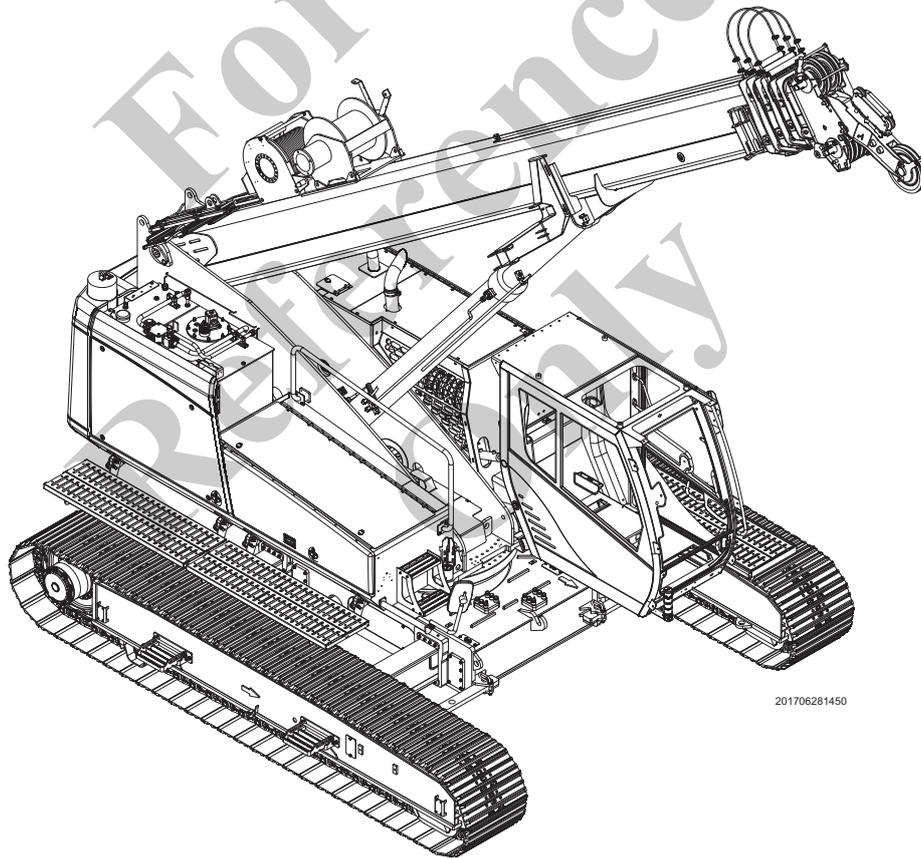


# Service instructions

**GHC 30**  
**Telescopic crane**



Version 1

Read this manual prior to performing any task!

For  
Reference  
Only

5, en\_US

<b>DE</b>	Wenn Sie die Sprache der Betriebsanleitung nicht verstehen, dürfen Sie die Maschine nicht in Betrieb nehmen. Im Bedarfsfall kontaktieren Sie bitte Ihren regionalen Grove-Servicepartner.	
<b>EN</b>	If you do not understand the language in which the operating manual is written, you are not permitted to place the machine in service. If necessary contact your regional Grove dealer.	
<b>FR</b>	Si vous ne comprenez pas la langue du manuel d'exploitation, vous n'êtes pas autorisé à mettre la machine en service. Si nécessaire, contactez votre revendeur Grove local.	
<b>ES</b>	Si no entiende el idioma del manual de instrucciones, usted no está autorizado a poner en funcionamiento la máquina. En caso necesario, póngase en contacto con su distribuidor Grove regional.	
<b>PT</b>	Caso não compreenda o idioma do manual de instruções, não poderá colocar a máquina em funcionamento. Se necessário contate o seu fornecedor regional Grove.	
<b>IT</b>	In caso di difficoltà di comprensione delle Istruzioni d'uso, si prega di non utilizzare la macchina. All'occorrenza, contattare il proprio rivenditore regionale Grove.	
<b>NL</b>	Wanneer u de taal van de handleiding niet begrijpt, mag u de machine niet in bedrijf nemen. Neem indien nodig contact op met uw regionale Grove- dealer.	
<b>RU</b>	Запрещается вводить машину в эксплуатацию, если Вы не понимаете языка руководства. В случае необходимости обратитесь к Вашему региональному дилеру Grove.	
<b>BG</b>	Ако не разбирате езика на инструкциите за експлоатация, не пускайте машината в експлоатация. Моля, при необходимост се обръщайте към регионалния представител на Grove.	
<b>DA</b>	Hvis du ikke forstår sproget, som betjeningsvejledningen er udarbejdet på, må du ikke tage maskinen i drift. Kontakt ved behov din lokale Grove-forhandler.	
<b>ET</b>	Kui Te ei peaks kasutusjuhendi keelest aru saama, siis ei tohi Te masinat käiku võtta. Vajaduse korral võtke palun regionaalse Grove'i.	
<b>FI</b>	Jos et ymmärrä käyttöohjeen kieltä, konetta ei saa ottaa käyttöön. Ota tarvittaessa yhteyttä paikalliseen Grove-edustajaan.	
<b>EL</b>	Αν δεν γνωρίζετε τη γλώσσα των οδηγιών χρήσης, δεν επιτρέπεται να θέσετε σε λειτουργία τη μηχανή. Σε περίπτωση ανάγκης επικοινωνήστε με τον αντιπρόσωπο Grove.	
<b>HR</b>	Ako ne razumijete jezik iz uputa za uporabu, ne smijete se služiti strojem. Ako je potrebno, obratite se svom dobavljaču ili regionalnom distributeru Grove.	
<b>LV</b>	Ja nesaprotat valodu, kādā sarakstīta lietošanas instrukcija, jūs nedrīkstat darbināt mašīnu. Ja nepieciešams, lūdzu, sazinieties ar vietējo Grove.	
<b>LT</b>	Nesuprantant naudojimo instrukcijos kalbos, pradėti eksploatuoti mašiną draudžiama. Prireikus susisiekite su Grove.	
<b>PL</b>	Jeśli nie rozumieją Państwo języka, w którym sporządzona została instrukcja obsługi, nie wolno Państwu uruchamiać maszyny. W razie potrzeby prosimy o kontakt z regionalnym dystrybutorem Grove.	
<b>NO</b>	În situația în care nu înțelegeți limba instrucțiunilor de utilizare, nu este permis să puneți mașina în funcțiune. În caz de necesitate, contactați comerciantul dumneavoastră regional Grove.	
<b>SV</b>	Om du inte skulle förstå språket i bruksanvisningen får du inte ta maskinen i drift. Kontakta vid behov din regionala Grove.	
<b>SK</b>	Ak nerozumiете jazyku v návode na obsluhu, nesmiete stroj uviesť do prevádzky. V prípade potreby kontaktujte vášho miestneho predajcu spoločnosti Grove alebo priamo spoločnosť Grove Maschinenfabrik GmbH.	
<b>SL</b>	Če jezika navodil za uporabo ne bi razumeli, stroja ne smete dajati v obratovanje. Po potrebi se obrnite na svojega regionalnega prodajalca z izdelki Grove.	

<b>CS</b>	Pokud nerozumíte jazyku, ve kterém je návod napsán, nesmíte stroj uvést do provozu. V případě potřeby kontaktujte svého regionálního prodejce Grove.	
<b>HU</b>	Amennyiben a kezelési utasítás nyelvét Ön nem érti, úgy tilos a gépet üzembe helyezni. Szükség esetén lépjen kapcsolatba a regionális Grove.	
<b>IS</b>	Ef notandinn skilur ekki tungumálið sem notkunarleiðbeiningarnar eru á má hann ekki nota vélina. Ef þörf krefur skal leita til söluaðila Grove.	
<b>NO</b>	Dersom du ikke forstår språket til bruksanvisningen, må du ikke ta maskinen i drift. Ved behov må du ta kontakt med din regionale Grove-forhandler.	
<b>TR</b>	Kullanma kılavuzunun dilini anlamadığınızda, makineyi işleme almanıza müsaade edilmez. Gerktiğinde lütfen bulunduğunuz ülkedeki yetkili Grove.	

**About this operating manual**

This manual allows you to use the machine safely and efficiently. The instructions are an integral part of the machine and should be kept in the designated storage compartment. This manual should be accessible at all times. Personnel should have carefully read and understood this manual before any work is done. Working safely requires compliance with all safety information and instructions in this manual. Local occupational health and safety regulations, and general safety regulations also apply for the work area of the machine.

**Validity of the document**

This manual refers to the machine with various tools.

**Spare parts and accessories**

Only use original replacement parts and Grove accessory products authorized by the manufacturer. Grove will not be held responsible for any parts or accessory products that have not been approved.

**Other applicable documents**

- Hydraulic diagram
- Electrical diagram
- Spare parts catalog

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For Reference Only

# 1 Maintenance

## 1.1 Maintenance schedule

Interval	Maintenance work	Personnel
Particular interval: during hydraulic oil change	Change the hydraulic tank's oil leakage filter	Service Technician
Particular interval: after the 5th Change the air filter's primary element	Change the filter element (secondary element) of the air filter	Service Technician
Particular interval: in accordance with the display	Change the air filter's filter element (main element)	Service Technician
	Check water separator (fuel) and drain if necessary	Service Technician The machine operator
Particular interval: as required	clean the DEF tanks filling filter	Service Technician The machine operator
Particular interval: before/after long usage periods,	check the pressure roller on the winch	Service Technician The machine operator
	change the DEF supply module return filter	Service Technician
	change the DEF supply module inlet filter	Service Technician
Every 10 OH / daily	Check winch gear oil	The machine operator
	Lubricate the track and gears of the slewing ring.	The machine operator
	Carry out a visual and functional check of the entire machine (in accordance with the manual): In particular, visually check the safety-relevant bolts, screw connections, rope, and cylinder, for general damage to the steelwork	The machine operator
	Check diesel fuel level	The machine operator
	Check fill level of the windshield washer system	The machine operator
	Checking the diesel engine oil level	The machine operator
	Checking the coolant level	The machine operator
	Check DEF fill level	The machine operator

# Maintenance

Maintenance schedule

Interval	Maintenance work	Personnel
	Check the hydraulic oil level	The machine operator
	Check the fat fill level of the central lubrication pump	The machine operator
	Check the fat fill level of the slewing ring lubrication pump	The machine operator
Every 50 operating hours / daily	Clean the sliding surfaces of the pushbeams, carry out a visual check, and lubricate.	The machine operator
	Visually check the slewing ring connection for damage to threaded union, gears, seal, and grease collar	The machine operator
	Deep clean of the entire machine	The machine operator
	Check and lubricate the manual lubrication stations	The machine operator
Particular interval: every 100 OH	Completely unwind ropes and then wind up under adequate pre-tension	Service Technician
	Check the limit switch on the winch	Service Technician
Particular interval: 150 operating hours / bi-annually	Drain the water from the fuel prefilter	Service Technician
	Drain the water from the fuel tank	Service Technician
every 250 OH / approx. 4-6 weeks after commissioning	Track the fastening screws on the track rollers and sprockets	Service Technician
	Check chain tension of the crawler chassis	
	Clean the sliding surfaces of the pushbeams, carry out a visual check, and lubricate.	Service Technician
	Track screw connections of the base plates on the chain	Service Technician
	Clean or change the circulating air and fresh air filters in the climate control system	Service Technician
	Visual check and lubrication of the sliding blocks / sliding surfaces.	The machine operator
	Clean and visually check the dust ejector valve in the air filter	The machine operator
	Carry out a visual and functional check of the entire machine (in accordance with the manual): In particular, visually check the safety-relevant bolts, screw connections, rope, and cylinder, for general damage to the steelwork	The machine operator
	Check the hydraulic oil level	The machine operator
	Check the fat fill level of the central lubrication pump	The machine operator

Interval	Maintenance work	Personnel
	Check the fat fill level of the slewing ring lubrication pump	The machine operator
	Check DEF fill level	The machine operator
	Checking the coolant level	The machine operator
	Checking the diesel engine oil level	The machine operator
	Check fill level of the windshield washer system	The machine operator
	Check winch gear oil	The machine operator
	Check diesel fuel level	The machine operator
	Change crawler travel drive gear oil	Service Technician
	Change winch gear oil	Service Technician
	Check securing of the winch load foot	Service Technician
	Change HydroClean or auxiliary control filter filter element	Service Technician
	Change hydraulic filter (main filter) filter element	Service Technician
	Check pressure accumulator	Service Technician (company specialist) Service Technician
	Check slewing ring mounting nuts for proper seating	Service Technician
	Measure slewing ring backlash	Service Technician
	Read SENCON error memory	Service Technician
	Check frost and corrosion protection of the coolant (diesel engine)	Service Technician
	Lubricate rope	The machine operator Service Technician

# Maintenance

Maintenance schedule



Interval	Maintenance work	Personnel
	Visual check of the exhaust system for damage, leaks	Service Technician The machine operator
	Remove hydraulic oil sample for Shell LubeAnalyst	Service Technician The machine operator
	Visually check hose and pipe connections for damage, leaks	The machine operator
	Check and lubricate the manual lubrication stations	The machine operator
	Check dust ejector valve in the air filter, clean if necessary	The machine operator
	Function check of the climate control system	The machine operator
every 250 OH/monthly	Check chain tension of the crawler chassis	
	Check crawler track for sufficient tension	The machine operator
	Clean and visually check the dust ejector valve in the air filter	The machine operator
	Clean or change the circulating air and fresh air filters in the climate control system	Service Technician
	Clean cab ventilation filter element, change if necessary	The machine operator
	Visually check hose and pipe connections for damage, leaks	The machine operator
	Check dust ejector valve in the air filter, clean if necessary	The machine operator
	Function check of the climate control system	The machine operator
	Check batteries, battery cables, and connections for secure placing/corrosion	The machine operator
Change hydraulic system filter element	Service Technician	
Every 6 months	Lubricate winch bearings	The machine operator
Every 500 OH	Test freezing point and additive concentration of the diesel engine coolant and refill if necessary, add additive via SCA filter change or liquid	Service Technician
	Change diesel engine fuel filter	Service Technician
	Read SENCON error memory	Service Technician

Interval	Maintenance work	Personnel
	Lubricate rope	The machine operator Service Technician
	Change diesel engine oil filter	Service Technician
	Change diesel engine oil	Service Technician
	Check frost and corrosion protection of the coolant (diesel engine)	Service Technician
	Change diesel engine prefilter	Service Technician
	Check diesel engine V-belt for tension and damage	Service Technician
	Clean the DEF supply module prefilter	Service Technician
	From 2000 OH: Remove hydraulic oil sample for Shell LubeAnalyst	Service Technician The machine operator
	Visual check of the exhaust system for damage, leaks	Service Technician The machine operator
Particular interval: every 2 years/1000 OH	Visually check diesel engine turbocharger for damage	Service Technician
	Remove hydraulic oil sample for Shell LubeAnalyst	Service Technician The machine operator
Particular interval 2000 OH	Remove hydraulic oil sample for Shell LubeAnalyst	Service Technician The machine operator
annually / every 2000 OH	Track the fastening screws on the track rollers and sprockets	
	Check the lock of the axle-brake.	Service Technician
	Track screw connections of the base plates on the chain	Service Technician
	Clean or change the circulating air and fresh air filters in the climate control system	Service Technician
	Change hydraulic oil tank aeration filter	Service Technician
	Change HydroClean or auxiliary control filter filter element	Service Technician

# Maintenance

Maintenance schedule



Interval	Maintenance work	Personnel
	Change crawler travel drive gear oil	Service Technician
	Change hydraulic oil (or in accordance with the result of the Shell Lube Analysis)	Service Technician
	Check the splined shaft connection on the winch	Service Technician
	Change winch gear oil	Service Technician
	Check the winch brake wear	Service Technician
	Check securing of the winch load foot	Service Technician
	Check the lock of the gear teeth lubrication sliding block	Service Technician
	Change fuel tank aeration filter	Service Technician
	Change hydraulic filter (main filter) filter element	Service Technician
	Check pressure accumulator	Service Technician (company specialist) Service Technician
	Check slewing ring mounting nuts for proper seating	Service Technician
	Clean coolant cooler	The machine operator Service Technician
	Change diesel engine V-belt	Service Technician
	Set diesel engine valve clearance	Service Technician
	Check the threaded union on the slewing gear for tightness.	Service Technician
	Measure slewing ring backlash	Service Technician
every 2 years/4000 OH	Change climate control system collection dryer	
	Test the contamination level of the diesel engine coolant with Fleetguard® Quik-Chek test strips and change if necessary.	Service Technician
	Change the DEF supply module main filter.	Service Technician
	Change the filter element (secondary element) of the air filter.	Service Technician

Interval	Maintenance work	Personnel
Every 4 years	Change diesel engine coolant	Service Technician
Particular interval: every 5000 OH / 5 years	carry out a material check of 4 representative screws from the slewing ring connection.	Service Technician (company specialist)
Particular interval: 12,000 OH / 3 years	Change climate control system oil	Service Technician (company specialist)
Particular interval: every 12000 OH / 6 years	Change hydraulic hoses	Service Technician
Particular interval: every 10 years	general winch overhaul	Service Technician (company specialist)

## 1.2 General information

**⚠ WARNING**

**Risk of death due to machine moving suddenly or starting unintentionally.**

- Park the machine on secure ground. Move the machine away from the edge of any trenches or pits.
- Lower attached loads and the boom to the ground.
- Apply the brake.
- Turn off the machine and secure it against unauthorized restart.
- Use wheel chocks to keep the machine from rolling away.

**Sudden machine movements or unintentional machine start-up can result in death or serious injury for persons on or near the machine.**

**⚠ WARNING**

**Risk of falling due to exceeding the maximum weight limit of the walkway.**

- Load the walkway with 200 kg (440 lbs) max.
- Check the walkway every three months for cracks and overall damage and repair it immediately as needed.

**Exceeding the maximum weight limit of the walkway can damage the structure and cause serious injury.**

### Safety when performing maintenance

- The maintenance listed below may only be performed by trained and instructed specialists.
- Wear personal protective equipment (e. g., hard hat, hearing protection, protective gloves, safety shoes) if the work is potentially hazardous.
- Observe statutory accident prevention and safety regulations.
- Pull the left safety lever back.
- Place clear warning signs on the controls.
- No smoking.

