine cool down.
- ▶ Put on protective gloves.
- ▶ Avoid skin contact with hot diesel engine.
- ▶ Avoid skin contact with hot engine oil.

Make sure the following preconditions are met:
❑ Machine is horizontal.

- ▶ Shut off diesel engine.
- ▶ Wait 1 min until oil has collected in the oil pan.
- ▶ Pull out dipstick **1**.

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- ▶ Clean dipstick **1** with clean lint-free cloth.
- ▶ Insert dipstick **1** fully.
- ▶ Pull out dipstick **1** again.
- ▶ Check that oil level is between **min** mark and **max** mark on dipstick **1**.

NOTICE
Incorrect mixture of engine oils!
Damage to diesel engine.

- ▶ Do not mix engine oils.

NOTICE
Unapproved oil!
Damage to diesel engine.

- ▶ Exclusively use oil in line with Liebherr specification.

- ▶ Observe difficulty factors and oil specification (For more information see: 5.3.4 Engine oils, page 282) .

If oil level is below **min** mark:

- ▶ Unlock oil fill cover **2**.
- ▶ Remove oil fill cover **2**.
- ▶ Fill oil through oil fill pipe **3** until **max** mark is reached.
- ▶ Clean oil fill cover **2** with clean lint-free cloth.
- ▶ Lock oil fill cover **2**.

5.8.3 Fuel pre-filter: Draining water

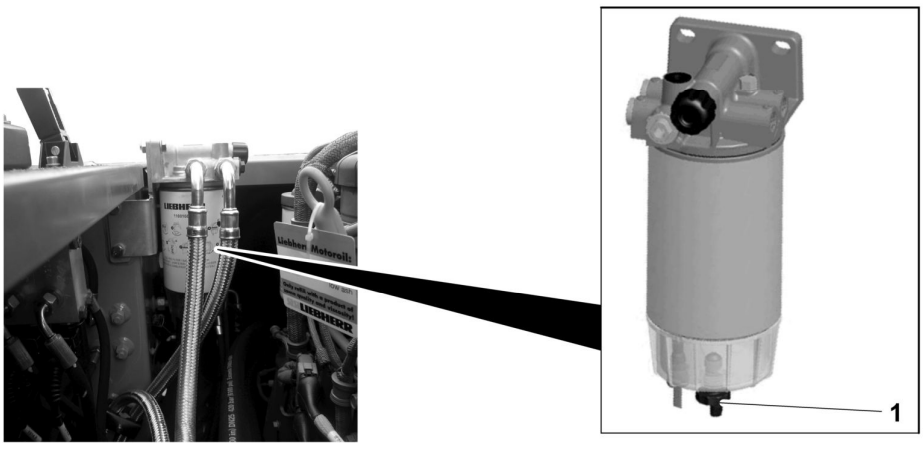

Fig. 925: Draining water

1 Water drain tap

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DANGER
Explosion of highly flammable fuel!
Danger to life.

- ▶ Avoid naked flames.
- ▶ Do not smoke.

WARNING
Engine hot!
Burns.

- ▶ Let engine cool down.
- ▶ Wear protective gloves.
- ▶ Avoid skin contact with engine when hot.

- ▶ Place suitable receptacle under the fuel pre-filter.
- ▶ Open water drain tap **1**.
  ▷ Condensed water in transparent container flows out.
- ▶ Drain water until pure fuel emerges.
- ▶ Close water drain tap **1**.
- ▶ Dispose of condensed water in an eco-friendly manner.

5.8.4 Fuel tank: Draining water and sediments

NOTICE
Condensed water in tank!
Engine damage.

- ▶ Make sure that fuel tank is filled during idle times.

DANGER
Explosion of highly flammable fuel!
Danger to life.

- ▶ Only work with diesel engine shut off.
- ▶ Avoid naked flames.
- ▶ Do not smoke.

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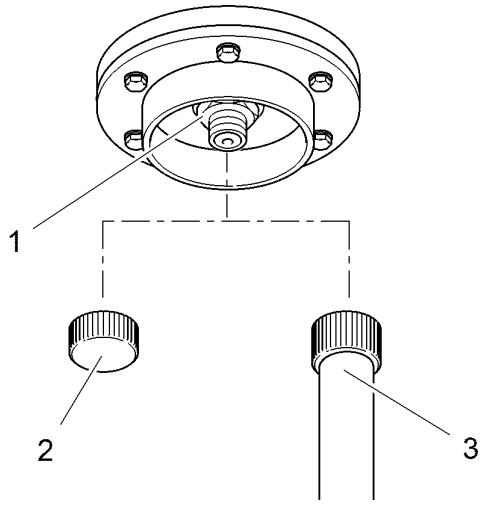

Fig. 926: Fuel tank: Draining water and sediments

1 Drain valve
2 Protective cap
3 Drain hose

Access to drain valve in fuel tank is under uppercarriage.

▶ Place receptacle under drain valve **1**.

▶ Remove protective cap **2** from drain valve **1**.

▶ Hold free end of drain hose **3** into receptacle.

▶ Screw drain hose **3** onto drain valve **1** until liquid emerges.
▷ Drain valve **1** is open.
▷ Water and sediment flow out of fuel tank.

When fuel emerges without water or sediment:

▶ Remove drain hose **3**.

▶ Screw protective cap **2** onto drain valve **1**.

▶ Dispose of water and sediment in eco-friendly manner.

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5.8.5 Air filter: Emptying dust collecting tank

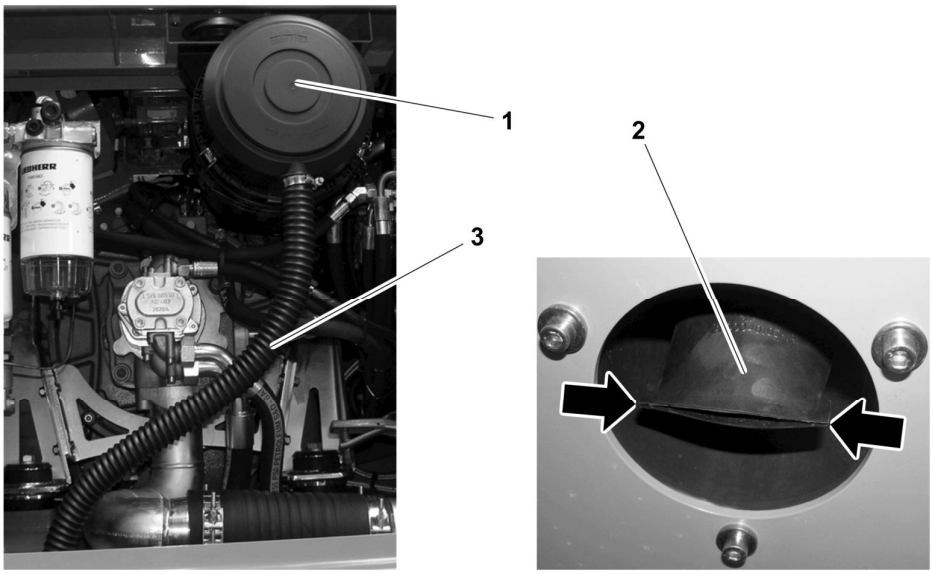

Fig. 927: Dust dump valve on air filter housing

1 Air filter housing
2 Dust dump valve
3 Air hose

The inside contour of the air filter housing **1** separates out some of the aspirated dust before it reaches the filter cartridge. The dust falls into the air hose **3**.

- ▶ Empty air hose **3** regularly using the dust dump valve **2**.
- ▶ Hold a suitable container under dust dump valve **2**.
- ▶ Open dust dump valve **2**: Squeeze slot at the bottom of the dust dump valve **2** by hand.
  ▷ Collected dust drops out.

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5.8.6 Air filter: Replacing main filter cartridge

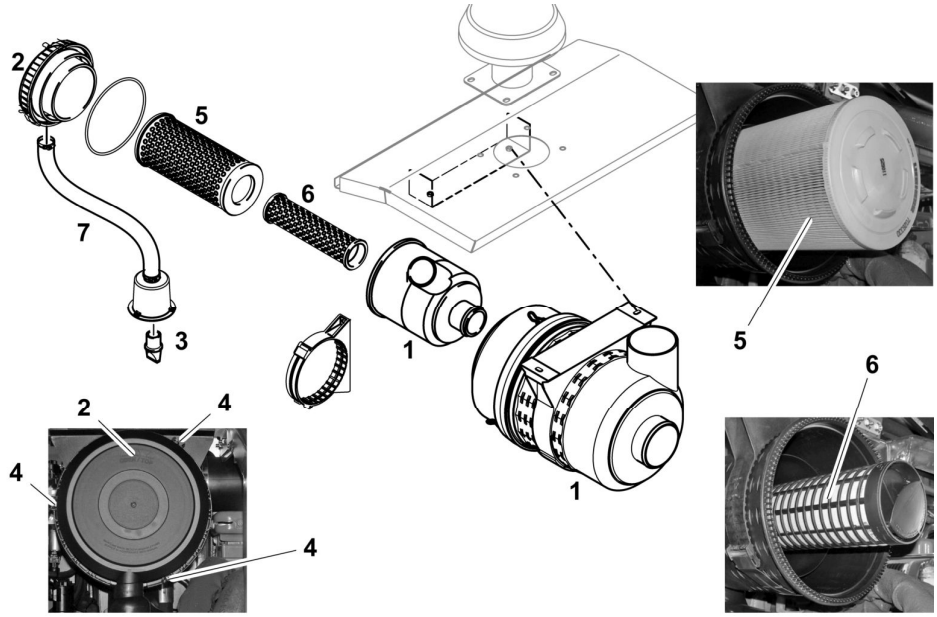

Fig. 928: Air filter: Replacing main filter cartridge

1	Filter housing	**5**	Main filter cartridge
2	Bowl with prefilter	**6**	Safety filter cartridge
3	Dust dump valve	**7**	Air hose
4	Clamp		

- ▶ Shut off diesel engine.
- ▶ Switch off battery main switch.
- ▶ Loosen clamps **4** (3 pieces) on bowl **2**.
- ▶ Remove bowl.
- ▶ Remove contaminated main filter cartridge **5**.
- ▶ Clean or replace main filter cartridge **5** depending on degree of contamination.

