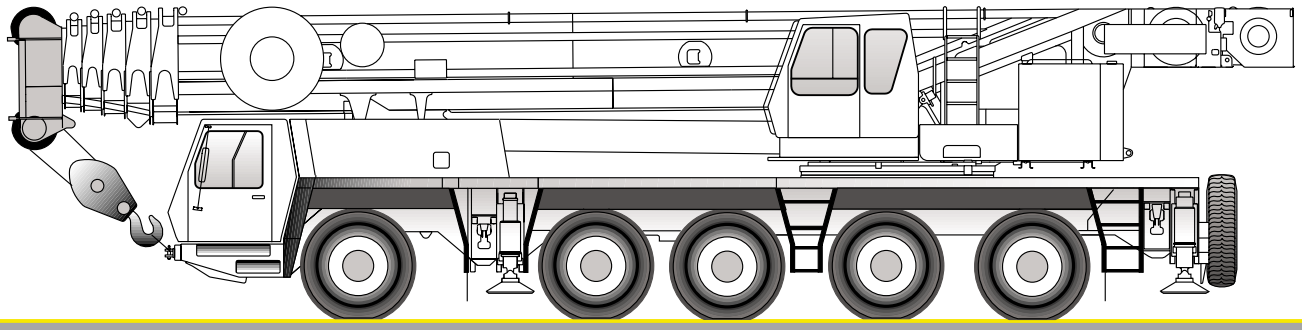
GROVE

GMK5200



Operating Instructions Part 1 Carrier

Vehicle serial number:

2 084 623 en
27.01.2001

1.3 Overview and contents of truck crane user information

1.3.1 Operating Instructions

These instructions contain information required to operate the truck crane. In order to make these operating instructions easier to use, we have divided them into two parts:

– Part 1 - Carrier
– Part 2 - Superstructure

In **chapter 2** you will find *Basic safety instructions*. Please read and observe these instructions, even if you are familiar with the safety manual. These *Basic safety instructions* are in this chapter only; special safety instructions which indicate concrete dangers are contained in the text. There the action related to the danger is described.

Chapter 3 contains *Information for applications engineering*. It is intended primarily for the truck crane operator and those responsible for applications engineering.

This chapter contains

– the required qualifications of those involved in applications engineering,
– special safety instructions,
– information that is relevant to applications engineering.

Chapters 4 to 6 contain information required for *driving the truck crane:* a description of all structural and operational components, clearly defined check lists for rigging modes and work, and the operating instructions for on-road and off-road driving and the removal and installation of the auxiliary hoist.

Chapter 7 contains information required to rig the truck crane for on-road driving (only with additional equipment).

Chapter 8 contains information on *Troubleshooting* for the carrier of the truck crane.

Chapter 9 contains the *Technical description* of the individual parts and functional elements of the carrier as well as its *Technical data*.

The *Alphabetical index* in **Chapter 10** helps you to find particular procedures and terms in the operating instructions. The *Alphabetical index* refers to both parts of the instructions.

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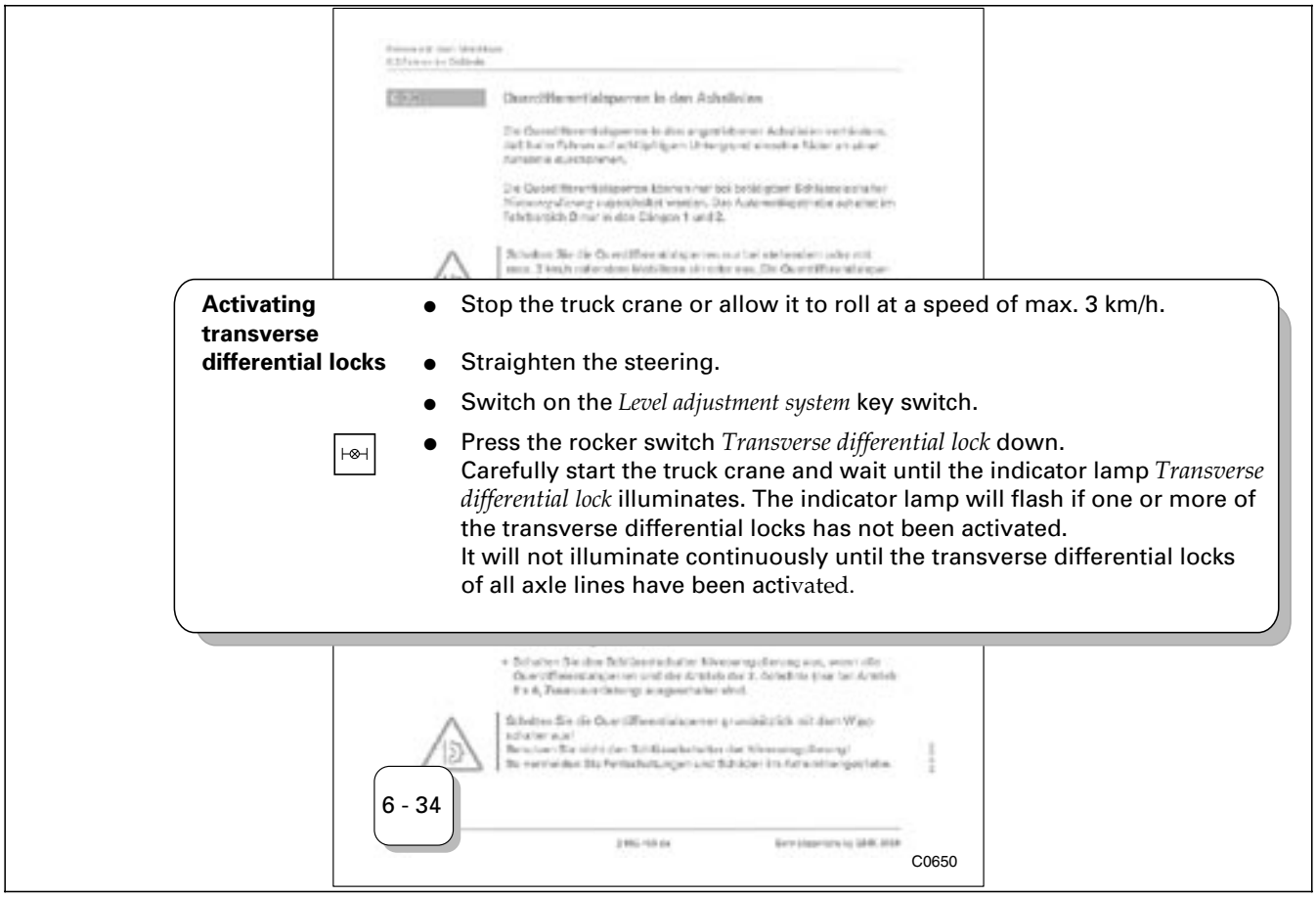

The section *Transverse differential locks in the axle lines* is on page 6 - 34 of our example. There the function and operation of the transverse differential locks is described in detail. You are also given warning information which will help prevent you from incorrectly operating the transverse differential locks and causing damage.

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Note the operational organization on the site. Report your arrival to site management. Ask for the personnel authorized to issue instructions.

Familiarize yourself with the location and operation of the fire extinguishers on every site.

Note the fire alarm and fire fighting facilities on the site.

Should the operating behaviour of the truck crane change in such a manner that safety is affected or if you doubt the truck cranes operating safety, stop the machine immediately and inform the appropriate responsible persons.

Do not modify any programs in programmable control systems (e.g. the SLI).

Do not modify or mount attachments to the truck crane without the consent of the manufacturer if such changes could affect the safety of the unit. This also applies to

– installing safety devices,

– setting safety devices and valves.

Welding work on load-bearing parts may only be conducted by properly qualified personnel following authorisation by the manufacturer. To avoid any damage, especially to electronic parts, there are certain steps you must take before doing any welding work. So always consult GROVE customer service before doing any welding work.

Ensure that both the prescribed periods and the periods specified in the operating and maintenance instructions for regular testing, inspection and maintenance work are maintained.

Replace the hydraulic hose lines at the prescribed intervals or have them replaced, even if no safety defects are noticeable.

Replacement parts must fulfil the technical requirements prescribed by the manufacturer. Genuine spare parts always meet these requirements.

It is imperative that appropriate service equipment be used when carrying out repair work.

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3.2 Applications engineering

3.2.1 Application engineering requirements

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

– the distance,

– the route,

– overhead clearances and

– 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) ➠ p. 4-37

5 Cab lighting ➠ p. 4-39

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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. 4-35

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

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

8 Rocker switch for longitudinal differential locks / drive of 2nd axle line (drive of 2nd axle line can only be switched on with 10 x 8 x 10 additional equipment) ➠ p. 4-27

9 Rocker switch with separate steering lock button ➠ p. 4-30

10 Unlocked steering warning lamp ➠ p. 4-30

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Rocker switch for longitudinal differential locks / drive of 2nd axle line

Switches the longitudinal differential locks on in the transfer case and on the 4th axle line.
In the case of additional equipment with 10 x 8 x 10 drive, the drive of the second axle line is switched on as well as the drives of the 1st, 4th and 5th axle lines.

May only be activated when the vehicle is stationary or is moving at a speed of no more than 2 mph.

To switch on: Press rocker switch down.

To switch off: Press rocker switch up.

➠ p. 6-41.

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

To check the switch states:
– Longitudinal differential lock in transfer case on/off,
– Longitudinal differential lock on the 4th axle line on/off
– Drive of 2nd axle line on/off (only with 10 x 8 x 10 additional equipment).

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).
➠ p. 6-41.

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 2 mph.

To switch on: Press rocker switch down.

To switch off: Press rocker switch up; ➠ p. 6-43.

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;
➠ p. 6-43.

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Switching on/off the cruise control pushbutton

For switching the heating on and off manually.
If the heating is switched off, it can be switched on by pressing the pushbutton once.
If the heating is switched on, it can be switched off by pressing the pushbutton once; ➠ *Switch heating on/off*, p. 6-58.

Input pushbutton –

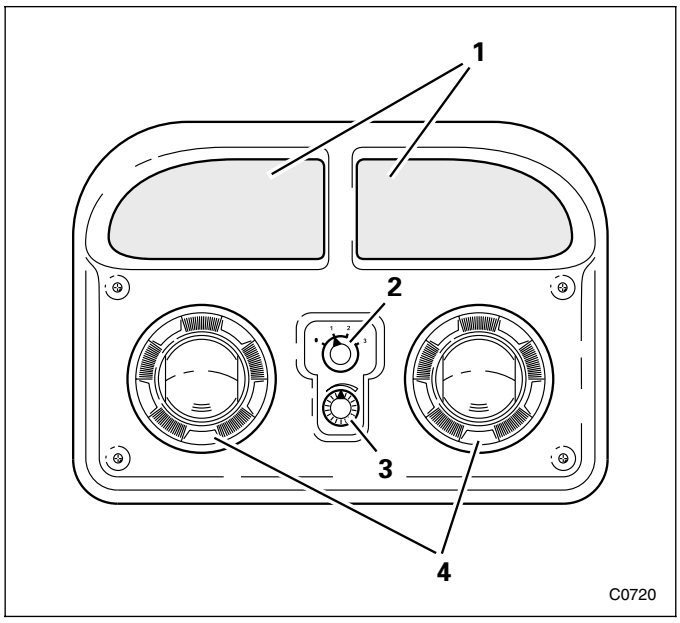
For entering values when storing an automatic heating start and when setting the time with a flashing *heating system display*. The flashing value decreases with every press. If the pushbutton is held down for longer than two seconds, quick run is activated and the value is decreased continually.
If the pushbutton is held down for longer than three seconds with the heating switched off, the set automatic heating duration flashes and can be adjusted; ➠ *Setting automatic heating duration*, p. 6-60.

Input pushbutton +

For entering values when storing an automatic heating start and when setting the time with a flashing *heating system display*. The flashing value increases with every press. If the pushbutton is held down for longer than two seconds, quick run is activated and the value is increased continually.

Air conditioning system (additional equipment)

The air-conditioning system is located on the roof of the driver's cab. There are two different designs which are distinguished by the location of the operating instruments. The function of the operating instruments is the same with both versions; ➠ p. 6-63.



Version A

1 Air exit vents

2 Knob switch for fan

3 Knob switch for thermostat

4 Air exit vents, adjustable for air quantity and direction

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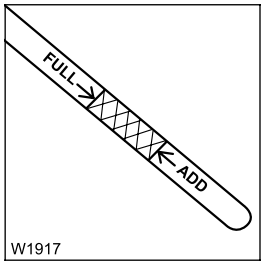
5 Vehicle engine

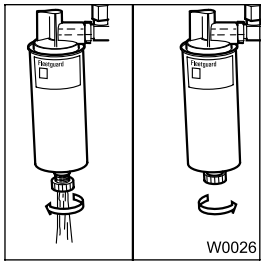
5.1 Starting / turning off vehicle engine

5.1.1 CHECK LIST: Starting vehicle engine

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!**



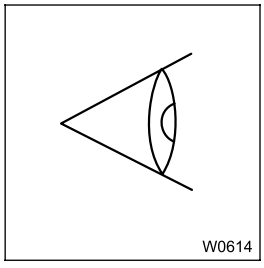
1. Checking the oil level in the vehicle engine; ➠ p. 5-4.



2. Draining off water from the fuel filter; ➠ *Draining off water from the fuel filter*, p. 5-5 and vehicle engine operating instructions.

3. Visual inspection of the drive belts, ➠ *Visual inspection of the drive belts*, p. 5-6 and vehicle engine operating instructions.

4. Visual inspection of the air combustion system; ➠ *Visual inspection of the air combustion system*, p. 5-7 and vehicle engine operating instructions.



5. Checking the overall condition of the vehicle engine and for leakage; ➠ p. 5-9.

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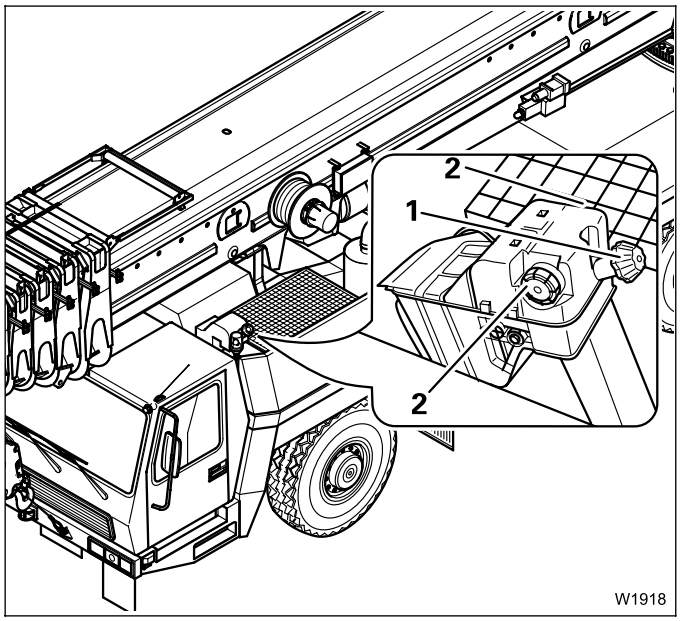
Checking the coolant level

The coolant reservoir is located on the left-hand side of the carrier behind the driver's cab.

Risk of burning when vehicle engine is hot!
The hot cooler is pressurised. Be careful to avoid burns from the hot cooler, with escaping steam or any escaping coolant if you remove the lid of the cooler when the vehicle engine is hot.
Wear suitable protective gloves and cover the lid of the cooler with a cloth before opening it.
Turn the cooler lid slowly to the first notch in order to allow the excess pressure to be released.



Do **not** open the pressure relief valves (**2**) on the sides of the coolant reservoir.

