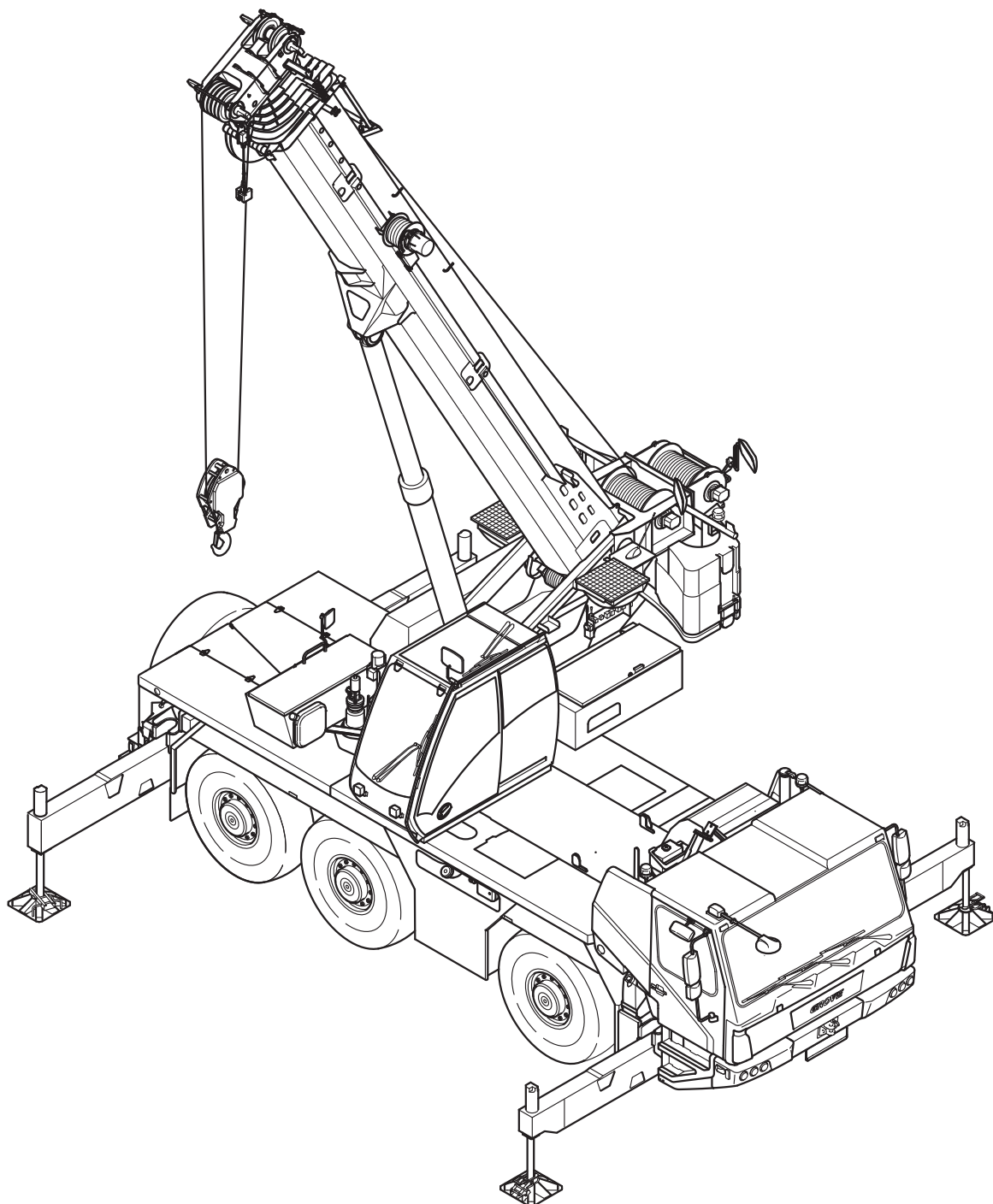


GROVE GMK3060

Maintenance manual



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03.11.2017

 **Manitowoc**[®]

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Manitowoc Crane Group Germany GmbH

Industriegelände West

D-26389 Wilhelmshaven, Germany

Tel: [+49] (0)44 21 294-0

Fax: +[49] (0) 44 21 294-301

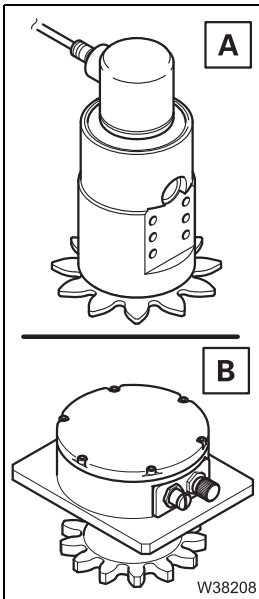
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03.11.2017

Slewing angle sensor

Version (A) and (B)

Depending on the type of truck crane, a slewing angle sensor of type (A) or (B) can be installed on the slewing bearing.



Version (A)

For this version, the specifications in the supplied *maintenance manual* apply.

Version (B)

Deviating from the specifications in the *maintenance manual* supplied, this version of the slewing angle sensor is maintenance-free.

Only use the telephone number **04160234** if in need of spare parts.

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- Appendix**

This maintenance manual does not replace the operating manual.

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

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1 General instructions

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1 General instructions

1.1 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 definitions and symbols are used in the operating instructions to highlight particularly important information:



This symbol indicates hazards related to the described operation, which can endanger persons. 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 that 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.

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 professionals.

Many cases of damage and failure 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 approved 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 controls

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 the 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.

These devices 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**.

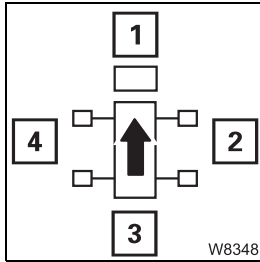
1.6

Definition of direction information

Basic rule

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

On the carrier

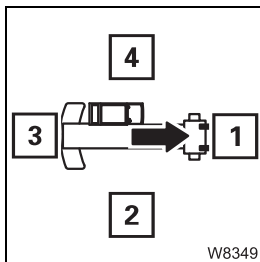


The driver's cab is always at the front, which means that:

- | | |
|----------|----------|
| 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.

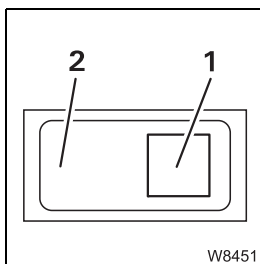
On the superstructure



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:** press in at (1) – next to the symbol
Up: press in at (2) – 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.

Converting from	in	Multiply by
mm	in	0.03937
in	mm	25.4
m	ft	3.28084
ft	m	0.30479
m ²	ft ²	10.76391
cm ²	in ²	0.155
cm ³	in ³	0.061
l	gal (US)	0.264178
kg	lbs	2.204622
lbs	kg	0.45359
t	lbs	2,204.622
lbs	t	0.0004536
kN	lbf	224.809
daN/cm ²	lbf/in ²	14.50378
lbf/in ²	daN/cm ²	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 ²	lbs/ft ²	204.8
m ² /t	ft ² /lbs	0.04882
MPa	bar	10
bar	MPa	0.1

2 Safety and environmental protection

2.1	Safety rules	2 - 1
2.1.1	Securing against unauthorised use	2 - 3
2.2	Handling substances that are harmful to the environment	2 - 4
2.3	Disposal of the truck crane	2 - 6

2

Safety and environmental protection

2.1

Safety rules

Observe the applicable **accident prevention regulations** when carrying out maintenance work.

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.
- 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 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 truck 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 process materials.
- Switch off all electrical consumers and first disconnect the earthing terminal before removing any electrical 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.

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 that 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 caustic. 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.

Separate collection and storage

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 responsibility for the proper, orderly and final decommissioning, disposal and scrapping of the truck crane.

Before you decide to finally decommission your truck crane and 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.
- On site, find out about certified vehicle disposal companies.
- Have the vehicle disposal company issue a disposal certificate for the truck crane.
- Once collected, have environmentally harmful substances disposed of only by disposal companies which are approved by the national or regional authority responsible; ■■■► *Handling substances that are harmful to the environment*, p. 2 - 4.

After disposal

- Inform **Manitowoc Crane Care** about the disposal of the truck crane, 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 over 60 °C (140 °F), even after the first three months.
- Do not use corrosive cleaning agents that might damage the paint.
- Never hold the spray nozzle of your cleaning unit at a right angle to the surface you are cleaning and ensure that you are standing at a sufficient distance away from the surface you are cleaning.



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.

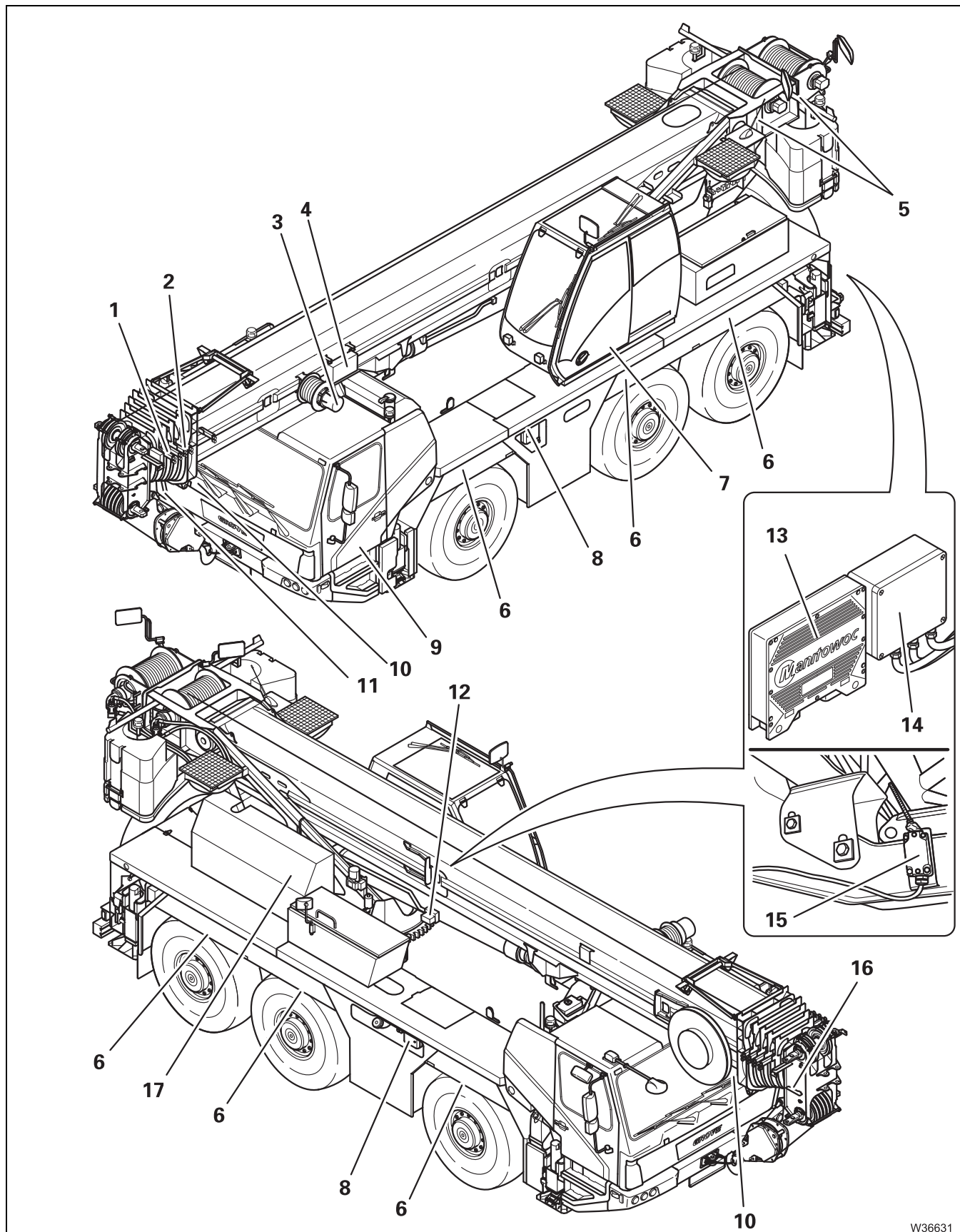
Always wear a face guard when cleaning the truck crane with high-pressure and steam-jet cleaning equipment!

- 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 parts 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 - 103). 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 RCL length data transmitter
- 4 Angle data transmitter
- 5 Lowering limit switch
- 6 Suspension struts
- 7 Slewing angle sensor
- 8 Control units for outriggers
- 9 Drag link supporting plate
- 10 Spotlights, pivoting
- 11 Lifting limit switch
- 12 Pressure sensors
- 13 Housing of the input-output circuit boards
- 14 Eddy current brake switch box (additional equipment)
- 15 Swing-away lattice extension proximity switch
- 16 RCL connections
- 17 Pressure sensor switch box



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 regulations about running in individual parts which must be followed, after:

- **First commissioning** or
- **Part replacement** or
- **General overhaul.**

This is why you must carry out **additional maintenance work** on the **carrier** and **superstructure** at specific intervals:

Operating hours (oper. hrs.)	Driven km (mi)	Additional maintenance work on the CARRIER
	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 - 128.</i>
during the first 100		Check the hydraulic oil filter every week, and change it if necessary; ■■■► <i>Changing the hydraulic oil filter, p. 7 - 98.</i>
after 100	after 1,000 (650)	Change the drive oil; ■■■► p. 7 - 53 for the axle centre drives, ■■■► p. 7 - 56 for the final drives.
after 250	after 2,500 (1,550)	Change the engine oil; ■■■► <i>Engine manufacturer's documentation.</i>



Operating hours (oper. hrs.)	Additional maintenance work on the SUPERSTRUCTURE
during the first 100	Check hydraulic oil filter 3 in the superstructure every week, and change it if necessary; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Changing oil filter 3, p. 7 - 100.</i>
after 100	Tighten the bolts on the slewing bearing; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Checking the bolts, p. 8 - 23,</i> ▣▣▣▣▶ <i>Special torques, p. 10 - 2.</i>
after 100	Hook blocks; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Greasing, p. 8 - 65.</i>
after 200	First oil change on the hoists; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Changing the oil/checking the oil, p. 8 - 12.</i>
after 1,000 or after 12 months at the latest	Second oil change on the hoists; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Changing the oil/checking the oil, p. 8 - 12.</i>
after 200	Change the slewing gear oil; <ul style="list-style-type: none"> ▣▣▣▣▶ <i>Changing the oil/checking the oil – Slewing gear transmission, p. 8 - 19,</i> ▣▣▣▣▶ <i>Changing the oil/checking the oil – Slewing gear brake, p. 8 - 21.</i>

5 Maintenance overview

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5.2.2	Maintenance plan W	5 - 6
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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 month) to **Y 10** (= every 120 months).

The **maintenance plans** are provided as tables, 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 the hydraulic oil level; ■■■► p. 7 - 83.

Checking the hydraulic oil level is described in Chapter 7, the section starts on page 7 - 83.

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 work must be carried out after

- a specified **time (maintenance interval)** or
- a specified number of **km driven (mi)** or
- a specified number of **operating hours (oper. hrs.)** or
- the **display** of a **symbol** on the instrument panel of the CCS display in the driver's cab; ■■■► p. 7 - 11 or
- the **display** of a **symbol** on the CCS display in the crane cab; ■■■► p. 8 - 7.



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

- The **driven km (or mi)** can be taken from the speedometer.
- The **operating hours (oper. hrs.) of the engine an power units** of the superstructure can be called up individually on the *CCS* display in the crane cab.
The operating hours of the engine are equivalent to the total operating hours of the superstructure.

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

Maintenance plans	Maintenance interval	Driven km (mi) (carrier)	Operating hours (oper. hrs.) of the engine (super-structure)
D	Daily / before putting into operation	—	—
W	Weekly	—	—
M 1	monthly	approx. 2,000 (approx. 1,240)	100
M 3	every three months	5,000 – 6,000 (3,100 – 3,730)	250
M 6	every six months	10,000 – 12,500 (6,210 – 7,770)	500
M 12	every twelve months	20,000 – 25,000 (12,430 – 15,530)	1 000
Y 2	every 24 months	40,000 – 50,000 (25,000 – 31,000)	2 000
Y 3	every 36 months	—	3 000
Y 5	every 60 months	100,000 (62,000)	5 000
Y 6	every 72 months	—	6 000
Y 10	every 120 months	200,000 (124,000)	12 000

Please note that the long-term maintenance plans always incorporate the short-term ones!

5.2

Maintenance plans

The descriptions of 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 that goes beyond the daily and weekly checks is **only partially** described in this maintenance manual! When carrying out such maintenance work, follow the instructions given in the accompanying *Engine manufacturer's documentation*.

5.2.1

Maintenance plan D

D

Maintenance work on the CARRIER: Daily/before putting into operation	
Engine – Check the oil level – Checking the air filter – Checking the coolant level	 p. 7 - 15  p. 7 - 18  p. 7 - 22
Fuel system – Draining off water from fuel filter 1	 p. 7 - 34
Exhaust system with exhaust emission control – Checking the AdBlue tank level	 p. 7 - 40
Wheels – Checking the tyres for damage	 p. 7 - 61
Steering – Checking for leaks	 p. 7 - 75
Hydraulic system – Check the oil level	 p. 7 - 83
Electrical system – Checking the lighting and indicators	 p. 7 - 105

Maintenance work on the SUPERSTRUCTURE: Daily/before putting into operation	
Hoist ropes – Checking the winding	▣▣▣▣▶ p. 8 - 45
Electrical system – Checking the lighting and indicators	▣▣▣▣▶ p. 8 - 67

5.2.2

Maintenance plan W

W

Maintenance work on the CARRIER: Weekly	
Engine – General inspection	▣▣▣▣▶ p. 7 - 23
Transmission – General inspection	▣▣▣▣▶ p. 7 - 47
Axle lines – General inspection	▣▣▣▣▶ p. 7 - 51
Wheels – Checking the tyre pressure	▣▣▣▣▶ p. 7 - 62
Compressed air system – Draining water from the compressed air system – Checking for leaks	▣▣▣▣▶ p. 7 - 79 ▣▣▣▣▶ p. 7 - 80
Hydraulic system – Checking the hydraulic hoses – Checking for leaks	▣▣▣▣▶ p. 7 - 84 ▣▣▣▣▶ p. 7 - 85
Central lubrication system – Checking the filling level	▣▣▣▣▶ p. 7 - 101
Other maintenance work – Checking the windscreen washing system	▣▣▣▣▶ p. 7 - 127


















W

Maintenance work on the SUPERSTRUCTURE: Weekly	
Hoists – Checking the oil level – General inspection – Checking the hoist brake	■■■▶ p. 8 - 9 ■■■▶ p. 8 - 10 ■■■▶ p. 8 - 10
Slewing gear – Oil level check – Slewing gear transmission – Oil level check – Slewing gear brake – Checking for leaks	■■■▶ p. 8 - 15 ■■■▶ p. 8 - 16 ■■■▶ p. 8 - 16
Hydraulic system – Checking the hydraulic hoses – Checking for leaks	■■■▶ p. 8 - 33 ■■■▶ p. 8 - 33
Hoist ropes – Checking the hoist ropes	■■■▶ p. 8 - 46
Central lubrication system – Checking the filling level	■■■▶ p. 8 - 63
Other maintenance work – Checking the windscreen washing system	■■■▶ p. 8 - 71

5.2.3

Maintenance plan M 1

M 1

Maintenance work on the CARRIER: monthly / after approx. 2,000 km (approx. 1 240 mi)	
Engine – Notes;  <i>Engine manufacturer's documentation</i> – Checking the air intake inhibitor	 p. 7 - 15  p. 7 - 19
Exhaust system with exhaust emission control – Check the exhaust system for external damage	 p. 7 - 41
Axle lines – Axle centre drives – checking the oil level – Final drives - Checking the oil level – Lubricating the drive shafts in the axle lines	 p. 7 - 51  p. 7 - 55  p. 7 - 58
Wheels – Checking that the wheel nuts are tight	 p. 7 - 62
Suspension – Suspension struts – checking the oil level – Suspension struts – checking the fastening	 p. 7 - 71  p. 7 - 72
Steering – Lubricating the drag link supporting plate	 p. 7 - 76
Electrical system – Checking the batteries	 p. 7 - 106
Air-conditioning system – Checking the air-conditioning system – Cleaning the condenser fins	 p. 7 - 113  p. 7 - 113
Towbar coupling – Lubricating the towbar coupling	 p. 7 - 119
Other maintenance work – Lubricating the outrigger beams – Checking the functioning of the auxiliary heater	 p. 7 - 128  p. 7 - 129














M 1

Maintenance work on the SUPERSTRUCTURE: Monthly/after 100 oper. hrs.	
Main boom – Grease the piston rod of the derricking cylinder	▣▣▣▣▶ p. 8 - 37
Air-conditioning system – Checking the air-conditioning system	▣▣▣▣▶ p. 8 - 69
Other maintenance work – Checking the functioning of the auxiliary heater	▣▣▣▣▶ p. 8 - 73

5.2.4

Maintenance plan M 3

M 3

Maintenance work on the CARRIER: every three months/after 5,000 - 6,000 km (3,100 - 3,730 mi)	
Engine – Notes;  <i>Engine manufacturer's documentation</i>	 p. 7 - 15
Vehicle brake – Checking brake lining thickness	 p. 7 - 69
Suspension – Forced lever – checking correct functioning	 p. 7 - 73
Electrical system – Checking the charge level of the batteries – Charging the batteries using the battery charger – Check the external starting socket	 p. 7 - 108  p. 7 - 110  p. 7 - 111
Towbar coupling – 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 middle position	 p. 7 - 121  p. 7 - 122  p. 7 - 123  p. 7 - 123  p. 7 - 124  p. 7 - 124

M 3

Maintenance work on the SUPERSTRUCTURE: Every three months/after 250 oper. hrs.	
Slewing bearing – Checking the bolts	▣▣▣▣▶ p. 8 - 23
Main boom – Lubricating the telescopic sections – Checking the sheaves	▣▣▣▣▶ p. 8 - 38 ▣▣▣▣▶ p. 8 - 42
Hoist ropes – Lubricating the hoist rope	▣▣▣▣▶ p. 8 - 47
Hook blocks – Checking the sheaves	▣▣▣▣▶ p. 8 - 65

5.2.5

Maintenance plan M 6

M 6

Maintenance work on the CARRIER: every six months / after 10,000 - 12,500 km (6,210 - 7,770 mi)	
Engine – Notes; ■■■► <i>Engine manufacturer's documentation</i> – Changing the oil and oil filter	■■■■► p. 7 - 15 ■■■■► p. 7 - 24
Fuel system – Replacing fuel filter 1 – Replacing fuel filter 2	■■■■► p. 7 - 35 ■■■■► p. 7 - 37
Axle lines – Lubricating longitudinal drive shafts	■■■■► p. 7 - 59
Wheels – Changing the wheels	■■■■► p. 7 - 64
Air-conditioning system – Checking hoses	■■■■► p. 7 - 114

M 6

Maintenance work on the SUPERSTRUCTURE: Every six months/after 500 oper. hrs.	
Hoists – Lubricating the auxiliary hoist	▣▣▣▣▶ p. 8 - 11
Slewing gear – Checking the slewing gear brake	▣▣▣▣▶ p. 8 - 17
Slewing bearing – Lubricating the gear teeth – General inspection – Measuring tilting play	▣▣▣▣▶ p. 8 - 27 ▣▣▣▣▶ p. 8 - 29 ▣▣▣▣▶ p. 8 - 30
Main boom – Checking locking units	▣▣▣▣▶ p. 8 - 43
Cable drums and slewing angle sensor – Maintenance of the slip ring assemblies	▣▣▣▣▶ p. 8 - 59
Air-conditioning system – Checking hoses	▣▣▣▣▶ p. 8 - 69

5.2.6

Maintenance plan M 12

M 12

Maintenance work on the CARRIER: every 12 months / after 20,000 - 25,000 km (12,430 - 15,530 mi)	
Engine – Notes; ■■■► <i>Engine manufacturer's documentation</i> – Have the radiator checked/cleaned	■■■► p. 7 - 15 ■■■► p. 7 - 26
Exhaust system with exhaust emission control – Having the AdBlue system checked – Having the soot particle filter system checked	■■■► p. 7 - 43 ■■■► p. 7 - 44
Transmission – Check the oil level	■■■► p. 7 - 47
Axle lines – Axle centre drives – changing the oil – Final drives - Changing the oil	■■■► p. 7 - 53 ■■■► p. 7 - 56
Suspension – Pressure accumulator – checking the gas pressure	■■■► p. 7 - 74
Steering – Pressure accumulator – checking the gas pressure	■■■► p. 7 - 77
Compressed air system – Replacing the filter cartridge of the compressed air drier	■■■► p. 7 - 81
Hydraulic system – 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 - 86 ■■■► p. 7 - 88 ■■■► p. 7 - 93 ■■■► p. 7 - 98
Air-conditioning system – Checking the entire air-conditioning system – Check V-belt/V-belt tension – Changing the pollen filter	■■■► p. 7 - 114 ■■■► p. 7 - 116 ■■■► p. 7 - 118
Other maintenance work – Lubricating the cab door – Lubricating the connecting and socket pins – Renewing the corrosion protection	■■■► p. 7 - 129 ■■■► p. 7 - 130 ■■■► p. 7 - 131






M 12


Maintenance work on the SUPERSTRUCTURE: Every twelve months/after 1 000 oper. hrs.	
Hoists – Changing the oil/checking the oil	▣▣▣▣▶ p. 8 - 12
Slewing gear – Changing the oil/checking the oil – Slewing gear transmission – Changing the oil/checking the oil – Slewing gear brake	▣▣▣▣▶ p. 8 - 19 ▣▣▣▣▶ p. 8 - 21
Slewing bearing – Lubricating the locking of turntable	▣▣▣▣▶ p. 8 - 32
Hydraulic system – Pressure accumulator – checking the gas pressure – Changing oil filter 3	▣▣▣▣▶ p. 8 - 34 ▣▣▣▣▶ p. 8 - 35
Main boom – Checking the locking system	▣▣▣▣▶ p. 8 - 44
Hook blocks – Greasing	▣▣▣▣▶ p. 8 - 65
Air-conditioning system – Checking the entire air-conditioning system	▣▣▣▣▶ p. 8 - 69
Other maintenance work – Lubricating the crane cab door – Lubricating the step – Lubricating the connecting and socket pins – Renewing the corrosion protection	▣▣▣▣▶ p. 8 - 74 ▣▣▣▣▶ p. 8 - 75 ▣▣▣▣▶ p. 8 - 76 ▣▣▣▣▶ p. 8 - 77

5.2.7

Maintenance plan Y 2

Y 2

Maintenance work on the CARRIER: every 24 months / after 40 000 – 50 000 km (25,000 – 31,000 mi)	
Engine – Notes;  <i>Engine manufacturer's documentation</i> – Changing the coolant	 p. 7 - 15  p. 7 - 30
Transmission – Changing the oil	 p. 7 - 48
Other maintenance work – Having the fire extinguisher checked	 p. 7 - 133


Maintenance work on the SUPERSTRUCTURE: every 24 months/after 2 000 oper. hrs.	
Other maintenance work – Having the fire extinguisher checked	 p. 8 - 79

5.2.8

Maintenance plan Y 3

Y 3

Maintenance work on the CARRIER: every 36 months	
No maintenance work in this period. The long-term intervals always include the short-term intervals!	

Maintenance work on the SUPERSTRUCTURE: every 36 months/after 3 000 oper. hrs.	
Hoists – Having a partial inspection carried out	 p. 8 - 14

5.2.9

Maintenance plan Y 5

Y 5

Maintenance work on the CARRIER: every 60 months / 100,000 km (62,000 mi)	
No maintenance work in this period. The long-term intervals always include the short-term intervals!	

Maintenance work on the SUPERSTRUCTURE: every 60 months/after 5 000 oper. hrs.	
Cable drums and slewing angle sensor – Lubricating the slewing angle sensor	▣▣▣▣▶ p. 8 - 62

5.2.10

Maintenance plan Y 6

Y 6

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

Maintenance work on the SUPERSTRUCTURE: every 72 months/after 6,000 oper. hrs.	
Hoists – Having a general inspection carried out	▣▣▣▣▶ p. 8 - 14

5.2.11

Maintenance plan Y 10

Y 10

Maintenance work on the CARRIER: every 120 months/after 200,000 km (124,000 mi)	
Electrical system – Replace the battery on the electronics board	▣▣▣▣▶ p. 7 - 112
Steel construction – Check the load-bearing steel construction. For further information, please contact Manitowoc Crane Care .	

Maintenance work on the SUPERSTRUCTURE: every 120 months/after 12 000 oper. hrs.	
Electrical system – Replace the battery on the electronics board	▣▣▣▣▶ p. 8 - 68
Steel construction – Check the load-bearing steel construction. For further information, please contact Manitowoc Crane Care .	
Rated capacity limiter (RCL) – Have the RCL checked by Manitowoc Crane Care .	

5.3

Periodic inspections

Your GMK3060 truck crane has been inspected before delivery.

- Truck cranes used in Germany are inspected in accordance with the regulations of the professional trade association as defined by BGV D 52 (BGV D 6).
- 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 52 (BGV D 6).

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 examinations 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 structural steelwork (for tears, deformations, etc.), including a special check of all welds.

If damage is found on the steel construction, 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.

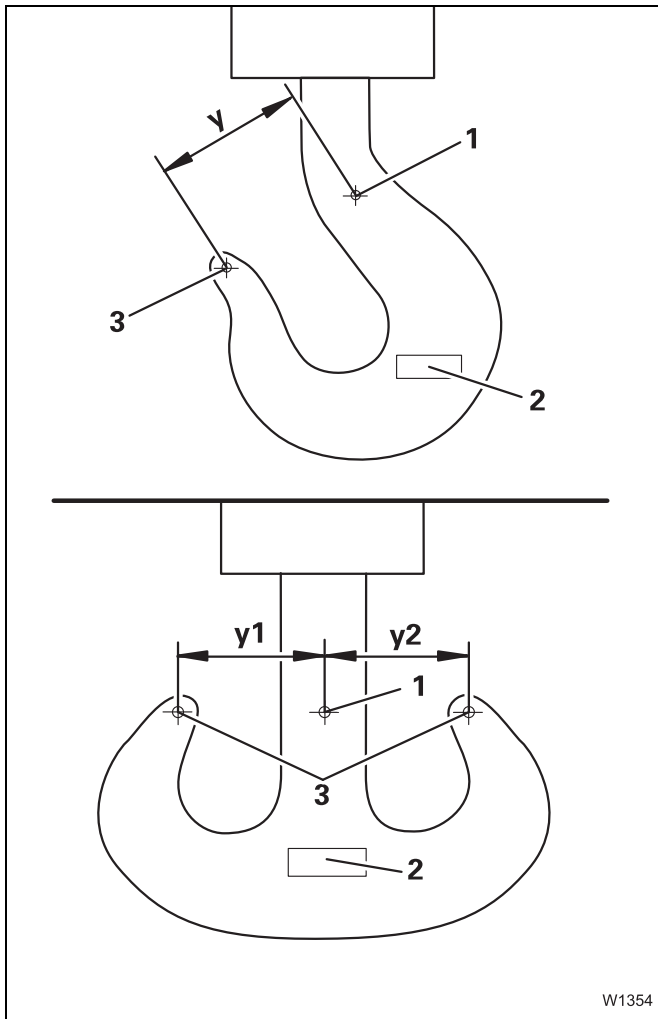
The inspector must write a report containing the result of the annual inspection that was performed and the measures taken to repair any damage.

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 dimensions y , $y1$, $y2$.



The original dimensions y , $y1$, $y2$ are specified in the 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 accidents due to the load falling!

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 - 14.

These measures for monitoring the winches (hoisting gears) were compiled by VDMA and are to be used for all vehicle cranes according to the *Accident Prevention Regulations for Winches, Hoisting and Tractor Machines DGUV Regulation 52 (BGV D 6)* and *DGUV Regulation 54 (BGV D 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 M 3 and the load spectrum L1 ($K_m = 0.125$) are generally given for truck cranes in assembly mode, resulting in a theoretical service life of 3,200 hrs. (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 drops and stops suddenly while suspended.
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. Concealed damage caused by accidents.
9. Extreme environmental conditions: Low or high temperatures, aggressive atmosphere, 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 DGUV Regulation 52 (BGV D 6) / DGUV Regulation 54 (BGV D 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 rope pull of the winch.

Load spectrum Class	Definition	Proportions of the running time	Factor of the loadspectrum $K_m =$	Graphic representation
Light 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 running time with greatest load (dead load + 1/1 payload) 40% of the running time with dead load + 1/3 payload 50% of the running time with dead load	0.125	<p>W1355</p>
Medium Q 2 L 2	Power unit or parts thereof that are subject to high stress quite often, but which are generally subject to only minimal stress	1/6 of the running time with greatest load (dead load + 1/1 payload) 1/6 of the running time with dead load + 2/3 payload 1/6 of the running time with dead load + 1/3 payload 50% of the running time with dead load	0.25	<p>W1356</p>
Heavy Q 3 L 3	Power units or parts thereof that are subject to high stress frequently and medium stress continuously	50% of the running time with greatest load (dead load + 1/1 payload) 50% of the running time with dead load	0.5	<p>W1357</p>
Very heavy Q 4 L 4	Power unit or parts thereof that are regularly subjected to high stress from neighbouring stress sources	90% of the running time with greatest load (dead load + 1/1 payload) 10% of the running time with dead load	1	<p>W1358</p>

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One of the load spectra 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 factor of the load spectrum $K_m = 0.125$ 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 are displayed in the *Operating hours submenu*;  *Operating Instructions*.

Determining the proportion of the theoretical service life used

For a testing interval i (max. 1 year according to ISO 9927-1 or DGUV Regulation 52 (BGV D 6) /DGUV Regulation 54 (BGV D 8)) the used proportion of the theoretical service life S_i is calculated using the formula:

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


K_m = Factor of the load spectrum used as the basis for winch calculation. This factor is specified 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 expert has confirmed that the used proportion of the service life is correct and useful by signing his/her name in the crane test book after every 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 occurs before expiry of the 12th operating year and must be repeated annually after this.

5.4.3

Example

A GMK3060 is equipped with a separate operating hours counter for the hoist and is classified by **Manitowoc Crane Group Germany GmbH** as follows:

Power unit group:	M 3
Load spectrum:	light L 1, $K_m = 0.125$
Theoretical service life:	$D = 3,200$ h

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

1. Inspection (1st 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 the theoretical service life after the 1st inspection is thus:

$$S_i = \frac{0,125}{0,125} \times 160 \text{ h} = 160 \text{ h}$$

Remaining theoretical service life:

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

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

2nd inspection (2nd 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 hrs. - 160 hrs. = 480 hrs. (160 hrs. were used during the first year)
 $T_2 = 480$ hrs.

The used proportion S_2 of theoretical service life after the 2nd inspection is therefore:

$$S_i = \frac{0,5}{0,125} \times 480 \text{ h} = 1,920 \text{ h}$$

Remaining theoretical service life:

$$D2 = 3,040 \text{ h} - 1,920 \text{ h} = 1,120 \text{ h.}$$

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

3. inspection (3rd 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: $940 \text{ h} - 640 \text{ h} = 300 \text{ h}$. $T3 = 300 \text{ h}$.

The used proportion S_3 of theoretical service life after the 3rd inspection is therefore:

$$S_i = \frac{0,25}{0,125} \times 300 \text{ h} = 600 \text{ h}$$

Remaining theoretical service life:

$$D3 = 1,120 \text{ h} - 600 \text{ h} = 520 \text{ h.}$$

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 in the country in which you are working.



Example table for determining the remaining theoretical service life on winch no. 1 (main hoist winch)

Crane type: **GMK 3045**
 Work number: **3045 42 06**
 Initial commissioning: **10.06.1990**
 Serial number of the winch in accordance with the model plate: **13301**
 Last general overhaul performed on:

Winch design data (see operating manual):
 Power unit group: **M 3**
 Load spectrum: **Q 1 (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	Operating hours of the entire crane	Operating hours of the superstructure	Operating hours of the superstructure since the last inspection	Winch operating hours	Operating hours T_i of the winch since the last inspection	Used proportion S_i of theoretical service life D :	Remaining theoretical service life	Name of the expert	Signature	Comment	Name of the approved inspector	Signature
0(*)	10. 6. 90	-	-	-	-	-	-	-	0	3,200					
1	5. 6. 91	L 1	0.125	-	-	-	160	160	160	3,040	Müller				
2	20. 5. 92	L 3	0.5	-	-	-	640	480	1,920	1,120	Huber				
3	18. 5. 93	L 2	0.25	-	-	-	940	300	600	520	Schmitz				

WARNING:
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_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 = Factor of the load spectrum used to calculate the winch. This factor is specified in the operating manual.
 K_{m1} = Factor of the load spectrum in the inspection interval "i" according to section 2.1
 T_i = Effective operating hours in the inspection interval "i" according to section 2.2
 (*) Copy the last line of the previous page to the following page.

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.

▣▣▣▣▶ *Lubricants list*, p. 6 - 2.



























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

6.1.1

Lubricants list










Con-sec. no.	GROVE-Part number	Lubricant type	Designation according to DIN 51502	Specification Classification	Viscosity
1	04162428	Engine oil	HD - CD	CES 20081 Cummins	SAE 15 W-40
2	03325153	Gear oil		ZF TE-ML02 Ecofluid M ZF (synthetic)	
3	00552891	Gear oil	C - LPF	MIL-L 2105 B API-GL-5	Hyp SAE 90 ISO - VG 220
4	02310863	Gear oil		Rivolta S.K.D. 170	
5	02313611	Gear oil	C - LPF	MIL-L 2105 B API-GL-4/5 (synthetic)	SAE 75 W-90 EP ISO - VG 220
6	01930670	Gear oil	ATF	AVIA Fluid ATF 66M DB 236.2 (coloured in red)	
7	04162158	Hydraulic oil	HVLP	Castrol Hypspin AWH-M 32 DIN 51524-3	ISO - VG 32
8	03233369	Lubricating grease	KP - 1K - 50	DIN 51825 Renolit JP 1619	- 50 °C to +120 °C (-58 °F to +248 °F)
9	00554205	Spray		Ceplattyn 300	
10	02314698	Slide paste		PAL 1	
11	03325215	Lubricating grease		RHUS SW 2	
12	01929824	Spray		Berulub spray	
13	03133770	Lubricating grease		Elaskon 30	

6.1.2 Lubricant applications list


Con-sec. no.	Lubricant type	Usage	Fill quantity in litres (gal)	Maintenance interval
1	Engine oil	Diesel engine;  p. 7 - 24	26.5 (7.0)	M 6
2	Gear oil	Manual transmission;  p. 7 - 48	12.5 (3.3)	Y 2
3	Gear oil	1st axle line axle centre drive;  p. 7 - 53	13.0 (3.5)	M 12
		2nd axle line axle centre drive;  p. 7 - 53	16.2 (4.3)	M 12
		3rd axle line axle centre drive;  p. 7 - 53	13.0 (3.5)	M 12
		4 or 6 x final drives;  p. 7 - 56	1.4 (0.4)	M 12
4	Gear oil	6 x suspension struts;  p. 7 - 71	1.5 (0.4)	M 1
5	Gear oil	2 x hoists;  p. 8 - 12	3 (0.8)	M 12
		Slewing gear transmission;  p. 8 - 19	0.9 (0.24)	M 12
6	Gear oil	Slewing gear brake;  p. 8 - 21	1 (0.26)	M 12
7	Hydraulic oil	Hydraulic tank;  p. 7 - 93	800 (210)	M 12
		Driver's cab tilting system;  p. 7 - 3	1 (0.26)	M 12
8	Lubricating grease	Carrier central lubrication;  p. 7 - 101		W
		Superstructure central lubrication;  p. 8 - 63		W
		Cardan shafts – transverse;  p. 7 - 58		M 1
		Cardan shafts – longitudinal;  p. 7 - 59		M 6
		Drag link supporting plate;  p. 7 - 76		M 1
		Towbar coupling;  p. 7 - 119		M 1
		Outrigger beams;  p. 7 - 128		M 1
		Auxiliary hoist;  p. 8 - 11		M 6
		Turntable lock;  p. 8 - 32		M 12
		Slewing angle sensor;  p. 8 - 62		Y 5
		Hook blocks;  p. 8 - 65		M 12
		Cab door hinges;  p. 7 - 129		M 12
		Carrier pins;  p. 7 - 130		M 12
		Superstructure pins;  p. 8 - 76		M 12

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Con-sec. no.	Lubricant type	Usage	Fill quantity in litres (gal)	Maintenance interval
9	Spray	Slewing bearing gear teeth;  p. 8 - 27		M 6
10	Slide paste	Telescope slide faces;  p. 8 - 38		M 3
11	Lubricating grease	Derricking cylinder piston rod;  p. 8 - 37		M 1
		Telescopic locking pins;  p. 8 - 38		M 3
		Cab door rails;  p. 8 - 74		M 12
		Extendable step;  p. 8 - 75		M 12
12	Spray	Outrigger pad/supporting cylinder;  p. 7 - 128		M 1
		Derricking cylinder piston rod;  p. 8 - 37		M 1
13	Lubricating grease	Lubricating the hoist ropes;  p. 8 - 47		M 3

6.2 Refrigerant

Refrigerant Designation	Usage	Fill quantity in kg (lbs)	Maintenance interval
Tetrafluoroethane (R134a) CAS no. 811-97-2 EC no. 212-377-0	Air-conditioning system;  p. 7 - 114 (Compressor oil: FUCHS SE 55)	1.4 (3.1)	M 12

6.3 Consumables

6.3.1 Fuel

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

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

6.3.2 Engine coolant admixtures

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

The coolant must be renewed every two years (Y 2);

▣▣▣▣ *Engine manufacturer's documentation*.

6.3.3 After-treatment of exhaust gases

Designation	Usage	Fill quantity in litres (gal)
DEF (Diesel Exhaust Fluid) ¹⁾ <i>AdBlue</i> : GROVE part number: 03140555	AdBlue tank; ▣▣▣▣ p. 7 - 40	37.8 (10)

- ¹⁾ 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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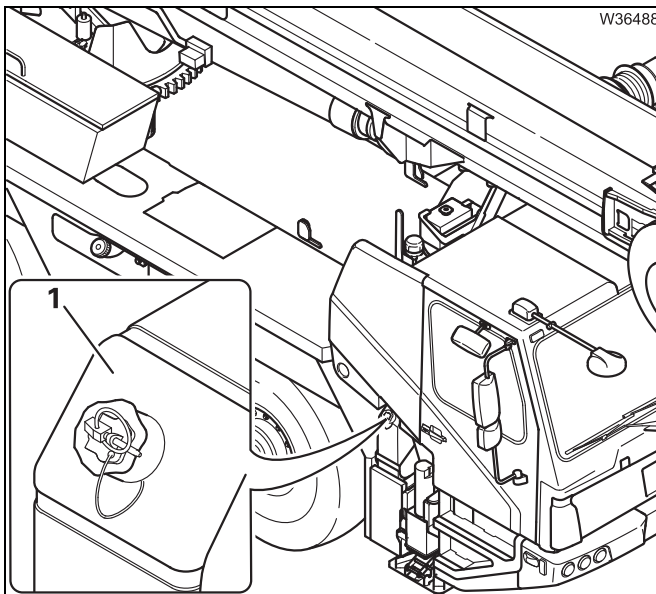
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7

Maintenance work on the carrier

7.1

General instructions



The GMK3060 truck crane is fitted as standard with an *AdBlue* system for exhaust gas emission control – Tier4 final.

In this case an AdBlue tank (1) is fitted to the truck crane; ■■■► p. 7 - 39.

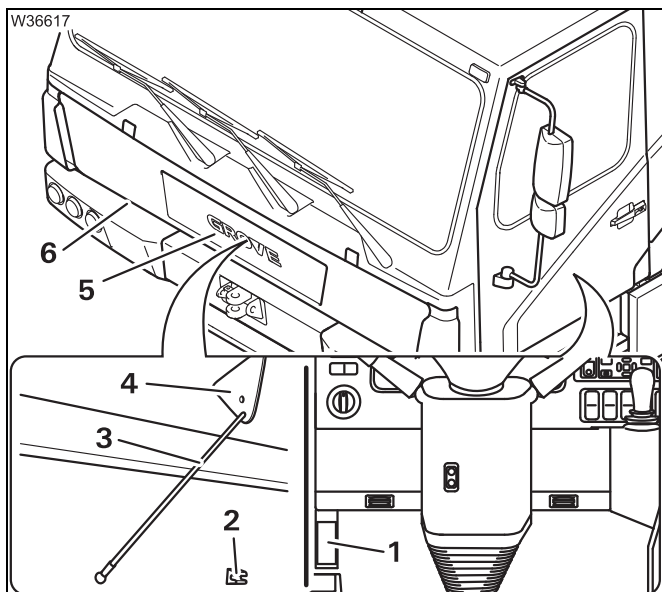
An engine that can be operated at the respective site without an *AdBlue* system is available, but only as special equipment.

In this case there is no AdBlue tank (1) fitted to the truck crane. The corresponding maintenance work is not required; ■■■► p. 7 - 39.

7.1.1

Front flap

Some maintenance tasks require that the front flap be opened.



Opening

- Pull the lever (1).
- Push the lever (6) to the right and open the flap (5).
- Secure the flap in the opening (4) using the support (3).

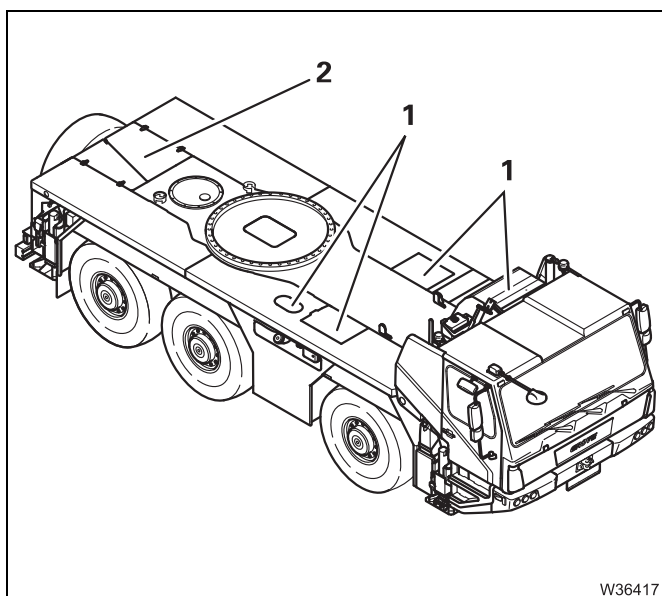
Closing

- Lift the flap and remove the support from the opening. Set down the support in the holder (2).
- Close the flap, applying slight pressure, until it audibly engages. Check that the flap is closed tight.

7.1.2

Covers

You must remove the covers for certain maintenance work.



Before maintenance work

- Remove the covers (1).

After maintenance work

- Fasten the covers (1) with the locks.

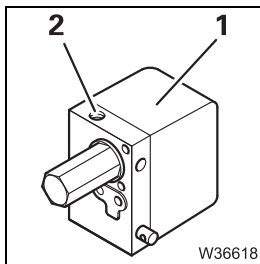
A storage compartment is located under the lockable flaps (2).

7.1.3

Tilting and lowering the driver's cab

Some maintenance tasks on the engine and the transmission require that the driver's cab be tilted forwards using a hydraulic hand pump.

Safety instructions



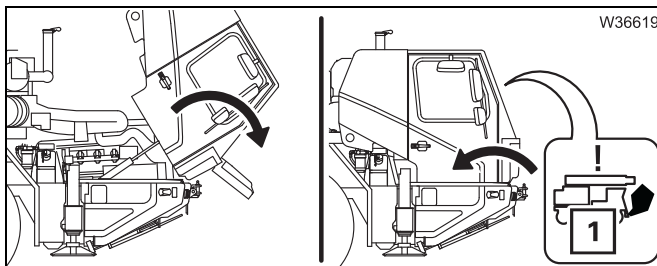
The driver's cab is tilted using a hydraulic hand pump (1).

- You can find information on how to operate the hand pump in the *operating manual*. Make sure you observe the safety instructions mentioned there; *Operating Instructions; Tilting and lowering the driver's cab*.
- Open the front flap; p. 7 - 2.

Oil, tools

Hydraulic oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
1 (0.26)	HVLP	DIN 51524-3 Viscosity: ISO-VG 32	04162158 Castrol Hyspin AWH-M 32

- Oil level: Lower edge of opening (2). Check every 12 months.
- Refilling: When required via the opening (2).
- Lever (spanner size 30 mm) for hand pump (1) from the toolbox.



Before maintenance work

- Tilt the driver's cab; *Operating Instructions*.

