en **Operator's manual**

Material handling machine

Document ID

ORIGINAL OPERATOR'S MANUAL

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Product ID

Manufacturer: Liebherr-Hydraulikbagger GmbH
Type: LH 50 M Timber Litronic
Type no.: 1474 (USA / CAN)
From Serial no.: 104394

Contact

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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

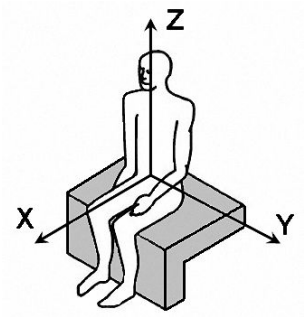
Operator's seat

– 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 8.2 ft/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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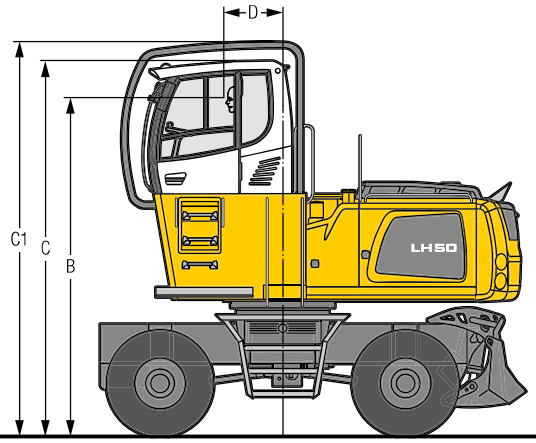
Choice of Cab Elevation

Cab Elevation LFC (Rigid Elevation)

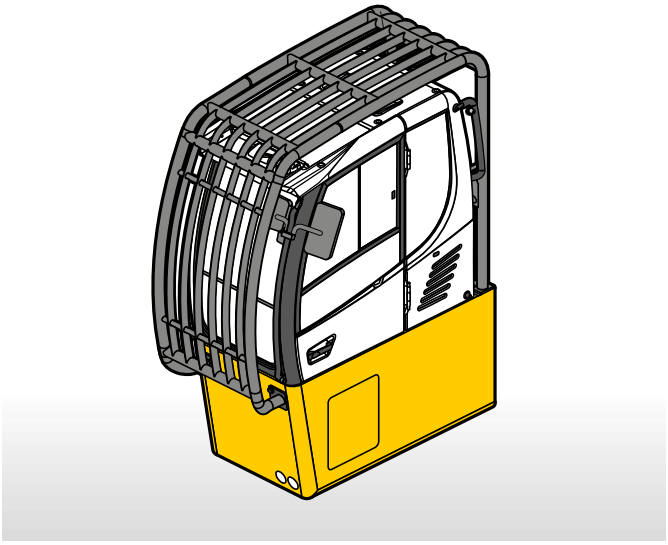


Increase type	LFC 120
Height	3'11"
B	14' 5"
C	16'
C1	16' 9"
D	2' 6"

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 13'1".

Cab Protection

Integral Guard



– 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 -4 °F to 104 °F.
– In case of divergent ambient temperatures, contact Liebherr customer service.
– In case of deployments at below 14 °F, adhere to diesel fuel quality (For more information see: 5.3.2 Diesel fuels, page 293) .
– In case of deployments at below 14 °F, 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	19 °F	To 14 °F
Arctic class 0	14 °F	To 9 °F
Arctic class 1	3 °F	To -4 °F

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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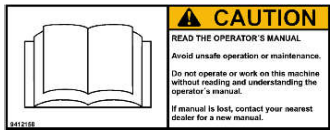
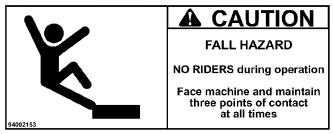
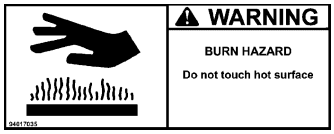
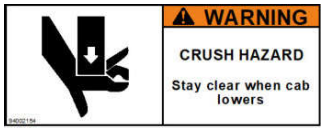
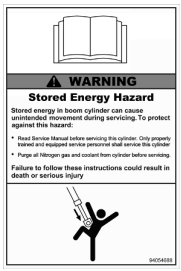
Sign	Description
	**Operator's manual** Read accident prevention instructions in operator's manual.
	**Safety belt** Put on safety belt before performing any work with machine.
	**Risk of crushing** Danger of crushing in marked areas.
	**Danger of falling** Danger of falling due to non-use of handrails and open access doors.
	**Danger of falling** Remaining in marked area prohibited during operation.
	**Risk of burns** Danger of burning from contact.
	**Risk of crushing** Increased danger of crushing in marked areas.
	**Danger from ejected objects** Danger of injury from ejected objects.
	**Danger from stored energy** Applies to machines with energy recuperation cylinder. Risk of injury due to unexpected movements of working attachment. Read accident prevention instructions in operator's manual.

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.

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.

