

MANUAL INSTALLATION, OPERATION AND MAINTENANCE

RSX EXTREME FORCE ROD-STYLE ACTUATOR



[Link to: Motor Installation \(pg 17\)](#)

2171-4007_04

Original Instructions - English

Translations will be supplied in other community languages as required by customers

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1.1 Safety Symbols

General

Read completely through the applicable sections of the manual before the equipment/unit is unpacked, installed or operated. Pay careful attention to all of the dangers, warnings, cautions and notes stated in the manual.

Serious injury to persons or damage to the equipment may result if the information in the manual is not followed.

Safety Symbols

Items that are specifically marked DANGER, WARNING, CAUTION, PROHIBITIVE, MANDATORY ACTION, or NOTE! are arranged in a hierarchical system and have the following meaning:

DANGER!

Indicates a very hazardous situation which, if not avoided, could result in death or serious injury. This signal word is limited to the most extreme situations.

WARNING!

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

Indicates a potentially hazardous situation which, if not avoided, this situation may result in property damage or minor or moderate injury.

PROHIBITED ACTION

Indicates Prohibited Action

MANDATORY ACTION

Indicates Mandatory Action

NOTE!

Information that requires special attention is stated here.

1.2 Safety Considerations

■ Proper and Safe Use of Product

Device Damage Prevention

To prevent permanent damage to the device, proper care should be taken not to exceed published voltage, current, temperature, and load/force ratings. In addition, proper mechanical assembly and proper wiring should be verified and safety measures checked before applying power to the complete equipment package.

Personal Safety

During normal operation the actuator can become hot, especially the appropriately marked electric motor housing, which is electrically coupled to the actuator. In addition, the case ground of the appropriately marked electric motor should be tied to an earth ground to prevent the presence of case voltage.

During normal operation, the actuator rod travels in and out creating a possible pinch point.

Proper guarding and signage must be used prevent entry into possible pinch zones and contact with hot surfaces. It is highly recommended to display proper safety notices and implement proper safety measures to prevent contact with hot surfaces.

Handling and Unpacking

When unpacking and handling the actuator, care should be taken not to drop the actuator as this can damage the connectors, internal electronics, or cause misalignment of the actuator feedback device. Damage the internal mechanical components may cause poor performance or render the actuator non-functional. Since this is an electromechanical device, proper ESD measures should be taken to avoid static electricity from contacting the signal and power lines of the device. as this can damage the internal mechanical components rendering the actuator damaged or non-functional.

Packing and Transport



NOTE!

Package actuator to prevent damage during transport. Also make sure the actuator is clean, dry and protected from moisture.

Modifications to the Equipment



WARNING! WARNING!

The manufacturer takes no responsibility whatsoever if the equipment is modified or if the equipment is used in any way beyond performance specifications. Unauthorized modifications or changes to the equipment are strictly forbidden and void all warranties.

■ Requirement Regarding Personnel



NOTE!

All personnel must be completely informed regarding all safety regulations and the function of the equipment.

Risk Area and Personnel



When installed, pinch points are generated capable of damaging forces. The risk area surrounding the actuator must either be guarded or clearly marked, including display signage in accordance with all applicable national and international legal requirements. The risk area must be protected by a safety system that stops the equipment if anyone enters the risk area. Personnel who enter the risk area must be authorized, trained and qualified for the different tasks inside the risk area.

2.1 General Description



Figure 2-1: RSX actuator with RP (Reverse Parallel) motor mount

RSX series is a family of roller screw or ball screw driven high force mechanical rod style linear actuators manufactured by Tolomatic Inc. to customer specified stroke length and mounting provisions for customer specified motor (gearhead) and are intended for use in general purpose industrial applications.

The product family currently includes the following models: RSX10, RSX15, RSX20 and RSX25.

The actuators have hard coat anodized aluminum construction with steel tie rods and thrust rod.

An appropriately marked electric motor or a motor (gearhead) assembly is coupled with the input shaft of the actuator to create linear motion. The motor (gearhead) may be installed by the customer at their facility or by Tolomatic.

2.2 Product Features

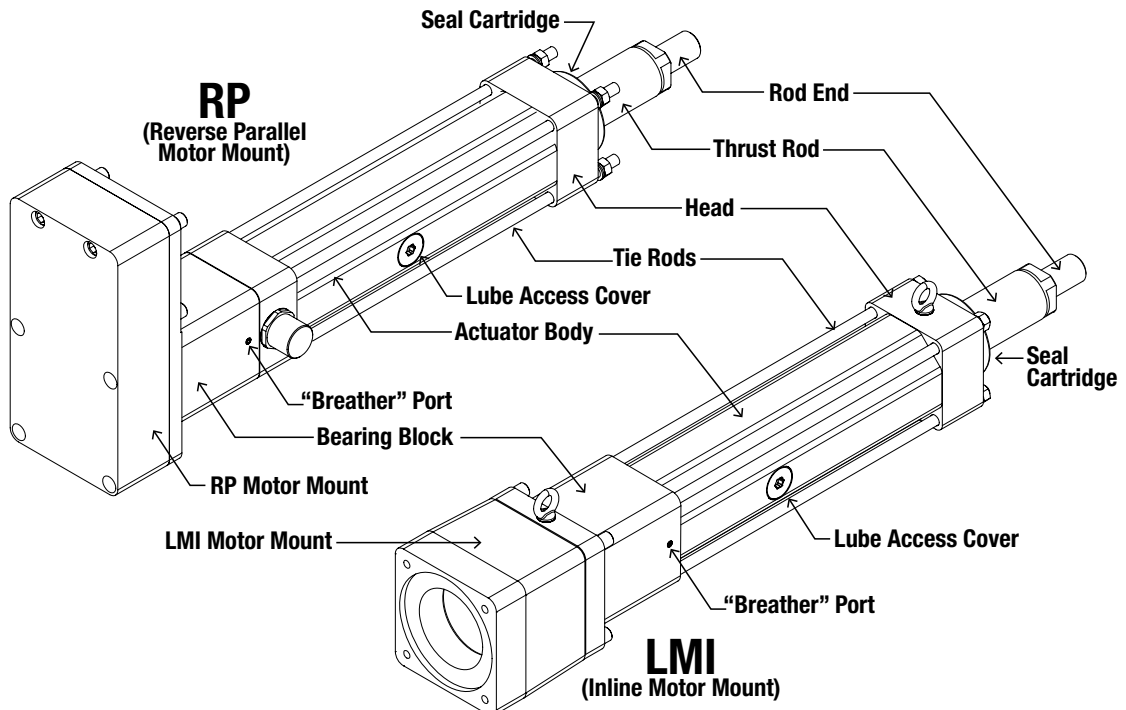


Figure 2-2: RSX actuator major components

3.1 RSX Series Standard Configurations and Options

RSX series includes four actuator models: RSX10, RSX15, RSX20 and RSX25

- Each of the RSX actuator models is available in a number of different motor mounting configurations
- Each of the RSX actuator models is available with a number of different mounting options:
- Each of the RSX actuator models is available with a number of different rod end options:
- Each of the RSX actuator models is available with a choice of positioning sensors (switches)
- Each of the RSX actuator models is available with extended length tie rods
- Each of the RSX actuator models is available with extended length thrust rod
- Each of the RSX actuator models is available with IP67 ingress protection
- Each of the RSX actuator models is available in an oil filled version



NOTE For performance data and specifications please refer to the [Tolomatic RSX Product Brochure 2171-4001](#).

3.2 RSX Configurations and Options Ordering Codes



NOTE See [Tolomatic RSX Product Brochure 2171-4001](#) for complete information on ordering codes. Please use 3D CAD files (available at www.tolomatic.com) for critical dimensions.

