

**engcon**<sup>®</sup>

User manual

# 3-SERIES TILTROTATOR

EC309 | EC319 | EC326 | EC333



Article 9000682 | Version 1.13 | 2026-03-12



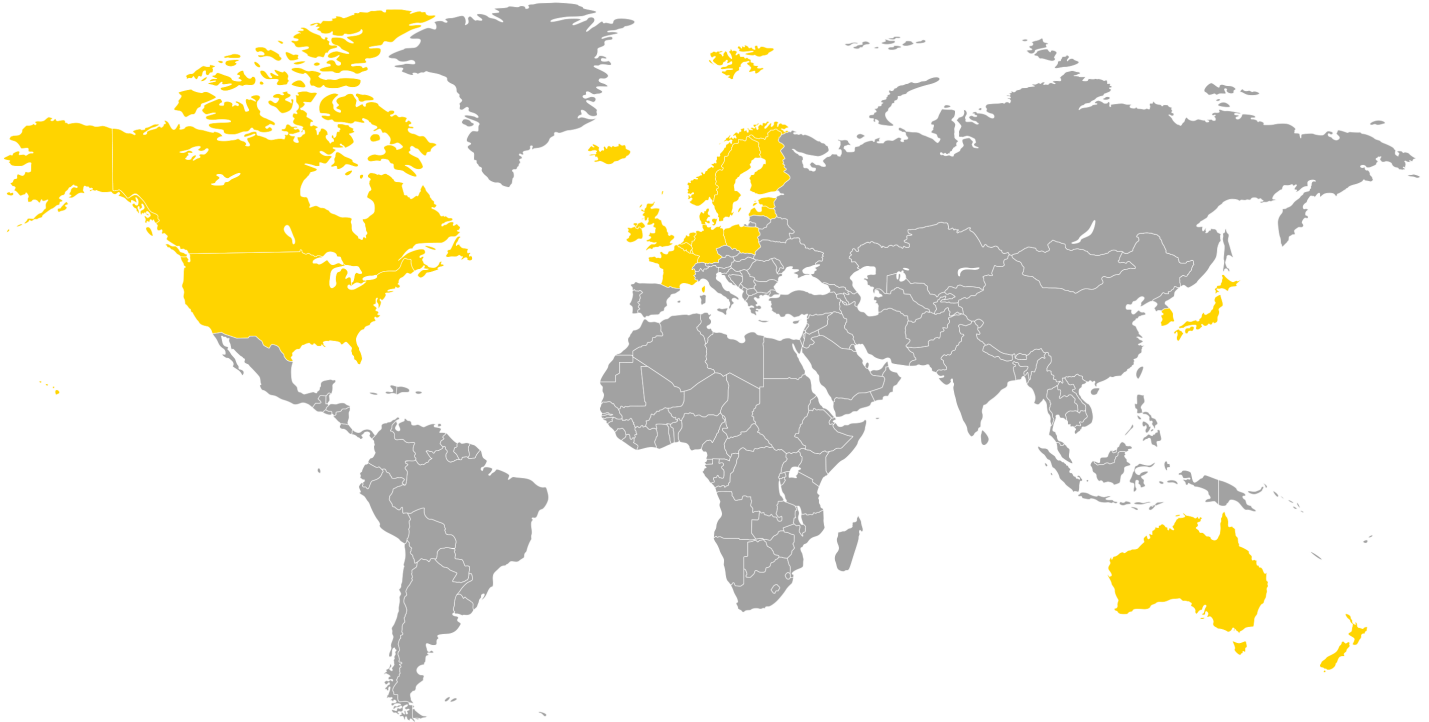
Original Instructions

## Preface

Dear Customer,  
Thank you for choosing a product from engcon.

engcon is the market leader in tiltrotators and tools for excavators. We represent innovation, knowledge and experience, and we develop our products with a focus on the customer's needs. Please visit our website for contact information and details about the rest of our product range.

[www.engcon.com](http://www.engcon.com)



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# 1. Introduction

## 1.1. General

This user manual contains important information about your product's functions and characteristics, and how to use it in the best way. Before you begin using the product, it is important that you read and understand the content of these instructions, especially the sections that address safety.

In addition to these instructions, you must study and understand the applicable safety information for the relevant base machine as well as any other equipment involved.

The user manual is supplied with supplementary documentation providing more detailed descriptions of the installation, fitting, operation and maintenance of control systems and custom modifications for your specific product.

Information, images, illustrations and specifications used in the instructions are based on product information that was available at the time of going to press. Images and illustrations used in the instructions are typical examples and not intended to be exact depictions of various parts of the product. We reserve the right to make changes without prior notice.

Always store the user manual together with any other supplementary information in a safe manner and such that it is always available.

## 1.2. Scrapping and recycling

engcon makes constant efforts to reduce its environmental impact. engcon's products comprise at least 99 per cent recyclable material. All assembly and service work must take place in compliance with legislation and ordinances governing the environment, health and occupational safety. This refers to all work with residual materials including handling, storage and processing. To prevent contamination of soil and water, spillages must be avoided. Should a spillage occur, it must be dealt with.

Hazardous waste may only be disposed of by those authorised to do so. All waste produced must be disposed of in compliance with applicable legislation and ordinances:

- Metal and plastics to be recycled.
- Hydraulic hoses are normally used for energy recovery (sort as hazardous waste).
- Oils and greases are normally used for energy recovery (sort as hazardous waste).
- Electronic components to be recycled for materials (sort as hazardous waste).
- Packaging to be sorted at source and recycled for materials.
- Paper to be sorted at source and recycled for materials.

If in doubt, contact the environmental manager at engcon.

## 1.3. Transport and storage

There are no lifting or attachment points on the tiltrotator. The tiltrotator may only be handled, moved or transported while strapped to a pallet.

When storing the piston rod of a cylinder for a long period, treat it with corrosion protection or push it inside the cylinder.

### 1.3.1. Temperature during operation and storage

Description	Temperature
Operating temperature	-30° to +50°C

Description	Temperature
Temperature range during storage	-30° to +50°C

## 1.4. Warranty

All customers receive a 2-year warranty on their tiltrotator.

We encourage you to register your tiltrotator to enjoy faster service. Visit [www.engcon.com](http://www.engcon.com) and search for "register your product".

## 1.5. Technical support and spare parts

Contact information for support and spare parts can be found at [www.engcon.com](http://www.engcon.com).

