

en

Operating manual

Wheel Loader

L512 Stereo

valid from serial no.: - 466 0501



LIEBHERR

Please enter the following details on receipt of your machine:

Vehicle ident. No.

Year of construction

Date of commissioning

*You will find these details on the machine type plate, on the right-hand side of the front section. They will be of assistance when ordering spare parts.

Address

Address: LIEBHERR-WERK BISCHOFSHOFEN GMBH

Dr. Hans Liebherr - Straße 4
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Product identification

Manufacturer: LIEBHERR-WERK BISCHOFSHOFEN GMBH

Product group: Wheel loader

Type: L512

Construction number: 466

Serial number: from 0501

Document identification

Order number: 8450723

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This Operating Manual is intended for the **driver** and for the **maintenance personnel** of the machine.

It contains descriptions of:

- technical data
- safety provisions
- control and operation
- maintenance

This Operating Manual should be carefully read before commissioning and should be read later at regular intervals and applied by everyone with responsibility for work on/with the machine.

Work with or on the machine includes for example:

- **Operation**, inclusive of rigging work, trouble-shooting during operation, correction of interruptions to production, disposal of operating and auxiliary materials.
- **Servicing**, inclusive of maintenance, inspection and repair work.
- **Transport** or loading of the machine.

This manual makes it easier for the driver to become acquainted with his machine and avoids malfunctions due to improper operation.

Observation of the operating instructions by the maintenance personnel:

- improves operational reliability,
- extends the service life of your machine,
- reduces repair costs and downtimes.

This manual belongs with the machine. Place a copy within easy reach in the glove compartment in the driver's cab.

The Operating Manual is to be supplemented by instructions based on existing national accident prevention and environmental protection regulations.

In addition to the Operating Manual and the applicable national and local legal requirements for accident prevention, as well as the recognised technical regulations for safe and professional operation should be observed.

This Operating Manual contains all necessary information for the operation and maintenance of your machine.

If you should however require more detailed explanations or information, our technical information and production quality (TIP), technical documentation and customer service departments will be only too glad to be of assistance.

You will readily understand 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 all obligations such as guarantee agreements, service contracts 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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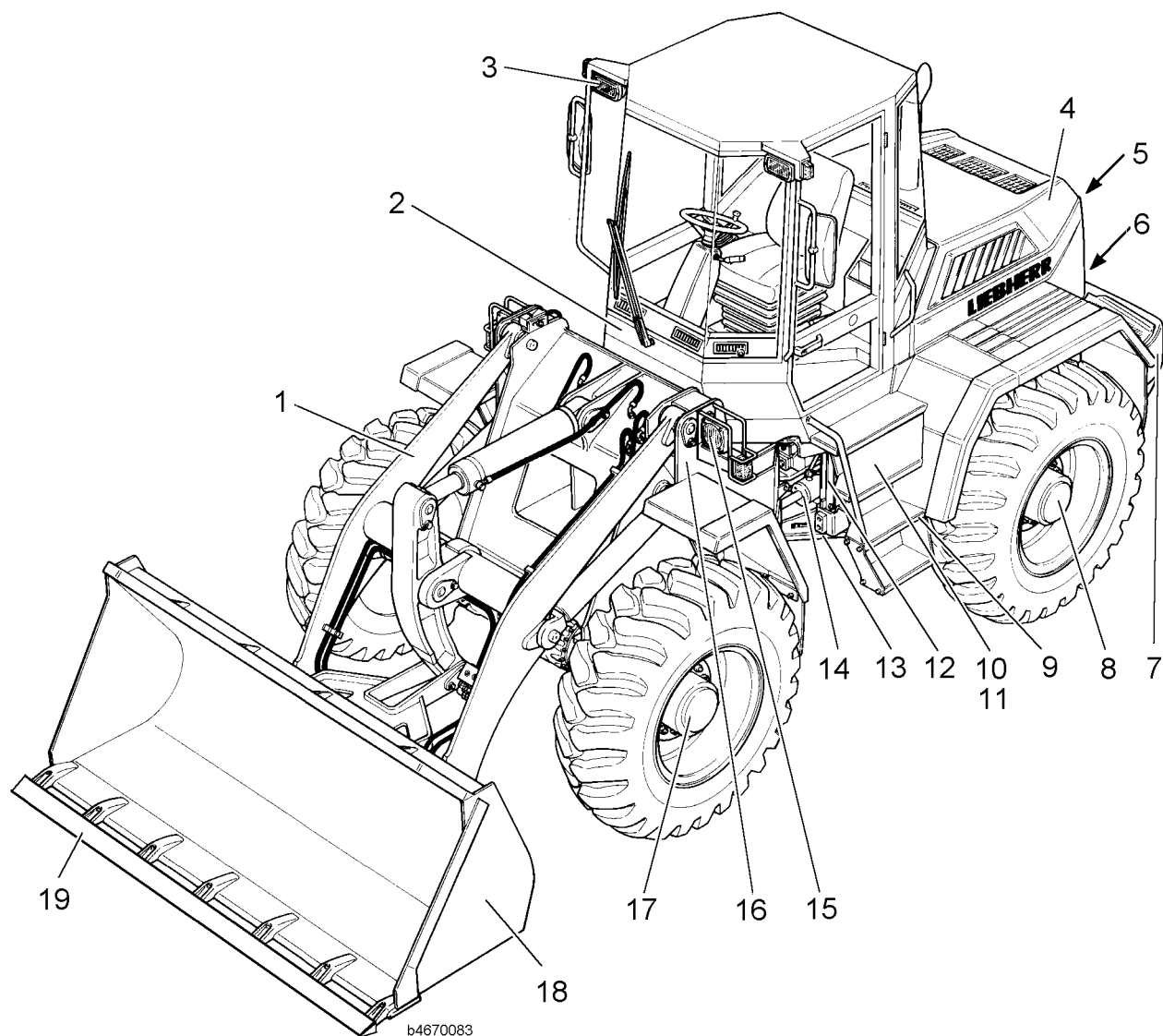
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1 Product description

Overview of design

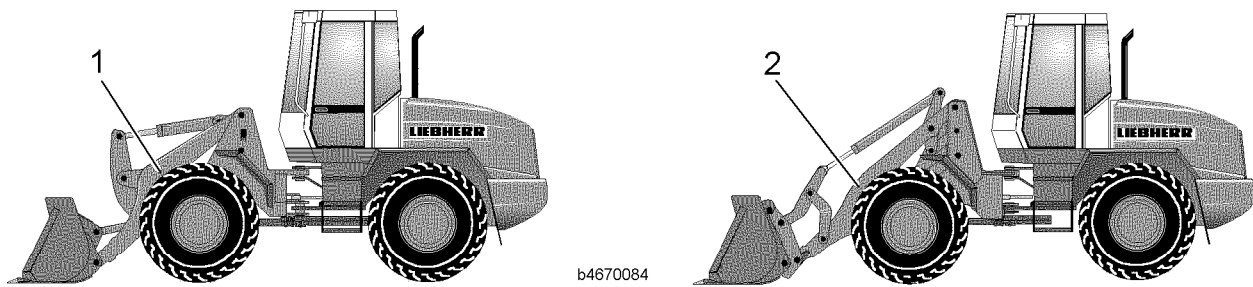
Design

This section contains an overview of the machine with annotation of the numbered components.



Basic machine – View from left

- | | | |
|-----------------------------------|-----------------------------------|-----------------------|
| 1 lift arms | 7 ballast weights | 13 rear section |
| 2 driver's cab | 8 rear axle | 14 steering cylinder |
| 3 working floodlights | 9 access ladder | 15 lighting |
| 4 engine compartment – hood | 10 battery compartment – covering | 16 front section |
| 5 engine compartment – rear hatch | 11 tool box | 17 front axle |
| 6 hitching device | 12 articulated joint lock | 18 loading bucket |
| | | 19 bucket tooth guard |



1 Z-bar lift arms

Design variants of the machine

2 P-lift arms

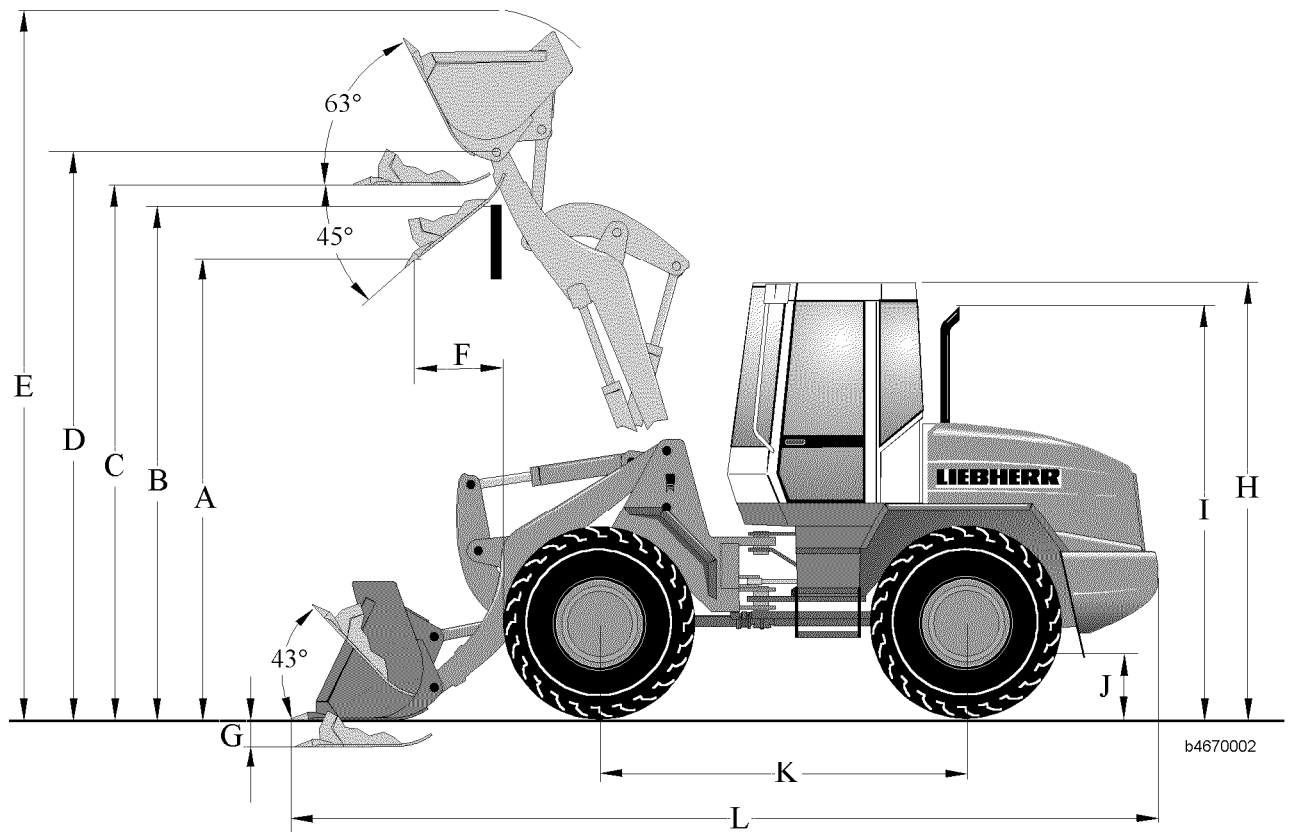
1.1 Technical data

1.1.1 Complete machine

Wheel loader with Z-bar lift arms

The values specified apply for:

- 1 the machine with Z-bar lift arms (2250 mm) without hydraulic quick-change device.
- 2 a machine with a toothed loading bucket – 1.1 m³ and with 15.5 R25 MICHELIN XTLA tyres.



Dimensions – Machine with Z-bar lift arms

Name	Value	Unit
Bucket capacity	1.1	m ³
Bucket width	2200	mm
Specific bulk material weight	1.8	t/m ³
A Dumping height with max. lift height and 45° tipping angle	2780	mm
B Max. dumping height	3075	mm
C Max. height bucket base	3295	mm
D Max. height of bucket pivot point	3525	mm
E Max. height of bucket upper edge	4455	mm
A Max. reach with max. lift height and 45° tipping angle	790	mm
G Digging depth	65	mm
H Height above cab	3035	mm
I Height above exhaust	2830	mm
J Ground clearance	355	mm
K Wheel base	2500	mm
L Total length	5990	mm
Turning radius of bucket outer edge	4535	mm
Lifting force (SAE)	59	kN
Breaking out force (SAE)	76	kN
Tipping load when straight *	4880	kg

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Name	Value	Unit
Tipping load when at 28° *	4550	kg
Bending angle (on each side)	28	°
Pivoting angle (on each side)	6	°
Operational weight *	6700	kg
Total volume – hydraulic oil	105	l
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

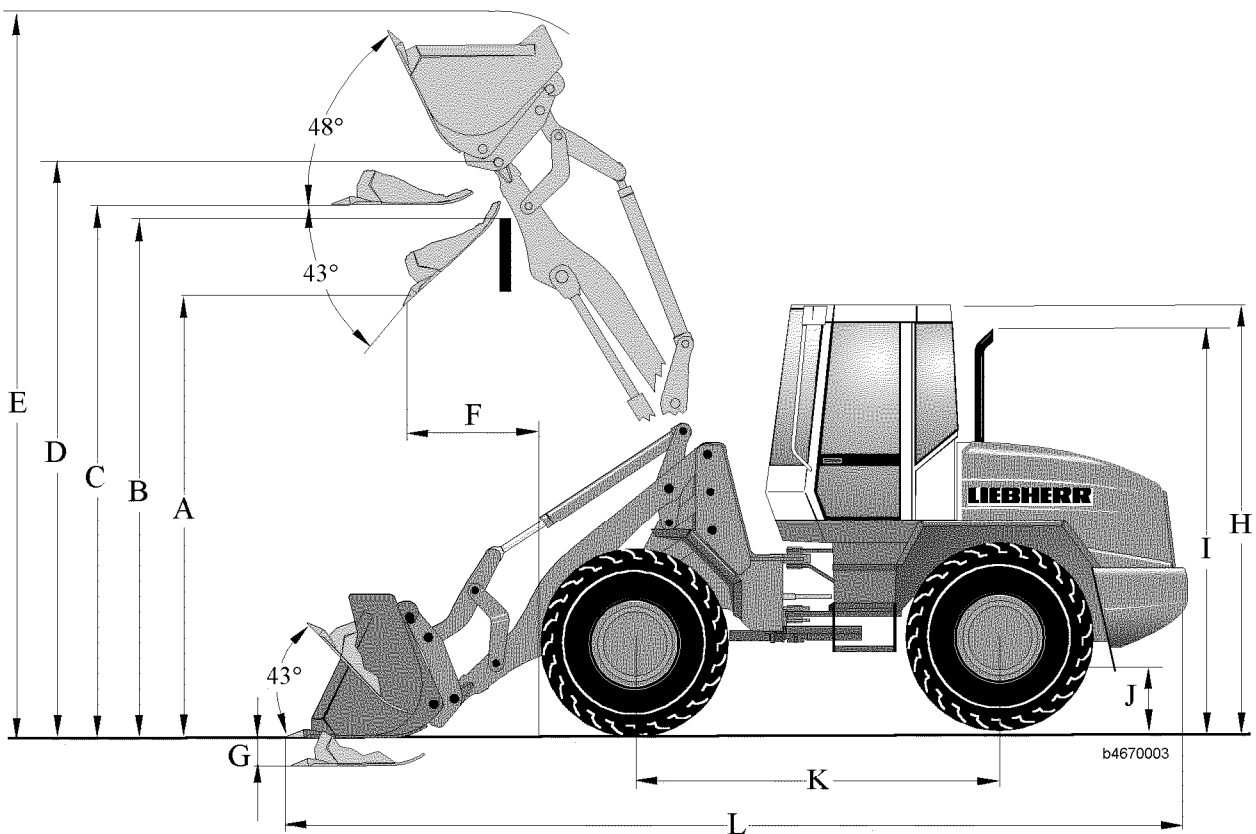
* The specified values assume 15.5 R25 MICHELIN XTLA tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.

** With tyre size 15.5 R25

Wheel loader with P-lift arms

The values specified apply for:

- the machine with P-lift arms (2300 mm) with hydraulic quick-change device.
- a machine with a toothed loading bucket – 1.1 m³ and with 15.5 R25 MICHELIN XTLA tyres.



Dimensions – Machine with P-lift arms

Name	Value	Unit
Bucket capacity	1.1	m ³
Bucket width	2200	mm

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Name	Value	Unit
Specific bulk material weight	1.6÷1.8	t/m ³
A Dumping height with max. lift height and 45° tipping angle	2845	mm
B Max. dumping height	3210	mm
C Max. height bucket base	3425	mm
D Max. height of bucket pivot point	3680	mm
E Max. height of bucket upper edge	4685	mm
A Max. reach with max. lift height and 45° tipping angle	815	mm
G Digging depth	75	mm
H Height above cab	3035	mm
I Height above exhaust	2830	mm
J Ground clearance	355	mm
K Wheel base	2500	mm
L Total length	6120	mm
Turning radius of bucket outer edge	4560	mm
Lifting force (SAE)	71	kN
Breaking out force (SAE)	69	kN
Tipping load when straight *	4360	kg
Tipping load when at 28° *	4065	kg
Bending angle (on each side)	28	°
Pivoting angle (on each side)	6	°
Operational weight * 1)	7000	kg
Total volume – hydraulic oil	105	l
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

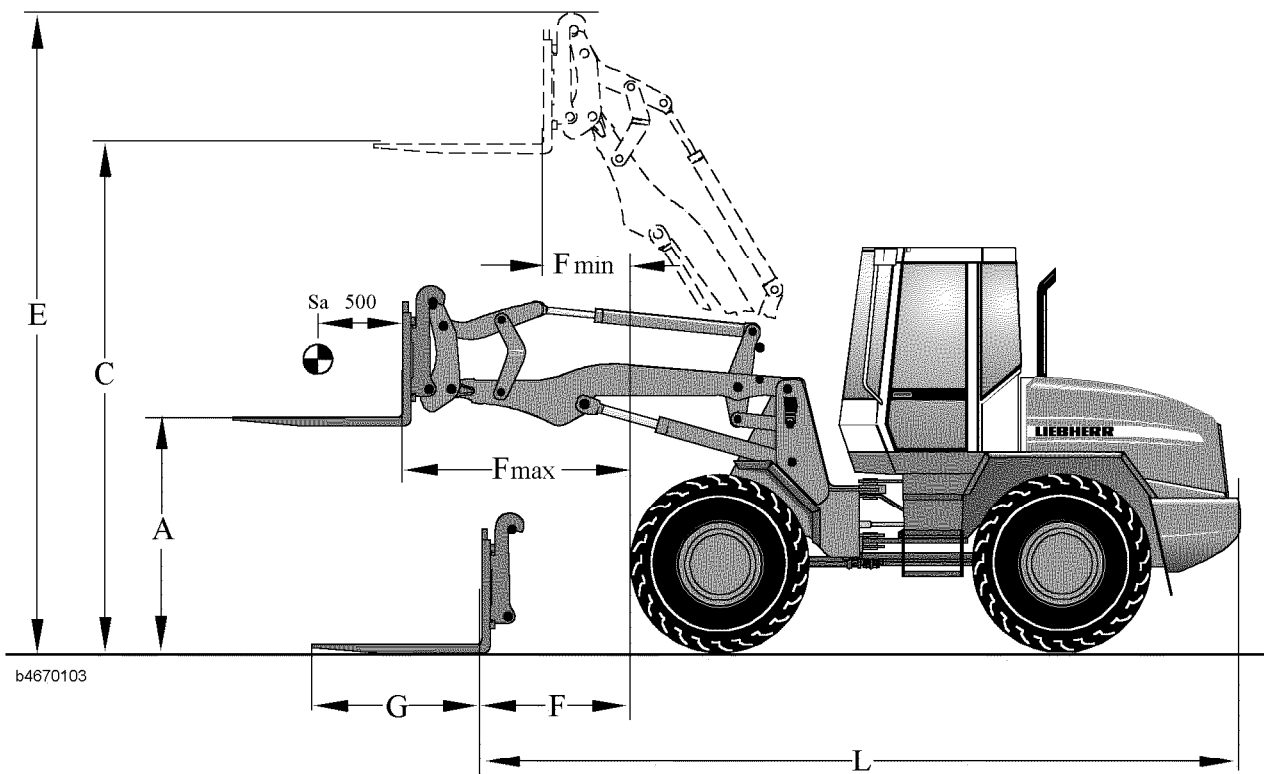
* The stated values assume 15.5 R25 MICHELIN XTLA tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.

** With tyre size 15.5 R25

Wheel loader with forklift (option)

The values specified apply for:

- the machine with P-lift arms (2300 mm) with hydraulic quick-change device.
- the machine with Z-bar lift arms (2250 mm) with hydraulic quick-change device.
- for the machine with a FEM III forklift and 15.5 R25 MICHELIN XTLA tyres.



Dimensions – Machine with P-lift arms and forklift

Loading geometry		P-kinematics		Z-bar kinematics	
Forklift equipment for quick-change device		FEM III forklift		FEM III forklift	
Name		Value	Units	Value	Units
A	Lifting limit at max. extension	1670	mm	1630	mm
C	Max. lifting limit	3480	mm	3350	mm
E	Max. height above fork carrier	4400	mm	4275	mm
F	Loading position reach	940	mm	915	mm
F max.	Greatest possible reach	1605	mm	1560	mm
F min.	Reach at max. lift limit	725	mm	760	mm
G	Fork prong length	1200	mm	1200	mm
L	Total length of the basic machine	6635	mm	6610	mm
	Tipping load when straight *	3360	kg	3470	kg
	Tipping load when arm not straight **	3130	kg	3230	kg
	Operational weight *	7000	kg	6880	kg

* The specified values assume 15.5 R25 MICHELIN XTLA tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.

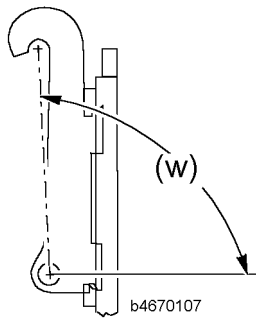
The operational weight and the tipping load is affected by the tyre dimensions and the accessories.

** permitted payload (ISO 8313):

1 on even terrain = 80% of the tipping load when arm not straight

2 on uneven terrain = 60% of the tipping load when arm not straight

Load bearing tables for forklift operation



The Safety Norm EN 474-3 serves as the basis for determining the loads (nominal working loads).

The permitted load is stated as a % of the tipping load.
The following values may not be exceeded.

- 1 even and firm terrain = 80% of the tipping load with forklift
- 2 uneven terrain = 60% of the tipping load with forklift

In the below tables, the permitted loads on different terrains, with different angles (w) and various centres of gravity S_a are detailed.

Terrain - even and firm Load = 80% of the tipping load		Lift arms with P-kinematics: Loads in kg with different centres of gravity - CG in mm							
Tyres	Additional ballast	500	600	700	800	900	1000	1100	1200
15.5-25 Dunlop E91-2	--	2435	2349	2269	2194	2124	2058	1996	1938
15.5R25 Michelin XTL A	--	2435	2349	2269	2194	2124	2058	1996	1938
405/80R25 Dunlop SP T9	--	2435	2349	2269	2194	2124	2058	1996	1938
15.5R25 Good Year GB2B	--	2470	2383	2301	2225	2154	2088	2025	1966
15.5R25 Michelin XHA	--	2470	2383	2301	2225	2154	2088	2025	1966
15.5R25 Michelin X-Mine D2	--	2650	2556	2469	2388	2311	2240	2173	2109

Terrain - uneven Load = 60% of the tipping load		Lift arms with P-kinematics: Loads in kg with different centres of gravity - CG in mm							
Tyres	Additional ballast	500	600	700	800	900	1000	1100	1200
15.5-25 Dunlop E91-2	--	1825	1761	1700	1644	1592	1542	1496	1453
15.5R25 Michelin XTL A	--	1825	1761	1700	1644	1592	1542	1496	1453
405/80R25 Dunlop SP T9	--	1825	1761	1700	1644	1592	1542	1496	1453
15.5R25 Good Year GB2B	--	1855	1789	1728	1671	1618	1568	1521	1476
15.5R25 Michelin XHA	--	1855	1789	1728	1671	1618	1568	1521	1476
15.5R25 Michelin X-Mine D2	--	1990	1920	1854	1793	1736	1682	1631	1584

Terrain - even and firm Load = 80% of the tipping load		Lift arms with Z-bar kinematics: Loads in kg with different centres of gravity - CG in mm							
Tyres	Additional ballast	500	600	700	800	900	1000	1100	1200
15.5-25 Dunlop E91-2	--	2450	2362	2280	2204	2132	2065	2003	1943
15.5R25 Michelin XTL A	--	2450	2362	2280	2204	2132	2065	2003	1943
405/80R25 Dunlop SP T9	--	2450	2362	2280	2204	2132	2065	2003	1943
15.5R25 Good Year GB2B	--	2490	2401	2317	2240	2167	2099	2035	1975
15.5R25 Michelin XHA	--	2490	2401	2317	2240	2167	2099	2035	1975
15.5R25 Michelin X-Mine D2	--	2670	2574	2485	2402	2324	2251	2182	2118

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Terrain - uneven Load = 60% of the tipping load		Lift arms with Z-bar kinematics: Loads in kg with different centres of gravity - CG in mm							
Tyres	Additional ballast	500	600	700	800	900	1000	1100	1200
15.5-25 Dunlop E91-2	--	1840	1774	1712	1655	1601	1551	1504	1459
15.5R25 Michelin XTL A	--	1840	1774	1712	1655	1601	1551	1504	1459
405/80R25 Dunlop SP T9	--	1840	1774	1712	1655	1601	1551	1504	1459
15.5R25 Good Year GB2B	--	1870	1803	1740	1682	1628	1576	1528	1483
15.5R25 Michelin XHA	--	1870	1803	1740	1682	1628	1576	1528	1483
15.5R25 Michelin X-Mine D2	--	2000	1928	1861	1799	1741	1686	1635	1586

1.1.2 Drive engine, cooling system

Diesel engine

Name	Value	Unit
Engine type	D504 NA	
Design	In-line engine	
Combustion process	Four stroke, direct injection	
Number of cylinders	4	
Ignition sequence	1-3-4-2	
Cylinder volume	4.5	dm ³
Rated power according to ISO 9249	59 (80)	kW (PS)
Rated engine speed	2400	min ⁻¹
Max. torque at 1200 min ⁻¹	302	Nm
Idling speed	min. 830 ^{±25} max. 2500 ^{±50}	min ⁻¹ min ⁻¹
Inclinability /longitudinal, traverse	on all sides 30	°
Operating voltage of the ignition	12	V
Power intake of the ignition	4.8	kW
Output voltage across alternator	14	V
Current flow from alternator	65	A
Emission limit values in accordance with	97/68/EC	

Fuel system

Name	Value	Unit
Tank capacity	160	l
Reserve tank capacity	20	l

1.1.3 Drive hydraulics

Variable displacement pump

Name	Value	Unit
Type	A4VG 90 DA	
Displacement max.	90	cm ³
Pump flow at rated speed	216	l/min
Pressure cut-off	430 ^{±5}	bar

Variable displacement motor

Name	Value	Unit
Type	A6VM 160 DA	
Displacement max.	160	cm ³

Hydraulic tank

Name	Value	Unit
Hydraulic tank	Steel container	

1.1.4 Working hydraulics

Working hydraulics pump

Name	Value	Unit
Type	P 330	
Displacement	48.4	cm ³
Pump flow at rated speed	116	l/min

Control valve block

Name	Value	Unit
Type	SM 18	
Primary pressure relief valve	230 ⁺⁵	bar

Pilot control device

Name	Value	Unit
Type	4 THF 6	

1.1.5 Steering

Servostat

Name	Value	Unit
Type	Eaton 263 - 4392	
Displacement volumes	370	cm ³

1.1.6 Electrical system

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

1.1.7 Axles

Front axle	Name	Value	Unit
	Type	AP-R 735	
	Locking value of the self-locking differential	45	%
	Track width	1700	mm

Rear axle	Name	Value	Unit
	Type	APL-R 735 / 1AVG185	
	Locking value of the self-locking differential	25	%
	Angle of swing	6	°

1.1.8 Tyres

Name	Value	Unit
Wheel lug diameter	27	mm
Tightening torque moment	650	Nm

The recommended tyre sizes with the corresponding tyre pressures are listed in the following tables.

The tyre pressure specifications are:

- The value set on delivery ex-works,
- Basic air pressure recommendations.

They relate to cold tyres and to a machine which is ready for operation – the basic machine with standard equipment with the permitted load.

Note: For special applications, such as timber transport where higher loading may be expected, a higher tyre pressure is recommended, depending on the load itself.

The tyre pressure may not however be greater than the max. permitted according to the tyre manufacturer's specifications!

DUNLOP – tyres

Name	Value	Unit
Tyre size *	405/80 R25 SPT9 L2	
Tyre pressure – front axle	3.00	bar
Tyre pressure – rear axle	1.80	bar
Tyre size **	15.5-25 EM E91-2	
Tyre pressure – front axle	2.80	bar
Tyre pressure – rear axle	1.50	bar

* With tyre size 405/80 R25 – the max. permitted tyre pressure according to the manufacturer is 3.75 bar

** With tyre size 15.5-25 – the max. permitted tyre pressure according to the manufacturer is 3.25 bar

MICHELIN – tyres

Name	Value	Unit
Tyre size *	15.5 R25 XTLA L2	
Tyre pressure – front axle	2.50	bar
Tyre pressure – rear axle	2.00	bar
Tyre size *	15.5 R25 XHA L3	
Tyre pressure – front axle	2.50	bar
Tyre pressure – rear axle	2.00	bar
Tyre size *	15.5 R25 XMine D2 L5	
Tyre pressure – front axle	2.50	bar
Tyre pressure – rear axle	2.00	bar

* With tyre size 15.5 R25 – the max. permitted tyre pressure according to the manufacturer is 4.50 bar

GOOD YEAR – tyres

Name	Value	Unit
Tyre size *	15.5 R25 GP-2B L2	
Tyre pressure – front axle	2.50	bar
Tyre pressure – rear axle	2.00	bar

* With tyre size 15.5 R25 – the max. permitted tyre pressure according to the manufacturer is 5.00 bar

Special tyres

Name	Value	Unit
Tyre size *		
Tyre pressure – front axle		bar
Tyre pressure – rear axle		bar

*Tyre size – max. permitted tyre pressure according to manufacturer is. bar

Tyres for machines with special equipment

Name	Value	Unit
Type of special equipment:		
Tyre size *		
Tyre pressure – front axle		bar
Tyre pressure – rear axle		bar

*Tyre size – max. permitted tyre pressure according to manufacturer is. bar

1.1.9 Cab, heating, air conditioning

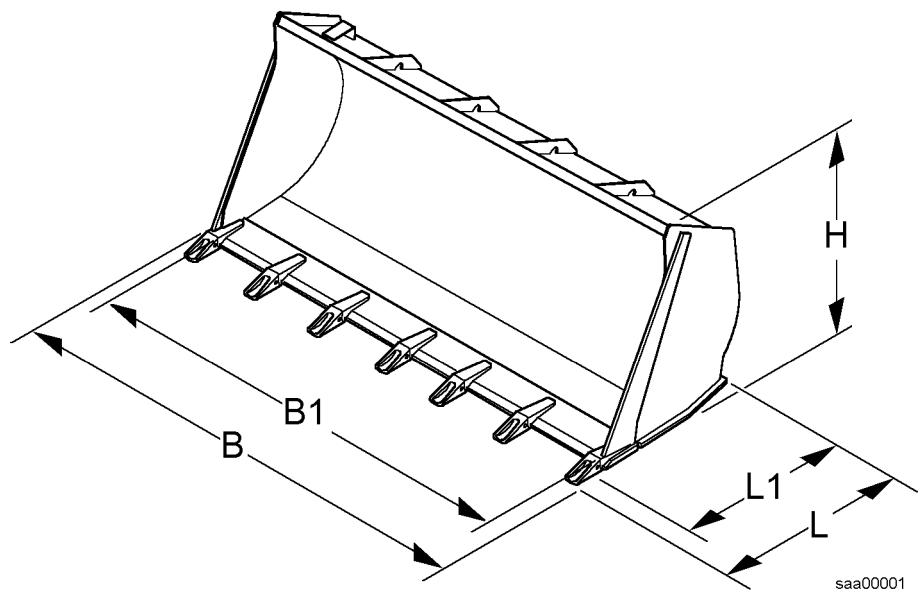
Driver's seat

Name	Value	Unit
Type	ISRI – 6000/575	
Type of suspension:	Gas suspension	

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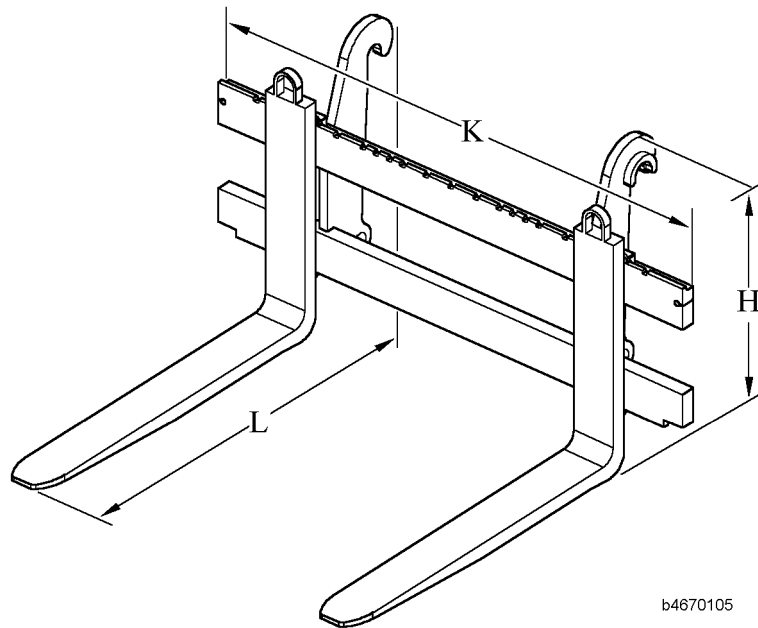
1.1.10 Attachments, accessories

Loading bucket



Main dimensions

Name	Value	Unit
B - Bucket width	2200	mm
B1 - Loading width	2148	mm
H - Height	980	mm
L - Length with teeth	1040	mm
L1 - Length without teeth	970	mm
Specific bulk weight	1.8	t/m ³
Heaped bucket capacity (ISO 7546)	1.1	m ³
Weight	475	kg
Teeth – UNI-Z-2000 I	7	pieces

Forklift (option)*Main dimensions*

Name	Value	Unit
Prong length	1200	mm
L – Length (fork carrier + prongs)	1572	mm
K – Fork carrier width	1778	mm
H – Height (fork carrier + prongs)	974	mm
Mass (fork carrier + prongs)	453	kg

1.2 Technical description

1.2.1 Complete machine

Wheel loader

The **Stereolader® L512** is a fully hydraulic wheel loader with hydrostatic travel drive system.

The machine is articulated with rear axle steering.

Design variants of the machine:

- 1 Z-bar lift arms with Z-bar kinematics
- 2 P-lift arms with parallel-kinematics

1.2.2 Drive engine, cooling system

Diesel engine

Water-cooled four stroke 4-cylinder in-line engine.

Cooling system

The cooling system is installed 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 from external side of the cooler units, feeding it over the cooling fins on the cooler and over 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.

Fuel system

The fuel tank is located behind the right-hand cab access.

Air filter system

The air filter unit of the diesel engine is designed to prevent the penetration of dust and various other impurities with the suction air into the engine.

The degree of wear on the engine depends to a large degree on how clean the drawn-in air is. It is therefore important that the air filtering unit is regularly inspected and serviced.

The dry air filter with safety cartridge is designed to provide maximum engine protection at extended maintenance intervals.

1.2.3 Drive hydraulics

Drive hydraulics

The drive from the diesel engine is transmitted to the axle transfer gear via the continuous hydrostatic drive in the closed circuit.

This drive enables:

- An automatic adaption of the travel speed to the tractive force in each travel range.
- A rapid changeover from forward travel to reverse by means of the LIEBHERR control lever.
- The adjustment of the tractive force or speed by means of the gas pedal and the combined inch-/brake pedal.

Variable displacement pump

The variable displacement pump is an axial piston pump with a swash plate design. The displacement is adjusted in relation to the engine speed and load.

The delivery direction of the pump is determined by the driving direction valve.

Variable displacement motor

The variable displacement motor with a band axis design drives the axle distributor gearbox. The hydraulic setting of the displacement makes a wide adjustment range possible.

A large tractive force is achieved at the maximum pivoting angle and the maximum possible speed is low.

The highest speed and the lowest possible tractive force are achieved at the minimum pivoting angle.

1.2.4 Working hydraulics

Working hydraulics

The working hydraulics systems operates in the open circuit. The gear 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 device and directs the oil volume to the lift or tilt cylinders.

Working hydraulics pump

The working hydraulics pump is a gear pump. The speed-dependent volumetric flow of the pump is distributed at 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 vehicle. The spool valves for the lift and tilt cylinders are integrated in the control valve block. An additional unit with spool valves for quick-release couplings or accessories can be attached to the existing control valve block.

Pressure relief valves protect the system from pressure peaks.

Servo system

The working hydraulics are controlled by the LIEBHERR control lever. In the process, the control valve block is hydraulically controlled via the pilot control valve.

The pilot control valve is supplied with oil from the replenishing pump via the solenoid valve of the working hydraulics lock. A hydro accumulator means that even when the diesel engine is at rest, the working attachments can be operated in emergencies, for example the lift arms can be lowered and/or the bucket can be tipped.

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

Hydraulic tank

The hydraulic tank provides the drive hydraulics, the working hydraulics and the steering system with hydraulic oil.

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

In addition, the fixing brackets for the cooling system, exhaust gas system and for the air filter are integrated on the steel section of the hydraulic tank.

Return-suction filter

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

Simultaneously the filter acts as a suction filter for the hydrostatic travel drive system replenishing pump.

Return strainer

The return strainer filters a fraction of the return-flow oil from the whole hydraulic system. The filtered oil then flows back to the hydraulic tank.

1.2.5 Steering

Steering

The machine is steered by a combination of articulated steering and rear axle pivot 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 activated 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.

Valve block

The valve block is mounted on the diesel engine. Its task is to distribute the oil flow from the working hydraulics pump to the steering, working hydraulics and the parking brake. The steering system has first preference for oil supply. A pressure relief valve integrated in the valve block protects the steering system from excessive pressure.

With the supply for the parking brake, the valve block fills the brake accumulator to a certain pressure.

Servostat

The servostat is activated by the steering wheel via the steering column. The metering pump in the servostat directs the oil flow from the variable displacement pump to the steering cylinders. In the process, the oil volume is precisely metered to achieve fully responsive steering.

Emergency steering pump

The emergency steering pump, with gearwheel design, is driven by an electric motor. The pump supplies oil as required to the steering system.

The electric motor 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 executes a short test run.

1.2.6 Brake system

Service brake

The service brake consists of a dual hydraulic-mechanical braking system. The hydrostatic travel drive system when reversed also acts as a service brake. The hydrostatic travel drive system acts on all 4 wheels.

The service brake acts on two fixed saddle disc brakes, which are arranged on two brake discs one behind the other on the input shaft of the front axle.

The service brake is activated by oil pressure, which is built up by the inch-brake pedal via the main brake cylinder.

The action of the service brake on the brake discs is independent of diesel engine running.

Parking brake

The spring loaded glide saddle brake acts on the front brake disc - on the input shaft of the front axle.

The parking brake is opened by oil pressure and closed by spring force.

The parking brake can only be released when the diesel engine is running, (manual release of brake for towing possible).

1.2.7 Electrical system

Description of the electrical system

The machine's electrical system operates at 12 V. 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.

1.2.8 Axles

Front axle

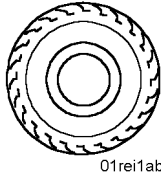
The front axle is a fixed axle and is rigidly bolted to the front section.

The axle is equipped with a central tapered gear with integrated disc-type self-locking differential. The planetary final drives are located in the wheel hubs.

Rear axle

The rear axle is steering axle with built-in transfer gear. The axle transfer gear is driven by the variable displacement motor. The oscillating axle casing is integrated in the differential housing; it is mounted on rotary bearings in the rear 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. The wheel hubs can be rotated via the axle pivot steering and are actuated via connecting rods.



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Tyres

The driving performance of the machine depends among other things on the tyres.

It is essential that the tyres on all four wheels are of the same size and type.

The correct tyre pressure is a decisive factor for perfect machine performance in operation and for high tyre mileage.

Snow chains or guard chains

When snow chains or guard chains are fitted, it must be to all four wheels!

Note: Non-observance can result in damage to the drive system!

1.2.9 Vehicle chassis, ballast weights

Chassis

The vehicle chassis consists of front and rear sections. These are linked by the articulated bearing.

For steering, the vehicle chassis is pivoted to the left or right via the articulated bearing.

The vehicle chassis bears various built-on assemblies such as the driver's cab, lift arms and drive aggregates.

Articulated joint lock

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

1.2.10 Cab, heating, air conditioning

Cab

The cab is a safety cab and has been tested and certified according to ROPS/FOPS regulations. It is spring-mounted 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 vehicle via the cab access and the left-hand door.

In emergencies, exit by the right-hand door is also possible.

Driver's seat

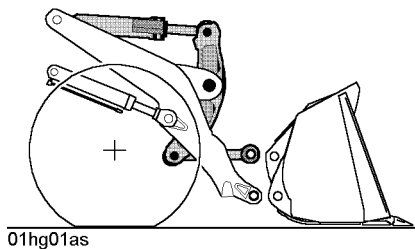
The ergonomically designed driver's seat offers a high degree of comfort. The adjustable seat surface, back support and suspension mean that the driver can individually adjust the seat for maximum comfort.

Vibration damping:

The seat installed in the machine corresponds to ISO 7096.

When the machine is being properly used, the values of the vibrations transmitted by the driver's seat are smaller or equal to the simulated vibrations 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 fulfilling the requirements for protection from whole body vibrations according to EN 474-1.

1.2.11 Lift arms, quick-change device



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Z-bar kinematics

Z-bar lift arms – 2250 mm

The lift arms are attached to the front section of the machine.

The lift arms have a Z-kinematic design. By this it meant that the arrangement of the tilt cylinder, reversing lever and connecting strap form a "Z". The "Z-form" can be seen when the frame is viewed from the right-hand side.

With lift arms with Z-bar kinematics, it is not possible to keep the load parallel to the ground.

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 arms.

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

The bearing points on the lift arms are sealed and hence protected against wear due to contamination and corrosion.

P-lift arms – 2300 mm

The lift arms are 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.

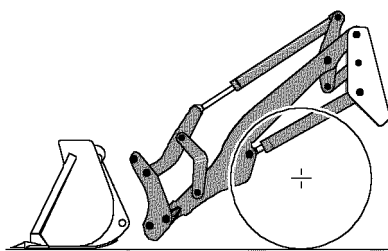
The parallel kinematics means that the load can be kept parallel to the ground, e.g. with a forklift, over the entire lifting range.

The P-lift arms are equipped with a hydraulic quick-change device. The hydraulic quick-release coupling 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 arms are sealed and hence protected against wear due to contamination and corrosion.



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P-kinematics

1.2.12 Attachments, accessories

Loading bucket

The loading bucket is one of a variety of implements which can be mounted on the lift arms.

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

The loading bucket is attached as standard, directly to the lift arms.

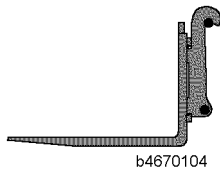
Where the optional quick-change device is provided, the loading bucket is attached to this.

Forklift (option)

The forklift is one of a variety of implements which can be mounted on the lift arms.

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

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



2 Safety regulations

Working with the machine involves possible risks to life and limb of the operator, driver or maintenance technician. If you always pay attention to the various safety instructions, the risk of accidents will be considerably reduced.

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

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

When work is described in this manual which could result in dangers for personnel or damage to the machine, the safety precautions required are explained.

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

2.1 Introduction

1. The headings listed below have the following significance:



“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 less severe 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 applicable at the operating site,
- legally enforceable “road traffic regulations”,
- the guidelines issued by the employers' liability assurance associations.

2.2 General safety precautions

1. Familiarise yourself with the **“Operating manual”** before starting up the machine.

Make sure that you are in possession of and have read and understood additional instructions applicable for any accessory equipment installed on your machine.

2. Only expressly authorised personnel may operate, service or repair the machine.

Observe the legally enforceable minimum ages!

3. Only deploy trained or instructed personnel, clearly assign responsibility for operation, rigging, maintenance and repair work.
4. Clearly establish the driver's responsibilities (also in respect of traffic regulations) and empower him 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/with 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 **"Operating manual"**.
7. Wear safe working overalls when working on or with the machine. Avoid wearing rings, wrist watches, ties, scarves, open jackets, loose clothing and so on. There is a risk of injuries due to hanging or being pulled in.
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.
This can result in unforeseen movements by the machine which could in turn 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 down the working attachment on the ground.
 - Move all control levers to neutral.
 - Shut down the engine and take out the ignition key.
13. Before commencing any work on the hydraulic circuit, you must also actuate all servo control devices (joystick and pedals) in both directions, in order to reduce the control pressure and banded up pressure in the operating circuits. You must then reduce the internal tank pressure.
14. Lock the working hydraulics to prevent unforeseen activation before leaving the driver's cab.
Block the working hydraulics in accordance with the instructions in the **"Operating manual"**.
15. Secure all loose parts on the machine.
16. Never start up a machine without first making a thorough inspection walkabout and check if any warning signs are missing or illegible.
17. Observe all signs bearing danger or safety instructions.
18. The machine must be provided with specific safety installations 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 for the installation and adjustment of safety installations and valves as well as for welding work on load bearing components.

