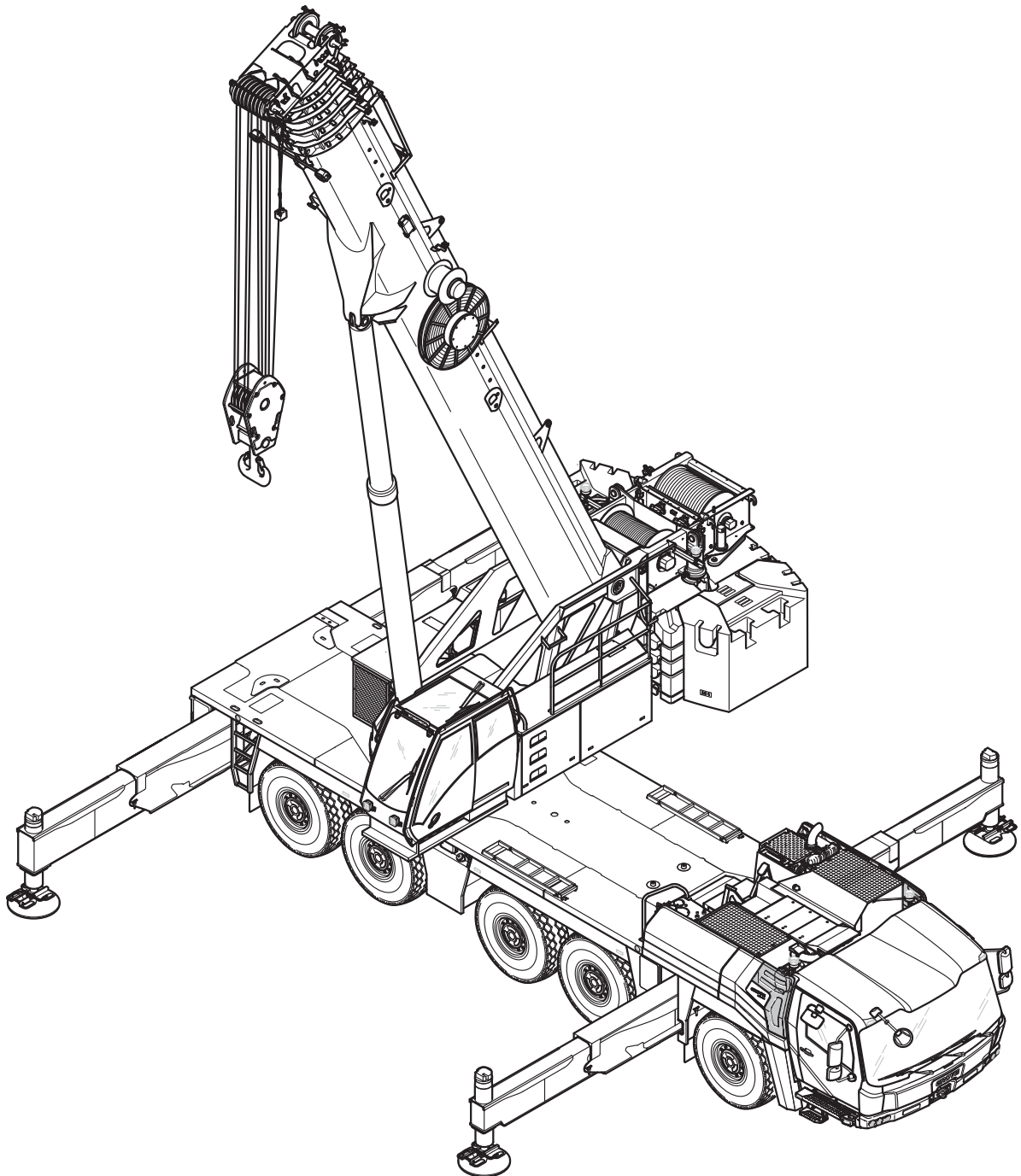


# Grove GMK 5200-1

## Maintenance manual



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09.03.2018

Grove

Manitowoc

National Crane

Potain



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09.03.2018

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**This maintenance manual does not replace the operating manual.**

**Details of operation and standard safety instructions can be found  
in the operating instructions.**

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# 1 General instructions

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# 1

## General instructions

### 1.1

#### Instructions for using the maintenance manual

**This maintenance manual is not designed to replace proper training and instructions.**

Maintenance personnel for this truck crane must have the relevant, specialist knowledge and that of proper safety procedures.

Please read chapters 1 and 2 carefully before beginning maintenance work.



Maintenance work on the lattice extensions is described in the *Lattice extension operating manual*.

### 1.2

#### Warnings and symbols

The following designations and symbols are used in the operating manual to highlight particularly important information:



This symbol indicates hazards related to the described operation and which may cause personal injury during execution. The type of danger (e.g. life-threatening, personal injury, risk of crushing or electric shocks) generally precedes the warning sign.



Dangers which could put objects at risk are pointed out here, e.g. damage to the truck crane or the load.



This symbol is to remind you that you are working with substances which pose a risk to the environment. Take particular care. The measures required for the corresponding maintenance work are indicated next to the symbol. You will find more detailed information in section *Handling substances which are harmful to the environment*, p. 2 - 4.

The vertical line to the left of the text indicates that: This text, regardless of its length, relates to the warning symbol.





The hand with the pointing finger indicates passages that contain additional instructions and tips regarding truck crane operation.



This symbol indicates that the topic is continued on the next page. Turn to the next page.

## 1.3

### Maintenance instructions

This maintenance manual is intended for maintenance personnel. The maintenance manual does not contain information on repair work. Repair work may only be carried out by a qualified repair crew (e.g. **Manitowoc Crane Care**).

Repair work also requires:

- Appropriate workshop equipment,
- Special tools and
- Spare parts approved by **Manitowoc Crane Group Germany GmbH**.

It is your responsibility to maintain and service the truck crane regularly and carefully in order to extend its service life and keep it in good working order.

Please note that **Manitowoc Crane Group Germany GmbH** can only uphold the warranty provided for the truck crane if the following conditions are met:

- It is used for the purpose for which it was intended,
- Care and maintenance are carried out as prescribed,
- Repair work/overhauling is carried out by qualified personnel.



Many defects and failures are caused by **improper maintenance** such as:

- Insufficient oil, grease or antifreeze,
- Dirt,
- Damage to the ropes,
- Faulty compressed air and hydraulic systems,
- Damaged hoses or loose screw connections,
- Faulty brakes,
- Faulty tyres or wheel rims,
- Exceeded maintenance intervals.

For your safety and the safety of others, avoid these errors by carrying out maintenance work carefully within the specified intervals. Do not put off maintenance work that is due. If repairs are needed, immediately contact **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew. This work may only be carried out by trained, qualified personnel.

A few **general maintenance instructions**:

- Clean the parts of the truck crane that are to be serviced, particularly the area around the oil filler opening, the oil inspection opening, the oil drain opening and the lubricating nipples.
- When changing the oil, it should run out at operating temperature.
- Ensure that only oils and lubricants specified in the *Lubricants*, p. 6 - 1 are used.
- Replace all filters within the specified period if cleaning is not explicitly permitted.
- Always replace all gaskets before assembly. Clean the sealing surfaces.
- Tighten loose screw connections on hydraulic and compressed air systems only when the system is depressurised.
- Keep brake and clutch linings free of grease.
- Replace hydraulic hoses immediately once damage or moisture penetration becomes visible.
- Cleanliness is imperative when handling hydraulic oil. Even when filling with fresh hydraulic oil, it must be filtered.



- Cleanliness is imperative when handling grease for the central lubrication system. Do not remove the caps from the filling hole and grease gun until immediately before refilling the grease.
- Check fastening and retaining elements (nuts, bolts, lock washers etc.) before re-using them and replace them if necessary.

Torques can be found in sections p. 10 - 1 and p. 10 - 2.

The training centre at our factory offers specialised training programmes for your qualified personnel.

Please contact **Manitowoc Crane Care**.

**The vehicle must meet all current regulations applicable to it before being put into operation and driven on public roads.**

## 1.4

### Instructions regarding the electronic control

The electronic ESX control is designed for a service life of 10 years. In terms of use, the control system's service life can be estimated based on the following limiting factors:

- The service life of EEPROM allows  $10^6$  accesses.
- The maximum number of make-and-break cycles for the safety relay is  $10^7$ .
- Some conventional capacitors in the ESX have a service life of 10 years.

The device must be serviced or replaced by **Manitowoc Crane Care** before one of these limits is reached.

## 1.5

### Safety instructions for welding work

To avoid damage, especially to electronic parts, there are certain measures you must take before doing any welding work. You should therefore always consult **Manitowoc Crane Care** before any welding work.

All welding work (especially on load carrying members) may only be performed by qualified professional personnel with the prior written permission from **Manitowoc Crane Group Germany GmbH**.

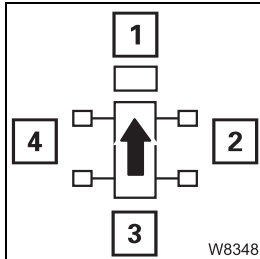
## 1.6

## Definition of direction references

### Basic rule

Direction information always depends on whether the carrier or the superstructure is being operated.

### On the carrier

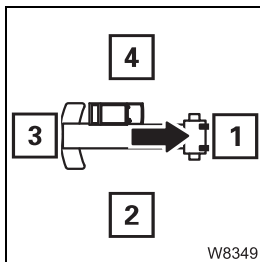


The driver's cab is always at the front, which means that:

- |          |          |
|----------|----------|
| 1: front | 2: right |
| 3: rear  | 4: left  |

**Forwards** always means with the driver's cab leading,  
**Backwards** always means with the rear lights on the carrier leading.

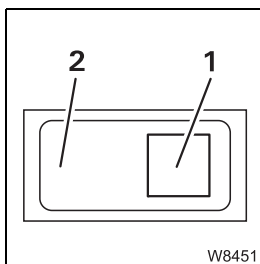
### On the superstructure



The main boom head is always at the front, which means that:

- |          |          |
|----------|----------|
| 1: front | 2: right |
| 3: rear  | 4: left  |

### Switches and buttons



For switches and buttons, the terms **down** and **up** are used.

Regardless of the fitting position (vertical, horizontal, diagonal, perpendicular or turned), the following always applies:

**Down:** If (1) press – next to the symbol

**Up:** If (2) press – opposite the symbol

**1.7****Conversion table for US measuring units**

The following conversion factors will help you convert from metric to US units when the truck crane is used in countries that use US units of measurement and vice versa.

<b>Converting from</b>	<b>into</b>	<b>Multiply by</b>
mm	in	0.03937
in	mm	25.4
m	ft	3.28084
ft	m	0.30479
m <sup>2</sup>	ft <sup>2</sup>	10.76391
cm <sup>2</sup>	in <sup>2</sup>	0.155
cm <sup>3</sup>	in <sup>3</sup>	0.061
l	gal (US)	0.264178
kg	lbs	2.204622
lbs	kg	0.45359
t	lbs	2204.622
lbs	t	0.0004536
kN	lbf	224.809
daN/cm <sup>2</sup>	lbf/in <sup>2</sup>	14.50378
lbf/in <sup>2</sup>	daN/cm <sup>2</sup>	0.06895
bar	psi	14.50378
psi	bar	0.06895
m/s	ft/s	3.28084
km/h or km	mph or mi	0.62137
mph or mi	km/h or km	1.60935
Nm	lbf ft	0.7375
°C	°F	1.8 x °C + 32
°F	°C	(°F-32)/1.8
t/m <sup>2</sup>	lbs/ft <sup>2</sup>	204.8
m <sup>2</sup> /t	ft <sup>2</sup> /lbs	0.04882
MPa	bar	10
bar	MPa	0.1

---

## 2 Safety and environmental protection

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# 2

## Safety and environmental protection

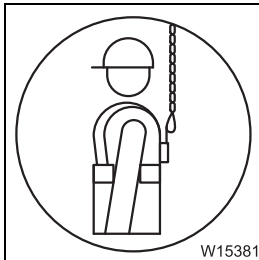
### 2.1

### Safety rules

When carrying out maintenance work, please observe the applicable **accident prevention regulations**.

Observe the following safety rules:

- Familiarise yourself with the truck crane and its operation.  
Read the *Operating manual* carefully and request guidance from the crane operator.
- Do not carry out maintenance work on the truck crane unless you are authorised to do so.
- Observe all safety and warning signs on the truck crane.
- Observe all safety instructions contained in this *Maintenance manual*.
- Familiarise yourself with the conditions under which the superstructure may be slewed and the boom may be extended into horizontal position.
- Do not carry out maintenance work unless the truck crane is standing on flat, stable ground and is secured against rolling away.
- Keep all handles, steps, railings and ladders free of dirt, grease, snow and ice.
- Use the provided, safe access aids and working platforms when carrying out work above body height. Wear a safety harness when carrying out maintenance work at a great heights.  
Use your personal fall protection equipment to secure yourself from falling from the truck crane.  
All locations on the truck crane designed for fastening a fall prevention safety system are marked with a *symbol*.
- Walk only on those machine parts which are equipped with appropriate tread grids and railings and therefore guarantee safety. During rigging and maintenance work on machine parts above body height which have no apparatus for walking on, always use the supplied extendable ladder (e.g. when lubricating telescopic slide faces).



- Perform maintenance work only after the truck crane has been shut down. Always ensure that the truck crane is well-protected from unauthorised operation before beginning maintenance work. Remove the key and put up warning signs.

If, due to exceptional circumstances, the truck crane needs be put into operation for certain types of maintenance work, great care must be taken where there are moving parts (superstructure, outriggers, cardan shafts, slewing bearing, engines, tiltable crane cab). There is a **risk of injury**.

- Ensure that all hydraulic components are returned to their initial positions (e.g. the main boom) or locked (e.g. the outriggers) before starting maintenance work.

Escaping hydraulic fluid or compressed air can cause severe injury. Remember that the hydraulic and compressed air systems of the truck crane are pressurised even when the crane is not in operation. Tighten loose screw connections only when the systems are depressurised. Always depressurise the hydraulic and compressed air systems before opening them.

- Do not allow hot fluids to escape in an uncontrolled manner. Risk of scalding.
- Observe the applicable safety regulations when working with flammable fluids.
- Observe the applicable safety regulations when working with consumables and auxiliary materials.
- Switch off all electrical consumers and first disconnect the earthing terminal before removing any storage batteries.
- Keep in mind the corrosive effect of battery acid.
- Note the fire alarm and fire-fighting facilities on site.
- Return the truck crane to proper working order once maintenance work is completed. Inform the crane operator accordingly.



## 2.1.1

### Securing against unauthorised use

- Secure the truck crane against unauthorised use by:
  - Applying the parking brake,
  - Switching the transmission to position **N**,
  - Turning off the engine,
  - Removing the ignition key and
  - Stowing away the hand-held control in the crane cab or in the driver's cab,
  - Locking the driver's cab and the crane cab.



#### **Danger due to unauthorised use.**

Always stow away the hand-held control in the crane cab or in the driver's cab before leaving the truck crane and lock the doors.

In this way you can prevent unauthorised persons from starting the engine with the hand-held control.

- Set up warning signs in the driver's cab and in the crane cab with information about
  - when
  - why
  - and by whom

the truck crane was secured to prevent unauthorised use.

Remove the warning signs from the driver's cab and the crane cab after **completion** of the maintenance work.

## 2.2

## Handling substances which are harmful to the environment

### Which substances are harmful to the environment?

When you carry out maintenance work on the truck crane you will occasionally work with consumables which are classified as harmful to the environment by applicable national and regional regulations.

These include oil, fuel, grease, used oil and fuel filters, as well as rags which have come into contact with these environmentally harmful substances.

- When handling these substances observe the applicable national and regional regulations as well as the instructions in this chapter.

### Using suitable equipment

Substances harmful to the environment can sometimes be corrosive. When doing maintenance work involving these consumables (oils, coolant, fuel) always use receptacles, hoses, pumps, funnels etc. which have sufficient capacity and which are resistant to the consumables.

For oil samples, always use receptacles that can be closed and have sufficient capacity and resistance to the consumables.

The approximate amount of consumables to be expected is specified in the maintenance plans.

### Filling and draining

- When filling and draining, make absolutely sure that no substances harmful to the environment seep into the earth, escape into the sewage system or pollute natural waters.
- Collect consumables (e.g. oils, fuels, coolant) in a suitable receptacle when draining.
- Always use a drain hose when draining, and a funnel or a pump with a hose suitable for the respective substance when filling.

**Collecting and storing separately**

Substances which are harmful to the environment should always be collected separately from other waste.

- Ask your local environmental protection authority about the different categories of the substances.
- Also, when collecting substances which are harmful to the environment, keep solid materials (e.g. filter cartridges) separate from fluids. Disposal costs will be reduced if you collect fluids separately according to defined categories.
- Store environmentally harmful substances only in approved receptacles and in locations which meet the requirements of applicable national and regional regulations.

**Disposal**

- Ask your local environmental protection authority about the prescribed disposal options.
- Once collected, have environmentally harmful substances disposed of only by disposal companies which are approved by the national or regional authority responsible.

## 2.3

### Disposal of the truck crane

Since you are the owner/operator, you can be faced with the proper, orderly and final putting out of service and disposal and scrapping of the truck crane.

Before you decide to finally put your truck crane out of service and to scrap it:

- Allow **Manitowoc Crane Care** to advise you about alternatives.

#### Proper disposal

- Find out about the applicable official regulations regarding the final de-registration and disposal at the place of registration of the truck crane.
- At site, find out about certified vehicle disposal companies.
- Have the vehicle disposal company issue a disposal certificate for the truck crane.
- Once collected, have all the environmentally harmful substances disposed of only by disposal companies which are approved by the national or regional authority responsible; ■■■► *Handling substances which are harmful to the environment*, p. 2 - 4.

#### After disposal

- Inform **Manitowoc Crane Care** about the disposal of the truck crane while specifying the serial number.

---

**3      Cleaning**

**3.1      Overview of assemblies easily damaged when cleaning ..... 3 - 2**



# 3

## Cleaning

### During the first 3 months

The paintwork on the truck crane will continue to harden for the first three months.

- During this period the crane may be cleaned only with cold water.
- Do not use high-pressure or steam jet cleaning equipment during this period.

### After the first 3 months

- Avoid water temperatures above 60 °C (140 °F), even after this period.
- Do not use corrosive cleaning agents that might damage the paint.
- Never hold the spray nozzle of your cleaning unit at right angles to the surface you are cleaning, and ensure that it is at a sufficient distance away from the surfaces to be cleaned.



#### **Risk of accidents from a misdirected high pressure water jet.**

When working with high-pressure and steam-jet cleaners, the water jet will be deflected by crane parts and could spray into your face and eyes at high speed and great pressure.

Always wear a face guard when cleaning the truck crane with high-pressure and steam-jet cleaning equipment.

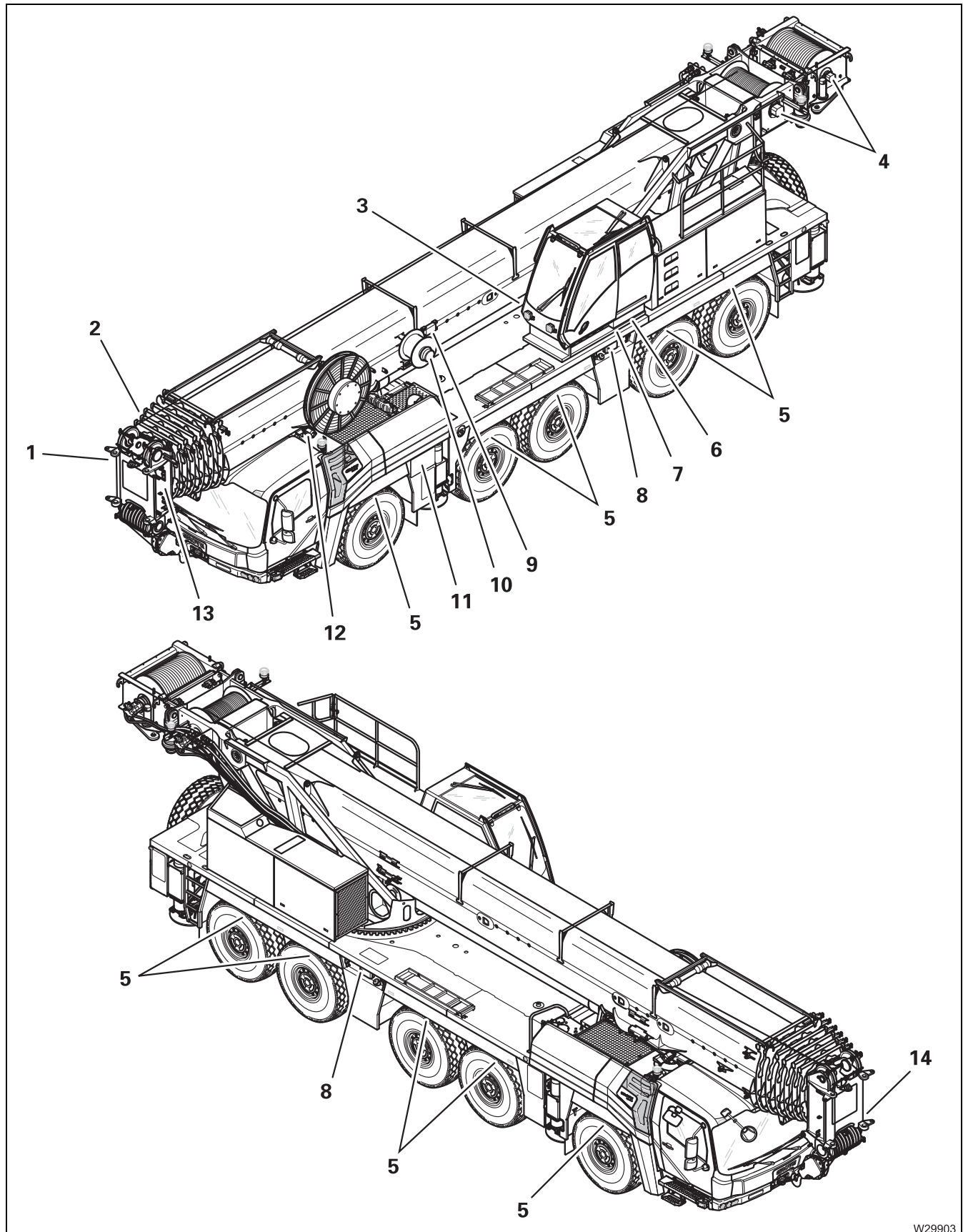
- To prevent damage to the gaskets, never point the spray nozzle directly at them.
- Never point the spray nozzle at electrical equipment, relay and switch boxes, suction and ventilation filters or control elements and lubricated surfaces.
- To prevent corrosion, relubricate all slide faces after cleaning.
- Keep all electric and hydraulic connections free of dirt. Check the connecting points for dust, foreign bodies and moisture before installation. This also applies to protective caps and bridging plugs.

#### **The components specified in the next section are particularly at risk.**

- After cleaning with high-pressure or a steam jet equipment, activate intermediate lubrication on the central lubrication system (▣▣▣▣▶ *Triggering intermediate lubrication*, p. 7 - 121). Lubricate all remaining lubricating points using a grease gun.

**3.1**

**Overview of assemblies easily damaged when cleaning**




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- 1 RCL terminal box
- 2 Telescopic slide faces
- 3 Pressure sensors on the derricking cylinder
- 4 Lowering limit switch
- 5 Suspension struts
- 6 Heating/air conditioning system under the crane cab
- 7 Slewing angle sensor
- 8 Control units for outriggers
- 9 Angle data transmitter
- 10 RCL length data transmitter
- 11 Battery compartment
- 12 Spotlights, pivoting
- 13 RCL connections
- 14 Lifting limit switch



Assemblies at risk of damage on the lattice extension;  *Operating Instructions Lattice Extension.*

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## 4 Run-in regulations



# 4

## Run-in regulations

There are rules about running in individual parts which must be followed after:

- **First commissioning** or
- **Replacement of a part** or
- **General inspection.**

This is why you must carry out **additional maintenance work** on the **carrier** and **superstructure** after specific periods of time have expired:

Operating hours (oper. hrs.)	Driven km (mi)	Additional maintenance work on the CARRIER
after 4 and 24		Check the V-belt on the second alternator (additional equipment); ■■■► <i>Check V-belt tension, p. 7 - 22.</i>
	after 50 (30)	Tighten the wheel nuts; ■■■► <i>Special torques, p. 10 - 2.</i>
	after 150 (95)	Tighten the wheel nuts; ■■■► <i>Special torques, p. 10 - 2.</i>
after 50		Tighten the clips on the coolant hoses; ■■■► <i>Special torques, p. 10 - 2.</i>
after 100		Lubricate the outrigger beams; ■■■► <i>Lubricating the outrigger beams, p. 7 - 144.</i>
during the first 100		Check the hydraulic oil filter every week, and change it if necessary; ■■■► <i>Cleaning the magnetic rods, p. 7 - 103,</i> ■■■► <i>Changing the hydraulic oil filter, p. 7 - 115.</i>
after 100	after 1,000 (650)	Change the drive oil; ■■■► p. 7 - 50 for the transfer case, ■■■► p. 7 - 63 for the axle centre drives, ■■■► p. 7 - 68 for the final drives.
after 250	after 2,500 (1,550)	Change the engine oil; ■■■► <i>Engine manufacturer's documentation.</i>



<b>Operating hours (oper. hrs.)</b>	<b>Additional maintenance work on the SUPERSTRUCTURE</b>
after 50	Tighten the clips on the coolant hoses; ▣▣▣▣► <i>Special torques</i> , p. 10 - 2.
during the first 100	Check the hydraulic oil filter every week, and change it if necessary; ▣▣▣▣► <i>Cleaning the magnetic rods</i> , p. 8 - 34, ▣▣▣▣► <i>Changing the hydraulic oil filter</i> , p. 8 - 39.
after 100	Tighten the bolts on the slewing bearing; ▣▣▣▣► <i>Checking the screws</i> , p. 8 - 21, ▣▣▣▣► <i>Special torques</i> , p. 10 - 2.
after 100	Hook blocks; ▣▣▣▣► <i>Greasing</i> , p. 8 - 71.
after 200	First oil change on the hoists; ▣▣▣▣► <i>Changing the oil/checking the oil</i> , p. 8 - 11.
after 1000 or after 12 months at the latest	Second oil change on the hoists; ▣▣▣▣► <i>Changing the oil/checking the oil</i> , p. 8 - 11.
after 200	Change the slewing gear oil; ▣▣▣▣► <i>Changing the oil/checking the oil</i> , p. 8 - 19.
after 200	Change the oil on the angle gear (with the power transmission from the carrier to the superstructure at the centre of rotation); ▣▣▣▣► p. 7 - 53.

## 5 Maintenance overview

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# 5


## Maintenance overview

- Maintenance plans **D** (= daily),
- Maintenance plans **W** (= weekly) and
- Maintenance plans **M 1** (= once a month) to **M 12** (= every 12 months) and
- Maintenance plans **Y 2** (= every 24 months) to **Y 10** (= every 120 months).

The maintenance plans are given in table form, divided into

- Maintenance work on the **carrier** and
- Maintenance work on the **superstructure**.

In the tables, cross references direct you to the sections in which the appropriate maintenance work is described. The cross references consist of the chapter number and the corresponding page number, e.g.

Check hydraulic oil level;  p. 7 - 101.



Checking the hydraulic oil level is described in chapter 7, the section starts on page 7 - 101.

### 5.1

## Maintenance intervals

The length of the maintenance interval depends on the grade of oil used and operating conditions of the truck crane.

The next maintenance must be carried out after

- a specified **time (maintenance interval)** or
- a specified number of **driven km (mi)** or
- a specified number of **operating hours (oper. hrs.)** or
- an **indication** on the **CCS** display in the driver's cab;  p. 7 - 9 or
- an **indication** on the **CCS** display in the crane cab;  p. 8 - 7.



The **maintenance interval which occurs first** determines when the next maintenance is due.

- The **driven km (or mi)** can be taken from the speedometer.
- You can individually call up the **Operating hours (oper. hrs.) of the engine and power units** on the *CCS* display.

The following table sets out the maintenance intervals for the maintenance plans:

<b>Mainten- ance plans</b>	<b>Maintenance interval</b>	<b>Driven km (mi) (carrier)</b>	<b>Engine operating hours (oper. hrs.)</b>
<b>D</b>	daily/before start- ing up	—	—
<b>W</b>	weekly	—	—
<b>M 1</b>	monthly	approx. 2,000 (approx. 1,240)	approx. 100
<b>M 3</b>	every three months	5,000 – 6,000 (3,100 – 3,730)	250
<b>M 6</b>	every six months	10,000 – 12,500 (6,210 – 7,770)	500
<b>M 12</b>	every 12 months	20,000 – 25,000 (12,430 – 15,530)	1,000
<b>Y 2</b>	every 24 months	40,000 – 50,000 (25,000 – 31,000)	2,000
<b>Y 3</b>	every 36 months	—	3,000
<b>Y 5</b>	every 60 months	100,000 (62,000)	5,000
<b>Y 6</b>	every 72 months	—	6,000
<b>Y 10</b>	every 120 months	200,000 (124,000)	12,000

**Please note that the long-term maintenance plans always include the short-term ones.**

## 5.2

### Maintenance plans

The descriptions for certain maintenance work for the maintenance plans **D**, **W**, **M 1** to **M 12** and **Y 2** to **Y 10** are provided for

- the carrier in chapter 7 and for
- the superstructure in chapter 8.

References (chapter and page number) to the description of this maintenance work can be found after the respective maintenance work for carrier and superstructure.

The section titles

- of chapter 7 *Maintenance work on the carrier* and
- of chapter 8 *Maintenance work on the superstructure*

contain the symbol (**D** to **Y 10**) of the relevant maintenance plan for better comprehension.

In addition to the **Maintenance work on the carrier** and the **Maintenance work on the superstructure** chapter 6 also lists the **Lubricants and consumables**:

- The **designations** of the oils/lubricants in accordance with *Lubricants list*, p. 6 - 2.
- The **amounts** as approximate values for oil amounts in litres (l) (and US gallons (gal)) (the exact oil amounts can always be determined by the oil level inspection holes, the oil dipsticks or the oil level indicators) *Lubricant applications list*, p. 6 - 3.



Items that are only available with additional equipment are designated accordingly in chapter 7 and chapter 8.



Maintenance work on the engines over and above the daily and weekly checks is **only partially** described in this maintenance manual. When carrying out such maintenance work, follow the instructions in the *Engine manufacturer documentation* supplied.

**5.2.1**

**Maintenance plan D**

**D**

<b>Maintenance work on the CARRIER: daily/before putting into operation</b>	
<b>Engine</b> – Checking the oil level – Checking the air filter – Checking the coolant level	<p>▣▣▣▣▶ p. 7 - 11</p> <p>▣▣▣▣▶ p. 7 - 15</p> <p>▣▣▣▣▶ p. 7 - 16</p>
<b>Fuel system</b> – Draining off water from fuel filter 1	▣▣▣▣▶ p. 7 - 28
<b>Exhaust system with exhaust emission control</b> – Checking the AdBlue tank level	▣▣▣▣▶ p. 7 - 34
<b>Wheels</b> – Checking the tyres for damage	▣▣▣▣▶ p. 7 - 73
<b>Vehicle brake</b> – Checking the wear display	▣▣▣▣▶ p. 7 - 81
<b>Steering</b> – Checking for leaks	▣▣▣▣▶ p. 7 - 95
<b>Hydraulic system</b> – Checking the oil level	▣▣▣▣▶ p. 7 - 101
<b>Electrical system</b> – Checking the lighting and indicators	▣▣▣▣▶ p. 7 - 123

<b>Maintenance work on the SUPERSTRUCTURE: daily/before putting into operation</b>	
<b>Hydraulic system</b> – Checking the oil level	▣▣▣▣▶ p. 8 - 31
<b>Hoist ropes</b> – Checking the winding	▣▣▣▣▶ p. 8 - 53
<b>Electrical system</b> – Checking the lighting and indicators	▣▣▣▣▶ p. 8 - 75

**5.2.2**

**Maintenance plan W**

**W**

<b>Maintenance work on the CARRIER: weekly</b>	
<b>Engine</b> – General inspection	▣▣▣▣▶ p. 7 - 17
<b>Transmission</b> – General inspection	▣▣▣▣▶ p. 7 - 40
<b>Transfer case</b> – General inspection	▣▣▣▣▶ p. 7 - 49
<b>Angle gear</b> – General inspection	▣▣▣▣▶ p. 7 - 54
<b>Axle lines</b> – General inspection	▣▣▣▣▶ p. 7 - 61
<b>Wheels</b> – Checking the tyre pressure	▣▣▣▣▶ p. 7 - 74
<b>Compressed air system</b> – Draining water from the compressed air system – Checking for leaks	▣▣▣▣▶ p. 7 - 97 ▣▣▣▣▶ p. 7 - 98
<b>Hydraulic system</b> – Checking the hydraulic hoses – Checking for leaks	▣▣▣▣▶ p. 7 - 102 ▣▣▣▣▶ p. 7 - 102
<b>Central lubrication system</b> – Checking the level	▣▣▣▣▶ p. 7 - 119
<b>Other maintenance work</b> – Checking the windscreen washing system	▣▣▣▣▶ p. 7 - 143

















**W**

<b>Maintenance work on the SUPERSTRUCTURE: weekly</b>	
<b>Hoists</b> – Checking the oil level – General inspection – Checking the hoist brake	■■■▶ p. 8 - 9 ■■■▶ p. 8 - 10 ■■■▶ p. 8 - 10
<b>Slewing gear</b> – Checking the oil level – Checking for leaks	■■■▶ p. 8 - 15 ■■■▶ p. 8 - 16
<b>Hydraulic system</b> – Checking the hydraulic hoses – Checking the ventilation filter – Checking for leaks	■■■▶ p. 8 - 32 ■■■▶ p. 8 - 32 ■■■▶ p. 8 - 33
<b>Hoist ropes</b> – Checking the hoist ropes	■■■▶ p. 8 - 54
<b>Central lubrication system</b> – Checking the level	■■■▶ p. 8 - 69
<b>Other maintenance work</b> – Checking the windscreen washing system	■■■▶ p. 8 - 81

**5.2.3**

**Maintenance plan M 1**

**M 1**

<b>Maintenance work on the CARRIER: monthly/after approx. 2,000 km (approx. 1,240 mi)</b>	
<b>Engine</b> – Notes;  <i>Engine manufacturer's documentation</i>	 p. 7 - 11
<b>Exhaust system with exhaust emission control</b> – Check the exhaust system for external damage	 p. 7 - 35
<b>Transfer case</b> – Checking the oil level	 p. 7 - 49
<b>Angle gear</b> – Checking the oil level	 p. 7 - 54
<b>Axle lines</b> – Axle centre drives – checking the oil level – Final drives – checking the oil level – Lubricating the cardan shafts in the axle lines	 p. 7 - 61  p. 7 - 67  p. 7 - 70
<b>Wheels</b> – Checking that the wheel nuts are tight	 p. 7 - 75
<b>Suspension</b> – Suspension struts – checking the oil level – Suspension struts – checking the fastening	 p. 7 - 89  p. 7 - 91
<b>Electrical system</b> – Checking the batteries	 p. 7 - 124
<b>Air conditioning system</b> – Checking the air conditioning system	 p. 7 - 131
<b>Towbar coupling</b> – Lubricating the towbar coupling	 p. 7 - 135
<b>Other maintenance work</b> – Lubricating the outrigger beams – Checking the auxiliary heater	 p. 7 - 144  p. 7 - 145


















<b>Maintenance work on the SUPERSTRUCTURE: monthly/after approx. 100 oper. hrs.</b>	
<b>Main boom</b> – Greasing the piston rod of the derricking cylinder	▣▣▣▣▶ p. 8 - 47
<b>Air conditioning system</b> – Checking the air conditioning system – Cleaning the condenser fins	▣▣▣▣▶ p. 8 - 77 ▣▣▣▣▶ p. 8 - 77
<b>Other maintenance work</b> – Checking the auxiliary heater	▣▣▣▣▶ p. 8 - 82

**5.2.4**

**Maintenance plan M 3**

**M 3**

<b>Maintenance work on the CARRIER: every three months/after 5,000 - 6,000 km (3,100 - 3,730 mi)</b>	
<b>Engine</b> – Notes;  <i>Engine manufacturer's documentation</i>	 p. 7 - 11
<b>Fuel system</b> – Replacing fuel filter 1	 p. 7 - 29
<b>Vehicle brake</b> – Checking disc brakes	 p. 7 - 82
<b>Suspension</b> – Forced lever – checking correct functioning	 p. 7 - 92
<b>Hydraulic system</b> – Cleaning the magnetic rods	 p. 7 - 103
<b>Electrical system</b> – Checking the charge level of the batteries – Charging the batteries using the battery charger – Check the external starting socket	 p. 7 - 126  p. 7 - 128  p. 7 - 129
<b>Towbar coupling</b> – Checking the bearing – Checking the cotter pin – Checking the lower bushing – Checking the initial tension of the springs – Checking the support ring – Checking the function of the coupling jaw/ resetting the central position	 p. 7 - 137  p. 7 - 138  p. 7 - 139  p. 7 - 139  p. 7 - 140  p. 7 - 140








**M 3**

<b>Maintenance work on the SUPERSTRUCTURE: every three months/after 250 oper. hrs.</b>	
<b>Slewing bearing</b> – Checking the screws	▣▣▣▣▶ p. 8 - 21
<b>Hydraulic system</b> – Cleaning the magnetic rods	▣▣▣▣▶ p. 8 - 34
<b>Main boom</b> – Lubricating the telescopic sections – Checking the sheaves	▣▣▣▣▶ p. 8 - 48 ▣▣▣▣▶ p. 8 - 52
<b>Hoist ropes</b> – Lubricating the hoist rope	▣▣▣▣▶ p. 8 - 55
<b>Hook blocks</b> – Checking the sheaves	▣▣▣▣▶ p. 8 - 71

**5.2.5**

**Maintenance plan M 6**

**M 6**

<b>Maintenance work on the CARRIER: every six months/after 10,000 - 12,500 km (6,210 - 7,770 mi)</b>	
<b>Engine</b> – Notes;  <i>Engine manufacturer's documentation</i>	 p. 7 - 11
<b>Transfer case</b> – Changing the oil	 p. 7 - 50
<b>Angle gear</b> – Changing the oil and the oil filter	 p. 7 - 57
<b>Axle lines</b> – Lubricating longitudinal cardan shafts	 p. 7 - 71
<b>Wheels</b> – Changing the wheels	 p. 7 - 76
<b>Air conditioning system</b> – Checking the entire air conditioning system	 p. 7 - 132

**M 6**

<b>Maintenance work on the SUPERSTRUCTURE: every six months/after 500 oper. hrs.</b>	
<b>Slewing gear</b> – Checking the slewing gear brake	▣▣▣▣▶ p. 8 - 16
<b>Slewing bearing</b> – Lubricating the gear teeth – General inspection – Measuring tilting play	▣▣▣▣▶ p. 8 - 25 ▣▣▣▣▶ p. 8 - 27 ▣▣▣▣▶ p. 8 - 28
<b>Cable drums</b> – Maintenance of the slip ring assemblies	▣▣▣▣▶ p. 8 - 67
<b>Air conditioning system</b> – Checking hoses	▣▣▣▣▶ p. 8 - 78

**5.2.6**

**Maintenance plan M 12**

**M 12**

<b>Maintenance work on the CARRIER: every 12 months/after 20,000 - 25,000 km (12,430 - 15,530 mi)</b>	
<b>Engine</b> – Notes; ■■■► <i>Engine manufacturer's documentation</i> – Have the radiator checked/cleaned – Check V-belt tension	■■■► p. 7 - 11 ■■■► p. 7 - 18 ■■■► p. 7 - 22
<b>Fuel system</b> – Replacing fuel filter 2	■■■► p. 7 - 31
<b>Exhaust system with exhaust emission control</b> – Having the AdBlue system checked	■■■► p. 7 - 37
<b>Transmission</b> – Checking the VIAB oil level – Checking the transmission oil level	■■■► p. 7 - 41 ■■■► p. 7 - 42
<b>Axle lines</b> – Axle centre drives – changing the oil – Final drives – changing the oil	■■■► p. 7 - 63 ■■■► p. 7 - 68
<b>Suspension</b> – Pressure accumulator – checking the gas pressure	■■■► p. 7 - 93
<b>Steering</b> – Pressure accumulator – checking the gas pressure	■■■► p. 7 - 96
<b>Compressed air system</b> – Replacing the filter cartridge of the compressed air drier	■■■► p. 7 - 99
<b>Hydraulic system</b> – Changing the ventilation filter – Taking oil samples: depending on the oil sample test results: – Changing the hydraulic oil – Changing the hydraulic oil filter	■■■► p. 7 - 105 ■■■► p. 7 - 106 ■■■► p. 7 - 111 ■■■► p. 7 - 115
<b>Air conditioning system</b> – Cleaning the condenser fins – Checking the entire air conditioning system – Changing the pollen filter	■■■► p. 7 - 132 ■■■► p. 7 - 132 ■■■► p. 7 - 134
<b>Other maintenance work</b> – Lubricating the cab door – Lubricating the connecting and socket pins – Renewing the corrosion protection	■■■► p. 7 - 145 ■■■► p. 7 - 146 ■■■► p. 7 - 147

**M 12**

<b>Maintenance work on the SUPERSTRUCTURE: every 12 months/after 1,000 oper. hrs.</b>	
<b>Hoists</b> – Changing the oil/checking the oil	▣▣▣▣▶ p. 8 - 11
<b>Slewing gear</b> – Changing the oil/checking the oil	▣▣▣▣▶ p. 8 - 19
<b>Slewing bearing</b> – Lubricating the locking of turntable	▣▣▣▣▶ p. 8 - 30
<b>Hydraulic system</b> – Changing the ventilation filter – Pressure accumulator – checking the gas pressure – Taking oil samples: depending on the oil sample test results: – Changing the hydraulic oil – Changing the hydraulic oil filter	▣▣▣▣▶ p. 8 - 36 ▣▣▣▣▶ p. 8 - 37 ▣▣▣▣▶ p. 8 - 37 ▣▣▣▣▶ p. 8 - 44 ▣▣▣▣▶ p. 8 - 39
<b>Main boom</b> – Checking the locking system	▣▣▣▣▶ p. 8 - 52
<b>Hook blocks</b> – Greasing	▣▣▣▣▶ p. 8 - 71
<b>Air conditioning system</b> – Checking the entire air conditioning system – Changing the pollen filter	▣▣▣▣▶ p. 8 - 78 ▣▣▣▣▶ p. 8 - 80
<b>Other maintenance work</b> – Lubricating the crane cab door – Lubricating the step – Lubricating the connecting and socket pins – Renewing the corrosion protection	▣▣▣▣▶ p. 8 - 83 ▣▣▣▣▶ p. 8 - 84 ▣▣▣▣▶ p. 8 - 85 ▣▣▣▣▶ p. 8 - 86

## 5.2.7

## Maintenance plan Y 2

Y 2

<b>Maintenance work on the CARRIER: every 24 months/after 40,000 - 50,000 km (25,000 - 31,000 mi)</b>	
<b>Engine</b> – Notes; ■■■▶ <i>Engine manufacturer's documentation</i> – Changing the oil and oil filter	■■■▶ p. 7 - 11 ■■■▶ p. 7 - 24
<b>Other maintenance work</b> – Having the fire extinguisher checked	■■■▶ p. 7 - 149

<b>Maintenance work on the SUPERSTRUCTURE: every 24 months/after 2,000 oper. hrs.</b>	
<b>Other maintenance work</b> – Having the fire extinguisher checked	■■■▶ p. 8 - 88

## 5.2.8

## Maintenance plan Y 3

Y 3

<b>Maintenance work on the CARRIER: every 36 months</b>	
<b>Transmission</b> – Changing the VIAB oil – Transmission oil change	■■■▶ p. 7 - 43 ■■■▶ p. 7 - 46

<b>Maintenance work on the SUPERSTRUCTURE: every 36 months/after 3,000 oper. hrs.</b>	
<b>Hoists</b> – Having a partial inspection carried out	■■■▶ p. 8 - 13



**5.2.9**

**Maintenance plan Y 5**

**Y 5**

<b>Maintenance work on the CARRIER: every 60 months/ 100,000 km (62,000 mi)</b>	
– Have the cardan shaft between the transmission on the engine and the transfer case replaced by <b>Manitowoc Crane Care</b> or an authorised GROVE dealer.	

<b>Maintenance work on the SUPERSTRUCTURE: every 60 months/after 5,000 oper. hrs.</b>	
– Have both the cardan shafts (+ resilient damper) on the angle gear replaced by <b>Manitowoc Crane Care</b> or an authorised GROVE dealer.	

**5.2.10**

**Maintenance plan Y 6**

**Y 6**

<b>Maintenance work on the CARRIER: every 72 months</b>	
No maintenance work in this period. The long-term intervals always include the short-term intervals.	

<b>Maintenance work on the SUPERSTRUCTURE: every 72 months/after 6,000 oper. hrs.</b>	
<b>Hoists</b> – Having a general inspection carried out	➡ p. 8 - 13

**5.2.11**

**Maintenance plan Y 10**

**Y 10**

<p><b>Maintenance work on the CARRIER: every 120 months/after 200,000 km (124,000 mi)</b></p>	
<p><b>Steel fabrication</b> – Check the load-bearing steel fabrication. For further information, please contact <b>Manitowoc Crane Care</b>.</p>	
<p><b>Maintenance work on the SUPERSTRUCTURE: every 120 months/after 12,000 oper. hrs.</b></p>	
<p><b>Electrical system</b> – Have the battery on the electronics board replaced</p>	<p>▣▣▣▣▶ p. 8 - 76</p>
<p><b>Steel fabrication</b> – Check the load-bearing steel fabrication. For further information, please contact <b>Manitowoc Crane Care</b>.</p>	
<p><b>Rated capacity limiter (RCL)</b> – Have the RCL checked by <b>Manitowoc Crane Care</b>.</p>	

## 5.3

### Periodic inspections

Your GMK5200-1 truck crane has been inspected before delivery.

- Truck cranes that are to be used in Germany are inspected in accordance with the regulations of the professional trade association as defined by BGV D 6 (VBG 9).
- Truck cranes that are to be used abroad are inspected in accordance with the regulations of the respective country. If such regulations do not exist, they are inspected in accordance with the regulations of the professional trade association as defined by BGV D 6 (VBG 9).

According to German regulations, an inspection must be carried out once a year. The regulations in other countries may prescribe different inspection intervals. If such regulations do not exist, an inspection should be carried out by an *expert* at least once a year.

These periodic inspections are generally visual inspections intended to assess the condition of the truck crane and its components. Their purpose is to detect defects at an early stage and thus prevent accidents.

Inspections must be carried out on the following, if they are not already included in the list of periodic maintenance work:

- the hydraulic and electrical control and safety devices,
- the rated capacity limiter (RCL),
- the fastening and safety devices of all screwed-on parts,
- the hoist ropes,
- the load hooks (▣▣▣▣► *Load hook inspection*, p. 5 - 20),
- the load-bearing steel fabrication (for cracks, deformation, etc.), including a special check of all welds.

If damage is found on the steel fabrication, qualified specialists must determine the extent of the damage using the required material examination methods. They should then determine what sort of repair should be carried out.

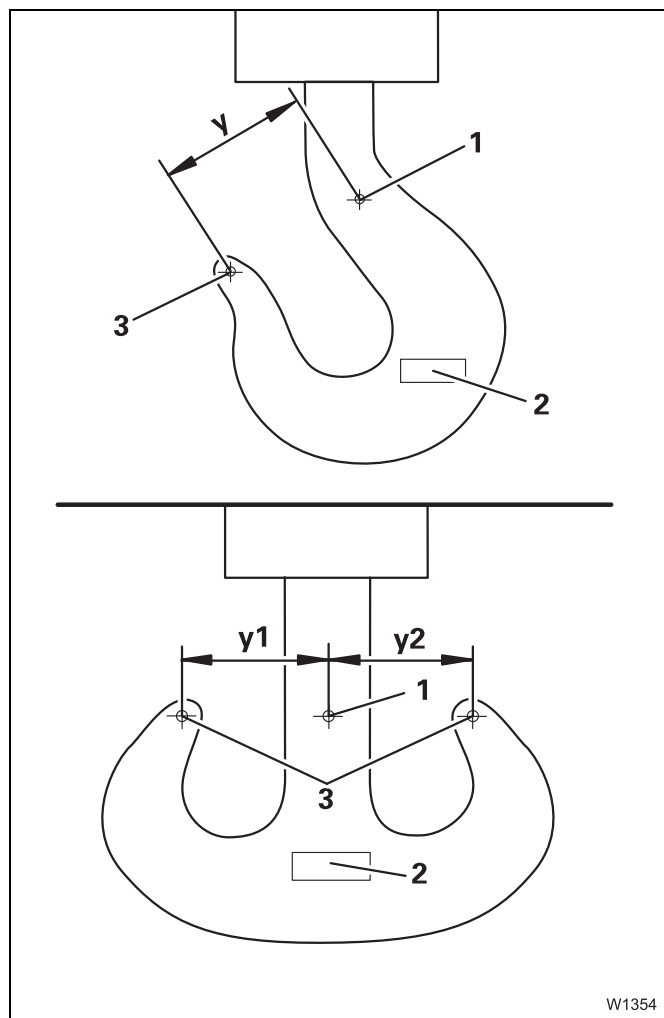
Prior to carrying out welding work on the truck crane, observe the ▣▣▣▣► *Safety instructions for welding work*, p. 1 - 4.

The inspector must write a report containing the result of the annual inspection that was performed and the measures taken to repair any damage.

### 5.3.1 Load hook inspection

The hook opening on the load hooks must be checked regularly for deformation.

The hook opening must not have increased by more than 10% of the original dimension  $y$ ,  $y1$ ,  $y2$ .



The original dimensions  $y$ ,  $y1$ ,  $y2$  are specified in field (2) on the load hooks.

- To check this, measure the distance between the marked measuring points on the load hook shaft (1) and the tip of the hook (3).

The hook block may no longer be used if the opening has increased by more than 10% of its original dimension.



#### **Risk of accident through falling load.**

Hook blocks with deformed load hooks are no longer safe to use. The load hooks could break and drop the load.  
Deformed load hooks must always be replaced.

## 5.4

### Measures required for winch monitoring



Also observe the information on the general inspection of the hoists;  
▶ p. 8 - 13.

These measures for monitoring the winches (hoists) were compiled by the German Machine Builders' Association (VDMA) and are to be used for all truck cranes according to the German *Accident Prevention Regulations for Winches, Hoists and Tractor Machines, BGV D 6 (VBG 9) and BGV D 8 (VBG 8)*.

### 5.4.1

#### Theoretical service life

The theoretical service life is determined according to certain operating conditions and a theoretical total operating time assumed by the design engineer when calculating and dimensioning the winches of your truck crane.

The power unit group M3 and the load spectrum L1 ( $K_m = 0.125$ ) are generally given for truck cranes in erection mode, resulting in a theoretical service life of 3,200 h (ISO 4301/1, FEM 1.001, DIN calculation basis for power units).



The **theoretical service life** is not the same as the **real (actual) service life** of a winch.



The actual service life of a winch is affected by a number of additional external factors, such as:

1. Overloading caused by improper use of the truck crane.
2. Insufficient maintenance: Oil is not changed at the specified intervals.
3. Operating errors: Extreme acceleration or deceleration of the load,  
Load falling into the ropes.
4. Improper maintenance: Wrong oil used,  
Incorrect filling quantity,  
Contamination during oil change.
5. Improper assembly during maintenance and repair work.
6. Leaks which were ignored.
7. Improper adjustment of safety devices.
8. Latent damage caused by accidents.
9. Extreme environmental conditions: Low or high temperatures,  
Aggressive ambient conditions,  
Dust and dirt.

## 5.4.2

### Proportion of theoretical service life used

The truck crane operator must perform a truck crane inspection at least once a year (ISO 9927-1 and BGV D 6 (VBG 9) / BGV D 8 (VBG 8)).

This includes determining the proportion of theoretical service life that has been used. If required, the truck crane operator has to appoint an approved inspector for this assessment.

The actual operating conditions (load spectrum) and the hoist operating hours must be determined for each inspection interval when determining the proportion of theoretical service life that has been used. The operator is responsible for proper documentation in the crane logbook.

**Determining the operating conditions (load spectrum)**

The truck crane's load spectrum is divided into groups (see also ISO 4301/1, FEM 1.001):



When determining the load spectrum, the existing rope pull is used as the standard, i.e. under certain circumstances, the truck crane can be supporting a small load, whereby the winch is actually supporting a heavy load, e.g. due to insufficient reeving. Therefore, the following graphic representation of the load spectrum refers to the winch's rope pulls.

Load spectrum class	Definition	Timing period proportions	Factor of the load spectrum $K_m =$	Graphic representation
<b>Light</b> Q 1 L 1	Power units or parts thereof that are subject to high stress in exceptional situations, but which are generally subject to only low stress	10% of the timing period with greatest load (dead load + 1/1 payload) 40% of the timing period with dead load + 1/3 payload 50% of the timing period with dead load only	0.125	
<b>Medium</b> Q 2 L 2	Power units or parts thereof that are subject to high stress quite frequently, but which are generally subject to only low stress	1/6 of the timing period with greatest load (dead load + 1/1 payload) 1/6 of the timing period with dead load + 2/3 payload 1/6 of the timing period with dead load + 1/3 payload 50% of the timing period with dead load only	0.25	
<b>Heavy</b> Q 3 L 3	Power units or parts thereof that are subject to high stress frequently and medium stress continuously	50% of the timing period with greatest load (dead load + 1/1 payload) 50% of the timing period with dead load only	0.5	
<b>Very heavy</b> Q 4 L 4	Power units or parts thereof that are regularly subjected to the highest stress from adjacent stress sources	90% of the timing period with greatest load (dead load + 1/1 payload) 10% of the timing period with dead load only	1	

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One of the load spectrums listed above should be selected on the basis of the actual operating conditions and entered in the crane logbook for the respective testing interval.

Note for truck cranes:

The load spectrum L1 and the load spectrum factor  $K_m = 0.125$  are generally applied to truck cranes in assembly mode.

### Determining the effective operating hours $T_i$

The effective winch operating hours must be entered in the crane logbook for the respective inspection interval.

- The effective winch operating hours  $T_i$  displayed in the *Operating hours submenu*;  *Operating manual*.

### Determining the proportion of theoretical service life used

For an inspection interval  $i$  (max. 1 year according to ISO 9927-1) or BGV D 6 (VBG 9) / BGV D 8 (VBG 8), the proportion of theoretical service life used  $S_i$  is calculated using the formula:

$$S_i = \frac{K_{m_i}}{K_m} \times T_i$$


$K_m$  = Load spectrum factor used as the basis for winch calculation. This factor is given in the operating manual.

$K_{m_i}$  = Load spectrum factor in inspection interval  $i$  in accordance with the section "Determining the operating conditions (Load spectrum)"

$T_i$  = Effective operating hours in the testing interval  $i$  as described in the section "Determining the actual operating hours  $T_i$ "

This used proportion is subtracted from the remaining theoretical service life  $D_i$  after every inspection interval (see example in the appendix to this chapter).

If the remaining theoretical service life is not sufficient for the next operating period, then a general overhaul of the winch must be performed.

If theoretical service life  $D$  has been reached ( *Theoretical service life*, p. 5 - 21), the winch must not be operated until after a general overhaul has been performed.

A general overhaul must always be performed at least once every 10 years after putting the truck crane into operation.



The general overhaul is to be arranged by the operator and performed by the manufacturer or a representative authorised by the manufacturer. The results are to be entered in the crane logbook.

The manufacturer or an authorised representative will specify a new theoretical service life D upon completion of the general overhaul.

The next general overhaul must be performed within 10 years at the latest.

**Alternative provision**

If, after 10 years, the theoretical service life has not been used up, the winch can continue to be operated without a general overhaul under the following conditions:

The crane inspector has confirmed that the used proportion of the service life is correct and proper by signing his/her name in the crane logbook after every expert inspection.

In this case, the crane inspector must closely inspect the winch. This includes at least:

- A visual examination of the exterior (for leaks, damage, deformation etc.)
- An oil inspection (especially for metallic residues)
- A load inspection with minimum and maximum rope pull and each at maximum possible speed. At least one layer must be wound. Investigate any unusual noises during the load inspection.

This inspection must be confirmed in the crane logbook by the approved crane inspector and there must be a statement on continued operation for the winch. The next inspection takes place before the end of the 12<sup>th</sup> year of operation and must be repeated every year thereafter.

### 5.4.3

### Example

A GMK5200-1 is equipped with a separate operating hours counter for the hoist and is classified by **Manitowoc Crane Group Germany GmbH** as follows:

<b>Power unit group:</b>	M3
<b>Load spectrum:</b>	Light L 1, $K_m = 0.125$
<b>Theoretical service life:</b>	$D = 3,200$ h

The used proportion  $S$  of theoretical service life is calculated based on the individual inspection intervals as follows:

1<sup>st</sup> inspection (1<sup>st</sup> year)

The truck crane was used for assembly work during the previous year:  
Load spectrum L 1, i.e.  $K_{m1} = 0.125$ .

The operating hours counter for the main hoist reads 160 h, i.e.  $T_1 = 160$  h.

The used proportion  $S_1$  of theoretical service life after the first inspection therefore is:

$$S_i = \frac{0.125}{0.125} \times 160 \text{ h} = 160 \text{ h}$$

Remaining theoretical service life:

$$D_1 = 3,200 \text{ h} - 160 \text{ h} = 3,040 \text{ h.}$$

The above values are entered in the table (see table example p. 5 - 28).

2<sup>nd</sup> inspection (2<sup>nd</sup> year)

The truck crane was used for unloading work on docks: Load spectrum:  
L 3, i.e.  $K_{m2} = 0.5$ .

The operating hours counter for the main hoist reads 640 h, i.e. during this period:  $640 \text{ hrs.} - 160 \text{ h} = 480 \text{ h}$  (160 h were used during the first year)  
 $T_2 = 480 \text{ h}$

The used proportion  $S_2$  of theoretical service life after the second inspection is therefore:

$$S_i = \frac{0.5}{0.125} \times 480 \text{ h} = 1,920 \text{ h}$$

Remaining theoretical service life:

$$D_2 = 3,040 \text{ h} - 1,920 \text{ h} = 1,120 \text{ h}.$$

The above values are entered in the table (see table example p. 5 - 28).

3<sup>rd</sup> inspection (3<sup>rd</sup> year)

The truck crane was used for assembly work and occasional unloading work on docks: Load spectrum: L 2, i.e.  $Km_3 = 0.25$ .

The operating hours counter for the main hoist reads 940 h, i.e. during this period:  $940 \text{ h} - 640 \text{ h} = 300 \text{ h}$ .  $T_3 = 300 \text{ h}$ .

The used proportion  $S_3$  of theoretical service life after the third inspection is therefore:

$$S_i = \frac{0.25}{0.125} \times 300 \text{ h} = 600 \text{ h}$$

Remaining theoretical service life:

$$D_3 = 1,120 \text{ h} - 600 \text{ h} = 520 \text{ h}.$$

The values are entered in the table (see table example p. 5 - 28).

The remaining theoretical service life is to be documented in a separate table for each winch.

This table is to be attached to the crane logbook. This table is to be found in the maintenance manual's appendix for truck cranes that do not require a crane logbook or similar documentation according to the regulations of the respective country.



**Sample table to determine the remaining theoretical service life on winch no. 1 (main hoist winch)**

Crane type: GMK 3045  
 Work number: 3045 42 06  
 First commissioned on: 10.06.1990  
 Serial number of the winch in accordance with the model plate: 13 301  
 Last general overhaul performed on: .....

Winch design data (see operating manual):  
 Engine group: M 3  
 Load spectrum: Q1 (L1)  
 Factor of the load spectrum: Km = 0.125  
 Theoretical service life: D = 3,200 h

Inspection interval no. (max. 1 year)	Date of first commissioning/date of inspection	Operating conditions since the last inspection	Factor of the load spectrum	Crane operating hours (complete)	Superstructure operating hours	Superstructure operating hours since the last inspection	Winch operating hours	Operating hours T <sub>i</sub> of the winch since the last inspection	Used proportion S <sub>i</sub> of the theoretical service life D:	Remaining theoretical service life D <sub>i</sub> = D <sub>i-1</sub> - S <sub>i</sub>	Name of the expert	Signature	Comment	Name of the approved inspector	Signature
0(*)	10. 6. 90	-	Km <sub>1</sub>	[h]	[h]	[h]	[h]	[h]	0	3,200					
1	5. 6. 91	L1	0.125	-	-	-	160	160	160	3,040	Müller				
2	20. 5. 92	L3	0.5	-	-	-	640	480	1,920	11,20	Huber				
3	18. 5. 93	L2	0.25	-	-	-	940	300	600	520	Schmitz				

**IMPORTANT:**  
**A general overhaul is to be performed every 10 years.**

For alternative provision, refer to section 5.4.2, p. 5 - 25.

General overhaul performed on.....

S<sub>i</sub> = Used proportion of theoretical service life since the last inspection  
 D<sub>i</sub> = Remaining theoretical service life  
 D<sub>i-1</sub> = Remaining theoretical service life after the previous inspection  
 Km = Load spectrum factor used as the basis for winch calculation.  
 This factor is given in the operating manual.  
 Km<sub>1</sub> = Load spectrum factor in inspection interval "i" according to section 2.1  
 T<sub>i</sub> = Effective operating hours in inspection interval "i" according to section 2.2  
 (\*) Copy the last line of the previous page to the following page.

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## 6 Lubricants and consumables

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# 6

## Lubricants and consumables

### 6.1

#### Lubricants

All lubricants that you require for

- *Maintenance work on the carrier*, p. 7 - 1 and
- *Maintenance work on the superstructure*, p. 8 - 1

are listed with serial numbers in the lubricants list and the lubricant applications list.

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▣▣▣▣▶ *Lubricant applications list*, p. 6 - 3.


















### 6.1.1

### Lubricants list





















Serial no.	GROVE part number	Lubricant type	Designation to DIN 51502	Specification classification	Viscosity
1	03329588	Engine oil	HD - CD	MIL-L 2104 C DB 228.5	SAE 5 W-30
2	04162043	Gear oil		Shell Spirax S6 ATF VM	
3	04162042	Gear oil		Fuchs Titan Cytrac MB Synth API-GL-4	SAE 75 W-90
4	00552891	Gear oil	C - LPF	MIL-L 2105 B API-GL-5	Hyp SAE 90 ISO - VG 220
5	01373344	Gear oil		MIL-L 2105 C API-GL-5	SHC 75 W-90
6	02310863	Gear oil		Rivolta S.K.D. 170	
7	02313611	Gear oil	C - LPF	MIL-L 2105 B API-GL-4/5 (synthetic)	SAE 75 W-90 EP ISO - VG 220
8	04162158	Hydraulic oil	HVLP	Castrol Hyspin AWH-M 32 DIN 51524-3	ISO-VG 32
9	03233369	Lubricating grease	KP - 1K - 50	DIN 51825 Renolit JP 1619	-50 °C to +120 °C (-58 °F to +248 °F)
10	00554205	Spray		Ceplattyn 300	
11	02314698	Slide paste		PAL 1	
12	03325215	Lubricating grease		RHUS SW 2	
13	01929824	Spray		Berulub spray	
14	03133770	Lubricating grease		Elaskon 30	



## 6.1.2 Lubricant applications list

Serial no.	Lubricant type	Usage	Filling quantity in litres (gal)	Maintenance interval
1	Engine oil	Diesel engine;  p. 7 - 24	39 (10.3)	Y 2
2	Gear oil	VIAB (Voith);  p. 7 - 43	11 (2.9)	Y 3
3	Gear oil	Transmission;  p. 7 - 46	17.5 (4.6)	Y 3
4	Gear oil	3 <sup>er</sup> axle line transfer case for drive 10 x 6;  p. 7 - 50	12.8 (3.4)	M 6
		3 <sup>er</sup> axle line transfer case for drive 10 x 8;  p. 7 - 50	14 (3.7)	M 6
		3 <sup>er</sup> axle line axle centre drive;  p. 7 - 63	14 (3.7)	M 12
		2 <sup>nd</sup> axle line axle centre drive;  p. 7 - 63	13.0 (3.5)	M 12
		5 <sup>th</sup> axle line axle centre drive;  p. 7 - 63	13.0 (3.5)	M 12
		4 <sup>th</sup> axle line axle centre drive;  p. 7 - 63	16.5 (4.4)	M 12
		6 or 8 x final drives;  p. 7 - 68	2.7 (0.7)	M 12
5	Gear oil	Angle gear;  p. 7 - 57	7.7 (2.0)	M 6
6	Gear oil	5 x suspension struts;  p. 7 - 89	1.5 (0.4) each	M 1
		5 x suspension struts;  p. 7 - 89	3.2 (0.84) each	M 1
7	Gear oil	2 x hoists;  p. 8 - 11	7 (1.8) each	M 12
		3 x slewing gears;  p. 8 - 19	0.9 (0.24) each	M 12
8	Hydraulic oil	Carrier hydraulic tank;  p. 7 - 111	200 (53)	M 12
		Superstructure hydraulic tank;  p. 8 - 44	980 (259)	M 12



Serial no.	Lubricant type	Usage	Filling quantity in litres (gal)	Maintenance interval
9	Lubricating grease	Carrier central lubrication;  p. 7 - 119		W
		Superstructure central lubrication;  p. 8 - 69		W
		Cardan shafts – transverse;  p. 7 - 70		M 1
		Cardan shafts – longitudinal;  p. 7 - 71		M 6
		Towbar coupling;  p. 7 - 135		M 1
		Outrigger beams;  p. 7 - 144		M 1
		Turntable lock;  p. 8 - 30		M 12
		Hook blocks;  p. 8 - 71		M 12
		Cab door hinges;  p. 7 - 145		M 12
		Carrier pins;  p. 7 - 146		M 12
		Superstructure pins;  p. 8 - 85		M 12
10	Spray	Slewing bearing gear teeth;  p. 8 - 25		M 6
11	Slide paste	Telescopic slide faces;  p. 8 - 48		M 3
12	Lubricating grease	Telescope locking pins;  p. 8 - 48		M 3
		Derricking cylinder piston rod;  p. 8 - 47		M 1
		Cab door rails;  p. 8 - 83		M 12
		Stair tread rails;  p. 8 - 84		M 12
13	Spray	Outrigger pads/cylinders;  p. 7 - 144		M 1
		Derricking cylinder piston rod;  p. 8 - 47		M 1
14	Lubricating grease	Lubricating the hoist ropes;  p. 8 - 55		M 3

## 6.2 Refrigerant

Refrigerant Designation	Usage	Quantity to be filled in kg (lbs)	Maintenance interval
Tetrafluoroethane (R134a) CAS no. 811-97-2 EC no. 212-377-0	Driver's cab air-conditioning system; ▶▶▶▶▶ p. 7 - 132 (Compressor oil: FUCHS SE 55)	1.0 (2.2)	M 12
	Crane cab air-conditioning system; ▶▶▶▶▶ p. 8 - 78 (Compressor oil: EMKARATE RL68H)	1 x 1.0 (2.2) or 2 x 0.95 (2,1)	M 12

## 6.3 Consumables

### 6.3.1 Fuel


The fuels that can be used, and their respective specifications, can be found in the *Engine manufacturer's documentation*.

- Also observe the **signs** on the diesel tank of the truck crane:  
"The **use of additives is not permitted** and can cause damage to the engine system."

