en **Operator's manual**

Machine for Industrial Applications

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ORIGINAL OPERATOR'S MANUAL

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1.2 Technical data

1.2.1 Vibration emission

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

Tab. 1: Vibration emission

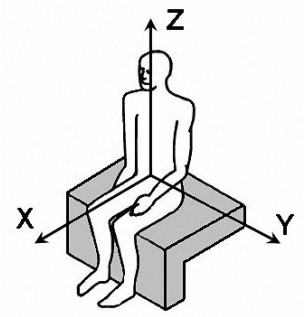
Operator's seat

– 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.
– In order to accurately assess the daily exposure of an operator in the course of an 8-hour working day, use the Liebherr brochure concerning whole-body vibrations as well as the specially written software.
– Both documents are available from Liebherr dealers and are provided with every new machine on a documentation CD (Liebherr-Parts).

1.2.2 CO_2 emissions of diesel engine

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

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Operator's Cab

Cab	safety cab structure with fixed built-in front and roof window made from impact-resistant laminated safety glass, 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
Option	
Premium	in addition to operator's seat comfort: active electronic weight adjustment (automatic readjustment), 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 out-side temperatures, sensors for solar radiation, inside and outside temperatures

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
Energy recovering cylinder	Liebherr gas cylinder with special sealing and control system
Bearings	sealed, low maintenance

Undercarriage

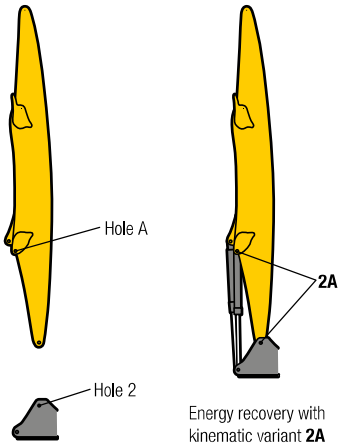
Mobile	
Versions	Standard, High Rise
Drive	one driven axle with transmission with Liebherr axial piston motor and functional brake valve on both sides
Travel speed	
Joystick steering	0 – 5.0 km/h stepless (creeper speed) 0 – 8.0 km/h stepless
Driving operation	automotive driving using accelerator pedal, cruise control function: storage of variable accelerator pedal positions
Axles	90 t drive axles; manual or automatic hydraulically controlled front axle oscillation lock
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	4 point outriggers
Crawler	
Versions	SW, High Rise
Drive	Liebherr compact planetary reduction gear with Liebherr axial piston motor per side of undercarriage
Travel speed	0 – 2.6 km/h stepless (creeper speed) 0 – 4.0 km/h stepless
Brake	functional brake valves on both sides
Holding brake	wet multi-disc (spring applied, pressure released)
Track pads	flat

Complete Machine

Lubrication	Liebherr central lubrication system for uppercarriage and attachment, automatically
Option	
Mobile	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) = 107 dB(A)