- Loosen (do not open!) the lid of the filling hole (**1**) when the coolant is at operating temperature so that the pressure decreases.
- Open the lid.
  The coolant must reach the lower edge of the pipe in the filler neck.

If the coolant level is too low:

- Add coolant. See the Cummins operating instructions for the composition of the coolant.
- Screw the lid of the filling hole back on until it reaches end position.

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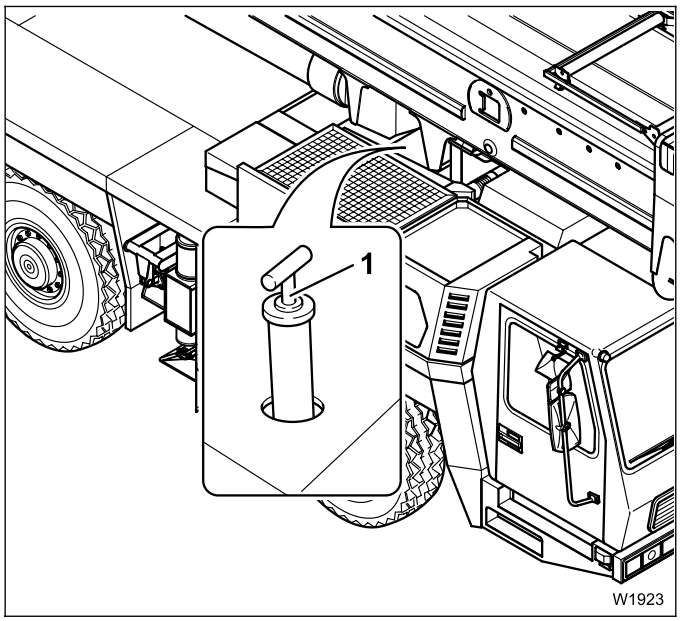
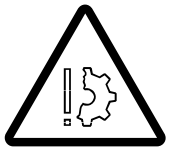
Checking oil level in the automatic gearbox



The dipstick (**1**) is on the right side of the carrier (looking in the direction of travel) behind the vehicle engine.
The dipstick tube is also intended for topping up the oil.



The correct oil level must be maintained to ensure smooth operation of the automatic gearbox:
– if the oil level is too low the gearbox will not function properly,
– if the oil level is too high the gearbox will lose power and overheat.

Requirements:

To check the oil level:
– the truck crane must be on a level surface,
– the parking brake must be engaged,
– the automatic gearbox must be in neutral **N**,
– the vehicle engine must be running,
– the precheck of the oil level must have been carried out.

Two types of oil level check:

The oil check can be performed in two different ways, depending on certain conditions:
– when the gear oil is cold,
– when the gear oil is warm.

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Driving mode table

Driving mode of the truck crane on public roads with a maximum axle load of 26 455 lbs. The table is based on a truck crane with a full petrol tank and a driver.

	Equipment	Driving mode							
		1	2	3	4	5	6	7	8
A	Tyres 14.00	X	X	X	X			X	X
	Tyres 16.00					X	X		
	Drive 10 x 6 x 10	X		X		X			X
	Drive 10 x 8 x 10*)		X		X		X		
	Eddy current retarder*)			X	X				
B	Spare wheel 14.00 at rear*)			●				●	
	32 t - (70 550 lbs -) hook block, attached at front							●	
	12 t - (26 455 lbs -) hook tackle, attached at front			●					
	12 t - (26 455 lbs -) hook tackle tied to chassis				●	●			●
	32 t - (70 550 lbs -) hook block tied to chassis	●	●						
	Two-stage swing-away lattice extension removed *)	●	●	●	●	●	●	●	●
	Hose drum for lattice extension removed	●	●	●	●	●	●	●	
	Auxiliary hoist removed	●	●	●	●	●	●	●	●
	Counterweight completely removed	●	●	●	●	●	●	●	●

*) Additional equipment

How to use the table:

The driving mode of your truck crane depends on the equipment specified under **A**. Determine the driving mode of your truck crane.

Each truck crane has only one driving mode.

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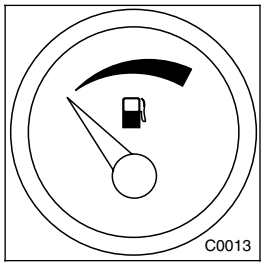
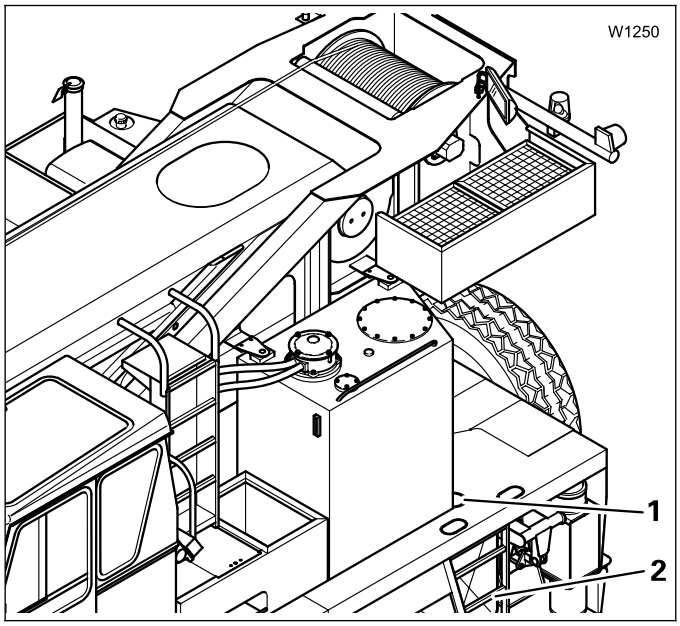
Refuelling



Monitor the fuel gauge. Refuel with diesel whenever necessary.

Fires may occur due to flammable gases!
Switch off the vehicle engine, driver's cab heater and all additional heating devices before refuelling.



A fuel tank with a fill plug (**1**) is located on the carrier on the left and right sides at the rear. Both fuel tanks are connected and can be filled together from the right or the left.

To refuel, use the step up (**2**) on the carrier.

The prescribed fuel specification may be found in the supplied Cummins operating instructions for the vehicle engine.
The combined capacity of the two fuel tanks is approx. 106 gal.

Danger of accident if the fuel tank is not closed!
Screw the sealing cover back on after each refueling. In this way, you prevent vehicles behind you from being endangered by the sealing cover falling off or fuel escaping.

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For a **longer stop** when the vehicle engine is running you must

– release the accelerator,

– engage the service brake,

– lock the parking brake,

– shift the automatic gearbox to neutral position **N**.

Upshifting the automatic gearbox

The position of the accelerator can be used to influence the time at which the automatic gearbox upshifts.

If you press the accelerator down completely, the automatic gearbox will not shift until the engine speed is high. The automatic gearbox will only shift at lower engine speeds when the accelerator is only partially pressed down.

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Deactivating the cruise control

The truck crane will brake if you deactivate the cruise control without first pressing the accelerator.

- Press the accelerator until the truck crane accelerates.

- Press the *Cruise control/speed set* rocker switch down once. The set speed is cancelled and you can control the speed again with the accelerator.

Cruise control is automatically deactivated if you activate the service brake, the retarder or the eddy current retarder.
➠ *Driving on downhill slopes*, p. 6-31.
The *Cruise control* indicator lamp then goes out.

6.2.6 Speed set

The truck crane is equipped with a speed limiter function. This function enables you to limit the truck crane to a particular speed (e. g., in areas with speed limitations). As long as the speed limiter function is switched on, you can not exceed the set speed.

Switching on speed limiter

Bring the truck crane up to the speed which can not be exceeded.

- Press the *cruise control/speed limiter* rocker switch upwards once.

The current speed is set as the upper limit. You can now drive the truck crane only in the range below the set speed limit.

Deactivating the speed limiter

- Press the *cruise control/speed limiter* rocker switch downwards once.

The speed limiter function is deactivated and you can travel with the truck crane in the whole speed range again.

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The rocker switches for the following functions are also activated using this key switch:

– Transverse differential locks in all driven axle lines;

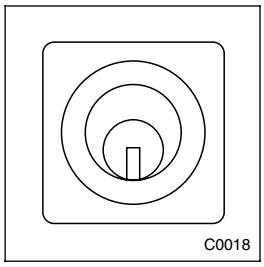
– Longitudinal differential locks / drive of the 2nd axle line (drive of 2nd axle line only with 10 x 8 x 10 additional equipment);

– Separate steering;

– Blocking gears **3**, **4** and **5** in the automatic gearbox (only gears **1**, **2** and **R** may still be used).

Activating the level adjustment system

The suspension locking system of all axle lines must be switched off for all level changes!
The transverse differential locks and the drive of the second axle line / longitudinal differential locks must also be switched off!



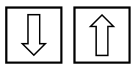
- Insert the key into the *Level adjustment system* key-operated switch and turn on the switch.
- Maintain the engine speed at between 1000 and 1300 rpm using the accelerator during each level change.

Raising or lowering the entire truck crane

- Select the direction of movement of the level adjustment using the *Raise / lower vehicle level* rocker switch:

Raising the truck crane: Press rocker switch up.

Lowering the truck crane: Press rocker switch down.



The *Raise vehicle level* and *Lower vehicle level* indicator lamps show the selected direction of movement.

- Let the truck crane roll at approx. 2 mph during the level change.

Applying the brakes during the level change increases tyre wear as well as the load on the suspension cylinders. Therefore you should – if possible – release the parking brake and allow the truck crane to roll during a level change.

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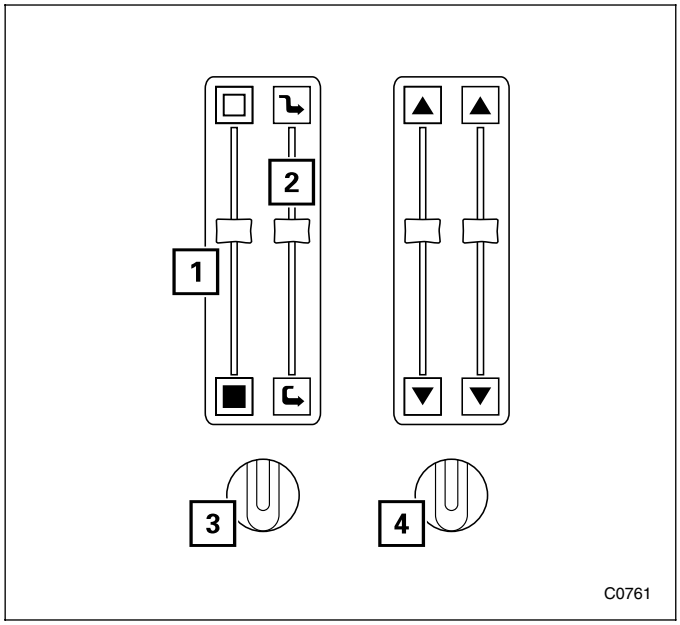
Ventilating the driver's cab



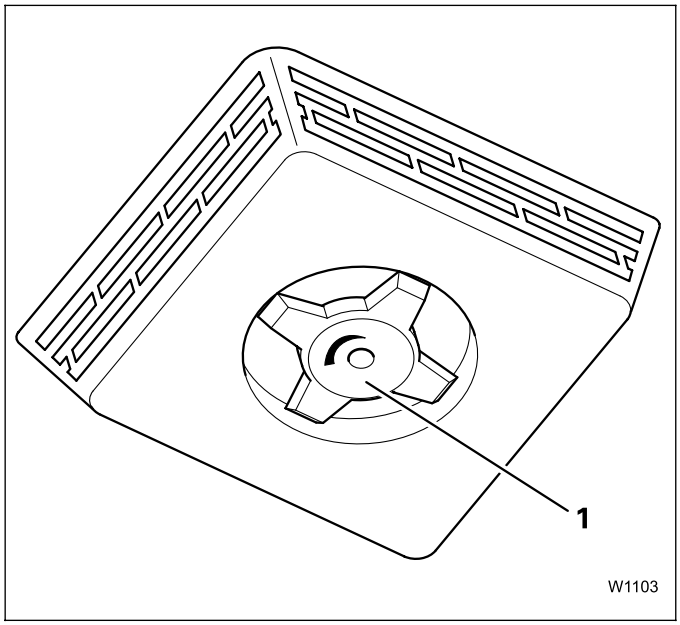
- Push the regulator *heater temperature* (**1**) up as far as it will go and turn on the blower using the knobs (**3**) and (**4**).
- Push the regulator *Circulation air operation / fresh air mode* (**2**) up.

6.5.2 Roof blower (additional equipment)

The blower used to ventilate the driver's cab is installed in the ceiling of the cab.

You may determine the direction of the air flow (in or out) using the *Roof fan* rocker switch located on the front instrument panel.

Remove air:	switch pressed up
Off:	mid-position
Air in:	switch pressed down



You may adjust the volume of air and close the roof blower using the handwheel (**1**).

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Dehumidifying the air in the driver's cab

On humid days at the turn of the season you can dehumidify the air in the crane operator's cab by operating the air-conditioning system in the combined heating and cooling mode. Operation of the heating system is described in section *Heating and Ventilation*, p. 6-53.

As this involves the heating and air-conditioning system functioning "in opposition to each other" dehumidifying produces little or no heat.

- Set the knob *Driver / passenger side heater fan* and the knob switch *Thermostat* of the air-conditioning system to approximately the same output.
- Switch on the blower.

The air in the cab will be dehumidified more thoroughly the higher the heating and cooling settings are set.

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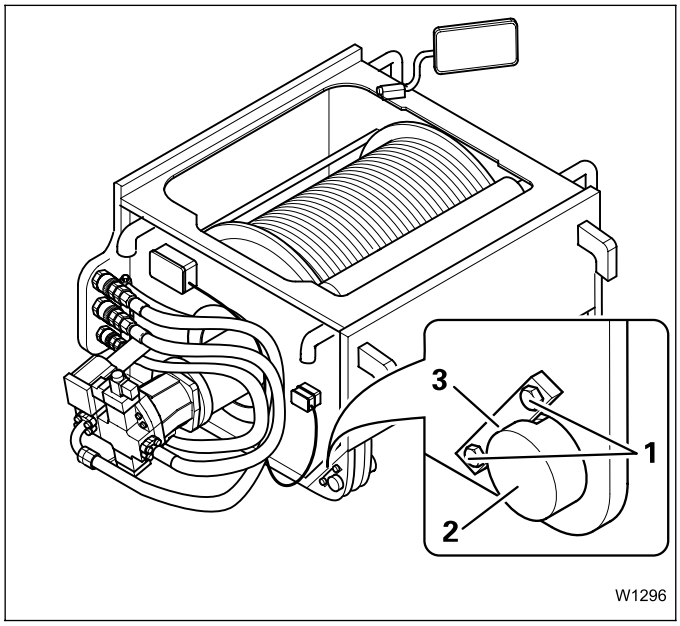
6.8.2 Mounting the auxiliary hoist

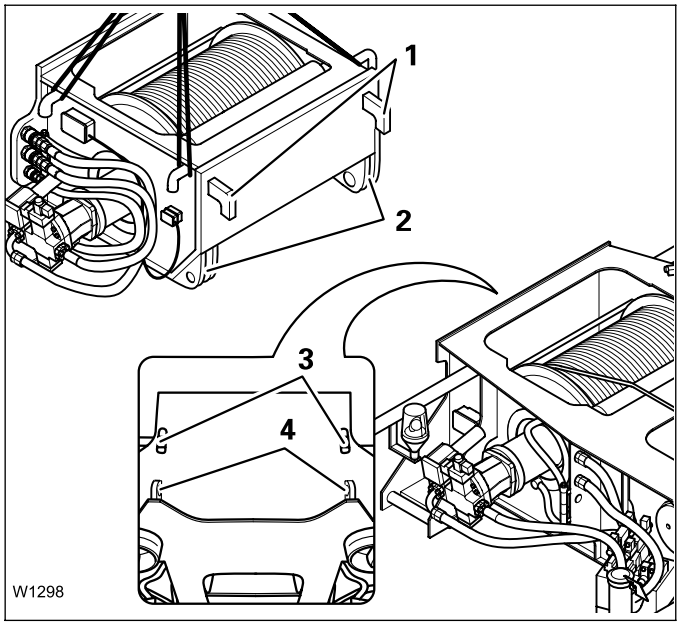
Remove axle holders and pins



- Unscrew the screws (**1**) on the axle holders (**3**) on both sides of the auxiliary hoist and remove the axle holders.
- Extract the connecting pins (**2**) on both sides of the auxiliary hoist.

