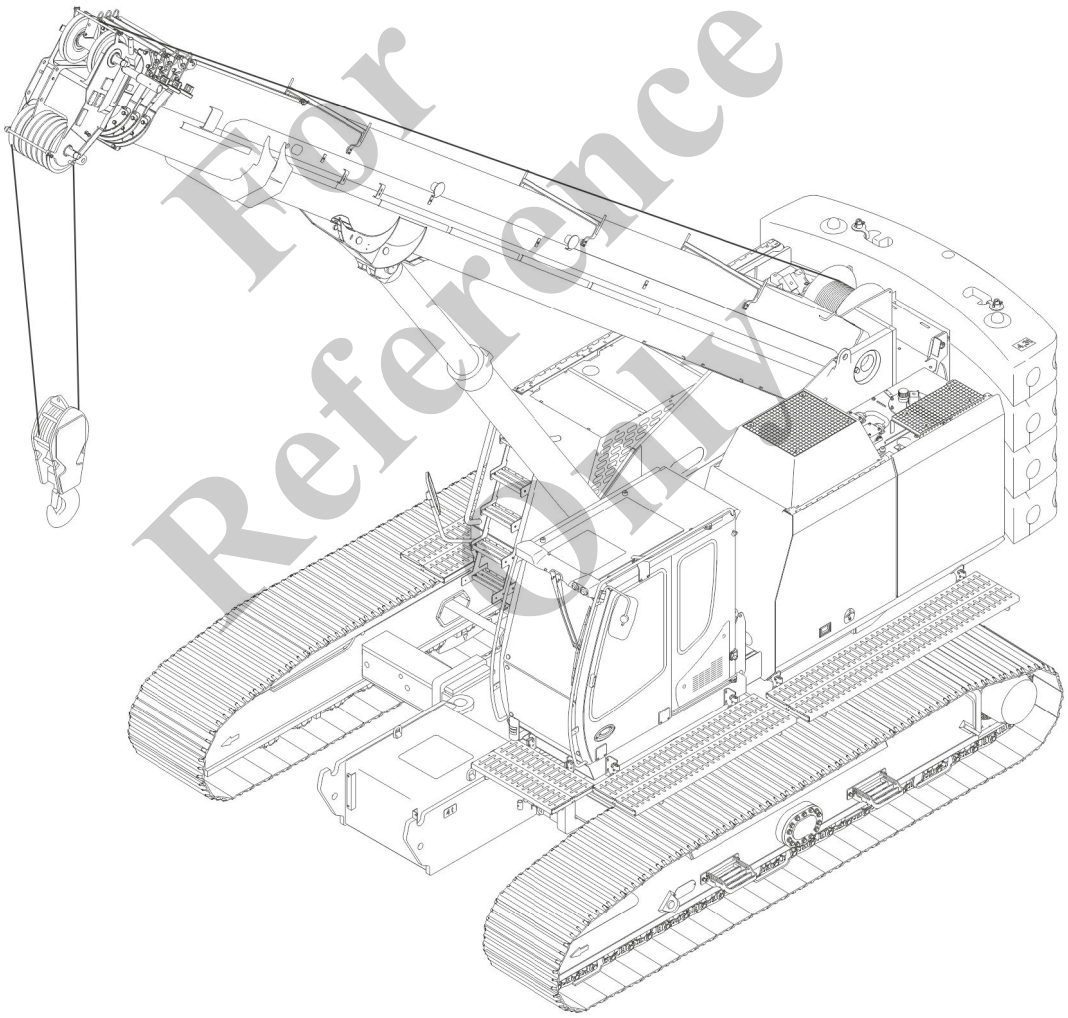
Manitowoc Crane Care

Maintenance instructions

GHC75

Telescopic crane



Version: 1.0

Read this manual prior to performing any task!

GHC, 6, en_US

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1 Tightening torques

1.1 General information

If screws or nuts are changed, only use new or reconditioned parts.

Screws, nuts and all threads must be clean, dry and free of grease.

There are 2 different tables for tightening torques:

- Standard connections
- Rotary connection

1.2 Standard connections

In order to avoid a screw connection failure, only phosphate black screws may be used in the following applications:

- Sprocket
- Slewing ring
- Track rollers
- Slewing gear, travel drives and travel gears
- Winch installations
- All the screws for the following connections:
  - Cab console - Cab
  - Base frame - Cab adjustment
  - Base frame - Engine

Bolt		Tightening torque	
Dimensions	**Strength class**	**Zinc flake coating [Nm]**	**Black phosphated [Nm]**
M6	8.8	6.4	9.4
	10.9	9.4	13.8
	12.9	11	16.1
M8	8.8	15.4	22.8
	10.9	22.7	33.4
	12.9	26.5	39.1
M10	8.8	30	45
	10.9	44.2	65.8
	12.9	51.7	77.5
M12	8.8	52.5	77.5
	10.9	76.7	114.2
	12.9	90	133.3
M14	8.8	83.3	123.3

Bolt		Tightening torque	
Dimensions	**Strength class**	**Zinc flake coating [Nm]**	**Black phosphated [Nm]**
	10.9	121.7	181.7
	12.9	142.5	212.5
M16	8.8	127.5	191.7
	10.9	186.7	281.7
	12.9	218.3	329.2
M18	8.8	183	274
	10.9	262	391
	12.9	306	458
M20	8.8	257	387
	10.9	365	551
	12.9	428	644
M22	8.8	348	528
	10.9	496	753
	12.9	580	881
M24	8.8	441	665
	10.9	628	947
	12.9	735	1108
M27	8.8	643	980
	10.9	917	1395
	12.9	1073	1633
M30	8.8	878	1331
	10.9	1250	1895
	12.9	1463	2218
M33	8.8	1179	1801
	10.9	1679	2565
	12.9	1965	3001
M36	8.8	1521	2315
	10.9	2167	3298
	12.9	2535	3859
M39	8.8	1957	2998
	10.9	2788	4269
	12.9	3262	4995

1.3 Rotary connection

Bolt		Tightening torque	
Dimensions	**Strength class**	**Zinc flake coating [Nm]**	**Black phosphated [Nm]**
M33	10.9	*Not permissible*	2600

2 Maintenance schedule

Activities that must be performed on the individual subassemblies are specified in the maintenance schedule.

The maintenance intervals are specified in operating hours (OH).

Safety instructions

- The maintenance work listed must only be carried out by trained and instructed specialists.
- Wear personal protective equipment (for example, hard hat, hearing protection, protective gloves, safety footwear).
- Only mix oils, lubricants and operating fluids that are of the same type, i.e. identical (same specifications) from one manufacturer!
- Only use the oils, lubricants and operating materials provided by GROVE.

Information

– *Under extreme operating conditions, for example at high ambient temperatures, shorter intervals can be necessary.*
– *Observe the instructions in the supplemental manuals, if required.*
– *Observe the provided instructions from the manufacturer of the assemblies as well ,e.g. MOTOR DOCUMENTATION).*

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2,000 OH/2 years
Carry out visual and functional check in accordance with the operating instructions.	x	x	x	x	x	x
Cab – cab mounting: Check bolts and screw fastenings.	x	x	x	x	x	x
Check that all loose fixtures are seated firmly (bolts, cotter pins, etc.).	x	x	x	x	x	x
Visual inspection of all straps: Fastening, lubrication and wear	x	x	x	x	x	x
Wire cable: uncoil and then coil up again under sufficient tension[1)].		x[1)]				
[1)] After 100 OH at the latest, then every 100 OH						

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2,000 OH/2 years
Visual inspection of all links and diagonal ties	x	x	x	x	x	x
Check engine oil level. Observe the intervals specified in the manual provided by the engine manufacturer.	x	x	x	x	x	x
HydroClean micro-filtration system (option): check contamination indicator on SENCON.	x	x	x	x	x	x
Hydraulic system: Check oil level	x	x	x	x	x	x
Lubricate slewing ring gearing.	x	x	x	x	x	x
Lubricate the rotary connection.		x	x	x	x	x
Central lubrication system: check level (option).		x	x	x	x	x
Slewing ring pinion lubrication: check level of lubricant tank		x	x	x	x	x
Check and clean engine cooler.		x	x	x	x	x
Check coolant level.		x	x	x	x	x
Water separator: Check filter		x	x	x	x	x
Slewing gear: check oil level, add oil if necessary[2)].		x[2)]	x[2)]			
[2)] After 50-100 OH, then every 50-100 OH/monthly						
Slewing gear: clean oil filter[3)].		x[3)]	x[3)]			
[3)] After 250 OH/6 weeks, then monthly						
Slewing gear: Lubrication[4)].		x[4)]	x[4)]			
[4)] After 250 OH/6 weeks, then every 150-200 OH/weekly						
Check and clean hydraulic oil cooler.		x	x	x	x	x
Check and clean combination cooler		x	x	x	x	x

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2,000 OH/2 years
Check heating system filter.		x	x	x	x	x
Clean hydraulic cylinders and check for leaks.		x	x	x	x	x
Hoisting winches: Check oil level and check for leaks.		x	x	x	x	x
Rotary connection: visually check all connecting elements for damage and corrosion.		x	x	x	x	x
Batteries: check cables and fuses.		x	x	x	x	x
Lubricate machine.		x	x	x	x	x
Rope clamps: re-tighten bolts.		x	x	x	x	x
Air conditioning compressor: Check belt tension and status.		x	x	x	x	x
Air conditioning compressor: check the compressor mounts and bolts for tightness.[5)]			x[5)]	x[5)]	x[5)]	x[5)]
						[5)] Every 250 OH
Check heating system filter.			x	x	x	x
Shut-off flap - hydraulic tank (optional): Visually check for leaks			x	x	x	x
Check antifreeze.			x	x	x	x
All winches: lubricate bearing bushes.			x	x	x	x
Both crawler gearboxes: Check oil level and check for leaks.			x	x	x	x
Crawler track: check the chain tension.			x	x	x	x
Sprocket: check bolts for firm seat using appropriate means.			x	x	x	x

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2,000 OH/2 years
Track shoes: check bolts for firm seat using appropriate means.			x	x	x	x
Check slewing ring bolts for firm seat with suitable methods.			x	x	x	x
Steel structure Clean and maintain using suitable materials.		x		x	x	x
Steel structure Check the steel structure for structural damage (e.g., deformation, damage, corrosion, cracking).			x	x	x	x
Counterweight Check for secure fastening of the counterweight elements to the required torque.				x	x	x
Preload pressure - have hydraulic accumulator checked by specialized hydraulic company6).			x[6)]	x[6)]	x[6)]	x[6)]
[6)] After 250 OH/6 weeks and after 500 OH/3 months, then every 1000 OH/yearly						
Slewing gear: change oil[7)].			x[7)]			x[7)]
Slewing gear: clean the magnetic closure of the oil drain[8)].			x[7)]			x[7)]
Return filter: replace filter element[7)].			x[7)]			x[7)]
Leakage oil filter replace filter element[7)].			x[7)]			x[7)]
Ventilation filter: replace filter element[7)].			x[7)]			x[7)]
Hoisting winches: change oil.[7)]			x[7)]			x[7)]
Both travel gears: Change oil [7)]			x[7)]			x[7)]
[7)] After 250 OH/6 weeks, then every 2000 OH/yearly						

Activity	Every 10 OH / daily	Every 50 OH / weekly	Once after 250 OH / 6 weeks	Every 500 OH / 3 months	Every 1000 OH / yearly	Every 2,000 OH/2 years
Check the gallery (= operator bridge) for cracks and general damage and repair immediately if necessary.				x	x	x
Heating/air conditioning system (option): Have checked by an authorized workshop.					x	x
Air filter: change replacement cartridge and safety cartridge.					x	x
DEF tank filter: Replace 10).						
DEF supply module: replace[10)].						
Change coolant.						x
Hydraulic system: change oil[8)].						x[8)]
[8)] Certain hydraulic oils do not have to be changed as often depending on the results of regularly performed hydraulic oil analyses. The machine must be equipped with GROVE-HydroClean. The hydraulic oils approved for extended intervals are included in the list of operating fluids in the Appendix.						
Check or replace slewing ring bolts.[9)]						x[9)]
[9)] Every 5000 OH/5 years						
[10)] Every 4500 OH						

Information
Testing the slew ring bolts must be performed by an expert from an independent specialist company / an independent institute. Unrestricted further use of the slewing ring bolts must be verified with a certificate. Otherwise, replace the slewing ring screws!

3 Safety

3.1 Symbols in the manual

3.1.1 Warnings

This manual contains safety notices to alert you to hazardous situations. These safety notices are indicated by a preceding signal word. The signal word indicates the severity and the probability of occurrence of the hazard if the information is not observed.

⚠ DANGER	**Signal word that is used to indicate an imminent hazardous situation. If this situation is not av**
⚠ WARNING	**Signal word that is used to indicate a potentially dangerous situation. If this situation is not avoided, death or severe injury may result.**
⚠ CAUTION	**Signal word that is used to indicate a potentially dangerous situation. If this situation is not avoided, death or severe injury may result.**
NOTICE	**Signal word that is used to indicate a potentially dangerous situation. If this situation is not avoided, damage to the machine or other property damage may result.**

3.1.2 Structure of safety instructions

The following example shows the structure of the safety information in this manual. Safety-relevant information is always introduced by a signal word.

⚠ DANGER

Type and source of hazard

– **The steps you should take to avoid the hazardous situation.**

Consequences of non-compliance

3.1.3 Tips and recommendations

This symbol highlights useful tips, recommendations and other information for efficient, failure-free operation.

3.2 Danger zone

The danger zone is the area in which persons can be injured or tools, attachments or loads can be damaged.

Possible danger zones include:

- Areas in which persons can be struck by the slewing motions of the machine.
- Areas in which persons can be injured by the machine moving, rolling or tipping over.
- Ares in which persons can be injured by loads swinging out or falling.
- Areas in which persons can be crushed between the machine and objects such as buildings and scaffolding.
- Areas in which persons can be injured by hot or pressurized substances.
- Areas with hot surfaces.

3.3 Personal protective equipment

Description of personal protective equipment

Personnel should wear personal protective equipment, which will be referenced separately in the individual sections of this manual, while working on and with the machine.

Personal protective equipment refers to the following:

Protective clothing

Protective clothing is tight-fitting, tear-resistant clothing with tight sleeves and no protruding parts.

Fig. 1: Protective clothing

Fall arrest safety harness

The fall arrest safety harness reduces the risk of injury when falling from a great height.

There are attachment points on the machine's base frame which serve for the attachment of a fall arrest safety harness.

Fig. 2: Fall arrest safety harness

At working heights of 2.00 m or more, GROVE recommends the use of a fall arrest safety harness. At working heights above 3.00 m, using a fall arrest safety harness is a legal requirement.

Hearing protection

Hearing protection protects against hearing loss due to noise.

Fig. 3: Hearing protection

Fig. 4: Hard hat

Hard hat

Hard hats protect the head against falling objects, swinging loads and collisions with fixed objects.

Fig. 5: Safety goggles

Safety goggles

Safety goggles protect eyes against flying parts and splashing.

Fig. 6: Protective gloves

Protective gloves

Protective gloves protect the hands against friction, abrasions, punctures, deep wounds and hot surfaces.

Fig. 7: Safety shoes

Safety shoes

Safety shoes protect feet against crushing, falling parts and slipping on slippery surfaces.

Fig. 8: Restraining system

Restraining system

The restraining system secures the operator in his seat and serves to reduce the consequences of an accident for the operator.

3.4 Environmental protection

ENVIRONMENT

Danger to the environment due to improper handling of environmentally harmful substances!

- **Always pay attention to the notices given below on how to handle environmentally-damaging materials and their disposal.**
- **If environmentally-damaging materials are inadvertently introduced to the environment, immediately take suitable measures. If in doubt, inform the responsible authorities about the damage and inquire about suitable measures to take.**

Incorrect use of environmentally-damaging materials, particularly in the case of incorrect disposal, can lead to serious damage to the environment.

The following environmentally-damaging materials are used:

Battery packs or batteries

Battery packs and batteries contain poisonous heavy metals. They are subject to hazardous waste treatment and must be deposited at the communal collection points or disposed of by a specialist company.

Refrigerant

Refrigerants develop environmentally-damaging decomposition products when released. As a result, the utmost care and caution is required when handling refrigerants. The manufacturer's MSDS must be observed. Staff working with refrigerant must be regularly informed about possible dangers and instructed in the safe handling of refrigerants.

Cooling water with antifreeze

Cooling water and antifreeze contain poisonous substances. They must not be introduced to the environment. Disposal must be carried out by a specialist disposal company.

Lubricants

Lubricants such as fats and oils contain poisonous substances. They must not be introduced to the environment. Disposal must be carried out by a specialist disposal company.

Diesel fuel

Diesel fuel contains poisonous substances. It must not be introduced to the environment. Disposal must be carried out by a specialist disposal company.

4 Machine

4.1 Visual and function check of the machine

Personnel	Interval
The machine operator	Every 10 OH / daily
	Once every 250 OH / approx. 4-6 weeks after commissioning

In order to ensure the operating safety of the machine, the operator must carry out a daily visual and function check of the machine. Alongside general damage and possible leakage, safety-relevant bolts, screw connections, the rope, and the cylinder are to be checked in particular.

Painted surfaces

Paint damage can be caused by external factors or cracks and deformations in the steel structure.

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Inspect all accessible painted surfaces for damage.

In the case of damage, proceed as follows:

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

1. Determine the cause of the damage.
2. Repair paint damage without cracks or deformation in the steel construction in accordance with GROVE repair instructions for paint damage.

   The GROVE repair instructions for paint damage can be obtained from the GROVE sales and service partners.
3. If cracks or deformation in the steel structure is suspected, have the damage inspected by an expert.

   Experts
   – *has extensive knowledge of this machine and the relevant regulations and guidelines due to technical training and*
   – *having been trained by GROVE*

   An expert is someone who and can assess the safe working condition of this machine, and the directives and regulations that apply for this machine, and who can evaluate the operationally reliable status of the machine.
4. Have the repairs performed by a specialist.

Attachments

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

Inspect all attachments, access ladders, walkways, railings of the uppercarriage and tools for proper mounting and damage.

⇨ Tighten or replace fasteners as needed.

Replace damaged components.

Leaks

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

→ Inspect the entire machine for leaking operating fluids.

If leaks are discovered, proceed as follows:

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

1. → Determine the cause for the leak.
2. → Tighten loose connections.
3. → Replace the damaged parts.

Rope and rope drive

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

→ Before beginning work, check and test all visible parts of the wire rope to make sure the rope is lying correctly on the parts of the rope drive.

⇨ Recognize general damage and deformation.

Document every visible change to the wire rope.

Visual check of the locking bolts

Personnel	Interval
The machine operator	Daily

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

→ Before starting work, check that the locking bolts are seated correctly. The bolts (left and right) must be at least level with the outer edges of the frame panels.