ACTUATOR

RSX 15 RN12 SM450 RPI HT1 FFG OIL CLV XR10 RK2 YM

MODEL & MOUNTING

RSX Rod-Style Actuator

SIZE (TONNAGE RATING)

10, 15, 20, 25, 33†

23PT, 33PT Press Models

†Contact Tolomatic for ordering

NUT/SCREW

SIZE	CODES
10	RN12, BN01, BN02
15	RN12, BN01, BN02
20	RN12
25	RN10
33†	RN10
33PT	RN10

RN = Roller Nut/Screw
BN = Ball Nut/Screw
†Contact Tolomatic for ordering

STROKE LENGTH

SM... Enter desired stroke length in millimeters

See page 8 for minimum and maximum stroke lengths available

OPTIONS

MOTOR MOUNTING

LM In-line motor mount
RP1 1:1 ratio, reverse parallel motor mount
RP2 2:1 ratio, reverse parallel motor mount

STANDARD OR HIGH TORQUE

ST1* Standard Actuator
HT1 High Torque Option

*Only available with FP option on RSK10

TRUNNION MOUNT

TR Trunnion mount

NOTE: Trunnion mount is not available for field retrofit, contact Tolomatic for details

IP67

IP67 Ingress protection and thrust rod scraper

ACTUATOR MOUNTING

For all motor mounts:
FFG Front Flange Mount
MP2 Mounting Plates (2 required)
XT Extended Tie Rods (min. 50mm, max. 100mm)

OIL COOLED

OIL For extended high duty cycle/high force performance

NOTE: The RSX actuator with oil cooled option is IP67 rated. To get a motor gasket select IP67 option

ROD END

Externally threaded rod end is standard
CLV Clevis Rod End
SR1 Imperial Thread

ROD EXTENSION

XR... Enter desired rod extension in millimeters

NOTE: XR option does not increase the working stroke, only the length of the thrust rod.

NOTE: Please consult Tolomatic if your application requires rod extension length greater than 100mm (3.9in).

SWITCHES

TYPE	LOGIC	NORMALLY OPEN	QUICK-DISCONNECT	CODE	QUANTITY	LEAD LENGTH
REED	SPST	Open	no	RY	5 meters (16.4 feet)	
		Closed	yes	RK		
	PNP	Open	no	TY		
		Closed	yes	NK		
SOLID STATE	NPN	Open	no	TK	After code enter quantity desired	
		Closed	yes	KK		
	PNP	Open	no	PT		
		Closed	yes	PK		
NPN	Open	no	HY			
	Closed	yes	HK			

YOUR MOTOR HERE

YM... Motor mount for non-Tolomatic motor.
www.tolomatic.com

Contact Tolomatic for food grade option lead time and application review.

**Fast delivery
Built-to-Order**

NOTE: Brakes mounted on reverse parallel motor mounts (especially in vertically positioned actuators) will not prevent back driving of the screw and the load falling under gravity in the event of a timing belt failure. An inline motor mount with a fail-safe brake mounted directly to the actuator shaft or a special geared or thru-shaft reverse parallel construction should be considered if a brake is required in a safety critical application. Contact Tolomatic for alternate reverse parallel brake mounting options.

Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

Figure 3-1 RSX ordering codes and descriptions

3.3 Motor (Gearhead) Mounting Options

- Each of the RSX actuators is available in Reverse Parallel or Inline motor (gearhead) mounting configuration;
- Timing belt reduction drive in the Reverse Parallel configuration is available with 1:1 or 2:1 reduction ratio;
- Motor (gearhead) can be installed by the Customer at their facility or at Tolomatic.

3.4 Actuator Mounting Options

All of the RSX actuators are available with the following mounting options:

- Front Flange mount;

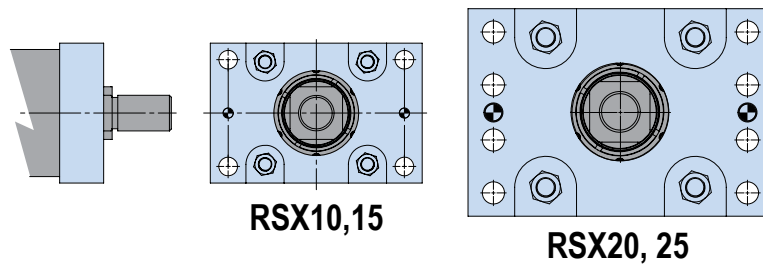


Figure 3-2 RSX front flange option

- Mounting Plates.

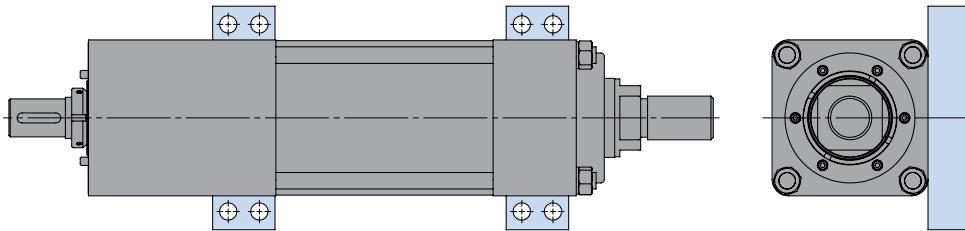


Figure 3-3 RSX mounting plates option

- Trunnion mount.

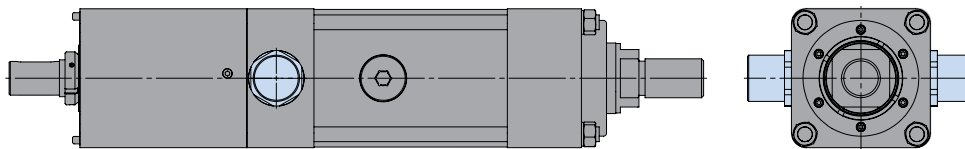


Figure 3-4 RSX trunnion mount option

3.5 Rod End Options

All of the models are available with the following rod end options:

- Rod Clevis;

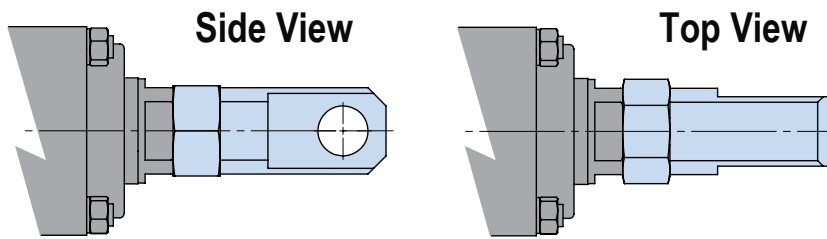


Figure 3-5 RSX rod clevis option

- Rod End with male Imperial mounting thread.

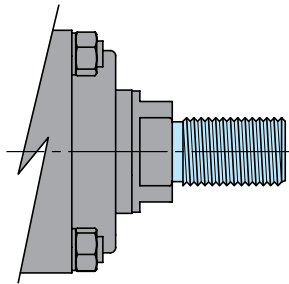


Figure 3-6 RSX external thread option

3.6 Extended Thrust Rod

All of the RSX actuator models are available with a thrust rod of extended length per customer specifications.