NOTICE
Incorrect cleaning!
Damage to the main filter cartridge.

- ▶ Clean main filter cartridge exclusively with dry air from the inside outward.
- ▶ Do not beat main filter cartridge.

NOTICE
Dirt entering open engine intake!
Damage to diesel engine.

- ▶ When cleaning filter housing leave safety filter cartridge in the filter housing.

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NOTICE
Incorrect cleaning!
Damage to safety filter cartridge.

- ▶ Do not blow out filter housing with compressed air.

- ▶ Clean insides of bowl **2** and filter housing **1** with damp cloth.
- ▶ Clean sealing surface in filter housing **1** with damp cloth.
- ▶ Check insides of bowl **2** and filter housing **1** and for damage.
- ▶ Check sealing surface in the filter housing **1** for damage.
- ▶ Clean sealing surfaces on bowl **2** and filter housing **1** with damp cloth.
- ▶ Check sealing surfaces for damage.
- ▶ Insert main filter cartridge **5**.
- ▶ Make sure that main filter cartridge **5** is tight and has a firm seat.
- ▶ Place bowl **2** on filter housing **1**.

NOTICE
Incorrectly mounted bowl!
Leaking filter system, damaged clamps.

- ▶ Make sure that bowl is in contact with the filter housing all around the circumference.
- ▶ Tighten clamps without too much force.

- ▶ Close clamps **4**.

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5.8.7 Air filter: Replacing safety filter cartridge

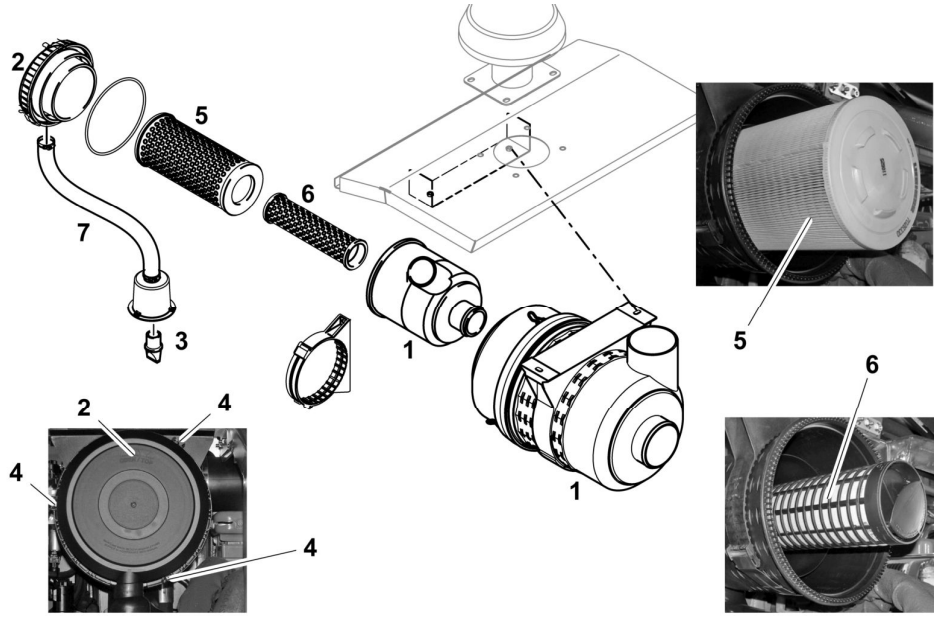

Fig. 929: Air filter: Replacing safety filter cartridge

1	Filter housing	**5**	Main filter cartridge
2	Bowl with prefilter	**6**	Safety filter cartridge
3	Dust dump valve	**7**	Air hose
4	Clamp		

- ▶ Shut off diesel engine.
- ▶ Switch off battery main switch.
- ▶ Loosen clamps **4** (3 pieces) on bowl **2**.
- ▶ Remove bowl **2**.
- ▶ Take out main filter cartridge **5**.
- ▶ Turn safety filter cartridge **6** counter-clockwise and remove.

NOTICE
Dirt entering open engine intake!
Damage to diesel engine.

- ▶ After taking out the contaminated safety filter cartridge immediately insert new safety filter cartridge.

- ▶ Turn new safety filter cartridge **6** and tighten slightly by hand.

NOTICE
Incorrect cleaning!
Damage to safety filter cartridge.

- ▶ Do not blow out filter housing with compressed air.

- ▶ Clean insides of bowl **2** and filter housing **1** with damp cloth.

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- ▶ Clean sealing surface in filter housing **1** with damp cloth.
- ▶ Check insides of bowl **2** and filter housing **1** and for damage.
- ▶ Check sealing surface in the filter housing **1** for damage.
- ▶ Clean sealing surfaces on bowl **2** and filter housing **1** with damp cloth.
- ▶ Check sealing surfaces for damage.
- ▶ Insert main filter cartridge **5**.
- ▶ Make sure that main filter cartridge **5** is tight and has a firm seat.
- ▶ Place bowl **2** on filter housing **1**.

NOTICE
Incorrectly mounted bowl!
Leaking filter system, damaged clamps.

- ▶ Make sure that bowl is in contact with the filter housing all around the circumference.
- ▶ Tighten clamps without too much force.

- ▶ Close clamps **4**.

5.8.8 Pump distributor gear: Checking oil level

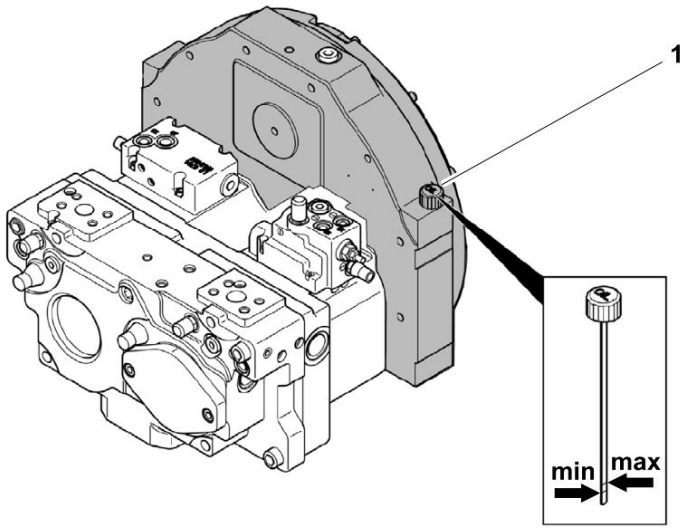

Fig. 930: Pump distributor gear: Checking oil level

1 Dipstick

CAUTION
Hot gear oil!
Burns.

- ▶ Let pump distributor gear cool down.
- ▶ Wear gloves.
- ▶ Avoid skin contact with hot pump distributor gear.
- ▶ Avoid skin contact with hot gear oil.

Make sure the following preconditions are met:
- ❑ Machine is horizontal.
- ▶ Shut off diesel engine.
- ▶ Wait a few minutes until oil has collected in oil pan.
- ▶ Unscrew dipstick **1**.
- ▶ Pull out dipstick **1** and clean with clean lint-free cloth.
- ▶ Insert dipstick **1** fully.
- ▶ Pull out dipstick **1** again.
- ▶ Check that oil level is between **min** mark and **max** mark on dipstick **1**.

NOTICE
Incorrect mixture of gear oils!
Damage to pump distributor gear.

- ▶ Do not mix gear oils.

NOTICE
Unsuitable gear oil!
Damage to pump distributor gear.

- ▶ Exclusively use gear oil in approved quality.

If oil level is below **min** mark:
- ▶ Fill with oil until **max** mark is reached.
- ▶ Screw in dipstick **1**.

5.8.9 Diesel particulate filter: Activating and deactivating regeneration

Operating condition of diesel particulate filter

Following symbols and menus indicate the operating condition of the diesel particulate filter on the display:
- *Start page* menu
- *Diesel particulate filter* menu
- Bar chart display
- Status symbols
- Warning symbols

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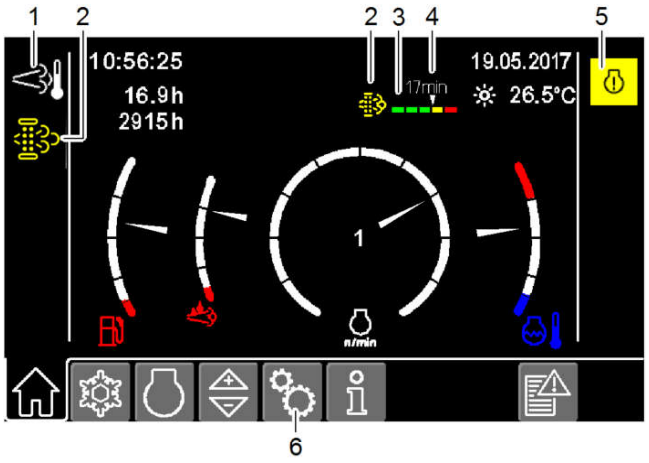

Fig. 931: Start page menu

1 *Increased exhaust temperature* status symbol
2 *Diesel particulate filter contaminated* status symbol
3 Contamination level of diesel particulate filter
4 Remaining filter regeneration time
5 *Prewarning: Control error of diesel engine* warning symbol
6 *Function settings* menu

Contamination level of diesel particulate filter

NOTICE
Contaminated diesel particulate filter!
Damage to diesel engine.