- No open flames.
- Use secure access ladders or work platforms.
- Maintain a safe distance from rotating and moving parts.
- Depressurize the hydraulic system before beginning maintenance.
- The hydraulic valves may only be adjusted by trained service personnel.
- Wear protective gloves when working with steel wire ropes.
- Only use genuine spare parts.
- Do not lift heavy components manually, use lifting equipment instead.
- Disconnect the power with the battery disconnect switch.
- When working near the battery, cover it with insulating material.
- Do not place any tools on the battery.
- Reinstall all protective devices on completion of maintenance work.
- Keep the cab clean and orderly.
- Test functionality to ensure proper working order.
- Only the crane owner or his representative may release the machine following maintenance tasks.
  - Always conduct a visual inspection and a function test following maintenance or repair.
  - Dispose of hydraulic oil in accordance with regulations.
  - Only use the oils, operating fluids and lubricants specified in the table of operating fluids.

### 1.3 Cleaning

Clean the machine every month, especially before maintenance or repair. Shorten the cleaning intervals depending on operating conditions and contamination.

**▲ WARNING**

**Danger of injury due to falling.**

- Park the machine.
- Lower the attachment tool to the ground.
- Only perform work from a safe standing surfaces.
- Use work platforms.
- Only climb on designated machine parts.

**Danger of falling when performing work above body height.**

**▲ WARNING**

**Risk of injury from unintentional machine movements.**

- Turn off the machine and secure it against being restarted.
- Place a sign in the cab indicating that cleaning is being performed.

**Risk of crushing or falling due to unintentional machine movements.**

#### Dry cleaning

For minor dust, carry out a dry cleaning with compressed air (max. 2 bar/29 psi) and a soft brush.

**Wet cleaning**

**ENVIRONMENT**

**Environmental hazard due to improper handling of environmentally harmful substances.**

- Only wash the machine on a surface equipped with an oil separator.

**If the machine is wet-cleaned, there is a risk that environmentally harmful cleaning agents and operating fluids can get into the environment.**

**NOTICE**

**Danger of material damage due to improper cleaning.**

- Remove all foreign objects with compressed air 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.

Close all openings where water is not allowed to ingress:

- Exhaust pipe
- Air filter
- Climate control system external air filter

Protect all components that must not be cleaned with water from the direct water jet:

- Electrical and electronic assemblies and components
- Exhaust aftertreatment system
- Rotary connection
- Bolt bearing points

**NOTICE**

**Danger of material damage due to improper cleaning.**

- Only use neutral or slightly alkaline cleaning agents.
- Only use clean sponges, brushes and cloths.

**When using a pressure washer, excessive pressure and temperature can damage the paint.**

- Observe the following for the first three months after startup or repainting:
  - Use cold water with a low dose of a neutral cleaning agent.
  - Operating pressure: max. 60 bar/870 psi
  - Spray distance: min. 30 cm/1 ft
  - Spray angle: 30° to 60°
- Observe the following after three months:
  - Water temperature: max. 60 °C/140 °F
  - Operating pressure: max. 100 bar/1 450 psi
  - Spray distance: min. 30 cm/1 ft
  - Spray angle: 30° to 60°

**1.** → Apply water with cleaning agent and let it soak 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.

### After cleaning

- Remove all coverings that were attached for cleaning.
- Lubricate all bearing points and rotary connections.
- Warm up the engine so residual water can evaporate.
- Check all machine functions.
- Check all lines for damage and leaks.
- Treat rubber seals with a commercial rubber conditioner.
- Make sure warning signs and information signs are complete and legible. Replace missing or damaged signs.
- Check the paint for visible damage. Repair paint damage immediately. Pay attention to the corrosivity class of the coating.
- Check the anti-corrosive and touch up or restore as needed.

*Repair paint damage as specified in the repair manual for paint damage. Apply anti-corrosion measures according to the corrosion protection manual. The manuals are available from your service partner.*

## 1.4 Oils and lubricants

### 1.4.1 General information

#### NOTICE

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

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

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

*The approved oils and lubricants can be found in the operating fluids list. The ambient temperature for the machine must be between -20 °C and +50 °C (-4 °F to 122 °F). If the on-site temperature exceeds these limits, consult your 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 is 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.

### 1.4.2 Disposing of lubricants and operating fluids

#### ENVIRONMENT

**Risk of environmental damage due to improper disposal of lubricants and operating fluids.**

- **Observe applicable environmental standards.**
- **Properly handle and dispose of solvents and lubricants in particular.**

**Lubricants and operating fluids that are not properly disposed of contaminate ground water.**

Observe the following:

- Do not mix used oil with other waste
- Do not mix together used oils.
- Collect, store, transport and dispose of used oil filters separately from other waste.



*Dispose of lubricants and other operating fluids at a designated collection point. In addition, any national environmental regulations applicable at the site of operation must be observed.*

### Batteries

Observe the relevant safety information and safety measures when handling batteries.



*Do not dispose of batteries with normal waste. Dispose of defective batteries at a collection point for used batteries. In addition, any national environmental regulations applicable at the site of operation must be observed.*

## 1.5 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.

The coolant manufacturer's usage guidelines/instructions for use also contain possible health or environmental hazards.

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



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 Service Partner before starting up the machine.



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 add clean drinking water to supplement the missing amount in the meantime. 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.



- Use clean, pH-neutral, filtered and softened fresh water. Recommendation: distilled 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	max. 100 ppm
Sulfate content	max. 100 ppm
Water hardness	3 – 12 °dGH



*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

**CAUTION**

When using any other than the specified coolant no liability or warranty is accepted.

**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.**



*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 for example cause sludge accumulation or gelatinization and clog the cooler, causing the engine to overheat or the cooling system to fail (resulting in engine damage).**



*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 evenly 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.

## 1.6 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.

## 1.7 Diesel engine

### 1.7.1 Safety instructions

**▲ WARNING**

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

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

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

**ENVIRONMENT**

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

- **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.**

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



*Observe the engine manufacturer's operating manual.*

**1.7.2 Cummins Diesel engine QSB4.5, Tier 4f**

**Engine oil**

**ENVIRONMENT**

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

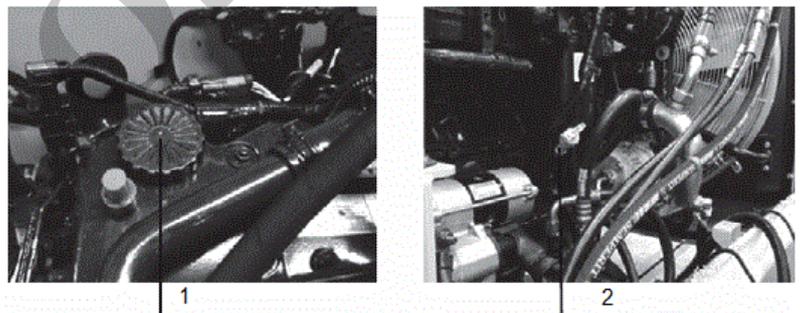
- **Make sure used oil does not seep into the soil or reach bodies of water.**
- **Observe applicable environmental standards for disposing of oil and oil filters.**

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



*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.*

**Check the engine oil level**



*Fig. 1: Oil dipstick and filler neck*

- 1 Oil filler neck
- 2 Dipstick

1. ➔ Park the machine on a level surface.
2. ➔ Let the diesel engine run for approx. 2 minutes until the system is filled with oil.
3. ➔ Switch off the diesel engine.
4. ➔ Open the left rear service door.

5. ➤ Remove the oil dipstick (2) and wipe it off with a clean, lint-free cloth.
6. ➤ Insert the oil dipstick as far as it will go and remove it again.
7. ➤ The oil level must be between the lower marking (MIN) and the upper marking (MAX).
8. ➤ Add engine oil to the filler neck (1) in as needed according to the engine manufacturer's instructions.

## Changing the engine oil and oil filter

1. ➤ Warm up the diesel engine.
2. ➤ Park the machine on a level surface.
3. ➤ Open the left rear service door.
4. ➤ Switch off the diesel engine.

**⚠ CAUTION! Risk of burns from hot engine oil.**

- **Wear protective gloves and protective clothing when draining engine oil.**

**Draining hot engine oil poses a burn risk.**

5. ➤ Change the engine oil and oil filter according to the engine manufacturer's instructions.
6. ➤ Check oil level.  
The oil level must be between the lower marking (MIN) and the upper marking (MAX).
7. ➤ Add engine oil to the filler neck (1) in as needed according to the engine manufacturer's instructions.

## Air filter

**⚠ CAUTION**

**Risk of engine damage from cleaning with compressed air.**

- **Do not use compressed air to clean the inside of the housing.**

**Cleaning with compressed air can allow contaminants to get into and damage the engine.**

## 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.

### Replacing the air filter



Read through the safety information before starting work.

- Replace the main filter during every cleaning.
- Replace the safety filter during every other cleaning.

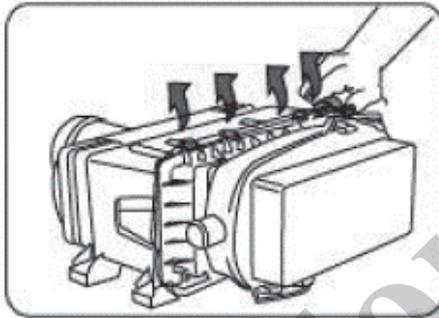


Fig. 2: Opening the air filter service cover

1. → Open the locking clamps and remove the service cover.

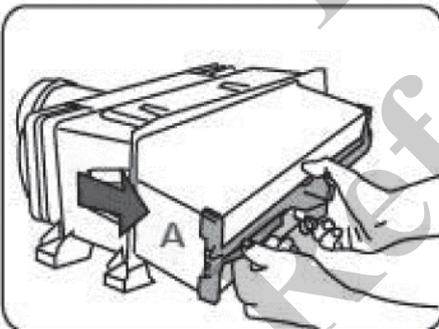


Fig. 3: Removing the main filter

2. → Carefully remove the contaminated main filter (A).
  - Make sure no absorbed dirt gets in the housing.
  - Check the filter for any uneven contamination pattern, which can indicate an inadvertent release of dust or sealing problems.

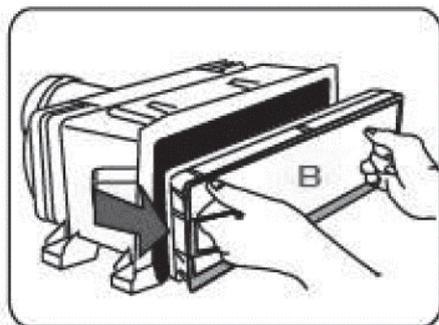


Fig. 4: Removing the safety filter

3. → Remove the safety filter (B).
4. → Clean the filter housing with a damp cloth, leaving no residue. A vacuum cleaner can also be used if available.
5. → Insert the safety filter.
6. → Insert the main filter.

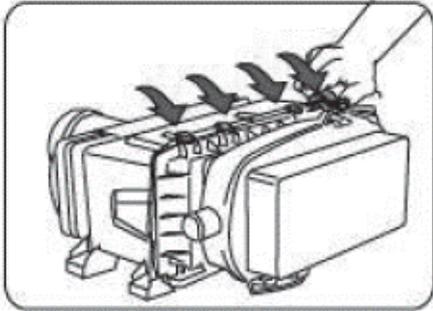


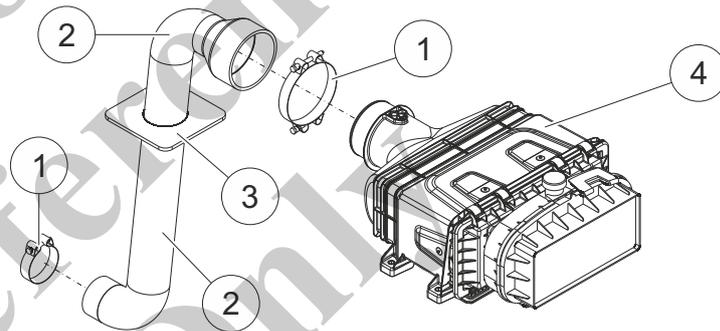
Fig. 5: Closing the air filter service cover

7. ➤ Replace the service cover and secure it with the locking clamps.
8. ➤ Check the entire line system for cracks and holes, especially between the air filter and the engine.
9. ➤ Make sure all clamps and connections are seated properly.

## Air intake system

**i** Regularly checking the air intake system is the only way to ensure maximum protection of the drive motor against damage and destruction due to dust.

### Checking the air intake system



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Fig. 6: Air intake system components

- 1 Hose clip
- 2 Suction hose
- 3 Seal [profiled], gasket [flat]
- 4 Air filter

1. ➤ Ensure the hose clamps (1) are properly tightened.
2. ➤ Check the suction hoses (2) for leaks.
3. ➤ Make sure the suction hoses are in the correct position.
4. ➤ Check the seal (3) for leaks.

## 1.7.3 Cummins diesel engine QSB4.5 Tier IIIa

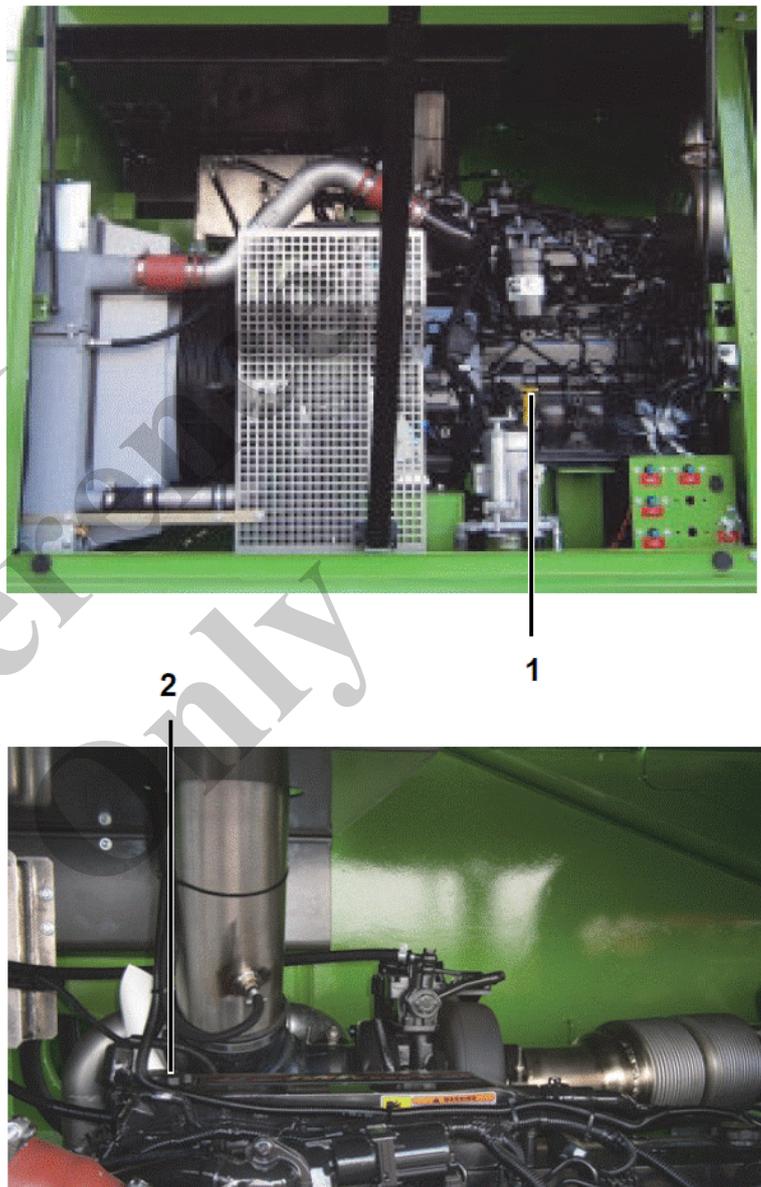
### Engine oil

#### Safety instructions

- Proceed with the utmost caution when draining hot oil.
- Waste oil must not seep into the ground or waterways. Dispose of oil and oil filters in accordance with statutory regulations.

- Comply with the instructions in the operating manual provided by the engine manufacturer.
- Only mix oils, lubricants and operating fluids that are of the same type, or identical (same specifications) and/or manufacturer.

**Check the engine oil level**



*Fig. 7: Oil dipstick and filler neck*

- 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.

## 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.

## Air filter

**⚠ WARNING**

**Risk of burns from unsuitable 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.

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

**NOTICE**

**Risk of engine damage when cleaning with compressed air.**

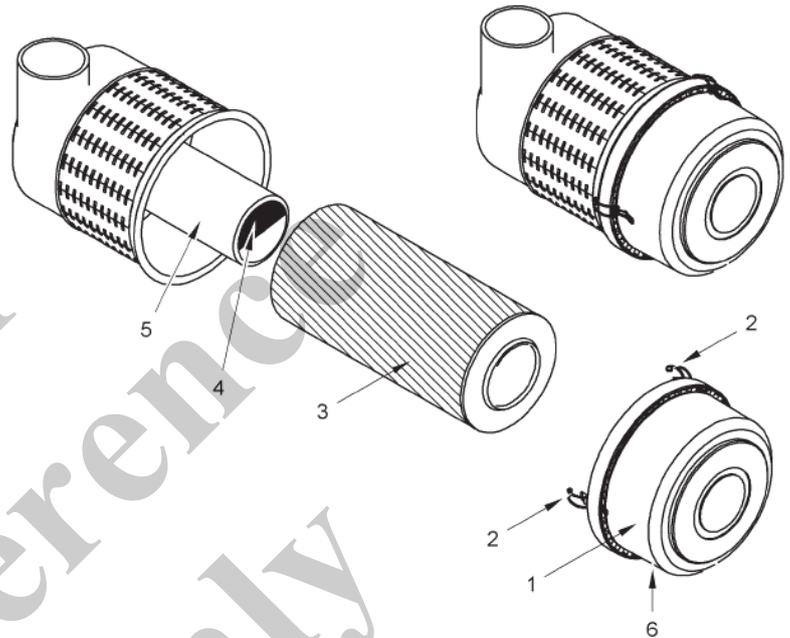
- Never use compressed air to clean the interior of the housing.

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

**Air filter indicator light**



The condition of the air filter is monitored by a sensor. The degree of contamination is determined by measuring the resistance to air flow through the filter. If the maximum permissible flow resistance is reached, the air filter indicator light is illuminated on the SENCON Air filter. A warning tone also sounds. Check and clean the air filter immediately.



