



# Service manual for Tiltrotators

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## Table of Contents

Introduction .....	5
General Maintenance .....	5
Steelwrist Support Structure .....	5
Installation of G2 module .....	7
Instructions .....	7
Replacing the Worm gear .....	9
Removing the Worm gear .....	9
Installing the Worm gear .....	10
Replacing the Grab arm .....	11
Removing the Grab arm .....	11
Installing the Grab arm .....	12
Replacing the locking valve .....	13
Removing the lock valve .....	13
Installing the lock valve .....	14
Replacing the lock cylinder .....	15
Removing the lock cylinder .....	15
Installing the lock cylinder .....	16
Replacing gasket in the swivel .....	18
Instructions .....	18
Radial and axial play .....	20
Tightening torque tiltrotator .....	21
Tightening torque shafts locked with expander cones .....	21
Tightening torque for the hydraulic adapter and hose couplings .....	22



# Introduction

## General Maintenance

It is important to carry out regular inspections and maintenance to ensure that the tiltrotator functions without problems during its entire service life. All safety instructions must be followed during the maintenance work.



### NOTE

When in contact with your supplier or Steelwrist regarding maintenance, service or spare parts it is always good to have the serial number of your tiltrotator available. The serial number is found in [EG-försäkrän om överensstämmelse 2016](#) and on the machine plate that is mounted on the tiltrotator.



### WARNING

The person who shall carry out inspection, maintenance and service must have sufficient knowledge for carrying out the work in question.



### CAUTION

Hydraulic lines may be under pressure. Make sure to relieve the system pressure before work is started.



### CAUTION

When using spare parts, original Steelwrist spare parts should be used. Steelwrist is not responsible for non-original spare parts and their impact on other parts of the product.

Table 1. Intervals for maintenance and lubrication

Time	Carried out by	Documented in the service protocol
On delivery of the machine	Installer	-
Daily	Operator	-
Weekly	Operator	-
At 250 hours	Operator	Yes
At the first machine service or at the latest at 500 operating hours	Professional	Yes
Periodically every 1500 operating hours or at the latest 1 year	Professional	Yes

Complete the service protocol after each service. Contact Steelwrist or dealer in the event of uncertainty.

## Steelwrist Support Structure

Our goal is to give you as installation technician of Steelwrist products the best support possible. You can reach Steelwrist Support Line on telephone number +46 8 6260712 where you can turn for answers to questions.

In addition there is the documentation you might need even at Steelwrist Supportweb

([www.steelwrist.se](http://www.steelwrist.se)) where you can log in as user (click Distributor login).

If you do not already have a login on the Support web you can sign up for login on the website by clicking the "Distributor Login" and then "Register".

## Installation of G2 module

These instructions go through how to install the G2 module for control system 10 on X12-X32.



### IMPORTANT

- Do not trap or pinch cables and hoses. Use cable ties.
- Before removing previously installed cables, compare with how these instructions state that cables should be connected. If they differ, mark how the cables were previously installed and install accordingly. Rotor A and B must still be switched.
- Check that the contacts are properly inserted.
- If possible, test operate before installing the protective panel.
- If there are no cut-outs at the bottom of the protective panel, the protective panel must be replaced to carry out the installation.

## Instructions



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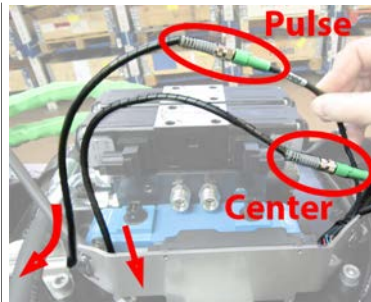


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1. Ensure that the G2 module is mounted and that the cables are secured with cable ties as in image 1001.
2. Remove the protective panel as well as the screws and the washers where the G2 module is to be installed, see 1002.