Attach the auxiliary hoist to the main hoist

- Sling the auxiliary hoist onto an auxiliary crane; ➠ *Slinging points*, p. 6-73.



- Attach the auxiliary hoist with both (**1**) hooks at the top of the holding rod (**3**).
- When attaching the auxiliary hoist, be careful that the forks (**2**) are aligned with the holdings (**4**) on the main hoist frame.
- Correct the position of the auxiliary hoist if necessary.

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7.1 Rigging the outrigger beams

For rigging the outrigger beams the connections on the valve blocks must be equipped with quick-action couplings (additional equipment) at the factory, otherwise the outrigger beams may only be removed by employees of GROVE customer service.

The front and rear outrigger beams can be removed. The outrigger beams are constructed in such a manner that for every outrigger beam the complete "package" comprising inner and outer outrigger beams, sliding cylinders, outrigger cylinders, ropes and retaining parts is removed and installed again. The necessary aids and the space required are found in the following section.

The manner of proceeding with installation and removal is the same for all outrigger beams and is described in the usual form with checklists and corresponding sections;
➠ *CHECK LIST: Removal of the outrigger beams*, p. 7-4.
➠ *CHECK LIST: Installation of outrigger beams*, p. 7-5.

Space required and equipment

A list of space requirements and equipment for the installation and removal of the outrigger beams is given below.

Size of the installation area (excluding approach and departure ways):	For removal/installation of the outrigger beams approx. 3875 ft^2 fir approx. 65 ft width (minimum width 39 ft)

These specifications are dependent on the size of the auxiliary cranes and the separate vehicles. They can vary for each individual job.

Auxiliary crane:	1 auxiliary crane (dimensions and weights – outrigger beams/pads ➠ *Dimensions and weights of removable parts – outrigger*, p. 9-9).
Lifting gear:	Suitable chains or ropes with sufficient load bearing capacity.
Separate vehicles	One or more separate vehicles are required.

Risk of overturning!
If the truck crane is not on outriggers, it overturns when the superstructure is slewed. Do not use the truck crane to raise the outrigger beams! The superstructure may only be slewed when all four outrigger beams are installed and the truck crane is supported by all four outrigger beams!

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7.1.7 Locking/releasing locking pin of sliding cylinders

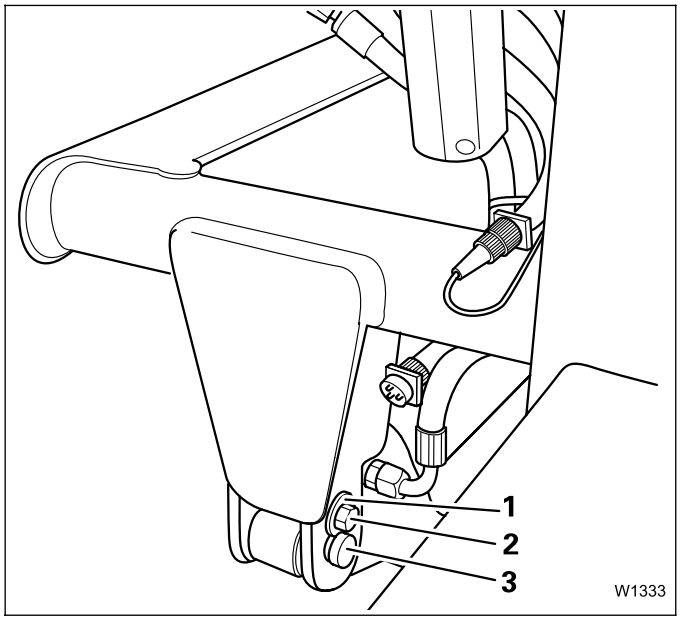
The locking cylinders of the outrigger beams are fastened to a holder on the outrigger housing with one pin each. The holdings of the respective beams are located on the side opposite the corresponding outrigger cylinders.

You must release the locking pin when **removing**.

You must lock the sliding cylinder when **installing**.

Releasing the locking pin

Risk of crushing by falling sliding cylinders!
Do not support yourself on the transverse struct of the inner outrigger beam when pulling out the pin. When you pull out the pin, the sliding cylinder falls onto this transverse struct and can crush your fingers or hands.



- Release the pin-type keeper. Unscrew the screw (**2**) and remove it together with the securing washer (**1**).
- Pull the pin (**3**) from the holder.

The sliding cylinder falls approx. 1 inch downward into a pouch and remains in this position for transport.

- Re-insert the pin (**3**) into the holder and fasten the pin-type keeper.

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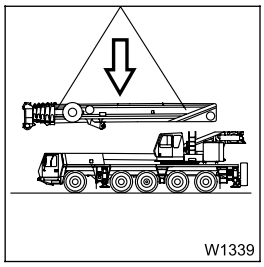
7.2.2 CHECK LIST: Installing the main boom

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!**

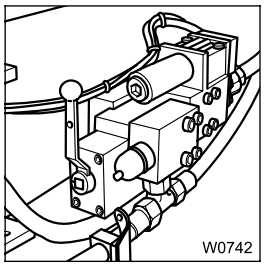
Prerequisites

- The truck crane is supported by at least the outrigger span of 27.9 x 8.9 ft; ➠ *Outrigger for main boom installation/removal,* p. 14-23.
- The superstructure is slewed to the front and superstructure lock is engaged.
- The battery master switch for the superstructure is activated.
- The installation area has the required space.

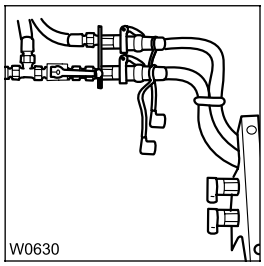
Installing the main boom



1. Lifting the main boom using the auxiliary crane to the turntable; ➠ *Rigging work with the auxiliary crane – lifting the main boom onto turntable*, p. 7-28.



2. Check whether the boom floating position is switched on for pressure relief of the derricking cylinder; ➠ *Pressure relief of the derricking cylinder*, p. 7-45.



3. Connect withdrawing device for the bottom axle of boom; ➠ *Hydraulic connection*, p. 7-32.

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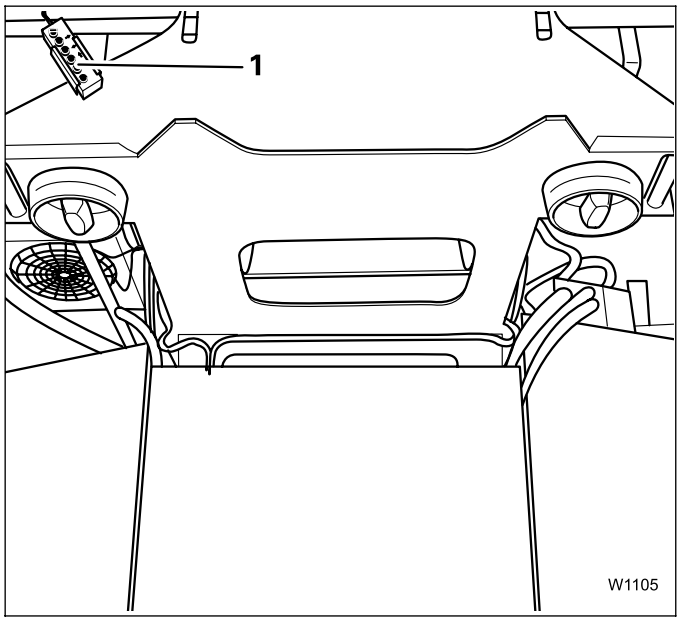
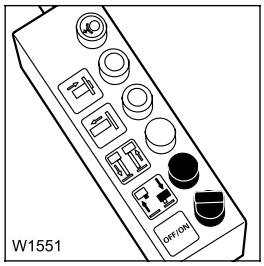
Retracting/ extending pins

You may only **retract** the pins when the main boom is slung onto an auxiliary crane and the slinging tackle is taut.
Before you **extend** the pins, you must align the pivot points on the turntable with the pins of the bottom axle of boom.



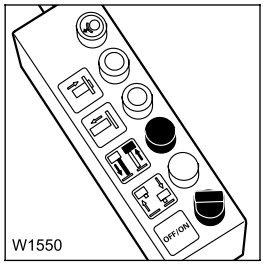
If the withdrawing device is hydraulically connected, you can operate it via the *Counterweight lifting gear switch unit*.

The switch unit (**1**) is located in a holder on the left rear of the turntable.



Retracting pins

- Turn the *Release switch unit* knob to the right and hold it down.
- Also press the *Retract counterweight lifting cylinder/lower counterweight* switch.



Extending pins

- Turn the *Release switch unit* knob to the right and hold it down.
- Also press the *Extend counterweight lifting cylinder/raise counterweight* switch.

The positions of the bolts on the bottom axle of boom have no influence on the indicator and warning lamps in the switches. These lamps always show the position of the locking bar.

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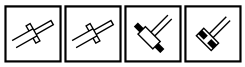
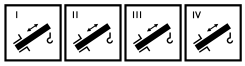


- Check whether the warning and indicator lamps for the locking and unlocking of the telescope sections and the telescoping cylinder display the current positions (lock and unlock the telescope section to do this; the lamps must change accordingly).



- Check whether the indicator lamps for the position of the telescoping cylinder display the current position of the telescoping cylinder (move the unlocked telescoping cylinder in the foot sections back and forth).

If the information on the *Crane control* display is wrong or the warning and indicator lamps do not display correct information:

- Check the electrical connections on the shutter in the middle of the turntable. If necessary, put the connections completely onto the plugs and tighten the coller nuts.

Checking the connections for the SLI

The connections for the SLI can be checked with the lifting limit switch.

- Lift the lifting limit switch weight on the main boom.

The warning lamp lifting limit switch cut-off in the crane cab must illuminate as long as the lifting limit switch is raised.

- Check if an error message appears on the SLI display;
  ➠ *Operating the safe load indicator*, p. 13-19.
- Check the electrical connections in the left side of the main boom if:
  – the warning lamp does not illuminate when the lifting limit switch weight is lifted,
  – an error message appears on the SLI display.

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8.3 Towing the truck crane

Observe the following when towing the truck crane:

- The truck crane may only be towed with a tow-rod. Attach the tow-rod on the tow-rod coupling on the front bumper of the truck crane and the towbar coupling of the towing vehicle.
- The statutory regulations concerning the overall length of the towing and towed vehicle, including the tow-rod must be observed.
- If the vehicle engine, the steering and the service brake still work, you may tow the truck crane with a truck.
- If the vehicle engine, the steering or the service brake no longer function properly, the truck crane must be towed with a special breakdown truck.
- Maximum towing speed is 16 mph.
- The front towing coupling is for a maximum tractive force of 22 050 lbs. The tractive force may go forwards or at an angle of 45° to both sides from the longitudinal axle of the truck crane.

Towing with running vehicle engine

If the compressed-air supply system is damaged, the filler connection of the truck crane must be connected to the *Supply* coupling head of the towing vehicle; ➠ *Compressed-air supply for vehicle engine breakdown* in this section, p. 8-7.

Accidents may occur if the brakes fail!
If the service brake system of the truck crane is damaged, the crane can only be braked by the towing vehicle. You should therefore use extreme caution when towing. Observe the mass of the towed vehicle and adjust the speed and driving style accordingly.

- Let the vehicle engine run in neutral gear when towing.
- Select neutral on the automatic transmission; ➠ *Driving ranges of the automatic gearbox*, p. 6-21.
- Switch the transfer case into neutral position; ➠ *Gearbox* in this section, p. 8-8.

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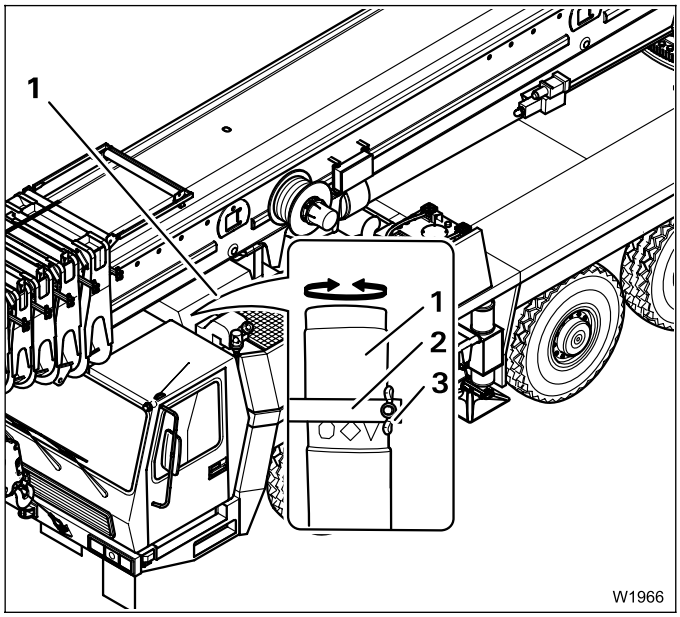
8.5 Changing the cartridge with cold start assisting agent (additional equipment)

The batching unit with the bolted-on cartridge for the cold start assisting agent is attached to the left behind the driver's cab under the engine cover.

Risk of explosion!
Cold start assisting agents are highly flammable. You must not smoke when using cold start assisting agents. Avoid at all costs naked flames, sparks or other sources of ignition. Switch off vehicle engine when changing the cartridge of the cold start assisting agent. Be sure to observe the safety instructions on the packaging and the cartridge. If the cold start assisting agent explodes, it could cause serious burns on face and arms.

Use only an original replacement part for a new cartridge as only these can be screwed tightly onto the dosing unit. You can obtain the new cartridge from GROVE customer service (see list of replacement parts).

- By opening the service flap above the vehicle engine, the cartridge is accessible from the top. It is found on the left behind the driver's cab.



- Unscrew the wing screw (**3**).
- Fold the bracket (**2**) out.
- Release the cartridge (**1**) by turning it to the right and then screw it out of the dosing unit.
- Screw in the new cartridge by screwing it anticlockwise into the dosing unit. Observe the installation instructions on the cartridge.

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8.7 Troubleshooting and malfunction correction

8.7.1 Vehicle engine malfunctions

In the event of vehicle engine malfunctions also refer to the Cummins Instruction Manual.

Malfunction	Cause	Action
Engine does not start (starter does not turn over)	Battery master switch not switched on	Switch battery master switch on; ➠ p. 5-13.
	Ignition switched off	Switch on ignition; ➠ p. 5-14.
	Automatic gearbox not in neutral	Switch automatic gearbox to position **N**; ➠ p. 5-14.
	Parking brake not engaged	Engage parking brake; ➠ p. 5-14.
	Fuse F7 CR defective	Check fuse, replace if necessary; ➠ p. 8-19.
Engine does not start (starter motor turns over)	Batteries flat	Charge batteries; ➠ also *Maintenance Manual*.
	Fuel tank empty	1. Fill fuel tank; ➠ p. 6-15 2. Ventilate fuel tank; ➠ Cummins operating manual
Cold starting unit (additional equipment) is not functioning	container for cold start assisting agent is empty	change container for cold start assisting agent; ➠ p. 8-15.
	Carrier fuse F7 CR is defective	check fuse, replace if necessary; ➠ p. 8-19.
Engine malfunction **indicator lamp illuminates**	various, also see the Cummins operating instructions for the vehicle engine	rectify the cause of the malfunction. If this is not possible, drive carefully. Have the fault repaired as soon as possible.

