en

Operator's manual

Wheeled excavator

A 922 Rail - SV004 - 1190

From serial number 94581

Document ID

ORIGINAL OPERATOR'S MANUAL

Order number: 12221419
Issued: 2017-05-03
Version: 01
Author: LHB / Technical Documentation Department

Product ID

Manufacturer: Liebherr-Hydraulikbagger GmbH
Type: A 922 Rail - SV004
Type no.: 1190
From Serial no.: 94581
Conformity: CE

Contact

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

LHB/12221419/01/2017-05-03/en

1.1.3 Undercarriage

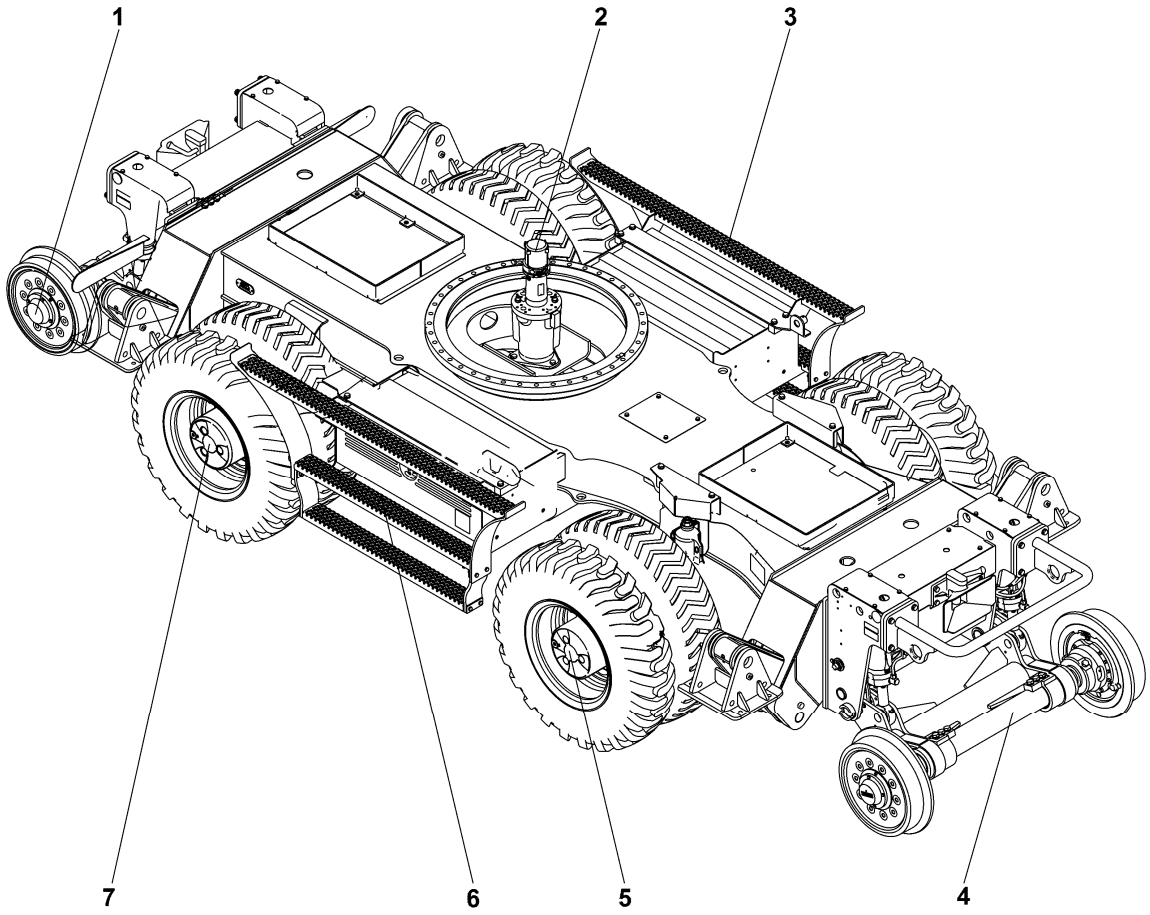

Fig. 4: Undercarriage

1	Rail guide system rigid axle side	**4**	Rail guide system, swing axle side	**7**	Rigid axle
2	Rotary connection	**5**	Oscillating axle		
3	Left side cab access	**6**	Right side cab access, toolbox, fire extinguisher		

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Maximum Efficiency

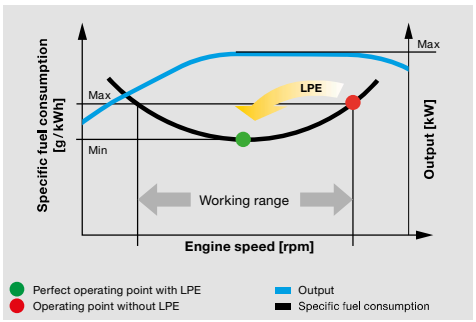
Liebherr Working Tools and LIKUFIX
To boost the productivity of its construction machines, Liebherr offers a broad range of working tools for different fields of application. Furthermore, the hydraulic excavators can also be equipped with the Liebherr LIKUFIX hydraulic quick coupling system. The combination of a hydraulic Liebherr quick coupling system with the LIKUFIX coupling block permits fast safe changing of mechanical and hydraulic working tools from the operator's cabin. This boosts productivity on average by 30 %. The construction process is accelerated, and orders are completed faster. That enables more turnover to be achieved per machine.

Engine Idling
The standard automatic idling function reduces the engine speed to idle as soon as the operator takes his hand from the joystick so that no hydraulic function is activated. Proximity sensors in the joystick levers restore the original engine speed as soon as the operator's hand is moved towards the lever again. This ensures that the set engine speed is available immediately. The result is a combination of fuel saving and reduced noise level.

Increased Productivity

Low Emissions and Low Operating Costs
The Liebherr D 834 diesel engine sets the benchmark for consumption in its performance class while adhering to emissions stage IIIB with a maintenance-free oxidation catalyst. A Liebherr particulate filter is available as an option (use depends on legislative regulations). The environment is protected by adhering to the emissions specifications. Fewer emissions. Lower operating costs. More economic environmental protection.

Efficient Management
LiDAT, Liebherr's own data transmission and positioning system, facilitates efficient management, monitoring and control of the entire fleet in terms of machinery data recording, data analysis, fleet management and service. All of the important machinery data can be viewed at any time in a web browser. LiDAT provides you comprehensive work deployment documentation, greater availability thanks to shorter downtimes, faster support from the manufacturer, quicker detection of strain/overload and subsequently a longer service life of the machine as well as greater planning efficiency. This service includes 1 year of use free of charge as standard for the wheeled excavator A 922 Rail.



Add-On-Axle
- In Germany, nationwide road travel approval
- Load distribution on three axles
- Securing of new areas of use
- Higher load capacities (up to 15 %) thanks to the use of the heavy counterweight

Low Fuel Consumption Thanks to Intelligent Machine Control
- Liebherr-Power Efficiency (LPE) optimises the interaction of the drive components in terms of efficiency
- LPE enables machine operation in the area of the lowest specific fuel use for less consumption and greater efficiency with the same performance

Liebherr Quick Coupling System LIKUFIX
- Faster and safer changing of mechanical and hydraulic working tools from the operator's cabin
- Machine utilization increased to up to 90 % thanks to extended deployment options
- Visual and acoustic check of correct locking position of tool at quick coupling system by two proximity sensors

Operator's Cab

Double cabin	ROPS safety cab structure (roll-over protection system) with individual windscreens or featuring a slide-in subpart under the ceiling, work headlights integrated in the ceiling, operator's 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 window shades for the sunroof window and windscreen
Operator's seat Standard	air cushioned operator's seat with headrest, lap belt, seat heater, manual weight adjustment, adjustable seat cushion inclination and length and mechanical lumbar vertebrae support
Operator's seat Comfort (Option)	in addition to operator's seat standard: lockable horizontal suspension, automatic weight adjustment, adjustable suspension stiffness, pneumatic lumbar vertebrae support and passive seat climatisation with active coal
Operator's seat Premium (Option)	in addition to operator's seat comfort: active electronic weight adjustment (automatic readjustment), pneumatic low frequency suspension and active seat climatisation with active coal and ventilator
Control system	joysticks with arm consoles and swivel seat
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, separate display for rear view and side view monitoring
Air-conditioning	automatic air-conditioning, recirculated air function, fast de-icing and demisting at the press of a button, air vents can be operated via a menu; recirculated air and fresh air filters can be easily replaced and are accessible from the outside; heating-cooling unit, designed for extreme outside temperatures, sensors for solar radiation, inside and outside temperatures

Undercarriage

Drive	two speed power shift transmission with additional creeper speed, Liebherr axial piston motor with functional brake valve on both sides
Pulling force	117 kN
Travel speed	0 – 3.5 km/h stepless (creeper speed off-road) 0 – 7.0 km/h stepless (off-road) 0 – 13.0 km/h stepless (creeper speed on-road) 0 – 20.0 km/h stepless (road travel) 0 – max. 25.0 or 30.0 km/h Speeder (Option)
Driving operation	automotive driving using accelerator pedal, cruise control function: storage of variable accelerator pedal positions, both off-road, on-road and on-rail
Axles	automatic or operator controlled front axle oscillation lock
Option	axle with wheel head width 2,100 mm and differential lock 100 % in track operation
Service brake	two circuit travel brake system with accumulator; road axle wet and backlash-free disc brake; rail wheels with drum brake
Holding brake	wet multi-disc (spring applied, pressure released)
Wagon braking system	1 circuit compressed air brake for railway wagon
Option	2 circuit compressed air brake for trailer 2 circuit hydraulic brake for trailer
Rail guide	standard gauge 1,435 mm
Option	width gauge, narrow gauge type friction drive
Stabilization	without outriggers
Option	4 point outriggers

Attachment

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

Complete Machine

Lubrication	Liebherr central lubrication system for uppercarriage and attachment, automatically
Noise emission	
ISO 6396	L_{pA} (inside cab) = 72 dB(A)
2000/14/EC	L_{WA} (surround noise) = 100 dB(A)

Lift Capacities

with Offset Two-Piece Boom 5.25 m (4 Point Outriggers) with Tail Radius 2,000 mm

Stick 1.85 m

m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m				m
9.0	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											
7.5	outriggers raised, on rail	7.3	7.6*							3.9	4.5*	
	outriggers raised, on tyres	7.6*	7.6*							4.5*	4.5*	4.3
	4 point outriggers down	7.6*	7.6*							4.5*	4.5*	
6.0	outriggers raised, on rail	6.8*	6.8*	3.9	6.5*					2.3	3.5*	
	outriggers raised, on tyres	6.8*	6.8*	5.2	6.5*					3.2	3.5*	5.8
	4 point outriggers down	6.8*	6.8*	6.5*	6.5*					3.5*	3.5*	
4.5	outriggers raised, on rail	6.8	9.5*	3.9	7.1*	2.3	5.8*			1.7	3.2*	
	outriggers raised, on tyres	9.2	9.5*	5.2	7.1*	3.2	4.9			2.5	3.2*	6.7
	4 point outriggers down	9.5*	9.5*	6.4	7.1*	4.0	5.8*			3.2*	3.2*	
3.0	outriggers raised, on rail	6.5	9.3*	3.8	8.0*	2.3	6.0*			1.5	3.1*	
	outriggers raised, on tyres	8.8	9.3*	5.1	7.4	3.2	4.9			2.2	3.1*	7.2
	4 point outriggers down	9.3*	9.3*	6.2	8.0*	4.0	6.0*			2.8	3.1*	
1.5	outriggers raised, on rail	6.4	11.4*	3.7	8.4*	2.2	6.2*			1.4	3.2*	
	outriggers raised, on tyres	8.7	11.4*	5.0	7.4	3.0	4.8			2.1	3.2*	7.3
	4 point outriggers down	11.1	11.4*	6.2	8.4*	3.9	6.2*			2.7	3.2*	
0	outriggers raised, on rail	5.9	13.3*	3.4	8.5*	2.0	6.3*			1.4	3.4*	
	outriggers raised, on tyres	8.5	13.3*	4.7	7.6	2.9	4.6			2.1	3.4*	7.0
	4 point outriggers down	11.4	13.3*	6.1	8.5*	3.8	6.3*			2.8	3.4*	
−1.5	outriggers raised, on rail	5.6	13.8*	3.1	8.9*	1.9	5.4*			1.6	3.9*	
	outriggers raised, on tyres	8.2	13.8*	4.4	7.3	2.7	4.5			2.4	3.9*	6.5
	4 point outriggers down	11.1	13.8*	5.8	8.9*	3.6	5.4*			3.2	3.9*	
−3.0	outriggers raised, on rail	5.5	12.4*	3.0	6.3*					2.5	4.6*	
	outriggers raised, on tyres	8.1	12.4*	4.3	6.3*					3.6	4.6*	5.0
	4 point outriggers down	11.0	12.4*	5.6	6.3*					4.6*	4.6*	
−4.5	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											