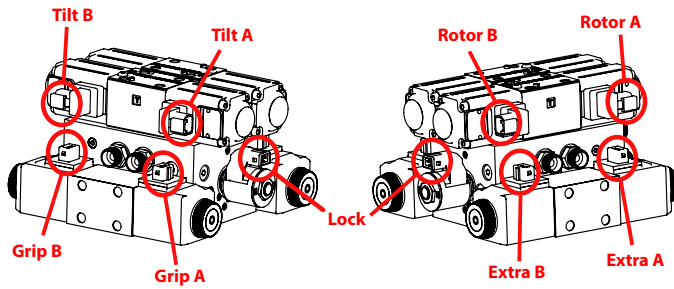


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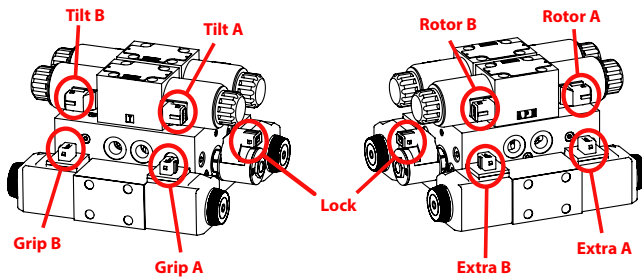
3. Mount the panel with the G2 module, see image 1003.
4. Connect the Pulse and Center cables as per the image. The Pulse cable is easy to identify as it runs down under a small protective panel, see image 1004.



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#### 5. Cable installation for G2 on X18-X32 CS10

Image 1008 shows where the cables are to be connected. The different connection points are marked and must be followed, with the exception of Rotors A/B which must be switched with each other. All cables are marked.



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#### 6. Wiring installation for G2 on X12 CS10

Image 1009 shows where the cables are to be connected. The different connection points are marked and must be followed, with the exception of Rotors A/B which must be switched with each other. All cables are marked.



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7. If it is difficult to install the cables because the hydraulic hoses are in the way, the hose sleeves can be slackened off to angle the hoses temporarily.

8. Gather all cables on the same side where the G2 module is mounted and use cable ties to secure them together as per image 1010.

9. The cable from the G2 module which is to be attached to the excavator arm must be secured to the hydraulic hose that is also to be attached there, using a cable tie. See image 1011.

10. Reinstall the protective panel.



## Replacing the Worm gear

These instructions go through how to remove the worm gear and reinstall it. This may be necessary if the gear wheel needs removing for example.

### Removing the Worm gear



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1. Slacken off the 3 screws holding the motor's protective cover.
2. Unscrew the last screw holding the motor. At the same time, tilt the motor slightly so that the screw can be unscrewed, see image 1023. Remove the motor.
3. Slacken off all screws from the screw cover, see image 1024.



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4. Use the worm gear/screw gear to push the screw cover out. Do this by turning the entire gear housing by hand. A special tool (part no. 209874) can also be used to screw the worm gear on.
5. Remove the screw cover, see image 1026. If it cannot be removed by hand, use a jimmy bar.



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6. Ensure that the notch at the end of the worm gear is turned to the 3 o'clock position (see image 1027) and then continue to rotate the entire gear housing until the worm gear can be removed, see image 1031.

## Installing the Worm gear



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1. Check that the slide washers are correctly positioned. The sliding surface must be towards the worm gear. Ensure that any pins are correctly positioned. Push them in again if necessary, see image 1028.
2. Insert the worm gear and ensure that the marking at the end is turned to the 3 o'clock position, see image 1027.
3. Rotate the entire gear housing and simultaneously feed in the worm gear. Ensure that the worm gear still protrudes slightly to facilitate installation of the screw cover, see image 1030.



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4. Before installing the cover, shims can be added (see image 1029) if there is play in the rotational movement. (Testing can be carried out if special tool with part no. 209874 is used. Test by rotating the worm gear when the cover and shims are installed. There should be very little movement.) Do not forget to slide the sliding bearing onto the worm gear's shaft first. Screw the cover on (see image 1024) to the correct torque, see chapter regarding Tightening torques.



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5. Push the motor back and screw it into place (see image 1023), also install the protective cover for the motor (see image 1033).

## Replacing the Grab arm

These instructions show how to remove and install a grab arm and check whether the grab arms need shims.



### CHECK THE PLAY OF THE GRAB ARM



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Check whether the grab arm has too much play by pushing a jimmy bar or similar under the grab arm, see image 1015. Use the jimmy bar as a lever to see how much play there is. If there is too much play, install spacers, see image 1040.

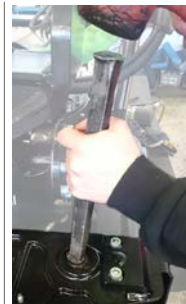
### Removing the Grab arm



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1. Ensure that the grab is open slightly to make removal easier, see image 1041.
2. Remove the circlip that locks the shaft and unscrew the nipple to prevent damaging it, see image 1034.
3. Tap out the shaft from above, see image 1019.



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4. Pull the arm outside the protective panel to gain access to the other shaft, see image 1035.
5. Remove the circlip and tap out the other shaft, see image 1036.