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8.8.2 Troubleshooting for malfunctions in the automatic gearbox

In the event of a malfunction of the automatic gearbox, the gearbox control attempts to establish the most secure gearbox operating condition possible in order that the crane may be driven to a safe place.

The gearbox control locks the last gear selected (gearbox in locked position) and opens the converter override coupling.

The warning lamp *Shift lock for automatic gearbox* in the selector switch panel of the gearbox control illuminates and an acoustic signal sounds for 10 seconds.

When the *Shift lock for automatic gearbox* warning lamp lights up, the gearbox control no longer responds to the selector switch being actuated. You can no longer shift from neutral position **N** into another gear. The driving direction can therefore not be changed!

Risk of accidents!
With the gearbox in locked position, the stationary vehicle must be secured against rolling away. Engage the parking brake and secure the vehicle using chocks.

Resetting the gearbox control

When the warning lamp *Shift lock in automatic gearbox* indicates a gear malfunction, you can reset the gearbox control to its original position.

- Stop the truck crane at a safe place.
- Turn off the vehicle engine.
- Turn off the ignition.
- Wait for at least ten seconds before turning on the ignition again and restarting the vehicle engine.

The warning lamp *Shift lock in the automatic gearbox* will not light up again in the event of a temporary malfunction and the gearbox operates normally.

The warning lamp *Shift lock in the automatic gearbox* lights up again if the malfunction is permanent.

In this case the functioning of the gearbox is dependent on the malfunction:

– The gearbox appears to function normally;
– The gearbox only operates in the lower gears;
– The gearbox remains in neutral position. In this case, driving cannot be continued.

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9.1.6 Steering

The steering gear is mechanically connected to the first, second, third and fifth axle lines. The dual-circuit hydraulic steering supports the steering movement through hydraulic cylinders on all steerable axle lines.

The steering is divided into two steering circuits which are supplied by different hydraulic pumps. If both steering pumps malfunction, an emergency steering pump flanged onto the transfer case is switched on automatically.

The steering system can be switched from normal steering mode to separate steering for slow manouvering. This switches on the steering of the 4th axle line. The wheels of the fourth and fifth axle lines are then turned regardless of the steering direction of the front wheels.
With separate steering, the wheels of the 1st, 2nd and 3rd axle lines are steered with the steering wheel; the fourth and fifth axle lines are steered with the rocker switch of the separate steering at the driver's seat.

If you switch to separate steering, you can drive with either all-wheel steering or with crab travel mode:

– The size of the turning circle decreases with all-wheel steering.
  The front and rear axle lines turn in opposite directions.
– The truck crane moves diagonally sideways in crab travel mode.
  The front and rear axle lines now turn in the same direction.

9.1.7 Suspension system

All wheels are individually suspended from the crane carrier with hydropneumatic suspension cylinders. The hydraulic system of the suspension system is separated from the carrier's hydraulic system by solenoid valves.

The suspension system is adjusted by control signals of the gearbox control and the level adjustment system by the various driving modes (e.g. driving off-the-road).

The axle lines are interconnected respectively to suspension groups. The wheel load is transferred equally between all axle lines of a suspension group. The oil displaced when the suspension cylinders are compressed is stored in pressure accumulators.

The suspension groups must be locked for various driving modes on the site and during crane work. The suspension cylinders are separated from the pressure accumulators by pneumatically operated blocking valves.

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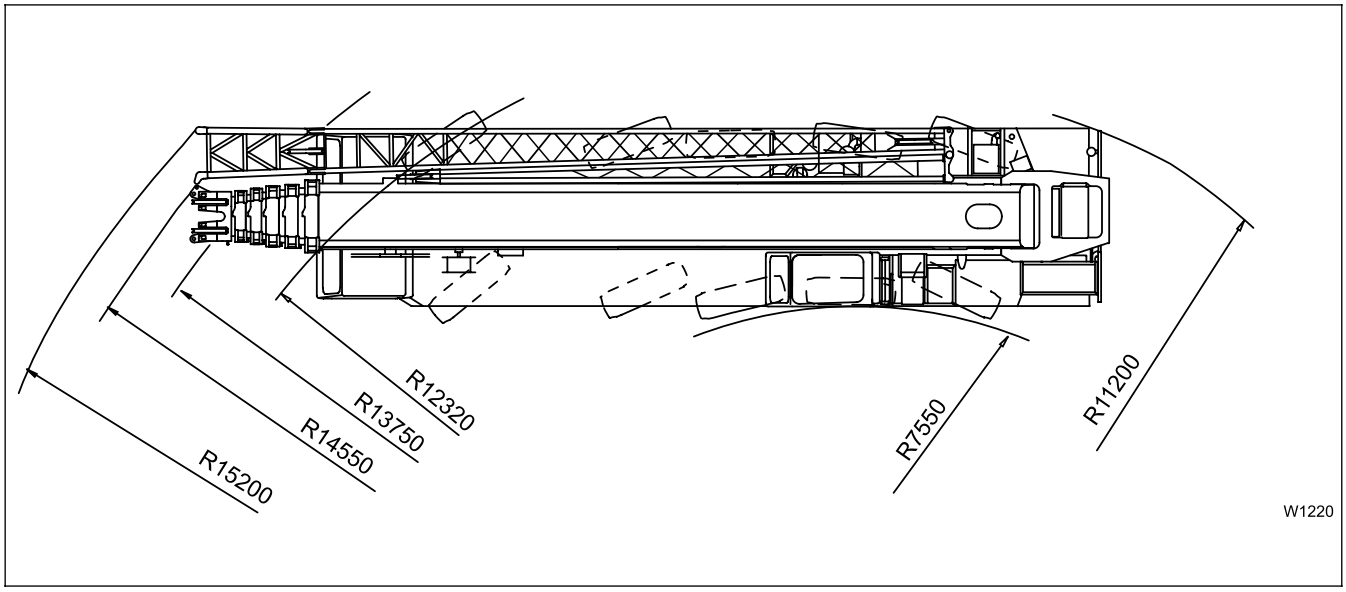
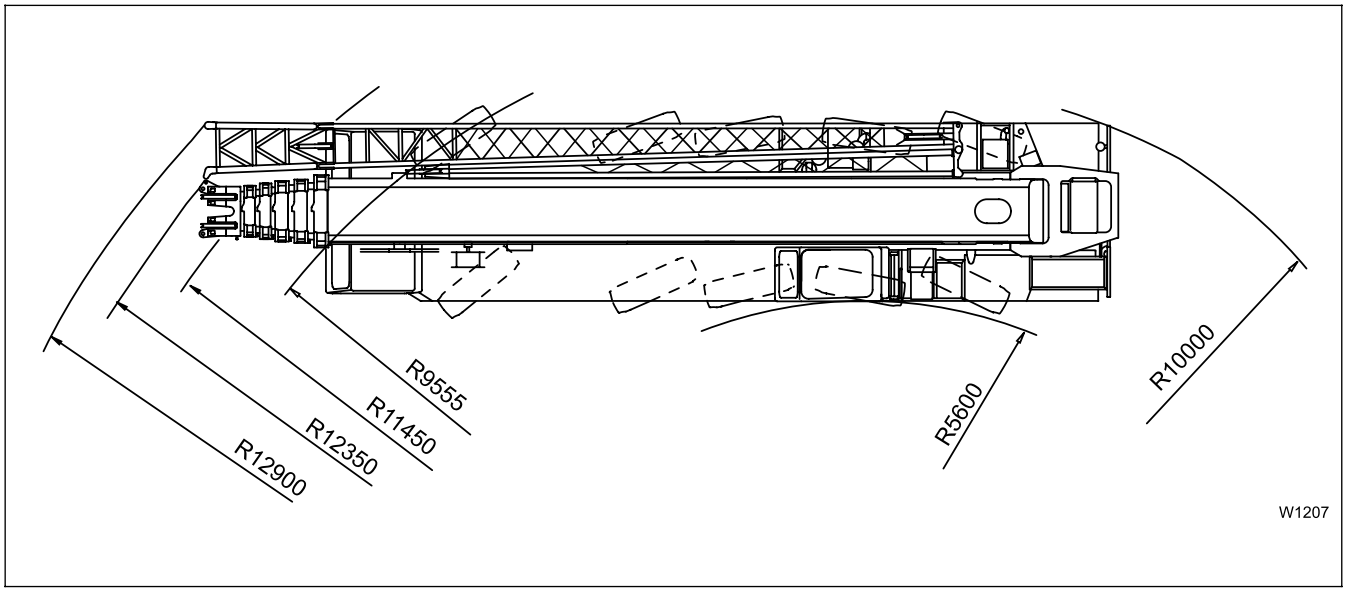
Turning radiuses

– for normal steering mode



– for separate steering mode



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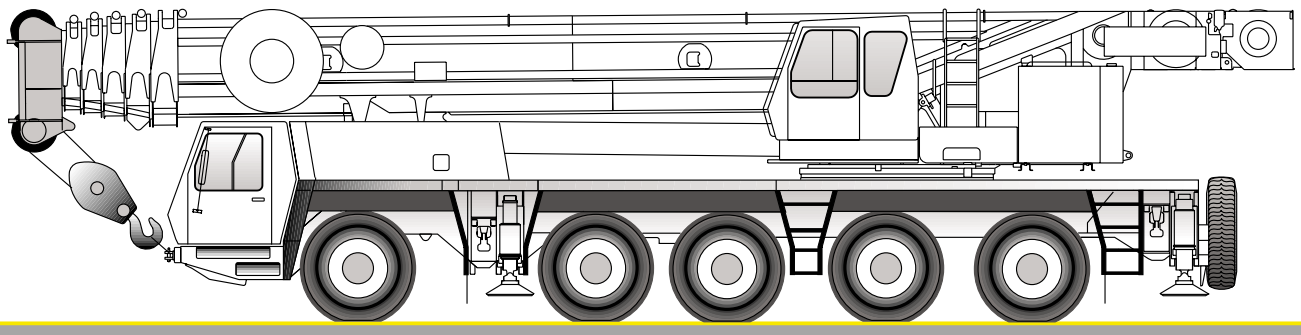
GROVE

GMK5200



Operating Instructions Part 2 Superstructure

Vehicle serial number:

2 084 623 en
27.01.2001

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1 Membrane switch with warning lamp for error information ➠ p. 11-42

2 Without function (in preparation)

3 Membrane switch with indicator lamp for permissible slewing range ➠ p. 11-42

4 Membrane switch with indicator lamp for main boom ➠ p. 11-43

5 Information status display ➠ p. 11-44

6 Membrane switch with indicator lamp for main boom length ➠ p. 11-43

7 Membrane switch with indicator lamp for height of single-sheave boom top ➠ p. 11-43

8 Membrane switch with indicator lamp for angle of lattice extension *)

9 Membrane switch with indicator lamp for degree of utilization ➠ p. 11-43

10 Without function (in preparation)

11 Membrane switch with hydraulic oil pressure indicator lamp for derricking cylinder lower chamber Sensor A ➠ p. 11-43

12 Membrane switch with hydraulic oil pressure indicator lamp for derricking cylinder lower chamber Sensor B ➠ p. 11-44

13 Membrane switch with indicator lamp for hydraulic oil pressure in derricking cylinder upper chamber ➠ p. 11-44

14 Outrigger span display with membrane switch ➠ p. 11-46

15 Numerical pad with membrane switches 1 to 0 ➠ p. 11-47

*) ➠ *GMK 5200/6220 lattice extension operating instructions*

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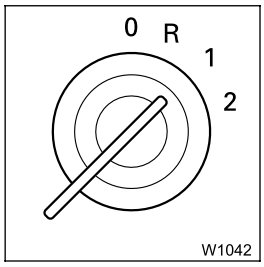
11.2 Functional description of the display and operating instruments

Definition of direction information for using operating elements;
➠ p. 1-16.

11.2.1 Crane work

Crane engine



Ignition lock

To switch on the ignition and to start the crane engine;
➠ *Starting the crane engine,* p. 12-10.

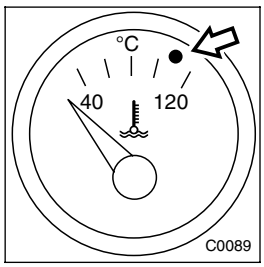
Rocker switch for cold start unit

For the injection of starter fuel (e.g. starter spray) into the crane engine's suction unit; ➠ *Starting crane engine*, p. 12-11.
The rocker switch is only active as long as the ignition key is in position **2**.

Injecting starter fuel: Press rocker switch up
The starter fuel will be injected for as long as the switch is pressed.

Warning lamp for crane engine coolant level

Illuminates if the fluid level in the coolant water circuit of the crane engine is too low; ➠ *Checking the instruments*, p. 12-14.



Status display with warning lamp – temperature of crane engine coolant

The temperature of the coolant should not exceed 95 °C (203 °F).

The warning lamp on the *Vehicle engine coolant temperature* status display illuminates if the temperature exceeds 100 °C (212 °F); ➠ *Malfunctions in the crane engine*, p. 15-17.

Indicator lamp for crane engine air filter

Illuminates if the air filter is dirty.
Change the filter element; ➠ *Maintenance manual*.

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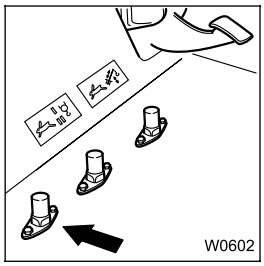


Foot-operated switch free movement of the slewing gear

If the free movement of the slewing gear is switched on, the superstructure can adjust to external forces.

Switch on the free movement of the slewing gear:	Push the foot-operated switch downwards and hold it down
Switch off free movement of the slewing gear:	Release the foot-operated switch

Derricking gear

➠ *Derricking gear*, p. 13-47

Rocker switch for preselection of control lever function derricking / telescoping / derricking lattice extension *)

Switches the control lever function between derricking gear, telescoping gear and lattice extension.

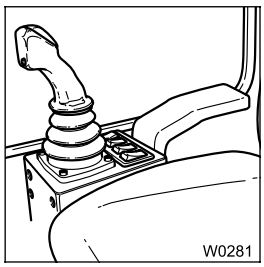
Derricking control lever function:	Put rocker switch in the central position
Telescoping control lever function:	Press rocker switch up
Derricking lattice extension control lever function:	Press rocker switch down

Indicator lamp for right-hand control lever in derricking function

Illuminates when the control lever function *Derricking* has been selected.

Rocker switch for switching off derricking gear/derricking lattice extension *)

To switch off the functions *Derricking* and *Derricking lattice extension* to prevent unintentional activation.



Righthand control lever

Raise (= raise boom):	Control lever to the left
Lower (= lower boom):	Control lever to the right

*) Control level function *Derrick lattice extension* only with additional equipment (➠ *GMK 5200/6220 lattice extension operating instructions).*

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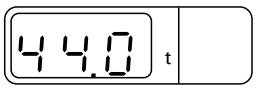


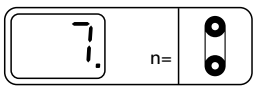
Status display – counterweight with membrane switch

Displays the counterweight which is to be used in tons (t).
The value is derived from the set SLI code.
If the *Rigging mode* display of the entry mode is switched on, pressing the membrane switch repeatedly displays other values which are permitted according to the *Lifting capacity table*.

Status display, working position with membrane switch

Displays the set SLI code.

When entry mode is switched on in this display, the required SLI code can be entered by pressing the membrane switch *Rigging mode* repeatedly or by entering on the numerical pad.
The SLI code entered appears in the first three spaces of the *Rigging mode* status display, and the supplement to the SLI code in the fourth.
The SLI code and its supplement are separated by a decimal point;
➠ *The elements of the display*, p. 11-41.

