en

Operating manual

Wheel Loader

L514 Stereo

valid from serial no.: - 467 8500

LIEBHERR

Please enter the following details on receipt of your vehicle:
*You will find these details on the vehicle type plate. They will be useful when ordering spare parts.

*** Serial no.**	_ _ _ _ _ _ _ _ _ _ _ _ _ _
*** Year of manufacture**	_ _ _ _ _ _ _
Initial start-up date	_ _ / _ _ / _ _

Address

Address: LIEBHERR-WERK BISCHOFSHOFEN GMBH

Dr. Hans Liebherr – Straße 4
A – 5500 BISCHOFSHOFEN

Product identification

Manufacturer: LIEBHERR-WERK BISCHOFSHOFEN GMBH
Product group: Wheel loader
Type: L514
Construction number: 467
Serial number: 8500
Conformity: CE

Document identification

Order number: 8450694
Author: LBH/Department - T-DOK
Document version: 01

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Foreword

This operating manual has been written for the **driver** and for the **maintenance personnel** of the machine.
It describes:
– Technical data
– Safety provisions
– Control and operation
– Maintenance

This operator's manual should be carefully read before initial operation and should be read and used later at regular intervals by anyone responsible for working on the machine.
This includes the following activities:
– **Operation**, including equipping, troubleshooting during operation, removing production refuse, maintenance, removing operating and auxiliary materials.
– **Servicing**, including maintenance, inspection and servicing.
– **Transport** or loading the machine.

This manual helps the driver to become acquainted with the machine and prevents malfunctions due to improper operation.
Observance of the operating instructions by maintenance personnel:
– Improves operational reliability
– Extends the service life of your machine
– Reduces repair costs and downtimes

This manual must be kept with the machine. Place a copy within easy reach, in the glove compartment in the driver's cab.
The operator's manual is to be supplemented by instructions based on existing national accident prevention and environmental protection regulations.
In addition to the operator's manual and the applicable national and local legal requirements for accident prevention, the recognised technical regulations for safe and professional operation should be observed.
This operator's manual contains all the necessary information for the operation and maintenance of your machine.
If you should, however, require more detailed explanations or information, our technical information and customer services departments will be happy to provide assistance.
Please note that we cannot accept guarantee claims in the event of improper operation, insufficient maintenance, the use of unauthorised operating materials or non-observance of safety regulations.
LIEBHERR will cancel without prior notice all obligations such as guarantee agreements, service contracts etc. entered into by **LIEBHERR** and/or its agents when spare parts other than original **LIEBHERR** parts or those purchased from **LIEBHERR** are used for maintenance and repairs.
Under extreme conditions, shorter maintenance intervals than provided for in the inspection schedule may be necessary.

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Modifications, conditions, copyright:

- We reserve the right to alter the technical specifications of the machine regardless of the specifications and illustrations in these documents.
- The warranty and liability terms contained in LIEBHERR's general conditions of trade are not affected by the information in the manual.
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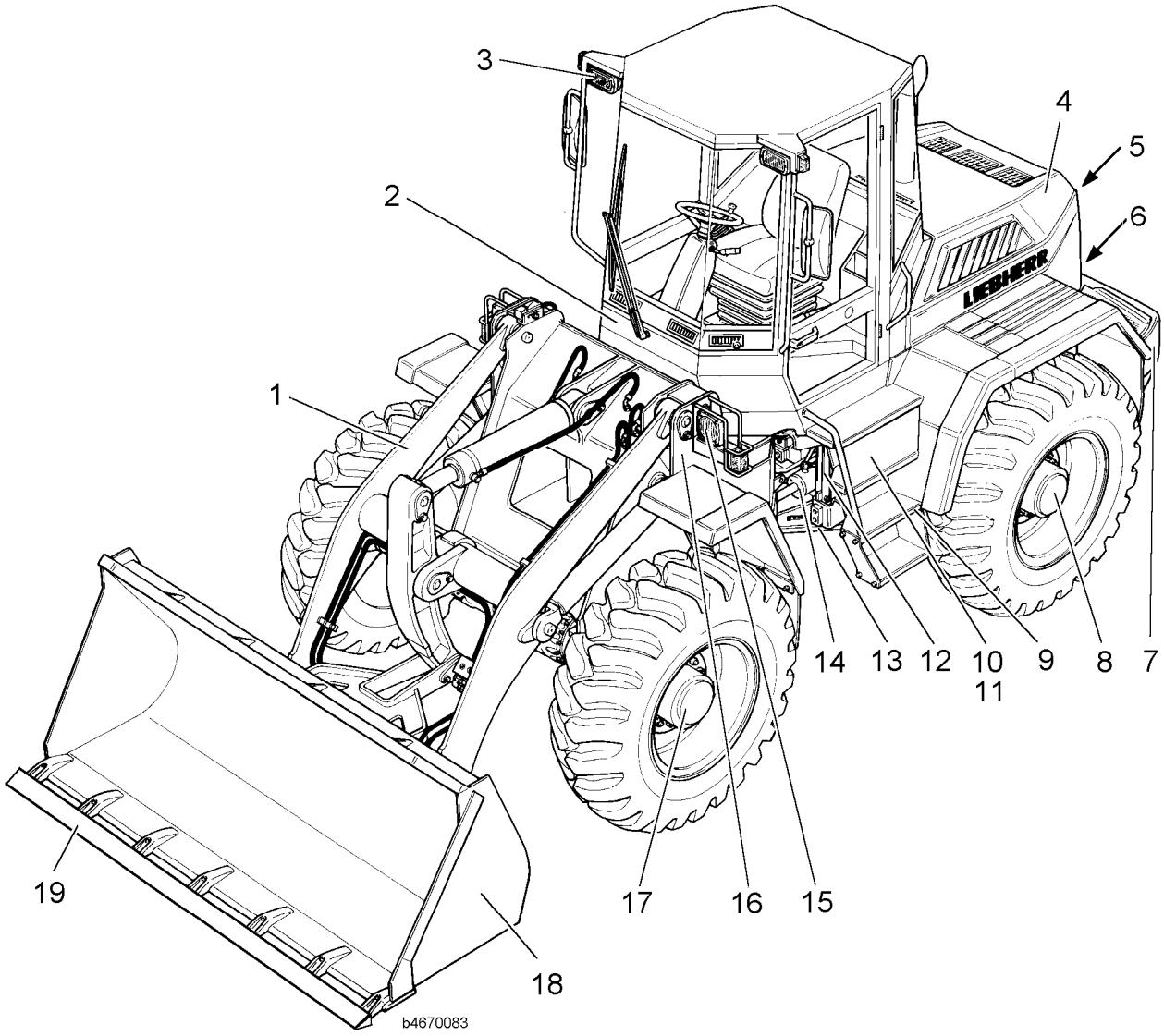
1 Product description

Equipment layout

Standard model

This section contains an overview of the machine and the names of the components shown.



Full machine – View from left

1 Lift arms
2 Driver's cab
3 Working floodlight
4 Engine compartment hood
5 Engine compartment rear hatch
6 Towing device
7 Ballast weights
8 Rear axle
9 Cab access
10 Battery compartment cover
11 Tool box
12 Articulation lock
13 Rear section
14 Steering cylinder
15 Lighting
16 Front section
17 Front axle
18 Bucket
19 Tooth guard

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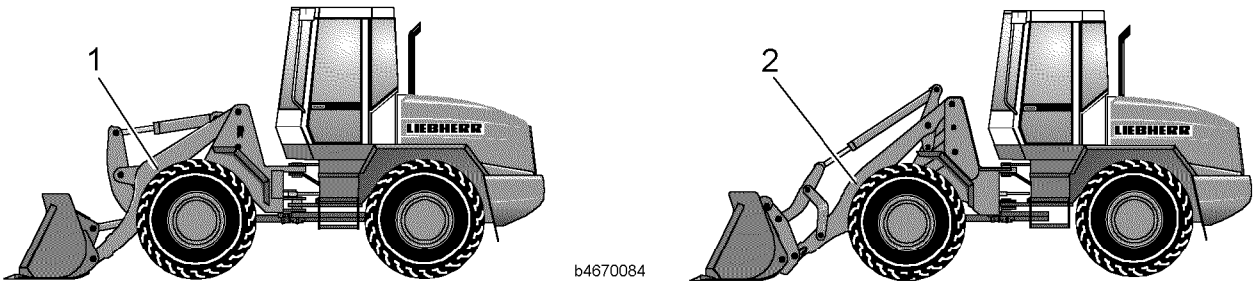
Different versions

This section provides a brief overview of the different versions of the machine.



Different machine versions

1 Z-bar lift arm

2 P-bar lift arm

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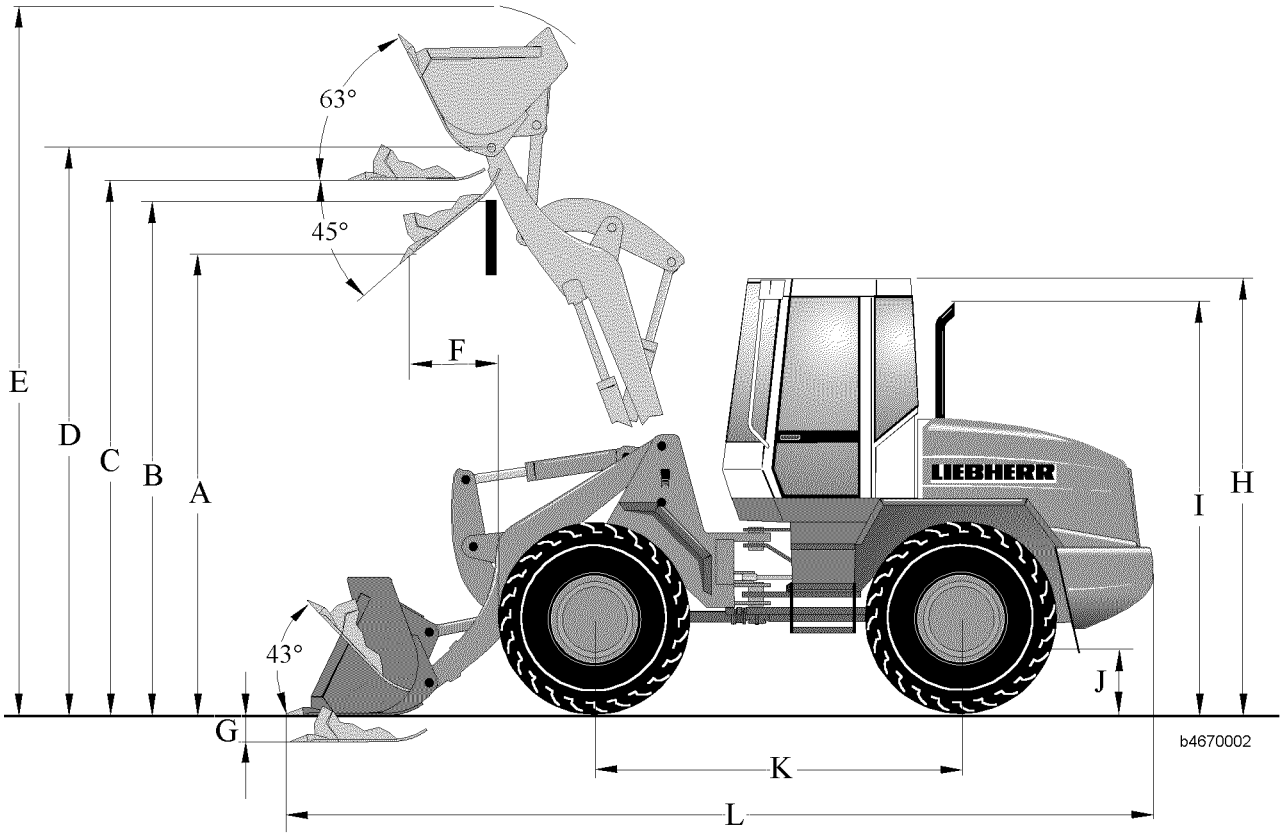
1.1 Technical data

1.1.1 Complete machine

Wheel loader with Z-bar lift arms

The values stated refer to the standard version of the machine:
- With Z-bar lift arm (2350 mm) without hydraulic quick-change device.
- With 17.5R25 GoodYear GP-2B tyres.
- The specified tipping loads and weight include all lubricants, full fuel tank, ROPS/FOPS cab and driver.



Dimensions of machine with Z-bar lift arms

Name	Value	Units
Bucket capacity as per ISO 7546	1.5	m³
Bucket width	2400	mm
Specific material weight	1.8	t/m³
A - Dump height at maximum lifting height and 45° tilt-out angle	2825	mm
B - Maximum dumping height	3260	mm
C - Maximum height of bucket base	3450	mm
D - Maximum height of bucket pivot point	3680	mm
E - Maximum height of bucket upper edge	4690	mm

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Name	Value	Units
F - Reach at maximum lifting height and 45° tilt-out angle	835	mm
G - Digging depth	50	mm
H - Height above cab	3025	mm
I - Height above exhaust	2690	mm
J - Ground clearance	385	mm
K - Wheel base	2600	mm
L - Overall length	6160	mm
Turning radius over bucket outer edge	4445	mm
Lifting force (SAE)	88	kN
Breakout force (SAE)	77	kN
Tipping load when straight	5675	kg
Tipping load, articulated 28°	5305	kg
Angle of articulation (to each side)	28	°
Angle of swing (to each side)	6	°
Operating weight	7720	kg
Tractive force	58.3	kN
Travel speed – travel range 1 (forward and reverse)	0–8.0	km/h
Travel speed – travel range 2 (forward and reverse)	0–30.0	km/h
Sound pressure level in the cab – L_{pA}	72	dB

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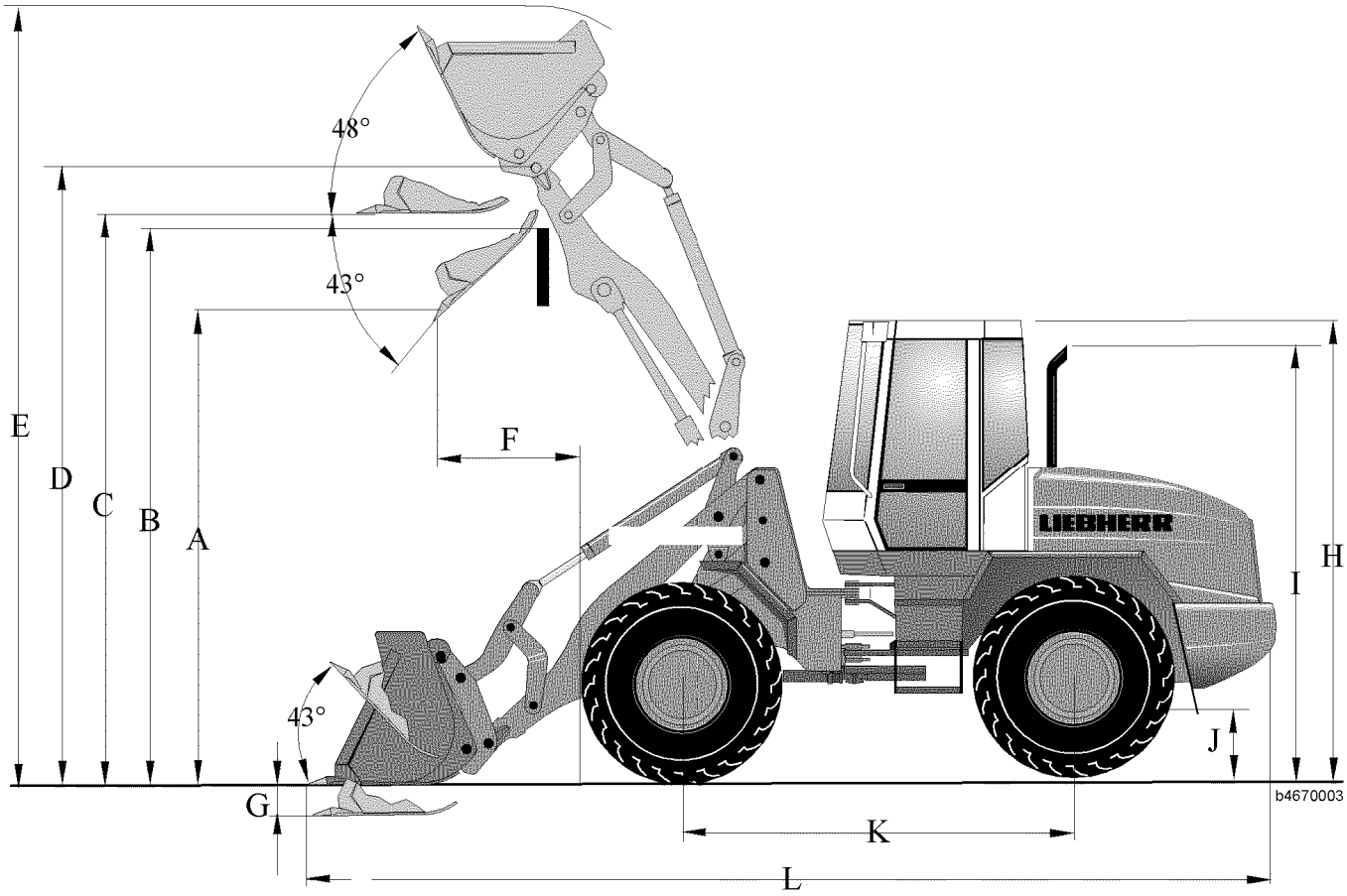
Wheel loader with P-lift arms

The values stated refer to the standard version of the machine:
- With P-bar lift arm (2400 mm) and with hydraulic quick-change device.
- With 17.5R25 GoodYear GP-2B tyres.
- The specified tipping loads and weight include all lubricants, full fuel tank, ROPS/FOPS cab and driver.



Dimensions of machine with P-bar lift arms

Name	Value	Units
Bucket capacity as per ISO 7546	1.3	m³
Bucket width	2400	mm
Specific material weight	1.8	t/m³
A - Dump height at maximum lifting height and 45° tilt-out angle	3010	mm
B - Maximum dumping height	3430	mm
C - Maximum height of bucket base	3610	mm
D - Maximum height of bucket pivot point	3860	mm
E - Maximum height of bucket upper edge	4845	mm
F - Reach at maximum lifting height and 45° tilt-out angle	800	mm
G - Digging depth	45	mm
H - Height above cab	3025	mm

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Name	Value	Units
I - Height above exhaust	2690	mm
J - Ground clearance	385	mm
K - Wheel base	2600	mm
L - Overall length	6335	mm
Turning radius over bucket outer edge	4535	mm
Lifting force (SAE)	83	kN
Breakout force (SAE)	77	kN
Tipping load when straight	4780	kg
Tipping load, articulated 28°	4475	kg
Angle of articulation (to each side)	28	°
Angle of swing (to each side)	6	°
Operating weight	7830	kg
Tractive force	58.3	kN
Travel speed – travel range 1 (forward and reverse)	0–8.0	km/h
Travel speed – travel range 2 (forward and reverse)	0–30.0	km/h
Sound pressure level in the cab – L_{pA}	72	dB

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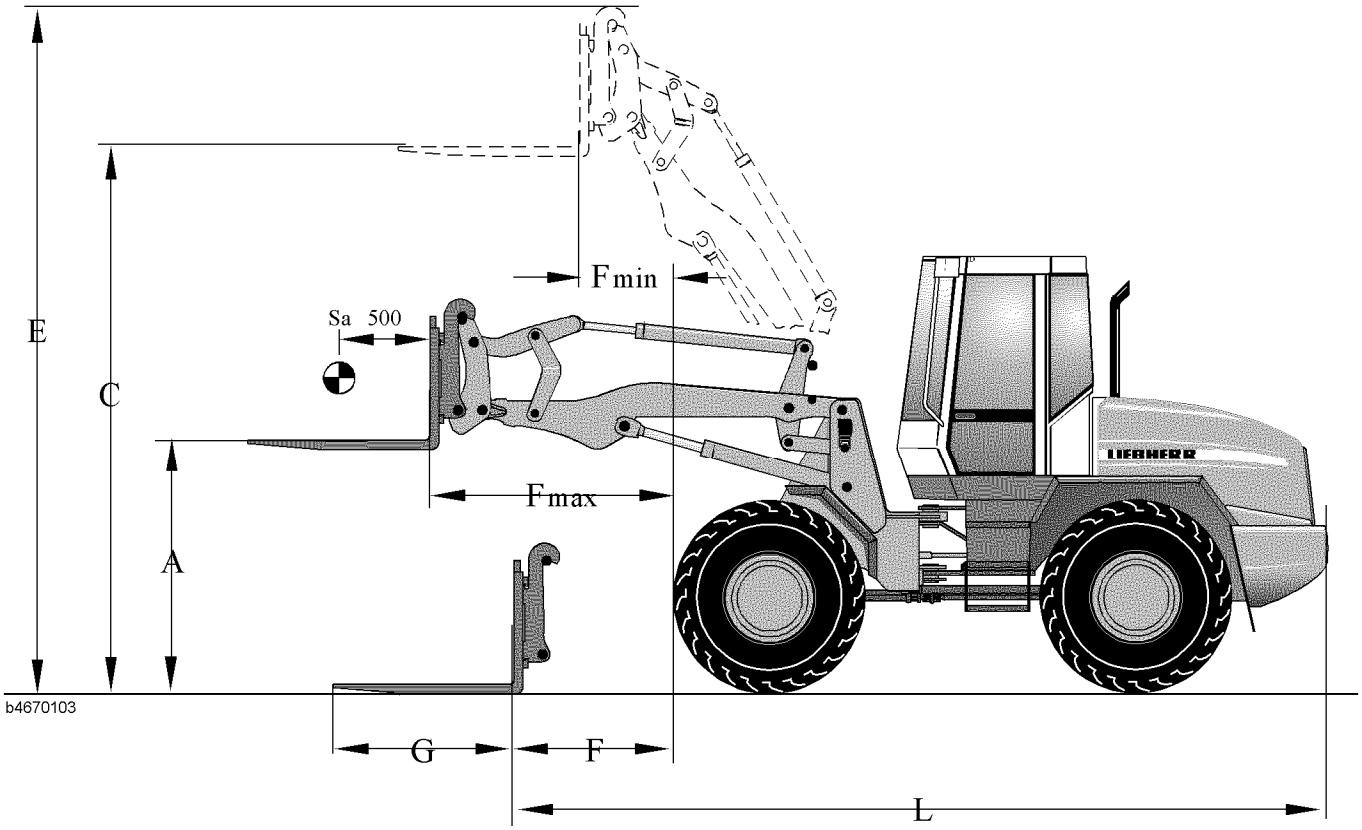
Wheel loader with forklift

This equipment is optional.
The values stated refer to the standard version of the machine:

– With P-bar lift arm (2400 mm) and with hydraulic quick-change device
  With Z-bar lift arm (2350 mm) and with hydraulic quick-change device
– With one FEM III forklift and with 17 R25 Good Year GP-2B tyres
– The stated tipping loads and weights:
  • Include all lubricants, full fuel tank, ROPS/FOPS cab and driver.
    The operational weight and the tipping load are affected by the tyre dimensions and accessories.

Note for road worthiness certification: In Germany, a driver's licence class II is required for a machine weight over 7.5 t.



Dimensions of machine with P-bar lift arm and forklift

Loading geometry		Z-bar kinematics		P-bar kinematics	
Forklift equipment for quick-change device		FEM III forklift		FEM III forklift	
Description		**Value**	**Unit**	**Value**	**Unit**
A	Lifting height at max. reach	1735	mm	1720	mm
C	Max. lifting height	3505	mm	3660	mm
E	Max. height above forklift	4425	mm	4585	mm
F	Loading position reach	810	mm	960	mm
F max.	Greatest possible reach	1515	mm	1630	mm
F min.	Reach at max. lifting height	710	mm	640	mm
G	Fork prong length	1200	mm	1200	mm
L	Total length of the basic machine without fork prongs	5455	mm	5605	mm
	Tipping load when straight	4000	kg	3735	kg

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Loading geometry		Z-bar kinematics		P-bar kinematics	
Forklift equipment for quick-change device		FEM III forklift		FEM III forklift	
Description		Value	Unit	Value	Unit
	-- // --	1) 4185	kg	2) 4085	kg
	Tipping load, articulated	3740	kg	3490	kg
	-- // --	1) 3910	kg	2) 3815	kg
	Permissible payload on uneven terrain = 60% of the static articulated tipping load *	2244	kg	2094	kg
	-- // --	1) 2346	kg	2) 2289	kg
	Permissible payload on even terrain = 80% of the static articulated tipping load *	2992	kg	2792	kg
	-- // --	1) 3128	kg	2) 3052	kg
	Operating weight	7755	kg	7750	kg
	-- // --	1) 7905	kg	2) 8050	kg

[1)]Specifications include 150 kg additional ballast
[2)]Specifications include 300 kg additional ballast
* As per EN 474-3 and ISO 8313

Load bearing tables for forklift operation

The EN 474-3 safety norm serves as the basis for determining the loads (nominal working loads).
The permissible load is stated as a percentage of the tipping load as per ISO 8313.
The following values may not be exceeded:
– On even and firm terrain – 80% of the tipping load with forklift
– On uneven terrain – 60% of the tipping load with forklift

The permitted loads on various types of terrain and various distances to the centre of gravity **Sa** are specified in the table below.

Even and firm terrain Load = 80% of the tipping load		Lift arm with Z-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additional ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Good Year GP-2B	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Good Year GP-2B **	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin XHA	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Michelin XHA	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin X-Mine D2	- -	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *

* Payload restricted by tilt cylinders of Z kinematics.
** Standard tyres

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Uneven terrain Load = 60% of the tipping load		Lift arm with Z-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additi-onal ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	- -	2186	2108	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Good Year GP-2B	- -	2227	2147	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Good Year GP-2B **	- -	2243	2163	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin XHA	- -	2208	2129	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Michelin XHA	- -	2246	2166	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin X-Mine D2	- -	2379	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *

* Payload restricted by tilt cylinders of Z kinematics.
** Standard tyres

Even and firm terrain Load = 80% of the tipping load		Lift arm with Z-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additi-onal ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Good Year GP-2B	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Good Year GP-2B **	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin XHA	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Michelin XHA	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin X-Mine D2	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *

* Payload restricted by tilt cylinders of Z kinematics.
** Standard tyres

Uneven terrain Load = 60% of the tipping load		Lift arm with Z-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additi-onal ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	150 kg	2290	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Good Year GP-2B	150 kg	2331	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Good Year GP-2B **	150 kg	2347	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin XHA	150 kg	2312	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
17.5R25 Michelin XHA	150 kg	2350	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *
15.5R25 Michelin X-Mine D2	150 kg	2840 *	2560 *	2330 *	2130 *	1970 *	1830 *	1700 *	1600 *

* Payload restricted by tilt cylinders of Z kinematics.
** Standard tyres

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Even and firm terrain Load = 80% of the tipping load		Lift arm with P-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additional ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	- -	2721	2627	2540	2458	2381	2309	2241	2177
15.5R25 Good Year GP-2B	- -	2773	2678	2588	2505	2427	2353	2284	2219
+17.5R25 Good Year GP-2B *	- -	2794	2698	2608	2524	2445	2371	2301	2235
15.5R25 Michelin XHA	- -	2749	2654	2566	2483	2405	2332	2264	2199
17.5R25 Michelin XHA	- -	2798	2701	2611	2527	2448	2374	2304	2238
+15.5R25 Michelin X-Mine D2	- -	2968	2865	2770	2681	2597	2518	2444	2374

* Standard tyres

Uneven terrain Load = 60% of the tipping load		Lift arm with P-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additional ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	- -	2041	1971	1905	1843	1786	1732	1681	1633
15.5R25 Good Year GP-2B	- -	2080	2008	1941	1879	1820	1765	1713	1664
17.5R25 Good Year GP-2B *	- -	2096	2023	1956	1893	1834	1778	1726	1676
15.5R25 Michelin XHA	- -	2062	1991	1924	1862	1804	1749	1698	1649
17.5R25 Michelin XHA	- -	2098	2026	1958	1895	1836	1780	1728	1679
15.5R25 Michelin X-Mine D2	- -	2226	2149	2077	2010	1948	1889	1833	1781

* Standard tyres

Even and firm terrain Load = 80% of the tipping load		Lift arm with P-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additional ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	300 kg	2982	2879	2783	2694	2610	2530	2456	2386
15.5R25 Good Year GP-2B	300 kg	3034	2930	2832	2741	2655	2575	2499	2427
17.5R25 Good Year GP-2B *	300 kg	3055	2950	2852	2760	2673	2592	2516	2444
15.5R25 Michelin XHA	300 kg	3010	2906	2809	2719	2634	2554	2479	2408
17.5R25 Michelin XHA	300 kg	3059	2953	2855	2763	2676	2595	2519	2447
15.5R25 Michelin X-Mine D2	300 kg	3229	3117	3014	2916	2825	2740	2659	2583

* Standard tyres

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Uneven terrain Load = 60% of the tipping load		Lift arm with P-bar kinematics and quick-change device: Loads in kg with different distances to the centre of gravity - CG in mm							
Tyres	**Additi-onal ballast**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
405/80R25 Dunlop SP T9	300 kg	2237	2160	2088	2020	1957	1898	1842	1789
15.5R25 Good Year GP-2B	300 kg	2276	2197	2124	2056	1991	1931	1874	1821
17.5R25 Good Year GP-2B *	300 kg	2291	2212	2139	2070	2005	1944	1887	1833
15.5R25 Michelin XHA	300 kg	2258	2180	2107	2039	1975	1915	1859	1806
17.5R25 Michelin XHA	300 kg	2294	2215	2141	2072	2007	1946	1889	1835
15.5R25 Michelin X-Mine D2	300 kg	2422	2338	2260	2187	2119	2055	1994	1937

* Standard tyres

1.1.2 Diesel engine, pump distributor gear

Diesel engine

Name	Value	Units
Engine type	D 504 T	
Number of cylinders	4	
Cylinder volume	4500	cm³
Rated power according to ISO 9249	72 / 98	kW / hp
Rated speed	2400	min^{-1}
Maximum torque at 1200 min^{-1}	395	Nm
Lower idling speed	830 $^{\pm 50}$	min^{-1}
Upper idling speed	2550 $^{+50}$	min^{-1}
Inclinability – longitudinal / traverse	30 / 30	°
Operating voltage of starter	12	V
Power consumption of starter	4.8	kW
Output voltage of alternator	14	V
Current output from alternator	65	A
Emission limit values comply with	EU – RL 97/68/EG – level 1	

Fuel system

Name	Value	Units
Tank level FULL	140	l
Tank RESERVE	10	l

Soot particle filter

This equipment is optional.
One exception:
– The soot particle filter is fitted as standard with the tunnel version.

Name	Value	Units
Filter medium	Ceramic filter block	
Maximum permissible exhaust gas counter-pressure	0.2	+bar
Regeneration	self-cleaning	

Refuelling pump

This equipment is optional.

Name	Value	Units
Flow rate	45	l/min
Max. duty cycle	15	minutes
Max. suction height	4	m

Air filter system

Name	Value	Units
Air throughput	min.8 max.14	m³/min m³/min

1.1.3 Travel hydraulics

Variable displacement pump

Name	Value	Units
Maximum displacement	90	cm³
Flow rate at rated engine speed	216	l/min
Pressure cut-off	460 ±5	+bar

Variable displacement motor

Name	Value	Units
Max. displacement	200	cm³

1.1.4 Working hydraulics

Working hydraulics pump

Name	Value	Units
Displacement	48.4	cm³
Flow rate at rated engine speed	116	l/min

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Control valve block

Name	Value	Units
Primary pressure relief valve / L512	210 ±5	+bar
Primary pressure relief valve / L514	230 ±5	+bar

1.1.5 Steering system

Steering pump

Name	Value	Units
Flow rate at rated engine speed	116	l/min
Power output	40.6	kW

Servostat

Name	Value	Units
Displacement	370	cm³

1.1.6 Brake system

Main brake cylinder

Name	Value	Units
Brake pressure (at 60 kg pedal force)	120	+bar

Disc brake

Name	Value	Units
Parking brake / brake pad gap	1.0 ±0.5	mm

1.1.7 Electrical system

Name	Value	Units
Power supply voltage	12	V

Battery

Name	Value	Units
Battery voltage	12	V
Battery capacity	88	Ah
Number of batteries	Two	

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1.1.8 Axles, tyres

Front axle

Name	Value	Units
Locking value of the self-locking differential	45	%
Wheel base	1870	mm
Wheel lug tightening torque	650	Nm
Wheel lug spanner size	27	mm

Rear axle

Name	Value	Units
Locking value of the self-locking differential	25	%
Angle of swing (to each side)	6	°
Wheel base	1870	mm
Wheel lug tightening torque	650	Nm
Wheel lug spanner size	27	mm

Tyres

The recommended tyre sizes with the corresponding tyre pressures are listed in the following tables.
The tyre pressure specifications are:
– The value set before leaving the factory
– The basic air pressure recommendations

They refer to cold tyres and to a machine which is ready for operation – the basic machine with standard equipment and permitted load.
Note:
For special applications, such as stockyard operations with timber, where heavier loads may be expected, a higher tyre pressure is recommended, depending on the specific load.
The tyre pressure may not however be greater than the maximum permitted by the tyre manufacturer's specifications!
Please observe the safety instructions concerning checking tyre pressure and pumping up the tyres.
See the chapter on maintenance.

DUNLOP tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissible air pressure (bar)
405/80 R25 SPT9 L2	3.50	2.00	3.75
445/80 R25 SPT9 L2	2.80	1.80	3.75

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MICHELIN tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissible air pressure (bar)
15.5 R25 XTLA L2	2.50	2.00	450
15.5 R25 XHA L3	2.50	2.00	4.50
15.5 R25 XMine D2 L5	2.50	2.00	4.50
17.5 R25 XTLA L2	2.00	2.00	4.50
17.5 R25 XHA L3	2.00	2.00	4.50

GOODYEAR tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissible air pressure (bar)
15.5 R25 GP-2B L2	3.00	2.00	5.00
17.5 R25 GP-2B L2	2.50	2.00	5.00

Special tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissible air pressure (bar)
1)			
2)			
2)			

The specifications should be entered in the tables as follows:

1) By the manufacturer, if the machine is delivered ex-works with special tyres.

2) By the machine operator, if the machine is retrofitted by the machine operator.

Tyres for machines with optional accessories

Specifications	Type of optional accessory
1)	
2)	
2)	

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissible air pressure (bar)
1)			
2)			
2)			

The specifications should be entered in the tables as follows:

1) By the manufacturer, if the machine is delivered ex-works with optional accessories.

2) By the machine operator, if the machine is retrofitted by the machine operator.

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1.1.9 Central lubrication system

EP-tronic controlling device for the automatic central lubrication system – "LIEBHERR"

Name	Value	Units
Factory set lubrication time	6	min
Factory-set dead time	0.5	Hours
Adjustable lubrication time	min.1 max.16	min min
Adjustable dead time	min.0.5 max.8	Hours Hours
Supply voltage	min.. . max.24	V V

TWIN automatic central lubrication system

Name	Value	Units
Supply voltage	12	V

1.1.10 Cab, heating, air-conditioning

Heating, ventilation

Name	Value	Units
Blower speeds	3	
Heating output	4.0	kW

Air-conditioning system

This equipment is optional.

Name	Value	Units
Type	Heating/air-conditioning unit	
Cooling output	4.7	kW

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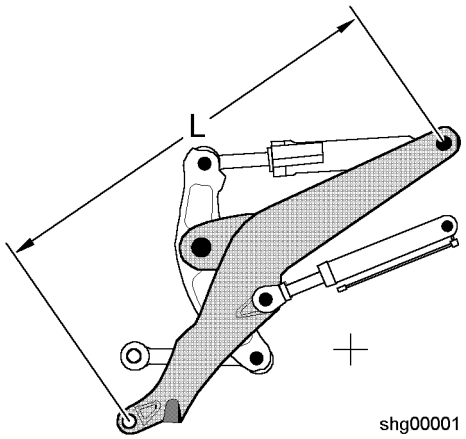
1.1.11 Lift arm, quick-change device

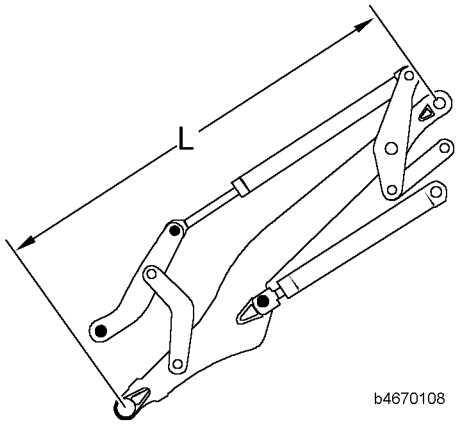
Z-bar lift arm



Distance between bore holes

Name	Value	Units
L – Length	2350	mm

P-bar lift arm

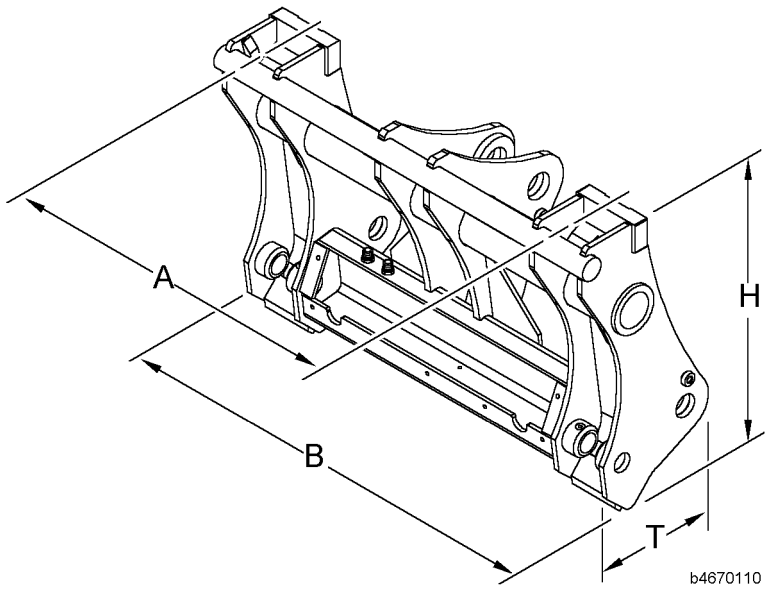


Distance between bore holes

Name	Value	Units
L – Length	2400	mm

Hydraulic quick-change device for Z-lift arm

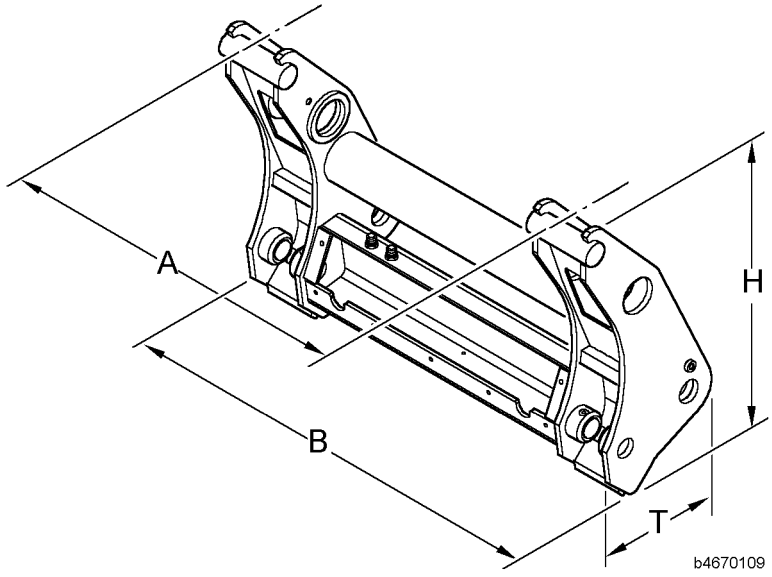
This equipment is optional.



Main dimensions

Name	Value	Units
A – System connection dimensions	1000	mm
Weight	200	kg

Hydraulic quick-change device for P-lift arm



Main dimensions

Name	Value	Units
A – System connection dimensions	1000	mm
Weight	170	kg

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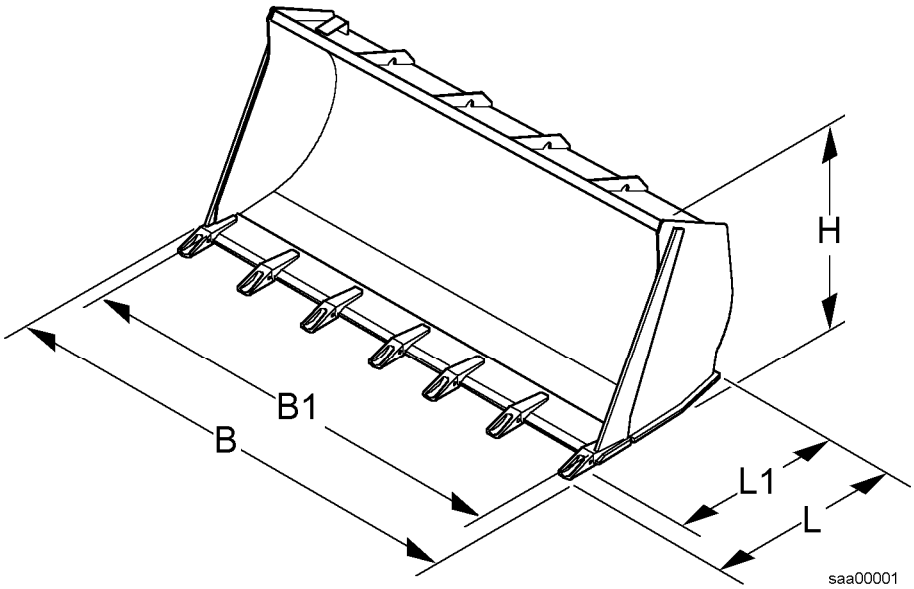
1.1.12 Attachments, accessories

Bucket



Main dimensions

Name	Value	Units
B - Bucket width	2400	mm
B1 - Loading dimension	2348	mm
H - Height	1055	mm
L - Length with teeth	1165	mm
L1 - Length without teeth	1100	mm
Specific material weight	1.8	t/m³
Heaped bucket capacity (ISO 7546)	1.5	m³
Weight	620	kg
Toothing – UNI-Z-2000 I	7	units

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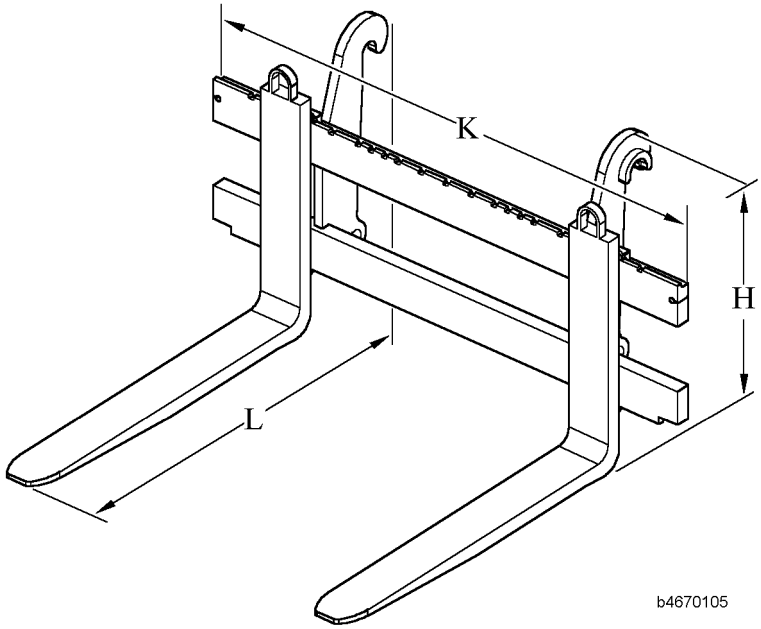
Forklift This equipment is optional.



Main dimensions

Name	Value	Units
Fork carrier prong size	FEM III	
Prong length	1200	mm
L – Length (fork carrier + prongs)	1572	mm
K – Fork carrier width	1778	mm
H – Height (fork carrier + prongs)	974	mm
Weight (fork carrier + prongs)	453	kg

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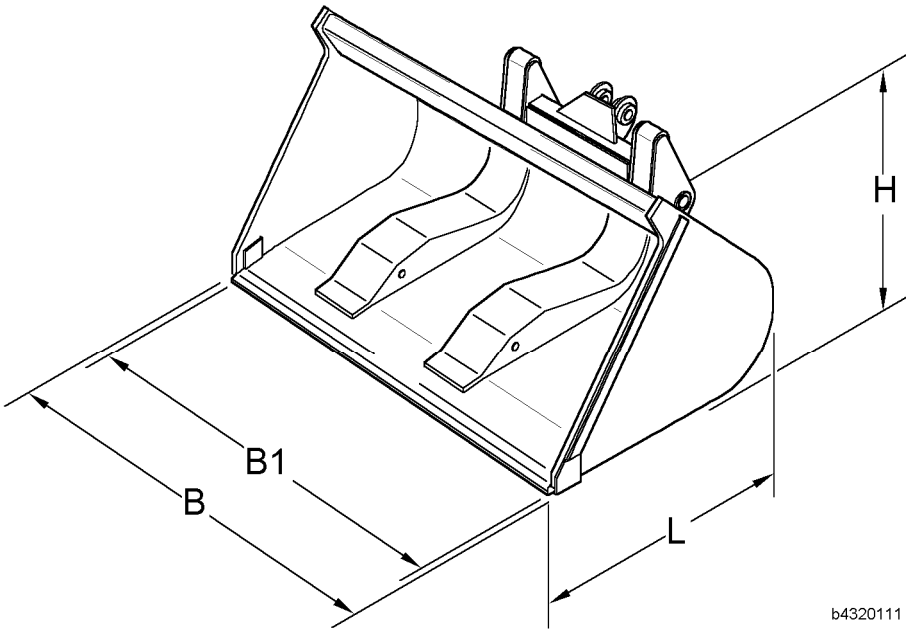
High dump bucket This equipment is optional.



Main dimensions

Name	Value	Units
B – Bucket width	2490	mm
Specific material weight	0.8	t/m³
Bucket capacity as per ISO 7546	2.5	m³
Max. permissible operating pressure of attachment hydraulics	250	+bar

1.2 Technical description

1.2.1 Complete machine

Wheel loader

The wheel loader is a fully hydraulic machine with a hydrostatic travel drive.
The machine is articulated in combination with rear axle steering.
Different machine versions:
– Z-bar lift arm with Z-bar kinematics
– P-bar lift arm with parallel kinematics

1.2.2 Diesel engine, pump distributor gear

Diesel engine

The diesel engine is a water-cooled, four stroke in-line engine with direct injection and turbocharger.
The engine is installed transversely on the rear section and elastically mounted on rubber bearings. The flywheel end faces to the left.
The tandem pump unit, consisting of the travel hydraulics and working hydraulics pump, is driven by the flywheel via the torsion absorber.
The gear pump for the hydraulic fan drive is mounted on the starter side of the diesel engine.

Fuel system

The plastic fuel tank is located behind the right-hand cab access.
The tank filler cap can be locked.
The fuel is drawn up by the fuel supply pump via the suction line and the fuel pre-filter, and is fed to the injection pump via a fine filter with integrated water and contaminant precipitator.
There is a valve on the bottom of the fuel tank for draining condensated water and sediment from the fuel.
It can be used with the same drain pipe, whichever drain engine oil is used.

Fuel pre-filter

The fuel pre-filter is an in-line filter between the fuel tank and the fuel pump and acts as a pre-filter. This prevents coarse dirt accruals on the fuel fuel supply pump and the fine filter.

Soot particle filter

This equipment is optional.
One exception:
– The soot particle filter is fitted as standard with the tunnel version.

The installation site is in the engine compartment.
Functions:
It reduces the emission of soot particles.
It regenerates itself during normal operation.

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Refuelling pump

This equipment is optional.
The refuelling pump is installed at the back on the rear section.
The refuelling pump is only suitable for diesel fuel.
The refuelling system is designed to facilitate filling the fuel tank with diesel fuel from a container (drum).

Air filter system

The air filter system of the diesel engine cleans the intake air, removing dust and other dirt.
The degree of wear on the engine depends to a large degree on how clean the inlet air is. It is therefore important that the air filter system is inspected and serviced on a regular basis.
The main element and the safety element of the dry air filter are designed so that maximum engine protection is guaranteed over very long service intervals.

Coupling

The coupling is fitted as a connecting element between the flywheel on the diesel engine and the tandem pump.
It is a sturdy, plug-in, oil-resistant, non-torsion coupling, and transmits the torque of the diesel engine to the tandem pump.

1.2.3 Cooling system

The cooling system is fitted between the diesel engine and the driver's cab on the rear section.
The cooling system cools the diesel engine coolant, the hydraulic oil cools the hydraulic system.
The hydrostatically driven fan draws in cool air via the cooler duct and the cooling fins on the cooler and blows it at the diesel engine.
The speed of the hydrostatically driven fan depends on the diesel engine speed and the temperature of the coolant or hydraulic oil.

1.2.4 Travel hydraulics

The power from the diesel engine is transmitted to the transfer gear via the continuous hydrostatic drive in a closed circuit.
This drive enables:
- Automatic adjustment of the travel speed to the tractive force in each travel range
- Rapid shifting from forward travel to reverse travel by means of the LIEBHERR control lever
- Control of the tractive force or speed by means of the gas pedal and the combined inch/brake pedal

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Variable displacement pump

The variable displacement pump is an axial piston pump with a swash plate design.
The pump delivers directly to the variable displacement motor. The oil flowing back from the variable displacement motor is fed back to the suction side of the pump.
The flow rate is adjusted in relation to the engine speed and load. The flow direction of the pump is determined by the travel direction valve.
The pressure cut-off limits the maximum operating pressure in the travel hydraulics.

Variable displacement motor

The variable displacement motor with an inclined axle design drives the transfer gear. The hydraulic regulation of the displacement enables a wide adjustment range.
A large tractive force at a low speed is achieved at the maximum pivoting angle.
The highest speed and the lowest possible tractive force are obtained at the minimum swivel angle.

Inching function

The tractive force or speed is controlled by means of the gas pedal and the combined inch/brake pedal.
The inch/brake pedal is actuated in the following situations:
– When, at the same time, a high performance is required from the working hydraulics, the tractive force or speed can be regulated by using the inch/brake pedal
– When lifting up material in order to regulate the pushing power of the machine
– In order to regulate speed when approaching the truck when loading material

1.2.5 Working hydraulics

The working hydraulics system operates in an open circuit. The working hydraulics pump draws the oil from the hydraulic tank and delivers it via the valve block to the control valve block.
The control valve block is hydraulically controlled by the pilot control unit and directs the oil volume to the lift or tilt cylinders.

Working hydraulics pump

The working hydraulics pump is a gear pump. The speed-dependant pump flow is distributed by the valve block to the working hydraulics, steering system and parking brake.

Control valve block

The control valve block is installed in the front section of the machine. The control valve block contains the spool valves for the lift and tilt cylinders. An additional unit with spool valves for quick-change couplings or accessories can be attached to the existing control valve block.
Pressure relief valves for the various working functions protect the system from pressure peaks.

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Pilot control

The working hydraulics are controlled using the LIEBHERR control lever. The control valve block is thus hydraulically controlled via the pilot control valve.

The pilot control valve is supplied with oil from the replenishing pump via the pilot control solenoid valve. The presence of a hydro accumulator means that even when the diesel engine is at a standstill, the working attachments can be operated in emergencies. For example, the lift arm can be lowered and/or the bucket can be tilted out.

The bucket return-to-dig, lift kick-out and float position functions are all controlled via retaining magnets in the pilot control unit and via proximity switches.

Hydraulic tank

The hydraulic tank supplies the travel hydraulics, working hydraulics, brake system and steering system with hydraulic oil.

The variable displacement pumps deliver the oil via control units to the individual consumers and back to the hydraulic tank via the oil cooler. The oil passes through the return suction filter as it flows back.

Return suction filter

The return-suction filter cleans the oil as it flows back from the working hydraulics. The oil flows from the inside outwards through the filter.

At the same time, the filter acts as a suction filter for the replenishing pump of the hydrostatic travel drive.

Return strainer

The return strainer filters part of the returning oil of the entire hydraulic system. The filtered oil then flows back to the hydraulic tank.

1.2.6 Steering system

The machine is articulated with additional rear axle steering. The steering cylinder pushes the front and rear section together via the articulated joint. At the same time, the axle pivot steering of the rear axle is actuated by connecting rods.

The hydraulic steering is supplied with oil from the working hydraulics pump via the valve block. When the steering wheel is turned, oil metered by the servostat is directed to the steering cylinders.

An emergency steering system makes steering possible even if the normal oil supply breaks down.

Steering pump

The steering system is supplied with oil via the working hydraulics pump. The flow of oil from the pump is distributed at the valve block as required to the working hydraulics, steering system and parking brake.

Servostat

The servostat is actuated by the steering wheel via the steering column. The servostat's metering pump directs the oil flow from the steering pump to either one or two steering cylinders, depending on the machine type.

In the process, the oil volume is precisely metered to enhance the responsiveness of the steering.

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Emergency steering

The emergency steering function is controlled by an electronic system. If the standard steering system breaks down, the emergency steering pump is automatically activated.
Each time the diesel engine is started, the emergency steering pump is briefly tested.

Emergency steering pump

The emergency steering pump is a gear pump driven by an electric motor. The pump supplies oil as required to the steering system.

1.2.7 Brake system

The brake system consists of a service brake and a parking brake.
An equalising reservoir supplies the main braking cylinder of the service brake with oil.
The parking brake is supplied with oil from a gear pump. The accumulator charge valve in the valve block fills the brake accummulator of the parking brake with pressure oil.

Service brake

The service brake is a hydraulic dual-circuit system. It acts on two fixed caliper disc brakes, which are arranged on two brake discs one behind the other on the input shaft of the front axle.
The brake is closed by oil pressure, which is built up via the main brake cylinder when the inch/brake pedal is pressed.

Parking brake

The parking brake is an electro-hydraulically operated spring accummulator - sliding caliper brake. The brake disc is mounted on the transfer gear together with the sliding caliper.
The parking brake is opened by oil pressure and closed by spring force. When the parking brake is actuated, the brake is opened by means of oil pressure via a solenoid valve.
When the parking brake is closed, a pressure switch prevents the preselection of a travel direction and therefore driving with the parking brake engaged.

1.2.8 Electrical system

The operating voltage of the machine is 12 volts. The batteries (2x 12 V, connected in parallel) are located under the left-hand cab access.
The battery main switch is at the rear of the engine compartment.
When the main switch is turned off, the whole electrical system is shut down. If the main switch is turned on and the start switch on the instrument panel is turned off, the batteries are still connected to the electrical system.
The main battery switch must not be turned off when the diesel engine is running. This may damage the electrical system.

Batteries

The batteries are mounted in the left cab access.
The batteries (2x 12 V) are connected in parallel.

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1.2.9 Transfer gear

The transfer gear is mounted on the rear axle and is driven by a flanged, parallel switched hydraulic motor.
The drive shaft is flange-mounted on the transfer gear. This establishes the connection to the front axle.

1.2.10 Axles, tyres

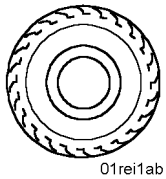
Front axle

The front axle is a fixed axle and is bolted to the front section.
The axle is equipped with a central tapered gear with an integrated disc-type self-locking differential. The planetary final drives are located in the wheel hubs.

Rear axle

The rear axle is a steering axle with built-in transfer gear. The axle transfer gear is driven by the variable displacement motor. The oscillating axle mount is integrated in differential housing.
The axle is equipped with a central tapered gear with an integrated disc-type self-locking differential. The planetary final drives are located in the wheel hubs. The wheel hubs are then manoeuvrable on the axle pivot steering. They are actuated via connecting rods.

Tyres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The driving performance of the machine also depends on the tyres.

It is essential that all four tyres are of the same size.

When changing the tyres or if there is increasing wear on the tyres, make sure that the difference in diameter between the tyres on the front and rear axles is no more than 3%.

Otherwise the axles may be damaged.

The correct tyre pressure is a decisive factor for the proper performance of the machine and for a long tyre lifetime.

Snow chains or guard chains

When snow chains or guard chains are used, they must be attached to all four wheels.
Note: Failure to observe this may result in damage to the drive system.

1.2.11 Machine frame, ballast weight

Machine frame

The machine frame consists of the front and rear sections. These are linked by the articulation bearing.
In order to steer, the machine frame is pivoted to the left or right via the articulation bearing.
The machine frame transmits the forces from the lift arm to the axles. The frame bears all the key components of the machine such as the diesel engine, driver's cab and transfer gear.

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Articulation lock

The front and rear sections must be mechanically locked together in close proximity to the articulated joint when the machine is moved with a crane and during transport by truck or rail, as well as for maintenance and repair work.

The joint is locked by means of a safety bar.

This is attached to the rear section on the left next to the cab access ladder.

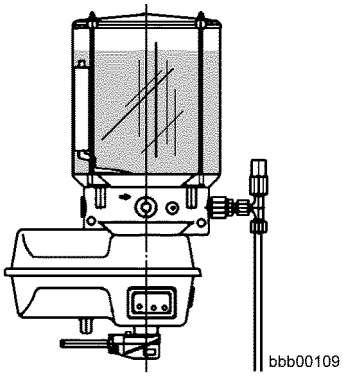
1.2.12 Central lubrication system

Manual central lubrication

The manual central lubrication system consists of two central lubrication rails and is mounted on the left-hand side of the machine in the articulation zone.

Inaccessible lubrication points are manually lubricated via the central lubricating rails.

LIEBHERR automatic central lubrication system



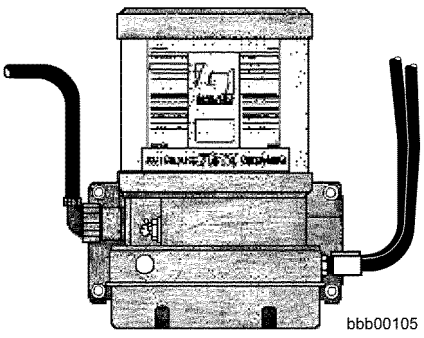
This equipment is optional.

The LIEBHERR automatic central lubrication system is a progressive system. It lubricates progressively, that is to say, all points are lubricated one after the other.

An electrically driven central lubrication pump delivers the grease to the primary progressive distributor and distributes it among the secondary progressive distributors. The secondary progressive distributors pump the grease to the individual lubrication points. An integrated electronic control device controls the lubrication and dead time of the piston pump.

An overpressure valve monitors lubrication of the individual lubrication points.

TWIN automatic central lubrication system



Central lubrication pump

This equipment is optional.

The TWIN automatic central lubrication system is a 2–line system.

The system lubricates all the connected lubrication points simultaneously with automatically the right quantity of grease at set intervals.

The electrically driven central lubrication pump with an integrated controller delivers the grease (lubricant) to the distributor blocks using measuring valves.

The grease is delivered to the individual lubrication points using the measuring valves.

An integrated electronic control device controls the lubrication and dead time of the piston pump.

An electric pressure switch monitors the system pressure in the main supply line.

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1.2.13 Cab, heating, air-conditioning

Cab

The cab is a safety cab and has been tested and certified according to ROPS/FOPS regulations. It is mounted on cushioned bearings on the rear section.

The cab is equipped with heating and ventilation systems.

Access to the cab is from the left-hand side of the machine via the cab access and the left-hand door.

In emergencies, it is possible to exit through the door on the right hand side.

Driver's seat with gas spring suspension

The driver's seat is equipped with a gas-filled spring suspension.

The ergonomically designed driver's seat offers a high degree of comfort.

The adjustable seat, back support and suspension mean that the driver can individually adjust the seat for maximum comfort.

Vibration damping:

The seat installed in the machine complies with ISO 7096.

When the machine is used correctly, the vibrations transmitted by the driver's seat are less than or equal to the vibrations simulated in test conditions for the corresponding machine class in accordance with ISO 7096.

The values of the evaluated vibration accelerations "a_{ZW} ", measured according to ISO 2631, Part 1, thus fulfil the requirements for protection against overall body vibrations according to EN 474-1.

Driver's seat with pneumatic suspension

This equipment is optional.

The driver's seat is equipped with pneumatic suspension (compressor-operated).

An electrically driven compressor supplies a pneumatic spring in the seat section and two pneumatic chambers in the back rest.

The ergonomically designed driver's seat offers a high degree of comfort.

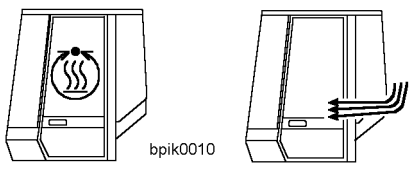
The adjustable seat, back support and suspension mean that the driver can individually adjust the seat for maximum comfort.

Vibration damping:

The seat installed in the machine complies with ISO 7096.

When the machine is used correctly, the vibrations transmitted by the driver's seat are less than or equal to the vibrations simulated in test conditions for the corresponding machine class in accordance with ISO 7096.

The values of the evaluated vibration accelerations "a_{ZW} ", measured according to ISO 2631, Part 1, thus fulfil the requirements for protection against overall body vibrations according to EN 474-1.



Heating, ventilation

The driver's cab is equipped with a warm water heating system.

A 3-speed radial blower is used to ventilate the cab.

An air filter which is installed in front of the blower in the fresh air/recirculated air intake shaft, filters dust particles and other foreign bodies out of the inlet fresh air or recirculated air.

A lever connected to an air flap in the back right-hand side of the cab enables switching between fresh air and circulated air.

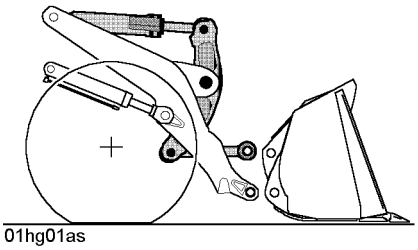
Air-conditioning system


bsym0029

This equipment is optional.
The inlet air is filtered via one dry servicable filter cartridge and directed into the cab via a vaporiser, heat exchanger and the adjustable outlet nozzles.

1.2.14 Lift arm, quick-change device

Z-bar lift arm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The lift arm is attached to the front section of the machine.

The lift arm has a Z-kinematic design. This means the tilt cylinder, Z-bar linkage and connecting link form a “Z” shape. The “Z” shape can be seen from the right-hand side.

No parallel movement is possible with a lift arm with Z-bar kinematics.

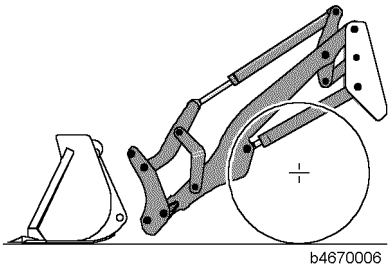
The Z-bar lift arms can be equipped with a hydraulic quick-change device (option).

Two lift cylinders and a tilt cylinder are attached to the lift arm.

The lift arm is bolted to the front section via the bucket arm bearings and the cylinder bearings on the cylinder base side.

The bearing points on the lift arm are sealed and protected against wear caused by dirt and corrosion.

P-bar lift arm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P-bar kinematics

The lift arm is attached to the front section of the machine.

The P-lift arms have a parallel kinematic design. This means that the arrangement of the tilt cylinder, reversing levers at the back and front, connecting strap and bucket arm form a parallelogram.

The parallel kinematics enable the load to be kept parallel to the ground, e.g. with a forklift, over the entire lifting range.

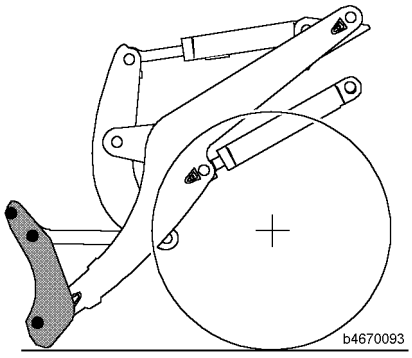
The P-lift arms are equipped with a hydraulic quick-change device. The hydraulic quick-change device is fitted as standard equipment.

Two lift cylinders and two tilt cylinders are attached to the lift arms.

The lift arms are bolted to the front section via the bucket arm bearings and via the cylinder bearings at the cylinder base.

The bearing points on the lift arm are sealed and protected against wear caused by dirt and corrosion.

Hydraulic quick-change device for Z-lift arm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This equipment is optional.

The quick-change device can be attached to the lift arm of the machine.

It is designed to facilitate the fast changing of various attachments on the lift arm.
Design of the quick-change device:
– Combined electro-hydraulic design
  Electric activation and deactivation by means of a switch
  Hydraulic actuation using the LH control lever

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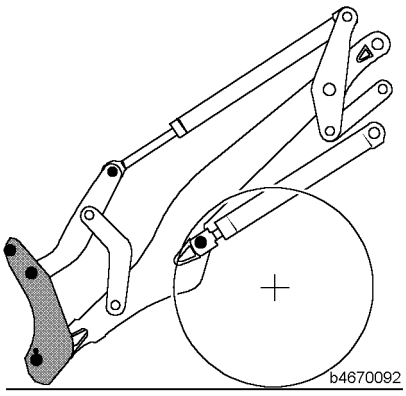


Hydraulic quick-change device for P-lift arm

The quick-change device can be attached to the lift arm of the machine.

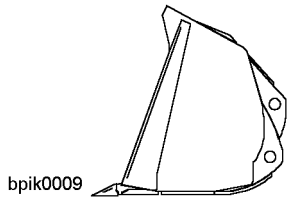
It is designed to facilitate the fast changing of various attachments on the lift arm.

Design of the quick-change device:

– Combined electro-hydraulic design
  Electric activation and deactivation by means of a switch
  Hydraulic actuation using the LH control lever

1.2.15 Attachments, accessories

Bucket



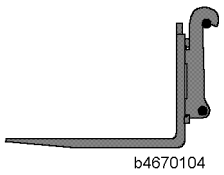
The bucket is one of a variety of attachments which can be mounted on the lift arm.

The loading bucket is part of the standard equipment on the machine. The bottom cutting edge is supplied in a variety of designs, depending on the intended use.