3.7 Extended Tie Rods

All of the RSX actuator models are available with extended tie rods that could be used to mount the actuator to any wall with a set of through holes by protruding the tie rods into the holes and securing the actuator with 4 jam nuts from the other side. If this option is used it is strongly recommended that the actuator is properly aligned by providing a pilot hole to prevent side loading. (see section 4.2)

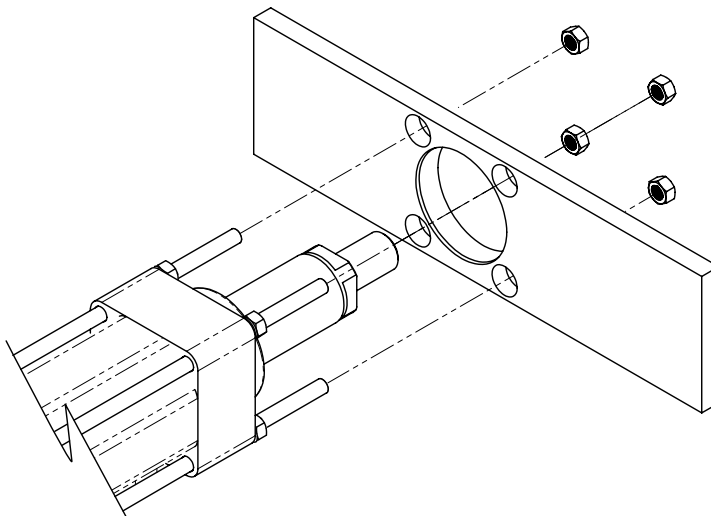


Figure 3-7 RSX extended tie rods option

3.8 IP67 Ingress Protection

All of the RSX actuator models are available with optional IP67 ingress protection, when additional sealing gaskets and washers are used when mounting the motor (gearhead) as well as between mating parts of Reverse Parallel or Inline motor mounting kits.

3.9 Position Sensors

All of the RSX actuator models are available with Reed, Solid State PNP or Solid State NPN position sensors with a choice of Normally Open or Normally Closed logic, and with “Quick Disconnect” Connectors or flying leads. Please see [Tolomatic RSX Product Brochure 2171-4001](#) for specifications and dimensional information.

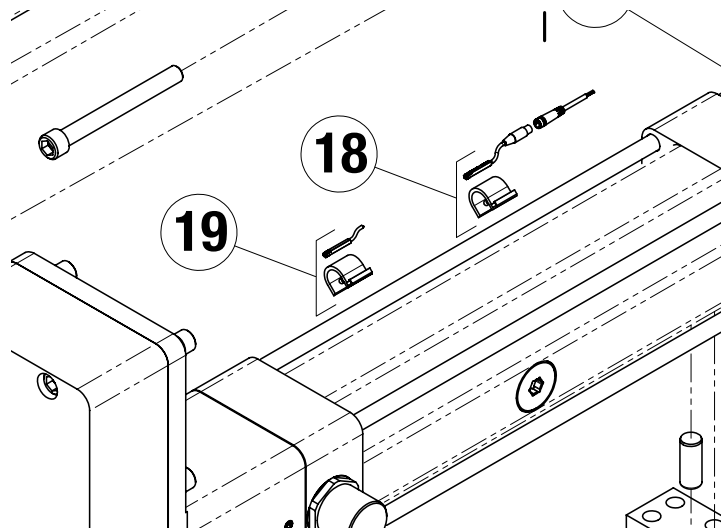


Figure 3-8 RSX position sensors

3.10 Oil Filled Version

The oil filled version of the RSX actuator provides improved thermal capacity by using synthetic oil that serves as a lubricant for the roller screw as well as the cooling media transferring internal heat generated by the roller nut to the inside walls of the aluminum body, more rapidly dissipating heat and enabling improved performance (higher continuous force outputs and duty cycles).

⚠ WARNING **WARNING!**

Prior to installation and commissioning of this equipment this Manual and all accompanying manufacturer documents and manuals MUST be completely read by the appropriate personnel. All warnings must be given special attention.

4.1 General Operation

RSX series linear actuators function by translating the rotary motion of externally mounted electric motor into linear motion of the thrust rod using a planetary roller screw mechanism. The travel coordinates, linear speed, acceleration and force are typically controlled by a servo drive.

The relationship between the rotary motion of the motor and the linear motion of the actuator corresponds to the following relationships:

$$\text{Linear Force (N)} = \frac{[\text{motor torque (Nm)} / 1000 \times 2 \times \pi \times \text{reduction ratio} \times \text{screw efficiency}]}{\text{screw lead (mm)}}$$

$$\text{Linear Force (lbf)} = \frac{[\text{motor torque (lbf-in)} \times 2 \times \pi \times \text{reduction ratio} \times \text{screw efficiency}]}{\text{screw lead (in)}}$$

⚠ CAUTION **CAUTION!**

Care should be taken not to exceed the physical travel limits of the actuator. Exceeding the specified stroke will cause the actuator to reach mechanical end of stroke internally. Although protected by the end of stroke bumpers, reaching internal end of stroke at speeds and torque greater than those used to home (less than 25mm/sec and low torque) may physically damage the screw and the internal components of the actuator.

4.2 Alignment and Side Loading

Alignment of the actuator with regard to the application axis of motion and the direction of the force is essential to its proper functioning. Misalignment creates side loads on the thrust rod, leading to rod binding, uneven roller nut loading and premature wear of rod seals, leading to excessive heat generation and reduced service life of the actuator. RSX series actuators must not be used in applications where side loading occurs. Loads must be aligned with the line of motion of the thrust rod. Where necessary rod alignment couplers may be used.

4.3 Mechanical Installation

1. Open the crate and remove packaging material
2. Carefully remove linear actuator from the crate *Consider the weight of the actuator. Depending on the configuration, the actuator can weight over 227 kg (500 lb)
3. Visually inspect the actuator for damage
4. Notify the carrier of any shipping damage immediately
5. Move the actuator to its position.
6. If the actuator is mounted in a vertical or inclined position include safety measures to prevent load from falling in the case of screw failure or loss of power
7. Ensure sufficient clearance around the actuator to allow for airflow and cooling
8. Follow installation mounting instructions for each configuration.

4.4 Lifting and Moving

⚠ CAUTION CAUTION!

Special care must be taken when lifting and moving the RSX actuators. Depending on the size and configuration RSX actuators can represent heavy and awkward loads. Lifting equipment with appropriate capacity must be used, and safe hoisting practices must be employed.

RSX SIZE	WEIGHT					PER UNIT
	BASE ACTUATOR					
	kg					kg per mm
	LMI	RP1 ST	RP1HT	RP2 ST	RP2 HT	
10	65.65	72.61	–	73.45	–	0.041
15	65.65	–	73.23	–	73.77	0.041
20	83.67	–	93.31	–	93.85	0.045
25	176.62	–	207.95	–	209.86	0.079
	lb					lb per in
10	144.74	160.07	–	161.92	–	2.31
15	144.74	–	161.45	–	162.63	2.31
20	184.45	–	205.72	–	206.90	2.51
25	389.38	–	458.44	–	462.66	4.40

Table 4-1 RSX actuator weights. Calculate total actuator weight by: (multiplying stroke x per unit weight) then adding base actuator weight.

4: MECHANICAL INSTALLATION

Special care must be taken when lifting and moving the RSX actuators. Depending on the size and configuration RSX actuators can represent heavy and awkward loads. Lifting equipment with appropriate capacity must be used, and safe hoisting practices must be employed.