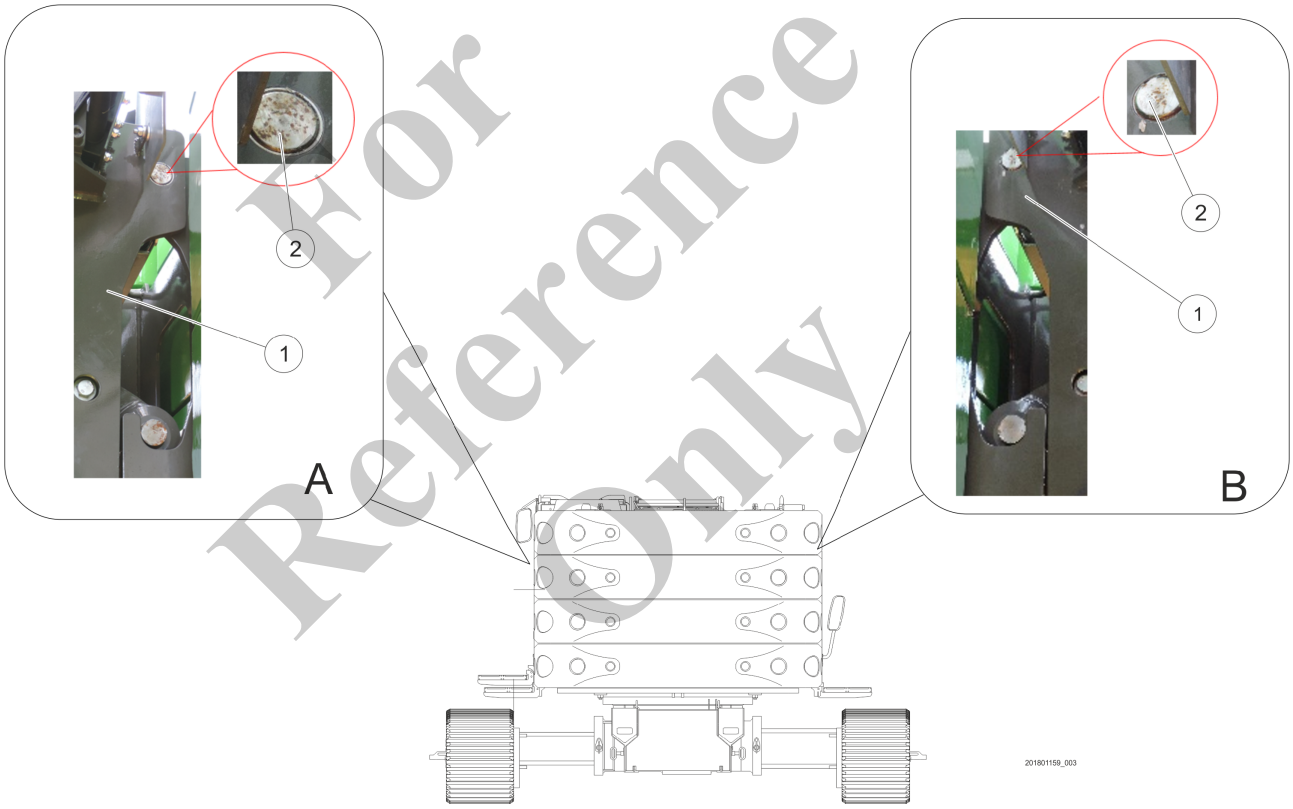
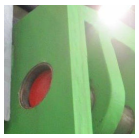


Fig. 9: locking bolt

A Side view, left
W Side view, right
1 Frame plate
2 locking bolt

Seat of the locking bolts	Status
	Seating is OK. The locking bolt is level with the outer edge of the frame plate.
	The seat is **not** in order as the locking bolt is **not** level with the outer edge of the frame plate. In this case, check the function of the locking bolts. See the description ↳ *Chapter 7.6 “Check function of the locking bolts” on page 67* for more information.

4.2 Basic cleaning of the machine

Personnel	Interval
The machine operator	Every 50 operating hours / weekly

Safety instructions

NOTICE

Incorrect cleaning can lead to machine damage!

General safety measures before cleaning

- **The cleaning agents must not damage sealant.**
- **Only use neutral or slightly alkaline cleaning agents.**
- **Only clean the acoustic insulation mats with neutral cleaning agents.**
- **Only use clean sponges, brushes and lint-free cloths.**

Wet cleaning

- **Remove all foreign objects with compressed air from the coolers before washing. In a dusty environment, e.g. with fine dust or paper dust, wet-cleaning the radiators or coolers may cause concrete-like clumping.**
- **Lubricate all bearing points to prevent water ingress.**
- **Seal all openings into which water must not penetrate:**
  - **Exhaust pipe**
  - **Air filter**
  - **Air conditioning system external air filter**
- **Protect all components that must not be cleaned with water from the direct water jet:**
  - **Electrical components**
  - **Exhaust aftertreatment system**
  - **Slewing ring**
  - **Bolt bearing points**

Compressed air cleaning

- **Only use dry, filtered compressed air, to a maximum of 2 bar.**
- **Take note of the device's manufacturer's instructions and country-specific regulations.**

General safety measures after cleaning

- **Remove all coverings that were attached prior to cleaning.**
- **Lubricate all bearing points and the slewing ring.**
- **Warm up the diesel engine so residual water can evaporate.**
- **Treat all rubber seals with a commercial rubber conditioner.**
- **After cleaning works, always carry out a visual and function check of the machine. In particular, check the following:**
  - **Make sure that all warning signs and information signs are complete and legible. Replace missing or damaged signs.**
  - **Check the paint for visible damage. Immediately have any paint damage repaired by a specialist firm. Pay attention to the corrosivity class of the coating.**
  - **Check the corrosion protection and have touched up or restored as needed.**
  - **Check all lines for damage and leaks.**

ENVIRONMENT

- **Carry out damp cleaning on a surface equipped with an oil separator.**
- **Dispose of environmentally-dangerous cleaning agents and operating fluids in accordance with the regulations.**

Environmental hazard due to improper handling of environmentally harmful substances.

Have paint damage repaired in accordance with GROVE Repair Instructions for paint damage. Have the corrosion protection measures carried out in accordance with the GROVE instructions for conservation. The instructions can be obtained from the GROVE service partners.

During the first three months after commissioning or after repainting, observe the following:

- *Use cold water with a low dose of a neutral cleaning agent.*
- *Working pressure: max. 60 bar*
- *Spray distance: min. 30 cm*

After three months, observe the following:

- *Water temperature: max. 60 °C*
- *Working pressure: max. 100 bar*
- *Spray distance: min. 30 cm*
- *Spray angle: 30 ° to 60 °*

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

Special tool:
- Sponge, brush, lint-free cloth
- Neutral cleaning agent

Materials:
- Glass-cleaner

1. Apply the water with a cleaning agent to the respective machine parts and allow to work in.
2. Remove firmly adhering contamination with a sponge or brush.
3. Rinse off the machine with clean water.
4. Clean the cab windows and mirrors with a commercial glass cleaner.
5. After cleaning works, carry out a visual and function check of the machine.

4.3 Check and lubricate the manual lubrication stations

Personnel	Interval
The machine operator	Every 50 operating hours / weekly
	Once every 250 OH / approx. 4-6 weeks after commissioning

NOTICE

Danger of damage to the lubrication system due to too high a pressure in a high-pressure lubricating device!

– Do not exceed the maximum pressure of 250 bar.

If a high-pressure lubricating device is used, damage can occur to the bearing points and sealant, etc., during lubrication.

Operating fluids
Grease type, ☞ 🕮 operating fluids list.

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

Special tool:
- Ladder
- Standard grease gun
- Brush, lint-free cloth
- Paintbrush

Materials:
- Commercial solvent
- Refilling
- GROVE gear spray

1. Park the machine.
2. Completely extend the outriggers.
3. Extend the main boom.
4. Fold in the main boom to 0°.

   It may be necessary here to switch to setup mode.
5. Secure the machine against being restarted without authorization.

Lubrication plan, upper carriage, lubricating bar

The lubricating bar is at the front, to the right, under the service hatch.

Position	lubrication point	Lubricating nipple on the lubricating bar
1	Derricking cylinder, lower	M8
2	Output side winch bearing point	M6
3	Boom mounting	M10
4	Boom mounting	
5	Slewing ring, inner	
6	Slewing ring, inner	
7	Slewing ring, inner	
8	Slewing ring, inner	
9	Slewing ring, inner	
10	Slewing ring, inner	
11	Slewing ring, inner	
12	Slewing ring, inner	

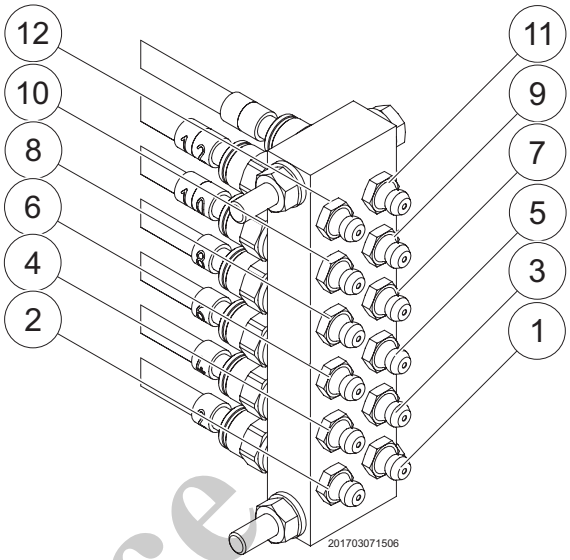


Fig. 10: Lubricating bar (illustration rotated by 90°)

1. Open the right service door.
2. Remove the protective caps from the lubricating nipples.
3. Carry out lubrication as per the lubrication plan.
4. Seal the lubricating nipples with the protective caps.
5. Remove the excess grease and dispose of it correctly.
6. After lubrication, slew the upper carriage several times.
   ⇨ The layer of lubricant will spread evenly across the gears.

Lubrication plan, upper carriage, single lubrication points

lubrication point
Derricking cylinder, upper
Telescopic boom segment, sliding surfaces

1. Remove the protective cap from the lubricating nipple.
2. Lubricate the derricking cylinder's upper lubricating nipple.
3. Seal the lubricating nipple with the protective cap.
4. Remove the excess grease and dispose of it correctly.
5. Remove the protective cap from the lubricating nipple, which is positioned in the front third of the main boom.
6. Lubricate the lubricating nipple.
   ⇨ The rear, upper sliding blocks are lubricated.

7. Remove the excess grease and dispose of it correctly.

lubrication point
Slewing ring, outer

1. Clean the slewing ring gears down to the bare metal.
2. Spray the gearing from approx. 30 cm away with GROVE gear spray.
3. Slew the upper carriage several times.
   ⇨ The layer of lubricant will spread evenly across the gears.

Lubrication plan, undercarriage

lubrication point	City
Pushbeam sliding surfaces	The pushbeams are on the left and on the right, between center frames and track wheel carriers.

1. Extend the undercarriage.
2. Remove dirt and old grease from all sides of the pushbeam and the center frame.
3. Clean the surfaces of the pushbeam and the center frame with a solvent.
4. Apply a thin layer of lubricating grease with a brush.

4.4 Check fill level

Personnel	Interval
The machine operator	Every 10 OH / daily
	Once every 250 OH / approx. 4-6 weeks after commissioning

⚠ WARNING

Operating fluids are harmful to health. They contain poisonous and irritating components!

- **Do not breath in vapors. Always ensure sufficient aeration in closed spaces, in order to avoid poisoning.**
- **Do not bring operating fluids into contact with skin, eyes, or clothing. Use water and soap to clean any skin affected by inadvertent contact, in order to avoid irritation and other injuries.**
  Rinse with plenty of clean water upon contact with the eyes.
- **Fire, open flame, and smoking are forbidden when handling operating fluids due to their high flammability.**

Operating fluids are easily flammable.

ENVIRONMENT

Dispose of operating fluids in an environmentally-friendly manner!

Filling quantity reference points

Component	Quantity
Diesel engine oil tank ■ Oil quantity at minimum level ■ Oil quantity at maximum level	■ approx. 8.6 l ■ approx. 12.33 l
DEF® tank	43 l
Hydraulic oil tank	180 l
Winch gear	approx. 1.5 l
Axle distribution gearbox	approx. 3.0 l
Wheel hub transmission	approx. 2.4 l
Axle drives	approx. 9.0 l
Central lubrication pump lubricant tank	2.0 l
Slewing ring lubrication pump lubricant tank	1.2 l
Windshield washer system tank	8 l
Diesel fuel tank	200 l
The filling quantity specifications are reference points. The fill levels shown on the respective part are authoritative.	

Diesel engine oil level

NOTICE

Risk of diesel engine damage due to incorrect diesel engine oil level or incorrect diesel engine oil.

- **The diesel engine oil level should not drop below the MIN mark on the oil dipstick.**
- **The diesel engine oil level should not be above the MAX mark on the oil dipstick.**
- **Only use the diesel engine oils approved by GROVE.**

Too little or too much diesel engine oil can reduce the diesel engine performance and damage the diesel engine. Using the wrong diesel engine oil can damage the diesel engine.

Operating fluid, ☞ 🕮 operating fluids list. Determine diesel engine oil level, ☞ 🕮 operating manual chapter: Appendix.

Coolant level

⚠ WARNING

Coolant contains glycol and is therefore poisonous!

- **Do not swallow coolant. If coolant is swallowed, seek medical attention immediately.**
- **Do not bring coolant into contact with skin, eyes, or clothing. Rinse out with plenty of clean water upon contact with the eyes.**
- **Clean immediately with water and soup upon contact with skin and clothing. Immediately change affected clothing.**

⚠ WARNING

Risk of severe burns from hot diesel engine parts and hot coolant.

- **Only add the coolant when the diesel engine is off.**
- **Avoid contact with hot diesel engine parts.**
- **Wait until the coolant temperature has dropped below 50 °C before opening the cooling system sealing cover.**
- **Wear protective clothing and protective gloves.**

Contact with hot diesel engine parts or hot coolant can cause severe burns.

NOTICE

Risk of engine damage due to incorrect coolant level or incorrect coolant.

- **If a coolant warning appears in the SENCON diagnostics window, coolant must be topped up.**
- **Only use the coolant approved by GROVE.**

Too little or too much coolant can reduce the diesel engine performance and damage the diesel engine. Using the wrong coolant can damage the diesel engine.

Operating fluid, ☞ 🕮 operating fluids list. Determine coolant level, ☞ 🕮 operating manual chapter: Appendix.

DEF level

⚠ CAUTION

Risk to health and danger of machine damage due to contact with DEF!

- **Wear protective clothing, safety goggles and protective gloves.**
- **Avoid contact with eyes and skin.**
- **Do not pour DEF on machine parts, hoses or cables.**
- **Immediately remove any DEF spilled.**
- **Carefully rinse with lots of water.**
- **Have damaged hoses or cables replaced before starting up the machine.**

Machine parts, especially hoses and cables, can be damaged beyond repair by DEF.

NOTICE

DEF contamination can lead to engine damage!

- **When handling DEF make sure that no other operating fluids, cleaning agents, or dust are introduced.**

Operating fluids: ☞ 🕮 operating fluids list.

Fill DEF at a surrounding temperature of maximum -11 °C.

Protective equipment:
- Protective clothing
- Chemical-resistant protective gloves
- Safety shoes
- Safety goggles

Materials:
- Lint-free cloth

1. Park the machine.
2. Pull back the safety lever.
3. Turn ignition key into **I** position.
   ⇨ The SENCON home screen appears.
4. Observe the SENCON display.
   ⇨ The current fill-level is displayed in %.

   If the symbol lights up orange and an acoustic signal sounds, the fill-level has sunk below 10 %. If the symbol lights up red and an acoustic signal sounds, the fill-level has sunk below 5 %.
5. Turn the ignition key to **0** position.
6. Secure the machine against being restarted without authorization.
7. Open the service flap.
8. Check DEF tank for contamination and clean as needed.

Hydraulic oil level

⚠ WARNING

Risk of severe burns from hot parts and hydraulic oil.

- **Only check the hydraulic oil level when the hydraulic system is cooled.**
- **Only fill up with hydraulic oil when the hydraulic system is cooled.**
- **Avoid contact with hot parts.**
- **Wear protective clothing and protective gloves.**

Contact with hot hydraulic system parts or hot hydraulic oil can cause severe burns.

⚠ WARNING

Risk of serious injury from pressurized hydraulic oil!

- **Before working on the hydraulic system, remove pressure from the hydraulic system.**

Opening the hydraulic system can cause pressurized hydraulic oil to eject and result in serious injury.

NOTICE

Danger of damage to parts of the hydraulic system due to incorrect hydraulic oil level or incorrect hydraulic oil!

- **The hydraulic oil level should not drop below the MIN mark on the sight glass.**
- **The hydraulic oil level should not rise above the MAX mark on the sight glass.**
- **Only use the hydraulic oils approved by GROVE.**
- **Ensure absolute cleanliness when filling with hydraulic oil.**

Too low or too high a hydraulic oil level can lead to reduced performance and to damage to the parts of the hydraulic system. The use of unsuitable or contaminated hydraulic oil can lead to damage to the parts of the hydraulic system.

Protective equipment:
- Protective clothing
- Chemical-resistant protective gloves
- Safety shoes

Materials:
- Hydraulic oil

Operating fluids: hydraulic oil ☞ 🕮 operating fluids list.

1. Park the machine in the control position.
2. Completely lower the cab.
3. Fully extend the telescopic boom segment.
4. Completely retract all cylinders.
5. Open the service flap.
6. Check the hydraulic oil level on the sight glass.
   ⇨ The hydraulic oil level must reach **MAX** on the sight glass.
7. Add hydraulic oil as needed.
8. Close the service door.

Driving mode oil level

NOTICE

Danger of gearbox damage due to incorrect gear oil level or incorrect gear oil!

- **The oil level must reach the bottom of the filler opening.**
- **Only use gear oils approved by GROVE.**

Too low or too high a gear oil level can lead to gearbox damage. The use of unsuitable gear oil can lead to gearbox damage.

Operating fluids, travel gear: ☞ 🕮 operating fluids list.

Protective equipment:
- Safety shoes
- Chemical-resistant protective gloves
- Protective clothing

Special tool:
- Square key

Materials:
- Sealing ring
- Gear oil

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Unscrew the screw plug of the filling opening with a square key.
4. Check the gear oil level.
   ⇨ The oil level must reach the bottom of the filler opening.
5. Add gear oil as needed.
6. Screw the screw plug into the filling opening with a new O-ring.

Grease fill level of the central lubrication pump

- *In the tropics*
- *In high humidity*
- *If there are high levels of dust and contamination*
- *In areas with severe temperature fluctuations*
- *With continuous rotary movement.*

The machine is equipped with a central lubrication system. The central lubrication system lubricates all bearing points for the operating equipment as well as the slewing ring track. The cycle for the automatic lubrication process is factory-set to one hour. If needed, additional lubrication processes can be introduced. The preset lubricating cycle can be shortened. Shorter intervals between lubrication are needed,

Grease type: ☞ 🕮 operating fluids list.

