

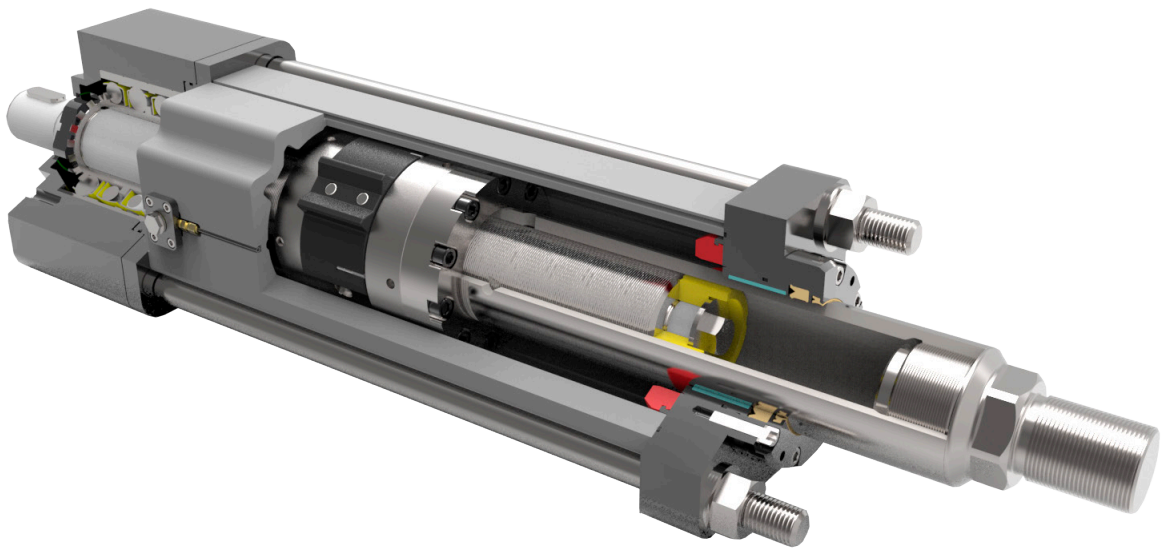
# FTX/P SERIES actuators

**CURTISS -  
WRIGHT**

## Installation & Service Instructions

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**EXLAR®**



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## 1.0 INTRODUCTION

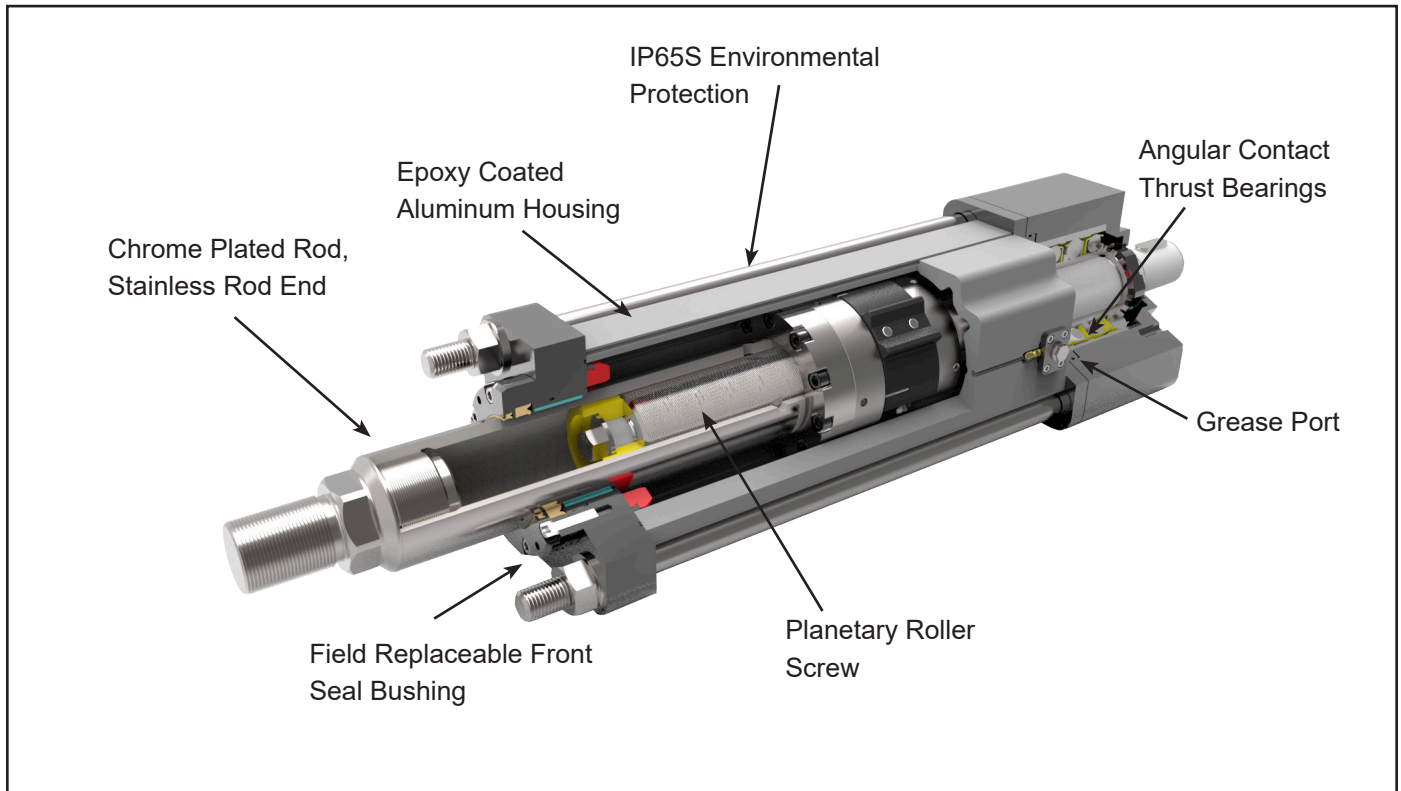
### 1.1 GENERAL PRODUCT DESCRIPTION

The FTX and FTP Series actuators feature a robust planetary roller screw mechanism and offer force density not attainable with more common ball screw actuators. Withstanding significantly higher shock loads they also offer up to 15 times the life of ball screw alternatives.

The FTX and FTP Series actuators are every bit as rugged and reliable as the hydraulics they are meant to replace and are environmentally sealed to IP65S.

These roller screw actuators deliver outstanding performance and flexibility allowing you to meet your ever-increasing demands. They eliminate the mess and leaks associated with hydraulics significantly reducing the maintenance and cost required.


### 1.2 PRODUCT FEATURES





**Figure 1** - FTX Series actuator features

### 1.3 SAFETY CONSIDERATIONS


Safety is of paramount importance during the installation and operation of your FTX/P Series actuator. Throughout this manual, content flagged with the cautionary symbols shown below should be read carefully by installers and operators to help avoid property damage, personal injury or death.

 **DANGER!** Indicates an extremely hazardous situation which will result in serious injury or death if precautions are not followed. Extreme care should be taken in these situations.

 **WARNING!** Indicates a potentially hazardous situation which could result in serious injury or death if precautions are not followed. Extra care should be taken in these situations.

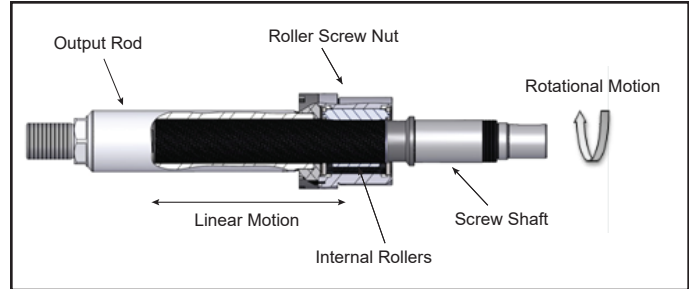
 **CAUTION!** Indicates a potentially hazardous situation which could result in property damage or minor to moderate injury.

**IMPORTANT!** Identifies statements that provide important information to help ensure safe and trouble-free installation and operation.

 **WARNING!** Do not exceed the physical travel limits of FTX/P Series actuators. Exceeding the travel limits of the actuator creates a high-energy impact that may result in permanent damages to the actuator.

### 1.4 FTX SERIES ROLLER SCREW BASED LINEAR Actuators Overview

Exlar FTX Series actuators utilize a satellite roller screw mechanism that converts rotary motion to linear motion and is mounted within a sealed tube assembly. The roller screw follower (nut) is attached to the moveable output rod, which extends or retracts as the screw shaft is rotated. The general operating principle is illustrated below.




**Figure 2 - Actuator Operating Principle**

The FTX Series force tube design provides the contamination isolating advantages of hydraulic cylinders without the limitations of load, life, and speed which are inherent in ball screw and acme screw actuators. All rotary to linear conversion components are mounted within a sealed housing, preventing abrasive particles and other forms of contamination to enter the actuator's critical mechanisms. This assures trouble-free operation in even the most severe environments.

### 1.5 BASIC ACTUATOR CONSTRUCTION

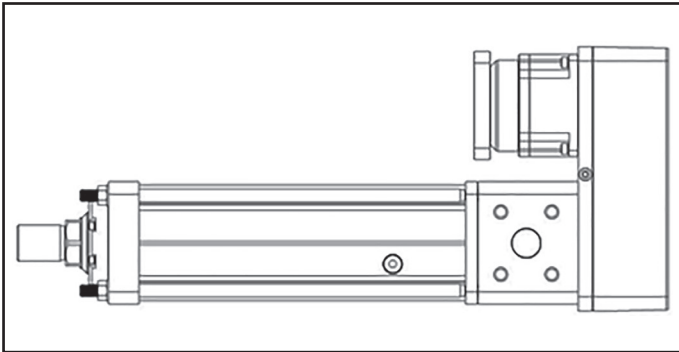
All FTX Series actuators are completely sealed from the outside environment by the use of O-Rings on both ends of the extruded aluminum case. The output rod runs through a wiper and seal, which are captured within a gland insert.

The extruded aluminum case is epoxy coated (powder coated) on all external surfaces. In cases where a motor is mounted in a parallel configuration (see section 1.5) the pulley cover is also epoxy coated. All other aluminum parts (faceplate, end plate, inline adapters etc.) are anodized. All steel mounting parts (flange plates, trunnion components, etc.) are finished with QPQ.

 **CAUTION!** The output rod on FTX/P Series actuators are manufactured from case hardened and chrome plated carbon steel. The case hardened chrome plated rod provides a very tough and wear resistant surface for the rod seal to operate against.

**CAUTION!** If the surface of the output rod gets dinged or severally scratched, the wiper and or rod seal may be compromised, causing contamination of the internal components in the actuator.

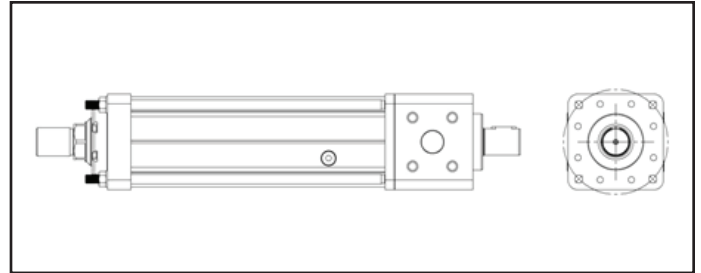
**CAUTION!** The tie rods on all FTX/P Series actuators are manufactured out of 17-4 PH stainless steel and are corrosion resistant to most non-chlorine based chemicals.