*Fig. 8: Construction of air filter*

- 1 Air filter cover
- 2 Locking clamps (3 piece)
- 3 Replacement cartridge
- 4 Handle
- 5 Safety cartridge
- 6 Nose

**Clean filter element, replace if necessary**

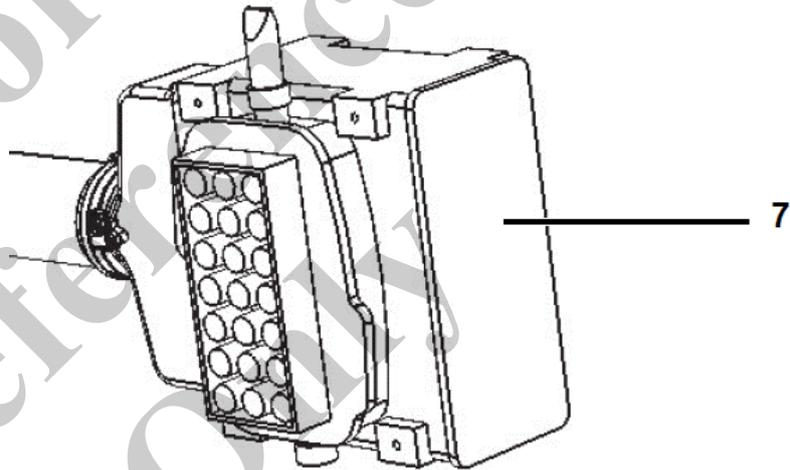
1. ➔ Open the locking clamps (2) of the air filter cover (1) and take off the air filter cover.
2. ➔ Remove replacement cartridge (3).
3. ➔ Clean the replacement cartridge:
  - Blow out from inside to outside using dry compressed air (max. 2 bar / 29 psi).
  - Only knock out if there is an emergency!
4. ➔ Check replacement cartridge for damage of the filter paper and the seals. Replace if necessary.

5. ➤ Replace the safety cartridge (5) after 5 filter service intervals (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).

### Cleaning the air filter pre-separator



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



*Fig. 9: Cleaning the air filter pre-separator*

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. ➤ Refasten the pre-separator cover (7) using the locking clamps.
6. ➤ Close the service door.

**Diesel pre-filter**

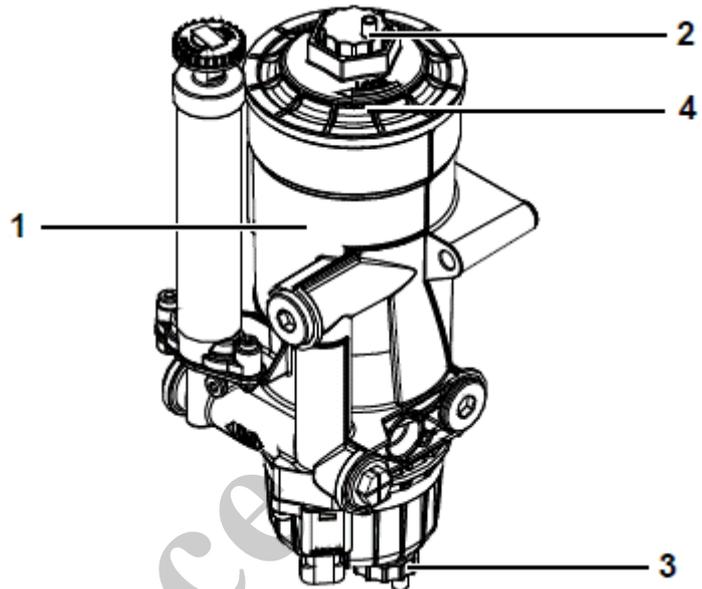


Fig. 10: 208 Position and overview of the diesel prefilter

- 1 Housing of filter cartridge
- 2 Vent screw
- 3 Drain valve
- 4 Screw cap

**⚠ WARNING**

**Risk of injury from rotating or hot engine parts!**

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

**Persons can be injured by moving or hot engine parts.**

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

**Changing the filter cartridge**



- 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.
2. ➔ Place a suitable collecting vessel under the drain valve (4).

3. ➤ Open the drain valve (3).
4. ➤ Drain water and contamination from the water container until fuel flows out.
5. ➤ Close the drain valve (3).
6. ➤ Unscrew the screw cap (4) from the housing (1) and pull out the filter element that is fastened on it



Fig. 11: Screw cap



Fig. 12: Filter element

7. ➤
  - Unclip the filter element from the screw cap.
  - Replace the O-ring of the screw cap (new O-ring is provided with the spare 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 (4) with new filter element into the housing (1) to the stop.  
Ensure tightening torque of 50 Nm!
9. ➤ Dispose of old filter element and O-rings.
10. ➤ Close the service door.

## Diesel fine filter change



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

## 1.8 Combination cooler

**⚠ WARNING**

Risk of injury from rotating, sharp or hot parts.

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

Persons can be injured by moving, sharp or hot parts on or near the combination cooler.

**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.



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.

## Check and clean combination cooler

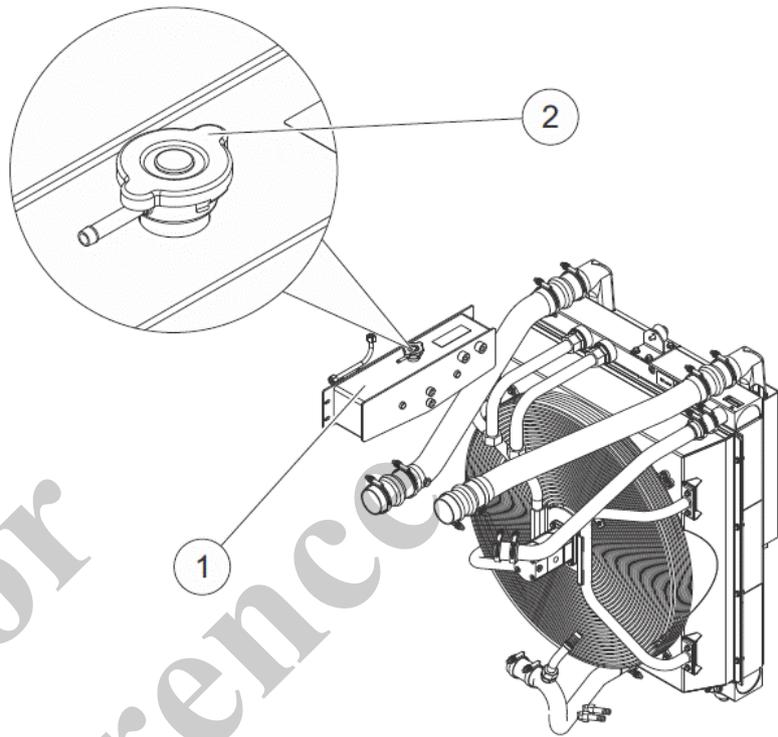


Fig. 13: Combination cooler

1. ▶ Let the diesel engine and combination cooler cool down.
2. ▶ Carefully open the sealing cap (2) in of the expansion tank (1) in to equalize the pressure.
3. ▶ Check the antifreeze and coolant level. Add coolant as needed.

The coolant must contain at least 50 % antifreeze throughout the year.

4. ▶ Close the expansion tank with the sealing cap.
5. ▶ Blow off the cooling fins on the exhaust side with dry, filtered compressed air (max. 2 bar).

If contaminated with grease and oil, clean the radiator fins using cold-cleaning agent and a steam cleaner.

6. ▶ Check the combination cooler for leaks and damaged cooling fins.



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

## 1.9 Water separator

**⚠ WARNING**

**Risk of injury from hot exhaust aftertreatment system.**

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

**Persons can be injured when the exhaust aftertreatment system is hot.**

**i**

Observe the engine manufacturer's operating manual.

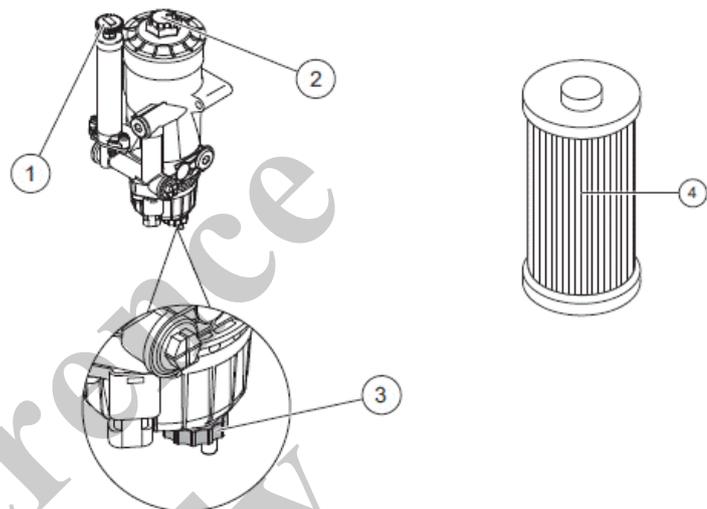


Fig. 14: Water separator

### Drain water

1. → Place a container under the hose connected to the drain plug (3).
2. → Open the drain plug.
3. → Drain water and dirt until fuel comes out.
4. → Close the drain plug.

5. ➤ Dispose of the fluid in the container properly.

## Changing the filter element

Depending on filter design and conditions, the manufacturer recommends changing the filter element after 1 year of operating time at the latest.

If the element is exposed to greater dynamic strain, it can be necessary to keep shorter change intervals, as well as for startup, repairs, oil changes, etc. on the hydraulic system.

1. ➤ Turn the shut-off valve (5) in one-quarter of a turn to the right to close it.
2. ➤ Loosen the housing cover with a fork wrench SW 46 and remove it and the filter element together from the filter housing.
3. ➤ Remove the filter element (4) in from the housing cover.
4. ➤ Replace the O-ring in the housing cover.
5. ➤ Dispose of the used filter element properly.
6. ➤ Press a new filter element with O-rings into the housing cover.
7. ➤ Insert the housing cover with filter element into the filter housing and tighten.
8. ➤ Turn the shut-off valve one-quarter of a turn to the left to open it.
9. ➤ Loosen the bleed screw (2) to allow air to escape.
10. ➤ Open the manual bleeder pump (1) in and pump it several times until fuel comes out of the bleed screw.
11. ➤ Close the manual bleeder pump.
12. ➤ Tighten the bleed screw.

## 1.10 Belt drives

### Safety instructions

- Before beginning maintenance, turn off the machine and secure it against being restarted without authorization.
- Only execute maintenance tasks with drive engine shut down and at a standstill.
- After maintenance, replace any protective coverings that have been removed.



*See the engine manufacturer's operating manual for details on checking, tensioning and replacing the belt drives.*

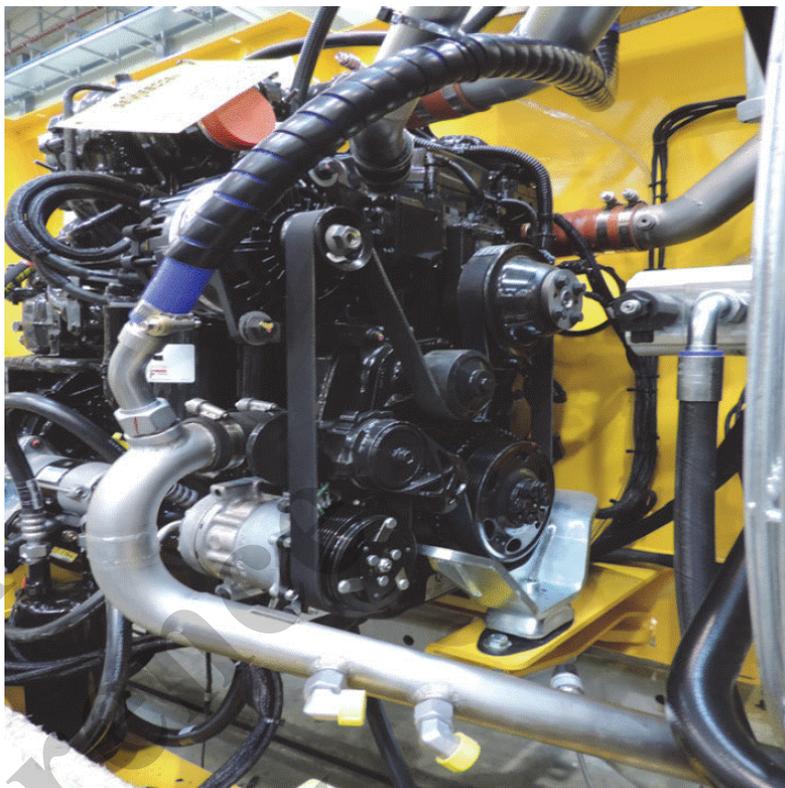


Fig. 15: Drive belts

## 1.11 Hydraulic system

### 1.11.1 Safety instructions

**⚠ WARNING**

**Risk of injury from loose hydraulic connections and hot hydraulic oil system.**

- Seek immediate medical attention for injuries caused by hydraulic oil.
- Before beginning work on the hydraulic system, make sure it is depressurized.
- Depressurize the pressure accumulator.
- Only open the hydraulic lines and fittings when they are not pressurized.
- Only perform maintenance when the hydraulic oil system is cool.

**Persons in the danger zone can be injured by leaking hydraulic oil.**

#### **Safety instructions**

- Work on hydraulic systems must only be carried out by personnel with special knowledge and experience in the area of hydraulic systems.
- The hydraulic valves may only be adjusted by trained service personnel.

- Wear personal protective equipment (e. g., hard hat, hearing protection, protective gloves, safety shoes).
- Only perform maintenance when the engine is off and the impeller is stationary. Make sure the engine cannot be started automatically.
- Ensure the following before restarting the machine:
  - There are no objects near the impellers (e. g., tools).
  - No objects can fall down near the impellers, e. g., due to vibration.
  - The safety devices are installed.

## Cylinders

Pressure cylinders are subject to slight leakage. Remove excess leak oil with a cloth. Dispose of the oil-soaked cloth as hazardous waste.

The sliding surfaces of the piston rods are chrome-plated. Heavier leakage indicates damaged sliding surfaces or defective seals.

Cleaning hydraulic cylinders

- Do not use sharp tools, corrosive fluids or abrasives.
- Clean the piston rods regularly with a steam jet. Do not aim the jet directly at the sealing elements.
- Apply preservative to extended piston rods after cleaning. This protects the surface against environmental and weather conditions.

## Threaded unions

Check hydraulic fittings and couplings regularly for leaks. Seal leaks and remove oil spots.

Escaping hydraulic oil is harmful to the environment and poses a hazard due to danger of slipping.

Always seal disconnected threaded unions with stoppers on both sides.

## Shut-off flap

Close the shut-off flap in the following situations:

- When working on the pump regulators.
- When replacing pumps.
- When performing maintenance or repairs.

This prevents larger amounts of hydraulic oil from leaking out.

An indicator light on the SENCON monitors the shut-off flap.

### ENVIRONMENT

**Risk of environmental damage due to improper disposal of hydraulic oil.**

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

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

### 1.11.2 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.

#### Check

Have the hose lines inspected at least once per year by an expert to make sure they are safe to use.

Repair any defects detected immediately.

#### Defects

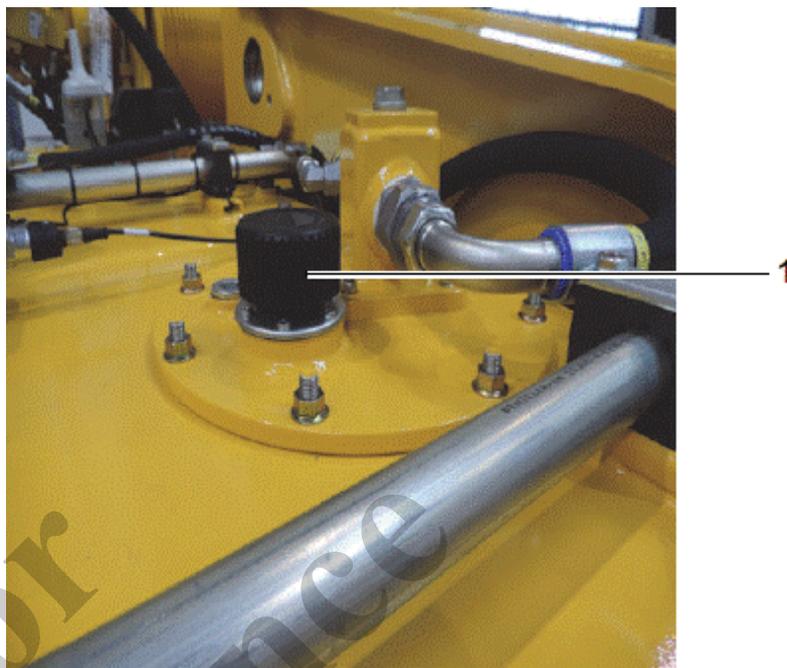
Replace hose lines in the following cases:

- Outer layer damaged up to the lining (e.g. chafe marks, cuts, cracking)
- Outer layer embrittlement (cracks appearing in hose material)
- Deformations that do not conform to the natural shape of the hose or hose line, either in a pressurized state or a depressurized state, or when bent (e. g., layer separation, blistering)
- Leaks
- Damaged or deformed hose fittings (sealing function impaired)
- Hose has separated from fittings
- Corrosion of fittings that reduces function and strength
- Failure to comply with Installation requirements;
- Storage periods or service life exceeded

### 1.11.3 Depressurizing the hydraulic system

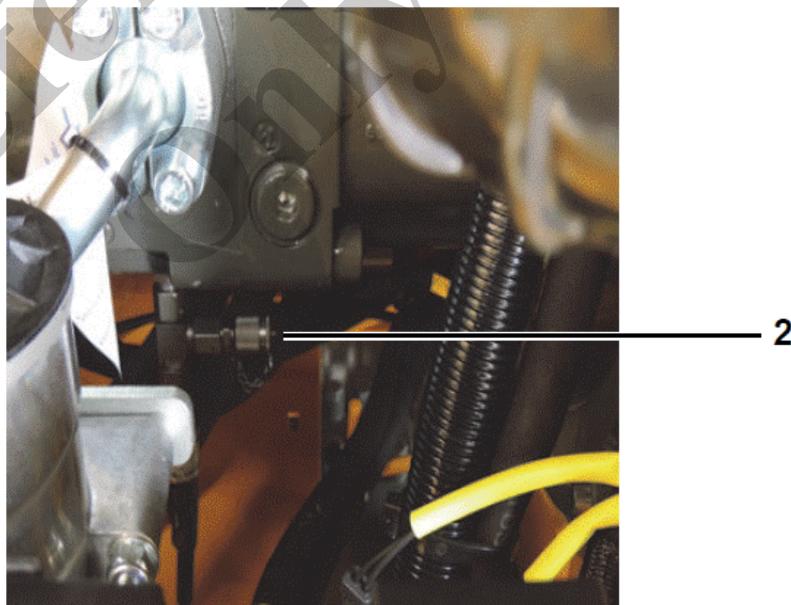
The hydraulic system must be depressurized before beginning any work.

