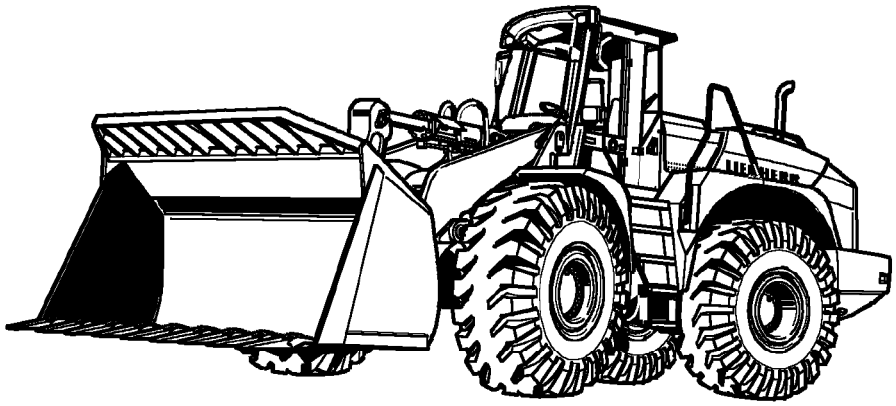
en

Operating manual

L544

valid from serial no.: - 442 0248
444 0248



Please enter the following details on receipt of your machine:
*You will find these details on the machine type plate, on the front right-hand side. They will be of assistance when ordering spare parts.

*** Vehicle identity No.**	. . . .
*** Year of construction**	. . . .
Date of commissioning	. . / . . / . .

Address

Address: LIEBHERR-WERK BISCHOFSHOFEN GMBH

Dr. Hans Liebherr – Straße 4
A -5500 BISCHOFSHOFEN

Product identification

Manufacturer:	LIEBHERR-WERK BISCHOFSHOFEN GMBH	
Product group:	Wheel loader	
Type:	L544	L544 T
Construction number:	442	444
Serial number:	0248	0248
Conformity:	CE	

Document identification

Order number:	8450645
Author:	LBH / Dept. - TIP
Document version:	02

LBH/02/0038O1/0003/6.0/en

Foreword

This Operating manual is intended for the **driver** and for the **maintenance personnel** of the vehicle.

It contains descriptions of:
- technical data
- safety provisions
- control and operation
- maintenance

This Operator's Manual should be carefully read before initial operation and should be read later at regular intervals and used by everyone with responsibility for work on/with the vehicle.

Work with or on the vehicle includes, for example:
- **Operation** including rigging work, trouble-shooting during operation, removal of operational waste, maintenance, disposal of operating and auxiliary materials
- **Servicing** including maintenance, inspection and repair work
- **Transport** or loading of the vehicle

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

Observance of the operating instructions by the maintenance personnel:
- improves operational reliability
- extends the service life of your vehicle.
- reduces repair costs and downtimes

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

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

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

This Operator's Manual contains all necessary information for the operation and maintenance of your vehicle.

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.

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agreements, service contracts etc. entered into by **LIEBHERR** and/or its agents when spare parts other than original **LIEBHERR** parts or those purchased from **LIEBHERR** are used for maintenance and repairs.
Under extreme conditions, shorter maintenance intervals than provided for in the inspection schedule may be necessary.

Modifications, conditions, copyright:

- We reserve the right to alter the technical specifications of the vehicle with respect to the specifications and illustrations in the documents provided.
- The guarantee and liability conditions of the general conditions of business of LIEBHERR are not affected by the information in the manual.
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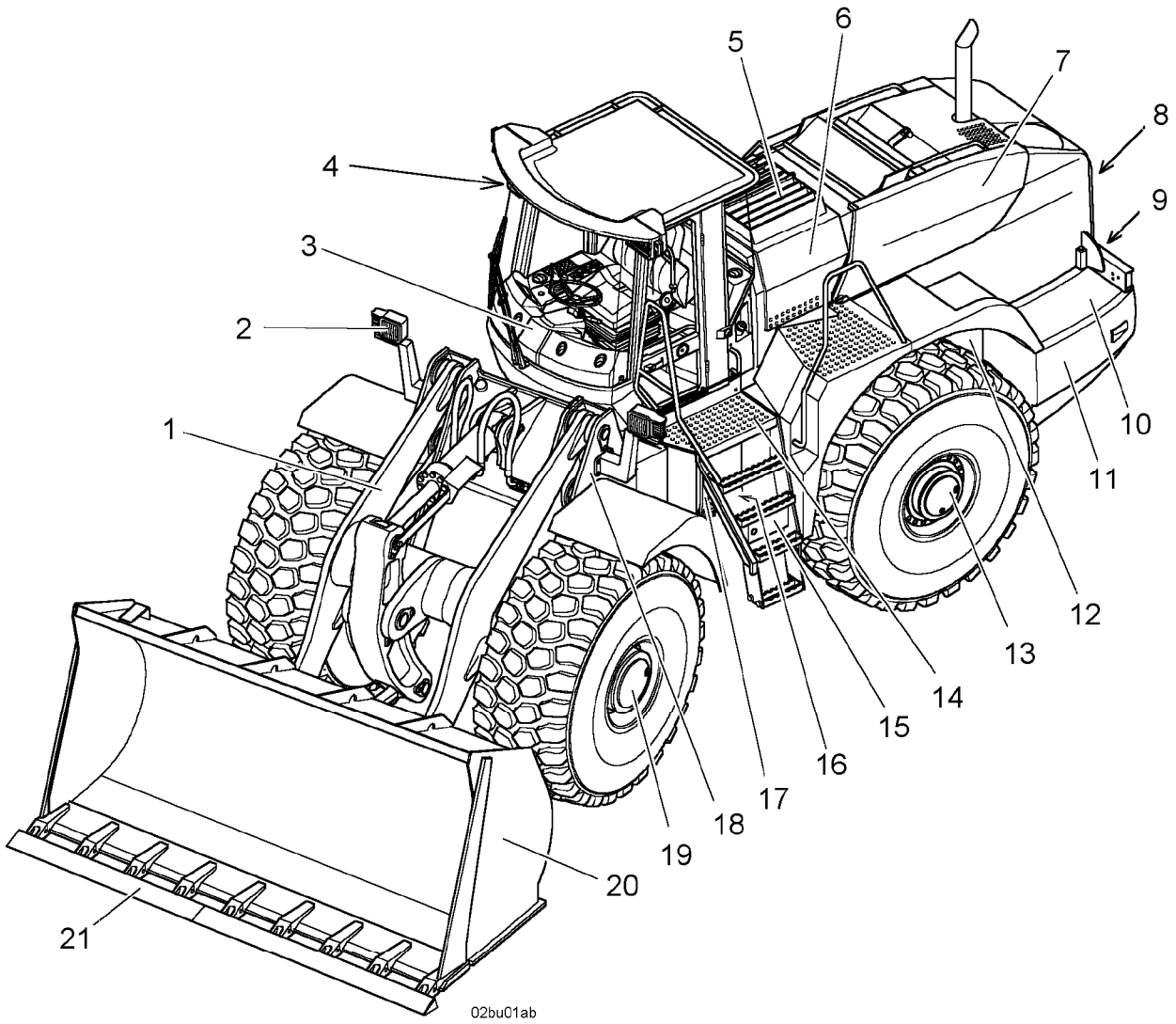
1 Product description

Equipment layout

Standard version

This section contains an overview of the vehicle with names of the illustrated components.



Basic vehicle – View from left

1 Lift arm
2 Lighting
3 Driver's cab
4 Working floodlights
5 Cooling system
6 Cooling system hood
7 Engine compartment hood
8 Engine compartment door
9 Hitching device
10 Battery compartment cover
11 Ballast weights
12 Rear section
13 Rear axle
14 Cab access
15 Tool box
16 Steering cylinder
17 Articulation lock
18 Front section
19 Front axle
20 Loading bucket
21 Bucket tooth guard

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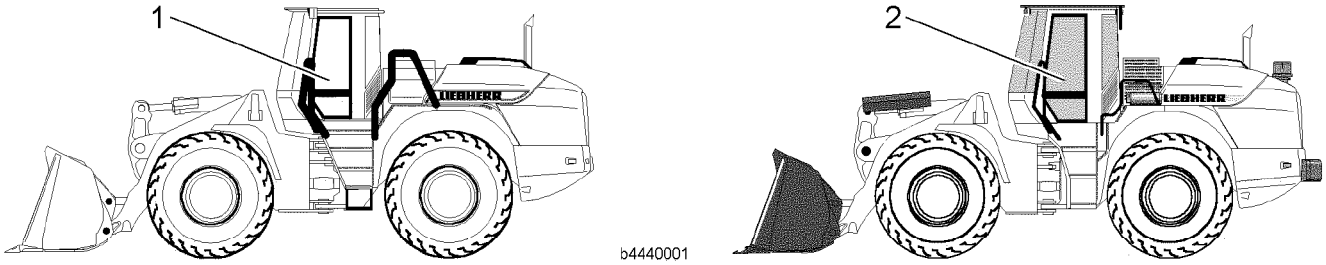


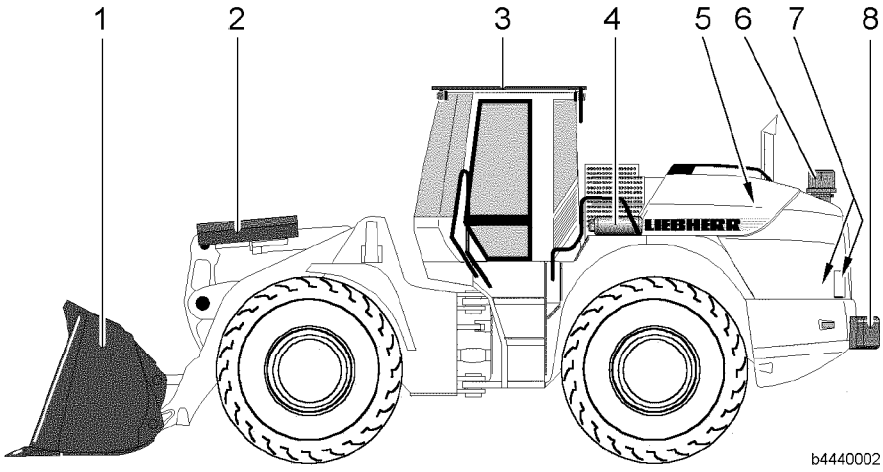
Different vehicle versions

1 Standard version

2 Tunnel version

Tunnel version L544 T

This section provides a brief overview of the distinguishing features of the vehicle, while naming the illustrated parts.



Tunnel version

1 HD bucket
2 Tilt cylinder guard
3 Roof plate
4 Fire extinguisher
5 Diesel particle filter
6 Top air preliminary separator
7 Reverse warning device
8 Collision guard at the rear

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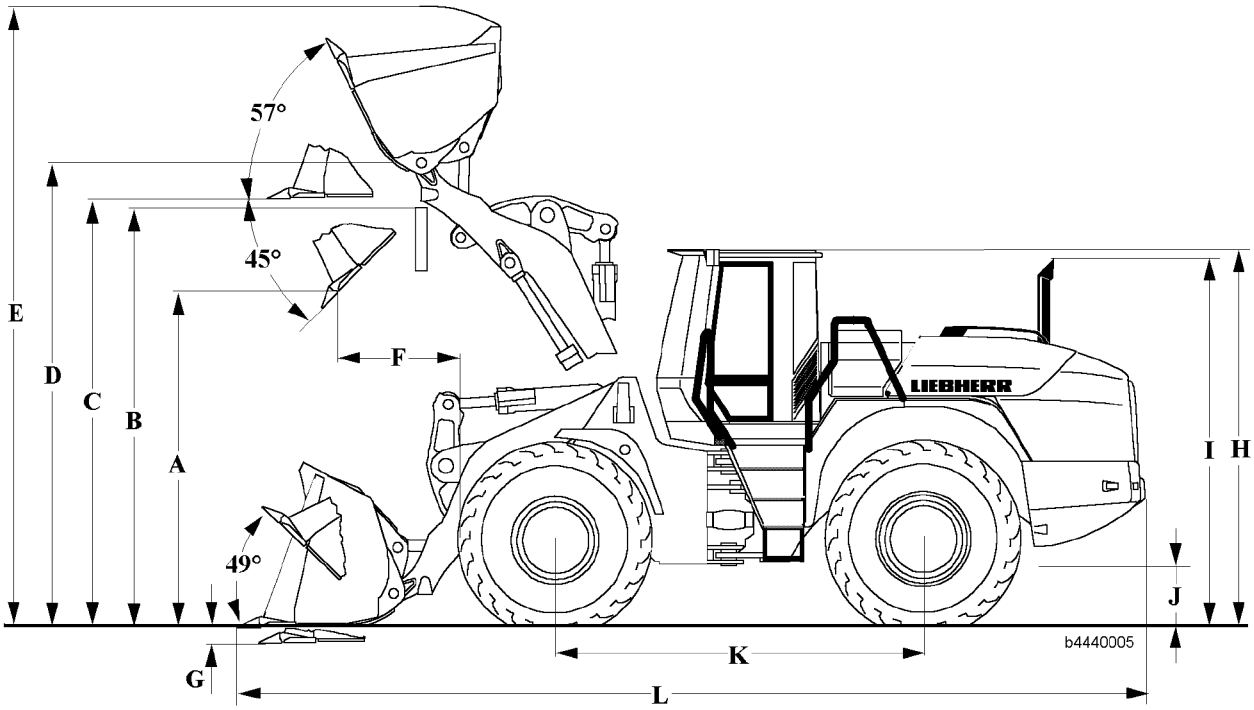
1.1 Technical data

1.1.1 Complete vehicle

Wheel loader with Z-bar lift arm

The values specified apply to:

- the vehicle with Z-bar lift arm (2,600 mm) without hydraulic quick-change device
- a vehicle with a toothed loading bucket -3.0 m³ and with 23.5 R25 Michelin XHA tyres



Dimensions

Name	Value	Units
Bucket capacity	3.0	m³
Bucket width	2700	mm
Specific material weight	1.8	t/m³
A - dumping height at max. lifting height and 45° tilt-out angle	2920	mm
B - max. dumping height	3500	mm
C - max. height of bucket base	3645	mm
D - max. height of bucket pivot point	3915	mm
E - max. height of bucket upper edge	5350	mm
F - reach at max. lifting height and 45° tilt-out angle	1040	mm

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Name	Value	Units
G - excavating depth	85	mm
H - height above cab	3355	mm
I - height above exhaust	3310	mm
J - ground clearance	530	mm
K - wheel base	3150	mm
L - overall length	7785	mm
Turning radius over bucket outer edge	6235	mm
Lifting force (SAE)	170	kN
Breakout force (SAE)	125	kN
Tipping load when straight *	12020	kg
Tipping load, articulated 35° *	10910	kg
Tipping load, articulated 40° *	10600	kg
Articulation angle	40	°
Operating weight	15300	kg
Travel speed – travel range 1 forward and reverse	0–7.0	km/h
Travel speed – travel range 2 forward and reverse	0–16.5	km/h
Travel speed – travel range A2 (automatic), forward and reverse 1)	0–16.5	km/h
Travel speed – travel range A2 (automatic), forward and reverse 2)	0–38.0	km/h
Travel speed – travel range A2 (automatic), forward and reverse	0–38.0	km/h

* The specified values refer to Michelin 23.5 R25 XHA tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.

1) Automatic travel range A2 switches the 1st and 2nd gears.

Valid for: *L544-442/0104-0429*

2) **Modification** Automatic travel range A2 switches the 2nd and 3rd gears.

Valid for: *L544-442/0430-*

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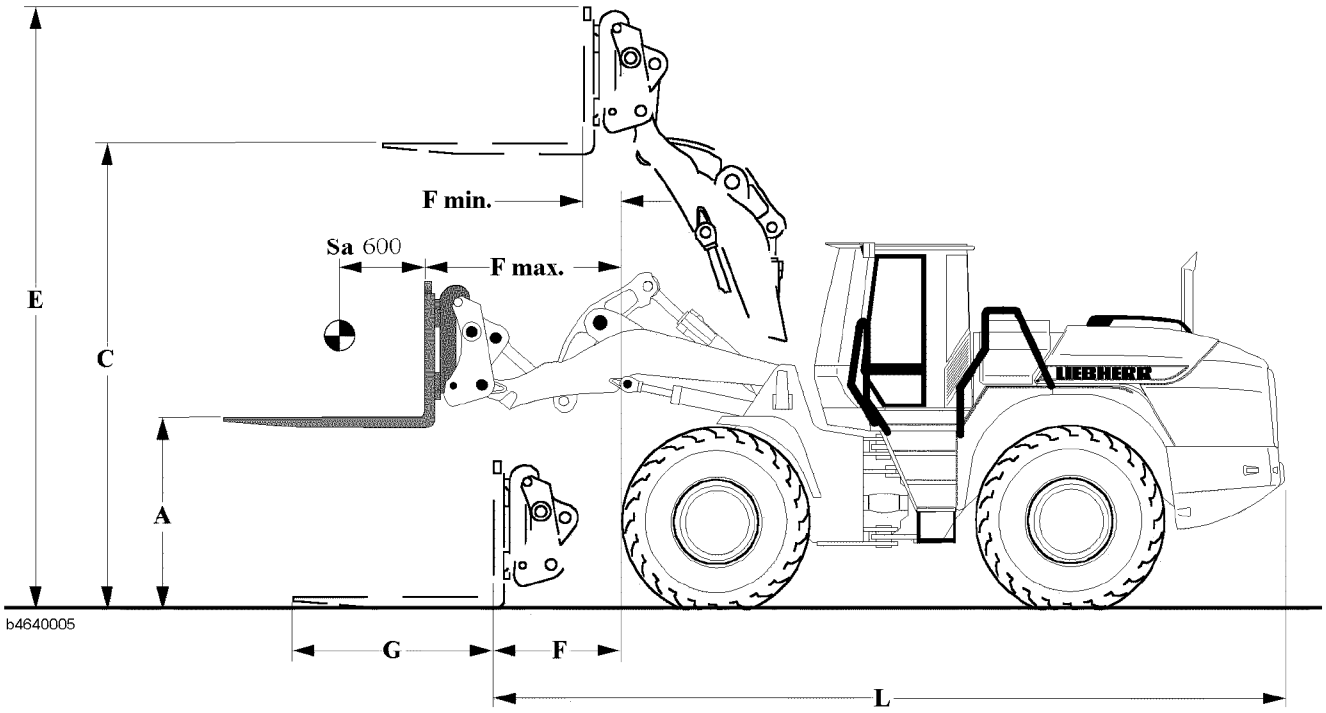
Wheel loader with forklift

This equipment is optional.

The values specified apply to:

- the vehicle with Z-bar lift arm (2,600 mm) and with hydraulic quick-change device
- for the vehicle with a FEM IV forklift and 23.5 R25 Michelin XHA tyres



Dimensions – Machine with Z-bar lift arm and forklift

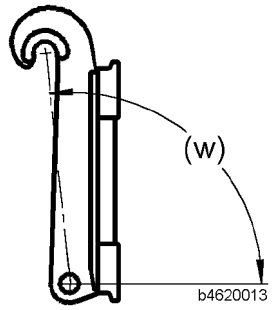
Loading geometry		Z-bar kinematics		Z-bar kinematics	
Forklift equipment for quick-change device		FEM IV 1,200 mm forklift		FEM IV 1,500 mm forklift	
Name		Value	Units	Value	Units
A	Lifting limit at max. reach	1780	mm	1780	mm
C	Max. lifting height	3675	mm	3675	mm
E	Max. height above forklift	4685	mm	4685	mm
F	Loading position reach	1020	mm	1020	mm
F max.	Greatest possible reach	1655	mm	1655	mm
F min.	Reach at max. lift height	835	mm	835	mm
G	Fork prong length	1200	mm	1500	mm
L	Total length of the basic vehicle	6885	mm	6885	mm
	Tipping load when straight *	8280	kg	8230	kg
	Tipping load, articulated **	7290	kg	7250	kg
	Operating weight *	14930	kg	14980	kg

* The specified values refer to Michelin 23.5 R25 XHA tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.
The operational weight and the tipping load are affected by the tyre dimensions and the accessories.

** permitted payload (ISO 8313):

- on even terrain = 80% of the tipping load when arm not straight
- on uneven terrain = 60% of the tipping load when arm not straight

Load bearing tables for forklift operation



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

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

– even and firm terrain = 80% of the tipping load with forklift
– uneven terrain = 60% of the tipping load with forklift

The permitted loads on various bases, angles (w) and various centre of gravity offsets Sa are specifiied in the table below.

Terrain - even and firm Load = 80% of the tipping load		**Lift arm with Z-bar kinematics: Loads in kg with different centres of gravity distances - CG in mm**					
Tyres	**Tyre filling**	**500**	**600**	**700**	**800**	**1000**	**1200**
23.5-25	- -	5967	5770	5586	5413	5098	4817
23.5-25	1,140 kg	5967	5770	5586	5413	5098	4817
20.5-25	- -	5677	5490	5315	5150	4850	4583
20.5-25	820 kg	5967	5770	5586	5413	5098	4817

Terrain - uneven Load = 60% of the tipping load		**Lift arm with Z-bar kinematics: Loads in kg with different centres of gravity distances - CG in mm**					
Tyres	**Tyre filling**	**500**	**600**	**700**	**800**	**1000**	**1200**
23.5-25	- -	4478	4330	4192	4062	3825	3615
23.5-25	1,140 kg	5129	4960	4802	4653	4382	4141
20.5-25	- -	4260	4120	3988	3865	3640	3440
20.5-25	820 kg	4726	4570	4424	4287	4038	3815

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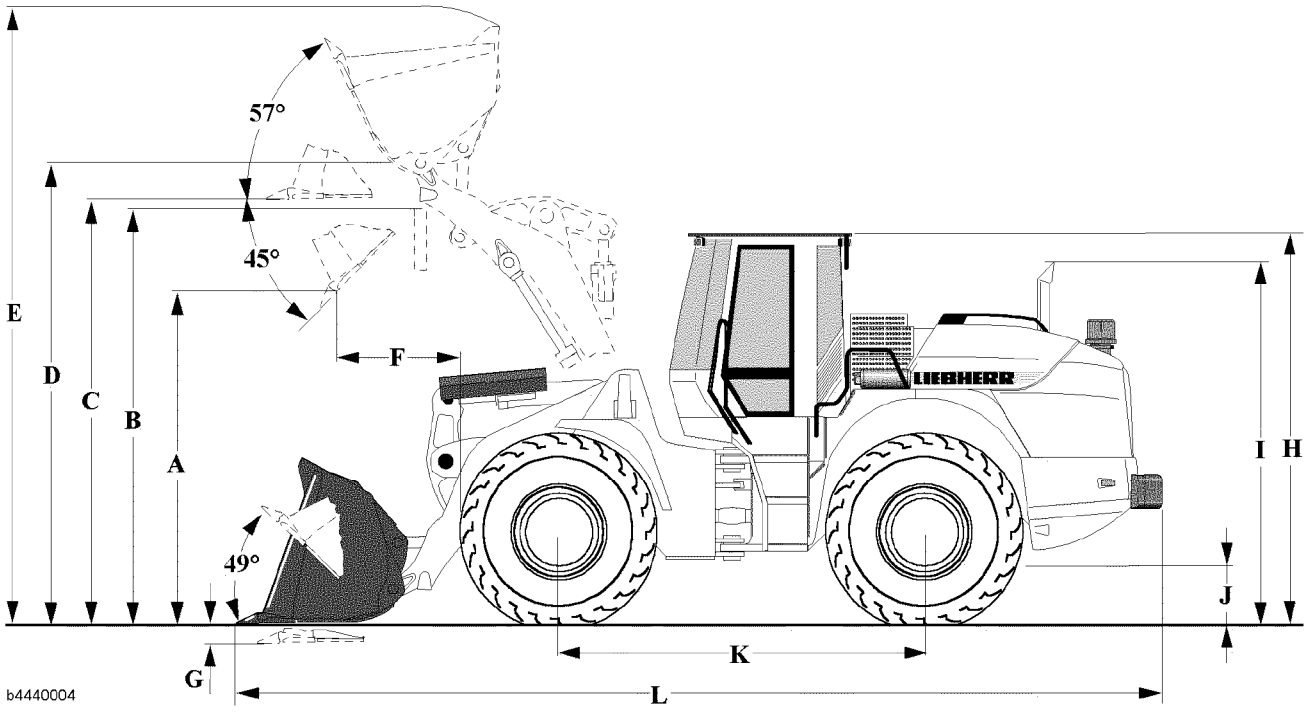
Wheel loader in tunnel version L544 T

The values specified apply to:

- the vehicle with Z-bar lift arm (2,600 mm) without hydraulic quick-change device
- for the vehicle with a HD toothed loading bucket -2.8 m³ and with 20.5 R25 Michelin XLD D2A L5 tyres.



Dimensions – Tunnel version

Name	Value	Units
Bucket capacity	2.8	m³
Bucket width	2700	mm
Specific material weight	1.8	t/m³
A - dumping height at max. lifting height and 45° tilt-out angle	2970	mm
B - max. dumping height	3500	mm
C - max. height of bucket base	3645	mm
D - max. height of bucket pivot point	3915	mm
E - max. height of bucket upper edge	5275	mm
F - reach at max. lifting height and 45° tilt-out angle	990	mm
G - excavating depth	85	mm
H - height above cab	3355	mm
I - height above exhaust	3310	mm
J - ground clearance	530	mm
K - wheel base	3150	mm
L - overall length	7975	mm
Turning radius over bucket outer edge	6220	mm

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Name	Value	Units
Lifting force (SAE)	170	kN
Breakout force (SAE)	135	kN
Tipping load when straight *	12300	kg
Tipping load, articulated 35° *	11170	kg
Tipping load, articulated 40° *	10840	kg
Articulation angle	40	°
Operating weight	16000	kg
Travel speed – travel range 1 forward and reverse	0–7.0	km/h
Travel speed – travel range 2 forward and reverse	0–16.5	km/h
Travel speed – travel range A2 (automatic), forward and reverse 1)	0–16.5	km/h
Travel speed – travel range A2 (automatic), forward and reverse 2)	0–38.0	km/h
Travel speed – travel range A2 (automatic), forward and reverse	0–38.0	km/h

* The specified values refer to Michelin 20.5 XLD D2A L5 tyres, inclusive of all lubricants, full fuel tank, ROPS/FOPS cab and driver.

1) Automatic travel range A2 switches the 1st and 2nd gears.

Valid for: *L544T-444/0104-0429*

2) **Modification** Automatic travel range A2 switches the 2nd and 3rd gears.

Valid for: *L544T-444/0430-*

1.1.2 Diesel engine, Pump distributor gear

Diesel engine

Name	Value	Units
Engine type	D924T-E A2	
Combustion process	Diesel, four stroke, direct injection	
Number of cylinders	4	
Cylinder volume	6640	cm^3
Rated power according to ISO 9249	121 / 165	kW / hp
Rated speed	2000	min^{-1}
Max. torque at 1200 min^{-1}	690	Nm
Lower idling speed	800 $^{\pm 50}$	min^{-1}
Upper idling speed	2100 $^{+50}$	min^{-1}
Max. inclination / lengthwise, crosswise	45	°
Operating voltage of the starter	24	V
Power consumption of the starter	5.4	kW

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Name	Value	Units
Output voltage of alternator	28	V
Current output from alternator	55	A
Emission limit values in accordance with	ISO 8178 EUROMOT 1	

Fuel system

Name	Value	Units
Tank capacity	260	l
Tank RESERVE	70	l

Diesel particle filter

This equipment is standard with the tunnel version of the vehicle.

Name	Value	Units
type	PF -18 S	
Candles (radial)	6	pieces
Filter medium	Ceramic micro-fibres	
Max. permissible exhaust gas counterpressure	0.2	bar
Regeneration	Additive supported	
Additive mixing ratio in litres (after first-time operation)	1:1000s	

Refuelling pump

This equipment is optional.

Name	Value	Units
Flow rate	50	l/min
Duty cycle max.	15	minutes
Suction height max.	4	m

Torsion absorber coupling

Name	Value	Units
Coupling type	Torsion absorber	

Pump distributor gear

Name	Value	Units
Transmission type	PVG 300 B 341	

1.1.3 Travel hydraulics

Variable displacement pump

Name	Value	Units
Type	A4VG 90 DA	
Displacement max.	90	cm³
Flow at rated engine speed	222	l/min
Pressure cut-off	430 ±5	bar

Variable displacement motor

Name	Value	Units
Type	A6VM 107 DA	
Displacement max.	107	cm³

1.1.4 Working hydraulics

Variable displacement pump

Name	Value	Units
Type	A11VO 95 LRDS	
Displacement max.	95	cm³
Flow at rated engine speed	234	l/min
Pressure cut-off	290 ±5	bar

Control valve block

Name	Value	Units
Type	M7-3023	
Primary pressure relief valve	360 ±5	bar

Pilot control unit

Name	Value	Units
Type	5 THF 6	

Stabilisation module

Name	Value	Units
Type	MH RSM 25 D2X	
Cut-off valve	170 ±20	bar

Hydro accumulator unit

Name	Value	Units
Number of hydro accumulators	7	
Hydro accumulator volume	750	cm³

1.1.5 Steering system

Steering pump

Name	Value	Units
Type	A10VO 45 DFR	
Displacement max.	45	cm³
Flow at rated engine speed	111	l/min
Pressure cut-off	210 ±5	bar

Servostat

Name	Value	Units
Type	Eaton 233 -3072	
Displacement	462	cm³

1.1.6 Braking system

Compact brake valve

Name	Value	Units
Max. brake pressure at pedal stop	65 ±5	bar

Parking brake

Name	Value	Units
Nominal gap	1.0	mm
Gap	min.0.5 max.1.5	mm mm

1.1.7 Electrical system

Name	Value	Units
Power supply voltage	24	V
Battery voltage	12	V
Battery capacity	110	Ah

1.1.8 Transfer gear

Mechanical transfer gear

Name	Value	Units
type	3 AVG 210	
Number of gears	3	

1.1.9 Axles

Front axle

Name	Value	Units
Type	AP 409 DK	
Locking value of the self-locking differential	45	%
Wheel base	2000	mm
Wheel lug tightening torque	650	Nm
Wheel lug spanner size	30	mm

Rear axle

Name	Value	Units
type	AP 409 DK	
Locking value of the self-locking differential	45	%
Angle of swing	13	°
Wheel base	2000	mm
Wheel lug tightening torque	650	Nm
Wheel lug spanner size	30	mm

1.1.10 Tyres

For information concerning "wheel lug tightening torque" and "wheel lug spanner size", refer to the section "Axles".

Tyre size and air pressures

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 refer to cold tyres and to a vehicle which is ready for operation – the basic vehicle with standard equipment and permitted load.

Note: For special applications, such as stockyard operations with timber, where heavier loads may be expected, a higher tyre pressure is recommended, depending on the specific load.

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

DUNLOP – tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissble air pressure (bar)
20.5 R25 T7LD L3	4.30	2.50	4.50
23.5 R25 T7LD L3	3.00	2.00	4.50

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MICHELIN tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissble air pressure (bar)
20.5 R25 XHA L3	4.30	2.00	4.50
20.5 R25 XLD D2A L5	4.30	2.00	4.50
20.5 R25 XMine D2 L5	4.30	2.00	4.50
23.5 R25 XHA L3	2.80	2.00	4.50
625/70 R25 XLD 70-1 L3	2.80	2.00	4.50
23.5 R25 XLD D2A L5	2.80	2.00	4.50
23.5 R25 XMine D2 L5	2.80	2.00	4.50

GOODYEAR tyres

Tyre size	Air pressure - front axle (bar)	Air pressure - rear axle (bar)	Max. permissble air pressure (bar)
20.5 R25 GP-2B L2	4.20	2.50	5.00
20.5 R25 RL-2 + L2	4.20	2.50	5.00
20.5 R25 RL 5K L5	4.20	2.50	5.00
23.5 R25 GP-2B L2	3.00	2.00	5.00
23.5 R25 RL-2 + L2	3.00	2.00	5.00
23.5 R25 RL 5K L5	3.00	2.00	5.00

Special tyres

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

The specifications should be entered in the table as follows:
[1)] from the manufacturer: If the vehicle is delivered ex-works with special tyres.
[2)] from the vehicle operator: If the vehicle is retrofitted by the vehicle operator.

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Tyres for vehicles with special attachments

Particulars	Type of special attachments
1)	
2)	
2)	

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

The specifications should be entered in the tables as follows:
[1] from the manufacturer: If the vehicle is delivered ex-works with special tyres.
[2] from the vehicle operator: If the vehicle is retrofitted by the vehicle operator.

1.1.11 Cab, Heating, Air conditioning system

Driver's seat with gas-filled spring suspension

Name	Value	Units
Type	ISRI – 6000/575	
Type of suspension	Gas-filled spring suspension	

Driver's seat with pneumatic suspension

This equipment is optional.

Name	Value	Units
Seat compressor (comfort model)	ISRI – 6500KM/575	
Voltage	24	V
Type of suspension	Pneumatic	

Heating, Ventilation

Name	Value	Units
Number of blower speeds	3	
Heat output	12	kW

Air-conditioning system

Name	Value	Units
Type	Heating / air-conditioning unit	
Refrigerant	R134a	
Cooling output	4.8 ±10%	kW

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1.1.12 Lift arm, Quick-change device

Z-bar lift arm

Name	Value	Units
L – length	2600	mm

Quick-change device, hydraulic actuation

This equipment is optional.

Name	Value	Units
Control	Accessory kit, 1 pc.	
Actuation	Additional control lever	
Shut-off	Changeover valve	
Locking indicator	Mechanical	
Mass	400	kg

Quick-change device, electro-hydraulic actuation (with comfort control)

This equipment is optional.

Name	Value	Units
Control	Accessory kit, 1 pc.	
Actuation	comfort control (button on the LH operating lever)	
Shut-off	Changeover valve	
Locking indicator	Mechanical	
Mass	400	kg

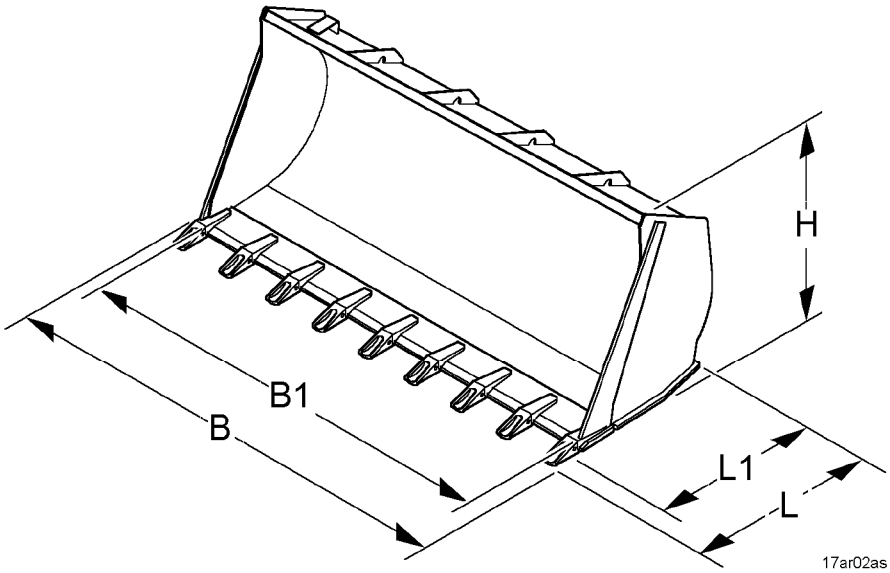
Quick-change device, electro-hydraulic actuation (without comfort control)

This equipment is optional.

Name	Value	Units
Control	Accessory kit hydr. quick-change device	
Actuation	LH control lever	
Shut-off	–	
Locking indicator	Mechanical	
Mass	400	kg

1.1.13 Attachments, Accessories

loading bucket



Main dimensions

Name	Value	Units
B - bucket width	2700	mm
B1 - loading dimension	2638	mm
H - height	1390	mm
L - length with teeth	1480	mm
L1 - length without teeth	1380	mm
Specific material weight	1.8	t/m³
Heaped bucket capacity (ISO 7546)	3,0	m³
Mass	1255	kg
Toothing - UNI-Z-2000 III	8	pieces

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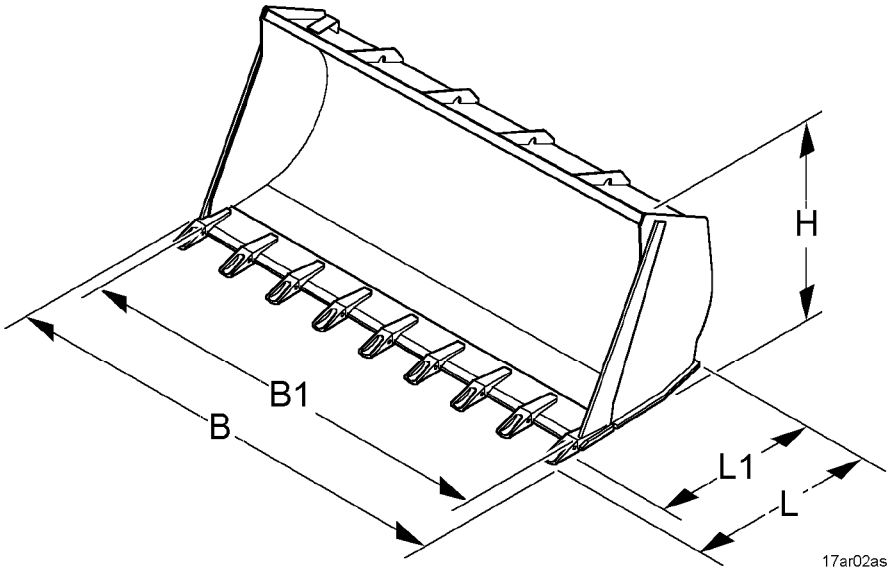
HD loading bucket This equipment is optional.



Main dimensions

Name	Value	Units
B - bucket width	2700	mm
B1 - loading dimension	2638	mm
H - height	1350	mm
L - length with teeth	1415	mm
L1 - length without teeth	1250	mm
Specific material weight	1.9	t/m³
Heaped bucket capacity (ISO 7546)	2.8	m³
Mass	1260	kg
Toothing - Bofors C2T1C	8	pieces

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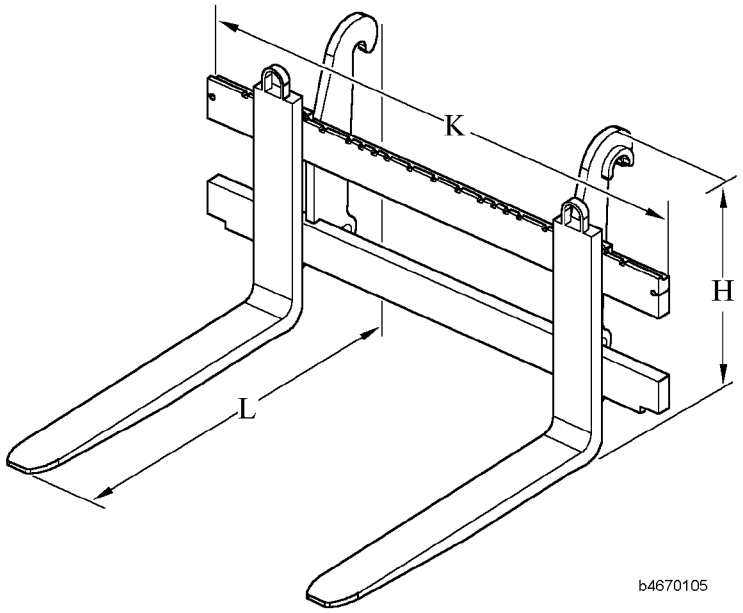
Forklift This equipment is optional.



Main dimensions

Name	Value	Units
Prong length	1500	mm
L – length (fork carrier + prongs)	1860	mm
K – fork carrier width	2000	mm
H – height (fork carrier + prongs)	1040	mm
Mass (fork carrier + prongs)	740	kg

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1.2 Technical description

1.2.1 Complete vehicle

Wheel loader

The **L544** is a fully hydraulic wheel loader with a hydrostatic travel drive system.
The vehicle has an articulated design.

Different vehicle versions:
- Z-bar lift arm with Z-bar kinematics
- tunnel version **L544 T**

Distinguishing features of the tunnel version L544 T:
- HD bucket – reinforced bucket with wear-protection
- stone impact protection for tilt cylinder
- additional roof plate over the driver's cab
- fire extinguisher outside/left on the vehicle
- diesel particle filter
- Top air preliminary separator
- reverse warning device
- collision guard at the rear

1.2.2 Diesel engine, Pump distributor gear

Diesel engine

The diesel engine is a water-cooled, four stroke in-line engine with direct injection and turbocharger.
The diesel engine is installed longitudinally on the rear section and elastically mounted on rubber bearings. The flywheel end faces backwards.
The power from the engine is transmitted via a torsion absorber to the pump distributor gear.
The gear pumps for the auxiliary drives are flange-mounted at the engine-side.

Fuel system

The fuel tank is located behind the right-hand cab access.
The lockable tank seal can be reached from the right-hand cab access.
The fuel is drawn up by the fuel supply pump via the suction line and the fuel separator (water and contaminant precipitator) and is fed to the injection pump via a fine filter.

Diesel particle filter

This equipment is standard with the tunnel version of the vehicle.
The diesel particle filter is installed on the left-hand side of the engine compartment.
It reduces the emission of soot particles.

Refuelling pump

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

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 inlet air into the engine.
The degree of wear on the engine depends to a large degree on how clean the inlet air is. It is therefore important that the air filtering unit is inspected and serviced on a regular basis.
The dry air filter with safety cartridge is designed to provide maximum engine protection during extended maintenance intervals.

Torsion absorber coupling

The torsion absorber acts as an elastic coupling and oscillation damper between the flywheel of the diesel engine and the pump distributor gear.
It transmits the diesel engine torque to the pump distributor gear.

Pump distributor gear

The pump distributor gear is a single stage spur wheel-type transmission and is attached to the flywheel housing on the diesel engine.
It distributes the power from the diesel engine to the hydraulic pumps of the hydrostatic travel drive, the working hydraulics and the steering hydraulics.

1.2.3 Cooling system

Cooling system

The cooling system is mounted between the diesel engine and the driver's cab on the rear section.
The cooling system cools the diesel engine coolant, the hydraulic oil and the air-conditioning condenser.
The hydrostatically driven fan draws up cool air through the cooler units and blows it over the diesel engine.
The speed of the hydrostatically-driven fan depends on the diesel engine speed and the temperature of the coolant and hydraulic oil.

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1.2.4 Travel hydraulics

Travel hydraulics

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

This drive enables:

- automatic adaptation of the travel speed to the tractive force in each travel range
- rapid shifting from forward travel to reverse travel by means of the LIEBHERR control lever
- control of the tractive force or speed by means of the gas pedal and the combined inch- brake pedal

Variable displacement pump

The variable displacement pump is an axial piston pump with a swash plate design. The flow is adjusted in relation to the engine speed and load.
The flow direction of the pump is determined by the travel direction valve.

Variable displacement motor

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

1.2.5 Working hydraulics

Working hydraulics

The working hydraulics systems operates in an open circuit. The variable displacement pump draws oil from the hydraulic tank and delivers it 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. A spool valve for floating position / fast lowering function and the LFD system are integrated in the control block.

Variable displacement pump

The variable displacement pump is an axial piston pump with a swash plate design. The controllers attached to the variable displacement pump determine the swivel angle of the pump and its flow rate.
The flow controller ensures that the variable displacement pump only delivers that volume of oil from the hydraulic tank, which is currently required by the working hydraulics.
The pressure limits the maximum operating pressure of the working hydraulics.
The power controller ensures that the pump does not draw off too much power from the diesel engine.

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, as well as an additional spool valve for float position, quick drop function and ride control are all integrated in the control valve block.
Pressure relief valves protect the system from pressure peaks.

Pilot control

The working hydraulics are controlled using the LIEBHERR control lever. The control valve block is thereby hydraulically controlled via the pilot control valve.
The pilot control valve is supplied with oil from the replenishing pump via the pilot control - solenoid valve. The presence of a hydro accumulator means that even when the diesel engine is at rest, the working attachments can be operated in emergencies, for example the lift arm can be lowered and/or the bucket can be tilted out.
The functions 'bucket return-to-dig', 'lift kick-out' and 'float position' are all controlled via retaining magnets in the pilot control unit and via proximity switches.

Ride control (LFD system)

The LFD system absorbs the bouncing and pitching motion by the vehicle when driving, considerably improving driver comfort and safety.
The lift cylinders are linked at their base ends with the hydraulic accumulator unit via the control block and the stabilising module. The rod end of the lift cylinders is linked to the hydraulic tank.

Stabilisation module

The stabilization module protects the hydro accumulators from pressure peaks.
When the pressure is too high, the stabilization module cuts off the oil flow to the hydro accumulator unit.

Hydro accumulator unit

The hydro accumulator unit of the LFD system consists of a steel block with 7 hydraulic accumulators.
The hydro accumulators absorb the pressure peaks from the lift cylinder bottom end and thus absorb the bouncing and pitching vibrations by the vehicle when travelling.

Hydraulic tank

The hydraulic tank supplies the travel hydraulics, working hydraulics, brake system and steering system with hydraulic oil.
The variable displacement pumps move the oil via control units to the individual consumers and back to the hydraulic tank via the oil cooler. The oil passes through the return suction filter as it flows back.
In addition, the fixing brackets for the exhaust gas system and for the air filter are integrated into the steel section of the hydraulic tank.

Return suction filter

The return suction filter cleans the oil as it flows back from the working and travel hydraulics. The oil flows from the inside outwards through the filter.
The filter acts simultaneously as a suction filter for the replenishing pump of the hydrostatic travel drive

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Return strainer

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

1.2.6 Steering system

Steering system

The vehicle has articulated steering. Two steering cylinders push the front and rear sections together via the articulated joint.
The hydraulic steering system is supplied with oil from the variable displacement pump. When the steering wheel is turned, the oil is directed by the servostat to the steering cylinders.
An absorption system in each steering cylinder prevents an abrupt impact at the limit of the articulated steering movement in both directions. Two hydro accumulators damp the steering movements during steering.
An emergency steering system makes steering possible, even in the event that the variable displacement pump breaks down.

Steering pump

The steering pump is an axial piston pump with a bent axis design and is flange-mounted on the variable displacement pump of the working hydraulics.
The pressure and flow controllers - mounted on the pump housing - determine the flow rate of the pump.

Emergency steering pump

The emergency steering pump, is a gear pump driven by an electric motor. The pump supplies oil as required to the steering system.
The electric motor is controlled by an electronic system. If the variable displacement pump 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.

Servostat

The servostat is actuated 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 enhance the responsiveness of the steering.

1.2.7 Braking system

Braking system

The service brake is a hydraulic dual-circuit pump accumulator brake system. It acts on the wet disc brakes in the wheel hubs of the front and rear axles.
The service brake in conjunction with the hydrostatic braking is operated by the combined inch/brake pedal.

Compact brake valve

The compact brake valve is mounted outside on the cab floor. It is actuated by the inch/brake pedal.
The compact braking valve is supplied with hydraulic oil from a gear pump.

Parking brake

The parking brake is a spring-accumulator - gliding caliper brake and acts on the external brake disc mounted on the output shaft of the transfer gear.
The parking brake is opened by oil pressure and closed by spring force.

1.2.8 Electrical system

Electrical system

The batteries are connected in series, one is located in each counterweight (left and right side).
The battery main switch is located at the rear left of the engine compartment.
When the main switch is turned off, the whole electrical system is shut down.
If the main battery switch is turned on and the starter switch on the instrument panel is turned off, the batteries are still connected to the electrical system.
The main battery switch may not be turned off when the diesel engine is running. The electrical system could be damaged as a result.

1.2.9 Transfer gear

Transfer gear

The transfer gear is a 3-gear power shift gearbox with a planetary design.
The gearbox is controlled and monitored by an electronic control system.
The multi-disc couplings of the gearbox are pressure modulated.
The gearbox lubrication and circuit are supplied by a separate hydraulic system driven by a gear pump. A pressure filter is integrated in the supply line.

1.2.10 Axles, Tyres

Front axle

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

Rear axle

The rear axle is a fixed axle and is rigidly bolted to the oscillating axle frame.
The oscillating axle frame is mounted on a rotating bearing on the rear section.
The axle is equipped with a central tapered gear with an integrated disc-type self-locking differential. The planetary drives and wet disc brakes are located in the wheel hubs.

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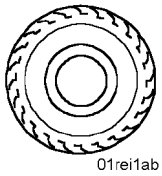
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Tyres

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

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

The correct tyre pressure is a decisive factor for perfect vehicle performance and for high tyre mileage.

Snow chains or guard chains

When snow chains or guard chains are used, then they must be attached to all four wheels!

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

1.2.11 Vehicle frame, Ballast weight

Vehicle frame

The vehicle frame consists of the front and rear sections. These are linked by the articulation bearing.

For steering, the vehicle frame is pivoted to the left or right via the articulation bearing.

The vehicle frame transmits the forces from the lift arm to the axles. The frame bears all the key components of the vehicle such as the diesel engine, driver's cab, transfer gear, etc.

Articulation lock

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

The joint is locked by means of a safety bar.

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

1.2.12 Central lubrication system

Manual central lubrication

The "manual central lubrication" consisting of two central lubrication rails is mounted on the left-hand side of the vehicle in the articulation zone.

Otherwise inaccessible lubrication points are manually lubricated via the two central lubricating rails.

Automatic central lubrication system

This equipment is optional.

The automatic central lubrication system is a progressive system. It lubricates progressively; that is to say, all the lubrication points are served sequentially.

An electrically driven central lubrication pump EP-1, delivers the grease to the primary progressive distributor and distributes it amongst the secondary progressive distributors. The secondary progressive distributors pump the grease to the individual lubrication points. An integrated, electronic control device controls the lubrication and dead time of the piston pump.

An overpressure valve monitors lubrication of the individual lubrication points.

1.2.13 Cab, Heating, Air conditioning system

Cab

The cab is a safety cab and has been tested and certified according to ROPS/FOPS regulations. It is mounted on cushioned bearings on the rear section.
The cab is equipped with heating, ventilation and air-conditioning.
Access to the cab is from the left-hand side of the vehicle via the access ladder and the left-hand door.
In emergencies, exiting through the right-hand door is also possible.

Driver's seat with gas-filled spring suspension

The driver's seat is equipped with a gas-filled spring suspension.
The ergonomically designed driver's seat offers a high degree of comfort.
The adjustable seat surface, back rest, suspension and arm rest mean that the driver can adjust the seat for maximum individual comfort.

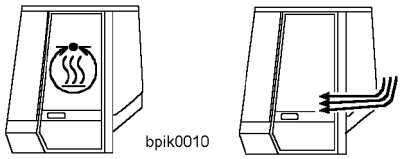
Vibration damping

The seat installed in the vehicle complies with ISO 7096.
When the vehicle is used correctly, the values of the vibrations transmitted by the driver's seat are smaller or equal to the simulated vibrations for the corresponding vehicle class in accordance with ISO 7096.
The values of the evaluated vibration accelerations "a_{ZW}", measured according to ISO 2631, Part 1, thus fulfil the requirements for protection against whole body vibrations according to EN 474-1.

Driver's seat with pneumatic suspension

This equipment is optional.
The driver's seat is equipped with pneumatic suspension (compressor operated).
An electrically driven compressor supplies a pneumatic spring in the seat section and two pneumatic chambers in the back rest.
For information on seating comfort, adjustability and vibration damping see the section "Driver's seat with pneumatic spring suspension"

Heating, Ventilation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The driver's cab is equipped with a warm water heating system.
The inlet air is filtered via two serviceable dry filter cartridges and directed to the cab via the heating/air-conditioning unit and the adjustable air flow nozzles.

Air-conditioning system


bsym0029

An air-conditioning system is installed as standard in the driver's cab.
The drawn-in air is filtered via two serviceable dry filter cartridges and directed into the cab via a vaporiser and heat exchanger and the adjustable outlet nozzles.

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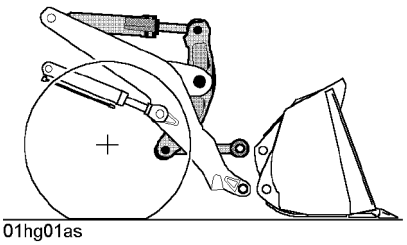
1.2.14 Lift arm, Quick-change device

Z-bar lift arm



Z-bar kinematics

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

The lift arm has a Z-kinematic design. That is to say, the tilt cylinder, reversing lever and connecting strap form a "Z". The "Z-form" can be seen from the right-hand side.

In the case of the lift arm with Z-bar kinematics, no parallel movement is possible.

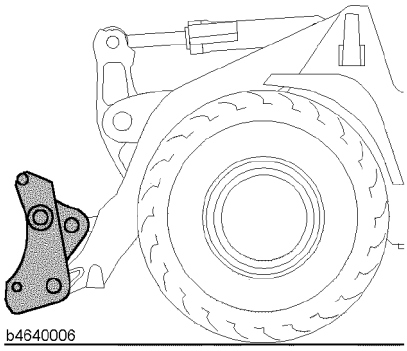
The lift arm can be equipped with a hydraulic quick-change device (optional).

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

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

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

Quick-change device



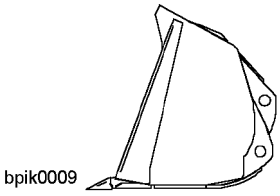
This equipment is optional.
The quick-change device is or will be attached to the lift arm of the vehicle.

It is designed to facilitate the fast changing of various attachments on the lift arm.
Different models of the quick-change device:

- Model: Hydraulic actuation by an additional controller.
- Model: combined, electro-hydraulic actuation with comfort control
- Model: combined, electro-hydraulic actuation with switch

1.2.15 Attachments, Accessories

Loading bucket



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

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

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

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

HD loading bucket

This equipment is optional.
The HD bucket is a reinforced bucket with wear-protection. It is employed when the vehicle is deployed under difficult conditions (e.g. for tunnel work).

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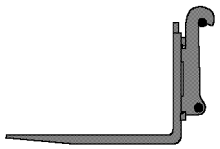
Forklift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This equipment is optional.
The forklift is one of a variety of attachments which can be mounted on the lift arm.

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

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

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2 Safety regulations

Working on the vehicle involves possible risk to life and limb of the operator, driver or maintenance technicians. You can considerably reduce the risk of accidents by always reading and observing the various safety instructions carefully.
This is especially important for personnel who only occasionally work on the vehicle, for example, carrying out rigging or maintenance work.
The safety regulations listed below, if conscientiously followed, will ensure your own safety and that of others, and will prevent the vehicle from being damaged.
Whenever tasks which could cause danger to personnel or damage to the vehicle are described in this manual, the necessary safety precautions are explained.
These are indicated by the headings – **Danger**, **Warning** or **Caution** – .

2.1 Introduction

1. The symbols below have the following meaning:

"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 vehicles.

2. **Observance of these instructions does not relieve you of the responsibility of following any additional rules and guidelines that may apply!**

   The following should also be observed:
   - the safety rules in force at the operating site
   - legally enforceable "traffic regulations"
   - guidelines issued by the employees trade associations

2.2 General safety precautions

1. Familiarise yourself with the **"Operating manual"** before starting up the vehicle.
   Make sure that you are in possession of and have read and understood additional instructions applicable to any accessory equipment installed on your vehicle.
2. Only expressly authorised personnel may operate, service or repair the vehicle.
   Observe the legal minimum ages!
3. Only deploy trained or instructed personnel, clearly assign responsibility for operation, rigging, maintenance and repair work.

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4. Clearly establish the driver's responsibilities (also with respect to 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 vehicle under constant supervision.
6. Check occasionally that your personnel, in observance of the **"Operating manual"**, are working safely and are aware of possible dangers.
7. Wear safe working overalls when working on or with the vehicle.
   Avoid wearing rings, wrist watches, ties, scarves, open jackets, loose clothing and so on. There is a risk of injuries due, for example, to being caught or being drawn 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 vehicle which could in turn lead to accidents.
10. Never jump down from the vehicle. 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 vehicle on firm, level ground and set the working attachment down on the ground
    - move all control levers to neutral
    - shut down the engine and take out the ignition key

13. Before 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 banked up pressure in the operating circuits. You must then reduce the internal tank pressure.
14. Lock the working hydraulics to prevent unforeseen actuation before leaving the driver's cab.
    Lock the working hydraulics in accordance with the instructions in the **"Operating manual"**.
15. Secure all loose components on the vehicle.
16. Never start up a vehicle without first making a thorough tour of inspection and check if any warning signs are missing or illegible.
17. Observe all signs bearing danger or safety instructions.
18. The vehicle must be provided with specific safety devices for special deployments. In this case, only operate the vehicle when these have been installed and are fully functional.
19. Do not make any modifications, extensions or conversions to the vehicle with possible safety implications, without the approval of the supplier. This also applies to the installation and adjustment of safety equipment and valves as well as for welding work on load bearing components.

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2.3 Proper use

1. When equipped with a standard loading bucket, forklift or 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 regarded as improper use.
   The manufacturer/supplier accepts no liability for any injury or damage resulting from the above.
   The risk is borne by the user alone.
3. Vehicles used for lifting purposes are subject to special conditions and must also be equipped with the prescribed safety equipment.
4. Proper use also includes observance of the **"Operating manual"** and adherence to the inspection and maintenance conditions.