**Figure 2 - FTX Actuator with Parallel Motor Mount**

### 1.6 ACTUATOR DRIVE TRAIN CONFIGURATIONS

Exlar offers a base FTX/P Series actuator model for the greatest flexibility in application. The base actuator includes: a high performance satellite roller screw assembly, pre-loaded angular contact bearings, an epoxy powder coated aluminum housing, stainless steel tie-rods, internal anti-rotation mechanism, a sealed output rod, and a keyed input shaft for attachment to a drive system. A typical base FTX Series actuator is shown below.

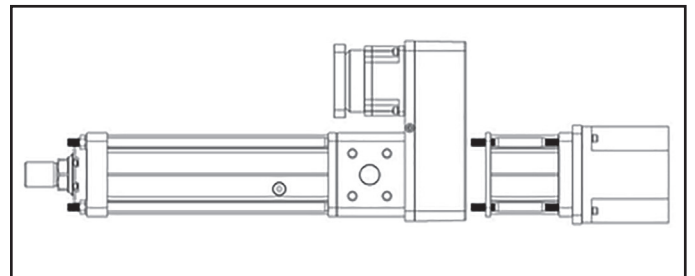


**Figure 3 - Base FTX Actuator**

Exlar also offers a FTX/P Series actuators, with one of a variety motor mounting configurations, combined in one product package. Parallel and in-line mounting options are offered as standard configurations. The parallel motor mounting configuration utilizes a high performance synchronous belt drive system and the inline motor mounting configuration uses a zero backlash coupling to transmit power from the motor to the input shaft of the actuator.

Drive ratios of 1:1 or 2:1 are available for FTX Series actuators in parallel motor mount configurations. FTP Series actuators are available in 1:1 parallel motor mount configurations.

FTX/P series actuators will also mate up with a wide variety of standard planetary gearboxes to attain higher input torque.



**Figure 4 - Motor-Mounting Configurations**

## 2.0 INSTALLATION

### 2.1 MOUNTING CONFIGURATIONS

The actuators come with a variety of mounting configurations as well. Refer to the Exlar catalog or Exlar.com to review available options.

### 2.2 MOUNTING CONSIDERATIONS

As with any linear actuator product, misalignment of the FTX/P Series actuator with respect to the load the actuator is being used to move is of great concern. Any misalignment will decrease the life of the components within the actuator and also may create problems within the application associated with misalignment. Any misalignment between the actuator and load must be removed before commissioning the actuator.

**CAUTION!** The FTX base unit is equipped with side tapped holes and a rear bearing surface. When intending to create side trunnion plates to mount the actuator, follow the recommendations below for proper installation:

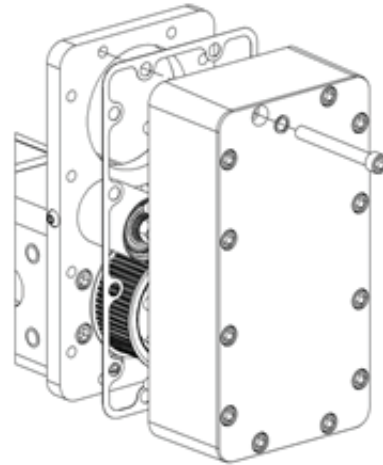
- All side tapped holes must be utilized to support actuator.
- Front or back mounting screws should have adequate clearance or slots to allow for actuator assembly tolerances
- Use high quality alloy steel screws. Class 12.9 Socket Head Cap Screws recommended.
- Screws should be properly torqued to ensure sufficient clamp load to stabilize the mounting plate. Recommended screw torque in Table 7.8
- Use the pilot feature in the end cap to withstand actuator load

**CAUTION!** Side load (also referred to as radial load) on the output rod of the actuator can cause permanent damage to the actuator and should be avoided.

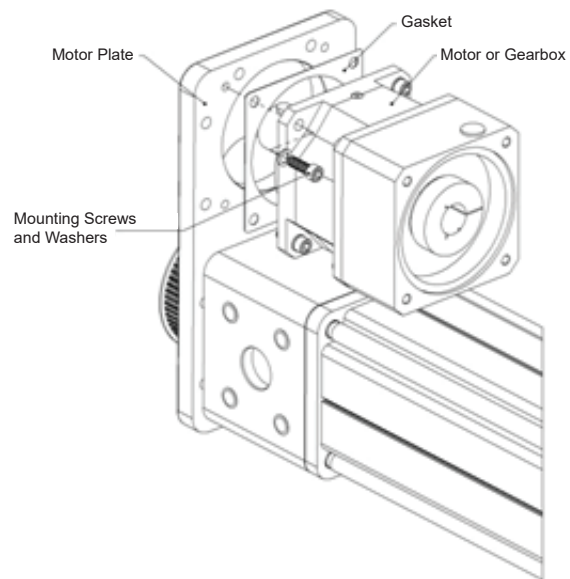
Use the wrench flats provided on the actuator output rod when torquing on rod end accessories or other adaptors.

### 2.3 MOTOR INSTALLATION

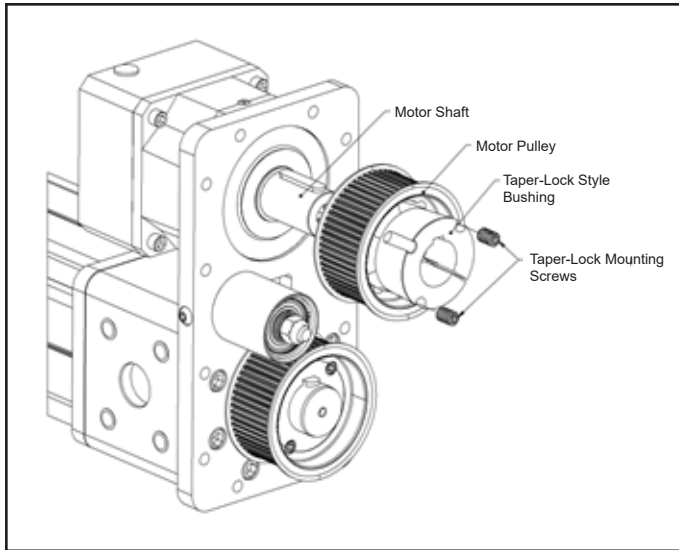
1. Remove parallel drive cover screws, washers, cover and gasket. The screws are hand tightened from the factory for shipment.



2. Attach motor or gearbox to motor plate using supplied mounting screws, washers and gasket.

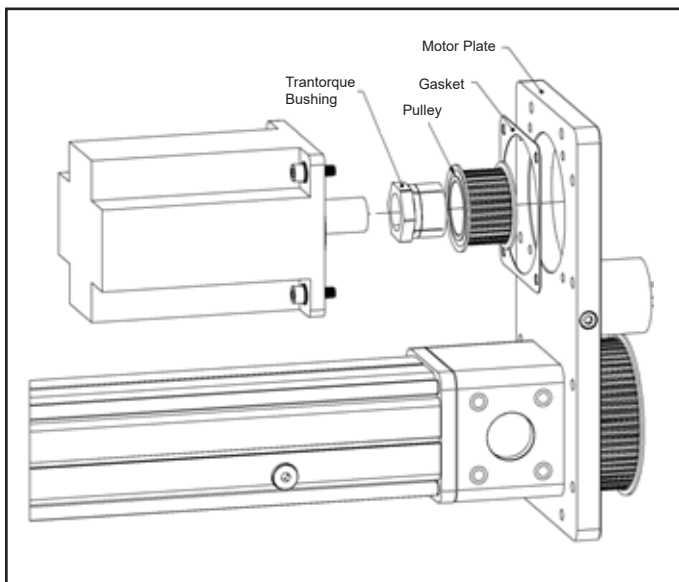


3. Attach bushing and pulley to motor or gearbox output shaft and actuator input shaft. Refer to belt tensioning procedure for the approximate distance between the pulley and motor plate. Torque the Taper-Lock screws to specification. The Taper-Lock bushings can be used with or without a key.



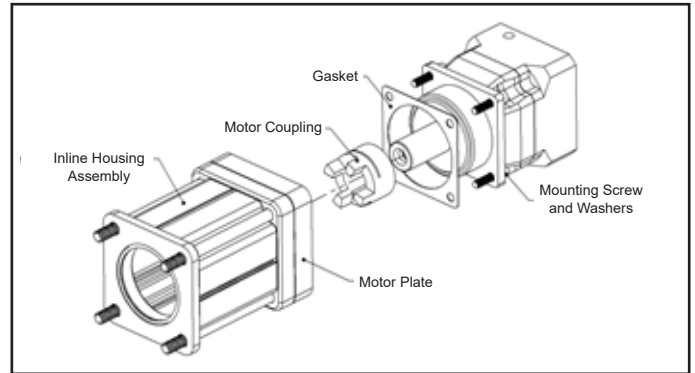
**Figure 5 - Motor and Pulley with Taper-Lock Bushing**

4. If the parallel drive assembly is supplied with a keyless style bushing, a key cannot be used. The bushing may have to be reversed to attain proper pulley distance. In some instances the bushing and pulley may have to be installed before the motor is attached to the motor plate to allow clearance for tightening the bushing. Torque the bushing using the large hex and refer to the torque specification for bushing torque.

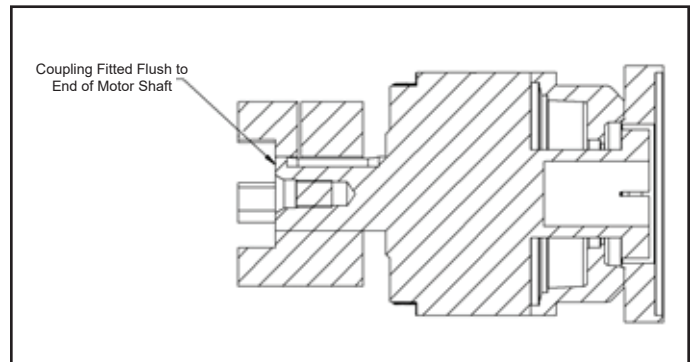


**Figure 6 - Motor Pulley with keyless Style Bushing**

5. Refer to section 3.3 for belt installation, belt tension and cover assembly.
6. For inline motor mounting, an elastomer jaw coupling is used. The coupling must be fitted flush to the end of the motor shaft.

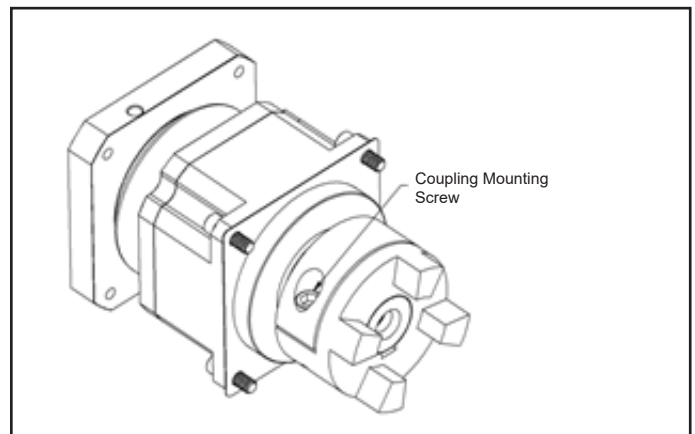


**Figure 7 - Inline Motor Mounting**



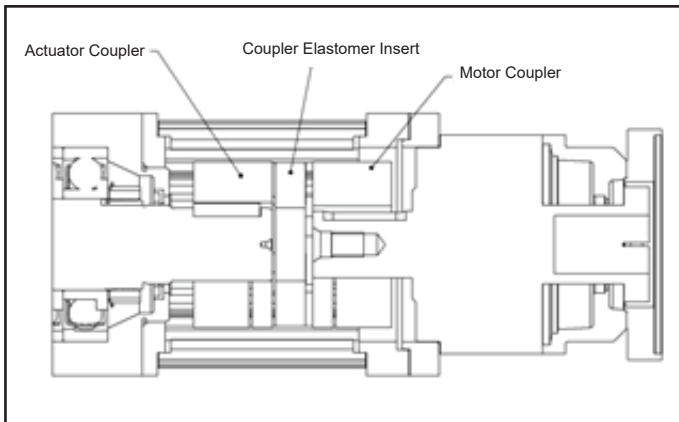
**Figure 8 - Coupling Alignment**

7. Torque coupling mounting screw to specification



**Figure 9 - Coupling-Mounting Screw**

- Insert motor or gearbox as assembled into inline housing assembly. This is a blind assembly and may require reposition of motor coupling to match actuator coupling. Do not force installation or use motor mount screws to join pieces. If any resistance is felt, reposition motor coupling to aid alignment. A light film of oil will aid in the assembly process.

