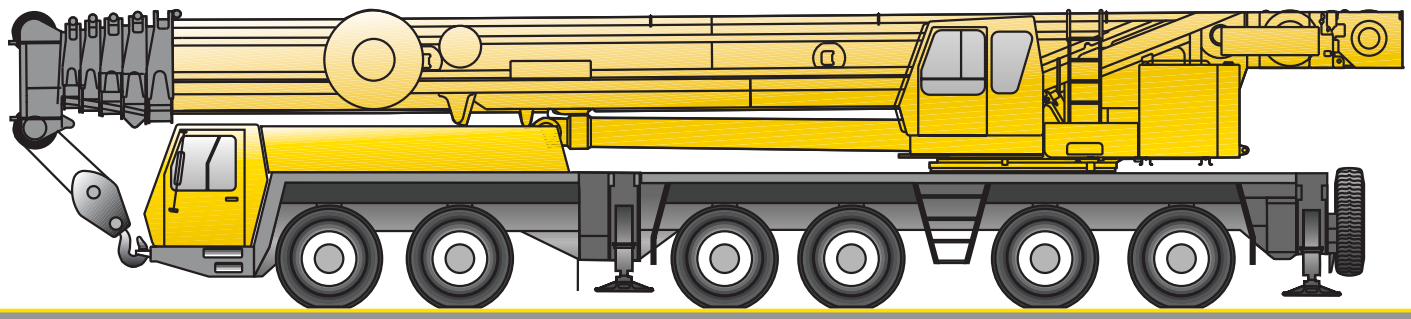
GROVE®

GMK6220-L



Operating instructions Part 1 Driving

Vehicle serial number:

2 084 753 en
31.01.2003

The following plates and numbers have been fitted to the truck crane for identification:

1 The superstructure name plate at the front of the crane operator's cab containing serial number and description of the crane model.

2 The CE mark on the name plate (only with truck cranes that are delivered to member countries of the EU).

3 The chassis name plate on the passenger seat console containing the chassis number and designation of the crane model.

4 The chassis number at the front right above the first axle line, in the web plate of the frame.

The location of identification numbers for removable rigging parts (e.g. counterweights, lattice extension, auxiliary hoist) is specified in the corresponding chapters.

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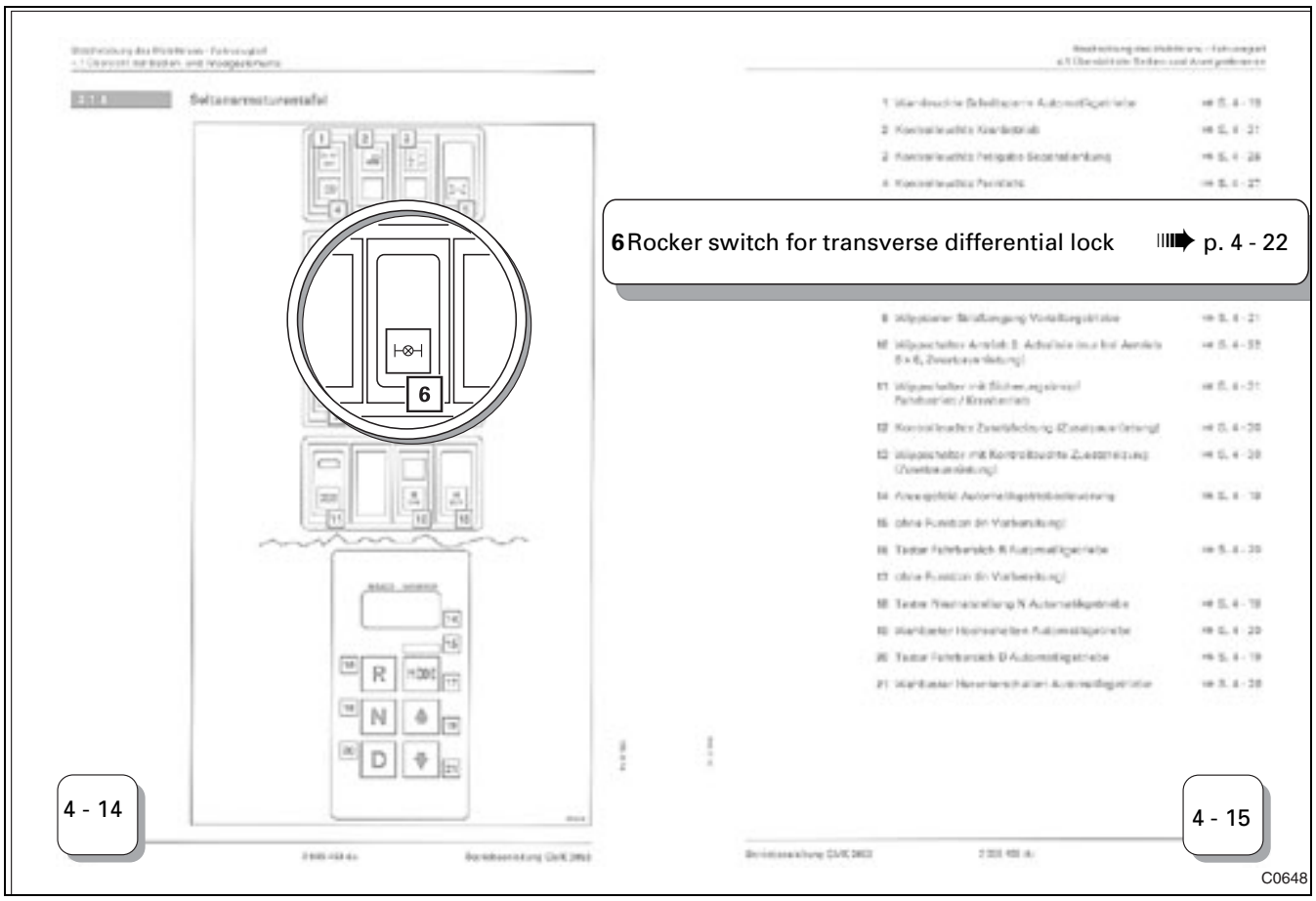

The side instrument panel is shown on page 4 - 14. In our example the magnifying glass is directed at the symbol designated by the item number **6**. On the opposite page 4 - 15 under number **6** you will find the designation *Rocker switch for transverse differential lock*. You will find information on this switch on page 4 - 22.

Improper use includes:

- Transporting loads on the carrier
- Pushing, pulling or lifting loads with the level adjustment system, the beams or the outrigger cylinders
- Pushing, pulling or lifting loads off the ground using the slewing gear, the derricking gear or the telescoping gear
- Pulling off fixed objects using the crane
- Two-hook operation with the boom extension and two-hook operation on the main boom head without additional equipment
- Two-hook operation
- Operation when crane is not on outriggers (free on wheels)
- Defining SLI codes that do not correspond to the actual rigging mode
- Working with an overridden SLI or overridden lifting limit switch
- After SLI deactivation, the radius must be increased by pulling the raised load at an angle
- Misuse of the outrigger pressure display as a safety function to prevent overturning after an SLI shutdown (outrigger pressure greater than 0 t)
- Road driving in an unauthorised driving mode (axle load, dimension)
- Moving the rigged crane in an unauthorised driving mode
- Using equipment that is not authorised for use with the crane
- Transporting passengers on unauthorized parts of the vehicle
- Transporting passengers without previous written permission from the manufacturer
- Carrying passengers outside the driver's cab
- Loading and unloading work, i.e. continuous operation without a corresponding break
- Usage for any kind of sport or recreation event, especially for "bungee jumping"

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. Applications engineering

. . Application engineering requirements

Plan each application carefully. Gather information concerning the route, including in particular

– the distance,

– the route,

– overhead clearances or

– the load bearing capacity of bridges.

Gather information about the job including

– the load bearing capacity and stability of the ground (soil, buildings),

– the weight and dimensions of the loads to be lifted,

– the type of load (degree of risk involved),

– required stroke length and radius,

– restricted movement due to buildings etc.

Have the necessary equipment arranged, such as

– lifting gear,

– counterweight,

– blocks for support etc.

Organise transportation and obtain any necessary driving permits.

Poor planning leads to improvisation – and improvisation is the cause of many accidents!

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1 Sun screen

2 Loudspeaker

3 Radio

4 Air conditioning (additional equipment) or ➠ p. 4 - 38
roof ventilator (additional equipment) ➠ p. 4 - 36

5 Cab lighting ➠ p. 4 - 40

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1 Rocker switch for off-the-road gear transfer case ➠ p. 4 - 26

2 Rocker switch for transfer case neutral position ➠ p. 4 - 26

3 Rocker switch for on-road gear transfer case ➠ p. 4 - 26

4 Rocker switch for transverse differential lock in all driven axle lines ➠ p. 4 - 27

5 Indicator lamp for additional heating system (additional equipment) ➠ p. 4 - 36

6 Separate steering indicator lamp ➠ p. 4 - 31

7 Rocker switch with automatic gearbox driving mode lock button ➠ p. 4 - 25

8 Switch with diagnostic warning lamp for automatic gearbox ➠ p. 4 - 24

9 Drive 2nd axle line/transverse differential lock rocker switch ➠ p. 4 - 27

10 Rocker switch with separate steering lock button ➠ p. 4 - 31

11 Unlocked steering warning lamp ➠ p. 4 - 31

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Axle drive

The drive of the second axle line/longitudinal differential locks and the transverse differential locks can only be switched on when the off-the-road gear is switched on and the key-operated switch of the level adjustment system is pressed; ➠ p. 6 - 41.

Rocker switch for drive of second axle line/longitudinal differential locks

Activates the drive of the first, fourth and fifth axle lines as well as the drive of the second axle line. The longitudinal differential locks in the transfer case and in the fourth axle line are switched on simultaneously.

May only be activated when the vehicle is stationary or is moving at a speed of no more than 3 km/h.

Switching on: Press rocker switch down.

Switching off: Press rocker switch up.

➠ *Drive of the second axle line/longitudinal differential locks*, p. 6 - 37.

Indicator lamp for drive of 2nd axle line/longitudinal differential locks

To check the switch states:
– Drive of 2nd axle line, on/off
– Longitudinal differential lock in transfer case on/off,
– Longitudinal differential lock on the 4th axle line on/off

Illuminates when **one** of the three numbered switch states is mechanically switched on.
Goes out when **all three** of the numbered switch states are mechanically switched off (if present).
➠ *Drive of the second axle line/longitudinal differential locks*, p. 6 - 37.

Transverse differential lock in all driven axle lines rocker switch

Locks the transverse differentials in all driven axle lines.
May only be activated when the vehicle is stationary or is moving at a speed of no more than 3 km/h.

Switching on: Press rocker switch down.

Switching off: Press rocker switch up; ➠ p. 6 - 39.

Indicator lamp for transverse differential lock in all driven axle lines

Illuminates if all transverse differential locks have been switched on.
Flashes if all transverse differential locks have not be switched on or off.
Goes out if all transverse differential locks have been switched off;
➠ *Transverse differential locks in all driven axle lines*, p. 6 - 39.

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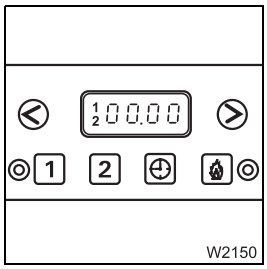
Auxiliary heater with timer (additional equipment)

Operating the auxiliary heater with timer additional equipment ➠ p. 6 - 60.



The operating elements described in the following section are in the insert for the auxiliary heater with timer and are only available with additional equipment.

Heating system display

Serves as a display for the time and selected storage locations for the automatic heating start, and for the input of times.

Push-button for displaying/setting time

Used to display and set the current time.
To set, push the *Flow* or *Return* push-button as well.

Push-button for storage location 1

Used to display automatic heating start for storage location 1 and to switch it on and off.

Push-button for storage location 2

Used to display automatic heating start for storage location 2 and to switch it on and off.

"Switch heating on/off" push-button

Used to switch the heating on and off manually.

Return push-button

To enter the time for the automatic heating start and to set the current time (in combination with the *Display/set time* push-button).

Flow push-button

To enter the time for the automatic heating start and to set the current time (in combination with the *Display/set time* push-button).

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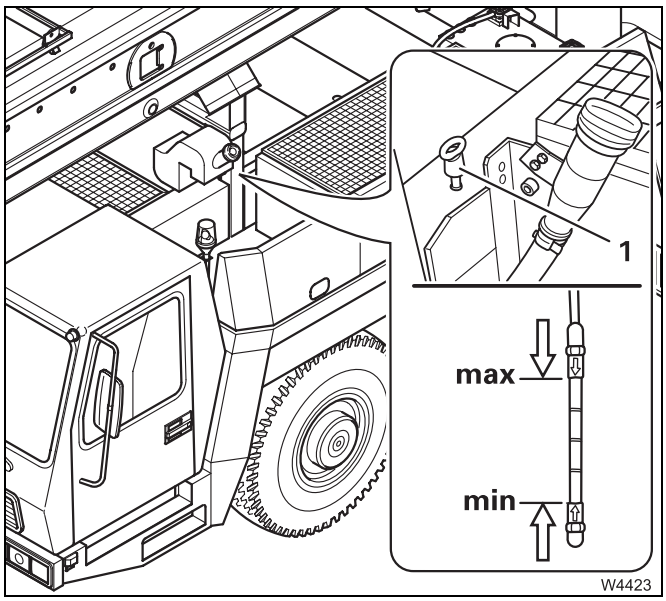


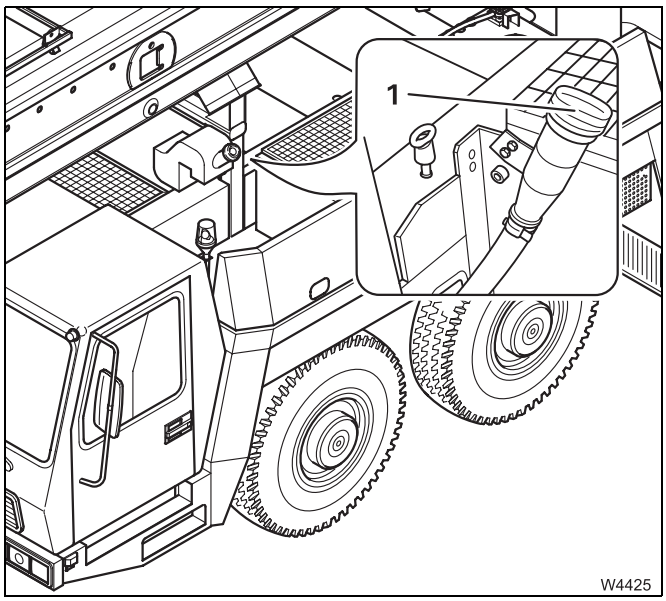
The oil dip stick (**1**) for the vehicle engine is on the left-hand side, in front of the boom support.

The oil level must be between **min** and **max** (arrow marks).

Top up the engine oil if necessary, ➠ *Topping up engine oil*, p. 5 - 9.

Topping up engine oil

Data for the prescribed oil specifications may be found in the operating manual for the vehicle engine.



The oil filler neck (**1**) for the vehicle engine is on the left-hand side, in front of the boom support.

- Refill the engine oil through the filler neck (**1**).

Damage may occur to the engine if the oil level is too high.
Do not put in too much oil. The oil level must not exceed the upper arrow mark (**max**). Drain oil if necessary; ➠ *Operating instructions of the vehicle engine manufacturer*.

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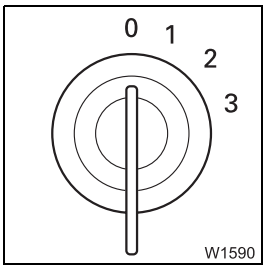
Turning off the vehicle engine

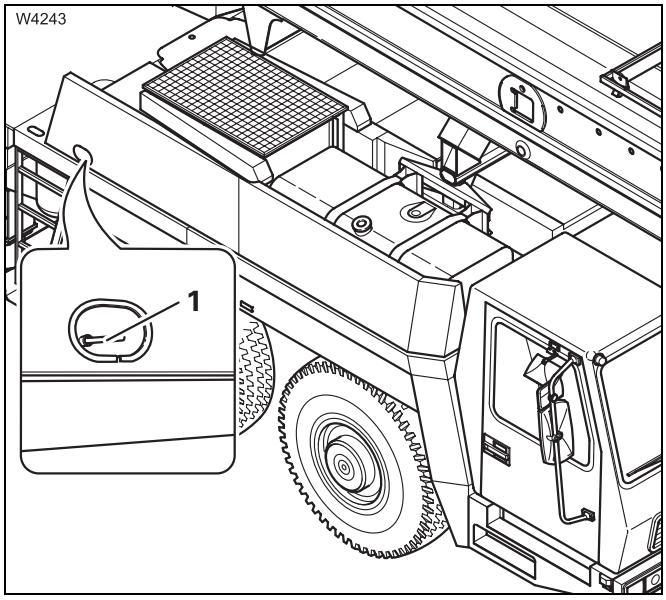
Risk of accidents due to truck crane steering not functioning!
Turn off the vehicle engine only when the truck crane is at a standstill. When you remove the ignition key, the steering locks and you will loose control of the truck crane if it is moving.