The bucket is attached directly to the lift arm as a standard feature.

If the optional quick-change device is provided, the bucket is attached to this.

Forklift

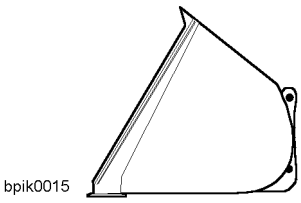


This equipment is optional.
The forklift is one of a variety of attachments which can be mounted on the lift arm.

The forklift is either attached directly to the lift arms or via the quick-change device.

The forklift is intended for picking up, transporting and transferring pallets and for stacking jobs.

High dump bucket



This equipment is optional.
The high dump bucket is one of a variety of attachments which can be mounted on the lift arm.

The high dump bucket is attached to the lift arm via the quick-change device as standard.

The high dump bucket is equipped with its own hydraulic circuit for the high dumping function.

This high dumping function means that the buckets are especially suitable for work requiring a great dump height, such as loading high-sided wagons.

It can be used for light materials such as wood shavings, sawdust and cereals.

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2 Safety regulations

Working on the machine may pose a risk of serious or fatal injury to the operator, driver or maintenance technicians. You can considerably reduce the risk of accidents by carefully reading and observing the various safety instructions at regular intervals.

This is especially important for personnel who only occasionally work on the machine, for example, carrying out rigging or maintenance work.

The safety regulations listed below, if conscientiously followed, will ensure your own safety and that of others, and will prevent the machine from being damaged.

Whenever tasks which could cause danger to personnel or damage to the machine are described, the necessary safety precautions are explained in this manual.

These are indicated by the headings **Danger**, **Warning** or **Caution**.

2.1 Introduction

1. The symbols below have the following meanings:

"Danger"

Warning that without appropriate precautions, certain operational procedures could result in fatal accidents.

"Warning"

Warning that without appropriate precautions, certain operational procedures could result in severe physical injuries.

"Caution"

Warning that without appropriate precautions, certain operational procedures could result in minor physical injuries or damage to the machine.

2. **Observance of these instructions does not relieve you of the responsibility to observe other rules and guidelines!**

   The following should also be observed:
   - The safety rules in force at the operating site
   - Legally enforceable road traffic regulations
   - Guidelines issued by trade associations

2.2 General safety regulations

1. Make sure you are familiar with the **Operator's Manual** before starting the machine.

   Make sure that you are in possession of and have read and understood additional instructions applicable to any special equipment installed on your machine.
2. Only expressly authorised personnel may operate, service or repair the machine.

   Observe the legal minimum ages.
3. Only trained or instructed personnel are to operate the machine. Clearly assign responsibility for operation, rigging, maintenance and repair work.

4. Clearly establish the driver's responsibilities (also with respect to traffic regulations) and authorise the driver to refuse to carry out unsafe instructions from third parties.
5. Personnel undergoing training, instruction or who are not yet fully qualified may only be allowed to work on the machine under constant supervision.
6. Now and again check that your personnel are working safely and are aware of possible dangers in observance of the **Operator's Manual**.
7. Wear safe working clothes when working on the machine.
   Avoid wearing rings, wrist watches, ties, scarves, open jackets, loose clothing etc. There is a risk of injuries if these objects are caught or drawn into the machinery.
   For certain kinds of work the following are prescribed: safety goggles, safety boots, hard hats, gloves, reflective vests, ear protection. . .
8. Obtain information about any special safety regulations in force on-site from the site manager.
9. Do not hold onto the steering column, the control panel or the control levers when getting on or off the machine.
   This can result in accidental movements by the machine which in turn could lead to accidents.
10. Never jump down from the machine. Use the steps, ladders and gangways provided for getting on and off.
11. Familiarise yourself with the emergency exit through the right-hand cab door and/or rear window.
12. If no other instructions are in effect, proceed as follows with maintenance and repair work:
    Procedure:
    – Park the machine on firm, level ground and set the working attachment down on the ground
    – Move all control levers to neutral
    – Shut down the engine and take out the ignition key
13. Before starting any work on the hydraulic circuit, you must also actuate all pilot control units (joystick and pedals) in both directions in order to reduce the control pressure and accumulated pressure in the operating circuits. You must then reduce the internal tank pressure.
14. Lock the working hydraulics to prevent accidental actuation before leaving the driver's cab.
    Block the working hydraulics in accordance with the instructions in the **Operator's Manual**.
15. Secure all loose components on the machine.
16. Never start up a machine without first making a thorough tour of inspection and checking if any warning signs are missing or illegible.
17. Observe all signs bearing danger or safety instructions.
18. The machine must be equipped with specific safety devices for special applications. In this case, only operate the machine when these have been installed and are fully functional.
19. Do not make any modifications, extensions or conversions to the machine with possible safety implications without the approval of the supplier. This also applies to the installation and adjustment of safety equipment and valves as well as for welding work on load-bearing components.

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2.3 Proper use

1. When equipped with a standard loading bucket, forklift or gripper, the wheel loader is designed exclusively for loosening, picking up, transferring, loading and dumping earth, stone, rock fragments or other materials and loading the same onto trucks, ships, conveyor belts or crushing installations.
2. Any other use, such as breaking up rocks, driving in posts, transporting personnel etc., is regarded as improper use.
   The manufacturer/supplier accepts no liability for any injury or damage resulting from the above.
   The risk is borne by the user alone.
3. Vehicles used for lifting purposes are subject to special conditions and must also be equipped with the prescribed safety equipment.
4. Proper use also includes observance of the **Operator's Manual** and adherence to the inspection and maintenance conditions.

2.4 Decals on the machine

1. Your machine has several types of decals.
   Types of decals:
   – Safety decals
   – Information decals
   – Type plates

   Their contents and location are described below.
   The order numbers are included in the spare parts list.

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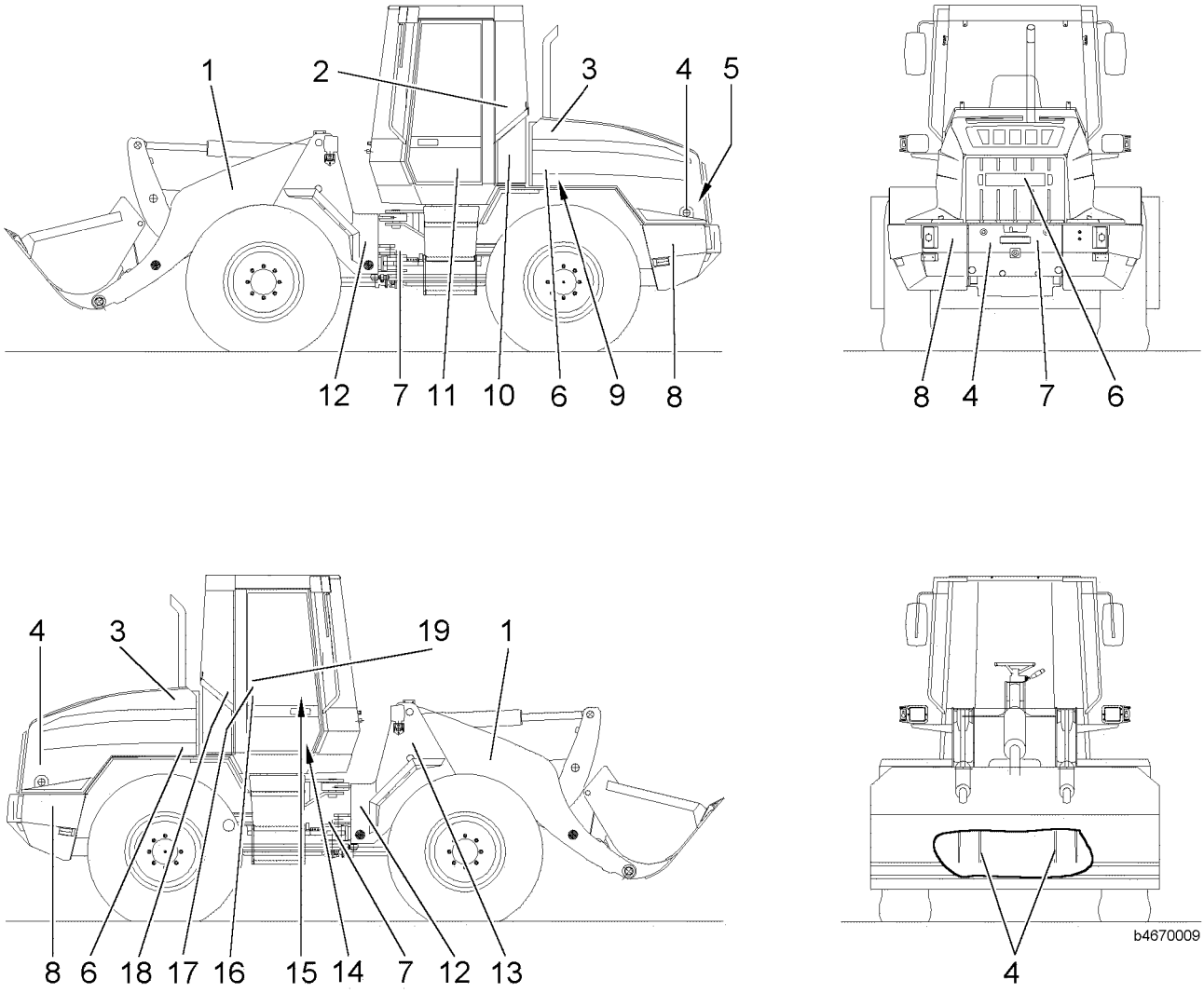
2.4.1 Location of decals



Location of decals

1 Keep clear sign
2 Noise output decal – L_{WA}
3 Cooler unit decal
4 Decal for slinging - lifting point
5 Voltage decal
6 Engine standstill decal
7 Slinging point decal
8 30 km/h speed limit decal
9 Oil level decal
10 Windscreen water decal
11 Lubrication chart
12 Articulation area warning decal
13 Machine type plate
14 ROPS decal
15 Working hydraulics decal
16 Accident prevention decal
17 Steering decal
18 Cab ventilation decal
19 Wheel lugs decal

2.4.2 Safety decals

1. Non-observance of the safety decals can result in serious or even fatal injuries.
   The safety decals should be continuously checked for completeness and legibility.
   Missing or illegible safety decals should be replaced immediately.

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Keep clear sign

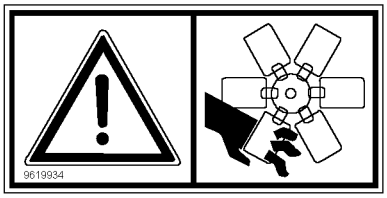
03sc01ab

The decal **1** is affixed to the outside of the lift arm on the left and right.

It warns of the risk of accidents, possibly resulting in severe or even fatal injuries.

Meaning: **Keep out of the danger area!**

Engine standstill decal



03sc04ab

The sign **6** attached on the left and right outside the engine compartment hood, and on the rear hatch.

Warns of the risk of accidents, possibly resulting in severe injuries.

Meaning: **Only open when the engine is shut down!**

Articulation area warning decal

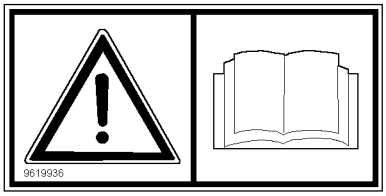
03sc02ab

The decal **12** is affixed outside on the left and right in the articulation area.

It warns of the risk of accidents, possibly resulting in severe or even fatal injuries.

Meaning: **Keep out of the articulation area when it is not locked!**

Accident prevention decal



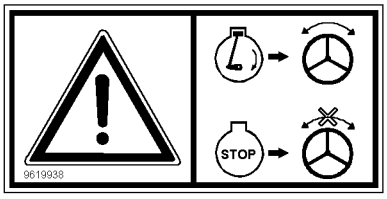
03sc03ab

The decal **16** is attached to the right-hand side of the driver's cab.

It refers to regulations in the operator's manual for accident prevention.

Meaning: **When operating the machine, the regulations in the operator's manual for accident prevention must be followed precisely!**

Steering decal



03sc05ab

The decal **17** is attached to the right-hand side of the driver's cab.

It warns of the risk of accidents, possibly resulting in severe or even fatal injuries.

Meaning: **The steering is only operational when the engine is running!**

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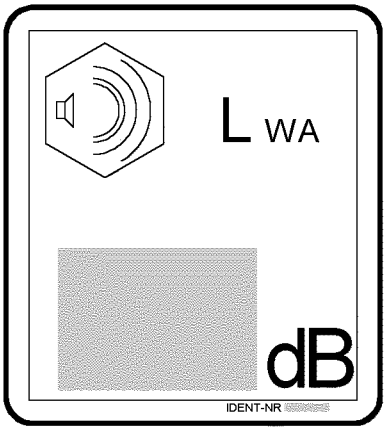
2.4.3 Information decals

1. The information decals refer to certain facts in respect to the operation, maintenance and properties of the machine.

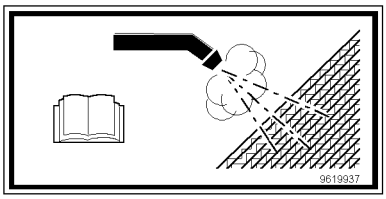
Noise output decal – L_{WA}



03sc24ab

The decal **2** is affixed inside the left-hand window of the driver's cab.
It states the noise output level (L_{WA}) of the machine in decibels.
You can find the level on the sign on the machine.

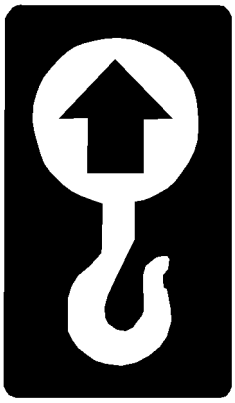
Cooler unit decal



03sc07ab

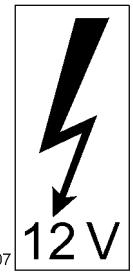
Decal **3** is affixed externally to the engine compartment hood on the left.
It refers to cleaning the cooling system.

Decal for slinging - lifting point


03sc17ab

Decal **4** is affixed to the slinging-lifting points on the machine.
See the section on slinging and lifting the machine.
Refers to the slinging- lifting points on the machine.

Voltage decal



b4670007

The decal **5** is a) on the inside of the rear hatch and b) attached in the battery compartment
Indicates the power supply voltage of the electrical system.
Indicates the activation of the battery main switch.

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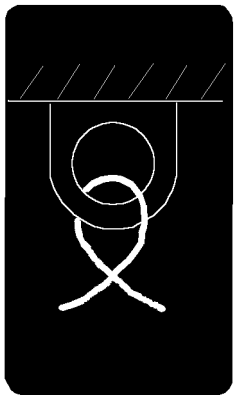
Slinging point decal



03sc16ab

The decal **7** is affixed to the slinging points on the machine.

See the section on transporting the machine by truck or rail.

It refers to the slinging points on the machine.

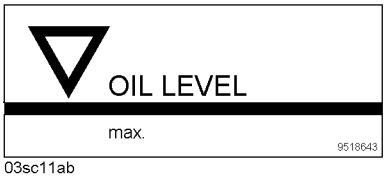
30 km/h speed limit decal

bsym0001

The Decal **8** is affixed to the rear of the machine and on the sides to the left- and right-hand ballast weights.

It refers to the permitted speed limit for the machine.

Oil level decal

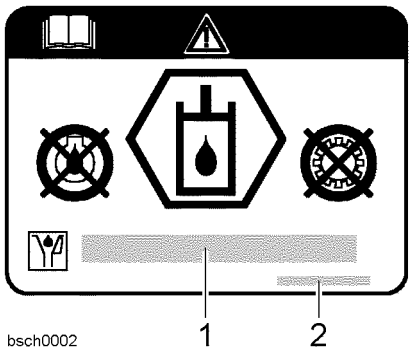


03sc11ab

The sign **9** is attached to the hydraulic tank in the engine compartment.

It indicates the oil level in the hydraulic tank.

Bio oil decal



bsch0002

This equipment is optional.

The decal is attached to the hydraulic tank on the right-hand side of the engine compartment.

1 Bio oil type field

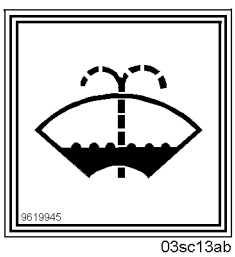
2 ID number field

It indicates that the hydraulic system is filled with Bio oil.

It indicates that Bio oil is not suitable as lubrication oil for the engine and gearbox.

The field **1** contains the exact designation of the Bio oil with which the hydraulic system is filled.

Windscreen water decal



03sc13ab

The decal **10** is affixed outside on the left side of the driver's cab.

It indicates the container for the windscreen washer fluid.

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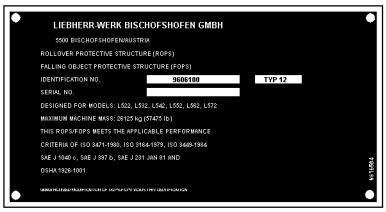
Lubrication chart

The decal **11** is attached to the door on the left-hand cab door.
Figure – see the Maintenance section.
It indicates the maintenance points and intervals in relation to lubricants and operating materials for the machine.

ROPS decal

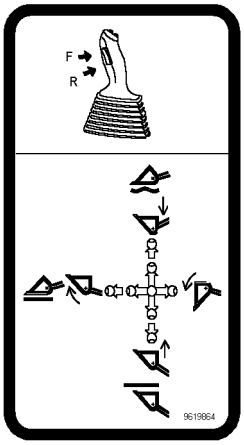


03sc09ab

The decal **14** is affixed to the floor of the driver's cab on the right-hand side of the driver's seat.

It shows the maximum loading of the rollbar structure.

Working hydraulics decal

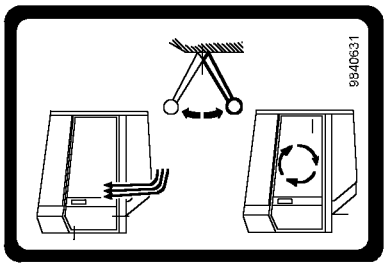


03sc06at

The decal **15** is attached to the right-hand side of the driver's cab.

It indicates the directions in which the LH control lever can be moved.

Cab ventilation decal

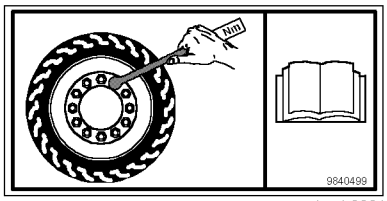


b4670101

The decal **18** is attached to the right-hand side of the driver's cab.

Indicates the lever position for fresh or recirculated air.

Wheel lugs decal



bsch0001

The decal **19** is attached to the right-hand side of the driver's cab.

It refers to the service interval for checking the tightness of the wheel lugs specified in the operating manual.

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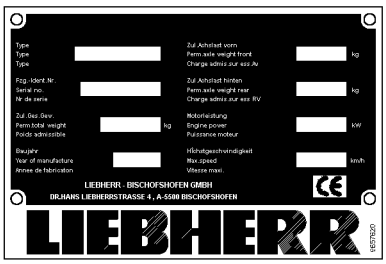
2.4.4 Type plates

1. The machines and the indicated components are provided with a type plate.

Machine type plate



03sc10ab

The decal **13** is affixed to the right hand side of the front section.
Details on the type plate:
- Type
- Vehicle identity no.
- Permissible total weight
- Year of construction
- Permissible front axle load
- Permissible rear axle load
- Engine output
- Maximum speed

2.5 Instructions for avoiding crushing injuries and burns

1. Do not work underneath the working attachment until it has been securely set down on the ground or is supported.
2. Do not use any ropes or chains which are damaged or which have insufficient load bearing capacity.
   Wear protective gloves when handling wire ropes.
3. When working with the attachment, never align the boreholes with your fingers, instead, use a suitable mandrel for this purpose.
4. Make sure that when the engine is running, no objects come into contact with the fan.
   Objects which fall or project into the fan will be thrown back out or destroyed and could damage the fan.
5. At operating temperature, the engine cooling system is hot and under pressure.
   Avoid contact with parts carrying cooling water.
   There is a risk of burns.
6. Do not attempt to check the cooling water level until the screw cover of the expansion container is cool enough to touch.
   Open the cover carefully to release the excess pressure.
7. When running at or near the operating temperature, the engine oil and hydraulic oil are hot.
   Do not let hot oil or parts conducting oil come into direct contact with your skin.
8. Wear safety goggles and protective gloves when working on the battery.
   Avoid sparks and naked flames.
9. Never let anyone move the bucket or other working attachments into position by hand.
10. Before reaching into the engine compartment, ensure that the engine compartment hatches do not accidently fall down by using the struts provided for this purpose.
11. Before starting up the machine, the engine compartment hatches and the battery container covers should be closed and locked.

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12. Never get under the machine when it is propped up on the working attachment without first securely supporting the undercarriage on wooden beams.

2.6 Instructions for avoiding fires and explosions

1. When refuelling, the engine must be turned off. Shut down any auxiliary heating systems.
2. Do not smoke. Avoid naked flames when refuelling or where batteries are being recharged.
3. Always follow the instructions in the **Operator's Manual** when starting the engine.
4. Check the electrical system.
   Immediately eliminate all faults such as loose connections, worn cables or burnt out fuses and bulbs.
5. Do not transport any flammable liquids on the machine except in the tanks designated for this purpose.
6. Regularly check all leads, hoses and couplings for leaks and damage.
7. Immediately repair the leaks and replace the defective components.
   Oil escaping under pressure from leaks can easily cause fires.
8. Ensure that all supports and protective plates are properly installed so as to avoid vibrations, abrasion and heat build-up.
9. Starting aid (ether) is a particularly dangerous fire hazard.
   Never use volatile gas-based cold starting aids in the proximity of heat sources, naked flames (e.g. cigarettes) or in poorly ventilated spaces.
10. Do not use starting agents containing ethers to start diesel engines with preglow or flame glow systems.
    Otherwise there is a risk of **EXPLOSIONS**.
11. Familiarise yourself with the operation and location of fire extinguishers and obtain any available information on the local fire alarm and fire fighting facilities.

2.7 Safety instructions for start-up

1. Each time before starting up, perform a thorough tour of inspection.
2. Check the machine for loose bolts, cracks, wear, leaks and deliberate damage.
3. Never attempt to start a defective machine.
4. Ensure that any defects are rectified immediately.
5. Ensure that all hoods and covers are closed and locked. Check that all warning and information decals are present.
6. Make sure that the cab windows and inside and outside mirrors are clean, and secure the doors and windows against unforeseen movements.
7. Make sure that nobody is working on or under the machine. Warn persons in the vicinity that the machine is being started up.
8. After getting into the driver’s cab, adjust the seat, the inside and outside mirrors, the control lever and the seat belt so that you can work comfortably.

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9. Sound insulation equipment on the machine must be activated during operation.

2.8 Safety precautions during start-up

1. Before starting, check that all pilot lamps and instruments are in proper working order.
   Move all control levers to neutral.
2. Before starting the engine, briefly sound the horn to warn other persons in the vicinity of the machine.
3. Only start the machine when sitting in the driver's seat.
4. Unless otherwise instructed, start the engine in accordance with the instructions in the **Operator's Manual**.
5. Start the engine and then check all display and monitoring devices.
6. Never run the engine in an enclosed space unless there is sufficient ventilation.
   If necessary, open doors and windows to guarantee an adequate supply of fresh air.
7. Run the engine until both it and the hydraulic oil are at operating temperature. Low oil temperatures lead to sluggish performance.
8. Check that the control for the working attachment is functioning properly.
9. Drive the machine carefully to an open space and then check that the service brake, the steering and the signal and lighting equipment all function properly.

2.9 Instructions for safe working

1. Before starting work, acquaint yourself with the special features of the building site as well as special regulations and warning signals.
   The working environment includes, for example, any obstacles in the working area and on access roads, the load bearing capacity of the ground and any protective barriers to secure the site from the public roads.
2. Always maintain sufficient safety clearance from overhangs, edges, slopes and unstable ground.
3. Be especially careful when the ground conditions are variable, when your field of vision is restricted or under changing weather conditions.
4. Familiarise yourself with the position of the utility supply lines on the site and be especially careful when working in proximity to them. If necessary, inform the authorities repsonsible.
5. Maintain a sufficient safety clearance from overhead power lines.
   When working in close proximity to overhead power lines, be especially careful not to let the working attachment get close to the lines.
   – There is a risk of **FATAL INJURIES**.
   – Obtain information about the safety clearances to be observed.

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If you do come into contact with live power lines:
- Do not attempt to leave the machine!
- If possible, drive the machine a sufficient distance away from the danger area.
- Warn others not to approach or touch the machine.
- Arrange for the power to be switched off.
- Do not get out of the machine until you are certain that no current is flowing through the contacted/damaged power line!

6. Before driving or working with the machine, always make sure that the accessories have been stowed away so as to prevent accidents.
7. When driving on public roads, paths and spaces, observe the applicable traffic regulations and if necessary, make sure that the machine is road-worthy.
8. Always turn on the lights in the dark or when visibility is poor.
9. Do not allow anybody to ride on the machine.
10. Only work when seated and with your seat belt fastened.
11. Report all malfunctions and ensure that all necessary repairs are carried out immediately.
12. Personally ensure that nobody could possibly be endangered when you set the machine in motion.
13. Before starting work, check the brake system in accordance with the regulations in the **Operator's Manual**.
14. Never leave the driver's seat when the machine is still in motion.
15. Never leave the machine unattended when the engine is running.
16. When in motion, lower the working attachment into the transport position and keep the load as close to the ground as possible.
17. Avoid movements which could cause the machine to tip over.
    If the machine should start to tilt or slide to one side, set down the working attachment immediately and turn the machine so that it is facing downhill.
    Wherever possible, work up or downhill and not sideways to the slope.
18. Drive carefully on rocky or swampy ground or on slopes.
19. Only drive downhill within the permitted speed limit, otherwise you could lose control of the machine.
    The engine must be running at the rated speed and the travel speed must only be reduced by means of the pedals.
    Shift down to the lowest gear before reaching the slope. Do not wait until you are actually on it.
20. When loading a truck, insist that the driver leaves his cab, even when stone impact protection is provided.
21. With demolition work, clearance, crane operation etc., always use the protective equipment provided for these specific applications.
22. Where vision is restricted and whenever it is necessary, get an assistant to give you directions from outside.
    Only let one person give you directions.
23. Only assign experienced personnel to sling loads and direct crane operators.
    A second person should remain in visual contact with the operator or at the very least be in spoken contact with him.

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2.10 Safety instructions for driving on slopes

1. On downward slopes, always drive carefully and never at top speed, as you could otherwise lose control of the machine.
   Travel speeds:
   – The travel speed limits specified in the **Operator's Manual** must never be exceeded.
   – Exceeding the maximum speed causes the permitted limits to be exceeded for all rotating parts, such as the drive engine, the drive shaft, all gears including axles and ultimately the diesel engine itself.
2. Therefore, before driving onto a slope, a travel range (gear) should be previously selected, in which the machine can comfortably manage the whole slope without endangering other traffic, the driver or the machine itself.
3. When driving on slopes, you should also ease off the gas pedal.

2.11 Parking safely

1. If possible, only park the machine on firm, level ground.
   If it must be parked on a slope, then the machine should be secured against rolling away with wedges.
2. If the machine has an articulated design, the articulation lock must be installed.
   With wheel loaders, this applies to machines with articulated steering.
3. Lower the working attachment and lightly anchor the digging attachment in the ground.
4. Move all control levers into neutral position and engage the parking brake.
5. Shut down the engine in accordance with the instructions in the **Operator's Manual**.
6. Lock the working hydraulics before leaving the driver's cab.
   Lock the working hydraulics in accordance with the instructions in the **Operator's Manual**.
7. Secure all locks on the machine, take out all keys and secure it against unauthorised use and vandalism.

2.12 Transporting the machine safely

1. Only use suitable means of transport and lifting devices with sufficient lifting capacity.
2. Park the machine on a flat surface and wedge the tracks or wheels securely.
3. If necessary, dismantle part of the working attachment for the duration of transport.
4. The ramp for driving onto a low loader should have an inclination of no more than 30° and should be covered with wooden boards to prevent slipping.
5. Clean the machine tracks or wheels of snow, ice and mud before driving onto the ramp.

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6. Before driving on, lock the superstructure to the undercarriage with the locking pin.
   This procedure does not apply to wheel loaders.
7. Align the machine precisely with the loading ramp.
8. Attach the hand levers to the gas pedals for more responsive control.
   This procedure does not apply to wheel loaders.
9. A second person must give the machine driver directions.
   Drive carefully onto the ramp and then on to the transport vehicle itself.
10. Have wedges ready in case the machine starts to roll back while on the ramp.
11. Retract the working attachment and drive onto the loading ramp.
    Always keep the working attachment as close as possible to the loading bed.
12. After loading, set down the working attachment on the loading bed.
    Apply the articulation lock (this only applies to wheel loaders with articulated steering).
13. Secure the machine and the remaining individual components with chains and wedges against slipping.
14. Depressurise the pressure lines, take out the starting key, lock the driver's cab and side panels and leave the machine.
15. Acquaint yourself with the route before transport, especially as regards the width, height and weight limits you will encounter.
16. Make a special note of any overhead power lines, bridges and tunnels en route.
17. Proceed with the same care when unloading as with loading.
    Procedure:
    – Remove all chains and wedges.
    – Start the engine in accordance with the instructions in the **Operator's Manual**.
    – Drive carefully off the loading bed down a ramp.
    – Keep the working attachment as close as possible to the ground.
    – Get someone to give you hand signals.

2.13 Towing the machine safely

1. Always observe the correct procedure in accordance with the instructions in the **Operator's Manual**, see the section on towing the machine.
2. The machine may only be towed in exceptional circumstances, in order, for example to move the machine away from a dangerously exposed position for repairs.
3. When towing, check that all attachment and towing devices are safe and secure.
4. The rope or tow bar used for towing must have sufficient tensile strength and be fed through the boreholes provided for this purpose in the front section.
   In no event are damage or accidents resulting from towing covered by the manufacturer's guarantee.
   Instructions for towing by rope:
   – Make sure that nobody is standing in the vicinity of the taut rope
   – Keep the rope taut and avoid kinks
   – Carefully pull the rope until it becomes taut
   – Sudden jerks can cause a slack rope to tear

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5. When towing, maintain the prescribed transport position, observe speed limits and permitted routes.
6. When starting the machine up again, proceed in accordance with the instructions in the **Operator's Manual**.

2.14 Measures for ensuring safe maintenance

1. Never attempt maintenance or repair work unless you are qualified to do so.
2. Observe the prescribed periods or those specified in the **Operator's Manual** for cyclical checks and inspections.
   An appropriately equipped workshop is an absolute necessity for the proper execution of maintenance work.
3. Who must or may carry out what jobs is precisely defined in the table at the end of this **Operator's Manual**.
   The jobs listed under **daily/weekly** in the maintenance schedule can be carried out by the driver or by service personnel.
   The remaining jobs may only be carried out by specialist technicians with appropriate training.
4. Spare parts must meet the technical requirements set by the manufacturer. This is always guaranteed by the use of original spare parts.
5. Wear safety overalls for maintenance work. For certain jobs, safety goggles and protective gloves are required in addition to a hard hat and safety boots.
6. Keep unauthorised persons away from the machine during maintenance work.
7. Set up an extended cordon around the maintenance area if necessary.
8. Inform operating personnel in advance of specialist and maintenance work. Designate supervisory staff.
9. Unless otherwise specified in the **Operator's Manual**, carry out all maintenance work on the machine on firm level ground with the engine shut down.
10. Afterwards always re-tighten any bolts loosened during maintenance and repair work.
11. If safety equipment has to be dismantled for rigging, maintenance and repair work, it must be re-installed and checked as soon as the job is finished.
12. When undertaking maintenance jobs, especially work under the machine, attach a warning sign reading **DO NOT SWITCH ON** to the ignition where it is clearly visible. Remove the ignition key.
13. Clean the machines of oil, fuel or service fluids, especially from couplings and threaded connections. Do not use aggressive cleaning agents. Use fibre-free cloths.
14. Before starting any welding, burning or grinding work on the machine, remove all dust and flammable materials from the machine and ensure that there is sufficient ventilation.
    Otherwise there is a risk of **EXPLOSIONS**.
15. Before cleaning the machine with water, steam jets (high pressure cleaners) or other cleaning agents, cover or tape down all openings where safety or operational considerations require that no water, steam or cleaning agent may penetrate the machine.

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It is especially important to protect electric motors, control cabinets and battery casings.
Additional procedure:
- Make sure that during cleaning work on the machine housings, the temperature sensors for the fire alarm and extinguisher systems do not come into contact with hot cleaning agent. Otherwise the fire extinguishing system could be activated.
- After cleaning, completely remove the covers and tape.
- After cleaning, check all fuel, engine oil and hydraulic oil lines for leaks, loose connections, abrasion and damage.
- Rectify any defects as soon as they are discovered.

16. Note the safety regulations which apply to the respective product when handling oils, greases and other chemical substances.
17. Make sure that operating and auxiliary materials as well as replaced parts are disposed of safely in an environmentally friendly manner.
18. Be careful when handling hot operating and auxiliary materials (danger of burns and scalding).
19. Only operate internal combustion engines and fuel burning heating systems in spaces with sufficient ventilation. Before starting up in an enclosed space, make sure that there is sufficient ventilation. Observe the locally applicable regulations.
20. Only carry out welding, burning and grinding work on the machine if this has been expressly approved. There is a risk of fire and/or explosions.
21. Avoid lifting heavy components by yourself. Always use suitable lifting equipment with sufficient load-bearing capacity designed for this purpose.
    Procedure:
    - Carefully fix and secure individual components and larger assemblies to the lifting aids when they are being replaced to prevent risk of accidents.
    - Only use suitable lifting aids and slinging gear in a technically perfect working condition with sufficient load-bearing capacity.

    Keep out from under suspended loads.
22. Do not use ropes which are damaged or of insufficient load bearing capacity. Wear protective gloves when handling wire ropes.
23. Only assign experienced personnel to sling loads and direct crane drivers. A second person should be in visual contact with the operator or at the very least in spoken contact with him.
24. When carrying out fitting work above head height, use the safety climbing aids and working platforms provided or equivalent. Do not use machine parts as climbing aids. When working at greater heights, wear a safety harness. Keep all handles, steps, rails, gangways, platforms and ladders free from dirt, snow and ice.
25. Make sure when working on the attachment (e.g. when changing the teeth on the bucket) that sufficient support is provided. Avoid direct metal to metal contact when doing this.
26. Never get under the machine when it is propped up on the working attachment without first securely supporting the undercarriage on wooden billets.
27. Always jack up the machine so that any shifts in its centre of gravity do not jeopardise its stability, while at the same time avoiding any direct metal on metal contact.
28. Work on the chassis, the braking and steering systems may only be carried out by personnel with specialist training.
29. If the machine has to be repaired on a slope, the wheels must be secured with wedges. Move the working attachment into the maintenance position and insert the articulation lock.

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30. Only personnel with specialist knowledge and experience may work on the hydraulics.
31. Wear protective gloves when looking for leaks. Under pressure, a thin jet of liquid can pierce the skin.
32. Never release hydraulic lines or bolts before setting down the working attachment and shutting down the engine.
    All servo control devices (joystick and pedals) must then be moved in both directions – with the ignition key in the contact position – in order to relieve control pressure and ram pressure in the working circuits; in addition, release the internal tank pressure by unscrewing the bleeder screw.
33. Regularly check all hydraulic lines, hoses and screws for leaks and externally recognisable damage. Rectify all damage immediately. Oil escaping under pressure can result in injuries and fires.
34. Before beginning repair work, depressurise the system sections and pressure lines which are to be opened (hydraulics, compressed air) in accordance with the component descriptions.
35. Lay and install hydraulic and pneumatic lines properly. Do not mix up the ends of the hoses. Fittings, as well as the length and quality of the hose lines must match the manufacturer's requirements.
    Only use LIEBHERR spare parts.
36. Hydraulic hose lines should be replaced at the specified or appropriate time intervals, even where no safety-related deficiencies are apparent.
37. Work on the machine's electrical equipment may only be carried out by a qualified electrician or by instructed persons under the direction and supervision of a qualified electrician, in accordance with the recognised electrical engineering rules.
38. Only use original fuses with the prescribed ratings. If there is a malfunction in the electrical power supply, switch off the machine immediately.
39. Inspect and test the machine's electrical equipment regularly. Immediately rectify all faults, such as loose connections, scorched or worn cables or burnt out fuses and bulbs.
40. If it is necessary to carry out work on live components, then obtain the assistance of a second person, who in an emergency can throw the emergency stop or main switch with voltage trip-out. Cordon off the working area with a red and white safety chain and a warning sign. Only use insulated tools.
41. When working on high-voltage assemblies after they have been isolated from the power supply, short the supply cable and the components, such as capacitors with an earthing rod.
42. First, check that the isolated parts are not live, connect them to earth and then short them. Isolate adjacent components which are still live.

2.15 Safety instructions for maintenance work to the machine with hydro accumulator

1. All work on the hydraulic and pneumatic connections of the membrane accumulator may only be carried out by qualified technicians.
   Serious accidents could result from improper fitting and operation.
   The hydrualic system must be depressurised before work can be carried out on it.

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Do not carry out any welding or souldering work on the membrane accumulator.

Risk of explosion with welding or soldering work

Risk of bursting and loss of operating permit with mechanical processing.

Hydro accumulators may only be filled with nitrogen, not with oxygen or air - **risk of explosion!**

The accumulator body can heat up, risk of burning.

Do not use membrane accumulators which have been damaged during transportation.

New membrane accumulators must be filled with nitrogen before they are used. Remove the sealing caps on the fluid side.

The minimum and maximum operating data are permanently marked on the membrane accumulator. The marking must remain visible.

2.16 Safety instructions for welding work on the machine

1. Only the manufacturer or an authorised contractor is permitted to carry out welding work on . . power transmitting assemblies (e.g., chassis or attachments).

   Disconnect the battery when working on the electrical system or when carrying out arc welding on the machine.

   Always disconnect the negative terminal first and reconnect it last.

   With machines with an electronic gearbox control unit:

   – In addition, disconnect the multi-pin plug on the electronic gearbox control unit before starting any welding work on the machine.

   The earth cable of the welding device should be brought as close as possible to the actual welding location, so that it is not possible for the welding current to flow through components or sealing elements (e.g. slewing ring, joints, bearings, bushes, rubber components, seals, etc.) . . .

2.17 Instructions for working safely on machine attachments

1. Do not work underneath the attachment unless it is resting safely on the ground or is properly supported.
2. Avoid metal to metal contact when exchanging attachments . . (decal, cutting edge, teeth etc).
3. Never attempt to lift heavy components by yourself. Always use suitable lifting equipment with sufficient load-bearing capacity designed for this purpose.
4. Always wear gloves when working with wire ropes.
5. Never release hydraulic lines or bolts before setting down the working attachment and shutting down the engine.

   All servo control devices (joystick and pedals) must then be moved in both directions – with the ignition key in the contact position – in order to relieve control pressure and ram pressure in the working circuits; in addition, release the internal tank pressure by unscrewing the bleeder screw.

6. Ensure that all lines and threaded couplings are reconnected and re-tightened on completion of the jobs.
7. Be especially careful when removing or inserting bolts and pins made of hardened steel, as they can splinter, causing serious injury.
   Always wear protective gloves and safety goggles.
   Whenever possible use special tools (such as mandrels, extractors, etc.) . . .

2.18 Safety regulations when transporting the machine by crane

1. Lower the attachment and tilt back the loading attachment to its stop limit.
2. Apply the articulation lock (this only applies to wheel loaders with articulated steering).
3. Move all control levers into neutral position and engage the parking brake.
4. Shut down the engine in accordance with the instructions in the **Operator's Manual**.
5. Lock the working hydraulics before leaving the driver's cab.
   Block the working hydraulics in accordance with the instructions in the **Operator's Manual**.
6. Close all doors, covers and hoods securely.
7. Only assign experienced personnel to sling loads and direct crane operators. A second person should remain in visual contact with the operator or at the very least be in spoken contact with him.
8. Attach the lifting tackle to the lugs and bore holes provided on the machine.
9. Ensure that the lifting tackle is of sufficient length.
10. Raise the machine carefully.
11. **CAUTION Keep out from under the machine when it is raised.**
12. When restarting the machine, proceed strictly according to the **Operator's Manual**.

2.19 Safe maintenance of hydraulic hoses and hose lines

1. Never attempt to repair hydraulic lines and hydraulic hoses.
2. All hoses, hose lines and threaded couplings must be checked regularly, at the very least once a year for leaks and visible signs of damage.
   Replace damaged parts immediately. Oil escaping under pressure can result in injuries and fires.
3. Even when properly stored and subjected to normal load, hoses and hose lines are subject to natural ageing. This limits their service life.
4. Improper storage, mechanical damage and loads in excess of permitted limits are the most common causes of malfunctions.
5. The service life of a hose line should not exceed six years, including a storage period of no more than 2 years (note the date of manufacture on the hoses).

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6. The service life may be reduced if the hoses are frequently subject to the maximum permissible loading (e.g. due to high temperatures, frequent movement cycles, extremely high pulse frequencies, multiple-shift operation).
7. Hoses and hose lines should be replaced if any of the following conditions are discovered during inspection.
   Criteria:
   – Damage to the outer layer penetrating through to the inner layer (e.g. abrasion, cuts and tears)
   – Brittle outer layer (cracks in the hose material)
   – Deformation out of the natural shape of the hose or the hose line, both when pressurised and depressurised or at bends, e.g. layer separation, blistering
   – Leaks
   – Non-observance of the installation requirements
   – Damage or deformation of the hose fittings, which reduces the strength of the fittings or the hose/fitting coupling
   – Slippage of the hose out of the fitting
   – Corrosion of the fitting, impairing its function and strength
   – Exceeding the prescribed storage period or service life
8. Only use original spare parts when replacing hoses and hose lines.
9. Lay and install hoses and hose lines properly. Do not mix up the ends of the hoses.

2.20 Attachments and accessories

1. Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting may not be installed or fitted on the machine without prior written consent from LIEBHERR.
2. The appropriate technical documentation should be made available to LIEBHERR for this purpose.

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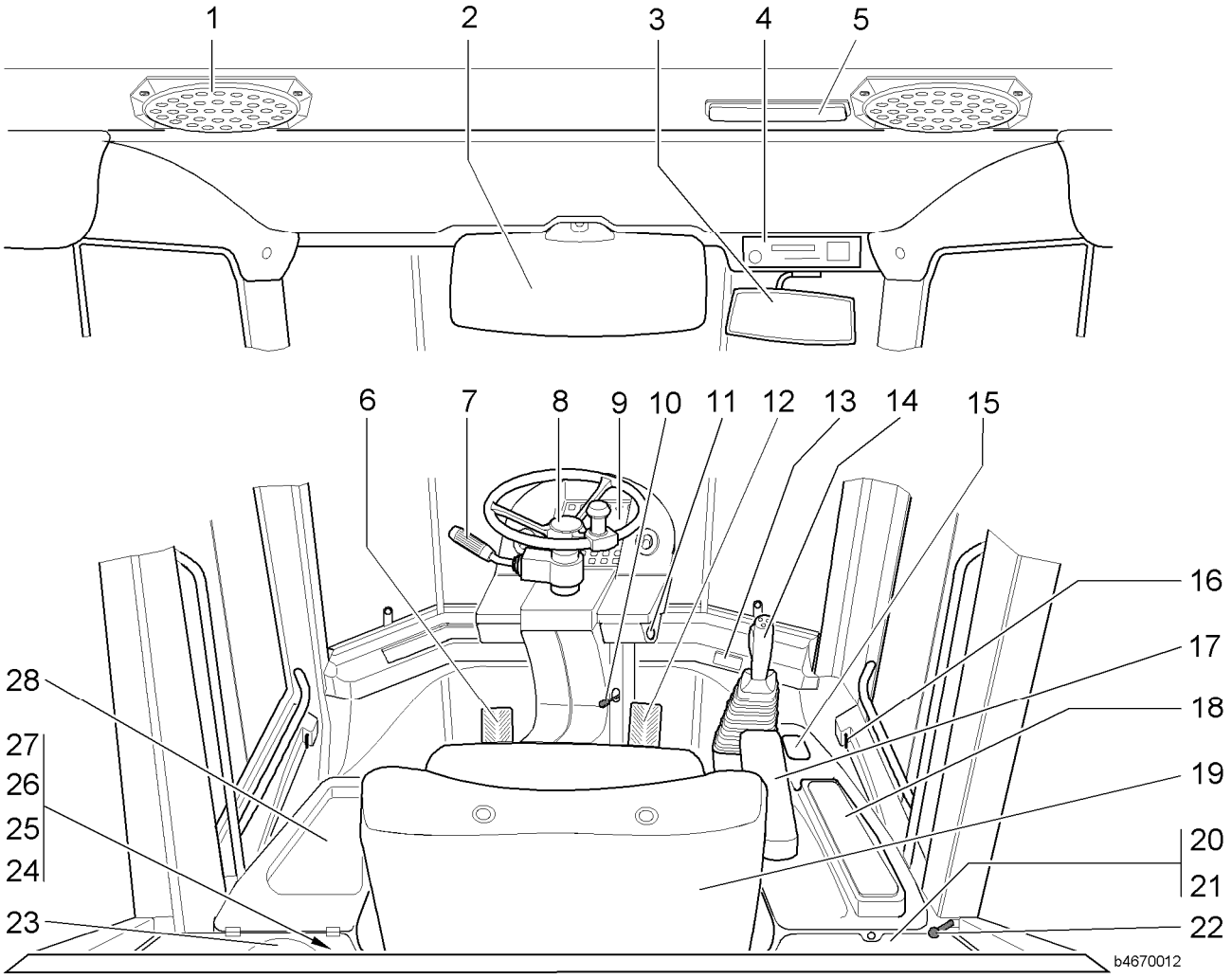
3 Operation, Handling

3.1 Layout of controls and instruments



Inside view of the driver's cab

1 Radio loudspeaker
2 Sun visor
3 Interior mirror
4 Radio (optional)
5 Interior illumination with switch
6 Brake / inching pedal
7 Steering column switch
8 Adjustable steering column with steering wheel
9 Display unit
10 lever – steering column adjustment
11 Starter switch
12 Gas pedal
13 Ashtray
14 LIEBHERR control lever
15 Control lever mounting for optional working functions
16 Door handle (right-hand door)
17 Adjustable arm rest
18 Switches on the side cover (control console)
19 Driver's seat
20 Fuse box
21 Box with control electronics and relays
22 Ventilation vent adjustment lever
23 Round glove compartment
24 Heater controls
25 Ventilation controls
26 Heating/ventilation/air-conditioning system oulet nozzles
27 Cigarette lighter socket
28 Glove compartment with cover

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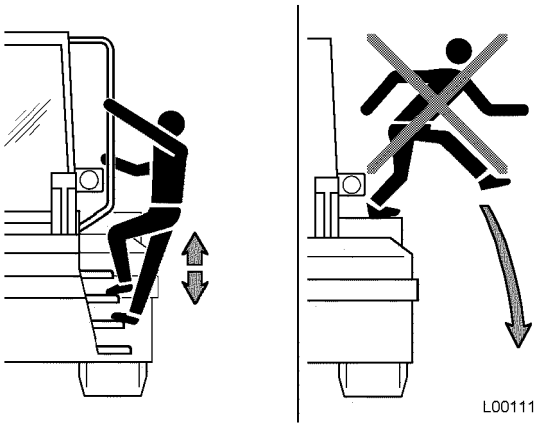
3.2 Operation

3.2.1 Cab access

Only get on and off the machine using the access aids provided.
Normally, the driver's cab must be entered and exited through the left-hand driver's cab door. The right-hand driver's cab door is provided as an emergency exit and therefore should only be used in this event.
Familiarise yourself with the emergency exit through the right-hand cab door. Refer to the section on the "emergency exit".



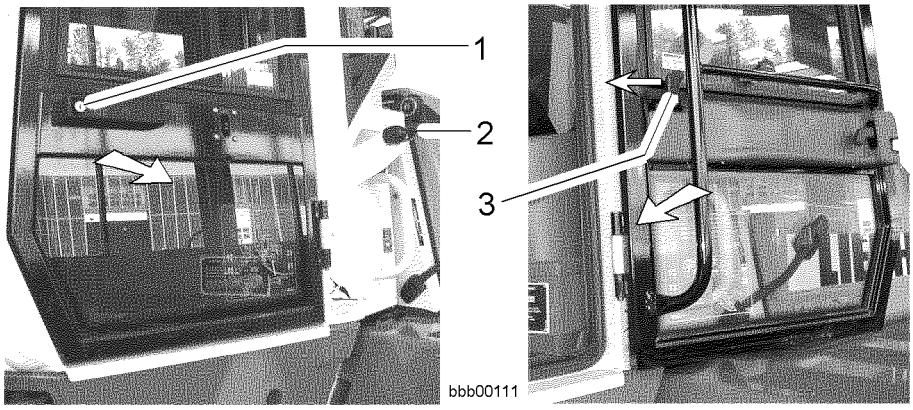
Warning

You risk injury if you jump or fall off the machine.
! Use the steps, ladders and handles provided for getting on and off.
! Never jump down from the machine.

Warning

There is a risk of injuries if the machine suddenly moves.
! Do not hold onto the steering column, the control panel or the control levers when getting on or off.

Entering the driver's cab



Entering the driver's cab

1 Door handle with lock
2 Door holder
3 Door holder lever

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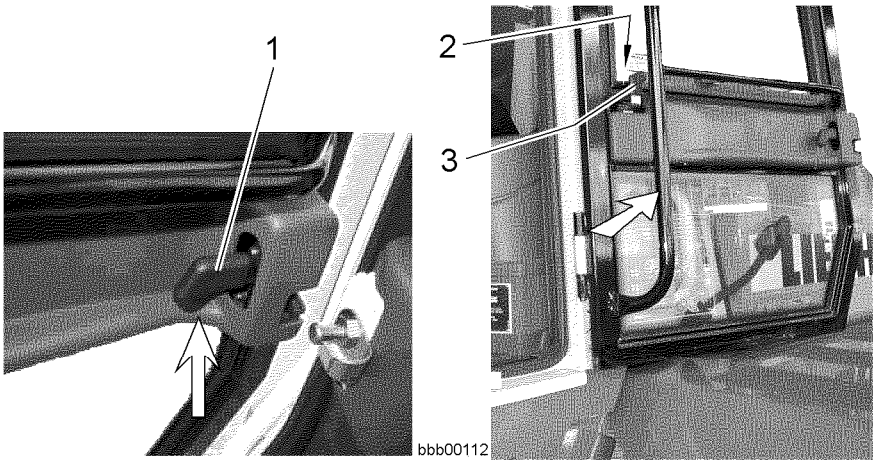
- Open the lock of the driver's cab door with the starting key.
- Open the driver's cab door with the door handle **1** until it locks into the door holder **2**.
- Enter the driver's cab.
- Release and shut the driver's cab door with the door holder lever **3**.

Exiting the driver's cab

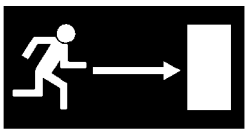


Exiting the driver's cab

1 Door opener lever
2 Door holder
3 Door holder lever

- Open the driver's cab door with the door opener lever **1** until it locks into the door holder **2**.
- Exiting the driver's cab.
- Release and shut the driver's cab door with the door holder lever **3**.
- Shut the lock of the driver's cab door with the starting key.

3.2.2 Emergency exit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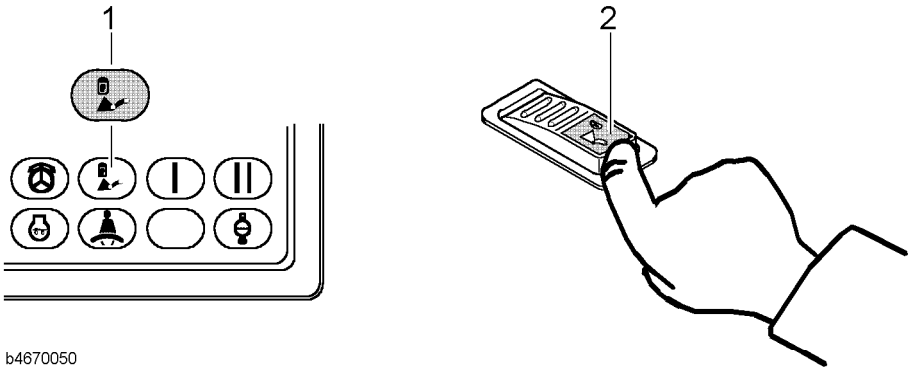
The right-hand driver’s cab door is provided as an emergency exit and therefore should only be used in this event.

Before starting up the machine, check that the driver’s cab can be exited through the right-hand driver’s cab door from inside without any hindrance.

Leaving the driver's cab by the emergency exit

Before leaving the driver's cab activate the working hydraulics lock.

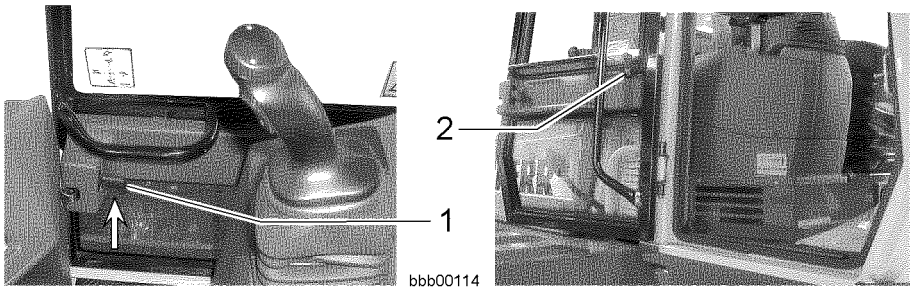


Working hydraulics lock switch

1 Working hydraulics lock symbol field
2 Working hydraulics lock switch

- Press the switch **2** for working hydraulics lock.

The symbol field **1** for the working hydraulics lock must light up.
The working hydraulics are no longer operational.

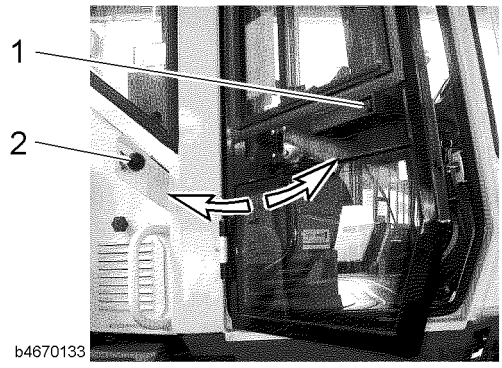


Door - Inside emergency exit

1 Door opener lever
2 Door holder

- Open the driver's cab door with the door opener lever **1** until it locks into the door holder **2**.
- Exiting the driver's cab.

Open the emergency exit from the outside



Door - Inside emergency exit

1 Door handle with lock
2 Door holder

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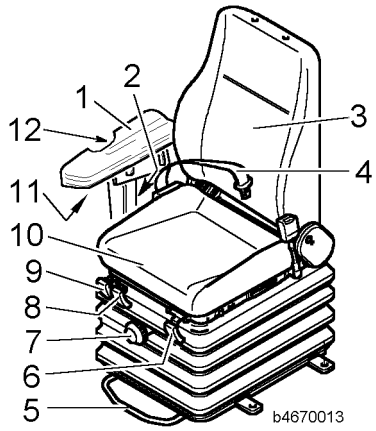
- Open the driver's cab door with the door handle **1** until it locks into the door holder **2**.

3.2.3 Driver's seat with gas spring suspension

Layout



Driver's seat – main components and adjustable elements

1 Arm rest
2 Star-grip for arm rest height adjustment
3 Back rest
4 Safety belt
5 Lever for horizontal adjustment
6 Lever for back rest adjustment
7 Weight adjustment rotary knob
8 Lever for adjusting front seat inclination
9 Lever for adjusting rear seat inclination
10 Seat surface
11 Locking screw for arm rest horizontal adjustment
12 Locking screw for adjusting the arm rest inclination

Individual adjustment for ergonomic seating position

The seat can be adjusted to the driver's individual requirements to provide the highest possible degree of comfort.

Adjusting the driver's seat for use on public roads

Warning

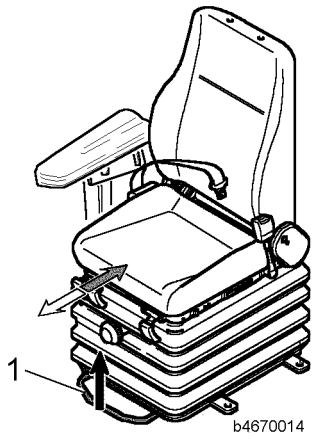
There is a risk of injuries if the driver's seat is not properly adjusted.

! When driving on public roads, the driver's seat may only be adjusted when the machine is at a standstill.

- Adjust the driver's seat before starting the machine.

Horizontal adjustment

The seat can be moved backward or forward adjustment by means of the lever **1** at the front of the driver's seat.



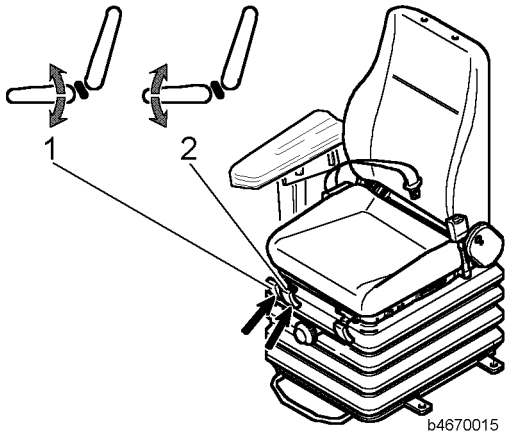
Horizontal adjustment

1 Lever for horizontal adjustment

- Pull lever **1** in the direction of the arrow,
- Adjust the driver’s seat horizontally and release the lever.

Seat surface inclination

The adjustment is made with the levers **1** and levers **2** at the front right of the driver's seat.



Adjusting the seat surface and seat height

1 Lever for adjusting rear seat inclination

2 Lever for adjusting front seat inclination

- To adjust the rear seat tilt angle Pull lever **1** in the direction of arrow, adjust inclination and release lever.
- To adjust the front seat tilt angle Pull lever **2** in the direction of arrow, adjust inclination and release lever.

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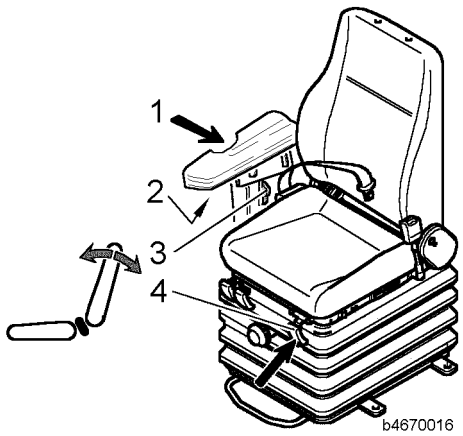
Adjusting the seat height

The adjustment is made with the levers **1** and levers **2** at the front right of the driver's seat.

- Raise lever **1** and lever **2** simultaneously.
- Move the seat to the required height and release both levers.

Adjusting the back rest

The tilt angle of the backrest is adjusted with lever **4** on the left-hand side of the driver's seat.



Adjusting the back rest and arm rest

1 Locking screw for adjusting the arm rest inclination
2 Locking screw for arm rest horizontal adjustment
3 Star-grip for arm rest height adjustment
4 Lever for back rest adjustment

- Raise lever **4**.
- Move the seat to the required inclination and release both levers.

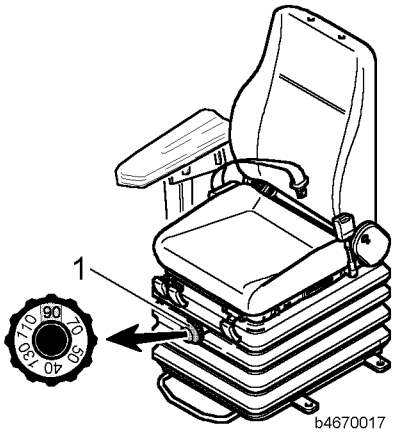
Adjusting the arm rest

The height, inclination and horizontal position of the arm rests can be adjusted separately.

- Height adjustment: release star grip **3**, adjust height and lock in place.
- Adjustment of inclination: release clamp screw **1**, adjust tilt angle and lock in place.
- To adjust horizontally release clamp screw **2**, adjust arm rest horizontally and lock in place.

Adjusting the seat suspension

The seat suspension can be adjusted to the driver's individual body weight.
Adjustments can be made by turning the rotary knob **1** at the front of the driver's seat.
The figures on the rotary knob indicate the set body weight in kg.



Adjusting the seat suspension

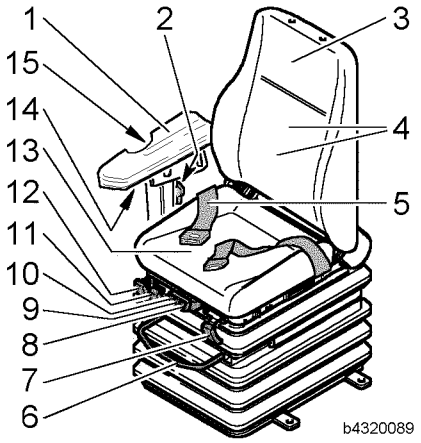
1 Weight adjustment rotary knob

- Set the appropriate body weight with the rotary knob **1**.

3.2.4 Driver's seat with pneumatic suspension

This equipment is optional.

Layout



Driver's seat – main components and adjustable elements

1 Arm rest
2 Star-grip for arm rest height adjustment
3 Back rest
4 Lumbar support chambers
5 Safety belt
6 Lever for horizontal adjustment
7 Lever for back rest adjustment
8 Top lumbar support chamber button
9 Lower lumbar support chamber button
10 Weight adjustment button
11 Lever for adjusting front seat inclination

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12 Lever for adjusting rear seat inclination
13 Seat surface
14 Locking screw for arm rest horizontal adjustment
15 Locking screw for adjusting the arm rest inclination

Individual adjustment for ergonomic seating position

The seat can be adjusted to the driver's individual requirements to provide the highest possible degree of comfort.

Adjusting the driver's seat for use on public roads

Warning 

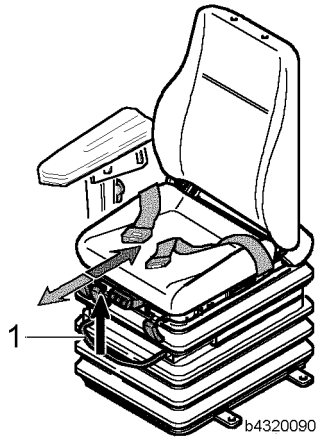
There is a risk of injuries if the driver's seat is not properly adjusted.

! When driving on public roads, the driver's seat may only be adjusted when the machine is at a standstill.

- Adjust the driver's seat before starting the machine.

Horizontal adjustment

The seat can be moved backward or forward adjustment by means of the lever **1** at the front of the driver's seat.



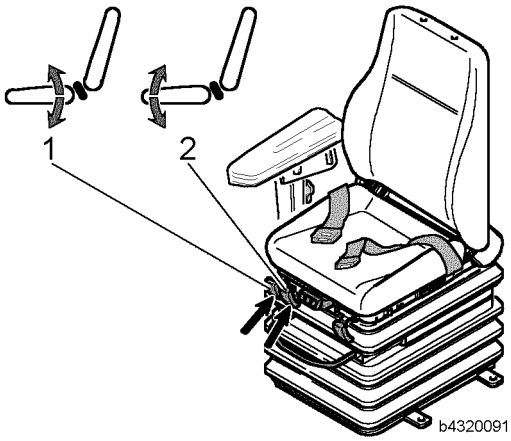
Horizontal adjustment

1 Lever for horizontal adjustment

- Pull lever **1** in the direction of the arrow,
- Adjust the driver's seat horizontally and release the lever.

Seat surface inclination

The adjustment is made with the levers **1** and levers **2** at the front right of the driver's seat.



Adjusting the seat surface and seat height

1 Lever for adjusting rear seat inclination
2 Lever for adjusting front seat inclination

- To adjust the rear seat tilt angle Pull lever **1** in the direction of arrow, adjust inclination and release lever.
- To adjust the front seat tilt angle Pull lever **2** in the direction of arrow, adjust inclination and release lever.

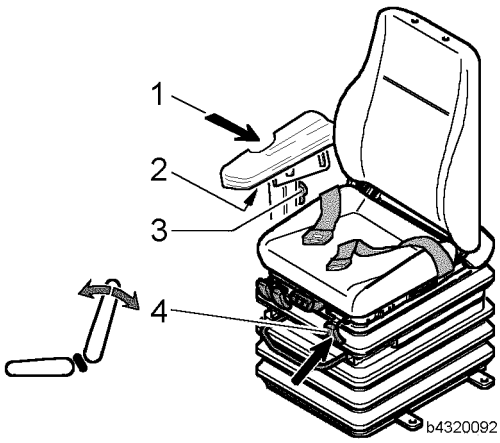
Adjusting the seat height

The adjustment is made with the levers **1** and levers **2** at the front right of the driver's seat.

- Raise lever **1** and lever **2** simultaneously.
- Move the seat to the required height and release both levers.

Adjusting the back rest

The tilt angle of the backrest is adjusted with lever **4** on the left-hand side of the driver's seat.



Adjusting the back rest and arm rest

1 Locking screw for adjusting the arm rest inclination
2 Locking screw for arm rest horizontal adjustment
3 Star-grip for arm rest height adjustment
4 Lever for back rest adjustment

- Raise lever **4**.
- Move the seat to the required inclination and release both levers.