1. → Lower attached loads and the boom to the ground.
2. → Turn off the diesel engine and turn the ignition key back to the 1 position.



*Fig. 16: Ventilation filter*

- 3.** → Open the aeration filter (1) in on the hydraulic oil tank.  
⇒ This relieves the charging pressure in the tank.



*Fig. 17: M1 measurement connection*

- 4.** → Connect the pressure gauge (up to 600 bar) to the M1 measurement connection (2).

5. → Move both joysticks in the cab several times in all directions. Operate all pedals and switches with a hydraulic function several times.  
⇒ This relieves pressure in the hydraulic system.

**i** *The pressure gauge must display 0 bar. If the pressure has not been fully relieved, repeat the above steps.*

#### 1.11.4 Checking the oil level

**▲ WARNING**

**Risk of injury from hot or pressurized hydraulic oil.**

- Work on hydraulic systems must only be carried out by personnel with special knowledge and experience in the area of hydraulic systems.
- Only carry out maintenance tasks after the hydraulic oil system has cooled down. The hydraulic oil can reach temperatures of 70 °C and more.
- Only perform maintenance when the hydraulic system is depressurized.
- Only perform maintenance on the hydraulic system with safety equipment.

Hot or pressurized hydraulic oil can cause serious scalding and injury.

**ENVIRONMENT**

**Risk of environmental damage due to improper disposal of hydraulic oil.**

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

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

**i** *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. → Lower attached loads and the boom to the ground.
2. → Park the machine on a level surface.
3. → Completely retract all hydraulic cylinders.
4. → Switch off the diesel engine and secure it against being restarted.

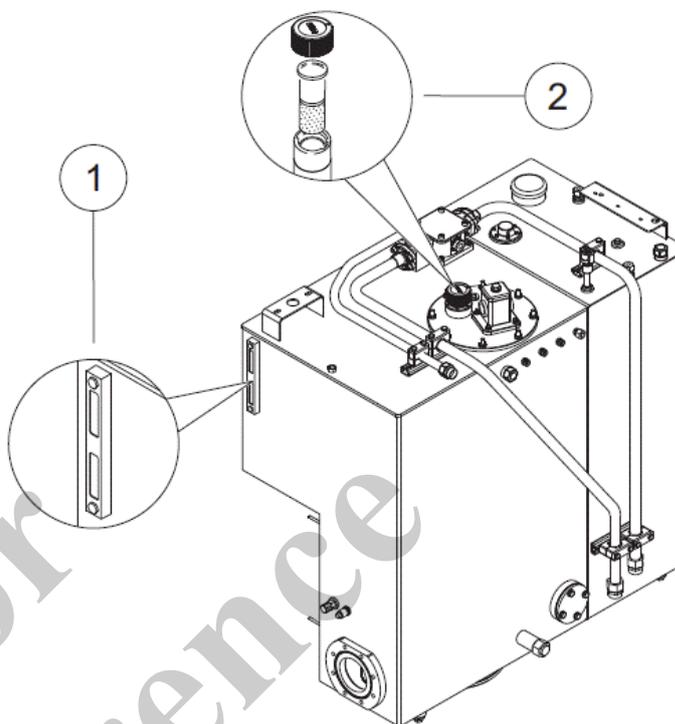


Fig. 18: Hydraulic tank

1. → Check the oil level on the oil level indicator (1):
  - ⇒ The oil level must reach the upper marking on the sight glass.
2. → Add hydraulic oil as needed.

## Adding hydraulic oil

1. → Unscrew the cap to the oil filler neck (2).
2. → Add hydraulic oil and re-check.
3. → Screw the cap back on.

### 1.11.5 Changing the hydraulic oil

**⚠ WARNING**

**Risk of injury from hot or pressurized hydraulic oil, or loose hydraulic connections.**

- **Work on hydraulic systems must only be carried out by personnel with special knowledge and experience in the area of hydraulic systems.**
- **Only carry out maintenance tasks after the hydraulic oil system has cooled down. The hydraulic oil can reach temperatures of 70 °C and more.**
- **Only perform maintenance when the hydraulic system is depressurized.**
- **Only perform maintenance on the hydraulic system with safety equipment.**

**Hot or pressurized hydraulic oil, or loose hydraulic connections can cause serious scalding and injury.**

**ENVIRONMENT**

**Risk of environmental damage due to improper disposal of hydraulic oil.**

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

**Hydraulic oil that has not been properly disposed of or poured contaminates ground water.**

**i**

*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.*

**i**

*The work can be facilitated by pumping out as much oil as possible makes the work easier. Use the return filter openings to do this.*

1. **Lower attached loads and the boom to the ground.**
2. **Park the machine on a level surface.**
3. **Completely retract all hydraulic cylinders.**
4. **Depressurize the hydraulic system.**

*☞ Chapter 1.11.3 “Depressurizing the hydraulic system” on page 37*

5. **Change the filter element in the return flow filter.**

*☞ Chapter 1.11.6 “Return filter – changing filter element” on page 43*

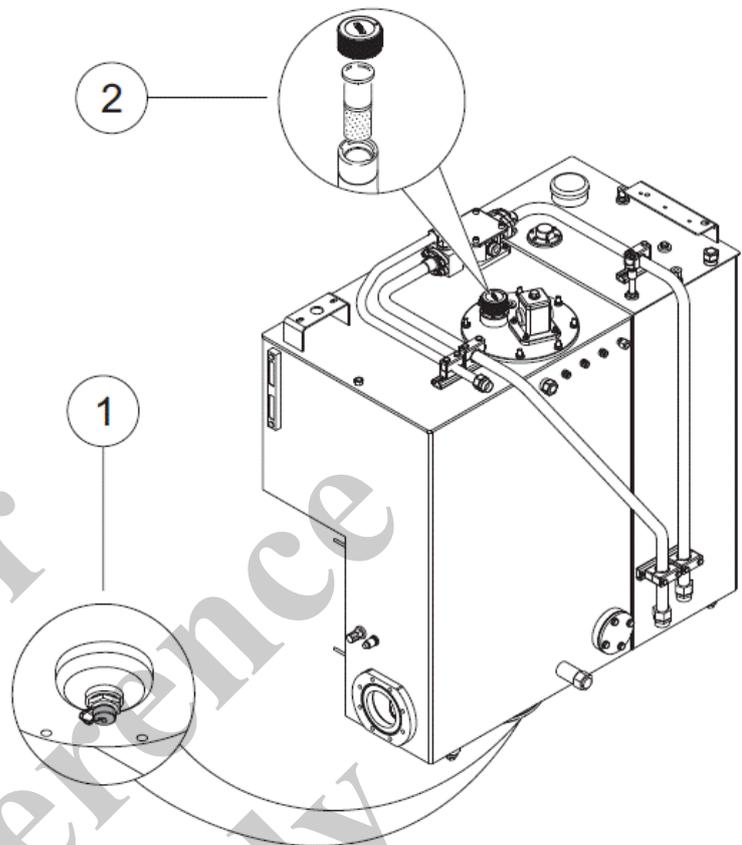


Fig. 19: Oil drain plug and filler neck

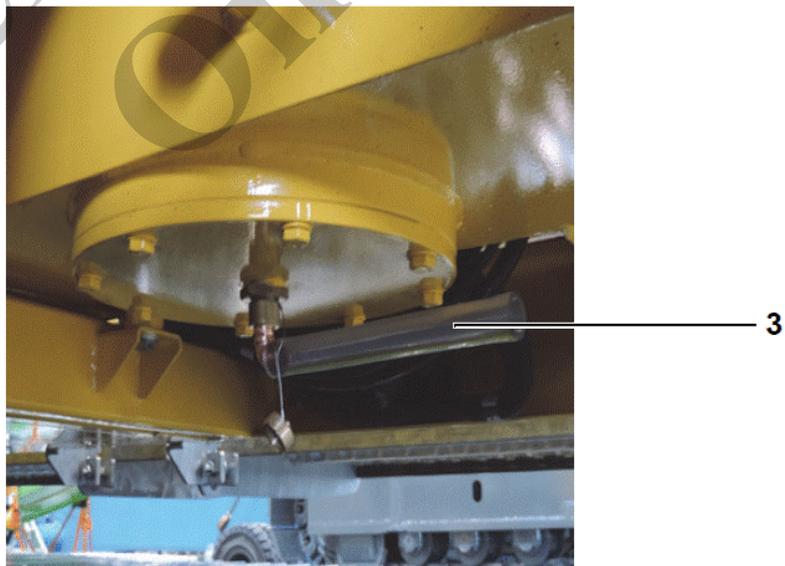


Fig. 20: Counterpart with hose on oil drain

6. ➤ Place a suitable container under the tank drain opening.

7. ➔ Unscrew the oil drain plug (1) in on the bottom of the tank and screw on the counterpart with hose (3).
8. ➔ Collect the used oil in the container.
9. ➔ Clean the cover, oil drain plug and inside of the hydraulic tank as needed.
10. ➔ Unscrew the counterpart with hose and screw in the oil drain plug.
11. ➔ Unscrew the cap to the oil filler neck (2).
12. ➔ Add new hydraulic oil through the filler neck.
13. ➔ Bleed the hydraulic pump:
  - Loosen the bleed screw on the pump but do not remove, and hold it in place by pressing on it gently with your thumb.
  - Wait several seconds until the air has escaped.
  - Retighten the bleed screw.

#### 1.11.6 Return filter – changing filter element

The manufacturer recommends changing the filter element after 1 year of operating time at the latest.

If the element is exposed to greater dynamic strain, it can be necessary to keep shorter change intervals, as well as for startup, repairs, oil changes, etc. on the hydraulic system.

1. ➔ Depressurize the hydraulic system.

🔗 *Chapter 1.11.3 “Depressurizing the hydraulic system” on page 37*

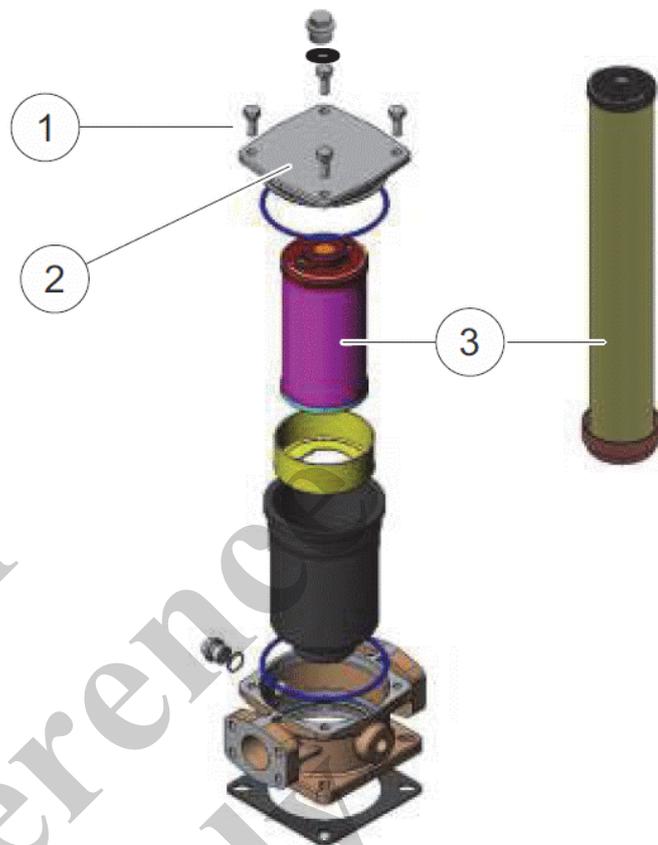


Fig. 21: Return filter

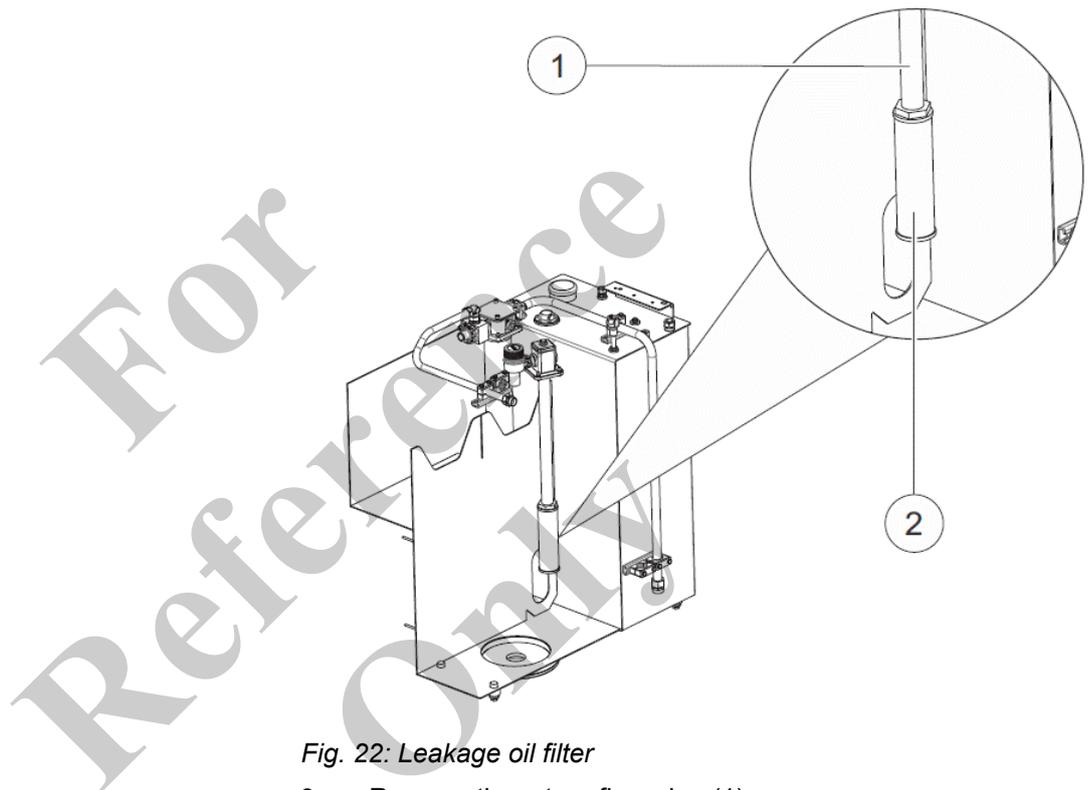
2. ➤ Unscrew the cover screws (1).
3. ➤ Remove the cover (2).
4. ➤ Pull out the filter element (3).
5. ➤ Check the surface of the element for residue and larger particles. These can indicate damage to the components.
6. ➤ Dispose of the filter element in accordance with applicable environmental standards.
7. ➤ Clean the housing and cover.
8. ➤ Check the filter, especially the sealing surfaces, for mechanical damage.
9. ➤ Check the O-rings and replace as needed.
10. ➤ Coat the sealing surfaces and the O-rings with a clean medium.
11. ➤ Carefully insert the new filter element.
12. ➤ Replace the cover and tighten the screws by hand (alternating between screws).
13. ➤ Insert the filter in the tank.
14. ➤ Turn on the hydraulic system.

15. ➤ Bleed the filter at a suitable location and check for leaks.

### 1.11.7 Changing the leak-oil filter element

The manufacturer recommends changing the filter element after 1 year of operating time at the latest.

1. ➤ Loosen the four nuts on the square tube.



*Fig. 22: Leakage oil filter*

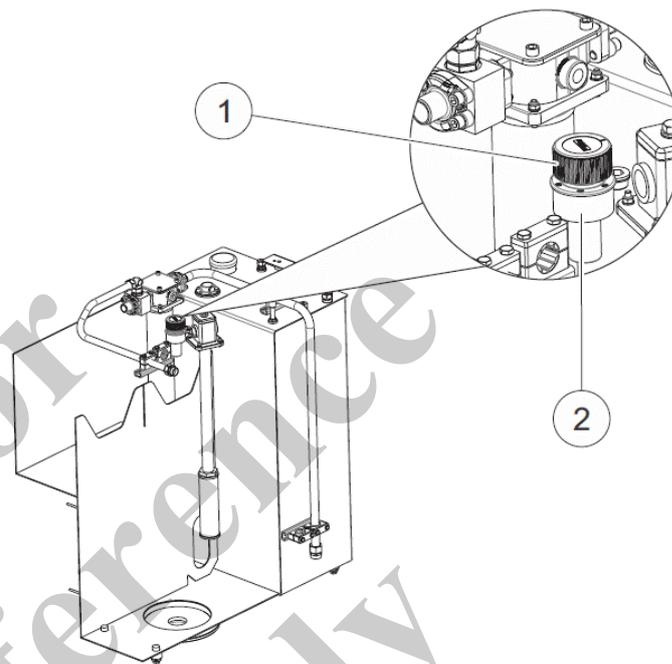
2. ➤ Remove the return flow pipe (1).
3. ➤ Unscrew the filter element (2) and remove it from the return pipe.
4. ➤ Screw the new filter element into the return pipe.
5. ➤ Insert the return pipe.
6. ➤ Tighten the four nuts on the square tube.

### 1.11.8 Replacing the aeration filter

Temperature changes and the use of cylinders or pressure accumulators cause the oil level in hydraulic system containers to vary constantly.

Exchanging air with the surrounding atmosphere is necessary to avoid unsafe pressure build-up in the container. When using an aeration filter, the air drawn in from the outside is filtered to prevent the ingress of contaminants.

The manufacturer recommends replacing the aeration filter every 1 000 operating hours, at the latest however every year.



*Fig. 23: Ventilation filter*

1. ➤ Unscrew the screw cap (1) on the hydraulic tank.
2. ➤ Pull out the filter element (2) in and dispose of it in accordance with applicable environmental standards.
3. ➤ Insert the new filter element.
4. ➤ Screw the cap back on.