▶ Shut off diesel engine.

▶ Have diesel particulate filter checked by Liebherr customer service.

The bar chart display on the display shows the contamination level of the diesel particulate filter in five stages. The pointer above the bar chart display indicates the degree of contamination of the diesel particulate filter.

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5
Stage shown on the display						
Activation of filter regeneration	—	—	—	Manual	Manual	Manually by Liebherr customer service
Deactivating or cancelling filter regeneration	—	—	—	Deacti-vating or cancelling possible	Cancelling possible	Cancelling possible

Tab. 134: Contamination level of diesel particulate filter

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Warning symbols and status symbols on the display

Symbol on the display		Meaning	Effect
	*Increased exhaust temperature* status symbol appears on the display.	Exhaust temperature is increased.	Automatic filter regeneration is active.
	*Diesel particulate filter contaminated* status symbol appears on the display.	Diesel particulate filter is contaminated.	Filter regeneration is required. (For more information see: Activating filter regeneration, page 322)
	*Diesel particulate filter heavily contaminated* status symbol appears on the display.	Diesel particulate filter is heavily contaminated.	Filter regeneration is required. (For more information see: Activating filter regeneration, page 322)
	*Prewarning: Control error of diesel engine* warning symbol appears on the display.	Engine power and hydraulic flow are restricted to 75%.	Filter regeneration is required. (For more information see: Activating filter regeneration, page 322)
	*Control error of diesel engine* warning symbol appears on the display.	Engine power and hydraulic flow are restricted to 50%.	Checking and filter regeneration of the diesel particulate filter by Liebherr customer service is required.

Tab. 135: Warning symbols and status symbols on the display

Activating filter regeneration

DANGER
Hot exhaust gases!
Danger to life.

- ▶ Exclusively activate manual regeneration outdoors.
- ▶ Make sure that no flammable materials are in the vicinity.

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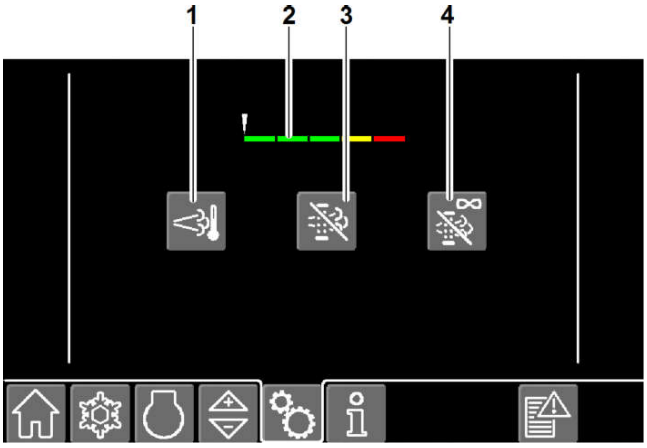

Fig. 943: Activating filter regeneration

1 *Activating filter regeneration* button
2 Contamination level of diesel particulate filter
3 *Temporarily deactivating filter regeneration* button
4 *Permanently deactivating filter regeneration* button

Following factors extend the regeneration time:
– Outside temperature
– Exhaust temperature
– Contamination level of diesel particulate filter

Make sure the following preconditions are met.
❑ Machine is shut down.
❑ Machine is not in an enclosed space.
❑ Machine is in a safe location without fire risk.
❑ Fuel level is sufficient.
❑ Diesel engine is at operating temperature.

▶ Let diesel engine run.

▶ Move folding console up.

▶ Open *diesel particulate filter* menu.

▶ Press *activating filter regeneration* button.
▷ *Filter regeneration in progress* status symbol appears on the display:

▷ *Activating filter regeneration* button is deactivated as button and lights up green:

▷ Filter regeneration starts.
▷ Diesel engine runs at higher speed.
▷ Remaining filter regeneration time is displayed:

▷ Diesel engine drops to idle speed.

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▷ Filter regeneration is complete.

Deactivating filter regeneration

Deactivate filter regeneration in following cases:
– Working in enclosed spaces
– Working in areas at risk of fire

Blocking is possible depending on the degree of contamination of the diesel particulate filter. (For more information see: Contamination level of diesel particulate filter, page 321)

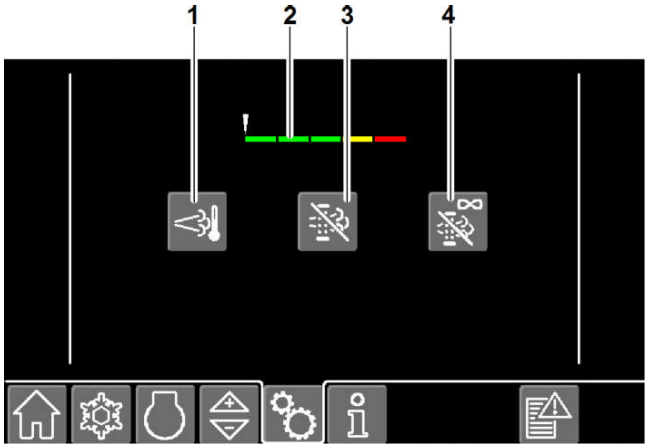

Fig. 948: Deactivating filter regeneration

1 *Activating filter regeneration* button
2 Contamination level of diesel particulate filter
3 *Temporarily deactivating filter regeneration* button
4 *Permanently deactivating filter regeneration* button

Temporarily deactivating filter regeneration

Temporarily deactivating filter regeneration **button**	**Meaning**
	Temporary deactivation of filter regeneration is possible.
	Filter regeneration is blocked until next start of diesel engine.
	Temporary deactivation of filter regeneration is not possible.

Tab. 136: Deactivating filter regeneration button

▶ Open *diesel particulate filter* menu.

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▶ Press *temporarily deactivating filter regeneration* button **3**.
▷ *Temporarily deactivating filter regeneration* button **3** lights up green:

▷ Filter regeneration is blocked until the diesel engine is next started.

Permanently deactivating filter regeneration

***Permanently deactivating filter regeneration* button**	**Meaning**
	Permanent deactivation of filter regeneration is possible.
	Filter regeneration is permanently blocked.
	Permanent deactivation of filter regeneration is not possible.

Tab. 137: Permanently deactivating filter regeneration button

▶ Open *diesel particulate filter* menu.

▶ Press *permanently deactivating filter regeneration* button **4**.
▷ *Permanently deactivating filter regeneration* button **4** lights up green:

▷ Filter regeneration is permanently blocked.

Cancelling filter regeneration

▶ Open *diesel particulate filter* menu.

▶ Press *deactivating filter regeneration* button.
or

Move folding console down.
▷ Filter regeneration is stopped.
▷ *Filter regeneration in progress* status symbol is hidden.

Filter regeneration after longer downtime

During longer downtimes the fuel oxidises. Filter regeneration is necessary at regular intervals.

The maximum service life depends on the fuel used.

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Fuel used	Maximum service life
ASTM D975 1D S15	12 months
ASTM D975 2D S15	
EN 590	

Tab. 138: Filter regeneration after longer downtime

When maximum service life is reached:

▶ Activate filter regeneration. (For more information see: Activating filter regeneration, page 322)

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5.9 Cooling system

5.9.1 Checking coolant level

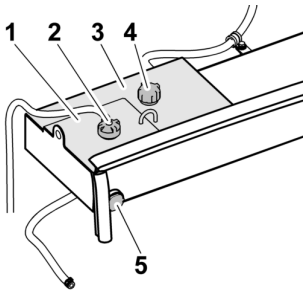

Fig. 960: Checking coolant level

1	Expansion chamber	**4**	Sealing cover
2	Bleeding cover	**5**	Sight glass
3	Coolant container		

WARNING
Hot pressurised engine cooling system!
Burns.

- ▶ Do not touch coolant and parts carrying coolant.
- ▶ Open engine cooling system exclusively when cooled down.

Make sure the following preconditions are met:
- ❑ Machine is parked on level ground.
- ❑ Diesel engine is shut off.
- ❑ Diesel engine has cooled down.

Checking coolant level

- ▶ Open rear left side door.
- ▶ Check whether sight glass **5** is half filled with coolant.

If sight glass **5** is not half filled with coolant:
- ▶ Fill with coolant.

Filling with coolant

NOTICE
Incorrect mixture of coolants!
Damage to engine cooling system.

- ▶ Do not mix coolants.

- ▶ Open engine bonnet.
- ▶ Release any excess pressure: Slowly open bleeding cover **2** completely.
- ▶ Slowly open sealing cover **4**.

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- ▶ Fill coolant no faster than 8 l/min into coolant container **3** until coolant container **3** is completely filled with coolant.
- ▶ Fill coolant no faster than 8 l/min into expansion chamber **1** until sight glass **5** is half filled with coolant.
- ▶ Close sealing cover **4**.
- ▶ Close bleeding cover **2**.