Protective equipment:
- Safety shoes
- Chemical-resistant protective gloves
- Protective clothing

Special tool:
- Lint-free cloth

Materials:
- Refilling

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check the grease fill level in the central lubrication pump's container.
   ⇨ The grease fill level must be between the **MIN** marking and the **MAX** marking.
4. Add grease as needed.
5. Check the ventilation pipe.
   ⇨ The ventilation pipe must be free of grease and contaminants.
6. Clean the ventilation pipe if necessary.

Adding grease

Grease type, ☞ 🕮 operating fluids list.

Protective equipment:
- Safety shoes
- Chemical-resistant protective gloves
- Protective clothing

Materials:
- Refilling

1. Park the machine.
2. Secure the machine against being restarted without authorization.

⚠ CAUTION! Danger of explosion if the container is overfilled! If a pump with increased power is used to fill the container, you must make sure that the MAX marking is not exceeded.

The grease must be free of contaminants and should not change its consistency over time.

The pump may require up to 10 minutes following complete draining to reach full performance.

3. Fill the central lubrication pump's container from above via the filling nipple or - if available - via the filling opening, up to the **MAX** marking.

Grease fill level of the slewing ring lubrication pump

Grease type: ☞ 🕮 operating fluids list.

Protective equipment:
- Safety shoes
- Chemical-resistant protective gloves
- Protective clothing

Special tool:
- Lint-free cloth

Materials:
- grease

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the service flap.
4. Check the grease fill level in the slewing ring lubrication pump's container.
5. Add grease as needed.
6. Close the service door.

Fill level of the windshield washer system

Operating fluids: Windshield washer fluid; antifreeze, ☞ 🕮 operating fluid list.

Protective equipment:
- Chemical-resistant protective gloves
- Protective clothing

Materials:
- Windshield washer fluid

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the left service door.
4. Check the windshield washer fluid reservoir level.
5. Add washer fluid as needed.
6. Close the service door.

Check diesel fuel level

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Turn the ignition key to **I** position.
   ⇨ The SENCON welcome screen appears.
4. Check the SENCON parameter field for the diesel fuel level.
   ⇨ If necessary, fill with diesel fuel.
5. Turn ignition key to position **0**.

Checking the winch oil level

If, when checking the winch gear's oil level, a continuous loss of oil is recorded, adjust the winch gear and resolve the cause of the leak.

Protective equipment:
- Protective clothing
- Hard hat
- Safety shoes

Always carry out the oil level check when the winch gear is out of operation.

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check the winch oil level display.
   ⇨ The oil level must be between the lower marking **MIN** and the upper marking **MAX**.
4. Add gearbox oil, if necessary.

4.5 Welding

Safety instructions

- Welding may only be performed by an authorized and qualified welding specialist.
- Cover vulnerable components with fireproof material.
- Drilling and welding is prohibited on the following components:
  - Boom parts
  - Load-bearing frame parts
  - Engine
  - Hydraulic tank
  - Fuel tank
  - Fuel-carrying and oil-carrying components

Preliminary work

Make the following preparations before beginning welding:

1. Press the battery disconnect switch or disconnect the battery to disconnect power.
2. Attach the ground connection as close to the welding site as possible.

4.6 Oils and lubricants

NOTICE

Risk of damage to machine components due to mixing different lubricants and operating fluids.

- **Only use the same type of oils, lubricants and operating fluids.**
- **Only use the oils, lubricants and operating fluids approved by GROVE.**
- **Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.**

Mixing different types of oils, lubricants or operating fluids can damage machine components.

Information
The oils and lubricants approved by GROVE are found in the list of operating fluids. The ambient temperature for operating the machine must be between -20 °C and +50 °C (-4 °F and 122 °F). If the on-site temperature exceeds these limits, consult your GROVE Service Partner before starting up the machine.

Oil diagnosis

The oil diagnosis is conducted by a qualified laboratory. Regular oil diagnosis helps to avoid unnecessary costs. A series of tests will determine the following:

- Oil condition
- Amount of abraded metal particles in the sample
- Wear rate of components

Conducting an oil diagnosis is recommended for the following components:

- Hydraulic system
- Drive engine
- Winch

Biodegradable oils and lubricants

If there a risk of mineral oil-based oils and lubricants leaking and harming the environment, biodegradable oils and lubricants must be used.

Environmentally friendly lubricants are mandatory especially in water conservation areas and nature reserves. Only synthetic, ester-based biolubricants may be used.

See the list of operating fluids for more information.

4.7 Coolant

⚠ WARNING

Health hazard due to nitrosamines.

- **Avoid skin contact with coolants.**
- **Avoid inhaling vapors.**
- **Use skin protection products.**

Mixing nitrite-based coolants with amine-based agents produces harmful nitrosamines.

NOTICE

Risk of engine damage due to overheating.

- **Only add approved coolants of the same type.**
- **Only add approved coolant additives.**

Adding unapproved coolants and coolant additives can damage the radiator and cause the engine to overheat.

NOTICE

Risk of engine damage from adding coolant when hot.

Let the engine cool down before adding coolant.

Adding coolant to a hot engine can cause engine damage.

ENVIRONMENT

Risk of environmental damage due to improper disposal of coolant.

- **Make sure coolant does not seep into the soil or reach bodies of water.**
- **Observe applicable environmental standards for disposing of coolants.**

Coolant that has not been properly disposed of or poured contaminates ground water.

Possible health hazards or environmental hazards are also evident from the instructions for use / operating instructions of the coolant manufacturer.

The coolant added to a specific engine at the factory can be found in the list of operating fluids. The antifreeze is sufficient to -37 °C (-34 °F).

Information
Observe the coolant sticker near the radiator.
If the ambient temperature on site is below -37 °C (-34 °F), check the engine manufacturer's operating manual or consult your GROVE Service Partner before starting up the machine.

Information
If only a small amount (up to max. 5 l) is required to top up the cooling circuit and no suitable coolant is available, you can provisionally add clean drinking water. The coolant not only prevents freezing, it is also important for corrosion protection. This is why the correct concentration must be checked regularly and adjusted as needed. The concentration must be checked at the next opportunity, at the latest however before temperatures reach freezing. The appropriate coolant must be added to protect against freezing and corrosion.

Information
- *Use clean, pH-neutral, filtered and softened fresh water. GROVE recommends using demineralized water.*
- *Cummins specifies the use of distilled water.*
- *Do not use ditch water, industrial drain water, salt water, sea water or rain water.*
- *Always fill in mixture of water and anti-freeze agent. Observe the manufacturer's recommended mixing ratio. Mix before filling.*

Make sure the water has the following properties:

pH value	7 – 8
Chloride content	maximum 100 ppm
Sulfate content	maximum 100 ppm
Water hardness	3-12 °dGH

Information
If the coolant concentration is too high, the cooling and antifreeze properties will be adversely affected. Observe the coolant manufacturer's specifications.

Using other coolants

GROVE cannot be held liable and will void any warranty if any coolant other than the one specified is used.

⚠ CAUTION

Risk of scalding from coolant steam.
- **Let the engine cool down before draining coolant.**

Opening the coolant tank will cause hot coolant to evaporate. Persons in the vicinity can be scalded.

Information
Collect draining coolant and dispose of it in accordance with regulations.

NOTICE

Risk of cooling system failure and engine damage from using incorrect coolant or coolant additives.
- **Do not mix coolants.**
- **Do not use cooling system sealing agents or antifreeze containing sealing agents.**

Adding or mixing different coolants or coolant additives can cause sludge accumulation or gelatinization and clog the radiator, causing the engine to overheat or the cooling system to fail, resulting in engine damage.

Information
The coolant must be changed if a routine check of the coolant level reveals the presence of lubricating oil or noticeable cloudiness.

Changing coolant

1. Switch off the diesel engine
2. Let the diesel engine and combination cooler cool down.
3. Carefully open the sealing cap of the expansion tank to equalize the pressure.
4. Completely drain the cooling system before filling.
5. Flush the cooling system several times with clean water.
6. Fill the cooling system at a consistent rate not exceeding 9 l/min.
7. Check the level 5 minutes after filling and add coolant as needed.
8. Replace the sealing cap on the expansion tank.
9. Run the diesel engine at low idle for five minutes.
10. Check the coolant level and add as needed.

Change intervals

See the engine manufacturer's operating manual for change intervals.

5 Cab

5.1 Safety instructions

Maintenance and repairs may only be performed by trained and authorized professionals.

Information

Check the following components monthly:

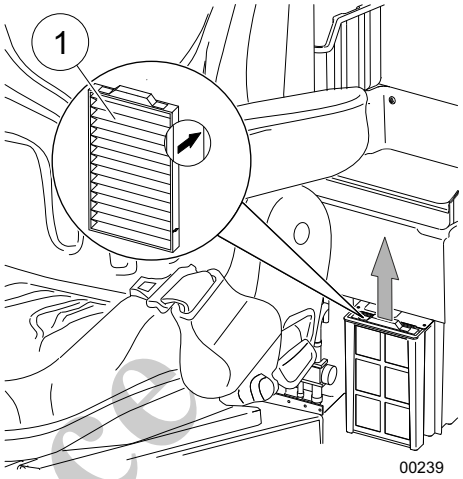
- *wiring*
- *Condition of the heating and cooling lines*
- *Flow of condensed water*
- *Filter for visible damage*
- *Plug for proper seating and soiling*

5.2 Climate control function check

1. Park the machine.
2. Pull the safety lever back
3. Close the side windows, front window, and cab door.
4. Turn the ignition key to **I**.
5. Open the air nozzles.
6. Switch on the blower.
7. With the button, select the desired heating or cooling mode.
8. Set the desired temperature using the temperature control.
9. Check the internal temperature and blower performance.

5.3 Cleaning the recirculating air filter

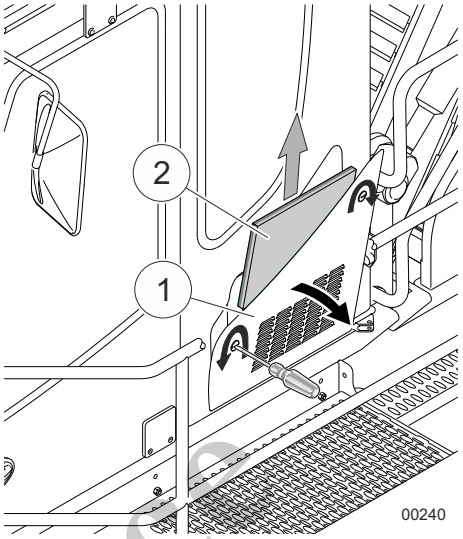
Information The recirculating air filter for the air conditioning system is located in the cab behind the driver seat.



1. Use the handle to pull the filter element (1) out of the filter cartridge.
2. Beat out the filter element or carefully clean it with compressed air.
3. Replace the filter element if it has been damaged or it is too dirty.
4. Insert the cleaned filter element or a new filter element into the filter cartridge.

Information
The arrows on the filter element must point toward the back of the cab.

5.4 Cleaning the fresh air filter



1. Open the cover closures (1) with a screwdriver.
   - Turn the front closure to the left to open it.
   - Turn the rear closure to the right to open it.
2. Open the cover.
3. Pull the filter element (2) up and out.
4. Beat out the filter element or carefully clean it with compressed air.
5. Replace the filter element if it has been damaged or it is too dirty.
6. Insert the cleaned filter element or a new filter element.
   - The colored side of the filter element must point toward the interior of the cab.
7. Close the cover.
8. Close the cover closures with a screwdriver.

6 Diesel engine service

6.1 Safety instructions

⚠ WARNING

Risk of injury due to rotating parts or hot engine parts.

Persons can be injured by moving or hot engine parts when the engine is running.

- **Only perform maintenance and repairs with the engine off and the cooling system cooled down.**
- **Secure the machine against being restarted without authorization.**

ENVIRONMENT

Risk of environmental damage due to improper disposal or oils and coolants.

Oils and coolants that are not properly disposed of contaminate ground water.

- **Make sure used oil and coolant do not seep into the soil or reach bodies of water.**
- **Observe applicable environmental standards for disposing of oil, oil filters and coolant.**

Information
Observe the engine manufacturer's operating manual.

6.2 Check the engine oil level

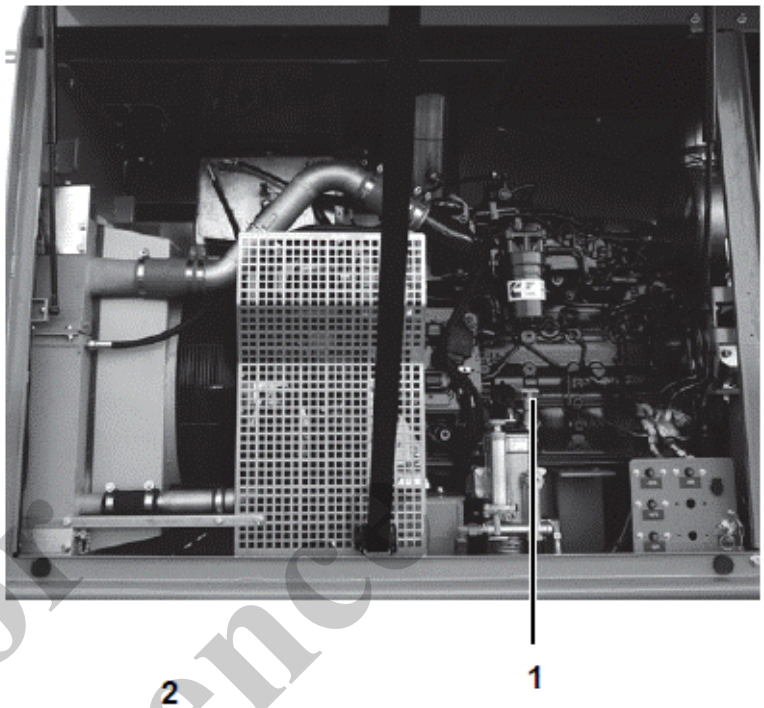
ENVIRONMENT

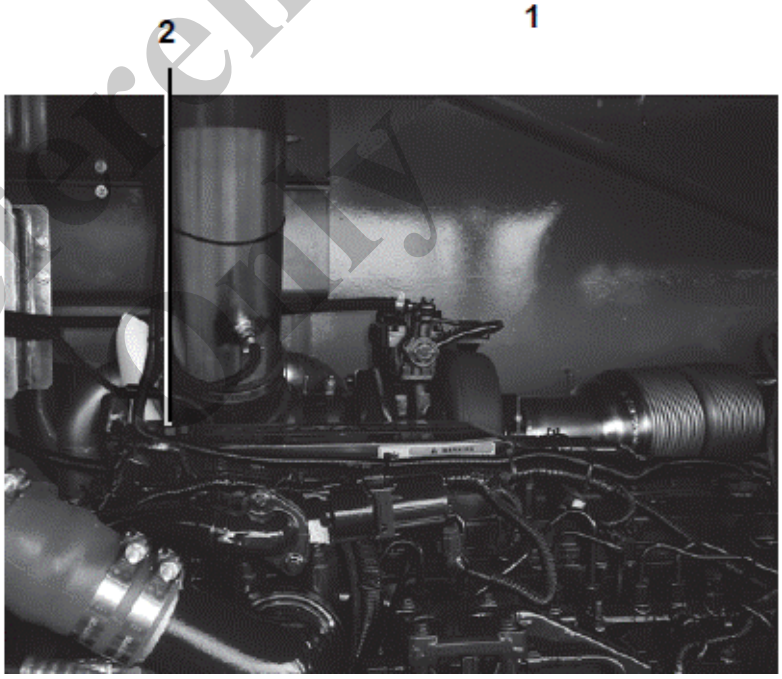
Risk of environmental damage due to improper disposal of used oil.

Used oil that has not been properly disposed of contaminates ground water.

- **Make sure used oil does not seep into the soil or reach bodies of water.**
- **Observe applicable environmental standards for disposing of oil and oil filters.**

Information
Observe the engine manufacturer's operating manual. Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.





1 Dipstick
2 Oil filler neck

1. Park the machine in horizontal position.
2. Run engine for approximately 2 minutes until the system is filled with oil.
3. Shut down the drive engine.
4. Open rear right maintenance door.

5. Pull out oil dipstick (1), and wipe it off with a clean, lint-free cloth.
6. Insert oil dipstick up to stop and pull out again.
7. Check oil level:
   The oil level must be between the lower marking (MIN) and the upper marking (MAX).
8. If necessary, top up engine oil via the filler neck (2), as specified in the operating manual provided by the engine manufacturer.

6.3 Changing the engine oil and oil filter

1. Warm up engine.
2. Park the machine in horizontal position.
3. Open rear right maintenance door. Remove lower cover.
4. Change engine oil and oil filter in accordance with the instructions in the engine manufacturer's operating manual.
5. Check oil level:
   The oil level must be between the lower marking (MIN) and the upper marking (MAX).
6. If necessary top up engine oil as specified in the operating manual provided by the engine manufacturer.

6.4 Check and clean combination cooler

⚠ WARNING

Risk of injury from rotating or hot engine parts!

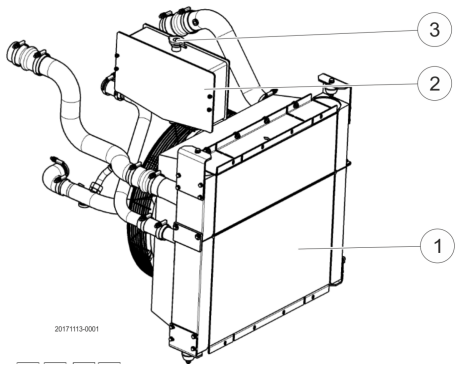
Persons can be injured by moving or hot engine parts.

– **Only perform maintenance when the drive engine is shut down and the cooling system has cooled down.**

Safety instructions

- Coolant must not seep into the ground or into waterways. Dispose of coolant in accordance with statutory regulations.
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

Check and clean the cooler



1 Radiator
2 Expansion tank
3 Sealing cap

1. Allow the diesel engine and radiator (1) to cool down.

⚠ WARNING! Risk of burns from hot engine parts.

– Only open the expansion tank when the engine is cold.

2. Carefully open the cap (3) of the expansion tank (2) to relieve the pressure.
3. Check the antifreeze and coolant level, top up if necessary. The coolant must contain at least 50% antifreeze throughout the year.
4. Re-close the expansion tank sealing cap (3).
5. Blow off cooling fins from the exhaust air side with dry, filtered compressed air (maximum 2 bar).
   If contaminated with grease and oil, clean the radiator fins using cold-cleaning agent and a steam cleaner.
6. Check radiator for leaks and damaged cooling fins.

Information

– *To change the coolant, observe the instructions in the operating manual provided by the engine manufacturer.*
– *GROVE recommends a change interval of 2000 operating hours or maximum 24 months. Whichever comes first.*
– *Also comply with the additional instructions, "Cleaning the cooler", see Appendix, Chapter 11.6 CLEANING THE COOLER.*

6.5 Diesel pre-filter

1 Service door
2 Housing of filter cartridge
3 Vent screw
4 Drain valve
5 Screw cap

Dewatering the diesel prefilter

⚠ WARNING! Risk of injury from rotating or hot engine parts!
Persons can be injured by moving or hot engine parts.