6. The grab arm is now loose and can be removed.

## Installing the Grab arm



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1. Ensure that the sliding bearing is correctly positioned and the sliding surface is towards the grab arm, see image 1037.
2. Install the grab arm onto the grab cylinder first to make installation easier. Do not forget to install the spacer under the grab cylinder lug, see image 1038.
3. Lubricate the shaft and install from underneath. Lock with the circlip.
4. Ensure that the nipple on the lug points outwards so that it can be used, see image 1039.



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5. Push in the grab arm so that it lies against the shaft hole.
6. Insert the slide washer with the slide surface downwards towards the grab arm, see image 1040. Insert shims if necessary.
7. Lubricate and install the shaft from underneath. Ensure that the notch in the shaft head is correctly positioned so it can be inserted all the way.
8. Lock with the circlip, see image 1034.

## Replacing the locking valve

These instructions go through how to replace or clean the lock valve. This may be necessary if there is a problem with the locking function for the tools.



### TESTING THE LOCK VALVE



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The function of the lock valve can be tested when it has been removed. Install the magnet and connect the current. Try locking from the cab as usual. Look at the valve to see if it works as it should.

### Removing the lock valve



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1. Remove the protective panel.
2. Disconnect the contact from the lock valve, see image 1043.
3. Undo the nut on the lock valve that locks the magnet and remove the magnet, see image 1044.



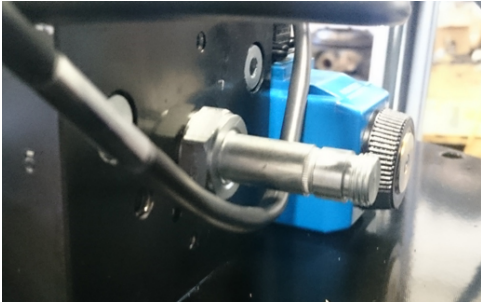
1016



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4. Remove the lock valve from the block, see image 1016 and 1055.

## Installing the lock valve



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1. Screw the lock valve onto the block, see image 1016. Ensure that the valve is clean beforehand.
2. Thread the magnet on and lock in place with the nut, see image 1044.



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3. Connect the contact for the lock valve, see image 1043.
4. Install the protective panels. Use the standard torque for the screws.

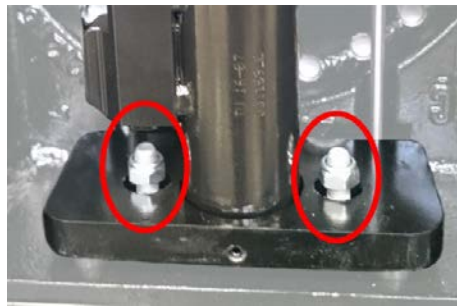
## Replacing the lock cylinder

These instructions go through how to remove and install the lock cylinder. This may be needed if the machine's hydraulic oil is contaminated.

### Removing the lock cylinder



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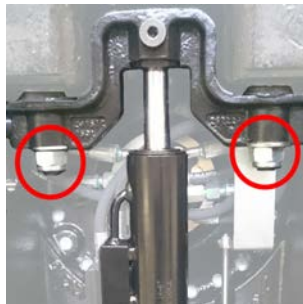


1052

1. Slacken off the screws on the side of FPL and remove FPL, see image 1047.
2. Turn the tiltrotator so that it can be accessed from underneath. Remove the protective panel.
3. Remove the two smaller nuts by the thick support plate, see image 1049.
4. Unscrew the screws enough so that the support plate releases, see image 1052.



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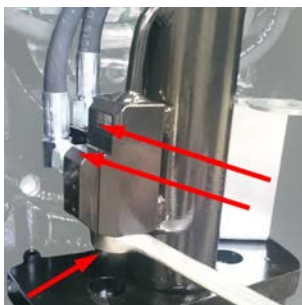


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5. Remove the green indicator pin. Do not hold the green plastic part as it will come off, see image 1051.
6. Undo the two large nuts securing the locking wedges, see image 1048.
7. Remove the screw and nut at the top of the locking wedge, see image 1050.



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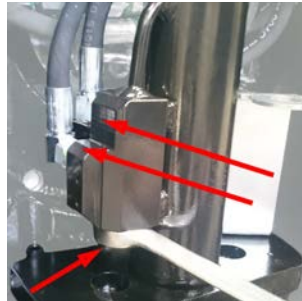


8. Unscrew the check valve and hoses. Ensure that the location of each hose is noted to make reinstallation easier, see image 1053.
9. Pull out the locking wedges and use a jimmy bar or similar to pry off the lock cylinder and support plate, see image 1054.