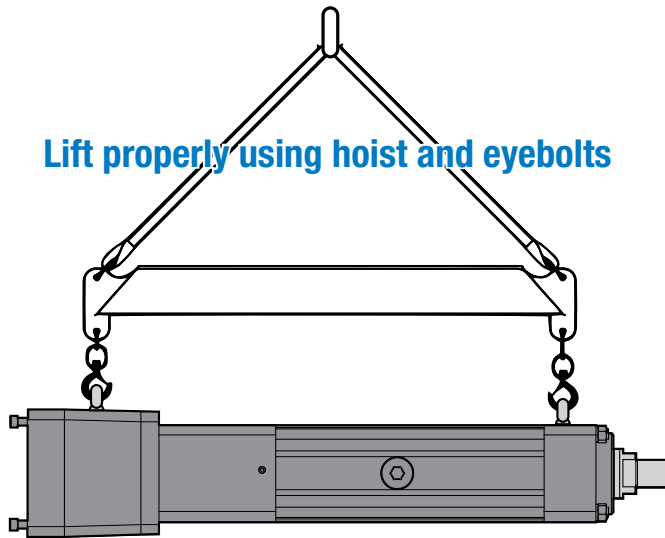


Figure 4-1 Lift RSX properly using hoist and eyebolts

If for any reason the RSX actuator is not equipped with lifting eyebolts it may be lifted by securing straps around the bearing block next to the motor mount and the thrust rod next to the front head. The reverse parallel housing must be oriented vertically pointing upward. (Figure 4-2)



Figure 4-2 Lift RSX properly without eyebolts

4.5 Motor Installation

4.5.1 Reverse Parallel Configuration

When the motor (gearhead) is installed by the Customer at their facility, RSX actuator is shipped with 6 socket head cap screws holding the Reverse Parallel Cover “hand tight” and the motor (gearhead) fasteners and the timing pulley separate.

To install the motor (gearhead):

- a. RSX actuators use taper lock bushings for mounting pulleys.
- b. Assemble the timing pulley on the motor (gearhead) shaft using the motor (gearhead) key and secure with fasteners tightened to the torque values given below:

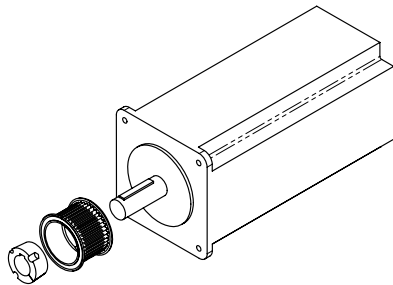


Figure 4-3 RSX RP motor and pulley

MODEL	REDUCTION RATIO	NUMBER OF SET SCREWS	SET SCREW SIZE	TORQUE	
				(Nm)	(lbf-ft)
RSX10,15, 20	RP1	2	1/2-13 UNC	48.5	35.8
	RP2	2	3/8-16 UNC	19.8	14.6
RSX25	RP1	2	5/8-11 UNC	90.4	66.7
	RP2	2	7/16-14 UNC	31.6	23.3

Table 4-2 RSX motor pulley set screw torque requirements

*Thread adhesive is recommended.

- c. Install the motor (gearhead) on the Reverse Parallel Plate (with fasteners not tight)*;
- d. Tension the timing belt using the following instruction
 1. Locate the belt over the pulleys and slide the drive pulley over the motor shaft. Tighten the pulley to the motor shaft.
 2. Verify that there is clearance between the inside of the RP case and each pulley. Verify that the pulleys are aligned to each other.
 3. Tension the belt by pulling the motor away from the drive shaft with the appropriate force from the “Total Belt Tension” column in the chart below. Tighten the motor fasteners while this force is applied to the motor.

4: MECHANICAL INSTALLATION

			Tension Specs				Sonic Tension Method						Force Deflection Method					
			Total Belt Tension		Belt Span Tension Force		Natural Frequency	Tension Tolerance	Mass		Width		Span		Deflection		Deflection Force	
			lbf	N	lbf	N			Hz	Hz	lb/in	g/m	in	mm	in	mm	in	mm
RSX10,15,20	RP1	ST1	440	1,957	220 ± 20	979 ± 89	190	±8	0.408	4.7	1.42	36	7.87	200	0.12	3.0	16 ± 2	71 ± 9
		HT1	440	1,957	220 ± 20	979 ± 89	145	±6	0.408	4.7	2.44	62	7.87	200	0.12	3.0	16 ± 2	71 ± 9
	RP2	ST1	440	1,957	220 ± 20	979 ± 89	197	±8	0.408	4.7	1.42	36	7.60	193	0.12	3.0	16 ± 2	71 ± 9
		HT1	440	1,957	220 ± 20	979 ± 89	150	±6	0.408	4.7	2.44	62	7.60	193	0.12	3.0	16 ± 2	71 ± 9
RSX25	RP1	HT1	500	2,224	250 ± 20	1,112 ± 89	110	±5	0.408	4.7	2.44	62	11.024	280	0.17	4.3	19 ± 2	84.5 ± 9
	RP2	HT1	500	2,224	250 ± 20	1,112 ± 89	111	±5	0.408	4.7	2.44	62	11.087	282	0.17	4.3	19 ± 2	84.5 ± 9

Table 4-3 RSX belt tension specifications

4. Validate the span tension of the belt using either a sonic tension meter or force deflection method.

a. Sonic tension meter

i. Enter the mass, width, and span from the table above into the tension meter.

ii. Test the belt using the manufacturers recommendations

iii. Compare the span tension to the target in the “Span Tension Force”

b. Force deflection method

i. At the center of the span, measure the force required to deflect the belt the distance called out in the “Deflection” column in the table above. The measured force should fall within the deflection force tolerance noted in the “Deflection Force” column.

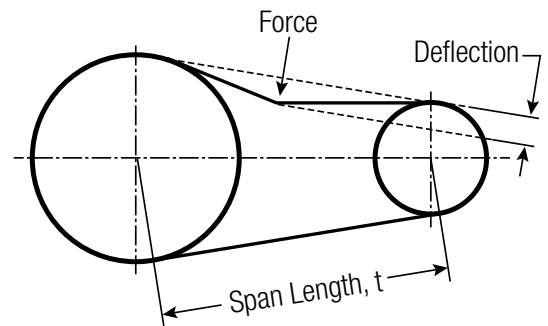


Figure 4-4 RSX belt pulley diagram

1. Ensure one pulley is free to rotate.

2. The deflection force needs to be evenly applied across the entire belt width. Use a piece of steel or angle iron across the belt width and deflect the belt evenly.

e. Tighten the motor fasteners to the following torque values:

4: MECHANICAL INSTALLATION

SCREW SIZE	TORQUE	
	(Nm)	(lbf-ft)
M6	10	7
M8	25	18
M10	50	35
M12	85	60
M14	135	100
M18	275	200

Table 4-4 RSX motor fasteners torque requirements

f. Tighten the Reverse Parallel Cover fasteners to the following minimum torque values**:

MODEL	FASTENER SIZE	TORQUE	
		(Nm)	(lbf-ft)
RSX10, 15, 20	M16	200	150
RS25	M24	675	500

Table 4-5 RSX reverse parallel cover fasteners torque requirements

*If equipped with IP67 option verify that the gasket is installed between the motor (gearhead) and the plate, and the sealing washers are used on the motor fasteners.

**If equipped with IP67 option verify that the Reverse Parallel cover gasket is properly seated inside the machined recess of the Reverse Parallel plate.

4.5.2 Inline Configuration

When the motor (gearhead) is installed by the Customer at their facility, RSX actuator is shipped with the motor (gearhead) fasteners and the coupling half separate.