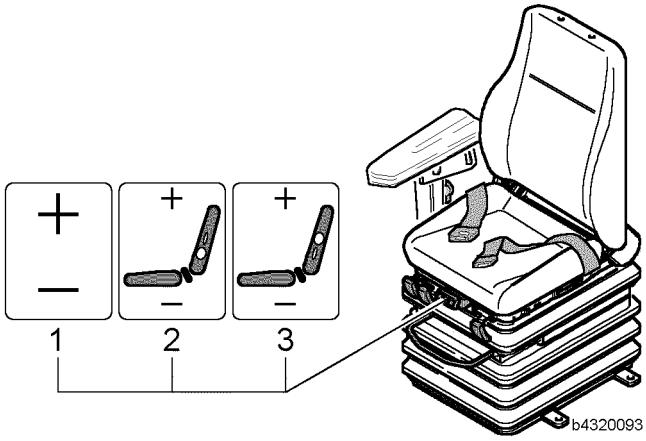
Adjusting the arm rest

The height, inclination and horizontal position of the arm rests can be adjusted separately.

- Height adjustment: release star grip **3**, adjust height and lock in place.
- Adjustment of inclination: release clamp screw **1**, adjust tilt angle and lock in place.
- To adjust horizontally release clamp screw **2**, adjust arm rest horizontally and lock in place.

Adjusting the seat suspension

The seat suspension can be adjusted to the driver's individual body weight.
The weight can be adjusted using the button **1** at the front of the driver's seat.



Adjusting the seat suspension and lumbar support

1 Weight adjustment button
2 Lower lumbar support chamber button
3 Top lumbar support chamber button

- Press button **1** and set the damping system according to the body weight into the central position.

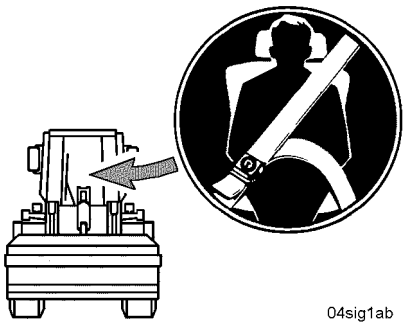
This does not adjust the height.

Adjusting the lumbar support

The contours of the back rest can be adapted to the driver's body.

- Press button **2** to fill the bottom lumbar chamber with air or release air.
- Press the button **3** to fill the top lumbar chamber with air or to release the air.

3.2.5 Safety belt (automatic belt)



Compulsory wearing of seat belts

Observance of safety factors

The driver's cab is equipped with roll-over protection – **ROPS**.

The ROPS roll-over protection system only affords the driver protection when the seat belt has been fastened.

This section describes the safety features of wearing the seat belt.

Warning

There is a risk of injuries if the seat belt is not fastened.
If the machine is braked or stops abruptly, the driver may suffer severe injuries if he is not wearing a seat belt.

! It is essential that you fasten your safety belt before starting up the machine.

Danger

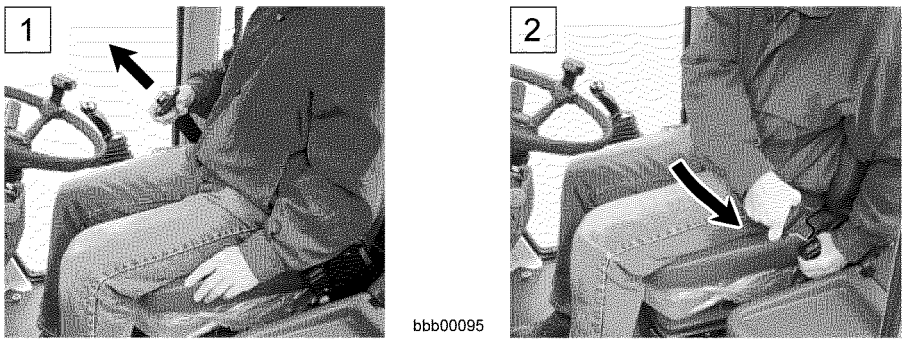
There is a risk of injuries if the seat belt is not fastened.
If the machine tips or rolls over, the driver could suffer fatal injuries if he is not wearing a seat belt.

! It is essential that you fasten your safety belt before starting up the machine.

- To guarantee your safety: Regularly check the condition, proper functioning and anchorage of the seat belt.
- Immediately replace damaged parts.
- The safety belt may not be twisted when in use.

Putting on the safety belt

The safety belt is an automatic belt.
No adjustment of the belt length is required.



Putting on and locking the belt

- Hold the buckle with the right hand.
- Pull the belt briskly out of the roller.

NOTE: When the belt is pulled out too quickly, it can be blocked by the roller.

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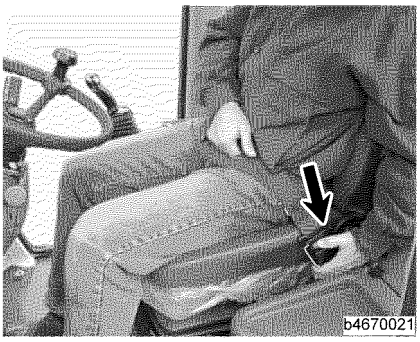
- Hold the snap lock with the left hand.
- Pull the belt over your body at hip level.
- Insert the buckle in the snap lock.
- Check that the snap lock is engaged by pulling the clasps.

Releasing the seat belt

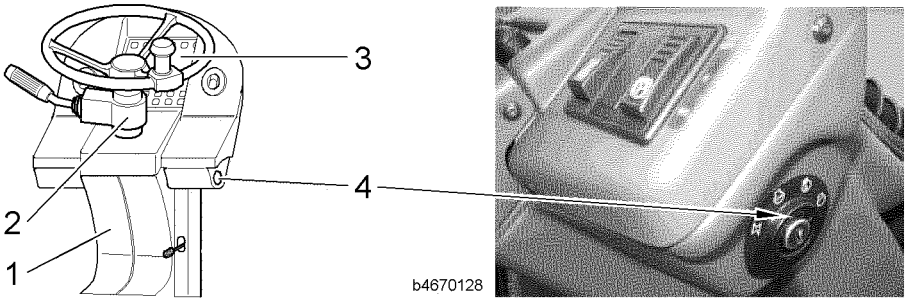
- Release the seat belt: pushing the catch on the snap lock downward with your thumb.



Releasing the seat belt

3.2.6 Steering consule with steering column, instrument panel and starter switch

Layout



Steering consule

The steering consule **1** contains:
– at the front of the steering column **2** with the steering wheel and steering column switch,
– At the top the instrument panel **3**,
– On the right the starter switch **4**.

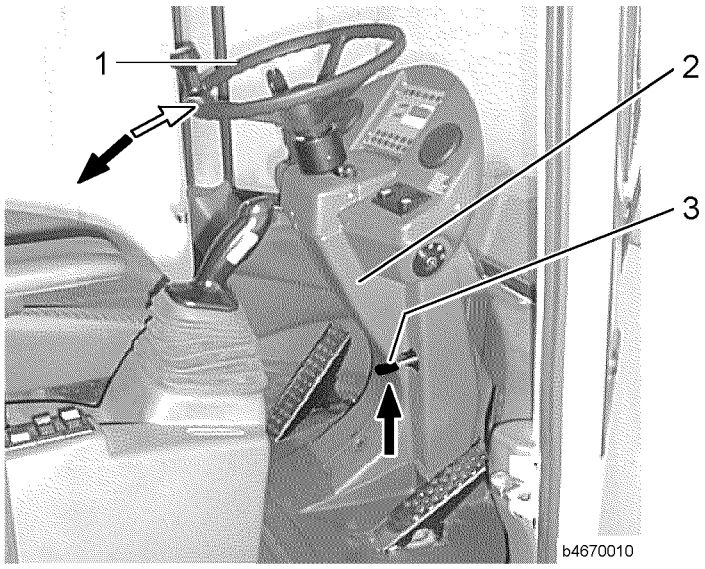
Adjusting the steering column

The steering wheel can be adjusted to meet the driver's individual requirements by adjusting the steering column.
Continuous adjustment is possible.

Warning

There is a risk of injuries if the steering column is incorrectly adjusted.

! When driving on public roads, the steering column may only be adjusted when the machine is at a standstill.



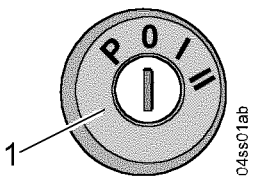
Adjusting the steering column

1 Steering wheel
2 Steering column
3 Lever

- Raise lever **3** by hand in the direction of the arrow.
- By pulling or pushing the steering wheel **1**, adjust the steering column **2** as required.
- Release the lever **1** to lock the selected position of the steering column **2**.

3.2.7 Starter switch

The starter switch is equipped with a repeat start lock. The starting key can be pulled out when in the 0 – 0 position / engine shutdown.
When the starting key is in the 0 position or parking position, the following consumer units can be switched on from the instrument panel:
– Parking and driving light
– Hazard warning system
– Working floodlight
– Flashing beacon



Starter switch

Layout

Switch positions:
P – Park position
0 – 0 position / engine shutdown
I – Contact, operating preglow position
II – Starting position

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Switching the electrical system on and off

- Switch the electrical system on or off with the starter key.

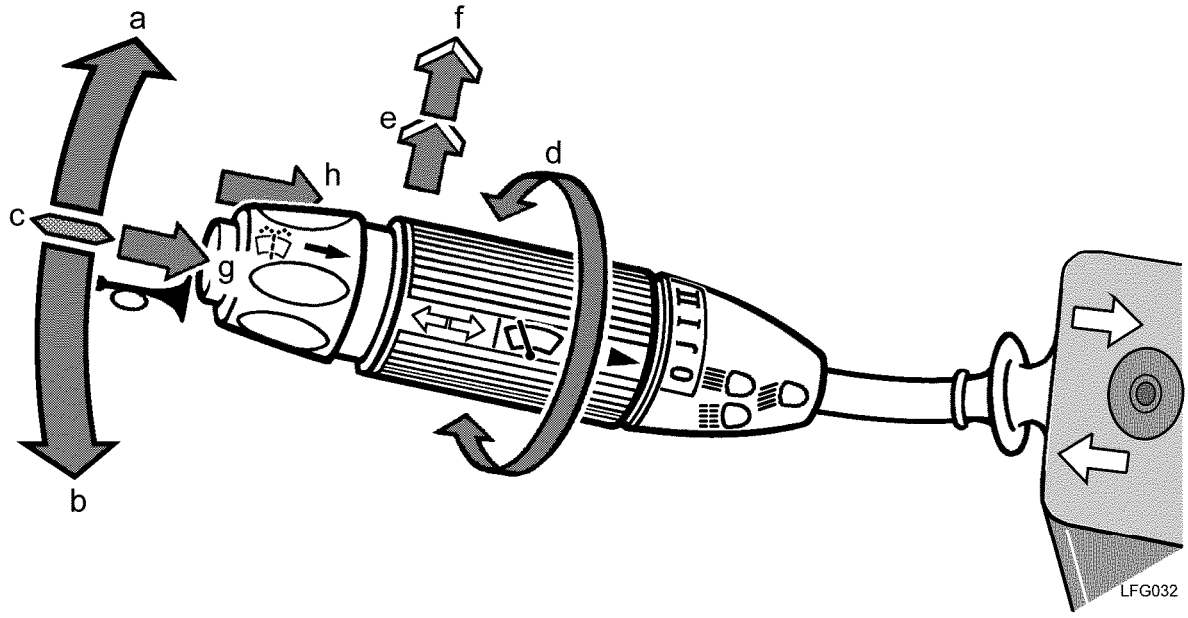
3.2.8 Steering column switch

The steering column switch is mounted on the left-hand side of the steering column.

Layout

The steering column switch consists of controls for the following:
– Drive direction display
– High beam
– Horn and headlight flasher
– Front windscreen wiper
– Windshield wiper and washer system for the front windscreen

Function description



Steering column switch

Functions of the steering column switch when activated in each direction:
a – Drive direction display: right-hand flashing lights
b – Drive direction display: left-hand flashing lights
c – Centre position: neutral position
d – Windshield wiper: front windscreen
- **0** – Level 0
- **J** – Interval
- **I** – Level I
- **II** – Level II

e – Headlight flasher
f – High beam: full headlights
g – Acoustic horn: horn
h – Windshield wiper / washer system: front windscreen

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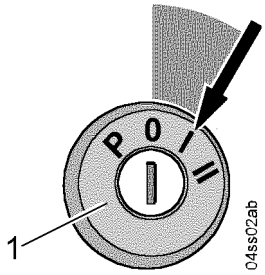
Operating the parking light, driving light or high beam

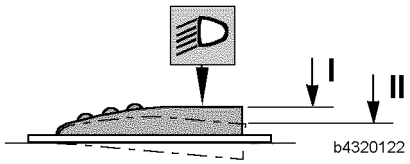
Make sure that the electrical system is switched on.



Starter switch contact position

Switching the parking light / driving light on and off

Switching on the parking light / driving light



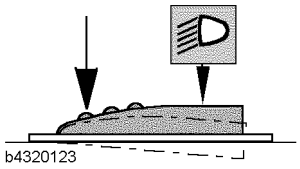
- Turn the parking/driving light to level **I**.

The parking light goes on.

- Turn the parking/driving light to level **II**.

The driving light goes on.

Switching off the parking light / driving light

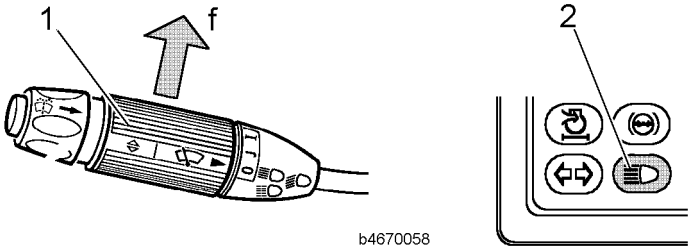


- To switch off the parking light and driving light: push the switch all the way back.

All functions are switched off.

Switching on the driving light high beam

Make sure that the switch for the parking/driving light is pushed down.



Steering column switch and indicator unit

1 Steering column switch 2 High beam symbol field

- Press the switch for parking/driving light.

The driving light goes on.

- Push the steering column switch in direction - **f**.

The symbol field **2** for the driving light must light up.
The high beam lights up.

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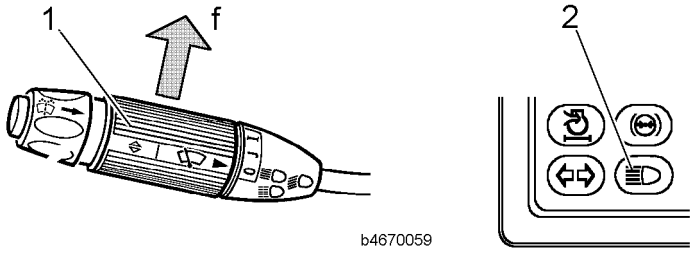
Switching back to driving light low beam



Steering column switch and indicator unit

1 Steering column switch
2 High beam symbol field

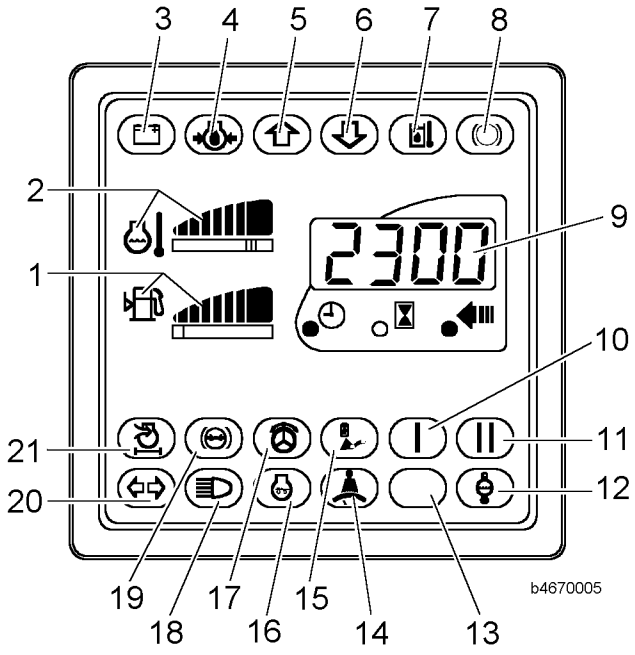
- Switching over to dipped beam: push the steering column switch in direction - **f**.

The symbol field **2** for the headlight must go out.
The driving light low beam lights up.

3.2.9 Display unit

The layout and function of the control unit are described in this section.

Layout



Display unit

1 Fuel supply segment field
2 Coolant temperature segment field
3 Battery charging symbol field (charge control)
4 Engine oil pressure symbol field
5 Symbol field – travel direction “forward”
6 Symbol field – travel direction reverse
7 Hydraulic oil overheating symbol field
8 Parking brake symbol field
9 LC display for travel speed, service hours and time
10 Travel range I symbol field
11 Travel range -II- symbol field

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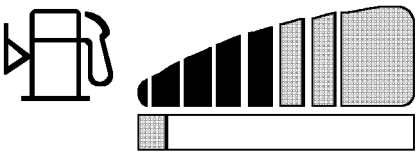
12 Engine overheating symbol field
13 Special function symbol field
14 Safety belt symbol field
15 Working hydraulics lock symbol field
16 Preglow monitor symbol field
17 Emergency steering symbol field
18 High beam symbol field
19 Braking system accumulator pressure symbol field
20 Direction indicator system symbol field
21 Air filter contamination symbol field

The display unit is installed at the front on the instrument panel.
It consists of segment and symbol fields as well as an LC display for the various warning or display functions.
Each symbol field is assigned the appropriate colour (red, yellow, green or blue).

Function description

Fuel supply tank content display


bsym0022

Segment field **1** – fuel supply

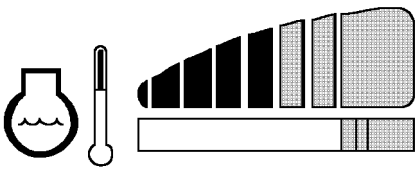
Segment field colour - black

On the lower bar, the boundary range for reserve is marked in red.

Indicates the level of the diesel fuel tank.

Warning function: If the fuel sensor fails, the middle bars 4 and 5 flash.

Coolant temperature display


bsym0023

Segment field **2** coolant temperature

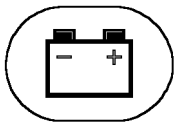
Segment field colour - black

On the lower bar, the boundary range for excess temperature is marked in red.

Indicates the coolant temperature.

Warning function: If the display sensor fails, the middle bars 4 and 5 flash.

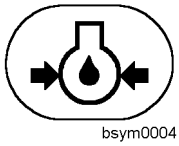
Battery charge control display


bsym0003

3 Battery charge (charge control) symbol field

Symbol field colour – red
Warning functions:
– Lights up when the starting key is at the ignition position - **I**.
When the diesel engine has started, the symbol field goes out.
– It will light up, for instance, if the V-ribbed belt of the alternator drive tears.

Engine oil pressure display


bsym0004

4 Engine oil pressure display

Symbol field colour – red
Warning functions:
– Lights up when the starting key is at the ignition position - **I**.
When the diesel engine has started, the symbol field goes out.
– Flashes when the engine oil pressure drops. – **Prerequisite:** the diesel engine is running


bpik0008

The warning function of the symbol field is supplemented accoustically by a “tone sounding at intervals (without pauses)”.

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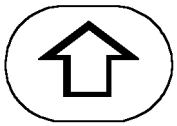
Forward travel direction display

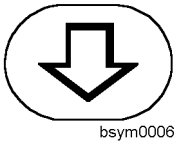

bsym0005

5Forward travel direction symbol field

Symbol field colour – green

Displays that the selected travel direction of the machine is “forwards”.

Reverse travel direction display

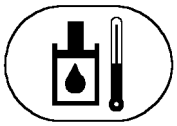

bsym0006

6Reverse travel direction symbol field

Symbol field colour – green

Displays that the selected travel direction of the machine is “reverse”.

Hydraulic oil overheating display


bsym0007

7 Hydraulic oil overheating symbol field

Symbol field colour – red
Warning functions:
– Lights up continuously when the hydraulic oil temperature is too high.

When the symbol field lights up:
– The fan switches on at maximum speed,
– the travel range is automatically switched back to - **I** -,
– the symbol fields – travel range - **I** - and - **II** - light up.


bpik0012

The warning function of the symbol field is supplemented accoustically by a “tone sounding at intervals”.

Acoustic warning: Interval tone sounds (without pause) until the cause is corrected.

Parking brake activation display


bsym0008

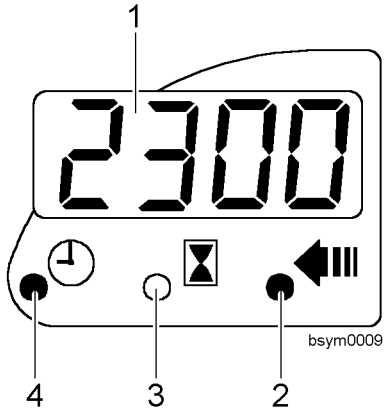
8 Parking brake symbol field

Symbol field colour – red
Warning functions:
– Lights up when the ignition key is turned to contact, run, preglow position – **I**.
– Lights up when the parking brake is engaged
When the parking brake is released, the symbol field goes out.

Displaying speed, operating hours or time

LC display **9** - travel speed, operating hours or time **1**

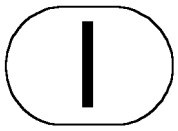
Field colour - yellow (with backlighting)
Display functions:
– Diode **2** – displays the machine's travel speed,
– Diode **3** – display's the machine's operating hours,
– Diode **4** – displays the time.



LC display

LBH/01/003801/0003/10.03/en

Displaying travel range - I -


bsym0010

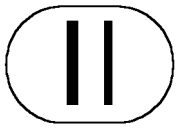
Symbol field **10** – travel range - **I** -

Symbol field colour – green

Displays the machine's preselected travel direction - **I**.

Lights up when the machine is in travel range - **I**.

Displaying travel range - II -


bsym0011

11 Travel range - **II** - symbol field

Symbol field colour – green

Displays the machine's preselected travel range - **II** -

Lights up when the starting key is in position - **I** - and when the engine starts up.

Lights up when the machine is in travel range - **II** -.

Displaying or reporting engine overheating

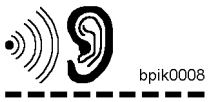

bsym0012

Symbol field **12** – engine overheating

Symbol field colour – red

Warning functions:

– Lights up when the coolant temperature is too high.
– Lights up when the cooling blower-drive breaks down


bpik0008

The warning function of the symbol field is supplemented accoustically by a "tone sounding at intervals (without pauses)".

Special function

bsym0013

Symbol field **13** – special function

Not assigned. Symbol field colour – red

Reserved for special function.

Instruction to use the safety belt


bsym0014

Symbol field **14** – safety belt

Symbol field colour – yellow

Display function:

– Indicates the safety belt should be worn.
  Flashes at starting key position - **I** -.
  After the engine has started, the symbol field goes out after approx. 15 seconds.

Working hydraulics lockout activation display


bsym0015

15 Working hydraulics lockout symbol field

Symbol field colour – red

Lights up when the working hydraulics lockout is activated.

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Preglow monitoring


bsym0016

16 Preglow monitor symbol field

Symbol field colour – yellow
Function:
– at external temperature of 0° C and below
  Lights up when the ignition key is turned to contact, run, preglow position – **I**.

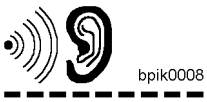
At the end of the preglow period and when the diesel engine is started, the symbol field goes out.

Emergency steering display


bsym0017

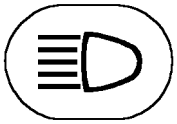
17 Emergency steering symbol field

Symbol field colour – red
Warning functions:
– Lights up when the ignition key is turned to contact, run, preglow position – **I**.
– Lights up if the diesel engine shuts down or if the steering pump breaks down when underway
  In this case, the emergency steering pump is activated for approximately 50 seconds.


bpik0008

Acoustic warning:
– When the emergency steering function (emergency steering pump) is switched on, an interval tone sounds immediately.

High beam activation display

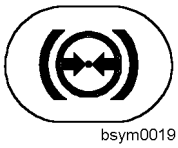

bsym0018

18 High beam symbol field

Symbol field colour – blue

Lights up when the high beam is activated.

Brake system accumulator pressure display

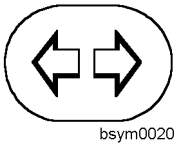

bsym0019

19 Brake system accumulator pressure display

Symbol field colour – red

NOTE: Symbol field is not active.

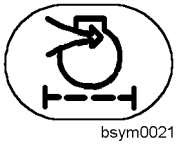
Direction indicator system activation display


bsym0020

20 Direction indicator system symbol field

Symbol field colour – green
Display functions:
– Flashes when the steering column switch is actuated to display the travel direction
– Flashes when the hazard warning system is activated
– Flashes when the ignition and actuated steering column switch is switched off.

Air filter contamination display


bsym0021

21 Air filter contamination symbol field

Symbol field colour – yellow

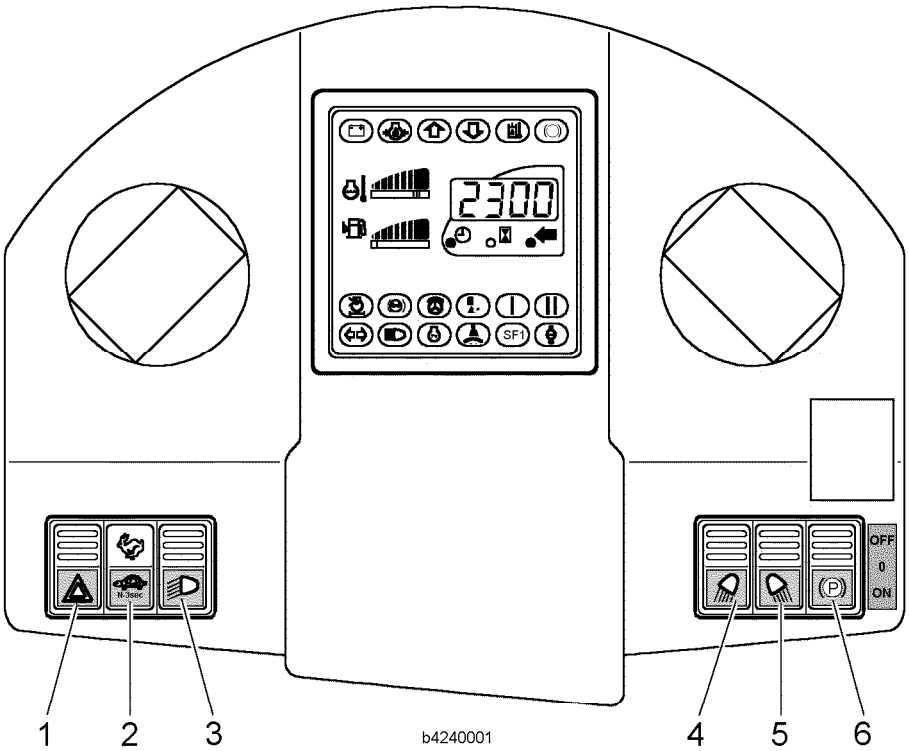
Lights up when the air filter is heavily contaminated. The air filter must be serviced.

LBH/01/003801/0003/10.03/en

3.2.10 Switches on the instrument panel

The layout and function of the switches on the instrument panel is described in this section.

Layout



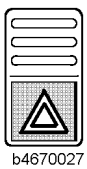
Switches on the instrument panel

1 Hazard warning system switch
2 Travel range and neutral position button
3 Parking light/driving light switch
4 Front working floodlights switch
5 Rear working floodlights switch (optional)
6 Parking brake switch

The switches are integrated in the instrument panel.

Function description

Switching on the hazard warning system


b4670027

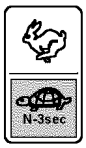
Switch **1** – hazard warning system

Field colour - red

Switches the hazard warning system ON or OFF.
When the switch is activated:
– If the hazard warning system symbol field is flashing, all flashing lights on the machine are flashing
– If the hazard warning system symbol field goes out, all flashing lights on the machine go out

LBH/01/003801/0003/10.03/en

Selecting travel ranges



b4270120

Button **2** - travel range and neutral position

Field colour – green

For selecting travel ranges **I**, **II** and neutral **N**.

After the electrical system has been turned on, travel range - **II** - is automatically activated.

It is not possible to select another travel range until the travel direction has been selected.

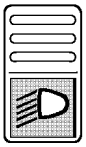
Shifting the driving ranges:

– Press the tortoise symbol to switch the travel range down to **I**.
– Press the hare symbol to switch the travel range up to **II**.

Function – neutral selection:

Pressing and holding down the button **2** on the **tortoise** symbol switches the direction of travel to - **N** - after approx. 3 seconds.

Switching on the parking or driving light


b4670029

Switch **3** – parking light/driving light

Field colour – green

Switching postions:

– Position I for parking light
– Position II for driving light

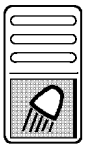
Function for parking light - switch/level - **I** -:

– Switches the parking light ON or OFF
– After the switch has been turned to position - **I** -, the following lights on the machine must light up:
  • Driving headlamps – left/right (sidemarker lamp)
  • Tail lights – left/right

Function for driving light – switch/level - **II** -:

– Switches the driving light ON or OFF
  The function is only possible when the electrical system of the machine is switched on.
– After the switch has been turned to position - **II** - the following lights on the machine must light up:
  • Driving headlights – left/right
  • Tail lights – left/right

Switching on the front working floodlight


b4670030

Switch **4** front working floodlight

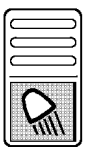
Symbol field colour – orange

For turning the front working floodlights ON or OFF.

When the switch is pressed the front working floodlights go out.

Switching on the rear working floodlights

This equipment is optional.


b4670031

Switch **5** – rear working floodlight

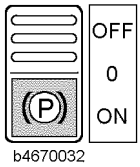
Symbol field colour – orange

For turning the rear working floodlights ON or OFF.

When the switch is pressed the rear working floodlights go out.

LBH/01/003801/0003/10.03/en

Engaging and releasing the parking brake



Switch **6** - parking brake

Field colour - red

Engages or releases the parking brake.

When the engine is started the parking brake is automatically engaged.

When the switch is pressed the parking brake is engaged or released.
Key function – OFF position:
– When the switch is pushed to the OFF position the parking brake is released.

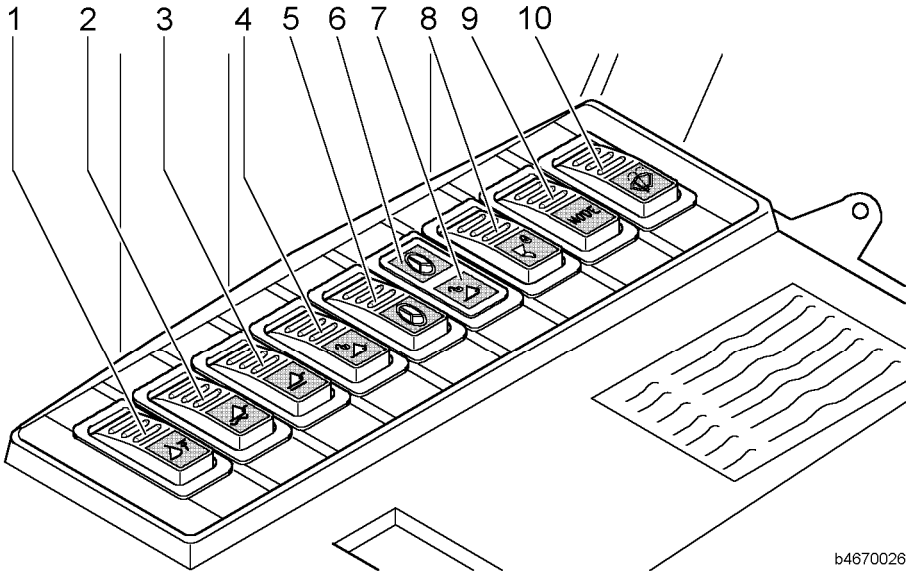
Central position – 0:
– Driving functions can be selected in this position.

Key function – ON position:
– After switching to the ON position, the parking brake is locked.
– When the switch is pushed to the “ON” position, the direction of motion is also turned to neutral.

3.2.11 Switches on the side cover (control console)

The layout and function of the switches on the side cover is described in this section.

Layout



Switches on the side cover

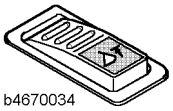
1 Air conditioning switch (optional)
2 Float position switch
3 Bucket return-to-dig switch
4 Hydraulic quick-change device switch (optional)
5 Emergency steering button
6 Emergency steering check indicator lamp
7 Hydraulic quick-change device indicator lamp (optional)
8 Working hydraulics lock switch
9 Mode button
10 Rear windshield wiper and washer switch

LBH/01/003801/0003/10.03/en

The switches and pilot lamps are built into the side cover (control console).

Function description

Activating/deactivating the lift kick-out function


b4670034

This equipment is optional.
Lift kick-out switch **1**

White symbol field

Switches the automatic lift kick-out function ON or OFF.

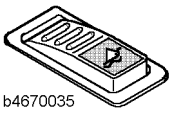
This function is not available until the engine is started.

When the switch is pressed, a magnet on the pilot control device is activated.

The “LIEBHERR control lever” is kept in the raised lift arm position – “by magnetic force”.

Also refer to the Section “Operation” under “Working with the attachment”.

Activating/deactivating the float position


b4670035

Float position switch **2**

Field colour – green

Switches the float position function ON or OFF.

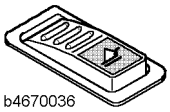
This function is not available until the engine is started.

When the switch is pressed, a magnet on the pilot control device is activated.

The “LIEBHERR control lever” is held in the lower lift arm position – “by magnetic force”.

Also refer to the Section “Operation” under “Working with the attachment”.

Activating/deactivating bucket return-to-dig


b4670036

Bucket return-to-dig switch **3**

Field colour – green

Switches the automatic bucket return-to-dig function ON or OFF.

This function is not available until the engine is started.

When the switch is pressed, a magnet on the pilot control device is activated.

The “LIEBHERR control lever” is held in the tip bucket up position “by magnetic force”.

Also refer to the Section “Operation” under “Working with the attachment”.

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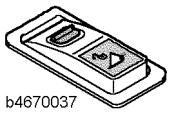
Activating deactivating hydraulic quick-change device (Option)


b4670037

Hydraulic quick change device switch **4**– with optional Z-bar lift bar arms

Hydraulic quick change device switch **4**– with optional standard equipment P-bar lift bar arms

Field colour - red

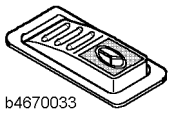
When the optional quick-change device is fitted to the lift arms: For switching the hydraulic quick-release function ON or OFF.

The switch is secured with an actuation lock to prevent unforeseen operation! Before activation release the lock.

When the switch is pressed, a warning signal is issued from the side cover (control console).

Also refer to the Section “Operation” under “Working with the attachment”.

Activating/deactivating emergency steering


b4670033

Emergency steering button **5**

Field colour - red

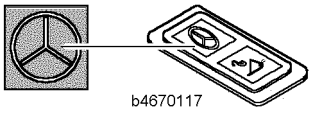
For starting and repeat starting the emergency control pump for emergency steering functions.

When ignition is switched on, the emergency steering pump can be started by keeping the button pressed down.

Continuous operation of the emergency steering pump will overheat the pump motor. The thermostat switch integrated in the pump motor automatically switches the emergency steering pump off in the event of overheating.

See also the section on towing the machine when the steering system has broken down.

Emergency steering display


b4670117

Emergency steering check indicator lamp **6**

Field colour - red

Display function:

– When the engine is started, the pilot lamp lights up for approx. 4 seconds.

  The emergency steering pump check is carried out during this time.

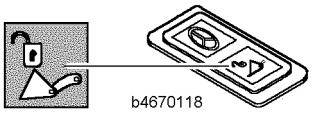
Warning functions:

– If the emergency steering pump check is unsuccessful, the pilot lamp remains on until the ignition is switched off.

  Switch off the engine and check the cause: consult LIEBHERR CUSTOMER SERVICE

LBH/01/003801/0003/10.03/en

Displaying or indicating hydraulic quick-release device (Option)


b4670118

Hydraulic quick change device switch **7**– with optional Z-bar lift bar arms

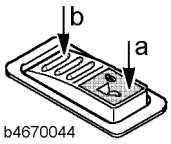
Hydraulic quick change device switch **7**– with optional standard equipment P-bar lift bar arms

Field colour - red

For pressure monitoring (5 bar), for “Lock” function of the hydraulic quick-change device.
Warning functions:

– Lights up with engine standstill, when the ignition key is in operating position - **I**.
– Illuminates on pressure drop or in event of line rupture in the quick-change device hydraulic system.
  The warning function is acoustically supported when the engine is running.
  Switch off the engine and rectify the problem!

Activating/deactivating the working hydraulics lockout



b4670044

Working hydraulics lock switch **8**

Symbol field colour – orange

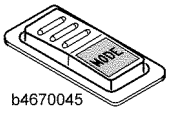
Locks or enables the working hydraulics functions.
Switch function:

– When the switch is pressed, the working hydraulics lockout is activated or deactivated.

Key function when ignition switched off:

– When the button is pressed and the LH control lever is simultaneously pushed in direction - **b** - (lower), the lift arms can be lowered and the lowering of the bucket is possible.
  See also the section on the LIEBHERR control lever.

Switching over the MODE LCD / travel speed - real time - operating hours



b4670045

Mode button – **9**

Field colour – green

For switching the LCD between speed, time or operating hours.

Switching to real time

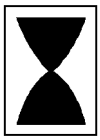
When the button is pressed once, the LCD is switched to time.
Setting the clock:

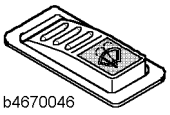
– Keep the MODE button **9** pushed down until the required time is displayed.

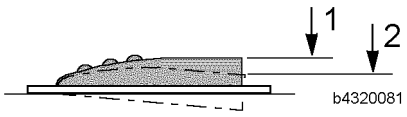

bsym0037

Switching to operating hours

When the button is pressed again, the LCD is switched to operating hours.


bsym0038





Switching the rear windshield wiping and washing system on or off

Rear windshield wiper and washer switch **10**

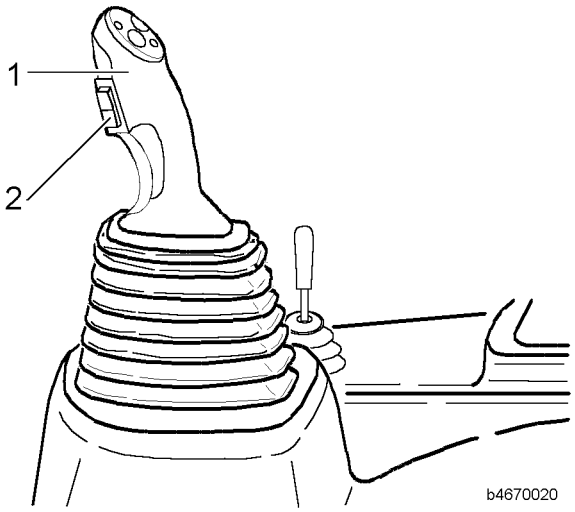
Field colour – green

Switches the windshield wiper and washer system for the rear window ON or OFF.
The switch has a switch function **1** and a button function **2**.
Switch functions:
– Switch position **1** is for wiping
– Button position **2** is for washing

3.2.12 LIEBHERR control lever

Use the “LIEBHERR control lever” (LH control lever) to control the travel direction and movements of the working attachment.

Layout



LH control lever

1 Pilot control unit lever 2 Travel direction switch

The LH control lever contains the controls for selecting the travel direction and operating the working attachment.

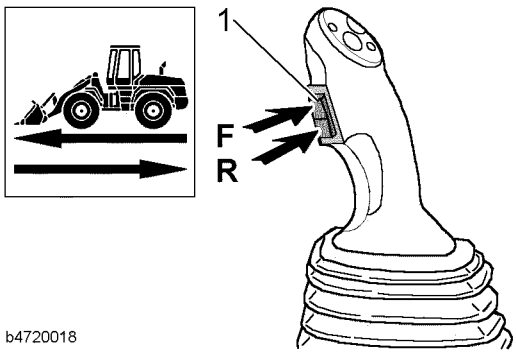
Travel direction switch

Travel directions are shifted using the button **1** on the Liebherr control lever.
See also the section on the driving mode.

Function description

LBH/01/003801/0003/10.03/en

Switching the travel direction



LH control lever

1 Travel direction switch

Functions of the travel direction switch:
– **F** travel direction is **F**orward
– **R** travel direction is **R**everse

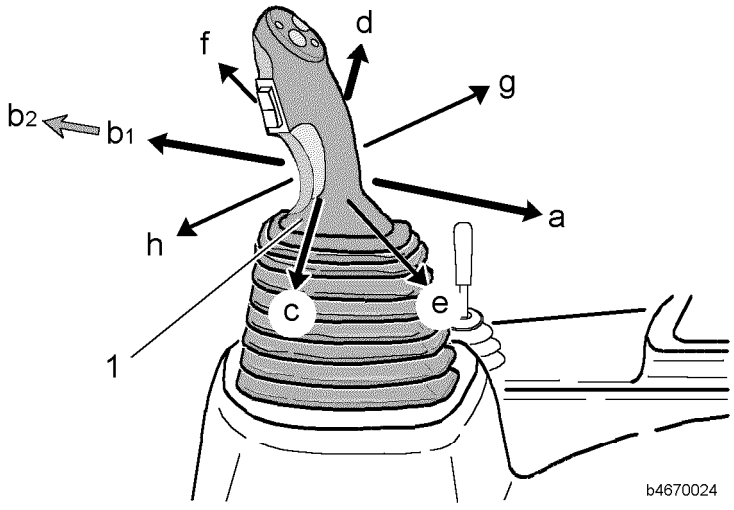
Symbol fields are used to show the selected travel direction on the instrument panel in the display unit.

LH control lever for controlling the working attachment

Layout

The grip of the LH control lever is mechanically linked to the pilot control device directly underneath it.

Function description



Movement directions of the LH control lever

a	Back	c	Left
b1	Forward to action point	d	Right
b2	Forward to limit	e-h	Diagonal

The working attachment is controlled by moving the LH control lever **1**.

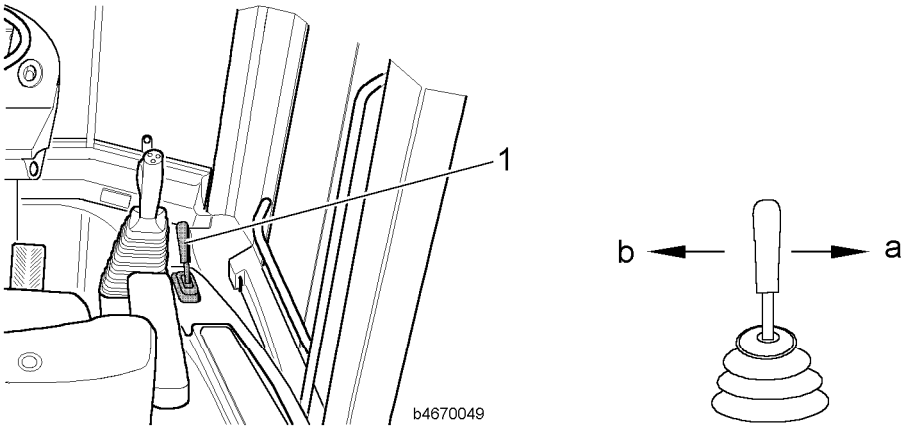
Movements of the LH control lever and the associated functions:
a – Raises the lift arm
b1 – Normal lowering function – lift arm is lowered slowly
b2 – Float position function – lift arms move to float position
c – Tilts the bucket inward
d – Tilts the bucket outward
e – Raises the lift arm while tilting the bucket inward
f – Lowers the lift arm while tilting the bucket outward
g – Raises the lift arm while tilting the bucket outward
h – Lowers the lift arm while tilting the bucket inward

3.2.13 Control lever for additional working functions

This equipment is optional.
The control lever for additional working functions (additional control lever) is installed to the right of the LH control lever, in the control panel.

Function description

If an optional attachment with an independent control circuit is attached to the lift arm, it is controlled by the additional control lever.



Movement directions of the additional control lever

a – Back b – Forward

The optional equipment is controlled by moving the additional control lever **1**.
The movements of the additional control lever and the associated functions:
a– (Function depends on the type of optional equipment attached)
b– (Function depends on the type of optional equipment attached)

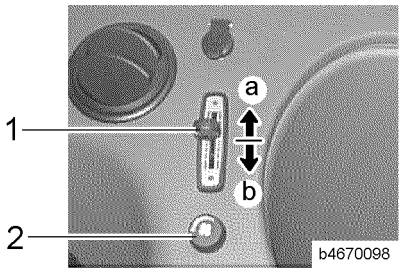
Make sure you are familiar with the operation of the optional attachment installed
Refer to the sections on operation and working with optional equipment, as well as to the operator's manual for the additonal equipment.

LBH/01/003801/0003/10.03/en

3.2.14 Heating, ventilation

The driver's cab is equipped with a warm water heating system.
The heating circuit is included in the cooling circuit of the diesel engine.

Switching the heating system on/off

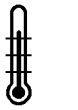


Control elements for the heating:
1– Slider – temperature control
Rotary switch **2** – Blower

Ensure that:
– The machine's electrical system is switched on
– The outlet nozzles for the required air stream are open
e.g. to the body, front windscreen, rear window

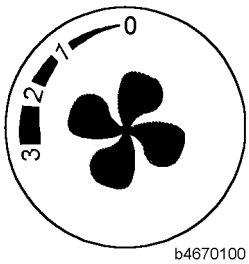
- Switching on the heating: Turn rotary switch **2** to level 1.

The air stream is blown into the driver's cab via outlet nozzles.


bpik0002

- The temperature can be continuously adjusted: The blue range is cold – the red range is warm.
  Regulating the temperature: Push slider **1** to the required position.

Regulating the blower

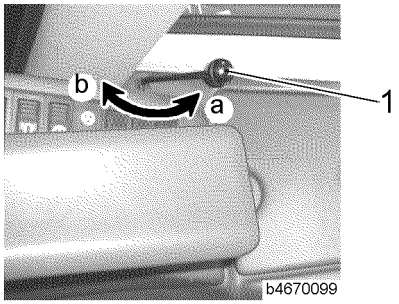


The blower is switched on/off with the rotary switch **2**.
Blower levels:
Level **0** – OFF
Level **1** – gentle air flow
Level **2** – medium air flow
Level **3** – strong air flow

- Turning the rotary switch **2** to the required level.

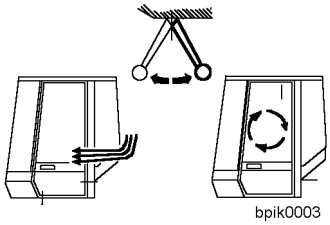
The air stream is blown into the driver's cab via outlet nozzles.

Regulating the air supply



The lever for air vent adjustment is mounted behind the driver's seat on the right.

Ventilation vent adjustment lever **1**
Lever settings:
Position a – recirculated air
Position b – fresh air


bpik0003

- Switching over between fresh and recirculated air: turn the lever **1** to the required position.

LBH/01/003801/0003/10.03/en

3.2.15 Air-conditioning system


bsym0029

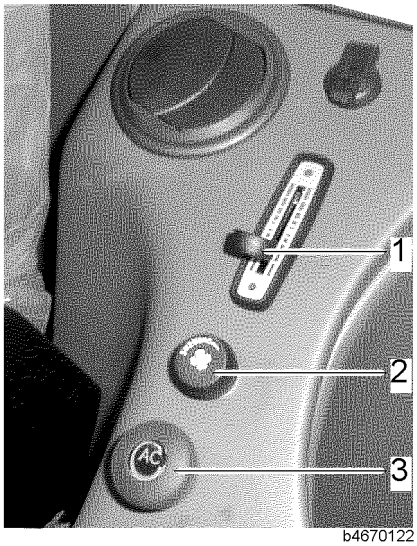
This equipment is optional.
The inlet air is filtered via one dry servicable filter cartridge and directed into the cab via a vaporiser and heat exchanger and the adjustable outlet nozzles.

Operating the air-conditioning system

In order to guarantee the long-term reliability of the air-conditioning system, we recommend that it is switched on at least every 14 days.
When the air-conditioning system is running, the shaft seal ring in the air-conditioning compressor is also lubricated. This prevents refrigerant escaping from the air-conditioning compressor.
The prerequisites for switching on the air-conditioning are:

– The engine is running
– The blower switch **2** is turned to at least position - **1**.
– The temperature in the cab is above +1 °C (below this temperatur the temperature switch in the evaporator is switched off)

Switching on the air-conditioning



b4670122

1 Heater button
Rotary switch **2** – Blower
3 Air-conditioning system button

- Switch on the rotary switch **2** for the blower.
- Switch on the rotary switch **3** for air-conditioning system by turning in the clockwise direction.

Adjusting the cab temperature

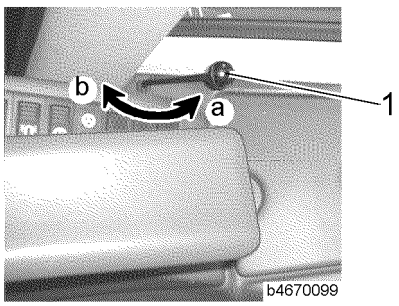
The cab temperature is regulated by mixing in warm air; the heating is switched on for this.

- Set the heating slider **1** as required.

Slider above set to = warmer

Slider below set to = colder

Maximum cooling of the cab



b4670099

- If the cab air is stale:
  First air it well.

In order to achieve even more cooling in the cab, take the following steps:

– Switch on the strongest blower position
– push the slider for heating as far as it will go,
– Close the cab windows and doors
– Set the lever **1** for the air-vent flap to circulate (fresh/circulated air) (position a).

- Switch on the air-conditioning rotary switch.

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Re-heat mode

The air-conditioning system can be used to dehumidify the cab air when the weather is cool and damp.

- To dehumidify the cab air, switch on the air-conditioning system in addition to the heater.

This prevents condensation from forming on the windows, since the air humidity condenses on the cool evaporator and is collected as water in the drip tray and drains away outside.

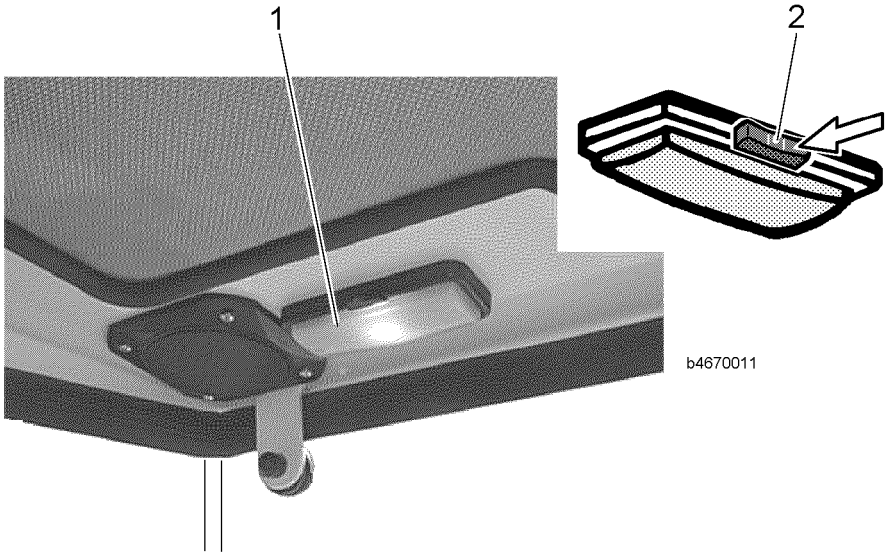
Switching off the air-conditioning system

- Turn the rotary switch **3** in an anti-clockwise direction to the turn of the air-conditioning system.

Cab interior lighting

The cab lighting **1** is installed in the cab behind the driver's seat on right.

Switching the internal illumination on/off



Interior lighting

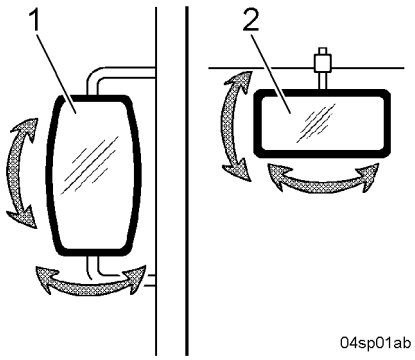
1 Interior lighting 2 Switch

- Switching the internal illumination on/off: press switch **2** .

3.2.16 Interior and exterior mirrors

The driver's cab is equipped with one interior and two exterior mirrors.

Adjusting the mirrors



Adjusting the mirrors

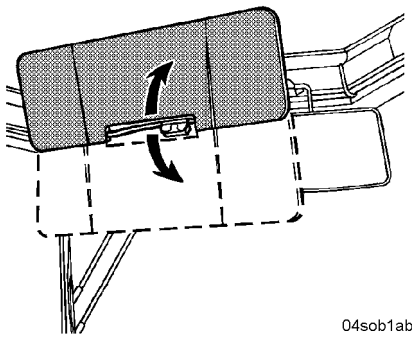
1 Exterior mirror
2 Interior mirror

- Individually adjust all mirrors by turning them.

3.2.17 Sun visor

The driver's cab is equipped with a sun visor.

Adjusting the sun visor

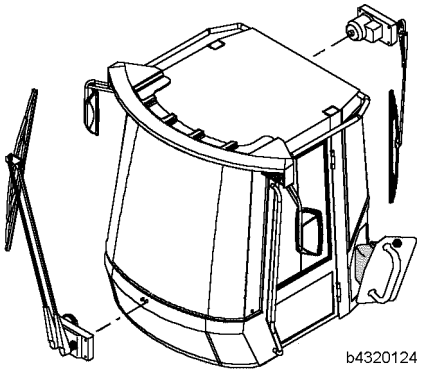


Adjusting the sun visor

- Adjust the sun visor according to your individual requirements by pulling it up or down.

3.2.18 Electric windshield wiper and washer system

Layout



The machine is equipped with an electric windshield wiper and washer system for the front and rear windows.

It basically consists of the controls, the windshield wipers, the reservoir and the outlet nozzles for the washing agent.

The windshield wiper and washer systen for the front and rear windows use a common washing agent container.

Check valves are built into the washing agent pipes to the outlet nozzles.

The switches for the windshield wiper and washer system for the front windscreen are on the steering column switch.

The switches for the windshield wiper and washer system for the rear windscreen are on the right-hand side cover. A sprung button function controls the washing agent pump.

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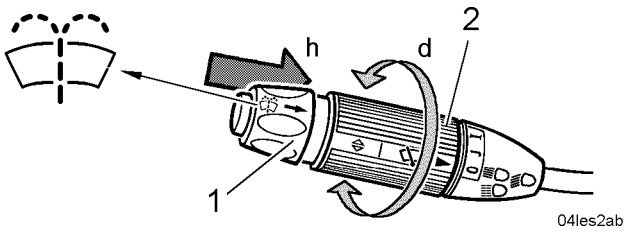
Switching on the windshield wiper and washer system

Before switching on the windshield wiper and washer system, make sure that the machine's electrical system is switched on.

Operating the front windshield wiper and washer system



Steering column switch

1 Button
2 Handle
h Windshield wiper and washer system activation
d Windshield wiper activation

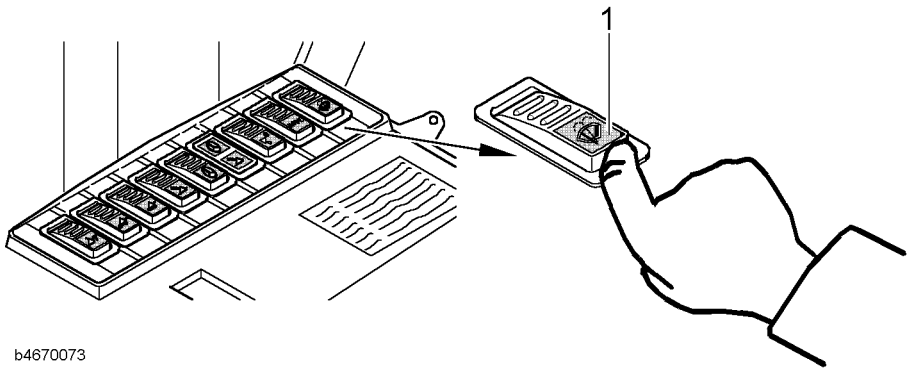
- Wiping windows: first turn the handle **2** to the required level **J** – **I** – **II**.
- Washing windows: press the button **1** on the steering column switch.

Washer fluid is sprayed onto the front windscreen through each outlet nozzle.

Switching on the rear windshield wiper and washer system

The window wiping and washing system is actuated by pressing the switch **1**

This is how to operate the window wiping and washing system:



Switches on the side cover

1 Rear windshield wiper and washer switch

- Wiping windows: first press the switch **1** .

The back windshield wiper is activated.

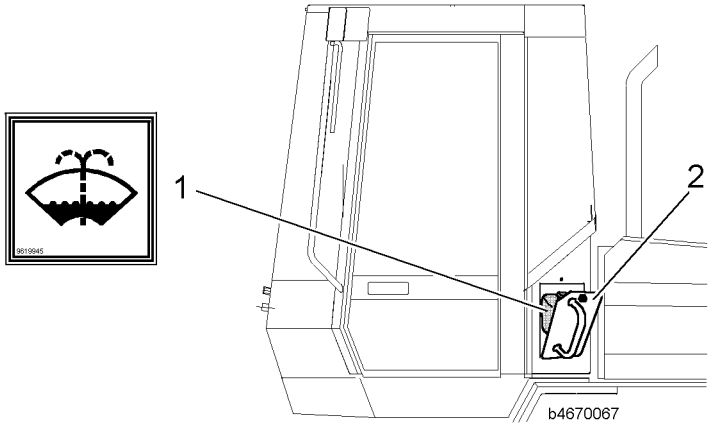
- Wiping and washing window: press the switch **1** a second time and keep it pressed down.

Washer fluid is sprayed onto the rear window via an outlet nozzle.

- Switch off the window washing system: Release the switch **1** .
- Switch off the window washing system: press switch **1** back.

3.2.19 Reservoir for windshield washer fluid

Layout



Windshield washer fluid reservoir

1 Reservoir with filling inlet 2 Cover

The reservoir **1** is installed on the left of the driver's cab behind the cover **2**.

Topping up with windshield washer fluid

Filling quantity approximately 3.5 litres.

- Open the cover **2**.
- When necessary, refill with commercially available window cleaning agent.

Caution

Ice can damage the windshield wiper and washer system.
Icing up can result in the breakdown or damage to the windscreen wiping and washing system. A dirty front or rear windscreen is a safety hazard!

! Scrape snow and ice from the windshield before driving.

! You must protect the windshield wiper and washer system using anti-freeze.

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- Use commercially available windscreen anti-freeze.
- Top up with an appropriate quantity of anti-freeze before the winter starts.

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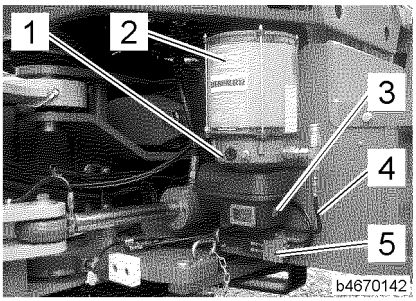
3.2.20 LIEBHERR automatic central lubrication system



This equipment is optional.
1 Central lubrication pump
2 Transparent container
3 Pushbutton
4 Lubricant supply lines
5 Main progressive distributor

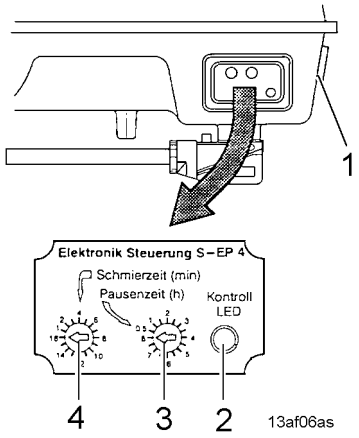
The central lubrication pump with its see-through reservoir and integrated control unit is installed on the left-hand side of the machine.

The central lubrication pump delivers the lubricant via supply lines and via one primary and several sub-progressive distributors to the individual lubrication points. An overpressure valve monitors lubrication of the individual lubrication points.

Function description

Lubrication and delay times

The integrated control unit electronically controls the central lubrication system.
1 Pushbutton
2 Yellow LED
3 Display and adjustment of the delay
4 Display and adjustment of the lubrication time



Control device

The yellow LED (light emitting diode) **2** lights up for about 3 secs after the ignition is switched on and hence signals standby condition.

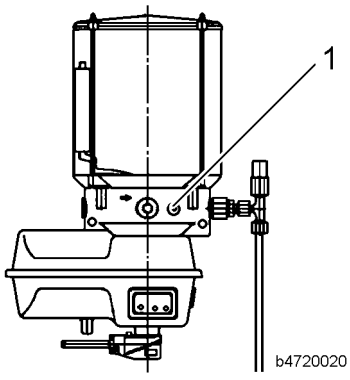
The pump can also be switched on manually by pressing the button **1**. The pump motor switches off after the set lubrication time **4** has elapsed and the dead time **3** begins. All further lubrication cycles follow automatically in a pattern determined by the set dead time.

If the ignition is switched off during the lubrication or dead time, the control unit stops the clock and logs the time. After the ignition has been switched on again, the control unit scans the data from the memory and continues the function sequence from the point where it was interrupted.

Non-scheduled lubrication

Non-scheduled lubrication can be triggered at any time when the ignition is switched on, via button **1** on the motor housing.
For the default settings of the lubrication and dead times, see the Chapter “Product description”, section “Technical data”.

Refilling the reservoir



The grease fitting **1** is used to fill the reservoir.

Grease specification: See in the maintenance chapter under the lubricants and fuels section.

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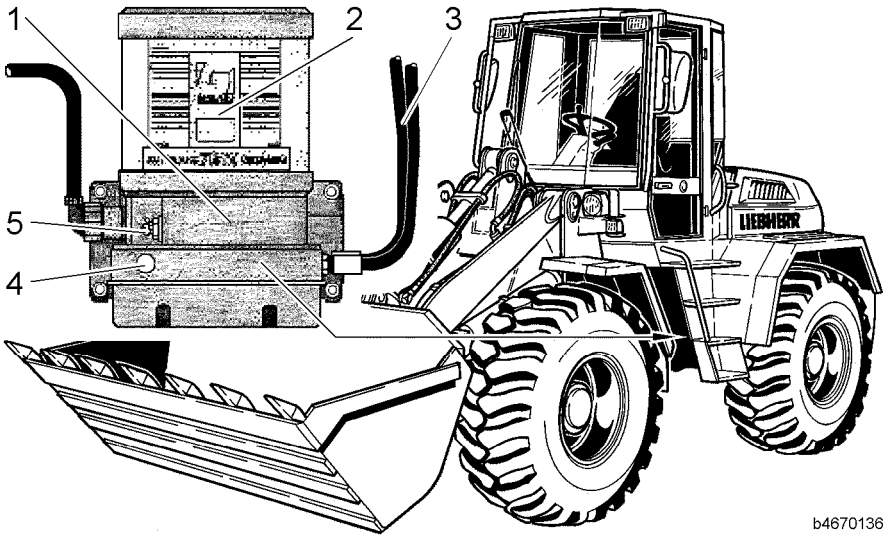
3.2.21 TWIN automatic central lubrication system

This equipment is optional.
The TWIN automatic central lubrication system is a 2–line system.

Layout

The central lubrication pump has been built into the left side of the machine, in the articulation zone at the entrance.
The control element has been mounted on the right side of the driver's cab to the instrument panel.



Automatic central lubrication system

1 Central lubrication pump
2 Transparent container
3 Lubricant supply lines
4 Test switch
5 Filling coupling with protective cover

The automatic central lubrication system consists of:
– The central lubrication pump with a transparent container and an intergrated control unit
– The control element with operating switch, the display and LED indicator lamps,
– The distributor blocks with measuring valves
– The electric pressure switch and the lubricant supply lines

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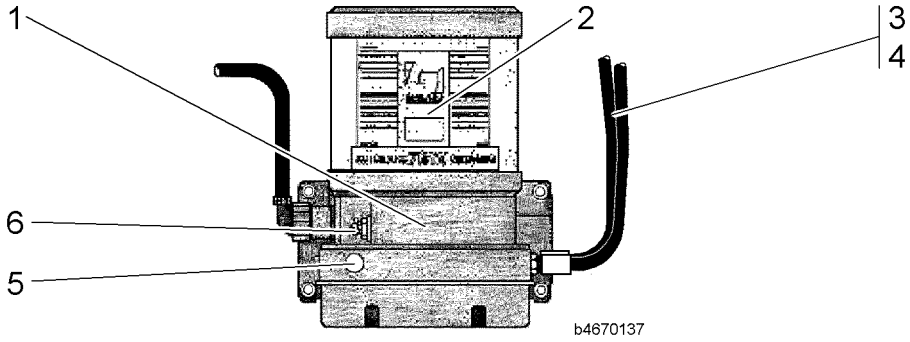
Function description

Function of the system

The system carries out all functions automatically.

After the ignition has been switched on, the pump delivers the grease to the lubrication points in set intervals using the measuring valves.

The set interval time between lubrication appears immediately in the display after the ignition has been switched on.



Central lubrication pump

1 Central lubrication pump
2 Transparent container
3 Lubricant supply lines
4 Distributor block
5 Test switch
6 Filling coupling with protective cover

The electrically driven central lubrication pump **1** with an integrated controller delivers the grease (lubricated) to the distributor blocks **4** using measuring valves.

The grease is delivered to the individual lubrication points using the measuring valves.

The integrated electronic control device controls the lubrication and dead time of the piston pump.

An electric pressure switch monitors the system pressure in the main supply line.

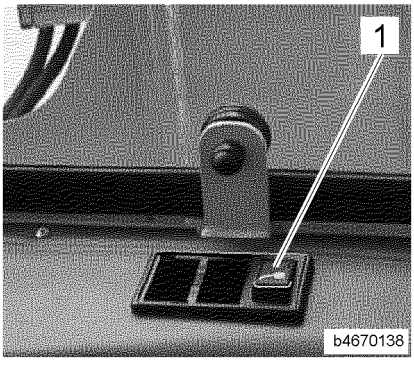
Setting the lubricating mode

The required lubricating mode is set by using the pushbutton **1** on the left, at the front of the driver's cab.