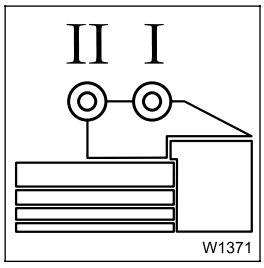


Reeving display with membrane switch

Displays the number of ropes reeved on the hoist indicated by the *Hoist* position lights.
Main hoist: lamp I illuminates
Auxiliary hoist: lamp II illuminates

When entry mode is switched on in the display, the desired reeving can be entered by pressing the membrane switch *Reeving* repeatedly or by entering on the numerical pad.

If the maximum load is reduced because of reeving, pressing the membrane switch displays the maximum possible load (according to the *Lifting capacity table*) for approx. three seconds in the *Maximum load* display.



Hoist position lights

Indicates which hoist is monitored by the SLI:

Lamp **I** illuminates: Main hoist is switched on and the display *Reeving* applies to this hoist.

Lamp **II** illuminates: Auxiliary hoist (additional equipment) is switched on and the display *Reeving* applies to this hoist.

If a lamp flashes, the corresponding hoist is switched on and but the display *Reeving* applies to the other hoist;
➠ *Display lamps*, p. 13-28.

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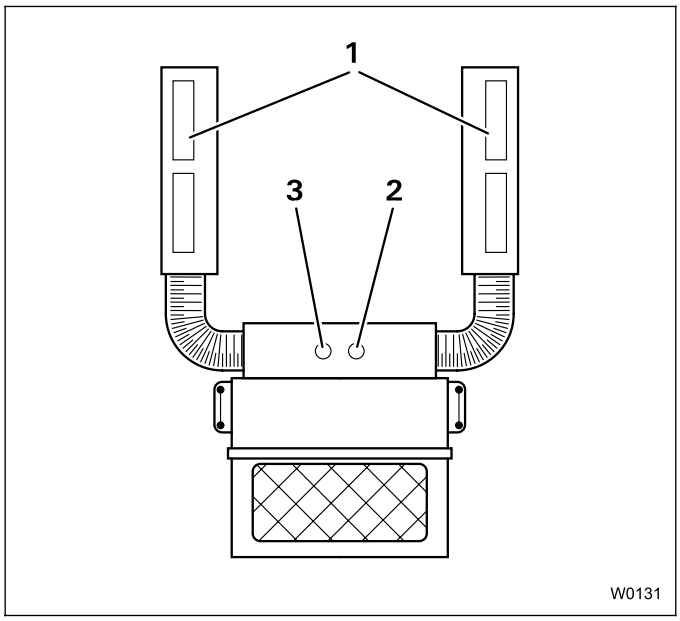
Air-conditioning system (additional equipment)

➠ *Air-conditioning system,* p. 13-111.

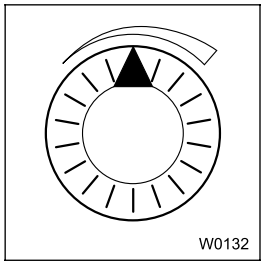


The air-conditioning system is installed at the rear of the crane cab.

1 Air outlets, volume of air and direction of air can be adjusted

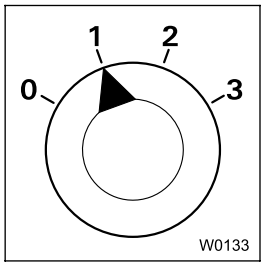
2 Knob switch for thermostat

3 Knob switch for blower



Rotary knob for thermostat

Turning the rotary switch to the right increases the cooling output.



Blower knob

0 Fan and air-conditioning system off

1 *Low* output level

2 *Medium* output level

3 *High* output level

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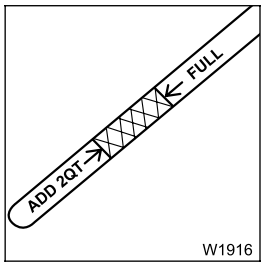
12 Crane engine

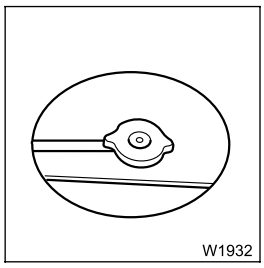
12.1 Starting/turning off the crane engine

12.1.1 CHECK LIST: Starting the crane engine

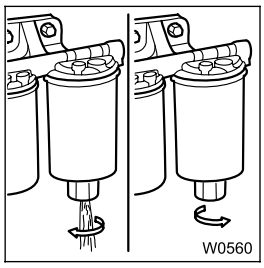
This checklist is not equivalent to a complete instruction manual. There are accompanying handling instructions which are indicated by cross-references. **Observe the warning and safety information given there!**



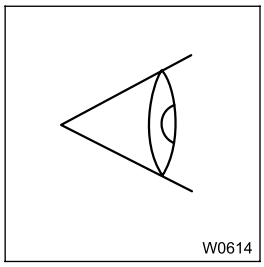
1. Checking the oil level in the crane engine; ➠ *Checking the oil level in the crane engine*, p. 12-3.



2. Check the coolant level of the crane engine; ➠ *Checking coolant level*, p. 12-4.



3. Draining off water from the fuel filter; ➠ *Draining off water from the fuel filter*, p. 12-5.



4. Checking the overall condition of the crane engine and for leakage; ➠ p. 12-6.

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The following indicator and warning lamps must illuminate:

Crane engine oil pressure

Charge indicator lamp

If the *Charge indicator* warning lamp does not illuminate, the alternator will not generate any charging current when the crane engine is running.

VDO electronics

Starting the crane engine

To operate the crane engine refer to the enclosed Cummins Operating Instructions.

Risk of explosion!
Volatile cold start assisting agents (in gas or liquid form) are highly flammable. You must not smoke when using cold start assisting agents. Avoid at all costs naked flames, sparks or other sources of ignition. Do not operate any electric switches. Switch off the extra water heating system (additional equipment).

Risk of explosion!
Do not use volatile cold start assisting agents underground or in a tunnel. The cold start assisting agent can ignite from contact with other ignition sources. Ask for details in your local mining authority office.

Damage may occur to the engine!
Do not spray any volatile cold start assisting agents into the air filter. This could lead to engine overdrive, engine explosion or serious engine damage. Only use securely installed cold start devices with a dosing unit. If, however, you find it necessary to use volatile cold start assisting agents, be sure to ask the relevant Cummins branch for details.

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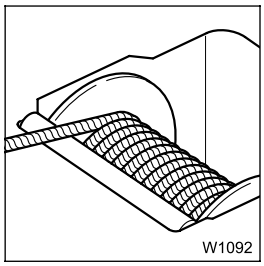
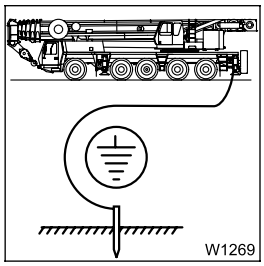
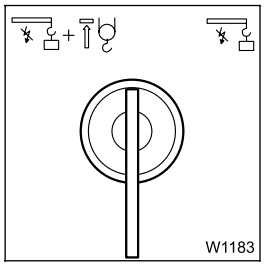


12. The position of the hoist ropes on the hoist drum have been checked; ➠ *Checking the position of the hoist ropes,* p. 13-13.

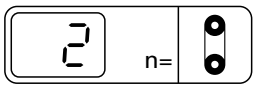


13. The truck crane is earthed accordingly; ➠ *Earthing the truck crane*, p. 14-17.



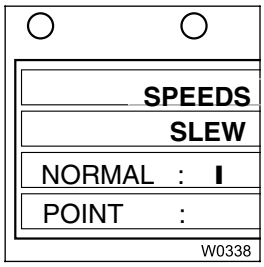
14. The key from the key-operated switch *Override* for SLI and lifting limit switch has been removed; ➠ *SLI override*, p. 13-36.

15. The current rigging mode is set on the SLI and the accompanying SLI code is displayed according to the *Lifting capacity table*; ➠ *Entering values*, p. 13-25.

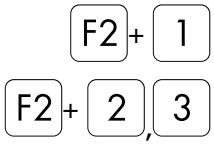


16. The number of the reeved rope lines for the corresponding hoist has been entered with the membrane switch or via the numerical pad and appears in the display *Reeving*; ➠ *Setting rigging mode*, p. 13-22.

17. The telescope status has been checked; ➠ *Check before telescoping for the first time*, p. 13-59



18. The maximum permitted slewing speed for the current rigging mode is set; ➠ *Maximum permitted slewing speeds*, p. 13-51.



19. The lamp test has been performed on the SLI and the brightness of the SLI status display has been set in such a way that all of the displays are easily read; ➠ p. 13-21.

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Switching off the houselock

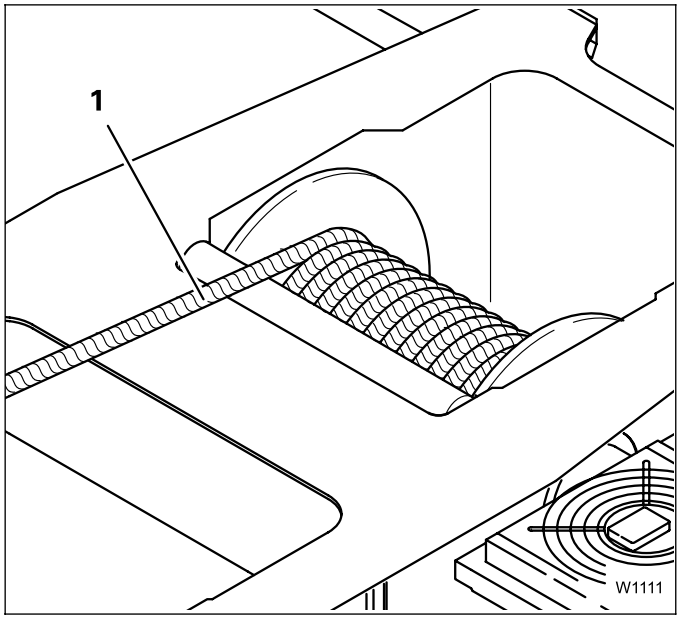
The indicator lamp *Houselock switched on* is lit.

- To switch off, press the *Switch houselock on/off* rocker switch down.
- Hold the rocker switch down until the *Houselock switched off* indicator lamp display.
- Press the *Slewing gear permanent brake* rocker switch up.

When the indicator lamp in the *Switch houselock on/off* rocker switch and the *Houselock switched off* indicator lamp are lit, the houselock is switched off.

13.1.8 Check the position of the hoist ropes

Risk of accidents with turning rope drum!
Keep yourself and other people away from the turning rope drum. If you take hold of the turning rope drum, your fingers and hands could be crushed between the rope drum and hoisting gear frame or get caught and drawn in by the turning drum.



Check the position of the hoist ropes (**1**) on the rope drums of the hoists.

- Slowly turn the rope drum at least one turn in the lowering direction. At the same time, watch the unreeled rope.

– The rope must be wound evenly on the drum.

– The turns on the drum must all be at an equal distance of 0 to 0.08 inch.

– The cross-over points must be at an angle of approx. 180° to each other.
(The upper layer of rope lies over the lower layer at the cross-over points.)

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Danger of overturning due to incorrectly set rigging mode!
When the individual components are selected, values which have already been set can change again. After selecting always compare the SLI code which appears in the *Rigging mode* status display with the SLI code which is provided in the *Lifting capacity table* for the actual rigging mode. If the SLI changes the components which have already been set, the SLI codes do not coincide and the settings must be corrected.
In this way you prevent the SLI from calculating with the incorrectly set components and the truck crane becoming overloaded and overturning when in operation, ➠ *Checks before working with the crane*, p. 13-29.

General instructions

An error code appears in the status display *Information* when there is an error message. This status display automatically switches over if you enter values on the status display *Rigging mode*.

In this case the *Information* status display automatically switches to the display of the permitted slewing range and the green indicator lamp in the *Permitted slewing range* membrane switch illuminates.

If error messages now occur, you will be able to recognize this by the acoustic signal and the red warning lamp in the *Error information* membrane switch. You can see these error messages in the *Information* status display by pressing this membrane switch; ➠ *Error messages,* p. 13-34.

After you have read the error message, you can cancel the acoustic signal by pressing the *Acknowledge* membrane switch. You can cancel the error message and warning lamp only after the cause of the error has been eliminated; ➠ *Error messages,* p. 13-34.

Sequence during setting

The setting sequence is the same for all status displays. There are only differences when the values are entered directly.

If the flashing status display requests that you enter values after having switched on the SLI, the SLI is already in entry mode and you can directly enter values; ➠ *Entering values*, p. 13-25.

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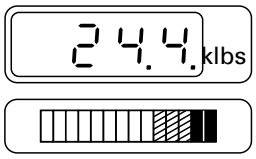
A **shutdown resulting from overloading** can be recognised by the fact that in addition to the messages mentioned above:



– the signalling point lights up in the *Actual load* status display and

– the red LEDs light up in the *Degree of utilization* status display.

E

If the **SLI shuts down due to an error**, the red warning lamp in the membrane switch *Error information* also lights up (➠ *Error messages* in this section, p. 13-34).

If you would like to switch off the continuous buzzer tone:

CE

- Press the *Acknowledge* membrane switch.

For shutdowns caused by overloading, you can cancel the shutdown by leaving the shutdown area. You may then only perform the crane operations listed in the following table.

Crane movements switched off	**Crane movements allowed**
Lift load	Lower load
Lower main boom	Raise main boom
Extend main boom	Retract main boom*)

*) With certain telescoping states the SLI also shuts down the retraction of the telescoping for safety reasons. In this case leave the shutdown area by raising the boom or, if this is not possible, set the load down, telescope to the next fixed length and lift the load again.

CE

If you have not already switched off the buzzer tone, you must press the *Acknowledge* membrane switch after leaving the shutdown area in order to cancel the shutdown.

The *SLI shutdown* warning lamp goes out after you leave the shutdown area.

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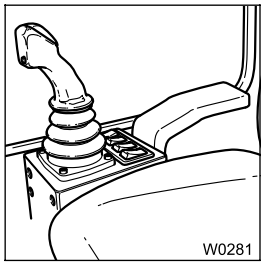


Lifting: Pull the right-hand control lever back.

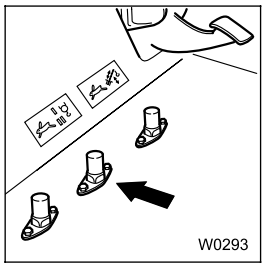
Lowering: Push the right-hand control lever forward.

You may regulate the speed of the main hoist by moving the control lever and changing the engine speed using the accelerator.

F2

You can set the maximum speed of the hoist gear on the *Crane control display*; ➠ *Power unit speeds/critical load control menu*, p. 13-43.

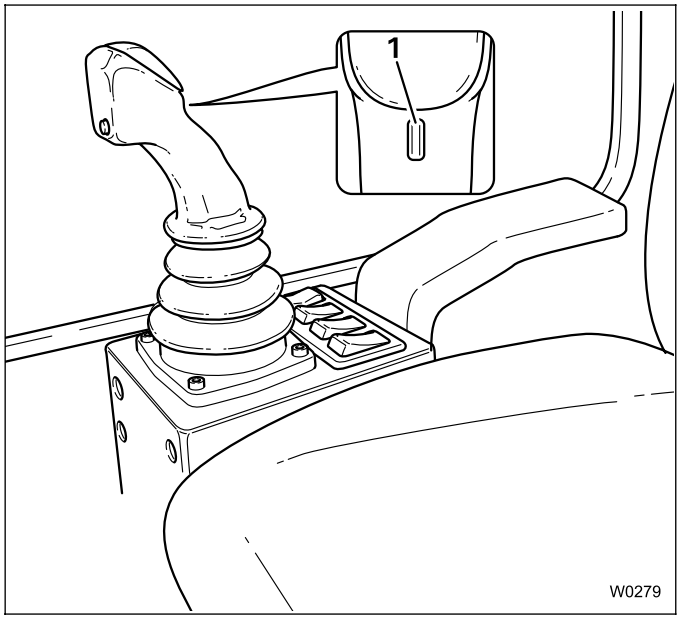
You can set a constant engine speed with the rocker switch *Constant engine speed*; ➠ p. 13-95.