If the temperature of the coolant is still very high (e.g. after driving over a pass), let the diesel engine run for another one or two minutes at increased idling speed.



- Turn the ignition key to position **0** and remove the ignition key.

When you want to turn off the truck crane, follow the further steps described in section *Turning off the truck crane*, p. 6 - 32.



In the case of an emergency or when the vehicle engine does not turn off after the ignition key has been turned to position **0**, it is also possible to shut-down the vehicle engine outside the driver's cab.

- Switch off the battery master switch (**1**) to do this. The battery master switch is switched off if the selector handle can be removed.

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On-road driving mode table

For the GMK 6220-Ltruck crane there are driving modes for up to 12 t axle load. This section contains a table listing the different driving modes and the corresponding overall weight and axle loads. The table is in three parts:

- The top part, **Equipment**, gives the driving mode of your truck crane. Determine which driving mode (1 to 7) applies to your truck crane. Each truck crane has only one driving mode.
- The middle part, **Rigging mode** lists the necessary rigging state for this driving mode and the accessories which you may transport with it.
- The bottom part gives the **Axle loads** and the **Overall weight**. The values stated are based on a truck crane with a full petrol tank and a driver.

Example of how to use the table:

Assume your truck crane is equipped with 14.00 tyres, 12 x 6 x 12 drive. The driving mode for these specifications is given in the top part, **Equipment 1**.

According to the specifications in the middle part, as well as **Rigging state**,

- the outrigger beams must be mounted
- the auxiliary hoist must be mounted
- the two-stage swing-away lattice extension must be folded to the side
- the counterweight must be dismounted
- the 32 t hook block must be attached to the front bumper.

In the bottom part you can see that the **axle loads** for all axle lines is 12 t with an **overall weight** of 72.2 t
(Differences between axle load and overall weight are due to rounding up/down).

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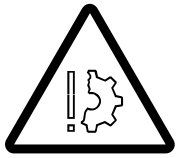
Trip recorder

Inserting the 24-hour disc in the trip recorder

- Insert a new 24-hour disc in the trip recorder before driving.



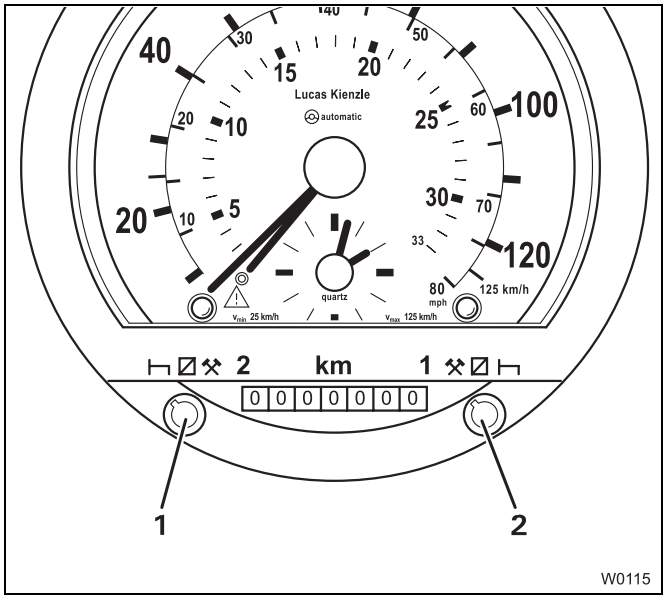
Risk of damage to the trip recorder!
The trip recorder may only be opened and closed when the truck crane is stationary, otherwise the mechanical components of the recorder or the recording stylus may be damaged.

- Once you have inserted a new 24-hour disk, close the trip recorder and remove the key.

The key may not be left in the lock of the trip recorder while driving.

The trip recorder has not been locked properly if the warning lamp in the recorder illuminates.
Open the trip recorder while the truck crane is stationary and check that the 24-hour disc has been properly inserted.
The journey will not be recorded correctly if the warning lamp is on.

Setting the trip recorder



As the crane operator, you are obliged to set the trip recorder for the respective activities using group control switches (**1**) and (**2**).

Set time group switch (**2**) to the symbol corresponding to the activities of the first driver. The time group switch (**1**) is used for the activities of the second driver.

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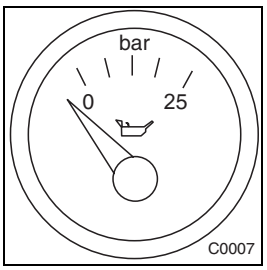
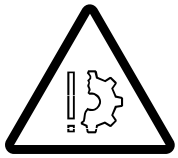
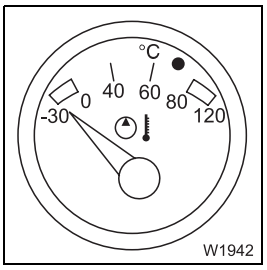


Status display for the automatic gearbox oil pressure

The oil pressure in the automatic gearbox must be between 10 to 12 bar when driving and in neutral position **N**.



Risk of damage to the gearbox!
If the gear oil pressure in both brake circuits drops below 7 bar stop the truck crane immediately. Switch the vehicle engine off and look for the cause; ➠ *Automatic gearbox malfunctions*, p. 8 - 27.

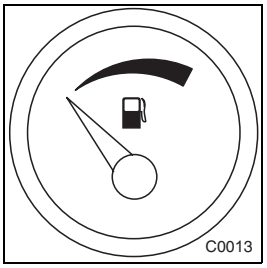


Status display for hydraulic system oil temperature

The hydraulic oil temperature should not exceed 80 °C in normal driving mode.

The radiator built into the oil circuit is switched thermostatically at approx. 45 °C.

The hydraulic system is defective if the temperature of the hydraulic oil increases to over 80 °C. Stop the truck crane as soon as possible and attempt to find the cause.
Stop the truck crane immediately and turn off the vehicle engine if the temperature of the hydraulic oil increases to over 100 °C!



Status display for fuel reserve

Monitor the status display *Fuel reserve*.
Never allow the fuel tank to run completely empty.

If the fuel tank is almost empty, accumulated dirt could clog the fuel filters. The fuel system must be bled when air is taken in (refer to the Mercedes-Benz operating manual).

If one of the following warning or indicator lamps illuminates:
Refer to ➠ *Malfunctions on the carrier*, p. 8 - 1.

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Off-the-road driving

Switch to a lower driving range when there are difficulties obtaining traction on swampy ground or on poorly compacted surfaces.
Shift the automatic gearbox to driving mode **P**, ➠ *Automatic gearbox driving modes*, p. 6 - 19.

You may also perform the following steps in the order specified below:

– **Switching from on-the-road gear to off-the-road gear**
The off-the-road gear reduces the travelling speed in all gears and thus increases the thrust of the driven wheels.
You may also use the off-the-road gear to shunt (driving slowly) on solid ground.

– **Drive of the second axle line**
You can switch on the drive of the second axle line and the longitudinal differential locks in the transfer case and in the fourth axle line for off-the-road driving.
However you must not use the drive of the second axle line and the longitudinal differential locks on firm ground.

– **Transverse differential locks in all driven axle lines**
The transverse differential locks in the driven axle lines prevent the spinning of individual wheels on one axle line when driving on slippery ground. (Must not be used on firm ground and when cornering!)

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Freeing an immobilised truck crane

Freeing the truck crane by oneself

If the crane is stuck in terrain, you can attempt to free it by changing between forward and reverse driving (rocking free):

When rocking the vehicle free you should engage the off-the-road gear, the transverse differential lock and the drive of the 2nd axle line.

- Let the engine speed drop to idling speed.

1

- Select the limited driving range **1**.
- Press the accelerator until the truck crane comes to a halt.
- Press the service brake and release the accelerator.
- Let the engine speed drop to idling speed.

N

- Switch to neutral position **N**.

R

- Select driving range **R**.
- Release the service brake and press the accelerator until the truck crane comes to a standstill.
- Press the service brake and release the accelerator.
- Let the engine speed drop to idling speed.

N

- Switch to neutral position **N**.

Repeat the procedure until the truck crane has been freed.

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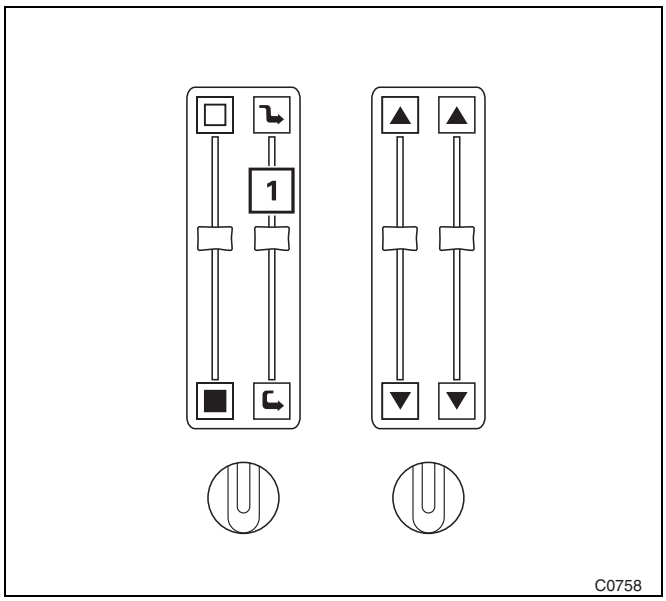
Heating and ventilation

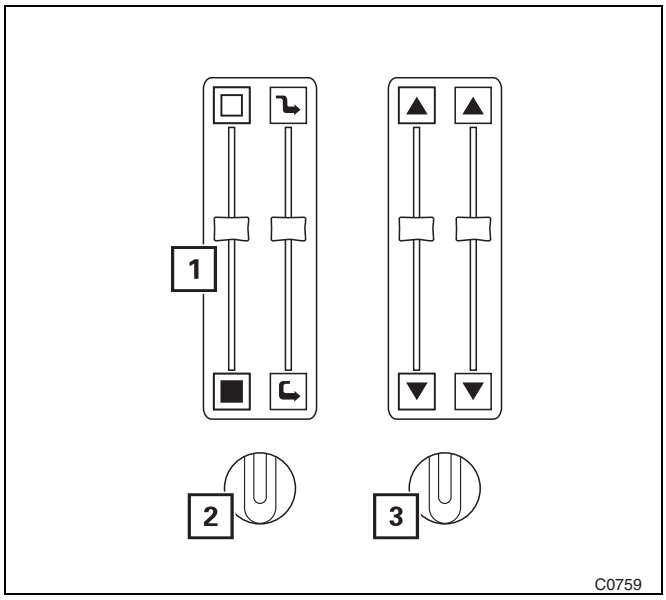
Driver's cab heating system

A heat exchanger heats the driver's cab with the heat from the engine coolant.



Fresh air, recirculated air or mixed air can be used as the suction air of the heating system. The air is controlled using the *Recirculated air/ fresh air mode* regulator (**1**):

Fresh air:	Push regulator up.
Mixed air:	Regulator in mid-position.
Recirculated air:	Push regulator down.

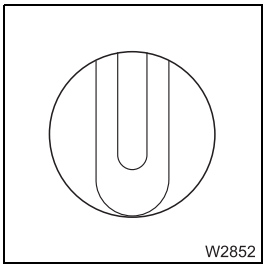


In the driver's cab there is one heater on the driver's side and one on the passenger's side. The regulator *Heater temperature regulator* (**1**) is used to set the desired air temperature:

Warm:	Push regulator down.
Cold:	Push regulator up.

The blower is switched on with knobs (**2**) and (**3**):

Knob (**2**): Driver's side
Knob (**3**): Passenger side



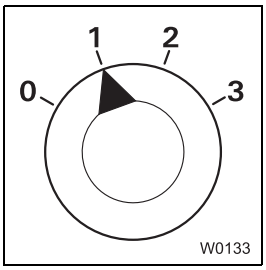
The fans have three levels (low, medium, high).
To **switch on**, turn the knob to the right; the three levels engage one after the other.
To **switch off**, turn the knob as far as possible to the left.

Air-conditioning system (additional equipment)

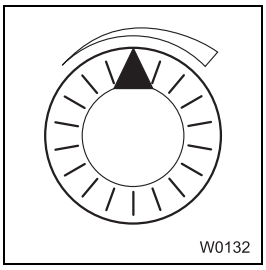
The air-conditioning system is located on the roof of the driver's cab. It only works in recirculated air mode. The refrigerant compressor is driven via V-belts by the vehicle engine.

Further information on the crane cabin air conditioning can be found in section *Air conditioning*, p. 6 - 66.

Switching on



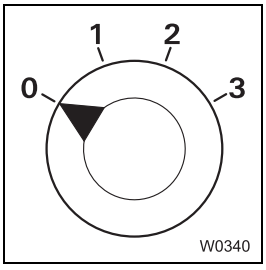
- Turn the *Blower* knob to level **1**, **2** or **3** depending on the output desired.



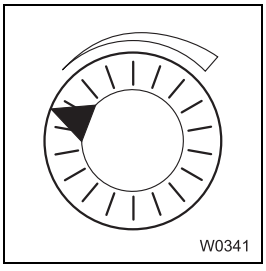
- Set the desired temperature with the *thermostat* knob switch.

- Adjust the air outlet jets so that the cool air is mixed well with the cabin air.

Switching off



- Turn the *Blower knob* to the **0** position.



- Turn the *Thermostat* knob switch to the left as far as possible.

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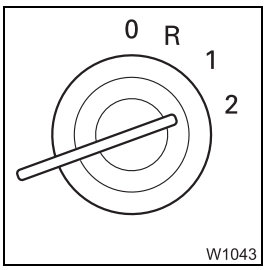
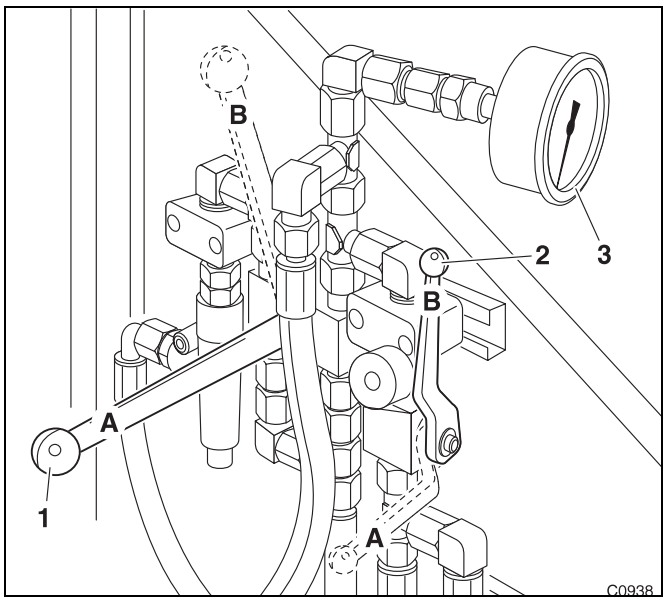


- Start the crane engine.

- Press up the *Incline crane cab* rocker switch. The pressure reservoir will fill as long as the rocker switch is held.

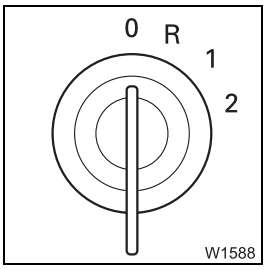


- Fill up the pressure reservoir until the pressure on the pressure gauge (**3**) stops increasing.

The hydraulic system is designed in such a way that the pressure in the reservoir can increase only until the required pressure for pressurizing the boom is reached.

- Switch tap III (**1**) in the **A** position (closed).

Boom pretensioning is now switched on.



- Turn off the crane engine.

The exact value for the required pressure for boom pretensioning can be found in the hydraulic circuit diagram.

Switching off boom pretensioning after on-road driving; ➠ p. 14 - 21.