- **Only perform maintenance when the drive engine is shut down and the cooling system has cooled down.**

1. Open the service door (1).
2. Place a suitable collecting vessel under the drain valve (4).
3. Open the drain valve (4).
4. Drain water and contamination from the water container until fuel flows out.
5. Close the drain valve (4).
6. Close the service door (1).

Changing the filter cartridge

Information

– *After dismantling the filter, clean all parts, check for damage or wear and replace parts if necessary.*
– *Ensure the utmost cleanliness when replacing the filter element! In addition, pay attention to the description imprinted on the filter cartridge!*

1. Open the service door (1).
2. Place a suitable collecting vessel under the drain valve (4).
3. Open the drain valve (4).
4. Drain water and contamination from the water container until fuel flows out.
5. Close the drain valve (4).
6. Unscrew the screw cap (5) from the housing (2) and pull out the filter element that is fastened to it.

7. ■ Unclip the filter element from the screw cap.
   ■ Replace the O-ring on the screw cap (new O-ring included with replacement filter element).
   ■ Moisten the O-rings on the filter element and on the screw cap with fuel.
   ■ Clip a new filter element into the screw cap.
8. Screw the screw cap (5) with new filter element into the housing (2) to the stop. Ensure tightening torque is at 50 Nm (442.53 lbf in)!
9. Dispose of old filter element and O-rings.
10. Close the service door (1).

6.6 Diesel fine filter

Replacement

Information
See the operating manual provided by the engine manufacturer for more information concerning replacement of the fuel filter.

6.7 Checking the air intake system

Safety instructions

- Check the air intake system regularly.
  - Check the suction hoses for leaks.
  - Check the suction hoses for correct position.
  - Check the hose clips for firm seat.
- Service the dry air filter and the air intake system regularly.

Information
To check the intake system and for replacement of the dry air filter, observe the instructions in the operating manual provided by the engine manufacturer.

6.8 Check the V-ribbed belt drive

Safety instructions

- Only carry out maintenance work when the drive engine is shut down and at a standstill.
- Switch off the machine and safeguard it against unauthorized restart before starting the tasks.
- Reinstall the protective covering after maintenance work.

Information
To check, tension and change the belt drives, refer to the directions in the operating instructions of the engine manufacturer.

6.9 Air filter

6.9.1 Air filter, general information

⚠ WARNING

Risk of burns from unsuitable cleaning agents.

Persons suffer burn injuries when cleaning the air filter with hot or flammable cleaning agents.

- **Never use gasoline, soap or hot liquids to clean the air filter.**
- **Only clean the air filter when the engine is shut off and cooled down.**

NOTICE

Risk of engine damage when cleaning with compressed air.

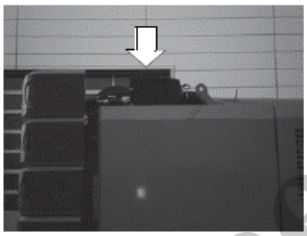
When cleaning the interior of the housing with compressed air, contaminants get into the engine.

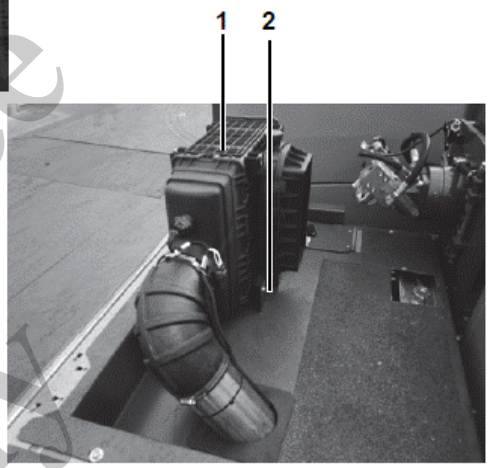
- **Never use compressed air to clean the interior of the housing.**

SENCON symbol air filter

The condition of the air filter is monitored by the SENCON. When contaminated, the SENCON displays the following icon:

- Turn off the diesel engine immediately.
- Check the air filter and replace it as needed.





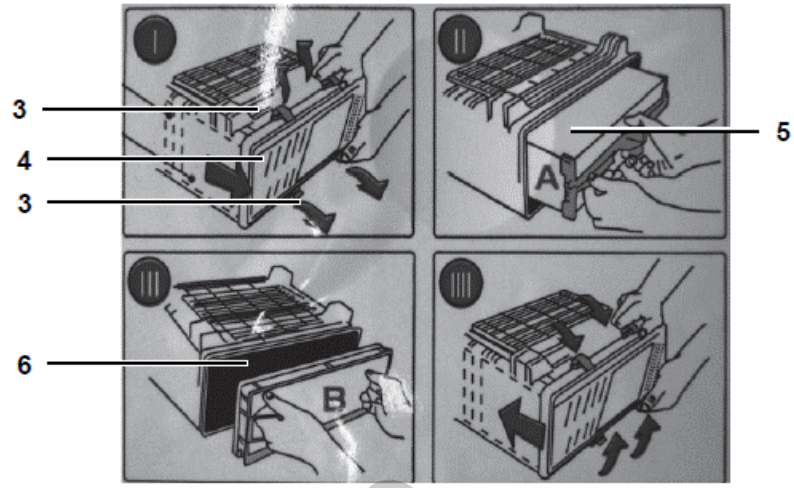
1 Air filter cover
2 Dust discharge valve

6.9.2 Change the air filter - Tier 4f

Read through the safety information before starting work.

Information

– *Replace the main filter during every cleaning.*
– *Replace the safety filter during every other cleaning.*



1. Set down loads and turn off the engine.
2. Open the service hatch (1).
3. Open four locking clamps (3) of the air filter cover and take off the air filter cover.
4. Pull out the main element, Primary (5), and the safety element, Secondary (6), and dispose of them properly.
5. Insert the new main element, Primary (5) and safety element, Secondary (6).
6. Attach the air filter cover (4) using the locking clamps (3).
7. Close the service door.

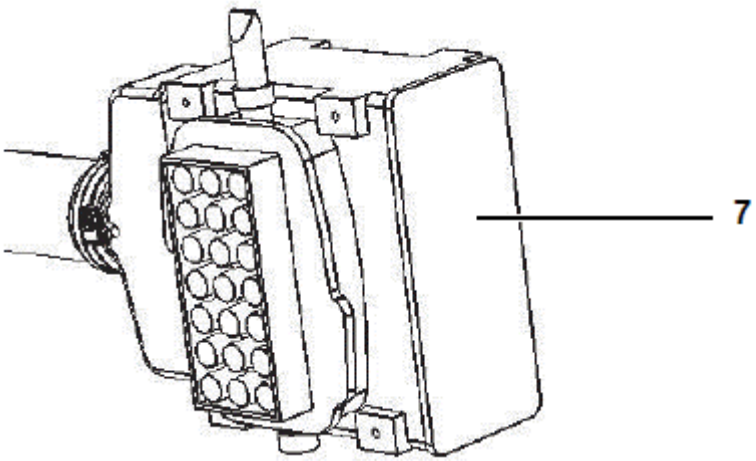
NOTICE

Information
Replace the main element and safety element, do not clean them! Danger of engine damage!

6.9.3 Cleaning the air filter pre-separator

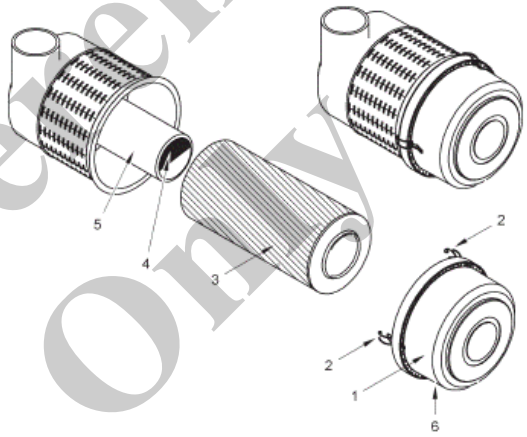
Information If dust escapes when pressing the dust discharge valve, the pre-separator of the air filter must be cleaned.

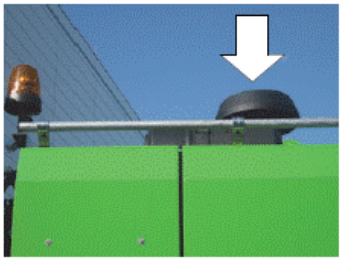
1. Set down loads and turn off the engine.
2. Open the service hatch (1).
3. Open the locking clamps of the pre-separator cover (7).
4. Carefully clean the pre-separator of the air filter with compressed air.
5. Attach the air filter cover (7) using the locking clamps.
6. Close the service door.



6.9.4 Change air filter cartridge

Read through the safety information before starting work.





1 Air filter cover
2 Locking clamps (3 each)
3 replacement cartridge
4 Handle
5 safety cartridge
6 Nose

1. Open the locking clamps (2) of the air filter cover (1) and remove the air filter cover.
2. Remove replacement cartridge (3).

3. Clean the replacement cartridge:
   - Blow out from inside to outside using dry compressed air (max. 2 bar / 29 psi).
   - Only knock out if there is an emergency!
4. Check replacement cartridge for damage of the filter paper and the seals. Replace if necessary.
5. Replace safety cartridge (5) at the latest after 5 filter procedures (at least every 2 years):
   - Pull out the safety cartridge by the handle (4). Never clean the safety cartridge!
   - Insert new safety cartridge.
6. Insert new or cleaned exchange cartridge (3).
7. Replace the air filter cover (1) so that the tab (6) faces downwards, i.e. the word "TOP" faces upwards.
8. Reattach the air filter cover (1) using the locking clamps (2).

6.10 Exhaust after-treatment system

6.10.1 Change and/or clean the DEF dosing unit filter

⚠ CAUTION

Risk to health and danger of machine damage due to contact with DEF!

- **Wear protective clothing, safety goggles and protective gloves.**
- **Avoid contact with eyes and skin.**
- **Do not pour DEF on machine parts, hoses or cables.**
- **Immediately remove any DEF spilled.**
- **Have damaged hoses or cables replaced before starting up the machine.**

Machine parts, especially hoses and cables, can be damaged beyond repair by DEF.

Personnel	Interval
Service Technician Machine Technician	Particular interval: as required

Clean the DEF tank filling filter

Protective equipment:
- Protective clothing
- Chemical-resistant protective gloves
- Safety shoes
- Safety goggles

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the left service door.
4. Unscrew the lock of the DEF tank.
5. Remove the filling filter.
6. Take off the filter seal.
7. Clean the filling filter with water.
8. Replace the filter seal.
9. Place the filling filter into the DEF tank opening.
10. Screw the lock onto the DEF tank.
11. Close the service door.

Personnel	Interval
Service Technician	Particular interval: as required

Change the DEF disposal module return filter

☞ 🕮 *Operating manual, Chapter:* ***Appendix****.*

Personnel	Interval
Service Technician	Particular interval: as required

Change the DEF disposal module input filter

Protective equipment:
- Protective clothing
- Chemical-resistant protective gloves
- Safety shoes
- Safety goggles

Materials:
- Warm water

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the left service door.
4. Separate the hose connection from the DEF disposal module.
5. Remove the input filter.
6. Rinse the input filter through with warm water.
7. Place the input filter back in the hose connection.
8. Connect the hose connection with the DEF disposal module.
9. Close the left service door.

6.10.2 Visual check of the exhaust after-treatment system for damage, leaks

Personnel	Interval
Service Technician	Every 500 OH
The machine operator	Once every 250 OH / approx. 4-6 weeks after commissioning

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Let diesel engine cool.
4. Open the service flap.
5. Visually check that the exhaust after-treatment system is not blocked, corroded or damaged. In particular, carry out the following visual checks.

Visual check	Particular features
Visible soot discharge, particularly on the clips	Black substance
Visible DEF deposits®	White substance
Visible coolant deposits	Greenish substance

7 Uppercarriage

7.1 Check pressure accumulator

Personnel	Interval
Service Technician	Annually / every 2000 OH
Service Technician (company specialist)	Once every 250 OH / approx. 4-6 weeks after commissioning

The preload pressure is checked using the pressure accumulator of the pilot control circuit pressure accumulator.

Special tool: ■ Manometer

1. Lower the attached loads to the ground.
2. Secure the machine against being restarted without authorization.
3. Open the left service door.
4. Connect the manometer to the storage fill-valve of the pilot control circuit pressure accumulator.
5. Switch off the engine and return ignition key immediately to position **I**.
6. Move both control levers in the operator cab in all directions several times.
7. Observe the pressure gauge.

   The value displayed just prior to the pressure drop corresponds to the preload pressure of the pressure accumulator.

   ⇨ As soon as the preload pressure is reached, the valve in the pressure accumulator closes. The pressure gage pointer drops suddenly to 0.
8. Compare the indicated value with the tolerances for the pressure accumulator.

   ⇨ If the preload pressure is outside tolerance, replace the pressure accumulator or have it refilled with nitrogen.
9. Remove the pressure gauge.

Every 10 years/20,000 operating hours, arrange for a pressure test and an internal inspection of the pressure accumulator by a specialist.

7.2 Servicing battery connections

⚠ WARNING

Risk of explosion due to heating!

The battery could explode if overheated.
This can result in injury.

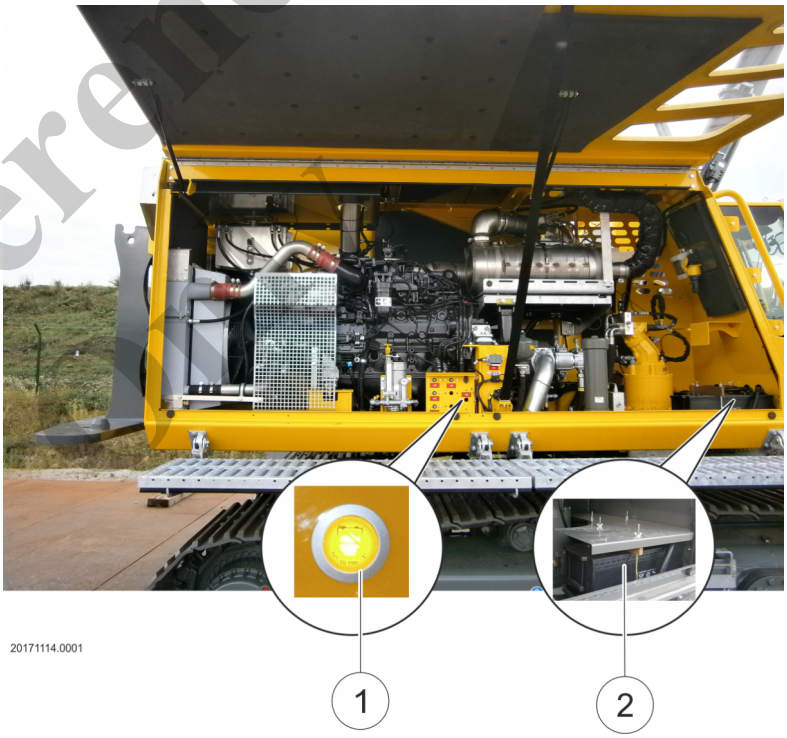
- **Smoking and working with open flame are prohibited.**
- **Avoid sparks in the vicinity of the battery.**

⚠ WARNING

Risk of acid burns from battery acid!

Escaping battery acid causes burns to skin or eyes.

- **Wear safety goggles and protective gloves when working on the battery.**
- **Do not tilt the battery.**
- **Do not place tools on the battery.**
- **Disconnect the batteries before starting any welding.**
- **Do not swap the battery connections.**
- **Dispose of old batteries as hazardous waste.**



Check terminals and cable connections of batteries:

1. Switch over battery disconnect switch (1).
2. Clean terminals and cable connections of batteries (2). Check for firm seat and grease with terminal grease.
3. Return battery disconnect switch (1) to its initial position.

7.3 Slewing gear

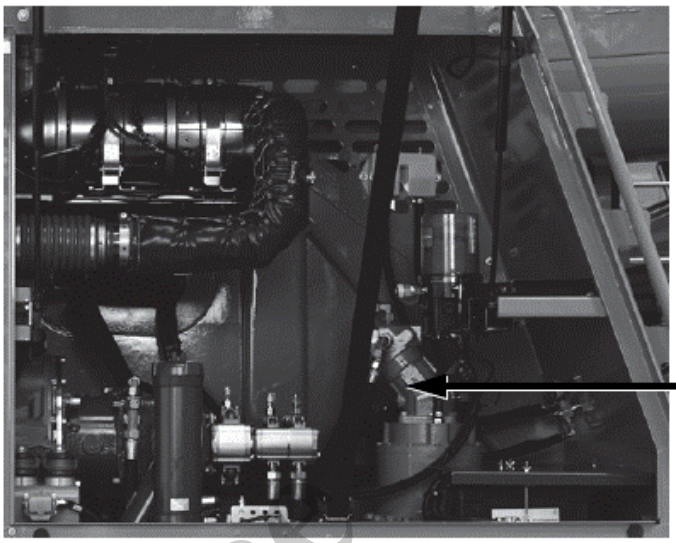
7.3.1 Safety instructions

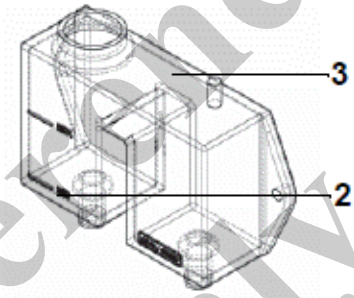
Safety instructions

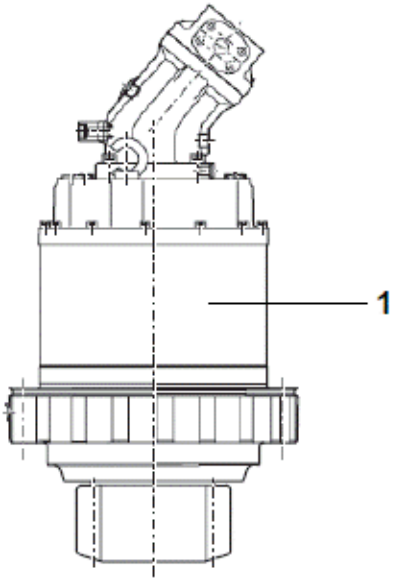
- Only mix oils, lubricants and operating fluids that are of the same type, i.e. identical (same specifications) from one manufacturer!

7.3.2 Check the slewing gear oil level

1. Lower attached loads and the boom to the ground.
2. Park the machine in horizontal position.
3. Shut down drive engine and safeguard it from being restarted.