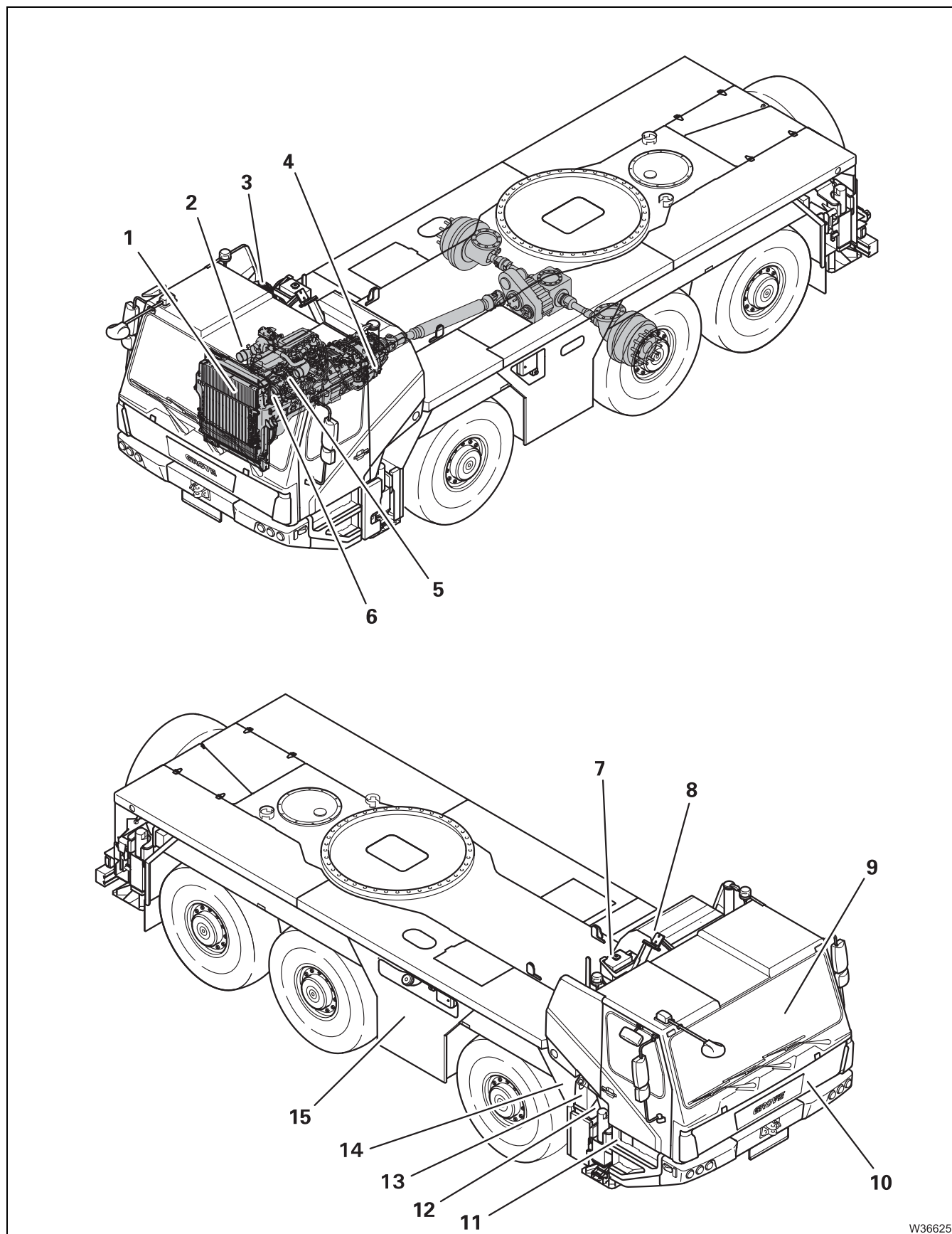
After maintenance work

- Lower the driver's cab; *Operating Instructions*.

- Check that the lamp (1) on the CCS control unit has gone out – the driver's cab is then locked.

7.1.4

Overview of maintenance work on the carrier

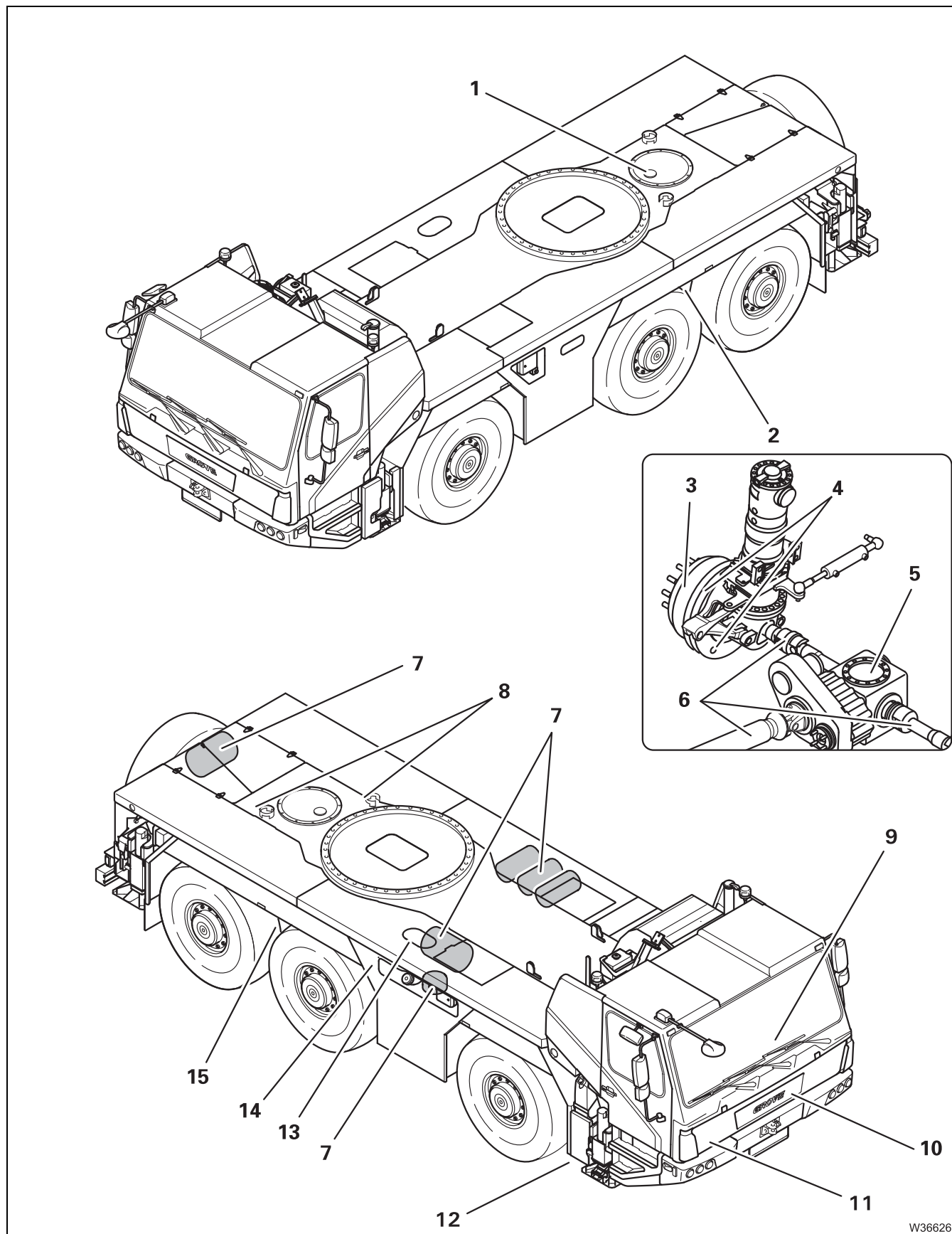


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Symbols for maintenance work	▶▶▶▶ p. 7 - 11
9 On the instrument panel and CCS control unit	▶▶▶▶ p. 7 - 11
Engine	▶▶▶▶ p. 7 - 15
1 Diesel engine	▶▶▶▶ p. 7 - 15
11 Hand pump (tilting the driver's cab)	▶▶▶▶ p. 7 - 3
10 Front flap	▶▶▶▶ p. 7 - 2
12 Dipstick	▶▶▶▶ p. 7 - 15
3 Air filter	▶▶▶▶ p. 7 - 18
5 Air intake inhibitor ¹⁾	▶▶▶▶ p. 7 - 19
7 Coolant reservoir	▶▶▶▶ p. 7 - 22
2 Oil filter	▶▶▶▶ p. 7 - 24
Fuel system	▶▶▶▶ p. 7 - 33
14 Filter 1	▶▶▶▶ p. 7 - 34
6 Filter 2	▶▶▶▶ p. 7 - 37
15 Diesel tank (1- chamber)	▶▶▶▶ p. 7 - 33
15 Diesel tank (2-chamber) ¹⁾	▶▶▶▶ p. 7 - 33
Exhaust system with exhaust emission control	▶▶▶▶ p. 7 - 39
13 AdBlue tank	▶▶▶▶ p. 7 - 40
8 Exhaust silencer with filter and catalytic converter	▶▶▶▶ p. 7 - 41
Transmission	▶▶▶▶ p. 7 - 47
4 Oil level plug	▶▶▶▶ p. 7 - 48



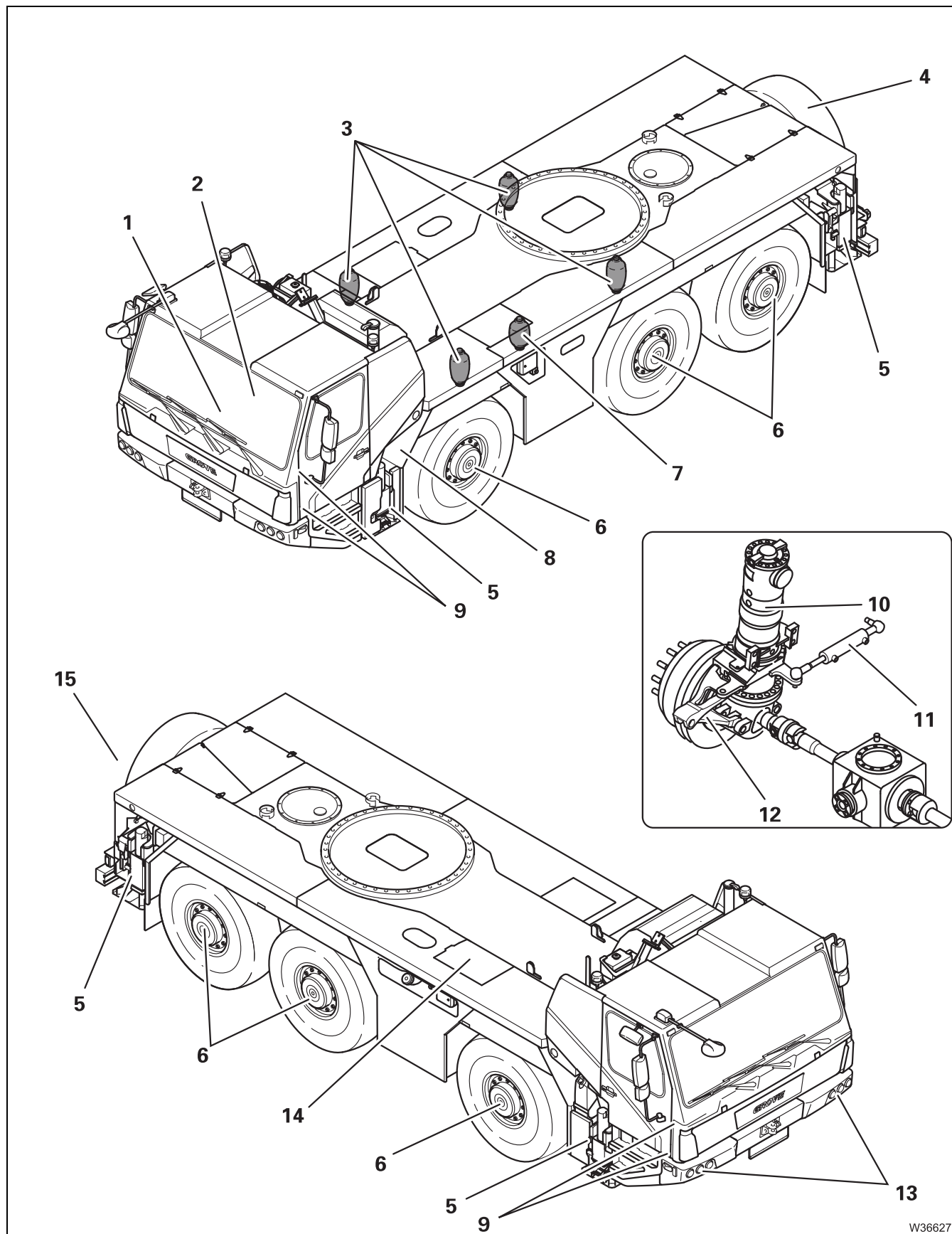


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Axle lines	▶▶▶▶ p. 7 - 51
5 Axle centre drives	▶▶▶▶ p. 7 - 51
3 Final drives	▶▶▶▶ p. 7 - 55
6 Cardan shafts	▶▶▶▶ p. 7 - 58
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4 Brake linings	▶▶▶▶ p. 7 - 69
Compressed air system	▶▶▶▶ p. 7 - 79
7 Receptacle	▶▶▶▶ p. 7 - 79
14 Drier	▶▶▶▶ p. 7 - 81
Hydraulic system	▶▶▶▶ p. 7 - 83
2 Oil tank with sight glass	▶▶▶▶ p. 7 - 83
15 Oil filters 1 and 2	▶▶▶▶ p. 7 - 99
12 Oil filter 4	▶▶▶▶ p. 7 - 100
8 Ventilation filter	▶▶▶▶ p. 7 - 86
1 Oil filler opening	▶▶▶▶ p. 7 - 95
Central lubrication system	▶▶▶▶ p. 7 - 101
13 Centralized lubrication pump	▶▶▶▶ p. 7 - 101
Air-conditioning system	▶▶▶▶ p. 7 - 113
9 Driver's cab air conditioning system ¹⁾	▶▶▶▶ p. 7 - 113
10 Condenser fins ¹⁾	▶▶▶▶ p. 7 - 113
11 Pollen filter	▶▶▶▶ p. 7 - 118





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Wheels	▣▣▣▣ p. 7 - 61
6 Wheels	▣▣▣▣ p. 7 - 61
4 Spare wheel	▣▣▣▣ p. 7 - 61
Suspension	▣▣▣▣ p. 7 - 71
10 Suspension struts	▣▣▣▣ p. 7 - 71
12 Forced lever	▣▣▣▣ p. 7 - 73
3 Pressure accumulator	▣▣▣▣ p. 7 - 74
Steering	▣▣▣▣ p. 7 - 75
11 Steering cylinder	▣▣▣▣ p. 7 - 75
7 Pressure accumulator	▣▣▣▣ p. 7 - 77
Electrical system	▣▣▣▣ p. 7 - 105
13 Carrier lighting	▣▣▣▣ p. 7 - 105
14 Battery box	▣▣▣▣ p. 7 - 106
Towbar coupling	▣▣▣▣ p. 7 - 119
15 Towbar coupling ¹⁾	▣▣▣▣ p. 7 - 119
Other maintenance work	▣▣▣▣ p. 7 - 127
8 Windscreen washing system reservoir	▣▣▣▣ p. 7 - 127
5 Outrigger beams	▣▣▣▣ p. 7 - 128
1 Driver's cab auxiliary heater ¹⁾	▣▣▣▣ p. 7 - 129
9 Cab door hinges	▣▣▣▣ p. 7 - 129
– Various connecting pins and socket pins	▣▣▣▣ p. 7 - 130
– Corrosion protection	▣▣▣▣ p. 7 - 131
2 Fire extinguisher	▣▣▣▣ p. 7 - 133

¹⁾ Additional equipment

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7.2

Symbols for maintenance work


7.2.1

Instrument panel

Middle

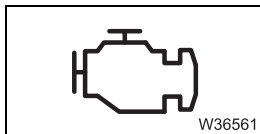
- Check the symbols on the instrument panel in the driver's cab each day before starting operations.
- Carry out a lamp test after switching on the ignition. Check that the lamps light up briefly. Warning messages are only present when the symbols are continuously lit;  *Operating Instructions*.




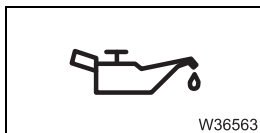
Engine malfunction;  p. 7 - 15.



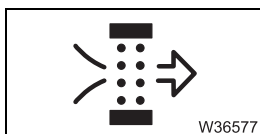
Engine pre-heating;  p. 7 - 15.



Engine malfunction;  p. 7 - 15.




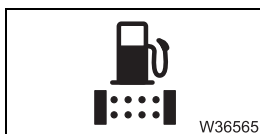
Engine oil pressure;  p. 7 - 15.




Air filter;  p. 7 - 18.




Air intake inhibitor;  p. 7 - 19.



Fuel filter 1;  p. 7 - 34.




AdBlue system;  p. 7 - 40.





Exhaust gas temperature;  p. 7 - 44.



Exhaust gas regeneration (passive);  p. 7 - 44.



Exhaust gas regeneration (active);  p. 7 - 44.



Transmission malfunction;  p. 7 - 47.

7.2.2

CCS display

CCS

- Check the symbols on the *CCS Start menu (Crane Control System)* in the driver's cab each day before starting operations.
- The Start menu shows the most important measurements and the Warning submenu shows all pending warning messages;
 ▮▮▮▮ *Operating Instructions*.

Warning submenu

If a symbol is displayed, you must carry out the appropriate maintenance work:



Engine oil level; ▮▮▮▮ p. 7 - 15.



Air filter; ▮▮▮▮ p. 7 - 18.



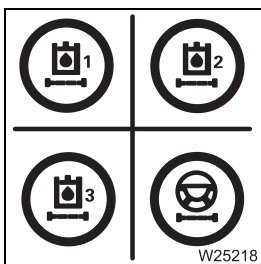
Air intake inhibitor; ▮▮▮▮ p. 7 - 19.



Coolant level; ▮▮▮▮ p. 7 - 22.



AdBlue system; ▮▮▮▮ p. 7 - 40.



Hydraulic oil filter; ▮▮▮▮ p. 7 - 98.

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7.3

Engine

- Also carry out the additional maintenance work specified in the *Engine manufacturer's documentation* supplied.

7.3.1

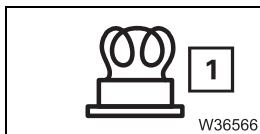
Check the oil level

D

Prerequisites

- The truck crane must be level.

Check the oil level



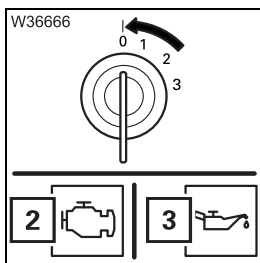
- After switching on the ignition, wait until the pre-heating lamp (1) on the instrument panel goes out.
- Start the engine.



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

Switch off the engine immediately if the lamps (2) or (3) on the instrument panel light up.

Running the engine when the oil pressure is too low can damage it.

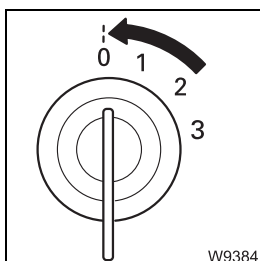


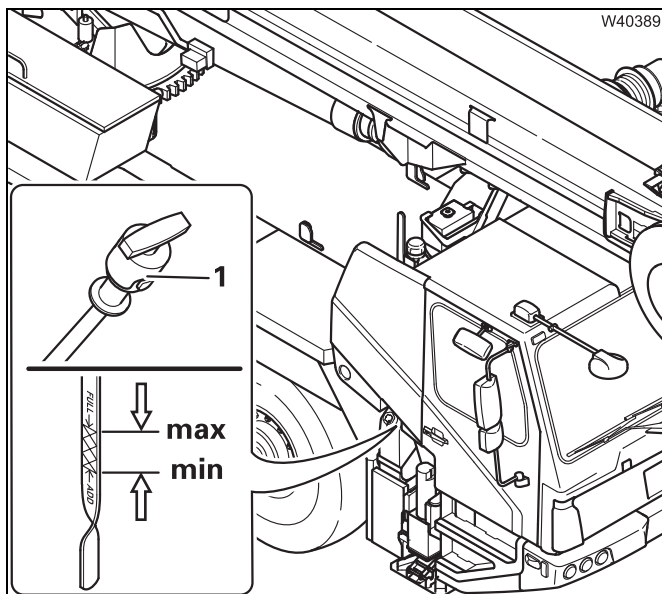
- **Switch off the engine immediately, if**

- The lamps (2) or (3) on the instrument panel remain lit for longer than 10 seconds,
- and the warning buzzer sounds.

If the lamp (2) remains lit then an engine fault is present and you must have the error read.

- Allow the engine to run at idling speed for 2 - 3 minutes.
- Switch the engine off.
- Check the oil level after a few minutes.





- Check that the oil level on the dipstick (1) is between the **Min.** and **Max.** marks (arrow markings).
- Put the oil dipstick into the dipstick tube after the check and close the front flap.

If the oil level is too low

- Top up with oil; p. 7 - 17.



You can **additionally** check the oil level on the **CCS display** in the **Warning submenu**.




The oil pressure is too low if the symbol is displayed.

- Top up with oil; p. 7 - 17.

7.3.2


Topping up the oil

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

Oil

Engine oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
26.5 (7.0)	HD - CD	CES 20081 Cummins	SAE 15 W-40 04162428

Prerequisites


- The truck crane must be level.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Topping up the oil

- Tilt the driver's cab forwards;  *Tilting and lowering the driver's cab*, p. 7 - 3.



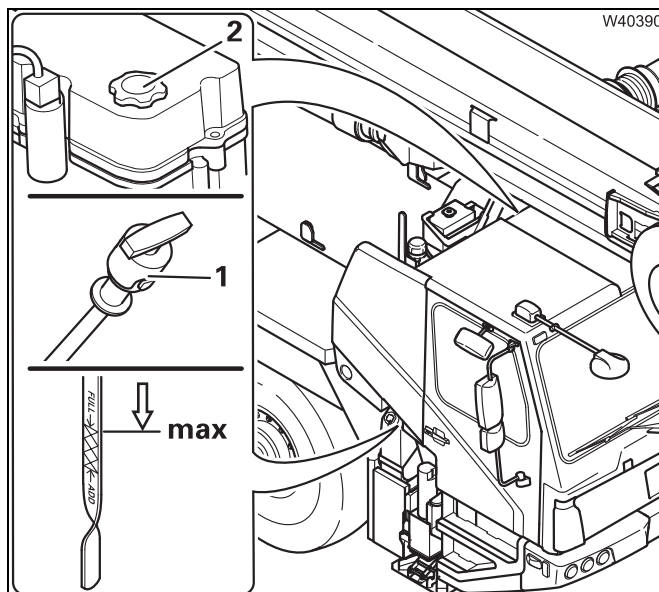
Risk of damage to the engine if the oil level is too high!


Do not overfill with oil; 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 touch hot parts.



- Add oil through the filler neck (2) up to the **Max.** mark.
- Close the filler neck with the cover.
- Insert the dipstick (1) into the dipstick tube after checking the oil level.
- Lower the driver's cab;  *Tilting and lowering the driver's cab*, p. 7 - 3.

7.3.3

Checking the air filter

D




Change the air filter if the symbol is displayed.

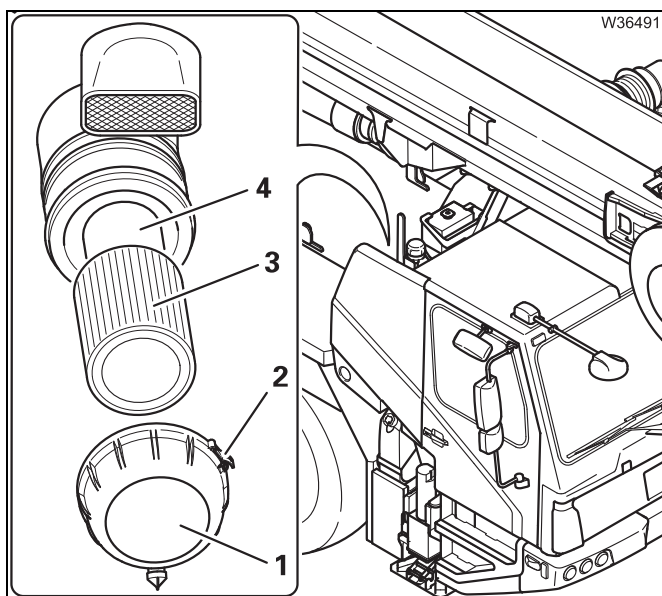
Spare parts and tools

Designation	Quantity	GROVE part no.
Main filter	1	04182216
Back-up filter	1	04182217

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Replacing air filters




- Open the lock (2).
- Twist the cover (1) to the left (into the open position) and remove it.
- Change the main filter (3) and the back-up filter (4).
- Fit the cover (1) and twist it to the right (into the closed position).
- Close the lock (2).

7.3.4

Checking the air intake inhibitor

M 1

Additional equipment

The GMK3060 truck crane can be equipped with an air intake inhibitor as additional equipment;  *Operating Instructions*.

Purpose

The engine speed of the truck increases if the intake air at the current site of the truck crane is enriched with explosive gases or dust (in extreme cases this can lead to destruction of the engine).

The air intake inhibitor control system reacts to an unintentional increase in the engine speed and **automatically** blocks the air supply to the engine.


The engine shuts down.

The **automatic** engine shutdown occurs when the engine speed exceeds $2,400 \text{ min}^{-1}$ 2,400 rpm.

Installation location

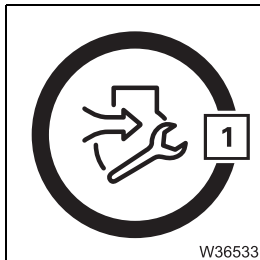
The air intake inhibitor is installed under the driver's cab between the charge air cooler and the charge air intake of the engine.

CCS menu

- Familiarise yourself with the *Air intake inhibitor* CCS menu;  *Operating Instructions*.

The air intake inhibitor can be **manually** triggered in the CCS menu for a function test.

Interval



If the symbol (1) is shown then the 4-week interval prescribed by the air intake inhibitor manufacturer has expired and you must perform the periodic function test of the air intake inhibitor.

The symbol (1) is first displayed in **yellow** so that you can plan a suitable time for performing the function test within the next week.

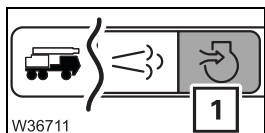
The symbol (1) is displayed in **red** when the function test has not been performed for 5 weeks. The symbol remains lit until the function test has been successfully completed.

- Always check the shut-off flap **before** driving the truck crane to the following locations:
 - at service stations and tank farms,
 - fuel depots and chemical factories,
 - at places where explosive dust can be found or formed (e.g. carbon dust, wood dust and grain dust).

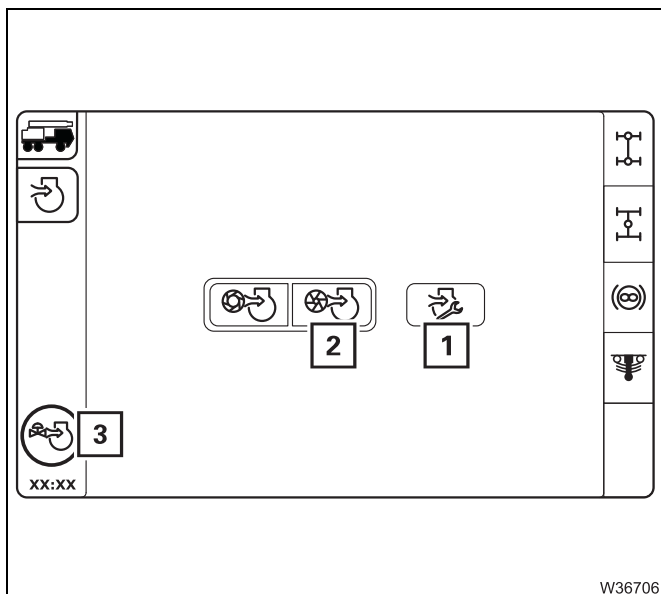


Prerequisites – The truck crane is in on-road mode and the engine is running.

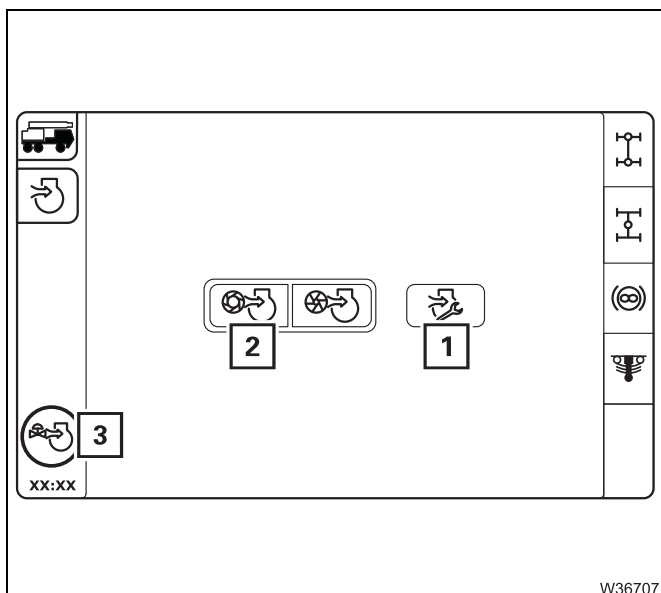
Checking The function test is performed via the CCS menu.



- Select and confirm the symbol (1).
The *Air intake inhibitor* menu opens.

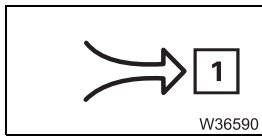


- Select and confirm the symbol (1) – symbol is green.
- Select and confirm the symbol (2):
 - The air intake inhibitor closes,
 - The engine switches off,
 - The warning lamp (3) lights up yellow.The engine cannot be started while the air intake inhibitor is closed.
- Attempt to start the engine:
 - The starter motor must not turn over,
 - The engine cannot start.



- Select and confirm the symbol (2):
 - The air intake inhibitor opens,
 - The warning symbol (3) goes out.The engine can then be started again.
- Exit the function test – press the symbol (1)
 - symbol is grey.
- Check that the engine can now be started again.

On the Instrument panel



- Also note the **additional monitoring elements** on the middle instrument panel in the driver's cab.

The state of the air intake inhibitor is indicated by the symbol (1).

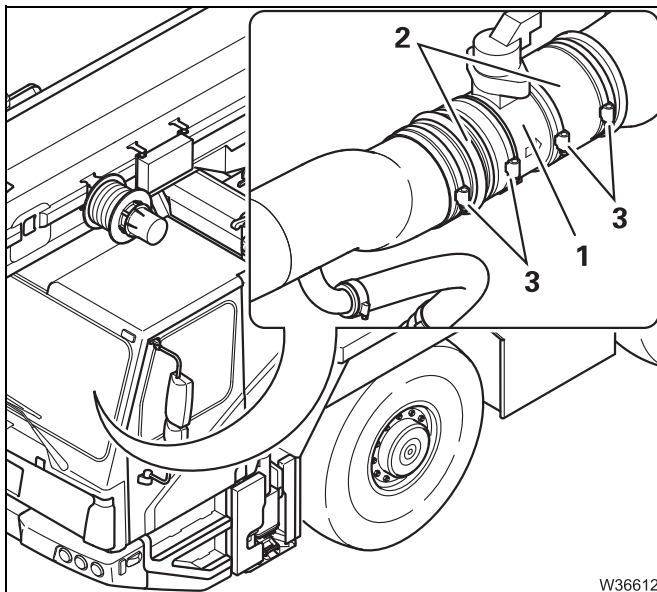
- | | |
|------------------------|--------|
| Symbol (1) lights up: | closed |
| Symbol (1) is not lit: | opened |

Repeating from the crane cab

- Repeat the check from the crane cab.
- Open the CCS menu in the crane cab for this.
- Start the engine from the crane cab.

After checking

The engine is not running and has cooled down.



- Tilt the driver's cab; ►► p. 7 - 3.
- Check the air intake inhibitor (1), hoses (2) and clamps (3) for damage and tight seating.
- Lower the driver's cab; ►► p. 7 - 3.



The function test of the air intake inhibitor exerts a very heavy load on the components. You should therefore not perform the test unnecessarily often. The closed air intake inhibitor is opened again by the control system automatically after a certain pre-programmed time (30 seconds), if the operator has not pressed the symbol for opening in the CCS menu before this time has expired. In an emergency, the closed air intake inhibitor can also be opened before expiry of the pre-programmed time by disconnecting the power supply (remove the switching handle on the main battery switch).

7.3.5

Checking the coolant level

D



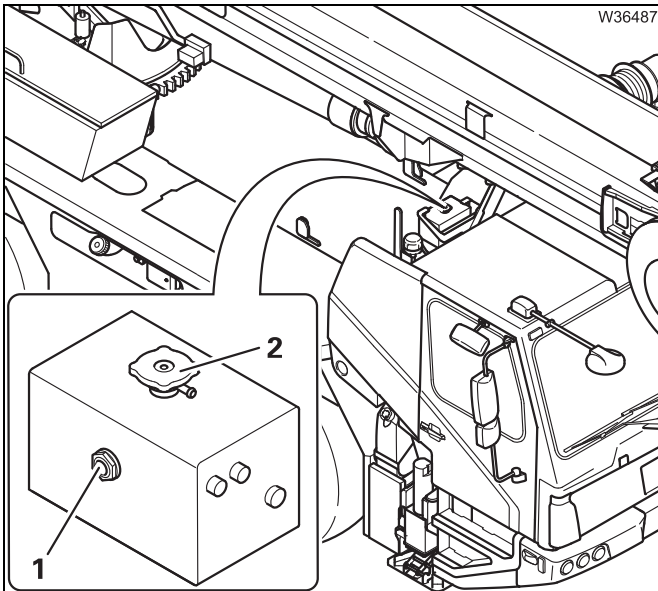
Top up the coolant if the symbol is displayed.

Topping up coolant




There is a risk of scalding when the cooling circuit is hot!

The hot cooling circuit is under pressure. When you open the expansion tank, you could be scalded by escaping vapour/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.



- Check the coolant level via the inspection glass (1).

If the coolant level is too low

- Loosen (do not open) the cap (2) to reduce the pressure if the coolant is at operating temperature.
- Open the cap (2).
- Top up the coolant.
Composition of the coolant;  *Engine manufacturer's documentation.*
- Close the cap (2).



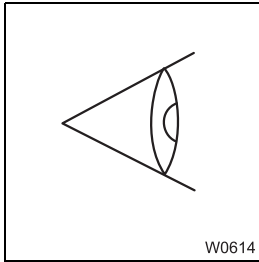
Risk of damage to engine due to lack of coolant!

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;
 - ▣▣▣▣▶ *Check the oil level, p. 7 - 15,*
 - ▣▣▣▣▶ *Checking the coolant level, p. 7 - 22.*
- Check that pipes and hoses are tightly connected and undamaged.

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

7.3.7

Changing the oil and oil filter

M 6

Oil, spare parts, tools

Engine oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
26.5 (7.0)	HD - CD	CES 20081 Cummins	SAE 15 W-40 04162428

Designation	Quantity	GROVE part no.
Gasket for oil drain plug	1	03042026
Oil filter	1	04182152

– Receptacle, approx. 30 l (8 gal); ■■■▶ p. 2 - 4.

Prerequisites

- Find out the prescribed oil specifications and about the need to shorten 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 not be running and must be secured against unauthorised use; ■■■▶ p. 2 - 3.

Changing




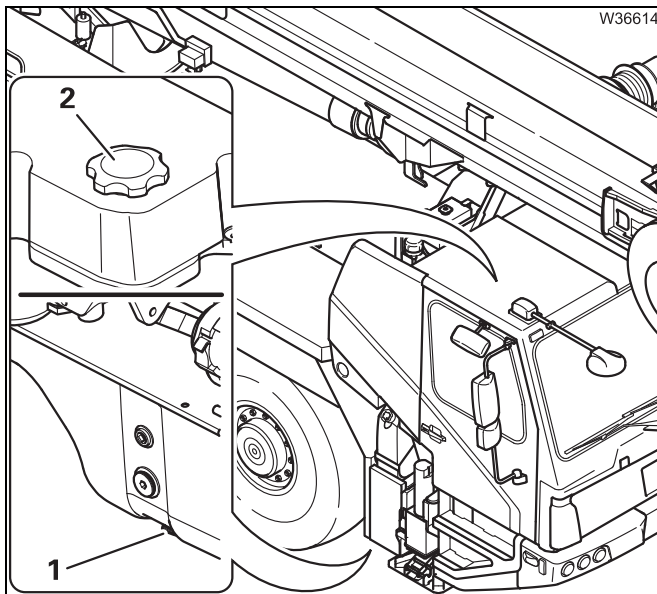
Risk of environmental damage due to leaking consumables!

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

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

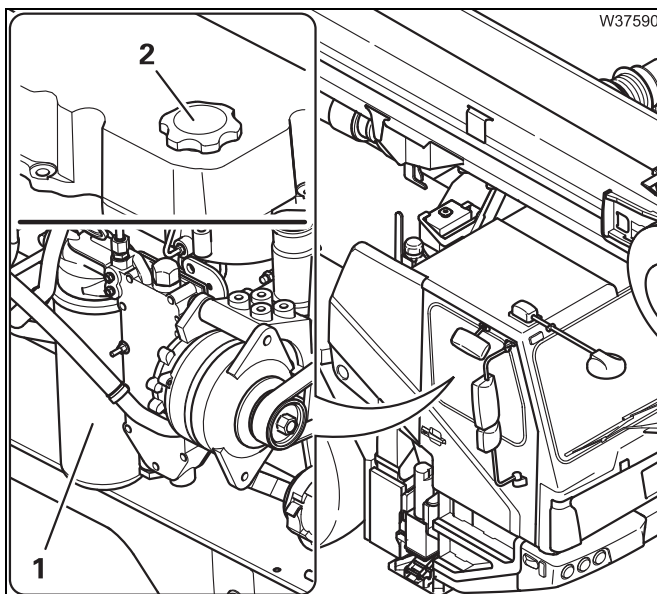
- Tilt the driver's cab;  *Tilting and lowering the driver's cab*, p. 7 - 3.



Draining oil

- Place a receptacle underneath the engine.
- Remove the cover (2) from the filler neck.
- Unscrew the drain plug (1) and let the oil drain off.
- Fit a new gasket and tighten the screw (1).


- Leave the receptacle in place for the oil filter change.




Oil filter

- Unscrew the filter (1).
- Apply a light film of oil to the seal of the new filter (1) and firmly screw it in by hand.

Topping up the oil

- Top up with fresh oil through the filler neck (2);  p. 7 - 17.
- Remove the receptacle.

- Lower the driver's cab;  *Tilting and lowering the driver's cab*, p. 7 - 3.

7.3.8




Have the radiator checked/cleaned

M 12

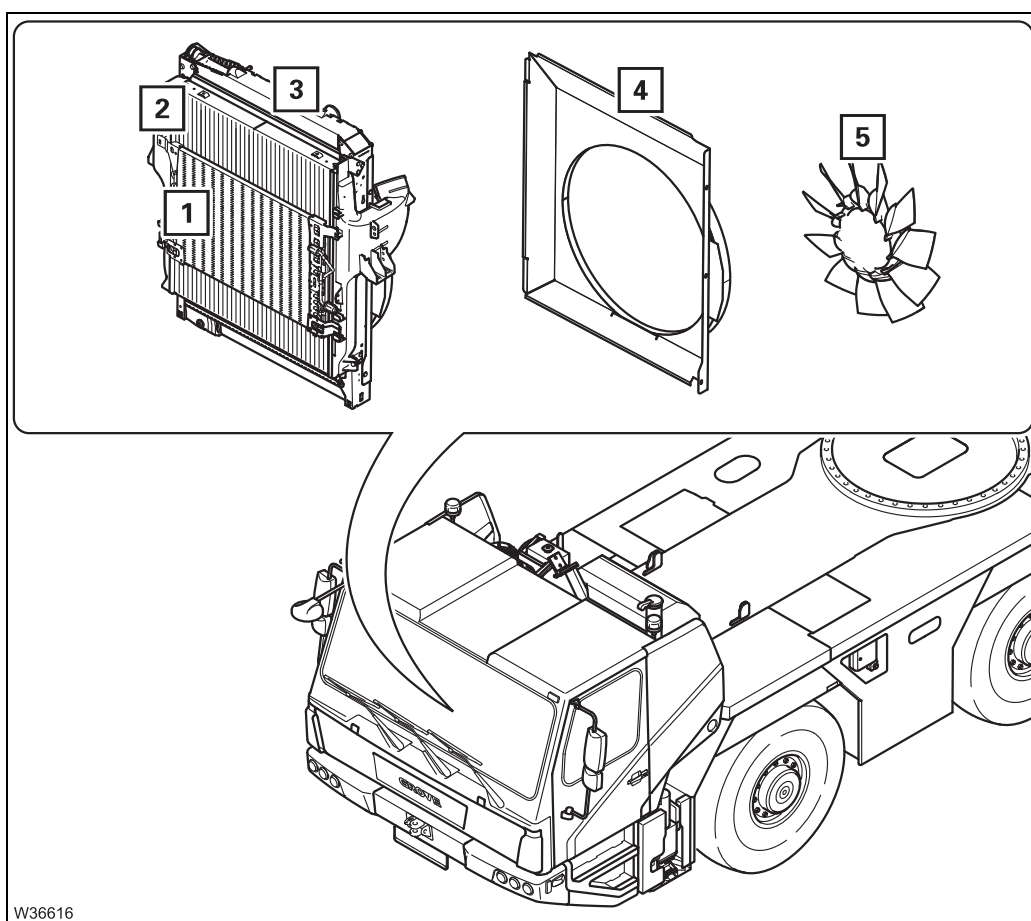
Reducing the interval

- 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 on outriggers and level;  *Operating Instructions*.
- The driver's cab is tipped;  p. 7 - 3.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Check the level of dirt



The radiator unit is located in front of the diesel engine. The diesel engine fan impeller (5) is surrounded by a fan hood (4). The fan impeller rotates when the engine is running!



Risk of injury at the fan wheel!

When the fan impeller is rotating it can trap the fingers of your hand and amputate them. Never reach into the fan impeller when it is rotating. Do not push any tools through the openings in the fan hood to clean them. Always stop the engine before attempting to clean the fan wheel and radiator fins.


Radiator unit

Radiator for engine coolant (3), radiator for the engine charge air (2), condenser for refrigerant (1) of the combination air-conditioning system for the driver's cab and crane cab.

Checking

- If necessary remove leaves, twigs and other debris from the fan hood (4).
- Check the condition of the fan impeller (5). 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 - 28.



**Have them
cleaned**



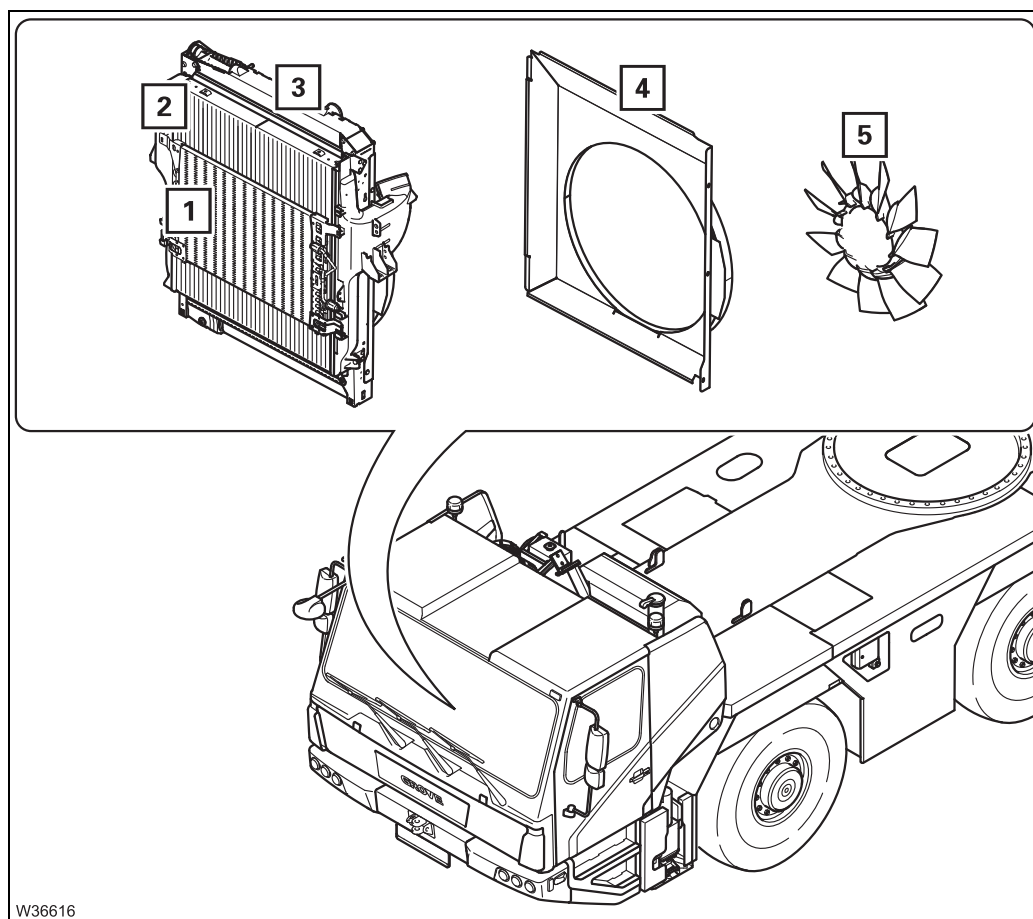
Risk of injury at the fan wheel!

When the fan impeller is rotating it can trap the fingers of your hand and amputate them. Never reach into the fan impeller when it is rotating. Do not push any tools through the openings in the fan hood to clean them. Always stop the engine before attempting to clean the fan wheel 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, 2, 3**) 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 impeller (**5**) cleaned.
- Have the fan hood (**4**) 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 radiator components are fastened in place.
- Start the engine and wait until the fan wheels are rotating.
- Switch the engine off.
- Check the radiator unit and connections for leaks.
- Lower the driver's cab;  p. 7 - 3.

7.3.9



Changing the coolant

Y 2

Tools

- Receptacle, approx. 20 l (5.3 gal);  p. 2 - 4.
- Antifreeze 20 l (5.3 gal);  *Engine manufacturer's documentation.*

Prerequisites

- Information on the coolant and admixture ratio has been obtained;  *Engine manufacturer's documentation.*
- The truck crane must be level.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The engine has cooled down.



Risk of environmental damage due to leaking consumables!

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

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



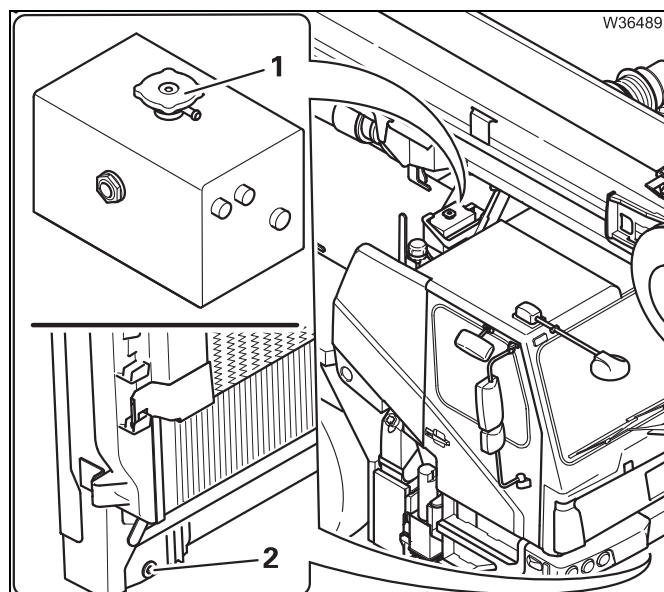
There is a risk of scalding when the cooling circuit is hot!

The hot cooling circuit is under pressure. When you open the expansion tank, you could be scalded by escaping vapour/coolant.

Wear suitable protective gloves and cover the cap on the expansion tank with a rag before opening it.

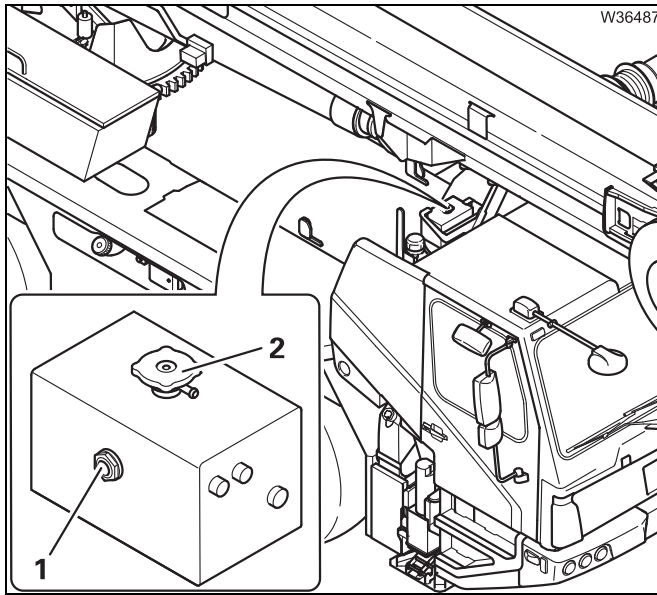
Turn the cap slowly to the first detent in order to allow the pressure to be released.