## 1.6. Product approval

### 1.6.1. EU Declaration of Conformity

Manufacturer: engcon Nordic AB  
 Address: Box 111, SE 833 22 Strömsund, SWEDEN  
 Telephone: + 46 670 178 00  
 Email: info@engcon.se

engcon hereby declares that the below is manufactured in conformance with Machinery Directive 2006/42/EU.

Type designation:	
Part no:	Serial No:
Max jacking point:	Max hydraulic pressure:
Date:	Other:

Because the following standards and regulatory directives are also applied, the product complies with the requirements for CE marking.

- EMC Directive 2014/30/EU
- SS-EN ISO 12100:2010, SS-EN 474-1:2022 och SS-EN 474-5:2022, SS-ISO 13031:2016
- ISO 10567:2007, SAE J2506:2012, SAE J1362:2018

This declaration and engcon's warranties will cease to be valid immediately if spare parts other than engcon original spare parts are used, or if any changes or other interventions are made without engcon's permission.



Krister Blomgren - Signatory for engcon Nordic AB

Qualified person authorised to compile the technical documentation:

Fredrik Jonsson, Head of R&D, engcon AB

## 2. Safety

### 2.1. General

It is important that you read and understand all warnings prior to installation work on this product or before you use it and any accessories supplied. The warning texts highlight potential risks and describe how to avoid them. The following warning levels are used in this user manual:

**DANGER**

Indicates that an accident will occur if the regulation is not followed.  
Risk of personal injury or death.

**WARNING**

Indicates that an accident may occur if the regulation is not followed.  
Risk of personal injury or death.

**CAUTION**

Indicates that an accident may occur if the regulation is not followed.  
Risk of personal injury.

**IMPORTANT**

Indicates that an accident may occur if the regulation is not followed. Risk of damage to property, process or the surroundings.

**REMARKS**

Specifies additional information that may make performance or understanding of specific operations easier.

## 3. Design and function

### 3.1. General

The engcon tiltrotator adds flexibility and efficiency to an excavator and allows it to be used for more operations. The product provides the ability to both tilt and rotate a tool.

### 3.2. Tool(s)

engcon's tiltrotators are designed to be used with engcon's hydraulic tools and tools that are type-approved in the base machine's operator's manual.

**DANGER**

**Do not exceed tipping load limits. The weight of the product and the increased reach may impair stability. Risk of personal injury and damage to property.**

### 3.3. Q-Safe

Q-Safe is a warning system that monitors the connection of tools to the machine quick hitch and/or the quick hitch beneath the tiltrotator. It has a double mechanical lock to prevent the tool coming loose from the hitch, even if some part of the locking system should fail. The alarm outputs are connected to a QLM module mounted on the stick. It uses sound and light warning signals when a tool is incorrectly connected, as the primary safety purpose of the quick hitch is to protect personnel nearby. The operator must inform personnel concerned what the alarms mean.

**WARNING**

**Stop work immediately and begin troubleshooting if the system warns of a faulty tool connection during operation. Risk of personal injury and damage to property.**

**CAUTION**

**Use hearing protection when close to or handling the Q-Safe quick hitch when it is connected. Risk of hearing damage.**

## 3.3.1. Overview

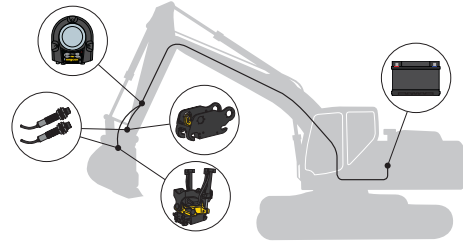
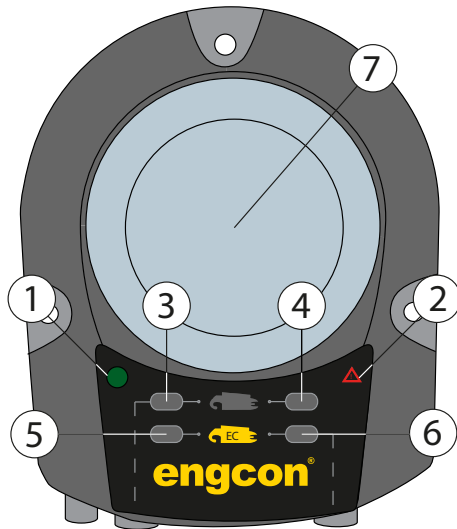


Figure 1.

Position	Description
1	Power supply
2	Alarm indication
3	Sensor, machine hitch hook
4	Sensor, machine hitch ejector
5	Sensor, quick hitch hook
6	Sensor, quick hitch ejector
7	Warning lamp

Table 1.

For indications, see section 7.1.1. Indications

### 3.4. EC-Oil

engcon's system for more efficient tool changes. It provides the ability to switch hydraulic tools without leaving the cab. The system is designed for maximum reliability in harsh environments. It is a fully hydraulic system that handles the connection of tools under full system pressure.

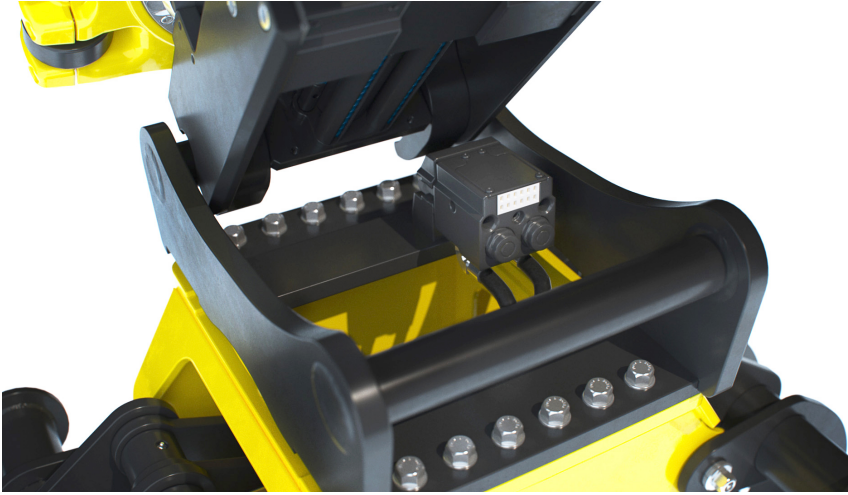


Figure 2.

## 4. Installation

It is important to check the necessary additional documentation before installation. At time of delivery, your product and supplementary documentation are as far as possible adapted to your base machine.