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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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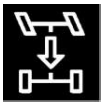
Height-adjustable cab

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	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

Replacing the display in case of sensor failure

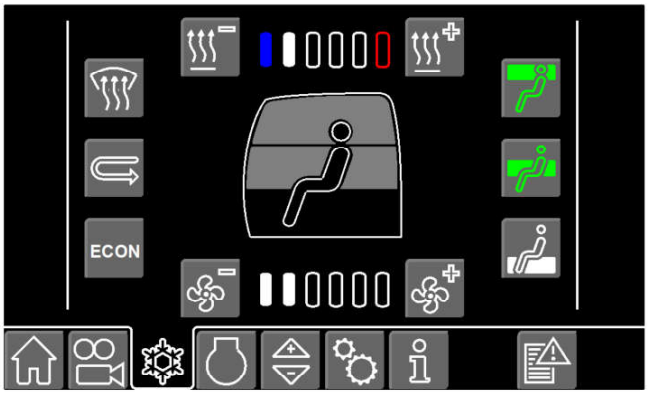


Fig. 382: Display in case of sensor failure

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

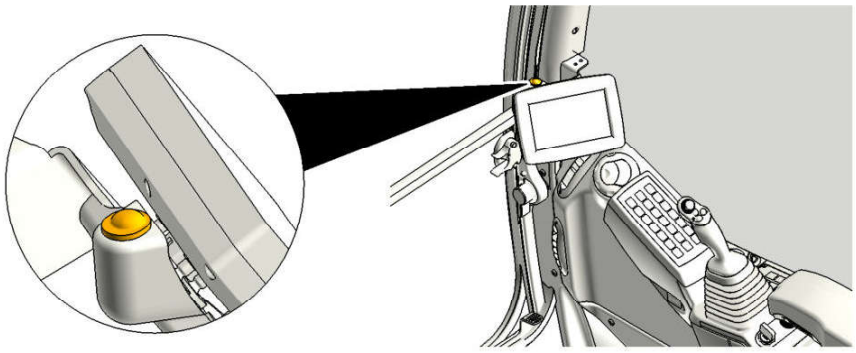


Fig. 383: Position of sunshine sensor

▶ 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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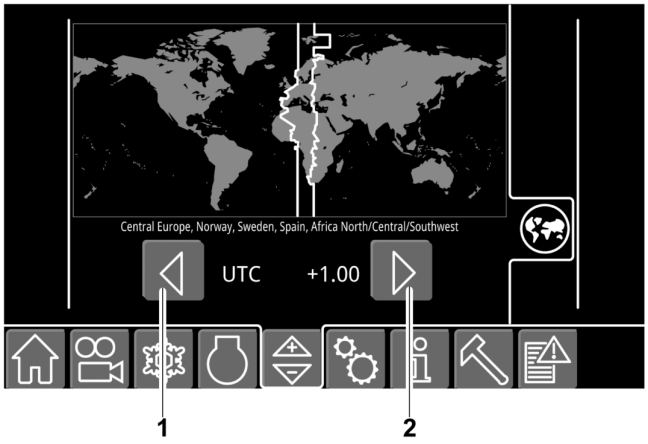

Fig. 415: Time zone submenu

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:  > >

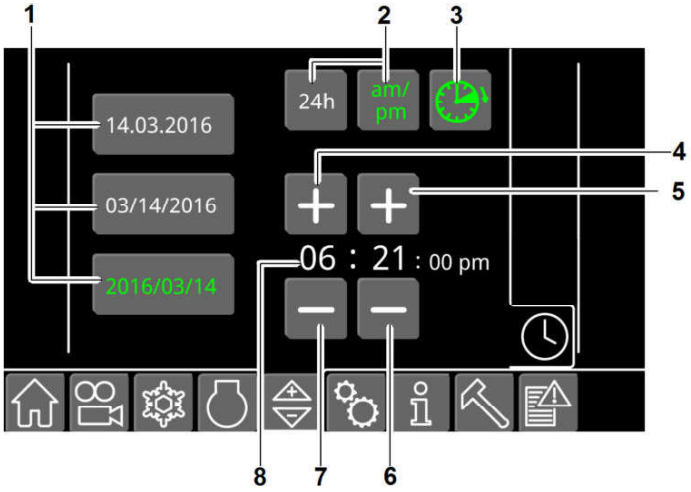

Fig. 416: Time format and date format submenu

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:  > >

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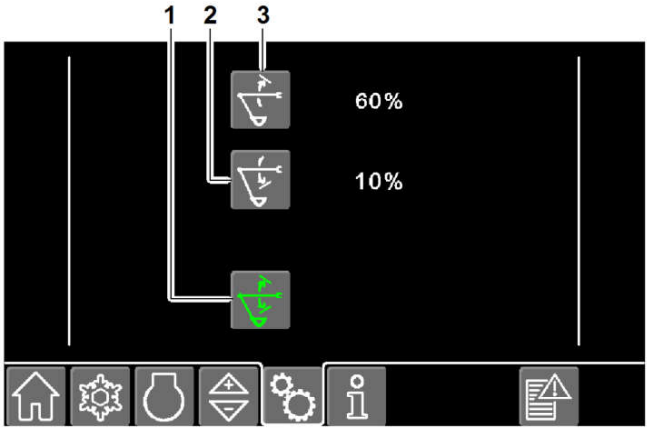