Changing



Draining when the engine is cold


- Open the cap (1) on the expansion tank.
- Place a receptacle under the screw (2) on the radiator under the driver's cab.
- Unscrew the drain plug (2) and let the coolant drain off.
- Fit a new gasket and tighten the screw (2).
- Remove the receptacle.



Topping up when the engine is cold

- Slowly top up the expansion tank (2) with coolant until it is filled up to the middle of the inspection glass (1).
- Wait about 1 minute. Add more coolant if necessary.
- Close the cover (2).

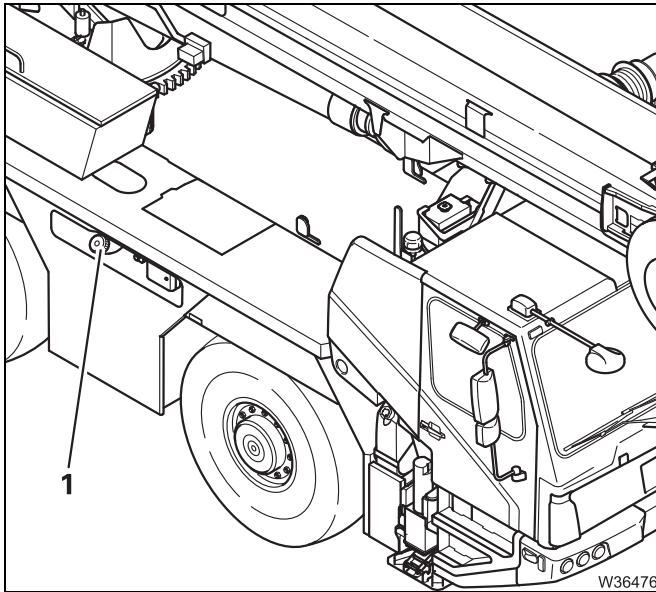
Check it when the engine is warm

- Start the engine.
- Let the engine run at idling speed for approx. 5 minutes.
- Switch the engine off.
- Check the coolant level when the engine is warm;  *Checking the coolant level, p. 7 - 22.*

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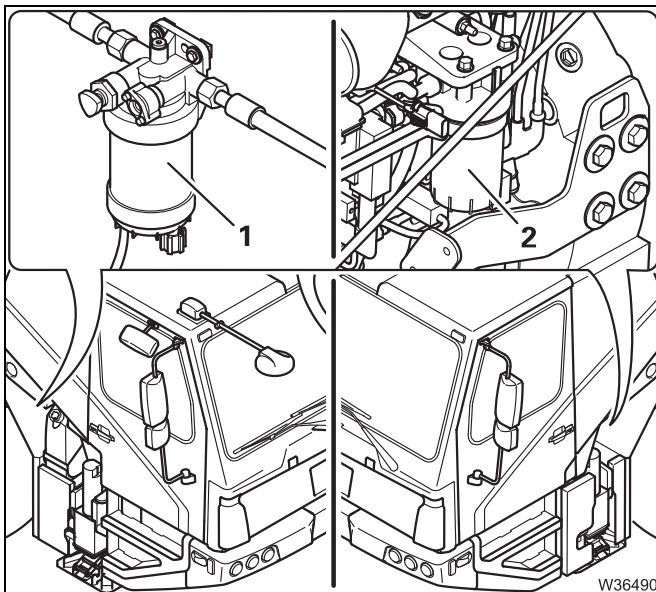
7.4

Fuel system



This section describes the maintenance work for the standard fuel system with a 1-chamber fuel tank (1).

If the truck crane is additionally equipped with a 2-chamber fuel tank, please refer to **Manitowoc Crane Care** for information on the fuel filters required.



The following are installed in the fuel line as standard:


- 1 Fuel filter 1
- 2 Fuel filter 2

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.

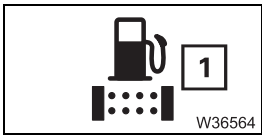
Prerequisites

- The truck crane must be level.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

WIF sensor

Fuel filter 1 is equipped with a chamber in the lower region that collects the separated water.

The sensor emits a signal when the chamber is full (WIF = Water in Fuel).



If the lamp (1) on the instrument panel lights up then you must drain the water from fuel filter 1.

- Where possible, drain the water regularly before the sensor is triggered.
- Note that the quality of the fuel, and thus the water content, can vary greatly with the site.
- **Daily** water draining may be necessary in the case of very low quality fuel.

Draining off water

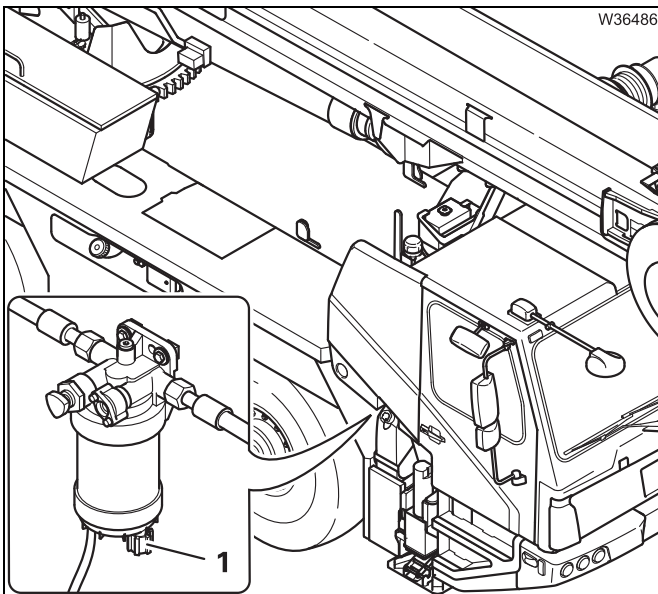


Risk of environmental damage due to leaking consumables!

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

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 6

Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	04182148

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

Prerequisites

- The truck crane must be level.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- If the fuel is dirty: Reduce the maintenance interval.

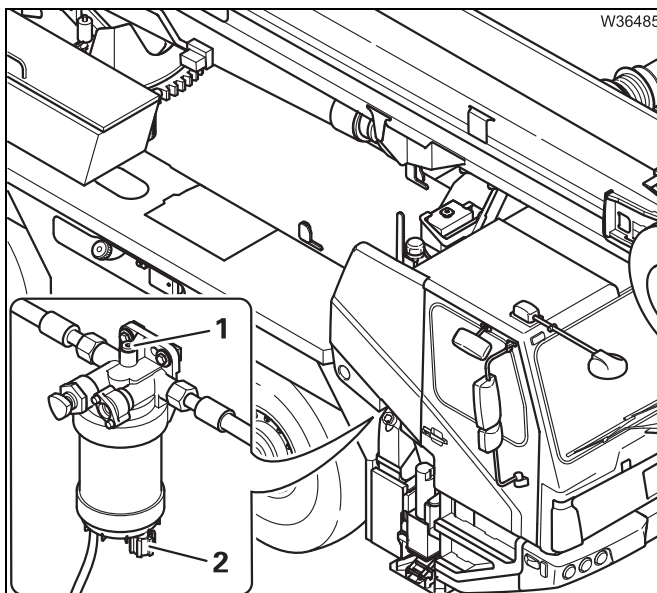
Changing



Risk of environmental damage due to leaking consumables!

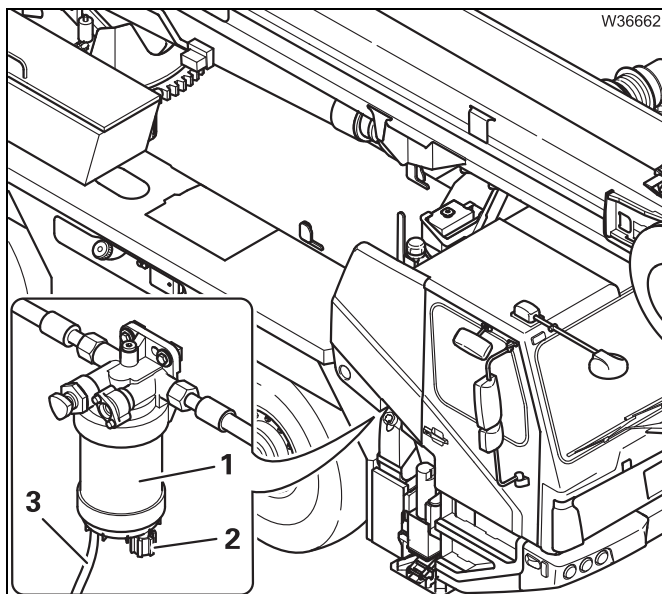
Always let consumables drain into suitable receptacles. Wipe up any consumables that escape.

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

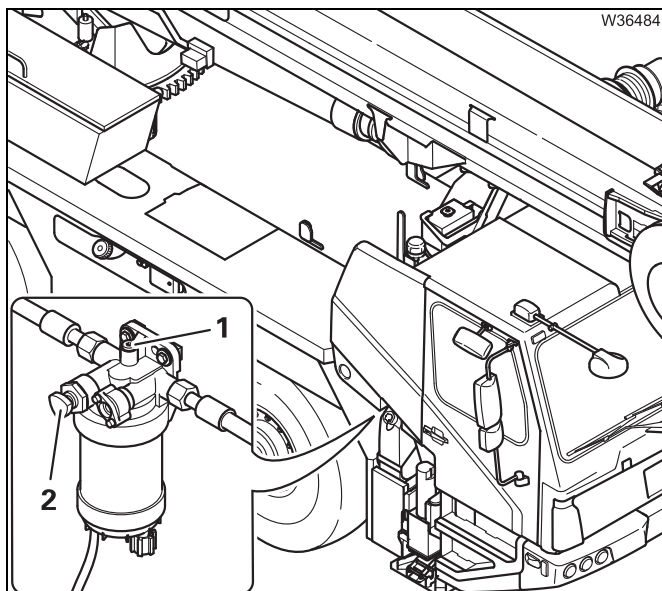


- Place a receptacle underneath the filter.
- Open the screw (1) and the valve (2) and drain the consumable.





- Remove the electrical connecting cable (3) from the water sensor (WIF = Water in Fuel).
- Remove the filter (1).
- Screw on a new filter (1) and tighten it.
- Close the valve (2) manually.
- Attach the electrical connecting cable (3) to the water sensor (WIF = Water in Fuel).



- Actuate the pump (2) until the fluid flowing out of the drain plug (1) no longer contains any bubbles.
- Close the drain plug (1).
- Start the engine and check for leaks.
- Remove the receptacle.



If you have used a clean receptacle, you can refill the fuel tank with the consumable using a filter.
Otherwise dispose of the consumable properly.


7.4.3

Replacing fuel filter 2




M 6

Spare parts and tools

Designation	Quantity	GROVE part no.
Filter	1	04182157

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

Prerequisites

- The truck crane must be level;  *Operating Instructions*.
- The driver's cab is tipped;  p. 7 - 3.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

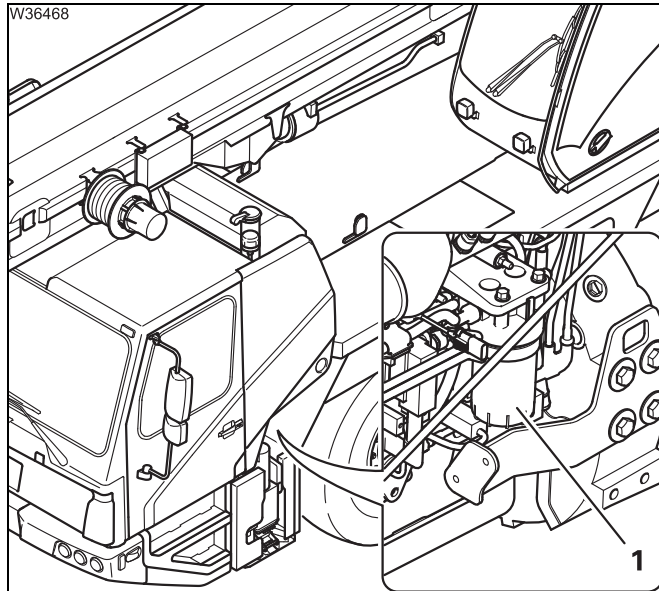


Risk of environmental damage due to leaking consumables!

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

Changing filter 2

Filter 2 is mounted on the left side of the engine.

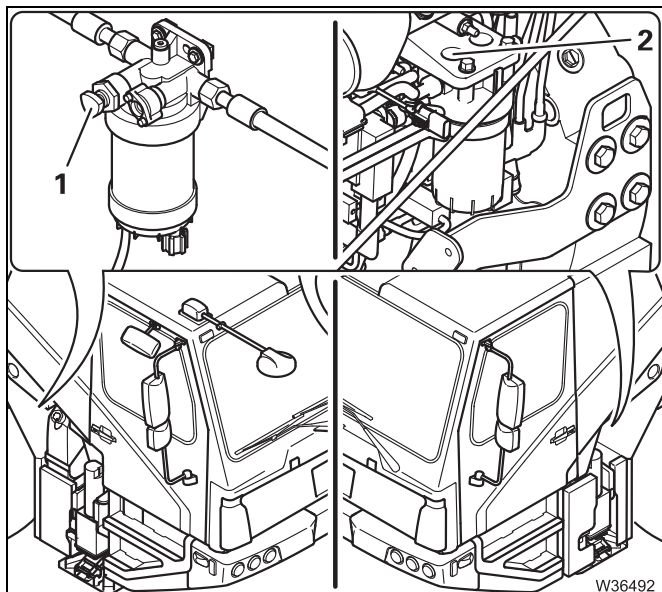


- Place a receptacle under the filter (1).
- Remove the filter (1).
- Let the consumable drain into the receptacle.
- Fill a new filter (1) with clean consumable and screw it up (lightly grease the gasket).



Bleeding the fuel line

If necessary, the fuel line can be bled via the bleed screw on the head of filter 2.




At filter 2

- Open the screw (2) on the head of filter 2.

At filter 1

- Actuate the pump (1) until the fluid flowing out of the drain plug (2) no longer contains any bubbles.
- Close the drain plug (2).
- Remove the receptacle.

- Lower the driver's cab;  p. 7 - 3.
- Start the engine and check for leaks.



If you have used a clean receptacle, you can refill the fuel tank with the consumable using a filter.
Otherwise dispose of the consumable properly.



7.5

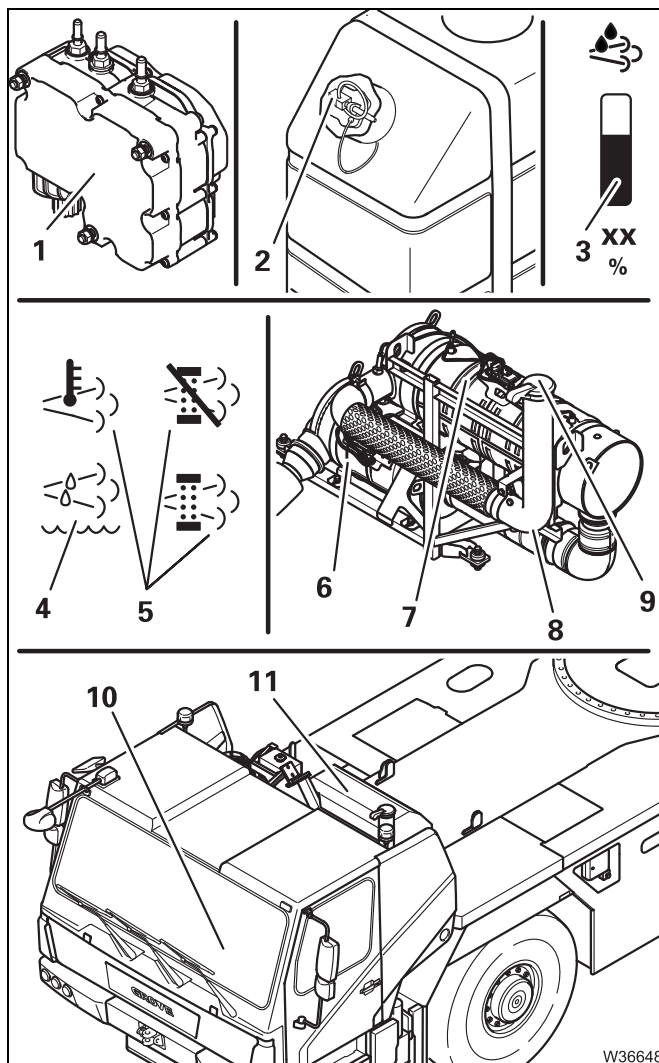
Exhaust system with exhaust emission control

Overview

To adhere to the exhaust emission regulations, you are only permitted to drive the crane with the **multi-stage exhaust system** consisting of a **DOC catalytic converter, DPF particle filter and SCR catalytic converter** (DOC = Diesel Oxidation Catalyst, DPF = Diesel Particulate Filter, SCR = Selective Catalytic Reduction).

The exhaust gas is cleaned with an **AdBlue system (DEF)**. **AdBlue (DEF) (Diesel Exhaust Fluid)** from the AdBlue tank is injected into the mixing tube in the exhaust system for this.

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 Instructions*,  *Engine manufacturer's documentation*.



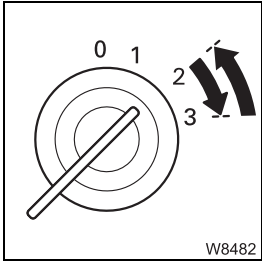
AdBlue system

- 1** Pump unit for pumping AdBlue to the dosing unit on the diesel engine and for pumping engine coolant for preheating the AdBlue tank.
- 2** AdBlue tank
- 3** Tank gauge, AdBlue tank
- 4** Warning lamp: AdBlue system fault.
- 5** 3 warning lamps: Exhaust gas temperature, active/passive regeneration of the exhaust gas filter.
- 6** Tail pipe: DOC catalytic converter and DPF particle filter.
- 7** Tail pipe: SCR catalytic converter.
- 8** AdBlue mixing tube with injection nozzle For injecting the mixture of AdBlue and compressed air.
- 9** Exhaust end pipe with rain flap
- 10** Diesel engine with dosing unit for AdBlue (compressed air supply) and a solenoid valve for pre-heating the AdBlue tank using engine coolant.
- 11** Heat shield

7.5.1 Checking the AdBlue tank level

D

Checking



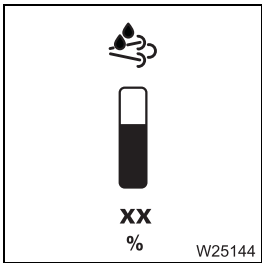
W8482



W36555

- Start the engine.

- Check that the symbol on the **instrument panel** is no longer lit. When the symbol lights up the filling level is already at the reserve level and when the symbol flashes then a malfunction is present; *Operating Instructions*.



W25144

The Warning submenu of the *CCS (Crane Control System)* shows the level in the AdBlue tank.

- Open the Warning submenu.
- Check the symbol for the level in the AdBlue tank.
The tank has a maximum filling volume of approx. 37.8 l (10 gal).
- Refill the tank when the level falls below 25% at the very latest.



Depending on the site of the truck crane is used, it may be sensible to carry additional canisters of AdBlue.

7.5.2 Filling up with AdBlue

Consumable and tools


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

- As required: 2 canisters of about 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 not be running and must be secured against unauthorised use; p. 2 - 3.

Filling up

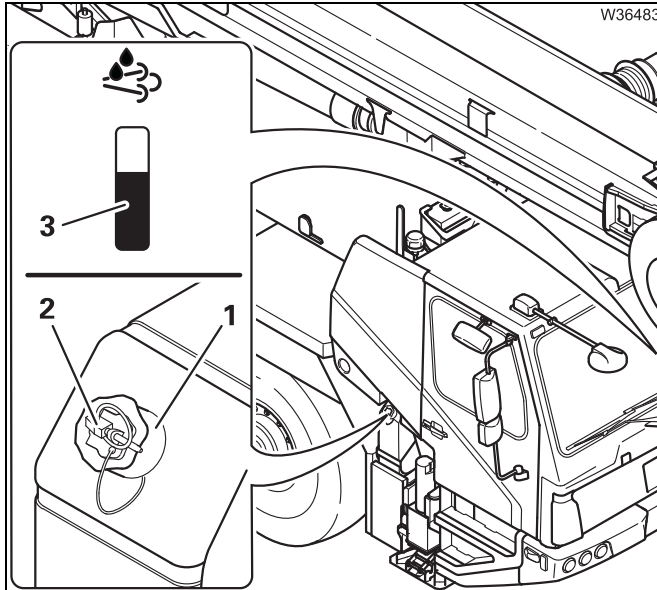
- Find out about filling up in the operating manual and note the warnings;  *Operating Instructions*.




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.
- Secure the cap with the retaining pin (2).
- Check the filling level on the CCS display (3);  p. 7 - 40.

7.5.3


Check the exhaust system for external damage

M 1

Spare parts and tools

Designation	Quantity	GROVE part no.
Entire exhaust system (kit)	1	04192288
– DOC catalytic converter + DPF particle filter	1	04180232
– AdBlue mixing tube	1	04168809
– SCR catalytic converter	1	04180235

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The engine and the exhaust system must be cool.

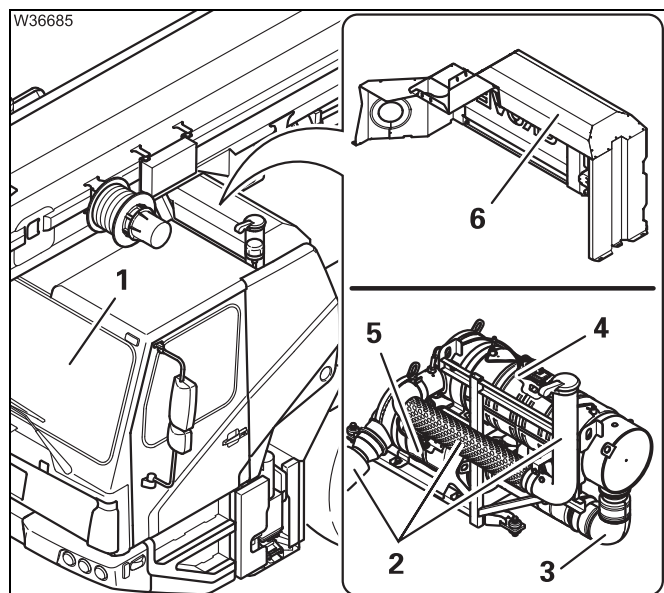


Checking




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. Be sure not to touch any hot parts.



- Remove the heat shield (6).
- Check the exhaust system (2) for damage, from the engine (1) through the DOC catalytic converter with DPF particle filter (5), the AdBlue mixing pipe (3), the SCR catalytic converter (4) up to the end pipe. The exhaust pipes (2) may not have any loose clamps, 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 mixing tube (3) at the inclined filler neck for injecting AdBlue for external damage.

After checking

- Start the engine.
- Check the symbol for the AdBlue system on the instrument panel and the CCS (*Crane Control System*) control unit;  p. 7 - 40.
- Check whether exhaust gases are leaking from any damaged places in the exhaust system.
- Switch the engine off and allow it to cool down.
- Attach the heat shield (6).

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

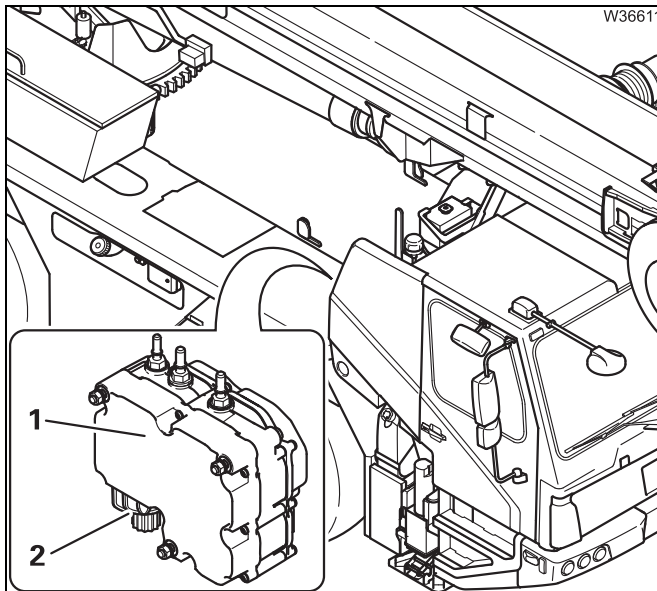
M 12

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 correct operation; *Overview, p. 7 - 39.*
- 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

A diagnostic unit and special tools are required for this work.
The operating pressure must be discharged before replacing the filters!

- Have the AdBlue filter (2) in the pump unit (1) changed.
 GROVE part number: 04182142.

The operating pressure must be adjusted anew after replacing the filters!

- Have the electrically heated AdBlue lines at the pump unit (1) checked for correct operation.

The AdBlue tank and pump unit can be fitted with an insulation hood as extra equipment.

- Have the insulation hood checked for damage and for tight fitting on the AdBlue tank. The insulation hood prevents the AdBlue tank freezing up.





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 04156032.

- Use only the suitable filter cartridge; *Replacing the filter cartridge of the compressed air drier*, p. 7 - 81.

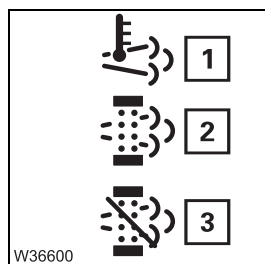
7.5.5

Having the soot particle filter system checked

M 12

Checking daily

The exhaust system contains a soot particle filter (DPF particle filter).



- Check the operating status of the exhaust system on a **daily basis** by checking the lamps (1) to (3) on the instrument panel in the driver's cab; *Operating Instructions*.
 - High exhaust gas temperature warning lamp (1),
 - passive regeneration (2),
 - Active regeneration (3).



Under high loads (intensive crane operation for longer periods of time), the **passive** regeneration system ensures permanent conversion of the soot particles into gases that are then expelled. Under long periods of operation at low loads (city traffic) the warning lights indicate that the system has switched over to **active** regeneration.

Active regeneration switches on automatically when the soot particle filter is in danger of clogging. When this occurs, more diesel is injected into the engine, which significantly increases the exhaust gas temperature and burns the soot filter free of soot.

Active regeneration can be manually suppressed (3), and specific soot-burning cycles are available; *Operating Instructions*; *Engine manufacturer's documentation*.

The soot particles are not completely burned away without residue, so that the particulate filter and catalytic converter in the exhaust system must be replaced after a long period of operation; p. 7 - 45.

Renewal


The maintenance periods can fluctuate greatly depending on the truck crane operating conditions, fuel quality, and engine oil quality.

Under good operating conditions the soot particle filter and catalytic converter must be replaced after five years (**Y 5**), 100,000 km (62,000 mi), or 5,000 operating hours (**5,000 oper. hrs.**).

Service partner

- Have the particulate filter and catalytic converter replaced by service partners.
Information can be obtained from **Manitowoc Crane Care**.

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The exhaust system has cooled down.



Risk of burns if the exhaust system is hot!

During operation, the exhaust system can heat up to 600 °C (1,100 °F). Wear suitable gloves and/or wait until the exhaust system has cooled down. Be sure not to touch any hot parts.



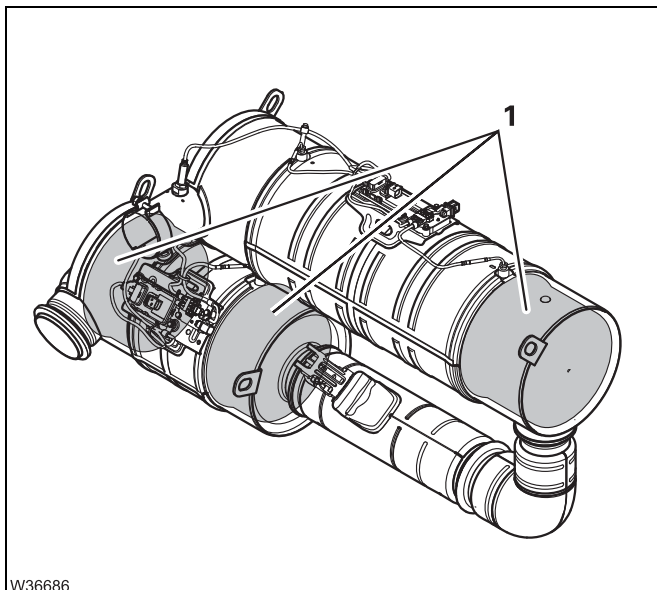
Soot particles can be a health hazard!

Soot particles are suspected of being hazardous to health. Wear appropriate dust respirator masks and be careful not to breathe in or ingest soot particles.



Risk of polluting the environment!

Collect the combustion residues from the particulate filter and catalytic converter in a suitable receptacle and dispose of them according to the relevant regulations.



Overview

The filters/catalytic converters (**1**) are located internally in different sections of the exhaust system.

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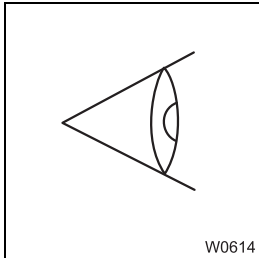
7.6

Transmission

7.6.1

General inspection

W



- Pay attention to any unusual running noises from the transmission.
- Check the transmission and the connections for leaks. If consumables are leaking; Check the oil level, p. 7 - 47.
- Check that pipes and hoses are tightly connected and undamaged.

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

7.6.2

Check the oil level

M 12

Spare parts and tools

Designation	Quantity	GROVE part no.
O-ring	1	04155708

- Receptacle, approx. 5 l (1.5 gal); p. 2 - 4.
- Torque wrench for a torque of 60 Nm (44.2 lbf ft).

Prerequisites

- The gear oil has cooled down (below 40 °C (104 °F)).
- The truck crane must be raised on outriggers or parked over an inspection pit.
- The truck crane must be level.
- The truck crane is not running and is secured against unauthorised use; p. 2 - 3.

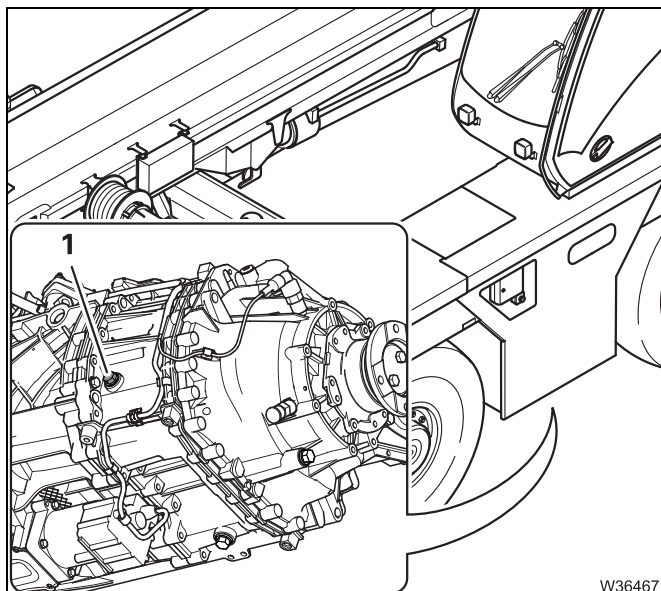


Check the oil level



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. Wait until the oil cools down (below 40 °C (104 °F)).



- Unscrew the screw (1).
- Check the oil level; it must reach to the lower edge of the opening.
- Replace the O-ring and tighten the drain plug – torque 60 Nm (44.2 lbf ft).

If the oil level is too low

- Top up with oil; ►► p. 7 - 50.

W36467

7.6.3

Changing the oil

Y 2


Oil, spare parts and tools

Gear oil in litres (gal)	Specification Classification	GROVE part no.
12.5 (3.3)	ZF TE-ML02 Ecofluid M ZF; synthetic, Do not mix this with mineral oil!	03325153

Designation	Quantity	GROVE part no.
Gasket 22 x 27 Cu DIN 7603	2	00117142
O-ring	1	04155708

- Receptacle, approx. 15 l (4 gal); ►► p. 2 - 4.
- Torque wrench for a torque of 60 Nm (44.2 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 be level.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Draining oil



Risk of scalding from gear oil at operating temperature!

You could scald 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.

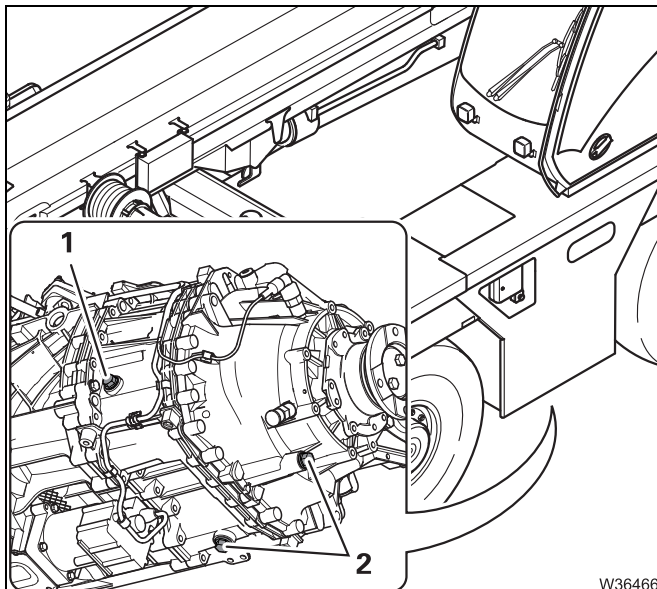


Risk of environmental damage due to leaking consumables!

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

Store/dispose of consumables and any soaked equipment properly.

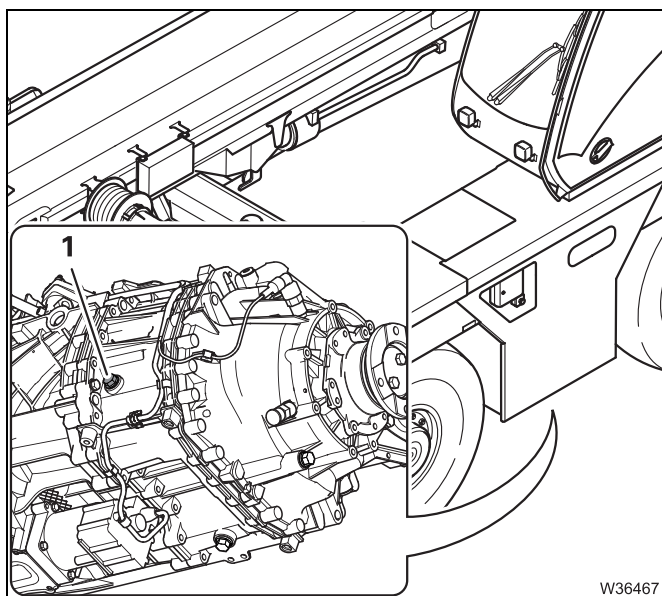
Ask about the applicable regulations.



- Place a container under the drain plugs (2).
- Unscrew the drain plugs (1) and (2) and allow the oil to drain.
- Clean the drain plugs.
- Replace the gasket and tighten the drain plugs (2) – torque 60 Nm (44.2 lbf ft).

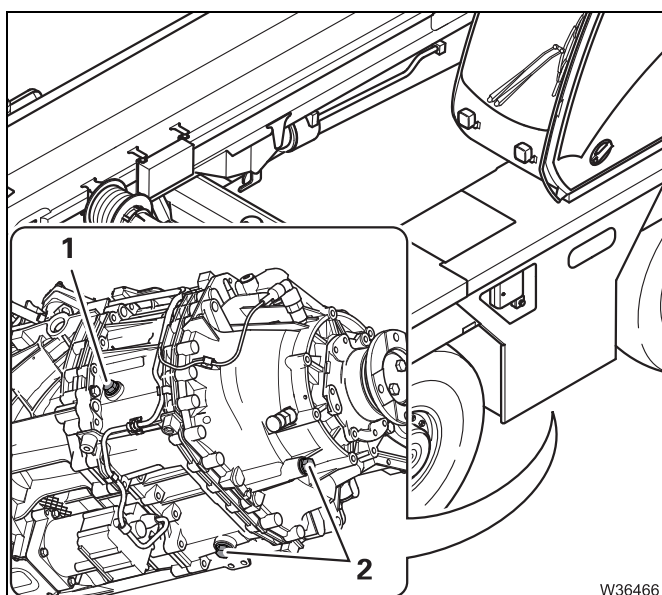


Topping up the oil



- Fill the oil up to the lower edge of the opening.
- Replace the gasket and tighten the drain plug (1) – torque 60 Nm (44.2 lbf ft).

Checks after the oil change



After changing oil, check for leakage:


- Start the engine and let it idle in shift position **N**.
- Check the transmission and screws (1) and (2) for leakage.



- Check that the lamp (1) on the front instrument panel has gone out (**no transmission fault**); p. 7 - 11.

7.7

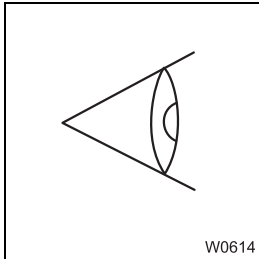
Axle lines



- Comply also with the running-in instructions;  p. 4 - 1.

7.7.1

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 - 51,
 -  *Final drives - Checking the oil level*, p. 7 - 55.
- Check that pipes and hoses are tightly connected and undamaged.

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

7.7.2

Axle centre drives – checking the oil level


M 1

Spare parts and tools

for drive	Designation	Quantity	GROVE part no.
6 x 4 x 6	Gasket 30 x 36 Cu DIN 7603	2	00117151
	Gasket 24 x 29 Cu DIN 7603	1	00117145
6 x 6 x 6 ¹⁾	Gasket 30 x 36 Cu DIN 7603	3	00117151
	Gasket 24 x 29 Cu DIN 7603	1	00117145

¹⁾ Additional equipment (1st axle line driven)

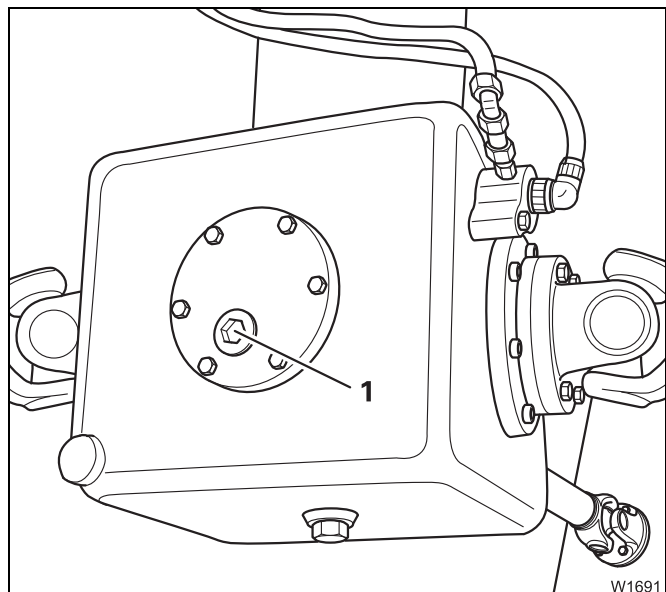
Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.




1st and 3rd axle line

Axle centre drive on the 1st Axle line only present with a 6 x 6 x 6 drive.

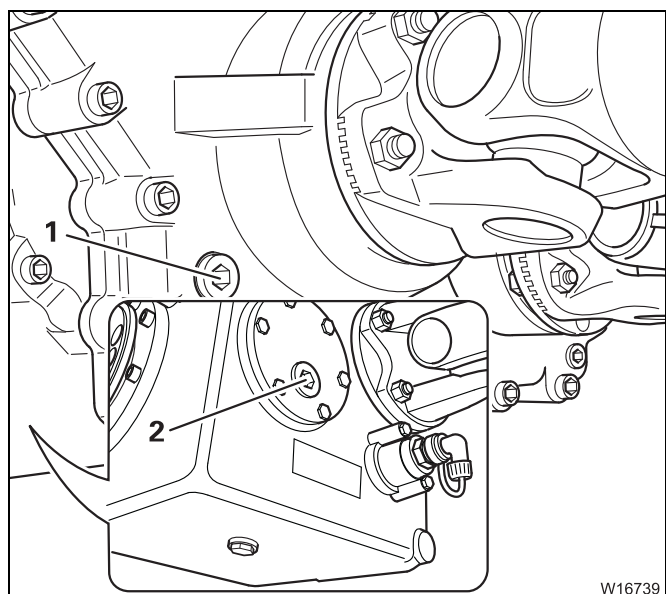


- Unscrew the screw (1).
- Check that the oil reaches the lower edge of the opening.
- Fit a new gasket and tighten the screw.

If the oil level is too low

- Top up with oil;  p. 7 - 54.


2nd axle line



The drive has two oil chambers.

- Remove the drain plugs (1) and (2).
- Check that the oil reaches the lower edge of the openings.
- Fit new gaskets and tighten the screws.

If the oil level is too low

- Top up with oil;  p. 7 - 54.

7.7.3

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 1+3: 13.0 (3.5) each	C - LPF	MIL-L 2105 B API-GL-5 Viscosity: Hyp SAE 90 ISO - VG 220	00552891
Axle line 2: 16.2 (4.3)			

for drive	Designation	Quantity	GROVE part no.
6 x 4 x 6	Gasket 30 x 36 Cu DIN 7603	2	00117151
	Gasket 24 x 29 Cu DIN 7603	1	00117145
	Gasket 36 x 42 Cu DIN 7603	2	01371208
	Gasket 16 x 20 Cu DIN 7603	1	00117134
6 x 6 x 6 ¹⁾	Gasket 30 x 36 Cu DIN 7603	3	00117151
	Gasket 24 x 29 Cu DIN 7603	1	00117145
	Gasket 36 x 42 Cu DIN 7603	3	01371208
	Gasket 16 x 20 Cu DIN 7603	1	00117134

¹⁾ Additional equipment (1st axle line driven)

– 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 not be running and must be 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 escape.

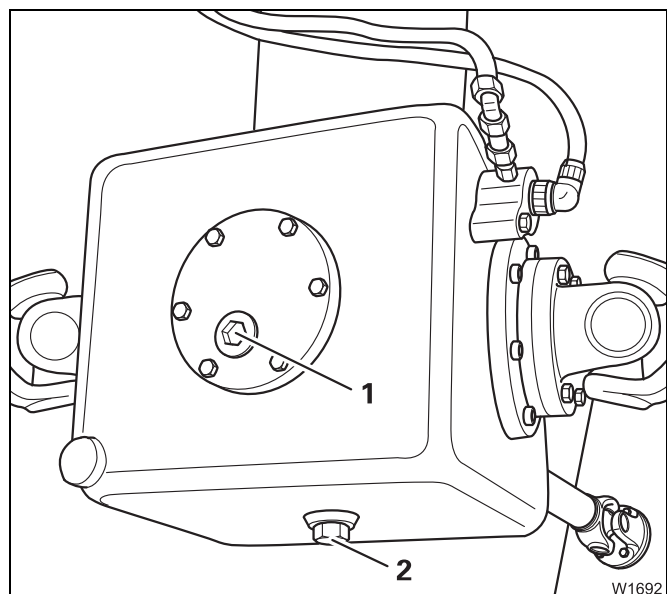
Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.



1st and 3rd axle line

Axle centre drive on the 1st Axle line only present with a 6 x 6 x 6 drive.



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

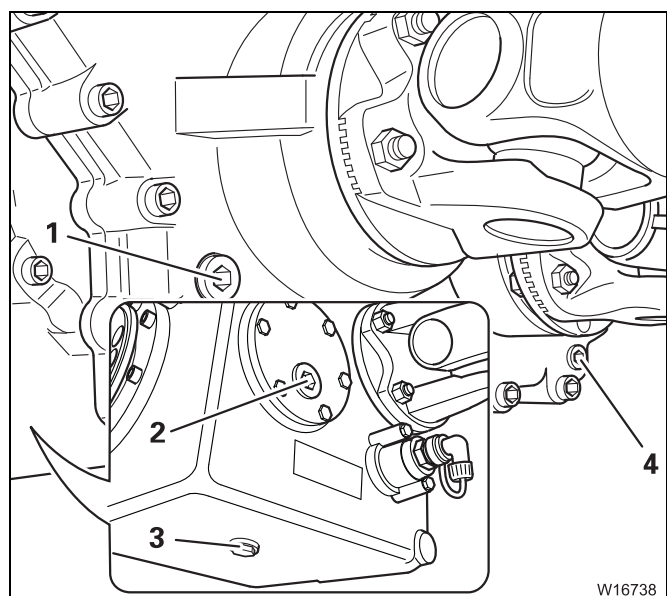
2nd axle line

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 the oil tanks from being overfilled and thus the oil from overheating.



- Place a receptacle under the screws (3) and (4).
- Remove the drain plugs (1), (2), (3) and (4) and let the oil drain off.
- Fit new gaskets and tighten the screws (3) and (4).
- Top up oil through opening (1) until it flows out of the opening (2).
- Fit new gaskets and tighten the screws (1) and (2).

7.7.4

Final drives - Checking the oil level


M 1

Spare parts and tools

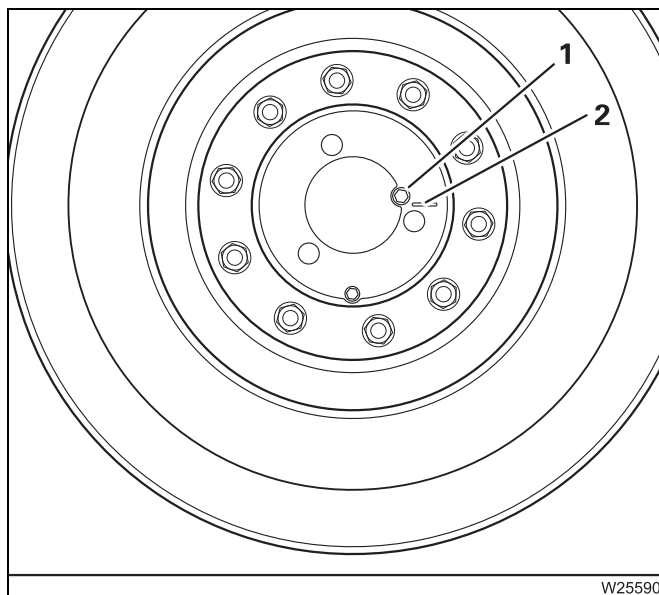
for drive	Designation	Quantity	GROVE part no.
6 x 4 x 6	Gasket 24 x 30 Cu DIN 7603	4	04181265
6 x 6 x 6 ¹⁾	Gasket 24 x 30 Cu DIN 7603	6	04181265

¹⁾ Additional equipment (1st axle line driven)

Prerequisites


- The truck crane must be raised on outriggers and must be level.
- The engine must not be running and must be 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 marking (2) is horizontal and is on the right, next to the centre of the axle.
- Unscrew the screw (1).
- Check that the oil level is at the mark (2).
- Fit a new gasket and tighten the screw.

If the oil level is too low

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

7.7.5

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: 1.4 (0.4)	C - LPF	MIL-L 2105 B API-GL-5 Viscosity: Hyp SAE 90 ISO - VG 220	00552891

for drive	Designation	Quantity	GROVE part no.
6 x 4 x 6	Gasket 24 x 30 Cu DIN 7603	4	04181265
	Gasket 16 x 20 Cu DIN 7603	4	00117134
6 x 6 x 6 ¹⁾	Gasket 24 x 30 Cu DIN 7603	6	04181265
	Gasket 16 x 20 Cu DIN 7603	6	00117134

¹⁾ Additional equipment (1st axle line driven).

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

Prerequisites

- The truck crane must be raised on outriggers.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The parking brake must be released.



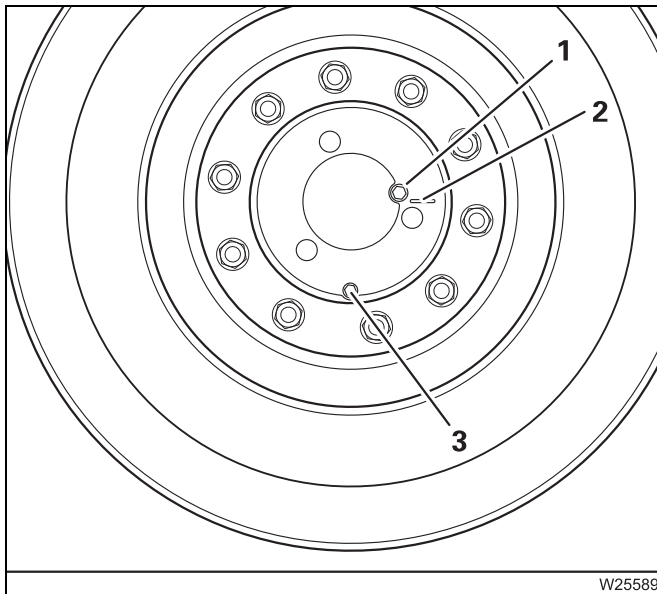
Risk of environmental damage due to leaking consumables!