### 6.3.2 Engine coolant admixtures

The specifications and admixture ratios can be found in the *Engine manufacturer's documentation*.

### 6.3.3 After-treatment of exhaust gases

Designation	Usage	Filling quantity in litres (gal)
DEF ( <b>Diesel Exhaust Fluid</b> ) <sup>1)</sup> <i>AdBlue</i> : GROVE part number: 03140555	AdBlue tank on the carrier;  p. 7 - 34	40 (10.5)

- <sup>1)</sup> DEF (**Diesel Exhaust Fluid**),  
Consumable for after-treatment of exhaust gases, e.g. *AdBlue*.  
For *AdBlue* there are registered trademarks of the following companies
- Kruse GmbH & Co KG
  - BASF SE
  - and of the Association of the Automotive Industry e. V.

### 6.3.4 Windscreen washing system admixtures

Commercial cleansers and antifreeze may be added to the windscreen washing water. Observe the application instructions on the packaging.

### 6.3.5 Fuel for crane cab heating system

Only if the truck crane is fitted with a separate tank for the auxiliary heater do you have the option of selecting whether to use the same fuel as in section 6.3.1 or to use EL heating oil.

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# 7

## Maintenance work on the carrier

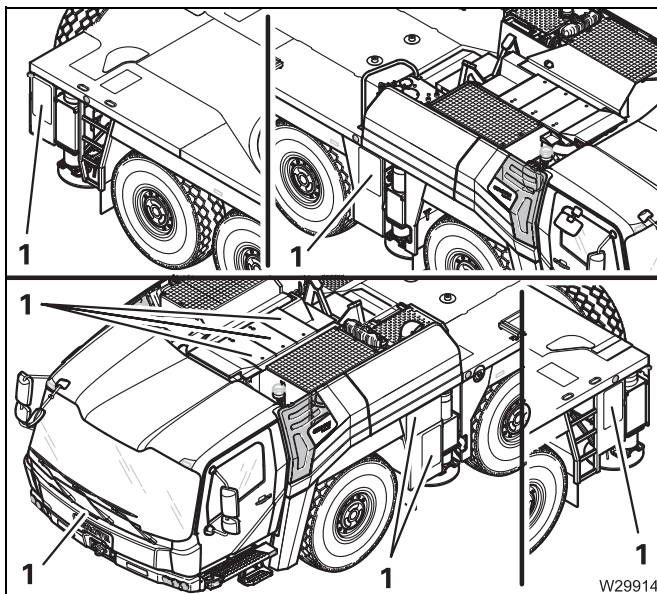
### 7.1

### General instructions

#### 7.1.1

#### Covers

Various types of work (e.g. oil change) require that the covers be removed.



#### Before maintenance work

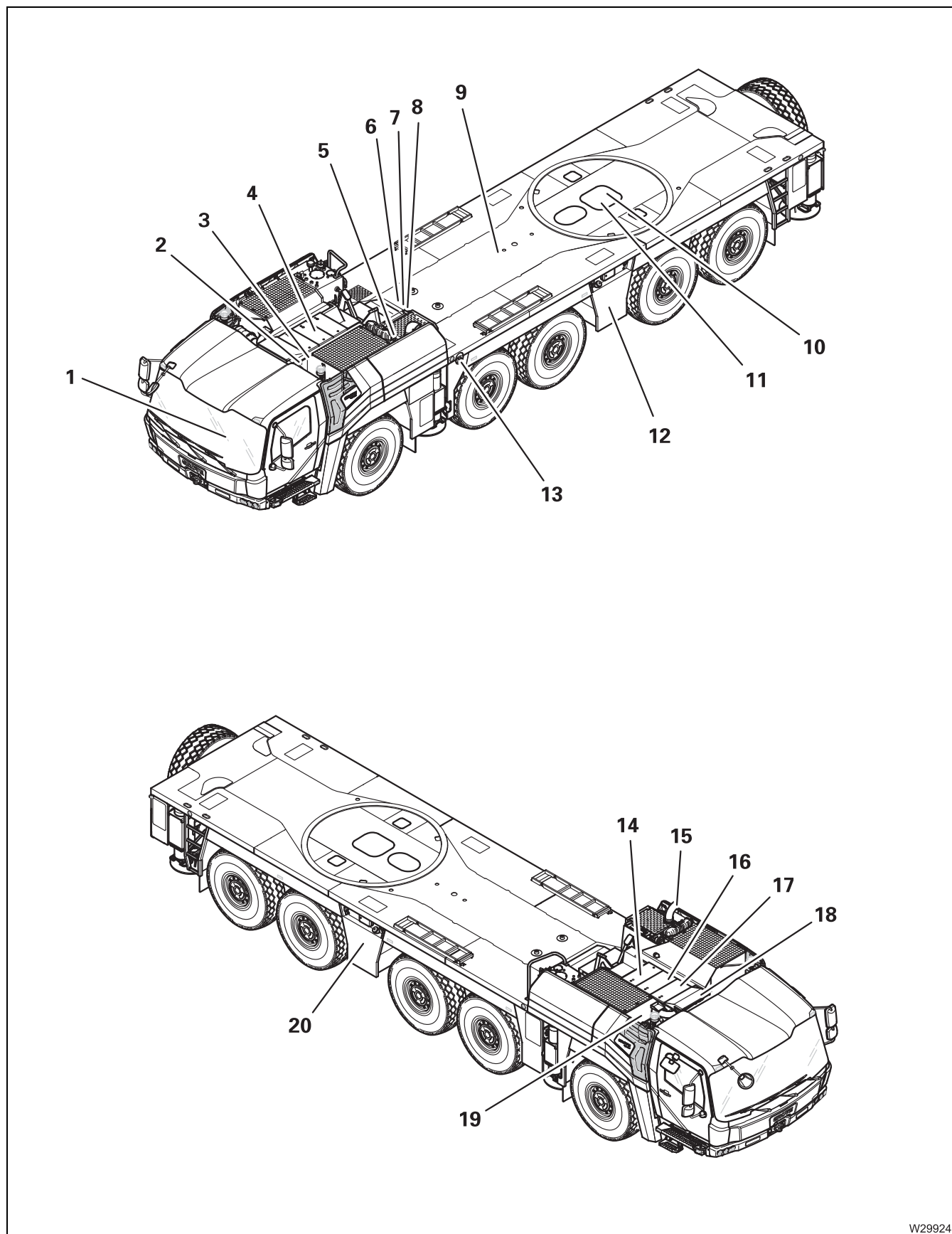
- Remove the covers (1).

#### After maintenance work

- Fasten the covers (1) with the locks.

### 7.1.2

### Overview of maintenance work on the carrier



W29924

09.03.2018

## Symbols for maintenance work

1 CCS (*Crane Control System*) control unit

▣▣▣▣ p. 7 - 9

▣▣▣▣ p. 7 - 9

## Engine

4 Diesel engine

▣▣▣▣ p. 7 - 11

▣▣▣▣ p. 7 - 11

14 Covers

▣▣▣▣ p. 7 - 1

2 Dipstick

▣▣▣▣ p. 7 - 11

3 Oil filler opening

▣▣▣▣ p. 7 - 13

19 Air filter

▣▣▣▣ p. 7 - 15

5 Coolant reservoir

▣▣▣▣ p. 7 - 16

18 Oil filter

▣▣▣▣ p. 7 - 24

## Fuel system

12 Left fuel tank

▣▣▣▣ p. 7 - 27

▣▣▣▣ p. 7 - 27

20 Right fuel tank

▣▣▣▣ p. 7 - 27

16 Filter 1

▣▣▣▣ p. 7 - 28

17 Filter 2

▣▣▣▣ p. 7 - 31

## Exhaust system with exhaust emission control

13 AdBlue tank

▣▣▣▣ p. 7 - 33

▣▣▣▣ p. 7 - 34

15 Exhaust silencer with SCR catalytic converter

▣▣▣▣ p. 7 - 35

## Transmission

6 VIAB oil-level plug

▣▣▣▣ p. 7 - 39

▣▣▣▣ p. 7 - 41

7 Transmission oil-level plug

▣▣▣▣ p. 7 - 42

8 Oil filter on the transmission

▣▣▣▣ p. 7 - 46

## Transfer case

9 Oil-level plug

▣▣▣▣ p. 7 - 49

▣▣▣▣ p. 7 - 49

## Angle gear

10 Oil-level plug

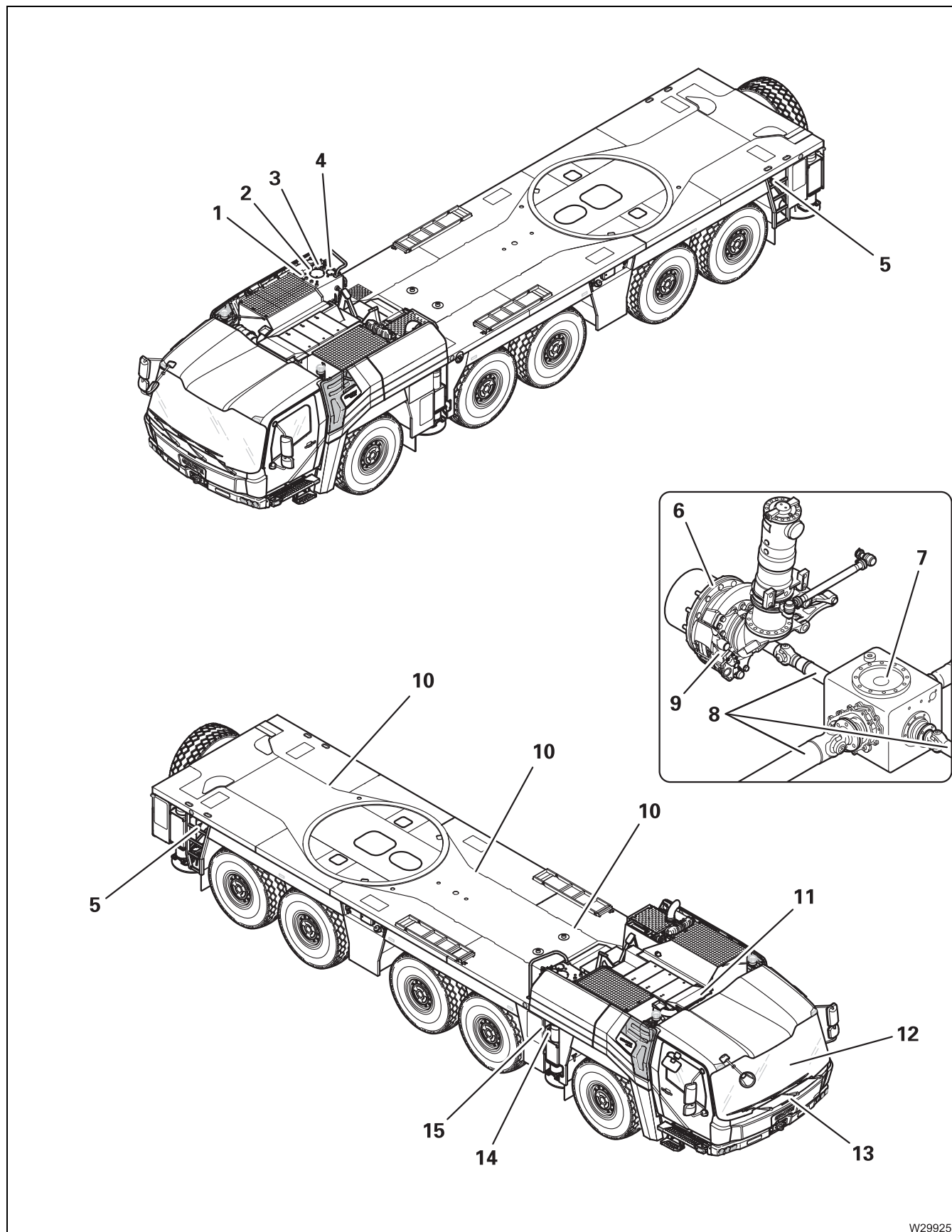
▣▣▣▣ p. 7 - 53

▣▣▣▣ p. 7 - 54

11 Filter

▣▣▣▣ p. 7 - 57



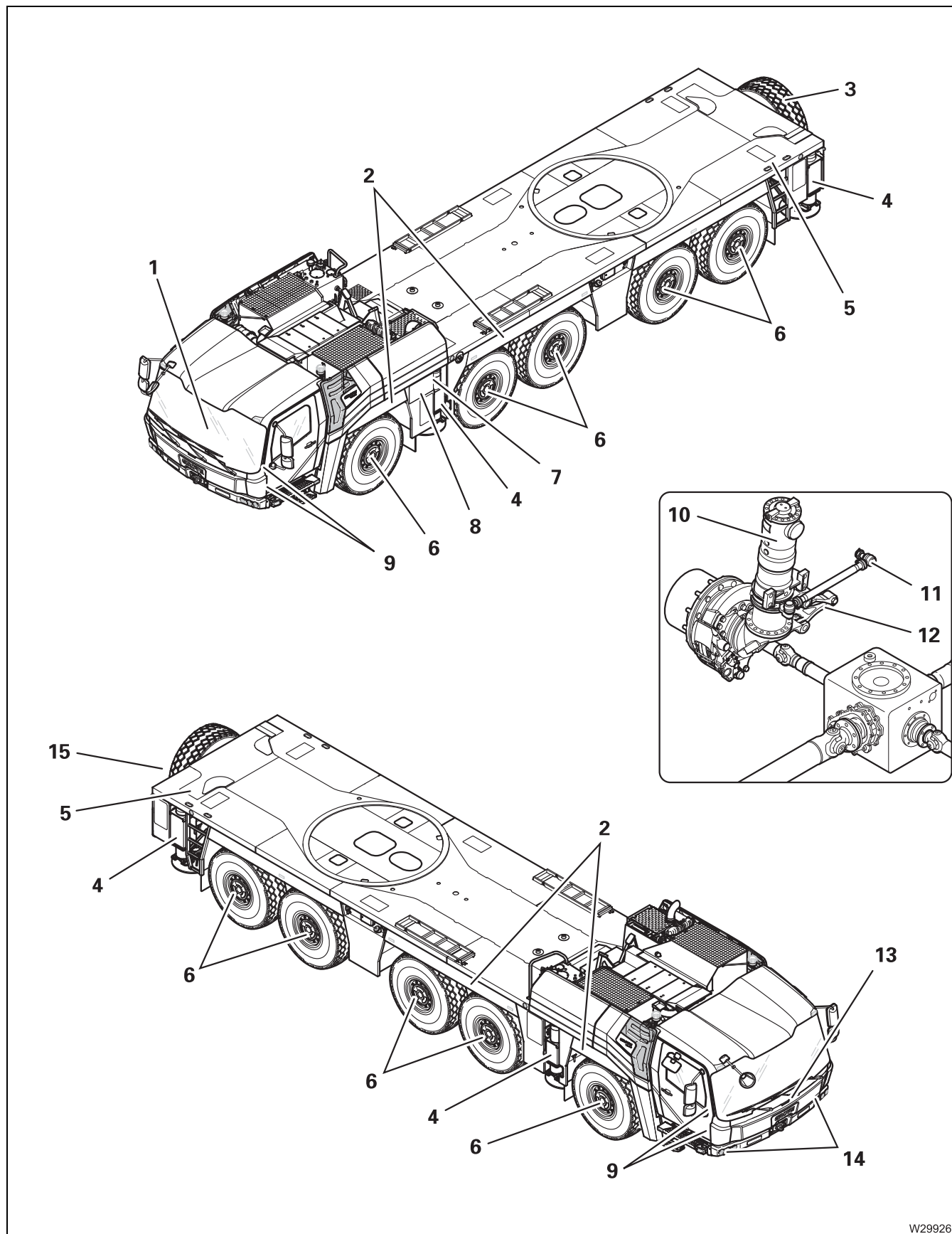


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<b>Axle lines</b>	▣▣▣▣▶ p. 7 - 61
7 Axle centre drives	▣▣▣▣▶ p. 7 - 61
6 Final drives	▣▣▣▣▶ p. 7 - 67
8 Cardan shafts	▣▣▣▣▶ p. 7 - 70
<b>Vehicle brake</b>	▣▣▣▣▶ p. 7 - 81
9 Disc brake	▣▣▣▣▶ p. 7 - 82
<b>Compressed air system</b>	▣▣▣▣▶ p. 7 - 97
10 Receptacle	▣▣▣▣▶ p. 7 - 97
14 Drier	▣▣▣▣▶ p. 7 - 99
<b>Hydraulic system</b>	▣▣▣▣▶ p. 7 - 101
1 Oil tank with inspection glass	▣▣▣▣▶ p. 7 - 101
2 Oil filters 1 and 2	▣▣▣▣▶ p. 7 - 115
5 Oil filters 3 and 4	▣▣▣▣▶ p. 7 - 115
3 Ventilation filter	▣▣▣▣▶ p. 7 - 105
4 Oil filler opening	▣▣▣▣▶ p. 7 - 111
<b>Central lubrication system</b>	▣▣▣▣▶ p. 7 - 119
15 Central lubrication pump	▣▣▣▣▶ p. 7 - 119
<b>Air conditioning system</b>	▣▣▣▣▶ p. 7 - 131
12 Air-conditioning system in the driver's cab	▣▣▣▣▶ p. 7 - 131
11 Condenser fins	▣▣▣▣▶ p. 7 - 132
13 Pollen filter	▣▣▣▣▶ p. 7 - 134





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<b>Wheels</b>	▣▣▣▣▶ p. 7 - 73
6 Wheels	▣▣▣▣▶ p. 7 - 73
3 Spare wheel (alternatively storage box)	
<b>Suspension</b>	▣▣▣▣▶ p. 7 - 89
10 Suspension struts	▣▣▣▣▶ p. 7 - 91
12 Forced lever	▣▣▣▣▶ p. 7 - 92
2 Pressure accumulator	▣▣▣▣▶ p. 7 - 93
<b>Steering</b>	▣▣▣▣▶ p. 7 - 95
11 Steering cylinder	▣▣▣▣▶ p. 7 - 95
5 Pressure accumulator	▣▣▣▣▶ p. 7 - 96
<b>Electrical system</b>	▣▣▣▣▶ p. 7 - 123
14 Carrier lighting	▣▣▣▣▶ p. 7 - 123
8 Battery box	▣▣▣▣▶ p. 7 - 124
7 External starting socket	▣▣▣▣▶ p. 7 - 129
<b>Towbar coupling</b>	▣▣▣▣▶ p. 7 - 135
15 Towbar coupling <sup>1)</sup>	▣▣▣▣▶ p. 7 - 135
<b>Other maintenance work</b>	▣▣▣▣▶ p. 7 - 143
13 Windscreen washing system receptacle	▣▣▣▣▶ p. 7 - 143
4 Outrigger beams	▣▣▣▣▶ p. 7 - 144
9 Cab door hinges	▣▣▣▣▶ p. 7 - 145
– Driver's cab auxiliary heater <sup>1)</sup>	▣▣▣▣▶ p. 7 - 145
– Various connecting pins and socket pins	▣▣▣▣▶ p. 7 - 146
– Corrosion protection	▣▣▣▣▶ p. 7 - 147
1 Fire extinguisher	▣▣▣▣▶ p. 7 - 149
1) <sup>1)</sup> Additional equipment	


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## 7.2

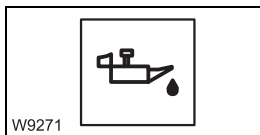
## Symbols for maintenance work


### CCS

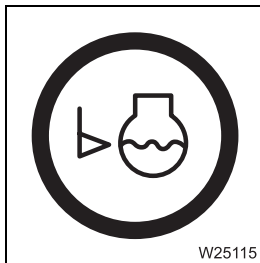
- Check the symbols on the *CCS* start menu (*Crane Control System*) in the driver's cab each day before starting work.
- The Start menu shows the most important measurements and the Maintenance submenu shows all the outstanding warning messages;  *Operating manual*.

### Maintenance submenu

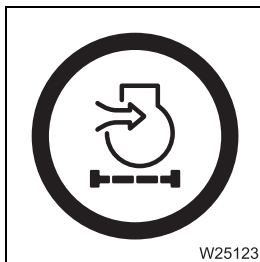
If one of the symbols is displayed, you must carry out the appropriate maintenance work:




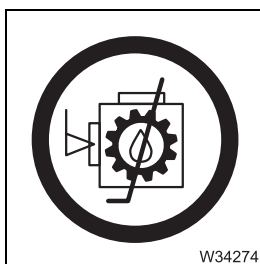
- Oil pressure;  p. 7 - 11,




- Coolant level;  p. 7 - 16,



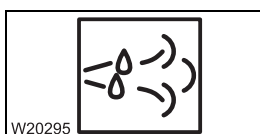
- Air filter;  p. 7 - 15,



- Angle gear;  p. 7 - 54,

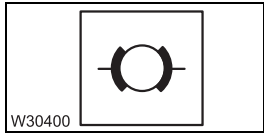



- Hydraulic oil filter;  p. 7 - 115,



- AdBlue system;  p. 7 - 34,






– Disc brakes wear display;  p. 7 - 81.

## 7.3

## Engine

- In addition, carry out the additional maintenance work as specified in the *Engine manufacturer's documentation* supplied with the vehicle.
- At the first oil change, fit a drain valve in place of the drain plug;  p. 7 - 14.

### 7.3.1

### Checking the oil level

D

#### Prerequisites

- The truck crane must be level.

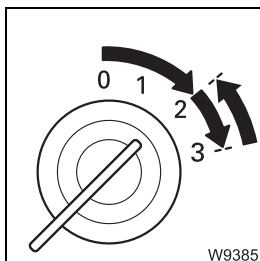
#### Checking the oil level

- Start the engine from the driver's cab;  *Operating manual*.

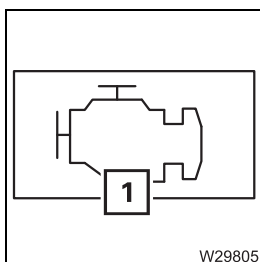


#### Risk of damage to the engine if the oil pressure is too low.

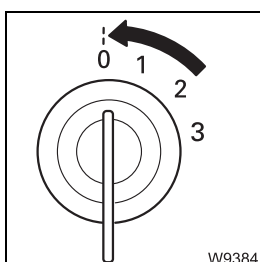
Switch off the engine immediately if the symbol (1) is displayed. The engine can be damaged by running it when the oil pressure is too low.



- Start the engine and watch the symbol (1).
- **Stop the engine immediately** if the symbol does not disappear after 10 seconds.  
If symbol (1) is displayed, the oil pressure is too low.

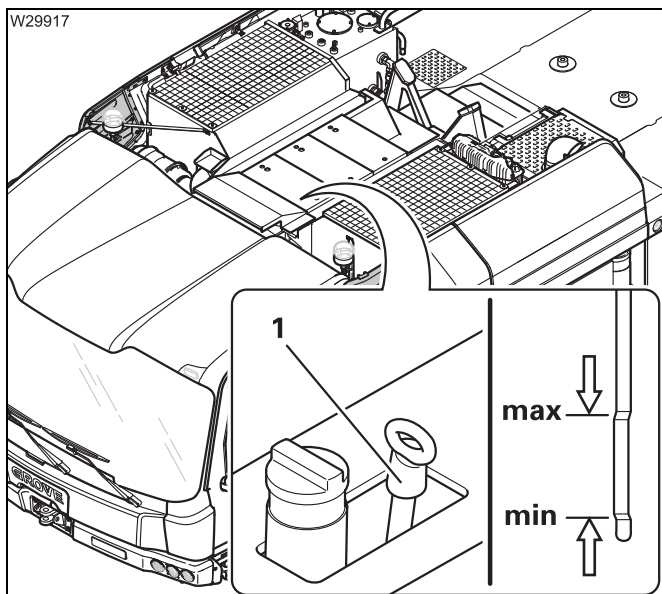


- Allow the engine to run at idling speed for 2 - 3 minutes.
- Switch off the engine.



- Check the oil level after approx. 2 minutes.






- On the dipstick (1), check that the oil level is between the **min.** and the **max.** marks (arrow markings).
- Put the dipstick into the dipstick tube after checking the oil level.

**If the oil level is too low**

- Top up the oil; ➡ p. 7 - 13.

## 7.3.2


### Topping up the oil

Data on the prescribed oil specification;  *Engine manufacturer's documentation.*

#### Oil

Engine oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
39 (10.3)	HD - CD	MIL-L 2104 C DB 228.5	SAE 5 W-30 03329588


#### Prerequisites

- The truck crane must be level.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Topping up the oil



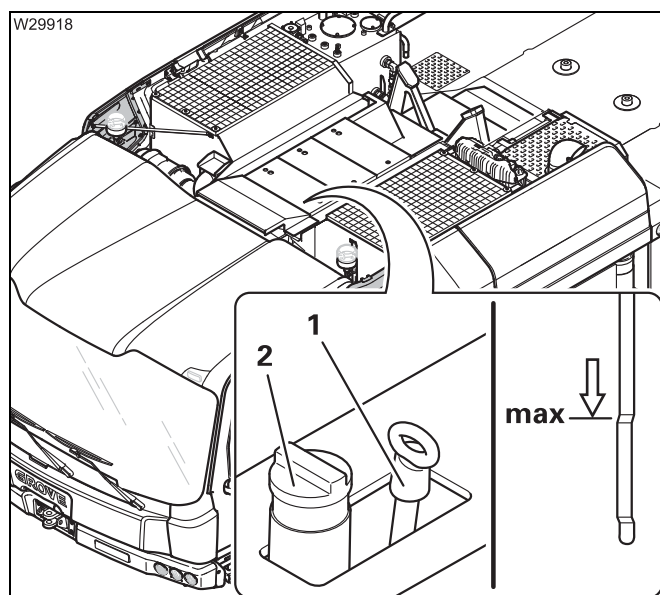
#### Risk of damage to the engine if the oil level is too high.

Do not overfill; the oil level must not be higher than the **max.** mark (arrow marking). Drain off oil if necessary;  *Engine manufacturer's documentation.*



#### Risk of burns when the engine is hot.

During operation, the engine and add-on parts reach temperatures up to 400 °C (750 °F). Wear appropriate protective gloves and be careful not to come into contact with hot parts.



- Add oil through the filler neck (2) up to the **max.** mark.
- Close the filler neck with the cap.
- Put the dipstick (1) into the dipstick tube after checking the oil level.

### 7.3.3

## Installing the drain valve

You can replace the drain plug on the oil pan with a valve.  
This makes it easier to check the draining oil during subsequent oil changes.

### Spare parts and tools

Designation	Quantity	GROVE part no.
Valve M 20 x 1.5	1	03041579
Gasket 20 x 24 Cu DIN 7603	1	00117139
<b>or:</b>		
Valve M 26 x 1.5	1	03046878
Gasket 26 x 31 Cu DIN 7603	1	00117147

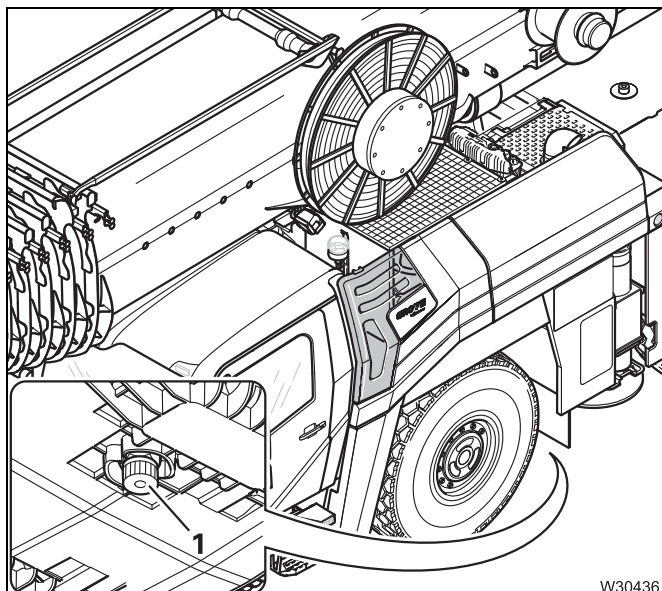
- Drain channel.
- Torque wrench for torque of 80 Nm (59 lbf ft).

### Prerequisites

- The truck crane must be level.
- The engine must be switched off and secured against unauthorised use;  
  - ▣▣▣▣ p. 2 - 3.

### Installing the valve

- Check the thread size (M 20 or M 26).



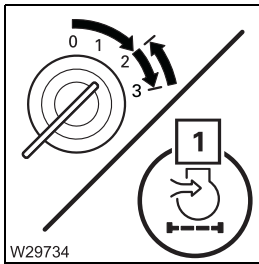
- Use a drain channel when draining the oil.
- Drain the engine oil as described in the *Engine manufacturer's documentation*.
- Fit a new gasket and tighten the valve (1).
  - M 20 Torque of 60 Nm (44.25 lbf ft)
  - M 26 Torque of 80 Nm (59.00 lbf ft)
- Check the valve for leaks after filling the oil.

For the next oil change, you can drain the oil as done for the hydraulic tank;  
▣▣▣▣ *Handling the valves*, p. 7 - 112.

### 7.3.4

## Checking the air filter

D




- Start the engine and observe the display.
- If the symbol (1) is displayed, you must change the air filter.
- Switch off the engine.

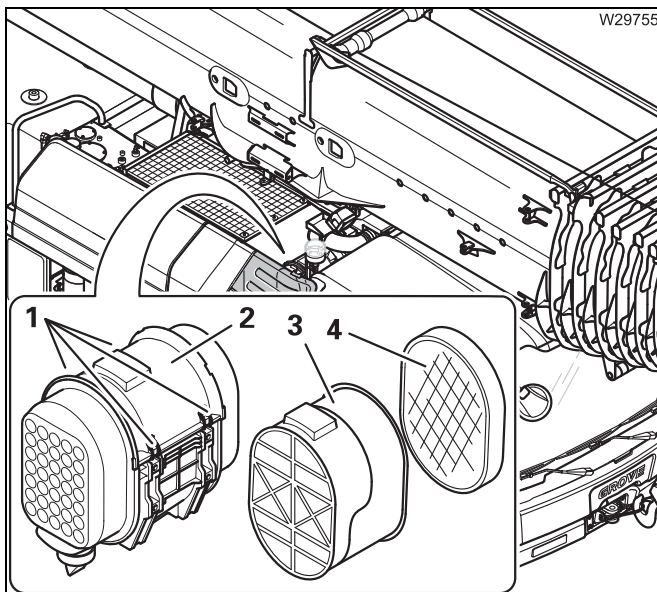
### Spare parts and tools

Designation	Quantity	GROVE part no.
Main filter	1	04161948
Back-up filter	1	04161949

### Prerequisites

- The engine must be switched off and secured against unauthorised use;  
 p. 2 - 3.

### Replacing the air filter

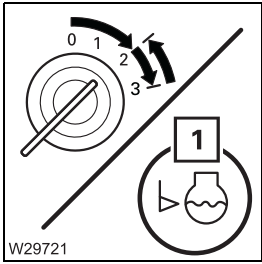


- Undo all the clamps (1) and remove the cover (2).
- Change the filters (3) and (4).
- Replace the cover and secure it with all the clamps.

### 7.3.5

## Checking the coolant level

D



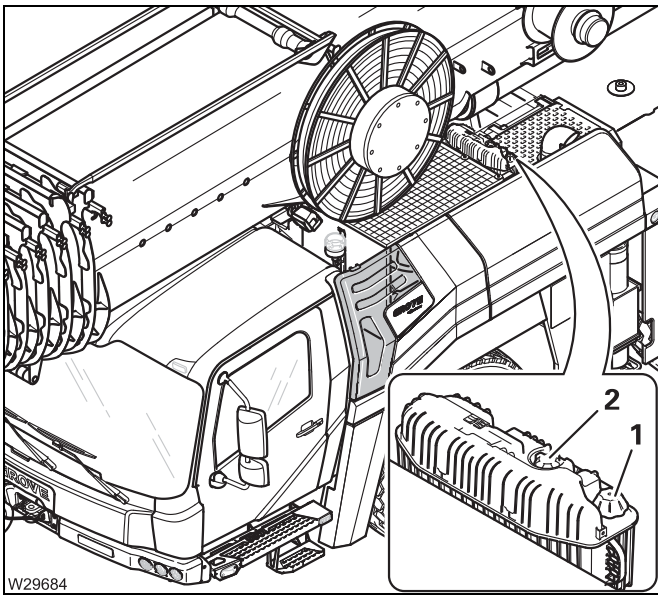
- Start the engine and monitor the display.
- When the symbol (1) is displayed you must top up the coolant.
- Switch off the engine.

### Topping up coolant



#### There is a danger of scalding if the cooling circuit is hot.

The hot cooling circuit is under pressure. When you open the expansion tank, you could be scalded by escaping steam/coolant. Wear suitable protective gloves and cover the cap on the expansion tank with a rag before opening it. Turn the cap slowly to the first detent in order to allow the pressure to be released.



- Do **not** open the pressure relief valve (2).
- Loosen (do not open) the cap (1) to reduce the pressure if the coolant is at operating temperature.
- Open the cap (1).  
The coolant level must be at the lower marking in the filler neck.

#### If the coolant level is too low

- Top up the coolant.  
Composition of the coolant; Engine manufacturer's documentation.
- Close the cap (1).



#### Risk of damage to engine due to lack of coolant.

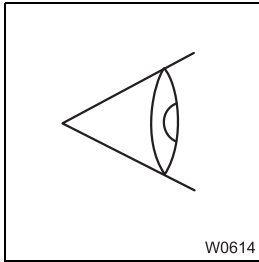
If the coolant has to be topped up frequently, the cooling system may be leaking. Have the cooling system checked by **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.



### 7.3.6

## General inspection

W



- Investigate any unusual running noises from the engine.
- Check the engine and the connections for leaks. If consumables are leaking;
  - ▣▣▣▣▶ *Checking the oil level*, p. 7 - 11,
  - ▣▣▣▣▶ *Checking the coolant level*, p. 7 - 16.
- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

## 7.3.7

## Have the radiator checked/cleaned

M 12

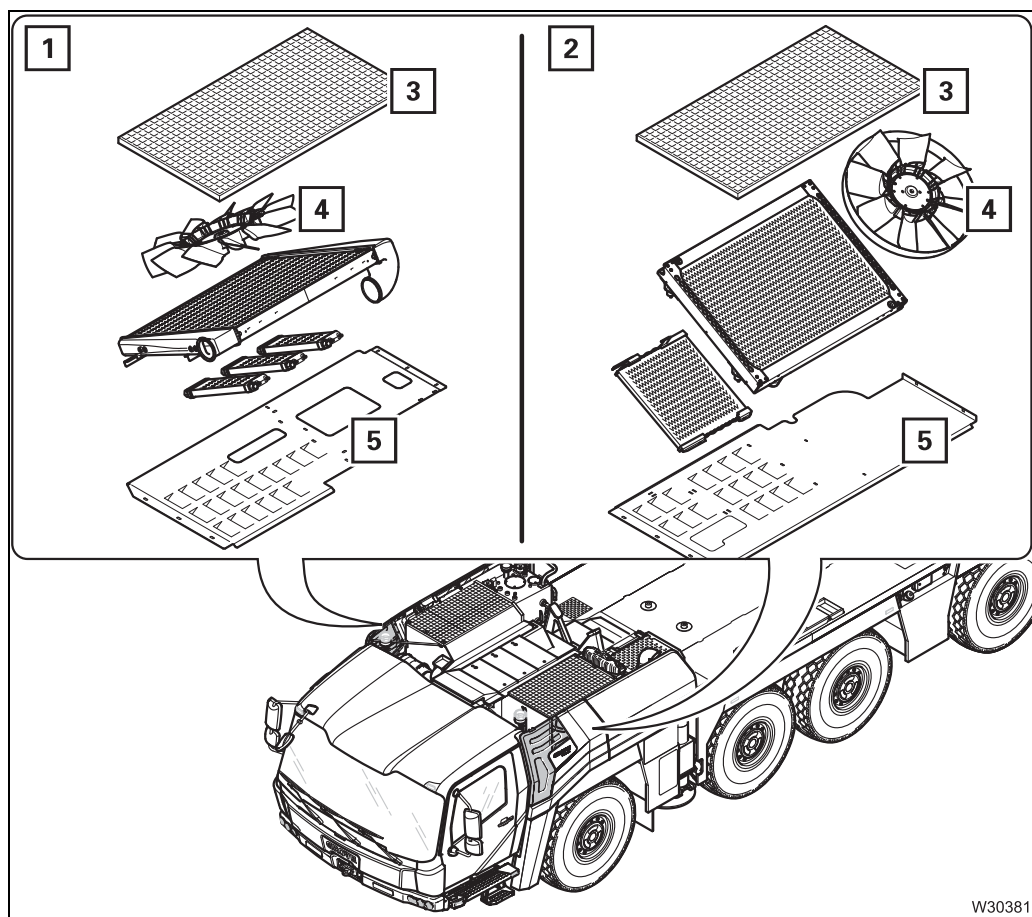
### Reducing the interval

- Under difficult operating conditions – at extremely sandy or dusty locations or if there is a heavy density of fallen leaves – you must have the radiator fins cleaned earlier than this.

### Prerequisites

- The truck crane must be supported on outriggers and must be level;   
    ▮▮▮▮ *Operating manual*.
- The main boom must be fully retracted and raised to 75°;   
    ▮▮▮▮ *Operating manual*.
- The engine must be switched off and secured against unauthorised use;   
    ▮▮▮▮ p. 2 - 3.
- The working area on the carrier above the engine covers and between the radiator units must be freely accessible.
- Trained repair specialists and repair tools must be available.

### Check the level of dirt



W30381

The two radiator units (1) and (2) are protected by grilles (3) and plates (5). The fan wheels (4) are located under the grilles. When the engine is running, the fan wheels rotate under the grilles!



**Risk of injury due to the fan wheels.**

When the fan wheels are rotating they can trap the fingers of your hand and amputate them. Never reach into the fan wheels when they are rotating. Do not push any tools through the grilles to clean them.

Always stop the engine before attempting to clean the fan wheels and radiator fins.

**Radiator unit 1 (right)**


Radiator for engine charge air, radiator for transmission gear oil, radiator for differential gear oil, radiator for compressed air system.

**Radiator unit 2 (left)**

Radiator for engine coolant, condenser for refrigerant for the driver's cab air-conditioning system.

- If necessary remove leaves, twigs and other debris from the grilles (3).
- View the fan wheels (4) through the grilles from above to check their condition. The impeller blades must be clean and undamaged.



If the radiator fins are heavily soiled have them cleaned, since further soiling can lead to overheating;  *Have them cleaned*, p. 7 - 20.

### Have them cleaned



#### **Risk of injury due to the fan wheels.**

When the fan wheels are rotating they can trap the fingers of your hand and amputate them. Never reach into the fan wheels when they are rotating. Do not push any tools through the grilles to clean them.

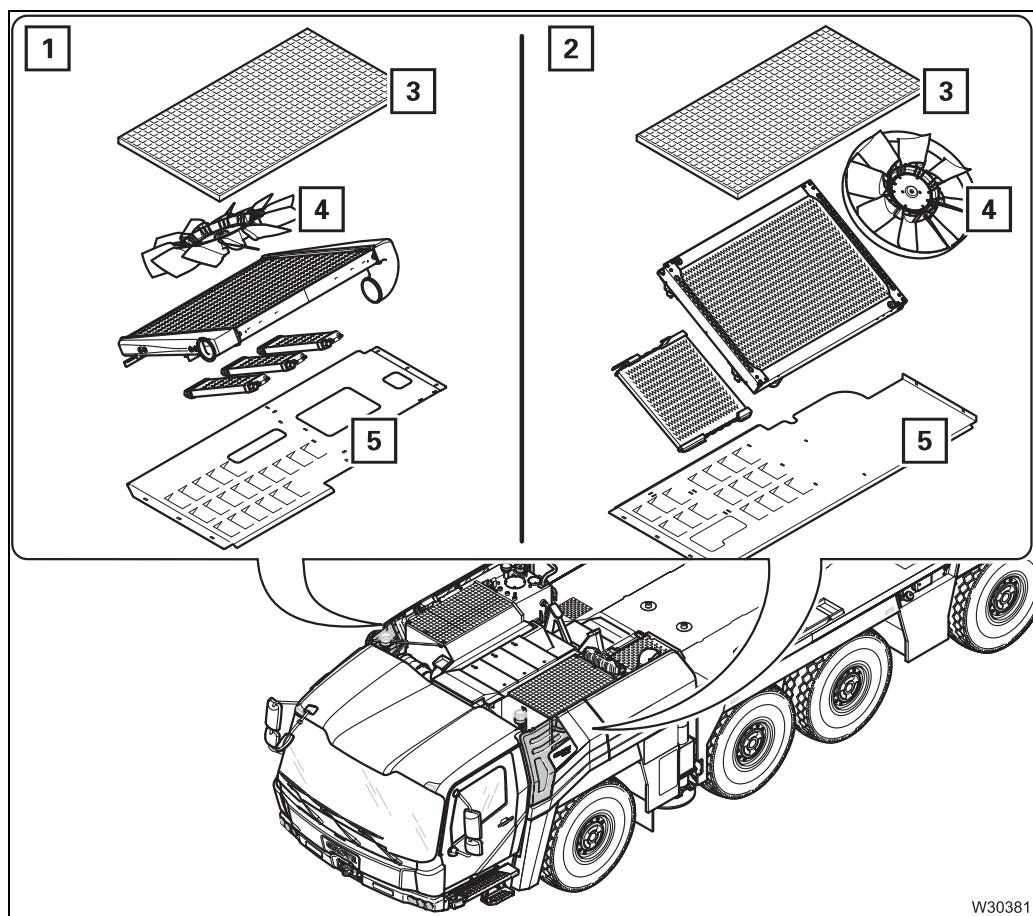
Always stop the engine before attempting to clean the fan wheels and radiator fins.



#### **Risk of damaging the radiator fins.**

Do not use a high pressure cleaner or steam jet cleaner. The powerful jet may damage the fins.

Use only suitable cleaning agents air for cleaning.



- Have the radiator units (1) and (2) opened up by the repair specialists, so that the radiator fins are accessible.
- Have the radiator fins cleaned on both sides, using suitable cleaning agents.
- Have the fan wheel (4) cleaned.
- Have the cooling air baffle (5) cleaned.
- Have the hoses and connections checked for damage and leaks.
- Have any damaged parts replaced.


**After checking/  
cleaning**

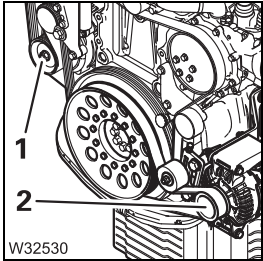
- Remove all tools and cleaning equipment.
- Check that all the grilles (3) and plates (5) are secure.
- Start the engine and wait until the fan wheels are rotating.
- Check that the fan wheels are running freely.
- Check the respective temperature displays in the driver's cab;  
    ▣▣▣▣► *Operating manual*.
- Switch off the engine.
- Check the radiator and connections for leaks.

### 7.3.8


### Check V-belt tension

M 12

- Note the  *Run-in regulations*, p. 4 - 1.



- Check whether your mobile crane is equipped with a second alternator (2).

The maintenance on the V-belt of the standard first alternator (1) is described in the supplied documentation;  *Engine manufacturer's documentation*.

#### Spare parts and tools

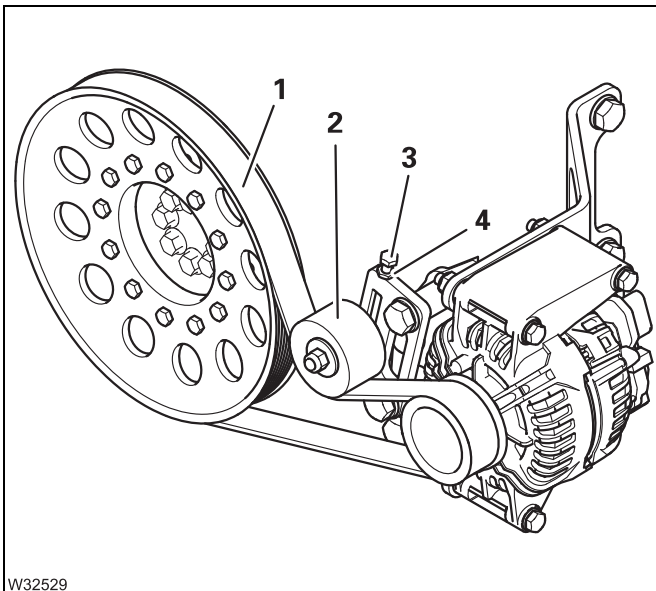
Designation	Quantity	GROVE part no.
V-belt	1	03301553

- Frequency measuring equipment, GROVE parts no. 04165439;  
new V-belt: frequency 102.8 Hz;  
used V-belt: frequency 90.2 Hz.


#### Prerequisites

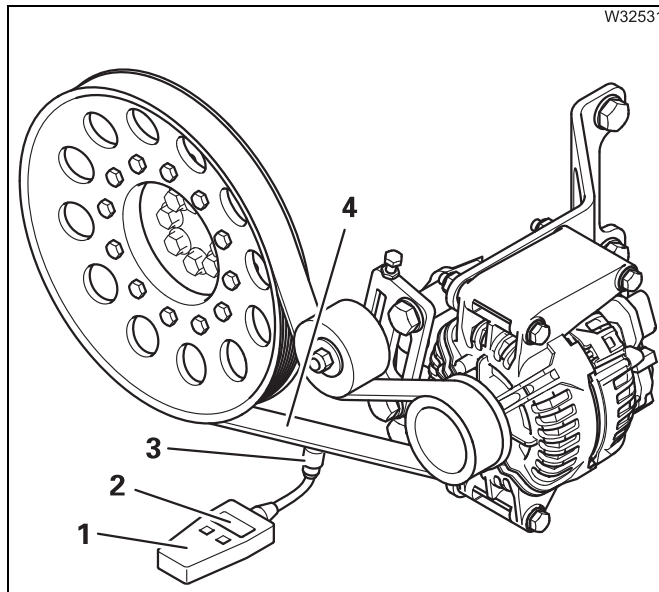
- The engine is not running and is secured against unauthorised use.

#### Checking



- Check the charge air cooling system (1) for dirt and damage.
- Install a new V-belt if required (1).
- Roughly set the initial tension with the tension tube (2). To do this, loosen the nuts (4) and turn the bolt (3) until you have achieved the desired initial tension. Secure the bolt (3) with the nut (4).

- Familiarise yourself with the correct operation of the frequency measuring equipment;  *Separate operating manual*.



- Turn on the frequency measuring equipment (1) – it is ready for acoustic measurement.
- Hold the measuring head (3) over the V-belt (4).
- Hit the V-belt (4) with an object (tool) so that it vibrates.
- Read the measured value on the display (2):  
new V-belt: 102.8 Hz;  
used V-belt: 90.2 Hz.

- Correct the initial tension on the tension tube (if required) until the prescribed measure value has been achieved.
- Check the tension on a **newly** installed V-belt **only** after **4 operating hours (oper. hrs.)** and after **24 operating hours (oper. hrs.)**.

## 7.3.9



## Changing the oil and oil filter

Y 2




Oil, spare parts,  
tools

Engine oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
39 (10.3)	HD - CD	MIL-L 2104 C DB 228.5	SAE 5 W-30 03329588

Designation	Quantity	GROVE part no.
Oil filter	1	04161614
Cover gasket	1	03328606
Gasket for oil drain plug	1	04161531

- Receptacle, approx. 40 l (11 gal);  p. 2 - 4.
- Torque wrench for torque of 55 Nm (40.5 lbf ft).
- Connecting piece and hose (tool box);  p. 7 - 112.

### Prerequisites

- Find out the prescribed oil specification and about the necessity of shortening the maintenance interval under special operating conditions;  *Engine manufacturer's documentation.*
- Find out about the safety instructions and the sequence of steps to change the oil and the oil filter;  *Engine manufacturer's documentation.*
- The truck crane must be level.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Changing



#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

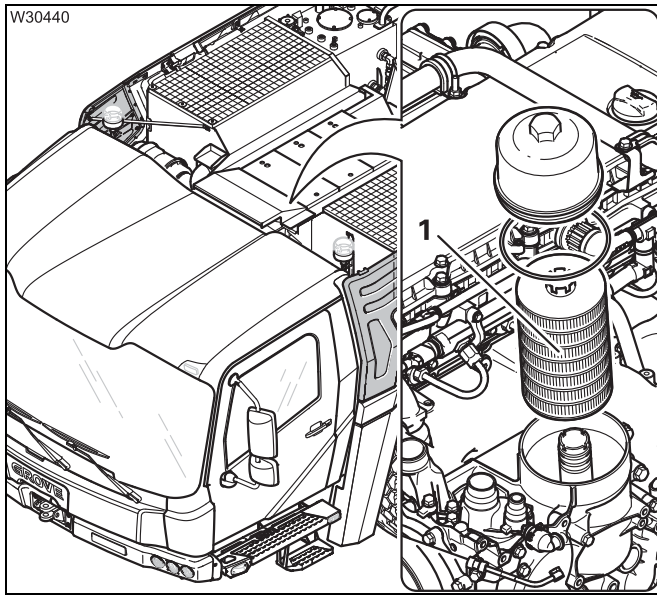
If a valve is already mounted on the oil pan:



#### **Risk of environmental damage due to leaking consumables.**

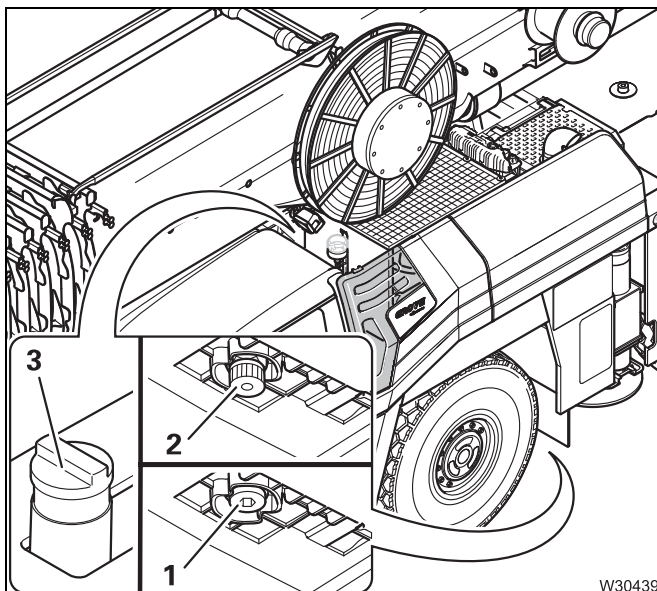
If a valve is mounted on the oil pan, use the delivered connecting piece with hose and a receptacle with adequate capacity to drain the oil.





### Oil filter

- Place a receptacle underneath the engine.
- Change the oil filter (1) using a socket wrench – torque 55 Nm (40.5 lbf ft);  
    ▣▣▣▣▣ *Engine manufacturer's documentation.*
- Leave the receptacle in place for the oil change.



### Draining oil

- Remove the drain plug (1) or screw the connecting piece with hose on the valve (2) and drain the oil into the receptacle; ▣▣▣▣▣ *Handling the valves*, p. 7 - 112.

If required, you may replace the drain plug with a valve; ▣▣▣▣▣ p. 7 - 14.

- Tighten the drain plug (1) – torques for M 20/ M 26; ▣▣▣▣▣ p. 7 - 14 or remove the connecting piece with hose from valve (2) and remove the receptacle.

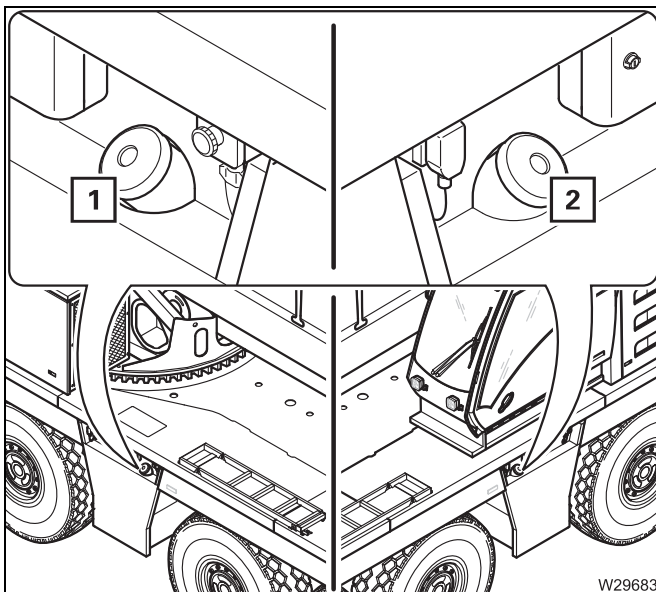
### Topping up oil

- Top up with fresh oil through the filler neck (3); ▣▣▣▣▣ p. 7 - 13.

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## 7.4

## Fuel system

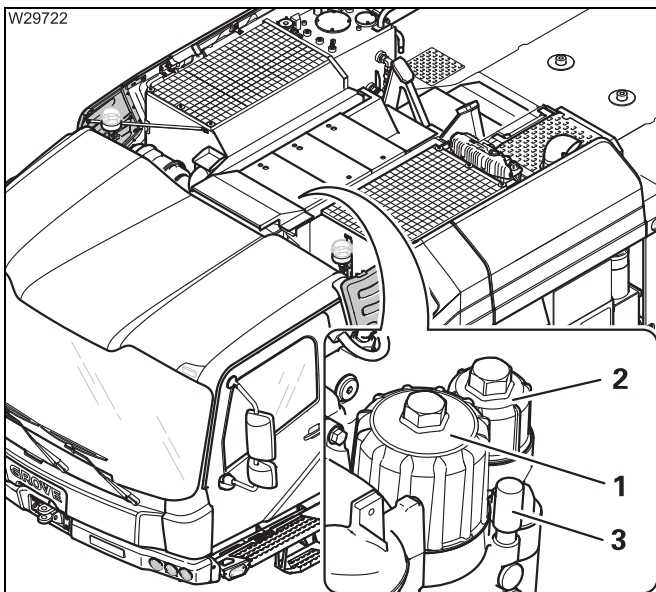


This section describes the maintenance work for the **standard fuel system** with two connected fuel tanks, (1) and (2), which may only be filled with a single type of fuel.

For **additional equipment** with a **dual tank system**, the fuel tanks, (1) and (2), are separate and are filled with different types of fuel;

▣▣▣▣► *Operating manual.*

- Obtain information from **Manitowoc Crane Care** on the additional fuel filter required for the dual tank system.



The following elements are installed as **standard** in the carrier fuel line:


- 1 Fuel filter 1 (large)
- 2 Fuel filter 2 (small)
- 3 Fuel hand pump

## 7.4.1




## Draining off water from fuel filter 1

D

### Spare parts and tools

- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

### Prerequisites

- The truck crane must be level and on outriggers;  *Operating manual*.
- The main boom must be fully raised;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Draining off water

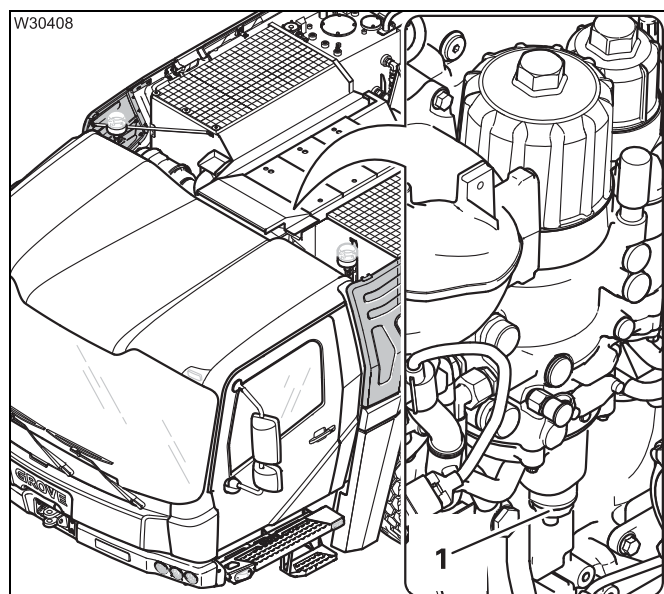


#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.



- Place a receptacle underneath the filter.
- Open the valve (1).
- If the consumable that emerges is clean, close the valve by hand.
- Remove the receptacle and properly dispose of the drained consumable.


## 7.4.2

## Replacing fuel filter 1




M 3

### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter (large)	1	04161567
<b>Alternatively:</b> Set of both filters 1 + 2 (large + small)	1	04180966

- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.
- Torque wrench for torque of 55 Nm (40.5 lbf ft).

### Prerequisites

- The truck crane must be level and on outriggers;  *Operating manual*.
- The main boom must be fully raised;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- If the fuel is contaminated: Reduce the maintenance interval.

### Changing

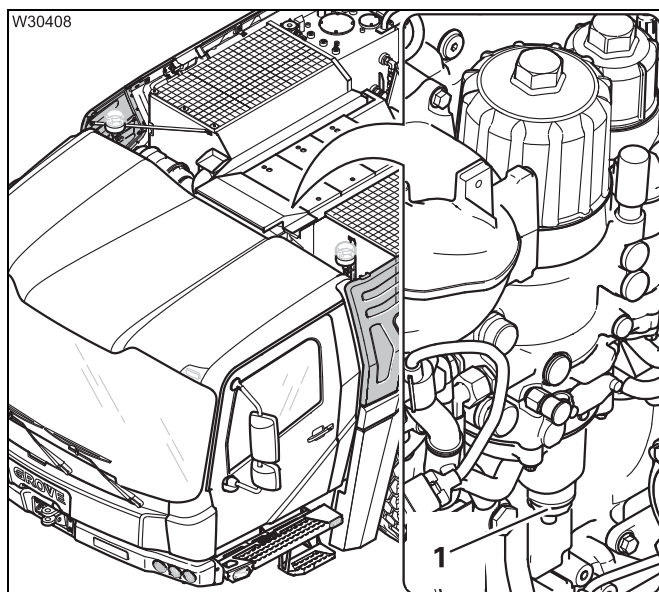


#### Risk of environmental damage due to leaking consumables.

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

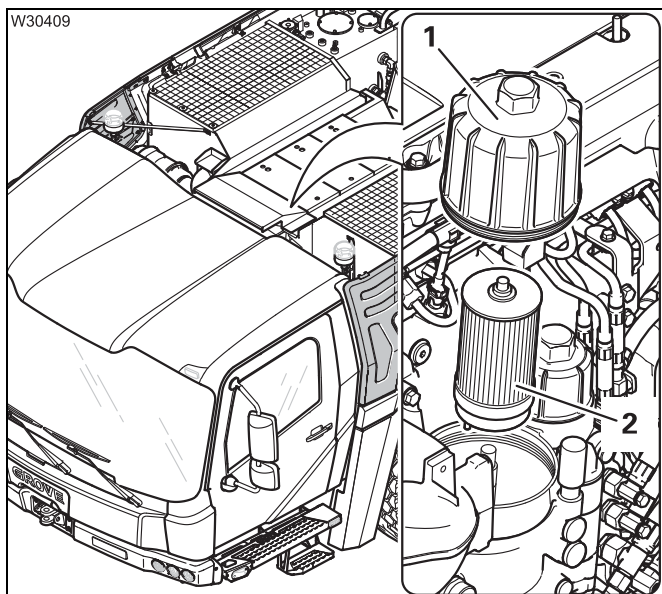
Store/dispose of consumables and any soaked equipment properly.


Ask about the applicable regulations.

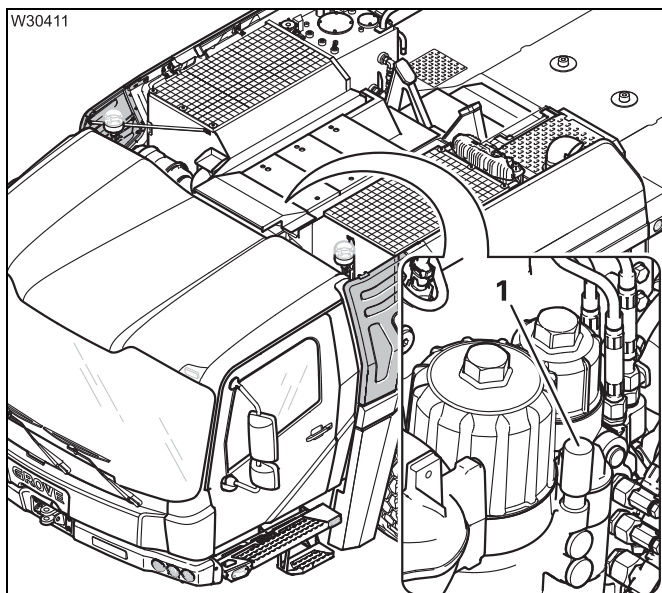



- Place a receptacle underneath the filter.
- Open the valve (1) and let the consumable drain out.





- Remove the cover (1).
- Remove the old filter (2) from the casing.
- Place the old filter (2) in the receptacle.
- Insert a new filter (2) into the casing.
- Attach the cover (1) – torque 55 Nm (40.5 lbf ft);  Engine manufacturer's documentation.
- Remove the receptacle.



- Open the two tank covers on the fuel tank;  p. 7 - 27.
- Operate the hand pump (1) until you sense definite resistance.
- Close the two tank covers on the fuel tank.
- Start the engine and check for leaks.

### 7.4.3

## Replacing fuel filter 2

M 12

### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter (small)	1	04161566
<b>Alternatively:</b> Set of both filters 1 + 2 (large + small)	1	04180966

- Receptacle, approx. 5 l (1.5 gal); p. 2 - 4.
- Torque wrench for torque of 15 Nm (11 lbf ft).

### Prerequisites

- The truck crane must be level and on outriggers; *Operating manual*.
- The main boom must be fully raised; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.
- The fuel must be drained from the fuel filter 1; p. 7 - 29.
- If the fuel is contaminated: Reduce the maintenance interval.

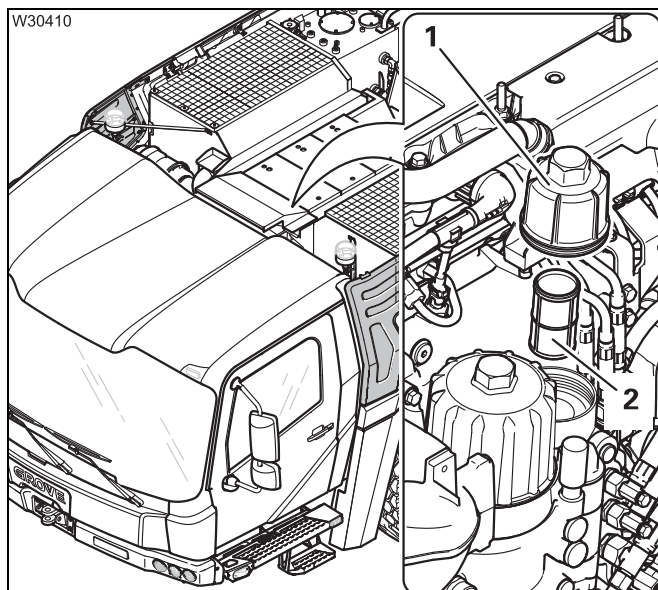
### Changing



#### Risk of environmental damage due to leaking consumables.

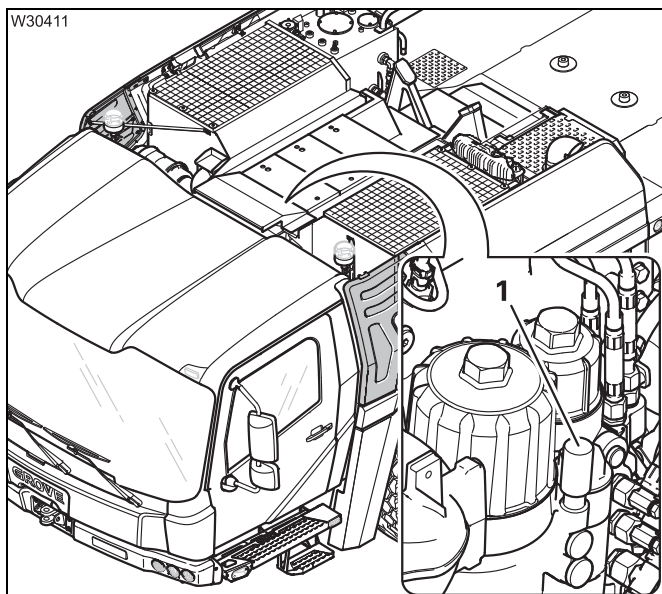
Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.



- Place a receptacle underneath the filter.
- Remove the cover (1).
- Remove the old filter (2) from the casing.
- Place the old filter (2) in the receptacle.
- Insert a new filter (2) into the casing.
- Attach the cover (1) – torque 15 Nm (11 lbf ft); *Engine manufacturer's documentation*.
- Remove the receptacle.





- Open the two tank covers on the fuel tank;  
    ▣▶ p. 7 - 27.
- Operate the hand pump (1) until you sense definite resistance.
- Close the two tank covers on the fuel tank.
- Start the engine and check for leaks.





## 7.5

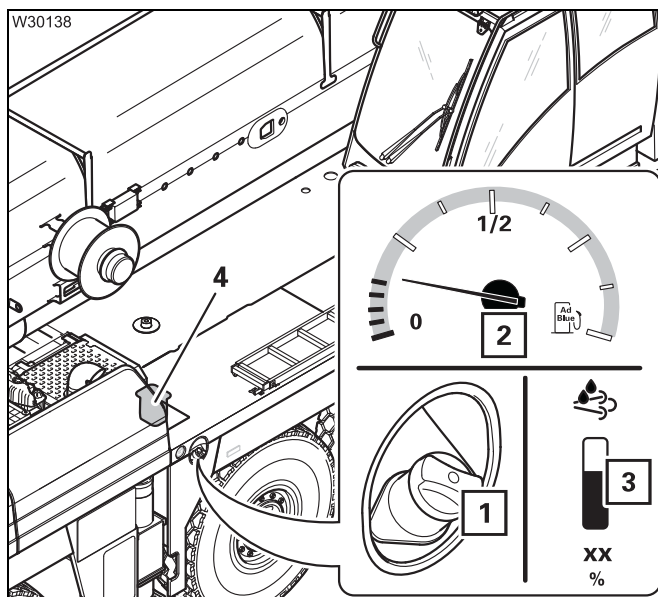
## Exhaust system with exhaust emission control

### Overview

To comply with the exhaust emission regulations, the truck crane may only be run with the **exhaust system with SCR catalytic converter (SCR = Selective Catalytic Reduction)**.

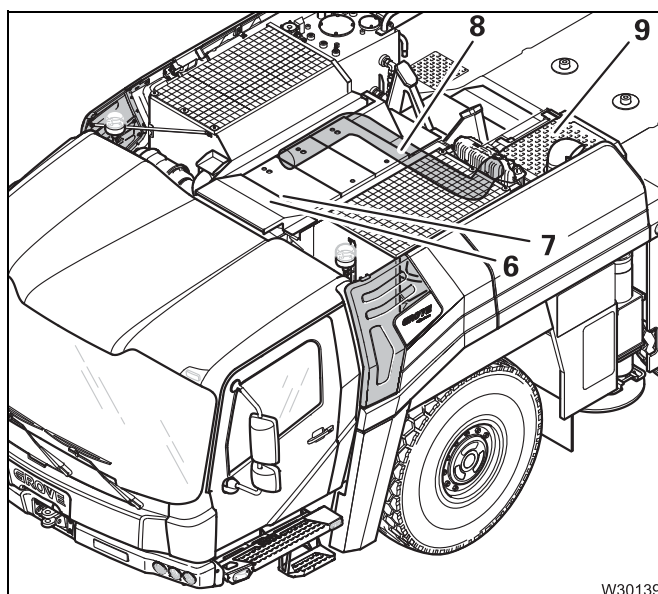
The exhaust gas is cleaned with an **AdBlue system (DEF)**. To do this, **AdBlue (DEF) (Diesel Exhaust Fluid)** from the AdBlue tank is injected into the exhaust system.