## Installing the lock cylinder



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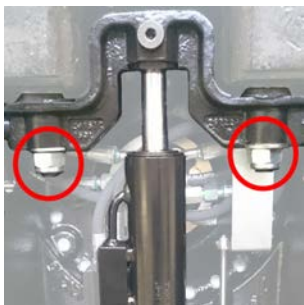


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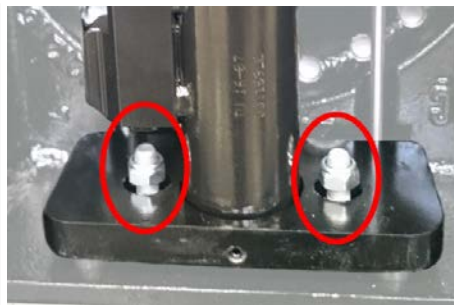
1. Insert the locking wedges, see image 1054.
2. Reinstall the lock cylinder with the support plate, see image 1054.
3. Connect the hoses as before and screw the lock valve back into position, see image 1053.
4. Tighten screw and nut at the top, see image 1050.



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5. Install the two large nuts and washers in the locking wedges, see image 1048. Only tighten the nuts enough so that the panel holding the red indicator pin is loosely in place, see image 1048.
6. Reinstall the green indicator pin. Do not hold the green plastic when tightening as it will become loose, see image 1051.
7. Screw back the screws through the support panel. Install the nuts. Only tighten slightly, see image 1049.



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8. Reinstall FPL, see image 1047.



9. Test operate and ensure the lock function operates correctly.
  - a) The locking wedges must be completely withdrawn, see image 1098.
  - b) The screw that is secured in the locking pins' yoke must not catch on the end of the slit in the side of the cast body when the cylinder is in the withdrawn position.
  - c) The green indicator pin must be fully withdrawn when the mounting is in the unlocked position. The screw must be adjusted so that all the criteria are fulfilled, see image 1049.
10. Verify that the front pin lock mechanism functions.
10. Reinstall the protective panel.

## Replacing gasket in the swivel

### Instructions



1060

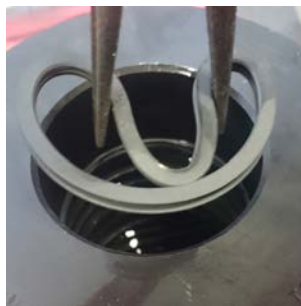


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1. Slacken off the swivel bolt so that the swivel can be removed together with the washer, see image 1060.
2. Reinstall the swivel bolt and use it to tap out the centre part of the swivel, see image 1061.



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3. Remove all gaskets and O-rings. Depress the gaskets to remove them according to image 1062.
4. Clean everything and install new O-rings and gaskets. To insert the gasket, bend it as per image 1063.
5. Tap in the centre part of the swivel housing. Use something soft between the centre part and the hammer so prevent damage, see image 1064.



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6. Remove the small O-rings on the base plate and replace with new ones, see image 1065.
7. Reinstall the swivel housing and ensure that the locating pins are correctly positioned, see image 1018.

8. Secure the swivel bolt into place and the large washer. Use a Nordlock washer and tighten to the correct torque, see image 1060.

## Radial and axial play

The tiltrotator is designed with so little play as possible on both axial and radial axes. This is necessary because the friction between sliding surfaces generates heat and as this affects the various metals differently there would otherwise be a risk of the tiltrotator "pinching". After a certain time in operation, the gap will increase slightly as the tiltrotator is run-in. Wear is influenced by high break out forces and general driving style but mainly neglected lubrication.

It is very important that you lubricate and clean the tiltrotator periodically. Hydraulic breakers can significantly increase the wear so that tiltrotator over time may exhibit excessive play. It is important to monitor development over time and ensure that neither the axial nor radial play become too large. Play above that specified should be adjusted as soon as possible.

On delivery the amount of axial and radial play is about 0.3-0.4 mm. Radial play is checked by the attachment coupler being manually rotated relative to the gearbox. Mark a line on the gearbox and attachment coupler. Now turn the attachment coupler manually to an end position (i.e. so that the screw tooth is pushed against the gear wheel and the screw is against its sliding bushing inside the gearbox). This may be hard to do and maybe you need a crowbar or similar. When the attachment coupler is in its other end position it should not differ by more than that permitted (see table) against the original line. If the play is larger, the screw's sliding bearings may need to be replaced or shimmed.

Axial play is measured with a dial gauge between the attachment coupler and gearbox, so that the attachment coupler can be manually raised/lowered using a crowbar or similar. Also in this case, the play should not exceed the permitted value, see the table. If there is greater play, the gearbox bearings may need to be replaced or shimmed.