With a degree of utilization of up to 50 % (lifted load maximum of 50 % of the load bearing capacity according to the *Lifting capacity table*) you may move the hoists also in fast speed.

Activate a higher speed with the *Hoists fast speed* foot-operated switch. The fast speed for the main and auxiliary hoists (additional equipment) is activated at the same time with the foot-operated switch; ➠ p. 13-84.

The speed of the hoists is clearly increased by switching to fast speed only if you have extended the control lever more than approx. 70 %.



A hoist drum synchro (**1**) is installed in the manual control lever. You will notice an impulse on the hoist drum synchro when the hoist drum rotates.

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13.3.6 Telescoping gear

Structure of the chapter

Most procedures which you initiate for the operation of the telescoping gear are afterwards carried out by the crane control and monitored. In the process you receive acknowledgements, you can follow the procedure and, at the right time, initiate further procedures.
For this it is important that you are not only familiar with the operation, display, and control instruments of the telescoping gear, but also its functioning. Then you can comprehend the procedures which the crane control carries out in the boom while you move the control lever; you will become familiar with the status displays and crane control more quickly.
Therefore the chapter is organized in the following sections:

- Description of functioning,
- Main boom fixed lengths, intermediate lengths, telescoping lengths,
- Telescope status,
- Notes on telescope-sequence,
- Function of the control lever,

- Example of procedures when telescoping
  (further sections are refered to in this section).

The last section and the sections following it belong together and describe the actual telescoping procedure. Before you proceed according to this section for the first time, you must know the basic information from the previous sections. Only in this manner is a safe operation of the telescoping gear possible.

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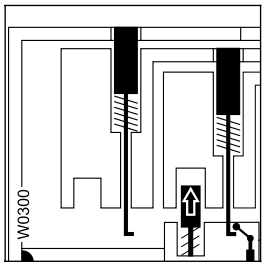
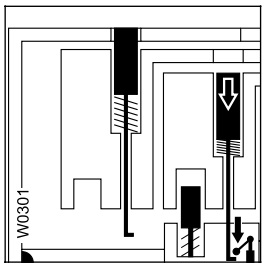
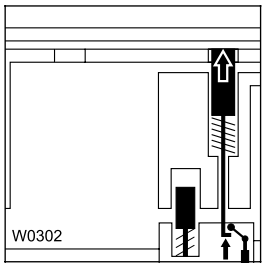


3. Move telescoping cylinder into the telescope section, the telescope section which needs to be telescoped and lock it there (in our example telescope section III); ➠ *Extending / retracting telescoping cylinders,* p. 13-68.



4. Unlock telescope section for telescoping; ➠ *Unlocking telescopic section,* p. 13-71.



5. Telescope telescope section to fixed length and lock; ➠ p. 13-73 , 13-73.

6. To telescope other telescope sections (in our example telescope section II would be the next one) repeat Points 2 to 5 until all required telescope sections have been telescoped to the required length.

7. If necessary, extend the last telescope section (in our example telescope section I) to the necessary intermediate length;
➠ *Telescoping telescope section to intermediate length,* p. 13-77.

Check initial position

Before you telescope the main boom, you must check the following states:

– **the current telescope status**
(how far the telescope sections are telescoped),

– **the position of the telescoping cylinder**
(in which foot section the telescoping cylinder is located),

– **the position of the locking pins**
(whether telescope sections and cylinders are locked or unlocked).

Various displays on the front instrument panel define the current status of the main boom.

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Telescoping telescope section to fixed length and lock

Read the sections concerning the fixed, intermediate, and telescoping lengths, the telescoping sequence and the functioning of the control lever at the beginning of this chapter and observe the notes for telescoping; ➠ p. 13-53.

If you extend several telescope sections or want to work on a fixed length, you must extend the telescope section to a fixed length and lock it there. You can select the locking before the telescope section has reached the fixed length. The crane control then locks the telescope section at the first fixed length which is reached. Since every telescope section has three fixed lengths, the point in time of the selection depends on whether the telescope section:

– is to be locked at the **fixed length reached first**

– or is to be locked at the **fixed length after the next**.

Before you telescope the telescope section with the selection, 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 III)* illuminates.

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

– The telescope section in which the telescoping cylinder is located is unlocked, the red indicator lamp *Telescope section unlocked* illuminates.

Locking the telescope section at the first fixed length reached

This case applies if you for example extend a fully retracted telescope section to the middle fixed length and want to lock it there.

Before you telescope a telescope section, the prerequisites at the beginning of this chapter must be fulfilled.

- Check if the indicator lamp *Telescoping gear switched on* is on.
- Move the telescoping cylinder; to do this, move the control lever in the corresponding direction.

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Lowering the main boom for maintenance

In order to lower the partly extended boom to an angle below that permitted in the operating area, you must enter an SLI rigging code. The rigging codes are found in the corresponding rigging curves of the *Lifting capacity table.*

If the main boom is fully retracted and no load is raised, the SLI switches automatically to the rigging code when the working range is left.

- Put down the load.
- If the main boom is not fully retracted, enter the appropriate SLI code for the current rigging mode of the truck crane according to the *Lifting capacity table*.
- Turn the superstructure in the necessary direction;
➠ *Slewing with rigged counterweight*, p. 14-65.

Risk of overturning with an outrigger span of 27.9 x 8.9 ft!
With an outrigger span of 27.9 x 8.9 ft the main boom may be set down only in the 0° forwards or 180° to the rear positions.
If you place the boom to the side with this outrigger span, the truck crane tips over even with the boom retracted.

Risk of overturning if SLI is overridden!
If the SLI switches off the lowering of the boom, the truck crane is in a status in which the main boom can not be placed in a horizontal position (e.g. a raised load or extended too far).
Do not override the SLI, put down the load if necessary and retract the main boom.

- Lower the main boom to the horizontal position.

Telescoping the main boom in the horizontal position

- Enter the corresponding SLI rigging code for the current rigging mode of the truck crane according to the *Lifting capacity table*.

The maximum permitted telescope status for the current rigging mode (counterweight, outrigger span, direction of rotation) is determined by the SLI rigging code. If this telescope status is exceeded, the SLI switches off the extending function.

- Put down the load.
- Extend the main boom only so far that the SLI switches off the extending function.

If you continue to extend the main boom after an SLI shutdown, you can get into areas in which you can not retract or raise.

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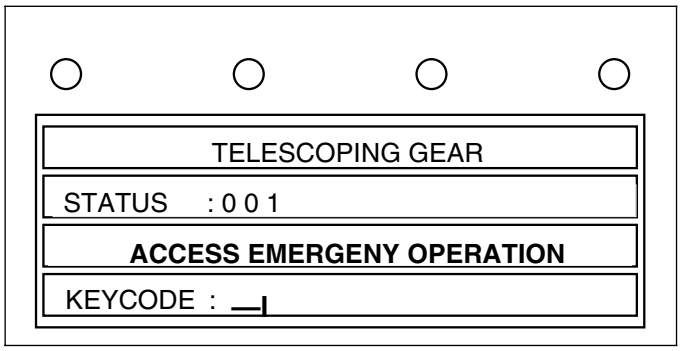


The menu can be recognised by the message ACCESS EMERGENCY OPERATION in the third line.
The three-digit numeric code in the second line displays which type of error has occurred; ➠ *Deciphering the numeric code*, p. 15-74.

In the last line there is the message KEYCODE and the entry request (__) flashes.

To start the emergency program, a key code must be entered in this line:

- Press the following membrane switches next to the display one after the other:

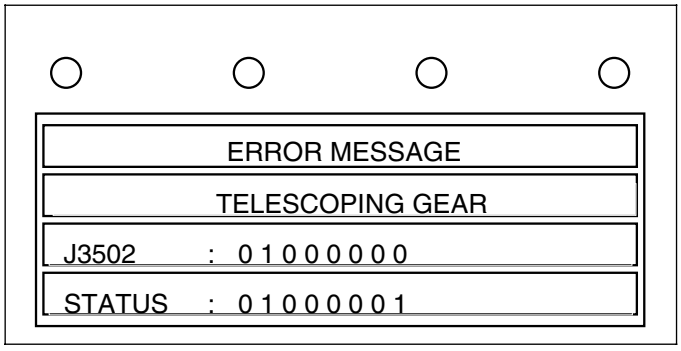
Each correct entry is confirmed on the display with a star (*).

If you press the wrong membrane switch more than once, the entries which have already been confirmed (*) will also be erased and the key combination must be entered again.

When the key combination has been correctly entered, the crane control starts the emergency operation.

Display of an error message

The crane control shows current errors with priority on the display *Crane control*. As soon as there is an error, the display switches to the *Error message* display.



The message ERROR MESSAGE appears in the top line.
The power unit concerned is displayed in the second line (e.g. the telescoping gear).
The third line shows the designation of the part on which a malfunction occurred. Behind that is a numerical code which describes the cause of the error.

The numerical code in the last line describes the area in which the error occurred.

Further information on the numerical code; ➠ *Crane control error messages*, p. 16-57.

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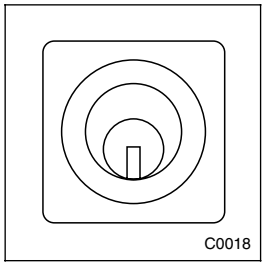
Switching on separate steering

Before driving with the rigged crane you must switch on separate steering:



- Switch on the *Level adjustment system* key switch.

- Switch on separate steering by releasing the *Separate steering* rocker switch and pressing it down.

Damage may occur to steering linkage!
Before driving with the rigged crane always switch on separate steering and steer the truck crane only when the vehicle is moving.
If separate steering is switched off or if you steer with the vehicle stationary the steering linkage may become damaged.

Driving

Risk of tyre damage!
Check the pressure in the tyres before the rigged truck crane is moved!
The truck crane may be moved only if tyre pressures are at the prescribed levels; ➠ p. 6-9.
Do not reduce the tyre pressure!

Damage may occur to steering linkage!
Steer only when the vehicle is moving. The steering linkage can be damaged if the steering is turned when the vehicle is stationary.

The wind speed must be checked before the rigged truck crane is moved! The same maximum permissible wind speeds apply as when working with the crane; ➠ *Effect of wind on crane operation*, p. 13-38.

- Switch the transfer case to off-the-road gear to move the truck crane; ➠ *Off-the-road gear*, p. 6-40.
- Switch on driving range **1**; ➠ *Driving ranges of the automatic gearbox*, p. 6-21.
- Drive at only a very low speed!
- The turning radius should be as large as possible when turning corners!

Dehumidifying crane cab air

On humid days at the turn of the season you can dehumidify the air in the driver's cab by operating the air-conditioning system in a combined heating and cooling mode. Operation of the heating system is described in section *Crane cab heating and ventilation*, p. 13-107.

As this involves the heating and air-conditioning system functioning "in opposition to each other", dehumidifying produces little or no heat.

- Set the *Temperature* regulator of the crane cab heating system and the *Thermostat* knob on the air-conditioning system to approximately the same output.
- Switch on the fan.

The higher the level of heating and cooling selected the more efficiently cab air becomes dehumidified.

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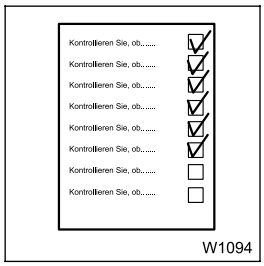
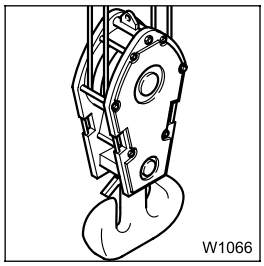
14.1.3 CHECK LIST: Unrigging (boom set down on trailer)

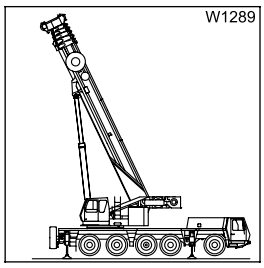
This checklist is not equivalent to a complete instruction manual. There are accompanying instructions which are indicated by cross-references. **Observe the warning and safety information given there!**



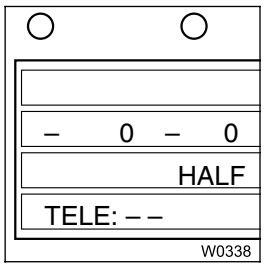
1. Unrig the counterweight; ➠ *CHECK LIST: Unrigging the counterweight*, p. 14-48.



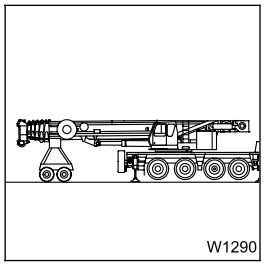
2. Set the hook block down on a separate vehicle; ➠ p. 14-69.



3. Retract boom and slew toward the rear.



4. All telescopic sections are locked; ➠ *Locking telescopic section*, p. 13-78.



5. Set the boom down onto the trailer.

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14.2.4 Earthing the truck crane

Risk of accidents due to electrical shock!
Earth the truck crane before operation
– near strong transmitters (radio/television transmitters, radio stations, etc.),
– near high-frequency switchgears,
– in potentially stormy weather.

The truck crane can become electrostatically charged. This applies in particular if the truck crane is equipped with synthetic outrigger pads or the outrigger pads are packed with insulated material (e.g. wooden planks).

Earthing the truck crane

To prevent the electrostatic charging of the truck crane, you will need:

– an electrically conductive metal rod inserted in the ground (approx. 5 ft in length),
– an electrically conductive cable (minimum cross section 0.016 inch^2),
– a screw clamp for welding work.

Risk of accidents due to electrical shock!
Ensure that the connection between the truck crane and the ground is a faultless, electrically conductive connection!

- Connect one end of the cable to the metal rod that is to be inserted into the ground. Hammer the metal rod at least 3.3 ft into the ground. Moisten the soil around the metal rod for better conductivity.

Risk of accidents due to electrical shock!
Fasten the screw clamp for welding work on soldered parts of the main boom or the superstructure only. Do not fasten the clamp to screwed on parts such as valves, cover plates, engines, gear units, etc.!

- Connect the other end of the cable to the screw clamp for welding work and fasten the clamp to the main boom or the superstructure.