The motor output is automatically sharply reduced when there is not enough AdBlue solution available. Driving with an empty AdBlue tank will invalidate the truck crane's licence for use on public roads;  *Operating manual*,  *Engine manufacturer's documentation*.



### AdBlue system

- 1 AdBlue tank
- 4 Pump unit for pumping AdBlue to the dosing unit on the diesel engine and for pumping engine coolant for preheating the AdBlue tank.
- 2 Tank level gauge, AdBlue tank
- 3 Tank level gauge, AdBlue tank with warning symbol
- 6 Diesel engine with dosing unit for AdBlue (compressed air supply) and a solenoid valve for preheating the AdBlue tank using engine coolant.
- 7 Injection nozzle for injecting the AdBlue/compressed air mixture.
- 8 Exhaust pipes
- 9 Exhaust silencer with SCR catalytic converter



## 7.5.1

### Checking the AdBlue tank level

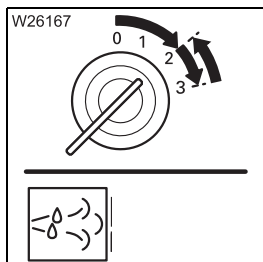
D

#### Check the following

The display includes a gauge showing the level in the AdBlue tank.



The tank has a maximum filling volume of approx. 40 l (10.5 gal). Depending on where the truck crane is used, it may be sensible to carry additional canisters of AdBlue.



- Start the engine and check the gauge after the engine starts; p. 7 - 35.
- Refill with AdBlue before the tank becomes empty.

## 7.5.2

### Filling up with AdBlue

#### Consumable and tools

AdBlue in litres (gal)	Specification Classification	GROVE part no.
40 (10.5)	DEF (Diesel Exhaust Fluid); e.g. <i>AdBlue</i> .	03140555

- As required: Two canisters of approx. 20 l each (5 gal); p. 2 - 4.

#### Prerequisites

- A service station with a filling pump for AdBlue can be used, or AdBlue can be filled manually from canisters.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

### Filling up

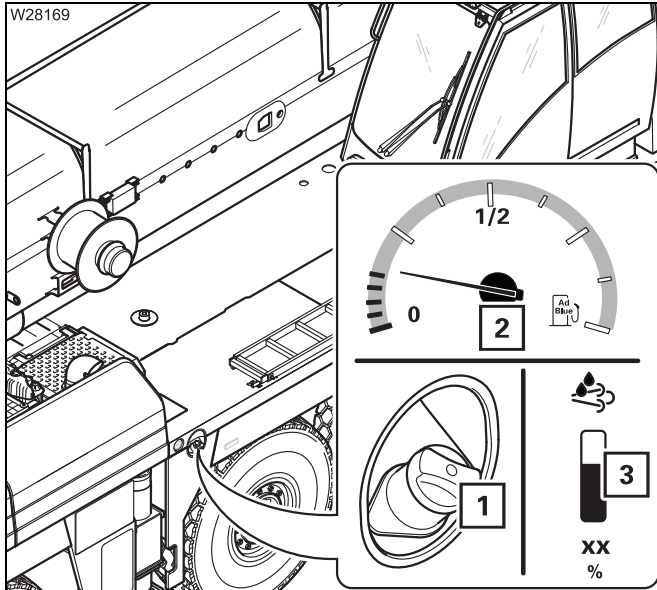
- Find out about filling up in the operating manual and note the warnings;  
    ▮▮▮▮ *Operating manual.*



#### **Danger of scalding due to ammonia vapours.**

Ammonia vapour can escape if the AdBlue tank is opened when the outside temperature is high. Ammonia vapours can irritate mucous membranes, skin and eyes.

Ensure that there is adequate fresh air supply and do not breathe in the escaping ammonia vapours.



- Fill the AdBlue tank via the filler neck (1) and close it using the cap.
- Check the level on the gauges (2) and (3) in the driver's cab; ▮▮▮▮ p. 7 - 34.

## 7.5.3

### Check the exhaust system for external damage

**M 1**

#### Spare parts and tools

Designation	Quantity	GROVE part no.
Exhaust silencer with <b>SCR</b> catalytic converter ( <b>SCR</b> = <b>S</b> elective <b>C</b> atalytic <b>R</b> eduction) (with diesel particulate filter)	1	03140048

#### Prerequisites

- The engine must be switched off and secured against unauthorised use;  
    ▮▮▮▮ p. 2 - 3.
- The engine and the exhaust system must be cool.

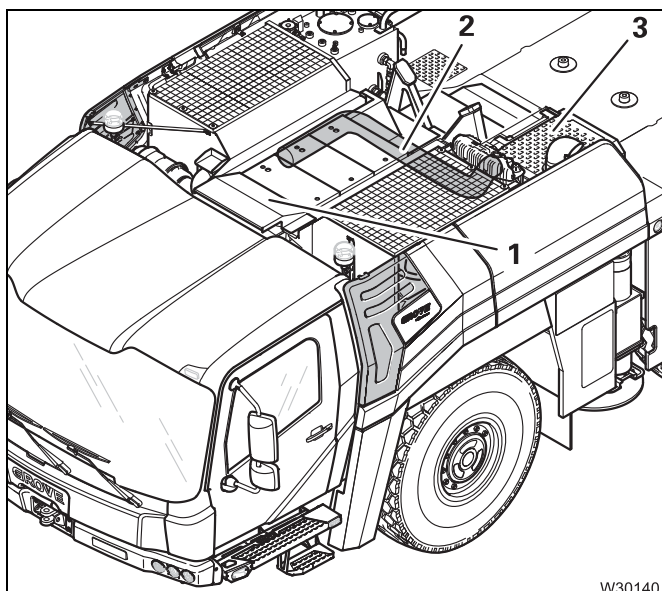


**Check the following**



**Risk of burns if the exhaust system is hot.**

During operation, the exhaust system heats up to 400 °C (750 °F). Wear suitable gloves and wait until the exhaust system has cooled down. Make sure not to touch any hot parts.



- Check the exhaust pipes (2) from the engine (1) to the silencer (3) for damage. The exhaust pipes (2) may not have any holes or cracks.
- Check that the area around the exhaust pipes is free of loose components which could burn by coming into contact with the hot exhaust system.
- Check the filler neck for injecting AdBlue for external damage.

**After checking**

- Start the engine.
- Check the AdBlue system gauge on the display in the driver's cab;  
    ▶ p. 7 - 34.
- Monitor, if exhaust gases leak from possibly damaged places in the exhaust system.
- Switch off the engine.

**If you discover any damage**

Have any damaged parts of the exhaust system replaced immediately by **Manitowoc Crane Care** or an authorised GROVE dealer.

## 7.5.4

### Having the AdBlue system checked

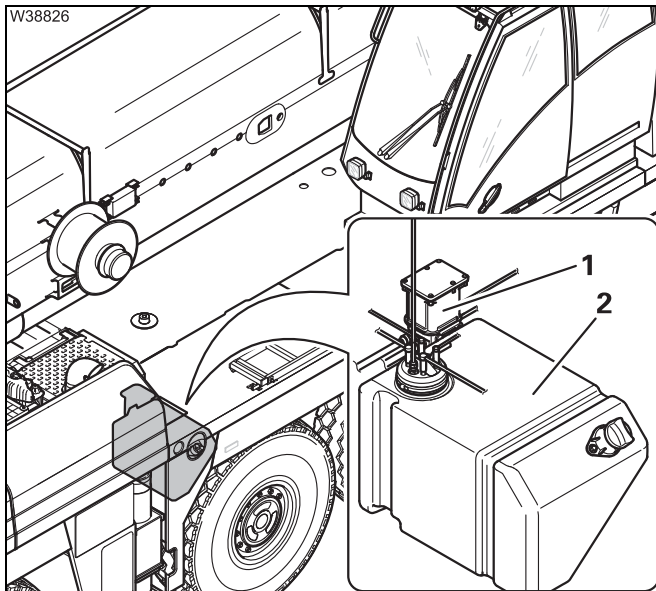
**M 12**

This inspection may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

- Have the entire AdBlue system checked for leaks and proper functioning;  
    ▣▣▣▣► *Overview, p. 7 - 33.*
- Also observe the information on the components mounted on the engine;  
    ▣▣▣▣► *Engine manufacturer's documentation:*
  - AdBlue dosing unit,
  - Solenoid valve for engine coolant for preheating the AdBlue tank.

#### Maintenance interval for the pump unit

The engine manufacturer specifies additional maintenance intervals for the pump unit (1); ▣▣▣▣► *Engine manufacturer's documentation.*



#### AdBlue filter

- Have the AdBlue filter in the pump unit (1) changed:
  - For the first time after one year (**M 12**),
  - after that, every two years (**Y 2**).

#### Pressure accumulator

- Have the pressure accumulator in the pump unit (1) filled:
  - For the first time after one year (**M 12**),
  - after that, every two years (**Y 2**).


- Have the insulation hood (2) checked for damage and for tight fitting on the AdBlue tank. The insulation hood prevents the AdBlue tank freezing up.
- Have the electrically heated AdBlue lines at the pump unit (1) checked for correct operation.





**Risk of damage to the pump unit.**

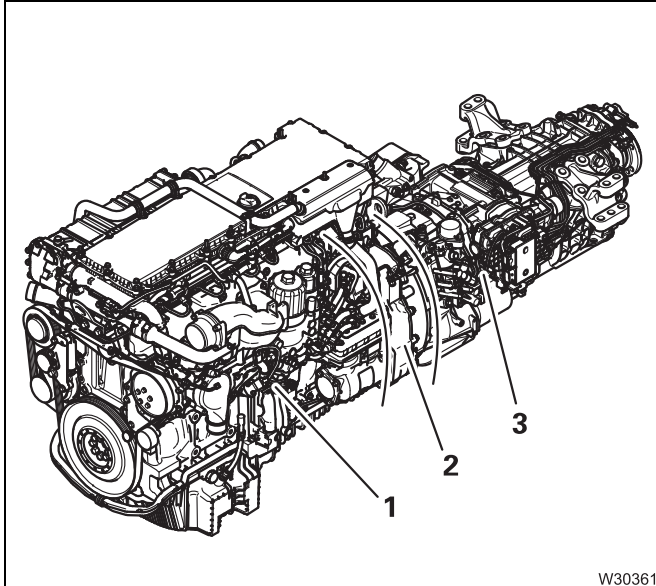
Oil from the compressed air system can damage the pump unit. Therefore, a filter cartridge must be installed in the compressed air drier that removes both water and oil. **Manitowoc Crane Care** recommends the suitable filter cartridge with the GROVE part number 04157844.

- Use only the suitable filter cartridge;  *Replacing the filter cartridge of the compressed air drier, p. 7 - 99.*

## 7.6

## Transmission

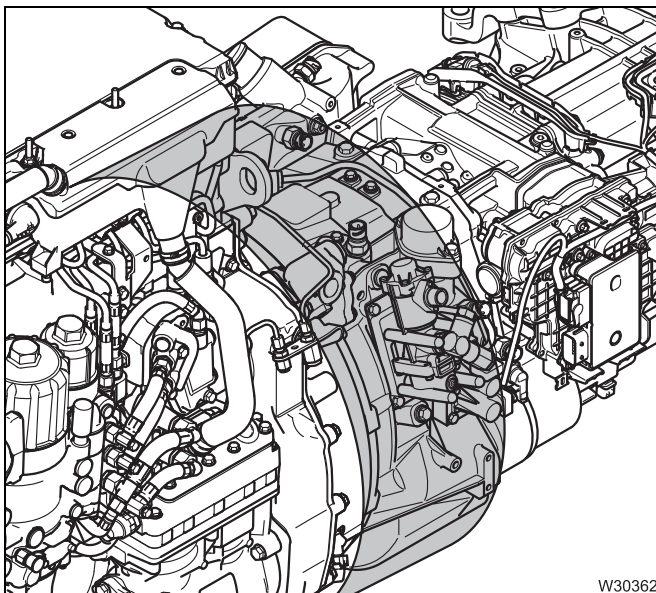
### Overview



W30361

### Engine-transmission unit

- Diesel engine (1),
- VIAB (2),
- Transmission (3).




W30362

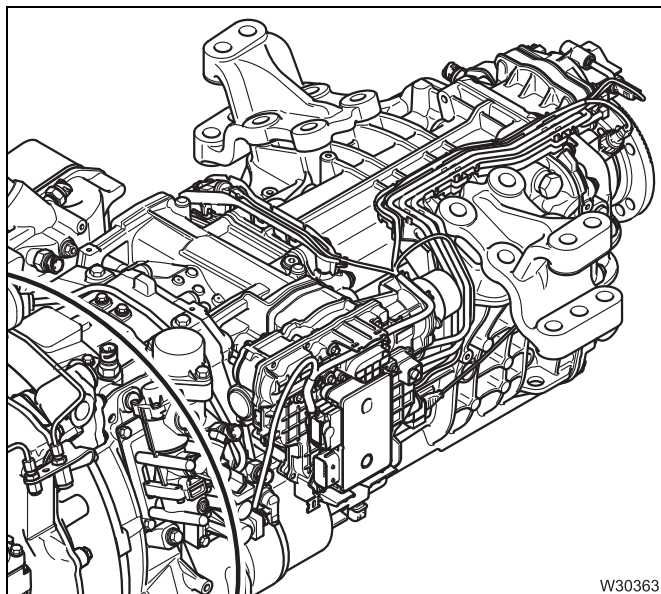
### VIAB

**VIAB** is the abbreviation for: **V**erschleiß**f**reies **I**ntegriertes **A**nfahr- und **B**remssystem (wear-free integrated starting and braking system).

The VIAB is an oil-filled clutch which permits starting and braking and delicate manoeuvring.

Therefore the VIAB has its own oil supply and is filled with a special grade of oil;  *Checking the VIAB oil level, p. 7 - 41.*





## Transmission

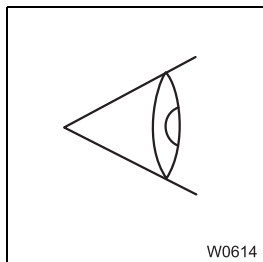
The automatic transmission has 16 speeds and the type designation G 280-16.

The transmission has its own oil supply and is filled with a special grade of oil, different from the one used by the VIAB; ■■■► *Checking the transmission oil level*, p. 7 - 42.

### 7.6.1

## General inspection

W



- Investigate any unusual running noises from the VIAB or transmission.
- Check the transmission and the connections for leaks. If consumables are leaking;
  - *Checking the VIAB oil level*, p. 7 - 41,
  - *Checking the transmission oil level*, p. 7 - 42.

- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.




## 7.6.2

## Checking the VIAB oil level


**M 12**

### Spare parts and tools

Designation	Quantity	GROVE part no.
Gasket 24 x 29 Cu DIN 7603	1	00117145

- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.
- Torque wrench for torque of 25 Nm (18.4 lbf ft).

### Prerequisites

- The transmission oil must have an operating temperature of at least 60 °C (140 °F)).
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The truck crane must not running and secured against unauthorised use;  p. 2 - 3.

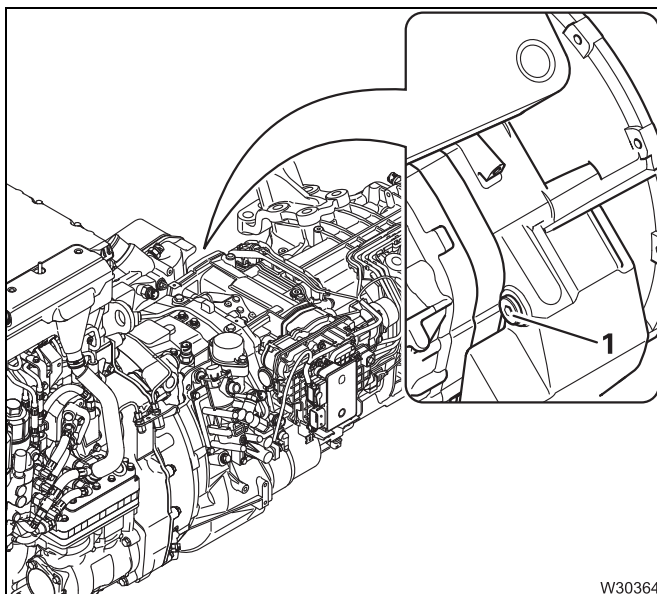
### Checking the oil level



#### **Risk of damage to the transmission.**


If the oil level is too low or too high, this can lead to malfunctions and damage to the transmission.

Check the oil level at the correct intervals.



- Remove the drain plug (1).
- Check the oil level; it must reach to the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

#### **If the oil level is too low**

- Top up the oil;  p. 7 - 43.


### 7.6.3

## Checking the transmission oil level


M 12

### Spare parts and tools

Designation	Quantity	GROVE part no.
Gasket 24 x 29 Cu DIN 7603	1	00117145

- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.
- Torque wrench for torque of 25 Nm (18.4 lbf ft).

### Prerequisites

- The gear oil must be at operating temperature (70 to 95 °C (160 to 200 °F)).
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The truck crane must not running and secured against unauthorised use;  p. 2 - 3.

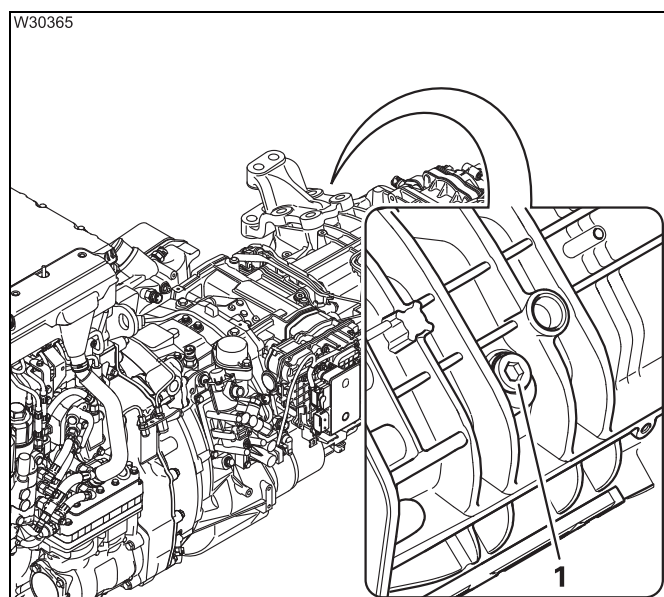
### Checking the oil level



#### **Risk of damage to the transmission.**


If the oil level is too low or too high, this can lead to malfunctions and damage to the transmission.

Check the oil level at the correct intervals.



- Remove the drain plug (1).
- Check the oil level; it must reach to the lower edge of the opening.
- Replace the gasket and tighten the drain plug – torque 25 Nm (18.4 lbf ft).

#### **If the oil level is too low**

- Top up the oil;  p. 7 - 48.

## 7.6.4


## Changing the VIAB oil

Y 3


### Oil, spare parts and tools

Gear oil in litres (gal)	Specification Classification	GROVE part no.
11.0 (2.9)	Shell Spirax S6 ATF VM	04162043

Designation	Quantity	GROVE part no.
Gasket 24 x 29 Cu DIN 7603 (oil filler neck, top)	1	00117145
Gasket 24 x 29 Cu DIN 7603 (oil level plug, side)	1	00117145
Gasket 24 x 29 Cu DIN 7603 (oil drain cock, bottom)	1	00117145
Gasket 14 x 18 Cu DIN 7603 (heat exchanger oil drain cock)	1	00117131
Filter exchange kit	1	04163770
Vent valve filter	1	04163771
Cover gasket filter	1	04163772

- Receptacle, approx. 20 l (5 gal);  p. 2 - 4.
- Torque wrench.

### Prerequisites

- The transmission oil must have been warmed up in advance and reached an operating temperature of at least 60 °C (140 °F)).
- The engine must have been run at full throttle in 8th gear for 10 to 15 seconds.
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Draining oil



#### Risk of scalding from gear oil at operating temperature.

You could burn yourself by gear oil escaping in an uncontrolled manner at operating temperature. Wear appropriate protective gloves and take care not to come into contact with the gear oil.



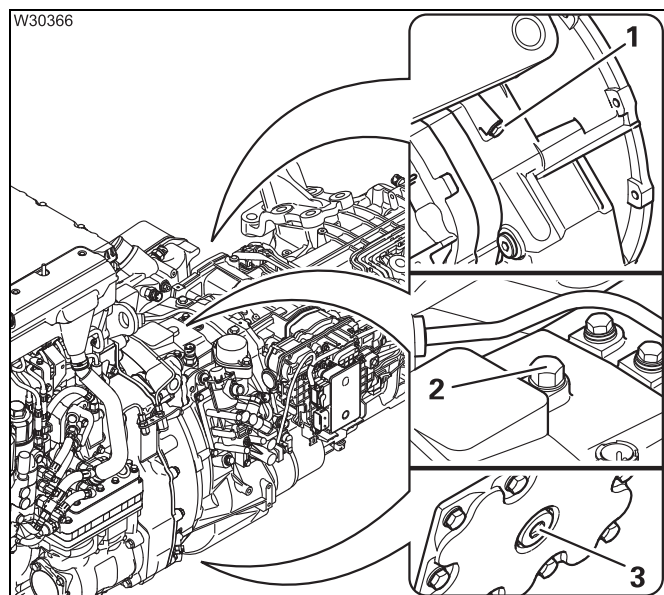


**Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

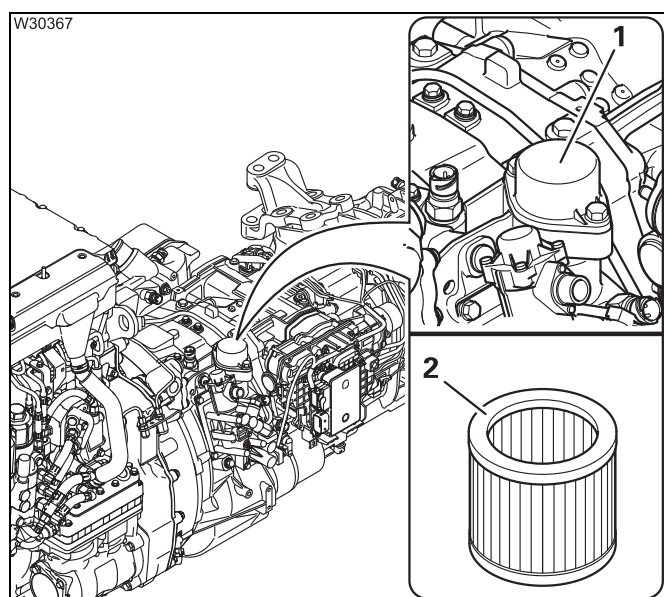
Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.



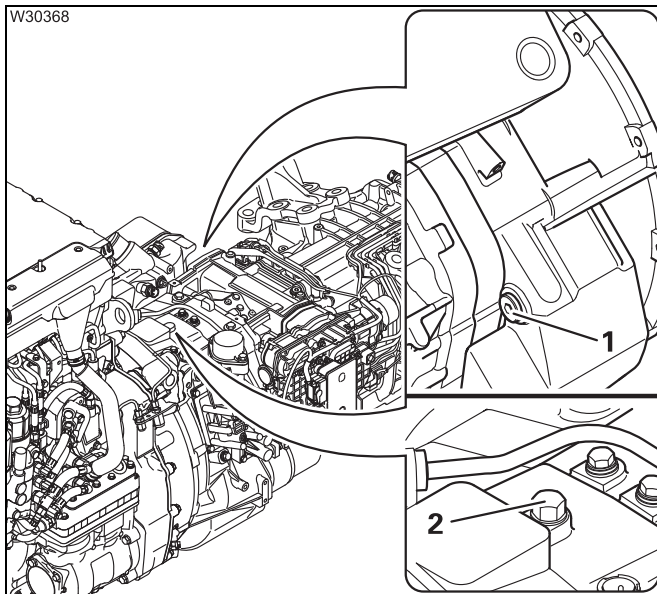
- Remove the drain screw (2).
- Place a receptacle under screws (1) and (3).
- Unscrew the screws (1) and (3) and allow the oil to drain off.
- Clean the drain screws.
- Replace the gaskets and tighten the drain screw (3) to torque 55 Nm (40.5 lbf ft).
- Replace the gaskets and tighten the drain screw (1) to torque 24 Nm (17.7 lbf ft).

### Changing the filter



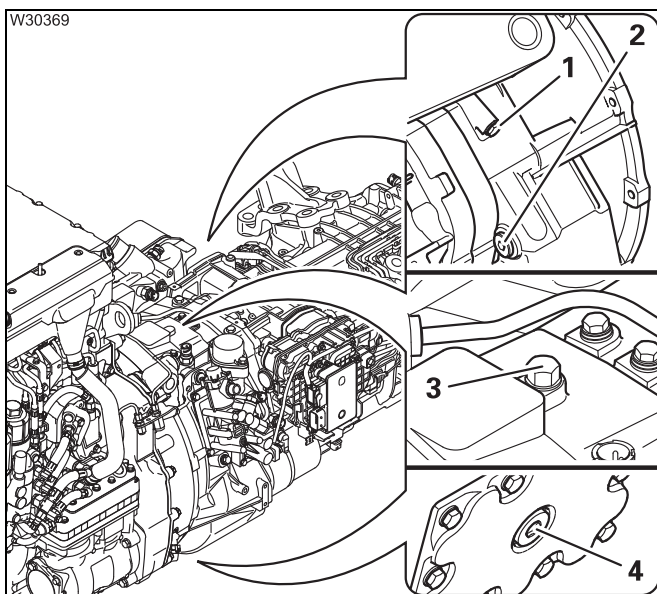
- Remove the cover (1).
- Remove the old filter (2) from the casing.
- Place the old filter (2) in the receptacle.
- Insert a new filter (2) into the casing.
- Replace the cover gasket and the vent valve.
- Bolt the cover (1) on.

## Topping up the oil



- Remove the drain plug (1).
- Top up oil through the hole (2) until oil comes out of the hole (1).
- Replace the gasket and tighten the drain plug (1) – torque 55 Nm (40.5 lbf ft).
- Replace the gasket and tighten the drain plug (2) – torque 55 Nm (40.5 lbf ft).

## Inspections after the oil change



After changing oil, check for leakage:

- Start the engine and let it idle in neutral **N**.
- Check the screw plugs (1) to (4) for leakage.

## 7.6.5



## Transmission oil change

Y 3


### Oil, spare parts and tools

Gear oil in litres (gal)	Specification Classification	GROVE part no.
17.5 (4.6) (with oil cooler)	Fuchs Titan Cytrac MB Synth API-GL-4; SAE 75 W-90	04162042

Designation	Quantity	GROVE part no.
Filter	1	03328342
Spring	1	03328343
Gasket	1	03328344
Gasket 24 x 29 Cu DIN 7603	1	00117145

- Receptacle, approx. 20 l (5 gal);  p. 2 - 4.
- Torque wrench for torque of 25 Nm (18.4 ft lbf) and 60 Nm (44.25 ft lbf).
- Connecting piece and hose (tool box);  p. 7 - 112.

### Prerequisites

- The gear oil must be at operating temperature (70 to 95 °C (160 to 200 °F)).
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Draining oil



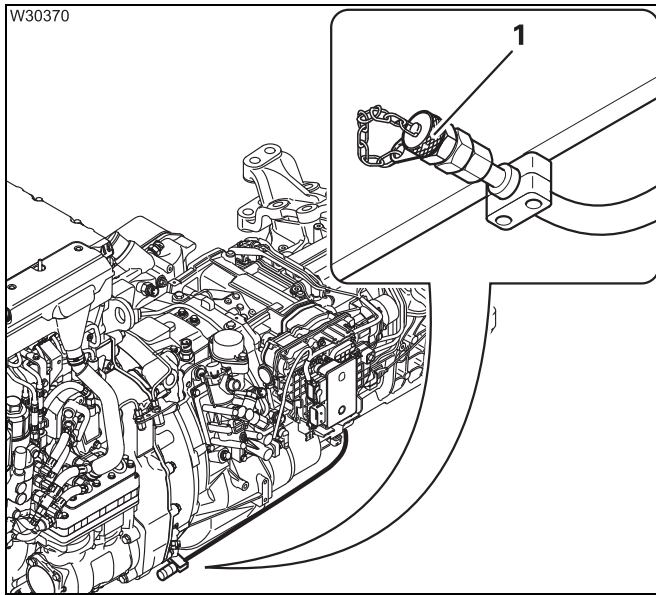
#### **Risk of scalding from gear oil at operating temperature.**


You could burn yourself by gear oil escaping in an uncontrolled manner at operating temperature. Wear appropriate protective gloves and take care not to come into contact with the gear oil.



#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked. Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.



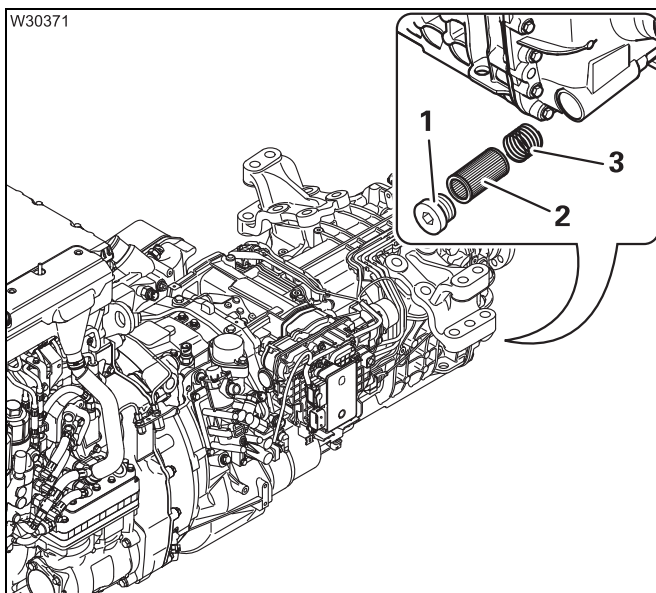
- Place a receptacle under the valve (1).
- Screw the connecting piece and hose onto the valve (1) and drain the oil into the receptacle;  *Handling the valves*, p. 7 - 112.
- Remove the connecting piece and hose from the valve (1) and take away the receptacle.

### Cleaning the filter



#### **Risk of injury due to spring tension**

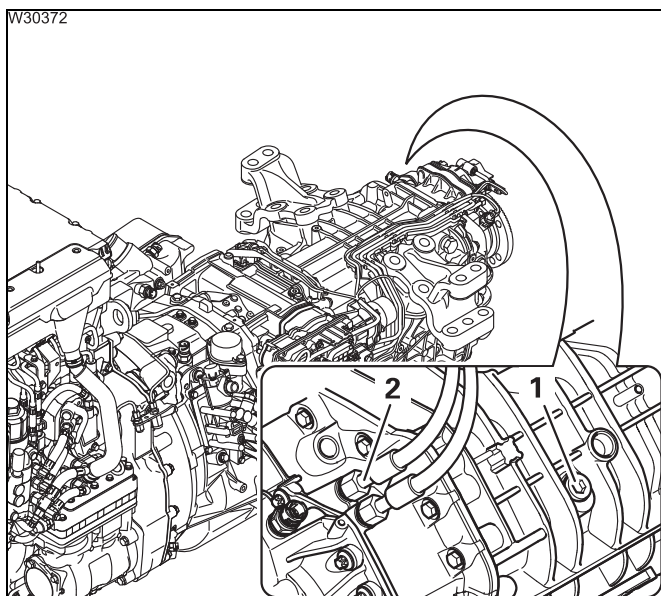
The oil strainer bolt is spring-loaded. Release it carefully and be careful of the spring tension.



- Remove the drain plug (1).
- Take the strainer (2) and the spring (3) out and clean them.  
Replace any damaged parts.
- Insert the spring and strainer into the opening.
- Replace the gasket and tighten the drain plug – torque 60 Nm (44.25 lbf ft).

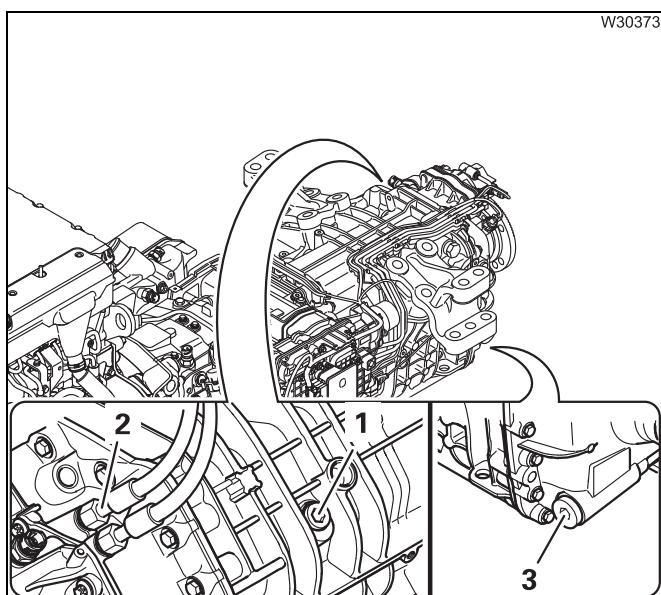


## Topping up the oil



- Remove the drain plug (1).
- Remove the hose (2).
- Top up oil through the hole (2) until oil comes out of the hole (1).
- Replace the gasket and tighten the drain plug (1) – torque 25 Nm (18.4 lbf ft).
- Add an additional 1.5 l (0.4 gal) oil through the hole (2).
- Attach the hose (2).

## Inspections after the oil change



After changing oil, check for leakage:

- Start the engine and let it idle in neutral **N**.
- Check the screw plugs (1) to (3) for leakage.
- Check the hoses and connections on the oil cooler.

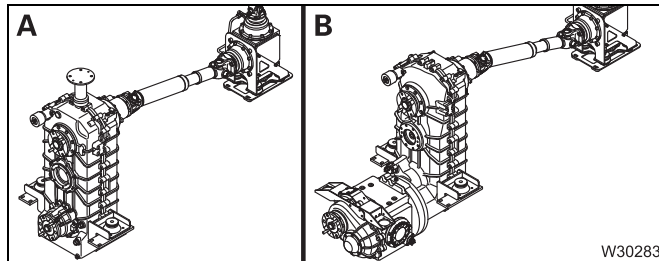


## 7.7

## Transfer case

### Variants

The truck crane GMK5200-1 is equipped with different transfer cases depending on whether the drive variant is 10 x 6 x 10 or 10 x 8 x 10:



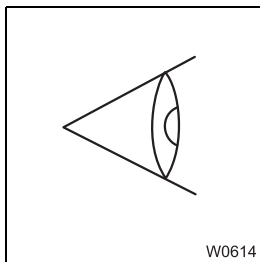
- A** Transfer cases for drive 10 x 6 x 10.
- B** Transfer cases for drive 10 x 8 x 10.

- Note the *Run-in regulations*, p. 4 - 1.

### 7.7.1

### General inspection

**W**



- Investigate any unusual noises made by the transfer case.
- Check the transfer case and the connections for leaks. If consumables are leaking; *Checking the oil level*, p. 7 - 49.
- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

### 7.7.2

### Checking the oil level

**M 1**

#### Spare parts and tools

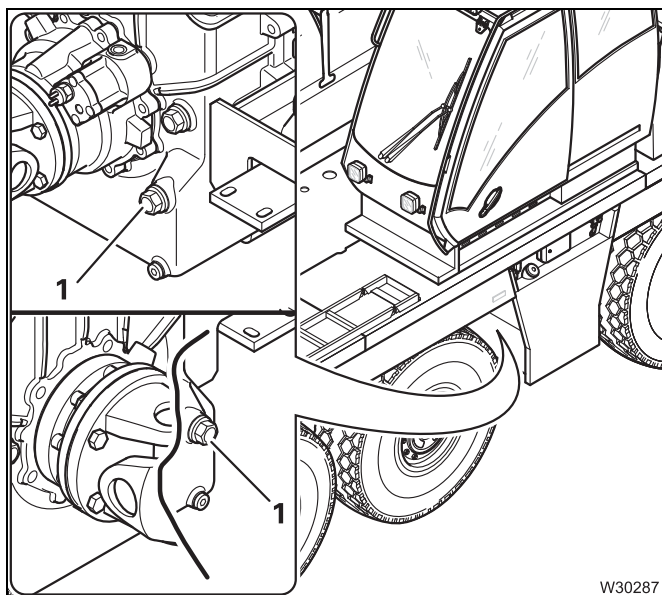
Designation	Quantity	GROVE part no.
Gasket 30 x 36 Cu DIN 7603	1	00117151

#### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.



## Checking



- Remove the drain plug (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

### If the oil level is too low

- Top up the oil; ►►► p. 7 - 51.

## 7.7.3

## Changing the oil

## M 6

### Oil, spare parts, tools

Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
<b>12.8 (3.4)</b> for 10 x 6 x 10	C - LPF	MIL-L 2105 B API-GL-5 Viscosity: Hyp SAE 90 ISO - VG 220	00552891
<b>14.0 (3.7)</b> for 10 x 8 x 10			

Designation	Quantity	GROVE part no.
Gasket 16 x 20 Cu DIN 7603	1	00117134
Gasket 30 x 36 Cu DIN 7603	1	00117151

- Receptacle, approx. 15 l (4.0 gal); ►►► p. 2 - 4.

### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use; ►►► p. 2 - 3.

## Changing the oil



### Risk of scalding from gear oil at operating temperature.

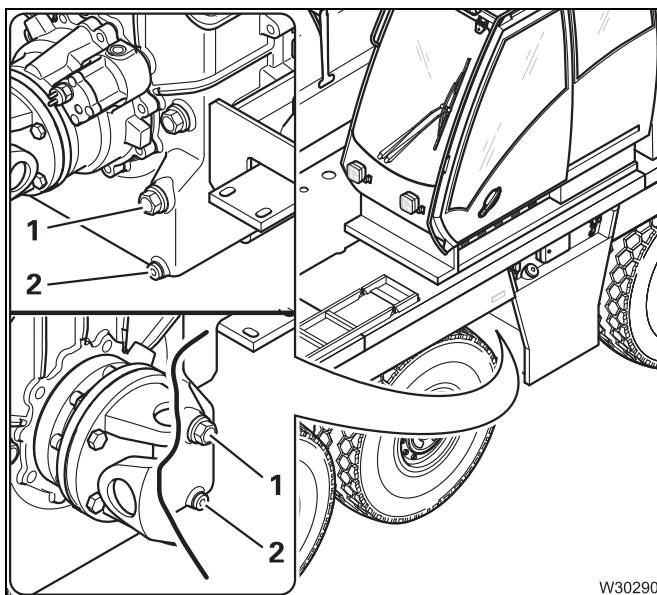
You could burn yourself by gear oil escaping in an uncontrolled manner at operating temperature. Wear appropriate protective gloves and take care not to come into contact with the gear oil.



### Risk of environmental damage due to leaking consumables.

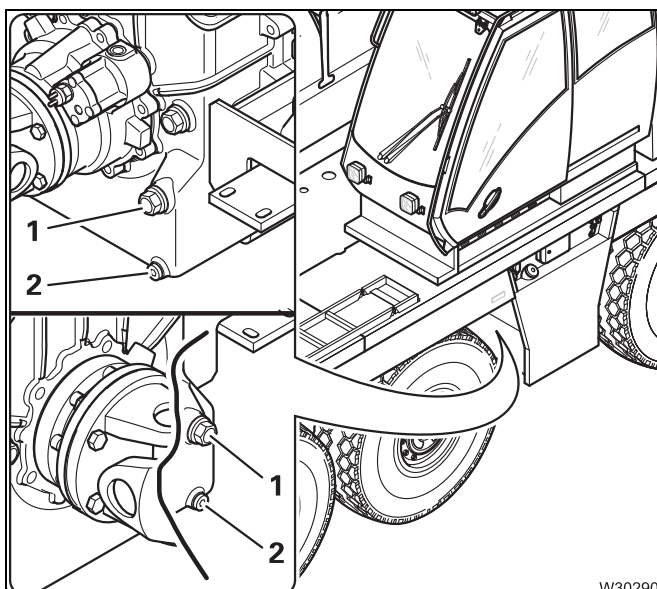
Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.


Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.



- Place a receptacle under the screw (2).
- Unscrew the screws (1) and (2) and allow the oil to drain off.
- Fit a new gasket and tighten the drain screw (2).
- Fill the oil up to the lower edge of the opening.
- Fit a new gasket and tighten the screws (1).

## Inspections after the oil change



- Go for a test drive.
- Switch the engine off and wait for approx. 5 minutes.
- Check the oil level;  p. 7 - 49.
- Check drain plugs (1) and (2) for leaks.

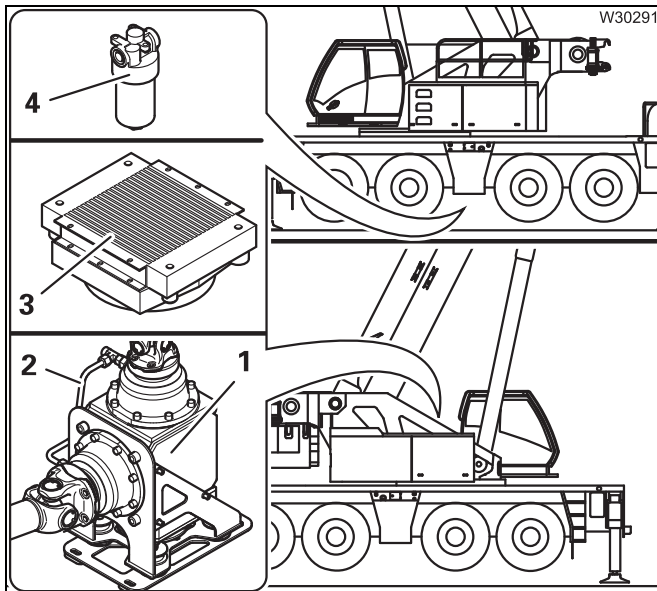
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## 7.8

## Angle gear

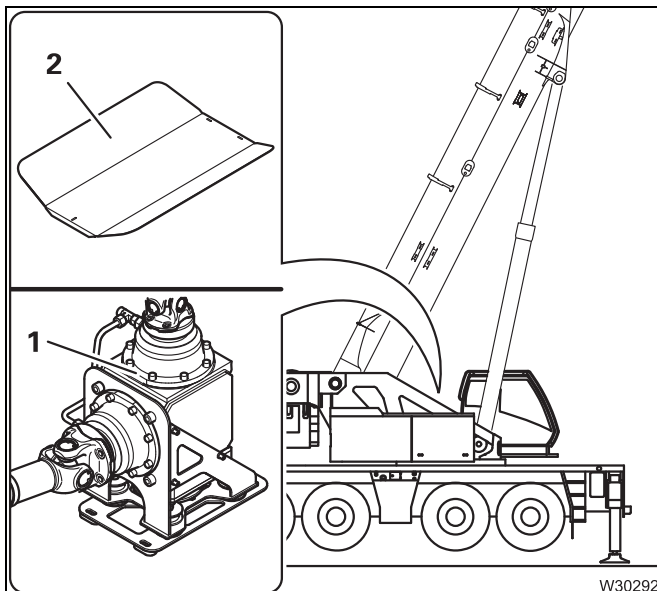
- Comply also with the  *Run-in regulations*, p. 4 - 1.

### Access



The angle gear (1) is located in the travel gear frame at the centre of rotation of the turntable.

Within the oil circuit (2) the gear oil for the angle gear (1) is routed under the chassis via a separate oil cooler (3) and through a separate filter (4).



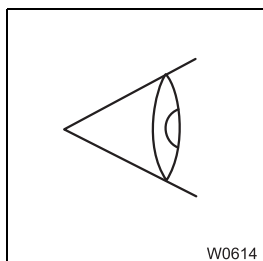
Access to the angle gear (1) is possible only when

- the truck crane is resting on outriggers,
- the main boom is raised,
- the turntable is turned to the 0° position to the rear,
- the cover (2) at the centre of rotation has been taken off.

## 7.8.1

### General inspection

**W**



- Investigate any unusual noises in the angle gear.
- Check the transmission and the oil circuit (oil cooler, filter, hoses, connections) for leaks. If consumables are leaking;

▣▣▣▣▶ *Checking the oil level*, p. 7 - 54.

- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

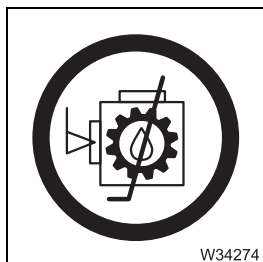
## 7.8.2

### Checking the oil level

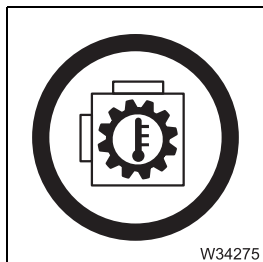
**M 1**

#### Symbols

The oil is monitored by sensors in the angle gear and the following **warning messages** are displayed in the CCS menu:



- Oil level too low,







- Oil temperature too high.

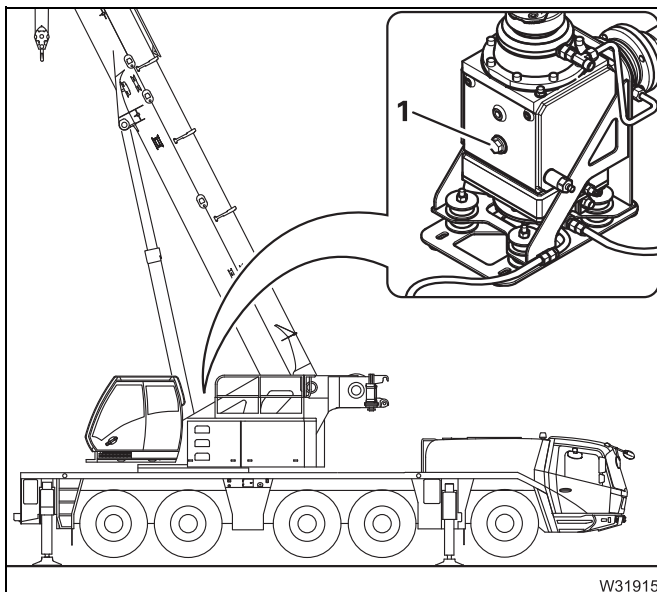
#### Spare parts and tools

Designation	Quantity	GROVE part no.
Gasket 30 x 36 Cu DIN 7603	1	00117151

## Prerequisites


- The crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be level;  *Operating manual*.
- The main boom must be fully retracted and fully raised;  *Operating manual*.
- The turntable must be turned to the 0° position to the rear;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The cover on the turntable over the centre of rotation must be removed.
- The hydraulic drives and the angle gear must have cooled down sufficiently.
- The access opening and the interior space must be clean and free of oil so that the fitter can work safely in the restricted space where the angle gear is installed.

## Checking



- Remove the drain plug (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

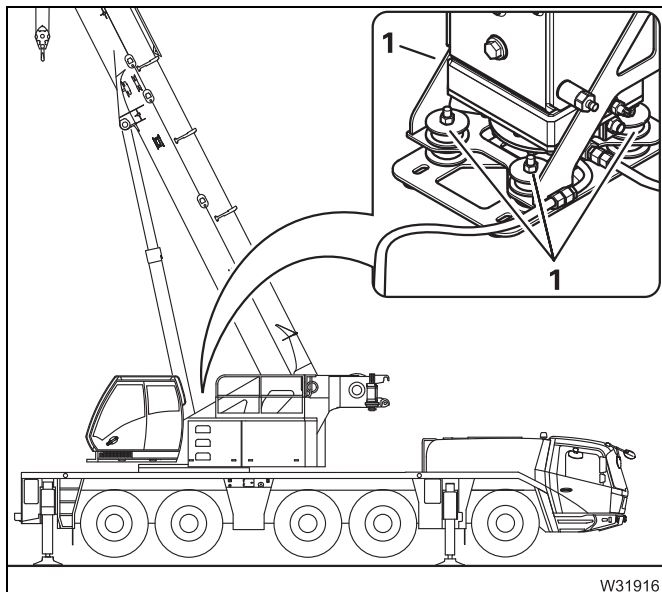
### If the oil level is too low

- Top up the oil;  p. 7 - 57.



### Checking the resilient dampers

The angle gear is mounted on four resilient dampers.



- Check the secure fastening and the condition of the resilient dampers (1).

If the resilient dampers are damaged, have them replaced by **Manitowoc Crane Care** or an authorised GROVE dealer.



### 7.8.3



## Changing the oil and the oil filter

**M 6**





Oil, spare parts,  
tools

Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
7.7 (2.0)		MIL-L 2105 B API-GL-5 Viscosity: Hyp SHC 75-90	01373344

Designation	Quantity	GROVE part no.
<b>Angle gear:</b>		
Gasket 30 x 36 Cu DIN 7603	1	00117151
<b>Filter:</b>		
Filter	1	03135866
Packing set	1	04161645

- Connecting piece and hose (tool box).
- Two receptacles, approx. 10 l (2.5 gal);  p. 2 - 4.
- Key for the lock on the drain tap;  p. 7 - 58.

### Prerequisites

- The crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be level;  *Operating manual*.
- The main boom must be fully retracted and fully raised;  *Operating manual*.
- The turntable must be turned to the 0° position to the rear;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The cover on the turntable over the centre of rotation must be removed.
- The hydraulic drives and the angle gear must have cooled down sufficiently.
- The access opening and the interior space must be clean and free of oil so that the fitter can work safely in the restricted space where the angle gear is installed.



## Drain tap



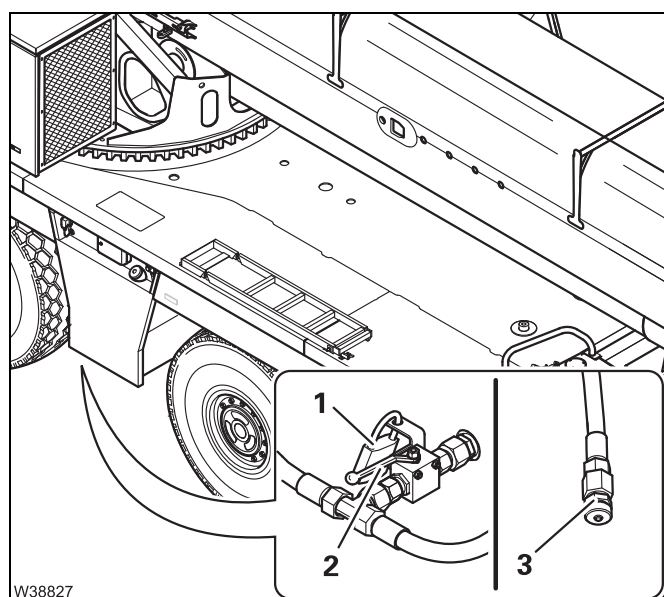
### **Risk of damage to the angle gear!**

If the drain tap remains open after changing the oil, the oil circuit will be interrupted and the upper bearing will not be adequately supplied with oil. This can lead to malfunctions and transmission damage.

The drain tap must always remain closed and secured with the lock during driving and crane operation.

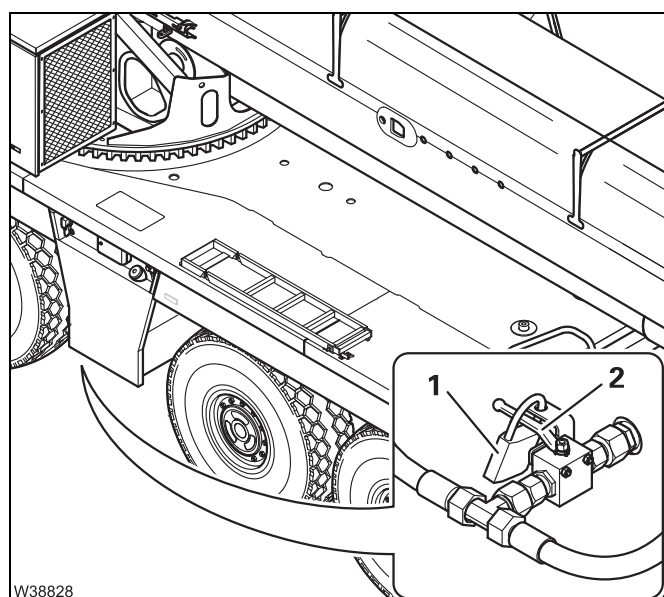
You only need to open the drain tap to drain the oil during an oil change.

After this, you must restore the normal operating condition by closing the drain tap and securing it with the lock.



### **Before the oil change – open the valve**

- Open the lock (1) with the key and remove it.
- Open the valve – lever (2) parallel to the line.  
The oil change valve (3) prevents oil from escaping uncontrollably.



### **After the oil change – close the valve**

- Close the valve – lever (2) at right angles to the line.
- Fit the opened lock (1) and press it together – the lever (2) on the valve is now locked in position.
- Return the key to the storage location (driver's cab or toolbox) so that it is always available.

## Changing the oil



### Risk of scalding from gear oil at operating temperature.

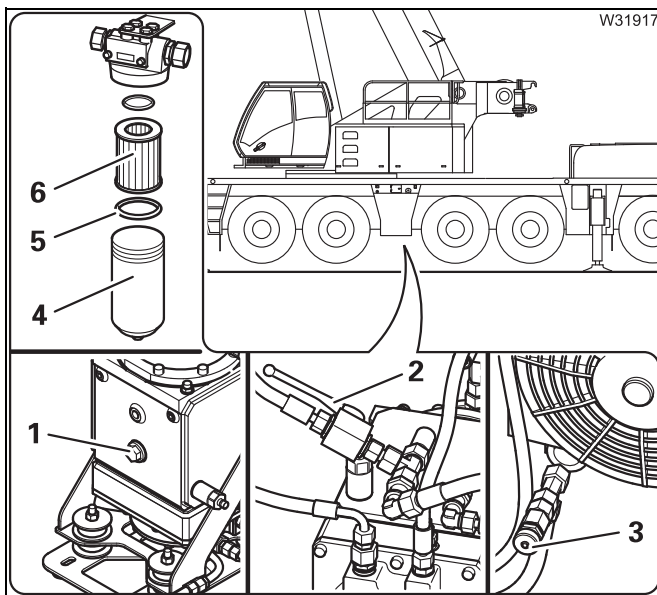
You could burn yourself by gear oil escaping in an uncontrolled manner at operating temperature. Wear appropriate protective gloves and take care not to come into contact with the gear oil.



### Risk of environmental damage due to leaking consumables.

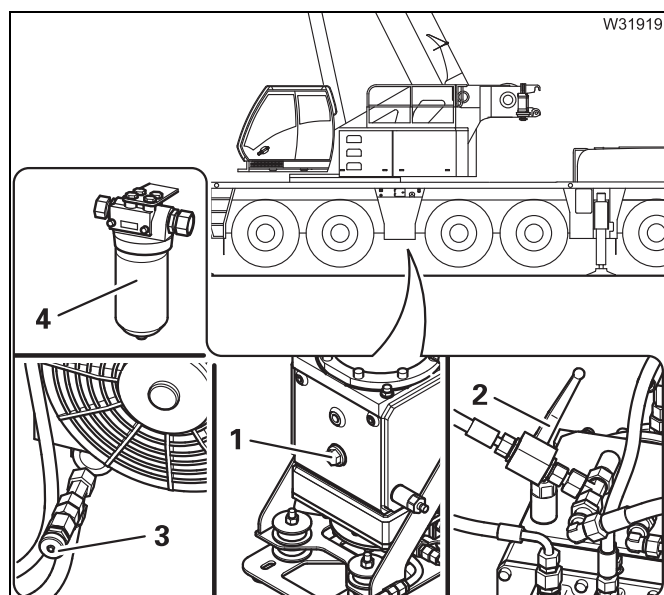
Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.



- Place a receptacle under the filter (4).
- Place a receptacle under the oil cooler.
- Remove the screw (1).
- Open the valve – lever (2) parallel to the line.
- Screw the connecting piece and hose onto the valve (3) and drain the oil.
- Release the filter (4) and allow the oil to drain from it.
- Change the filter (6).
- Replace the gasket (5).






- Tighten the filter (4).
- Remove the connecting piece and hose from the valve (3) – the valve (3) is closed.
- Fill the oil up to the lower edge of the opening (1).
- Fit a new gasket and tighten the screw (1).
- Close the valve – lever (2) at right angles to the line.

#### Inspections after the oil change

In order to circulate the oil around the oil circuit you must try out operation of a hydraulic function on the superstructure (for instance tilting the crane cab).

- Switch the engine off and wait for approx. 5 minutes.
- Check the oil level;  p. 7 - 54.
- Check the angle gear, the filter and the oil cooler for leaks.

## 7.9

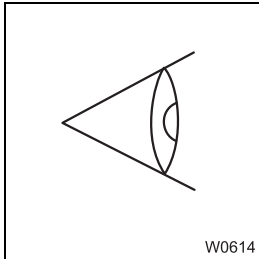
### Axle lines



- Comply also with the  *Run-in regulations*, p. 4 - 1.

### 7.9.1

#### General inspection

**W**



- Investigate any unusual running noises from the axle centre drives and the final drives.
- Check the axle centre drives/final drives and the connections for leaks. If consumables are leaking;
  -  *Axle centre drives – checking the oil level*, p. 7 - 61,
  -  *Final drives – checking the oil level*, p. 7 - 67.
- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

### 7.9.2

#### Axle centre drives – checking the oil level


**M 1**

#### Spare parts and tools

for drive	Designation	Quantity	GROVE part no.
10 x 6 x 10	Gasket 30 x 36 Cu DIN 7603	3	00117151
10 x 8 x 10 <sup>1)</sup>	Gasket 30 x 36 Cu DIN 7603	4	00117151

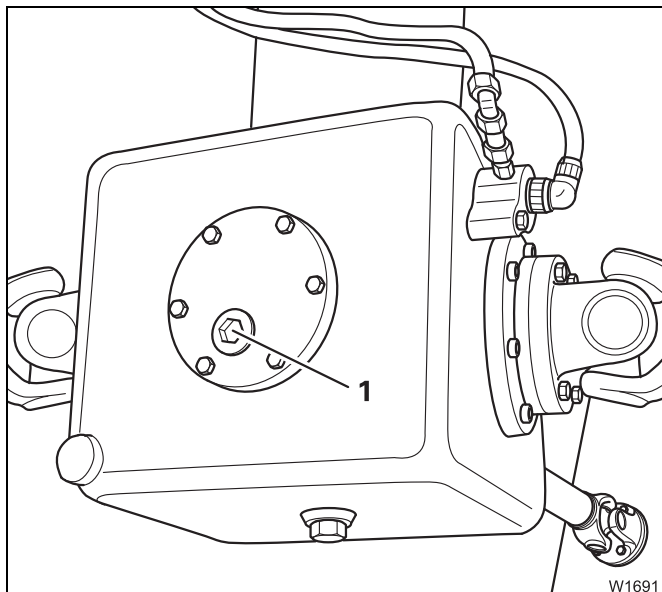
<sup>1)</sup> Additional equipment (3rd driven axle line)

#### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;
  -  p. 2 - 3.



## 2<sup>nd</sup> and 5<sup>th</sup> axle line



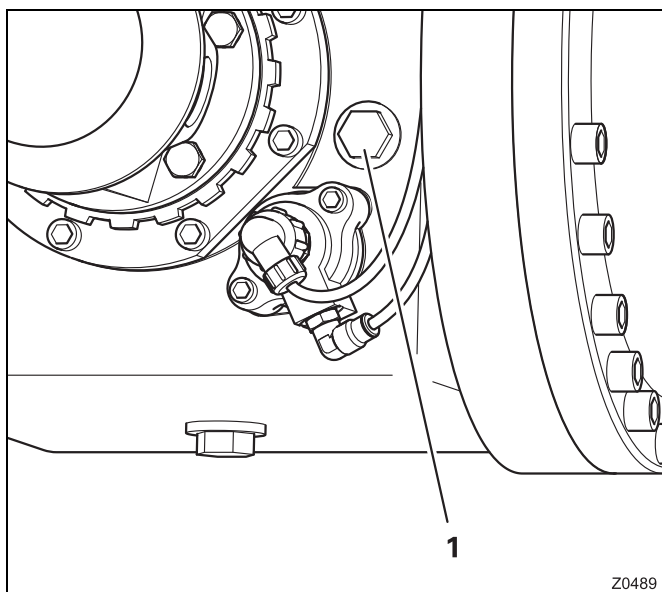
- Remove the drain plug (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

### If the oil level is too low

- Top up the oil; ►►► p. 7 - 64.

## 3<sup>rd</sup> axle line

This axle centre drive is available only with the 10 x 8 x 10 drive and is flanged directly to the transfer case; ►►► *Transfer case*, p. 7 - 49.

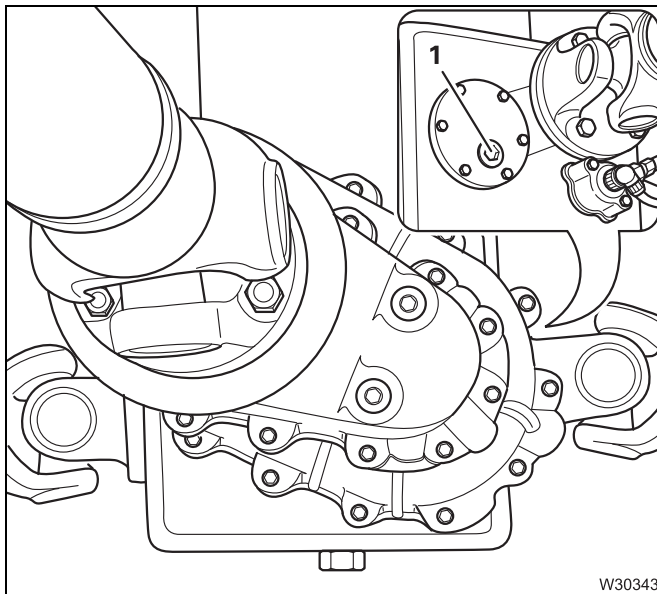


- Remove the drain plug (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

### If the oil level is too low

- Top up the oil; ►►► p. 7 - 64.

## 4<sup>th</sup> axle line



The drive has two oil chambers.

- Remove the drain plug (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the drain plug.

### If the oil level is too low

- Top up the oil; ■■■► p. 7 - 65.

## 7.9.3

## Axle centre drives – changing the oil

## M 12

### Oil, spare parts, tools

Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
Axle lines 2+5: <b>each 13.0 (3.5)</b> Axle lines 3: <b>14 (3.7)</b> Axle lines 4: <b>16.5 (4.4)</b>	C - LPF	MIL-L 2105 B API-GL-5 Viscosity: Hyp SAE 90 ISO - VG 220	00552891


for drive	Designation	Quantity	GROVE part no.
10 x 6 x 10	Gasket 30 x 36 Cu DIN 7603	3	00117151
	Gasket 24 x 29 Cu DIN 7603	2	00117145
	Gasket 36 x 42 Cu DIN 7603	3	01371208
10 x 8 x 10 <sup>1)</sup>	Gasket 30 x 36 Cu DIN 7603	4	00117151
	Gasket 24 x 29 Cu DIN 7603	2	00117145
	Gasket 36 x 42 Cu DIN 7603	4	01371208

<sup>1)</sup> Additional equipment (3<sup>rd</sup> driven axle line)

– Receptacle, approx. 20 l (5.0 gal); ■■■► p. 2 - 4.



### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.



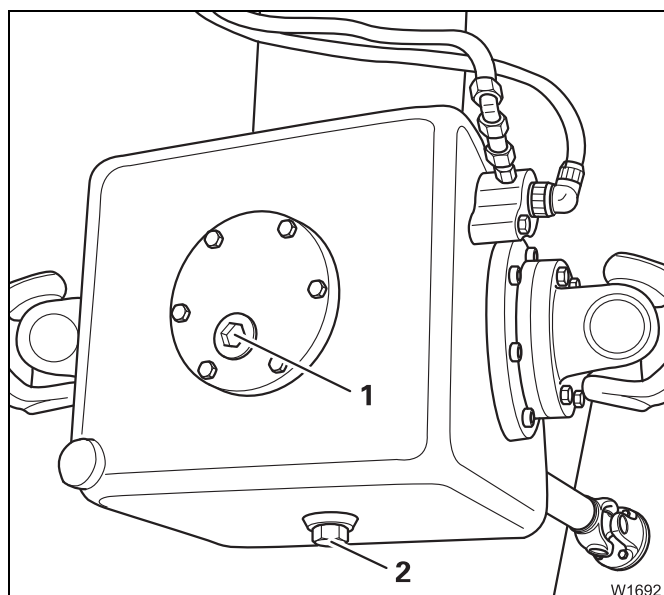
#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.


Ask about the applicable regulations.

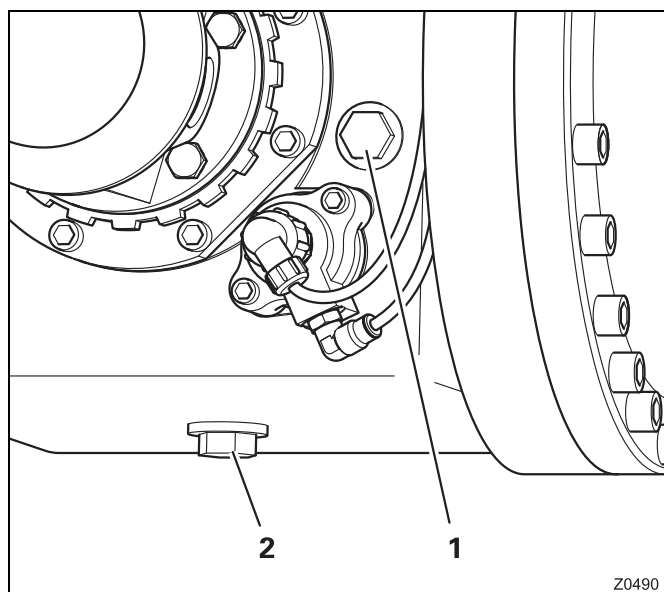
### 2<sup>nd</sup> and 5<sup>th</sup> axle lines



- Place a receptacle under the screw (2).
- Unscrew the screws (1) and (2) and allow the oil to drain off.
- Fit a new gasket and tighten the drain screw (2).
- Fill the oil up to the lower edge of the opening.
- Fit a new gasket and tighten the drain screw (1).

### 3<sup>rd</sup> axle line

This axle centre drive is available only with the 10 x 8 x 10 drive and is flanged directly to the transfer case;  *Transfer case*, p. 7 - 49.



- Place a receptacle under the screw (2).
- Unscrew the screws (1) and (2) and allow the oil to drain off.
- Fit a new gasket and tighten the drain screw (2).
- Fill the oil up to the lower edge of the opening.
- Fit a new gasket and tighten the drain screw (1).