### 1.11.9 Checking the pre-load pressure in the pressure accumulator

1. → Place attached loads and the boom on the ground.



*Fig. 24: Pressure accumulator measurement connection*

2. → Connect the pressure gauge to connection M25 (1).
3. → Turn off the engine.
4. → Immediately turn the ignition key back to position 1.
5. → Push the safety lever forward.
6. → Move both control levers in the cab several times in all directions.
7. → Observe the pressure gauge.  

As soon as the preload pressure is reached, the valve in the pressure accumulator closes. The pressure gauge pointer drops suddenly to 0. The value displayed just prior to the pressure drop corresponds to the preload pressure of the pressure accumulator.
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.

## 1.11.10 Replacing the HydroClean micro-filter element

**⚠ WARNING**

**Risk of injury from hot engine parts.**

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

**Persons can be injured by the hot parts on a running engine.**



*Before changing the filter element, space constraints require that first the oil filter and then the filter element for the water separator be removed.*



*Contamination of the HydroClean filter element is monitored by the SENCON. When the warning icon appears in the SENCON error diagnostics, the filter element has to be replaced.*

1. Depressurize the hydraulic system.

↳ Chapter 1.11.3 "Depressurizing the hydraulic system" on page 37

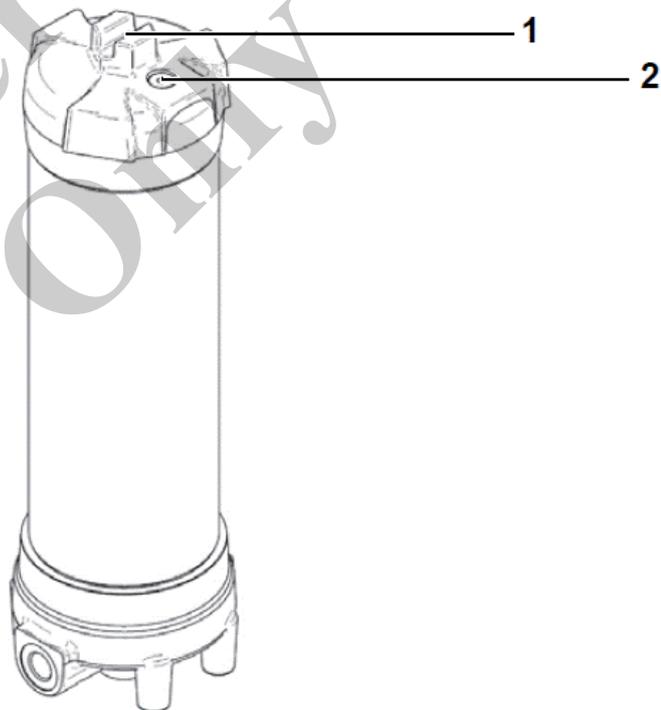


Fig. 25: HydroClean

2. Unscrew the cover (1) in using the integrated hexagon head.
3. Remove the filter element.
4. Dispose of the filter element as hazardous waste.

5. ➤ Clean the components, check the seal and replace it as needed.
6. ➤ Insert the new filter element.
7. ➤ Screw the cover back on.
8. ➤ Start the drive motor.
9. ➤ Unscrew the hexagon socket head bolt (2) slightly until bleeder opening is exposed.
10. ➤ Once oil begins to leak out, retighten the hex screw.
11. ➤ Turn off the drive motor and check the filter for leaks.

## 1.12 Winch

### 1.12.1 Winch

**⚠ WARNING**

**Risk of injury from high spring tension.**

The winch brakes are under extreme spring tension and if opened can cause injury.

- Do not disassemble the winch brakes.
- Only work on the winch and its attachments when the machine is off and not under load.
- Before beginning work on the winch, secure its drive and attachments against being started unintentionally.
- Make sure the hydraulic supply lines are not pressurized.

**⚠ WARNING**

**Risk of injury from rotating or hot parts.**

- Only perform maintenance when the drive motor is off and the winch is not moving.
- Wear safety equipment (e.g., protective gloves and clothing).

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

**NOTICE**

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

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

Oil that has not been properly disposed of contaminates ground water.

### Safety instructions

- Drain oil when the gearbox is warm.
- Make sure the screws in the load flow are seated properly after longer periods of continuous use and when frequently under maximum load.
- Do not disassemble the winch brakes. Always replace the winch brakes completely. Warranty is invalidated if winch brakes are dismantled.

- Remove the engine and brake once per year and check the spline shaft couplings on the drive end. These spline shaft couplings cannot show any plastic strain or abrasive wear (spline edges partially worn, spline bases uneven). If damage can be seen on the involute spline connections, the affected parts must be replaced immediately.
- The crane winch must undergo a general overhaul at the end of the remaining service life, or every 10 years at the latest.

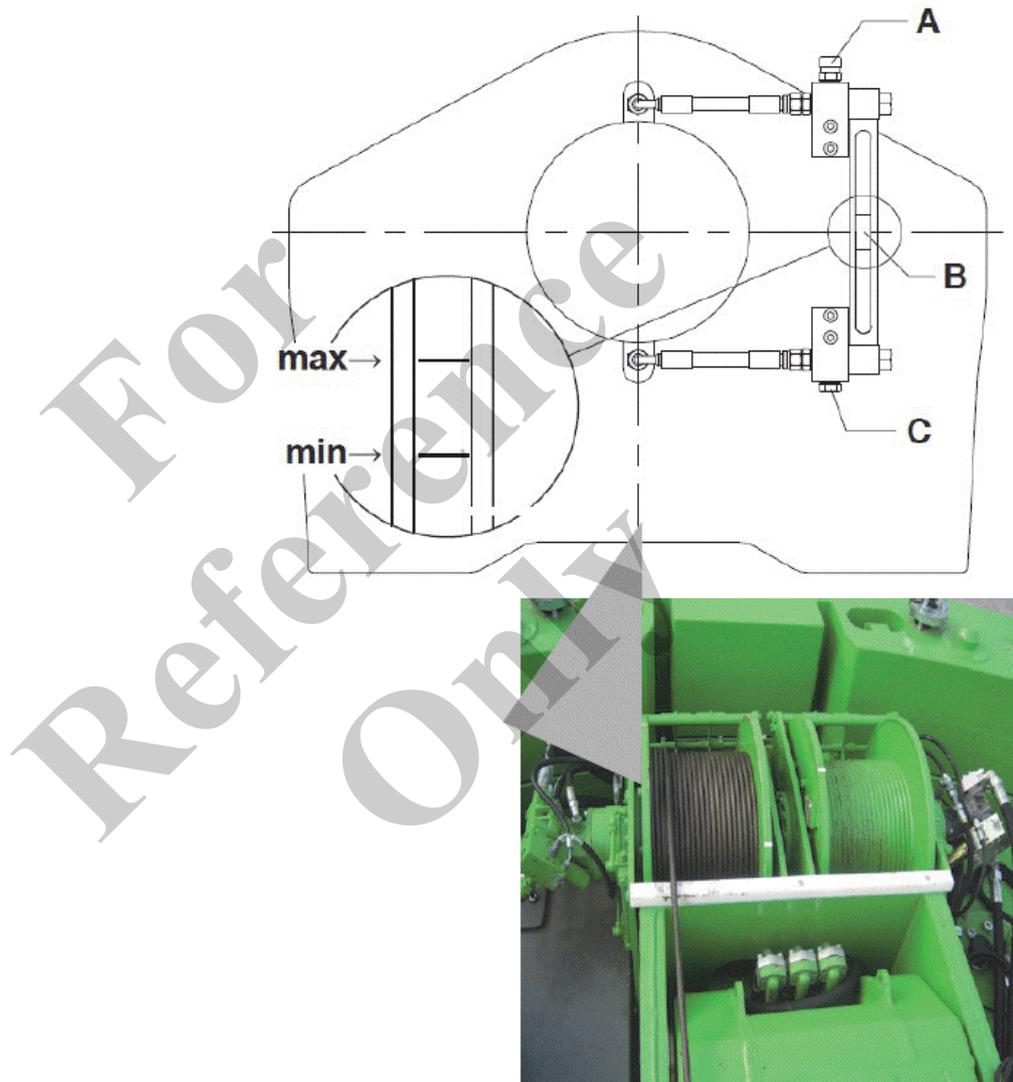


Fig. 26: Winch

- A Oil filler neck – gearbox
- B Oil level indicator
- C Oil drain – gearbox



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.

## 1.12.2 Maintaining the brake

### Safety instructions

- Do not disassemble the winch brakes. Always replace the brakes completely. 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.

## 1.12.3 Checking the winch gear oil level

**i** *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 a level surface.
2. → Turn off the drive engine.
3. → Check the oil level on the oil level indicator (B).  
The oil level must be between the lower marking (MIN) and the upper marking (MAX).
4. → Add gear oil as needed.
5. → Remove the cap of the oil filler neck (A).
6. → Add fresh gear oil until the oil level is between the MIN and MAX markings.
7. → Replace the filler neck closure.

## 1.12.4 Changing the winch gear oil

**i** *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 a level surface.
2. → Turn off the drive engine.
3. → Place a collecting vessel under the oil drain (C).
4. → Remove the oil drain plug (C).
5. → Allow the old oil to drain completely.
6. → Clean the components, check the seals and replace as needed.
7. → Reinstall the oil drain plug (C).
8. → Remove the cap of the oil filler neck (A).
9. → Add fresh gear oil until the oil level is between the MIN and MAX markings.

10. ▶ Replace the oil filler neck cap (A).
11. ▶ Operate the winch.
12. ▶ Check the oil level again.

## 1.13 Undercarriage

### 1.13.1 Safety instructions

**⚠ WARNING**

**Risk of injury from rotating and hot parts.**

- Only perform maintenance when the drive motor is off and the distributor gearbox is cool.

Persons can be injured and scalded by rotating and hot parts.

**ENVIRONMENT**

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

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

Oil that has not been properly disposed of contaminates ground water.

### 1.13.2 Cleaning and lubricating

**i** *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 a level surface.
2. ▶ Turn off the diesel engine
3. ▶ Clean the undercarriage, crawler track and sheaves with a steam jet.
4. ▶ Lightly grease the guides and bolts.

### 1.13.3 Checking the travel drive oil level

**⚠ WARNING**

**Risk of scalding from hot oil.**

- Only drain the oil when the gearbox is warm.

Persons can be injured when draining hot oil.

**i** *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.*

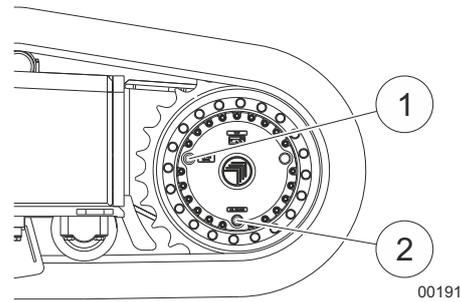


Fig. 27: Lubricating points (1) and (2) of the travel drive

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).

#### 1.13.4 Changing the travel drive oil

**⚠ WARNING**

**Risk of injury due to oil coming into contact with skin.**

- 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.

**Contact with oil can cause severe skin disorders and other severe injuries.**



*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.*

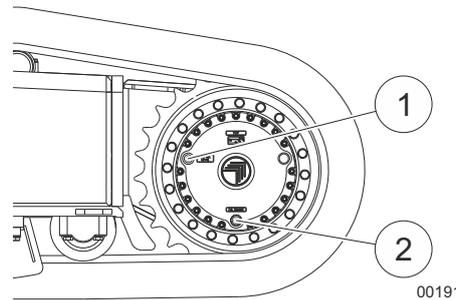


Fig. 28: Lubricating points (1) and (2) of the travel drive

1. ➤ Place the machine on an even and hard surface so the lubricating points (1) and (2) are positioned.
2. ➤ Switch off the diesel engine.
3. ➤ Place a container under the plugs for lubricating point (1) and lubricating point (2).
4. ➤ Loosen the plug for lubricating point (1) so the oil can flow out better.
5. ➤ Loosen and remove the plug 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 plug for lubricating point (1) until it overflows.
9. ➤ Retighten the plugs for lubricating point (1) and lubricating point (2).
10. ➤ Check the oil level after 2 operating hours.



*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.*

## 1.13.5 Crawler track



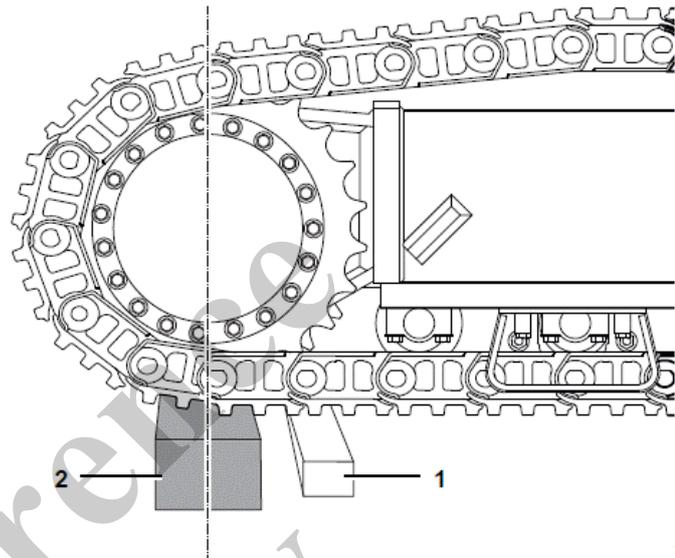
*Properly adjusted track tension will reduce the wear of undercarriage parts. Grease and a grease gun are needed for adjusting track tension. More detailed information can be found in the attached list of operating materials. Clean the running gear and crawler tracks thoroughly before checking the chain tension.*

### Safety instructions

- Park the machine on even, hard ground.
- Ensure no one is in the danger zone of the machine.
- Slew the uppercarriage 180° to the undercarriage.
- Do not attach any loads.
- Completely retract the boom.
- Move the boom to 10°.
- Apply the slew gear brake.

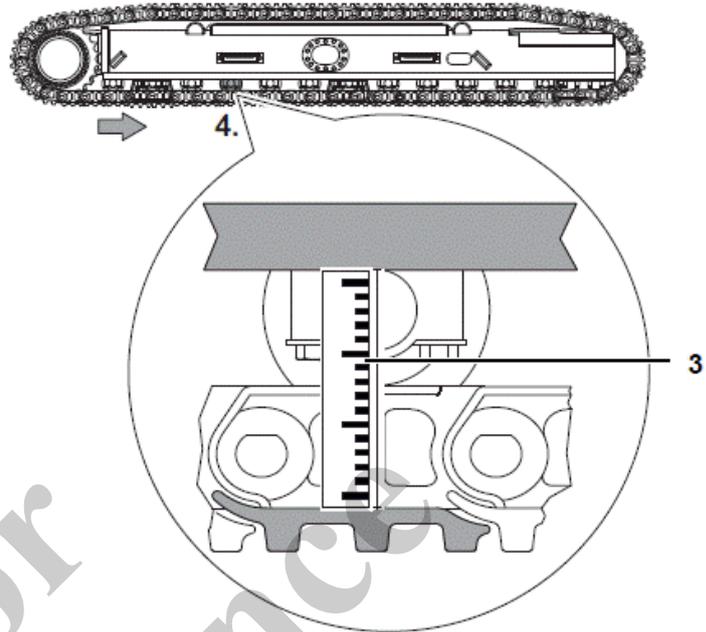
**Checking and adjusting track tension**

1. → Place two sufficiently long and stable wooden planks (1) approx. 13 cm (5 in) in height and two sufficiently long and stable wooden planks (2) approx. 20 cm (8 in) in height in front of the crawler track.



*Fig. 29: Driving the crawler undercarriage onto wooden planks*

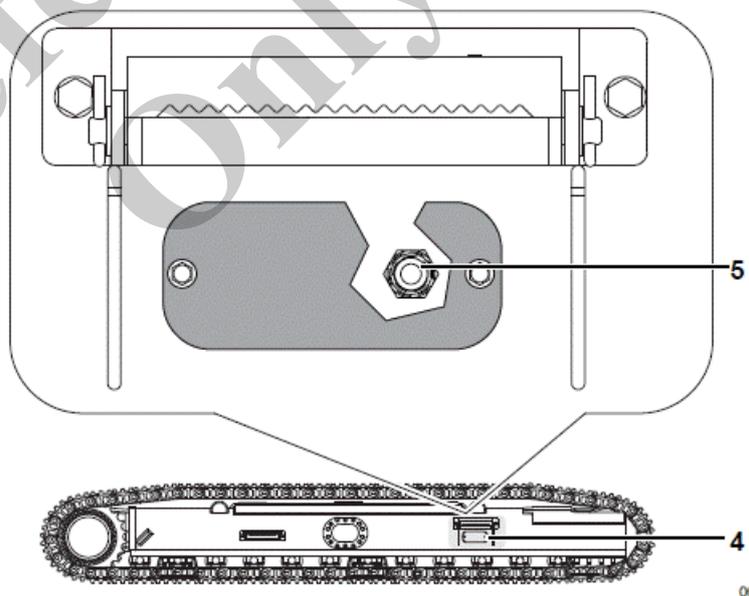
2. → Carefully drive onto the planks. The crawler track must be in the end position approx. 20 cm (8 in) in height on the large wooden plank.



00448

*Fig. 30: Measure chain tension*

3. → Measure the distance (3) between the frame of the track wheel carrier and the track shoe on the 4th track roller in . Measure track roller. The distance has to be approx. 27 cm (11 in) to 30 cm (12 in).



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*Fig. 31: Adjusting track tension*

4. → To adjust the track tension, unscrew the service panel (4) in on the back of the track wheel carrier and add grease through the lubricating nipple (5) with a grease gun.
5. → Check the track tension again. Readjust the track tension as needed.

### 1.13.6 Spring tensioner – adjusting track tension

**⚠ WARNING**

**Risk of death from ejecting grease.**

- Do not fully remove the valve or lubricating nipples.
- Always use an extension for the grease gun in order to be able to work at a safe distance from the access door.

Without lubricating nipples or valve, the grease sprays out at high pressure and the valve is ejected from the machine. This can cause serious injury or death.

**i** Consistently correct tension of the crawler tracks increases the service life of the components of the undercarriage. The crawler track tension must be adjusted depending on the machine's operating conditions. If the ground is highly compact, the crawler track tension must be as low as possible.