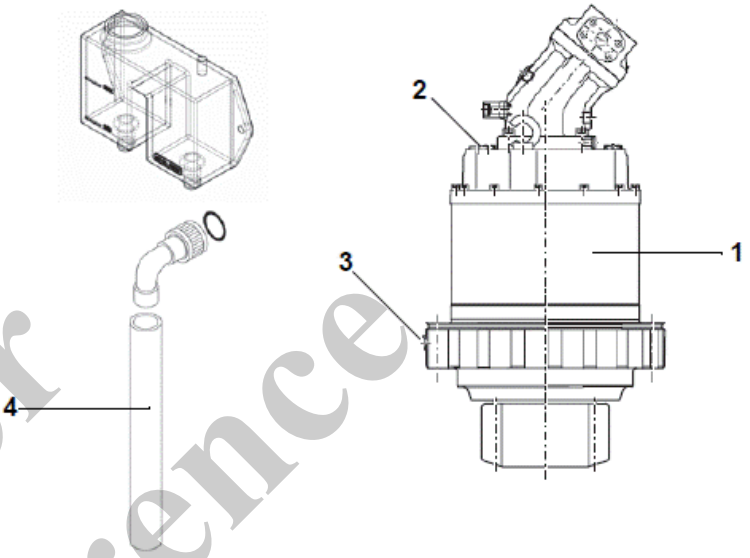


1 Slewing gear
2 Fill level at 15 °C (59 °F) - 20 °C (68 °F) oil temperature (approximately quarter full mark on the oil expansion tank)
3 Oil expansion tank per slewing gear

4. Allow the oil in the slewing gear to cool.
5. Check oil level:
   - Fill level at 15 °C (59 °F) - 20 °C (68 °F) oil temperature (approximately quarter full mark on the oil expansion tank).
   - The oil level can vary according to the oil temperature, up to a three-quarter filling is possible.
6. Top up oil in accordance with specification if necessary.

7.3.3 Change slewing gear gear oil

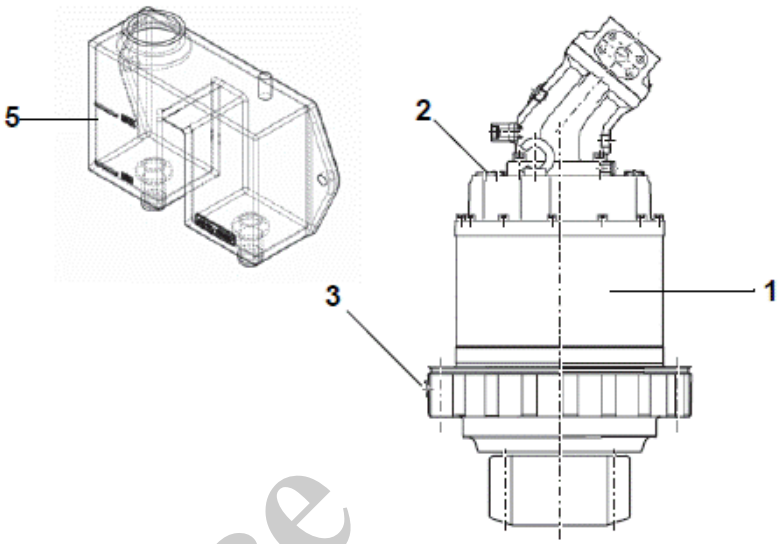
1. Lower attached loads and the boom to the ground.
2. Park the machine in horizontal position.
3. Shut down drive engine and safeguard against restart.



1 Slewing gear
2 Gear bleeder
3 Oil drain with cap nut
4 Connection piece with hose

4. Open the front right service door.
5. Unscrew oil expansion tank (5) cover.
6. Unscrew cover nut (3).
7. Screw in connection piece with hose (4) until the waste oil drains through the hose. Collect used oil in a suitable container.
8. Unscrew connection piece with hose (4).
9. Screw cover nut (3) back on.

Adding oil



1. Unscrew the gear bleeder (2).
2. Add new oil via the oil expansion tank (5).
3. When oil flows out of the gear bleeder (2), screw it closed again.
4. Add new oil via the oil expansion tank (5).
5. Check oil level:
   - Fill level at 15 °C (59 °F) - 20 °C (68 °F) oil temperature (approximately quarter full mark on the oil expansion tank).
   - The oil level can vary according to the oil temperature, up to a three-quarter filling is possible.
6. Screw oil expansion tank (5) cover closed.
7. Operate for 2 hours, then re-check the oil level.

7.4 Check the slewing gear fastening bolts

Personnel	Interval
Service Technician	Annually / every 2000 OH

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

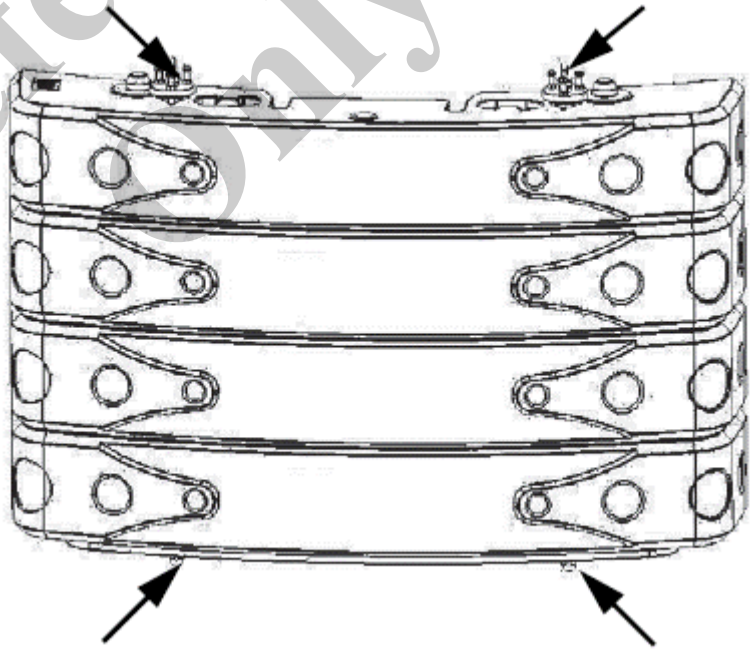
Special tool:
- Spanner, width 24 mm

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check all fastening screws on the slewing gear with a torque wrench, width 24 mm, on firm ground, and tighten if necessary.

   Tightening torque = 200 Nm

7.5 Check ballast elements - ballast rods

1. Drive engine as per the description in Chapter: Turn off starting/stopping operation/diesel engine.
2. Thoroughly clean the machine.
3. Check the ballast elements for firm seat.
4. If necessary, retighten all hex nuts on the ballast rods.



7.6 Check function of the locking bolts

Safety instructions Make sure no one is on or under the counterweight.

Personnel	Interval
The machine operator	weekly

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes
- Hard hat

1. Enter the cab.
2. Align the uppercarriage with the undercarriage in the direction of travel.
   ⇨ The uppercarriage should be at 0°.
3. Lock the uppercarriage at 0°.

Fig. 11: Uppercarriage is locked

Fig. 12: Ballasting mode is switched on

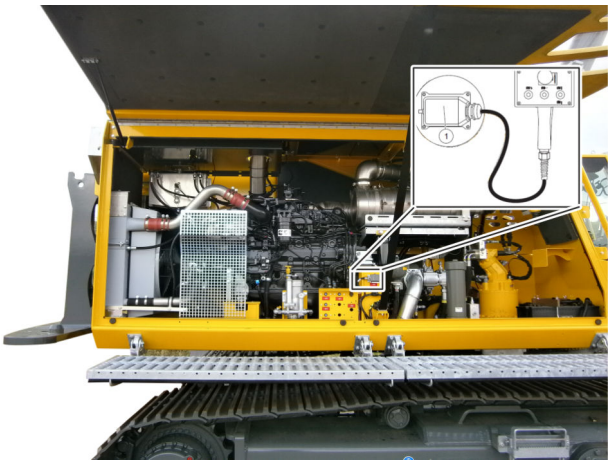
4. Open the Setup window in the SENCON and select "Ballasting mode".

SENCON Setup menu icons

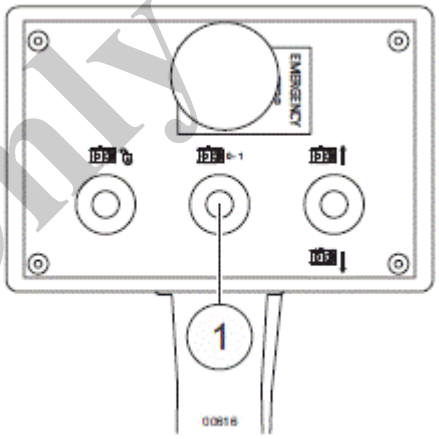
Icon	Name
	Gray: Uppercarriage is unlocked
	Green: Uppercarriage is locked
	Gray: The ballasting operation is switched off
	Green: The ballasting operation is switched on
	Green: Left locking bolt is locked
	Gray: Left locking bolt is unlocked
	Green: Right locking bolt is locked
	Gray: Right locking bolt is unlocked
	Green: The lifting arm is in the lower position.
	Gray: The lifting arm is in the upper position.

⇨ The diesel engine shuts off.

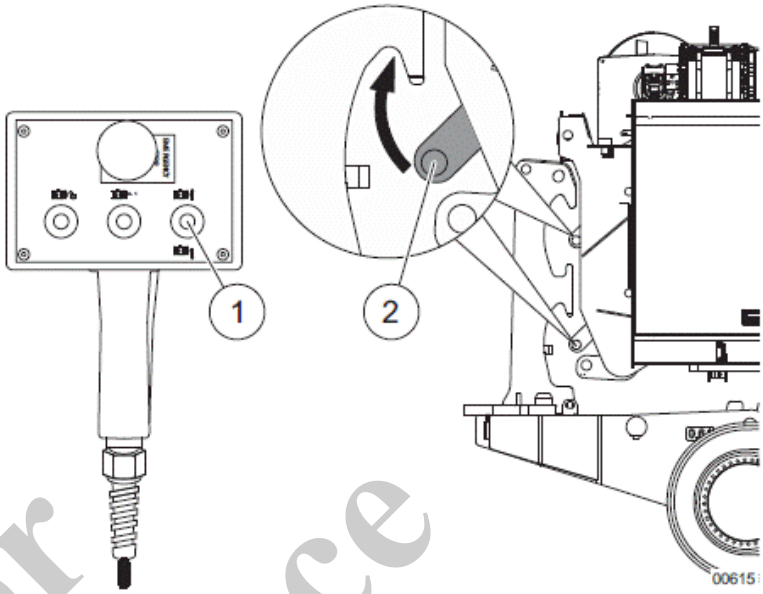
5. Exit the cab.



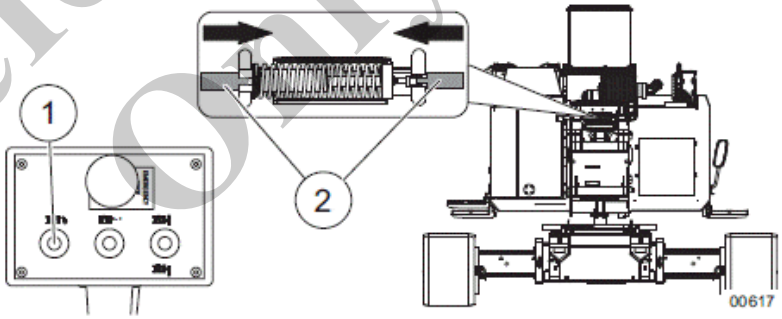
6. Plug the cable remote control (1) into the power socket. The power socket is under the right maintenance hatch.
7. Enter the cab.
8. Start the diesel engine in the cab using the "Start/Stop switch".
9. Exit the cab.
10. Push the safety lever forward.



11. Push the lever (1) on the cable remote control to the right.
    ⇨ The cable remote control is ready for use.

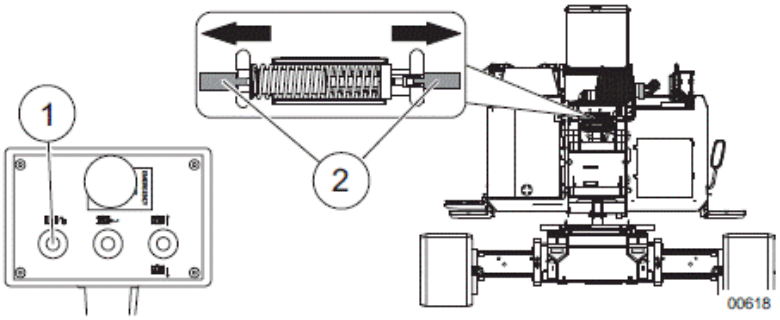


12. Push the lever (1) on the cable remote control upward until the lifting arms (2) completely enter the brackets on the ballast bracket.
13. Make sure the lifting arms are in the brackets correctly.
14. Continue to push the lever (1) on the cable remote control upward until the counterweight is fully elevated and the locking bolts are released.



15. Push the lever (1) on the cable remote control to the right and hold it until the locking bolts (2) on the counterweight are fully retracted.
16. Check the symbol display in SENCON. The symbols for the locking bolts must be displayed in gray.

Fig. 13: Locking bolts in unlocked state



17. Release the lever (1) on the cable remote control.
    ⇨ The locking pins (2) of the locking mechanism should move fully into the ballast bracket openings.
18. Check that the locking bolts are level with the outer edges of the frame plates.
19. Check the symbol display in SENCON. The symbols for the locking bolts must be displayed in green.

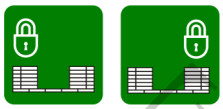
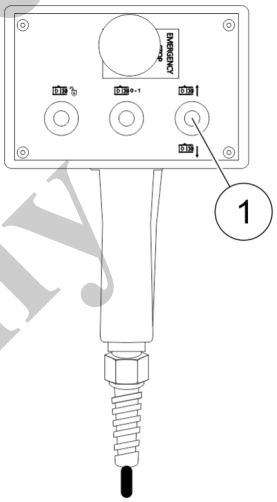


Fig. 14: Locking bolts in locked state



20. Press down the lever (1) on the cable remote control until the lifting arms are fully retracted.
21. Deactivate "Ballasting mode" in the Setup window in the SENCON.

Fig. 15: Ballasting mode is switched off

Fig. 16: Uppercarriage is unlocked

22. Unlock the uppercarriage.
23. Unplug and stow the cable remote control.
    ⇨ The diesel engine shuts off.

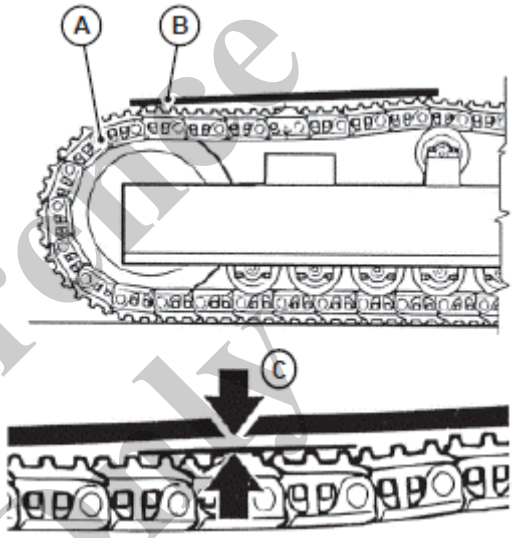
8 undercarriage

8.1 Maintain the crawler track

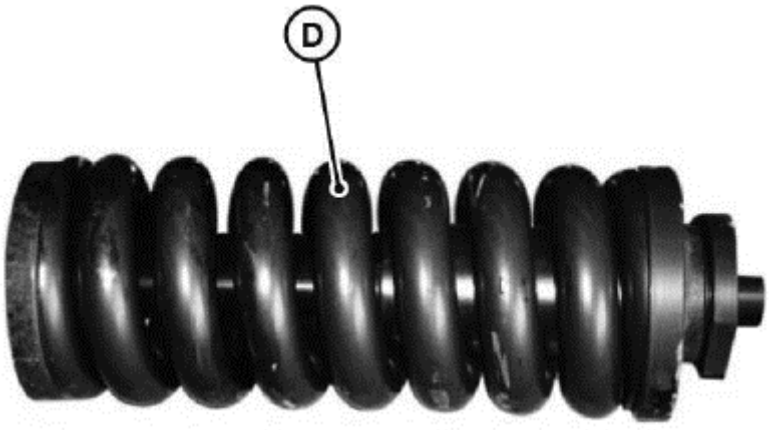
Check track tension

The correct tension of the crawler track **A** is of fundamental significance for the movement of the machine. If the right and left crawler tracks are tensioned differently, driving in a straight line is impossible. Consequently the tension on both crawler tracks must be checked regularly to exclude the possibility disruption of operation. The sag value for the chain tension is 50 mm.

1. Position the machine on level and solid ground.
2. Place a straight edge (B) on crawler track (A).
3. Measure the distance (C) (sag) between track roller and chain link.



4. If the sag dimension is excessive, tension the chain with the provided spring tensioning fixture (D)! If the sag is insufficient, loosen the chain tension.



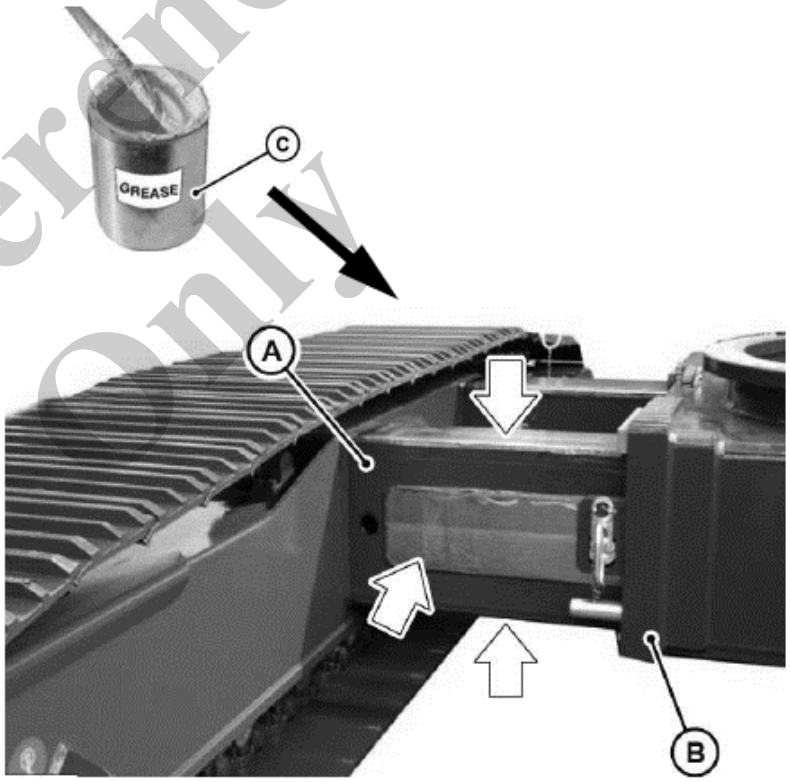
Information
Consistently correct tension of the crawler tracks increases the service life of the components of the undercarriage. In addition, the tension of the crawler tracks must be adjusted depending on the machine's operating conditions.

8.2 Cleaning the frame and track frames

Safety instructions

- Do not use gasoline or flammable solvents to clean the undercarriage! Only commercially available solvents are permissible.
- Regularly clean and lubricate all pull-out elements (A).

1. Widen the track width to its maximum setting.
2. Remove accumulated fouling and old grease on all sides of the cross member (A) and the middle frame (B). Clean surfaces with solvent.
3. Lubricate surfaces: Apply a thin layer of lubricating grease (C) with a brush.