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

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

Draining oil

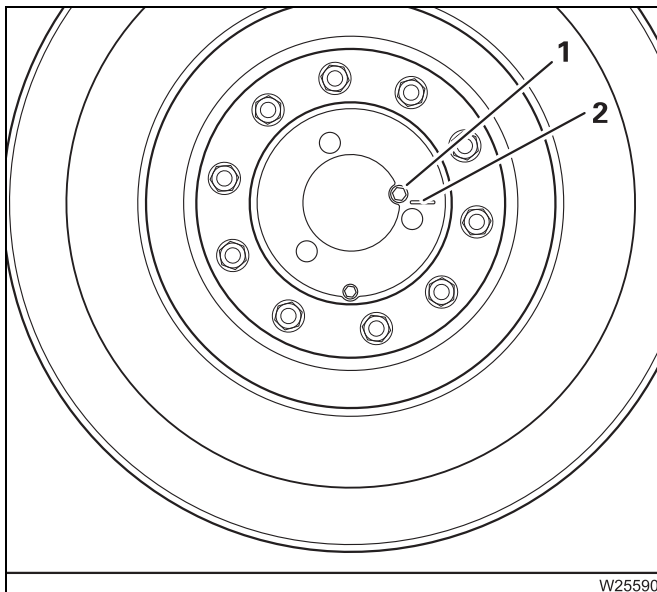


- Change the oil on all final drives in the same way.
- Turn the wheel until the marking (2) is horizontal and to the right – the screw (3) points downwards.
- Use a drain channel and place a container under the screw (3).

Unscrew the drain plugs (1) and (3) and allow the oil to drain.

- Fit a new gasket and tighten the screw (3).

Topping up the oil



- Check that the marking (2) is still horizontal.
- Fill the oil up to the lower edge of the opening (marking 2).
- Fit a new gasket and tighten the screw (1).

7.7.6 **Lubricating the drive shafts in the axle lines** **M 1**



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

Grease, spare parts, tools

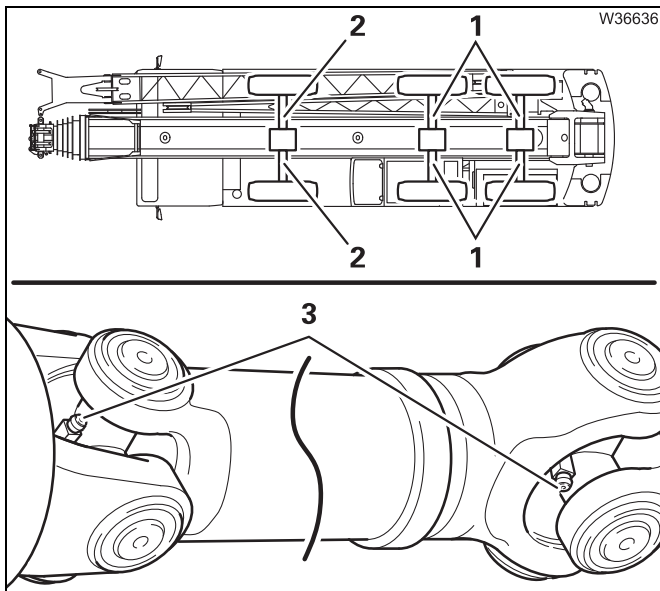
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Grease gun from the tool set.

Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must not be running and must be 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



Drive shafts (2) are fitted only to the 6 x 6 x 6 drive.

- Check which drive 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 any grease that has escaped.

7.7.7

Lubricating longitudinal drive shafts

M 6



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

Grease, spare parts, tools

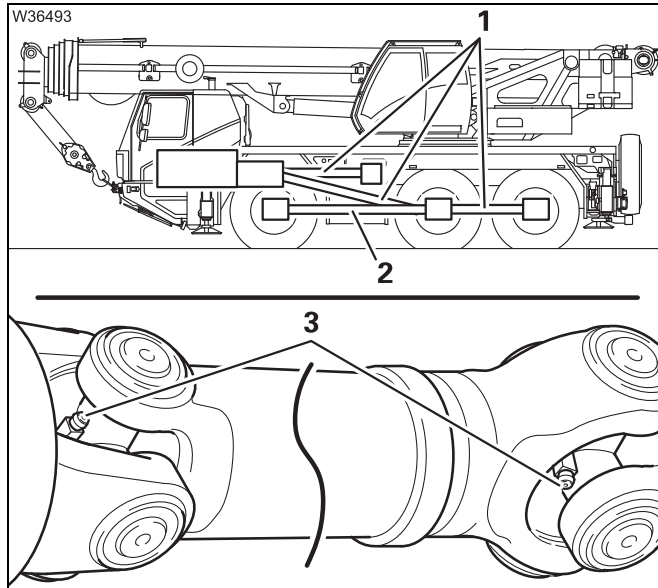
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Grease gun from the tool set.

Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must not be running and must be secured against unauthorised use; ► p. 2 - 3.

Greasing



The drive shaft (2) is fitted only to the 6 x 6 x 6 drive.

- Check which drive 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 any grease that has escaped.

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7.8


Wheels

7.8.1

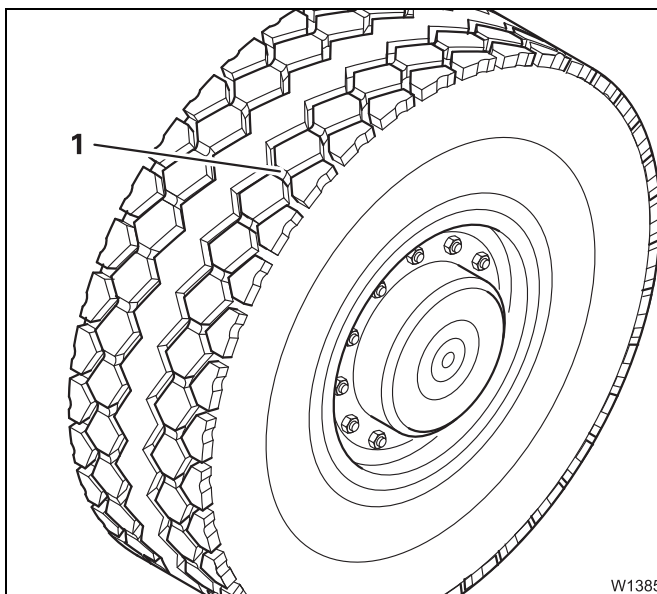
Checking the tyres for damage


D

Prerequisites

- The truck crane must be raised on outriggers.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The parking brake must be released.

Checking



- Check all tyres and the spare wheel for:
 - Broken off tread blocks,
 - Dents,
 - Areas of uneven wear,
 - Whether the wear mark (1) has been reached.
- Replace any damaged tyres.
- If the tyres show varying degrees of wear, change the wheels;  *Changing the wheels*, p. 7 - 64.



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.

7.8.2

Checking the tyre pressure

W



Risk of damage to the tyres!

The air pressure increases when the tyres become hot during driving.
Never release the increased air pressure of tyres at operating temperature!
Always check the air pressure in on-road driving mode with cold tyres.

- Check the air pressure using the following table.

Tyres	Air pressure in bar (psi) with cold tyres
14.00 R 25 385/95 R 25	10.0 (145)
16.00 R 25 445/95 R 25	9.0 (131)
20.50 R 25 525/80 R 25	7.0 (102)
all Michelin X-Crane all Michelin X-Crane +	9.0 (131)

7.8.3

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	10	01207756
Wheel nut with pressure plate (ALCOA) for aluminium rims	10	7659100000
Wheel nut with pressure plate (BIMECC) for aluminium rims	10	03246867
Protective cap on the wheel nut (only for aluminium rims)	10	80038328

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

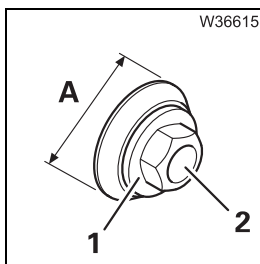
In the case of Aluminium rims



Risk of accidents through incorrect wheel nuts!

Incorrect wheel nuts can come loose while driving and cause accidents. You are only permitted to use wheel nuts from the initial equipment manufacturer because the wheel nuts are matched to the diameter of the pressure plate and the thread length of the respective aluminium rim.

Wheel nut type	Diameter (A) of the pressure plate
ALCOA	50 mm (1.97 in)
BIMECC	53 mm (2.09 in)

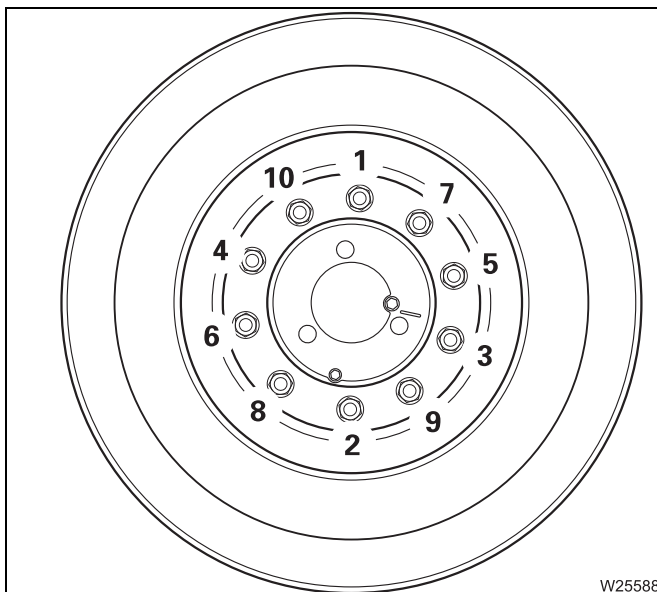


- Check the type of the wheel nuts (1).
- Check the wheel nuts are closed with the protective cap (2).

Prerequisites

- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.

Check 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 the sequence (1-10) for a tight fit – torque 650 Nm (480 lbf ft).

7.8.4

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	10	01207756
Wheel nut with pressure plate for aluminium rims (ALCOA)	10	7659100000
Wheel nut with pressure plate for aluminium rims (BIMECC)	10	03246867

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

Prerequisites

- The engine must not be running and must be 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.

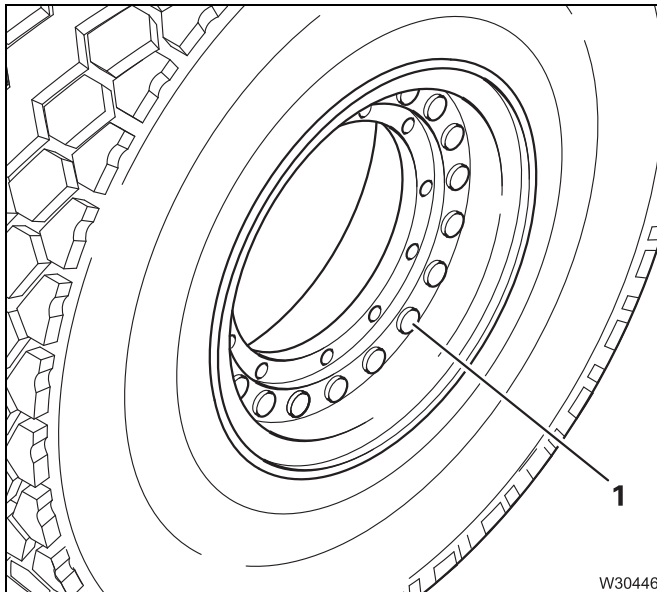
When removing/installing the wheels, observe all the safety instructions and the procedure stated in the operating manual.

- 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, the bolted connection can be recognised by the bolts on the outer face of the wheel rim. On the inner face of the wheel rim are nuts whose tightening torque you must have checked in a specialist workshop;  *Recognising two-piece aluminium rims*, p. 7 - 65.

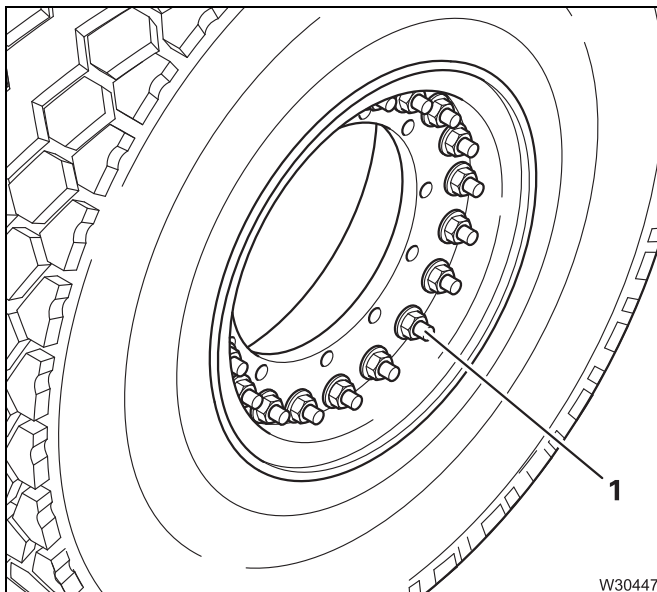
Recognising two-piece aluminium rims



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

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


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

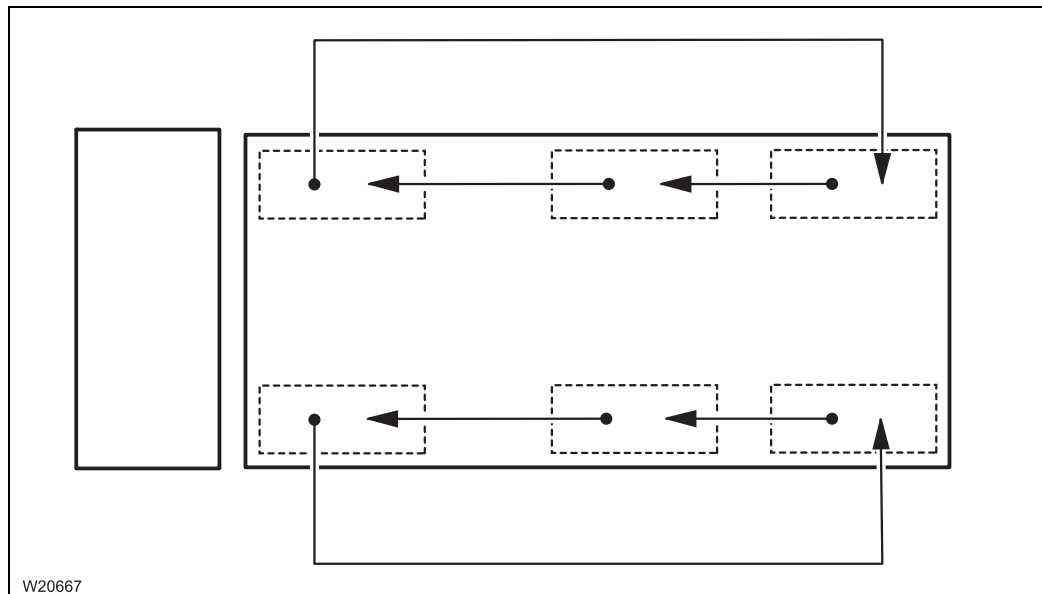


The nuts (1) are on the inner face of the wheel rim.

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



- Mount the wheels on another axle, as shown in the diagram. Replace any damaged parts. Tighten the wheel nuts;  p. 7 - 62.



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/installing 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.

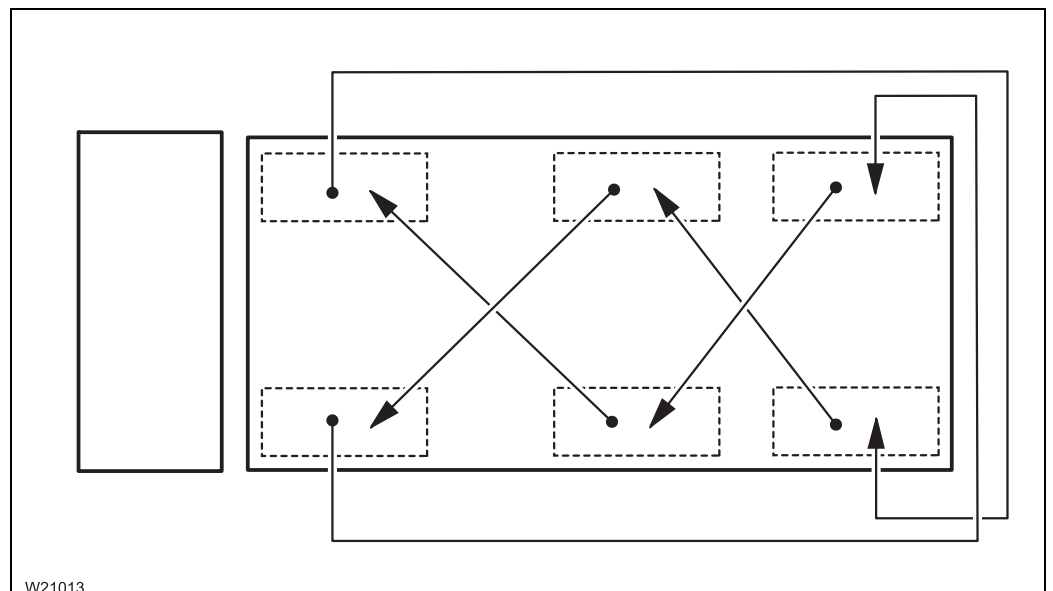


Risk of tyre damage caused by the tyres running in a different direction!

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 wheel 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 - 62.



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7.9

Vehicle brake

7.9.1

Checking brake lining thickness


M 3

Spare parts and tools

Designation	Quantity per axle line	GROVE part no.
1st axle (duplex brake)		
Brake shoe with brake lining	4	03322112
Spring	4	03322110
Brake drum	2	01924699
2nd and 3rd axle line (simplex brake)		
Brake shoe with brake lining	4	03324293
Spring	4	02315398
Brake drum	2	03324286


- Measuring tool for brake linings.

Prerequisites

- The truck crane must be parked over an inspection pit.
- The truck crane must be raised on outriggers.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- 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 approval of the truck crane and no claims of liability for damage can then be accepted.

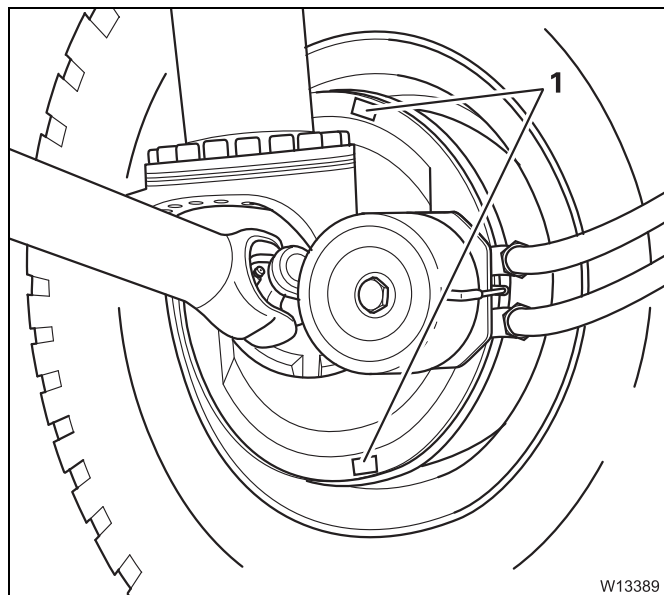
All repair work on the vehicle brakes may only be performed by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop with specially trained repair crew.

- Perform **only maintenance work**;  *Checking*, p. 7 - 70.



Checking

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



- Check the brake lining thickness from the inside at the openings (1).

If the brake lining thickness has worn down to the wear marks (stepped edges or grooves) or if the brake lining thickness has worn down to only 6 mm (0.25 in):

- Have the brake linings replaced; *Having repairs performed*, p. 7 - 70.
- Close the openings using the covers.

Having repairs performed

- **Do not perform repair work** on the vehicle brakes; *Safety instructions*, p. 7 - 69.
- 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 - 69.



Risk of accidents due to uneven braking!

If the brake linings are only replaced on one side of the axle line then the wheels have an uneven braking force.

Always have the brake linings replaced on both ends of the axle line.

Allow the brakes to run in

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.

7.10 Suspension

7.10.1 Suspension struts – checking the oil level



M 1

Oil, spare parts,
tools

Oil in litres (gal)	Designation	GROVE part no.
for each suspen- sion strut: 1.5 (0.4)	Rivolta S.K.D. gear oil 170	02310863

- Press with connected hose (from the toolbox).

Prerequisites

- The engine must not be running and must be 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 Instructions*.



Risk of damage due to faulty suspension struts!

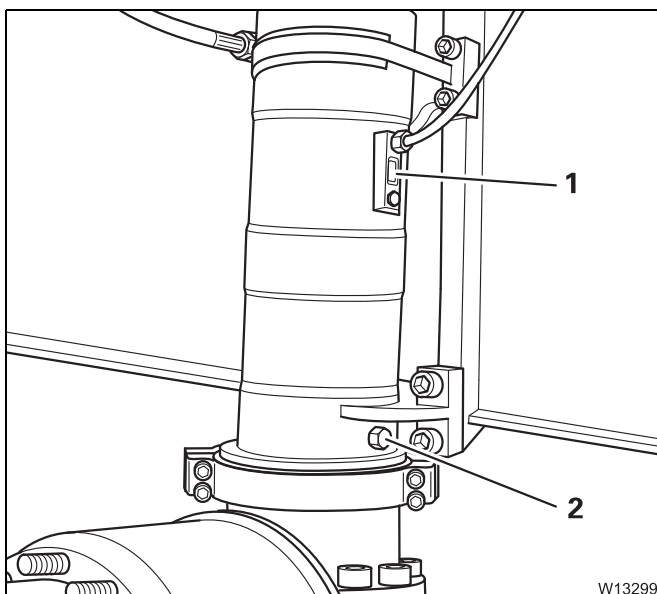
If the oil level is above the upper marking on the sight glass, the suspension strut is faulty and must be replaced.

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. Do not fill oil through the inspection glass connections. If you do this, the oil will not reach all the lubricating points.



- Check that oil is visible in the middle 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 sight glass.
- Remove the hose and quickly close the connection (2).

7.10.2



Suspension struts – checking the fastening


M 1

Spare parts and tools

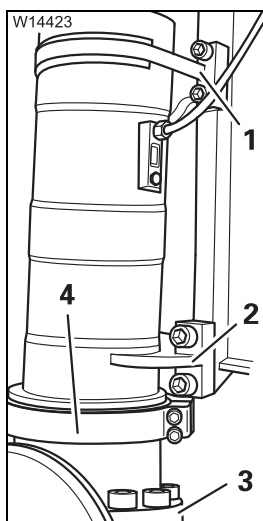
- Torque wrench for torques up to 900 Nm (664 lbf ft).

Prerequisites

- The truck crane must be raised on outriggers;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The wheels must have been removed.

- Check that 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 lever.



7.10.3

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 enabling the suspension locking system!

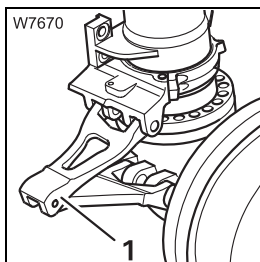
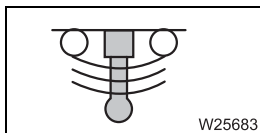
When the suspension is switched on, the wheels drop down suddenly. Ensure that nobody is in close proximity to the wheels when you switch on the suspension.





Risk of damage to the tyres!

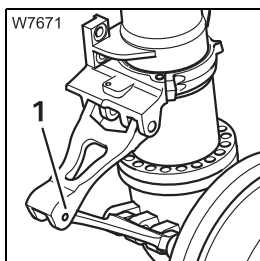
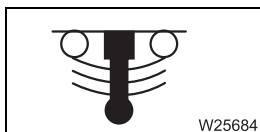
Remove sharp-edged or pointed objects from below the wheels before switching on the suspension. In this way you prevent the tyres from bursting or being damaged when the wheels come down.

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



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

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



- Check that 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.

7.10.4

Pressure accumulator – checking the gas pressure

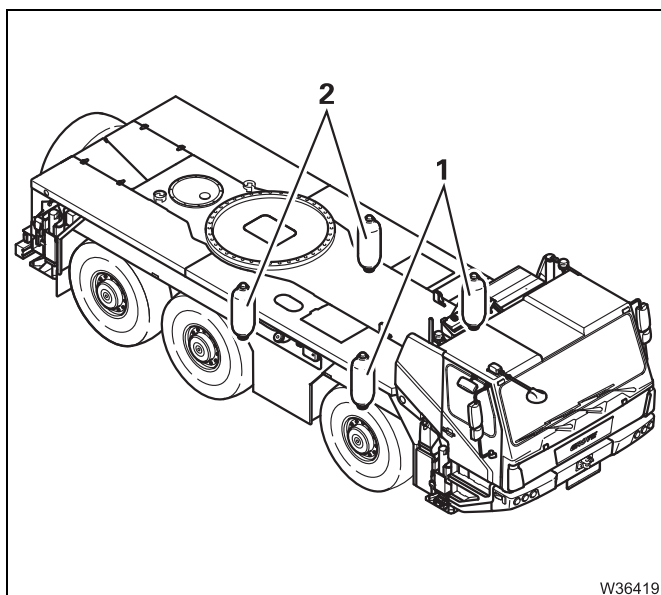
M 12

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.



The suspension has integrated pressure accumulators (1) and (2) that contain nitrogen.

The filling pressure at 20 °C (68 °F) is:

- | | |
|---|------------------|
| 1 | 60 bar (870 psi) |
| 2 | 65 bar (943 psi) |

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

7.11

Steering

7.11.1

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 the oil if necessary;  *Check the oil level*, p. 7 - 83.

After changing pipes and hose lines

- Bleed the hydraulic system;  *Bleeding the hydraulic system*, p. 7 - 97.

If damage cannot be rectified immediately or further damage is likely

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

7.11.2

Lubricating the drag link supporting plate

M 1

The front drag link from the servo steering to the first axle line is brought over a lubricated supporting plate made of synthetic material.



Lubricate the supporting plate every time you clean the truck crane with a high-pressure device or a steam jet device; p. 3 - 2.

Grease, tools

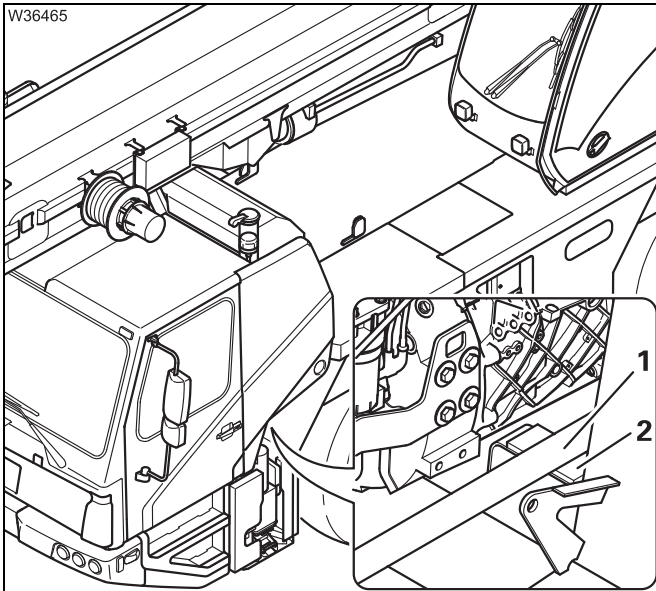
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369

- Brush or spatula.

Prerequisites

- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.
- The ladder under the driver's cab is removed; *Operating Instructions*.

Greasing



- Remove any old grease from the drag link (1) and the supporting plate (2).
- Apply new lubricating grease to the supporting plate using a brush or a spatula.

Checking

If you notice grinding noises of the drag link at a steering angle:

- Lubricate the supporting plate.

7.11.3

Pressure accumulator – checking the gas pressure

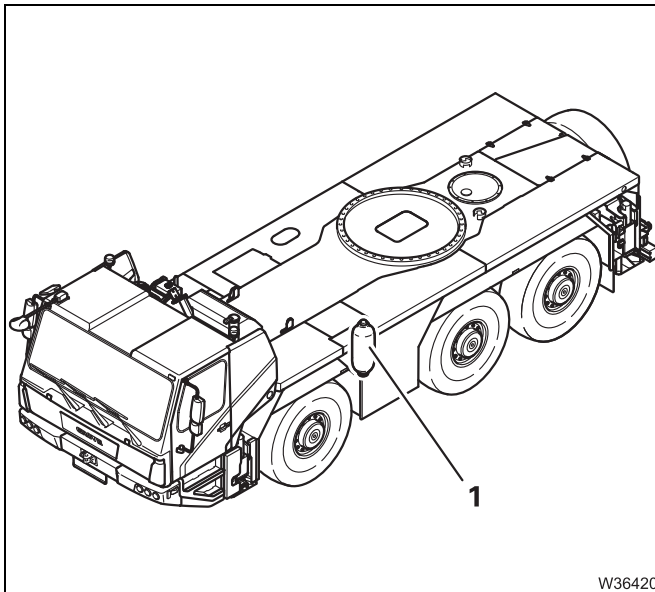
M 12

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.



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

The filling pressure at 20 °C (68 °F) is:

1 100 bar (14,504 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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7.12 Compressed air system



7.12.1 Draining water from the compressed air system

W

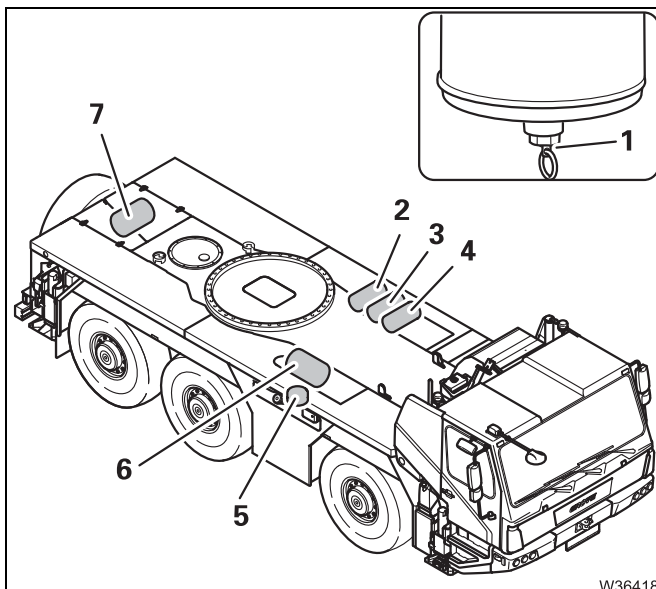
Spare parts and tools

Designation	Quantity	GROVE part no.
Valve	6	01570750
Gasket 22 x 27 Cu DIN 7603	6	00117142

Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The compressed-air supply is completely full;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Draining water from the compressed air system



- Actuate the valves (1) on the air reservoirs (2) to (7).

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.

7.12.2

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.

7.12.3

Replacing the filter cartridge of the compressed air drier

M 12

Spare parts and tools

Designation	Quantity	GROVE part no.
Filter cartridge	1	04156032

- Strap wrench.

Prerequisites

- The truck crane must be raised on outriggers or parked over an inspection pit.
- The engine must not be running and must be secured against unauthorised use; ►► p. 2 - 3.

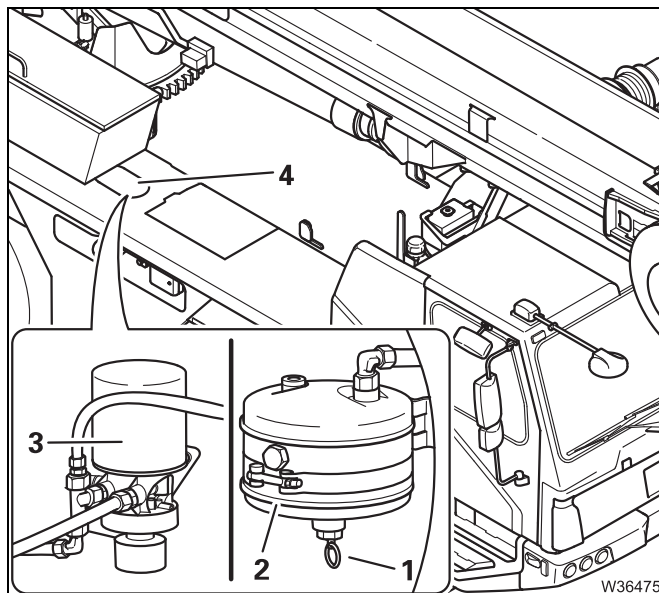
Changing the filter cartridge



Risk of injury from escaping compressed air!

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

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



- Remove the cover (4).
- Use the valve (1) to bleed all the air from the reservoir (2).
- Replace the filter cartridge (3) using the strap wrench (lubricate gasket slightly).
- Fasten the cover (4).

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7.13

Hydraulic system



Risk of environmental damage due to leaking consumables!

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

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

7.13.1

Check the oil level

D

Prerequisites

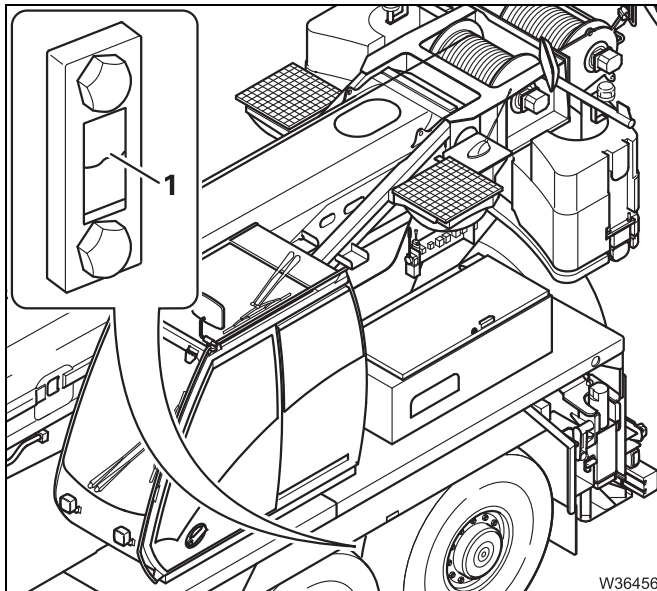
- The truck crane must be aligned horizontally at on-road level; *Operating Instructions*.
- The outriggers are retracted; *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.



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 sight glass (1) before starting operations.

If the oil level is too low

- Top up with oil; p. 7 - 95.

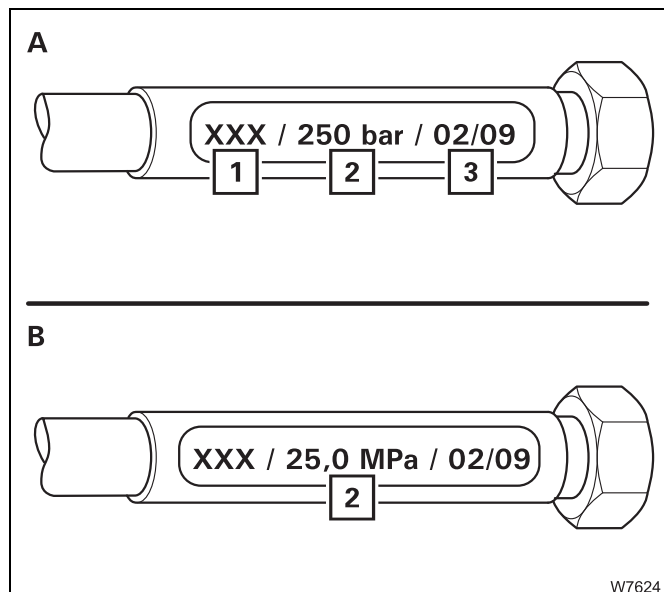
7.13.2

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:

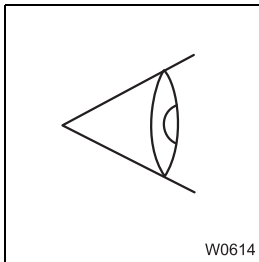
- 1 Manufacturer's designation.
- 2 Maximum operation pressure and unit of measurement (**A**) (e.g. 250 bar (3,626 psi)).
Maximum operation pressure and unit of measurement (**B**) (e.g. 25.0 MPa (3,626 psi)).
- 3 Month and year of manufacture.


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

7.13.3

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;  *Check the oil level*, p. 7 - 83.



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

After parts have been changed

- Bleed the carrier's hydraulic system;  *Bleeding the hydraulic system*, p. 7 - 97.

If damage cannot be rectified immediately or further damage is likely

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

7.13.4

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	2	03142360

Prerequisites

- The truck crane is on outriggers with an outrigger span of at least **6.825 x 4.40 m (22.4 x 14.4 ft)** and is aligned horizontally;
 ▮▮▮▮ *Operating Instructions*.
 The superstructure may then be slewed by 360°;
 ▮▮▮ *Lifting capacity table*.
- The engine must not be running and must be secured against unauthorised use;
 ▮▮▮ p. 2 - 3.

Slewing superstructure



Danger of overturning if the truck crane is free on wheels!

Slewing is permissible only to a limited extent if the truck crane is free-on-wheels. Support the truck crane on outriggers before slewing the superstructure. This prevents the truck crane from overturning when slewing.

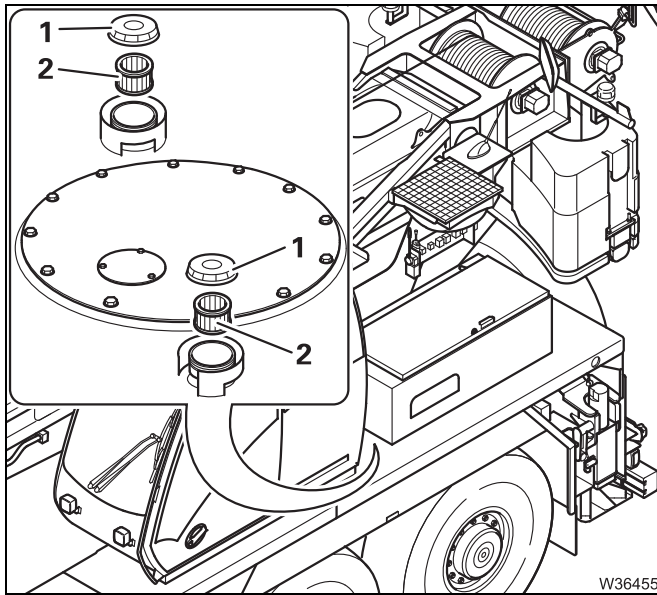
- Support the truck crane with an outrigger span of at least **6.825 x 4.40 m (22.4 x 14.4 ft)** and align it horizontally;
 ▮▮▮▮ *Operating Instructions*.
- Slew the superstructure to the rear;
 ▮▮▮ *Operating Instructions*.
 The ventilation filters are accessible for maintenance work.
- Switch the engine off and secure against unauthorised use.

Changing



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 caps (1) and pull out the filters (2).
- Place the filters in a receptacle.
- Insert the new filters (2).
- Fasten the caps.

7.13.5

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 litres (0.08 gal).

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

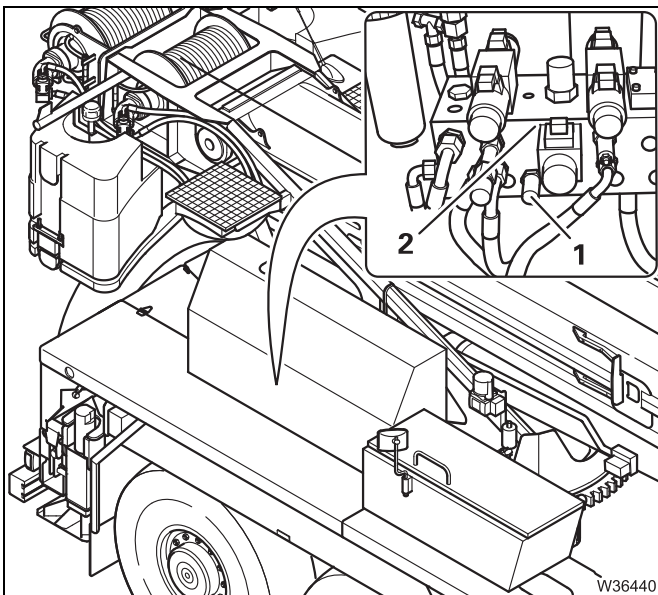
- Receptacle, approx. 5 l (1.5 gal);  p. 2 - 4.

Prerequisites

- The outriggers are retracted.
- The engine must not be running and must be 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 gauge port (1) is located on the control block (2) at the *MLS* marking. Oil can be taken at the gauge port when e.g. the counterweight lifting cylinders are moved to the end stop.

- Clean the gauge port before connecting the hose.

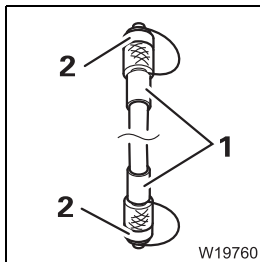
Protecting the hose from dirt



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 then 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



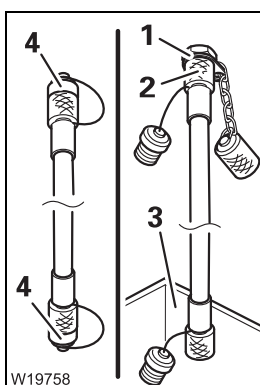
Danger due to escaping hydraulic oil!

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 escape.

Store/dispose of consumables and any soaked equipment properly.

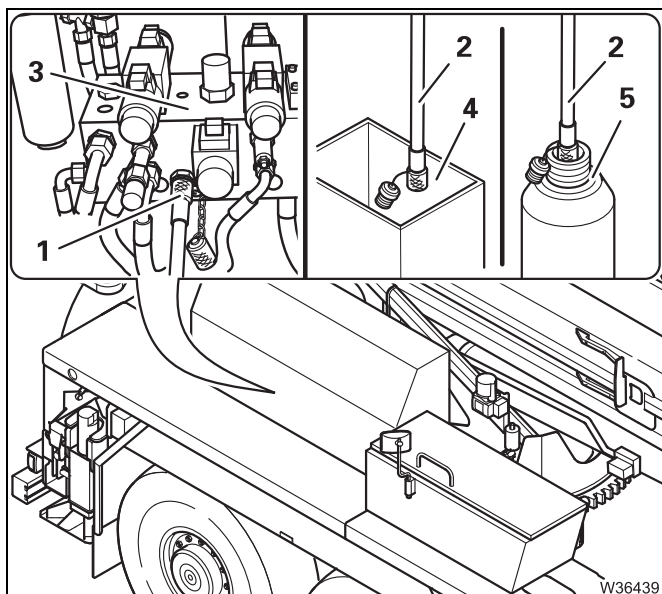
Ask about the applicable regulations.



- Only use a hose with a connecting piece.
- Remove the caps (4).
- Insert 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.



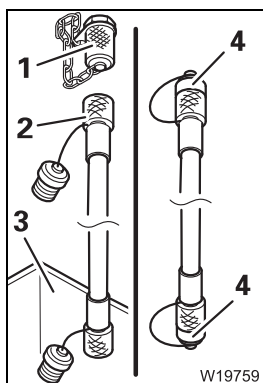
Taking oil samples The hose end (1) is connected to the control block (3). The hose end (2) is in the receptacle (4).



- Start the engine.
- Move the counterweight lifting cylinders to the stop.
- Allow 2 litres (0.5 gal) of oil to flow into the receptacle.
- Switch the engine off and insert the hose end (2) into the sample container (5).
- Start the engine.
- Move the counterweight lifting cylinders to the stop.
- Allow 0.3 litres (0.08 gal) of oil to flow into the sample container.

- Switch the engine off.
- 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.

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,
 - date of sample,
 - 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 condition 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 as per 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 - 93.

Contamination limit value

- Contamination as per 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 - 98.
- Have the hydraulic oil cleaned with a mobile filter unit until the required cleanliness class is achieved.

Water content limit value

- Water content ≤ 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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7.13.6 Changing the hydraulic oil

The oil only needs to be changed if the laboratory analysis indicates the need for it; *Determining the condition of the oil*, p. 7 - 91.

Oil, spare parts,
tools

Hydraulic oil in litres (gal)	Designation to DIN 51502	Specification Classification	GROVE part no.
800 (210)	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	03199793

- Connecting piece and hose (toolbox).
- One or more containers, max. 800 l (210 gal); p. 2 - 4.

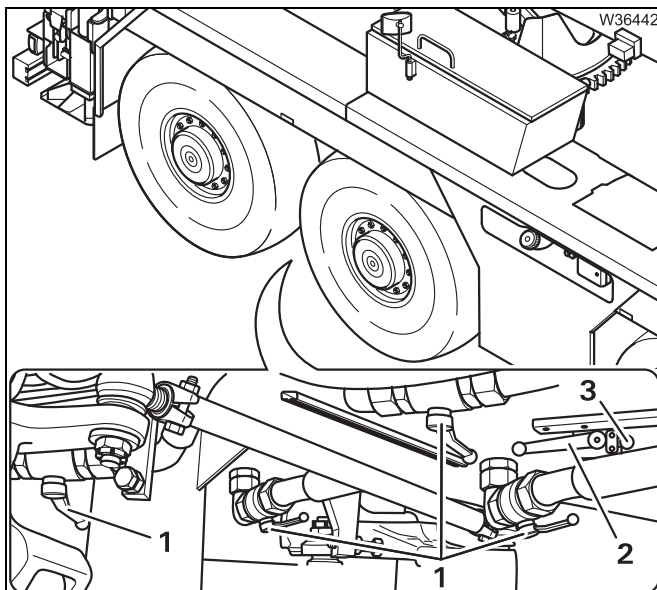


The central oil tank in the travel gear frame supplies the hydraulic system in the carrier and in the superstructure. Not all of the oil of the original filling is changed when changing the oil. There will be some remaining oil in the cylinders and hoses.

Prerequisites

- The superstructure is slewed to the rear; *Slewing superstructure*, p. 7 - 86.
- The main boom is retracted and raised.
- The outriggers are retracted after the superstructure has been slewed to the rear; *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.

Closing the valves



- Close the valves (1) – lever at right angles to the line.
- Pull the locking bar (3).
- Close the valve (2) – lever at right angles to the line.
- Insert the locking bar (3).
- Secure the engine against unauthorised use.





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!

**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!

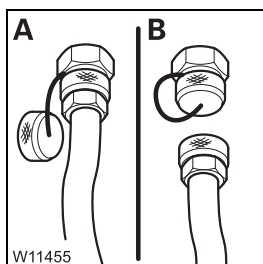
Use the supplied connecting piece and hose and a receptacle with sufficient
capacity to drain the hydraulic oil.



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 required amount of oil.
- **B** – Remove the connecting piece and hose – the valve will close.
- Screw the cap on to the valve.

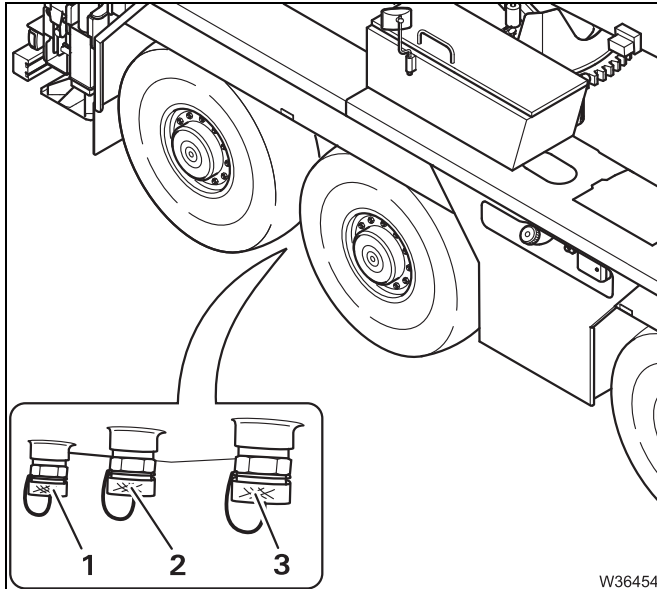


Draining oil



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.



The superstructure is slewed to the rear.

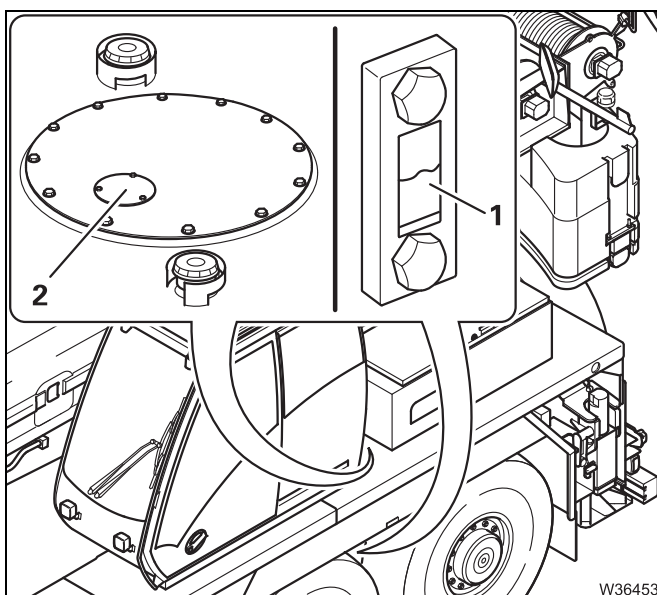
- Place a receptacle underneath the valves.
- One after the other, screw the connecting piece and hose onto the valves (1), (2) and (3); Handling the valves, p. 7 - 94.
- Change the filters; p. 7 - 98.

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.