Fig. 454: Hoist cylinder shut-off submenu

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 191)

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

Menu call:  > 

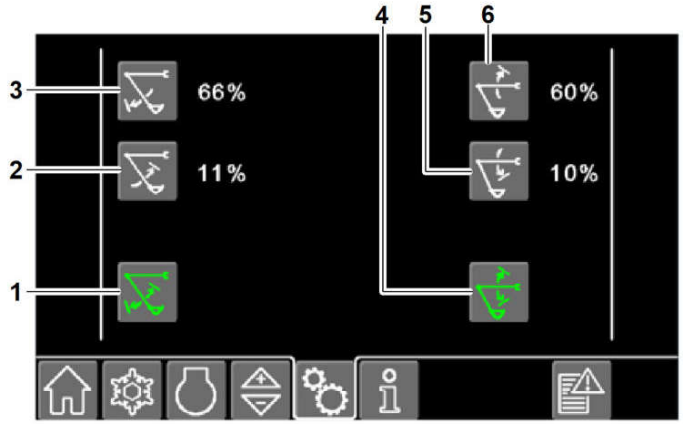

Fig. 455: Stick cylinder shut-off and hoist cylinder shut-off submenu

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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3.3.2 Entering and exiting machine

WARNING
Incorrect entry and exit!
Fall.

- ▶ Enter and leave machine exclusively using climbing aids.
- ▶ Do not use control elements as handles.
- ▶ Never jump off machine.

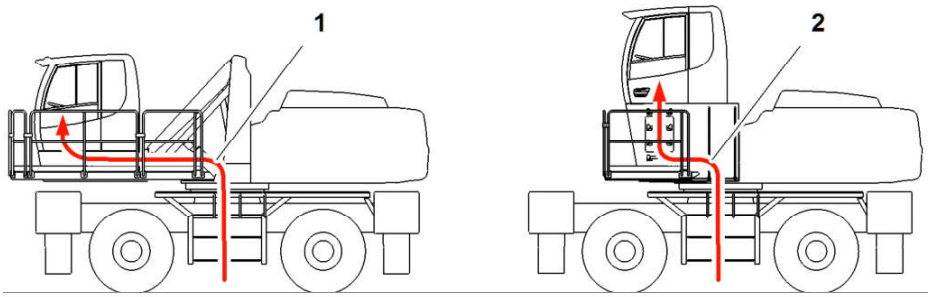

Fig. 480: Access to operator's cab

1 Access for height adjustable cab **2** Access for rigid operator's cab

Entering machine

If machine is equipped with step lighting:

- ▶ Switch on step lighting. (For more information see: 3.3.3 Step lighting (option), page 122)
- ▶ Turn upper body and face to ladder.
- ▶ Make sure you always have two hands and a foot or two feet and one hand in contact with the ladder.
- ▶ Enter machine via climbing aids.
- ▶ Open cab door.
- ▶ Enter operator's cab.
- ▶ Adjust operator's seat and steering wheel.
- ▶ Close cab door.

Exiting machine

- ▶ Park machine. (For more information see: 3.8 Parking machine, page 242)
- ▶ 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.
- ▶ Leave operator's cab.
- ▶ Close cab door.

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Automatically adjusting operator's seat

Operator's seat with mechanical adjustment (option)

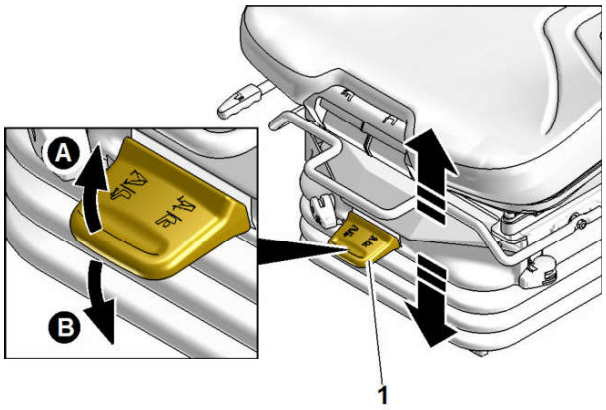

Fig. 500: Operator's seat with mechanical adjustment

A Increase
B Reduce
1 Adjustment lever

▶ Sit on operator's seat.

▶ Turn ignition key to **I**. (For more information see: 3.3.10 Ignition key, page 135)
▷ 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**.

Operator's seat with pneumatic adjustment (option)

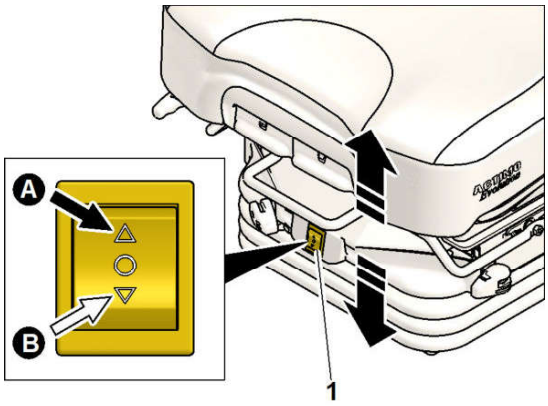

Fig. 501: Adjusting operator's seat with pneumatic adjustment

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.