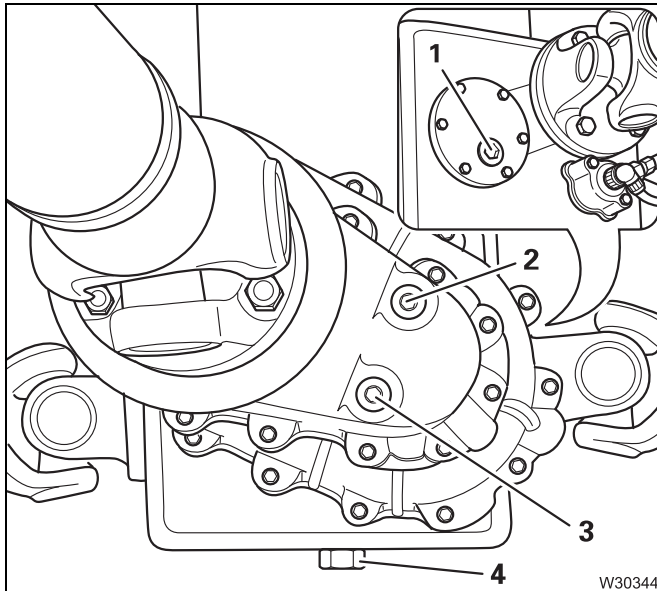
#### 4<sup>th</sup> axle line

The drive has two oil chambers.



#### Risk of oil overheating.

When topping up the oil, both openings must be opened so that both oil tanks are filled equally. This prevents both oil tanks from being overfilled and thus the oil from overheating.



- Place a receptacle under screws (3) and (4).
- Remove screws (1), (2), (3) and (4) and let the oil drain off.
- Fit new gaskets and tighten screws (3) and (4).
- First add 1.5 l (0.4 gal) oil through the hole (2).
- Add more oil through the hole (1), up to the lower edge of the hole (1).
- Fit new gaskets and tighten screws (1) and (2).

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## 7.9.4

## Final drives – checking the oil level


**M 1**

### Spare parts and tools

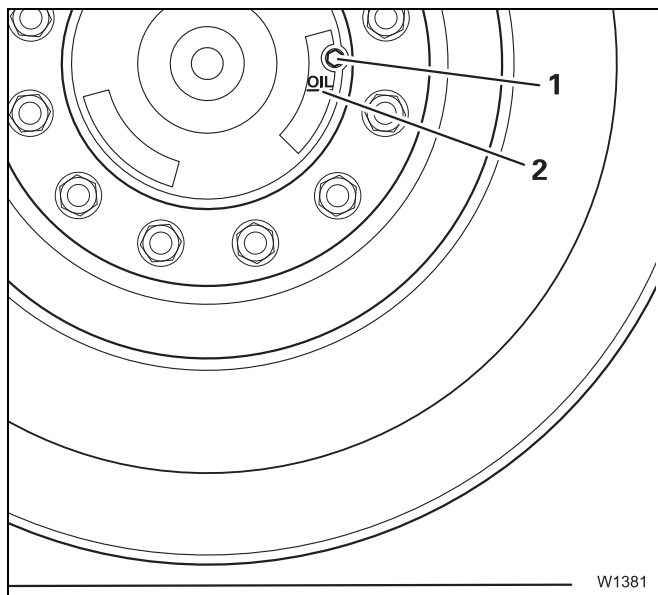
for drive	Designation	Quantity	GROVE part no.
10 x 6 x 10	Gasket 24 x 29 Cu DIN 7603	6	00117145
10 x 8 x 10 <sup>1)</sup>	Gasket 24 x 29 Cu DIN 7603	8	00117145

<sup>1)</sup> Additional equipment (3<sup>rd</sup> driven axle line)

### Prerequisites


- The truck crane must be raised on outriggers and must be level.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The parking brake must be released.

### Checking the oil level



- Check the oil level at all other final drives in the same way.
- Turn the wheel until the mark (2) is horizontal and is on the right, next to the centre of the axle.
- Remove the drain plug (1).
- Check that the oil level is at the mark (2).
- Fit a new gasket and tighten the drain plug.

#### If the oil level is too low

- Top up the oil;  p. 7 - 69.

## 7.9.5

## Final drives – changing the oil


M 12

### Oil, spare parts, tools


Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
for each final drive: 2.7 (0.7)	C - LPF	MIL-L 2105 B API-GL-5 Viscosity: Hyp SAE 90 ISO - VG 220	00552891

for drive	Designation	Quantity	GROVE part no.
10 x 6 x 10	Gasket 24 x 29 Cu DIN 7603	6	00117145
10 x 8 x 10 <sup>1)</sup>	Gasket 24 x 29 Cu DIN 7603	8	00117145

<sup>1)</sup> Additional equipment (3<sup>rd</sup> driven axle line)

- Drain channel.
- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

### Prerequisites

- The truck crane must be raised on outriggers.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The parking brake must be released.



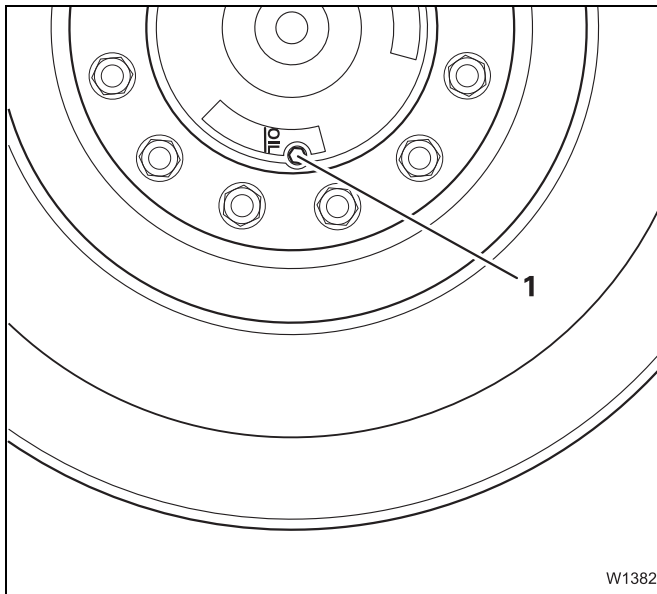
#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

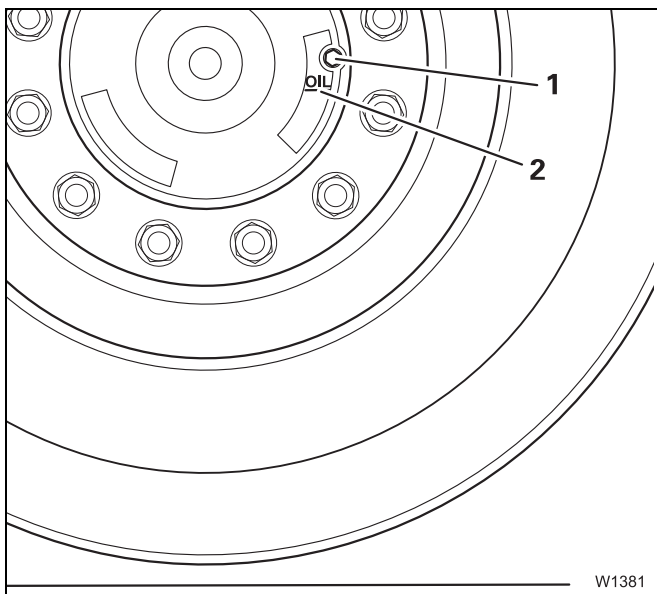
Ask about the applicable regulations.

## Draining oil



- Change the oil on all final drives in the same way.
- Turn the wheel until the screw (1) is at the bottom.
- Use a drain channel and place a receptacle under the screw.
- Remove the screw and let the oil drain out.

## Topping up the oil



- Turn the wheel until the mark (2) is horizontal and is on the right, next to the centre of the axle.
- Top up the oil through the opening.
- Fit a new gasket and tighten the drain screw (1).

## 7.9.6

## Lubricating the cardan shafts in the axle lines

M 1



Check all cardan shafts to see if they have grease nipples. Cardan shafts with grease nipples must be serviced, cardan shafts without grease nipples are maintenance-free.

### Grease, spare parts, tools

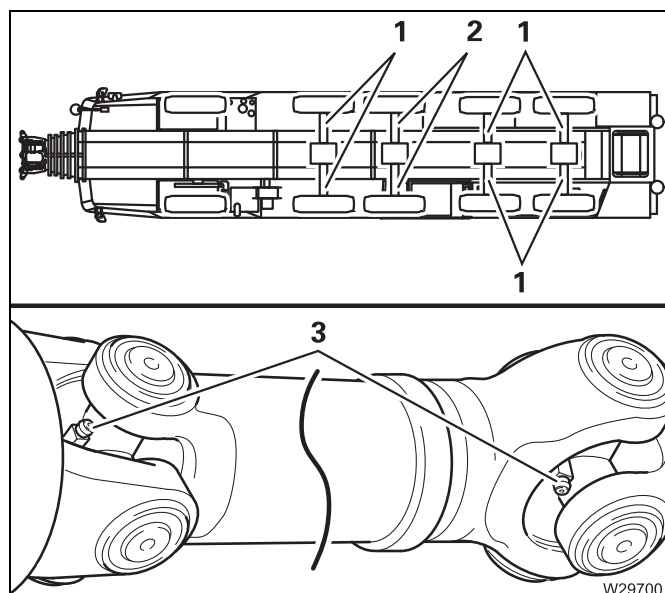
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Grease gun from the tool set.

### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.
- The wheels must be turned as far as they will go, so that the lubricating nipples on the sides of the final drives are more easily accessible.

### Greasing



Cardan shafts (2) are fitted only to the 10 x 8 x 10 drive.

- Check which cardan shafts (1) and (2) have lubricating nipples (3).
- Clean the grease nipples (3).
- Inject grease into the grease nipples until grease escapes from the bearing points. Do not inject grease with excessive force, otherwise the lip seals may be damaged.
- Remove the excess grease.

## 7.9.7

## Lubricating longitudinal cardan shafts

## M 6



Check all cardan shafts to see if they have grease nipples. Cardan shafts with grease nipples must be serviced, cardan shafts without grease nipples are maintenance-free.

### Grease, spare parts, tools

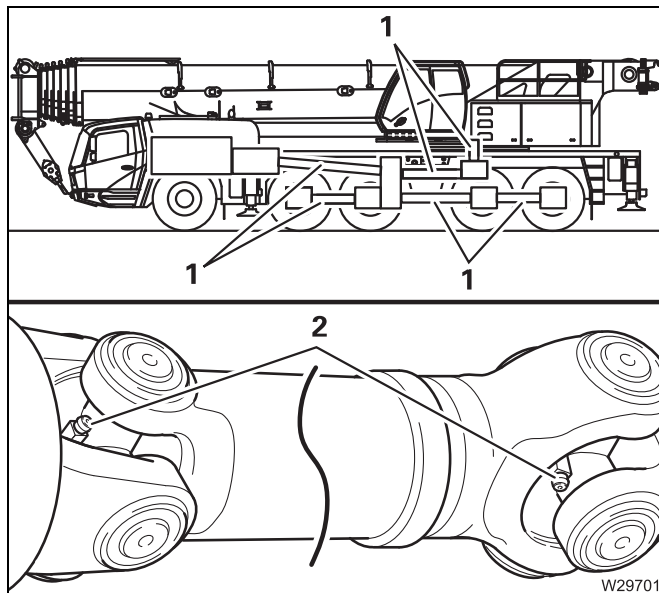
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Grease gun from the tool set.

### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

### Greasing



- Check which cardan shafts (1) have grease nipples (2).
- Clean the grease nipples (2).
- Inject grease into the grease nipples until grease escapes from the bearing points. Do not inject grease with excessive force, otherwise the lip seals may be damaged.
- Remove the excess grease.

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## 7.10

## Wheels

### 7.10.1

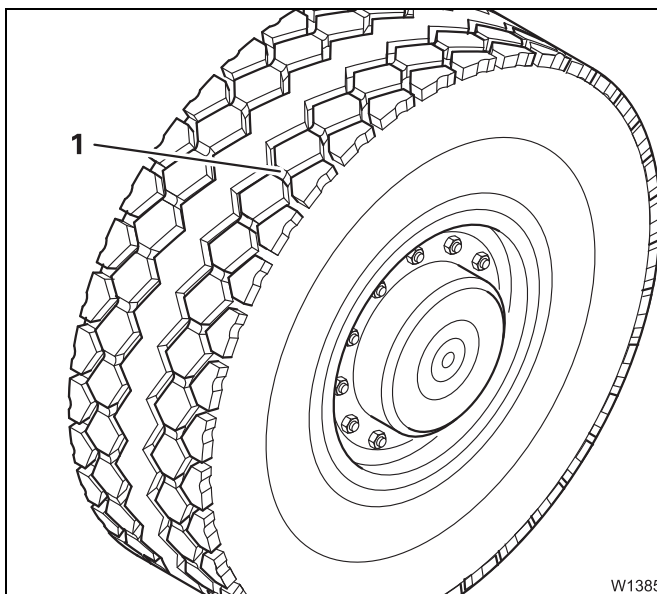
### Checking the tyres for damage

D

#### Prerequisites

- The truck crane must be raised on outriggers.
- The engine must be switched off and secured against unauthorised use;  
    ▮▮▮▮▶ p. 2 - 3.
- The parking brake must be released.

#### Checking



- Check all tyres for:
  - Broken off tread blocks
  - Dents
  - Areas of uneven wear
  - Whether the wear marking (1) has been reached.
- Replace any damaged tyres.
- If the tyres show varying degrees of wear, change the wheels; ▮▮▮▮▶ *Changing the wheels*, p. 7 - 76.



#### **Risk of accidents due to uneven braking.**

When replacing the tyres, only use the same quality of tyres as those originally fitted (dimensions, load bearing capacity, air pressure) so that the driving characteristics are maintained.

Always replace all the tyres on an axle line.

## 7.10.2

### Checking the tyre pressure

W



#### **Risk of damage to the tyres.**

The tyre pressure increases during operation. Never release the increased air pressure of tyres at operating temperature.

Always check the tyre pressure in on-road driving mode with cold tyres.

- Check the tyre pressure using the following table.

<b>Tyres</b>	<b>Air pressure of cold tyres in bar (psi)</b>
14.00 R 25 385/95 R25	9,0 (131)
16.00 R 25 445/95 R25	9,0 (131)
20.50 R 25 525/80 R 25	7,0 (102)

### 7.10.3

## Checking that the wheel nuts are tight

**M 1**

#### Spare parts and tools

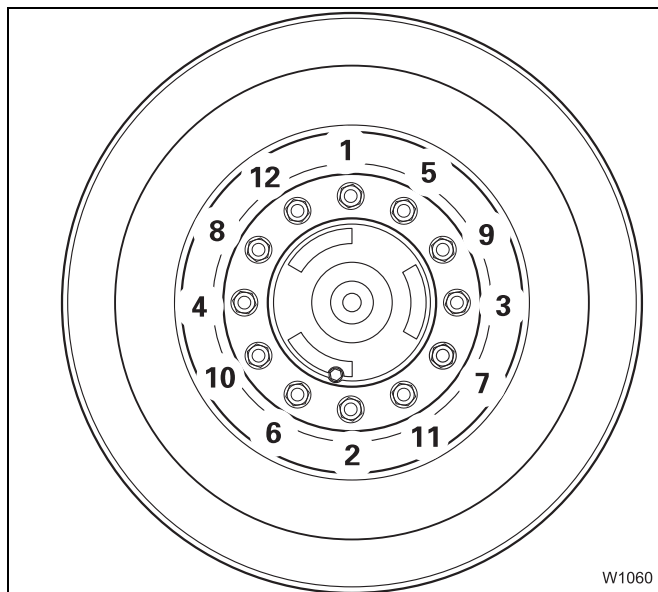
Designation	Quantity per wheel	GROVE part no.
Wheel nut with pressure plate for steel rims	12	01207756
Wheel nut with pressure plate for aluminium rims	12	7659100000

– Torque wrench for 650 Nm (480 lbf ft).

#### Prerequisites

– The engine must be switched off and secured against unauthorised use;  
 ■■■▶ p. 2 - 3.

#### Checking the wheel nuts



- Check the wheel nuts and the pressure plates for damage.
- Replace any damaged wheel nuts or pressure plates.
- Check the wheel nuts in sequence (1-12) for a tight fit – torque 650 Nm (480 lbf ft).

## 7.10.4

## Changing the wheels

M 6

The wear on tyres varies depending on whether the axle

- is driven/not driven,
- is steered/not steered,
- is braked/not braked
- and whether it is subject to more or less load.

To achieve even wear, you must swap the wheels to different positions regularly.


This will have a positive effect on tyre life and performance.

### Spare parts and tools

Designation	Quantity per wheel	GROVE part no.
Wheel nut with pressure plate for steel rims	12	01207756
Wheel nut with pressure plate for aluminium rims	12	7659100000

- Torque wrench for 650 Nm (480 lbf ft).

### Prerequisites

- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Changing the wheels




#### **Risk of accidents if the procedure is not carried out correctly.**

This section only shows the sequence to be followed when changing wheels.

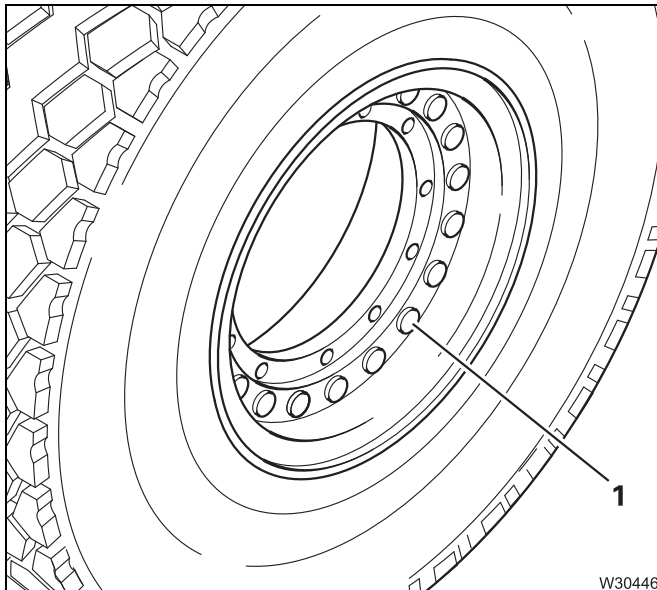
When removing/mounting the wheels, observe all the safety instructions and the procedure stated in the operating manual.

- Remove the wheels from the axles.

#### **Only for two-piece aluminium rims**

- Have a specialist workshop check the bolts on the two-piece aluminium rims, using the appropriate special tool.  
Depending on the manufacturer, there are 20 or 22 bolts visible on the outer face of the rim. On the inner face of the rim there are 20 or 22 nuts. It is the torque of these that you must have checked in a specialist workshop;  *Recognising two-piece aluminium rims*, p. 7 - 77.

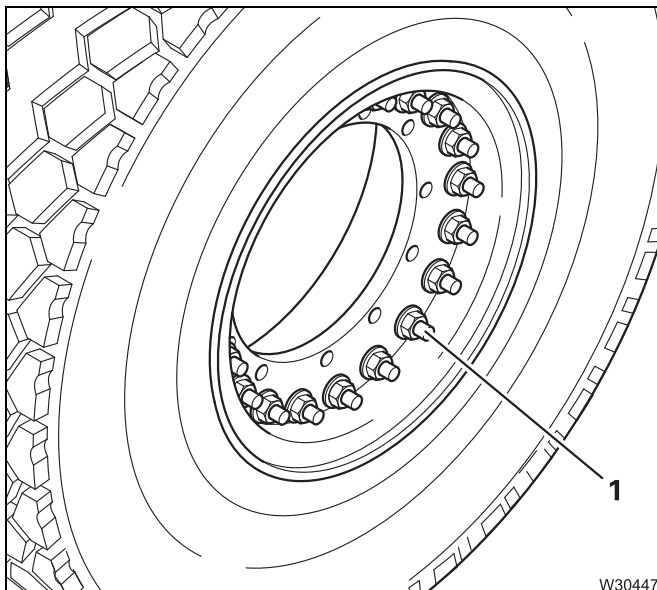
## Recognising two-piece aluminium rims



The round-head bolts (1) are on the outer face of the rim.

The round heads must be free of cracks, and the bolts must be seated securely in the holes.

Around the edge of the aluminium rim there are impressed marks and safety instructions which must be complied with by the specialist workshop.



The nuts (1) are on the inner face of the rim.

The round heads must be free of cracks and securely seated on the bolts. The torque must be checked within the specialist workshop.


Aluminium rims with 20 nuts:

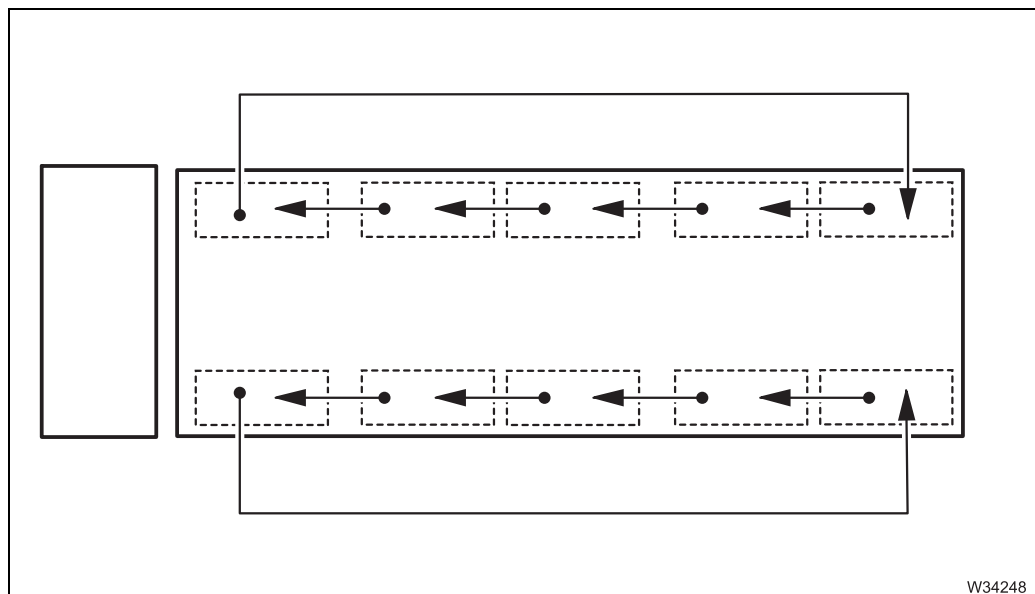
550 Nm (406 lbf ft)

Aluminium rims with 22 nuts:

385 Nm (284 lbf ft)



- Mount the wheels on another axle, as shown in the diagram. Replace any damaged parts. Tighten the wheel nuts;  p. 7 - 75.



## Optimised wheel changes

To ensure even more even wear on all tyres, you can also rotate the tyres on the wheel rim and mount them on the other side of the vehicle.



### **Risk of accidents if the procedure is not carried out correctly.**

This section only shows the sequence to be followed when changing wheels.

When removing/mounting the wheels, observe all the safety instructions and the procedure stated in the operating manual.



### **Risk of accidents due to errors when mounting aluminium wheel rims.**

Only have tyres fitted to aluminium wheel rims in an authorised workshop with the correct special tool.


This will prevent tyre damage caused by assembly errors.

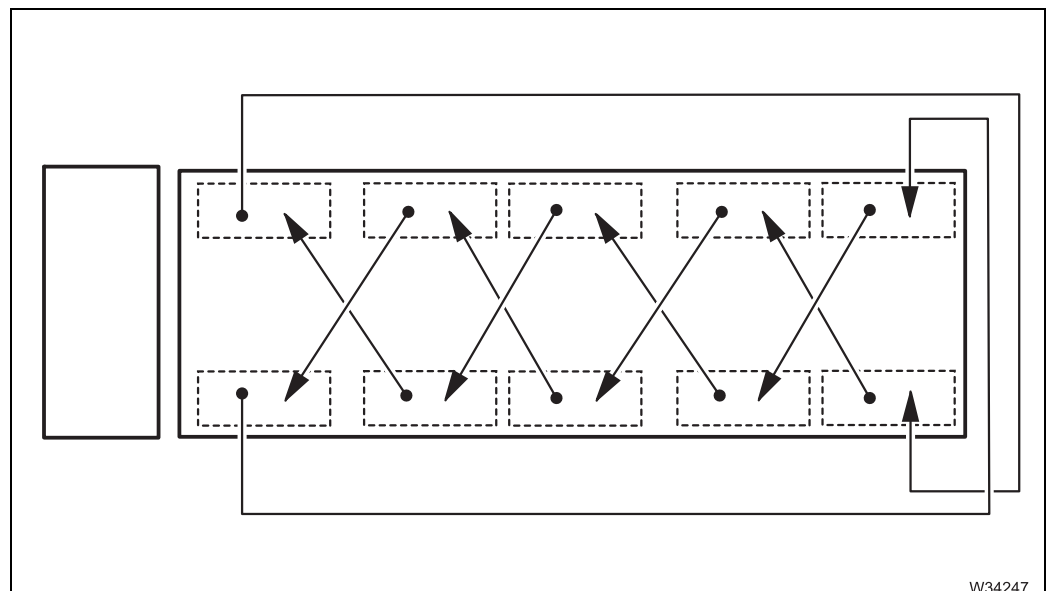


### **Risk of tyre damage caused by the tyres running in a different direction.**

Turn the tyres on the wheel rims before you put the wheels on the other side of the vehicle.

This will prevent tyre damage caused by the tyres running in a different direction.

- Remove the wheels from the axles.
- Turn the tyre on the rim if the wheel is to be used on the other side of the crane.
- Mount the wheels on another axle, as shown in the diagram. Replace any damaged parts. Tighten the wheel nuts;  p. 7 - 75.



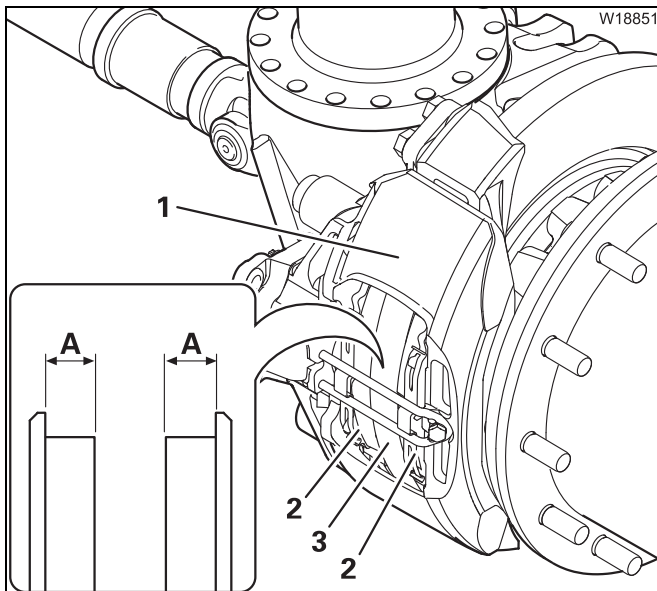
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## 7.11 Vehicle brake

### 7.11.1 Checking the wear display

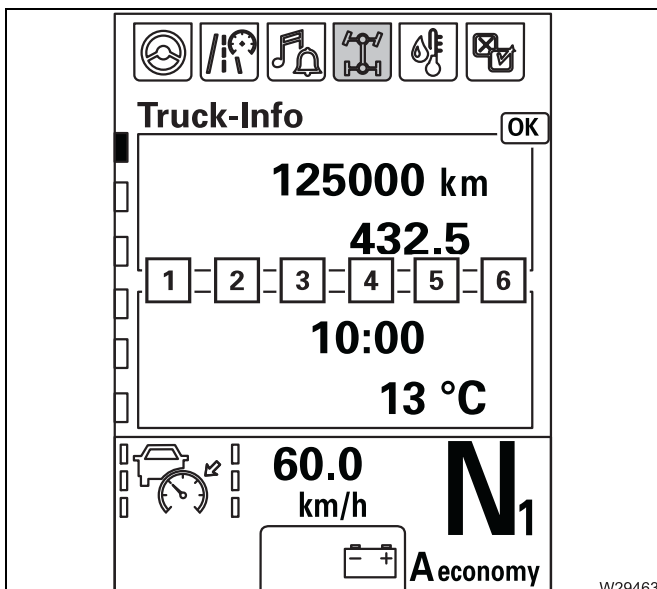
D



#### On the brake calliper

Each brake calliper (1) carries two brake pads (2), arranged one to the left and one to the right of the brake disc (3).

The lining thickness (A) is monitored by an electric wear indicator on the brake calliper (1). If the lining thickness (A) falls below the permissible minimum value, a warning message is displayed on the on-board computer in the driver's cab.



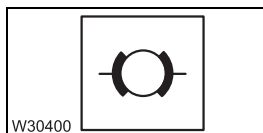
#### On the on-board computer

- Familiarise yourself with the correct operation of the on-board computer; *Operating manual*.

The *Operation and Maintenance* menu also provides information on the condition of the disc brakes.

- Check the outstanding warning messages every day.





If the symbol (1) is displayed on the on-board computer, one of the disc brakes has exceeded the brake lining wear limit.

- Check **all** disc brakes on **all** axle lines; ■■■▶ *Checking disc brakes*, p. 7 - 82.
- Have the disc brakes repaired immediately; ■■■▶ *Having the brakes repaired*, p. 7 - 87.

## 7.11.2

### Checking disc brakes

M 3

#### Spare parts and tools


Designation	Quantity	GROVE part no.
Wear contact set	12	03142924
Set of brake pads with a wear contact set	12	03142923
Guide set and seals set	24	03142922
Packing set	24	03142925
Brake disc	10	03142916

- Measuring tools for brake pad and brake disc thicknesses.
- Dial gauge for the brake disc runout.
- Ring spanner for adjustment.

#### Prerequisites

- The truck crane must be parked over an inspection pit.
- The truck crane must be raised on outriggers.
- The engine must be switched off and secured against unauthorised use; ■■■▶ p. 2 - 3.
- The wheels must be removed from all the axle lines.
- The parking brake must be released.

## Safety instructions

- **Do not perform repair work** on the vehicle brakes;  *Maintenance instructions*, p. 1 - 2.




### **Risk of accidents due to incorrect work on the vehicle brakes.**


Incorrect work on the vehicle brakes can lead to failure of the brakes causing severe accidents.


Incorrect work invalidates the operating licence of the truck crane and no claims of liability for damage can then be accepted.

All repair work on the vehicle brakes may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop with specially trained repair crew.

- Perform **only maintenance work**:

 *Checking the brake discs*, p. 7 - 83,

 *Checking the brake pads*, p. 7 - 85,

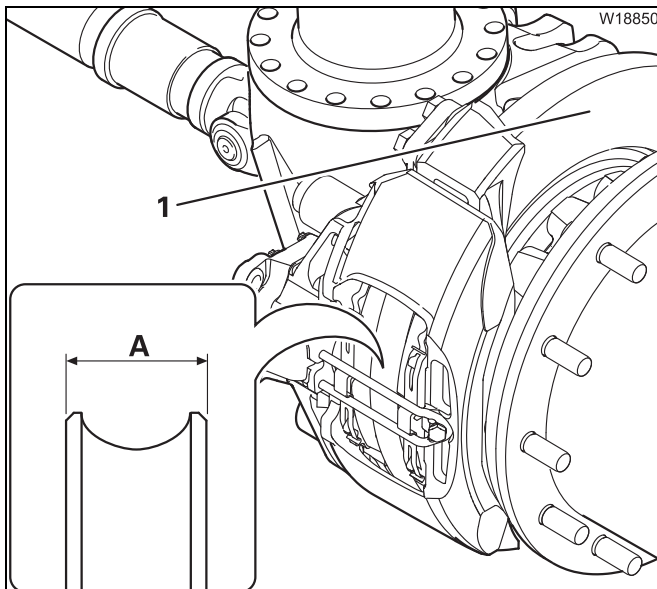
 *Checking the adjustment mechanism*, p. 7 - 85.

If damage is discovered then you must have the vehicle brakes repaired;

 *Having the brakes repaired*, p. 7 - 87.

## Checking the brake discs

- Check the thickness of the brake discs on all axle lines.



### **Measure the thickness**

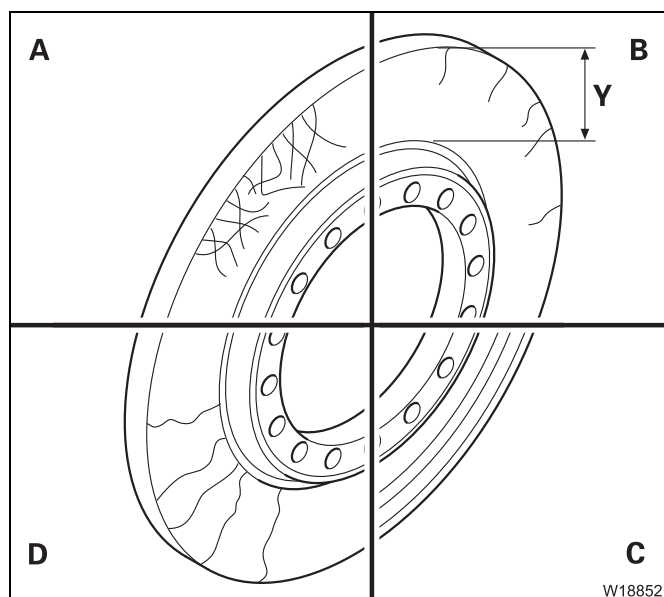
- Measure the thickness (**A**) of the brake discs (**1**).

New brake discs have a thickness of 41 mm (1.61 in).

You must have the brake disc replaced if the thickness is less than 33 mm (1.30 in);

 *Having the brakes repaired*, p. 7 - 87.





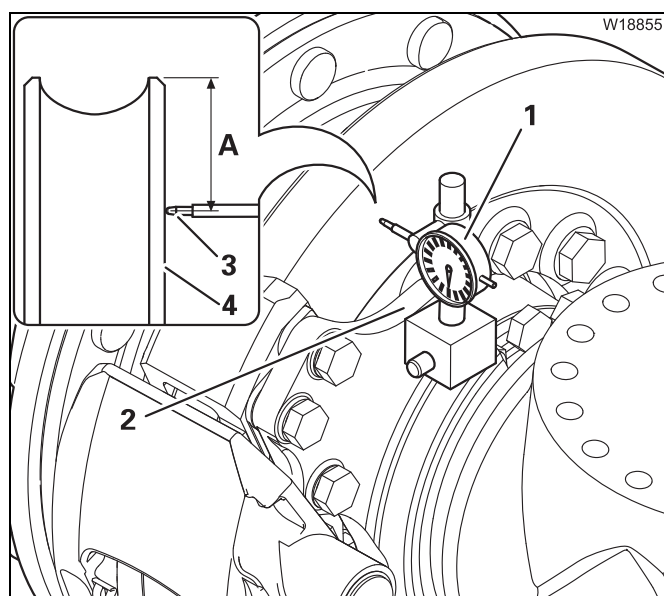
### Checking the surface

- Check for signs of damage such as cracks and irregularities:
  - (A) – fine network of cracks,
  - (B) – radial cracks,
  - (C) – circular irregularities,
  - (D) – continuous cracks.
- Check that any damage found lies within the permissible **limit values**.

You must have the brake disc replaced if any limit values are exceeded; ■■■► *Having the brakes repaired*, p. 7 - 87.

### Limit values for damage:

- (A) – permissible,
- (B) – only permissible for a crack length up to three-quarters of the length Y.
- (B) – only permissible for a crack width of up to 0.5 mm (0.02 in).
- (C) – only permissible for a depth of up to 1.5 mm (0.06 in).
- (D) – not permissible.



### Measure the runout

- Attach the dial gauge (1) to the brake anchor plate (2).
- Position the measuring probe (3) perpendicular to the brake disc (4).  
The distance (A) to the edge of the brake disc must be 35 mm (1.38 in).
- Rotate the brake disc one full revolution and read the runout on the dial gauge pointer.

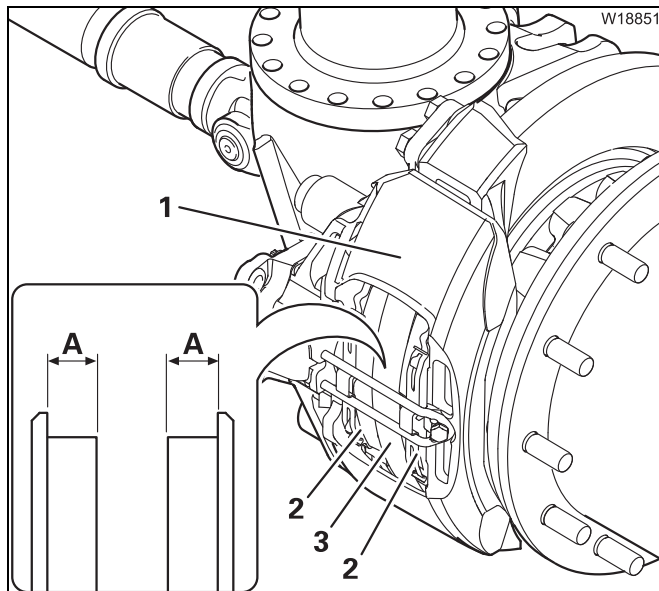
You must have the brake disc replaced if the runout is greater than 0.15 mm (0.006 in);  
■■■► *Having the brakes repaired*, p. 7 - 87.

## Checking the brake pads

- Check the thickness of the brake pads on all axle lines.

Each brake calliper (1) carries two brake pads (2), arranged one to the left and one to the right of the brake disc (3).

This first axle line has **two** brake callipers per brake disc. The second to fifth axle lines have **one** brake calliper per brake disc.



### On the brake calliper

- Measure the pad thickness (A).

New brake pads have a pad thickness of 23 mm (0.90 in).

You must have the brake pads replaced if

- the brake pad thickness is less than 2 mm (0.08 in) or
- the brake pads are burnt, glassy, broken or oily; *Having the brakes repaired*, p. 7 - 87.
- Check that the electrical cable to the wear display is undamaged.



The brake pad wear (A) is taken up by the automatic adjustment mechanism. When the pad thickness is small, the travel adjustment is large and you must also check the adjustment mechanism; *Checking the adjustment mechanism*, p. 7 - 85.

## Checking the adjustment mechanism

- Using a ring spanner, check all the brake callipers.



### There is a risk of damage if an unsuitable tool is used.

The use of an unsuitable tool can damage the hexagon head of the adjustment mechanism. An unsuitable tool can slip off the hexagon head or can become jammed.

Always use a ring spanner, never an open-jaw spanner.

When you apply the brakes the ring spanner on the hexagon head will rotate with it. Therefore check in advance that there is sufficient clearance for this rotational movement.

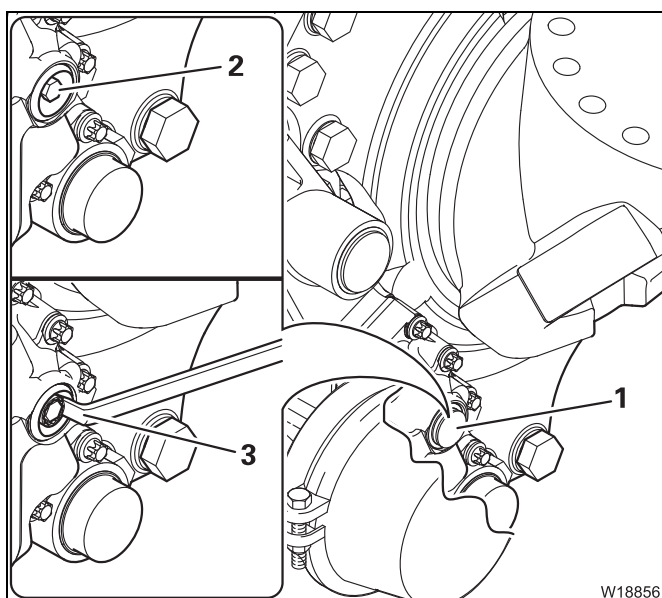




**Risk of injury due to rotation of the ring spanner.**

If you are holding the ring spanner when another person in the driver's cab applies the brakes your hand could be crushed.

Do not hold the ring spanner when another person in the driver's cab applies the brakes. Just observe the rotation of the ring spanner from a safe distance.



**On the brake calliper under the brake cylinder**

- Remove the cap (1) – the hexagon head (2) is then exposed.
- Place the ring spanner (3) on the hexagon head.
- Turn the ring spanner half a turn clockwise. Leave the ring spanner attached.
- Ask a second person in the driver's cab to apply the brakes (approx. 5 times at approx. 1 bar) and observe the rotation of the ring spanner.
- Remove the ring spanner.
- Replace the cap.

The way the ring spanner rotates allows you to assess the condition of the adjustment mechanism.

**The adjustment mechanism is OK if the ring spanner**



- turns one step anticlockwise at each brake application,
- rotating a small angle at each step.

**The adjustment mechanism is defective if the ring spanner**

- fails to turn at any of the brake applications,
- or turns only at the first brake application,
- or at the brake application first turns anticlockwise but then turns back clockwise again.

If the adjustment mechanism is defective then you must have the vehicle brakes repaired;  *Having the brakes repaired*, p. 7 - 87.

### Having the brakes repaired

- **Do not perform repair work** on the vehicle brakes;  *Safety instructions*, p. 7 - 83.
- All repair work on the vehicle brakes may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop with specially trained repair crew.
- Make sure that only original spare parts are used;  *Spare parts and tools*, p. 7 - 82.



#### **Risk of accidents due to uneven braking.**

If the brake pads and brake discs are replaced on only one side of the axle then the wheels will brake unevenly.

Always have the brake pads and brake discs replaced on both sides of the axle. Where axles lines have two brake callipers per brake disc, you must always have the brake pads changed on both brake callipers.

### Running in the brake pads

New brake linings do not provide optimal braking and must therefore be run in by periodic braking.



#### **Risk of damage to the brakes when running them in.**

Constant or heavy braking at high speeds can overheat the brakes and damage them.

The brakes must only be run in through periodic braking.

This must first be done at low speed and then later at medium speed.

- Perform a test drive to make sure that the new brake pads are sufficiently run in before putting the truck crane into normal operation.

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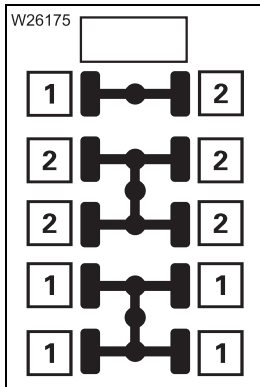


## 7.12 Suspension

### 7.12.1 Suspension struts – checking the oil level

M 1

Oil, spare parts,  
tools



Oil in litres (gal)	Designation	GROVE part no.
5 x suspension struts (1) 1.5 (0.4) each	Gear oil Rivolta S.K.D. 170	02310863
5 x suspension struts (2) 3.2 (0.84) each		

– Press with connected hose (from toolbox).

Designation	Quantity	GROVE part no.
Filter	1	03324588

#### Prerequisites

- The engine must be switched off and secured against unauthorised use; p. 2 - 3.
- Immediately before the inspection, the truck crane must be completely lowered and returned to *on-road level*; *Operating manual*.

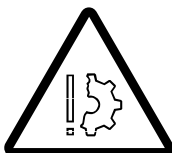
#### Checking the oil level



#### Risk of damage due to faulty suspension struts.

If the oil level is above the upper marking on the inspection glass, the suspension strut is faulty and must be replaced.

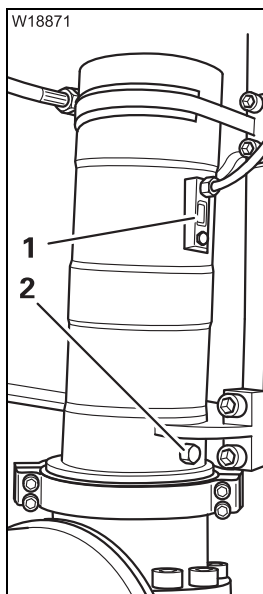
Notify **Manitowoc Crane Care** or an authorised GROVE dealer.



#### Risk of damage to the suspension struts due to insufficient lubrication.

It is difficult to inject the oil. Even so, do not fill oil through the inspection glass connections. If you do this, the oil will not reach all the lubricating points.



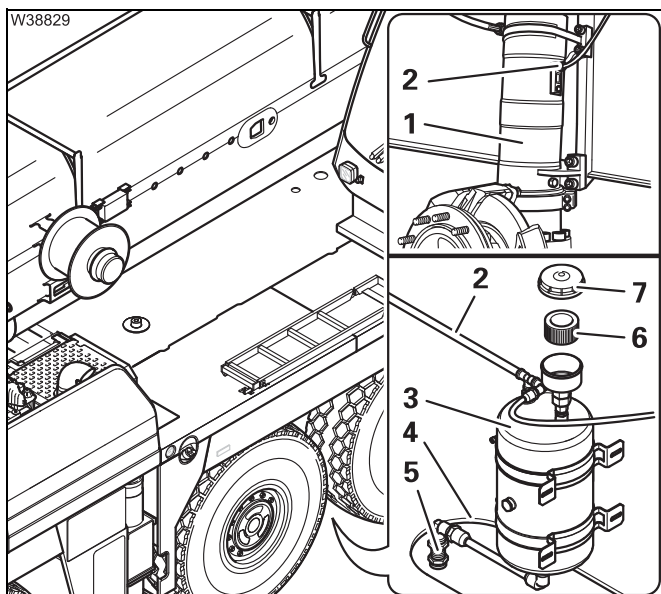


- Check whether oil is visible in the centre of the inspection glass (1) on each suspension strut.

**If the oil level is too low**

- Open the connection (2) – oil escapes – and quickly connect the press with the hose.
- Inject oil until it reaches the middle of the inspection glass.
- Remove the hose and quickly close the connection (2).

**Checking the bleed overflow oil collection tank**



All suspension struts (1) are connected to the oil collection tank (3) by a bleed hose (2). The oil collection tank (3) is accessible from below through the opening (4).

- Place an oil collection container under the oil drain plug (5).
  - Open the drain plug (5) and allow the oil to drain; normally this is a very small quantity.
  - If there has been a large quantity of oil collected, then one or more suspension struts are defective.
  - Close the drain plug (5).
- 
- Remove the cover (7).
  - Change the filter (6) if necessary and fasten the cover.
- 
- Defective suspension struts should be replaced as soon as possible by **Manitowoc Crane Care** or an authorised GROVE dealer.

## 7.12.2



## Suspension struts – checking the fastening

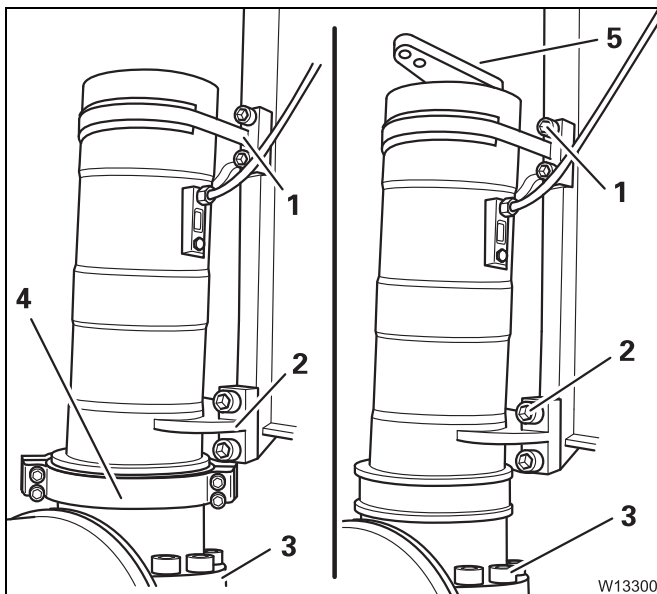
M 1


### Spare parts and tools

- Torque wrench for torques up to 900 Nm (664 lbf ft).

### Prerequisites

- The truck crane must be raised on outriggers;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The wheels must have been removed.



- Check whether the screws on all suspension struts are fitted tightly;  *Special torques*, p. 10 - 2:
  - 1 on the upper bracket,
  - 2 on the lower bracket,
  - 3 on the lower flange,
  - 4 on the half shells for the steering arm,
  - 5 on the upper steering arm.

### 7.12.3

## Forced lever – checking correct functioning

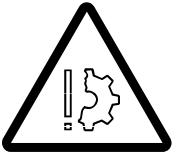
M 3

On suspension struts with forced levers, the forced levers must be checked for proper functioning when the suspension is switched on and off.



#### **Risk of crushing when releasing the suspension locking system.**

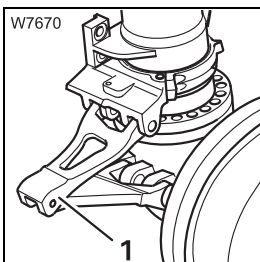
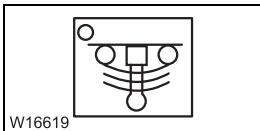
When the suspension is switched on, the wheels drop down suddenly. Ensure that nobody is in close proximity to the wheels when you switch on the suspension.



#### **Risk of damage to the tyres.**

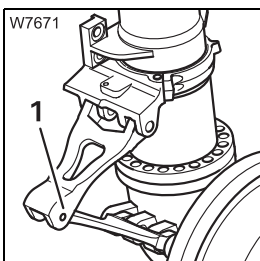
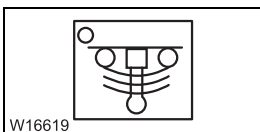
Remove sharp-edged or pointed objects from below the wheels before switching on the suspension. In this way you prevent the tyres from bursting or being damaged when the wheels come down.

- Start the engine.
- Lower the truck crane to the lowest level with the level adjustment system; *Operating manual*.
- Switch off the suspension; *Operating manual*.



The suspension struts and the forced levers (1) are brought together.

- Raise the truck crane with the outriggers; *Operating manual*.
- Switch on the suspension; *Operating manual*.



- Check whether all suspension struts are extended and the forced levers (1) are slackened.

If the suspension struts are not extended or only partially extended, the forced lever is faulty.

- Faulty forced levers should be replaced as soon as possible by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.

## 7.12.4

### Pressure accumulator – checking the gas pressure

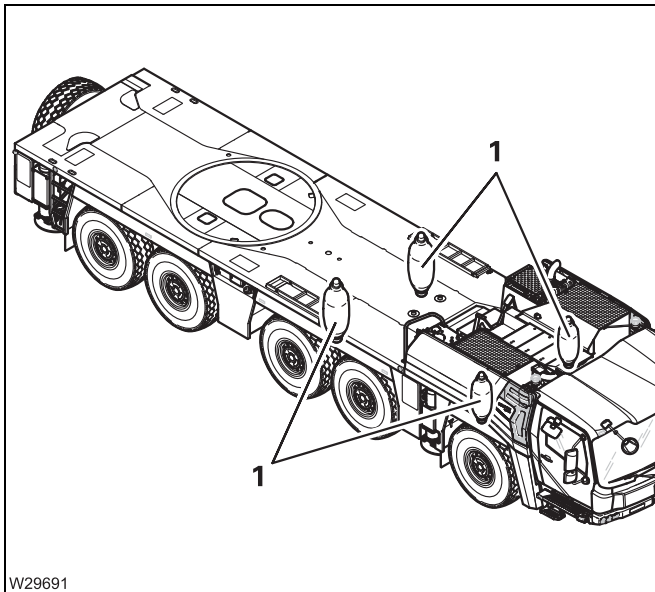
M 12

The gas pressure must be checked every 3,000 operating hours, but in any case no less frequently than every 12 months.



#### **Risk of accidents due to incorrect inspection.**

The gas pressure test must be carried out only by an authorised official inspector of pressure tanks or under his/her supervision or instructions.



W29691

The suspension features integrated pressure accumulators that contain nitrogen (1).

The filling pressure at 20 °C (68 °F) is 50 bar (725 psi).

- Have the filling pressure checked, and if necessary corrected, by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

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## 7.13

## Steering

### 7.13.1

### Checking for leaks

D

- Check the hydraulic system of the steering (steering cylinders, pipes and hose lines and their connections) for leaks.



#### **Risk of accidents from hydraulic oil spraying out.**

Never tighten leaking connections when the system is under pressure.  
Change pipes and hose lines only when the system is depressurised.

- Top up oil if necessary;  *Checking the oil level*, p. 7 - 101.

#### **After changing pipes and hose lines**

- Bleed the hydraulic system;  *Bleeding the hydraulic system*, p. 7 - 114.

#### **If damage cannot be rectified immediately or further damage is likely**

- Notify **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

## 7.13.2

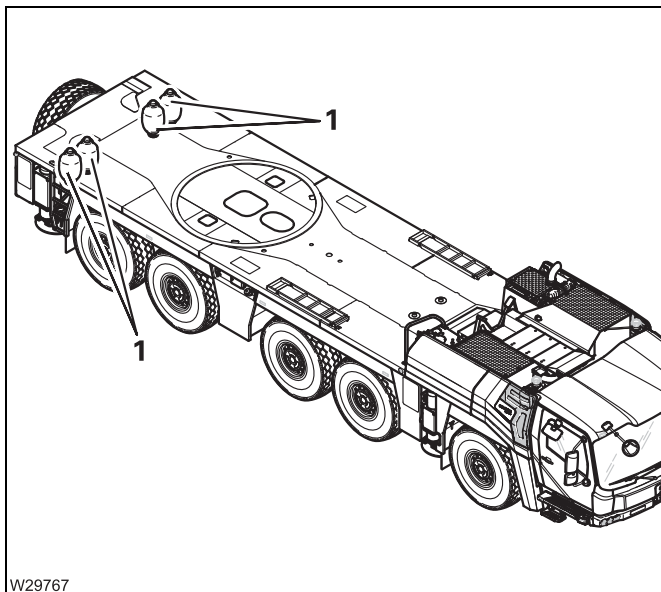
## Pressure accumulator – checking the gas pressure

M 12



### Risk of accidents due to incorrect inspection.

The gas pressure test must be carried out only by an authorised official inspector of pressure tanks or under his/her supervision or instructions.



Pressure accumulators containing nitrogen (1) have been built in for the steering of the 4<sup>th</sup> and 5<sup>th</sup> axle lines.

The filling pressure at 20 °C (68 °F) is 89 bar (1,290 psi).

- Have the filling pressure checked, and if necessary corrected, by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

W29767



## 7.14 Compressed air system



### 7.14.1 Draining water from the compressed air system

**W**

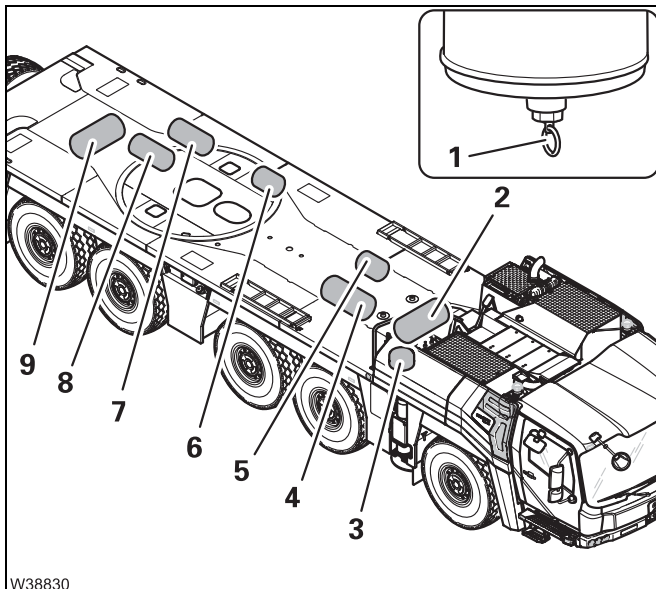
#### Spare parts and tools

Designation	Quantity	GROVE part no.
Valve	8	01570750
Gasket 22 x 27 Cu DIN 7603	8	00117142

#### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The compressed-air supply is completely full;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Draining water from the compressed air system



- Actuate the valves (1) on the air reservoirs (2) to (9).

#### If a great deal of moisture escapes

- Have the compressed air drier checked or replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.

## 7.14.2

### Checking for leaks

W

- Start up the compressed air system.
- Check for any possible leaks in the compressed air system (connections, pipes, hose lines and valves).



**Risk of accidents due to escaping compressed air.**

Never tighten connections when the system is under pressure. Only change gaskets, pipes and hose lines when the system is depressurised.

If damage cannot be rectified immediately or further damage is likely:

- Notify **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

### 7.14.3

## Replacing the filter cartridge of the compressed air drier


M 12

### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter cartridge with gasket	1	04157844

- Strap wrench.

### Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

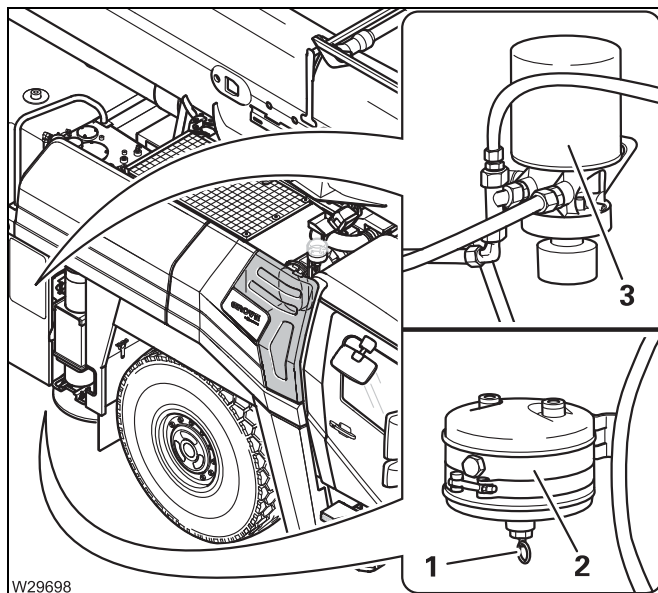
### Changing the filter cartridge



#### Risk of injury from escaping compressed air.

If the reservoir (2) is not completely vented, the compressed air drier will be under pressure.

Bleed the reservoir until air no longer escapes from the valve.



- Using the valve (1), release all the air from the reservoir (2).
- Replace the filter cartridge (3) using the strap wrench (lubricate gasket slightly).

W29698

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## 7.15

## Hydraulic system



### Risk of environmental damage due to leaking consumables.

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

### 7.15.1

### Checking the oil level

D

#### Prerequisites

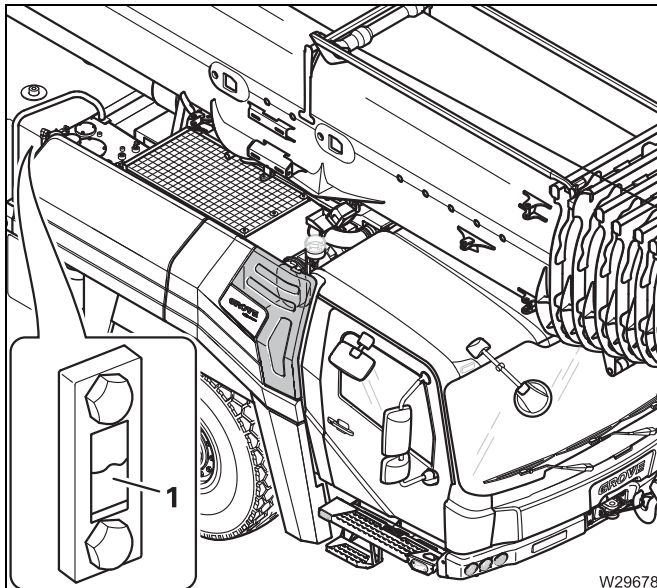
- The truck crane must be aligned horizontally at on-road level;  
    ▣▣▣▣► *Operating manual*.
- The outriggers must be retracted; ▣▣▣▣► *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  
    ▣▣▣▣► p. 2 - 3.



### Risk of damage to the hydraulic system.

When working with hydraulic oil, cleanliness is imperative.

Even fresh hydraulic oil should be filtered.



- Check that oil is visible in the middle of the inspection glass (1) before starting work.

#### If the oil level is too low

- Top up the oil; ▣▣▣▣► p. 7 - 113.

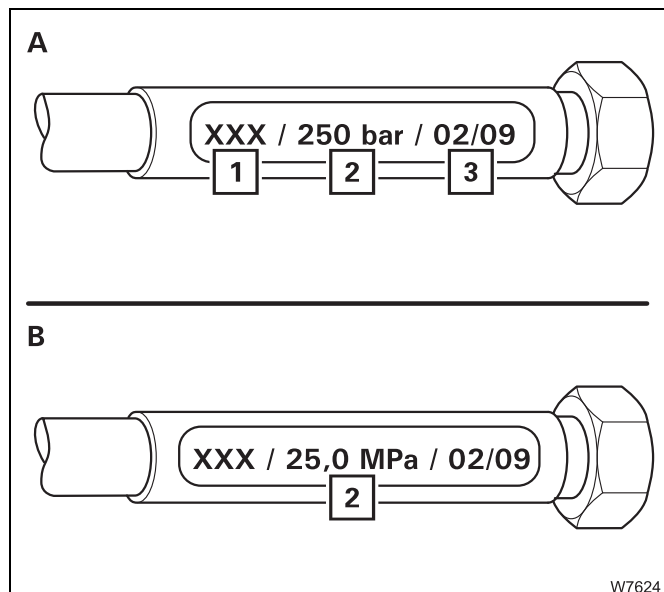
## 7.15.2

### Checking the hydraulic hoses

W

Hydraulic hoses are also subject to ageing as well as internal and external strain.

- Check the hydraulic hoses for
  - external damage (tears, abrasion, heat damage, chemical damage),
  - leaks and moist areas,
  - blistering or unevenness of hose casing,
  - signs of ageing (porous surface, rust on hose fittings).



Hydraulic hoses should not be used for longer than 72 months from date of manufacture. The date of manufacture and the permitted operating pressure are marked on the hose fitting:

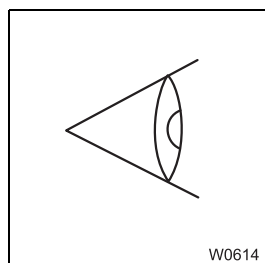
- 1 Manufacturer's designation.
- 2 Maximum operating pressure and unit of measurement (**A**) (e.g. 250 bar (3,626 psi)).  
Maximum operation pressure and unit of measurement (**B**) (e.g. 25.0 MPa (3,626 psi)).
- 3 Month and year of manufacture.


- Always ensure that the corresponding parts of the hydraulic system are depressurised.
- Damaged or old hydraulic hoses must be replaced immediately.

## 7.15.3

### Checking for leaks

W



- When the engine is running, carry out a visual inspection for leaks on the hydraulic system (pumps, drives, cylinders, control blocks, valves, pipe and hose lines and connections).
- Check the oil level if there are leaks;  *Checking the oil level*, p. 7 - 101.



**Risk of accidents from hydraulic oil spraying out.**

Never tighten any leaking connections when the system is under pressure. Change pipes and hose lines only when the system is depressurised.



**Risk of environmental damage due to leaking consumables.**

Immediately repair or have leakages in the hydraulic system repaired to ensure that no hydraulic oil escapes, seeps into the ground or reaches waterways when the crane is being used.

**After parts have been changed**

- Bleed the carrier's hydraulic system; *Bleeding the hydraulic system*, p. 7 - 114.

**If damage cannot be rectified immediately or further damage is likely**

- Notify **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

**7.15.4**

**Cleaning the magnetic rods**

**M 3**

**Spare parts and tools**

Designation	Quantity	GROVE part no.
Filter	2	03329152
Packing set	2	03135778

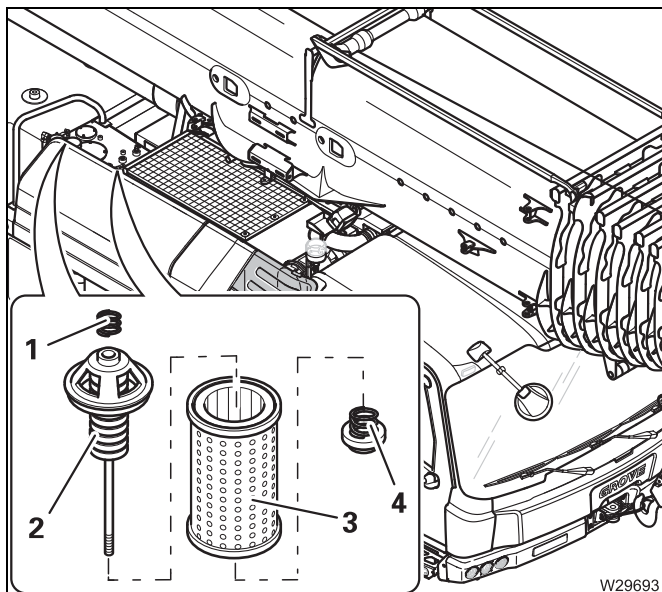
- Receptacle, approx. 5 l (1.5 gal); p. 2 - 4.

**Prerequisites**

- The truck crane must be standing on a level surface.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.
- During the first 100 operating hours: Clean the magnetic rods weekly.



## Cleaning the magnetic rods

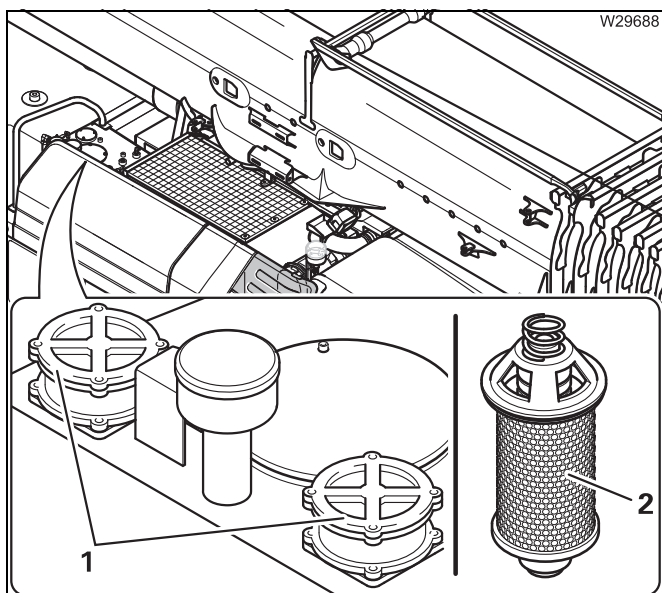


- Loosen the cover and pull out the filters.
- Place the filters in a receptacle.
- Remove the spring (1).
- Undo the nut (4).
- Take the magnetic rod (2) out of the filter cage (3) and clean it.
- Replace any damaged parts, where necessary.



### **Risk of damage to the hydraulic system.**

Large amounts of metal particles are a sign of damage in the hydraulic system. Have the hydraulic system checked by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.



- Assemble the filters (2) and insert them.
- Replace the gaskets if necessary and fasten the cap (1).
- Start the engine and check for leaks.



## 7.15.5

## Changing the ventilation filter

M 12


### Reducing the interval

- Under difficult operating conditions – at extremely sandy or dusty locations – you must change the ventilation filters earlier than normal.

### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	03324588

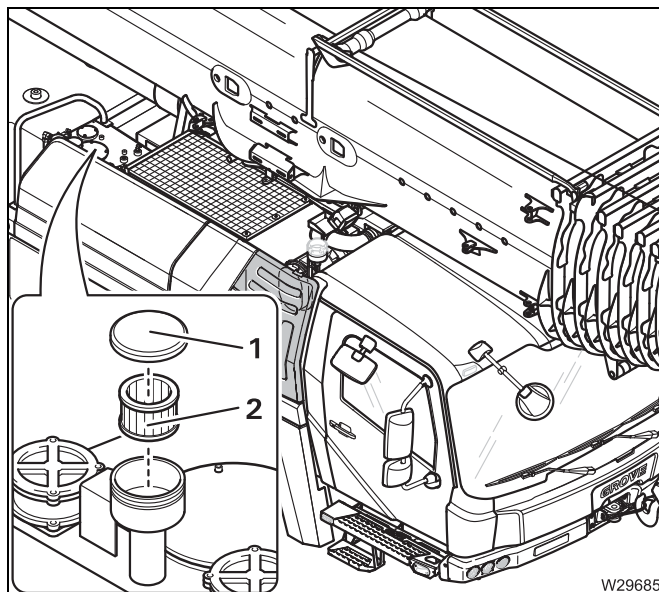
### Prerequisites

- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.