Bleeding cooling system

- ▶ Start diesel engine.
- ▶ Turn on operator's cab heating.
- ▶ Set operator's cab heating to highest level.
- ▶ Let diesel engine run at idle speed for 5 minutes.
- ▶ Shut off diesel engine.
- ▶ Check coolant level, refill coolant if necessary. (For more information see: Filling with coolant, page 327)

When machine has cooled down:

- ▶ Check coolant level, refill coolant if necessary. (For more information see: Filling with coolant, page 327)

5.9.2 Checking cooling system and heat exchanger for contamination and cleaning

NOTICE
Incorrect cleaning!
Damage to condenser fins.

- ▶ Never clean condenser fins mechanically or by steam cleaning.
- ▶ Clean condenser fins exclusively with compressed air.

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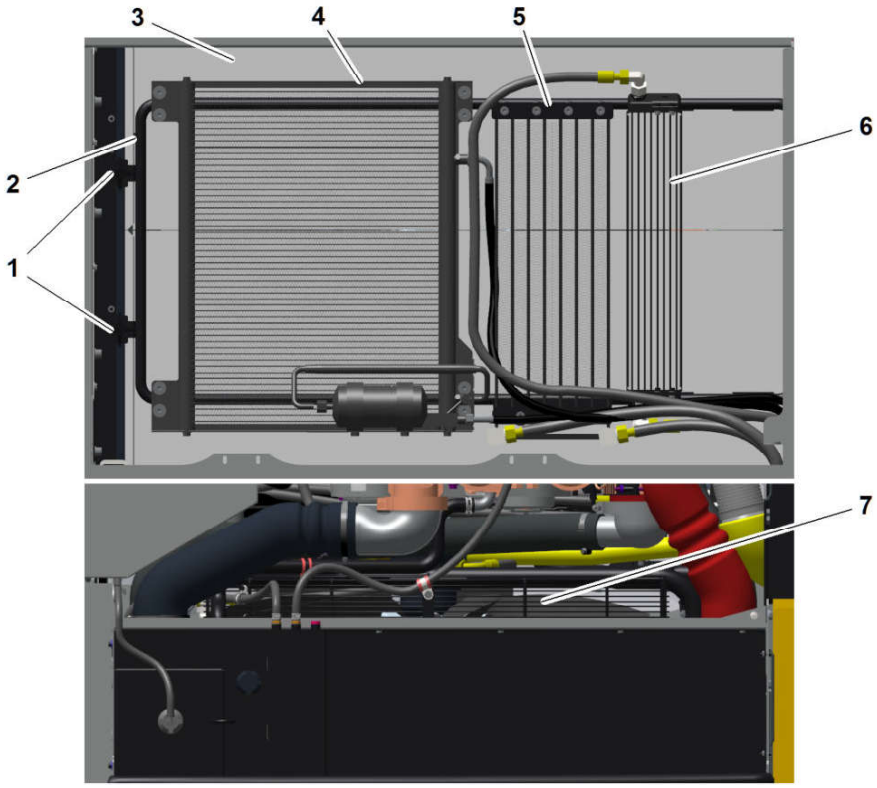

Fig. 961: Checking cooling system and heat exchanger for contamination and cleaning

1	Star knob screw	**5**	Fuel cooler
2	Swivel frame	**6**	Gear oil cooler
3	Combination cooling unit	**7**	Radiator fan
4	Air conditioning condenser		

The combination cooling unit consists of the following coolers:
– Engine cooling
– Hydraulic oil cooler
– Intercooler

The machine is equipped with the following additional cooling units:
– Air conditioning condenser
– Fuel cooler
– Gear oil cooler

For optimal cooling, cooling units must be kept clean.

Make sure the following preconditions are met:
❑ Diesel engine is off.
❑ Diesel engine has cooled down.

▶ Loosen star knob screws **1** on swivel frame **2**.

▶ Swing swivel frame **2** out.

▶ Check combination cooling unit **3**, fuel cooler **5**, gear oil cooler **6** and radiator fan **7** for contamination and clean if necessary.

▶ Clean cooling fins with compressed air if necessary (from inside outward).

▶ Swing swivel frame **2** back.

▶ Screw in star knob screws **1** into swivel frame **2** and tighten.

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5.10 Working hydraulics

5.10.1 Depressurising hydraulic system

Depressurising hydraulic hoses

Make sure the following preconditions are met:
❑ Ignition key is in position 1.

▶ Lower working attachment to the ground.

▶ Shut off diesel engine or electric motor immediately.

▶ Move folding console downwards.

▶ Operate joysticks and pedals carefully in all directions.
▷ Hydraulic lines are depressurised.

Depressurising hydraulic tank

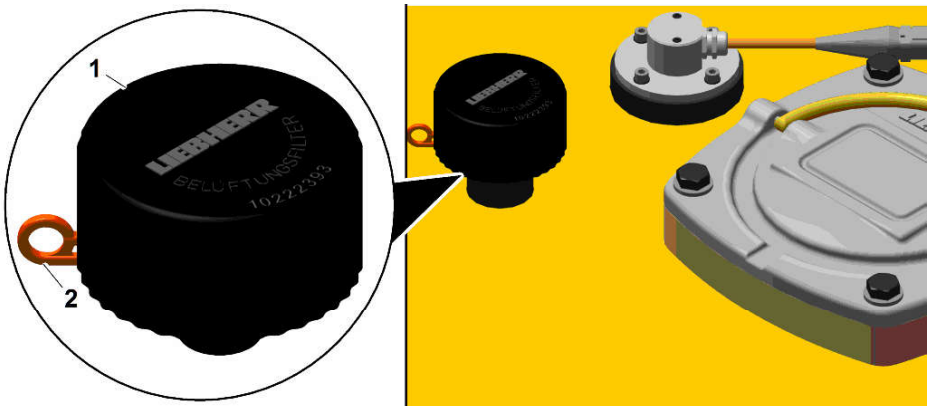

Fig. 962: Depressurising hydraulic tank

1 Breather filter **2** Securing pin

▶ Insert securing pin **2**.

▶ Unscrew breather filter **1** by hand by a maximum of one turn. Use open-end spanner if necessary.
▷ Hydraulic tank is depressurised.

When maintenance tasks on hydraulic system are complete:
▶ Screw in breather filter **1**.

▶ Pull out securing pin **2** (theft prevention).

5.10.2 Hydraulic tank: Checking oil level

Checking hydraulic oil level

The hydraulic oil level depends on the hydraulic oil temperature.

Make sure the following preconditions are met:
– Machine is parked on level ground.

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– Diesel engine or electric motor is shut off.

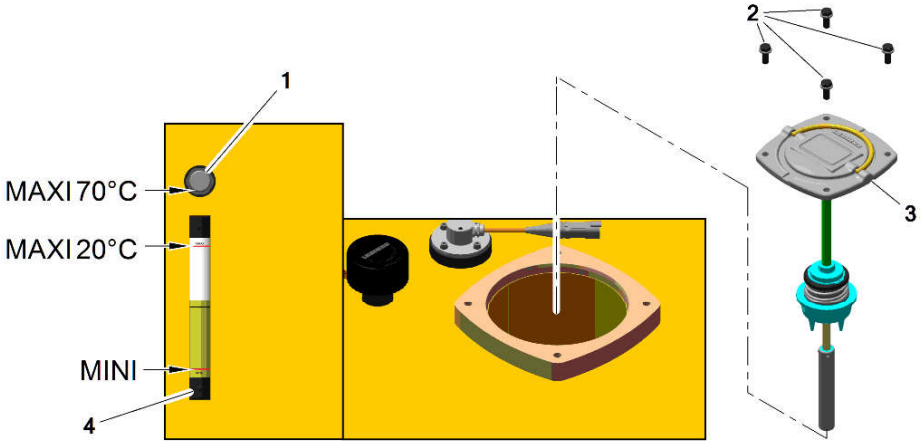

Fig. 963: Hydraulic tank

1	Oil sight glass	**3**	Return filter cover
2	Hex head screw	**4**	Oil sight glass

▶ Check hydraulic oil temperature shown on the display.

▶ Make sure that hydraulic oil temperature is at 20 $^{\pm 5}$ °C.

▶ Extend hoist cylinders, stick cylinders, bucket cylinders, adjustable boom cylinders and support cylinders as far as possible.

▶ Check hydraulic oil level on oil sight glass **4**.

If hydraulic oil level is below **MINI** mark:

▶ Fill with hydraulic oil. (For more information see: Filling with hydraulic oil, page 331)

▶ Retract hoist cylinders, stick cylinders, bucket cylinders, adjustable boom cylinders and support cylinders as far as possible.

▶ Check hydraulic oil level on oil sight glass **4**.

If hydraulic oil level is above **MAXI** mark:

▶ Drain hydraulic oil. (For more information see: Draining hydraulic oil, page 332)

When the machine has reached operating temperature 70 °C:

▶ Retract hoist cylinders, stick cylinders, bucket cylinders, adjustable boom cylinders and support cylinders as far as possible.

▶ Check hydraulic oil level on oil sight glass **1**.

If hydraulic oil level is above bottom edge of oil sight glass **1**:

▶ Drain hydraulic oil. (For more information see: Draining hydraulic oil, page 332)

Filling with hydraulic oil

NOTICE
Incorrect mixture of hydraulic oils!
Damage to hydraulic system.

▶ Do not mix hydraulic oils.

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NOTICE
Incorrect filling!
Damage to hydraulic system.

▶ Fill hydraulic tank exclusively through return filter.

▶ Depressurise hydraulic tank. (For more information see: Depressurising hydraulic tank, page 330)

▶ Unscrew hex head screws **2** on return filter cover **3**.

▶ Remove return filter cover **3**.

▶ Slowly pour in hydraulic oil.