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Adjust mirrors so that following fields of vision are guaranteed:
– Rear field of vision at least 98‘ 5“ ft-in
– Side field of vision at least 3‘ 3“ ft-in

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)

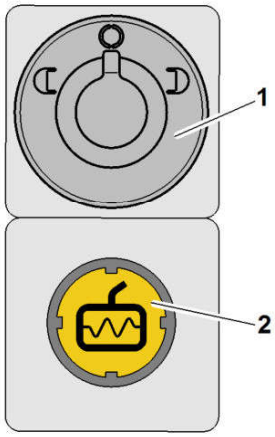

Fig. 529: Control unit for electrical mirrors

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

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

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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.

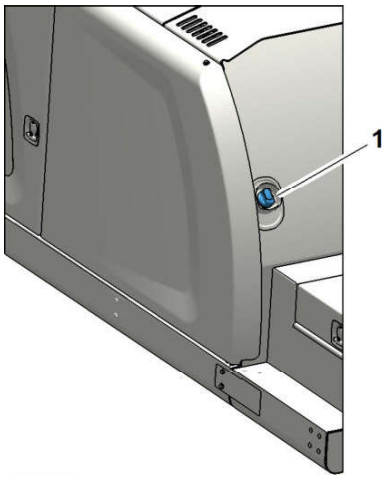

Fig. 565: Diesel exhaust fluid tank

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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3.4.14 Sensor-controlled low idle automatic

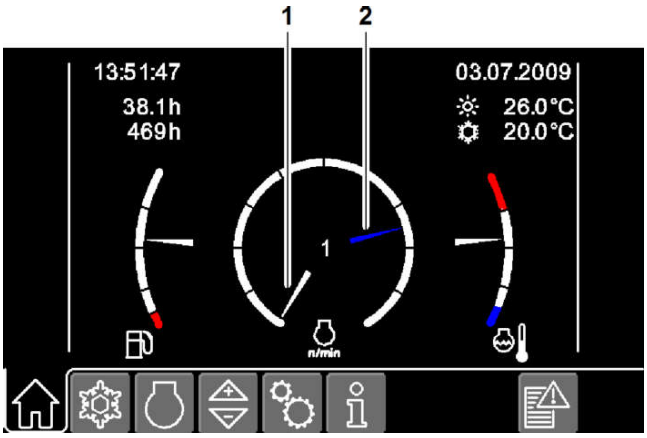

Fig. 587: Sensor-controlled low idle automatic

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 122 °F.

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3.4.23 Travel alarm (option)

Note
Different machine configuration!

▶ Observe control description sticker.

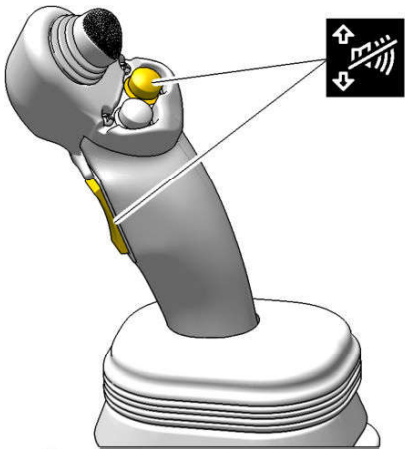

Fig. 634: Switching off travel alarm

▶ 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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NOTICE
Incorrect use!
Wear on brake discs.

▶ Exclusively hold stationary uppercarriage in position.

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

3.4.31 Hoist cylinder pressure warning device (option)

Hoist cylinder pressure warning device fulfils following tasks:

– Warns operator of lowering of working attachment.
– Protects against damage from excessive hydraulic oil pressure.

DANGER
Unexpected machine movement!
Danger to life.

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

If *hoist cylinder pressure warning device* status symbol appears on the display and warning sound sounds:
▶ Reduce reach.

▶ Reduce load.

3.4.32 Lowering boom actively (option)

Note
Different machine configuration!

▶ Adhere to control description sticker.

If boom is not lowered through its curb weight:
▶ Stop attachment movements.

▶ Press *active boom lowering* key.
or

Press button on joystick.
▷ *Lowering boom actively* status symbol appears on the display.

▷ Boom is lowered hydraulically.

3.4.33 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.

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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.

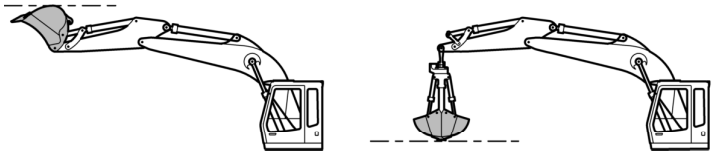

Fig. 715: Maximum height with bucket, minimum height with grapple

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.