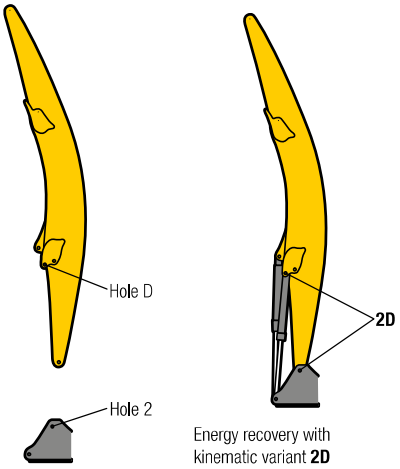
Kinematic Variants

Kinematic Variant 2A

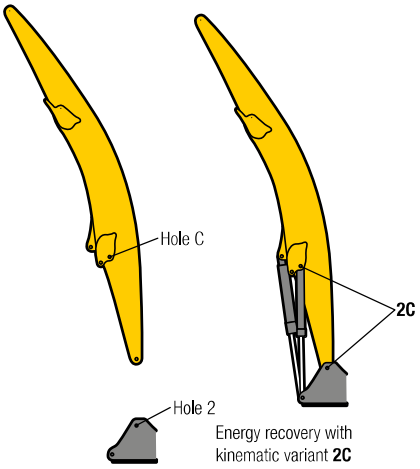


Energy recovery with kinematic variant **2A**

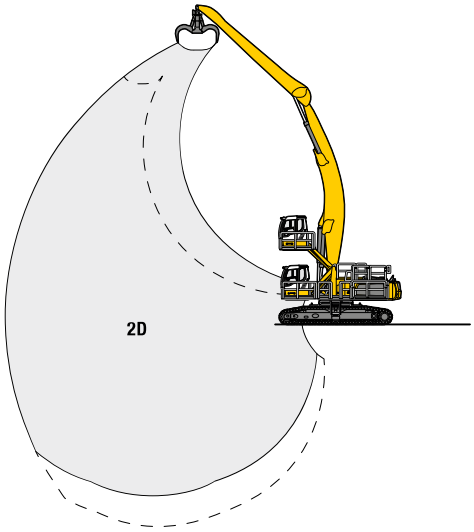
Kinematic Variant 2D / 2C

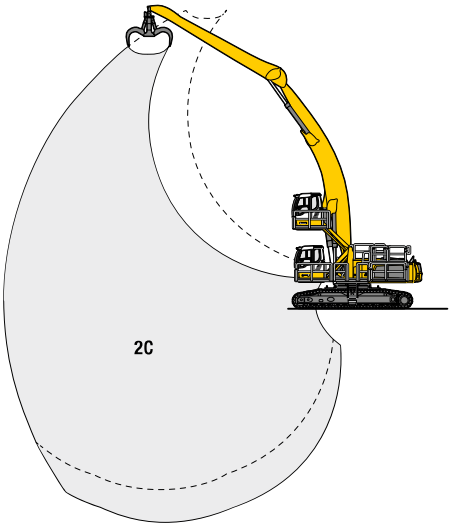


Energy recovery with kinematic variant **2D**



Energy recovery with kinematic variant **2C**





Altered range curve with additional reach depth, e.g. for unloading from ships

Attachment

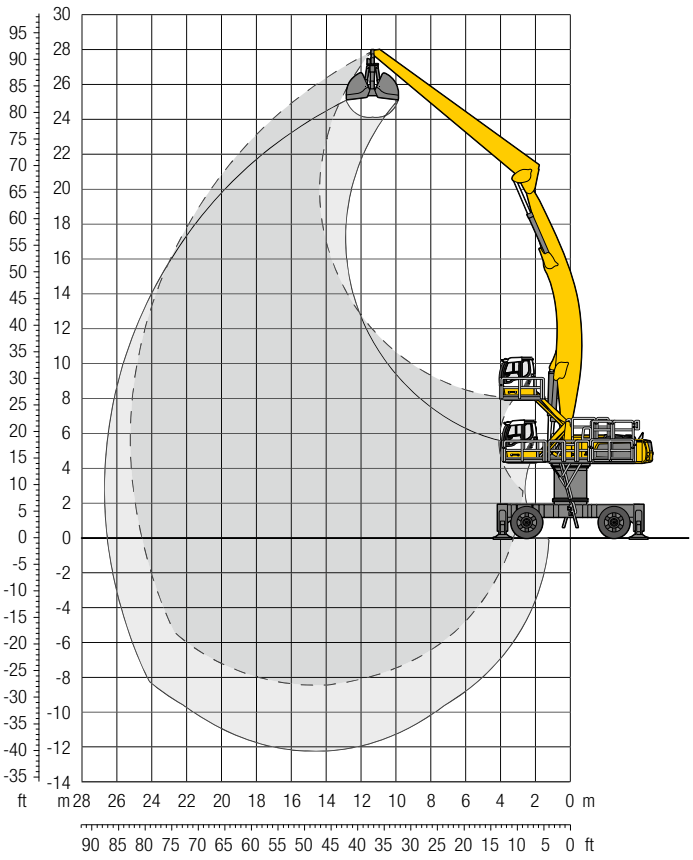
- High lift capacities and long reaches thanks to weight-optimised design for more handling capacity
- Energy recovery cylinder filled with nitrogen for maximum efficiency through less fuel consumption at more handling capacity
- Pipe fracture safety valves on hoist and stick cylinders and retract stick shut-off for maximum safety during every application
- Electro-hydraulic end position control extends the service life of the components
- Quick coupling systems and working tools made by Liebherr for maximum machine capacity utilisation and greater handling performance

Operator's Cab

- Hydraulic cab elevations for always the best view downwards as well as forwards
- Less strain on the operator, workers and reduced environmental pollution due to lower noise emissions
- Optimum visibility thanks to large glass surfaces and standard rear and side area monitoring with camera
- Joystick steering without steering column as standard for convenient operation, greater legroom and clear view of the working area at mobile undercarriage
- Proportional control as standard with 4-way minijoystick for greater precision, highprecision control and functions

LH 110 M HR – Attachment AG25

Port – Kinematic 2D

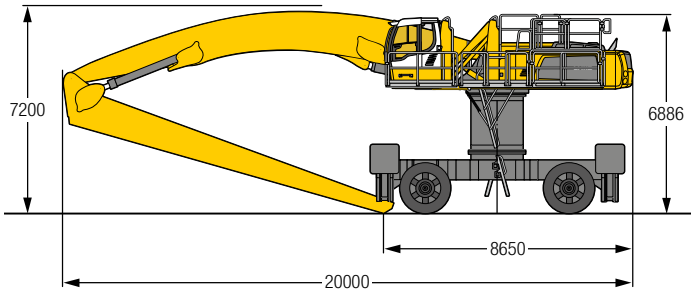


Operating Weight

The operating weight includes the basic machine with 4 point outriggers, hydr. cab elevation, 4 solid tyres, angled boom 14.50 m, straight stick 12.00 m and grab model GMZ 120/6.00 m³ shells for loose material.