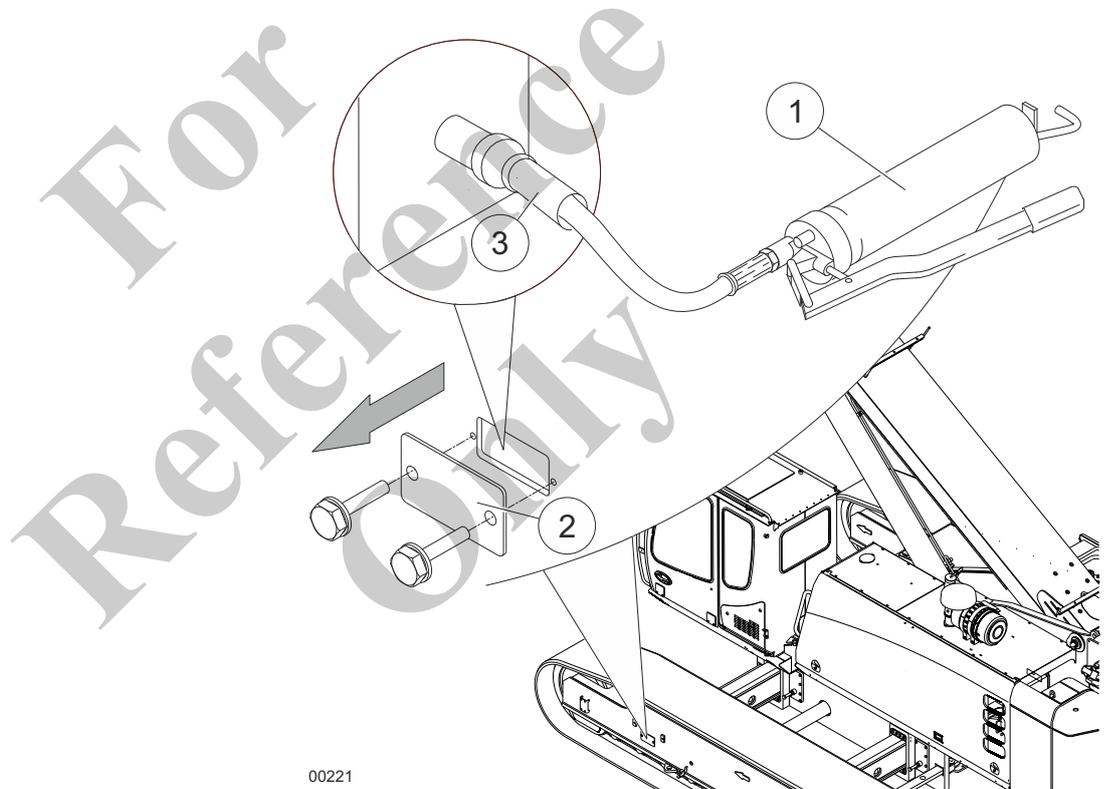


Fig. 32: Adjusting track tension

1. → Part the machine on even, hard ground.
2. → Prepare the grease gun (1).
3. → Remove the screws and cover (2).
4. → Insert the connection hose (3) into the lubricating valve.
5. → Inject the grease. Interrupt the process from time to time to verify the sag.
6. → If the track is tensioned too tightly, loosen the valve slightly so the excess grease comes out of the breather hole and the track loosens.

7. ➤ Replace the cover with the screws.
8. ➤ Repeat this process for the other crawler track.

## 1.13.7 Track rollers

### Re-tighten screws



Fig. 33: Track rollers

**i** Retighten the screws (1) in with a torque wrench. Tightening torque: ↪ Chapter 1.22 "Tightening torques" on page 80

## 1.13.8 Sprocket

### Re-tighten screws

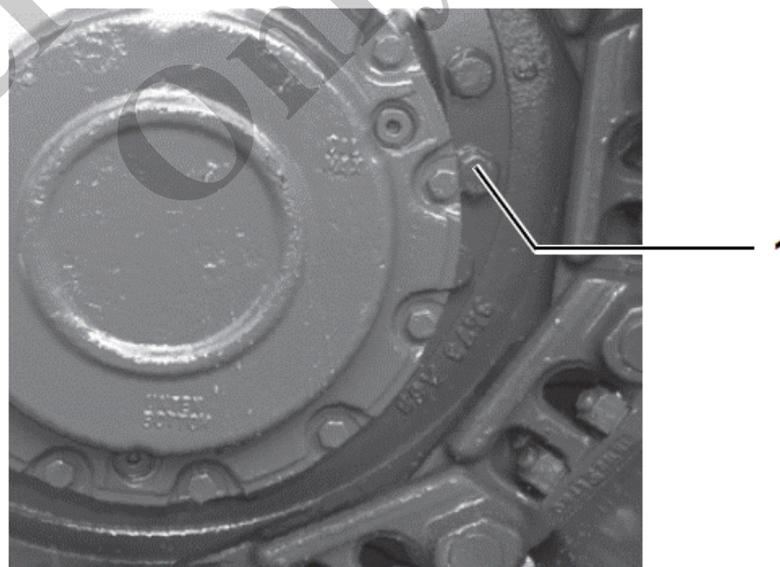


Fig. 34: Sprocket mounting screws

**i** Retighten the sprocket fixing screws with a torque wrench. Tighten M24x2 hex screw to a tightening torque of 1,150 Nm.

### 1.13.9 Base plates

#### Re-tighten screws

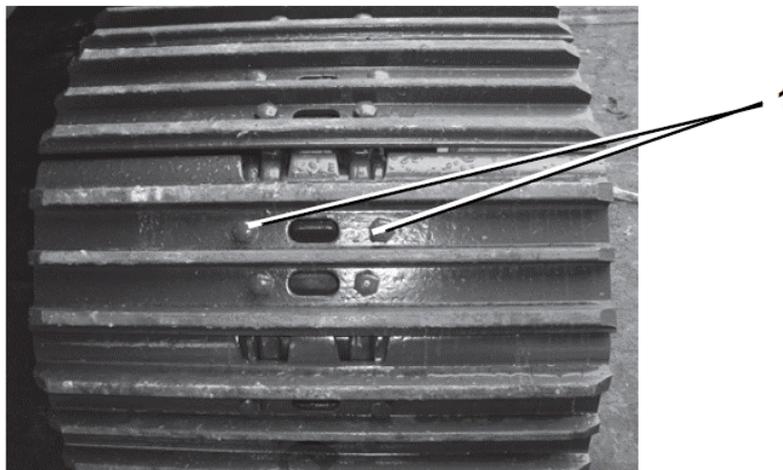


Fig. 35: Base plate mounting screw



Retighten the base plate screws with a torque wrench.  
Tighten M18x1 hex screw to a tightening torque of 530 Nm.

### 1.14 Rotary connection

#### 1.14.1 General information

Ensure that the rotary connection is well lubricated.

- Track (1)
  - via lubrication nipple
- Gearing (2)
  - via lubricating nipples or
  - With gear spray
- Seal (3)
  - Check the seal between the bearing race and the gear teeth for damage.



Before and after longer periods of non-use (longer than 3 months),  
relubricating is necessary.

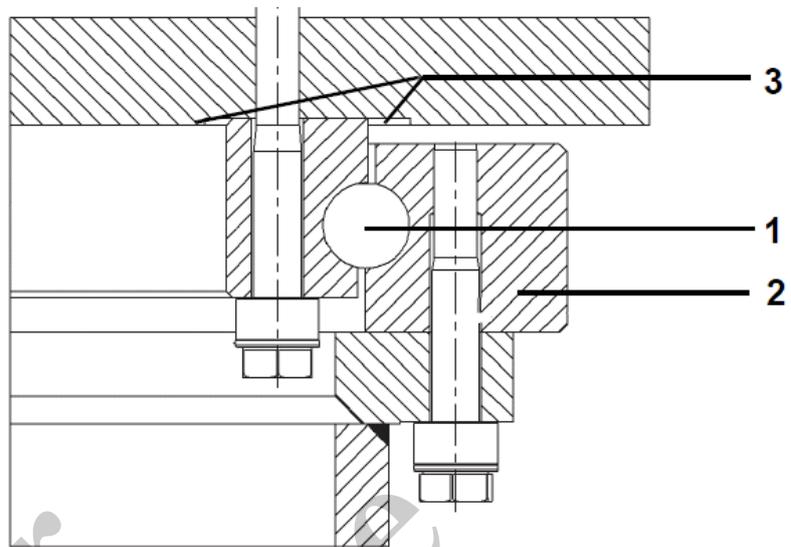


Fig. 36: Rotary connection components

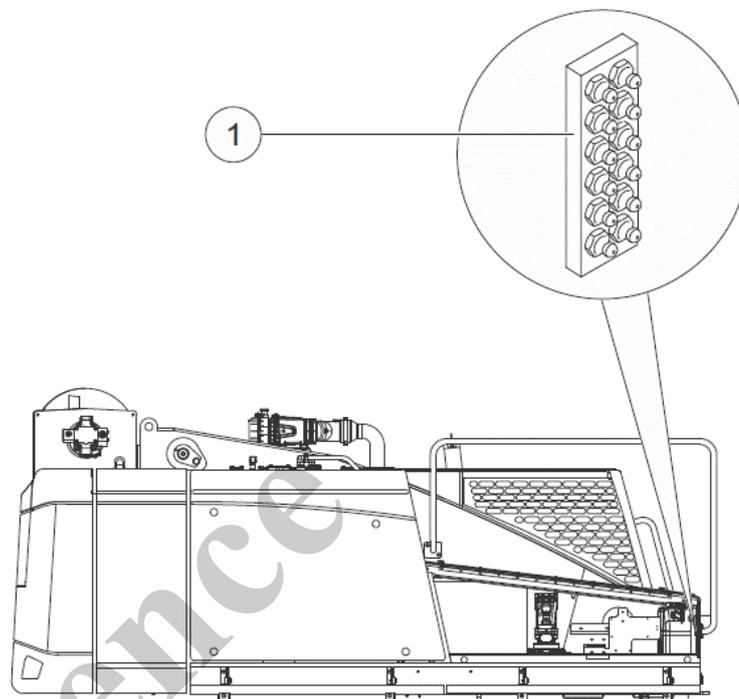
- 1 Bearing race
- 2 Gearing
- 3 Seal [profiled], gasket [flat]

## 1.14.2 Lubricating the slewing ring bearing race

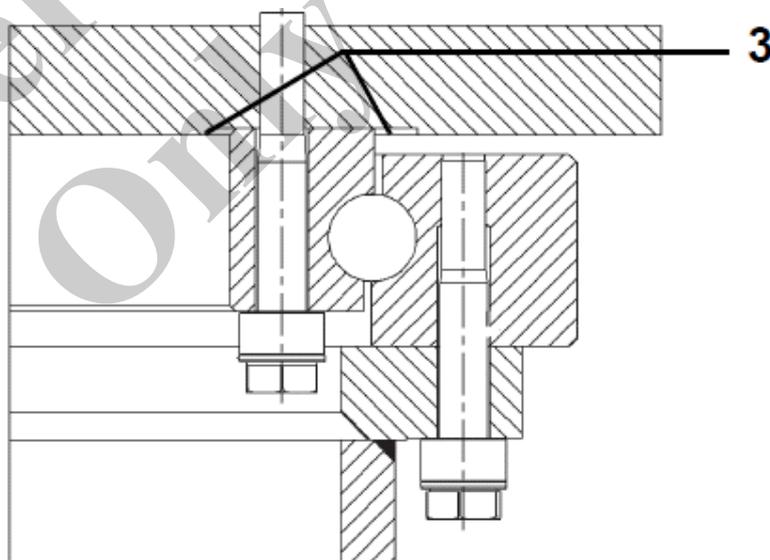
**i** *Mixing different types of oils, lubricants and operating fluids is prohibited. Only mix the same type of or identical (same specification) oils, lubricants and operating fluids from the same manufacturer.*

- i**
- High humidity
  - High levels of dust and contamination
  - High temperature fluctuations
  - Frequent slewing movements

*The specified lubricating intervals can be shortened in the following situations:*



*Fig. 37: Central lubricating strip*



*Fig. 38: Rotary connection sealing lips*

1. ➔ Turn off the diesel engine
2. ➔ Open the right service door.
3. ➔ Lubricate the top 8 lubricating nipples (1) in(outlet no. 5 – 12) until grease comes out of the sealing lips (3).
4. ➔ Slew the uppercarriage several times in both directions to distribute the grease.

5. ➤ Repeat this process until fresh grease appears on the grease collar.
6. ➤ Close the service door.

### 1.14.3 Lubricate slewing ring gearing

Lubricate the slewing ring every 10 operating hours or daily, depending on operating conditions!



*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.*

#### Gear spray



Fig. 39: Lubricate slewing ring gearing

1. ➤ Turn off the diesel engine
2. ➤ Thoroughly clean the gearing.
3. ➤ Check the gearing of the slewing ring and the slewing ring pinion for wear and replace as needed.
4. ➤ Spray the gearing from approx. 30 cm away with gear spray.
5. ➤ Slew the uppercarriage several times to evenly distribute the grease on the gearing.
6. ➤ Check whether an uninterrupted film of lubricant is present. Repeat the lubrication process as needed.

**Pinion gearing lubrication (option)**

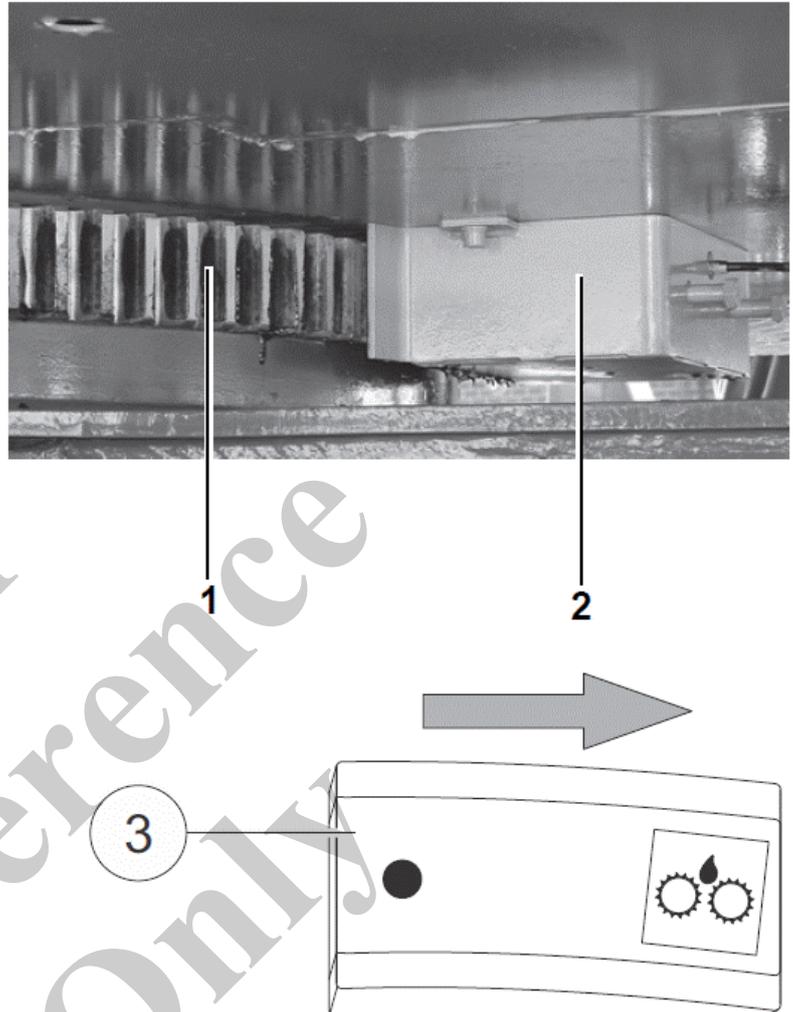


Fig. 40: 236

- 1 Slewing ring, outer teeth
- 2 Slew-ring pinion shaft
- 3 Pinion lubrication push-button

**i** Clean the lubrication point thoroughly down to the bare metal before the first application of lubricant to ensure that the lubricant creates a continuous film across the surface.

1. → Switch off the diesel engine.
2. → Thoroughly clean the gearing.
3. → Check the slewing ring and slewing ring pinion for wear and replace as needed.
4. → Start the diesel engine.

**5.** ▶ Lubrication process:

- Press and hold the push-button (3) in on the control panel.
- Slew the uppercarriage with the left control lever 360° to the left and to the right to distribute the lubricant evenly over the gearing.

**6.** ▶ Release the push-button.



*Lubricate the slewing ring every 10 operating hours or daily, depending on operating conditions! Check the lubrication reservoir once a week and add lubricant as needed (see list of operating fluids).*

**NOTICE**

**Risk of machine damage due to not observing the wear limit.**

- Check the plastic sliding wear block (2) in the lubrication system (1) every month for wear and tear.
- Observe the wear limit (min. width 16 mm).
- Replace the plastic sliding wear block (2) when the wear limit has been reached.

**If the plastic sliding wear block (2) is not replaced when it has reached its wear limit, the machine can be seriously damaged.**



*The owner of the machine is solely responsible for this type of damage and any subsequent damage.*

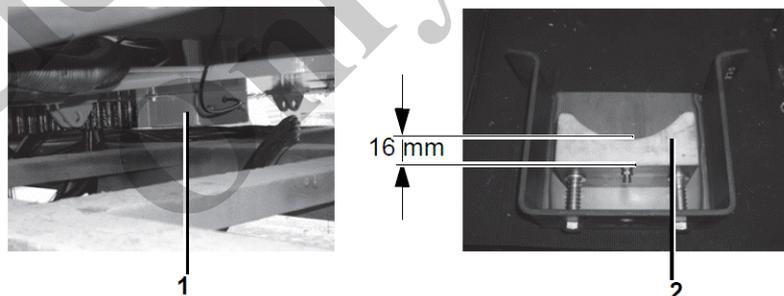


Fig. 41: Plastic sliding wear block on the pinion lubrication

**Safety instructions**

Proceed as follows before checking the plastic sliding wear block (2):

- Lower attached loads and the boom to the ground.
- Pull the left safety lever back.
- Before beginning maintenance, turn off the machine and secure it against being restarted without authorization.
- Place a warning sign on the controls.