After prolonged use it may be worthwhile to submit tiltrotator to your local service centre or Steelwrist for full service review. Normally, all wear parts such as slide bearings, bushings, grease, chafed hoses etc. are replaced. For further information see Steelwrist's website: [www.steelwrist.com](http://www.steelwrist.com)

*Table 2. Permitted play for Tiltrotators*

Checkpoints	X04	X06	X07	X12	X18	X20	X26	X32
Permitted radial play (mm)	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
Permitted axial play (mm)	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2

## Tightening torque tiltrotator

The table below gives the recommended tightening torques for different mounting screws.

Size	Bolted joint	Dimensions	Quality	Torque
<b>X04/X06/X07</b>	Top cover	M6	12.9	15.8 Nm
	Worm flange	M8	12.9	38 Nm
	Hydraulic motor	M8	12.9	38 Nm
		M10		75 Nm
	Tilt cylinder holder	M12	12.9	128 Nm
	Gear wheel	M16	12.9	311 Nm
	Gripper cassette	M16	12.9	311 Nm
<b>X12</b>	Top cover	M10	12.9	75 Nm
	Worm flange	M12	12.9	128 Nm
	Hydraulic motor	M12	12.9	128 Nm
	Tilt cylinder holder	M16	12.9	311 Nm
	Gear wheel	M16	12.9	311 Nm
	Gripper cassette	M16	12.9	311 Nm
<b>X18/X20/X26</b>	Top cover	M10	12.9	75 Nm
	Worm flange	M12	12.9	128 Nm
	Hydraulic motor	M12	12.9	128 Nm
	Tilt cylinder holder	M16	12.9	311 Nm
	Gear wheel	M18	12.9	437 Nm
	Gripper cassette	M16	12.9	311 Nm
<b>X32</b>	Top cover	M10	12.9	75 Nm
	Worm flange	M12	12.9	128 Nm
	Hydraulic motor	M12	12.9	128 Nm
	Tilt cylinder holder	M16	12.9	311 Nm
	Gear wheel	M20	12.9	610 Nm
	Gripper cassette	M16	12.9	311 Nm

## Tightening torque shafts locked with expander cones



### NOTE

Important, the bolts for shaft pins with expander cones must be retightened with a torque and at intervals set out below:

- After 1 hr
- After 3 hrs
- After 1 day of use
- After 4 days of use
- During service

Table 3. Tightening torque for shafts with expander cones

Type	Dimensions	Quality	Torque
Screw	M12	12.9	128 Nm
Screw	M16	12.9	311 Nm
Nut	M20	-	200 Nm
Nut	M24	-	275 Nm
Nut	M27	-	300 Nm

Type	Dimensions	Quality	Torque
Nut	M30	-	350 Nm

Table 4. Tightening torque generally for screws

Dimensions	Quality	Torque
M8	12.9	38 Nm
M10	12.9	75 Nm
M12	12.9	128 Nm
M16	12.9	311 Nm

## Tightening torque for the hydraulic adapter and hose couplings

All ports in blocks and cylinders have BSPP G threads according to ISO 228, ISO 1179-1.

We recommend adapters with ED seals against the blocks according to ISO 1179-2.

Our recommended torque for adapters, see the table.

Table 5. Tightening torque for the hydraulic adapter

Block adapter		Hose couplings			Weo cartridge	
Thread	Torque	Coupling	Thread	Torque	Thread	Torque
1/8" BSPP	15 Nm	6L	M12x1.5	20 Nm	-	-
1/4" BSPP	35 Nm	8L	M14x1.5	30 Nm	1/4"	30 Nm
-	-	10L	M16x1.5	40 Nm	-	-
3/8" BSPP	60 Nm	12L	M18x1.5	60 Nm	3/8"	35 Nm
1/2" BSPP	80 Nm	15L	M22x1.5	100 Nm	1/2"	45 Nm
-	-	18L	M26x1.5	100 Nm	-	-
3/4" BSPP	150 Nm	20S	M30x2	120 Nm	3/4"	75 Nm
-	-	22L	M30x2	120 Nm	-	-

The adapters in our tiltrotators have connections on the hose side according to DIN 3861/ISO 8434-1,

The hoses in our tiltrotators have compression ring couplings with soft seals according to DIN 3865/DIN EN ISO 8434-4.

Hose couplings also known as DIN couplings or metric couplings have a 24-degree sealing angle.

Figure 1. Connector type DIN (metric connector)