2.3 Proper use

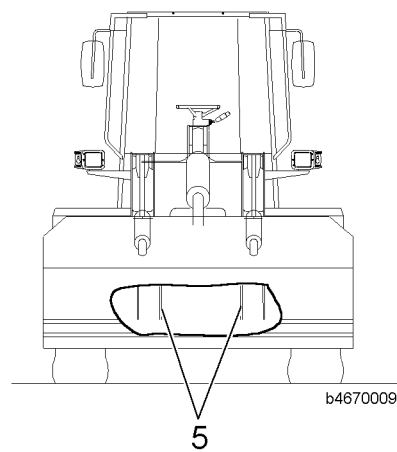
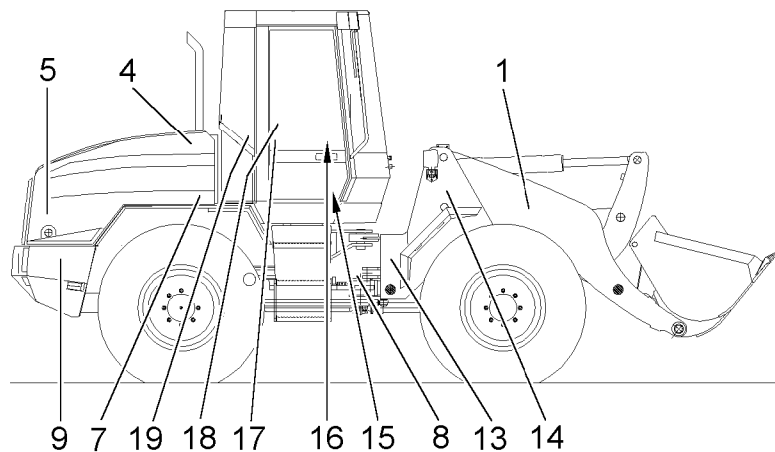
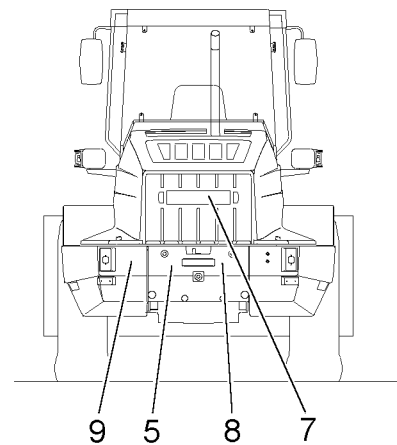
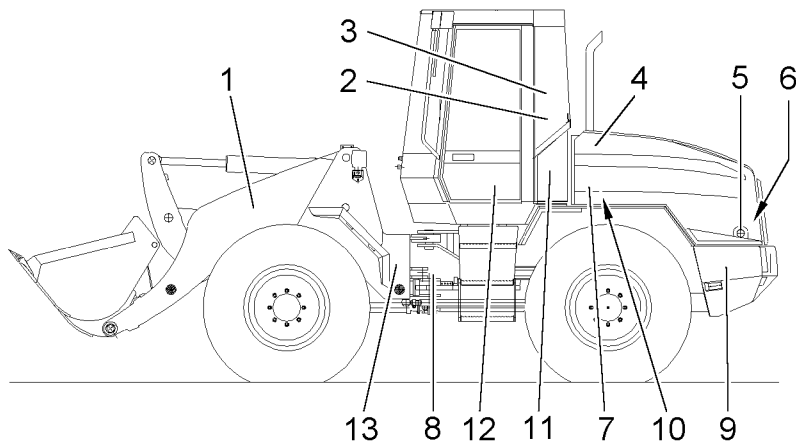
1. When equipped with standard loading bucket, forklift or grab, the wheel loader is designed exclusively for loosening, picking up, transferring, loading and dumping earth, stone, rock fragments or other materials and loading the same onto trucks, ships, conveyor belts or crushing installations.
2. Any other use or a use going beyond this, such as breaking up rock, driving in posts, transporting personnel etc., is considered 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. Machines used for lifting purposes are subject to special conditions and must among other things, be equipped with the prescribed safety equipment.
4. Proper use also includes observance of the “**Operating manual**” and adherence to the inspection and maintenance conditions.

2.4 Signs on the machine

1. Your machine has several types of signs.
Types of signs:
 - Safety signs
 - Information signs
 - Type plates

Their contents and location are described below.

The order numbers are included in the spare parts list.



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Arrangement of signs

- | | | |
|-------------------------------------|-------------------------------|--------------------------------|
| 1 Loiter warning sign | 8 Sign for lashing point | 15 ROPS sign |
| 2 Acoustic pressure sign – L_{pA} | 9 Speed limit sign 30 | 16 Sign for working hydraulics |
| 3 Acoustic power sign – L_{WA} | 10 OIL LEVEL sign | 17 Accident prevention sign |
| 4 Cooler unit sign | 11 Sign for windscreen water | 18 Steering sign |
| 5 Sign for slinging - lifting point | 12 Lubrication chart | 19 Cab ventilation sign |
| 6 Voltage sign | 13 Pivoting area warning sign | |
| 7 Engine standstill sign | 14 Machine – type plate | |

2.4.1 Safety signs

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

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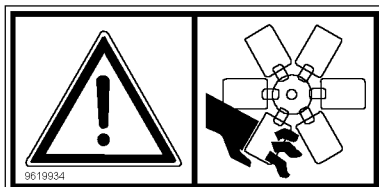
03sc01ab

Loiter warning sign

Sign 1 is attached to the outside of the lift arms on the left and right.

Warns of risk of accidents, possibly resulting in severe or even fatal injuries.

Significance: **Remaining in the danger area is prohibited!**



03sc04ab

Engine standstill sign

Sign 7 attached on the left and right outside the engine compartment – hood, – and on the rear hatch.

Warns of risk of accidents possibly resulting in severe injuries.

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



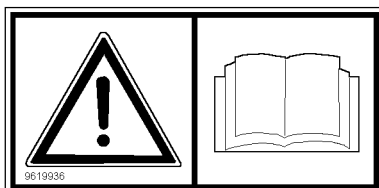
03sc02ab

Pivoting area warning sign

Sign 13 is attached outside on the left and right in the pivoting area.

Warns of risk of accidents, possibly resulting in severe or even fatal injuries.

Significance: **Remaining in the pivoting area is prohibited, when this is unlocked!**



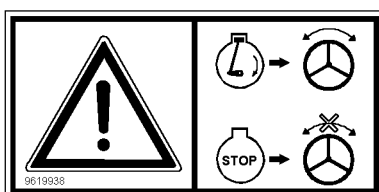
03sc03ab

Accident prevention sign

Sign 17 is attached to the right-hand side of the driver's cab.

Refers to regulations in the “**Operating manual**” for accident prevention.

Significance: **When operating the machine, the regulations in the Operating Manual for accident prevention must be followed precisely!**



03sc05ab

Steering sign

Sign 18 is attached to the right-hand side of the driver's cab.

Warns of risk of accidents, possibly resulting in severe or even fatal injuries.

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

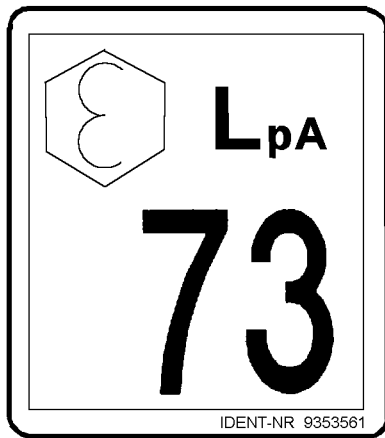
2.4.2 Information signs

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

Acoustic pressure sign – L_{pA}

Sign 2 is attached inside the left side window of the driver's cab.

Indicates the L_{pA} - acoustic pressure of the machine in decibels.

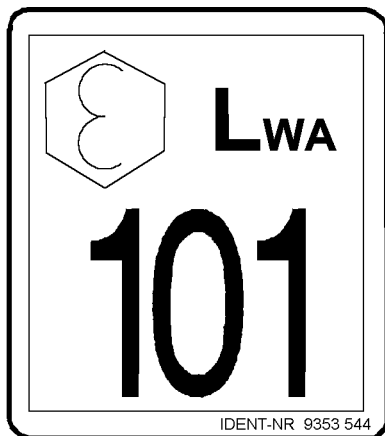


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Acoustic power sign – L_{WA}

Sign 3 is attached inside the left side window of the driver's cab.

Indicates the L_{WA} - acoustic power level of the machine in decibels.

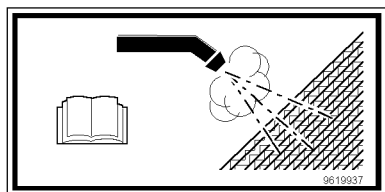


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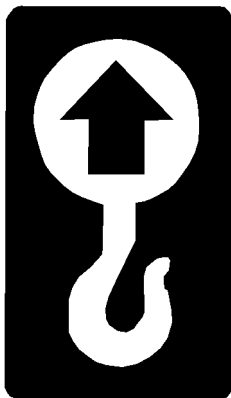
Cooler unit sign

Sign 4 attached on the left and right, outside the engine compartment – hood.

Refers to cleaning the cooling system.



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03sc17ab

Sign for slinging - lifting point

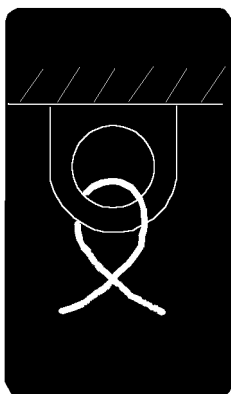
Sign 5 is attached to the slinging-lifting points on the machine.
 Refer to the Section “Slinging the machine from a crane”.
 Refers to the slinging- lifting points on the machine.



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Voltage sign

Sign 6 is attached outside on the left of the engine compartment.
 Indicates the activation of the battery main switch.



03sc16ab

Sign for lashing point

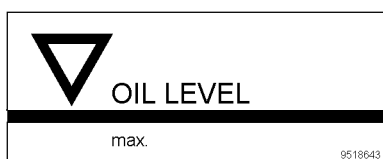
Sign 8 is attached to the lashing points on the machine.
 Refer to the Section “Transporting the machine by truck or rail”.
 Refers to the lashing points on the machine.



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Speed limit sign 30

Sign 9 is attached to the rear of the machine and on the sides to the left- and right-hand ballast weights.
 Refers to the permitted speed limit for the machine.



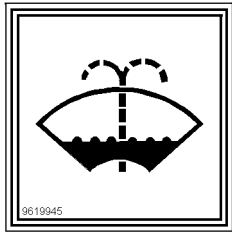
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OIL LEVEL sign

Sign 10 is attached to the hydraulic tank in the engine compartment.
 Indicates the oil level in the hydraulic tank.

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Sign for windscreen water

Sign 11 is attached outside on the left side of the driver's cab. Indicates the container for the windscreen washing agent.

Lubrication chart

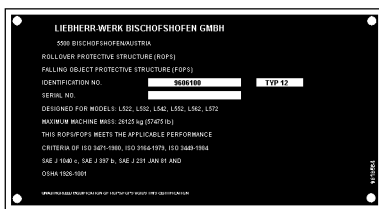
Sign 12 is attached to the door on the left-hand cab door. Fig. – refer to the Section "Maintenance".

Indicates the maintenance points and intervals in relation to lubricants and operating materials for the machine.

ROPS sign

Sign 15 is attached to the floor of the driver's cab on the right-hand side of the driver's seat.

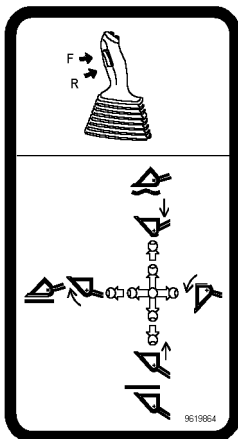
Indicates the maximum loading of the rollbar structure.



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Sign for working hydraulics

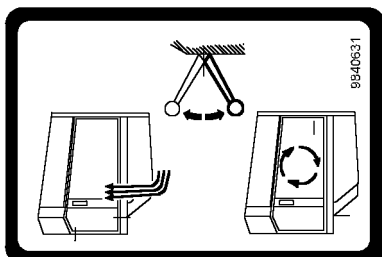
Sign 16 is attached to the right-hand side of the driver's cab. Indicates the directions in which the LH control lever can be moved.



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Cab ventilation sign

Sign 19 is attached to the right-hand side of the driver's cab. Indicates the lever position for fresh or recirculated air.



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2.4.3 Type plates

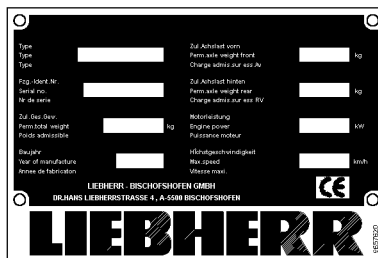
1. The machines and the indicated components are provided with a type plate.

Machine – type plate

Sign 14 is attached to the right-hand side of the front section.

Details on the type plate:

- Type
- Vehicle identity No.
- Permitted total weight
- Year of construction
- Permitted front axle load
- Permitted rear axle load
- Engine output
- Speed limit



03sc10ab

2.5 Instructions for avoiding crushing injuries and burns

1. Do not work below 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 with insufficient load bearing capacity.
Wear protective gloves when handling wire hawsers.
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 in contact with the fan.
Objects which fall or project into the fan will be catapulted 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. At around operating temperature, the engine and hydraulic oil are hot.
Do not let hot oil or oil carrying parts 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 the loading bucket or other working attachments to be moved into position by hand.
10. Before reaching into the engine compartment, secure the engine compartment hatches against unforeseen dropping or closing with the struts provided for this purpose.
11. Before starting up the vehicle, the engine compartment hatches and the battery container covers should be closed and locked.

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

2.6 Instructions for avoiding the risk of fire and explosions.

1. When refuelling, the engine must be shut down. Shut down any auxiliary heating systems.
2. Do not smoke and avoid naked flames when refuelling or near batteries when they are being recharged.
3. Always follow the instructions in the “**Operating manual**” when starting the engine.
4. Check the electrical system.
Immediately rectify 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 designed 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 lead to fires.
8. Ensure that all supports and protective plates are properly installed so as to avoid vibrations, abrasion and heat damming.
9. Starting pilot (ether) is a special fire hazard!
Never employ volatile gas-based cold starting aids in the proximity of heat sources, naked flames (e.g. cigarettes) or in poorly ventilated spaces.
10. Familiarise yourself with the operation and location of fire extinguishers and obtain information on the fire alarm and fire fighting options available on site.

2.7 Safety instructions for starting up

1. Each time before starting up, walk around the machine, carrying out a thorough inspection.
2. Check the machine for loose bolts, cracks, wear, leaks and malicious damage.
3. Never attempt to start up 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 signs 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 safety belt so that you can work comfortably.
9. Acoustic protection equipment on the machine must be activated during operation.

2.8 Safety precautions when starting up

1. Before starting, check that all pilot lamps and instruments are working perfectly.
Move all control levers to neutral.
2. Before starting the engine, briefly sound the horn, to warn other persons who are in the vicinity of the machine.
3. Only ever start the machine from the driver's seat.
4. Unless otherwise instructed, start the engine in accordance with the instructions in the "**Operating manual**".
5. Start the engine and then check all display and monitoring devices.
6. Never run the engine in an enclosed space, unless it is sufficiently ventilated.
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 result in a sluggish performance.
8. Check that the control for the working attachment is functioning perfectly.
9. Drive the machine carefully to an open space and then check that the service brake, the steering and the signal and lighting equipment are all functioning properly.

2.9 Instructions for safe working

1. Before commencing 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 cordoning off 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 when the weather conditions are changeable.
4. Familiarise yourself with the position of the utility supply lines on the site and be especially carefully when working in proximity to them. If necessary, inform the responsible authorities.
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.

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 come close or to touch the machine.
 - Arrange for lines to be de-energised.
 - Do not get out of the machine until you are certain that the contacted/damage power line is voltage free!
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 when visibility is poor or in darkness.
9. Do not allow any passengers 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 can 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 **“Operating manual”**.
14. Never leave the driver's seat when the machine is still in motion.
15. Never leave the machine unmonitored 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 pointing downhill.
Wherever possible work up- or downhill and not perpendicular 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 over the machine.
The engine must be running at the rated speed and the travel speed may only be reduced by means of the gas pedals.
Shift down to the lowest gear before reaching the slope, don't 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 deployments.
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 for slinging loads and directing crane operators.
The banksman should be in visual contact with the operator or at least be in audio contact with him.

2.10 Safety instructions for driving on slopes

1. On downward slopes, always drive carefully and never at top speed, as otherwise you could lose control over the machine.
Travel speeds:
 - The travel speed limits specified in the **“Operating manual”** must never be exceeded!
 - Exceeding the max. speed limit causes the permitted limits to be exceeded for all rotating parts, such as the drive engine, the cardan shaft, all drives inclusive of 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 Safe parking

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 articulated joint 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 **“Operating manual”**.
6. Lock the working hydraulics before leaving the driver's cab.
Block the working hydraulics in accordance with the instructions in the **“Operating 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 no more than 30 and should be provided with a wooden cover to prevent slipping.
5. Clean the machine tracks / wheels of snow, ice and mud before driving onto the ramp.
6. Before driving on, secure the superstructure with respect to the undercarriage with the locking pin.
Procedure: not applicable with wheel loader.
7. Align the machine precisely with the loading lamp.
8. Attach the hand levers to the gas pedals for more responsive control.
Procedure: not applicable with wheel loader.
9. A banksman must give the machine driver the required signs.
Drive carefully onto the ramp and then onto 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. Install the articulated joint lock (this is only applies to wheel loaders with articulated steering)
13. Secure the machine and the remaining individual components against sliding with chains and wedges.
14. Depressurise the pressure lines, take out the ignition key, lock the driver's cab - and side panels and leave the machine.
15. Acquaint yourself with the route before transport, especially in relation to width, height and weight limits.
16. Make 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 “**Operating 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 “**Operating manual**” see the section “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, which is used for towing, must have a sufficient tensile strength and be fed through the boreholes provided for this purpose in the front section.

In no event can damage or accidents resulting from towing be covered by the manufacturer's guarantee.

Instructions for towing by rope:

- Make sure that nobody remains in the vicinity of the taut rope.
 - Keep the rope taut and avoid kinks.
 - Carefully draw the rope until it becomes taut.
 - Sudden jerks can cause a slack rope to rupture.
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 “**Operating manual**”.

2.14 Measures to ensure safe maintenance

1. Never attempt maintenance or repair work unless you are fully competent.
2. Observe the prescribed periods or those specified in the “**Operating manual**” for cyclical checks/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 “**Operating 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, in addition to a hard hat and safety boots, safety goggles and protective gloves are required.
6. Keep unauthorised persons away from the machine during maintenance work.
7. Set up an extended cordon around the maintenance area, when necessary.
8. Inform operating personnel in advance of specialist and maintenance work. Designate supervisory staff.
9. Unless otherwise specified in the “**Operating manual**”, carry out all maintenance work on the machine on firm level ground with the engine shut down.
10. Afterwards always re-tighten threaded couplings loosened during maintenance and repair work.
11. If dismantling of safety installations is required during rigging, maintenance and repair work, then as soon as the maintenance and repair work is concluded, the safety installations must be re-installed and checked.
12. When undertaking maintenance jobs, especially work under the machine, attach a warning sign “**DO NOT SWITCH ON**” to the ignition where it is clearly visible. Take out the ignition key.
13. Clean oil, fuel or maintenance fluids off the machine, especially from couplings and threaded connections. Do not use any aggressive cleaning agents. Use fibre-free cloths.
14. Before 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/tape down all openings into which no water/steam/cleaning agent may penetrate for reasons of safety/operational considerations.

Electric motors, control cabinets and battery cases are especially vulnerable.

Further procedure:

- Make sure that during cleaning work on the machine housing, 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/taping.
- After cleaning, check all fuel, engine oil and hydraulic oil lines for leaks, loose connections, abrasions and damage.
- Rectify any defects as soon as they are established.

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. Take care when handling hot operating materials (danger of burns and scalding).
19. Only operate combustion engines and fuel burning heating systems in spaces with sufficient ventilation. Before starting up in an enclosed space, make sure that the ventilation is sufficient. 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, for example.
21. Avoid lifting heavy components by yourself. Always use suitable lifting equipment with sufficient load bearing capacity for this purpose.

Procedure:

- Carefully fix and secure individual components and larger assemblies to the lifting aids when they are being replaced, so that the risk of accidents is precluded.
- Only use suitable and lifting aids and slinging gear in a technically perfect condition with sufficient load bearing capacity.

It is prohibited to remain or work under suspended loads.

22. Do not use ropes, which are damaged or with insufficient load bearing capacity. Wear protective gloves when handling wire hawsers.
23. Only assign experienced personnel with responsibility for slinging loads and directing crane drivers. The banksman should be in visual contact with the operator or at least in audio contact with him.
24. When carrying out fitting work over head height, use the safety climbing aids and working platforms provided or similar. 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 soiling, 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 on metal contact when doing this.
26. Never get under the machine when this 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 which may arise 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 must be repaired on a slope, then the wheels must be secured with wedges. Move the working attachment into the maintenance position and insert the articulated joint lock.
30. Only personnel with specialist knowledge and experience may work on the hydraulic equipment.
31. When searching for leaks, wear protective gloves. A fine fluid jet, under pressure, can penetrate the skin.
32. Never release hydraulic lines or threaded couplings before setting down the working attachment and shutting down the engine.
Next all pilot control devices (joystick and pedals) must 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 internal tank pressure by loosening the air bleeder screw.
33. Regularly check all hydraulic lines, hoses and screw 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 (hydraulics, compressed air) in accordance with the component descriptions.
35. Lay and install hydraulic and pneumatic lines properly. Do not cross over couplings. 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 in 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 disruptions occur in the electrical power supply, switch off the machine immediately.
39. Inspect/check the machine's electrical equipment regularly. Immediately rectify all faults, such as loose connections, scorched/worn cables or burnt out fuses and bulbs.
40. If it is necessary to carry out work on parts when live, then obtain the assistance of a second person, who can in an emergency throw the emergency stop or main switch with voltage trip-out. Cordon off the working area with a red/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, for example an earthing rod.
42. First of all check that the isolated parts are voltage free, connect to earth and then briefly short them. Isolate adjacent components which are still live.

2.15 Safety instructions for welding work on the machine

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

Always disconnect the minus terminal first and reconnect it last.

With machines with an electronic gearbox control unit:

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

2.16 Safety instructions for working on the attachments

1. Do not work below the attachment, unless it is resting safely on the ground or has been properly supported.
2. Avoid direct metal on metal contact when propping the attachment in order to replace parts (signs, cutting edges, teeth ...)
3. Never attempt to lift heavy components by yourself. Always use suitable lifting equipment with sufficient load bearing capacity for this purpose.

4. Always wear gloves when working with wire hawsers!
5. Never release hydraulic lines or threaded couplings before setting down the working attachment and shutting down the engine.
Next all pilot control devices (joystick and pedals) must 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 internal tank pressure by loosening the air bleeder screw.
6. Ensure that all lines and threaded couplings are reconnected and re-tightened on completion of the work.
7. Use extreme caution 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 ...).

2.17 Safety instructions when slinging the machine from a crane

1. Lower the attachment and tilt back the loading attachment as far as it will go.
2. Install the articulated joint lock (this is 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 “**Operating manual**”.
5. Lock the working hydraulics before leaving the driver's cab.
Block the working hydraulics in accordance with the instructions in the “**Operating manual**”.
6. Close all doors, covers and hoods securely.
7. Only assign experienced personnel with responsibility for slinging loads and directing crane operators. The banksman should remain in visual contact with the operator or at least be in audio contact with him.
8. Attach the lifting tackle to the lugs/bore holes provided on the machine.
9. Ensure that the lifting tackle is of sufficient length.
10. Raise the machine carefully.
11. **NOTE! Going under the machine when it is raised is strictly prohibited.**
12. When restarting the machine, proceed strictly according to the “**Operating manual**”.

2.18 Safely servicing hydraulic hoses and hose lines

1. Repairing hydraulic lines and hydraulic hoses is prohibited!
2. All hoses, hose lines and threaded couplings must be checked regularly, at 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 loading, hoses and hose lines undergo natural ageing. This limits their service life.

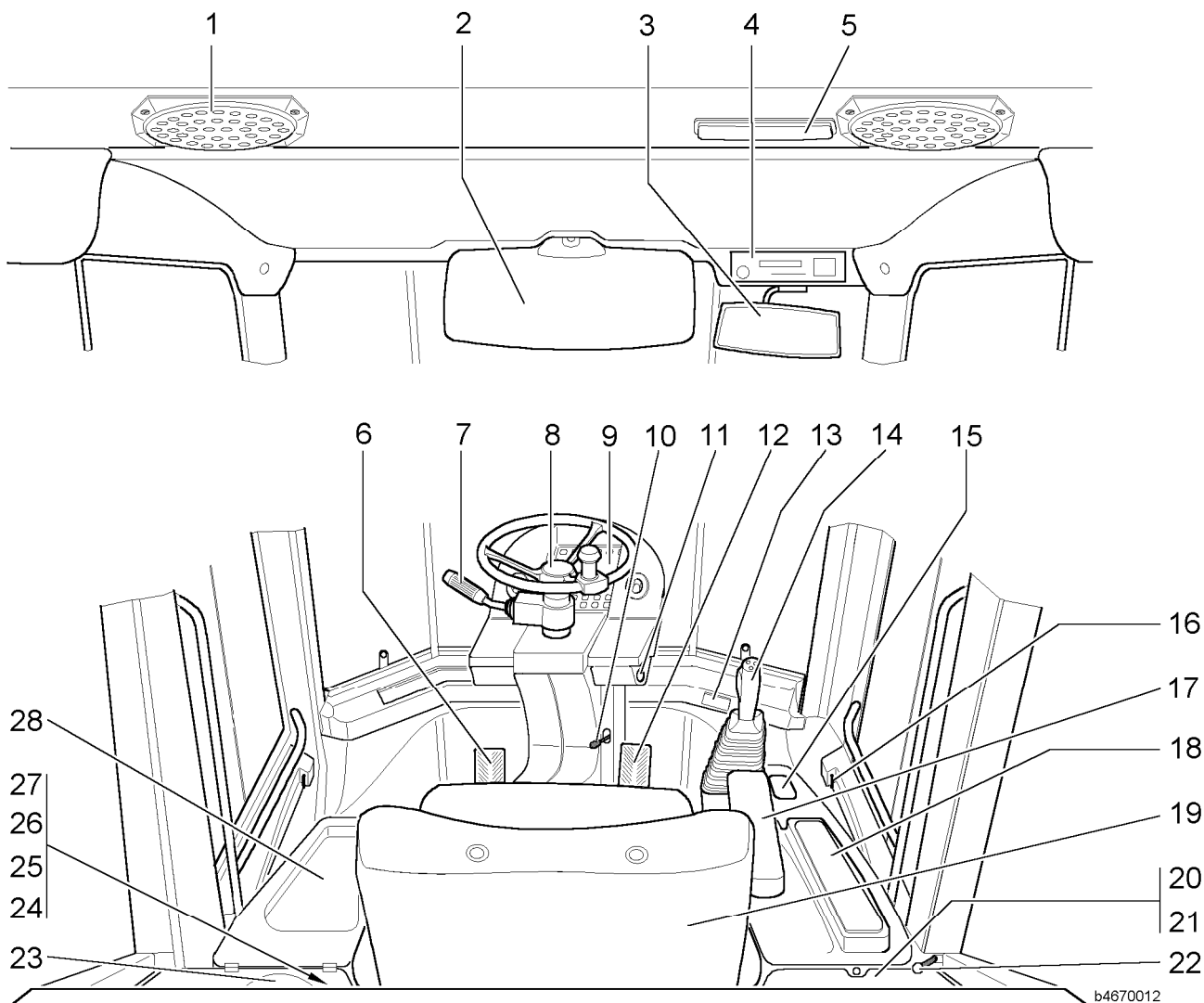
4. Improper storage, mechanical damage and loads in excess of permitted limits are the most common causes of malfunctions.
5. The service life of a hose line should not exceed six years, including a storage period of no more than 2 years (note the date of manufacture on the hoses).
6. The service life 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 criteria are met 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 not conforming to 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 reduce the strength of the fittings or the hose/fitting coupling;
 - Slippage of the hose out of the fitting;
 - Corrosion of the fittings, which impair their functioning and strength;
 - Exceeding of 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 cross over couplings.

2.19 Attachments and accessories

1. Attachments and accessories produced by other manufacturers or those which have not been given general approval by LIEBHERR for installation or for external fitting, may not be installed or fitted on the machine without the previous written agreement of LIEBHERR.
2. The appropriate technical documentation should be made available to LIEBHERR for this purpose.

3 Operation, handling

3.1 Layout of control elements and instruments



Inside view – driver's cab

- | | | |
|--|--|---|
| 1 radio loudspeaker | 11 starter switch | 21 box – control electronics – control relay |
| 2 sun visor | 12 gas pedal | 22 lever – air vent adjustment |
| 3 interior mirror | 13 ashtray | 23 glove compartment, round |
| 4 radio set (optional) | 14 LIEBHERR control lever | 24 control element – heater |
| 5 interior illumination with switch | 15 control lever – module for optional working functions | 25 control element – ventilation |
| 6 brake- / inch pedal | 16 door handle (right-hand door) | 26 outlet nozzles – heating/ventilation/air conditioning (8 in total) |
| 7 steering column switch | 17 adjustable arm rest | 27 socket – cigarette lighter |
| 8 adjustable steering column with steering wheel | 18 switches on the side cover (control console) | 28 glove compartment with cover |
| 9 indicator unit | 19 driver's seat | |
| 10 lever – steering column adjustment | 20 fuse – box | |

3.2 Operation

3.2.1 Cab access

Entering and leaving the driver's cab

Personnel may 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.

Familiarise yourself with the emergency exit through the right-hand cab door.

Refer to the Section "Emergency exit".



Warning



Danger of injuries as a result of jumping or falling off the machine!

! Use the steps, ladders and handles provided for getting on and off.

! Never jump down from the machine.

Warning



Risk of injuries due to unforeseen movement by the machine!

! Do not hold onto the steering column, the control panel or the control levers when getting on or off.

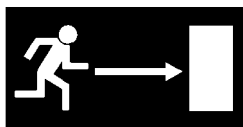
- Get on the machine via the left-hand cab access.

3.2.2 Emergency exit

Leaving the driver's cab by the emergency exit

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.

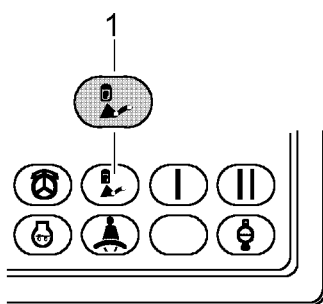


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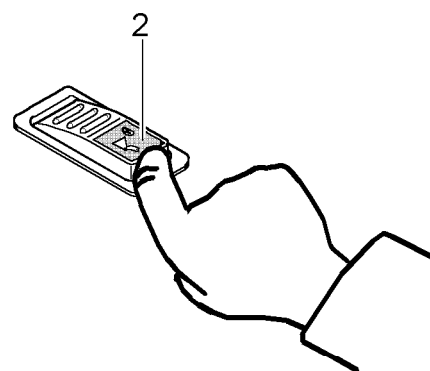


Driver's cab door, right

- 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.
- Opening the driver's cab door: to do this, pull the lever 1 on the door lock upwards.



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Switch – working hydraulics lock

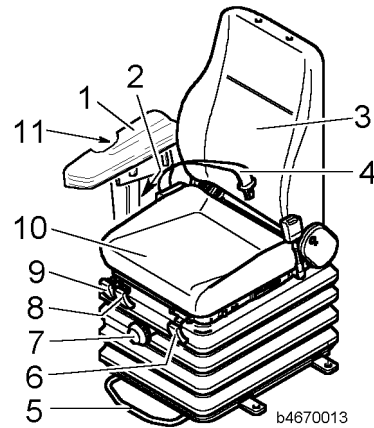
1 symbol field – working hydraulics lock

2 switch – working hydraulics lock

- Before leaving the driver's cab, press the switch 2 for the working hydraulics lock. The symbol field 1 for the working hydraulics lock must light up. The working hydraulics is now inoperative.

3.2.3 Driver's seat

Design



Driver's seat – main components and adjustable elements

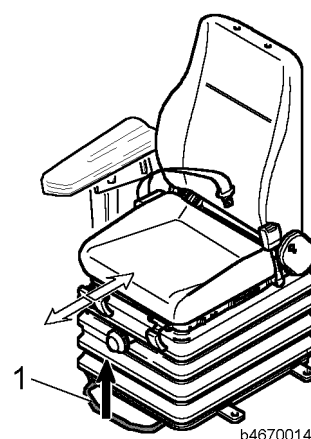
- | | |
|-------------------------------------|--|
| 1 arm rest | 8 lever – front inclination adjustment |
| 2 star grip – adjustment – arm rest | 9 lever – rear inclination adjustment |
| 3 back rest | 10 seat surface |
| 4 safety belt | 11 locking screw – adjustment – arm rest |
| 5 lever – horizontal adjustment | |
| 6 lever – adjustment – back rest | |
| 7 rotary knob – seat suspension | |

Individual adjustment for ergonomic seating

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

Horizontal setting:

Backward or forward adjustment is by means of the lever 1 at the front of the driver's seat.



Adjustment – horizontal

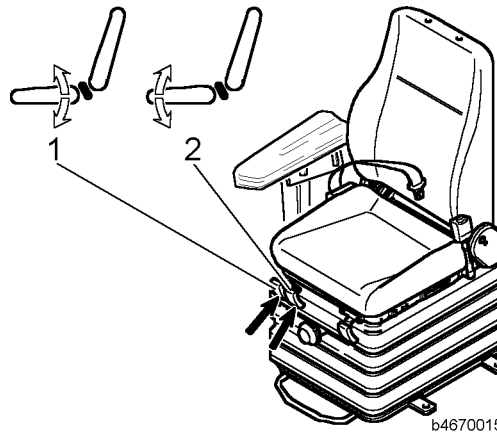
- 1 lever – horizontal adjustment

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

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Inclination of the seat surface:

Adjustment is made with lever 1 and lever 2 at the front right of the driver's seat.



Adjustment – seating surface, seating height

1 lever – rear inclination adjustment

2 lever – front inclination adjustment

- Rear inclination adjustment: Raise lever 1 in the direction of arrow, adjust inclination and release lever.
- Front inclination adjustment: Raise lever 2 in the direction of arrow, adjust inclination and release lever.

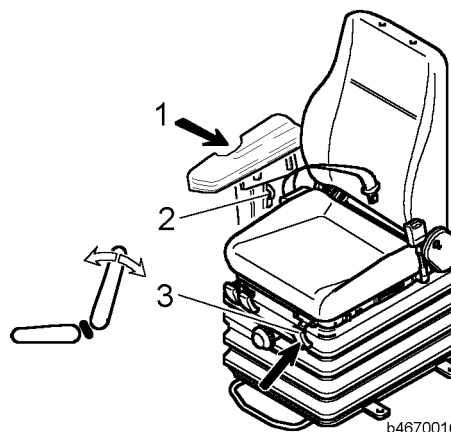
Adjustment of the seat height

Adjustment is made with the lever 1 and lever 2 at the front left of the driver's seat.

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

Adjustment of back rest

The inclination of the seat back is adjusted with the lever 3 on the left-hand side of the driver's seat.



Adjustment – back rest, arm rest

1 locking screw – adjustment – arm rest

2 star grip – adjustment – arm rest

3 lever – adjustment – back rest

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- Raise lever 3 .
- Move the seat to the required inclination and release both levers.

Adjustment of the arm rest

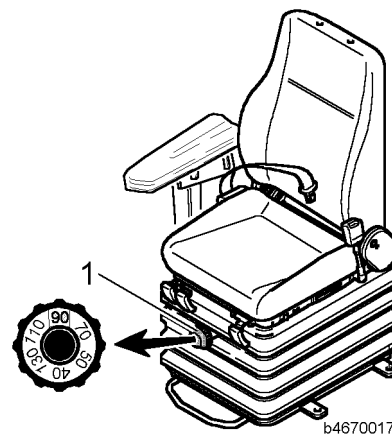
The height and inclination of the arm rests can be individually adjusted.

- Height adjustment: Release star grip 2 adjust and fix the height.
- Adjustment of inclination: Loosen clamping screw 1 adjust and fix the inclination.

Adjustment of seat suspension

The seat suspension can be individually adjusted to the driver's body weight.

Adjustment is by means of the rotary knob at the front of the driver's seat. The figures on the rotary knob indicate the set body weight in kg.



Adjustment – seat suspension

1 rotary knob – seat suspension

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

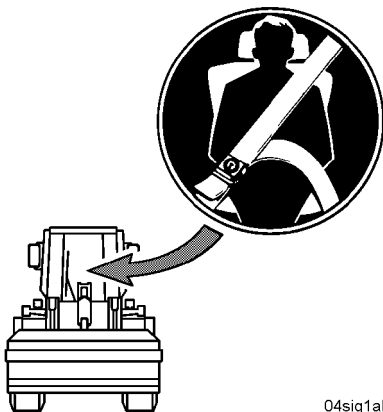
3.2.4 Safety belt

Observance of safety factors


The driver's cab is equipped with rollover protection – **ROPS**.


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

In this section, the safety features of wearing the safety belt are described.



Compulsory wearing of seat belts

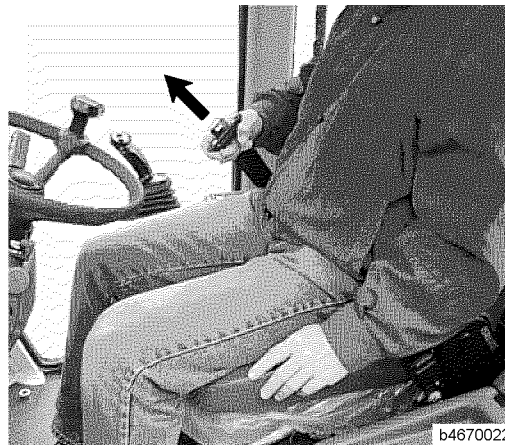
Warning  Risk of injuries when the safety belt not fastened!
If the machine is braked or stops abruptly, the driver could suffer severe injuries!
! It is essential that you fasten your safety belt before starting up the machine.

Danger  Risk of injuries when the safety belt not fastened!
If the machine tips or rolls over, the driver could suffer fatal injuries!
! 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 and have defective parts replaced without delay.
- The safety belt may not be twisted when in use.

Attaching the safety belt

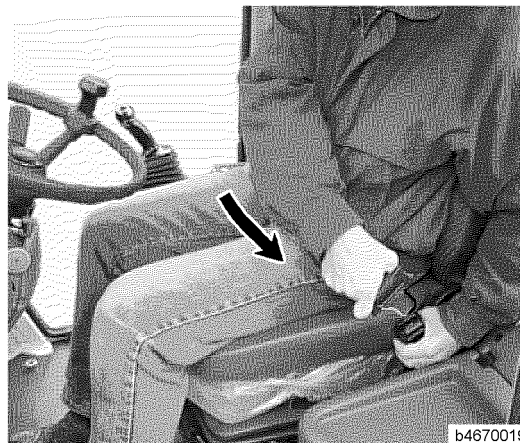
The safety belt is an automatic belt. No adjustment of the belt length is required.



Fastening the belt

- Hold the buckle with the right hand and pull the belt slowly out of the roller.

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



Locking the belt

- Hold the snap lock with the left hand and pull the belt over the body at hip height.
- Insert the buckle into the snap lock and check by pulling the buckle whether the snap lock has 'snapped in place'.

Releasing the seatbelt



Releasing the seatbelt

- Release the seat belt: to do this push the catch on the snap lock downward with your thumb.

3.2.5 Starter switch

The starter switch is equipped with a repeat start lock. The ignition key can be pulled out when in 0 – 0-position / motor standstill. When the ignition key is in the 0 position or parking position, the following consumer units can be switched on from the control unit. Also refer to the Section “Control unit”.

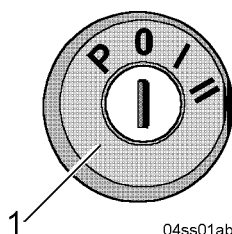
Consumer units:

- parking and driving light
- hazard warning system
- working floodlights
- rotating beacon

Design

Switching positions:

- P – parking position
- 0 – 0 position / engine standstill
- I – contact, operating preglow position
- II – starting position



Starter switch

Function description

Switching electrical system ON / OFF

The electrical system is switched ON or OFF with the ignition key.

3.2.6 Steering column and steering wheel

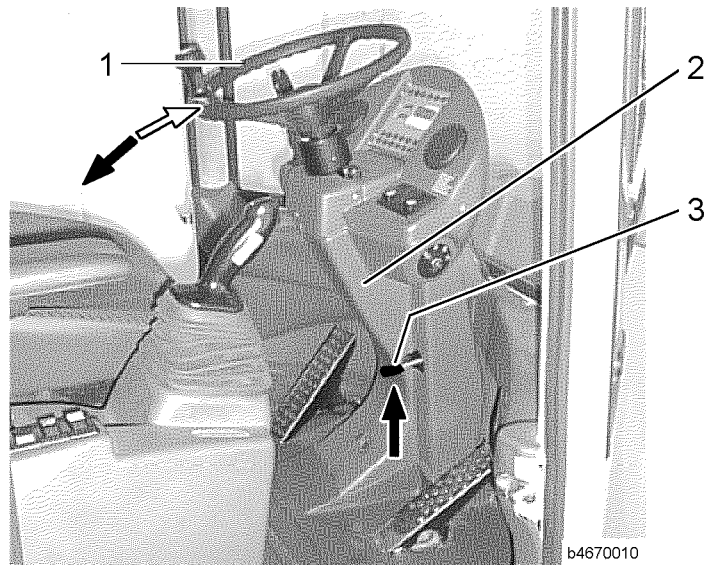
Design

The steering column with steering wheel and steering column switch is integrated in the steering console.

Adjustment of steering column

The steering wheel can be matched to the driver's requirements by adjusting the steering column.

Continuous adjustment is possible.



Adjustment – steering column

- | | |
|-------------------|---------|
| 1 steering wheel | 3 lever |
| 2 steering column | |

- 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.
- Lock the selected position of the steering column 3 by releasing the lever 2 .

3.2.7 Steering column switch

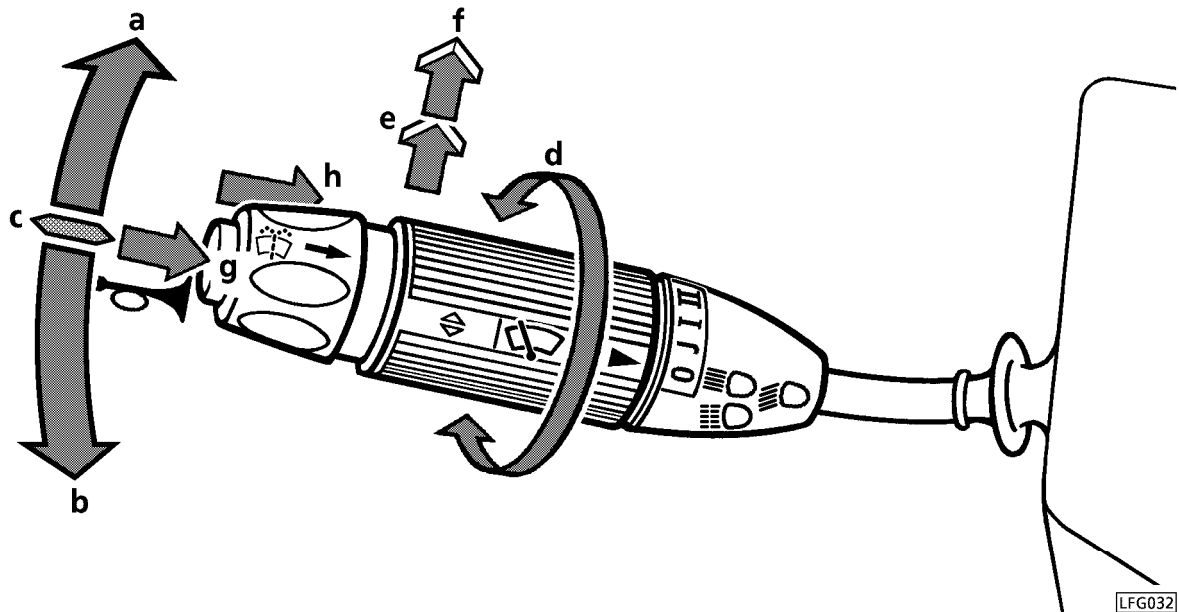
The steering column switch is mounted on the left-hand side of the steering column.

Design

The steering column switch contains the control elements for the following:

- direction indicators
- driving light
- acoustic and optical horn
- window wiper for the front windscreen
- window wiping and washing system for the front windscreen

Function description



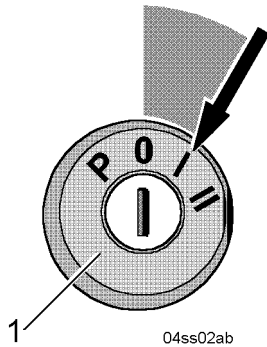
Steering column switch

Functions of the steering column switch when activated in direction:

- a – drive direction display: right-hand flashing indicator lights
- b – drive direction display: left-hand flashing indicator lights
- c – central position: neutral position
- d – window wipers: front windscreen
 - 0 – level-0
 - J – Interval
 - I – level-I
 - II – level-II
- e – optical horn: light horn
- f – driving light: high beam
- g – acoustic horn: horn tone
- h – window wiping / washing system front windscreen

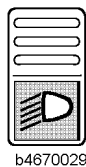
Operation of driving light or headlamp

Make sure that the machine's electrical system is switched on.