4. Thereafter, reduce and widen the track width so that the lubricating grease is optimally distributed.

8.3 Spring tensioning fixture - adjusting the chain tension

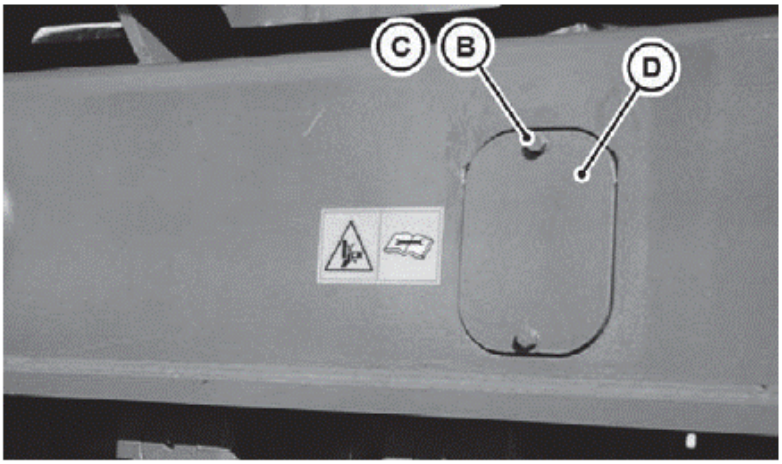
⚠ DANGER

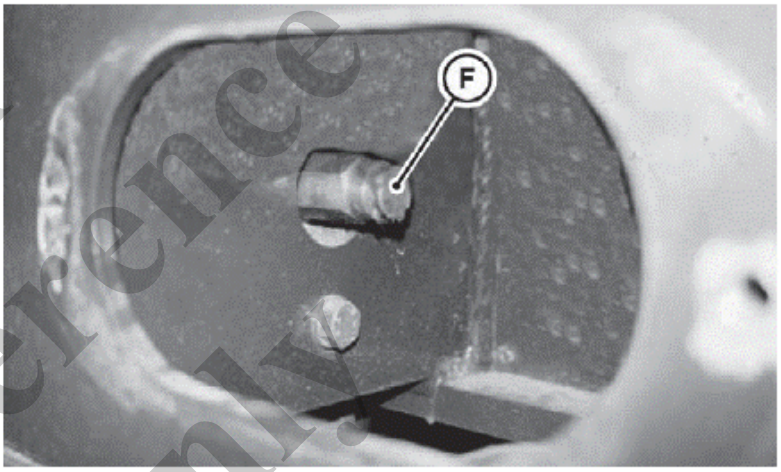
Risk of death from ejecting grease!

Without lubricating nipples or valve in place, lubricating grease sprays out under high pressure and the valve will be ejected from the machine. Persons could be injured or killed.

- **Never take completely the valve or the lubricating nipples completely off.**
- **Always use a suitable extension for the grease gun in order to work at a necessary safety distance from the access hatch.**

1. Position the machine on level and solid ground.
2. Prepare the grease gun (A).
3. Remove screws (B), the washers (C) and the cover (D).
4. Introduce connection hose (E) into the lubricating valve F.
5. Inject lubricating grease. Interrupt the process from time to time to verify the sag.
6. If the chain is tensioned too tight, loosen valve (F) slightly so that the excess lubricating grease escapes via the vent opening and chain loosens.
7. Reattach cover (D), washers (C), and the screws B.
8. Repeat the procedure on the opposite crawler track.

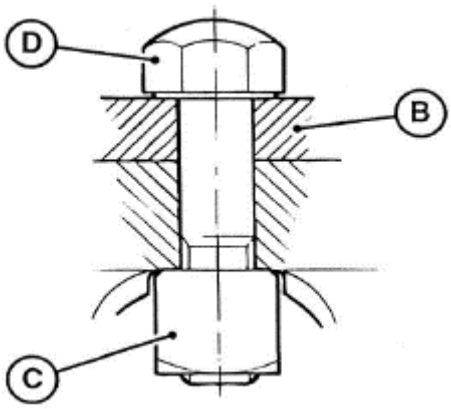




Information
Consistently correct tension of the crawler tracks increases the service life of the components of the undercarriage. In addition, the tension of the crawler tracks must be adjusted depending on the machine's operating conditions. If the ground is extremely compacted, the crawler tracks must be tensioned as loosely as possible.

8.4 Checking the tightening torque of base plate bolts

The tightening torque for the screws of the base plate must show a value of 747 Nm to 877 Nm. Check the tightening torque using a torque wrench. If one or more base plates (B) must be replaced together with the corresponding bolts (C)- (D), then the bolts must be thoroughly lubricated and tightened to the values stated in column "lubricated".



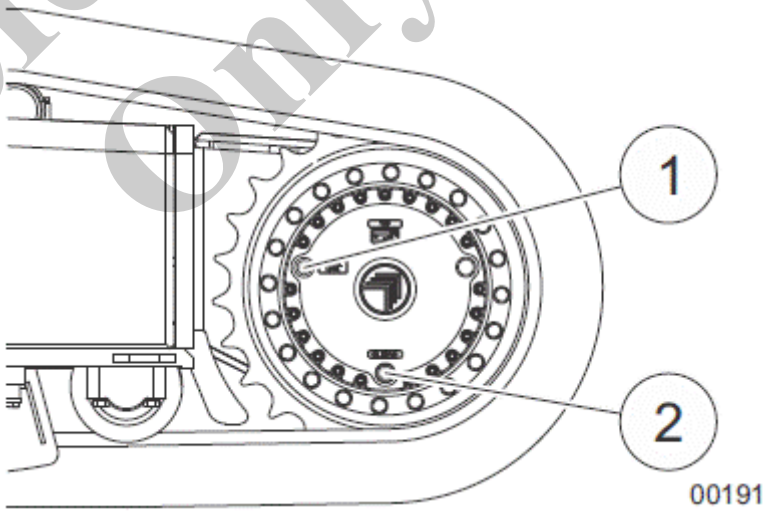
8.5 Checking the travel drive oil level

⚠ WARNING

Risk of scalding from hot oil.
Persons can be injured when draining hot oil.

– **Only drain the oil when the gearbox is warm.**

Information
Mixing different types of oils, lubricants and operating fluids is prohibited. Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.



1. Park the machine on an even and hard surface so the lubricating points (1) in and (2) in are as shown in the figure.
2. Switch off the diesel engine
3. Place a container under the lubricating point plug.
4. Slowly loosen the lubricating point plug until oil comes out of the threaded hole. If too much oil comes out, tighten the plug.
5. If no oil comes out, add oil.

6. To add oil, completely remove the lubricating point plug and pour fresh oil into the threaded hole until it overflows.
7. Tighten the closure of the lubricating point (1).

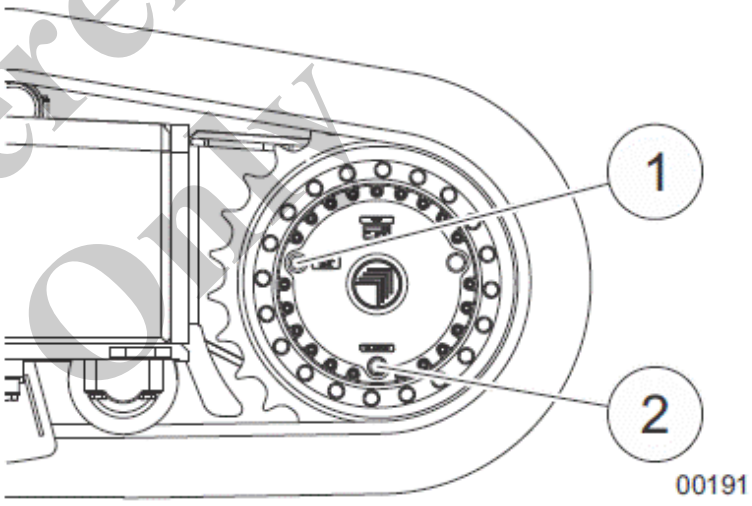
8.6 Changing the travel drive oil

⚠ WARNING

Risk of injury due to oil coming into contact with skin.
Contact with oil can cause severe skin disorders and other severe injuries.

- **Wear gloves and safety glasses with side protection.**
- **Avoid skin contact with used oil.**
- **If skin contact occurs, thoroughly wash off the affected area.**
- **Do not inhale oil vapors or swallow oil.**

Information Mixing different types of oils, lubricants and operating fluids is prohibited. Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.



1. Park the machine on an even and hard surface so the lubricating points (1) and (2) are positioned as in .
2. Switch off the diesel engine
3. Place a collecting vessel under the closure for lubricating point (1) and lubricating point (2).
4. Loosen the closure for lubricating point (1) so the oil can flow out better.
5. Loosen and remove the closure for lubricating point (2).
6. Let the used oil drain completely.
7. Tighten the closure of the lubricating point (2).

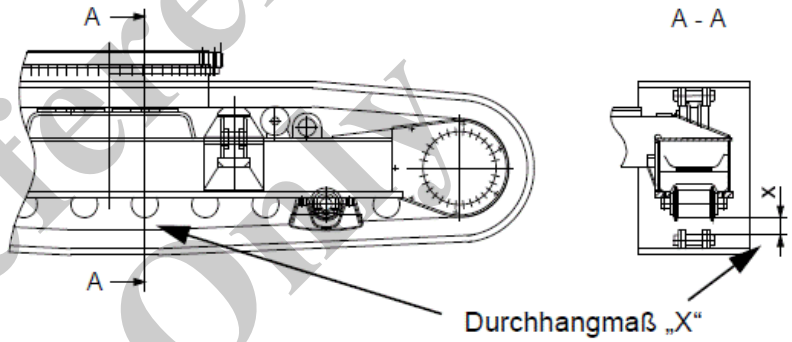
8. Add fresh oil through the threaded hole of the closure for lubricating point (1) until it overflows.
9. Re-tighten the closures for lubricating point (1) and lubricating point (2).
10. Check the oil level after 2 operating hours.

Information
Make sure the oil is warm so it can drain more easily. Keep the work area free and clean. Carefully clean the fill plug and drain plug before screwing them back in.

8.7 Check crawler chain tension

Adequate but not excessive track tension is essential for the track running gear to function smoothly and with minimal wear.

Information
Properly adjusted track tension will reduce the wear of undercarriage parts.



Clean the running gear and crawler tracks thoroughly before checking the chain tension.

Park the machine on even, hard ground.

Safety instructions

- Make sure no one is in the danger zone of the machine.
- Use suspension gear with sufficient load-bearing capacity (see Chapter "Transport" for weights).
- For lattice boom cranes, remove the ballast and boom.
- Slowly and carefully lift the machine at the designated lifting points (see Chapter "Transport").

1. Lift the machine until the track no longer touches the ground.
2. Check the slack span "X" between the track roller and chain link.
   The track is properly tensioned when the sag measurement "X" in the middle of the track wheel carrier is at least 70 mm or at most 80 mm. Adjust the track tension as needed.

3. Set the machine back down.
4. Remove the suspension gear.

8.8 Slewing ring

8.8.1 Visual check of the slewing ring connection

Personnel	Interval
The machine operator	Every 50 operating hours / weekly

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check the slewing ring connection for damage to the
   - threaded union,
   - gearing,
   - sealing lip,
   - and grease collar.

8.8.2 Lubricate slewing ring gearing

Lubricate the slewing ring gearing with the GROVE gear spray, or via the optional slewing ring lubrication feature.

8.8.3 Check the slewing ring fastening nuts

Personnel	Interval
Service Technician	Annually / every 2000 OH
	Once every 250 OH / approx. 4-6 weeks after commissioning

Protective equipment:
- Protective clothing
- Protective gloves
- Safety shoes

Special tool:
- Torque wrench, width xx mm

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check all fastening nuts on the slewing gear with a torque wrench, width xx mm, on firm ground, and tighten if necessary.

   Tightening torque = xx Nm

4. Tighten the fastening nuts cross-wise.
   ⇨ Start with the fastening nuts at 90° to the direction of travel.
5. Carry out the check a second time.

8.8.4 Tighten slewing ring bolts.

⚠ WARNING

Risk of death from defective slewing ring bolts!

If slewing rings bolts are defective, the uppercarriage tips and persons can be severely injured.

- **Check the slewing ring screws every 5000 operating hours or every 5 years.**
- **Replace the slewing ring bolts if necessary.**

Safety instructions

- Have the slewing ring bolts tested by an expert from an independent specialist company / an independent institute.
- Unrestricted further use of the slewing ring bolts must be verified with a certificate. Otherwise, replace the slewing ring bolts.
- Replace corroded bolts immediately.
- Replace loose screws with new screws immediately.
- Retighten slewing ring bolts weekly using a torque wrench.
- Strictly comply with the correct number and diameter of screws.
- Only use original GROVE spare parts.
- If you suspect damage to the bolt connections, have GROVE Customer Service execute a check.
- Contact GROVE Customer Service if you have any other questions. The telephone number of GROVE Customer Service is in the introduction at the beginning of this document.

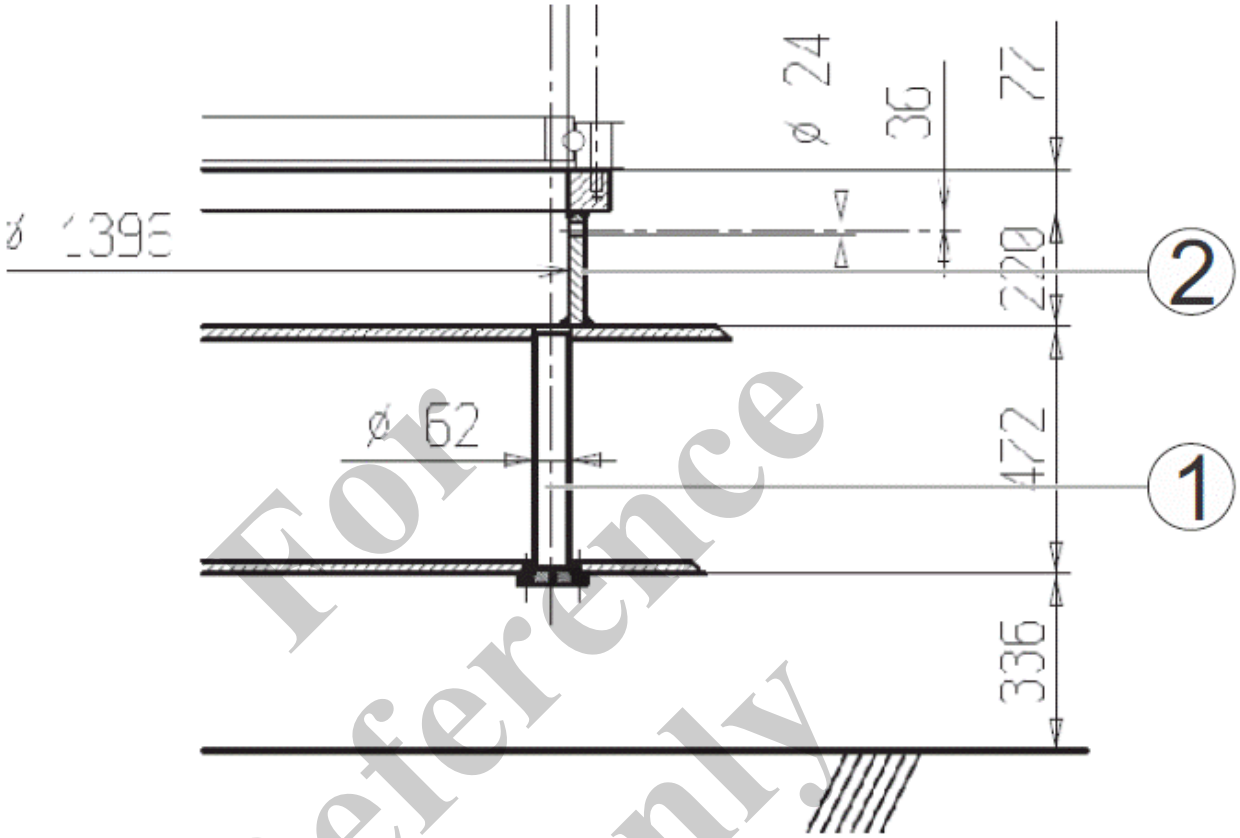
Retightening the outer race

1. Shut down the drive engine.
2. Go to the area of the slewing ring in the undercarriage.
3. Use a torque wrench to tighten the slewing ring bolts (2) of the outer race from above, in a cross pattern.
4. Turn the uppercarriage to gain access to all bolts.

Tightening the inner race

1. Shut down the drive engine.
2. Go to the area of the middle bridge in the undercarriage. This is the only access to the bolts of the inner race.
3. Use a torque wrench to tighten the slewing ring bolts of the inner race (1) in a cross pattern, in accordance with the drawing.
4. Use an extension for the torque wrench. If necessary drive over a pit.

5. Turn the uppercarriage to gain access to all bolts.



Information
The initial tension of the first bolt tightened will be affected by tightening the other bolts. It is therefore necessary to make at least two rounds tightening all bolts. Bolts should preferably be tightened with a hydraulic socket wrench.

8.8.5 Measure slewing ring backlash

Personnel	Interval
Service Technician	Annually / every 2000 OH

The slewing play must be measured in four upper carriage settings, each 90° apart. The first measurement is carried out in the direction of travel. Use a dial gage with a measuring preciseness of 0.01 mm.

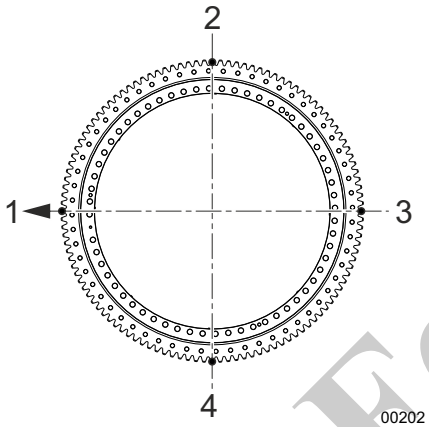


Fig. 17: Measuring points

Special tool:
- Gauge
- Dial gage stand

1. Park the machine on level, flat ground.
2. Lower the outriggers.
3. Bring the magnetic foot of the dial gage stand on the upper carriage as close as possible to the slewing ring protector.
4. Constantly indicate the position of the magnetic foot and of the measuring point.
5. Raise the machine approx 10 cm with the work equipment.
6. Set the dial gage to **0**.
7. Lower the machine and stretch the work equipment out approx. 10 cm above the ground.
8. Read and document in tabular form the value on the dial gage.
9. Dismantle the dial gage stand and the dial gage.
10. Repeat the measurement in the same manner at the three other measuring points.

i The values measured serve as reference values for the maximum permissible slewing ring play. If a measuring value exceeds the reference value and the maximum permissible increase in slewing ring play during following service intervals, the operation of the machine must be adjusted. In this case, the slewing ring must be changed.