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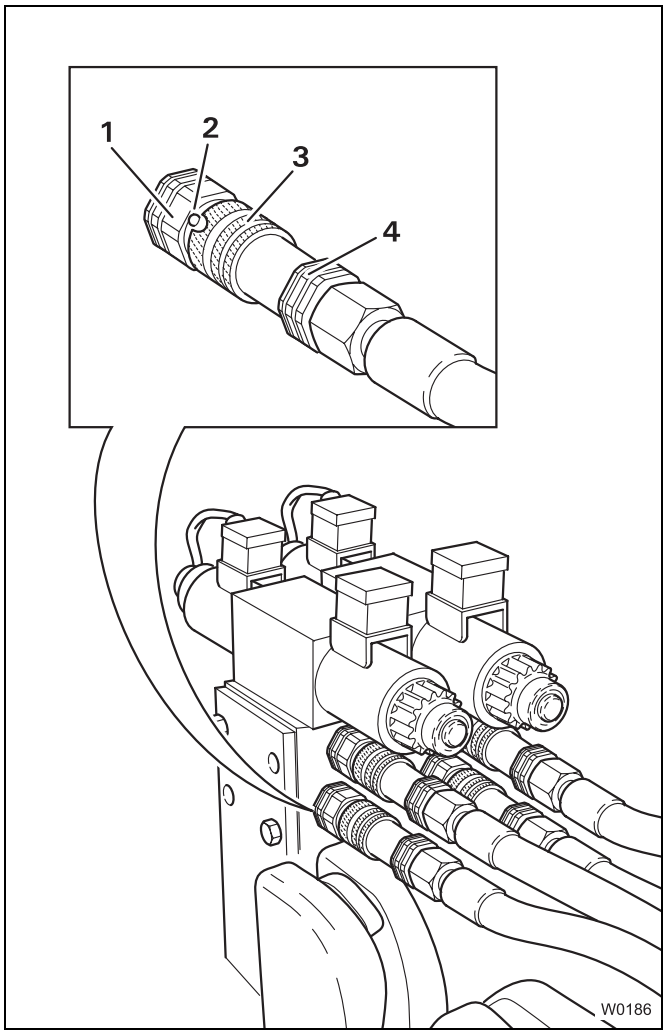
The valve block illustrated here serves only as an example for explanation. The valve blocks on your truck crane may look a little different, but the procedure for disconnecting and establishing joints is the same.

Detach the hydraulic connection

You must uncouple all quick couplings on the valve block to disconnect the hydraulic joint of the front or rear support beams. Proceed in the following manner:



- Release the quick release coupling. To do this, turn the knurled bush (**3**) with the recess in front of the ball catch (**2**).
- Hold the hydraulic hose firmly by the half coupling (**4**).
- Push the knurled bush (**3**) as far as it will go (**1**). The hydraulic hose is pushed out of the half coupling in the course of this.
- Also pull off all other quick couplings on the valve block.
- Seal all half couplings with the corresponding protective caps.

If the truck crane is equipped with an outrigger pressure status display additional equipment;
➠ *Establishing/disconnecting the electrical connection for the outrigger pressure indicator*, p. 7 - 21.

Risk of malfunctions!
Always seal off all half couplings with protective caps after separating the hydraulic connection. You thus prevent dirt penetrating the hydraulic circuit and any malfunctions which may result.

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Transporting the outrigger beams/outrigger pads

The outrigger beams and outrigger pads are transported by a separate vehicle. The outrigger pads must be removed from the outrigger beams before transport. Dimensions and weights of the outrigger beams and outrigger pads; ➠ *Dimensions and weights of removable parts – Outriggers*, p. 9 - 10.

Danger of damage to the sliding cylinder piston rod.
Always use a suitable device for depositing and securing the outrigger beams when transporting. In this way you can prevent damage to the sliding cylinder piston rods when the outrigger is put down.

- Deposit the outrigger beams onto a suitable device on the separate vehicle, so that the piston rods do not come under stress and are not damaged.
- Secure the piston rods with a suitable cover.
- Load the outrigger beams in such a way that no danger is posed to traffic; secure the outrigger beams with holding ropes in such a way that they cannot fall from the transport vehicle, slip, or damage other parts.
- Load the transport vehicle in such a way that the weight is evenly distributed.
- Only transport the outrigger beams and outrigger pads on a separate vehicle with a sufficient load bearing capacity; use more than one separate vehicle if necessary.

Danger of damage to outrigger beams and outrigger beam pads!
If the outrigger beams are to be transported on their sides, you must always remove the outrigger pads beforehand. If the outrigger beams are set down along with the outrigger pads, their joints could become bent and damaged.

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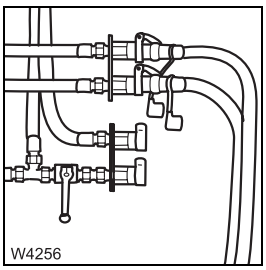
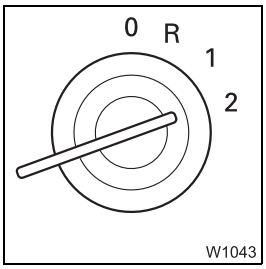
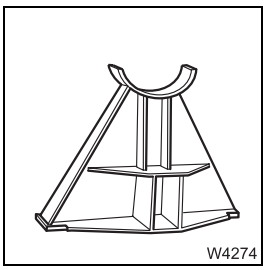


15. With additional equipment including lattice extension, create a hydraulic connection to the lattice extension; ➠ *Establishing/disconnecting the hydraulic connection to the lattice extension additional equipment*, p. 7 - 43.



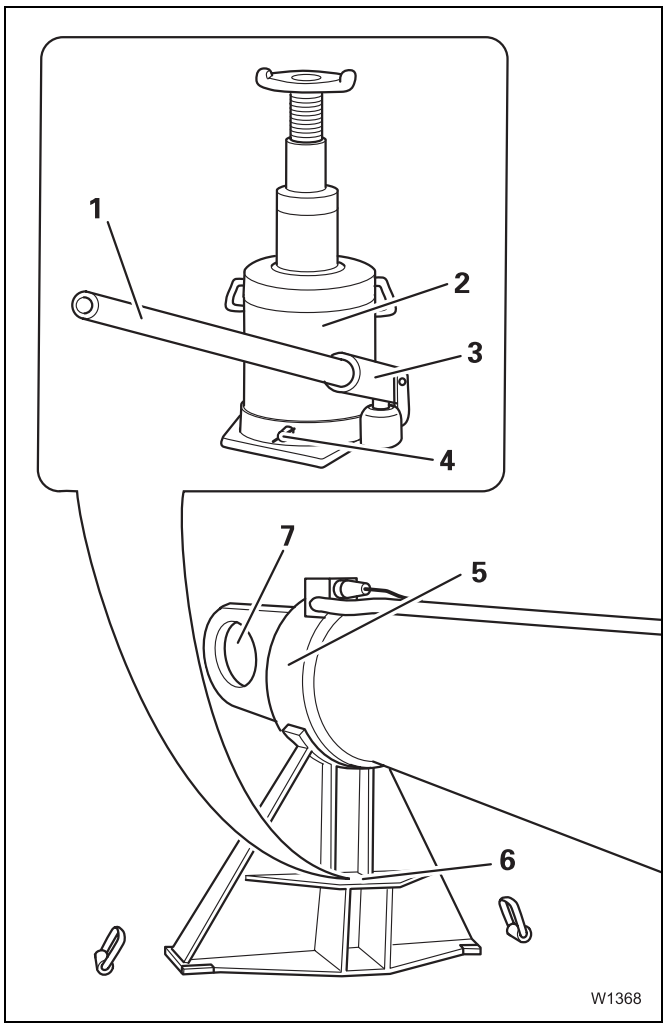
16. Start the crane engine; ➠ *Starting the crane engine*, p. 12 - 9.

17. On the SLI, enter the rigging code for 0 t counterweight acc. to the *Lifting capacity table*; ➠ *Setting rigging mode*, p. 13 - 20.



18. Remove the derricking cylinder support from the counterweight platform and stow it away carefully.

19. Carry out the checks for the main boom when set down:
– Main boom hydraulic system check
– Crane control electrics check
– SLI electrics check
➠ *Checks following main jib mounting*, p. 7 - 55.



- Insert the end of the pump lever (**1**) into the holder (**3**). The correct end of the pump lever is indicated by a punched mark.
- Turn the pump lever to the left. The pump lever is now securely connected to the lifting equipment.
- Open the drain screw (**4**). Unscrew the screw anticlockwise.
- Move the pump lever up and down a number of times while the drain screw is open.
- Close the drain screw. Tighten the screw clockwise.
- Place the lifting equipment (**2**) centrally on bracket (**6**) of the support for the derricking cylinder (**5**).
- Screw out the setting spindle of the lifting device until it is under the derricking cylinder.
- Raise the derricking cylinder until the pin (**7**) can be moved with the hydraulic cylinder. Lower the derricking cylinder again if necessary.

Lifting: Move the pump lever up and down while the drain screw is closed. Use the full travel of the lever.

Lowering: Move the pump lever up and down while the drain screw is closed. Use the full travel of the lever.

Have the lifting equipment checked by an expert at least once a year. The test badge attached to the device indicates when the last check was conducted.

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Derricking cylinder pressure relief

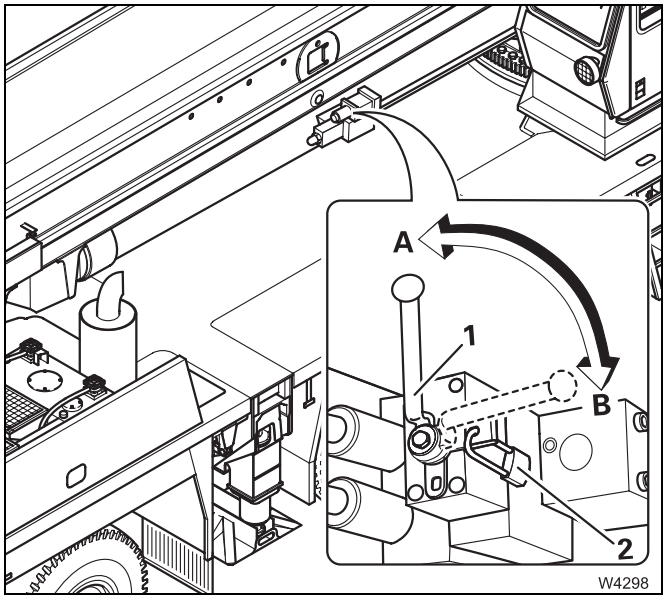
As soon as the crane engine is started, slight pressure builds up on both sides of the derricking cylinder. Due to the difference in area between the piston head and the surface of the piston ring, the force is greatest in the direction *Extend derricking cylinder*. The movement is suppressed, however, by the weight of the main boom.
Pressure relief must be switched on to prevent the derricking cylinder from extending after dismounting the main boom.

Activating pressure relief

The pressure relief is activated when boom floating position is switched on.

Risk of accidents from falling boom!
You may only switch on boom floating position when the main boom is resting in the boom support.
In this way you prevent the raised boom from falling down.

Always switch on boom floating position before you start the crane engine when the main boom has been removed. Otherwise the derricking cylinder will extend while the crane engine is running.



Tap I (**1**) is located on the derricking cylinder.

- Remove the padlock (**2**) on the lever.
- Shift the hand lever to position **A**.
- Secure the hand lever with the padlock (**2**) and remove the key.

Pressure relief is now activated for the derricking cylinder.

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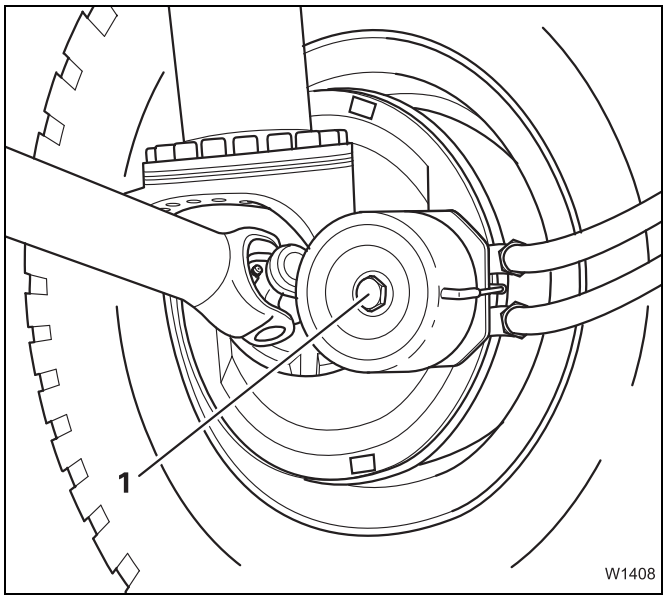
Mechanically releasing the parking brake

Risk of accidents with parking brake released!
You may only release the parking brake mechanically for towing if it can no longer be released pneumatically. Prevent the vehicle from rolling away after towing and immediately reactivate the parking brake.

Risk of accidents when releasing the parking brake!
Always secure the vehicle with wheel chocks or other suitable aids before mechanically releasing the parking brake.
This will prevent unchecked vehicle movement on releasing the parking brake.



Remove all spring accumulators as follows (two each on the second to fifth axle lines):

- Unscrew the hexagon screw (**1**) (spanner size 27) until it is touching the preloaded spring.
- Continue to unscrew the hexagon screw (**1**) until the wheel brake is released (torque 5 to 15 Nm).

Accidents may occur due to released parking brake!
The spring-loaded brake cylinder must be unblocked immediately after towing. This may be carried out by trained, qualified personnel only as the operational safety and roadworthy condition of the truck crane could otherwise be impaired!

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Pos.	Designation in elec. circuit diagram	Function
1	1.2 D	Displays: Oil temperature and pressure in automatic gearbox, hydraulic system, brake circuits/monitoring for steering circuits, hydraulic system, driving direction indicator, suspension locking
2	4.1 D	Display: Speedometer with tachometer and trip recorder
3	5.3 D	Display: Temperature and oil pressure in vehicle engine/monitoring for vehicle engine, transfer case, coolant condition, differential locks, lighting, Tempomat
4	Heating insert	Control: Heating and ventilation, driver's side and passenger side
5	6 D	Control and monitoring: Transfer case, transverse differential locks, drive for 2nd axle line/longitudinal differential locks, separate steering, auxiliary heater, automatic gearbox, suspension system

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8. . Differential lock malfunctions

This section applies to malfunctions of all differential locks:

- transverse differential locks of the driven axle lines
- drive of the 2nd axle line/longitudinal differential locks (in the transfer case and in the 4th axle line)

Malfunction	Cause	Action
Differential locks cannot be switched on	Off-the-road gear not switched on	Switch on off-the-road gear; ➠ p. 6 - 36.
	Level adjustment system switched off	Switch on level adjustment system key switch
	Suspension locking system switched on	Switch off suspension locking system
	Stress in transmission system	Switch the automatic gearbox to neutral position
	Compressed-air system not filled sufficiently	Let the engine idle. Ten minutes after the indicator lamp for the air pressure in circuit 3 goes out, the fourth circuit is filled for the secondary consumers
	Fuse F2/7 CAR defective	Check fuse, replace if necessary; ➠ p. 8 - 20.
Differential locks cannot be switched off	Stress in transmission system	Drive truck crane backwards and forwards slowly with the steering straight

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Moving the steering into on-road driving

For on-the-road mode, you must:

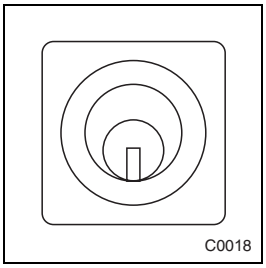
– Connect the drag rod between the third and fifth axle lines.

– Lock the manual steering of the third axle line.

– Lock the steering of the fourth axle line.

When a fault occurs air is automatically removed from the locking devices which are held by spring force. To lock the numbered positions, the wheels must be brought successively to the straight forward position so that the locks engage.

- Let the engine run and steer the front wheels to the straight forward position with the steering wheel.



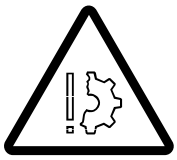
- Switch on the *Level adjustment system* key-operated switch and leave it on for all of the following procedures.

First you must steer the fifth and sixth axle lines to the straight forward position. You can steer these axle lines with the steering wheel if the front axle lines have more of a load on them than the rear axle lines.

- Extend both rear outrigger cylinders until the wheels of the sixth axle line are just above the ground; ➠ *Extending/retracting the outrigger cylinders*, p. 14 - 40.

Now the front axle lines are under a load and you can steer the rear axle lines with the steering wheel.

- Steer the fifth and sixth axle lines to the straight forward position until the lock audibly snaps into place.



Danger of damage to the steering linkage!
Do not continue to steer after the locks have snapped into place. After continued steering with unequally loaded wheels, very high stresses in the steering linkage can cause eventual damage.

Now you can move the wheels of the third and fourth axle lines to the straight ahead position. To do this you have to first build up the necessary pressure in the corresponding hydraulic circuit. Then a second person can steer the axle lines via valves.