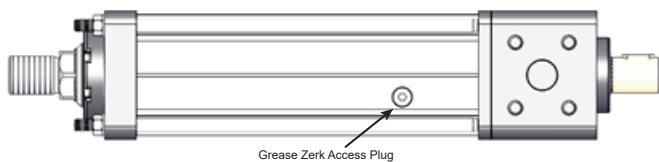


**Figure 10** - Inline Mount Final Assembly

## 2.4 LUBRICATION

### Grease Specification

FTX Series actuators are shipped from the factory fully lubricated with high temperature grease. Exlar uses Mobilith SHC 220, a high performance, extreme-pressure grease. The unique physical properties of the synthetic base oil provide outstanding protection against wear, rust, corrosion and high or low-temperature degradation. Mobilith SHC allows for very low starting and running torque values. Its operating range is -40 degrees C to 177 degrees C (-40 degrees F to 350 degrees F).



Periodic inspection and renewal of the bearing and roller screw grease is recommended. Re-greasing and maintenance schedules are largely based upon customer applications. Contact the factory for general recommendations on regreasing schedules.

Follow the procedure in section 3.6 for renewing the lubrication.

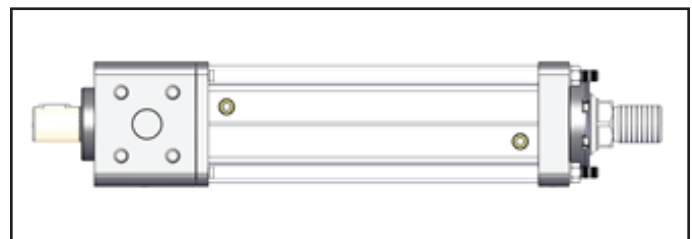
**CAUTION!** Upon initial startup of your FTX Series actuator, cold grease may cause increased motor torque to operate actuator. Once grease has warmed up required motor torque should decrease. Elevated operating temperatures may result in shorter lubrication renewal periods.

### Oil Specification

The FTX and FTP Series use Mobil SHC 626 for oil fill. The actuator is shipped empty and only receives a light oil coating from the factory for initial test.

**CAUTION!** The actuator must be filled by the customer for their specific application.

The case features integrated sight glasses and sight tubing to ensure a proper oil fill level depending upon the orientation of the actuator. Slight foaming of the oil in operation is normal and is a result of the initial coating of grease from the bearings.



**Figure 11a** - Horizontal Oil Fill Sight Glasses





**Figure 11b** - Vertical Oil Fill Sight Tube and Fill Ports

For lubrication of seals, see section 3.1.

For inspection and lubrication procedure, see section 3.6.

### Horizontal Oil Fill

If the actuator is to be used primarily in the horizontal orientation, the side sight glass will indicate a proper oil fill level. Either port can be used to fill the actuator depending upon the final orientation of the actuator. The correct fill is achieved when the oil level covers the lower sight glass completely. For reference, this table shows the approximate oil quantity in correlation with stroke.

**! CAUTION!** Oil fill volumes provided are with the main rod retracted.

**\*\*Fill the Actuator with the Main Rod Retracted ONLY\*\***

	Approximate Horizontal	Oil Fill Level
Actuator	Liter	Quart
FTX095-0150	0.36	0.38
FTX095-0300	0.57	0.60
FTX095-0600	1.00	1.05
FTX095-0900	1.42	1.50
FTX095 - Oil Qty. Per 25mm of Stroke	0.035	0.037

	Approximate Horizontal	Oil Fill Level
Actuator	Liter	Quart
FTX125-0150	0.57	0.60
FTX125-0300	0.87	0.92
FTX125-0600	1.50	1.58
FTX125-0900	2.12	2.24
FTX125 - Oil Qty. Per 25mm of Stroke	0.052	0.055

	Approximate Horizontal	Oil Fill Level
Actuator	Liter	Quart
FTX/P160-0150	1.21	1.28
FTX/P160-0300	1.82	1.92
FTX/P160-0600	3.04	3.20
FTX/P160-0900	4.26	4.48
FTX/P160 - Oil Qty. Per 25mm of Stroke	0.102	0.107

	Approximate Horizontal	Oil Fill Level
Actuator	Liter	Quart
FTX/P215-0150	2.63	2.78
FTX/P215-0300	3.69	3.90
FTX/P215-0600	5.81	6.14
FTX/P215-0900	7.93	8.38
FTX/P215 - Oil Qty. Per 25mm of Stroke	0.177	0.187

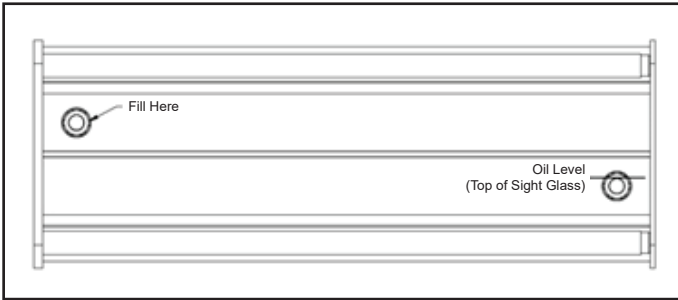


Figure 12 - Horizontal Oil Fill

### Vertical Oil Fill

If the actuator is to be used primarily in the vertical orientation, the sight tube running the length of the actuator will be used to measure the oil fill level. Two magnetic plug ports are provided for fill and drain. Proper oil quantity will vary with the stroke of the actuator as well as the motion profile.

**IMPORTANT!** Fill level should be decided by where the most work is done by the roller screw nut. The nut should be submerged in oil or allowed to dip back into the standing oil in a cycle. The tables below are an approximation for half oil fill. This should be used as a starting point; final level is decided by end user application to ensure the roller screw nut is submerged in oil each cycle.

**CAUTION!** Oil fill volumes provided are with the main rod retracted

**\*\*Fill the Actuator with the Main Rod Retracted ONLY\*\***

Approximate Rod End Down Level		
Actuator	Liter	Quart
FTX095-0150	0.25	0.26
FTX095-0300	0.80	0.84
FTX095-0600	1.90	2.00
FTX095-0900	2.99	3.16
FTX095 - Oil Qty. Per 25mm of Stroke	0.091	0.096

Approximate Rod End Up Level		
Actuator	Liter	Quart
FTX095-0150	0.12	0.12
FTX095-0300	0.67	0.70
FTX095-0600	1.77	1.86
FTX1095-0900	2.86	3.02
FTX095 - Oil Qty. Per 25mm of Stroke	0.091	0.096

Approximate Rod End Down Level		
Actuator	Liter	Quart
FTX125-0150	0.57	0.60
FTX125-0300	1.44	1.52
FTX125-0600	3.17	3.35
FTX125-0900	4.90	5.18
FTX125 - Oil Qty. Per 25mm of Stroke	0.144	0.153

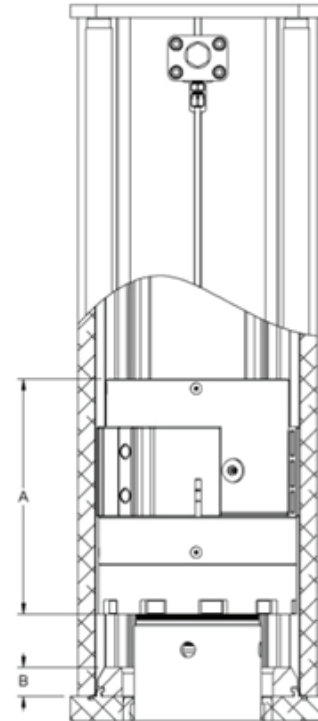
Approximate Rod End Up Level		
Actuator	Liter	Quart
FTX125-0150	0.30	0.31
FTX125-0300	1.16	1.23
FTX125-0600	2.90	3.06
FTX125-0900	4.63	4.89
FTX125 - Oil Qty. Per 25mm of Stroke	0.144	0.153

Approximate Rod End Down Level		
Actuator	Liter	Quart
FTX/P160-0150	1.03	1.08
FTX/P160-0300	2.49	2.63
FTX/P160-0600	5.42	5.73
FTX/P160-0900	8.35	8.83
FTX/P160 - Oil Qty. Per 25mm of Stroke	0.244	0.258

Approximate Rod End Up Level		
Actuator	Liter	Quart
FTX/P160-0150	0.43	0.45
FTX/P160-0300	1.89	2.00
FTX/P160-0600	4.82	5.10
FTX/P160-0900	7.75	8.20
FTX/P160 - Oil Qty. Per 25mm of Stroke	0.244	0.258

Approximate Rod End Down Level		
Actuator	Liter	Quart
FTX/P215-0150	2.11	2.23
FTX/P215-0300	4.68	4.95
FTX/P215-0600	9.83	10.39
FTX/P215-0900	14.98	15.83
FTX/P215 - Oil Qty. Per 25mm of Stroke	0.429	0.453

Approximate Rod End Up Level		
Actuator	Liter	Quart
FTX/P215-0150	1.75	1.84
FTX/P215-0300	4.32	4.56
FTX/P215-0600	9.47	10.00
FTX/P215-0900	14.62	15.44
FTX/P215 - Oil Qty. Per 25mm of Stroke	0.429	0.453



#### Vertical Oil Fill Dimensions

Vertical Oil Fill Dimensions		
Actuator	Nut Length A	Bumper Height B
FTX095	110.1mm (4.33 in)	13.3mm (0.53 in)
FTX125	128.1mm (5.04 in)	14.6mm (0.58 in)
FTX/P160	169.0mm (6.65 in)	19.0mm (0.75 in)
FTX/P215	199.2mm (7.84 in)	24.8mm (0.98 in)