### WARNING

Never attempt to increase the maximum capacity of the equipment by modifications not approved by the supplier. Risk of personal injury and damage to property.



### WARNING

Welding is not permitted. It can have a negative impact on safety. Risk of injury and damage to property. For welding, contact your dealer or engcon AB.



### WARNING

Beware of moving parts. A lack of awareness may lead to crush injuries. Risk of personal injury.

### 4.1. Oil

On delivery, your product is filled with Fuchs Hydraway White 46, a white oil-based hydraulic oil.

An oil drain pan must be available during installation.

T and P are labelled with:



### IMPORTANT

Ensure miscibility with the base machine's hydraulic oil prior to installation. If you are in any doubt, contact your lubricant supplier. An incorrect mixture could damage hydraulic components.

### 4.2. Identification

Check that your product's rating plate matches the information on the EU Declaration of Conformity. If there is any deviation, contact the supplier before you begin initial installation.

The rating plate is located on the tiltrotator yellow body.

**Rating plate content:**

Part number  
Type designation  
Serial number  
Year of manufacture  
Weight  
Max jacking point  
Max hydraulic pressure

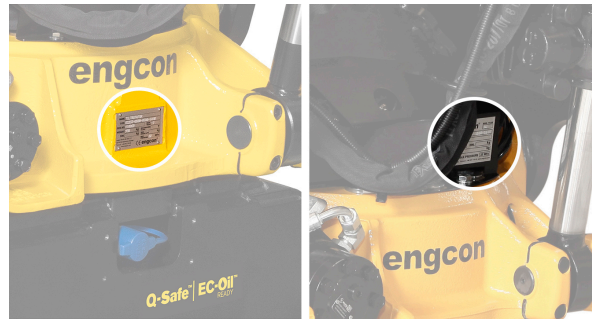


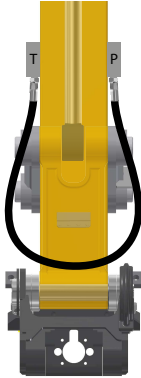
Figure 3.

### 4.3. Electrical and hydraulics



For electrical and hydraulic hose installation, refer to the separate installation instructions supplied with the selected control system. Also available on the website or by contacting engcon.

#### 4.3.1. Filter the hydraulic oil



1. Connect a hydraulic hose between (P) and (T) on the excavator's hydraulic circuit.
2. Open shut-off valves for (P) and (T).
3. Run the hydraulic oil through the excavators oil filter for approximately 3 minutes to make sure that the hoses and pipes are clean.
4. Close shut-off valves for (P) and (T).
5. Remove the hydraulic hose from the excavator's hydraulic circuit.

#### IMPORTANT

Maintenance and repair of the electrical system may only be carried out by professionally qualified persons.



#### WARNING

Switch off power when working on the electrical system and remove any live objects before starting work Risk of personal injury.



#### WARNING

Be meticulous with the insulation of electrical conductors and components when installing/fitting electrical equipment. Short circuits in electrical wiring can result in fires.

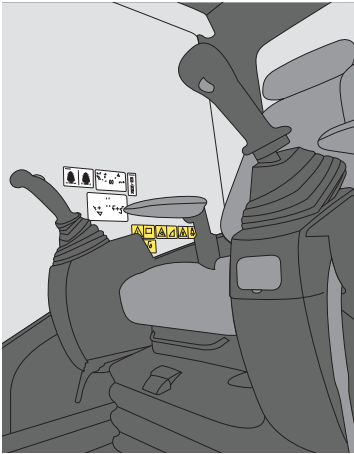
#### 4.3.2. Q-Safe



See separate installation instructions. Also available on the website or by contacting engcon.

## 4.4. On completion

### 4.4.1. Apply decals



Affix the warning decal supplied in a conspicuous place in the cab where it does not distract the operator.



**WARNING**  
Replace damaged or illegible signs and decals before using the machine. Risk of personal injury and damage to property.

### 4.4.2. Function check

Carry out a function test according to the following items.

- Run all the tiltrotator functions a few times to remove any air from the system. Important for preventing uncontrolled movement.
- Check that the tiltrotator functions according to section 5.4. Manoeuvring.
- Make sure the tool operates when the hydraulics are activated.
- Check that hoses and cables are not exposed to wear or pinching.

## 5. Operation

### 5.1. Before and during use

Check your base machine manufacturer's recommendations for calculating tipping loads, and be sure to include the increased weight and reach the product entails.

**DANGER**

Do not exceed tipping load limits. The weight of the product and the increased reach may impair stability. Risk of personal injury and damage to property.

The tiltrotator may be used only for the brackets and tools it is intended for.



See additional information in the separate user manual for each tool.

**WARNING**

Take care when handling long objects. Take dynamic load and the extended risk area into account. Risk of personal injury and damage to property.

**WARNING**

Always make sure of a good grip when handling objects. Risk of personal injury and damage to property.

**WARNING**

Using the tiltrotator to lift people or work platforms is prohibited. Risk of personal injury and damage to property.

**IMPORTANT**

Check the base machine's specified max capacity. Any use of the product in excess of base machine max capacity may damage the machine.

## 5.2. Lifting points

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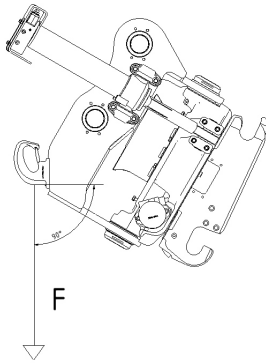


Figure 4.

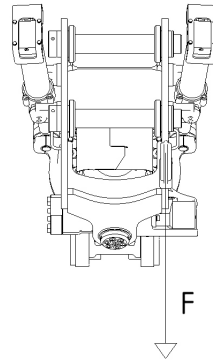


Figure 5.

Not approved

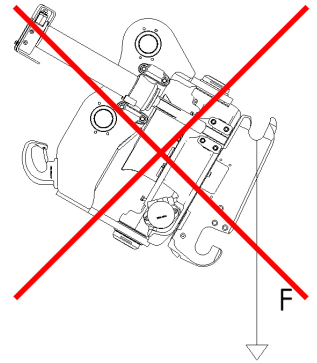


Figure 6.

Check the maximum permitted load for the lifting point as stamped on the lifting hook / lug and rating plate. Designed with safety factor 5:1.



### WARNING

The base machine must be equipped with a load-holding valve on the boom/stick and an overload warning when using a jacking point on the tiltrotator. Risk of injury and damage to property.