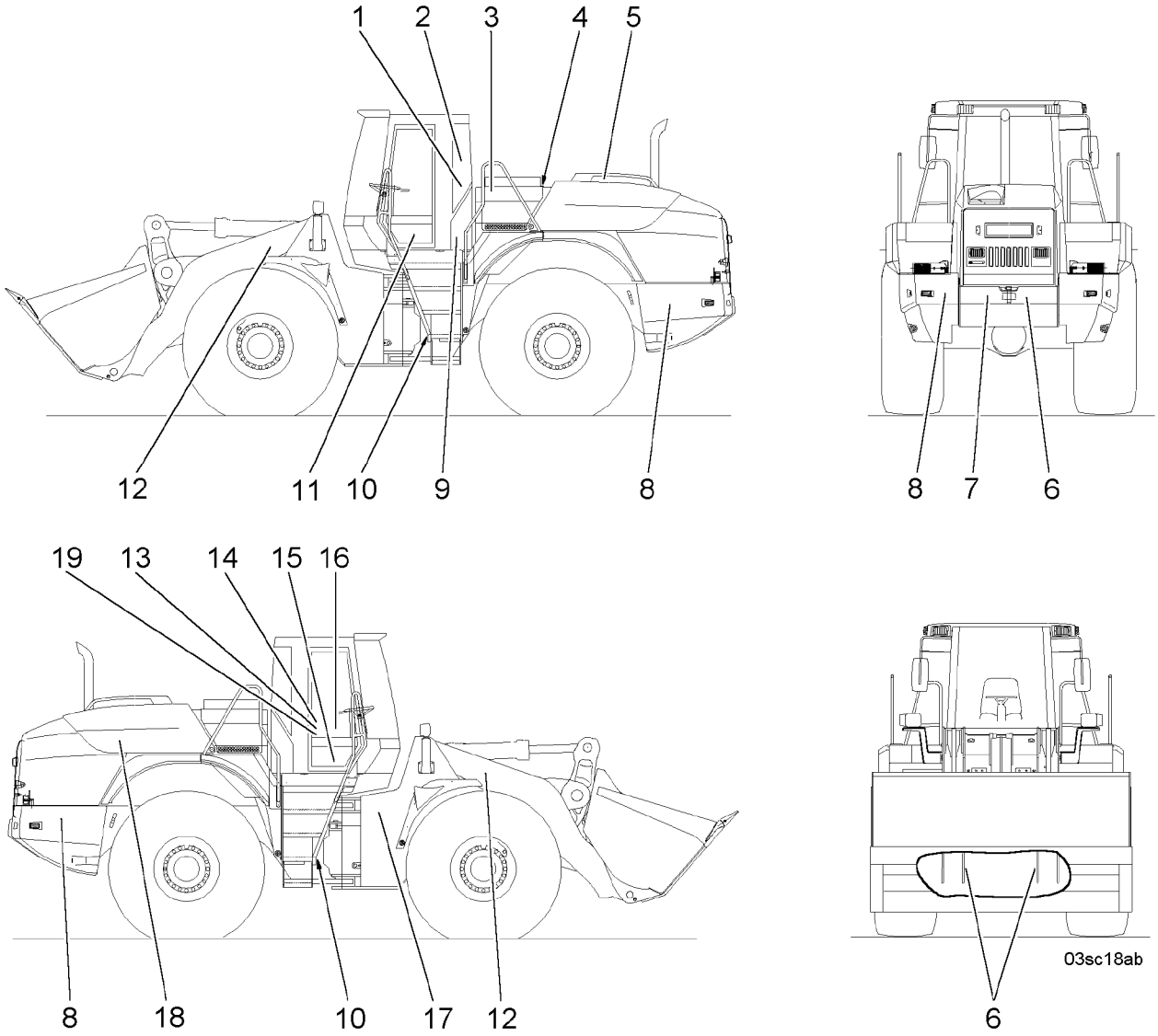
2.4 Decals on the vehicle

1. Your vehicle has several types of decals.

   Types of decals:
   - Safety decal
   - Information decals
   - Type plates

   Their texts and locations are described below.
   The order numbers are included in the spare parts list.

2.4.1 Location of decals



Layout of decals

1 Noise pressure decal – L_{pA}
2 Noise output decal – L_{WA}
3 Cooler unit decal
4 Minimum level decal
5 Engine standstill decal
6 Decal for slinging and lifting point
7 Decal for lashing point
8 Speed limit decal 40
9 Decal for windshield water
10 Articulation area warning decal
11 Lubricant chart
12 Keep clear decal
13 Accident prevention decal
14 Steering decal
15 ROPS decal
16 Decal for working hydraulics
17 Type plate – vehicle
18 OIL LEVEL decal
19 Wheel lugs decal

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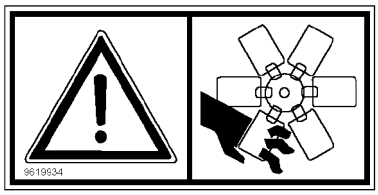
2.4.2 Safety decals

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

Engine standstill decal



03sc04ab

Decal 5 is affixed on top of the engine-compartment hood.

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

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

Articulation area warning decal

03sc02ab

Decal 10 is affixed outside on the left and right in the articulation area.

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

Meaning: **Remaining in the articulation area is prohibited, when this is unlocked!**

Keep clear decal

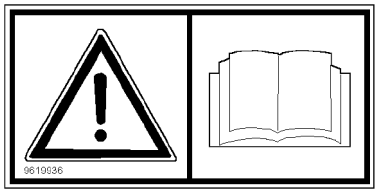
03sc01ab

Decal 12 is affixed to the outside of the lift arm on the left and right.

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

Meaning: **Standing in the danger area is prohibited!**

Accident prevention decal



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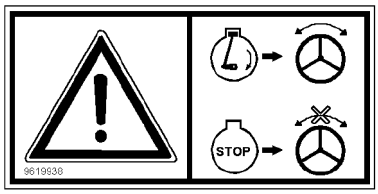
Decal 13 is attached to the right-hand side of the driver's cab.

Refers to regulations in the operating manual for accident prevention.

Meaning: **When operating the vehicle, the regulations in the operating manual for accident prevention must be followed precisely!**

Steering decal



03sc05ab

Decal 14 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.

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

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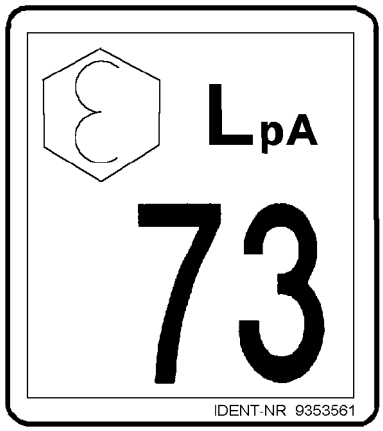
2.4.3 Information decals

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

Noise pressure decal – L_{pA}



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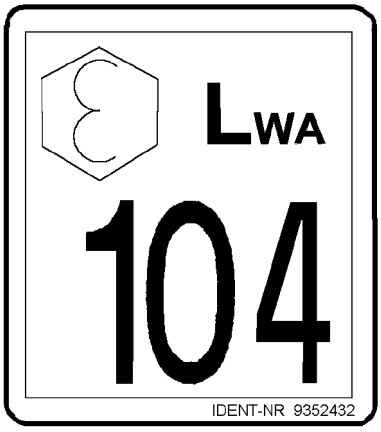
Decal 1 is affixed inside the left-hand window of the driver's cab.

Specifies the L_{pA} – sound pressure of the vehicle in decibels.

Noise output decal – L_{WA}

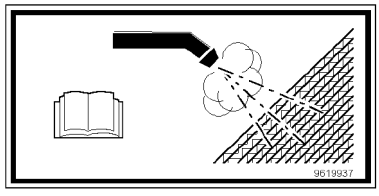


03sc19ab

Decal 2 is affixed inside the left-hand window of the driver's cab.

Specifies the L_{WA} – sound pressure level of the vehicle in decibels.

Cooler unit decal

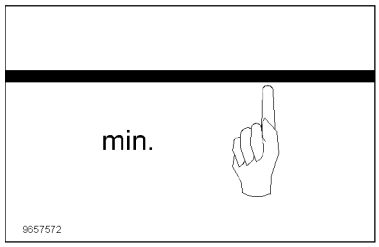


03sc07ab

Decal 3 is affixed externally to the cooling-system hood on the left.

Refers to cleaning the cooling system.

Minimum level decal

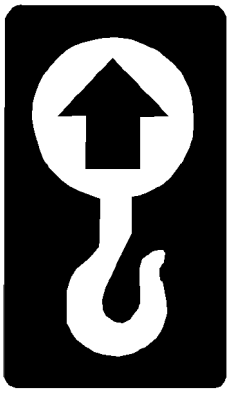


03sc12ab

Decal 4 is attached in the engine compartment to the coolant reservoir.

Indicates the coolant level in the coolant reservoir.

Decal for slinging and lifting point



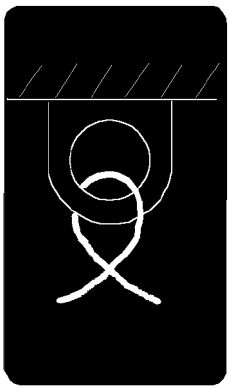
03sc17ab

Decal 6 is affixed to the slinging-lifting points on the vehicle.

See the "Slinging the vehicle from a crane" section .

Refers to the slinging- lifting points on the vehicle.

Decal for lashing point



03sc16ab

Decal 7 is affixed to the lashing points on the vehicle.

See the "Transporting the vehicle by truck or rail" section.

Refers to the lashing points on the vehicle.

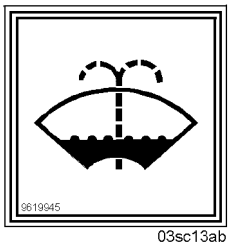
Speed limit decal 40

03sc08ab

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

Refers to the permitted speed limit for the vehicle.

Decal for windshield water



03sc13ab

Decal 9 is affixed outside on the left side of the driver's cab.

Indicates the container for the windscreen washing agent.

Lubricant chart

The decal is affixed to the left-hand door of the driver's cab.
Fig. – see the "Maintenance" section.
Indicates the maintenance points and intervals in relation to lubricants and operating materials for the vehicle.

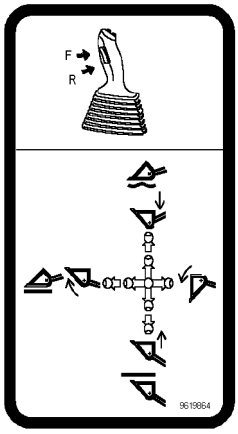
ROPS decal

03sc09ab

Decal 15 is affixed 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.

Decal for working hydraulics

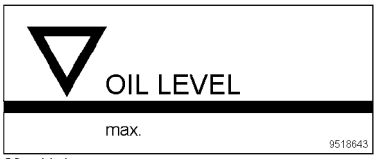


03sc06at

Decal 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.

OIL LEVEL decal

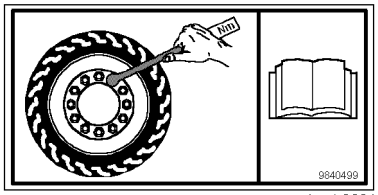


03sc11ab

Decal 18 is attached to the hydraulic tank on the right-hand side of the engine compartment.

Indicates the oil level in the hydraulic tank.

Wheel lugs decal



bsch0001

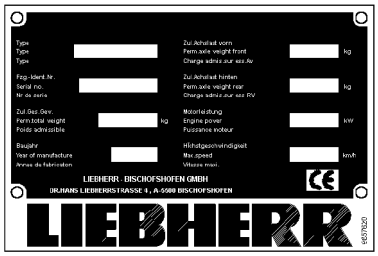
Decal 19 is attached to the right-hand side of the driver's cab.

Indicates the service interval for checking the tightness of the wheel lugs specified in the Operating Manual.

2.4.4 Type plates

1. A type plate is attached to the vehicle and individual components such as, the diesel engine, gearbox, axles etc.

Type plate – vehicle



03sc10ab

Decal 17 is affixed to the right-hand side of the front section.
Details on the type plate:

- type
- vehicle identity no.
- permissible total weight
- year of construction
- permissible front axle load
- permissible rear axle load
- engine output
- speed limit

2.5 Instructions for avoiding crushing injuries and burns

1. Do not work underneath the working attachment until it has been securely set down on the ground or is supported.
2. Do not use any ropes or chains, which are damaged or which have insufficient load bearing capacity.
   Wear protective gloves when handling wire ropes.
3. When working with the attachment, never align the boreholes with your fingers, instead, use a suitable mandrel for this purpose.
4. Make sure that when the engine is running, no objects come into contact with the fan.
   Objects which fall or project into the fan will be 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 parts conducting oil come into direct contact with your skin.
8. Wear safety goggles and protective gloves when working on the battery.
   Avoid sparks and naked flames.
9. Never let the loading bucket or other working attachments 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.

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

2.6 Instructions for avoiding fires and explosions

1. When refuelling, the engine must be shut down. Shut down any auxiliary heating systems.
2. Do not smoke. Avoid naked flames when refuelling or when near batteries while they are being recharged.
3. Always follow the instructions in the **"Operating manual"** when starting the engine.
4. Check the electrical system.
   Immediately eliminate all faults, such as loose connections, worn cables or burnt-out fuses and bulbs.
5. Do not transport any flammable liquids on the vehicle except in the tanks designated for this purpose.
6. Regularly check all leads, hoses and couplings for leaks and damage.
7. Immediately repair the leaks and replace the defective components.
   Oil escaping under pressure from leaks can easily 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 facilities available on site.

2.7 Safety instructions for start-up

1. Each time before starting up, walk around the vehicle, carrying out a thorough inspection.
2. Check the vehicle for loose bolts, cracks, wear, leaks and malicious damage.
3. Never attempt to start up a defective vehicle.
4. Ensure that any defects are rectified immediately.
5. Ensure that all hoods and covers are closed and locked. Check that all warning and information decals are present.
6. Make sure that the cab windows and inside and outside mirrors are clean, and secure the doors and windows against unforeseen movements.
7. Make sure that nobody is working on or under the vehicle. 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 vehicle must be activated during operation.

2.8 Safety precautions during start-up

1. Before starting, check that all pilot lamps and instruments are in proper working order.
   Move all control levers to neutral.
2. Before starting the engine, briefly sound the horn, to warn other persons in the vicinity of the vehicle.
3. Start the vehicle only 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 lead to sluggish performance.
8. Check that the control for the working attachment is functioning perfectly.
9. Drive the vehicle 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 protective barriers to secure the site from the public roads.
2. Always maintain sufficient safety clearance from overhangs, edges, slopes and unstable ground.
3. Be especially careful when the ground conditions are variable, when your field of vision is restricted or under changing weather conditions.
4. Familiarise yourself with the position of the utility supply lines on the site and be especially careful when working in proximity to them. If necessary, inform the 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 vehicle!
   – If possible, drive the vehicle a sufficient distance away from the danger area.
   – Warn others not to come close or to touch the vehicle.
   – Arrange for lines to be de-energized.
   – Do not get out of the vehicle until you are certain that the contacted/damaged power line is voltage free!
6. Before driving or working with the vehicle, 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 vehicle is roadworthy.
8. Always turn on the lights in the dark or when visibility is poor.
9. Do not allow anybody to ride on the vehicle.
10. Only work when seated and with your seat belt fastened.
11. Report all malfunctions and ensure that all necessary repairs are carried out immediately.
12. Personally ensure that nobody could possibly be endangered when you set the vehicle 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 vehicle is still in motion.
15. Never leave the vehicle unattended when the engine is running.
16. When in motion, lower the working attachment into the transport position and keep the load as close to the ground as possible.
17. Avoid movements which could cause the vehicle to tip over.
    If the vehicle should start to tilt or slide to one side, set down the working attachment immediately and turn the machine so that it is facing downhill.
    Wherever possible work up- or downhill and not 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 loose control over the vehicle.
    The engine must be running at the rated speed and the travel speed must 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 with responsibility for slinging loads and directing crane operators.
    The banksman should remain in visual contact with the operator or at the very 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 you could otherwise loose control over the vehicle.

   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 gears 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 vehicle can comfortably manage the whole slope without endangering other traffic, the driver or the machine itself.

3. When driving on slopes, you should also ease off the gas pedal.

2.11 Parking safely

1. If possible, only park the vehicle on firm, level ground.
   If it must be parked on a slope, then the vehicle should be secured against rolling away with wedges.
2. If the vehicle has an articulated design, the articulation lock must be installed.
   With wheel loaders, this applies to vehicles 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 vehicle, take out all keys and secure it against unauthorised use and vandalism.

2.12 Transporting the vehicle safely

1. Only use suitable means of transport and lifting devices with sufficient lifting capacity.
2. Park the vehicle on a flat surface and wedge the tracks or wheels securely.
3. If necessary, dismantle part of the working attachment for the duration of transport.
4. The ramp for driving onto a low loader should have an inclination of no more than 30° and should be covered with wooden boards to prevent slipping.
5. Clean the vehicle tracks/wheels of snow, ice and mud before driving onto the ramp.
6. Before driving on, lock the superstructure to the undercarriage with the locking pin.
   Procedure: not applicable with wheel loader.
7. Align the vehicle 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 second person must give the vehicle driver directions.
   Drive carefully onto the ramp and then onto the transport vehicle itself.
10. Have wedges ready in case the vehicle starts to roll back while on the ramp.
11. Retract the working attachment and drive onto the loading ramp.
    Always keep the working attachment as close as possible to the loading bed.
12. After loading, set down the working attachment on the loading bed.
    Apply the articulation lock (this only applies to wheel loaders with articulated steering)
13. Secure the vehicle and the remaining individual components with chains and wedges against sliding .
14. Depressurise the pressure lines, take out the starting key, lock the driver's cab - and side panels and leave the vehicle.

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 vehicle safely

1. Always observe the correct procedure in accordance with the instructions in the **"Operating manual"** see the section "Towing the vehicle".
2. The vehicle may only be towed in exceptional circumstances, in order, for example to move the machine away from a dangerously exposed position for repairs.
3. When towing, check that all attachment and towing devices are safe and secure.
4. The rope or tow bar used for towing must have 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 is standing 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 vehicle up again, proceed in accordance with the instructions in the **"Operating manual"**.

2.14 Measures for ensuring 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. The persons required or permitted to carry out specific jobs are 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 vehicle during maintenance work.
7. Set up an extended cordon around the maintenance area if necessary.
8. Inform operating personnel in advance of specialist and maintenance work. Designate supervisory staff.
9. Unless otherwise specified in the **"Operating manual"** carry out all maintenance work on the vehicle on firm level ground with the engine shut down.
10. Afterwards always re-tighten threaded couplings loosened during maintenance and repair work.
11. If safety equipment has to be dismantled for rigging, maintenance and repair work, it must be re-installed and checked as soon as the respective job is finished.
12. When undertaking maintenance jobs, especially work under the vehicles, attach a warning decal **"DO NOT SWITCH ON"** to the ignition where it is clearly visible. Take out the starting key.
13. Clean the vehicles of oil, fuel or service fluids, especially from couplings and threaded connections. Do not use aggressive cleaning agents. Use fibre-free cloths.
14. Before starting any welding, burning or grinding work on the vehicle, remove all dust and flammable materials from the machine and ensure that there is sufficient ventilation.
    Otherwise there is a risk of **"EXPLOSION"**!
15. Before cleaning the vehicle 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 safety/operational considerations.
    It is especially important to protect electric motors, control cabinets and battery casings.

    Further procedure:
    - make sure that during cleaning work on the vehicle housings, the temperature sensors for the fire alarm and extinguisher systems do not come into contact with hot cleaning agent otherwise the fire extinguishing system could be activated
    - after cleaning, completely remove the covers/tapes
    - after cleaning, check all fuel, engine oil and hydraulic oil lines for leaks, loose connections, abrasion and damage
    - rectify any defects as soon as they are discovered
16. Note the safety regulations which apply to the respective product, when handling oils, greases and other chemical substances.
17. Make sure that operating and auxiliary materials as well as replaced parts are disposed of safely in an environmentally friendly manner.
18. Take care when handling hot operating and auxiliary materials (danger of burns and scalding).
19. Only operate internal combustion engines and fuel burning heating systems in spaces with sufficient ventilation. Before starting up in an enclosed space, make sure that the ventilation is sufficient. Observe the locally applicable regulations.

20. Only carry out welding, burning and grinding work on the vehicle if this has been expressly approved. There is, for example a risk of fire and/or explosions.
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 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 the very 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 equivalent. Do not use vehicle 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 vehicle when this is propped up on the working attachment without first securely supporting the undercarriage on wooden billets.
27. Always jack up the vehicle so that any shifts in its centre of gravity do not jeopardise its stability, while at the same time avoiding any direct metal on metal contact.
28. Work on the chassis, the braking and steering systems may only be carried out by personnel with specialist training.
29. If the vehicle has to be repaired on a slope, the wheels must be secured with wedges. Move the working attachment into the maintenance position and insert the articulation lock.
30. Only personnel with specialist knowledge and experience may work on the hydraulics.
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.
    All servo control devices (joystick and pedals) must then be moved in both directions – with the starter 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 unscrewing the breather screw.
33. Regularly check all hydraulic lines, hoses and screws for leaks and externally recognisable damage. Rectify all damage immediately. Oil escaping under pressure can result in injuries and fires.
34. Before beginning repair work, depressurise the system sections and pressure lines (hydraulics, compressed air) in accordance with the component descriptions.
35. Lay and install hydraulic and pneumatic lines properly. Do not mix up hoses at 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 at the specified or appropriate time intervals, even where no safety-related deficiencies are apparent.
37. Work on the vehicle'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 vehicle immediately.
39. Inspect/check the vehicle'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 electrically live components, 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 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 vehicle

1. Only the manufacturer or an authorised contractor is permitted to carry out welding work on . . power transmitting assemblies (e.g., chassis, attachments).
   Disconnect the battery when working on the electrical system or when carrying out electric arc welding on the vehicle.
   Always disconnect the minus terminal first and reconnect it last.

   For vehicles with an electronic gearbox control unit:
   – In addition, disconnect the multi-pin plug on the electronic gearbox control unit before starting any welding work on the vehicle.

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

2.16 Instructions for working safely on vehicle attachments

1. Do not work below the attachment, unless it is resting safely on the ground or is properly supported.
2. Avoid metal-metal contact when exchanging attachments . . (decal, cutting edge, 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.
   All servo control devices (joystick and pedals) must then be moved in both directions – with the starter 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 unscrewing the breather screw.
6. Ensure that all lines and threaded couplings are reconnected and re-tightened on completion of the job(s).
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 regulations when transporting the vehicle by crane

1. Lower the attachment and tilt back the loading attachment to the stop.
2. Apply the articulation lock (this only applies to wheel loaders with articulated steering)
3. Move all control levers into neutral position and engage the parking brake.
4. Shut down the engine in accordance with the instructions in the **"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 the very least be in audio contact with him.
8. Attach the lifting tackle to the lugs/bore holes provided on the vehicle.
9. Ensure that the lifting tackle is of sufficient length.
10. Raise the vehicle carefully.
11. **NOTE! Standing under the vehicle when it is suspended is strictly prohibited.**
12. When restarting the vehicle, proceed strictly according to the **"Operating manual"**.

2.18 Safe maintenance of 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 the very least once a year for leaks and visible signs of damage!
   Replace damaged parts immediately! Oil escaping under pressure can result in injuries and fires.
3. Even when properly stored and subjected to normal loading, hoses and hose lines are subject to natural ageing. This limits their service life.
4. Improper storage, mechanical damage and loads in excess of permitted limits are the most common causes of malfunctions.

5. The service life of a hose line should not exceed six years, including a storage period of no more than 2 years (note the date of manufacture on the hoses).
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 are discovered during inspection.

   Criteria:
   - damage to the outer layer penetrating through to the inner layer (e.g. abrasion, cuts and tears)
   - brittle outer layer (cracks in the hose material)
   - deformation 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 the prescribed storage period or service life
8. Only use original spare parts when replacing hoses and hose lines.
9. Lay and install hoses and hose lines properly. Do not mix up hoses at couplings.

2.19 Attachments and accessories

1. Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting, must not be installed or fitted on the vehicle without the previous written agreement of LIEBHERR.
2. The appropriate technical documentation should be made available to LIEBHERR for this purpose.

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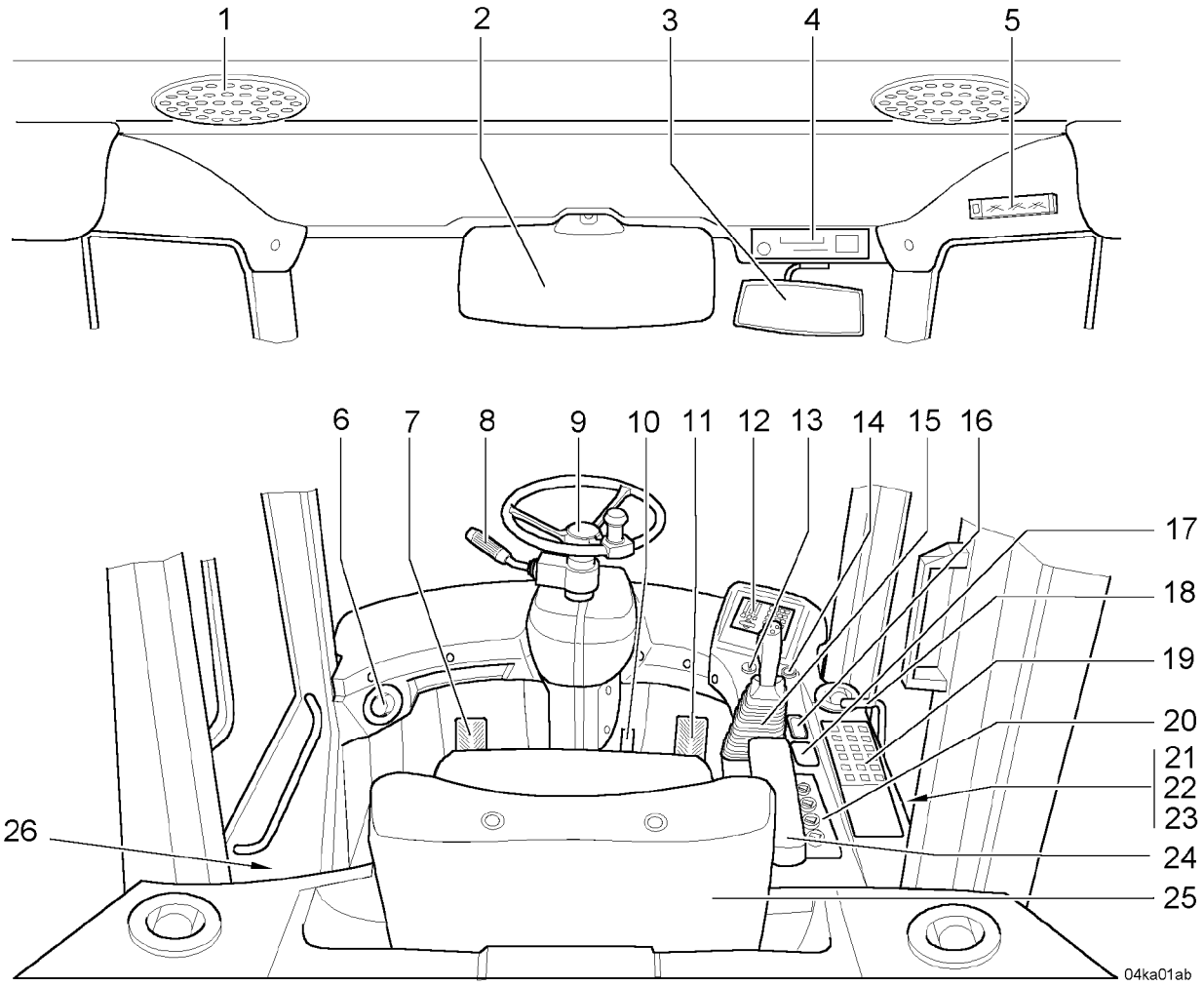
3 Operation, Handling

3.1 Layout of controls and instruments

Valid for: L544-442/0104-0392; L544T-444/0104-0392



Driver's cab — inside view

1 Radio loudspeaker
2 Sun visor
3 Interior mirror
4 Radio unit
5 Interior illumination with switch
6 Heating/ventilation/air-conditioning outlet nozzles (9 in total)
7 Brake- inching pedal
8 Steering column switch
9 Adjustable steering column with steering wheel
10 Steering column adjustment lever
11 Gas pedal
12 Instrument panel display unit
13 Starter switch
14 Socket/cigarette lighter
15 LIEBHERR control lever
16 Ashtray
17 Control lever mounting for optional working functions
18 Door handle (right-hand door) – emergency exit
19 Control unit
20 Control element
21 Fuses
22 Control electronics
23 Control relay
24 Adjustable arm rest
25 Driver's seat
26 Glove compartment

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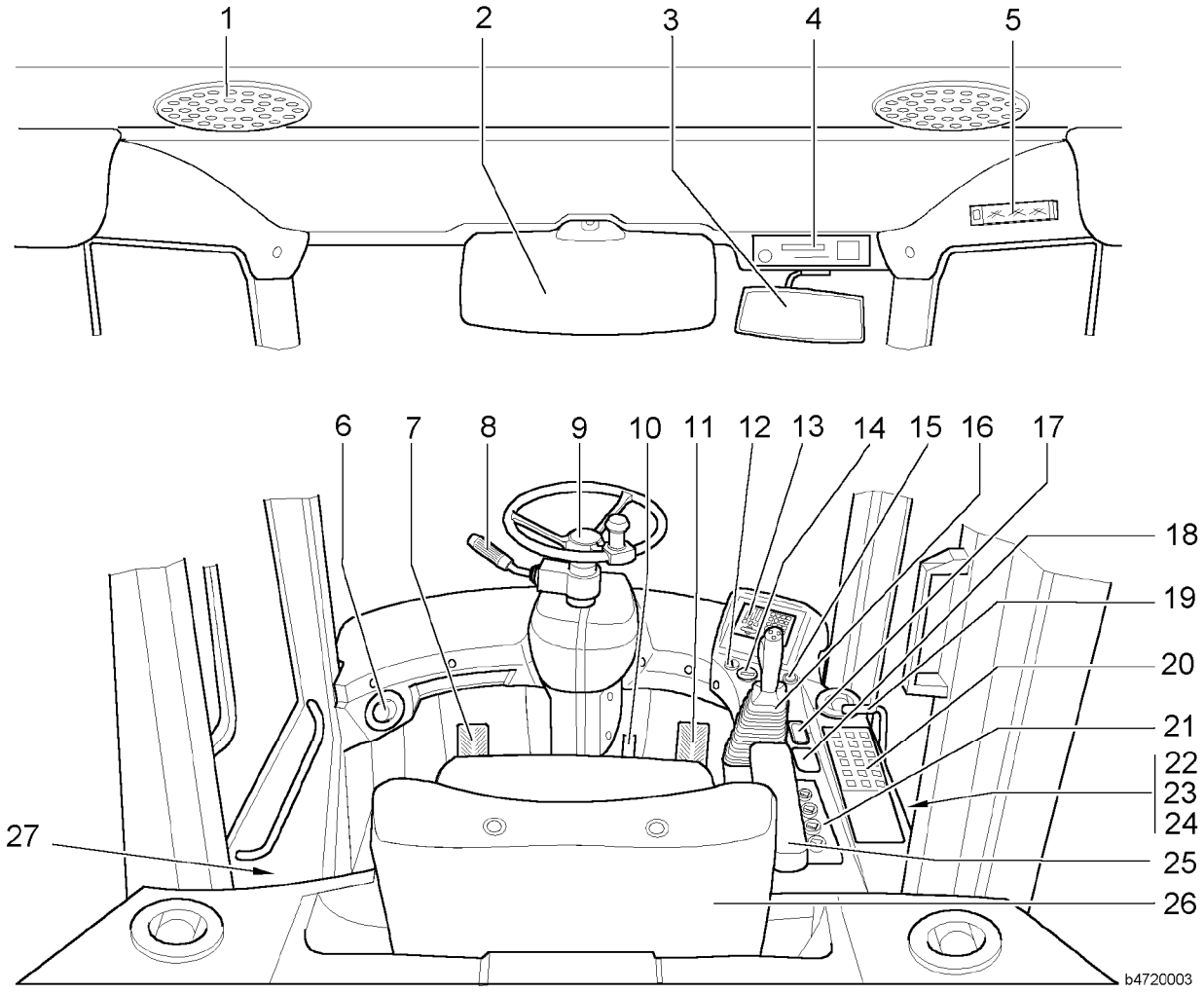
Modification Instrument panel with integrated mechanical hour meter 14 .

Valid for: *L544-442/0393-; L544T-444/0393-*



Driver's cab — inside view

1 Radio loudspeaker
2 Sun visor
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5 Interior illumination with switch
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11 Gas pedal
12 Starter switch
13 Instrument panel display unit
14 Mechanical hour meter
15 Socket/cigarette lighter
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21 Control element
22 Fuses
23 Control electronics
24 Control relay
25 Adjustable arm rest
26 Driver's seat
27 Glove compartment

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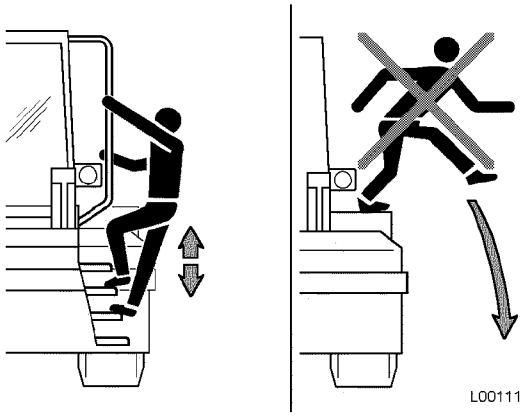
3.2 Operation

3.2.1 Cab access

Personnel should only get on and off the vehicle using the access aids provided.
Normally, the driver's cab must be entered and exited through the left-hand driver's cab door.

Entering and leaving the driver's cab

Familiarise yourself with the emergency exit through the right-hand cab door. Refer to the "Emergency exit" section.



Warning

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

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

! Never jump down from the vehicle.

Warning

Risk of injuries due to unforeseen movement by the vehicle!

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

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

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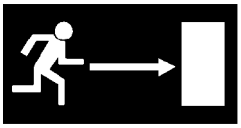
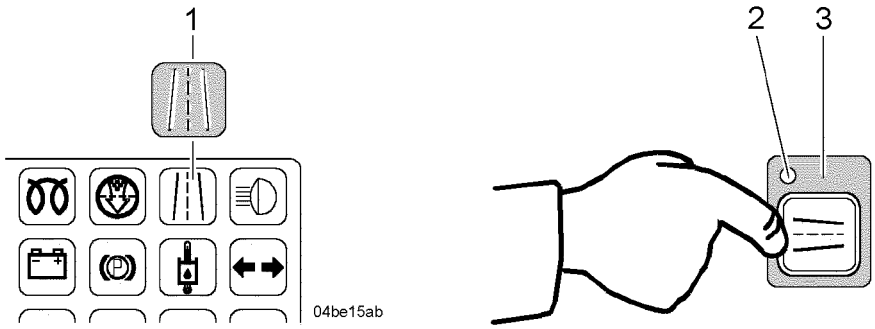
3.2.2 Emergency exit

Leaving the driver's cab by the emergency exit


bsym0002

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.

- Before starting up the vehicle, make sure that it is possible to leave the driver's cab through the right-hand driver's cab door from inside without hindrance.



working hydraulics lock button

1 working hydraulics lock symbol field
2 LED
3 working hydraulics lock button

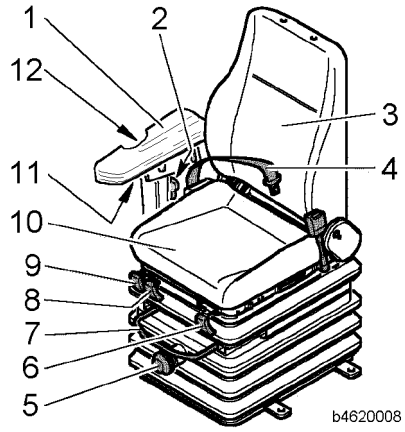
- Before leaving the driver's cab, press button 3 for the working hydraulics lock.

An LED 2 on the button indicates that the function is active.
The symbol field 1 for the working hydraulics lock must light up.
The working hydraulics are no longer operational.

- Open the emergency exit door and leave the cab by stepping over the side control console.

3.2.3 Driver's seat with gas-filled spring suspension

Layout



Driver's seat – main components and adjustable elements

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

Individual adjustment for ergonomic seating position

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

Adjusting the driver's seat for use on public roads

Warning 

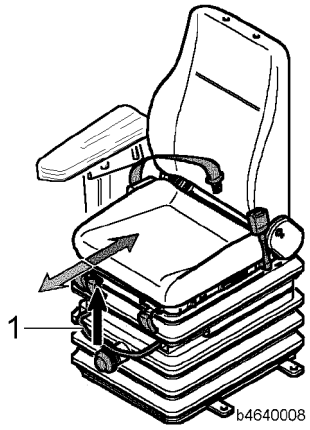
Risk of injuries if the driver's seat is improperly adjusted!

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

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

Horizontal setting

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



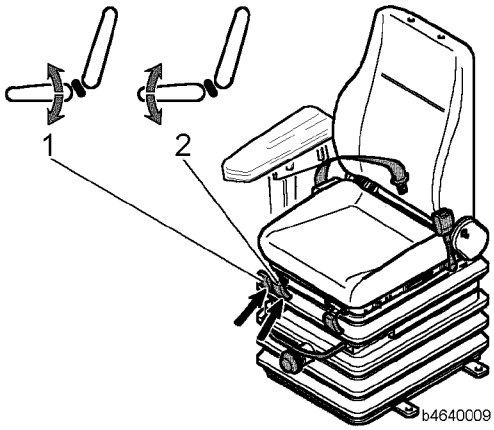
Adjustment – horizontal

1 Lever for horizontal adjustment

- Pull lever 1 in the direction of the arrow.
- Horizontally adjust the driver's seat and release lever.

Tilting the seat surface

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



Adjustment – seating surface, seat height

1 Lever for adjusting rear seat inclination

2 Lever for adjusting front seat inclination

- Adjustment – seat inclination rear: pull lever 1 in the direction of arrow, adjust inclination and release lever.
- Adjustment – seat inclination front: pull lever 2 in the direction of arrow, adjust inclination and release lever.

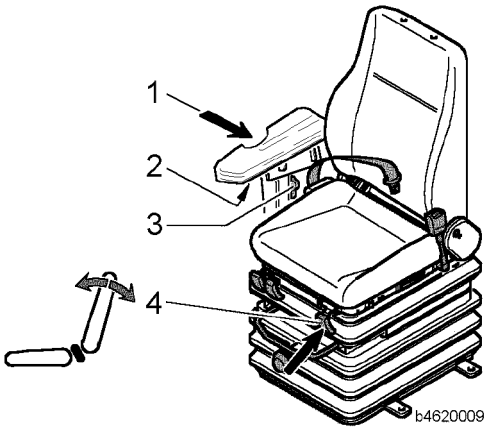
Adjusting the seat height

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

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

Adjusting the back rest

The inclination of the seat back is adjusted with lever 4 on the left-hand side of the driver's seat.



Adjustment – back rest, arm rest

1 Clamp screw for adjusting arm rest inclination adjustment
2 Clamp screw for arm rest horizontal adjustment
3 Star-grip for arm rest height adjustment
4 Lever for backrest adjustment

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

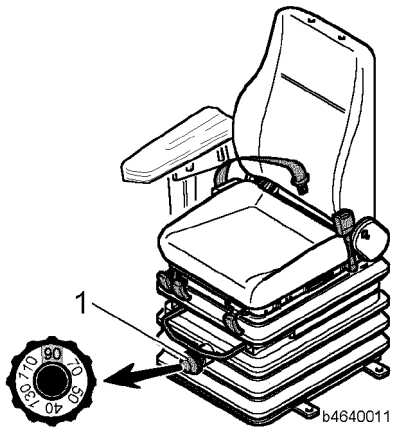
Adjusting the arm rest

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

- Height adjustment: release star-grip 3, adjust height and fix in place.
- Inclination adjustment: release clamp screw 1, adjust inclination and fix in place.
- Horizontal adjustment: release clamp screw 2, adjust arm rest horizontally and fix in place.

Adjusting seat suspension

The seat suspension can be adapted to the driver’s individual body weight. Adjustments are by means of rotary knob 1 at the front of the driver’s seat. The figures on the rotary knob indicate the set body weight in kg.



Adjustment – seat suspension

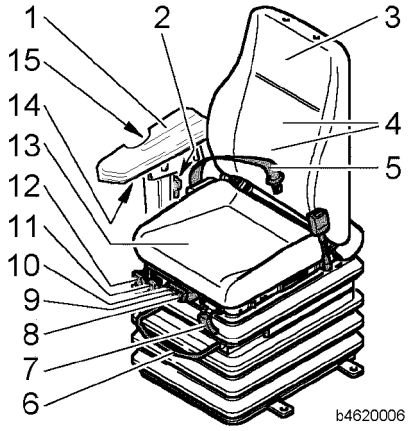
1 weight adjustment rotary knob

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

3.2.4 Driver's seat with pneumatic suspension

This equipment is optional.

Layout



Driver's seat – main components and adjustable elements

1 Arm rest
2 Star-grip for arm rest height adjustment
3 Back rest
4 Lumbar support chambers
5 Safety belt
6 Lever for horizontal adjustment
7 Lever for backrest adjustment
8 Top lumbar support chamber button
9 Bottom lumbar support chamber button
10 Weight adjustment button
11 Lever for adjusting front seat inclination
12 Lever for adjusting rear seat inclination
13 Seat surface
14 Clamp screw for arm rest horizontal adjustment
15 Clamp screw for adjusting arm rest inclination adjustment

Individual adjustment for ergonomic seating position

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

Adjusting the driver's seat for use on public roads

Warning

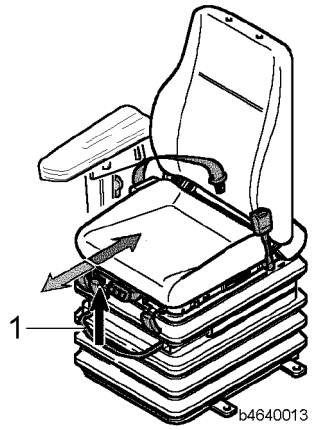
Risk of injuries if the driver's seat is improperly adjusted!

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

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

Horizontal setting

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



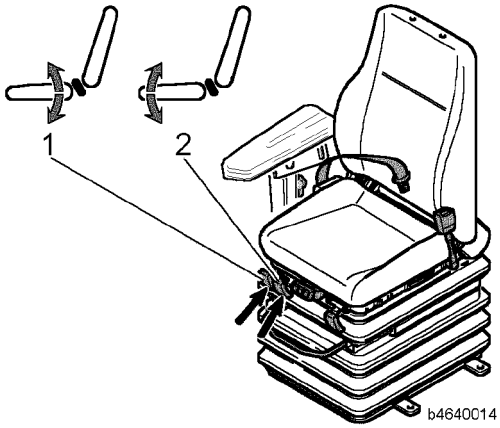
Adjustment – horizontal

1 lever for horizontal adjustment

- Pull the lever 1 in the direction of the arrow.
- Horizontally adjust the driver's seat and release lever.

Tilting the seat surface

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



Adjustment – seating surface, seat height

1 Lever for adjusting rear seat tilt angle

2 Lever for adjusting front seat inclination

- Adjustment – seat tilt angle rear: pull lever 1 in the direction of arrow, adjust inclination and release lever.
- Adjustment – seat tilt angle front: pull lever 2 in the direction of arrow, adjust inclination and release lever.

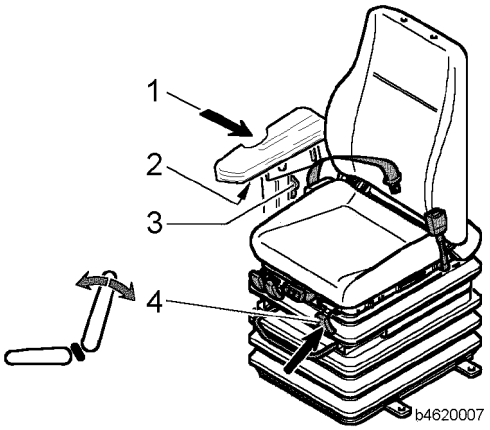
Adjusting the seat height

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

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

Adjusting the back rest

The inclination of the seat back is adjusted with the lever 4 on the left-hand side of the driver's seat.



Adjustment – back rest, arm rest

1 Clamp screw for adjusting arm rest inclination adjustment

2 Clamp screw for arm rest horizontal adjustment

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3 Star-grip for arm rest height adjustment

4 Lever for backrest adjustment

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

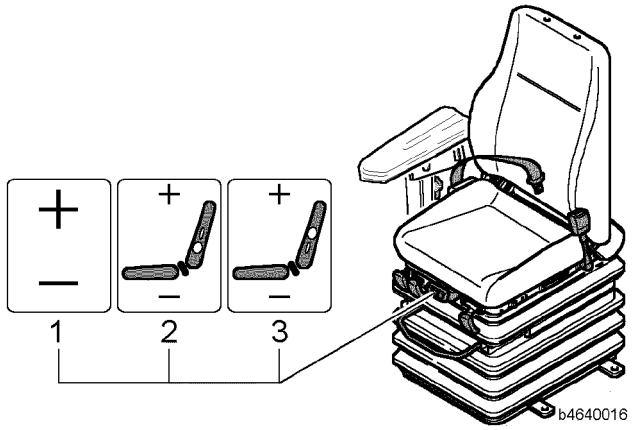
Adjusting the arm rest

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

- Height adjustment: release star-grip 3, adjust height and fix in place.
- Inclination adjustment: release clamp screw 1, adjust inclination and fix in place.
- Horizontal adjustment: release clamp screw 2, adjust arm rest horizontally and fix in place.

Adjusting seat suspension

The seat suspension can be adapted to the driver's individual body weight. Adjustment is by means of button 1 at the front of the driver's seat.



Adjustment – seat suspension, lumbar support

1 Weight adjustment button

2 Bottom lumbar support chamber button

3 Top lumbar support chamber button

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

The height is not adjusted in this process!

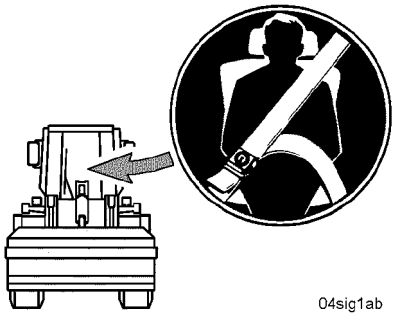
Adjustment of the lumbar support

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

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

3.2.5 Safety belt

Observance of safety factors



Compulsory wearing of seat belts

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.

Warning

Risk of injuries if safety belt is not fastened!
Suddenly braking the vehicle or stopping abruptly, could cause severe injuries to the driver!

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

Danger

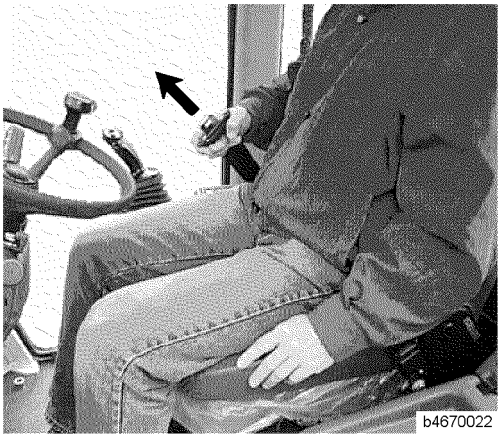
Risk of injuries when the safety belt is not fastened!
If the vehicle tips or rolls over, the driver could suffer fatal injuries!

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

- 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.

Putting on the safety belt

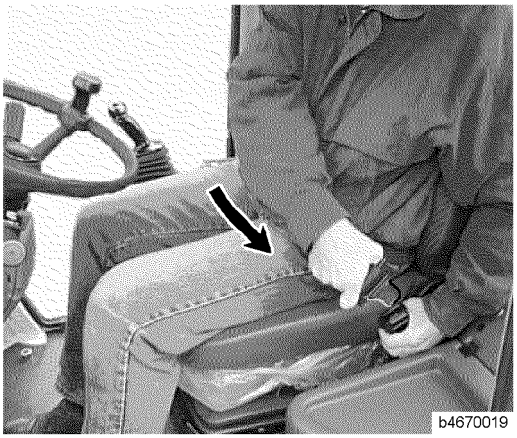
The safety belt is an automatic belt. No adjustment of the belt length is required.



Putting on the belt

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

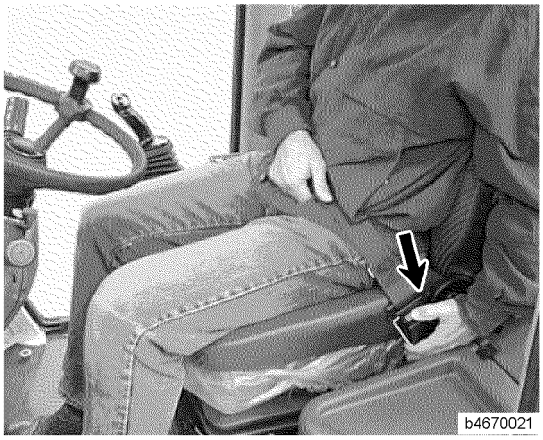
NOTE: When the belt is pulled out too quickly, it can be blocked by the roller.



Locking the belt

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

Releasing the seatbelt



Releasing the seatbelt

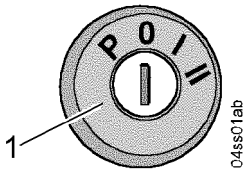
- Release the seat belt by pushing the catch on the snap lock downward with your thumb.

3.2.6 Starter switch

The starter switch is equipped with a repeat start lock. The starting key can be pulled out when in 0 – 0-position/engine shutdown.

When the starting key is in the 0 position or parking position, the following consumer units can be switched on from the instrument panel:

– Parking and driving headlight
– Hazard warning system
– Working floodlights
– Rotating beacon



Starter switch

Layout

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

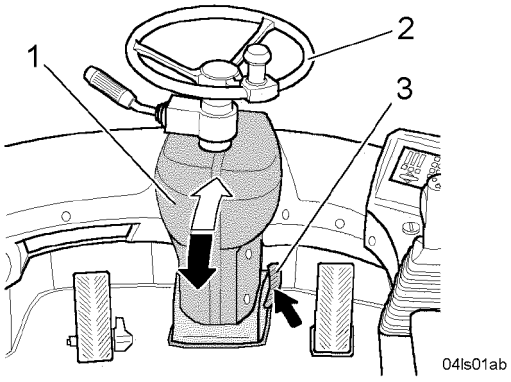
Switching electrical system on or off

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

3.2.7 Steering column and steering wheel

Adjusting the steering column

The steering wheel can be adjusted to meet the driver's requirements by adjusting the steering column.
The column can be set to one of three snap-in settings.



Adjustment – steering column

1 Steering column
2 steering wheel
3 Pedal

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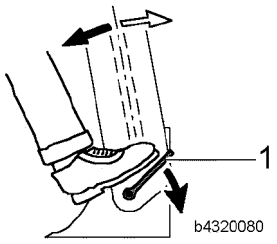

- Press down pedal 1 in the direction of the arrow.
- By pulling or pushing steering wheel 2, adjust the steering column 1 as required.
- Lock the selected position of steering column 3 by releasing the lever 1.

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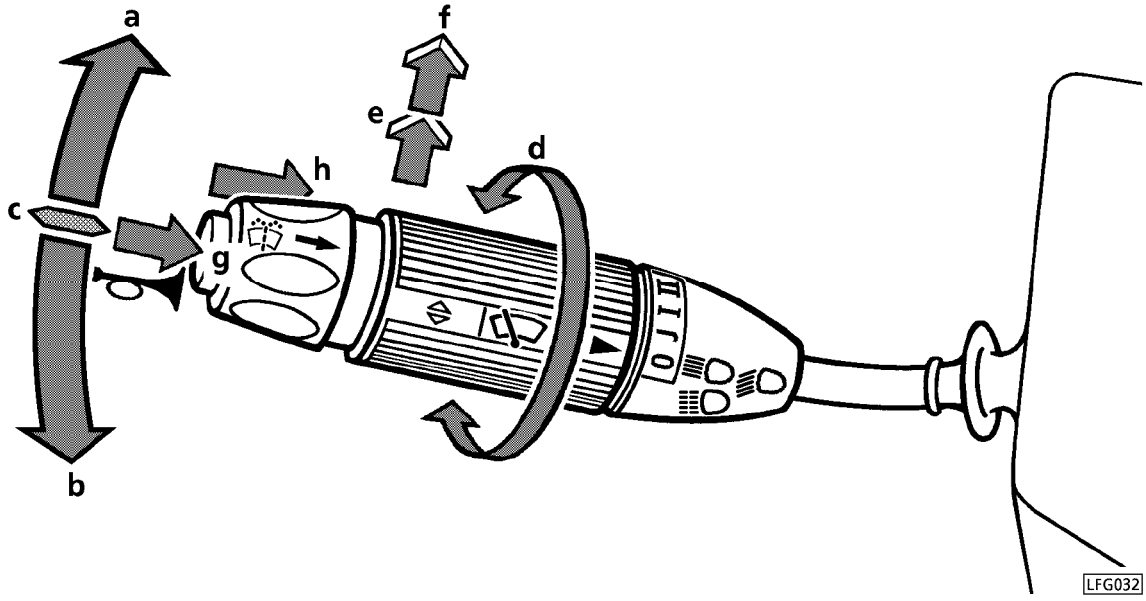
3.2.8 Steering column switch

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

Layout

The steering column switch consists of controls for the following:
- direction indicators
- high beam
- acoustic and optical horn
- windshield wiper for the front windscreen
- windshield wiper and washer 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 lights
b – drive direction display: left-hand flashing lights
c – centre position: neutral position
d – windshield wiper: front windscreen
- 0 – level-0
- J – interval
- I – level-I
- II – level-II

e – optical horn: light horn
f – high beam: full headlights
g – acoustic horn: horn tone
h – windshield wiper / washer system: front windscreen

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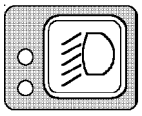
Operating driving light or high beam

Operation is also possible if the starting key is in the 0 position or parking position.

Switching on the parking light / driving light



- Press the button once.

The parking light goes on.

- Press the button again.

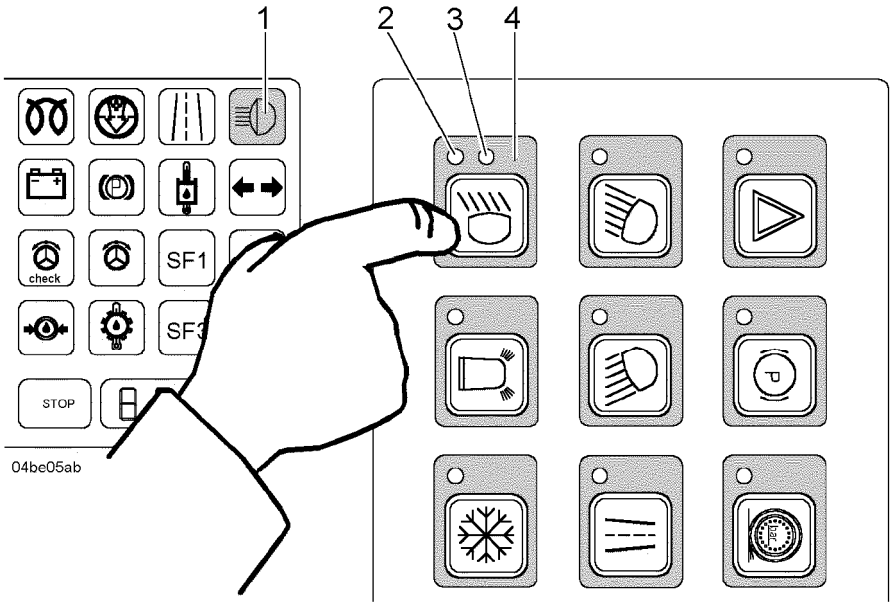
The driving light goes on.

- To switch off the parking light and driving light: press the button a third time.

All functions are switched off.

Switching on the driving light – high beam

Make sure that the button 4 for the parking/driving light has been pressed twice.



Control unit

1 Symbol field – headlight
2 Parking light LED
3 Driving light LED
4 Button – parking light/driving light

- Press the parking light/driving button 4 light twice.

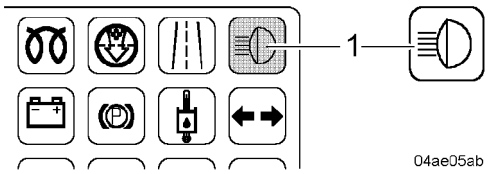
LED 2 and LED 3 light up.

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

The symbol field 1 for the driving light must light up.
The high beam lights up.

Switching back to driving light – dipped beam

Make sure that the button 4 for the parking/driving light is switched off.



Display unit

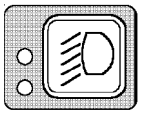
- Press button 4 for the parking light/driving light once.

LED 2 and LED 3 light up.

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

The symbol field 1 for the headlight must go out.
The driving light – dipped beam lights up.

Switching off the parking light/driving light



- To switch off the parking light / driving light (low and high beams): press the button.

Caution

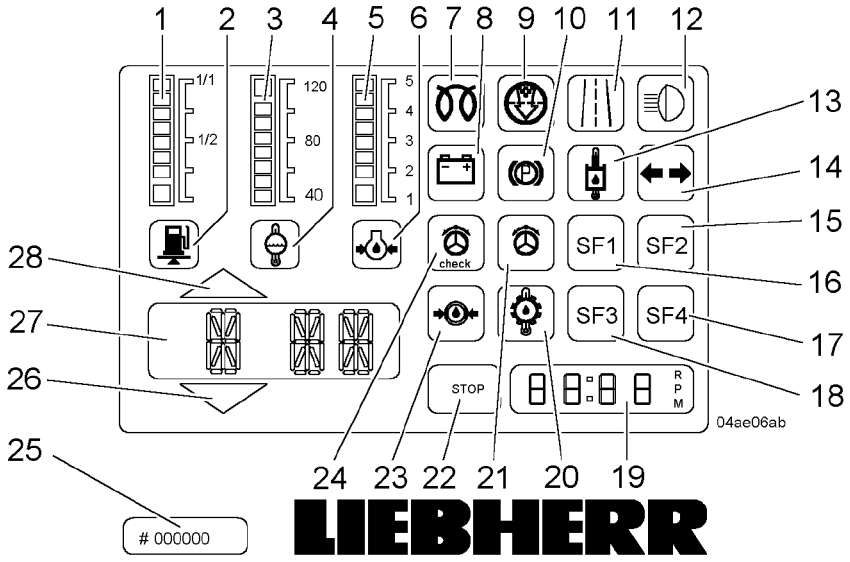
Risk of damage to the battery!
If the battery is in a discharged condition over a long period of time (e.g. longer than one month), the battery can no longer be recharged!
! Avoid discharging the battery unintentionally!

- When you leave the driver's cab:
  be sure to switch off the parking / driving light.

3.2.9 Display unit

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

Layout



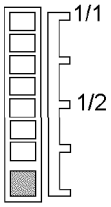
Display unit

1 Segment field – fuel supply
2 Symbol field – fuel supply
3 Segment field – coolant temperature
4 Symbol field – engine overheating and coolant level
5 Segment field – engine oil pressure
6 Symbol field – engine oil pressure
7 Symbol field – preglow monitor
8 Symbol field – battery charging (charge control)
9 Symbol field – air filter contamination
10 Parking brake symbol field
11 Working hydraulics lock symbol field
12 Symbol field – headlight
13 Symbol field – hydraulic oil overheating
14 Symbol field – direction indicator system
15 Symbol field – special function
16 Symbol field – special function
17 Symbol field – special function
18 Symbol field – special function
19 Segment display – speed or clock
20 Symbol field – gear oil overheating
21 Symbol field – emergency steering
22 Symbol field – stop
23 Symbol field – braking system accumulator pressure
24 Symbol field emergency steering"check"
25 Operating hours counter
26 Symbol field – travel direction"reverse"
27 Segment display – travel range, travel speed or error codes
28 Symbol field – travel direction"forward"

The display unit is integrated at the front on the right-hand side of the instrument panel.
It consists of the display (symbol LCD) and the operating hours counter.
Each symbol field is assigned the appropriate colour (red, yellow, green or blue).