Stick 2.05 m

m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m				m
9.0	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											
7.5	outriggers raised, on rail			3.7	4.5*					3.5	3.7*	
	outriggers raised, on tyres			4.5*	4.5*					3.7*	3.7*	4.6
	4 point outriggers down			4.5*	4.5*					3.7*	3.7*	
6.0	outriggers raised, on rail			4.0	6.3*	2.2	3.7*			2.2	3.1*	
	outriggers raised, on tyres			5.3	6.3*	3.1	3.7*			3.1	3.1*	6.1
	4 point outriggers down			6.3*	6.3*	3.7*	3.7*			3.1*	3.1*	
4.5	outriggers raised, on rail	6.9	9.8*	3.9	6.9*	2.3	5.7*			1.7	2.8*	
	outriggers raised, on tyres	9.2	9.8*	5.2	6.9*	3.2	5.0			2.4	2.8*	6.9
	4 point outriggers down	9.8*	9.8*	6.4	6.9*	4.1	5.7*			2.8*	2.8*	
3.0	outriggers raised, on rail	6.5	9.8*	3.8	7.9*	2.3	6.0*			1.4	2.8*	
	outriggers raised, on tyres	8.8	9.8*	5.1	7.4	3.2	5.0			2.1	2.8*	7.3
	4 point outriggers down	9.8*	9.8*	6.2	7.9*	4.1	6.0*			2.8*	2.8*	
1.5	outriggers raised, on rail	6.4	11.5*	3.7	8.4*	2.2	6.2*			1.4	2.9*	
	outriggers raised, on tyres	8.7	11.5*	5.1	7.4	3.1	4.8			2.0	2.9*	7.4
	4 point outriggers down	11.1	11.5*	6.2	8.4*	4.0	6.2*			2.6	2.9*	
0	outriggers raised, on rail	5.9	13.2*	3.4	8.5*	2.1	6.3*			1.4	3.1*	
	outriggers raised, on tyres	8.5	13.2*	4.8	7.5	2.9	4.7			2.1	3.1*	7.2
	4 point outriggers down	11.3	13.2*	6.2	8.5*	3.8	6.3*			2.7	3.1*	
−1.5	outriggers raised, on rail	5.6	13.7*	3.2	8.9*	1.9	5.8*			1.6	3.6*	
	outriggers raised, on tyres	8.2	13.7*	4.5	7.3	2.8	4.5			2.3	3.6*	6.7
	4 point outriggers down	11.2	13.7*	5.9	8.9*	3.6	5.8*			3.1	3.6*	
−3.0	outriggers raised, on rail	5.5	13.1*	3.0	7.0*					2.2	4.2*	
	outriggers raised, on tyres	8.1	13.1*	4.3	7.0*					3.3	4.2*	5.3
	4 point outriggers down	11.0	13.1*	5.6	7.0*					4.2*	4.2*	
−4.5	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											

Stick 2.25 m

m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m				m
9.0	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											
7.5	outriggers raised, on rail			3.8	4.9*					3.2*	3.2*	
	outriggers raised, on tyres			4.9*	4.9*					3.2*	3.2*	4.9
	4 point outriggers down			4.9*	4.9*					3.2*	3.2*	
6.0	outriggers raised, on rail			4.0	6.0*	2.3	4.3*			2.1	2.7*	
	outriggers raised, on tyres			5.3	6.0*	3.2	4.3*			2.7*	2.7*	6.3
	4 point outriggers down			6.0*	6.0*	4.1	4.3*			2.7*	2.7*	
4.5	outriggers raised, on rail	6.9	9.4*	3.9	6.7*	2.4	5.5*			1.6	2.5*	
	outriggers raised, on tyres	9.3	9.4*	5.2	6.7*	3.3	5.0			2.3	2.5*	7.1
	4 point outriggers down	9.4*	9.4*	6.4	6.7*	4.2	5.5*			2.5*	2.5*	
3.0	outriggers raised, on rail	6.5	10.1*	3.8	7.7*	2.4	5.9*			1.4	2.5*	
	outriggers raised, on tyres	8.8	10.1*	5.1	7.4	3.3	5.0			2.0	2.5*	7.5
	4 point outriggers down	10.1*	10.1*	6.2	7.7*	4.1	5.9*			2.5*	2.5*	
1.5	outriggers raised, on rail	6.4	11.4*	3.8	8.4*	2.3	6.1*	1.3	3.8*	1.3	2.6*	
	outriggers raised, on tyres	8.7	11.4*	5.0	7.3	3.1	4.9	2.0	3.2	1.9	2.6*	7.6
	4 point outriggers down	11.0	11.4*	6.2	8.4*	4.0	6.1*	2.6	3.8*	2.5	2.6*	
0	outriggers raised, on rail	6.0	13.0*	3.5	8.4*	2.1	6.2*			1.3	2.8*	
	outriggers raised, on tyres	8.6	13.0*	4.8	7.4	3.0	4.7			2.0	2.8*	7.4
	4 point outriggers down	11.2	13.0*	6.2	8.4*	3.8	6.2*			2.6	2.8*	
−1.5	outriggers raised, on rail	5.6	13.6*	3.2	8.7*	1.9	6.0*			1.5	3.3*	
	outriggers raised, on tyres	8.2	13.6*	4.5	7.4	2.8	4.5			2.2	3.3*	6.8
	4 point outriggers down	11.1	13.6*	5.9	8.7*	3.6	6.0*			2.9	3.3*	
−3.0	outriggers raised, on rail	5.5	13.6*	2.9	7.6*					2.0	3.9*	
	outriggers raised, on tyres	8.1	13.6*	4.2	7.1					3.0	3.9*	5.5
	4 point outriggers down	11.0	13.6*	5.6	7.6*					3.9*	3.9*	
−4.5	outriggers raised, on rail											
	outriggers raised, on tyres											
	4 point outriggers down											

Stick 2.65 m

m	Undercarriage	3.0 m		4.5 m		6.0 m		7.5 m				m
9.0	outriggers raised, on rail	4.1*	4.1*							3.8*	3.8*	
	outriggers raised, on tyres	4.1*	4.1*							3.8*	3.8*	3.1
	4 point outriggers down	4.1*	4.1*							3.8*	3.8*	
7.5	outriggers raised, on rail			4.0	4.7*					2.5*	2.5*	
	outriggers raised, on tyres			4.7*	4.7*					2.5*	2.5*	5.5
	4 point outriggers down			4.7*	4.7*					2.5*	2.5*	
6.0	outriggers raised, on rail			4.0	5.0*	2.4	4.5*			1.8	2.2*	
	outriggers raised, on tyres			5.0*	5.0*	3.3	4.5*			2.2*	2.2*	6.7
	4 point outriggers down			5.0*	5.0*	4.2	4.5*			2.2*	2.2*	
4.5	outriggers raised, on rail	5.9*	5.9*	3.9	6.1*	2.5	5.3*			1.4	2.0*	
	outriggers raised, on tyres	5.9*	5.9*	5.2	6.1*	3.4	5.0			2.0*	2.0*	7.5
	4 point outriggers down	5.9*	5.9*	6.1*	6.1*	4.2	5.3*			2.0*	2.0*	
3.0	outriggers raised, on rail	6.5	10.0*	3.8	7.4*	2.5	5.7*	1.4	4.2*	1.2	2.0*	
	outriggers raised, on tyres	8.8	10.0*	5.0	7.4*	3.3	4.9	2.1	3.3	1.8	2.0*	7.9
	4 point outriggers down	10.0*	10.0*	6.2	7.4*	4.2	5.7*	2.7	4.2*	2.0*	2.0*	
1.5	outriggers raised, on rail	6.3	11.2*	3.7	8.2*	2.4	6.0*	1.4	4.8*	1.2	2.1*	
	outriggers raised, on tyres	8.6	11.2*	5.0	7.3	3.2	4.9	2.0	3.2	1.7	2.1*	8.0
	4 point outriggers down	10.9	11.2*	6.1	8.2*	4.1	6.0*	2.7	4.8*	2.1*	2.1*	
0	outriggers raised, on rail	6.0	12.6*	3.5	8.3*	2.2	6.1*	1.3	4.5*	1.2	2.3*	
	outriggers raised, on tyres	8.7	12.6*	4.8	7.3	3.0	4.7	1.9	3.2	1.8	2.3*	7.8
	4 point outriggers down	11.0	12.6*	6.2	8.3*	3.9	6.1*	2.6	4.5*	2.3*	2.3*	
−1.5	outriggers raised, on rail	5.6	13.4*	3.2	8.5*	1.9	6.2*			1.3	2.6*	
	outriggers raised, on tyres	8.2	13.4*	4.6	7.5	2.8	4.5			2.0	2.6*	7.3
	4 point outriggers down	11.1	13.4*	6.0	8.5*	3.7	6.2*			2.6*	2.6*	
−3.0	outriggers raised, on rail	5.6	14.0*	2.9	8.3*	1.8	4.4*			1.6	3.3*	
	outriggers raised, on tyres	8.1	14.0*	4.3	7.1	2.7	4.4*			2.4	3.3*	6.3
	4 point outriggers down	11.1	14.0*	5.6	8.3*	3.5	4.4*			3.2	3.3*	
−4.5	outriggers raised, on rail									7.1	10.6*	
	outriggers raised, on tyres									10.6*	10.6*	2.5
	4 point outriggers down									10.6*	10.6*	

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

The lift capacities are stated in metric tonnes (t) with PowerLift of 375 bar at the stick end without tools. This applies to a firm flat substrate with a closed steering axle. These capacities can be slewed through 360° with the undercarriage in the transverse position. Capacities in the longitudinal position of the undercarriage (+/– 15°) are specified over the steering axle with the stabilizers raised and over the rigid axle with the stabilizers down. The values apply when the adjusting cylinder is in the optimal position. Indicated loads based on the ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity, or are limited by the permissible load of the load lift 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 lift hook and a lift capacity chart.

Please note that the stability will be reduced by approx. 20 % in case of a 100 mm cant and 50 % in case of a 200 mm cant.