#### **Risk of damage to the environment from filter residues.**

Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



- Remove the cover (1).
- Change the filter (2) and fasten the cover.

## 7.15.6

## Taking oil samples

M 12

### Reducing the interval

- Under difficult operating conditions – at tropical or very hot locations – you must halve the oil change interval.


### Spare parts and tools

- A hose with a connecting piece for a gauge port.


Hose lengths	GROVE part no.
1 m (3.3 ft)	01923003
2 m (6.6 ft)	00551941
4 m (13.2 ft)	01923139

- A sample container 0.3 l (0.08 gal).

	GROVE part no.
A set of sample containers with protective mailing bag and delivery note to the contracted laboratory	03141012

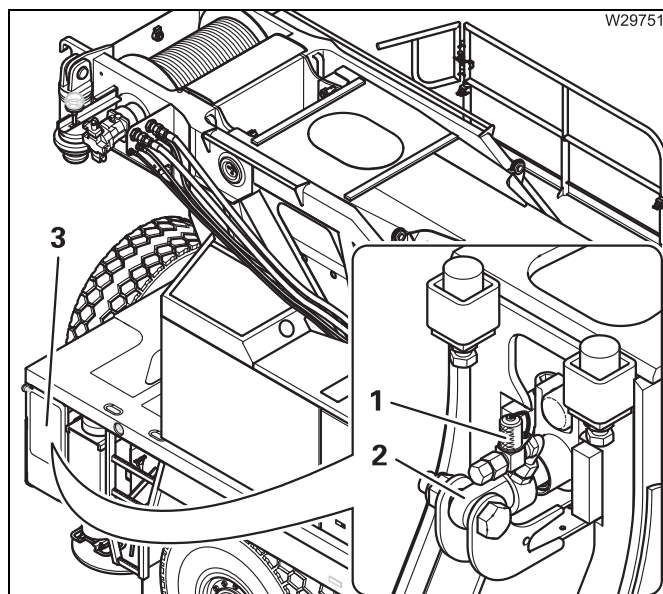
- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

### Prerequisites

- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

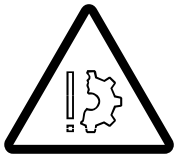
### Select the sampling location

To determine the usability of the oil, you must take a sample from the hydraulic system. To do that you must connect the hose with the connecting piece to a gauge port.



- Remove the cover (3). The gauge port (1) is located on the cylinder (2) of the outrigger.
- Clean the gauge port before connecting the hose.

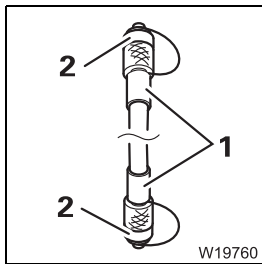
## Protecting the hose from dirt



### Danger of contamination of the oil sample.

If the hose with the connecting piece is dirty, the dirt can contaminate the oil sample in the sample container during the sampling process. The laboratory analysis would thus be incorrect.

For flushing, always allow 2 litres (0.5 gal) of oil to flow through the hose into a receptacle before filling the sample container.



### When storing the hose

- Close the hose ends (1) with the caps (2).

## Connecting the hose



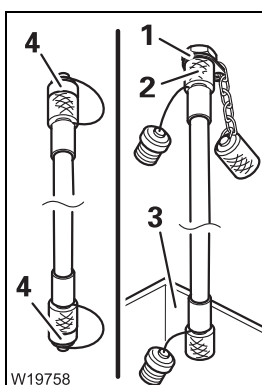
### Danger due to escaping hydraulic oil.

When you screw the connecting piece on to the gauge port, the gauge port opens and oil flows out of the hose. Put the hose end into a receptacle before screwing on the connecting piece.

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

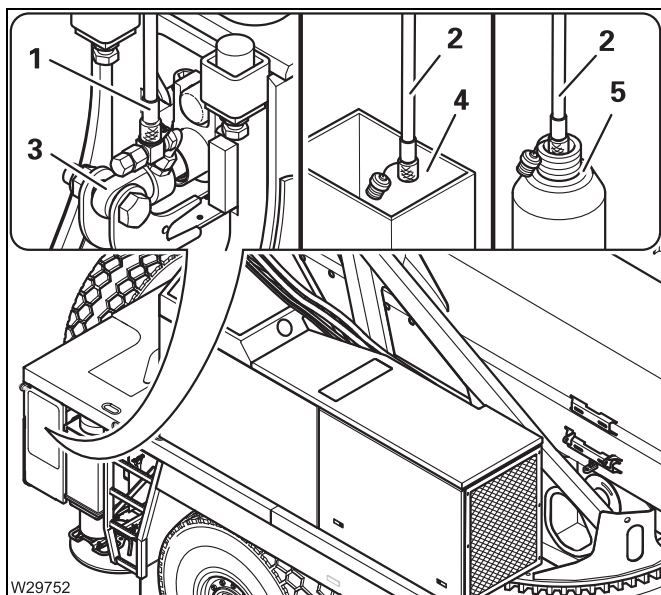
Ask about the applicable regulations.



- Only use a hose with a connecting piece.
- Remove the caps (4).
- Put the hose end into the receptacle (3).
- Remove the cap from the gauge port (1) and screw the connecting piece (2) on to the gauge port – the gauge port opens.



## Taking oil samples

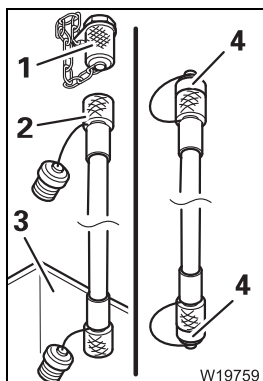


The hose end (1) is connected to the cylinder (3).

The hose end (2) is in receptacle (4).

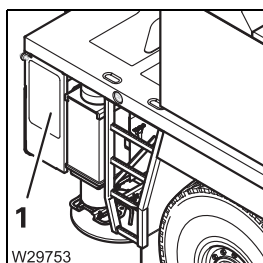
- Start the engine.
- Allow 2 litres (0.5 gal) of oil to flow into the receptacle.
- Switch off the engine and put the hose end (2) into the sample container (5).
- Start the engine.
- Allow 0.3 litres (0.08 gal) of oil to flow into the sample container.
- Switch off the engine.
- Put the hose end back into the receptacle.
- Seal the sample container.

## Disconnecting the hose



- Disconnect the hose (2) – the gauge port (1) closes.
- Close the gauge port with the cap.
- Allow the oil to flow out of the hose into the receptacle (3).
- Close the hose ends with the caps (4).

Remove the receptacle and properly dispose of the oil.



- Fasten the cover (1).

### Dispatch the oil sample to the laboratory

**Manitowoc Crane Care** gives you the opportunity to have the oil sample analysed at our contracted laboratory. A delivery note and a protective mailing bag are available along with the sample containers (GROVE part no. 03141012). You will get the laboratory analysis via the Internet in a short time.

- Label the sample container prior to dispatch with
  - the truck crane serial number,
  - the date of sampling,
  - the number of operating hours since the last oil change and
  - the sampling location (e.g. gauge port on a control block).
- Have the following properties of the oil sample determined by the laboratory
  - the viscosity,
  - the viscosity index,
  - the contamination,
  - the water content.


### Determining the quality of the oil

- Compare the laboratory analysis with the **limit values** and carry out the specified measures if necessary.

#### Viscosity limit values

- Viscosity ISO-VG 32 in accordance with DIN 51524 Part 2.
- Viscosity index  $V_i \geq 150$ .


If one of these limit values has been reached/fallen short of:

- Carry out an oil change;  p. 7 - 111.

#### Contamination limit value

- Contamination according to NAS 1638 class 7 or ISO 4406:1999 code 18/16/13 (purity class).

If this limit value has been reached/exceeded:

- Replace the filters of the hydraulic system;  p. 7 - 115.
- Have the hydraulic oil cleaned with a mobile filter unit until the required cleanliness class is achieved.

#### Water content limit value

- Water content  $\leq 100$  ppm.

If this limit value has been reached/exceeded:

- Have the hydraulic oil cleaned with a mobile water separator until the water content is clearly below the limit value.

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## 7.15.7 Changing the hydraulic oil

The oil only needs to be changed if the laboratory analysis indicates the need for it; *Determining the quality of the oil*, p. 7 - 109.

### Oil, spare parts, tools

Hydraulic oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
200 (53)	HVLP	DIN 51524 - 3 Viscosity: ISO-VG 32	04162158 Castrol Hyspin AWH-M 32

Designation	Quantity	GROVE part no.
Cover gasket 140 / 90 x 3	1	02313899

- Connecting piece and hose (toolbox).
- One or more receptacles, approx. 200 l (53 gal); p. 2 - 4.

### Prerequisites

- The outriggers must be retracted; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

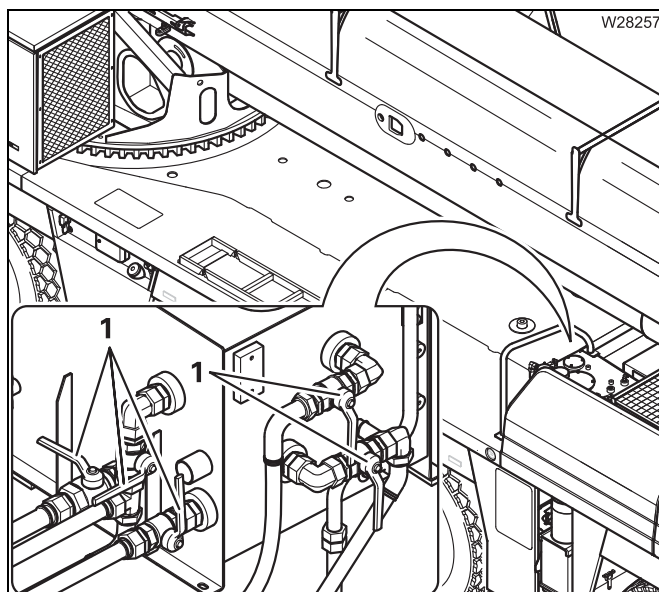
### Close the valves



#### Risk of damage to the hydraulic pumps.

Be sure to secure the engine against unauthorised use.

If the engine is started while the valves in the suction line are closed, the hydraulic pumps will be damaged.



- Close the valves – lever (1) at right angles to the line.



## Handling the valves

The valves can only be opened and closed using the connecting piece and hose. The connecting piece is available in the toolbox.



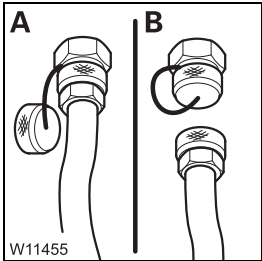
### Risk of environmental damage due to leaking consumables.

Use the supplied connecting piece and hose and a receptacle with sufficient capacity to drain the hydraulic oil.



### Danger due to escaping hydraulic oil.

When the connecting piece is screwed on to the valve, the valve opens and the hydraulic oil immediately flows out of the connecting piece. Holding it by the connecting piece, place the hose into a suitable receptacle before screwing on the connecting piece.



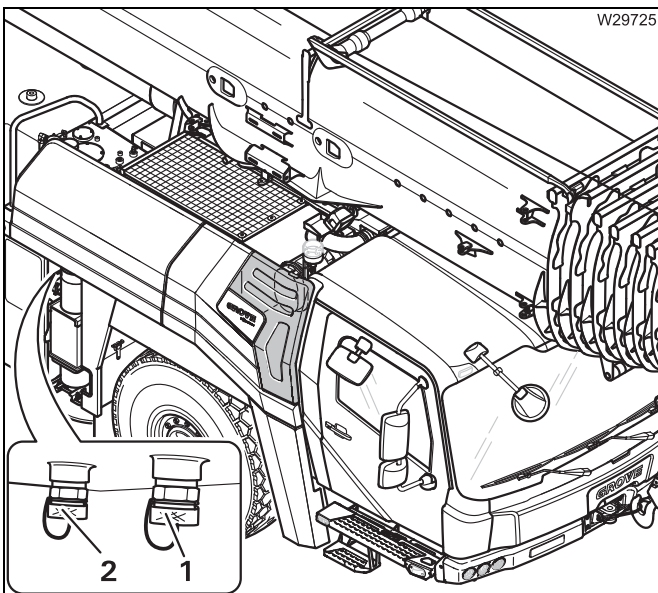
- Fit the hose on to the connecting piece and put the other end of the hose into a receptacle.
- **A** – Remove the cap and screw the connecting piece and hose on to the valve – the valve will open.
- Drain the oil.
- **B** – Remove the connecting piece and hose – the valve will close.
- Screw the cap on to the valve.



## Draining oil



### Risk of environmental damage due to leaking consumables.

Use the supplied connecting piece and hose and a receptacle with sufficient capacity to drain the hydraulic oil.



- Place a receptacle underneath the valves.
- One after the other, screw the connecting piece and hose onto the valves (1) and (2);  *Handling the valves*, p. 7 - 112.
- Change the filters;  p. 7 - 115.

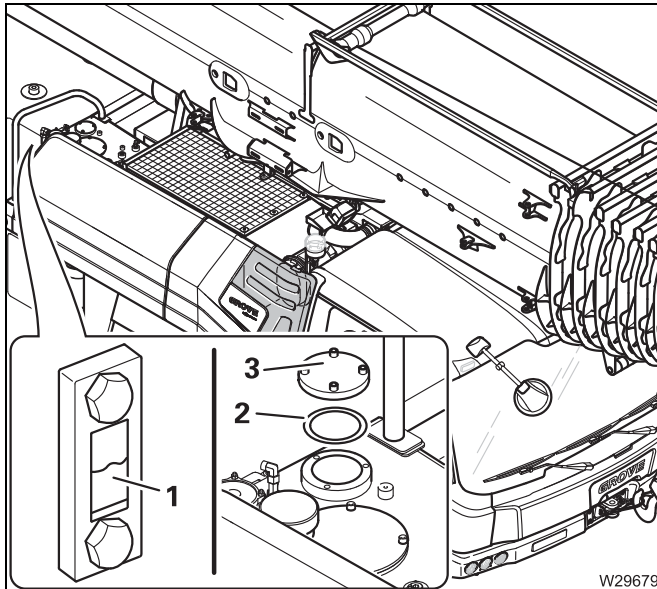


## Topping up the oil



### Risk of damage to the hydraulic system.

Cleanliness is of the utmost importance when handling hydraulic oil. Even fresh hydraulic oil must be filtered before it is added to the tank.



- Remove the cover (3).
- Add new oil through a filter until the level reaches the centre of the inspection glass (1).
- If required, replace the gasket (2) and fasten the cap.

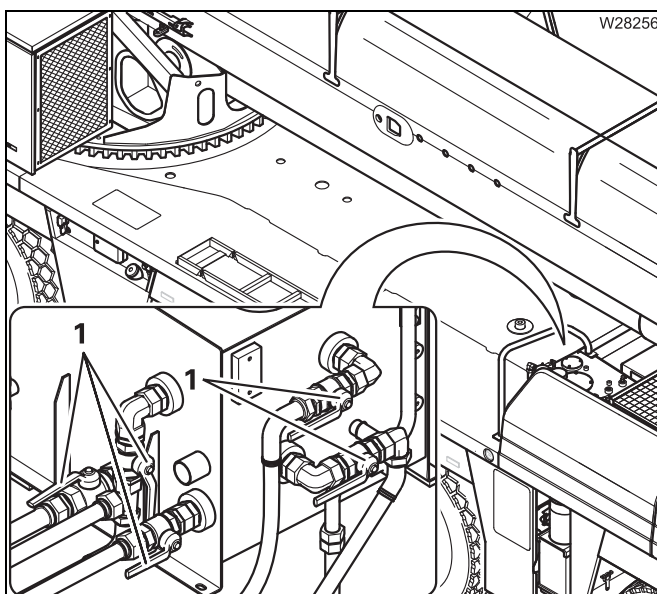
## Establishing the operating conditions

After having changed the oil filters and topping up the oil, you must re-establish the operating conditions.



### Risk of damage to the hydraulic pumps.


Open the valves prior to starting the engine. This prevents damage to the hydraulic pumps.



## Opening the valves

- Open the valves – lever (1) parallel with the line.




- Start the engine.
- Carry out all hydraulic functions several times to remove any air in the system.
- Test drive the truck crane, turning the steering wheel several times to its fullest extent.
- Check the oil level through the inspection glass on the hydraulic oil tank. Top up oil, if necessary;  *Checking the oil level*, p. 7 - 101.

### Bleeding the hydraulic system

If the steering is "spongy" during the test run, you must bleed the hydraulic system at the steering cylinders.

### Preparations

- The truck crane must be raised on outriggers;  *Operating manual*.
- The parking brake must be engaged.



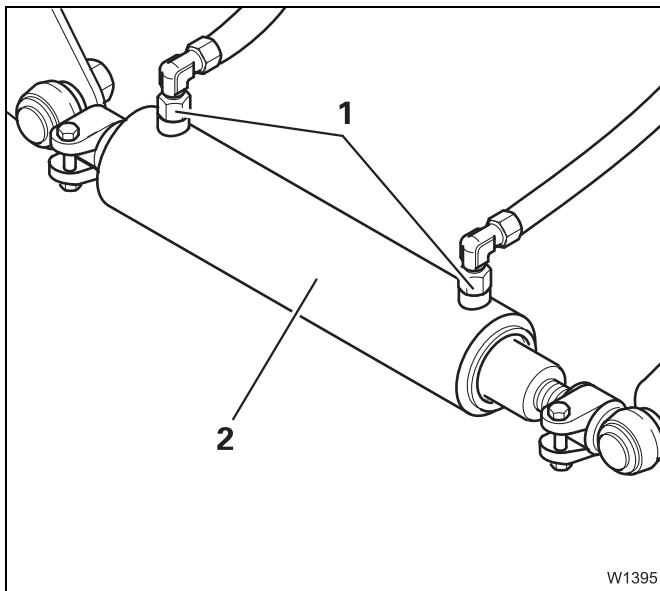
#### Risk of crushing from turning wheels.

When working between the wheels ensure that the steering wheel cannot be turned by an unauthorised person. The wheels turn when the steering wheel is operated.



#### Risk of accidents from high oil pressure.

Never undo the hose connections completely. The hydraulic system is under pressure, even when the steering wheel is not turned.



### Bleed the steering cylinders individually, one after the other

- Start the engine.
- Bleed each steering cylinder (2) by loosening each of the collar nuts (1) in turn, until the oil coming out no longer contains air bubbles.

### If the steering system is still not operating properly

- Notify **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

## 7.15.8

### Changing the hydraulic oil filter

**Oil filters must be replaced** when changing the oil.




**If a warning message appears**, the symbol (1) in the *Warning* submenu indicates that you must change oil filters 1 and 2.


**Filters 3 and 4** must be replaced **after the first 50 hours in driving mode** and then **annually (M 12)** after this.

#### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter (for filters 1 and 2)	2	03329152
Packing set	2	03135778
Filter (for filters 3 and 4)	2	03135866
Packing set	2	03135867

– Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

#### Prerequisites

– The engine must be switched off and secured against unauthorised use;  
 p. 2 - 3.

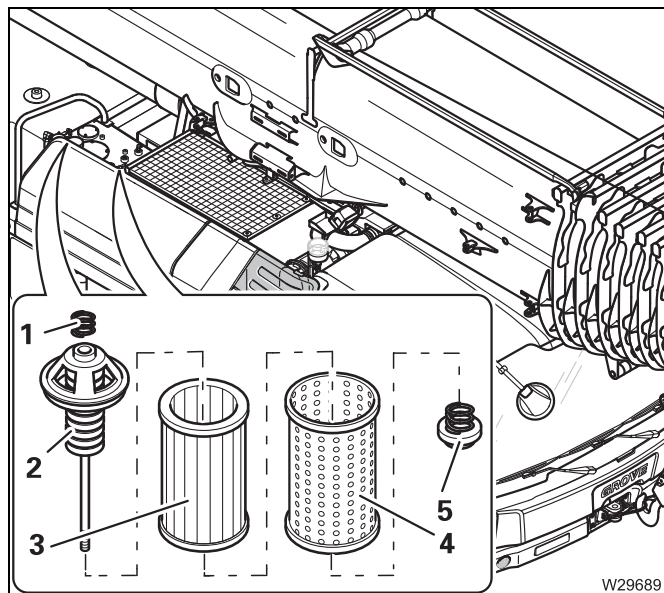


## Changing filters 1 and 2



### Risk of environmental damage due to leaking consumables.

Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



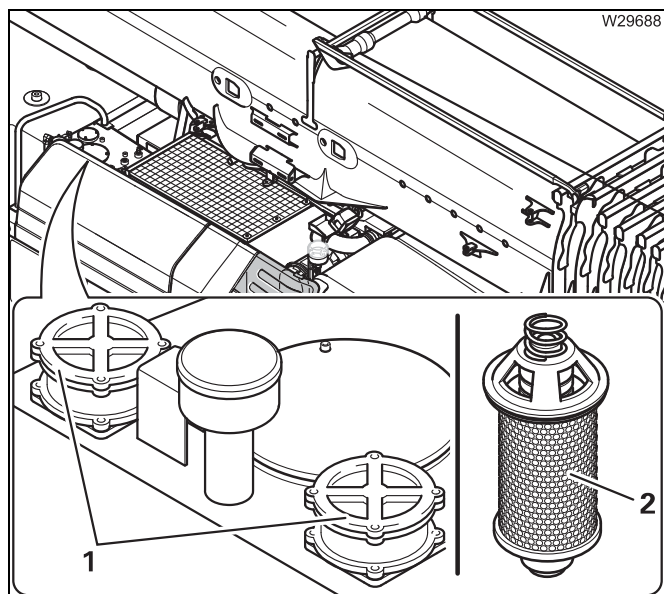
- Loosen the cover and pull out the filters.
- Place the filters in a receptacle.
- Remove the spring (1).
- Undo the nut (5).
- Take the magnetic rod (2) and the filter (3) out of the filter cage (4).
- Clean the magnetic rod (2) and the filter cage (4).
- Insert a new filter (3) into the filter cage (4).
- Replace any damaged parts, where necessary.



### Risk of damage to the hydraulic system.

Large amounts of metal particles are a sign of damage in the hydraulic system.

Have the hydraulic system checked by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.



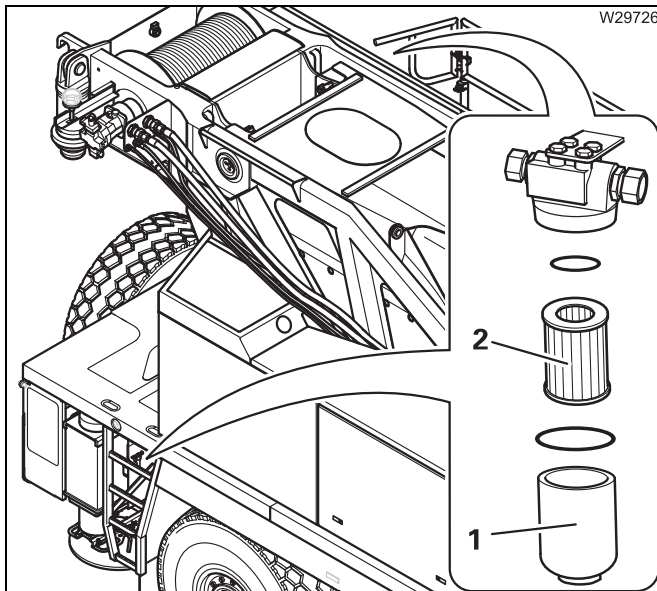
- Assemble the filters (2) and insert them.
- Replace the gaskets and fasten the caps (1).
- Start the engine and check for leaks.

## Changing filters 3 and 4



### **Risk of damage to the environment from filter residues.**

Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



- Remove the receptacle (1).
  - Place the filter in a receptacle.
  - Change the filter (2).
  - Replace any defective parts, where necessary.
  - Fill the receptacle with clean oil.
  - Put the receptacle on and tighten it.
- 
- Change the filter on the opposite side in the same way.

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## 7.16 Central lubrication system

### 7.16.1 Checking the level

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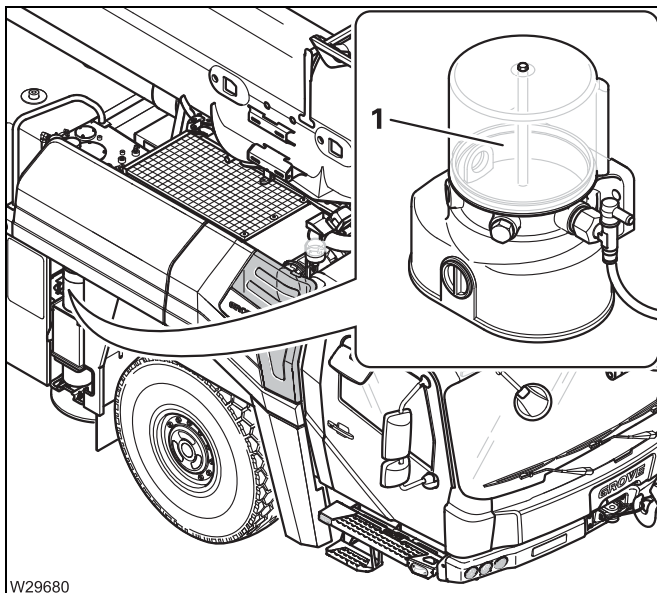
Grease, spare parts, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

– Filling pump from the tool set.

**Prerequisites** – The parking brake must be engaged.


#### Checking the level



- Check the level in the grease container (1). The grease level must be near the **max.** mark.

If it is below the **min.** mark, the level is too low.

#### If the level is too low:

- Add more grease;  p. 7 - 120.



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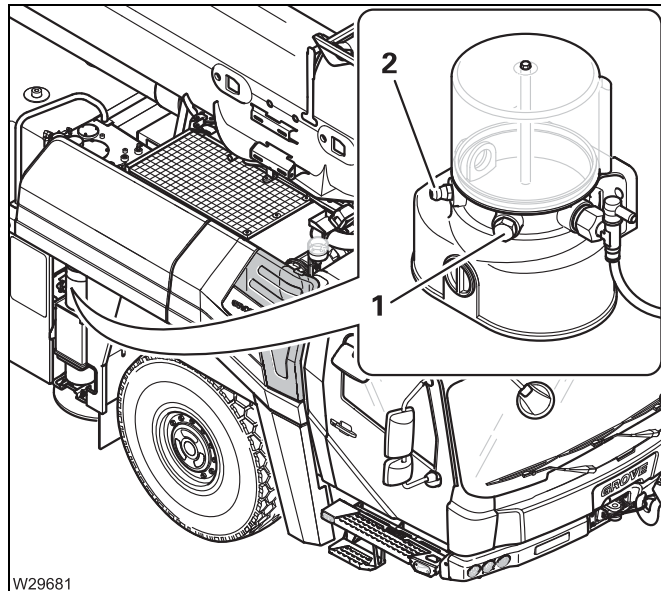
## Topping up



### Risk of damage to the central lubrication system.

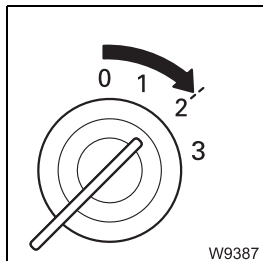
Cleanliness is of the utmost importance when handling grease and filling pumps.

Do not remove the caps from the opening and filling pump until immediately before refilling the grease. This prevents dirt particles from getting into the grease and damaging the central lubrication system.

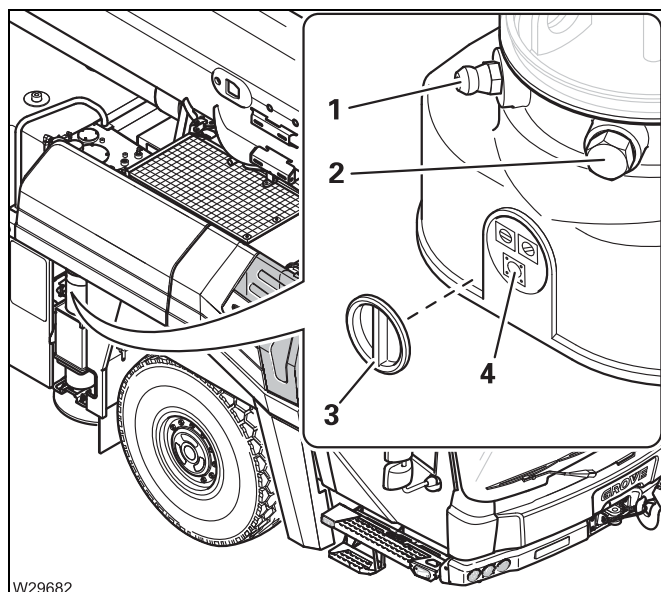


Fill the grease container as follows:

- 1 Filling pump tool set  
You must install the connector from the toolbox.
- 2 Filling pumps for lubrication nipples



- Switch on the ignition.



- Attach the respective filling pump to the connection (1) or (2).
- Remove the cap (3).
- Press the button (4) for approx. 2 seconds once.
- Bolt the cover (3) on.

Intermediate lubrication will be triggered.

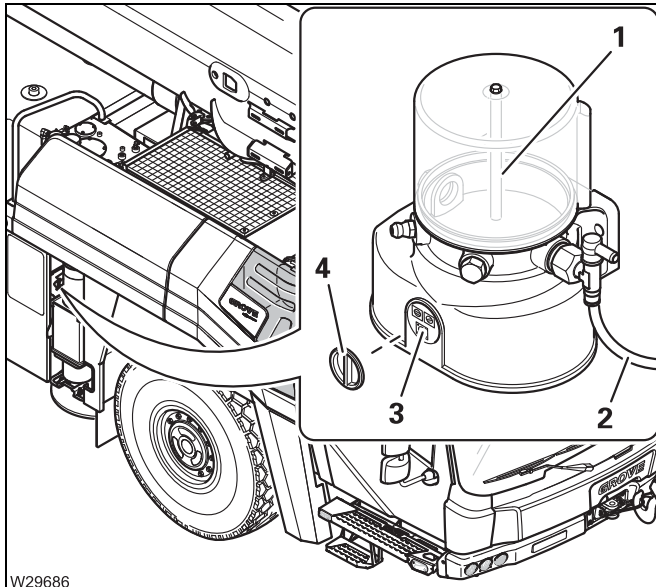
- Fill the grease container up to the **max.** mark.
- Remove the filling pump, wipe away any excess grease and close the holes.



## 7.16.2

### Bleeding the central lubrication system

If the grease container is empty or contains bubbles, you must bleed the central lubrication system.



The grease container (1) is full.

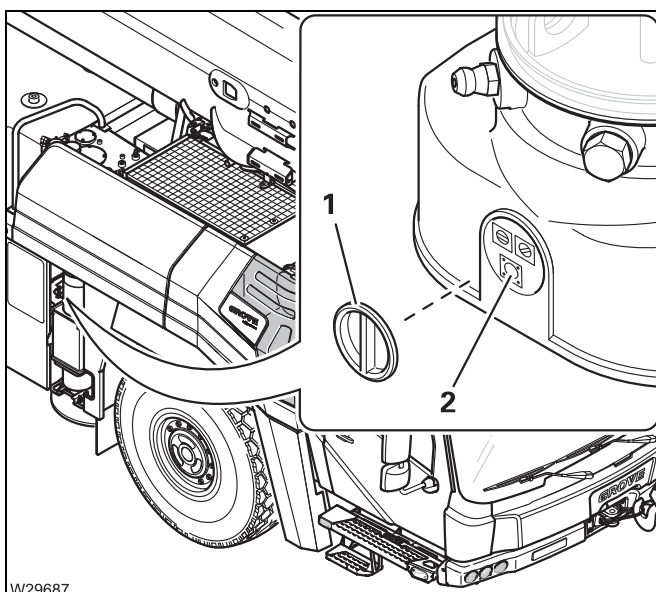
- Loosen the lubricating pipe at the connection (2).
- Switch on the ignition.
- Remove the cap (4).
- Press the button (3) for approx. 2 seconds. Repeat the procedure until the grease flowing from the connection (2) no longer contains any bubbles.
- Bolt the cover (4) on.
- Fasten the lubricating pipe at connection (2).
- Remove any grease that emerges.

## 7.16.3

### Triggering intermediate lubrication

Intermediate lubrication should be activated:

- after high pressure cleaning,
- to check the lubrication system at all lubricating points.



- Switch on the ignition.
- Remove the cap (1).
- Press the button (2) for approx. 2 seconds once.

An intermediate lubrication cycle will be triggered which lasts approx. 3 minutes. Check whether grease is applied to all lubricating points (steering arms on the 1<sup>st</sup>, 4<sup>th</sup> and 5<sup>th</sup> axle lines).

- Bolt the cover (1) on.
- Turn off the ignition and remove any excess grease.

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## 7.17

## Electrical system

### 7.17.1

### Checking the lighting and indicators

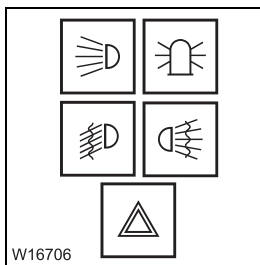
D



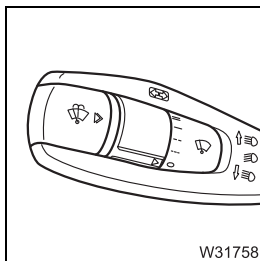
#### Risk of accidents if the safety devices are faulty.

Have faulty lights and indicators repaired by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

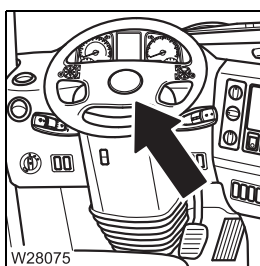
- Check the following functions every day before operating or driving the truck crane, and have faulty parts repaired:



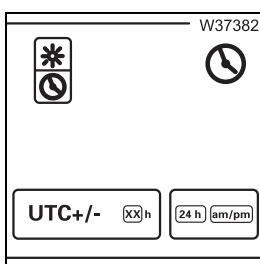
- Parking light/headlight, marker lights, rotating beacons, fog tail light, fog light, outrigger lights,
- Hazard warning system,
- Brake lights,
- Reversing lights,
- Warning buzzer,
- Reverse camera (additional equipment).



- Full-beam headlight,
- Turn signal indicators,
- Windscreen wipers,
- Windscreen washing system,



- Horn.



- Date/time on CCS display.

## 7.17.2

## Checking the batteries

M 1



### **Risk of poisoning from batteries containing lead .**

Battery poles, terminals and parts inside the battery contain lead. Residue containing lead can stick to your hands and may not be allowed to enter your body – e.g. by touching food.

Wash your hands after working on batteries.



### **Risk of explosion from escaping hydrogen.**

Do not place tools on the battery and keep naked lights away from it.



### **Risk of explosion from static charge.**

Only use antistatic cloth to clean the batteries.

This prevents static charging which could result in hydrogen mixtures exploding.



### **Risk of burns from battery acids.**

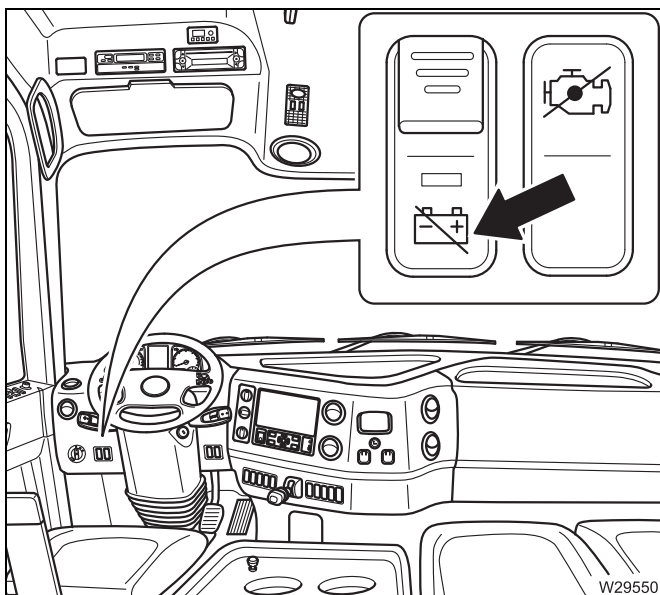
Battery acid is highly caustic. Wear safety glasses and protective gloves. Do not tilt the battery. Rinse off or wash out any acid spray on the skin or clothing using soap suds.



### **Risk of damage to the crane's electrical system.**

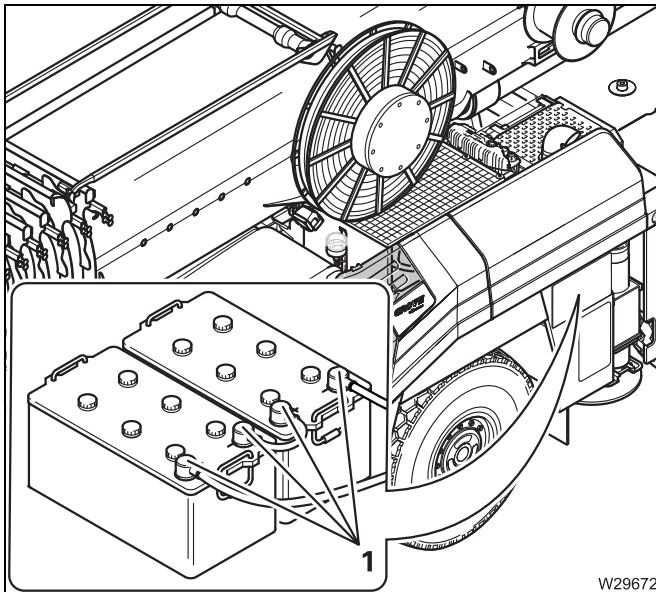
Always switch off the battery master switches before commencing work on the truck crane's electrical system.

This prevents short circuits and resulting damage to the electrical system.



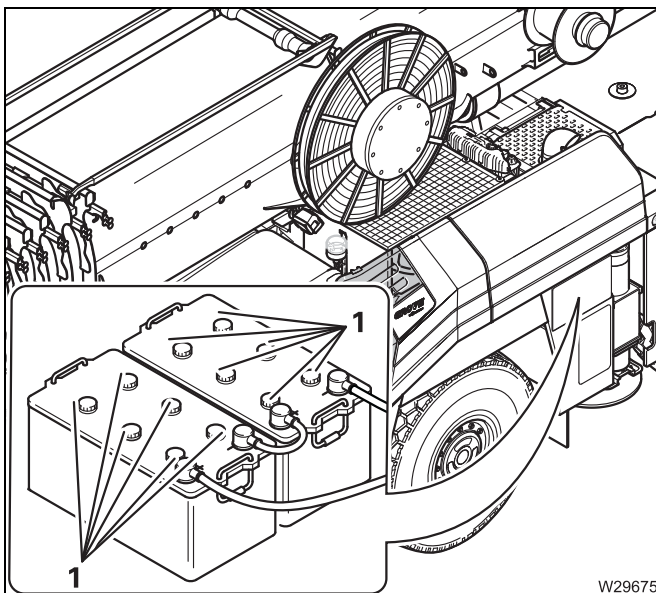
### **Before checking**

- Switch off the battery master switch;  
    ▣▣▣▣▶ *Operating manual*.
- Pull the battery box out.



### Checking the connecting terminals

- Keep the batteries clean and dry.
- Remove any dirty connecting terminals (1) and clean them.
- Fasten any loose connecting terminals.
- Grease the connecting terminals and poles lightly with a special battery terminal grease.



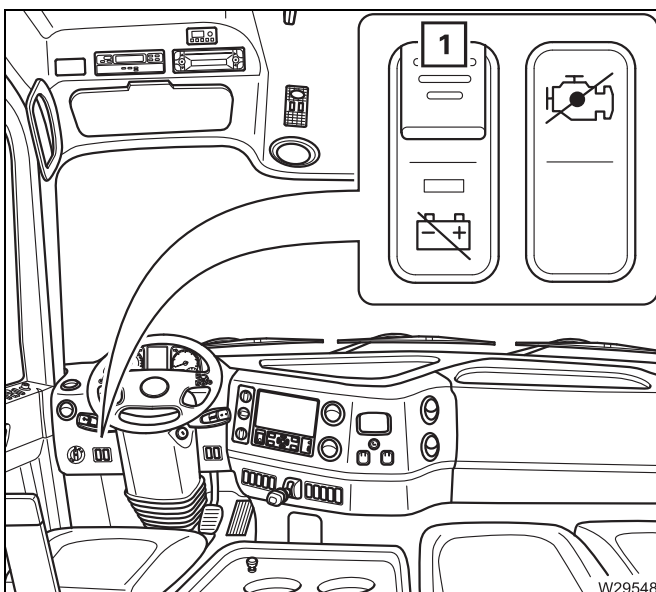
### Checking the acid level

Batteries without caps (1) are maintenance-free.

- Remove all caps (1).  
The acid level must be above the plates.

### If the acid level is too low

- Top it up using only distilled water until the plates are covered.
- Tightly bolt on all caps (1).



### After checking


- Push the battery box in.
- Switch on the battery master switch (1);  
▣▣▣▣ *Operating manual*.
- Check the timers on the tachograph and on the auxiliary heater; ▣▣▣▣ *Operating manual*.
- Enter the code for the radio; ▣▣▣▣ *Separate operating manual*.

### 7.17.3

## Checking the charge level of the batteries

M 3

### Spare parts and tools

- Battery charger (additional equipment);  p. 7 - 128 or
- Acid siphon.

### Charge level table

The measurement of the acid concentration with the acid siphon will give you an indication of the charge level of the batteries. The acid siphon can have a scale in g/cm<sup>3</sup>, for example. Observe the special scale on your acid siphon.

Acid concentration (g/cm <sup>3</sup> )	Charge level
1.28	good
1.20	half-charged; recharge
1.12	flat; recharge immediately



#### **Risk of poisoning from batteries containing lead.**

Battery poles, terminals and parts inside the battery contain lead. Residue containing lead can stick to your hands and may not be allowed to enter your body – e.g. by touching food.

Wash your hands after working on batteries.



#### **Risk of explosion from escaping hydrogen.**

Do not place tools on the battery and keep naked lights away from it.



#### **Risk of explosion from static charge.**

Only use antistatic cloth to clean the batteries.

This prevents static charging which could result in hydrogen mixtures exploding.



#### **Risk of burns from battery acids.**

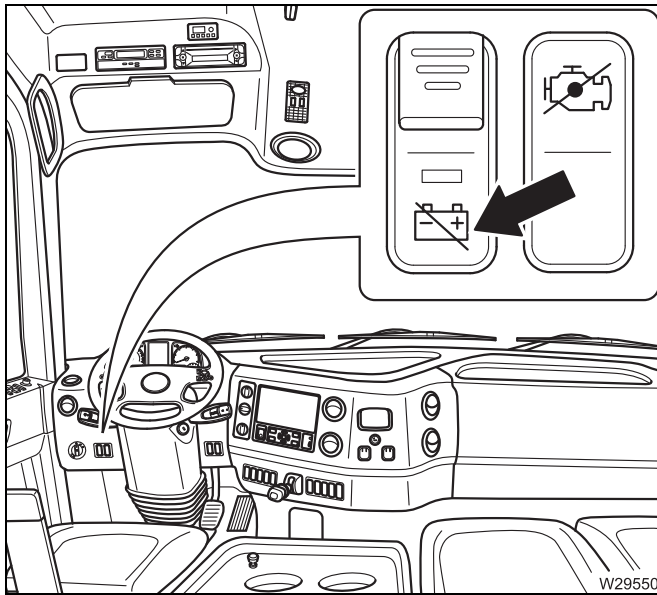
Battery acid is highly caustic. Wear safety glasses and protective gloves. Do not tilt the battery. Rinse off or wash out any acid spray on the skin or clothing using soap suds.



#### **Risk of damage to the crane's electrical system.**

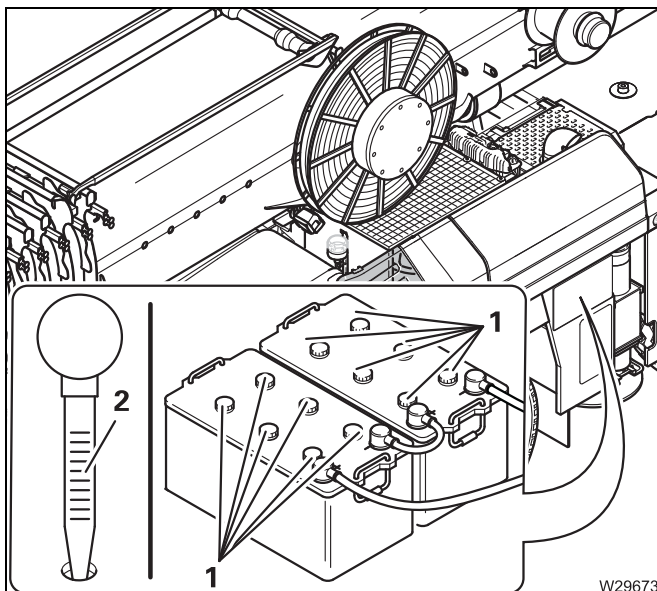
Always switch off the battery master switches before commencing work on the truck crane's electrical system.

This prevents short circuits and resulting damage to the electrical system.



### Before checking

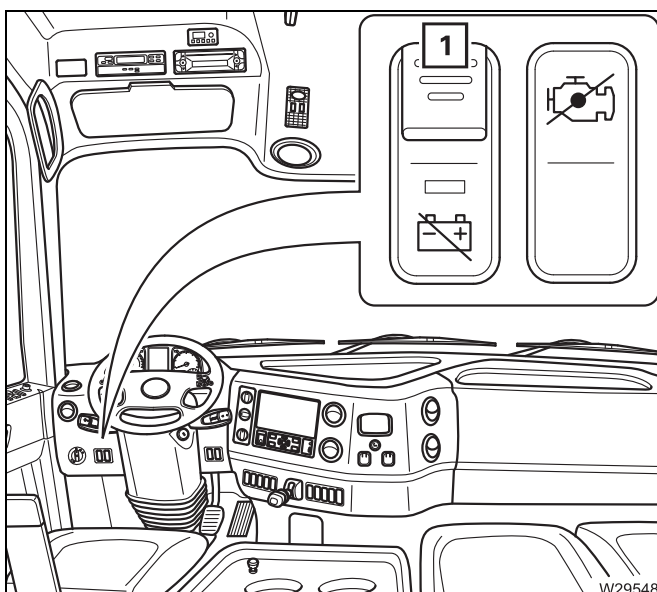
- Switch off the battery master switch;  
    ▣▣▣▣► *Operating manual*.
- Pull the battery box out.



### Checking the acid concentration

Batteries without caps (1) are maintenance-free.

- Remove all caps (1).
- Read off the cell value on the acid siphon (2) and compare the value with that in the table;  
    ▣▣▣▣► *Charge level table, p. 7 - 126*.
- Check all cells in the same way.
- Tightly bolt on all caps (1).



### After checking


- Push the battery box in.
- Switch on the battery master switch (1);  
    ▣▣▣▣► *Operating manual*.
- Check the timers on the tachograph and on the auxiliary heater; ▣▣▣▣► *Operating manual*.
- Enter the code for the radio; ▣▣▣▣► *Separate operating manual*.

## 7.17.4


## Charging the batteries using the battery charger

M 3

### Prerequisites

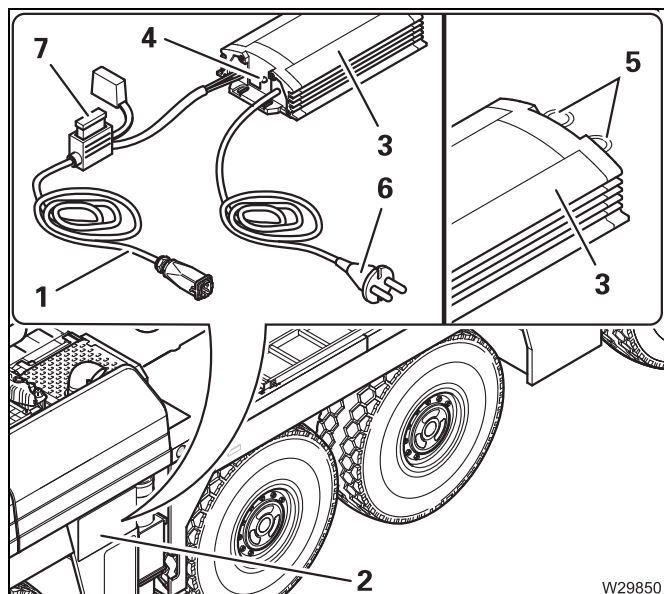
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- An external 230 V mains power supply must be available at the location.
- The battery charger (GROVE part no. 03320239; additional equipment) must be available.
- The location must be well ventilated and protected against moisture. The battery charger may not be used at locations where there is risk of a gas or dust explosion.

### Battery charger

- Familiarise yourself with the correct operation of the battery charger;  *Separate operating manual.*

### Connecting

- Take the battery charger out of its storage compartment in the driver's cab.



- Insert the plug (1) into the socket (2) on the battery box.
- Place the battery charger (3) in a protected place where you can see the indicator lamp (4).  
The battery charger can be suspended from the ring eyes (5).
- Insert the plug (6) into the socket on the mains supply 230 V at the location.  
The indicator lamp (4) flashes – the charging process starts.
- If the indicator lamp (4) does not flash, check the fuse (7).

### Charging

- Check the charging process at the indicator lamp (4).

Indicator lamp flashing:                      The batteries are being charged.

Indicator lamp lit continuously:          The batteries are fully charged.

### After completion of charging

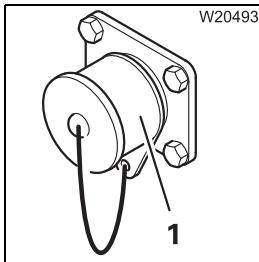
- Remove the plug (6) from the 230 V mains supply.
- Remove the plug (1) from the battery box.
- Return the battery charger to the storage compartment in the driver's cab.



## 7.17.5

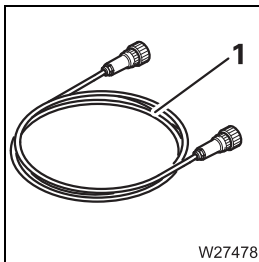
## Check the external starting socket

M 3



The battery box is equipped with an external starting socket (1).


### Accessories



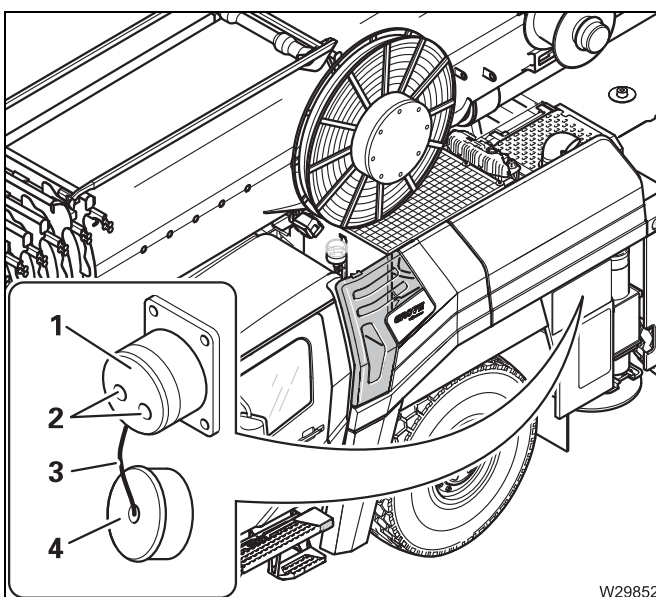
A connection cable (1) for the external starting socket is supplied with the truck crane (tool set).

Designation	GROVE part no.
Connecting cable with two plugs; length 12 m	03143281

The battery box can also be equipped with a battery charger as **additional equipment**.

- Consult the operating instructions supplied with the battery charger and regularly check that all components are functioning correctly to ensure that the external starting socket, connecting cable and battery charger are ready for operation if needed;  *Operating manual*.

### Check the following



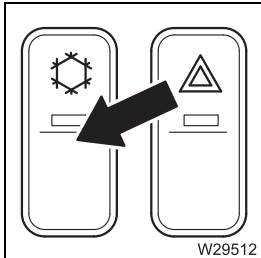
- Remove the cap (4) from the socket (1).
- Check that the cap is not damaged and is secured with the chain (3).
- If necessary, clean the poles (2).
- Attach the cap – the cap must be fitted tightly and compactly on the socket.


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## 7.18 Air conditioning system

### 7.18.1 Checking the air conditioning system

M 1



- Switch on the air-conditioning system;  *Operating manual*.
- Check that cooling takes place. If it does not, the air conditioning system is defective.
- Switch the air conditioning system off.

#### If the air conditioning system is defective

- Do not start it up again to avoid further damage.

Have the air-conditioning system repaired as soon as possible by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

### 7.18.2 Checking hoses

M 6



#### Risk of burns due to escaping refrigerant.

Wear suitable safety glasses and gloves when checking the hoses and connections.

This will prevent injury from suddenly escaping refrigerant. Seek medical attention if the skin or eyes come into contact with the refrigerant.

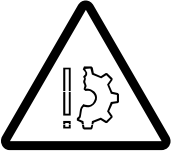
- Check all refrigerant hoses for damage and areas of wear.

Have damaged hoses checked by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop only.

### 7.18.3

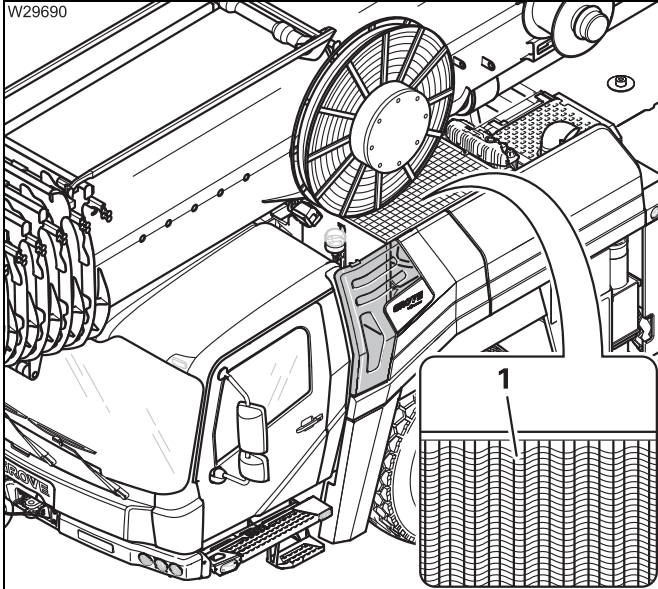
## Cleaning the condenser fins


M 12



### Risk of damage to the condenser.

Do not use a high pressure cleaner or steam jet cleaner. The powerful jet may damage the fins. Use only compressed air for cleaning.



- Switch the air conditioning system off.
- Clean the condenser fins (1) with compressed air;  *Have the radiator checked/cleaned, p. 7 - 18.*

### 7.18.4

## Checking the entire air conditioning system

M 12



This inspection may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.



### Risk of burns due to escaping refrigerant.

Wear suitable safety glasses and gloves when checking the hoses and connections.

This will prevent injury from suddenly escaping refrigerant. Seek medical attention if the skin or eyes come into contact with the refrigerant.

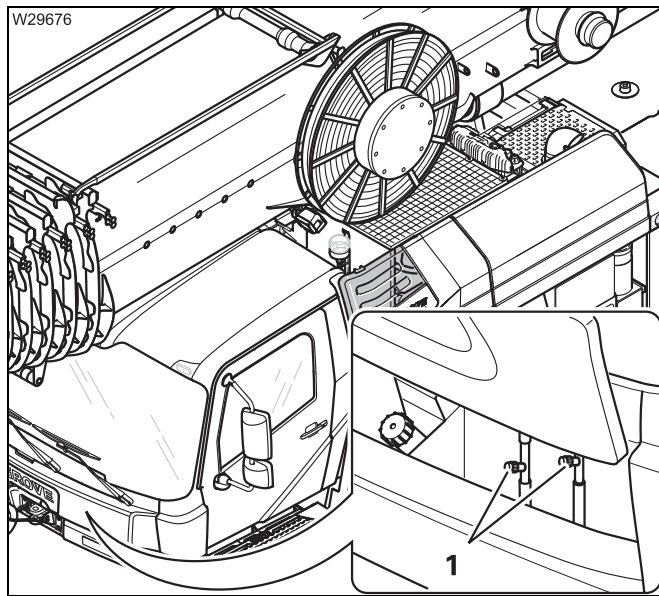
- Have the entire air conditioning system checked for leaks and proper functioning.  
The inspection of the air conditioning system particularly includes the inspection of
  - the refrigerant collector, in accordance with the pressure container regulations (test group II) and
  - the refrigerant compressor.
- Only allow the system to be topped up with suitable refrigerant.

## Refrigerant

Fill quantity in kg (lbs)	Designation	CAS no. EC no.
1.0 (2.2)	Tetrafluoroethane (R134a)	811-97-2 212-377-0

Compressor oil: FUCHS SE 55

## Filler connections



The filler connections (**1**) for refrigerants are on the refrigerant compressor hoses.

## 7.18.5

## Changing the pollen filter

M 12

### Reducing the interval

- Under difficult operating conditions – at extremely sandy or dusty locations – you must change the filter earlier than normal.

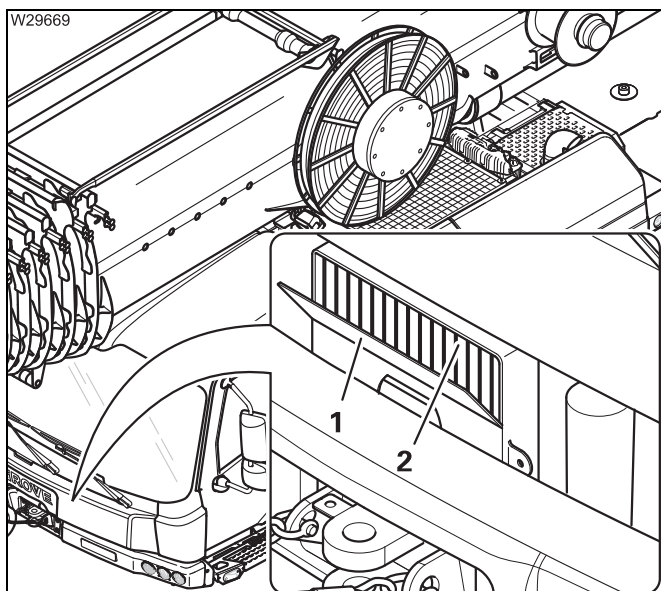
### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	03134974

### Prerequisites

- The engine must be switched off and secured against unauthorised use;  
    ▶▶▶ p. 2 - 3.

### Changing



- Open the cover (1).
- Remove the filter (2) from the housing and clean the housing with a cloth.
- Insert a new filter.
- Fasten the cover.

## 7.19 Towbar coupling

Depending on the equipment fitted to your truck crane, it may have towbar couplings (additional equipment) from different manufacturers.

The wear values for other manufacturers may vary from those specified;  
▣▣▣▣▶ *Separate operating manual.*

### 7.19.1 Lubricating the towbar coupling

**M 1**

This maintenance work is not required if the towbar coupling is connected to the central lubrication system.

#### Grease, spare parts, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

– Grease gun from the tool set.



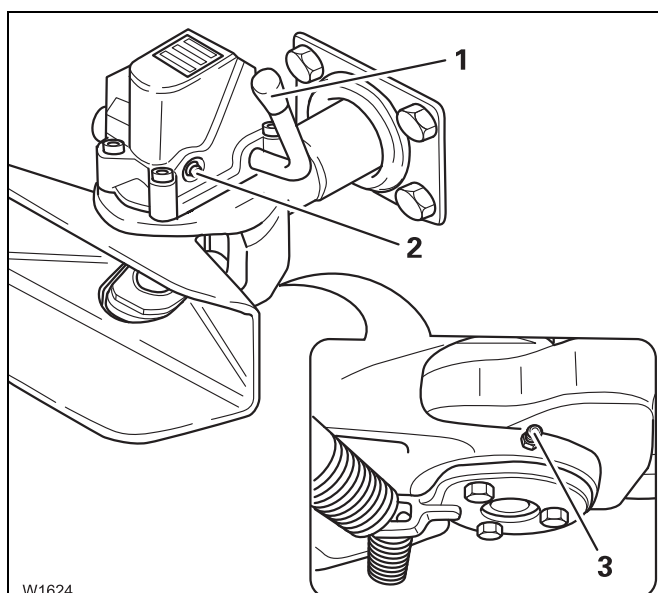
#### Risk of injury when the automatic closing device is triggered.

Do not put your hand into the coupling jaw when the towbar coupling is open.

This may trigger the automatic closing device, make the cotter pin move down and seriously injure your hand.



To avoid over-lubrication, the towbar coupling may only be lubricated when open.



- Clean the grease nipples (2) and (3).
- Open the towbar coupling. To do this, move the lever (1) up.
- Press grease into the grease nipples (2) and (3).
- Close the towbar coupling.



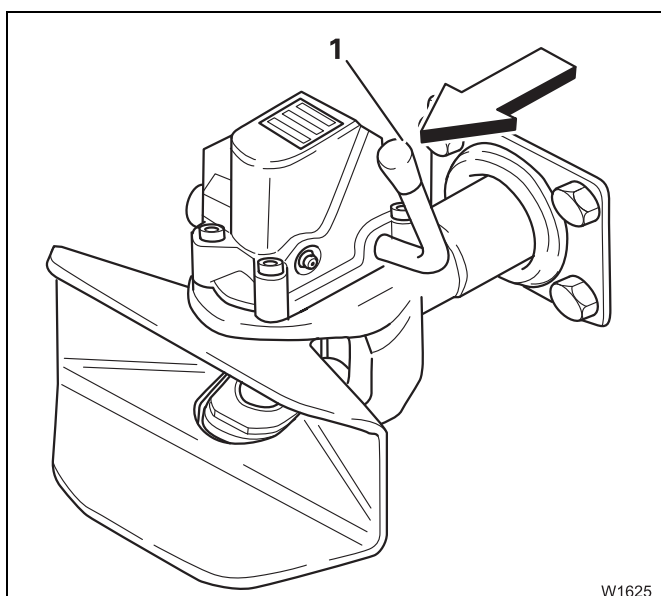
## Closing the towbar coupling



### **Risk of injury when manually closing the towbar coupling.**

When closing, the lever moves down with great force in the direction of the coupling jaw. Start the closing process only by moving the lever briefly in the direction of the coupling jaw with the ball of your hand.

If you hold the lever and move it down, it may carry your hand with it and crush it.



After lubrication you must close the towbar coupling.

- Move the lever (**1**) briefly in the direction of the coupling jaw (observe the arrow).
- Remove any grease that emerges.




## 7.19.2

## Checking the bearing

M 3

### Prerequisites

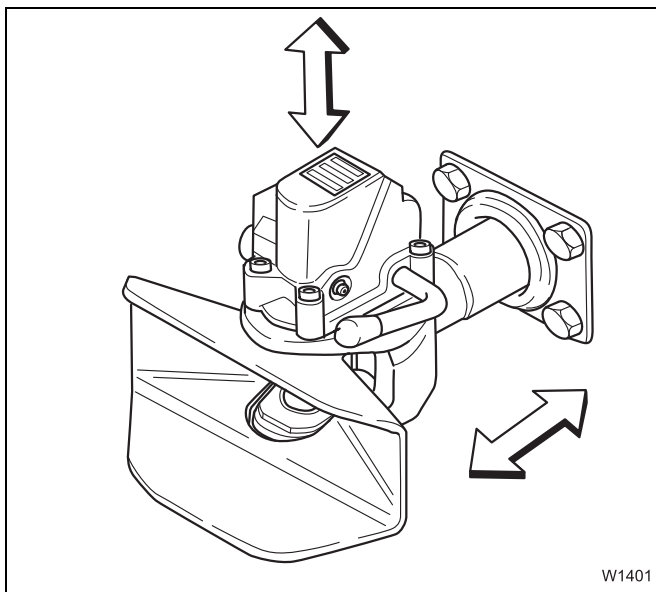
– The coupling must be closed;  p. 7 - 136.

### Checking the bearing



#### Risk of injury.

Ensure that the towbar coupling is closed for the following work (lever points downwards). The lever may otherwise come down with great force and cause serious injury to your hand.



- Check the bearing of the towbar coupling by vigorously shaking it up and down and in the longitudinal direction (arrows). Hold the towbar coupling at the top and bottom of the coupling head and not by the coupling jaw.


The vertical play at the coupling head must be no more than 3 mm (0.1 in).

### 7.19.3

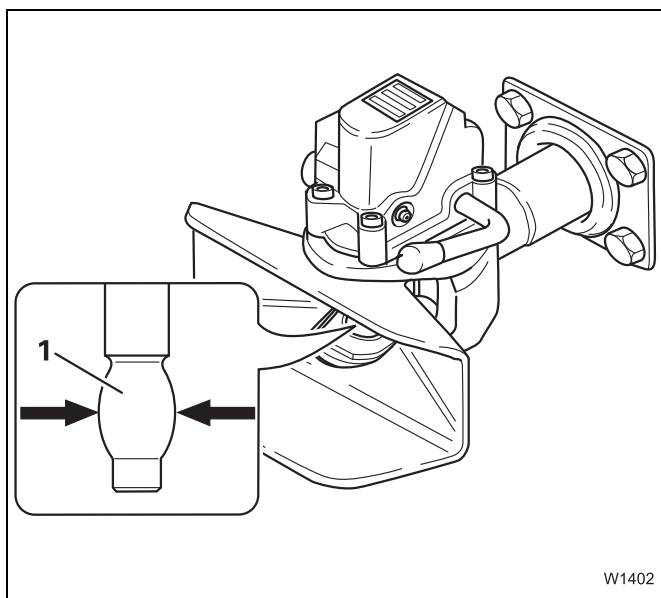
## Checking the cotter pin

M 3

### Prerequisites

– The coupling must be closed;  p. 7 - 136.

### Checking the cotter pin

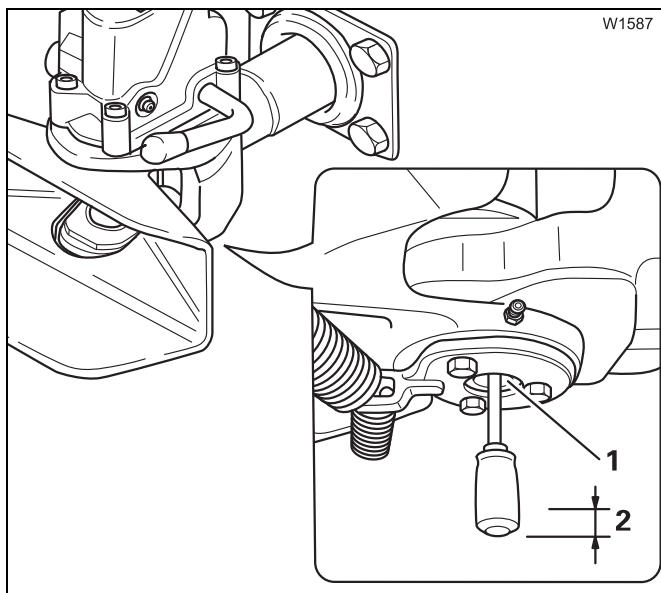


- Check the wear on the cotter pin (1). The diameter of the crowned section (arrows) must not be less than the following values:

Model series 400: **36.5 mm (1.44 in)**

Model series 700: **46.0 mm (1.81 in)**

If the dimension is smaller than that given above, have the cotter pin replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair personnel.