**1.** ▶ Remove the lubrication device (1) in.

**2.** ▶ Check the plastic sliding wear block (2) in for wear.

**3.** ▶ Install the lubrication device.

**Adding grease**

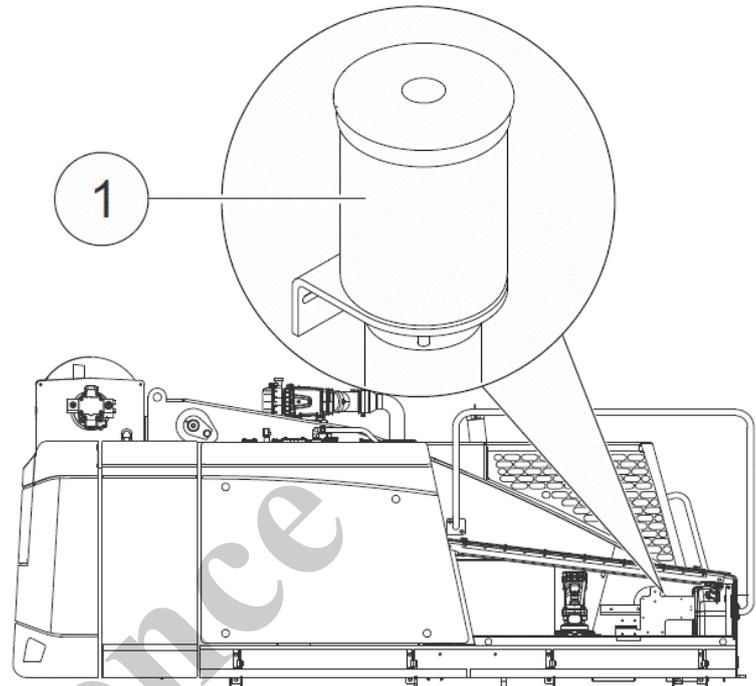


Fig. 42: Position of the lubricant reservoir

1. → Open the lubricant reservoir lid (1).
2. → Add lubricant (see list of operating fluids).
3. → Close the cover.

**1.14.4 Tighten slewing ring bolts.**

**⚠ DANGER**

**Risk of death due to uppercarriage tipping over.**

- Check the slewing ring screws every 5000 operating hours or every five years and replace as needed.

**Defective slewing ring bolts can cause the uppercarriage to tip over, resulting in serious injury or death.**

***i*** *The test must be performed by an expert from an independent specialist/institute. Unrestricted further use of the slewing ring bolts must be verified with a certificate. Otherwise the slewing ring bolts must be replaced.*

**Safety instructions**

Corroded or damaged screws can shear and cause the uppercarriage to tip over.

- Do not tighten corroded or damaged bolts, replace them immediately with new screws.
- Do not tighten loose bolts, replace immediately by new bolts.
- Retighten the slewing ring bolts with a torque wrench.
- Always observe the number and diameter of the bolts.
- Only use genuine spare parts.

- If you suspect the bolts have been damaged, have your Service Partner check them.
- Contact your Service Partner with any other questions.

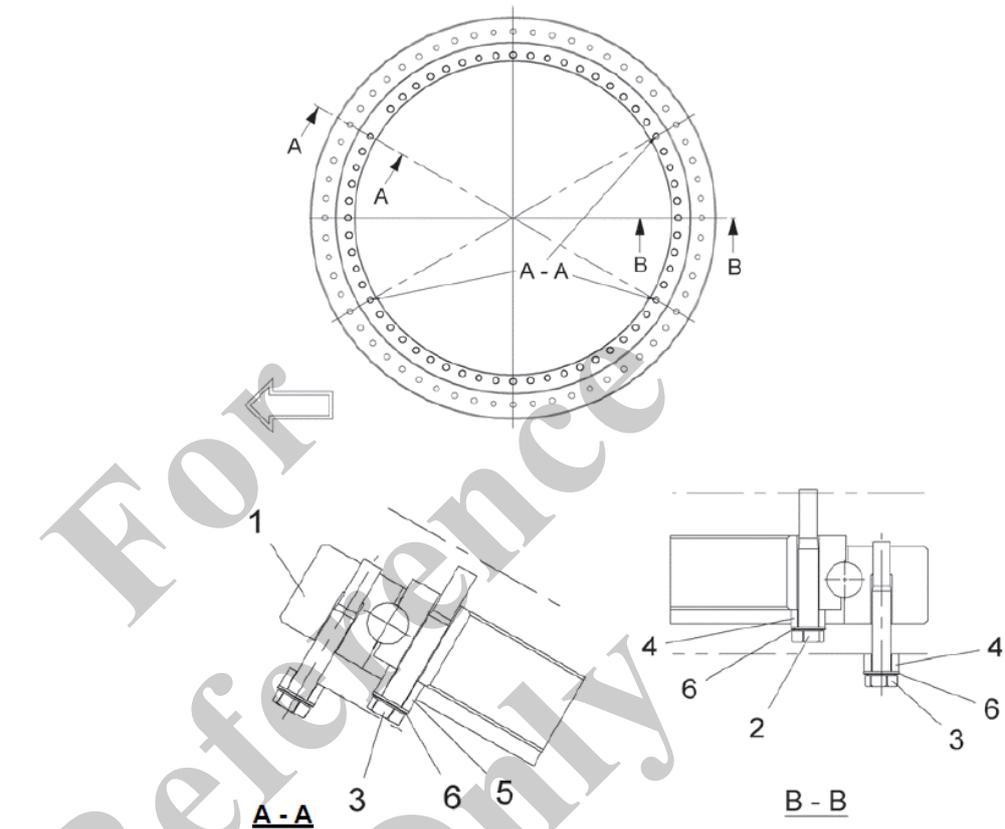


Fig. 43: Slewing ring bolts

1. → Turn off the drive engine.
2. → Retighten the slewing ring bolts (2, 3 – M22) in with a torque wrench in a criss-cross pattern. Tighten M22 slewing ring bolts to a tightening torque of 750 Nm.



- The initial tension of the first bolt tightened will be affected by tightening the other bolts. This is why at least two full turns are necessary.
- Screws larger than M30 should be tightened with a hydraulic bolt tensioner.

## 1.15 Telescopic boom

### 1.15.1 Lubricating the telescopic boom

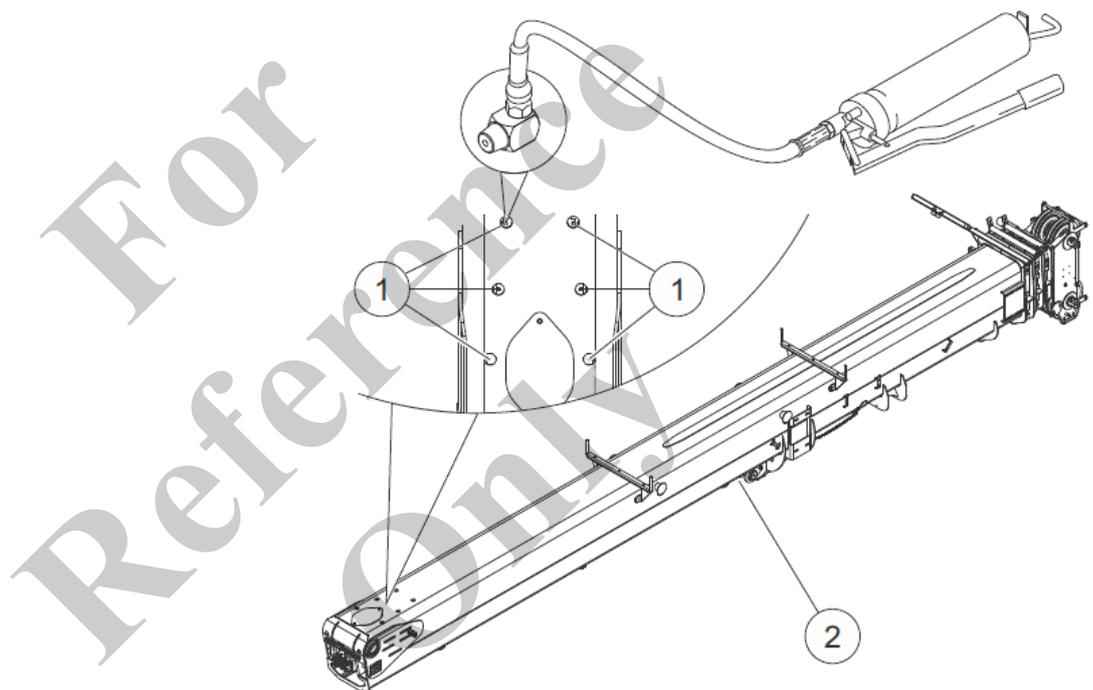
Sufficient and regular lubricating is required for reliable boom operation.

The specified lubricating intervals can be shortened in the following situations:

- High humidity
- High levels of dust
- High levels of contamination

**i** *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.*

**i** *Fully extend the undercarriage to 100 %.*



*Fig. 44: Lubricating the telescopic boom*

1. → Thoroughly clean the telescopic boom before lubricating. Let the surfaces being lubricated dry completely.
2. → Fully retract the telescopic boom and lower it as far as it will go.
3. → Bring the telescopic boom in line with the vehicle.
4. → The end of the shaft has 6 inspection openings. Though these openings the lubricating nipples (2x3) on the rear upper sliding blocks can be accessed from the outside. The lubricating nipples are lubricated by the central lubricating nipple bar.
5. → Lubricate the lubricating nipples with a grease gun.
6. → Fully extend the boom horizontally and either spray or brush the exterior of all shaft parts near the guides with grease.

7. ➔ Extend and retract the boom several times so the grease is distributed evenly.
8. ➔ Lubricate the tilting cylinder pivot points via the lubricating nipples (2).

### 1.15.2 Inspect the telescoping boom

The telescopic boom should be disassembled after 10,000 operating hours or 10 years so the bearings, holding lines, haulback lines, sheaves and telescoping cylinders can be inspected.

The stop cables are held under tension by the return cables. If this tension is relieved as a result of the rope being stretched for long period of time, the haulback and holding lines must be re-tensioned.

### 1.15.3 Rope mechanism in the telescopic boom – holding lines and haulback lines

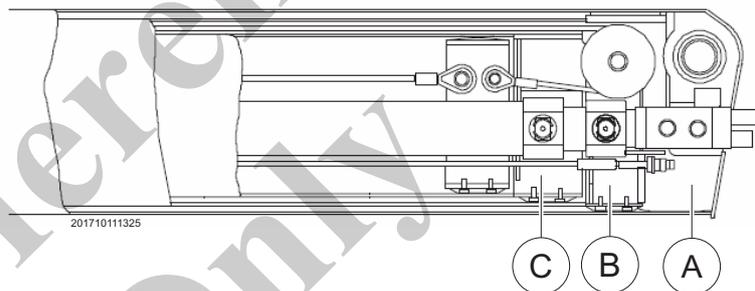


Fig. 45: Rope mechanism in the telescopic boom

- A Basic body
- B Telescope 1
- C Telescope 2

Telescope 2 (C) in is pushed out of the telescoping cylinder at the same time when telescope 1 (B) in is pushed out by the rope mechanism.

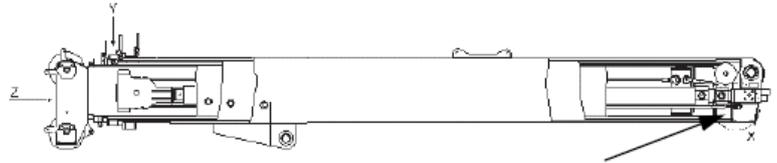
Telescope 2 is pushed out by 6 holding lines and 2 haulback lines.

Telescope 2 is retracted by 2 haulback lines.

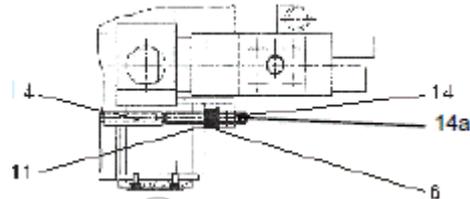


*When a new line rope is installed, it must be of the same make, tensile strength and diameter as the original line rope.*

**Re-tensioning holding lines (4)**



*Fig. 46: Tensioning the holding lines (4) using the nuts and disc spring assemblies*

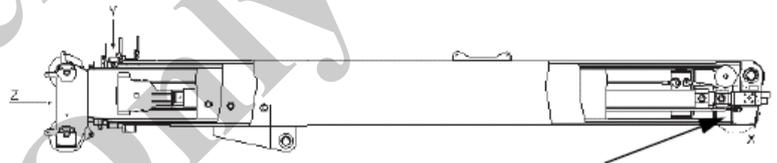


*Fig. 47: Detailed view X - re-tension holding lines*

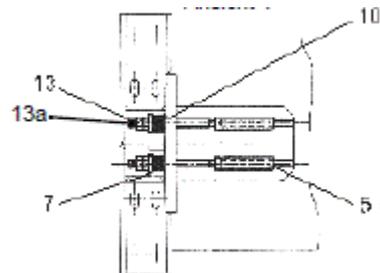
4 Holding rope

1. → Tighten the nuts (14) in until telescope 1 and telescope 2 move outward.
2. → Tighten the counter nut (14a).
3. → Carry out the tensioning on all 6 holding lines.

**Retensioning haulback lines (5)**



*Fig. 48: Tensioning the haulback lines (5) using nuts and disc spring assemblies*



*Fig. 49: Detailed view Y - tension haulback lines*

5 Return cable

1. → Tighten the nut (13) in until the disc spring assemblies (10) in are slightly compressed.
2. → Tighten the counter nut (13a).



*Make sure the telescopes are pushed in simultaneously each time you re-tension the lines.*

## Checking synchronization

1. → Carefully retract the telescopes as far as they will go. Both telescoping sections must be retracted right to the stops.
2. → IF this is not the case, proceed as follows:
  - Increase the stop of telescope 1 by placing a plate underneath.
  - or
  - Reduce the stop of telescope 2.

## 1.16 Electrical system

### 1.16.1 Safety instructions

- Only qualified electricians may work on the electrical system.
- Observe the appropriate regulations for installing electrical equipment and preventing accidents.

### 1.16.2 Batteries

**⚠ DANGER**

**Risk of death from exploding battery.**

- Do not smoke or have open flames near the battery.
- Avoid generating sparks near the battery.

**An exploding battery can cause serious injury or death.**

**⚠ WARNING**

**Risk of chemical burns from battery acid.**

- Avoid contact with eyes or skin.
- Wear protective goggles and gloves.
- Do not tip the battery.
- If skin contact occurs, immediately wash off with plenty of water.
- If eye contact occurs, rinse for several minutes under running water and consult a physician.
- If swallowing occurs, immediately drink plenty of water, take a dose of activated charcoal and consult a physician.

**Persons can suffer severe chemical burns from battery acid.**

### Safety instructions

- Do not set tools down on the battery.
- Disconnect batteries before starting welding work.
- Do not switch battery connections.
- Observe applicable environmental standards for disposing of used batteries.

### Checking battery terminals and cables

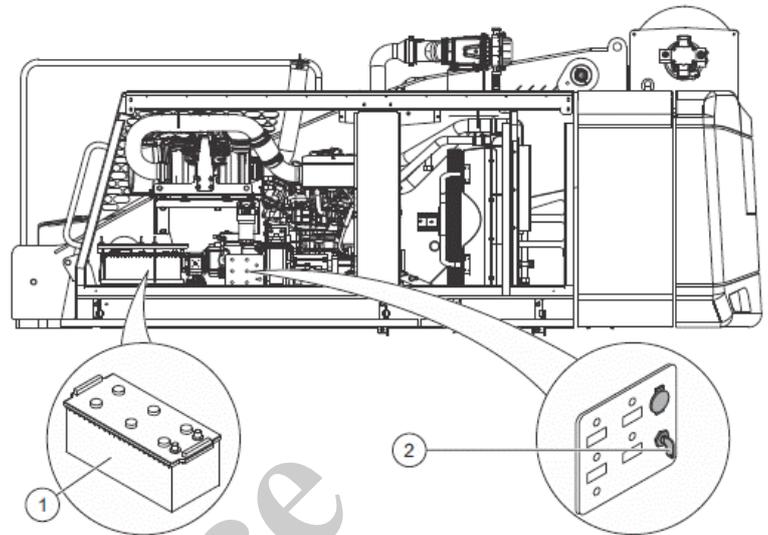


Fig. 50: Battery and battery disconnect switch

1. → Press the battery disconnect switch (2).
2. → Clean the terminals and cables of the battery (1), make sure they are positioned properly and apply terminal grease.
3. → Press the battery disconnect switch back to its initial position.

### 1.16.3 Fuses

**⚠ WARNING**

**Risk of injury and burns from incorrect fuses.**

- Do not repair fuses.
- Always use new fuses with the same amperage.

**Using incorrect fuses poses a risk of fire that can cause serious injury.**

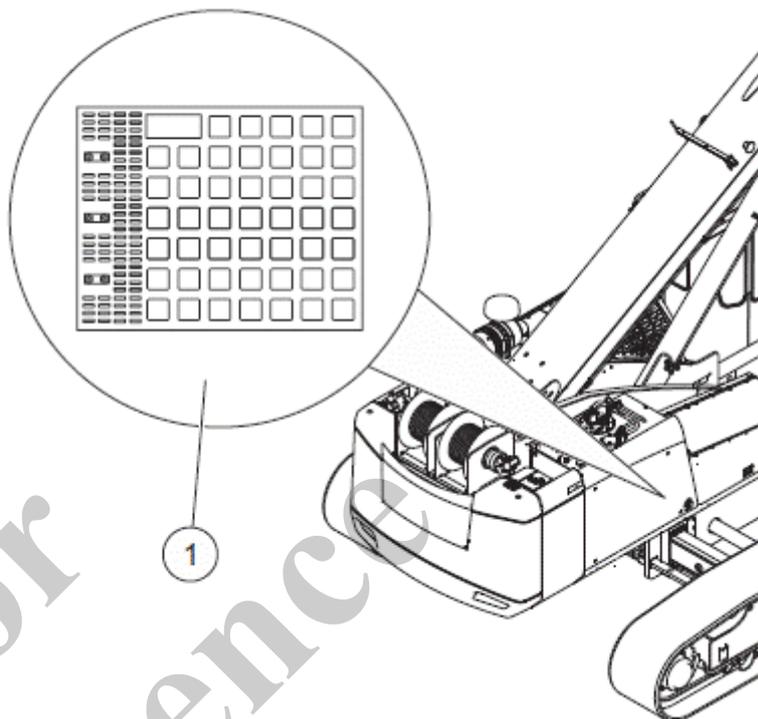


Fig. 51: Location of the fuse box

1. ➤ Switch off the diesel engine.
2. ➤ Open the fuse box cover.
3. ➤ Replace the defective fuse (1).
4. ➤ Check the contacts and clean any oxidized contacts.
5. ➤ Put the fuse box cover back on.