Equipment

Undercarriage

Dual-circuit braking system with rail wheel brake, hydraulically	•
4 point outriggers, outriggers rear and front	+
Support frame, lockable (front and rear)	+
Add-on-axle	+
Bumper (front and rear)	+
Trailer couplings	•
Earthing cable with ball-headed pin	✖
Travel speed levels (four)	•
Fire extinguisher 6 kg, ÖCU-bag	✖
Grab suspension bracket	+
Drag shoe, 2 pieces	•
Coupling bar	✖
Line protection for rail guide cylinders	+
Parking brake, maintenance-free	•
Outrigger with individual control	+
Tyre inflation hose with pressure gauge at wagon braking system	+
Tyres, variants	+
Pipe fracture safety valves stabilizer cylinders	•
Rail undercarriage convertible (position and pressure control)	+
Rail guide axles, oscillating 30 on the steering axle side, 30 at the rear	+
Rail guide axles, oscillating 60 on the steering axle side, 60 at the rear	+
Rail sweeper	+
Narrow excavator axles with wheel head width of 2,100 mm	+
Rail guide narrow gauge 1,000 mm	+
Protection for oscillating axle cylinders	+
Proportional servo-steering with emergency function	•
Special gauges	+
Speeder	+
Power socket 24 V/10 A (front/rear)	+
Lashing eyelets for transport	•
Wagon braking system (pneumatic, 1 circuit)	•
Tool equipment, extended	+
Tool box left – lockable	•
Tool box right – lockable	•
Two-speed power shift transmission	•

Uppercarriage

Uppercarriage rear light, 2 pieces, LED	+
Uppercarriage right side light, 1 piece, LED	+
Refuelling system with filling pump	+
External starting aid	+
Handrails, non slip surfaces	•
Main battery switch for electrical system	•
Engine hood with gas spring	•
Uppercarriage doors, lockable	•
Signal light D.B., halogen	✖
Signal light D.B., LED	+
Special counterweight	+

Hydraulic System

Shut-off valve between hydraulic tank and pump(s)	•
Pressure test fittings	•
Accumulator for controlled lowering of the attachment with the engine shut down	•
Electronic pump regulation	•
High pressure circuit, continuous operation	•
Hydraulic oil filter with integrated microfilter	•
Liebherr hydraulic oil from –20 °C to +40 °C	•
Liebherr hydraulic oil, biologically degradable	+
Liebherr hydraulic oil, specially for warm or cold regions	+
Bypass filter	+
Emergency actuation, electric	✖
Priority circuit LSC for attachments	•
Electric switchover clamshell operation and tipping cylinder	•
Switchover high pressure circuit 1 and tipping cylinder	+
Switchover high pressure circuit 1 and two-piece boom	+
Preparation Liebherr hydro-magnet	+

Diesel Engine

Fuel anti-theft device	+
Sensor controlled engine idling	•
Liebherr particle filter	+
Air pre-filter with dust discharge	+
Pre-installation particle filter with sound attenuation module	•
Preheating hydraulic oil	+
Preheating fuel	+
Preheating coolant	+
Preheating engine oil	+

Work Space Limitation

Electronic lift limitation	✖
Load torque limitation (RCI/RCL)	✖
Swivel limitation	✖
Overload warning device*	+
Virtual wall	+

  - Operator's manuals for components
  - Operator's manuals from third party manufacturers
  - Additional instructions
- Maintain and repair machine for safe and reliable function.
- Perform all prescribed maintenance tasks and repair work.
- Isolate battery main switch of power supply system and secure it against switching on again.
- Clearly define and label working position.
- Wear personal protective equipment.
- Use adapted tools.
- Adhere to safety regulations at place of use.
- Report all changes to machine that affect safety to operating company.
- Exclusively perform retrofittings of machine after consultation with manufacturer.
- Exclusively use original Liebherr spare parts.

Requirement

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

2.3.8 Rigger

Responsibility

The rigger has following tasks:
- Wear personal protective equipment.
- Choose correct and undamaged slinging gear.
- Correctly attach slinging gear to load or lifting accessory.
- Correctly remove slinging gear from load or lifting accessory.
- Grant approval for movement or accompaniment.

Requirement

The rigger has following qualification and skills:
- Has completed the legally specified minimum age.
- Is physically and mentally capable of attaching loads.
  - Satisfactory eyesight
  - Satisfactory hearing ability
  - Quick reactions

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***Close upper windscreen* sign**

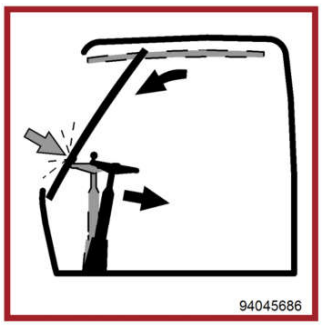

Fig. 32: Close upper windscreen sign

Indicates sequence for closing upper windscreen:
– Fold back steering wheel.
– Pull upper windscreen down.

Warning signs in Germany

Note

▶ Make sure that all warning signs are in place and are legible.

▶ Adhere to warning signs.

***Service brake and parking brake* sign**

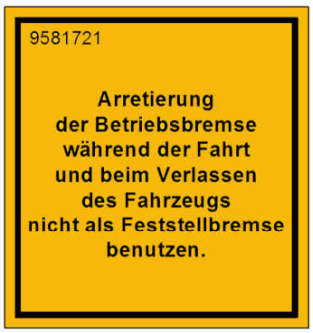

Fig. 33: Service brake and parking brake sign

Do not apply service brake and parking brake at the same time when machine is in operation.

***Earth machine* sign**

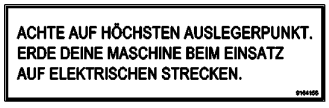

Fig. 34: Earth machine sign

This sign contains following information:
– Make sure that machine is earthed when on electrified sections.

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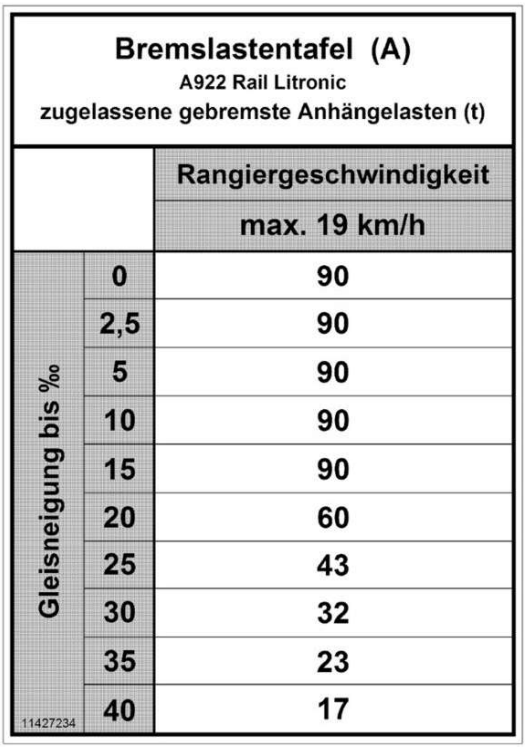
Stalling load table sign



Bremslastentafel (A)
A922 Rail Litronic
zugelassene gebremste Anhängelasten (t)

Gleisneigung bis ‰	Rangiergeschwindigkeit max. 19 km/h
0	90
2,5	90
5	90
10	90
15	90
20	60
25	43
30	32
35	23
40	17

11427234

Fig. 59: Stalling load table sign

The sign shows the approved trailer loads.

Axle 1 sign

Fig. 60: Axle 1 sign

Indicates the rail guide system on oscillating axle side.

Axle 2 sign

Fig. 61: Axle 2

Indicates the rail guide system on rigid axle side.

LHB/12221419/01/2017-05-03/en

Incorrect handling of electrical system

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

Injuries

Incorrect protection

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

Incorrect refuelling

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

Incorrect maintenance

- Make sure there are no persons in danger zone.
- Park machine and secure to prevent rolling or driving away.
- Park machine on level, firm ground.
- Park machine with lowered working attachment.
- When searching for leaks in the hydraulic system wear protective gloves.
- Exclusively search for leaks in the hydraulic system with cardboard or similar material.
- Do not weld or solder hydraulic accumulators.
- Do not perform mechanical work on hydraulic accumulators.
- Make sure that the permanent labelling of the hydraulic accumulators (operating data) is kept visible.

Crushing injuries

Unexpected movements of machine

- Make sure there are no persons in danger zone.
- Park machine and secure to prevent rolling or driving away.

Unintended closing of access doors

- Secure access doors by inserting the securing mechanisms.

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3.1.5 Control unit D

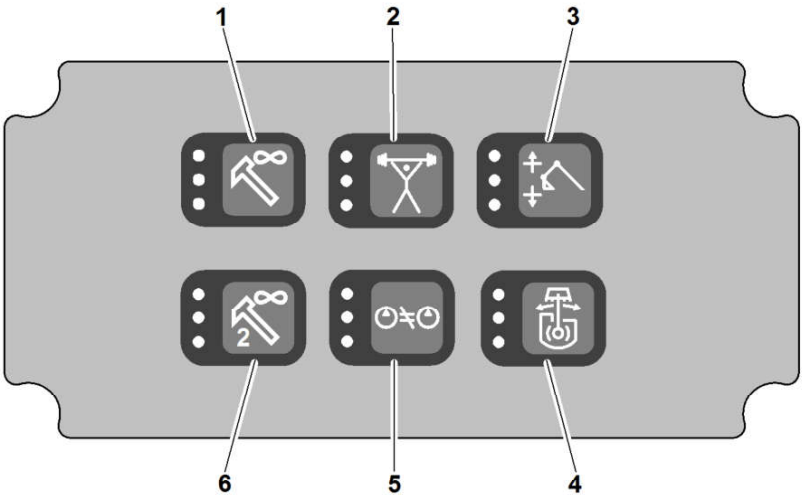

Fig. 72: Control unit D

1 *Continuous mode* key
2 *PowerLift* key
3 *Bypassing height limitation* key
4 *Bypassing slew limitation* key
5 *Disconnecting hydraulic oil circuit* key
6 *Continuous mode for working tool 2* key

3.1.6 Control unit F

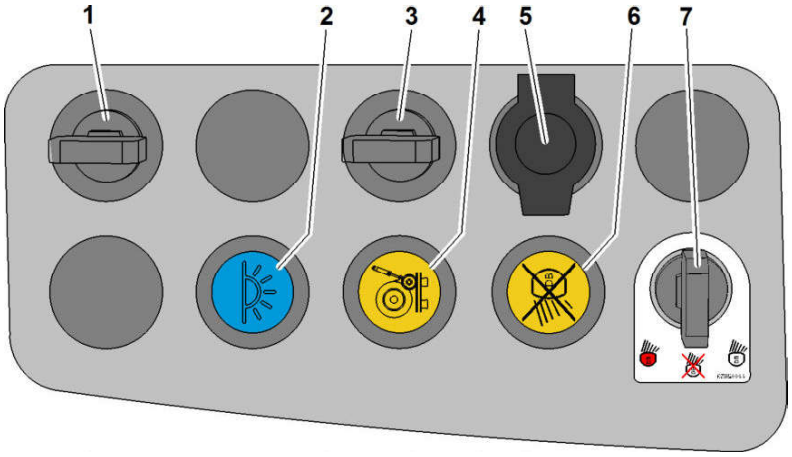

Fig. 73: Control unit F

1 Key switch for authorisation
2 *Interior lighting* button
3 Key switch for narrow gauge rail guide system (option)
4 Indicator light for narrow gauge rail guide system (option)
5 Socket (24 V) (option)
6 *Front signal* button
7 *Rear signal* button

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Adjusting armrest angle

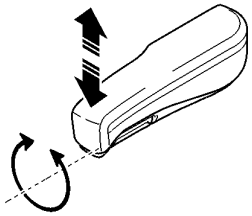

Fig. 89: Adjusting armrest angle

- ▶ Turn hand wheel on the underside to the right.
  - ▷ Armrest is moved upwards.
- ▶ Turn hand wheel on the underside to the left.
  - ▷ Armrest is moved downwards.

Adjusting armrest height

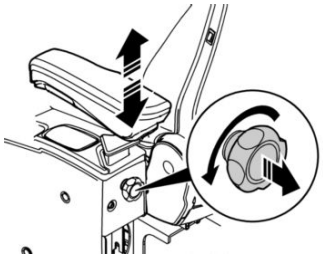

Fig. 90: Adjusting armrest height

- ▶ Unlock knob: Turn one turn to the left.
- ▶ Pull and hold knob.
- ▶ Push armrest up or down.
- ▶ Release knob.
- ▶ Move armrest along to next engagement position.
  - ▷ Knob engages audibly.
- ▶ Lock knob: Turn one turn to the right.
  - ▷ Armrest height is adjusted.

Adjusting seat cushion

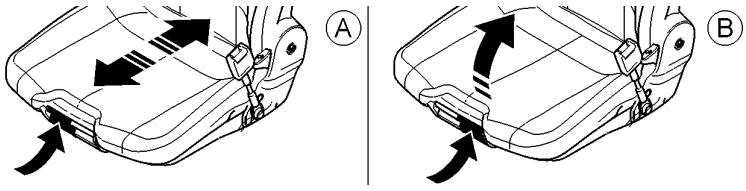

Fig. 91: Adjusting seat cushion

A Adjusting seat cushion depth **B** Adjusting seat cushion angle

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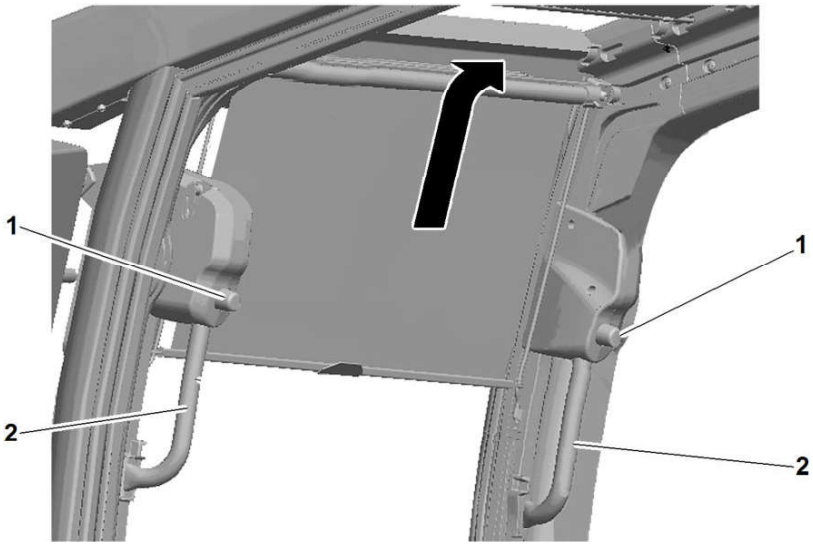

Fig. 106: Upper windscreen

1 Knob **2** Handle

Opening upper windscreen

Make sure the following preconditions are met:
- ❑ Steering column is swivelled away from windscreen.