- Also check the cotter pin for the correct vertical play. Take a screwdriver and press the pin (1) upwards. The vertical play (2) of the pin must not exceed 4 mm (0.15 in).

## 7.19.4

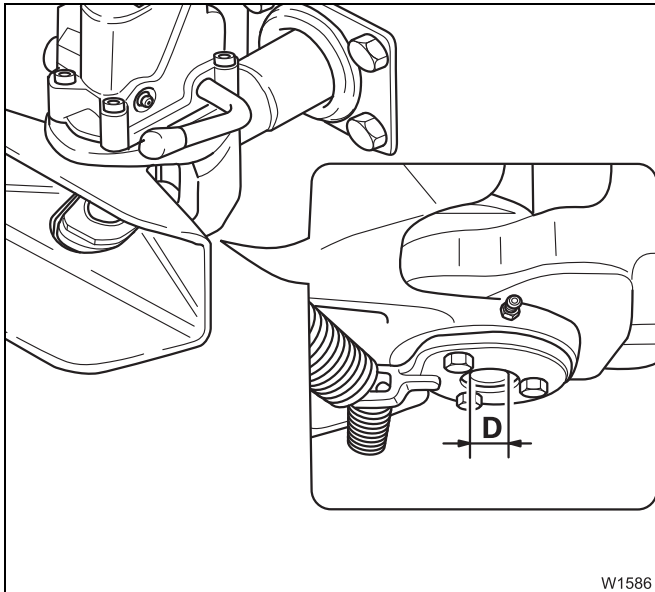
### Checking the lower bushing

M 3

#### Prerequisites

– The coupling must be closed; ▮▮▮▮ p. 7 - 136.

#### Checking the bushing



- Check the internal diameter of the lower bushing. The dimension **D** must not exceed the following values:

Model series **400**: **31.5 mm (1.25 in)**

Model series **700**: **34.2 mm (1.35 in)**

If the dimension is larger than that given above, have the bushing replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your specialist repair crew.

## 7.19.5

### Checking the initial tension of the springs

M 3

The coupling head should require physical force to twist it when checking the torque.


- Twist the coupling head clockwise and anticlockwise to check the initial tension of the rubber springs.

### 7.19.6

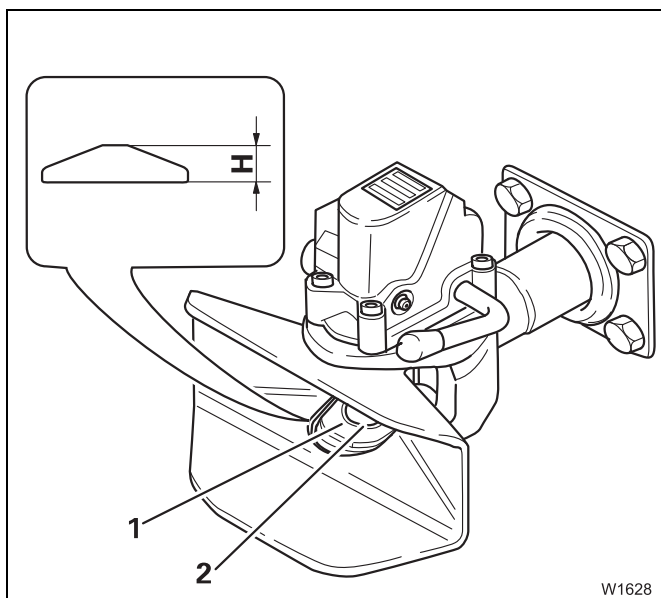
## Checking the support ring

M 3

### Prerequisites

- The coupling must be closed;  p. 7 - 136.

### Checking the support ring



- Check the support ring (1) at the bottom of the coupling jaw.  
When the trailer is coupled, the draw eyelet of the trailer must not be in contact with the lower bushing (2).

### Have the support ring changed if:

- The trailer's draw eyelet touches the lower bushing because of wear or
- The support ring has reached its wear limit of  $H = 14 \text{ mm (0.55 in)}$ .

### 7.19.7


## Checking the function of the coupling jaw/ resetting the central position

M 3

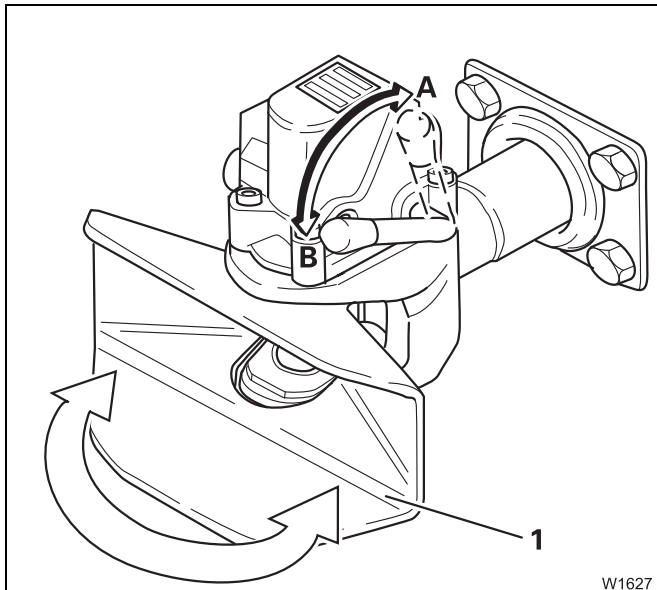
### Spare parts and tool

- Torque wrench for torque of 58 Nm (42.7 lbf ft).

### Prerequisites

- The coupling must be closed;  p. 7 - 136.

## Checking for correct functioning




The coupling jaw must be able to move easily in both directions.

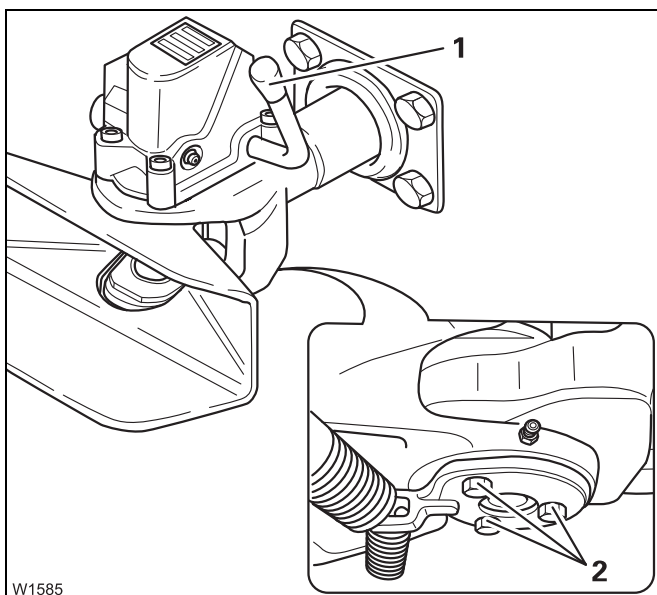
- Hold the coupling jaw (1) pressed slightly to the left or right.
- Open the coupling (position A) and let the coupling jaw go.


The lever must automatically lock the coupling jaw in the middle position. The coupling jaw is locked when the coupling can no longer move to the side.



If the lever does not automatically engage with the coupling jaw, the central position must be re-adjusted;  p. 7 - 141.

## Resetting the middle position



- Open the coupling (lever (1) pointing upwards) and loosen the screws (2).
- Push the coupling jaw to the side until the lever engages.
- Tighten the screws – torque 58 Nm (42.7 lbf ft).
- Check the functioning of the coupling jaw;  p. 7 - 140.

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## 7.20 Other maintenance work

### 7.20.1 Checking the windscreen washing system

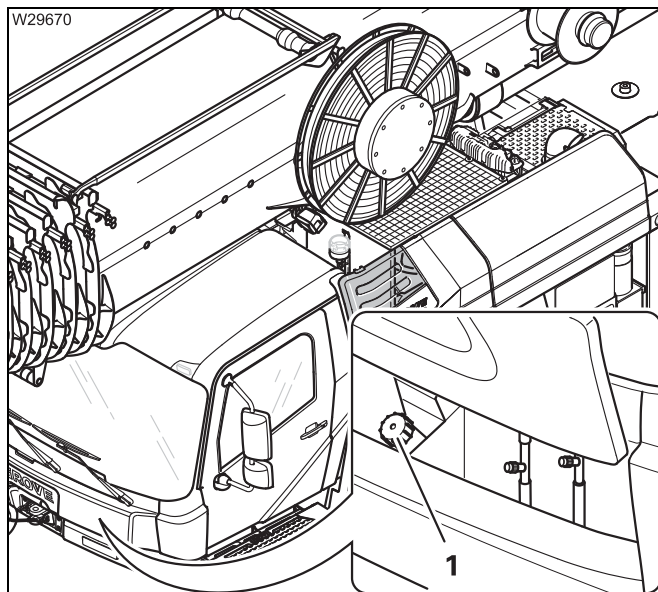
**W**

Water, spare parts, tool

Designation	Quantity	GROVE part no.
Wiper blades	3	02311858

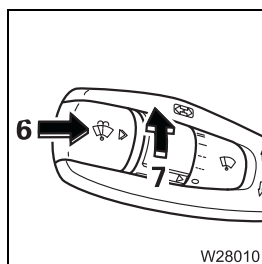
- Water; add commercially available detergent and antifreeze to it.
- A can for mixing and filling.

#### Topping up



- Open the cap (1) on the filler neck.
- Top up the windscreen washing fluid through the filler neck.
- Close the filler neck with the cap.

#### Wiping



- Press the multipurpose switch of the windscreen wiper/washing system (6) and (7); *Operating manual*.

- Check all the wiping stages (slow, fast, intermittent).

#### If the windscreen does not wipe clean

- Change the wiper blades.

## 7.20.2

## Lubricating the outrigger beams

M 1

- Comply also with the  *Run-in regulations*, p. 4 - 1.

### Grease, spare parts, tools

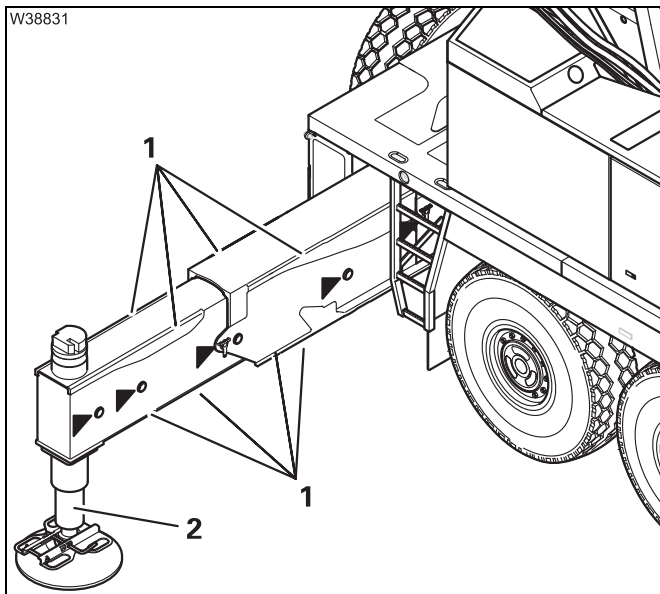
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369
Spray	Spray on Berulub; 0.5 litres (spray-on)		01929824


– Brush or roller.



### **Danger of crushing from extending outrigger beams.**

Ensure that there is sufficient room around the crane. Warn any persons nearby before extending the outrigger beams. Observe the safety instructions in the operating manual.



- Fully extend all outrigger beams;  *Operating manual*.
- Apply the grease to both sides of the slide faces (1) on all the outrigger beams.
- Extend and retract the outrigger beams several times.
- Remove any excess grease.
- Clean the uncovered end (2) of the outrigger cylinder and bearing surfaces on the outrigger pad by removing old grease, dirt particles and rust.
- Spray the uncovered end (2), making sure the grease coating is evenly distributed.

### **After every high-pressure cleaning operation on the truck crane**

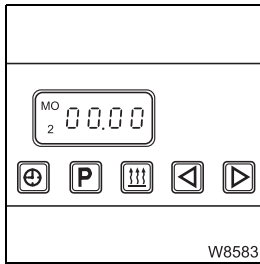
- Lubricate the outrigger beams.



### 7.20.3

## Checking the auxiliary heater

M 1



Depending on the equipment, your truck crane has been fitted with an auxiliary heater.

During the warm summer months, run the auxiliary heater for 20 to 30 minutes; *Operating manual*.

- Check that the system is working properly. Also perform a functional check of the controls.
- If the heating system is not working correctly, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

### 7.20.4

## Lubricating the cab door

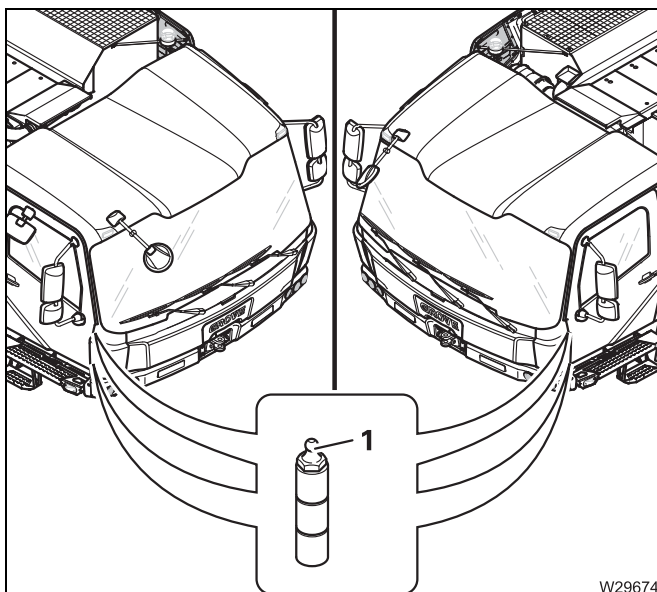
M 12

### Grease, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

– Grease gun from the tool set.

### Greasing



- Open the doors on the driver and passenger side.
- Clean the grease nipples (1) on the door hinges.
- Press grease into the grease nipples.
- Close and open the doors several times – the doors should move easily.
- Remove any grease that emerges.

- In case the doors are stiff or do not close properly after lubrication, have them adjusted by **Manitowoc Crane Care** or by an authorised GROVE dealer.

## 7.20.5

## Lubricating the connecting and socket pins

M 12

### Grease, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

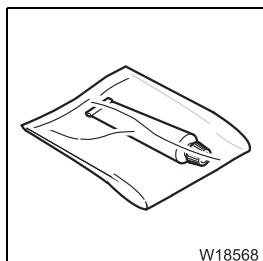
- Brush.

### Check the following

Depending on the equipment, there are various connecting and socket pins on the carrier such as:

- Fastenings to hold the hook block on the bumper while driving on the road,
  - Clamps for ladders on the carrier,
  - Hinged warning panels under the bumper,
  - Fastenings for the outrigger pads and socket pins on the outrigger,
  - Locks on the removable covers,
  - Hinges on the doors and covers of the storage box.
- Check the pins for wear such as rust, deformation, broken clips, chains and pin-type keepers.
  - If the pins are damaged, have them replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.
  - Use only authentic replacement pins.

### Greasing



- Clean the pins.
- Lubricate the pins with a brush.

## 7.20.6

## Renewing the corrosion protection

M 12

### Protective agent, tools

Protective agent	GROVE part no.
Corrosion protection	03140192

- Spray gun with spray extension.
- Brush.
- Protective clothing, protective goggles.

### Prerequisites

- The undercarriage of the truck crane must be thoroughly cleaned.
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must be switched off and secured against unauthorised use;  
▣▣▣▶ p. 2 - 3.

### Check the following

At the factory, the underside of the carrier was sprayed with corrosion protection for the first time.

The corrosion protection is solvent-free and is water soluble while being sprayed on. A transparent, waxy, protective film is formed after a drying time of one hour.

- Check the condition of the original protective film.
- If required, remove any rust and touch up the paintwork before you spray on a new protective film.

### Processing instructions

- Observe the processing instructions for corrosion protection:
  - Processing temperature: above 10 °C (50 °F).
  - Removability before drying: With water.
  - Removability after drying: With solvent naphtha.
  - Drying time: 1 hour.

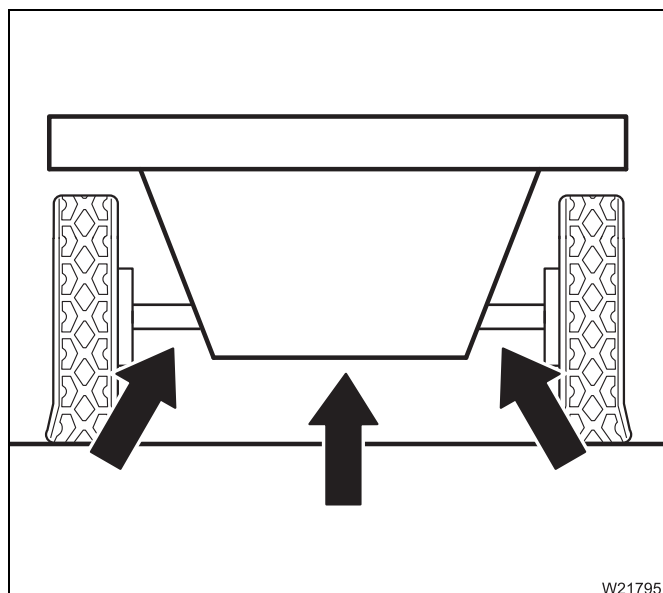


## Spraying



### **Risk of injury to the eyes.**

While working with the spray extension you could be hit by the spray jet or spray droplets. Wear protective goggles, protective clothing and gloves.



- Spray the corrosion protection agent on the underside of the carrier using a spray extension.
- Clean surfaces sprayed by accident immediately with water.
- Let the corrosion protection dry for one hour.
- Check that a transparent waxy protective film has covered the entire surface.

## 7.20.7

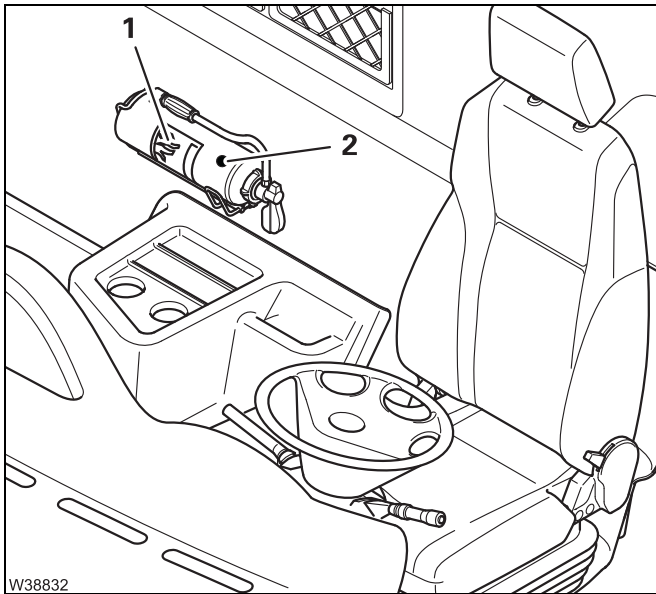
### Having the fire extinguisher checked

Y 2

Depending on your truck crane's equipment, it has fire extinguishers.



The maintenance interval may even be shorter, depending on the respective national regulations and the operating location. Ask the local fire safety officer about the national and local regulations.



- Follow the operating manual (1) on the fire extinguisher.
- Have the fire extinguisher serviced by trained personnel in good time before the maintenance interval specified on the label (2) expires.



#### **Danger due to the fire extinguisher not working.**

There is no guarantee that the fire extinguisher will still work properly once the maintenance interval on the label has expired.

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## 8 Maintenance work on the superstructure

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# 8

## Maintenance work on the superstructure

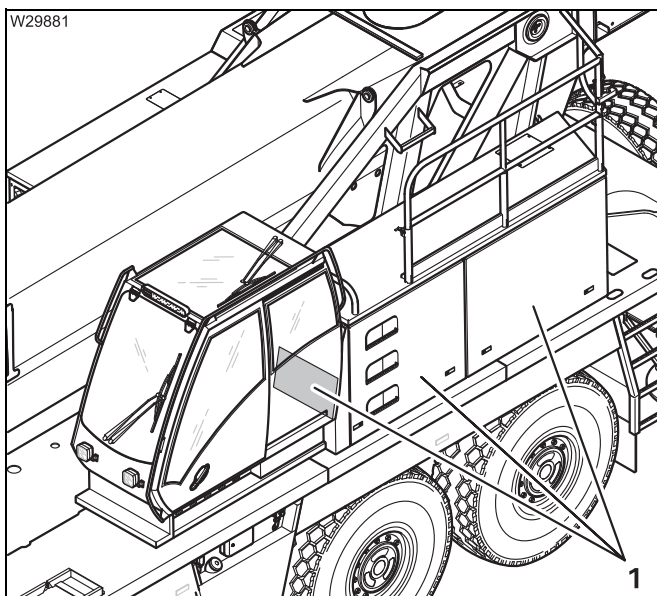
### 8.1

### General instructions

#### 8.1.1

#### Covers

Various types of work (e.g. oil change) require that the covers be removed.

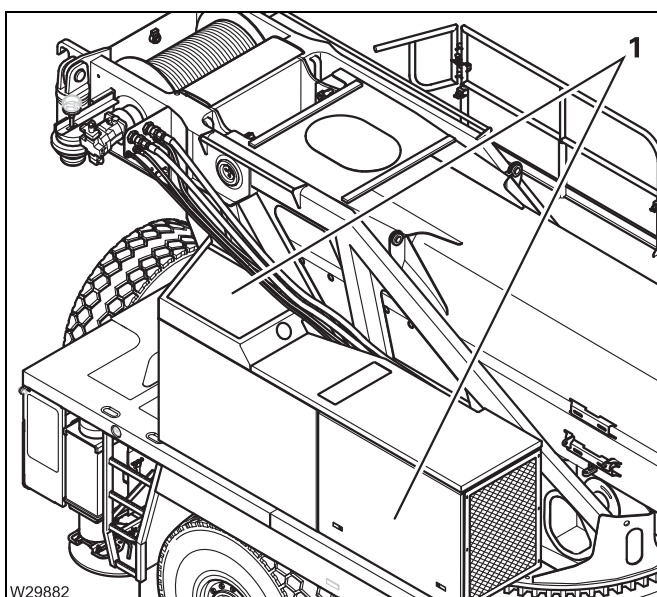


#### Before maintenance work

- Remove the covers (1).

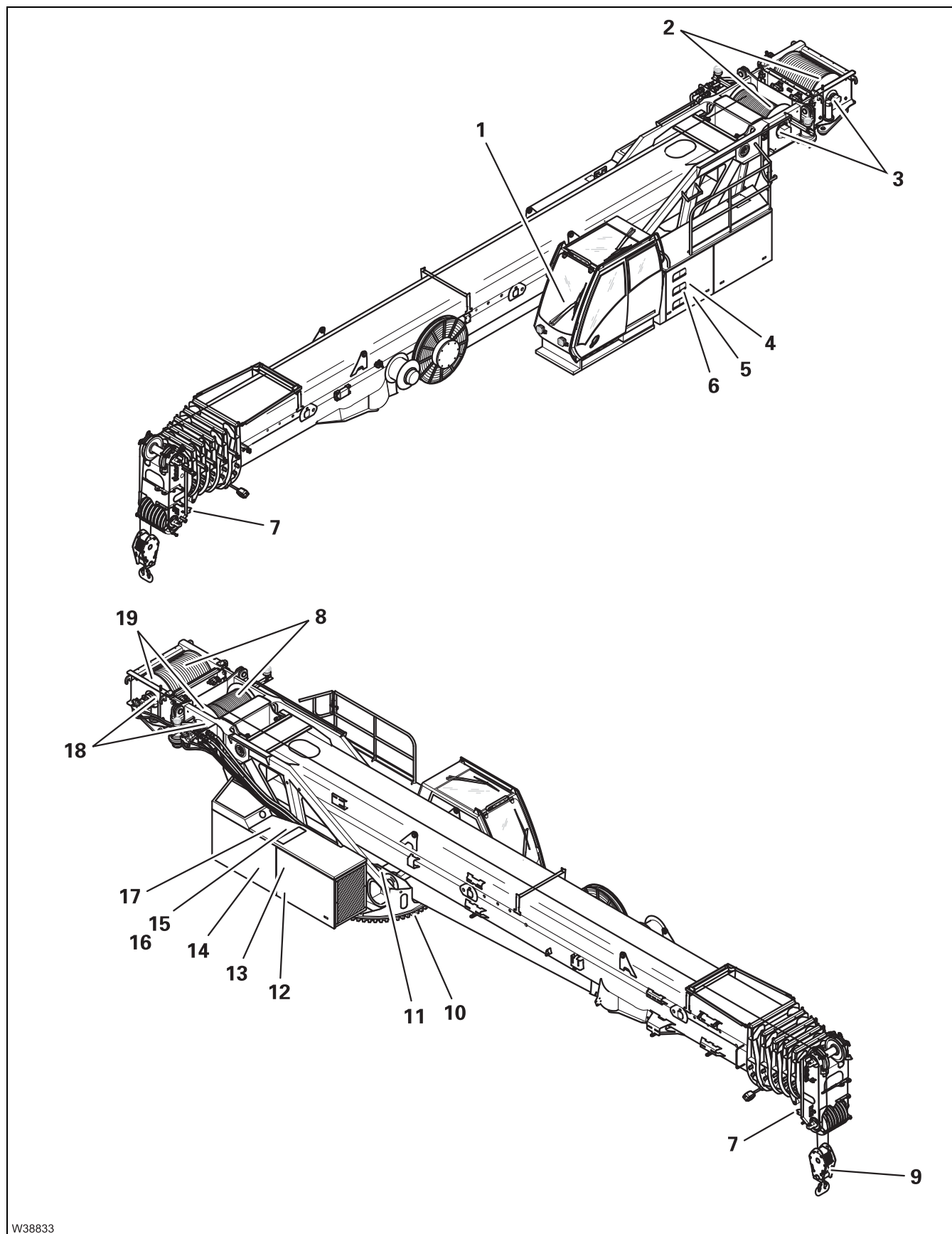
#### After maintenance work

- Fasten the covers (1) with the locks.



### 8.1.2

### Overview of maintenance work on the superstructure



W38833

09.03.2018

## Symbols for maintenance work

- 1 CCS (*Crane Control System*) control unit

## Hoists

- 8 Hoist ropes
- 2 Rope wedges
- 19 Rope drums
- 18 Oil inspection glasses
- 9 Hook block
- 7 Rope end fitting
- 3 Lowering limit switch

## Slewing gear

- 6 Oil inspection glasses

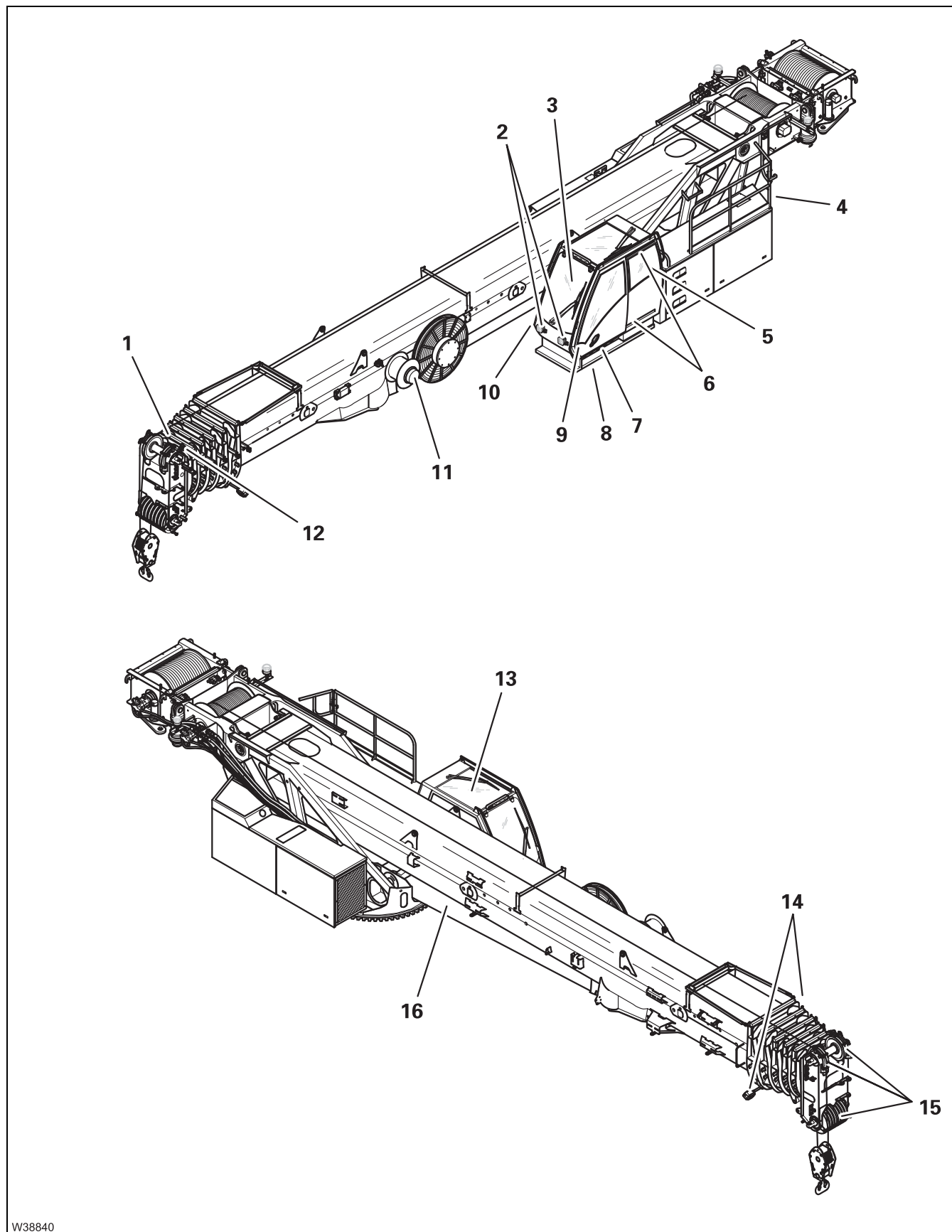
## Slewing bearing

- 10 Gear teeth
- 5 Slewing angle sensor
- 4 Locking of turntable

## Hydraulic system

- 14 Oil tank with inspection glass
- 15 Oil filler opening
- 16 Ventilation filter
- 12 Pressure accumulator
- 16 Oil filter 1
- 13 Oil filter 2
- 11 Oil filter 3





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<b>Main boom</b>	▣▣▣▣ p. 8 - 47
1 Telescopic sections 1 to 5 and basic section	▣▣▣▣ p. 8 - 48
<b>16</b> Derricking cylinder	▣▣▣▣ p. 8 - 47
<b>15</b> Sheaves	▣▣▣▣ p. 8 - 52
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4 Cable drum 2	▣▣▣▣ p. 8 - 67
<b>Central lubrication system</b>	▣▣▣▣ p. 8 - 69
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2 Spotlights on the crane cab	▣▣▣▣ p. 8 - 75
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<b>Air conditioning system</b>	▣▣▣▣ p. 8 - 77
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5 Pollen filter	▣▣▣▣ p. 8 - 80
<b>Other maintenance work</b>	▣▣▣▣ p. 8 - 81
9 Windscreen washing system receptacle	▣▣▣▣ p. 8 - 81
– Crane cab auxiliary heater <sup>1)</sup>	▣▣▣▣ p. 8 - 82
6 Cab door rails	▣▣▣▣ p. 8 - 83
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– Various connecting pins and socket pins	▣▣▣▣ p. 8 - 85
– Corrosion protection	▣▣▣▣ p. 8 - 86
<b>13</b> Fire extinguisher <sup>1)</sup>	▣▣▣▣ p. 8 - 88

<sup>1)</sup> Additional equipment


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## 8.2

## Symbols for maintenance work

Check the following symbols every day before starting work.

### CCS

- Check the symbols on the *CCS* start menu (*Crane Control System*) in the crane cab each day before starting work.
- The Start menu shows the most important measurements and the Warning submenu shows all pending warning messages;  *Operating manual*.

### Warning submenu

If a symbol is displayed, you must carry out the maintenance work:



Hydraulic oil filter;  p. 8 - 39.

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## 8.3

## Hoists

### 8.3.1

### Checking the oil level

**W**

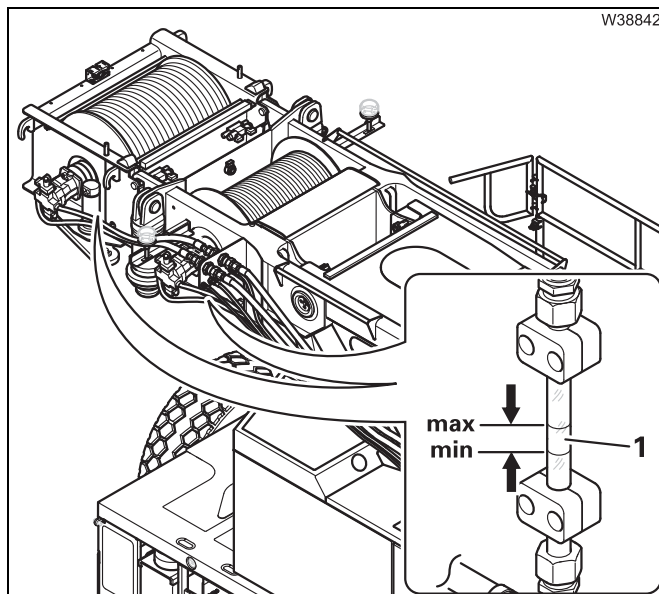
#### Spare parts and tools

Designation	Quantity	GROVE part no.
Oil inspection glass; complete	2	04161717

#### Prerequisites

- The truck crane must be level and in on-road mode; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

#### Checking the oil level



- Check that the oil level is visible between the **min.** and the **max.** marks (1).

#### If the oil level is too low

- Top up the oil; p. 8 - 11.

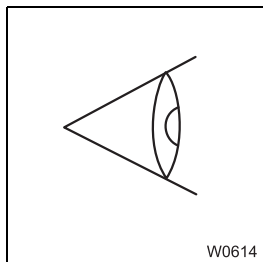



The oil level in the hoist gear must be 16 mm below the centre of rotation of the hoist. If the sight glass is loose in the clamps, or a new sight glass has been fitted, you must adjust this difference in height before you adjust the clamps.

### 8.3.2

## General inspection

W



- Pay attention to any unusual running noises from the hoists.
- Check the hoists and the connections for leaks. If consumables are leaking;  *Checking the oil level*, p. 8 - 9.
- Check that pipes and hoses are tightly connected and not damaged.

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

### 8.3.3

## Checking the hoist brake

W

Check that the hoist brake is working correctly on the main hoist and the auxiliary hoist.

- Attach the hook block to the hoist rope, reeved once.
- Lift a load of approx. 9.5 t (21,000 lbs) to approx. 30 cm (1.0 ft) above the ground.
- Measure the distance to the ground when the load is hanging completely still.
- Switch off the engine.

If the load has not lowered after approx. 2 minutes, the brake is currently in working order.

If the load lowers, notify **Manitowoc Crane Care** or an authorised GROVE dealer.

### 8.3.4

## Changing the oil/checking the oil


M 12

- Comply also with the  *Run-in regulations*, p. 4 - 1.



#### Oil, spare parts, tools

Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
7 (1.8) for each hoist	C - LPF	MIL-L 2105 B API-GL-4/5 Viscosity: SAE 75 W-90 EP ISO - VG 220	02313611  Synthetic oil; do not mix this with mineral- based oils.

Designation	Quantity	GROVE part no.
Oil inspection glass; complete	2	04161717

- Receptacle, approx. 8 l (2 gal);  p. 2 - 4.


#### Prerequisites

- The truck crane must be level and in on-road mode;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Changing the oil at the hoist



##### Risk of damage to the hoist gears.

The waste oil must be checked for abrasion particles. This test is used to detect any damage at an early stage;  p. 8 - 12.



##### Risk of environmental damage due to leaking consumables.

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

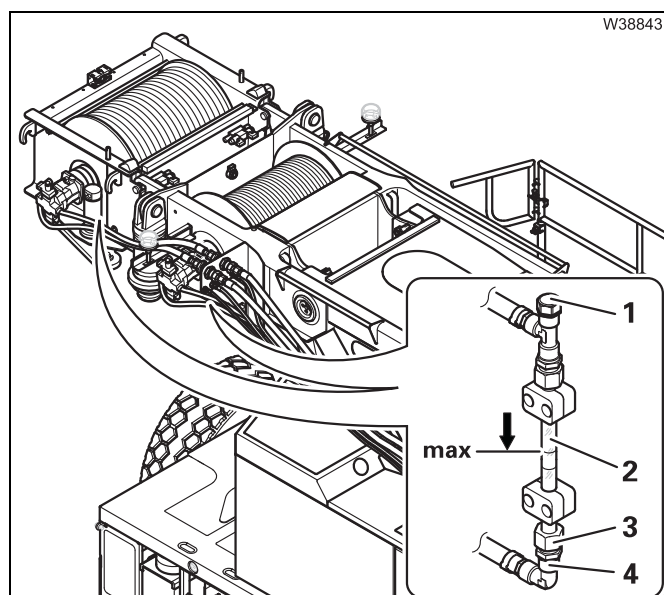
Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.



During filling, the oil spreads only slowly in the hoist. The oil level therefore rises quickly in the standpipe at first, then drops slightly and then eventually rises again to its true level.





### Draining oil

- Place a receptacle under the pipe (2).
- Remove the venting neck (1).
- Disconnect the screw fastening (3) and allow the oil to drain out of the hose (4) and the pipe (2).
- Replace the gasket if necessary.
- Reconnect the hose (4) to the screw fastening (3) at the pipe (2).

### Topping up oil

- Add oil at the top through the pipe up to the **max.** mark.
- Secure the venting neck (1).

### Checking the oil



#### **Risk of accidents from falling load.**

If this inspection is not performed, there is a risk of damage to the hoist gear which could lead to the load falling.



Check the waste oil for abrasion particles or have it tested in a laboratory:

- Pour the waste oil through a clean filter mat.
- Examine the oil, i.e. the residues on the filter mat using a magnifying glass.

If you find abrasion particles or solid materials on the mat, the hoist gear must be dismantled and inspected by the manufacturer.



Some abrasion particles may appear in the first oil filled. If you notice such particles during the first oil change (after 200 oper. hrs.), first consult **Manitowoc Crane Care** before introducing any specific measures.

### 8.3.5

### Having a partial inspection carried out

Y 3

- Only suitably trained specialists should carry out a partial inspection of
- the multiple-disc brake,
  - the plug connections between the hydraulic motor and the multiple-disk brake,
  - the plug connections between the multiple-disk brake and transmission unit

and be permitted to exchange parts with signs of wear.

### 8.3.6

### Having a general inspection carried out


Y 6



When carrying out the general inspection of the hoists, also observe the information contained in *Measures required for winch monitoring*, p. 5 - 21.

The general inspection involves removing the transmission and sending it to the manufacturer to be examined.



For transmissions that have undergone a general overhaul, an oil change must be carried out after 200 and 1000 operating hours;  *Run-in regulations*, p. 4 - 1.

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## 8.4

## Slewing gear

### 8.4.1



### Checking the oil level

**W**

#### Spare parts and tools

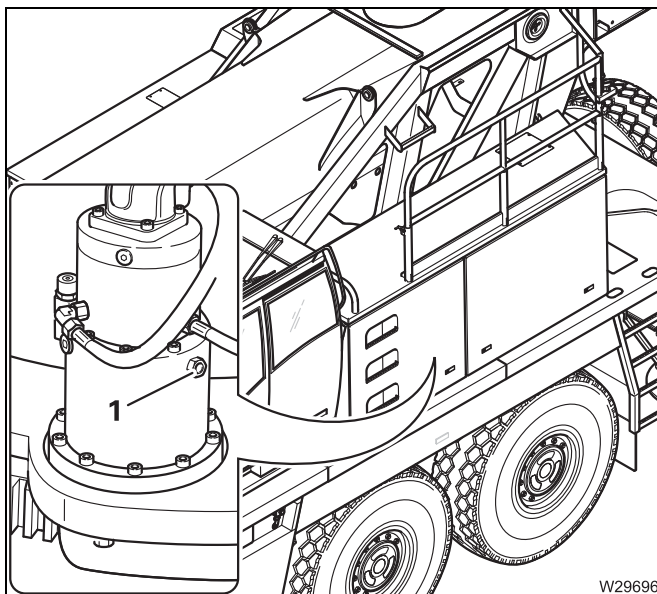
Designation	Quantity	GROVE part no.
Gasket 10 x 14 Cu DIN 7603	3	00117125

#### Prerequisites

- The truck crane must be level and in on-road mode;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.


#### Checking the oil level

Always check the oil level prior to using the crane.



- Check that oil is visible in the inspection glass (1).
- Always check the oil level for all the slewing gears.

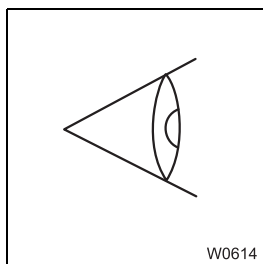
#### If the oil level is too low


- Top up the oil;  p. 8 - 19.

### 8.4.2

## Checking for leaks

W



- Pay attention to any unusual running noises from the slewing gears.
- Check the slewing gears and the connections for leaks. If consumables are leaking;  *Checking the oil level*, p. 8 - 15.
- Check that pipes and hoses are tightly connected and not damaged.



If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

### 8.4.3

## Checking the slewing gear brake

M 6

### Prerequisites

- The crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be level;  *Operating manual*.
- The truck crane must be rigged for a slewing range of 360° according to the *Lifting capacity table*.
- The RCL code for the current rigging mode must be entered;  *Operating manual*.
- The current load must not exceed **1 t (2,200 lbs)** – where necessary unreeve the hook block.
- The slewing range 360° around the truck crane must be secured.
- The main boom must be raised to 45° and fully retracted.



### Risk of overturning while slewing.

Always set a rigging mode for the slewing range of 360° in accordance with the *Lifting capacity table* and enter the corresponding RCL code. Do not override the rated capacity limiter (RCL).



### Risk of injury due to swinging hook block.

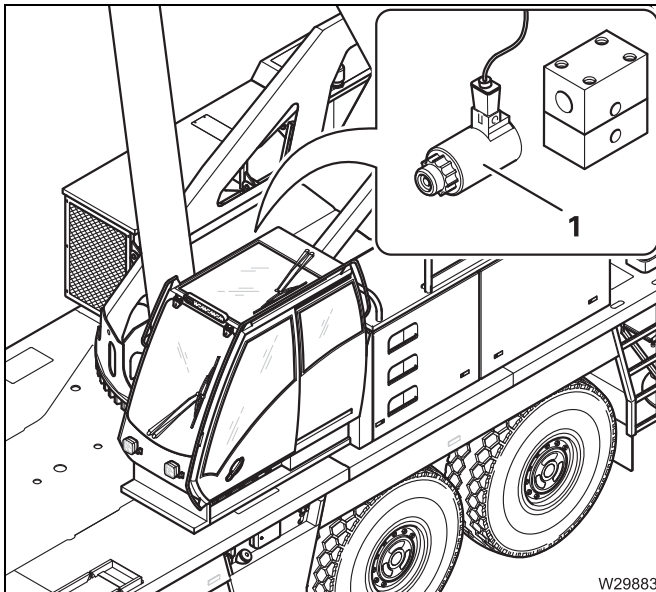
If a faulty slewing gear brake slips, the superstructure can accidentally, suddenly turn and the hook block can suddenly swing. People standing within the slewing range could be injured.

Secure the slewing range 360°, before you check the slewing gear brake.

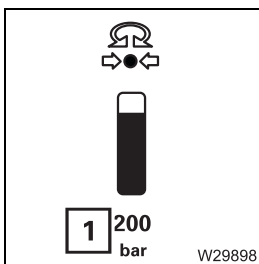


**Check the following**

When checking the slewing gear brake you must perform the slewing movement against the slewing gear brake.

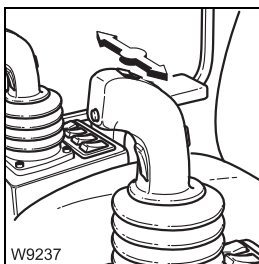


- Switch off the engine.
- Remove the coil (1) from the valve Y 2304. The slewing gear brake will now not be released when the slewing gear is switched on.



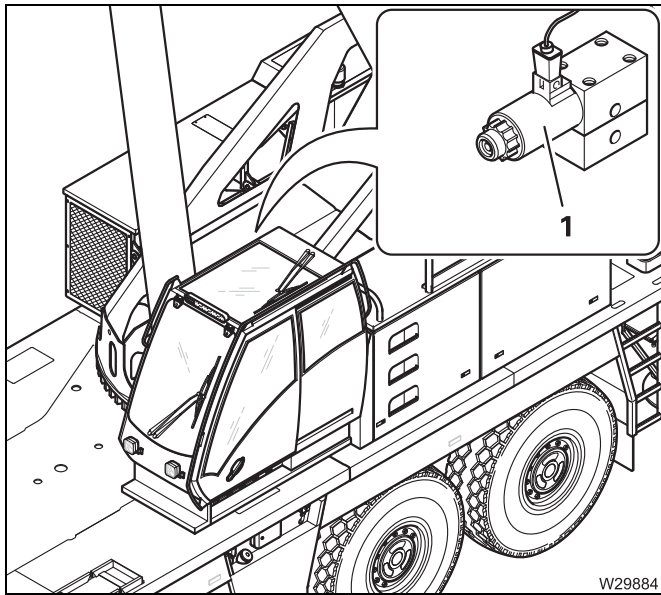
- Start the engine and switch on the slewing gear.
- Open the CCS menu *Hydraulic pressure*.

Display (1) will show the pressure in the slewing gear's hydraulic circuit.



- Move the control lever slowly to the stop and wait until the pressure in the hydraulic circuit has risen to approx. 200 bar (approx. 2,900 psi).
  - If the superstructure still does **not** slew, the braking force of the slewing gear brake is adequate.
  - If the superstructure does slew, the slewing gear brake is defective and must be repaired immediately by **Manitowoc Crane Care** or an authorised GROVE dealer.





- Switch the slewing gear off and switch the engine off.
- Fasten the coil (1) to the valve Y 2304 using the nut.
- Start the engine and check the slewing gear for correct operation.

## 8.4.4

## Changing the oil/checking the oil


M 12

- Comply also with the  *Run-in regulations*, p. 4 - 1.



Oil, spare parts,  
tools

Gear oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
0.9 (0.24) for each slewing gear	C - LPF	MIL-L 2105 B API-GL-4/5 Viscosity: SAE 75 W-90 EP ISO - VG 220	02313611  Synthetic oil; do not mix this with mineral-based oils.

Designation	Quantity	GROVE part no.
Gasket 10 x 14 Cu DIN 7603	3	00117125
Gasket 14 x 20 Cu DIN 7603	3	00117132

- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

### Prerequisites

- The truck crane must be level and in on-road mode;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Changing the oil



#### Risk of environmental damage due to leaking consumables.

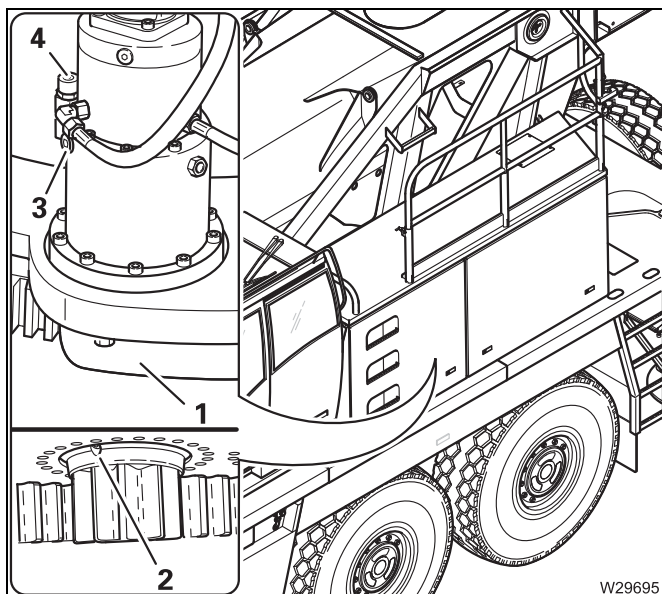
Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

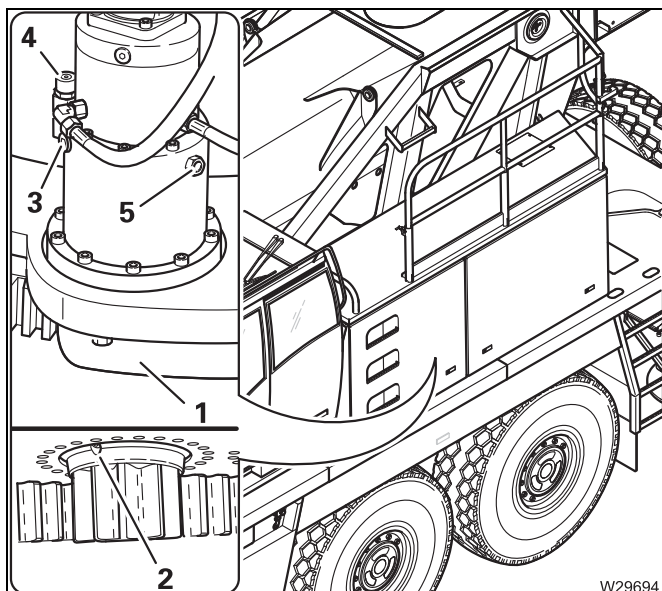
- Always change the oil in all slewing gears.





#### Draining oil

- Remove the plate (1).
- Place a container under the screws (2).
- Unscrew the filter (4) and screws (3) and (2).
- Drain the oil.



- Replace the gasket and tighten the screws (2).

#### Topping up oil

- Top up the oil through the filler neck (4) until oil is visible in the inspection glass (5).
- Replace the gaskets and tighten the screw (3) and the filter (4).
- Replace the plate (1).

#### Checking the oil

Check the waste oil that was drained from the slewing gears for abrasion particles, or have it tested at a laboratory.

- Pour the waste oil through a clean filter mat.
- Examine the oil, i.e. the residues on the filter mat using a magnifying glass.

If you find abrasion particles or solid materials on the mat, the slewing gear transmission must be removed and inspected by the manufacturer.

## 8.5

## Slewing bearing


### 8.5.1

### Checking the screws





M 3

- Comply also with the  *Run-in regulations*, p. 4 - 1.

#### Tools

- Torque wrench.
- Auxiliary tools for the torque wrench;  p. 8 - 23.

#### Prerequisites

- No counterweight has been rigged;  *Operating manual*.
- The crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be level;  *Operating manual*.
- In addition, the tyres on the 3<sup>rd</sup> and 4<sup>th</sup> axle lines must be removed to improve the freedom of movement under the slewing bearing.
- The main boom must be fully retracted and raised to 75°;  *Operating manual*.
- The current load must not exceed **1 t (2,200 lbs)** – where necessary unreeve the hook block.
- The slewing range 360° around the truck crane must be secured.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Safety instructions



#### **Risk of damage to the screws on the slewing bearing.**

All screws were tightened at the factory with a certain torque, and this should be checked during maintenance. Only slight tightening of the screws is permissible, if required.

You may **not** slacken the screws and re-tighten them, or completely unscrew and then reuse them.

If the superstructure has to be removed from the carrier, only a completely **new set of screws** may be used to reinstall the superstructure. **Only original screws** should be used, which were manufactured according to the factory specifications.



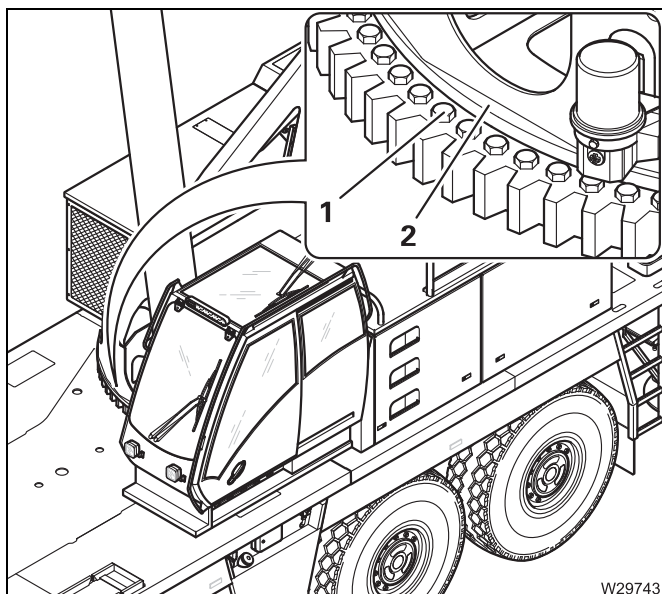


**Danger of the slewing bearing being ripped off.**

If while checking you notice very loose, broken or missing screws, then the slewing bearing has been overloaded and is no longer safe to use. During crane operation, the slewing bearing may rip off suddenly and thus cause fatal accidents.

Do not put the truck crane back into operation and have the slewing bearing repaired by **Manitowoc Crane Care**.

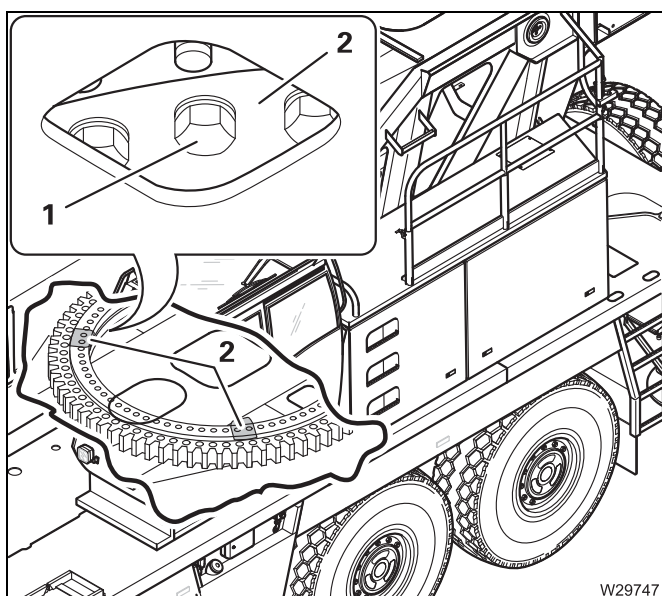
**Access**



The **outer ring** is connected to the carrier with the screws (1).

- Check all 96 screws (1) from **above**.

To do this, you must rotate the clear area (2) on the turntable gradually to check all the screws (1).

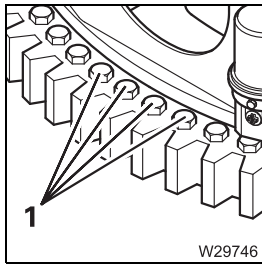


The **inner ring** is connected to the turntable with the screws (1).

- Check all 95 screws (1) from **below**.

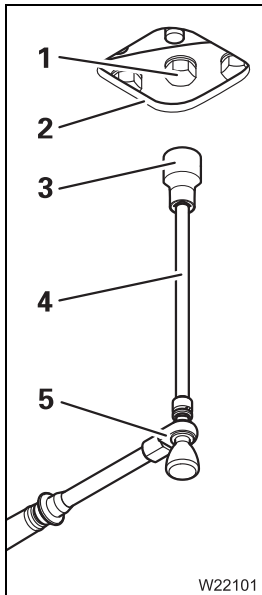
To do this, you must rotate the turntable gradually with a pair of screws (1) each on the opposite side through the openings (2) in the carrier.

## Selecting the tools



### Outer ring

The screw heads (1) are easily accessible for fitting a socket wrench. Therefore, you can use **manual or mechanical torque tools** (electric or hydraulic drivers).



### Inner ring

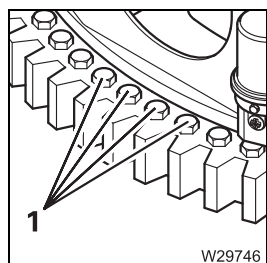
The screw head (1) is accessible only via a rectangular, long, narrow opening (2). An extension (4) is required for fitting a socket wrench (3).

A **manual torque tool (5)** is recommended so that it can be tightened gently, and slipping from the screw head (1) is avoided.

## Torques

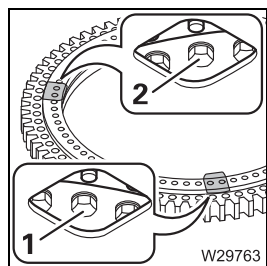
Screw type	GROVE part number	Torque Nm (lbf ft)
Ball slewing bearing Bearing type: KDV, single-row	04192540 or 03246884 Model plate: Inside the inner ring.	
M 27 x 155: 96 pieces on the outer ring	04170754	1150 (848)
M 27 x 155: 95 pieces on the inner ring	04170754	1150 (848)

### Checking the outer ring



- Divide the checking of the 96 screws into 24 working steps of 4 screws each.  
Between each of the 24 working steps you need to rotate the turntable to the next group of 4 screws on the opposite side.
- Switch the engine off after every rotation and secure the truck crane against unauthorised use; ■■■▶ p. 2 - 3.
- Check the tightness of the first group of 4 adjoining screws (1); ■■■▶ *Torques*, p. 8 - 23.
- Once they have been checked, mark the screws to avoid subsequent confusion.
- Remove the tool.
- Start the engine and turn the turntable by 180° – the second group on the opposite side is now accessible.
- Switch off the engine.
- Check all other groups in the same way.

### Checking the inner ring



- Divide the inspection of the 95 screws into 23 work steps with 4 screws each and 1 work step with 3 screws.  
Between each of the 24 working steps you need to rotate the turntable to the next pair of screws on the opposite side.
- Switch the engine off after every rotation and secure the truck crane against unauthorised use; ■■■▶ p. 2 - 3.
- Check the tightness of the first pair of screws (1) and (2) on the opposite side; ■■■▶ *Torques*, p. 8 - 23.
- Mark the screws that have been checked, to avoid confusion later.
- Remove the tool.
- Start the engine and turn the turntable by 90° – the second pair of screws on the opposite side is now accessible.
- Switch off the engine.
- Check all other screws in the group in the same way.



## 8.5.2

## Lubricating the gear teeth

M 6

### Grease

Designation	Quantity	GROVE part no.
Adhesive lubricating grease (spray can)	1	00554205



Observe the instructions and safety instructions on the adhesive lubricating grease packaging.

### Prerequisites

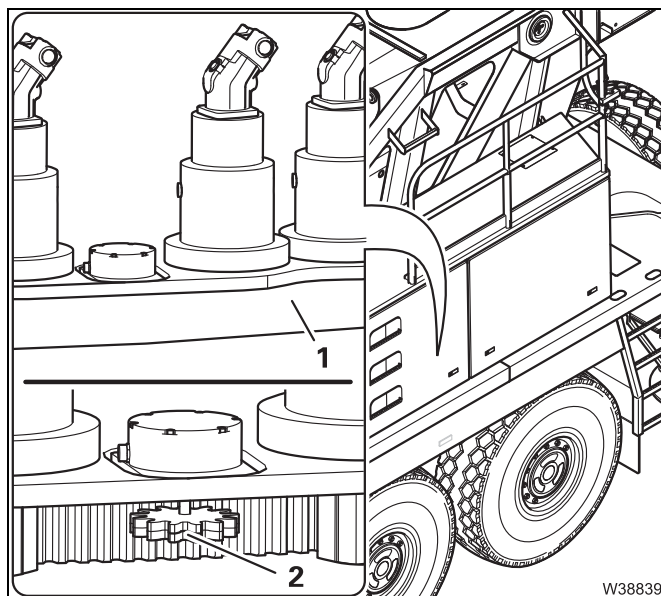
- The truck crane must be level and on outriggers; *Operating manual*.
- The main boom must be fully raised; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

### Greasing



#### Risk of crushing from the gear teeth.

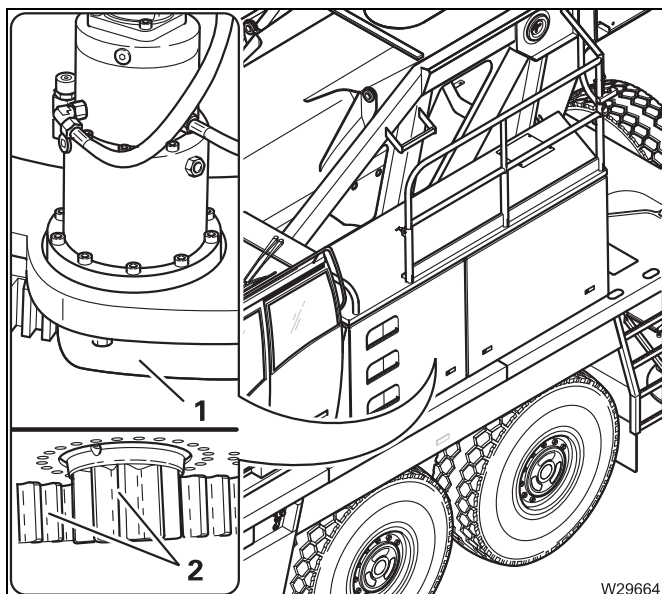
Fingers may be crushed or clothing can be drawn into the open, rotating pinion. For this reason, be sure to remount the plate after lubricating.



#### Checking the slewing angle sensor

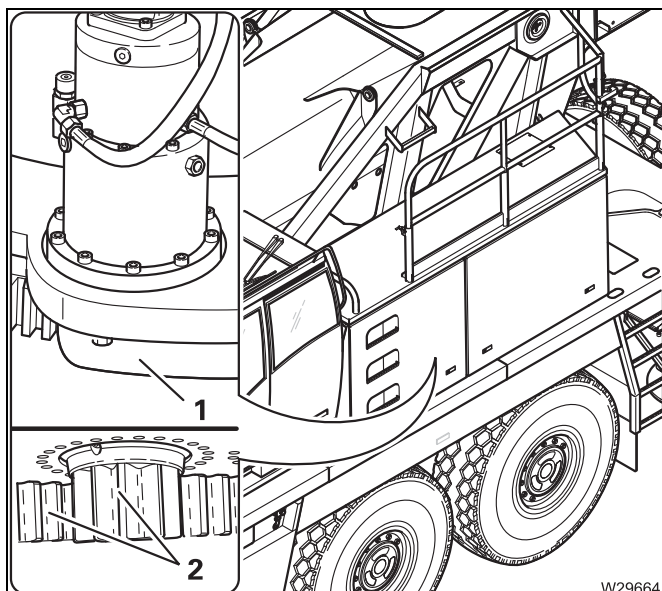
- Remove the plate (1).
- Check whether the pinion (2) is undamaged and lies straight and firmly against the gear teeth of the slewing bearing.
- If need be, remove dirt and foreign bodies from the pinion (2).
- If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE-dealer.
- Attach the plate.





### First lubrication

- Remove the plate (1).
- Remove the old grease from all the gear teeth (2).
- Apply a thin layer of new grease to all the gear teeth and allow it to penetrate for approx. 10 minutes.
- Apply a second, thicker layer of grease and allow it to penetrate for approx. 30 minutes.
- Attach the plate.



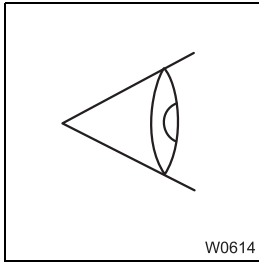
### Subsequent lubrication

- Remove the plate (1).
- Apply new grease to all the gear teeth (2).
- Allow it to penetrate for approx. 30 minutes.
- Attach the plate.

### 8.5.3

## General inspection

M 6



- Pay attention to any unusual running noises from the slewing bearing.
- If unusual noises occur, take a sample of the grease that has escaped. Have **Manitowoc Crane Care** examine the sample for metal residue.
- Check the slewing bearing for damage (e.g. gaskets).

If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.



The maintenance interval specified here must be reduced if the slewing bearing was subjected to heavy blows (falling load, load slipping).

## 8.5.4


## Measuring tilting play

**M 6**



### Reducing the interval

- When after several years of intensive crane operation, half of the value for the maximum permissible tilting play is reached, then you must reduce the maintenance interval.
- Measure the tilting play from then on every three months (**M 3**).

### Spare parts and tools

- Dial gauge (precision 0.01 mm (0.00039 in)) with tripod.
- Measurement report from when the truck crane was put into operation;  *Delivery receipt.*

### Prerequisites

- The slewing bearing must have been previously checked for tightness;  *Checking the screws, p. 8 - 21.*
- The truck crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be aligned horizontally;  *Operating manual.*
- The counterweight combination of **7.0 t (15,400 lbs)** must be rigged according to the *Lifting capacity table.*
- The lattice extension must be removed.
- The auxiliary hoist must be removed.
- The main boom is telescoped to 0-0-0-0-0.
- The load being lifted must not exceed **1 t (2,200 lbs)** – where necessary unreeve the hook block.

### Type

The truck crane GMK5200-1 is equipped with a slewing bearing of the bearing type: KDV, single-row.

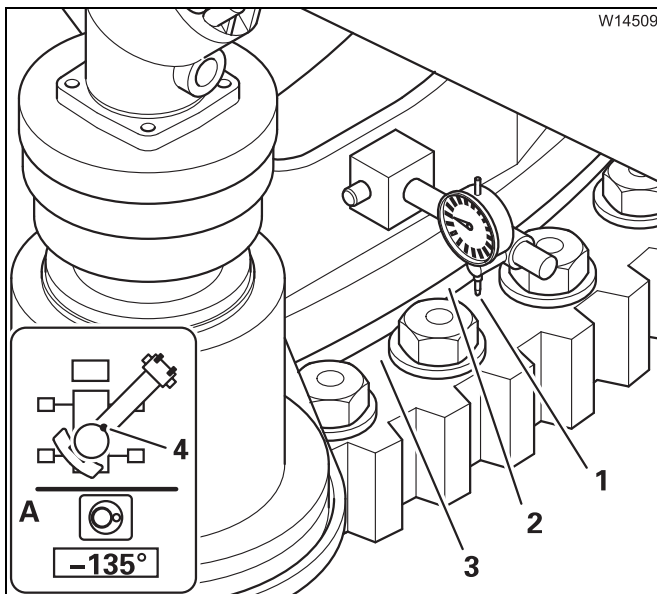
Type of slewing bearing	GROVE part number
Ball slewing bearing Bearing type: KDV, single-row	04192540 or 03246884 Model plate: Inside the inner ring.

### Measuring tilting play

The base value of the tilting play is determined and documented by **Manitowoc Crane Care** or an authorised GROVE dealer when the slewing bearing is put into operation or replaced.

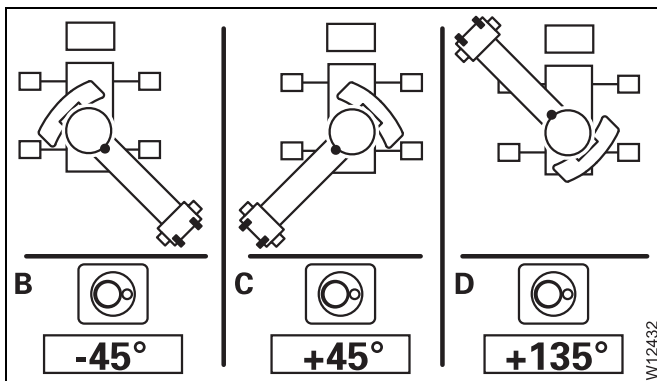
The maximum permissible wear is 4.0 mm (0.157 in).  
This results in the maximum permissible tilting play.