1 Starter switch – contact position

Switching on driving light – dipped beam



- Turn the switch – parking/driving light 3 to level I.

The parking light lights up.

- Turn the switch – parking/driving light 3 to level II.

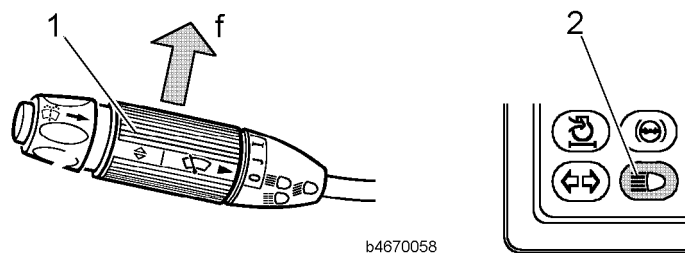
The driving light lights up.

- 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.



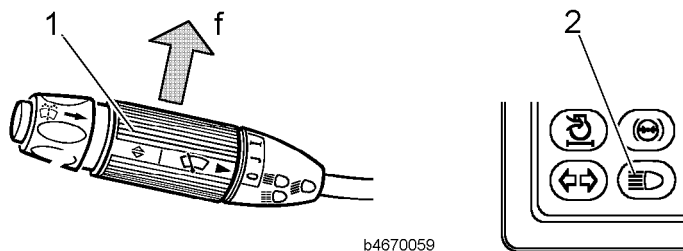
Steering column switch and indicator unit

1 steering column switch

2 symbol field – driving light

- Press the switch for parking/driving light.
The driving light illuminates.
- Push the steering column switch in direction - f -.
The symbol field 2 for the driving light must light up.
The driving light illuminates.

Switching back to driving light – dipped beam



b4670059

Steering column switch and indicator unit

- 1 Steering column switch
- 2 symbol field – driving light

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

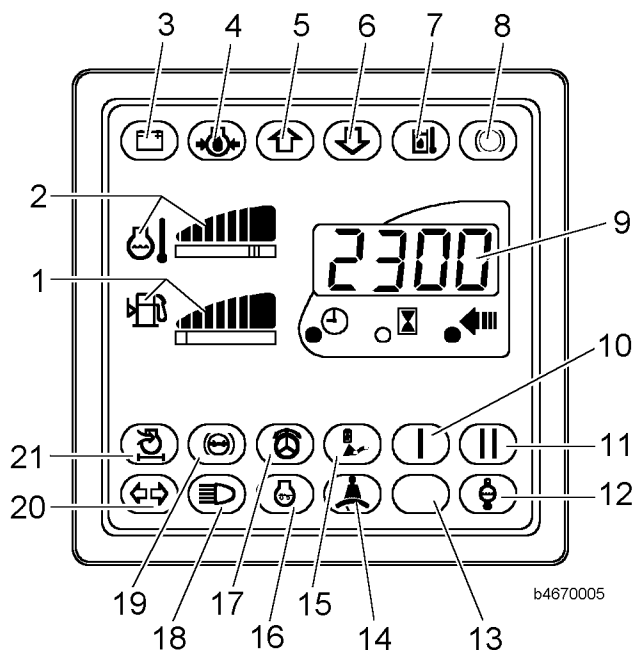
The symbol field 2 for the driving light must go out.

The driving light – dipped beam lights up.

3.2.8 Indicator unit

The layout and function of the control unit is described in this section. The detailed description of operation is to be found in the appropriate sections in the Chapter “Operation, handling”.

Design



b4670005

Indicator unit

- | | |
|--|---|
| 1 segment field – fuel supply | 5 symbol field – travel direction “forward” |
| 2 segment field – coolant temperature | 6 symbol field – travel direction “reverse” |
| 3 symbol field – battery charging (charge control) | 7 symbol field – hydraulic oil overheating |
| 4 symbol field – engine oil pressure | 8 symbol field – parking brake |

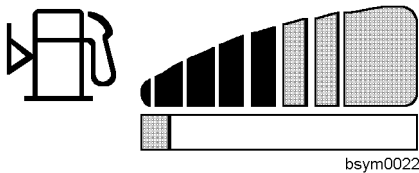
LBH/01/003801/0003/5.99/en

- | | | | |
|----|--|----|--|
| 9 | LC display – travel speed, op. hours, time | 16 | segment field – preglow monitor |
| 10 | symbol field – travel range -I- | 17 | symbol field – emergency steering |
| 11 | symbol field – travel range -II- | 18 | symbol field – driving light |
| 12 | symbol field – engine overheating | 19 | symbol field – braking system accumulator pressure |
| 13 | symbol field – special function | 20 | symbol field – direction indicator system |
| 14 | symbol field – safety belt | 21 | symbol field – air filter contamination |
| 15 | symbol field – working hydraulics lock | | |

The indicator 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. The appropriate colour (black) is assigned to each segment field. Each symbol field is assigned the appropriate colour (red, yellow, green or blue).

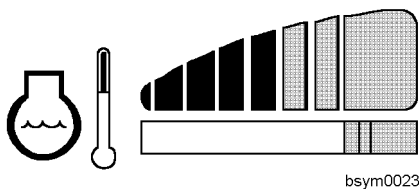
Function description

Fuel supply – displaying tank contents



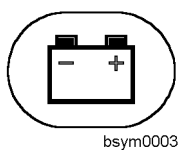
Segment field – fuel supply 1
 Segment field colour – black
 On the green bar underneath, the boundary range with reserve is marked in – red.
 Indicates the level of the diesel fuel tank.

Displaying coolant temperature



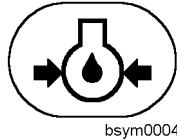
Segment field – coolant temperature 2
 Segment field colour – black
 On the green bar underneath, the boundary range when the temperature is too high is marked in – red.
 Indicates the coolant temperature.

Battery charging – displaying charging control



Symbol field – battery charging (charge control) 3
 Symbol field colour – red
 Warning functions:

- Illuminates when the ignition key is at the ignition position - I -. When the diesel engine has started, the symbol field goes out.
- Lights up when for example the V-ribbed belt of the dynamo drive tears.



bsym0004

Displaying or indicating engine oil pressure

Symbol field – engine oil pressure 4

Symbol field colour – red

Warning functions:

- Illuminates when the ignition 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. – **Condition:** Diesel engine is running.

The warning function of the symbol field is supported by an acoustic signal.



bsym0005

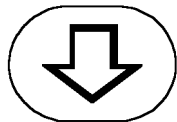
Displaying the travel direction “forward”

Symbol field – travel direction “forward” 5

Symbol field colour – green

displays the machine's preselected travel direction “forward”

Refer to the Section “LIEBHERR control lever”.



bsym0006

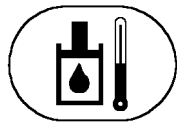
Displaying travel direction “reverse”

Symbol field – travel direction “reverse” 6

Symbol field colour – green

displays the machine's preselected travel direction “reverse”

Refer to the Section “LIEBHERR control lever”.



bsym0007

Displaying or indicating hydraulic oil overheating

Symbol field – hydraulic oil overheating 7

Symbol field colour – red

Lights up when the hydraulic oil temperature is too high.

The warning function of the symbol field is supported by an acoustic signal.

When the symbol field lights up:

- 1 the travel range is automatically switched back to - I -,
- 2 the symbol fields – travel range - I - and - II - illuminate.



bsym0008

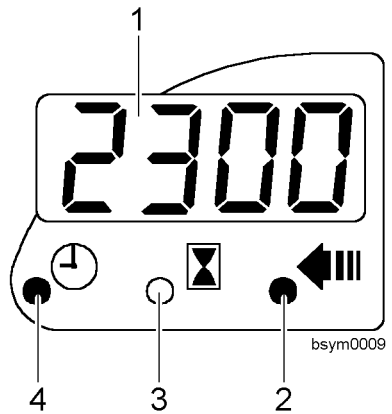
Displaying parking brake – activation

Symbol field – parking brake 8

Symbol field colour – red

Warning functions:

- Lights up when ignition key is turned to ignition, run, preglow position - I -.
- Lights up when the parking brake is engaged.
When the parking brake is released, the symbol field goes out.



LC display

Displaying speed, operating hours or time

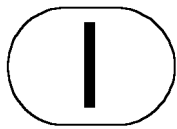
LC display – speed, operating hours or time 1

Field colour – yellow (with backlighting)

Display functions:

- LED 2 – displays the machine's travel speed,
- LED 3 – shows the machine operating hours,
- LED 4 – displays the time.

Setting: See the Section “Switches in the side cover (control console)”.



bsym0010

Displaying travel range - I -

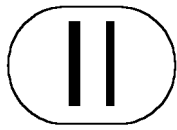
Symbol field – travel range -I- 10

Symbol field colour – green

displays the machine's preselected travel direction - I -.

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

Refer to the Section “LIEBHERR control lever”.



bsym0011

Displaying travel range - II -

Symbol field – travel range -II- 11

Symbol field colour – green

displays the machine's preselected travel range - II -.

Illuminates when the ignition key is in position - I - and when the engine starts up.

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

Refer to the Section “LIEBHERR control lever”.



bsym0012

Displaying or indicating engine overheating

Symbol field – engine overheating 12

Symbol field colour – red

Warning functions:

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

The warning function of the symbol field is supported by an acoustic signal.



bsym0013

Special function

Symbol field – special function 13

is not assigned. Symbol field colour – red

Reserved for special function.



bsym0014

Safety belt – Usage instruction

Symbol field – safety belt 14

Symbol field colour – yellow

Display function:

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



bsym0015

Displaying working hydraulics lock – activation

Symbol field – working hydraulics lock 15

Symbol field colour – yellow

Lights up when the working hydraulics lock is activated.



bsym0016

Preglow monitoring

Segment field – preglow monitor 16

Symbol field colour – yellow

Function:

- 1 At external temperature of 0 °C and below.
- Lights up when ignition key turned to ignition, run, preglow position - I -.

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



bsym0017

Displaying or indicating emergency steering

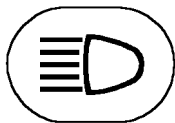
Symbol field – emergency steering 17

Symbol field colour – red

Warning functions:

- Lights up when ignition key turned to ignition, 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 approx. 30 seconds.

See the section “Switches in the side cover (control console)”.



bsym0018

Displaying driving light – activation

Symbol field – driving light 18

Symbol field colour – blue

Lights up when the driving light is activated.



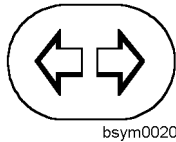
bsym0019

Displaying or indicating braking system – accumulator pressure

Symbol field – braking system accumulator pressure 19

Symbol field colour – red

NOTE: Symbol field is not active



bsym0020

Displaying direction indicator system – activation

Symbol field – direction indicator system 20

Symbol field colour – green

Display functions:

- Flashes when the steering column switch is turned to display the travel direction.
- Flashes when the hazard warning system is activated.



bsym0021

Displaying air contamination

Symbol field – air filter contamination 21

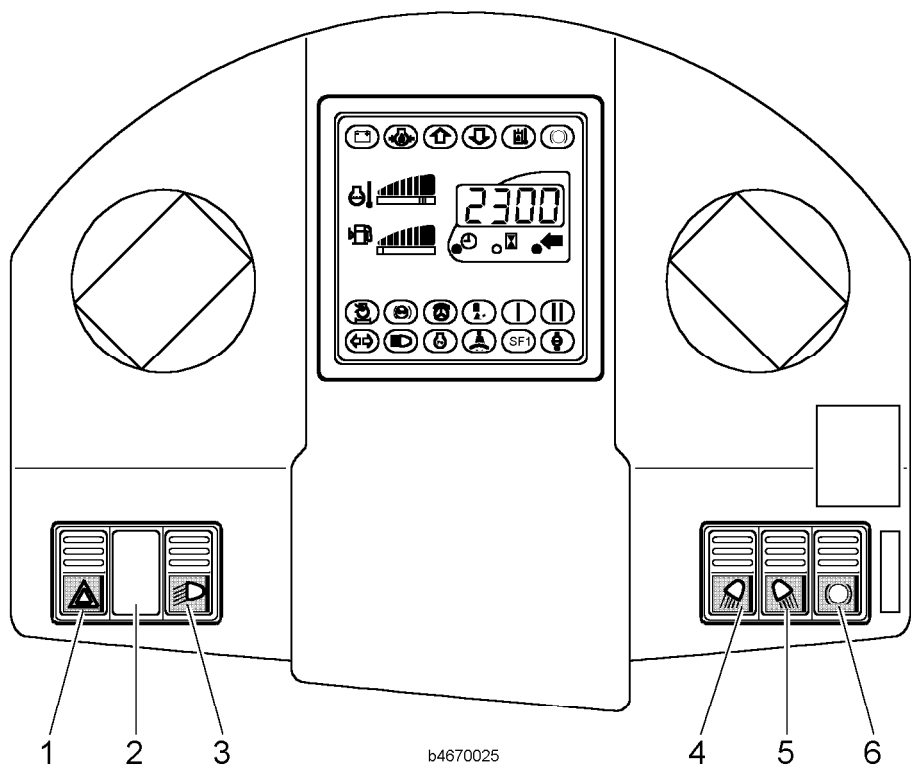
Symbol field colour – yellow

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

3.2.9 Switches on the instrument panel

The layout and function of the switches is described in this section. The description of operation is to be found in the appropriate sections in the Chapter “Operation, handling”.

Design



b4670025

Switches on the instrument panel

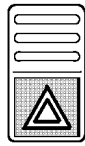
- | | |
|--|---|
| 1 switch – hazard warning system | 4 switch – working flood-lights/front |
| 2 dummy plug | 5 switch – working flood-lights/rear (Option) |
| 3 switch – parking light/driving light | 6 switch – parking brake |

LBH/01/003801/0003/5.99/en

The switches are integrated in the instrument panel.

Function description

Switching on the hazard warning system



b4670027

Switch – hazard warning system 1

Field colour – red

For switching the hazard warning system ON or OFF.

When the switch is activated:

- 1 if the symbol field – hazard warning system is flashing, all flashing lights on the machine are flashing,
- 2 if the symbol field – hazard warning system goes out, all flashing lights on the machine are extinguished.

Dummy plug



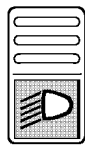
b4670028

Dummy plug 2

is not assigned.

reserved for special functions.

Switching on parking or driving light



b4670029

Switch – parking light/driving light 3

Symbol field colour – green

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

- 1 For switching the parking light ON or OFF.

After the switch has been turned to level - I -, the following lights on the machine must light up:

- Driving headlamps – left/right (sidemarker lamp)
- Tail lamps – left/right

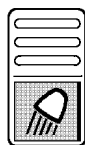
Function for driving light – switch/level - II -:

- 1 To turn the driving light ON or OFF.

After the switch has been turned to level - II -, the following lights on the machine must light up:

- Driving headlamps – left/right
- Tail lamps – left/right

Switching on the working floodlights/front



b4670030

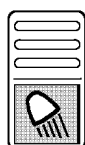
Switch – working floodlights/front 4

Symbol field colour – orange

To turn the working floodlights/front ON or OFF.

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

Switching on the working floodlights/rear (Option)



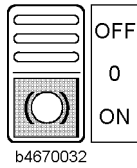
b4670031

Switch – working floodlights/rear 5 – optional

Symbol field colour – orange

To turn the working floodlights/rear ON or OFF.

When the button is pressed – the working floodlights/rear go out.



Engaging/releasing the parking brake

Switch – parking brake 6

Field colour – red

To engage or release the parking brake.

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

When the switch is pressed, the parking brake is engaged – released.

Key function – position “OFF”:

- 1 When the switch is pushed to the “OFF” position, the parking brake is released.
- 2 When the switch is pushed to the “OFF” position, the direction of motion is changed to neutral.

Central position – 0:

- 1 The selection of driving functions is possible in this position.
Refer to the Section “Driving mode”.

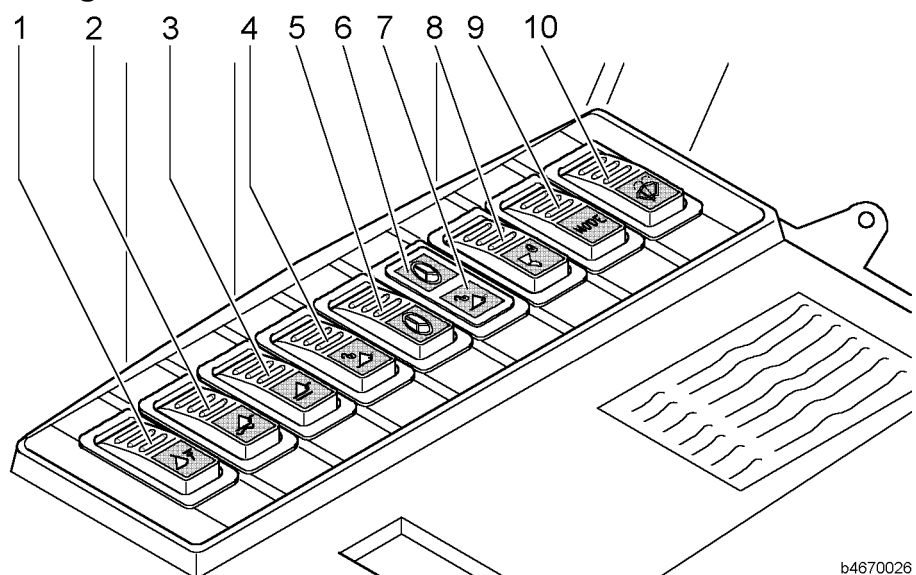
Key function – position “ON”:

- 1 After switching to the “ON” position, the parking brake is engaged.
- 2 When the switch is pushed to the “ON” position, the direction of motion is turned to neutral.

3.2.10 Switches on the side cover (control console)

The layout and function of the switches is described in this section. The description of operation is to be found in the appropriate sections in the Chapter “Operation, handling”

Design



Switches on the side cover

- | | |
|---------------------------------|---|
| 1 switch – lifting limit switch | 4 switch – hydraulic quick-change device (optional) |
| 2 switch – float position | 5 button – emergency steering |
| 3 switch – bucket return-to-dig | |

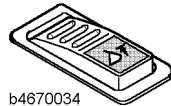
LBH/01/003801/0003/5.99/en

- | | |
|---|--|
| 6 pilot lamp – emergency steering “check” | 8 working hydraulics lock – switch |
| 7 pilot lamp – hydraulic quick-change device (optional) | 9 button – “MODE” |
| | 10 switch – window wiping and washing system – rear window |

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

Function description

Activating – deactivating lifting limit switch



b4670034

Switch – lifting limit switch 1

Field colour – white

For switching the automatic lifting limit switch function ON or OFF.

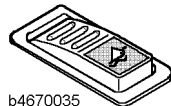
This function is not available until the engine is started.

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

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

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

Activating – deactivating the float position



b4670035

Switch – float position 2

Symbol field colour – green

For switching the float position function ON or OFF.

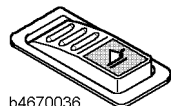
This function is not available until the engine is started.

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

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

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

Activating – deactivating bucket return-to-dig



b4670036

Switch – bucket return-to-dig 3

Symbol field colour – green

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

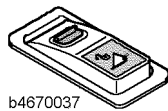
This function is not available until the engine is started.

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

The “LIEBHERR control lever” is kept in the position – “Tip bucket up” by magnetic force.

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

Activating – deactivating hydraulic quick-change device (Option)



b4670037

Switch – hydraulic quick-change device 4 – optional with Z-bar lift arms

Switch – hydraulic quick-change device 4 – standard equipment with P-lift arms

Field colour – red

When 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 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

Button – emergency steering 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 repeat started by keeping the button pressed down.

Continuous operation of the emergency steering pump results in overheating of the pump motor! The thermostat switch integrated in the pump motor, automatically switches the emergency steering pump off.

Also refer to the Section “Towing the machine when the steering system has broken down”.

Displaying or indicating emergency steering

Pilot lamp – emergency steering “check” 6

Field colour – red

Function:

- 1 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.

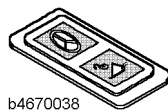
Warning functions:

- 1 If the emergency steering pump “Check” is unsuccessful, the pilot lamp remains illuminated until the ignition is switched off.

Switch off the engine and check the cause: Consult LIEBHERR CUSTOMER SERVICE.

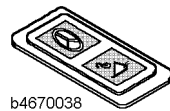


b4670033



b4670038

Displaying or indicating hydraulic quick-release device (Option)



b4670038

Pilot lamp – hydraulic quick-change device 7 – optional with Z-bar lift arms
 Pilot lamp – hydraulic quick-change device 7 – standard equipment with P-lift arms

Field colour – red

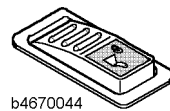
For pressure monitoring (5 bar), for “Lock” function of the hydraulic quick-change device.

Warning functions:

- 1 Lights up with engine standstill, when the ignition key is in operating position - I -.
 - 2 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 lock



b4670044

Switch – working hydraulics lock 8

Symbol field colour – orange

For locking or releasing the working hydraulics functions.

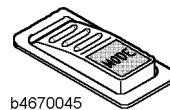
Switch function:

- 1 When the switch is pressed, the working hydraulics lock is activated – deactivated.
- Also refer to the Section “Operation” under “Working with the attachment”.

Key function when ignition switched off:

- 1 When the button is pressed and the LH control lever is simultaneously pushed in direction - **b** - (lower), the lift arms can be lowered.
- Also refer to the Section “LIEBHERR control lever”.

Switching over the “MODE” – LCD



b4670045

Button – “MODE” 9

Symbol field colour – green

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

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

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

Adjustment of the clock:

- 1 Keep button – “MODE” 9 pushed down until the required time is displayed.

Switching on or off the window wiping and washing system – rear window on or off



b4670046

switch – window wiping and washing system – rear window 10

Symbol field colour – green

For switching ON or OFF the window wiping and washing system for the rear window.

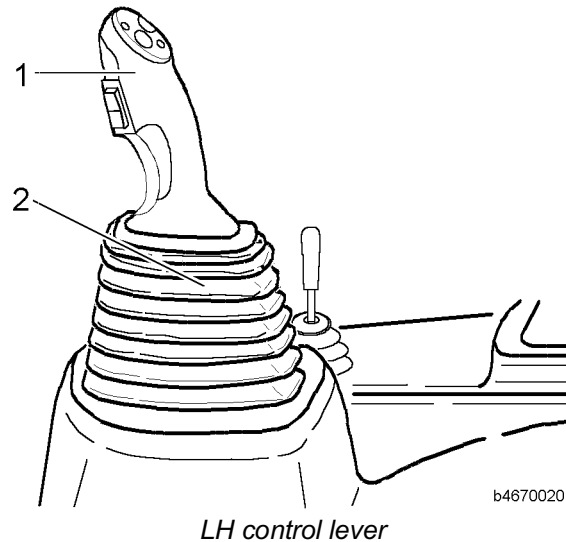
Switch function:

- 1 Switch – position 1 is wipe
- 2 Switch – position 2 is additional washing

3.2.11 LIEBHERR control lever

The travel ranges, travel directions and movements of the working attachment are controlled by the "LIEBHERR control lever" (LH control lever).

Design



1 drive switch

2 lever – pilot control device

The LH control lever consists the control elements for shifting the travel range, the travel direction and operating the working attachment.

Drive switch for travel range and travel direction

Function description

Basic function

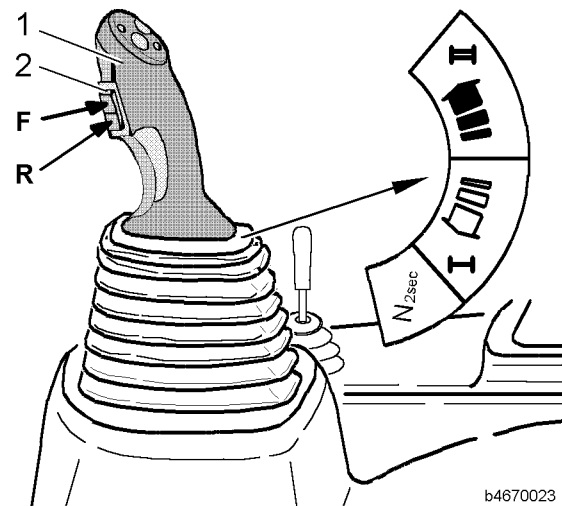
After the electrical system is turned on, travel range - II - is automatically activated.

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

Shifting travel ranges

The travel ranges are selected by jogging the drive switch 1 to the left or right as appropriate.

Also refer to the Section "Driving mode".



LH control lever

- | | | | |
|---|--|---|-----------|
| 1 | drive switch for shifting travel range | F | F orward |
| 2 | rocker switch for travel direction | R | R erverse |

Functions of the drive switch 1 :

- by jogging in direction - I -, the travel range is shifted down to - I -.
- by jogging in direction - II -, the travel range is shifted up to - II -.

Function – neutral selection:

- 1 When the drive switch 1 is held in the direction - N -, the travel direction is switched to the neutral position - N -, after approx. 2 seconds.

Functions of the rocker switch 2 :

- F is travel direction – F orward
- R is travel direction – R erverse

The preselected travel direction as well as the selected travel range are displayed on the instrument panel in the indicator unit by means of symbol fields.

Refer to the Section “Indicator unit”.

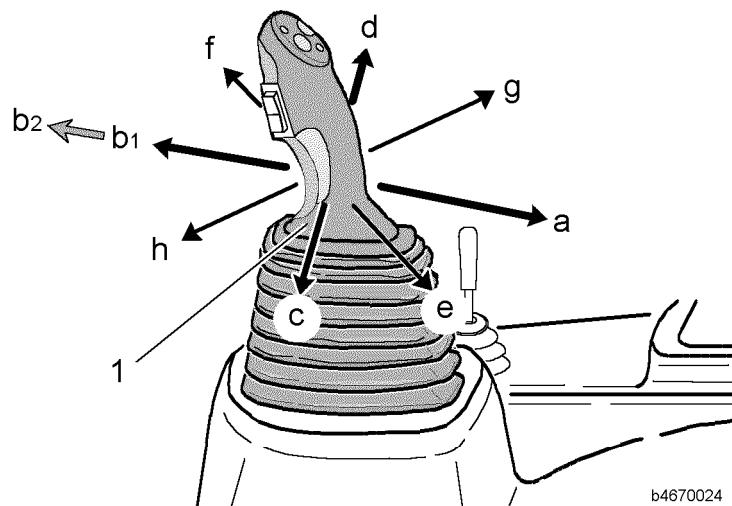
LH control lever for controlling the working attachment

Design

The connection between the grip of the LH control lever and the underlying pilot control device is established by a rod.

Function description

Also refer to Section “Working with the attachment”.



Movement directions of the LH control lever

- | | |
|-------------------------------|----------------|
| a reverse | c to the left |
| b1 forward up to action point | d to the right |
| b2 forward up to the stop | e-h diagonal |

The working attachment is controlled by moving the LH control lever 1 .
 The movement directions of the LH control lever and the resulting functions:

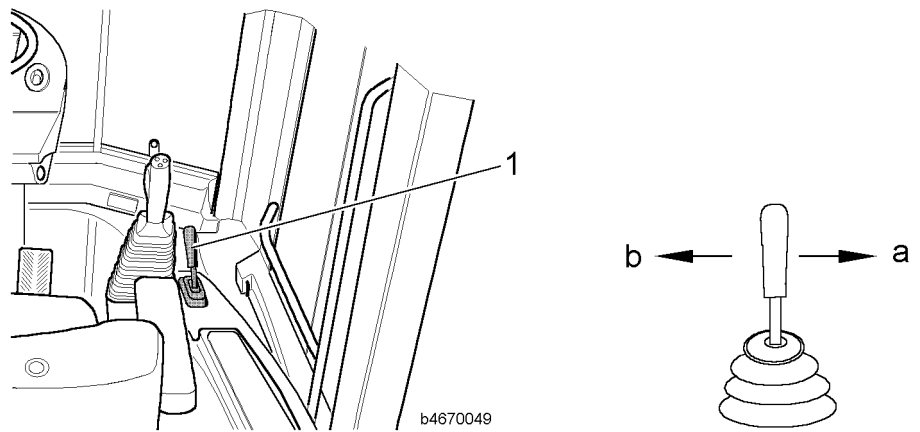
- a – Lift arms are raised,
- b1 – “Normal lowering function” – lift arms are lowered,
- b2 – “Float position function” – lift arms move to float position,
- c – Bucket is tipped up,
- d – Bucket is tipped down,
- e – The lift arms are raised and the bucket is simultaneously tipped up,
- f – The lift arms are lowered and the bucket is simultaneously tipped down.
- g – The lift arms are raised and the bucket is simultaneously tipped down,
- h – The lift arms are lowered and the bucket is simultaneously tipped up.

3.2.12 Control lever for additional working functions (optional)

Henceforth it will be referred to as the additional control lever. The additional control lever is built into the control panel to the right of the LH control lever.

Function description

If an optional attachment with independent control circuit is built onto the lift arms, then this will be controlled by the additional control lever.



Movement directions of the additional control lever

a – backwards

b – forwards

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

The movement directions of the additional control lever and the resulting functions:

a – (function depends on the type of optional attachment mounted),

b – (function depends on the type of optional attachment mounted),

Familiarise yourself with the operation of the built-on optional attachment!

3.2.13 Heating, ventilation, air-conditioning (Option)

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

The driver's cab may also be equipped with an air-conditioning system.

Switching the heating system on/off

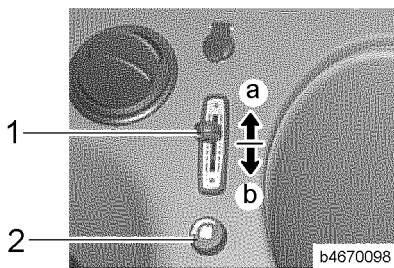
Control elements for the heating:

1 – slider – temperature control

2 – rotary switch – blower

Make sure:

- the machine electrical system is switched on.
- the outlet nozzles for the required air stream are open.
e.g. to the body, front windscreen, rear window.

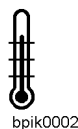


- Switching on the heating: Turn rotary switch 2 to level 1.

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

- The temperature can be continuously adjusted: The blue range is cold – The red is warm.

Regulating the temperature: Push slider 1 to the required position.



Regulating the blower

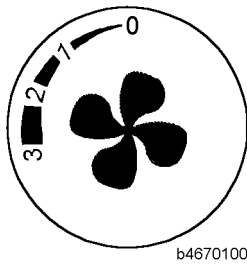
The blower is switched on/off with the blower rotary switch 2 .

Blower levels:

- Level 0 – position – OFF
- Level 1 – gentle air flow
- Level 2 – medium air flow
- Level 3 – strong air flow

- Turn rotary switch 2 to the required level.

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



b4670100

Regulating air supply

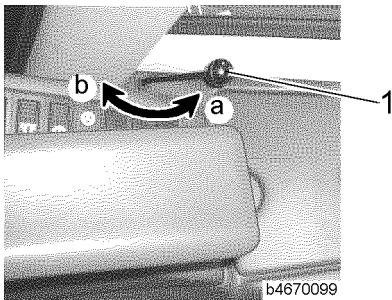
The lever for air vent adjustment is mounted behind the driver's seat on the right.

lever – air vent adjustment 1

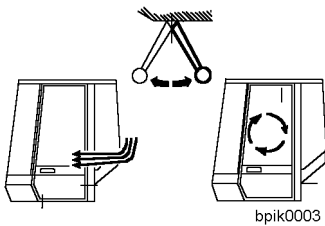
Lever settings:

- Position a – Recirculated air
- Position b – Fresh air

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



b4670099

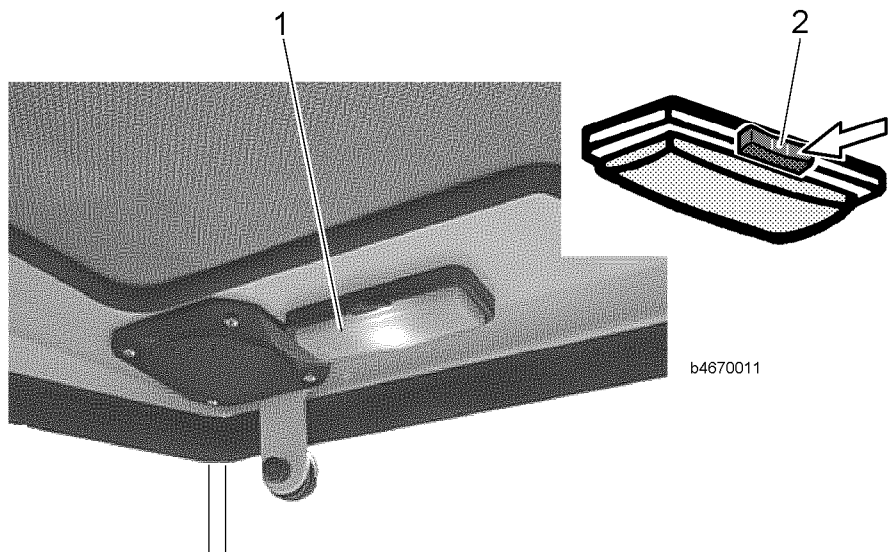


bpik0003

3.2.14 Cab internal illumination

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

Switching the internal illumination on/off



b4670011

Internal illumination

1 internal illumination

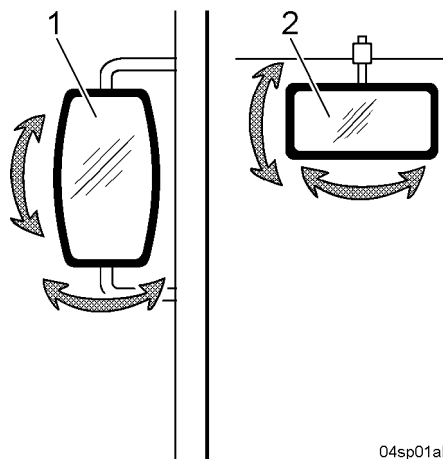
2 switch

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

3.2.15 Inside and outside mirrors

The driver's cab is equipped with an inside and two outside mirrors.

Adjusting the mirrors



04sp01ab

Adjustment — mirrors

1 outside mirror

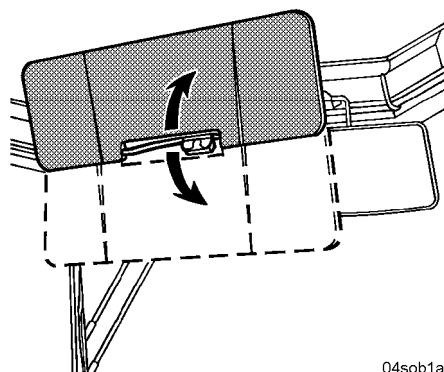
2 interior mirror

- Individually adjust all mirrors by turning them.

3.2.16 Sun visor

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

Adjustment of sun visor



04sob1ab

Adjustment — sun visor

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

3.2.17 Electrical window wiping and washing system

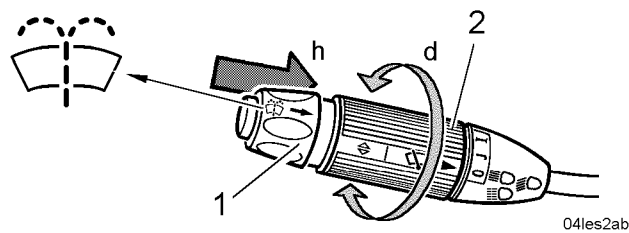
Design

The machine is equipped with an electrical window wiping system for the front and rear windows.

Essentially it consists of the control elements, the window wipers, the container and the outlet nozzles for the washing agent.

Before switching on the window wiping and washing system, make sure that the machine electrical system is switched on.

Operating the window wiping and washing system – front window



Steering column switch

- 1 button
- 2 handle

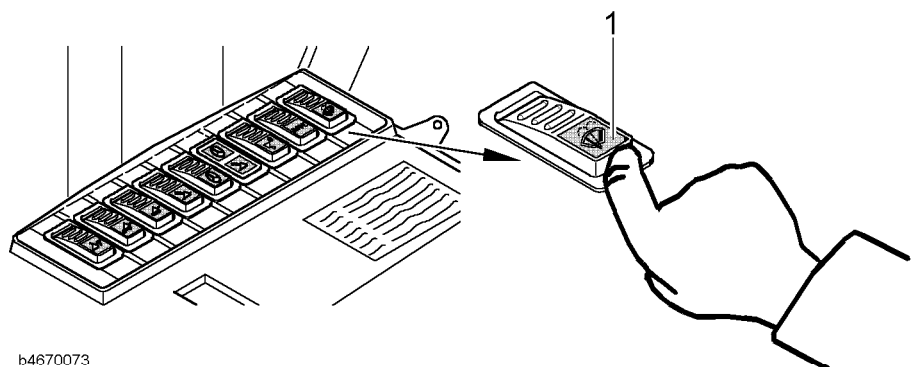
- h actuation – window wiping and washing system
- d actuation – window wipers

- Wiping windows: Turn the handle 2 to the required level J – I – II.
- Washing windows: Press button 1 on the steering column switch.

Washing solution is sprayed onto the front windscreen by each outlet nozzle.

Operating the window wiping and washing system – rear window

The window wiping and washing system is activated by pressing the switch 1.



Switches on the side cover

- 1 switch – window wiping and washing system – rear window

- Wiping windows: Press switch 1 first time. The rear window – wiper is activated.

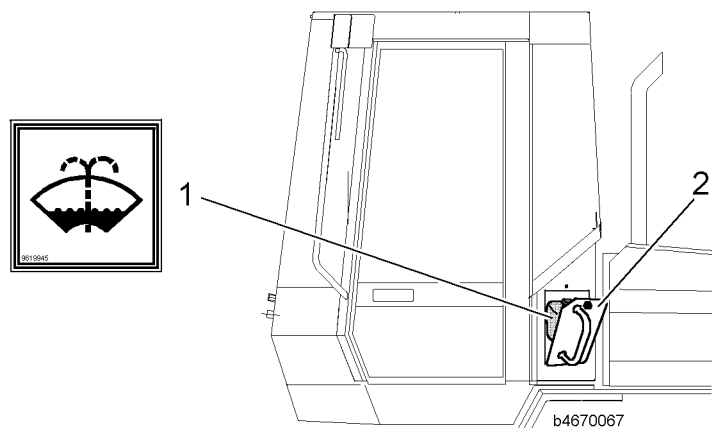
- Wiping and washing window: press the switch 1 a second time and keep it pressed down.

Washing solution is sprayed onto the rear window via an outlet nozzle.

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

3.2.18 Container for windscreen washing solution

Design



Container – windscreen washing solution

1 container with filling inlet

2 cover

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

Topping up windscreen washing solution

Filling quantity approx. 3.5 litres.

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

Caution 

Risk of damage to the windscreen wiping and washing system from ice! Icing up can result in the breakdown or damage to the windscreen wiping and washing system. An opaque front or rear windscreen is a safety risk!
! It is essential to protect the windscreen wiping and washing system from ice build-up!



04sy02ab

- Use commercially available windscreen frost protection.
- Before the cold season starts, top up with an appropriate quantity of anti-freeze.

3.3 Handling

3.3.1 Daily start up routine

Before starting up the machine each day, the “(daily) maintenance jobs should be carried out every 10 operating hours”. Refer to the Section “Maintenance”.

After the “maintenance jobs (daily / every 10 operating hours)” have been completed, the machine should be moved into the operating position. Refer to the Section “Operating position”.

At the start of each working day before starting up the machine, make sure that the “maintenance jobs (daily / every 10 operating hours)” have been carried out.

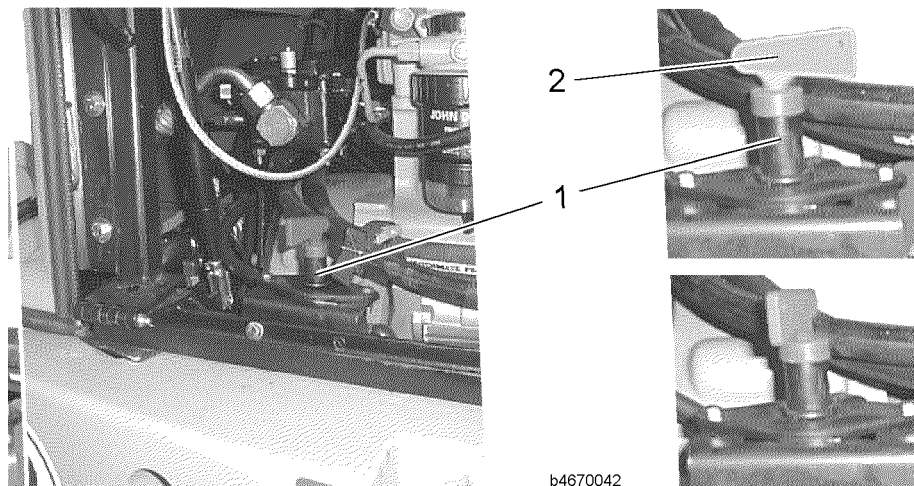
Operating position

This is how to bring the machine into the operating position.

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”.



Main battery switch

1 main battery switch

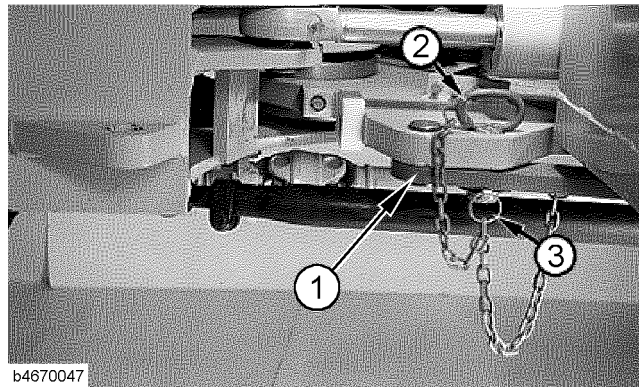
2 main switch key

Closing service doors, hatches and hoods

- Turn on the main battery switch.
- Close all service doors, hatches and hoods and where possible lock them.

Releasing the articulated joint lock

When the articulated joint lock is installed, no steering functions are possible.



b4670047

Articulated joint lock

1 locking bar
2 pin

3 spring clip

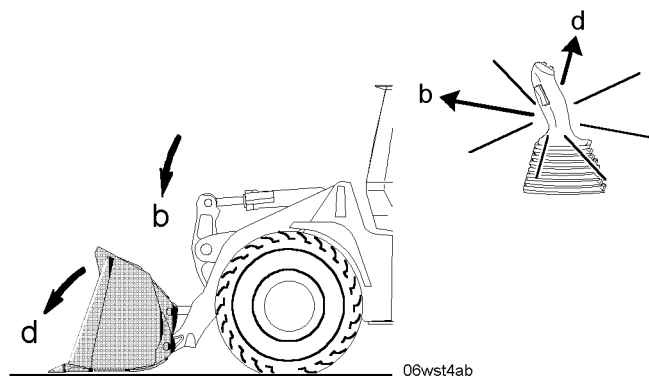
Warning

Risk of accidents when steering is blocked!
When the articulated joint lock is installed, no steering functions are possible.

! Release the articulated joint lock

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

Moving the working attachment to the starting position

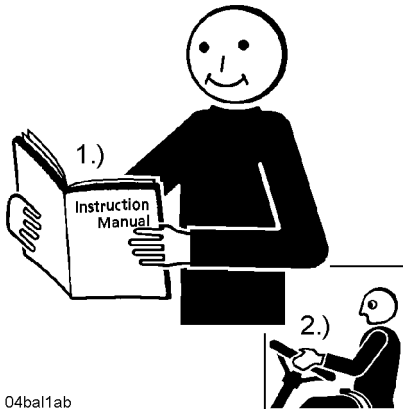


06wst4ab

Starting position

- Set down the bucket flat on the ground.
The machine is ready for operation.

3.3.2 Starting the diesel engine



04ba1ab

Operating manual

- 1.) first read and understand
- 2.) then drive and work

Only ever operate the machine, when you have read and understood the Operating 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

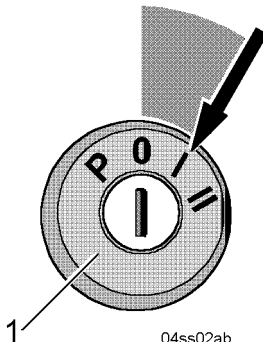
The following precautions should be taken before starting the machine. Make sure previously that the machine is in its operating position. Refer to the Section "Operating position".

Starting procedure

Lamp check

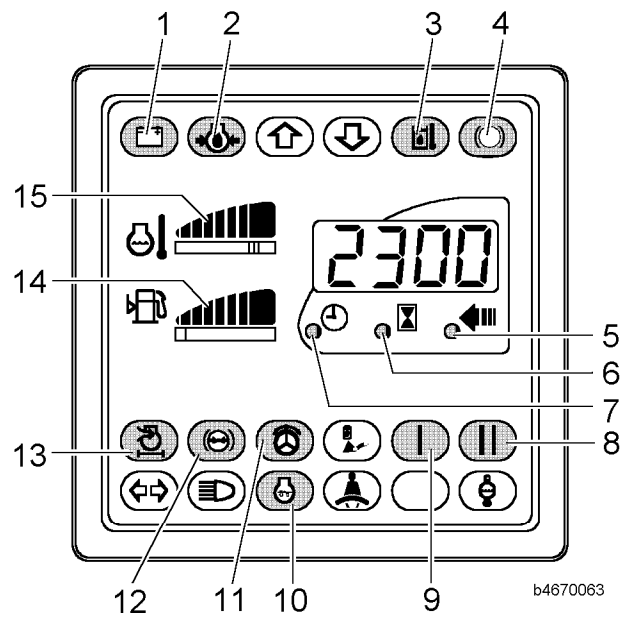
During a "lamp check", the following symbol fields are checked by the control electronics.