Make sure that the electrical system is switched on.

Automatic central lubrication system control element

1 Pushbutton with indicator light



- Setting the desired lubricating mode:
  within 30 seconds of pressing the ignition, press the pushbutton **1** during or after the Blinkcode of the indicator lamp.

- press the pushbutton **1** repeatedly once, twice or three times for a short time.

After two seconds the indicator lamp shows the selected adjustment:

Blinkcode	Setting
flash once	Heavy use

Blinkcode	Setting
flash twice	Normal use
flash three times	Light use

Filling the transparent container

If the indicator lights flash at the start of each lubricating sequence for two minutes (0.5 seconds on / 0.5 seconds off), the container holds the minimum grease level.
In this case, the container must be refilled as quickly as possible.

- Remove the protective covers from the filling coupling.
- Thoroughly clean the filling coupling and the coupling on the filling hose.
- Secure the filling hose to the filling coupling.
- Fill the container to the maximum level (see the markings on the container).
- Release the filling hose and replace the protective covers.

Test lubrication (non-scheduled lubrication)

Make sure that the electrical system is switched on.
To test the system, you can carry out a single lubricating sequence manually.

- Press the test switch on the pump for 3 to 5 seconds.

The system will now carry out a single lubrication system.
During this lubricating sequence, the indicator lamps flash (2 seconds on / 2 seconds off).

Nonstop lubrication

Make sure that the electrical system is switched on.
To deliver additional grease to all lubricating points (for example, after cleaning the machine) or to bleed air from the system, you can carry out lubricating sequences without intervals.

- Press the test switch on the pump for more than 6 seconds.

The system will now carry out lubricating sequences without intervals.
During this sequence, the indicator lamps flash (0.2 seconds on / 0.2 seconds off).
The nonstop sequence ends, if the ignition is switched off.

3.2.22 Acoustic reverse warning device

This equipment is optional.
The acoustic reverse warning system is to warn people standing behind the machine while it is reversing.

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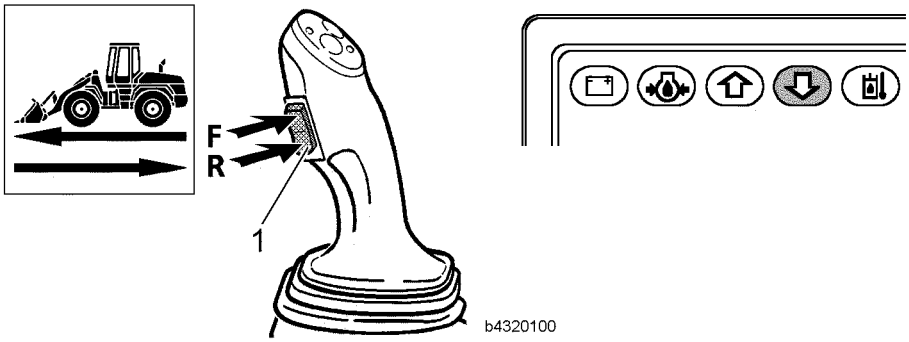
Switching on the reverse warning device

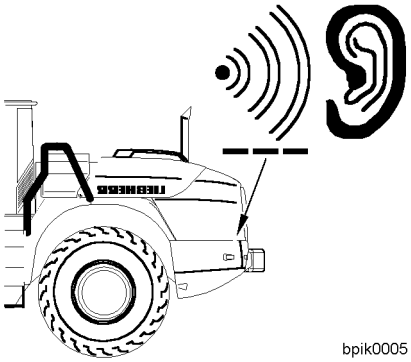


LH control lever and display unit

The reverse warning system is electrically actuated by means of the travel direction switch (reverse travel position).

When the switch **1** is moved to position **R** for reverse travel, you will hear an alarm.

- Press the switch **1** for **R = REVERSE** travel direction.



The reverse warning device, installed at the rear left of the machine in the engine compartment, sounds an alarm signal with about 60 impulses per minute.

The alarm signal is approximately 5 dB louder than the ambient noise.

3.3 Handling

3.3.1 Daily start-up routine

Make sure that:

– Before starting up the machine each day the (daily) maintenance tasks must be carried out after every 10 hours of operation. See the chapter on maintenance.
  After the (daily) maintenance tasks have been completed every 10 operating hours, the machine must then be put into the operating position. See the section on the operating position.
– Enough diesel fuel is available for the daily workload. See the section on refuelling with diesel fuel.

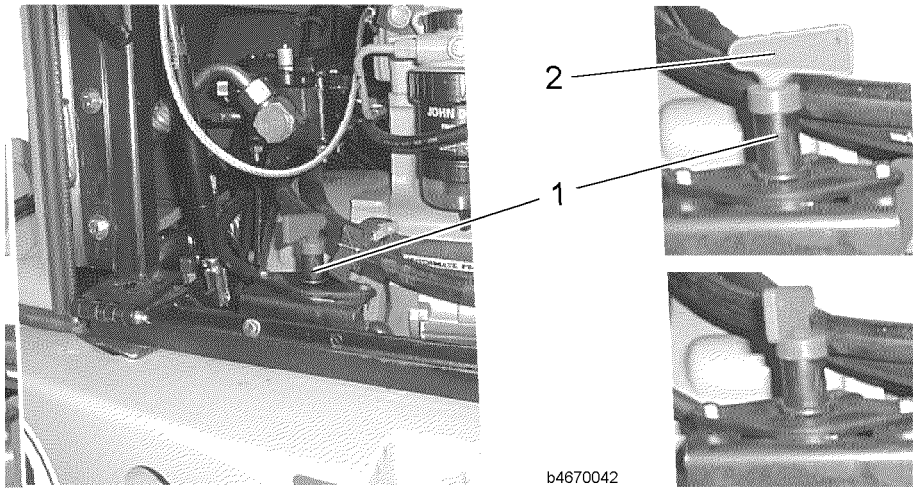
Operating position

To put the machine into operating position, proceed as follows.

Turning on the main battery switch

The battery main switch is located at the rear left-hand side of the engine compartment.

- Completely open the rear hatch **1**. Also refer to the Section “Opening service hatches and hoods”.



Battery main switch

1 Battery main switch 2 Main switch key

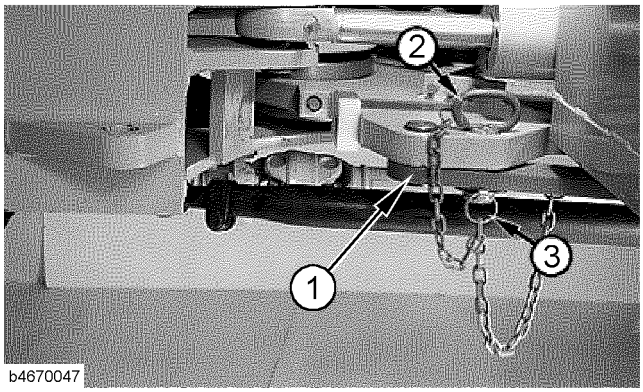
- Turn on the main battery switch.

Closing service doors, hatches and hoods

- Close all service doors, hatches and hoods and where possible lock them.

Releasing the articulation lock

When the articulation lock is engaged, no steering functions are possible.



Articulation lock

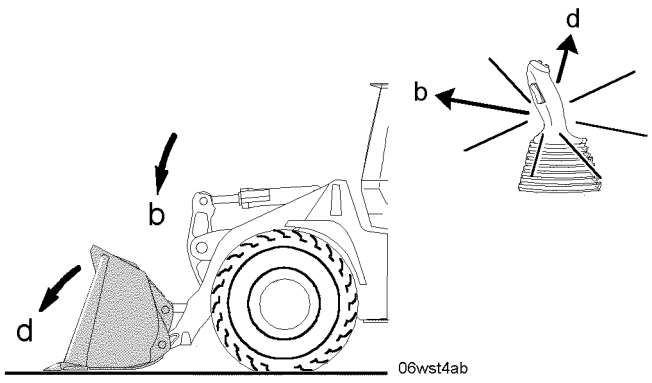
1 Safety bar
2 Pin
3 Spring clip

Warning

There is a risk of accidents if the steering is locked.
When the articulation lock is engaged, no steering functions are possible.
! Release the articulation lock

- Pin locking bar **1** in the rear position.
- Secure the pin **2** against dropping out with a split pin **3**.

Putting the working attachment in the starting position

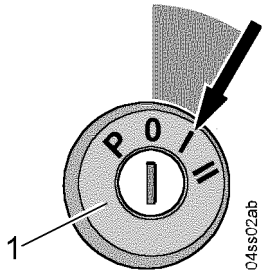


Starting position

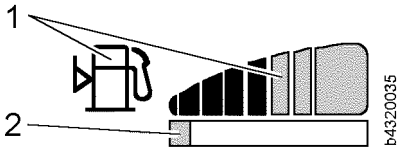
- Set the bucket down flat on the ground.

Refuelling with diesel fuel

Make sure that the electrical system is switched on.



Starter switch contact position



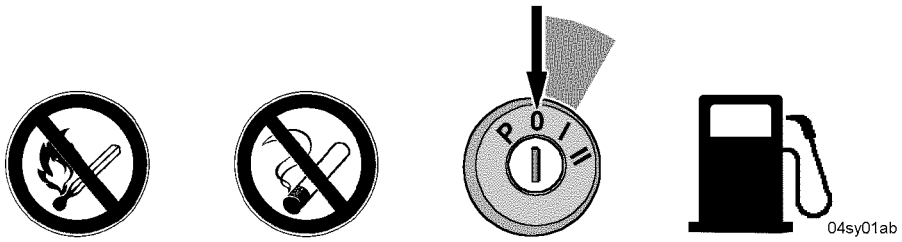
Fuel supply display

- Read the display in the fuel supply segment field **1** to see if there is sufficient fuel in the tank.

Display for fuel reserve:

On the lower bar **2**, the boundary range for reserve is marked in red.

There will still be a residual volume of approximately 10 litres left in the tank.



Safety when refuelling

Danger

There is a risk of fires and explosions.

! Do not smoke and avoid naked flames when refuelling.

! Only refuel when the engine is switched off.

- It is essential to observe the safety regulations for refuelling. Also refer to the “Safety regulations” chapter.
- Only use clean diesel fuel.
- Carefully clean around the tank cap before taking it off.
- If necessary, refuel with diesel fuel.
- If possible, refuel at the end of the working day to prevent condensation from accumulating in the tank.

The machine is ready for operation.

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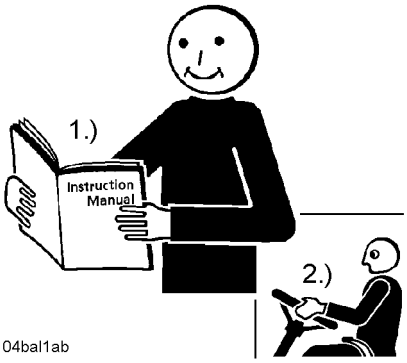
3.3.2 Starting the diesel engine



Operator's manual

1.) Make sure you have read and understood the operator's manual
2.) Then you are ready to use the machine

Only ever operate the machine once you have read and understood the operator's manual.

Information about the machine's travel drive system:
- **The machine is equipped with a hydrostatic travel drive system.**
- **The engine cannot be bump started or tow started.**

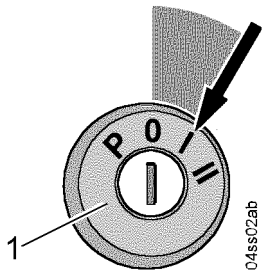
Precautions before starting

The following precautions should be taken before starting the machine.
First make sure that the machine is in its operating position.
See the section on the operating position.

Starting procedure

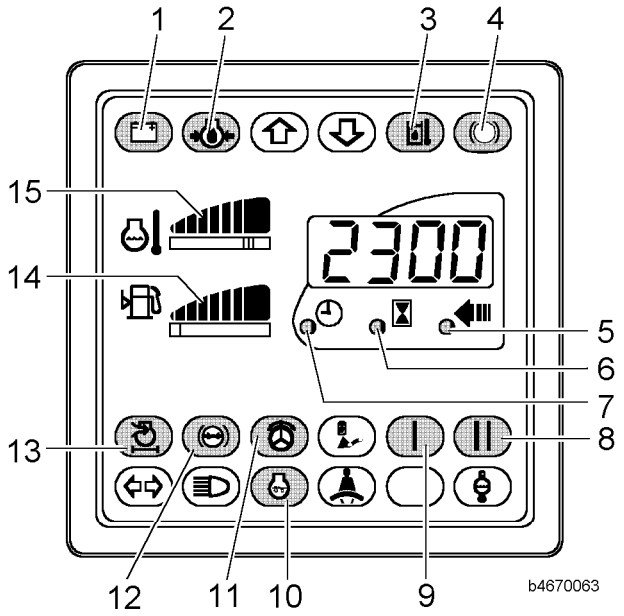
Lamp check

During a “lamp check” the following symbol fields are checked by the control electronics.



- Switch on the electrical system by turning the ignition key to position - **I**.

The following symbol fields light up only briefly (2.5–3 secs):



Indicator unit lamp check

1 Battery charging symbol field (charge control)
2 Engine oil pressure symbol field
3 Hydraulic oil overheating symbol field
4 Parking brake symbol field
5 Travel speed diode
6 Operating hours diode
7 Time diode
8 Travel range - **II** - – symbol field
9 Travel range - **I** - – symbol field
10 Preglow monitor symbol field
11 Emergency steering symbol field
12 Braking system accumulator pressure symbol field
13 Air filter contamination symbol field
14 Fuel supply segment field
15 Coolant temperature segment field

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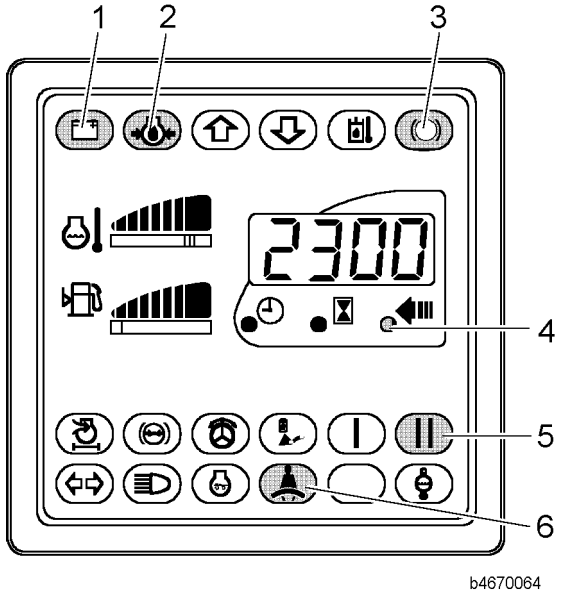
After the “check” is completed, the following symbol fields must still illuminate with the key at position - **I**:



Indicator unit lamp check

1 Battery charging symbol field (charge control)
2 Engine oil pressure symbol field
3 Parking brake symbol field
4 Travel speed diode
5 Travel range - **II** - – symbol field
6 Safety belt symbol field flashes.

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Preglowing the engine

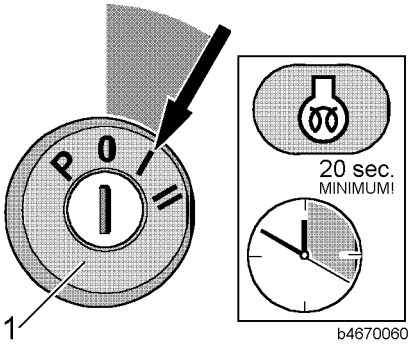
The preglow time depends on the current ambient temperature and the electrical starting conditions.

It takes at least 20 seconds and when ambient temperatures are extremely low it can last over 120 seconds.

When the engine is warm and the ambient temperature high, it is not necessary to wait until the preglow time is over.

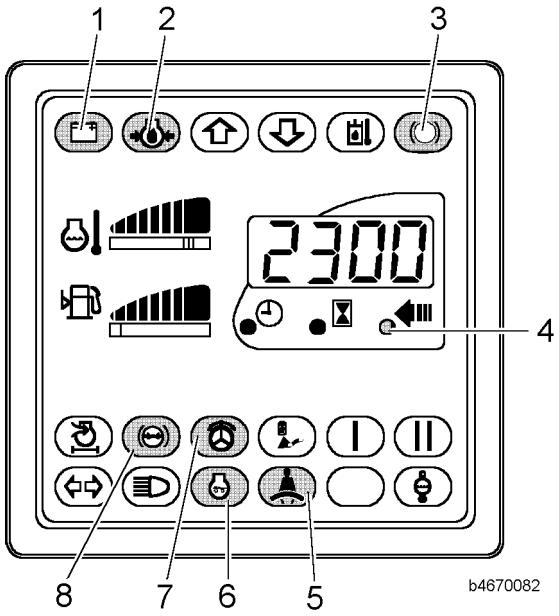
Note: Do not preheat engines which are already at operating temperature.

- Switch on the electrical system by turning the ignition key to position - **I**.



Starter switch – contact- preglow position

The following symbol fields must light up:



Display unit

1 Battery charging symbol field (charge control)
2 Engine oil pressure symbol field
3 Parking brake symbol field
4 Travel speed diode
5 Safety belt symbol field flashes.
6 Preglow monitor symbol field
7 Emergency steering symbol field
8 Braking system accumulator pressure symbol field

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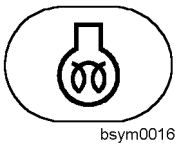
Starting the engine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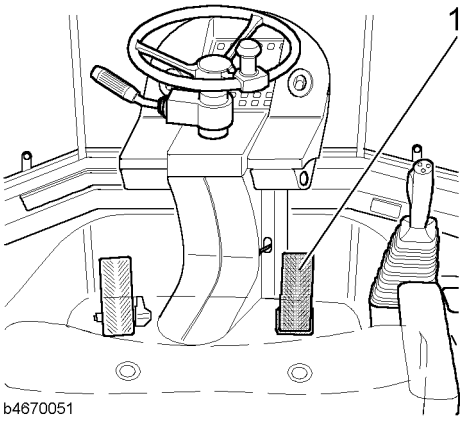
- When the temperature is below freezing:
  Wait until the symbol field **6** for the preglow monitor goes out.

When the symbol field goes out, the preglow time is over.

Note: when the engine is being preheated, the symbol field **6** goes out when the preglow time has elapsed, i.e. when the engine is ready.

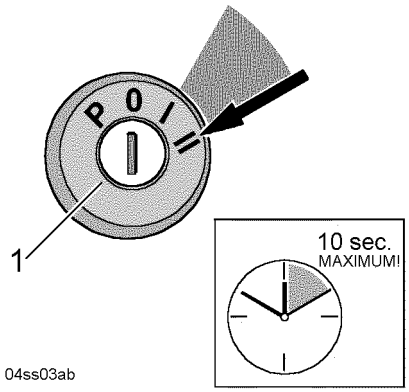
The preglow time can be as long as 120 seconds when the ambient temperature is extremely low.

The engine can now be started.



Gas pedal

- Press the gas pedal **1** to adjust the engine speed.
- Turn the ignition key to the starting position - **II** - and keep it in this position until the engine starts.
- **Do not attempt to start the engine for longer than 10 seconds without interruption.**
- If the engine does not start:
  Turn the ignition key back to the 0 position.



Starter switch – starting position

Troubleshooting

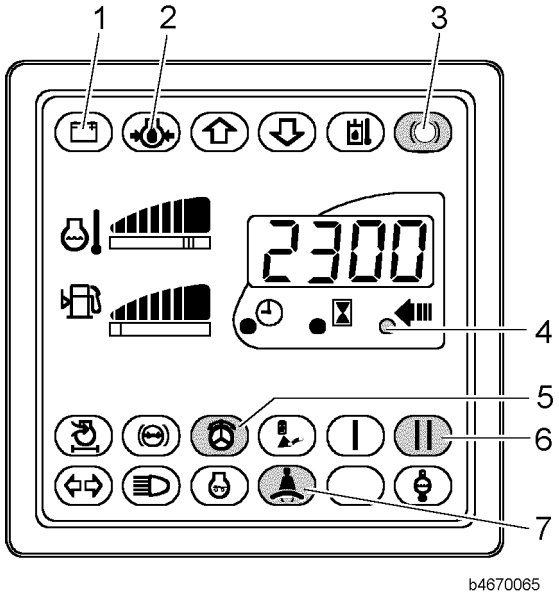
The engine will not start.

- Repeat the starting procedure after a break of 120 seconds.
- If the motor does not start after two attempts, find the cause and rectify it.

- As soon as the engine starts running, release the ignition key.

The starting key automatically returns to the operating position.

When the engine starts, the following symbol fields must go out:



Display unit

1 Battery charging symbol field (charge control)
2 Engine oil pressure symbol field

When the engine cuts in, the following symbol fields must light up:

3 Parking brake symbol field
4 Travel speed diode
5 Emergency steering symbol field
6 Travel range - **II** - symbol field
7 The safety belt symbol field flashes for about 15 secs.

Troubleshooting

Do the symbol fields **1, 2, 5** go out or do the symbol fields **6, 7** light up and the LED **4** does not?

- Shut down the engine and rectify the problem in accordance with the section on malfunctions.

- Once the engine has started, decrease the speed immediately to a medium speed.
- Let the engine warm up briefly: by actuating the working attachments at medium power.
- Then gradually increase to full load.

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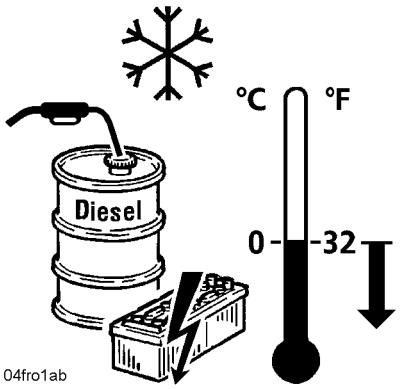


Winter operation

Precautions when starting at temperatures below freezing

The following measures improve the starting performance at low temperatures.

Precautions:

– Check the battery charge
  If necessary, recharge the battery
– Use winter-grade fuel
  See the lubricants and fuels section under winter operation.

Warning

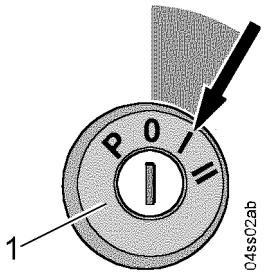
There is a risk of explosion with the diesel engine

There is a risk of explosions when using volatile fluids for starting diesel engines with preglow systems!

! Do not use volatile starting aids.

- Carry out the precautions listed for starting at temperatures below freezing.

3.3.3 Driving mode



The situation after the electrical system is switched on:

– The parking brake is automatically activated.
– When the parking brake is engaged, the travel lockout is active.
– Preselection of the travel direction is not possible.
– The travel range - **II** - is automatically activated.
– Preselection of the travel ranges is possible

Preparations for driving mode

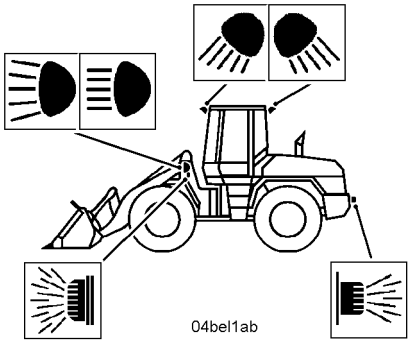
The preparations for driving should be carried out in the following sequence.

First make sure that the machine is in its operating position.

See the section on the operating position.

Checking the lighting equipment

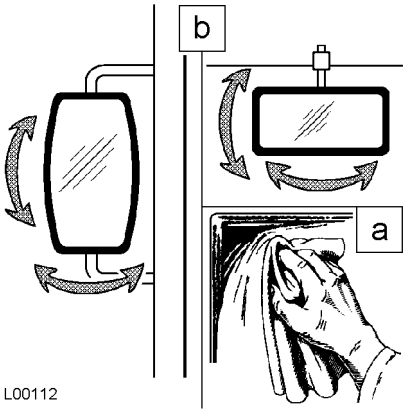
- Check the lighting equipment.
- If required, adjust the setting of the headlamps.



Headlamp adjustment

Checking the interior and exterior mirrors

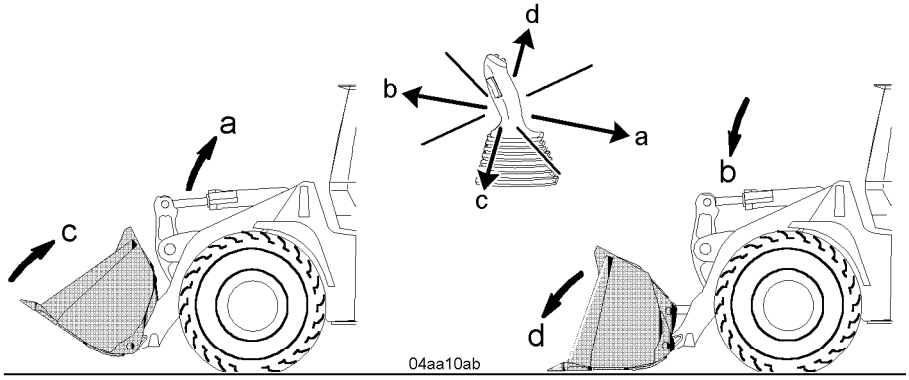
- Clean the interior and exterior mirrors.
- Adjust the interior and exterior mirrors.



Interior and exterior mirrors

Putting the working attachment into position

For detailed information, see the sections on the LIEBHERR control lever and working with the attachment.



Bucket position

- Depending on the starting position, the lift arms should be raised or lowered.
- Move the bucket into position.

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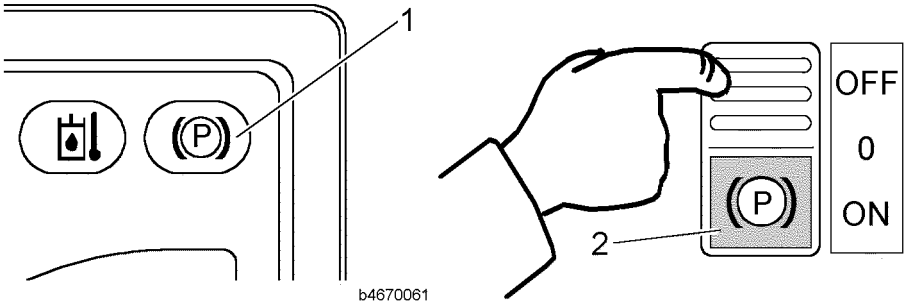
Releasing the parking brake

When the parking brake is engaged, the travel lockout is active.
Preselection of the travel direction is not possible.



Display unit and switch – parking brake

1 Parking brake symbol field
2 Parking brake switch

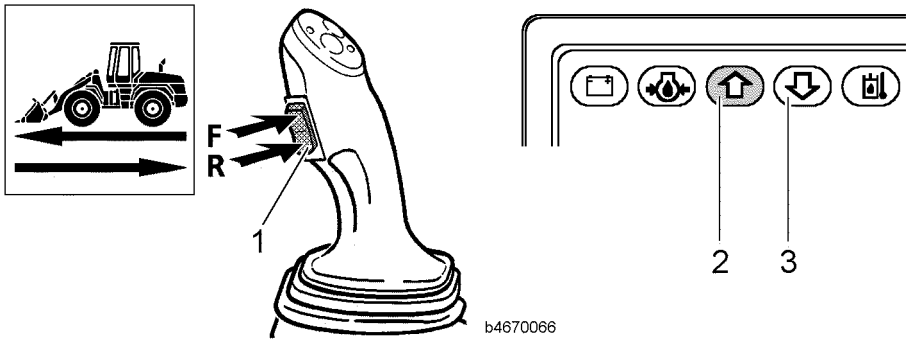
- Release the parking brake: to do this, push the switch **2** back.

The symbol field **1** for the parking brake goes out.

Selecting the travel direction

When the electrical system is switched on, the travel direction is automatically switched to neutral.

The forward or reverse travel direction is selected by pushing the travel direction switch.



Switch for travel direction and display unit

1 Travel direction switch
2 Symbol field – travel direction “forward”
3 Symbol field – travel direction reverse

- Press the switch **1** for **F = FORWARD** travel direction.

or

- Press the switch **1** for **R = REVERSE** travel direction.

Depending on the switch position, the symbol field for forward travel **2** or for reverse travel **3** lights up.

Selecting travel ranges

After the electrical system has been turned on, travel range - **II** - is automatically activated.

The travel ranges are selected using the travel range and neutral position buttons.

The selected travel range is shown on the instrument panel in the indicator unit. See also the section on the “display unit.”

Selecting another travel range is possible at any travel speed. If the travel speed is high when shifting down, the machine is braked hydrostatically.

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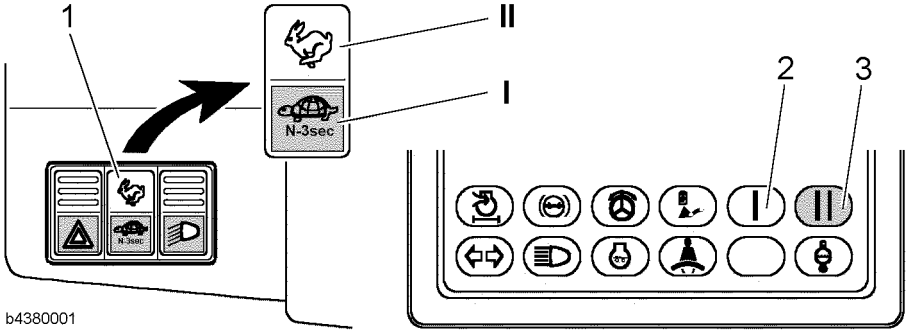
The following travel ranges can be selected:

– Travel range - **I** - (tortoise symbol) for slow travel (e.g. on steep terrain).
– Travel range - **II** - (hare symbol) for normal working operation.

Travel speeds: see the technical data section.



Travel range and neutral position buttons

1 Travel range and neutral position button
2 Travel range - **I** - – symbol field
3 Travel range - **II** - – symbol field

I Tortoise symbol (slow drive)
II Hare symbol (normal operation)

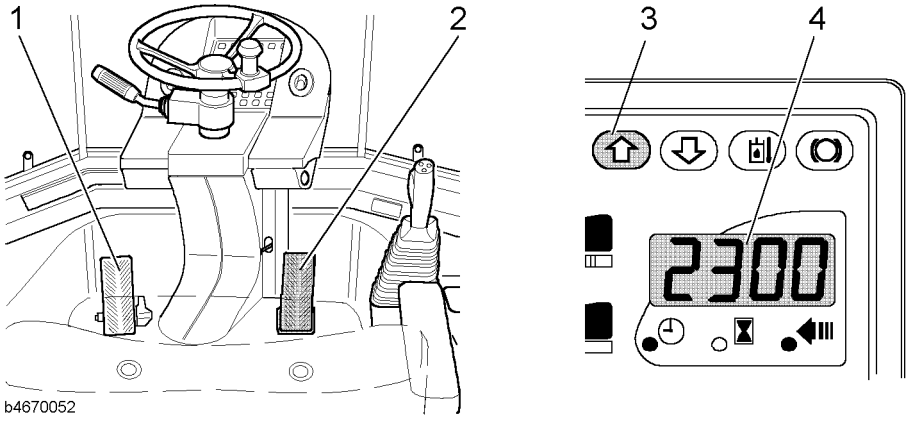
- Push the button **1** to drive range - **I** - or - **II** -, depending on how the machine to be used.

The selected drive range is indicated with the symbol fields **2, 3** in the display unit.

Driving off

After the electrical system has been turned on, travel range - **II** - is automatically activated.

Make sure that the preparations for driving mode have been implemented.



Gas pedal and travel speed indicator

1 Brake / inching pedal
2 Gas pedal

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3 Travel direction symbol field 4 Travel speed LCD

- Push down the gas pedal **2**.

The machine starts moving.

- Regulate the travel speed with the gas pedal.

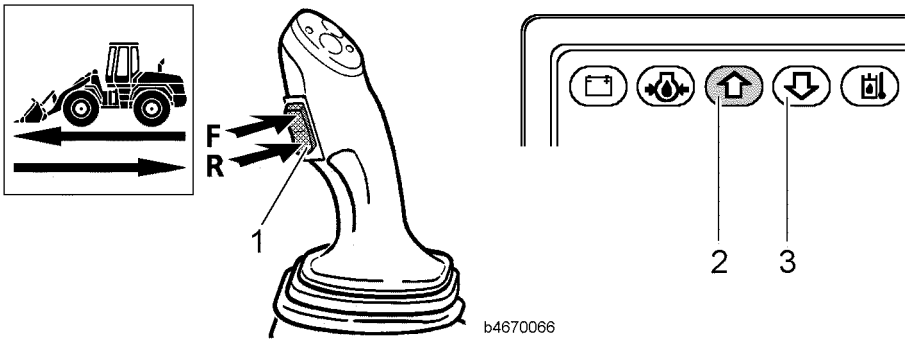
The actual travel speed is displayed in the travel speed LCD **4**.
The prerequisite for this is that the MODE button is set to displaying the driving speed.

Driving

You will find descriptions of work operations, driving, transport and transferring bulk material in the section on general working methods.
Shortly after driving off with the machine, make sure that the steering and brakes are functioning properly.
Refer to the maintenance section.

Reversing

The machine can be reversed in all travel ranges and at all speeds.
If the direction of movement is reversed at a high speed, the machine is braked hydrostatically.

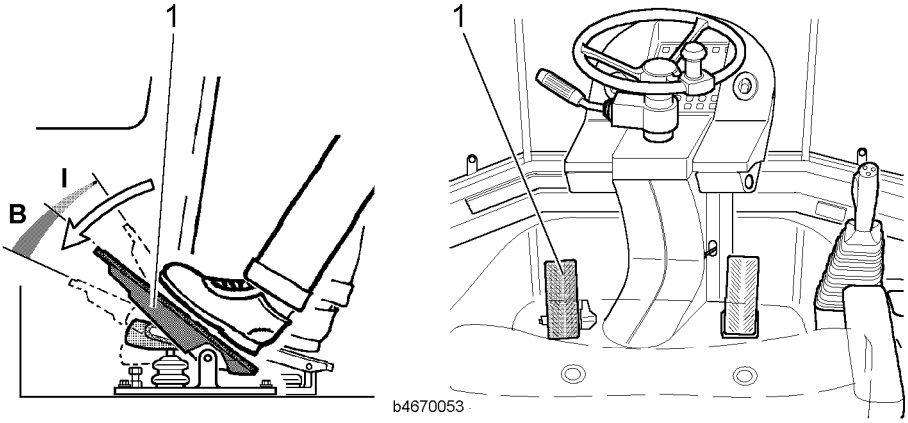


Switch for travel direction and display unit

1 Travel direction switch
2 Symbol field – travel direction “forward”
3 Symbol field – travel direction reverse

- Changing travel direction: press switch **1**.

Depending on the switch position, the symbol field for forward travel **2** or for reverse travel **3** lights up.



Inch- brake pedal

Reversing can be supported by reducing the diesel engine speed or by gently pressing the inch- brake pedal **1**.

- **Support reversing in this way as necessary.**

This produces a smoother reversing performance.

Driving on public roads

Before driving on public roads, acquaint yourself with the route (roads, bridges, tunnels, subways, narrow places etc.) in respect to the prescribed weight limits, bridge load bearing limits, width and height limits.

In the case of wheel loaders with a design-limited maximum speed of 20 km/h which do not have a licence plate, a company name (operating base) should be displayed, as well as certification of the operational liability insurance.

The wheel loader may only be driven on public roads when unloaded.

Before driving on public roads, find out:

– From the machine owner, whether the required conditions for licensing for public roads have been met.
  - “Operating permit”
  - “Special licence”
– About the appropriate safety regulations.
– Refer to the sections:
  - “Safety regulations”
  - “Safety instructions for driving on slopes”
  - “Instructions for safe working”

Make sure that the preparations for driving mode have been implemented.

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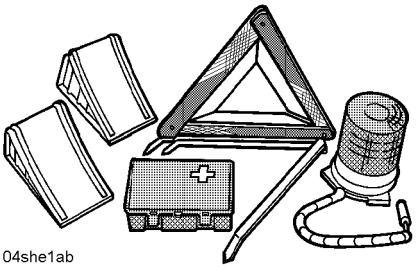
Preparations for driving on public roads



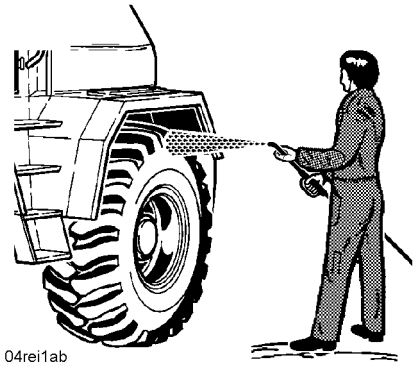
Make sure that the safety devices listed below are all stowed on board, in accordance with the provisions of the **Roadworthiness Certification**.

– Warning triangle
– Flashing beacon
– First aid box
– Wheel wedge(s)

In addition, make sure that the jobs listed below have been carried out.

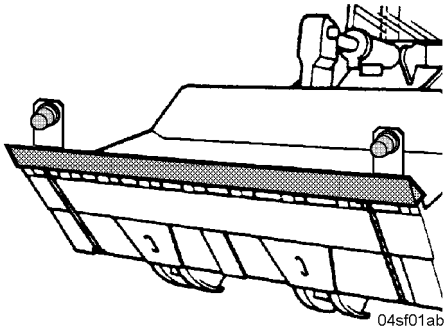
- Remove coarse dirt from the machine and clean the tyre treads.

See also the section on cleaning the machine in the maintenance chapter.



Wet cleaning

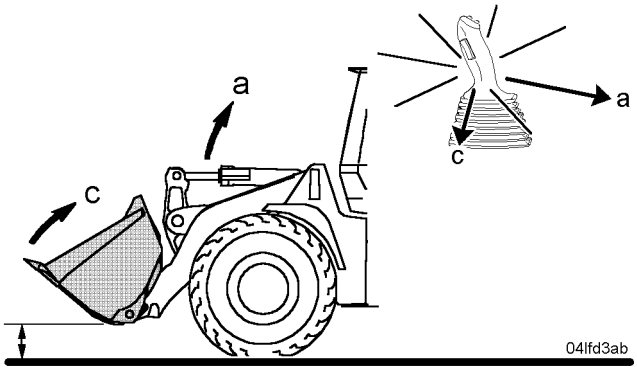
- Close all service doors, hatches, covers and hoods and where possible lock them.



Bucket tooth guard and side lamps

- Attach the tooth guard to the bucket.
- Attach the side lamps.
- Connect the cables for the side lamps.

Driving You will find descriptions of work operations, driving, transport and transferring bulk material in the section on general working methods.



Transport height

Ensure that:
– When driving, the loading bucket is in the transport position.
  The transport position means that the bucket pivot point must be approximately 40 cm above the ground.
– The bucket is tipped up as far as it will go.

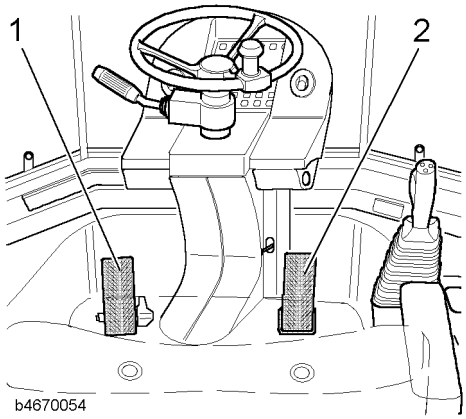
- Always drive with due care.
- Observe traffic regulations.

Braking

There are two ways to brake the machine:
– With the hydrostatic circuit only
– Braking with the hydrostatic circuit and the disc brakes.

Hydrostatic braking The machine is hydrostatically braked by reducing the speed of the diesel engine.

The hydrostatic travel drive system of the machine also acts in the delay phase as a service brake.



Brake / inching pedal and gas pedal

1 Brake / inching pedal 2 Gas pedal

- Reduce the speed of the diesel engine with the gas pedal **2**.

Service brake If hydrostatic braking is not sufficient, the machine must also be braked with the brake / inching pedal **1**.

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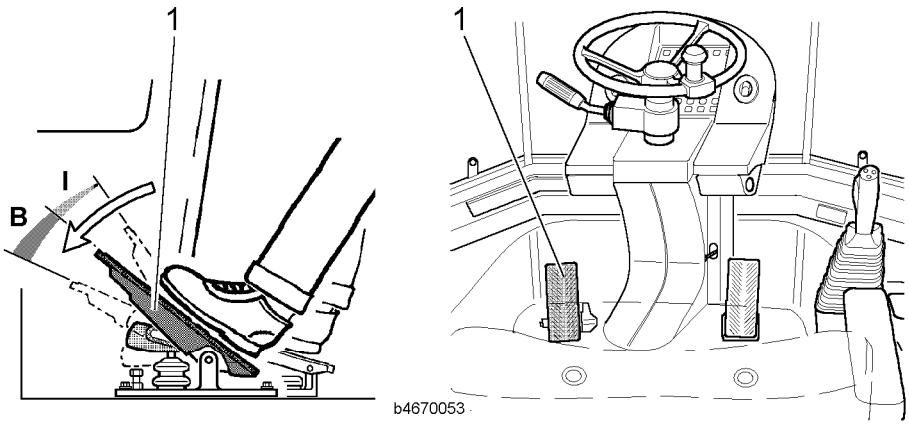
Braking with the brake / inching pedal

During braking, there are two ranges for activating the brake / inching pedal:

– Range - **I** - for hydrostatic braking only.
– Range - **B** - for braking with the hydrostatic circuit and disc brakes.



Brake / inching pedal

1 Brake / inching pedal
I Actuation range – I
B Actuation range – B

Warning

There is a risk of accidents when braking without due care
If the machine is braked without due care, the driver could suffer severe injuries if the safety belt is not properly fastened.

! It is essential that you fasten your safety belt before starting up the machine.

- Braking with the hydrostatic circuit only: activate the brake / inching pedal **1** in range - **I** - of the pedal travel.

or

■ Brakes with the hydrostatic circuit and the disc brake. Activate the brake / inching pedal **1** in range - **B** - of the pedal travel.

The force of the braking of the machine corresponds to force applied to the pedal.

Troubleshooting

Little or no braking effect

- Shut down the machine immediately
- Contact LIEBHERR CUSTOMER SERVICE

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Braking in potentially dangerous situations

Danger

There is a risk of accidents due to inappropriate braking in dangerous situations

! For full braking in dangerous situations, the brake / inching pedal must be pressed all the way down.

- Press down the brake / inching pedal **1** in range - **B** - of the pedal travel to the stop.

The machine brakes with great force.

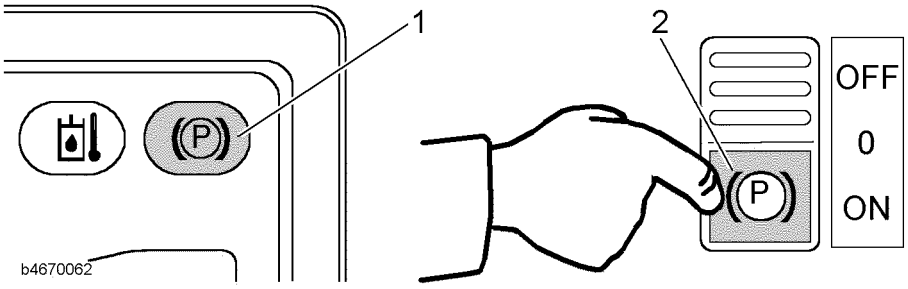
After the machine comes to rest

If you leave the stationary machine while the engine is still running, the following precautions should be taken.

Engaging the parking brake

When the parking brake is engaged, the gearbox is automatically switched to neutral.

The parking brake may not be engaged until the machine is absolutely stationary.



Display unit and switch – parking brake

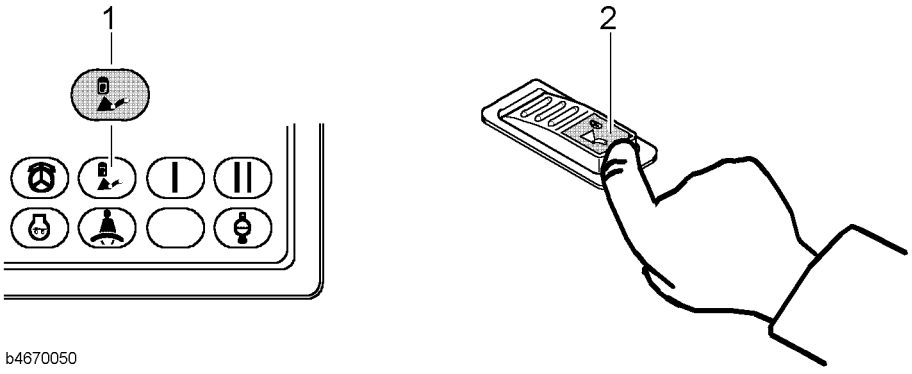
1 Parking brake symbol field 2 Parking brake switch

- Activate the parking brake with the switch **2**.

The symbol field **1** for the parking brake lights up.

The parking brake is engaged and the travel direction is in neutral.

Locking the working hydraulics



Display unit and switch – working hydraulics lock

1 Working hydraulics lock symbol field 2 Working hydraulics lock switch

- Press the button **2** for working hydraulics lock to prevent unforeseen activation of the working attachment.

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The symbol field **1** for the working hydraulics lock lights up.
The working hydraulics are no longer operational.

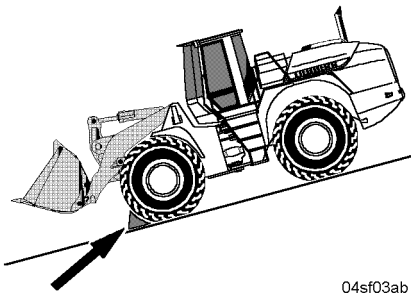
Securing the machine

The following precautions should be taken when the machine is to be parked for a prolonged period on a slope.

Danger

There is a risk of accidents due to the machine suddenly rolling away.
! Secure the machine against rolling away.

- Take the wedges out of their holders.
- Secure the machine against rolling away with the wedges.



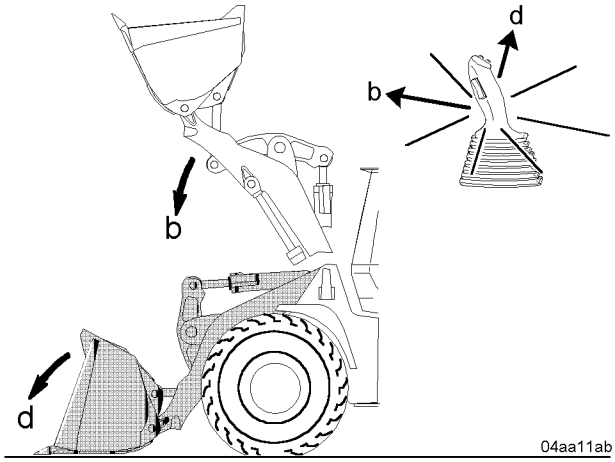
On downhill slopes

3.3.4 Shutting down the machine

Before you shut down the engine and leave the machine, the following precautions should be taken.

Lowering the working attachment

Make sure that the loading bucket is empty.

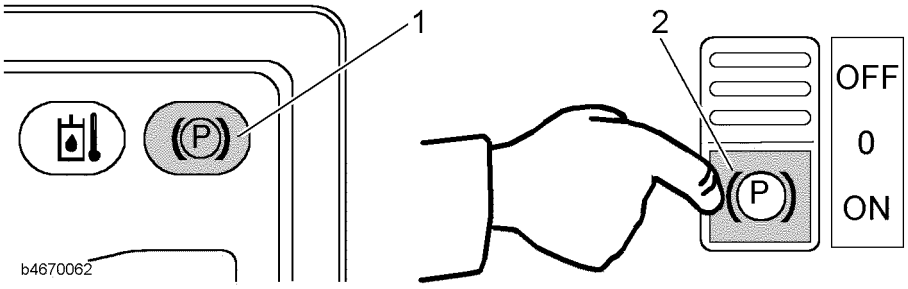


Bucket arm movement

- Lower the lift arms by moving the control lever in direction - **b**.
- Set down the bucket flat on the ground: by moving the control lever in direction - **d**.

Engaging the parking brake

When the ignition is switched off, the parking brake is automatically engaged.
If you wish to engage the parking brake before switching off the ignition, proceed as follows.



Display unit and switch – parking brake

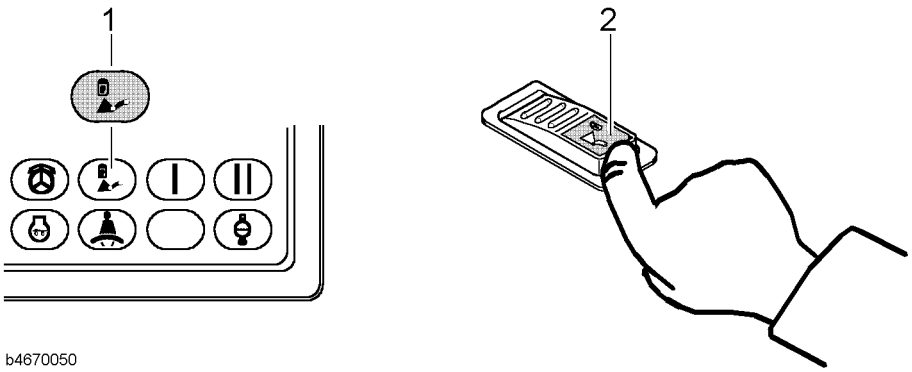
1 Parking brake symbol field 2 Parking brake switch

- **If necessary**, activate the parking brake with the switch **2**.

The symbol field **1** for the parking brake lights up.

Locking the working hydraulics

When the ignition is switched off, the working hydraulics lock is automatically activated.
If you wish to engage the working hydraulics lock before switching off the ignition, proceed as follows.



Display unit and switch – working hydraulics lock

1 Working hydraulics lock symbol field 2 Working hydraulics lock switch

- **If necessary**, press the working hydraulics lock switch **2** to prevent unforeseen operation of the working attachment.

The symbol field **1** for the working hydraulics lock lights up.
The working hydraulics are no longer operational.

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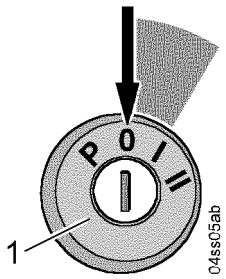
Shutting down the engine

Do not attempt to suddenly shut down the engine when it is running at full load speed. This is especially important with turbo engines.
If the engine is suddenly switched off, the turbo charger continues running for a time without an oil supply.

- Reduce the engine speed to idle running speed and take your foot off the gas pedal.
- Let the engine continue idling briefly - for 10 to 15 seconds.
- Turn the starting key to position - **0** - and pull it out.

All symbol fields go out.



Starter switch 0 position

Turning off the battery main switch

The battery main switch is located at the rear left of the engine compartment.
See also the section on turning off the battery main switch in the section on preparing for maintenance.

- If you are leaving the machine unattended
  the main battery switch must be turned off.

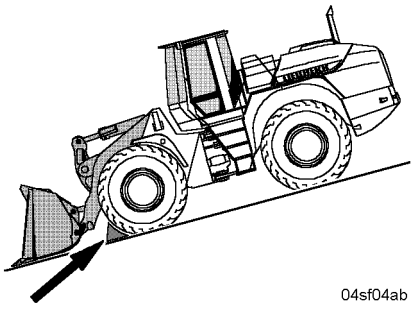
Securing the machine

The following precautions should be taken when the machine is to be parked for a prolonged period on a slope.

Danger

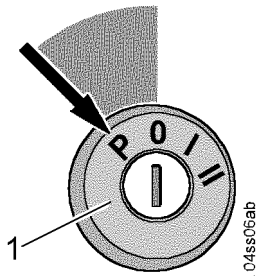
There is a risk of accidents due to the machine suddenly rolling away.
! Secure the machine against rolling away.

- Take the wedges out of their holders.
- Secure the machine against rolling away with the wedges.



On downhill slopes

Parking position



Starter switch - parking position

The starting key cannot be pulled out in the parking position - **P**.

- Turn the ignition key to the parking position - **P**.
- You can keep the battery main switch turned on when parking the machine on public roads.

The consumer units listed below are ready for operation:

– Parking and driving light
– Interior lighting
– Hazard warning system
– Socket / cigarette lighter
– Working floodlight

If they have also been installed, the following items are also ready:

– Flashing beacon
– Radio

Danger

If unauthorised people are on the machine it can put the maintenance personnel in extreme danger.

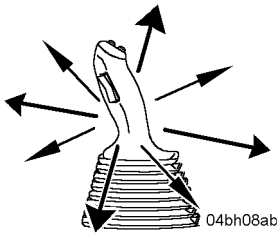
! Secure the machine against access by unauthorised persons

- When you leave the machine:
  Turn the ignition key to position - **0** - and pull it out.

Any power consumers which are still required can be switched on at the instrument panel.

See the section on the starting key.

3.3.5 Operating the lift arm



LH control lever

The working movements of the lift arm and the working attachment (bucket) are controlled by the LH control lever.

See also the section on the LIEBHERR control lever.

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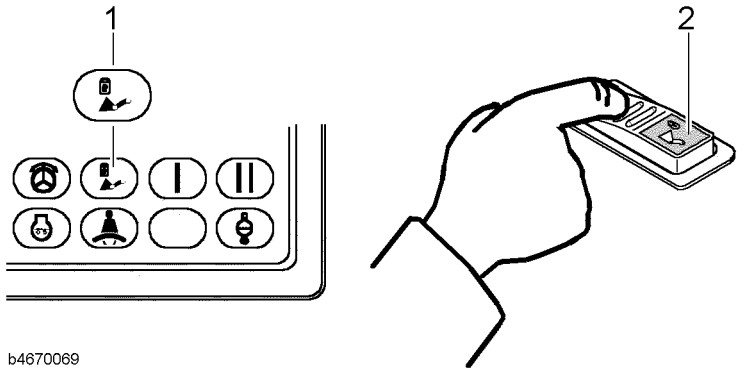
Enabling actuation of the working hydraulics

When the ignition is switched on, the working hydraulics are automatically enabled.

- **If you have previously engaged the working hydraulics lock, operate the working hydraulics to enable them for further use.**



Display unit and switch – working hydraulics lock

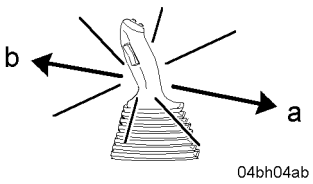
1 Working hydraulics lock symbol field
2 Working hydraulics lock switch

- Deactivating the working hydraulics lock: pushing the switch **2** back.

The symbol field **1** for the working hydraulics lock goes out.
The working hydraulics are now ready for operation.
The working attachment can now be operated.

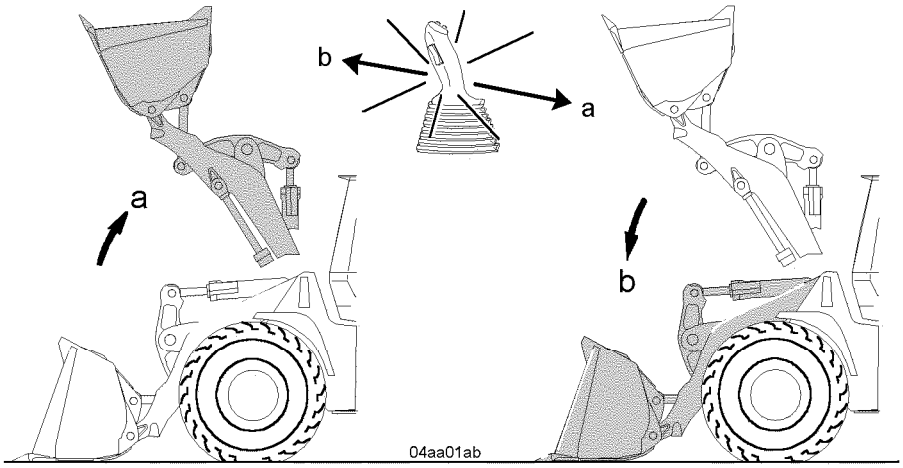
Operating the lift cylinder

The lift cylinders raise and lower the lift arm.



LH control lever

Raising the lift arm



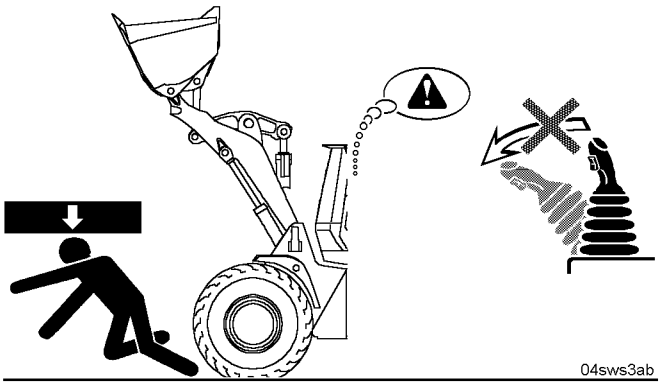
Bucket arm movement

- Move the LH control lever in direction - **a**.

The lift arm is raised.

Lowering the lift arm

The lift arms are lowered with the normal lowering function.



Danger

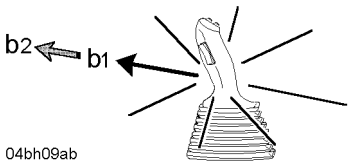
Danger

There is a risk of accidents when the working attachment is lowered quickly.
The raised working attachment is lowered rapidly when the float position is activated.
Anyone standing under the raised working attachment will be crushed.

! Keep out of the danger area.

- **Do not lower the lifted working attachment with the float position function!**
- Operate the normal lowering function: by moving the LH control lever in the direction - **b1** - up to the action point.

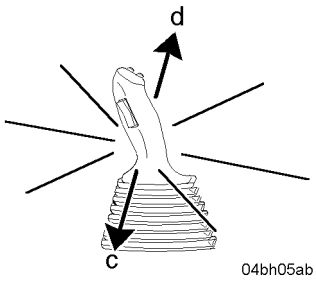
The lift arm is lowered slowly.



LH control lever

Operating the tilt cylinder

The tilt cylinder makes it possible to tilt the bucket in or out.



LH control lever

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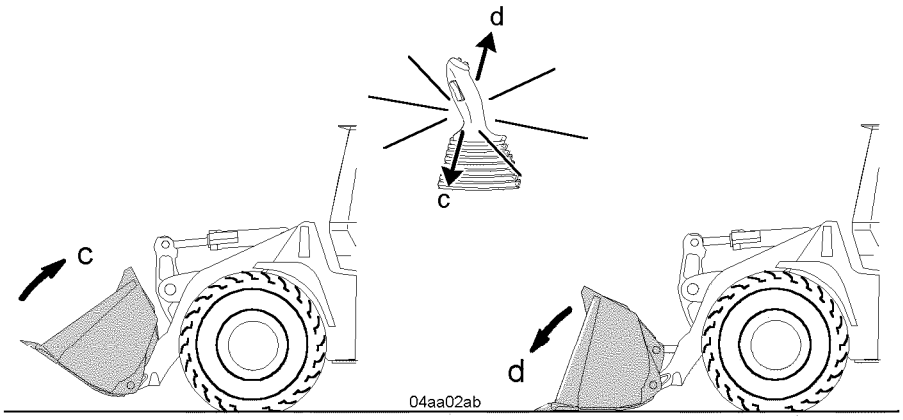
Tilting the bucket in



Bucket movement

- Move the LH control lever in direction - **c**.

The bucket is tilted in.

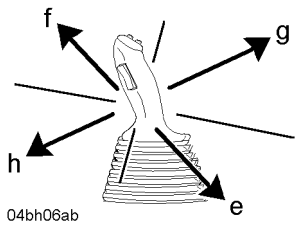
Tilting the bucket out

- Move the LH control lever in direction - **d**.

The bucket is tilted out.

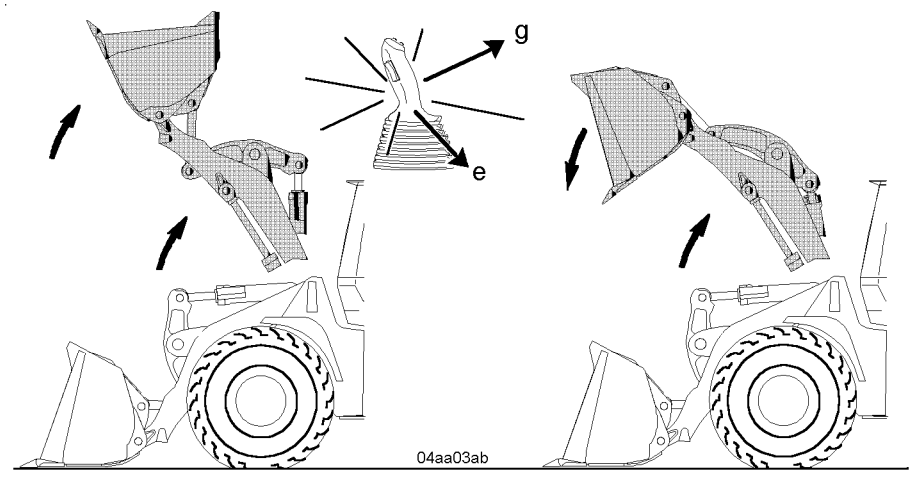
Operating the lift and tilt cylinders at the same time

The lift and tilt cylinders can be simultaneously retracted or extended by moving the LH control lever diagonally.



LH control lever

Raising the lift arm while tilting the bucket in



Working movements

- Move the LH control lever in direction - **e**.

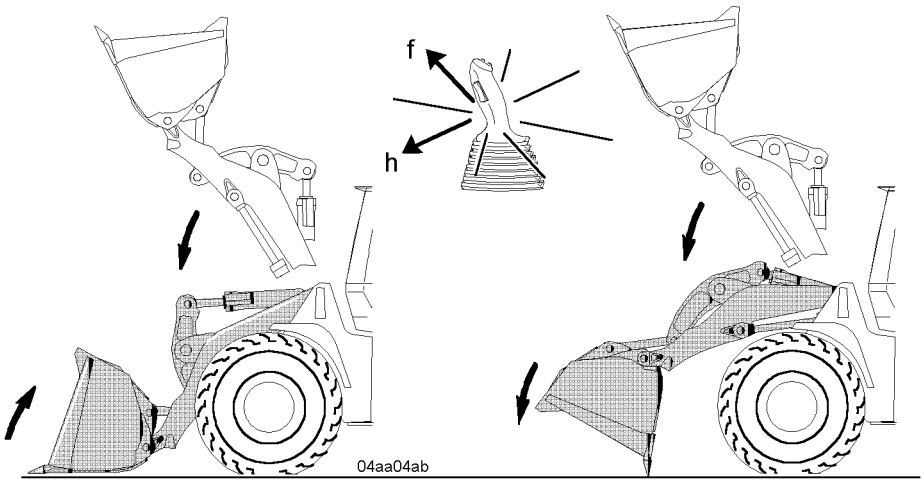
The lift arm is raised and the bucket is simultaneously tilted in.

Raising the lift arm while tilting the bucket out

- Move the LH control lever in direction - **g**.

The lift arm is raised and the bucket is simultaneously tilted out.

Lowering the lift arm while tilting the bucket in



Working movements

- Move the LH control lever in direction - **h**.

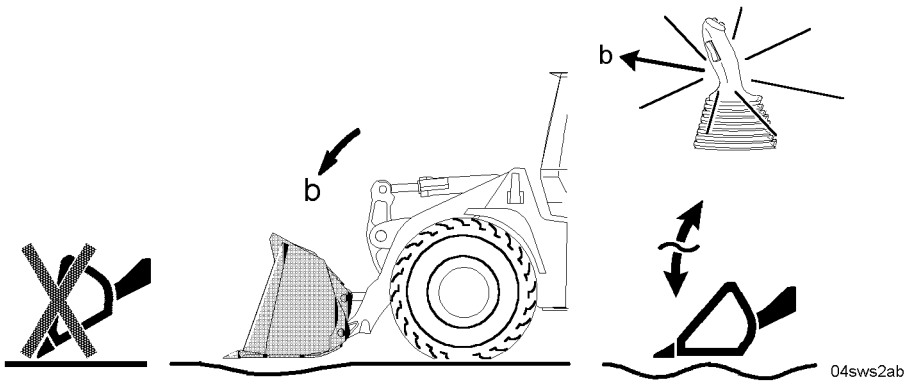
The lift arm is lowered and the bucket is simultaneously tilted in.

Lowering the lift arm while tilting the bucket out

- Move the LH control lever in direction - **f**.

The lift arm is lowered and the bucket is simultaneously tilted out.

Activating the float position



Bucket position for float position

In the float position, the working attachment is kept just above the ground by its own weight and can adapt its position to uneven surfaces.

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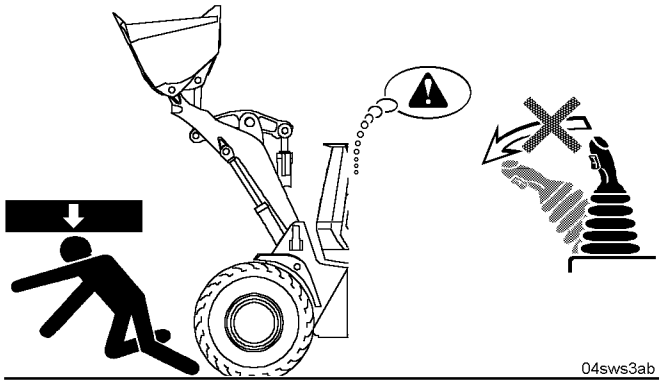
Activating the float position

The procedure for activating the float position is as follows:

Make sure that the lift arm is lowered and that the bucket is lying flat on the ground.



Danger

Danger

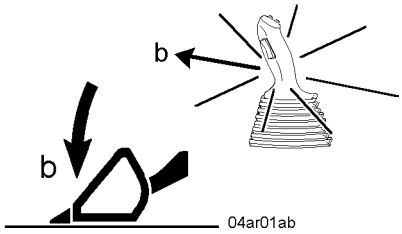
There is a risk of accidents when the working attachment is lowered quickly.