Weight	111,700 kg

Dimensions



m	Undercarriage	6.0 m		7.5 m		9.0 m		10.5 m		12.0 m		13.5 m		15.0 m		16.5 m		18.0 m		19.5 m		21.0 m		22.5 m		24.0 m		m	
27.0	4 pt. outriggers down																											10.4*	10.4*	**13.0**
25.5	4 pt. outriggers down											11.9*	11.9*	9.9*	9.9*													9.5*	9.5*	**15.2**
24.0	4 pt. outriggers down													10.8*	10.8*	10.0*	10.0*											9.0*	9.0*	**17.1**
22.5	4 pt. outriggers down													10.6*	10.6*	10.0*	10.0*	9.5*	9.5*									8.6*	8.6*	**18.6**
21.0	4 pt. outriggers down													10.5*	10.5*	9.9*	9.9*	9.4*	9.4*	9.0*	9.0*							8.3*	8.3*	**19.9**
19.5	4 pt. outriggers down													10.5*	10.5*	9.9*	9.9*	9.3*	9.3*	8.9*	8.9*							8.1*	8.1*	**20.9**
18.0	4 pt. outriggers down													10.5*	10.5*	9.9*	9.9*	9.3*	9.3*	8.9*	8.9*	8.5*	8.5*					8.0*	8.0*	**21.9**
16.5	4 pt. outriggers down													10.6*	10.6*	9.9*	9.9*	9.4*	9.4*	8.9*	8.9*	8.5*	8.5*	8.2*	8.2*			7.9*	7.9*	**22.7**
15.0	4 pt. outriggers down											11.6*	11.6*	10.8*	10.8*	10.1*	10.1*	9.5*	9.5*	8.9*	8.9*	8.5*	8.5*	8.2*	8.2*			7.9*	7.9*	**23.4**
13.5	4 pt. outriggers down											11.9*	11.9*	11.0*	11.0*	10.2*	10.2*	9.6*	9.6*	9.0*	9.0*	8.6*	8.6*	8.2*	8.2*			7.9*	7.9*	**23.9**
12.0	4 pt. outriggers down									13.5*	13.5*	12.3*	12.3*	11.3*	11.3*	10.4*	10.4*	9.8*	9.8*	9.2*	9.2*	8.7*	8.7*	8.3*	8.3*	7.9*	7.9*	7.8*	7.8*	**24.4**
10.5	4 pt. outriggers down							15.7*	15.7*	14.0*	14.0*	12.7*	12.7*	11.6*	11.6*	10.7*	10.7*	10.0*	10.0*	9.3*	9.3*	8.8*	8.8*	8.3*	8.3*	8.0*	8.0*	7.8*	7.8*	**24.7**
9.0	4 pt. outriggers down			22.5*	22.5*	19.0*	19.0*	16.5*	16.5*	14.6*	14.6*	13.1*	13.1*	11.9*	11.9*	11.0*	11.0*	10.2*	10.2*	9.5*	9.5*	8.9*	8.9*	8.4*	8.4*	8.0*	8.0*	7.8*	7.8*	**25.0**
7.5	4 pt. outriggers down	30.9*	30.9*	24.5*	24.5*	20.3*	20.3*	17.4*	17.4*	15.3*	15.3*	13.6*	13.6*	12.3*	12.3*	11.3*	11.3*	10.4*	10.4*	9.7*	9.7*	9.1*	9.1*	8.5*	8.5*	8.1*	8.1*	7.8*	7.8*	**25.1**
6.0	4 pt. outriggers down	31.0*	31.0*	26.4*	26.4*	21.6*	21.6*	18.3*	18.3*	15.9*	15.9*	14.1*	14.1*	12.7*	12.7*	11.6*	11.6*	10.7*	10.7*	9.9*	9.9*	9.2*	9.2*	8.7*	8.7*	8.2*	8.2*	7.8*	7.8*	**25.2**
4.5	4 pt. outriggers down	12.3*	12.3*	28.2*	28.2*	22.8*	22.8*	19.2*	19.2*	16.6*	16.6*	14.6*	14.6*	13.1*	13.1*	11.9*	11.9*	10.9*	10.9*	10.1*	10.1*	9.4*	9.4*	8.8*	8.8*	8.2*	8.2*	7.8*	7.8*	**25.2**
3.0	4 pt. outriggers down	9.1*	9.1*	17.4*	17.4*	23.9*	23.9*	20.0*	20.0*	17.2*	17.2*	15.1*	15.1*	13.5*	13.5*	12.2*	12.2*	11.1*	11.1*	10.3*	10.3*	9.5*	9.5*	8.8*	8.8*	8.2*	8.2*	7.8*	7.8*	**25.1**
1.5	4 pt. outriggers down	8.5*	8.5*	14.0*	14.0*	24.3*	24.3*	20.6*	20.6*	17.7*	17.7*	15.5*	15.5*	13.8*	13.8*	12.4*	12.4*	11.3*	11.3*	10.4*	10.4*	9.6*	9.6*	8.9*	8.9*	8.2*	8.2*	7.8*	7.8*	**24.9**
0	4 pt. outriggers down	8.8*	8.8*	13.0*	13.0*	20.2*	20.2*	21.1*	21.1*	18.1*	18.1*	15.8*	15.8*	14.1*	14.1*	12.6*	12.6*	11.5*	11.5*	10.5*	10.5*	9.6*	9.6*	8.9*	8.9*	8.1*	8.1*	7.8*	7.8*	**24.6**
–1.5	4 pt. outriggers down	9.4*	9.4*	12.9*	12.9*	18.6*	18.6*	21.3*	21.3*	18.3*	18.3*	16.0*	16.0*	14.2*	14.2*	12.8*	12.8*	11.6*	11.6*	10.5*	10.5*	9.6*	9.6*	8.8*	8.8*	7.9*	7.9*	7.8*	7.8*	**24.2**
–3.0	4 pt. outriggers down	10.1*	10.1*	13.2*	13.2*	18.1*	18.1*	21.2*	21.2*	18.3*	18.3*	16.0*	16.0*	14.2*	14.2*	12.8*	12.8*	11.5*	11.5*	10.4*	10.4*	9.5*	9.5*	8.6*	8.6*			7.8*	7.8*	**23.7**
–4.5	4 pt. outriggers down	10.9*	10.9*	13.7*	13.7*	18.1*	18.1*	20.8*	20.8*	18.0*	18.0*	15.8*	15.8*	14.1*	14.1*	12.6*	12.6*	11.3*	11.3*	10.2*	10.2*	9.2*	9.2*	8.1*	8.1*			7.7*	7.7*	**23.1**
–6.0	4 pt. outriggers down			14.4*	14.4*	18.5*	18.5*	20.0*	20.0*	17.4*	17.4*	15.4*	15.4*	13.7*	13.7*	12.2*	12.2*	10.9*	10.9*	9.8*	9.8*	8.6*	8.6*					7.9*	7.9*	**21.9**
–7.5	4 pt. outriggers down							18.7*	18.7*	16.5*	16.5*	14.6*	14.6*	13.0*	13.0*	11.6*	11.6*	10.3*	10.3*									9.2*	9.2*	**19.3**

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 rigid axle with the stabilizers down. Indicated loads based on the ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity. The lift capacity values indicated are attained at the corresponding operating temperature. This operating temperature is ensured by continuous movement of the boom. Weights of fitted working tools (grabs, load hooks, etc.) and load accommodation equipment are to be deducted from the lift capacity values. 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.