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

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

▶ Swivel steering column into working position.

Closing upper windscreen

Make sure the following preconditions are met.
- ❑ Steering column is swivelled away from windscreen.

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

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

▶ Swivel steering column into working position.

Complete windscreen

Opening complete windscreen

▶ Open lower windscreen.

▶ Open upper windscreen.

Closing complete windscreen

▶ Close upper windscreen.

▶ Close lower windscreen.

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

Tab. 13: General status symbols

Working attachment and working tools

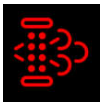
Symbol	Meaning
	Lowering boom active
	Boom adjustment active
	Boom adjustment; neutral position required
	Lateral boom adjustment active
	Lateral boom adjustment; neutral position required
	Working tool; neutral position required
	Rotary stick; neutral position required

LHB/12221419/01/2017-05-03/en

Symbol	Meaning
	Outrigger support extended
	Support fully extended

Tab. 22: Support status symbols

Diesel particulate filter

Symbol	Meaning
	Active regeneration
	Regeneration blocked
	High contamination
	Critical contamination

Tab. 23: Status symbols of diesel particulate filter

SCR system

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

Tab. 24: Status symbols of SCR system

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3.2.27 *System settings* menu

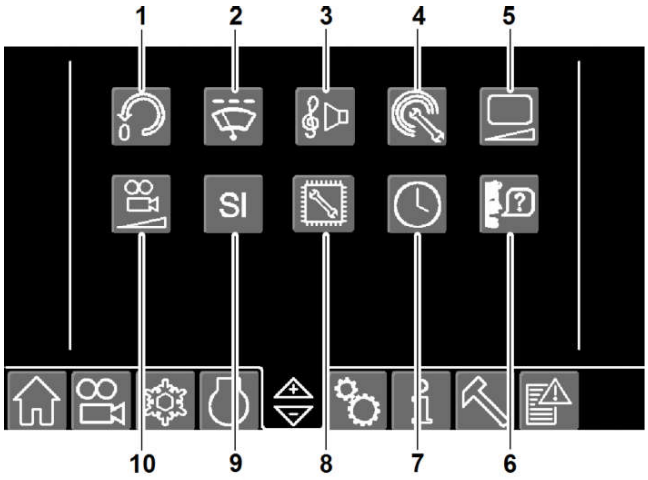

Fig. 323: System settings menu

1 *Operating hours counter and kilometre counter* menu button
2 *Windscreen wiper interval* menu button
3 *Radio remote control* menu button (option)
4 *Teleservice* menu button
5 *Display brightness* menu button
6 *Language* menu button
7 *Time zone and time* menu button
8 *System diagnosis* menu button
9 *Unit switching* menu button
10 *Camera settings* menu button[3)]

Operating hour meter and kilometre counter menu

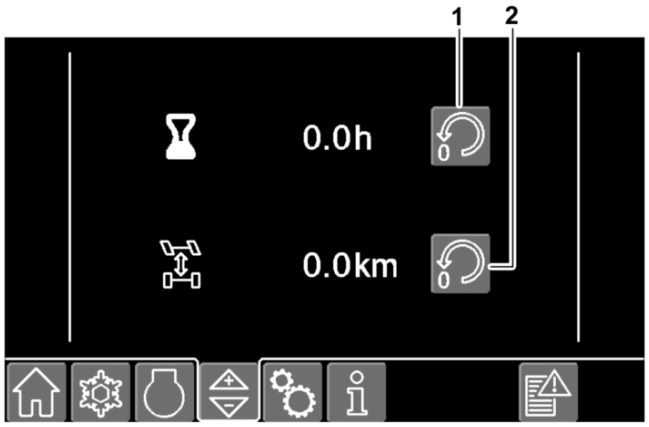

Fig. 324: Operating hour meter and kilometre counter menu

1 *Resetting daily operating hour meter* button
2 *Resetting daily kilometre counter* button

▶ Reset daily operating hour meter: Press *resetting daily operating hour meter* button **1.**

▶ Reset daily kilometre counter: Press *resetting daily kilometre counter* button **2.**

[3)] Available in machines without display for cameras

Setting contact pressure menu

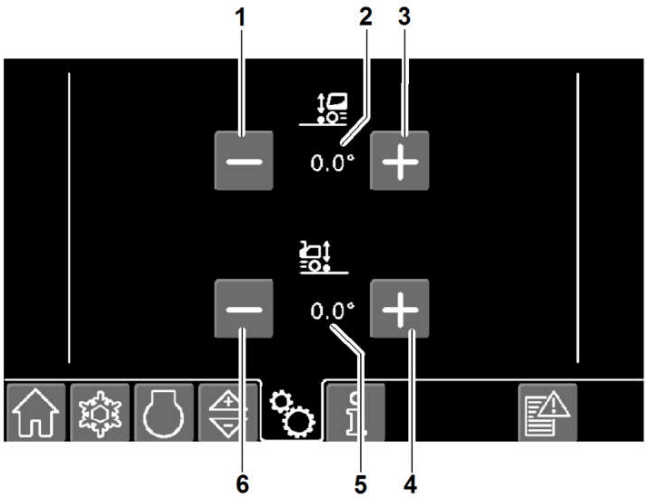

Fig. 343: Setting contact pressure menu

1 *Reducing contact pressure on oscillating axle side* button
2 Set value
3 *Increasing contact pressure on oscillating axle side* button
4 *Increasing contact pressure on rigid axle side* button
5 Set value
6 *Reducing contact pressure on rigid axle side* button

Workspace limitation menu

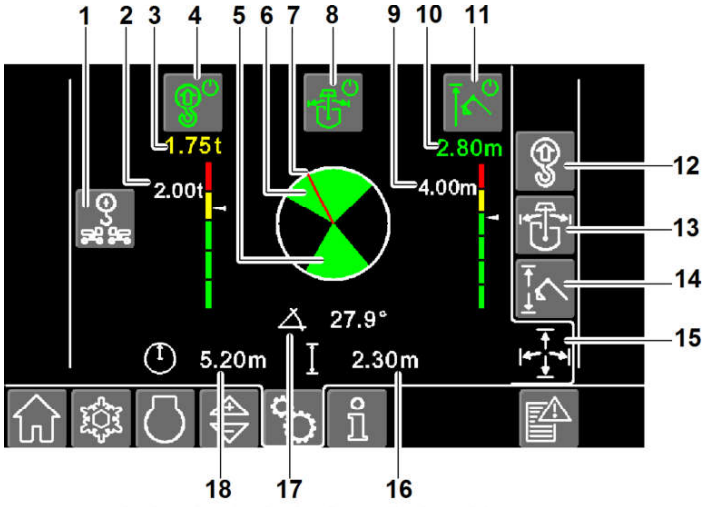

Fig. 344: Workspace limitation menu

1 *Tandem Lift* button
2 Maximum permitted load on hook
3 Load on hook
4 *Load moment limitation* button
5 Slewing range 2
10 Current height of working attachment
11 *Height limitation* button
12 *Load moment limitation* menu button
13 *Slew limitation* menu button
14 *Depth limitation and height limitation* menu button

See next page for continuation of the image legend

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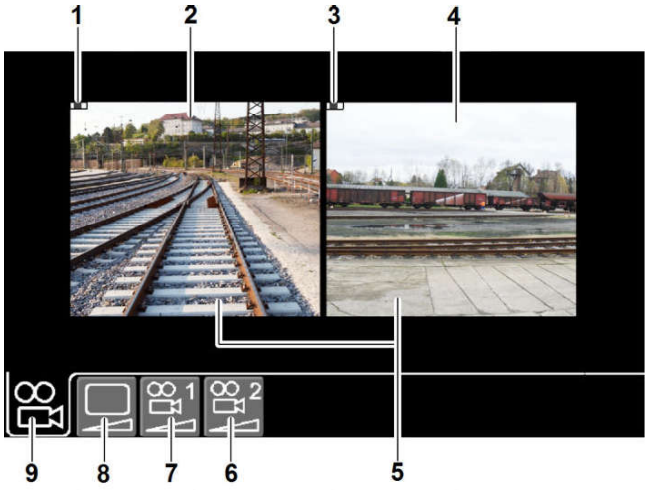

Fig. 374: Display for cameras

1	Rear area camera activity indicator	**6**	*Contrast setting for side area camera menu* button
2	Rear area camera image	**7**	*Contrast setting for rear area camera menu* button
3	Side area camera activity indicator	**8**	*Display brightness menu* button
4	Side area camera image	**9**	*Splitscreen mode* button
5	Splitscreen mode		

Correct rendition of camera images in real time is indicated by:
– Rear area camera activity indicator **1**
– Side area camera activity indicator **3**

It is possible to display the camera images in full screen mode.

In Splitscreen mode the rear area camera image and the side area camera image are displayed.

Selecting camera image

▶ Select full screen view of rear area camera: In camera images **9** menu press rear area camera image **2**.

▶ Select full screen view of side area camera: In camera images **9** menu press side area camera image **4**.

▶ Select Splitscreen mode **5**: Press *Splitscreen mode* button **9**.
or

Press full screen.

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Deleting ignition key

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

3.3.5 Preparing machine for dust intensive application

NOTICE
Contaminated hydraulic oil!
Damage to machine.

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

- ▶ Equip machine with bypass filters.
- ▶ Equip machine with attachment for “flow reversal for radiator cleaning”. (For more information see: 3.3.35 Reversible fan drive for radiator cleaning (option), page 198)

3.3.6 Preparing machine for use in biologically sensitive areas

The machine can be operated with biodegradable Liebherr hydraulic oils or biodegradable hydraulic oils from other manufacturers. (For more information see: 5.3.5 Hydraulic oils, page 408)

If biodegradable hydraulic oil is used:
- ▶ Use bypass filter.

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

- ▶ Have hydraulic oil changed by authorised specialist staff.
- ▶ Have oil analysis performed by authorised specialist staff.
- ▶ Repeat hydraulic oil change if necessary.

3.3.7 Operator code (option)

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

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

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

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Travelling

WARNING
Steering directions reversed!
Injuries.

▶ Align uppercarriage so that oscillating axle is in front during forward travel.

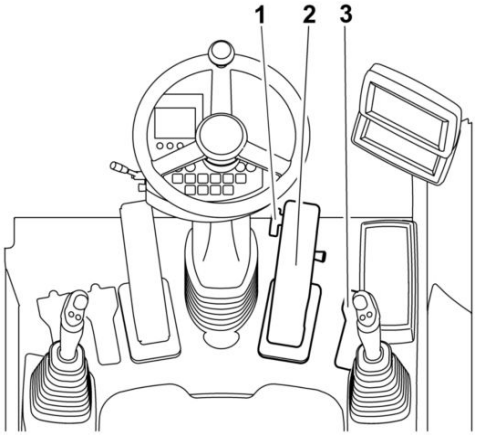

Fig. 433: Control elements

1 Retainer
2 Pedal of service brake
3 Travelling pedal

Make sure the following preconditions are met:
❑ Driveway is clear.
❑ Travel without danger is possible.
❑ Outriggers are fully retracted.

Travelling forward

▶ Turn operator's cab over oscillating axle.

If it is not possible to turn operator's cab over oscillating axle:
▶ Observe instructions on travel with camera for rear area monitoring. (For more information see: Travel with camera for rear area monitoring, page 164)

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

If service brake is applied:
▶ Press retainer **1** downward.

▶ Select travel direction.

▶ Press travelling pedal **3** slowly.

Travelling backwards

▶ Turn operator's cab over rigid axle.