## 5.3. Tool(s)



### WARNING

Do not use a grab when handling standing trees. Risk of injury and damage to property.

### 5.3.1. Grab saw

Do not use the tiltrotator with a grab saw when felling trees.

### 5.3.2. Hydraulic hammers

The use of hydraulic hammers together with the tiltrotator is not recommended as this leads to increased wear.

### 5.3.3. Augers

The use of augers together with the tiltrotator is not recommended as this leads to increased wear.

### IMPORTANT

Avoid rotation for extended periods; it can cause the worm gear to overheat. Risk of property damage.

### 5.3.4. Pallet forks

When using pallet forks, the tiltrotator's cylinders must be fitted with load-holding valves. If uncertain, contact your supplier.

To avoid overloading the quick hitch locking pins, the pins must be turned away from the forklift tines.



**WARNING**

The excavator arm system cylinders must be fitted with valves to prevent the load from dropping in the event of a hose failure. Risk of personal injury and damage to property.



**WARNING**

When using pallet forks together with the tiltrotator, exercise caution and manoeuvre carefully. The load can easily fall off during rapid rotation or tilting.

### 5.3.5. Crane boom

The tiltrotator may not be used together with a crane boom. During crane boom operation, the tiltrotator must be disconnected from the carrier.

## 5.4. Manoeuvring

The functions described for each control system apply to the recommended installation/configuration. Deviations may occur depending on the user's preferences for alternative button functionality and configuration.

### 5.4.1. DC3 Control System

The engcon control system allows simultaneous operation of all functions.



Refer to separate user manual supplied on delivery. Also available on the website or by contacting engcon.

## 5.5. Changing tools



Refer to separate user manual supplied on delivery. Also available on the website or by contacting engcon.

## 5.6. Work under water

We do not recommend work under water as this leads to increased wear and risks reducing tiltrotator service life. Work in brackish or salt water will reduce the service life of EC-Oil electrical connectors by more than half.

### 5.6.1. Before performing work under water

- Fill the tiltrotator with grease as described in section 6.3.3. Worm gear lubrication. Ideally, use grease that is more water repellent. Always check with your dealer to ensure miscibility.
- Fill all connectors with contact grease. Ideally, use contact grease that is water repellent.
- Check the condition of the O-ring between the rotator frame and the quick hitch. See section 9.1.1. Overview.

### 5.6.2. After performing work under water

- Always finish the working day by rotating, tilting and filling grease via the central lubrication to expel water from bearings.

- Apply oil to shiny surfaces.

## 6. Maintenance

Daily maintenance is essential for ensuring optimal function of your product. Neglected maintenance may result in loss of warranty.



### DANGER

Check the attachment points regularly and be alert for the formation of cracks. Risk of personal injury and damage to property.



### WARNING

Make sure that service and maintenance is carried out according to the manufacturer's recommendations. Inadequate maintenance may cause defects on the base machine and its equipment.



### WARNING

When changing hoses, only hoses with press couplings may be used. Screw connections may not be used. Risk of personal injury and damage to property.

### 6.1. General

Scheduled greasing and inspections to be performed by the operator:

- **Daily:** To be performed according to section 6.2. Daily inspections and 6.5. Special maintenance before the working day is begun.
- **Every 8 operating hours:** Lubrication according to section 6.3.2. Lubrication every 8 operating hours.
- **Every 250 operating hours:** Perform according to section 6.4. Service every 250 operating hours.

In addition to the above, service must be performed by a service technician during the first machine service or no later than 500 operating hours. Then at 500-hour intervals according to section 11.1. Service schedule.

Fill in section 11.3. Service record after completed service.

### IMPORTANT

Review the personal and environmental risks of hydraulic oil and grease by reading the safety data sheets for the hydraulic oil and grease in use. Risk of personal injury and damage to surroundings.

### IMPORTANT

Be sure to keep your product clean. Inadequate cleaning can cause damage to your equipment.

### 6.2. Daily inspections

Check that:

- Visible fasteners are tightened (see section 6.8. Tightening torque).
- The shaft journal lock attachment points are not loose.
- No damage or cracks are present.
- The tiltrotator is correctly attached to the machine and tool.
- Warning decals are present and legible.
- The quick hitch is clean, without visible damage and is functioning normally.
- No breakout play or rotational play is present (see section 6.6. Breakout play and rotational play).
- There are no hydraulic leaks.
- No grease leakage is present on hoses or in connectors.
- The QLM electronics modules signals correctly when attaching and detaching tools.



**WARNING**  
Avoid contact with hydraulic oil. Risk of burns.



**WARNING**  
Never use your hands to search for leaks in the hydraulic system. Use the necessary protective equipment. Pressurised hydraulic oil can penetrate the skin. Risk of personal injury.



**WARNING**  
Beware of moving parts. A lack of awareness may lead to crush injuries. Risk of personal injury.



**WARNING**  
The hydraulic system must be de-pressurised before work on the system is begun. Risk of personal injury and damage to property.

### 6.3. Tiltrotator lubrication

The tiltrotator has sliding bearings that require daily greasing; it is fitted with a progressive central lubrication system.

Blockage in one grease channel will entail blockage of the entire lubrication system. Use pre-filled hoses when replacing lubrication hoses; this is especially important when the tiltrotator is connected to the base machine's lubrication system.

For troubleshooting, contact your service partner or engcon AB.

#### 6.3.1. Grease recommendation

The tiltrotator's worm gear is factory filled with the recommended lithium-based universal grease (NLGI 2). This grease is often miscible with other greases of similar type.

Always check with your dealer to ensure miscibility. The use of inferior grease categories will lead to increased consumption.

**IMPORTANT**

Do not use greases containing solid particles such as molybdenum, graphite or copper. Such particles can lead to failure of the lubrication block.

**IMPORTANT**

Ensure the highest possible cleanliness when greasing or connecting the lubrication system. The lubrication system is sensitive to dirt.

**IMPORTANT**

Grease with a higher base oil viscosity will be required in greater quantities during heavy excavation and when using hydraulic tools.

### 6.3.2. Lubrication every 8 operating hours

**IMPORTANT**

Never add greater quantities of grease via central lubrication as over lubrication will damage the seals in certain places.

**IMPORTANT**

The quantities of grease specified refer to the minimum quantity that must be added.