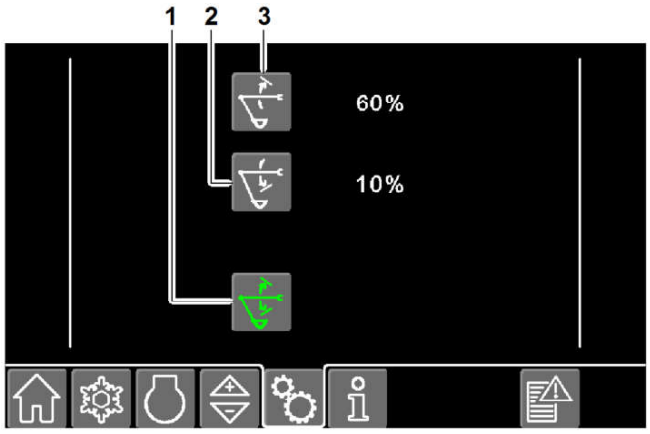

Fig. 716: Hoist cylinder shut-off menu

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

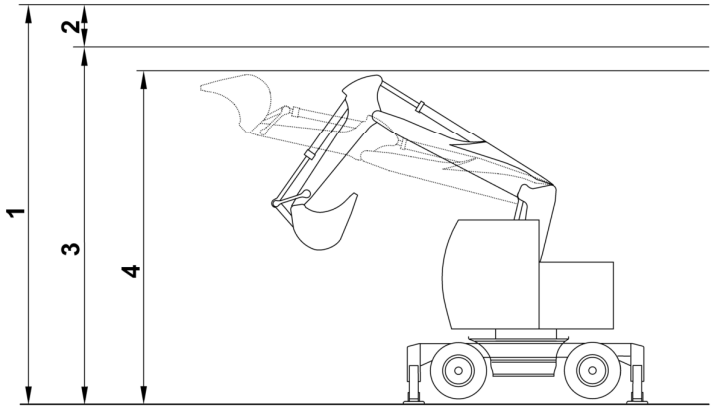

Fig. 759: Height limitation

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 (5‘ 9“ ft-in). 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

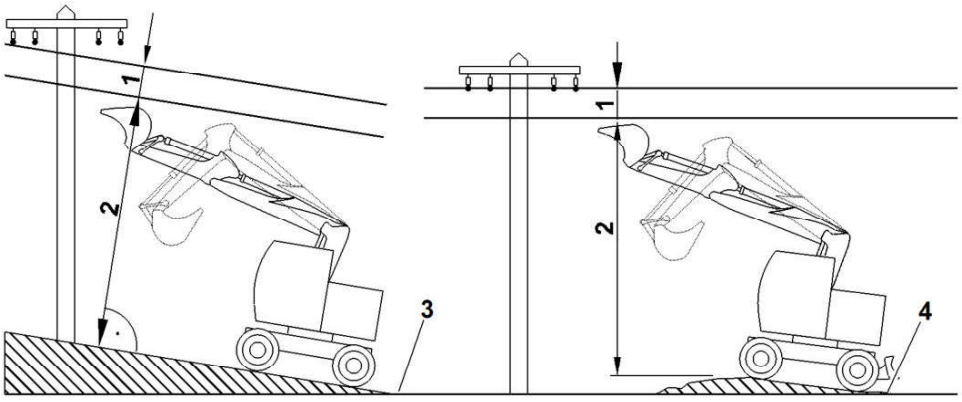

Fig. 760: Example factors for setting maximum working height

1	Safe distance	**3**	Pitch
2	Maximum working height	**4**	Uneven ground

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Maximum working depth

Teaching in maximum working depth

Make sure the following preconditions are met:
- ❑ Supervisor supervises the setting of limit value.
- ❑ Settings for depth limitation are enabled.
- ❑ Depth limitation is switched on.
- ❑ Machine is in working position.
- ❑ Working tool operating mode is selected.

If new maximum working depth is lower than previously set maximum working depth:

▶ Bypass depth limitation (For more information see: Bypassing depth limitation, page 215) .

▶ Move working attachment to maximum permitted working depth.

▶ Press *maximum working depth* button.

▶ Press confirmation button.
▷ Maximum working depth is saved.

Entering maximum working depth

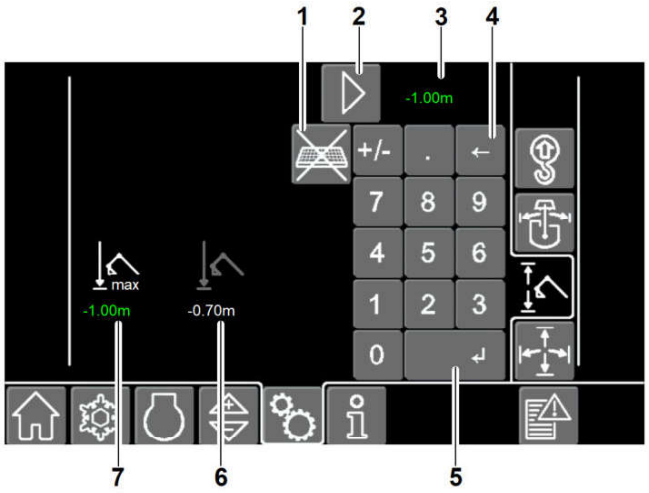

Fig. 788: Entering limit value manually menu

1 *Hiding keyboard* button
2 *Changeover* button
3 Manually set limit value
4 *Delete* button
5 *Accept* button
6 Limit value of bottom shut-off point for bolt-in point of working tool
7 Limit value of maximum working depth for bolt-in point of working tool

Make sure the following preconditions are met:
- ❑ Supervisor supervises the setting of limit value.
- ❑ Settings for depth limitation are enabled.
- ❑ Depth limitation is switched on.
- ❑ Machine is in working position.
- ❑ Working tool operating mode is selected.