## 1.17 Climate control

### 1.17.1 Safety instructions

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



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

*Check the following components monthly:*

### 1.17.2 Cleaning the recirculating air filter

**i** The recirculating air filter for the climate control system is located in the cab behind the driver seat.

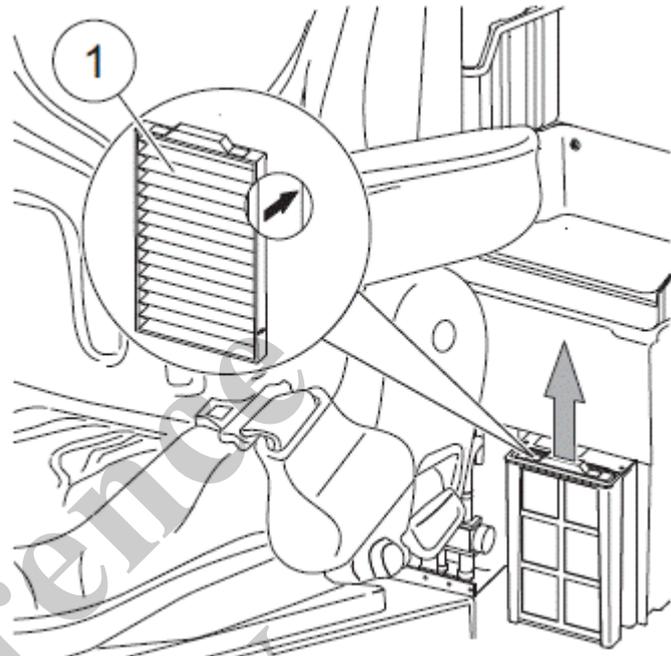


Fig. 52: Recirculating air filter

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.

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

## 1.17.3 Cleaning the fresh air filter

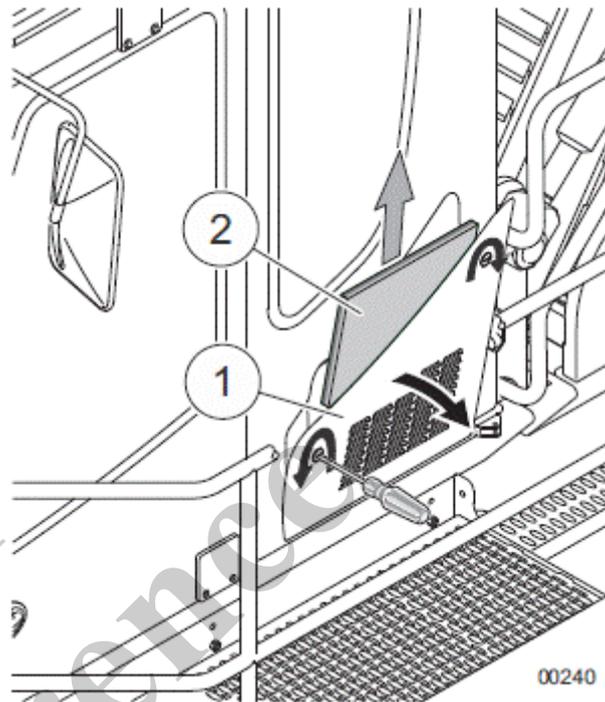


Fig. 53: Fresh-air filter

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.

## 1.18 Ropes

Steel wire ropes are lubricated during manufacture. This lubrication suffices for storage and for initial operation.

The lubrication intervals for ropes depend on the operating conditions (type of rope, weather conditions, uses) so they cannot be specified precisely. It is ensured by the manufacturer that rope lengths are chosen according to customer specifications and that they correspond with the load lift chart. Ensure the following to keep wear and corrosion damage to a minimum:

- The wire ropes are always sufficiently lubricated in everyday operation.
- The wire ropes are always completely unreeled at intervals of 100 operating hours, checked for damage, sufficiently lubricated and then reeled in under sufficient tension.  
This prevents loosening of the rope layers and potential risk of damage. This applies especially when the entire length of a rope is not used and remains wound around the drum.

**i** *More detailed information can be found in the supplementary documentation HANDLING, ASSEMBLY AND MAINTENANCE OF WIRE ROPES. Maintenance schedule, lubrication schedule*

## 1.19 Hydraulic oil analysis

Every machine is filled with Shell hydraulic oil at the factory. Performing regular hydraulic oil analyses allows this hydraulic oil to be used for extended periods.

These hydraulic oil analyses can detect critical states in the hydraulic system early and prevent damage.

The machine must be equipped with a HydroClean filter in order to be able to extend the change intervals.

When performing the hydraulic oil analyses, samples of the hydraulic oil must be sent to an authorized laboratory at fixed intervals.

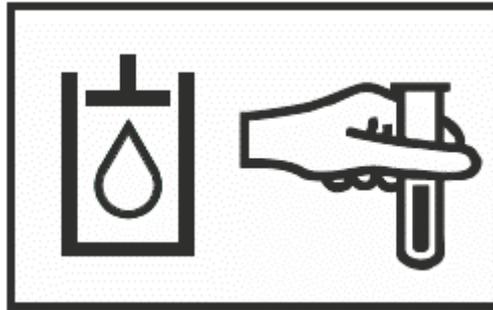
### Intervals for the sampling

The hydraulic oil analysis must be performed at the following intervals:

- A service technician will take the first hydraulic oil sample after 250 operating hours.
- The owner must take the second hydraulic oil sample after 1,000 operating hours.
- The third hydraulic oil sample is taken by the owner after around 1,900 operating hours so the results are available to Service after 2,000 operating hours.
- After 2,000 operating hours, the owner must take a hydraulic oil sample every 500 operating hours.

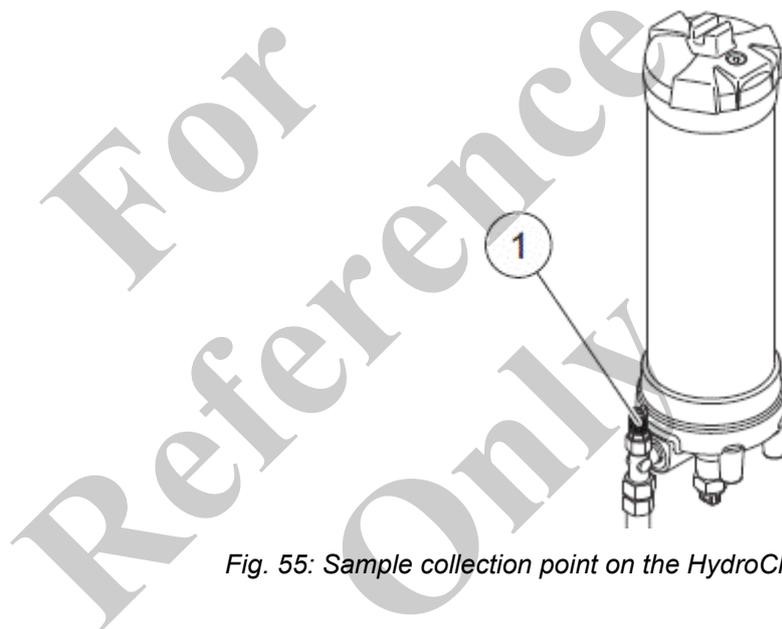
### Sampling point

The sampling point is marked by the sticker.



*Fig. 54: Sampling point sticker*

Take the sample from the measurement connection (1) on the HydroClean filter.



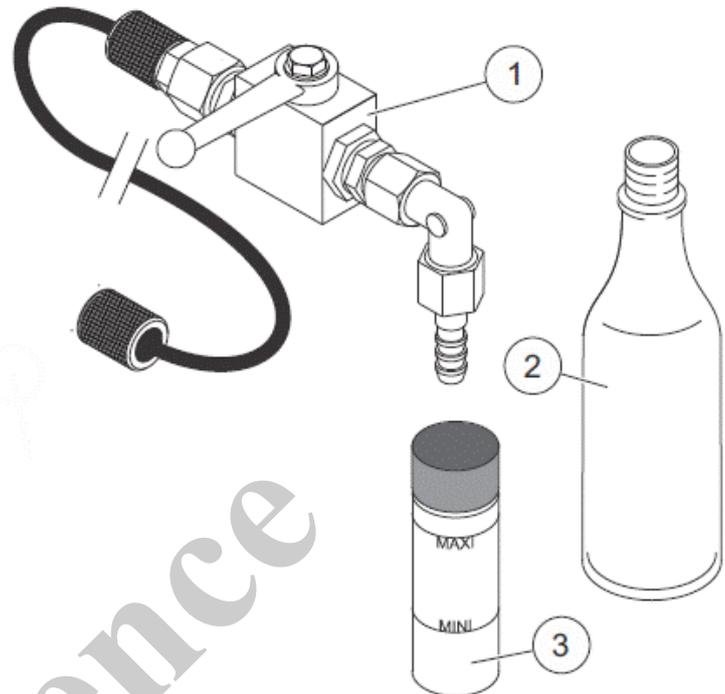
*Fig. 55: Sample collection point on the HydroClean filter*

### Sampling

**NOTICE**

**Risk of machine damage due to fault hydraulic oil analysis.**  
The hydraulic system could be damaged if the results of the analysis are distorted due to an unclean hydraulic oil sample.

- Ensure absolute cleanliness when sampling.
- Only use new and unused sample containers.



*Fig. 56: Hydraulic oil sampling materials*

- 1 Hydraulic oil sample extractor
- 2 Container for flushing oil
- 3 Sample container

**⚠ WARNING**

**Risk of severe burns from hot parts and hydraulic oil.**

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

- **Avoid contact with hot parts.**
- **Wear protective clothing and protective gloves.**

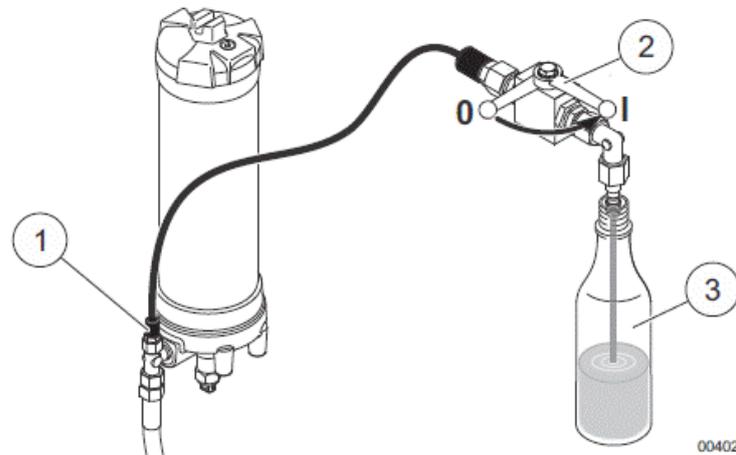
**⚠ WARNING**

**Risk of serious injury from pressurized hydraulic oil!**

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

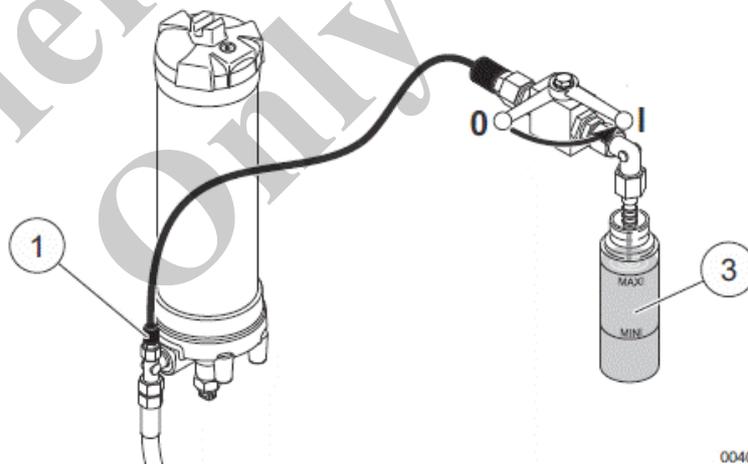
- **Wear protective clothing and protective gloves.**

1. ➔ Start the machine and let it run for at least 15 minutes.
2. ➔ Set the tool on the ground and let the machine run to idle.
3. ➔ Thoroughly clean the area around the sampling point.



*Fig. 57: Draining flushing oil*

4. ➤ Remove the protective cap from the measurement connection (1).
5. ➤ Connect the hydraulic oil sample extractor (2) to the measurement connection (1) and drain approx. 0.25 l hydraulic oil into an empty container (3).
6. ➤ Dispose of the drained hydraulic oil in accordance with regulations.



*Fig. 58: Taking a hydraulic oil sample*

7. ➤ Open a new, clean sample container (3) and fill it to the MAX mark with hydraulic oil. Make sure the sample container or closure do not become contaminated.
8. ➤ Carefully close the sample container.
9. ➤ Remove the hydraulic oil sample extractor from the sampling point and clean it.
10. ➤ Cover the measurement connection (1) with the protective cap.
11. ➤ Send the sample container to the laboratory.

**i** The slewing ring bolts must be tested by an expert from an independent, qualified company or institute. Unrestricted further use of the slewing ring bolts must be verified with a certificate. Otherwise replace the slewing ring bolts.

## 1.20 Lubrication points overview

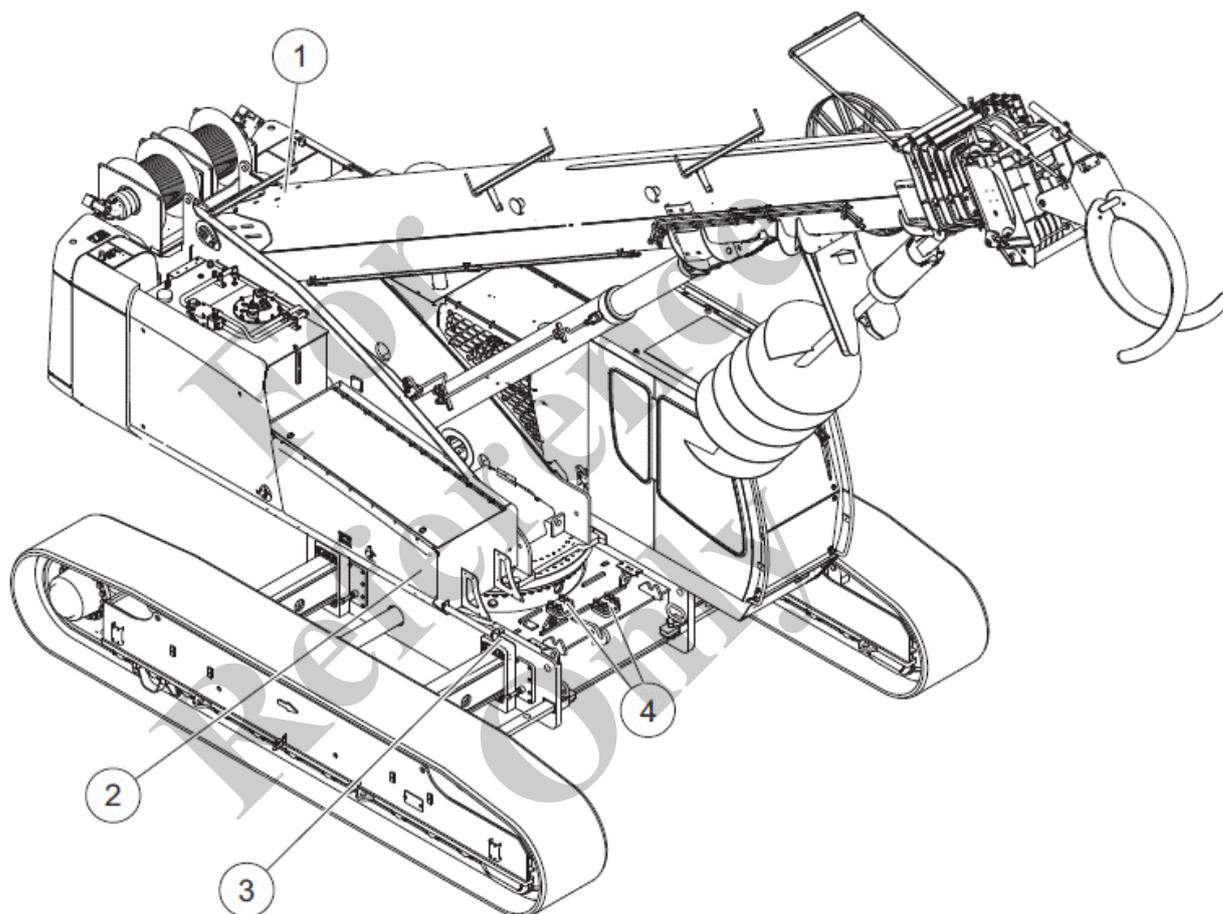


Fig. 59: Lubrication points on the machine

- 1 Telescopic boom, sliding surfaces
- 2 Central lubricating strip
- 3 Undercarriage
- 4 Cross member

## 1.21 Filling capacities

**i** 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.

The following values are guide values. The fill level shown on the respective part is authoritative.

Component	Quantity
Engine oil	15 l / 4.0 US gal
Cooling system	35 l / 9.2 US gal coolant
Fuel tank	360 l / 95.1 US gal
Hydraulic tank	500 l / 132.1 US gal
DEF® tank	30 l / 7.9 US gal
Winch	3 l / 0.8 US gal
Lubrication points (see Lubrication schedule)	As needed
Grease tank for slewing ring gearing/pinion lubrication	1 l / 0.3 US gal
Telescopic boom, sliding surfaces	As needed
Central lubrication system lubricant tank	2.0 l / 0.5 US gal
Travel gear	9.0 l / 2.4 US gal

## 1.22 Tightening torques

### 1.22.1 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

### 1.22.2 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
	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

Bolt		Tightening torque	
Dimensions	Strength class	Zinc flake coating [Nm]	Black phosphated [Nm]
	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

### 1.22.3 Rotary connection

Bolt		Tightening torque	
Dimensions	Strength class	Zinc flake coating [Nm]	Black phosphated [Nm]
M33	10.9	<i>Not permissible</i>	2600