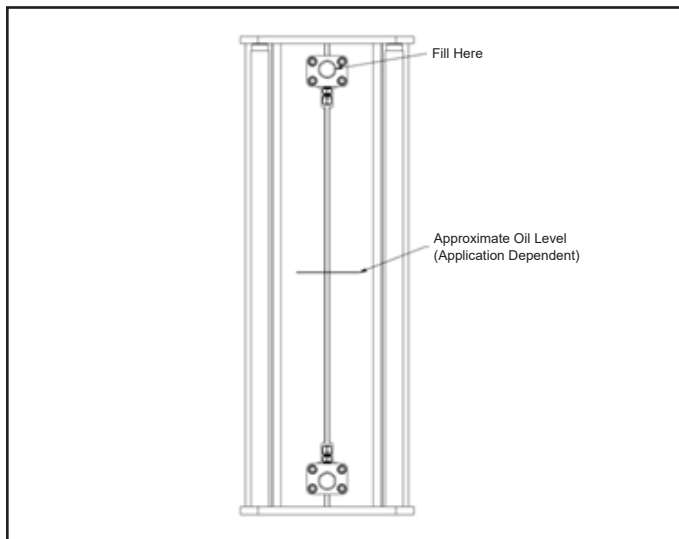
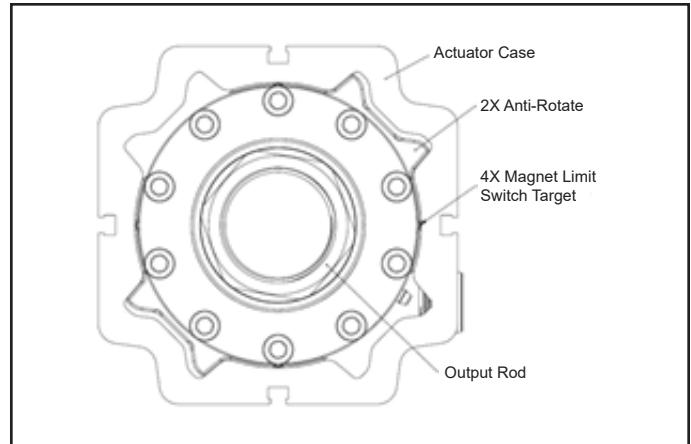
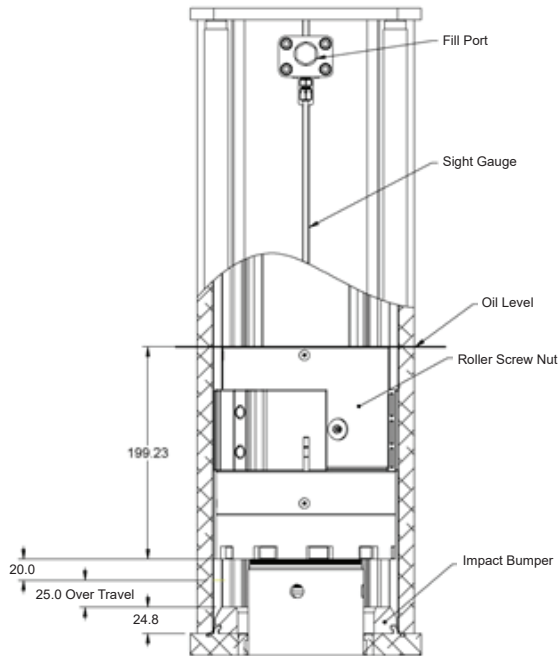


Figure 13 - Vertical Oil Fill Ports and Sight Tube

#### Vertical Oil Fill Example

In this example, a 300mm stroke FTX215 is running oil fill, rod down in the last 20mm of stroke. It is a high speed, low amplitude press with the cycle running 1-2 mm movement per press at high cycle rate. Most of the input power is being used in the last 20mm of stroke but the actuator can cycle once every hour to move tooling. Oil would only need to be filled up to the nut where the majority of the work is being performed by the roller screw. The vertical oil fill table shows the bumper and nut height with each actuator. In the example, the oil level

needs only to be above the nut level in the last 20mm. With the bumper height being 24mm, add in the additional over travel of the actuator of 25mm plus the distance of the working area, 20mm in this case. After this, add in the height of the nut (199.2mm) to get the total oil level from the faceplate. The oil level should be at 269mm from the faceplate.



**Figure 14 - Anti-Rotate Mechanism**

**CAUTION!** Do not apply more than the following values for torque to the output rod without opposing that torque. Doing so can damage the anti-rotate mechanism inside the actuator.

- FTX095----25 lbf-ft (34 Nm)
- FTX125----50 lbf-ft (67 Nm)
- FTX/P160----75 lbf-ft (102 Nm)
- FTX/P215----100 lbf-ft (135 Nm)

## 2.5 ANTI-ROTATE MECHANISM

FTX/P Series actuators have an internal anti-rotate mechanism guided by extruded channels in the actuator case. The anti-rotates are comprised of a high performance, thermal and abrasion-resistant polymer. This precise mechanism will limit angular backlash and is designed to withstand the high force and speed created by these actuators.

### 3.0 MAINTENANCE & SERVICE

#### 3.1 SEALS

Both ends of the extruded housing on the FTX actuator are sealed using O-rings. The outer diameter of the output rod is sealed with a gland that utilizes a dual seal system with a wiper seal on the outside and a high pressure rod seal within the gland assembly. Another O-ring is used to seal the gland seal itself to the front plate of the actuator. The input shaft is sealed using a spring loaded shaft seal that is contained within the back plate of the actuator. These seals are lubricated on initial assembly with grease; however, the front gland seal should have a small amount of mineral oil applied to it periodically depending on amount of actuator use or storage to keep the seal operating smoothly and to prolong life.

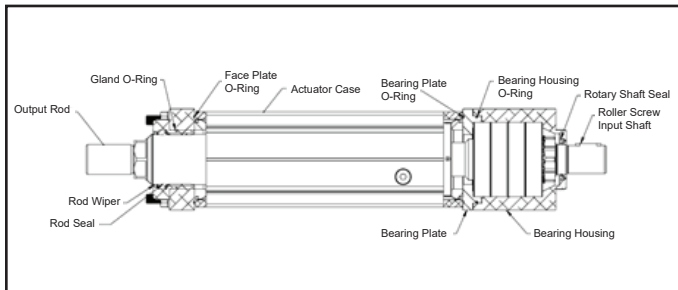


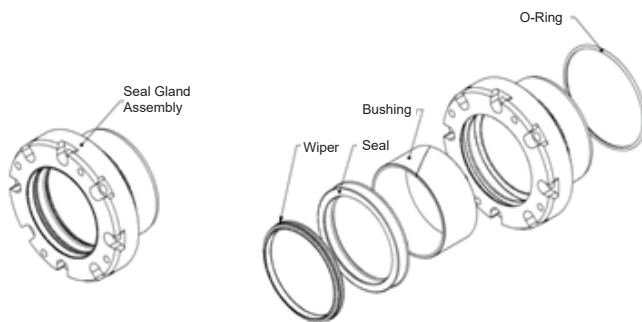
Figure 15 - Actuator Sealing Details

#### Seal Parts

Grease and Oil Units		
Frame	PN	Description
FTX095	50178	Wiper, AY, 1.75 inch ID
	70635	Seal, BT, 1.75 inch ID
	70755	Bearing, Linear Sleeve
	10076	O-Ring, -137 Buna N70
FTX125	63032	Wiper, AY, 2.25 inch ID
	63033	Seal, BT, 2.25 inch ID
	63034	Bearing, Linear Sleeve
	62679	O-Ring, -233 Buna N70
FTX/P160	72575	Wiper, AY, 3.25 inch ID
	72576	Seal, BT, 3.25 inch ID
	72574	Bearing, Linear Sleeve
	72929	O-Ring, -239 Buna N70
FTX/P215	69308	Wiper, AY, 4.25 inch ID
	69309	Seal, BT, 4.25 inch ID
	69307	Bearing, Linear Sleeve
	64084	O-Ring, -248 Buna N70

#### Seal Gland

Frame	Seal Gland PN	Description/Size
FTX095	70634	Seal Gland Assembly - BA
FTX125	70879	Seal Gland Assembly - BA
FTX/P160	72568	Seal Gland Assembly - BA
FTX/P215	69297	Seal Gland Assembly - BA



### 3.2 DRIVE TRAIN

The FTX/P Series actuators are combined in a parallel motor mounting configuration using a synchronous belt. The drive train does not require any lubrication but any oil or dirt contamination within the belt drive system will decrease belt effectiveness and life. The belt and pulley system should be inspected periodically for excessive wear and proper tensioning.

**CAUTION!** Do not remove the belt cover while the actuator is operating. Always remove power from the attached motor before removing the belt cover to service any component of the drive train (i.e. belts, pulleys, bushings, inline couplings, gears, etc...). Failure to do so can result in damage to the actuator or cause serious injury to the operator.

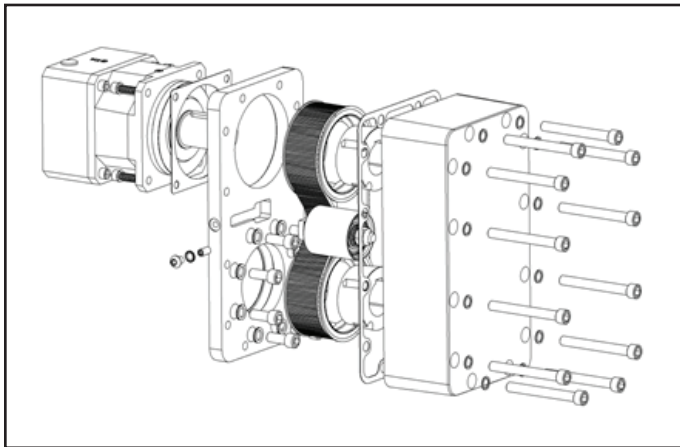


Figure 16 - Parallel Motor Mount Drive Train Assembly

### 3.3 BELT TENSIONING PROCEDURE

1. Install motor, pulleys and bushings. The image below shows the proper distance to fix the pulley from the motor plate. See torque chart for bushing screw torque values.

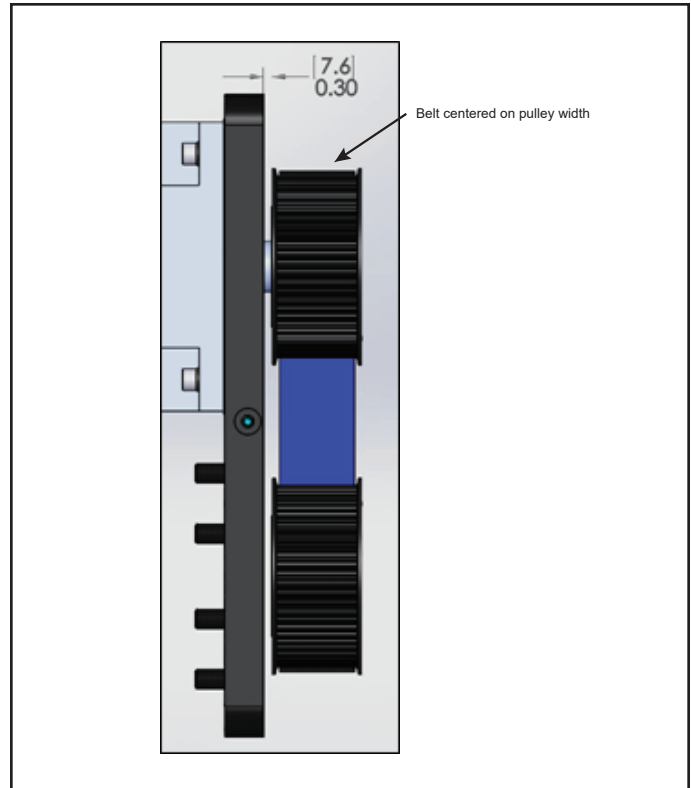
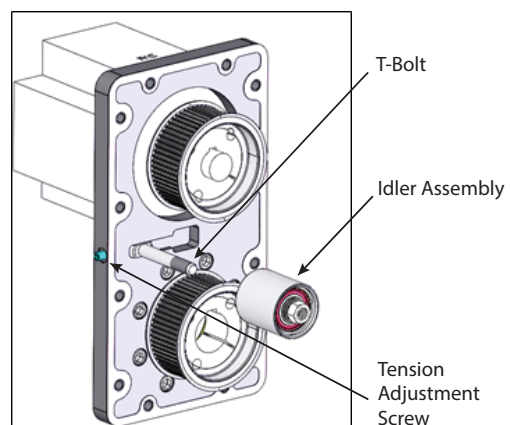
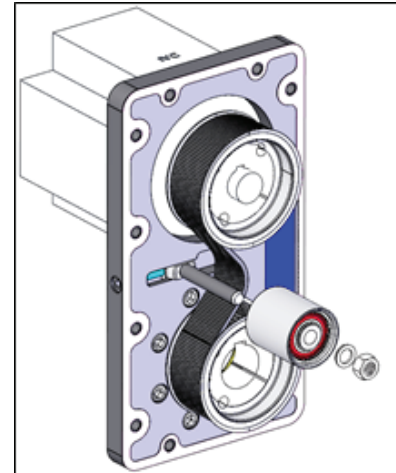
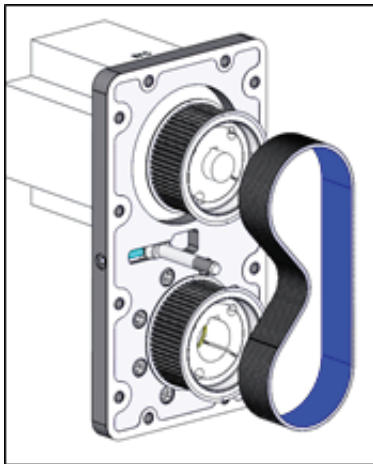