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Technical specifications

GROVE truck crane GMK 6220-L

Permissible temperature range: –25 to +40 °C

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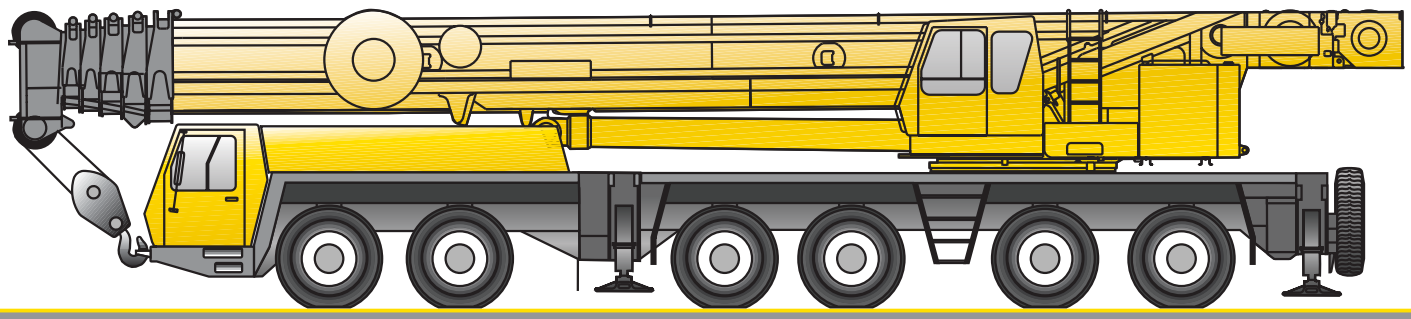
GROVE

GMK6220-L



Operating instructions Part 2 Crane operation

Vehicle serial number

2 084 753 en
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1	Main hoist	➠ p. 11 - 34
2	Counterweight (detached)	➠ p. 14 - 47
	Auxiliary hoist additional equipment (detached) or compensation weight for 2 t auxiliary hoist	➠ p. 11 - 35
3	Hydraulic oil cooler (second hydraulic oil cooler)additional equipment	➠ p. 13 - 97
4	Rear outriggers	
	Outrigger operation	➠ p. 14 - 23
	Assembly/dismantling	➠ p. 7 - 11
5	Shut-off valve for superstructure hydraulic system	➠ p. 12 - 4
6	Hydraulic oil tank, inspection glass	➠ p. 12 - 6
7	Switching valves for hydraulic emergency operation according to ZH 1/461 (additional equipment)	➠ p. 15 - 79
8	Connections for crane control unit	➠ p. 15 - 64
9	Crane cab (inclinable)	
	Operating elements	➠ p. 11 - 4
10	Electronic level switch box/	➠ p. 11 - 26
	outrigger pressure indicator	➠ p. 11 - 26
11	Switch boxes for outrigger operation	➠ p. 11 - 24
12	Working area spotlight (additional equipment)	➠ p. 11 - 50
13	Boom floating position (additional equipment)	➠ p. 14 - 20
14	Boom pretensioning (additional equipment)	➠ p. 14 - 21
15	Front support (outrigger beam, outrigger pad)	
	Outrigger operation	➠ p. 14 - 23
	Erection/dismantling	➠ p. 7 - 11
16	Data transmitters	
17	Filler neck of fuel tank in crane engine	➠ p. 12 - 8
18	Hoist mirror	➠ p. 13 - 15
19	Crane engine oil filler neck	➠ p. 12 - 7
20	Air intake inhibitor (additional equipment)	➠ p. 12 - 16
21	Central lubrication system	*Maintenance manual*
22	Hook block	➠ p. 14 - 78
23	Slewing gear freewheel	➠ p. 14 - 18
24	Slewing gears	➠ p. 13 - 47
25	Battery master switch	➠ p. 12 - 4
26	Crane engine dipstick	➠ p. 12 - 6
27	Crane engine emergency stop switch (only for additional equipment with air intake inhibitor)	➠ p. 12 - 16
28	Crane engine coolant reservoir	➠ p. 12 - 5
29	Crane engine	➠ p. 12 - 1

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1 Display for current status of telescope section I ➠ p. 11 - 43
2 Display for current status of telescope section II ➠ p. 11 - 43
3 Display for current status of telescope section III ➠ p. 11 - 43
4 Display for current status of telescope section IV ➠ p. 11 - 43
5 Display for current status of telescope section V ➠ p. 11 - 43
6 Status display for lattice extension angle with membrane switch *)
7 Indicator lamp for SLI shutdown ➠ p. 11 - 46
8 SLI early warning lamp ➠ p. 11 - 46
9 Status display for lattice extension length with membrane switch *)
10 Display for maximum load ➠ p. 11 - 44
11 Display for degree of utilization ➠ p. 11 - 44
12 Display for actual load ➠ p. 11 - 44

*) ➠ *Betriebsanleitung Spitzenausleger GMK 6220-L*

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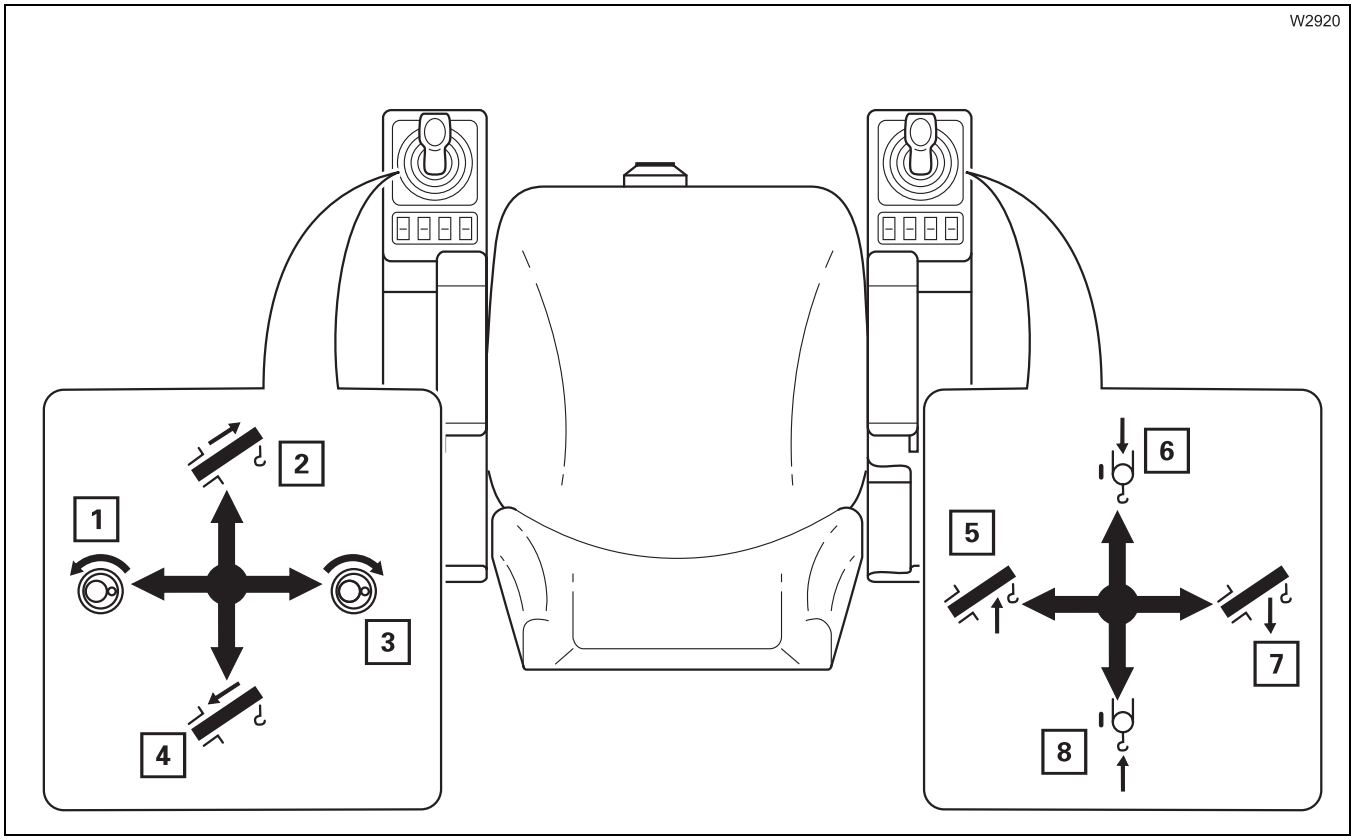
Version 2 (additional equipment)

The illustrations in this section show the control lever allocation in version 1 (truck crane without auxiliary hoist gear); ➠ *Version 1 (standard)*, p. 11 - 22.



Left-hand control lever allocation

- **1** Slewing to the left
- **2** Extending
- **3** Slewing to the right
- **4** Retracting

Right-hand control lever allocation

- **5** Raise derricking gear/lattice extension[1)]
- **6** Lowering the main hoist
- **7** Lower derricking gear/lattice extension[1)]
- **8** Lifting the main hoist

[1)] Additional equipment

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F1 **Display states membrane switch**

Pushing the switch selects the *Display states* menu. This menu shows the current states and the operating hours of the crane engine, the hoists, the derricking gear, the slewing gear, the telescoping gear, the control units, the locking devices and, with additional equipment, the lattice extension. If a function is completely or partially blocked by the crane control system due to a malfunction, the menu displays that a malfunction is present;
➠ *Menu Display states*, p. 13 - 83.

F2 **Power unit speeds/critical load control membrane switch**

Pressing the switch selects the *Power unit speed/Critical load control* menu. In this menu, one can enter the maximum speed for main boom and lattice extension operation for the slewing gear, hoists, telescoping gear, derricking gear and, with additional equipment, for the derricking cylinder or the lattice extension. The critical load control can be switched on and off in another submenu;
➠ *Menu Power unit speeds/Critical load control*, p. 13 - 87;
➠ *Critical load control*, p. 13 - 95.

F3 **Control lever emergency program membrane switch**

Pushing the switch selects the *Control lever emergency program* menu. If one control lever fails, the corresponding crane motions can be carried out in an emergency using this menu; ➠ *Control lever emergency program*, p. 15 - 68.

F4 **Display telescope status and teleautomatic membrane switch**

Pressing the switch selects the *Display telescope status and teleautomatic* menu. This menu shows the current telescoping status of all telescope sections as a percentage.
If all telescope sections are locked, the current extended length of the telescoping cylinder is shown in feet; *à Telescoping gear*, p. 13 - 51.
By pressing the switch again, the submenu *Fully automatic telescope* is selected; ➠ *Telescoping with fully automatic control*, p. 13 - 77.

F5 **Entering telescope status after emergency operation membrane switch**

This button selects the *Enter telescoping for emergency operation* menu. In order to select the menu, the button must be pressed three times in a row within 2 seconds. This menu is required to enter the current telescope status if the crane control system is to be suddenly cut off from the power supply during storage of the values, or if telescoping was done in emergency mode;
➠ *Entering telescope status after emergency operation menu*, p. 15 - 76.

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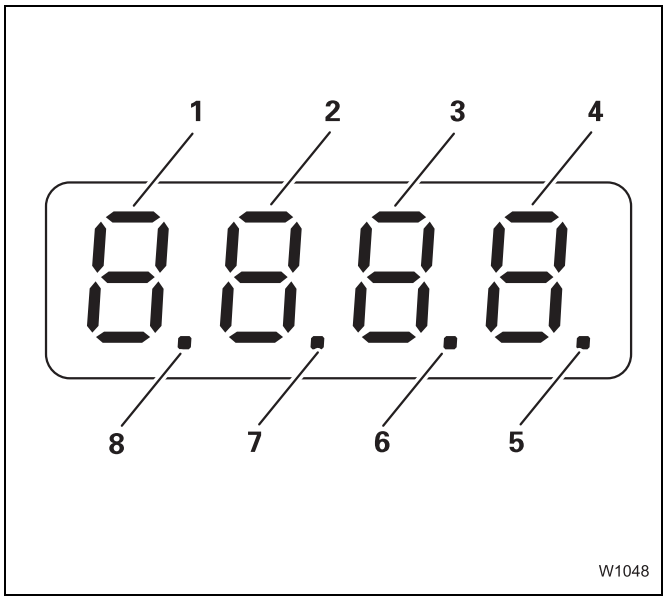
Safe load indicator *Operation of safe load indicator*; ➠ p. 13 - 17



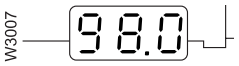
The elements in a display

1 – **4** Values

5 Signalling point

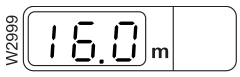
6 Decimal point;
in the *Working position* display:
Separator point between the SLI code and supplement

7 – **8** Decimal points



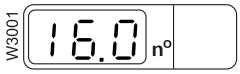
Status display, telescope status (telescope sections I – V)

Displays the current telescoping status of telescope sections I to V.
Fixed lengths are indicated as decimal values (**0.0**, **0.5** and **1.0**).
Intermediate and telescoping lengths up to 99% are indicated as percentages (**00** to **99**).
The intermediate length of 100% is indicated as a decimal value with a signalling point (**1.0.**) and the display flashes.
Structure of a status display; ➠ , p. 11 - 43.



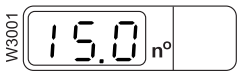
Status display for length of lattice extension with membrane switch

Control level function only with additional equipment
(➠ *Betriebsanleitung Spitzenausleger GMK 6220-L*).



Status display for angle of lattice extension with membrane switch

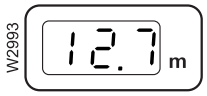
Control level function only with additional equipment
(➠ *Betriebsanleitung Spitzenausleger GMK 6220-L*).



Status display – Current main boom angle

Displays the current main boom angle to the horizontal in degrees.
For negative angles, a minus sign (–) appears to the left of the number.

Status display – Current radius



Displays the current radius in meters.

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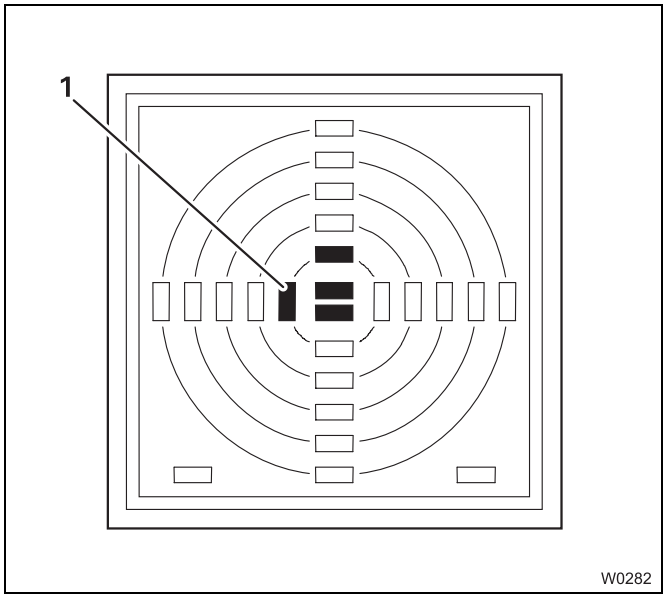
Electronic level in crane cab

Display of the electronic level in the control box on the carrier;
➠ *Reading the status display*, p. 14 - 43.



The electronic level in the crane cab only displays correct values when the ignition has been turned off in the driver's cab in the carrier.

Displays the current inclination of the truck crane in the LED display (**1**); ➠ *Horizontal alignment*, p. 13 - 35.

Two different measurement ranges can be set.

1°

Switching the rocker switch with indicator lamp for measurement range level indicator (crane cab)

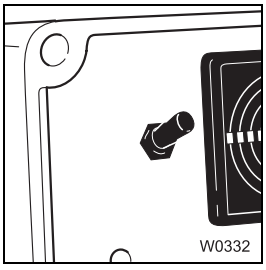
Changes the measurement range of the electronic level in the crane cab between 1° and 5° angle.

Measuring range angle 0° to 1°: Press down the rocker switch and the indicator lamp lights up.
1 graduated collar corresponds to 0.2°.

Measuring range angle 0° to 5°: Push rocker switch upwards,
1 graduated collar corrsponds to 1°.

Toggle switch to change measuring range

(Toggle switches in the outrigger switch boxes)
➠ *Switching over the measuring range*, p. 14 - 44.



Changes the measurement range of the electronic level on the carrier between 1° and 5° angle.

Measuring range angle 0° to 1°: Push the toggle switch upwards.

Measuring range angle 0° to 5°: Push the toggle switch downward.

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. Functional description of the safety devices

. . Safe load indicator (SLI)

To increase operational safety, the GMK 6220-L truck crane is equipped with a safe load indicator (SLI) as overload protection.

Danger of overturning with two-hook operation!
Two-hook operation with the boom extension or lattice extension is not stored by the SLI and is not permitted!
Two-hook operation is permitted with the main boom and auxiliary single-sheave boom top only as described in *Betriebsanleitung Spitzenausleger GMK 6220-L – Auxiliary single-sheave boom top.*

The safe load indicator serves to prevent the permissible load bearing capacity of the truck crane from being exceeded at a particular radius.
The load bearing limit can be exceeded, for example, during crane operation when the main boom is telescoped out or lowered further than is allowed.

The safe load indicator is an electronic unit.
It is used to set the truck cranes rigging mode.

The SLI automatically registers the following factors:	These factors must be set according to the current rigging mode:
– Length of the main boom – Angle of main boom – Actual load (from the pressure load on the derricking cylinder) – Angle of the luffing jib – (additional equipment)	– Supporting span – Counterweight mass – Length of the lattice extension – Number of reevings of the hoist rope Setting either by entry of the individual components or by SLI code.