▶ Check hydraulic oil level on oil sight glass **4**.

▶ Put on return filter cover **3**.

▶ Screw in hex head screws **2** on return filter cover **3**.

▶ Tighten hex head screws **2** on return filter cover **3**.

Draining hydraulic oil

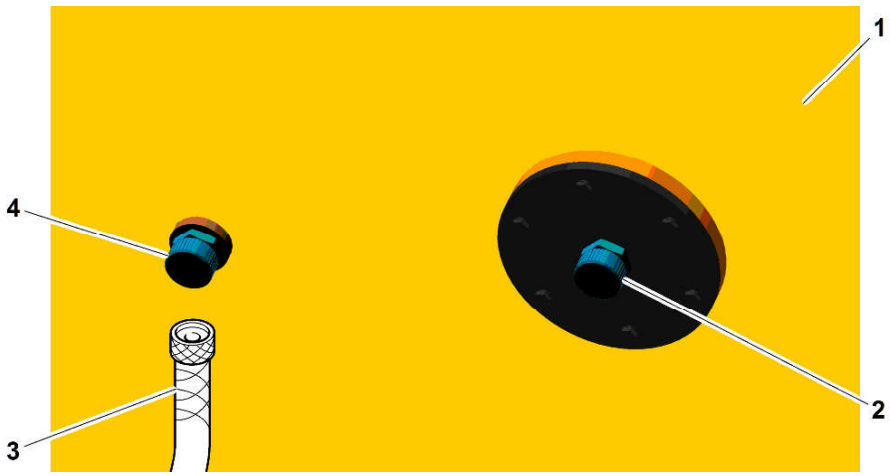

Fig. 964: Hydraulic tank drain valves

1	Hydraulic tank	**3**	Drain hose
2	Return side drain valve	**4**	Suction side drain valve

Make sure the following preconditions are met:
– Suitable receptacle is at hand.

WARNING
Hot hydraulic system and hot hydraulic oil!
Burns.

▶ Let hydraulic system cool down.

▶ Wear protective gloves.

▶ Avoid skin contact with hot parts carrying oil.

▶ Avoid skin contact with hot hydraulic oil.

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NOTICE
Escaped oil!
Environmental pollution.

- ▶ Collect oil in suitable receptacle.
- ▶ Dispose of discharged oil in eco-friendly manner.

- ▶ Remove existing covers. (For more information see: 5.4.2 Access points under the uppercarriage, page 294)
- ▶ Depressurise hydraulic tank. (For more information see: Depressurising hydraulic tank, page 330)
- ▶ Remove protective cap from suction side drain valve **4**.
- ▶ Place suitable receptacle under suction side drain valve **4**.
- ▶ Place free end of drain hose **3** in receptacle.
- ▶ Screw drain hose **3** onto suction side drain valve **4** until oil is discharged slowly.
- ▶ Monitor hydraulic oil level, work with assistant if necessary.

When required hydraulic oil level is reached:

- ▶ Remove drain hose **3** from suction side drain valve **4**.
- ▶ Dispose of hydraulic oil in eco-friendly manner.
- ▶ Screw protective cap onto suction side drain valve **4**.

5.10.3 Hydraulic tank: Draining water and sediments

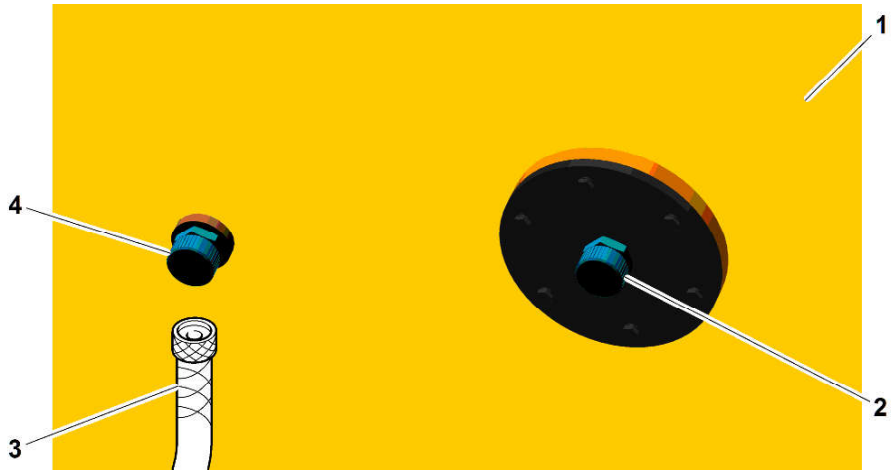

Fig. 965: Hydraulic tank drain valves

1	Hydraulic tank	**3**	Drain hose
2	Return side drain valve	**4**	Suction side drain valve

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NOTICE
Not approved water content in eco-friendly liquid!
Damage to hydraulic components.

- ▶ Make sure that water content is under 0.1% of total content.
- ▶ Install bypass filter.
- ▶ Take an oil sample for oil analysis.

- ▶ Remove existing covers. (For more information see: 5.4.2 Access points under the uppercarriage, page 294)
- ▶ Depressurise hydraulic system. (For more information see: 5.10.1 Depressurising hydraulic system, page 330)
- ▶ Place receptacle under return side drain valve **2** and suction side drain valve **4**.
- ▶ Remove protective cap from return side drain valve **2** on oil pan.
- ▶ Place free end of drain hose **3** in receptacle.
- ▶ Screw drain hose **3** on return side drain valve **2** until liquid emerges.
  - ▷ Return side drain valve **2** is open.
  - ▷ Water and sediment flow out of hydraulic tank **1**.

When hydraulic oil emerges without water or sediment:

- ▶ Remove drain hose **3**.
- ▶ Screw protective cap onto return side drain valve **2**.
- ▶ Remove protective cap from suction side drain valve **4**.
- ▶ Place free end of drain hose **3** in receptacle.
- ▶ Screw drain hose **3** onto suction side drain valve **4** until liquid emerges.
  - ▷ Suction side drain valve **4** is open.
  - ▷ Water and sediment flow out of hydraulic tank **1**.

When hydraulic oil emerges without water or sediment:

- ▶ Remove drain hose **3**.
- ▶ Screw protective cap onto suction side drain valve **4**.
- ▶ Dispose of water and sediment in eco-friendly manner.

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5.10.4 Return filter: Checking and cleaning magnetic rod

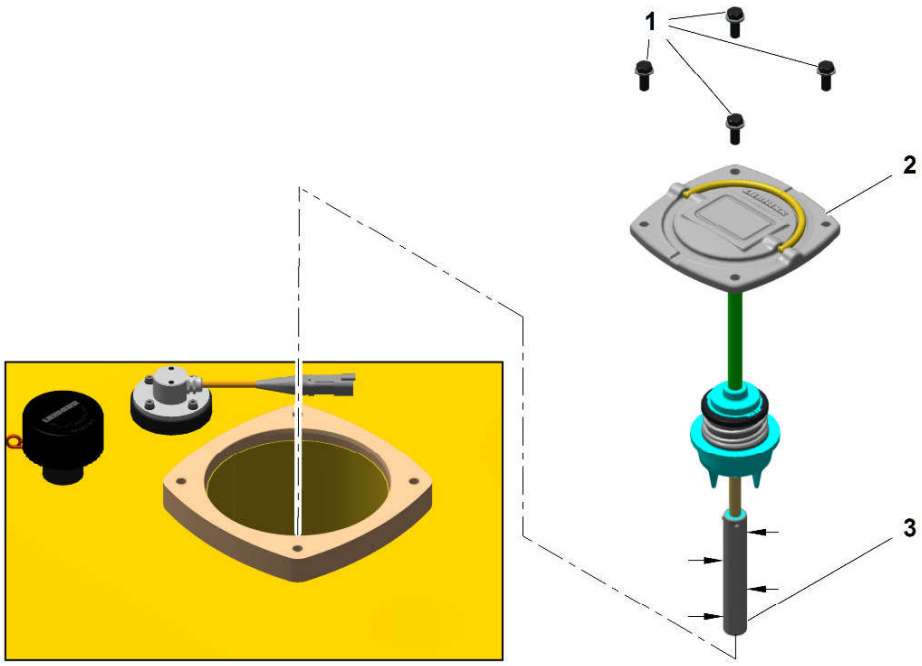

Fig. 966: Return filter

1 Hex head screw
2 Return filter cover
3 Magnetic rod

▶ Depressurise hydraulic system. (For more information see: 5.10.1 Depressurising hydraulic system, page 330)

▶ Unscrew hex head screws **1**.

▶ Remove return filter cover **2**.

▶ Check magnetic rod **3** for sticky contamination.

If magnetic rod **3** is heavily contaminated:

▶ Remedy cause of contamination.

▶ Take an oil sample if necessary.

▶ Clean magnetic rod **3** with lint-free cloth.

▶ Put on return filter cover **2**.

▶ Screw in hex head screws **1**.

▶ Tighten hex head screws **1**.