#### 6.3.2.1. Manual lubrication

EC309: 15g | EC314: 20g | EC319: 20g | EC226: 25g | EC333: 35g

Grease the tiltrotator by removing the protective cap from the grease nipple and connecting a grease gun. Grease the tiltrotator until grease forces its way out at all axles and bearings. Wipe the grease nipple and nozzle thoroughly clean before attaching the grease gun.

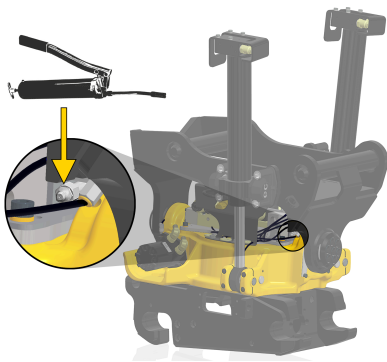


Figure 7.

### 6.3.2.2. Automatic lubrication

The distribution block on the tiltrotator is of progressive type and distributes the grease to all connected grease points automatically. The distributor delivers the grease to the grease points one by one. This makes sure no grease point goes without. The system can be connected to the base machine's automatic lubrication system.

Replace the grease nipple on the distribution block with a suitable hose connection (the thread in the distributor is M10x1) and connect the hose from the base machine's lubrication system. To deliver grease to the tiltrotator, always check that the valve supplied and the pump's operating settings provide the correct volume and that system pressure is sufficiently high (max 300 Bar).

#### IMPORTANT

In winter, a higher system pressure is required for tiltrotator lubrication.

#### IMPORTANT

Check regularly that new grease is supplied to the tiltrotator.

### 6.3.3. Worm gear lubrication

1. Remove the protective cover on the left side of the tiltrotator and the plug on the bolted joint.
2. Clean and remove all grease from the hole where the plug was installed.
3. Rotate the worm wheel anticlockwise and note if grease accumulates in the hole.

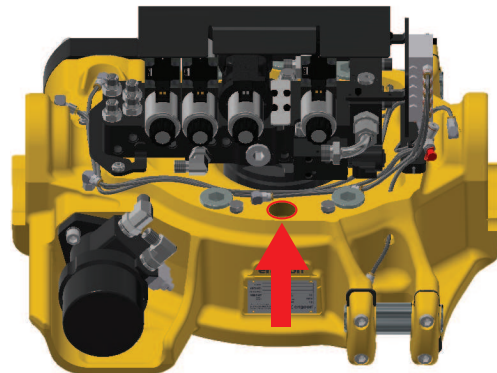


Figure 8. Plug

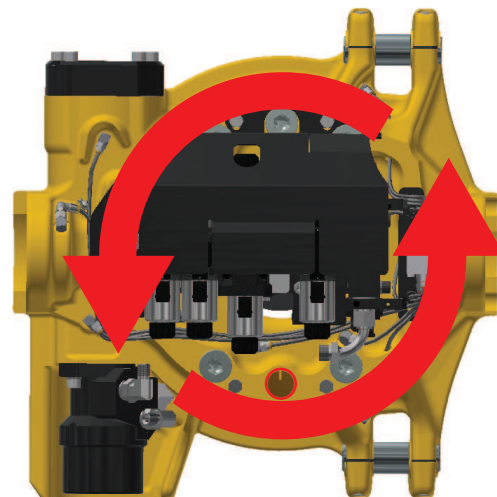


Figure 9. Rotation

4. If grease accumulates in the hole, no grease need be added. Otherwise add grease (while rotating if possible) and repeat step 3.

**WARNING**

**Beware of moving parts. A lack of awareness may lead to crush injuries. Risk of personal injury.**

## 6.4. Service every 250 operating hours

To be checked by the operator; complete section 11.3. Service record.

- Review according to section 6.2. Daily inspections.
- Check the grease level according to section 6.3.3. Worm gear lubrication.
- Check the central lubrication system for any leaks at connections.
- Check the tilt axles according to section 6.4.1. Tilt axle checks.

### 6.4.1. Tilt axle checks

#### 6.4.1.1. Shimming, tilt upper section

1. Make sure the tilt upper section abuts the base machine by using a suitable tool as a wedge. Insert the tool between the rotator body and the tilt upper section where the tilt axle points away from the cab.
2. Undo the tilt axial washer's two bolts.
3. Install shims on the inside of the tilt axial washer where the tilt axle points towards the cab.
4. Refit the tilt axial washer.

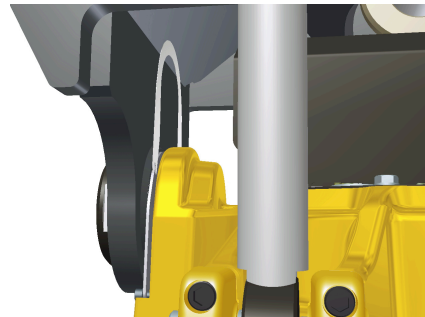


Figure 10.

#### 6.4.1.2. Tightening the tilt axle

1. Undo the tilt axle cover bolts
2. Tighten the bolts concealed behind according to 6.8. Tightening torque
3. Reinstall the tilt axle cover

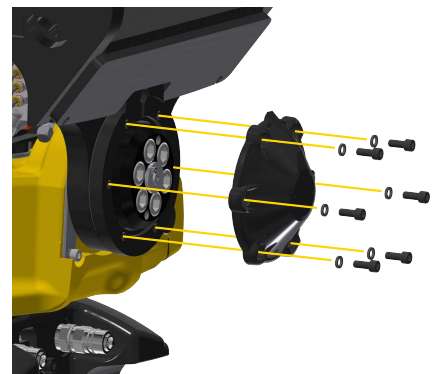


Figure 11.

## 6.5. Special maintenance

### 6.5.1. EC-Oil

#### Cleaning

- Clean oil connections, electrical connectors, grease connections and dirt guards before and after use in order to avoid oil or grease leakage and safeguard EC-Oil function.
- If oil or grease leakage occurs despite cleaning, we recommend face seal replacement.
- Clean electrical connectors daily and spray with water repellent.



Figure 12.

#### Replacing face seals

Applies to hydraulic connectors on quick hitches.

1. Remove the existing face seal with the aid of a sharp tool.
2. Carefully install the new face seal by hand.

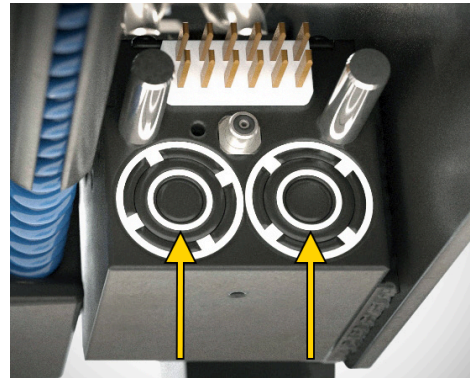


Figure 13.