Danger of overturning if wrong settings are entered into the SLI!
The SLI does not automatically assimilate all information in crane operation required to calculate the load limit.
You must therefore enter the rigging mode (SLI code) and the reeving mode at the SLI control unit manually.

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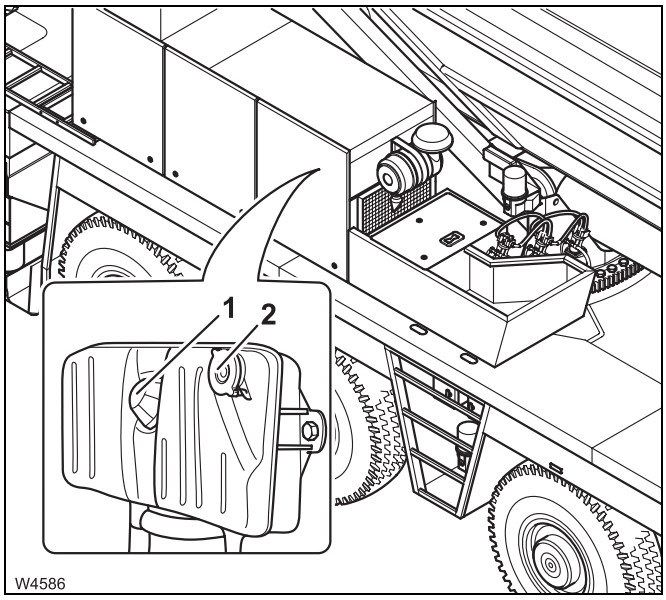
Checking coolant level

The coolant reservoir is located at the top of the crane engine and can be reached through an opening in the panelling.

Risk of scalding when the crane engine is hot!
The radiator is hot and under pressure. Be careful to avoid burns from the hot radiator itself or from steam or hot coolant escaping upon removing the radiator cap when the vehicle engine is hot.
Wear suitable protective gloves and cover the radiator cap with a cloth before opening it.
Turn the radiator cap lid slowly to the first notch in order to allow the excess pressure to be released.



- Do **not** open the pressure relief valve (**2**).
- Loosen (do not open!) the cap on the filling hole (**1**) when the coolant is at operating temperature, to release the pressure.
- Open the cap.
  The coolant must reach the lower edge of the pipe in the filler neck.

If the coolant level is too low:

- See the vehicle engine operating instructions for the composition of the coolant.
- Screw on the fillinghole cap as tight as possible.

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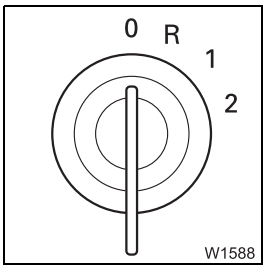
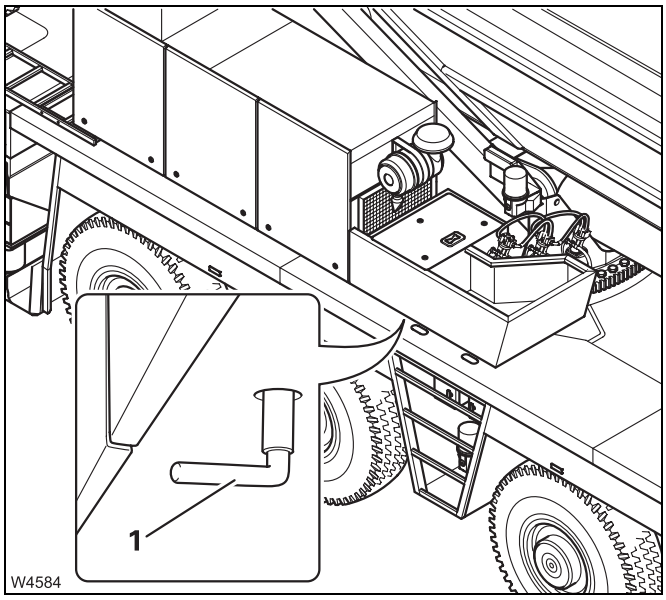
Switching off the crane engine

Danger of accidents due to suspended loads!
Never turn the crane engine off while a load is suspended!
Never leave the crane cab while a load is suspended on the hook.
Always keep your hands near the control levers while a load is suspended.
This enables you to take corrective action at all times.
Always put down the load before you interrupt work!



- To turn off the crane engine, turn the ignition key to the **0** position and remove the key.



In an emergency or if the crane engine does not stop after you have turned the ignition key to the **0** position, you can also turn the crane engine off from outside of the crane cab using the battery master switch.

The battery master switch (**1**) is located on the right-hand side of the superstructure, under the battery box behind the side plate, and is accessible from below.

- Switch the battery master switch off. The battery master switch is switched off if the selector handle can be removed.

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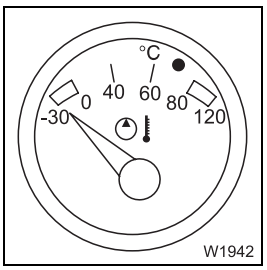
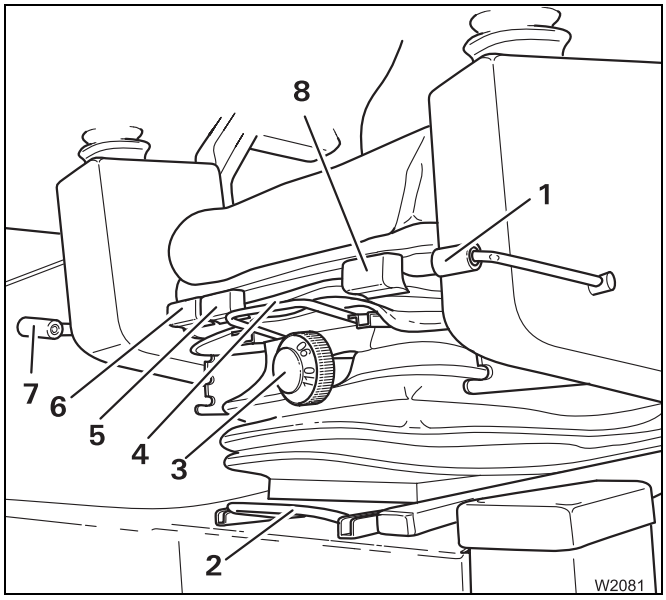


26. The temperature of the hydraulic oil is regulated; preheat the hydraulic oil if necessary; ➠ p. 13 - 10.

Adjusting the crane operator's seat



You may adjust the hydraulically spring-mounted seat in the crane cab for your height and weight.

1 Unlocking and adjusting the height of the left arm rest

2 Adjustment backwards/forwards of the whole seat with the control consoles

3 Adjustment of the stiffness of the suspension to suit your weight in kg

4 Adjustment backwards/forwards of the seat and the back rest without the control consoles

5 Inclining the seat forwards

6 Inclining the seat backwards

7 Unlocking and adjusting the height of the right arm rest

8 Inclining the back rest

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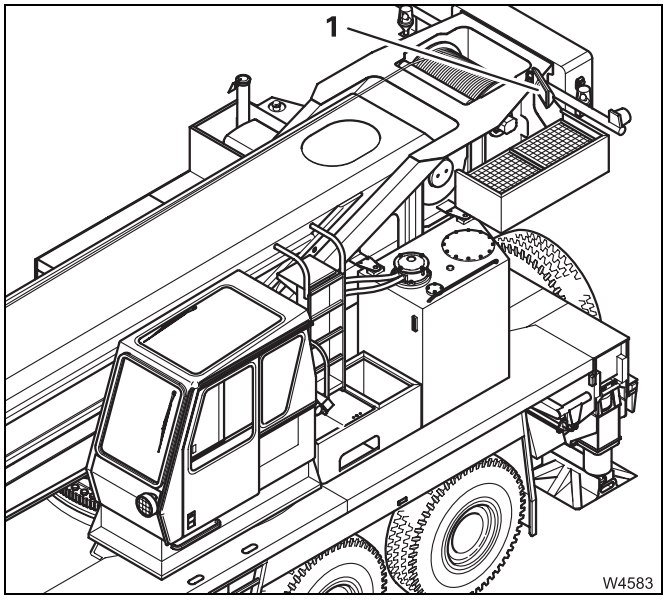
. .8 Adjusting the mirrors



- Adjust the mirror (**1**) on the hoist unit so that you have a clear view of the rope running on the lifting gear.
  If your truck crane is equipped with an auxiliary hoist (additional equipment), also adjust the mirror on the auxiliary hoist.

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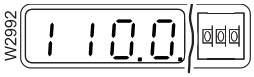
After entering the values

When you have selected all necessary values on the displays or have entered them via the numerical pad, you must confirm the entry and transfer the values to the SLI.

Confirming entry

- Press the membrane switch *Confirm entry* once.



The numerical value on the status display *Rigging mode* or *Reeving* does not flash any more (depending on which status display the entry mode was switched on). The signalling point at the right edge of the respective status display illuminates.

The entry is now confirmed and the SLI is ready to transfer the entered value.

If you have entered a value which is not allowed according to the *Lifting capacity table*, the value is not transferred and the status display continues to flash after pressing the membrane switch *Confirm entry*; furthermore an error message is displayed; ➠ *Error messages*, p. 13 - 32.

Transferring values

For the transfer of newly entered values, you must transfer the value on the status display at which the signalling point is displayed:

– A newly entered value for reeving is transferred on the status display *Reeving.*

– All other newly entered values are transferred on the status display *Rigging mode*.

Press the membrane switch next to the corresponding status display (here *Rigging mode* is used as an example).

The signalling point goes out; the value displayed has been accepted by the SLI.

If you have changed several rigging components (e.g. the outrigger span and the length of lattice extension as well), then these values are transferred at the same time as the new SLI code.
In addition you must confirm and transfer the current reeving on the display *Reeving*.

Crane work with the main boom

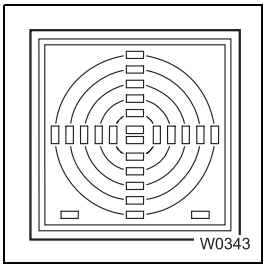
If a swing-away lattice extension is reeved during operation with the main boom, the loads given in the *Lifting capacity tables* decrease. The values which have to be taken of the loads are given in the *Lifting capacity tables* in their own table.

External influences during crane operation

Horizontal alignment

The horizontal alignment of the truck crane may change due to the varying load on the ground during crane work.

Risk of accidents if the truck crane is not horizontally aligned!
The SLI calculates the radius using the length and angle of the main boom. If the truck crane is not horizontal the actual radius will change and the crane may overturn!



- Check the horizontal alignment of the crane on the status display of the *Electronic spirit level* in the crane cab immediately before commencing crane work. When the alignment is horizontal, only the two squares in the center of the status display illuminate.
- Check the *electronic level* regularly while working with the crane. If a diode lights up on the crossed bars, the truck crane is no longer positioned horizontally.
  Due to deformation of the frame, the horizontal positioning can change up to 2° when the superstructure is turned from the 0° or 180° position.
  If the truck crane does not return to the horizontal alignment after turning back to the 0° or 180° position, you must find the cause, eliminate it and, if necessary, re-align the truck crane. Check the position of the superstructure when doing so; ➠ p. 14 - 44.

Safe distances

When working with the crane, maintain adequate distance between all parts of the truck crane including the load and objects on the site as well as all persons on the site.

Keep a particularly close watch on objects that pose a direct risk (for example, scaffolding or gas containers).

Keep a safe distance away from electrical lines; ➠ *Safe distance from electrical lines*, p. 14 - 14.

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Derricking gear

The main boom is inclinable between –1.5° and +82°. The angle of the main boom in relation to the horizontal position can be adjusted by raising and lowering the main boom.
The SLI switches off the lowering of the boom, depending on the load size and main boom length in accordance with the *Lifting capacity table*.
Raising from a horizontal position (raising) and lowering into a horizontal position (setting down) in telescoping mode *driving* is automatically enabled by the SLI, if it is permitted according to the SLI telescoping rigging programs (rigging programs ➠ *Lifting capacity table*).
A rigging code must be entered for the other telescope statuses (also for 0/0/0/0/0).

For the 8.70 x 2.68 m outrigger span, a rigging code must also be entered for *On-road driving telescope status* and raising and setting down is permitted only in the positions 0° to the rear or 180° to the front.

The truck crane may overturn when lifting loads!
Lifting loads by raising the boom is strictly prohibited as the SLI does not function when this is carried out!

Raising the boom is a movement which decreases the load moment; it is not deactivated by the SLI. However, if excessively heavy loads are lifted by raising the boom, the truck crane can overturn.

- Switch the derricking gear on.
  Push the *Derricking gear shutdown* rocker switch on the right-hand control lever upward.

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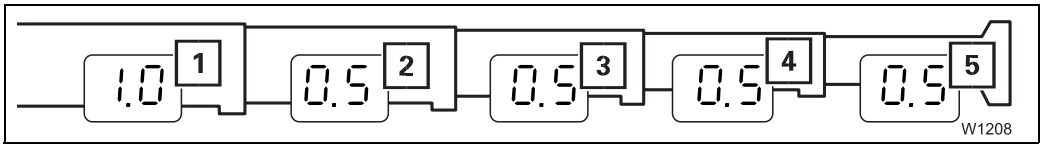
This section deals with the status display of the telescope status on the SLI, the status display of the telescope status on the *Crane control display* is described starting at the section *Example of procedures when telescoping*.

If a telescope section is retracted or extended, both the length of the main boom and the length of the respective telescope section change on the display.

The main boom fixed length is displayed in decimals (e.g. 0.5) and the main boom intermediate length and main boom telescoping length are displayed as two-digit percent values (e.g. 47).

Intermediate lengths and telescoping lengths at 100% are indicated by the flashing display **1.0**.

Example: Telescope status display for main boom **fixed lengths**



Telescope section I	100% extended	(fixed length)
Telescope section II	50% extended	(fixed length)
Telescope section III	50% extended	(fixed length)
Telescope section IV	50% extended	(fixed length)
Telescope section V	50% extended	(fixed length)

The following percent values represent main boom **fixed lengths**:

Telescope section I	0/50/100 [%]
Telescope section II	0/50/100 [%]
Telescope section III	0/50/100 [%]
Telescope section IV	0/50/100 [%]
Telescope section V	0/50/100 [%]

*) Another locking point is at 8 to 10%, depending on the works number of the crane. This locking point has no function and is neither displayed at the SLI nor at the *Crane control display*.

Not all locked telescope statuses are permitted as main boom fixed lengths; ➠ p. 13 - 53.
The fixed lengths can be found in the *Lifting capacity table.*

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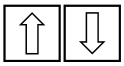
If the locking process is not finished after about 10 seconds (warning lamp *Telescoping cylinder unlocked* is not on), you can not retract the locking pins because they are under load.
With the *Telescoping cylinder at locking point* indicator lamps you can see if you need to retract or extend the telescoping cylinder to relieve the load.

If only the bottom indicator lamp lights up, you must extend the telescoping cylinder.



If both indicator lamps or only the top indicator lamp light up, you must retract the telescoping cylinder.

Risk of damaging the boom system!
If extending and retracting the telescoping cylinder several times does not cause unlocking, you must not move the telescoping cylinder any further against the stop.

If extending and retracting several times does not unlock the telescoping cylinder:

- Lock the telescoping cylinder by pressing the *Select locking/unlocking* rocker switch up and moving the control lever.
- Start the locking process again by pressing the *Select locking/unlocking* rokker switch down and moving the control lever.

The process of unlocking applies to all telescoping procedures; thus the red indicator lamp *Telescoping cylinder unlocked* would also now illuminate in our **example**. The display would display the length L = 1.10 m.
Current end state: – Telescoping cylinder is locked in telescope section IV –
The next target: – Moving telescoping cylinder in foot section III –

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In our **example**, the section "Locking the telescope section at the fixed length reached first" applies. Telescope section III should be extended to 50%, so you can select locking as soon as the telescope section has been telescoped approx. 2% from initial state.
The values in this section are suited to the example. You can accept this section directly as an example.
Present end state: – Telescope section III extended to 50% –
New objective: – Extend telescope section II –

In order to reach the end position of the example from page 13 - 60, you would have to now extend telescope section II first. You would have to repeat the sections which are refered to in items 2 to 5 of the example on page 13 - 60. The steps are the same as with extending telescope section III. The initial and end positions would simply have to be changed for telescope section II and the status displays would change accordingly. This is the case for every other telescoping process.

You can also telescope a telescope section without selecting the lock, as described in the next section.