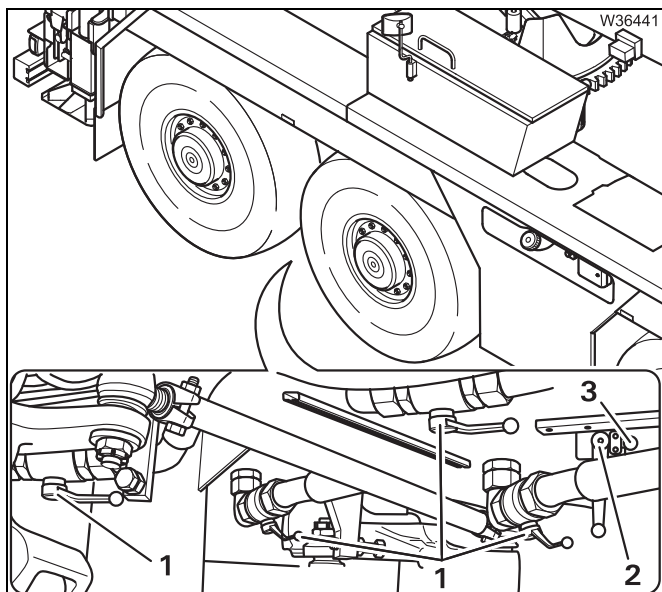
The superstructure is slewed to the rear so that the cover (2) is accessible.

- Remove the cover (2).
- Add new oil through a filter until the level reaches the centre of the sight glass (1).
- Replace the gasket if necessary and fasten the cover.



Establishing the operating conditions

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




Opening the valves

- Open the valves (1) – lever parallel with the line.
- Pull the locking bar (3).
- Open the valve (2) – lever parallel to the line.
- Insert the locking bar (3).



Risk of damage to the hydraulic pumps!

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

- 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 sight glass on the hydraulic oil tank.
Top up oil if necessary;  Check the oil level, p. 7 - 83.

Bleeding the hydraulic system

If the steering is "loose" during the test drive, you must bleed the steering cylinders of the hydraulic system.

Preparations

- The truck crane must be raised on outriggers.
- The parking brake must be applied.



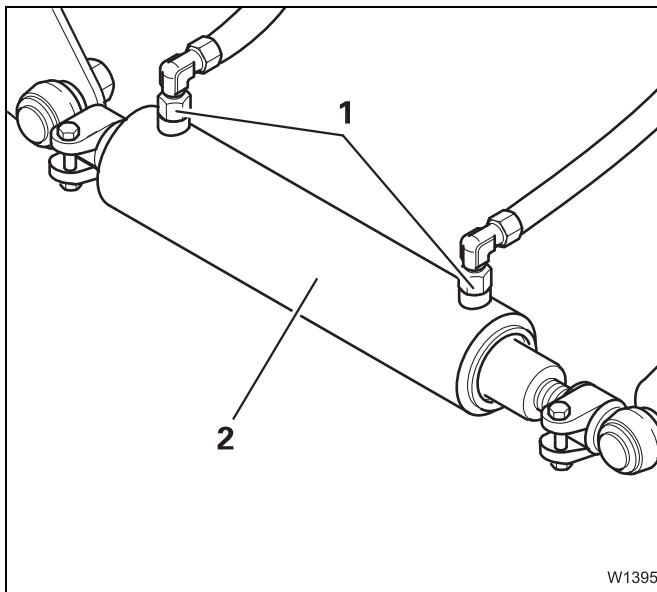
Risk of crushing from turning wheels!

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.

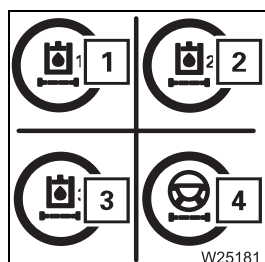
If the steering system is still not operating properly

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

7.13.7

Changing the hydraulic oil filter

Oil filters must be replaced when changing the oil.



In the event of a warning message in the driver's cab the symbols (1), (2), (3) and (4) on the *CCS (Crane Control System)* control unit indicate the oil filter(s) you need to change.

In the event of a warning message in the crane cab the symbols (1), (2), (3) and (4) on the *CCS (Crane Control System)* control unit indicate the oil filter(s) you need to change.

- | | | |
|------------|-----------------------|-----------------------|
| 1 Red ring | Changing oil filter 1 | in the carrier |
| 2 Red ring | Changing oil filter 2 | in the carrier |
| 3 Red ring | Changing oil filter 3 | in the superstructure |
| 4 Red ring | Changing oil filter 4 | in the carrier |
| | (Steering) | |

- Always replace both oil filters 1 and 2 together.

Spare parts and tools

Designation	Quantity	GROVE part no.
For oil filter 1:		
Filter	2	03143251
For oil filter 2:		
Filter	2	03143251
For oil filter 4:		
Filter	1	03142357
Housing packing set	1	03326049
For oil filter 3:		
Filter	1	03142356
Housing packing set	1	03326049

- Receptacle, approx. 5 l (1.5 gal); p. 2 - 4.
- Torque wrench for 25 Nm (18.5 lbf ft).

Prerequisites

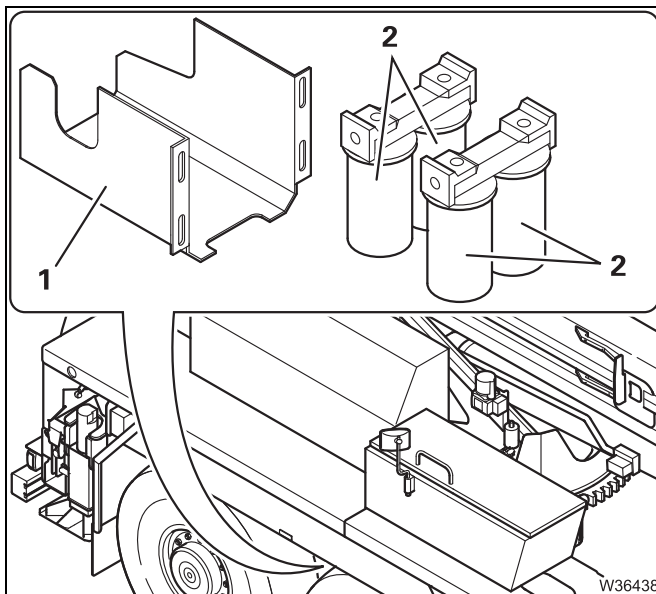
- The engine must not be running and must be secured against unauthorised use; ■■■► p. 2 - 3.
- The hydraulic system is depressurised.

Changing oil filters 1 and 2



Risk of damage to the environment from filter residues!

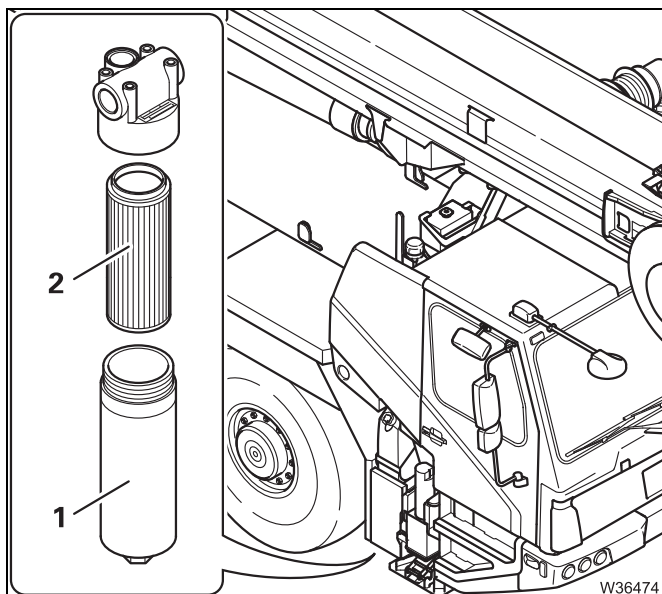
Store used hydraulic oil filter inserts in suitable receptacles and have them disposed of properly by qualified personnel.



- Undo the screws on the right and left of the cover (1) and remove it.
- Place a receptacle under the oil filters.
- Unscrew the filter (2).
- Place the filters in a receptacle.
- Screw on new filters - slightly grease the gasket.
- Fasten the cover (1).

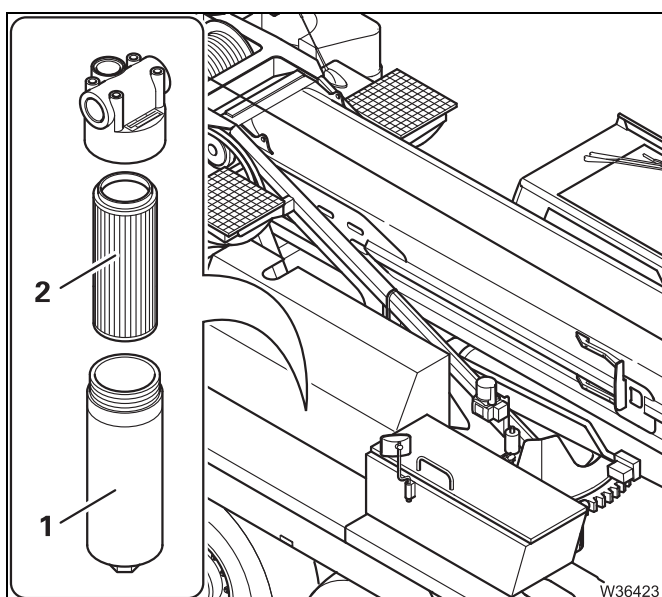


Changing oil filter 4




- Release the receptacle (1) at the hexagon head.
 - Change the filter (2).
 - Replace the gaskets.
 - Screw the receptacle on.
-
- Start the engine and check for leaks.

Changing oil filter 3



- Release the receptacle (1) at the hexagon head.
- Change the filter (2).
- Replace the gaskets.
- Fill the receptacle with clean oil and tighten it – torque 25 Nm (18.5 lbf ft).

After changing

- Restore the operating condition;  *Establishing the operating conditions*, p. 7 - 96.
- Start the engine and check the oil filters for leaks.

7.14 Central lubrication system

7.14.1 Checking the filling level

W

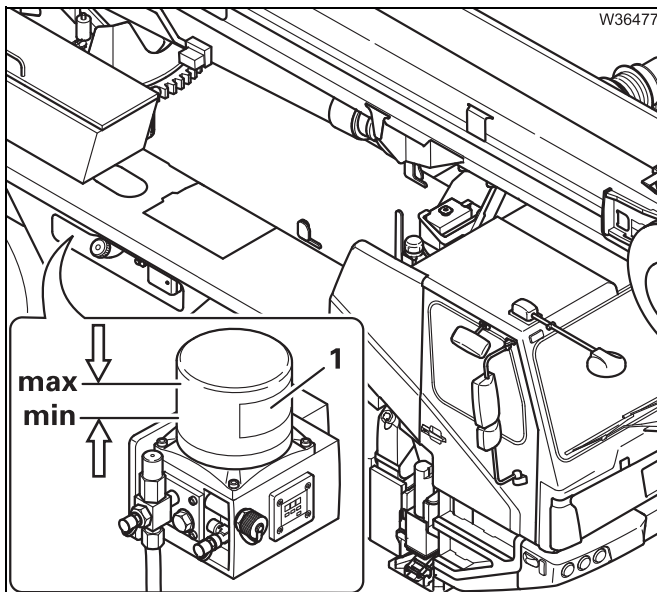
Grease, spare parts, tools

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

Designation	Quantity	GROVE part no.
Manual filling pump (in the tool set supplied)	1	03320403

Prerequisites – The parking brake must be applied.

Checking the filling level



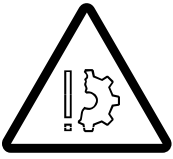
- Check the level in the grease container (1). The filling level must be near the **max.** mark. If it is below the **min.** marking, the level is too low.

If the level is too low

- Top up with grease; → p. 7 - 102.



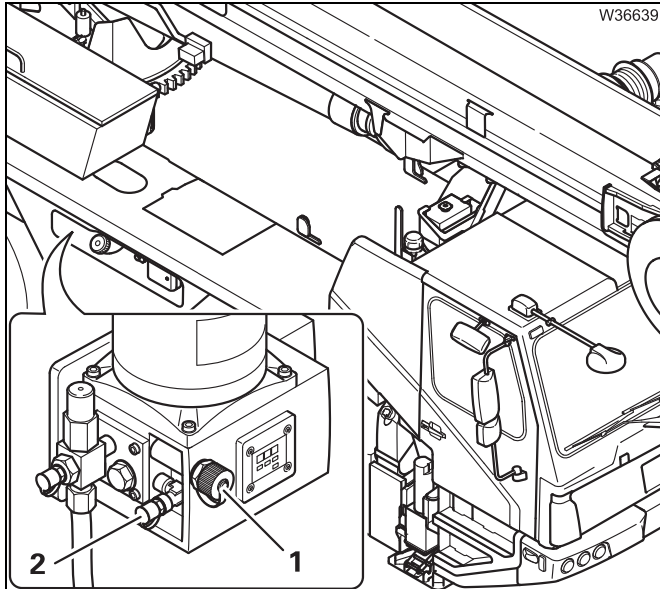
Topping up



Risk of damage to the central lubrication system!

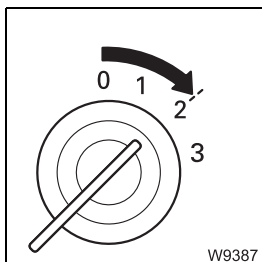
Cleanliness is of the utmost importance when handling grease and filling pumps.

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.

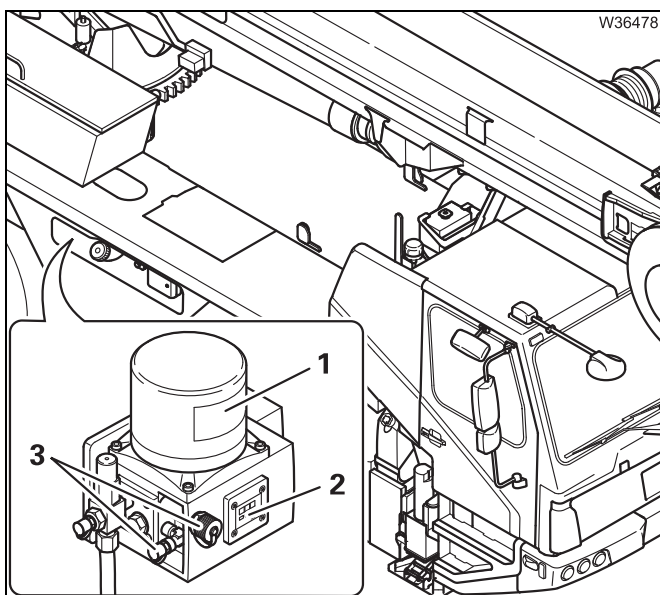



Fill the grease container as follows:

- 1 Filling pump tool set:
(insert the grease cartridge into the empty filling pump)
- 2 Filling pump for lubrication nipples



- Switch on the ignition.

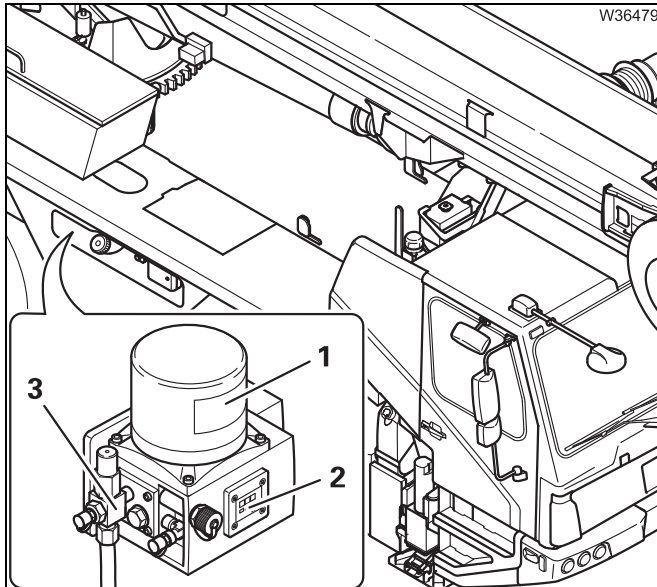


- Select one of these two connections (3).
- Remove the cap from the selected connection (3).
- Connect the filling pump to the connection (3).
- Trigger an intermediate lubrication by pressing the button (2);  *Triggering intermediate lubrication*, p. 7 - 103.
- Fill the grease container (1) up to the **max.** marking.
- Remove the filling pump, wipe away any grease that emerges and fasten the cap on the connection (3).


7.14.2

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.

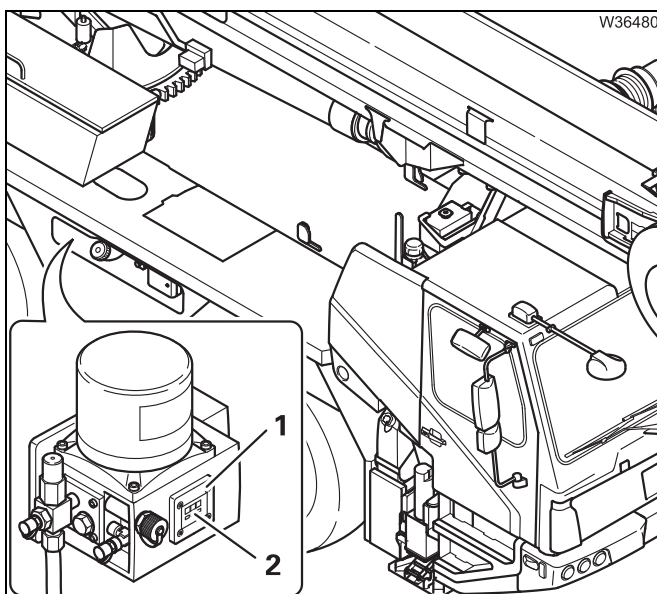
- Release the connection (3).
- Trigger an intermediate lubrication by pressing the button (2);  *Triggering intermediate lubrication, p. 7 - 103.*
- Repeat the procedure until the grease flowing from the connection (3) no longer contains any bubbles.
- Fasten the connection (3).
- Remove any grease that emerges.

7.14.3

Triggering intermediate lubrication

Intermediate lubrication should be triggered,

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



- Switch on the ignition.
- Remove the cover (1) and press the button (2) for approx. 2 seconds.

An intermediate lubrication cycle will be triggered which lasts approximately 3 minutes. Check whether grease oozes from all the lubricating points (steering lever on all axle lines).

- Switch off the ignition.
- Fasten the cover (1).
- Remove any grease that emerges.

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7.15 Electrical system

7.15.1 Checking the lighting and indicators

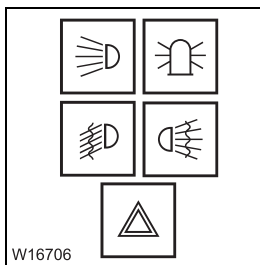
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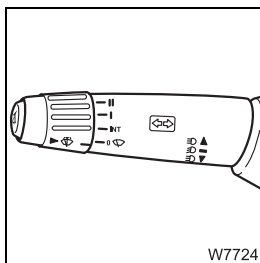
Risk of accidents if the safety devices are faulty!

Have faulty lights and indicators repaired by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

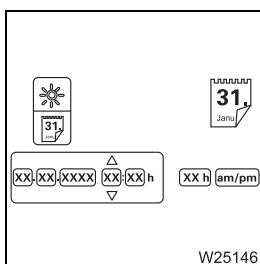
- Check the following functions every day before starting operations or driving the truck crane, and have faulty parts repaired:



- Parking light/headlight, marker lights, rotating beacons, fog tail light, outrigger lights,
- Hazard warning system,
- Brake lights,
- Reversing lights,
- Warning buzzer,



- Full-beam headlight,
- Turn signal indicators,
- Windscreen wipers,
- Windscreen washing system,
- Horn.



- Date/Time on CCS display.
- You can correct the time/date via the *Settings* menu in the CCS display; *Operating Instructions*.
- 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 driver's cab; *Replace the battery on the electronics board, p. 7 - 112.*

7.15.2

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 the build-up of static charges which could cause hydrogen mixtures to explode.



Risk of burns from battery acids!

Battery acid is highly caustic. Wear safety glasses and protective gloves.

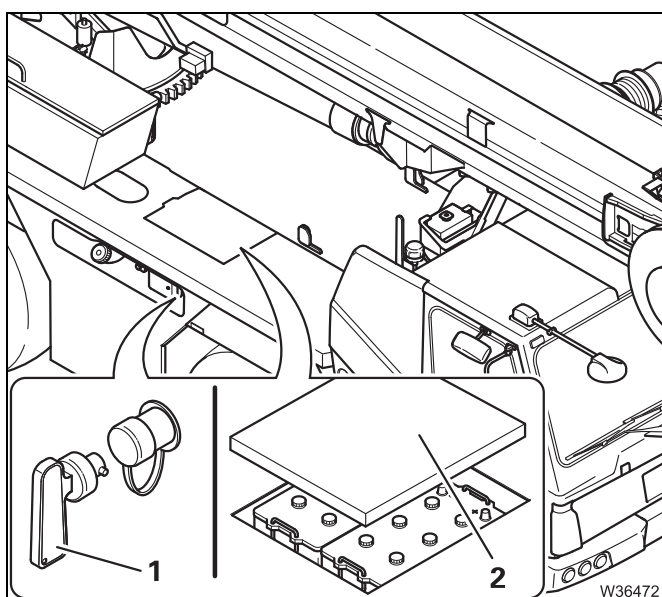
Do not tilt the battery. Rinse off or wash out any acid spray on the skin or clothing using soap suds.



Risk of damage to the crane's electrical system!

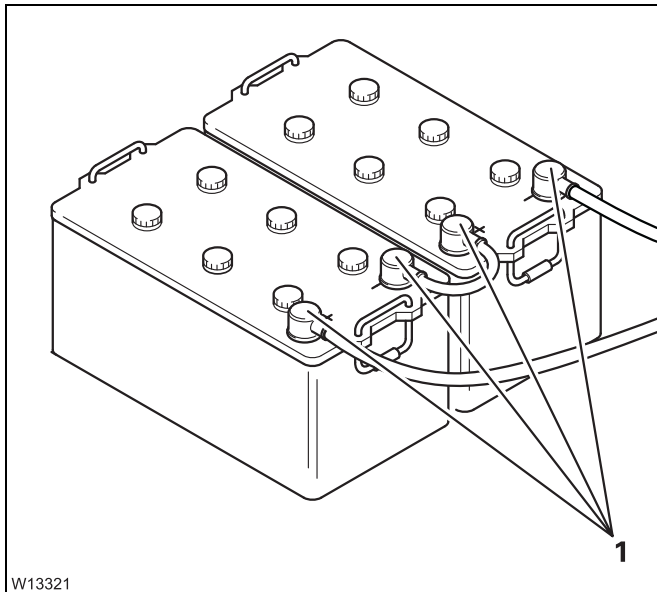
Always switch off the battery master switch before commencing work on the truck crane's electrical system.

This prevents short circuits and resulting damage to the electrical system.



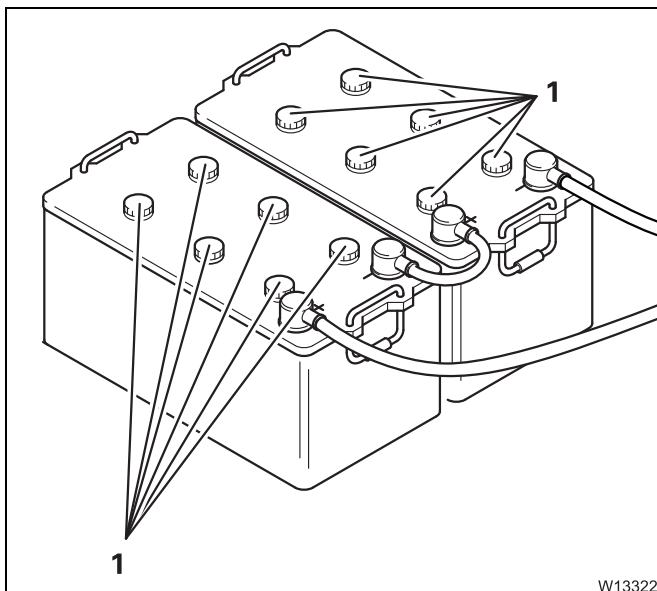
Before checking

- Switch the battery master switch (1) off and remove the selector handle.
- Open the cover (2) on the battery box.



Checking the connecting terminals

- Keep the batteries clean and dry.
- Release 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.



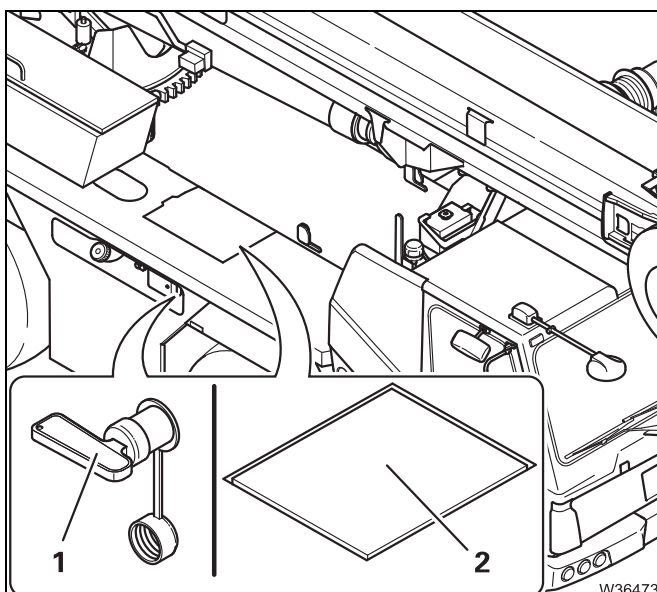
Checking the acid level

Batteries without covers (1) are maintenance-free.



- Remove all covers (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 screw on all covers (1).



After checking


- Close the cover (2) on the battery box.
- Attach the selector handle and switch on the battery master switch (1).
- Check the clocks on the tachograph and on the auxiliary heater;  *Operating Instructions*.
- Enter the code for the radio;  *Separate operating instructions*.

7.15.3

Checking the charge level of the batteries

M 3

Spare parts and tools

- Battery testing device;  *Separate operating instructions*, 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/cm³, for example. Observe the special scale on your acid siphon.

Acid concentration (g/cm ³)	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 the build-up of static charges which could cause hydrogen mixtures to explode.



Risk of burns from battery acids!

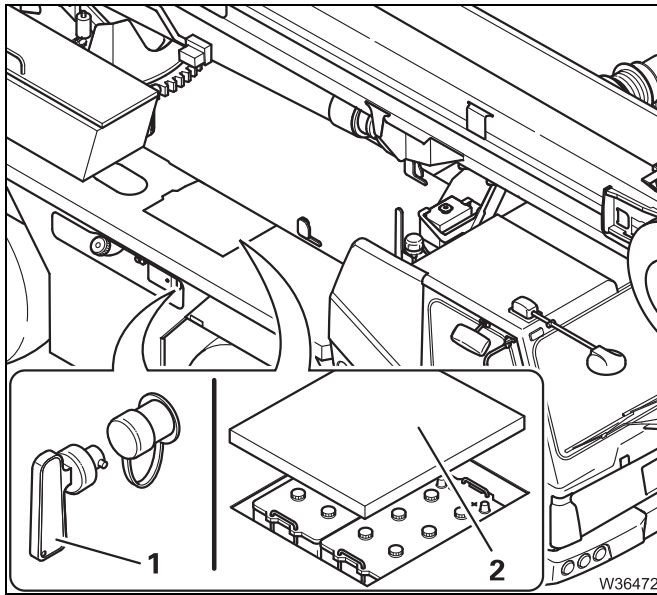
Battery acid is highly caustic. Wear safety glasses and protective gloves. Do not tilt the battery. Rinse off or wash out any acid spray on the skin or clothing using soap suds.



Risk of damage to the crane's electrical system!

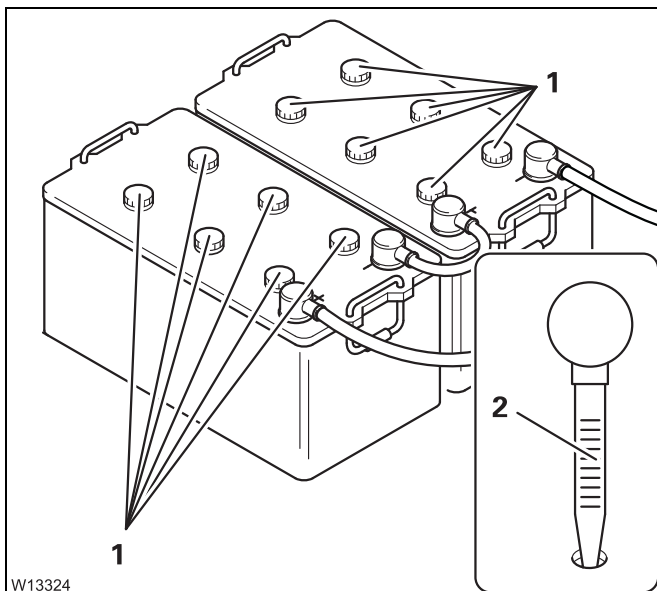
Always switch off the battery master switch before commencing work on the truck crane's electrical system.

This prevents short circuits and resulting damage to the electrical system.




Before checking

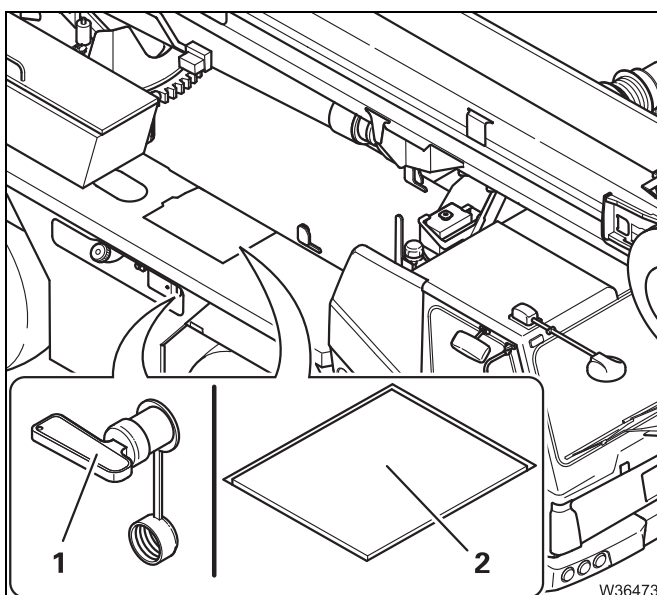
- Switch the battery master switch (1) off and remove the selector handle.
- Open the cover (2) on the battery box.





Checking the acid concentration

Batteries without covers (1) are maintenance-free.

- Remove all covers (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 - 108.*
- Check all cells in the same way.
- Tightly screw on all covers (1).



After checking


- Close the cover (2) on the battery box.
- Attach the selector handle and switch on the battery master switch (1).
- Check the clocks on the tachograph and on the auxiliary heater;  *Operating Instructions.*
- Enter the code for the radio;  *Separate operating instructions.*

7.15.4


Charging the batteries using the battery charger

M 3

Prerequisites

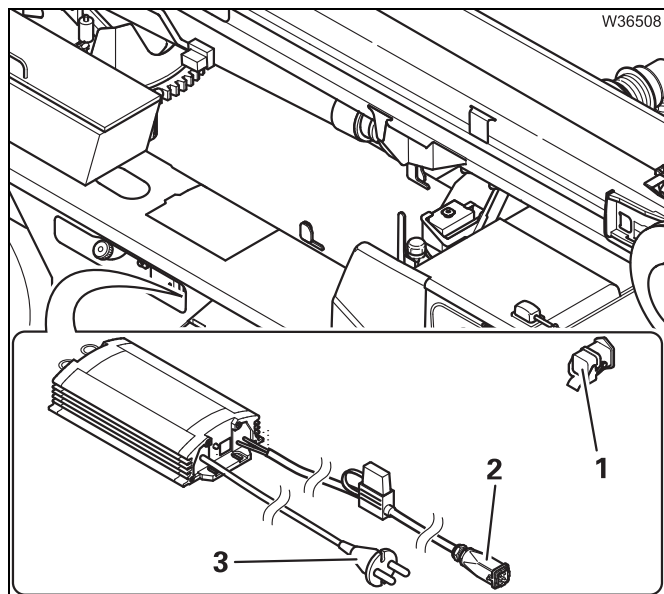
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- An external 230 V mains power supply must be available at the location.
- The socket on the battery box and the battery charger (GROVE part no. 03320239) are present as **additional equipment**.
- The location 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 instructions*.

Connecting

- Take the battery charger out of its storage compartment in the driver's cab.



- Insert the plug (2) into the socket (1).
- Place the battery charger in a protected place where you can see the indicator lamp on the charger. The battery charger can be suspended from the ring eyes.
- Insert the plug (3) into the socket on the mains supply 230 V at the location. The indicator lamp flashes – the charging process starts.
- If the indicator lamp does not flash, check the fuse directly on the cable.

Charging

- Check the charging process via the indicator lamp on the charger.

Indicator lamp flashing: The batteries are being charged.

Indicator lamp lit continuously: The batteries are fully charged.

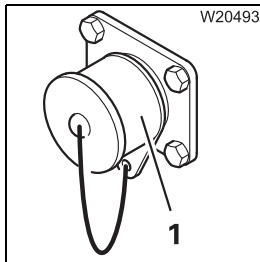
After completion of charging

- Remove the plug (3) from the 230 V mains supply.
- Remove the plug (2) from the battery box.
- Return the battery charger to the storage compartment in the driver's cab.

7.15.5

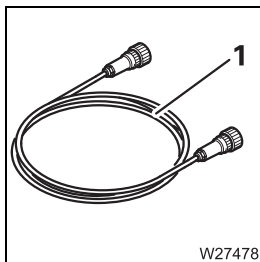
Check the external starting socket

M 3



The battery box can also be equipped with an external starting socket (1) as **additional equipment**.


Accessories



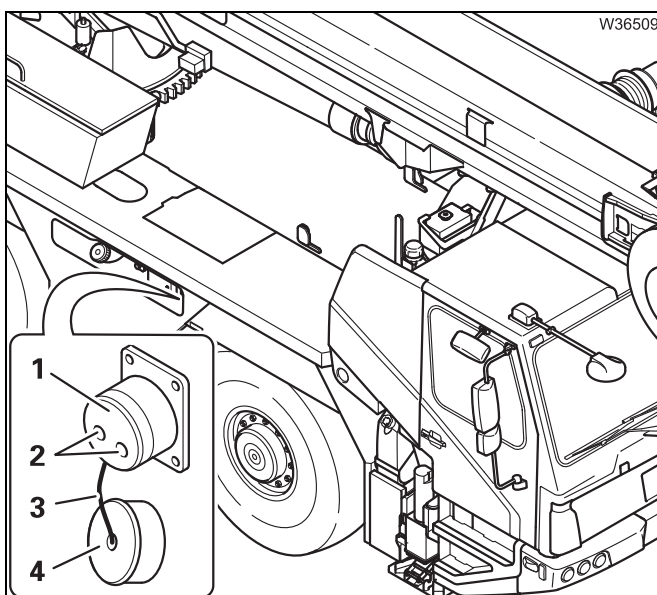
A connection cable (1) for the external starting socket is supplied with the truck crane (tool set) as **additional equipment**.

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 Instructions*.

Checking



- 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.

7.15.6


Replace the battery on the electronics board

Y 10

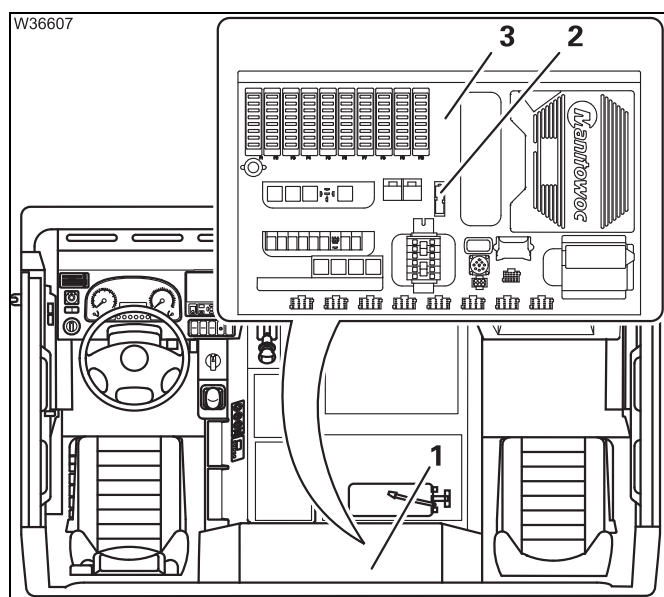
Spare parts and tools

Designation	Quantity	GROVE part no.
Lithium battery 3.6 V	1	03143172

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Changing




- Open the cover (1) on the rear wall of the driver's cab.
- Changing the battery (2) on the electronics board (3).
- Close the cover.
- Check the correct operation of all controls.

7.16 Air-conditioning system

7.16.1 Checking the air-conditioning system

M 1

- Switch on the air conditioning system;  *Operating Instructions*.
- 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.

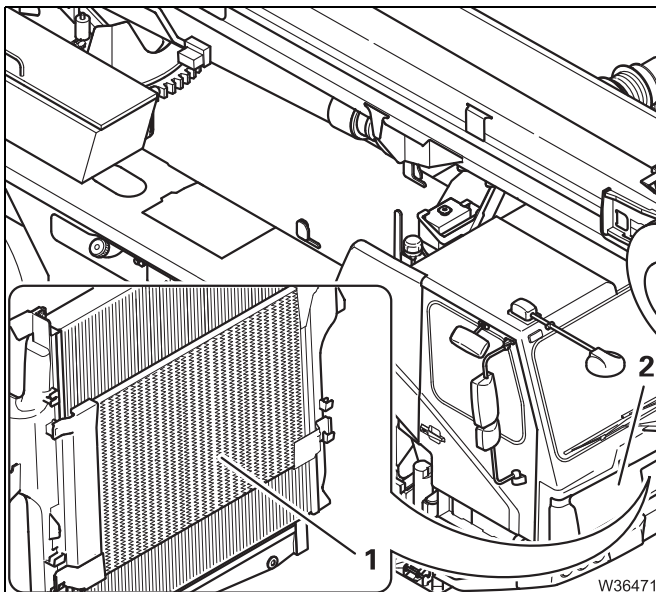
7.16.2 Cleaning the condenser fins



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 suitable cleaning agents air for cleaning.



- Switch the air-conditioning system off.
- Open the front flap (2);  *Front flap*, p. 7 - 2.
- Have the condenser fins (1) cleaned;  p. 7 - 26.

7.16.3

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.

7.16.4

Checking the entire air-conditioning system

M 12

The GMK3060 truck crane is equipped with a combined air conditioning system for the driver's cab in the carrier and the crane cab in the superstructure.



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.

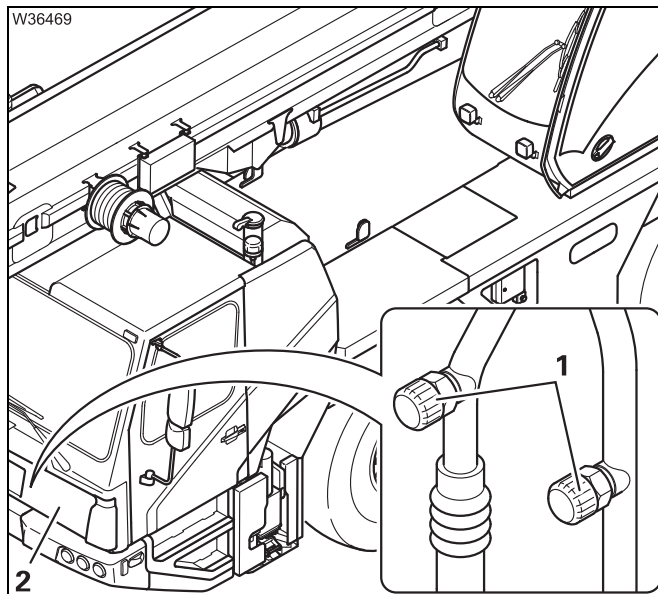
- Have the entire air-conditioning system checked for leaks and proper functioning.
The inspection of the air-conditioning system particularly includes the inspection of
 - The refrigerant collector, in accordance with the pressure container regulations (test group II) and
 - The refrigerant compressor.
- Only allow the system to be topped up with suitable refrigerant.

Refrigerant

Fill quantity in kg (lbs)	Designation	CAS no. EC no.
1.4 (3.1)	Tetrafluoroethane (R134a)	811-97-2 212-377-0

Compressor oil FUCHS SE 55

Filler connections



The filler connections (1) for the refrigerant are behind the front flap (2) in the driver's cab.

7.16.5

Check V-belt/V-belt tension


M 12

Spare parts and tools

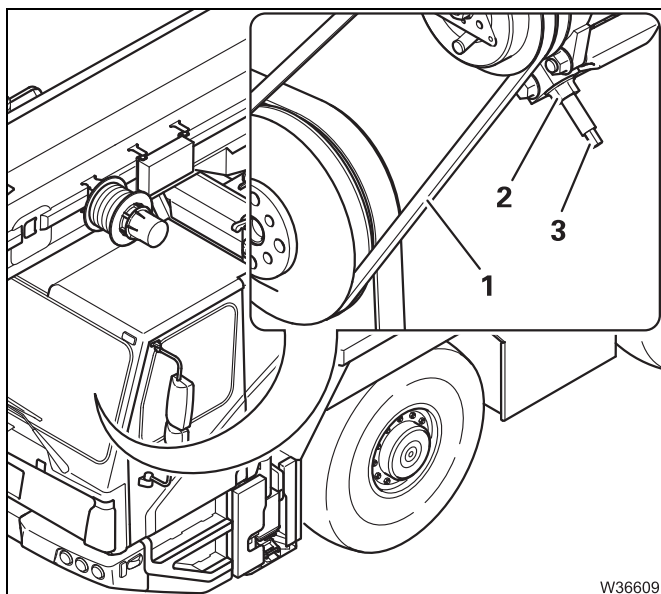
Designation	Quantity	GROVE part no.
V-belt	1	01207273

- Frequency measuring instrument; GROVE part no. 04165439;
new V-belt: Frequency 68 Hz;
run-in V-belt: Frequency 60 Hz.


Prerequisites

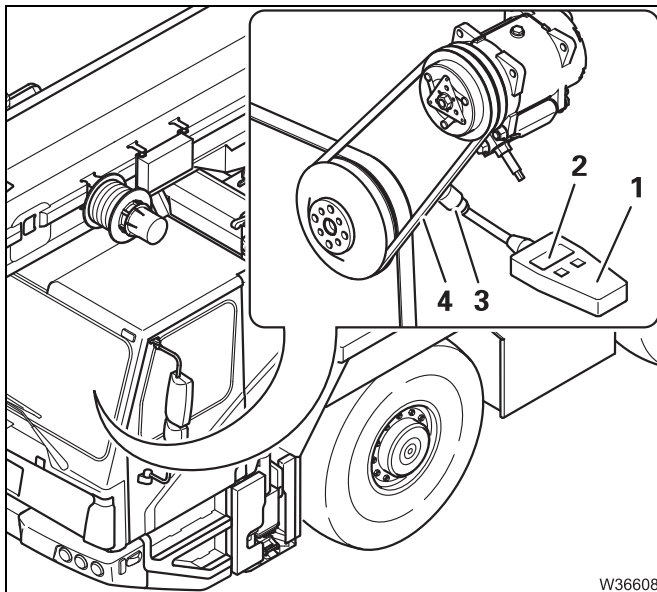
- The driver's cab is tipped;  p. 7 - 3.
- The engine must not be running and must be secured against unauthorised use.

Checking



- Check the V-belt (1) for cracks and damage.
- If necessary, fit a new V-belt (1).
- Roughly set the initial tension with the tension tube (3). To do this, loosen the nuts (2) and turn the bolt (3) until you have achieved the desired initial tension.
- Secure the safety pin (3). Screw the nuts (2) tightly – torque 78 Nm (57.5 lbf ft).


- Familiarise yourself with the correct operation of the frequency measuring instrument;  *Separate operating instructions.*

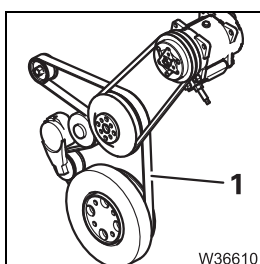


- Switch the frequency measuring instrument (1) on – it is now ready for acoustic measurement.
- Hold the measuring head (3) over the V-belt (4).
- Strike the V-belt (4) with an object (tool) so that it vibrates.
- Read the measurement on the display (2):
new V-belt: 68 Hz;
run-in V-belt: 60 Hz.

- If necessary, correct the pre-tension on the tensioning bar until the specified measurement is achieved.
- Check the tension on a **newly** installed V-belt **for the first time after 4 operating hours (oper. hrs.)** and then after **24 operating hours (oper. hrs.)**.



Maintenance of the fan V-belt (1) and alternator V-belt fitted as standard equipment is described in the documentation supplied;  *Engine manufacturer's documentation.*



7.16.6

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.

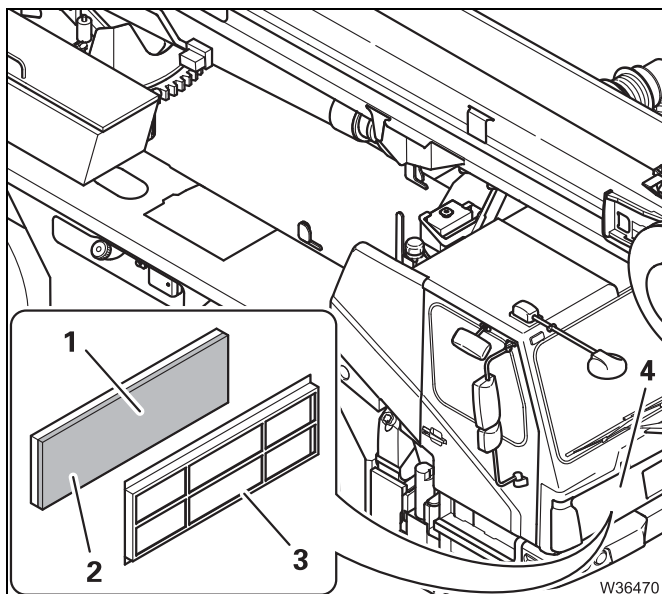
Spare parts and tools



Designation	Quantity	GROVE part no.
Filter	1	03326193

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Changing



- Open the front flap (4);  p. 7 - 2.
- Remove the frame (3).
- Remove the filter (2) from the frame and clean the frame with a cloth.
- Insert a new filter – with the blue side (1) facing outwards.
- Fasten the frame.
- Close the front flap;  p. 7 - 2.

7.17 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 instructions.*

7.17.1 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.



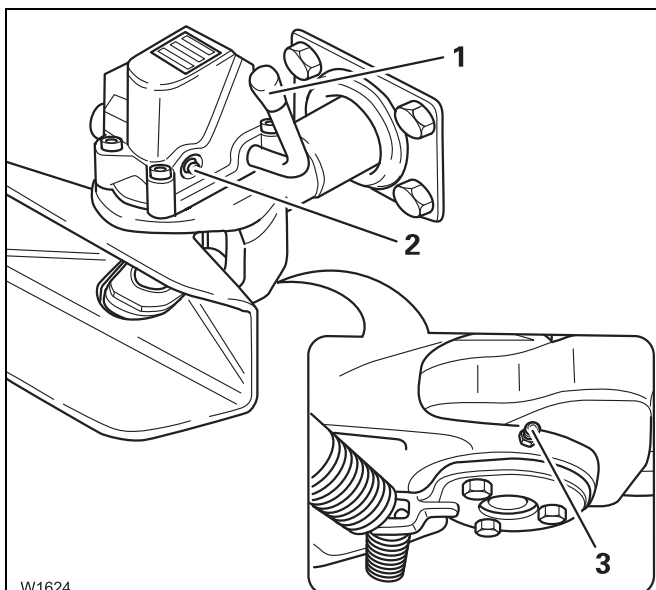
Risk of injury when the automatic closing device is triggered!

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 be lubricated only when it is 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.



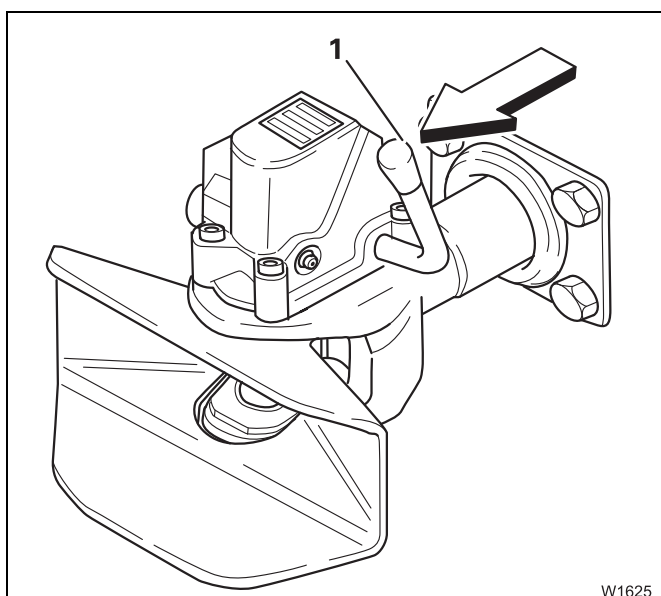
Closing the towbar coupling



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.