EC-Oil	Face seal	Part number
ECO40-50	3/8"	1052976
ECO60	1/2"	1050018
ECO70	3/4"	1050580
ECO80	1"	1056072

**REMARKS**

Install the tapered face seal with a narrow edge outward.

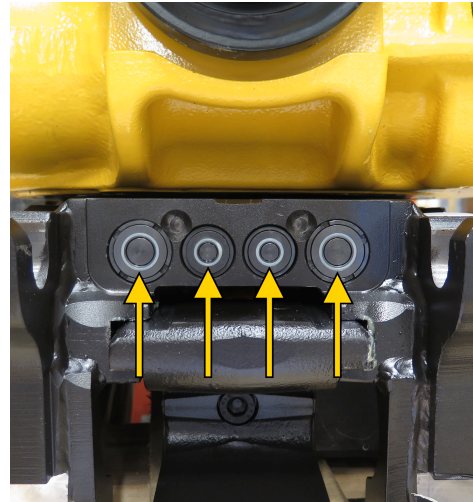


Figure 14.

## 6.6. Breakout play and rotational play

**IMPORTANT**

No tool may be connected during checks.

The following tools are required for checking lateral and rotational play:

- Extended 10 mm Allen key.
- Dial indicator with magnetic base.
- Long hexagonal socket
- Crowbar.



### 6.6.1. Checking lateral play

1. Raise the tiltrotator to a comfortable working height and switch off the machine.
2. Remove the protective cover on the left side of the tiltrotator and the plug on the bolted joint.
3. Clean and remove all grease from the hole where the plug was installed.
4. Rotate the worm wheel until a free surface without a bolt head is visible.
5. Lower the tiltrotator and press it against firm, level ground.

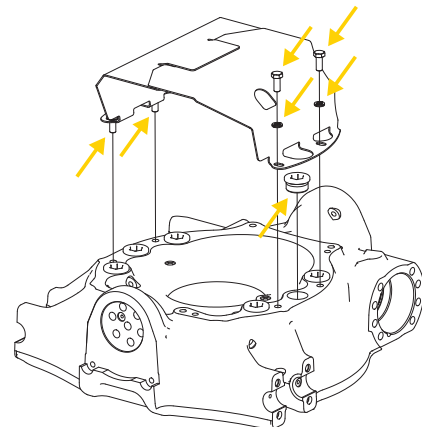


Figure 15. Remove the protective cover.

6. Insert the hex socket into the hole, making sure it connects with the worm wheel.
7. Mount the dial indicator with the magnetic base and zero the dial gauge to the top of the hex socket.
8. Carefully raise the tiltrotator off the ground and read the clock.

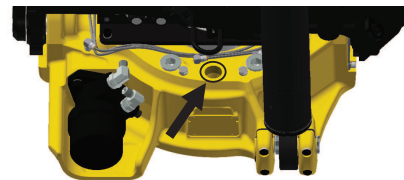


Figure 16. Free surface without bolt head.

EC309-333	Remarks
< 0,10mm	Requires action immediately.
0,10-0,25mm	Correct lateral play
0,26-0,35mm	Requires action soon.
> 0,35mm	Requires action immediately.

9. Using the crowbar as a lever, read off any changes on the dial gauge.

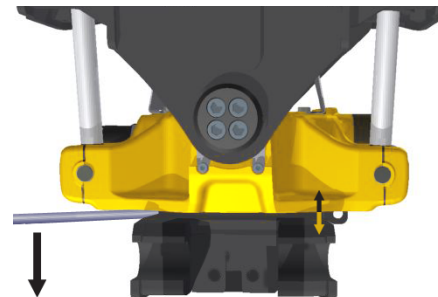


Figure 17. Prise apart with a crowbar.

### 6.6.2. Checking rotational play

1. Use the crowbar to move the quick hitch to the left.
2. Remove the motor bolts and the motor.
3. Clean the worm screw thoroughly and remove all grease.
4. Mount the dial indicator on the rotatorbody and reset the clock against the end of the worm screw.
5. Use the crowbar to move the quick hitch to the right and read off the clock.

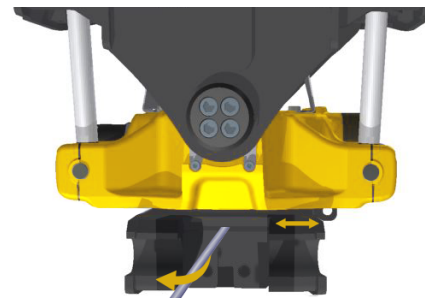


Figure 18. Rotate the quick hitch to the left.

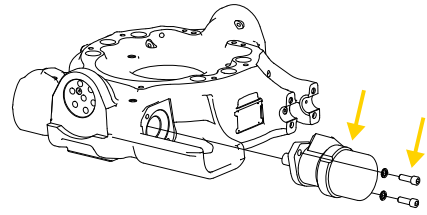


Figure 19. Remove the motor.

EC309-333	Remarks
< 0,12mm	Adjustment required
0,12-0,20mm	Correct rotational play
> 0,20mm	Adjustment required

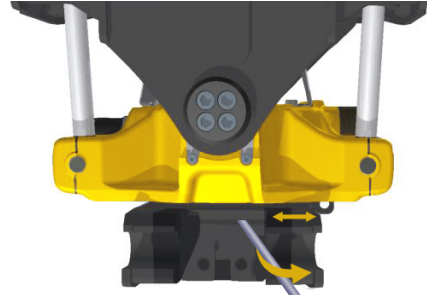


Figure 20. Rotate the quick hitch to the right.

#### REMARKS

We recommend adjustment be carried out by a specialist in a workshop.

#### 6.6.2.1. Significance of rotation play

Play of less than 0.12 mm will cause early overheating. Play greater than 0.25 mm will have a leverage effect causing impact and shocks to destroy the lubrication film between the thrust washers.

#### REMARKS

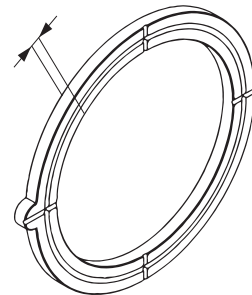
Lack of lubrication can deform the thrust washers.