Function description

Fuel supply – tank contents display



04ml01ab

Segment field 1 – fuel supply

segment field colour – green (limit range with reserve – red)

Indicates the level of the diesel fuel tank.

Fuel supply – reserve display/message

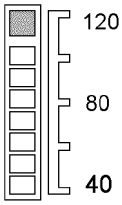

04ml23ab

Symbol field 2– fuel supply

symbol field colour – yellow

Flashes when diesel fuel reserve is reached.

Coolant temperature display



04ml02ab

3 segment field – coolant temperature

segment field colour – green (limit range when temperature too high – red)

Displays the coolant temperature in °C.


bpik0007

Acoustic warning message:

– issued at a coolant temperature of 95°C
  5 time interval tone with 5 sec pause.

Engine overheating and coolant level display/message


04ml24ab

Symbol field 4 – engine overheating and coolant level

red symbol field

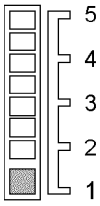
Warning functions:

– flashes when the coolant temperature is too high
– flashes when the coolant temperature is too low
– flashes when the cool blower drive breaks down

Warning message sequence:

– when a warning message is issued, the symbol field flashes first
– the warning function of the symbol field is supplemented acoustically after 10 seconds by a "continuous tone"

Engine oil pressure display



04ml03ab

5 segment field – engine oil pressure

segment field colour – green (limit range when pressure too low – red)

Displays the engine oil pressure in bar.

LBH/02/0038O1/0003/6.0/en

Engine oil pressure display/message


04ml25ab

6 symbol field – engine oil pressure

red symbol field

Warning functions:

– flashes when the starting key is at the ignition position - **I** -
  When the diesel engine has started, the symbol field goes out.
– flashes when the engine oil pressure drops – **Precondition:** the diesel engine must be running

Warning message sequence:

– when a warning message is issued, initially the symbol field flashes
– the warning function of the symbol field is supplemented acoustically after 10 seconds by a "continuous tone"

Preglow monitoring


04ml05ab

7 symbol field – preglow monitor

symbol field colour – yellow

Lights up when starting key is turned to ignition, run, preglow position - **I** - and in starting position - **II** -.

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

Battery charging – charging control display


04ml09ab

8 symbol field – battery charging (charge control)

red symbol field

Warning functions:

– lights up when the starting key is at the ignition position - **I** -
  When the diesel engine has started, the symbol field goes out.
– lights up when, for example the V-ribbed belt of the alternator drive tears

Air filter contamination display


04ml06ab

9 symbol field – air filter contamination

symbol field colour – yellow

Lights up when the air filter is heavily contaminated.

Parking brake – display activation


04ml10ab

10 symbol field – parking brake

red symbol field

Warning functions:

– lights up when starting key 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.

Working hydraulics lockout – activation display


04ml07ab

11 symbol field – working hydraulics lock

symbol field colour – yellow

Lights up when the working hydraulics lock is activated.

Headlight – activation display


04ml08ab

12 symbol field – headlight

symbol field colour – blue

lights up when the headlight is switched on.

Hydraulic oil overheating display/message


04ml11ab

13 symbol field – hydraulic oil overheating

red symbol field

Lights up when the hydraulic oil temperature is too high.

Warning message sequence:

– when a warning message is issued, initially the symbol field flashes when the hydraulic oil temperature exceeds 100 °C
– the warning function of the symbol field is supplemented acoustically after 10 seconds by a "continuous tone"


bpik0007

Acoustic warning message:

– issued when hydraulic oil temperature reaches 95°C
  5 time interval tone with 5 sec pause.

Direction indicator system – activation display


04ml12ab

Symbol field 14 – direction indicator system

green symbol

Warning functions:

– flashes when the steering column switch is actuated to display the travel direction
– flashes when the hazard warning system is activated

Special function

04ml16ab

Symbol field 15 – special function

Not assigned. green symbol

Reserved for special function.

Special function

04ml15ab

Symbol field 16– special function

Not assigned. red symbol field

Reserved for special function.

Special function

04ml20ab

Symbol field 17 – special function

Not assigned. green symbol

Reserved for special function.

Special function

04ml19ab

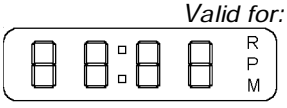
Symbol field 18 – special function

Not assigned. red symbol field

Reserved for special function.

Engine speed or time display

Valid for:



04ml22ab

L544-442/0104-0392; L544T-444/0104-0392

Segment display 19 – speed or clock

Field colour – green

Precondition: the required function must be selected at the "control unit".

Display functions:

– displays the time
– displays the rotary speed of the diesel engine

Gear oil overheating display/message


04ml18ab

Symbol field 20 – gear oil overheating

red symbol field

Lights up when the gear oil temperature is too high.

Warning message sequence:

– when a warning message is issued, initially the symbol field flashes
– the warning function of the symbol field is supplemented acoustically after 10 seconds by a "continuous tone"

Emergency steering display/message


04ml14ab

Symbol field 21 – emergency steering

red symbol field

Warning functions:

– lights up when starting 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. 50 seconds.

  See also "Control unit" and "Emergency operation" the sections.


bpik0008

Acoustic warning message:

– when the emergency steering function (emergency steering pump) is switched on, an interval tone also sounds

Stop message/display

04ml21ab

Symbol field 22 – stop

red symbol field

Lights up: with an error code message, which means that the vehicle must be brought to a stand still.

Braking system – accumulator pressure display/message


04ml17ab

Symbol field 23 – braking system accumulator pressure

red symbol field

Lights up when the brake accumulator pressure is too low.

Warning message sequence:

– when a warning message is issued, initially the symbol field flashes
– the warning function of the symbol field is supplemented acoustically after 10 seconds by a "continuous tone"

Emergency steering "Check" display/message

04ml13ab

Symbol field 24 emergency steering "check"

red symbol field

Lights up briefly when the engine starts (approx. 2 seconds).

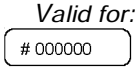
The symbol field goes out after a successfully executed "check".

The symbol field does not go out if the emergency steering pump does not start during the check.

Operating hours of the vehicle display

Valid for:

L544-442/0104-0392; L544T-444/0104-0392

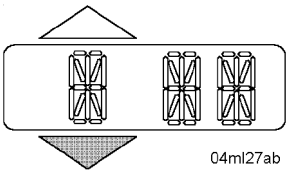


04ae07ab

Operating hours 25 counter

Shows the time in operating hours that the vehicle was in service.

The operating hours are the basis for the observance of the maintenance intervals.

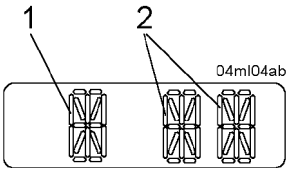


Travel direction "reverse" display

Symbol field 26 – travel direction "reverse"

green symbol

Displays the vehicle's preselected travel direction "reverse"



Segment display

Travel range, travel speed or error codes display/message

Segment display 27 – travel range, travel speed or error codes

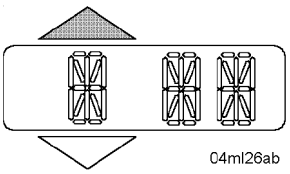
1 LCD field – travel range or **E**rror

2 LCD field – travel speed or error code No.

Field colour – green

Display functions:

– displays the activated travel range - **1** - to - **A3**.
  In automatic mode, the display in the LCD field changes regularly between the output - **A** - (automatic) and the respective automatic range - **2** - or - **3** -.
– displays the vehicle's travel speed
– displays the error code in the event of malfunction
  Error code structure: Field 1 = **E** plus Field 2 = error code No.
  The error code display is supplemented acoustically by a "continuous tone".
  When an error code is displayed, which results in the vehicle being stopped, the symbol field for "STOP" also lights up.
  The segment display goes out when the ignition is switched off. If appropriate, first note the displayed error code.



Travel direction "forward" display

28 symbol field – travel direction "forward"

green symbol

Displays the vehicle's preselected travel direction "forward".

LBH/02/003801/0003/6.0/en

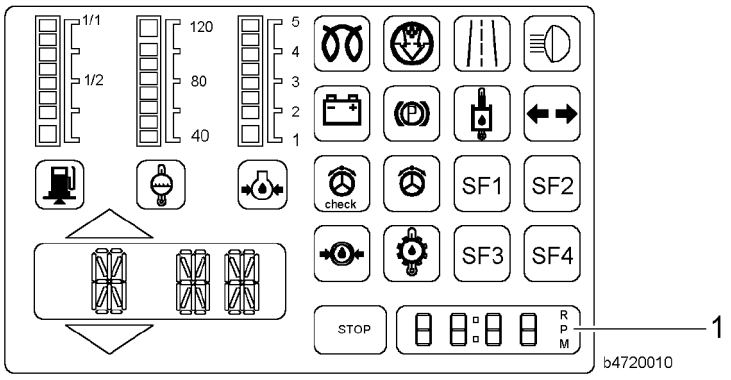
3.2.10 Display unit

ModificationOperating hour display is shown in the segment display 1 as well.

Valid for: *L544-442/0393-; L544T-444/0393-*

This section only describes the segment display function – engine speed, real time, operating hours 1.

For the description on set up and operation not discussed here: Refer to the Section "Indicator unit" above.

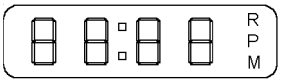


Display unit

1 Segment display – engine speed, real time, operating hours

Function description

Engine speed, real time or operating hour display



04ml22ab

Segment display 1 – engine speed, real time, operating hours

Field colour – green

Precondition: the required function must be selected at the "control unit".

Display functions:

- displays the time
- displays the rotary speed of the diesel engine
- Shows the time in operating hours that the vehicle was in service.

The operating hours are the basis for the observance of the maintenance intervals.

3.2.11 Mechanical hour meter

Modification Instrument panel with integrated mechanical mechanical hour meter 1 .

Valid for: *L544-442/0393-; L544T-444/0393-*

The vehicle is equipped with an additional mechanical hour meter.

Layout

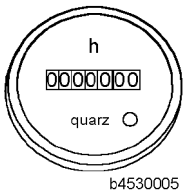
Hour meter

1 Hour meter

The mechanical hour meter 1 is integrated in the instrument panel.

Function description

Operating hours of the vehicle display



1 mechanical hour meter

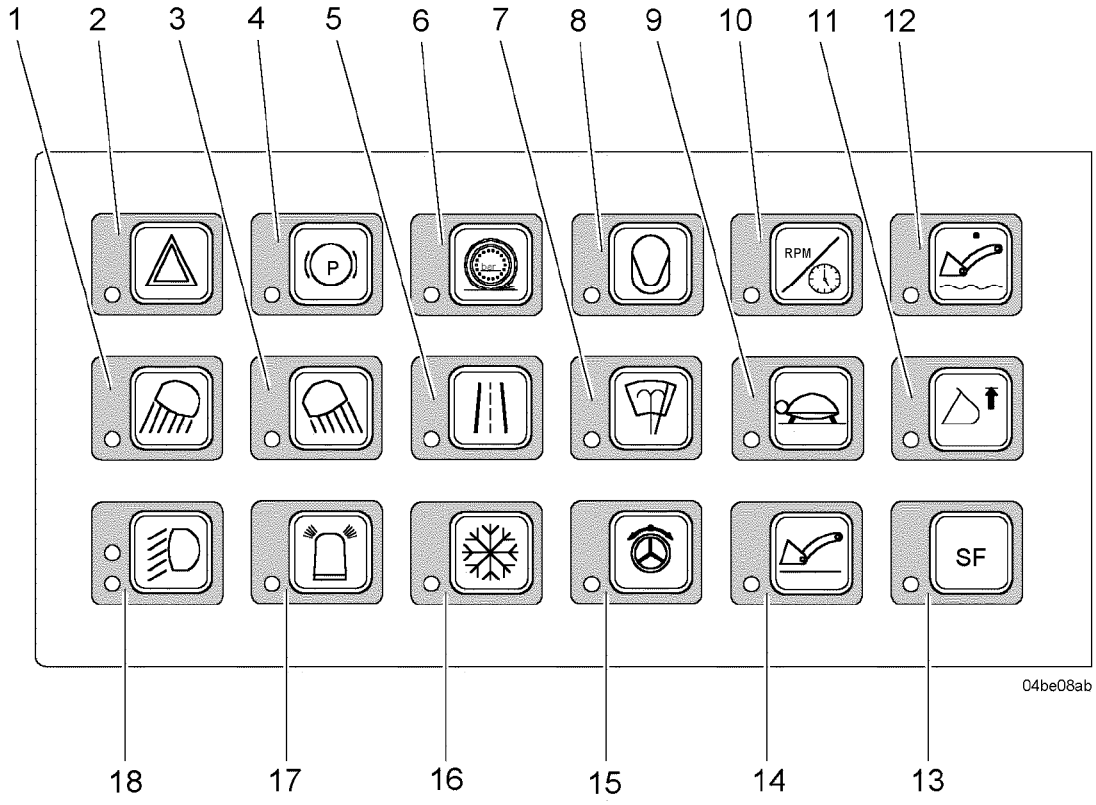
Shows the time in operating hours that the vehicle was in service.

The operating hours are the basis for the observance of the maintenance intervals.

3.2.12 Control unit

The design and function of the control unit is described in this section.

Layout



Control unit (view rotated by 90°)

1 Working floodlights button– front
2 Hazard warning system button
3 Working floodlights button – rear
4 Parking brake button
5 Working hydraulics lock button
6 Tractive force reduction button
7 Windshield wiper and washer system button – rear window
8 Ride control button (LFD system)
9 Creeper button (slow drive)
10 Speed or clock button
11 Lifting limit switch button
12 Float position button
13 Special function button
14 Bucket return-to-dig button
15 Emergency steering button
16 Air-conditioning system button
17 Flashing beacon button
18 Parking light/driving light button

The control unit is integrated in the instrument panel at the right of the driver's seat.

All buttons in the control unit are equipped with LEDs.

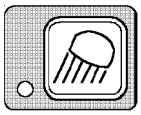
When the button is switched ON, the LED glows red.

When the button is switched OFF, the LED goes out.

LBH/02/003801/0003/6.0/en

Function description

Working floodlights – front


04ta07ab

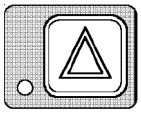
Button 1 – working floodlights – front

For turning the working floodlights – front on or off.

When the button is pressed, the working floodlights – front go off.

The button is also functional when the starting key is in the 0 position or parking position.

Hazard warning system


04ta01ab

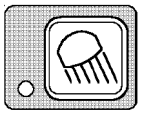
Button 2 – hazard warning system

For switching the hazard warning system ON or OFF.
When the button is pressed:

– if the symbol field – hazard warning system is flashing, all four flashing lights on the vehicle are on
– if the symbol field – hazard warning system goes out, all four flashing lights on the vehicle go out

The button is also functional when the starting key is in the 0 position or parking position.

Working floodlights – rear


04ta08ab

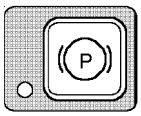
Button 3 – working floodlights – rear

For turning the working floodlights – rear ON or OFF.

When the button is pressed, the working floodlights – rear go off.

The button is also functional when the starting key is in the 0 position or parking position.

Parking brake



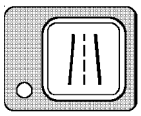
04ta02ab

Button 4 – parking brake

For engaging or releasing the parking brake.

When the button is pressed, the parking brake is engaged or released.

Working hydraulics lock

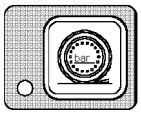

04ta09ab

Button 5 – working hydraulics lock

For locking or releasing the working hydraulics functions.

When the button is pressed, the parking brake is engaged or released.

Tractive force adjustment

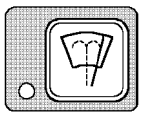

04ta03ab

Button 6 – tractive force adjustment

For preparing the tractive force adjustment function.

The function is retained after the ignition is switched OFF and is thus still active when the ignition is switched ON again.

Windshield wiper and washer system – rear window

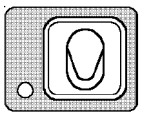

04ta10ab

Button 7– windshield wiper and washer system – rear window

For switching ON or OFF the windshield wiper and washer system for the rear window.

LBH/02/003801/0003/6.0/en

Ride control (LFD system)

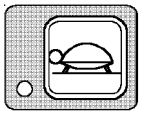

04ta04ab

Button 8 – ride control (LFD system)

For switching the drive vibration absorption function ON or OFF.

The function is retained after the ignition is switched OFF and is thus still active when the ignition is switched ON again.

Creeper (slow drive)


04ta11ab

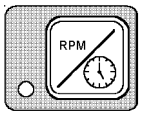
Button 9 – crawl speed (slow drive)

For switching the vehicle's travel drive between normal and slow travel.

The function is retained after the ignition is switched OFF and is thus still active when the ignition is switched ON again.

Engine speed or clock

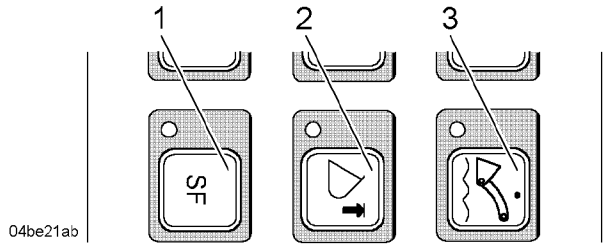
Valid for: *L544-442/0104-0392; L544T-444/0104-0392*



04ta05ab

10 button – speed or clock

For switching over the display between time and engine speed.



04be21ab

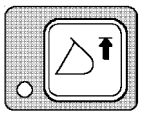
Control unit

1 Special function button
2 Lifting limit switch button
3 Float position button

Adjusting the clock:

- press the button 1, 2 and button 3 simultaneously and switch off the vehicle electrical system with the ignition key
- with button 3, you can switch from hours to minutes
- with button 2, the hours or minutes are counted forwards
- with button 1, the hours or minutes are counted backwards
- to save the setting: switch off the vehicle electrical system with the starting key

Lift kick-out


04ta12ab

Button 11 – lift kick-out

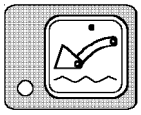
For switching the automatic lift kick-out function ON or OFF.

When the button is pressed, a solenoid on the servo control device is activated.

The "LIEBHERR control lever" is kept in the position – "Raise lift arm" by magnetic force.

LBH/02/003801/0003/6.0/en

Float position


04ta06ab

Button 12 – float position

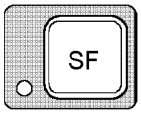
For switching the float position function ON or OFF.

When the button is pressed, a solenoid on the servo control device is activated.

The "LIEBHERR control lever" is held in the position – "Raise lift arm" by magnetic force.

The function is retained after the ignition is switched OFF and is thus still active when the ignition is switched ON again.

Special function

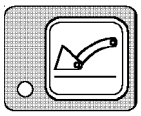


04ta18ab

Button 13 – special function

Button is not assigned: reserved for special functions.

Bucket return-to-dig


04ta17ab

Button 14 – bucket return-to-dig

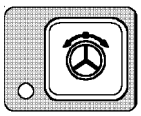
For switching the automatic bucket return-to-dig function ON or OFF.

When the button is pressed, a solenoid on the servo control device is activated.

The "LIEBHERR control lever" is held in the position – "Tip bucket up" by magnetic force.

The function is retained after the ignition is switched OFF and is thus still active when the ignition is switched ON again.

Emergency steering


04ta16ab

Button 15 – emergency steering

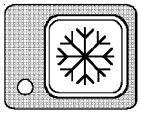
For repeat start of the emergency control pump for emergency steering functions.

When the ignition is switched on, the emergency steering pump can be repeat started by keeping the button pressed down for approx. 50 seconds.

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 in the event of overheating.

See also the "Towing the vehicle when the steering system has broken down" section .

Air-conditioning system

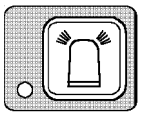

04ta15ab

16 button – air-conditioning system

Before pressing the button, switch on the rotary knob for the blower (see "Controls") section.

For switching the air-conditioning system ON or OFF.

Rotating beacon


04ta14ab

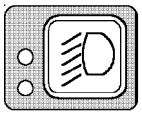
This equipment is optional.
Button 17 – flashing beacon

For switching the rotating beacon ON or OFF.

The button is also functional when the starting key is in the 0 position or parking position.

LBH/02/0038O1/0003/6.0/en

Parking light/driving light



Button 18 – parking light/driving light
Function for parking light:
– For switching the parking light ON or OFF
When the button is pressed once, the parking light goes on.
Function for driving light:
– for turning the driving light ON or OFF
When the button is pressed again, the driving light goes on.

When the button is pressed a third time, all functions are switched off.

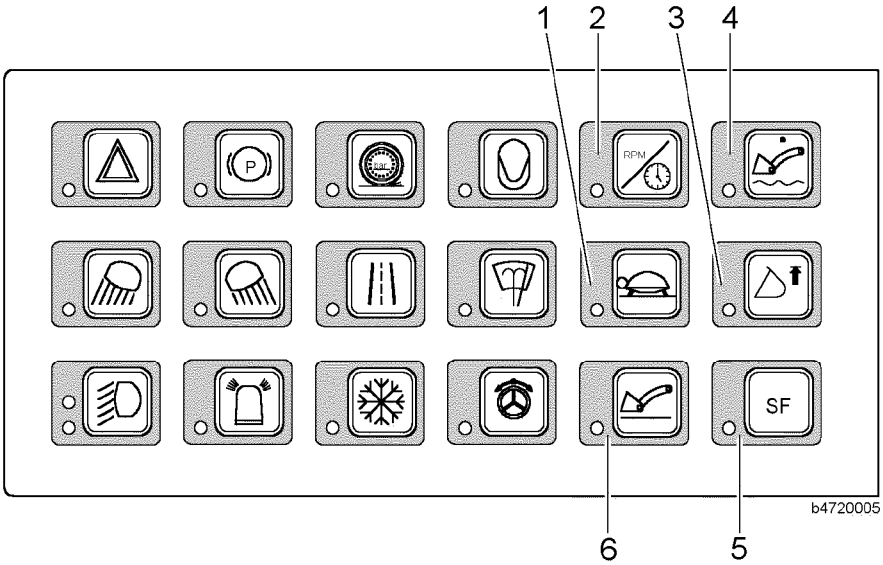
The button is also functional when the starting key is in the 0 position or parking position.

3.2.13 Control unit

Modification Button 2 is also used to switch over to the operating hour display in the Engine speed, real time, operating hour segment display.

Valid for: *L544-442/0393-; L544T-444/0393-*

This section only describes the function of the Engine speed, clock, date or operating hours button 2.
For the description on set up and operation not discussed here: Refer to the Section "Control unit".



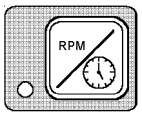
Control unit (view rotated by 90°)

1 Creeper button (slow drive)
2 Engine speed, clock, date or operating hours button
3 Lifting limit switch button
4 Float position button
5 Special function button
6 Bucket return-to-dig button

LBH/02/003801/0003/6.0/en

Function description

Switching over to engine speed, clock, date or operating hours

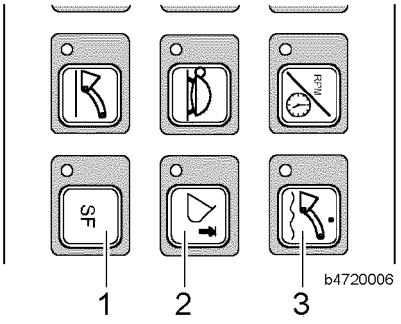


04ta05ab

Button 2 – engine speed, clock, date or operating hours

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

Setting the real time



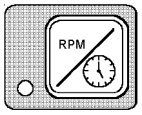
Control unit

Button 1 – special function
Button 2 – lift kick-out
Button 3 – float position

- Press the button 1, 2 and button 3 simultaneously and switch off the vehicle electrical system with the ignition key.
- With button 3, you can switch from hours to minutes.
- With button 2, the hours or minutes are counted forwards.
- With button 1, the hours or minutes are counted in descending order.
- To save the time setting: switch off the vehicle electrical system with the starting key

Operating hour display

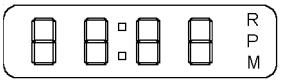
The digital hour meter is set by the manufacturer.
Readjustment will be performed by LIEBHERR CUSTOMER SERVICE as required.



04ta05ab

Button – engine speed, clock, date or operating hours

- Switch the vehicle electrical system on using the starter key.
- Press the button.



04ml22ab

The vehicle operating period is shown in operating hours.

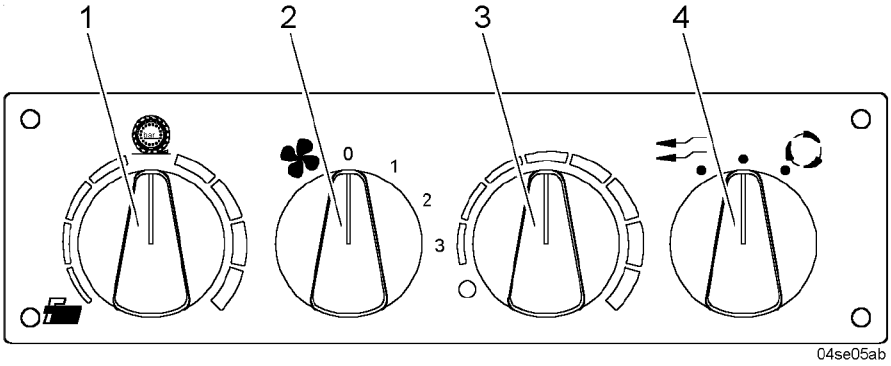
The operating hours are the basis for the observance of the maintenance intervals.

LBH/02/0038O1/0003/6.0/en

3.2.14 Control element

The design and function of the control element is described in this section.

Layout



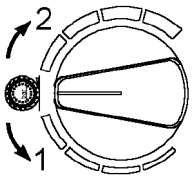
Control element (view rotated by 90°)

1 Rotary switch – tractive force adjustment
2 Rotary switch – blower
3 Rotary switch – heater
4 Rotary switch – heater

The controls are integrated in the instrument panel to the right of the driver's seat.
They consist of controls for tractive force adjustment, heating, ventilation and the blower.

Function description

Regulation of tractive force adjustment



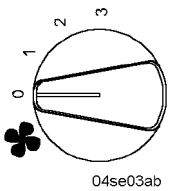
Rotary switch 1 – tractive force adjustment

For adjusting the tractive force.

1 reduce tractive force

2increase tractive force

Regulating the blower



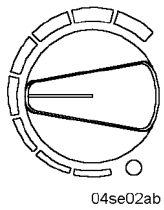
Rotary switch 2 – blower

Functions:

- for switching the blower ON or OFF
- for regulating the blower levels for heating, ventilation and air conditioning systems

  Blower levels:
  - Level **1** – gentle air flow
  - Level **2** – medium air flow
  - Level **3** – strong air flow

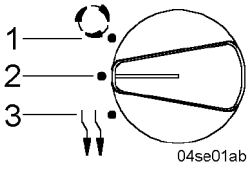
Heating adjustment



Rotary switch 3 – heater

For infinite adjustment of the temperature.

Adjusting ventilation



Rotary switch

Rotary switch 4 – ventilation

Switch settings:

1 position – recirculated air

2 position – recirculated and fresh air

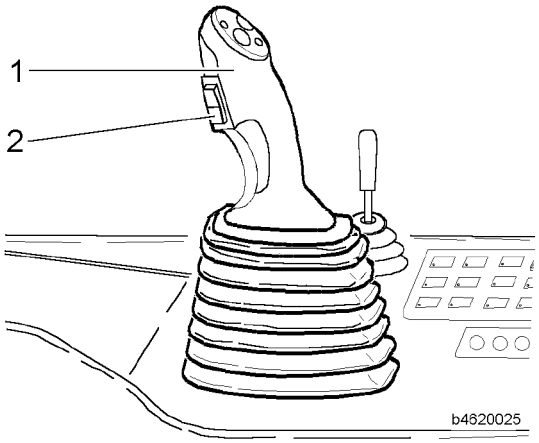
3 position – fresh air

For switching between recirculated air and fresh air

3.2.15 LIEBHERR control lever

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

Layout



LH control lever

1 Switch for travel range

2 Switch for travel direction

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

LBH/02/003801/0003/6.0/en

Switches for travel range and travel direction

Function description

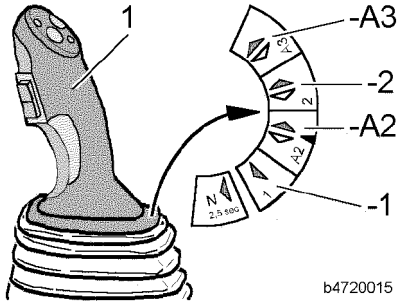
Basic function

After the electrical system has been turned on, travel range - **A2** - (automatic) is automatically selected.
It is not possible to select another travel range until the travel direction has been selected.

Selecting travel ranges

Valid for: *L544-442/0104-429; L544T-444/0104-429*

The drive ranges are selected by jogging the LH control lever to the left or right as appropriate.
See also the the section "Driving mode".



LH control lever

1	Switch for travel range	-A2	Travel range A2
-1	Travel range 1	-A3	Travel range A3
-2	Travel range 2		

Functions of the travel range switch:
- by jogging in direction - **A3** -, the travel range is shifted up to - **A3** -
- by jogging in direction - **1** -, the travel range is shifted down to - **1** -
- neutral selection - **N** - of the travel direction

Function – neutral selection:
- when the switch 1 is held in the direction - **N** -, the drive direction is switched to the neutral position - **N** -, after approx. 2.5 seconds.

Function – shifting the automatic travel ranges:
- in the automatic travel ranges - **A2** - and - **A3** -, the gears are automatically shifted up and down, according to the the gas pedal position, the travel speed and the rate of change of speed

Symbol fields are used to show the selected driving range on the instrument panel in the display unit.

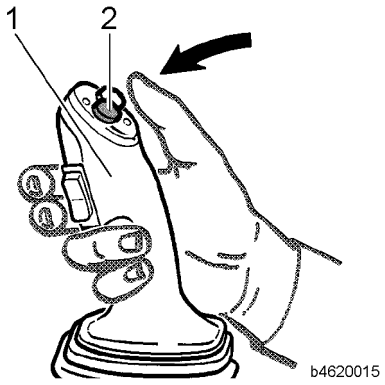
LBH/02/003801/0003/6.0/en

Kick-down shifting

Valid for: *L544-442/0104-0429; L544T-444/0104-0429*

Kick-down shifting is possible in forwards and reverse travel in the travel ranges - **A2** - and - **A3** - and from every travel speed.

Use: see section "Driving mode" under "Driving with kick-down shift".



1 LH control lever

2 button – kick-down

Selection procedures for kick-down shift:

– when button 2 is pressed, the vehicle is automatically braked hydrostatically
  You then automatically shift into "1st gear" (gear 1).
– when you drive without resistance, the "1st gear" (gear 1) is active for approx. 4 secs.
  The vehicle then automatically shifts to "2nd gear" (gear 2) when the speed increases.
– when driving into a pile, "1st gear" remains selected as long as a resistance is present

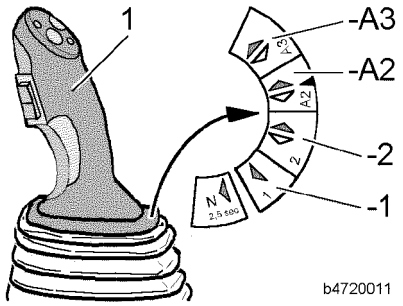
Selecting travel ranges

Modification Other sequences when shifting travel ranges.

Valid for: *L544-442/430-; L544T-444/430-*

The drive ranges are selected by jogging the LH control lever to the left or right as appropriate.

See also the the section "Driving mode".



LH control lever

1 switch for travel range
-1 Travel range 1
-2 Travel range 2
-A2 Travel range A2
-A3 Travel range A3

Functions of the travel range switch:

– by jogging in direction - **A3** -, the travel range is shifted up to - **A3** -
– by jogging in direction - **1** -, the travel range is shifted down to - **1** -
– neutral selection - **N** - of the travel direction

Function – neutral selection:

– when the switch 1 is held in the direction - **N** -, the drive direction is switched to the neutral position - **N** -, after approx. 2.5 seconds.

Function – shifting the automatic travel ranges:

– in the automatic travel ranges - **A2** - and - **A3** -, the gears are automatically shifted up and down, according to the the gas pedal position, the travel speed and the rate of change of speed

Symbol fields are used to show the selected driving range on the instrument panel in the display unit.

LBH/02/0038O1/0003/6.0/en

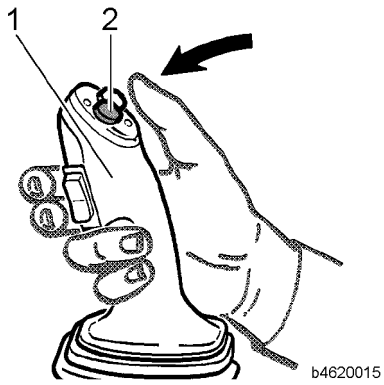
Kick-down shifting

Modification The kick-down shifting function is also provided in travel range **2**.

Valid for: *L544-442/0430-; L544T-444/0430-*

Kick-down shifting is possible in forward and reverse travel in the travel ranges **2**, **A2** and **A3** and from every travel speed.

Use: see section "Driving mode" under "Driving with kick-down shift".



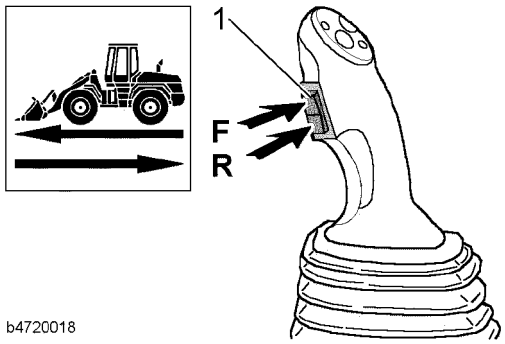
1 LH control lever
2 button – kick-down

Selection procedures for kick-down shift:

- when button 2 is pressed, this automatically brakes the vehicle hydrostatically
  You then automatically shift into "1st gear" (gear 1).
- when you drive without resistance, the "1st gear" (gear 1) is active for approx. 4 secs.
  The vehicle then automatically shifts to "2nd gear" (gear 2) when the speed increases.
- when driving into a pile, "1st gear" remains selected as long as a resistance is present

Shifting the travel direction

Travel directions are shifted using button 1 on the left-hand control lever. See also the the section "Driving mode".



LH control lever

1 Switch for travel direction

Functions of the travel direction switch:

- F travel direction is – forward (**F**orward)
- R travel direction is – reverse (**R**everse)

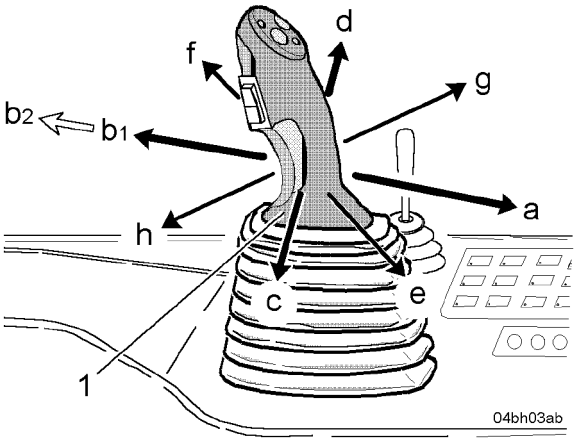
Symbol fields are used to show the preselected driving direction on the instrument panel in the display unit.

LH control lever for controlling the working attachment

Layout

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

Function description



Movement directions of the LH control lever

a	Backwards	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 arm is raised
b1 – "normal lowering function" – lift arm is lowered slowly
b2 – "rapid lowering function" – lift arm is lowered rapidly
c – bucket is tilted in
d – bucket is tilted out
e – lift arm is raised and the bucket is simultaneously tilted in
f – lift arm is lowered and the bucket is simultaneously tilted out
g – lift arm is raised and the bucket is simultaneously tilted out
h – lift arm is lowered and the bucket is simultaneously tilted in

3.2.16 Control lever for optional working functions

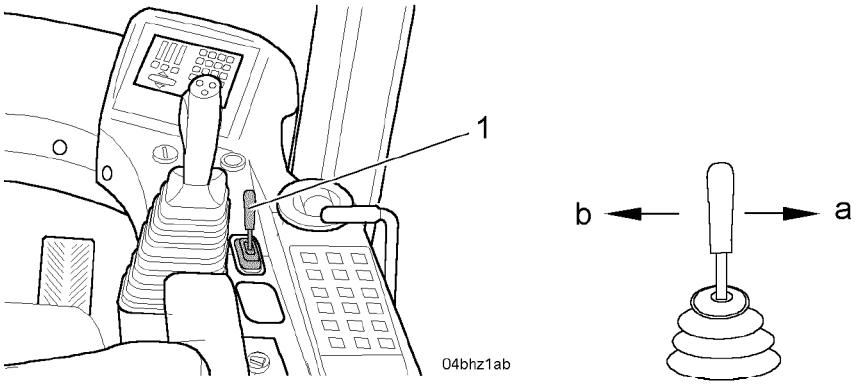
This equipment is optional.

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

Function description

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

LBH/02/0038O1/0003/6.0/en



Movement directions of the additional control lever

a – Backwards b – Forwards

The optional equipment 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 equipment attached)

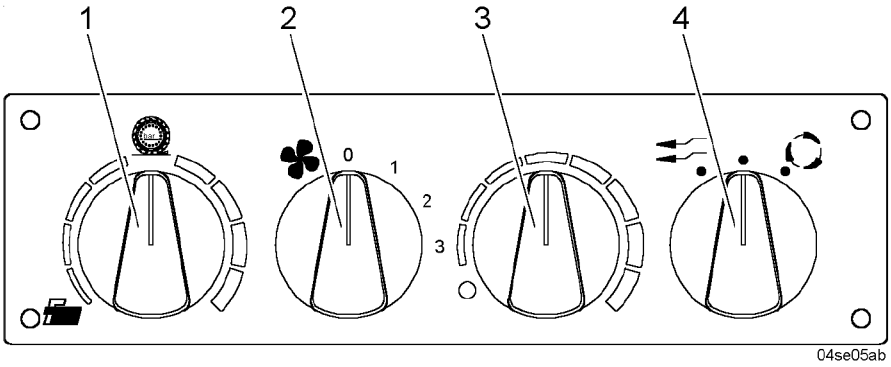
b – (function depends on the type of optional equipment attached)

Familiarise yourself with the operation of the attached optional equipment!

Refer to the section "Operation", "Working with optional equipment", or to the Operator's manual for the additonal equipment.

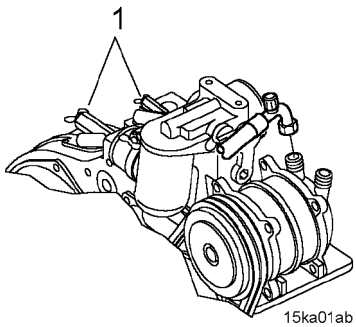
3.2.17 Heating, Ventilation

Switching the heater on/off



Control element (view rotated by 90°)

1 Rotary switch – tractive force adjustment
2 Rotary switch – blower
3 Rotary switch – heater
4 Rotary switch – heater



The shut-off valves 1 on the thermostat housing of the diesel engine must be open so that the cab can be heated.

- Switching on the heater: to do this, turn the heater rotary switch 3 to the right.
- To speed up the warming process: turn the heater rotary switch 3 all the way clockwise to the stop. Simultaneously turn the rotary switch – ventilation 4 to the position recirculated air 1 and the blower rotary switch 2 to level - **3** -.
- Switch off the heater: to do this, turn the heater rotary switch 3 all the way anti-clockwise to the stop.

Adjusting ventilation

The rotary switches for adjusting the ventilation and the blower are integrated in the control element.

To ensure proper ventilation, the filters in the heater/air-conditioning device have to be serviced regularly. A contaminated filter hinders air throughflow (see the "Maintenance" chapter).

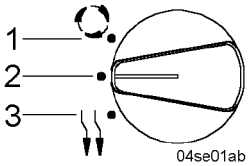
The air outlet nozzles in the driver's cab must also be open.

LBH/02/003801/0003/6.0/en

Caution

Danger of damage to the evaporator if recirculated air filter not present!
If the recirculated air and/or fresh air filter are missing, the close-meshed, deep evaporator fins soon become contaminated.
It is then necessary to replace the evaporator as cleaning is no longer possible.

! Never operate the heater/air-conditioning unit without filters!



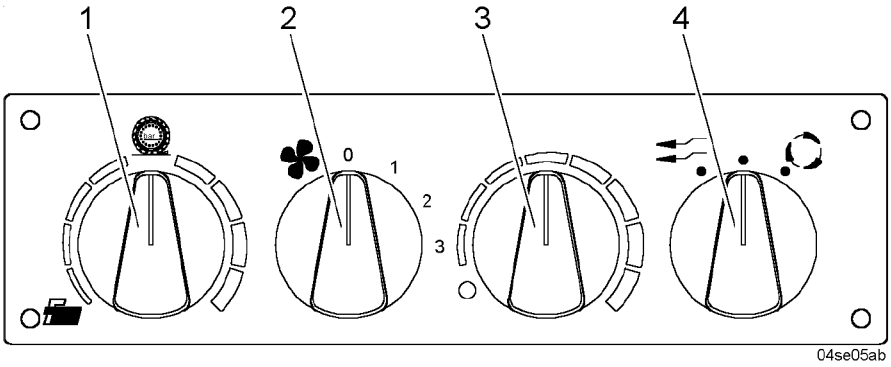
Switch settings:
Position 1 – recirculated air
Position 2 – recirculated and fresh air
Position 3 – fresh air

- For optional ventilation of the cab: Turn the ventilation rotary switch 4 to fresh air 3 (left-hand stop) and turn the blower rotary switch 2 to position **3** (right-hand stop).
- In order to circulate the cab air just within the cab: Set the ventilation rotary switch 4 to recirculated air 1 (right-hand stop). Particles (dust, etc.) are filtered out of the recirculated air by the recirculated air filter.
- Mixing filtered external with the circulating cab air: Move ventilation rotary switch 4 to position 2 for recirculated air and fresh air.

3.2.18 Air-conditioning system

Operating the air-conditioning system

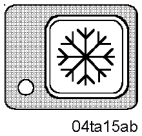
In order to guarantee the long-term reliability of the air-conditioning system, we recommend that it is switched on at least every 14 days.
When the air-conditioning system is running, the shaft seal ring in the air-conditioning compressor is also lubricated. This prevents refrigerant escaping from the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



Control element (view rotated by 90°)

Before the air-conditioning system can be switched on, the diesel engine must be running and the rotary switch 2 for the blower must be set at least to level - **1** -.

- Switch on the air-conditioning system by pressing the air-conditioning system button



Button – air-conditioning system

An LED on the button indicates that the function is active.

- The required cab temperature can be set by the heating rotary switch 3 :

Turn the rotary switch clockwise = warmer
Turn the rotary switch anticlockwise = colder
In order to achieve a still greater degree of cooling in the cab, take the following steps:

- set the highest blower level
- turn the heating rotary switch 3 all the way anti-clockwise
- close cab windows and doors
- set fresh air/recirculated air flap to recirculated air
- if stale heat is present in cab, thoroughly ventilate the cab first

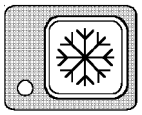
Re-heat mode

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

- For de-humidifying the cab air: switch on the air-conditioning system in addition to the heater.

The formation of a layer of condensation on the windows is thus prevented, as the humidity in the air condenses on the cooler evaporator and is collected as water in the drip tray and drains away outside.

Switching off the air-conditioning system



Button – air-conditioning system

- Switch off the air-conditioning system by pressing the air-conditioning system button

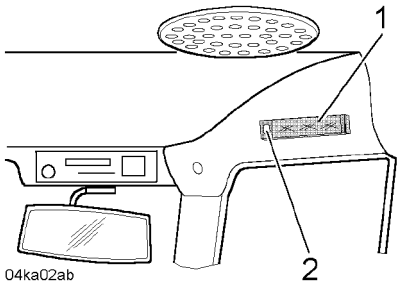
When the function is switched off, the LED on the button goes out.

3.2.19 Internal cab illumination

The internal lighting 1 is mounted on the top right-hand side of the cab.

Switching the internal illumination on/off

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



internal illumination

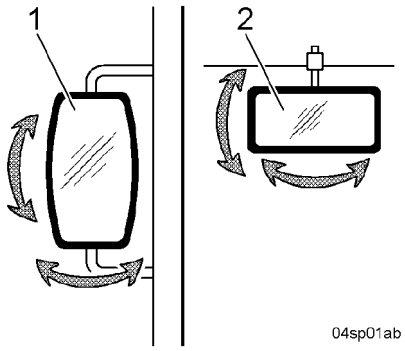
1 internal illumination
2 switch

- Switch internal illumination 1 on or off by operating switch 2 .

3.2.20 Inside and outside mirrors

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

Adjusting the mirrors



Adjusting the mirror

1 exterior mirror
2 interior mirror

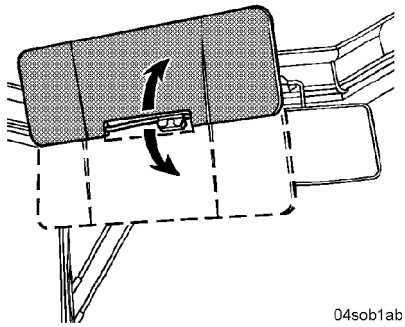
- Individually adjust all mirrors by turning them.

3.2.21 Sun visor

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

Adjusting the sun visor

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



Adjusting the sun visor

3.2.22 Electric windshield wiper and washer system

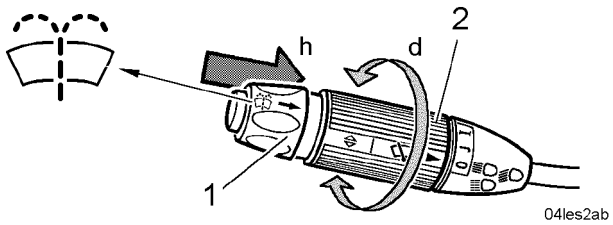
Layout

The vehicle is equipped with an electric windshield wiper and washer system for the front and rear windows.
Essentially it consists of the controls, the windowshield wipers, the resevoir and the outlet nozzles for the washing agent.

Switching on the windshield wiper and washer system

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

Operating the windshield wiper and washer system – front window



Steering column switch

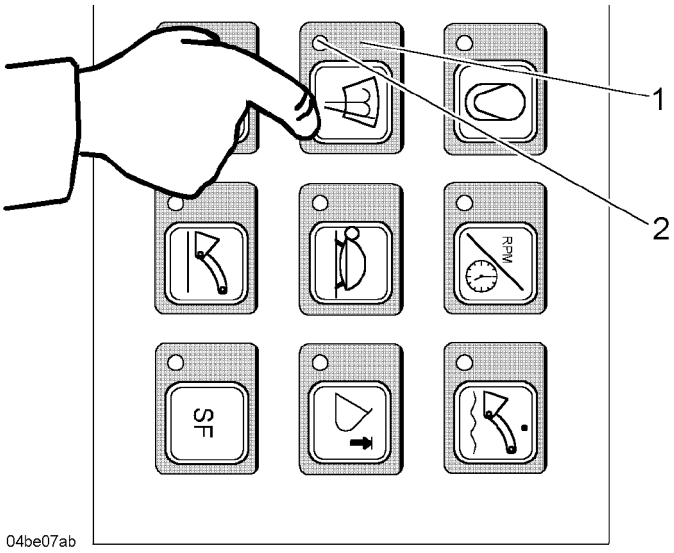
1 Button
2 Handle
h Switching on the windshield wiper and washer system
d Windshield wiper actuation

- Wipe the window first turn handle 2 to the required level **J – I – II**
- Wash window: press the button 1 on the steering column switch

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

Switching on the windshield wiper and washer system – rear window

The windshield wiper and washer system is switched on by pressing the button 1 .



Control unit

1 button – windshield wiper and washer system – rear window
2 LED

- Wipe the window first by pressing the button 1 once.

An LED 2 on the button indicates that the function is active.

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

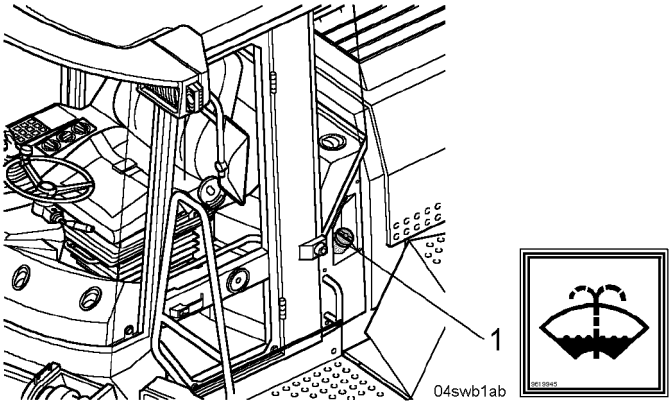
Washing solution is sprayed onto the rear windscreen through each outlet nozzle.

- Switch off the windshield wiper and washer system: press button 1 a third time.

The LED 2 on the button goes out.

3.2.23 Resevoir for windshield washer fluid

Layout



Windshield washer fluid container

1 Resevoir - filling inlet

The reservoir is located on the left-hand side of the driver's cab.
The inlet opening 1 is mounted outside on the left-hand side of the driver's cab.

Topping up with windshield washer fluid

Filling quantity approx. 3.5 litres.

- When necessary, refill with commercially available window cleaning agent.

Caution

Risk of damage to the windshield wiper and washer system from ice!
Icing up can result in the breakdown or damage to the windshield wiper and washer system. A dirty front or rear windscreen is a safety hazard!

! It is essential to protect the windshield wiper and washer system from ice build-up!

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

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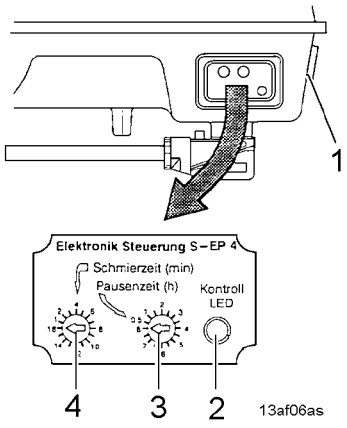
3.2.24 Automatic central lubrication system

This equipment is optional.
The central lubrication pump with a see-through reservoir and integrated control unit is installed on the left-hand side of the vehicle.
The central lubrication pump delivers the lubricant via supply lines and via one primary and several sub-progressive distributors to the individual lubrication points. An overpressure valve monitors lubrication of the individual lubrication points.

Function description

Lubrication and delay times

The S-EP4 control unit electronically controls the central lubrication system.



Control unit S-EP4

1 Button
2 LED - yellow
3 Display and adjustment of the delay
4 Display and adjustment of the lubrication time

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

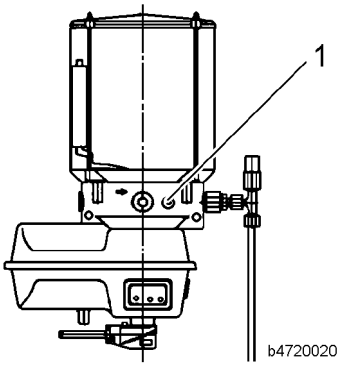
The pump can also be switched on manually by pressing the button 1. The pump motor switches off after the set lubrication time 4 has elapsed and the pause time 3 begins. All further lubrication cycles follow automatically in a pattern determined by the set dead time.

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

Switching on for non-scheduled lubrication

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

Refilling the reservoir



The grease fitting 1 is used to fill the reservoir.

Grease specification: see the chapter "Maintenance" under "Lubricants and fuels"

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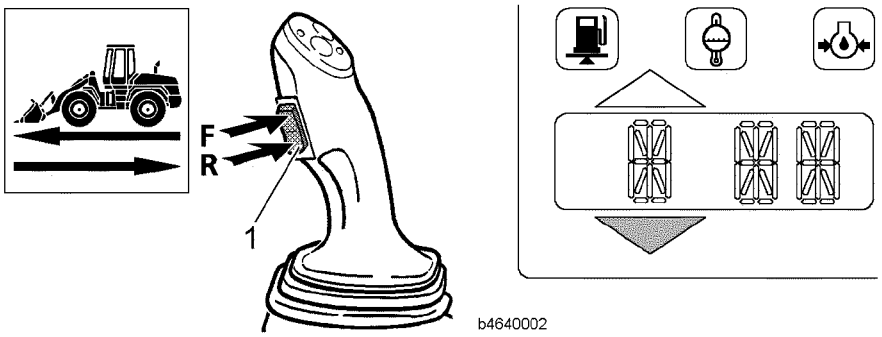
3.2.25 Acoustic reverse warning device

This equipment is optional.
This equipment comes as standard with the tunnel version of the vehicle.

Switching on reverse warning device



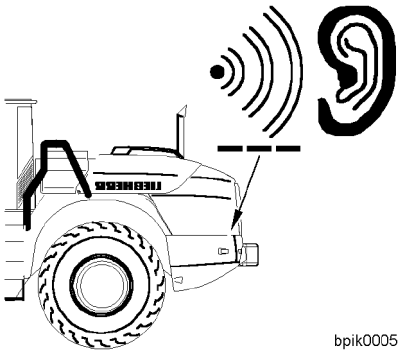
LH control lever and display unit

When the switch 1 is moved to position **R** for reverse travel, an audible alarm signal is issued.

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

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

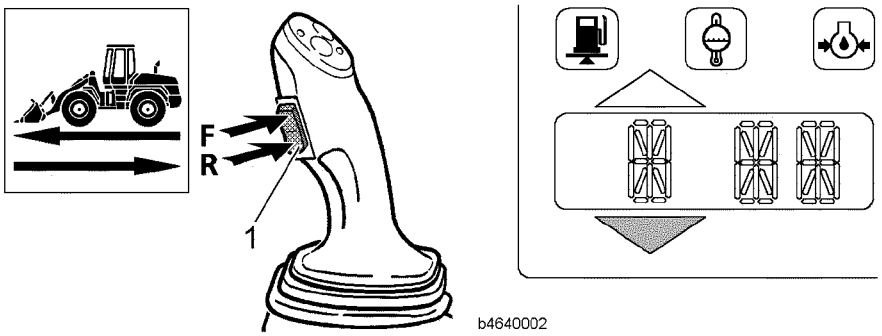
The alarm signal is approx. 5 dB louder than the ambient noise.



3.2.26 Optical reverse warning device

This equipment is optional.
The vehicle can also be equipped with an optical reverse warning device – in addition to the acoustic one.
Two red warning lights are integrated into the rear of the vehicle.

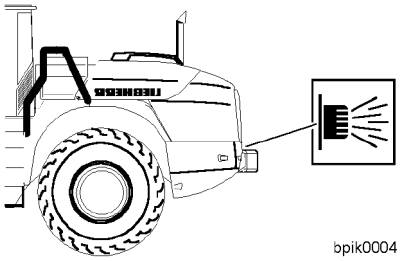
Switching on the reverse warning device



LH control lever and display unit

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

The two warning lights flash.



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3.3 Operation

3.3.1 Daily start-up routine

Ensure that:

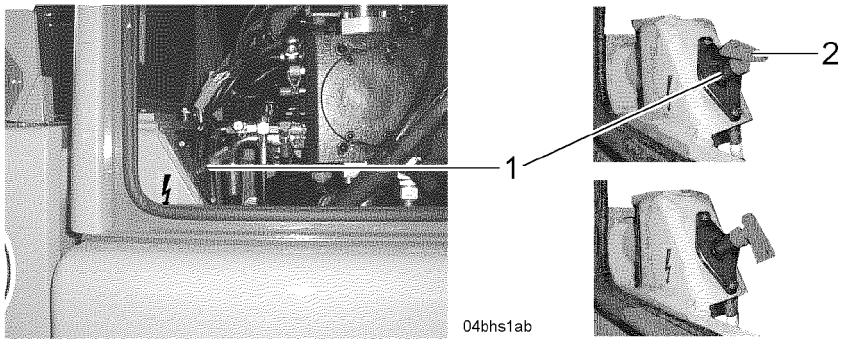
– Before starting up the vehicle each day, the "(daily) maintenance tasks must be carried out after every 10 hours of operation". See "Maintenance" chapter.
After the "maintenance (daily) jobshave been completed every 10 operating hours" , the vehicle is then put into the operating position. See "Operating position" section .

– Enough diesel fuel is available for the foreseen daily workload. See "Refuelling with diesel fuel" section .

Operating position

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

Turn on the main battery switch



Main battery switch

1 Main battery switch
2 Main switch - key

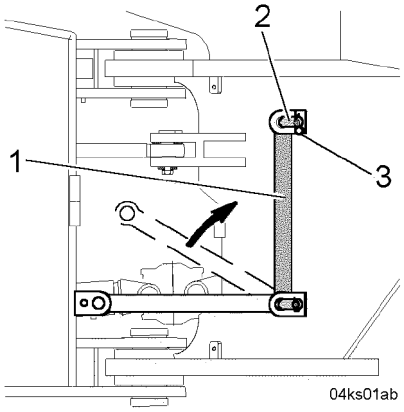
- Turn on the main battery switch.

Closing service hatches and hoods

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

Releasing the articulation lock

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



1 Safety bar
2 Pin
3 Spring clip

Articulation lock

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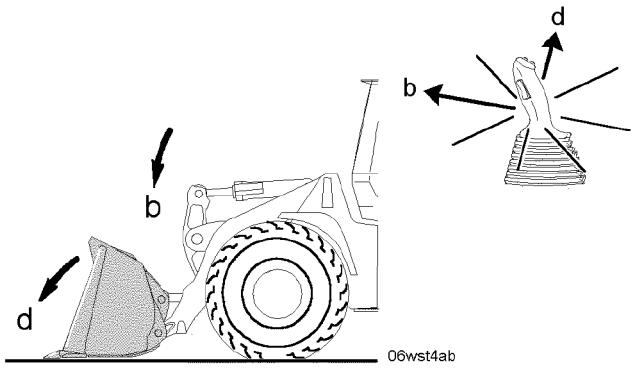
Warning

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

- Pin locking bar 1 in the upper position.
- Secure pin 2 against dropping out with a spring clip 3.

Putting the working attachment in the starting position

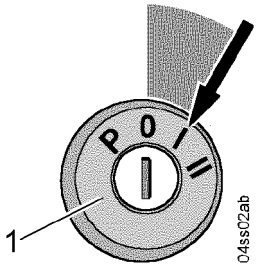


Starting position

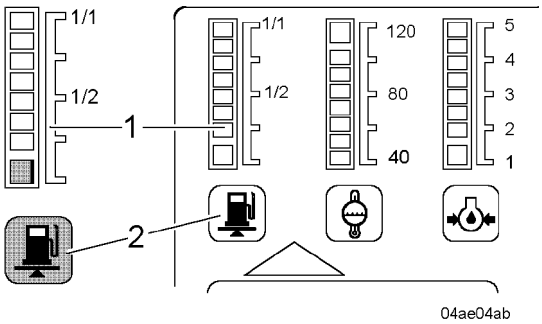
- Set the bucket down flat onto the ground.