If it is not possible to turn operator's cab over rigid axle.
▶ Observe instructions on travel with camera for rear area monitoring. (For more information see: Travel with camera for rear area monitoring, page 164)

LHB/12221419/01/2017-05-03/en

Disassembly

DANGER
Unexpected machine movement!
Danger to life.

- ▶ Place machine on level and firm ground.
- ▶ Secure machine to prevent rolling away.
- ▶ Make sure that no person operates machine during tyre assembly.

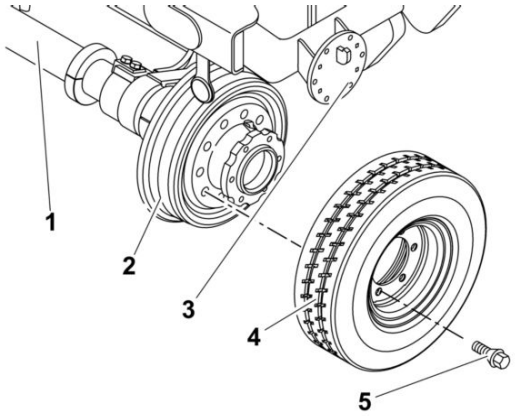

Fig. 457: Disassembling additional tyres

1	Rail guide axle on rigid axle side	**4**	Additional tyre
2	Rail wheel	**5**	Wheel bolts
3	Holder		

- ▶ Switch off automatic mode of additional tyres: Press *additional tyres automatic* key.
  ▷ LEDs in key go out.
- ▶ Loosen wheel bolts **5**.

- ▶ Raise rail guide axle on rigid axle side **1** to assembly height: Press *raising additional tyres* key.
  ▷ LEDs in *raising additional tyres* key light up.
- ▶ Unscrew wheel bolts **5**.
- ▶ Pull additional tyre **4** off rail wheel **2**.
- ▶ Push additional tyre **4** onto holder **3**.
- ▶ Fasten additional tyre **4** with wheel bolts **5**.

- ▶ Fully raise rail guide axle on rigid axle side **1**: Press *raising additional tyres* key.

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Double pedals

Function	Operation
Lower two-piece boom.	Press double pedal **1**.
Raise two-piece boom.	Press double pedal **2**.

Tab. 40: Double pedals

3.3.23 Switching from bucket operation to grapple operation

After a change of working tools, the operating mode of the working tool has to be selected:
- Bucket operation
- Grapple operation

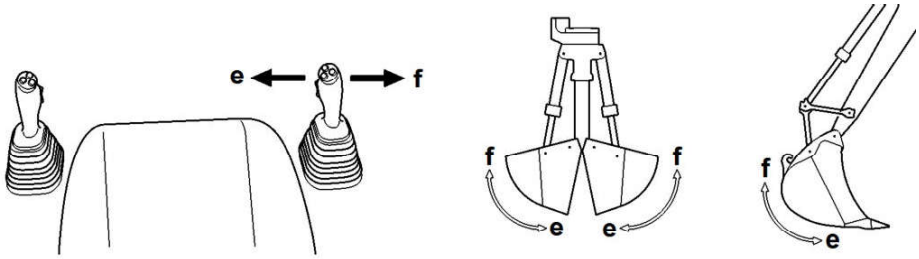

Fig. 491: Operating mode of working tool and operation

If the machine is equipped with a hydraulic quick coupler and Likufix, there is no need to switch between bucket operation and grapple operation.

Switching on grapple operation

DANGER
Falling load!
Danger to life.

- ▶ Make sure that machine is not switched to bucket operation while working in grapple operation
- ▶ Exclusively change operating mode when changing the working tool.

Make sure the following preconditions are met:
- ❑ Grapple is attached.

- ▶ Make sure that working attachment is not moved during changeover.

- ▶ Press *bucket grapple changeover* key.
  - ▷ LEDs in *bucket grapple changeover* key flash.
  - ▷ *Confirmation required* status symbol appears on the display:

Keys for preselecting working tool	Function	Status symbol of preselected working tool
	Select continuous mode for working tool 2.	
	Select continuous mode for working tool and working tool 2.	

Tab. 42: Keys for preselecting working tool

▶ Press *continuous mode* key.
▷ LEDs in *continuous operation* key flash.
▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ LEDs in *continuous operation* key light up.
▷ *Continuous mode for working tool* status symbol appears on the display:

Troubleshooting
Preselection of continuous mode not switched on?
If confirmation button is not pressed within 5 seconds, preselection of continuous mode is switched off.

▶ Preselect continuous mode again.

If *request denied* status symbol appears on the display:
▶ Make sure that all preconditions are met.
▶ Preselect continuous mode again.

Switching on continuous mode

Note
Different machine configuration!

▶ Adhere to control description sticker in operator's cab. (For more information see: 2.4.3 Control description sticker, page 54)

LHB/12221419/01/2017-05-03/en

4 Key switch
5 Indicator light for excavation position
6 No function assigned
7 No function assigned
8 *Traction increase through pressure regulation* key (option)
9 *Locking rail guide axles automatically when slewing* key (option)
13 *Locking rail guide axle on rigid axle side* key
14 *Lowering rail guide axle* key
15 *Raising rail guide axle* key
16 *Automatic mode* key
17 *Emergency braking* key

The following keys have no function assigned in machines with narrow gauge rail guide system (option):
– *Traction increase through pressure regulation* key **8**
– *Locking rail guide axle automatically when slewing* key **9**
– *Clamber function on oscillating axle side* key **10**
– *Clamber function on rigid axle side* key **11**

3.4.3 Switching on rail-road system

Note
Driving on rails is subject to rail operator's instructions (for example Deutsche Bahn AG)!

▶ When using the machine observe regulations of rail operator.

The following functions are active when rail-road system is switched on:
– Control elements of rail-road control unit
– Control elements relevant for rail travel on control units **A** to **F**
– Rail lighting
– Signal horn

Lighting for driving on roads is deactivated.

Switching on rail-road system

▶ Move key switch to position **1**.
▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ *Rail-road system* indicator light lights up:

▷ Font colour on the display of the rail-road control unit is yellow.

Troubleshooting
Rail-road system is not activated?
If confirmation button is not pressed within 5 seconds, rail-road system is switched off.

▶ Switch on rail-road system again.

▶ Continue rail travel.

▶ Check contract pressure on the rail-road display.

Automatic mode is blocked

If there is a hydraulic or electric error, the contact pressure of rail guide axles on the rails cannot be regulated and maintained. Automatic mode is blocked.

DANGER
Machine tipping over!
Danger to life.

If warning buzzer sounds and simultaneously LEDs of *automatic mode* key flash:
▶ Stop rail travel immediately.

If warning buzzer sounds and simultaneously LEDs of *automatic mode* key flash:
▶ Check rail guide system.

▶ Contact Liebherr customer service.

Deactivating automatic mode

▶ Press *automatic mode* key.
▷ LEDs in *automatic mode* key flash.
▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ LEDs in *automatic mode* key go out.
▷ Automatic mode is deactivated.
▷ Font colour on the rail-road display is yellow.
▷ *Automatic mode not activated* status symbol appears on the display.

Troubleshooting
Automatic mode is not deactivated?
If confirmation button is not pressed within 5 seconds, automatic mode remains activated.

▶ Deactivate automatic mode again.

3.4.6 Axles with slip differential

Axles with slip differential improve traction when travelling on rails. The slip differential is activated with automatic mode.

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3.4.14 Taking machine off rails

Taking machine off rails with standard rail guide system

Make sure the following preconditions are met:
- ❑ Rails and road are level with each other at the changeover point.
- ❑ Ground is stable.

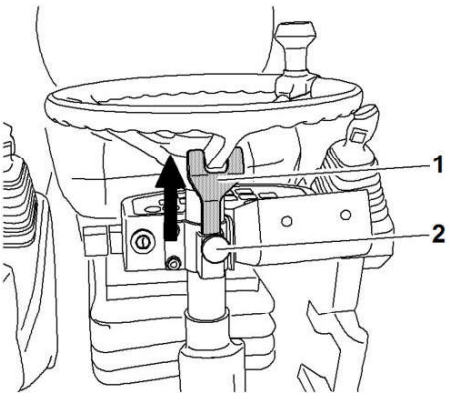

Fig. 636: Mechanical steering wheel lock

1 Steering wheel lock **2** Screw

▶ Loosen screw **2**.

▶ Push steering wheel lock **1** down.

▶ Deactivate automatic mode. (For more information see: Deactivating automatic mode, page 213)

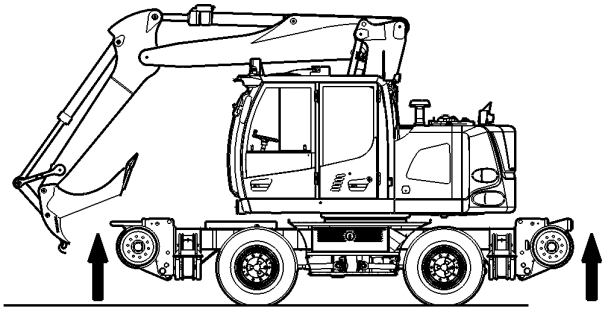

Fig. 637: Taking machine off rails

▶ Press and hold *raising rail guide axle* key.
- ▷ Both rail guide axles are raised.
- ▷ LEDs in *raising rail guide axle* key light up.
- ▷ Positions of rail guide axles are shown on the display of the rail-road control unit.

When rail guide axle is raised to end stop:

▶ Release *raising rail guide axle* key.

▶ Switch off rail-road system.
- ▷ *Rail-road system* indicator light goes out:

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Example using a coupling rod (Robel 58.03/12) with coupling eye on both sides:

Coupling type: Rockinger coupling + Rockinger coupling	
Maximum permitted propulsive force and drawbar pull	100 kN
Maximum unbraked trailer load	40 t
Maximum braked trailer load	120 t

Tab. 49: Maximum values of coupling rod Robel 58.03/12

Coupling rail vehicles

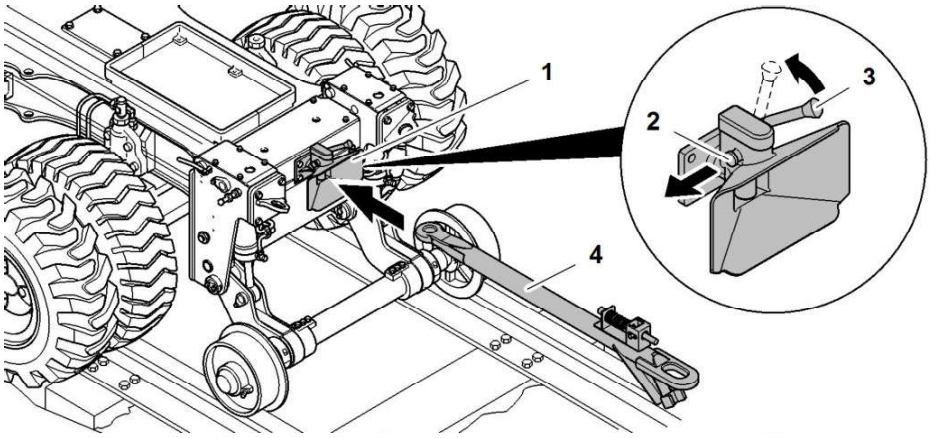

Fig. 666: Coupling rail vehicles

1 Trailer coupling
2 Securing knob
3 Hand lever
4 Coupling rod

The coupling rod is by right cab access.

Make sure the following preconditions are met:
- ❑ Operator's cab is aligned towards rail vehicle.
- ❑ Permitted trailer load is not exceeded.
- ❑ Coupling rod is approved by the rail operator.

DANGER
People in the danger zone!
Death.

▶ Make sure that no-one is between machine and rail vehicle during coupling operation.

▶ Attach coupling rod **4** to the rail vehicle.

▶ Pull securing knob **2** while at the same time moving hand lever **3** in direction of arrow.

▶ Set coupling rod **4** to level of trailer coupling **1** on the machine.

▶ Turn uppercarriage towards the rail vehicle and observe coupling process.

▶ Slowly drive up to rail vehicle until automatic coupling engages.

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3.5 Shut-off functions

3.5.1 Height limitation

Height limitation prevents collision between the working attachment and tunnel roofs, overhead lines or other obstacles above the machine.

Height limitation checks continuously whether the machine and its working attachment are within the permitted movement range. Maximum height depends on the position of attachment.