#### 6.6.3. Thrust washers

Check that the thrust washers are flat.

**Max wear:** Min 4.5 mm

We always recommend the installation of new thrust washers before adjusting.



#### 6.6.4. ePS

Your tiltrotator is fitted with an engcon rotation sensor; it must be calibrated after service.

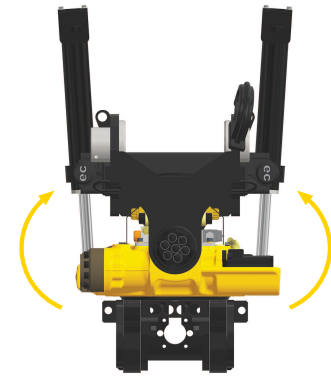
## 6.7. Testing load-holding valves

A lever is required when testing load-holding valves.

Load the tilt function in both directions; it must not move.

If it moves, replace the load-holding valve on the cylinder that can be extended (on the side where the tilt upper section moves away from the rotator body).

See also section 9.1.1. Overview.



## 6.8. Tightening torque

The rotator section is dimensioned to cope with major shear loads and torsional loads. For reasons of strength, it is essential that certain fasteners be torque tightened.

Bolts and threaded holes must be thoroughly clean.

### EC309

Fastener	Dimension	Quality	Quantity	Torque
Screw cap	M12	12.9	8	136 Nm
Quick hitch	M14	12.9	12	217 Nm
Yoke bracket	M16	12.9	8	333 Nm
Tilt axle	M16	12.9	8	333 Nm
Clamping half	M10	12.9	8	79 Nm
Hydraulic motor	M12	12.9	2	136 Nm

\*Only needs to be tightened during the first service after installation.

Table 2.

### EC314

Fastener	Dimension	Quality	Quantity	Torque
Screw cap	M12	12.9	8	136 Nm
Quick hitch/ Worm wheel*	M16	12.9	12	333 Nm
Yoke bracket	M16	12.9	8	333 Nm
Tilt axle	M16	12.9	14	333 Nm
Clamping half	M10	12.9	8	79 Nm
Hydraulic motor	M12	12.9	2	136 Nm

\*Only needs to be tightened during the first service after installation.

Table 3.

**EC319**

Fastener	Dimension	Quality	Quantity	Torque
Screw cap	M12	12.9	8	136 Nm
Quick hitch/ Worm wheel*	M20	12.9	12	649 Nm
Yoke bracket	M16	12.9	8	333 Nm
Tilt axle	M16	12.9	14	333 Nm
Clamping half	M12	12.9	8	136 Nm
Railway grab, grab axle	M20	12.9	2	649 Nm
Hydraulic motor	M12	12.9	2	136 Nm

\*Only needs to be tightened during the first service after installation.

Table 4.

**EC326**

Fastener	Dimension	Quality	Quantity	Torque
Screw cap	M14	12.9	8	217 Nm
Quick hitch/ Worm wheel*	M20	12.9	12	649 Nm
Yoke bracket	M16	12.9	8	333 Nm
Tilt axle	M16	12.9	18	333 Nm
Clamping half	M20	12.9	8	136 Nm
Railway grab, grab axle	M20	12.9	2	649 Nm
Hydraulic motor	M12	12.9	2	136 Nm

\*Only needs to be tightened during the first service after installation.

Table 5.

**EC333**

Fastener	Dimension	Quality	Quantity	Torque
Screw cap	M12	12.9	12	136 Nm
Quick hitch/ Worm wheel*	M20	12.9	20	649 Nm
Yoke bracket	M16	12.9	8	333 Nm
Tilt axle	M20	12.9	16	649 Nm
Clamping half	M14	12.9	8	217 Nm
Railway grab, grab axle	M20	12.9	2	649 Nm
Hydraulic motor	M12	12.9	2	136 Nm

\*Only needs to be tightened during the first service after installation.

Table 6.

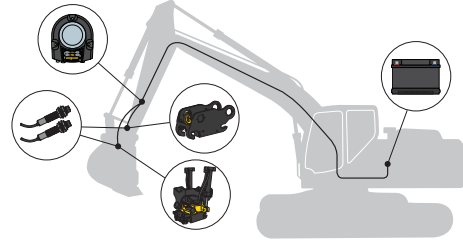
**EC-Oil hydraulic connectors**

Type	Fastener	Quantity	Torque
ECO40-80	Hydraulic connector ECO	2	60 Nm

Table 7.

## 7. Troubleshooting

### 7.1. Q-Safe



#### 7.1.1. Indications

Position	Behaviour	Indicates	Remarks
1	2 flashes ** ** *	Power supply OK	
2	1 flash * * *	CAN time out	
	2 flashes ** ** *	Short circuit, power to sensor in EC	Applies when starting up the system
	3 flashes *** ** *	Short circuit, power to sensor in RF	Applies when starting up the system
	3 flashes *** ** *	Short circuit, power to sensor in EC	
	Inactive	No fault	
3	Constant light	Connected tool	Sensor, hook for quick hitch on machine
4	Constant light	Connected tool	Sensor, ejector for quick hitch on machine
5	1 flash * * *	Tiltrotator removed	
	Constant light	Connected tool	Sensor, hook for quick hitch underneath tiltrotator
6	1 flash * * *	Tiltrotator removed	

Position	Behaviour	Indicates	Remarks
	Constant light	Connected tool	Sensor, ejector for quick hitch underneath tiltrotator
7	Flashing white and intermittent siren (normal behaviour during the connection sequence)	Unsafe tool connection	Check attachment

*Table 8.*

*For overview, see section 3.3.1. Overview*

## 8. Decals

Machine instructions, decals and warning signs must be kept clearly legible. Contact your supplier to order replacements.



### 8.1. Warning decals

#### 8.1.1. Warning decals in cab

The decals are usually placed to the right of the operator in clearly visible locations.

##### 8.1.1.1. 9000157



Figure 21. Warning decal to the right of operator.

#### 8.1.2. Warning decals on product

##### 8.1.2.1. 980101




Figure 22. Warning decal on the tilt cylinder.

8.1.2.2. 9000338



Figure 23. Warning decal on locking cylinder.