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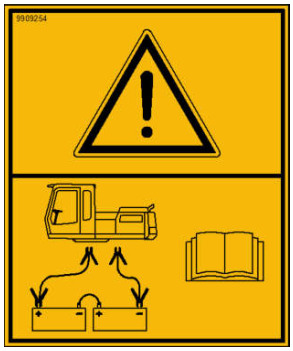
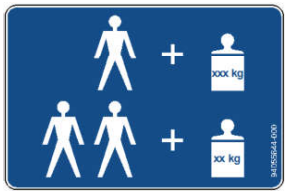
Sign	Description
	**Jump starting** Applies to machines with diesel engine. Before jump-starting machine, read instructions in the operator's manual.
 	**Load capacity** Indicate maximum load capacity value of height adjustable cab.
	**Closing upper windscreen** Applies to wheeled excavators. Indicates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

Tab. 7: Warning signs

2.4.2 Information signs

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

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.
- 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.

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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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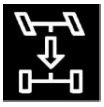
3.1.12 Height-adjustable cab

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

Tab. 15: Height-adjustable cab

3.1.13 Wheeled excavator travel mode

Symbol	Description	Symbol	Description
	Travel brake		Travelling to the left
	Increasing traction in automatic mode		Steering to the left
	Travelling forward		Travelling to the right
	Travelling backwards		Steering to the right

Tab. 16: Wheeled excavator travel mode

3.1.14 Crawler excavator travel mode

Symbol	Description	Symbol	Description
	Extending side frames		Travelling to the left

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Symbol	Meaning
	Ride control switched on

Tab. 22: 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
	Turning alarm deactivated

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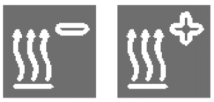
Automatic mode

The climate in the cab depends on the following factors:
- Set temperature
- Outside temperature
- Direct sunlight

Depending on these factors, the following functions are adjusted automatically:
- Air distribution
- Cooling power
- Heating power
- Blower power

▶ Press *automatic mode* button.
▷ *Automatic mode* button lights up green.

Setting set temperature



▶ Press *reducing temperature* or *increasing temperature* button.
▷ Set temperature **2** is displayed in °C.

Setting blower power

▶ Press *reducing blower power* or *increasing blower power* button.
▷ Bar chart display for blower power **9** displays set value.
▷ Automatic setting of blower power is switched off.

Selecting air outlets

▶ Press *head area air outlets* button or *chest area air outlets* button or *foot area air outlets* button.
▷ Pressed button lights up green.
▷ Automatic setting of air distribution is switched off.

Recirculated air mode

Recirculated air mode reduces penetration of impure fresh air (e.g. due to exhaust fumes).

▶ Press *recirculated air mode* button.
▷ *Recirculated air mode* button lights up green.
▷ Air in operator's cab is recirculated.
▷ Minimum quantity of fresh air is added.

Defrosting and defogging

Defrosting and defogging are used for defrosting the windows or defogging the cab if the windows are fogged.

▶ Press *defrosting and defogging* button.
▷ *Defrosting and defogging* button lights up green.
▷ Air conditioning control settings are saved.
▷ Blower power and air outlets are set automatically.

When windows are no longer fogged:
▶ Press *defrosting and defogging* button.
▷ Defrosting and defogging button is switched off.

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Menu button	Designation
	System diagnosis (For more information see: 3.2.19 *System diagnosis* submenu, page 99)

Tab. 36: Menu buttons

3.2.18 *Unit selection* submenu

Menu call:  >  > SI

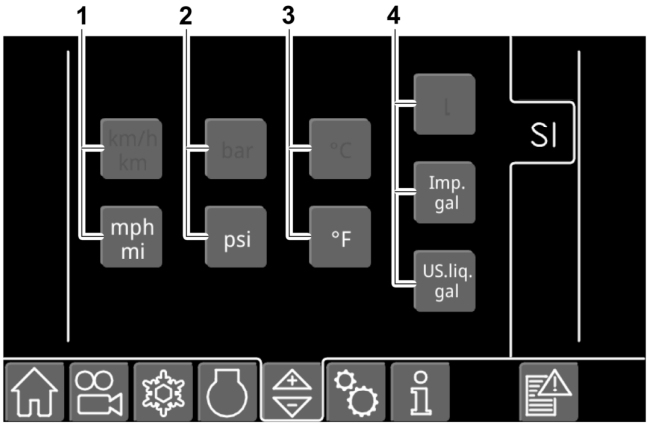

Fig. 416: Unit selection submenu

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

3.2.19 *System diagnosis* submenu

Menu call:  >  > 

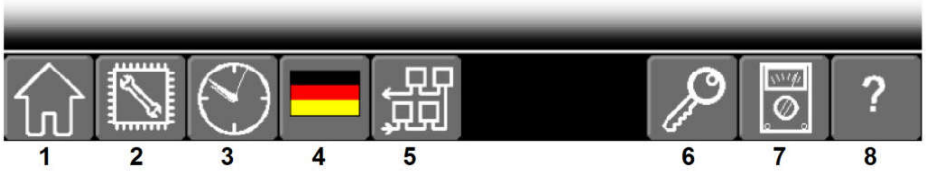

Fig. 417: System diagnosis menu bar

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**

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Travel gearbox fine adjustment menu button[12)]