Telescoping telescope section to intermediate length

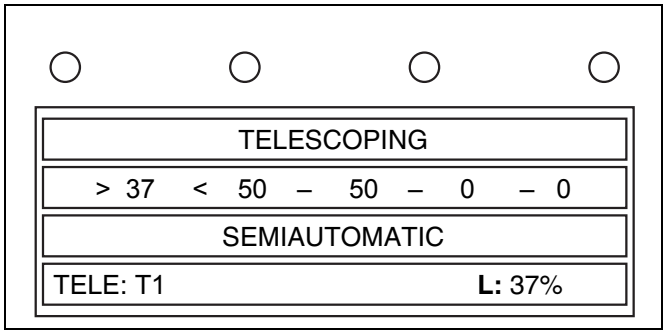
Before you telescope a telescope section to an intermediate length, the following prerequisites must be fulfilled:

– The telescoping cylinder is situated in the foot section of the telescope section which is to be telescoped. The corresponding display lamp (e.g. *Telescoping cylinder in foot section I)* illuminates; ➠ *Extending/retracting telescoping cylinder and locking*, p. 13 - 66.

– The telescope section in which the telescoping cylinder is located is unlocked, the red indicator lamp *Telescope section unlocked* illuminates; ➠ *Unlock telescope section*, p. 13 - 69.

– The telescoping cylinder is locked to the telescope section; the green indicator lamp *Telescoping cylinder locked* illuminates.

• Check if the *Telescoping gear switched on* indicator lamp is on and telescope the telescope section.



While you are telescoping the telescope section, the status display on the *Crane control display* changes for the current telescope status (e.g. for telescope section I).

Extend the telescope section until the status display shows the desired intermediate length in percent (e.g. **L:** 37%).

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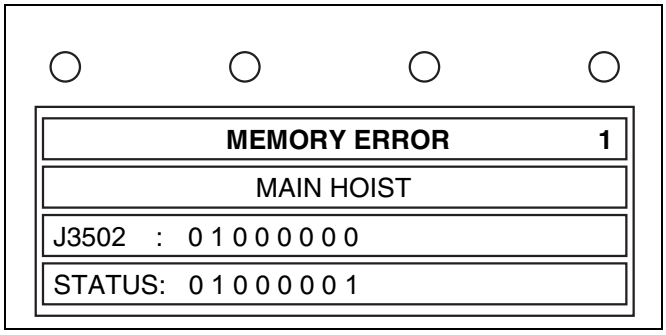
Status display	Significance
O.K	There are not malfunctions, the power unit is released by the crane control without restrictions.
ERROR	One or more error messages have been acknowledged for this power unit and stored in the sub-menu *Memory error*.
not connected	Auxiliary hoist or two-stage swing-away fly jib not available or not connected.

Memory error sub-menu

You can call up the sub-menu *memory error* from this status display in order to see already acknowledged error messages again.

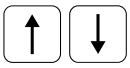
Press this membrane switch next to the status display to do so.

The display now changes to the sub-menu *Memory error*.



The entry **MEMORY ERROR** is in the top line; to the right of it is the number of the error which was acknowledged (e.g. **1**).
The second line shows the power unit concerned (e.g. main hoist).

Both lower lines display the error exactly like the corresponding error message which was acknowledged; ➠ *Display of an error message*, p. 13 - 92.



You can call up further existing errors with both of these membrane switches next to the display. The errors are numbered consecutively and the corresponding number of the error is displayed at the top right.
Once the error with the number 1 has been reached and you press the upper membrane switch again, the display changes back to the menu *Display states.*

To leave the *Memory error* submenu you can press one of the adjacent membrane switches.

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Critical load control

The truck crane is equipped (standard) with a critical load control. The critical load control system ensures that the crane engine does not stall when the engine speed is low and more hydraulic power is demanded of it simultaneously. You do not have to take over any steering tasks with the accelerator here.

The critical load control takes into account the available engine power at the set crane engine speed. It reduces the performance of the hydraulic pumps automatically, when the hydraulic power demanded is greater than the power of the crane engine at the time (e.g. when another crane movement is switched on).

If the hydraulic power demanded exceeds the engine power, the critical load control system reduces the performance of all variable displacement pumps, in the correct relationship to the degree of deflection of the respective control levers. The relationship of the working speeds remains identical. It is not necessary to correct the movements of the control levers.

If overloading occurs, the critical load control system ensures that the you do not have to adjust the working speeds of several simultaneous crane movements using the control levers to stop the crane engine from stalling.

If the critical load control does not work faultlessly owing to a defect and the crane engine stalls because of this, or if individual power units can no longer be controlled, you can switch off the critical load control;
➠ *Switching on/off critical load control*, p. 13 - 90.

The slewing gear is not influenced by the critical load control.

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Work break

Short work break

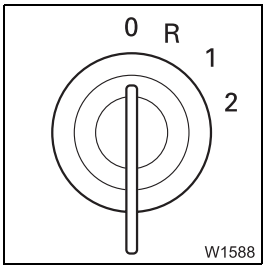
Risk of accidents when the load is suspended!
Never leave the crane cab while a load is suspended on the hook block.
Never turn the crane engine off while a load is suspended on the hook.
Always keep your hand close to the control levers while a load is suspended on the hook so that you are able to react correspondingly at all times.
Always put down the load before you stop work!

- Lock the slewing gear permanent brake by pushing down the *Slewing gear permanent brake* rocker switch.
- Switch the crane engine off, turn the ignition key to the **0** position and remove it.
- Ensure that no unauthorized persons can operate the truck crane.

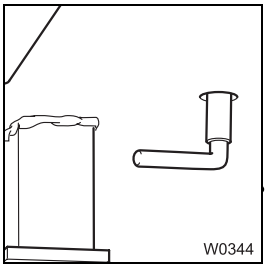
Work breaks lasting more than 8 hours

- Retract all telescope sections.
- Lower the boom onto the boom support.

- Lock the slewing gear permanent brake by pushing down the *Slewing gear permanent brake* rocker switch.



- Switch the crane engine off, turn the ignition key to the **0** position and remove the ignition key.
- Switch off all current consumers.



- Switch off the main battery switch.

You can switch off the battery master switch even if the heater is still running down. This does not interrupt the run-down period of the heater.

- Ensure that no unauthorized persons can operate the truck crane.

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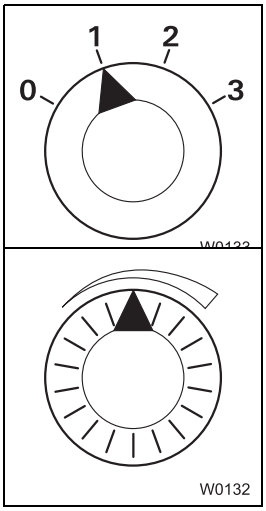
Air-conditioning system (additional equipment)

The air-conditioning system is installed behind the crane operator's seat. It only works in recirculated air mode. The refrigerating agent compressor is driven by the crane engine.

At the bottom front of the air conditioner, there is a grille through which the air in the cabin is evacuated. Therefore, do not cover the grilles with bags or items of clothing.

Information on the air conditioning in the crane cab can be found in the section *Air conditioning*, p. 13 - 116.

Switching on



- Turn the *Fan* knob to level 1, 2 or 3, depending on the output desired.
- Set the desired temperature with the *Thermostat* knob switch.
- Adjust the air outlet jets so that the cool air is mixed well with the cabin air.

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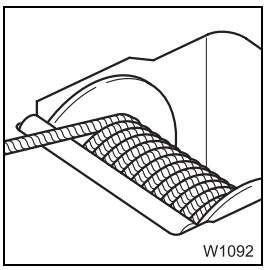
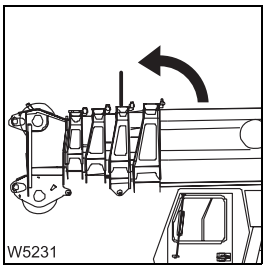
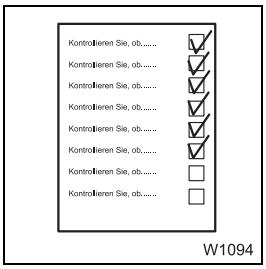


12. Check the position of the hoist ropes; ➠ p. 13 - 7.

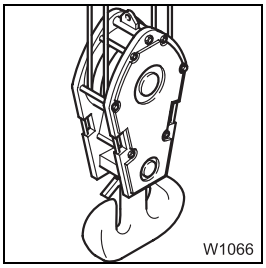


13. The front rope grab has been installed; ➠ p. 14 - 84.

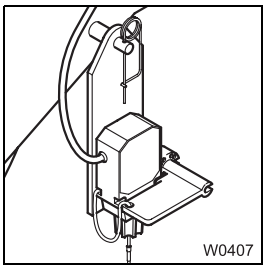


14. Starting the crane engine; ➠ *CHECKLIST: Starting the crane engine*, p. 12 - 1.

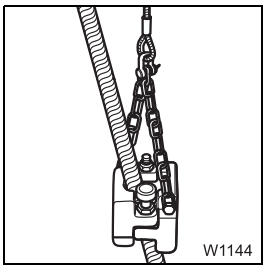
15. Releasing the superstructure lock; ➠ p. 13 - 11.



16. Pick up hook block
- from accompanying vehicle; ➠ p. 14 - 80,
- from the stop rod; ➠ p. 14 - 78.



17. Install the lifting limit switch, connect and check whether the locking has been cancelled; ➠ *Lifting limit switch on the main boom*, p. 14 - 87.



18. Attach lifting limit switch weight and fasten to hoist rope; ➠ *Attaching and mounting the lifting limit switch weight*, p. 14 - 89.

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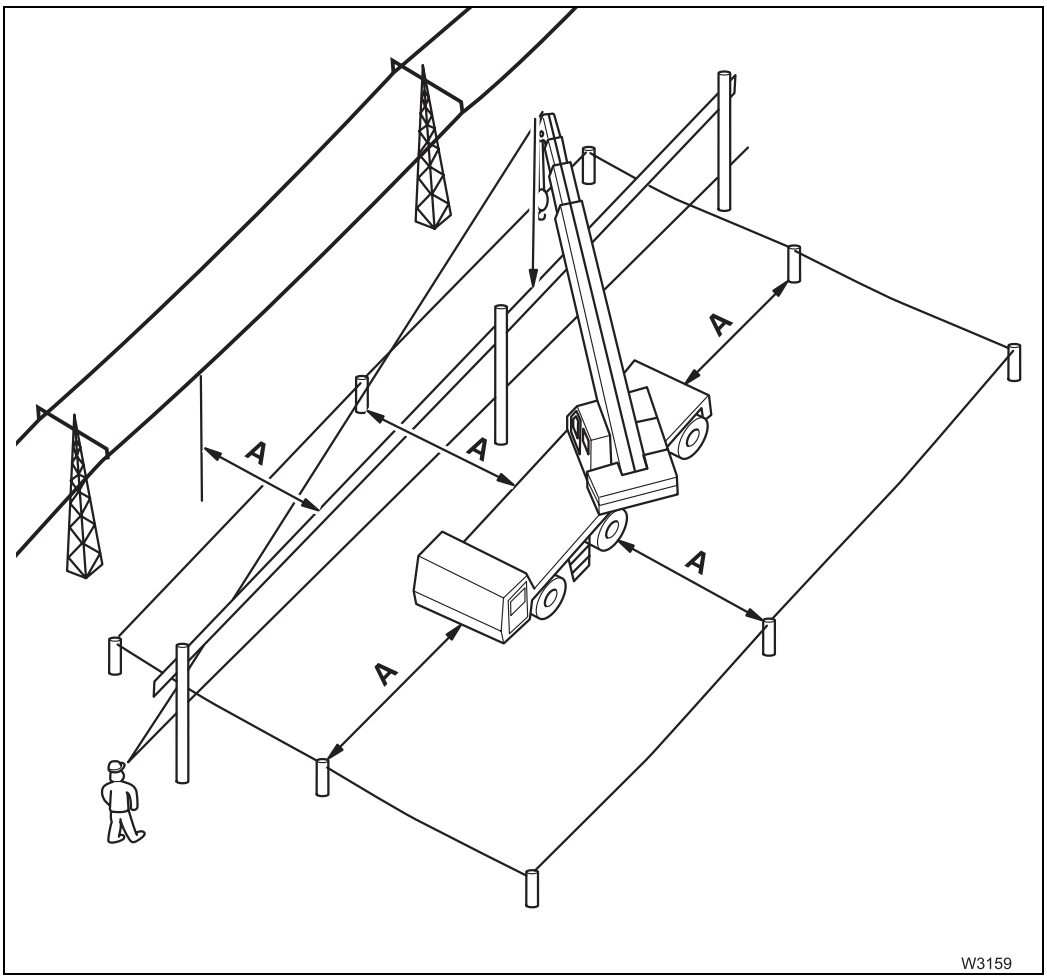
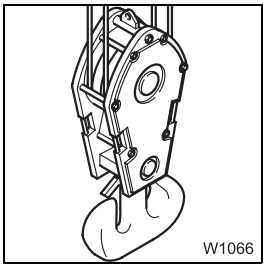


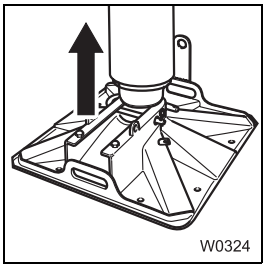
- Set up an obstacle at the minimum safe distance which keeps the truck crane and its attachments away from the power line. The obstacle must be erected in such a manner, so that wind effects on the cable and possible swinging of the load are taken into account.
- One banksman, or more than one if necessary, must monitor compliance to the minimum safe distance and warn the crane operator in time, if it is necessary to stop crane movements. The banksman and crane operator must be in communication with each other via radio.
- In addition block the area around the truck crane with minimum safety distance. The safety area in case of line contact is thus enlarged.
- The banksman must also ensure that nobody is near power lines or in the safety area when work is being carried out.
- When the load has to be guided, use only guide ropes of non-conducting material.

CHECKLIST: Retracting outrigger

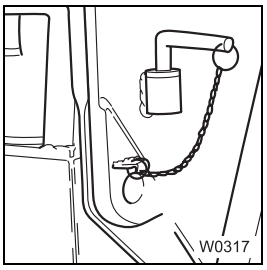
This checklist is not equivalent to a complete instruction manual. There are accompanying handling instructions which are indicated by cross-references. **Observe the warning and safety information given there!**



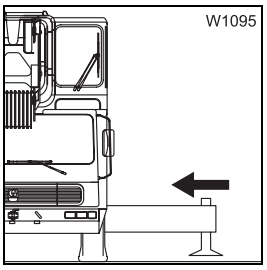
1. Depending on the transportation of the hook block place this
- on a separate vehicle; ➠ p. 14 - 80.
- attach to the bumper; ➠ p. 14 - 78.



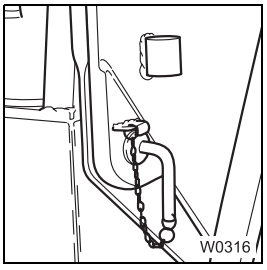
2. Retract the outrigger cylinders completely; ➠ p. 14 - 41.



3. Tighten all four locking pins and plug into the holdings; ➠ p. 14 - 32.



4. Retract outrigger beam; ➠ p. 14 - 37.



5. Secure all outrigger beams against independent extension with the lokking pins; ➠ *Safety for on-road driving*, p. 14 - 31.

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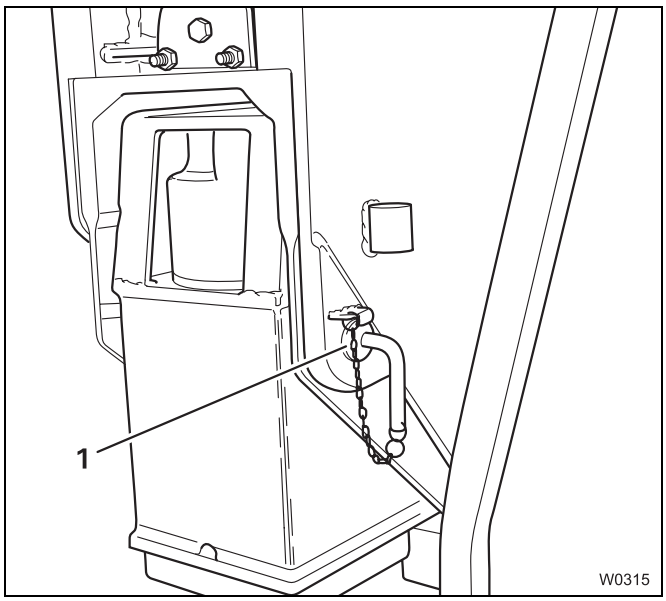
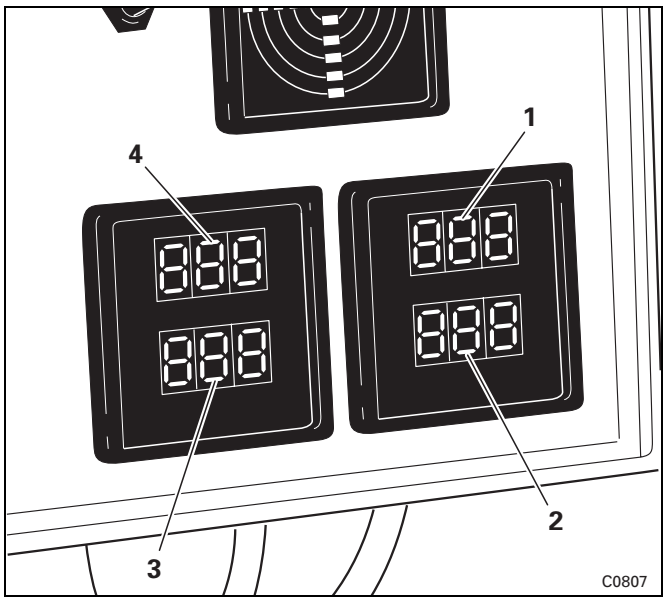


Outrigger span of 8.70 x 2.68 m

The outrigger beams are retracted as far as possible with the span of 2.68 m and the locking pins (**1**) can fit completely into the bores in the outrigger housing and outrigger beam.