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5.10.5 Bypass filter (option): Checking degree of contamination of filter cartridge

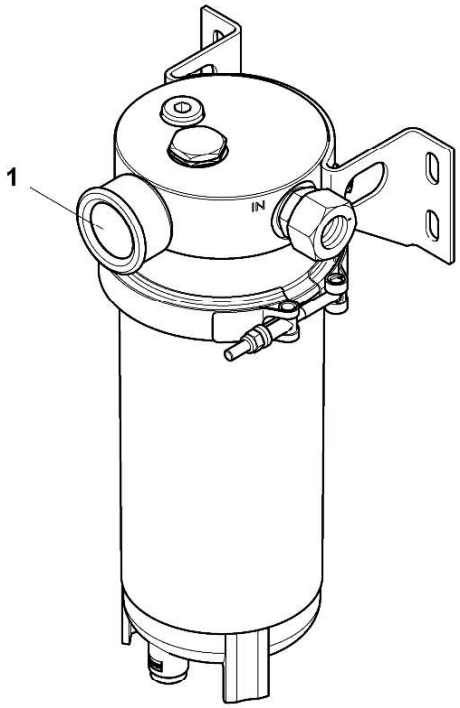

Fig. 967: Bypass filter

1 Pressure gauge

Make sure the following preconditions are met:
- ❑ Diesel engine or electric motor is idling.
- ❑ Hydraulic oil is at operating temperature.

▶ Check pressure on pressure gauge **1** of bypass filter.

If displayed value exceeds 2.5 bar:
▶ Have filter cartridge of bypass filter replaced by Liebherr customer service.

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5.11 Electrical system

5.11.1 General information

Before any intervention in electrical system

- ▶ Put on safety glasses and work gloves.
- ▶ Switch off battery main switch.
- ▶ Disconnect batteries: First disconnect negative terminal **(-)**.
- ▶ Connect batteries: Connect negative terminal **(-)** last.

General maintenance work

- ▶ Check correct condition of electrical system.
- ▶ Have all defects repaired immediately.

If fuse or bulb is damaged:

- ▶ Remove cause.
- ▶ Replace damaged fuse or bulb immediately.

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5.12 Axles

5.12.1 Screw plug tightening torques

Thread size	Tightening torque (guide values)
M14x1.5	45 Nm
M16x1.5	60 Nm
M22x1.5	100 Nm
M24x1.5	120 Nm
M30x1.5	160 Nm
M42x1.5	260 Nm
M45x1.5	280 Nm

Tab. 139: Screw plug tightening torques

5.12.2 Lubricating axles

NOTICE
Insufficient lubrication!
Damage to bearings.

- ▶ Make sure that grease emerges at all lubricating points.
- ▶ Adapt lubricating interval to deployment.
- ▶ Exclusively use grease as per prescribed specification.

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Manually lubricating oscillating axle and steered rigid axle

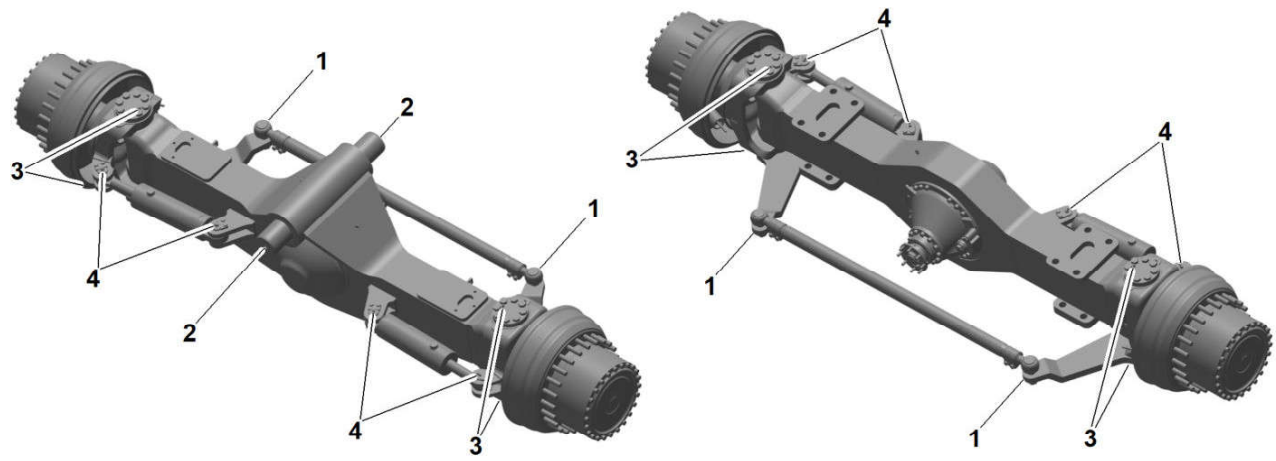

Fig. 968: Lubricating points of oscillating axle and steered rigid axle

1	Grease fitting of tie rod bearings	**3**	Grease fittings of steering knuckle bearings
2	Grease fittings of pendulum bolt bearings	**4**	Grease fittings of steering cylinder bearings

▶ Remove dust protection caps from grease fittings.

If grease fitting are installed on tie rod bearings:

▶ Use grease gun to inject grease in grease fitting of central lubrication point **1** until clean grease emerges from tie rod bearings.

▶ Use grease gun to inject grease via all grease fittings until clean grease emerges from bearings of oscillating axle.

▶ Use grease gun to inject grease via all grease fittings until clean grease emerges from bearings of steered rigid axle.

▶ Put dust protection caps onto grease fittings.

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Manually lubricating oscillating axle and steered rigid axle at central lubrication point (option)

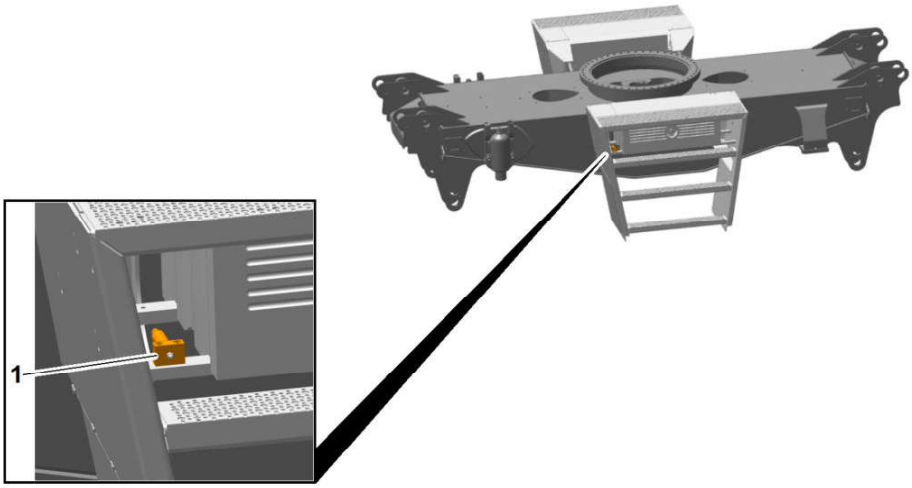

Fig. 969: Position of central lubrication point

1 Central lubrication point

- ▶ Remove dust protection cap from grease fitting of central lubrication point **1**.
- ▶ Use grease gun to inject grease in grease fitting of central lubrication point **1** until clean grease emerges from bearings of oscillating axle and steered rigid axle.
- ▶ Put dust protection cover on grease fitting of central lubrication point **1**.

5.12.3 Tyres: Checking tyre pressure

Make sure the following preconditions are met:
- ❑ Machine is parked on level and firm ground.
- ❑ Machine is secured with chocks to prevent it from rolling away.

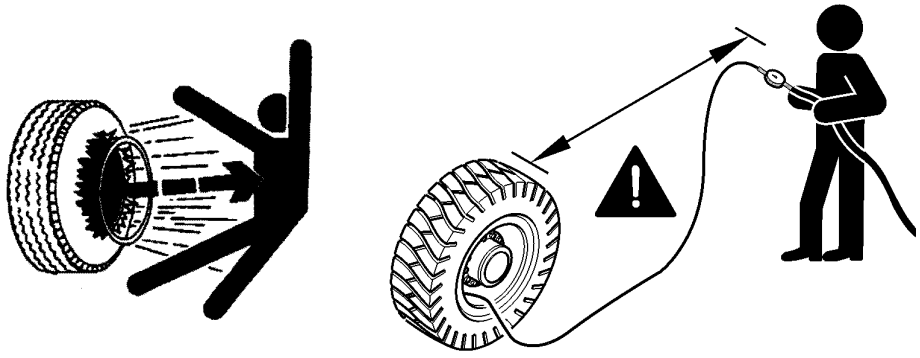

Fig. 970: Checking pressure, maintaining safety distance

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DANGER
Bursting tyre!
Death.

- ▶ Never pump up tyres that have gone flat.
- ▶ Use a sufficiently long tyre inflation hose with self-locking inflation valve.
- ▶ Stand sideways to the tyre and away from the danger zone.

Tyre pressure affects the operating behaviour of the machine.

Manufacturer	Type	Size	Air pressure
Bridgestone	Fast Grip	11.00–20	7.00 bar
Michelin	XZM	11.00–20	10.00 bar
Michelin	XZM	12.00–20	10.00 bar
Mitas	NB 59	11.00–20	9.00 bar
Mitas	NB 59	12.00–20	9.00 bar
Nokian	Armor Gard	12.00–20 PR18	9.50 bar
Nokian	Armor Gard	12.00–20 PR20	10.00 bar

Tab. 140: Tyre pressure table

- ▶ See table for specified value.
- ▶ Attach measuring instrument.
- ▶ Check tyre pressure.
- ▶ Correct tyre pressure if necessary.

5.12.4 Tyres: checking foam-filled tyres

Note
The running characteristics change when tyres are filled with foam. This can adversely affect the performance of the machine.

- ▶ Use only foam-filled tires supplied by Liebherr.

5.12.5 Wheels: Checking mounting of wheel nuts

DANGER
Incorrectly tightened wheel nuts!
Danger to life.

- ▶ Make sure that all wheel nuts are tightened with specified tightening torque.
- ▶ Check tightening torque after 50, 100 and 250 operating hours.