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



04ss02ab

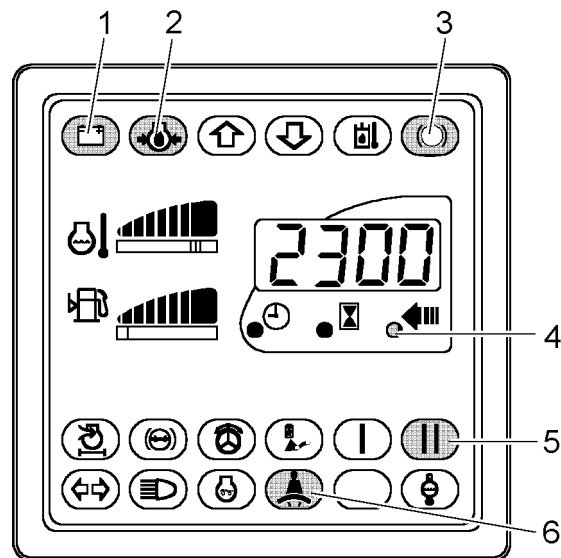
The following symbol fields only briefly light up (duration approx. 2.5–3 secs):



indicator unit – lamp check

- symbol field – battery charging (charge control) 1
- symbol field – engine oil pressure 2
- symbol field – hydraulic oil overheating 3
- symbol field – parking brake 4
- LED – travel speed 5
- LED – operating hours 6
- LED – time 7
- symbol field – travel range - II - 8
- symbol field – travel range - I - 9
- segment field – preglow monitor 10
- symbol field – emergency steering 11
- symbol field – braking system accumulator pressure 12
- symbol field – air filter contamination 13
- segment field – fuel supply 14
- segment field – coolant temperature 15

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



b4670064

indicator unit – lamp check

- symbol field – battery charging (charge control) 1
- symbol field – engine oil pressure 2
- symbol field – parking brake 3
- LED – travel speed 4
- symbol field – travel range - II - 5
- symbol field – safety belt 6 starts flashing.

Preheating the engine

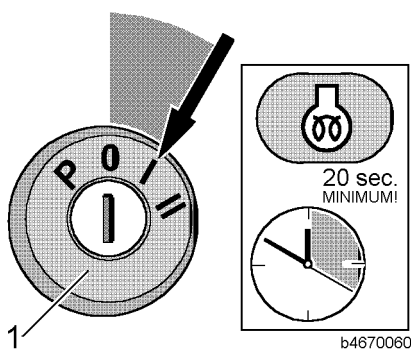
The preglow time depends on the actual ambient temperature and the electrical starting conditions.

It lasts 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.

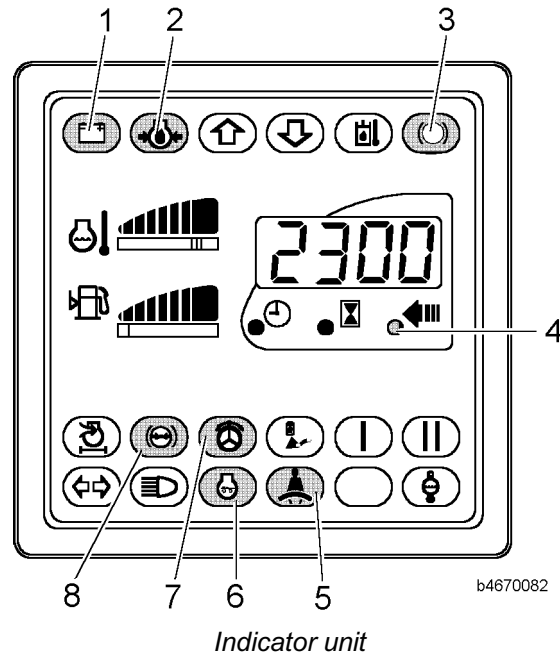
- Switch on the electrical system by turning the ignition key to position - I -.



b4670060

Starter switch – contact- preglow position

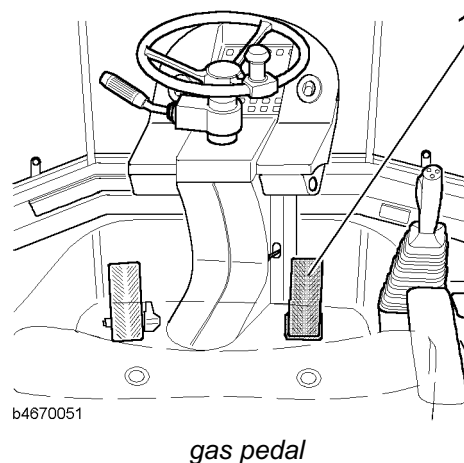
The following symbol fields must light up:



- symbol field – battery charging (charge control) 1
- symbol field – engine oil pressure 2
- symbol field – parking brake 3
- LED – travel speed 4
- symbol field – safety belt 5 starts flashing.
- segment field – preglow monitor 6
- symbol field – emergency steering 7
- symbol field – braking system accumulator pressure 8

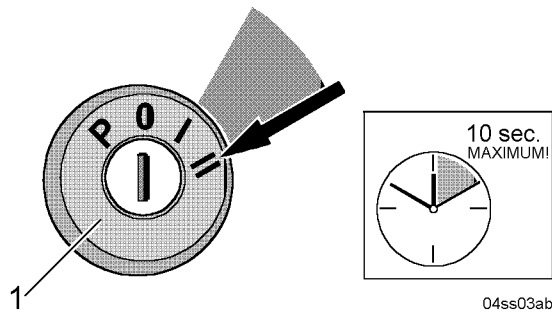
Starting the engine

- 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. It lasts at least 20 seconds and when ambient temperatures are extremely low it can last over 120 seconds. The engine can now be started.



- To adjust the engine speed, push the gas pedal 1 about 3/4 of the way down.

LBH/01/003801/0003/5.99/en



Starter switch – starting position

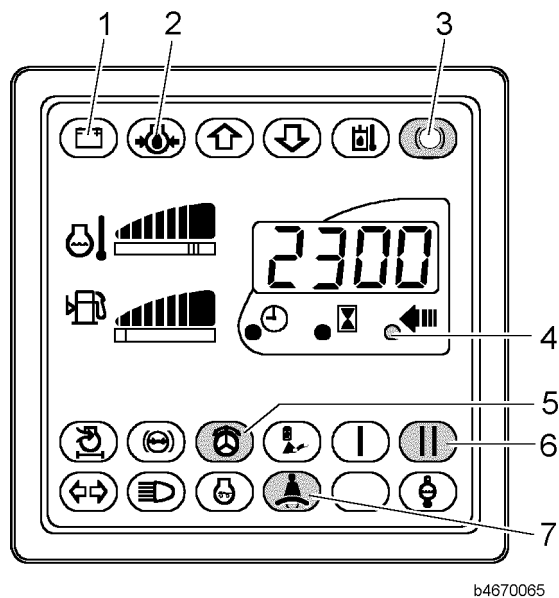
- Turn the ignition key to the starting position - II - and keep it in this position until the engine starts.
- **Do not attempt to start the engine for longer than 10 seconds without interruption.**
- If the engine does not cut in:
Turn the ignition key back to the 0-position.

Trouble shooting

Does the engine not start?

- Repeat the starting procedure after a break of 120 seconds.
- If the engine does not cut in after two start attempts, find the cause in accordance with the malfunction chart (refer to the Section “Malfunctions”) and rectify it.

- As soon as the engine starts running, release the ignition key. The ignition key returns automatically to the operating position. When the engine cuts in, the following symbol fields must go out:



Indicator unit

symbol field – battery charging (charge control) 1
 symbol field – engine oil pressure 2

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

symbol field – parking brake 3
 LED – travel speed 4
 symbol field – emergency steering 5
 symbol field – travel range - II - 6
 symbol field – safety belt 7 flashes for about 15 secs.

Trouble shooting

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

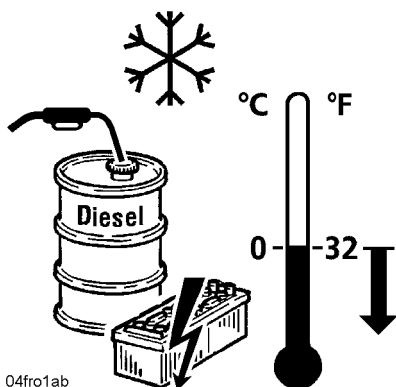
- Shut down the engine and rectify the problem in accordance with the Section “Malfunctions”
- Adjust the engine speed with gas pedal.

Precautions when starting at temperatures below freezing

The following measures improve the starting performance at low temperatures.

Precautions:

- Check battery charging, if necessary recharge the battery.
- Use special winter fuel.
 Refer to the Section “Lubricants and operating materials” under Winter operation.



04fro1ab

Winter operation

Warning



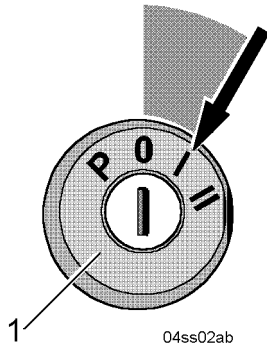
Risk of explosion with the diesel engine!

There is a risk of explosions, when using volatile fluids for starting the 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



Situation after the electrical system is switched on:

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

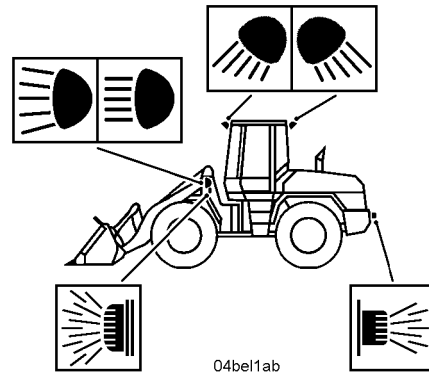
Preparations for driving mode

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

Make sure previously that the machine is in its operating position.

Refer to the Section "Operating position".

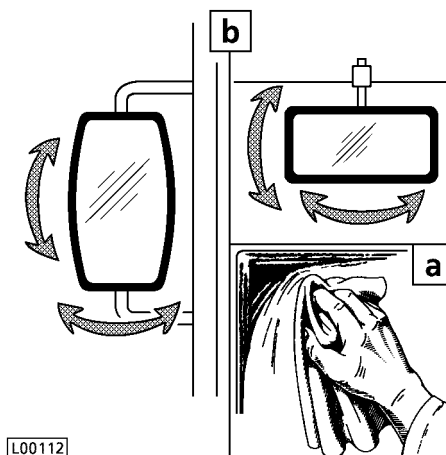
Checking the lighting equipment



Headlamp adjustment

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

Checking inside and outside mirrors



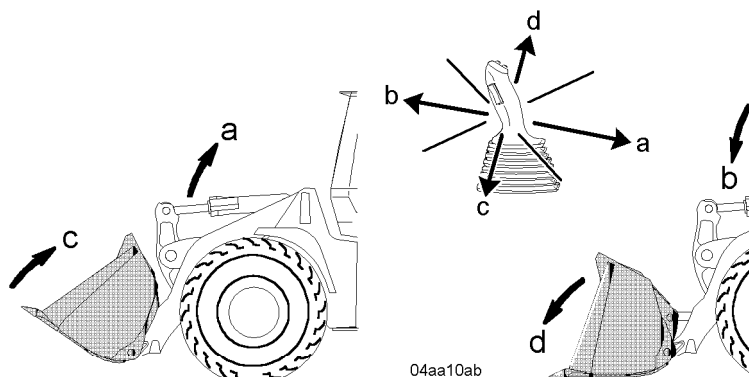
L00112

Inside and outside mirrors

- Clean the inside and outside mirrors.
- Adjust the inside and outside mirrors.

Moving the working attachment into position

You will find detailed information on this in the Sections “LIEBHERR control lever” or “Working with the attachment”.



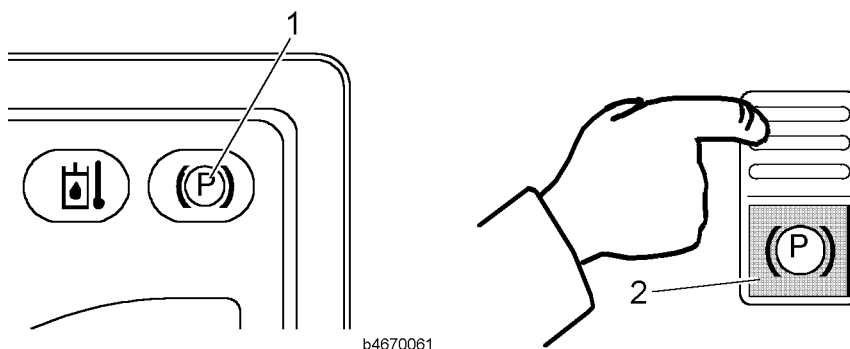
04aa10ab

Bucket position

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

Releasing the parking brake

When the parking brake is engaged, the driving block is active. Preselection of the travel direction is not possible!



b4670061

Indicator unit and switch – parking brake

- 1 symbol field – parking brake 2 switch – parking brake

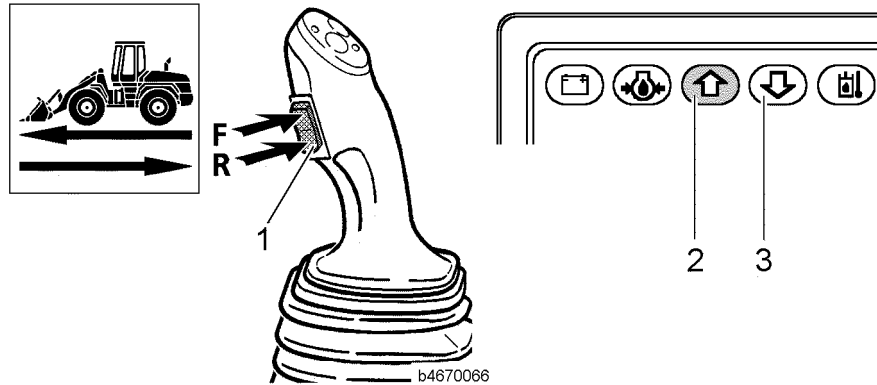
LBH/01/003801/0003/5.99/en

- Release the parking brake: to do this push the switch 2 back.
The symbol field 1 for the parking brake goes out.

Preselection of travel direction

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

The travel direction forward or reverse is preselected by pressing the rocker switch in the appropriate direction.



Rocker switch and indicator unit

- | | |
|--------------------------------------|-----------------------------------|
| 1 rocker switch for travel direction | 3 symbol field – travel direction |
| 2 symbol field – travel direction | “reverse” |
| “forward” | |

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

or

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

Depending on the switch position, the symbol field for Forward drive 2 or for Reverse drive 3 lights up.

Selection of travel ranges:

After the electrical system is turned on, travel range - II - is automatically activated. It is not possible to shift to another travel range until the travel direction has been selected.

The travel ranges are selected with the drive switches for travel range and travel direction. Also refer to the Section “LIEBHERR control lever”.

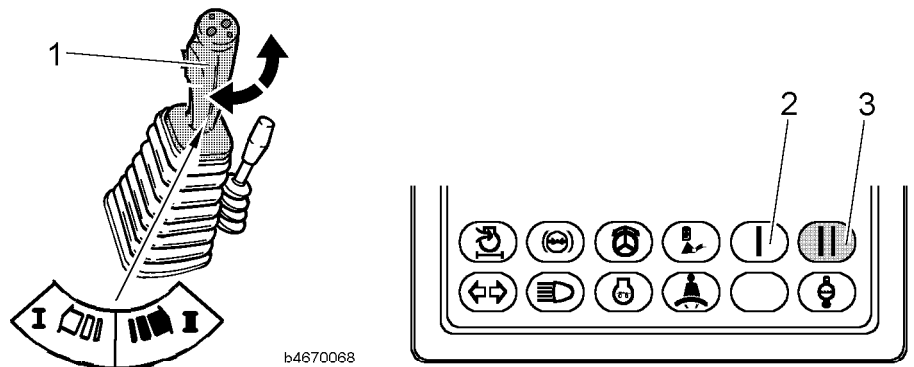
The selected travel range is shown on the instrument panel in the indicator unit. Also refer to the Section “Indicator unit”.

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

The following travel ranges can be selected:

- Travel range - I - for slow travel (e.g. on steep terrain).
- Travel range - II - for normal working operation.

Travel speeds: Refer to the Section “Technical data”.



b4670068

Drive switch for shifting travel range

- 1 drive switch
- 2 symbol field – travel range - I -
- 3 symbol field – travel range - II -

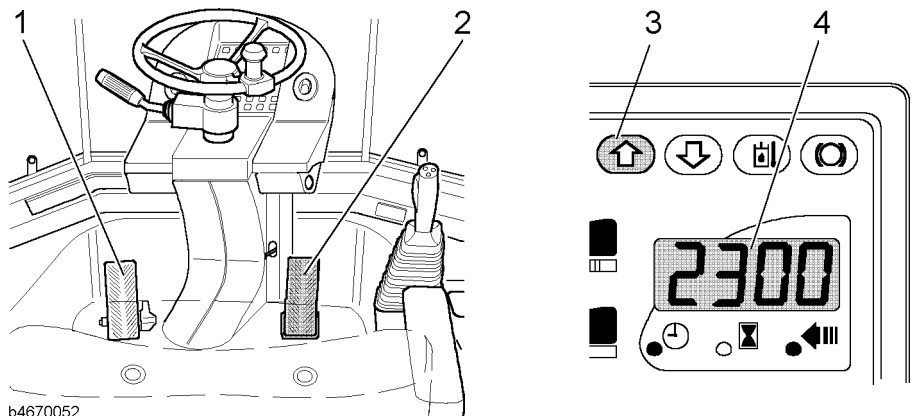
- Jog the drive switch 1 to travel range - I - or - II -, depending on how the machine is being employed.

The selected travel range is indicated with the symbol fields 2, 3 in the indicator unit.

Moving off

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

Make sure that the preparations for driving mode have been carried out.



b4670052

Gas pedal and travel speed indicator

- 1 BRAKE- / inch pedal
- 2 gas pedal
- 3 symbol field – travel direction
- 4 LCD – travel speed

- Push down the gas pedal 2 .

The machine moves off.

- Adjust the travel speed with the gas pedal.

The actual travel speed is displayed in the LCD – travel speed 4 .

The prerequisite is that the button – “MODE” is switched to the travel speed display.

Also refer to the section “Switches on the side cover (control console)”.

Driving

You will find appropriate descriptions of work operations, driving, transport and transferring bulk material in the Section "General working methods". Shortly after moving off with the machine, make sure that the steering and brakes are functioning properly.

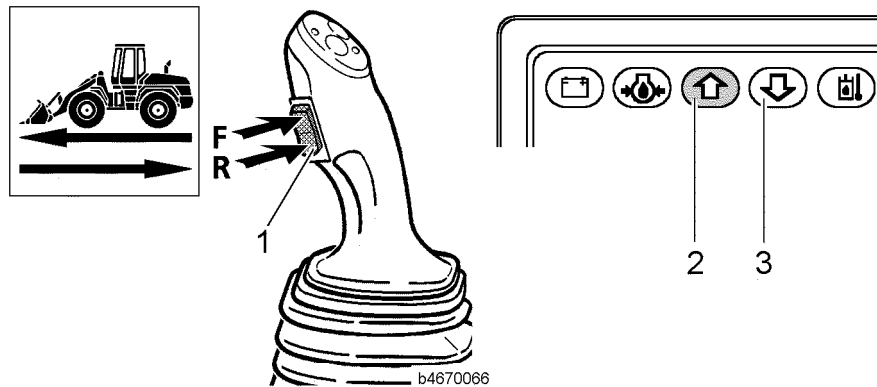
Refer to the Section "Maintenance".

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.

This produces a smoother reversing performance.

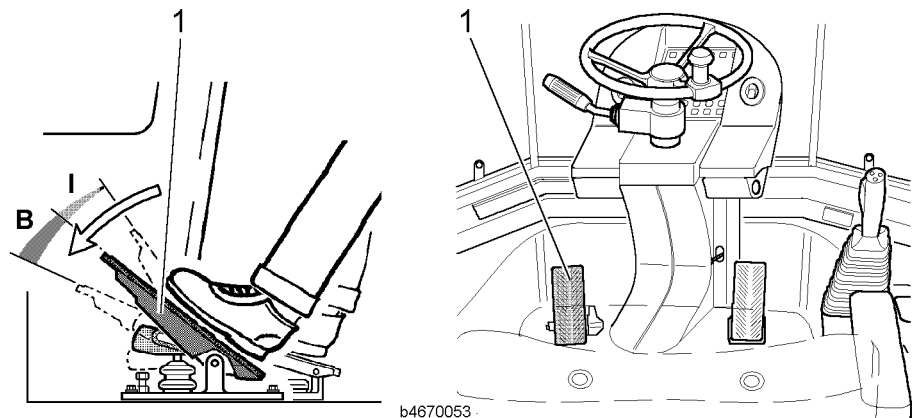


Rocker switch and indicator unit

- 1 rocker switch for travel direction
- 2 symbol field – travel direction "forward"
- 3 symbol field – travel direction "reverse"

- Changing travel direction: Press rocker switch 1 .

Depending on the switch position, the symbol field for Forward drive 2 or for Reverse drive 3 lights up.



INCH- /brake pedal

Reversing can be supported by reducing the diesel engine speed or by gently pressing the INCH- /brake pedal.

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

This produces a smoother reversing performance.

LBH/01/003801/0003/5.99/en

Driving on public roads

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

Obtain information about the applicable safety regulations before driving on public roads.

Refer to the Sections:

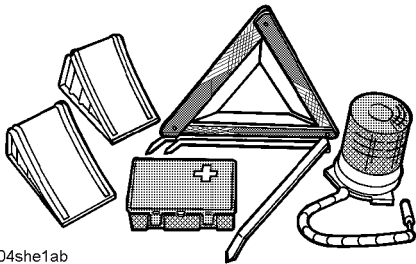
- “Safety instructions for driving on slopes”
- “Instructions for safe working”

Make sure that the preparations for driving mode have been carried out.

Refer to the Section “Preparations for driving mode”.

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

Preparations for driving on public roads

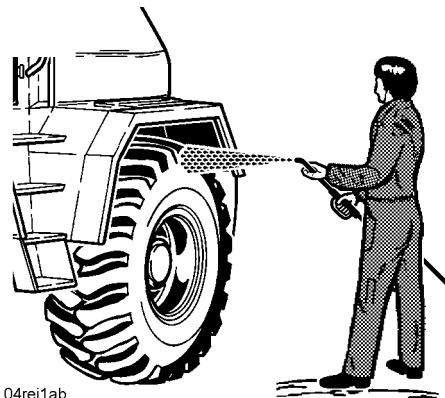


04she1ab

Road safety equipment

- warning triangle
- rotating beacon
- first aid box
- wheel wedge(s)

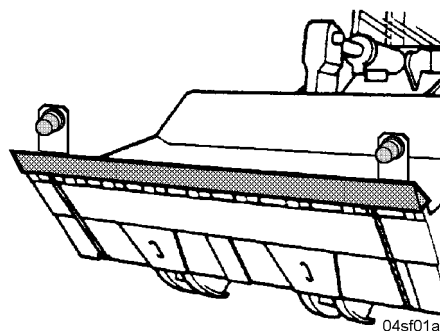
In addition, make sure that the jobs listed below have been carried out.



04rei1ab

Cleaning the machine

- Remove coarse dirt from the machine and clean the tyre treads.
- Close all service hatches and hoods and where possible lock them.

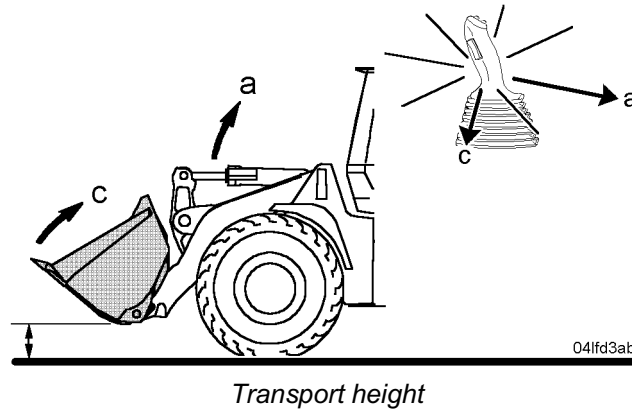


04sf01ab

Bucket teeth guard and side lamps

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

Driving You will find appropriate descriptions of work operations, driving, transport and transferring bulk material in the Section “General working methods”.



Make sure:

- When “driving” that the loading bucket is in the transport position. The transport position means: The bucket pivot point must be approx. 40 cm above the ground.
- The loading bucket is tipped up as far as it will go.
- Always drive with due care.
- Observe traffic regulations.

Braking

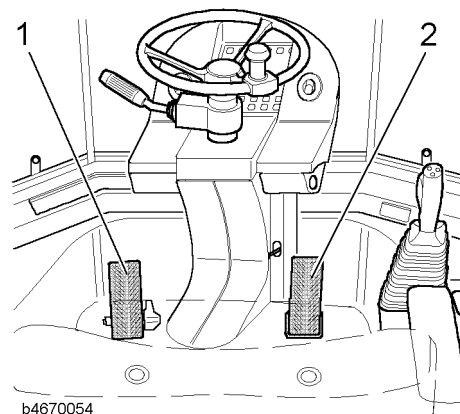
Two options are detailed below for braking the machine:

- Braking only with the hydrostatic circuit.
- 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- /inch pedal and gas pedal

1 BRAKE- / inch pedal

2 gas pedal

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

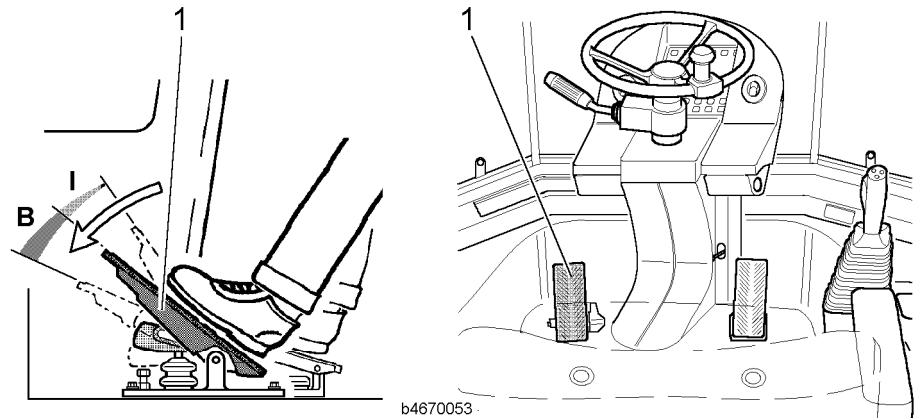
Service brake

If hydrostatic braking is not sufficient, the machine must also be braked with the BRAKE- /inch pedal 1 .

Braking with the BRAKE- /inch pedal

During braking, there are two activation ranges for activating the BRAKE- /inch pedal:

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



BRAKE- /inch pedal

1 BRAKE- /inch pedal
I Activation range – I

B Activation range – B

Warning

Risk of accidents when the machine is braked 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. Activating BRAKE- /inch pedal 1 in range - **I** - of the pedal travel.

or

- Brakes with the hydrostatic circuit and the disc brake. Activating BRAKE- /inch pedal 1 in range - **B** - of the pedal travel.

The machine will be braked quite strongly.

Trouble shooting

Little or no braking effect?

- Consult LIEBHERR CUSTOMER SERVICE!

Braking in potentially dangerous situations

Danger

Risk of accidents due to inappropriate braking in dangerous situations!

! For full braking in dangerous situations, the BRAKE- /inch pedal must be pressed all the way down!

- Press BRAKE- /inch pedal 1 in range - **B** - of the pedal travel.

The machine is heavily braked.

LBH/01/003801/0003/15.99/en

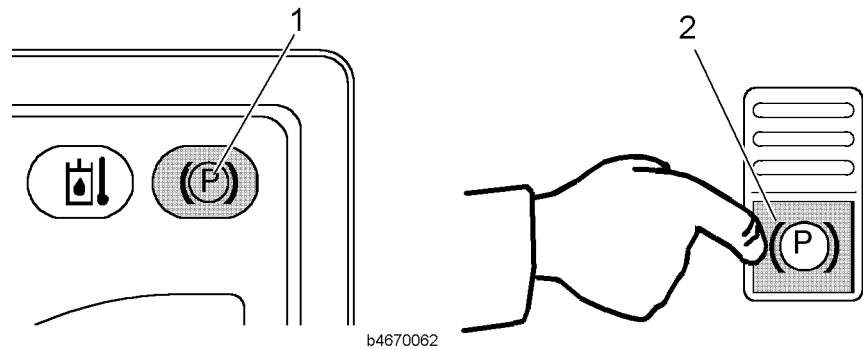
After the machine comes to rest

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

Engaging the parking brake

When the parking brake is engaged, the selected travel direction is as a result shifted to neutral.

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



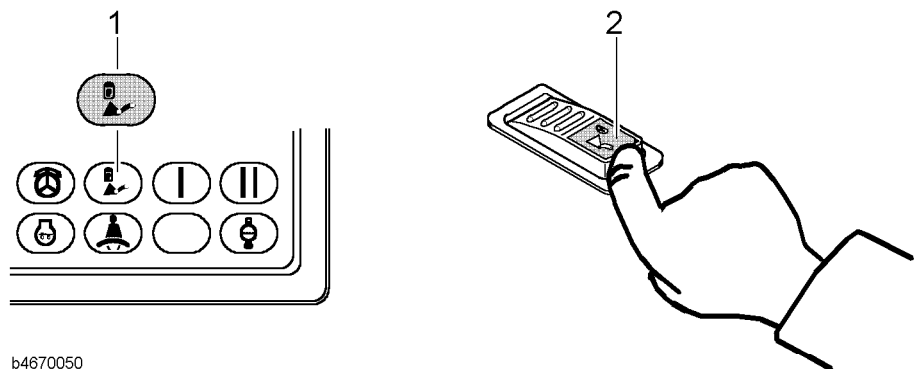
b4670062

Indicator unit and switch – parking brake

- 1 symbol field – parking brake
- 2 switch – parking brake

- 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 working hydraulics



b4670050

Indicator unit and switch – working hydraulics brake

- 1 symbol field – working hydraulics lock
- 2 switch – working hydraulics lock

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

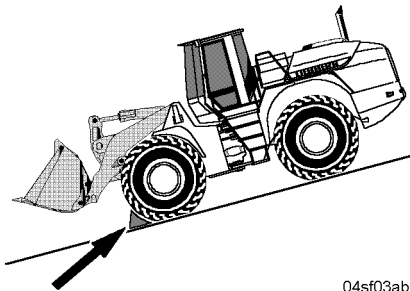
Symbol field 1 for the working hydraulics lights up.
The working hydraulics is no longer operational.

Locking up the machine

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

Danger

Risk of accidents due to the unforeseen rolling away by the machine!
! Secure the machine against rolling away.



04sf03ab

On downhill slopes

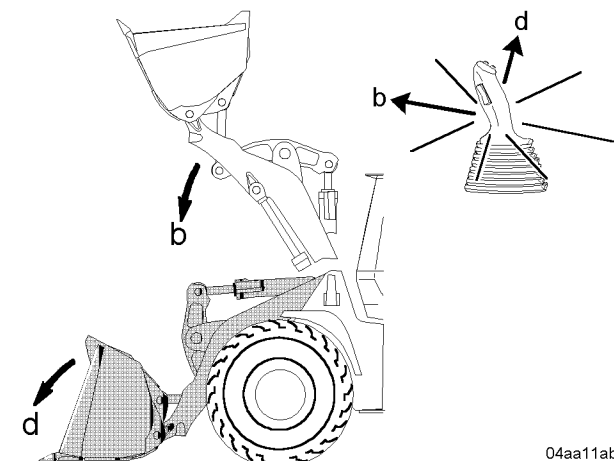
- Take the wedges out of their holders.
- Secure the machine against rolling away with the wedges.

3.3.4 Shutting down the machine

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

Lower the working attachment

Make sure that the loading bucket is empty.



04aa11ab

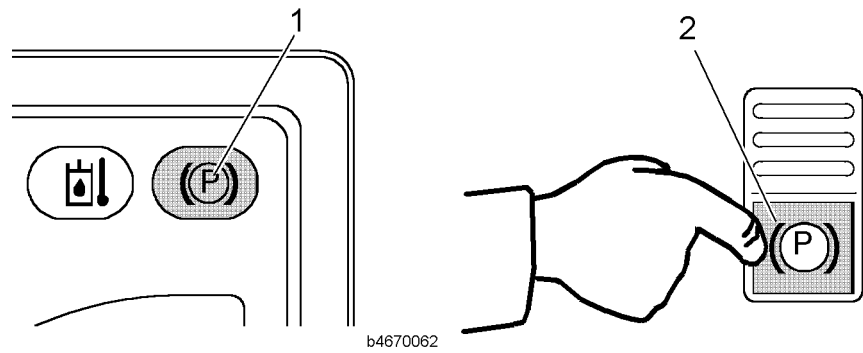
Bucket arm movement

- Lowering the lift arms: Move the control lever in direction - **b** -.
- Set down the bucket flat on the ground: Move 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.



b4670062

Indicator unit and switch – parking brake

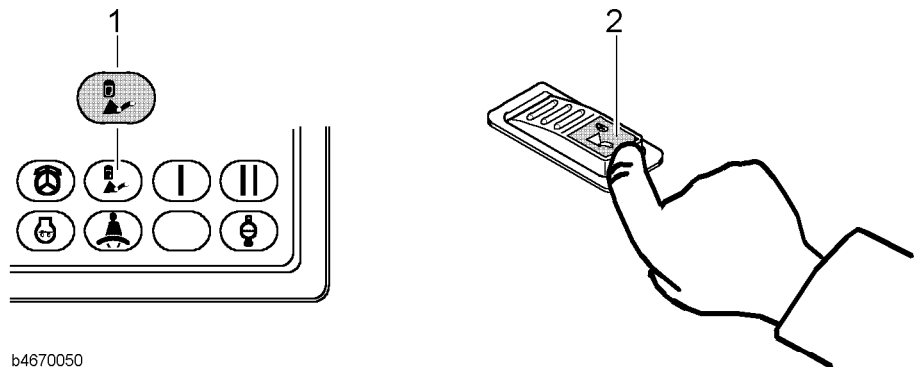
- 1 symbol field – parking brake
- 2 switch – parking brake

- **If necessary** : Activate the parking brake with the switch 2 .
The symbol field 1 for the parking brake lights up.

Locking 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.



b4670050

Indicator unit and switch – working hydraulics brake

- 1 symbol field – working hydraulics lock
- 2 switch – working hydraulics lock

- **If necessary** : to prevent unforeseen activation of the working attachment, press the switch 2 for the working hydraulics lock.
The symbol field 1 for the working hydraulics lights up.
The working hydraulics are no longer operational.

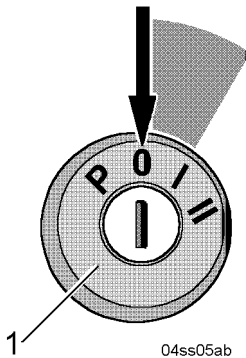
Shutting down the engine

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: take your foot off the gas pedal.
- Let the engine continue idling for – approx. 10 to 15 seconds –.
- Turn the ignition key to position - **0** - and pull it out.

All symbol fields go out.



Starter switch – 0-position

Locking up the machine

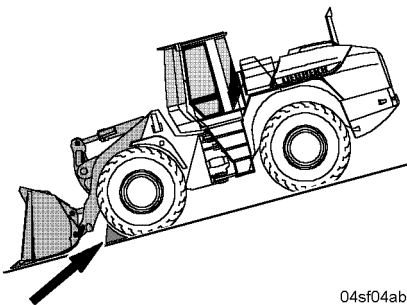
The following precautions should be effected when the machine is to be parked for a prolonged period on a slope.

Danger



Risk of accidents due to the unforeseen rolling away by the machine!
! 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

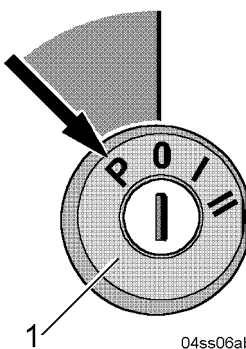
Parking position

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

- Turn the ignition key to the parking position - **P** -.
- The consumer units listed below are ready for operation.
- parking and driving light
 - internal illumination
 - hazard warning system
 - socket/cigarette lighter
 - working floodlights

Additionally, when the following items are installed in the machine as optional extras:

- rotating beacon
- radio



Starter switch – parking position

LBH/01/003801/0003/5.99/en

Danger

Unforeseen operation of the machine by an unauthorised person can put the maintenance personnel in extreme danger!

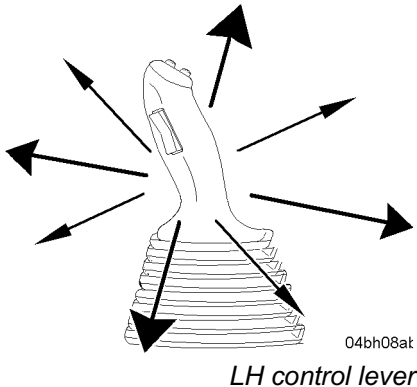
! Secure the machine against unforeseen operation by unauthorised persons!

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

3.3.5 Operating the lift arms

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

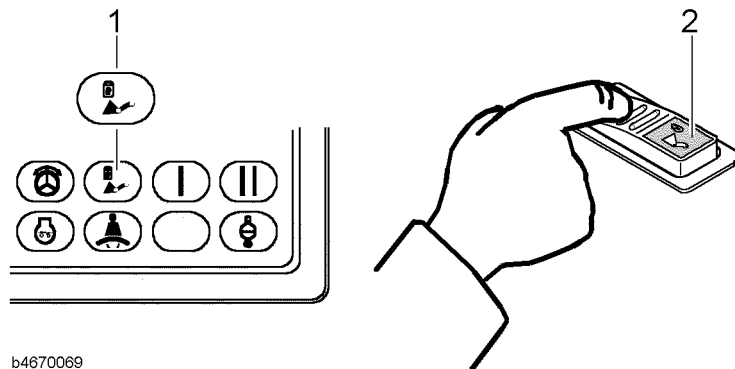
Also refer to the Section "LIEBHERR control lever".



Enabling operation of the working hydraulics

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

- In the event that the working hydraulics lock is already engaged:
Operate the working hydraulics to enable them for further use.



b4670069

Indicator unit and switch – working hydraulics brake

1 symbol field – working hydraulics lock

2 switch – working hydraulics lock

- Deactivating the working hydraulics lock: to do this push 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 cylinders

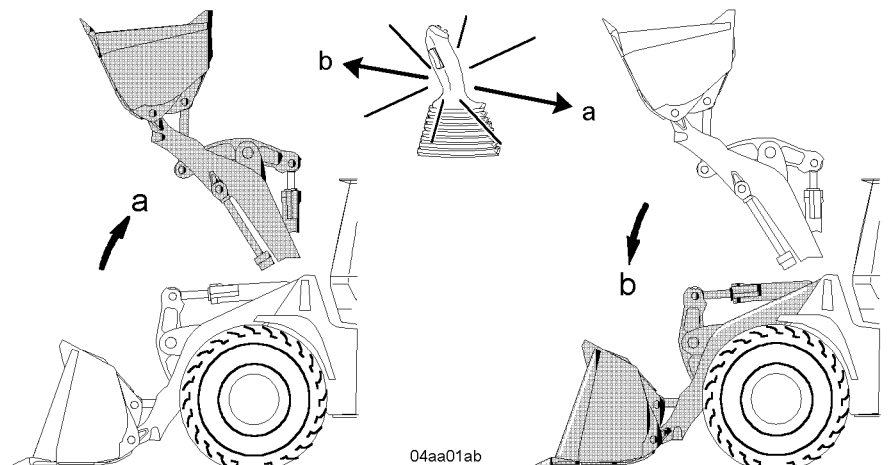
The lift cylinders raise and lower the lift arms.



04bh04ab

LH control lever

Raising the lift arms



04aa01ab

Bucket arm movement

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

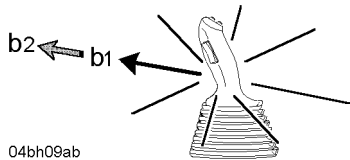
The lift arms are raised.

The lift arms are lowered with the “normal lowering function”.

- Operate the “normal lowering function”: to do this move the LH control lever in the direction - b1 - up to the action point.

The lift arms are lowered.

Lowering the lift arms

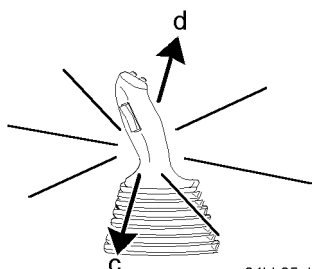


04bh09ab

LH control lever

Operating the tilt cylinder

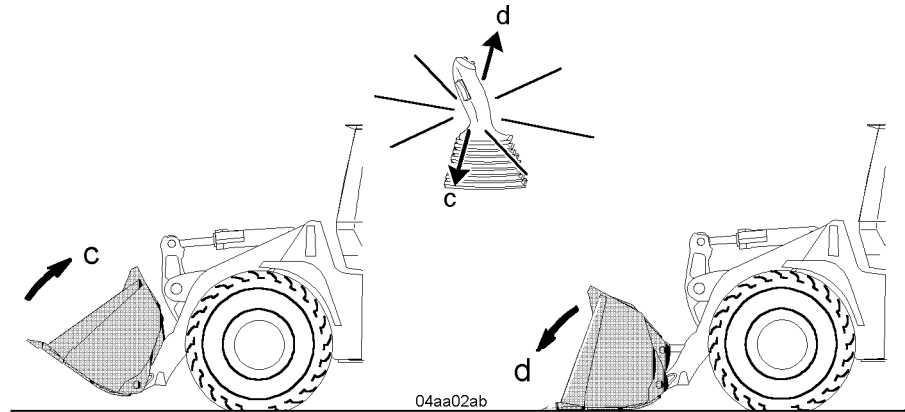
The tilt cylinder makes it possible to tip the bucket up or down.



04bh05ab

LH control lever

Tipping the bucket up

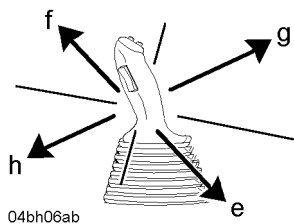


Bucket movement

- Move the LH control lever in direction - **c** - .
The bucket is tipped up.

Tipping the bucket down

- Move the LH control lever in direction - **d** - .
The bucket is tipped down.



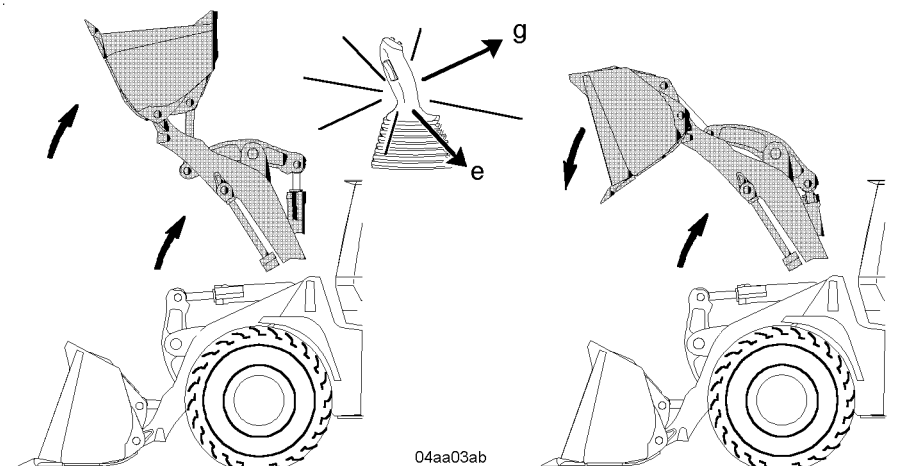
04bh06ab

LH control lever

Simultaneous operation of lift and tilt cylinders

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

Raising the lift arms and simultaneously tipping the bucket up



04aa03ab

Working movements

- Move the LH control lever in direction - **e** - .
The lift arms are raised and the bucket is simultaneously tipped up.

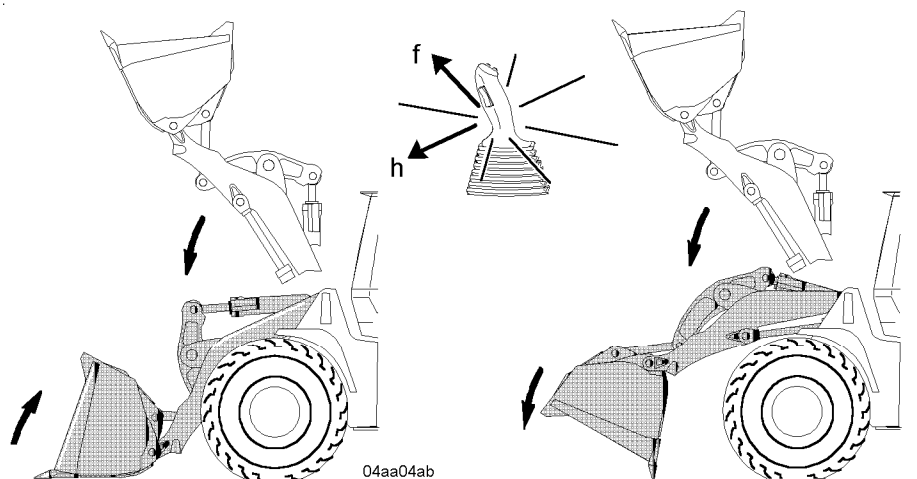
Raising the lift arms and simultaneously tipping the bucket down

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

The lift arms are raised and the bucket is simultaneously tipped down.