If you, for example, are before the status displays on the left side, as the illustration shows. The following arrangement applies:

Display (1): Outrigger pressure right rear

Display (2): Outrigger pressure left rear

Display (3): Outrigger pressure left front

Display (4): Outrigger pressure right front

The crane is well aligned when the outrigger pressures in both of the front outrigger cylinders are about the same and when the outrigger pressures in both of the rear outrigger cylinders are about the same.
But the horizontal alignment with the electronic level is definitive for the correct state for working with the crane.

CHECKLIST: Unrigging the counterweight

This checklist is not equivalent to a complete instruction manual. There are accompanying handling instructions which are indicated by cross-references. **Observe the warning and safety information given there!**

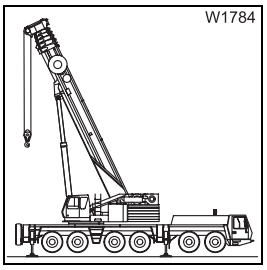
Unrig counterweight

Requirements:

– The truck crane is stabilized with the outrigger span required for crane work according to the *Load capacity chart*; ➠ *Outrigger span*, p. 14 - 27.

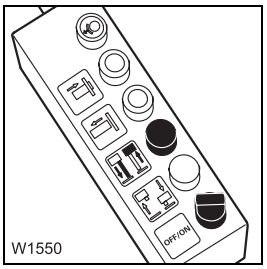
– The SLI is set to the current rigging mode with the currently rigged counterweight; ➠ *Entering values*, p. 13 - 23.

– The hydraulic connection on the 5.4 t base plate is established; ➠ *Connecting/disconnecting the hydraulic connection*, p. 14 - 60.

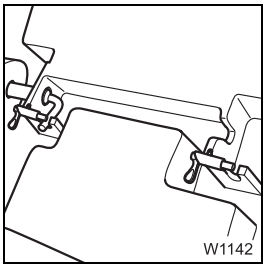


1. Turn the superstructure to the rear; ➠ *Slewing with the counterweight rigged*, p. 14 - 76.

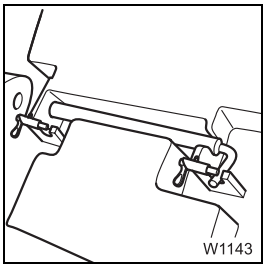
2. Lock the superstructure; ➠ *Superstructure lock*, p. 13 - 11.



3. Extend the lifting cylinder of the 5.4 t base plate up to the counterweight platform; ➠ p. 14 - 69.



4. If the 3.5 t counterweight section is to remain rigged:
lock the 3.5 t counterweight section to the turntable; ➠ *Rigging with assemble rods (additional equipment)*, p. 14 - 67.



5. If the 3.5 t counterweight section is to be unrigged:
loosen the locking pin between the 3.5 t counterweight section and the turntable; ➠ *Rigging with assemble rods (additional equipment)*, p. 14 - 67.

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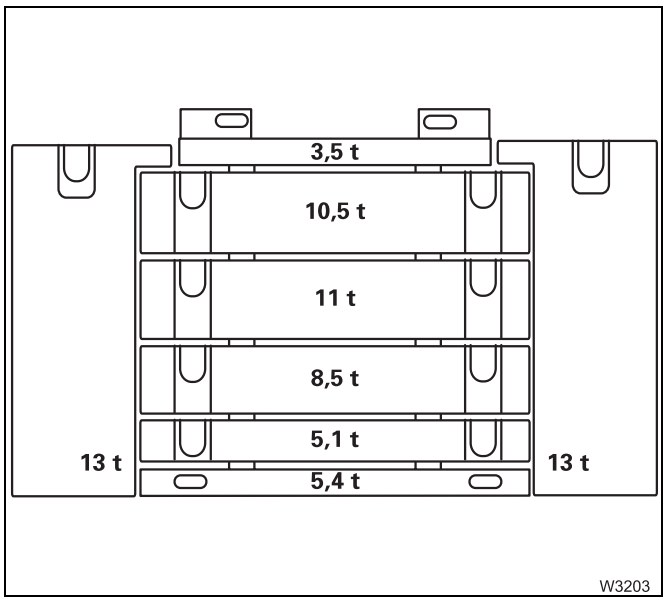
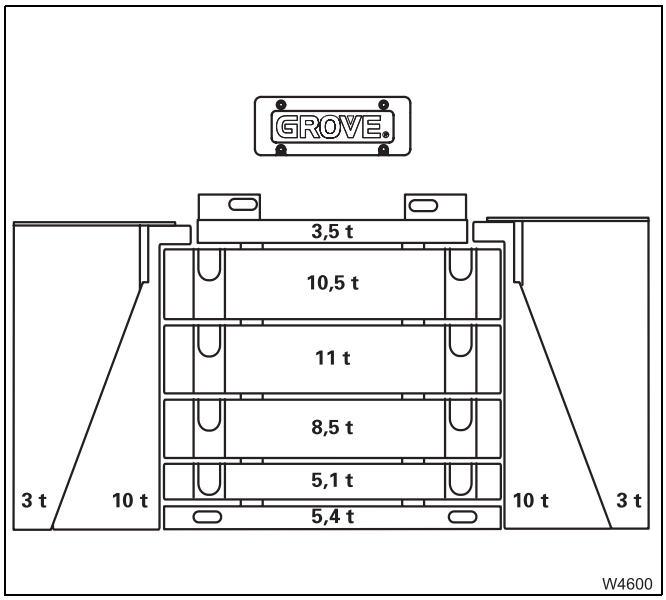


70.0 t counterweight version

- Hoist
  –the 5.1 t counterweight section,
  –the 8.5 t counterweight section,
  –the 11 t counterweight section,
  –the 10.5 t counterweight section and
  –the 3.5 t counterweight section one
  after the other onto the 5.4 t base plate.
- Hoist the 13 t counterweight blocks above the 5.4 t base plate so that the attachment plates are located vertically above the recesses.
- Attach the 13 t counterweight blocks into the recesses slowly.



70.0 t counterweight version additional equipment

- Rig the 64 t counterweight version.
- Hoist the 3 t counterweight blocks above the 10 t counterweight blocks so that the attachment plates are located vertically above the recesses.
- Attach the 3 t counterweight blocks into the recesses slowly.

Slewing with the counterweight rigged

You may only slew the superstructure with rigged counterweight if the truck crane is stabilized with a sufficiently large outrigger span. If this minimum outrigger span is not observed, the truck crane can overturn to the rear.

The following table shows, depending on counterweight and outrigger span, whether slewing the superstructure is permitted or whether the superstructure must be locked after rigging the counterweight.

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Rigged outrigger span</th></tr>
<tr><th>8.70 x 8.50 m</th><th>8.70 x 6.00 m</th><th>8.70 x 2.68 m</th></tr>
<tr><td rowspan="10">Rigged counterweight</td><td>0 t</td><td rowspan="10">Slewing permitted</td><td rowspan="8">Slewing permitted</td><td colspan="2">Slewing permitted only if the main boom is raised to an incline permissible in the operating area.</td></tr>
<tr><td>4.4 t</td><td rowspan="9">Rigging mode not permissible, slewing not permissible</td></tr>
<tr><td>8.9 t</td></tr>
<tr><td>10.5 t</td></tr>
<tr><td>14.0 t</td></tr>
<tr><td>22.5 t</td></tr>
<tr><td>33.5 t</td></tr>
<tr><td>44 t</td></tr>
<tr><td>64 t</td><td rowspan="2">Superstructure must be in working position 0° locked to the rear, slewing not permitted</td></tr>
<tr><td>70 t</td></tr>
</table>

Risk of overturning when slewing with too little outrigger span!
Check using the table whether sufficient outrigger span is set for the rigged counterweight before you unlock and slew the superstructure. Only turn the superstructure if the truck crane is sufficiently stabilized. In this way you can avoid the truck crane overturning to the rear during slewing because of too much counterweight mass.

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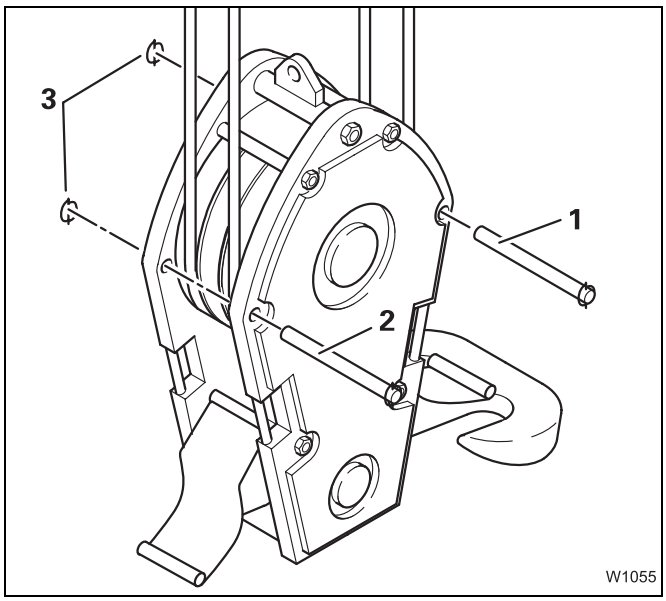
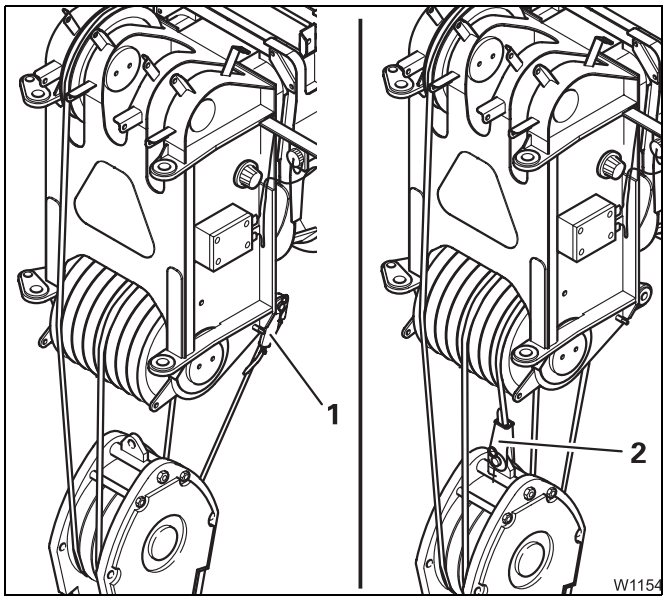


- Loosen the spring cotter pins (**3**) and remove the holding rods (**1**) and (**2**) from the bores in the hook block.
- Fold the guards on either side of the hook block down.

The hoist rope may now be reeved.

Depending on the reeving method used, the rope end clamp is secured either on the boom head or on the hook block; ➠ *Possible reeving methods on the main boom*, p. 14 - 90.
The rope end clamp is attached to the boom head if the number of lines is even (two, four, six, etc.). The rope end clamp is attached to the hook block if the number of lines is odd (one, three, five, etc.).



- To reeve, guide the rope from the outermost sheave on the head of the boom into the hook block from the front.
- Guide the rope upwards from the back over the next sheave on the boom head, etc.
- Secure the rope end clamp to the bracket on the boom head (**1**) or the hook block (**2**) depending on the reeving. Secure the bolt with a retaining pin.

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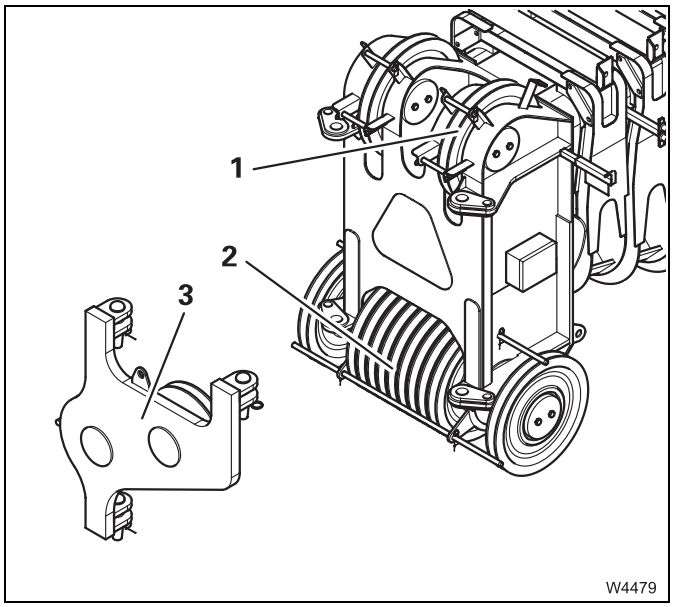
Rigging heavy duty equipment

Heavy duty equipment is available as additional equipment. When the heavy duty equipment is rigged the hoist rope can be reeved up to 22 times, whereby a maximum lifting capacity range of 685 tm can be reached (191 t x 2.40 m).
The heavy duty equipment is only intended for main boom operation.

Heavy duty equipment parts

For heavy duty equipment various parts are mounted on the truck crane and further parts are supplied.



Mounted parts

1 Additional head sheave (attached to the left of the axle)

2 Extended head sheave axle with 11 sheaves (2 sheaves outside on single-sheave boom top)

Supplied parts

3 Adapter for rope deflection (with retaining pins and safety clips)

Equipment required

In addition, you will require the following auxiliary equipment:

– An auxiliary crane with sufficient lifting capacity

– A suitable lifting gear with sufficient lifting capacity

For the dimensions and weights of the dismounted parts; ➠ *Heavy duty-equipment*, p. 16 - 12.

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15 Malfunctions on the superstructure

. Superstructure emergency stop device

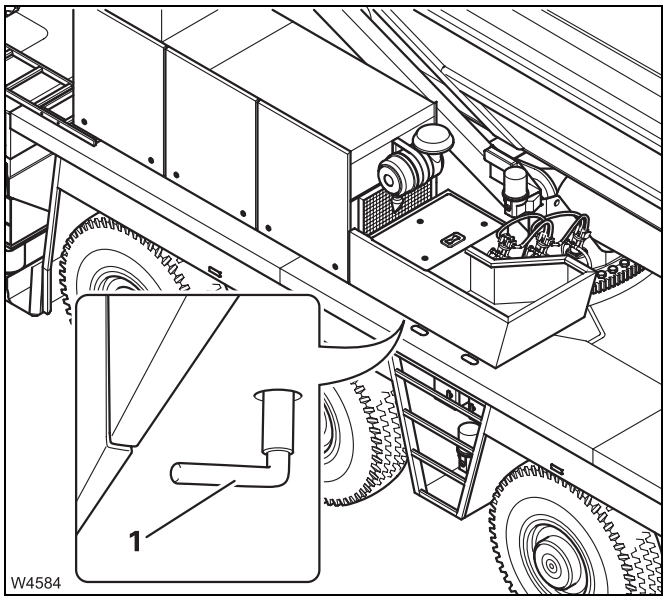
The GMK 6220-L truck crane is equipped with two emergency stop devices on the superstructure. With these devices you:

– can turn off the **crane engine** even when outside the crane cab (e.g. with an ignition lock malfunction or when access to the crane cab is blocked);

– can turn off the **crane control** when a crane movement can not be switched off (e.g. when there is a crane control malfunction).

Switching off the crane engine

You can turn off the crane engine from outside the crane cab by switching off the battery master switch.



The battery master switch (**1**) is located on the right-hand side of the superstructure, under the battery box behind the side plate, and is accessible from below.

- Switch off the main battery switch. Turn the selector handle so that it can be pulled off.

The crane engine switches off.

Furthermore you can switch off the crane engine with the *Crane engine emergency stop switch* using the air intake inhibitor; ➠ p. 12 - 16.

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Designation in circuit diagram: F 8	Rating (A)	Function
1	15	Crane cab heating
2	15	Radio
3	15	No function
4	5	Crane control unit 0
5	5	Crane control unit 1
6	5	Crane control unit 2

Designation in circuit diagram: F 9	Rating (A)	Function
1	20	Oil cooler
2	5	Oil cooler (relay)
3	15	No function
4	10	No function
5	5	Central lubrication system
6	10	No function

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Malfunction	Cause	Action
Raising or lowering the boom function can not be switched off	Malfunction on the crane control	Stop the movement with the *Crane control* emergency stop switch; ➠ p. 15 - 2.