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▶ 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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- ▶ Exclusively raise and lower loads vertically.
- ▶ Move loads close to the ground.

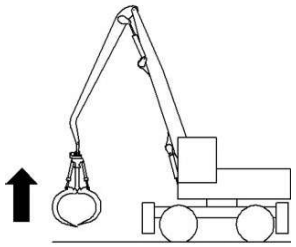
3.6.9 Use of banksmen

Deploying banksman

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.

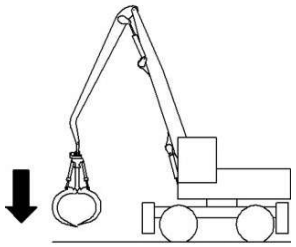
Hand gestures

Raising load

Hand gesture	Banksman	Machine
Extend forearm upwards. Extend index finger upwards. Move hand in small circles.		

Tab. 78: Raising load

Lowering load

Hand gesture	Banksman	Machine
Extend arm downwards. Extend index finger downwards. Move hand in small circles.		

Tab. 79: Lowering load

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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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Towing

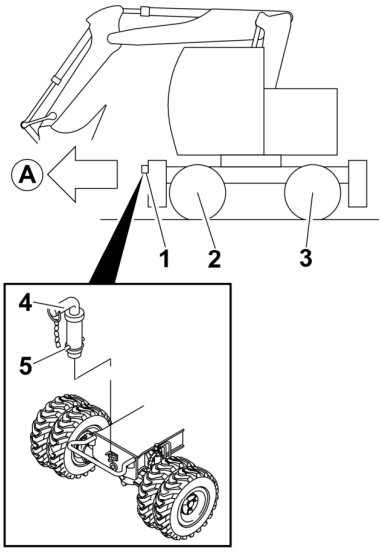

Fig. 873: Towing

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 252)

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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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. 98: 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. 100: 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. 108: Meaning of symbols

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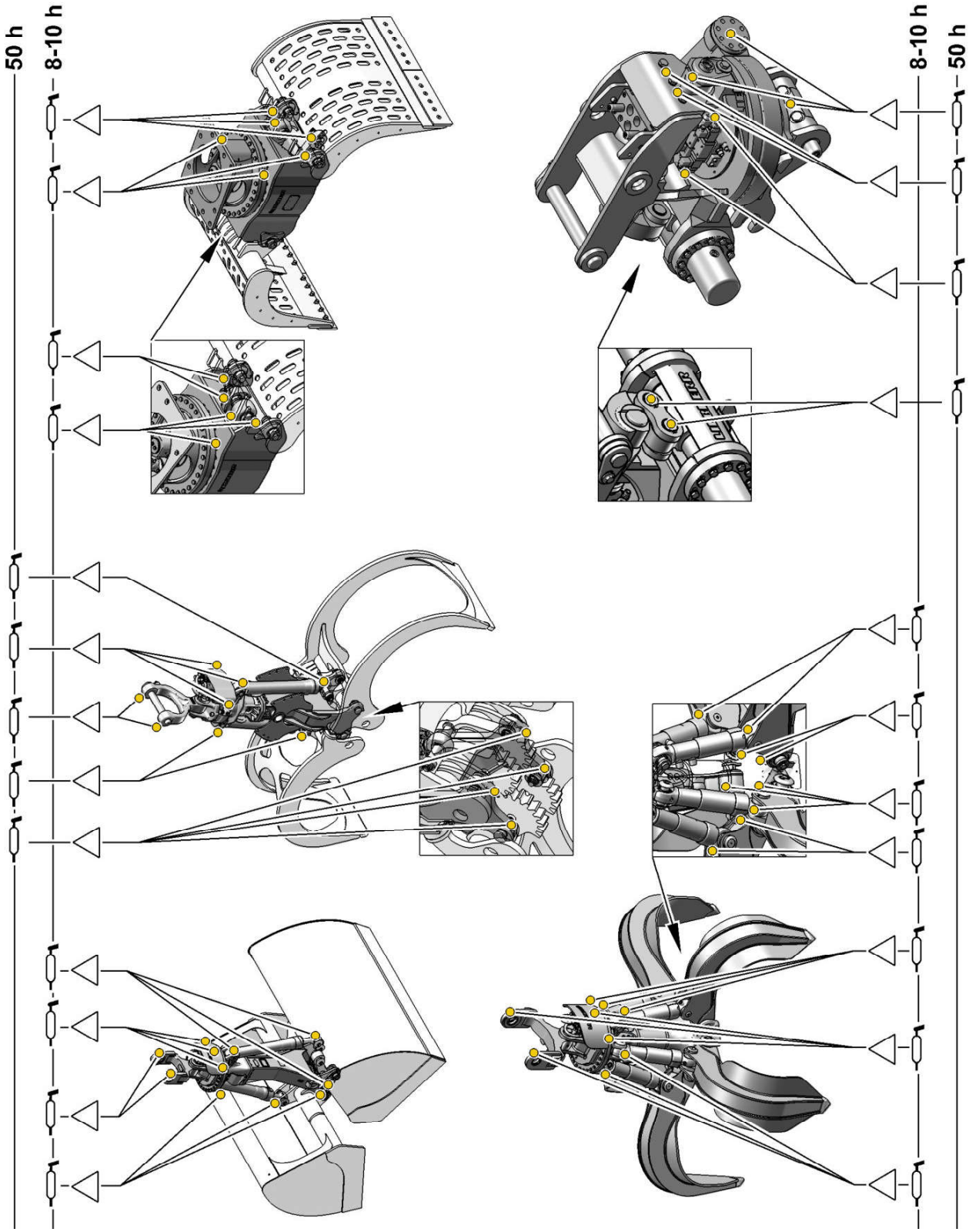