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Lowering the lift arms and simultaneously tipping the bucket up



04aa04ab

Working movements

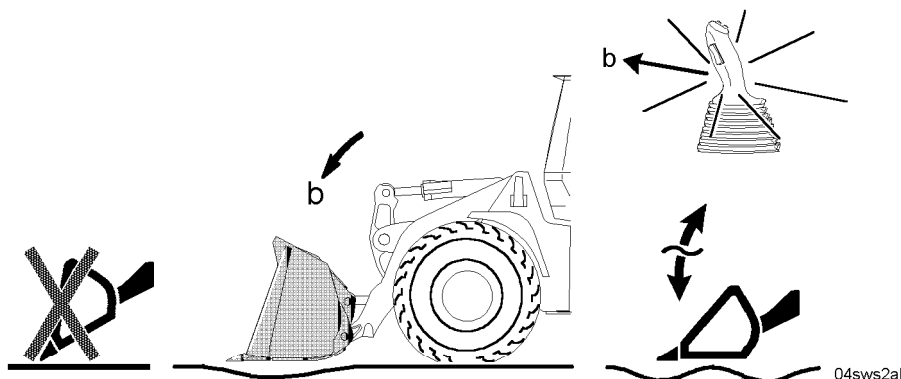
- Move the LH control lever in direction - **h** - .
The lift arms are lowered and the bucket is simultaneously tipped up.

Lowering the lift arms and simultaneously tipping the bucket down

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

The lift arms are lowered and the bucket is simultaneously tipped down.

Activating the float position



04sws2ab

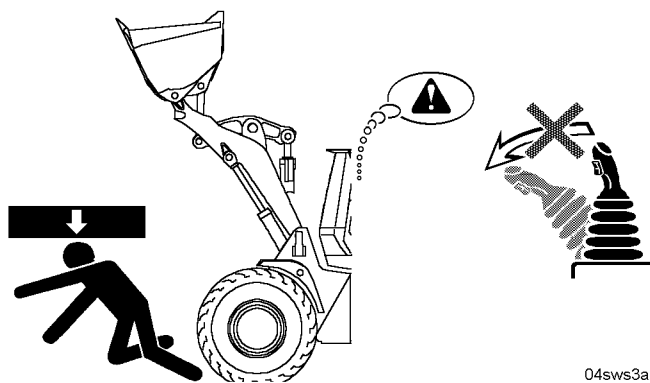
Bucket position for float position

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

Activating the float position

The procedure for activating the float position is as follows:

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



04sws3ab

Potentially dangerous situation

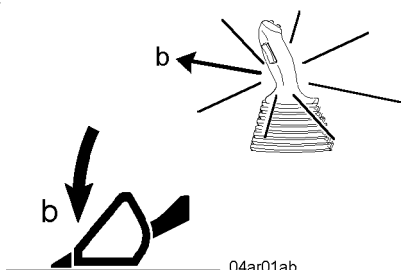
Danger 

Risk of accidents due to rapid lowering of the working attachment!
The raised working attachment is lowered rapidly when the float position is activated!

Persons standing under the raised working attachment risk severe crushing injuries!

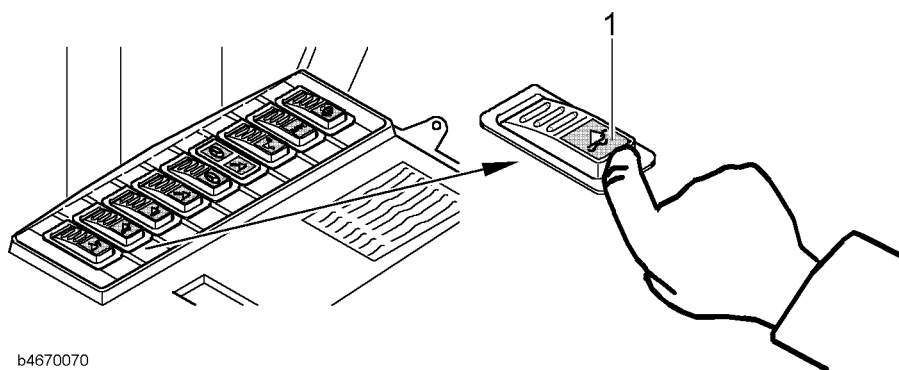
! Remaining in the danger area is strictly prohibited!

- Do not activate the float position function when the working attachment is raised!
- Move the lift arms and the bucket into position.



04ar01ab

Bucket position

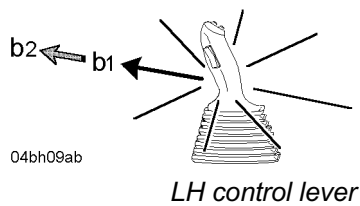


b4670070

Switches on the side cover

1 switch – float position

LBH/01/003801/0003/5.99/en



When the switch 1 for float position is turn, the function is prepared.

- 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.

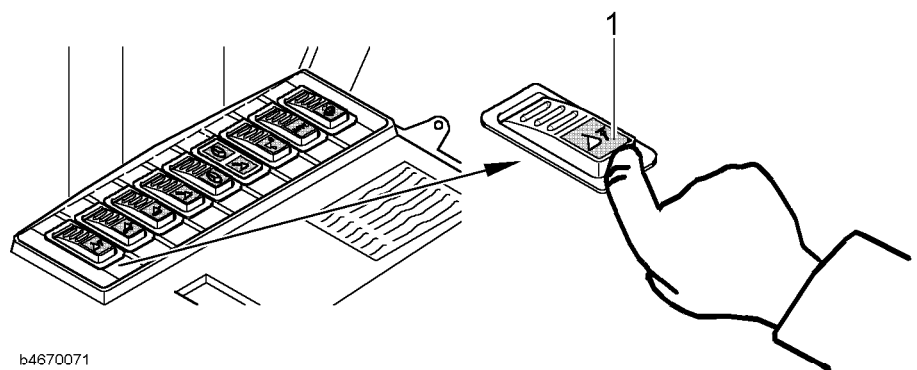
The LH control lever is kept in this position by magnetic force.
The float position function is now active.

Activation of the automatic lifting limit switch

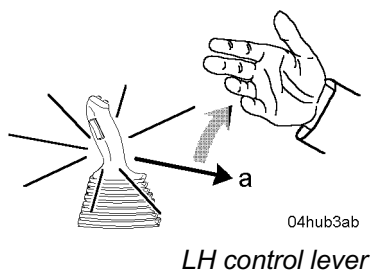
Activation of the automatic lifting limit switch

The automatic lifting limit switch prevents the lift arms coming to an abrupt halt at the upper "lift limit". This protects both the machine and the driver from jolting.

The procedure for activating the automatic lifting limit switch is as follows:



1 switch – lifting limit switch



- Press switch 1 for the lifting limit switch.
- The lifting limit switch function is now active.
- 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.

Lifting limit switch for reduced dumping height



This means that the lift arms are only raised as far as the switching point for the lifting limit switch.

The lifting process is automatically interrupted at this point.

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

Risk of accidents when working close to a height limit!
When working close to a height limit, there is a risk of accidents due to the lifting limit switch being overrun!
! When working near to a height limit, proceed with extreme caution!

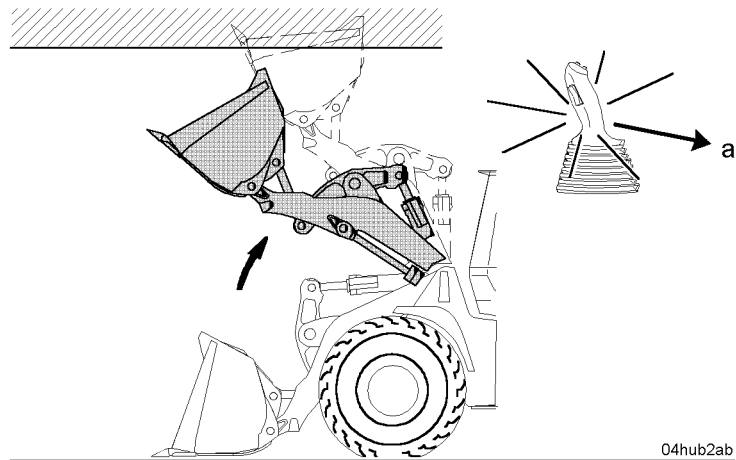
- Set the lifting limit switch for a reduced dumping height.

Setting the lifting limit switch for a reduced dumping height

The proximity switch for the automatic lifting limit switch is adjusted ex-works.

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

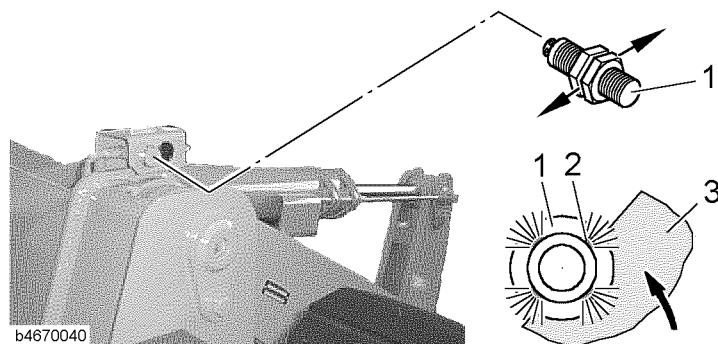
This is the procedure for re-adjusting the proximity switch.



04hub2ab

Reduced dumping height

- Raise the lift arms to the required dumping height.



b4670040

Proximity switch

- 1 proximity switch – autom. lifting limit switch
- 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 of the contact surface of the proximity switch.

When the bucket arm enters the switching area 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 lifting limit switch is once more ready for operation.

- Test the adjustment and reset if necessary.

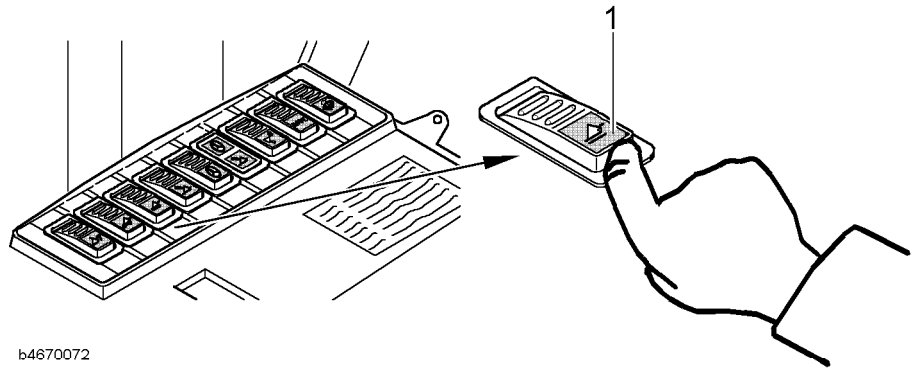
Activation of the automatic bucket return-to-dig

With loading jobs, with which a certain digging position is required again and again, the automatic bucket return-to-dig can be operated.

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

Activation of the automatic bucket return-to-dig

LBH/01/003801/0003/5.99/en



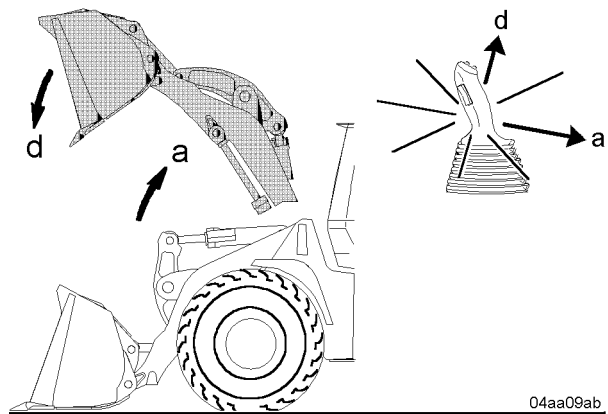
b4670072

Switches on the side cover

1 switch – bucket return-to-dig

Working with the automatic bucket return-to-dig

- Press the switch 1 for bucket return-to-dig. The automatic bucket return-to-dig function is now active. Make sure that the automatic bucket return-to-dig function is active.

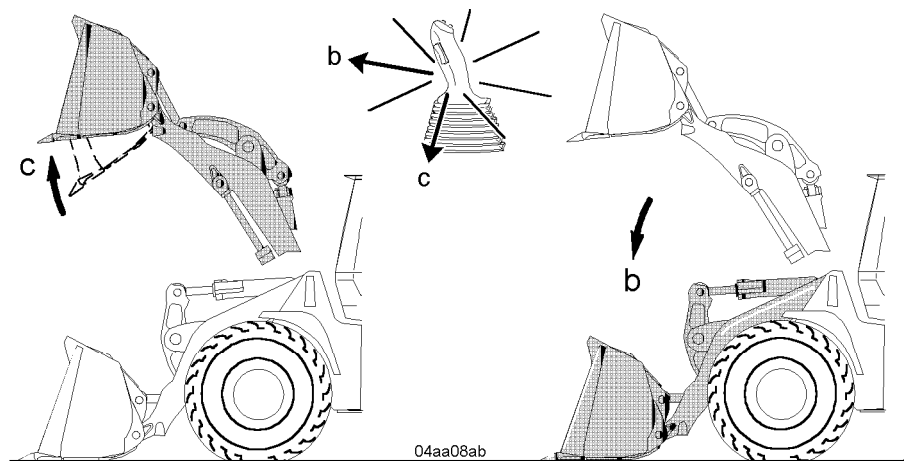


04aa09ab

Working movements

- Raising the lift arms: Move the LH control lever in direction - **a** -.
- Tip the loading bucket down in the raised position: Move the LH control lever in direction - **d** -.

LBH/01/003801/0003/5.99/en



Working movements

- Tipping the loading bucket up in the raised position: Move 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.

The loading bucket is thus moved 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 magnet.

- Lowering the lift arms: Move the LH control lever in direction - **b** -.

The loading bucket is thus moved into the digging position on the ground.

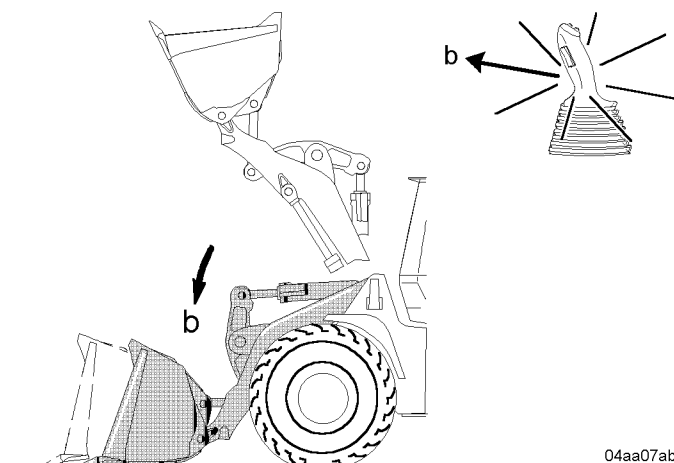
The proximity switch for the automatic bucket return-to-dig is adjusted ex-works.

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

This is the procedure for re-adjusting the proximity switch.

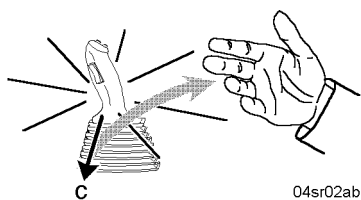
Coarse adjustment

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



Digging position – coarse adjustment

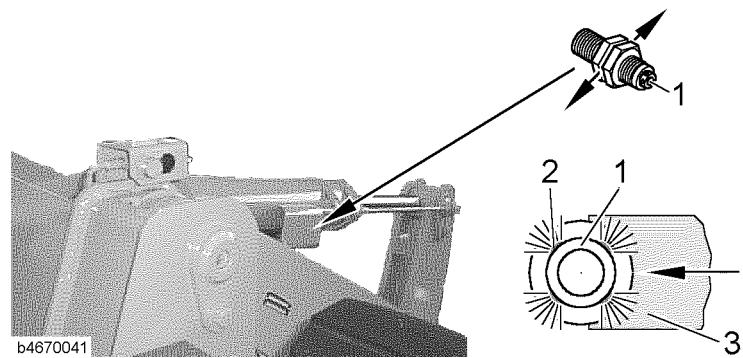
- Move the loading bucket with the LH control lever into the required digging position.



04sr02ab

LH control lever

Adjustment of digging position



Device – bucket return-to-dig

- | | |
|--|-----------------|
| 1 proximity switch – autom. bucket reverse | 2 LED |
| | 3 sliding gauge |

- Release the fixing nuts on the proximity switch 1 .
Horizontally adjust the proximity switch 1 until the sliding gauge 3 covers up to half of the contact surface of the proximity switch.
When the sliding gauge enters the switching area of the proximity switch, the four LEDs 2 on the proximity switch light up.
- Retighten the fixing nuts on the proximity switch 1 .
The coarse adjustment of the required digging position is now complete.
- Testing the “coarse adjustment”: Refer to the Section “Working with the automatic bucket return-to-dig”.
- If required, carry out a “fine adjustment”: Refer to the Section “Fine adjustment”.

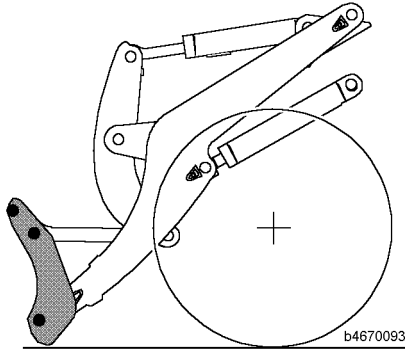
Fine adjustment

The required fine adjustment is obtained after several attempts.

- Move the loading bucket with the LH control lever to the exact digging position.
- Readjust the proximity switch: Procedure detailed in the Section “Coarse adjustment”.
- Testing the “fine adjustment”: Procedure detailed in the Section “Working with the automatic bucket return-to-dig”.

3.3.6 Operating the hydraulic quick-change device

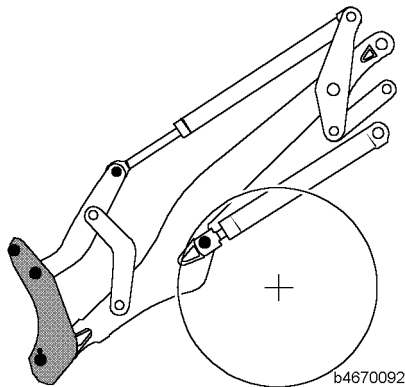
The hydraulic quick-change device is supplied as an option with the machine – version with Z-bar lift arms.



With the machine – version with P-lift arms, the hydraulic quick-change device comes as standard.

Information on attachment and accessories:

- 1 **Attachments and accessories produced by other 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 the previous written agreement of LIEBHERR.**
- 2 **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**



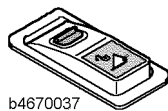
Operating the hydraulic quick-change device

The hydraulic quick-change device is activated/deactivated with the hydraulic quick-change device – switch. Also refer to the Section – Side cover (control console)".

The procedure for activating the hydraulic quick-change device is as follows:

Make sure that:

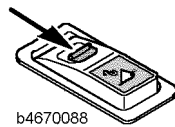
- 1 the lift arms are lowered just above the ground.
- 2 where a working attachment with its own hydraulics is mounted, make sure that any cylinders, valves and so on are in the initial position or closed.
- 3 where a working attachment is mounted, make sure that this is tipped up.



Danger

Risk of accidents due to falling the working attachment!

! Do not activate lockable switch when working attachment is raised!



b4670088

- 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 thus prepared.

Unlocking the hydraulic quick-change device

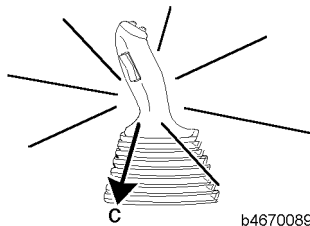
The procedure for unlocking the hydraulic quick-change device is as follows:

Make sure that the switch – hydraulic quick-release attachment is 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 retract.

- Completely retract the locking pins: Move the LH control lever in direction - **c** - as far as it will go and keep it in this position.



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Decoupling the working attachment

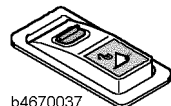
This is the procedure for decoupling the working attachment.

Make sure when a working attachment is mounted with its own hydraulic circuit, that the coupling to the hydraulic lines is released.

Warning

Risk of accidents due to incorrectly set down working attachment!

! The working attachment may in no event be set down in unsecured areas (roadways etc.).



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- Deactivate the hydraulic quick-change device: Push back the switch – hydraulic quick-release attachment.

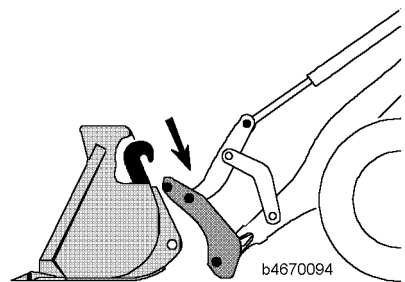
When the switch is pressed, the warning signal in the side cover (control console) goes out.

- Set down the working attachment down flat on firm, even ground.

Where the working attachment has its own hydraulic circuit: 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 decoupled.



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Disconnecting the hydraulic lines for hydraulically actuated 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



Risk of accidents from hydraulic lines under pressure!

! Depressurise the hydraulic circuits before connecting or disconnecting hydraulic lines/couplings!

- Shut down the diesel engine.
- Activate 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.

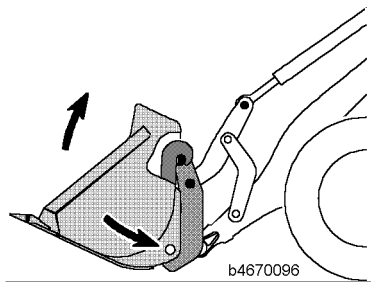
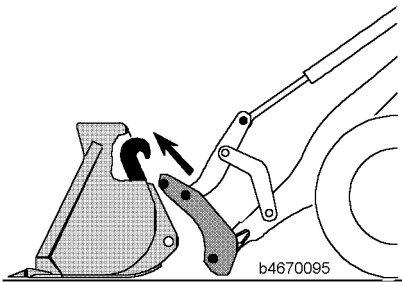
- Close the hose line couplings with protective covers.
- Lay the hydraulic hoses in the hose retainers.

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 in the quick-change device.

Locking the hydraulic quick-change device

The procedure for locking the hydraulic quick-change device is as follows:

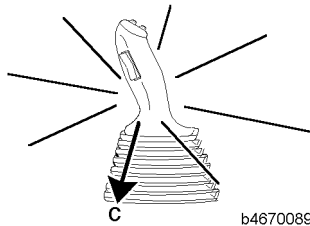
Make sure that:

- 1 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.
- 2 the hydraulic quick-release attachment – switch is turned off.

Danger

Risk of accidents due to the working attachment dropping!

! Check whether the working attachment is fully engaged in the quick-change device.



- 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 extend.

- Completely extend the locking pins: Move the LH control lever in direction - c - as far as it will go and keep it in this position.

The working attachment is now coupled.

Check after locking procedure

This is the procedure for checking after locking.

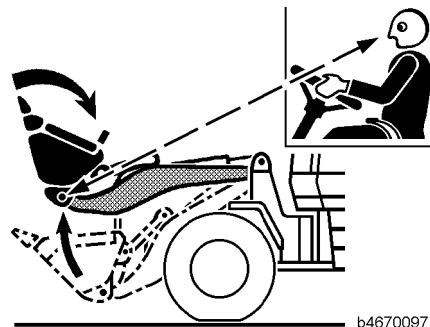
Make sure that the working attachment is secured with the quick-change device.

Danger

Risk of accidents due to falling the working attachment!

! 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 "Control lever for additional working functions (Option)" and "Working with optional attachments".

Connecting the hydraulic lines for hydraulically operated working attachments

Where the working attachment has its own hydraulic circuit, the hydraulic supply lines must be connected.

- Remove the protective covers from the hydraulic line couplings.

- The hydraulic lines are now functional.

The following points should be observed with the connections:

- 1 Clean the line couplings before connection.
- 2 Do not connect the hydraulic lines so that they are twisted.
- 3 Lay the hydraulic lines so that these are not jammed by the operation of the working attachment.
- 4 Make use of any hose retainers when laying the hose.

- Check the hydraulic lines for any leakage after connection.

3.3.7 Working with optional equipment

Forklift operation

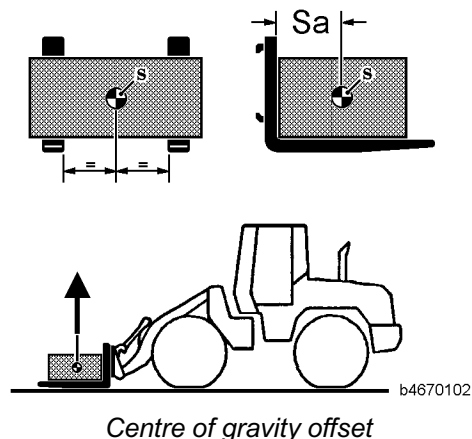
For forklift operation with lift arms with P-kinematics:

- 1 The parallel kinematics enables parallel guidance of the load over the entire lifting range during lifting or sinking.

For forklift operation with lift arms with Z-bar kinematics:

- 1 With lift arms with Z-bar kinematics, parallel loading is not possible. This means, that the attachment tips up with a lift movement of up to 2/3 of the max. lifting height and with another upward lift movement it tips out, but does not however tip down negatively forwards.
- 2 Due to the less favourable lever ratio of the Z-bar kinematics in the topmost lifting range, restrictions in load bearing capacity may result. Also see the Section "Load bearing tables for forklift operation".

This is the procedure for forklift operation.



Sa Centre of gravity



Risk of damage to load and 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 could be damaged.

! Make sure when using forklifts that this is done properly!

- 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: make sure that the – centre of gravity Sa of the load is correctly positioned.



Risk of accidents due to the machine tipping over!

! Make sure when using forklifts that this is done properly!

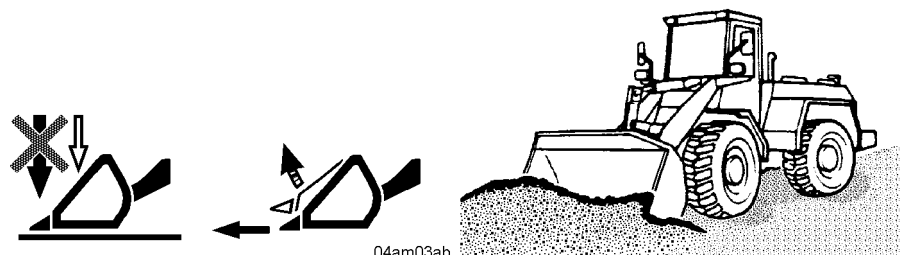
- Raise the lift arms to the transport position (approx. 30–40 cm above the ground).
- When the forks are empty, tip them up slightly and keep them low.
- When carrying a load, tip the forklift up slightly and keep the load low.
- When on slopes or inclines, always keep the load uphill!
- Never traverse slopes or inclines!
- Never turn on slopes or inclines!
- When a high unloading position is unavoidable:
do not raise the lift arms 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.

3.3.8 General working methods

In this section, the routine working methods are described.

Picking up and transferring bulk materials

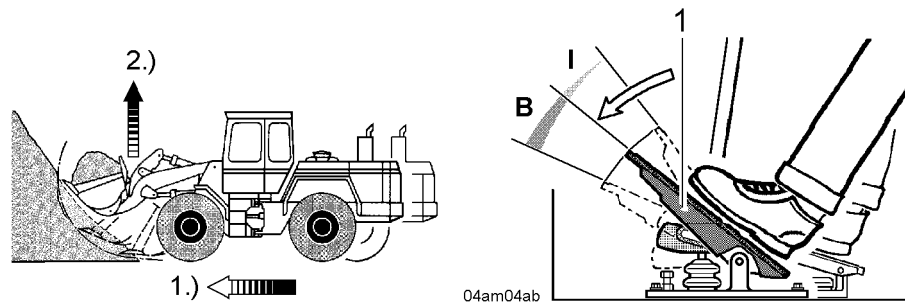
The following procedure is recommended to avoid any possible loss of traction.



Picking up bulk material 1

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

When the brake- /INCH PEDAL is activated, the advance force (tractive force) is reduced, thus making loading easier.



Power distribution by INCHING

1 brake- / INCH PEDAL
I range – INCHING

B range – BRAKING

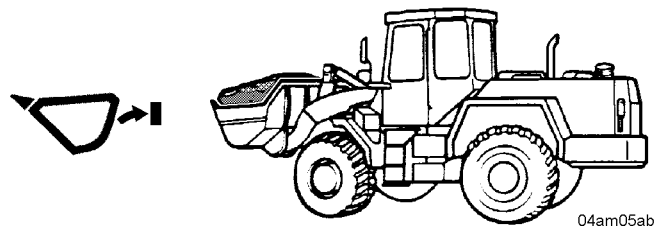
- In addition, push down the brake- /INCH PEDAL 1 in range - I - of the pedal travel with the required force.

The engine output is adjusted:

- 1.) The power of the drive hydraulics is reduced.
- 2.) The power of the working attachment is increased.

The advantages of power adjustment:

- The wheels do not turn over unnecessarily,
- The fuel consumption is reduced.



Picking up bulk material 2

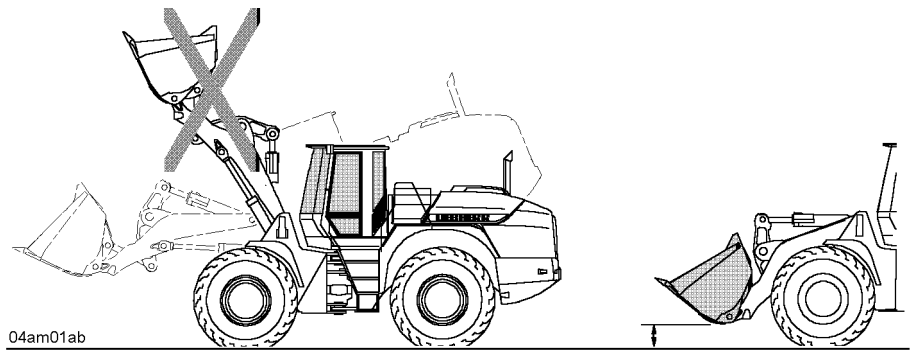
- The loaded bucket is tipped as far up as it will go and the lift arms are raised.

Transporting and transferring bulk material

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 approx. 40 cm above the ground.

Transport position



Danger of the machine tipping over

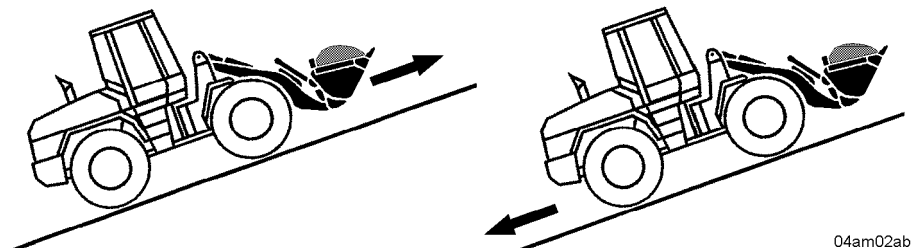
Warning



Risk of accidents due to the machine tipping over!
 There is a risk that the machine might tip over when the lift arms are raised due to a shift in the centre of gravity!
 ! Observe the max. 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

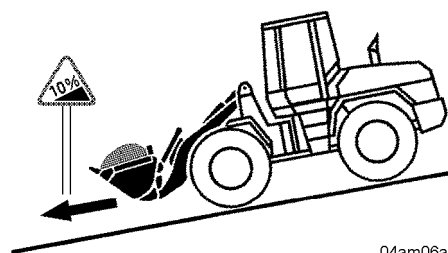


Risk of accidents due to the machine tipping over!
 ! When transporting a load on a steep slope, keep the loaded bucket low.

- When transporting uphill, drive forwards.
- When transporting downhill, drive in reverse.

Driving on slopes

It is essential that the safety instructions are observed when driving on sloping ground!
 Refer to the Section "Safety instructions for driving on sloping ground".



Slopes

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Warning

Risk of accidents due to the machine tipping over!

The load at which the machine can tip over is reduced when driving on sloping ground!

! Always keep the loaded bucket low during transport!

! Do not suddenly change direction or brake abruptly!

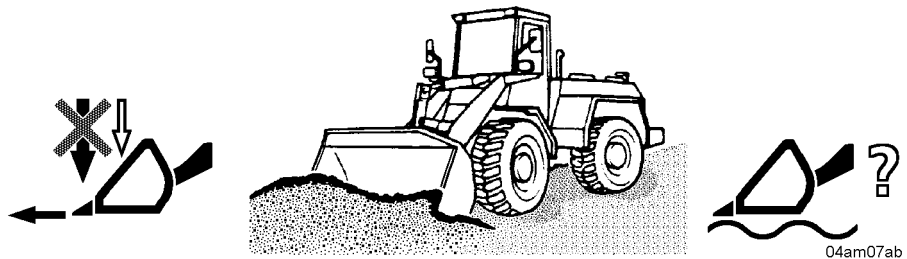
- Select the lowest possible travel range.
- Ease off the gas pedal.
- Drive downhill carefully.

Grading work

Keep the bucket base horizontal when grading.

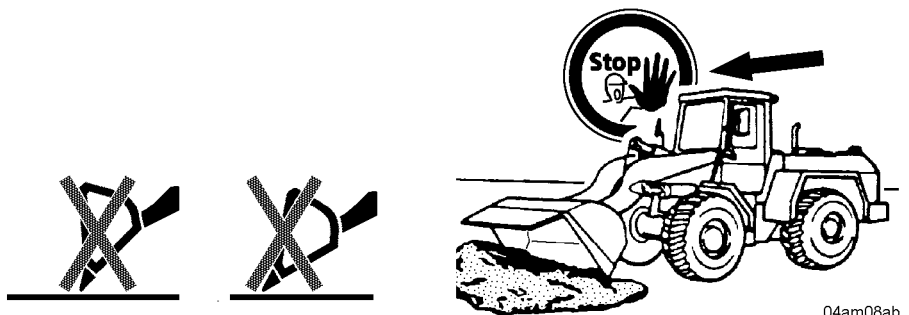
Grading

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 function – float position: refer to the Section “Float position”.



Impermissible bucket positions

Caution

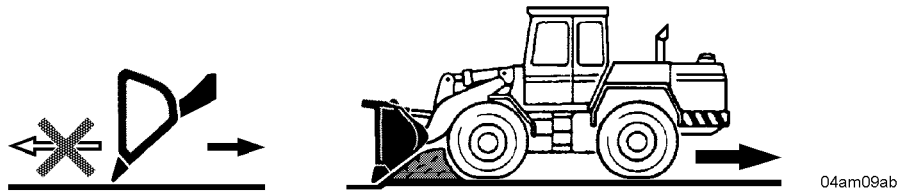
Risk of damage to the machine!

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 travel direction “forward” when the bucket is tipped down!

- Position the bucket base parallel to the ground.
- or
- Gently tilt the bucket base downwards.

Dragging bulk material

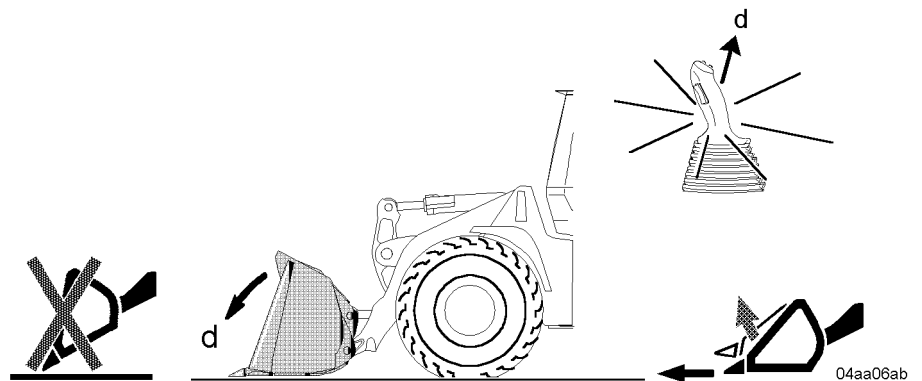


Procedure for dragging

- Tilt the bucket downwards and reverse the machine.

Loading from a tip

Picking up bulk material



Bucket position

Caution

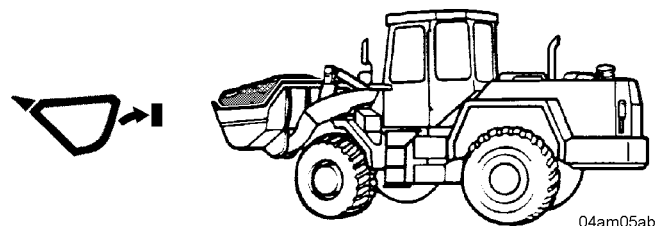


Risk of damage to the machine!

The lift arms may be damaged, if when clearing away bulk material in travel direction “Forward” with a tipped down bucket, 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 bucket 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: When driving the bucket into the material, gently tip it up and down.
- In addition, press the brake- /INCHPEDAL: refer to the Section “Picking up and transferring bulk materials”.



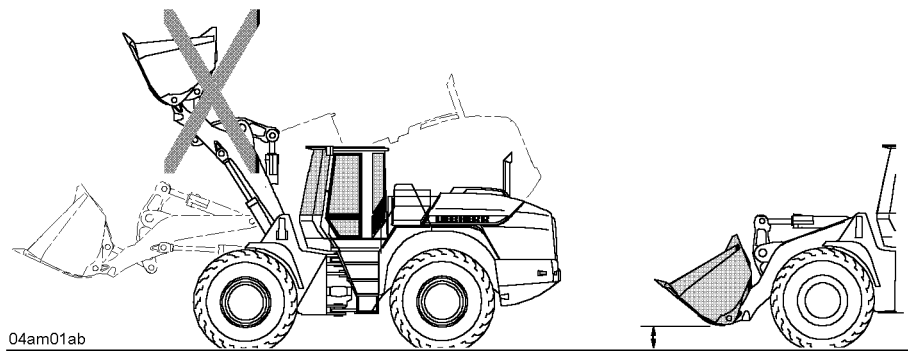
Bucket position

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- The loaded bucket is tipped as far up as it will go and the lift arms are raised.

Bulk material transport

Keep the loaded bucket low during transport, in order to improve the machine's stability and to ensure good viewing conditions.



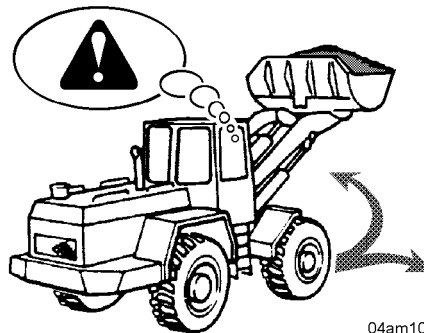
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Bucket position

Make sure that the bucket is in the transport position.

The transport position means that the bucket pivot point is approx. 40 cm above the ground.

- Move the bucket into the transport position.



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*Danger of the machine tipping over***Warning**

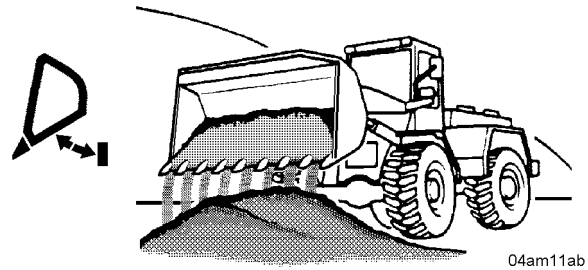
Risk of accidents due to the machine tipping over!

There is a risk that the machine might tip over when the lift arms are raised due to a 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



04am11ab

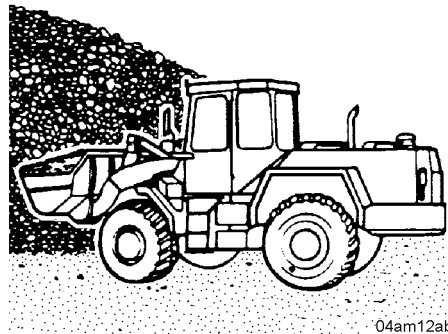
Dumping

- Tip the bucket down.
- Loosen material adhering to the bucket: Quickly tip the bucket to and fro, briefly jolting against the bucket arm stops in the process.

Loading from slopes or banks

Material removal from a slope

This is the procedure for removing normal loading material such as sand or gravel.



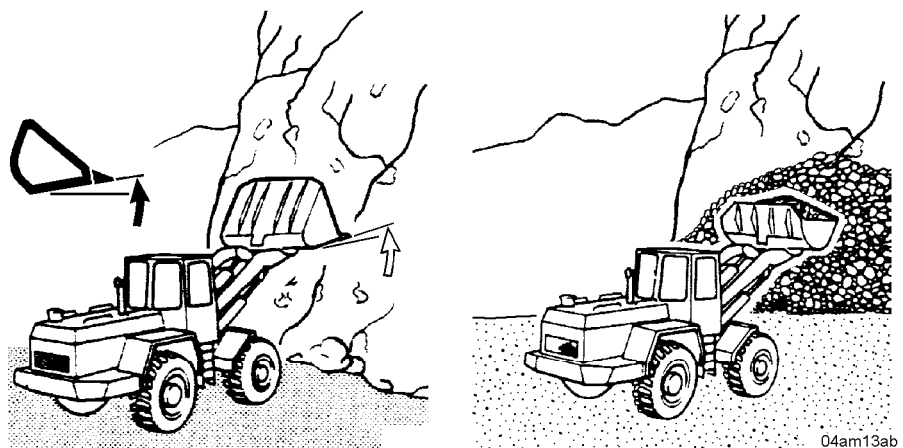
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Bulk material removal 1

- Start removing the material at the foot of the slope, working your way upwards.

Material removal from a bank

This is procedure for removing atypical hard materials such as rock.



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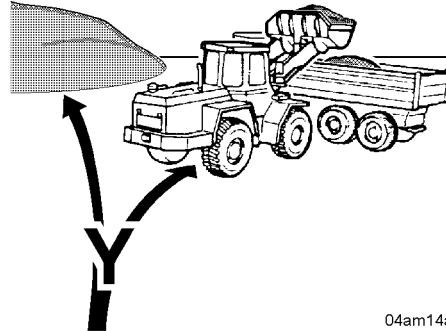
Bulk material removal 2

- Gently tilt the bucket base upwards.
- Start removing material at the top and work your way downwards.

Warning

Risk of accidents due to falling material!
! Do not work under overhangs!

- Remove overhangs first and look out for after-slippage.

Loading bulk transport vehicles**Loading paths**

04am14ab

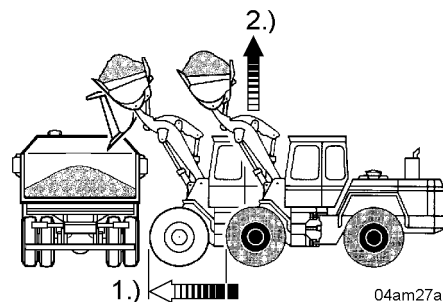
Y-movements

The vehicle to be loaded should be parked so that the transport distance for the machine are as short as possible.

If possible make a “**Y-movement**”. Also refer to the Section “Driving mode” under “Reversing”.

Loading procedure

In order to speed up the loading procedure, the machine should be braked in front of the truck with the brake- /INCH PEDAL.



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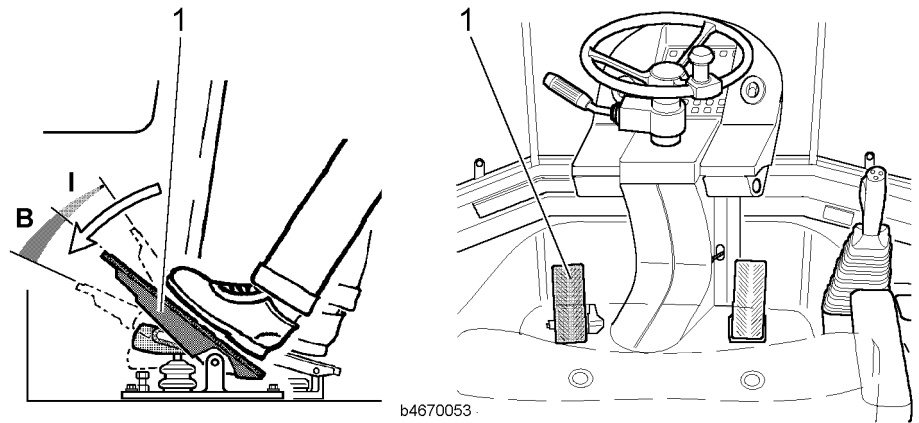
Unloading position

This yields the following benefits:

- 1.) responsive adjustment of the speed,
- 2.) optimum performance adaption for the working attachment,

Also refer to the Section “Picking up and transferring bulk materials”.

- Adopt the unloading position: do not raise the lift arms until just before reaching the unloading point.



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BRAKE- / inch pedal

1 brake- / INCH PEDAL
I range – INCHING

B range – BRAKING

- Braking the machine: push down the brake- /INCH PEDAL 1 in range - I - of the pedal travel with the required force.

Warning

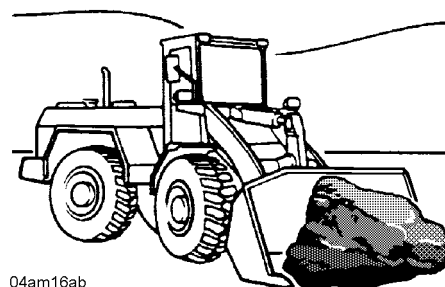
Risk of accidents due to falling material!

- ! The machine driver may only swing the working attachments over occupied driver-, operating- and working stations of other vehicles when these 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 vehicle 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 skip floor of the transport vehicle is buffered against the impact of large rocks.



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Bucket loading

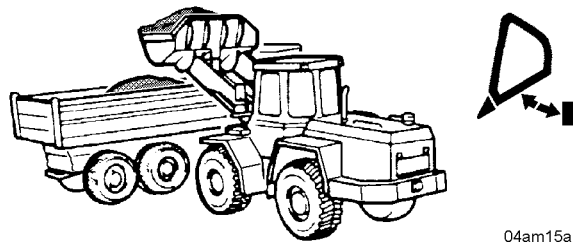
- First place a load of smaller pieces of rock in the transportation vehicle.
- Proceed to load the transportation vehicle.