**Example:**      **Base value + max. permissible wear =**      **max. permissible tilting play**  
0.35 mm (0.014 in) + 4.0 mm (0.157 in)      4.35 mm (0.171 in)



### Measuring current tilting play

- Raise the main boom to 80° and slew to – 135° – display (A).
- Fasten a dial gauge on the front on the turntable (4) and place the button (1) on to the lower ring (3) as close as possible to the gasket (2).
- Slowly lower the main boom to 30°. The hook block may not touch the ground.
- Read off from the dial gauge how far the turntable is inclined and record this value as the current tilting play; ► *Appendix – Tilting play measurement report.*
- Remove the dial gauge.



- Repeat the measurement with the slewing angles
  - B** –45°
  - C** +45°
  - D** +135°

If the **current tilting play** is greater than the **max. permissible tilting play**, you must have the slewing bearing replaced by **Manitowoc Crane Care** or an authorised GROVE dealer.

If the **current tilting play** is half as great as the **max. permissible tilting play**, you must reduce the maintenance interval; ► *Reducing the interval*, p. 8 - 28.

## 8.5.5

## Lubricating the locking of turntable



M 12

### Grease, spare parts, tools


Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

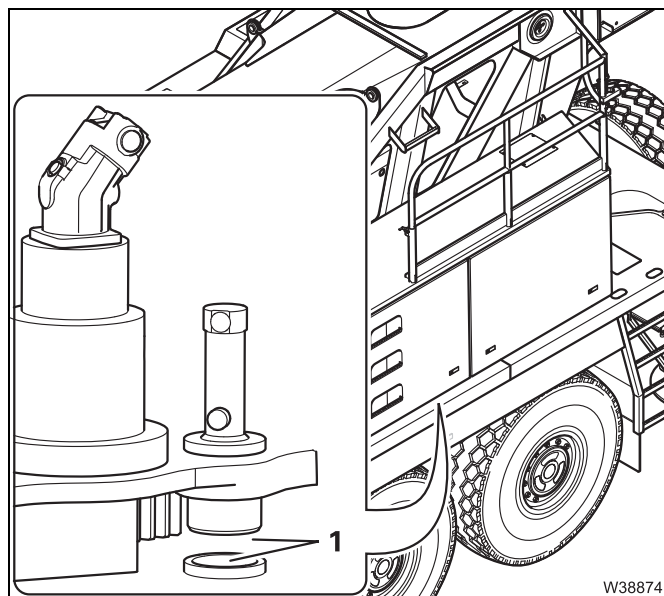
- Brush.

### Prerequisites

- The truck crane must be level and in on-road mode;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Greasing

- Familiarise yourself with the correct operation of the turntable lock;  *Operating manual*.



- Grease the lubrication points (1) with the brush.

## 8.6

## Hydraulic system



### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

### 8.6.1

### Checking the oil level

D

#### Prerequisites

- The truck crane must be level and in on-road mode; *Operating manual*.
- The telescoping cylinder must be locked in telescopic section **I**; *Operating manual*.
- The truck crane must be standing on a level surface.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.

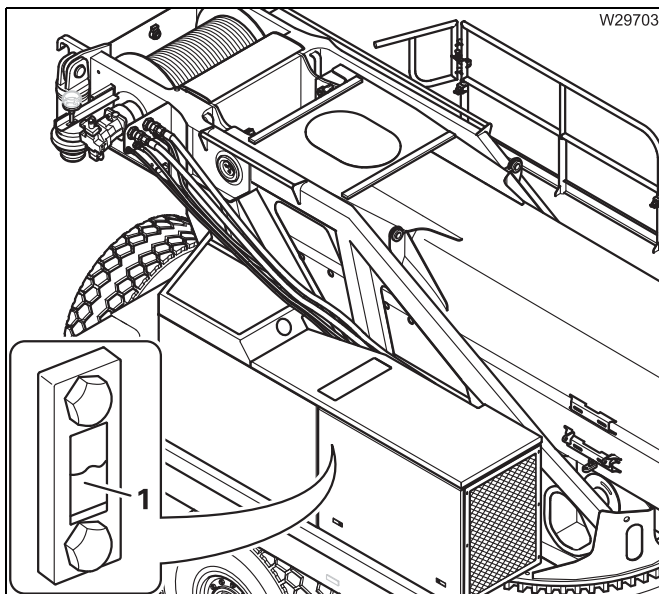
#### Checking the oil level



### **Risk of damage to the hydraulic system.**

Cleanliness is imperative when handling hydraulic oil.

Even fresh hydraulic oil must be filtered before it is added to the tank.



- Check whether oil is visible in the middle of the inspection glass (1).

#### **If the oil level is too low**

- Top up the oil; p. 8 - 45.

### 8.6.2

## Checking the hydraulic hoses

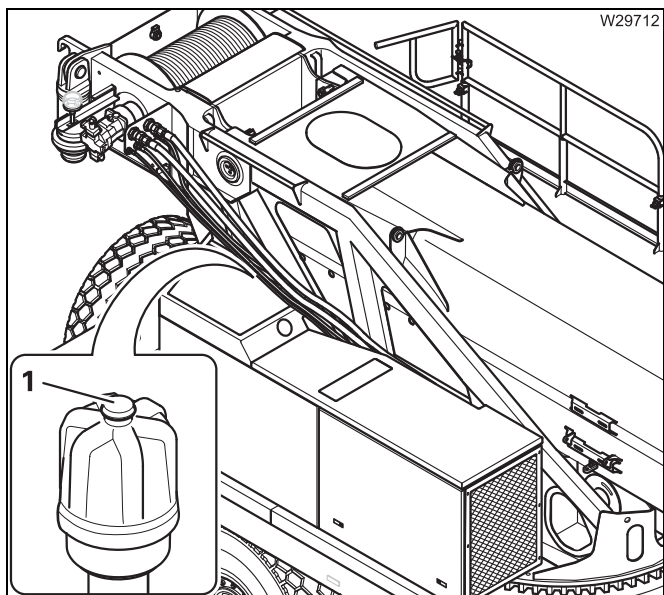
W

The inspection work is described in section *Checking the hydraulic hoses*, p. 7 - 102.

### 8.6.3

## Checking the ventilation filter

W



- Check the display (1) on the ventilation filter.

### If the indicator is coloured

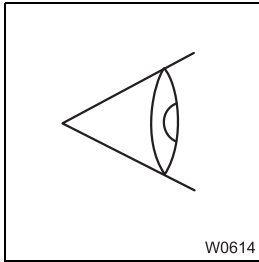
- Replace the filter;  p. 8 - 36.



## 8.6.4

### Checking for leaks

W



- When the engine is running, carry out a visual inspection for leaks on the hydraulic components (tank, pumps, drives, cylinders, control blocks, valves, pipe and hose lines and connections).
- If leaks are detected, check the oil level and top up if necessary;  
    ▣▣▣▣▶ *Checking the oil level*, p. 8 - 31.



#### **Risk of accidents from hydraulic oil spraying out.**

Never tighten any leaking connections when the system is under pressure. Change pipes and hose lines only when the system is depressurised.



#### **Risk of environmental damage due to leaking consumables.**

Immediately repair or have leakages in the hydraulic system repaired to ensure that no hydraulic oil escapes, seeps into the ground or reaches waterways when the crane is being used.

#### **After hydraulic components have been changed**

- Bleed the hydraulic system; ▣▣▣▣▶ *Establishing the operating conditions*, p. 8 - 46.

#### **If damage cannot be rectified immediately or further damage is likely**

- Notify **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.


## 8.6.5

## Cleaning the magnetic rods


M 3

### Spare parts and tools

Designation	Quantity	GROVE part no.
<b>For oil filter 1:</b>		
Filter	1	04156358
Packing set	1	04165792

– Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

### Prerequisites

- The truck crane must be standing on a level surface.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- During the first 100 operating hours: clean the magnetic rod once a week.



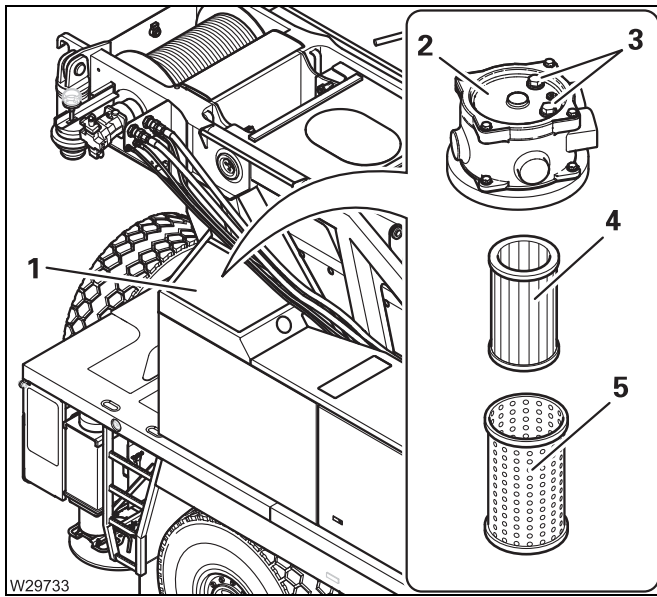
#### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

## Cleaning oil filter 1



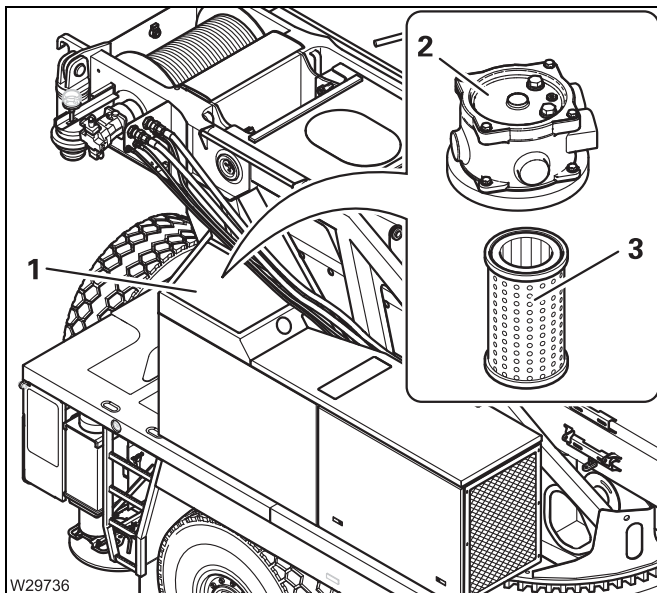
- Remove the cover (1).
- Remove the cap (2) and pull out the hydraulic oil filter.
- Place the filter in a receptacle.
- Remove the filter (4) from the filter cage (5).
- Clean the filter cage (5) and the magnetic rod (3).
- Replace the filter (4) if necessary.



### **Risk of damage to the hydraulic system.**

Large amounts of metal particles are a sign of damage in the hydraulic system.

Have the hydraulic system inspected by **Manitowoc Crane Care** or by your qualified repair crew.



- Assemble the filter (3) and insert it.
- Replace the cover gasket if necessary.
- Bolt the cap (2) on.
- Fasten the cover (1).

## 8.6.6

## Changing the ventilation filter

M 12

### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	03134932

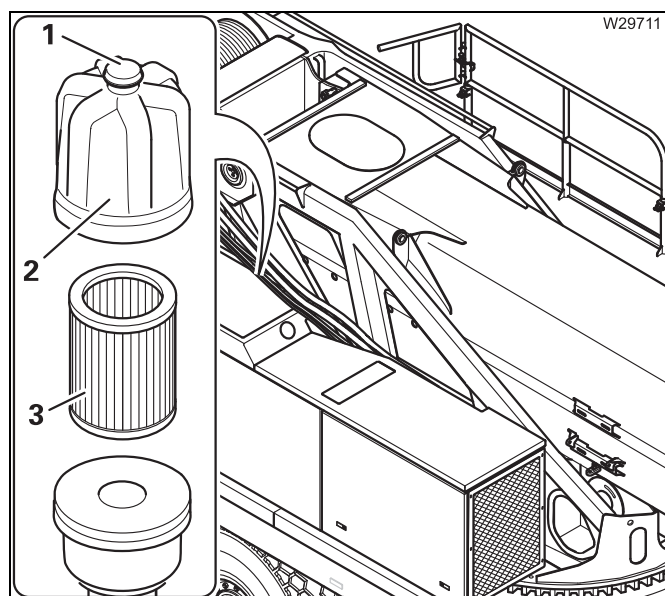
### Prerequisites

- The engine must be switched off and secured against unauthorised use;  
    ▶ p. 2 - 3.



#### **Risk of damage to the environment from filter residues.**

Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



- Remove the cap (2).
- Change the filter (3) and fasten the cap.
- Reset the display by depressing the pin (1) on the housing.

### 8.6.7

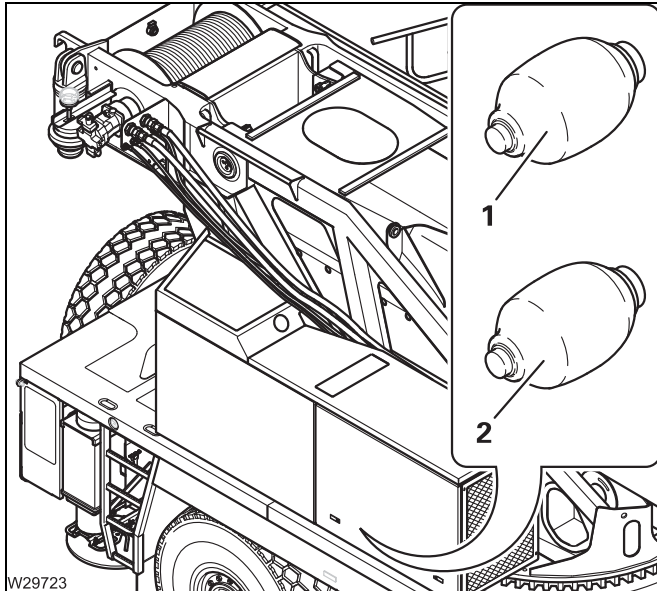
## Pressure accumulator – checking the gas pressure

M 12



### Risk of accidents due to incorrect inspection.

The gas pressure test must be carried out only by an authorised official inspector of pressure tanks or under his/her supervision or instructions.



The superstructure is equipped with pressure accumulators.

The filling pressure at 20 °C (68°F) is:

**1 Pressure accumulator** 20 bar (290 psi)

**2 Pressure accumulator** 180 bar (2,610 psi)


- Have the filling pressure checked and if necessary corrected by **Manitowoc Crane Care** or an authorised GROVE dealer.

### 8.6.8


## Taking oil samples

M 12

The oil sample from the superstructure hydraulic system is taken in a way similar to that for the carrier hydraulic system.

Information for taking samples with the hose and for the laboratory analysis;  *Taking oil samples*, p. 7 - 106.

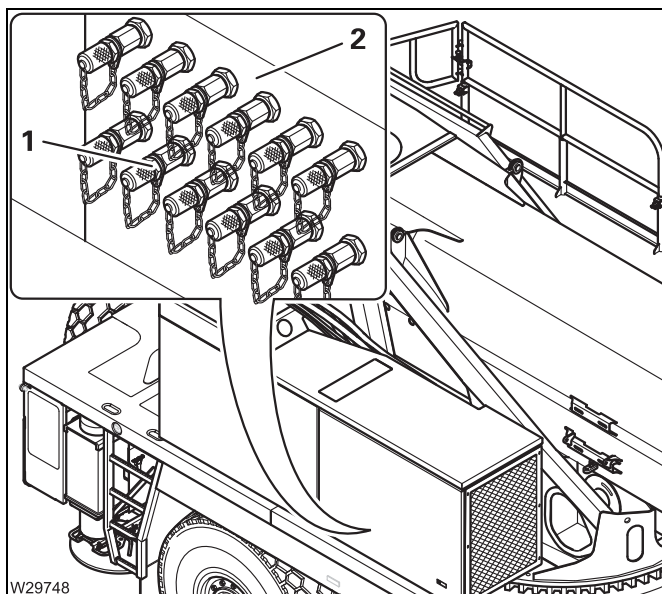
### Prerequisites

- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

### Select the sampling location

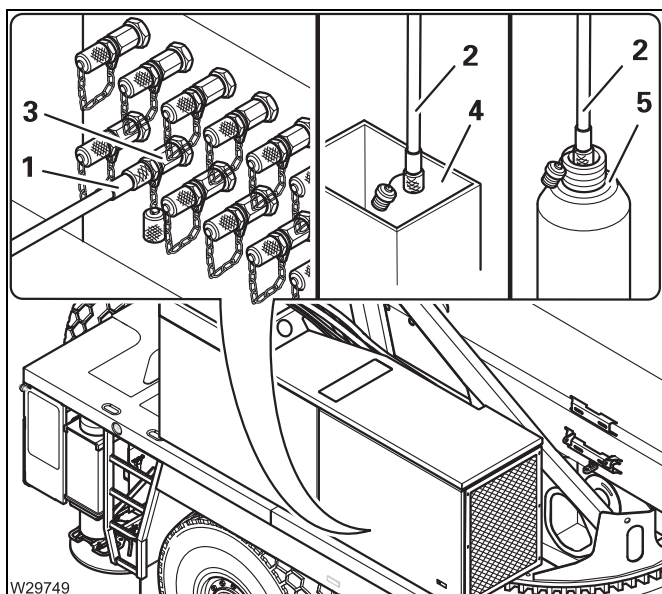
To determine the usability of the oil, you must take a sample from the hydraulic system. To do that you must connect the hose with the connecting piece to a gauge port.





The *MLS* gauge port (1) is located on the bracket (2). When a hydraulic function is run, oil can be taken at the gauge port.

### Taking oil samples



- Clean the gauge port and connect the hose (1) to the bracket (3); **▶▶▶▶▶** *Connecting the hose*, p. 7 - 107.
- Put the hose end (2) into the receptacle (4).
- Start the engine.
- Tilt the crane cab.
- Allow 2 litres (0.5 gal) of oil to flow into the receptacle.
- Switch off the engine and put the hose end (2) into the sample container (5).
- Start the engine.
- Tilt the crane cab.
- Allow 0.3 litres (0.08 gal) of oil to flow into the sample container.

- Switch off the engine.
- Remove the hose; **▶▶▶▶▶** *Disconnecting the hose*, p. 7 - 108.
- Seal the sample container and dispatch it; **▶▶▶▶▶** *Dispatch the oil sample to the laboratory*, p. 7 - 109.
- Determine the quality of the oil; **▶▶▶▶▶** *Determining the quality of the oil*, p. 7 - 109.

## 8.6.9

### Changing the hydraulic oil filter

**All oil filters must be replaced** when changing the oil.

If a **warning message** appears, the red symbols on the CCS control unit indicate whether oil filter 1 or oil filter 2 is clogged. There is no indicator for oil filter 3.



- 1 Red – Changing oil filter 1
- 2 Red – Change oil filters 2 and 3

#### Spare parts and tools

Designation	Quantity	GROVE part no.
<b>For oil filter 1:</b>		
Filter	1	04156358
Packing set	1	04165792
<b>For oil filter 2:</b>		
Filter	1	03142356
Housing packing set	1	03326049
<b>For oil filter 3:</b>		
Filter	1	03249527

- Torque wrench for 25 Nm (18.4 lbf ft).
- Receptacle, approx. 5 l (1.5 gal); p. 2 - 4.

#### Prerequisites

- The crane must be rigged with an outrigger span of at least **8.95 x 7.80 m (29.4 x 25.6 ft)** and be level; *Operating manual*.
- The main boom must be fully retracted and raised to the maximum; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.



#### **Risk of damage to the environment from filter residues.**

Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



## Changing oil filter 1

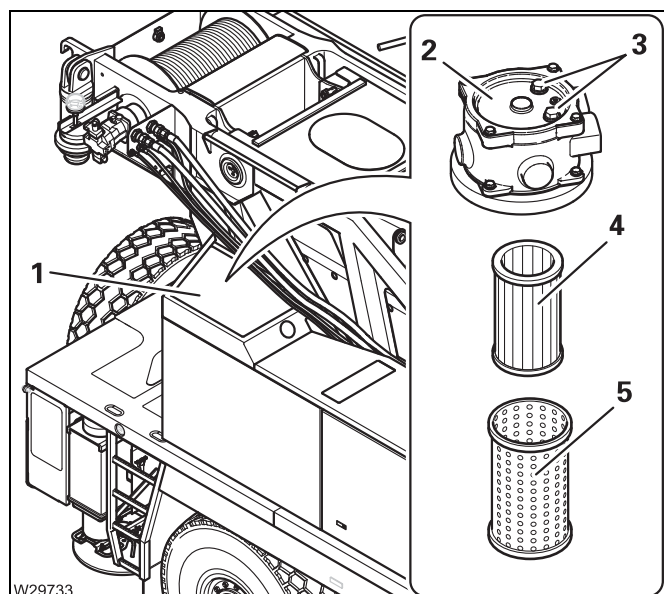


### **Risk of environmental damage due to leaking consumables.**

Always let consumables drain into suitable receptacles. Wipe up any consumables that have leaked.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.



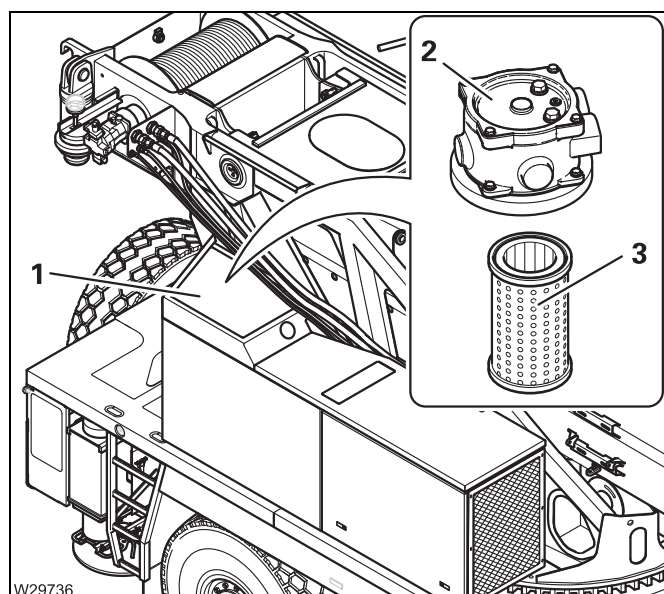
- Remove the cover (1).
- Remove the cap (2) and pull out the hydraulic oil filter.
- Place the filter in a receptacle.
- Remove the filter (4) from the filter cage (5).
- Clean the filter cage (5) and insert a new filter (4).
- Clean the magnetic rods (3).
- Replace any damaged parts, where necessary.



### **Risk of damage to the hydraulic system.**

Large amounts of metal particles are a sign of damage in the hydraulic system.

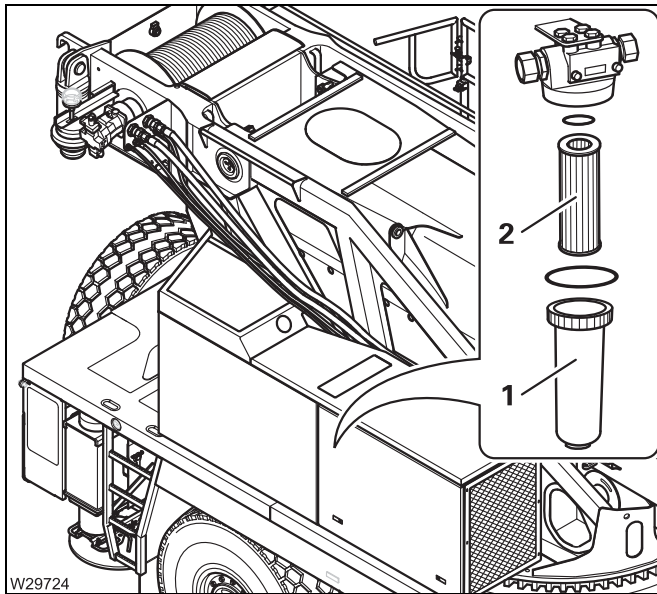
Have the hydraulic system checked by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.



- Assemble the filter (3) and insert it.
- Replace the cover gasket if necessary.
- Bolt the cap (2) on.
- Fasten the cover (1).



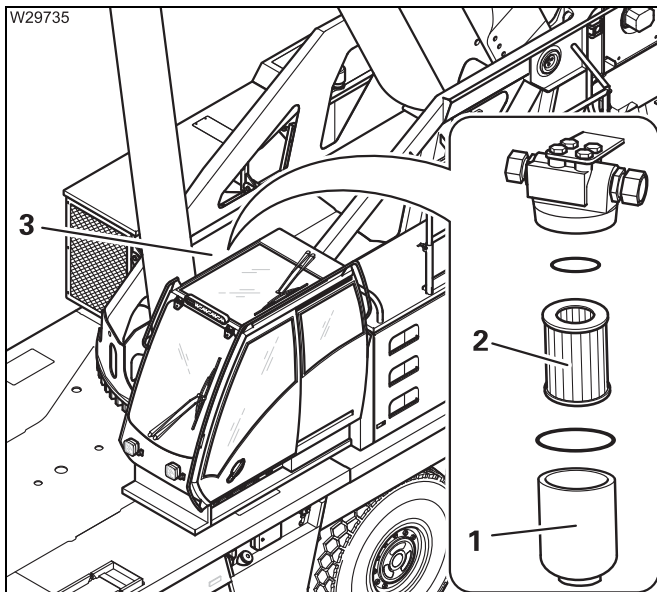
### Changing oil filter 2



- Release the receptacle (1) at the hexagon.
- Change the filter (2).
- Replace the gaskets.
- Fill the receptacle with clean oil and tighten it – torque 25 Nm (18.4 lbf ft).

### Changing oil filter 3

The oil filter 3 is located in the centre of rotation under the telescopic boom.



- Remove the cover (3).
- Release the receptacle (1) at the hexagon.
- Change the filter (2).
- Replace the gaskets.
- Fill the receptacle with clean oil and tighten it up.
- Fasten the cover (3).





### After changing the filter



#### **Risk of damage to the hydraulic pumps.**


The engine may only be started if the valve in the suction line of the hydraulic pumps is open and there is enough hydraulic oil in the hydraulic oil tank.

- Check the valve on the hydraulic oil tank. Open the valve, if necessary;  p. 8 - 46.
- Check the oil level. Top up the oil, if necessary;  p. 8 - 45.
- To bleed the system, start the engine and let it idle for 3 minutes.
- Check that none of the oil filters is leaking.

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## 8.6.10

### Changing the hydraulic oil




The oil only needs to be changed if the laboratory analysis results indicate this;  *Taking oil samples*, p. 8 - 37.

#### Oil, spare parts, tools

Hydraulic oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
980 (259)	HVLP	DIN 51524 - 3 Viscosity: ISO-VG 32	04162158 Castrol Hyspin AWH-M 32

- Connecting piece and hose (tool box);  p. 7 - 112.
- One or more receptacles, approx. 1,100 l (290 gal);  p. 2 - 4.

#### Prerequisites

- The truck crane must be level and in on-road mode;  *Operating manual*.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.
- The oil filters must be removed;  *Changing the hydraulic oil filter*, p. 8 - 39.

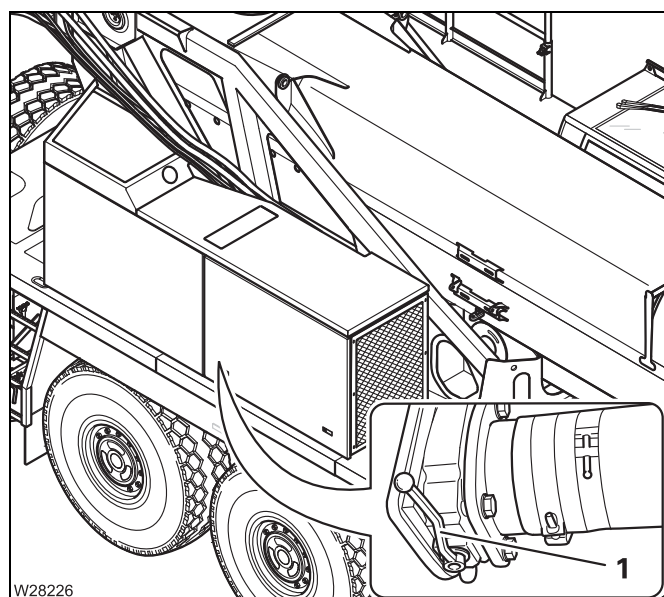
#### Closing the valve



#### Risk of damage to the hydraulic pumps.

Be sure to secure the engine against unauthorised use.

If the engine is started while the valve in the suction line is closed, the hydraulic pumps will be damaged.



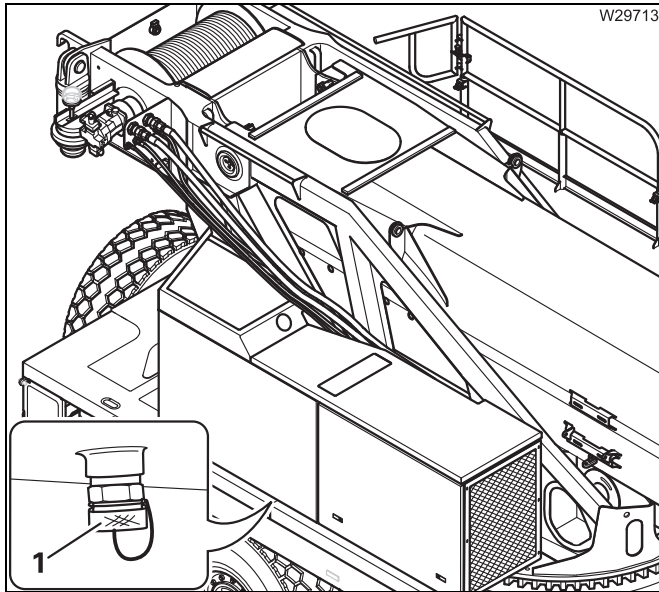
- Close the valve – lever (1) at right angles to the line.

## Draining oil



### Risk of environmental damage due to leaking consumables.

Use the supplied connecting piece and hose and a receptacle with sufficient capacity to drain the hydraulic oil.



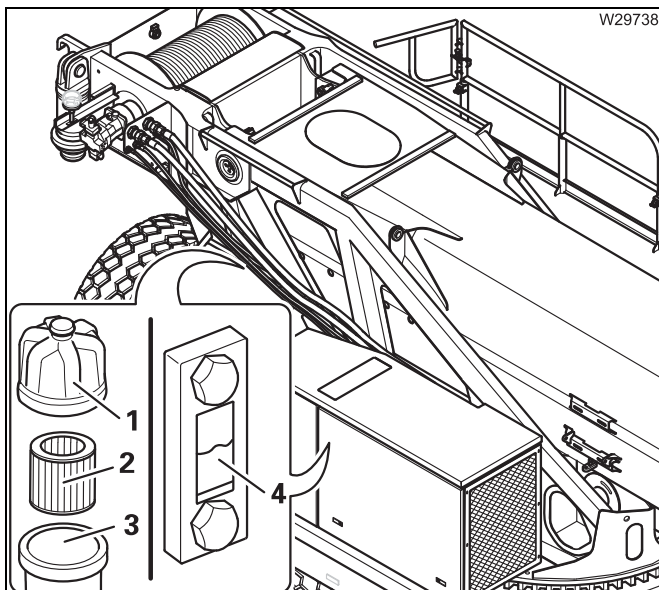
- Place a receptacle underneath the valve.
- Screw the connecting piece and hose onto the valve (1) and drain the oil; Handling the valves, p. 7 - 112.
- Change the filters; p. 8 - 39.

## Topping up the oil



### Risk of damage to the hydraulic system.

Cleanliness is of the utmost importance when handling hydraulic oil. Even fresh hydraulic oil must be filtered before it is added to the tank.



- Remove the cap (1) and the filter (2).
- Add new oil via the filler neck (3) through a filter until the level reaches the centre of the inspection glass (4).
- Tighten the cap and filter.



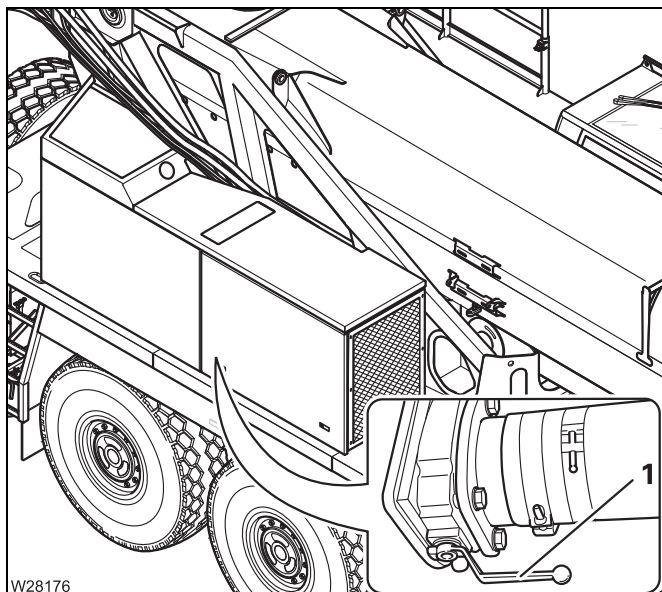
### Establishing the operating conditions

After having changed the oil filters and topping up the oil, you must re-establish the operating conditions.




#### **Risk of damage to the hydraulic pumps.**

Open the valve prior to starting the engine.  
This prevents damage to the hydraulic pumps.



#### **Opening the valve**

- Open the valve – lever (1) parallel to the line.

- Start the engine.
- Carry out all hydraulic functions several times to remove any air in the system.
- Check that none of the oil filters is leaking.
- Check the oil level through the inspection glass on the hydraulic oil tank. Top up oil, if necessary;  p. 8 - 45.

## 8.7

## Main boom

### 8.7.1

### Greasing the piston rod of the derricking cylinder

M 1

#### Grease, spare parts and tools

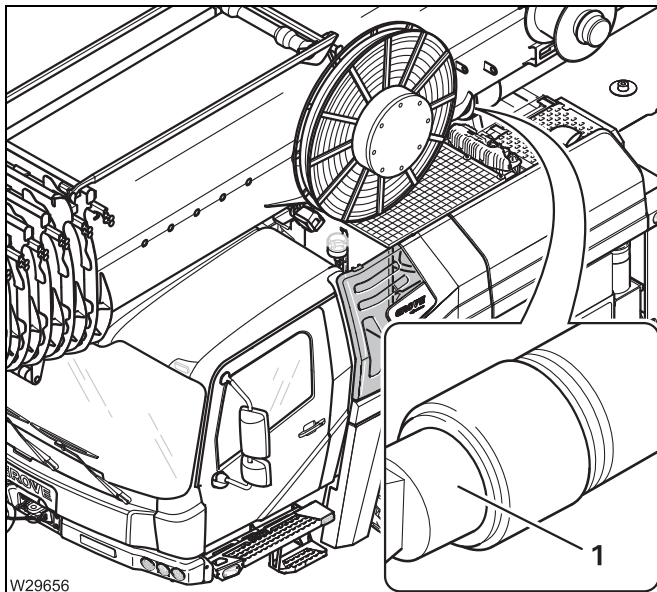
Designation	GROVE part no.
Lubricant RHUS SW 2; 1 kg (Apply the grease with a brush)	03325215
<b>or</b>	
Spray on Berulub; 0.5 litres (spray-on)	01929824

– Brush.



#### **Risk of damage to the derricking cylinder's gasket due to rust.**

Ensure that the uncovered end of the piston rod is always kept covered with a layer of grease. In this way you can avoid rust which damages the seal in the derricking cylinder head when fully lowered.



- Clean the uncovered end (1) of the piston rod by removing old grease, dirt particles and rust.
- Grease the uncovered end, making sure the grease coating is evenly distributed.

#### **After every high-pressure cleaning operation on the truck crane**

- Grease the piston rod.



You can hinder the formation of rust if you turn the main boom to the side between maintenance intervals and completely lower it.

## 8.7.2

## Lubricating the telescopic sections

M 3

### Grease, spare parts, tools

Designation	GROVE part no.
Lubricant for the locking pins: RHUS SW 2, 1 kg can	03325215
Slide paste for the telescopic slide faces: PAL1, 25 kg bucket	02314698

- A grease gun for the lubricating nipples on the locking pins.
- A grease gun for the grease nipples on the upper telescopic slide faces.
- A brush or roller for the outer, upper and lower telescopic slide faces.



The **Manitowoc Crane Group Germany GmbH** recommends pneumatic grease spray guns for more effective lubrication of the telescopic slide faces:

Designation	GROVE part no.
Grease spray gun, complete: Mobile, external compressed air connection required	03325445
Spray extension, length 2 m, splittable	04159862
Manual grease spray gun for cartridge: Via the tyre inflator connection on the truck crane	03329027
25 m hose for manual grease spray gun:	03329072
Slide paste for the telescopic slide faces: PAL1, 400 ml cartridge, refillable	03329071

### Prerequisites

- The truck crane must be level.
- The hook block must be unreeved.
- The main boom must be completely retracted and lowered into horizontal position.
- A rigging mode must be created with a telescoping status which satisfies the lifting capacity tables necessary for maintenance; *Lifting capacity table*; Section *Telescoping sequences* for greasing the boom.
- The RCL code for the current rigging mode must be entered.



If at the start you set up a rigging mode under which the telescope positions 50/100/0/0/0 are released in the context of the corresponding lifting capacity table, this rigging mode allows you to perform the complete maintenance work on the main boom.





If the desired telescoping status is not a fixed length, you can first telescope to the next closest fixed length with the semi-automation and then telescope further to the desired length manually; *Operating manual*.

### Information



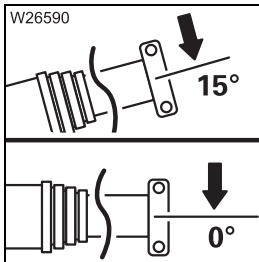
#### Risk of overturning when telescoping if the RCL is overridden.

Do not override the rated capacity limiter (RCL) when telescoping is switched off. Select a suitable lifting capacity table which contains the required telescoping. Set the associated rigging mode and enter the RCL code.



#### Risk of accidents from slipping off the main boom.

There is grease residue on the telescopic sections. For this reason, you must not walk on the main boom. Use the extendable ladders provided with your crane.

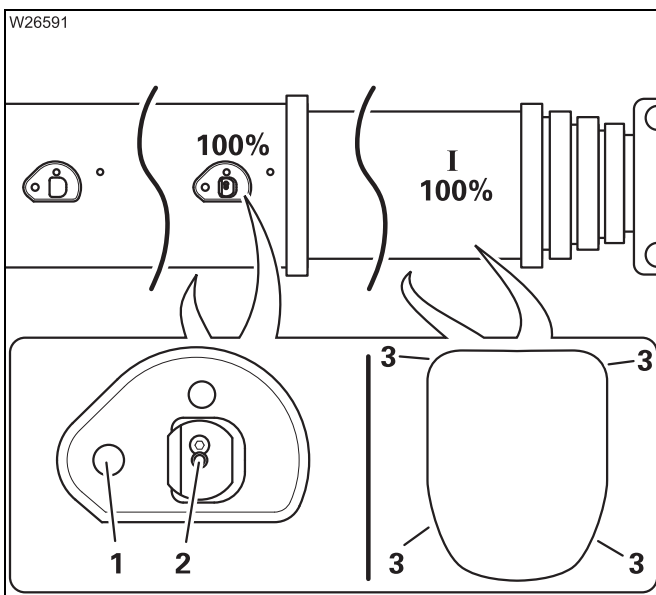


If the main boom has been telescoped several times, the telescoping mechanism and derricking gear can be so heavily loaded that the main boom can be neither telescoped nor derricked. Therefore note the following instructions:

- Before retracting the boom, raise it to approximately 15°.
- Do not lower the main boom below 0°.

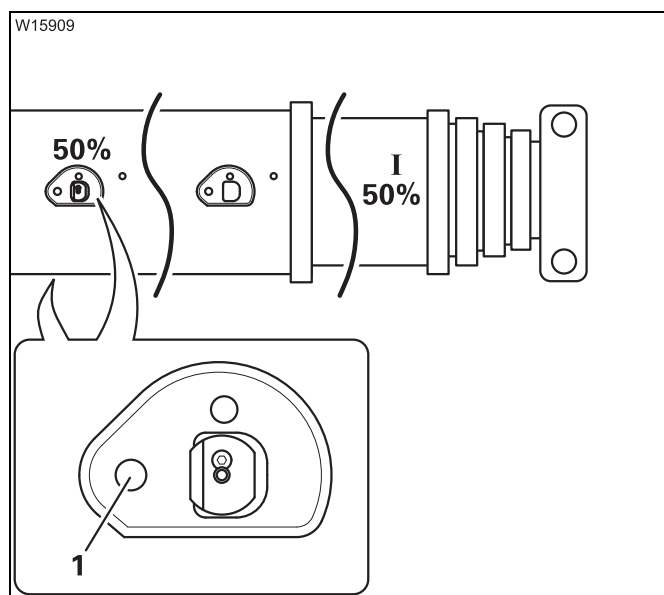
### Telescopic section I

- Observe the following instructions regarding maintenance work.



- Extend the telescopic section I to 100%.
- Use a brush or a roller (PAL1) to lubricate the outer, upper and outer, lower slide faces (3).
- Use the grease gun (PAL1) to lubricate the upper inner slide faces at the lubricating nipples (1) on both sides.
- Use the grease gun (RHUS SW 2) to lubricate the locking pins at the lubricating nipples (2) on both sides.
- Lock and unlock the telescopic section I several times, so that the grease is distributed over the locking pins.



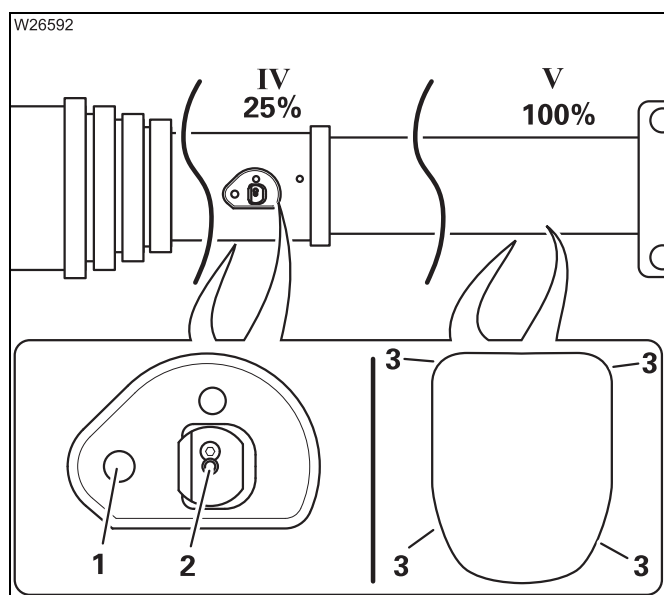


- Extend the telescopic section **I** to 50%.
- Use the grease gun (PAL1) to lubricate the upper inner slide faces at the lubricating nipples (**1**) on both sides.
- Fully retract telescopic section **I**.
- Fully extend and retract telescopic section **I** again so that the grease is distributed over the telescope slide faces.

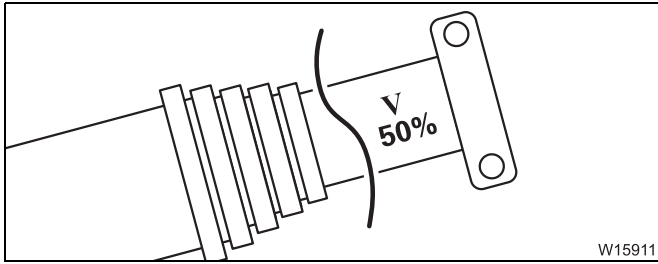
### Telescopic section II-V

- Observe the following instructions regarding maintenance work.

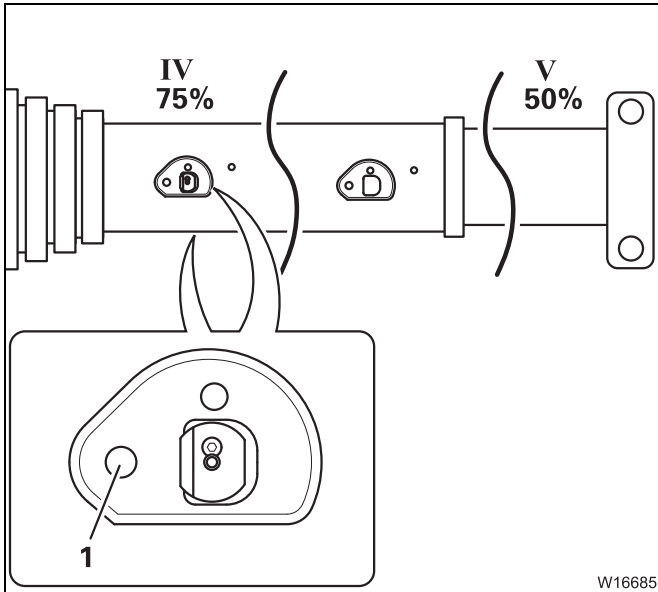
The following diagrams show the lubrication of telescopic section **V**.  
The telescopic sections **IV**, **III**, **II** are lubricated in the same way.



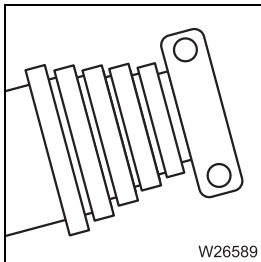
- Extend telescopic section **V** to 100% and telescopic section **IV** to approx. 25%.
- Use a brush or a roller (PAL1) to lubricate the outer, upper and outer, lower slide faces (**3**).
- Use the grease gun (PAL1) to lubricate the upper inner slide faces at the lubricating nipples (**1**) on both sides.
- Use the grease gun (RHUS SW 2) to lubricate the locking pins at the lubricating nipples (**2**) on both sides.
- Lock and unlock telescopic section **V** several times, so that the grease is distributed over the locking pins.



- Raise the main boom to 15°.
- Extend telescopic section **IV** to 0% and telescopic section **V** to approx. 50%.



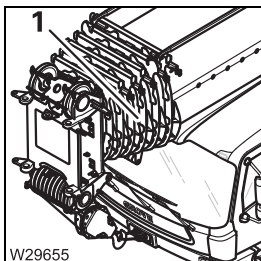
- Lower the main boom to 0° – do not lower to below 0°.
- Extend telescopic section **IV** to approx. 75%.
- Use the grease gun (PAL1) to lubricate the upper inner slide faces at the lubricating nipples (**1**) on both sides.



- Raise the main boom to 15°.
- Retract telescopic sections **IV** and **V** to 0%.
- Fully extend and retract telescopic section **V** again so that the grease is distributed over the telescope slide faces.
- Lower the main boom to 0°.

- Lubricate telescopic sections **IV**, **III** and **II** in the same way.

### Before driving the truck crane

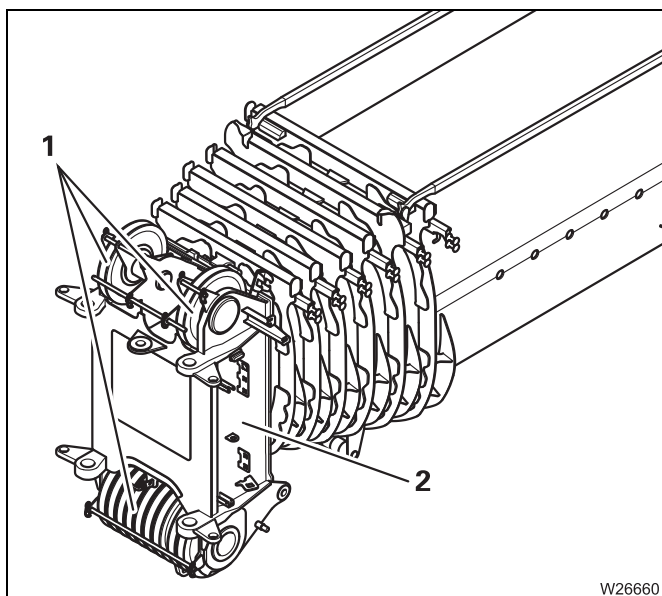


- Fully retracting all telescopic sections of the main boom after greasing may result in excess lubricant paste emerging at the collar (**1**).
- Remove any excess lubricant paste from the collar (**1**). This is to prevent any lumps dropping off on to the windscreen and suddenly obstructing the view when driving.

### 8.7.3

### Checking the sheaves

M 3



- Check all sheaves (1) on the main boom head (2) for damage, wear, mobility and heavy soiling.

Have damaged, worn, stiff or extremely soiled sheaves replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

### 8.7.4

### Checking the locking system

M 12



#### **Risk of accidents if maintenance work is not carried out.**

Have the maintenance work on the main boom locking system performed regularly by **Manitowoc Crane Care** or an authorised GROVE dealer.

This prevents the complete unlocking of a telescopic section in emergency operation/emergency program mode, which could cause serious accidents and damage to the truck crane.

- Have the main boom locking system checked regularly by **Manitowoc Crane Care** or an authorised GROVE dealer.

## 8.8

## Hoist ropes

### 8.8.1

### Checking the winding

D



#### Risk of accidents when the rope drum is turning.

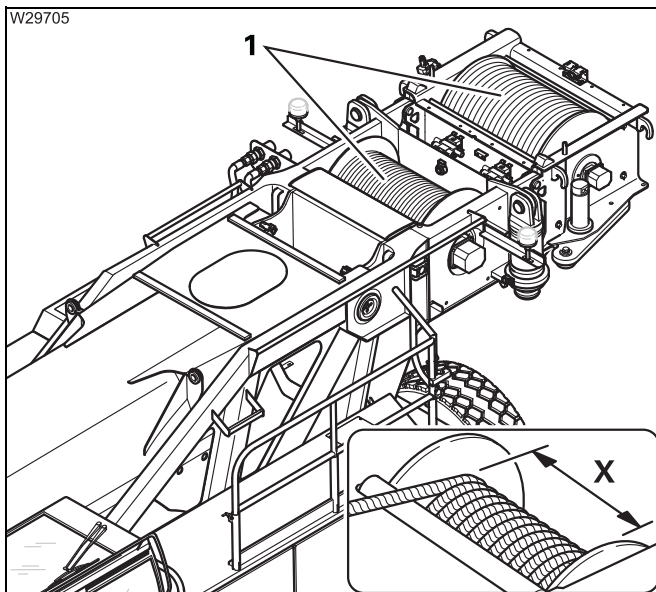
Keep away from the rope drum while it is turning.

This will prevent your limbs from being drawn in and getting crushed.

#### Prerequisites

- The hoist mirrors must be folded out; *Operating manual*.
- One hook block must be reeved; *Operating manual*.
- The main boom must be raised to approx. 30°; *Operating manual*.
- The engine must be started.

#### Check the following



Always check the entire length of the winding of the ropes (1).

- Slowly perform the *lowering* movement until the rope has moved over the complete width (X) of the rope drum.
  - The rope needs to be evenly wound.
  - The rope turns on the drum must be evenly spaced at a distance of 0 to 2 mm (0 to 0.08 in).
  - The cross-over points must offset by approx. 180°.



The ropes of the top layer lie over the ropes of the bottom layer at the cross-over points.

## 8.8.2




## Checking the hoist ropes

W


### Spare parts and tools


- Torque wrench for 78 Nm (57.5 lbf ft).

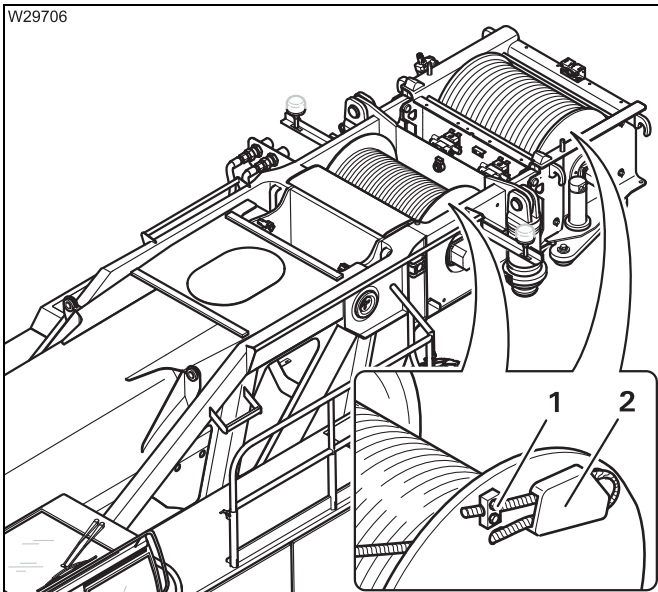
### Prerequisites

- Establish a rigging mode in accordance with the *Lifting capacity table* and enter the RCL;  *Operating manual*.
- A hook block must be reeved 5-fold;  *Operating manual*.
- The main boom must be raised and fully extended;  *Operating manual*.

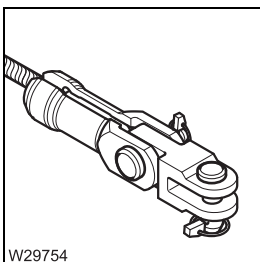
### Checking the ropes


- Start the engine.
- Unreel the rope and check the rope and the rope spooling;  *Assessing the condition of the hoist rope*, p. 8 - 56. When 5 turns are left on the rope drum, the lowering limit switch must switch off.

If the lowering limit switch does not switch off or switches off too late, it must be reset;  *Setting the lowering limit switch*, p. 8 - 65.



- Check the clamp (1) for damage and firm seating – torque to 78 Nm (57.5 lbf ft).
- The free end of the rope must not project above the flanged wheel.
- The rope wedge must be in the pocket (2).
- The rope end on the rope wedge must not show any signs of wear.
- Reel in the rope. At the same time, the rope may not show any signs of kinking or being flattened.



- Check the end of the rope and the rope end fitting for damage.
- Make sure the rope end is correctly fitted in the rope end fitting;  *Operating manual*.

### 8.8.3

## Lubricating the hoist rope

M 3

#### Grease, spare parts and tools

Designation	Quantity	GROVE part no.
Grease	1	03133770

- Brush, roller, spray gun, tray or pressure pump.

#### Lubricating the rope

Lubricating the rope

- significantly prolongs its service life and
- keeps the friction between the rope, the sheaves and the hoist drum as low as possible.

The lubricant is applied to the rope by

- spraying, brushing, rolling or
- by running it through a tray filled with lubricant or
- by means of high-pressure lubrication with a pressure pump.



The **Manitowoc Crane Group Germany GmbH** recommends high-pressure lubrication with a pressure pump (GROVE part no. 90018525) for reasons of sustainability, efficiency and environmental protection.

When lubricating the hoist ropes, observe the instructions concerning the lubricant.

When using the pressure pump, observe the manufacturer's separate operating instructions.

For further information, contact **Manitowoc Crane Care** or an authorised GROVE dealer.

### 8.8.4

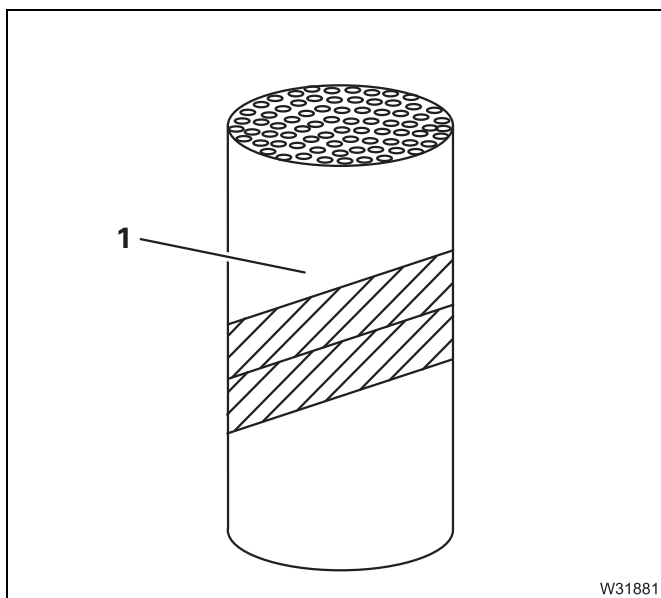
## Assessing the condition of the hoist rope



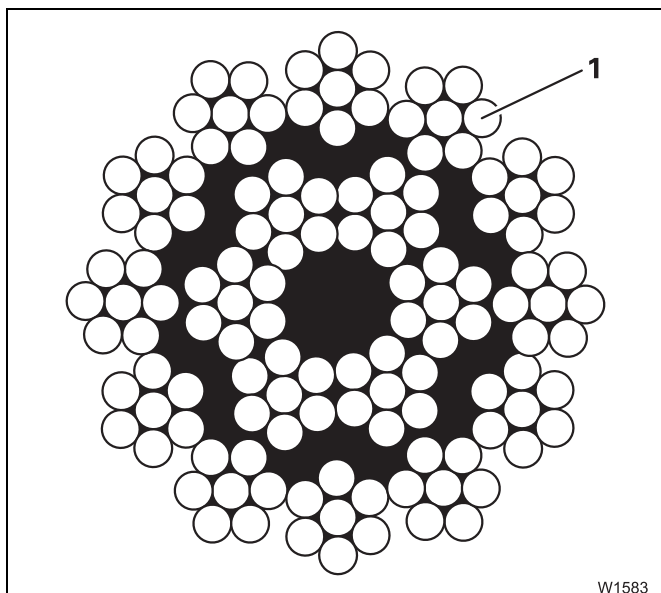
If in doubt about damage assessment, always consult an official inspector.

To assess the condition of the rope, you must be familiar with the following:

- The type of rope (regular lay)
- The number of load-bearing wires in the outer strands
- The rope diameter (▮▮▮▮▶ *Operating manual*).



In a regular lay rope (1), the wires run more or less in the longitudinal direction of the rope.



You get the number of load-bearing outer wires (1), by counting the number of outer strands of the rope and multiplying by 7.



If there are multiple layers of strands, only the outer layer is counted.



The **tables** show by rope diameter the number of wire breaks in a length 6 times and 30 times the rope diameter which if reached would require replacement of the rope.

- Familiarise yourself with DIN ISO 4309:2013-06 (rotation-resistant ropes).

This table applies only to the **hoist ropes** fitted as initial equipment and original replacement ropes!

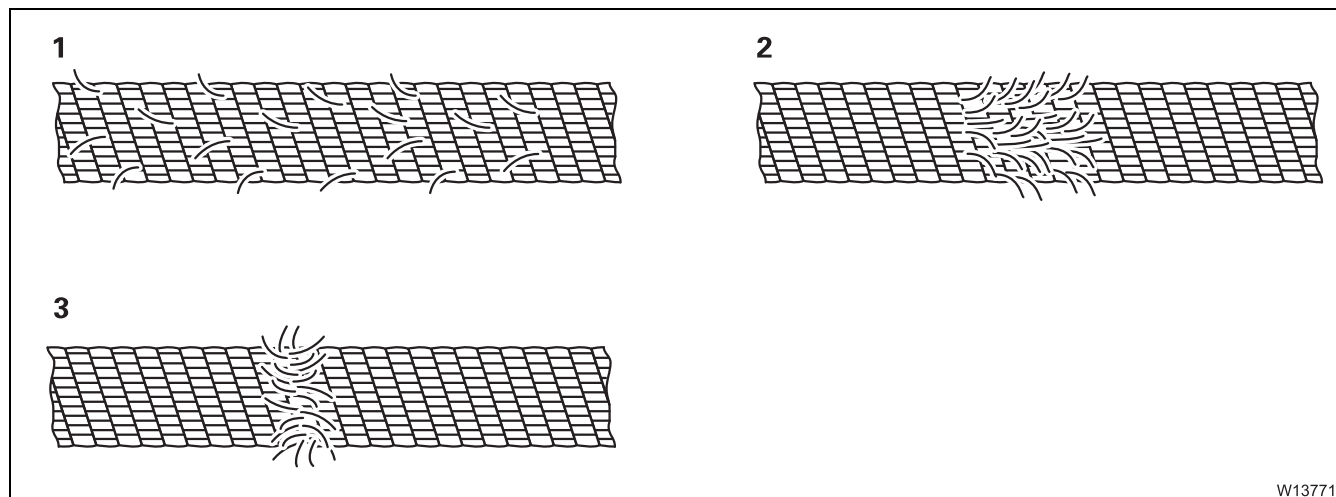
<b>Number of visible wire breaks on a rotation-resistant hoist rope</b>						
The rope section runs over a rope disc or on a drum wound as a single layer						
Number of load-bearing outer wires	Ø 13 mm		Ø 16 mm		Ø 17 mm	
	to 78 mm	to 390 mm	to 96 mm	to 480 mm	to 102 mm	to 510 mm
101-120	3	5	3	5	3	5
121-140	3	5	3	5	3	5
	Ø 19 mm		Ø 22 mm		Ø 24 mm	
	to 114 mm	to 570 mm	to 132 mm	to 660 mm	to 144 mm	to 720 mm
101-120	3	5	3	5	3	5
121-140	3	5	3	5	3	5
The rope section is running on a drum wound as multiple layers						
	Ø 13 mm		Ø 16 mm		Ø 17 mm	
	to 78 mm	to 390 mm	to 96 mm	to 480 mm	to 102 mm	to 510 mm
101-120	5	10	5	10	5	10
121-140	6	11	6	11	6	11
	Ø 19 mm		Ø 22 mm		Ø 24 mm	
	to 114 mm	to 570 mm	to 132 mm	to 660 mm	to 144 mm	to 720 mm
101-120	5	10	5	10	5	10
121-140	6	11	6	11	6	11





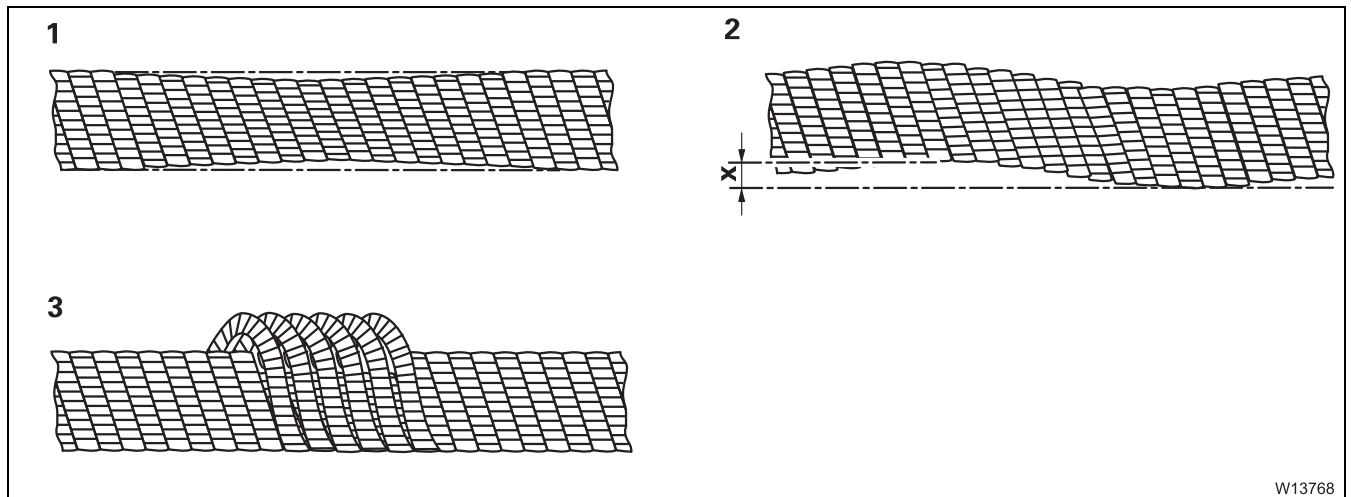
**Risk of accidents due to reduced load bearing capacity.**

Remember that other factors may also make it necessary to replace a rope before the number of wire breaks requiring rope replacement has been reached (age of rope, frequency of use or exceptional loading).



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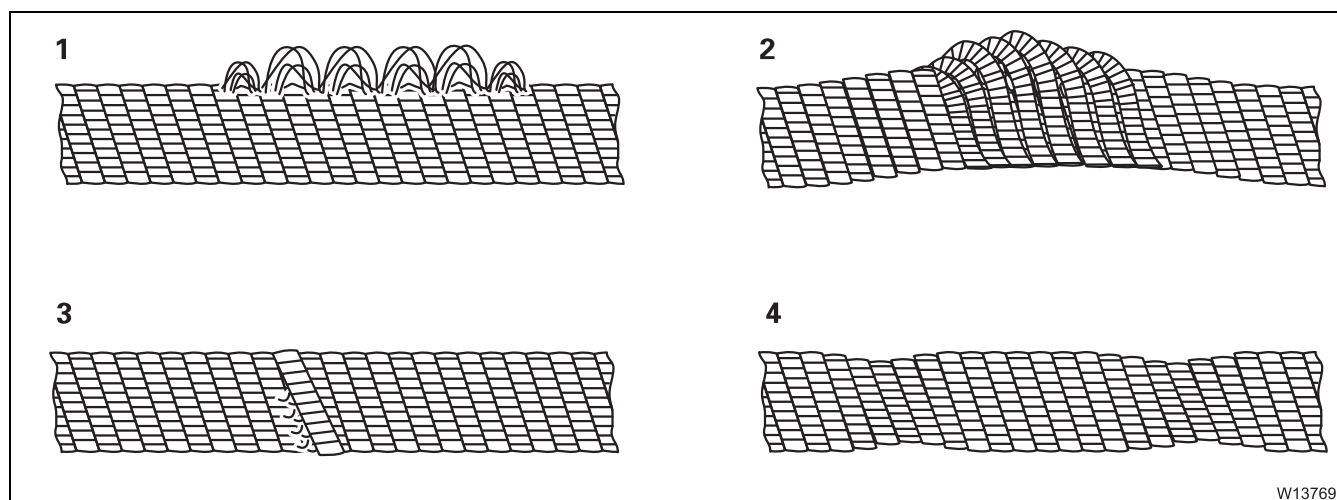
Damage	Description	Cause	Replacement
<b>Wire break (1)</b>	Individual wires are broken; the broken ends of the wires are protruding from the rope.	General wear caused by ageing of the rope or consequential damage as a result of damage to the rope.	Replace the rope <b>at the latest</b> when the maximum permissible number of wire breaks according to the table are visible externally.  Replace the rope <b>immediately</b> if wire break clusters or strand breakages occur.  The frequency of wire breaks increases with a rope's age. For reasons of safety, it is advisable to replace the rope while the number of wire breaks is still low.
<b>Wire break-age cluster (2)</b>			
<b>Strand break-age (3)</b>			
<b>Effect of heat</b>	Tarnished colour is visible externally on the rope.	Rope has been subjected to excessive heat.	Replace the rope <b>immediately</b> .