Fine adjustment of speed of travel gearbox

Travel gear fine adjustment menu button[13)]

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[14)]

Fine adjustment of speed of adjustable boom

Laterally adjustable boom fine adjustment menu button[15)]

Fine adjustment of speed of laterally adjustable boom

Rotary stick fine adjustment menu button[16)]

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: > >

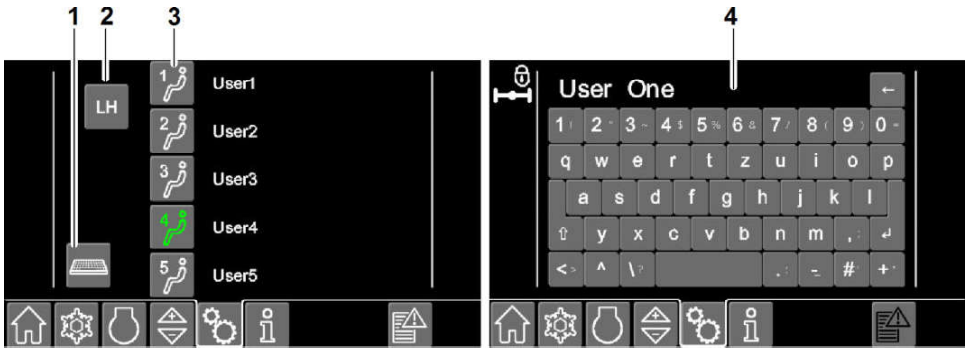

Fig. 455: User profile submenu and on-screen keyboard submenu

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.

▶ Rename user profile.

▶ Reset adjustments: Press *factory settings* button **2**.
▷ Machine operates with basic settings.

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

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3.3 Control

3.3.1 Battery main switch

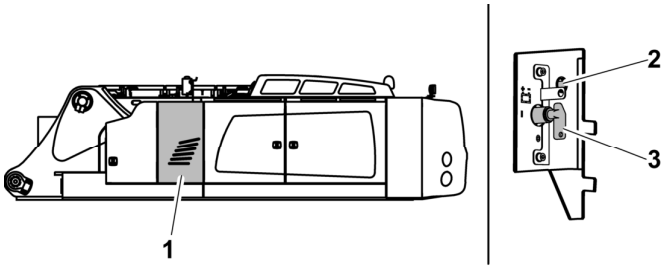
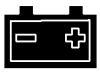


Fig. 479: Battery main switch

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

The battery main switch **3** is located behind the service hatch **1**.

The battery main switch establishes the connection between the batteries and the machine's electrical system.

Symbol	Switch position	Function
	0	Off
	I	On

Tab. 40: Battery main switch

Switching on power supply

▶ Open service hatch **1**.

▶ Set 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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▶ Lower operator's seat: Press bottom of button.

When limit stop is reached during adjustment:
▶ Make sure that operator's seat has finished automatic height adjustment to ensure minimum travel.

Adjusting operator's seat to body weight

Adjusting seat manually to body weight

▶ Set shock absorption to “soft”.

▶ Sit on operator's seat.

▶ Pull lever upwards.
▷ Operator's seat automatically adjusts to body weight.

Adjusting seat pneumatically to body weight (option)

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 133)
▷ Operator's seat automatically adjusts to body weight.
▷ Setting is stored for 5 minutes after leaving operator's seat.

▶ Adjust operator's seat again: Briefly press button.

When limit stop is reached during adjustment:
▶ Make sure that operator's seat has finished automatic height adjustment to ensure minimum travel.

Adjusting lumbar support

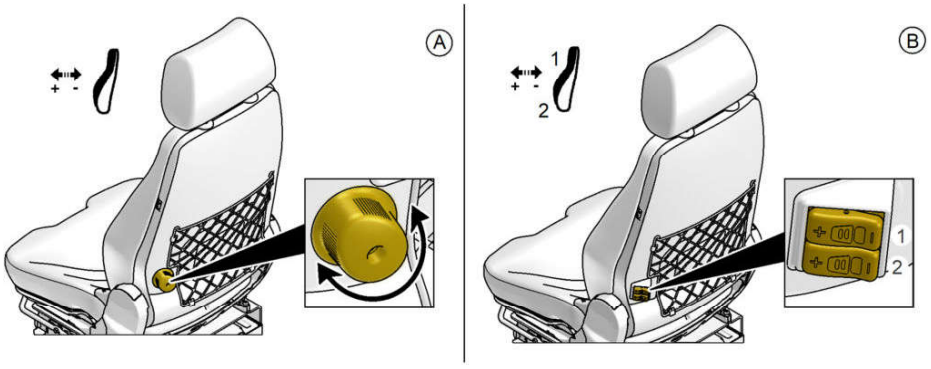

Fig. 501: Adjusting lumbar support

A Manual adjustment
B Pneumatic adjustment[17)]

1 *Upper back cushion* button
2 *Lower back cushion* button

[17)] Option

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3.3.15 Sun blind

Windscreen sun blind

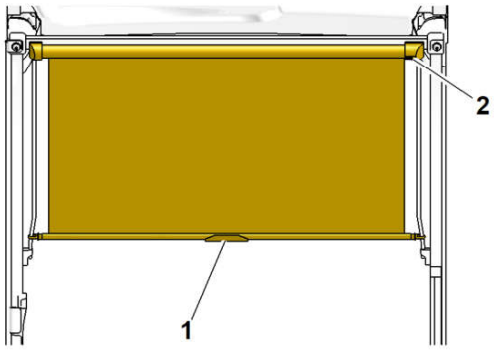

Fig. 526: Windscreen sun blind

1 Tab **2** Roll up button

Roof glass panel sun blind

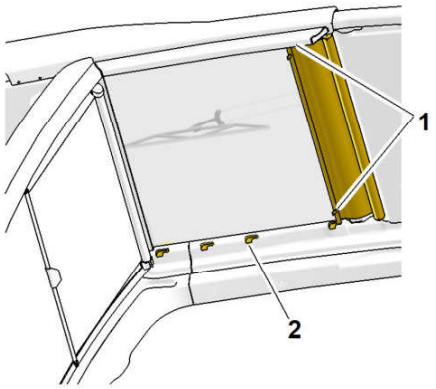

Fig. 527: Roof glass panel sun blind

1 Handle **2** Notch

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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 268)

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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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.