Off loading material lodged in the bucket

With loading jobs, for which a certain digging position is required again and again, the automatic bucket return-to-dig can be operated.

Refer to the Section “Activation of the automatic bucket return-to-dig”.

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Dumping

- Tip the bucket down.



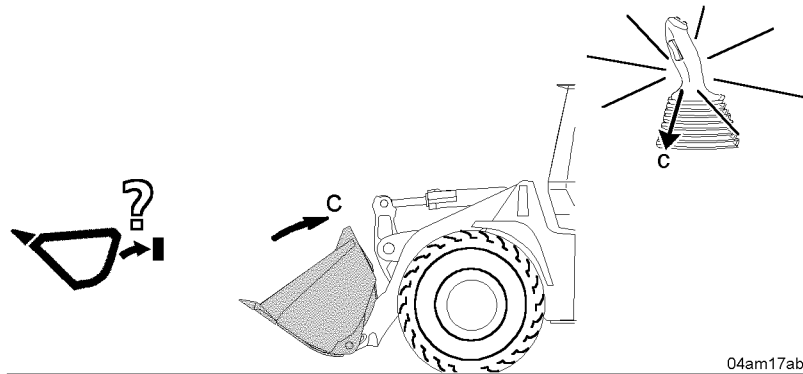
Risk of damage to the machine!

Unnecessary jolting when tipping up and down against the bucket arm stops can lead to accelerated wear to the bolts and bushes on the kinematics!

! Avoid unnecessary impacts against the stops!

- Loosening material adhering to the bucket: Quickly tip the bucket to and fro, briefly jolting against the bucket arm stops in the process.

Moving the machine back



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Bucket position

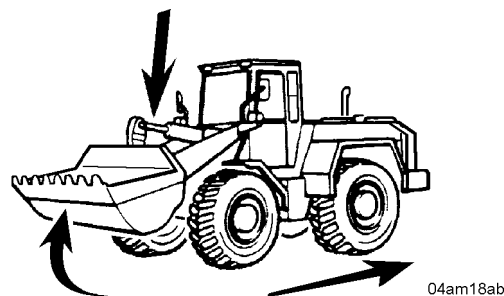


Risk of damage to the machine!

Unnecessary jolting when tipping up and down against the bucket arm stops can lead to accelerated wear to the bolts and bushes on the kinematics!

! Avoid unnecessary impacts against the stops!

- Tip the bucket up.



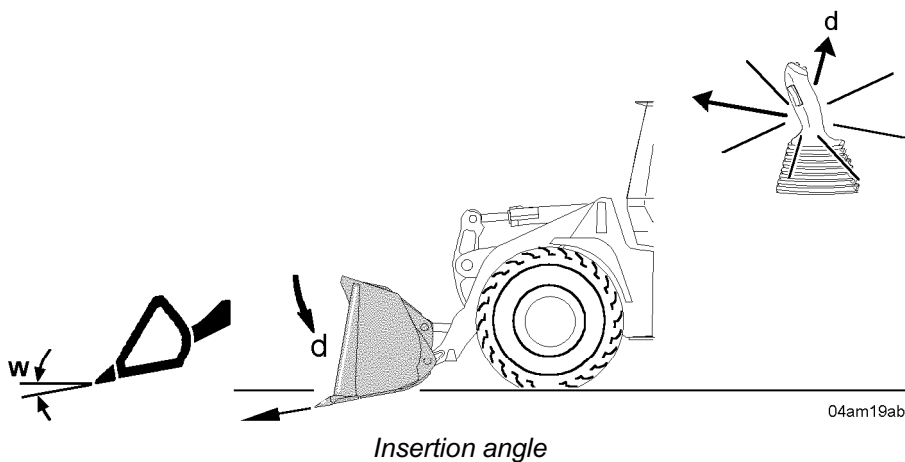
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Lift arms position

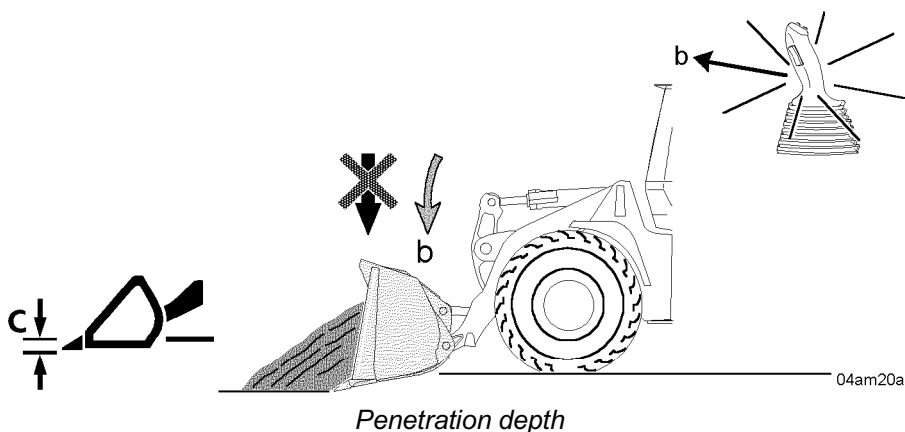
- When moving backwards, lower the lift arms.

Excavation

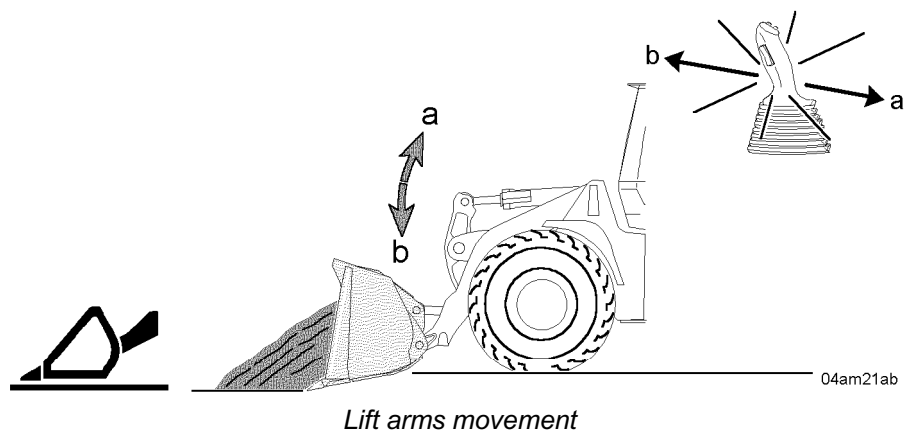
Excavating soft material This is the procedure for excavating soft material.



- Lower the loading bucket onto the ground.
- Set a small cutting angle – **W** of no more than 10°.



- When approaching with the machine, simultaneously press the lift arms down, until a sufficient penetration depth – **C** is achieved.
- The following procedure is recommended to avoid any possible loss of traction: Do not work with a strong downwards pressure on the bucket.

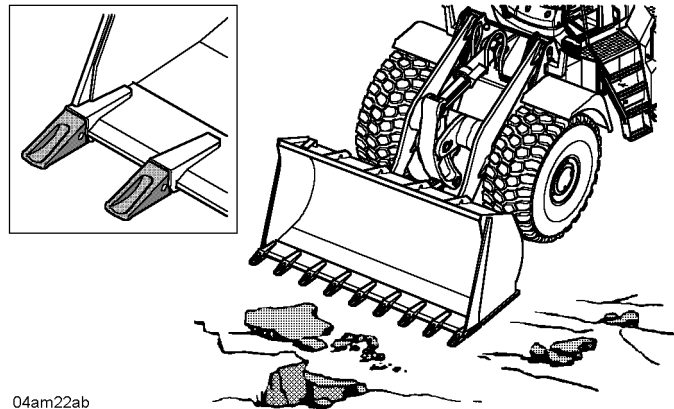


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- Make horizontal cuts while driving forwards.
- The work is made easier by appropriately raising or lowering the lift arms.

Excavating hard material

When excavating hard material, a bucket with teeth should be used.



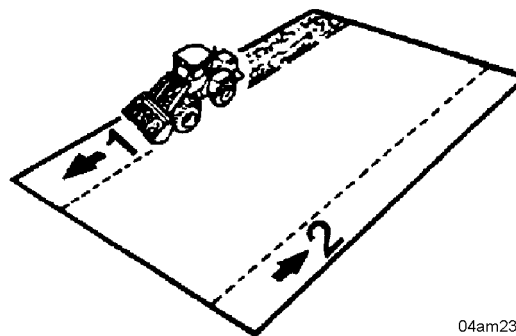
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Working attachment

- Further procedure: Refer to the Section “Excavating soft material”.

Example of foundation excavation

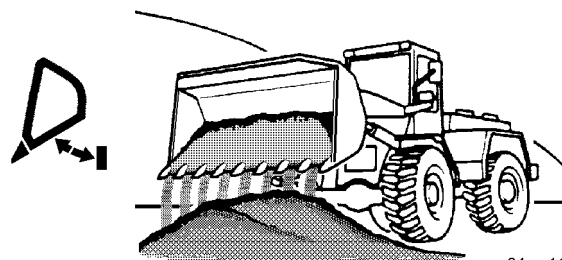
This is the procedure for excavating foundations.



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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 approx. 1 metre: Start a second trench along the opposite side.
- Work the area between down to the same depth as the side trenches.

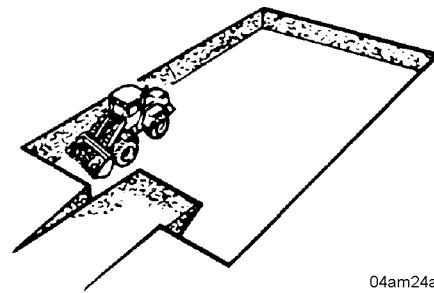


04am11ab

Heaping material

- Pile up the bulk material in a corner, leaving the foundation banks exposed.

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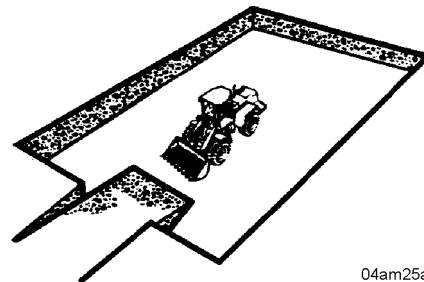
04am24ab

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

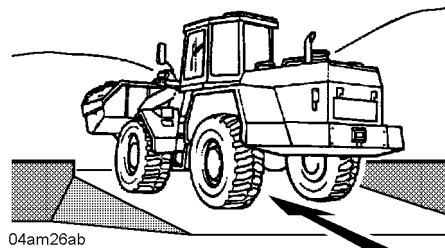
A ramp must be made so that the machine can drive out of the excavated area.



04am25ab

Exit ramp

- To make an exit for the machine: cut a ramp in the middle of a side bank.



04am26ab

Direction of transportation

- Keep the loaded bucket low during transport.
- Drive out of the excavated area forwards.

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3.3.9 Transporting the machine

Slinging the machine from a crane

It is essential when the machine is slung from a crane, that the accident prevention regulations are observed!

Refer to the Section "Safety regulations when slinging the machine from a crane".

The following precautions should be effected before slinging the machine from a crane.

Precautions:

- lower the working attachment and tilt back the loading equipment as far as it will go,
- install articulated joint 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 "Operation, handling".

Obtain information about:

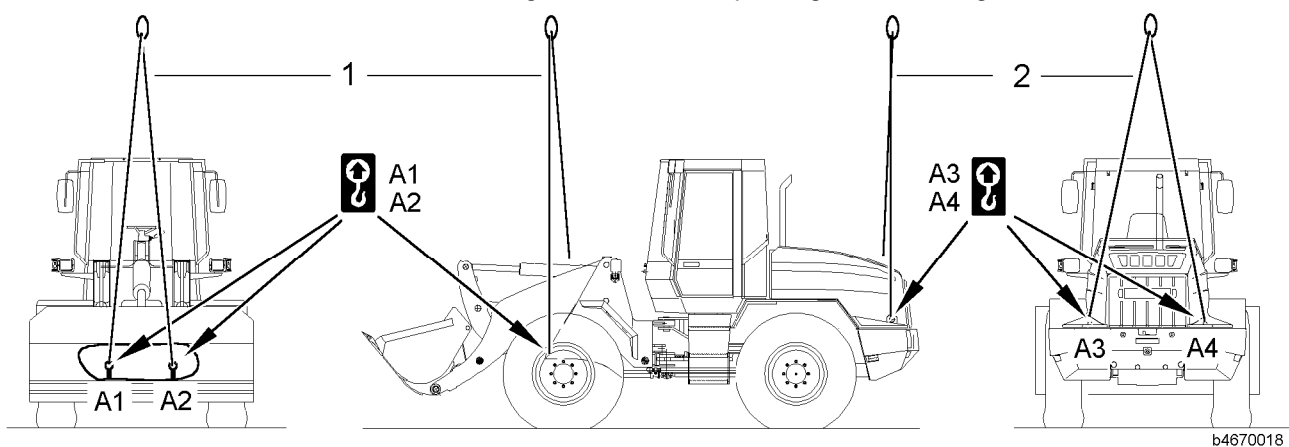
- Weight and collision masses of the machine: Refer to the Section "Technical data",
- The required load bearing capacity and lengths of the lifting tackle.

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.



Sketch 1 of slung machine

- 1 lifting tackle – 2-strand rope
- 2 lifting tackle – 2-strand rope
- A1 slinging and lifting point right-hand, front

- A2 slinging and lifting point left-hand, front
- A3 slinging and lifting point left-hand, rear

- A4 slinging and lifting point right-hand, rear

Danger



Risk of accidents due to suspended/falling load!

! Remaining under the machine when it is suspended is strictly prohibited.

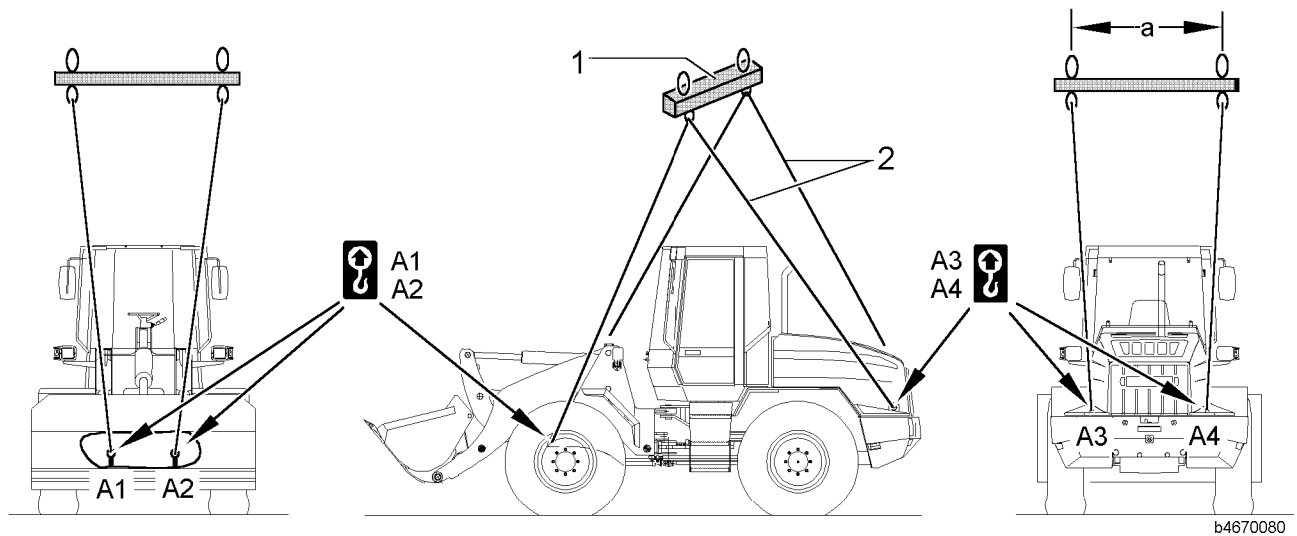
- Fix/attach the rope to the slinging and lifting points A1, A2, A3, A4 provided on the machine.
- Raise and load the machine with due care.

Loading for transport by ship

Execution: when necessary, sling the machine from a crane.

Required equipment:

- slinging device/-bar 1 from the shipping company: Minimum size a = 1.0 m.
- Lifting tackle 2 : Rope length – Min. length = 4.0.



Sketch 2 of slung machine

- 1 slinging device/-bar
- 2 lifting tackle – 2-strand rope
- A1 slinging and lifting point right-hand, front
- A2 slinging and lifting point left-hand, front
- A3 slinging and lifting point right-hand, rear
- A4 slinging and lifting point left-hand, rear

Danger



Risk of accidents due to suspended/falling load!

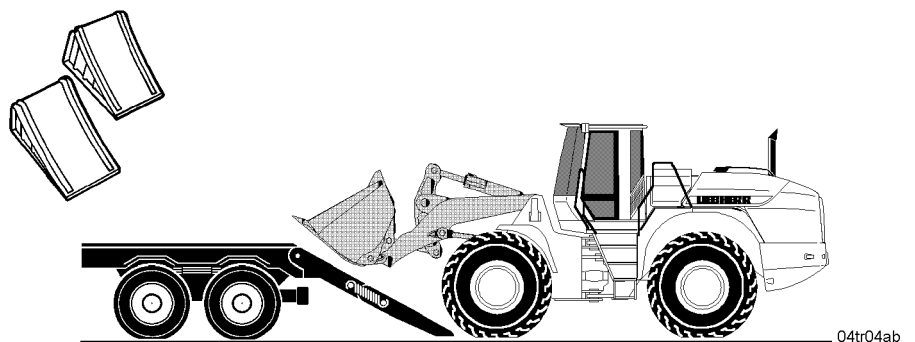
! Remaining under the machine when it is suspended is strictly prohibited.

- Fix/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.

Transport the machine by truck or rail

Before driving onto the loading bed

The following precautions should be undertaken before driving onto the loading bed.

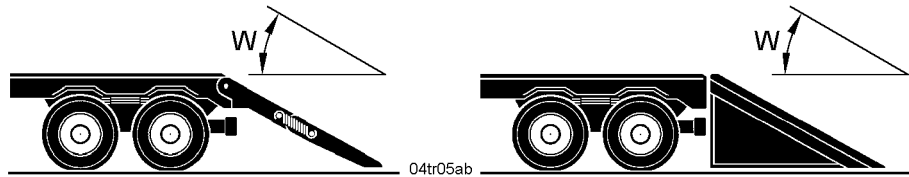


Loading the machine onto the transporter

LBH/01/003801/0003/5.99/en

Precautions:

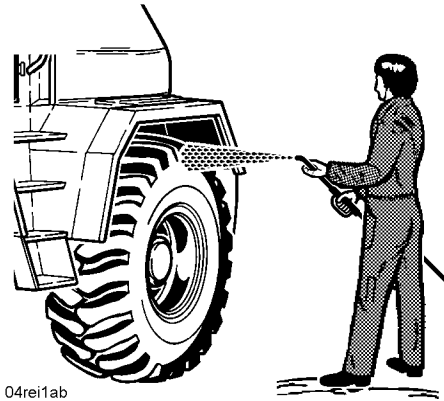
- have wheel wedges ready,
- have suitable tensioning ropes or chains ready to lash the machine down.



Ramp inclination

A ramp should be provided up which the machine can be driven onto the loading bed.

The inclination of the ramp - **W** - may not exceed 30°.



Cleaning

Any snow, ice or mud on the tyres should be cleaned off before the machine is driven up the ramp.

For more detailed descriptions, refer to the Section "Operation, handling". When driving onto the loading bed get a second person to 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!

Driving onto the loading bed

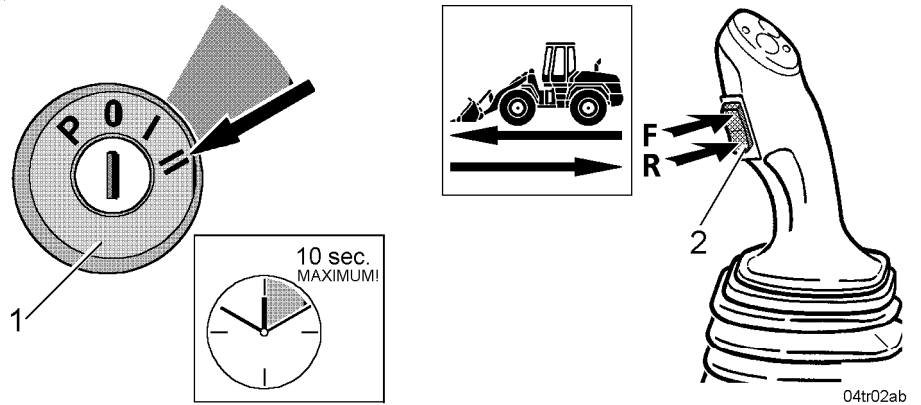


04tr03ab

Signal giver



This is the procedure for driving onto the transporter bed:



Starting procedure

1 starter switch

2 rocker switch for travel direction

- Start up the engine.

Situation once the engine is started:

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

Also refer to the Sections “Starting the diesel engine” and “Driving mode”.

- Release the parking brake.
- Select the travel direction.

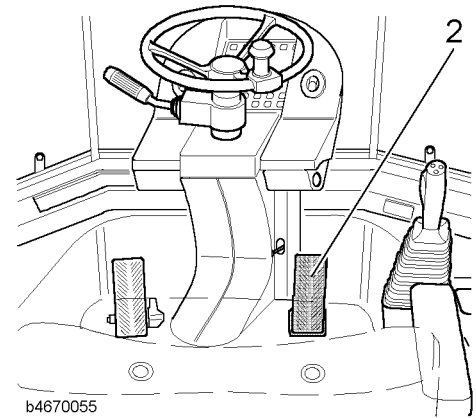
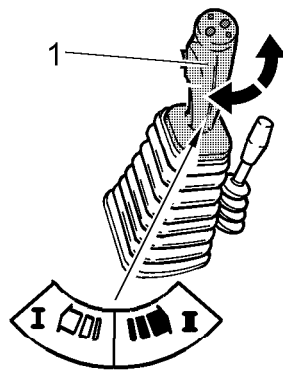
Warning

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

Risk of accidents if 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!

- Only ever drive onto the ramp in a low travel range!



b4670055

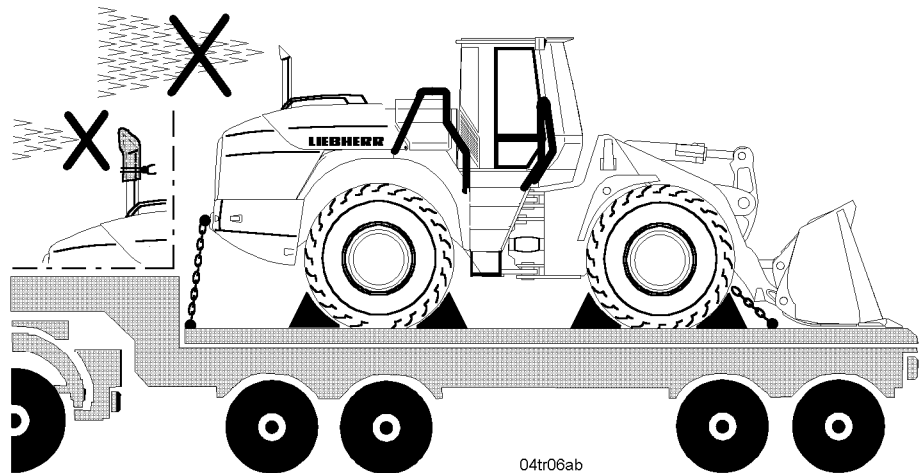
Moving off procedure

- 1 drive switch for shifting travel range
- 2 gas pedal

- Select a low travel range: actuate the drive switch 1 .
- Push down the gas pedal 2 carefully.
- Carefully start the machine in motion.

After driving onto the loading bed

For more detailed descriptions, refer to the Section "Operation, handling".
 If the machine is facing away from the direction of motion during transport, then the air stream can penetrate the exhaust opening.
 The penetrating air stream can drive the diesel engine turbo.



04tr06ab

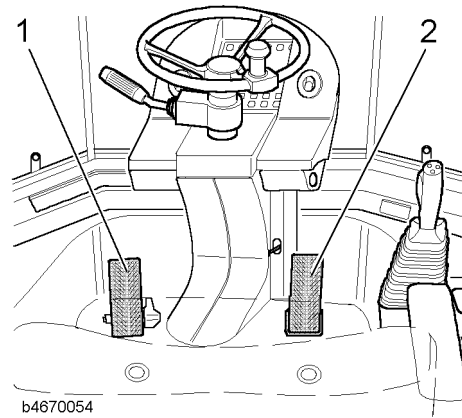
Exhaust pipe cover

The following precaution should be effected to prevent damage to the turbo during transport.

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!

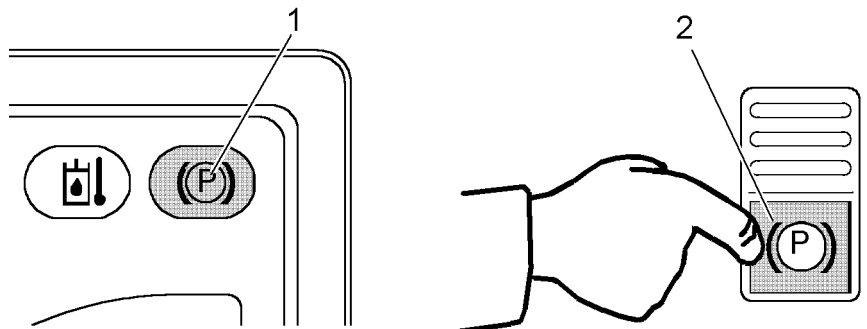
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b4670054

BRAKE- /inch pedal – gas pedal

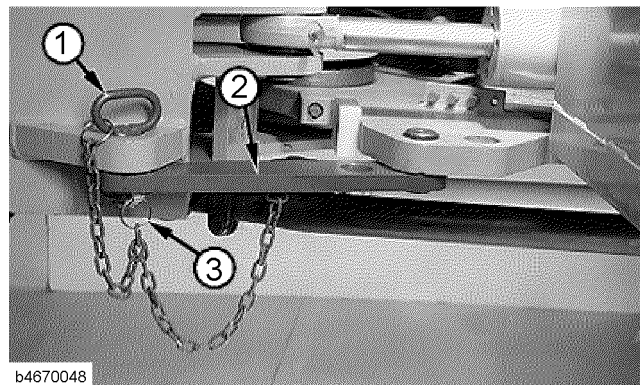
- Stop the machine



b4670062

Parking brake

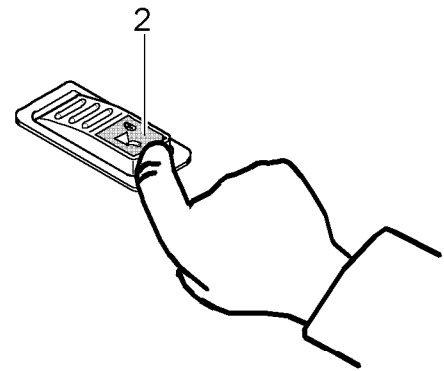
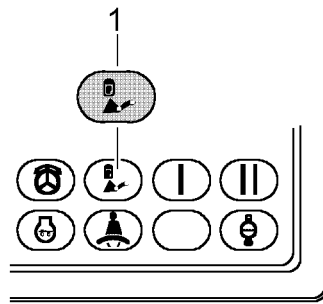
- Engage the parking brake.



b4670048

- Attach the articulated joint lock.
- Lower the lift arms and set down the loading bucket flat on the transporter bed.

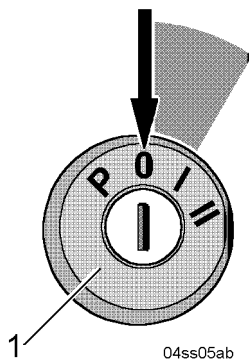
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b4670050

Working hydraulics lock

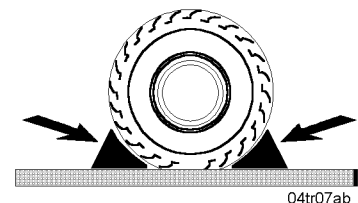
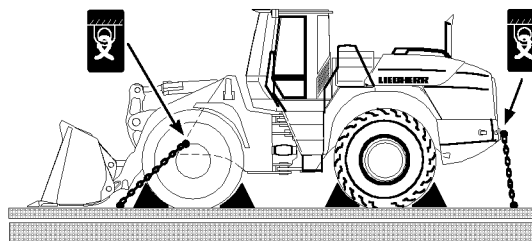
- Lock the working hydraulics.
- Shut down the engine.



04ss05ab

Starter switch

- Close and lock all doors and hoods on the machine.



04tr07ab

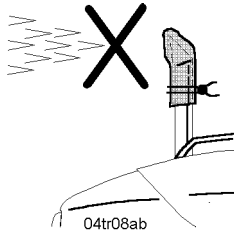
Lashing points

- Secure the machine against sliding: use wheel wedges and tensioning ropes or chains for this purpose.
- Securely attach the tensioning ropes or chains to the marked lashing points on the machine.

Caution 

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, entering the exhaust!

- To block off the exhaust pipe opening: only climb onto the machine via the cab access and choose a safe place to stand.
- Securely block off the exhaust pipe opening with windproof material, so that it cannot slip.



Blocking off the exhaust pipe opening

3.4 Emergency operation

It may be necessary if the machine is damaged to tow it away from an exposed position.

The following towing instructions only apply for 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:

- max. 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!

3.4.1 Towing the machine

Towing the machine is problematic and is always undertaken under the sole responsibility of the operator.

In no event can damage or accidents resulting from towing be covered by the manufacturer's guarantee.

Safety when towing

Also refer to the Section "Towing the machine safely".

Danger



Risk of accidents when towing not properly carried out!

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 recommendations 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.

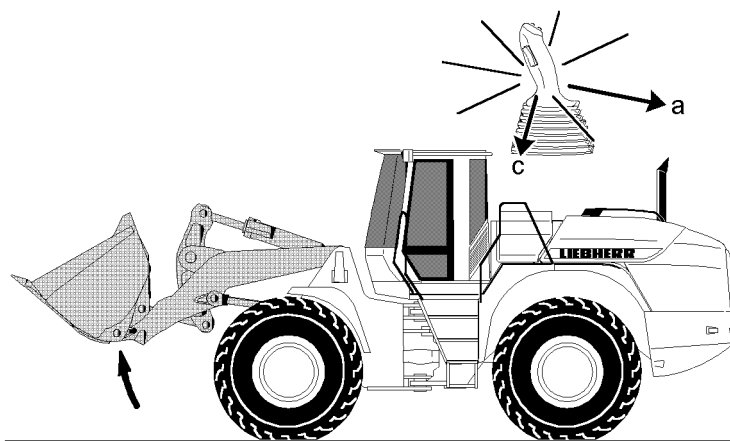
The braking effect of the brakes is impaired by switching over to overrun drive.

- 1 The hydrostatic braking effect is not available.
- 2 The machine can only be braked via the brake pedal via the main braking cylinder.

The following precautions should be effected before towing the machine.

Precautions:

- adopt the transport position,
- make all drive functions inoperational,
- release the parking brake.



04sl03ab

Transport position during towing

- Take up the transport position: raise the lift arms.
- If it is possible to hydraulically actuate the working attachment, tip up the bucket as far as it will go.

Caution

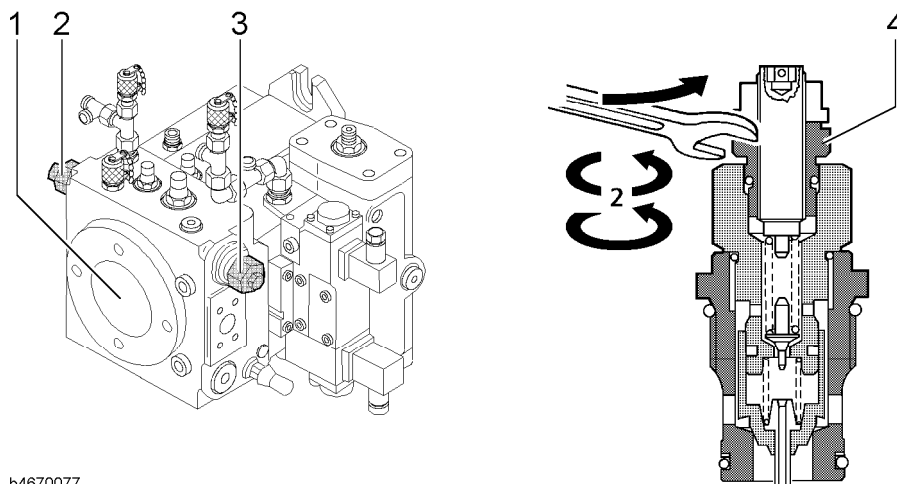


Risk of accidents due to restricted braking effect!

The braking effect of the brakes is impaired by switching over to overrun drive.

The machine can only be braked via the brake pedal via the main braking cylinder.

! Always drive carefully when under tow!



b4670077

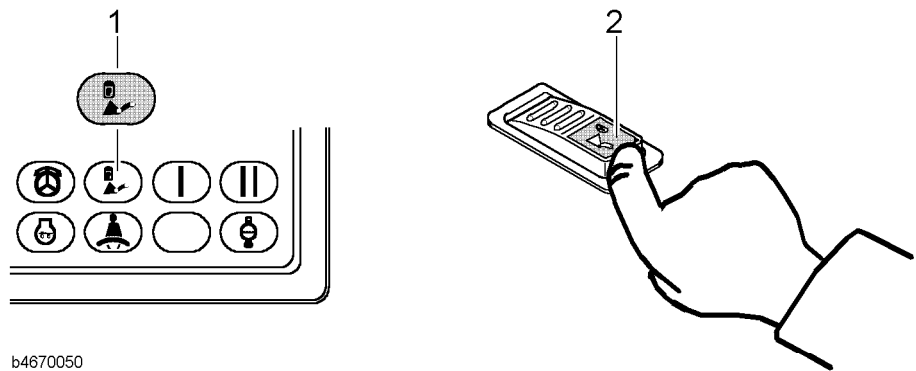
High pressure relief valves

- | | |
|--|------------------------------|
| 1 variable displacement pump –
drive hydraulics | 3 high pressure relief valve |
| 2 high pressure relief valve | 4 spring sleeve |

Switch travel drive system to overrun: to do this, release 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 makes free circulation of the oil possible. The machine's drive functions are now inoperational.

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b4670050

Indicator unit and switch – working hydraulics brake

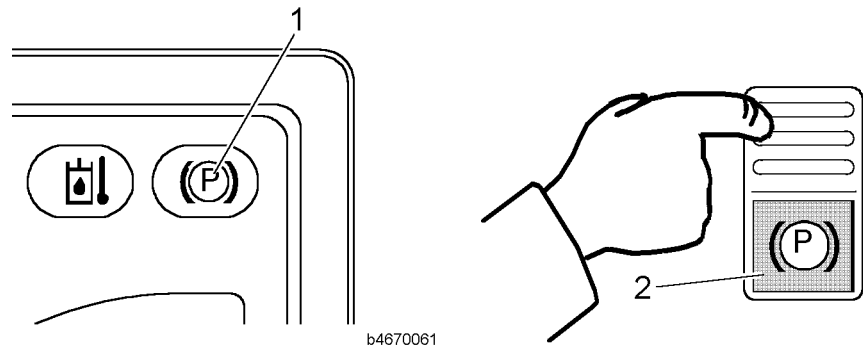
1 symbol field – working hydraulics lock

2 switch – working hydraulics lock

- **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 lights up.

The working hydraulics are no longer operational.



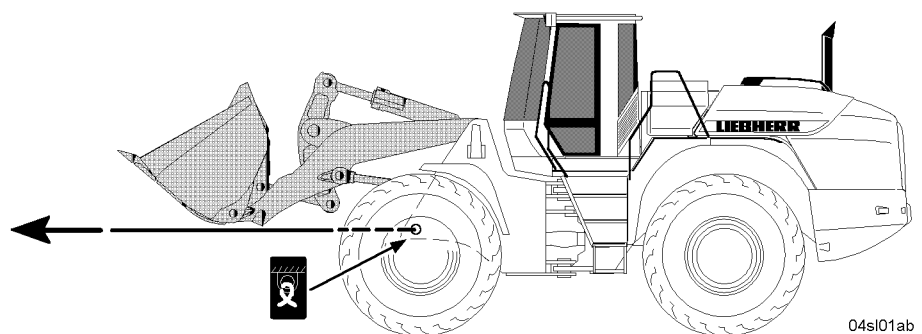
b4670061

Indicator unit and switch – parking brake

1 symbol field – parking brake

2 switch – parking brake

- 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.



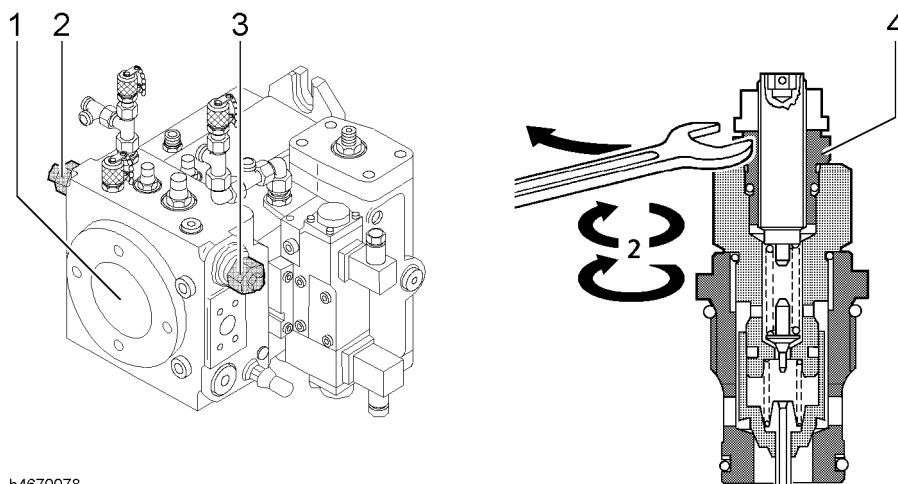
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Attaching towing ropes

- Feed the two towing ropes through the bore holes provided in the front section and secure them.

Retighten the valve insert of the high pressure relief valves 2, 3 on completion of towing.

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High pressure relief valves

- | | |
|--|------------------------------|
| 1 variable displacement pump –
drive hydraulics | 3 high pressure relief valve |
| 2 high pressure relief valve | 4 spring sleeve |

- Screw in spring sleeve 4 two turns with a wrench (SW 22).

The original adjustment of the high pressure relief valves is thus re-established.

Towing when the diesel engine is 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.

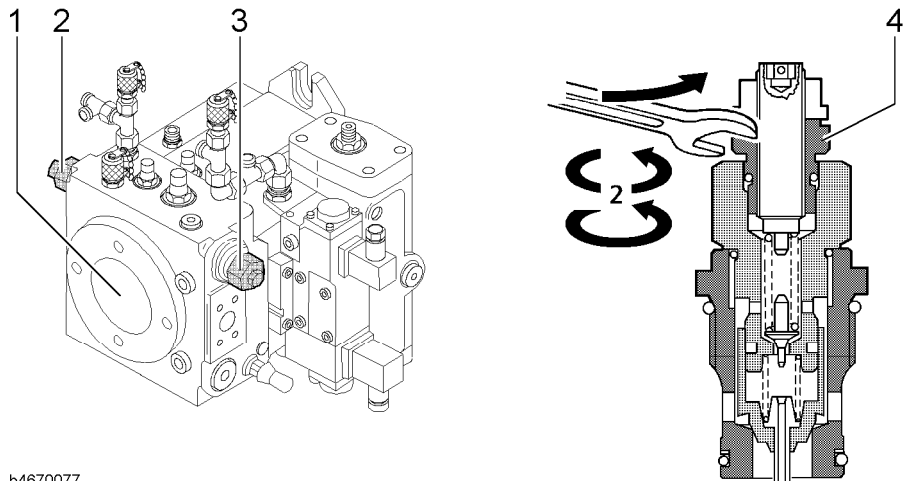
- The hydrostatic braking effect is not available.
- The machine can only be braked via the brake pedal via the main braking cylinder.

The following precautions should be effected before towing the machine.

Precautions:

- Turn the battery main switch 1 with the key 2 to position - I - ON.
- Adopt the transport position,
- Make all drive functions inoperational,
- Mechanically release the parking brake.

This is how to proceed when towing with diesel engine shut down.



b4670077

High pressure relief valves

- | | |
|---|------------------------------|
| 1 variable displacement pump – drive hydraulics | 3 high pressure relief valve |
| 2 high pressure relief valve | 4 spring sleeve |

Switch travel drive system to overrun: to do this, release 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 makes free circulation of the oil possible.

The machine's drive functions are now inoperational.

Warning



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).

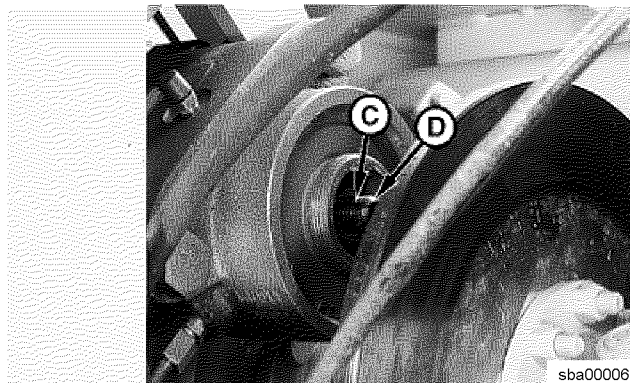


sba00001

Parking brake

- In order to mechanically release the parking brake: Unscrew the A sealing cover.

LBH/01/003801/0003/5.99/en



Parking brake

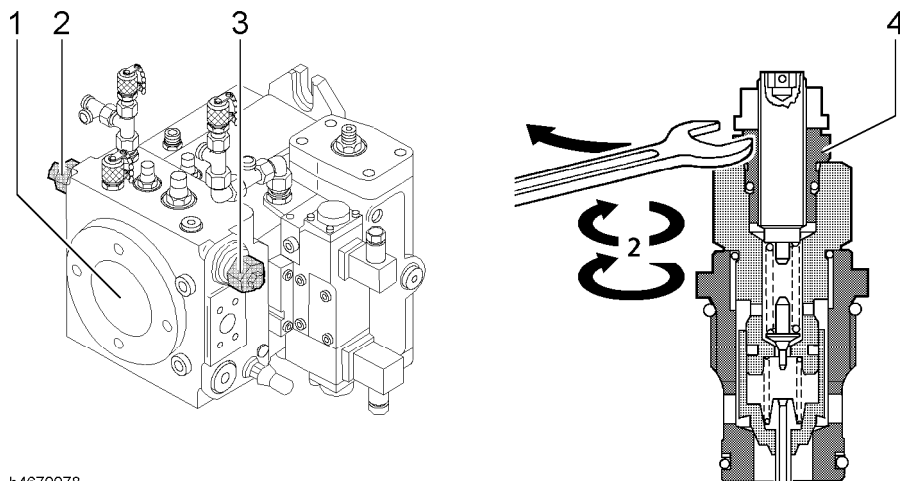
- Release the C lock nut.
 - Unscrew adjusting screw D in the counterclockwise direction until the brake lining pads are released from the brake disc.
- The parking brake is now mechanically released.

Warning

Risk of accidents when the machine is under tow!
 Since the steering function is restricted, there is a risk of accidents when the machine is being towed!
! When the machine is under tow, 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”.

Retighten the valve insert of the high pressure relief valves 2, 3 on completion of towing.



b4670078

High pressure relief valves

- | | |
|---|------------------------------|
| 1 variable displacement pump – drive hydraulics | 3 high pressure relief valve |
| 2 high pressure relief valve | 4 spring sleeve |

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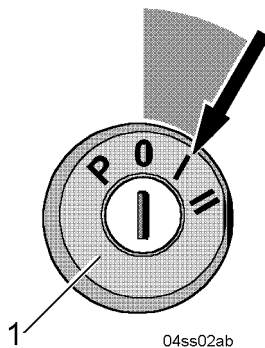
- Unscrew the spring sleeve 4 with two turns of a wrench (SW 22). The original adjustment of the high pressure relief valves is thus re-established.
- On completion of towing, set the brake as under “Setting the free travel”.

Towing the machine when the steering system has broken down

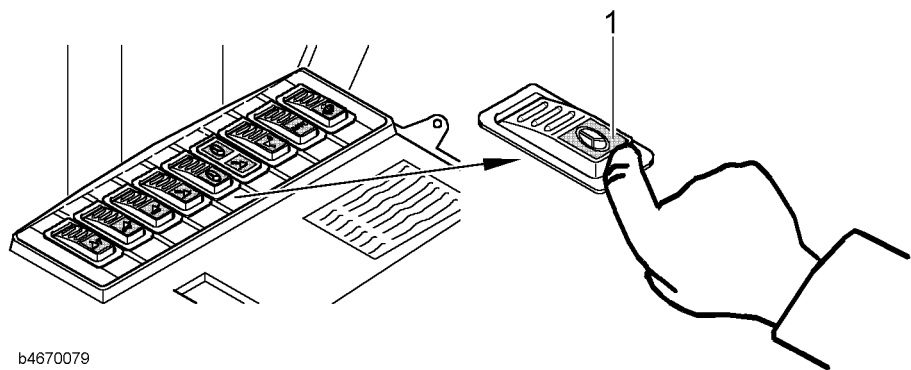
When the diesel engine or the steering pump break down during a journey, the emergency steering pump starts automatically for a period of approx. 30 seconds. Then the emergency steering pump switches off automatically – steering is no longer possible.

When the ignition is activated steering is possible via the function – Repeat start of the emergency steering pump –.

Continuous operation of the emergency steering pump results in overheating of the pump motor! The thermostat switch integrated in the pump motor, automatically switches the emergency steering pump off. Make sure that the machine's electrical system is switched on.