- Hammer the lever (1) briefly in the direction of the coupling jaw (observe the arrow).
- Remove any grease that emerges.

7.17.2

Checking the bearing

M 3

Prerequisites

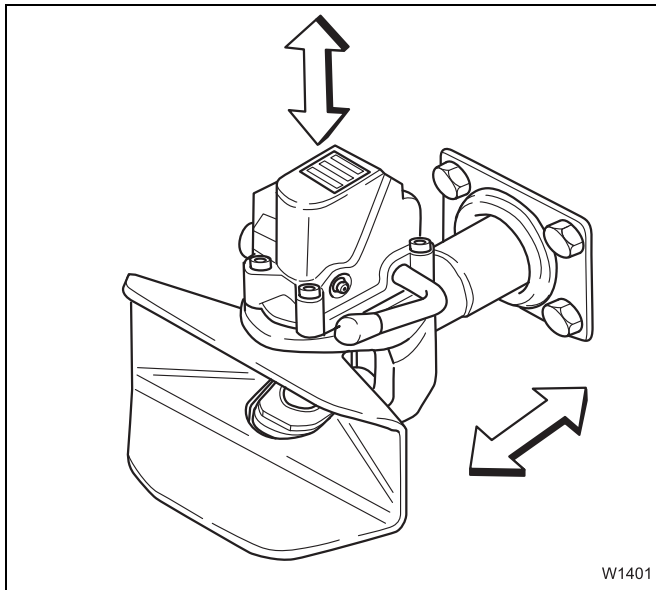
– The coupling must be closed;  p. 7 - 120.

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).

7.17.3

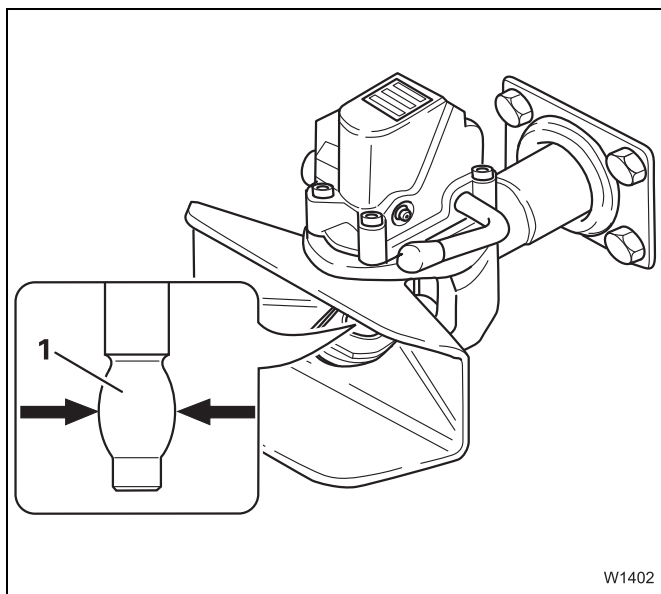
Checking the cotter pin

M 3

Prerequisites

– The coupling must be closed; ▮▮▮▮▶ p. 7 - 120.

Checking the cotter pin

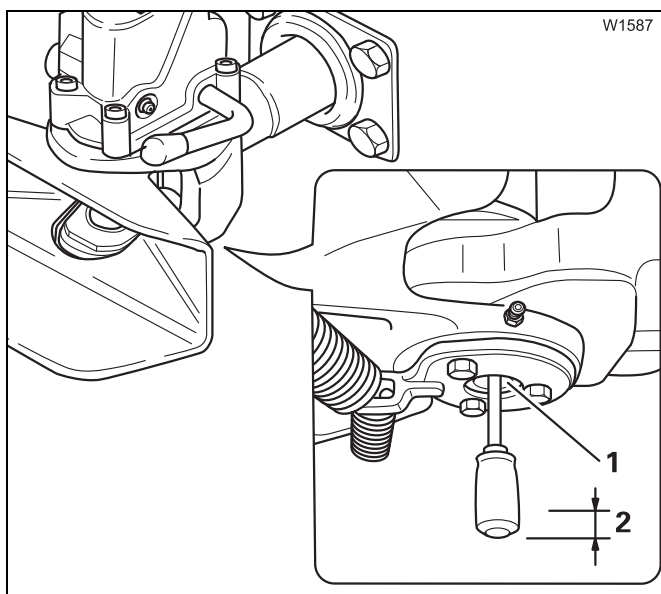


- Check the wear on the cotter pin (1). The diameter of the crowned section (arrows) must not be less than the following values:

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 crew.




- Also check the cotter pin for the correct vertical play. Use a screwdriver to press the pin (1) upwards. The vertical play (2) of the pin must not exceed 4 mm (0.15 in)

7.17.4

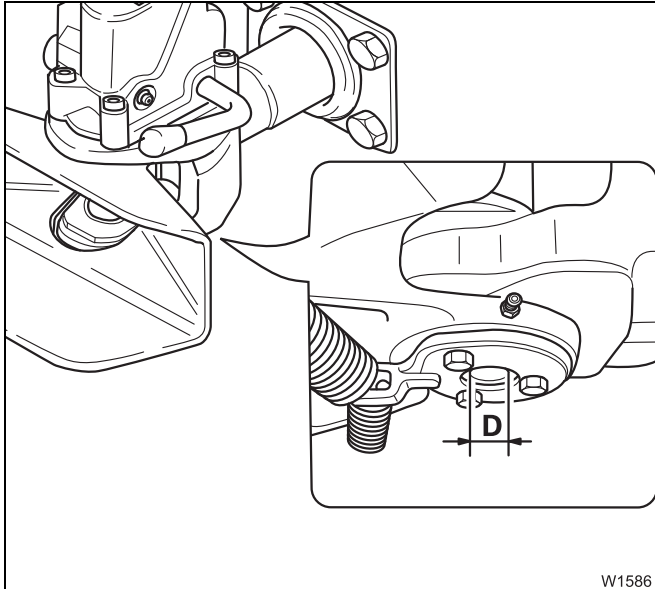
Checking the lower bushing

M 3

Prerequisites

– The coupling must be closed;  p. 7 - 120.

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.

7.17.5

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.

7.17.6

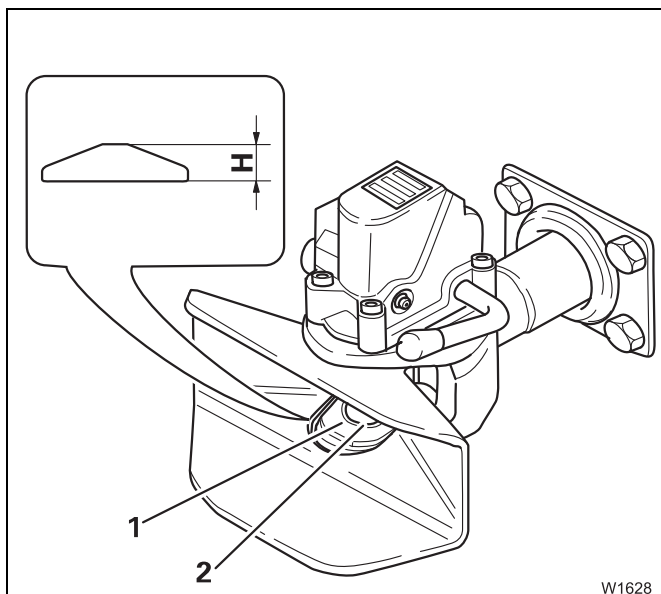
Checking the support ring

M 3

Prerequisites

- The coupling must be closed;  p. 7 - 120.

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 $H = 14 \text{ mm (0.55 in)}$.

7.17.7


Checking the function of the coupling jaw/ Resetting the middle position

M 3

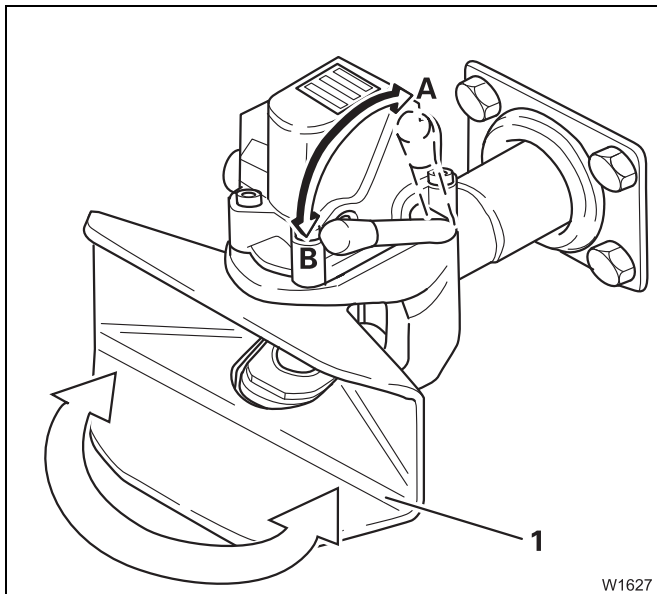
Spare parts and tool

- Torque wrench for a torque of 58 Nm (42.7 lbf ft).

Prerequisites

- The coupling must be closed;  p. 7 - 120.

Checking the function



The coupling jaw must be able to move easily in both directions.

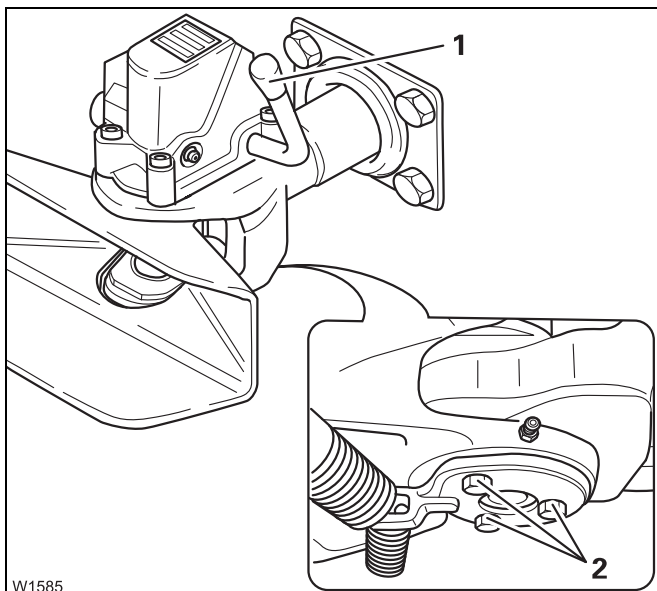
- Hold the coupling jaw (1) pressed slightly to the left or right.
- Open the coupling (position A) and let the coupling jaw go.

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 middle position must be re-adjusted; p. 7 - 125.

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 - 124.

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7.18 Other maintenance work

7.18.1 Checking the windscreen washing system

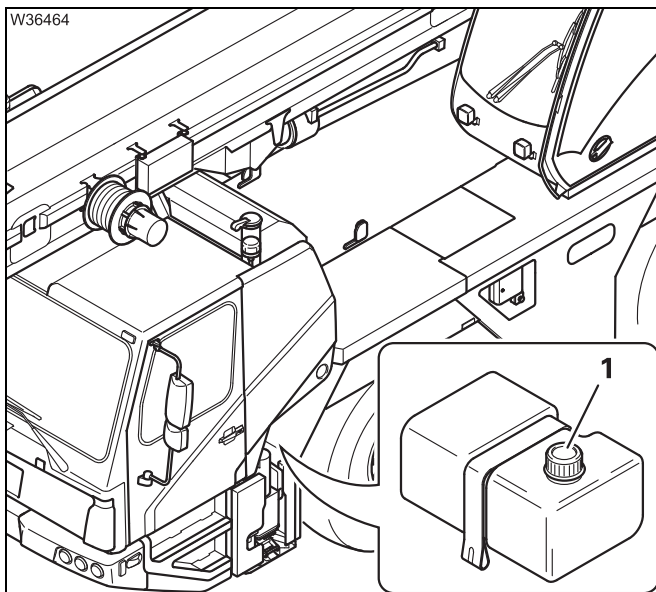
W

Water, spare parts, tool

Designation	Quantity	GROVE part no.
Wiper blades	3	02311858

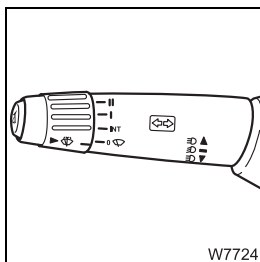
- Water; add commercially available detergent and antifreeze to it.
- A can for mixing and filling.

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; *Operating Instructions*.

- Check all the wiping stages (slow, fast, intermittent).


If the windscreen does not wipe clean

- Change the wiper blades.

7.18.2

Lubricating the outrigger beams

M 1

- Comply also with the running-in instructions;  p. 4 - 1.

Grease, spare parts, tools

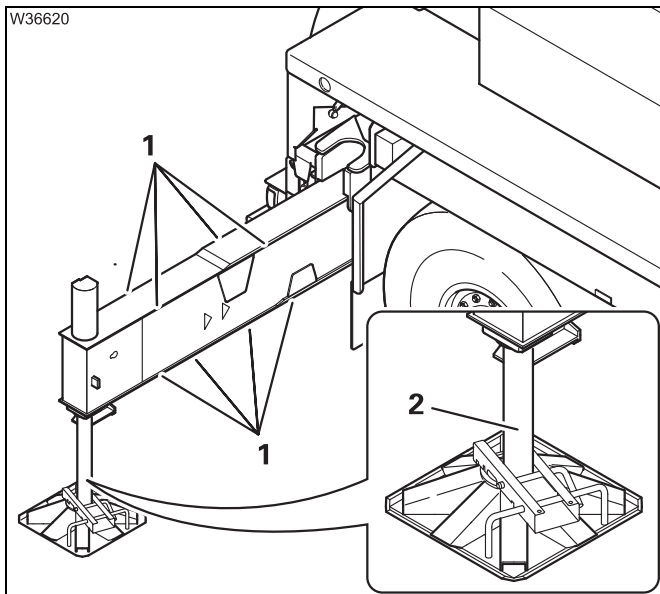
Lubricating grease	Designation to DIN 51502	Specification Classification	GROVE part no.
Grease	KP - 1K - 50	DIN 51825	03233369
Spray	Spray on Berulub; 0.5 litres (spray-on)		01929824


– Brush or roller.



Risk of crushing by 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 Instructions*.
- 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.

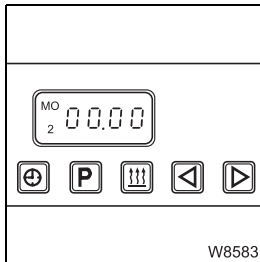
After every high-pressure cleaning of the truck crane

- Lubricate the outrigger beams.

7.18.3

Checking the functioning of the auxiliary heater

M 1



Depending on the equipment, your truck crane is fitted with an auxiliary heater.

Even during the warm summer months, run the auxiliary heater for 20 to 30 minutes; *Operating Instructions*.

- 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.

7.18.4

Lubricating the cab door

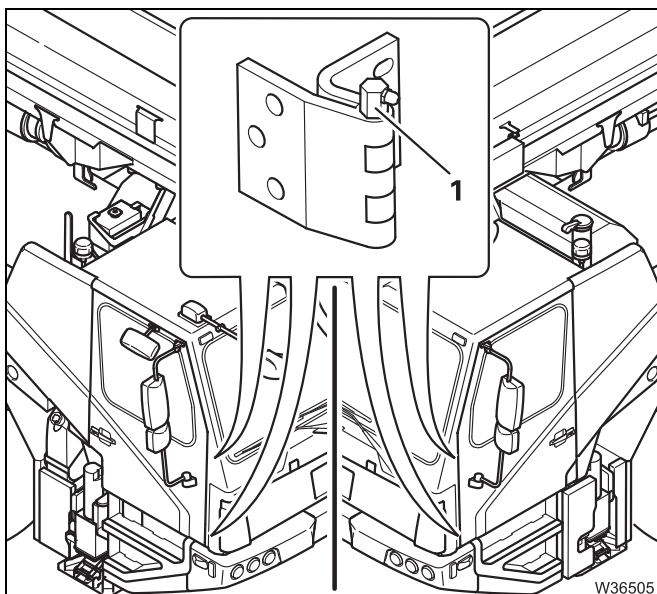
M 12

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.

7.18.5

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

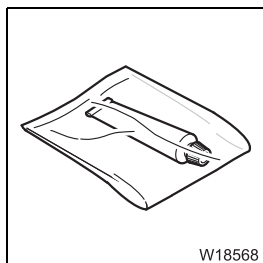
- Brush.

Checking

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.

7.18.6

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 not be running and must be secured against unauthorised use;  p. 2 - 3.

Checking

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:
 - Working temperature: above 10 °C (50 °F).
 - Removability before drying: with water.
 - Removability before drying: with test petrol.
 - Drying time: 1 hour.

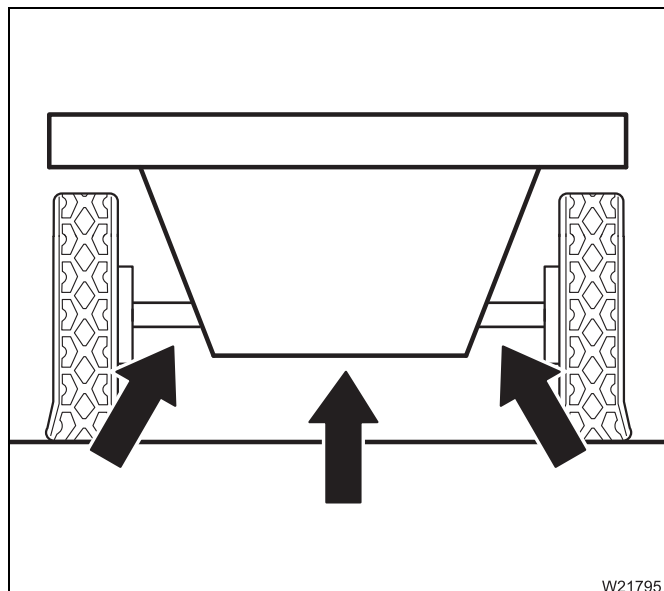


Spraying



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.

7.18.7

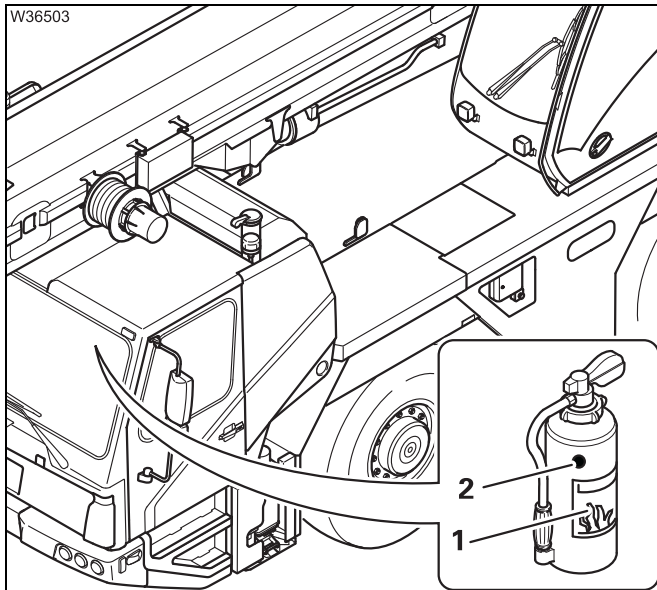
Having the fire extinguisher checked

Y 2

Depending on your truck crane's equipment, it can be fitted with fire extinguishers.



The maintenance interval may even be shorter, depending on the respective national regulations and the site. Ask the local fire safety officer about the national and local regulations.



- Observe the instructions (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

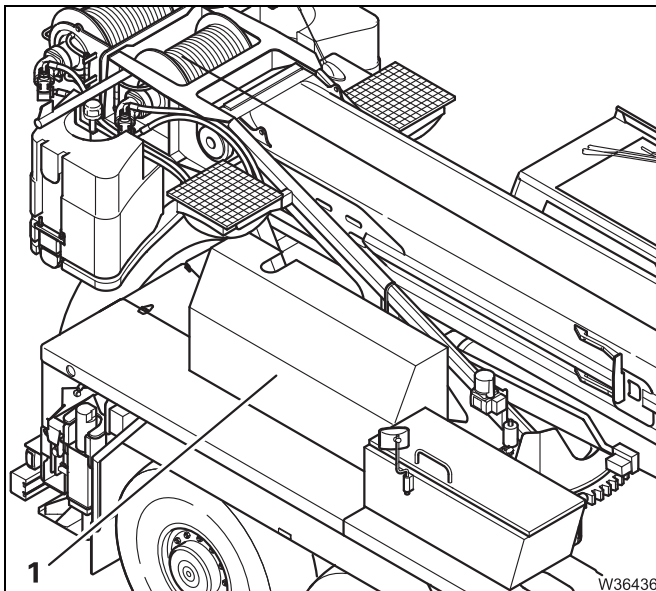
8.1

General instructions

8.1.1

Covers

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



Before maintenance work

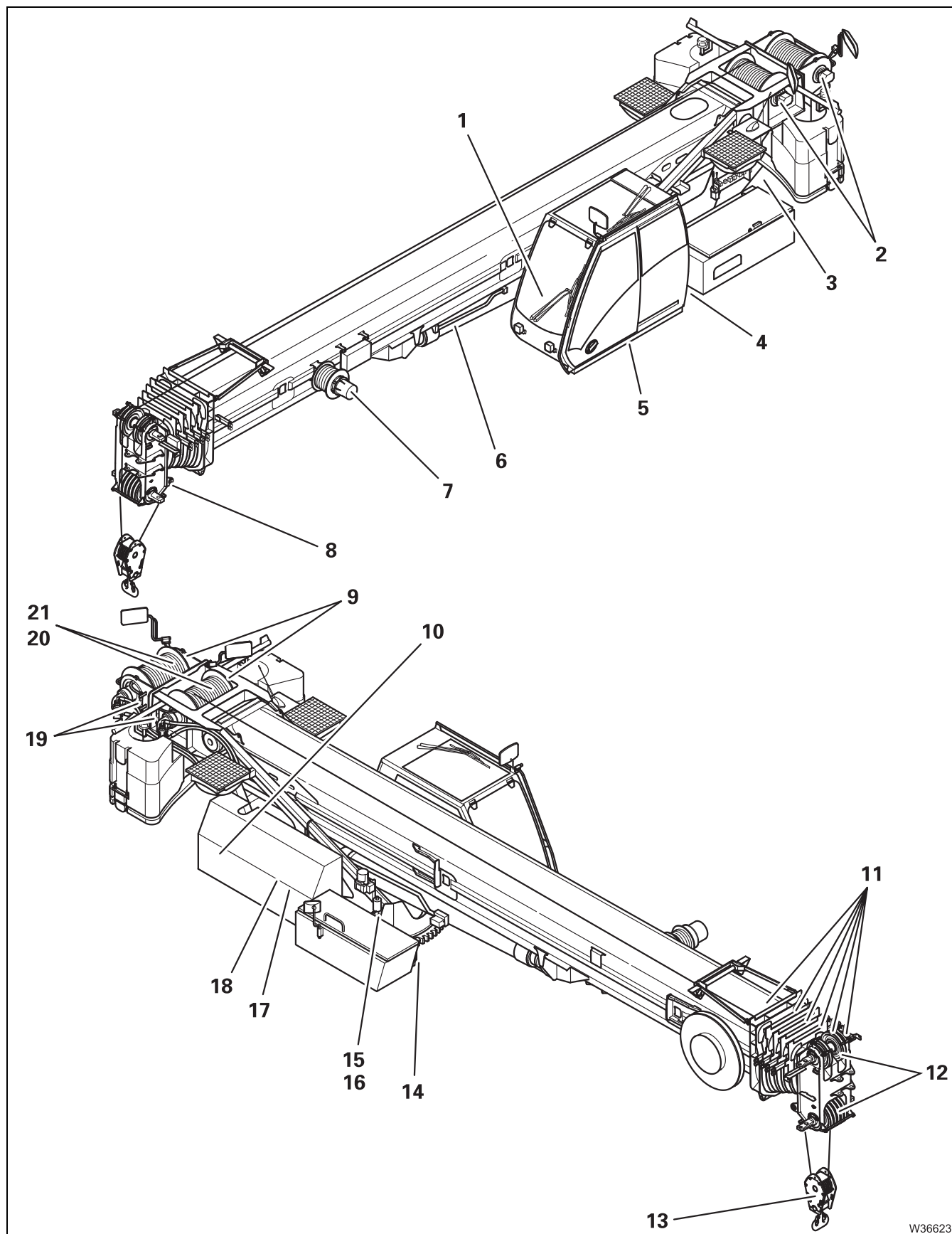
- Remove the cover (1).

After maintenance work

- Fasten the cover (1).

8.1.2

Overview of maintenance work on the superstructure

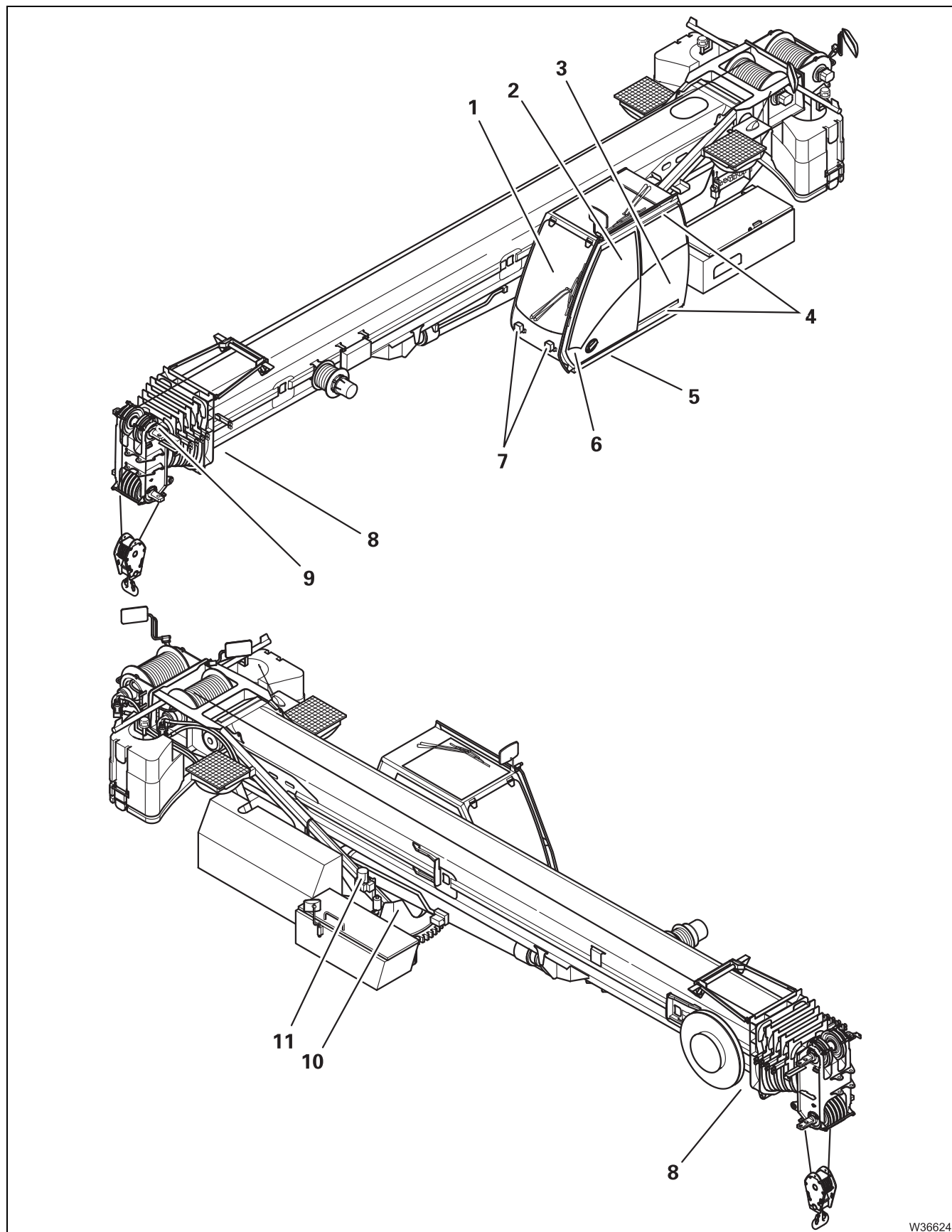


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Hoists	▣▣▣▣ p. 8 - 9
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4 Turntable lock ¹⁾	▣▣▣▣ p. 8 - 32
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7 Spotlights on the crane cab	▣▣▣▣ p. 8 - 67
8 Spotlights on the telescopic boom ¹⁾	▣▣▣▣ p. 8 - 67
9 Anemometer, air traffic control light	▣▣▣▣ p. 8 - 67
Air-conditioning system	▣▣▣▣ p. 8 - 69
1 Crane cab air-conditioning system ¹⁾	▣▣▣▣ p. 8 - 69
Other maintenance work	▣▣▣▣ p. 8 - 71
6 Windscreen washing system reservoir	▣▣▣▣ p. 8 - 71
2 Crane cab auxiliary heater ¹⁾	▣▣▣▣ p. 8 - 73
4 Cab door rails	▣▣▣▣ p. 8 - 74
5 Extendable step	▣▣▣▣ p. 8 - 75
– Various connecting pins and socket pins	▣▣▣▣ p. 8 - 76
– Corrosion protection	▣▣▣▣ p. 8 - 77
3 Fire extinguisher ¹⁾	▣▣▣▣ p. 8 - 79

¹⁾ Additional equipment

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8.2

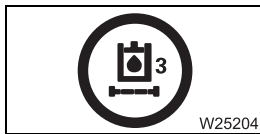
Symbols for maintenance work

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 Warning submenu shows all pending warning messages;
 ▶ *Operating Instructions*.

Warning submenu

If a symbol is displayed, you must carry out the maintenance work:



Hydraulic oil filter; ▶ p. 8 - 35.

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8.3

Hoists

8.3.1



Checking the oil level

W

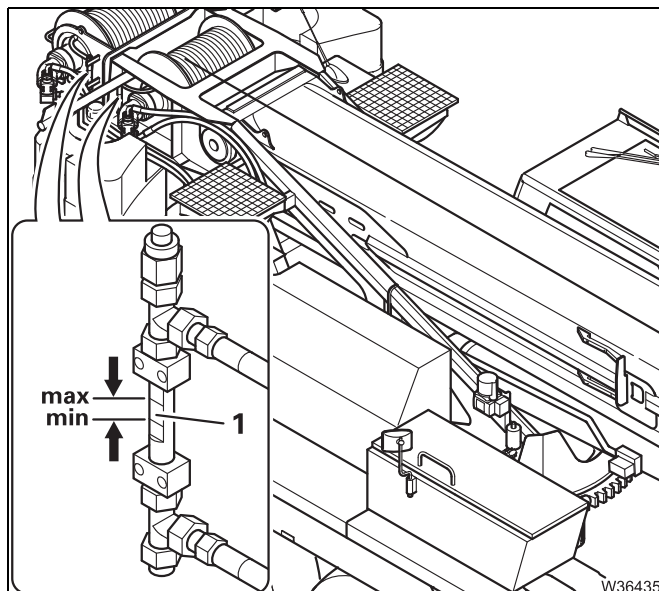
Spare parts and tools

Designation	Quantity	GROVE part no.
Oil inspection glass with 2 hoses For main hoist; complete	1	04193151
Oil inspection glass with 2 hoses For auxiliary hoist; complete	1	04193153

Prerequisites


- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The oil in the hoist has cooled down.

Checking the oil level



- Check that the oil level is visible between the **min.** and **max.** marks (1).

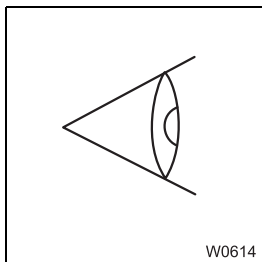
If the oil level is too low


- Top up with oil;  p. 8 - 12.

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 undamaged.

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. 5.1 t (11 250 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 the engine off.

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

Lubricating the auxiliary hoist


M 6

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 engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

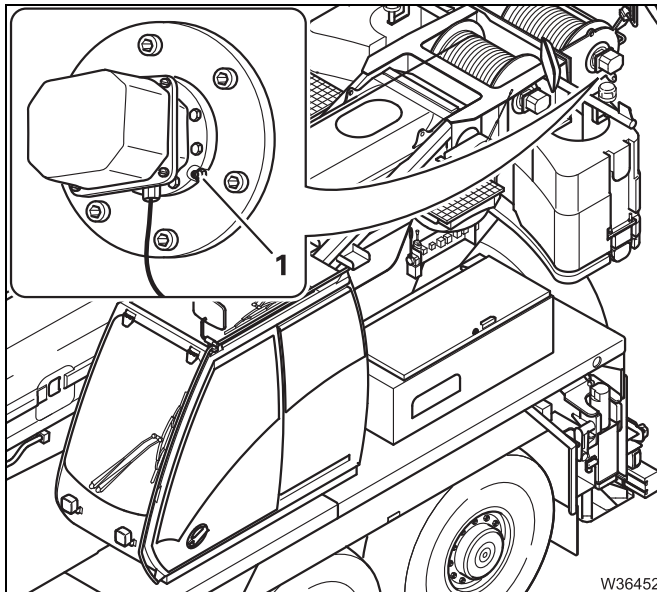
Greasing



Risk of damage to the auxiliary hoist!

The auxiliary hoist drum bearing is **not** automatically lubricated by the distributor on the turntable.

Lubricate the auxiliary hoist drum bearing with the grease gun at the lubricating nipple.



- Clean the grease nipple (1) and lubricate the hoist at the grease nipple.
- Remove any grease that emerges.

8.3.5

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.
3 (0.8) 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 with 2 hoses For main hoist; complete	1	04193151
Oil inspection glass with 2 hoses For auxiliary hoist; complete	1	04193153

- Receptacle, approx. 8 l (2 gal); p. 2 - 4.

Prerequisites

- The truck crane is horizontal and is in on-road mode; *Operating Instructions*.
- The engine must not be running and must be 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 - 13.



Risk of environmental damage due to leaking consumables!

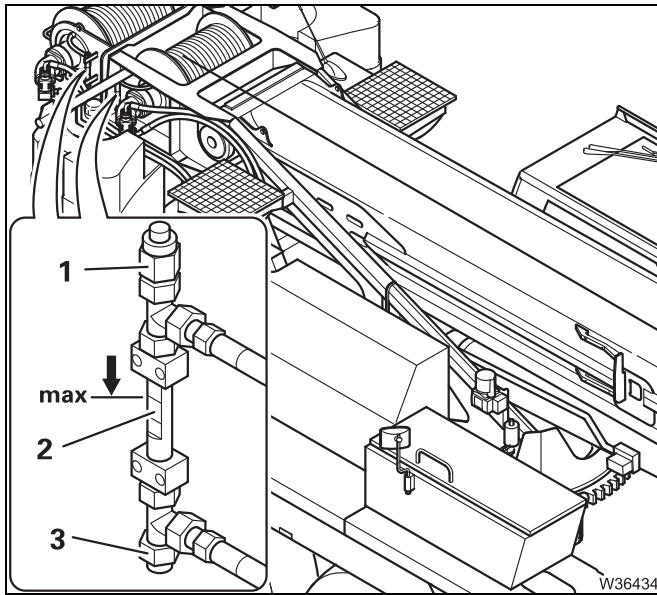
Always let consumables drain into suitable receptacles. Wipe up any consumables that escape.

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 underneath the connection (3).
- Disconnect the connection (1).
- Disconnect the connection (3) and let the oil drain off.
- Fasten the connection (3) to the pipe.

Topping up the oil

- Fill the oil through the connection (1) up to the **max.** mark (2).
- Fasten the connection (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 or 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 abrasion particles during the first oil change (after 200 oper. hrs.), first consult **Manitowoc Crane Care** before introducing any specific measures.

8.3.6

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 replace parts with signs of wear.

8.3.7

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 1,000 operating hours;  *Run-in regulations*, p. 4 - 1.

8.4

Slewing gear

8.4.1



Oil level check – Slewing gear transmission

W

Spare parts and tools

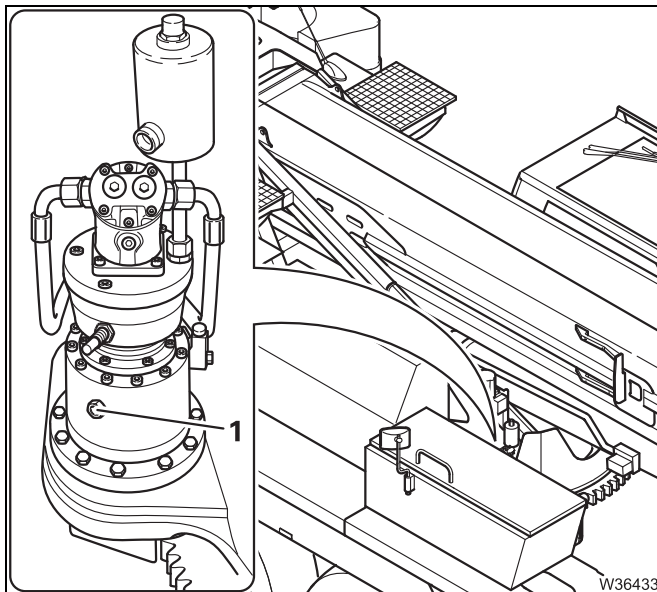
Designation	Quantity	GROVE part no.
Gasket 10 x 14 Cu DIN 7603	1	00117125

Prerequisites

- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.


Check the oil level

Always check the oil level prior to using the crane.



- Check that oil is visible in the sight glass (1).

If the oil level is too low



- Top up with oil;  p. 8 - 19.

8.4.2

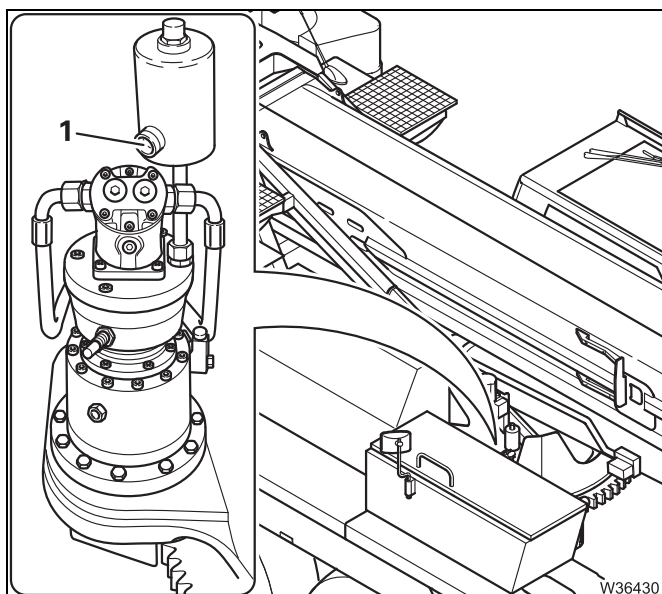
Oil level check – Slewing gear brake

W

Prerequisites


- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Check the oil level Always check the oil level prior to using the crane.



- Check that oil is visible in the sight glass (1).

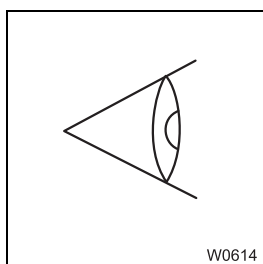
If the oil level is too low



- Top up with oil;  p. 8 - 21.

8.4.3

Checking for leaks

W



- Pay attention to any unusual noises from the slewing gear.
- Check the slewing gear and the connections for leaks. If consumables are leaking;  *Oil level check – Slewing gear transmission*, p. 8 - 15,  *Oil level check – Slewing gear brake*, p. 8 - 16.
- Check that pipes and hoses are tightly connected and undamaged.





If any damage is found, report it to **Manitowoc Crane Care** or an authorised GROVE dealer or your repair crew.

8.4.4

Checking the slewing gear brake

M 6

Prerequisites

- The truck crane is on outriggers with an outrigger span of **6.825 x 6.2 m (22.4 x 20.3 ft)** and is aligned horizontally;  *Operating Instructions*.
- The counterweight combination **7.6 t (16 700 lbs)** is rigged according to the *lifting capacity table* and equipment of the truck crane;  *Operating Instructions*.
- The RCL code for the current rigging mode must be entered;  *Operating Instructions*.
- The main boom must be raised to 45° and fully retracted;  *Operating Instructions*.



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.

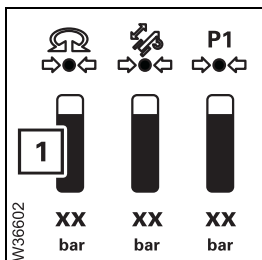
Secure the slewing range 360°, before you check the slewing gear brake.


Checking

When checking the slewing gear brake you must perform the slewing movement against the slewing gear brake.



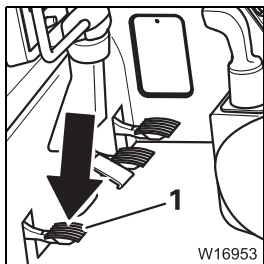
- Start the engine and switch on the slewing gear – the symbol lights up green;  *Operating Instructions*.



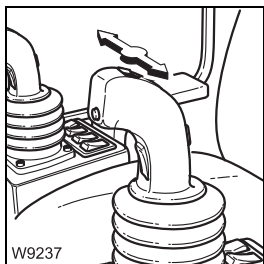
- Open the *Hydraulic pressure and fuel consumption CCS* menu group;  *Operating Instructions*.

The display (1) shows the pressure in the slewing gear's hydraulic circuit.





- Press the service brake pedal (1) for the slewing gear brake down and hold it down.




- Move the control lever slowly to the end stop and wait until the pressure in the hydraulic circuit has risen to approx. 200 bar (approx. 2,900 psi).
 - If the superstructure **does not** slew, the braking force of the slewing gear brake is adequate.
 - If the superstructure slews, 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.

8.4.5

Changing the oil/checking the oil – Slewing gear transmission


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)	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	1	00117125
Gasket 14 x 20 Cu DIN 7603	1	00117132

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

Prerequisites

- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Changing the oil

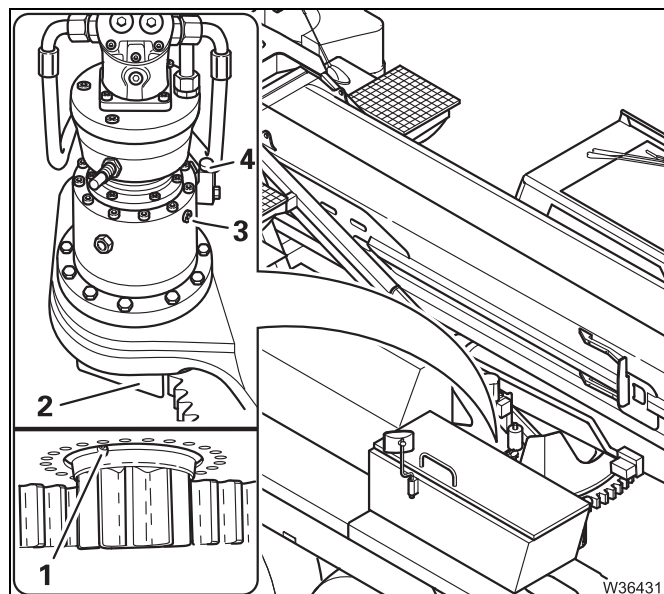


Risk of environmental damage due to leaking consumables!

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

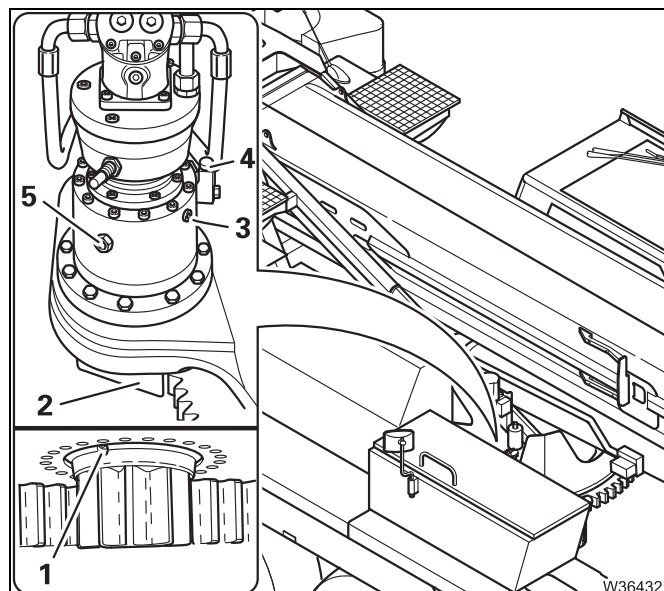
Store/dispose of consumables and any soaked equipment properly. Ask about the applicable regulations.





Draining oil

- Remove the plate (2).
- Place a receptacle under the screw (1).
- Unscrew the filter (4) and screws (3) and (1).
- Drain the oil.



- Replace the gasket and screw the screw (1) back in.

Topping up the oil

- Top up the oil through the filler neck (4) until oil is visible in the sight glass (5).
- Replace the gasket and screw the screw (3) back in.
- Screw the filter (4) in.
- Fasten the plate (2).

Checking the oil

Check the old oil drained from the **slewing gear transmission** for abrasion particles or have it tested in a laboratory.


- Pour the waste oil through a clean filter mat.
- Examine the oil or 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 for an inspection and inspected by the manufacturer.

8.4.6

Changing the oil/checking the oil – Slewing gear brake


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.
1.0 (0.26)	ATF	AVIA Fluid ATF 66M DB 236.2 (coloured in red)	01930670

Designation	Quantity	GROVE part no.
O-ring 23.47 x 2.62	1	03046046

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

Prerequisites

- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Changing the oil



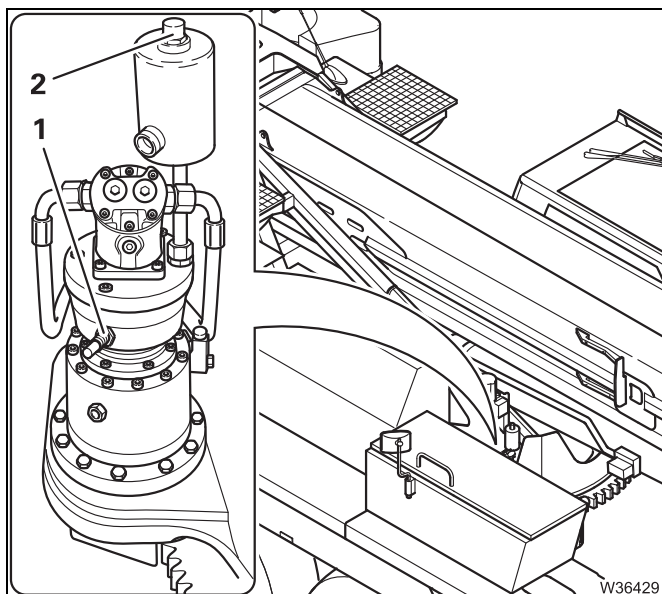
Risk of environmental damage due to leaking consumables!

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

Store/dispose of consumables and any soaked equipment properly.

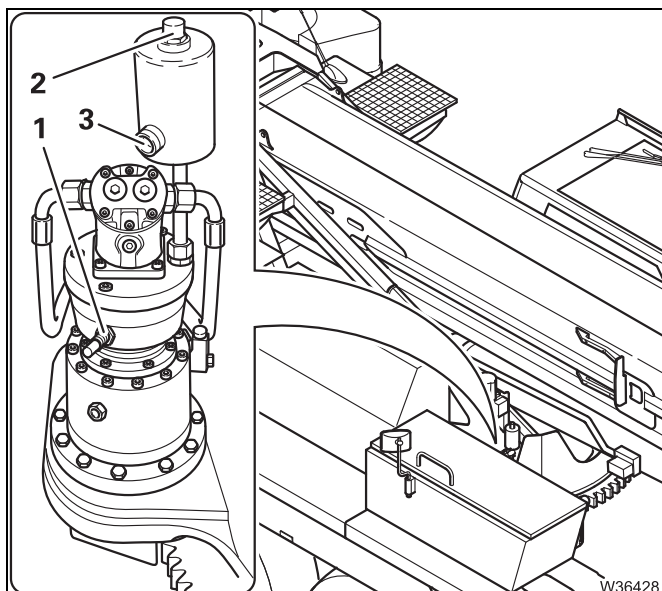
Ask about the applicable regulations.





Draining oil

- Use a drain channel and place a container under the screw (1).
- Unscrew the filter (2).
- Unscrew the screw (1).
- Drain the oil.



- Replace the O-ring and screw the screws (1) back in.

Topping up the oil

- Top up the oil through the filler neck (2) until oil is visible in the sight glass (3).
- Screw the filter (2) in.

Checking the oil

Check the old oil drained from the **slewing gear brake** for abrasion particles or have it tested in a laboratory.

- Pour the waste oil through a clean filter mat.
- Examine the oil or the residues on the filter mat using a magnifying glass.

If you find abrasion particles or solid materials on the mat, the **slewing gear brake** must be removed for inspection and sent to the manufacturer.


8.5

Slewing bearing


8.5.1

Checking the bolts




M 3

- Comply also with the run-in regulations;  p. 4 - 1.

Tools

- Torque wrench for maximum of 790 Nm (583 lbf ft).
- Auxiliary tools for the torque wrench;  p. 8 - 25.