3.4.14 Sensor-controlled low idle automatic

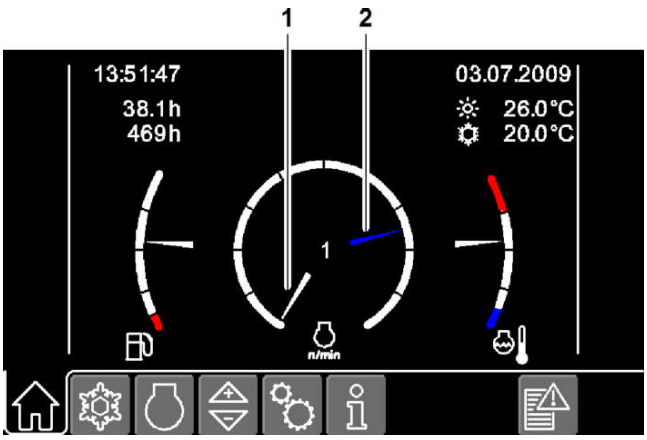

Fig. 588: Sensor-controlled low idle automatic

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

Deactivating locking mechanism

▶ Press *slewing brake* switch **1** to position **A**.
▷ LEDs in *slewing brake* key go out.
▷ Uppercarriage can be turned.

Semi-automatic locking of uppercarriage

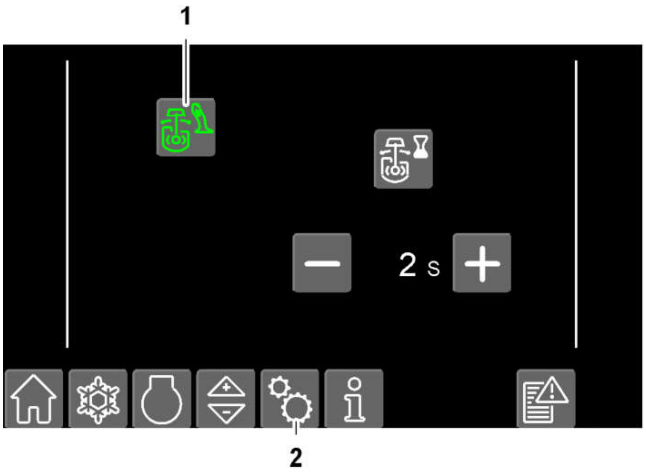

Fig. 616: Comfort slewing brake menu: Semi-automatic mode

1 *Semi-automatic* button **2** *Function settings* menu button

Switching on semi-automatic

▶ Press *function settings* menu button **2**.

▶ Press *comfort slewing brake* menu button.
▷ *Comfort slewing brake* menu appears on the display.
▶ Press *semi-automatic* button **1**.
▷ *Semi-automatic* button lights up green.

Activating locking mechanism

Note
Different machine configuration!

▶ Observe control description sticker.

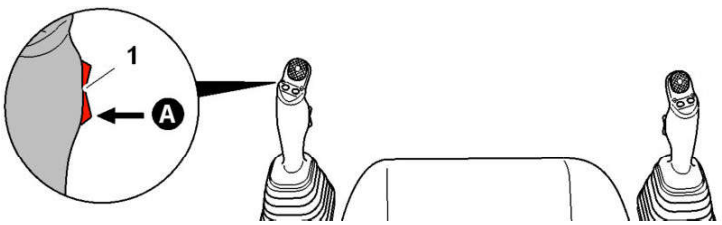

Fig. 619: Slewing brake switch (example of switch on left joystick)

1 *Slewing brake* switch

▷ Holding force of magnet increases.

▶ Wait until magnet has reached required holding force and lift load.

▶ Release *magnet* button **2**.
▷ Magnet has maximum holding force.

▶ Carefully move working attachment.

▶ Put down load.

Deactivating magnet with sorting function (option)

▶ Press and hold *magnet* button **2**.
▷ Holding force of magnet drops.

▶ Wait until magnet has reached required holding force.

▶ Release *magnet* button **2**.
▷ Magnet has maximum holding force.

▶ Press *magnet* button **2** again.

Switching off magnet system

▶ Press *magnet system* key on control unit A. (For more information see: 3.1.2 Control unit A, page 61)
▷ LEDs in *magnet system* key go out.
▷ Magnet system is switched off.

3.4.33 Reversible fan drive for radiator cleaning (option)

The reversing fan for radiator cleaning changes the direction of rotation of the fan. Air is blown out from the engine compartment and removes contamination from the air intake area.

NOTICE
Insufficient cooling performance!
Damage to machine.

▶ Activate reversible fan drive for radiator cleaning no more than once within a 10 minute period.

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

Switching on reversible fan drive manually

▶ Press *reversible fan drive* key.
▷ LEDs in *reversible fan drive* key light up one after the other.