Refuelling with diesel fuel

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



Starter switch – contact position



Display unit

1 Segment field – fuel supply 2 Symbol field – fuel supply

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

If there is too little diesel fuel, the fuel supply symbol field 2 starts flashing.
See also the "Display unit" section .
There will still be a residual volume of approx. 70 left in tank.

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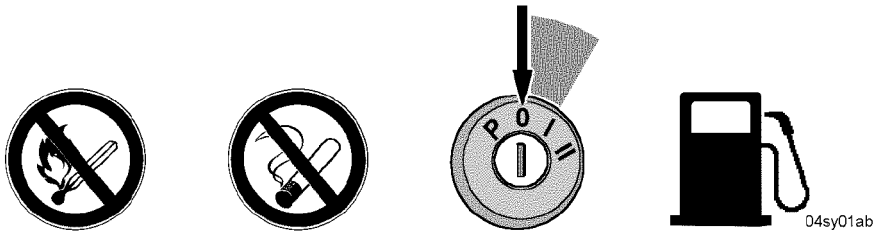


Safety when refuelling

Danger

Risk of fires and explosions!

! Do not smoke. Avoid naked flames when refuelling.

! Only refuel when the engine is switched off.

- It is essential to observe the safety regulations for refuelling. Also refer to the Chapter "Safety regulations".
- Only use clean diesel fuel.
- Carefully clean around the tank cap, before taking it off.
- If required, refuel with diesel fuel.
- Refuel if possible at the end of the working day, to prevent condensation build-up in the tank.

The vehicle is ready for operation.

3.3.2 Operation with diesel particle filter

The diesel particle filter is fitted as standard with the tunnel version.
The particle filter system is maintenance-free and regenerates itself independently during normal operation when a fuel additive is used.

Daily vehicle start-up with particle filter system

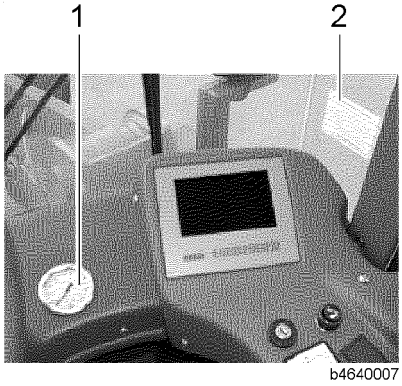
It is the responsibility of the vehicle operator to ensure that the following requirements are met.
The particle filter system may only be operated in conjunction with diesel fuel with additive.

Additive for diesel particle filter:

– approved additive – Refer to the Section "Lubricant and fuel specifications" under "Diesel fuels"
– additive mixing ratio – Refer to the Seciton "Technical data" under "Diesel particle filters"

In addition, the additional information affixed to the vehicle should be observed:

– see the decal on the fuel tank referring to the "Additive mixing ratio" for the diesel fuel
– see the decal in the driver's cab, on the right-hand side of the front windscreen regarding "counter-pressure"



1 Exhaust gas counter-pressure display
2 Information sign - counter-pressure

The exhaust gas counter-pressure display indicates the loading condition of the filter particle system.

With turbo engines, the counter-pressure of max. 0.2 bar may not be exceeded.

Caution

Risk of damage to the diesel particle filter!
The diesel particle filter will be damaged if there is no admixture or if the additive mixing ratio is incorrect.
If the vehicle idles for prolonged periods or is run in the lower load range, the max. counter-pressure may be exceeded.

! Observe the admixture and the mixing ratio required. See the "Lubricants and fuels" section.
! Avoid letting the vehicle idle for prolonged periods or run in the lower load range .

- If the counter-pressure is too high:
  take counter measures to reduce it.

Steps to reduce the counter-pressure:
Run the travel or working hydraulics of the vehicle at a higher load for 10-15 minutes, until the counter-pressure drops.
When the engine is at running temperature, the counter-pressure must drop within 15 minutes.

- If the counter-pressure is over 0.2 bar:
  do not suddenly move the gas pedal!

Trouble shooting
If the counter-pressure cannot be reduced by these measures:

- Shut down the vehicle immediately!
- Contact LIEBHERR CUSTOMER SERVICE!

- If a fault in the injection system occurs in the vehicle during operation:
  Immediately reduce the vehicle load and contact LIEBHERR CUSTOMER SERVICE!

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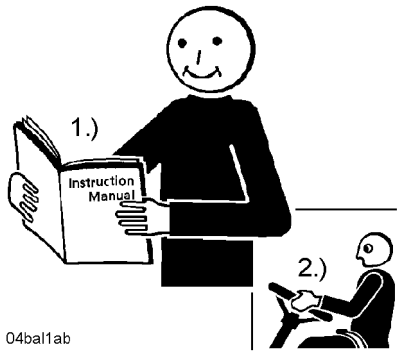
3.3.3 Starting the diesel engine



Operator's manual

1.) First read and understand
2.) Then drive and work

Only operate the vehicle when you have read and understood the operator's manual.

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

Precautions before start-up

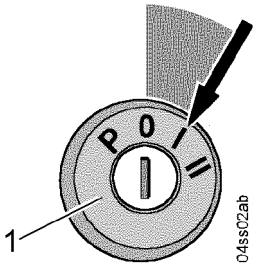
The following precautions should be taken before starting the vehicle.
First make sure that the vehicle is in its operating position.
See "Operating position" section .

Start-up procedure

Preheating the engine

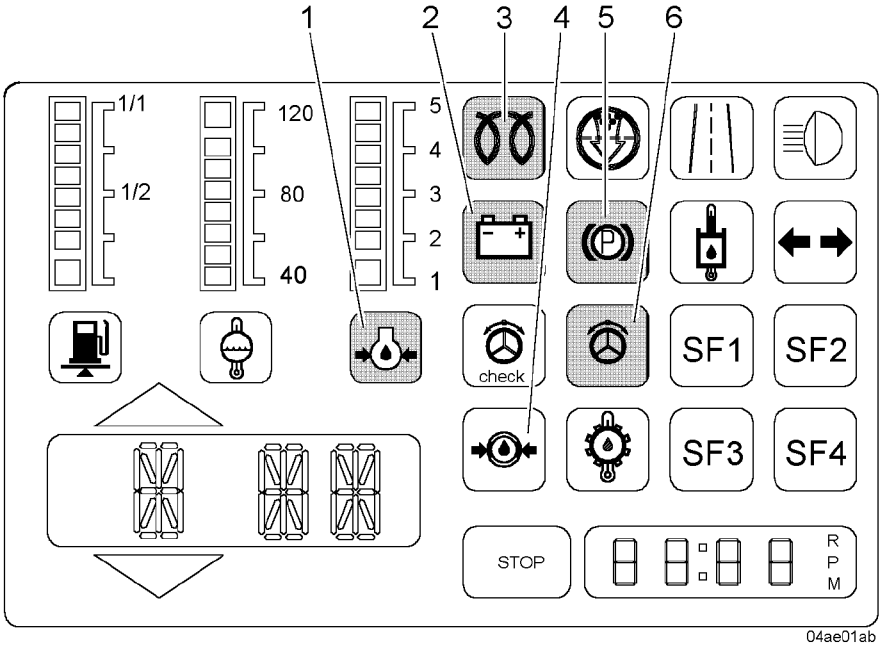
The preglow time is dependent on the ambient temperature.

There is no preglow when the temperatures are above freezing.
The preglow time can be as long as a 120 seconds when the ambient temperature is extremely low.



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

As a "Check", all the segment and symbol fields light up for approx. 3 secs.



Display unit

1 Symbol field – engine oil pressure
2 Symbol field – battery charging (charge control)
3 Preglow monitor symbol field*
4 Symbol field – braking system accumulator pressure
5 Parking brake symbol field
6 Symbol field – emergency steering

After the "Check" is completed, the following symbol fields must still flash or illuminate with the key at position - **I** -:

1 engine oil pressure (red) – flashes
2 battery charging (red) – lights up
4 braking system accumulator pressure (red):
lights up when the brake accumulator pressure is too low.
5 parking brake (red) – lights up
6 emergency steering (red) – lights up

* The symbol field 3 for the preglow monitor only lights up when the ambient temperature is below freezing.

Starting the engine

- Below freezing :
  wait until symbol field 3 for the preglow monitor goes out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When the symbol field goes out, the preglow time is over.

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

The engine can now be started.

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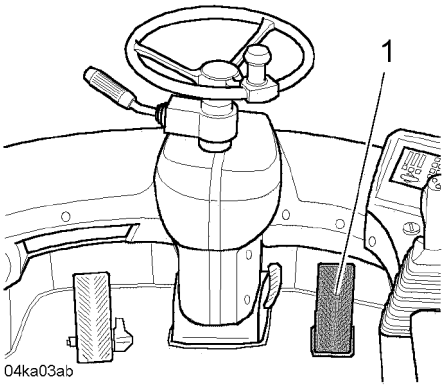
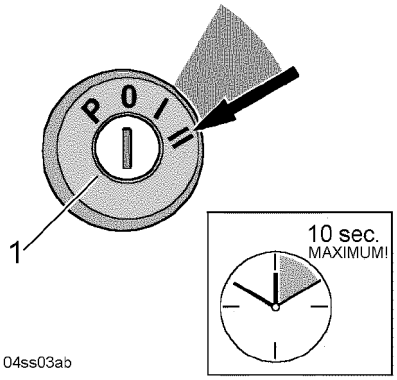


Gas pedal

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



Starter switch – starting position

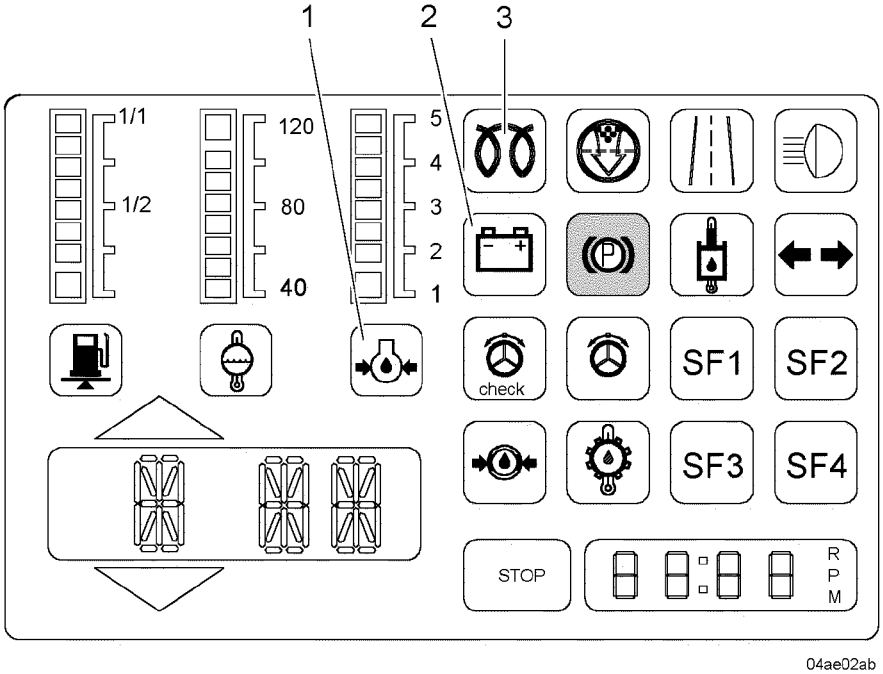
Trouble shooting

Will 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 starting key.

The starting key returns automatically to the operating position.



Display unit

1 Symbol field – engine oil pressure

2 Symbol field – battery charging (charge control)

3 Symbol field – preglow monitor

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

1 Engine oil pressure (red)

2 Battery charging (red)

3 Preglow monitor (yellow)

Note: when the engine is being preheated, the symbol field 3 goes out when the perglow time has elapsed, i.e. when the engine is ready.
The preglow time can be as long as a 120 seconds when the ambient temperature is extremely low.

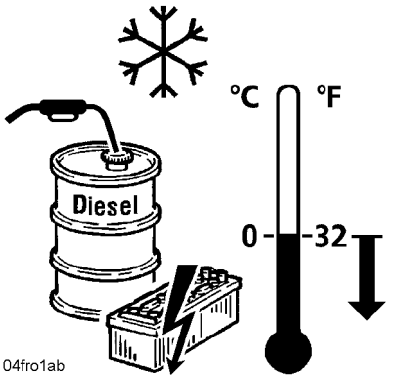
Trouble shooting

Will the symbol fields 1, 2 and 3 not go out?

- Shut down the engine and rectify the problem in accordance with the section "Malfunctions".

- After the motor has started, go back immediately to a medium speed.
- Briefly let the engine warm up: by actuating the working attachments at medium power.
- Then increase gradually to full power.

Precautions when starting at temperatures below freezing



Winter operation

The following measures improve the starting performance at low temperatures.

Precautions:

– check battery charging
if necessary, recharge the battery

– use winter-grade fuel
see "Lubricants and fuels" section under Winter operation.

– use additional heating – engine preheating system (cooling water):
if required, the vehicle can be equipped with an additional heating – engine prewarming system (cooling water)
The additional heating – engine prewarming system is optionally available from your LIEBHERR dealer.

Warning

Risk of explosion with the diesel engine!

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

! Do not use volatile starting aids.

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

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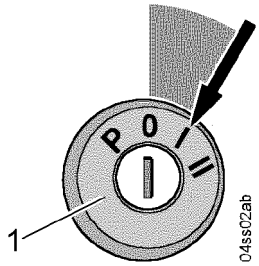
3.3.4 Driving mode



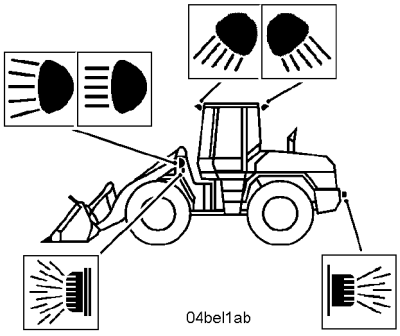
Situation after the electrical system is switched on:
– parking brake is automatically activated
– When the parking brake is engaged, the travel lockout is active.
– preselection of the travel direction is not possible

Preparations for driving mode

The preparations for driving mode should be carried out in the following sequence.
First make sure that the vehicle is in its operating position.
See "Operating position" section .

Checking the lighting equipment

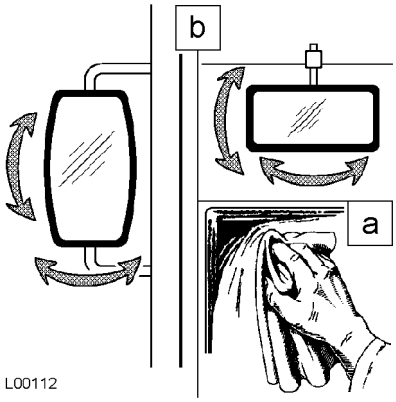
- Check the lighting equipment.
- If required, adjust the setting of the headlamps.



Headlamp adjustment

Checking inside and outside mirrors

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



Inside and outside mirrors

Putting the working attachment into position

For detailed information, see the sections "LIEBHERR control lever" or "Working with the attachment".

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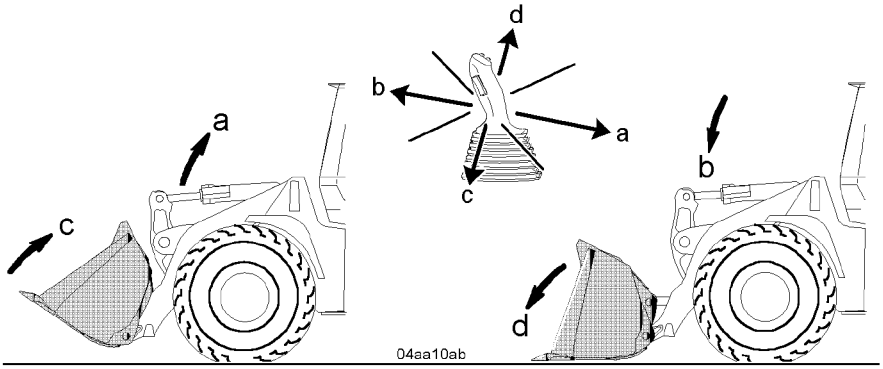


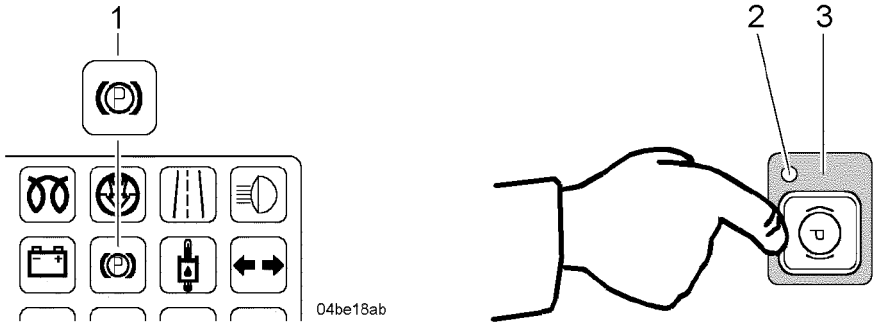
Bucket position

- Depending on the starting position, the lift arm should be raised or lowered.
- Move the loading bucket to the required position.

Releasing the parking brake

When the parking brake is engaged, the travel lockout is active.

Preselection of the travel direction is not possible!



Control unit

1 Parking brake symbol field
2 LED
3 Parking brake button

- Release the parking brake by pressing button 3.

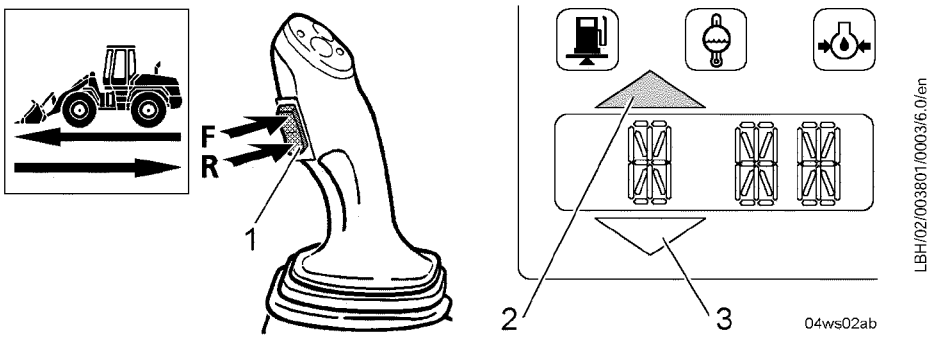
The LED 2 on the button 3 goes out.

Symbol field 1 for the parking brake goes out.

Preselection of travel direction

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

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



LH control lever and display unit

LBH/02/003801/0003/6.0/en

1 Switch for travel direction
2 Symbol field – travel direction"forward"
3 Symbol field – travel direction"reverse"

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

or

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

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

Selection of travel ranges

Valid for: *L544-442/0104-0429; L544T-444/0104-0429*

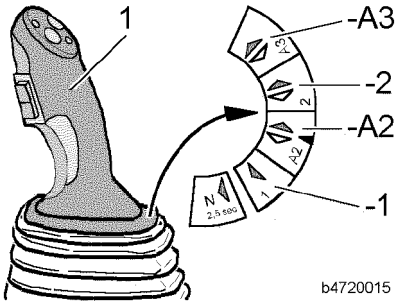
After the electrical system is turned on, travel range - **A2** - (automatic) is automatically selected. It is not possible to select another travel range until the travel direction has been selected.

The travel ranges are selected using the switch 1 for travel range. See also the "LIEBHERR control lever" section.

The selected driving range is shown on the instrument panel in the display unit. See also the "Display unit" section .

Selecting another travel range is possible at any travel speed. If the driving speed is too high when shifting down, the vehicle is first hydrostatically braked. The driving range is then automatically shifted down.

The following travel ranges can be selected:



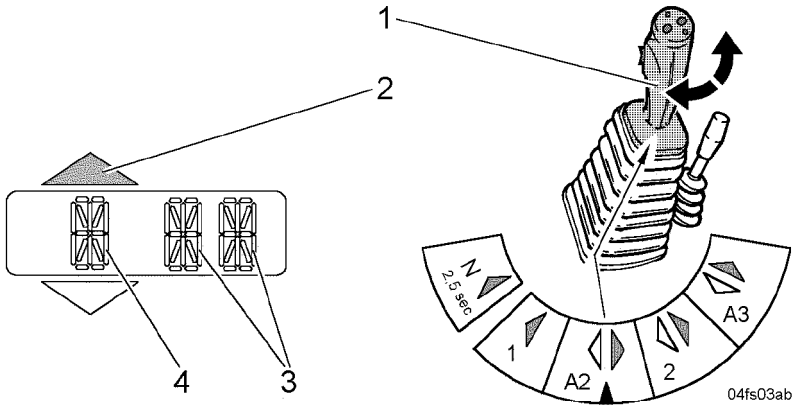
LH control lever

- **Travel range -1** for slow drive (on steep terrain).
  the gears are thereby shifted to gear level - **1** -
- **Travel range -A2** (automatic) for normal working operation.
  the gearbox is thereby shifted to gear level - **1** - or - **2** -
- **Travel range -2** for normal working operation.
  the gearbox is thereby shifted to gear level - **2** -
- **Travel range -A3** (automatic) for driving on public roads or transport.
  the gearbox is thereby shifted to gear level - **1** -, - **2** - or - **3** -

Gear shifts in the automatic travel ranges:

- In the automatic travel ranges - **1** -, - **2** - and - **3** -, the gears are automatically shifted up and down, according to the the gas pedal position, the driving speed and the rate of change of speed.

Travel speeds: see the "Technical data" section



Switch for travel range

1 Travel range switch
2 Travel direction symbol field
3 Travel speed LCD field
4 Travel range LCD field

- Push the switch 1 according to conditions, in travel range - **1** -, - **A2** -, - **2** - or - **A3** -.

The selected driving range is displayed in the LCD field 4.
In automatic mode, the display in the LCD field 4 changes regularly between the output - **A** - (automatic) and the respective automatic range - **2** - or **3** -.

Selection of travel ranges

Valid for:

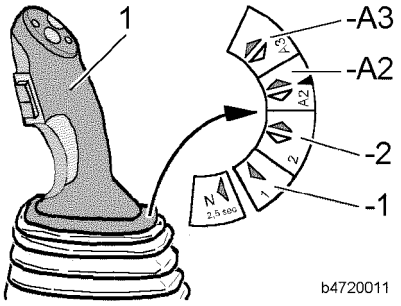
Modification Other sequences when shifting travel ranges.
L544-442/0430-; L544T-444/0430-
After the electrical system is turned on, travel range - **A2** - (automatic) is automatically selected. It is not possible to select another travel range until the travel direction has been selected.

The travel ranges are selected using the switch 1 for travel range. See also the "LIEBHERR control lever" section.

The selected driving range is shown on the instrument panel in the display unit. See also the "Display unit" section .

Selecting another travel range is possible at any travel speed. If the driving speed is too high when shifting down, the vehicle is first hydrostatically braked. The driving range is then automatically shifted down.
The following travel ranges can be selected:

– **Travel range -1** for slow drive (on steep terrain).
the gears are thereby shifted to gear level - **1** -
– **Travel range -2** for normal working operation.
the gearbox is thereby shifted to gear level - **2** -
– **Travel range -A2** (automatic) for normal working operation.
The gearbox is thereby shifted to gear level- **2** - or - **3** -.
– **Travel range -A3** (automatic) for driving on public roads or transport.
the gearbox is thereby shifted to gear level - **1** -, - **2** - or - **3** -

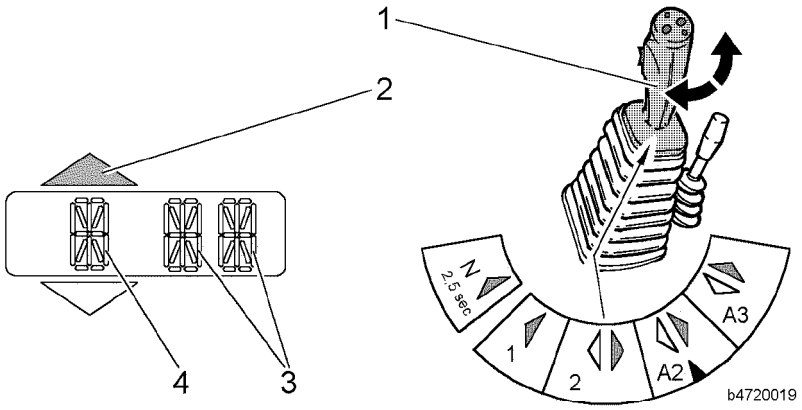


LH control lever

Gear shifts in the automatic travel ranges:

– In the automatic travel ranges - **1** -, - **2** - and - **3** -, the gears are automatically shifted up and down, according to the the gas pedal position, the driving speed and the rate of change of speed.

Travel speeds: see the "Technical data" section



Switch for travel range

1 Travel range switch
2 Travel direction symbol field
3 Travel speed LCD field
4 Travel range LCD field

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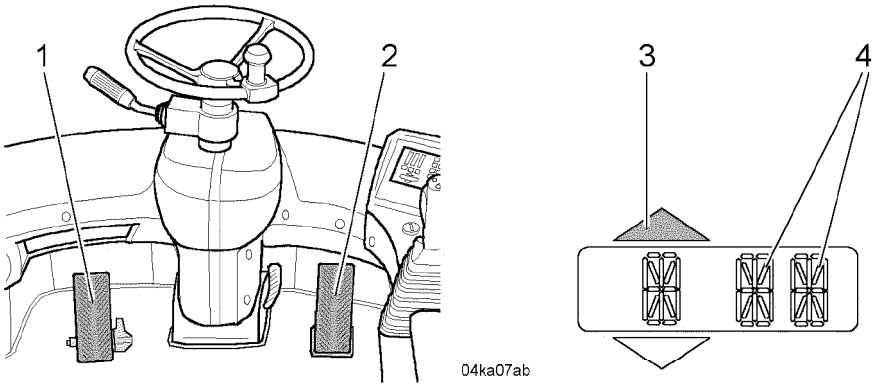
- Push the switch 1 according to conditions, in travel range - **1** -, - **2** -, - **A2** - or - **A3** -.

The selected driving range is displayed in the LCD field 4.
In automatic mode, the display in the LCD field 4 changes regularly between the output - **A** - (automatic) and the respective automatic range - **2** - or **3** -.

Driving off

After the electrical system has been turned on, the travel range - **A2** - (automatic) is automatically selected.
Make sure that the preparations for driving mode have been implemented.



Gas pedal and travel speed indicator

1 Brake-inching pedal
2 Gas pedal
3 Travel direction symbol field
4 Travel speed LCD field

- Push down the gas pedal 2.

The vehicle starts moving.

- Adjust the travel speed with the gas pedal.

The driving speed will be displayed in the LCD field 4.

Driving

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

Driving with kick-down shift

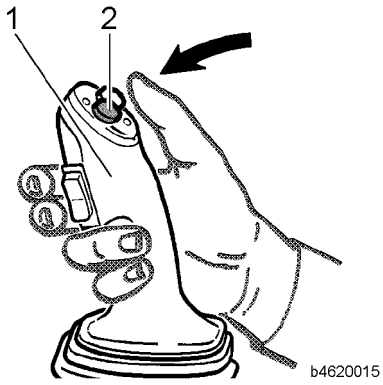
The use of the kick-down shift makes it easier to load bulk materials.

When loading bulk materials, it is advantageous to shift to "1st gear" (gear level 1) shortly before penetrating the material. This is made possible by the kick-down shift.

Valid for: *L544-442/0104-0429; L544T-444/0104-0429*

Kick-down shifting is possible in forwards and reverse travel in the travel ranges - **A2** - and - **A3** - and from every travel speed.
Modification The kick-down shifting function is also provided in travel range **2**.

Valid for: *L544-442/0430-; L544T-444/0430-*



Kick-down shifting is possible in forward and reverse travel in the travel ranges **2**, **A2** and **A3** and from every travel speed.

1 LH control lever
2 Button – kick-down

- Press the button 2 for the kick-down shift.

Selection procedures for kick-down shift:

– when button 2 is pressed, this automatically brakes the vehicle hydrostatically
  You then automatically shift into "1st gear" (gear 1).
– when you drive without resistance, the "1st gear" (gear 1) is active for approx. 4 secs.
  The vehicle then automatically shifts to "2nd gear" (gear 2) when the speed increases.
– when driving into a pile, "1st gear" remains selected as long as a resistance is present

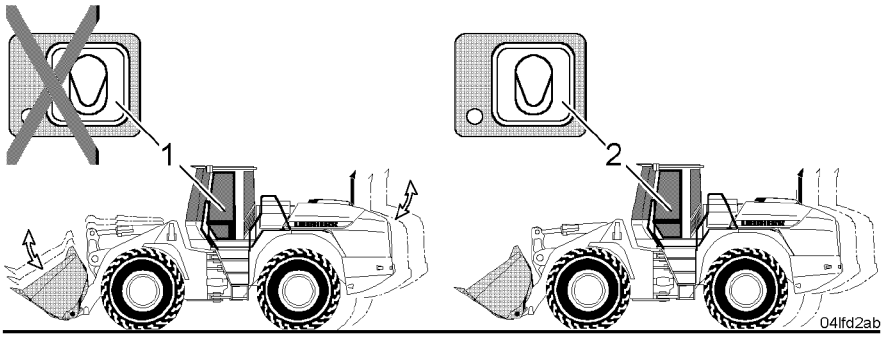
Driving without LFD

When driving over extended distances without LFD, vibrations may be produced.

Therefore, the LFD system should be switched on for all applications which require significant distances to be covered.

- Improve driver comfort: by activating the LFD system.

Driving with LFD



Driving with or without LFD

1 Driving without LFD 2 Driving with LFD

In virtually all driving modes, the LFD system improves driver comfort by reducing vehicle vibrations.

Therefore, the LFD system should be switched on for all applications which require significant distances to be covered.

Activating the LFD system

The LFD system is switched on automatically:

– when the bucket is tilted in
  In this condition, the proximity switch - ride control is selected.
– when the bucket is tipped out, when the travel speed of the vehicle is more than 10 km/h

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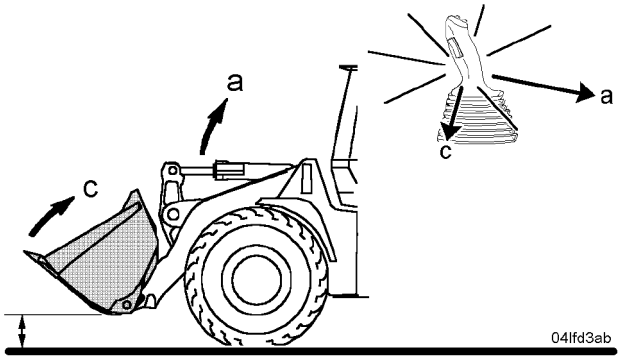
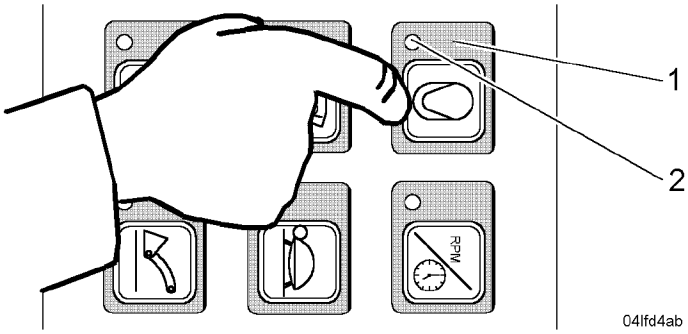


Transport height

Ensure that:

– the loading bucket is in the transport position
  The transport position means that the bucket pivot point must be approx. 40 cm above the ground.



Control unit

1 Ride control button - 2 LED

The function is made ready by pressing the button 1 for ride control (LFD system).

- Press the button 1 for ride control (LFD system).

An LED 2 on the button indicates that the function is active.

The LFD system function is now active.

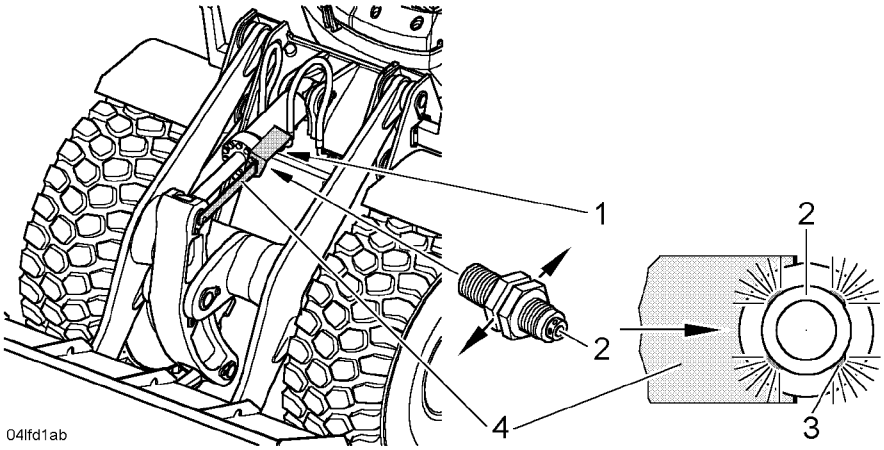
Adjustment of the proximity switch

The proximity switch 2 for the LFD system is set ex-works.

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

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

- Raise the lift arm to the required transport height and tilt in the loading bucket approx. 10 cm before the stop.



Proximity switch

1 Proximity switch – autom. bucket return-to-dig
2 Proximity switch – LFD system
3 LED
4 Positioning curve

- Release the fixing nuts on the proximity switch 2.

Horizontally adjust the proximity switch 2 until the positioning curve 4 covers up to half the contact surface of the proximity switch.
When the positioning curve enters the contact area of the proximity switch, the four LEDs 3 on the proximity switch light up.

- Retighten the fixing nuts on proximity switch 2.

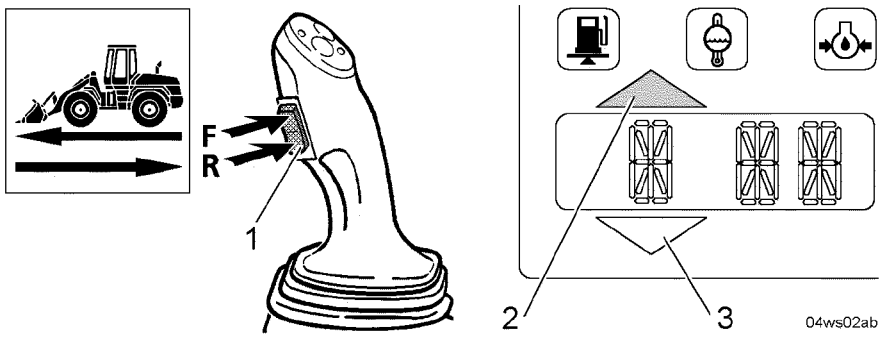
The proximity switch has been reset and the LFD system is once more ready for operation.

Reverse travel

The vehicle can be reversed in all travel ranges and at all speeds.

Selection process when reversing:

– When reversing in travel ranges - **A2** - (automatic) or - **A3** - (automatic), there is no automatic shift back into gear level - **1** -.
– the system only shifts to gear level - **1** - when it is not possible to drive off in gear level - **2** -

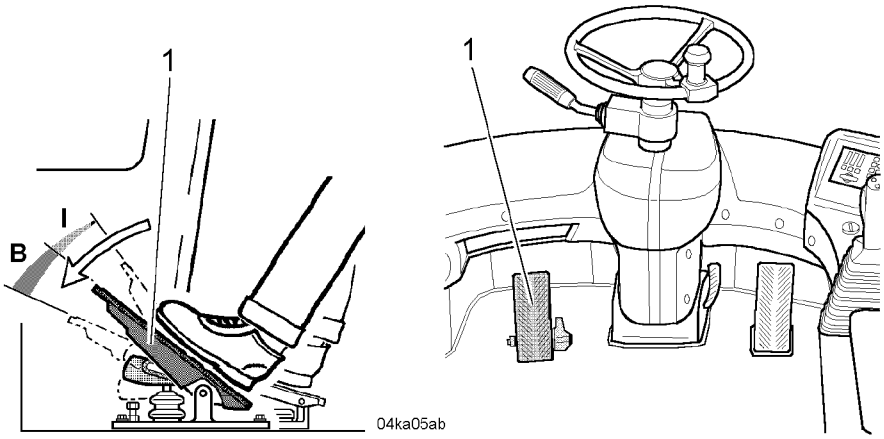


Switch for travel direction and display unit

1 Switch for travel direction
2 Symbol field – travel direction "forwards"
3 Symbol field – travel direction "reverse"

- Changing travel direction: operating switch 1.

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



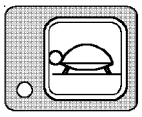
Brake- inching pedal

- If a gentle reverse action is required:
  support the reversing procedure by easing off the gas pedal or by gently pressing the brake- inching pedal

This produces a smoother reversing performance.

Selecting creeper

When slow drive is necessary, the creeper function can be activated.

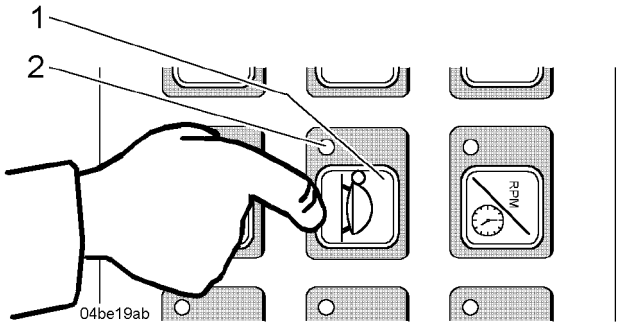


The creeper function is effective in the travel directions forwards and reverse.

The creeper limits the travel speed when the vehicle is in gear - **1** -.

Activation is automatic as soon as the following conditions have been met.
Conditions for automatic activation:

– the creeper button has been pressed
– the gearbox has automatically selected gear level - **1** -



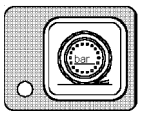
Control unit

1 button – creeper (slow drive) 2 LED

- Press the button 1 for creeper (slow travel).

An LED 2 on the button indicates that the function is active.
The creeper (slow drive) function is now active.
The travel speed is limited to approx. 4 km/h in gear level - **1** -.

Tractive force adjustment



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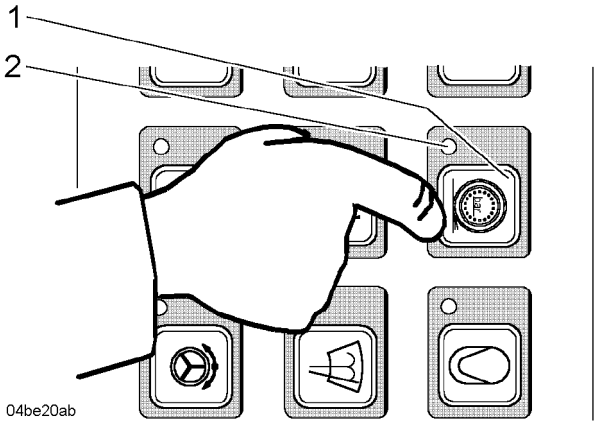
For special deployments (e.g. on loose sand), the maximum tractive force of the vehicle can be adjusted in 9 levels. This prevents the wheels from spinning.

See also the sections "Control unit" and "Control element".

The tractive force is adjusted:

– when the button for tractive force adjustment has been pressed
– only in the travel direction forward
– when the travel speed of the vehicle is under 3 km/h
– Only in gear - **1** -.



Control unit

1 button – tractive force adjustment
2 LED

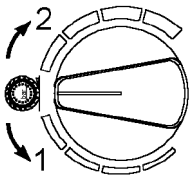
- Press button 1 for tractive force adjustment.

An LED 2 on the button indicates that the function is active.

The tractive force adjustment function is now active.

- Adjust tractive force by turning rotary switch to the required level.

1 reduced tractive force
2increased tractive force



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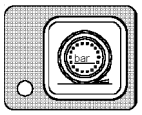
Rotary switch – tractive force adjustment



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- **When the tractive force adjustment is no longer required: Switch it off again!**

Otherwise it is not posible to achieve the maximum tractive force.

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Driving on public roads

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

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

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

Before driving on public roads, find out:

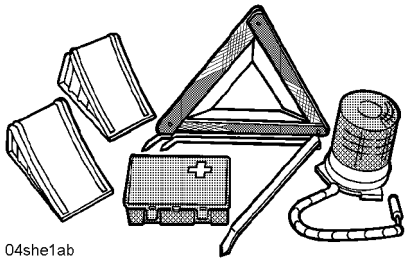
– from the vehicle owner, whether the required conditions for licensing for public roads have been met
  - "Operating permit"
  - "Special licence"
– about the appropriate safety regulations

  Refer to the sections:
  - "Safety regulations"
  - "Safety instructions for driving on slopes"
  - "Instructions for safe working"

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

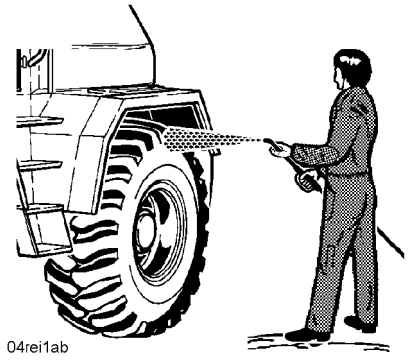
Preparations for driving on public roads

Make sure that the safety equipment listed below is on board, in accordance with the provisions of the **STVZO** (i.e. highway code):



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

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



Wet cleaning

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

See also the chapter "Maintenance", section "Cleaning the vehicle"

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

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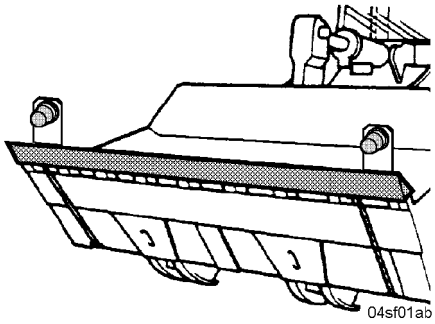
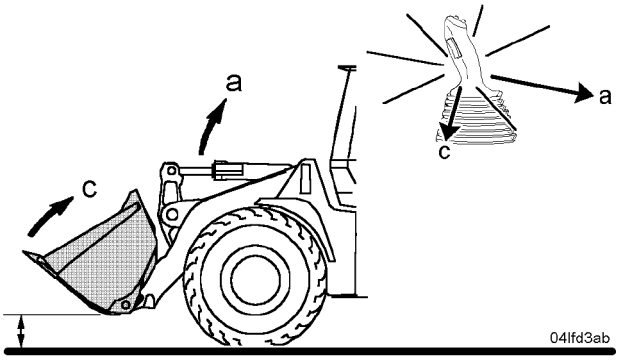


Bucket teeth guard and profile lamps

- Attach the tooth guard to the bucket.
- Attach the profile lamps.
- Plug in the cables for the profile lamps.

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



Transport height

Make sure that:
– the loading bucket is in the transport position when "driving"
  The transport position means that 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

There are two ways to brake the vehicle:
– with the hydrostatic circuit only
– with the hydrostatic circuit and the disc brake

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

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

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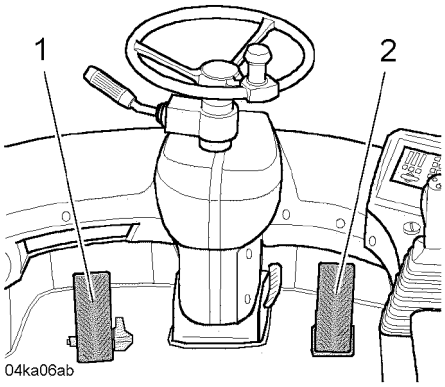


Brake- inching pedal and gas pedal

1 Brake- inching pedal 2 Gas pedal

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

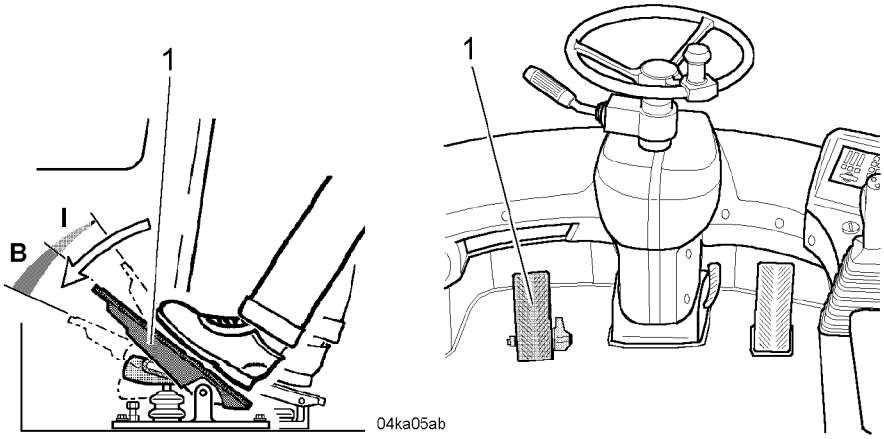
Service brake

If hydrostatic braking is not sufficient, the vehicle must also be braked with the brake-inching pedal 1.

Braking with the brake- inching pedal

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

– range - **I** - for hydrostatic braking onl.
– range - **B** - for braking with hydrostatic circuit and with wet disc brakes in the wheel hubs



Brake- inching pedal

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

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Warning

Risk of accidents when braking without due care!

Braking the vehicle without due care could cause severe injuries to the driver if the safety belt is not properly fastened!

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

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

or

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

This will brake the vehicle more or less suddenly.

Trouble shooting

Little or no braking effect?

- Shut down the vehicle immediately.
- Contact 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- inching pedal must be pressed all the way down!

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

This brakes the vehicle suddenly.

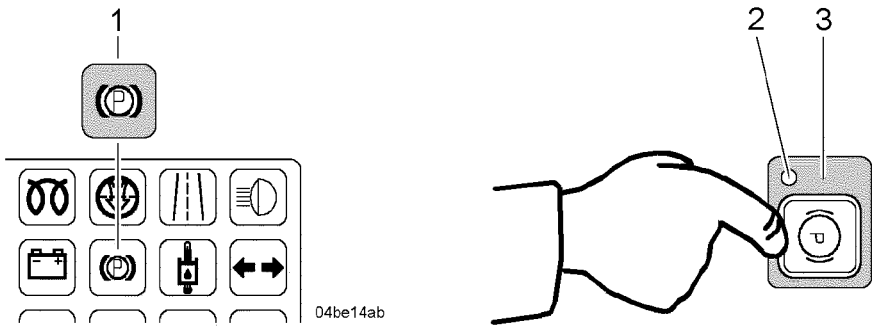
After the vehicle comes to rest

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

Engaging the parking brake

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

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



Control unit

1 Parking brake symbol field
2 LED
3 Parking brake button

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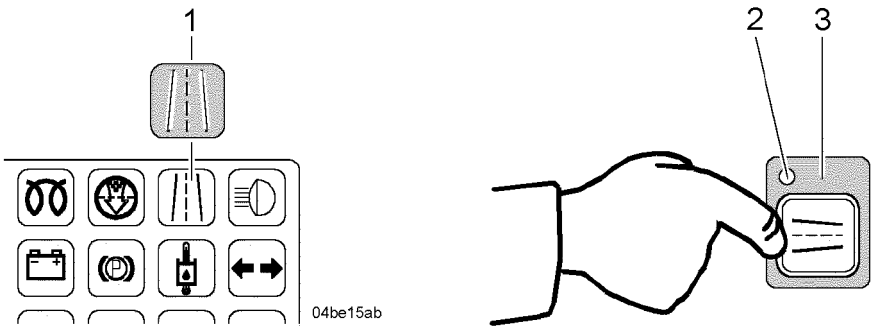
- Activate the parking brake with the button 3.

An LED 2 on the button indicates that the function is active.
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



Control unit

1 Working hydraulics lock symbol field
2 LED
3 Working hydraulics lock button

- Press the button 3 to prevent unforeseen actuation of the working hydraulics lock.

An LED 2 on the button indicates that the function is active.
The symbol field 1 for the working hydraulics lights up.
The working hydraulics are no longer operational.

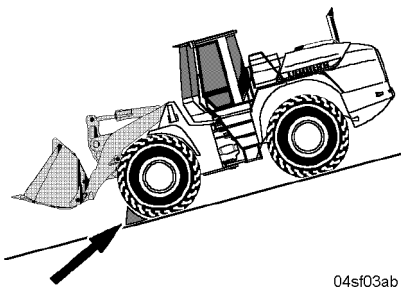
Locking up the vehicle

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

Danger

Risk of accidents due to the vehicle suddenly rolling!
! Secure the vehicle against rolling.

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



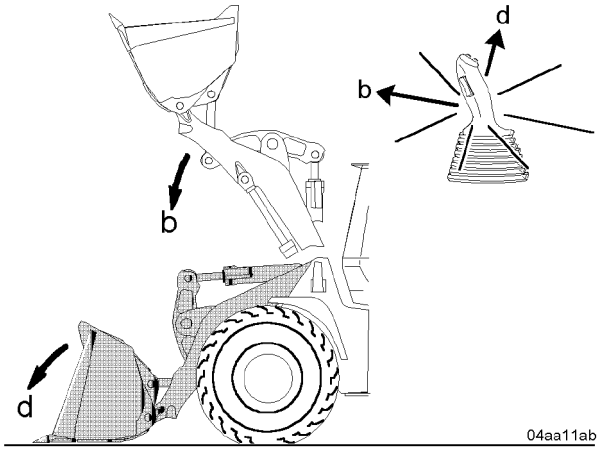
On downhill slopes

3.3.5 Shutting down the vehicle

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

Lower the working attachment

Make sure that the loading bucket is empty.

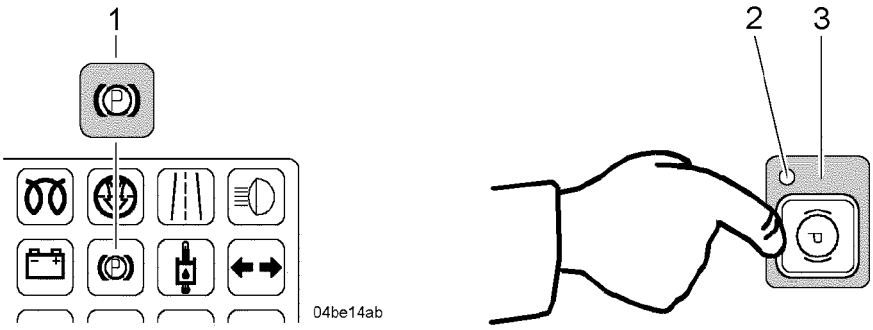


Bucket arm movement

- Lower the lift arm: 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.



Control unit

1 Parking brake symbol field
2 LED
3 Parking brake button

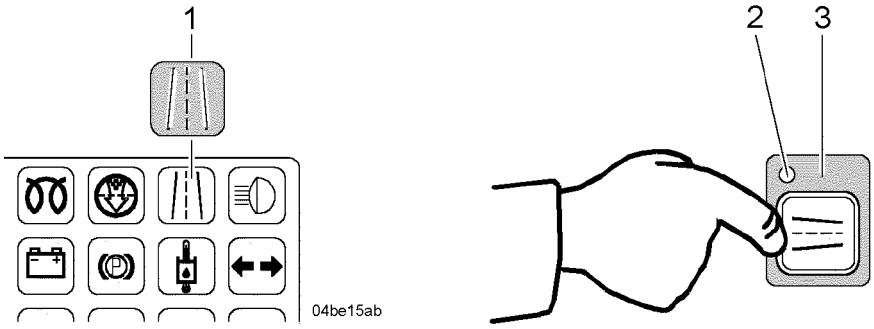
- **If necessary**: activate the parking brake with the button 3.

An LED 2 on the button indicates that the function is active.
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.



Control unit

1 Working hydraulics lock symbol field
2 LED
3 Working hydraulics lock button

- **If necessary**: press the button 3 for working hydraulics lock to prevent unforeseen activation of the working attachment.

An LED 2 on the button indicates that the function is active.

The symbol field 1 for the working hydraulics lights up.

The working hydraulics are no longer operational.

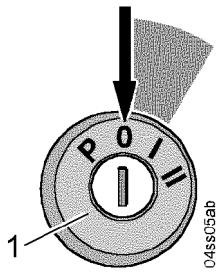
Shutting down the engine

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 briefly - for approx. 10 to 15 seconds -.
- Turn the starting key to position - **0** - and pull it out.

All symbol fields go out.



Starter switch - 0-position

Locking up the vehicle

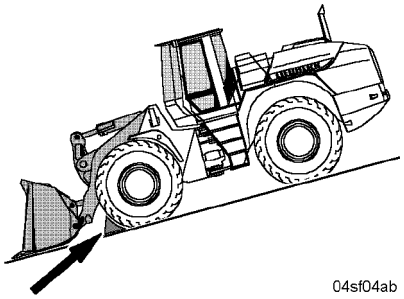
The following precautions should be taken when the vehicle is to be parked for a prolonged period on a slope.

Danger

Risk of accidents due to the vehicle suddenly rolling!

! Secure the vehicle against rolling.

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



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On downhill slopes

Parking position

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

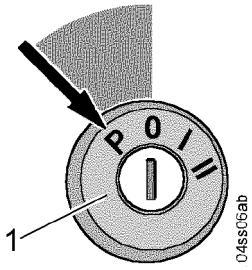
- Turn the starting key to the parking position - **P** -.

The consumer units listed below are ready for operation.

– Parking and driving headlight
– Internal illumination
– Hazard warning system
– Socket/cigarette lighter
– Working floodlights

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

– Rotating beacon
– Radio



Starter switch - parking position

Danger

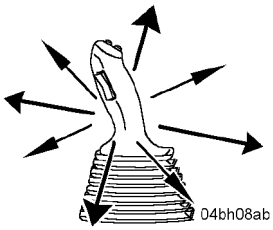
Unforeseen handling of the vehicle by an unauthorised person can place the maintenance personnel in extreme danger!

! Secure the vehicle against unforeseen operation by unauthorised persons!

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

LBH/02/003801/0003/6.0/en

3.3.6 Operating the lift arm



LH control lever

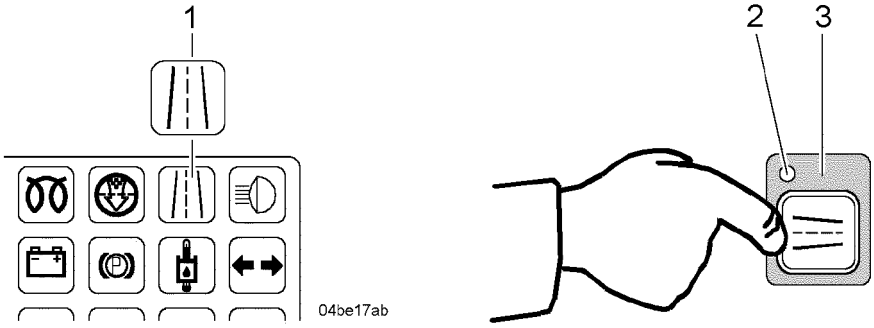
The working movements of the lift arm and the working attachment (bucket) are controlled by the LH control lever.

See also the "LIEBHERR control lever" section.

Enabling actuation of the working hydraulics

When the ignition is switched on, 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.**



Control unit

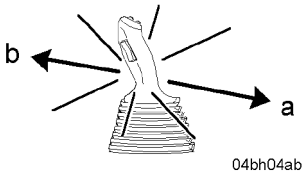
1 Working hydraulics lock symbol field
2 LED
3 Working hydraulics lock button

- Deactivate the working hydraulics lock by by pressing the button 3.

The LED 2 on the button goes out.
The symbol field 1 for the working hydraulics lock goes out.
The working hydraulics are now ready for operation.
The working attachment can now be operated.

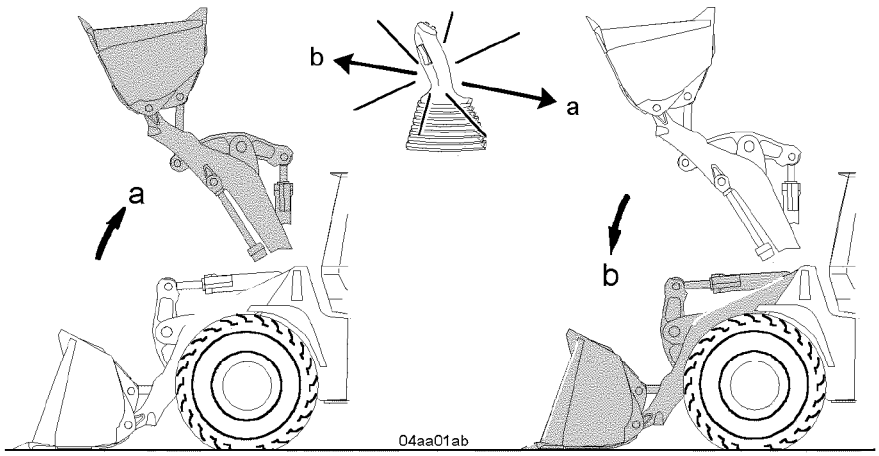
Operating the lift cylinder

The lift cylinders raise and lower the lift arm.



LH control lever

Raising the lift arm



Bucket arm movement

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

The lift arm is raised.

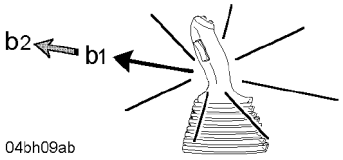
Lowering the lift arm

There are two ways to lower the lift arm:

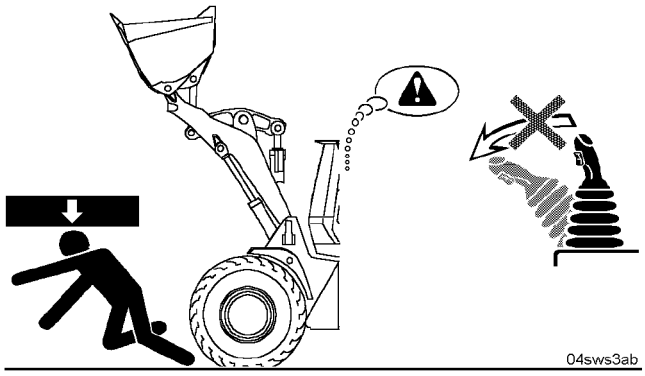
– Slowly with "normal lower function"
– Rapidly with "quick drop function"

- Actuate the "normal drop function" by to do this move the LH control lever in the direction - **b1** - up to the action point.

The lift arm is lowered slowly.