Example:

Slewing ring play measurement	**Machine number:**				
Date:					
Operating hours:	250	2 000	4 000	6 000	8 000
Measuring point 1	0.9 mm	1.5 mm	2.2 mm	3.5 mm	3.9 mm
Measuring point 2	0.6 mm	1.3 mm	2.0 mm	2.8 mm	**3.9 mm**
Measuring point 3	1.1 mm	1.6 mm	2.8 mm	3.5 mm	4.0 mm
Measuring point 4	1.0 mm	1.4 mm	3.0 mm	3.5 mm	4.0 mm
Maximum permissible increase in slewing ring play = 3.2 mm					

In the service after 8 000 operating hours, the value measured at measuring point 2 (3.9 mm) exceeds the sum of the reference value (0.6 mm) and the value of the maximum permissible increase in slewing ring play (3,2 mm).

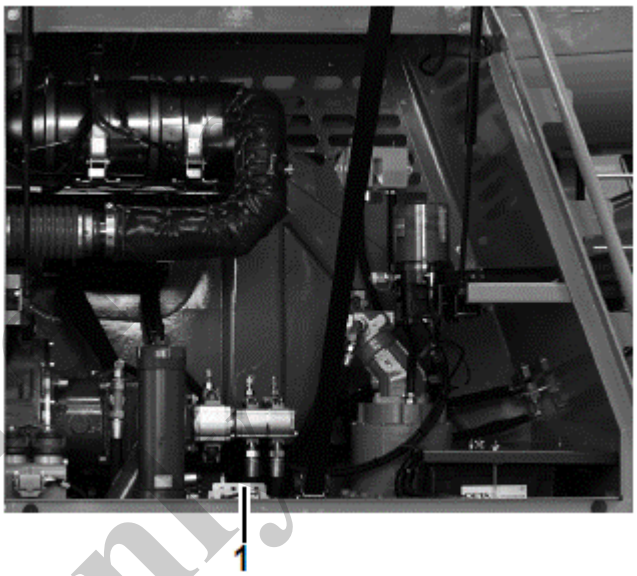
8.8.6 Lubricating the slewing ring raceway manually

Safety instructions

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) and/or manufacturer.

– *in the case of high humidity,*
– *if there are high levels of dust and contamination,*
– *if there are significant fluctuations in temperature and numerous slewing movements.*

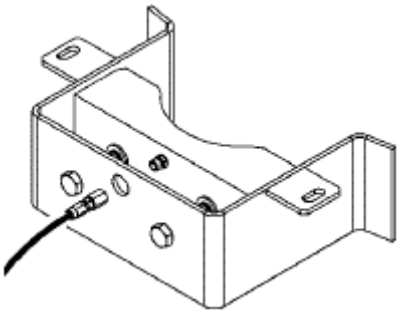
The specified lubrication intervals can be shorter:



1. Shut down the drive engine.
2. Open the right front service door.
3. Lubricate lubricating nipples (1), until grease emerges at the sealing lips.
4. Rotate uppercarriage in both directions several times to distribute the grease.
5. Repeat the process until the rotary connection is completely filled with grease.

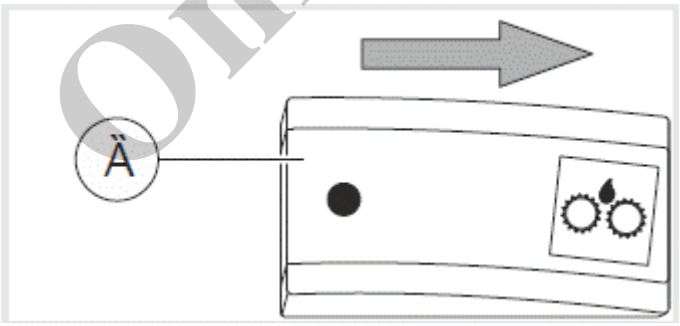
No.	Assembly / lubrication point	Number of lubricating nipples
1	Rotary connection	1

8.8.7 Slewing ring lubrication



Clean the lubrication point thoroughly down to the bare metal before the first application of lubricant.

1. Shut down drive engine and safeguard it from being restarted.
2. Thoroughly clean the gearing.
3. Check gearing of slewing ring and slewing ring pinion for wear and replace if necessary.
4. Start the drive engine.
5. Activate slewing ring lubrication:
   - Press the push button (3) for slewing ring lubrication on the right of the control panel and keep it depressed.
   - Use the control lever to slew the uppercarriage 360° to the left and right to distribute the lubricant evenly over the gearing.



6. Release the push button.
7. Check whether an uninterrupted film of lubricant is present. Repeat the lubrication process if necessary.

Information
Lubricate the slewing ring every 10 operating hours or daily (depending on operating conditions)! Check the lubricant tank weekly and top up lubricant if necessary!

Checking the plastic skid

NOTICE

Risk of machine damage due to worn plastic skid.

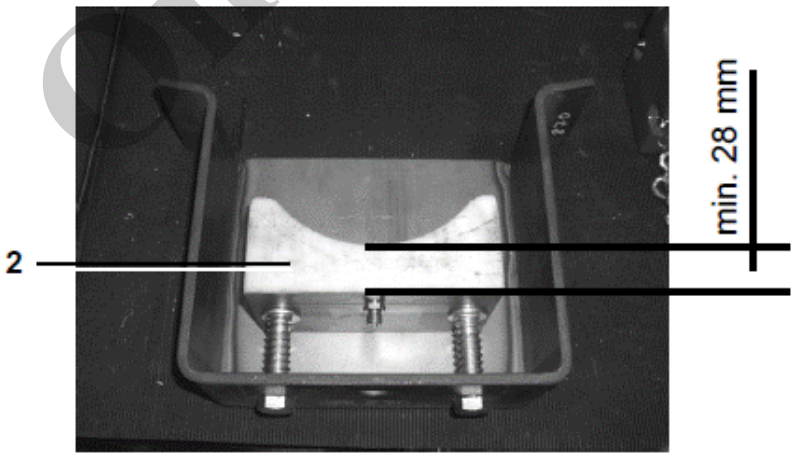
Considerable machine damage occurs if the plastic skid is worn.

- **Check the plastic sliding wear pad (2) in the lubrication device (1) for wear every three months.**
- **Replace the plastic sliding wear pad (2) as soon as the wear limit is reached.**

Safety instructions

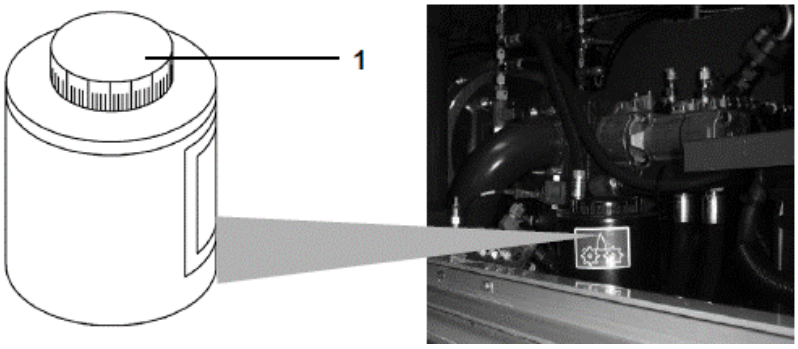
Before checking the plastic skid (2):

- Lower attached loads and boom to the ground.
- Pull the left-hand safety lever back.
- Shut down machine and secure it against unauthorized restart before starting maintenance tasks.
- Attach warning sign on the operating elements.



1. Remove the lubrication device (1).
2. Checking the plastic skid (2) for wear (minimum 28mm).
3. Replace the plastic skid if necessary.

Adding grease



1. Open cover (1).
2. Add lubricant.
3. Close the cap.

8.9 Rotary connection

9 Load hoist mechanism

9.1 check the pressure roller on the winch

Personnel	Interval
Service Technician The machine operator	Particular interval: before/after long usage periods,

Safety precautions

- The winch pressure roller is pre-tensioned. There is a risk of clamping. Ensure that the winch is disconnected from power and prevented from switching back on during work on the pressure roller.
- Only work on the winch when the machine is off and not under load.

Protective equipment:
- Protective clothing
- Safety goggles
- Hard hat
- Protective gloves
- Fall arrest safety harness

Special tool:
- Spanner

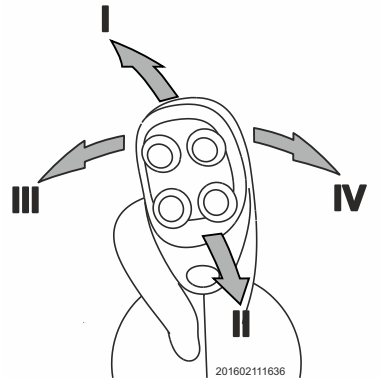
1. Check if the springs installed are pressing the pressure roller into the rope in the drum direction.
2. Check
   - if the pressure roller locking screws' counter nuts have loosened due to operational vibrations.
   - if the sheave turns freely.
3. Check the pressure rollers for freedom of movement.

Screw tightening torque in Nm

Quality	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M30
8.8	10	23	46	79	125	195	280	395	540	680	1350
10.9	14	34	67	115	185	290	400	560	760	970	1950
12.9	16	40	79	135	220	340	470	660	890	1150	2300

9.2 Check the limit switch on the winch

Personnel	Interval
Service Technician	Particular interval: every 100 OH



I Lower winch
position Lift winch
III Lift boom
IV Lower boom

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

1. Park the machine.
2. Reeve the load hook five times.
3. Hand a small load on the load hook.
4. Extend the main boom.
5. Activate the winch with the right joystick until the pre-set remaining rope length has been reached on the rope drum and the hoist rope no longer unrolls from the rope drum.
   ⇨ The "sink winch" function is automatically switched off.

   The remaining rope length must include 3 rope coils.

9.3 Check securing of the winch load foot

Personnel	Interval
Service Technician	Annually / every 2000 OH
	Once every 250 OH / approx. 4-6 weeks after commissioning

General safety instructions

- Tasks on the winch and its additional devices must only be performed when the machine is stopped and in a load-free state.
- Before starting tasks on the winch, safeguard its drive and additional devices against being switched on unintentionally. In this process, the system must be mechanically safeguarded against shaft rotation. Hydraulic and/or pneumatic supply lines must be depressurized.

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

Special tool:
- Spanner

1. Park the machine.
2. Secure the machine against being restarted without authorization.

3. On secure ground, check the bolt connections that secure the winch load foot to the boom.

9.4 Change winch gear oil

Personnel	Interval
Service Technician	Annually / every 2000 OH
	Once every 250 OH / approx. 4-6 weeks after commissioning

Safety measures before maintenance works

- The engine and the gearbox can heat up during operation. Before beginning any work on these parts, first allow them to cool.
- Only carry out maintenance work when the machine is off and not under load.
- Secure the winch drive and additional equipment from unintentional start-up.
- Separate the winch from the electrical power supply and mechanically secure it against sudden turning.
- Hydraulic and/or pneumatic supply lines must be depressurized.
- Only remove or mount protection devices when the machine is off.

Safety measures during maintenance works

- Only remove or mount protection devices when the machine is off.
- Oil release takes place when the gearbox is warm through opening the oil release screw. Avoid scalding and wear PPE.
- Mixing operating fluids of different types and/or the use of unsuitable lubricants can cause machine damage.
  - Do not mix operating fluids of different types.
  - Only mix operating fluids of the same type from the one manufacturer.
  - Observe the recommendations on the operating fluid list.

Safety measures after maintenance works

- Before start-up, check the winch to make sure that all protection devices have been attached and are functioning.
- Do not stand underneath a suspended load.

Checking the winch oil level

If, when checking the winch gear's oil level, a continuous loss of oil is recorded, adjust the winch gear and resolve the cause of the leak.

Protective equipment:
- Protective clothing
- Safety goggles
- Hard hat
- Safety shoes
- Hygiene protection gloves

Always carry out the oil level check when the winch gear is out of operation.

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Check the winch oil level display.
   ⇨ The oil level must be between the lower marking **MIN** and the upper marking **MAX**.
4. Add gearbox oil, if necessary.

Change winch gear oil

⚠ WARNING

Danger of scalding
- **Wear PPE.**
- **Avoid contact with discharged winch gear oil.**

Contact with winch gear oil can cause scalding.

⚠ CAUTION

- **Do not mix operating fluids of different types.**
- **Only mix operating fluids of the same type from the one manufacturer.**
- **Observe the recommendations on the operating fluid list.**

Mixing operating fluids of different types and/or the use of unsuitable lubricants can cause machine damage.

Protective equipment:
- Protective clothing
- Safety goggles
- Hard hat
- Safety shoes
- Hygiene protection gloves
- Fall arrest safety harness

Special tool:
- collecting vessel
- Spanner
- Cleaning cloths

Materials:
- Winch oil
- Seals

Release the oil when the machine is at operating temperature.

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Attach the fall arrest safety harness to an attachment point in the upper carriage.
4. Place a suitable collecting vessel under the winch oil drain screw.
5. Unscrew the oil filling screw from the oil level display.
6. Unscrew the oil release screw from the engine flange.

   ⇨ Completely drain the winch oil.
7. Rinse the winch gear with fresh oil.
8. Clean the winch components, check seals and replace, if necessary.
9. Screw in the oil release screw.

   i Maximum tightening torque moment = 30 Nm
10. Fill with new gear oil using a funnel or hose until the required oil level has been reached.

    ⇨ The oil level moves between the **MIN** and **MAX** markings.
11. Dispose of the drained winch oil in accordance with regulations.

Check the oil level immediately after winch start-up when the gearbox is idle, and top-up fill-level if necessary.

With winches that have a hose on the oil release screw, unscrew the hose blind plugs and carry out the work steps analogously.

9.5 Lubricate winch bearings

Personnel	Interval
Service Technician	Every 6 months

Safety precautions

- The engine and the gearbox can heat up during operation. Before beginning any work on these parts, first allow them to cool.
- Only remove or mount protection devices when the machine is off.
- Secure the winch drive and additional equipment from unintentional start-up.
- Before start-up, check the winch to make sure that all protection devices have been attached and are functioning.
- Do not stand underneath a suspended load.

Protective equipment:
- Protective clothing
- Safety goggles
- Hard hat
- Protective gloves

Special tool:
- Grease gun

Materials:
- approx. 15 g ball bearing grease as per DIN 51825

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the right service door.
4. Lubricate the winch bearings on the lubricating bar at lubrication point M6.
5. Remove the excess grease and dispose of it correctly.

9.6 Check the splined shaft connection on the winch

Personnel	Interval
Service Technician	Annually / every 2000 OH

Safety instructions

- Before loosening shaft connections, make sure that there is no torsion moment acting on the shaft connection.
- During winch operation, high surface temperatures can occur on the gearbox. Avoid burns through contact. Wear personal protective equipment.
- Before start-up, check the winch to make sure that all protection devices have been attached and are functioning.
- Do not stand underneath a suspended load.
- Secure the winch drive and additional equipment from unintentional start-up.

Protective equipment:
- Protective clothing
- Safety goggles
- Hard hat
- Protective gloves

Special tool:
- Spanner

1. Dismantle the winch engine.
2. Dismantle the winch brakes.
3. Check the drive-side splined shaft connection.
   ⇨ The involute spline connection should show no plastic deformation or abrasive wear.

If damage can be seen on the involute spline connections, the affected parts must be replaced immediately.

10 Rope

10.1 Completely unroll and roll up the rope

Personnel	Interval
Service Technician	Particular interval: every 100 OH

⚠ WARNING

- **If the rope meets discard criteria, do not use it any more.**
- **Ropes and rope end connections must not be overloaded.**
- **Ropes and rope end connections must be regularly serviced. Defective or missed maintenance leads to a shorter rope lifetime.**
- **Prevent rope contact with other parts bar the rope drive.**
- **Avoid corrosive surroundings.**
- **Avoid excessive contamination. If the rope is coming into contact with the ground, the ground must be clean.**
- **Avoid exposure to excessive heat.**
- **All elements of the rope drive must be in perfect condition.**
- **Perfect winding on the rope drum must be maintained.**
- **If possible, the entire rope length from the hoist ropes is to be used.**
- **Avoid the development of slack rope on the drop.**
- **Prevent damage through kinks or crushing.**
- **External twisting must not affect the rope.**
- **To reset the rope pre-tension, wind up the rope to three safety coils, and then roll it back into operation with a cable pull strength of approx. 10 % of the maximum cable pull strength.**
- **Avoid rope shock discharge due to e. g. uneven load set-down.**
- **Avoid unstable diagonal pull through e. g. diagonal load-pulling.**
- **Observe the valid manufacturer's instructions and standards for the monitoring of rope end connections.**

Ropes that are used despite wear, overload, misuse, damage or incorrect maintenance, can malfunction. This can result in serious injury and even death.

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

Special tool:
- Measuring tool for rope diameter

1. Completely unwind the rope and then wind up under adequate pre-tension.
2. When rolling out and up, check the wire rope and the rope drive in accordance with the test criteria in Table 1.

If there is obvious damage, do not operate the winch until the deviations have been checked by staff trained in the operation, safety, and maintenance of this winch.

Test criteria for wire rope check

Test criteria	Component	Comment
■ When rolling the wire rope out and up, check the rope mobility and winding on the rope drum.	■ Wire rope	■ For examination procedure, see section *Supplemental documentation.*
■ Check the rope guide components for mechanical damage.	■ Guide rollers ■ Fixed rope guide components	■ Display the test results.
■ Check the rope drum for traces of wear.	■ Rope drum	
■ Check if rope protection has been attached as per the manufacturer's instructions.	■ Wire rope clamps ■ Wedging clamps ■ Pouch sockets ■ etc.	■ Use the nominal sizes suitable for the rope diameter with all detachable components. ■ When using pouch sockets make sure that, after the insertion of the rope end connection, that the connection is secured against slipping out. ■ Wire rope clamps are not permissible as end fittings for running wire ropes and for repeated loads.
■ If necessary, untwist the wire rope when rolling out and up.	■ Wire rope	■ For untwisting, see section *Supplemental documentation.*
■ Check the wire rope for wear and damage.	■ Wire rope	■ Display the test results.
■ Check the wire rope for: – malformations – protruding wires – main strand extensions – Corrosion – broken or cut strands – the effects of heat – reduction of the rope diameter during operating time	■ Wire rope	■ Display the test results.

11 Hydraulic system

11.1 Hydraulic hose lines

Storage and service life

Even with proper storage and use at permissible loads, hoses and hose lines are subject to natural aging. This means that their service life is limited.

The owner is responsible for ensuring that hose lines are replaced at suitable intervals, even if safety defects cannot be detected on the hose line.

Hose lines must be replaced at least every six years, including a possible storage period of two years, maximum.

Check

Hose lines should be inspected by an expert at least once a year to ensure that they are safe for further use.

Repair any defects detected immediately.

Defects

Replace hose lines in the following cases:

- Outer layer damaged as far as reinforcement (e.g. abrasion points, cuts, cracks);
- Outer layer is brittle (cracks appearing in hose material);
- Deformation, which does not conform to the natural shape of the hose or hose line, both when under and not under pressure, or when bent (e.g. layer separation, bubbles forming);
- Leaks.
- Damaged or deformed hose fittings (sealing function impaired);
- Hose has separated from fittings.
- Corrosion of fittings that reduces function and strength;
- Failure to observe Installation requirements;
- Storage times and/or service life exceeded.