8.1.3. Symbol legend

-  Important to subtract tiltrotator weight when calculating lifts.
-  Rotating equipment hazard. Stay clear of rotating equipment.
-  Tilting equipment hazard. Stay clear of tilting equipment.
-  Take care when handling long objects. Bear in mind inertia and the extended risk area when handling long objects.
-  Falling material hazard. Never stand under or pass beneath a raised tool.
-  Keep clear. Moving and rotating equipment. Hazard zone 10 feet.
-  Crushing hazard. Stay clear of moving parts.
-  Tipping hazard. Never exceed the base machine's approved tipping load.



Suspended load hazard. Stay clear of suspended loads.

Read and understand the user manual before operating this machinery.

## 9. Technical data

The illustration shows a typical configuration. Technical data may vary.  
We reserve the right to make changes without prior notice.

### 9.1. Tiltrotator

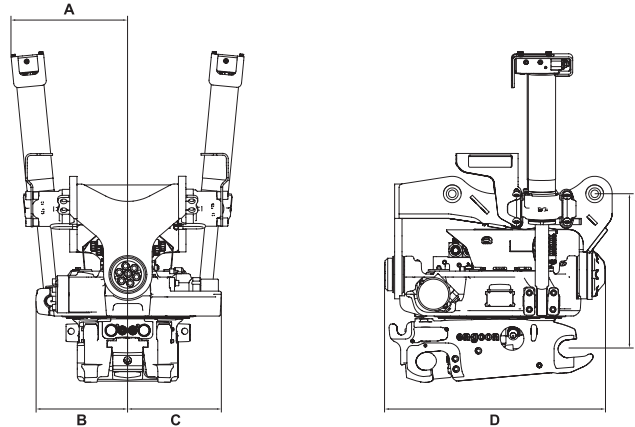


Figure 24.

Description	Unit	EC309	EC314	EC319	EC326	EC333
Max machine size	kg	9000	14,000	19,000	26,000	33,000
Standard bracket		S45	S60	S60	S70	S80
Width (A)	mm	342	355	392	447	501/581
Width (B)	mm	250	285	315	340	385
Width (C)	mm	273	303	310	340	385
Length (D)	mm	561	665	745	750	878
Construction height (E)	mm	485	508	517	638	720
Weight	kg	332	440	541	810	1015
Rec hydraulic flow	l/min	120	120	120	160	160
Max hydraulic pressure	MPa	22	22	22	22	25
Tilt angle	°	2×45	2×45	2×45	2×45	2×45
Rotation	°	∞	∞	∞	∞	∞
Electrical system	V	12/24	12/24	12/24	12/24	12/24

Description	Unit	EC309	EC314	EC319	EC326	EC333
Max breakout torque	kNm	74	126	186	270	340
Max bucket width	mm	1300	1600	1,700	2000	2200

Description	Unit	EC309	EC314	EC319	EC326	EC333
Rec max return line pressure	MPa	2.5	2.5	2.5	2.5	2.5
Max hydraulic flow EXTRA	l/min	120	120	120	160	160
Number of EXTRA ports	pcs	4	4	4	4	4
Dimension EXTRA ports	inches	1/2"	1/2" + 3/4"	1/2" + 3/4"	3/4"	3/4"
Tilt duration from end position to end position	s / l/min	3,1/40	3,1/50	3,1/63	3,1/86	3,1/97
Rotation duration for one rotation under hydraulic flow	s / l/min	7,1/40	7,1/50	7,1/63	7,1/86	7,1/97

### 9.1.1. Overview

Pos.	Designation
1	Bushing (tilt axle)
2	Tilt upper section
3	Tilt cylinder
4	EC-Oil block
5	Load-holding valve
6	Spherical bearings
7	Tilt sensor
8	Yoke bracket
9	Tilt axle
10	Shim set, tilt axle
11	Clamping half
12	Cylinder axle
13	Hydraulic motor
14	Central lubrication
15	Valve block and swivel
16	Shim kit, (screw cap)
17	Metal cover
18	Rotation sensor
19	Screw cap
20	Axial washer
21	Worm screw
22	Rotator frame
23	Worm wheel
24	Bearing ring
25	Quick hitch
26	Locking cylinder
27	EC-Oil block



## 9.2. Load-holding valve

Listed below are the torques required to defeat the load-holding valves on the tilt cylinders.

Description		EC309	EC314	EC319	EC326	EC333
Torque	Nm	18,000	22,000	41,000	45,000	68,000

## 10. Glossary

### 10.1. Abbreviations

Term	Description
BCM	Base Control Module
C2C	CAN to CAN
DC3	Digging Control 3
EC	engcon (Engström Construction)
eML	engcon Machine Link
ePS	engcon Positioning System
eTT	engcon Technician Tool
MCM	Machine Control Module
MGM	Master Gateway Module
MIG2	Microprop Grip 2
QLM	Q-Safe Light Module
QPM	Quick hitch Panel Module
QSC	Quick hitch Standard Control
TM3	Tiltrotator Module 3

## 11. Service



### WARNING

Make sure that service and maintenance is carried out according to the manufacturer's recommendations. Inadequate maintenance may cause defects on the base machine and its equipment.



### WARNING

Make sure the locking cylinder is in its maximum extended position before removing the locking hook. Risk of injury and damage to property.



### WARNING

Welding is not permitted. It can have a negative impact on safety. Risk of personal injury and damage to property. For welding, contact your dealer or engcon Nordic AB.

### 11.1. Service schedule

#### 11.1.1. Service every 500 operating hours

To be performed by a service technician during the first machine service or no later than 500 operating hours. Then every 500 operating hours.

Fill in section 11.3. Service record.

- Check the product compliance with the rating plate and user manual.
- Complete check items according to section 6.2. Daily inspections.
- Tighten bolted joints according to section 6.8. Tightening torque.
- Check connectors and cabling for wear and pinching.
- Check hoses for wear and pinching.
- Perform tests according to section 6.7. Testing load-holding valves.
- Check the tilt axles according to section 6.4.1.1. Shimming, tilt upper section.
- Check lubrication according to section 6.3. Tiltrotator lubrication .
- Perform function checks according to section 4.4.2. Function check.
- Perform checks according to section 6.6. Breakout play and rotational play.
- Visual inspection of bushings and spherical bearings; see section 9.1.1. Overview.

#### 11.2. Service every 250 hours

To be performed by the operator according to section 6.4. Service every 250 operating hours.

### 11.3. Service record

On the service record, there is space to note actions performed on the product that these instructions for use refer to. Specify the date of the action, what was done and who did it. Service partners may also use a stamp in the space provided. This will make sure your product is a safe buy for any future owner.

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