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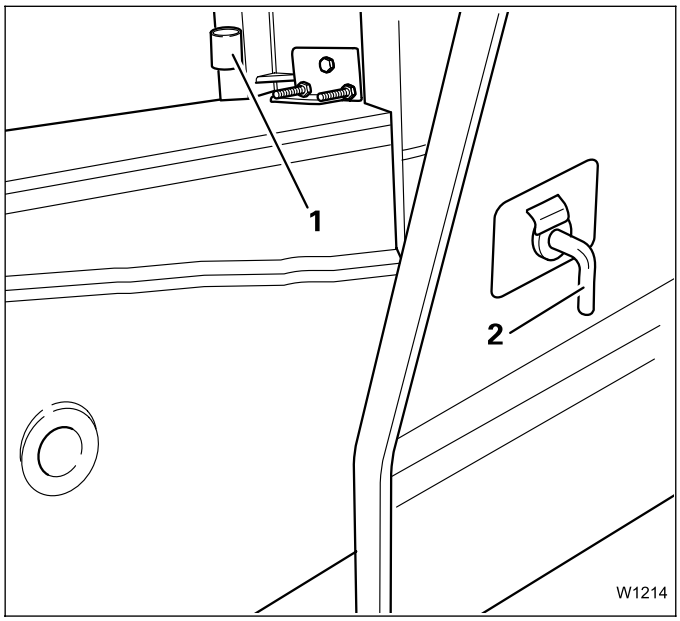
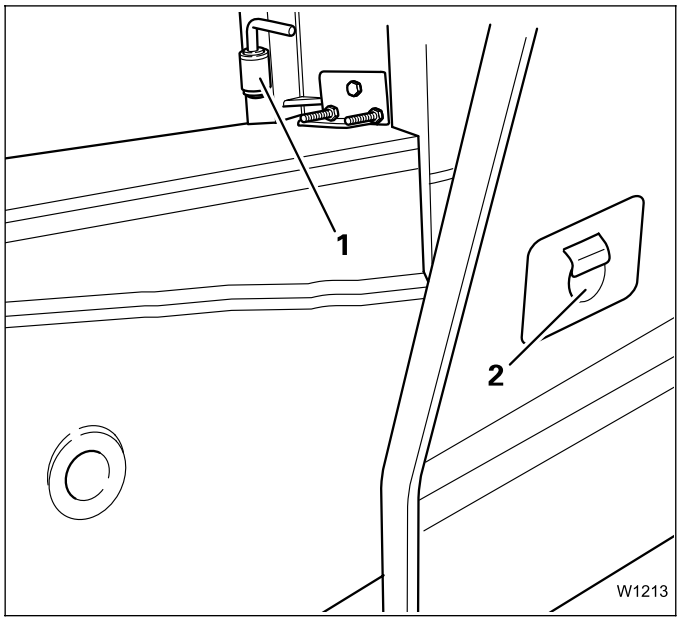


Securing the outrigger beams

- Take the pin (**2**) out of the holder (**1**) and fit it into the bores in the outrigger beam box and outrigger beam.
- Turn the pin so that it can not come out (handle must point down).

The outrigger beam is now secured against independent extension.

- Also secure the other outrigger beams.



Releasing the outrigger beams

- Turn the pin so that it can come out (handle must point up).
- Pull the pins out of the bores (**2**) in the outrigger beam box and outrigger beam and fit it into the holder (**1**).

The outrigger beam can now be extended or retracted.

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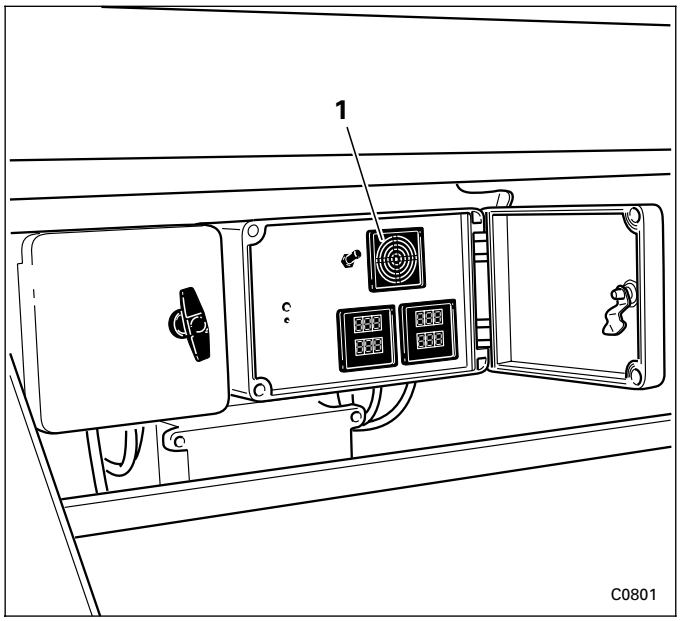
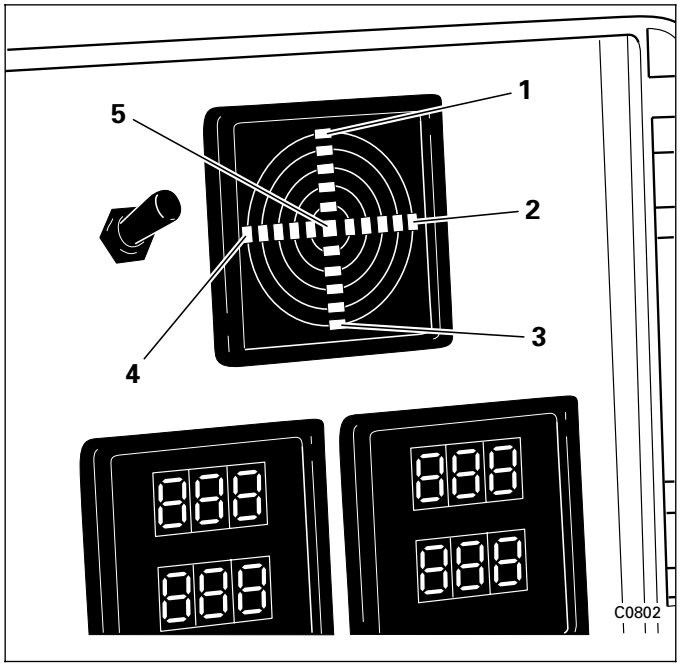


The electronic level (**1**) is located on both sides of the carrier in a control box behind the steps.

The status display is activated in both control boxes as soon as you open the door of one control box.

Reading the status display

Whenever the truck crane is higher on one side, the diodes in the cruciform arranged girders (**1** to **4**) illuminate. Every girder stands for one certain direction.



(1) The side of the truck crane opposite you is higher than the side where you are.

(2) The truck crane is higher to the right of the status display than it is left of it.

(3) The side of the truck crane where you are is higher than the side opposite you.

(4) The truck crane is higher to the left of the status display than it is right of it.

(5) The truck crane is horizontal.

Diagonal inclines are displayed; the diodes on two girders next to each other light up simultaneously.

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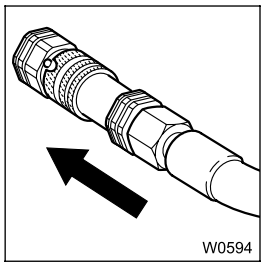
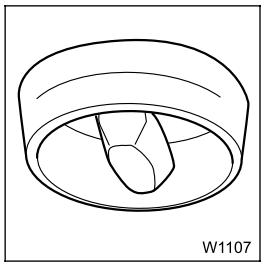
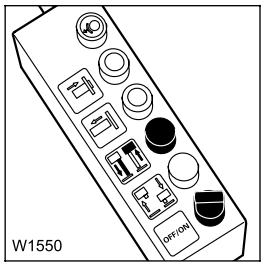
5. Lock the superstructure; ➠ *Mechanical superstructure lock*, p. 13-10.



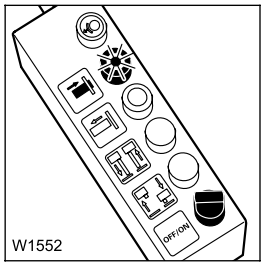
6. Establish the hydraulic connection to the 5.4 t base plate;
➠ *Preparing the 5.4 t base plate – connecting/disconnecting the hydraulic connection,* p. 14-52.



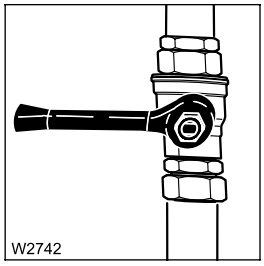
7. Check that the lock on the turntable is open;
➠ *Locking/unlocking the counterweight,* p. 14-63.
For counterweights of at least 44 t and/or if the 3.5 t counterweight section is rigged with installation rods (additional equipment), also check if that the pins on the 3.5 t counterweight section are lying with the handles in the rear recesses;
➠ *Locking 3.5 t counterweights,* p. 14-58.



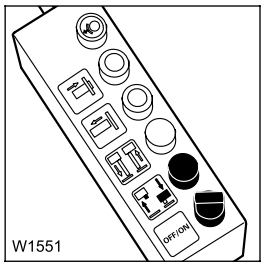
8. Extend the lifting cylinders on the 5.4 t base plate to lift the counterweight; ➠ *Extending/retracting the lifting cylinders of the 5.4 t base plate,* p. 14-59.



9. Mechanically lock the counterweight to the turntable; ➠ *Locking/unlocking the counterweight*, p. 14-63.



10. Close safety tap; ➠ *Safety tap,* p. 14-63.



11. Retracting the lifting cylinder of the 5.4 t base plate;
➠ *Extending/retracting the lifting cylinder of the 5.4 t base plate*, p. 14-59.

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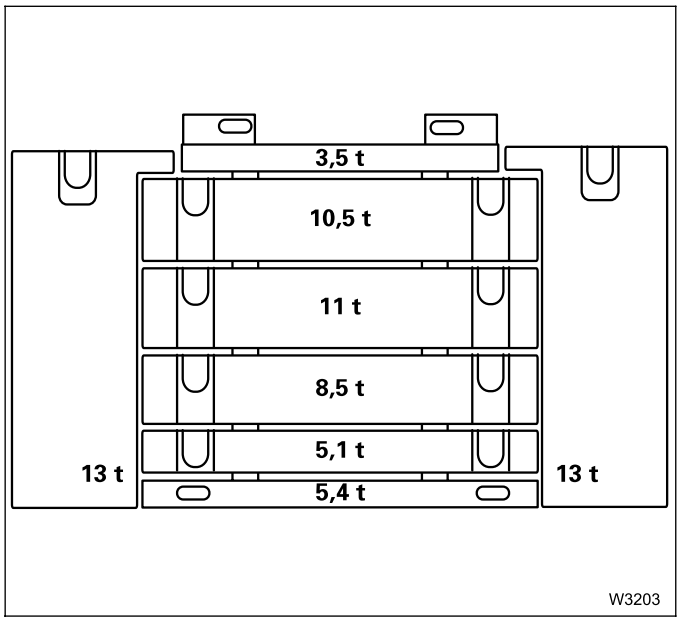

154 320 lbs counterweight version (70 t)

- 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 counterweight blocks into the recesses slowly.

14.4.9 3.5 t counterweight section

The 3.5 t counterweight section can be locked to the turntable.
Locking is appropriate in two cases:

– If you have to rigg a larger counterweight version, you do not have to hoist off the 3.5 t counterweight section and later hoist it back on.

– If you drive the truck crane to a work site with a axle load of more than 12 t, the 3.5 t counterweight can be transported on the turntable.

With 44 t and 64 t rigged counterweight, the 3,5 t counterweight section is located in the correct position for locking; ➠ *Locking 3.5 t counterweights,* p. 14-58.

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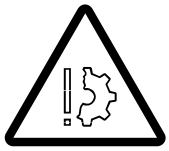
14.5 Rigging work on the main boom

14.5.1 Hook block on the bumper

The hook block must either be on a separate vehicle, attached to the front bumper or tied to a separate vehicle depending on how the truck crane is rigged; ➠ *Hook block on separate vehicle* p. 14-69.

Picking up the hook block

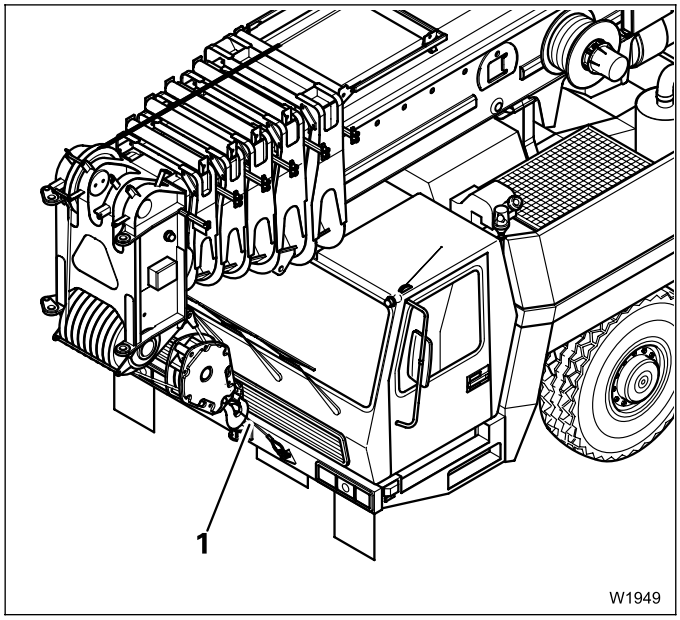
When the 77.2 klbs (32 t) hook block is rigged, it is attached to the front bumper with a holding rope.



Accidents may occur if your view is obstructed!
Have someone guide you when releasing the hook block from the holding rope beacause the view of the hook block is obscured by the driver's cab.

- Fully retract the main boom.

- Enter the rigging code for the current rigging mode of the truck crane on the SLI.



- Slacken the hoist rope and raise the main boom simultaneously. If the lifting limit switch weight touches the ground, the lifting limit switch comes into action and the lowering of the boom is switched off.
- In this case you have to override the shut-down in order to lower the boom further; ➠ *Overriding lifting limit switch shut down,* p. 11-61.
- Lower the main boom until the boom head is situated vertically above the hook block.
- Disconnect the hook block from the retaining rope (**1**).

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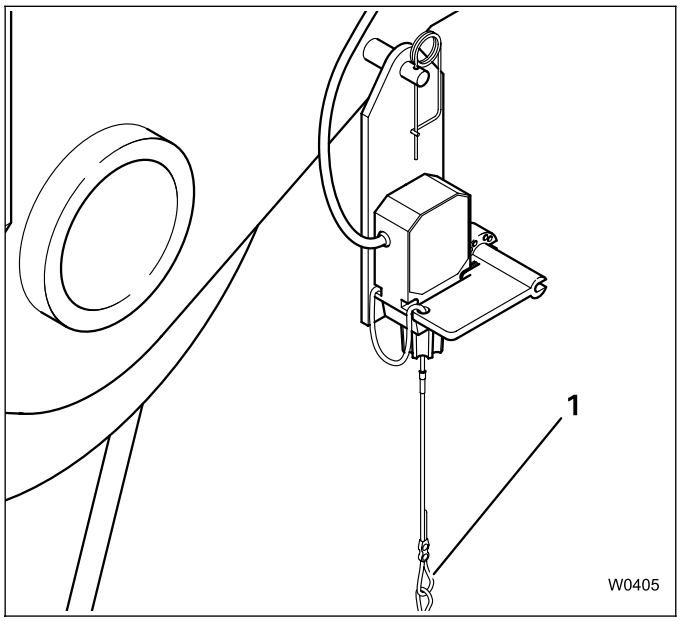
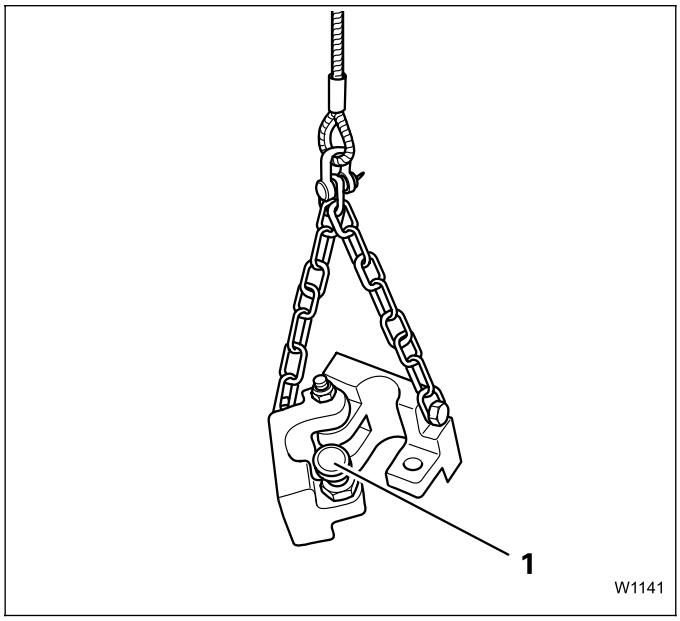


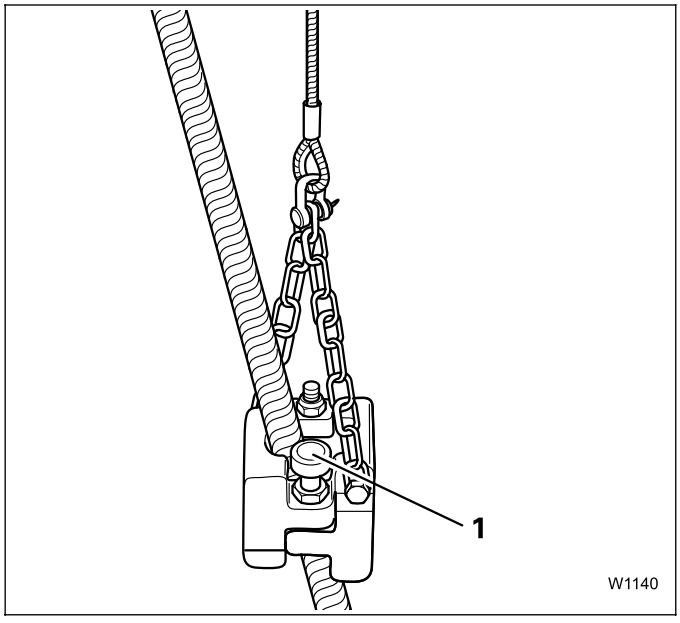
Attaching and mounting the lifting limit switch weight

Before working with the crane, you must mount the lifting limit switch weight and attach it to the hoist rope.