Prerequisites

- A counterweight **is not** rigged;  *Operating Instructions*.
- The truck crane is rigged with a maximum outrigger span of **6.825 x 6.2 m (22.4 x 20.3 ft)** and is aligned horizontally.
- In addition, the tyres on the 2nd axle line should be removed to improve the freedom of movement under the slewing bearing.
- The main boom must be fully retracted and raised to 75°;  *Operating Instructions*.
- The current load must not exceed **1 t (2 200 lbs)** – if necessary unreeve the hook block.
- The slewing range 360° around the truck crane must be secured.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Safety instructions



Risk of damage to the bolts on the slewing bearing!

All bolts were tightened at the factory with a certain torque, and this should be checked during maintenance. Only slight tightening of the bolts is permissible, if required.

You **may not** loosen the bolts and re-tighten them, or completely unscrew and then reuse them.

If the superstructure has to be removed from the carrier, only a complete set of **new bolts** may be used to reinstall the superstructure. **Only original bolts** manufactured according to the factory specifications may be used.



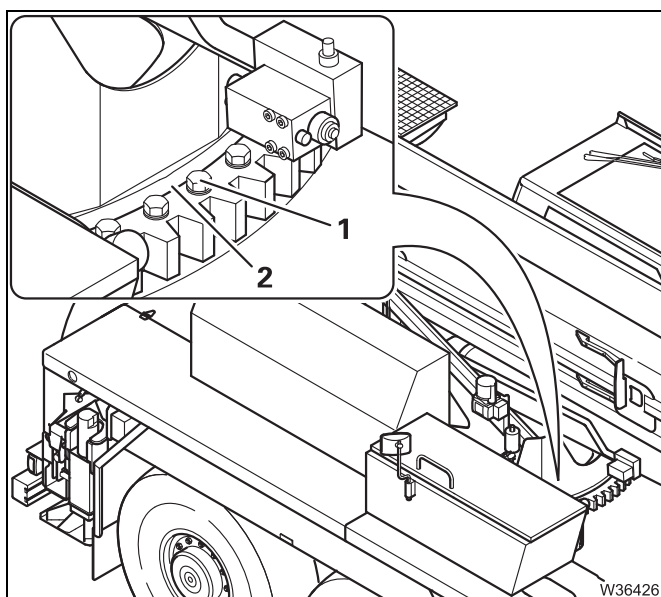


Danger of the slewing bearing being ripped off!

If while checking you notice very loose, broken or missing bolts, 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**.

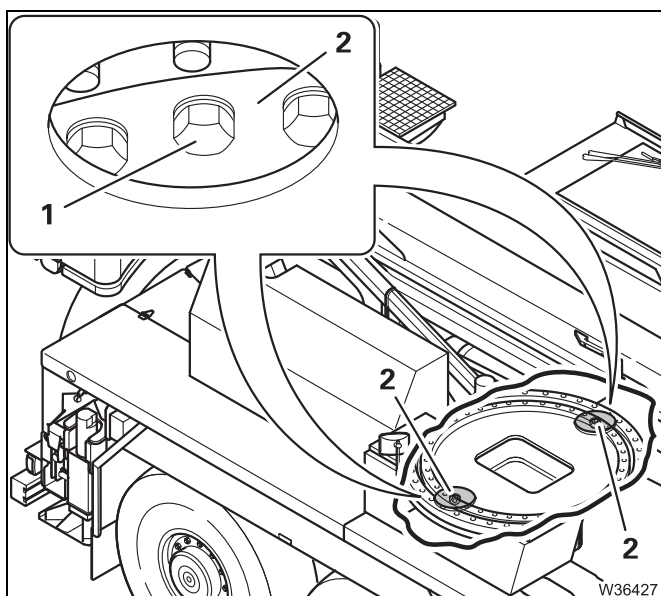
Access



The **outer ring** is attached to the carrier by the bolts (1).

- Check all 52 bolts (1) from **above**.

To do this, you must rotate the clear area (2) on the superstructure gradually to check all the screws (1).

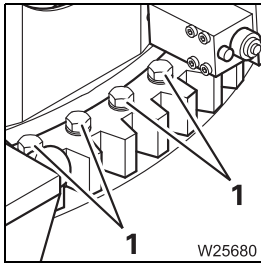


The **inner ring** is connected to the superstructure by the bolts (1).

- Check all 52 bolts (1) from **below**.

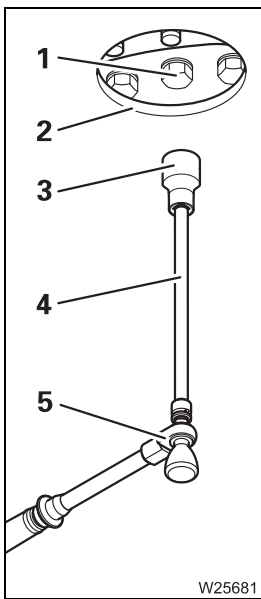
To do this, you must rotate the turntable gradually to gain access to a pair of bolts (1) opposite one another, through the openings (2) in the carrier.

Selecting the tools



Outer ring

The bolt heads (1) are easily accessible for fitting a socket wrench. Therefore, you can use **manual or powered torque wrenches** (electric or hydraulic drivers).



Inner ring

The bolt head (1) is accessible only via the opening (2). An extension (4) is required for fitting a socket (3).

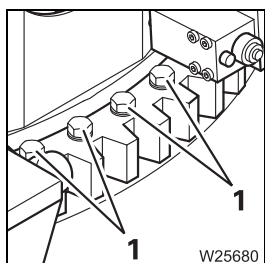
A **manual torque wrench** (5) is recommended so that it can be tightened gently, and slipping from the bolt head (1) is avoided.

Torques

Bolt type	GROVE part number	Torques Nm (lbf ft)
Ball slewing bearing Bearing type: KDV, single-row	03010997 Model plate: Inside the inner ring.	
M 24 x 100: 52 pieces on the outer ring	04170759	790 (583)
M 24 x 110: 52 pieces on the inner ring	04170758	790 (583)

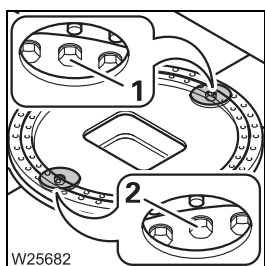


Checking the outer ring



- Divide the checking of the 52 screws into 13 working steps of 4 screws each.
Between each of the 13 operation steps you need to rotate the turntable to the next group of 4 bolts 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 - 25.
- Once they have been checked, mark the bolts to avoid subsequent confusion.
- Remove the tool.
- Start the engine and turn the turntable by 180° – the second group of screws on the opposite side is now accessible.
- Switch the engine off.
- Check all other groups in the same way.

Checking the inner ring



- Divide the inspection of the 52 screws in 26 operation steps each with a pair of screws on the opposite side.
Between each of the 26 operation steps you need to rotate the turntable to the next pair of bolts 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 - 25.
- Once they have been checked, mark the bolts to avoid subsequent confusion.
- 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 the engine off.
- Check all the other pairs 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 is level and on outriggers; *Operating Instructions*.
- The main boom must be fully raised; *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.

Greasing

A distinction is made between initial lubrication and subsequent lubrications.

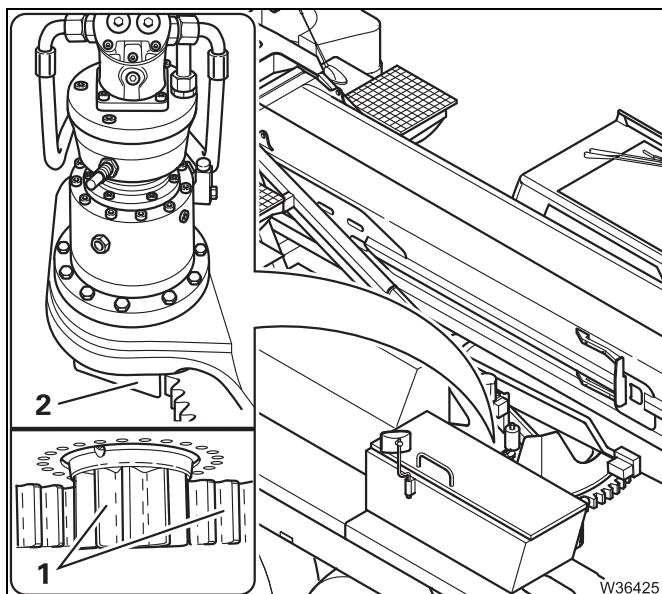


Risk of crushing from the gear teeth!

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.

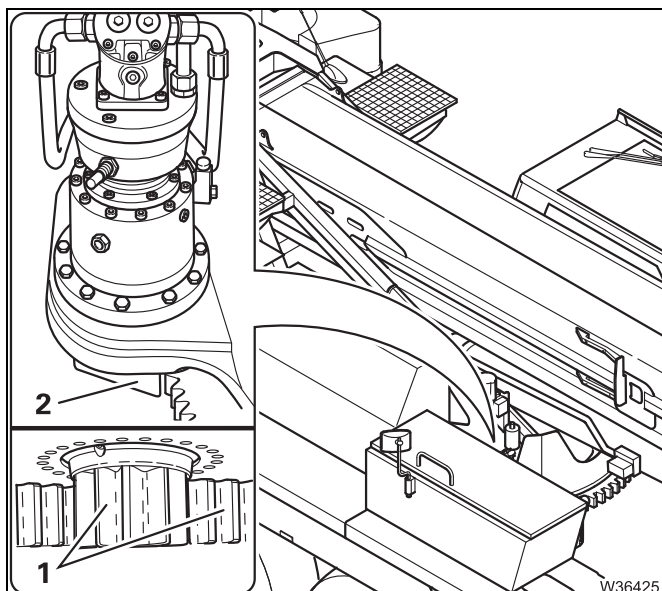
A distinction is made between initial lubrication and subsequent lubrications:





First lubrication

- Remove the plate (2).
- Remove the old grease from all the gear teeth (1).
- Apply a thin layer of new grease to all the gear teeth and allow it to penetrate for about 10 minutes.
- Apply a second, thicker layer of grease and allow it to penetrate for about 30 minutes.
- Fasten the plate.



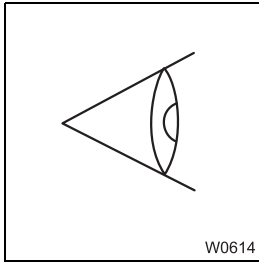
Subsequent lubrication

- Remove the plate (2).
- Apply new grease to all the gear teeth (1).
- Allow it to penetrate for about 30 minutes.
- Fasten 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 first be checked for tightness;  *Checking the bolts*, p. 8 - 23.
- The truck crane is on outriggers with an outrigger span of **6.825 x 4.40 m (22.4 x 14.4 ft)** and is aligned horizontally.
- The counterweight **6.60 t (14 500 lbs)** is rigged in accordance with the *lifting capacity table*.
- The lattice extension must be removed.
- The auxiliary hoist must be removed.
- The main boom is telescoped to 100-0-0-0-0.
- The current load must not exceed **1 t (2 200 lbs)** – if necessary unreeve the hook block.

Type

The GMK3060 truck crane 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	03010997 Model plate: Inside the inner ring.

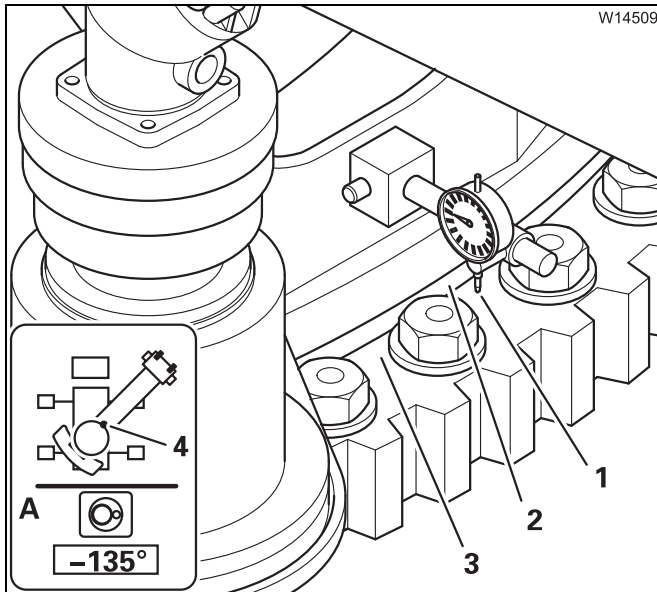
Measuring tilting play

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 2.6 mm (0.102 in).

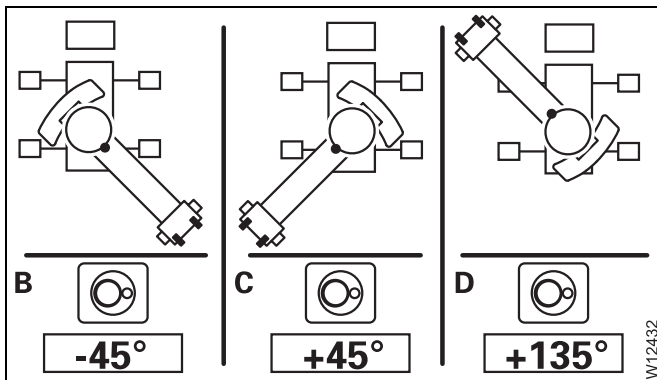
This results in the maximum permissible tilting play.

	Base value + max. permissible wear =	max. permissible tilting play
Example:	0.33 mm (0.013 in) + 2.6 mm (0.102 in)	2.93 mm (0.115 in)



Current tilting play

- Derrick 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 probe (1) on the lower ring (3) as close as possible to the gasket (2).
- Slowly derrick 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 - 30.

8.5.5

Lubricating the locking of turntable

M 12



The GMK3060 truck crane can be fitted with a hydraulic turntable lock as **additional equipment**.

Grease, spare parts, tools


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

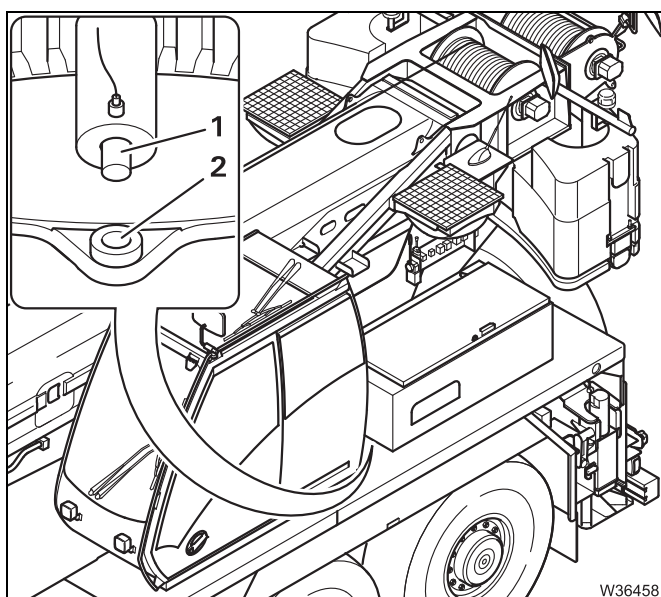
- Brush.

Prerequisites

- The truck crane is horizontal and is in on-road mode;  *Operating Instructions*.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Greasing

- Familiarize yourself with the correct operation of the hydraulic turntable lock;  *Operating Instructions*.



- Grease the lubricating points (1) and (2) 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 escape.

Store/dispose of consumables and any soaked equipment properly.

Ask about the applicable regulations.

8.6.1

Checking the hydraulic hoses

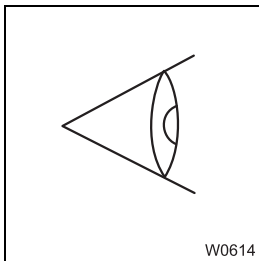
W

The inspection work is described in section *Checking the hydraulic hoses*, p. 7 - 84.

8.6.2

Checking for leaks

W



- When the engine is running, carry out a visual inspection for leaks on the hydraulic components of the superstructure (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;
 ▶ *Check the oil level*, p. 7 - 83.



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

After hydraulic components have been changed

- Bleed the hydraulic system.

If damage cannot be rectified immediately or further damage is likely

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

8.6.3

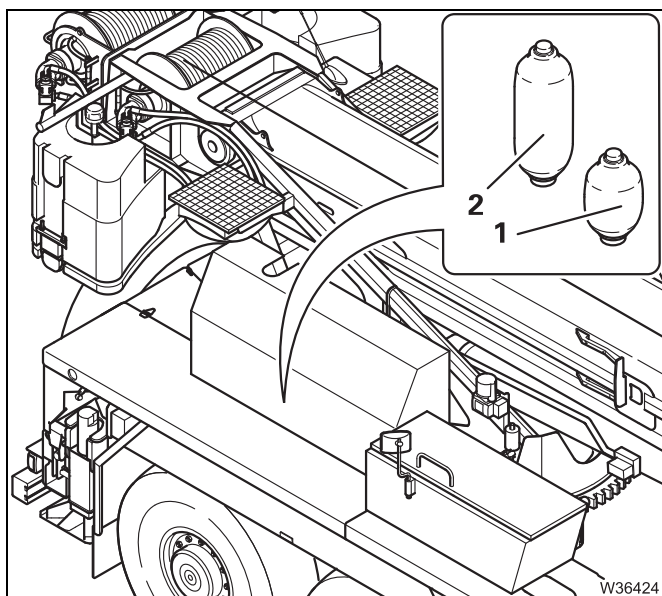
Pressure accumulator – checking the gas pressure

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.



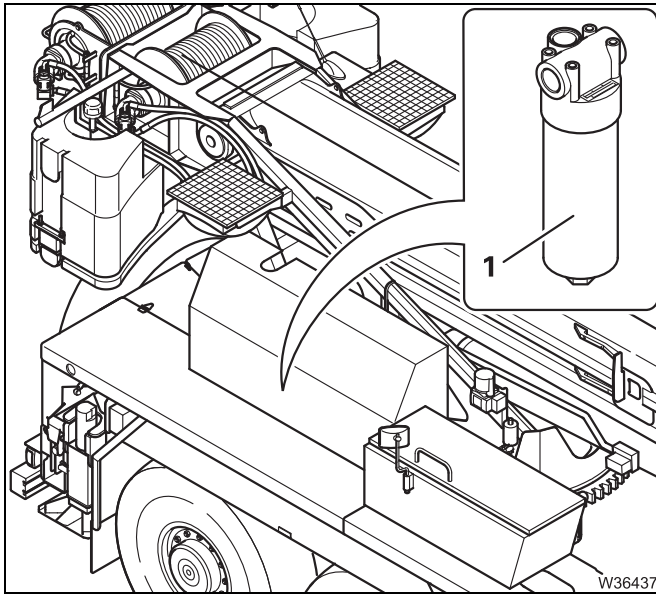
The superstructure is equipped with pressure accumulators.

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.

8.6.4

Changing oil filter 3



The changing of the oil filter 3 (1) in the superstructure is described together with the changing of oil filter 1, 2, 4 in the carrier;
▣▣▣▣► *Changing the hydraulic oil filter, p. 7 - 98.*

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8.7

Main boom

8.7.1

Grease the piston rod of the derricking cylinder

M 1

Grease, spare parts and tools

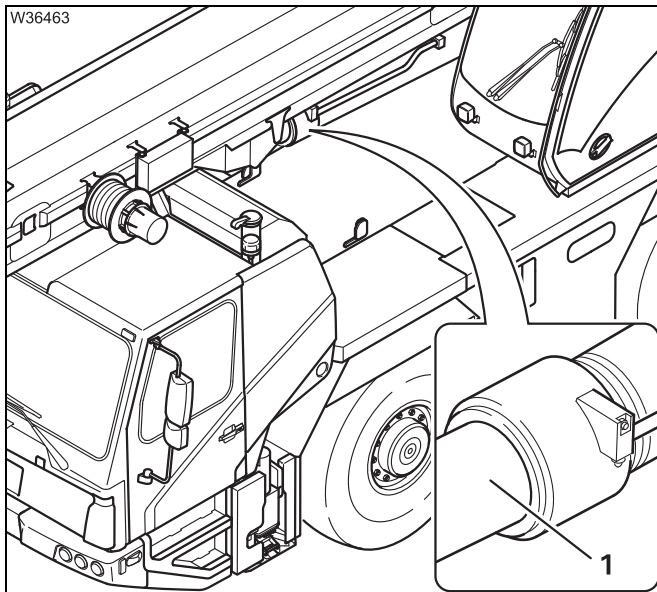
Designation	GROVE part no.
Lubricant RHUS SW 2	03325215
or	
Spray on Berulub; 0.5 litres (spray-on)	01929824

– 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 gasket 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 of 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 2 AF, 1 kg can	03325215
Slide paste for the telescopic slide faces: PAL1, 25 kg bucket	02314698

- A grease gun for the grease 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.



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 have been set up using the telescope positions required for maintenance as specified in the rigging tables; *Lifting capacity table*.
- 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 47/100/0/0/0 are released in the context of the corresponding rigging table, this rigging mode allows you to perform the complete maintenance work on the main boom.

Information



Risk of overturning when telescoping if the RCL is overridden!

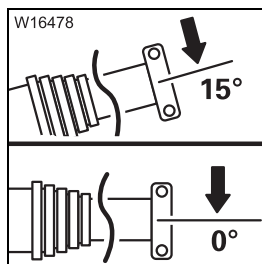
Do not override the rated capacity limiter (RCL) when telescoping is switched off. Select a suitable rigging table which contains the required telescoping. Set the associated rigging mode and enter the RCL code.



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 ladders provided with your crane!

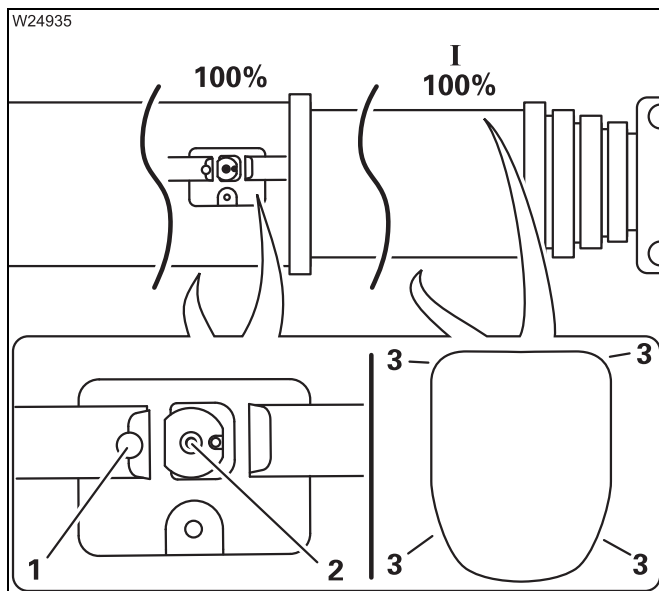


If the main boom has been telescoped several times, the telescoping mechanism and derricking gear can be so heavily loaded that the main boom can be neither telescoped nor derricked. Therefore note the following instructions:

- Before retracting the boom, derrick it to approximately 15°.
- Do not derrick the main boom below 0°.

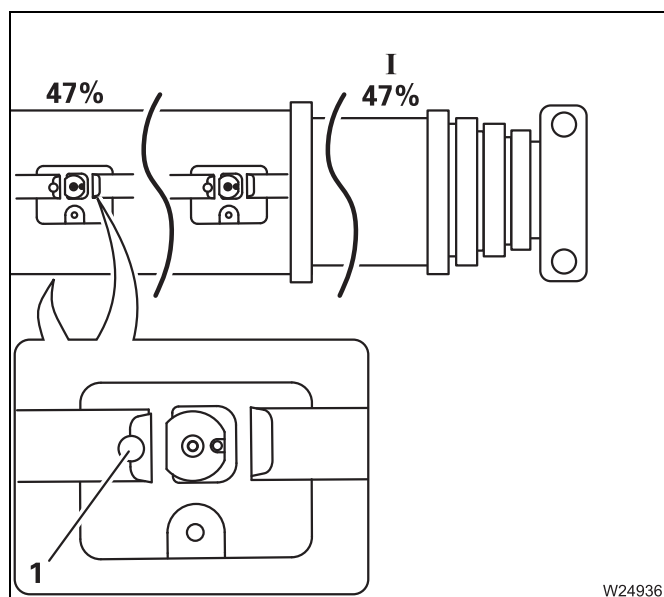
Telescopic section I

- Observe the following instructions regarding maintenance work.



- Extend 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 slide faces at the lubricating nipples (1) on both sides.
- Use the grease gun (RHUS 2 AF) to lubricate the locking pins at the grease nipples (2) on both sides.
- Lock and unlock the telescopic section I several times, so that the grease is distributed over the locking pins.



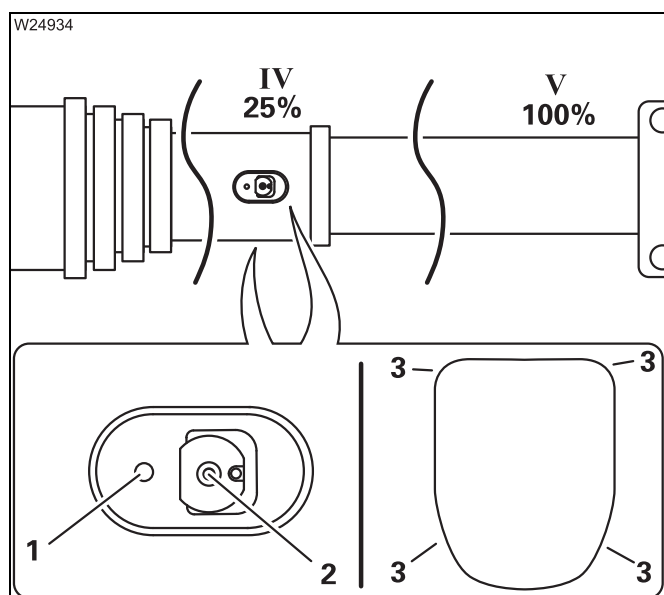


- Extend telescopic section **I** to 47%.
- Use the grease gun (PAL1) to lubricate the upper slide faces at the lubricating nipples (1) on both sides.
- Fully retract telescopic section **I**.
- Fully extend and retract the telescopic section **I** again so that the grease is distributed over the telescope slide faces.

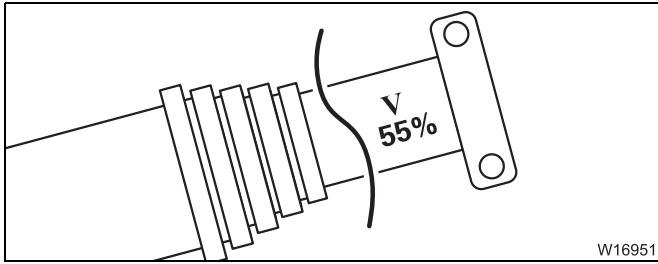
Telescopic section V - II

- Observe the following instructions regarding maintenance work.

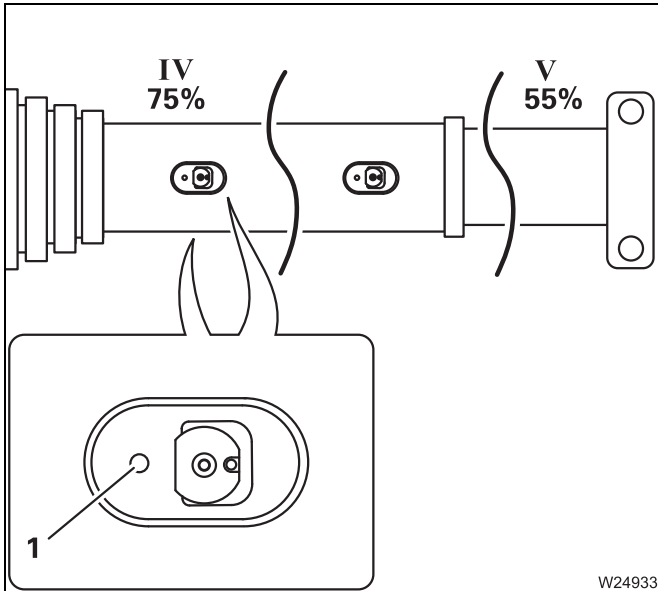
The following diagrams show the lubrication of telescopic section **V**.
The telescopic sections **II** - **IV** are lubricated in the same way.



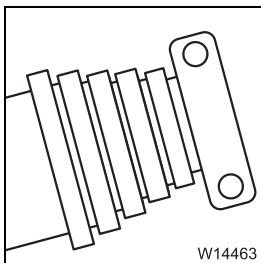
- Extend telescopic section **V** to 100% and telescopic section **IV** to approx. 25%.
- Use a brush or a roller (PAL1) to lubricate the outer, upper and outer, lower slide faces (3).
- Use the grease gun (PAL1) to lubricate the upper slide faces at the lubricating nipples (1) on both sides.
- Use the grease gun (RHUS 2 AF) to lubricate the locking pins at the grease nipples (2) on both sides.



- Derrick the main boom to 15°.
- Extend telescopic section **IV** to 0% and telescopic section **V** to 55%.
- Lock and unlock telescopic section **V** several times, so that the grease is distributed over the locking pins.



- Derrick the main boom to 0° – do not derrick to below 0°.
- Extend the telescopic section **IV** to approx. 75%.
- Use the grease gun (PAL1) to lubricate the upper slide faces at the lubricating nipples (**1**) on both sides.

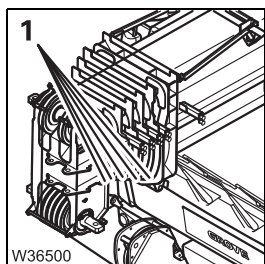


- Derrick the main boom to 15°.
- Retract telescopic sections **IV** and **V** to 0%.
- Fully extend and retract telescopic section **V** again so that the grease is distributed over the telescope slide faces.
- Derrick the main boom to 0°.

- Lubricate telescopic sections **IV**, **III** and **II** in the same way.
- When telescoping the respective telescopic sections, pay attention to different main boom fixed lengths:

Telescopic section I	0 / 47 / 100 (%)
Telescopic section II	0 / 49 / 100 (%)
Telescopic section III	0 / 51 / 100 (%)
Telescopic section IV	0 / 53 / 100 (%)
Telescopic section V	0 / 55 / 100 (%)





Before driving the truck crane

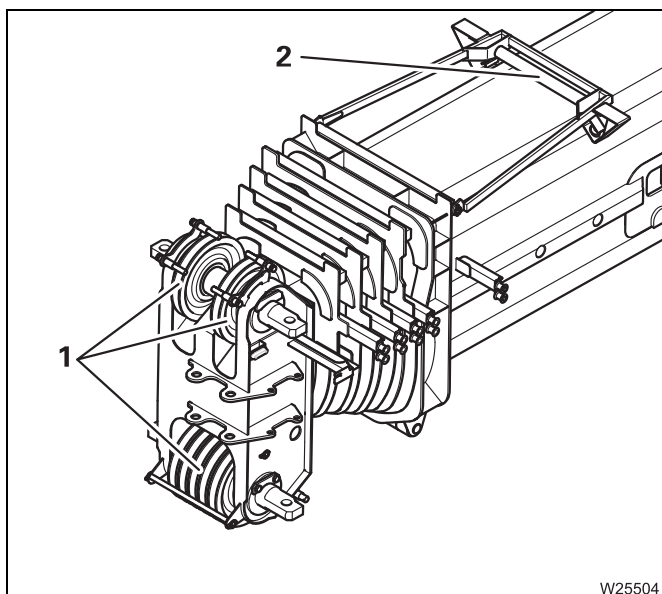
Fully retracting all telescopic sections of the main boom after greasing may result in excess lubricant paste emerging at the collar (1).

- 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) and (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 locking units

M 6

Adapting the interval

Each of the telescopic sections has two locking units. You have to visually inspect the outside of all the locking units. To do so, you have to telescope the various telescopic sections so that you can check two locking units each.

Manitowoc Crane Care recommends that you perform the external visual inspection at the same time as lubricating the telescopic sections (**M 3**), which is required every three months, as you will have established the telescope statuses needed for inspection.

- Perform this external visual inspection at least every six months (**M 6**) at every second lubrication of the telescopic sections.

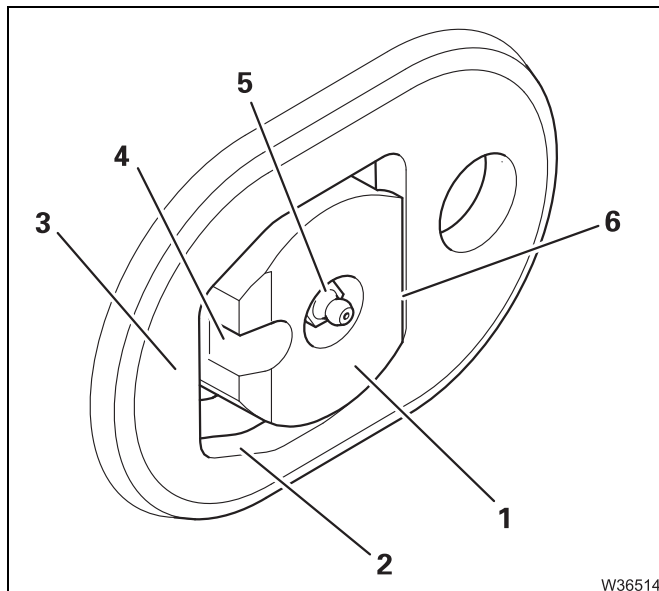
Prerequisites

- Familiarise yourself with the various telescoping modes:
 - ▣▣▣▣ *Lubricating the telescopic sections*, p. 8 - 38.
- Observe the prerequisites and safety instructions outlined there.

Visual inspection

The truck crane is not running and is secured against unauthorised use.

- Perform the visual inspection described here in the same way on all locking pins and all telescopic sections.



- Clean the locking pin (1).
- Check the locking pins (1) for external damage such as breakage or deformation. Pay particular attention to protruding contours (6).
- Check the opening (2) in the telescopic section (3). The opening must be flat and without grooves, cracks or deformations.
- Check that the holes for the lubricating nipples (5) and the emergency actuation screw (4) are undamaged.

- Have damage on the locking units repaired by **Manitowoc Crane Care** or an authorised GROVE dealer without delay.

8.7.5

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 due to turning rope drum!

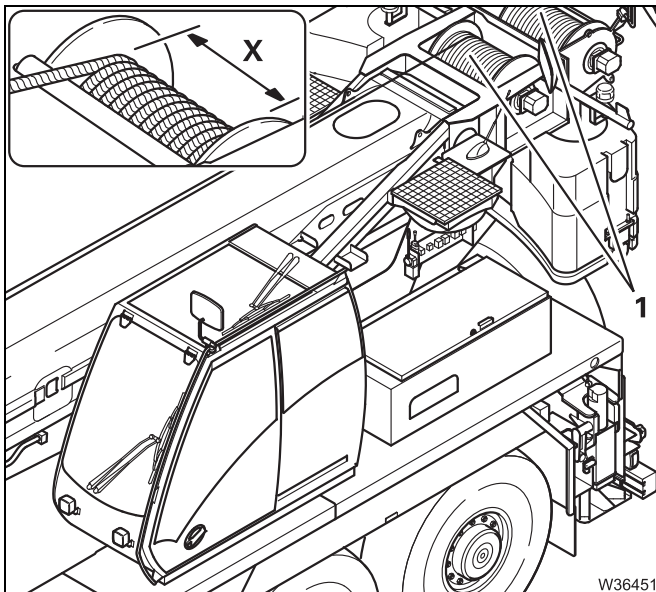
Keep away from the rope drum while it is turning.

This will prevent your limbs from being drawn in and getting crushed.

Prerequisites

- The hoist mirrors must be folded out; *Operating Instructions*.
- One hook block must be reeved; *Operating Instructions*.
- The main boom must be raised to about 30°; *Operating Instructions*.
- The engine must be started.

Checking



- Always check the entire length of the winding of the ropes (1).
- Slowly perform the *lowering* movement until the rope has moved over a complete width (X) of the rope drum.
 - The rope must 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 be at an angle of approx. 180° to each other.



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 44 Nm (32 lbf ft).

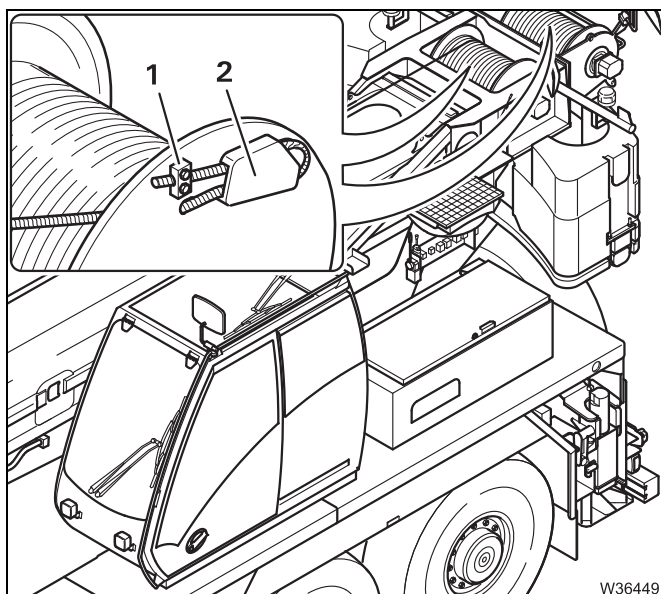
Prerequisites

- Establish a rigging mode in accordance with the *lifting capacity table* here and enter the rigging code on the RCL;  *Operating Instructions*.
- A hook block must be reeved 5-fold;  *Operating Instructions*.
- The main boom must be raised and fully extended;  *Operating Instructions*.

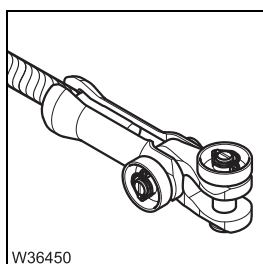
Checking the ropes


- Start the engine.
- Unreel the rope and check the rope and the rope spooling;  *Assessing the condition of the hoist rope*, p. 8 - 48. When 3 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 readjusted;  *Adjusting the lowering limit switch*, p. 8 - 57.



- Check the clamp (1) for damage and firm seating – torque 44 Nm (32 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 Instructions*.

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.



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

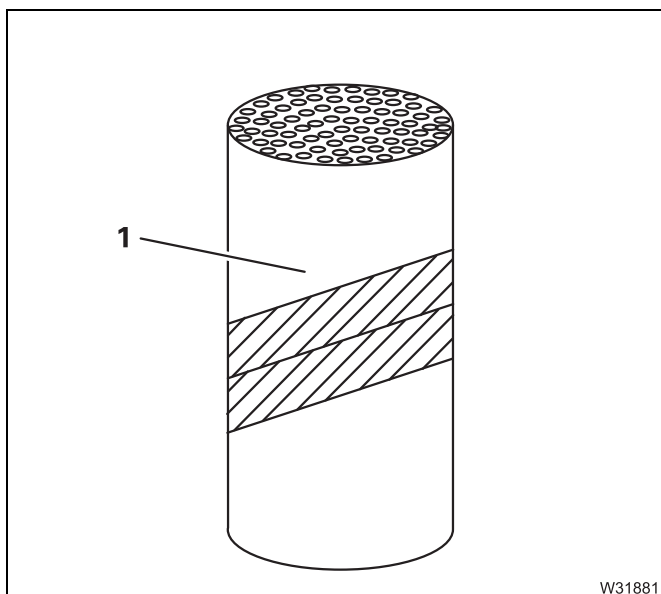
Assessing the condition of the hoist rope



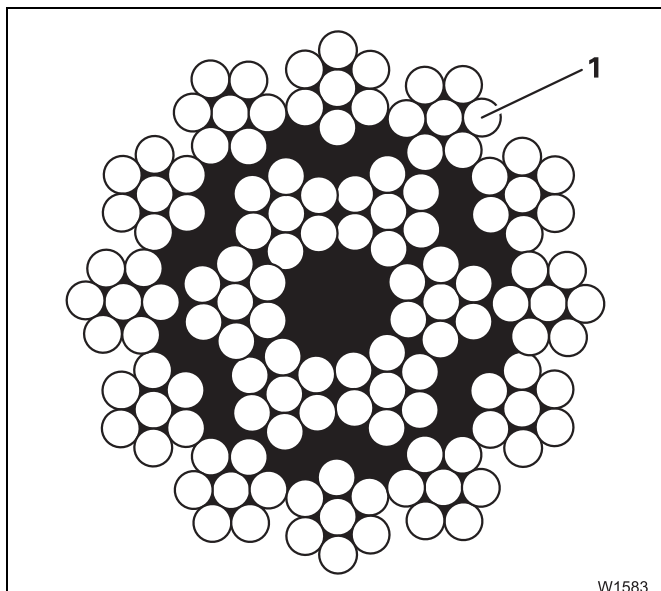
If in doubt about damage assessment, always consult an approved inspector.

To assess the condition of the rope, you must be familiar with the following:

- the type of rope (lang lay rope),
- the number of load bearing wires in the outer strand
- the rope diameter (▣▣▣▣ *Operating Instructions*).



In a lang lay rope (**1**) the wires run at an angle of approximately 45° to the longitudinal direction of the rope.



The number of load-bearing outer wires (**1**) is found 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!

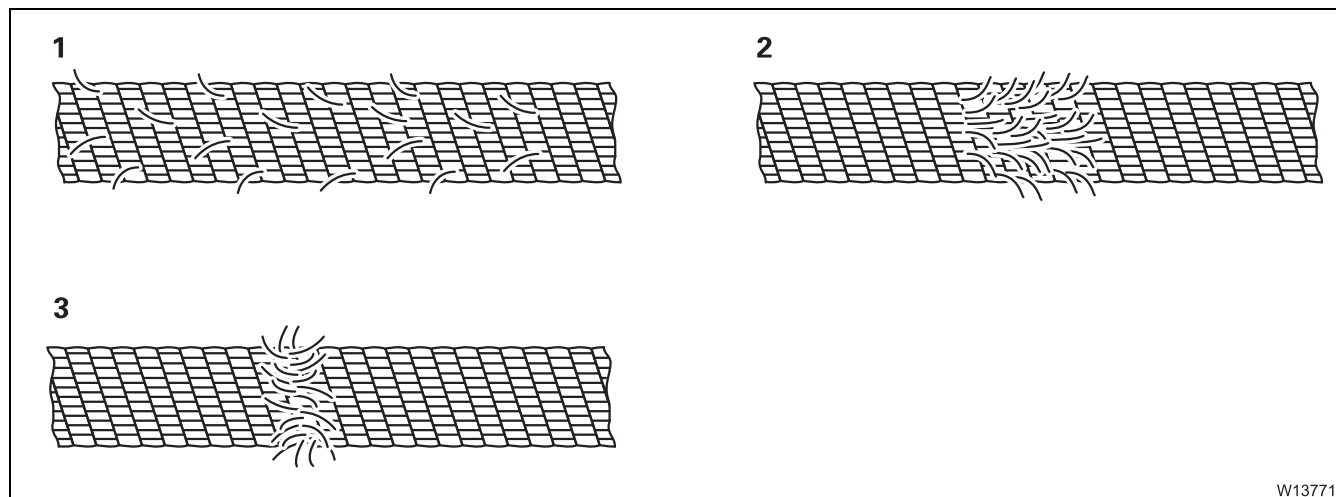
Number of visible wire breaks on a rotation-resistant hoist rope						
The rope section runs over a rope disc or on a drum wound as a single layer						
Number of load-bearing outer wires	Ø 13 mm		Ø 16 mm		Ø 17 mm	
	to 78 mm	to 390 mm	to 96 mm	to 480 mm	to 102 mm	to 510 mm
101-120	3	5	3	5	3	5
121-140	3	5	3	5	3	5
The rope section is running on a drum wound as multiple layers						
	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



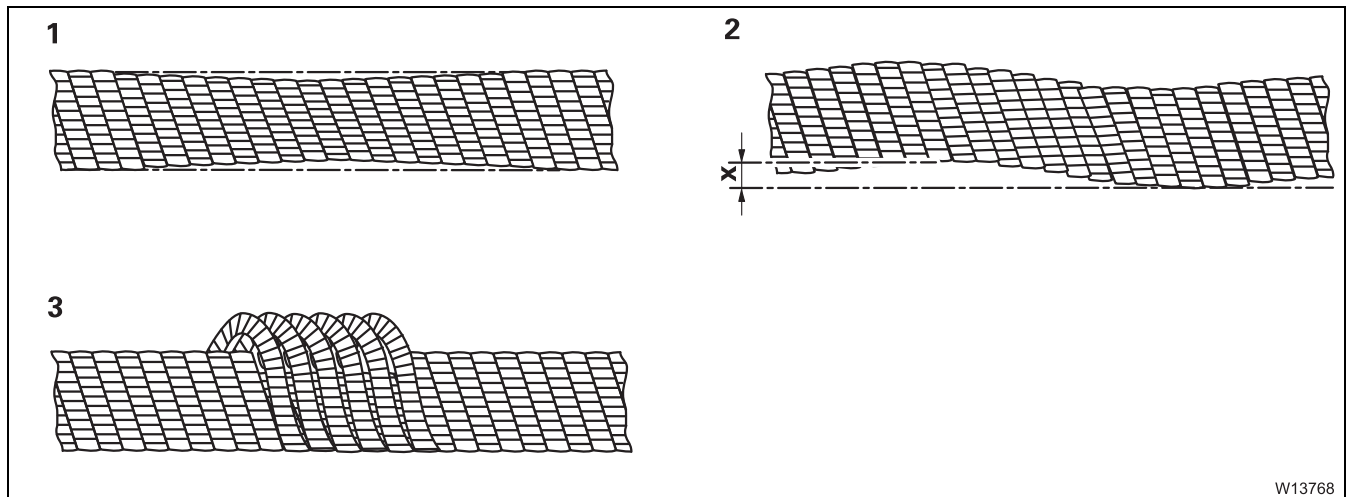


Risk of accidents due to reduced load bearing capacity!

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).



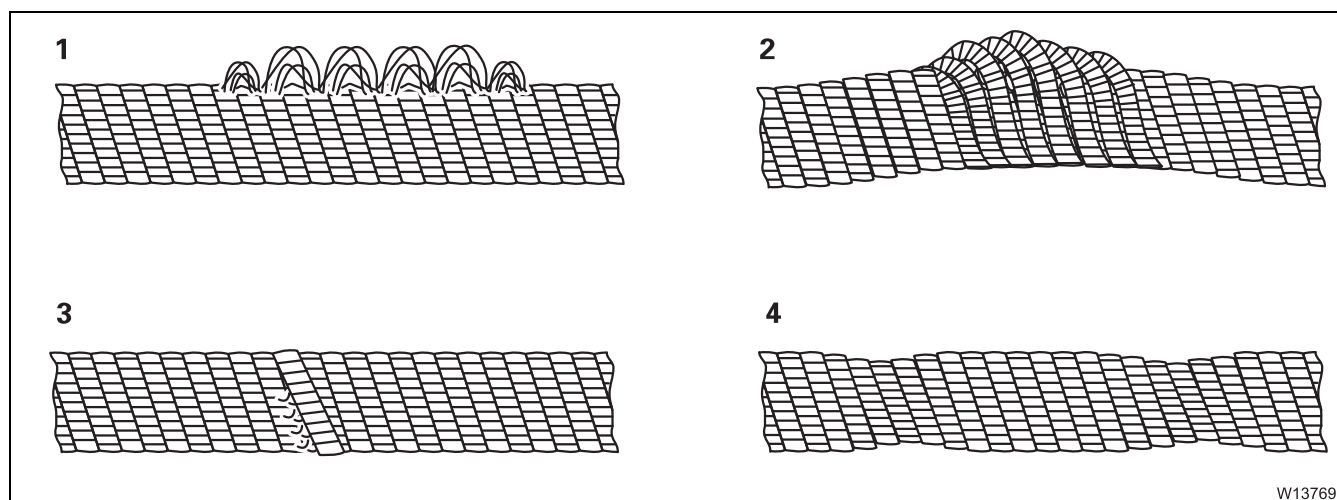
Damage	Description	Cause	Replacement
Wire break (1)	Individual wires are broken; the broken ends of the wires are protruding from the rope.	General wear caused by ageing of the rope or Consequential damage resulting from damage to the rope.	Replace the rope at the latest when the maximum permissible number of wire breaks according to the table are visible externally. Replace the rope immediately if wire breakage clusters or strand breakages occur. The frequency of wire breaks increases with a rope's age. For safety reasons, it is advisable to replace the rope while the number of wire breaks is still low.
Wire breakage cluster (2)			
Strand breakage (3)			
Effect of heat	Tarnished colour is visible externally on the rope.	Rope has been subjected to excessive heat.	Replace the rope immediately .