Figure 17 - Belt Distance from Motor Plate

2. Separate Idler assembly from T-bolt and remove the Tension Adjustment Screw. Install the T-bolt into the end of the slot.



3. The belt can now be placed onto the pulleys.



4. With the belt in place, the idler assembly can now be placed back over the T-bolt.

- Adjust the belt tension by first tightening the Idler Assembly Hex Nut to a point that assures the idler assembly is contacting the motor plate. Do not apply full torque at this point.
- Use the Tension Adjustment Screw to change belt tension
- Measure belt tension by using span deflection method OR Sonic Meter

**(Belt Frequency using a Sonic Meter is the preferred method)**

**Belt Tension**

Actuator Size	Installation Deflection mm (in)	Deflection Force Min. N (lbf)	Deflection Force Max. N (lbf)	Frequency Min. Hz	Frequency Max. Hz
FTX095	3.1 (0.122)	27.0 (6.07)	28.6 (6.43)	137	143
FTX125	3.1 (0.122)	38.2 (8.61)	40.6 (9.14)	118	124
FTX160	3.1 (0.122)	26.0 (5.85)	27.8 (6.25)	96	100
FTP160	3.1 (0.122)	123.4 (27.74)	134.0 (30.12)	233	243
FTX215	3.8 (0.149)	66.7 (15.00)	70.7 (15.90)	102	107
FTP215	3.8 (0.149)	279.2 (62.77)	302.6 (68.03)	245	256

## Proper Belt Tension

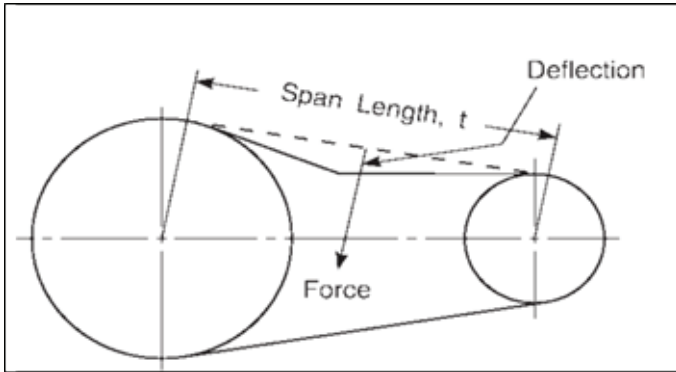


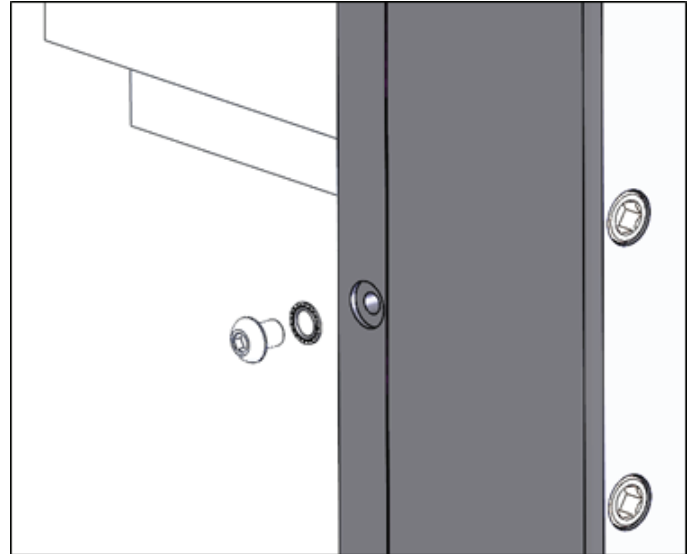
Figure 18 - Belt Tension Diagram

These belt drives do not require as much tension as other belt drives that depend on friction to transmit the load. The installation procedure should begin by installing the belt with a snug fit. Now, measure the belt span length, ( $t$ ), as shown in the picture above. With one pulley free to rotate, use a spring scale to apply a perpendicular force to the center of the belt width at the mid-point of the belt span. The appropriate amount of force for each belt is shown in the belt tension table

Measure the deflection of the belt at the mid-point. While applying the correct force, the belt deflection should match the distance in the belt tension table.

A sonic tension meter may also be used if available.

5. Fix the idler pulley in place by applying specified torque to the Idler Assembly Hex Nut.
6. Verify belt tension is at appropriate level after applying specified torque. Readjust if necessary.
7. Install Motor Plate Sealing Screw and sealing washer.
8. Reinstall the gasket and rear cover with the Cover to Motor Mounting Plate screws. Torque the screws to the appropriate value specified in the fastener torque section. Torque to spec.



## 3.4 ROLLER SCREW

The satellite roller screw used within the FTX/P Series actuators is a precision-machined mechanism. Lubrication of the roller screw should be maintained in accordance with section 2.3. Common conditions that accelerate wear and can lead to permanent damage to this mechanism are shock loading and radial loads (side loads). Loading the roller screw in such a manner will cause premature failure.



**WARNING!** Do not run the roller screw into the end of its stroke (in either extension or retraction), as this will severely damage the actuator and/or application.

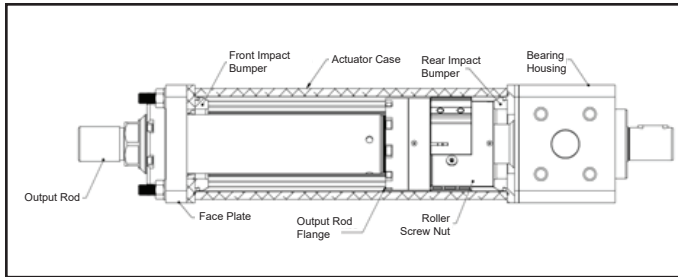
## 3.5 END OF STROKE CUSHIONS

Every FTX Series actuator is equipped with impact bumpers, which are designed to protect the actuator from unintentional over extension or retraction. The cushions are designed to reduce impact energy during these unintentional conditions.



**WARNING!** Do not use cushions as end of stroke limiters.





**Figure 19 - Actuator End of Stroke Cushions**

FTX Series actuators are designed with an additional 25 mm of travel over nominal stroke. This allows users to utilize the full nominal stroke without causing damage by end crashing.

**⚡ WARNING!** Do not exceed the physical travel limits of the FTX/P Series actuators. Exceeding the travel limits of the actuator creates a high-energy impact that may result in permanent damages to the actuator.

### 3.6 INSPECTION AND LUBRICATION PROCEDURE

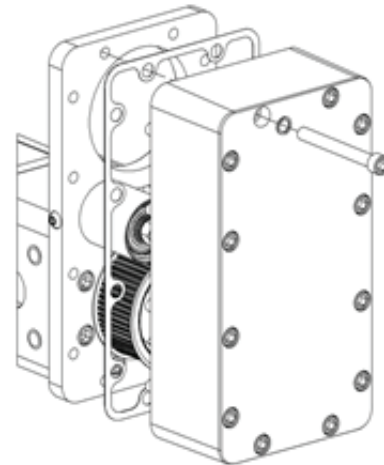
The following disassembly and reassembling procedures are general guidelines to provide basic maintenance to FTX/P Series actuators. For any maintenance or repairs outside of these guidelines, please consult Exlar.

#### Parallel drive train disassembly:

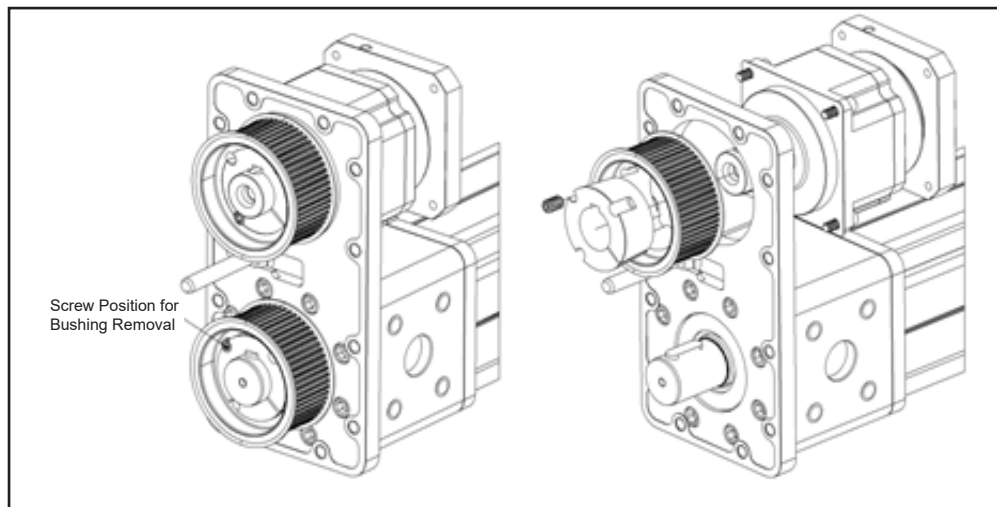
1. Remove the actuator assembly from the application or machine by removing power from the motor, disconnecting main rod coupling and actuator mounting bolts or fasteners. If the servo motor/gearbox is mounted inline, proceed to step six.

**⚠ DANGER!** Always remove power supplied to the system before beginning disassembly.

2. Remove pulley cover by removing cover screws and pulling cover away from end plate.
3. Relieve belt tension with idler as outlined in Section 3.3. Remove idler for clearance and remove belt.

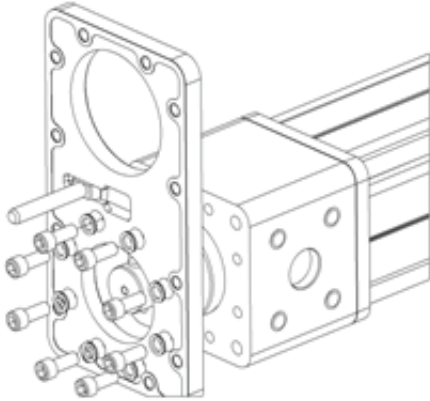


4. Remove screws from roller screw shaft pulley and use these same screws to push the pulley bushing off the pulley using the back out threads provided in the pulley or bushing. Then remove the motor pulley and bushing and remove the motor from the motor plate.