To install the motor (gearhead):

- a. Assemble the coupling half on the motor (gearhead) shaft using the motor (gearhead) key (see the drawing) and secure with fasteners tightened to the torque values given below (thread adhesive is recommended):

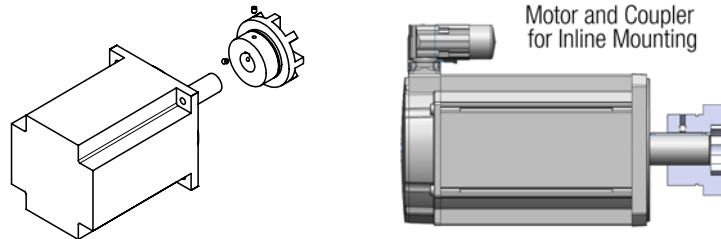


Figure 4-5 RSX motor coupler for LMI (inline) motor mounting

MODEL	NUMBER OF SET SCREWS	SET SCREW SIZE	TORQUE	
			(Nm)	(lbf-ft)
RSX10, 15, 20	2	5/16-18 UNC	20	15
RSX25	2	3/8-16 UNC	34	25

Table 4-6 RSX motor coupler set screw torque requirements

Carefully align the coupling half with the mating half on the actuator's drive shaft and move the motor (gearhead) in until it is fully seated on the LMI motor plate. If equipped with IP67 option verify that the gasket is installed between the motor (gearhead) and the plate.

- b. Tighten the motor fasteners to the following torque values*:

SCREW SIZE	TORQUE	
	(Nm)	(lbf-ft)
M6	10	7
M8	25	18
M10	50	35
M12	85	60
M14	135	100
M18	275	200

Table 4-7 RSX motor fasteners torque requirements

*If equipped with IP67 option verify that the sealing washers are used on the motor fastener

4.6 Options

4.6.1 Front Flange Mount

Front Flange (Option FFG) may be aligned to the axis of motion of the application (machine) with 2 dowel pins, and secured with fasteners (dowel pins and fasteners are not included) tightened to the torque values given below. Please see [Tolomatic RSX Product Brochure 2171-4001](#) for dimensional drawings.

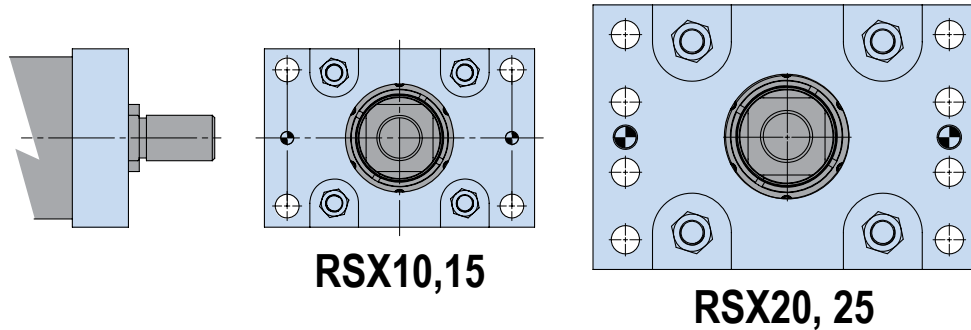


Figure 4-6 RSX front flange option

MODEL	NUMBER OF DOWEL PINS	DOWEL PIN SIZE	NUMBER OF FASTENERS	METRIC FASTENERS		
				PROPERTY CLASS	FASTENER SIZE	TORQUE (Nm)
RSX10,15,20	2	12	4	12.9	M20	685
RSX25	2	20	8	12.9	M24	1180

MODEL	NUMBER OF DOWEL PINS	DOWEL PIN SIZE	NUMBER OF FASTENERS	IMPERIAL FASTENERS		
				SAE GRADE	FASTENER SIZE	TORQUE (lbf-ft)
RSX10,15,20	2	12	4	8	3/4-16	445
RSX25	2	20	8	8	7/8-14	700

Table 4-8 RSX front flange fasteners torque requirements

4.6.2 Trunnion Mount

RSX actuators are available with Trunnion mount (Option TRR). Please see [Tolomatic RSX Product Brochure 2171-4001](#) for dimensional drawings.

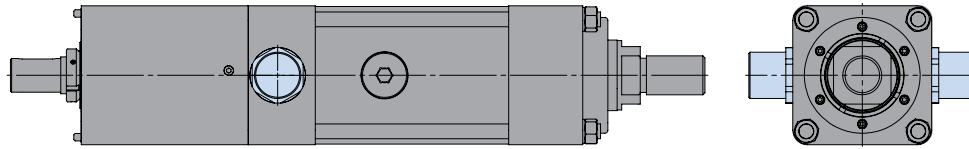


Figure 4-7 RSX10,15,25 trunnion mount option

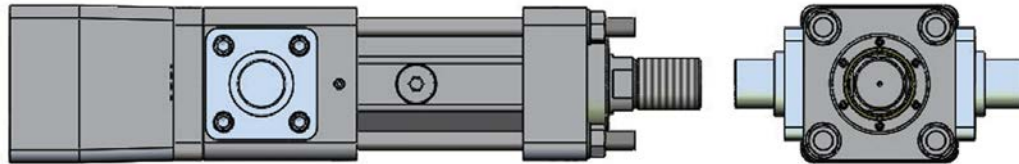


Figure 4-8 RSX20 trunnion mount option

MODEL	TRUNNION DIAMETER, mm	TOLERANCE, μm	TRUNNION DIAMETER, in	TOLERANCE, in
RSX10,15	50 f8	-25/-64	1.9685	-.0010/-.0025
RSX20	60 f8	-30/-76	2.3622	-.0012/-.0030
RSX25	63 f8	-30/-76	2.4803	-.0012/-.0030

Table 4-9 RSX trunnion diameter and tolerance

4.6.3 Mounting Plates

RSX series actuators may be mounted to a surface parallel to the line of motion using mounting plates located under the bearing block and the front head of the actuator (Option MP2). Each of the two mounting plates is secured with 4 fasteners (not included) tightened to the torque values given below. Please see [Tolomatic RSX Product Brochure 2171-4001](#) for dimensional drawings.

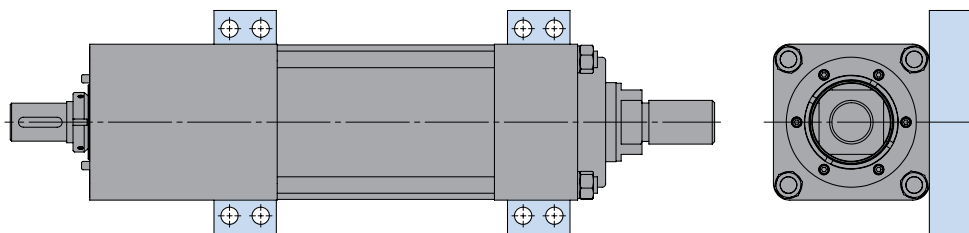


Figure 4-9 RSX mounting plates option

MODEL	NUMBER OF FASTENERS	METRIC FASTENERS		
		PROPERTY CLASS	FASTENER SIZE	TORQUE (Nm)
RSX10,15	8	12.9	M16	350
RSX20	8	12.9	M20	685
RSX25	8	12.9	M20	685

MODEL	NUMBER OF FASTENERS	IMPERIAL FASTENERS		
		SAE GRADE	FASTENER SIZE	TORQUE (lbf-ft)
RSX10,15	8	8	5/8-18	260
RSX20	8	8	3/4-16	445
RSX25	8	8	3/4-16	445

Table 4-10 RSX mounting plates torque requirements

4.6.4 Extended Tie Rod Mounting

In the event the actuator is mounted using optional Extended Tie Rods the actuator is secured by 4 hex jam nuts (not included) installed with flat washers on the extended threaded portion of each tie rod and tightened to the torque values given below.