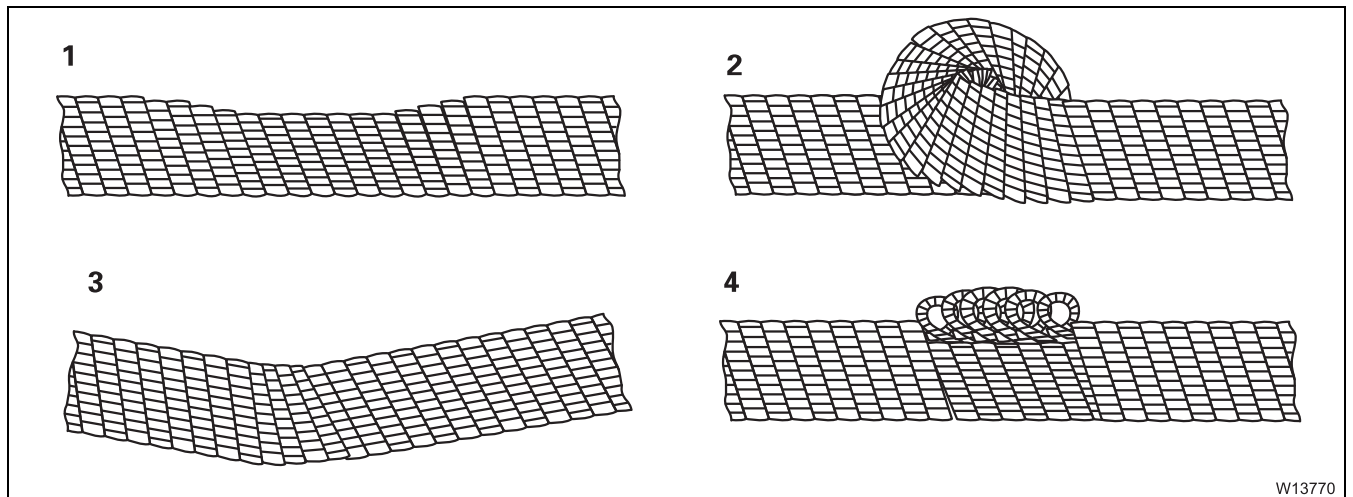
W13768

Damage	Description	Cause	Replacement
Reduced diameter (1)	The diameter of the rope has become smaller along large sections.	Structural changes	Replace the rope immediately if the diameter has decreased by 15% or more compared to the nominal diameter.
		Corrosion or abrasion.	Replace the rope immediately if the diameter has decreased by 10% or more compared to the nominal diameter.
Corkscrew-type rope deformation (2)	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.	Consequential 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 immediately .
Basket like deformation (3)	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 immediately.





Damage	Description	Cause	Replacement
Loop formation (1)	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.	Immediately replace the rope if the rope structure has been substantially altered by the loop formations.
Loosening of wires or strands (2)	Outer wires or strands have become loose. Only the inner strands continue to bear the load.	Corrosion or abrasion.	Replace the rope immediately .
		Other causes.	The number of wire breaks determines when the rope must be replaced.
Knot formation (3)	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 immediately if serious knot formation occurs.
Constriction (4)	Diameter reduction over short sections.	General wear caused by ageing of the rope.	Replace rope immediately if serious constrictions are detected.



Damage	Description	Cause	Replacement
Flattening (1)	Crushed areas, mostly with wire breaks.	Mechanical damage, e. g. due to driving over the rope.	Determine number of wire breaks; replace rope immediately if serious crushing has occurred.
Kink (2)	Rope deformation with twists and wire breaks.	Rope in the eyelets was pulled straight while twisted.	Replace the rope immediately .
Buckling (3)	Buckled section in the rope.	Mechanical damage.	Replace the rope immediately .
Crinkling (4)	Crinkling rope deformation.	Loaded rope was pulled over an edge.	Replace the rope immediately .

8.8.5

Replacing the hoist rope

Spare parts and tools

- An original replacement rope; ▮▮▮▮ *Rope certificate.*
- A reel stand with braking block.
- Torque wrench for 44 Nm (32 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 Instructions.*

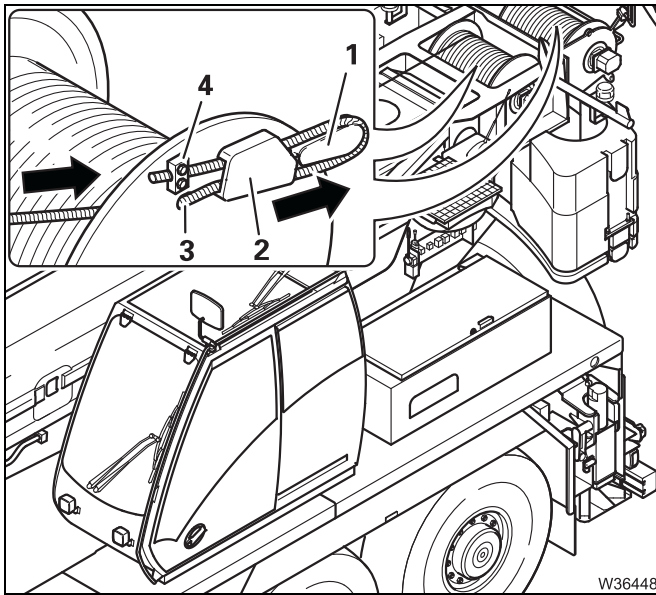
Replacing the old rope

- Unreel the hoist rope until it switches off.
- Adjust the lowering limit switch so that you can unreel the rope completely; ▮▮▮▮ *Adjusting the lowering limit switch, p. 8 - 57.*
- Unreel the remaining layers from the hoist drum.
- Lock the truck crane to prevent unauthorised use; ▮▮▮▮ p. 2 - 3.



Risk of accidents due to the rotating rope drum!

Switch the engine off and remove the ignition key so that no unauthorised operation of the hoist can occur.

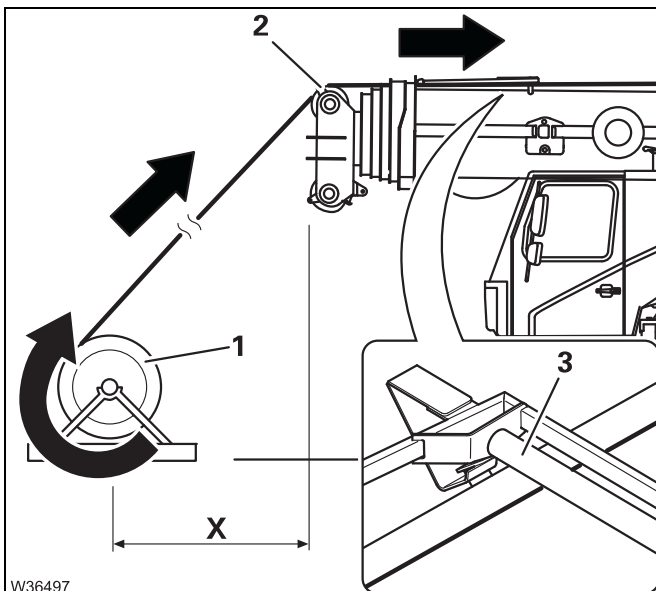


- Remove the clamp (4).
- Push the rope through the bore (3) until the rope wedge (1) slides out of the pocket (2).
- Remove the rope wedge and place the old rope away from the truck crane.

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.



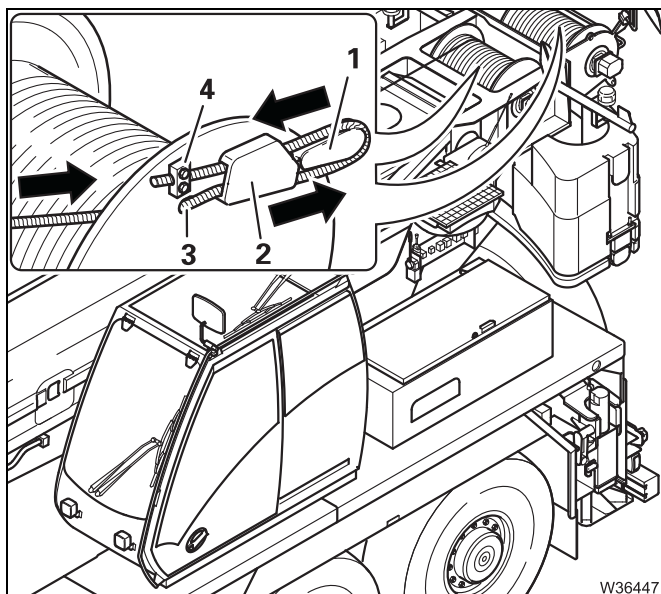
- Place the reel stand (1) with the new rope in front of the main boom head.

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.

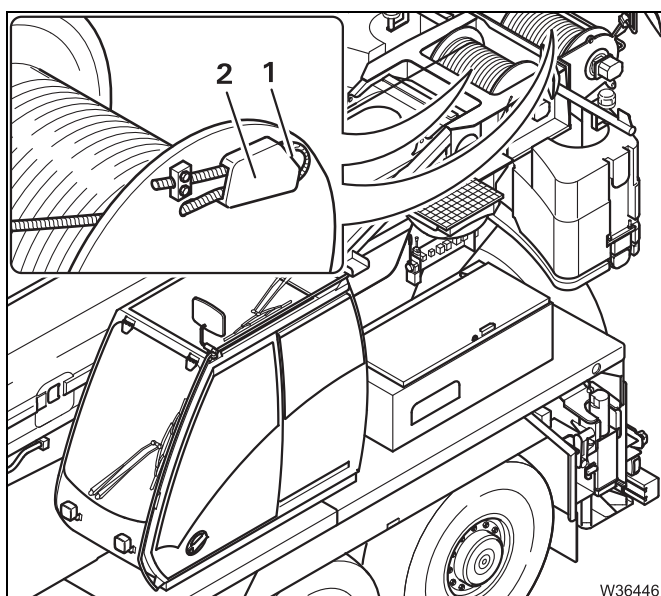
Ensure that the rope is being rolled on to the drum with the right slewing direction.

- 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.
- Fasten the clamp (4) and tighten it – torque 44 Nm (32 lbf ft).
- Place the rope wedge (1) in the loop.



- Pull 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 – at least 5-fold reeving;  *Operating Instructions*.
- 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.

- Adjust the lowering limit switch; p. 8 - 57.
- Run in the new rope with small loads so that the rope can settle on the hoist drum.

8.8.6

Adjusting 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 Instructions*.
- The main boom is fully raised and extended; *Operating Instructions*.
- The hook block is lowered until only 3 turns of the rope remain on the hoist drum.

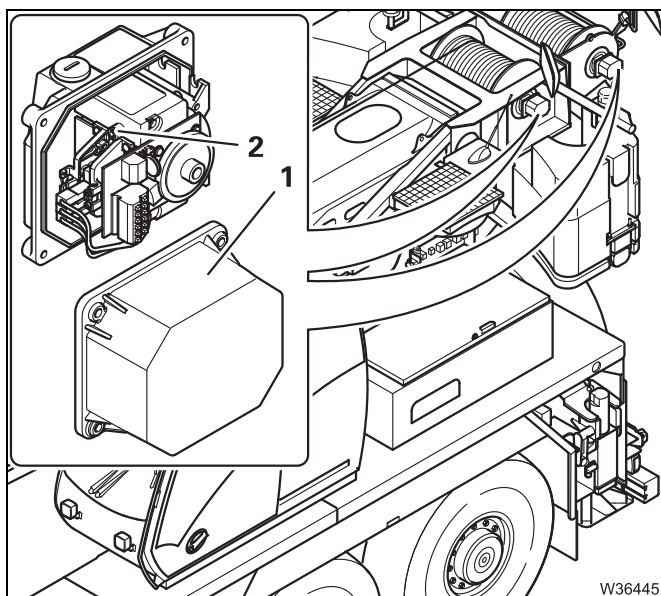


Adjusting the lowering limit switch



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 turn 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 3 rope turns are still on the hoist drum.

- Correct the setting of the lowering limit switch if necessary.

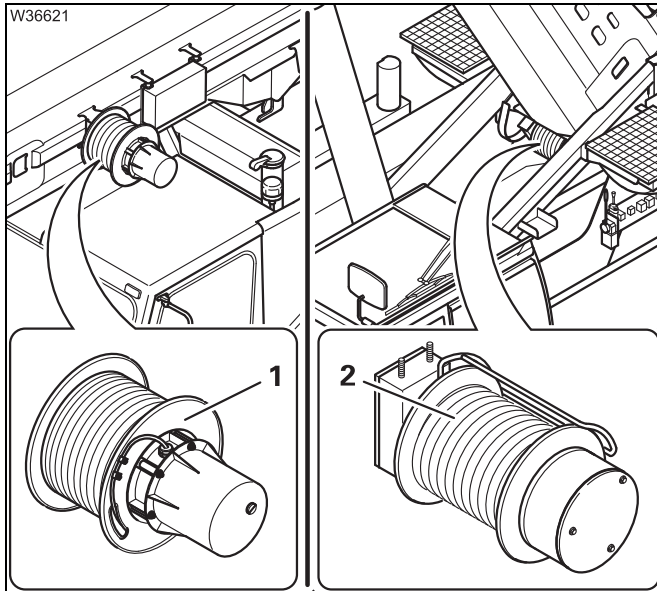
8.9

Cable drums and slewing angle sensor

8.9.1

Maintenance of the slip ring assemblies

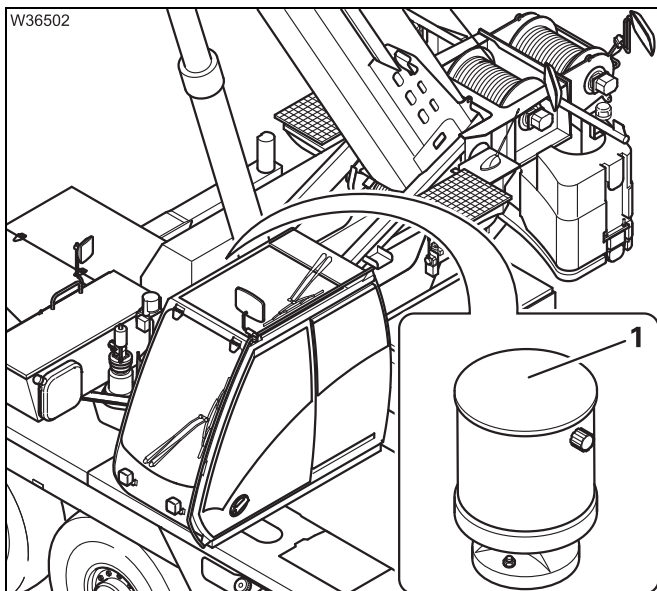
M 6



On the telescopic boom

The slip ring assemblies are located in:

- 1 Cable drum 1
- 2 Cable drum 2



On the turntable

The slip ring assemblies are located in:

- 1 Slewing duct



Spare parts and tools

Designation	Quantity	GROVE part no.
Cover gasket Cable drum 1	1	03138891
Cover gasket Cable drum 2	1	03138894


- Clean, lint-free cloth.
- Dry, oil-free compressed air.

Prerequisites


For cable drum 1

- The main boom is fully lowered;  *Operating Instructions*.

For cable drum 2 and slewing duct

- The truck crane must be on outriggers and level.
- The main boom must be fully raised;  *Operating Instructions*.

For cable drums 1, 2 and slewing duct

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.
- The selector handle must be removed from the battery master switch.



Risk of damaging the rated capacity limiter!

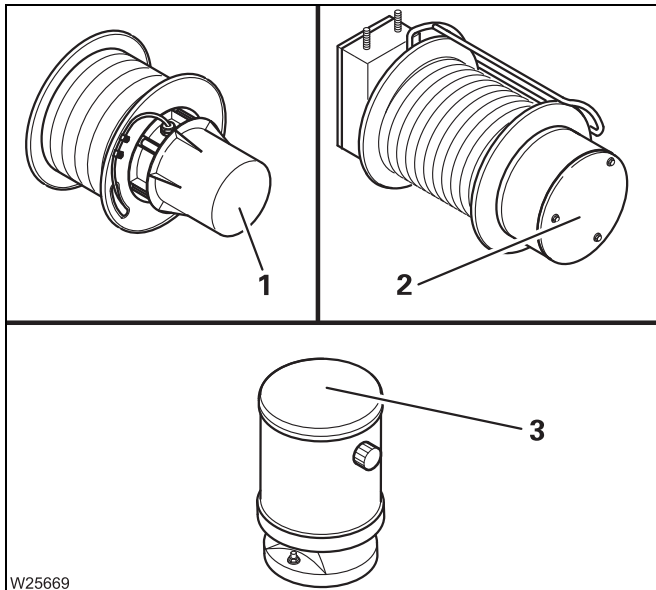
Before maintenance work on the slip ring assemblies, always switch off the battery master switch so that the cable drum is without power. This prevents short circuits which may lead to damage to the rated capacity limiter.



Risk of injury when main boom is in motion!

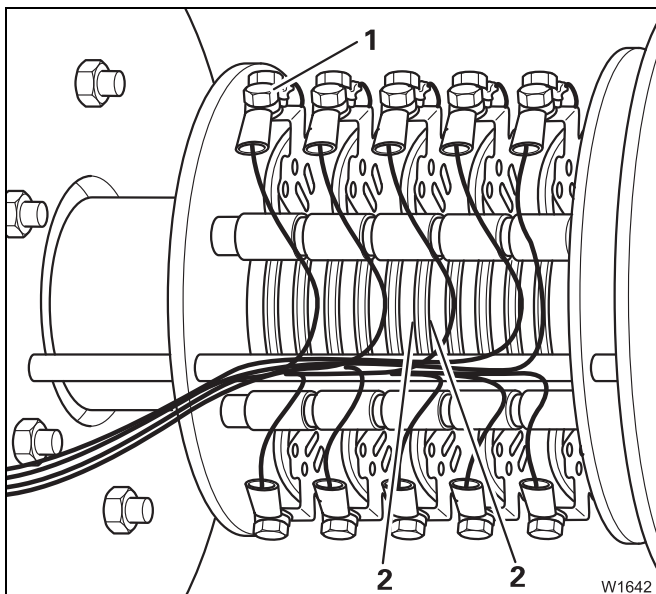
Perform maintenance work only after the truck crane has been shut down. Always ensure that the truck crane is protected from unauthorised use before beginning maintenance work. Remove the keys from the crane cab and put up warning signs.

Maintenance of the slip ring assemblies



- Remove the cover (1) or (2).
- Clean and dry the cover.
- Replace the gasket if necessary.

- Check that the cover (3) is undamaged. This slip ring assembly is maintenance-free. The cover (3) only needs to be opened for repairing the slip ring assembly.



- 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.
- Fasten the cover to the cable drum.

8.9.2

Lubricating the slewing angle sensor

Y 5

Grease, spare parts, tools

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

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

- Grease gun from the tool set.
- Sealing agent (e.g. Hylomar).
- Torque wrench for 25 Nm (18.5 lbs ft).

Prerequisites

- The engine must not be running and must be secured against unauthorised use; ►► p. 2 - 3.

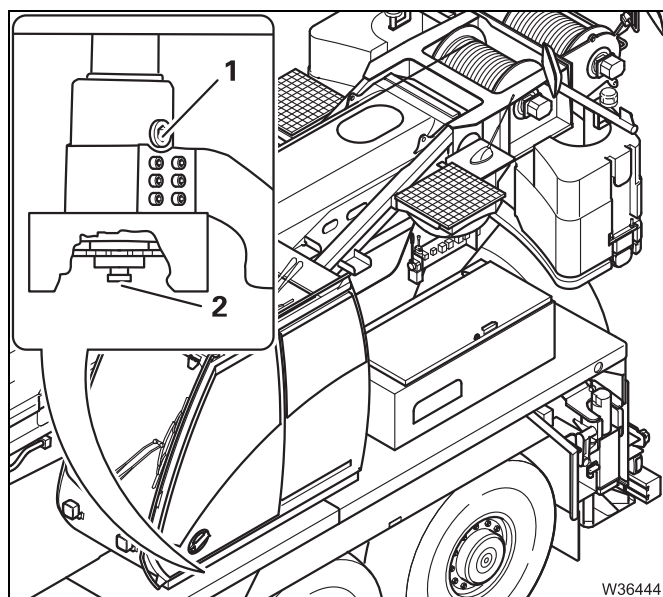


Risk of damage to the slewing angle sensor!

Before lubricating, always remove the screw from the slewing angle sensor.

This prevents the slewing angle sensor from damage.

Greasing




- Unscrew the screw (1).
- Clean the grease nipple (2) and inject about 5 cm³ (0.3 in³) of grease.
- Remove any excess grease, and close the grease nipple.
- Tighten the screw with a new gasket and sealing agent – torque 25 Nm (18.5 lbs ft).

8.10 Central lubrication system

Connected lubricating points:

- Main hoist drum,
- Ball slewing bearing,
- Telescopic boom – pivot pins,
- Derricking cylinder – pivot pin.

Lubricating points not connected:

- Auxiliary hoist drum;  p. 8 - 11.

8.10.1 Checking the filling level


W

Grease, spare parts, tools

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

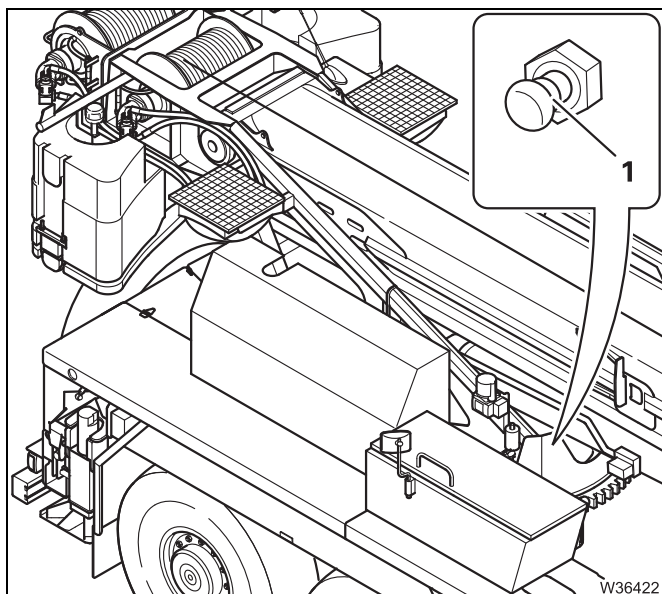
Designation	Quantity	GROVE part no.
Manual filling pump (in the tool set supplied)	1	03320403

Prerequisites

- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.



On the distributor head



Standard equipment

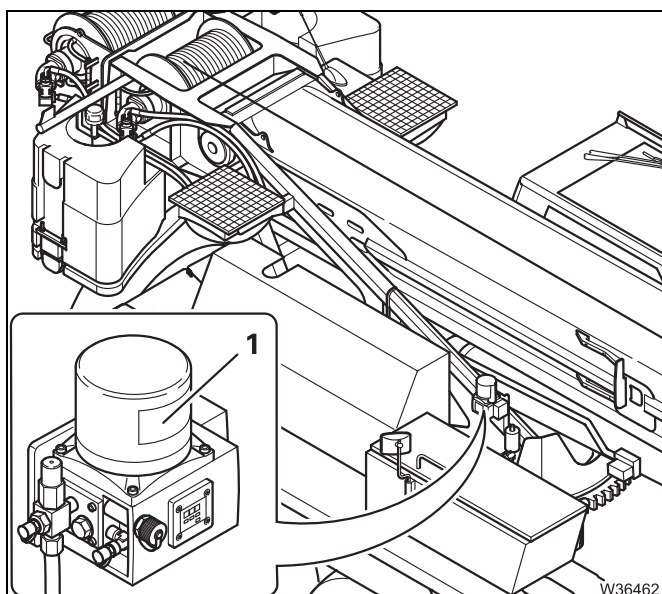
The central lubrication system is as standard equipped with a distributor head. Using the filling pump, you manually convey the grease to the lubricating points via the distributor head.

- Top up the filling pump; *Topping up*, p. 7 - 102.
- Use the filling pump to force grease into the lubricating nipple (1) until grease comes out of the lubricating points (e.g. on the ball slewing bearing).
- Remove any grease that emerges.



In the event of extensive crane operation, you must reduce the maintenance interval for lubricating manually. This prevents the lubricating points from receiving insufficient grease.

On the grease container



Additional equipment

As additional equipment, the central lubrication system is equipped with an electrical pump. The pump automatically and regularly conveys the grease to the lubricating points via the distributor head.

The grease container (1) is filled in the same way as in the carrier; p. 7 - 101.

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 2-fold;  *Operating Instructions*.

Greasing

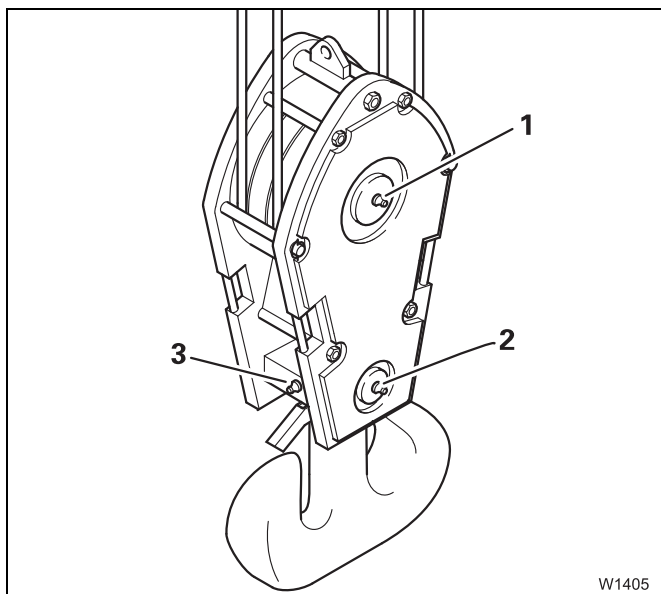
On the hook blocks supplied, the sheaves, crossheads and load hooks of the axial bearings are greased.



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.

Having them dismantled

Depending on the manufacturer, there are different maintenance intervals for the dismantling of the hook block. 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.

8.12

Electrical system

8.12.1

Checking the lighting and indicators

D



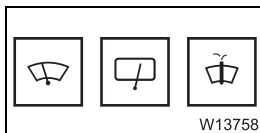
Risk of accidents if the safety devices are faulty!

Have faulty lights and indicators repaired by **Manitowoc Crane Care** or an authorised GROVE dealer or an authorised specialist workshop.

- Check the symbols and displays on the CCS (*Crane Control System*) control unit; *Operating Instructions*.

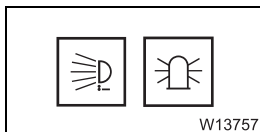
- Check the following functions:

- Windscreen wipers, windscreen washing system,



- Spotlight on the crane cab, air traffic control light,

- Spotlight on the main boom (xenon light),



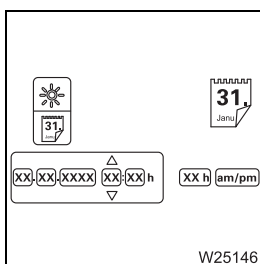
- Horn, anemometer.

- Camera lights on the main and auxiliary hoist.

- Date/Time on CCS display.

- If necessary, you can correct the time/date via the *Settings* menu in the CCS display; *Operating Instructions*.

- 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; *Replace the battery on the electronics board, p. 8 - 68*.





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

Replace the battery on the electronics board

Y 10

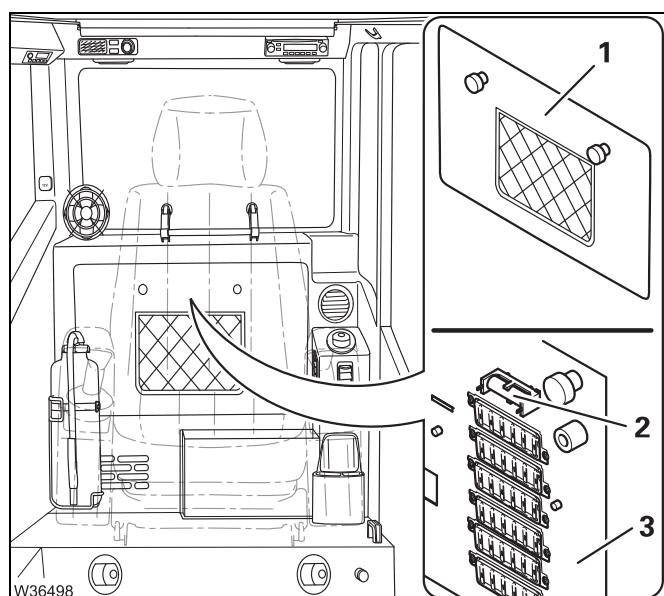
Spare parts and tools

Designation	Quantity	GROVE part no.
Lithium battery 3.6 V	1	03143172

Prerequisites

- The engine must not be running and must be secured against unauthorised use; p. 2 - 3.

Changing



- Open the cover (1) behind the seat in the crane cab.
- Change 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 crane cab in the same way as in the driver's cab; ■■■▶ *Checking the air-conditioning system*, p. 7 - 113.

8.13.2 Checking hoses

M 6

- Check the hoses in the same way as when checking them on the carrier; ■■■▶ *Checking hoses*, p. 7 - 114.

8.13.3 Checking the entire air-conditioning system

M 12

The GMK3060 truck crane is equipped with a combined air-conditioning system for the driver's cab in the carrier and the crane cab in the superstructure; ■■■▶ *Checking the entire air-conditioning system*, p. 7 - 114.

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8.14 Other maintenance work

8.14.1 Checking the windscreen washing system

W

Water, spare parts, tool

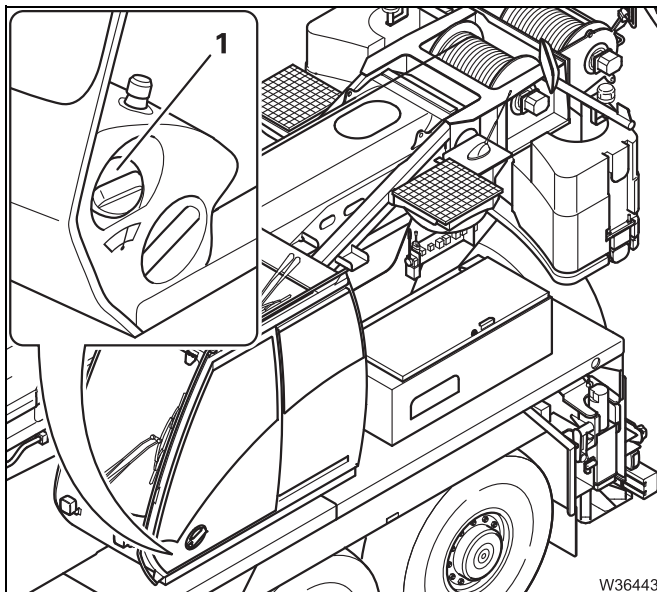
Designation	Quantity	GROVE part no.
Windscreen wiper blade	1	03268512
Roof wiper blade	1	03326121

- 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




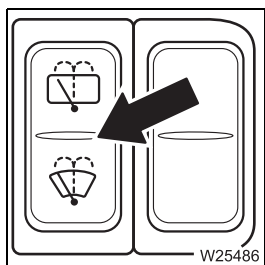
If the tank is empty

- 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

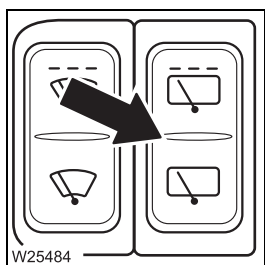
The wiping/washing system operation is described in the supplied operating instructions;  *Operating Instructions*.



- Spray water on the **windscreen** – press the **bottom** part of the switch.
- Spray water on the **skylight** – press the **top** part of the switch.



- Switch the **windscreen wiper** on – press in the **bottom** part of the switch for continuous operation.
- Also check intermittent operation – press in the **top** part of the switch.
- Switch the **windscreen wiper** off – push the switch in the middle position.



- Switch the **roof windscreen wiper** on – press in the **bottom** part of the switch for continuous operation.
- Also check intermittent operation – press in the **top** part of the switch.
- Switch the **roof windscreen wiper** off – push the switch in the middle position.

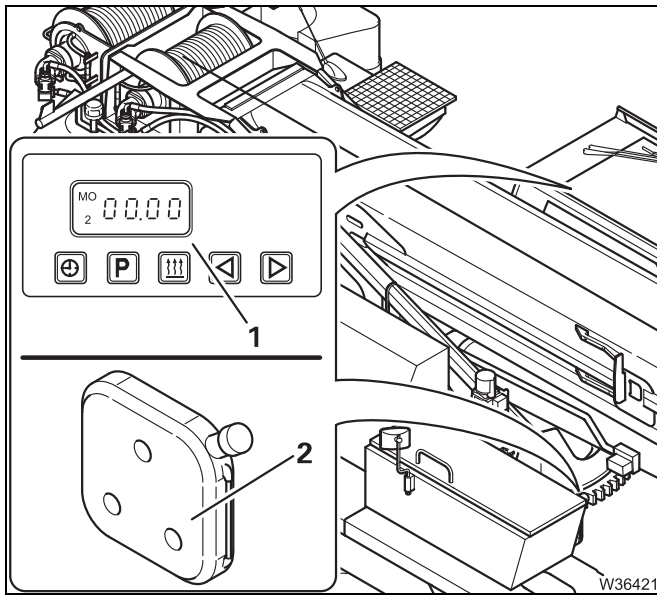
In case the windscreen/skylight is not wiped clean

- Change the wiper blade.

8.14.2

Checking the functioning of the auxiliary heater

M 1



- Check the auxiliary heater (1) in the crane cab in the same way as in the driver's cab;
 ▮▮▮▮▮ *Checking the functioning of the auxiliary heater, p. 7 - 129.*
- Check the filling level in the fuel tank (2);
 ▮▮▮▮▮ *Operating Instructions.*

8.14.3

Lubricating the crane cab door


M 12

Grease, spare parts, tools

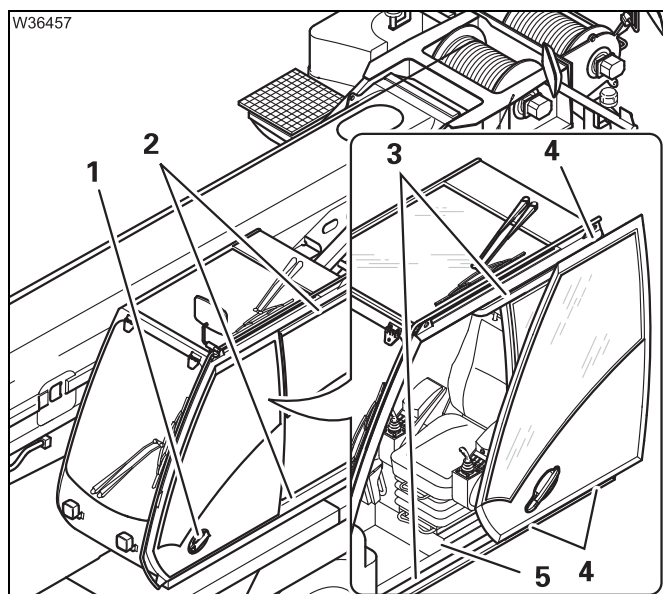
Designation	GROVE part no.
Grease: RHUS 2 AF, 1 kg can	03325215

- Brush.

Prerequisites

- The turntable is locked.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Greasing



- With the door closed, clean the rails (2) outside.
- Grease the rails (2) lightly with a brush.
- Push the door completely open using the handle (1) – the door locks in place.
- Clean the rails (3).
- Grease 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 adjusted 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

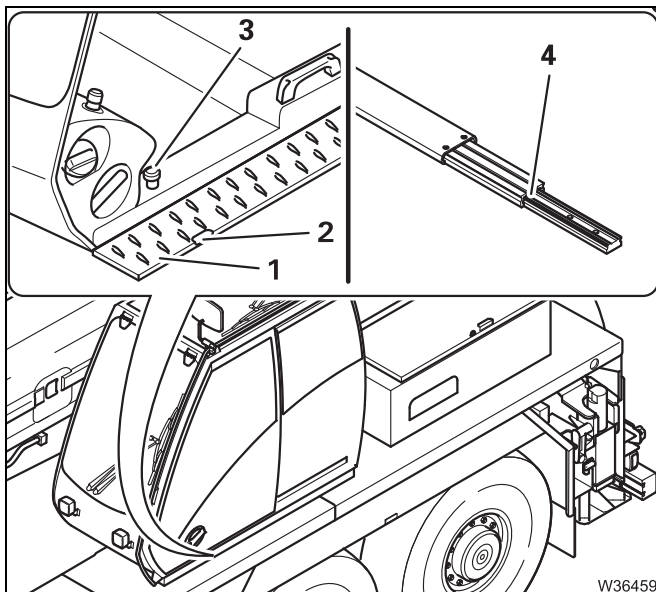
- The turntable must be locked.
- The engine must not be running and must be secured against unauthorised use;  p. 2 - 3.

Retracting/ extending

- Familiarise yourself with the description in the operating instructions of retracting/extending the step;  *Operating Instructions*.

Greasing

- Unlock the step at the spring latch (3) and pull the step out by the handle (2) until the spring latch (3) engages.



- Remove the step (1) – the rails (4) are now exposed.
- Clean the rails (4).
- Grease the rails (4) lightly with a brush.
- Check that the rails (4) run smoothly and without jerking.
- Fasten the step (1).

- Push the step in by the handle (2).
- Check that the step is locked by the spring latch (3).

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

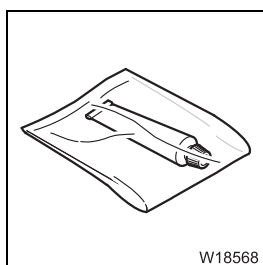
- Brush.

Checking

Depending on the equipment, the **superstructure** can have various connecting pins and socket pins such as:

- Locks and supports on the storage boxes,
 - 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 not be running and must be secured against unauthorised use;  p. 2 - 3.

Checking


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 - 78.

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 - 131.

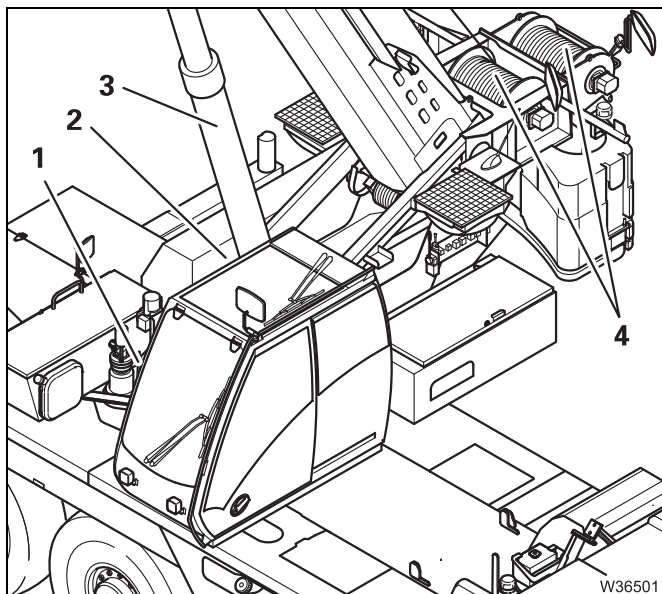


Spraying



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 slewing gear (1),
 - On the slewing duct (2),
 - On the derricking cylinder (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

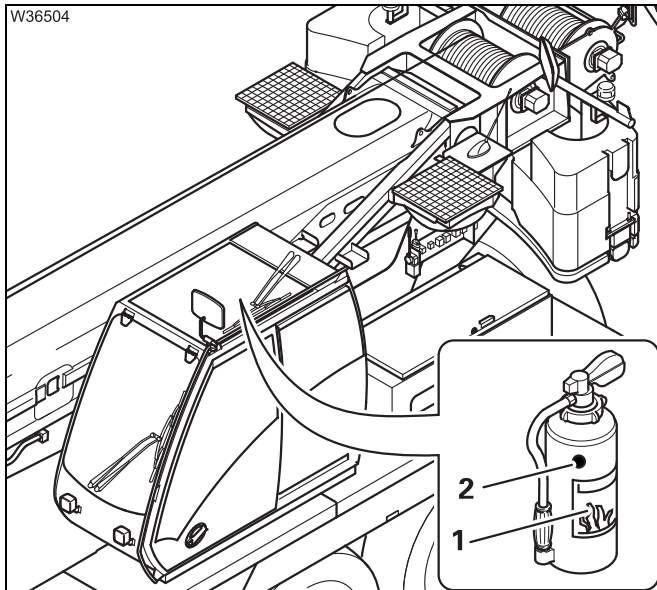
Having the fire extinguisher checked

Y 2

Depending on your truck crane's equipment, it can be fitted with fire extinguishers.



The maintenance interval may even be shorter, depending on the respective national regulations and the site. Ask the local fire safety officer about the national and local regulations.



- Observe the instructions (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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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 the air filter.
- Increase the tyre pressure by 10% and mark the tyre positioning, or support the truck crane and leave it standing on the outriggers.
- Observe the specifications on preservation in the *Engine manufacturer's documentation*.

Checks

- Check the level in the fuel tank. Always keep the tank 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 system up to a fluid temperature of approx. 50 °C (122 °F) and 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 the truck crane back into service 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 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	
M 36	55	27		3,300	

10.2 Special torques

Designation	Thread size (mm)	Spanner size (mm)		Torque (Nm)
		Hexagon-head bolt	Cylinder screw	
Suspension strut:				
– 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
Steering linkage:				
– Ball-and-socket joints and steering track rods	M 10 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
Others:				
– Coolant hose clamps				4
– Wheel nuts	M 22 x 1.5	32		650
– Retaining bolts for the Slewing bearing	M 24	36	—	790
– Hoist drum rope clamp	M 10		—	44

11 Spare parts required for maintenance

11.1	General information	11 - 1
11.2	Lighting	11 - 1
11.3	Spare parts for the carrier.....	11 - 5
11.4	Spare parts for the superstructure	11 - 8

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 accompanying *Spare parts list*.

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 location	GROVE part number	Designation	Power (W)
CARRIER LIGHTING:			
Front spotlights: (integrated in the bumper)			
– Daytime driving light	03328445	P21W 24 V	21
– Low-beam + full-beam headlights	03134828	H7 24 V	70
– Low-beam + full-beam headlights (USA)	03143584	H9 12 V	65
– Indicator light	03327578	PY21W 24 V	21
– Parking light (in the direction indicator light)	03140908	LED	
– Yellow side marker light	03320937	LED	
Front, side direction indicator lights: (under the access ladder to the driver's cab)			
– Indicator light	03327578	PY21W 24 V	21
Rear lights: (at the rear of the chassis)			
– Marker light	03137450	R5W 24 V	5
– Number plate light	03137450	R5W 24 V	5
– Rear light	03137450	R5W 24 V	5
– Brake light	03328445	P21W 24 V	21
– Indicator light	03327578	PY21W 24 V	21
– Fog tail light	03328445	P21W 24 V	21
– Reverse light	03328445	P21W 24 V	21
Yellow side marker lights: (at the sides, along the chassis)			
– Side marker light	03329572	LED	
Rear marker lights, red/white: (at the rear of the chassis)			
– Left marker light	03327625	LED	
– Right marker light	03327626	LED	
White front marker lights: (at the top on the driver's cab)			
– Marker light	03138527	LED	

Installation location	GROVE part number	Designation	Power (W)
Outrigger beam spotlights: (above the front and rear outrigger beams)			
– Filament lamp or – Spotlight; complete	02316460 03143786	8GH 002090251 LED	70
Yellow rotating beacon: (on the driver's cab)			
– Rotating beacon, complete	04156048		
Inside light: (in the driver's cab)			
– Cab light	00550434	K 24 V	10
– Reading light	00550434	K 24 V	10
SUPERSTRUCTURE LIGHTING:			
Marker lights, yellow: (left and right on the main boom head)			
– Side marker light	03329569	LED	
Red rear marker lights: (on the turntable)			
– Marker light	03329492	FPL 98 CKS	
Yellow rotating beacon: (on the turntable)			
– Rotating beacon, complete	04156048		
Inside light: (in the crane cab)			
– Cab light	00550434	K 24 V	10
– Reading light	00550434	K 24 V	10
Spotlight, angular-shaped, permanently installed: (at the front of the crane cab)			
– Filament lamp	01573349	H3 24 V	70
Spotlight, electrically adjustable: (at the front of the main boom)			
– Filament lamp	03142726	8GS009028001	35
Spotlight, swinging: (at the front of the main boom)			
– Halogen bulb	02309610	810992 RSY	100

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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
Engine						
Air filter – main filter	04182216	1 item when the symbol lights up				
Air filter – back-up filter	04182217					
Gasket for oil drain plug	03042026				1	
Oil filter	04182152				1	
Fuel system						
Filter 1	04182148				1	
Filter 2	04182157				1	
Exhaust system with exhaust emission control						
AdBlue/DEF filter	04182142					1
Transmission						
O-ring	04155708					1
Axle lines Axle centre drive (for max. 6 x 6 x 6)						
Gasket 30 x 36 Cu DIN 7603	00117151		3			3
Gasket 24 x 29 Cu DIN 7603	00117145		1			1
Gasket 36 x 42 Cu DIN 7603	01371208					3
Gasket 16 x 20 Cu DIN 7603	00117134					1
Axle lines Final drive (for max. 6 x 6 x 6)						
Gasket 24 x 30 Cu DIN 7603	04181265		6			6
Gasket 16 x 20 Cu DIN 7603	00117134					6
Wheels						
Wheel nuts for steel rims	01207756	In case of damage; 10 each per wheel				
Wheel nuts (ALCOA) for aluminium rims	7659100000					
Wheel nuts (BIMECC) for aluminium rims	03246867					
Protective cap on the wheel nut (only for aluminium rims)	80038328					



Assemblies and spare parts Carrier	GROVE- part number	Quantity, in single parts For maintenance interval				
		W	M 1	M 3	M 6	M 12
Vehicle brake (per axle line)						
1st axle line (duplex):		only in the case of wear on the drum brakes				
Brake shoe with brake lining	03322112					4
Spring	03322110					4
Brake drum	01924699					2
2nd and 3rd axle lines (Simplex):						
Brake shoe with brake lining	03324293					4
Spring	02315398	4				
Brake drum	03324286	2				
Compressed air system						
Valve (if defective)	01570750	(6)				
Gasket 22 x 27 Cu DIN 7603	00117142	(6)				
Filter cartridge	04156032					1
Hydraulic system						
Oil filter 1	03143251	2 item for every oil change and when the symbol lights up				2
Oil filter 2	03143251					2
Oil filter 3 (in the superstructure)	03142356	1 item for every oil change and when the symbol lights up				1
Housing packing set	03326049					1
Oil filter 4	03142357					1
Housing packing set	03326049					1
Oil tank cover gasket 140 / 90 x 3	03199793	1 item for every oil change (if damaged)				
Ventilation filter	03142360					2
Air-conditioning system						
Pollen filter	03326193					1
Other maintenance work						
Driver's cab wiper blades	02311858	(3)	(if damaged)			

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
Transmission						
Gasket 22 x 27 Cu DIN 7603	00117142	2				
O-ring	04155708	1				
Electrical system						
Lithium battery 3.6 V	03143172					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
Hoists						
Sight glass with hoses; complete For main hoist	04193151	(1)	(if damaged)			(1)
Sight glass with hoses; complete For auxiliary hoist	04193153	(1)				(1)
Slewing gear						
Gasket 10 x 14 Cu DIN 7603	00117125	(1)	(if damaged)			
Gasket 10 x 14 Cu DIN 7603	00117125				1	
Gasket 14 x 20 Cu DIN 7603	00117132				1	
O-ring 23.47 x 2.62	03046046				1	
Hydraulic system						
Oil filter 3	03142356	1 item for every oil change and when the symbol lights up			1	
Housing packing set	03326049				1	
Hoist ropes						
Cover gasket for the lowering limit switch	02315305	1 (if damaged) for every rope change on the hoist				
Cable drums						
Cover gasket Cable drum 1	03138891	(if damaged)			(1)	
Cover gasket Cable drum 2	03138894				(1)	
Other maintenance work						
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
Slewing angle sensor						
Gasket 16 x 20 Cu DIN 7603	00117134			1		
Electrical system						
Lithium battery 3.6 V	03143172					1

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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):
 Power unit 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	Operating hours of the entire crane	Operating hours of the superstructure	Operating hours of the superstructure since the last inspection	Operating hours of the winch	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
"1"			Km _i	[h]	[h]	[h]	[h]	[h]	$S_i = \frac{K m_i}{K m} \times T_i$	$D_i = D_{i-1} - S_i$					
(*)															

WARNING:

A general overhaul is to be performed every 10 years!
 For alternative provision, refer to section 5.4.2, p. 5 - 25.

- 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 = Factor of the load spectrum used to calculate the winch. This factor is specified in the operating manual.
- Km_i = Load spectrum factor in the inspection interval "i" according to section 2.1
- T_i = Effective operating hours in the inspection interval "i" according to section 2.2
- (*) Copy the last line of the previous page to the following page.

General overhaul performed on.....

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):
 Power unit 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	Operating hours of the entire crane	Operating hours of the superstructure	Operating hours of the superstructure since the last inspection	Operating hours of the winch	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	
"1"			Km _i	[h]	[h]	[h]	[h]	[h]	$S_i = \frac{K m_i}{K m} \times T_i$ [h]	D _i = D _{i-1} - S _i [h]						

WARNING:

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_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 = Factor of the load spectrum used to calculate the winch. This factor is specified in the operating manual.
- Km_i = Load spectrum factor in the inspection interval "i" according to section 2.1
- T_i = Effective operating hours in the inspection interval "i" according to section 2.2
- (*) = Copy the last line of the previous page to the following page.