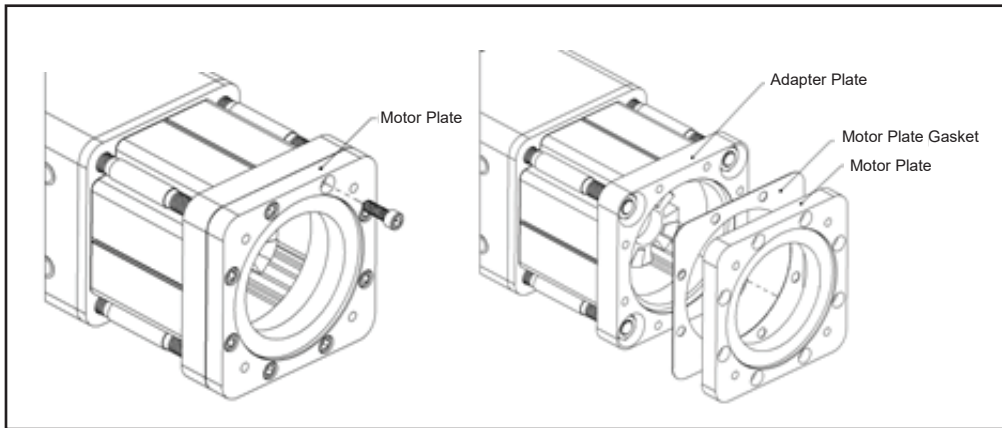


**Figure 19 - Parallel Motor Mount Disassembly**

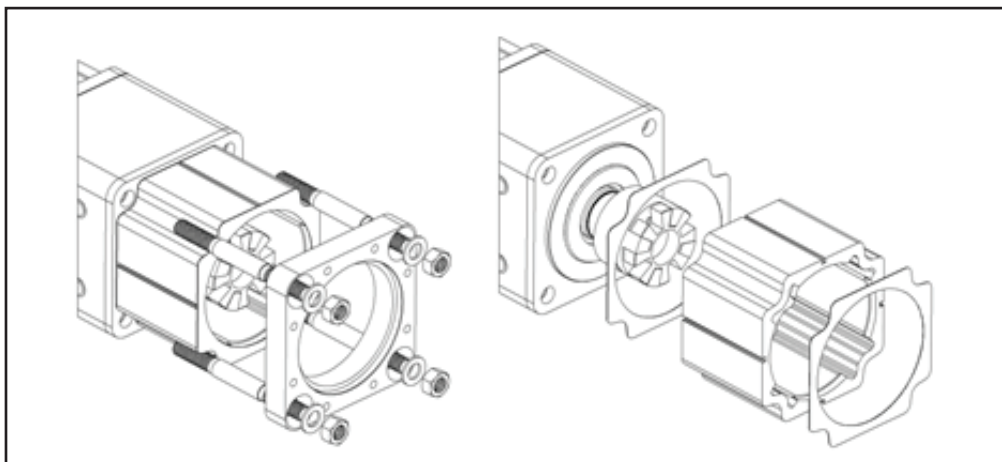
- Remove motor plate to actuator mounting screws and washers. The motor plate can now be removed from the actuator.



- Loosen the motor or gearbox mount screws and remove assembly with coupling from the inline housing.
- Remove motor plate screws and motor plate
- Remove nuts and tie rods or in some models, screws holding the adapter plate to the inline housing. Remove adapter plate. Some actuators have multiple adapter plates to align and mount the motor correctly.
- Remove the inline housing and gaskets.

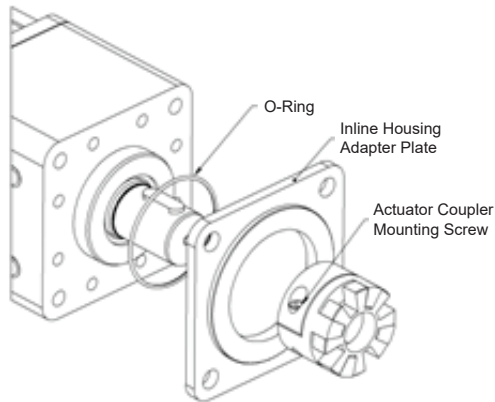


**Figure 20** - In-line Mount Motor Plate Removal



**Figure 21** - In-line Housing Removal

10. Loosen the actuator coupling mounting screw and remove coupling. (Note: For installation, the actuator coupling is mounted flush with the end of the input shaft.) Remove the inline housing adapter plate.

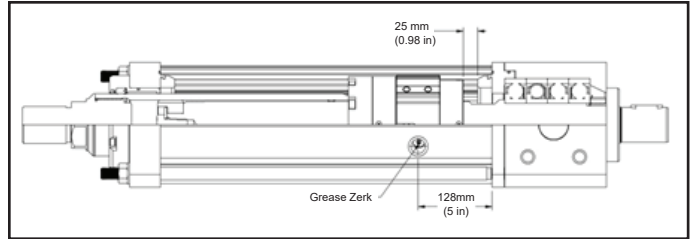


11. Installation is the reverse of removal.

### Grease Maintenance Procedure

The actuator will need periodic re-greasing based upon final use. The maintenance schedule will depend upon load, speed and duty cycle. High speed or load along with high duty cycle will need maintenance more often. The screw should be cycled its entire stroke periodically to redistribute grease, especially in short stroke applications.

To re-grease the roller screw, remove the grease access plug and move the actuator out from the rear stop 25mm. The grease zerk will now be accessible. Follow the chart below for the correct amount of grease to use. Cycle the unit after several cc's of grease to distribute.



**Figure 22** - Grease Port Location Apply grease into zerk through port in case, cycle actuator to distribute grease

Actuator Size	Initial Grease Fill (cc)	Additional cc Grease per 25mm Stroke
FTX095	5.25	0.26
FTX125	7.88	1.00
FTX160	15.25	1.27
FTX215	22.00	2.00

Routine maintenance only requires additional grease for the roller screw. See table above for amount of grease per 25mm of stroke. For example, if the actuator is 300 mm stroke and the additional cc per 25mm stroke is 3 cc, total amount of grease is 36 cc when routine maintenance is performed.

## 4.0 OPTIONAL EQUIPMENT

### 4.1 MOUNTING OPTIONS

The FTX product has a variety of standard mounting options to couple to the end use system. These configurations vary based upon frame size. The Exlar catalog should be consulted to determine the desired model and mounting configuration

### 4.2 STANDARD MOTOR MOUNTING CONFIGURATIONS

The FTX/P Series actuators are offered in two standard motor mounting configurations, parallel and inline. Each standard motor mount is designed to accommodate any one of the many standard servo motors or planetary gearboxes offered from a wide variety of manufactures.

### 4.3 LIMIT SWITCHES

FTX/P actuators equipped for adjustable externally mounted limit switches. Exlar offers magnetic proximity switches that are triggered by a target magnet that is located in the anti-rotate mechanisms inside of the actuator housing. The location of the four target magnets allow switches to be mounted on any side of the actuator.

The limit switches are available with normally open and normally closed output, channel mount magnetic sensing prox. The magnetic switch power is 10-30 VDC with a no-load operating current of <10mA and a load current of less than or equal to 200 mA

#### Wiring Diagram

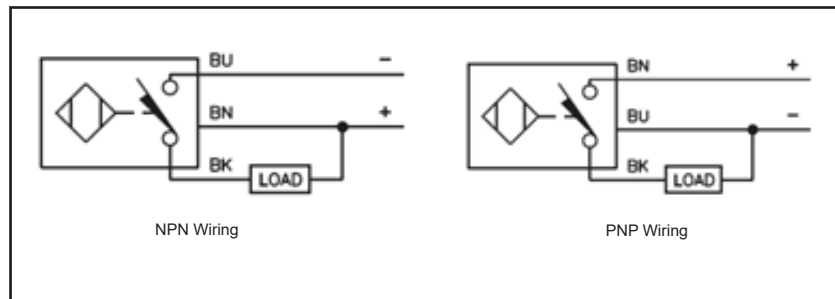


Figure 23 - Adjustable Limit Switch Wiring

Configuration of Logic of Standard Switch Option Selections			
Option	SW1	SW2	SW3
L1	Normally Open, PNP	Not Supplied	Not Supplied
L2	Normally Closed, PNP	Normally Closed, PNP	Not Supplied
L3	Normally Open, PNP	Normally Closed, PNP	Normally Closed, PNP
L4	Normally Open, NPN	Not Supplied	Not Supplied
L5	Normally Closed, NPN	Normally Closed, NPN	Not Supplied
L6	Normally Open, NPN	Normally Closed, NPN	Normally Closed, NPN
Switch Type	Exlar Part Number	Supplier Part Number	
Normally Closed Switch, PNP	43404	Turck P/N: BIM-UNT-RP6X	
Normally Open Switch, PNP	43403	Turck P/N: BIM-UNT-AP6X	
Normally Closed Switch, NPN	67635	Turck P/N: BIM-UNT-RN6X	
Normally Open Switch, NPN	67634	Turck P/N: BIM-UNT-AN6X	

See switch manufacturer's documentation for additional limit switch information.

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#### 4.4 ROD ENDS

FTX series actuators are available as standard with male or female rod ends with Metric threads. Each standard rod end is also equipped with wrench flats to aid in attachment to the load.

#### 4.5 MOTORS

FTX Series actuators are designed to accept many types of standard electric servo motors or planetary gear reducers that are available through various manufactures. Due to motor size, torque or speed, not all motors or reducers can be mounted to each standard actuator.

#### 4.6 ELECTRONICS

Electronics and drive amplifiers to match the appropriate motors are available through the same manufactures that supply the motors. All maintenance and service guidelines contained within the motor manufacture manuals should be followed to avoid service problems associated with the amplifier and motor. For additional questions about commutation of the motor, please consult the motor manufacturer.

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### 5.0 SPECIFICATIONS

#### 5.1 LIFE CALCULATIONS

The expected life of the roller screw in a FTX/P actuator is expressed as the linear travel distance that 90% of the screws are expected to meet or exceed before experiencing metal fatigue. This is not a guarantee. For accurate lifetime calculations of a roller screw in a linear application, cubic mean load should be used. Consult the catalog for ratings and formulas associated with life calculations.

#### 5.2 LOAD, TORQUE, AND LINEAR SPEED CALCULATIONS

The thrust load applied by the FTX/P actuator is dependent on the amount of torque that is applied to the roller screw shaft and the lead of the roller screw within the actuator. It is important to include any gearbox reduction and or drive train belt and pulley reduction into this equation as well. The equation that defines the amount of torque required for a corresponding thrust force is listed in the Exlar catalog. Reference this catalog for torque calculations and ratings.

It is also important to recognize that motor torque will be required to accelerate the inertial components of the system in addition to the thrust. Consult Exlar's sizing guideline for further details.

The linear speed that the FTX/P actuator will produce at the end of the output rod is a function of rotational speed of the roller screw shaft and roller screw lead. It is important to include any gearbox reduction and or drive train belt and pulley reduction into this equation as well. Reference the Exlar catalog for ratings and formulas regarding the linear speed of the FTX actuators.

#### 5.3 LOAD AND SPEED RATINGS

Each FTX/P actuator model has an associated maximum force rating. The maximum force rating is a value that should never be exceeded either by or applied to the actuator. Consult the Exlar catalog for maximum force ratings.