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3.5.3 Height limitation

Height limitation menu

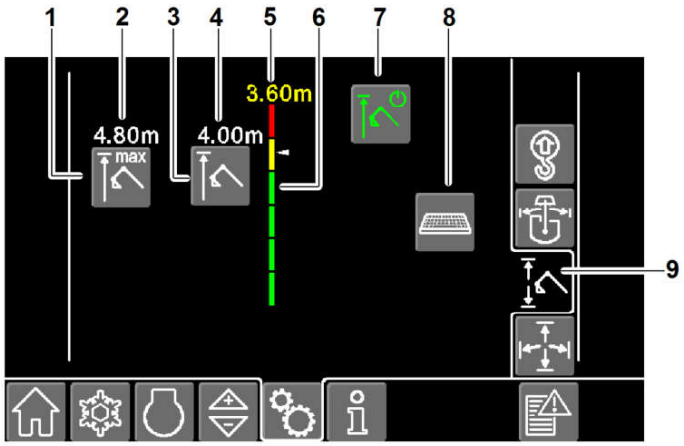
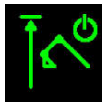


Fig. 701: Height limitation menu

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 *Height limitation* menu button

Key	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. 61: Status of height limitation button

Enabling settings for height limitation

A supervisor is authorised to enable following settings for the operator:
– Switching off height limitation
– Switching on height limitation
– Changing maximum working height limit value

Make sure the following precondition is met:
❑ Supervisor is present with authorisation key.

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3.5.4 Depth limitation (option)

Depth limitation menu

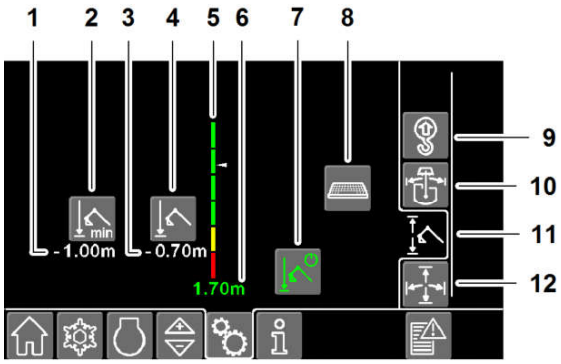

Fig. 727: Depth limitation menu

1 Value set for minimum working height
2 *Minimum working height* button
3 Value set for bottom shut-off point
4 *Bottom shut-off point* button
5 Scale
6 Current height of bolt-in point of working tool
7 *Depth limitation* button
8 *Manual entry* button
9 *Load moment limitation* button
10 *Slew limitation* button
11 *Depth limitation and height limitation* button
12 *Workspace limitation* button

Key	Meaning
	Settings for depth limitation are enabled. Depth limitation is switched off.
	Settings for depth limitation are enabled. Depth limitation is switched on.
	Settings for depth limitation are locked. Depth limitation is switched on.

Tab. 63: Status of depth limitation button

Enabling settings for depth limitation

A supervisor is authorised to enable following settings for the operator:
– Switch off depth limitation.
– Switch on depth limitation.
– Change minimum working height limit value.

Make sure the following preconditions are met:
❑ Supervisor is present with authorisation key.

▶ Turn key to right into enabled position for authorisation.

▶ Press *depth limitation* button.

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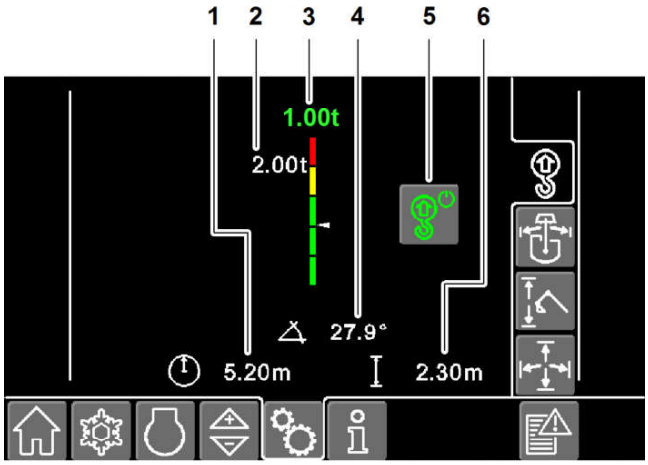

Fig. 753: Load moment limitation menu

1	Reach of loading point	**4**	Angle of uppercarriage to undercarriage
2	Maximum permitted load on hook	**5**	*Load moment limitation* button
3	Load on hook	**6**	Height of loading point

Switching on load moment limitation

If activated previously, load moment limitation is re-activated when the machine is started again.

DANGER
Machine tipping over!
Danger to life.

▶ Make sure that oscillating axle is locked.

Switching on load moment limitation using control unit A

▶ Press *load moment limitation* key.
▷ LEDs in *load moment limitation* key flash.
▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ LEDs in *load moment limitation* key light up.
▷ Warning buzzer sounds briefly.

Troubleshooting
Load moment limitation is not switched on?
If confirmation button is not pressed within 5 seconds, load moment limitation is not switched on.

▶ Switch on load moment limitation again.

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3.6.5 Travelling under obstacles

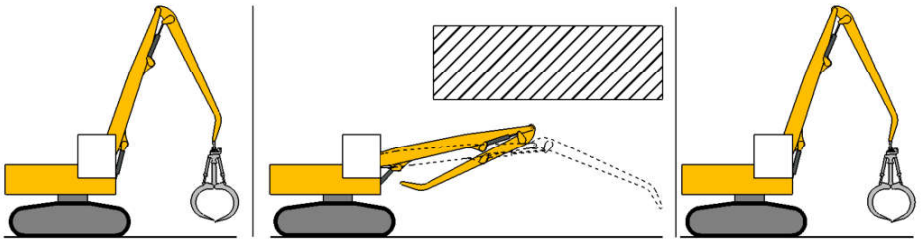

Fig. 787: Travelling under obstacles

- ▶ 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.