If a malfunction occurs, first check whether it applies in both directions of movement.
In this case also check the causes listed in the *Derricking gear not functioning* section!

Error messages from error group 1, sensory mechanism		
Error message	**Cause**	**Action**
1.11. 7	Notify GROVE Customer Support	
1.11. 8	Information message; You switched off the difference angle sensor on the lattic extension because of an error message	Message remains if the ignition is switched off
1.12. 1	Lattice extension pressure sensor, lower chamber does not react	Check line; ➠ p. 15 - 38. If necessary notify GROVE Customer Support
1.12. 2...6	Lattice extension pressure sensor, lower chamber reports error	Notify GROVE Customer Support
1.12. 7	Notify GROVE Customer Support	
1.13. 1	Lattice extension pressure sensor, upper chamber reacts	Check line; ➠ p. 15 - 38. If necessary notify GROVE Customer Support
1.13. 2...6	Lattice extension pressure sensor, upper chamber reports error	Notify GROVE Customer Support
1.13. 7	Notify GROVE Customer Support	
1.15.1...6	Notify GROVE Customer Support	
1.16.1...6	Notify GROVE Customer Support	
1.18.1...6	Notify GROVE Customer Support	
1.19. 1	The difference between the main boom length and the length control is too great. The display *Actual load* and *Actual radius* flash	Test length indicator, plug connection and supply line; ➠ p. 15 - 38. Test telescope diagram from outside. Notify GROVE Customer Support if necessary.
1.21. 1	Differences between rope indicator and cable drum in the main boom are too large The displays *Actual load* and *Current radius* flash	Notify GROVE Customer Support.

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If the SLI switches off before you can lower the main boom to the horizontal position,

you must

– For the **hydraulic emergency operation** check, if it can be moved by you; ➠ *When can hydraulic emergency operation be carried out?*, p. 15 - 44.

– For the **mechanical emergency operation** have two auxiliary cranes at your disposal, of which one is equipped with a permitted means of transporting people.

Procedure for retracting

There are different procedures for retracting in emergency mode. Which procedure is the best for your particular case depends both on which functions are still possible and on the circumstances at the site. You can e.g.:

– unlock the telescope sections in mechanical emergency mode if the locking mechanism on the head of the telescoping cylinder is defective and retract with an auxiliary crane (up to the section in which the telescoping cylinder is located) or

– first extend the main boom with one or two auxiliary cranes far enough that the main boom can be lowered to the horizontal position and then retract the rest of the telescope sections in the horizontal position or

– if the electrical controller for the head of the telescoping cylinder is defective, retract the telescope sections using hydraulic emergency operation (with the main boom raised or horizontal, depending on circumstances).

Not all possible situations can be described here, only activities for mechanical emergency operation and hydraulic emergency operation under certain circumstances.
Select the best procedure for your particular case and seek advice from the responsible GROVE Customer Support specialists. This applies especially if the conditions for hydraulic emergency operation are different than described here.

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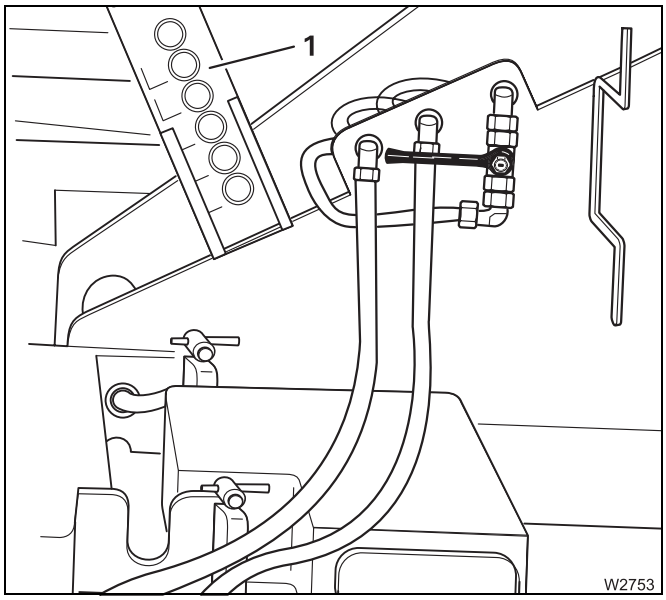
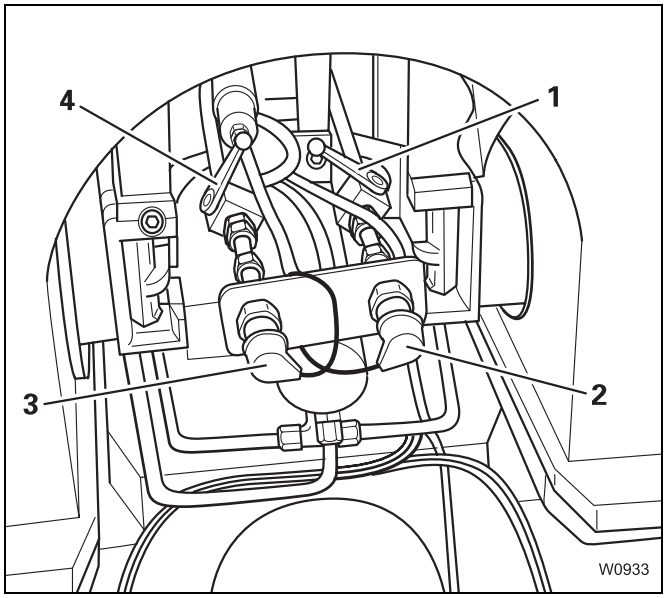
Risk of accidents from falling counterweight!
Always close the safety cock before carrying out hydraulic emergency operation.
If the safety cock is open, the hasps move into the *unlocked* position when unlocking with hydraulic emergency operation and the counterweight can fall down.

Operating the locking/unlocking mechanism in emergency mode



The locking/unlocking process is controlled with the *counterweight lifting gear* switch unit (**1**).

A hydraulic/mechanical safety circuit blocks the simultaneous unlocking of the telescope section and the telescoping cylinder. You can only unlock the telescoping cylinder if the telescope section is locked. The telescope section can only be unlocked when it is locked with the telescoping cylinder.



- Attach the appropriate hose for the required locking/unlokking.

– To lock/unlock the **telescoping cylinder**, the left connection (**3**) on the telescoping cylinder must be connected with the emergency supply.

– To lock/unlock the **telescope section**, the right connection (**2**) on the telescoping cylinder must be connected with the emergency supply.

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Error causes and effects

Once you have determined the defective part or the area where the error is, the table will give you more information on the cause and the effects. In this table the number code in the third line behind the part (e.g. 0 0 0 0 0 0 0 1 behind Y 2301) is decisive.

Defective part or area	Number code in the third line on the display	Cause of error	Effect/Remedy
Control lever J3501 or J3502	0 0 0 0 0 0 0 **1**	Analogue indicator in control lever defective	Control lever emergency programme is activated; ➠ p. 15 - 68. Notify GROVE Customer Support
	0 0 0 0 0 0 **1** 0		
	0 0 0 0 0 **1** 0 0	Earth contact/ line breakage	
	0 0 0 0 **1** 0 0 0	24 V short	
	0 0 0 **1** 0 0 0 0	Earth contact/ line breakage	
	0 0 **1** 0 0 0 0 0	24 V short	
	0 **1** 0 0 0 0 0 0	Mechanical error	
Length indicator A3502	0 0 0 0 0 0 0 **1**	No data reception	Notify GROVE Customer Support
	0 0 0 0 0 0 **1** 0	Hardware error	
Communication with SLI A100	0 0 0 0 0 0 0 **1**	No data reception from SLI	When there is no display on the SLI, check fuse SI13; ➠ p. 15 - 13.
	0 0 0 0 0 0 **1** 0		
ECOS	0 0 0 0 0 0 0 **1**	Locking status unrealistic	After acknowledgement start the menu *Emergency operation access*; ➠ p. 13 - 91.
	0 0 0 0 **1** 0 0 0	Displayed telescope status incorrect	➠ *Telescoping error messages*, p. 15 - 63
Digital input	0 0 0 0 0 0 0 **1**	Line breakage/ 24 V short	Notify GROVE Customer Support
	0 0 0 0 0 0 **1** 0	Earth contact	
Output	0 0 0 0 0 0 0 **1**	Line breakage/ 24 V short	Notify GROVE Customer Support
	0 0 0 0 0 0 **1** 0	Earth contact	
	0 0 0 0 0 **1** 0 0	Line breakage	
	0 0 0 0 **1** 0 0 0	Output overloaded	
	0 0 0 **1** 0 0 0 0	Output underloaded	

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Risk of damage to the main boom!
Never telescope the main boom if both the length indicator and the proximity switch have failed, i.e. with the number code 1 0 1 or 1 1 1. Otherwise you will no longer have any possibility to monitor and can damage components in the boom or put the boom in a condition in which it can no longer be extended.

Risk of damage to the main boom!
Depending on which error has occurred, you can only track the telescoping with certain warning and indicator lights. Use as a guide only the lights which are stated for the respective error in the following sections.
If you observe the incorrect indicator and warning lights, boom components could be damaged or you could put the main boom in a condition in which telescoping is no longer possible.

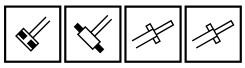
When you are in the *Emergency operation* menu, all functions for telescoping in the main boom are still released as long there are no other errors (hydraulic or mechanical).

If the error is due to a proximity switch (number code 0 **1** 0);
➠ *Retracting with an error on the proximity switch*, p. 15 - 74.

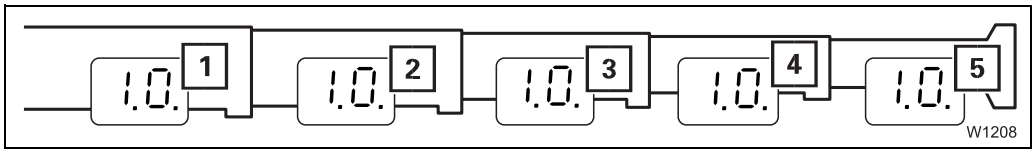
If the error is due to a length indicator (number code 0 0 **1**), retract the main boom as described in the following section:

Retracting with an error on the length indicator

If the error is on the length indicator, you can no longer read the extended length of the telescoping cylinder on the *Crane control display*.
The following status display elements are still available:



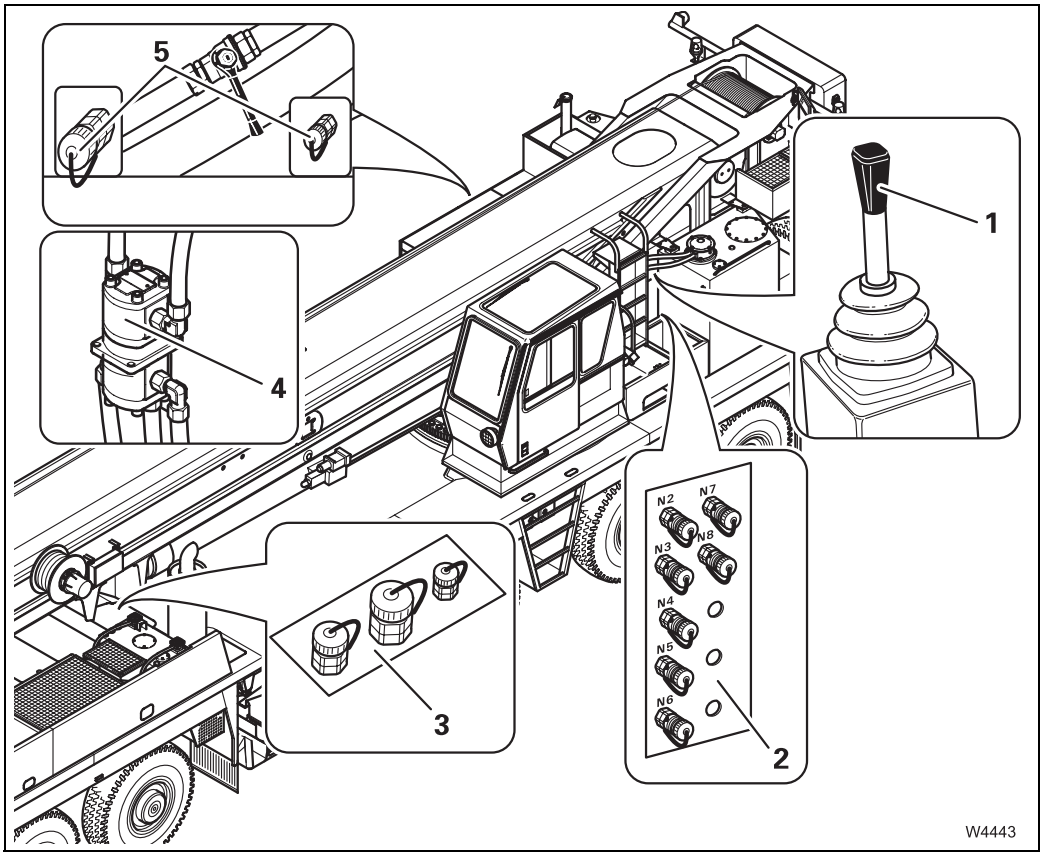
Check the **position of the locking pins** of the telescoping cylinder and telescope section with the red warning/green indicator lamps *Telescoping cylinder unlocked* and *locked* and *Telescope section unlocked* and *locked*.



Check the extended length of the telescope sections on the SLI display *Current telescope status of telescope section I to V*.

Functioning and accessories

This section gives a wide overview of the functioning, supplied accessories and connecting points on the truck crane. Also read the following sections before starting the work with hydraulic operation.



For emergency operation, a hydraulic transformer (**4**) with five connection hoses is available. Three lines are connected to the (**3**) connections in the carrier hydraulic system (or to another hydraulic energy source). The two other lines are connected to the (**5**) connections on the upper carriage hydraulic system.

After switching on the emergency operation, the carrier's hydraulic system drives the transformer and the transformer causes the oil in the upper carriage hydraulic system to be released.

The hydraulic circuits required for the different crane movements are created using specific connections in a connector field (**2**). In addition, specific taps should be closed and the valves should be activated if necessary.

The direction of movement and the speed is regulated using a control lever (**1**).

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16 Technical information for superstructure

16.1 Technical description of the superstructure

16.1.1 Turntable

The following components are installed on the turntable:

– the crane engine with fuel tank,
– the pumps, the oil tank and the oil cooler of the crane's hydraulic
– system,
– the main boom,
– the hoists,
– the slewing gears,
– the derricking cylinder,
– the tiltable crane operator's cab,
– the mountings for the counterweight with the hasps.

16.1.2 Crane operator's cab

All operating and control instruments required for crane operation are installed in the crane operator's cab on the front left-hand side of the turntable. The crane operator's cab can be tilted approx. 20° to the rear.

The aluminium cab is surrounded by safety glass. The sliding door has a sliding window. The windscreen can be opened to ventilate the cab.

The cab is heated via a heat exchanger using the engine coolant. The coolant can also be heated with an additional water heating system to preheat the engine and the cab.

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Hook blocks and hook tackle

Description	Length x width x height in m	Weight in kg
Double hook, 9 sheaves, lifting capacity **200 t (440 920 lbs)**	2.30 x 0.95 x 0.85	2 400
Double hook, 7 sheaves, lifting capacity **160 t (352 740 lbs)**	2.00 x 0.80 x 0.70	1 750
Double hook, 5 sheaves, lifting capacity **125 t (275 580 lbs)**	1.85 x 0.70 x 0.60	1 650
Single hook, 3 sheaves, lifting capacity **80 t (176 370 lbs)**	1.95 x 0.65 x 0.40	950
Double hook, 3 sheaves, lifting capacity **80 t (176 370 lbs)**	1.75 x 0.65 x 0.40	950
Single hook, 1 sheave, lifting capacity **32 t (70 550 lbs)**	1.50 x 0.65 x 0.35	600
Hook tackle, lifting capacity **12 t (26 455 lbs)**	0.91 x 0.35 x 0.35	300

Auxiliary hoist

Only with additional equipment

Description	Length x width x height in m	Weight in kg
Auxiliary hoist including rope and connections	1,60[1)] x 1.30 x 0.85	1700

1) Long hoisting gear frame approx. 1.60 m plus 0.5 m remaining hydraulic hoses that fit on the dummy connections.

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17 Index

How to use the alphabetical index; ➠ p. 1 - 16.
To prevent the index from becoming too long and unclear we have not included every single element from the instrument panel.
These elements, such as rocker switches, warning and indicator lamps, as well as status displays, are described and named in detail in the overviews of of Chapter 4 and 11 *Description of the truck crane*.
From there, you will be referred to more detailed descriptions of these elements.

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