**DANGER!** DO NOT exceed maximum force ratings of the FTX actuators. Doing so can and will cause damage to the actuator and put the operator at risk of injury.

The speed rating of the actuator is dependent on stroke length and diameter of the roller screw inside the actuator. The maximum rotational screw speed of the FTX/P actuators should be maintained below the maximum rotational screw speed. Consult the Exlar catalog for maximum rotational speeds.

## 6.0 TROUBLESHOOTING

### 6.1 MECHANICAL PROBLEMS

This section will provide you with a helpful guideline to troubleshooting various problems that may occur during operation and installation of your FTX actuator.

Symptom/ Problem	Possible Cause	Problem Solution
Abnormally loud whining coming from actuator.	Misalignment or Side Load	Check alignment with application, remount actuator if necessary. Remove side load.
Abnormally loud whining coming from actuator.	Improper servo tuning	Consult tuning guidelines for servo motor and drive.
Actuator motor rotates but output rod does not extend or retract.	Belt or inline coupling failure	Disconnect power to motor, remove belt cover and inspect belt or inline coupling. Replace if necessary.
Motor does not operate.	Motor electrical problem	Consult motor manufacturer.
Output rod has excessive rotation, or rotates but does not extend.	Anti-rotate failure	Replace anti-rotate mechanism
Excessive motor current to operate actuator.	An internal mechanism binding, application binding, roller screw failure. Operation over peak load rating.	Consult Exlar

### 6.2 ELECTRICAL PROBLEMS

All electrical problems associated with the motor used to drive the roller screw in a FTX/P actuator should be addressed with the motor manufacturer.

If an externally mounted limit switch is not operating properly, check all power connections to the switch and make sure that the switch is wired properly. Refer to the diagram in section 4.3 for further details regarding wiring.

### 6.3 RETURNING PRODUCT FOR REPAIR

#### Procedure to return products for repair or replacement:

1. Before requesting an RGA number, please contact Exlar Technical Support to see if it is possible to resolve the issue prior to return.
2. If it is determined that an RGA number is required, please do so by completing an online RGA request form found on the Exlar website. For international repairs, closely follow instructions provided by the Exlar Returned Goods Administrator. Failure to comply with issued instructions may result in delays for repair and return.

## 7.0 FASTENER TORQUE SPECIFICATION

### 7.1 FTX095 TORQUE SPECIFICATION

FTX095 Torque Specification							
Fastener	Description/Size	Part Number	Qty	Nm	ft-lb	in-lb	Loctite® Spec
Gland to Face Plate Screw	Screw, M5x0.8 x 22mm, SHCS, SS	48534	4	6	4	56	222MS
Tie Rod Nuts	Nut, M10x1.5, SS	11586	4	34	25	-	N/A
Motor Plate to Bearing Housing	Screw, M10x1.5 x 30mm, SHCS	10987	4	52	38	-	N/A
Idler Assembly Hex Nut	Nut, 1/2-13 UNC, Hex	50386	1	47	35	-	N/A
Drive Cover to Motor Plate	Screw, M8x1.25 x 85mm, SHCS, SS	71592	12	26	19	-	242
Motor Plate Sealing Screw	Screw, M6x1.0 x 12mm, SHCS, SS	45593	1	11	8	96	242
Clevis/Eye to Adapter Plate (MP1 and MP3 Option)	Screw, M12x1.75 x 30mm, SHCS, SS	63303	4	60	44	-	242
Clevis/Eye to Adapter Plate (FTC and FTG Option)	Screw, M12x1.75 x 30mm, SHCS, SS	63303	4	60	44	-	242
Inline Housing Screws	Screw, M10x1.5 x ----, SHCS, SS	-	4	52	38	-	242
Inline Adapter Plate Screws	Screw, M8x1.25 x 20mm, SHCS, SS	38215	4	26	19	228	242
Actuator Shaft to Motor Shaft Coupling	Size 60 Coupling, M6 Screw	-	2	15	11	133	N/A
	Size 150 Coupling, M10 Screw	-	2	35	25	310	N/A
Trunnion Mounting Screws	Screw, M10x1.5 x 25mm, SHCS, SS	51724	8	52	38	-	242
Grease Access Plug	Plug, Hex Socket, M16x1.5	70763	1	11	8	96	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M16x1.5	70834	2	11	8	96	N/A
Magnetic Oil Fill Plug	Plug, Magnetic, M16x1.5	70763	2	11	8	96	N/A
Adapter, 10-32 x 3/16	10-32 x 3/16	70836	2	0.56-0.79	-	5-7	N/A
Oil Port Block Screw	Screw, M5x0.8 x 12mm, SHCS, SS	31127	4	6	4.66	56	222MS
1108 Pulley Bushing Screw	1/4-20 x 1/2	N/A	-	6	4.66	56	N/A
2012 Pulley Bushing Screw	7/16-14 x 7/8	N/A	-	31	23	280	N/A

## 7.2 FTX125 TORQUE SPECIFICATIONS

FTX125 Torque Specification								
Description	Description/Size	Part Number	Qty	in-lbs	ft-lbs	N m	Loctite	Color
Gland to face plate	Screw, M6X1.0 x 25mm, SHCS, SS	40146	4	96	8	11	Y	222MS
Bearing Lock Nut	M30x1.5 Custom	71244	1	-	100	136	N	N/A
Tie Rod Nuts	Nut, M12x1.75 hex, SS	23511	4	-	45	61	N	N/A
Main rod flange to roller-screw nut	Screw, M6x1.0x30mm, SHCS	34931	10	140	11.66	16	Y	271
Main rod to flange	M57x2.0	N/A	1	-	600	813	Y	2047
Rod end to main rod	M48x2.0	N/A	1	-	600	813	Y	2047
Screw shaft bushing to screw shaft	Screw, M8X1.25 x 20mm SHCS	11111	1	228	19	26	Y	271
Motor Mounting Plate to Bearing Housing	Screw, M12 X 1.75 x 35MM SHCS	71020	4	-	40	54	N	N/A
Cover to Motor Mounting Plate	SCREW, M12 X 1.75 x 120, SHCS, SS	62959	8,12	-	44	60	Y	242
Clevis/Eye to Adapter Plate (MP1 and MP3 Option)	Screw, M12 x 1.75 x 30mm, SHCS, SS	63303	4	-	44	60	Y	242
Clevis to Adapter Plate (FTC Option)	Screw, M14 x 2.0 x 40mm SHCS, SS	38709	4	-	50	68		242
Idler Assembly Hex Nut	Nut, 1/2-13 UNC, Hex, SS	50386	1	480	40	54	N	N/A
Acuator shaft to motor shaft coupling	Size 150 Coupling, M8 screw		2	310	25.83	35		N/A
	Size 300 Coupling, M10 screw		2	620	51.66	70		N/A
Inline Housing Screws	Screw, M12x1.75 x -----, SHCS, Magni Coat		4	-	44	60	Y	242
Inline Adapter Plate Screws	Screw, M8x1.25 x 35mm, SHCS, SS	30001	4	228	19	26	Y	242
Trunnion mounting screws	SCREW, M12 x 1.75 x 30 SHCS, SS	70890	8	527	44	60	Y	242
Grease Access Plug	Plug, Hex Socket, M18x1.5	70882	1	120	10	14	N	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M16x1.5	70834	2	96	8	11	N	N/A
Magnetic Oil Fill Plug	Plug, M16x1.5	70763	2	96	8	11	N	N/A
Adapter, 10-32 x 3/16	10-32 x 3/16	70836	2	5-7	-	0.56-0.79	N	N/A
Oil Port Block Screw	Screw, M5x0.8 x 12mm SHCS, SS	31127	8	56	4.66	6	Y	222MS
Screw for 2012 Pulley Bushing	7/16-14 x 7/8	N/A	-	280	23	31	N	N/A
Trantorque Bushing	Trantorque OE 22mm Bore	70190	-	-	111	150	N	N/A
	Trantorque OE 24mm Bore	65165	-	-	120	163	N	N/A
	Trantorque OE 28mm Bore	66697	-	-	118	160	N	N/A
	Trantorque OE 32mm Bore	65166	-	-	116	157	N	N/A
	Trantorque OE 35mm Bore	71226	-	-	106	144	N	N/A
Motor Plate Sealing Screw	Screw, M10x1.5 x 16mm, SHCS, SS, Low Head	63905	1	120	10	14	Y	242
Motor SHCS or Misc. Fasteners	Misc.	Misc.	-	-	-	-	Y	242



### 7.3 FTX160 TORQUE SPECIFICATION

FTX160 Torque Specification							
Fastener	Description/Size	Part Number	Qty	Nm	ft-lb	in-lb	Loctite® Spec
Gland to Face Plate Screw	Screw, M8x1.25 x 30mm, SHCS, SS	38342	8	26	19	230	222MS
Tie Rod Nuts	Nut, M16x2.0 Hex, Magni Coat	73427	4	111	82	-	N/A
Motor Plate to Bearing Housing	Screw, M16x2.0 x 40mm, SHCS	22599	4	117	86	-	N/A
Screw for 2012 Pulley Bushing	7-16-14 x 7/8	N/A	-	31	23	280	N/A
Screw for 2517 Pulley Bushing	½-13 x 1	N/A	-	49	36	430	N/A
Screw for 3020 Pulley Bushing	5/8-11 x 1 1/4	N/A	-	91	67	800	N/A
Idler Assembly Hex Nut	Nut, 5/8-11 UNC, Hex	62513	1	136	100	-	N/A
Drive Cover to Motor Plate	Screw, M16x2.0 x 120mm, SHCS, Magni Coat	73862	12	81	60	-	242
Motor Plate Sealing Screw	Screw, M10x1.5 x 25mm, SHCS, SS	31127	1	14	10	120	242
Clevis/Eye to Adapter Plate (MP1 and MP3 Option)	Screw, M16x2.0 x 45mm, SHCS, SS	69000	4	107	79	-	242
Clevis/Eye to Adapter Plate (FTC and FTG Option)	Screw, M24x3.0 x 50mm, SHCS, SS	74151	4	160	118	-	242
Inline Housing Nut	Nut, M16x2.0 Hex, Magni Coat	73427	4	111	82	-	N/A
Motor Plate to Adapter Plate	Screw, M8x1.25 x 25mm, SHCS, SS	33680	8	26	19	230	242
Actuator Shaft to Motor Shaft Coupling	Size 300 Coupling, M6 Screw	-	2	70	52	-	N/A
	Size 450 Coupling, M12 Screw	-	2	119	88	-	N/A
Trunnion Mounting Screws	Screw, M16x2.0 x 40mm, SHCS, Magni Coat	74160	8	203	150	-	242
Grease Access Plug	Plug, Hex Socket, M24x1.5	73429	1	20	15	180	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M20x1.5	69618	2	16	12	144	N/A
Magnetic Oil Fill Plug	Plug, Magnetic, M16x1.5	70763	2	11	8	96	N/A
Adapter, 10-32 x 3/16	10-32 x 3/16	70836	2	0.56-0.79	-	5-7	N/A
Oil Port Block Screw	Screw, M5x0.8 x 12mm, SHCS, SS	31127	4	6	4.66	56	222MS