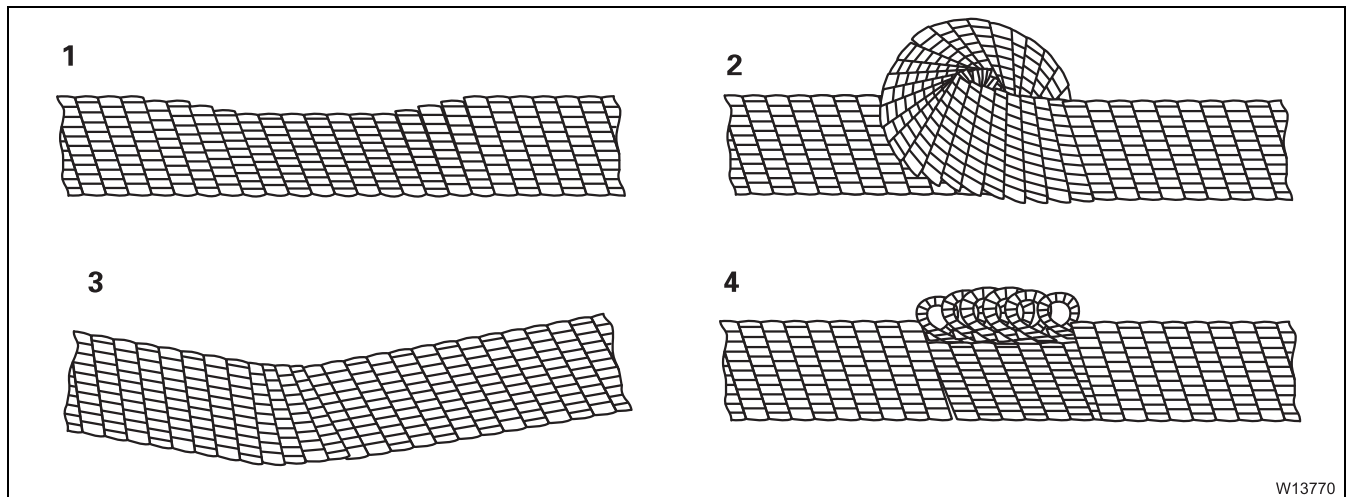
W13768

Damage	Description	Cause	Replacement
<b>Reduced diameter (1)</b>	The diameter of the rope has become smaller along large sections.	Structural changes	<b>Immediately</b> replace the rope if the diameter has decreased by 15% or more compared to the nominal diameter.
		Corrosion or abrasion.	<b>Immediately</b> replace the rope if the diameter has decreased by 10% or more compared to the nominal diameter.
<b>Corkscrew-type rope deformation (2)</b>	The rope winds its way along its longitudinal axis in a way that is similar to a corkscrew. Deformation is measured with suspended hook block.	Damage resulting from overloading.	Even a small amount of deformation leads to increased abrasion, wire breaks and rough operation of the rope drive. If deformation "x" at a position on the rope is greater than a third of the rope diameter, the rope must be replaced <b>immediately</b> .
<b>Basketlike deformation (3)</b>	Wires of the outer layer protrude. In other areas of the rope, the insert has buckled or is protruding from the rope.	Outer and inner layers have been displaced in relation to each other.	Replace the rope <b>immediately</b> .





Damage	Description	Cause	Replacement
<b>Loop formation (1)</b>	Outer layer wires in the form of hair pins are protruding from the rope away from the sheave.	General wear due to ageing of the rope or consequential damage as a result of damage to the rope.	<b>Immediately</b> replace rope if the rope structure has been substantially altered by the loop formations.
<b>Loosening of wires or strands (2)</b>	Outer wires or strands have become loose. Only the inner strands continue to bear the load.	Corrosion or abrasion.	Replace the rope <b>immediately</b> .
		Other causes.	The number of wire breaks determines when the rope must be replaced.
<b>Knot formation (3)</b>	If there is repeatedly occurring knot-like thickening of the rope; the insert comes out frequently. Strands bear on each other at thin points; increased frequency of wire breaks.	General wear due to ageing of the rope or consequential damage as a result of damage to the rope.	Determine number of wire breaks; replace rope <b>immediately</b> if serious knot formation occurs.
<b>Constriction (4)</b>	Diameter reduction over short sections.	General wear caused by ageing of the rope.	Replace rope <b>immediately</b> if serious constrictions are detected.



Damage	Description	Cause	Replacement
<b>Flattening (1)</b>	Crushed areas, mostly with wire breaks.	Mechanical damage, e.g. due to driving over the rope.	Determine number of wire breaks; replace rope <b>immediately</b> if serious crushing has occurred.
<b>Kinks (2)</b>	Rope deformation with twists and wire breaks.	Rope in the eyelets was pulled straight while twisted.	Replace the rope <b>immediately</b> .
<b>Buckling (3)</b>	Buckled section in the rope.	Mechanical damage.	Replace the rope <b>immediately</b> .
<b>Crinkling (4)</b>	Crinkling rope deformation.	Loaded rope was pulled over an edge.	Replace the rope <b>immediately</b> .

## 8.8.5

### Replacing the hoist rope

#### Spare parts and tools

- An authentic replacement rope; ■■■► *Rope certificate*.
- A reel stand with braking block.
- Torque wrench for 78 Nm (57.5 lbf ft).



#### **Risk of accidents from falling load.**

Use only a replacement rope that has the same technical specifications as the defective rope, or an authentic replacement rope.

#### Prerequisites

- The truck crane must be level.
- The main boom must be set down on the boom rest.
- The hook block must be unreeved; ■■■► *Operating manual*.

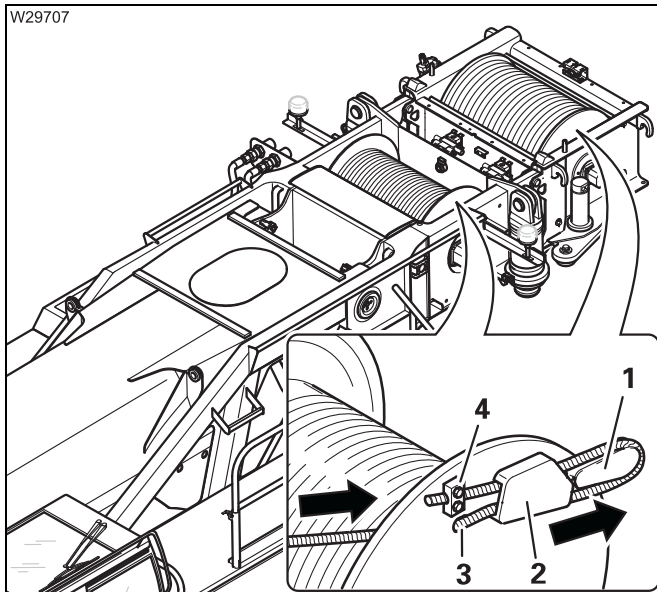
#### Replacing the old rope

- Unreel the hoist rope until it switches off.
- Adjust the lowering limit switch so that you can unreel the rope completely; ■■■► *Setting the lowering limit switch*, p. 8 - 65.
- Unreel the remaining layers from the hoist drum.
- Protect the truck crane from unauthorised use; ■■■► p. 2 - 3.



#### **Risk of accidents due to the rotating rope drum.**

Turn off the engine and remove the ignition key so that no unauthorised operation of the hoist can occur.

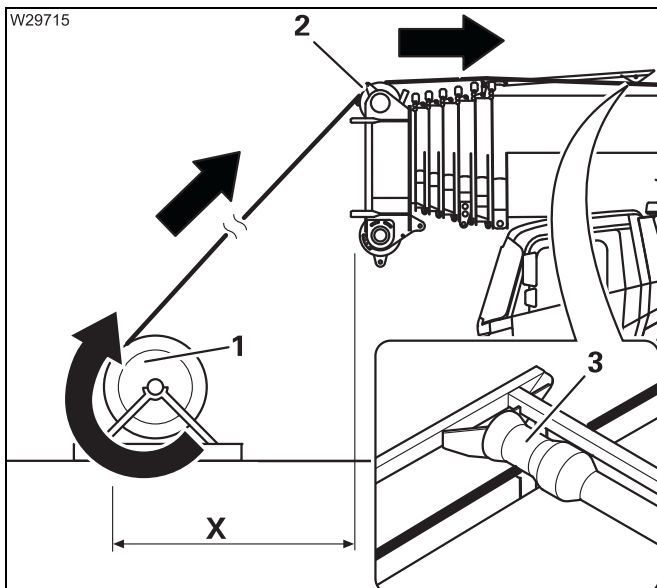


- Remove the clamp (4).
- Push the rope through the hole (3) until the rope wedge (1) slides out of the pocket (2).
- Remove the rope wedge and place the old rope away from the truck crane.

### Inserting a new rope

The service life of a rope can be significantly affected by the insertion procedure. Errors can significantly reduce the service life, therefore:

- Make sure the rope is not twisted when it is inserted.
- Avoid soiling and damage when fitting.
- Wind the rope up in the same direction in which the rope is reeled on to the reel.
- Tense the rope slightly while winding it up.

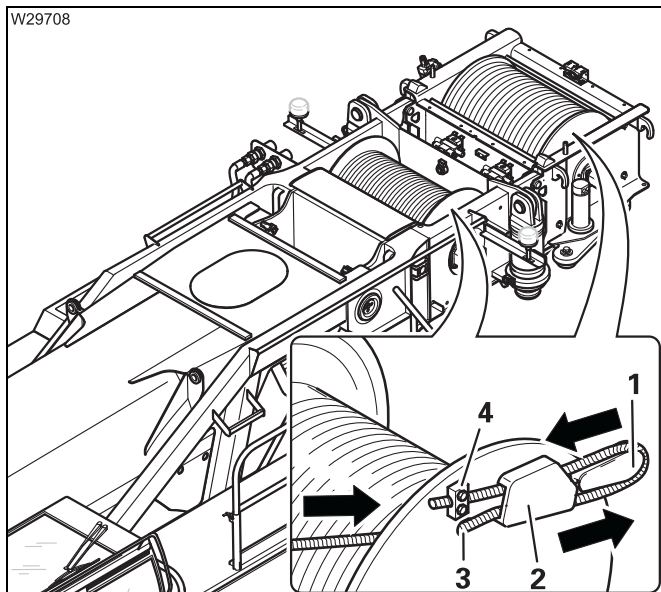


- Place the reel stand (1) with the new rope in front of the main boom head. The distance (X) between the reel stand (1) and the head sheave (2) must be at least 30 m (100 ft) so that the rope runs over the head sheave as straight as possible.

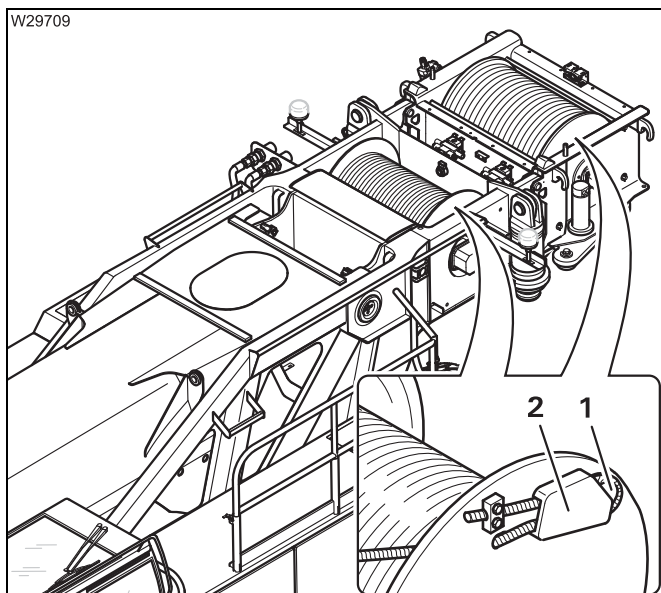
**Ensure that the rope is being rolled on to the drum with the right slewing direction.**

- Guide the rope over the head sheave (2) and under the bracket (3) up to the hoist drum.






- Guide the rope through the hole (3) until it protrudes about 1.5 m (5.0 ft) beyond the pocket (2).
- Feed the free end of the rope back through the pocket.
- Secure the clamp (4) and tighten it – torque to 78 Nm (57.5 lbf ft).
- Place the rope wedge (1) in the loop.



- Push the rope back until the rope wedge (1) is fully in the pocket (2).
- Ensure that the rope wedge, loop and rope end do not protrude beyond the flanged wheel. This will prevent damage.

- Start the engine.
- Hold the rope taut and wind up the rope slowly.
- Reeve a hook block – reeve it at least 5-fold;  *Operating manual*.
- Raise the main boom to a steep position and extend it fully.
- Unwind the rope until only five turns remain on the rope drum.





Observe the hook block when unreeling.  
The hook block must not rotate.



**Risk of accidents if the lowering limit switch is set incorrectly.**

After inserting a new rope, the lowering limit switch must always be reset. In this way you avoid the lowering limit switch switching off too late or not at all, the rope being damaged and the load being dropped.

- Set the lowering limit switch; p. 8 - 65.
- Run in the new rope with small loads so that the rope can settle on the hoist drum.

**8.8.6**

**Setting the lowering limit switch**

A lowering limit switch is mounted both on the main hoist and on the auxiliary hoist.

**Spare parts and tools**

Designation	Quantity	GROVE part no.
Cover gasket	2	02315305

**Prerequisites**

- A hook block must be reeved 5-fold; *Operating manual*.
- The main boom is fully raised and extended; *Operating manual*.
- The hook block is lowered until only five turns of the rope remain on the hoist drum.

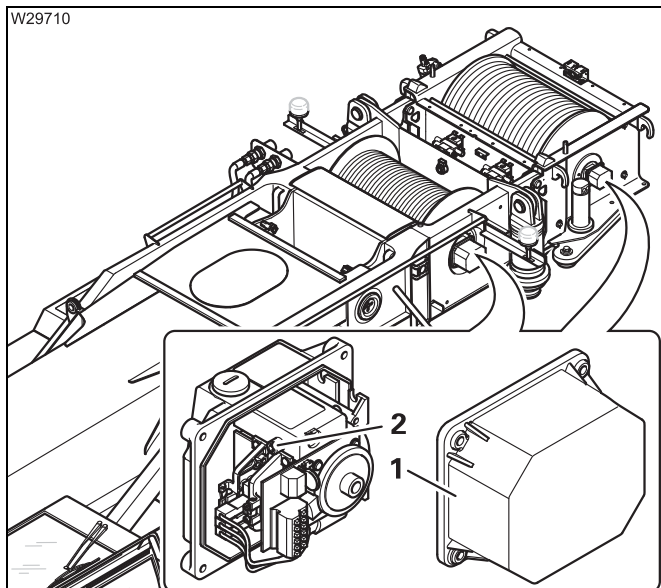


## Setting the lowering limit switch



### **Risk of accidents if the rope end fitting is overloaded.**

The lowering limit switch must always be reset after repair work on the hoist and after rope replacement. A faulty lowering limit switch must always be replaced.



- Remove the cover (1).
- Turn the screw (2) until you hear the switch activate.
- Screw the cover on again. Replace the gasket if necessary.
- Check that the lowering limit switch switches off the hoist correctly.

## Checking switch-off

- Raise the hook block until there are approx. 10 turns on the hoist drum.
- Lower the hook block and check whether the lowering limit switch switches off properly.

The lowering limit switch must switch off the hoist while five rope turns are still on the hoist drum.

- Correct the setting of the lowering limit switch if necessary.

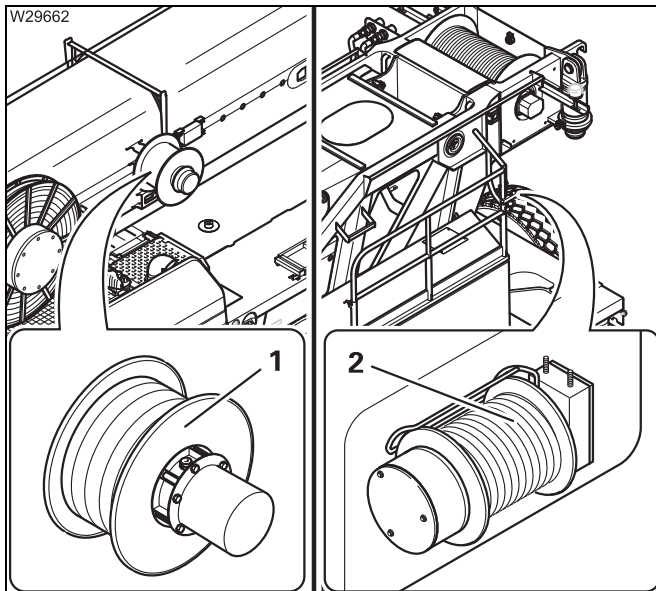
## 8.9

## Cable drums

### 8.9.1

### Maintenance of the slip ring assemblies

**M 6**



The slip ring assemblies are located in:

- 1 Cable drum 1
- 2 Cable drum 2

#### Spare parts and tools

Designation	Quantity	GROVE part no.
Cover gasket for cable drum 1	1	03325575
Cover gasket for cable drum 2	1	03138894

- Clean, lint-free cloth.
- Dry, oil-free compressed air.

#### Prerequisites

- All counterweight plates must be removed – the opening for cable drum 2 at the rear of the turntable must be accessible; *Operating manual*.
- The main boom must be set down on the support; *Operating manual*.
- The engine must be switched off and secured against unauthorised use; p. 2 - 3.
- The ignition must be switched off in the driver's cab; *Operating manual*.





**Risk of damage to the RCL.**

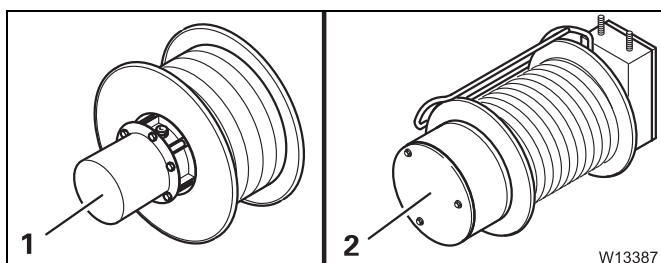
Before maintenance work on the slip ring assemblies, always switch off the battery master switch so that the cable drum is without power. This prevents short circuits which may lead to damage to the rated capacity limiter (RCL).



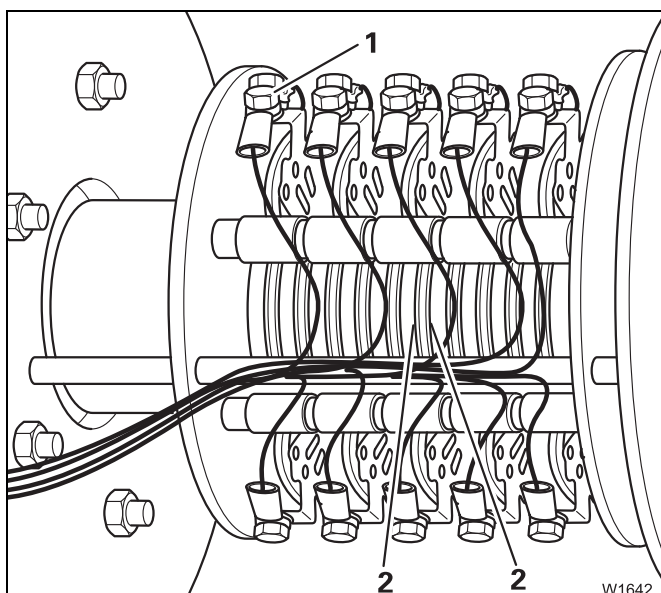
**Risk of crushing from movement of the main boom.**

Only perform maintenance work when the main boom is resting in the support and the truck crane is not running. Always ensure that the truck crane is protected from unauthorised use before beginning maintenance work. Remove the keys from the crane cab and put up warning signs.

**Maintenance of the slip ring assemblies**



- Remove the cover (1) or (2).
- Clean and dry the cover.
- Replace the gasket if necessary.

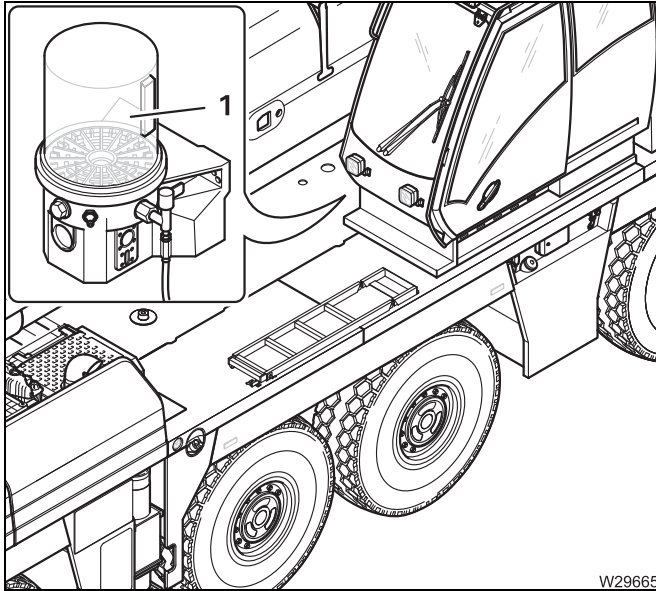



- Only use a cloth and compressed air to remove any dirt on the slip rings (2).
- Do **not** use spray oil.
- Check to make sure all screws (1) are tight.
- Attach the cover to the cable drum.

## 8.10 Central lubrication system

### 8.10.1 Checking the level

W



The maintenance of the pump (1) is similar to the maintenance on the carrier;  *Central lubrication system*, p. 7 - 119.

#### Connected lubricating points

- Main hoist drum,
- Auxiliary hoist drum,
- Slewing bearing,
- Telescopic unit – pivot pins,
- Derricking cylinder – pivot pins

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## 8.11 Hook blocks

### 8.11.1 Checking the sheaves

**M 3**

- Check the sheaves in the hook blocks for damage, wear, mobility and extreme soiling.

Have damaged, worn, stiff or extremely soiled sheaves replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

### 8.11.2 Greasing

**M 12**


- Comply also with the  *Run-in regulations*, p. 4 - 1.

Grease, spare parts, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Grease gun from the tool set.

Prerequisites

- The hook block has been reeved at least twice;  *Operating manual*.

Greasing

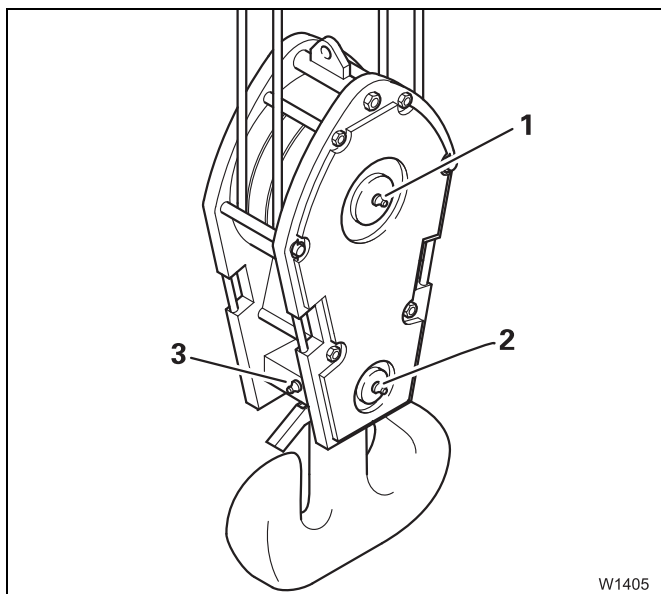
On the hook blocks supplied, the sheaves, crossheads and load hooks of the axial bearings are greased.



The sheaves on the hook block often have no grease nipple and are maintenance-free.

- Check all hook blocks for grease nipples. Hook blocks with grease nipples must be serviced, hook blocks without grease nipples are maintenance-free.





The diagram gives an example of the arrangement of the grease nipples (1), (2) and (3) on a hook block.

There are more grease nipples on the other side.

- Clean the grease nipples on all hook blocks and grease them using a grease gun.

### Checking the fastenings

The truck crane GMK5200-1 can be equipped with hook blocks that can be separated.

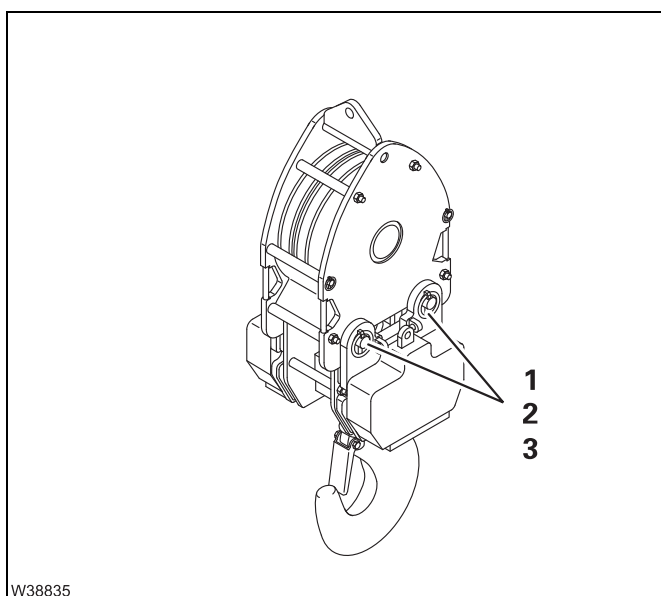


#### **Risk of accidents due to non-secured hook block components**

If the removable components of the bottom hook block are not properly secured, then they can fall from a great height and fatally injure people during crane operation.

Always check that the removable components are properly secured during loading and before crane operation.

The figure shows an example of the removable components on a hook block.



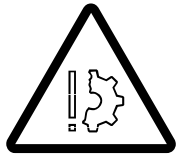
#### **Separable hook block**

- Check the separatable joints (1) for damage.
- Check the bolts (2) and the retaining pins (3) for damage.



### Information on crane operation

Exercise particular care when operating the crane. Check that the hook blocks have room to move freely, especially for two-hook operation.



#### Risk of damage to the hook blocks

Check the retainers for the ballast plates regularly for corrosion and conditions. This applies in particular if

- work is frequently carried out in a corrosive environment
- the hook blocks collide during crane operation.

In this way, you avoid damaging the retainers, which can lead to the hook blocks falling over.

### Having them dismantled

Depending on the manufacturer, there are different maintenance intervals for the dismantling of the hook blocks. The maintenance-free sheaves are also greased at this time. Some manufacturers recommend dismantling every 4 years or after 500 operating hours.

- Ask **Manitowoc Crane Care** about the maintenance intervals for the hook blocks supplied to you.
- Have the hook blocks dismantled by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.

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## 8.12

## Electrical system

### 8.12.1

### Checking the lighting and indicators

D



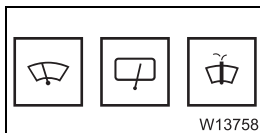
#### Risk of accidents if the safety devices are faulty.

Have faulty lights and indicators repaired by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

- Check the symbols and indicator lamps on the *CCS (Crane Control System)* control unit; *Operating manual*.

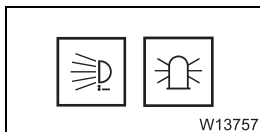
- Check the following functions:

- Windscreen wipers, windscreen washing system



- Spotlight on the crane cab, air traffic control light

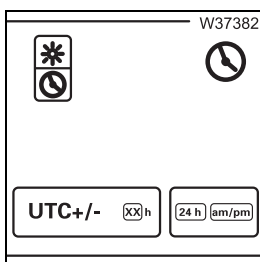
- Spotlight on the main boom (xenon light)



- Horn, anemometer

- Camera lights on the main and auxiliary hoists.

- Date/time on CCS display.



- A long-life battery with a service life of 10 years for retaining the control system data is located next to the fuses in the crane cab; *Have the battery on the electronics board replaced, p. 8 - 76.*





**Risk of accidents from exploding glass bodies and high voltage.**

The glass bodies of gas discharge lamps (xenon lights) are pressurised. If the lamp breaks, the glass splinters explosively and shards scatter.

Xenon lights operate at high voltage. While changing the lamp, there is still a danger of residual voltage discharging (electric shock) even when the battery master switch is switched off.

Have faulty lamps replaced only by properly qualified personnel who use the relevant protective equipment.

- Have faulty lamps in the spotlights replaced only by qualified personnel.

**8.12.2**


**Have the battery on the electronics board replaced**

**Y 10**

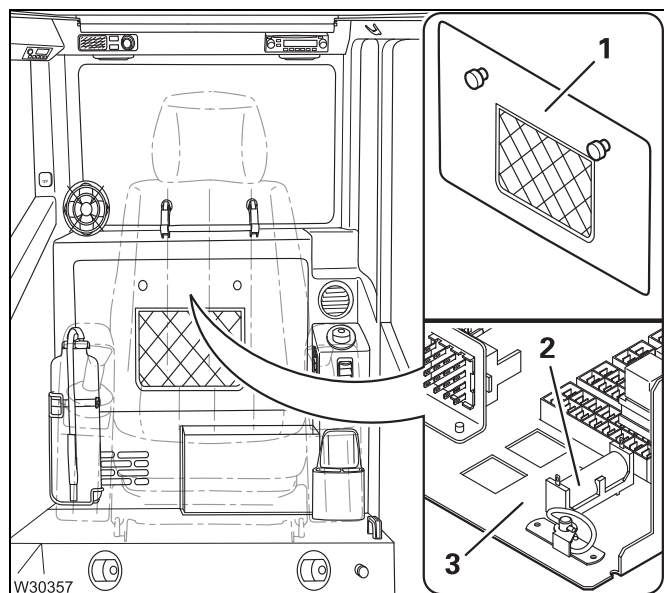
**Spare parts and tools**

Designation	Quantity	GROVE part no.
Lithium battery 3.6 V	1	03143172

**Prerequisites**

- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

**Changing**




- Open the cover (1) behind the seat in the crane cab.
- Changing the battery (2) on the electronics board (3).
- Close the cover.
- Check the correct operation of all controls.

## 8.13 Air conditioning system

### 8.13.1 Checking the air conditioning system

M 1

- Check the air-conditioning system in the same way as when checking it on the carrier;  *Checking the air conditioning system*, p. 7 - 131.

### 8.13.2 Cleaning the condenser fins

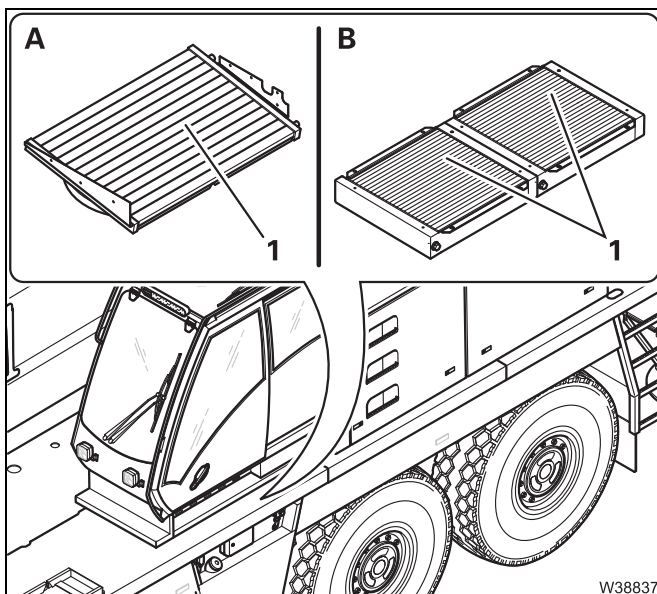
M 1



#### Risk of damage to the condenser.

Do not use a high pressure cleaner or steam jet cleaner. The powerful jet may damage the fins. Use only compressed air for cleaning.

Depending on the power of the air-conditioning system (3 KW or 6 KW), different condensers are installed (type **A** or **B**).



- Switch the air conditioning system off.
- Clean the condenser fins (1) with compressed air.

### 8.13.3

## Checking hoses

M 6



### **Risk of burns due to escaping refrigerant.**

Wear suitable safety glasses and gloves when checking the hoses and connections.

This will prevent injury from suddenly escaping refrigerant. Seek medical attention if the skin or eyes come into contact with the refrigerant.

- Check all refrigerant hoses for damage and areas of wear.

Have damaged hoses checked by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop only.

### 8.13.4

## Checking the entire air conditioning system

M 12



This inspection may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.



### **Risk of burns due to escaping refrigerant.**

Wear suitable safety glasses and gloves when checking the hoses and connections.

This will prevent injury from suddenly escaping refrigerant. Seek medical attention if the skin or eyes come into contact with the refrigerant.

- Have the entire air conditioning system checked for leaks and proper functioning.

The inspection of the air conditioning system particularly includes the inspection of

- the refrigerant collector, in accordance with the pressure container regulations (test group II) and
- the refrigerant compressor.

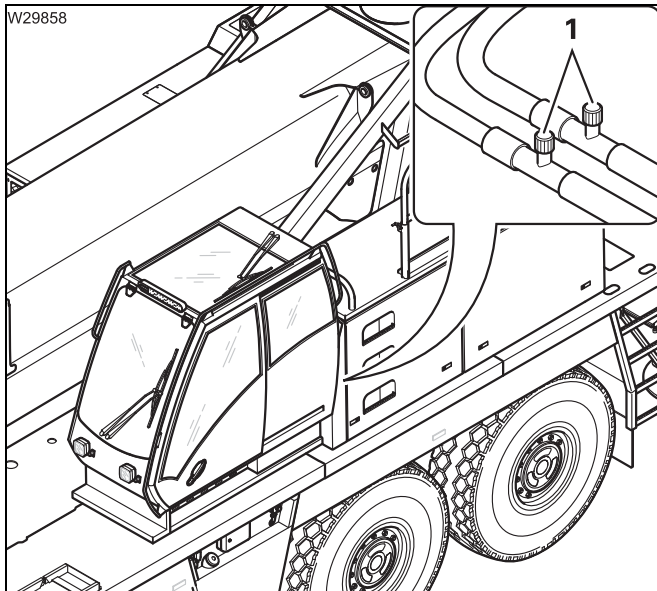
Only allow the system to be topped up with suitable refrigerant.

## Refrigerant

Fill quantity in kg (lbs)	Designation	CAS no. EC no.
1,0 (2,2) 1-circuit (3 KW)	Tetrafluoroethane (R134a)	811-97-2 212-377-0
2 x 0.95 (2.1) 2-circuit (6 KW)		

**Compressor oil:** POE OIL; EMKARATE RL68H

## Filler connections



The filler connections (1) for the refrigerant are on the compressor behind the cover (2).

Depending on the output (KW) of the air-conditioning system there may be two separate refrigerant circuits, which must be filled separately. There are then four filler connections (1) instead of two.

## 8.13.5

## Changing the pollen filter

M 12

### Reducing the interval

- Under difficult operating conditions – at extremely sandy or dusty locations – you must change the filter earlier than normal.

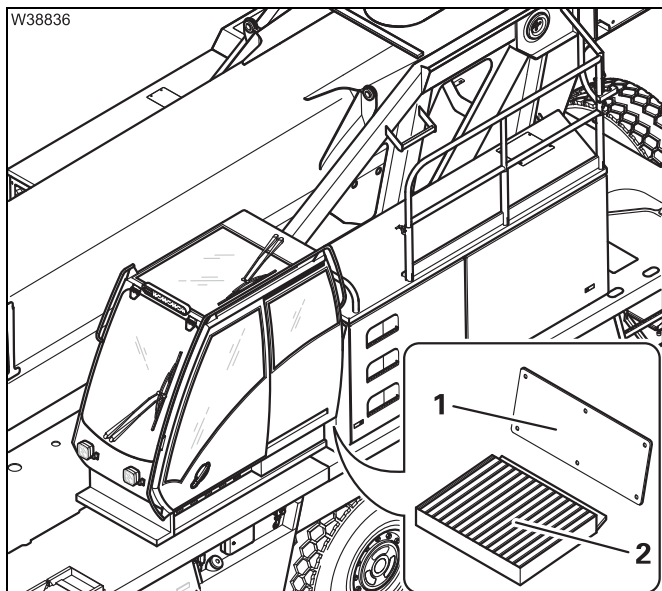
### Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	04163620

### Prerequisites

- The engine must be switched off and secured against unauthorised use;  
    ▶▶▶ p. 2 - 3.

### Changing



- Open the cover (1).
- Remove the filter (2) from the housing and clean the housing with a cloth.
- Insert a new filter.
- Fasten the cover (1).



## 8.14 Other maintenance work

### 8.14.1 Checking the windscreen washing system

**W**

**Water, spare parts, tool**

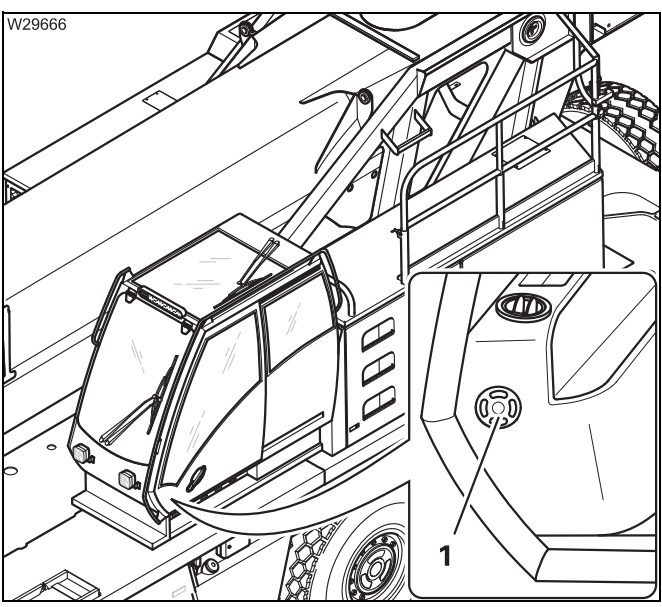
Designation	Quantity	GROVE part no.
Windscreen wiper blade	1	03268512
Roof wiper blade	1	03326121

- Water; add commercially available detergent and antifreeze to it.
- A can for mixing and filling.

**Prerequisites**

- The crane cab door is pushed back – the filler neck with the cap (1) is accessible.

#### Topping up




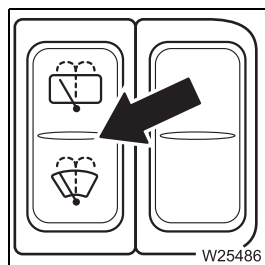
#### If the tank is empty

- Open the cap (1) on the filler neck.
- Top up the windscreen washing fluid through the filler neck.
- Close the filler neck with the cap.

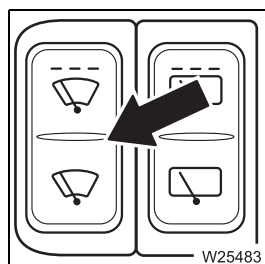


## Wiping

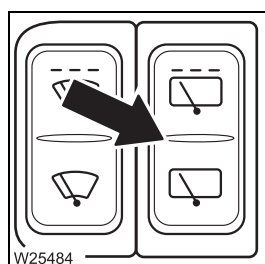
The wiping/washing system operation is described in the accompanying operating instructions;  *Operating manual*.



- Spray water on the **windscreen** – press **down** on the switch.
- Spray water on the **skylight** – press **up** on the switch.



- Switch on the **windscreen wiper** – press the switch **down** for continuous operation.
- Also check intermittent operation – press the switch **up**.
- Switch off the **windscreen wiper** – push the switch in the middle position.



- Switch on the **roof window wiper** – press the switch **down** for continuous operation.
- Also check intermittent operation – press the switch **up**.
- Switch off the **roof window wiper** – push the switch in the middle position.

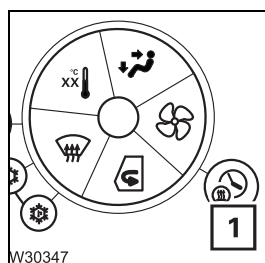
### In case the windscreen/skylight is not wiped clean


- Change the wiper blade.


## 8.14.2

### Checking the auxiliary heater

M 1



Check the auxiliary heater (1) in the same way you check it on the carrier;  *Checking the auxiliary heater*, p. 7 - 145.

- Familiarise yourself with the CCS Heating/Air-conditioning system menu in the crane cab;  *Operating manual*.

### 8.14.3

## Lubricating the crane cab door


M 12

#### Grease, spare parts, tools

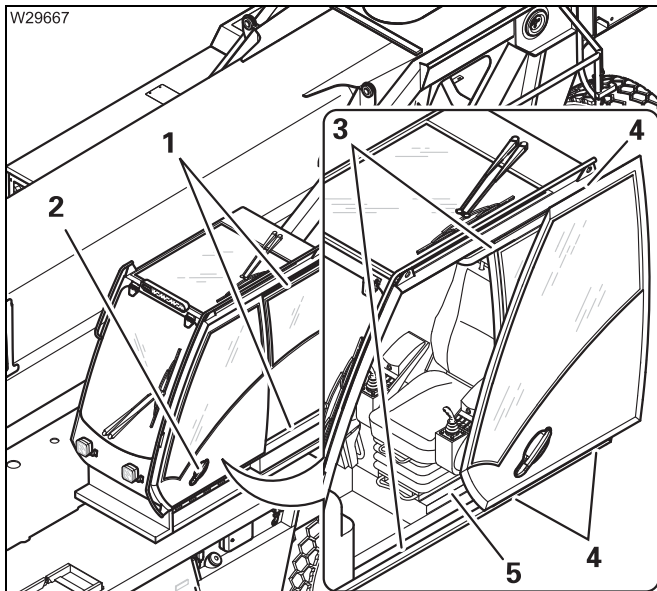
Designation	GROVE part no.
Grease: RHUS SW 2, 1 kg can	03325215

- Brush.

#### Prerequisites

- The turntable is locked.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Greasing



- With the door closed, clean the rails (1) outside.
- Lubricate the rails (1) lightly with a brush.
- Open the door completely using the handle (2) – the door locks in place.
- Clean the rails (3).
- Lubricate the rails (3) and the rollers (4) lightly with a brush.
- Pull the unlocking device (5).
- Check if the door moves smoothly on the rails and if it locks easily.

If the door is sluggish or does not close properly, have it reset by **Manitowoc Crane Care** or an authorised GROVE-dealer.

### 8.14.4

### Lubricating the step


M 12

#### Grease, spare parts, tools


Designation	GROVE part no.
Lubricant RHUS SW 2; 1 kg (Apply the grease with a brush)	03325215

- Brush.

#### Prerequisites

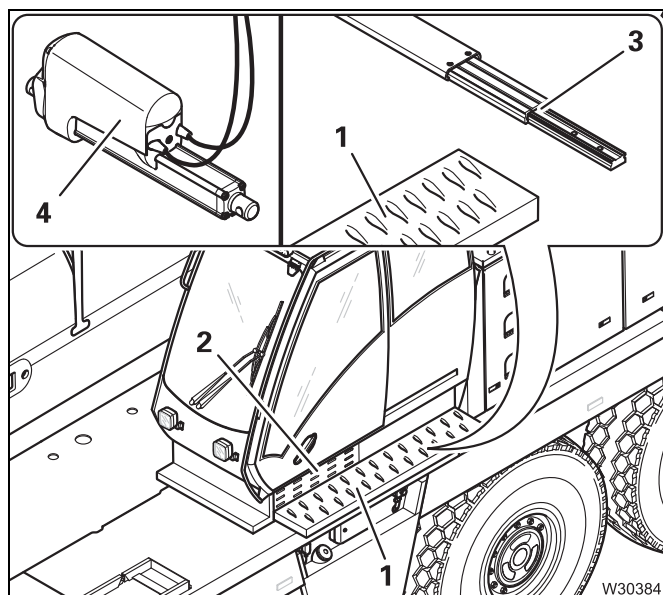
- The turntable must be locked.
- The engine must be switched off and secured against unauthorised use;  p. 2 - 3.

#### Retracting/ extending

- Familiarise yourself with the description in the operating instructions of retracting/extending the step (from the crane cab or at the outrigger control unit);  *Operating manual*.

#### Greasing

- Fully extend the step.



- Remove the step (1) and the grille (2) – the rails (3) are now exposed.
- Clean the rails (3).
- Lubricate the rails (3) lightly with a brush.
- Retract and extend the step several times. Whilst doing so, check that the step is moving easily on the rails.
- Check that the electric spindle motor (4) is running smoothly and without jerking.
- Attach the step (1) and the grille (2).

- Fully retract the step.

If the step is stiff, bent or does not retract completely, have the step aligned and adjusted by **Manitowoc Crane Care** or an authorised GROVE dealer.

### 8.14.5

## Lubricating the connecting and socket pins

M 12

### Grease, tools

Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

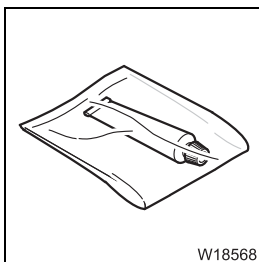
- Brush.

### Check the following

On the **superstructure**, depending on the equipment, there are various connecting pins and socket pins such as:

- Locks and supports on the covers,
  - Hinges on the crane cab's front and the rear window,
  - Retaining rods for the rope discs at the head of the main boom.
- 
- Check the pins for wear such as rust, deformation, broken clips, chains and pin-type keepers.
  - If the pins are damaged, have them replaced by **Manitowoc Crane Care** or an authorised GROVE dealer or your qualified repair crew.
  - Use only authentic replacement pins.

### Greasing



- Clean the pins.
- Lubricate the pins with a brush.

## 8.14.6

## Renewing the corrosion protection

M 12

### Protective agent, tools

Protective agent	GROVE part no.
Corrosion protection	03140192

- Spray gun with spray extension.
- Brush.
- Protective clothing, protective goggles.

### Prerequisites

- The superstructure must be thoroughly cleaned.
- The engine must be switched off and secured against unauthorised use;  
    ▶ p. 2 - 3.

### Check the following

Some particular parts of the superstructure were sprayed for corrosion protection for the first time in the factory itself.

These are pumps, valve blocks, controls and fittings, pipes, screw connections, hose fittings of the hydraulic system of the superstructure;  
▶ p. 8 - 87.

The corrosion protection is solvent-free and is water soluble while being sprayed on. A transparent, waxy, protective film is formed after a drying time of one hour.

- Check the condition of the original protective film.
- If required, remove any rust and touch up the paintwork before you spray on a new protective film.

### Processing instructions

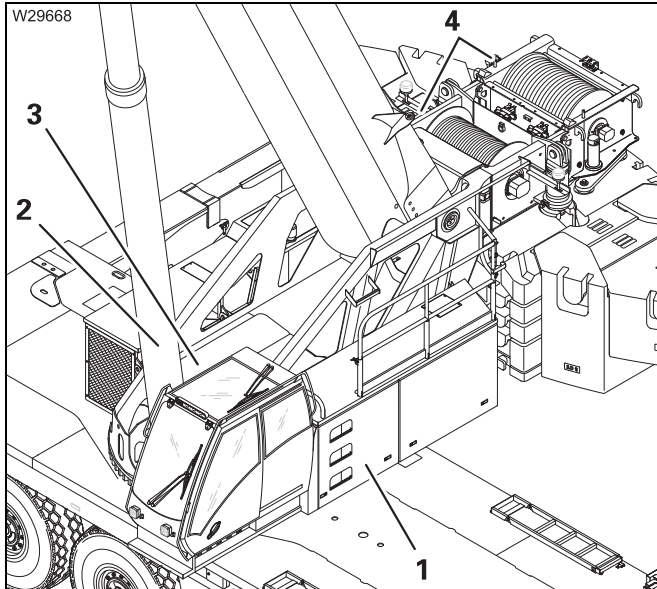
- Observe the processing instructions for corrosion protection;  
    ▶ *Processing instructions*, p. 7 - 147.

## Spraying



### Risk of injury to the eyes.

While working with the spray extension you could be hit by the spray jet or spray droplets. Wear protective goggles, protective clothing and gloves.



- Make sure that you do not spray running surfaces. There is a risk of slipping.
- Spray the corrosion protection with a spray gun aimed only at the pumps, valve blocks, screw connections, pipes, hoses of the hydraulic system of the superstructure:
  - On the derricking cylinder (2)
  - On the slewing gears (1)
  - On the slewing duct (3)
  - On the hoists (4)
- Clean surfaces sprayed by accident immediately with water.

- Let the corrosion protection dry for one hour.
- Check that a transparent waxy protective film has covered the entire surface.

### 8.14.7

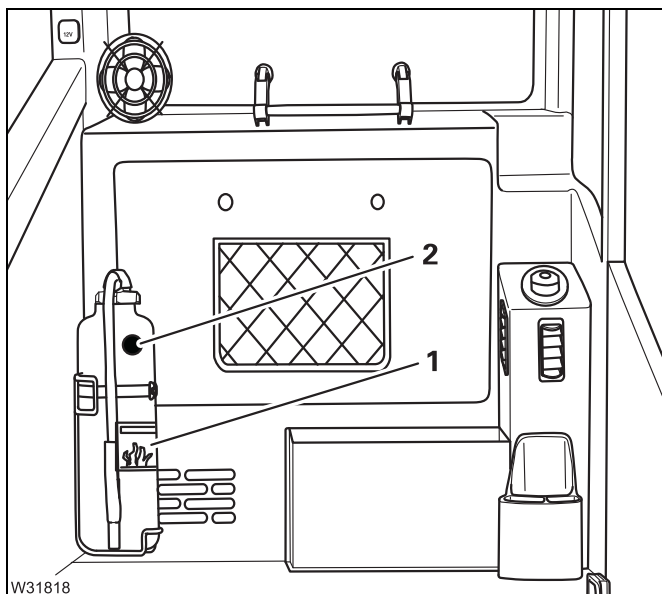
## Having the fire extinguisher checked

Y 2

Depending on your truck crane's equipment, it has fire extinguishers.



The maintenance interval may even be shorter, depending on the respective national regulations and the operating location. Ask the local fire safety officer about the national and local regulations.



- Follow the operating manual (1) on the fire extinguisher.
- Have the fire extinguisher serviced by trained personnel in good time before the maintenance interval specified on the label (2) expires.



### **Danger due to the fire extinguisher not working.**

There is no guarantee that the fire extinguisher will still work properly once the maintenance interval on the label has expired.



**9 Longer out of service periods**



# 9

## Longer out of service periods

Carry out the following jobs if the truck crane is going to be out of service for a long period (months).

### Putting the truck crane out of service

- Clean the truck crane thoroughly on the inside and outside.
- Remove any rust and touch up the paintwork.
- Parts that are not painted must be lubricated with an acid-free grease or oil.

If more than half of the oil change interval has passed:

- Change the oil according to the maintenance plans **M 3** to **M 12**.
- Seal all air filters.
- Increase the tyre pressure by 10% and mark the tyre positioning, or support the truck crane and let it stand on outriggers.
- Observe the specifications on preservation in the *Engine manufacturer's documentation*.

### Checks

- Check the level in the fuel tanks. Always keep the tanks filled.
- Check the batteries every week and recharge them if necessary.
- Check the tyre pressure every week and correct it if necessary.
- Perform a full functional test on the truck crane every two weeks. (Open the air filter beforehand).
- Run the hydraulic systems up to a fluid temperature of approx. 50 °C (122 °F) and then check all functions of the carrier and superstructure hydraulic systems.



- Ensure that the tyre positioning is different each time the crane is parked (without outriggers).
- Seal the air filter again.

If the truck crane is going to be out of service for more than 12 months:

- Carry out all maintenance work in accordance with the maintenance plan **M 12**.
- Observe the specifications on preservation in the *Engine manufacturer's documentation*.

### **Putting the truck crane into operation**

- Open the air filter.
- Inflate the tyres up to the prescribed pressure.
- Carry out periodic maintenance work in accordance with the maintenance plans in chapter 5.
- Observe the specifications on preservation and putting back into operation in the *Engine manufacturer's documentation*.

## 10 Torques

10.1	Torques for the retaining bolts .....	10 - 1
10.2	Special torques .....	10 - 2



# 10 Torques

## 10.1 Torques for the retaining bolts

Metric standard screw-thread Metric fine thread			Guide values		
Thread size (mm)	Spanner wrench size (mm)		Torques (maximum permissible pre-tensioning for bolts) for oiled bolts (Nm)		
	Hexagon head bolt	Cylinder screw	Bolt quality		
8.8			10.9	12.9	
M 8 M 8 x 1	13	6	23 24	32 34	36 41
M 10 M 10 x 1.25	17	8	44 47	62 66	75 79
M 12 M 12 x 1.5	19	10	78 81	110 113	130 135
M 14 M 14 x 1.5	22	12	120 135	170 189	210 225
M 16 M 16 x 1.5	24	14	165 203	190 284	320 342
M 18 M 18 x 1.5	27	14	260 293	365 414	435 495
M 20 M 20 x 1.5	30	17	370 414	520 576	620 693
M 22 M 22 x 1.5	32	17	500 549	700 774	840 945
M 24 M 24 x 1.5	36	19	640 702	900 990	1,080 1,170
M 30	46	22	1,300	1,800	2,160
M 33	50	24		2,700	
M36	55	27		3,300	

## 10.2 Special torques

Designation	Thread size (mm)	Spanner wrench size (mm)		Torque (Nm)
		Hexagon head bolt	Cylinder screw	
<b>Suspension strut:</b>				
– Bracket for the vehicle chassis, top	M 16	—	14	265
– Bracket for the vehicle chassis, bottom	M 24	—	19	900
– Suspension strut flange, bottom	M 20		17	520
– Half shell steering lever	M 16		14	265
– Upper steering arm on suspension strut	M 20	30		610
<b>Steering linkage:</b>				
– Ball-and-socket joints and steering track rods	M10 x 1 M 12 x 1.5 M 14 x 1.5 M 24 x 1.5 M 30 x 1.5			45 - 55 70 - 85 140 - 160 250 - 280 450 - 500
<b>Others:</b>				
– Coolant hose clamps				4
– Wheel nuts	M 22 x 1.5	32		650
– Rim connection bolts (only for aluminium rims)		Aluminium rims with 20 nuts		550
		Aluminium rims with 22 nuts		385
– Retaining bolts for the slewing bearing	M 27	41	—	1,150
– Hoist drum rope clamp	M 14	2 nuts		78



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## **11 Spare parts required for maintenance**

<b>11.1</b>	<b>General information .....</b>	<b>11 - 1</b>
<b>11.2</b>	<b>Lighting .....</b>	<b>11 - 1</b>
<b>11.3</b>	<b>Spare parts for the carrier.....</b>	<b>11 - 5</b>
<b>11.4</b>	<b>Spare parts for the superstructure .....</b>	<b>11 - 8</b>



# 11

## Spare parts required for maintenance

### 11.1

#### General information

The spare parts required for maintenance are divided into

- lighting,
- spare parts for the carrier and
- spare parts for the superstructure.

The only spare parts listed here are those required for the maintenance work described.

A more detailed spare parts document can be found in the *Spare parts list* supplied.

An overview of the required lubricants can be found in:

- *Lubricants list*, p. 6 - 2,
- *Lubricant applications list*, p. 6 - 3.

### 11.2

#### Lighting

Lamps are listed according to the installation point. The list includes standard and additional lighting equipment for the truck crane.

Lighting specific to certain countries can be found in the accompanying *Spare parts list*, in the section on country-specific packages.



##### **Risk of accidents from exploding glass bodies and high voltage.**

The glass bodies of gas discharge lamps (xenon lights) are pressurised. If the lamp breaks, the glass splinters explosively and shards scatter. Xenon lights operate at high voltage. While changing the lamp, there is still a danger of residual voltage discharging (electric shock) even when the battery master switch is switched off.

Have faulty lamps replaced only by properly qualified personnel who use the relevant protective equipment.



Installation point	GROVE part number	Designation	Power (W)
<b>CARRIER LIGHTING:</b>			
<b>Front spotlights:</b> (integrated in the bumper)			
– Daytime driving light (left)	04163680	LED	
– Daytime driving light (right)	04163679	LED	
– Low-beam + full-beam headlights	03134828	H7 24V	70
– Low-beam + full-beam headlights (USA)	03143584	H9 12V	65
– Indicator light	03327578	PY21W 24V	21
– Parking light (in direction indicator light)	03140908	LED	
– Yellow side marker light	03320937	LED	
<b>Front, side indicator lights:</b> (under the access ladder to the driver's cab)			
– Indicator light	04163927	LED	
<b>Tail lights:</b> (at the rear of the chassis)			
– Marker light	03137450	R5W 24V	5
– Number plate light	03137450	R5W 24V	5
– Rear light	03137450	R5W 24V	5
– Brake light	03328445	P21W 24V	21
– Indicator light	03137451	PY21W 24V	21
– Fog tail light	03328445	P21W 24V	21
– Reverse light	03328445	P21W 24V	21
<b>Licence plate lamp, external:</b> (at the rear of the chassis)			
– LED licence plate lamp	04163112	LED	
<b>Yellow side marker lights:</b> (at the sides, along the chassis)			
– Side marker light	03140042	LED	
<b>White rear marker lights:</b> (at the rear of the chassis)			
– Left marker light	04164499	LED	
– Right marker light	04164500	LED	

Installation point	GROVE part number	Designation	Power (W)
<b>Red triple light strip for USA:</b> (at the rear of the chassis)			
– Triple light strip	7581100056	LED	
<b>White front marker lights:</b> (at the top on the driver's cab)			
– Marker light	03138527	LED	
<b>Yellow additional lighting for the USA:</b> (at the top on the driver's cab)			
– Yellow side marker light	03320937	LED	
<b>Outrigger beam spotlights:</b> (above the front and rear outrigger beams)			
– LED spotlight; complete	03143786	M 70 LED	
– Filament lamp (for a non-LED spotlight)	02316460	8GH002090-251	70
<b>Yellow rotating beacon:</b> (on the driver's cab)			
– Rotating beacon; complete	04156048		
<b>Inside light:</b> (in the driver's cab)			
– Cab light	01207144	R10W	10
– Reading light	00439055	P25-1	21
<b>Dashboard light:</b> (in the driver's cab; socket 12 V)			
– Filament lamp	04159964	Xenon	12 V / 6 W



Installation point	GROVE part number	Designation	Power (W)
<b>SUPERSTRUCTURE LIGHTING:</b>			
<b>Yellow marker lights:</b> (left and right on the main boom head)			
– Marker light; complete	03329569	LED	
<b>Red rear marker lights:</b> (on the turntable)			
– Marker light; complete	03329492	LED	
<b>Yellow rotating beacon:</b> (on the turntable)			
– Rotating beacon; complete	04156048		
<b>Inside light:</b> (in the crane cab)			
– Cab light	01207144	R10W	10
– Reading light	00439055	P25-1	21
<b>Spotlight, angular-shaped, permanently installed:</b> (at the front of the crane cab)			
– Filament lamp	01573349	H3 24V	70
<b>Spotlight, electrically adjustable:</b> (at the front of the main boom)			
– Halogen bulb	03142726	8GS009028001	35

## 11.3 Spare parts for the carrier

Assemblies and spare parts Carrier	GROVE part number	Quantity, in single parts For maintenance interval				
		W	M 1	M 3	M 6	M 12
<b>Engine</b>						
Valve M 20 x 1.5	03041579	<b>Once when the oil is changed the first time; recommended modification from oil drain plug to valve</b>				
Gasket 20 x 24 Cu DIN 7603	00117139					
Valve M 26 x 1.5	03046878					
Gasket 26 x 31 Cu DIN 7603	00117147					
Air filter – main filter	04161948	<b>1 item when the symbol lights up</b>				
Air filter – back-up filter	04161949					
<b>Fuel system</b>						
Filter (filter 1; large)	04161567			1		
Filter (filter 2; small)	04161566					1
Set of both filters (filter 1 + 2)	04180966	<b>alternatively</b>				
<b>Transmission – VIAB</b>						
Gasket 24 x 29 Cu DIN 7603	00117145					1
<b>Transmission</b>						
Gasket 24 x 29 Cu DIN 7603	00117145					1
<b>Transfer case</b>						
Gasket 30 x 36 Cu DIN 7603	00117151		1		1	
Gasket 16 x 20 Cu DIN 7603	00117134				1	
<b>Angle gear</b>						
Gasket 30 x 36 Cu DIN 7603	00117151		1		1	
Filter	03135866				1	
Packing set	04161645				1	
<b>Axle lines axle centre drive (for max. 10 x 8 x 10)</b>						
Gasket 30 x 36 Cu DIN 7603	00117151		4			4
Gasket 24 x 29 Cu DIN 7603	00117145					2
Gasket 36 x 42 Cu DIN 7603	01371208					4
<b>Axle lines Final drive (for max. 10 x 8 x 10)</b>						
Gasket 24 x 29 Cu DIN 7603	00117145		8			8



Assemblies and spare parts Carrier	GROVE part number	Quantity, in single parts For maintenance interval				
		W	M 1	M 3	M 6	M 12
<b>Wheels</b>						
Wheel nuts for steel rims	01207756	<b>in case of damage; 12 each per wheel</b>				
Wheel nuts for aluminium rims	7659100000					
<b>Vehicle brake (for all 5 axle lines)</b>						
Wear contact set	03142924	<b>only if wear is present on the disc brakes</b>				<b>12</b>
Set of brake pads with a wear contact set	03142923					<b>12</b>
Guide set and seals set	03142922					<b>24</b>
Packing set	03142925					<b>24</b>
Brake disc	03142916					<b>10</b>
<b>Suspension</b>						
Ventilation filter	03324588		<b>1</b>	<b>only if blocked</b>		
<b>Compressed air system</b>						
Valve (if defective)	01570750	<b>(8)</b>				
Gasket 22 x 27 Cu DIN 7603	00117142	<b>(8)</b>				
Filter cartridge with gasket	04157844					<b>1</b>
<b>Hydraulic system</b>						
Filters 1 and 2 (only clean)	03329152			<b>(2)</b>		
Packing set	03135778			<b>2</b>		
Filters 1 and 2	03329152	<b>at every oil change and when the symbol lights up</b>				<b>2</b>
Packing set	03135778					<b>2</b>
Filters 3 and 4	03135866					<b>2</b>
Packing set	03135867					<b>2</b>
Oil tank cover gasket 140 / 90 x 3	02313899	<b>1 item for every oil change (if damaged)</b>				
Ventilation filter	03324588					<b>1</b>
<b>Air conditioning system</b>						
Driver's cab pollen filter	03134974					<b>1</b>
<b>Other maintenance work</b>						
Driver's cab wiper blades	02311858	<b>(3)</b>	<b>(if damaged)</b>			



Assemblies and spare parts Carrier	GROVE part number	Quantity, in single parts For maintenance interval				
		Y 2	Y 3	Y 5	Y 6	Y 10
<b>Engine</b>						
Oil filter	04161614	1				
Cover gasket	03328606	1				
Gasket for oil drain plug	04161531	1				
<b>Transmission – VIAB</b>						
Gasket 24 x 29 Cu DIN 7603	00117145		3			
Gasket 14 x 18 Cu DIN 7603	00117131		1			
Filter exchange kit	04163770		1			
Vent valve filter	04163771		1			
Cover gasket filter	04163772		1			
<b>Transmission</b>						
Filter	03328342		1			
Spring	03328343		1			
Gasket	03328344		1			
Gasket 24 x 29 Cu DIN 7603	00117145		1			

## 11.4 Spare parts for the superstructure

Assemblies and spare parts Superstructure	GROVE part number	Quantity, in single parts For maintenance interval				
		W	M 1	M 3	M 6	M 12
<b>Hoists</b>						
Sight glass with hoses; complete	04161717	(2)	(if damaged)			(2)
<b>Slewing gear</b>						
Gasket 10 x 14 Cu DIN 7603	00117125	(3)	(if damaged)			
Gasket 10 x 14 Cu DIN 7603	00117125					3
Gasket 14 x 20 Cu DIN 7603	00117132					3
<b>Hydraulic system</b>						
Filter 1 (only clean)	04156358			(1)		
Packing set	04165792			(1)		
Filter 1	04156358	<b>at every oil change and when the symbol lights up</b>				1
Packing set	04165792					1
Filter 2	03142356					1
Housing packing set	03326049					1
Filter 3	03249527					1
Ventilation filter	03134932					1
<b>Hoist ropes</b>						
Cover gasket	02315305	<b>1 (if damaged) for every rope change on the hoist</b>				
<b>Cable drums</b>						
Cover gasket for cable drum 1	03325575	(if damaged)			(1)	
Cover gasket for cable drum 2	03138894				(1)	
<b>Air conditioning system</b>						
Pollen filter for crane cab	04163620					1
<b>Other maintenance work</b>						
Windscreen wiper blade	03268512	(1)	(if damaged)			
Roof wiper blade	03326121	(1)				

Assemblies and spare parts Superstructure	GROVE part number	Quantity, in single parts For maintenance interval				
		Y 2	Y 3	Y 5	Y 6	Y 10
<b>Electrical system</b>						
Lithium battery 3.6 V	03143172					<b>1</b>

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# Appendix



# Appendix





**Table to determine the remaining theoretical service life on winch no. ....**

Crane type: .....  
 Work no.: .....  
 First put into operation on: .....  
 Winch serial number in accordance with the model plate: .....  
 Last general overhaul performed on: .....  
 Winch design data (see operating manual): .....  
 Engine group: .....  
 Load spectrum: .....  
 Load spectrum factor: .....  
 Theoretical service life: .....

Inspection interval no. (max. 1 year)	Date of first commissioning/date of inspection	Operating conditions since the last inspection	Factor of the load spectrum	Crane operating hours (complete)	Superstructure operating hours	Superstructure operating hours since the last inspection	Winch operating hours	Winch operating hours since the last inspection	Used proportion of theoretical service life D:	Remaining theoretical service life	Name of the expert	Signature	Comment	Name of the approved inspector	Signature
"i"			$Km_i$	[h]	[h]	[h]	[h]	[h]	$S_i = \frac{K m_i}{K m} \times T_i$	$D_i = D_{i-1} - S_i$					
(*)															

**IMPORTANT:**

A general overhaul must be performed every 10 years.  
 For alternative provision, refer to section 5.4.2, p. 5 - 25.

General overhaul performed on.....

$S_i$  = Used proportion of theoretical service life since the last inspection  
 $D_i$  = Remaining theoretical service life  
 $D_{i-1}$  = Remaining theoretical service life after the previous inspection  
 $Km$  = Load spectrum factor used as the basis for winch calculation.  
 This factor is given in the operating manual.  
 $Km_i$  = Load spectrum factor in inspection interval "i" according to section 2.1  
 $T_i$  = Effective operating hours in inspection interval "i" according to section 2.2  
 (\*) Copy the last line of the previous page to the following page.



**Table to determine the remaining theoretical service life on winch no. ....**

Crane type: .....  
 Work no.: .....  
 First put into operation on: .....  
 Winch serial number in accordance with the model plate: .....  
 Last general overhaul performed on: .....  
 Winch design data (see operating manual): .....  
     Engine group: .....  
     Load spectrum: .....  
     Load spectrum factor: .....  
     Theoretical service life: .....

Inspec- tion inter- val no. (max. 1 year)	Date of first commission- ing/date of inspection	Operating conditions since the last inspec- tion	Factor of the load spectrum	Crane operating hours (complete)	Super- structure operating hours	Superstruc- ture operat- ing hours since the last inspection	Winch oper- ating hours	Winch operat- ing hours since the last inspection	Used proportion of theoretical service life D: $S_i = \frac{K_{rm_i} \times T_i}{K_{rm}}$	Remaining theoretical service life $D_i = D_{i-1} - S_i$	Name of the expert	Signature	Comment	Name of the approved inspector	Signature
"i"			$K_{m_i}$	[h]	[h]	[h]	[h]	[h]	[h]						

**IMPORTANT:**

A general overhaul must be performed every 10 years.  
 For alternative provision, refer to section 5.4.2, p. 5 - 25.

General overhaul performed on.....

$S_i$  = Used proportion of theoretical service life since the last inspection  
 $D_i$  = Remaining theoretical service life  
 $D_{i-1}$  = Remaining theoretical service life after the previous inspection  
 $K_{m_i}$  = Load spectrum factor used as the basis for winch calculation.  
 This factor is given in the operating manual.  
 $K_{rm_i}$  = Load spectrum factor in inspection interval "i" according to section 2.1  
 $T_i$  = Effective operating hours in inspection interval "i" according to section 2.2  
 (\*) Copy the last line of the previous page to the following page.