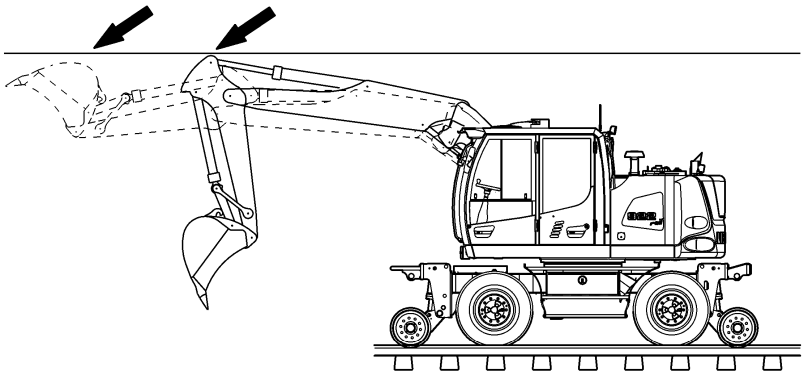

Fig. 683: Heights depending on position of attachment

There are two ways of setting the height limitation values:
– Teach in limit values via position of working attachment.
– Enter limit values via control unit.

DANGER
Machine setting incorrect!
Danger to life.

If working attachment is changed:
▶ Have height limitation re-programmed by Liebherr customer service.

If height limitation values are changed:
▶ Inform all operators of machine about changes.

If working tool is changed:
▶ Make sure that correct operating mode is selected.

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▶ Move boom up to limit value of upper shut-off point.

▶ Press *upper shut-off point* button.
▷ *Upper shut-off point* button lights up yellow:

▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ Upper shut-off point limit value is saved.

Troubleshooting
Upper shut-off point limit value not saved?
If the confirmation button is not pressed within 5 seconds, upper shut-off point limit value is not saved.

▶ Save upper shut-off point limit value again.

Setting upper shut-off point limit value manually

DANGER
Height limitation setting incorrect!
Danger to life.

▶ Set upper shut-off point limit value so that swinging working tools do not collide with obstacles.

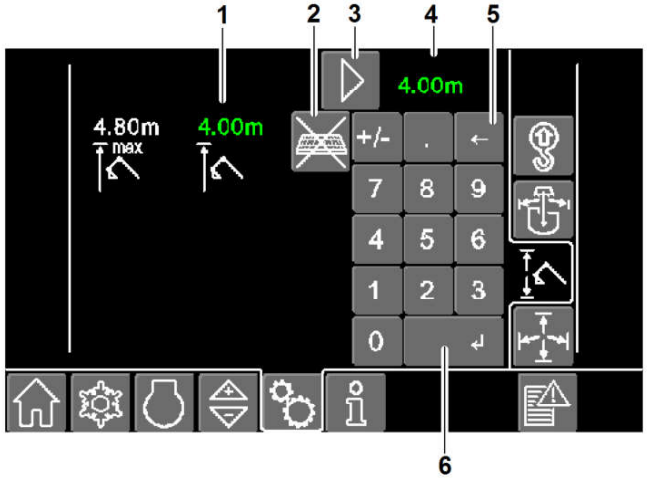

Fig. 731: Manually setting limit value

1	Limit value of upper shut-off point	**4**	Manually set limit value
2	*Hiding display keyboard* button	**5**	*Delete* button
3	*Toggling height* button	**6**	*Accept* button

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▶ Press confirmation button within 5 seconds.
▷ Left shut-off point of slewing range 1 is saved.
▷ *Left shut-off point of slewing range 1* button is deactivated:

Troubleshooting
Limit value of left shut-off point is not saved?
If confirmation button is not pressed within 5 seconds, limit value of left shut-off point is not saved.

▶ Save limit value of left shut-off point again.

If laterally adjustable boom is attached:
▶ Place laterally adjustable boom fully to right.

▶ Swing uppercarriage to right shut-off point of slewing range 1.

▶ Press *right shut-off point of slewing range 1* button.
▷ *Right shut-off point of slewing range 1* button lights up yellow:

▷ *Confirmation required* status symbol appears:

▶ Press confirmation button within 5 seconds.
▷ Right shut-off point of slewing range 1 is saved.
▷ *Right shut-off point of slewing range 1* button is deactivated:

Troubleshooting
Limit value of right shut-off point is not saved?
If confirmation button is not pressed within 5 seconds, limit value of right shut-off point is not saved.

▶ Save limit value of right shut-off point again.

Teaching in limit values for slewing range 2

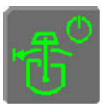
If slew limitation is locked:
▶ Enable temporary slew limitation for the operator. (For more information see: Enabling temporary slew limitation for the operator, page 260)

LHB/12221419/01/2017-05-03/en

Switching off virtual wall

Switching off left virtual wall

Make sure the following preconditions are met:
❑ Virtual wall is enabled. (For more information see: Enabling virtual wall for operator, page 269)



▶ Press *left virtual wall* button.
▷ *Left virtual wall* button lights up yellow:

▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ *Left virtual wall* button lights up white:

Troubleshooting
Left virtual wall is not switched off?
If confirmation button is not pressed within 5 seconds, left virtual wall is switched on.

▶ Switch off left virtual wall again.

Switching off right virtual wall

Make sure the following preconditions are met:
❑ Virtual wall is enabled. (For more information see: Enabling virtual wall for operator, page 269)

▶ Press *right virtual wall* button.
▷ *Right virtual wall* button lights up yellow:

▷ *Confirmation required* status symbol appears on the display:

▶ Press confirmation button within 5 seconds.
▷ *Right virtual wall* button lights up white:

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Continuous warning sound

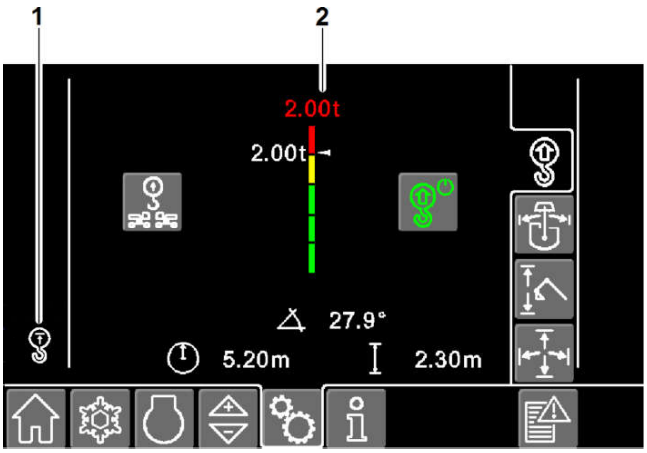

Fig. 861: Load moment limitation menu

1 *Load moment limitation shut-off initiated* status symbol

2 Current load on hook

When 100% of maximum permitted load is reached:
- Movements that increase load moment are stopped.
- *Load moment limitation shut-off initiated* status symbol **1** appears on the display.
- Font colour for current load on hook **2** changes from yellow to red.
- Continuous warning sound sounds.

▶ Reduce reach.

▶ Put down load without increasing the reach.

▶ Turn uppercarriage to an area that allows a greater payload.

Load moment limitation without shut-off (option)

The load moment limitation without shut-off option warns during work before maximum permitted load is exceeded. This is indicated visually on the display and acoustically by a warning sound.

DANGER
Machine tipping over!
Danger to life.

▶ Do not exceed maximum permitted load.

▶ Move working attachment slowly.

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3.6 General working methods

3.6.1 Working without damaging the machine

Comply with the following points in order to increase the service life of the machine and to avoid unnecessary damage and the need to carry out repairs as a result:

- Repeated striking of the working attachments against hard material will lead to damage to the machine. Do not use the working attachment to strike against material or objects to be demolished.
- Certain combinations of boom, stick and working tool mean that the working tool can strike against or penetrate the operator's cab. This can damage the operator's cab and injure the machine operator.
- The slewing gear can be damaged if the rotary motion is obstructed by an opposing force. Do not use the slewing gear to force the working attachment to penetrate material.
- The machine can be damaged by being raised using the working attachment. Do not lift the machine using the working attachment. If this does happen inadvertently nevertheless, lower the machine slowly onto the ground. Do not allow the machine to drop quickly, and do not attempt to cushion the drop using the hydraulics.

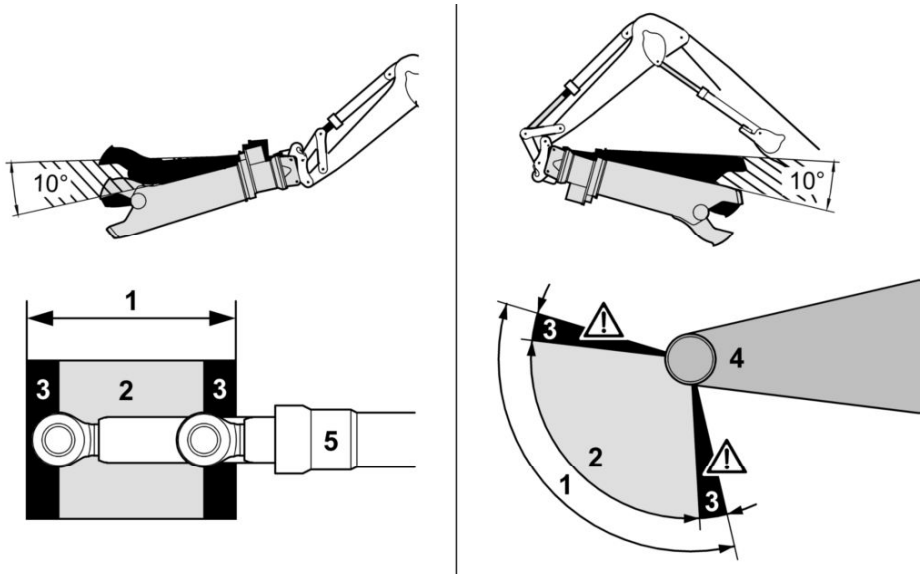

Fig. 894: Permissible working range for hydraulic cylinders

1 Possible slewing range
2 Permissible working range with 10° distance from the limit position
3 Boundary area
4 Boom or stick
5 Hydraulic cylinder

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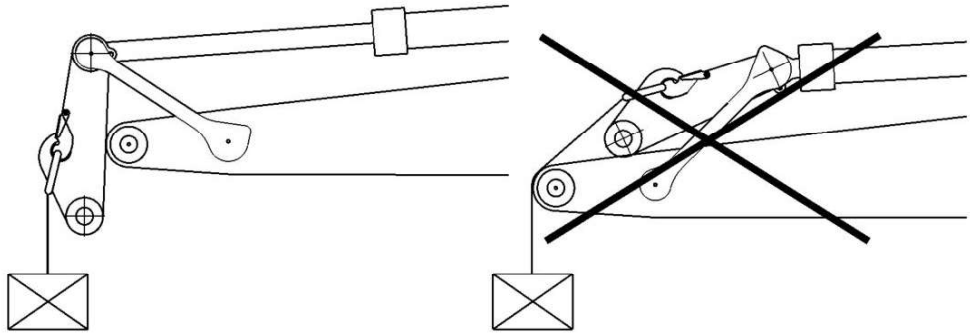

Fig. 903: Lifting loads correctly

- ▶ Fully extend bucket cylinder **1**.
- ▶ Make sure that bucket cylinder **1** is fully extended.
  ▷ Link **2** is in correct position for lifting a load.
- ▶ Make sure that lifting accessory **5** does not glide or swing over stick **7**.
  ▷ Lifting accessory **5** hangs free.
- ▶ Make sure that lifting accessory **5** is not diverted and cannot slip.
  ▷ Lifting accessory **5** hangs free.
- ▶ Observe load lift chart in operator's cab.
- ▶ Observe maximum load lift of load lift hook.
- ▶ Make sure that no-one is in danger zone.

WARNING
Incorrect handling of load lift hook!
Injuries.

- ▶ Make sure that load does not swing too close to operator's cab.
- ▶ Prevent load from swinging: Move joystick carefully and slowly.

- ▶ Pick up load **6**.
- ▶ Move load **6**.

3.6.10 Driving technique

Drive defensively.

Always look in the travel direction.

Drive with your thumb on the outside of the steering wheel, so as to avoid injuries if the steering wheel turns abruptly.

Malfunctions of the suspension, brakes and steering can make the machine difficult to control. Take particular care if electrical or mechanical malfunctions occur on slopes, demarcation banks and other structures that can stop the machine.