The raised working attachment is lowered rapidly when the float position is activated.

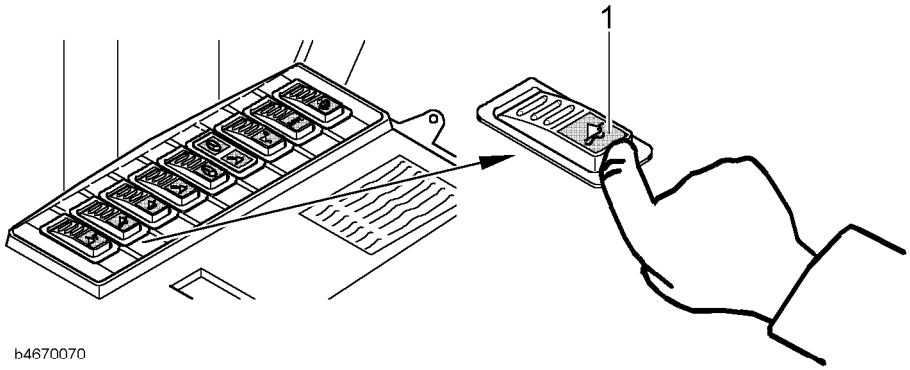
Anyone standing under the raised working attachment will be crushed.

! Keep out of the danger area.

- Do not activate the float position function when the working attachment is raised.
- Lower the lift arm and lay the bucket down flat on the ground.



Bucket position



Switches on the side cover

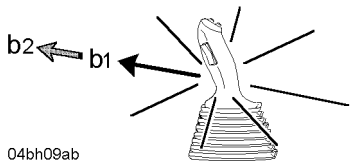
1 Float position switch

When the switch **1** for the float position is actuated, the function is ready.

- Press the switch **1** for float position.
- Move the LH control lever in direction - **b2** through the action point as far as it will go and then release it.

The LH control lever is kept in this position by magnetic force.

The float position function now remains active.



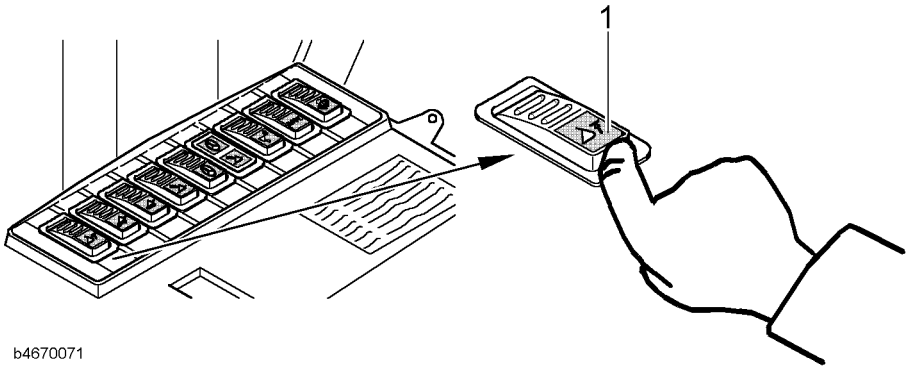
LH control lever

Activating the automatic lift kick-out function

This equipment is optional.
The automatic lift kick-out prevents the lift arm coming to an abrupt halt at the upper lift limit. This protects both the machine and the driver from unnecessary jolting.

Activating the automatic lift kick-out function

The procedure for activating the automatic lift kick-out is as follows:

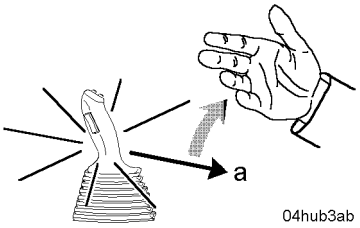


Switches on the side cover

1 Air conditioning switch (optional)

- Press the button **1** for the lift kick-out.

The lift kick-out function is now active.



LH control lever

- Move the LH control lever in direction - **a** through the action point as far as it will go and then release it.

The LH control lever is kept in this position by magnetic force.

This means that the lift arm is only raised as far as the switching point for the lift kick-out.

The lifting process is automatically interrupted at this point.

Lift kick-out for reduced dumping height

A reduced dumping height can also be set with the aid of the proximity switch.

Caution

There is a risk of accidents when working close to a height limit.
When working close to a height limit, there is a risk of accidents if the lift kick-out is overrun.
! When working near to a height limit, proceed with extreme caution.

- Set the lift kick-out for a reduced dumping height.

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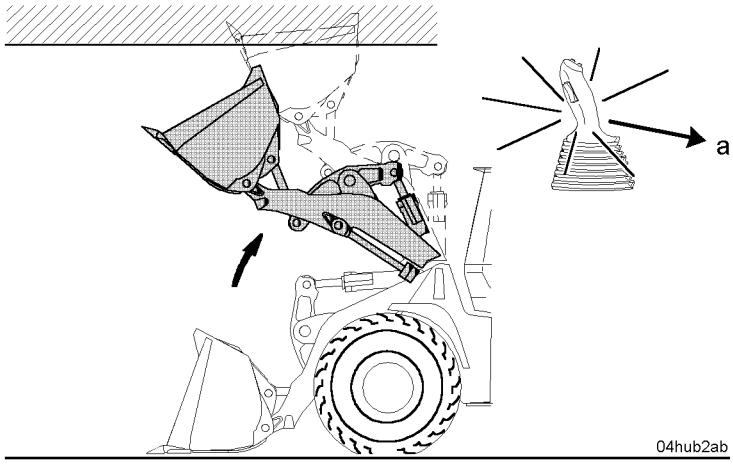
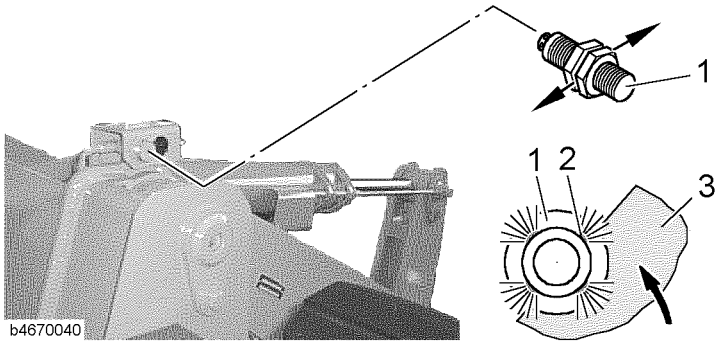
Setting the lift kick-out for a reduced dumping height

The proximity switch for the automatic lift kick-out is set at the factory.
If necessary, the proximity switch can be re-adjusted.
The procedure for re-adjusting the proximity switch is as follows.



Reduced dumping height

- Raise the lift arms to the required dumping height.



Proximity switch

1 Proximity switch for automatic lift kick-out
2 LED
3 Bucket arm

- Release the fixing nuts on the proximity switch.

Horizontally adjust the proximity switch **1** until the bucket arm **3** covers up to half the contact surface of the proximity switch.
When the bucket arm enters the actuation range of the proximity switch, the four LEDs **2** on the proximity switch light up.

- Retighten the fixing nuts on the proximity switch.

The proximity switch has been reset and the automatic lift kick-out is once more ready for operation.

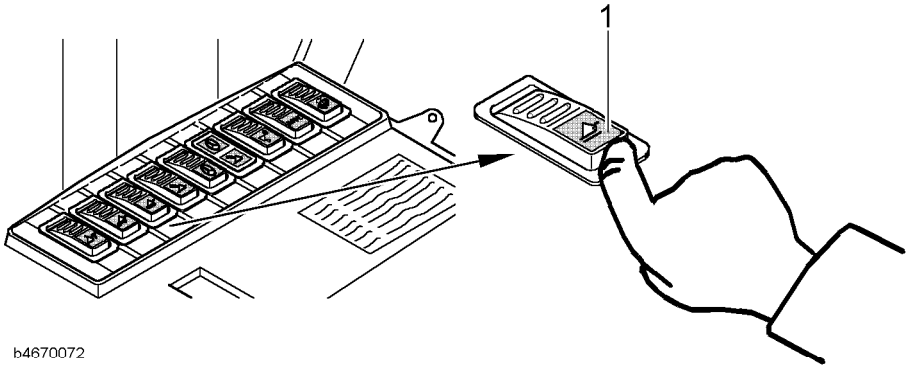
- Test the adjustment and reset if necessary.

Activating the automatic bucket return-to-dig function

You can use the automatic bucket return-to-dig function for loading jobs which require a certain digging position.

Activating the automatic bucket return-to-dig function

The procedure for activating the automatic bucket return-to-dig function is as follows:



Switches on the side cover

1 Bucket return-to-dig switch

- Press the switch **1** for bucket return.

The automatic bucket return-to-dig function is now active.

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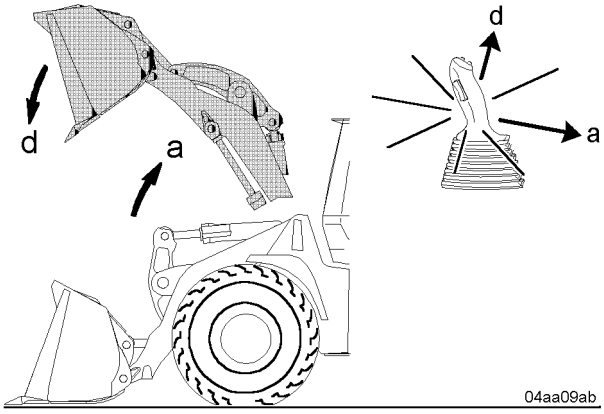
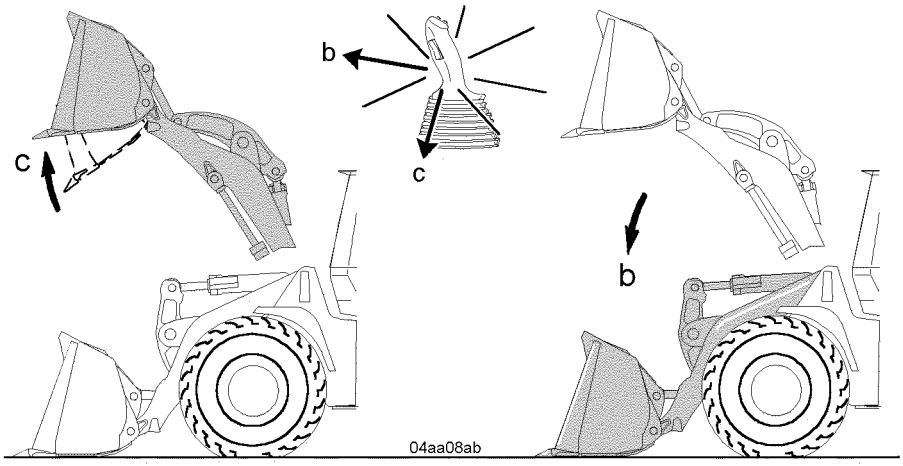
Working with the automatic bucket return-to-dig function

Make sure that the automatic bucket return-to-dig function is active.

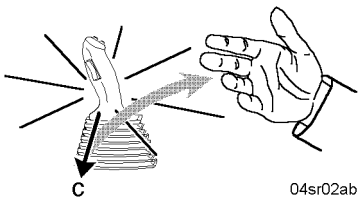


Working movements

- Raise the lift arms by moving the LH control lever in direction - **a**.
- Tip the loading bucket down in the raised position by moving the LH control lever in direction - **d**.



Working movements



LH control lever

- Tip the loading bucket up in the raised position by moving the LH control lever in direction - **c** - through the action point as far as it will go and release it.

The LH control lever is kept in this position by magnetic force.

This moves the bucket into the preliminary position for the digging position.

As soon as the loading bucket is in the preliminary position, the LH control lever is released by the solenoid.

- Lower the lift arms by moving the LH control lever in direction - **b** -.

This moves the loading bucket into the digging position on the ground.

Adjusting the digging position

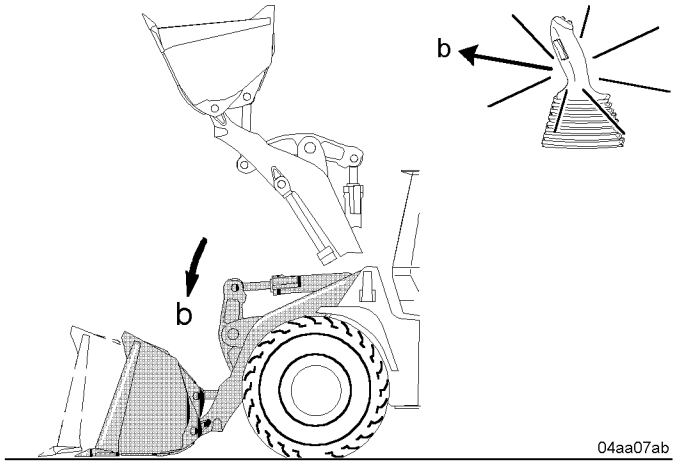
The proximity switch for the automatic bucket return-to-dig function is set at the factory.

If necessary, the proximity switch can be re-adjusted.

The procedure for re-adjusting the proximity switch is as follows.

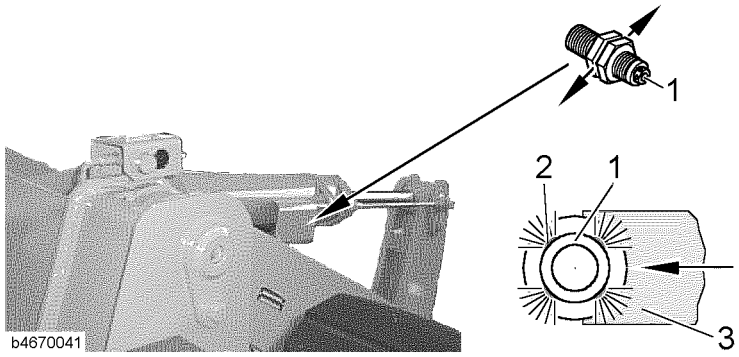
Rough adjustment

Make sure that the lift arm is lowered and that the loading bucket is empty.



Rough digging position

- Move the loading bucket with the LH control lever into the required digging position.



Setting up bucket return-to-dig

1 Proximity switch for automatic bucket return-to-dig
2 LED
3 Positioning curve

- Release the fixing nuts of the proximity switch **1**.

Horizontally adjust the proximity switch **1** until the positioning curve **3** covers up to a third or to half the contact surface of the proximity switch.

When the positioning curve enters the contact area of the proximity switch, the four LEDs **2** on the proximity switch light up.

- Tighten the fixing nuts on the proximity switch **1** again.

The rough adjustment of the required digging position is now complete.

- Testing the rough adjustment: see the section on working with the automatic bucket return-to-dig.
- If required, carry out a fine adjustment.

Fine adjustment

The required fine adjustment is attained after several attempts.

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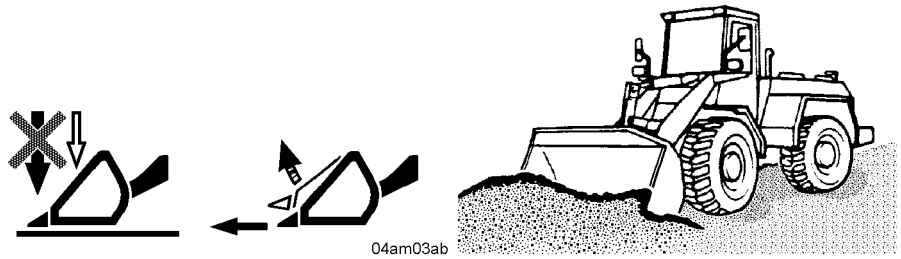
- Using the LH control lever, move the loading bucket to the exact digging position.
- Readjust the proximity switch, as detailed in the section on rough adjustment.
- Test the fine adjustment: as detailed in the section on working with the automatic bucket return-to-dig.

3.3.6 General working methods

The routine working methods are described in this section.

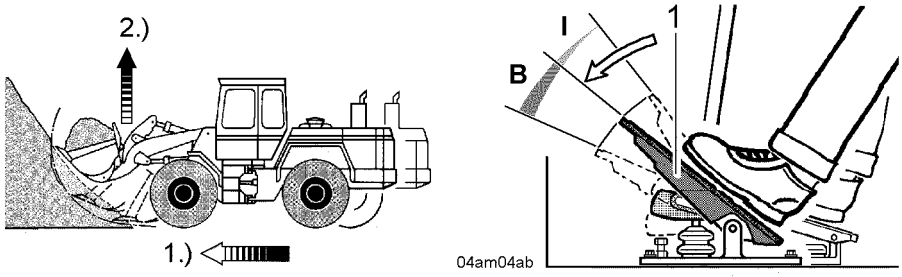
Load and carry operation

The following procedure is recommended to avoid any possible loss of traction.



- Do not work with a strong downwards pressure on the bucket.
- If the flow of the bulk material into the bucket needs to be assisted, When driving the bucket into the material, gently tip it up and down.

When the brake / inching pedal is activated, the advance force (tractive force) is reduced, thus making loading easier.



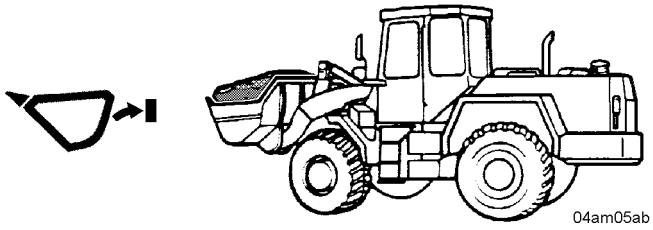
Power distribution by inching

1 Brake / inching pedal
I Inching range
B Braking range

- In addition, push down the brake / inching pedal **1** in range - **I** - of the pedal travel with the required force.

The engine power is adjusted:
1.) The power going to the travel hydraulics is reduced.
2.) The power going to the working attachment is increased.

The advantages of power adjustment:
– The wheels do not spin unnecessarily.
– The fuel consumption is reduced.

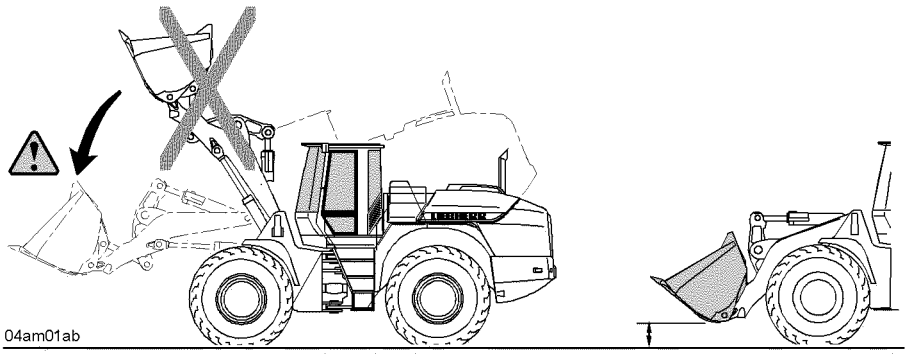


• Tip up the loaded bucket as fas as it will go and raise the lift arms.

Transport and carry operation

The bucket should be moved into the transport position to improve the machine's stability and to ensure good viewing conditions when transporting and transferring bulk materials.
The transport position means that the bucket pivot point is approximately 40 cm above the ground.

Transport position



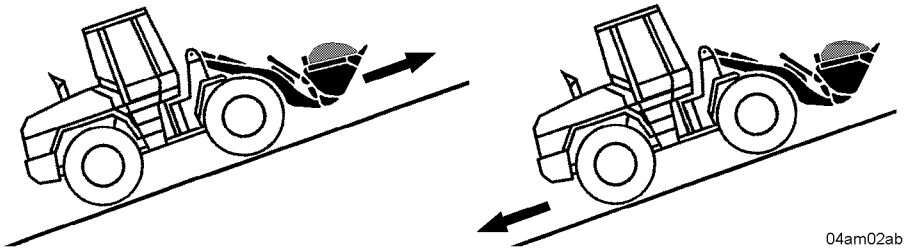
The machine may tip over

Warning

There is a risk of the machine tipping over.
There is a risk that the machine might tip over when the lift arms are raised due to the shift in the centre of gravity.
! Observe the maximum permitted bulk material weight and the specified tipping loads.

• Move the loaded bucket into the transport position.

Transporting a load on a slope

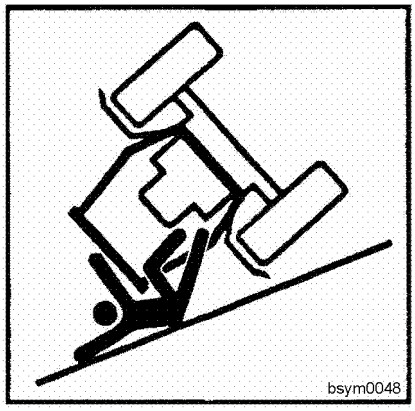


Travel directions when transporting loads

Warning

There is a risk of the machine tipping over.

! When transporting a load on a steep slope, keep the loaded bucket low.

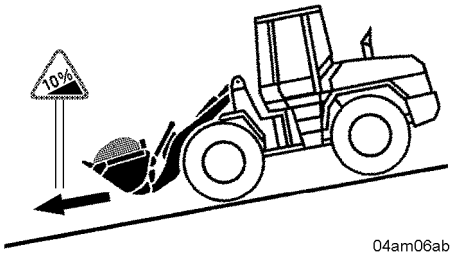


- When transporting uphill, drive forwards.
- When transporting downhill, drive in reverse.
- On slopes do not drive with the working attachment up.

Driving on slopes

It is essential that the safety instructions are observed when driving on sloping ground.

Refer to the section on “safety instructions for driving on slopes”.



Slope

Warning

There is a risk of the machine tipping over.

The machine can tip over more easily when driving on sloping ground.

! Always keep the loaded bucket low during transport.

! Do not suddenly change direction or brake abruptly.

- Select the lowest possible travel range.
- Ease off the gas pedal.
- Drive downhill carefully.

Grading work

Keep the bucket base horizontal when grading.

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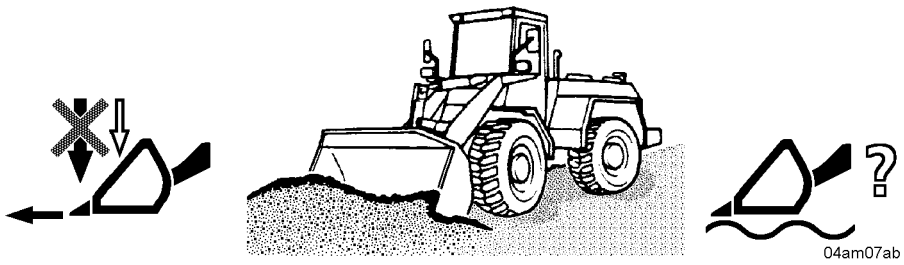
Grading

The following procedure is recommended to avoid any possible loss of traction.

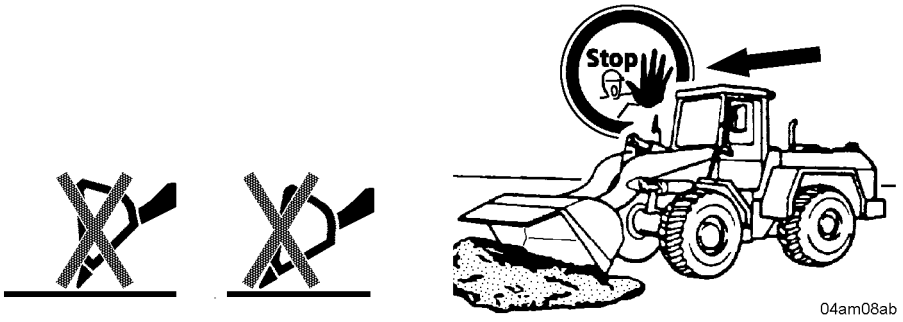


Grading procedure

- Do not work with a strong downwards pressure on the bucket.

or

- Use the float function position: refer to the sections on operating the lift arm and activating the float position.



Impermissible bucket positions

Caution

There is a risk of damage to the machine.
The machine may be damaged during grading work, if the bucket hits a hard object when it is tipped down while the machine is moving forward.

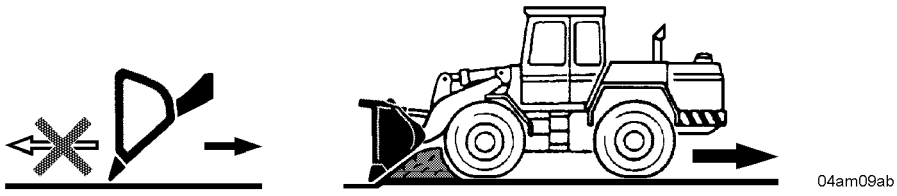
! Do not grade in the forward travel direction when the bucket is tipped down.

- Position the bucket base parallel to the ground.

or

- Gently tilt the bucket base downwards.

Bulldozing



- Tilt the bucket downwards and reverse the machine.

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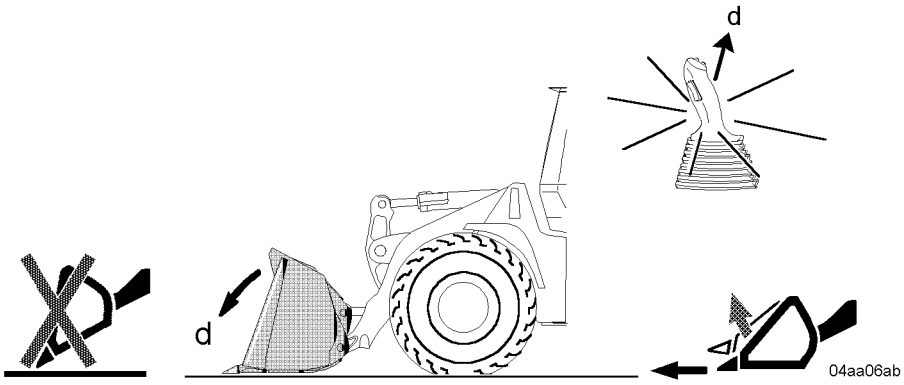
Loading from a tip

Picking up material



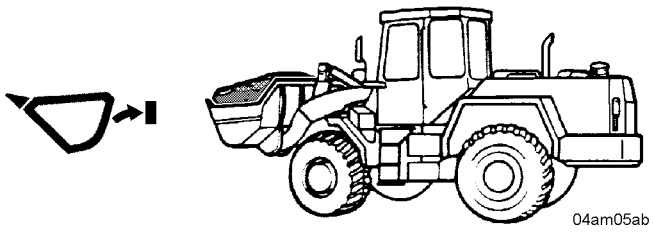
Bucket position

Caution

There is a risk of damage to the machine.
The lift arms may be damaged, if when clearing away bulk material in the forward travel direction with the bucket tipped down, you drive into a hard obstacle at speed.

! When clearing away bulk material, do not drive into the pile with the bucket tipped down.

- Lower the loading bucket horizontally onto the ground.
- Drive into the material, slightly tipping up the bucket in the process.
- If the flow of the bulk material into the bucket needs to be assisted, gently tip it up and down when driving the bucket into the material.
- In addition, press down the brake / inching pedal: see the section on picking up and transferring bulk materials.

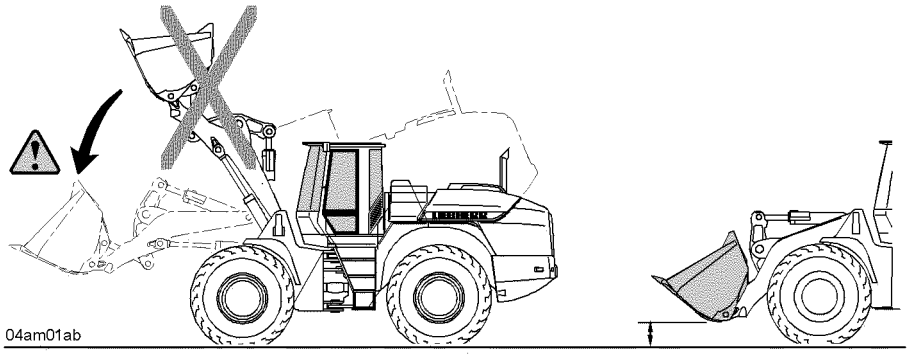


Bucket position

- Tip up the loaded bucket as fas as it will go and raise the lift arms.

Material transport

Keep the loaded bucket low during transport in order to improve the machine's stability and to ensure good viewing conditions.

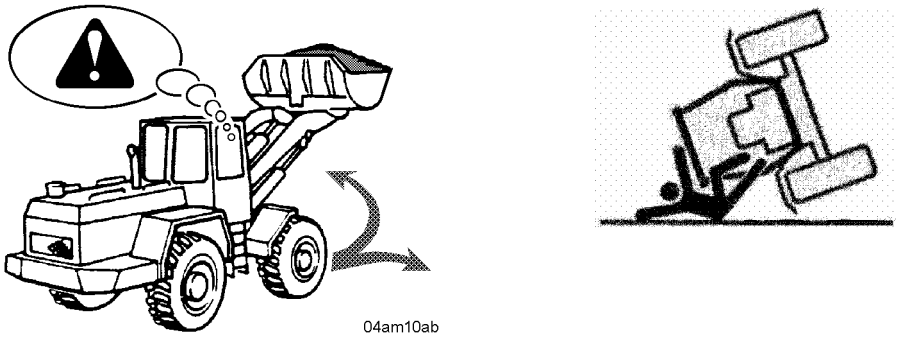


Bucket position

Make sure that the bucket is in the transport position.

The transport position means that the bucket pivot point is approximately 40 cm above the ground.

- Move the bucket into the transport position.



The machine may tip over

Warning

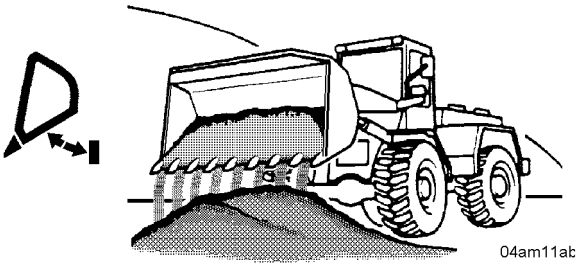
There is a risk of the machine tipping over.

There is a risk that the machine might tip over when the lift arms are raised due to the shift in the centre of gravity.

! Do not suddenly change direction or brake abruptly when the bucket is raised.

- Do not raise the lift arms until just before reaching the unloading point.

Dumping



Dumping

- Tip out the bucket.
- Loosening material adhering to the bucket: quickly tilt the bucket in and out, briefly jolting against the bucket arm stops in the process.

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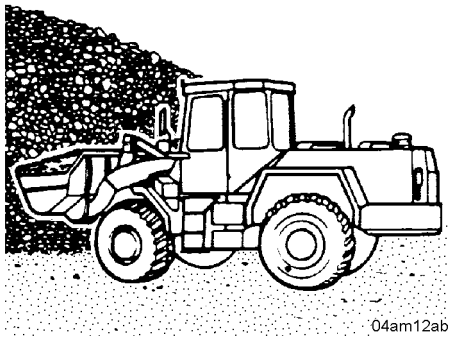
Loading from slopes or banks

Removing material from a slope

Remove normal loading material such as sand or gravel as follows.

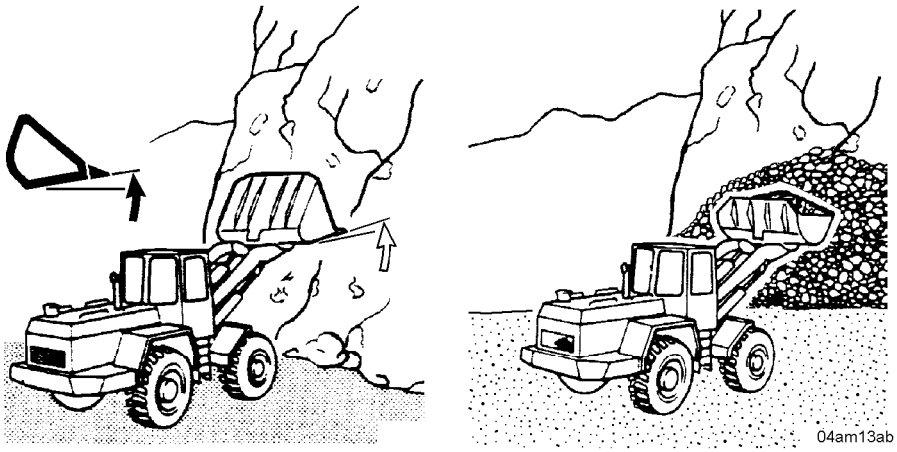


Removing bulk material 1

- Start removing the material at the foot of the slope, working your way upwards.

Material removal from a bank

Remove especially hard materials such as rock as follows.



Removing bulk material 2

- Gently tilt the bucket base upwards.
- Start removing material at the top and work your way downwards.

Warning

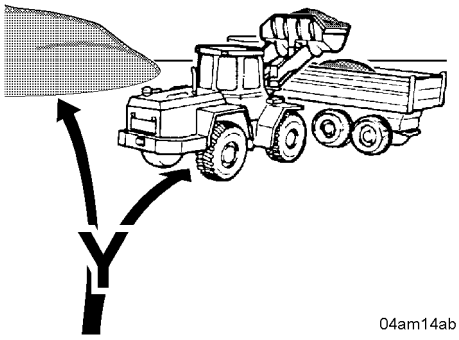
There is a risk of accidents due to falling material.

! Do not work under overhangs.

- Remove overhangs first and then look out for slippage.

Loading bulk transport vehicles

Loading paths



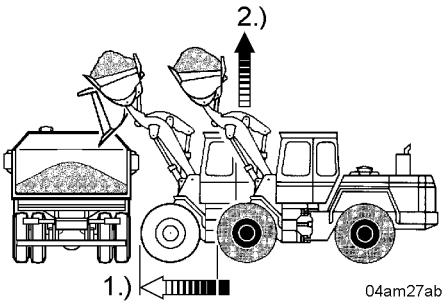
Y-movement

The machine to be loaded should be parked so that the transport distance for the machine is as short as possible.

If possible make a **Y-movement**. See also in the section on driving mode, the information on reversing.

Loading procedure

In order to speed up the loading procedure, brake the machine in front of the truck with the brake / inching pedal.



Unloading position

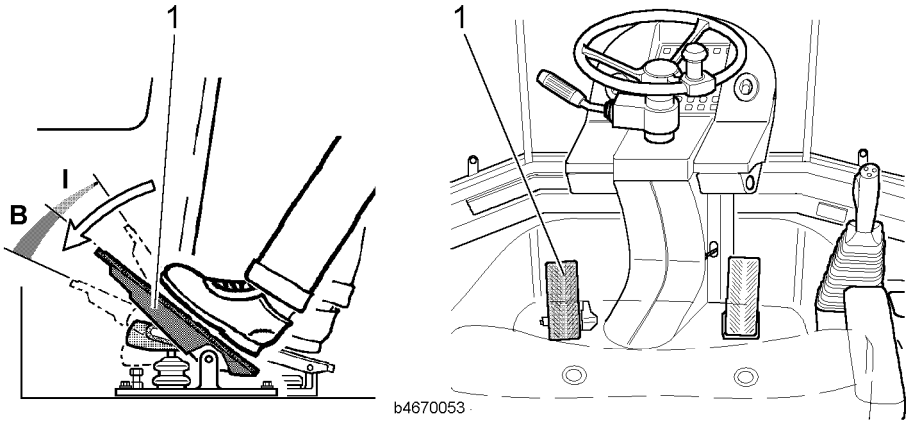
This yields the following benefits:

1.) Sensitive speed adjustment

2.) Optimum power adjustment for the working attachment

See also the section on load and carry operation.

- Put the machine in the unloading position. Do not raise the lift arm until just before reaching the unloading point.



Brake / inching pedal

1 Brake / inching pedal
I Inching range
B Braking range

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- Braking the machine: by pushing down the brake / inching pedal **1** in range - **I** - of the pedal travel with the required force.

When working in the close proximity of overhead power lines:

Danger

Risk of accidents through contact with overhead power lines!
There is a risk of **"FATAL INJURIES"**!

! Obtain information about the safety clearances to be observed!

- Keep a sufficient distance away from the machine.
- Do not go within proximity of the lines with equipment.!
- Also read the instructions for safe working in the chapter, safety regulations.

Warning

There is a risk of accidents due to falling material.

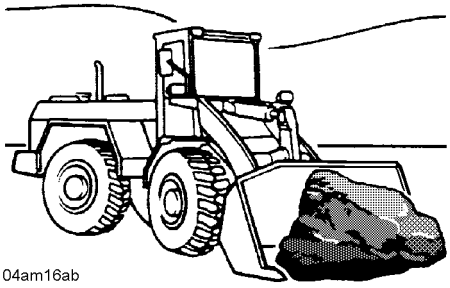
! The driver may only swing the working attachments over occupied driver cabs, operating and working stations of other machines if they are protected by reinforced roofs (FOPS).

! If the driver's cab is not equipped to provide the necessary degree of protection, then the driver of the machine in question must leave his cab during overhead operations.

- Load the truck with the machine so that the bulk material is dumped in the middle of the skip.
- With longer transportation vehicles, load from the front backwards.

Loading large rocks

Make sure that the loading surface of the transport vehicle can take the impact of large rocks.



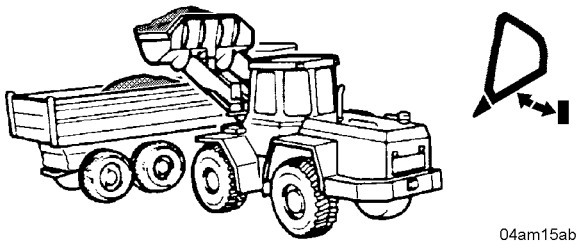
Loading the bucket

- First put a bucket load of smaller rocks in the transport vehicle.
- Carry on loading the transport vehicle.

Loading material which sticks

You can use the automatic bucket return-to-dig function for loading jobs which require a certain digging position.

Refer to the sections on operating the lift arm and activating the automatic bucket return-to-dig sections.



Dumping

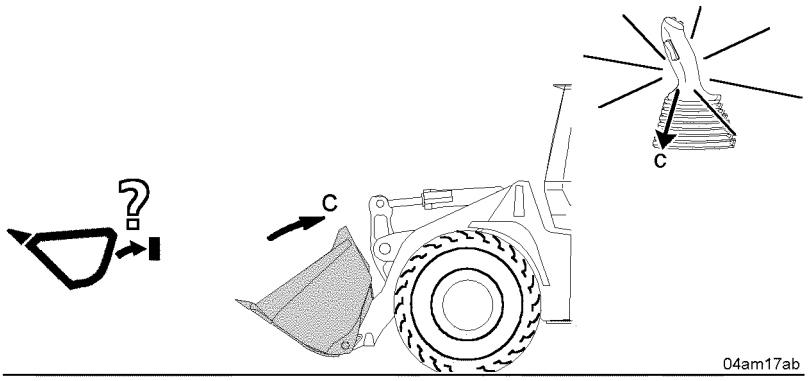
- Tip out the bucket.

Caution

There is a risk of damage to the machine.
Unnecessary jolting when tipping up and down against the bucket arm stops can increase wear on the bolts and bushes on the kinematics.
! Avoid unnecessary jolting.

- Loosening material adhering to the bucket: quickly tilt the bucket in and out, briefly jolting against the bucket arm stops in the process.

Moving the machine back



Bucket position

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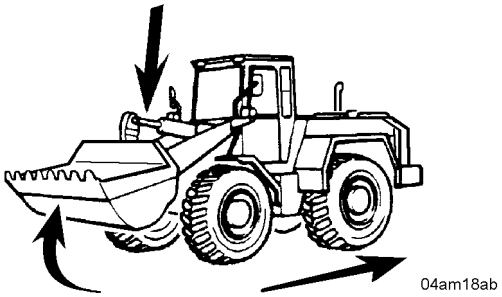
Caution

There is a risk of damage to the machine.
Unnecessary jolting when tipping up and down against the bucket arm stops can increase wear on the bolts and bushes on the kinematics.

! Avoid unnecessary jolting.

- Tilt the bucket in.



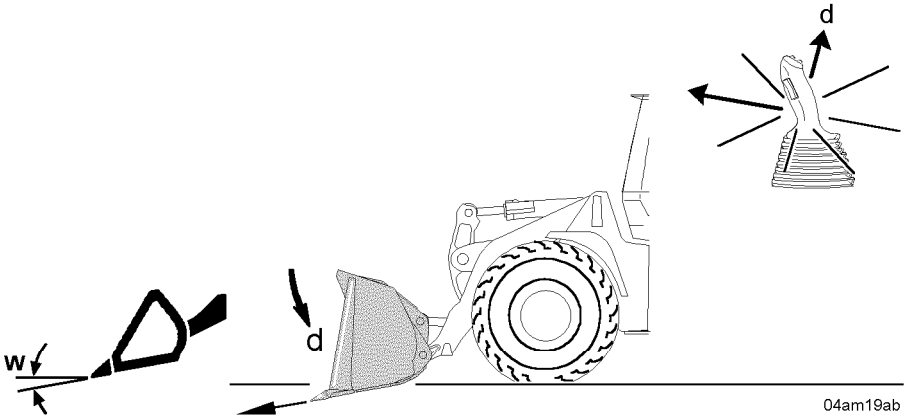
Lift arm position

- When moving backwards, lower the lift arms.

Excavation

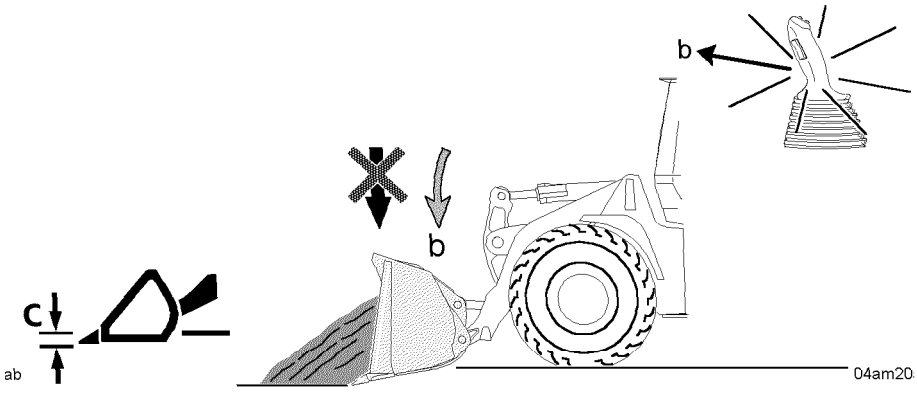
Excavating soft material

Excavate soft material as follows.



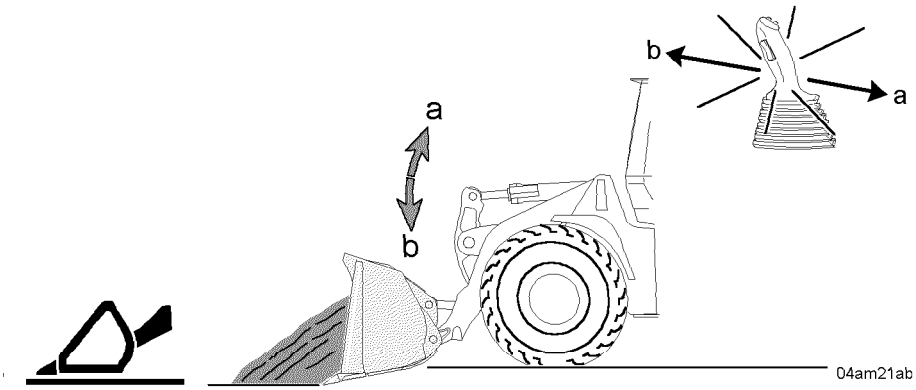
Angle of penetration

- Lower the loading bucket onto the ground.
- Set a small cutting angle – **W** of no more than 10°.



Penetration depth

- When approaching with the machine, simultaneously press the lift arms down, until a sufficient penetration depth – **C** is reached.
- The following procedure is recommended to avoid any possible loss of traction: do not work with a strong downwards pressure on the bucket.

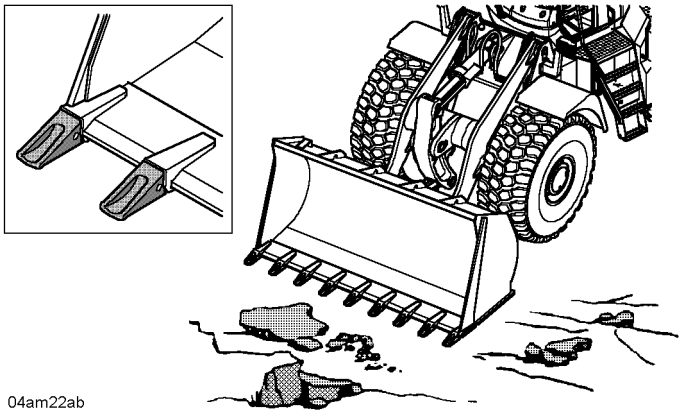


Lift arm movement

- Make horizontal cuts while driving forwards.
- Raise and lower the lift arms to make the work easier.

Excavating hard material

When excavating hard material, a bucket with teeth should be used.



Working attachment

- Further procedure: See the section on excavating soft material.

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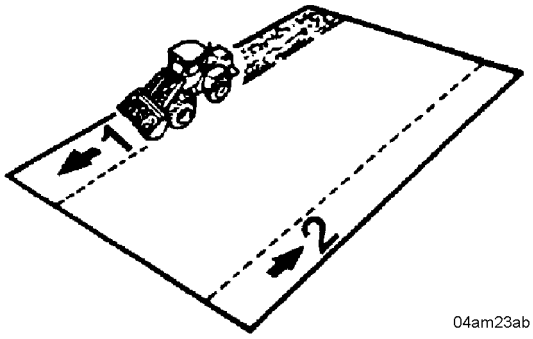
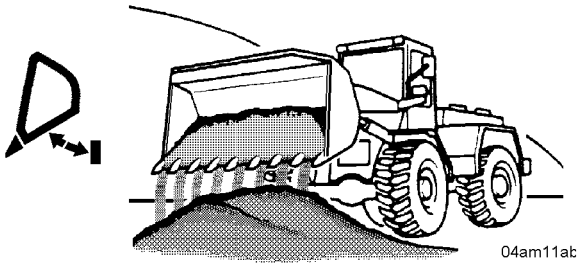
Example of foundation excavation

Excavate foundations as follows.



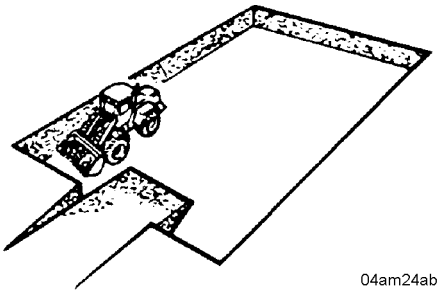
Longitudinal cuts

- Cut an initial trench with the bucket along the outer edge of the excavation.
- When the first cut is down to a depth of approximately 1 metre, start a second trench along the opposite side.
- Work the area between down to the same depth as the side trenches.



Heaping material

- Pile up the bulk material in a corner, leaving the foundation banks exposed.

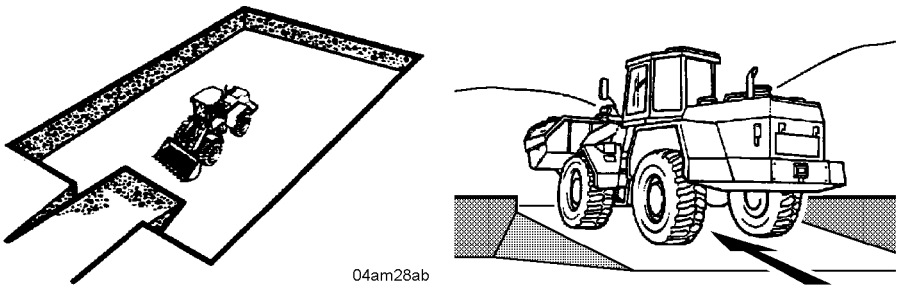


Corners of the foundations

- When the foundations have been excavated to the required depth, dig out the corners and transport the material out of the excavation.

Driving out of the excavation

A ramp must be made so that the machine can be driven out of the excavated area.



Exit ramp – transport direction

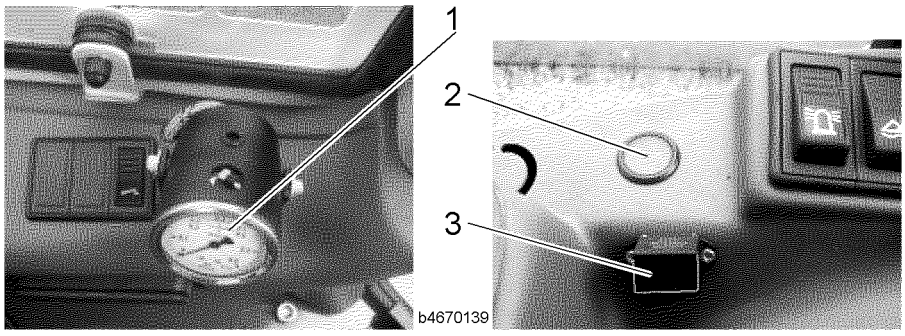
- To make an exit for the machine: dig out the centre of the ramp.
- Keep the loaded bucket low during transport.
- Drive out of the excavated area forwards.

3.3.7 Operation with the soot particle filter

This equipment is optional.
One exception:
– The soot particle filter is fitted as standard with the tunnel version.

Functions:
It reduces the emission of soot particles.
It regenerates itself during normal operation.

Daily machine start-up with the particle filter system



Exhaust gas counter-pressure display - accessories particle filter

1 Exhaust gas counter-pressure display
2 Optical counter pressure monitoring
3 Accoustic counter pressure monitoring

Function of the exhaust gas counter-pressure
To display the loading condition of the particle filter system.

Function of the electronic limit value monitor
To warn the operator accoustically or optically when the maximum counter pressure has been exceeded.

With turbo engines, a counter-pressure of maximum 0.2 bar may not be exceeded.

Optical and accoustic counter pressure monitor

If the counter pressure exceeds 0.2 bar for longer than 60 seconds, then the counter pressure monitor **2** lights up.
If the counter pressure exceeds 0.25 bar for longer than 60 seconds, then the counter pressure monitor **3** is also activated accoustically.

Caution

There is a risk of damage to the soot particle filter and the diesel engine
If the machine idles for prolonged periods or is run in the lower load range, the maximum counter-pressure may be exceeded.

! Avoid letting the machine idle for prolonged periods or run in the lower load range.

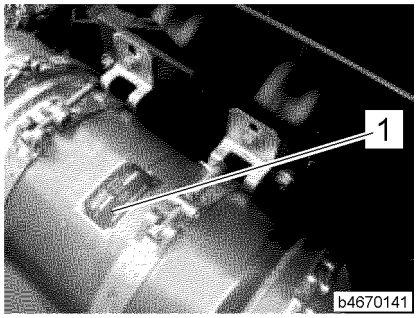
Steps to reduce the counter-pressure

- If the counter-pressure is too high:
  Take measures to reduce it.
- If the counter-pressure is over 0.2 bar:
  Do not move the gas pedal suddenly.
- Drive the hydraulics in intervals of approximately 20 seconds as often as necessary.
- Drive the diesel engine in maximum throttle (full load) for approximately 5 minutes.

Troubleshooting

If the counter-pressure cannot be reduced by these measures:

- Shut down the machine immediately
- Clean the filter and turn the middle section **1** (except Switzerland).



- Contact LIEBHERR CUSTOMER SERVICE

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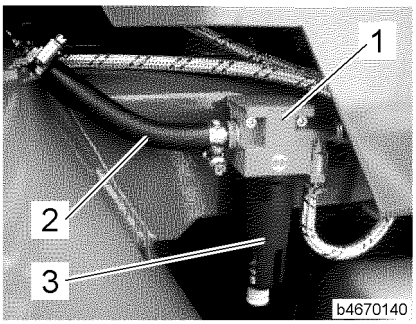
Checking the filter/drain unit



The filter/drain unit 1 is mounted to the left of the rear section.

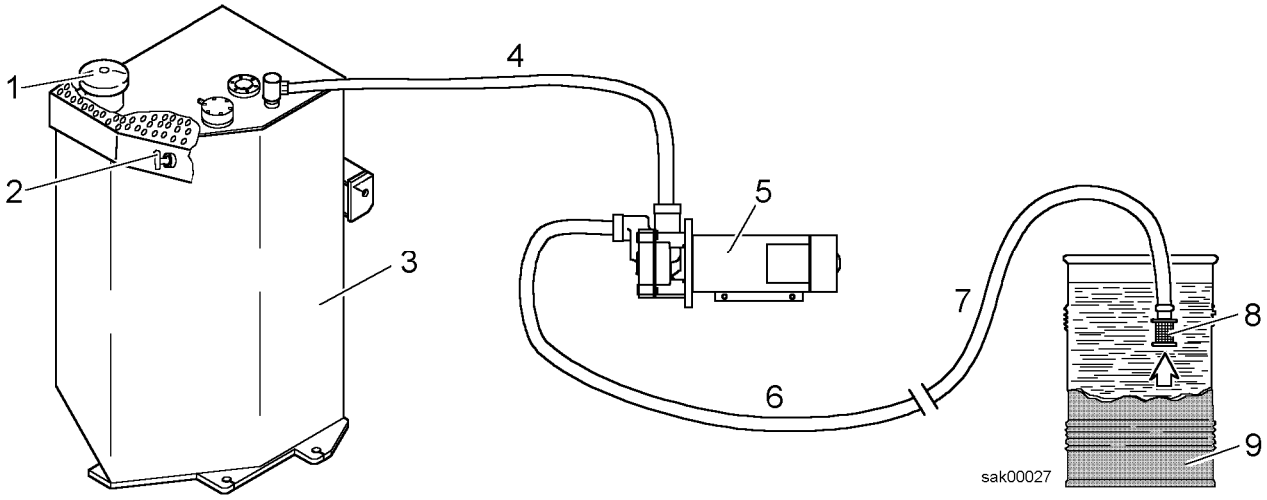
Filter/drain unit **1**

Counter-pressure line **2**

Condensate container **3**

- In regular intervals (daily or as required):
  check the filling level of the filter/drain unit.
- If the condensate container is over half full with condensation water,
  the accumulated condensation water must be released.
- Unscrew the condensate container **3** from the filter drain unit.
- Poor out the condensation water.
- Screw the condensate container **3** back onto the filter/drain unit.
- Check the filter insert (visible in the sight glass) of the filter/drain unit **1** for dirt.
- If the filter insert is too dirty,
  the filter insert must be replaced.

3.3.8 Refuelling with the refuelling pump



Refuelling pump

Make sure that:

– The machine is in maintenance position 1
– The suction line extension **7** (with suction strainer) is connected to the suction line **6** behind the engine compartment door. Make sure that the suction strainer **8** is not damaged, otherwise the refuelling pump **5** is not protected against foreign bodies.
– The suction line extension **7** with the suction strainer **8** can reach to the bottom of the tank **9** (so that the tank can be completely drained)
– The battery main switch is turned on
– The sealing cap **1** on the fuel tank filler neck is open
– The key for the refuelling pump switch **2** (next to the tank filler cap) is inserted

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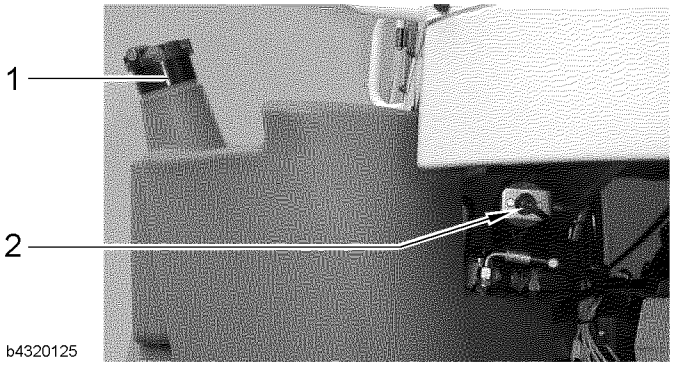
Starting up the refuelling pump



Fuel tank

Warning

There is a risk of burns and explosions.

! Never allow naked flames or lighted cigarettes in the vicinity during the refuelling procedure.

- Turn the key in the switch **2** to ON. The refuelling procedure starts.

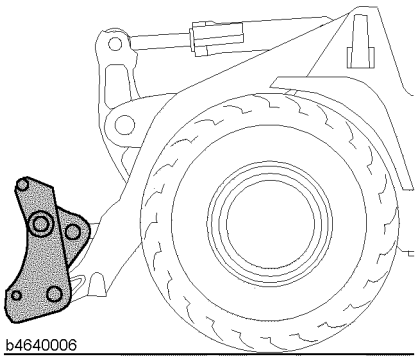
Caution

There is a danger due to the fuel overflowing from the filler neck.
The refuelling pump does not switch off automatically, which means fuel can overflow from the filler neck.

! Observe the refuelling procedure via the fuel tank filler neck **1**.

- When the refuelling process is complete, turn the key in the switch **2** to “OFF” and remove the key. Close the fuel tank sealing cap **1**.
- Disconnect the suction line extension **7** (with suction strainer) from the suction line **6** and seal lines with dummy plugs.

3.3.9 Activating the hydraulic quick-change device for the Z-lift arm



This equipment is optional.
Design of the quick-change device:
– Combined electro-hydraulic design
  Electric activation and deactivation by means of a switch
  Hydraulic actuation by means of an additional controller.

Information on attachments and accessories:
– **Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting may not be installed or fitted on the machine without prior written consent from LIEBHERR.**
– **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**

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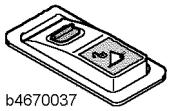
Operating the hydraulic quick-change device


b4670037

The hydraulic quick-change device is activated/deactivated with the hydraulic quick-change device switch. Also refer to the Section on the side cover (control console).

The procedure for activating the hydraulic quick-change device is as follows.

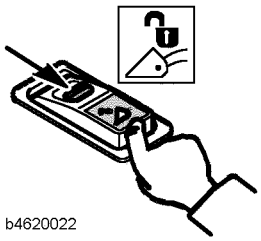
Make sure that:

– The lift arm is lowered to just above the ground.
– Where a working attachment with an independent hydraulic supply is mounted, all cylinders, valves etc. are in the initial position or closed.
– Where a working attachment is mounted, make sure that this is tilted in.

Danger

There is a risk of accidents if the working attachment drops.

! Do not activate the lockable switch when the working attachment is raised.


b4620022

- Release the activation block in the direction of the arrow and simultaneously press the switch forwards.


bpik0006

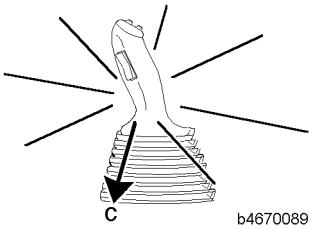
When the switch is pressed, a warning signal is issued from the side cover (control console).

The function for unlocking the hydraulic quick-change device is ready for operation.

Unlocking the hydraulic quick-change device

The procedure for unlocking the hydraulic quick-change device is as follows:

Make sure that the switch for the hydraulic quick-change device has been pressed.



b4670089

- Move the LH control lever in direction - **c** - (for tipping up the working attachment) as far as it will go.

The locking pins for the hydraulic quick-change device are retracted.

- Completely retract the locking pins, by moving the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and holding it in this position.

Detaching the working attachment

This is the procedure for detaching the working attachment.

Make sure when a working attachment is mounted with an independent hydraulic supply that the coupling to the hydraulic lines is released.

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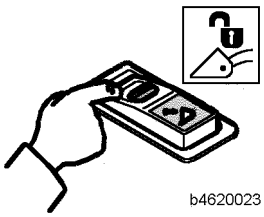
Warning

There is a risk of accidents if the working attachment is incorrectly set down.

! Never set down the working attachment in unsecured areas (roadways etc.).


b4620023

- Deactivate the hydraulic quick-change device by pushing back the hydraulic quick-change device switch.

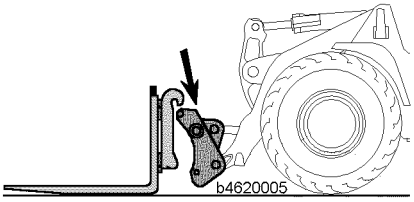
When the switch is pressed, the warning signal in the side cover (control console) goes out.

- Set down the working attachment flat on firm, even ground.

Where the working attachment has an independent hydraulic supply, set down the working attachment in such a way that the hydraulic lines are not subjected to any strain.

- Secure the working attachment against tipping over
- Carefully remove the quick-change device from the adapter-holder at the top of the working attachment

The working attachment is now detached.


b4620005

Disconnecting the hydraulic lines for hydraulically operated working attachments

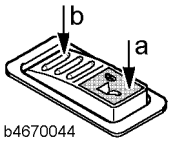
Where the working attachment has its own hydraulic circuit, the hydraulic supply lines must be disconnected.
The procedure for disconnecting the hydraulic lines is as follows:

Warning

There is a risk of accidents from hydraulic lines under pressure.

! Depressurise the hydraulic circuits before connecting or disconnecting hydraulic lines/couplings.

- Shut down the diesel engine.
- Press and hold down the switch for the working hydraulics lockout (key function **b**) and at the same time actuate all servo devices (control levers) in both directions.



b4670044

- Release the hydraulic lines / quick-release couplings from the machine.
- Make sure that no hydraulic oil leaks onto the ground.

Contaminated soil must be removed for proper disposal as the hydraulic oil can pollute the ground water.

- Close the hose line couplings with protective covers.
- Lay the hydraulic hoses in the hose retainers.

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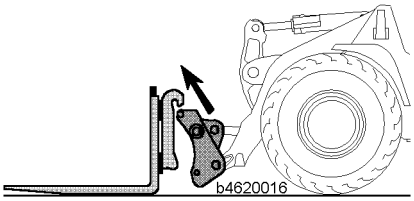
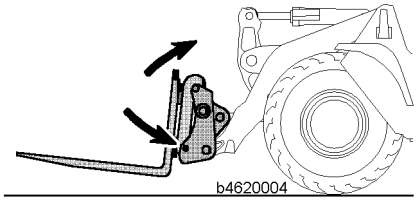
Attaching and coupling the working attachment

This is the procedure for attaching and coupling the working attachment.
Make sure that the hydraulic quick-change device is completely unlocked.



- Carefully move the quick-change device into the adapter-holder at the top of the working attachment.



- Slightly raise the working attachment and tip it up.

In the process, the working attachment must completely engage with the quick-change device.

Locking the hydraulic quick-change device

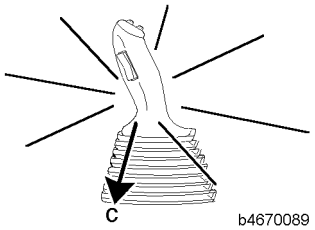
The procedure for locking the hydraulic quick-change device is as follows.
Make sure that:

– The working attachment is completely engaged in the quick-change device, so that the working attachment can be locked in place with the locking pins.
– The switch for the hydraulic quick-change device is turned off

Danger

There is a risk of accidents if the working attachment drops.

! Check whether the working attachment is fully engaged in the quick-change device.



- Completely extend the locking pins by moving the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and holding it in this position.

The locking pins for the hydraulic quick-change device extend.

The working attachment is now coupled.

Check after locking procedure

To make an inspection once the locking procedure has been completed, proceed as follows.
Make sure that the working attachment is secured with the quick-change device.

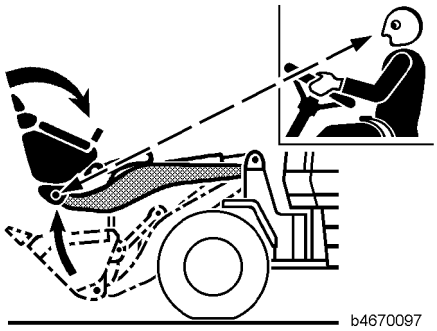
LBH/01/003801/0003/10.03/en

Danger

There is a risk of accidents if the working attachment drops.

! Do not move the working attachment until you have checked the lock.

! Check whether the working attachment is securely locked in place with the quick-change device.



- Raise the lift arms until the hydraulic quick-change device is visible from the driver's cab.
- Make a visual check to ensure that the locking pins have actually engaged in the working attachment.

You can see that the pins are properly locked by the degree to which they project from the side.

- Do not carry out any other movements with the working attachment until the check is complete.
- For operating a working attachment with its own control circuit, See the description in the sections on the control lever for additional working functions and working with optional equipment.

Connecting the hydraulic lines for hydraulically actuated working attachments

If the working attachment has an independent hydraulic circuit, the hydraulic supply lines must be connected.

Warning

There is a risk of accidents from hydraulic lines under pressure.

! Depressurise the hydraulic circuits before connecting or disconnecting hydraulic lines/couplings.

- Remove the protective covers from the hydraulic line couplings.
- Connect the hydraulic lines according to their function.

The following steps should be performed when connecting:

– Clean the line couplings before connecting
– Do not connect the wrong ends of the hydraulic lines
– Lay the hydraulic lines so that there is no risk of them being crushed by the movements of the working attachment
– Make use of any hose retaining clips when laying the hose

- Check the hydraulic lines for any leakage after connection.

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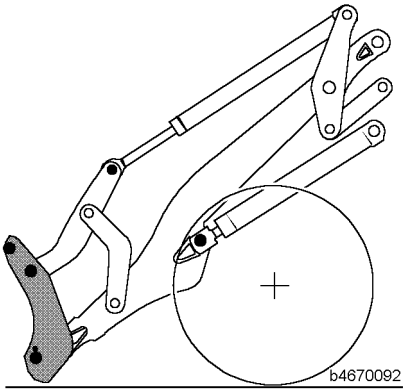
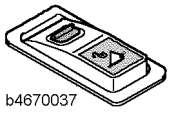
3.3.10 Activating the hydraulic quick-change device for the P-lift arm



With the machine version with P-lift arms, the hydraulic quick-change device comes as standard.
Design of the quick-change device:
– Combined electro-hydraulic design
  Electric activation and deactivation by means of a switch
  Hydraulic actuation by means of an additional controller.