1 Starter switch – contact position



Switches on the side cover

1 button – emergency steering

- Press button 1 for emergency steering and keep it pushed down. 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 for repeat start of the emergency steering pump again and keep it pressed down.

3.4.2 Procedure for jump starting

When it is difficult to start due to flat batteries, the machine can be jump started with an external battery.

Make sure that the precautions detailed below have been met.

Connecting the external battery

This is the procedure for jump starting.

Danger



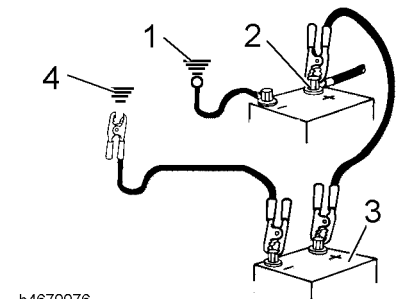
Risk of accidents due to incorrect or careless jump starting!

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 sufficient diameter.



b4670076

Procedure for jump starting

- | | |
|---|------------------------------------|
| 1 earth point of the discharged battery | 3 external battery |
| 2 positive pole of the discharged battery | 4 earth point for external battery |

- Connect a jump start cable first to the plus pole of the discharged battery 2 and then to the plus pole 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. Refer to the Section "Starting the diesel engine".

Disconnecting the external battery

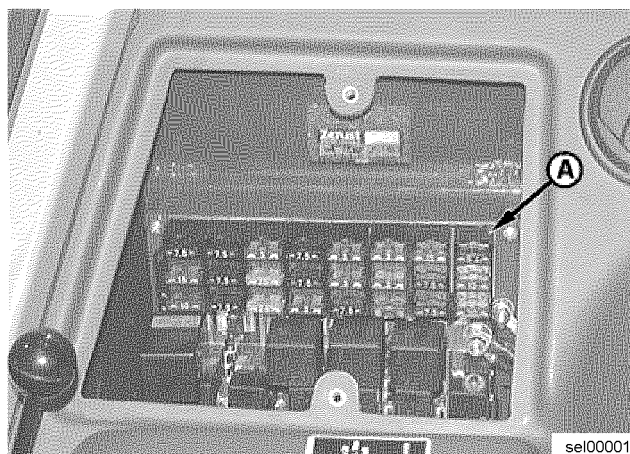
Before the jump start cables are removed, it is essential that the diesel engine of the machine is moved to lower idle running.

Excess voltage can be avoided by switching on big 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 pole of the external battery 3 and then from the positive pole of the discharged battery 2 .

4 Malfunctions

4.1 Malfunction rectification



Fuse – box

In order to avoid damage to the electrical system, only fuses with the appropriate Amp rating may be used.

Mega fuses

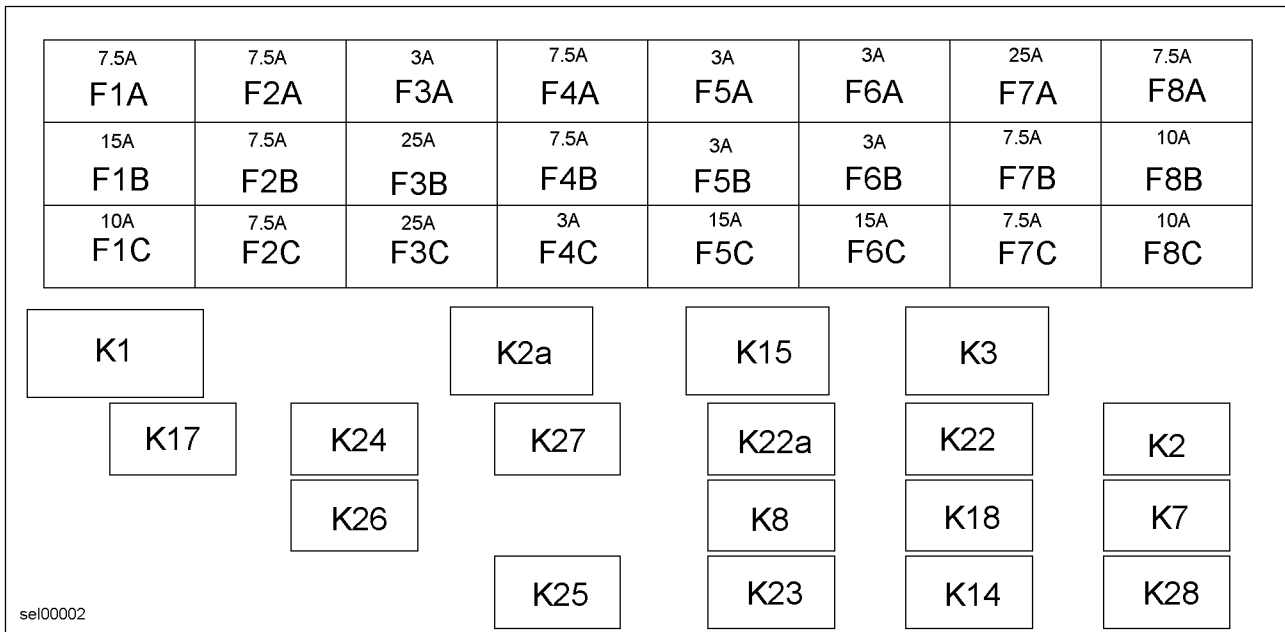
Use and location of the mega fuses:

Fuse	Rating	Units	Use	Location
Mega fuse	150	A	Emergency steering pump	on right-hand mudguard
Mega fuse	125	A	Preglow device	rear of engine compartment
Mega fuse	100	A	Main fuse	in battery case

Table – Mega fuses

Plug-in fuses

The F1A–F8C plug-in fuses for the functions listed in the below table are accommodated in the “Fuse – box” to the right behind the driver's seat on the control unit A .



Control unit with F1A–F8C plug-in fuses

Fuse	Rating	Units	Name/function
F1A	7.5	A	driving headlamp, left - high beam
F1B	15.0	A	blower motor
F1C	10.0	A	hazard warning system
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	--	A	unassigned
F3B	25.0	A	window wiping and washing system, driving headlamp preliminary fuse
F3C	25.0	A	working floodlights
F4A	7.5	A	starting block relay / pilot control solenoid valve
F4B	7.5	A	control electronics
F4C	3.0	A	indicator unit (battery + 30)
F5A	3.0	A	sidemarker light, right
F5B	3.0	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/indicator unit, preglow relay, beeper
F6C	15.0	A	window wiping / washing system front, signal horn
F7A	25.0	A	air conditioning system
F7B	7.5	A	working attachment (ignition + 15)
F7C	7.5	A	unassigned (battery + 30)
F8A	7.5	A	brake lights, prop. valve fan motor
F8B	10.0	A	radio (optional), socket - 2 pin.
F8C	10.0	A	motor stop

Table – fuse assignment

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4.1.1 Changing fuses

- Open the cover on the “fuse – box”, behind the driver's seat on the right.
- Determine the fuse associated with the electrical outage with the aid of the fuse chart above.
- Take out the blown fuse and replace with a new one (Amp rating according to location).

5 Maintenance

5.1 Maintenance and inspection schedule

The following abbreviations are used in this chapter:

- Oh = operating hours
- OM = Operating Manual
- SM = service manual
- ATP = authorised technical personnel
- MP = maintenance personnel

The maintenance work is divided into two groups by markings (circle, box, star – filled or circle, box, star – empty).

The markings have the following significance:

- Circle, box, star – filled means that the responsibility for carrying out the maintenance work lies with the machine operator or his maintenance personnel.
Affects the maintenance intervals: every 10 and 50 operating hours (Oh) and special intervals
- Circle, box, star – empty means, that the maintenance and inspection work must be carried out or directed by authorised technical staff from LIEBHERR or its authorised dealers.
Affects the maintenance intervals: on handing over and every 500, 1000, 2000 operating hours (Oh) and at special intervals

You will find a list of the spare parts which you will need for maintenance and inspection work in the “SERVICE PACKAGE” of the spare parts list.

Customer: Machine type: Serial No.: Oper. hours: Date:

Maintenance/inspection according to operating hours							JOBS TO BE PERFORMED		Performance instruction
on hand-over every 10	every 50	every 500	every 1000	every 2000	Special intervals	by maintenance personnel	by authorised qualified personnel	OM Page	
						■ one-off activity ● repetition interval † if necessary ❄ annually at the start of the cold season	□ one-off activity ○ repetition interval ✦ if necessary		
						OM-operating manual SM-service manual	Oh-operating hours		
General information									
<input type="checkbox"/>						Get the driver to lubricate the machine in accordance with the lubrication chart, while stressing the importance of proper maintenance			
<input type="checkbox"/>						Instruct the driver in the operation of all functions			
<input type="checkbox"/>	●	●	○	○	○	Check the machine for externally visible damage			
						†	Make sure that all threaded couplings are tightly fitted		
<input type="checkbox"/>						†	Rectify any leaks once established		
			<input type="checkbox"/>	○	○	Check hydraulic pressures according to the adjustment log - see the appendix in service manual			
Drive engine									
<input type="checkbox"/>	●	●	○	○	○	Check the oil level in the drive engine			
	●	●	○	○	○	Check the fuel system			
		■	○	○	○	250H	Change engine oil (inspection interval is 250 Oh or 500 Oh depending on oil specification)		
		■	○	○	○	Change the oil filters			
			○	○	○	Check engine speed			
			○	○	○	Check and if necessary replace V-ribbed belt			
			○	○	○	Check air suction hoses			
<input type="checkbox"/>	●	○	○	○	○	Drain off water and sediments in the fuel tank			
			○	○		Check attachment of the air intake and exhaust pipes			
			○	○		Check valve play			
			○	○		Grease sprocket on flywheel			
				○	❄	Check preglow system			
			○	○	✦	Replace fuel filter			
						2000H	Replace crank case ventilation (or no later than every 2 years)		
	●	○	○	○	†	Drain condensation from fuel filter			
					†	Clean dust extraction valve of the air filter			
			○	○	†	Clean or replace the air filter main element.			
					†	Replace air filter safety element (after the main element has been replaced 3 times)			
Cooling system									
<input type="checkbox"/>	●	○	○	○		Check coolant level			

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Customer: Machine type: Serial No.: Oper. hours: Date:

Maintenance/inspection according to operating hours							JOBS TO BE PERFORMED		Performance instruction
on hand-over	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	OM Page
							OM-operating manual SM-service manual	Oh-operating hours	
						†	Clean cooling system		
			○	○	○	❄	Check anti-freeze and DCA-4		
						3000H	Replace coolant (or no later than every 2 years)		
Working hydraulics									
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check the oil level in the hydraulic tank		
<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	250H	Check the magnetic rod on the hydraulic tank		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Drain off water and sediments in the hydraulic tank		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Replace return-suction filter		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Clean the return strainer in the hydraulic tank		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Replace bleeder filter on the hydraulic tank		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Clean pilot control device magnets and lubricate universal joints		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Change hydraulic oil		
Steering									
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check for proper functioning		
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Lubricate the bearing points on the steering cylinders		
Brake system									
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check the oil level in the equalizing reservoir		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check that the parking brake is functioning properly		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check that the parking brake is functioning properly		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check braking/inch pedal - rod adjustment		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check air clearance and linings of the service and parking brakes		
Electrical system									
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check pilot lights and lighting		
<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check batteries, fluid level and terminals		
Axles, tyres									
<input type="checkbox"/>							Check tyre pressure on attachments and accessories and adjust		
<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check the firmness of the wheel lugs (once at 50, 100 and 250 Oh)		
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Grease the lubrication points on the axle pivot steering on the rear axle		
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Lubricate front gear shaft		
<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check the oil level on the front axle		
<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Check the oil levels on the rear axle		

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Customer: Machine type: Serial No.: Oper. hours: Date:

Maintenance/inspection according to operating hours							JOBS TO BE PERFORMED		Performance instruction
on hand-over 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 OM-operating manual SM-service manual	by authorised qualified personnel □ one-off activity ○ repetition interval † if necessary Oh-operating hours	OM Page	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Replace the front axle transmission oil			
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Replace the rear axle transmission oil			
					†	Check tyre air pressure			
Vehicle chassis, ballast weights									
		●	○	○	○	Grease lubrication points on the rear axle oscillating axle casing and the articulated pendulum bearing			
Cladding, cab access									
						† Lubricate hinges on the rear hatch and engine compartment - hood			
Cab, air conditioning									
				○	○	† Clean or replace the fresh air filter			
						† Lubricate door hinges			
Lift arms, quick-change device									
		●	○	○	○	Lubricate bearings and lubrication points			
<input type="checkbox"/>						† Lubricate bucket bearings (the lower bucket bearing – if necessary – daily)			
		●	○	○	○	Check the bucket bearing seals			
			○	○	○	Check the lift arms and bucket stops			

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5.2 Lubricant chart, filling quantities

5.2.1 Table of filling quantities

The values stated for the filling quantities in the table are only guidelines:

- 1 In each case, the dipstick or level markings are definitive
- 2 Each time the oil is changed or topped up, the level in the unit in question must be checked.

For more detailed information about the required lubricants and operating materials, refer to the Section "Lubricants and operating materials".

	Name	Medium	Dosage	Unit
 06sy04ab	Cooling system – diesel engine total capacity	Coolant	18.4	l
 06sy05ab	Diesel engine	Lubricant oil	11.0	l
 1 06sy14ab	Front axle	Lubricant oil	9.4	l
 3 06sy16ab	Rear axle	Lubricant oil	7.0	l
 4 06sy17ab	Wheel hubs HA total capacity	Lubricant oil	1.4	l
 06sy03ab	Hydraulic tank	Hydraulic oil	65.0	l
 06sy03ab	Hydraulic system total contents	Hydraulic oil	105.0	l
 bsym0027	Brake system total capacity	Engine oil	1.0	l

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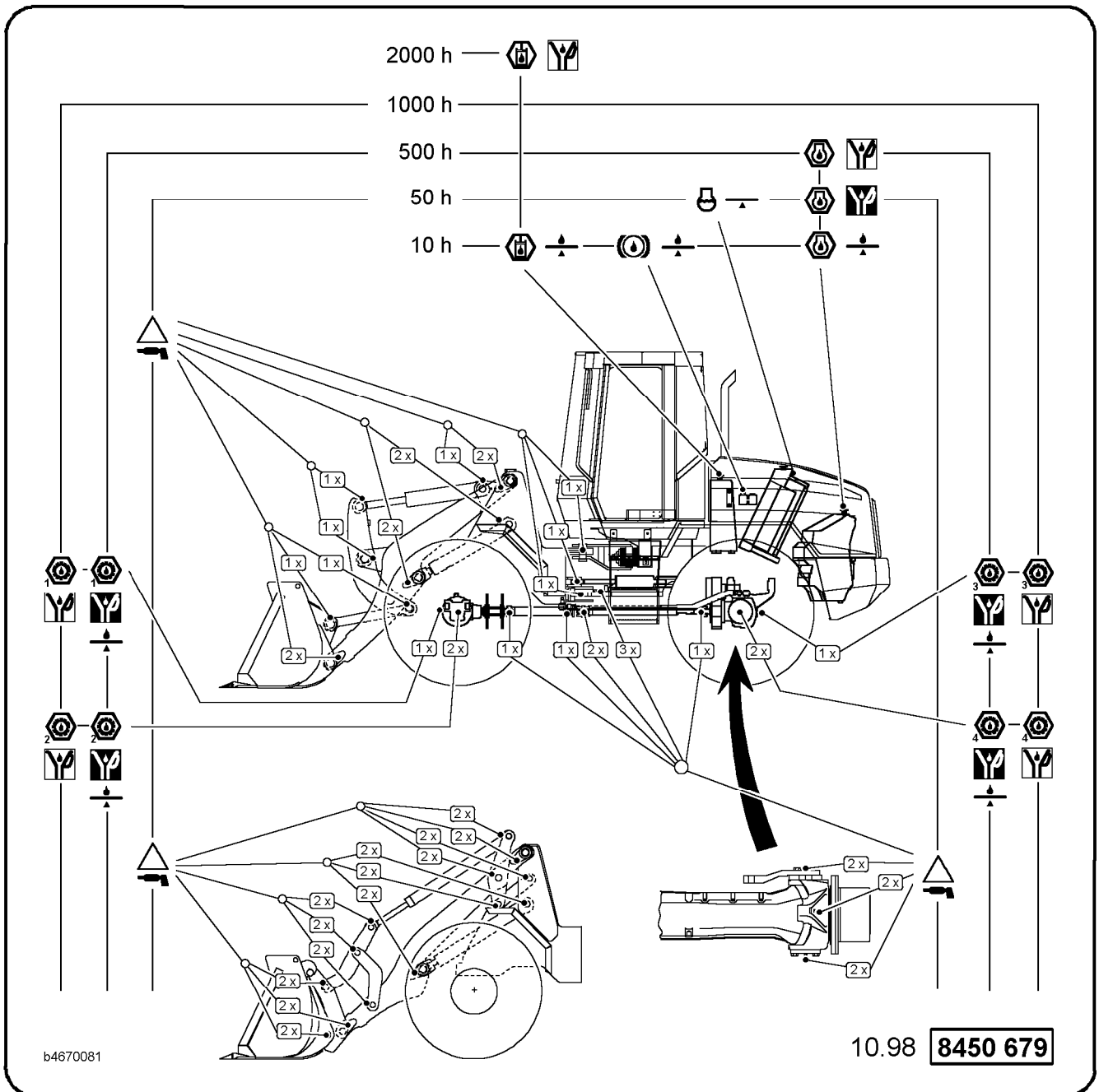
5.2.2 Lubricant chart

The lubricant chart provides an overview of the location of the service points on the machine and of the service intervals.

You will find detailed information in the Section "Maintenance and inspection schedule", as well as in the individual descriptions of the maintenance jobs, see Section "Maintenance jobs".







««For more detailed information about the required lubricants and operating materials, refer to the Section "Lubricants and operating materials".

For information about the required filling quantities, refer to the Section "Tables of filling quantities".



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Symbol	Name	Symbol	Name
 06sy09ab	General lubrication points	 06sy01ab	Lubrication
 06sy13ab	Check the oil level	 06sy21ab	Check coolant level
 06sy11ab	Oil change	 06sy12ab	First oil change

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5.3 Maintenance jobs

5.3.1 Preparatory jobs for maintenance

Before the various maintenance jobs are carried out, the machine must be moved into the maintenance position, unless otherwise specified in the description.

The various maintenance jobs include:

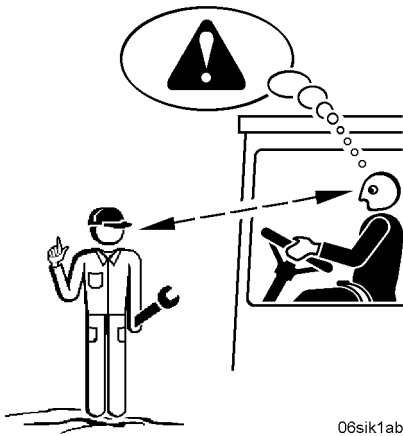
- lubricating the lift arms,
- checking the oil level or oil change in the engine, axle transfer gear, axles, hydraulic tank etc.,
- filter change as well as adjustment and repair work on the hydraulic system.

Safety precautions for maintenance

It is essential that the accident prevention regulations are observed during maintenance work!

Refer to the Section "Measures to ensure safe maintenance".

Make sure that visual contact is maintained between the operator in the cab and the maintenance personnel.



06sik1ab

Visual contact

Danger

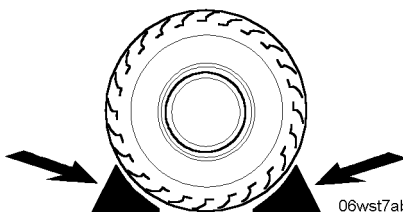


Risk of accidents for the maintenance personnel!

Unforeseen operation of the machine by an unauthorised person can put the maintenance personnel in extreme danger!

! Never enter the machine's danger area without making your presence known.

- Make yourself unmistakably visually obvious before entering the machine's danger area.
- Secure the machine against unforeseen rolling away with wheel wedges.



06wst7ab

Wheel wedges

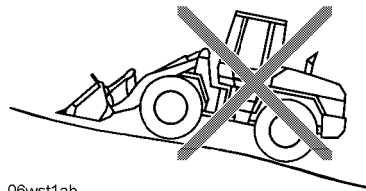
Maintenance positions The maintenance position depends on the maintenance job to be carried out.

The two basic maintenance positions 1 and 2 are described below. They enable access to the individual maintenance points.

Maintenance position 1

This is the procedure for moving the machine into the maintenance position 1.

For a detailed description of the individual procedures, refer to the Section "Operation, handling".



06wst1ab



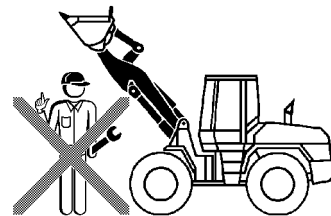
Maintenance position 1

- Park the machine on level ground.
- Lower the lift arms.
- Set down the bucket flat on the ground.
- Shut down the diesel engine.
- Take out the ignition key.

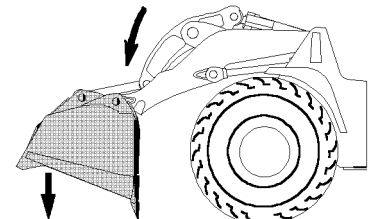
Maintenance position 2

This is the procedure for moving the machine into the maintenance position 2.

For a detailed description of the individual procedures, refer to the Section "Operation, handling".



06wst5ab



Maintenance position 2

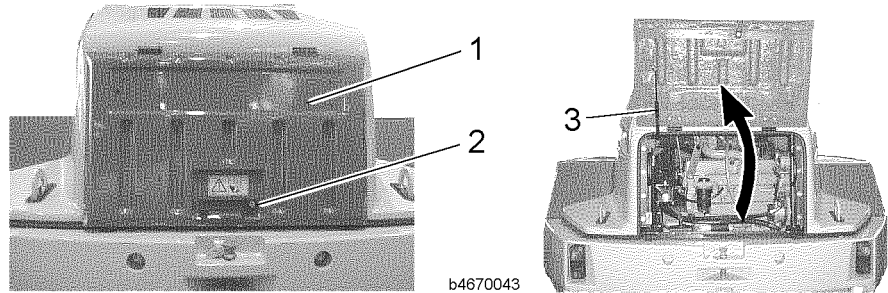
- Park the machine on level ground.
- Install the articulated joint lock.
- Lower the lift arms.
- Tip the bucket down and set it down on the ground on its teeth or cutting edge.
- Shut down the diesel engine.
- Take out the ignition key.

Opening the service doors, hatches and hoods

Opening the engine compartment – rear hatch

When the rear hatch is open, the following aggregates or components can be reached:

- diesel engine
- main battery switch



Engine compartment – rear hatch

- | | |
|-----------------------------------|--------------------|
| 1 engine compartment – rear hatch | 2 handle with lock |
| | 3 pneumatic ram |

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

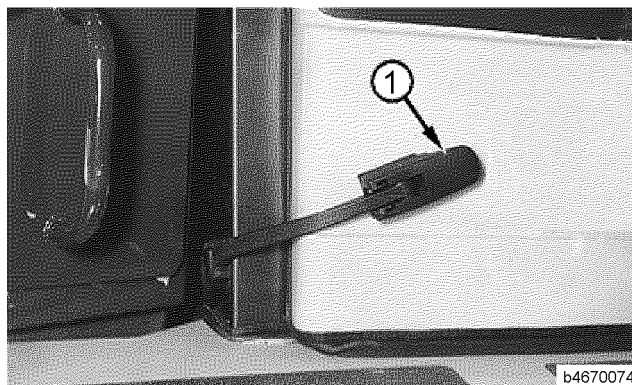
When the hood is open, the following aggregates or components can be reached:

- diesel engine
- variable displacement pump
- cooling system
- hydraulic tank
- air filter

Make sure that the rear hatch is completely open.

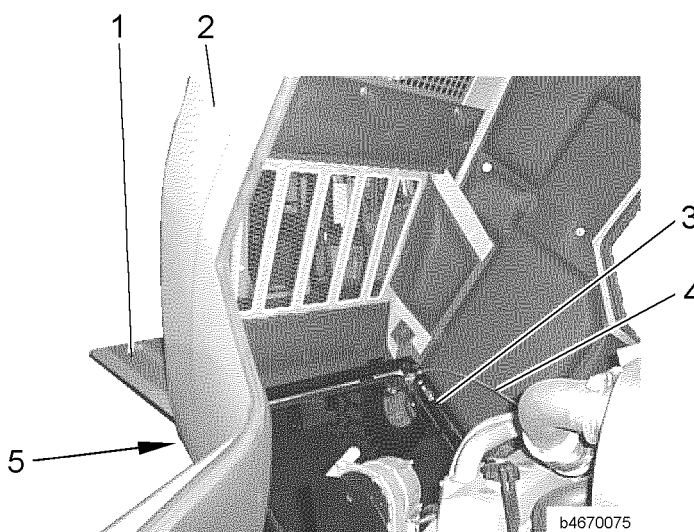
To open or close the hood: only climb onto the machine via the cab access and stand where you have a secure footing.

- Stand on the surfaces provided!



Clamping lever 1

- Open the clamping levers 1 on the left and right of the engine compartment – hood.



Engine compartment – hood

- | | |
|-----------------------------------|-----------------|
| 1 engine compartment – rear hatch | 3 pneumatic ram |
| 2 engine compartment – hood | 4 holding rope |
| 5 handle | |

Warning

Risk of accidents due to turning engine parts!
 The rotating or moving engine parts such as – the fan rotors or V-belts, for example are a potential source of injuries!
 ! Only open the engine compartment – hood when the engine is at rest.

- Completely open the hood 2 with the handle 5 .
 The hood is held in this position by two pneumatic rams 3 .

Warning

Risk of injuries due to hood falling closed!
 ! Check that the fully open position is guaranteed by the pneumatic rams.

- If this function is not assured, the cause of the defect must be rectified immediately.

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Trouble shooting

Is proper functioning not assured?

- Consult LIEBHERR CUSTOMER SERVICE.
-

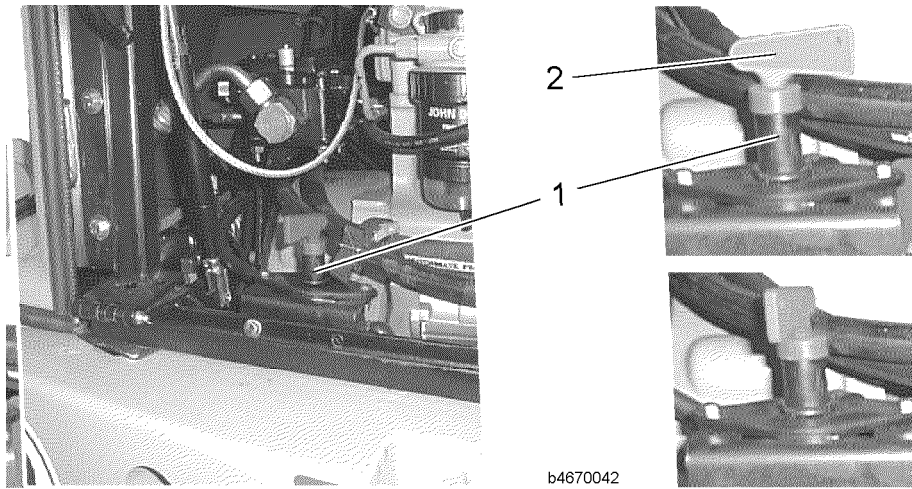
Turning off the battery main switch

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

For certain maintenance jobs, the battery main switch must first of all be turned OFF.

Get information in the descriptions of the relevant maintenance jobs: about whether the battery main switch must be turned ON or OFF. Refer to the Section "Maintenance jobs . . .".

When these maintenance jobs have been completed, turn the battery main switch back to ON.



Main battery switch

1 main battery switch

2 key



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.



Unforeseen operation of the machine by an unauthorised person can put the maintenance personnel in extreme danger!

! For reasons of safety, it is essential that the battery main switch is turned off!

! For reasons of safety, take out the key!

- Turn the battery main switch 1 with the key 2 to position - 0 - OFF.

5.3.2 Maintenance jobs (daily / every 10 operating hours)

When the daily maintenance has been carried out, the machine should be moved back into the operating position.

Refer to the Section "Operating position".

Complete machine

Checking the machine for externally visible damage

Make sure that the machine is in maintenance position 1.

- Before starting up the machine, check for externally visible signs of damage which could impair operational safety.
- Immediately rectify damage with safety implications.

Drive engine, cooling system

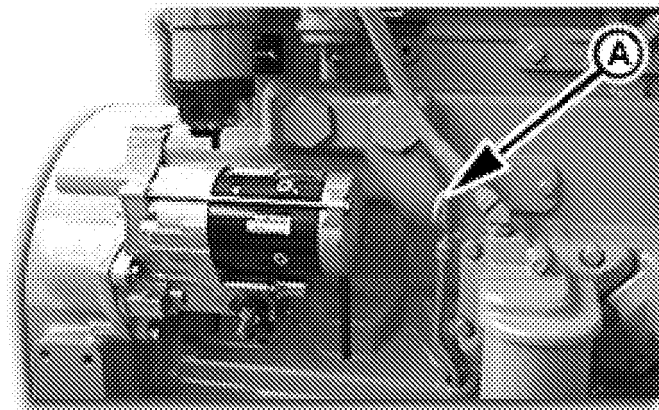
Check the oil level in the drive engine

The dipstick is located on the right-hand side of the 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 engine is level
- the engine is shut down
- the engine is cold
- the battery main switch if provided is switched off and the main switch – ignition key is taken out.



Diesel engine - oil dipstick

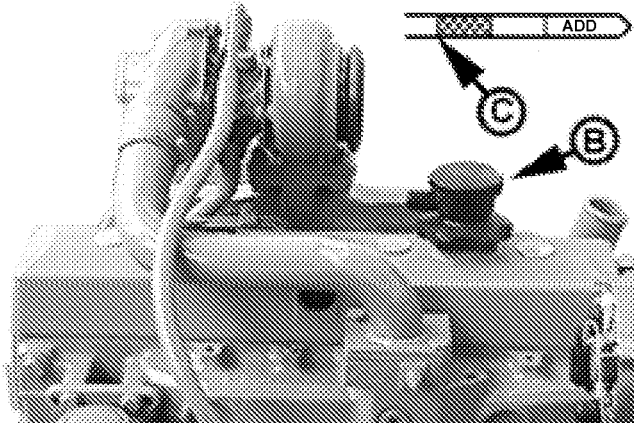
- Pull out the dipstick A , wipe it clean and reinsert it.
- Pull out the dipstick once more and read off the oil level.

The oil level must be between the cross hatching and the ADD mark.

Trouble shooting

If the oil level is too low:

- Do not start the engine.
- Remove oil inlet flap B .



Diesel engine - oil filler neck

- Fill with oil with the oil filler neck (oil quality, refer to Section “Lubricants and operating materials”).

Do not fill over the upper marking on the dipstick (C).

- Clean the filling cover, put it back on the oil filler neck and tighten it.

Checking coolant level

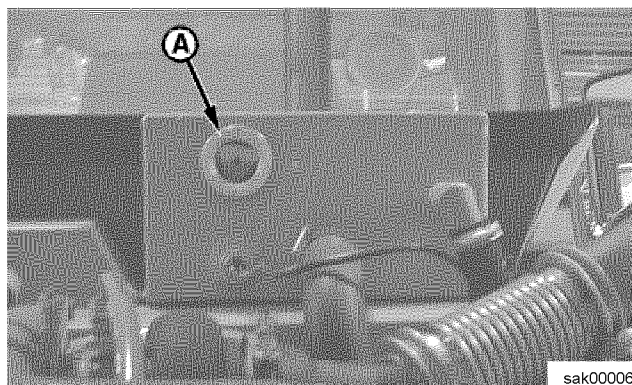
The coolant – equalizing reservoir with filling neck 1 is located on the upper side of the cooling unit. The equalizing reservoir is accessed by opening the engine compartment – hood.

The coolant level can be seen by looking through the sight glass (A). The correct coolant level when the engine is cold is in the middle of the sight glass (A). If the coolant level is below the sight glass then the coolant must be topped up.

Make sure that:

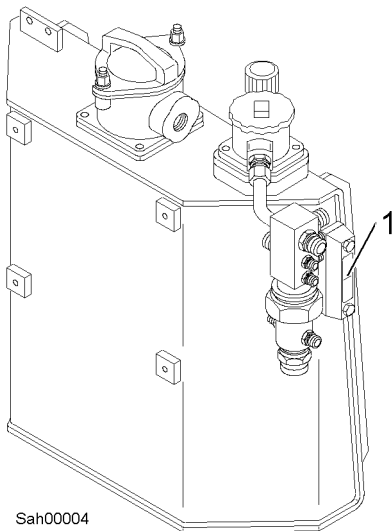
- the machine is in maintenance position 1,
- the rear hatch is open,

Procedure



- Check the coolant level in sight glass (A) in the equalizing reservoir, the coolant must be visible in the sight glass (A).
- If the coolant level is below the sight glass, the coolant must be poured in the inlet (B).

Checking the oil level in the hydraulic tank



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Working hydraulics

Make sure that:

- the machine is cold,
- the machine is in maintenance position 1,
- the engine compartment – hood is open.

Procedure for checking the hydraulic oil level

The red marking “OIL LEVEL - max.” 1 shows the required height of the oil level.

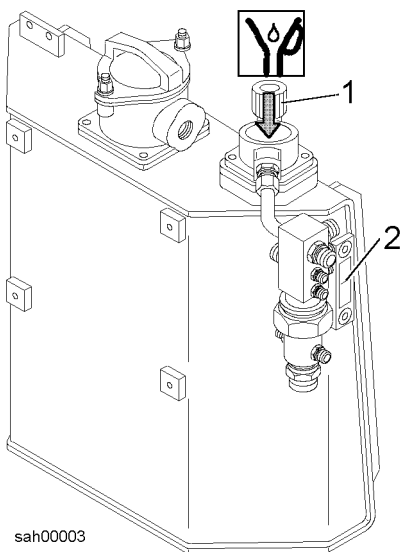
- Check the oil level at the sight glass.
- If the oil level is under the required level:
Refill with hydraulic oil.

Procedure for refilling with hydraulic oil.

- Clear tank pre-pressure: Tighten up the bleeder filter 1 on the hydraulic tank.

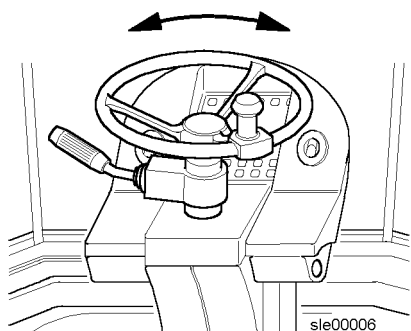
The hydraulic oil may only be poured in through a return strainer.

- Open the cover of the return strainer.
- Fill with hydraulic oil up to the oil level marking 2 .
- Put the cover with pressure spring on the housing and tighten it up.
- Screw on the bleeder filter.



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Checking the steering for proper functioning



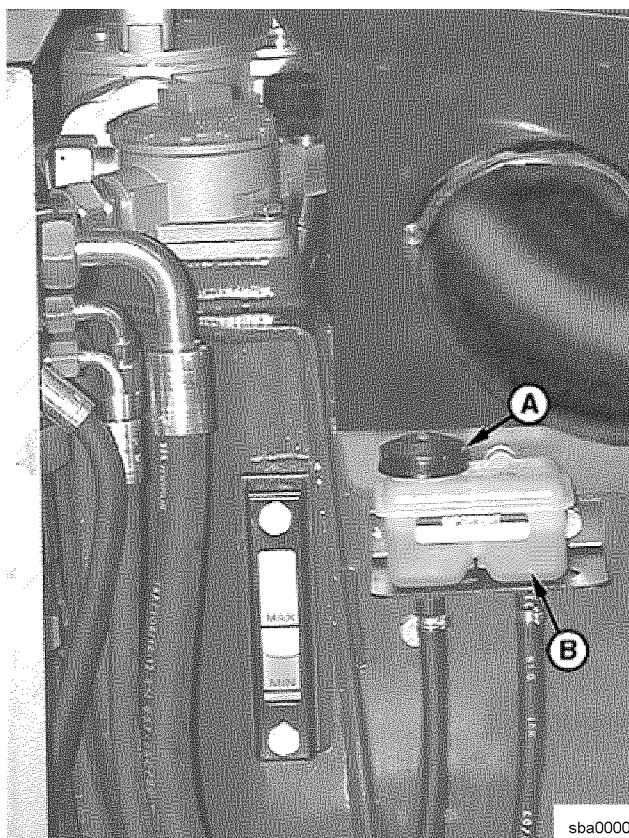
Steering

- Start the diesel engine.
- Turn steering in both directions and check that it is functioning properly.

Check the oil level in the equalizing reservoir

Brake system

Make sure that the machine is in maintenance position 1.





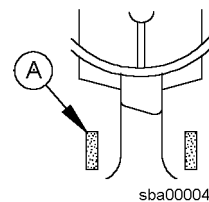
In order to avoid damage to the braking system, only use suitable engine oil (mineral oil).

! Make sure that only suitable oils are used when refilling (see in Section "Lubricants and operating materials").

- Open engine compartment – hood and secure in open position.
- Check the oil level in the equalizing reservoir (B).
- The oil level must lie between the minimum and maximum markings.
- If the oil level is at or below the minimum marking, remove cover (A) and top up as required with oil.
- Screw the cover (A) onto the equalizing reservoir.

Checking that the service brake is functioning properly

Move machine into operating position.



Pedal A 1 Service brake

- Start the diesel engine.
- Keep the inch - brake pedal (A) pushed down as far as it will go.
- Release the parking brake.



Risk of accidents due to machine moving off!

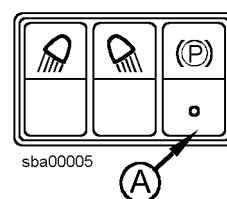
The machine can move off during testing procedure.

! Carry out the test procedure with appropriate degree of caution.

- Select forward drive and bring the diesel engine speed to full gas. The machine must not move off.

Checking that the parking brake is functioning properly

Moving machine into operating position.



Rocker switch – parking brake A



The machine stops abruptly when the parking brake is engaged during motion!

! Fasten safety belt.

- Move machine forward at approx. 3 km/h and activate the parking brake with the rocker switch – parking brake A .

The machine must come to an abrupt stop.

Electrical system

Checking pilot lights and lighting

For the layout of the illuminating components and symbol fields on the indicator unit refer to the Chapter "Operation, handling".

- Start the diesel engine and check that the illuminating components and symbol fields light up.

5.3.3 Maintenance jobs (weekly / every 50 operating hours)

Before the weekly maintenance jobs are carried out, the daily jobs must be completed.

Refer to the Section "Maintenance jobs (daily / every 10 operating hours)". When the weekly maintenance has been carried out, the machine should be moved back into the operating position.

Refer to the Section "Operating position".

Make sure previously that the machine is in maintenance position 1 or 2.

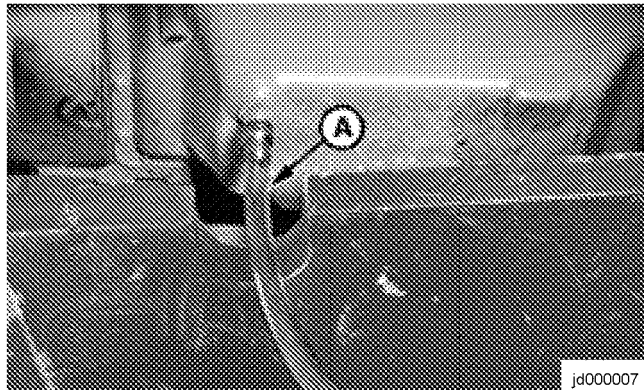
Refer to the Section "Maintenance positions".

Drive engine, cooling system

Changing the engine oil

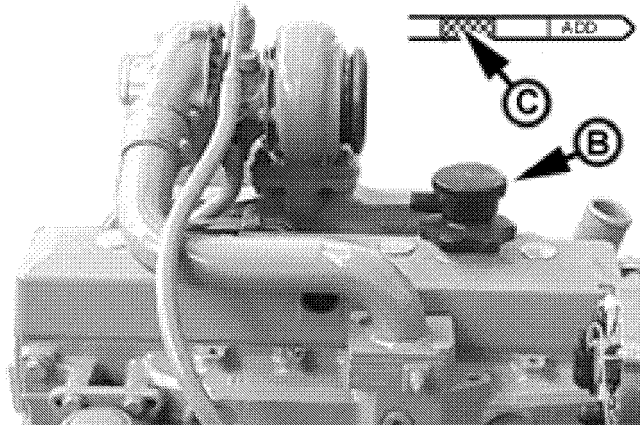
Make sure that:

- the machine is in maintenance position 1,
- the engine is level
- the engine is shut down
- the engine is warm
- the battery main switch is switched off and the main switch – key is taken out.
- 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.



Draining valve with draining hose

- Unscrew the sealing cover on the oil draining valve on the bottom of the oil pan.
- Screw the oil draining hose onto the oil draining valve.
- Let the oil drain off into the waiting container.
- Unscrew the oil draining hose and screw the sealing cover onto the oil draining valve.



Diesel engine - oil filler neck

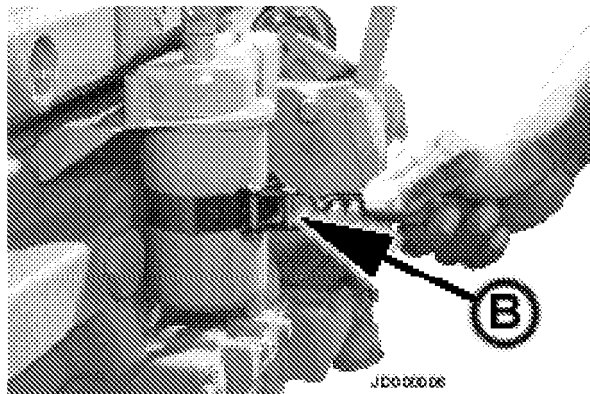
- Fill with oil via the filler neck until the oil level lies over the cross hatching on the dipstick .
- Clean the filling cover, put it back on the oil filler neck and tighten it.
- Start the engine and check the oil pressure.
- Shut down the engine and check the oil level with the dipstick after 5 - 10 minutes.

Trouble shooting

If the oil level is not within the cross hatched area?

- Correct the oil level.
-

Changing the oil filters Only use original LIEBHERR oil filter cartridges (1 piece).



Oil filters

- Release the oil filter cartridge B with a strap wrench and unscrew the filter.

- Clean the seals on the filter bracket.
The old filter seal and its residues must be removed.
- Brush the rubber gasket on the new oil filter cartridge lightly with engine oil.
- Refill new oil filter cartridge with fresh oil.
- Screw new oil filter cartridge onto the filter bracket until the seal contacts the filter bracket. Tighten by another half to three-quarter rotation.
- Start the engine.
- Check the oil pressure (engine oil pressure indicator unit) and the oil filter for leaks.
- Shut down the engine.
- Check the oil level with the dipstick after 5 - 10 minutes.

Trouble shooting

Oil level is not within the cross-hatched area?

- Correct the oil level.
-

Draining off water and sediments in the fuel tank

Make sure that the engine is shut down and that the machine is in maintenance position 1.

Work with the highest possible degree of cleanliness.

Danger



There is a risk of fires and explosions!

- ! Do not smoke and avoid naked flames when working on the fuel system.
 - ! Only work on the fuel system when the engine is shut down.
-

- Do not drain the fuel onto the ground, use suitable containers for receiving the fuel.
- Screw the draining valve onto the bottom side of the diesel tank.
- Let the condensation and sediments drain off into a suitable container until clean fuel begins to flow.
- Tighten draining valve
- Keep the fuel level in the tank as high as possible, in order to keep condensation to a minimum.

Working hydraulics

Make sure that:

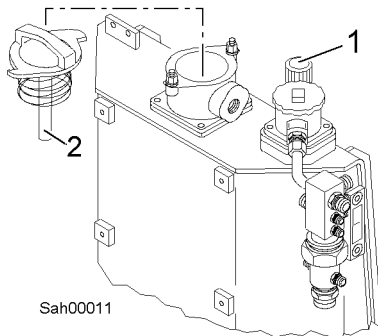
- the machine is in maintenance position 1,
- the engine compartment – hood is open.

Checking and cleaning the magnetic rod on the hydraulic tank

Checking the magnetic rod on the hydraulic tank

Procedure

- Clear tank pre-pressure: Unscrew the bleeder filter 1 on the hydraulic tank by two revolutions.
- Release the bolts on the cover and slowly lift the cover with the magnetic rod 2 .



Trouble shooting

Heavy soiling or larger metal fragments on the magnetic rod could indicate damage in the hydraulic system.

- In this event, isolate and rectify the fault in the hydraulic system.

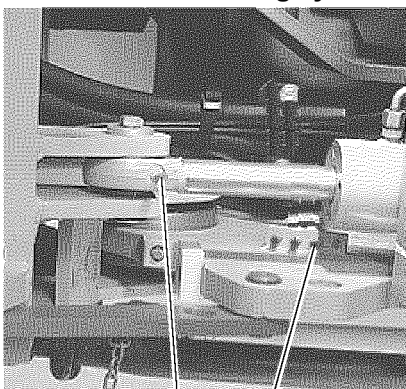
- Clean magnetic rod carefully.
- Place the O-ring and cover with magnetic rod on the housing.
- Tighten the bolts on the cover.
- Tighten up the 1 bleeder filter

Steering

Make sure that the machine is in maintenance position 1.

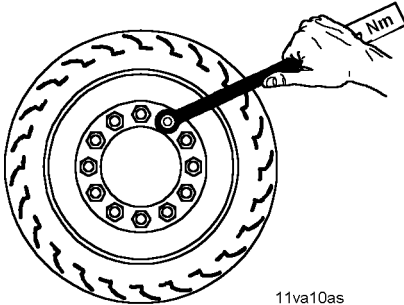
- Turn the machine to the right to improve access to the articulated joint zone.
- Lubricate the bearing points on the steering cylinder.