Look out for warning and indicator lamps lighting up.

Stop the machine if unusual operating statuses arise.

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Connecting hydraulic lines

CAUTION
Pressurised hydraulic lines!
Injuries.

▶ Depressurise hydraulic system before connecting.

Make sure the following preconditions are met:
❑ Ignition key is in position 1.
❑ Working attachment has been lowered to the ground.
❑ Diesel engine is shut off.
❑ Folding console is down.

If hydraulic and electrical connections are required:
▶ Reduce pressure: Carefully move joysticks and pedals in all directions.

If hydraulic and electrical connections are not accessible from the ground:
▶ Use platform.

▶ Connect hydraulic lines.

▶ Connect electrical lines.

Switching on bucket operation

If *grapple active* symbol appears on the display:
▶ Switch on bucket operation. (For more information see: Switching on bucket operation, page 184)

Visual inspection

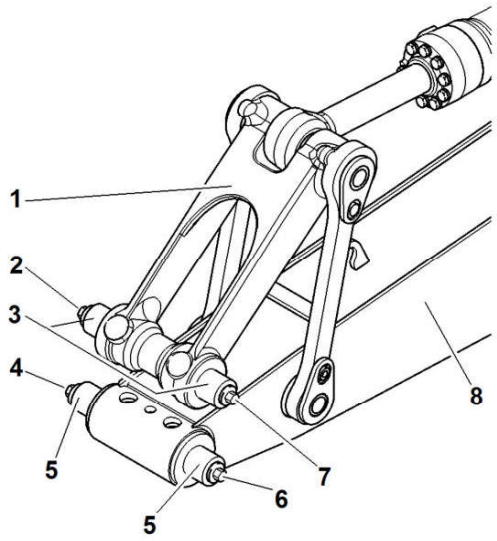

Fig. 916: Visual inspection

1	Link	**5**	Locking pin on stick
2	Screw plug	**6**	Locking screw
3	Locking pin on link	**7**	Locking screw
4	Screw plug	**8**	Stick

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Unlocking bucket

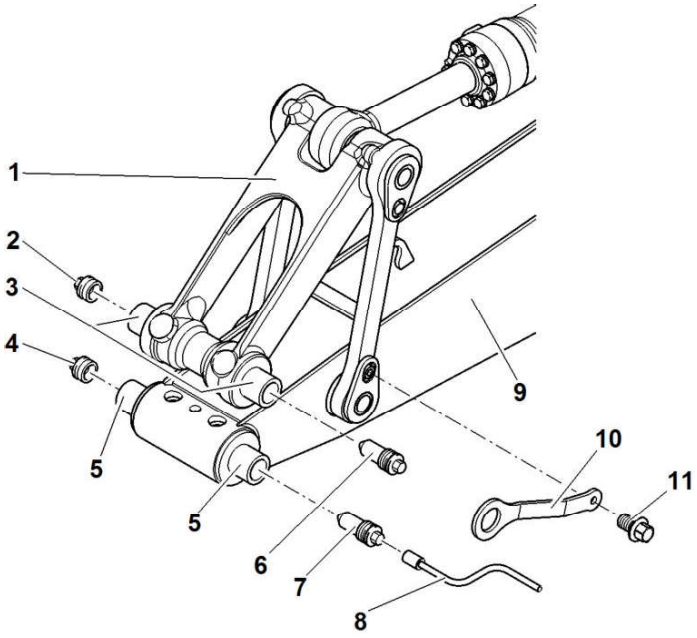

Fig. 928: Mechanical quick coupler

1	Link	**7**	Locking screw
2	Screw plug	**8**	Crank
3	Locking pin on link	**9**	Stick
4	Screw plug	**10**	Holder
5	Locking pin on stick	**11**	Fixing screw
6	Locking screw		

If locking mechanism on mechanical quick coupler is not accessible from the ground:

▶ Use platform.

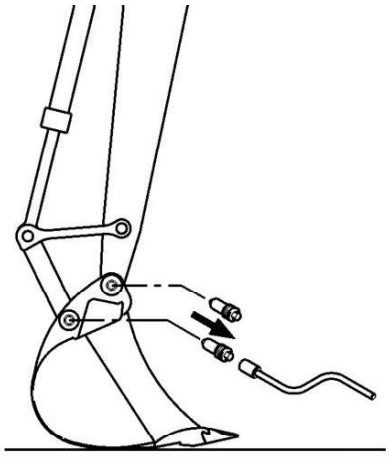

Fig. 929: Unlocking bucket

▶ Unscrew locking screw **6** with crank **8**.

▶ Insert crank **8** in locking pin on link **3**.

- ▶ Fold in mirrors.
- ▶ Lift and load machine carefully with crane.

3.9.5 Tying down the machine

The operator's cab contains a sign with machine-specific tying specifications.

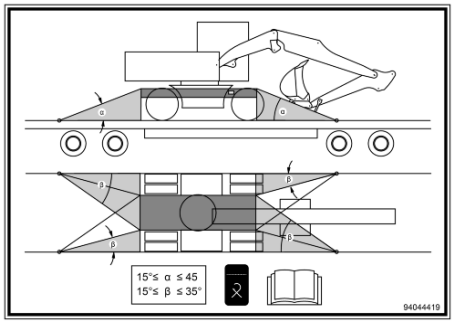

Fig. 946: Sign (example) in the operator's cab

DANGER
Machine slipping!
Danger to life.

- ▶ Secure machine adequately against slipping.
- ▶ Exclusively use suitable cables and chains.

- ▶ Tie machine with cables and chains at indicated points in line with machine-specific tying specifications.

LHB/12221419/01/2017-05-03/en

- ▶ Turn and move spool until control pin **2** engages in the desired position.
  ▷ Travel direction is selected.
- ▶ Put on protective cap **1**.

Installing wire harness for emergency mode

With the wire harness provided for emergency mode the activation of travelling pedal is simulated.

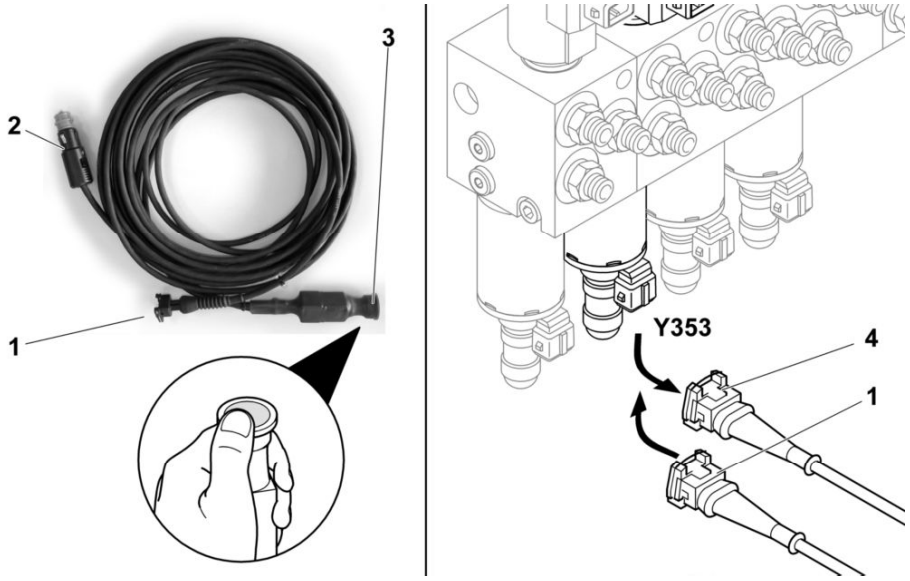

Fig. 959: Installing wire harness for emergency mode

1	Plug connection	**3**	Button
2	Plug	**4**	Plug connection

- ▶ Make sure that diesel engine is shut off.
- ▶ Disconnect plug connection **4** from proportional solenoid valve Y353.
- ▶ Connect plug connection **1** of wire harness for emergency mode to proportional solenoid valve Y353.
- ▶ Lay button **3** with cable to operator's seat.
- ▶ Insert plug **2** in socket of cigarette lighter (24 V).

Starting travelling emergency mode

- ▶ Start diesel engine.
- ▶ Move folding console down.

If diesel engine does not start:

- ▶ Generate hydraulic pressure using hydraulic emergency mode. (For more information see: 3.10.7 Emergency hydraulics, page 344)
- ▶ Move folding console down.
  or
  Generate hydraulic pressure using diesel engine emergency mode. (For more information see: 3.10.2 Diesel engine, page 334)

LHB/12221419/01/2017-05-03/en

- ▶ Remove protective cap **1**.
- ▶ Turn and move spool until control pin **3** engages in the desired position.
  ▷ Movement direction is selected.
- ▶ Put on protective cap **1**.

Starting slewing gear emergency mode

- ▶ Start diesel engine.
- ▶ Move folding console down.

If diesel engine does not start:

- ▶ Generate hydraulic pressure using hydraulic emergency mode. (For more information see: 3.10.7 Emergency hydraulics, page 344)
- ▶ Move folding console down.
  or

  Generate hydraulic pressure using diesel engine emergency mode. (For more information see: 3.10.2 Diesel engine, page 334)

DANGER
Unexpected machine movement!
Danger to life.

If machine is not standing on level ground and folding console is moved down:

- ▶ Brake uppercarriage with joystick.
- ▶ Hold uppercarriage with positioning slewing brake.
- ▶ Secure machine with chocks to prevent it rolling away.

- ▶ Move folding console down.

Turning uppercarriage in emergency mode

- ▶ Press emergency mode button **2** until required position is reached.

Ending emergency mode

- ▶ Move control pin **3** to neutral position **B**.

3.10.12 Slewing brake

DANGER
Unexpected machine movement!
Danger to life.

- ▶ Inform all affected persons about status of machine.
- ▶ Make sure that no unauthorised persons are in the danger area.

In case of malfunction in control electronics, *slewing brake* key is not active.

Following options are available for emergency activation:
– Release slewing brake in diesel engine emergency mode.
– Release slewing brake manually with solenoid valve.

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▷ Emergency operation of rail guide system is activated.

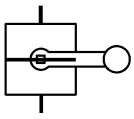
▶ Repeat process for other axle.

Switching to rail guide system operating mode

NOTICE
Activated emergency hydraulics!
Damage to emergency hydraulics.

▶ Make sure emergency hydraulics are switched off.

Make sure the following preconditions are met:
❑ Emergency hydraulics are switched off.



▶ Select rail guide system operating mode: Set block type ball valve.

Switching on emergency hydraulics and raising rail guide system

A warning sound sounds if the emergency hydraulics are switched on with diesel engine running.

Make sure the following preconditions are met:
❑ Ignition is switched on.
❑ Diesel engine is shut off.
❑ Hydraulic oil circuit for working tools and hydraulic oil circuit for machine hydraulics are disconnected.

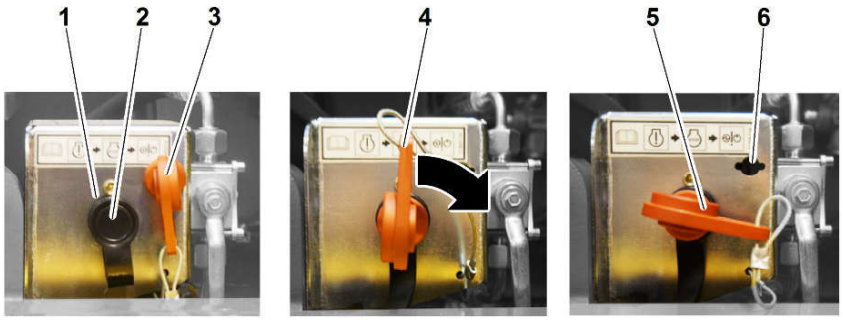


Fig. 995: Switching on emergency hydraulics

1	Key switch	**4**	Switch position emergency hydraulics switched off
2	Protective cap	**5**	Switch position emergency hydraulics switched on
3	Socket key	**6**	Holder

NOTICE
Diesel engine in operation!
Damage to emergency hydraulics.

▶ Switch on emergency hydraulics exclusively with diesel engine shut off.

LHB/12221419/01/2017-05-03/en

Symbol	Meaning	Effect, characteristic	Remedy
	Hoist cylinder protection is defective.	Hoist cylinder is damaged.	Contact Liebherr customer service.
	Stick cylinder shut-off is defective.	Stick cylinder is damaged.	Contact Liebherr customer service.
	Movement restrictions are switched off.	Attachment is damaged.	Move attachment carefully.
	Operator code is incorrect.	Machine is blocked.	Use correct operator code.