LH control lever



Potentially dangerous situation

Danger

Risk of accidents due to rapid lowering of the working attachment!
The raised working attachment is lowered rapidly when the "Quick-drop function" is activated!
Persons standing under the raised working attachment risk severe crushing injuries!

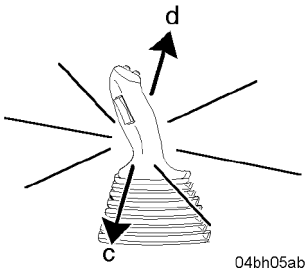
! Standing in the danger area is strictly prohibited!

- Actuate the "quick-drop function": move the LH control lever in direction - **b2** - through the action point to its limit.

The lift arm is lowered rapidly.

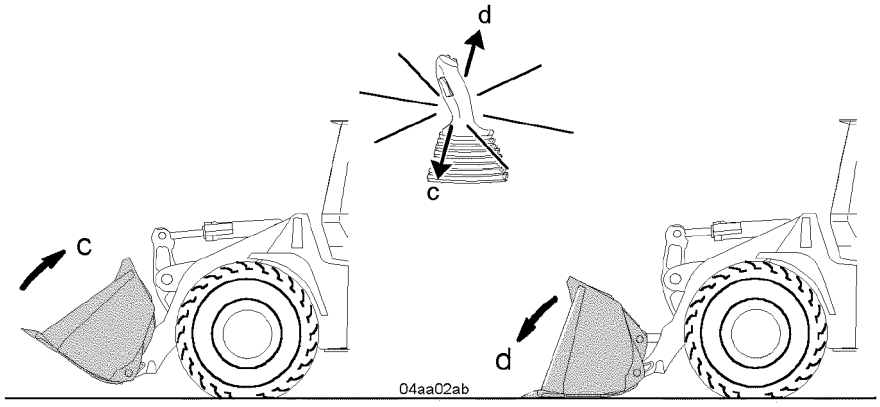
Operating the tilt cylinder

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



LH control lever

Tilting the bucket in



Bucket movement

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

The bucket is tilted in.

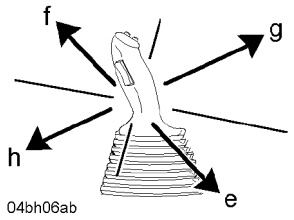
Tilting the bucket out

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

The bucket is tilted out.

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.



LH control lever

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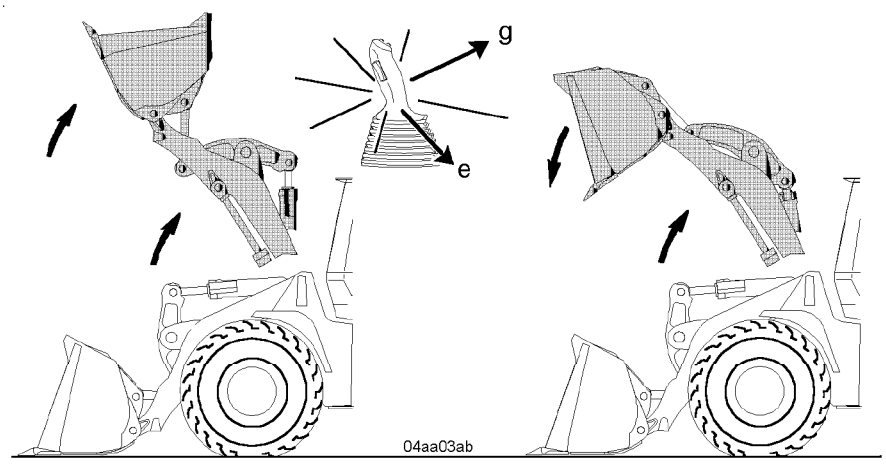
Raising the lift arm and simultaneously tilting the bucket in



Working movements

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

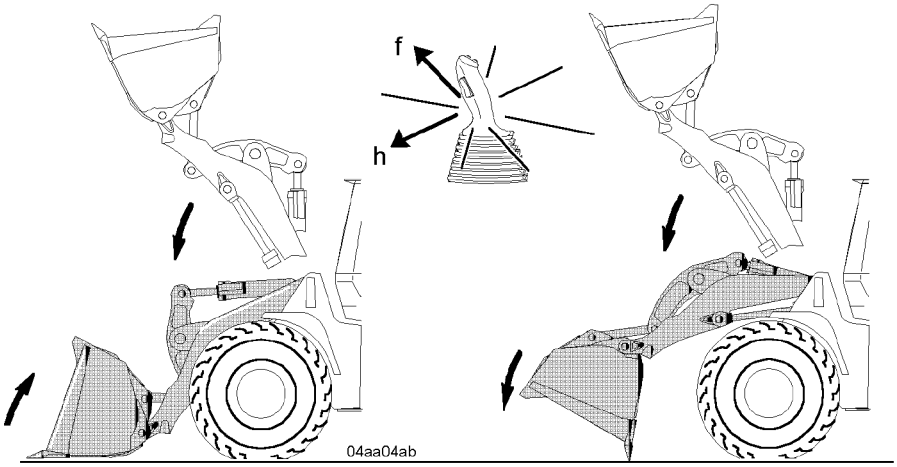
The lift arm is raised and the bucket is simultaneously tilted in.

Raising the lift arm and simultaneously tilting the bucket out

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

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

Lowering the lift arm and simultaneously tilting the bucket in



Working movements

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

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

Lowering the lift arm and simultaneously tilting the bucket out

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

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

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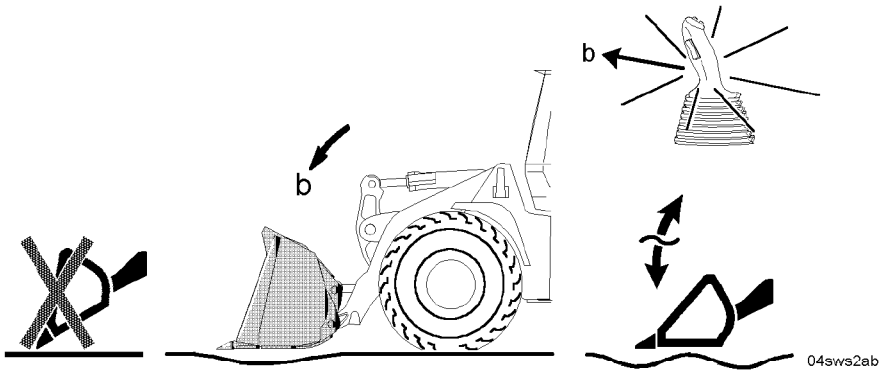
Activating the float position



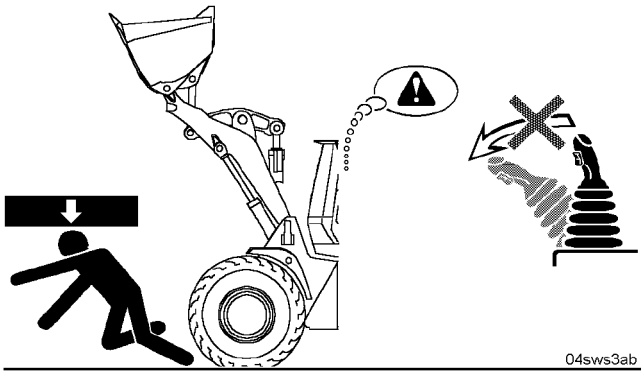
Bucket position for float position

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

Activating the float position

The procedure for activating the float position is as follows:

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



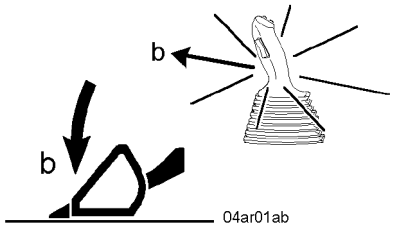
Potentially dangerous situation

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!

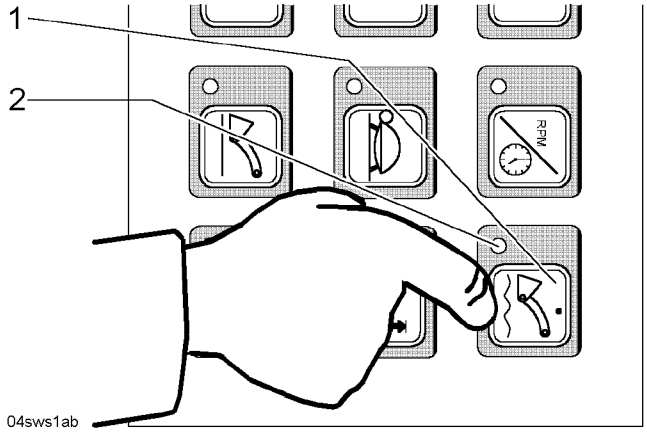
! Standing in the danger area is strictly prohibited!

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



Bucket position

LBH/02/003801/0003/6.0/en



Control unit

1 Float position button 2 LED

When button 1 for float position is turned on, the function is made ready.

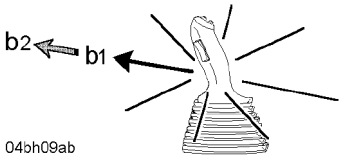
- Press the button 1 for float position.

An LED 2 on the button indicates that the function is active.

- Move the LH control lever in direction - **b2** - through the action point as far as it will go and then release it.

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

The float position function now remains active.



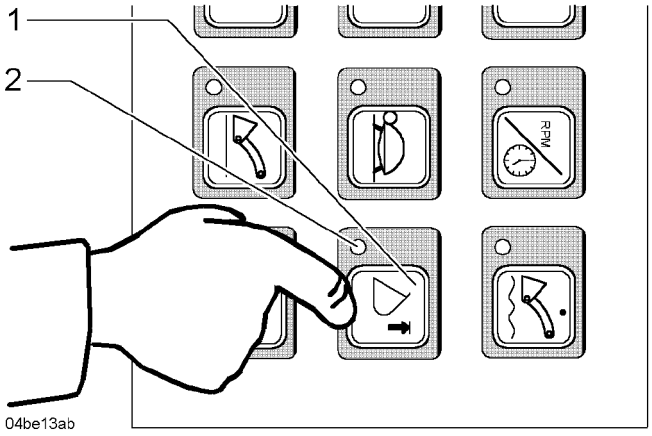
LH control lever

Activating the automatic lifting limit switch

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

Activating the automatic lifting limit switch

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



Control unit

1 Lifting limit switch button 2 LED

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- Press the button 1 to lift limit switch.

An LED 2 on the button indicates that the function is active.

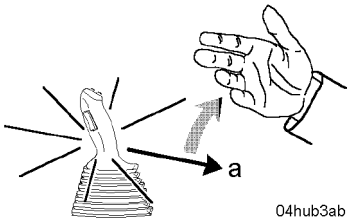
The lifting limit switch function is now active.

- 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.

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

The lifting process is automatically interrupted at this point.



LH control lever

Lifting limit switch for reduced dumping height

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

Caution

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!

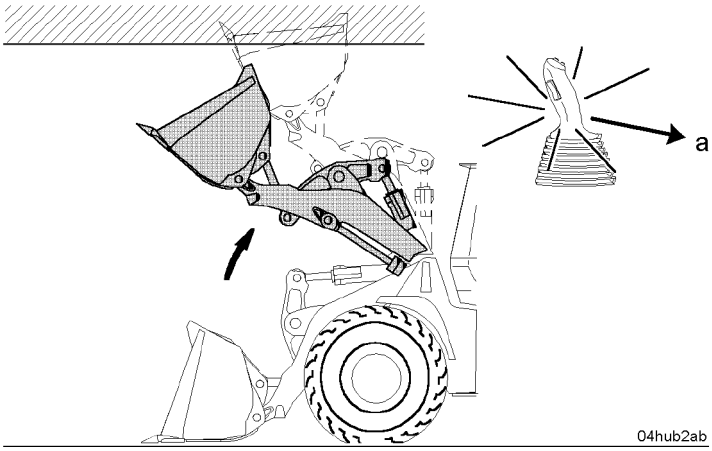
- Set the lifting limit switch for a reduced dumping height.

Setting the lifting limit switch for a reduced dumping height

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

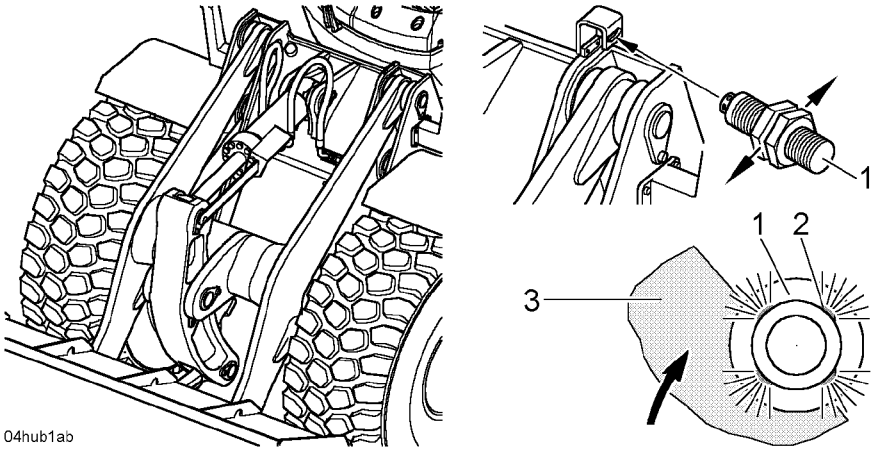
If necessary, the proximity switch can be re-adjusted.

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



Reduced dumping height

- Raise the lift arms to the required dumping height.



Proximity switch

1 Proximity switch – 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 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.

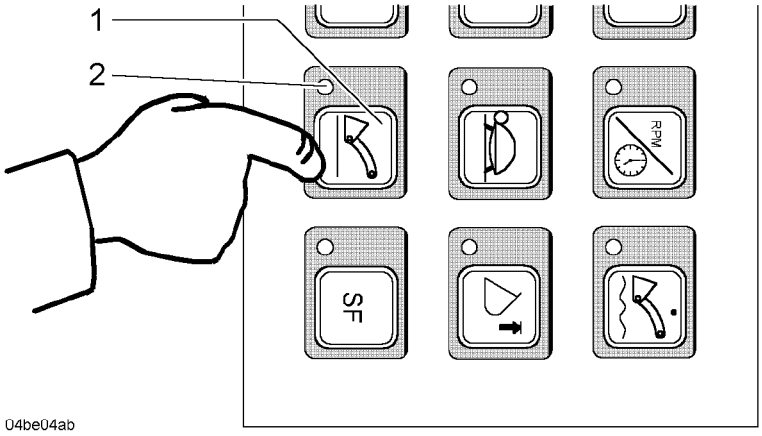
- Test the setting and re-adjust if necessary.

Activating the automatic bucket return-to-dig

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

Activating the automatic bucket return-to-dig

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



Control unit

1 Bucket return-to-dig button
2 LED

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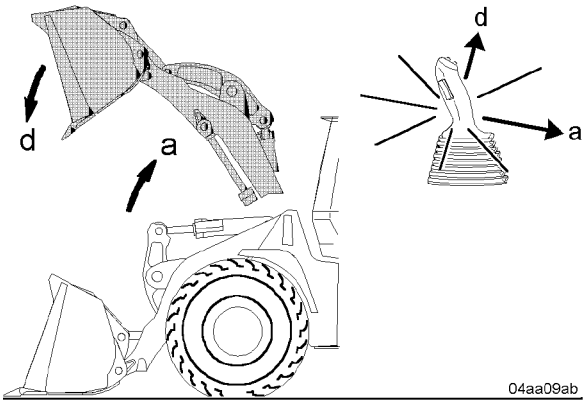
- Press button 1 for bucket return-to-dig.

LED 2 on the button indicates that the function is active.

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

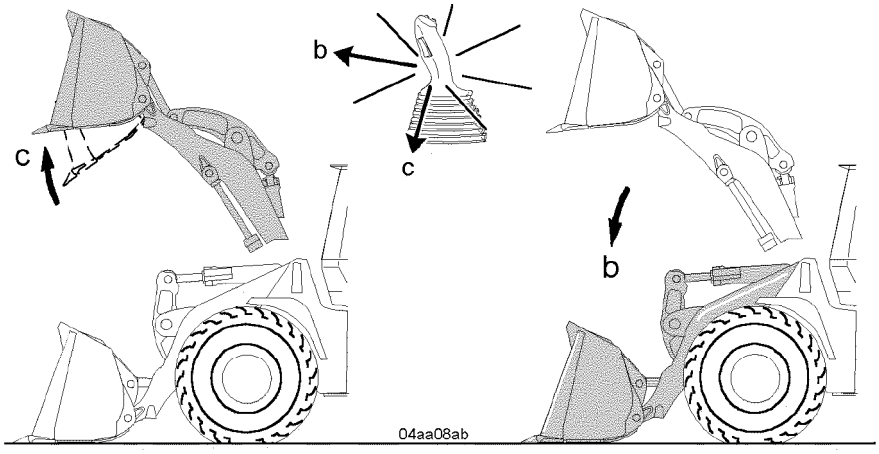
Working with the automatic bucket return-to-dig

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

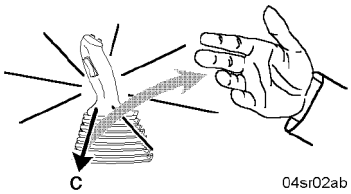


Working movements

- Raise the lift arm: Move the LH control lever in direction - **a** -.
- Tilt the loading bucket out in the raised position: Move the LH control lever in direction - **d** -.



Working movements



LH control lever

- Tilt in the loading bucket 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 solenoid.

- Lower the lift arm: move the LH control lever in direction - **b** -.

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

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Adjusting the digging position

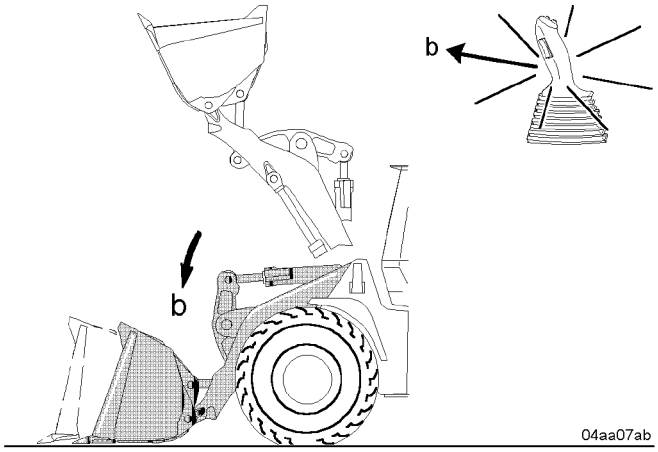
The proximity switch for the automatic bucket return-to-dig is adjusted ex-works.

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

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

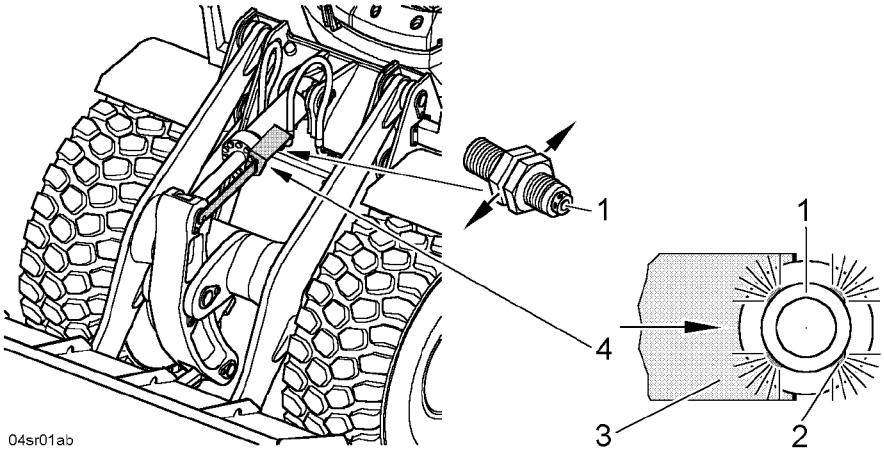
Coarse adjustment

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



Digging position - coarse

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



Setting up - bucket return-to-dig

1 Proximity switch – autom. bucket return-to-dig
2 LED
3 Positioning curve
4 Proximity switch – LFD system

- Release fixing nuts on the proximity switch 1.

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

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

- Retighten the fixing nuts on proximity switch 1.

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

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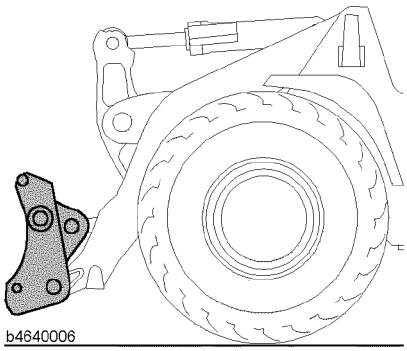
- Testing the "coarse adjustment": see the "Working with the automatic bucket return-to-dig" section.
- If required, carry out the "fine adjustment".

Fine adjustment

The required fine adjustment is obtained after several attempts.

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

3.3.7 Operating the hydraulic quick-change device



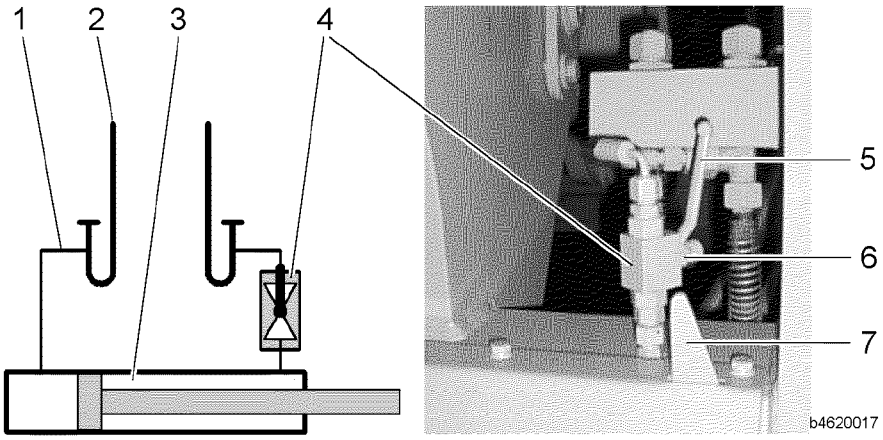
This equipment is optional.

Version: Hydraulic actuation by an additional controller.

Information on attachment and accessories:

- **Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting, must not be installed or fitted on the vehicle without the previous written agreement of LIEBHERR.**
- **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**

Operating the hydraulic quick-change device



Hydraulic quick-change device

1 Supply line for quick-change device
2 Supply line for build-on accessory set:
3 Hydr. cylinder
4 Changeover valve
5 changeover lever
6 Anti-twist lock
7 Indicator- mechanical

The hydraulic quick-change device is activated (enabled) or deactivated (blocked) with the changeover valve 4.

The changeover lever 5 is secured with an anti-twist lock 6 to prevent unforeseen operation!

Ensure that:

- the lift arm is lowered to just above the ground
- where a working attachment with an independent hydraulic supply is mounted, all cylinders, valves and so on are in the initial position or closed
- where a working attachment is mounted, make sure that this is tilted in

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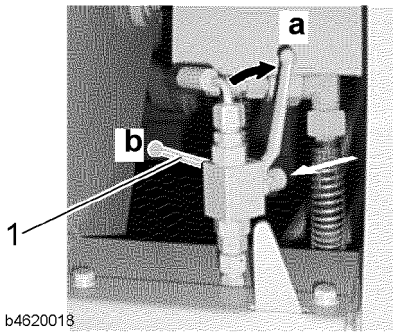
Danger

Risk of accidents due to the working attachment dropping!

! Do not activate (enable) the quick change device when the working attachment is raised!



- If you want to activate (enable) the quick change device: move the changeover lever 1 to position a and engage the anti-twist lock. The two lever positions are shown in the Fig. on the left.

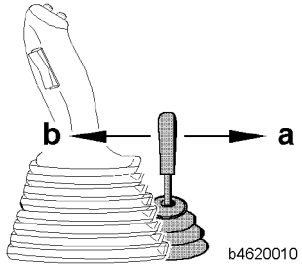
The changeover valve is thus opened.

The flow direction of the hydraulic oil is indicated by the lever position.

The function for unlocking the hydraulic quick-change device is thereby made ready.

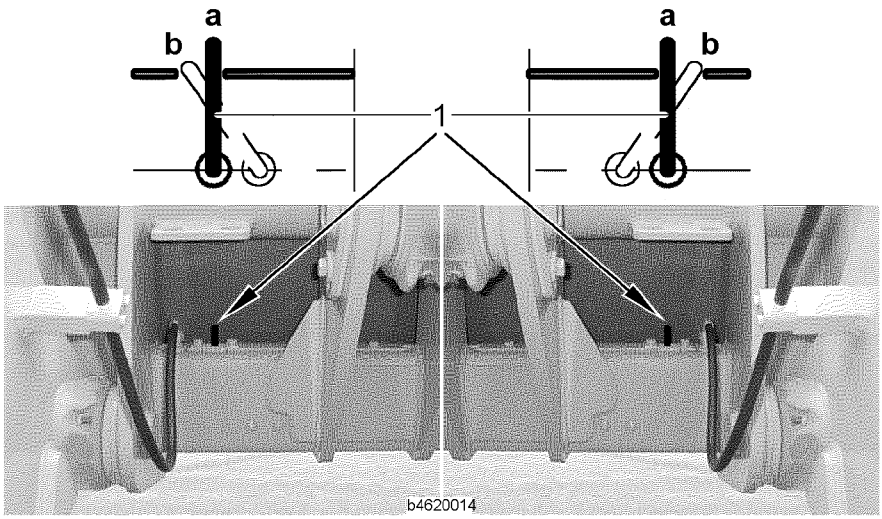
Unlocking the hydraulic quick-change device

The procedure for unlocking the hydraulic quick-change device is as follows:
Make sure that the quick change device has been activated (enabled) by means of the changeover valve 4



- Completely retract the locking pins: move the LH control lever in direction b to the stop and keep it in this position

The locking pins for the hydraulic quick-change device are retracted.



Quick-change device - view from the driver's cab

1 Indicator- mechanical
a Position - locked
b Position - unlocked

The position (retracted) of the locking pins is indicated mechanically by the display 1.

Decoupling the working attachment

This is the procedure for decoupling the working attachment.
Make sure when a working attachment is mounted with an independent hydraulic supply that the coupling to the hydraulic lines is released.

Warning

Risk of accidents due to incorrectly set down working attachment!

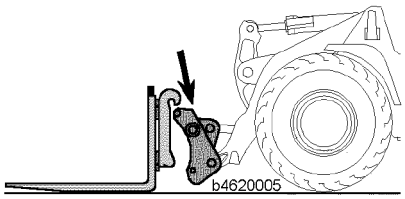
! The working attachment may in no event be set down in unsecured areas (roadways etc.).

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

Where the working attachment has an independent hydraulic supply: set down the working attachment in such a way that the hydraulic lines are not subjected to any strain!

- Secure the working attachment against tipping over!
- Carefully remove the quick-change device from the adapter-holder at the top of the working attachment.

The working attachment is now decoupled.



Disconnecting the hydraulic lines for hydraulically operated working attachments

Where the working attachment has its own hydraulic circuit, the hydraulic supply lines must be disconnected.
The procedure for disconnecting the hydraulic lines is as follows:

Warning

Risk of accidents from hydraulic lines under pressure!

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

- Shut down the diesel engine.
- Actuate all servo devices (control levers) in both directions.
- Release the hydraulic lines/quick action couplings from the vehicle.
- Make sure that no hydraulic oil leaks onto the ground!

Contaminated soil must be removed for proper disposal as the hydraulic oil can pollute the ground water.

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

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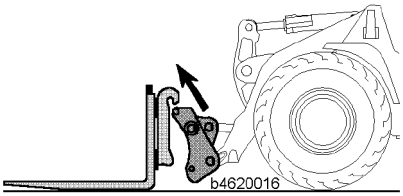
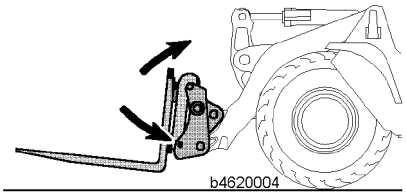
Attaching and coupling the working attachment

This is the procedure for attaching and coupling the working attachment.

Make sure that the hydraulic quick-change device is completely unlocked.



- Carefully move the quick-change device into the adapter-holder at the top of the working attachment.



- Slightly raise the working attachment and tilt it in.

In the process, the working attachment must completely engage with the quick-change device.

Locking the hydraulic quick-change device

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

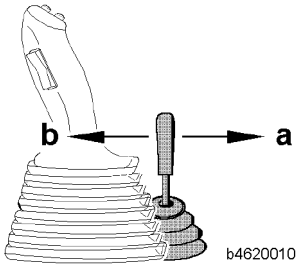
Make sure that:

– the working attachment is completely engaged in the quick-change device, so that the working attachment can be locked in place with the locking pins
– the quick change device has been activated (enabled) by means of the changeover valve 4

Danger

Risk of accidents due to the working attachment dropping!

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



- Completely extend the locking pins: move the LH control lever in direction a to the stop and keep it in this position

The locking pins for the hydraulic quick-change device extend.

The working attachment is now coupled.

Check after locking procedure

To check the locking procedure proceed as follows.

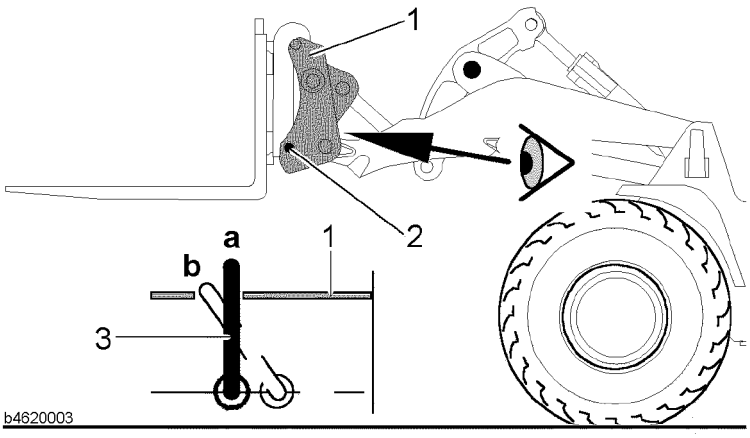
Make sure that the quick-change device has been moved to a suitable position for inspection.

Danger

Risk of accidents due to the working attachment dropping!

! Do not move the working attachment until you have checked the lock.

! Check whether the working attachment is securely locked to the quick-change device.



Quick-change device - visual inspection

1 Quick-change device
2 Locking pin
3 Indicator- mechanical

a Position - locked
b Position - unlocked

- Move the lift arm up until it is possible to view display 3.
- Get out of the vehicle and visually check that the locking pins 2 have actually locked the working attachment.
- Carry out the inpection on both sides of the vehicle.

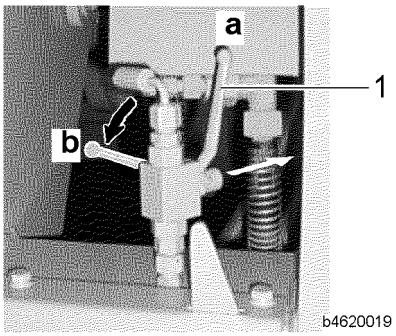
You can see that the pins are properly locked when indicator 3 is upright.
In addition, locking pins 2 must have been inserted all the way to the outer borehole of quick-change device 1.

LBH/02/003801/0003/6.0/en

Danger

Risk of accidents due to the working attachment dropping!
If the quick-change device is unintentionally locked, both personnel and the working attachment will be endangered!

! It is essential that the changeover valve is locked again after the locking procedure is finished!



Deactivate the hydraulic quick-change device with the changeover valve (block).

- Close the changeover valve: take the changeover valve 1 out of the anti-twist lock and set to position b. The two lever positions are shown in the Fig. on the left.

The changeover valve is thereby closed.

The function for unlocking the hydraulic quick-change device is thus blocked.

- Further working movements with the working attachment can only be carried out after the quick-change device has been inspected and deactivated (blocked).
- For operating a working attachment with an independent control circuit: see the description in the sections "Control lever for additional working functions" and "Working with optional equipment".

Connecting the hydraulic lines for hydraulically actuated working attachments

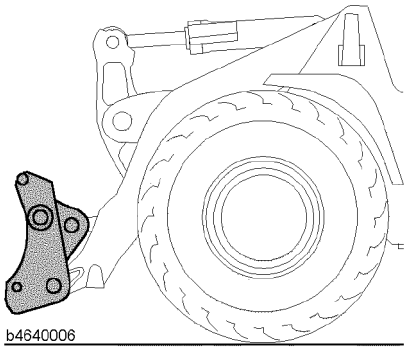
Where the working attachment has an independent hydraulic circuit, the hydraulic supply lines must be connected.

- Remove the protective caps from the hydraulic line couplings.
- Connect the hydraulic lines properly.

The following points should be observed with the connections:
– clean the line couplings before connecting
– do not connect the wrong ends of the hydraulic lines
– lay the hydraulic lines so that there is no risk of them being pinched by the operation of the working attachment
– make use of any hose retaining clips when laying the hose

- Check the hydraulic lines for any leakage after connecting.

3.3.8 Operation of the hydraulic quick-change equipment (electro-hydraulic actuation with comfort control)


b4640006

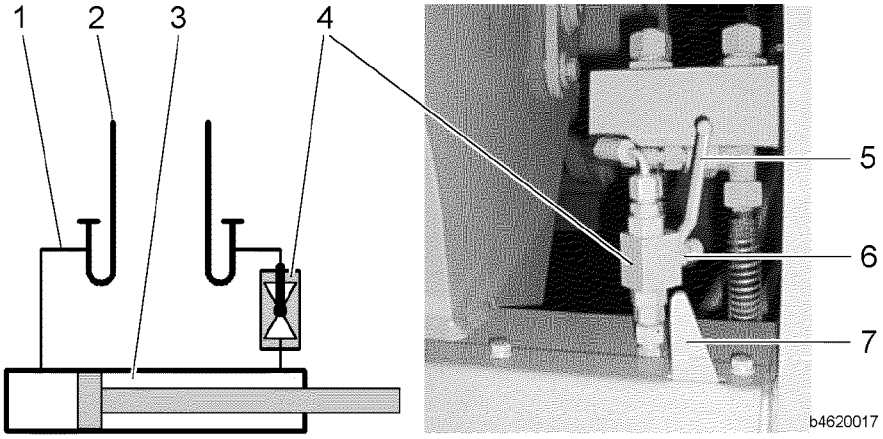
This equipment is optional.

Version: combined, electro-hydraulic actuation with comfort control

Information on attachment and accessories:

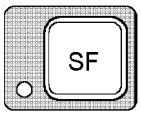
- **Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting, must not be installed or fitted on the vehicle without the previous written agreement of LIEBHERR.**
- **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**

Activation of the combined, electro-hydraulically actuated quick-change device



Hydraulic quick-change device

1 Supply line for quick-change device
2 Supply line for build-on accessory set:
3 Hydr. cylinder
4 Changeover valve
5 Changeover lever
6 Anti-twist lock
7 Indicator- mechanical



04ta18ab

The combined, electro-hydraulically operated quick-change device is activated/de-activated with the special functions button.

Make sure that:

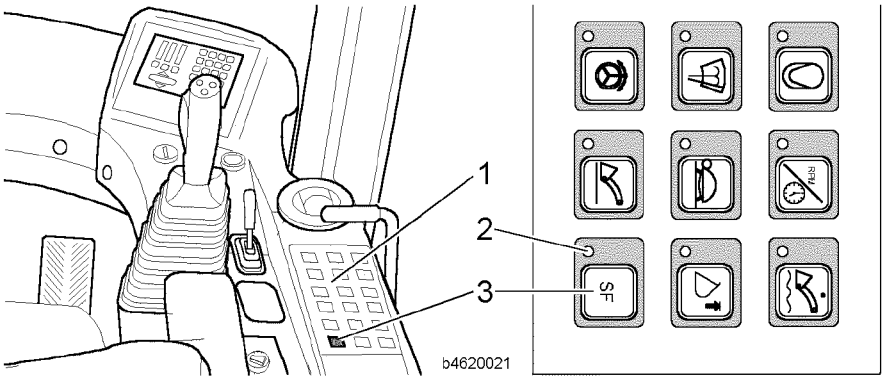
- the lift arm is lowered to just above the ground
- where a working attachment with an independent hydraulic supply is mounted, make sure that any cylinders, valves and so on are in the initial position or closed
- where a working attachment is mounted, make sure that this is tilted in
- the changeover valve 4 is open
  See the "Activation of the hydraulically operated quick-change device" section (Description of Version 1).

Danger

Risk of accidents due to the working attachment dropping!

! Do not activate button when working attachment is raised!

LBH/02/003801/0003/6.0/en



Control unit

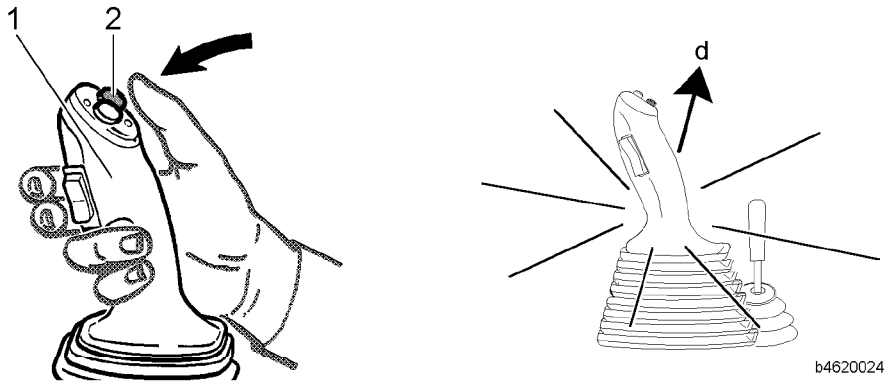
1 Control unit
2 LED
3 button – special function

- Press the button 3 for special functions.

An LED 2 on the button indicates that the function is active.
The quick-change device is now operational.

Unlocking the hydraulic quick-change device

The procedure for unlocking the hydraulic quick-change device is as follows:
Make sure that the quick-change device has been activated (enabled) by means of the button 3 for special functions.



LH control lever

1 LH control lever
2 Button - comfort control
d Direction of movement

- Press the button 2 and hold it down.

By pressing the button 2, the function operation of the lift and tilt cylinders is switched off.

- Completely retract the locking pins: move the LH control lever 1 in direction d- (to tilt out working attachment) to the stop and keep it in this position.

The locking pins for the hydraulic quick-change device are retracted.

- When the locking pins are completely retracted:
  release the button 2 and the LH control lever 1 again.

By releasing the button 2, the function operation of the lift and tilt cylinders is switched on again.

Decoupling the working attachment

Procedure: as described in the section "Operation of the hydraulic quick-change equipment".

Disconnecting the hydraulic lines for hydraulically operated working attachments

Procedure: as described in the section "Operation of the hydraulic quick-change equipment".

Attaching and coupling the working attachment

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

Locking the hydraulic quick-change device

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

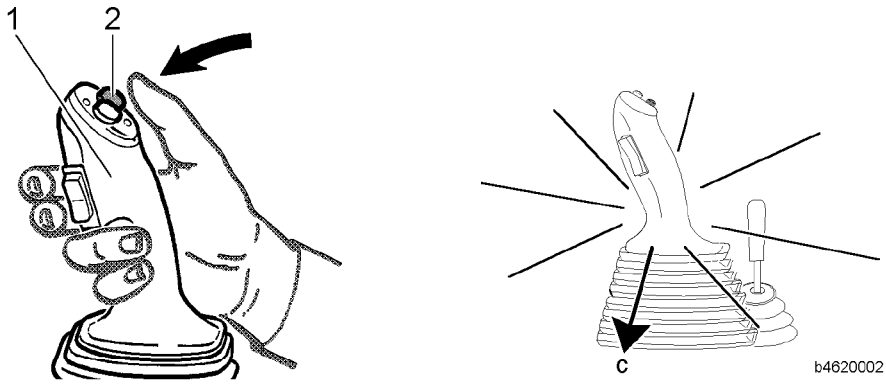
Ensure that:

– the working attachment is completely engaged in the quick-change device, so that the working attachment can be locked in place with the locking pins
– the quick-change device has been activated (enabled) by means of the button 3 for special functions.

Danger

Risk of accidents due to the working attachment dropping!

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



LH control lever

1 LH control lever
2 Button - comfort control
c Direction of movement

- Press the button 2 and hold it down.

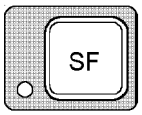
By pressing the button 2, the function operation of the lift and tilt cylinders is switched off.

- Completely extend the locking pins: Move the LH control lever 1 in direction c (to tilt in working attachment) to the stop and keep it in this position.

The locking pins for the hydraulic quick-change device extend.

- When the locking pins are completely extended:
  release the button 2 and the LH control lever 1 again.

By releasing the button 2, the function operation of the lift and tilt cylinders is switched on again.
The working attachment is now coupled.
After the locking procedure: deactivate the hydraulic quick-change device with the button for special functions.



04ta18ab

- Press the button for special functions.

The LED goes out.

The function for unlocking the hydraulic quick-change device is thereby deactivated.

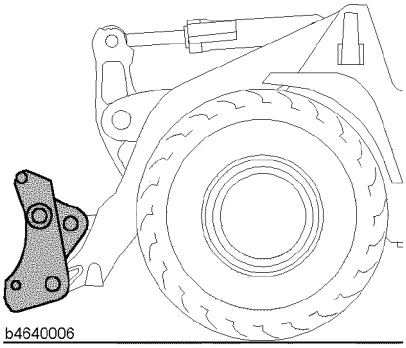
Check after locking procedure

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

Connecting the hydraulic lines for hydraulically actuated working attachments

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

3.3.9 Operation of the hydraulic quick-change equipment (electro-hydraulic actuation without comfort control)

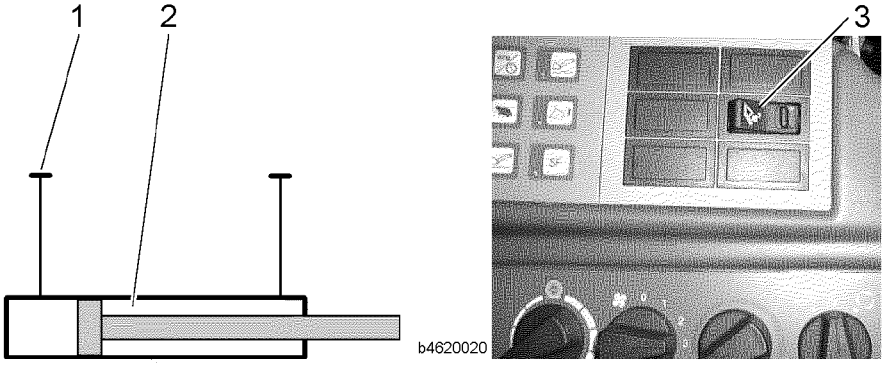

b4640006

This equipment is optional.

Version: combined, electro-hydraulic actuation with switch
Information on attachment and accessories:

- **Attachments and accessories produced by third-party manufacturers or those which have not been generally approved by LIEBHERR for installation or for external fitting, must not be installed or fitted on the vehicle without the previous written agreement of LIEBHERR.**
- **The appropriate technical documentation should be made available to LIEBHERR for this purpose.**

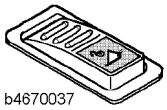
Activation of the combined, electro-hydraulically actuated quick-change device



b4620020

Hydraulic quick-change device

1 Supply line for quick-change device
2 Hydr. cylinder
3 Switch - hydr. quick-change device (option)


b4670037

The combined, electro-hydraulically operated quick-change device is activated/de-activated with switch 3 for the hydraulic quick-change device.

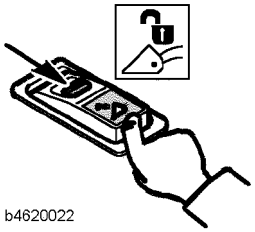
The procedure for activating the hydraulic quick-change device is as follows:

Ensure that:
- the lift arm is lowered to just above the ground
- where a working attachment with an independent hydraulic supply is mounted, make sure that any cylinders, valves and so on are in the initial position or closed
- where a working attachment is mounted, make sure that this is tilted in

Danger

Risk of accidents due to the working attachment dropping!

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


b4620022

- Release the activation block in the direction of the arrow and simultaneously push the switch forwards.


bpik0006

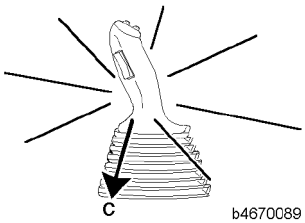
When the switch is pressed, a warning signal sounds from the instrument panel.

The function for unlocking the hydraulic quick-change device is thus made ready.

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-change device has been pressed.



b4670089

- Completely retract the locking pins: move the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and keep it in this position.

The locking pins for the hydraulic quick-change device are retracted.

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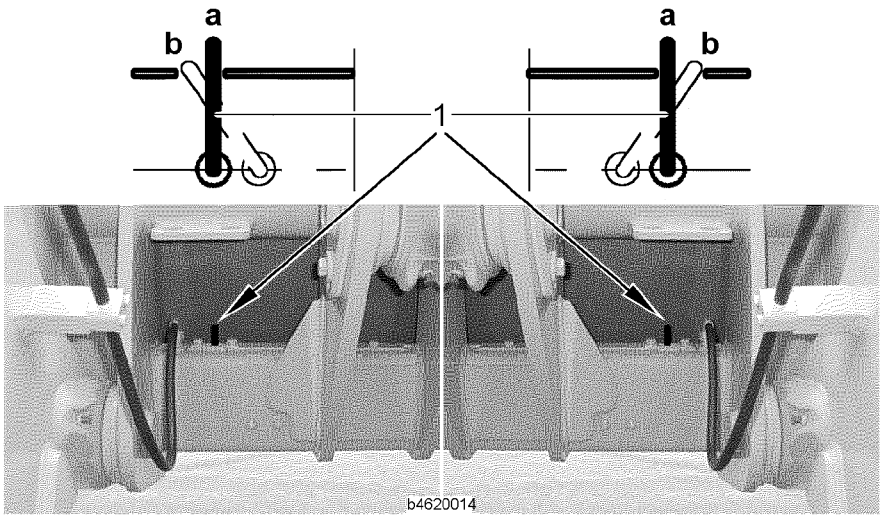


Quick-change device - view from the driver's cab

1 Indicator- mechanical
a Position - locked
b Position - unlocked

The position (retracted) of the locking pins is indicated mechanically by the display 1.

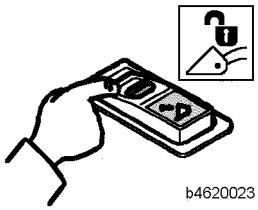
Decoupling the working attachment

This is the procedure for decoupling the working attachment.
Make sure when a working attachment is mounted with an independent hydraulic supply that the coupling to the hydraulic lines is released.

Warning

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.).



- Deactivate the hydraulic quick-change device: push back the switch – hydraulic quick-change device

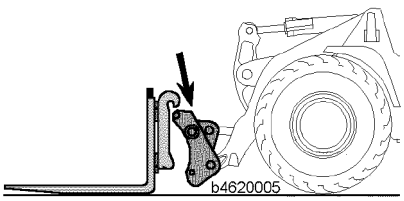
When the switch is pressed, the warning signal from the instrument panel goes out.

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

Where the working attachment has an independent hydraulic supply: set down the working attachment in such a way that the hydraulic lines are not subjected to any strain!

- Secure the working attachment against tipping over!
- Carefully remove the quick-change device from the adapter-holder at the top of the working attachment.

The working attachment is now decoupled.



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Disconnecting the hydraulic lines for hydraulically operated working attachments

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

Attaching and coupling the working attachment

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

Locking the hydraulic quick-change device

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

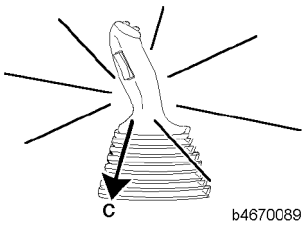
Ensure that:

– the working attachment is completely engaged in the quick-change device, so that the working attachment can be locked in place with the locking pins
– the switch for the hydraulic quick-change device is turned off.

Danger

Risk of accidents due to the working attachment dropping!

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



- Completely extend the locking pins: move the LH control lever in direction - **c** - (to tilt in working attachment) to the stop and keep it in this position.

The locking pins for the hydraulic quick-change device extend.

The working attachment is now coupled.

Check after locking procedure

To check the locking procedure proceed as follows.

Make sure that the quick-change device has been moved to a suitable position for inspection.

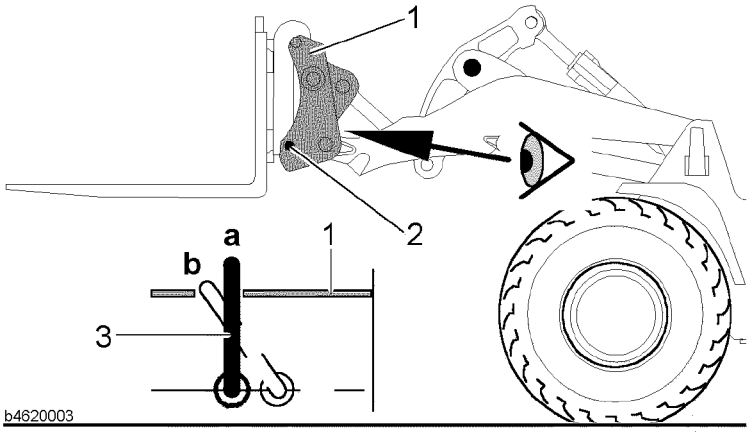
Danger

Risk of accidents due to the working attachment dropping!

! Do not move the working attachment until you have checked the lock.

! Check whether the working attachment is securely locked to the quick-change device.

LBH/02/003801/0003/6.0/en



Quick-change device - visual inspection

1 Quick-change device
2 Locking pin
3 Indicator- mechanical

a Position - locked
b Position - unlocked

- Move the lift arm up until it is possible to view display 3.
- Get out of the vehicle and visually check that locking pins 2 have actually locked the working attachment.
- Carry out the inpection on both sides of the vehicle.

You can see that the pins are properly locked when indicator 3 is upright.
In addition, locking pins 2 must have been inserted all the way to the outer borehole of quick-change device 1.

- Do not carry out any other movements with the working attachment until the check is complete.
- For operating a working attachment with an independent control circuit: see the description in the sections "Control lever for additional working functions" and "Working with optional equipment".

Connecting the hydraulic lines for hydraulically actuated working attachments

Procedure: as described in the "Operation of the hydraulic quick-change equipment" section .

3.3.10 Working with optional equipment

Operating and working with various items of optional equipment is described in this section.

Optional equipment:
- Forklift
- Refuelling pump

Forklift operation

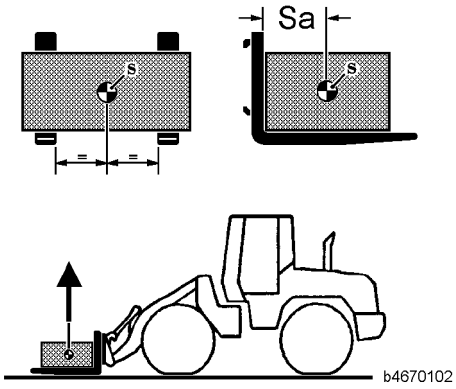
For forklift operation with P-kinematics lift arm:
- This only applies for vehicles with attached P lift arm
  The parallel kinematics enables parallel guidance of the load over the entire lifting range during lifting or lowering.

For forklift operation with lift arms with Z-bar kinematics:
- In the case of the lift arm with Z-bar kinematics, no parallel movement is possible.
  This means, that the attachment tilts in during the lift movement up to 2/3 of the max. lift height and with further upward lift movement it tilts out again, but it does not tilt down forwards.
- Due to the less favourable lever ratio of the Z-bar kinematics in the topmost lifting range, restrictions in load bearing capacity may result
  See also "Load bearing tables for forklift operation" section .

The procedure for forklift operation is as follows.

Make sure that the working attachment is securely locked to the quick-change device.

See the description in the sections "Operation of the hydraulic quick-change device", "Check after locking procedure".



Distance from centre of gravity

S Centre of gravity Sa Distance from centre of gravity

Caution

Risk of damage to load and vehicle!
When using forklifts, only use forks with prongs of suitable length and make sure that these do not project beyond the load. Otherwise goods or pallets lying in front of the forks could be damaged.
! Make sure that forklifts are operated correctly!

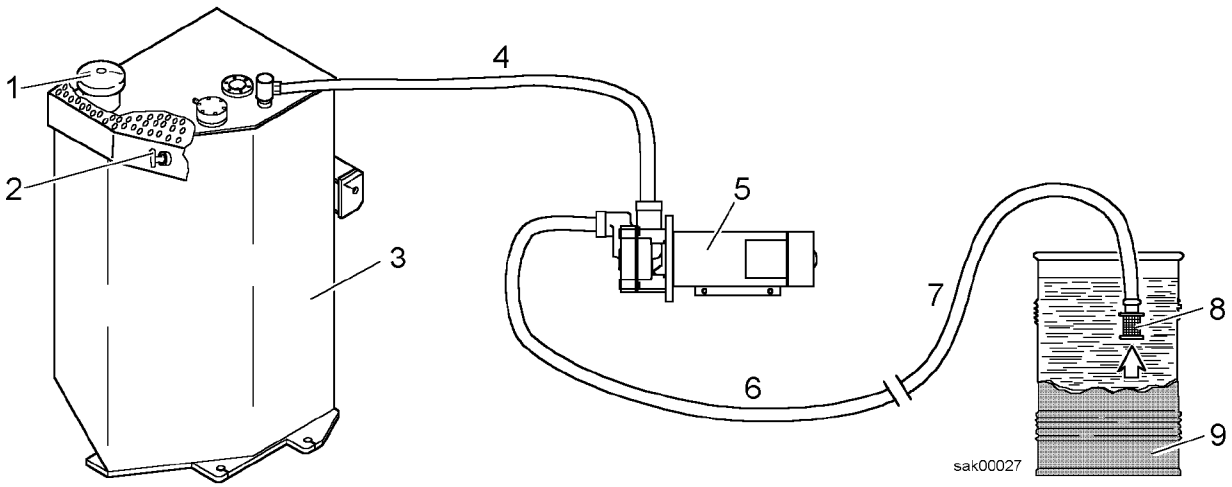
- When you lift the load: make sure that the load is resting as close as possible to the vertical limb of the fork prong.
  Pick up the load: make sure that the centre of gravity Sa of the load is correctly positioned.

Warning

Risk of accidents due to the vehicle tipping over!
! Make sure that forklifts are operated correctly!

- Raise the lift arm to the transport position (approx. 30–-40 cm above the ground).
- When the forklift is empty, tilt it in slightly and keep it low.
- When carrying a load, tip the forklift up slightly and keep the load low.
- When on slopes or inclines, always keep the load at the uphill end!
- Never drive on slopes or inclines!
- Never turn on slopes or inclines!
- When a high unloading position is unavoidable:
  do not raise the lift arms until you have reached the unloading point.
- When a low unloading position is required:
  do not lower the lift arm until you have reached the unloading point.

Refuelling procedure with refuelling pump



Refuelling pump

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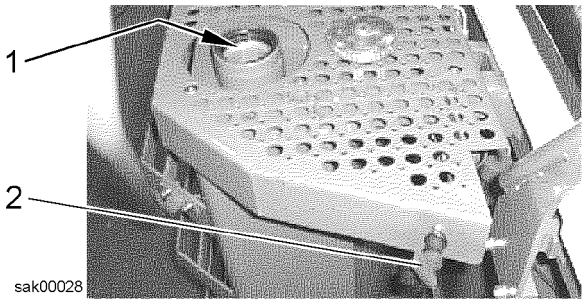
Make sure that:

- the vehicle is in maintenance position 1
- the suction line extension 7 (with suction strainer) is connected to the suction line 6 behind the engine compartment – door Make sure that the suction strainer 8 is not damaged, otherwise the refuelling pump 5 is not protected against foreign bodies.
- the suction line extension 7 with suction strainer 8 can reach to the bottom of the tank 9 (so that the tank can be completely drained)
- the battery main switch is turned on
- the sealing cap 1 on the filler neck - fuel tank is open
- the key for the refuelling pump switch 2 (next to tank filler cap) is inserted

Starting up the refuelling pump



Fuel tank

Warning

Risk of burns and explosions!

! In no event are naked flames or lighted cigarettes allowed in the vicinity during the refuelling procedure.

- Turn the key of the switch 2 to "ON". The refuelling procedure starts.

Caution

Danger due to the fuel overflowing from the filler neck!
The refuelling pump does not switch off automatically which could lead to fuel overflowing from the filler neck!

! Observe the refuelling procedure via the fuel-tank filler neck 1.

- When the refuelling process is complete, turn the key in the switch 2 to "OFF" and remove the key. Close the fuel-tank sealing cap 1.
- Disconnect suction line extension 7 (with suction strainer) from the suction line 6 and seal lines with dummy plugs.

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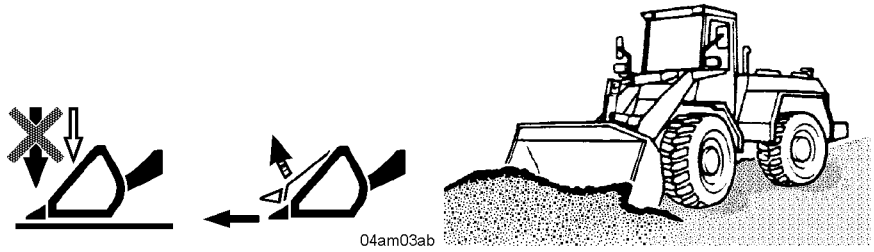
3.3.11 General working methods

The routine working methods are described in this section.

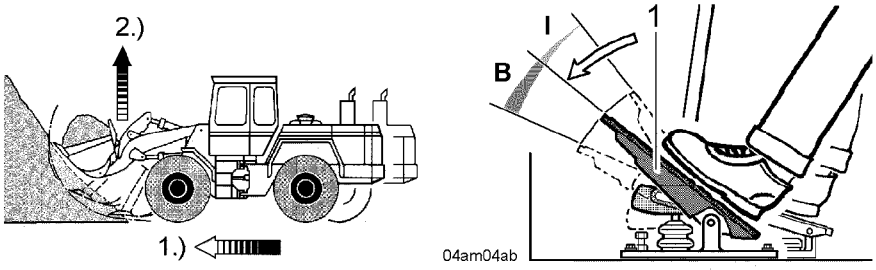
Picking up and transferring bulk materials

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



- Do not work with a strong downwards pressure on the bucket.
- If you do have to promote the flow of the bulk material into the bucket gently tilt it in and out.