3.6.6 Handling loads

Handling loads

DANGER
Machine tipping over!
Danger to life.

- ▶ Make sure there are no persons in danger 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.

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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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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. 65: Warning symbols

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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. 67: 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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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. 75: Meaning of symbols

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Minimum quality requirements

Specification
LH-00–ENG3A
ACEA E4, API CH-4, API CI-4

Tab. 88: Minimum quality requirements

If engine oils from other manufacturers 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[24)]	Liebherr Motoroil 10W-40 Liebherr Motoroil 10W-40 low ash [24)]	Liebherr Motoroil 5W-30 Liebherr Motoroil 5W-30 low ash [24)]
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. 89: 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. 90: Refrigerant

[24)] For machines with diesel particulate filter use low ash engine oil.

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. 111: 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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Reason	Definition	Additional task
Routine inspection	Fuel or operating fluid sample taken during maintenance	
When changing oil type	Oil type of a component is changed.	Enter name of previously used oil.
Damage	Damage has occurred in a component.	Enter nature of damage.
Other reason	None of the above reasons apply.	Enter reason.

Tab. 113: Reason for analysis

Sampling

▶ Enter date of sampling.

Last oil change

▶ Enter date of last oil change.

Top-up volume

If oil has been topped up since last oil change:
▶ Enter topped-up volume in litres.

Oil service life

▶ Tick specification (see: tab. 114, page 289) .

▶ Enter oil service life.

▶ Enter machine operating time.

Definition	Stated in
Fuel or operating fluid sample taken from drive train component	Hours
Fuel or operating fluid sample taken from machine after long downtime	Months and years

Tab. 114: Oil service life

Oil changed

If oil is changed after fuel or operating fluid sample has been taken:
▶ Tick yes.

If oil is not changed after fuel or operating fluid sample has been taken:
▶ Tick no.

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5.8.6 Air filter: Replacing main filter cartridge

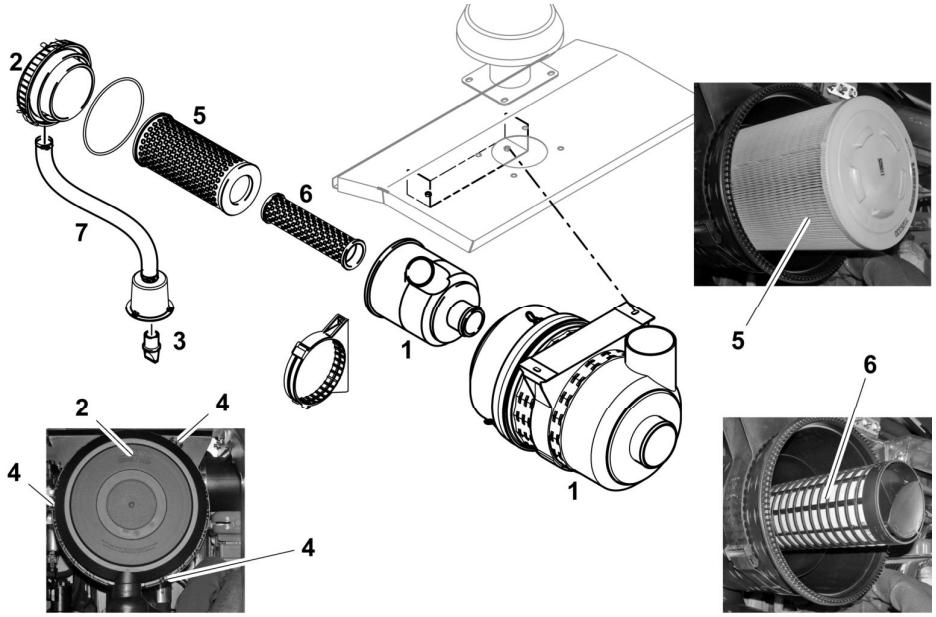

Fig. 885: Air filter: Replacing main filter cartridge

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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▶ 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. 119: 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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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: 5.4.1 Access points under the uppercarriage, page 277)
- ▶ Depressurise hydraulic system. (For more information see: 5.10.1 Depressurising hydraulic system, page 315)
- ▶ 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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5.13 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 Pin bearing: checking 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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6 Appendix

If your machine has special attachments, you can find relevant information on the subsequent pages.

6.1 Symbols on control description sticker

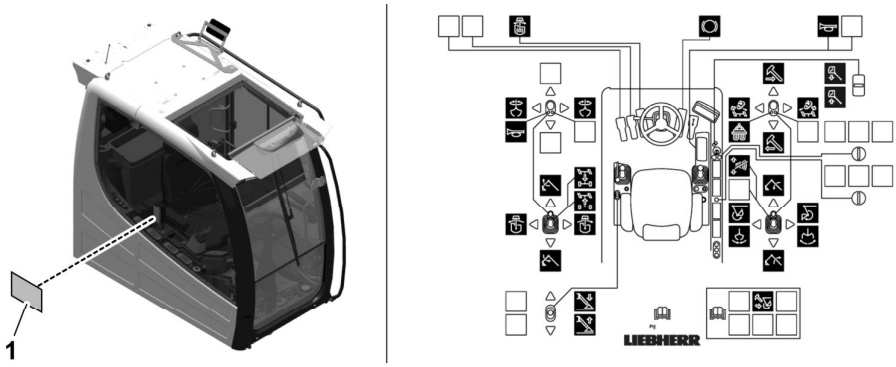

Fig. 942: Control description sticker in the operator's cab, example of control description sticker

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.

6.1 General symbols

Symbol	Description	Symbol	Description
	Scrolling in display		Windscreen wiper

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