Fig. 955: Lubrication chart for working tools

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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 301)
- Pump distributor gear (For more information see: 5.3.11 Pump distributor gear oils, page 302)
- Automatic transmission

Liebherr recommendation

Ambient temperature	Description
-22 to 122 °F	Liebherr Gear Basic 90 LS
-31 to 122 °F	Liebherr Gear Plus 20W-40
-22 to 122 °F	Liebherr Gear Hypoid 90 EP
-13 to 122 °F	Liebherr Hypoid 85W-140 EP
-40 to 122 °F	Liebherr Syntogear Plus 75W-90

Tab. 136: Liebherr recommendation

Minimum quality requirements

Specification
API: GL-5
MIL-L: 2105 D or E, PRF-2105 D or E

Tab. 137: 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 °F
Liebherr Motoroil 5W-30 low ash	To -40 °F
Liebherr Motoroil 10W-40	To -31 °F
Liebherr Motoroil 10W-40 low ash	To -31 °F

Tab. 138: Liebherr recommendation

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5.5.3 Putting machine in maintenance position

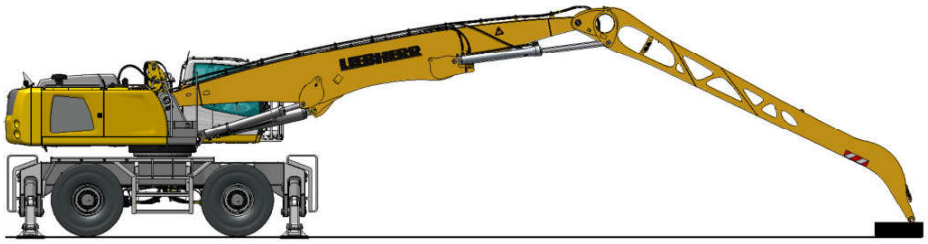

Fig. 967: Putting machine in maintenance position

- ▶ 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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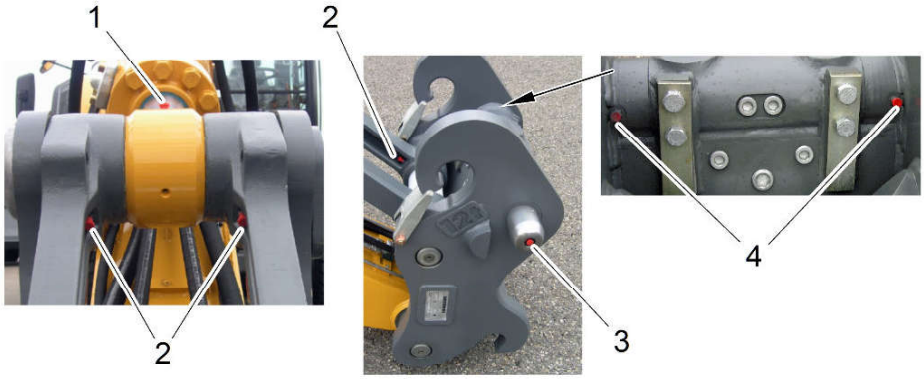

Fig. 974: Lubricating points

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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5.8.7 Air filter: Replacing safety filter cartridge