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



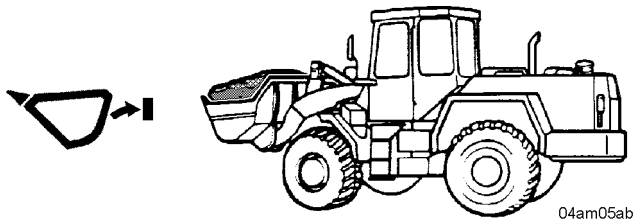
Power distribution by INCHING

1 Brake- inching pedal
I range - INCHING
B range - BRAKING

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

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

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

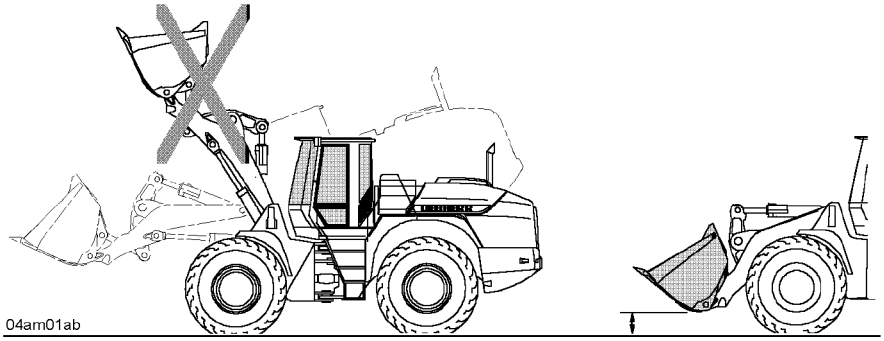


- The loaded bucket is tilted in to its limit and the lift arm is raised.

Transporting and transferring bulk materials

The bucket should be moved into the transport position to improve the vehicle'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 vehicle tipping over

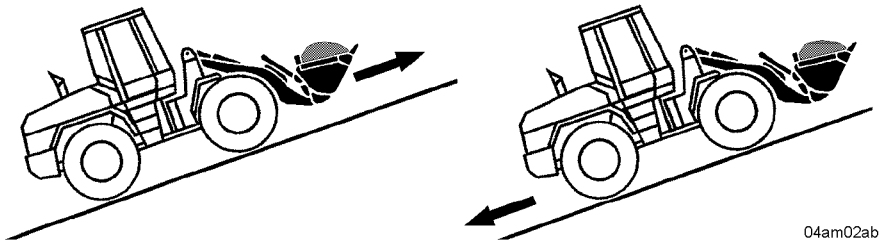
Warning

Risk of accidents due to the vehicle tipping over!
There is a risk that the vehicle might tip over when the lift arm is raised due to a shift in the centre of gravity!

! Observe the max. permissible 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

LBH/02/003801/0003/6.0/en

Warning

Risk of accidents due to the vehicle tipping over!

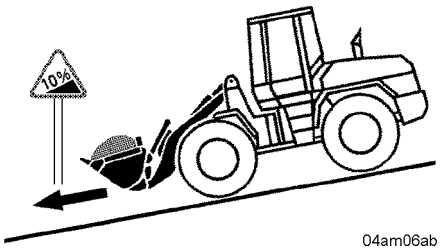
! When transporting a load on a steep slope, keep the loaded bucket low.

- 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 slopes".



Slopes

Warning

Risk of accidents due to the vehicle tipping over!

The load at which the vehicle 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!

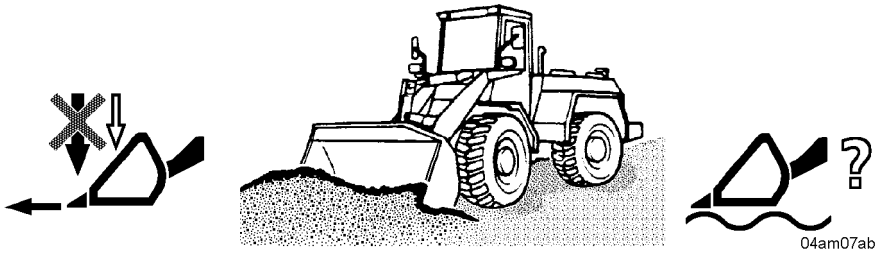
- Select the lowest possible travel range.
- Ease off the gas pedal.
- Drive downhill carefully.

Grading work

Keep the bucket base horizontal when grading.

Grading

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

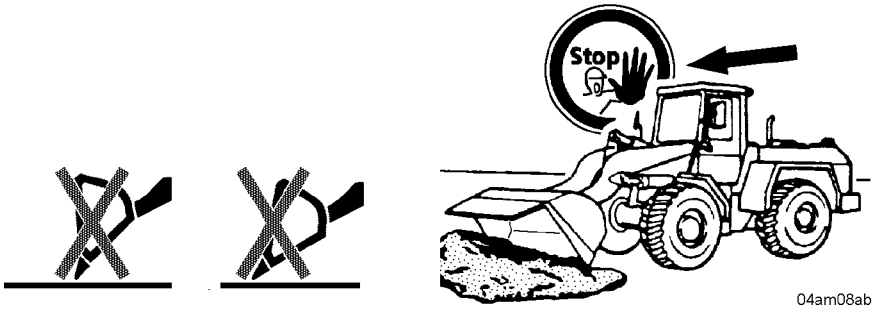


Grading procedure

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

or

■ Use the function – float position: Refer to the sections "Operating the lift arm", "Activating the float position".



Impermissible bucket positions

Caution

Risk of damage to the vehicle!
The vehicle may be damaged during grading work if the bucket hits a hard object when it is tilted out while the machine is moving "forward"!

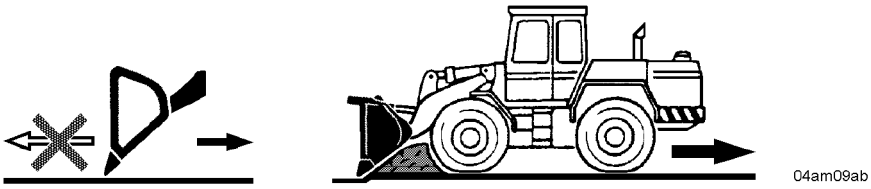
! Do not grade in travel direction "forward" when the bucket is tilted out!

- Position the bucket base parallel to the ground.

or

- Gently set the bucket base down.

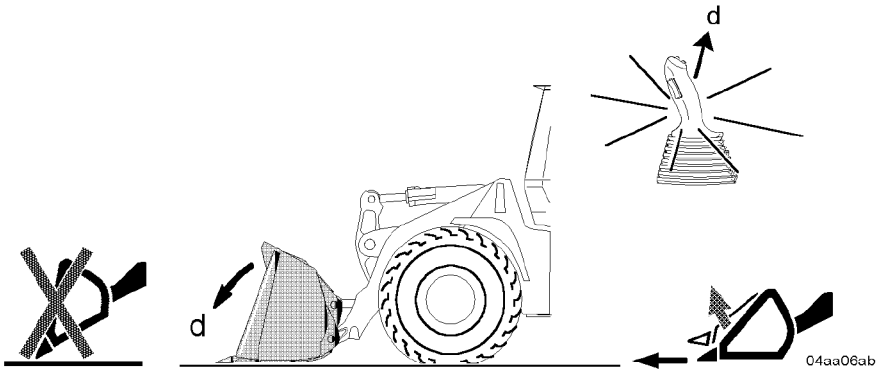
Bulldozing



- Tilt the bucket downwards and reverse the vehicle.

Loading from a tip

Picking up bulk material



Bucket position

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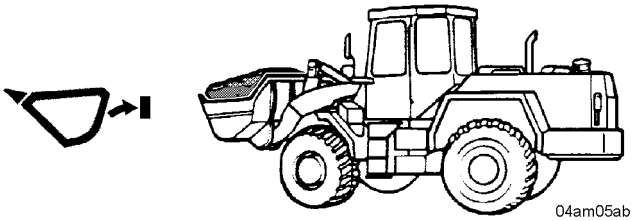
Caution

Risk of damage to the vehicle!
The lift arm may be damaged, if when clearing away bulk material in travel direction "Forward" with a tilted out bucket, you drive into a hard obstacle at speed!

! When clearing away bulk material, do not drive into the pile with the bucket tilted out!

- Set down the loading bucket horizontally on the ground.
- Drive the bucket into the material, slightly tipping up the bucket in the process.
- If you do have to promote the flow of the bulk material into the bucket gently tilt it in and out while driving the bucket into the material..
- In addition, press down the brake / inching pedal: see the "Picking up and transferring bulk materials" section .

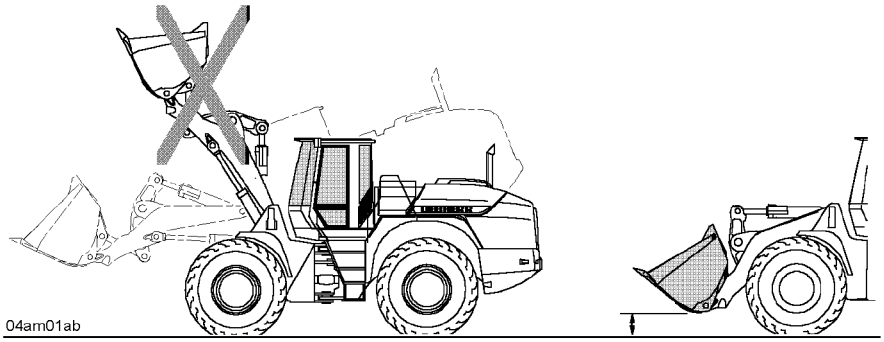


Bucket position

- The loaded bucket is tilted in to its limit and the lift arm is 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.



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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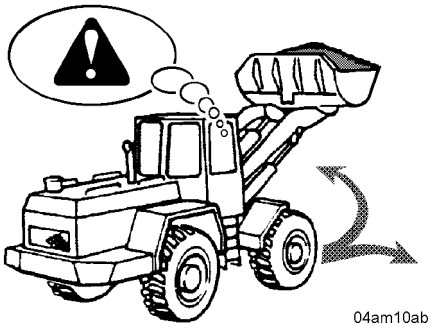


Danger of the vehicle tipping over

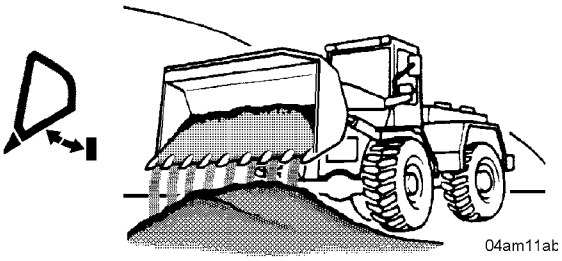
Warning

Risk of accidents due to the vehicle tipping over!
There is a risk that the vehicle might tip over when the lift arm is 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 arm until just before reaching the unloading point.

Dumping



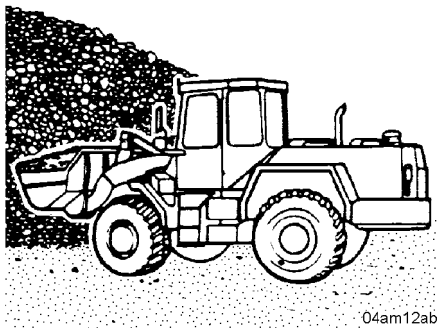
Dumping

- Tilt the bucket out.
- Loosen material adhering to the bucket: quickly tilt the bucket in and out, briefly jolting against the bucket arm stops in the process.

Loading from slopes or banks

Material removal from a slope

Remove normal loading material such as sand or gravel as follows.

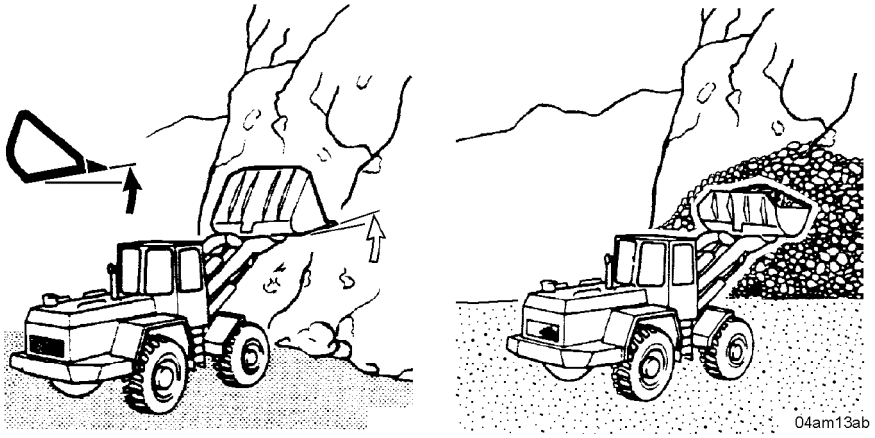


Bulk material removal 1

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

Material removal from a bank

Remove especially hard materials such as rock as follows.



Bulk material removal 2

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

Warning

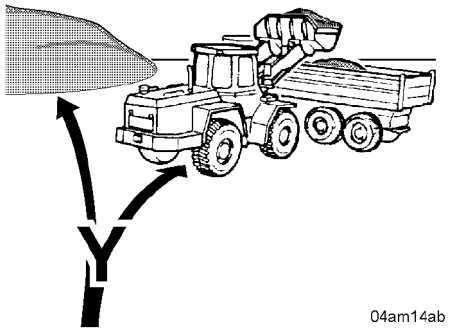
Risk of accidents due to falling material!

! Do not work under overhangs!

- Remove overhangs first and look out for falling material.

Loading bulk transport vehicles

Loading paths



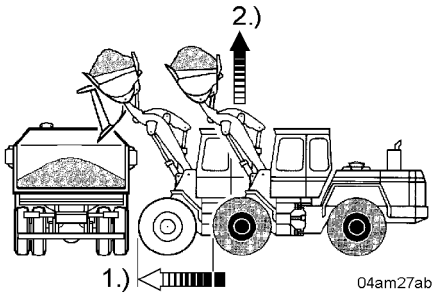
Y-movements

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

If possible make a **"Y-movement"**. Also refer to the section "Driving mode" under "Reversing".

Loading procedure

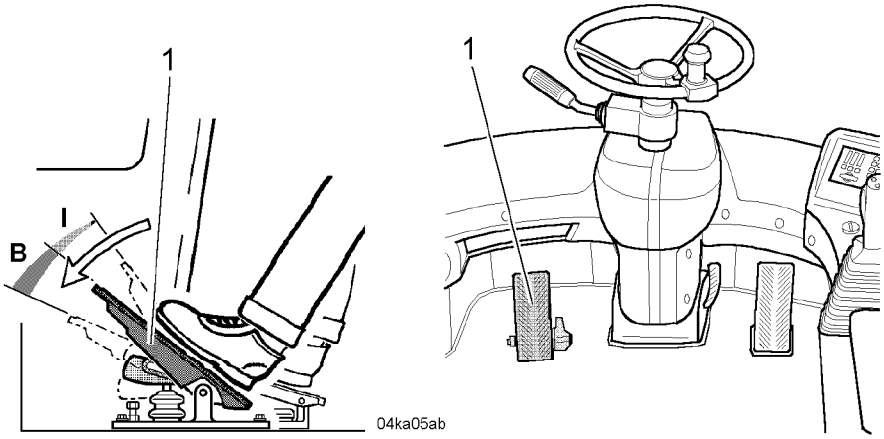
In order to speed up the loading procedure, the vehicle should be braked in front of the truck with the brake / inching pedal.



Unloading position

This yields the following benefits:
1.) responsive adjustment of the speed
2.) optimum performance adaptation for the working attachment
See also the "Picking up and transferring bulk materials" section .

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



Brake- inching pedal

1 Brake- inching pedal
I range - INCHING
B range - BRAKING

- Brake the vehicle: 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 vehicle 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 so that the bulk material is dumped in the middle of the dump body.
- With longer vehicles, load from the front backwards.

Loading large rocks

Make sure that the floor of the transport vehicle is buffered against the impact of large rocks.

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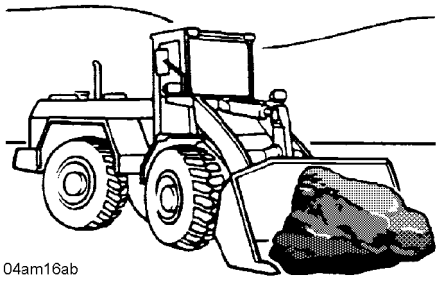


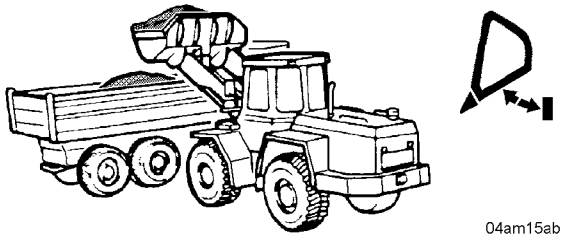
Bucket loading

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

Loading compacted material

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 sections "Operating the lift arm", "Activating the automatic bucket return-to-dig".



Dumping

- Tilt the bucket out.

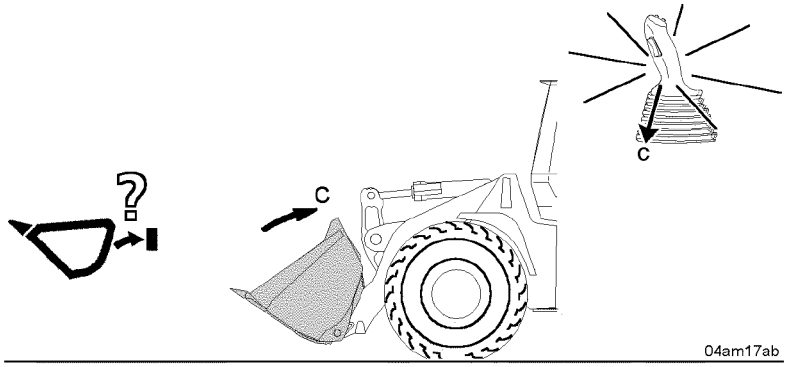
Caution

Risk of damage to the vehicle!
Unnecessary jolting against the bucket-arm-stops when tilting in and out can lead to accelerated wear to the bolts and bushes on the kinematics!

! Avoid unnecessary impacts against the stops!

- Loosen material adhering to the bucket: quickly tilt the bucket in and out, briefly jolting against the bucket arm stops in the process.

Moving the vehicle back



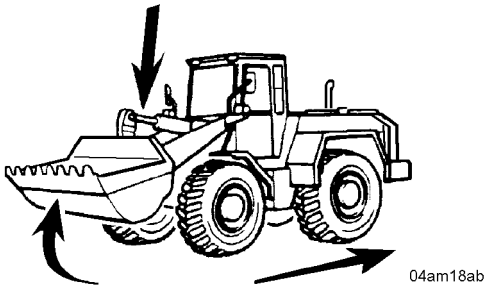
Bucket position

Caution

Risk of damage to the vehicle!
Unnecessary jolting against the bucket-arm-stops when tilting in and out can lead to accelerated wear to the bolts and bushes on the kinematics!

! Avoid unnecessary impacts against the stops!

- Tilt the bucket in.



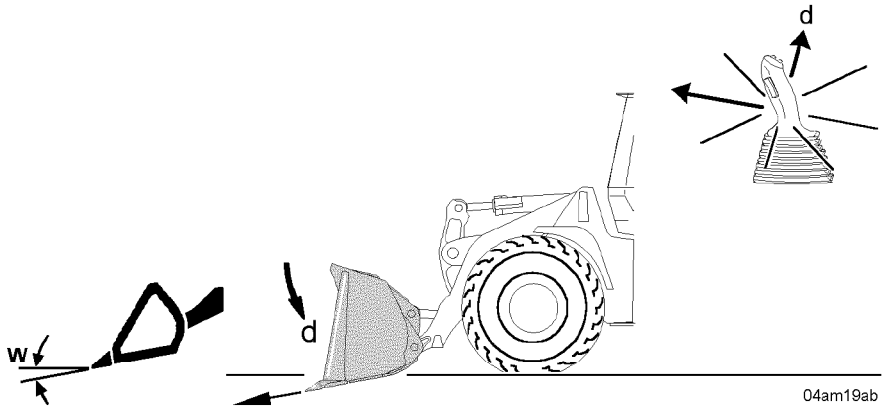
Lift arm position

- When moving backwards, lower the lift arm.

Excavation

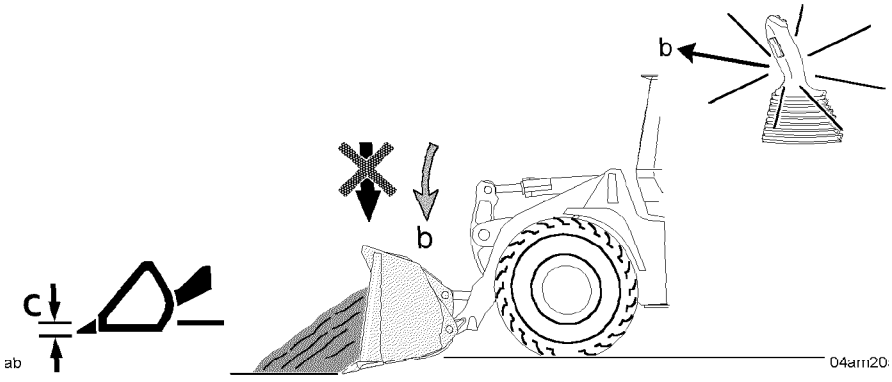
Excavating soft material

Excavate soft material as follows.



Insertion angle

- Lower the loading bucket onto the ground.
- Set a small insertion angle - **W** within a max. of 10°.



Penetration depth

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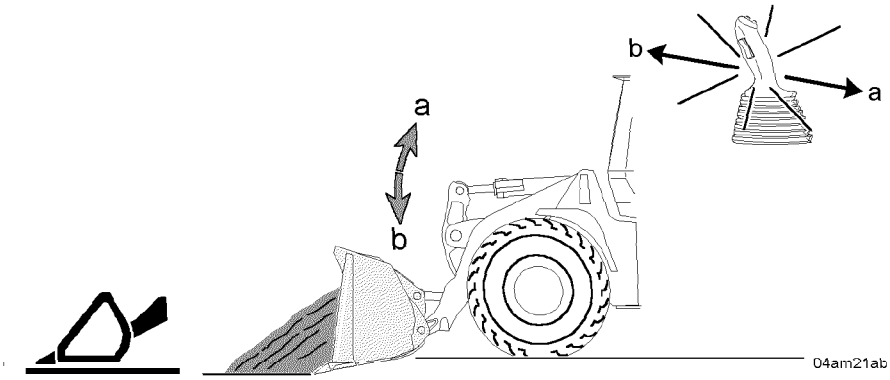
- When approaching with the vehicle, simultaneously press the lift arm down, until a sufficient penetration depth – **C** has been reached.
- The following procedure is recommended to avoid any possible loss of traction: Do not work with a strong downwards pressure on the bucket.

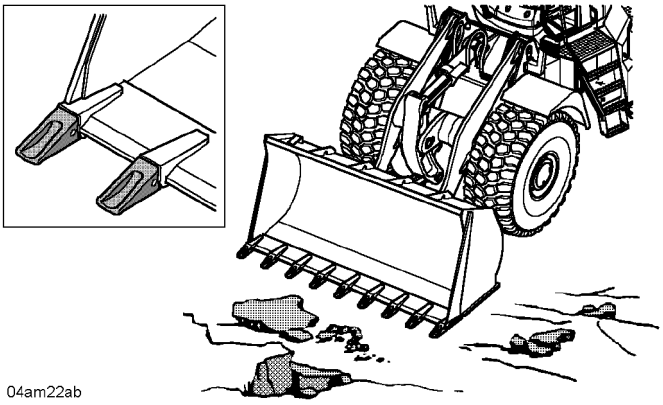


Lift arm movement

- Make horizontal cuts while driving forwards.
- The work is made easier by raising or lowering the lift arm as appropriate.

Excavating hard material

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

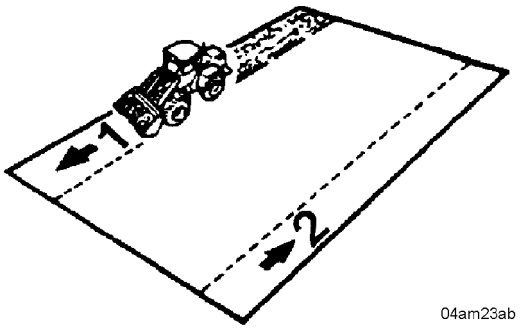


Working attachment

- Additional procedure: See the "Excavating soft material" section .

Example of foundation excavation

Excavate foundations as follows.



Longitudinal cuts

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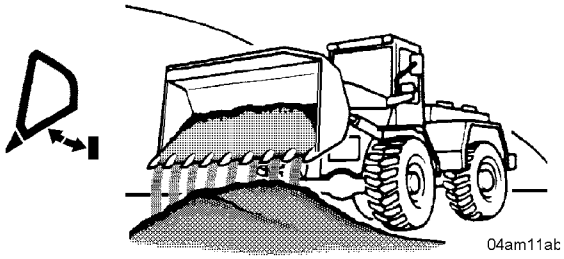
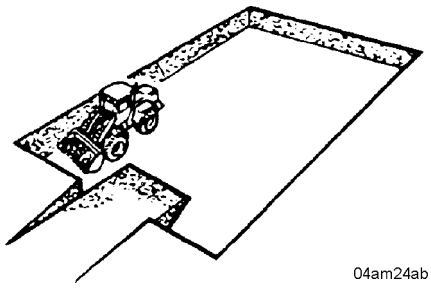
- Cut an initial trench with the bucket along the outer edge of the excavation.
- When the first cut is down to a depth of approx. 1 metre: start a second trench along the opposite side.
- Work the area between down to the same depth as the side trenches.



Heaping material

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

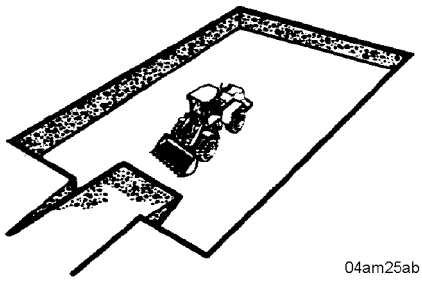


Corners of the foundations

- When the foundations have been excavated to the required depth: dig out the corners and transport the material out of the excavation.

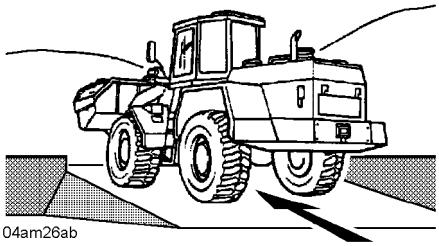
Driving out of the excavation

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



Exit ramp

- To make an exit for the vehicle: dig out the centre of the ramp.



Direction of transportation

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

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3.3.12 Transporting the vehicle

Slinging the vehicle from a crane

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

Refer to the section "Safety regulations" when slinging the vehicle from a crane.

The following precautions should be taken before slinging the vehicle from a crane.

Precautions:

- lower the working attachment and tilt back the loading equipment to its limit
- engage articulation lock
- move all control levers to neutral
- engage the parking brake
- lock the working hydraulics
- shut down the engine,
- close and lock all doors and hoods on the vehicle

For more detailed descriptions, see the "Operation, handling" section.

Obtain information about:

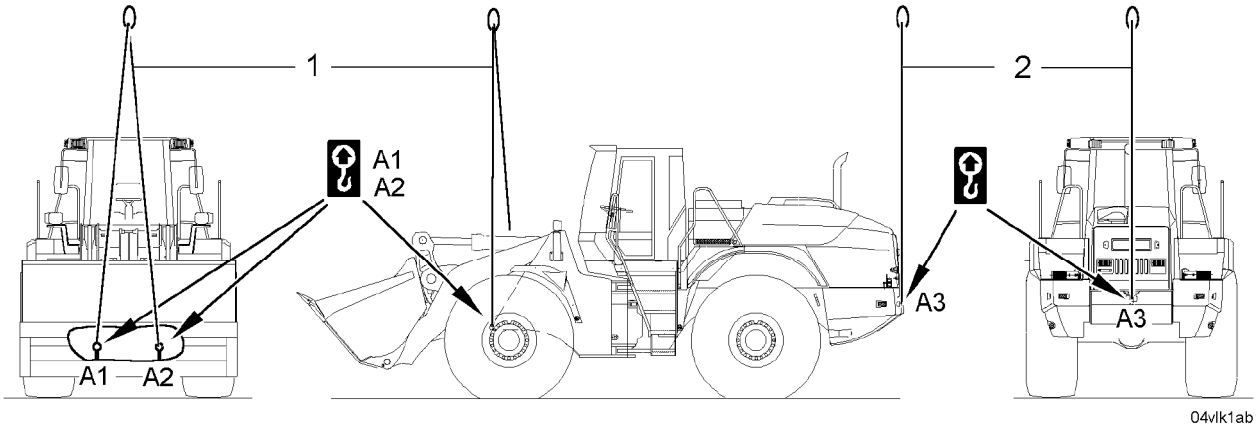
- weight and collision masses of the vehicle: see the "Technical data" section
- the required load bearing capacity and lengths of the lifting tackle

Loading for truck or rail transport

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

Required equipment:

- lifting tackle 1: rope length - min. length = 5.0 m.
- lifting tackle 2: rope length - min. length = 4.5 m.



Sketch 1 of slung vehicle

1 Lifting tackle – 2-strand rope
2 Lifting tackle – 1-strand rope

A1 Slinging and lifting point right-hand, front

A2 Slinging and lifting point left-hand, front

A3 Slinging and lifting point, rear

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Danger

Risk of accidents due to suspended/falling load!

! Standing under the vehicle when it is suspended is strictly prohibited.

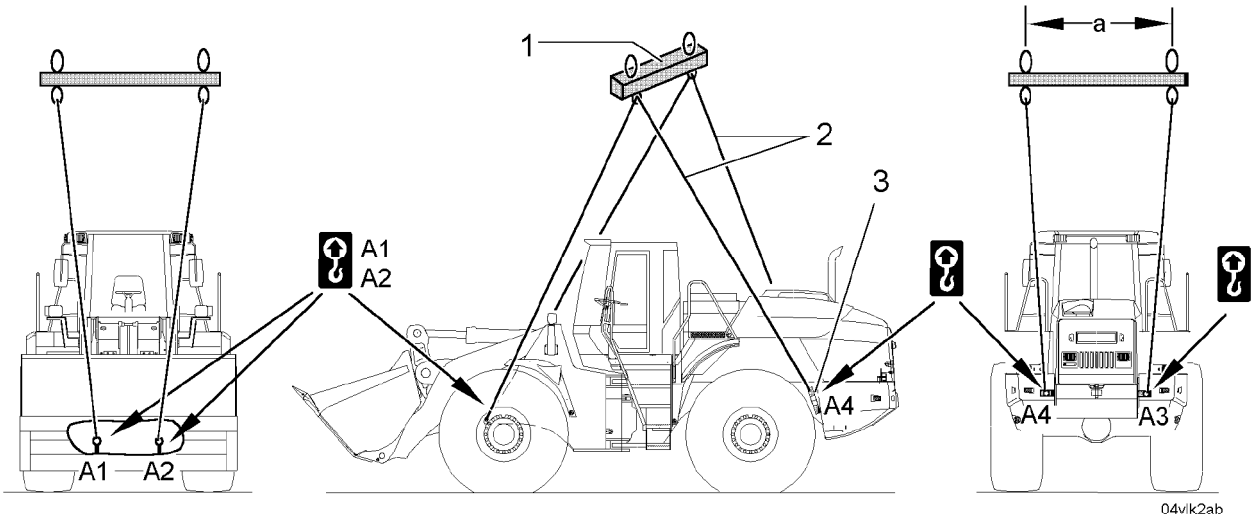
- Fix/attach the lifting tackle to the slinging and lifting points A1, A2, A3 provided on the vehicle.
- Raise and load the vehicle with due care.

Loading for transport by ship

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

Required equipment:

– slinging lug 3: is available as optional equipment – LIEBHERR order No. 9840127
– slinging attachment/yoke 1 of the shipping company: minimum dimension a = 2.5 m
– lifting tackle 2: rope length - min. length = 5-6 m



Sketch 2 of slung vehicle

1 Slinging device/-bar
2 Lifting tackle – 2-strand rope
3 Loading lug

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!

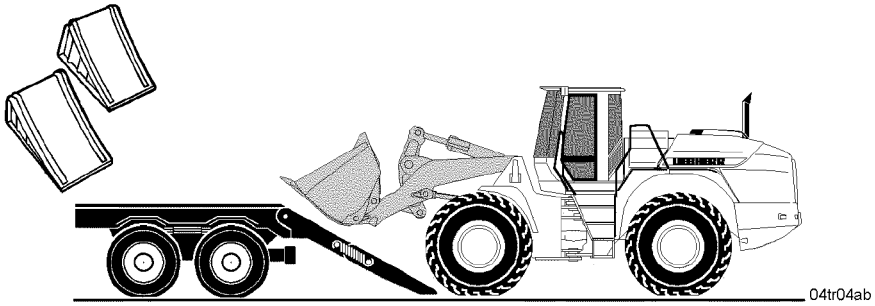
! Standing under the vehicle when it is suspended is strictly prohibited.

- Remove the mudguards at the rear left- and right-hand side of the vehicle.
- Attach the slinging lugs 3 to the rear left- and right-hand side of the vehicle.
- Fix/attach the lifting tackle to the slinging and lifting points A1, A2, A3, A4 provided on the vehicle.
- Raise and load the vehicle with due care.

Transporting the vehicle by road or rail

Before driving onto the loading bed

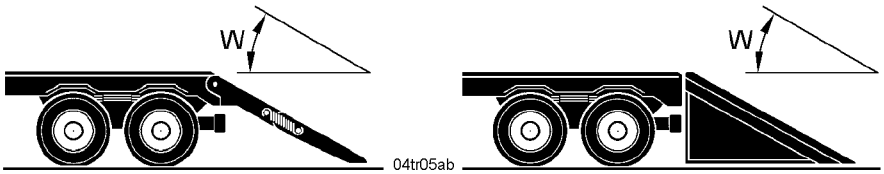
The following precautions should be undertaken before driving onto the loading bed.



Loading the vehicle onto the transporter

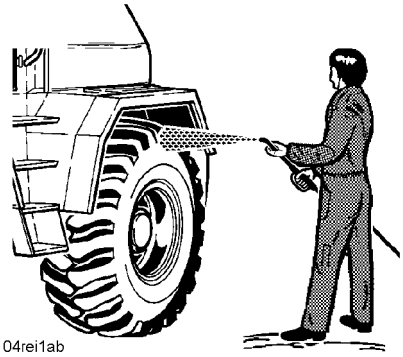
Precautions:

– have wheel wedges ready
– have suitable tensioning ropes or chains ready to lash the vehicle down



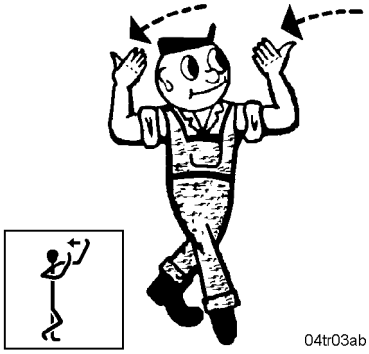
Ramp inclination

A ramp should be provided for driving the vehicle onto the loading bed.
The inclination of the ramp - **W** - may not exceed 30°.
Any snow, ice or mud on the tyres should be cleaned off before the vehicle is driven up the ramp.



Wet cleaning

Driving onto the loading bed



For more detailed descriptions, see the "Operation, handling" section.
When driving onto the loading bed get a second person to give you signals!

Make sure that someone is posted who can give the vehicle driver the required signals.

Persons giving directions must always take up a position to one side of the vehicle!

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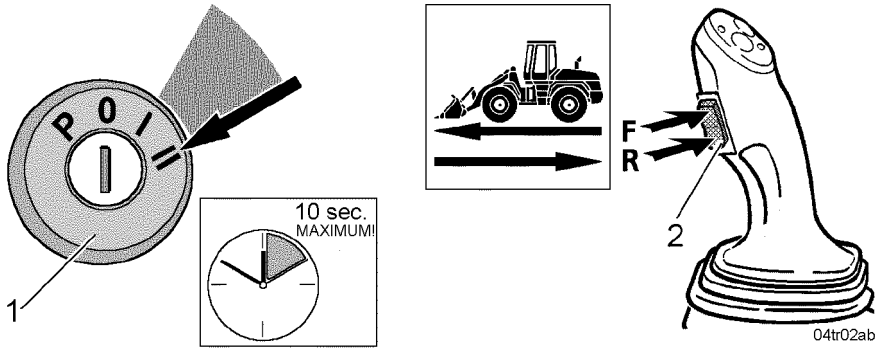
When driving onto the transporter bed proceed as follows:



Starting procedure and selection of travel direction

1 Starter switch 2 Switch for travel direction

- Start up the engine.

Situation once the engine is started:
– travel range - **A2** -(automatic) is automatically selected
– parking brake is automatically activated

Also refer to the sections "Starting the diesel engine" and "Driving mode".

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

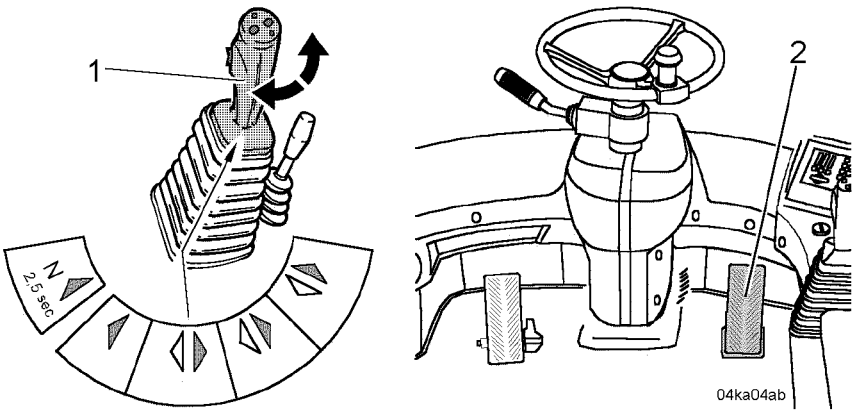
Warning

Risk of accidents if vehicle is driven without due care!
If the vehicle 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 vehicle!

Caution

Risk of accidents if vehicle is not driven with due care!
If the vehicle is not driven with due care, the transporter and the machine being loaded could be damaged.
! Always drive with due care when loading the vehicle!

- Drive onto the ramp only in a low travel range!



Driving off procedure

1 Switch for travel range 2 Gas pedal

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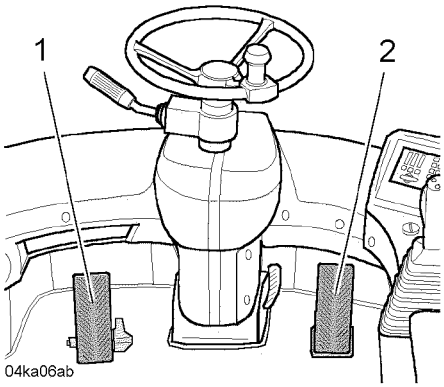
- Select a low travel range: turn switch 1.
- Press down the gas pedal 2 carefully.
- Carefully set the vehicle in motion.

After driving onto the loading bed

For more detailed descriptions, see the sectio "Operation, handling".

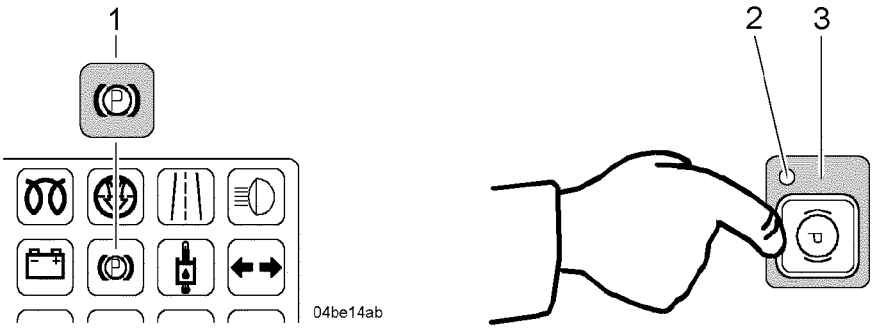
Make sure that the air stream cannot penetrate the exhaust pipe opening.

This is particularly important with rail transport, as the direction of travel cannot be foreseen!



Brake / inching pedal – gas pedal

- Stop the vehicle



Parking brake

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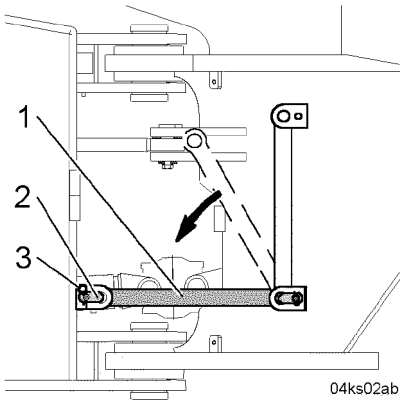
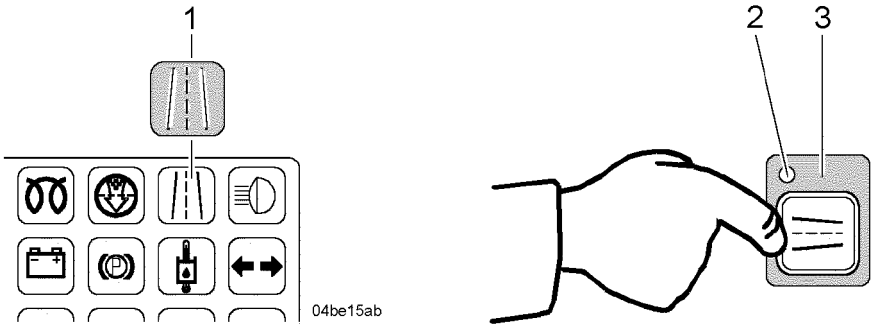


Articulation lock

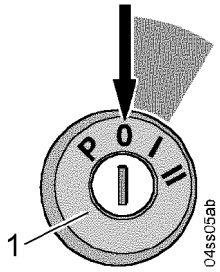
- Engage the parking brake.
- Engage the articulation lock.
- Bolt the safety bar 1 in the lower position.
- Secure the pin 2 against dropping out by means of a spring clip 3.

- Lower the lift arm and set the loading bucket down flat on the transporter bed.

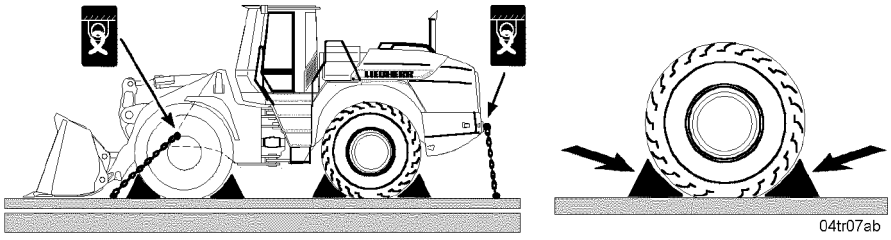


Working hydraulics lock

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

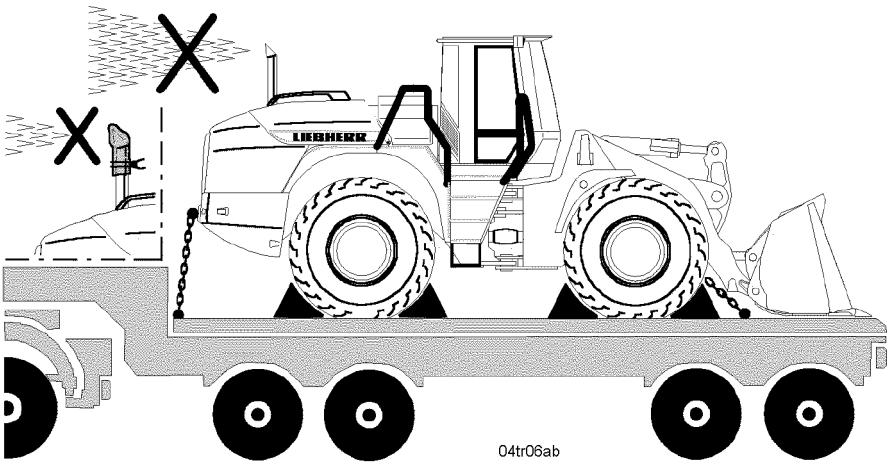


- Close and lock all doors and hoods on the vehicle.



Lashing points

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



Exhaust pipe cover

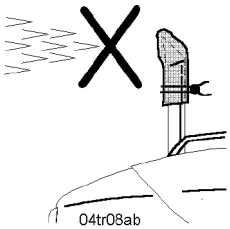
If the vehicle is facing towards the direction of motion during transport, then the air stream can penetrate the exhaust opening.
The following precaution should be taken to prevent damage to the turbo during transport.

Caution

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 turbocharger is not lubricated when the engine is not running.
Without lubrication, the turbocharger will be damaged.

! Prevent the air stream produced during transport entering the exhaust!

- To block off the exhaust pipe opening: climb onto the vehicle via the cab access only and make sure that you have secure footing.
- Block off the exhaust pipe opening securely with windproof material so that it cannot slip.



Blocking off the exhaust pipe opening

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3.4 Emergency operation

In this section, the various emergency operation modes of the vehicle are described.

Emergency operation modes:

– Towing the vehicle
– Procedure for jump starting

3.4.1 Towing the vehicle

If the vehicle is damaged, it may be necessary to tow it away from an exposed position.
The following towing instructions only apply to exceptional situations, in order to move a vehicle 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 vehicle away from a danger area
  The vehicle must always be put on a transporter for longer distances!

Safety when towing

Towing the vehicle is problematic. The operator always assumes full responsibility.
In no event can damage or accidents resulting from towing be covered by the manufacturer's guarantee.
See also the section "Towing the vehicle safely".

Danger

Risk of accidents through incorrect towing!
When a vehicle incapable of independent movement is not properly towed, the result could be severe or even fatal injuries!

! Always secure the vehicle against rolling away before releasing the brakes for towing!

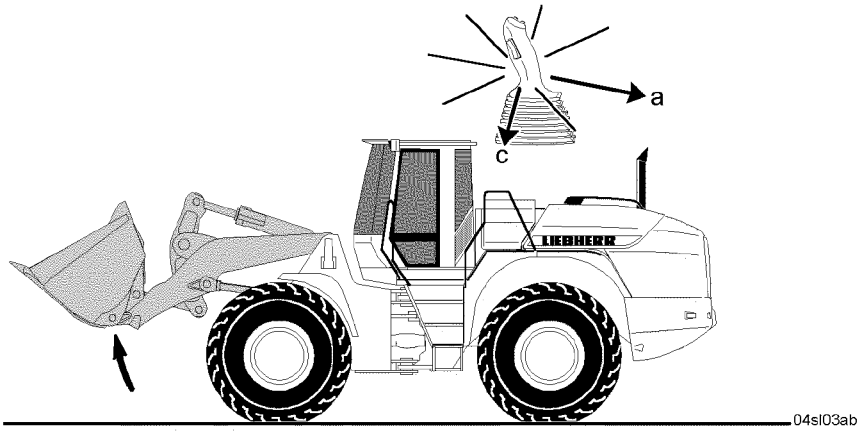
- Observe all prescribed safety regulations and the following recommendations when towing.

Towing when the diesel engine is running

The following precautions should be taken before towing the vehicle.

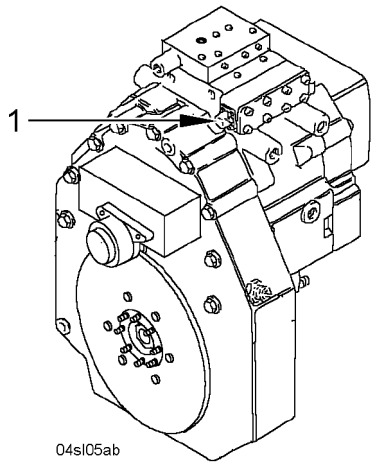
Precautions:

– put in the transport position
– make all drive functions inoperational
– release the parking brake



Transport position during towing

- Put in the transport position: raise the lift arm.
- If it is possible to hydraulically actuate the working attachment, tilt in the bucket to the limit.
- Make all travel functions inoperational: release CANON plug 1 from the transfer gear (gear shift section).

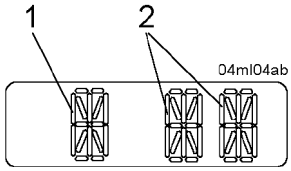


CANON plug connection

The electrical connection between the solenoid valve on the gearbox and the electronics is thereby broken.
Malfunction message:

– error code **E 81** is displayed
– in addition, this warning function is acoustically supported by a "continuous tone"

  See also the "Display unit" section .



Segment display – travel range, travel speed or error codes

The vehicle's drive functions are now inoperational.

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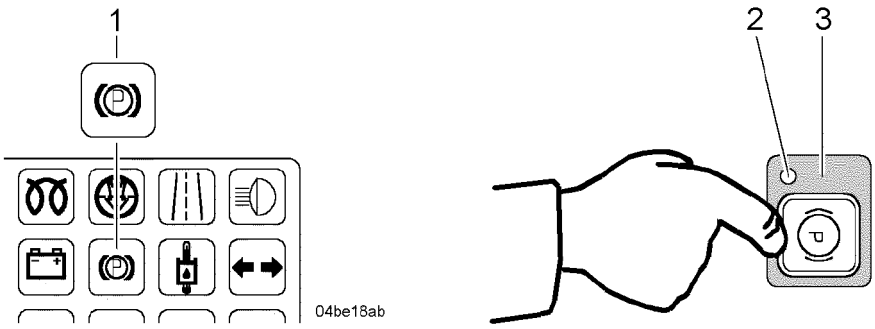
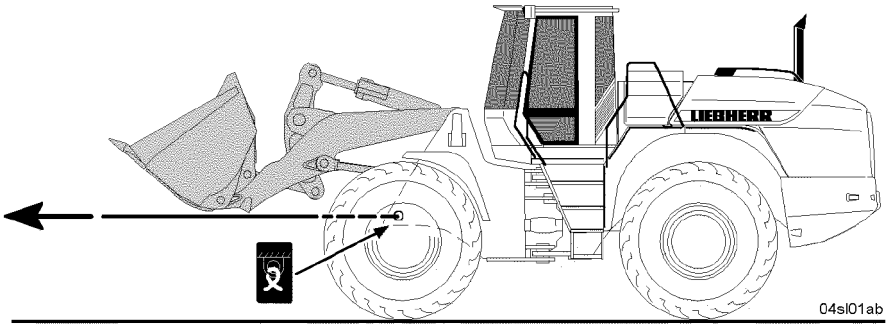


Control unit

1 Parking brake symbol field
2 LED
3 Parking brake button

- Release the parking brake by pressing button 3.

The LED 2 on the button 3 goes out.
Symbol field 1 for the parking brake goes out.
The parking brake is released. The vehicle is now ready for towing.



Attaching towing ropes

- Feed the two towing ropes through the bore holes provided in the front section and secure them.
- Tow the vehicle out of the danger area.
- **When the towing has been completed:**
  Refix the CANON plug 1 to the transfer gear.

The electrical connection between the solenoid valve on the gearbox and the electronics is thereby reestablished.
The vehicle's drive functions are operational once more.

Towing with the diesel engine switched off

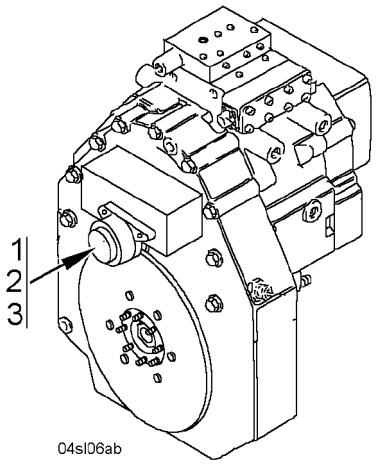
In the event of serious damage to the vehicle, with breakdown of the diesel engine, the braking and steering functions will be impaired.
Since the brake accumulator is not filled when the diesel engine is not running, the service brake becomes ineffective after it is used a few times.
Make sure that the parking brake has been mechanically released, before the vehicle is towed away.

Danger

Risk of accidents due to the vehicle suddenly rolling away!

! Secure the vehicle against rolling.

- Mechanically release the parking brake.



Parking brake

1 Cover
2 Lock nut
3 Adjusting screw

- Screw off cover 1.
- Release counter nut 2.
- Remove adjusting screw 3 until the brake lining carrier can be separated from the brake disc.

The parking brake is thereby released.

Warning

Risk of accidents when the vehicle is in tow!
Since the steering function is restricted, there is a risk of accidents when the vehicle is being towed!

! When the vehicle is in tow, use the emergency steering function!

- Refer to the section "Towing the vehicle when the steering system has broken down".
- Tow the vehicle with a tow bar only.
- **When the towing has been completed:**
  Correctly reset the parking brake.

Towing the vehicle when the steering system has broken down

If the diesel engine or the steering pump break down during a journey, the emergency steering pump starts automatically for a period of approx. 50 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 – .

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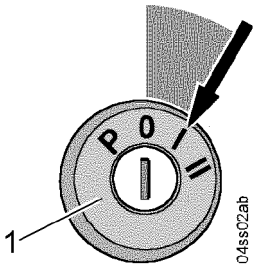
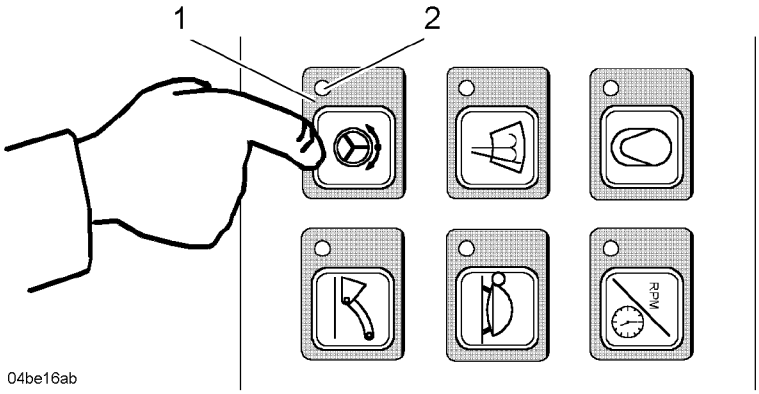
Continuous operation of the emergency steering pump results in overheating of the pump motor! The thermostat switch integrated in the pump motor automatically switches the emergency steering pump off in the event of overheating.
Make sure that the vehicle's electrical system is switched on.



To activate the repeat start of the emergency steering pump proceed as follows.



Control unit

1 Emergency steering button 2 LED

- Press the button 1 for emergency steering and keep it pressed.

LED 2 on the button indicates that the function is active.
The symbol field – emergency steering lights up when the emergency steering function is activated. Also refer to the section "Operation" under "Display unit".
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 vehicle out of the danger area during this time period:
  let the pump motor cool down until the thermostat is switched on again.
- Press button 1 again for repeat start of the emergency steering pump and keep it pressed down.

3.4.2 Procedure for jump starting

When it is difficult to start due to flat batteries, the vehicle can be jump started with an external battery.
Make sure that the precautions detailed below have been taken.

Connecting the external battery

To jump start, proceed as follows.

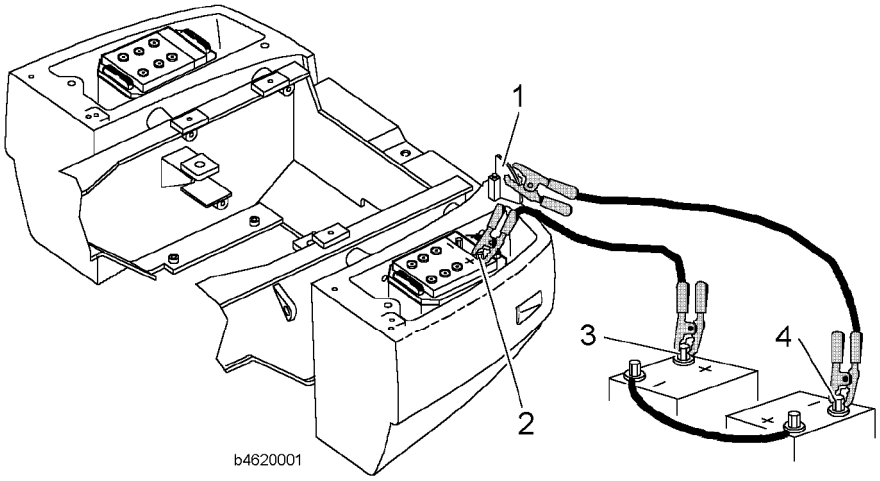
Danger

Risk of accidents due to incorrect or careless jump starting!
When external batteries are connected with old batteries there may be an increase in gas formation. There is a "RISK OF EXPLOSIONS"!

! Therefore, you should avoid naked flames and any sparks in the vicinity of the batteries.

! Protective goggles and gloves should be worn when jump starting.

! Only use jump starting cables with a sufficient diameter.



Procedure for jump starting

1 Earth point – vehicle frame
2 Positive termnal of the discharged battery
3 Positive terminal of the external battery(-ies)
4 Earth point of the external battery(-ies)

- Connect a jump start cable first to the plus terminal of the discharged battery 2 and then to the plus terminal of the external battery 3.
- Connect the second jump start cable first to the earth point of the external battery (-ies) 4 and then to the earth point – vehicle frame 1.
- Start up the diesel engine. See the "Starting the diesel engine" section.

Disconnecting the external battery

Before remmoving the jump start cables, the diesel engine speed must be reduced to the lower idle speed.

Excess voltage can be avoided by switching on big consumers such as floodlights.

- First remove the jump start cable from the earth point – vehicle frame 1 and then from the earth point of the external battery(-ies) 4.
- Then remove the second jump start cable first from the positive terminal of the external battery(-ies) 3 and then from the positive terminal of the discharged battery 2.

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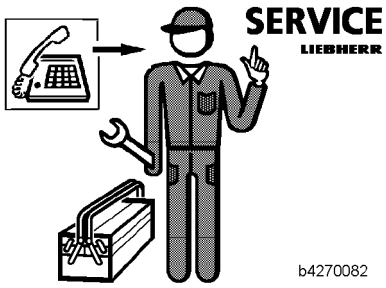
4 Malfunctions

Warning and fault messages

– Various faults are indicated by the corresponding symbol fields lamps (optically) or by display instruments on the instrument panel.
  See chapter "Operation, handling", section "Display unit" for further information.
– Warning functions are in some cases provided with additional acoustic support.

Identifying and correcting faults and errors

– Faults can often be traced back to the fact that the vehicle was incorrectly operated or serviced.
  Therefore, carefully read the appropriate section of the operating and "maintenance instructions" each time a fault occurs.
– **Analyse the cause of the fault and correct it immediately!**
– Describe the fault and all related circumstances as accurately as possible if you call on the services of the **LIEBHERR CUSTOMER SERVICE**.
  Precise descriptions will help us isolate the fault and quickly correct it.
  For this purpose, precise details about the vehicle type and serial number are required.
– Do not attempt any jobs for which you are not trained or instructed.