Make sure the following preconditions are met:
- ❑ Machine is parked on level and firm ground.
- ❑ Machine is secured with chocks to prevent it from rolling away.
- ❑ A torque wrench with a sufficient setting range is available.

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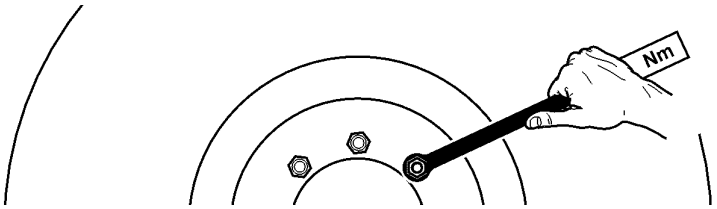

Fig. 971: Tightening wheel nuts

▶ Make sure that all wheel nuts are tightened with 650 Nm.

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5.13 Working attachment

5.13.1 Lubricating working tool

The central lubrication system of the machine does not lubricate the lubricating points of the working tool.

▶ For lubricating intervals see lubrication chart of working tool.

or

See lubrication chart in maintenance chapter.

▶ Connect grease gun to lubricating points.

▶ Lubricate until clean grease emerges from lubricating point.

5.13.2 Checking pin bearings for wear

▶ Check bearings of complete working attachment for proper condition.

▶ Check play between pin and bearing: Operate working attachment quickly and stop it suddenly.

▶ Inform operating company of defects affecting safety.

▶ Repair identified defects. See service manual for procedure.

If service manual cannot be accessed:

▶ Have repairs performed by Liebherr customer service.

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5.14 Operator's cab, heating and air conditioning

5.14.1 Filling with windscreen washer fluid

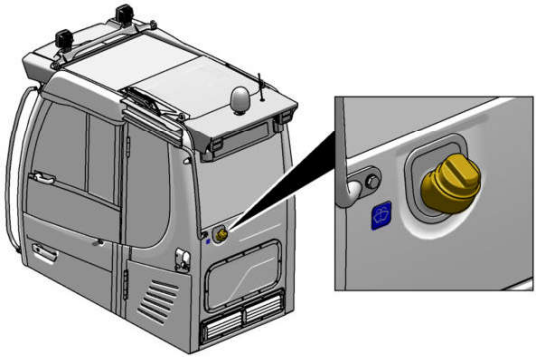

Fig. 972: Windscreen washer tank

▶ Fill with windscreen washer fluid. (For more information see: 5.3.13 Windscreen washer fluid, page 291)

5.14.2 Heating: Checking function

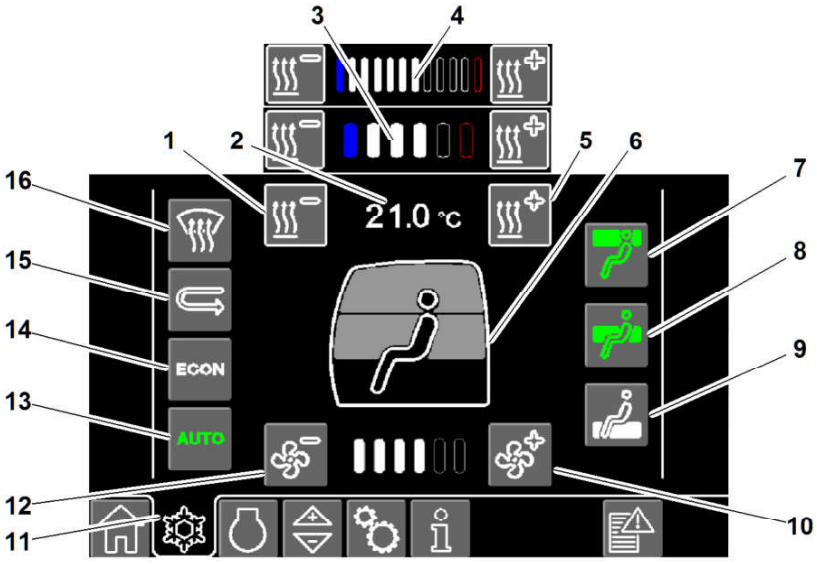

Fig. 973: Operation via menu

1 *Lower temperature* button
2 *Automatic air conditioning* temperature display
9 *Foot area air outlets* button
10 *Raise blower power* button

See next page for continuation of the image legend

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3	*6 temperature levels* temperature display (for emergency mode of automatic air conditioning)	**11**	*Heating and air conditioning* menu
4	*12 temperature levels* temperature display (for air conditioning)	**12**	*Lower blower power* button
5	*Raise temperature* button	**13**	*Automatic mode* button (not for emergency mode of automatic air conditioning and air conditioning)
6	Operating status of air outlets	**14**	*ECON* button (not for emergency mode of air conditioning)
7	*Head area air outlets* button	**15**	*Recirculated air* button
8	*Chest area air outlets* button	**16**	*Defrosting and defogging* button

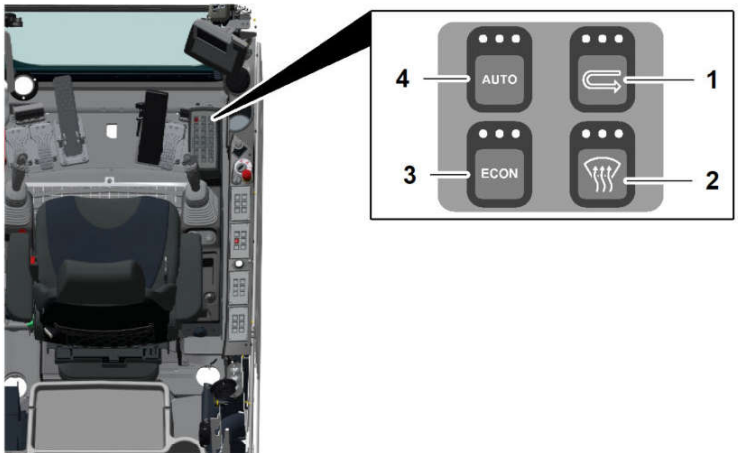

Fig. 974: Operation

1	*Recirculated air* key	**3**	*ECON* key
2	*Defrosting and defogging* key	**4**	*Automatic mode* key

▶ Start diesel engine.

▶ Run machine warm. (For more information see: 3.4.11 Bringing machine to operating temperature, page 159)

▶ Open air outlets in operator's cab.

▶ Switch on automatic mode.

▶ Switch on defrosting and defogging.

▶ Switch on recirculated air.

▶ Check heating air flow for sufficient air outlet output.

▶ Clean air outlet if necessary.

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5.14.3 Auxiliary heater (option): Checking function

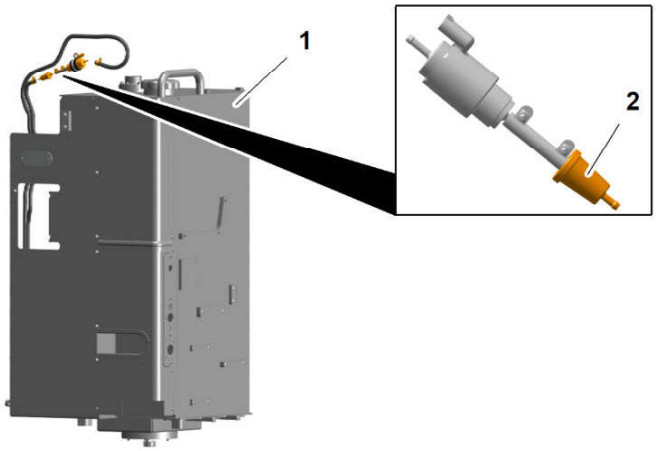

Fig. 978: Checking auxiliary heater

1 Fuel tank **2** Fuel filter

- ▶ Put auxiliary heater into service according to specifications in manufacturer's manual.
- ▶ Check heating air flow for sufficient air outlet output.
- ▶ Repair auxiliary heater. For procedure, refer to component documentation.

If component documentation cannot be accessed:

- ▶ Have repairs performed by Liebherr customer service.
- ▶ Clean fuel filter **2** if necessary.

5.14.4 Switching on air conditioning unit

NOTICE
Downtime too long!
Damage to air conditioning unit.

- ▶ Switch on air conditioning unit in winter too.

- ▶ Make sure diesel engine or electric motor is running.
- ▶ Activate AUTO operating mode.
- ▶ Wait 15 minutes.
- ▶ Deactivate AUTO operating mode.

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5.14.5 Checking condenser for contamination and cleaning if necessary

NOTICE
Incorrect cleaning!
Damage to condenser fins.

- ▶ Never clean condenser fins mechanically or by steam cleaning.
- ▶ Clean condenser fins exclusively with compressed air.