Information on attachments and accessories:
– **Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting may not be installed or fitted on the machine without prior written consent from LIEBHERR.**
– **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**

Operating the hydraulic quick-change device

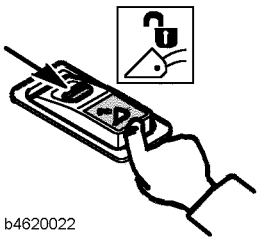


The hydraulic quick-change device is activated/deactivated with the hydraulic quick-change device switch. Also refer to the Section on the side cover (control console).

The procedure for activating the hydraulic quick-change device is as follows.
Make sure that:
– The lift arm is lowered to just above the ground.
– Where a working attachment with an independent hydraulic supply is mounted, all cylinders, valves etc. are in the initial position or closed.
– Where a working attachment is mounted, make sure that this is tilted in.

Danger

There is a risk of accidents if the working attachment drops.
! Do not activate the lockable switch when the working attachment is raised.



• Release the activation block in the direction of the arrow and simultaneously press the switch forwards.

When the switch is pressed, a warning signal is issued from the side cover (control console).

The function for unlocking the hydraulic quick-change device is ready for operation.

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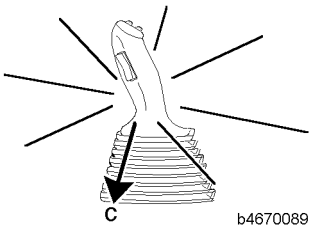
Unlocking the hydraulic quick-change device

The procedure for unlocking the hydraulic quick-change device is as follows:
Make sure that the switch for the hydraulic quick-change device has been pressed.



- Move the LH control lever in direction - **c** - (for tipping up the working attachment) as far as it will go.

The locking pins for the hydraulic quick-change device are retracted.

- Completely retract the locking pins, by moving the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and holding it in this position.

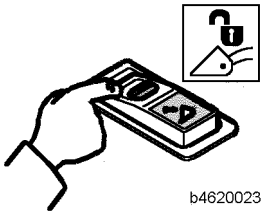
Detaching the working attachment

This is the procedure for detaching the working attachment.
Make sure when a working attachment is mounted with an independent hydraulic supply that the coupling to the hydraulic lines is released.

Warning 

There is a risk of accidents if the working attachment is incorrectly set down.

! Never set down the working attachment in unsecured areas (roadways etc.).



- Deactivate the hydraulic quick-change device by pushing back the hydraulic quick-change device switch.

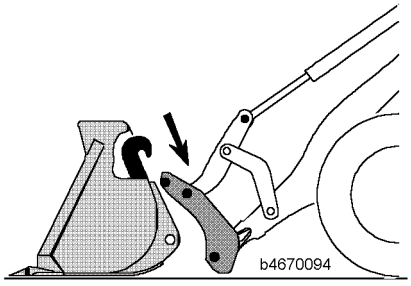
When the switch is pressed, the warning signal in the side cover (control console) goes out.

- Set down the working attachment flat on firm, even ground.

Where the working attachment has an independent hydraulic supply, set down the working attachment in such a way that the hydraulic lines are not subjected to any strain.

- Secure the working attachment against tipping over
- Carefully remove the quick-change device from the adapter-holder at the top of the working attachment

The working attachment is now detached.



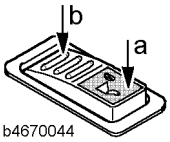
Disconnecting the hydraulic lines for hydraulically operated working attachments

Where the working attachment has its own hydraulic circuit, the hydraulic supply lines must be disconnected.
The procedure for disconnecting the hydraulic lines is as follows:

Warning

There is a risk of accidents from hydraulic lines under pressure.

! Depressurise the hydraulic circuits before connecting or disconnecting hydraulic lines/couplings.



- Shut down the diesel engine.
- Press and hold down the switch for the working hydraulics lockout (key function **b**) and at the same time actuate all servo devices (control levers) in both directions.
- Release the hydraulic lines / quick-release couplings from the machine.
- Make sure that no hydraulic oil leaks onto the ground.

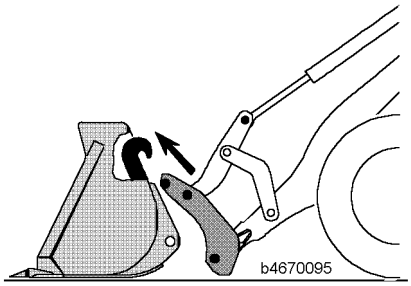
Contaminated soil must be removed for proper disposal as the hydraulic oil can pollute the ground water.

- Close the hose line couplings with protective covers.
- Lay the hydraulic hoses in the hose retainers.

Attaching and coupling the working attachment

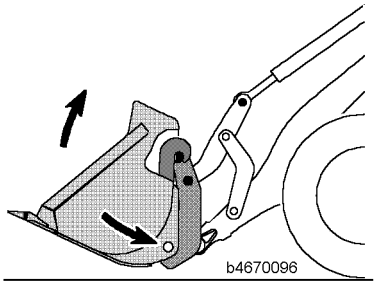
This is the procedure for attaching and coupling the working attachment.
Make sure that the hydraulic quick-change device is completely unlocked.

- Carefully move the quick-change device into the adapter-holder at the top of the working attachment.



- Slightly raise the working attachment and tip it up.

In the process, the working attachment must completely engage with the quick-change device.



Locking the hydraulic quick-change device

The procedure for locking the hydraulic quick-change device is as follows.
Make sure that:

– The working attachment is completely engaged in the quick-change device, so that the working attachment can be locked in place with the locking pins.
– The switch for the hydraulic quick-change device is turned off

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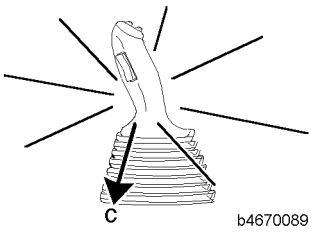
Danger

There is a risk of accidents if the working attachment drops.

! Check whether the working attachment is fully engaged in the quick-change device.



- Completely extend the locking pins by moving the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and holding it in this position.

The locking pins for the hydraulic quick-change device extend.

The working attachment is now coupled.

Check after locking procedure

To make an inspection once the locking procedure has been completed, proceed as follows.

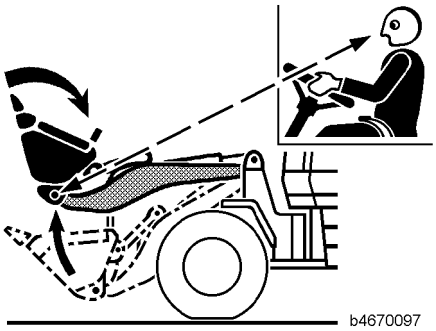
Make sure that the working attachment is secured with the quick-change device.

Danger

There is a risk of accidents if the working attachment drops.

! Do not move the working attachment until you have checked the lock.

! Check whether the working attachment is securely locked in place with the quick-change device.



- Raise the lift arms until the hydraulic quick-change device is visible from the driver's cab.
- Make a visual check to ensure that the locking pins have actually engaged in the working attachment.

You can see that the pins are properly locked by the degree to which they project from the side.

- Do not carry out any other movements with the working attachment until the check is complete.
- For operating a working attachment with its own control circuit, See the description in the sections on the control lever for additional working functions and working with optional equipment.

Connecting the hydraulic lines for hydraulically actuated working attachments

If the working attachment has an independent hydraulic circuit, the hydraulic supply lines must be connected.

Warning

There is a risk of accidents from hydraulic lines under pressure.

! Depressurise the hydraulic circuits before connecting or disconnecting hydraulic lines/couplings.

- Remove the protective covers from the hydraulic line couplings.
- Connect the hydraulic lines according to their function.

The following steps should be performed when connecting:

– Clean the line couplings before connecting
– Do not connect the wrong ends of the hydraulic lines
– Lay the hydraulic lines so that there is no risk of them being crushed by the movements of the working attachment
– Make use of any hose retaining clips when laying the hose

- Check the hydraulic lines for any leakage after connection.

3.3.11 Working with optional equipment

Forklift operation

For forklift operation with P-kinematics lift arm:

– The parallel kinematics permit parallel guidance of the load over the entire lifting range during lifting or lowering.

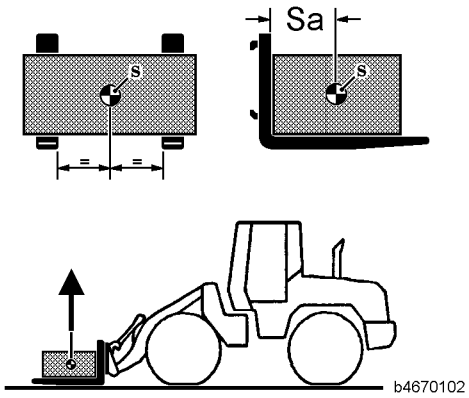
For forklift operation with lift arms with Z-bar kinematics:

– No parallel movement is possible with a lift arm with Z-bar kinematics. This means that the attachment tilts in during the lift movement up to 2/3 of the maximum lift height and with further upward lift movement it tilts out again, but does not tilt down forwards.
– Due to the less favourable lever ratio of the Z-bar kinematics in the topmost lifting range, restrictions in load bearing capacity may result
See also the load bearing tables for forklift operation.

The procedure for forklift operation is as follows.

Make sure that the working attachment is secured with the quick-change device.

See the description in the sections on “operation of the hydraulic quick-change device” and “checking after the locking procedure”.



– distance from centre of gravity

Sa – distance from centre of gravity

Caution

There is a risk of damage to the load and the machine.
When using forklifts, only use forks with prongs of suitable length and make sure that these do not project beyond the load. Otherwise goods or pallets lying in front of the forks could be damaged.

! Avoid incorrect operation during forklift operation.

- When you lift the load: make sure that the load is resting as close as possible to the vertical limb of the fork prong.
  Pick up the load making sure that the – centre of gravity **Sa** of the load is correctly positioned.

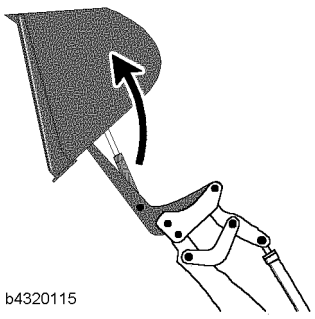
Warning

There is a risk of the machine tipping over.

! Avoid incorrect operation during forklift operation.

- Raise the lift arm to the transport position (approx. 30–40 cm above the ground).
- When the forks are empty, tip them up slightly and keep them low.
- When carrying a load, tip the forklift up slightly and keep the load low.
- When on slopes or inclines, always keep the load uphill.
- Never drive across slopes or inclines.
- Never turn on slopes or inclines.
- When a high unloading position is unavoidable:
  Do not raise the lift arm until just before reaching the unloading point.
- When a low unloading position is required:
  Do not lower the lift arms until just before reaching the unloading point.

3.3.12 Operating the high dump bucket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The high dump bucket is equipped with its own hydraulic circuit for the high dumping function.

This high dumping function means that the buckets are especially suitable for work requiring a great dump height, such as loading high-sided wagons.

It can be used for light materials such as wood shavings, sawdust and cereals.

The high dump bucket may not be used:

– To lift or transport persons
– To carry lifting equipment (in other words, you may not attach crane hooks or similar items)
– For bulk materials above the specified material weight (see the technical data section)
– For breaking up rocks
– For hammering in posts
– Below ground

The manufacturer does not take any responsibility for damage caused by improper use (such as, for example, breaking off rocks, hammering in posts or attaching load suspension weights).

Function check

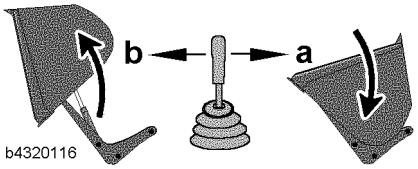
Before starting work:

– Carry out a function test without any load.
– Familiarise yourself with the operation of the high dump bucket.

Caution

There is a risk of accidents if the hydraulic circuit is incorrectly connected.

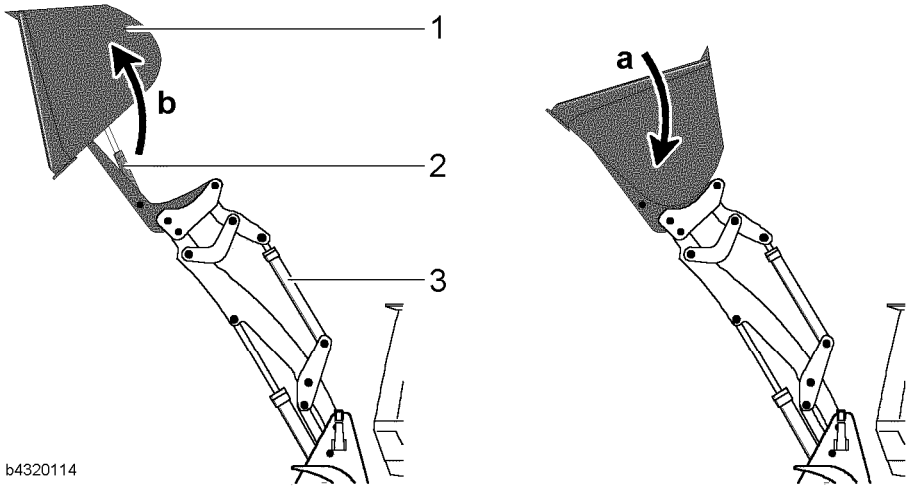
! Check to see that bucket tilts out and in properly.



- Actuate the high dump bucket with the additional control lever to check if the hydraulic circuit of the high dump bucket is correctly connected.

Tipping the high dump bucket in and out

The high dump bucket is controlled using the additional control lever.
See also the section on the control lever for additional working functions.



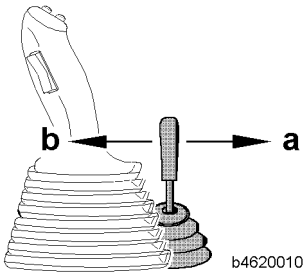
High dump bucket

1 Bucket body
2 Hydraulic cylinder for high dump bucket
3 Tilt cylinder for lift arm

Caution

There is a risk of damage to the machine and the vehicle to be loaded.
If the high dump bucket is not properly used, the side of the lorry, for example, may be damaged.

! When loading lorries or similar vehicles, only tip out the material using the hydraulic circuit of the high dump bucket.



- **Tilting out the high dump bucket:**
  Move the additional control lever in direction - **b**.

The high dump bucket is tilted out.

- **Tilting in the high dump bucket:**
  Move the additional control lever in direction - **a**.

The high dump bucket is tilted in.

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Loading operation with the high dump bucket

For high dump bucket operation such as loading light material, see the section on general working methods.

3.3.13 Transporting the machine

Lifting the machine by crane

It is essential to observe the accident prevention regulations when lifting the machine by crane.

Refer to the section on “safety regulations when lifting the machine by crane”.

The following precautions should be taken before lifting the machine by crane.

Precautions:

– Lower the working attachment and tilt back the loading equipment to its limit
– Engage the articulation lock
– Move all control levers to neutral
– Engage the parking brake
– Lock the working hydraulics
– Shut down the engine
– Close and lock all doors and hoods on the machine

For more detailed descriptions, refer to the section on operation and handling.

Obtain information about:

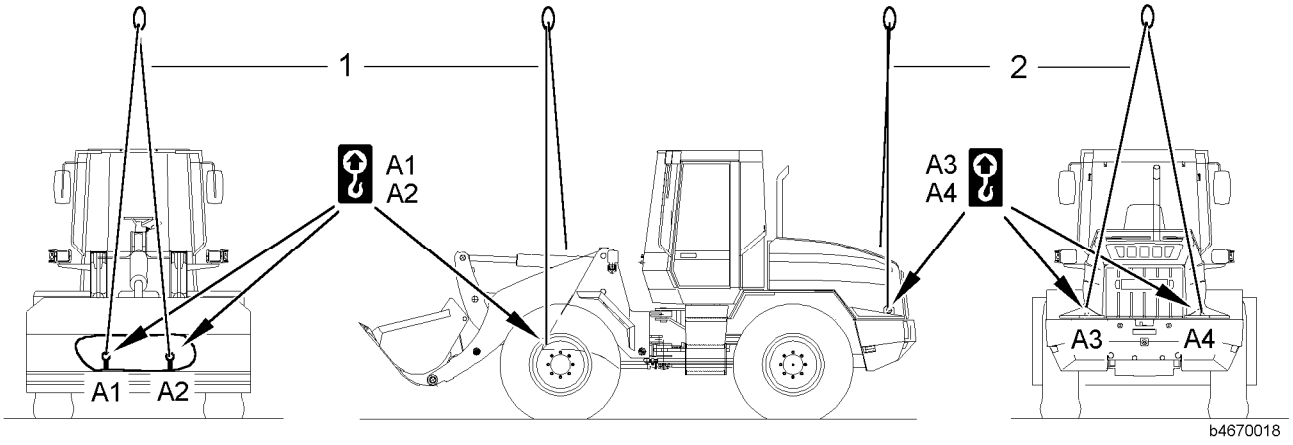
– The weight and collision masses of the machine: see the technical data section.
– The required load bearing capacity and lengths of the lifting tackle

Loading for truck or rail transport

Execution: when necessary, sling the machine from a crane.

Required equipment:

– Lifting tackle **1, 2**: rope length - Min. length = 4.0 m.



Sketch 1 of slung machine

1 Lifting tackle – 2-strand rope
2 Lifting tackle – 2-strand rope
A1 Front right slinging and lifting point
A2 Front left slinging and lifting point
A3 Rear right slinging and lifting point
A4 Rear left slinging and lifting point

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Danger

There is risk of accidents due to the suspended load falling.

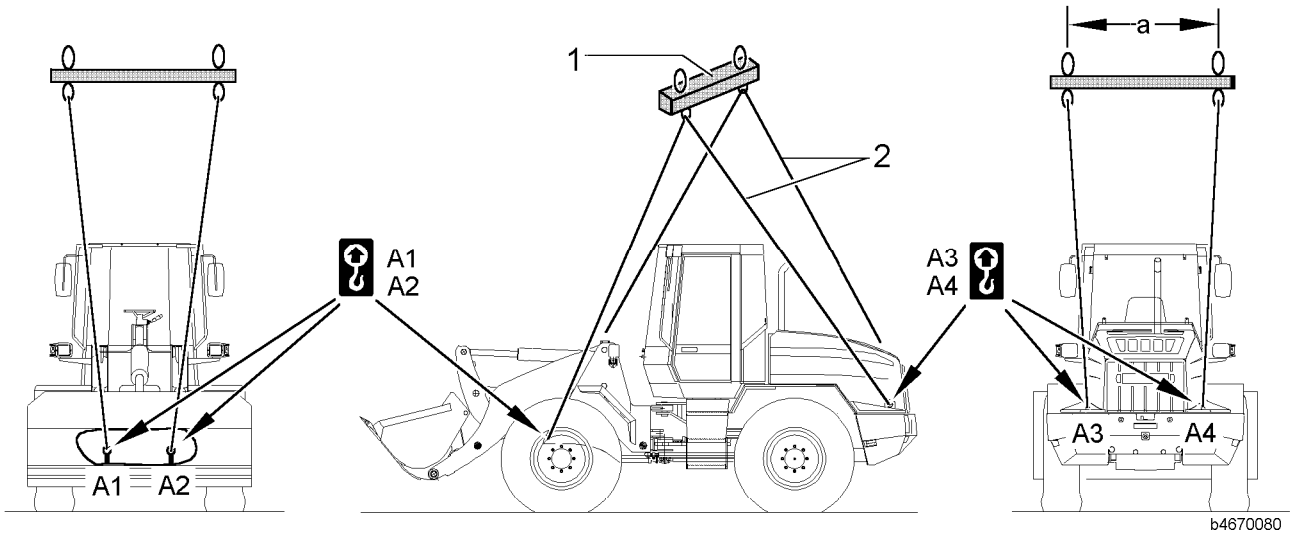
! Never stand under the machine when it is suspended.

- Fix or attach the lifting tackle to the slinging and lifting points **A1, A2, A3, A4** provided on the machine.
- Raise and load the machine with due care.

Loading for transport by ship

Execution: when necessary, sling the machine from a crane.
Required equipment:

– Slinging attachment or yoke **1** of the shipping company: Minimum size a **a** = 1.0 m.
– Lifting tackle **2**: rope length - Min. length = 4.0 m.



Sketch 2 of slung machine

1 Slinging device/yoke
2 Lifting tackle – 2-strand rope
A1 Front right slinging and lifting point
A2 Front left slinging and lifting point
A3 Rear left slinging and lifting point
A4 Rear right slinging and lifting point

Danger

There is risk of accidents due to the suspended load falling.

! Never stand under the machine when it is suspended.

- Fix or attach the lifting tackle to the slinging and lifting points **A1, A2, A3, A4** provided on the machine.
- Raise and load the machine with due care.

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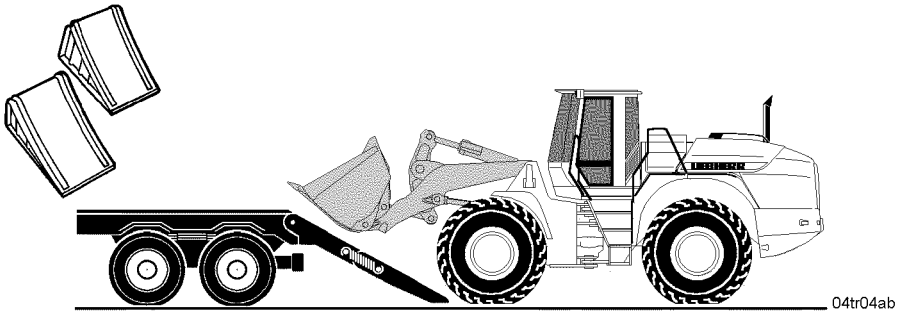
Transporting the machine by road or rail

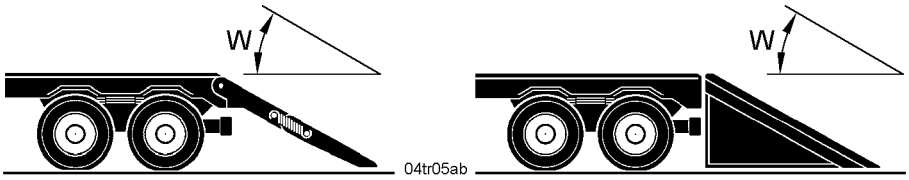
Before driving onto the loading area

The following precautions should be taken before driving onto the loading area.



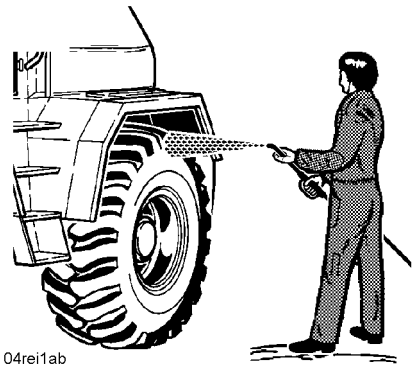
Loading the machine onto the transporter

Precautions:
- Have wheel wedges ready
- Have suitable tensioning ropes or chains ready to lash the machine down



Ramp inclination

A ramp should be provided for driving the machine onto the loading area.
The inclination of the ramp - **W** may not exceed 30°.
Any snow, ice or mud on the tyres should be cleaned off before the machine is driven up the ramp.



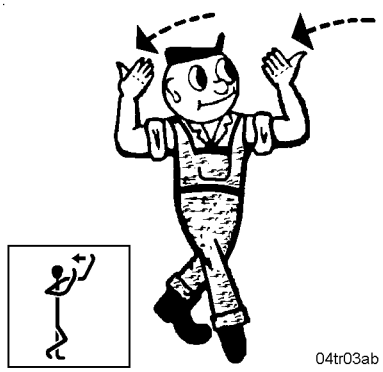
Wet cleaning

Driving onto the loading area

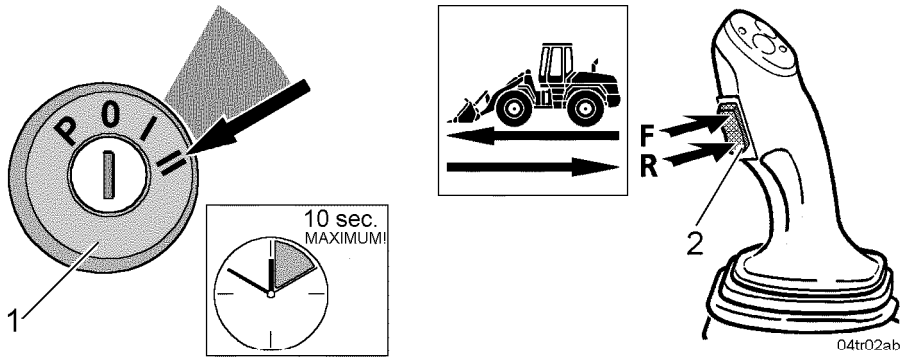
For more detailed descriptions, refer to the section on operation and handling.
When driving onto the loading area have a second person give you signals.

Make sure that someone is posted who can give the machine driver the required signals.

Persons giving directions must always take up a position to one side of the machine.



This is the procedure for driving onto the loading area.



Starting procedure and selection of travel direction

1 Starter switch 2 Travel direction switch

- Start up the engine.

Situation once the engine is started:
– Travel range - **II** - is automatically activated
– The parking brake is automatically activated.
– When the parking brake is engaged, the travel lockout is active.
– Preselection of the travel direction is not possible.

Also refer to the sections on starting the diesel engine and the driving mode.

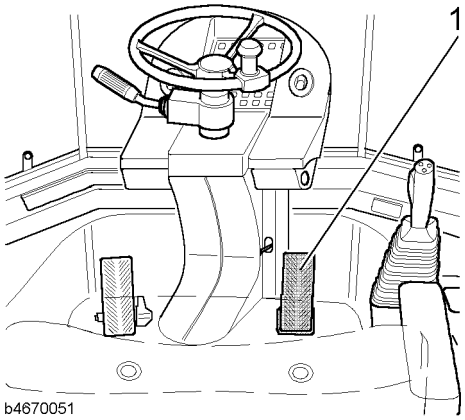
- Release the parking brake.
- Select the travel direction.

Warning

There is a risk of accidents if machine is driven without due care.
If the machine is driven without due care, the loading personnel, the person giving directions and the driver himself may be endangered.
! Always drive with due care when loading the machine.

Caution

There is a risk of accidents if the machine is not driven with due care.
If the machine is not driven with due care, the transporter and the machine being loaded could be damaged.
! Always drive with due care when loading the machine.



Gas pedal

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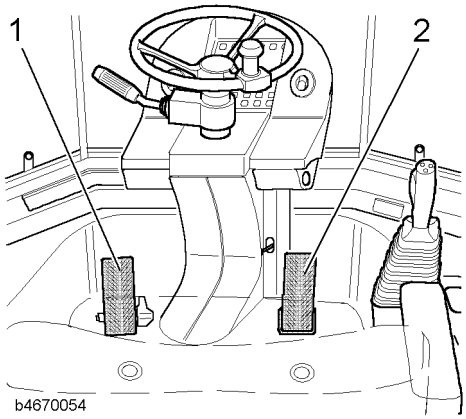
After driving onto the loading area

For more detailed descriptions, refer to the section on operation and handling.

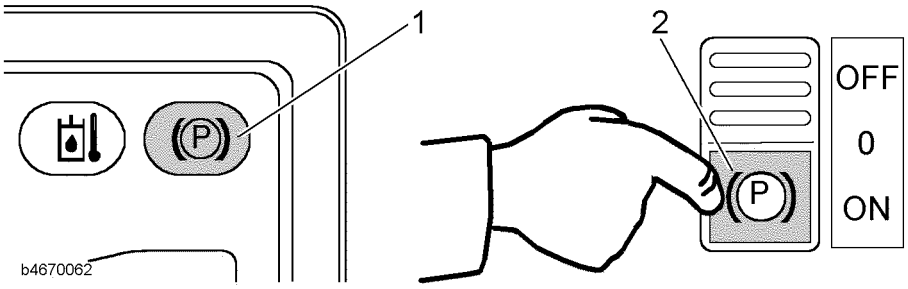
Make sure that the air stream cannot penetrate the exhaust pipe opening.

This is particularly important with rail transport, as the direction of travel cannot be foreseen.



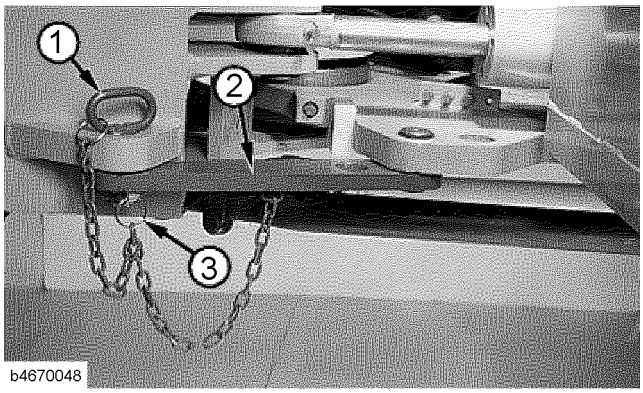
Brake/inching pedal – gas pedal

- Stop the machine



Parking brake

- Engage the parking brake.



- Engage the articulation lock.

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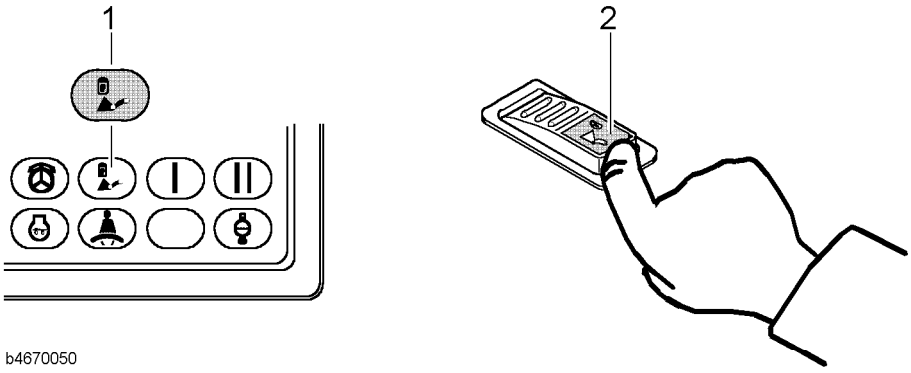
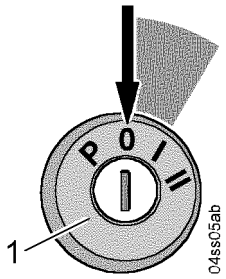
- Lower the lift arms and set down the loading bucket flat on the transporter bed.

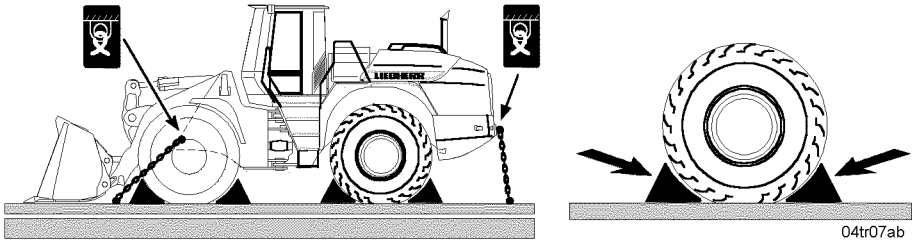


Working hydraulics lock

- Lock the working hydraulics.
- Shut down the engine.

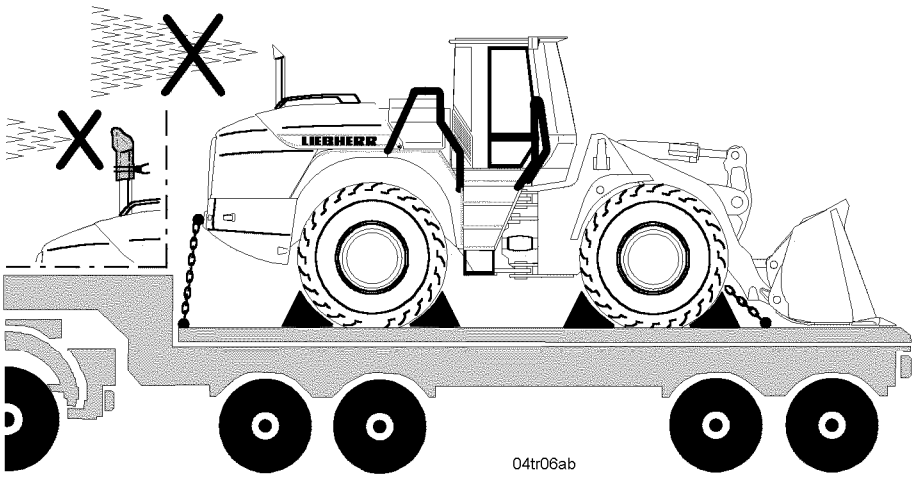


- Close and lock all doors and hoods on the machine



Lashing points

- Secure the machine against sliding: using wheel wedges and tensioning ropes or chains.
- Securely attach the tensioning ropes or chains to the marked lashing points on the machine.



Exhaust pipe cover

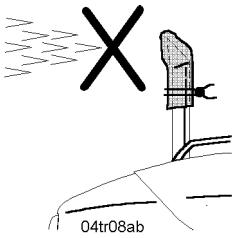
If the machine is facing towards the direction of motion during transport, then the air stream can penetrate the exhaust opening.
The following precaution should be taken to prevent damage to the turbo during transport.

Caution

There is a risk of damage to the turbo charger from foreign bodies.
Penetration of the air stream produced during transport into the exhaust pipe opening drives the diesel engine turbo.
The turbo charger is not lubricated when the engine is not running.
Without lubrication, the turbo charger will be damaged.

! Prevent the air stream produced during transport from entering the exhaust.

- To block off the exhaust pipe opening, climb onto the machine via the cab access only and make sure that you have secure footing.
- Securely block off the exhaust pipe opening with windproof material, so that it cannot slip.



Blocking off the exhaust pipe opening

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3.4 Emergency operation

In this section, the various emergency operation modes of the machine are described.
Emergency operation modes:
– Towing the machine
– Procedure for jump starting

3.4.1 Towing the machine

If the machine is damaged, it may be necessary to tow it away from an exposed position.
The following towing instructions only apply to exceptional situations, in order to move a machine incapable of independent movement to a place where it can be repaired or put on a transporter.
Towing speed and towing distance:
– Maximum towing speed 2 km/h
– Only short distances are permitted, in order to move the machine away from a danger area
  The machine must always be put on a transporter for longer distances.

Safety when towing

Towing the machine can be difficult and is therefore entirely in the re-sponisbility of the operator.
In no event can damage or accidents resulting from towing be covered by the manufacturer's guarantee.
See also the section on towing the machine safely.

Danger 

Incorrect towing can cause accidents.
When a machine incapable of independent movement is not properly towed, the result could be severe or even fatal injuries.
! Always secure the machine against rolling away before releasing the brakes for towing.

- Observe all prescribed safety regulations and the following recommen-dations when towing.

Towing when the diesel engine is running

When the machine is under tow, the travel drive system must be switched to overrun drive.
The braking effect of the brakes is impaired by switching over to overrun drive.
– The hydrostatic braking effect is not available.
– The machine can only be braked via the main braking cylinder using the the brake pedal.

The following precautions should be taken before towing the machine.

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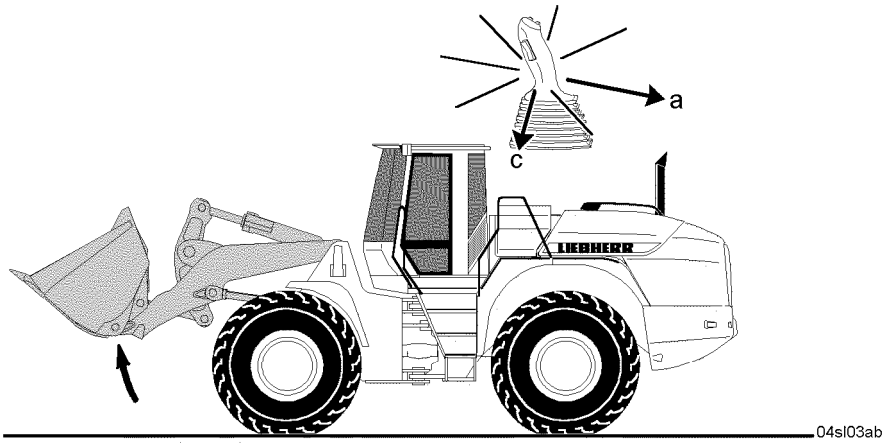
Precautions:
– Put the machine in the transport position
– Put all drive functions out of operation
– Release the parking brake

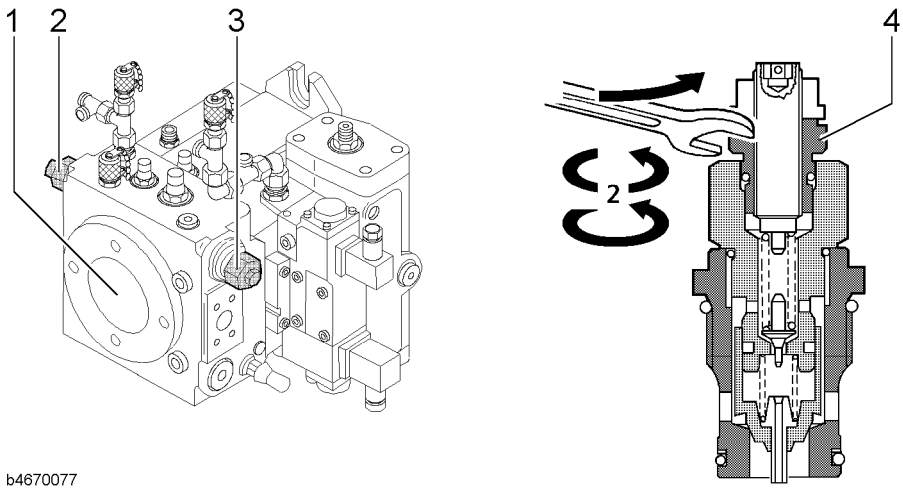


Transport position during towing

- Take up the transport position: raise the lift arm.
- If it is possible to hydraulically actuate the working attachment, tip up the bucket as far as it will go.

Caution

Risk of accidents due to restricted braking effect!
The braking effect of the brakes is impaired by switching over to overrun drive.
The machine can only be braked via the main braking cylinder using the the brake pedal.
! Always drive carefully when under tow!



High pressure relief valves

1 Variable displacement pump for travel hydraulics
2 High pressure relief valve
3 High pressure relief valve
4 Spring sleeve

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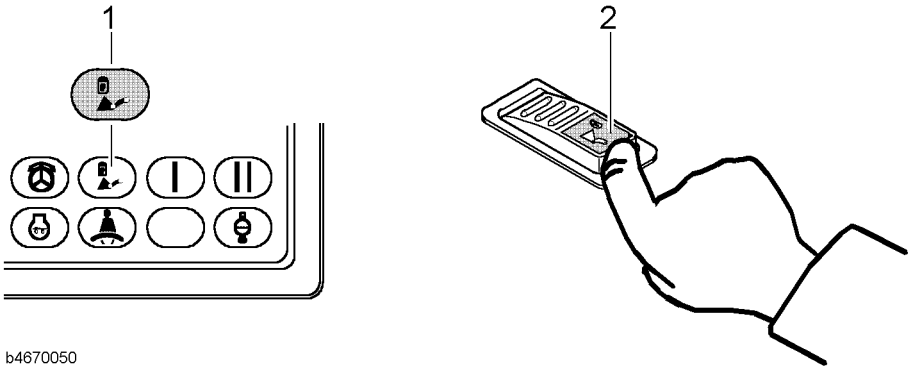
Switch the travel drive system to overrun by releasing the valve insert of the high pressure relief valves **2, 3**.

- Unscrew the spring sleeve **4** with two turns of a wrench (SW 22).

This enables free circulation of the oil.
The machine's drive functions are now out of operation.

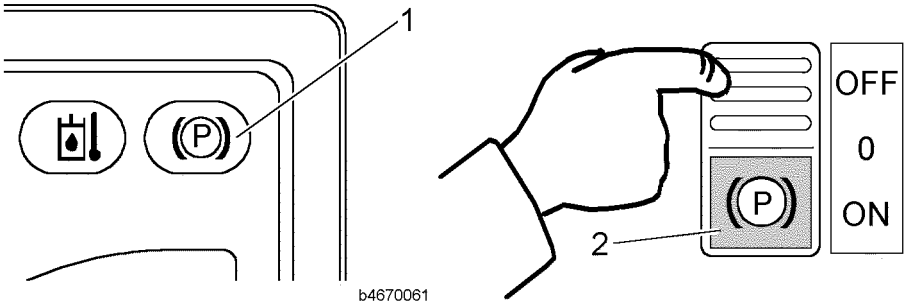


Display unit and switch – working hydraulics lock

1 Working hydraulics lock symbol field
2 Working hydraulics lock switch

- **If necessary**, press the working hydraulics lock switch **2** to prevent unforeseen operation of the working attachment.

The symbol field **1** for the working hydraulics lock lights up.
The working hydraulics are no longer operational.

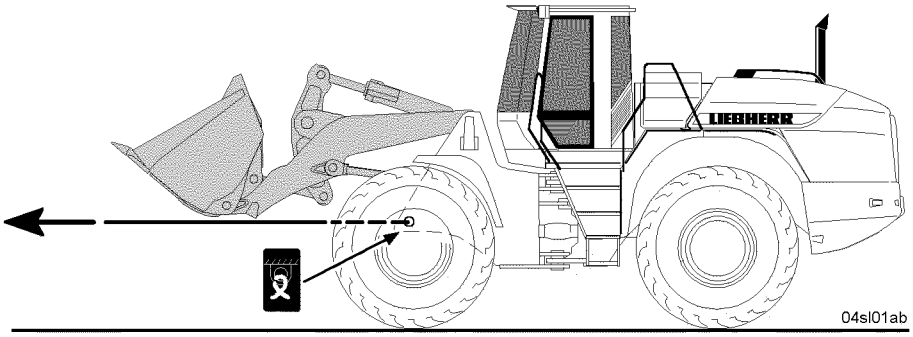


Display unit and switch – parking brake

1 Parking brake symbol field
2 Parking brake switch

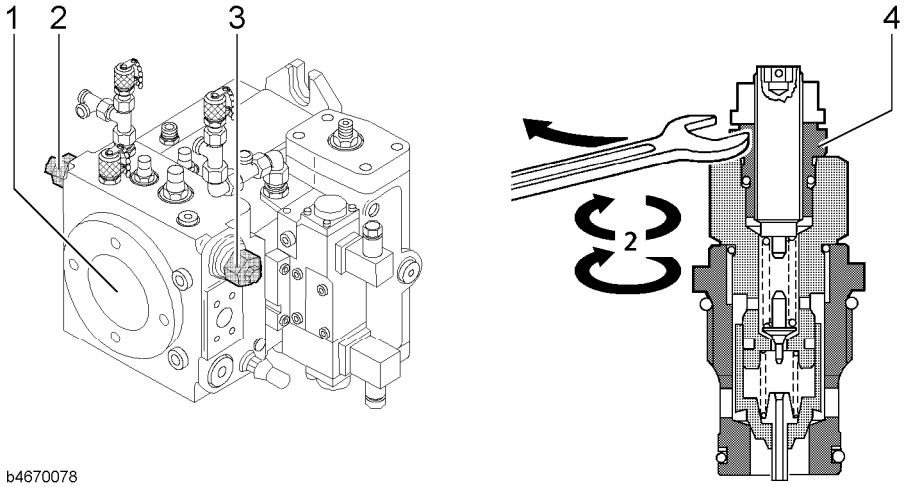
- Release the parking brake: to do this, push the switch **2** back.

The symbol field **1** for the parking brake goes out.
The parking brake is released. The machine is now ready for towing.



Attaching towing ropes

- Feed the two towing ropes through the bore holes provided in the front section and secure them.
- Tow the machine out of the danger area.
- When towing has been completed:
  retighten the valve insert of the high pressure relief valves **2, 3**.



High pressure relief valves

1 Variable displacement pump for travel hydraulics
2 High pressure relief valve
3 High pressure relief valve
4 Spring sleeve

- Screw the spring sleeve **4** with two turns of a wrench (SW 22).

The original adjustment of the high pressure limitation valves is thus re-established.

Towing with the diesel engine switched off

In the event of serious damage to the machine, such as breakdown of the diesel engine, the braking and steering functions will be impaired.
The braking effect of the brakes is impaired by switching over to overrun drive.

– The hydrostatic braking effect is not available.
– The machine can only be braked via the main braking cylinder using the the brake pedal.

The following precautions should be taken before towing the machine.

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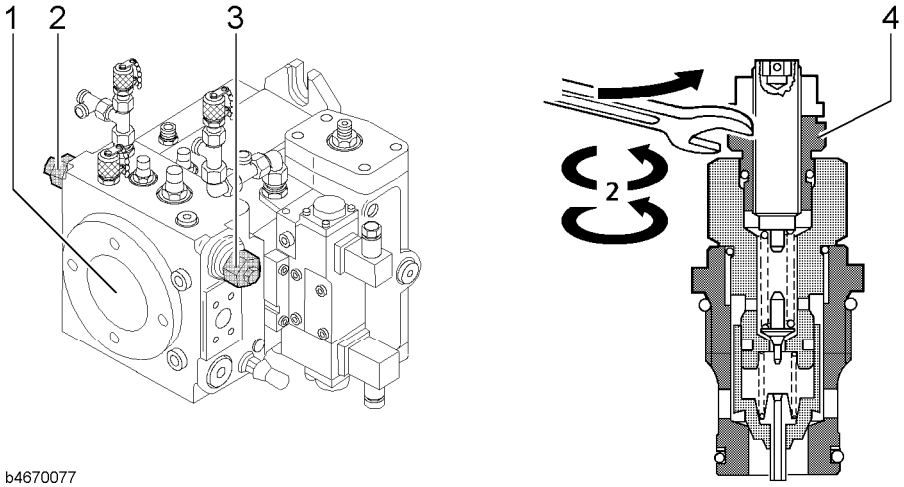
Precautions:
– turn the battery main switch **1** with the key **2** to position - **I** - ON
– Put the machine in the transport position
– Put all drive functions out of operation
– Mechanically release the parking brake.



High pressure relief valves

1 Variable displacement pump for travel hydraulics
2 High pressure relief valve
3 High pressure relief valve
4 Spring sleeve

Switch the travel drive system to overrun by releasing the valve insert of the high pressure relief valves **2, 3**.

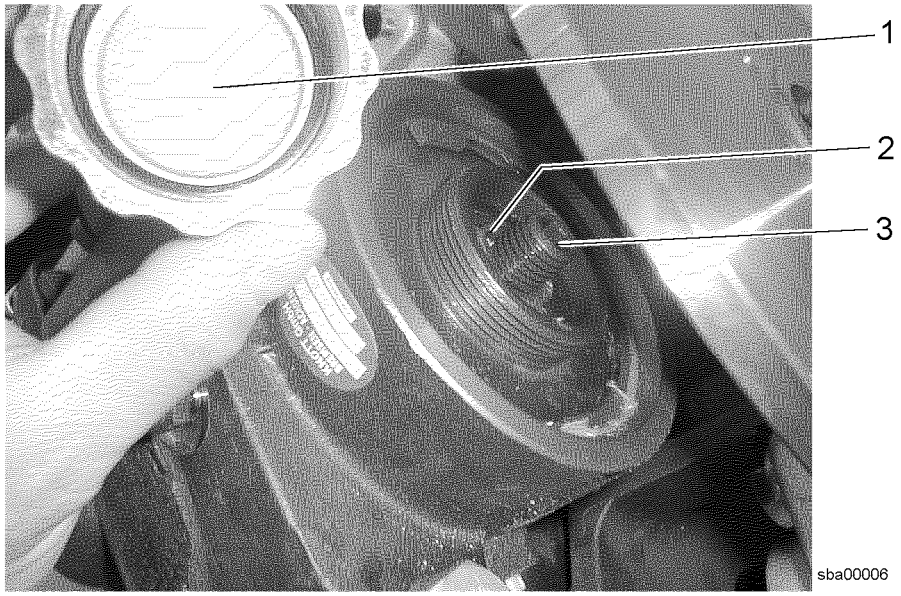
- Unscrew the spring sleeve **4** with two turns of a wrench (SW 22).

This enables free circulation of the oil.
The machine's drive functions are now out of operation.

Warning

There is a risk of injuries due to machine rolling away.

! Make sure when carrying out work on the parking brake that the machine is secured against rolling away (e.g. with wedges).



Parking brake

- In order to mechanically release the parking brake:
  Unscrew the sealing cover **1**.
- Release the lock nut **2**.
- Unscrew the adjusting screw **3** in the counterclockwise direction until the brake lining pads are released from the brake disc.

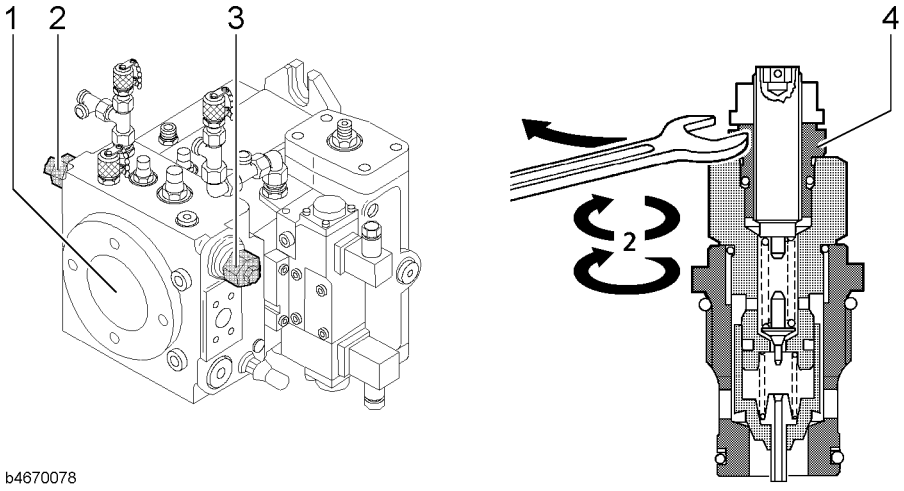
The parking brake is now mechanically released.

Warning

There is a risk of accidents when the machine is in tow.
Since the steering function is restricted, there is a risk of accidents when the machine is being towed.

! When the machine is being towed, use the emergency steering function.

- Switch on the ignition by turning it to position - **I** -.
- Feed the two towing ropes through the bore holes provided in the front section and secure them.
- If it is necessary to steer when under tow:
  Press the emergency steering button. Refer to the Sections “Side cover (control console)” and “Towing the machine when the steering system has broken down”.
- **When towing has been completed:**
  retighten the valve insert of the high pressure relief valves **2, 3**.



High pressure relief valves

1 Variable displacement pump for travel hydraulics
2 High pressure relief valve
3 High pressure relief valve
4 Spring sleeve

- Screw the spring sleeve **4** with two turns of a wrench (SW 22).

The original adjustment of the high pressure limitation valves is thus re-established.

- On completion of towing, set the brake as under “Setting the free travel”.

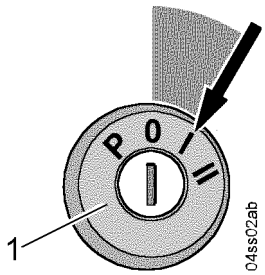
Towing the machine when the steering system has broken down

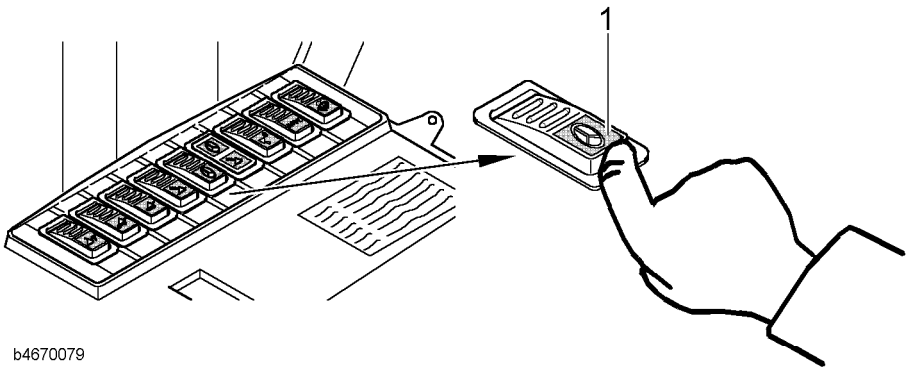
If the diesel engine or the steering pump break down during a journey, the emergency steering pump starts automatically for approximately 50 seconds. Then the emergency steering pump switches off automatically, and steering is no longer possible.

If the ignition is activated, steering is possible again with the emergency steering pump function.

Continuous operation of the emergency steering pump will overheat the pump motor. The thermostat switch integrated in the pump motor automatically switches the emergency steering pump off in the event of overheating.

Make sure that the electrical system is switched on.





Switches on the side cover

1 Emergency steering button

- Press the button **1** for emergency steering and keep it pressed.

The emergency steering pump can be operated until it is switched off automatically by the integrated thermostat in the pump motor.

- If it is not possible to tow the machine out of the danger area during this time period:

  Let the pump motor cool down until the thermostat cuts in again.

- Press button **1** again for repeat start of the emergency steering pump and keep it pressed.

3.4.2 Procedure for jump starting

If you have problems starting because the batteries are flat, the machine can be jump started with external batteries.

Make sure that the precautions detailed below have been taken.

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Connecting the external battery

This is the procedure for jump starting.

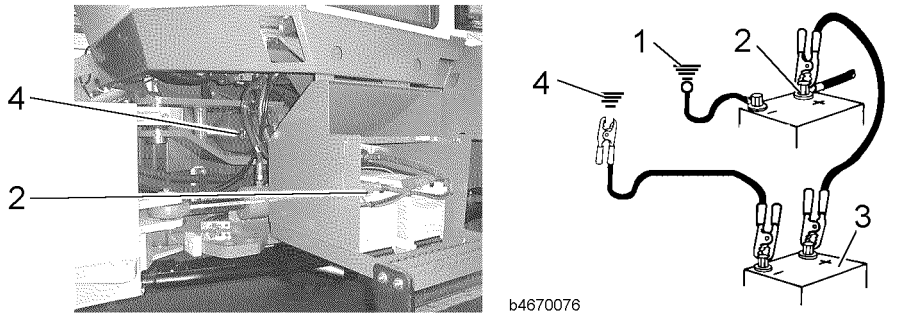
Danger

There is a risk of accidents due to incorrect or careless jump starting.
When external batteries are connected, a large amount of gas can form with old batteries. There is a RISK OF EXPLOSIONS!

! Therefore you should avoid naked flame and any sparks in the vicinity of the batteries.

! Protective goggles and gloves should be worn when jump starting.

! Only use jump starting cables with a sufficient cross section.



Procedure for jump starting

1 Earth point of the discharged battery
2 Positive termnal of the discharged battery
3 External battery
4 Earth point for external battery

- Connect a jump start cable first to the positive terminal of the discharged battery **2** and then to the positive terminal of the external battery **3**.
- Connect the second jump start cable first to the earth point for the external battery **4** and then to the minus pole of the external battery **3**.
- Start up the diesel engine. See the section on starting the diesel engine.

Disconnecting the external battery

Before the jump leads are removed, it is essential that the diesel engine is shifted to lower idling speed.
Excess voltage can be avoided by switching on major consumers such as floodlights.

- First remove the jump start cable from the negative pole of the external battery **3** and then from the earth point for the external battery **4**.
- Then remove the second jump start cable first from the positive terminal of the external battery **3** and then from the positive terminal of the discharged battery **2**.

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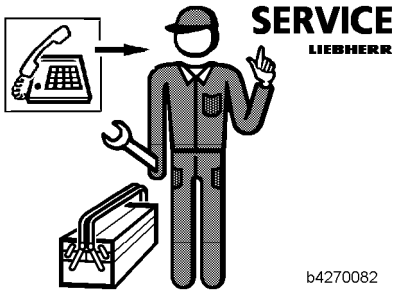
4 Malfunctions

Warning and fault messages

– Various faults are indicated by the corresponding symbol fields (optically) or by display instruments on the instrument panel.
  See the section on the display unit in the chapter on operation and handling.
– Some warning functions are accompanied by acoustic warning signals.

Identifying and correcting faults and errors

– Faults can often be traced back to incorrect operation or servicing of the machine.
  Therefore, carefully read the appropriate section of the operator's manual each time a fault occurs.
– **Analyse the cause of the fault and correct it immediately.**
– Describe the fault and all related circumstances as accurately as possible if you call on **LIEBHERR CUSTOMER SERVICE**.
  Precise descriptions will help us isolate the fault and quickly correct it. For this purpose, precise details about the machine type and serial number are required.
– Do not attempt any jobs for which you have not been trained or instructed.



If you are not able to identify the cause of the fault with the "Error code tables", or are not able to remedy the fault, contact LIEBHERR CUSTOMER SERVICE.

4.1 Service Code Table

4.1.1 Error code – Indication on the display

Service-Code	Symptom	Cause	Solution
OPEn	"OPEn" is displayed in the travel speed LCD when the ignition is turned on. The display unit switches into travel range - I -, in addition to this an interval tones sounds (without a pause).	Interruption between the RPM sensor on the transmission and the display unit. RPM sensor on the transmission is defective.	Contact LIEBHERR CUSTOMER SERVICE

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4.1.2 Audible warning signals

Warning messages accompanied by an acoustic tone are listed in the table below along with their causes and remedies.
There are two different audible warning signals:
– interval tone (tone sequence: 5 tone followed by 5 secs pause)
– Interval tone (without pause)

Description of error signals	Cause	Remedy
The hydraulic oil overheating symbol field lights up. The travel range is then automatically switched back to - I -. The symbol fields – travel range - I - and - II - light up. Interval tone sounds (without pause).	Hydraulic oil temperature over 100 °C	Clean cooling system or operate machine with a smaller load until the hydraulic oil temperature drops again.
	Fault in the cooling , hydraulic or electrical system	Contact LIEBHERR CUSTOMER SERVICE
The emergency motor overheating symbol field lights up and an interval tone (without pause) sounds immediately.	Coolant temperature over 100 °C	Clean cooling system or operate machine with a smaller load until the coolant temperature drops again.
	Error in the cooling or electrical system	Contact LIEBHERR CUSTOMER SERVICE
The emergency steering symbol field lights up and an interval tone (without pause) sounds immediately.	Automatic switch-on of the emergency steering when the oil supply to the steering is interrupted	Drive or tow the machine out of the danger area and consult LIEBHERR CUSTOMER SERVICE.
	Errors in the hydraulic system — Errors in the electrical system	Contact LIEBHERR CUSTOMER SERVICE
The emergency motor overheating symbol field lights up and an interval tone (without pause) sounds immediately.	Too little engine oil	Check the oil level and top up with engine oil if necessary
	Error in the diesel engine oil supply	Contact LIEBHERR CUSTOMER SERVICE
Interval tone sounds (without pause) — only when the switch for travel direction has been actuated.	When the travel direction forwards or backwards is selected and the parking brake is closed. Parking brake switch is “ON”. The travel lockout is active!	Open the parking brake. Press the parking brake button to «OFF».
No visual display. Interval tone sounds (tone sequence: 5 tone followed by 5 secs pause)	Coolant temperature or hydraulic oil temperature over 95 °C	Clean cooling system or operate machine with a smaller load until the coolant temperature or hydraulic oil temperature drops again.

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4.1.3 LIEBHERR automatic central lubrication system

This equipment is optional.

Malfunction	Cause	Remedy
The pump is defective	The integrated electronic control unit is defective. Electric line interrupted. The pump is defective	Replace the lower section of the engine protective housing. Replace the electric line. Replace the pump
The pump is working but there is no flow.	Air cushion in the transfer piston. Filling level below minimum. The pump unit is defective	Bleed air from pump. Fill the container. Replace the pump unit
No grease collar at all lubrication points.	The pump is not working. The dead time is too long or the lubrication time too short. System blocked	See section on defective pump. Reduce the dead time or increase the lubrication time. See section on grease leaking from pressure relief valve
No grease collar at several lubrication points.	Hose lines to auxiliary distributor burst or leaking. Screwed connection not tight	Replace the hose lines. Tighten or replace screwed connections
No grease collar at one lubrication points.	Lubrication hose line burst or leaking. Screwed connection not tight	Replace the hose line. Tighten or replace screwed connection
Reduced pump speed	High system pressure. Low ambient temperature. System pressure is too high	Check contact surface / bearing points. No damage. Lubricate once or twice if necessary
Grease leaking from pressure relief valve	System pressure is too high. Progressive distributor blocked. System blocked. The valve spring is defective	Check system. Replace the distributor. Repair blocked / stuck bearing points. Replace the pressure relief valve

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4.2 Eliminating malfunctions

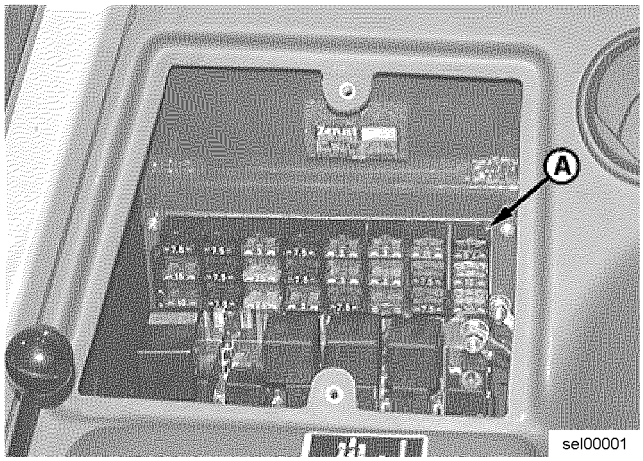
4.2.1 Changing fuses

In order to avoid damage to the electrical system, only fuses with the appropriate ampere rating may be used.
Make sure that:
– Before a fuse is replaced the relevant electrical circuit is checked.
– for reasons of safety, after the affected circuit has been checked, the electrical system of the machine is turned off.

Fuses in the driver's cab

Caution ⚠

There is a risk of electrocution
Through contact with live components, electricution can occur
! Before handling live components, switch off the electrical system of the machine



Fuse box in the cab

- Open the cover on the “fuse box”, behind the driver's seat on the right.
- Use the table above to identify the defective fuse.
- Take out the defective fuse of the function which is not working and replace it with a new fuse with the same rating.

Maxi Fuses

Fuse	Value	Unit	Use	Location
F04	50	A	Starter	in the control panel under the front cover
F30	50	A	Terminal 15(G1)	in the control panel under the front cover

Fuse chart – maximum fuses

- Remove the defective fuse of the function which is not working and replace it with a new fuse with the same rating.

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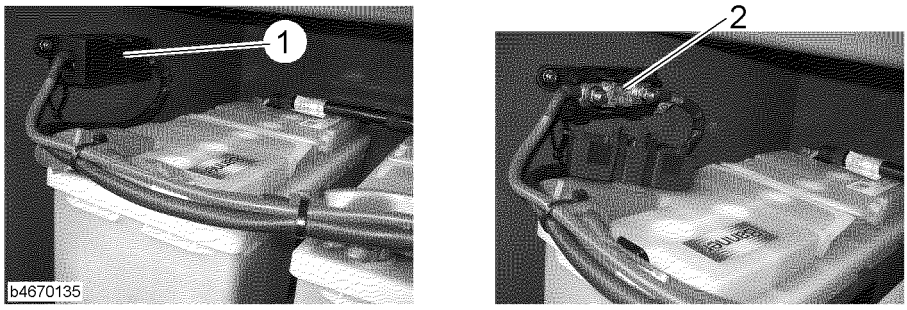
Mega fuses

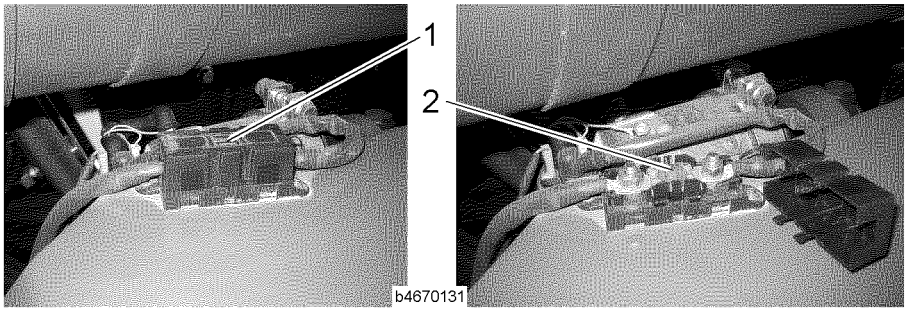
Fuse	Value	Unit	Use	Location
F01	125	A	Main fuse	in battery case
F02	200	A	Emergency steering pump	on right-hand mudguard
F03	125	A	Preglow device	rear of engine compartment

Fuse chart – mega fuses



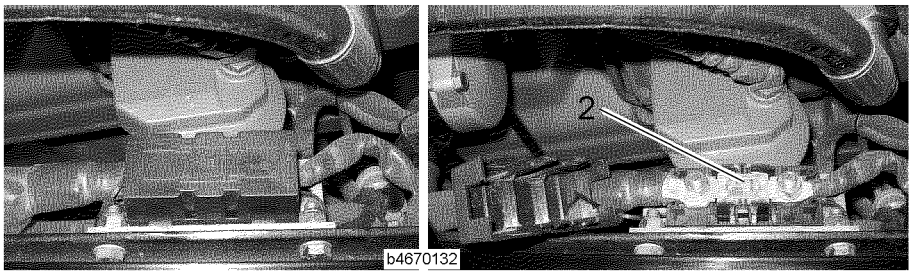
Mega fuse — main fuse F01

- Remove the cover **1** from the fuse box.
- Remove the defective fuse **2** of the function which is not working and replace it with a new fuse with the same rating.