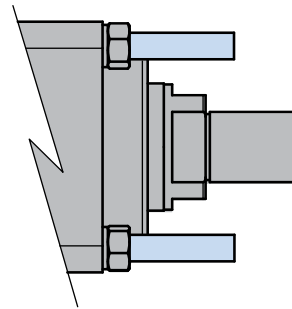


Figure 4-10 RSX extended tie rod mount option

MODEL	NUMBER OF NUTS	PROPERTY CLASS	NUT SIZE	TORQUE	
				(Nm)	(lbf-ft)
RSX10,15	4	10.9	M16x1.5	150	110
RSX20	4	10.9	M24x3.0	360	265
RSX25	4	10.9	M24x3.0	360	265

Table 4-11 RSX extended tie rod mounting torque requirements

The recommended pilot hole dimensions for the actuator head alignment (if provided):

MODEL	PILOT DIAMETER, mm	TOLERANCE, mm	PILOT DIAMETER, in	TOLERANCE, in
RSX10,15	125	80/30	4.9213	.0031/.0012
RSX20	125	80/30	4.9213	.0031/.0012
RSX25	175	80/30	6.8898	.0031/.0012

Table 4-12 RSX pilot holes diameter and tolerance

4.6.5 Rod End

Standard RSX actuators' Rod Ends have a male metric mounting thread. Optional Rod Ends with imperial threads are available (Option SR1). Please see [Tolomatic RSX Product Brochure 2171-4001](#) for dimensional drawings.

The recommended tightening torque values when securing Rod End threads to any moving components of an application are given below.

MODEL	STANDARD THREAD SIZE	TORQUE (Nm)	OPTIONAL THREAD SIZE	TORQUE (lbf-ft)
RSX10,15	M42x4.5-6g	1590	1-7/8-12 UN-2A	1175
RSX20	M64x3.0-6g	3560	2-1/2-12 UN-2A	2625
RSX25	M64x3.0-6g	3560	2-1/2-8 UN-2A	2625

Table 4-13 RSX rod end torque requirements

4.6.6 Rod Clevis

RSX actuators are available with Rod Clevis (Option CLV) for standard (metric) rod end. Please see [Tolomatic RSX Product Brochure 2171-4001](#) for dimensional drawings.

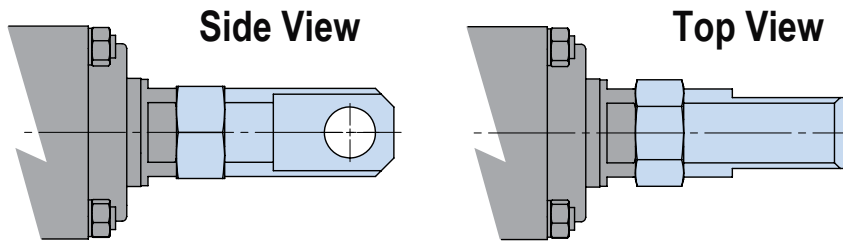


Figure 4-11 RSX rod clevis option

MODEL	ROD CLEVIS BORE DIAMETER, mm	TOLERANCE, μm	ROD CLEVIS BORE DIAMETER, in	TOLERANCE, in
RSX10,15	36 H9	62/0	1.4173	.0024/0
RSX20,25	45 H9	62/0	1.7717	.0024/0

Table 4-14 RSX rod clevis bore diameter and tolerance

MODEL	ROD CLEVIS WIDTH, mm	TOLERANCE, μm	ROD CLEVIS WIDTH, in	TOLERANCE, in
RSX10,15	50 h13	0/-39	1.4173	0/-.0015
RSX20,25	60 h13	0/-46	1.7717	0/-.0018

Table 4-15 RSX rod clevis width and tolerance

Unless requested RSX actuators are shipped with Rod Clevis Nut hand tight on the rod end thread to allow for the onsite alignment of the rod clevis.

The recommended tightening torque values when securing the Rod Clevis Nut are given below.

MODEL	NUT THREAD SIZE	TORQUE	
		(Nm)	(lbf-ft)
RSX10,15	M42x4.5	1590	1175
RSX20,25	M64x3.0	3560	2625

Table 4-16 RSX rod clevis torque requirements

5.1 Back Driving

⚠ WARNING **WARNING!**

RSX actuators are equipped with roller screws that are not self-braking and will not hold position under load. When there is no current/torque input to the drive motor, the screw will rotate and the thrust rod can move freely. A motor brake option should be used if the motion system/axis requires the actuator to hold position when it is not powered, or as a safety measure if the actuator is mounted in a vertical orientation to prevent the payload from free falling in the event of unintended power loss.

5.2 Homing

To establish full open and close position of the actuator, set the drive torque limits to the lowest values possible for motion (10-20% to begin with) and use a slow velocity jog command (<1mm/s) to search for the hard limits. If 10-20% of the continuous current is not sufficient to drive both the actuator installed on the equipment, slowly increase the current limit until the unit is able to move to both the fully open and fully closed positions. Proper care must be taken when finding hard limits after installation to the equipment. Applying a load in excess of the continuous rated force at the end of travel may cause internal damage and could render the assembly inoperable or cause damage.

Once the full open and closed positions are determined, these values can be stored in the drive/controller as travel limits.

5.3 Breather/Purge Port Operation

The port on the side of the actuator's bearing block can be used as a "breather" to relieve internal pressure buildup that may result from reciprocating linear motion of internal components, or as a "purge port" for providing positive pressure to the interior of the actuator as an additional means of preventing ingress of contaminants. It is recommended that the supplied air is dry and clean, and the air line should be periodically inspected for moisture.

The breather port threads are as follows:

MODEL	THREAD SIZE (BRITISH INTERNAL TAPER PIPE THREAD FOR PRESSURE TIGHT JOINTS)
RSX10,15,20	1/8-28
RSX25	1/4-19

Table 5-1 RSX breather/purge port thread size

5.4 Oil Fill and Drain

5.4.1 Oil Fill

Review all figures and instructions prior to service to prevent damage to the assembly due to improper operation

- Units are filled and tested prior to shipment from the factory ;
- Prior to shipment, the units are drained;
- A light coat of oil remains on the roller screw and nut assembly to prevent corrosion during transportation and storage;
- Tolomatic recommends oil filled units are only used with the following oil brand and type: Mobil SHC630;

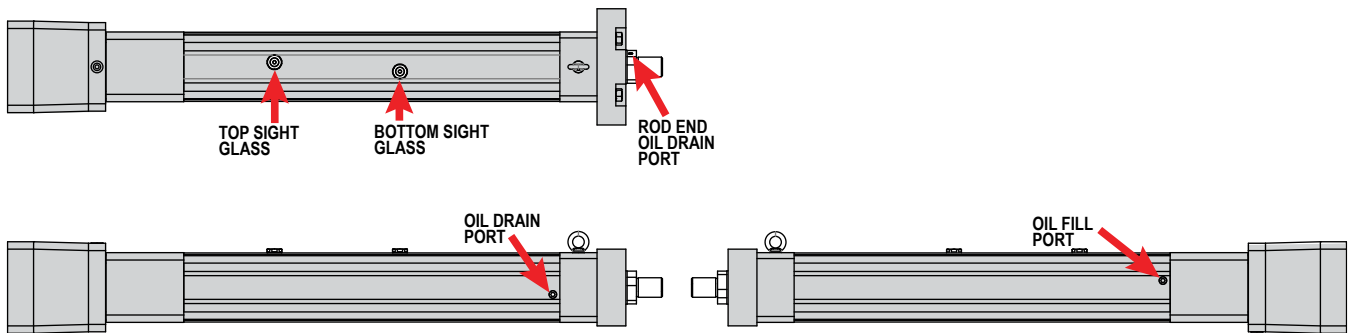


Figure 5-1 Locations of Oil Drain Port, Top & Bottom Sight Glass and Oil Fill Port

- When filling the actuator with oil, the thrust rod must be in the fully retracted position;
- Remove the 3/8-19 Rc plug from the oil fill port near the motor end of the actuator;
- Add 7.5 oz (0.22 L) of oil per each 25 mm of the actuator stroke;
- Apply pipe sealant (Loctite 561 or similar) to the plug's threads and reinstall it.
- When mounted horizontally or vertically with the motor end facing up, oil must cover the top sight glass completely ;
 - Contact Tolomatic for recommendation on orientations not listed in this document;
- In vertical installations where the motor end is pointed up, the oil level inside will drop as a result of some amount of oil migrating into the voids inside the assembly;
- When the oil level drops below the top sight glass, add an additional 1.2 oz (0.04 L) of oil per each 25 mm of the stroke;

- When the working stroke length of the thrust rod of a vertically mounted (motor end up) RSX096 actuator is less than 75 mm, to ensure effective roller screw lubrication the amount of oil needs to be increased by 7.5 oz (0.22 L) per each 25 mm of the difference between the actuator stroke length and the working stroke length.