11.2 Bleed hydraulic pumps

Protective equipment:
- Safety shoes
- Hygiene protection gloves
- Protective clothing

Special tool:
- Allen key, width 12 mm
- Lint-free cleaning cloth

1. Park the machine on secure, even ground.
2. Secure the machine against being restarted without authorization.
3. Depressurize the hydraulic system.

   i ☞ *Section Depressurizing the hydraulic system.*
4. Open the service flap.

5. Loosen the bleeding screw until hydraulic oil flows out.
6. Secure the bleeding screw.
7. Wash off run off hydraulic oil and dispose of as per regulations.

11.3 Depressurizing the hydraulic system

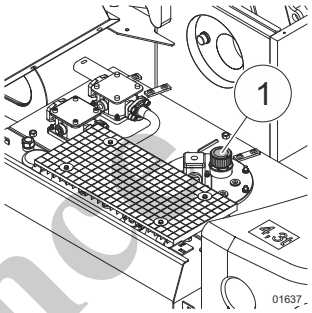


Fig. 18: Depressurizing the hydraulic system

1. Lower the attached loads to the ground.
2. Switch off the diesel engine
3. Turn the ignition key to position **I**.
4. Push the safety lever forward.
5. Slowly activate the steering lever and the pedals several times in all directions.
6. Activate all buttons and switches for hydraulic functions several times.
7. Open the aeration filter (/1) on the hydraulic oil tank.
   ⇨ The preload pressure is removed.
8. Close the aeration filter.
9. Turn the ignition key to position **0**.

11.4 Change hydraulic leakage oil filter

Personnel	Interval
Service Technician	Particular interval: during hydraulic oil change

⚠ WARNING

Risk of severe burns from hot parts and hydraulic oil.

- **Avoid contact with hot parts.**
- **Wear protective clothing and protective gloves.**
- **Shut down the leaking hydraulic system immediately.**

Contact with hot hydraulic system parts or hot hydraulic oil can cause severe burns.

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

Special tool:
- Spanner, width 64 mm
- collecting vessel

Materials:
- Hydraulic leakage oil filter

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Luff out the main boom to its maximum radius.

   Access to the hydraulic leakage oil filter is found in a maintenance opening in the upper carriage, under the end section of the main boom.
4. Depressurize the hydraulic system.

   ☞ *Section Depressurizing the hydraulic system.*
5. Unscrew the aeration filter.

   ⇨ The pre-tension pressure is released from the hydraulic oil tank.
6. Unscrew the hose connections from the filter head.

   ⇨ Collect any run off hydraulic oil and dispose of as per regulations.
7. Unscrew the four hex nuts.
8. Pull the hydraulic leakage oil filter out of the hydraulic oil tank.
9. Unscrew filter element from the return pipe.
10. Dispose of the filter element as per regulations.
11. Thoroughly clean the return pipe, the filter head, and the magnet.
12. Screw new filter element onto the return pipe.
13. Insert the hydraulic leakage oil filter into the hydraulic oil tank.
14. Secure leak oil filter with the four hex nuts.
15. Connect the hose connections to the filter head.
16. Screw on the aeration filter.

11.5 Change the hydraulic oil return filter

Personnel	Interval
Service Technician	Annually / every 2000 OH
	Once every 250 OH / approx. 4-6 weeks after commissioning

⚠ WARNING

Risk of severe burns from hot parts and hydraulic oil.
- **Avoid contact with hot parts.**
- **Wear protective clothing and protective gloves.**
- **Shut down the leaking hydraulic system immediately.**
- **When carrying out maintenance works on the filter casing, make sure that the filter casing is pressure-free.**

Contact with hot hydraulic system parts or hot hydraulic oil can cause severe burns.

Protective equipment:
- Safety shoes
- Protective gloves
- Protective clothing

Special tool:
- Spanner, width 8

Materials:
- Hydraulic oil return filter
- Sealing ring

1. Park the machine.
2. Luff out the main boom to its maximum radius.
3. Secure the machine against being restarted without authorization.
4. If necessary, alloy the hydraulic system to cool.
5. Unscrew the cover screws and lift off the cover.

   Access to the hydraulic oil return filter is found in a maintenance opening in the upper carriage, under the end section of the main boom.
6. Depressurize the hydraulic system.

   ☞ *Section Depressurizing the hydraulic system.*
7. Unscrew the aeration filter.

   ⇨ The pre-tension pressure is released from the hydraulic oil tank.
8. Unscrew the four hex screws.
9. Remove the filter cover from the filter head.

   If necessary, loosen the middle screw on the filter cover to remove the vacuum inside.

10. Pull the return filter out of the hydraulic oil tank.
11. Check the magnets in the filter cover for chips.
12. Thoroughly clean the filter cover and magnets.
13. Check the O-ring in the filter cover and replace if necessary.
14. Insert and secure a new return filter into the hydraulic oil tank.
15. Damp the O-ring in the filter cover with clean hydraulic oil.
16. Insert the filter cover into the filter head.
17. Screw in the four hex screws evenly in cross-form.
18. Screw in the middle hex screw on the filter cover.
19. Screw on the aeration filter.

11.6 Change hydraulic hoses

Personnel	Interval
Service Technician	Particular interval: every 12000 OH / 6 years

⚠ WARNING

Risk of severe burns from hot parts and hydraulic oil.
- **Avoid contact with hot parts.**
- **Wear protective clothing and protective gloves.**
- **Shut down the leaking hydraulic system immediately.**

Contact with hot hydraulic system parts or hot hydraulic oil can cause severe burns.

⚠ WARNING

Risk of serious injury from pressurized hydraulic oil!
- **Before working on the hydraulic system, remove pressure from the hydraulic system.**

Opening the hydraulic system can cause pressurized hydraulic oil to eject and result in serious injury.

Protective equipment:
- Protective clothing
- Protective gloves
- Safety goggles

Lower the stick and the boom.

Park the machine.

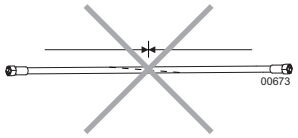
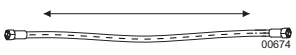
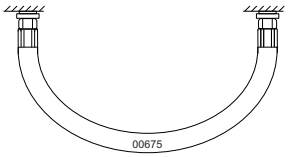
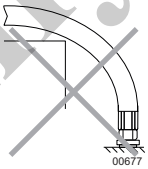
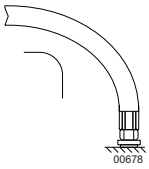
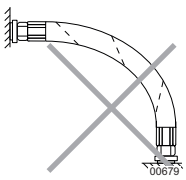
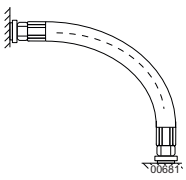
Depressurize the hydraulic system.

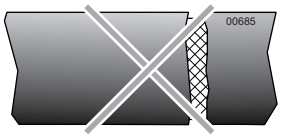
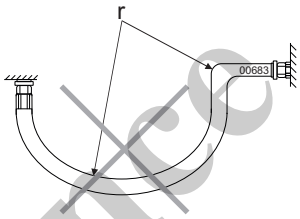
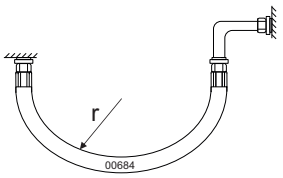
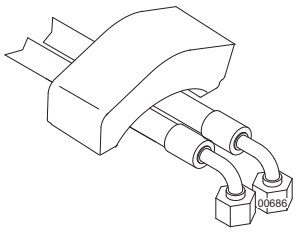
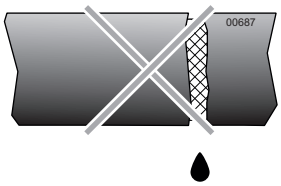
☞ *Section Depressurizing the hydraulic system.*

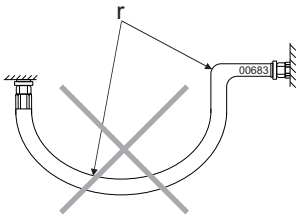
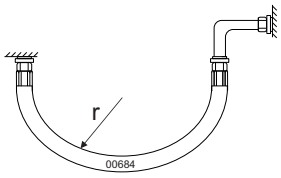
Open the rear left service door and switch the battery disconnect switch to Position 0.

1. When dismantling a defective hydraulic hose, make sure that
   - before opening the successful pressure release, the affected rope connection is checked once more;
   - the threaded union between hose fitting and connection loosen without pressure.

2. When mounting all hydraulic hoses, observe the following assembly instructions:

Assembly instructions	Hose connection and connection components	Incorrect assembly	Correct assembly
No tensile load due to short hose length	Hydraulic hose	 00673	 00674
No tensile load due to short bend radius	Hydraulic hose	 00676	 00675
Sufficient distance from neighboring components	Hydraulic hose	 00677	 00678
No torsion loading	Hydraulic hose	 00679	 00681

Assembly instructions	Hose connection and connection components	Incorrect assembly	Correct assembly
No damage to outer layer, reaching into the hose insert;	Hydraulic oil hose		
No prevention of natural hose movement in which the smallest permissible bend radii are fallen short of;	Hydraulic hose		
Protection of loose-lying hydraulic hoses using hose mounts;	Hydraulic hose		
No unsealed places and leaks	Hydraulic hose, hose fitting, connection		
Pre-determined usage period not exceeded	Hydraulic hose		

Assembly instructions	Hose connection and connection components	Incorrect assembly	Correct assembly
No kinks	Hydraulic hose		
No deformations, damage, corrosion of the fitting and the connection, that hinder the function, security, and impermeability of the connection	Hose fitting and connection, coupling sleeve, coupler plug		
Check all threaded unions on flange connections, fittings etc., and tighten if necessary.	Flange connection, fitting		

3. After mounting the hydraulic hoses, check the machine's hydraulic system at maximum operating pressure.

11.7 Change hydraulic oil reservoir aeration filter

Personnel	Interval
Service Technician	annually / every 2000 OH

Protective equipment:
- Safety shoes
- Hygiene protection gloves
- Protective clothing

Materials:
- Aeration filter

Depressurize the hydraulic system.

☞ *Section Depressurizing the hydraulic system.*

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Raise the boom to an approximate 60° boom angle.
4. Unscrew the aeration filter and dispose of as per regulations.
5. Screw in a new aeration filter.

11.8 Change HydroClean or auxiliary control filter filter element

Change HydroClean filter element

Personnel	Interval
Service Technician	Annually / every 2000 OH
	Once every 250 OH / approx. 4-6 weeks after commissioning

Protective equipment:
- Protective clothing
- Chemical-resistant protective gloves
- Safety shoes

Special tool:
- Spanner, width 32 mm
- Screw driver, width 13 mm
- Allen key, width 6 mm

Materials:
- HydroClean filter element
- O-ring, back-up ring

1. Park the machine.
2. Secure the machine against being restarted.
3. Open the aeration filter on the hydraulic oil tank.
4. Close the aeration filter.
5. Open the right service door.
6. Remove the two hex screws.
7. Unscrew the cover.
8. Unscrew the filter cover.
9. Use the handle to pull the filter element out of the filter casing.
10. Thoroughly clean the filter cover and the screw thread on the filter casing.
11. Check the O-ring in the filter cover and replace if necessary.
12. Insert new filter element into the filter casing.
13. Damp the screw thread and the O-ring in the filter cover with clean hydraulic oil.
14. Screw on the filter cover until the stop and unscrew a quarter turn.
15. Start the diesel engine.
16. Slightly loosen the socket head bolt until bleeder opening is exposed.
    ⇨ As soon as hydraulic oil runs out, securely screw in the socket head bolt.
17. Switch off the diesel engine
18. Set the cover on and screw it in.
19. Check the GROVE HydroClean Filter for leaks.
20. Dispose of the used filter element as per regulations.

Change the filter element for the auxiliary control filter

⚠ WARNING

Incorrect handling of the auxiliary control filter can cause damage to the hydraulic system and/or injuries

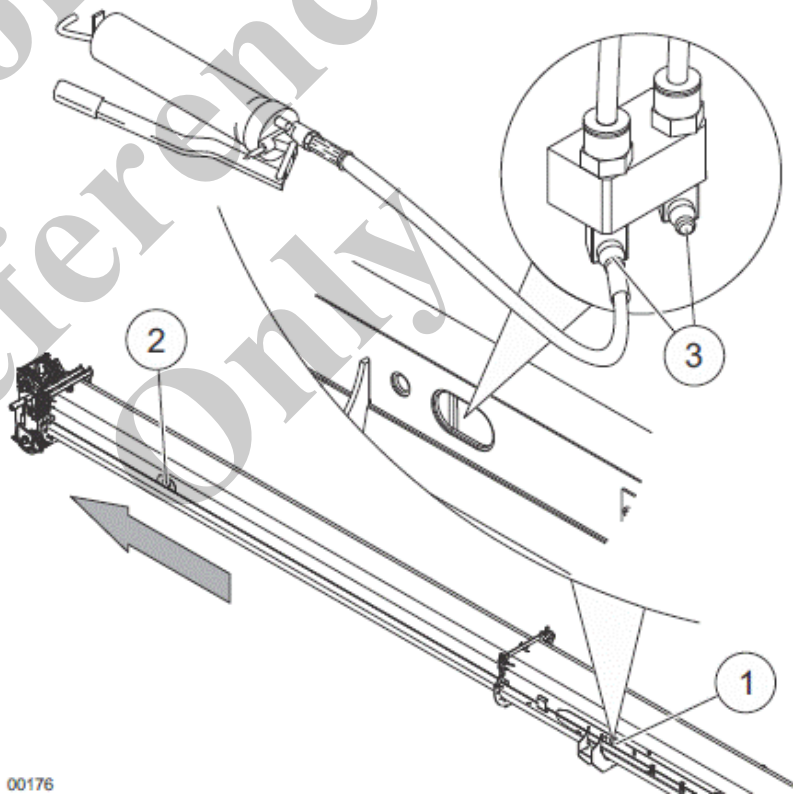
- **The operator must prevent the build-up of air pockets through suitable measure (e. g. bleeding).**
- **For all works on the pressure equipment, it must be ensured that the filter casing is pressure-free.**
- **The auxiliary control filter may not be altered due to sweating, drilling, violent opening, etc.**
- **Hot run-off oil is to be expected during all works on the filter, which can lead to injuries and scalding due to high pressure and high temperature.**
- **Observe legal accident protection regulations, safety agreements, and safety information sheets for liquids.**
- **Only touch the auxiliary control filter when it is cool.**
- **Ensure the utmost cleanliness when replacing a filter element.**

1. Park the machine.
2. Secure the machine against being restarted without authorization.
3. Open the right service door.
4. Open the aeration filter on the hydraulic oil tank.
5. Close the aeration filter.
6. Unscrew the filter cover.
7. Pull the filter element out of the filter casing.
8. Thoroughly clean the filter cover and the screw thread on the filter casing.
9. Check the O-ring and the back-up ring in the filter cover and replace if necessary.
10. Insert new filter element into the filter casing.
11. Damp the screw thread and the O-ring in the filter cover with clean hydraulic oil.
12. Screw on the filter cover until the stop and unscrew a quarter turn.
13. Check the auxiliary control filter for leaks.
14. Dispose of the used filter element as per regulations.

12 Telescopic boom

12.1 Lubricating the telescopic boom

1. Attach the maximum counterweight.
2. Slew the uppercarriage into the direction of travel.
3. Telescope the undercarriage to maximum track width.
4. Enter the cab.
5. Start the diesel engine and push the safety lever forward.
6. Select operating mode **Setup2** on the SENCON.
7. Lower the boom completely.
8. Unreeve the bottom hook block.
9. Extend the telescopic boom to 19.2 m.
   - The lubricating opening (1) at the basic body must align with the opening of the telescopic section below it.



10. Lubricate the lubrication points (3) by five strokes of the grease gun.
11. Repeat the procedure at a boom extension of 35.1 m and at lubrication opening (1) to lubricate the third telescope section.
12. Repeat the procedure at a boom extension of 34.7 m and at lubrication opening (2) to lubricate the second telescope section.

12.2 Check telescopic boom

After an operating time of 10,000 h or 10 years, the telescopic boom must be dismantled in such a manner that an examination of the bearings, rolls of rope, and the telescopic cylinders can be easily executed.

The following parts of the telescopic boom must be checked yearly:

- Bearings
- Telescopic cylinder
- Sheaves

Information
If damage, such as cracks, dents, warping, deformation are suspected, contact GROVE Customer Service.

13 Crane winch

13.1 Check the oil level of the winch gear

Safety instructions

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

1. Park the machine in horizontal position.
2. Shut down the drive engine.
3. Check oil level at the oil level indicator (B): The oil level must be between the lower marking (MIN) and the upper marking (MAX).
4. Add gearbox oil, if necessary.
5. Remove the closure of the oil filling (A).
6. Fill with new gear oil until the level (B) is between the MIN and MAX markings.
7. Reinstall the closure of the oil filling (A).

13.2 Change the winch gear oil

Safety instructions

- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) from one manufacturer.

1. Park the machine in horizontal position.
2. Shut down the drive engine.
3. Place a suitable collecting vessel under the oil drain (C).
4. Remove the closure of the oil drain (C).
5. Allow the old oil to drain completely.
6. Clean the components, check seals and replace, if necessary.
7. Reinstall the closure of the oil drain (C).
8. Remove the closure of the oil filling (A).
9. Fill with new gear oil until the level (B) is between the MIN and MAX markings.
10. Reinstall the closure of the oil filling (A).
11. Operate the winch.
12. Check the oil level again.

13.3 Maintaining the brake

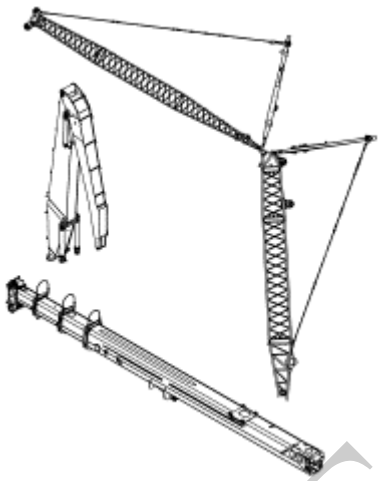
Safety instructions

- Do not dismantle the winch brakes under any circumstances. Always replace the brakes in complete units. Warranty is invalidated if winch brakes are dismantled.
- When replacing a seal, always replace all seals.

The brake adjusts itself automatically. At higher pressures and higher activation frequency, small amounts of leak oil on the pistons are unavoidable.

14 Static load-bearing steel components

14.1 Checking static load-bearing parts and steel components for damage



1. Thoroughly clean the components.
2. Visually inspect the components.
3. If damage is detected, check the components for structural damage by carrying out a dye penetrant test or magnetic particle test.

   Involve a specialist for the examination, if necessary.
4. Only trained and qualified specialists are authorized to execute a repair.