- Mount the lifting limit switch weight on the shackle (**1**).



- Pull the retaining pin (**1**) on the lifting limit switch weight upward and fold out the two sides of the weight.



- Close the two halves of the weight around the last rope line leading upward.
- Pull the retaining pin (**1**) upwards and close the two sides of the weight together. Ensure that the retaining pin locks into place and the two halves of the weight are securely attached to each other.

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15.2 Troubleshooting for malfunctions that occur during crane operation

If a malfunction occurs:

- Keep calm!
- If possible put down the load immediately. Retract the main boom completely and set it down on the boom support.
- Use warning signs in the crane cab to prevent unauthorized use of the truck crane. Remove the ignition key.
- Inform your supervisor.

Risk of accidents when the load is suspended!
Under no circumstances is repair work to be carried out with a suspended load!

You may override the SLI to set down the load if SLI malfunctions occur. Observe the warning and safety information in the section *SLI overriding* when doing so; ➠ p. 13-36.

Risk of accidents!
Do not perform any crane movements that may increase the size of the load moment when a load is on the hook block and the SLI is overriden.

- Try to repair the malfunction. Notify your local GROVE customer service if you cannot repair the problem yourself.

Load cannot be lowered

- Secure the danger zone using cordons and assigned personnel.
- Notify qualified repair personnel or local GROVE customer service.

Accidents may occur due to inappropriate emergency operation!
Only trained, qualified personnel may carry out an emergency operation if unrigging requires the manual operation of solenoid valves.

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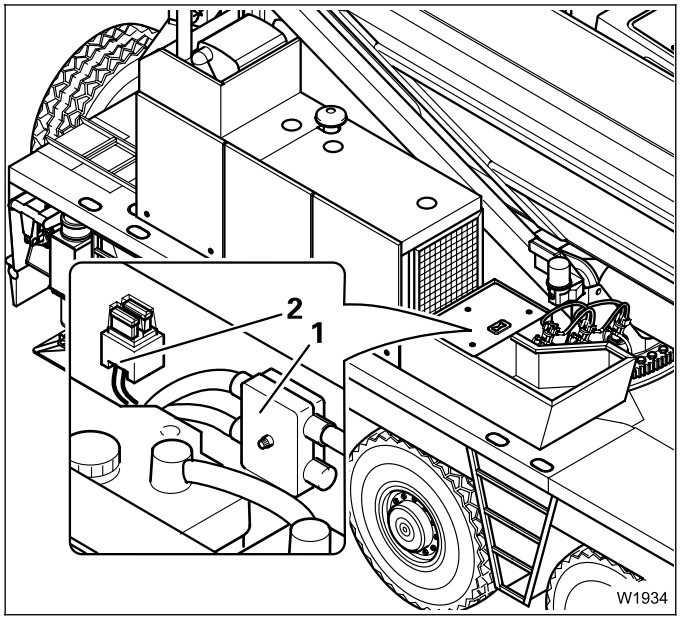
Groups F10 to F13

Battery poses a danger from lead and connections containing lead.
Battery poles, clamps, and parts of the battery itself contain lead and leaded connections.
Wash hands after working directly or indirectly with these parts!

The fuse groups **F10** to **F13** are located in the battery box. These fuse groups consists of only one fuse each.



- Open the lid of the battery box.

The fuse groups are attached to a mounting plate.

– The two fuses F10 and F11 are in terminal box (**1**).

– The two fuses F12 and F13 are in terminal box (**2**).

Terminal box	Designation in circuit diagram:	Rating (A)	Function
1	F10	50	Superstructure central fuse
	F11	50	
2	F12	20	For all consumers still supplied with current when the battery master switch is off.
	F13	20	

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Malfunction	Cause	Action
Raising or lowering the boom does not function	Fuse on corresponding SLI outlet defective	Replace if necessary; ➠ p. 15-14.
No raising or lowering the boom, or possible only at very low speed	Maximum speed set too low	Increase maximum spees on the display *Enter power unit speed*; ➠ p. 13-89.
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!

15.5.5 Telescoping gear malfunctions

Malfunction	Cause	Action
Telescoping gear not functioning or malfunctioning (telescope in, telescope out or fast speed not functioning)	Dead man's switch system not activated	Press dead man's switch; ➠ p. 11-62.
	Fuse F7/2 SS or F3/4 SS or F6/3 SS defective	Check fuses, replace if necessary; ➠ p. 15-9.
	Right-hand control lever set to *Derricking* function	Set control lever to *Telescoping*
	Rocker switch *Shutdown telescoping gear* or *Lattice extension incline* switched on	Switch off rocker switch *Shutdown telescoping gear*; ➠ p. 11-36.
	A control unit of the crane control has failed (error message is displayed)	Acknowledge error message once; ➠ p. 13-93. If the error message is repeated, change the connections on the control units; ➠ p. 15-59.
	Crane control emergency stop switch pressed in	Release crane functions again; ➠ p. 15-2.

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1. 08. 8	Information message; You have switched off length indicator A of the telescoping cylinder because of an error message	Message remains as long as the ignition is switched off
1. 09. 1	Length indicator B of the telescoping cylinder does not react	Check line; ➠ p. 15-41. If the line is O.K., switch off length indicator B of the telescoping cylinder; ➠ p. 15-38 and notify GROVE customer service
1. 09. 2...6	Length indicator B of the telescoping cylinder reports an error	Switch off length indicator B of the telescoping cylinder; ➠ p. 15-38 and notify GROVE customer service
1. 09. 7	Notify GROVE customer service	
1. 09. 8	Information message; You have switched off length indicator A of the telescoping cylinder because of an error message	Message remains as long as the ignition is switched off
1.10. 1	Angle sensor A, Lattice extension does not react	Check line; ➠ p. 15-41. If line is O.K., switch off angle sensor A, luffing jib; ➠ p. 15-38 and notify GROVE customer service
1.10. 2...6	Angle sensor A, Lattice extension reports error	Switch off angle sensor A, luffing jib; ➠ p. 15-38 and notify GROVE customer service
1.10. 7	Notify GROVE customer service	
1.10. 8	Information message; You have switched off angle sensor A, luffing jib because of an error message	Message remains as long as the ignition is switched off
1.11. 1	Difference angle sensor, lattice extension does not react	test supply line; ➠ p. 15-41. If supply line is O.K., switch off difference angle sensor; ➠ p. 15-38 and notify GROVE customer service

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15.5.11 Retraction emergency operation

If the locking mechanism on the head of the telescoping cylinder does not react to the operating instruments in the crane cab any longer, malfunctions in the electrical control system of the locking mechanism, the mechanical system or the hydraulic system could be the cause. For these cases, there is

– a **mechanical emergency activation system** with which you can manually lock and unlock the telescope sections. This emergency mode is for cases where the telescoping cylinder can no longer be moved hydraulically. In this case you need one or two auxiliary cranes.

– a **hydraulic emergency mode** with which you can move the locking and unlocking mechanism on the head of the telescoping cylinder directly. This emergency mode is for cases where the telescoping cylinder can still be moved but you cannot control the locking mechanism from the with the operating instruments.

In the worst case, emergency operations must be carried out by trained specialists because the risk of injury and damage to the main boom is too great if one proceeds incorrectly. These cases are described later in the section. Always check the following possibility first.

Check before all emergency operation

First check whether the main boom may be lowered with the current extension and the current rigging mode of the truck crane (if a boom extension or a luffing jib is rigged, the main boom must be fully retracted for this purpose.) Proceed as follows:

- Enter the rigging code for the current rigging mode of the truck crane on the SLI according to the *Lifting capacity table*.
- Lower the main boom.

If it is possible to lower but there is not sufficient space, you can check whether the truck crane can be driven in the current rigging mode; ➠ *Driving with the crane rigged,* p. 13-99.

If the SLI allows lowering to the horizontal position,

danger from the raised truck crane is impossible and you can:

– check whether it is possible for you to carry out **hydraulic emergency operation** in the horizontal position; ➠ *When can hydraulic emergency operation be carried out?,* p. 15-47.

– carry out **mechanical emergency operation** without an auxiliary crane using a personal transport vehicle because you can reach the locking points with the extendable ladder.

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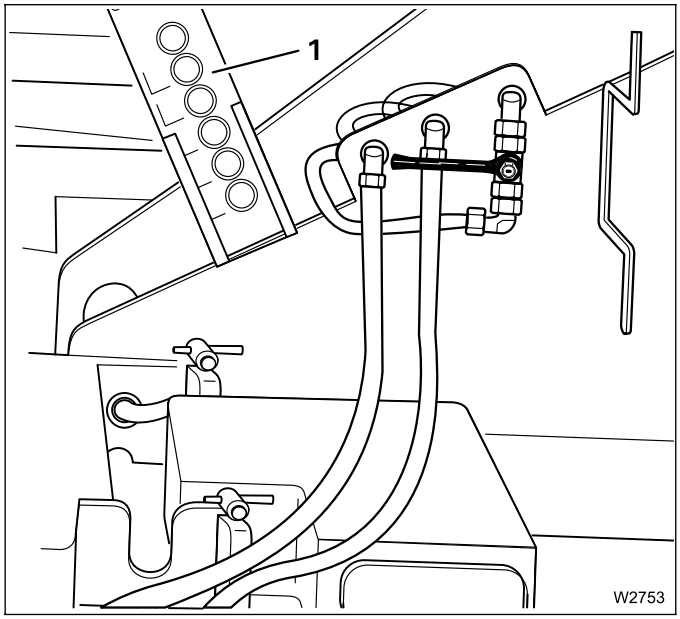
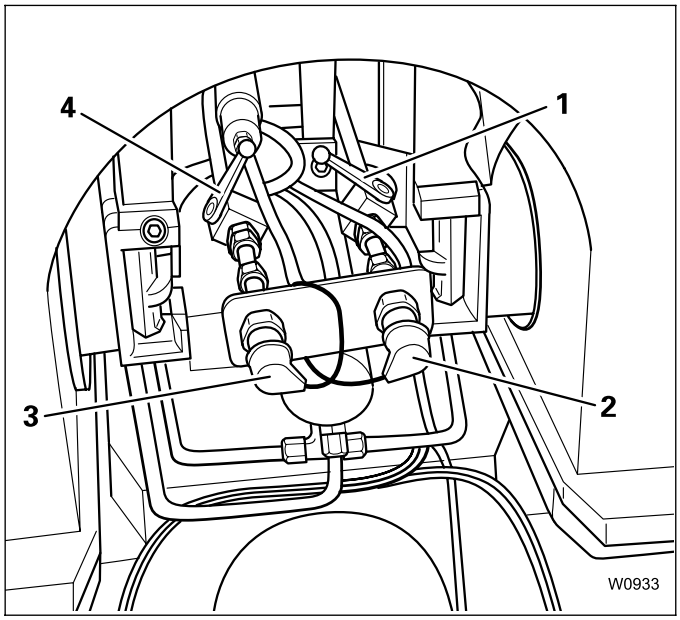
Risk of accidents from falling counterweight!
Always close the safety cock before carrying out hydraulic emergency operation.
If the safety cock is open, the hasps move into the *unlocked* position when unlocking with hydraulic emergency operation and the counterweight can fall down.

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/unlocking.

– 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. 15-70. Notify GROVE customer service
	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	Inform GROVE customer service
	0 0 0 0 0 0 **1** 0	Hardware error	
Communica-tion 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. 15-14.
	0 0 0 0 0 0 **1** 0		
ECOS	0 0 0 0 0 0 0 **1**	Locking status unrealistic	After acknow-ledgement start the menu *Emergency operation access;* ➠ p. 13-92.
	0 0 0 0 **1** 0 0 0	displayed telescope status incorrect	➠*Telescoping error messages* p.15-65
Digital input	0 0 0 0 0 0 0 **1**	Line breakage/ 24 V short	Inform GROVE customer service
	0 0 0 0 0 0 **1** 0	Earth contact	

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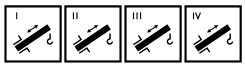
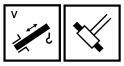
When the main boom has retracted fully:



- Move the telescoping cylinder at the lowest possible speed through the foot sections I to IV, monitor the status of the telescoping cylinder on the position lights *Telescoping cylinder in foot sections I to IV.*

- When the position light *Telescoping cylinder in foot section V* flashes, select the locking of the telescoping cylinder immediately.



- Monitor the locking process:
  When the position light *Telescoping cylinder in foot section V* lights up, the crane control locks the telescoping cylinder and the indicator lamp *Telescoping cylinder locked* lights up.

If the indicator lamp *Telescoping cylinder locked* does not light up and the indicator lamp *Telescoping cylinder in foot section V* flashes again, stop the telescoping cylinder immediately.

In this case the telescoping cylinder is extended beyond the locking point, can sling on the head of the telescope section and become damaged.

When the telescoping cylinder has extended beyond the locking point:

- Slowly retract the telescoping cylinder.
- Monitor the locking process again.

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16.2.2 Dimensions and weights of removable parts

This section contains the transport dimensions and weights of those parts of the superstructure which can be transported on separate vehicles during on-road driving.

On-the-road mode according to requirements ➠ p. 6-5 .

Counterweight-sections

Name	Length x width x height (ft)	Weight (lbs) [1]
3.5 t counterweight section	5.42 x 7.87 x 0.66	7 915
5.4 t base plate complete with hoist unit	7.42 x 9.78 x 3.84	11 900
5.1 t counterweight section	7.45 x 9.78 x 0.52	11 355
8.5 t counterweight section	7.45 x 9.78 x 0.82	18 650
11 t counterweight section	7.45 x 9.78 x 0.98	24 010
10.5 t counterweight section	7.45 x 9.78 x 0.89	23 060
10 t counterweight blocks, each block	4.00 x 5.45 x 3.77	22 000
13 t counterweight blocks, each block	5.00 x 5.72 x 3.83	28 660

[1] Variations of up to ± 2.5 % are possible due to technical manufacturing conditions.

The stability of the crane rigged with the delivered counterweight sections has been checked.

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17 Alphabetical index

Explanations on how to use this index; ➠ p. 1-16.
In order to avoid unnecessary length and confusion in the alphabetical index, not every single element of the instrument panels has been included. 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 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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