Lubricate the bearing points on the steering cylinders



Axles, tyres

Checking the wheel lug fixings



Make sure that:

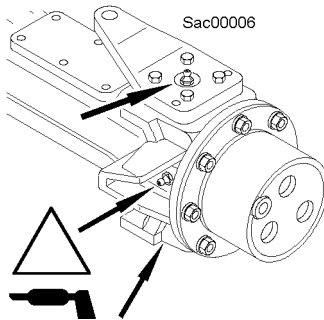
- the machine is in maintenance position 1,
- and a torque wrench for the measurement range up to 650 Nm is available.

Procedure

Note: The unique one-off maintenance jobs foreseen for 50, 100 and 250 operating hours are also to be carried out each time the wheels are changed.

- Check that the nuts on all four wheels have the required tightening moment of 650 Nm.

Greasing the lubrication points on the axle pivot steering on the rear axle



Make sure that the machine is in maintenance position 1.

Procedure

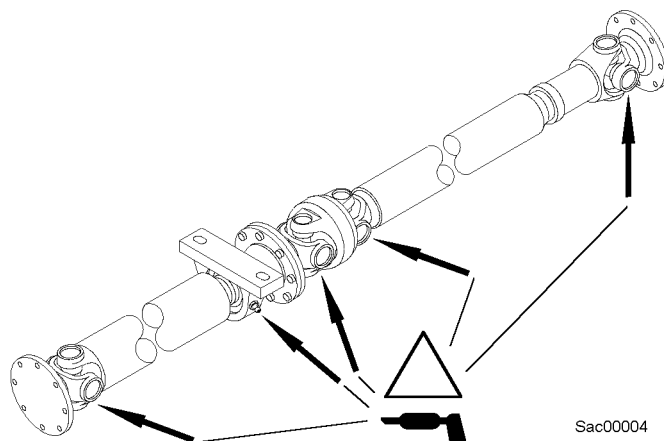
The lubrication point on the steering shaft of the wheel hub cannot be accessed until it is turned left or right. In addition the machine must be moved into such a position that the lubricating nipple can be accessed.

- Turn the machine to the left and right so that the respective lubrication points can be accessed.
- Grease the lubrication points on the gear shaft at both wheel hubs.
- Grease the lubrication points on the axle pivot bearing at both wheel hubs.

Lubricating front gear shaft

Make sure that the machine is in maintenance position 1.

Procedure



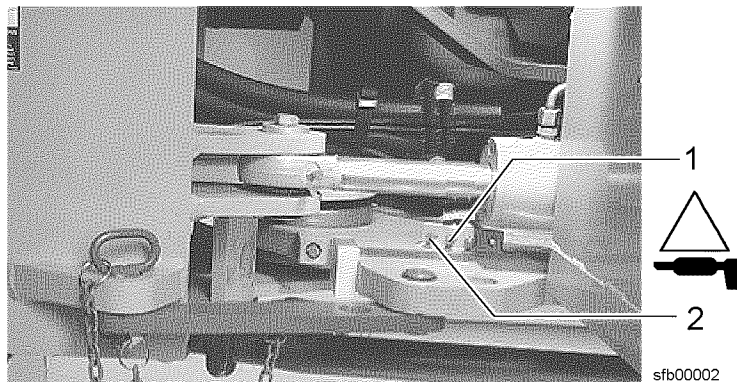
- Move the machine into the position where the lubricating nipples on the gear shaft point horizontally downwards.
- Turn the machine so that it is straight.
- Lubricate the 5 lubrication points on the gear shaft.

Vehicle chassis, ballast weights

Lubricating oscillating axle casing and articulated bearing

Make sure that:

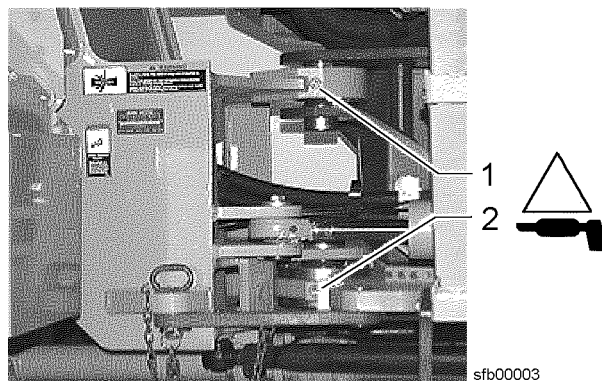
- the machine is in maintenance position 1,
- the articulated joint lock is installed.



Lubrication points on the right-hand side of the central lubrication rail

- 1 lubrication point - front oscillating axle mount
- 2 lubrication point - rear oscillating axle mount

- Lubricate front oscillating axle mount: Lubricate lubrication point 1 on the central lubrication rail.
- Lubricate rear oscillating axle mount: Lubricate lubrication point 2 on the central lubrication rail.



Articulated bearing lubrication points

- 1 lubrication point - articulated bearing at top
- 2 lubrication point - articulated bearing at bottom

- Lubricate articulated bearing at top: Lubricate lubrication point 1 on the articulated bearing
- Lubricate articulated bearing at bottom: Lubricate lubrication point 2 on the articulated bearing.

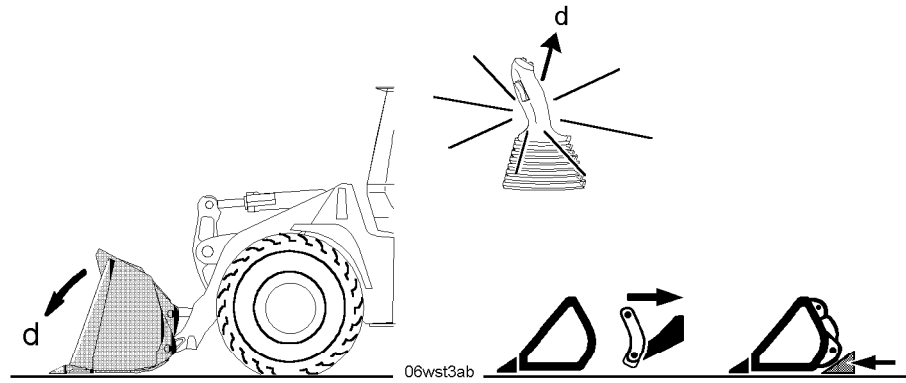
Lift arms, quick-change device

Lubricating bearings and lubrication points

Make sure that the machine is in maintenance position 1.

You will find details on this in the Section "Maintenance positions".

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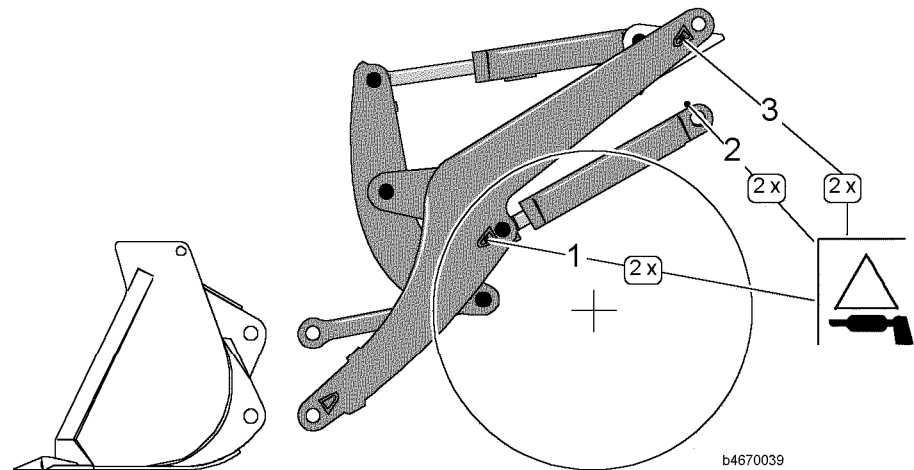
Maintenance position – lift arms

If the lubrication points near the bucket couplings are difficult to reach, make sure that the working attachment is decoupled.

This only applies to machines with attached optional equipment.

You will find details on this in the Section “Decoupling the working attachment”.

Lubricating the lift arms and lift cylinders



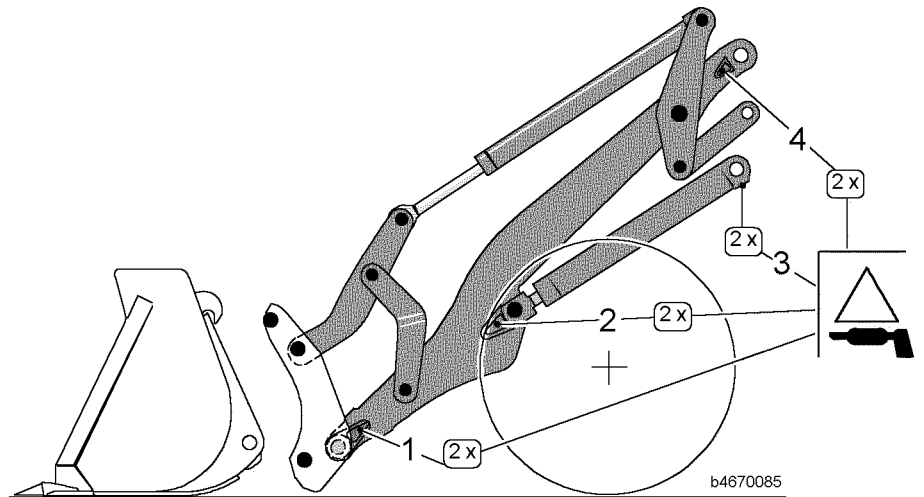
Lubrication points – lift arms and lift cylinders

1 lubrication point – front lift cylinder

2 lubrication point – rear lift cylinder

3 lubrication point – top lift arms

- Lubricate the bearing at the top of the lift arms: Grease lubrication point 3 left and lubrication point 3 right.
- 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.

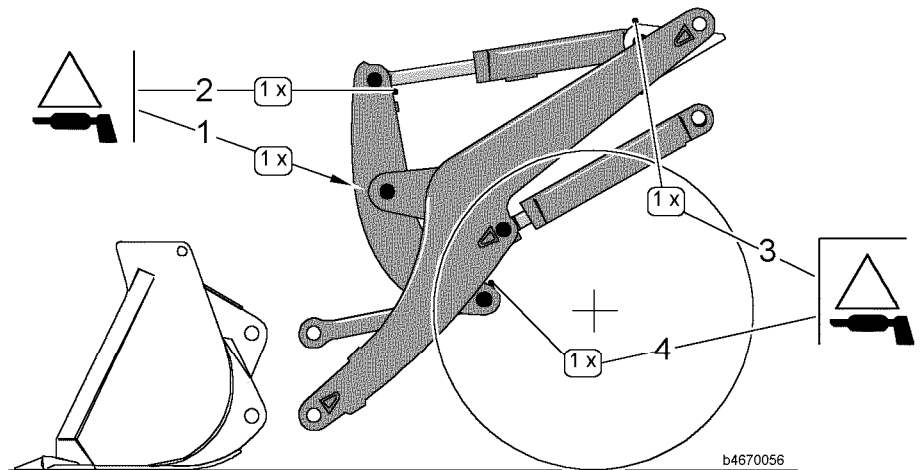


Lubrication points – lift arms and lift cylinders

- | | |
|---|--|
| 1 lubrication point – top lift arms | 3 lubrication point – rear lift cylinder |
| 2 lubrication point – front lift cylinder | 4 lubrication point – top lift arms |

- Lubricate the bearing at the top of the lift arms: Grease lubrication point 4 left and lubrication point 4 right.
- 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 lift1 arms.

Lubricating tilt cylinder, reversing lever and connecting strap

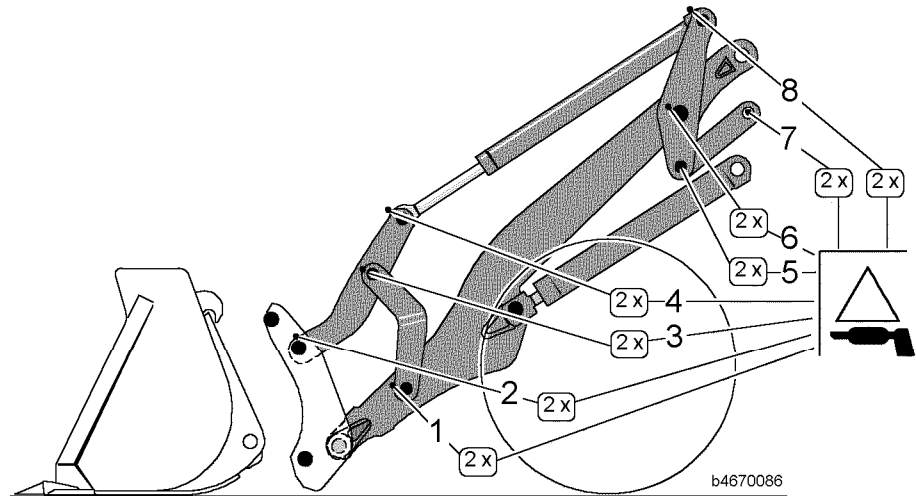


Lubrication points – tilt cylinder, reversing lever and connecting strap

- | | |
|---|--|
| 1 lubrication point – reversing lever | 3 lubrication point – rear tilt cylinder |
| 2 lubrication point – front tilt cylinder | 4 lubrication point – connecting strap |

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- Lubricate the lubrication point 1 on the reversing lever.
- Lubricate the bearing on the tilt cylinder: Grease lubrication point 2 front and lubrication point 3 rear.
- Lubricate the lubrication point 4 on the connecting strap.

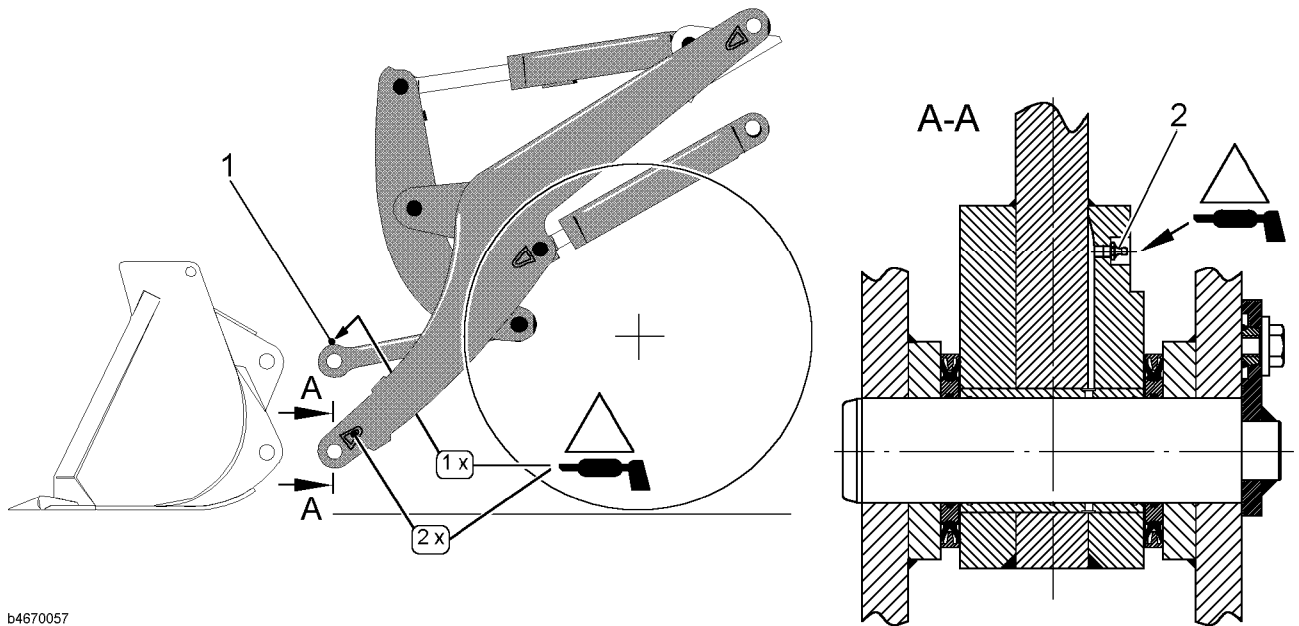


Lubrication points – tilt cylinder, reversing levers and straps

- | | |
|---|--|
| 1, 3 lubrication points - reversing lever front | 5, 6 lubrication points - reversing lever rear |
| 2 lubrication point - front strap | 7 lubrication point - rear strap |
| 4 lubrication point - front tilt cylinder | 8 lubrication point - rear tilt cylinder |

- Lubricate the lubrication point 2 on the front left- and right-hand strap.
- Lubricate the two lubrication points 1, 3 on the right and left front reversing lever.
- Lubricate the bearings on the tilt cylinders: Grease lubrication point 4 front and lubrication point 8 rear.
- Lubricate the two lubrication points 5, 6 on the right and left rear reversing lever.
- Lubricate the lubrication point 7 on the rear left- and right-hand strap.

Lubricating the bucket bearings If required, the lower bucket bearings should be lubricated daily.



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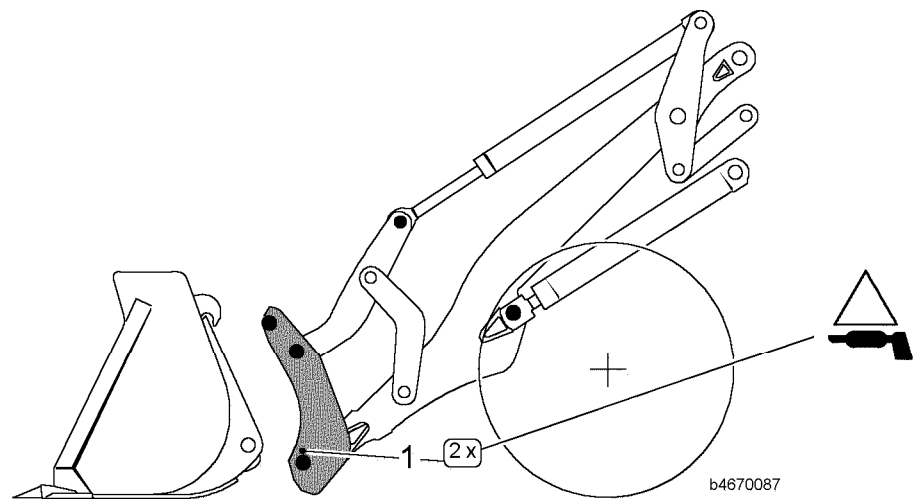
Lubrication points – bucket coupling

1 lubrication point – connecting strap

2 lubrication point – bucket bearing

A-A section

- Lubricate the lubrication point 1 on the connecting strap.
- Lubricate the lubrication point 2 on the bottom/left bucket bearing.
- Lubricate the lubrication point 2 on the bottom/right bucket bearing.



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Lubrication points – bucket coupling

1 lubrication point – bucket bearing

- Lubricate the lubrication point 1 on the bottom/left bucket bearing.
- Lubricate the lubrication point 1 on the bottom/right bucket bearing.

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Checking the bucket bearing seals

- Carry out a visual check.

5.3.4 Optional maintenance jobs

After the maintenance has been carried out, the machine should be put back in the operating position.

Refer to the Section "Operating position".

Make sure previously that the machine is in maintenance position 1 or 2.

Refer to the Section "Maintenance positions".

Complete machine

Make sure that all threaded couplings are tightly fitted

Make sure that:

- the machine is in maintenance position 2,
- the appropriate service hatches or hoods are open.
- Tighten any loose screws or bolts with the required torque.

Deal with any leaks if identified

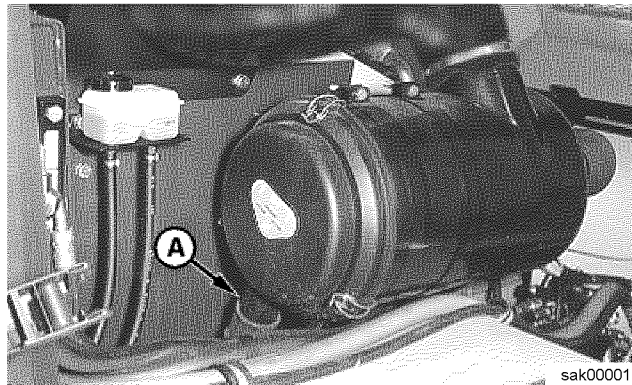
Make sure that:

- the machine is in maintenance position 2,
- the appropriate service hatches or hoods are open.
- Check the whole hydraulic system for leaks.
- Replace any damaged hydraulic seals.
- Tighten any loose hydraulic couplings.
- Also refer to the Section "Safe maintenance of hydraulic hoses and hose lines".

Drive engine

Clean dust extraction valve of the air filter

Important: A damaged or hardened dust extraction valve renders the service cover 3 ineffective, which in turn reduces the service life of the filter elements. The valve must also be closed when the diesel engine speed exceeds 1/3 of the max. speed.



Make sure that:

- the machine is in maintenance position 1,
- the battery main switch is turned off,
- the engine compartment – hood is open.
- Press the rubber lip on the dust extraction valve several times to drain the service cover.
- When working in dusty conditions, empty the dust extraction valve more often.

Trouble shooting

Is the dust extraction valve damaged or does it stay open?

- Replace the dust extraction valve

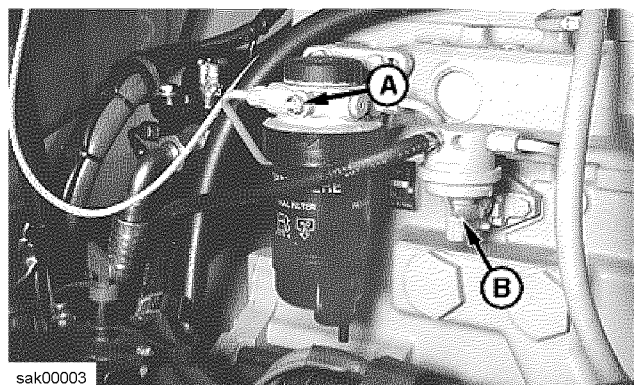
Cleaning or replacing the air filter main element.

The main element should be cleaned or replaced when the symbol field – air filter contamination on the indicator unit lights up or every 1000 operating hours.

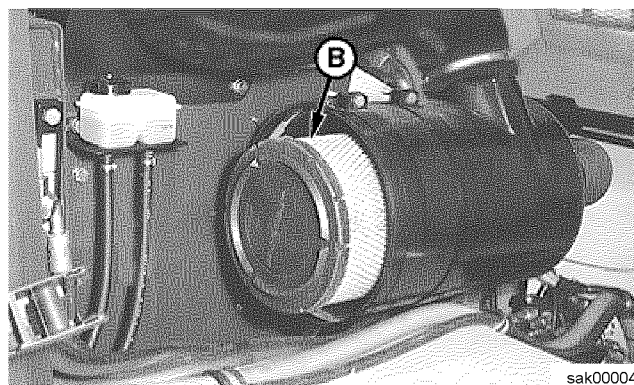
If the symbol field – air filter contamination continues to light after the main element has been serviced then the safety element must also be replaced.

Make sure that:

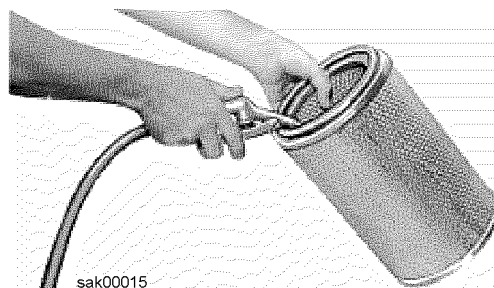
- the machine is in maintenance position 1,
- the battery main switch is turned off,
- the engine compartment – hood is open.



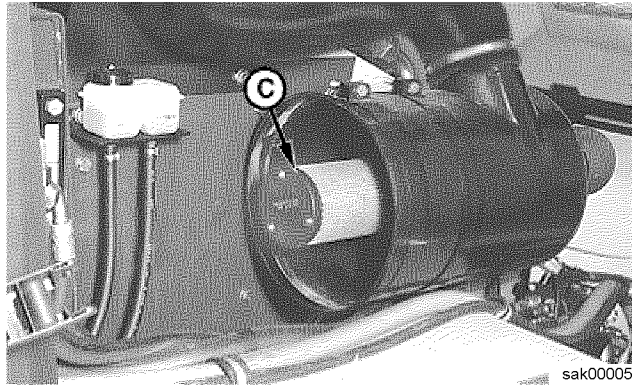
- Open fixing clips A on the service cover and remove it.



- Remove, clean or replace the main filter element B .



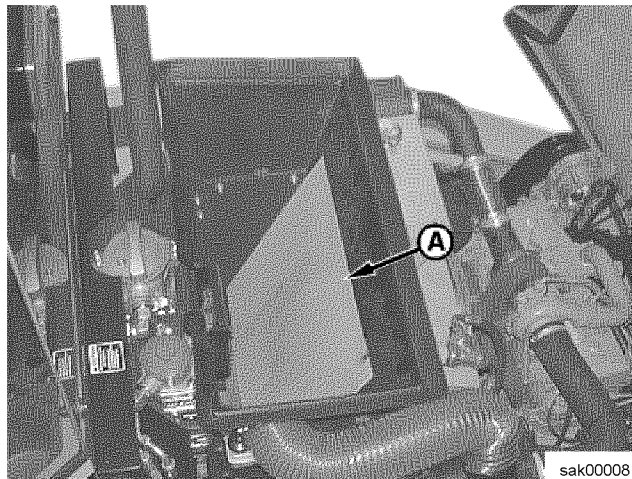
- Blow out the main filter element from the inside out with dry air. Avoiding tapping the filter, since this may cause damage.



- The safety element C should be replaced every third time the main filter element B is replaced.
- Ensure that all soiling is removed from the housing before inserting a new or cleaned filter element.
- Before installing the filter elements, lightly oil the seal surfaces (inner surface of the main filter element B and outer surface of the safety element C). Re-install filter elements (C) and (B) and make sure that they are correctly located.
- Clean the service cover and put it back on the filter housing. The fixing clips A have to be forced closed until the full circumference of the cover lies over the filter housing.
- Close the A fixing clips.

Cooling system

Cleaning the cooling system



In order to guarantee that cooling media function perfectly, the coolers should be cleaned when necessary. When operating in dusty conditions, the coolers should be checked daily and cleaned if necessary.

Dust and other contaminants can be removed from the cooling fins with water under pressure, 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

The cooler fins may be damaged if not treated with due care.

! Do not use hard objects or excessive water pressure for cleaning.

- Cleaning the cooler units (A) with compressed air, steam or water.

Axles, tyres**Checking tyre air pressure**

Make sure that the air pressure in the tyres on both axes corresponds to the required values for the tyre type, the actual application and the working attachment.

The reference values are to be found in the Section "Technical data"

Procedure

The air pressure in the tyres has a crucial effect on the overall operating performance of the machine.



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Exploding tyres

Risk of accidents due to exploding tyres!

Incorrect or careless operation of the tyre filling equipment or excess pressure could result in the tyres bursting or failure of the rims, with severe, possibly even fatal injuries as a consequence.

! Use a sufficiently long hose for pumping the tyres with a self-locking adapter.

! Personnel must always remain outside the danger zone when tyres are being pumped up.

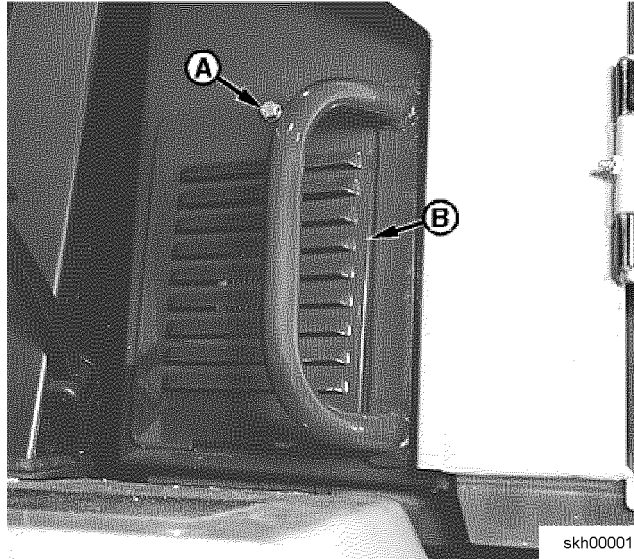
- Check the air pressure in all tyres with a test device and correct it if necessary.

Cab, air conditioning**Clean or replace the fresh air filter**

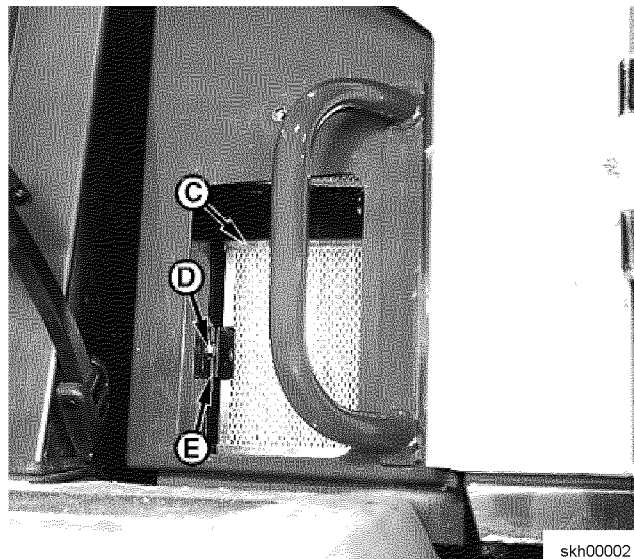
The cab fresh air filter can be accessed from the outside of the cab at the rear on the right-hand side.

Make sure that the machine is in maintenance position 1.

Procedure:



- Remove knurled screw (A) and ventilation grille (B).



- Unscrew hex. bolt (D) and remove holder (E).
- Swing out and remove filters (C) on the left-hand side.
- Clean (blow out) filters and replace, if necessary.
- Insert cleaned or new filter (C) and fix with holder (E) and screw (D). The holder must exert moderate pressure on the filter element - sealing surface. (Observe correct method of installation (arrow))
- Attach ventilation grid (B) and fix with knurled screw (A).
- Lubricate the door hinges with grease gun.

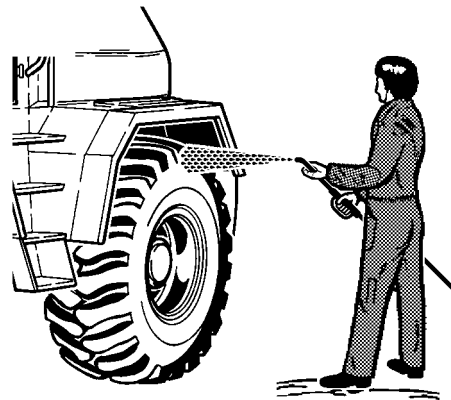
Lubricating the door hinges

5.3.5 Cleaning the machine

Wet cleaning the machine

Oil pressure switches are not watertight due to the necessity of diaphragm ventilation, therefore be careful when spraying!

Regreasing lubrication points after wet cleaning



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Wet cleaning

Each time the machine is cleaned with a steam jet, all lubrication points on the machine should be re-greased.

- Clean the machine with a steam jet.
- 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, for example, must not be exposed to direct jets.



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.

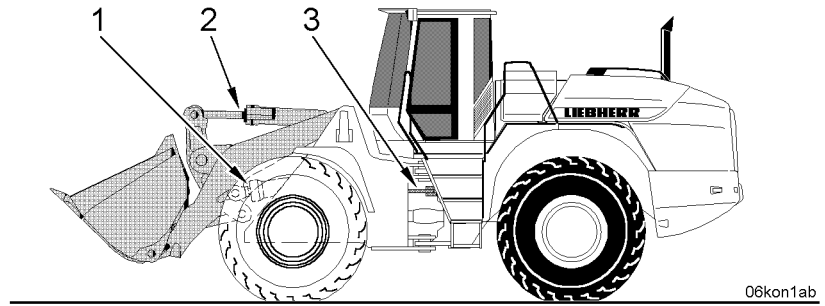
- Carefully clean the engine with a steam jet.

5.3.6 Corrosion protection work

When the machine is decommissioned 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.



Maintenance position for the conservation of piston rods

- | | |
|-----------------|---------------------|
| 1 lift cylinder | 3 steering cylinder |
| 2 tilt 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.

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.

5.4 Lubricants and fuels

5.4.1 Handling lubricants and fuels

Conscientious observance of the regulations for handling lubricants and operating materials increases the reliability and service life of your machine.

It is especially important that the stated lubricant qualities are observed.

The various specifications about the prescribed intervals are to be found in the Sections "Maintenance and inspection schedule" and "Lubrication chart".

You will find the details on carrying out: lubrication, level checking and replacing operating materials in the Section "Maintenance" under "Maintenance jobs. . .".

Observe the following procedures when handling lubricants and operating materials and observe environmental protection regulations.

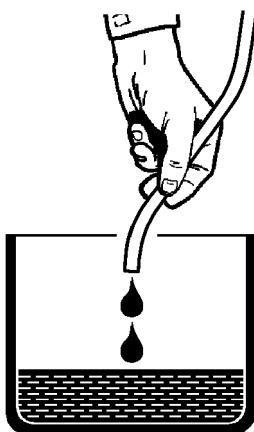
Environmental protection measures

- Always implement and observe environmental protection measures.
- Observe national regulations.
- Before draining off fluids, obtain information on the correct way to dispose of them.

Disposing of used materials

This applies to the following types of used materials:

- oils, lubricants, brake fluids, coolants etc.,
- fuels,
- filters, oil cartridges etc.,
- rubber, tyres, insulating materials etc.,
- batteries.
- Observe the regulations for protecting the environment when disposing of used materials.
- Collect and store used materials separately in suitable containers, and only dispose of them at official depots in an environmentally friendly way.
- Observe national regulations.



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Disposal

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**.



Risk of damage to the machine's hydraulic system!
When "environmentally compatible hydraulic fluids" are mixed with "mineral oils" a reaction with corrosive by-products is caused, which results in damage to the hydraulic system!

! Avoid mixing "environmentally compatible hydraulic fluids" with "mineral oils"!

- **When the machine is converted to an "environmentally-compatible hydraulic fluid"**, LIEBHERR CUSTOMER SERVICE must be consulted!
- 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 the coolant due to coolant loss, the anti-freeze fraction does not drop below 50% of the total volume.



Risk of damage to the diesel engine!
If the fraction of anti-freeze /corrosion protection agent is too high, the cooling effect is reduced, leading to damage to the diesel engine!

! Do not use more than 60% anti-freeze /corrosion protection agent.

- Check the ratio of corrosion/anti-freeze during maintenance with the strip kit 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 values stated for the filling quantities in the table of lubricants and operating materials are only guidelines:

- In each case, the dipstick or level markings are definitive
- Each time the lubricant or operating material is changed or topped up, the level in the appropriate aggregate must be checked.

Lubricating oils for diesel engines



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Lubricating oil quality

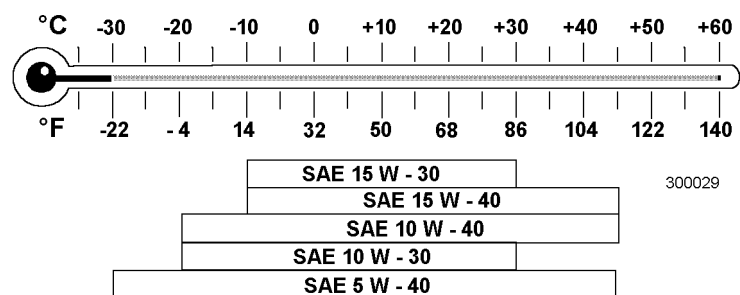
For modern day diesel engines, only high-alloy lubricating oils are used. They consist of basic oils with have been blended with additives. The lubricating oil regulation for LIEBHERR diesel engines is based on the following specifications and regulations:

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

Lubricating oil viscosity

The lubricating oil viscosity is selected according to the SAE classification (Society of Automotive Engineers). The decisive factor for the selection of the correct SAE class is the ambient temperature. The selection of the SAE classification does not give any information about the quality of a lubricant oil. If the viscosity is too high it can make starting difficult, if it is too low then the lubricant efficiency may be impaired. The temperature ranges detailed in the graphic are guidelines, which may be briefly exceeded or gone under.



Temperature dependent selection of the SAE class

Lubricant oil changing intervals

Changing intervals:

- First oil and filter change with initial oil filling: Refer to the Chapter "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 operating hours (Oh) are not achieved in a given year, engine oil and filter should be changed at least once a year.

Difficulty factors

Various difficulty factors or difficult deployment conditions can affect the maintenance interval.

Difficulty factors or difficult deployment conditions could be:

- frequent cold starts
- sulphur content in the fuel over 0.5%
- working temperature under -10 °C

If difficulty factors or difficult deployment conditions are present, then the oil change interval defined in the "Maintenance and inspection schedule" according to the table below, must be reduced by half.

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Difficulty factor:	Difficulty factor:	Oil quality:	Oil quality:
		E2-96	E3-96
		D4	D5
		CG-4	
		CF-4	
Working conditions	Sulphur content in fuel	Interval:	
Climate – normal, to -10 °C	to 0.5%	250 Oh	500 Oh
	over 0.5%	125 Oh	250 Oh
under -10 °C	to 0.5%	125 Oh	250 Oh
	over 0.5%		125 Oh

Diesel fuels



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Fuel specifications

The diesel fuels must meet the minimum requirements in the fuel specifications listed below.

Recognised 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 service life.

Lubricosity

The lubricosity of the diesel fuel becomes a critical factor as the sulphur content drops. It has been found that diesel fuels with the max. limit in force in Europe of 0.05 % sulphur by weight can cause wear in the injection system (especially with distributor injection pumps).

“Branded fuels” (in Germany) contain these lubricant additives as part of their additive package. The fuel lubricosity must correspond to HFRR(60°) Test <400 mm.

The additives should be admixed by the supplier in his capacity as agent responsible for the quality of the fuel. The admixture of secondary lubricosity additives by the customer is not recommended.

Diesel fuel at very low temperatures

With external temperatures under approx. 0 °C, the flow performance of summer diesel fuel may be insufficient due to paraffin separation. The same problem arises with winter diesel fuels under -15 °C.

Diesel fuel with additives with a working temperature down to -20 °C is also frequently offered.

In order to avoid breakdowns, the diesel fuel must be mixed with two star petrol or paraffin at low temperatures. The blending in of two star petrol must be considered as an emergency remedy and may not exceed 30% vol.

Supergrade petrol may not be used for blending.

The engine output can drop depending on the additive mixture used for cold conditions. Therefore the proportion of liquid additives should be kept as low as possible, taking into account the external temperatures.

For reasons of safety, the fuel mixture may only be made up in a fuel container. When tanking up, the fuel additive with its lower specific gravity should be poured in before the diesel. The engine should then be run until the fuel mixture is circulating in every part of the fuel system.

**Diesel fuels – mixture ratio
(Vol.-%)**

			Winter	Diesel	Additive	Additive
			Fuel	%	%	%
Ambient temperatures °C	Summer diesel %	Additive %	-15 °C	-20 °C	-15 °C	-20 °C
0 to -10	70	30	100	100	–	–
-10 to -15	50	50 *	100	100	–	–
-15 to -20	–	–	70	100	30	–
-20 to -25	–	–	50	70	50 *	30

* if a 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, improve the cold weather performance of the diesel fuel. When using flow improvers, the quantity and application recommendations of the manufacturer must be observed.

Hydraulic oils



Mineral oils

Hydraulic oil specifications

Engine oils which meet the Mercedes Benz operating materials specifications are prescribed.

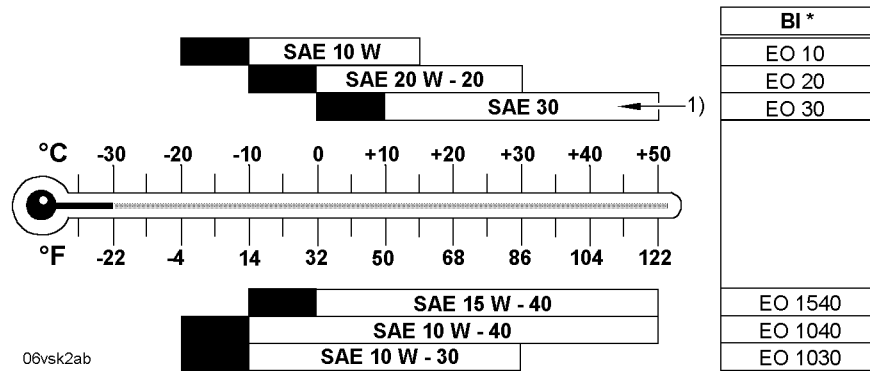
Mercedes-Benz – information sheet:	Hydraulic oil specifications:
Sheet No. 226.0 and 227.0 for single-grade oils:	API- CC / SF, CD / SF, CE / SF
Sheet No. 227.1 and 228.1 for multi-grade oils:	CD / SF, CE / SF,
	CD+API- CC / SF (MIL-L-46152 B),
	CD / SF, CE / SF (MIL-L-2104 D),
	CD / SF (MIL-L-2104 D), CE / SF,
	CD+ (MIL-L-46152 B)

Mercedes-Benz operating material requirements

Hydraulic oil viscosity

The hydraulic oil viscosity is selected according to the SAE classification (Society of Automotive Engineers).
The decisive factor for the selection of the correct SAE class is the ambient temperature.
The selection of the SAE classification does not give any information about the quality of a hydraulic oil.
The temperature ranges presented in the graphic are only provided as guidelines.

LBH/01/003801/0003/5.99/en



Temperature dependent selection of the SAE class

BI * = code designation = container labelling, refer to the Section “BI * Standard lubricants”.

Warm running regulation

With temperatures up to 10 °C below the specified limit:

- Adjust the diesel engine after starting to just approx. ½ speed.
- Activate hydraulic cylinders and engines and briefly move the cylinders to their stops.
- Warm running duration approx. 10 minutes.

With even lower temperatures:

- Before starting the engine, prewarm the oil tank.

1) = exception for axle transfer gear ATG – switching gearbox:

- **SAE 30** – can only be used when the ambient temperature is not lower than +10 °C.

Environmentally compatible hydraulic fluids

When operating LIEBHERR earth moving machines with environmentally compatible hydraulic fluids, we recommend **AVIA SYNTOFLUID**, in each case with the viscosity specified by LIEBHERR.

Caution!

- **Risk of damage to the machine's hydraulic system!**
When “environmentally compatible hydraulic fluids” are mixed with “mineral oils” a reaction with corrosive by-products is caused, which results in damage to the hydraulic system!
- **Avoid mixing “environmentally compatible hydraulic fluids” with “mineral oils”!**

With machines which were filled ex-works with “environmentally compatible hydraulic fluids”, an appropriate sign (decal - CAUTION) is attached to the driver's cab and hydraulic tank.

When you convert your machine to an “environmentally compatible hydraulic fluid” :

- You must consult the LIEBHERR CUSTOMER SERVICE!
- It is essential that you order the “**INSTRUCTION SHEET**” and the “**CONVERSION GUIDELINES**” from LIEBHERR and that you observe them!

Lubricating oils for gearboxes



06sy08ab

Axles

Gear oils must be in accordance with the specifications – API-GL-5-90 and MIL-L-2105 B, C or D and the viscosity class SAE 90 LS *.



06sy06ab

* = 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, refer to the Section “BI * Standard lubricants”.

Axle transfer gear

A hydraulic oil should be used as lubrication oil for the axle transfer gear.



06sy07ab

Refer to the Section “Hydraulic oils”.

Grease for general lubrication points

This grease must meet the specification **KP2k** – Consistency 2 of the NL GI class according to DIN 51 818 and DIN 51 825 or EP 2 according to NF-T-60 132.

The grease must consist of a lithium complex and display a four ball tester 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, refer to the Section “BI * Standard lubricants”.

LIEBHERR special paste CTK

Bonding, water resistant, complex saponified paste with high pressure additives and improved corrosion protection characteristics.



06sy20ab

Contains ingredients which counteract frictional and vibrational corrosion.

Especially recommended for use in roller live ring connections.

Range of application: -30 °C to +100 °C.

Reordering under ID No. 8613 31301 from your LIEBHERR dealer.

Corrosion protection grease

Non-acidic corrosion protection greases should be used to protect exposed piston rods.

LIEBHERR special paste CTK is especially recommended.

Refer to the Section "LIEBHERR special paste CTK".

Anti-seize for bolt installation

A molybdenum sulphide paste is recommended as anti-seize for the bolts.

BI * standard lubricants

Refer to the brochure "STANDARD LUBRICANTS for construction machines and vehicles".

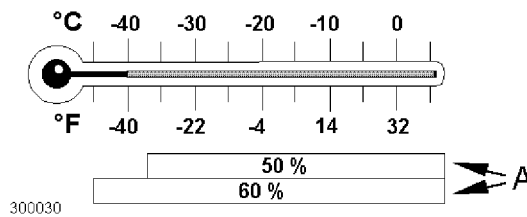
Issued by the German Construction Industry Federation (Hauptverband der Deutschen Bauindustrie e.V.)

Bauverlag GmbH – Wiesbaden and Berlin.

Coolants for diesel engines

Coolant The coolant must contain at least 50% vol. anti-freeze /corrosion protection agent all the year round. This provides protection against freezing down to approx. -37 °C.

Mixing ratio



Coolant

A Ratio in % of anti-corrosion /anti-freeze

Fresh water quality when using anti-corrosion/anti-freeze

Total of alkaline earths (water hardness)	0.6 to 3.6 mmol/dm ³ (3 to 20° d)
pH value to 20 °C	6.5 to -8.5
Choride ion content	max. 80 mg/dm ³
Sulphate ion content	max. 100 mg/dm ³

Anti-corrosion/anti-freeze quality

Ethyl glycol base with low silicate content.



Service brake

The engine oil **SAE 10W** is to be used as the braking oil for all ambient temperatures.



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