Tab. 63: Warning symbols

LHB/12221419/01/2017-05-03/en

Fuse	Consumer	Rating [A]
F6	Actuation variable-displacement pump rail guide systemY430, generator ON or OFF Y462	7.5
F7	Pressure connection stage Y160	5
F8	Switchable socket, stick, K1	3
F9	Switchable socket, stick, K2	3
F10	Reserve	7.5
F11	Beacon E178	7.5
F12	Working attachment headlight E1.1-E1.4	7.5
F13	Horn H9	5
F14	Central lubrication system M8	5
F15	Output module A201, logic	2
F16	Output module A201, sensor	5
F17	Power reduction P1, Y50, power reduction P2, Y544, fuel pre-heating	7.5
F18	Warning buzzer H33	7.5
F19	Reserve	
F20	Reserve	

Tab. 66: Fuse strip A214.XF2

Fuse	Consumer	Rating [A]
F1	Input module A52, logic	2
F2	Input module A52, sensor	5
F3	Input module A60, logic	2
F4	Input module A60, sensor	5
F5	Slip ring rotary connection, assignment 5	2
F6	Slip ring rotary connection, assignment 6	5
F7	Slip ring rotary connection, assignment 8	10
F8	Central lubrication system undercarriage	10
F9	Output module A65, logic	10
F10	Input module A66, sensor	10
F11	Stick socket, K458	15
F12	Stick socket, K419	20
F13	Stick socket, K397	15
F14	Reserve	
F15	Reserve	
F16	Reserve	
F17	Reserve	
F18	Reserve	

LHB/12221419/01/2017-05-03/en

2 Seat bracket cover

- ▶ Open seat bracket fastener **1**.
- ▶ Remove seat bracket cover **2**.
- ▶ Replace fuse.
- ▶ Attach seat bracket cover **2**.
- ▶ Close seat bracket fastener **1**.

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5.2 Filling quantities and lubrication chart

5.2.1 Filling quantities

Lubricants

Description	Quantity [9)]
Diesel engine	22.5 l
Hydraulic system: System content	300.0 l
Hydraulic system: Oil change volume	170.0 l
Hydraulic system: Tank content	130.0 l
Slewing gearbox	5.0 l
Transmission	3.0 l
Pump distributor gear	1.9 l
Rigid axle	13.0 l
Rigid axle with slip differential	9.9 l
Wheel hubs of rigid axle	each 2.5 l
Wheel hubs of rigid axle with slip differential	each 1.4 l
Steering axle	9.6 l
Steering axle with slip differential	12.0 l
Wheel hubs of steering axle	each 2.5 l
Wheel hubs of steering axle with slip differential	each 1.4 l

Tab. 79: Filling quantities, lubricants

Fuels and operating fluids

Description	Quantity [9)]
Fuel tank	330.0 l
Cooling system	32.0 l
Air conditioning unit	1.47 kg
Windscreen washer system	8.0 l

Tab. 80: Filling quantities, fuels and operating fluids

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9) Guidance values

If gear oils from other manufacturers are used, information on change intervals must be obtained from respective manufacturer or supplier.

5.3.10 Greases

Liebherr recommendation

Ambient temperature	Description
From -20 °C	Liebherr Universalfett 9900
From -55 °C	Liebherr Universalfett Arctic

Tab. 104: Liebherr recommendation

Minimum quality requirements

Thickener	Shelf life	Specification
Soap-based (lithium complex)	At least 3 years	Pumpable according to KP 2 K (DIN 51502)
		VKA welding force: ≥ 2300 N (DIN 51350/4, ASTM D 2596)

Tab. 105: Minimum quality requirements

5.3.11 Windscreen washer fluid

Liebherr recommendation

Liebherr recommends commercial washer fluid with anti-freeze.

Minimum quality requirements

Use mixture of water and denatured alcohol.

5.3.12 Lubricants and care products for electrical and mechanical systems

Liebherr recommendation

Application	Product
Contact spray for slip rings	Cramolin
Lubricant for pistons, piston nuts and piston bearing installation on hydraulic cylinders	Gleitmo 800
Special corrosion inhibitor for installation spaces of sealing elements on hydraulic cylinders	Rostilo Tarp CFX

Tab. 106: Liebherr recommendation

LHB/12221419/01/2017-05-03/en

Manually lubricating bearings

Lubricate following lubricating points manually:
- Lubricating points on change lever
- Lubricating points on quick coupler
- Lubricating points on working tools
- Lubricating points on undercarriage
- Lubricating points on uppercarriage

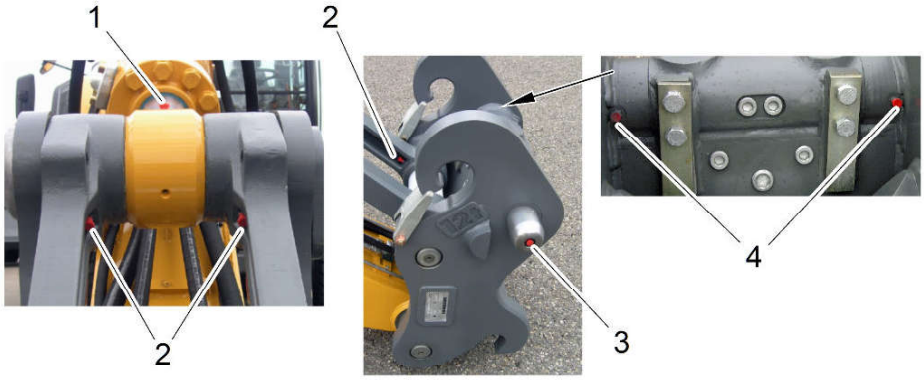

Fig. 1089: Lubricating points

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**.

LHB/12221419/01/2017-05-03/en

- ▶ Check inside of the bowl and filter housing and housing sealing surface for damage.
- ▶ Insert new safety element **6** by turning clockwise and tightening slightly by hand.
- ▶ Carefully clean sealing surfaces on bowl **2** and filter housing **1** with a damp cloth.
- ▶ Inspect sealing surfaces for possible damage.
- ▶ Insert main element **5**, check for firm seat and tightness.
- ▶ Set bowl on filter housing.

NOTICE
Bowl **2** not lying correctly against filter housing **1**!
Leaking filter system. Damaged clamps **4**.

- ▶ Make sure that the bowl **2** is in contact with the filter housing **1** all around the circumference.
- ▶ Tighten clamps **4** without too much force.

- ▶ Close clamps **4**.

5.8.9 Air filter and air lines: Checking tightness and condition

Use on engine tightening torque	new hose	used hose
Air side	9^{+1} Nm	7 Nm

Tab. 109: Tightening torque for PEBRA clamps

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▶ Depressurise hydraulic system. (For more information see: 5.10.1 Depressurising hydraulic system, page 439)

▶ Unscrew hex head screws **1**.

▶ Remove return filter cover **2**.

▶ Check magnetic rod **3** for sticky contamination.

If magnetic rod **3** is heavily contaminated:

▶ Remedy cause of contamination.

▶ Take an oil sample if necessary.

▶ Clean magnetic rod **3** with lint-free cloth.

▶ Put on return filter cover **2**.

▶ Screw in hex head screws **1**.

▶ Tighten hex head screws **1**.

5.10.4 Bypass filter (option): Checking degree of contamination of filter cartridge

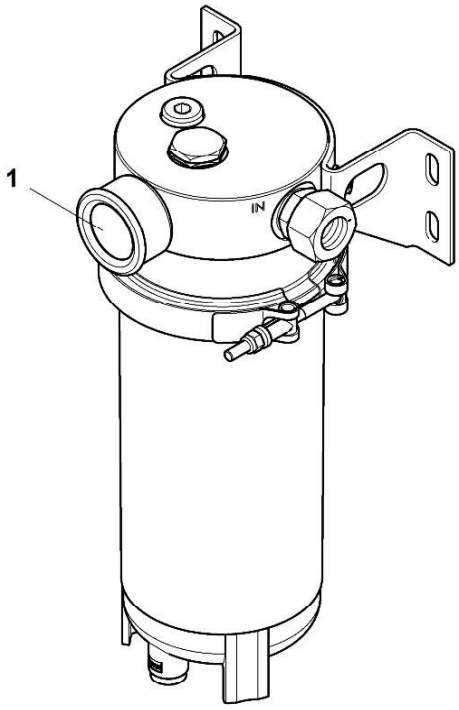

Fig. 1110: Bypass filter

1 Pressure gauge

Make sure the following preconditions are met:

❑ Diesel engine or electric motor is idling.

❑ Hydraulic oil is at operating temperature.

▶ Check pressure on pressure gauge **1** of bypass filter.

If displayed value exceeds 2.5 bar:

▶ Have filter cartridge of bypass filter replaced by Liebherr customer service.

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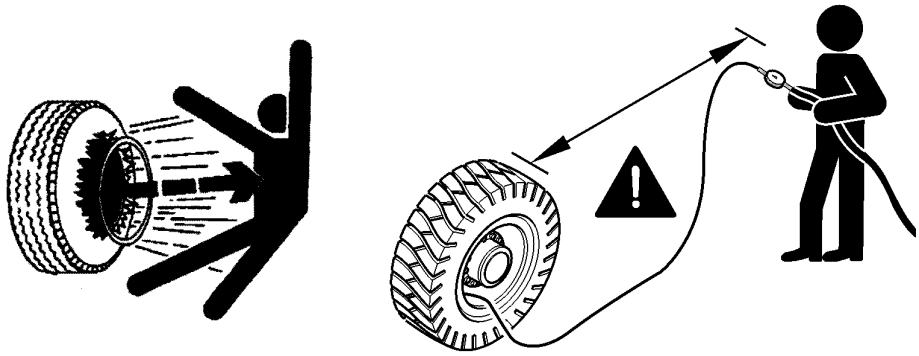

Fig. 1121: Checking pressure, maintaining safety distance

DANGER
Bursting tyre!
Danger to life.

- ▶ Never pump up tyres that have gone flat.
- ▶ Use a sufficiently long tyre inflation hose with self-locking inflation valve.
- ▶ Stand sideways to the tyre and away from the danger zone.

The tyre pressure affects the working behaviour of the machine.

Manufacturer	Type	Tyre pressure
Bridgestone	RL E3	8.0 bar
Bridgestone	Fast Grip	7.0 bar
Mitas	NB59	9.0 bar
Mitas	NB38	7.5 bar
Michelin	XZM	10.0 bar
Continental	RT20	10.0 bar

Tab. 110: Tyre pressure table

- ▶ See table for specified value.
- ▶ Attach measuring instrument.
- ▶ Check tyre pressure.
- ▶ Correct tyre pressure if necessary.

5.14.3 Additional tyres: Checking tyre pressure

Make sure the following preconditions are met:
- ❑ Machine is parked on level and firm ground.
- ❑ Machine is secured with chocks to prevent it from rolling away.

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Checking locking screws

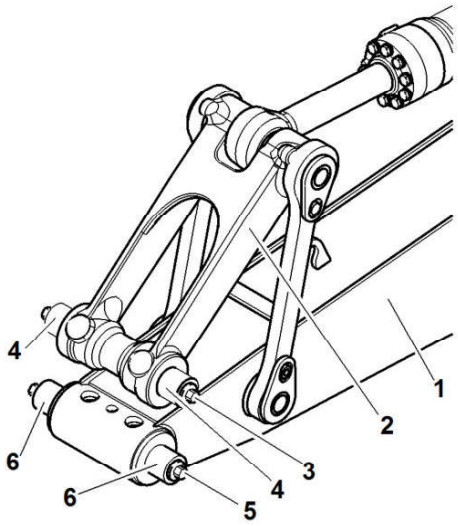

Fig. 1132: Checking locking screws

1	Stick	**4**	Locking pin on link
2	Link	**5**	Locking screw
3	Locking screw	**6**	Locking pin on stick

- ▶ Make sure that working attachment is not moved by third parties.
- ▶ Make sure that locking screw **3** is screwed into locking pin on link **4**.
- ▶ Check firm seat of locking screw **3**.
- ▶ Make sure that locking screw **5** is screwed into locking pin on stick **6**.
- ▶ Check firm seat of locking screw **5**.

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6 Appendix

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

LHB/12221419/01/2017-05-03/en