If you are not able to identify the cause of the fault with the "Error code tables," or are not able to remedy the fault, contact the LIEBHERR CUSTOMER SERVICE.

4.1 Error code tables

4.1.1 Error code – indication on the display

The hydrostatic travel drive and the travel gear are monitored by the gearbox electronics. The system is monitored for short circuits, cable rupture, external voltage and incorrect input and output signals. In addition, the gearbox electronics continuously checks program sequence and communication with the display unit.

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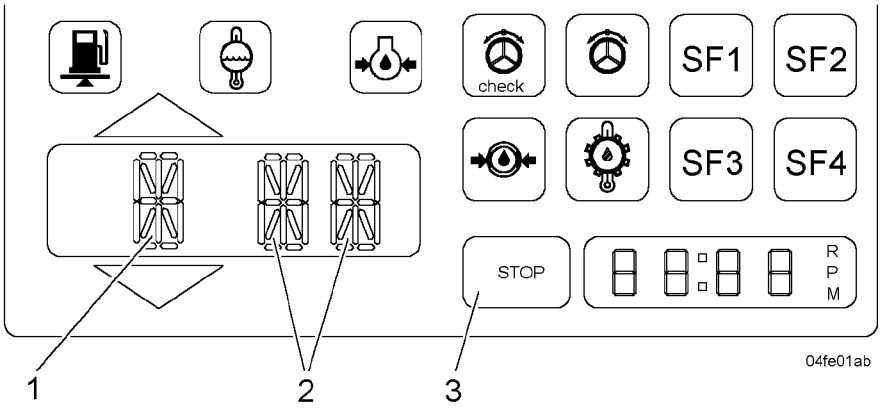


Display unit

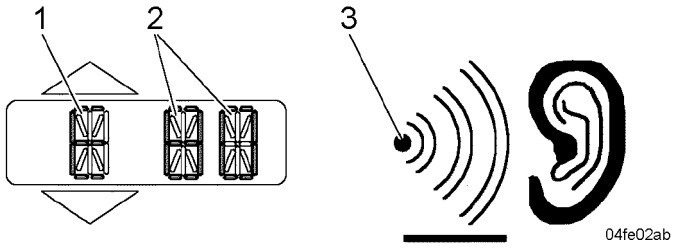
1 Display for travel range or error message – **E**rror
2 Display for travel speed or error code
3 Display"STOP"

If an error arises when the vehicle is started or when in use, this is indicated in the display unit. A distinction is made in the process between two types of errors.

– Error with emergency driving mode
– Error - vehicle is shut down

Error with emergency driving mode

If errors occur which cannot damage the vehicle, only the affected function is shut down. The vehicle can only be temporarily driven in emergency driving mode.



Error with emergency driving mode

If one of these errors occurs, an **"E"** for Error appears in display 1 and in addition an acoustic signal is issued from the buzzer 3 as a "continuous tone".
The error code is not shown on the display until parking brake 2 is engaged. Make a note of the error code, as it will be deleted when the ignition is switched off.
In emergency driving mode, only manual selection without automatic are possible. Only the driving ranges- **1** -, - **2** - or - **3** - can be selected when the vehicle is at a standstill.
Have the error rectified by LIEBHERR CUSTOMER SERVICE.

Error - vehicle is shut down

If errors occur which can damage the vehicle, the entire vehicle is shut down. In the process, the neutral travel direction is automatically selected and the vehicle coasts to halt.

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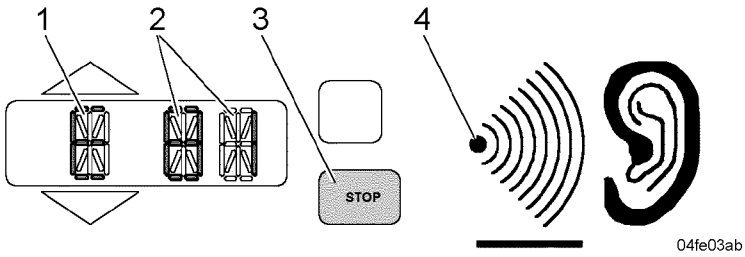

Error display - vehicle is shut down

If this error occurs, the system reacts as follows:
- an **"E"** for Error appears in the display 1
- the display 2 shows the error code (when the parking brake is active)
- the symbol field 3 for "STOP" lights up
- the buzzer 4 issues an acoustic signal in the form of a "continuous tone"
- the vehicle is brought to a standstill by selecting the neutral travel direction

The error code is not shown on display 2 until the parking brake is engaged or until the neutral travel direction - **N** - is selected.
Make a note of the error code, as it will be deleted when the ignition is switched off.
Have the error corrected by LIEBHERR CUSTOMER SERVICE.

Error code	Symptom	Cause	Solution
- EE	Machine stops	Display unit power supply connected, but no communication with the electronics or control unit	Contact LIEBHERR CUSTOMER SERVICE
E 61	Emergency driving mode	Short circuit on M1 - M9 which was already present when on-board circuit was switched on.	Contact LIEBHERR CUSTOMER SERVICE
E 62	Machine stops	Break at an output, already present when on-board circuit was switched on.	Contact LIEBHERR CUSTOMER SERVICE
E 64	Machine stops	Impermissible input combination (LH control lever V/R rocker or jog +/-)	Contact LIEBHERR CUSTOMER SERVICE
E 65	Machine stops	On-board circuit over / undervoltage (>39 V or >13 V)	Contact LIEBHERR CUSTOMER SERVICE
E 66	Machine stops	Incorrect RAM information (memory test failed)	Contact LIEBHERR CUSTOMER SERVICE
E 67	Machine stops	Incorrect drive program (data comparison failed)	Contact LIEBHERR CUSTOMER SERVICE
E 68	Machine stops	Incorrect program run (software test for all program sections)	Contact LIEBHERR CUSTOMER SERVICE
E 69	Emergency driving mode	Output speed sensor failure	Contact LIEBHERR CUSTOMER SERVICE

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Error code	Symptom	Cause	Solution
E 70	Emergency driving mode	Drive detector failure	Contact LIEBHERR CUSTOMER SERVICE
E 71	Emergency driving mode	Display interface error	Contact LIEBHERR CUSTOMER SERVICE
E 72	Machine stops	Drive and power output detector failure	Contact LIEBHERR CUSTOMER SERVICE
E 73	Machine stops	Slippage in travel gear	Contact LIEBHERR CUSTOMER SERVICE
E 74	Emergency driving mode	Short circuit M1	Contact LIEBHERR CUSTOMER SERVICE
E 75	Emergency driving mode	Circuit break at M1	Contact LIEBHERR CUSTOMER SERVICE
E 76	Machine stops	External voltage at M1	Contact LIEBHERR CUSTOMER SERVICE
E 77	Emergency driving mode	Short circuit M2	Contact LIEBHERR CUSTOMER SERVICE
E 78	Machine stops	Circuit break or external voltage at M2	Contact LIEBHERR CUSTOMER SERVICE
E 80	Emergency driving mode	Short circuit M3	Contact LIEBHERR CUSTOMER SERVICE
E 81	Machine stops	Circuit break or external voltage at M3	Contact LIEBHERR CUSTOMER SERVICE
E 83	Emergency driving mode	Short circuit M4	Contact LIEBHERR CUSTOMER SERVICE
E 84	Machine stops	Circuit break or external voltage at M4	Contact LIEBHERR CUSTOMER SERVICE
E 85	Emergency driving mode	Short circuit M5	Contact LIEBHERR CUSTOMER SERVICE
E 86	Machine stops	Circuit break or external voltage at M5	Contact LIEBHERR CUSTOMER SERVICE
E 87	Emergency driving mode	Short circuit M6	Contact LIEBHERR CUSTOMER SERVICE
E 88	Machine stops	Circuit break or external voltage at M6	Contact LIEBHERR CUSTOMER SERVICE
E 89	Emergency driving mode	Short circuit M7	Contact LIEBHERR CUSTOMER SERVICE

Error code	Symptom	Cause	Solution
E 90	Emergency driving mode	Circuit break or external voltage at M7	Contact LIEBHERR CUSTOMER SERVICE
E 91	Emergency driving mode	Maximum system pressure exceeded (K1 >22 bar)	Contact LIEBHERR CUSTOMER SERVICE
E 92	Machine stops	Block K1 (K1 >1 bar)	Contact LIEBHERR CUSTOMER SERVICE
E 93	Emergency driving mode	Short circuit M9	Contact LIEBHERR CUSTOMER SERVICE
E 95	Machine stops	Pressure in the selected coupling K1 too low (<11 bar)	Contact LIEBHERR CUSTOMER SERVICE
E 98	Emergency driving mode	Pressure sensor K1 error (>4.5 V or <0.25 V)	Contact LIEBHERR CUSTOMER SERVICE
E 99	Emergency driving mode	Pressure sensor inching error (>4.5 V or <0.25 V)	Contact LIEBHERR CUSTOMER SERVICE
E 9A	Emergency driving mode	Load sensor error (>4.5 V or <0.25 V)	Consutl LIEBHERR CUSTOMER SERVICE
E 9C	Emergency driving mode	Circuit break or external voltage at M9	Contact LIEBHERR CUSTOMER SERVICE
E 9E	Emergency driving mode	Short circuit or external voltage with supply voltage 5 V	Contact LIEBHERR CUSTOMER SERVICE
E 9F	–	Short circuit at output for tractive force limitation	Contact LIEBHERR CUSTOMER SERVICE
E A0	Emergency driving mode	Error on button – Kick-Down	Contact LIEBHERR CUSTOMER SERVICE

4.1.2 Error code (supplementary) – indication on the display

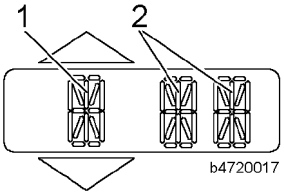
Valid for: *L544-442/0393-; L544T-444/0393-*

For vehicles starting with serial no. (see information above – Applies to:) supplementary error codes will be shown on the display unit or stored in the error memory.

For descriptions not detailed here: See "Error code– Indication on the display" section.

All error codes from **E 11** to **E 13**, **E 21** to **E 31** (E 31 = EE) and **E 61** to **E A0** are stored in the error memory and, with the use of supplemental data, can be evaluated by LIEBHERR CUSTOMER SERVICE.

Description of error codes **EE** and **E 61** through **E A0**: See "Error code– Indication on the display" section.



Error code display:
– Shown by **E** in segment field 1 for the travel range and the **code number** in segment field 2 for the travel speed.

Types of error representation in the display unit:
– Errors **E 11** through **E 13** are displayed for approx. 3 seconds only if the ignition has been switched ON.
– Errors **E 21** through **E 30** are not indicated on the display unit.
– Error **E 31** is indicated by the display of **EE** in segment field 2 for travel speed.

When an error code is displayed, an acoustic signal in the form of a "continuous sound" is emitted from the beeper.
Exceptions are: **E 11** through **E 13**, **E 29** through **E 30** and **E 31** (E 31 = EE)

Error code	Symptom	Cause	Solution
E 11	No effect	Incorrect RAM information for operating hours	Contact LIEBHERR CUSTOMER SERVICE
E 12	No effect	Incorrect EEPROM information for operating hours	Contact LIEBHERR CUSTOMER SERVICE
E 13	Inactive button indicator function	Incorrect EEPROM information for "saved buttons"	Contact LIEBHERR CUSTOMER SERVICE
E 21	Engine oil pressure symbol field is illuminated	Engine oil pressure is too low (switch)	Check engine oil level
E 22	Coolant level symbol field is illuminated	Coolant level too low	Top up coolant
E 23	Hydraulic oil temperature symbol field is illuminated	Hydraulic oil temperature is too high	Clean cooler
E 24	Braking reservoir pressure symbol field is illuminated	Braking reservoir pressure is too low	Contact LIEBHERR CUSTOMER SERVICE
E 25	Gearbox oil temperature symbol field is illuminated	Gearbox oil temperature is too high	Contact LIEBHERR CUSTOMER SERVICE
E 26	Coolant temperature symbol field is illuminated	Coolant temperature is too high	Clean cooler

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Error code	Symptom	Cause	Solution
E 27	Engine oil pressure symbol field is illuminated	Engine oil pressure is too low (sensor)	Check engine oil level
E 28	Emergency steering function symbol field is illuminated	The emergency steering is not building up pressure	Contact LIEBHERR CUSTOMER SERVICE
E 29	No effect	Diesel engine speed has been exceeded (> 2500 rev/min): This may occur if downward travel is too rapid	In future brake at a lower speed --> Braking
E 30	No effect	Diesel engine speed is too low (> 500 rev/min): If the diesel engine falls below 500 rev/min --> there is no fuel, air or diesel feed is too low	Check air and diesel filters and top up fuel

4.1.3 Acoustic warning signals

Those warning messages which are acoustically supported are listed in the table below with their causes and remedies .
There are three different "acoustic warning signals":
- interval tone (tone sequence is 5 x tones followed by 5 sec pause)
- interval tone (without pause)
- continuous tone

Error signal	Cause	Solution
Segment field - coolant temperature indicates high temperature and interval tone sounds. Tone sequence: 5 x tones followed by 5 secs pause	Coolant temperature over 95 °C	Cleaning the cooling system
	Fault in the cooling or electrical system	Contact LIEBHERR CUSTOMER SERVICE
Interval tone sounds tone sequence: 5 x tones followed by 5 secs pause	Hydraulic oil temperature over 95°C	Cleaning the cooling system
	Fault in the cooling, hydraulic or electrical system	Contact LIEBHERR CUSTOMER SERVICE
Symbol field - emergency steering lights up and interval tone (without pause) sounds.	Activation of the emergency steering function when the steering pump breaks down	Drive or tow vehicle out of the danger area and consult the LIEBHERR CUSTOMER SERVICE.
	Fault in the electrical system	Contact LIEBHERR CUSTOMER SERVICE

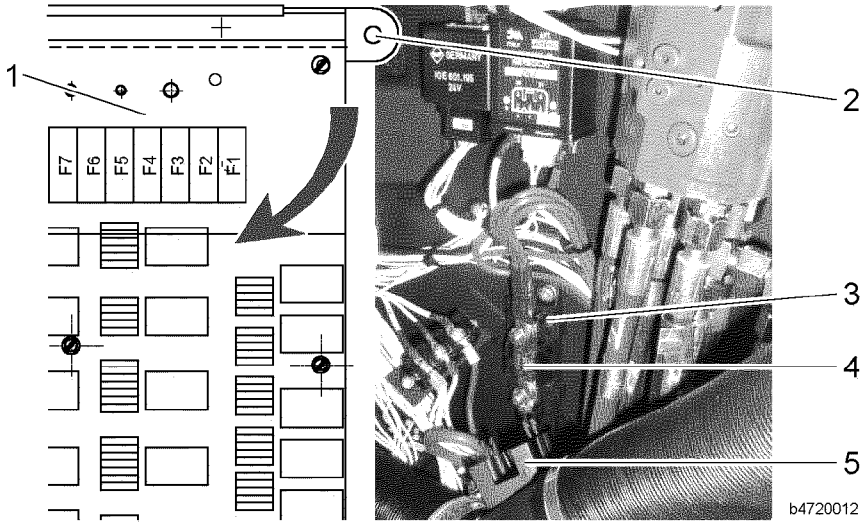
Error signal	Cause	Solution
Symbol field - engine overheating and coolant level flashes and continuous tone after 10 secs.	Coolant temperature over 100 °C	Cleaning the cooling system
	Coolant level too low	Top up with coolant
	Fault in the electrical system	Contact LIEBHERR CUSTOMER SERVICE
Symbol field - engine oil pressure flashes and continuous tone after 10 secs.	Too little engine oil	Check the oil level and top up with engine oil if necessary
	Fault in the diesel engine lubricant supply	Contact LIEBHERR CUSTOMER SERVICE
Symbol field - hydraulic oil overheating flashes and continuous tone after 10 secs.	Hydraulic oil temperature over 100 °C	Cleaning the cooling system
	Fault in the cooling or hydraulic systems	Contact LIEBHERR CUSTOMER SERVICE
Symbol field - hydraulic oil overheating lights up and continuous tone after 10 secs.	Gear oil temperature over 120 °C: due to fault in gearbox	Contact LIEBHERR CUSTOMER SERVICE
Symbol field - brake system accumulator pressure flashes and continuous tone after 10 secs.	Brake accumulator pressure too low: due to prolonged standstill of vehicle	Start the engine: when the diesel engine runs, the brake accumulators will be filled
	Fault in brake accumulator or brake system	Contact LIEBHERR CUSTOMER SERVICE
Error code - segment display shows error code and continuous tone is sounded.	Refer to the section error code tables.	Refer to the section error code tables.

4.2 Eliminating malfunctions

4.2.1 Changing fuses

In order to avoid damage to the electrical system, only fuses with the appropriate ampere rating may be used.
Ensure that the affected electrical circuit is checked before changing the fuse.

Mega fuses



Main fuse

1 Control board A12
2 Fixing screw
3 Fuse box
4 Main fuse – F01
5 Cover – fuse box (removed)

Fuse	Value	Units	Use	Location
F01	100	A	Main fuse	behind the control board
F02	200	A	Emergency steering pump	on the left-hand side in the engine compartment on the hydraulic tank frame

Mega fuses

- **If main fuse 4 must be replaced:**
  Open the driver's cab door on the right-hand side.
- Unscrew the console cover.
- Unscrew the fixing screw 2 for the control board 1.
- Use the table above to identify the defective fuse.
- Remove cover 5 from the fuse box 3.
- Unscrew the defective fuse which is not working and replace it with a new fuse with the same rating.
- **If the fuse for the emergency steering pump must be replaced:**
  Open engine compartment hood.

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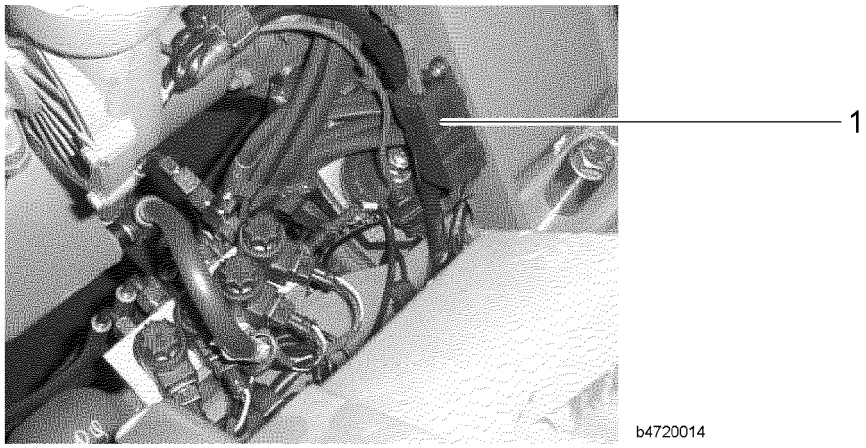
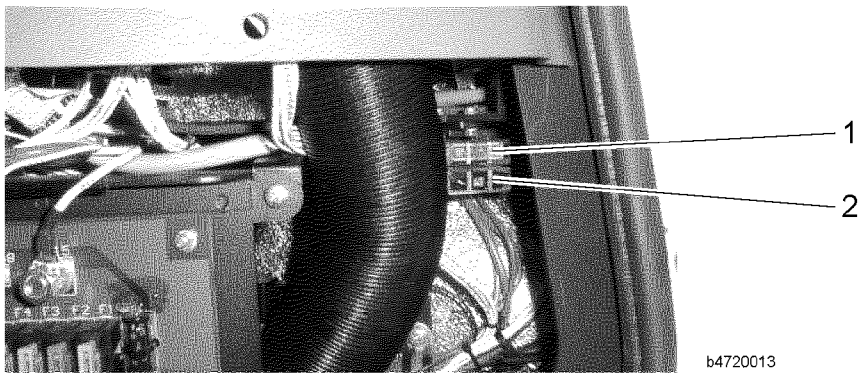


Emergency steering pump fuse

- Remove the cover from the fuse box 1.
- Use the table above to identify the defective fuse.
- Unscrew the defective fuse which is not working and replace it with a new fuse with the same rating.

Maxi Fuses



Fuses

1 Plug-in fuse – F03 2 Plug-in fuse – F04

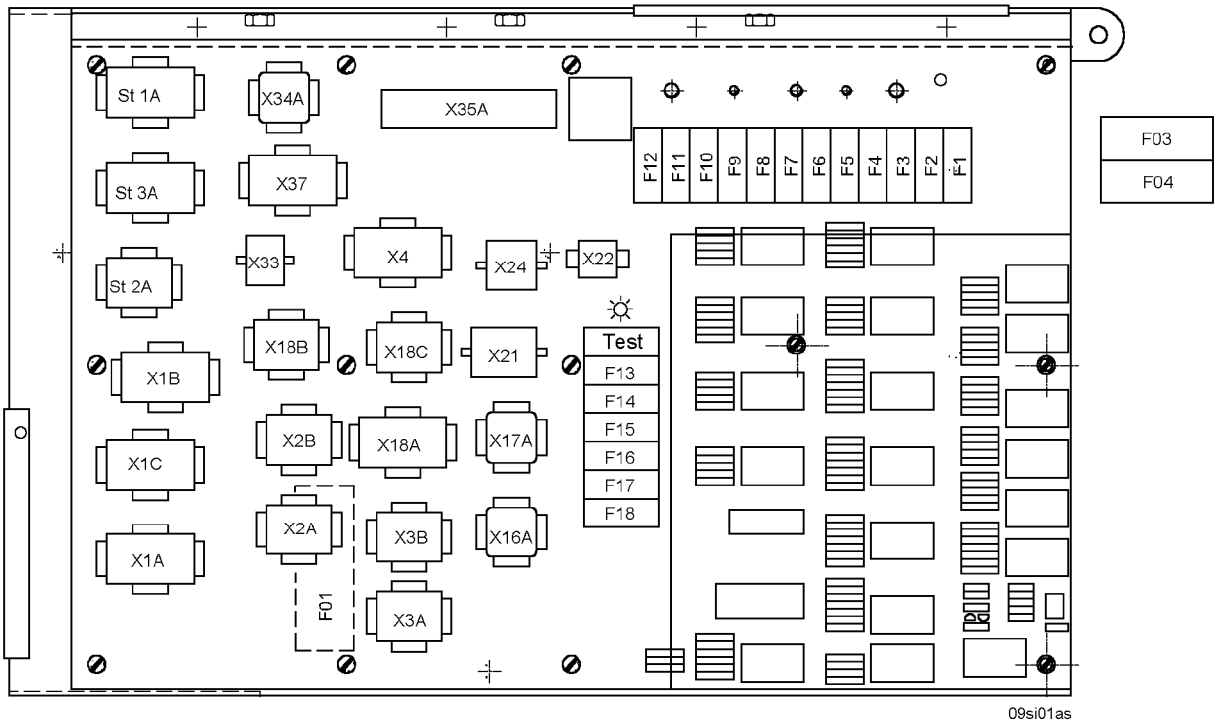
Fuse	Value	Units	Use	Location
F03	30	A	Motorstop solenoid	behind the console cover to the right of the inner tube heater
F04	60	A	Preglow device	behind the console cover to the right of the inner tube heater

Maxi Fuses

- Open the driver's cab door on the right-hand side.
- Unscrew the console cover.
- Use the table above to identify the defective fuse.
- Take out the defective fuse which is not working and replace it with a new fuse with the same rating.

Plug-in fuses on control board A12

The control circuit board, electronics, relays, main fusing and the plug-in fuses are located behind the right-hand door and panel covering.



Control circuit board A12 with plug-in fuses F1-18

F1 -15A Windscreen wiper-/washer system front, horn
F2 –10A Lifting limit switch, working hydraulics lock, bucket return-to-dig, float position, parking brake
F3-15A Blower motor, air-conditioning compressor, air-conditioning system
F4 -15A Windscreen wiper, rear washing pump, central lubrication system
F5-7.5A Supply control unit KL 15
F6 -7.5A Relay motor stop / preglow
F7 -15A Cab light, socket, radio, compressor seat
F8 - Free
F9 -10A Electronics A1, emergency steering pressure switch supply
F10-10A Gearbox control electronics A2, parking brake
F11-10A Flashing warning system / control unit KL30
F12-15A KL30 Steering column switch (light horn)
F13-7.5A Tail lamps, sidemarker lamp, profile lights right
F14 – 7.5A Tail lamps, sidemarker lamp, profile lights left
F15 – 7.5A Driving headlight, right (dipped beam)
F16 – 7.5A Driving headlight, left (dipped beam)
F17 – 7.5A Driving headlight, left (high beam)
F18 – 7.5A Driving headlight, right (high beam)

- Open the driver's cab door on the right-hand side.
- Unscrew the console cover.

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- Use the fuse chart above to identify the defective fuse.
- Take out the defective fuse which is not working and replace it with a new fuse with the same rating.
- Check that the plug-in fuses (F1 - F18) are functioning at the fuse base "TEST", before replacement. If the fuse is intact, the LED lights up.

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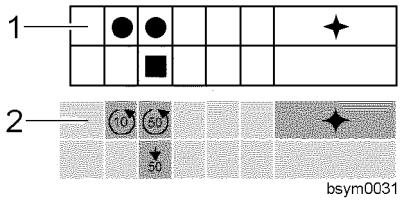
5 Maintenance

5.1 Maintenance and inspection schedule

The following abbreviations are used in this Chapter:
- h = service hours
- OM = Operator's manual
- SM = Service manual
- AST = Authorised specialist technicians
- MP = Maintenance personnel

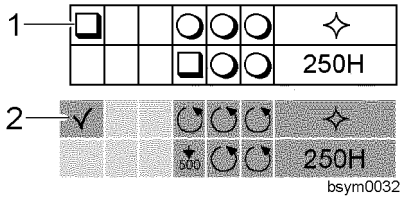
The two types of maintenance work are distinguished by their markings (circle, box, star – filled, or circle, box, star – empty).
The markings have the following meaning:



Reference sample

Example 1 – Paper documentation
table with circle, box, star – filled
Example 2 – online documentation
table with dark grey symbol in the field

- Here, the vehicle operator or his maintenance personnel are responsible for carring out maintenance tasks.
  This affects the maintenance intervals: every 10 and 50 service hours (h) and non-scheduled intervals.



Reference sample

The markings have the following significance:
Example 1 – Paper documentation
table with circle, box, star – empty or specifications from (h)
Example 2 – online documentation
table with yellow symbol or specifications from (h) in the field

- Here, authorised specialist technicians from LIEBHERR or its authorised dealers must perform or direct maintenance and inspection work.
  This affects the maintenance intervals: on delivery, every 500, 1000, 2000 service hours (h), and at unscheduled times.

You will find a list of the spare parts needed for maintenance and inspection work in the "SERVICE PACKAGE" of the spare parts list.

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

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED	Note on execution
on delivery: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 - operating manual** **SM -service manual** **h – operating hours**	OM Page
							Overall vehicle	
□							The driver should lubricate the vehicle in accordance with the lubrication chart and instructed on proper maintenance	
□							Instruct the driver in the operation of all functions	
	●	●	❍	❍	❍		Check the vehicle for external damage	
						✦	Check that all screwed connections are tight	
□						✦	Sealing any external leaks as necessary	
			□	❍	❍		Check the hydraulic pressures initially after 500 h, and thereafter every 1000 h	
				❍	❍		Check the hydraulic pressure every 1000 h	
					❍		Check the hydraulic pressure every 2000 h	
							Diesel engine, Pump distributor gear	
□	●	●	❍	❍	❍		Check oil level - diesel engine	
□		●	❍	❍	❍		Check the oil level in the pump distributor gear	
□		●	❍	❍	❍		Drain off water and sediment from the fuel tank	
			❍	❍	❍	250H	Replace engine oil (once every 500 h; normal interval is every 250 h or 500 h, depending on oil specifications)	
			❍	❍	❍		Replace the oil filters	
			❍	❍	❍		Check engine speed	
			❍	❍	❍		Check and, if necessary replace V-ribbed belt	
			❍	❍	❍		Check turbo hose	
				❍	❍		Make sure that the air inlet and exhaust lines are securely attached	
				❍	❍		Check valve play	
			□	❍	❍		Replace the gear oil in the pump distributor gear	
					❍		Lightly grease the ring gear on the flywheel	
					❍	❄	Check the flame glow system	
					❍	✧	Replace filter insert in the fuel separator	
				❍	❍	✧	Replace fuel fine filter	
						3000H	Replace oil separator (minimum of every 2 years)	
						✧	Check injection valves (in case of a drop in power)	
		■	❍	❍	❍	✦	Drain off condensate from the fuel-separator	
			❍	❍	❍	✧	Drain off condensate from the fuel filter	

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

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED	Note on execution
on delivery;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 - operating manual** **SM -service manual** **h – operating hours**	OM Page
				❍	❍	✦	Clean or replace the air filter - main element (replace safety element after having replaced the main element 3 times)	
		●	❍	❍	❍	✦	Cleaning service cap and dust extraction valve on the air filter	
Cooling system								
□		●	❍	❍	❍		Check coolant level	
			❍	❍	❍		Replace the coolant filter	
			❍	❍	❍	❄	Check anti-freeze protection and DCA-4 concentration in the coolant	
						✦	Clean the cooling system	
						3000H	Replace coolant with anti-freeze protection and DCA-4 (at least every 2 years)	
Working hydraulics								
□	●	●	❍	❍	❍		Check oil level in the hydraulic tank	
□		■	❍	❍	❍	250H	Check and cleaning the magnetic rod on the hydraulic tank	
			❍	❍	❍		Drain water and sediment from the hydraulic tank	
				❍	❍		Replace return-suction filter	
			□	❍	❍		Clean the return strainer on the hydraulic tank	
						10000H	Replace the return strainer on the hydraulic tank	
				❍	❍		Lubricate pilot control unit, clean magnets and lubricate universal joints	
				❍	❍		Replace breather filter on the hydraulic tank	
					❍		Replace hydraulic oil	
Steering system								
□	●	●	❍	❍	❍		Check the steering for proper functioning	
□		●	❍	❍	❍		Lubricate the bearing points on the steering cylinders	
Braking system								
□	●	●	❍	❍	❍		Check that the service and parking brakes are functioning properly	
				❍	❍		Check the play and wear on the parking brakes	
Electrical system								
□	●	●	❍	❍	❍		Check indicator lamps and lighting	
			❍	❍	❍		Check batteries, fluid level and terminals	
Transfer gear								
□		●	❍	❍	❍		Check the oil level	

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

Maintenance/inspection according to operating hours							TASKS TO BE PERFORMED	Note on execution
on delivery: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 - operating manual** **SM -service manual** **h – operating hours**	OM Page
			❍	❍	❍		Replace filter insert in the in-line filter	
			□	❍	❍		Change gear oil	
Axles, Tyres								
□		●	❍	❍	❍		Lubricate the drive shafts	
□		■	❍	❍	❍		Check the tightness of the wheel lugs (once after 50, 100 and 250 h)	
□			❍	❍	❍		Check the oil levels	
			□	❍	❍		Change gear oils	
□						✦	Check and if necessary, adjust tyre pressure on attachments and accessories	
Vehicle frame, Ballast weight								
□		●	❍	❍	❍		Lubricate oscillating axle frame and articulation bearing	
Central lubrication system								
□		●	❍	❍	❍		Check whether metered quantities are adequate at the bearing points (grease collars)	
□		●	❍	❍	❍		Check the hose lines (lubrication points, detached hoses, external leakage)	
Cab, Heating, Air conditioning system								
			❍	❍	❍		Check the indicator beads in the dryer-collector unit	
				❍	❍	✦	Lubricate the door hinges	
						✦	Clean or replace the fresh air and recirculated air filter as required	
Lift arm, Quick-change device								
□		●	❍	❍	❍		Lubricate bearings and lubrication points	
□		●	❍	❍	❍	✦	Lubricate bucket bearings (the lower bucket bearings - if necessary - daily)	
		●	❍	❍	❍		Check the bucket bearing seals	
			❍	❍	❍		Check the lift arm 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:
- in each case, the dipstick or level markings are definitive
- each time the oil is replaced or topped up, the level in the unit in question must be checked

For more detailed information about the required lubricants and service fuels, see the chapter "Lubricants and fuels".

	Name	Medium	Dosage	Units
 2 06sy15ab	Transfer gear	Lubricating oil	6	l
 06sy04ab	Cooling system – diesel engine	Coolant	32,5	l
 06sy05ab	Diesel engine (with filter change)	Lubricating oil	16	l
 06sy08ab	Pump distributor gear	Lubricating oil	2,5	l
 3 06sy16ab	Front axle	Lubricating oil	25	l
 5 06sy18ab	Rear axle	Lubricating oil	25	l
 06sy03ab	Hydaulic tank	Hydraulic oil	115	l
 06sy03ab	Total contents of hydraulic system	Hydraulic oil	220	l
 bsym0029	Air-conditioning system	Refrigerant	1800	g

5.2.2 Lubricant chart

The lubrication chart provides an overview of the location of the maintenance points on the vehicle and of their maintenance intervals.

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

For more detailed information about the required lubricants and service fuels, see the chapter "Lubricants and fuels".

For information about the required filling quantities, see the "Tables of filling quantities" section.

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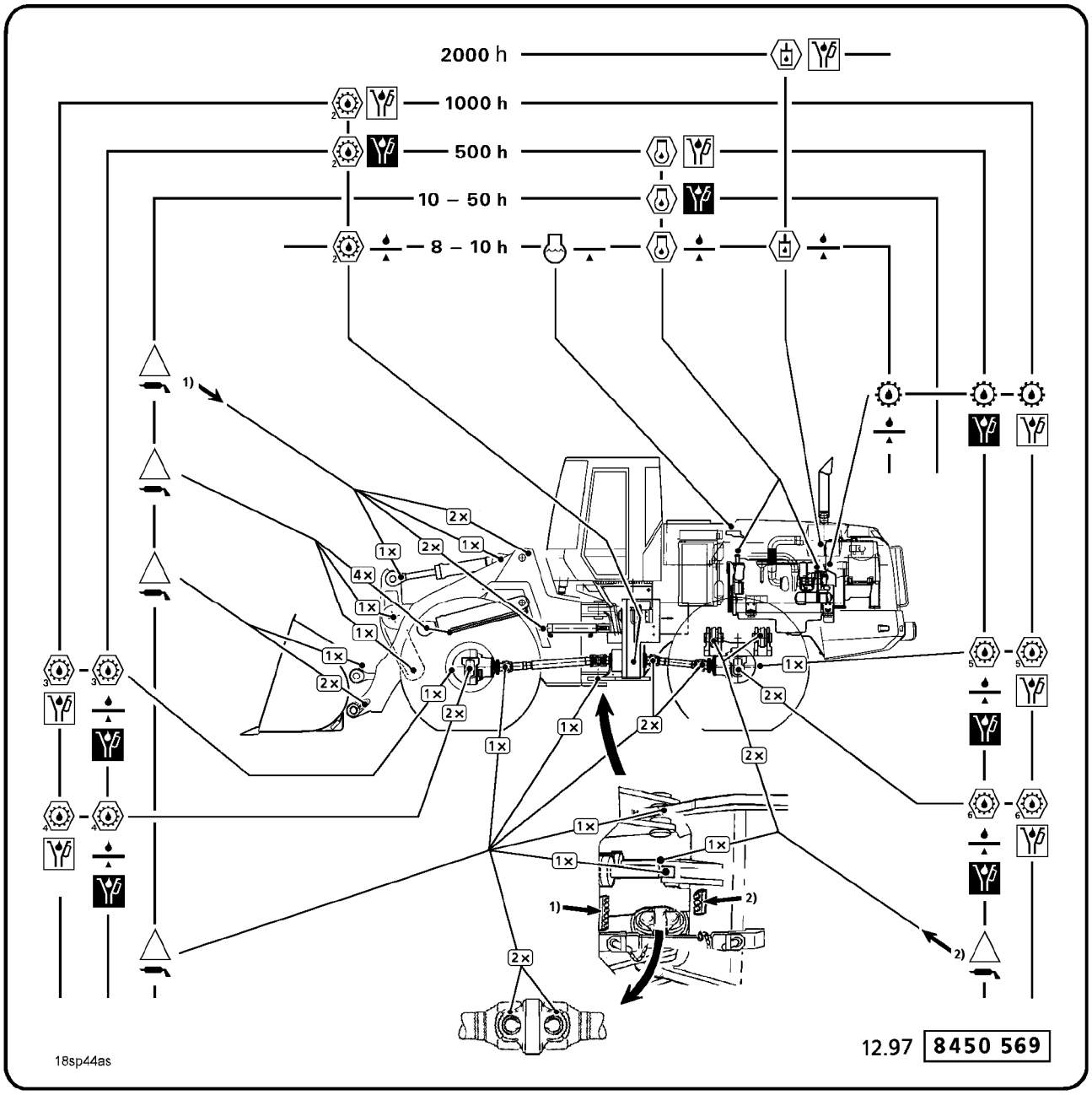


Symbol	Name	Symbol	Name
06sy09ab	General lubrication points	06sy01ab	Lubrication
06sy13ab	Check the oil level	06sy21ab	Check coolant level
06sy11ab	Oil change	06sy12ab	First oil change

5.3 Maintenance tasks

5.3.1 Preparatory tasks for maintenance

Before the various maintenance tasks are performed, the vehicle must be moved into the maintenance position unless otherwise explicitly specified in the description.

The various maintenance tasks include:

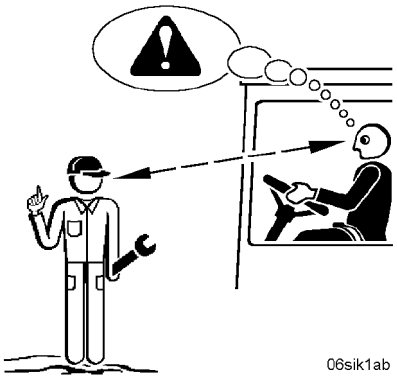
- lubricating the lift arm
- checking the oil level or changing the oil in the engine, transfer gear, axles, hydraulic tank, etc.
- replacing filter as well as adjustment and repair work on the hydraulic system

Safety precautions for maintenance

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

See the "Measures to ensure safe maintenance" section .

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



Visual contact

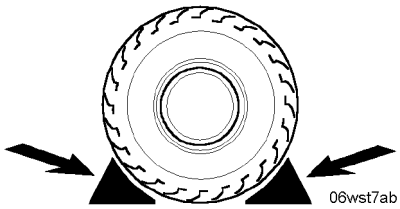
Danger

Risk of accidents for the maintenance personnel!

Unforeseen handling of the vehicle by an unauthorised person can place the maintenance personnel in extreme danger!

! Never enter one of the vehicle's danger areas without making your presence known.

- Make yourself clearly visible before entering one of the machine's danger areas.
- Secure the vehicle against unforeseen rolling away with wheel wedges.



Wheel wedges

Maintenance positions

The maintenance position depends on the maintenance task to be performed.
The two basic maintenance positions 1 and 2 are described below.
They enable access to the individual maintenance points.

Maintenance position 1

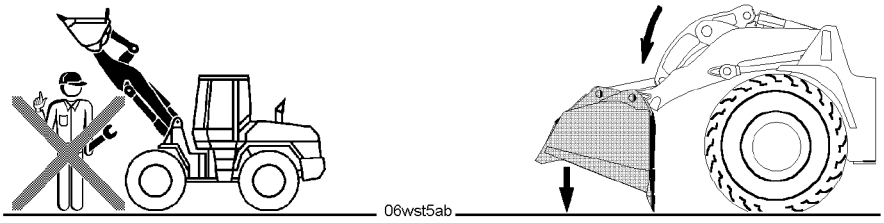
To put the vehicle into the maintenance position 1 proceed as follows.
For a detailed description of the individual procedures, see the Section "Operation, Handling".

Maintenance position 1

- Park the vehicle on level ground.
- Lower the lift arm.
- Set the bucket down flat on the ground.
- Shut down the diesel engine.
- Take out the starting key.

Maintenance position 2

To moving the vehicle into the maintenance position 2 proceed as follows.
For a detailed description of the individual procedures, see the section "Operation, Handling".



Maintenance position 2

- Park the vehicle on level ground.
- Engage the articulation lock.
- Lower the lift arm.
- Tilt the bucket out and set it down on the ground on its teeth or cutting edge.
- Shut down the diesel engine.
- Take out the starting key.

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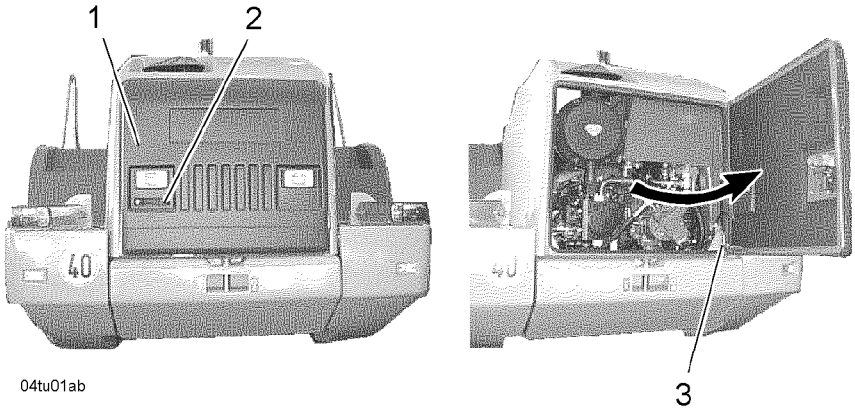
Opening the service doors and hoods

Open engine compartment door

When the door is open, you have access to the following units or components:

- hydraulic pumps
- hydraulic tank
- hydraulic tank shut-off valve
- air filter
- main battery switch



Engine compartment door

1 Engine compartment door
2 Handle with lock
3 Spring lock

Caution

Risk of accidents! Engine compartment may close unexpectedly.

! Check that the complete open door position can be secured by the spring lock.

- Open the lock with the starting key.
- Completely open the door 1 with the handle 2.

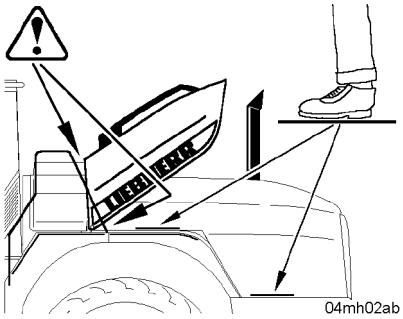
The spring lock 3 snaps into place.

Open engine compartment hood

When the hood is open, you can access the following units:

- Diesel engine
- Cooling system
- pump distributor gear

When opening or closing the hood: climb onto the vehicle via the cab access only and make sure that you have secure footing.



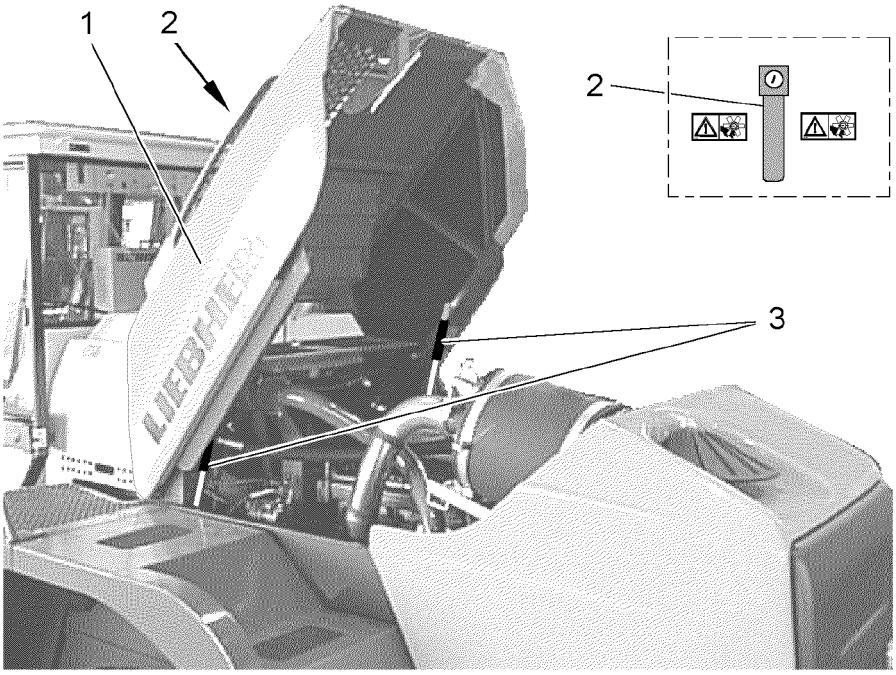
Foot plates

Caution

Risk of accidents when opening or closing the hood!
There is a risk of injury to your feet when they are in the pivoting range of the hood.

! Ensure your feet are in a safe place when opening or closing the hood!

- Stand to one side of the hood with both feet on the foot plates provided!



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Engine compartment hood

1 Engine compartment hood
2 Handle with lock
3 Gas-filled spring

Warning

Risk of accidents due to moving engine parts!
The rotating or moving engine parts such as – the fan blades or V-belts, for example, are potential sources of injury!

! Only open the engine compartment – hood when the engine is shut down.

- Open the lock with the starting key.
- Open hood 1 with handle 2 and pull it up to its limit by the handle rod.

The hood is held in this position by two gas-filled springs 3.

Warning

Risk of injuries due to hood falling closed!

! Check that the fully-open position can be secured by the gas-filled springs.

- If this function is not in order, the cause of the problem must be corrected immediately.

Trouble shooting

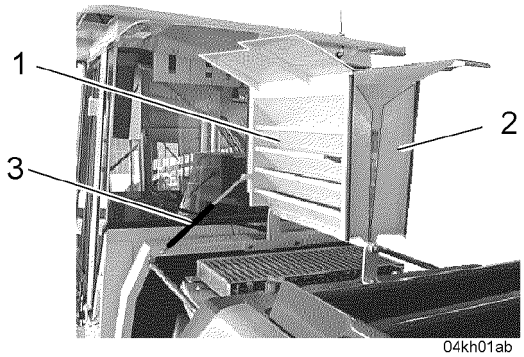
Is proper functioning not assured?

- Contact LIEBHERR CUSTOMER SERVICE!

Open cooling system hood

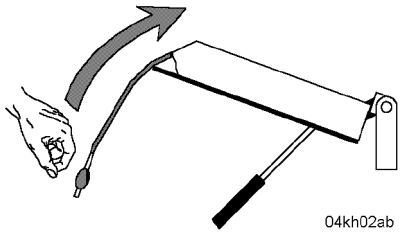
When the hood is open, you can access the cooling system:
Make sure that the driver's cab door is closed on the left or right as appropriate.

- When opening or closing the hood: climb onto the vehicle via the cab access only and make sure that you have secure footing.



Cooling system hood

1 Cooling system hood, left-hand side
2 Cooling system hood, right-hand side
3 Gas-filled spring



Cooling system hood

- Open hood 1 completely by pulling up the handle.

The hood is held in this position by the gas-filled spring 3.

Warning

Risk of injuries! Hood can fall down.

! Check that the fully-open position is secured by the gas-filled spring.

- If this function is not in order, the cause of the problem must be corrected immediately.

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Trouble shooting

Is proper functioning not assured?

- Contact LIEBHERR CUSTOMER SERVICE!

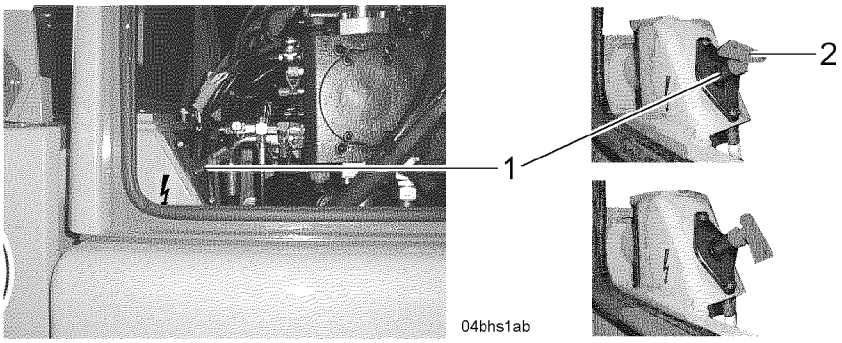
Turning off the battery main switch

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

For certain service tasks, the main battery switch must first be turned OFF.

Establish from the descriptions of the relevant maintenance jobs whether the battery main switch must be turned ON or OFF. See the Section "Maintenance tasks . . . ".

Switch on the main battery switch after completing these maintenance tasks.



Battery main switch

1 battery main switch

2 Battery main switch - key

Danger

Risk of accidents for maintenance personnel!

Unauthorised operation of the vehicle can place maintenance personnel in extreme danger!

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

! For security reasons, take the key out!

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

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5.3.2 Maintenance tasks (daily) every 10 service hours

On completion of daily servicing, the vehicle should be moved back into the operating position.
See also the section "Operation", "Operating position" section in the **"Operator's manual"**.

Overall vehicle

Checking the vehicle for external damage

Make sure that the vehicle is in maintenance position 1.

Procedure

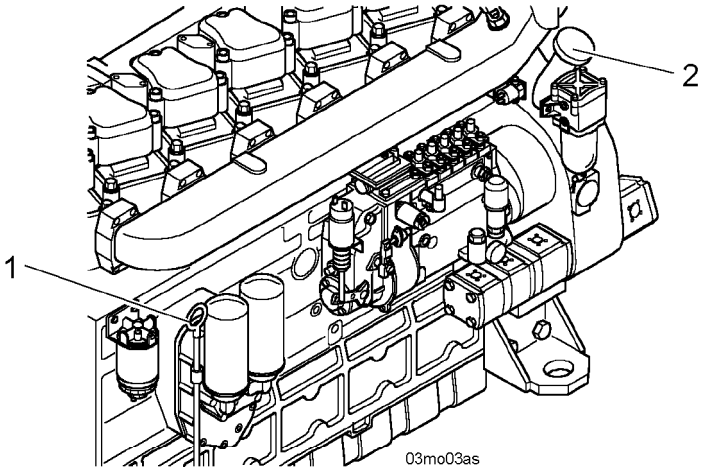
- Before starting up the vehicle, check for external damage which could impair operational safety.
- Repair any damage with safety implications immediately.

Diesel engine, Pump distributor gear

Checking oil level - diesel engine

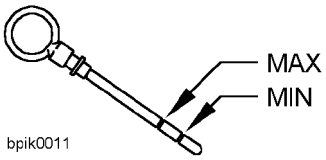
Ensure that:
– the vehicle is in maintenance position 1
– the engine compartment – hood is open

Procedure



Diesel engine

- Pull out dipstick 1, wipe clean, and re-insert.
- Pull out the dipstick once again and read the oil level.



The oil level must be between the MIN and MAX markings.

- If the oil level is too low:
  Remove sealing cap from the filler neck 2 and top up with oil. For information on the required oil quality: see the "Lubricants and fuels" section .

LBH/02/003801/0003/6.0/en

Caution

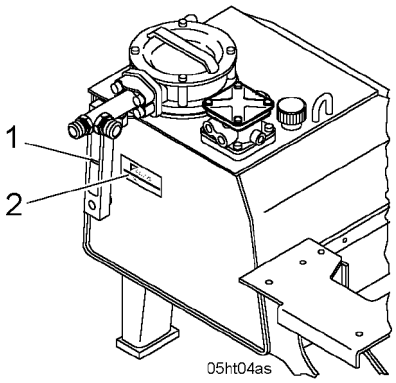
Danger of oil leakage due to excess pressure!
If the oil filler caps are mixed up, excess pressure can result in oil leakage in the pump distributor gear.
The sealing cap for the diesel engine does not have a breather filter. The sealing cap for the pump distributor gear is, however, equipped with one.
! Make sure that you do not mix up the sealing caps

- Top up with oil via the filler neck 2.
- Clean the sealing cap, place it on the filler neck 2 and tighten it up.

Working hydraulics

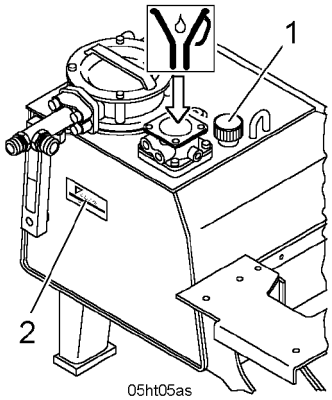
Checking oil level in the hydraulic tank

Make sure that:
– the vehicle is cold
– the vehicle is in maintenance position 1
– the engine-compartment hood is open



Procedure for checking the hydraulic oil level
The red marking 2"OIL LEVEL – max." shows the required oil level.

- Check the oil level at the sight glass 1.
- If the oil level is below the required level:
  Top up with hydraulic oil.



Procedure for topping up with hydraulic oil.

- Release tank pre-pressure by screwing out the breather filter 1 on the hydraulic tank.

The hydraulic oil may only be poured in through the 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.
- Tighten the breather filter.

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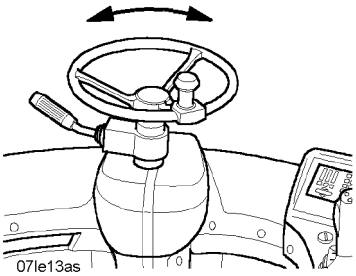
Steering system

Checking the steering for proper functioning

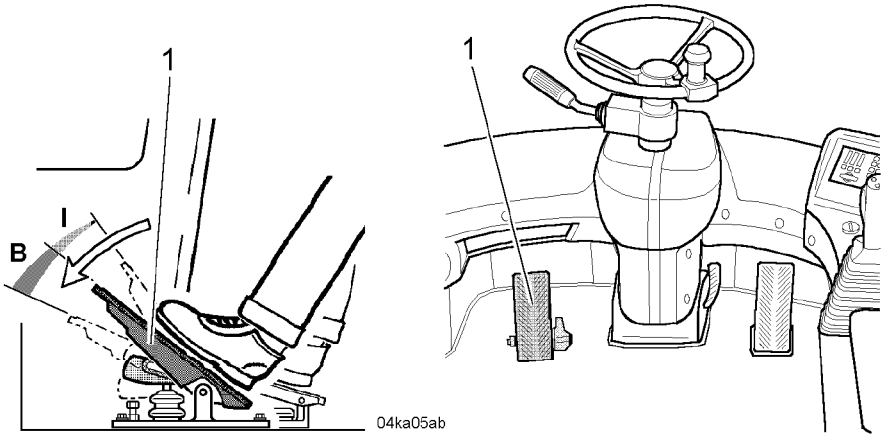


- Start the diesel engine
- Turn steering in both directions and check that it is functioning properly.

Braking system

Checking that the service and parking brakes are functioning properly

Procedure for checking that the service brake is functioning properly



- Start the engine in travel range 1 (1st gear) and drive at full throttle.

Warning

Danger of driving into bystanders or obstacles.

! Remaining in the danger area is strictly prohibited while these tests are being conducted!

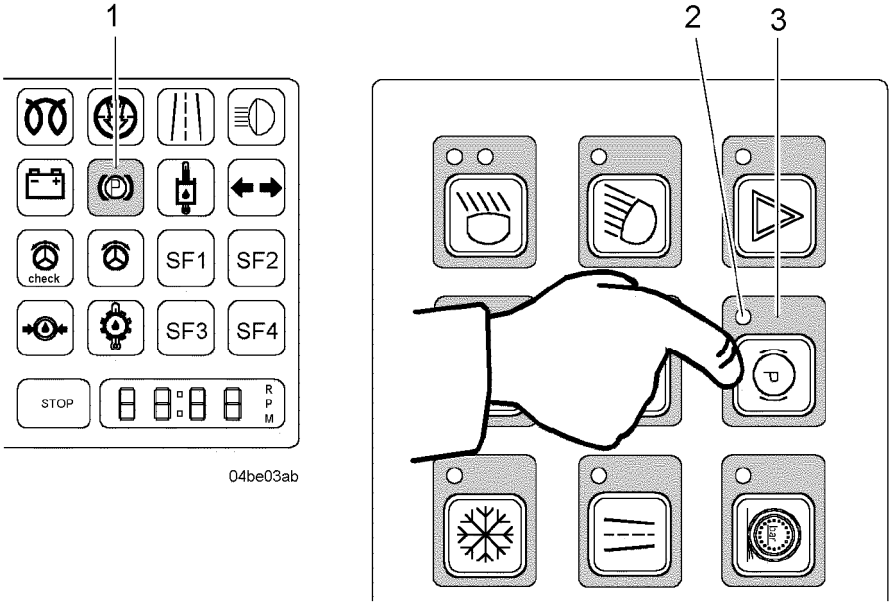
- Push down the brake / inching pedal all the way; the vehicle must come to a complete, abrupt halt.

Trouble shooting

If the braking effect is too small or entirely absent:

- Have LIEBHERR SERVICE determine the problem and eliminate the error.

Procedure for checking that the parking brake is functioning properly
Put vehicle into operating position.



Symbol field 1 and button 3 of the parking brake

- Turn starting key to position - I -. The symbol field 1 on the display unit should light up.
- Start the engine and without pressing the parking brake button 3, select the travel direction function forward or reverse. The forward or reverse symbol field should not light up, and the vehicle should not start moving even when the engine speed is increased.
- Press the parking brake button 3 . The symbol field 1 must go out. Select forward or reverse travel direction. The symbol field forward or reverse must light up and the vehicle should start moving when the engine speed is increased.
- Stop the vehicle and engage the parking brake with the button 3. The symbol field 1 must light up and the symbol fields for the travel directions must go out.

Electrical system

Checking indicator lamps and lighting

For the layout of the illuminating components and symbol fields on the display unit refer to the section "Operation", Chapter "Operation, handling" in the "Operator's manual".

Procedure

- Start the diesel engine and check that the illuminating components and symbol fields light up.

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5.3.3 Maintenance tasks (weekly) every 50 service hours

Daily maintenance must be completed before beginning weekly maintenance tasks.
See the "Maintenance jobs (daily) every 10 operating hours" section .
In the "Operator's manual", the "one-off jobs" are also described in this section.
On completion of weekly servicing or one-off servicing, the vehicle should be moved back into the operating position.
See also the section "Operation", "Operating position" section in the **"Operator's manual"**.