Mega fuse — emergency steering pump F02

- Remove the cover **1** from the fuse box.
- Remove the defective fuse **2** of the function which is not working and replace it with a new fuse with the same rating.



Mega fuse — preglow device F03

- Remove the cover **1** from the fuse box.
- Remove the defective fuse **2** of the function which is not worknig and replace it with a new fuse with the same rating.

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Plug-in fuses in the control panel

Fuse	Value	Unit	Use	Location
F31	15	A	Ignition start switch	in the control panel under the front cover

Fuse chart – plug-in fuses

- Take the cover off the control consule.
- Take out the defective fuse of the function which is not working and replace it with a new fuse with the same rating.

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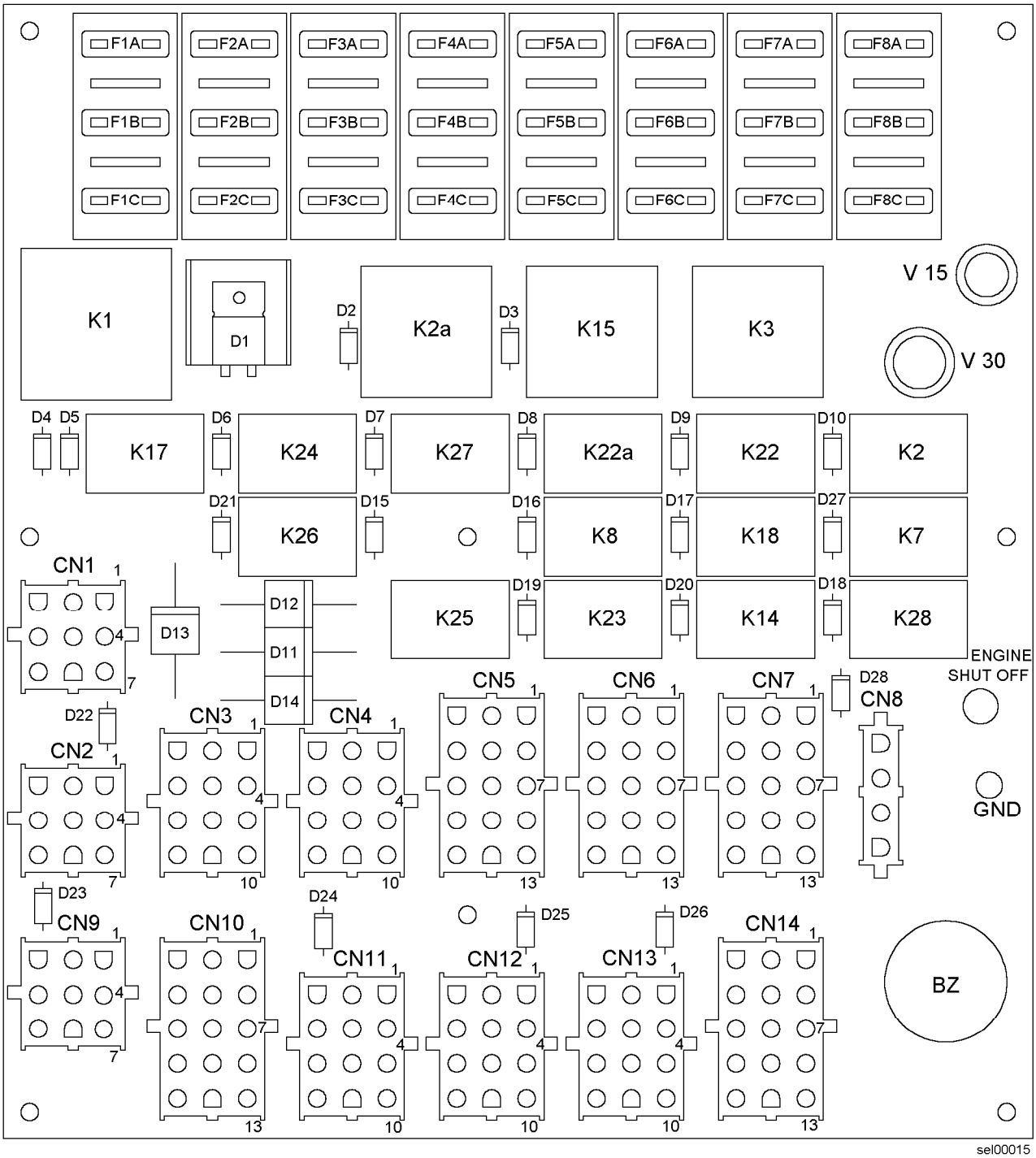
Plug-in fuses on control board A2

The F1A–F8C plug-in fuses for the functions listed in the below table are accomodated in the “fuse box” to the right behind the driver's seat on the control unit **A2**.



Control board A2

- Open the cover on the “fuse box”, behind the driver's seat on the right.

Fuse	Value	Unit	Name/function/use
F1A	7.5	A	Driving headlamp, left - high beam
F1B	7.5	A	Brake light
F1C	10.0	A	Hazard warning system, interior illumination, flashing beacon – optional
F2A	7.5	A	driving headlamp, right- high beam
F2B	7.5	A	driving headlamp, left - dipped beam
F2C	7.5	A	driving headlamp, right - dipped beam
F3A	15.0	A	Preliminary fuse – lighting, switch lighting
F3B	7.5	A	window wiper / wash system
F3C	20.0	A	Working floodlight
F4A	7.5	A	Start release valve, relay supply ignition voltage, control electronics A1
F4B	7.5	A	Quick-change device
F4C	3.0	A	indicator unit (battery + 30)
F5A	3.0	A	Sidemarker light, right
F5B	5.0	A	indicator unit (ignition + 15)
F5C	15.0	A	back-up alarm, drive hydraulics
F6A	3.0	A	sidemarker light, left
F6B	3.0	A	Start release relay, motor stop relay, preglow, warning buzzer
F6C	15.0	A	window wiping / washing system front, signal horn
F7A	25.0	A	Air conditioning system – option
F7B	7.5	A	Control electronics A1, emergency steering button
F7C	7.5	A	working attachment (battery + 15)
F8A	15.0	A	Air conditioning system – option
F8B	10.0	A	Compressor seat – option
F8C	10.0	A	Engine stop

Fuse chart – Plug-in fuses on control board A2

- Use the table above to identify the defective fuse.
- Take out the defective fuse of the function which is not working and replace it with a new fuse with the same rating.

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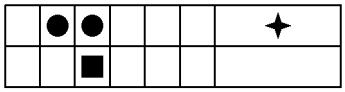
5 Maintenance

5.1 Maintenance and inspection schedule

The following abbreviations are used in this section:
- h = Service hours
- OM = Operator's manual
- SM = Service manual

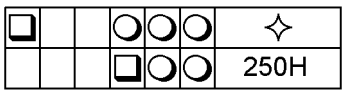
Various symbols (solid or empty circles, boxes and stars) are used to indicate the maintenance tasks, which fall into two main types.
The symbols have the following meanings:
Table with solid circle, box or star



bsym0039

- Here, the machine operator or his maintenance personnel are responsible for carrying out maintenance tasks.
  This affects the maintenance intervals every 10 and 50 service hours (h) and non-scheduled intervals.

The symbols have the following meanings:
Table with empty circle, box or star, or service hours (h)



bsym0040

- Here, authorised specialist technicians from LIEBHERR or its authorised dealers must perform or direct maintenance and inspection work.
  This affects the maintenance intervals on delivery, every 500, 1000, 2000 service hours (h), and at unscheduled times.

You will find a list of the spare parts needed for maintenance and inspection work in the SERVICE PACKAGE of the spare parts list.

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Customer: ..... Machine type: ..... Serial No.: ..... Oper. hours: ..... Date : .....

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED
On delivery	Every 10	Every 50	Every 500	Every 1000	Every 2000	Special intervals	**By maintenance personnel** ■ One-off activity ● Repetition interval ✦ If necessary ❄ Annually at the start of the cold season **By authorised qualified personnel** □ One-off activity ❍ Repetition interval ✧ If necessary
							Complete machine
□							Have the driver lubricate the machine in accordance with the lubrication chart and instruct him on proper maintenance
□							Instruct the driver in the operation of all functions
□	●	●	❍	❍	❍		Check the machine for external damage
						✦	Check that all screw connections are tight
□						✦	Seal any leaks
			□	❍	❍		Check the hydraulic pressure according to the testing and setting plan
							Diesel engine, pump distributor gear
□	●	●	❍	❍	❍		Check the oil level in the diesel engine
		■	❍	❍	❍	250h	Change the engine oil (every 250 h or 500 h depending on oil specification)
		■	❍	❍	❍		Replace the oil filters
			❍	❍	❍		Check and replace the V-ribbed belt
				❍	❍		Check the exhaust lines for leaks and tight fitting
				❍	❍		Check the valve play
□		●	❍	❍	❍		Draining off water and sediment from the fuel tank
		●	❍	❍	❍	✦	Draining condensate from the fuel fine filter
				❍	❍	✦	Changing the fine fuel filter
				❍	❍	✦	Changing the fuel pre-filter
		●	❍	❍	❍	✦	Clean the service cap and dust extraction valve on the air filter
				❍	❍	✦	Cleaning or replacing the air filter main element. (Replace the safety element after the main element has been replaced 3 times.)
			❍	❍	❍	✦	Make sure that the air suction hoses are securely attached and sealed
							Cooling system
□		●	❍	❍	❍		Check the coolant level
			❍	❍	❍	❄	Checking the antifreeze
						✦	Cleaning the cooling system
						3000h	Replacing the coolant (or no later than every 2 years)
							Working hydraulics
				❍	❍		Lubricate the pilot control unit, clean the magnets and lubricate the universal joints
□	●	●	❍	❍	❍		Check the oil level in the hydraulic tank
□		●	❍	❍	❍		Drain water and sediment from the hydraulic tank
					❍		Replacing the hydraulic oil
□		■	❍	❍	❍	250h	Check and clean the magnetic rod on the hydraulic tank

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Customer: ..... Machine type: ..... Serial No.: ..... Oper. hours: ..... Date : .....

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED
On delivery	Every 10	Every 50	Every 500	Every 1000	Every 2000	Special intervals	**By maintenance personnel** ■ One-off activity ● Repetition interval ✦ If necessary ❄ Annually at the start of the cold season **By authorised qualified personnel** □ One-off activity ❍ Repetition interval ✧ If necessary
			❍	❍	❍		Change the return suction filter
			□	❍	❍		Cleaning the return strainer in the hydraulic tank
				❍	❍		Replace the bleeder filter on the hydraulic tank
Steering system							
□	●	●	❍	❍	❍		Check the steering
□		●	❍	❍	❍		Lubricating the bearing points on the steering cylinder
Brake system							
□	●	●	❍	❍	❍		Check the service brake and parking brake
□	●	●	❍	❍	❍		Checking the oil level in the brake system equalizing reservoir
				❍	❍	✦	Checking the wear and gap on the brake pads
Electrical system							
□	●	●	❍	❍	❍		Check the indicator lamps and lighting
			❍	❍	❍		Check the batteries, fluid level and terminals
Axles, tyres							
□		■	❍	❍	❍		Check the tightness of the wheel lugs (once after 50, 100 and 250 h)
□			❍	❍	❍		Checking the oil levels on the front axle
			□	❍	❍		Changing the front axle gear oil
□			❍	❍	❍		Checking the oil levels on the rear axle
			□	❍	❍		Changing the rear axle gear oil
□		●	❍	❍	❍		Greasing the axle pivot bearing and the universal joints on the rear axle
□		●	❍	❍	❍		Checking and lubricating the drive shaft
□						✦	Set the correct tyre pressure for the machine's use and attachments
Machine frame, ballast weight							
		●	❍	❍	❍		Greasing the articulation and rear axle oscillating bearings
Central lubrication system							
□		●	❍	❍	❍		Check whether metered quantities are adequate at the bearing points (grease collars) of the central lubrication system
□		●	❍	❍	❍		Check the hose lines of the central lubrication system (lubrication points, detached hoses, external leakage)
Covering, cab access							
						✦	Lubricating the hinges on the rear hatch and engine compartment hood

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Customer: ..... Machine type: ..... Serial No.: ..... Oper. hours: ..... Date : .....

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED
On delivery	Every 10	Every 50	Every 500	Every 1000	Every 2000	Special intervals	**By maintenance personnel** ■ One-off activity ● Repetition interval ✦ If necessary ❄ Annually at the start of the cold season **By authorised qualified personnel** □ One-off activity ❍ Repetition interval ✧ If necessary
Cab, heating, air-conditioning							
						✦	Lubricating the door hinges
						✦	Cleaning or replacing the fresh air filter
			❍	❍	❍		Checking the indicator beads in the dryer-collector unit
Lift arm, quick-change device							
□		●	❍	❍	❍		Checking and lubricating the lift arm bearings
□		●	❍	❍	❍	✦	Checking and lubricating the bucket bearing (the lower bucket bearings daily, if necessary)
			❍	❍	❍		Checking the lift arms and bucket stops

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5.2 Lubricant chart, filling quantities

5.2.1 Table of filling quantities

Specifications in the Medium column:
- The standard lubricants and fuels required for central European climate conditions are stated here.
- **Before before you change or top up the oil in the hydraulic system (hydraulic tank), always check if it is filled with petroleum or bio oil.**
- For more detailed information about the required lubricants and service fuels, see the section on lubricants and fuels.

Specifications in the Dosage column:
- The values stated for the filling quantities in the table are only guidelines.
- The dipstick or level markings are always mandatory.
- Each time the oil is replaced or topped up, the level in the unit in question must be checked.

	Name	Medium	Dosage	Units
 06sy03ab	Hydraulic system total capacity	Engine oil SAE 20W -20	105	l
 06sy05ab	Diesel engine (with filter change)	SAE 10W - 40 engine oil	13.3	l
 06sy04ab	Cooling system – diesel engine total capacity	Coolant	18.4	l
 06sy03ab	Hydraulic tank	SAE 20W - 20 engine oil	65	l
 bsym0027	Brake system total capacity	SAE 10W engine oil	1.0	l
 1 06sy14ab	Differential front axle	SAE 90LS gear oil	11	l
 2 06sy15ab	Front axle wheel lug (each)	SAE 90LS gear oil	0.8	l
 3 06sy16ab	Differential rear axle / AVG	SAE 90LS gear oil	11.0	l

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	Name	Medium	Dosage	Units
 2 06sy15ab	Rear axle wheel lug (each)	SAE 90LS gear oil	0.8	l
 bsym0029	Air-conditioning system	Refrigerant R 134a	1800	g

5.2.2 Lubricant chart

The lubrication chart provides an overview of the location of the maintenance points on the machine and of their maintenance intervals.

You will find detailed information in the maintenance and inspection schedule, as well as in the individual descriptions of the maintenance tasks. Please see the section on maintenance tasks.

For more detailed information about the required lubricants and service fuels, see the section on lubricants and fuels.

For information about the required filling quantities, see the table of filling quantities.

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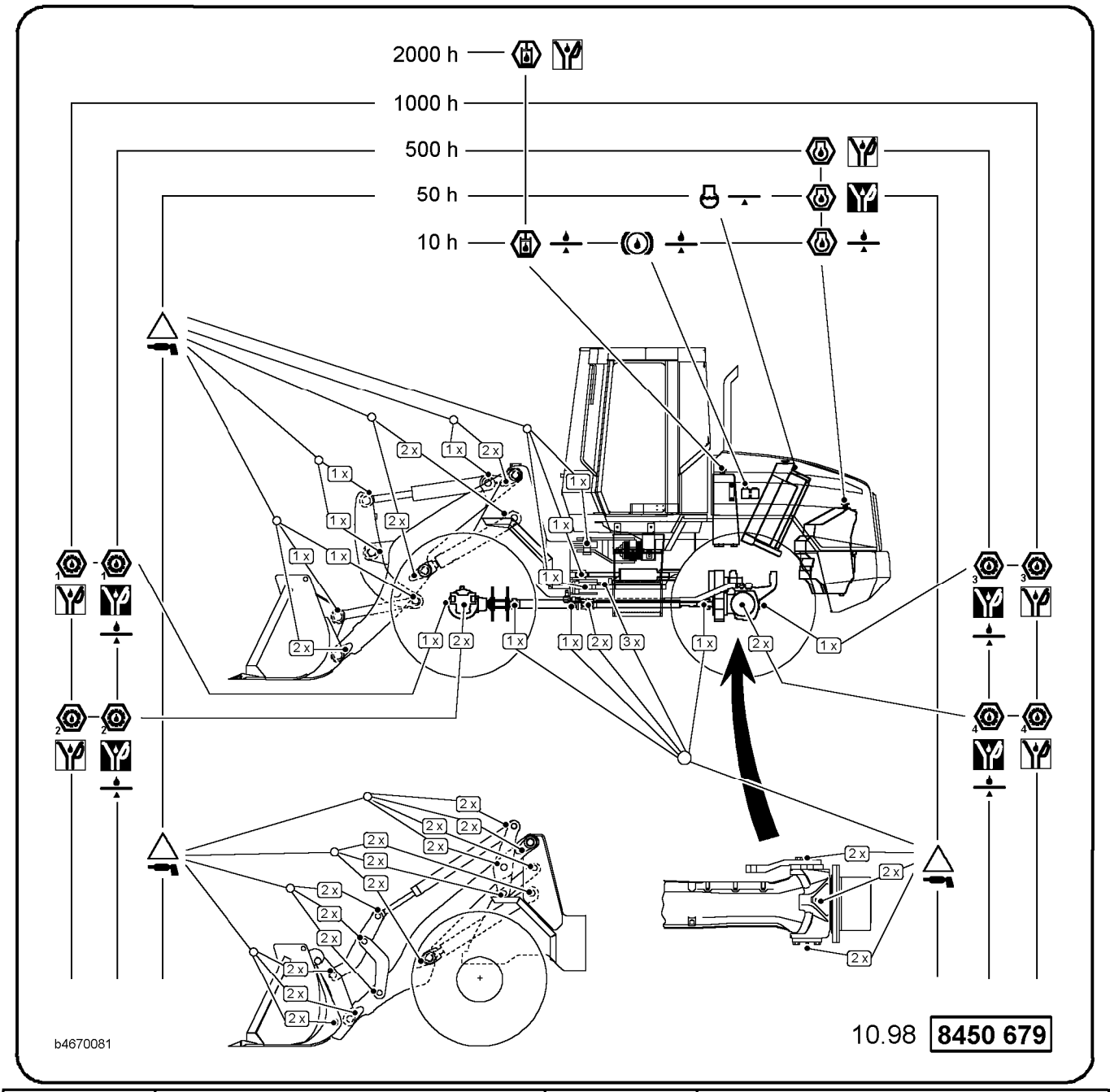

Symbol	Name	Symbol	Name
06sy09ab	General lubrication points	06sy01ab	Lubrication
06sy13ab	Checking the oil level	06sy21ab	Check the coolant level
06sy11ab	Oil change	06sy12ab	First oil change

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5.3 Maintenance tasks

On completion of servicing, the machine should be returned to the operating position.
See also the sections on operation and operating position sections in the **Operator's Manual**.

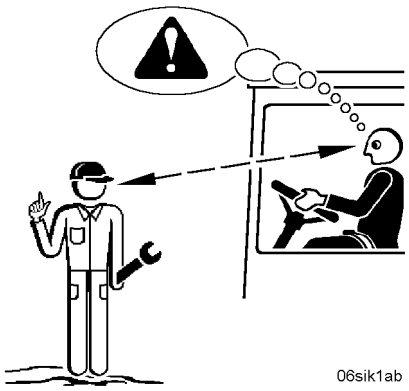
5.3.1 Preparatory tasks for maintenance

Before the various maintenance tasks are performed, the machine must be moved into the maintenance position unless otherwise explicitly specified in the description.
The various maintenance tasks include:

– Lubricating the lift arm
– Checking the oil level or changing the oil in the engine, transfer gear, axles, hydraulic tank, etc.
– Replacing filters as well as adjustment and repair work on the hydraulic system

Safety precautions for maintenance

It is essential that the accident prevention regulations are observed during maintenance work
See in the safety regulations section for measures to ensure safe maintenance.
Make sure that visual contact between the operator in the cab and maintenance personnel is always maintained.



Visual contact

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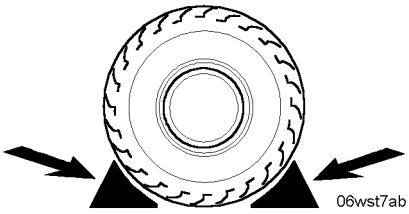
Danger

There is a risk of accidents for maintenance personnel.
The presence of unauthorised persons on the machine can place the maintenance personnel in extreme danger.

! Never enter a dangerous area of the machine without making your presence known.

- Make sure you can be clearly seen before entering one of the machine's danger areas.
- Secure the machine against rolling away with wheel wedges.



Wheel wedges

Maintenance positions

The maintenance position depends on the maintenance task to be performed.
The two basic maintenance positions 1 and 2 are described below.
They enable you to access the individual maintenance points.

Maintenance position 1

To move the machine into maintenance position 1 proceed as follows.

For a detailed description of the individual procedures, see the section on operation and handling.

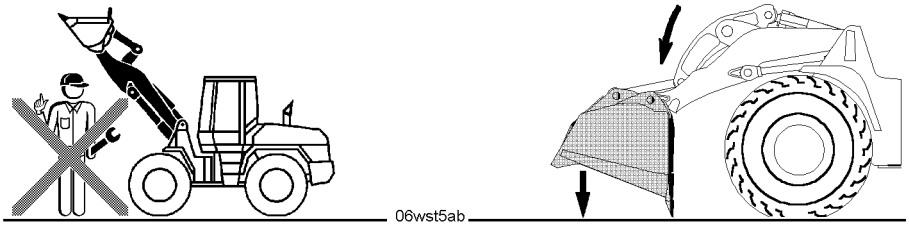
Maintenance position 1

- Park the machine on level ground.
- Lower the lift arm.
- Set the bucket down flat on the ground.
- Turn off the diesel engine.
- Take out the starter key.

Maintenance position 2

To move the machine into maintenance position 2 proceed as follows.

For a detailed description of the individual procedures, see the section on operation and handling.



Maintenance position 2

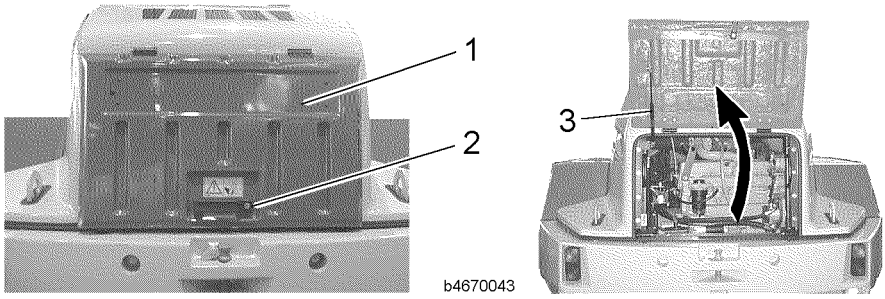
- Park the machine on level ground.
- Engage the articulation lock.
- Lower the lift arm.
- Tilt the bucket out and set it down on the ground on its teeth or cutting edge.
- Turn off the diesel engine.
- Take out the starter key.

Opening the service doors, hatches and hoods

Opening the engine compartment rear hatch

Open the rear hatch if you need to access the following units or components:

– Diesel engine
– Battery main switch



Engine compartment rear hatch

1 Engine compartment rear hatch
2 Handle with lock
3 Gas-filled spring

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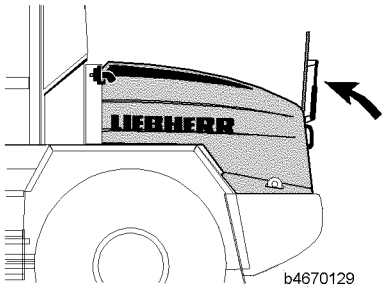
Caution

Risk of injuries due to rear hatch falling closed!

! Check that the rear hatch is secured in the fully open position by the pneumatic ram.



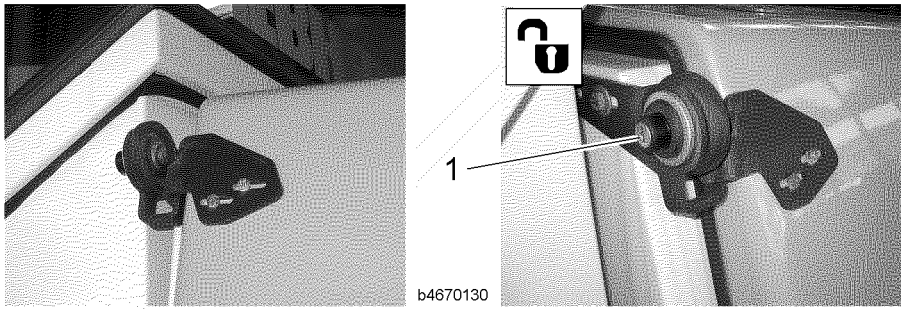
- Open the lock of the rear hatch **1** with the ignition key.
- Completely open the rear hatch **1** with the handle **2**.

The rear hatch is kept in this position by the pneumatic ram.

Opening the engine compartment hood

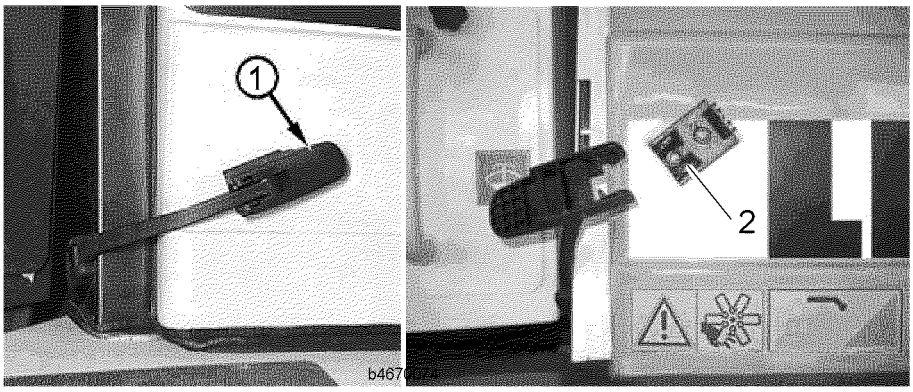
When the hood is open, you can access the following units:
- Diesel engine
- Variable displacement pump
- Cooling system
- Hydraulic tank
- Air filter

Make sure that the rear hatch is completely open.



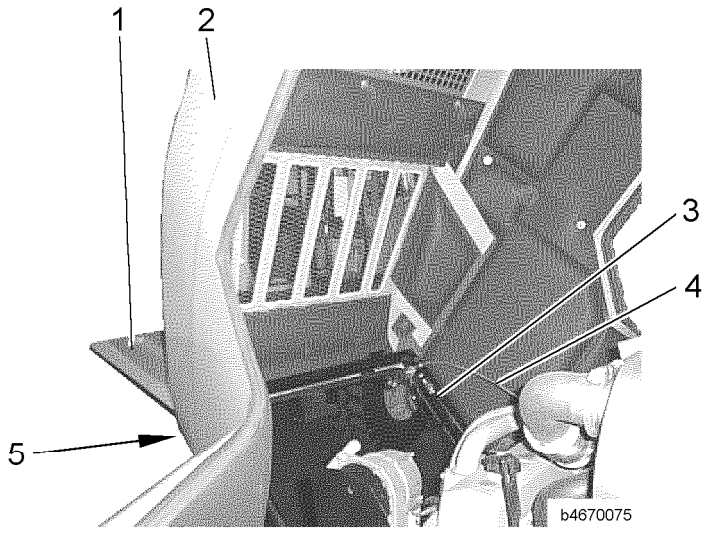
Engine compartment – lock for hood

- Open the lock of the Engine compartment – hood **1** with the ignition key.



Clamping lever for engine compartment hood

- Open the clamping levers **1** on the left and right of the engine compartment hood.



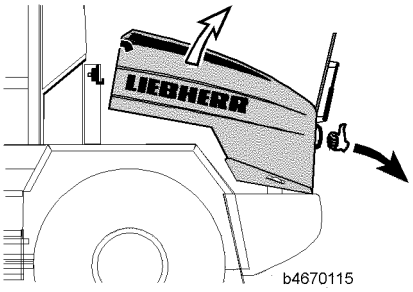
Engine compartment hood

1 Engine compartment rear hatch
2 Engine compartment hood
3 Gas-filled spring
4 Retaining cable
5 Handles

Warning

There is a risk of accidents due to moving engine parts.
The rotating or moving engine parts, such as the fan blades or V-belts, can cause injury.

! Only open the engine compartment hood when the engine is shut down.



- Completely open the hood **2** with both handles **5**.

The hood is held in this position by two gas-filled springs **3**.

Warning

There is a risk of injuries if the hood falls shut.

! Check that the fully open position can be secured by the gas-filled springs.

- If this function is not ensured, the cause of the problem must be rectified immediately.

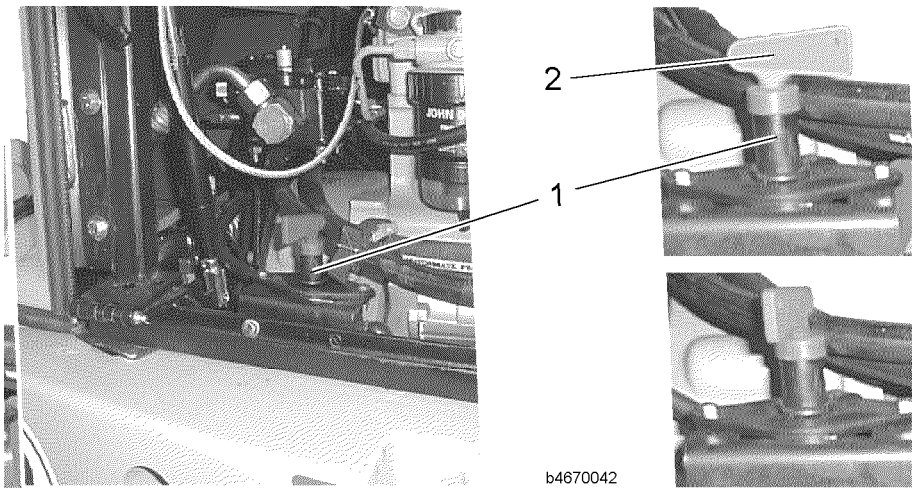
Turning off the battery main switch

The battery main switch is located at the rear left of the engine compartment.

For certain maintenance jobs, the battery main switch must first be turned OFF.

Find out from the descriptions of the relevant maintenance tasks whether the battery main switch must be turned ON or OFF. See the section on “maintenance tasks”.

Switch on the main battery switch after completing these maintenance tasks.



Battery main switch

1 Battery main switch
2 Key

Caution

Risk of damage to the electrical system!

! Do not turn off the main battery switch when the engine is running.

- Shut down the engine first and only then turn off the main battery switch.

Danger

There is a risk of accidents for maintenance personnel.
If unauthorised people are on the machine it can put the maintenance personnel in extreme danger.

! For safety reasons, it is essential that the battery main switch is turned off.

! Pull out the key for reasons of safety.

- To switch off the main battery switch **1** turn the key **2** to the - **0** - position.

5.3.2 Check the machine for external damage

Make sure that the machine is in maintenance position 1.

Procedure

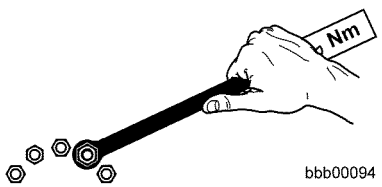
- Before starting up the machine, check for external damage which could detract from operational safety.
- Repair any damage with safety implications immediately.

5.3.3 Checking that all screw connections are tight

Make sure that:
– The machine is in maintenance position 2
– The appropriate service doors or hoods are open

Procedure

- Tighten any loose screws or bolts with the required tightening torque.



5.3.4 Seal any leaks

Make sure that:
– The machine is in maintenance position 2
– The appropriate service doors or hoods are open

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Procedure

- Check the whole hydraulic system for leakage.
- Replace any damaged hydraulic seals.
- Tighten any loose hydraulic couplings.
- Also see the section on “safe maintenance of hydraulic hoses and hose lines”.

5.3.5 Check the oil level in the diesel engine

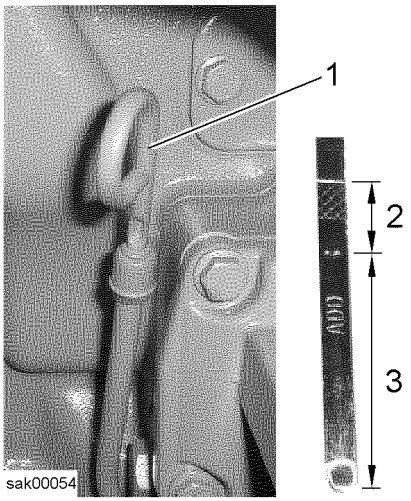
The oil filler neck is located on top of the engine on the valve cover.
Make sure that:
– The machine is in maintenance position 1
– The diesel engine is level and has not been running for 2 -3 minutes.

Procedure

- Pull out the dipstick **1**, wipe it clean, and re-insert it.
- Pull out the dipstick **1** once again and read off the oil level.

The oil level must be within the cross hatching **2**.

- If the oil level is in the area **3** or below it:
  top up with engine oil.



Diesel engine oil dipstick

5.3.6 Changing the engine oil

Make sure that:
– The machine is in maintenance position 1
– The diesel engine is level
– The diesel engine is warm
– A suitable container is in place with approx. 20 l capacity, and the oil draining hose and engine oil in accordance with the oil specifications are ready.

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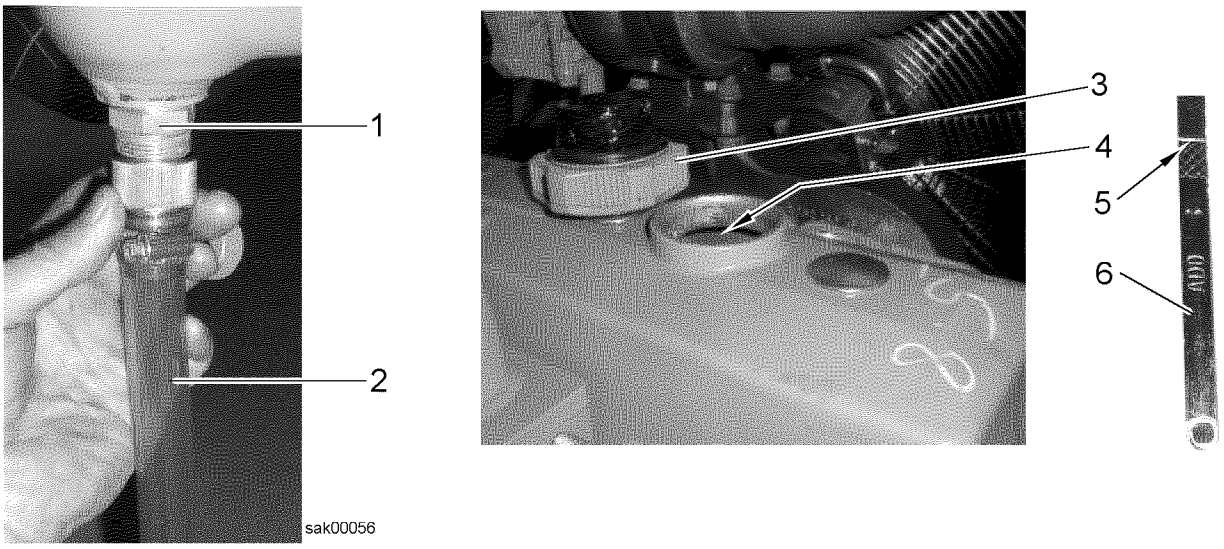
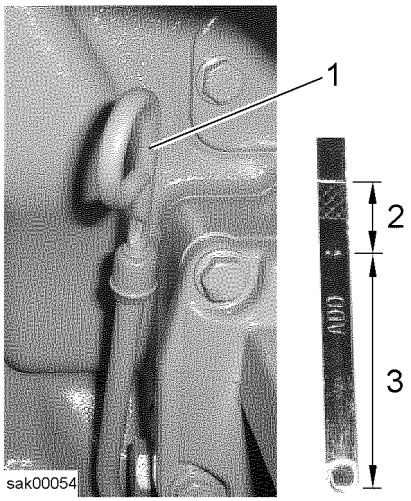
Procedure



Diesel engine oil change

- Unscrew the sealing cover on the oil drain valve **1** on the bottom of the oil pan.
- Screw the oil drain hose **2** onto the oil drain valve **1**.
- Let the oil drain off into the container.
- Unscrew the oil drain hose **2** and screw the sealing cover onto the oil drain valve **1**.
- **When changing the engine oil and the oil filter:**
  Change the oil filter according to the separate description.
- Top up the oil via the oil filler neck **4** up to the top marking **5** on the cross-hatching on the dipstick **6** (see“Lubricants and operating materials” for oil quality).
- Clean the oil filling cover **3**, put it back on the oil filler neck **4** and tighten it.
- Start the diesel engine and check the oil pressure.
- Shut down the diesel engine and check the oil level with the dipstick after 1 - 2 minutes.
- If the oil level is in the area **3** or below it:
  Correct the oil level.



Diesel engine oil dipstick

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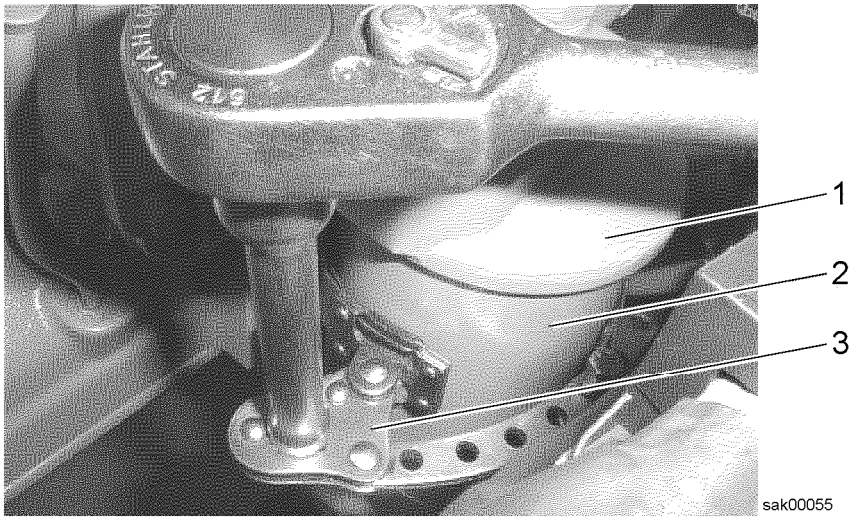
5.3.7 Replace the oil filters

Make sure that:
The machine is in maintenance position 1
The engine oil has been drained off
A LIEBHERR oil filter cartridge is ready

Procedure



Unscrew the oil filter

- Release the oil filter cartridge **2** with a strap wrench **3** and unscrew the filter.
- Clean the sealing surfaces of the filter bracket **1**, if necessary replace the old filter seal and any remnants.
- Brush the rubber seal ring on the new oil filter cartridge **2** lightly with engine oil.
- Screw the new oil filter cartridge onto the filter bracket **1** until the seal touches the filter bracket **1**. Tighten by another half to three-quarter turn.
- Top up the oil via the oil filler neck **4** up to the top marking **5** on the cross-hatching on the dipstick **6** (see“Lubricants and operating materials” for oil quality).
- Clean the oil filling cover **3**, put it back on the oil filler neck **4** and tighten it.

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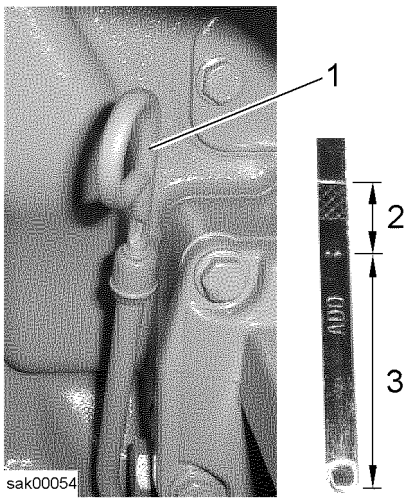
- Start the diesel engine and check the oil pressure.
- Shut down the diesel engine and check the oil level with the dipstick after 1 - 2 minutes.
- If the oil level is in the area **3** or below it:
  Correct the oil level.



Diesel engine oil dipstick

5.3.8 Drain off water and sediment from the fuel tank

Make sure that the machine is in maintenance position 1.

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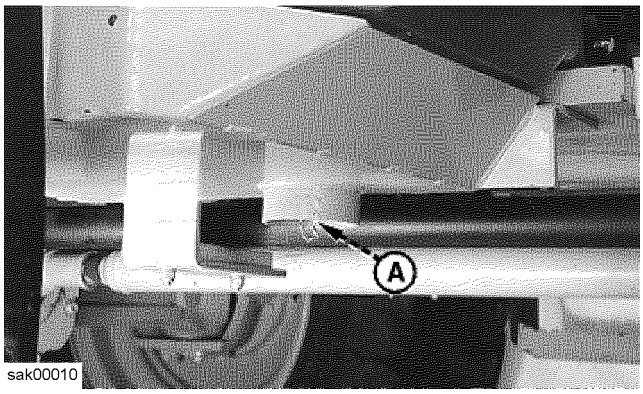
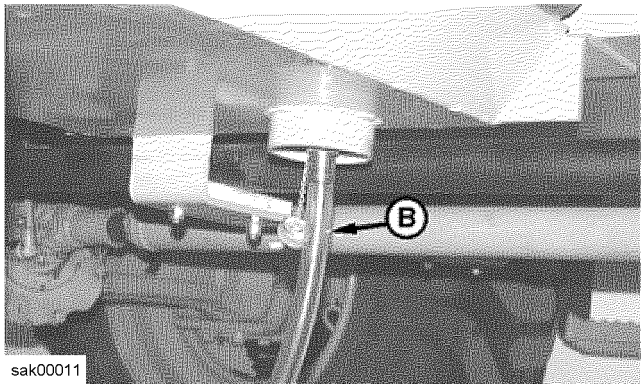
Procedure



- Unscrew the sealing cap **A** on the drain value on the underside of the fuel tank.

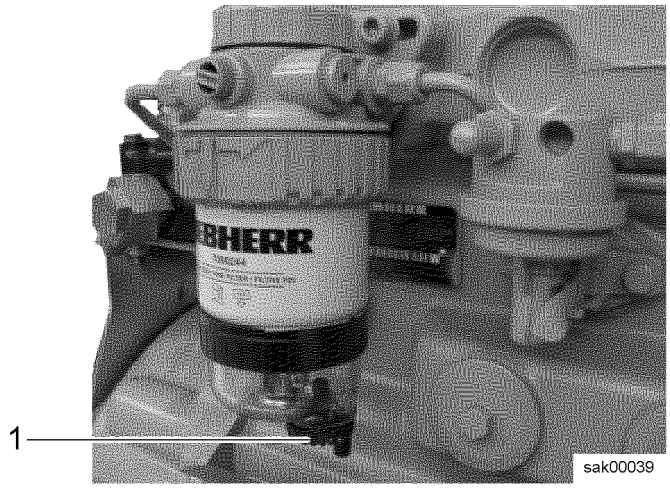


- Place a suitable receptacle under the tank.
- Screw the drain hose **B** on to the drain valve.
- Drain the condensation and sediment into the receptacle until clean fuel begins to flow.
- Unscrew the drain hose **B** and screw the sealing cap **A** on to the drain valve.

5.3.9 Draining condensate from the fuel fine filter

Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure for draining condensate from the fuel fine filter



- Place a receptacle under the fuel filter.
- Open the drain plug **1** and let the condensate drain off into the receptacle until clean fuel starts to flow.
- Close the drain plug **1** again.

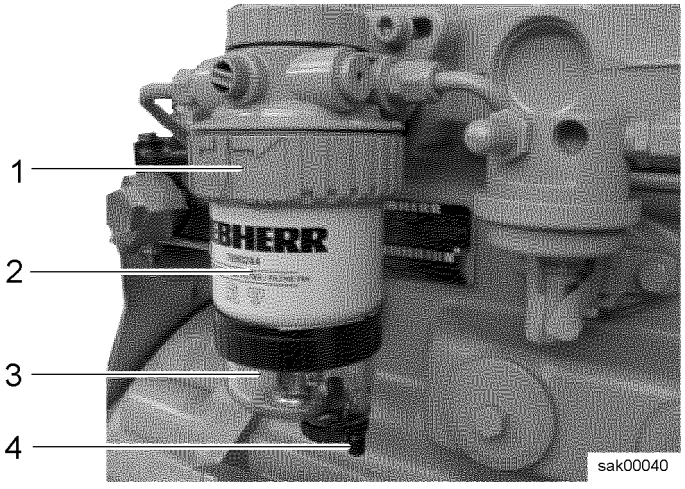
Bleeding air from the fuel system

Procedure: see the section on replacing the fuel pre-filter.

5.3.10 Changing the fine fuel filter

Make sure that:
– The machine is in maintenance position 1
– The engine compartment rear hatch is open.

Procedure for changing the fine fuel filter



- Carefully clean the fuel fine filter and the surrounding area.
- Place a receptacle under the fine fuel filter (you may need to plug a suitable piece of hosing into the drain valve **4**).
- Open the drain valve **4** and let out the fuel.
- Push up the snap ring **1** and turn it a quarter turn anticlockwise.

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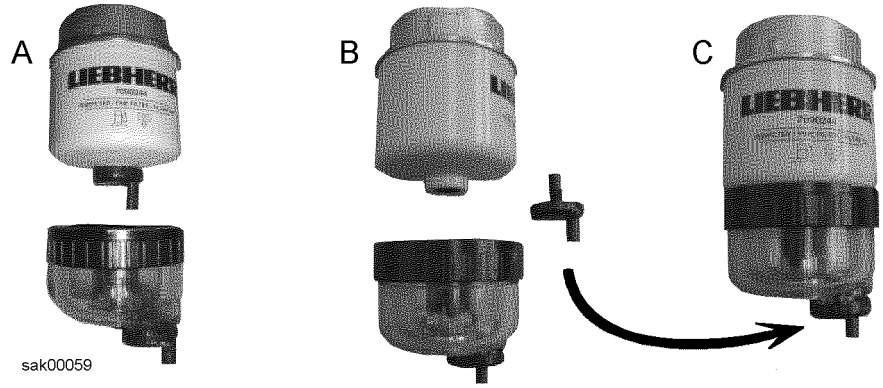
- Pull down the filter element **2** with the snap ring **1**.
- Unscrew the water separator **3** from the filter element.
- Dispose of the old filter element.



Pre-mounting the new fine fuel filter

- Wash the water separator **3** and blow it dry. Unscrew the (old) drain valve and dispose of it.
- Unscrew the drain valve from the new filter element and screw it on to the cleaned water separator.
- Screw the water separator **3** on to the new the filter element and tighten it.
- Check the filter base and the sealing ring, and replace if necessary.
- Mount the new filter element **2** on the filter base. Make sure that the slot in the filter base and the cams on the filter element fit.
- Put on the snap ring **1** and turn it a third of a turn clockwise. The snap ring snaps into the edge.

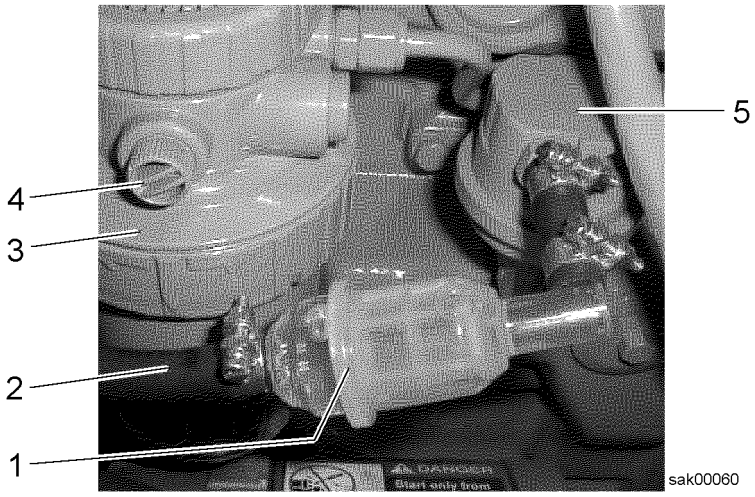
Bleeding air from the fuel system

Procedure: see the section on replacing the fuel pre-filter.

5.3.11 Changing the fuel pre-filter

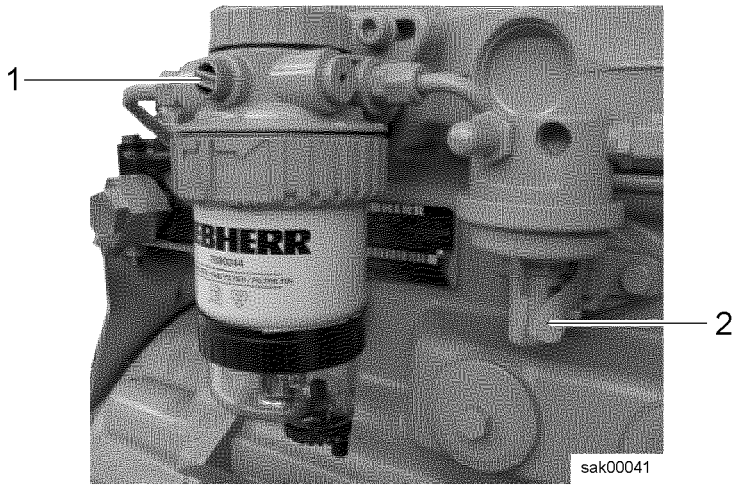
Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure for changing the fuel pre-filter



- Release the hose clips and remove the fuel pre-filter **1**.
- Fit the new fuel pre-filter **1**.

Bleeding air from the fuel system



- Loosen the bleeder screw **1** by two turns.
- Keep pushing the hand pump lever **2** until bubble-free fuel comes out of the bleeder screw **1**.
- Tighten the bleeder screw **1**.
- Keep pushing the hand pump lever **2** until you can feel resistance. Continue pumping and loosen the bleeder screw **1** (the remaining air escapes under pressure and the pump resistance rises again).
- Close the bleeder screw **1** and keep pushing the hand pump lever **2** until you can feel resistance fall again.
- If you cannot feel any resistance accumulating when you are pushing the hand pump lever **2**, or no fuel comes out of the bleeder screw **1**:

  Briefly crank the diesel engine with the starter, since the lever of the fuel pump is probably at the highest position on the cam.

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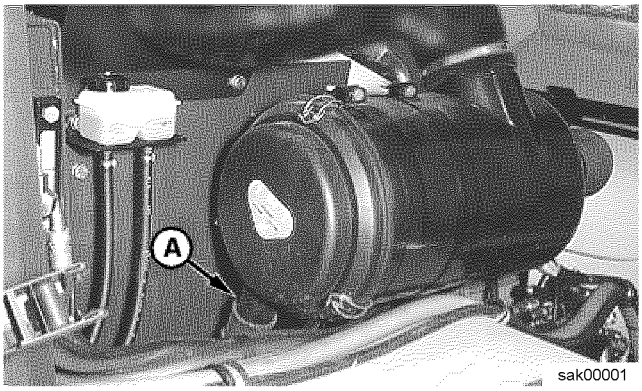
5.3.12 Clean the service cap and dust extraction valve on the air filter

Important: when the engine is running (bottom idle) you should be able to feel pulsations of air at the dust extraction valve.
If the valve is damaged the dust will not be properly extracted and the filters will get dirty more quickly.
Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure for cleaning the dust extraction valve



Air filter

- Press the rubber seal on the dust extraction valve **A** several times to remove the dust from the service cap.
- When working in dusty conditions, check and empty the dust extraction valve **A** more often.
- If the dust extraction valve **A** damaged or stays open:
  Replace the dust extraction valve **A**.

Procedure for cleaning the air cleaner cover

- The open fixing clips on the air cleaner cover and take the cover off.
- Clean the air cleaner cover.
- Put the air cleaner cover back on the filter housing. The dust extraction valve **A** must be down.
- Only when the lid completely covers the filter housing can you close the fixing clips without excess force.
  Close the fixing clips.

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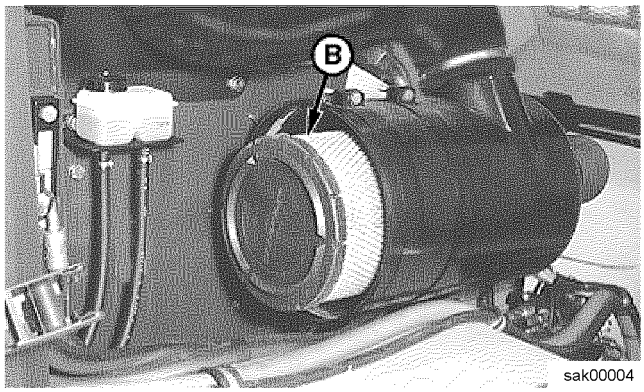
5.3.13 Cleaning or replacing the air filter main element

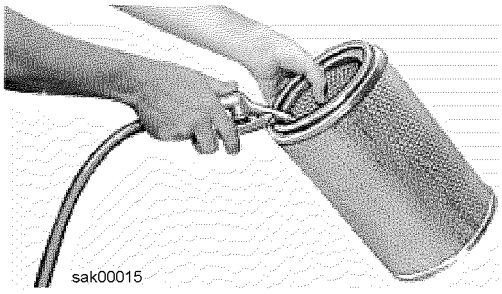
Clean or replace the main element when the air filter contamination symbol field on the indicator unit lights up or every 1000 operating hours.
If the air filter contamination symbol field continues to light after the main element has been serviced then the safety element must also be replaced.
Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure

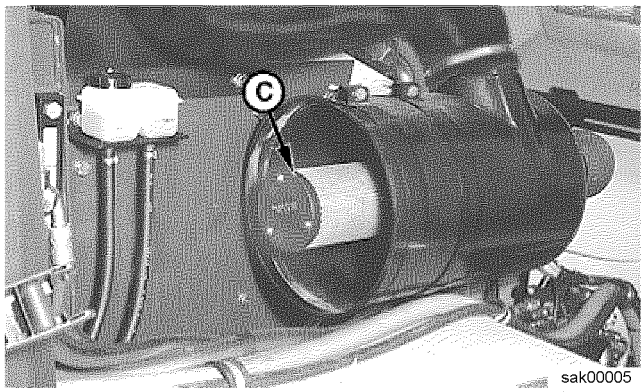
- Open fixing clips on the air cleaner cover and take the cover off.



- clean or change the main filter element **B**.



- Blow out the main filter element from the inside out with dry air. Avoid tapping the filter to clean it, as this could cause damage.



- The safety element **C** should be replaced every third time the main filter element is replaced.
- Make sure all dirt has been removed from the housing before inserting a new or cleaned filter element.
- Lightly oil the seal surfaces before installing the filter elements (for the main element, this is on the inside, for the safety element **C** on the outside). Put the filter elements back in and make sure that they are correctly fitted.
- Clean the service cover and put it back on the filter housing.

Only when the lid completely covers the filter housing can you close the fixing clips without excess force.

- Close the fixing clips.

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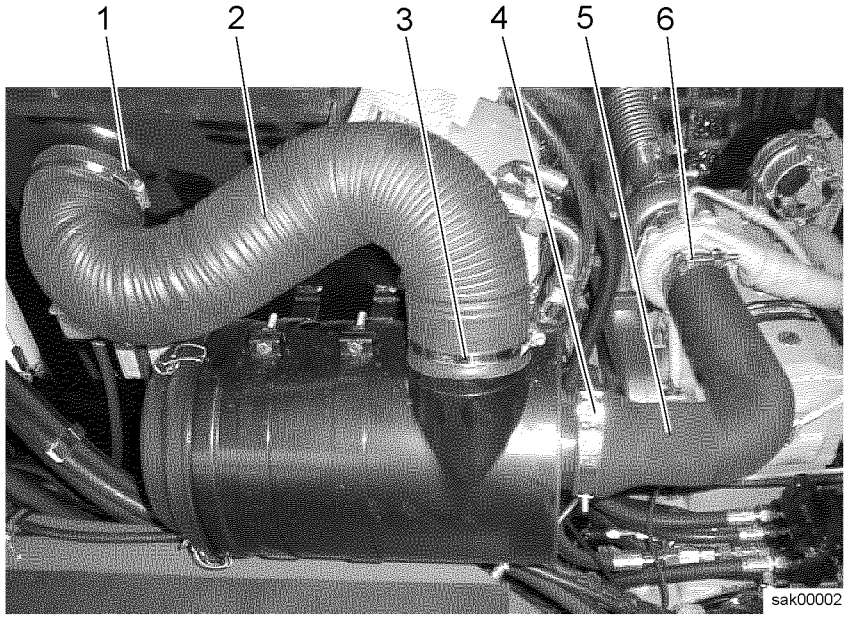
5.3.14 Make sure that the air suction hoses are securely attached and sealed

Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure



Checking the air suction hose

- Check the hose **5** between the filter housing and the turbocharger and the hose **2** between the filter housing and the suction shaft for cracks and damage.
- Check that the hose clips **1, 3, 4, 6** are tight.

5.3.15 Check the coolant level

Make sure that:
– The machine is in maintenance position 1
– The engine compartment rear hatch is open

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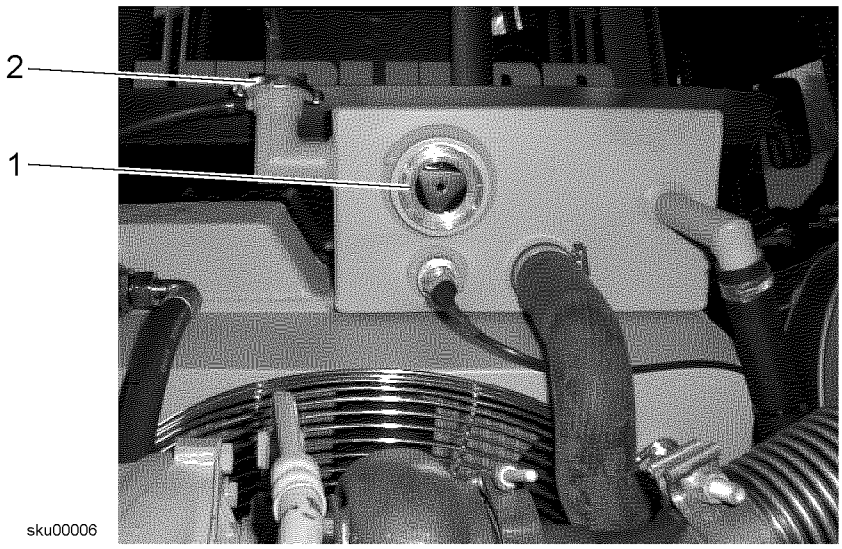
Procedure



- Check the coolant level in the sight glass **1** in the equalizing reservoir. The coolant must be visible in the sight glass **1**.
- If the coolant level is not visible in the sight glass **1**:
  Top up coolant via the filler neck **2** to the top of the sight glass.

5.3.16 Checking the antifreeze

The coolant must contain at least 50% vol. but no more than 60% vol. of concentrated anti-freeze all year round. This protects against freezing down to around -37 °C.
Make sure that:
The machine is in maintenance position 1
The engine compartment hood is open
The “optical density tester” or strip test kit is ready.

Procedure for checking the antifreeze

Caution ⚠

There is a danger of scalding due to coolant escaping under pressure.
Only open the sealing cap when the engine has cooled down. Only one or two bars of the coolant temperature display unit should be visible.

! Carefully open the sealing cap on the filler neck and let the pressure out of the cooling system.

- Take a sample of the coolant and check the antifreeze concentration using the testing tool or the strip test kit.
- If the antifreeze concentration is too low:
  Correct the mixture ratio of anti-freeze in the coolant.

Procedure for correcting the antifreeze concentration

- If the antifreeze concentration is too low,
  drain off the coolant and top up with pure anti-freeze according to the diagram below.

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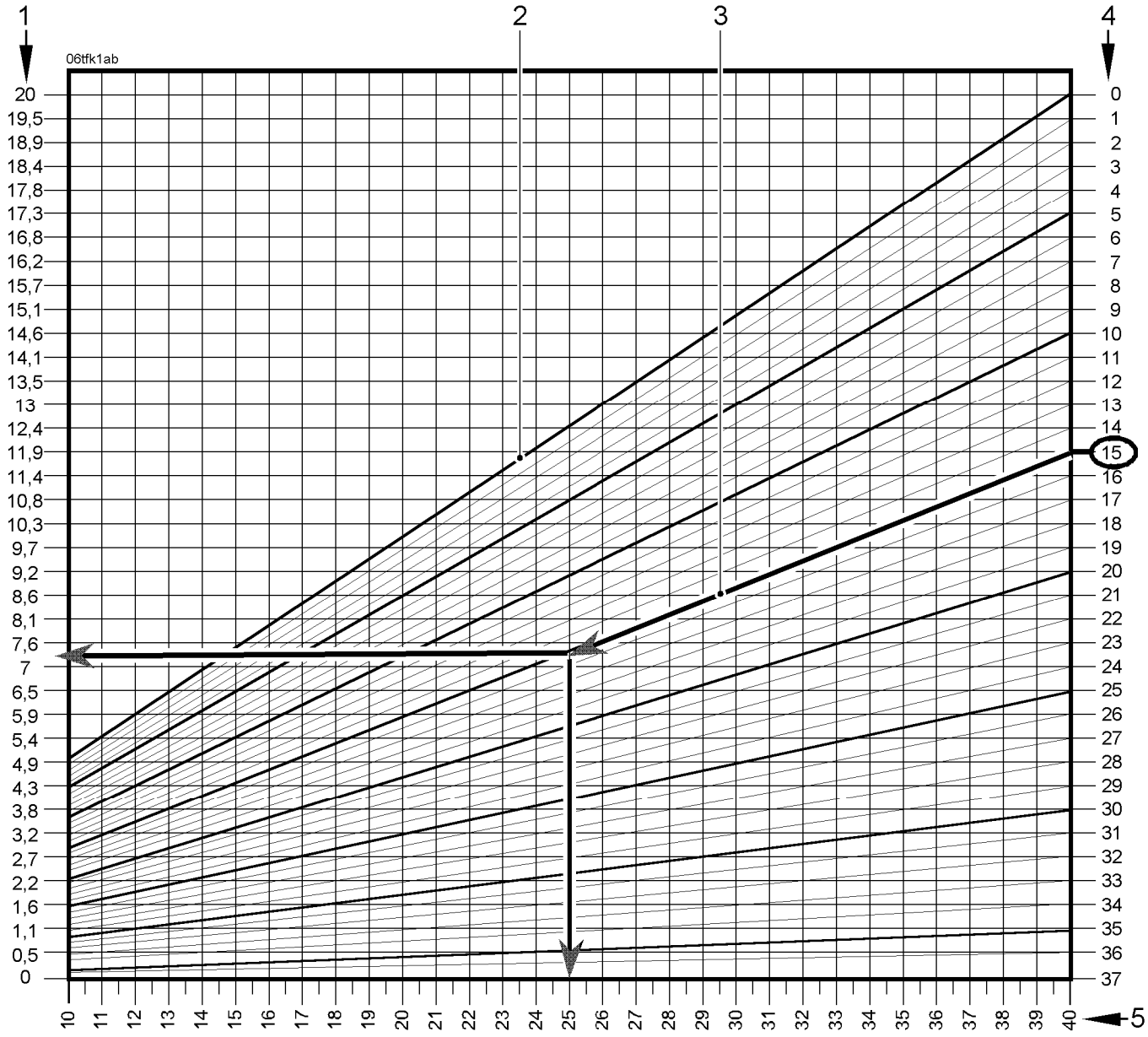
Caution

There is a risk of damage to the diesel engine.
Too much anti-freeze and corrosion protection agent impairs the cooling effect. This eventually causes damage to the diesel engine.

! Never use more than 60% anti-freeze and corrosion protection agent.



Selection for anti-freeze concentration

1 Topping up quantity of pure anti-freeze and corrosion protection agent in litres
2 Guidelines
3 Example -15 °C
4 Measured coolant freezing point in °C
5 Filling quantity of cooling system in litres .

- **Procedure for the example -15 °C:**
  If a temperature of -15 °C is measured in the cooling system, follow the guideline **3** (starting from the measured temperature) to the left down to the vertical line filling quantity – cooling system **5** and from this point horizontally to the left edge.

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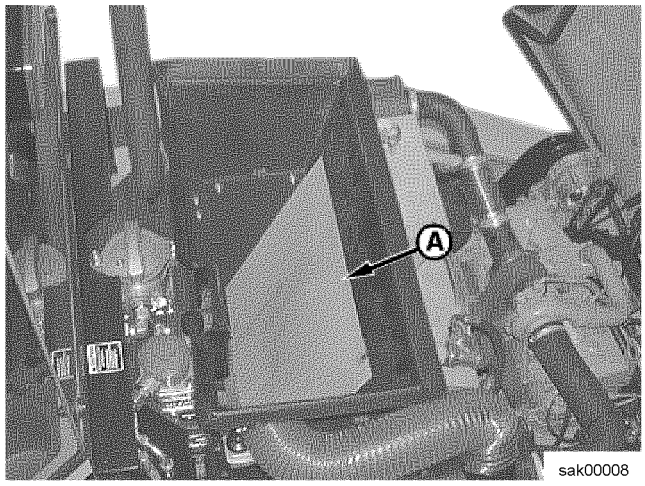
This gives you the topping up quantity of anti-freeze and corrosion protection agent **1** to be added in order to achieve antifreeze protection down to -37° C.

- To restore the correct mixture ratio, you must drain off at least the quantity identified from the cooling system.
- Top up with the correct quantity of pure anti-freeze and corrosion protection agent.
- The coolant previously drained off can be used if necessary to restore the required coolant level.

5.3.17 Cleaning the cooling system

Clean the cooler whenever necessary in order to ensure proper cooling. When operating in dusty conditions, the coolers should be checked daily and cleaned if required.
Dust and other contaminants can be removed from the cooling fins with water jets, steam or compressed air. Compressed air is preferable.
Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open

Procedure



Caution The cooler fins may be damaged if they are not treated with due care.
! Do not use hard objects or excessive water pressure for cleaning.