5.4.2 Oil Drain

NOTE

Prior to draining the oil, the area around and under the actuator should be protected from oil spills;

- There are two drain ports at the front of the actuator (See figure 1);
 - o One is located on the assembly body near the rod end;
 - o The other is located on the thrust rod;
- Slowly remove the 3/8-19 Rc plug fitting from the assembly body nearest the thrust rod;

Care needs to be taken when removing the plug as oil gets slightly pressurized during operation and may splash out.

- o Oil may be drained through gravity or with use of an oil extractor pump;
- When nearly all of the oil has been removed, proceed with removing the 1/8-28 Rc on the rod end, remove the remaining oil from inside the thrust rod;
 - o Oil extractor pump can be used to remove minor amounts of oil still remaining inside the thrust rod;
- Reinstall all drain plugs (apply pipe sealant to the plugs' threads prior to every installation) and refill per section 1;
- Oil should be changed annually.

It is recommended that the seal cartridge be replaced at the time of oil change. (See 6.1)



WARNING! WARNING!

Before starting any maintenance activities, make sure that the supply power is shut OFF.

6.1 Seal Cartridge Replacement

Seal Cartridge Parts List			Quantity	
Item	Description	Part Number	RSX10, 15, & 20	RSX25
SC	Seal Cartridge Kit	2173-9002	1	-
SC	Seal Cartridge Kit, IP67	2171-9002	1	-
SC	Seal Cartridge Kit	2172-9002	-	1

- a. Remove power and safely secure the actuator with the Thrust Rod fully retracted;
- b. Remove any tooling from the Rod End;
- c. Remove the Rod Clevis and the Jam Nut (if so equipped);
- d. Remove Front Flange (if so equipped);
- e. Remove any debris/contamination from around the Seal Cartridge
- f. Remove the Seal Cartridge fasteners and sealing washers
- g. Slide the old Seal Cartridge off the Thrust Rod
- h. Carefully slide the new Seal Cartridge (verify that the O-ring is installed on its mounting surface) onto the Thrust Rod and align it to the fastener holes
- i. Apply removable strength thread adhesive to the fasteners' threads and install the fasteners with sealing washers. Tightening torque is given below:

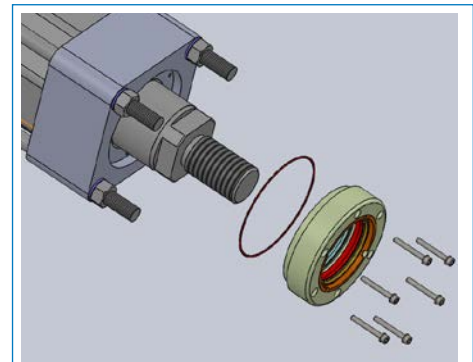


Figure 6-1 RSX seal cartridge exploded view

MODEL	NUMBER OF FASTENERS	SET SCREW SIZE	TORQUE	
			(Nm)	(lbf-ft)
RSX10,15,20	6	M5	6	4
RSX25	6	M8	20	15

Table 6-1 RSX seal cartridge torque requirements

- j. Reinstall Front Flange/Rod Clevis (if so equipped)

6.2 Screw Lubrication

Screw lubrication requirements depend on the motion cycle (velocity, force and frequency of operation), type of application, ambient temperature, environmental and other factors.

In general purpose applications to maximize service life Tolomatic recommends to re-lubricate the actuator at least every 1,000,000 cycles or once every year whichever comes first. For more demanding applications such as pressing, high frequency motion or other cases where the screw is highly stressed, the re-lubrication interval will need to be more frequent. In such applications it is recommended to execute at least 5 full length stroke moves every 5,000 cycles of operation to redistribute the lubricant within the actuator.

In order to re-lubricate the screw:

- a. Remove the Access Cover from the side of the actuator body;

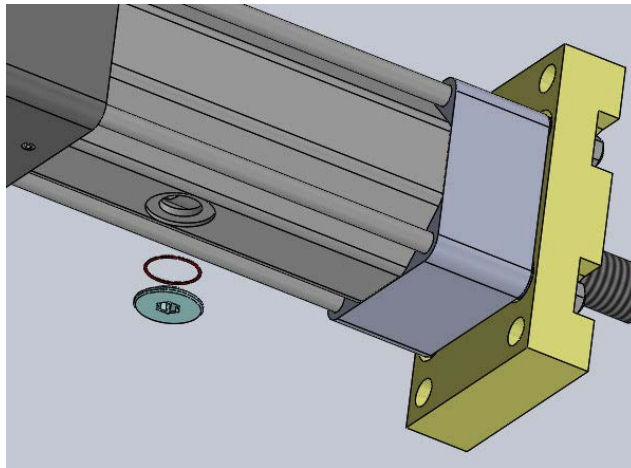


Figure 6-2 RSX lubrication access cover exploded view

- b. **Roller Screw:** Extend or retract the Thrust Rod so that the grease fitting on the Roller Nut Assembly is accessible through the port, see table 6-2 for quantity;
Ball Screw: Extend or retract the Thrust Rod.
- c. Remove power from the actuator;
- d. Supply Mobil Mobilith® SHC 220 Grease, 2 NLGI Grade in the quantity below:

MODEL	LUBRICANT QUANTITY	
	(g)	(oz)
RSX10,15,20	$9.5 + 0.025 \times \text{Stroke Length (mm)}$	$.34 + .022 \times \text{Stroke Length (in)}$
RSX25	$12.0 + 0.027 \times \text{Stroke Length (mm)}$	$.42 + .024 \times \text{Stroke Length (in)}$

Table 6-2 RSX roller screw lubrication quantity recommendations

- e. Replace Access Cover.

6.3 Storage Recommendations

- Prior to storing the actuator perform repairs, maintenance and inspections to ensure the equipment is in good working order.
- Make sure the equipment is placed in a suitable storage position to prevent damage to the seals or thrust rod.
- Make sure that storage will not damage external surfaces creating pits, scratches or crevices.
- Store in clean and dry environment.
- Prior to placing the actuator to service after storage it will be necessary to execute at least 5 full stroke length moves to redistribute the lubricant within the actuator.
- If stored for a period longer than 2 years without use it will be necessary to replace the lubricant. Please return to Tolomatic for this maintenance.
- Storage temperature range -25°C to +60°C (-13°F to 140°F).

6.4 Replacement Parts & Repairs

Tolomatic recommends returning the RSX for most repairs. Contact Tolomatic for RMA (Return Merchandise Authorization) instructions.