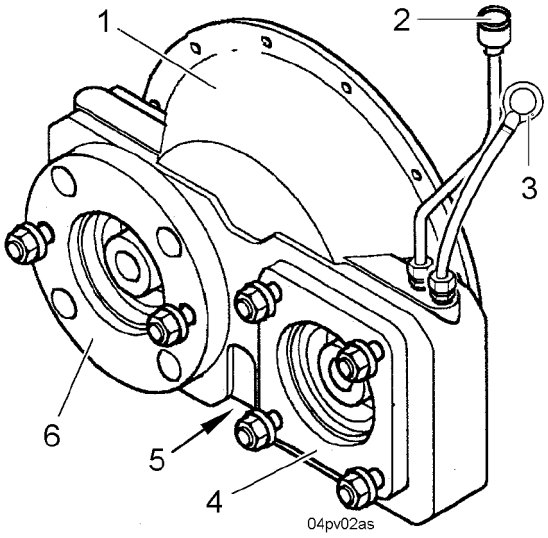
Diesel engine, Pump distributor gear

Checking the oil level in the pump distributor gear

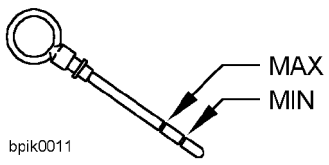
The dipstick 3 and the oil inlet pipe 2 are located in the engine compartment directly adjacent to the hydraulic tank. Access is from above the engine on the right-hand side.

Make sure that:
- the vehicle is in maintenance position 1
- the engine-compartment hood is open

Procedure



pump distributor gear



- Pull out dipstick 3, wipe clean, and re-insert.
- Pull out dipstick 3 once again and read off the oil level. The oil level must be between the MIN and MAX markings.
- If the oil level is too low:
  remove sealing cap from the oil inlet pipe 2 and top up with oil. For oil quality, see the Chapter "Lubricants and fuels".

LBH/02/003801/0003/6.0/en

Caution

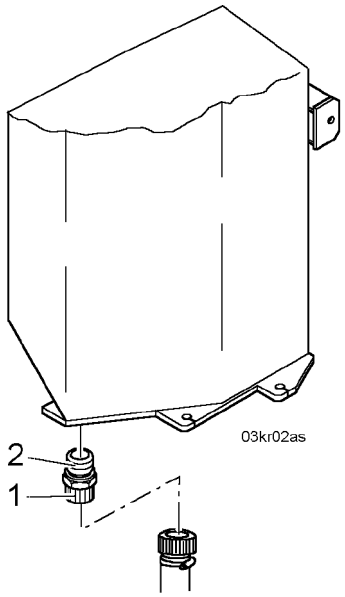
Danger of oil leakage due to excess pressure!
The sealing cap of the oil filler neck 2 of the pump distributor gear is equipped with a ventilation and breather filler. The sealing cap for the diesel engine, however, does not have such a filter.
If the oil filler caps are mixed up, excess pressure can result in oil leakage in the pump distributor gear.

! Make sure that you do not mix up the sealing caps

- Clean the sealing cap from the oil filler neck 2 and attach it to the oil filler neck 2 of the pump distributor gear and tighten it.

Draining off water and sediment from the fuel tank

Make sure that the vehicle is in maintenance position 1.

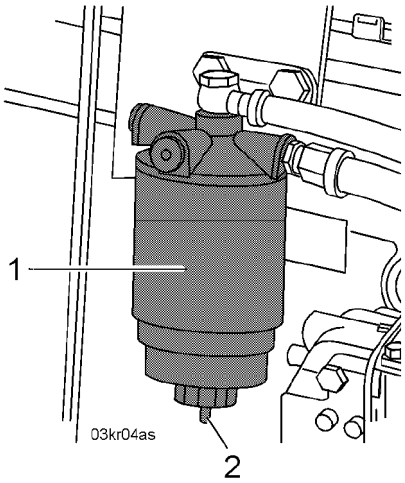


Procedure

- Unscrew sealing cap 1 on draining valve 2 on the underside of the diesel tanks.
- Screw the draining hose onto draining valve 2.
- Drain the condensation and sediment into a suitable receptacle until clean fuel begins to flow.
- Unscrew the draining hose and screw the sealing cap 1 onto the draining valve 2 and tighten it up.

Draining off condensate from the fuel fine filter

Make sure that:
– the vehicle is in maintenance position 1
– the engine compartment – hood is open



Procedure

- Open the drain plug 2 and let the condensate drain off into a suitable receptacle until clean fuel starts to flow.
- Close the drain plug 2 again.

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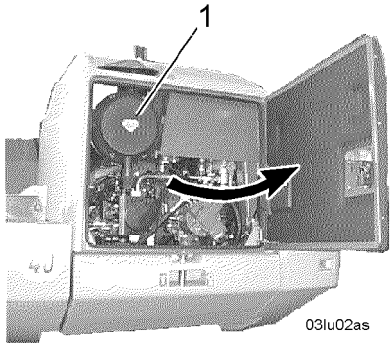
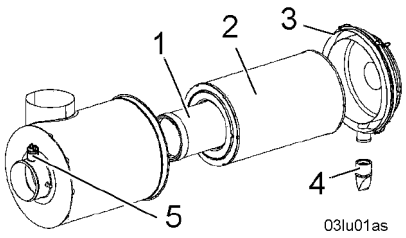
Cleaning service cap and dust extraction valve on the air filter



Important: a damaged or hardened dust-extraction valve 4 will impair the function of service cover 3, which will in turn reduce the service life of the filter elements. The valve must also be closed whenever diesel engine speed exceeds 1/3 of the max. speed.
Make sure that:

– the vehicle is in maintenance position 1
– the engine compartment-door is open
– the battery main switch is switched off and the main switch – key is taken out

Procedure



- Press the rubber lip on the dust-extraction valve 4 several times to empty the dust from the service cover 3.
- When working in dusty conditions, empty the dust extraction valve 4 more often.
- Open the spring clips on service cap 3 and take off the cap.
- Clean service cap 3.
- Replace the service cover 3 on the filter housing. Once the cover rests over its full circumference on the filter housing, you can close the fixing clips without excess force.
- Close the fixing clips.

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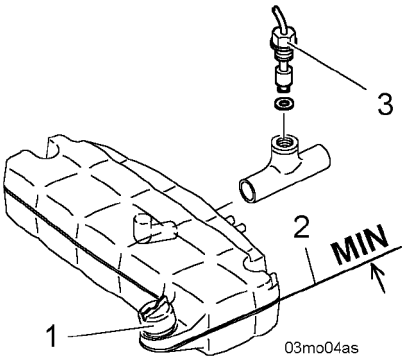
Cooling system

Checking coolant level

The coolant - equalizing reservoir with filler neck is located on the top side of the cooling unit. The equalizing reservoir can be accessed once the engine hood has been opened. The filler neck can be accessed after the left-hand cooler hood has been opened.

Make sure that:

– the vehicle is in maintenance position 1
– the engine compartment – hood is open



Procedure

The coolant level can be seen from outside through the transparent equalizing reservoir. The proper level for a cold engine is slightly below the middle of the equalizing reservoir MIN. marking. If the level is too far below the MIN. marking, coolant must be added. If the coolant level is too low, this is indicated by the coolant level probe 3 and displayed on the symbol field – engine overheating and coolant level, along with a simultaneous accoustic warning.

- Check the coolant level in the equalizing reservoir.
- The MIN marking 2 on the equalizing reservoir indicates the required coolant level.
- If the coolant level is below the MIN marking: 2
  top up the coolant in the equalizing reservoir filler neck 1 (see following description).

The coolant to be added must contain the appropriate concentrations of anti-freeze and DCA-4. See detailed description in the Chapter "Check anti-freeze and DCA-4 concentrations in the coolant".

Caution

Danger of scalding due to coolant escaping under pressure!

! Never open the sealing cap on the filler neck 1 of the equalizing reservoir until the engine has cooled down - the coolant temperature display in the indicator unit should be in the lower third of the segment field.

! Under no circumstances may the cooling system be topped up when the engine is still hot.

- Turn the sealing cap on the filler neck 1 slightly anti-clockwise, allowing excess pressure to escape, then open it fully.
- Fill with coolant up to the marking MIN 2 on the equalizing reservoir.
- Place the sealing cap on the filler neck 1 and tighten it up.

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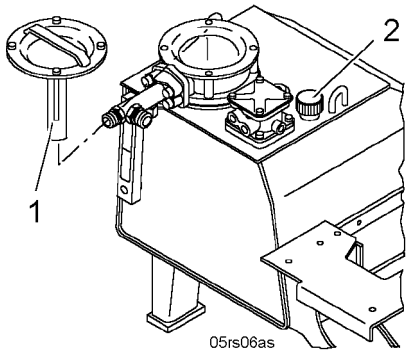
Working hydraulics

Checking and cleaning the magnetic rod on the hydraulic tank



Make sure that:
– the vehicle is in maintenance position 1
– the engine compartment - hood is open

Procedure

- Release tank pre-pressure by unscrew the breather filter 2 on the hydraulic tank by two revolutions.
- Release the bolts on the lid and slowly lift the lid with the magnetic rod 1.
- Clean magnetic rod carefully.
- Place the O-ring and cover with magnetic rod on the housing.
- Tighten the screws on the cover.
- Tighten the breather filter 2.

Trouble shooting

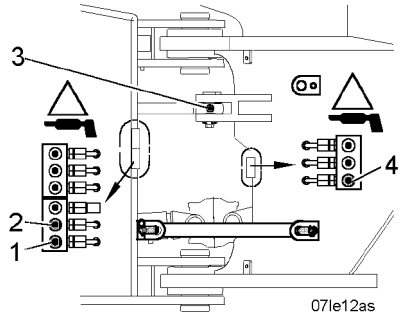
Heavy soiling or larger metal shavings on the magnetic rod could indicate damage in the hydraulic system.

- In this event, isolate the problem, then correct it.

Steering system

Lubricating the bearing points on the steering cylinders

Make sure that the vehicle is in maintenance position 2.



1 Lubrication point at base of right-hand steering cylinder
2 Lubrication point at base of left-hand steering cylinder
3 Lubrication point on piston rod of left-hand steering cylinder
4 Lubrication point on piston rod of right-hand steering cylinder

- Lubricate the bearing points on the steering cylinders

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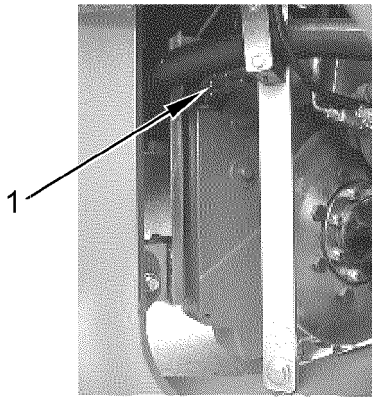
Transfer gear

Checking the oil level

Make sure that:
- the vehicle is in maintenance position 1
- the diesel engine has been shut down for approx. 20 minutes before a measurement is made



10av07as

Procedure

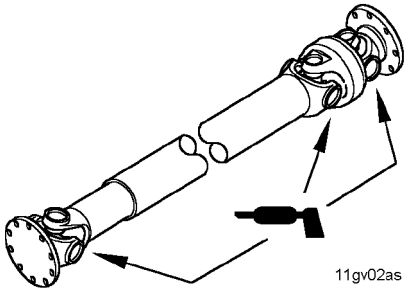
Oil is topped up at the opening for the oil dipstick.

- Remove the dipstick, 1 wipe it with a clean cloth, and reinsert it all the way.
- Pull out the dipstick once again and read off the oil level.
- If the oil level is at or below the MIN marking:
  top up with gear oil.

Axles, Tyres

Lubricating the front drive shaft

Make sure that the vehicle is in maintenance position 1.

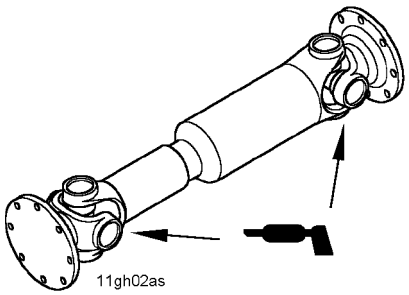

11gv02as

Procedure

- Lubricate drive shaft at both universal joints.

Lubricating the rear drive shaft

Make sure that the vehicle is in maintenance position 1.


11gh02as

Procedure

- Lubricate drive shaft at both universal joints.

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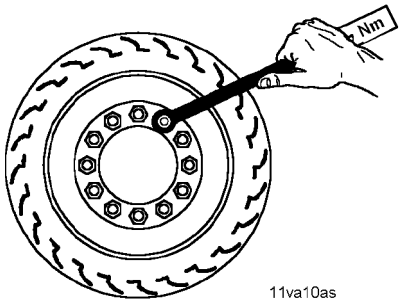
Checking the tightness of the wheel lugs (once after 50, 100 and 250 h)



Make sure that:
– the vehicle is in maintenance position 1
– and that a torque wrench with a measuring range of over 650 Nm is available

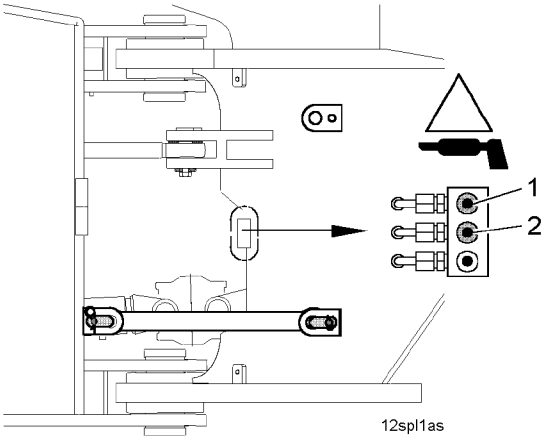
Procedure

- **When the wheels have been changed:**
  the once off intervals of 50, 100 and 250 operating hours must be observed!
- Check that the nuts on all four wheels have been tightened with the required torque. See the "Technical data" section .

Vehicle frame, Ballast weight

Lubricating the oscillating axle frame and articulation bearing

Make sure that:
– the vehicle is in maintenance position 1
– the articulation lock is engaged



Lubrication points on the right-hand side of the central lubrication rail

1 Lubrication point - front pendulum bearing

2 Lubrication point - rear oscillating axle mount

- Lubricate front oscillating bearing: lubricate lubrication point 1 on the central lubrication rail.
- Lubricate rear oscillating axle mount: lubricate lubrication point 2 on the central lubrication rail.

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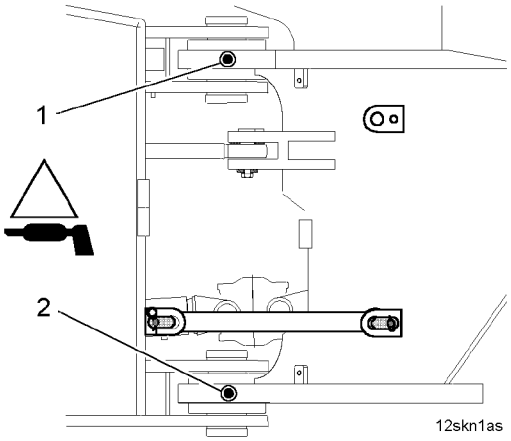

Articulation bearing lubrication points

1 Lubrication point - articulation bearing at top

2 Lubrication point - articulation bearing at bottom

- Lubricate upper articulation bearing: lubricate lubrication point 1 on the articulation bearings.
- Lubricating lower articulation bearing: lubricate lubrication point 2 on the articulation bearings.

Central lubrication system

Automatic central lubrication system

The automatic central lubrication system may be cleaned in washing systems or by means of high-pressure jets.
Stay within the minimum and maximum lubricant level indications!

Check whether metered quantities are adequate at the bearing points (grease collars)

- Visually examine whether metered quantities are adequate at the bearing points.
- If the bearing points are not sufficiently lubricated, isolate the problem, then correct it.

Check the grease volume in the reservoir at regular intervals.
The reservoir has a sight glass where the rubber stripper on the agitator can be seen. This is the point where you can check how much grease is still available.

- If necessary, fill the reservoir via the conical grease fitting. Lubricant specifications - refer to the Section "Lubricants and fuels".

Check the hose lines (lubrication points, detached hoses, external leakage)

- Visually examine the hose lines for defects.
- In case of any defects, isolate and rectify the problem.

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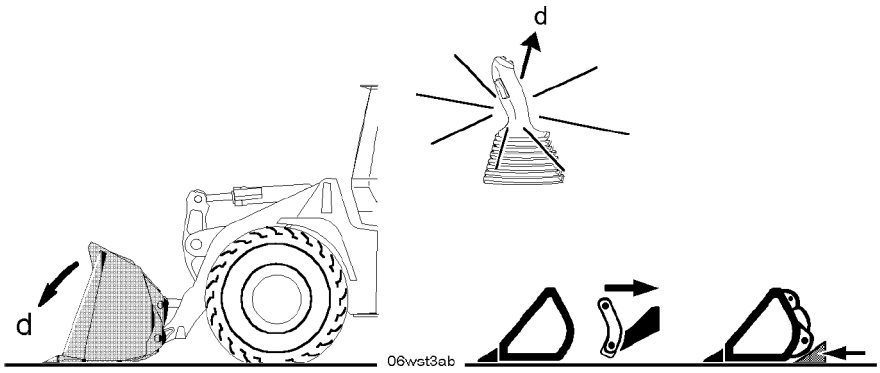
Lift arm, Quick-change device

Lubricating bearings and lubrication points

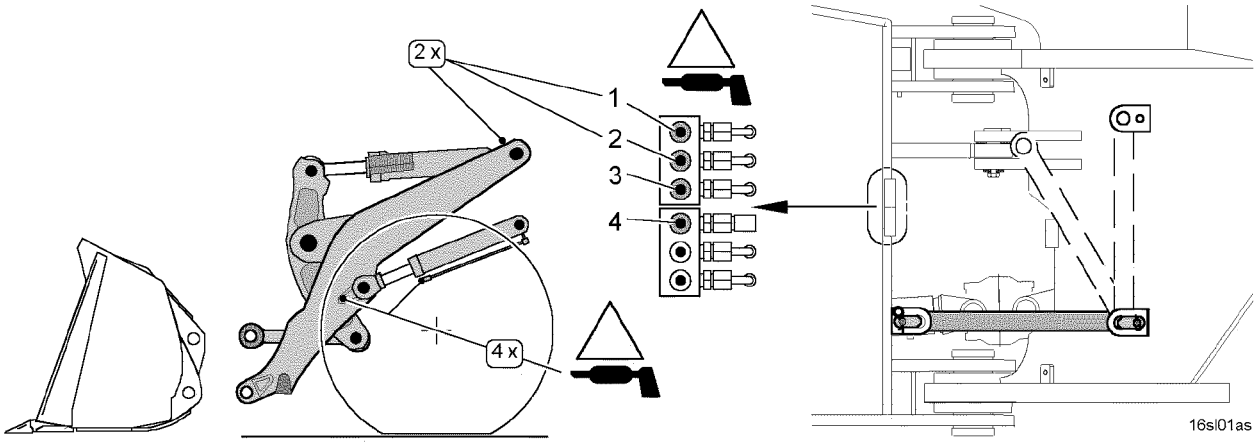
Make sure that the vehicle is in maintenance position 1.



Maintenance position - lift arm

If the lubrication points near the bucket couplings are difficult to reach, make sure that the working attachment is decoupled.

Lubricating the lift arm and lift cylinders

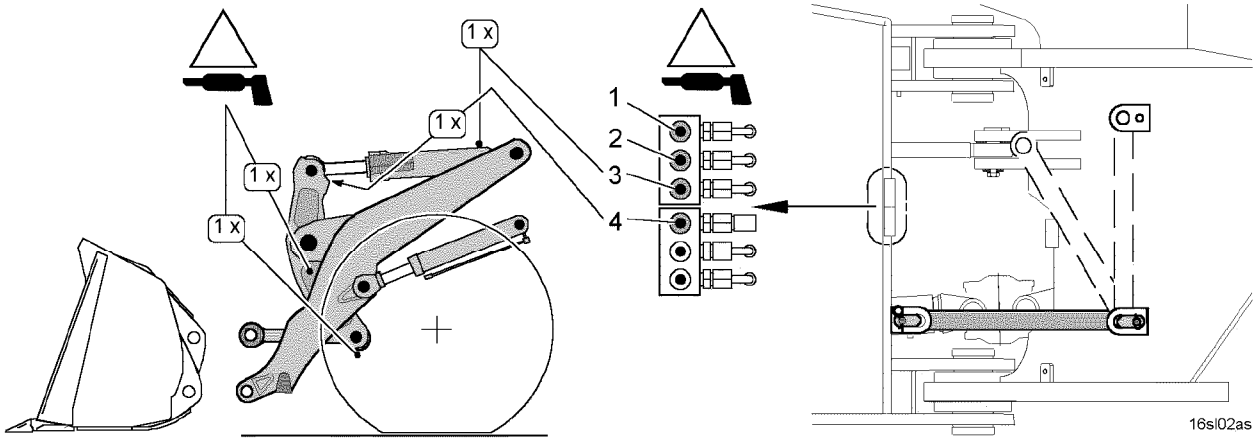


Lubrication points on the left-hand side of the central lubrication rail

1 Lubrication point - top right-hand side of lift arm
2 Lubrication point - top left-hand side of lift arm
3 Lubrication point - rear tilt cylinder
4 Lubrication point - front tilt cylinder

- Lubricate the bearing at the top of the lift arm: lubricate lubrication point 1 and lubrication point 2 on the left-hand side of the central lubrication rail.
- Lubricate the two lubrication points on the left-hand lift cylinder.
- Lubricate the two lubrication points on the right-hand lift cylinder.

Lubricate the tilt cylinder, Z-bar linkage and connecting link



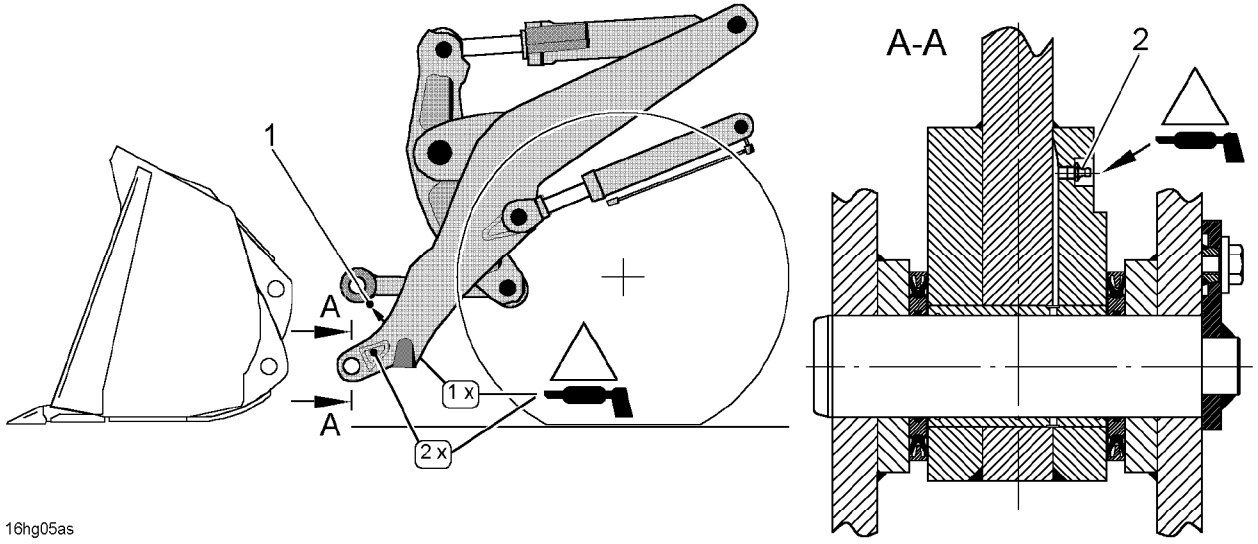
Lubrication points on the left-hand side of the central lubrication rail

1 Lubrication point - top right-hand side of lift arm
2 Lubrication point - top left-hand side of lift arm
3 Lubrication point - rear tilt cylinder
4 Lubrication point - front tilt cylinder

- Lubricate the bearing on the tilt cylinder: lubricate lubrication point 3 and lubrication point 4 on the left-hand side of the central lubrication rail.
- Lubricate the lubrication point on the Z-bar linkage.
- Lubricate the lubrication point on the connecting link.

Lubricating the bucket bearings

The lower bucket bearings should be lubricated daily if necessary.



Lubrication points - bucket coupling

1 Lubrication point - connecting bar
2 Lubrication point - bucket bearing
A-A section

- Lubricate the lubrication point 1 on the connecting bar.
- Lubricate the lubrication point 2on the bottom/left bucket bearing.
- Lubricate the lubrication point 2on the bottom/right bucket bearing.

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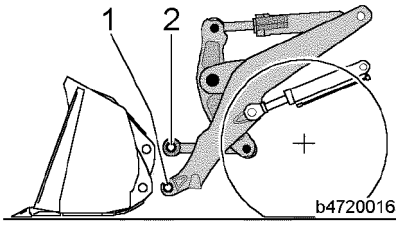
Checking the bucket bearing seals



- Check bearing bushes 1 on the bucket arm for wear and replace if necessary.
- Check bearing bush 2 on the connecting link for wear and replace if necessary.

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5.3.4 Unscheduled maintenance tasks

On completion of servicing, the vehicle should be moved back into the operating position.
See also the section "Operation", "Operating position" in the **"Operator's manual"**.

Overall vehicle

Checking that all screwed connections are tight

Make sure that:
– the vehicle is in maintenance position 2
– the appropriate service doors or hoods are open

Procedure

- Tighten any loose screws or bolts with the required tightening torque.

Sealing any external leaks as necessary

Make sure that:
– the vehicle is in maintenance position 2
– the appropriate service doors or hoods are open

Procedure

- Check the whole hydraulic system for leakage.
- Replace any damaged hydraulic seals.
- Tighten any loose hydraulic couplings.
- See also the "Safe maintenance of hydraulic hoses and hose lines" Section.

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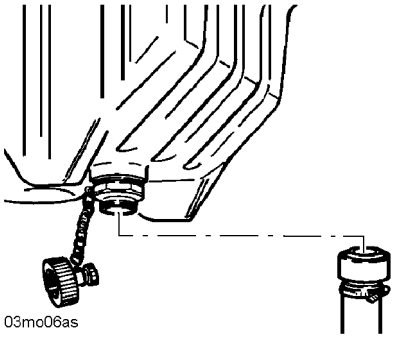
Changing the engine oil

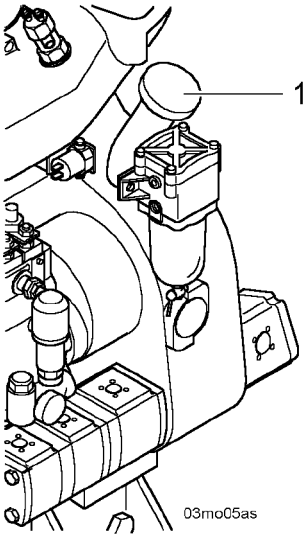
Make sure that:
- the vehicle is in maintenance position 2
- the engine-compartment hood is open
- a suitable receptacle with approx. 25 l capacity is in place, and the oil drain hose from the vehicle tool kit and engine oil in accordance with the oil specifications are ready.

Procedure

Only carry out an oil change when the engine is warm.



- Unscrew the the sealing cap on the oil drain valve on the oil pan.
- Screw oil drain hose onto the oil outlet valve and let the oil drain into the container provided.
- Unscrew the oil drain hose and screw the sealing cap onto the oil drain valve.



- Pour the fresh oil in through filler neck 1 up to the marking MAX on the oil dipstick.
- Clean the filler cap, place it on the filler neck 1 and tighten it up.
- Start the engine and check the oil pressure.
- Turn off the engine and check the oil level on the dipstick. Top up with oil, if necessary.

Cleaning or replacing the air filter main element

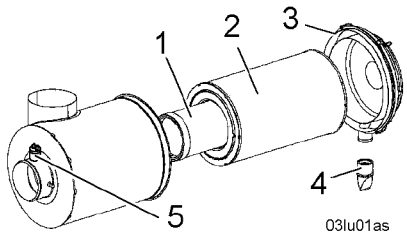
The main element 2 should be cleaned or replaced when the symbol field – air filter contamination on the display unit lights up or at least every 1000 service hours.

If the symbol field – air filter contamination continues lighting after the main element 2 has been serviced then the safety element 1 must also be replaced.

Make sure that:
- the vehicle is in maintenance position 1
- the engine compartment-door is open
- the battery main switch is switched off and the main switch – key is taken out

LBH/02/003801/0003/6.0/en

Procedure



air filter

1 safety element
2 main element
3 service cap
4 dust unloader valve
5 vacuum switch - air filter contamination

- Open fixing clips on the service cover 3 and take the cover off.
- Remove the main element 2 and the safety element 1. To do this pull or turn the elements gently upwards, downwards or to the side in order to release the seal.
- Blow the main element 2 from inside outwards with dry air. Avoid tapping the filter, as this could cause damage.
- Make sure that all contamination is removed before inserting a new or cleaned filter element.
- Safety element 1 should be replaced every third time the main filter element 2 is replaced.
- Lightly oil the seal surfaces before installing the filter elements (for the main element 2 this is on the inside, for the safety element 1 on the outside). Re-insert filter elements 1 and 2 and make sure that they are correctly fitted.
- Clean the service cover 3 and replace it on the filter housing. Once the cover rests over its full circumference on the filter housing, you can close the fixing clips without excess force.
- Close the fixing clips.

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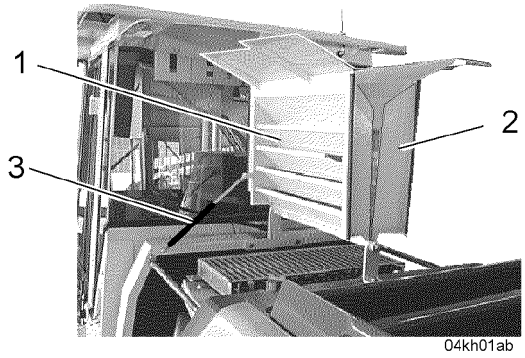
Cooling system

Cleaning the cooling system



Cooling system hood

In order to ensure that the cooling media are properly cooled, the coolers should be cleaned whenever necessary. When operating in dusty conditions, the coolers should be checked daily and cleaned if required.
Dirty cooler units result in overheating. The consequence is an acoustic and visual warning with simultaneous power reduction of the travel drive.
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 vehicle is in maintenance position 1
– the cooling system – left- and right-hand hoods are open

Procedure

- Clean cooler units with compressed air, steam or water.

Caution

The cooler fins may be damaged if they are not treated with due care.

! Do not use hard objects or excess water pressure for cleaning

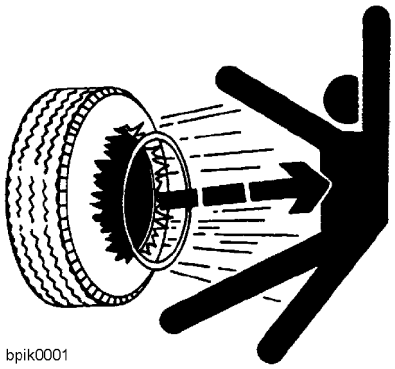
- Reclose hood 1 and hood 2 after closing the cab doors.

Axles, Tyres

Checking and if necessary, adjusting tyre pressure on attachments and accessories

Make sure that the air pressure in the tyres on both axles corresponds to the required values for the tyre type, the actual application and the working attachment.
The reference values can be found in the Section "Technical data", in the **"Operator's manual"**.

Procedure
The air pressure in the tyres has a significant influence on the overall operating performance of the vehicle.



Exploding tyres

Warning

Risk of accidents due to exploding tyres!
Incorrect or careless operation of the tyre inflation equipment or excess pressure could result in the tyres bursting or cause the rims to come off, 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 measuring gauge and adjust if necessary.

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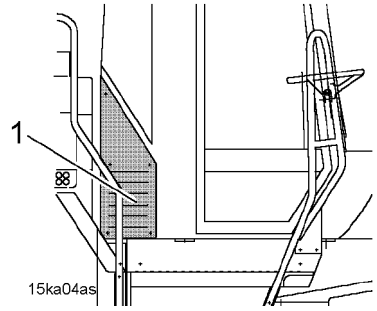
Cleaning or replacing the fresh air and recirculated air filter as required

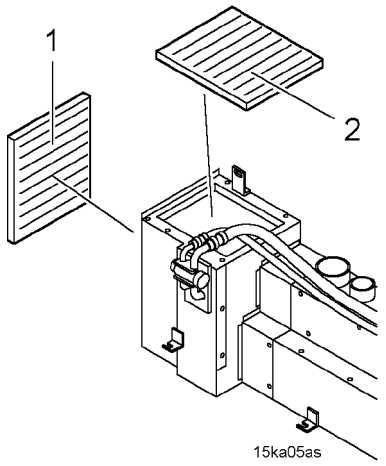
Make sure that the vehicle is in maintenance position 1.



Procedure

- Unscrew cover 1.
- After the ignition has been switched on:
  Turn the air flap with "rotary switch – ventilation" to the "fresh air" position.

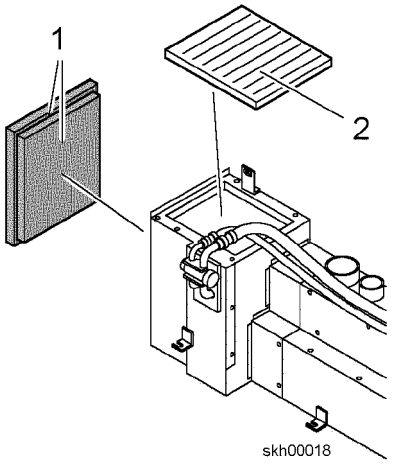
Valid for: *L544-442/0104-0358; L544T-444/0104-0358*



- Lightly press down fresh air filter 1 on upper end and pull it out.
- Carefully push out recirculted air filter 2 from inside / below via the open air flat and discard it.
- Clean the filters 1 (blow them out), replace if necessary.
- Clean the filters 2 (blow them out), replace if necessary.
- Insert clean or new filters, make sure that they are correctly positioned (cast arrows on the filter frame show the direction of the drawn in air).
- Screw down cover 1 again.

Modification The existing fresh air filter has been replaced with a foam pre-filter and a foam fine filter.

Valid for: *L544-442/0359-; L544T-444/0359-*



- Pull out the fresh air filter 1 (consisting of 2 pieces).
- Carefully push out recirculted air filter 2 from inside / below via the open air flat and discard it.
- Clean the filters 1, (blow them out or wash them out); replace if necessary.
- Clean the filters 2 (blow them out), replace if necessary.
- Insert clean or new filters, make sure that they are correctly positioned (cast arrows on the filter frame show the direction of the drawn in air).
- Screw down the cover 1 again.

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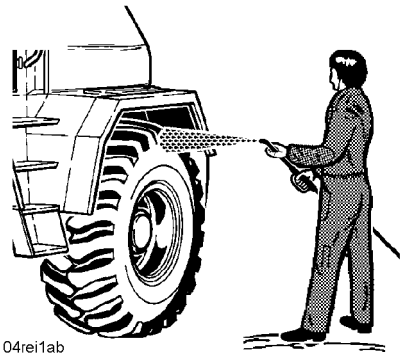
5.3.5 Cleaning the vehicle

Wet-cleaning the vehicle



Wet cleaning

Cleaning the vehicle

Oil pressure switches are not watertight due to the necessity of diaphragm ventilation, therefore be careful when spraying with a high pressure spray!

Each time the vehicle is cleaned with a steam jet, all lubrication points on the vehicle must be re-greased.

Caution

Risk of damage to freshly painted surfaces!
Cleaning with high pressure [more than 1379 kPa (13.8 bar) can damage freshly painted surfaces.

! After the vehicle has been delivered, the paint should dry for at least 30 days in the air, before the vehicle or parts thereof are cleaned with a high pressure cleaner.

! Until this 30 day period has elapsed, only use a low pressure cleaner for washing!

- Wet clean the vehicle.
- Re-grease all lubrication points on the vehicle.

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.

Caution

Risk of damage to the diesel engine!
Penetrating moisture results in corrosion of contacts and failure of measuring functions.

! Do not expose electrical transducers, such as oil pressure switches to direct water or steam jets.

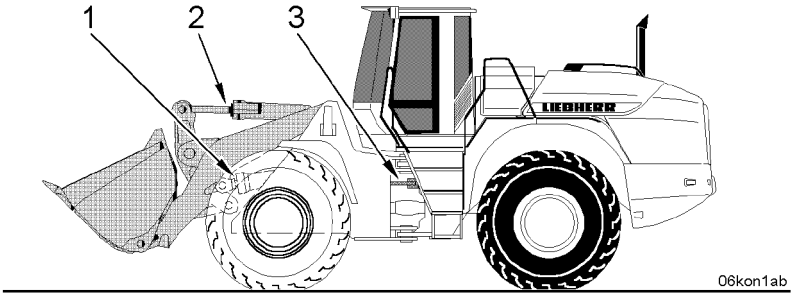
- Clean the engine carefully.

5.3.6 Corrosion protection work

When the vehicle is shut down for more than 4 weeks and especially for sea transport, the following measures must be carried out.

Protecting the piston rods from corrosion

LIEBHERR corrosion protection grease CTK ident. No. 8613 31301 is recommended.



1 Lift cylinder
2 Tilt cylinder
3 Steering cylinder

- When the vehicle is switched off, all 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 vehicle is moved for loading or transport, the corrosion protection layer on the cylinder piston rods is removed by the dirt scraper.

- When the vehicle is to be transported:
  The corrosion protection on the piston rods should be checked after loading.

Corrosion protection of the fuel tank

When the vehicle is out of service for longer periods, condensation can build up in the tank.
Condensation in the tank leads to rust formation.

- If the vehicle is out of service for longer than 2 months:
  Fill the fuel tank with diesel fuel.

5.4 Lubricants and fuels

5.4.1 Handling lubricants and fuels

Conscientious observance of the regulations for handling lubricants and fuels will increase the reliability and service life of the vehicle.
It is especially important that the specified lubricant qualities are observed.
You can find the various specifications about the prescribed intervals in the sections "Maintenance and inspection schedule" and "Lubrication chart".
You can find details on lubrication, level checking and changing operating fluids in the section "Maintenance" under "Maintenance tasks..."
Observe the rules for the proper handling of lubricants and fuels, especially the environmental regulations.

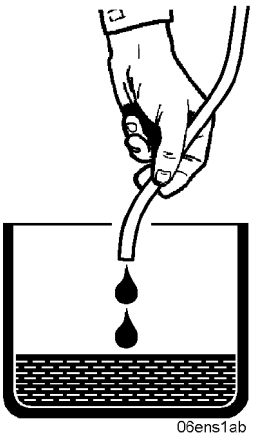
Environmental protection measures

- Always implement and observe environmental protection measures.
- Observe national regulations.
- Ensure that liquids can be properly disposed of before draining them off.

Disposing of used materials

This applies to the following types of used materials:
– oils, lubricants, brake fluids, refrigerants etc.
– fuels
– filters, oil cartridges etc.
– rubber, tyres, insulating materials etc.
– batteries

- Observe the environment regulations when disposing of used materials.
- Collect and store used materials separately in suitable receptacles, and only dispose of them at official depots in an environmentally friendly way.
- Observe national regulations.



Disposal

Conversion from mineral oils to environmentally compatible hydraulic fluids

For the operation of LIEBHERR earth moving vehicle with "environmentally compatible hydraulic fluids", we recommend **AVIA SYNTOFLUID**.

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Caution

Risk of damage to the vehicle's hydraulic system!
Mixing "environmentally-compatible hydraulic fluids" with "mineral oils" produces an aggressive reaction that can damage the hydraulic system!

! Avoid mixing "environmentally-compatible hydraulic fluids" with "mineral oils"!

- **If the vehicle is converted to an "environmentally-compatible hydraulic fluid by the customer"**, LIEBHERR CUSTOMER SERVICE must be contacted!
- It is essential that you request the **"INSTRUCTION SHEET"** and the **"CONVERSION GUIDELINES"** from LIEBHERR and that you observe them!

Handling coolants

Make sure that if you top up with coolant due to coolant loss, the level of anti-freeze does not drop below 50% vol.

Caution

Risk of damage to the diesel engine!
If the proportion of corrosion/frost protection agent is too high, the cooling effect is reduced, causing damage to the diesel engine!

! Do not use more than 60% anti-freeze and corrosion protection agent.

- As part of routine maintenance work, the mixture ratio of anti-freeze and corrosion protection agent and DCA 4 – concentration must be checked and if necessary corrected.
- Use the Fleetguard test set CC 2602 for testing.
- In order to top up with new coolant: check that the cooling system is clean and flush out if necessary.

5.4.2 Lubricant and fuel specifications

The values stated for the filling quantities in the table are only guidelines:
– in each case, the dipstick or level markings are definitive
– each time the lubricant or service fuel is replaced or topped up, the level in the appropriate unit must be checked
– For more detailed information about the required lubricants and service fuels, see the "Lubrication chart, filling quantities" and "Lubricants and fuels" sections.

Lubricating oils for diesel engines

Specifications

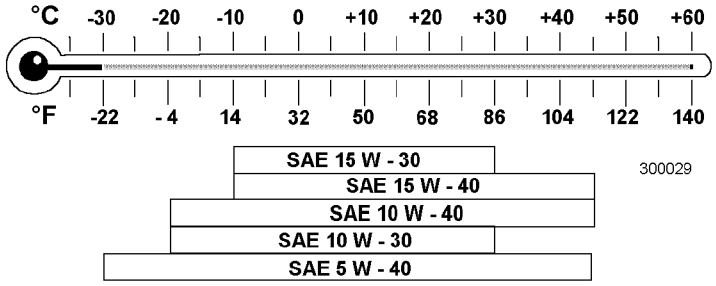
Only high-alloy lubricating oils are used in modern diesel engines.
They consist of basic oils blended with additives.
The lubricating oil regulation for LIEBHERR diesel engines is based on the following specifications and regulations.

Name	Specifications
ACEA (CCMC) - Classification (Association des Constructeurs Européens de l'Automobile)	E2-96, E3-96, E4-98, (D4, D5)
API - Classification (American Petroleum Institute)	CG-4, CF-4

Specifications and regulations for diesel engine lubricating oils

Lubricating oil viscosity

The lubricating oil viscosity is selected according to the SAE (Society of Automotive Engineers) classification.
The decisive factor for the selection of the correct SAE class is the ambient temperature.
The selection of SAE classification does not affect the quality of a lubricant oil.
If the viscosity is too high, starting can be difficult; if it is too low, lubricant efficiency may be impaired.
The temperature ranges detailed in the following graphic are guidelines; short-term deviations are permissible.



Temperature dependent selection of the SAE class

Lubricant oil changing intervals

Changing intervals:

- first oil and filter-change with initial oil filling: see the section "Maintenance and inspection schedule"
- first oil and filter-change with oils according to the lubricating oil guidelines: see the section "Maintenance and inspection schedule"
- further filter replacements: see the section "Maintenance and inspection schedule"
- oil change according to climate zone, sulphur content in the fuel and oil quality according to the following table

Even if the specified number of service hours (h) is not reached in a given year, the engine oil and filter should be replaced at least once.

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Difficulty factors

Various difficulty factors or difficult working conditions can affect the maintenance interval.

Difficulty factors or difficult working conditions could include:

– frequent cold starts
– sulphur content greater than 0.5% in fuel
– service temperature under - 10 °C

If difficulty factors or difficult working conditions apply, the oil change intervals defined in the "Maintenance and inspection schedule" according to the table below must be reduced by half.

Difficulty factor		**Oil quality**	
		E2-96	E3-96
		D4	E4-98
		CG-4	D5
		CF-4	- -
Working conditions	Sulphur content in fuel	interval	
climate - normal, up to - 10 °C	to 0.5%	250 h	500 h
	over 0.5%	125 h	250 h
under - 10 °C	to 0.5%	125 h	250 h
	over 0.5%	- -	125 h

Oil change intervals in service hours (h)– applicable for turbocharged engines

Diesel fuels

06sy02ab

Specifications

The diesel fuels must meet the minimum requirements in the fuel specifications listed below.

Authorised fuel specifications:

– DIN EN 590
– ASTM D 975-89a 1D and 2D

Other fuel specifications are only permissible after consultation with the Diesel Engine Development department.

The sulphur content should not exceed 0.5% by weight. Higher sulphur content affects the oil change intervals and the engine lifetime.

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 0.05 % sulphur by weight max. limit allowed in Europe can cause wear in the injection system (especially with distributor injection pumps).

"Branded fuels" (in Germany) contain these lubricant additives as part of their additives package. The fuel lubricosity must correspond to HFRR (60°) Test <400 µm.

The additives should be added by the supplier in his capacity as agent responsible for fuel quality. Addition of secondary lubricosity additives by the customer is not recommended.

Diesel fuel at very low temperatures

When external temperatures fall below approx. 0°C, the flow performance of summer diesel fuel may be insufficient as a result of paraffin separation. The same problem arises with winter diesel fuels below -15 °C.

Diesel fuel containing additives with a working temperature down to -20 °C is also often available.

To avoid breakdowns, the diesel fuel must be mixed with two star petrol or paraffin at low temperatures. Blending in two star petrol must be viewed as an emergency remedy and may not exceed 30% vol.

Supergrade petrol may not be used for blending.

Engine power can drop in relation to the additive mixture used for cold conditions. Blending in additives should therefore be kept to a minimum, taking into account the external temperatures.

For safety reasons, the fuel may only be mixed in a fuel container. When tanking up, pour in the fuel additive with lower specific gravity before the diesel fuel. The engine should then be run until the fuel mixture is circulating throughout the entire fuel system.

Diesel fuels – mixture ratio (Vol. %)

External temperatures °C	Summer diesel %	Additive %
0 to -10	70	30
-10 to -15	50	50 *
-15 to -20	- -	- -
-20 to -25	- -	- -

Mixing ratio for summer diesel fuel

* If an additive of 50% is necessary, only paraffin may be used (not two-star petrol).

External temperatures °C	Winter diesel fuel %		Additive %	
	-15 °C	-20 °C	-15 °C	-20 °C
0 to -10	100	100	- -	- -
-10 to -15	100	100	- -	- -
-15 to -20	70	100	30	- -
-20 to -25	50	70	50 *	30

Mixing ratio for winter diesel fuel

* If an additive of 50% is necessary, only paraffin may be used (not two-star petrol).

Additives for diesel fuel (flow improvers)

Flow improvers available on the market will also improve the cold weather performance of the diesel fuel. Their use requires the observance of quantity and application recommendations stipulated by the manufacturer.

Additive admixture for diesel particle filters:

The additive admixture can be made in various ways:

– by manual additive admixture at the company petrol station
– alternatively a ready blended diesel fuel can also be ordered directly from the fuel dealer

It is inadvisable due to its inaccuracy, to mix in additives manually at the vehicle.

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Approved additive

BRAND	MANUFACTURER
SATACEN	SAT CHEMIE GMBH, D-44649 Herne / Germany

Brands and manufacturers of additives

We expressly recommend that you maintain a sufficient supply of stocks.
Orders of containers with 10 litres of additive can be placed with the manufacturer under product No. 21840.

Metering during refuelling

It is absolutely essential for the continued operation of the particle filter system that the correct quantity of additive is always added.
Each time the vehicle is refuelled, the additive must be added in the prescribed quantity to the diesel fuel, or added directly to the tank.
Additive mixing ratio: see seciton "Technical data" under "Diesel particle filters".

Hydraulic oils

Mineral oils

Specifications

Only engine oils meeting the Mercedes Benz service fuels specifications are permitted.

Mercedes-Benz - Information sheet - No.:	Specifications:
226.0 and 227.0 (single-grade oils):	API- CC / SF, CD / SF, CE / SF
227.1 and 228.1 (multi-grade oils):	CD / SF, CE / SF,
	CD+API- CC / SF (MIL-L-46152 B),
	CD / SF, CE / SF (MIL-L-2104 D),
	CD / SF (MIL-L-2104 D), CE / SF,
	CD+ (MIL-L-46152 B)

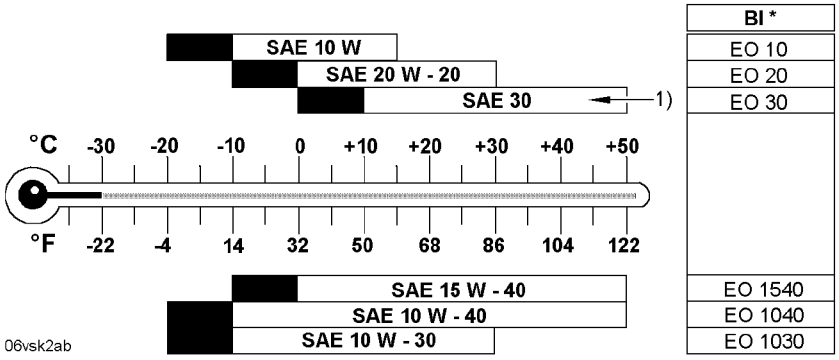
Mercedes-Benz service fuels requirements

Viscosity

The viscosity is selected according to the SAE (Society of Automotive Engineers) classification.
The decisive factor for the selection of the correct SAE class is the ambient temperature.
The selection of the SAE classification does not give any information about the quality of a hydraulic oil.

LBH/02/003801/0003/6.0/en

The temperature ranges presented in the graphic are only provided as guidelines.



Temperature dependent selection of the SAE class

BI * = code designation = container labelling, see the Section "BI * Standard lubricants".

Warm running regulations

For temperatures up to 10 °C below the specified limit:
- adjust the diesel engine after starting to just approx. ½ engine speed
- activate hydraulic cylinders and engines and briefly move the cylinders to their stops
- warm running duration approx. 10 minutes

For even lower temperatures:
- before starting the engine, prewarm the oil tank

1) = Exception for transfer gear (AVG - powershift transmission):
- **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 vehicles with environmentally compatible hydraulic fluids, we recommend **AVIA SYNTOFLUID** with the viscosity specified by LIEBHERR.

Caution!
- If the conversion of the hydraulic system to an "environmentally compatible hydraulic fluid" is not carried out properly, there is a danger that the vehicle's hydraulic system will be damaged!
  See the section "Conversion from mineral oils to environmentally harmless hydraulic fluids"

Machines which were filled ex-works with "environmentally compatible hydraulic fluids", have an appropriate sign (decal - CAUTION) attached to the driver's cab and hydraulic tank.

Conversion of the hydraulic system:
- See the section "Conversion of the hydraulic system from mineral oils to environmentally compatible hydraulic fluids" for guidelines on retrofitting your vehicle to adapt it to a "environmentally compatible hydraulic fluid".

LBH/02/0038O1/0003/6.0/en

Lubricating oils for the transmissions


06sy08ab

Pump distributor gear and axles

06sy06ab

Gear oils must comply with the specifications – API-GL-5-90 and MIL-L-2105 B, C or D and the viscosity class SAE 90 LS *.

* = Gear oil with limited – slip additives for disc brakes and self-locking differentials.

For the viscosity class SAE 90, an oil of the viscosity class SAE 80 W 90 can also be used.

Comparison to BI * – code designation:

– SAE 90 LS / BI * – GO 90 LS
– SAE 80 W - 90 / BI * – GO 90

BI * = code designation = container labelling, see the Section "BI * Standard lubricants".

Transfer gear

Oil in accordance with the section "Hydraulic oils" must be used for lubricating the transfer gear.


06sy07ab

Grease for general lubrication points


06sy09ab

This grease must meet the specification **KP2k**– Consistency 2 of the NL GI class according to DIN 51818 and DIN 51825 or EP 2 according to NF-T-60 132.

The grease must consist of a lithium complex and exhibit 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, see the Section "BI * Standard lubricants".

LIEBHERR special paste CTK

06sy20ab

Bonding, water resistant, complex saponified paste with high-pressure additives and improved corrosion protection characteristics.

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.

Re-order from your LIEBHERR dealer under Identno.: 8613 3101.

Lubricant grease for automatic central lubrication systems


06sy09ab

Grease complying with the specification **KP2k** – Consistency 2 of the NL GI class according to DIN 51818 is suitable.

Composition: Lithium-saponified multi-purpose grease with a mineral oil base with EP active ingredients, without colouring.

Grease with high-pressure additives (EP greases) are recommended.

Only use greases with the same type of saponification.

Lubricants with solid lubricant particles, e.g. graphite may not be used.

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Approved greases

LIEBHERR 9610 special grease is a milling resistant, aging resistant lithium grease, providing protection against corrosion with excellent lubricosity over a wide temperature range.
The molecular composition yields high degrees of shearing and milling stability and good flow properties in long pipes.

Description	ID No.	Quantity
LH special grease 9610	8613 01308	25 kg (drum)
LH special grease 9610	8613 02908	400 g (carton)

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 agent for bolt installation

A molybdenum sulphide paste is recommended as anti-seize agent for the bolts.

BI * standard lubricants

See the brochure "STANDARD LUBRICANTS for construction machines and vehicles".
Published by the German Construction Industry Federation (Hauptverband der Deutschen Bauindustrie e.V.)
Bauverlag GmbH – Wiesbaden and Berlin.

Coolants for diesel engines

Anti-freeze and corrosion protection agents


06sy04ab

In order to improve the quality of the coolant, coolant filter modules have been introduced in the LH diesel engines for earth-moving vehicles.
This ensures that the coolant is additionally filtered in the parallel flow and freed from contamination or rust particles that could result in leakage from the water pumps.
In addition, a chemical additive (DCA 4) protects the cooling system or the parts coming into contact with the coolant, such as water pump, cylinder sleeves etc., from cavitation, corrosion, calcification and foam formation.
Four different coolant filter modules have been introduced to deal with different coolant volumes and coolant filter assemblies on engines and vehicles.

LBH/02/003801/0003/6.0/en

Coolant with DCA 4 (DCA 4 = Diesel Coolant Additives)

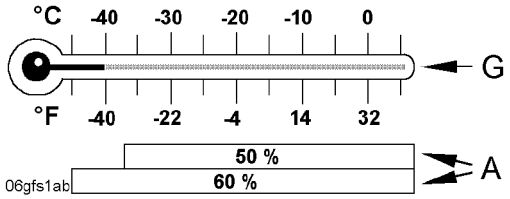
The coolant must contain at least 50% vol. anti-freeze and corrosion protection agent all year round. This protects against freezing down to approx. -37 °C.
When coolant loss occurs, make sure that the proportion of anti-freeze has not dropped below the 50% vol. limit.

Caution!

- **Risk of damage to the diesel engine!**
  If the proportion of anti-freeze and corrosion protection agent is too high, the cooling effect is reduced, causing damage to the diesel engine!
- **Do not use more than 60% anti-freeze /corrosion protection agent.**

In the context of maintenance work, the mixture ratio of anti-freeze and corrosion protection agent and DCA 4 – concentration must be checked and corrected as needed.
DCA 4 - concentration must be between 0.3 –0.8 units per litre.
The Fleetguard testing set CC 2602 M is recommended for testing purposes.
The prescribed interval for changing the coolant is 2 years.
Before adding new coolant, the system should be checked for cleanliness and flushed out if necessary.

Mixing ratio



Temperature dependent selection of mixing ratio of corrosion and anti-freeze protection agents

G Anti-freeze to – in °C A Proportion in % of anti-freeze

Filling the cooling system for the first time

When the cooling system is filled for the first time or re-filled following repairs, additional fluid DCA 4 must be added to the DCA 4 concentration in the coolant filters for anti-freeze and corrosion protection.
DCA 4 is available in bottles (packs of approx. 0.47 litres each).

Cooling system	Required quantity of fluid DCA 4		DC 4 - coolant filter
Content in litres	Packs	Litres	Description Identno.
24 - 39	3 or –	1.4	WF 2071 7367045
40 - 59	4 or –	1.9	WF 2072 7381493
60 - 79	5 or –	2.4	WF 2073 7367052
80 - 115	8 or –	3,8	WF 2073 7367052

DCA 4 mixture when filling the cooling system for the first time

Fresh water regulations

Clean water, not excessivel hard, must be used for preparing the coolant.
Tap water often, but not always, meets these requirements.
Sea water, brackish water, salt water and industrial waste water are not suitable.

Name	Value and unit
Total of alkaline earths (water hardness)	0.6 to 2.7 mmol/l (3 to 15° d)

Name	Value and unit
pH value at 20 °C	6.5 to 8.0
Choride ion content	max. 80 mg/l
Sulphate ion content	max. 80 mg/l

Fresh water quality for use of coolant with DCA 4

Use of DCA 4 without anti-freeze and corrosion protection agent

In exceptional cases and when ambient temperatures never drop below freezing, e.g., in tropical zones, where it is demonstrable that no approved anti-freeze and corrosion protection agent is available, the coolant may be composed solely of water and DCA 4.

In order also to protect the cooling system from corrosion in this case:

- approx. twice as much DCA 4 must be used in relation to the mixture ratio of anti-freeze and corrosion protection agent and DCA 4
- the DCA 4 – concentration must be between 0.6 and 1.06 units per litre

In the context of maintenance work, the DCA 4 – concentration must be checked and corrected if necessary.

The coolant must be replaced once a year.

No coolant treating agents (corrosion protection oil) may be used when water + DCA 4 are being used alone.

Approved anti-freeze and corrosion protection agents

BRAND		MANUFACTURER
A	Agip Antifreeze Plus	Agip Petroli S.p.A Rome Italy
	Agip-Auto Langzeit-Frostschutz	Agip Schmiertechnik GmbH, Würzburg
	Antigel DB 486	Sotragal SA, St. Priest / France
	Aral Antifreeze Extra	Aral AG, Bochum
	Aral Antifreeze T	Aral AG, Bochum
	Avia Antifreeze APN	Deutsche Avia-Mineralöl GmbH, Munich
B	BP Antifrost X 2270 A	Deutsche BP AG, Hamburg
	BP Napgel C 2270/1	BP Chemicals Ltd., London/England
D	DEA Kühlerfrostschutz	DEA Mineral AG, Hamburg
	DEUTZ Kühlschutzmittel 0101 1490	DEUTZ Service International GmbH, Cologne
	DOW Kühlmittel D 542 / 1993	BOSS Chemie AG, Wittenbach/Switzerland
F	Frostschutz 600	Mobil Schmierstoffe GmbH, Hamburg
G	Glacelf SX	Elf Lubrifiants Paris/France
	Glyco Shell	Shell Chemie GMBH, Eschborn
	Glysantin (G 48-00)	BASF AG, Ludwigshafen
I	Igol Antigel Type DB	Igol France, Paris/France
M	Motul Anti-Freeze	Motul SA, Aubervilliers Cedex/France
O	ÖMV - Kühlerfrostschutzmittel	ÖMV AG, Vienna/Austria
	OZO Frostschutz S	Total Deutschland GmbH, Düsseldorf
T	Total Multiprotect	Total Deutschland GmbH, Düsseldorf

Brands and manufacturers of anti-freeze and corrosion protection agents

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Sealing agents, safety agents and greases for diesel engines

This list contains all sealants, safety materials and greases required for installation or maintenance work on the engines.
Their application is described in the appropriate installation or maintenance procedure in the "Service Manual" for diesel engines.

Sealants and safety materials

Omnivisc 1050 or Hylomar SQ 32/M or Reinzoplast
Loctite 222 or Omnifit 50 M
Loctite 243
Loctite 262 or Omnifit 100 M
Loctite 270 or Omnifit 200 M
Loctite 577
Loctite 648 or Omnifit 230 M

Greases

Molykote Longterm 2 Plus
Barrierta L55/3
Staburags NBU 12

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