## 7.4 FTP160 TORQUE SPECIFICATION

FTP160 Torque Specification							
Fastener	Description/Size	Part Number	Qty	Nm	ft-lb	in-lb	Loctite® Spec
Gland to Face Plate Screw	Screw, M8x1.25 x 30mm, SHCS, SS	38342	8	26	19	230	222MS
Tie Rod Nuts	Nut, M20x2.5 Hex, Magni Coat	69120	4	271	200	-	N/A
Motor Plate to Bearing Housing	Screw, M16x2.0 x 40mm, SHCS	22599	4	117	86	-	N/A
Screw for 2517 Pulley Bushing	½-13 x 1	N/A	-	49	36	430	N/A
Idler Assembly Hex Nut	Nut, 5/8-11 UNC, Hex	62513	1	136	100	-	N/A
Drive Cover to Motor Plate	Screw, M16x2.0 x 120mm, SHCS, Magni Coat	73862	12	81	60	-	242
Motor Plate Sealing Screw	Screw, M10x1.5 x 25mm, SHCS, SS	31127	1	14	10	120	242
Inline Housing Nut	Nut, M16x2.0 Hex, Magni Coat	73427	4	111	82	-	N/A
Motor Plate to Adapter Plate	Screw, M8x1.25 x 25mm, SHCS, SS	33680	8	26	19	230	242
Actuator Shaft to Motor Shaft Coupling	Size 450 Coupling, M12 Screw	-	2	119	88	-	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M20x1.5	69618	2	16	12	144	N/A
Magnetic Oil Fill Plug	Plug, Magnetic, M16x1.5	70763	2	11	8	96	N/A
Adapter, 10-32 x 3/16	10-32 x 3/16	70836	2	0.56-0.79	-	5-7	N/A
Oil Port Block Screw	Screw, M5x0.8 x 12mm, SHCS, SS	31127	4	6	4.66	56	222MS

## 7.5 FTX215 TORQUE SPECIFICATION

FTX215 Torque Specification							
Fastener	Description/Size	Part Number	Qty	Nm	ft-lb	in-lb	Loctite® Spec
Gland to Face Plate Screw	Screw, M10x1.5 x 45mm, SHCS, SS	67921	8	52	38	457	222MS
Tie Rod Nuts	Nut, M20x2.5 Hex, Magni Coat	69120	4	293	216	-	N/A
Motor Plate to Bearing Housing	Screw, M16x2.0 x 40mm, SHCS	22599	8	77	57	-	N/A
Screw for 2012 Pulley Bushing	7-16-14 x 7/8	N/A	-	31	23	280	N/A
Screw for 3020 Pulley Bushing	5/8-11 x 1 1/4	N/A	-	91	67	800	N/A
Idler Assembly Hex Nut	Nut, 3/4-10 UNC, Hex	10991	1	271	200	-	N/A
Drive Cover to Motor Plate	Screw, M16x2.0 x 140mm, SHCS	69284	12	108	80	-	242
Motor Plate Sealing Screw	Screw, M12x1.75 x 16mm, BHCS, SS	69058	1	14	10	120	242
Clevis/Eye to Adapter Plate	Screw, M24x3.0 x 60mm, SHCS, SS	69321	4	203	150	-	242
Inline Housing Nut	Nut, M20x2.5 Hex, Magni Coat	69120	4	136	100	-	N/A
Motor Plate to Adapter Plate	Screw, M12x1.75 x 30mm, SHCS, SS	63303	8	87	64	774	242
Actuator Shaft to Motor Shaft Coupling	Size 450 Coupling, M12 Screw	-	2	119	88	-	N/A
	Size 800 Coupling, M16 Screw	-	2	289	213	-	N/A
Trunnion Mounting Screws	Screw, M16x2.0 x 35mm, SHCS, SS	43933	8	121	89	-	N/A
Grease Access Plug	Plug, Hex Socket, M27x2.0	69620	1	20	15	180	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M20x1.5	69618	2	16	12	144	N/A
Magnetic Oil Fill Plug	Plug, Magnetic, M16x1.5	69619	2	11	8	96	N/A
Oil Port Block Screw	Screw, M6x1.0 x 12mm, SHCS, SS	45593	4	11	8	96	222MS

## 7.6 FTP215 TORQUE SPECIFICATION

FTP215 Torque Specification							
Fastener	Description/Size	Part Number	Qty	Nm	ft-lb	in-lb	Loctite® Spec
Gland to Face Plate Screw	Screw, M10x1.5 x 45mm, SHCS, SS	67921	8	52	38	457	222MS
Tie Rod Nuts	Nut, M30x3.5 Hex, Magni Coat	69121	4	575	558	-	N/A
Motor Plate to Bearing Housing	Screw, M16x2.0 x 40mm, SHCS	22599	8	77	57	-	N/A
Screw for 3020 Pulley Bushing	5/8-11 x 1 1/4	N/A	-	91	67	800	N/A
Idler Assembly Hex Nut	Nut, 3/4-10 UNC, Hex	10991	1	271	200	-	N/A
Drive Cover to Motor Plate	Screw, M16x2.0 x 140mm, SHCS	69284	12	108	80	-	242
Motor Plate Sealing Screw	Screw, M12x1.75 x 16mm, BHCS, SS	69058	1	14	10	120	242
Inline Housing Nut	Nut, M20x2.5 Hex, Magni Coat	69120	4	136	100	-	N/A
Motor Plate to Adapter Plate	Screw, M12x1.75 x 30mm, SHCS, SS	63303	8	87	64	774	242
Actuator Shaft to Motor Shaft Coupling	Size 800 Coupling, M16 Screw	-	2	289	213	-	N/A
Oil Sight Glass Plug	Plug, Oil Sight, M20x1.5	69618	2	16	12	144	N/A
Magnetic Oil Fill Plug	Plug, Magnetic, M16x1.5	69619	2	11	8	96	N/A
Oil Port Block Screw	Screw, M6x1.0 x 12mm, SHCS, SS	45593	4	11	8	96	222MS

## 7.7 MOTOR FASTENER MOUNTING TORQUES

Motor Mounting Torques (Stainless Steel Mounting Hardware)			
Screw Size Inch	Torque	Screw Size Metric	Torque
8-32	19 lb-in (2.1 N-m)	M2x0.4	2 lb-in (0.2 N-m)
10-32	29 lb-in (3.3 N-m)	M2.5x0.45	7 lb-in (0.8 N-m)
1/4-20	62 lb-in (7 N-m)	M4.x0.7	19 lb-in (2.1 N-m)
5/16-18	9 lb-ft (12 N-m)	M5x0.8	29 lb-in (3.3 N-m)
3/8-16	16 lb-ft (22 N-m)	M6x1.0	62 lb-in (7 N-m)
7/16-14	26 lb-ft (35 N-m)	M8x1.25	9 lb-ft (12 N-m)
1/2-13	41 lb-ft (56 N-m)	M10x1.5	16 lb-ft (22 N-m)
9/16-12	50 lb-ft (68 N-m)	M12x1.75	26 lb-ft (35 N-m)
5/8-11	69 lb-ft (94 N-m)	M14x2.0	50 lb-ft (68 N-m)
11/16-12	95 lb-ft (129 N-m)	M16x2.0	69 lb-ft (94 N-m)
3/4-10	122 lb-ft (165 N-m)	M20x2.5	122 lb-ft (165 N-m)

## 7.8 FTX SIDE MOUNT TORQUE SPEC

FTX Side Mount Torque Recommendations					
Actuator	Description / Size	Nm	ft-lb	in-lb	Locite® Spec
FTX095	Screw, M10x1.5 SHCS	41	30	360	242
FTX125	Screw, M12x1.75 SHCS	98	72	-	242
FTX160	Screw, M16x2.0 SHCS	255	188	-	242
FTX215	Screw, M16x2.0 SHCS	313	230	-	242

## 8.0 WARRANTY AND LIMITATION OF LIABILITY

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Products are warranted for two years from date of manufacture as determined by the serial number on the product label. Labels are generated and applied to the product at the time of shipment. The first and second digits are the year and the third and fourth digits represent the manufacturing week. Product repairs are warranted for 90 days from the date of the repair. The date of repair is recorded and tracked by individual product serial number.

Exlar Corporation (“Exlar”) warrants its product(s) to the original purchaser and, in the case of original equipment manufacturers, to their original customer, to be free from defects in material and workmanship and to be made only in accordance with Exlar’s standard published catalog specifications for the product(s) as published at the time of purchase. Warranty or performance to any other specifications is not covered by this warranty unless otherwise agreed to in writing by Exlar and documented as part of any and all contracts, including but not limited to purchase orders, sales orders, order confirmations, purchase contracts and purchase agreements. In no event shall Exlar be liable or have any responsibility under such warranty if the product(s) has been improperly stored, installed, used or maintained, or if Buyer has permitted any unauthorized modifications, adjustments and/or repairs to such product(s). Seller’s obligation hereunder is limited solely to repairing or replacing (at its opinion), at the factory any product(s), or parts thereof, which prove to Seller’s satisfaction to be defective as a result of defective materials, or workmanship and within the period of time, in accordance with the Seller’s stated product warranty (see Terms and Conditions, above), provided, however, that written notice of claimed defects shall have been given to Exlar within thirty (30) days from the date of any such defect is first discovered. The product(s) claimed to be defective must be returned to Exlar, transportation prepaid by Buyer, with written specification of the claimed defect. Evidence acceptable to Exlar must be furnished that the claimed defects were not caused by misuse, abuse, or neglect by anyone other than Exlar.

Components such as seals, wipers, bearings, brakes, bushings, gears, splines, and roller screw parts are considered wear parts and must be inspected and serviced on a regular basis. Any damage caused by failure to properly lubricate Exlar products and/or to replace wear parts at appropriate times, is not covered by this warranty. Any damage due to excessive loading is not covered by this warranty.

The use of products or components under load such that they reach the end of their expected life is a normal characteristic of the application of mechanical products. Reaching the end of a product’s expected life does not indicate any defect in material or

workmanship and is not covered by this warranty.

Costs for shipment of units returned to the factory for warranty repairs are the responsibility of the owner of the product. Exlar will return ship all warranty repairs or replacements via UPS Ground at no cost to the customer.

For international customers, Exlar will return ship warranty repairs or replacements via UPS Expedited Service and cover the associated shipping costs. Any VAT or local country taxes are the responsibility of the owner of the product.

The foregoing warranty is in lieu of all other warranties (except as Title), whether expressed or implied, including without limitation, any warranty of merchantability, or of fitness for any particular purpose, other than as expressly set forth and to the extent specified herein, and is in lieu of all other obligations or liabilities on the part of Exlar.

Seller’s maximum liability with respect to these terms and conditions and any resulting sale, arising from any cause whatsoever, including without limitation, breach of contract or negligence, shall not exceed the price specified herein of the product(s) giving rise to the claim, and in no event shall Exlar be liable under this warranty otherwise for special, incidental or consequential damages, whether similar or dissimilar, of any nature arising or resulting from the purchase, installation, removal, repair, operation, use or breakdown of the product(s) or any other cause whatsoever, including negligence.

The foregoing warranty shall also apply to products or parts which have been repaired or replaced pursuant to such warranty, and within the period of time, in accordance with Seller’s stated warranty.

**NO PERSON, INCLUDING ANY AGENT OR REPRESENTATIVE OF EXLAR, IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY ON BEHALF OF EXLAR CONCERNING ANY PRODUCTS MANUFACTURED BY EXLAR, EXCEPT TO REFER PURCHASERS TO THIS WARRANTY.**

## About Curtiss-Wright Commercial / Industrial Segment

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Curtiss-Wright provides highly engineered products and services with a focus on advanced technologies for high performance platforms and critical applications. Our technological expertise spans decades of innovation and we have compiled an extensive portfolio of critical technologies serving commercial, defense, energy and industrial markets. Our technologies, some that are sole source or first-of-a-kind, achieve the demanding performance levels required for optimal safety, performance and reliability in difficult “must not fail” applications.

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