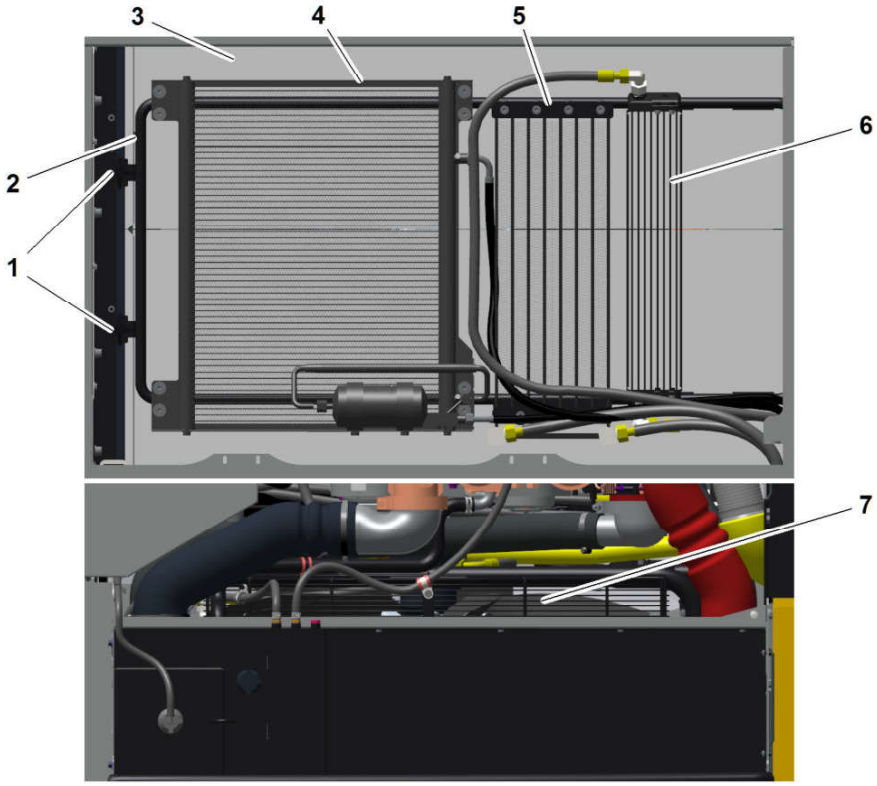

Fig. 979: Checking condenser for contamination and cleaning if necessary

1	Star knob screw	**5**	Fuel cooler
2	Swivel frame	**6**	Gear oil cooler
3	Combination cooling unit	**7**	Radiator fan
4	Air conditioning condenser		

The combination cooling unit consists of the following coolers:
- Engine cooling
- Hydraulic oil cooler
- Intercooler

The machine is equipped with the following additional cooling units:
- Air conditioning condenser
- Fuel cooler
- Gear oil cooler

For optimal cooling, cooling units must be kept clean.

Make sure the following preconditions are met:
- ❑ Diesel engine is off.

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❑ Diesel engine has cooled down.

▶ Loosen star knob screws **1** on swivel frame **2**.

▶ Swing swivel frame **2** out.

▶ Check air conditioning condenser **4** for contamination and clean if necessary.

▶ Clean contaminated condenser fins with compressed air.

▶ Swing swivel frame **2** back.

▶ Screw in star knob screws **1** into swivel frame **2** and tighten.

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5.15 Lubrication system

5.15.1 Lubrication system: Filling with grease

Uppercarriage

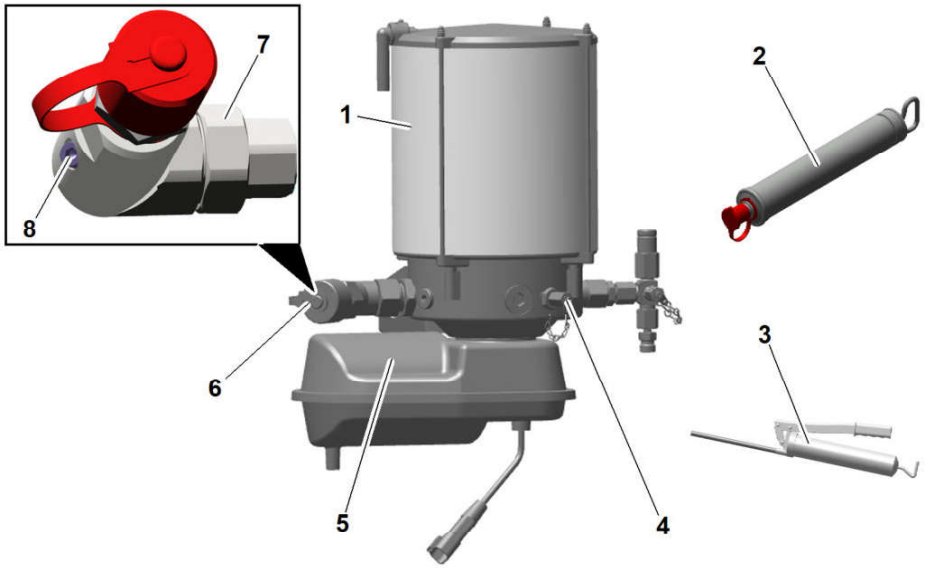

Fig. 980: Filling grease container

1	Grease container	**5**	Lubricating pump
2	Filling pump	**6**	Adjustable quick-fill connection
3	Grease gun	**7**	Locknut
4	Grease nipple	**8**	Fixing screw

NOTICE
Incorrect filling of grease container!
Damage to machine.

▶ Exclusively fill grease container via adjustable quick-fill connection or grease nipple.

▶ Check fill level in grease container **1**.

▶ Loosen fixing screw **8**.

▶ Unscrew locknut **7**.

▶ Turn quick-fill connection **6** to suitable position.

▶ Tighten fixing screw **8**.

▶ Tighten locknut **7**.

▶ Connect filling pump **2** to quick-fill connection **6**.

▶ Press contents of grease cartridge into grease container **1**.

If no filling pump **2** is available:

▶ Fill grease container **1** with grease gun **3** via grease nipple **4**.

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Undercarriage (option)

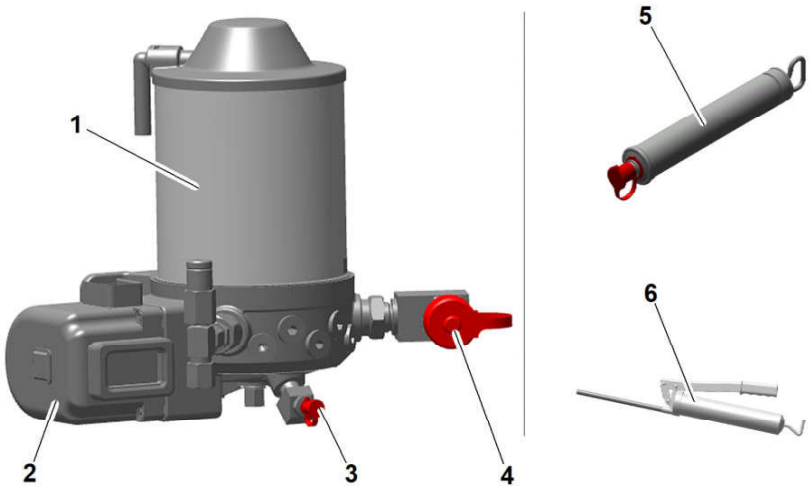

Fig. 981: Filling grease container

1	Grease container	**4**	Filling pump adapter
2	Lubricating pump	**5**	Filling pump
3	Grease nipple	**6**	Grease gun

NOTICE
Incorrect filling of grease container!
Machine damage.

▶ Exclusively fill grease container through adapter or grease nipple.

▶ Insert grease cartridge in filling pump **5**.

▶ Connect filling pump **5** to filling pump adapter **4**.

▶ Press contents of grease cartridge into grease container **1**.

If no filling pump **5** is available:

▶ Fill grease container **1** with grease gun **6** via grease nipple **3**.

5.15.2 Checking lubrication of bearings (grease collar)

▶ Check all connected lubricating points for sufficient lubricant distribution.

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5.16 Slewing gearbox and slewing ring

5.16.1 Slewing gearbox: Checking oil level

Checking oil level

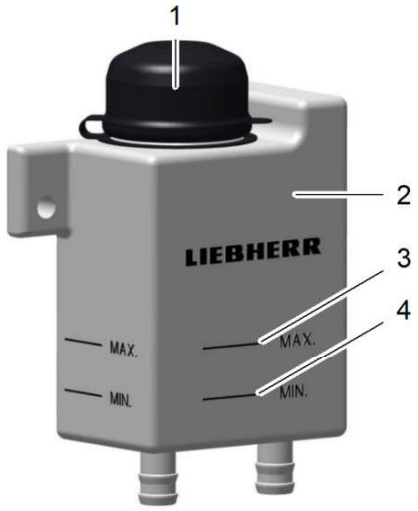

Fig. 982: Oil tank of slewing gearbox

1	Protective cap	**3**	**MAX**
2	Oil tank	**4**	**MIN**

▶ Check that oil level is between **MIN 4** and **MAX 3** marks.

If oil level is below **MIN 4** mark:

▶ Check tightness.

▶ Fill with oil.

Checking tightness

▶ Check slewing gearbox, oil tank, connecting hoses, connections and covers for tightness.

▶ Repair or replace leaking components. For procedure see service manual under chapter 180.

If service manual cannot be accessed:

▶ Have repairs performed by Liebherr customer service.

Filling with oil

NOTICE
Incorrectly mixed gear oils!
Damage to transmission.

▶ Do not mix gear oils.

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NOTICE
Unsuitable gear oil!
Damage to gearbox.

▶ Exclusively use oil in approved quality.

▶ Remove protective cap **1** on oil tank **2**.

▶ Unlock cover with key.

▶ Open cover.

▶ Make sure that oil has prescribed viscosity.

▶ Fill oil tank **2** with prescribed oil until **MAX 3** marking is reached.

▶ Check oil level after 5 minutes.

If oil level is below **MAX 3** mark:
▶ Fill with oil.

If oil level remains unchanged:
▶ Screw cover onto oil tank **2**.

▶ Lock cover with key.

▶ Put protective cap **1** on oil tank **2**.

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6 Appendix

If your machine has special attachments, you can find relevant information on the subsequent pages.

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