For additional information:

Parts Sheet	Web Link
RSX10,15,20,25	https://www.tolomatic.com/storyslab?resid=29075
<i>Previous Model Number Parts Sheet</i>	
<i>RSX080</i>	https://www.tolomatic.com/storyslab?resid=3080
<i>RSX096</i>	https://www.tolomatic.com/storyslab?resid=3077
<i>RSX128</i>	https://www.tolomatic.com/storyslab?resid=3104

A.1 Specifications

A.1.1 Performance and Mechanical Specifications



NOTE For performance data and specifications please refer to the [Tolomatic RSX Product Brochure 2171-4001](#)

A.1.2: Actuator Sizing



NOTE For performance data and specifications please refer to the [Tolomatic RSX Product Brochure 2171-4001](#)

A.1.3: Critical Speed



NOTE For performance data and specifications please refer to the [Tolomatic RSX Product Brochure 2171-4001](#)

A.1.4: Roller Screw Life



NOTE For performance data and specifications please refer to the [Tolomatic RSX Product Brochure 2171-4001](#)

B.1 Troubleshooting Procedure

SYMPTOM	CAUSE	SOLUTION
Thrust rod cannot move	Force exceeds the actuator's capacity	Verify force requirements
	Excessive side load	Verify that side loading is minimized
	Misalignment of the thrust rod and the application's line of motion	Ensure proper alignment
	Drive has insufficient current capacity	Verify the drive's settings
	Actuator underwent an end of stroke collision	Disconnect the tooling and manually jog away from the end of stroke. If problem persists contact Tolomatic for service
	Loose Coupler or belt failure	
	Controller / Drive Fault	Reset the Controller / Drive
	Improper / Failed Wiring	Check motor cables and connectors
Actuator body moves or vibrates during operation	Loose mounting	Check actuator mounting
	Actuator is improperly tuned	Tune actuator
	Excessive Belt Tension	Check Belt Tension
Actuator is overheating	Duty cycle exceeds actuator's power capacity	Verify actuator sizing
	Actuator is improperly tuned	Tune actuator
	Actuator is low on lubricant	Re-lubricate

C.1 Warranty

Warranty and Limitation of Liability

Tolomatic's complete terms and conditions can be found here <https://www.tolomatic.com/info-center/resource-details/terms-and-conditions>

Limited Warranty

Tolomatic warrants that at the time of delivery, Products shall be in good condition, free from defects in material and workmanship and that Products made to order shall conform to applicable drawings or specifications as referenced in the quotation or accepted purchase order ("Product Warranty"). The Product Warranty shall expire one year from date of shipment (the "Warranty Period"). Tolomatic warrants that Buyer shall acquire good title to the Products free from third party rights. These warranties are given only to Buyer and not to any third party.

The Product Warranty excludes any defects or non-conformance resulting (wholly or in part) from: (i) accidental damage, mishandling, incorrect installation, negligence or other circumstances arising after delivery; (ii) the repair or alteration of the Product by any party other than Tolomatic or its authorized representative; (iii) the failure by Buyer to provide a suitable storage, use, or operating environment for the Products; (iv) Buyer's use of the Products for a purpose or in a manner other than that for which they were designed; and (v) other abuse, misuse or neglect of the Products by Buyer or any third party.

The Product Warranty excludes any Products not manufactured by Tolomatic. Insofar as any Products are manufactured by third parties, Tolomatic shall, insofar as it can, pass to the Buyer the benefit of all warranties given by the supplier of such Products.

The Product Warranty shall be limited to defects of which Tolomatic is notified within twenty-one (21) days from the date of shipment to Buyer or, in the event of latent defects, within twenty-one (21) days of the defect being discovered and provided that such notice is received within the Warranty Period. As sole remedy for the breach of the warranty in paragraph (a) above, provided that (if required by Tolomatic) all non-conforming Products are returned to Tolomatic at Buyer's cost, and provided that Tolomatic confirms the defect or non-conformance, Tolomatic shall at its option (i) replace or repair the defective or non-conforming items, or correct any defective work or non-conformance, or (ii) refund to Buyer the original purchase price of the defective or non-conforming item and reimburse to Buyer any transportation and insurance charges incurred by Buyer.

Any claim by Buyer against Tolomatic alleging the breach of the Product Warranty must be commenced within twelve (12) months following the date of the alleged breach.

In the event the parties disagree whether or not a breach of the Product Warranty has occurred, Tolomatic may (but shall not be obliged to) undertake any repairs or replacement requested by Buyer pending final settlement of the matter. If it is determined that no such breach has occurred, Buyer shall pay Tolomatic upon demand the reasonable price of the repairs, corrections, or replacements made by Tolomatic including allowances for overheads and a reasonable profit margin.

THE WARRANTIES EXPRESSLY MADE UNDER THESE TERMS ARE EXCLUSIVE AND GIVEN IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES AND COVENANTS THAT MAY BE IMPLIED BY LAW, BY CUSTOM OF TRADE, BY THESE TERMS, BY THE PURCHASE ORDER OR OTHERWISE WITH

C: WARRANTY

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No Products shall be returned without Tolomatic's prior written consent. Products which Tolomatic consents to have returned shall be shipped by Buyer at Buyer's risk and expense, freight prepaid, to such location as Tolomatic designates.

Limitation of Liability

Tolomatic shall in no event be liable to Buyer or any third party, whether in contract, tort (including negligence), misrepresentation, strict liability or otherwise, for any incidental, punitive, consequential, indirect or special damages, including any loss of profits or savings or anticipated profits or savings, loss of data, loss of opportunity, loss of reputation, loss of goodwill or business or potential business, however caused, even if Tolomatic has been advised of the possibility of such damages in advance.

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Product Return Procedure

1. Before initiating the RMA process and obtaining an RMA number, please contact the Tolomatic Technical Support team to determine if it is possible to correct the issue in the field.
2. If an RMA is needed your Tolomatic Technical support team will initiate the RMA process and set up an RMA number.

End of Life

Your RSX actuator has been designed to provide years of reliable and trouble-free service, but at some point in time it may be necessary to retire the unit from service. To protect our environment specific guidelines and requirements should be followed. The RSX actuator is primarily constructed from steel and aluminum and contains no hazardous materials.

D.1 Declaration of Incorporation



EU Declaration of Incorporation

No: 36004711_01

We the manufacturer,

Tolomatic
3800 County Road 116
Hamel, MN 55340
USA

Declare under our sole responsibility that the product(s),

RSX Actuators

All Models

Fulfills the essential requirements of partly completed machinery in the following directives:

EC Machinery Directive 2006/42/EC

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive.

RoHS Directive (2011/65/EU, as amended by (EU) 2015/863)

REACH (Regulation (EC) No 1907/2006)

Assumption of conformity is based on the application of the harmonized or applicable technical standards and, when applicable or required, a European community notified body certification.

Gary Rosengren
Director of Engineering

13.05.2021

Date (dd.mm.yyyy)

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Toll-Free: **1-800-328-2174**
sales@tolomatic.com
www.tolomatic.com

MEXICO

Centro de Servicio

Parque Tecnológico Innovación
Int. 23, Lateral Estatal 431,
Santiago de Querétaro,
El Marqués, México, C.P. 76246
Phone: +1 (763) 478-8000
help@tolomatic.com

EUROPE

Tolomatic Europe GmbH

Elisabethenstr. 20
65428 Rüsselsheim
Germany
Phone: +49 6142 17604-0
help@tolomatic.eu
www.tolomatic.com/de-de

CHINA

Tolomatic Automation Products (Suzhou) Co. Ltd.

No. 60 Chuangye Street, Building 2
Huqiu District, SND Suzhou
Jiangsu 215011 - P.R. China
Phone: +86 (512) 6750-8506
Tolomatic_China@tolomatic.com

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