- Clean the cooler units **A** with compressed air, steam or water.

5.3.18 Check the oil level in the hydraulic tank

Make sure that:
– The machine is cold
– The machine is in maintenance position 1

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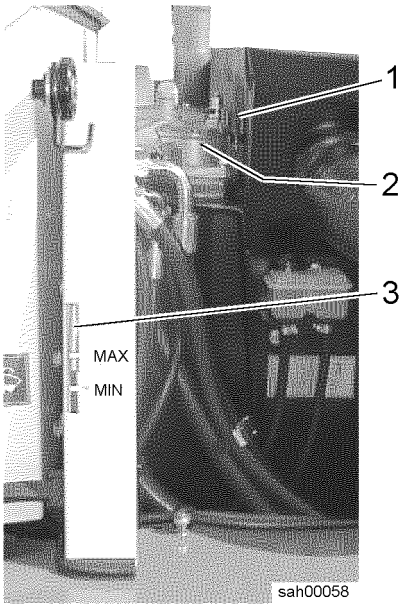


Procedure

The **MIN - MAX** marking indicates the required oil level.

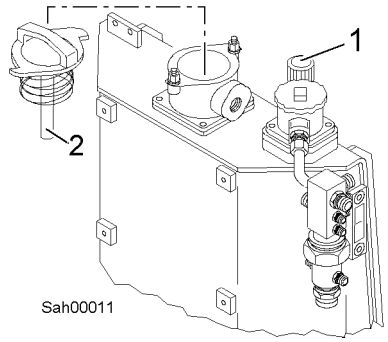
- Check the oil level in the sight glass **3**.
- If the oil level is below the required level:
  Top up with hydraulic oil.
- Release the tank pre-pressure by unscrewing the bleeder filter **1** on the hydraulic tank.

The hydraulic oil may only be poured in through the return strainer **2**.

- Open the cover of the return strainer **2**.
- Fill the hydraulic oil up to the **MIN - MAX** marking.
- Put the cover with the O-ring on the housing and tighten it up.
- Tighten the bleeder filter **1**.

5.3.19 Check and clean the magnetic rod on the hydraulic tank

Make sure that:
– The machine is in maintenance position 1
– The engine compartment hood is open



Procedure

- To release the tank pre-pressure unscrew the bleeder filter 1 on the hydraulic tank by two turns.
- To release the screws on the lid and slowly lift the lid with the magnetic rod 2.

Troubleshooting

Major contamination or large metal fragments on the magnetic rod could indicate damage to the hydraulic system.

- In this event, isolate the problem and rectify it.

- Carefully clean the magnetic rod.
- Place the O-ring and cover with the magnetic rod on the housing.
- Tighten the bolts on the cover.
- Tighten the bleeder filter 1.

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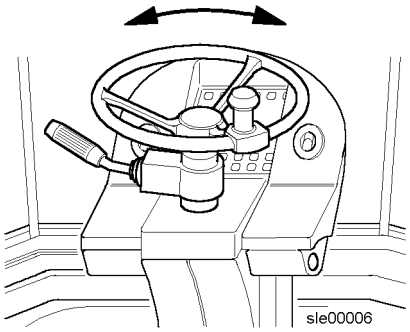
5.3.20 Check the steering

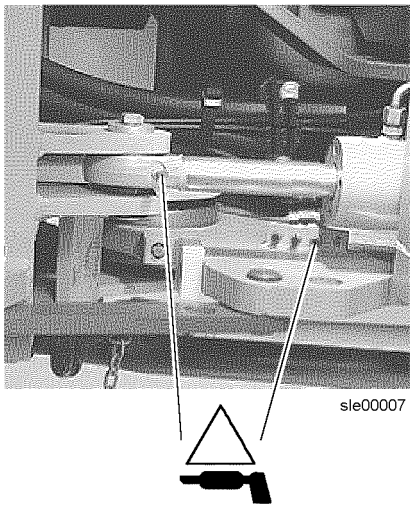


Procedure

- Start the diesel engine.
- Turn the steering in both directions when the vehicle is stationary and check that it is functioning properly.

5.3.21 Lubricating the bearing points on the steering cylinder

Make sure that the machine is in maintenance position 1.



Procedure

- Turn the machine to the right to improve access to the articulated joint zone.
- Lubricate the bearing points on the steering cylinder.

5.3.22 Check the service brake and parking brake

Procedure for checking the service brake

Make sure that there is enough room to check the service brake.

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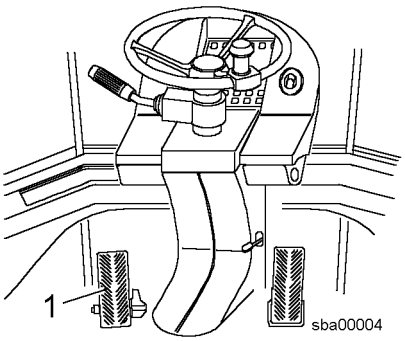
Warning

There is a danger of driving into bystanders or obstacles.

! Do not allow anyone into the danger area while these tests are being conducted.

! Carry out the testing on a level area without any obstacles.



- Start the diesel engine and drive forwards in travel range 1 at approximately 8 km/h.
- Push the inch/brake pedal **1** all the way down. The machine must come to an **abrupt** stop.

Troubleshooting

If the braking effect is too small or entirely absent:

- Contact LIEBHERR CUSTOMER SERVICE.

Procedure for checking the parking brake

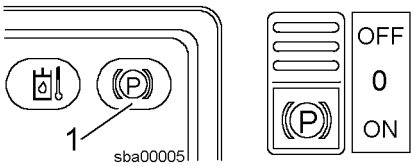
Make sure that there is enough room to check the parking brake.

Warning

There is a danger of driving into bystanders or obstacles.

! Do not allow anyone into the danger area while these tests are being conducted.

! Carry out the testing on a level area without any obstacles.



- Start the machine, select travel range 1 and forward travel direction.
- Move the machine forward at approx. 3 km/h and activate the parking brake with the parking brake switch.

The symbol field **1** for the parking brake lights up.

The machine must come to an abrupt stop.

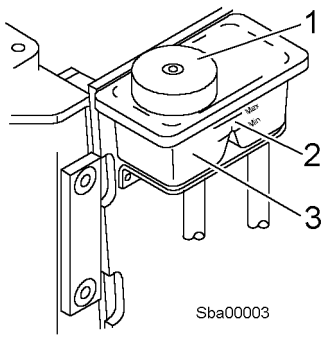
Troubleshooting

If the braking effect is too small or entirely absent:

- Contact LIEBHERR CUSTOMER SERVICE.

5.3.23 Checking the oil level in the brake system equalizing reservoir

Make sure that:
The machine is in maintenance position 1
The engine compartment hood is open



Procedure

The “MIN - MAX” markings show the required height of the oil level. The oil level must lie between the markings.

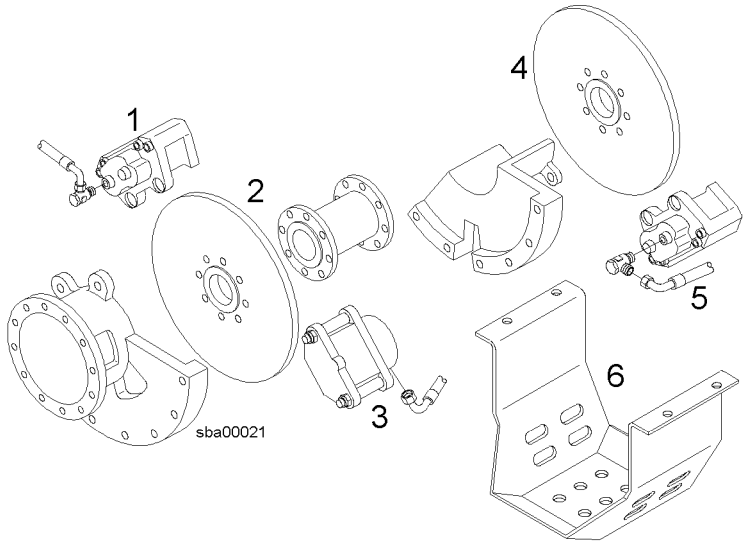
- Checking the oil level in the equalizing reservoir **3**

To avoid damaging the brake system, only top up with SAE 10W petroleum (see the section on lubricants and fuels).

- If the oil level is below the required level:
  Open the cover **1**and top up with oil.
- Unscrew the cover **1** on the equalizing reservoir **3**.

5.3.24 Checking the wear and gap on the brake pads

Frequent braking can wear down the brake pads. The brake pads must be renewed if they become worn down below the minimum thickness.
On the parking brake, wear to the brake pads can also alter the gap between the brake disc and the brake pad. If the gap exceeds a certain value it must be adjusted.
The gap is automatically adjusted on the service brake. This means that manual adjustment is not required.



1 Service brake caliper
2 Front brake disc
3 Parking brake caliper
4 Rear brake disc
5 Service brake caliper
6 Disc brake guard

Make sure that:
The machine is in maintenance position 2
Put wedges under the wheels to stop the machine rolling away.

Stopping the machine from rolling away

- Put the machine in maintenance position 2.
- Put wedges under the wheels to stop the machine rolling away.

Procedure for checking the wear on the brake pads

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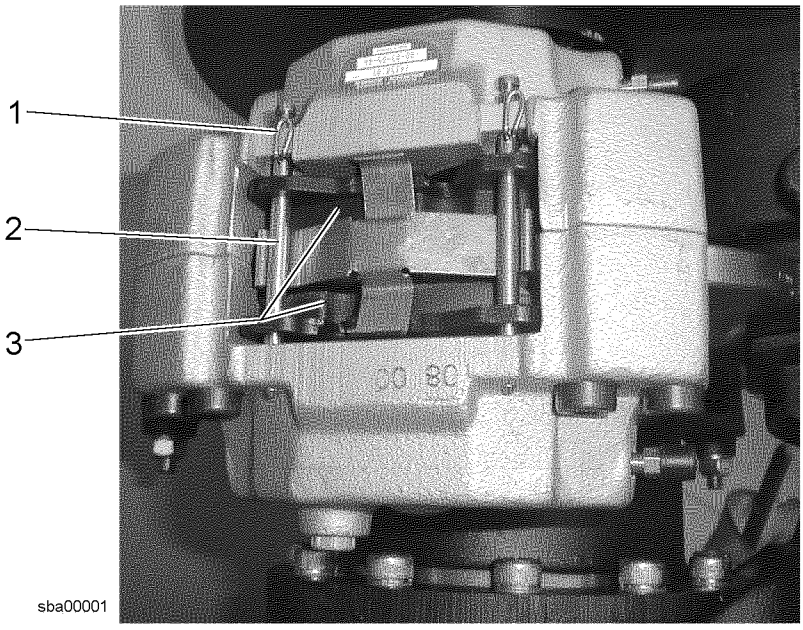
Description	Value	Unit
Service brake lining thickness NEW	9.0	mm
Service brake lining thickness MIN	2.0	mm
Parking brake lining thickness NEW	4.5	mm
Parking brake lining thickness MIN	1.0	mm

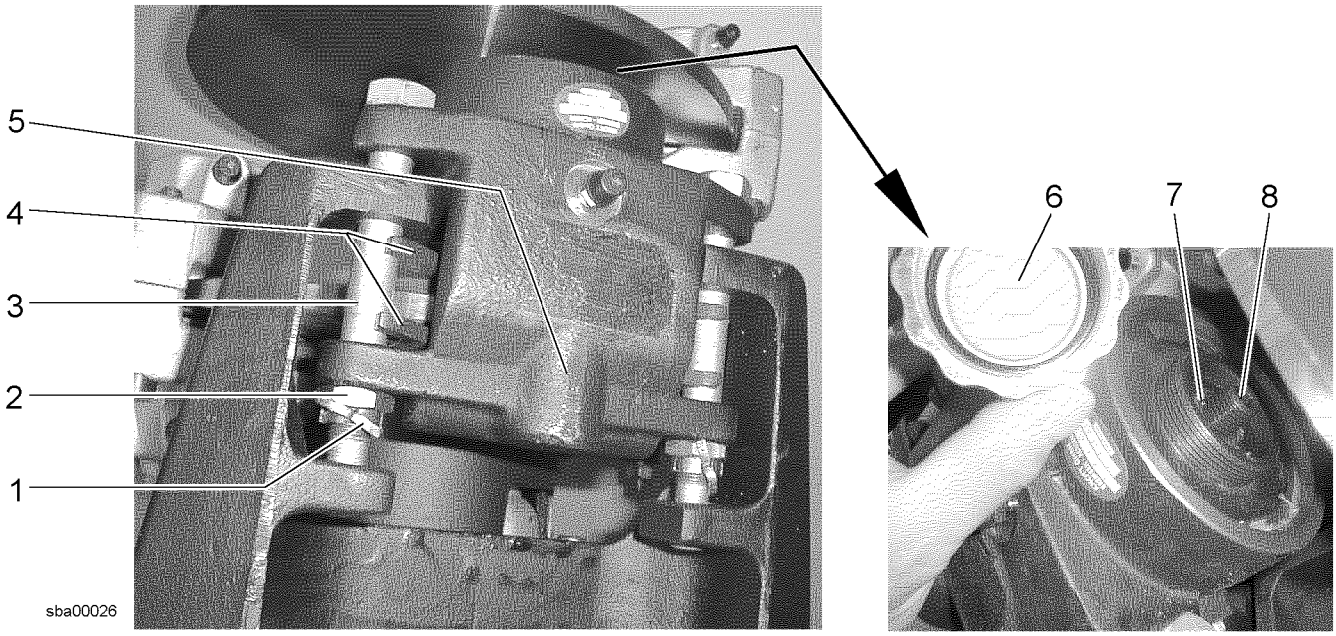
- Check the thickness of the linings on the service brake and parking brake (by sight, using a mirror).
- If the brake lining is too thin:
  Replace the brake lining on the service brake or parking brake.
- Take off the disc brake guard.



Service brake caliper

- Take off the retaining splints **1** and bolts **2** on both sides.
- Push in the brake piston using a suitable tool.
- take out both brake pads **3**.

- Put in new brake pads and assemble the brake caliper in the reverse order.



Parking brake caliper

- Unscrew the sealing cap **6** and loosen the lock nut **7** using a SW 24 box spanner.
- Unscrew the adjusting screw **8** to release the brake calipers.
- Remove the retaining splint **1** and nut **2** from the top screw **3**.
- Pull out the screw **3** and slightly pull the brake caliper **5** outwards.
- Liftout the brake pad **4**.
- Put in new brake pads and assemble the parking brake in the reverse order.
- Adjust the gap of the parking brake as described below.

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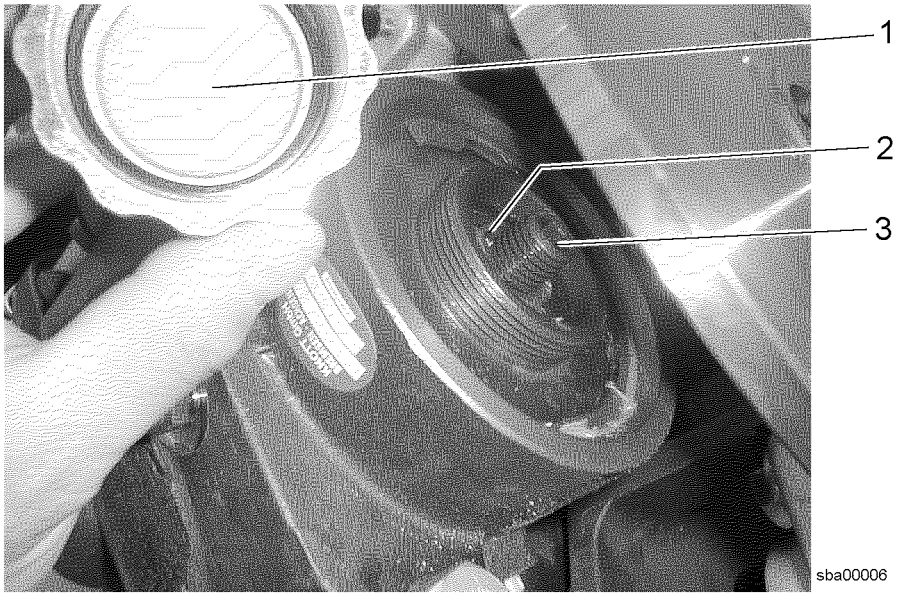
Procedure for checking the parking brake gap



- Start the diesel engine and release the parking brake by pressing the parking brake switch.
- Unscrew the sealing cap **1** and loosen the lock nut **2** using a SW 24 box spanner.
- Tighten the adjusting screw **3** until the brake calipers touch the brake disc.
- Unscrew the adjusting screw **3** by a quarter turn (0.5 mm gap).
- Hold the adjusting screw **3** in position and tighten the lock nut **2** using the box spanner.
- Screw on the sealing cap **1** and tighten it by hand.
- Put on the disc brake guard.

5.3.25 Check the indicator lamps and lighting

For the layout of the lightning components and symbol fields on the display, see the section on operation in the chapter on operation, handling in the operator's manual.

Procedure

- Start the diesel engine and check that the illuminating components and symbol fields light up.

5.3.26 Check the tightness of the wheel lugs (once after 50, 100 and 250 h)

Make sure that:
– The machine is in maintenance position 1
– A torque wrench with a measuring range of 650 Nm is available

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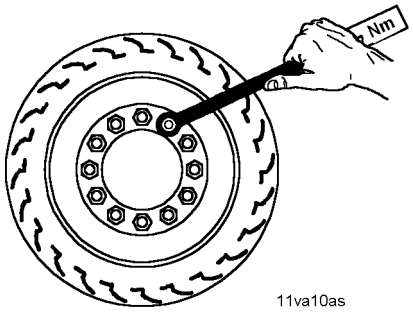
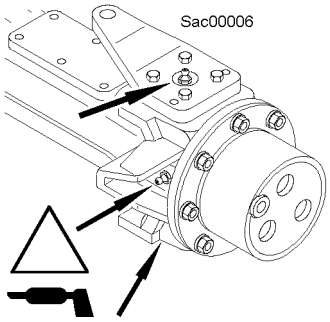


Procedure
Note: The one-off maintenace tasks scheduled for 50, 100 and 250 service hours must be performed every time the wheels are changed.

- Check that the nuts on all four wheels have been tightened with the required torque. See the “Technical data” section.

5.3.27 Greasing the axle pivot bearing and the universal joints on the rear axle

Make sure that:
The machine is in maintenance position 1
Put wedges under the wheels to stop the machine rolling away



Procedure
Turn the steering to the left or right to access the lubrication points of the drive shaft universal joint on the wheel hub. You must also move the machine into a position where you can access the grease fitting.

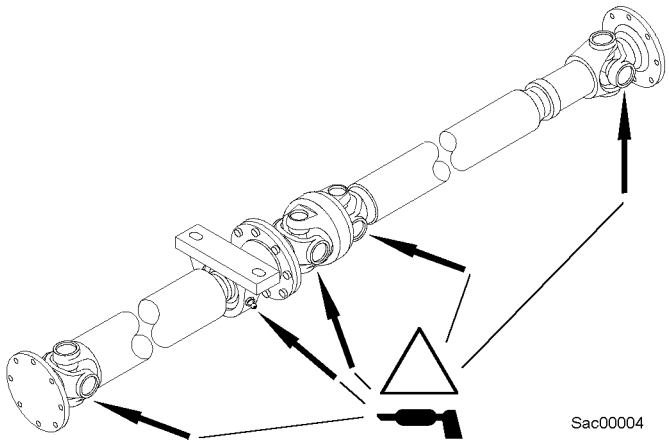
- Turn the machine to the left and right so that the respective lubrication points can be accessed.
- Grease the lubrication points on the universal joint of the gear shaft at both wheel hubs.
- Grease the lubrication points on the axle pivot bearing at both wheel hubs.

5.3.28 Checking and lubricating the drive shaft

Make sure that:
The machine is in maintenance position 1
Put wedges under the wheels to stop the machine rolling away

LBH/01/003801/0003/10.03/en

Procedure



- Move the machine into a position where the grease fittings on the drive shaft are tilted downwards.
- Turn the machine so that it is straight.
- Lubricate the 5 lubrication points on the gear shaft.
- Check the play of the drive shaft in the bearings.
- Check the rubber sleeve for leaks and damage.

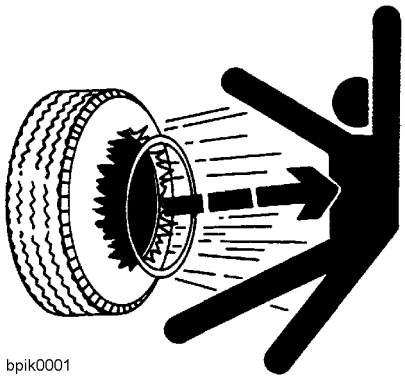
5.3.29 Setting the correct tyre pressure for the machine's use and attachments

Make sure that:

– the air pressure in the tyres on both axles is correct for the tyre type, the way the machine is used and the working attachments fitted.
  The reference values can be found in the **operator's manual**, in the technical data section.
– When changing or mounting the tyre, the tyre bead is not damaged.
– When lifting the tyres, the tyre bead must not come into contact with sharp edges or otherwise it may be damaged

Procedure

The air pressure in the tyres has a significant influence on the overall operating performance of the machine.



Exploding tyre

Warning

Exploding tyres can cause serious injury.
Incorrect or careless operation of the tyre filling equipment or excess pressure could result in the tyres bursting or damage to the rims, with severe, possibly even fatal injuries as a consequence.
Please note:

! That tyres must have cooled off before checking the tyre pressure.

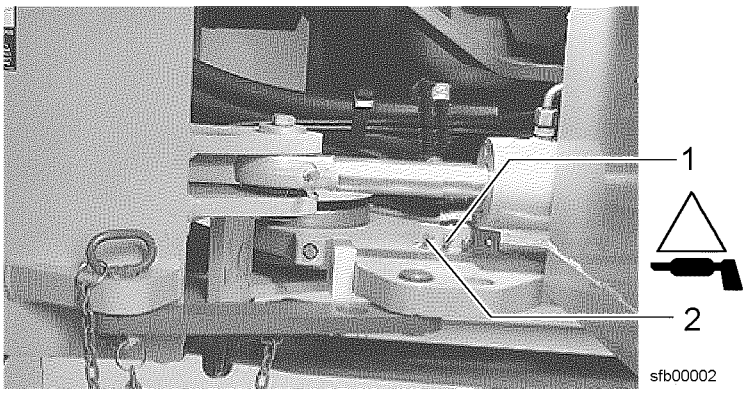
! That tyres must have cooled off before they are pumped up.

- Use a sufficiently long hose with a self-locking adapter for pumping the tyres.
- Always keep outside the danger zone when tyres are being pumped up.
- Check the air pressure in all tyres with a measuring gauge and adjust it if necessary.

5.3.30 Greasing the articulation and rear axle oscillating bearings

Make sure that:
– The machine is in maintenance position 1
– The articulation lock is engaged

Procedure



Lubrication points on the right-hand side of the central lubricating rail

1 Front oscillating bearing lubrication point
2 Rear oscillating bearing lubrication point

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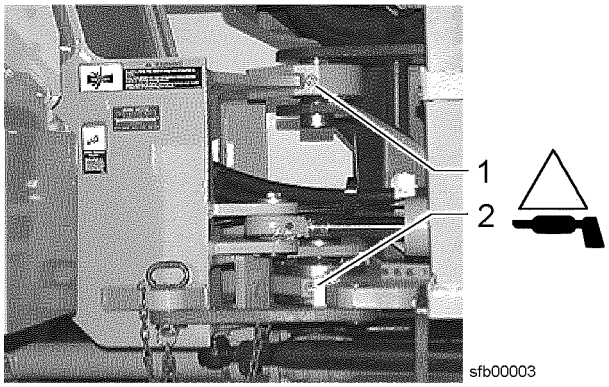
- Lubricating the front oscillating bearing: at the lubrication point **1** on the central lubricating rail.
- Lubricating the rear oscillating bearing: at the lubrication point **2** on the central lubricating rail.



Articulation bearing lubrication points

1 Top articulation bearing lubrication point
2 Bottom articulation bearing lubrication point

- Lubricating the top articulation bearing: grease the lubrication point **1** on the articulation bearing.
- Lubricating the lower articulation bearing: grease the lubrication point **2** on the articulation bearing.

5.3.31 Check whether metered quantities are adequate at the bearing points (grease collars) of the central lubrication system

- Visually examine whether metered quantities are adequate at the bearing points.
- If the bearing points are not sufficiently lubricated, isolate the problem and rectify it.

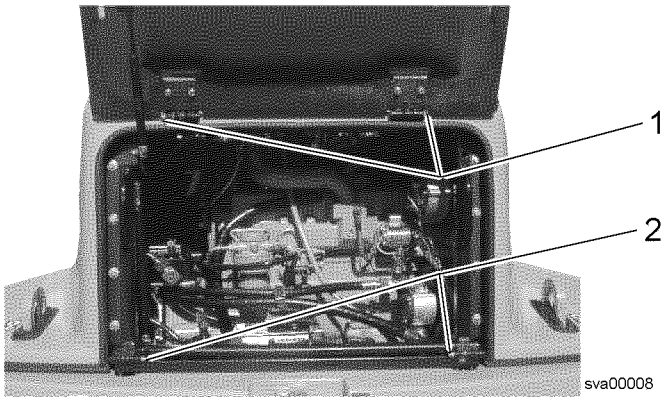
Check the grease volume in the reservoir at regular intervals.
Stay within the minimum and maximum lubricant levels.
The reservoir has a sight glass where the rubber scraper on the agitator can be seen. This is the point where you can check how much grease is still available.

- If necessary, fill the reservoir via the conical grease fitting. Lubricant specifications - refer to the section on lubricants and fuels.

5.3.32 Check the hose lines of the central lubrication system (lubrication points, detached hoses, external leakage)

- Visually examine the hose lines for defects.
- In case of any defects, isolate and rectify the problem.

5.3.33 Lubricating the hinges on the rear hatch and engine compartment hood



1 Rear hatch lubrication point

2 Engine compartment hood lubrication point

- Lubricating the hinges on the rear hatch and engine compartment hood

5.3.34 Lubricating the door hinges

- Lubricate the door hinges with a grease gun.

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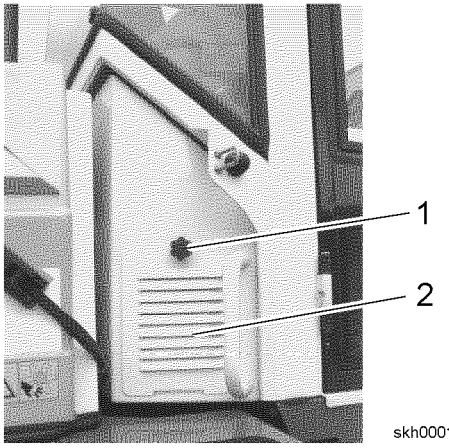
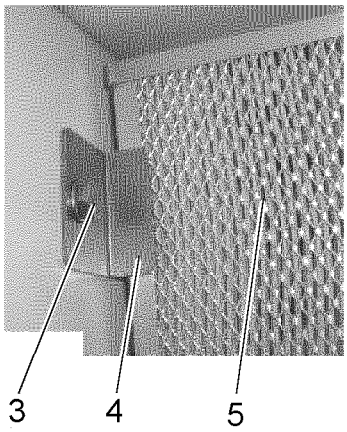
5.3.35 Cleaning or replacing the fresh air filter

The fresh air filter for the cab can be accessed from the outside of the cab on the rear right-hand side.
Make sure that the machine is in maintenance position 1.





Procedure

- Unscrew the star grip screw **1** and ventilation grid **2**.
- Unscrew the hex screw **3** and take off the holder **4**.
- Pull out the filter element **5** on the left side and take it out.
- Clean the filter element **5** or replace it if necessary.
- Carefully remove any dust which has collected in the fresh air filter duct. (The area behind the filter element must be completely free of dirt).
- Insert the new or cleaned filter element **5** and fix it in place with the holder **4** and bolt. The holder **4** must exert slight pressure on the filter element sealing surface. Make sure it is correctly fitted, with the arrow pointing in the direction of air flow.
- Put the ventilation grill **2** back on and fasten it with the star grip screw **1**.

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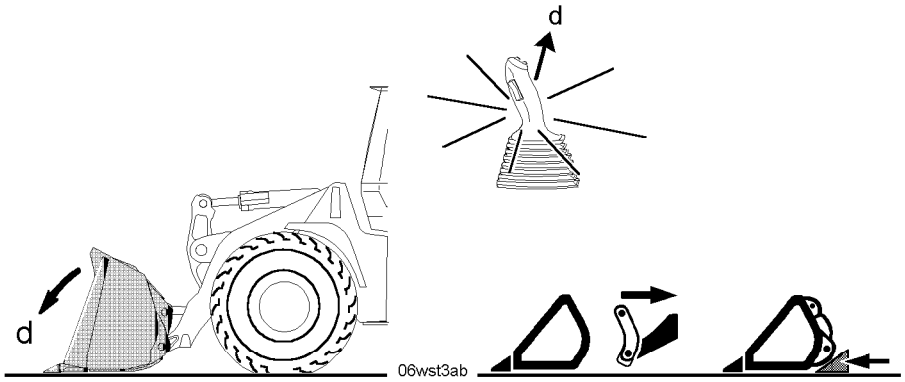
5.3.36 Checking and lubricating the Z-bar lift arm bearings

Make sure that the machine is in maintenance position 1.

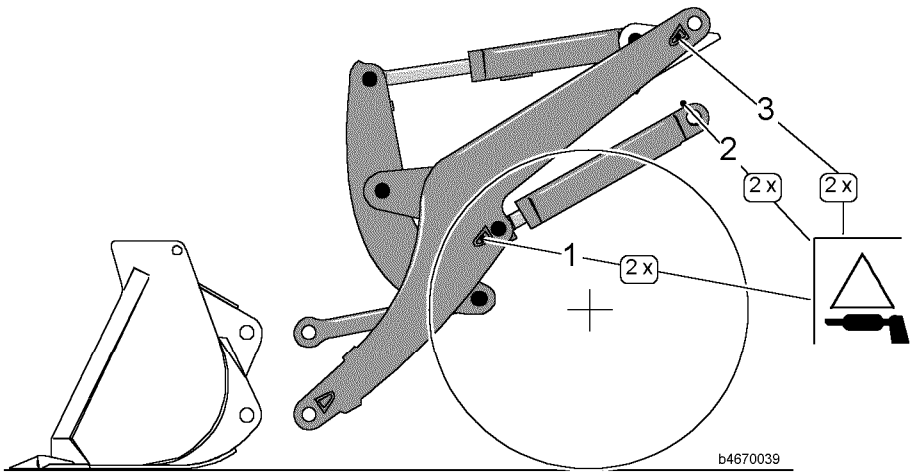


Lift arm maintenance position

If the lubrication points near the bucket couplings are difficult to reach, make sure that the working attachment is detached.

Z-bar lift arms without quick-change device

Lubricating the lift arm and lift cylinders



Lift arm and lift cylinder lubrication points

1 Front lift cylinder lubrication point
2 Rear lift cylinder lubrication point
3 Top lift arm lubrication point

- Lubricate the bearing at the top of the lift arms by greasing the left lubrication point **3** and the right lubrication point **3**.
- Lubricate the two lubrication points **1, 2** on the left-hand lift cylinder.
- Lubricate the two lubrication points **1, 2** on the right-hand lift cylinder.

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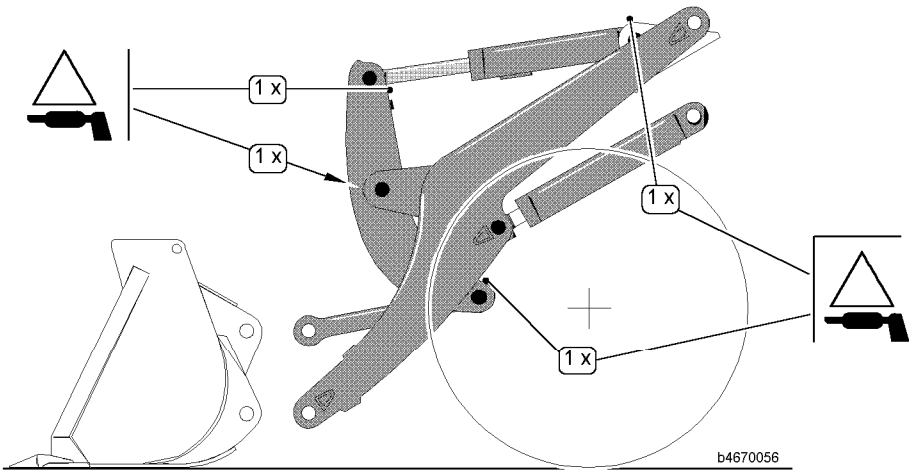
Lubricating the tilt cylinder, Z-bar linkage and connecting link



Tilt cylinder, z-bar linkage and connecting link lubrication points

1 Z-bar linkage lubrication point
2 Front tilt cylinder lubrication point
3 Rear tilt cylinder lubrication point
4 Connecting link lubrication point

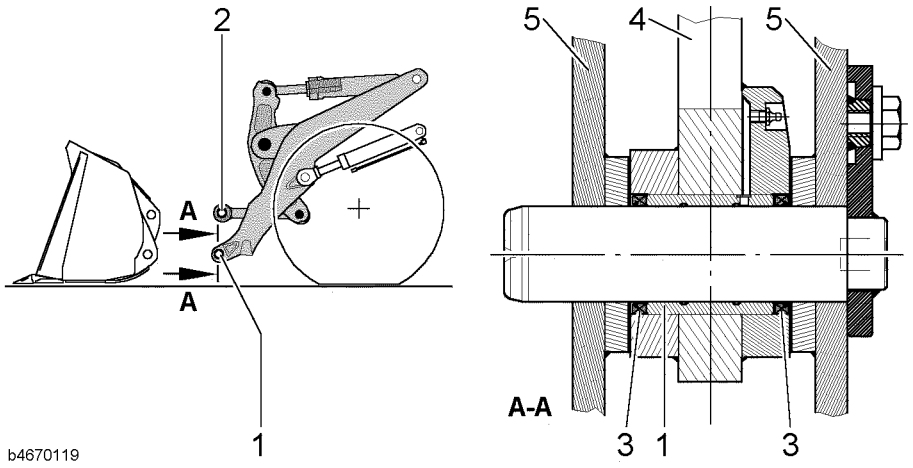
- Lubricate the lubrication point **1** on the Z-bar linkage.
- Lubricate the bearing on the tilt cylinder by greasing the front lubrication point **2** and the rear lubrication point **3**.
- Lubricate the lubrication point **4** on the connecting link.

5.3.37 Checking and lubricating the bucket bearing (Z-bar lift arms)

The lower bucket bearings should be lubricated daily if necessary.

Z-bar lift arms without quick-change device

Checking the bucket bearing

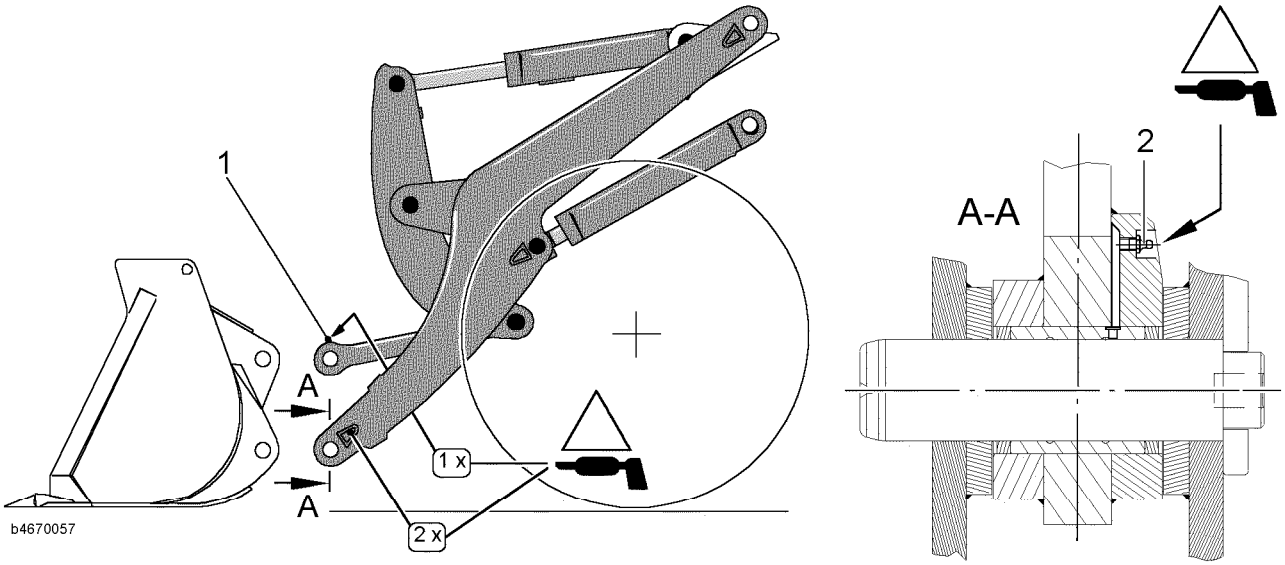


Bucket bearing

1 Bearing bushing for bucket arm
2 Bearing bushing for connecting link
3 Radial sealing ring
4 Bucket arm
5 Bucket bearing plate
A-A Cross-section

- Check the bearing bushes **1** on the bucket arm for wear and replace along with the radial sealing rings **3** if necessary.
- Check the bearing bush **2** on the connecting link for wear and replace along with the radial sealing rings if necessary.

Lubricating the bucket bearing



Bucket coupling lubrication points

1 Connecting link lubrication point
2 Bucket bearing lubrication point
A-A Cross-section

- Lubricate the lubrication point **1** on the connecting link.
- Lubricate one lubrication point **2** on the bottom/left bucket bearing.
- Lubricate one lubrication point **2** on the bottom/right bucket bearing.

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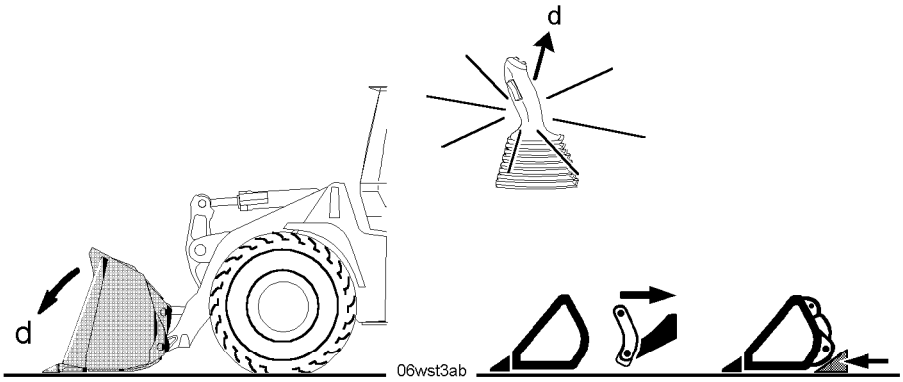
5.3.38 Checking and lubricating the P-lift arm bearings

Make sure that the machine is in maintenance position 1.

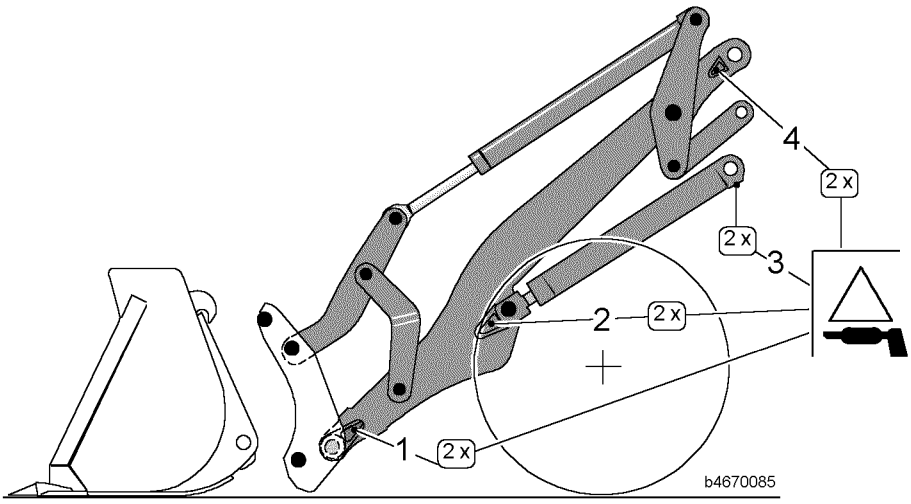


Lift arm maintenance position

If the lubrication points near the bucket couplings are difficult to reach, make sure that the working attachment is detached.

P-lift arms with quick-change device

Lubricating the lift arm and lift cylinders



Lift arm and lift cylinder lubrication points

1 Bottom lift arm lubrication point
2 Front lift cylinder lubrication point
3 Rear lift cylinder lubrication point
4 Top lift arm lubrication point

- Lubricate the bearing at the top of the lift arms by greasing the left lubrication point **4** and the right lubrication point **4**.
- Lubricate the two lubrication points **2, 3** on the left-hand lift cylinder.
- Lubricate the two lubrication points **2, 3** on the right-hand lift cylinder.
- Lubricate the two lubrication points on the lower lift **1** arms.

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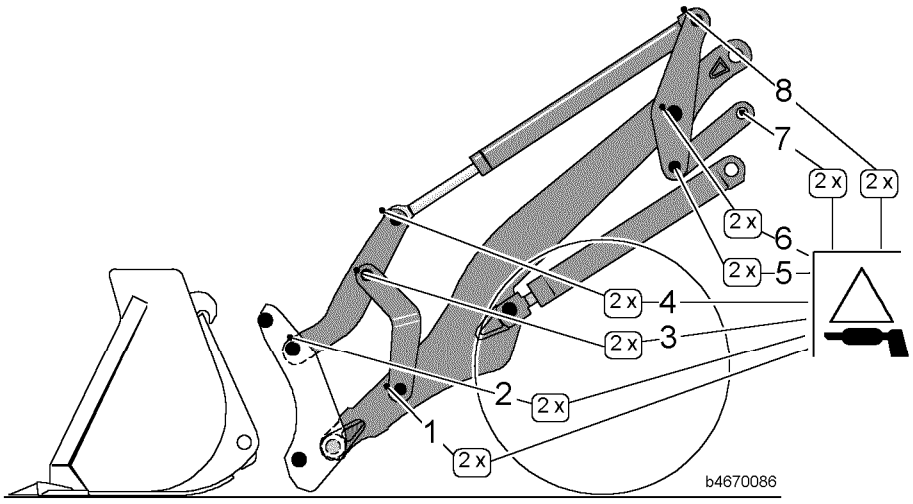
Lubricating the tilt cylinder, Z-bar linkage and connecting links



Tilt cylinder, Z-bar linkage and connecting link lubrication points

1, 3	Front connecting link lubrication points
2	Front Z-bar linkage lubrication points
4	Front tilt cylinder lubrication point
5, 6	Rear Z-bar linkage lubrication points
7	Rear connecting link lubrication point
8	Rear tilt cylinder lubrication point

- Lubricate one lubrication point **2** on the right and left Z-bar linkage at the front.
- Lubricate two lubrication points **1, 3** on the left and right connecting link at the front.
- Lubricate the bearings on the tilt cylinders: by greasing the front lubrication point **4** and the rear lubrication point **8**.
- Lubricate two lubrication points **5, 6** on the right and left rear Z-bar linkage lever.
- Lubricate one lubrication point **7** on the rear left and right connecting link.

5.3.39 Checking and lubricating the bucket bearing (P-lift arms)

The lower bucket bearings should be lubricated daily if necessary.

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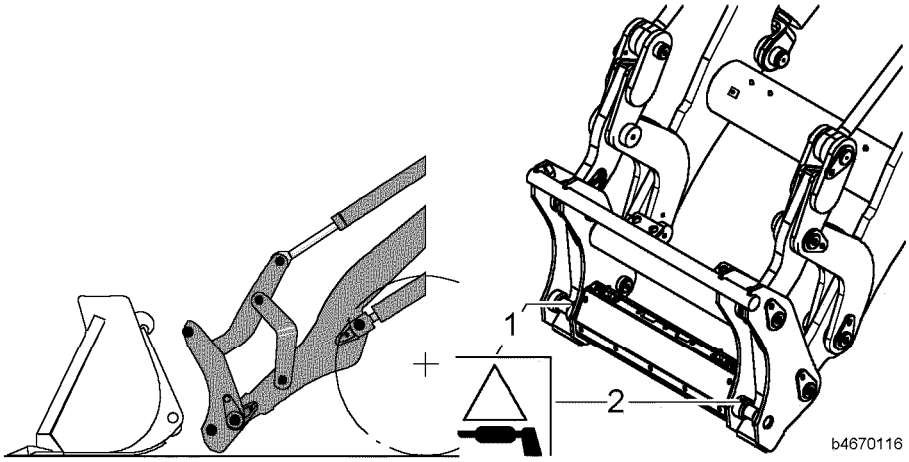
P-lift arms with quick-change device



Quick-change device lubrication points

- Lubricate one lubrication point **1** on the right bearing.
- Lubricate one lubrication point **2** on the left bearing.

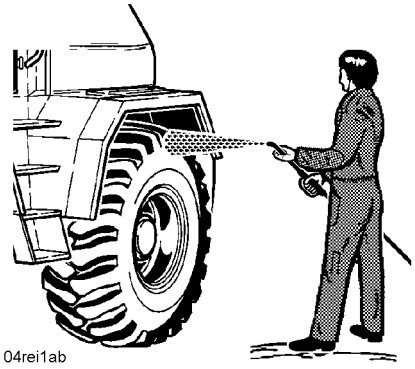
5.3.40 Cleaning the machine

Wet-cleaning the machine

Cleaning the machine

Oil pressure switches are not watertight due to the necessity of diaphragm ventilation; therefore be careful when spraying with a high-pressure spray.

Each time the machine is cleaned with a steam jet, all lubrication points on the machine must be re-greased.



Wet cleaning

Caution

Risk of damage to freshly painted surfaces.
Cleaning with high-pressure [more than 1379 kPa (13.8 bar) can damage freshly painted surfaces.

! After the machine has been delivered, the paint should dry for at least 30 days in the air, before the machine or parts are cleaned with a high-pressure cleaner.

! Until this 30 day period has elapsed, only use a low-pressure cleaner for washing!

Caution

Risk of damaging the soundproofing mats.
The soundproofing mats can be damaged if you clean them with high pressure.
Damaged soundproofing mats increase the sound output level above that guaranteed by the manufacturer.
! Do not expose soundproofing mats to water or steam jets.

- Wet clean the machine.
- Re-grease all lubrication points on the machine.

Cleaning the diesel engine

When the engine is being cleaned with water or steam, electrical transducers such as oil pressure switches must not be exposed to direct jets.

Caution

Risk of damage to the diesel engine.
Penetrating moisture results in corrosion of contacts and in outage of measuring functions.
! Do not expose electrical transducers, such as oil pressure switches to direct water or steam jets.

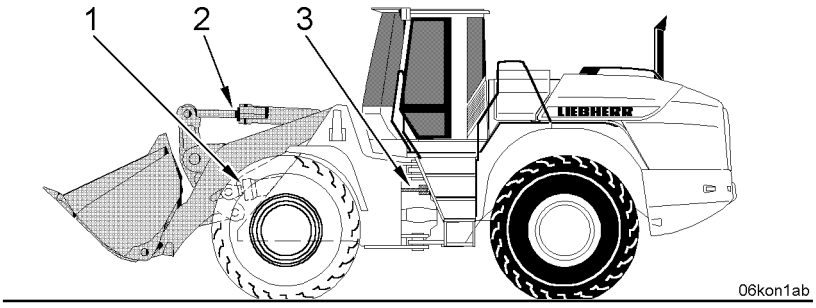
- Clean the engine carefully.

5.3.41 Corrosion protection work

When the machine is shut down for more than 4 weeks and especially for sea transport, the following measures must be carried out.

Protecting the piston rods from corrosion

LIEBHERR corrosion protection grease CTK ident. No. 8613 31301 is recommended.



1 Lift cylinder
2 Tilt cylinder
3 Steering cylinder

- When the machine is switched off, all the piston rods should be retracted as far as possible into the cylinders.
- Coat exposed parts of piston rods thickly with non-acidic corrosion protection grease.
- If the cylinder piston rods will not be wetted with hydraulic oil for a prolonged time period:
  The piston rods must be coated with corrosion protection grease.

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When the machine is moved for loading or transport, the corrosion protection layer on the cylinder piston rods is removed by the dirt scraper.

- When the machine is to be transported:

  The corrosion protection on the piston rods should be checked after loading.

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5.4 Lubricants and fuels

5.4.1 Handling lubricants and fuels

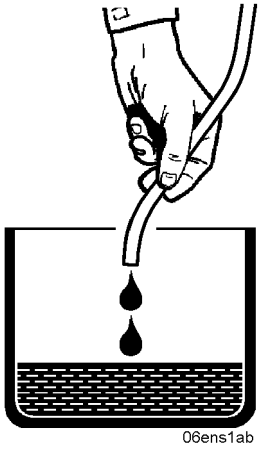
Conscientious observance of the regulations for handling lubricants and fuels will increase the reliability and service life of the machine.
It is especially important that the specified lubricant qualities are observed.
You can find the various specifications about the prescribed intervals in the maintenance and inspection schedule and the lubrication chart.
You can find details on lubrication, checking the oil level and changing operating fluids in the maintenance section under maintenance tasks.
Observe the rules for the proper handling of lubricants and fuels, especially the environmental regulations.

Environmental protection measures

- Always implement and observe environmental protection measures.
- Observe national regulations.
- Ensure that liquids can be properly disposed of before draining them.

Disposing of used materials

This applies to the following types of used materials:
– Oils, lubricants, brake fluids, refrigerants etc.
– Fuels
– Filters, oil cartridges etc.
– Rubber, tyres, insulating materials etc.
– Batteries



Disposal

- Observe the regulations for protecting the environment when disposing of used materials.
- Collect and store used materials separately in suitable receptacles, and only dispose of them at official depots in an environmentally harmless way.
- Observe national regulations.

Conversion from mineral oils to environmentally compatible hydraulic fluids

For the operation of LIEBHERR earth moving machines with environmentally compatible hydraulic fluids we recommend **AVIA SYNTOFLUID N**.

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Caution

Beware of damaging the machine's hydraulic system.
Mixing environmentally harmless hydraulic fluids with mineral oils produces a vigorous reaction that can damage the hydraulic system.
! Avoid mixing environmentally harmless hydraulic fluids with mineral oils.

- **If you intend to convert the machine to environmentally compatible hydraulic fluid, you must** first consult LIEBHERR CUSTOMER SERVICE.
- It is essential that you order the **INSTRUCTION SHEET** and the **CONVERSION GUIDELINES** from LIEBHERR and that you observe them.

Handling coolants

Make sure that if you top up with coolant due to coolant loss, the level of anti-freeze does not drop below 50% vol.

Caution

There is a risk of damage to the diesel engine.
Too much anti-freeze and corrosion protection agent impairs the cooling effect. This eventually causes damage to the diesel engine.
! Never use more than 60% anti-freeze and corrosion protection agent.

- Check the ratio of corrosion protection agent/anti-freeze during maintenance work with the antifreeze tester or optical density tester and adjust if necessary.
- Refill with new coolant: check that the cooling system is clean and flush out if necessary.
- Fill with coolant with the correct ratio of anti-corrosion/anti-freeze.

5.4.2 Lubricant and fuel specifications

The filling quantities listed in the tables are only guidelines.
– The dipstick or level markings are always mandatory.
– Check the level in the unit in question each time you replace or top up the lubricant or fuel.
– For more detailed information about the required lubricants, fuels and filling quantities, see the filling quantities in the lubrication chart and the section on lubricants and fuels.

Lubricants

Lubricating oils for the diesel engine

Lubricating oil quality

Only high-alloy lubricating oils are used in modern diesel engines.
They consist of basic oils blended with additives.
The lubricating oil regulation for LIEBHERR diesel engines is based on the following specifications and regulations.

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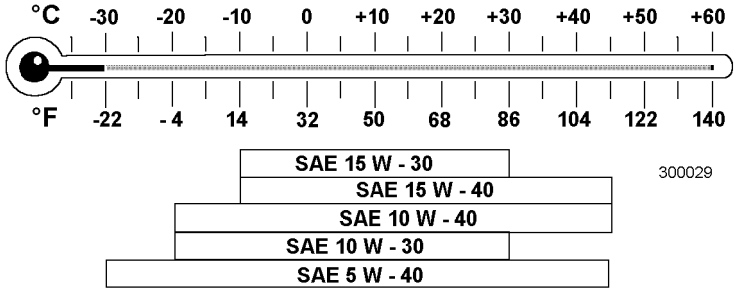
Description	Specifications
ACEA (CCMC) classification (Association des Constructeurs Européens de l'Automobile)	E2-96, E3-96, (D4, D5)
API classification (American Petroleum Institute)	CG-4, CF-4

Specifications and regulations for diesel engine lubricating oils

Lubricating oil viscosity

The lubricating oil viscosity is selected according to the SAE (Society of Automotive Engineers) classification.
The decisive factor for the selection of the correct SAE class is the ambient temperature.
The selection of SAE classification does not affect the quality of a lubricant oil.
If the viscosity is too high, starting can be difficult. If it is too low, lubricant efficiency may be impaired.
The temperature ranges detailed in the following diagram are guidelines - short-term deviations are permissible.



Selection of the SAE class according to temperature

Lubricant oil changing intervals

Changing intervals:
- First oil change and filter change using the original filling oil: see the maintenance and inspection schedule.
- Oil change according to climate zone, sulphur content in the fuel and oil quality according to the following table.

Even if the specified number of service hours (h) is not reached in a given year, the engine oil and filter should be replaced at least once a year.

Complicating factors

Various complicating factors or harsh operating conditions can affect the maintenance intervals.
Complicating factors or harsh operating conditions include:
- Frequent cold starts
- A sulphur content above 0.5% in the fuel
- Outside operating temperatures below -10 °C

If working under difficult conditions, the oil change intervals defined in the maintenance and inspection schedule must be reduced by half, as shown in the table below.

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Complicating factor		Oil quality	
		E2-96	E3-96
		D4	D5
		CG-4	
		CF-4	
Operating conditions	Sulphur content in fuel	Interval	
Normal climate, down to -10 °C	Below 0.5%	250 h	500 h
	Above 0.5%	125 h	250 h
Below - 10 °C	Below 0.5%	125 h	250 h
	Above 0.5%		125 h

Oil change intervals in service hours (h)

Diesel fuels


06sy02ab

Specifications

The diesel fuels must meet the minimum requirements in the fuel specifications listed below.
Authorised fuel specifications:
– DIN EN 590
– ASTM D 975-89a 1D and 2D

Other fuel specifications are only permissible after consultation with the Diesel Engine Development department.
The sulphur content should not exceed 0.5% by weight. Higher sulphur content affects the oil change intervals and the engine lifetime.

Lubricity

The reduction of the sulphur content in diesel fuels has raised the problem of lubricity. It has been found that diesel fuels which conform to the European limit of 0.05 % sulphur by weight can cause wear in the injection system, particularly with distributor injection pumps.
Branded fuels (in Germany) contain these lubricant additives as part of their additives package. The fuel lubricity must be <400µm according to the HFRR (60°) test.
The additives should be added by the supplier in his capacity as agent responsible for fuel quality. Addition of secondary lubricity additives by the customer is not recommended.

Diesel fuel at very low temperatures

When outside temperatures fall below 0°C, the flow performance of summer diesel fuel may be insufficient as a result of paraffin separation. The same problem arises with winter diesel fuels below -15 °C.
Diesel fuel containing additives for operating temperatures down to -20 °C is also often available.
To avoid breakdowns, the diesel fuel must be mixed with two star petrol or paraffin at low temperatures. Blending in two star petrol must be viewed as an emergency remedy and may not exceed 30% vol.
Super grade petrol may not be used for blending.
The engine power can drop in relation to the additive mixture used for cold conditions. Blending in additives should therefore be kept to a minimum, taking into account the outside temperatures.
For safety reasons, the fuel may only be mixed in a fuel container. When refuelling, pour in the fuel additive with lower specific gravity before the diesel fuel. The engine should then be run until the fuel mixture is circulating throughout the entire fuel system.

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Diesel fuel mixture ratio (% vol.)

Outside temperature °C	Summer diesel %	Additive %
0 to -10	70	30
-10 to -15	50	50 *
-15 to -20	- -	- -
-20 to -25	- -	- -

Mixing ratio for summer diesel fuel

* If an additive of 50% is necessary, only paraffin may be used (not two-star petrol).

Outside temperature °C	Winter diesel fuel %		Additive %	
	-15 °C	-20 °C	-15 °C	-20 °C
0 to -10	100	100	- -	- -
-10 to -15	100	100	- -	- -
-15 to -20	70	100	30	- -
-20 to -25	50	70	50 *	30

Mixing ratio for winter diesel fuel

* If an additive of 50% is necessary, only paraffin may be used (not two-star petrol).

Additives for diesel fuel (flow improvers)

Flow improvers available on the market will also improve the cold weather performance of the diesel fuel. Their use requires the observance of quantity and application recommendations stipulated by the manufacturer.

Hydraulic oils

Specifications

Only engine oils (mineral oils) meeting the Mercedes Benz service fuels specifications are permitted.

Mercedes-Benz info sheet no.:	Specifications:
226.0 and 227.0 (single-grade oils):	API- CC / SF, CD / SF, CE / SF
227.1 and 228.1 (multi-grade oils):	CD / SF, CE / SF,
	CD+API- CC / SF (MIL-L-46152 B),
	CD / SF, CE / SF (MIL-L-2104 D),
	CD / SF (MIL-L-2104 D), CE / SF,
	CD+ (MIL-L-46152 B)

Mercedes-Benz service fuels requirements

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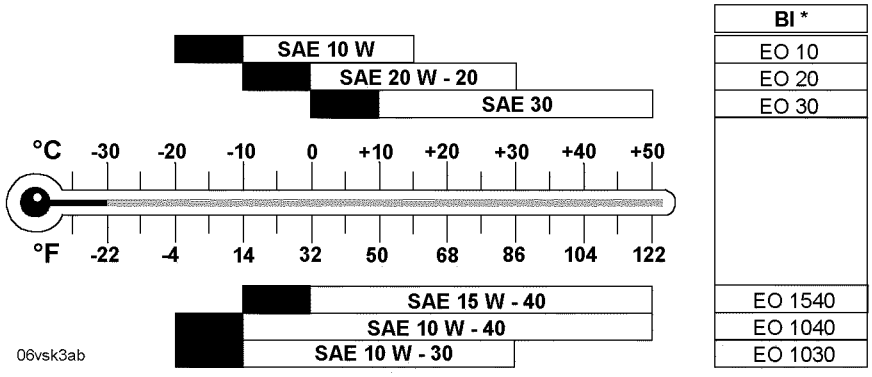
Viscosity

The viscosity is selected according to the SAE (Society of Automotive Engineers) classification.
The decisive factor for the selection of the correct SAE class is the ambient temperature.
The selection of the SAE classification has no bearing on the quality of a hydraulic oil.
The temperature ranges presented in the graphic are only provided as guidelines.



Selection of the SAE class according to temperature

BI * = code designation = container labelling, see the section on “BI * standard lubricants”.

Warming up

For temperatures up to 10 °C below the specified limit:
– Adjust the diesel engine to roughly half speed after starting
– Activate the hydraulic cylinders and engines and briefly move the cylinders to their stops
– Warming up takes roughly 10 minutes

At even lower temperatures:
– Before starting the engine, prewarm the oil tank

Environmentally compatible hydraulic fluids

When operating LIEBHERR earth moving machines with environmentally compatible hydraulic fluids, we recommend **AVIA SYNTOFLUID** with the viscosity specified by LIEBHERR.
Caution!
– Failure to carry out the conversion of the hydraulic system to an environmentally compatible hydraulic fluid may cause damage to the machine's hydraulic system.
See the section on conversion from mineral oils to environmentally harmless hydraulic fluids.

Machines filled at factory with environmentally compatible hydraulic fluids have an appropriate sign (CAUTION) attached to the driver’s cab and hydraulic tank.
Conversion of the hydraulic system:
– See the section on conversion of the hydraulic system from mineral oils to environmentally compatible hydraulic fluids for guidelines on retrofitting your machine to adapt it to an environmentally compatible hydraulic fluid.

Lubricating oils for the transmission

Axles

06sy06ab

Gear oils must comply with the API-GL-5-90 and MIL-L-2105 B, C or D specifications and the viscosity class SAE 90 LS *.

* = Gear oil with limited-slip additives for disc brakes and self-locking differentials.

For the viscosity class SAE 90, an oil of the viscosity class SAE 80 W 90 can also be used.

Comparison to BI * – code designation:

– SAE 90 LS / BI * – GO 90 LS
– SAE 80 W - 90 / BI * – GO 90

BI * = code designation = container labelling, see the section on “BI * standard lubricants”.

Transfer gear


06sy07ab

Use lubrication oil for the transfer gear as listed in the section on axles section.

Grease for general lubrication points


06sy09ab

This grease must meet the **KP2k** specification – consistency 2 of the NL GI class according to DIN 51818 and DIN 51825 or EP 2 according to NF-T-60 132.

The grease must be made of a lithium complex with a a four ball tester (VKA) value of at least 2300 N according to DIN 51350 or ASTM D 2596.

Comparison to BI * – code designation:

– NL GI class 2 / BI * – MPG - A

BI * = code designation = container labelling, see the section on BI * standard lubricants.

Approved greases

LIEBHERR 9610 special grease is a milling resistant, aging resistant lithium grease, providing protection against corrosion with excellent lubricity over a wide temperature range.

Its molecular composition yields high degrees of shearing and milling stability and good flow properties in long pipes.

Description	ID no.	Quantity
LH 9610 special grease	8613 01308	10 kg (drum)
LH 9610 special grease	8613 02908	400 g (cartridge)

LIEBHERR CTK special paste

06sy20ab

Bonding, water resistant, complex saponified, calcium-cased paste with high-pressure additives and improved corrosion protection characteristics.

It contains ingredients which counteract frictional and vibrational corrosion.

It is especially recommended for use in roller live ring connections.

Range of application: -30 °C to +100 °C.

Re-order from your LIEBHERR dealer under ID no. 8613 3101.

This grease is not suitable for use in automatic central lubricating systems or drive shafts.

Lubricant grease for automatic central lubrication systems


06sy09ab

Use grease complying with the **KP2k** specification – consistency 2 of the NL GI class according to DIN 51818 is suitable.

Composition: lithium-saponified multi-purpose grease with a mineral oil base with EP active ingredients, without colouring.

Greases with high-pressure additives (EP greases) are recommended.

Only use greases with the same type of saponification.

Greases with solid lubricant particles such as graphite may not be used.

LBH/01/003801/0003/10.03/en

Approved greases See the section on grease for general lubrication points.

Lubricating grease viscosity See the user manual of system manufacturers.

Anti-corrosion grease

Non-acidic anti-corrosion greases should be used to protect exposed piston rods.
LIEBHERR CTK special paste is especially recommended.
Refer to the section on LIEBHERR CTK special paste.

Anti-seize agent for bolt fitting

A molybdenum sulphide paste is recommended as anti-seize agent for the bolts.

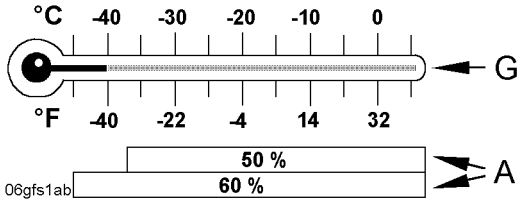
Bl * standard lubricants

See the brochure on STANDARD LUBRICANTS for construction machines and vehicles.
It is published by the German Construction Industry Federation (Hauptverband der Deutschen Bauindustrie e.V.)
Bauverlag GmbH – Wiesbaden and Berlin.

Coolants for diesel engines

Coolant The coolant must contain at least 50% vol. anti-freeze and corrosion protection agent all year round. This protects against freezing down to around -37 °C.

Mixing ratio



Selection of mixing ratio of corrosion and anti-freeze protection agents according to temperature

G Protection against freezing in °C

A Proportion of anti-freeze in %

Fresh water quality when using anti-freeze and corrosion protection agent

Description	Value and unit
Water hardness	0.6 to 3.6 mmol/l (3 to 20° d)
pH value at 20 °C	6.5 to 8.5
Choride ion content	max. 80 mg/l
Sulphate ion content	max. 100 mg/l

Fresh water quality

Anti-freeze and corrosion protection agent quality Ethyl glycol base with low silicate content.

LBH/01/003801/0003/10.03/en

Brake oil


bsym0027

Service brake Use **SAE 10W** engine oil as brake oil for all ambient temperatures.

06sy06ab

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Liebherr-Hydraulikbagger GmbH
Hans-Liebherr-Straße 12
D-88457 Kirchdorf/Iller
☎ + 49 7354 80-0
Fax + 49 7354 80-72 94
www.liebherr.com
E-Mail: info@lhb.liebherr.com

Liebherr-France SAS
2, Avenue Joseph Rey, B.P. 287
F-68005 Colmar Cedex
☎ + 33 389 21 30 30
Fax + 33 389 21 37 93
www.liebherr.com
E-Mail: info@lfr.liebherr.com

Liebherr-Werk Telfs GmbH
Hans-Liebherr-Straße 35
A-6410 Telfs
☎ + 43 5262 6 00-0
Fax + 43 5262 6 00-72
www.liebherr.com
E-Mail: info@lwt.liebherr.com

Liebherr-Werk Bischofshofen GmbH
Postfach 49
A-5500 Bischofshofen
☎ + 43 6462 8 88-0
Fax + 43 6462 8 88-3 85
www.liebherr.com
E-Mail: info@lbh.liebherr.com