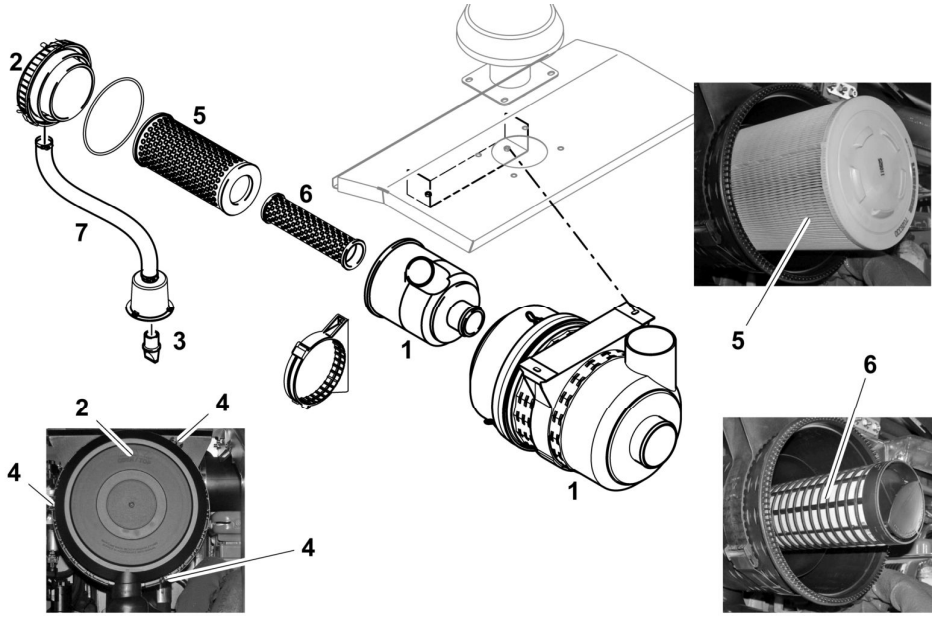

Fig. 981: Air filter: Replacing safety filter cartridge

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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- ▶ Fill coolant no faster than 2.11 gal/min into coolant container **3** until coolant container **3** is completely filled with coolant.
- ▶ Fill coolant no faster than 2.11 gal/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 340)

When machine has cooled down:

- ▶ Check coolant level, refill coolant if necessary. (For more information see: Filling with coolant, page 340)

5.9.2 Checking cooling system and heat exchanger for contamination

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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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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5.14.5 Checking and cleaning air conditioning condenser

NOTICE
Incorrect cleaning!
Damage to condenser fins.

- ▶ Clean condenser fins exclusively with compressed air.
- ▶ Do not clean condenser fins by machine or by steam cleaning.

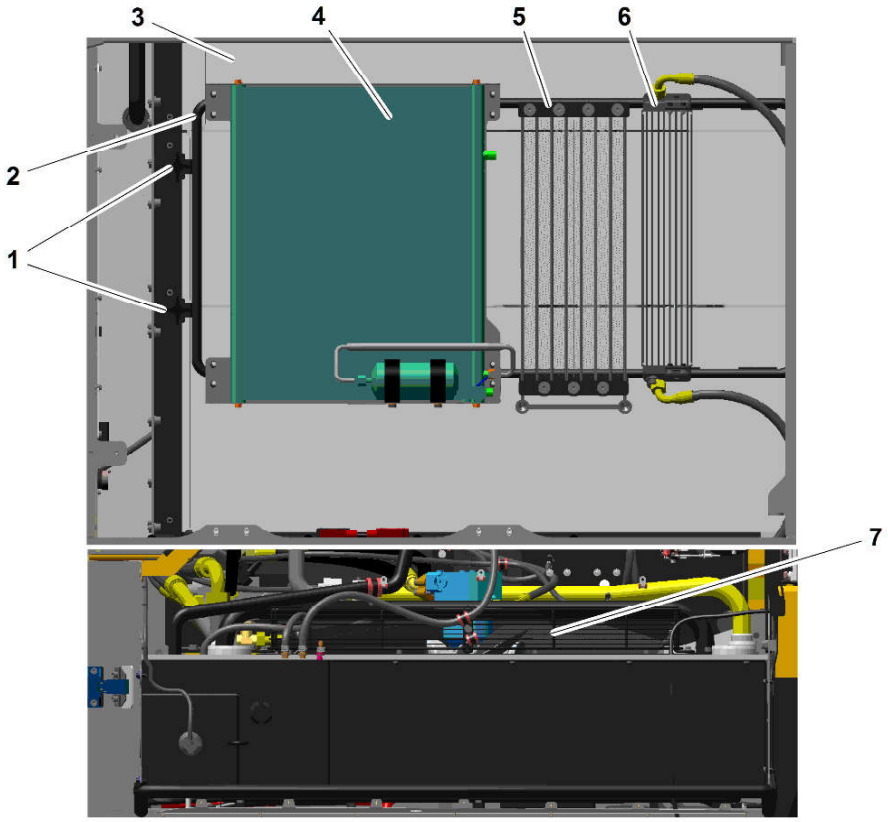

Fig. 1033: Checking cooling system and heat exchanger for contamination

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		

Make sure the following preconditions are met:
- ❑ Diesel engine is shut off.
- ❑ Diesel engine has cooled down.

- ▶ Loosen star knob screws **1** on swivel frame **2**.
- ▶ Remove swivel frame **2**.
- ▶ Check air conditioning condenser **4** for contamination.
- ▶ Clean air conditioning condenser **4** if necessary.
- ▶ Clean contaminated condenser fins with compressed air.

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