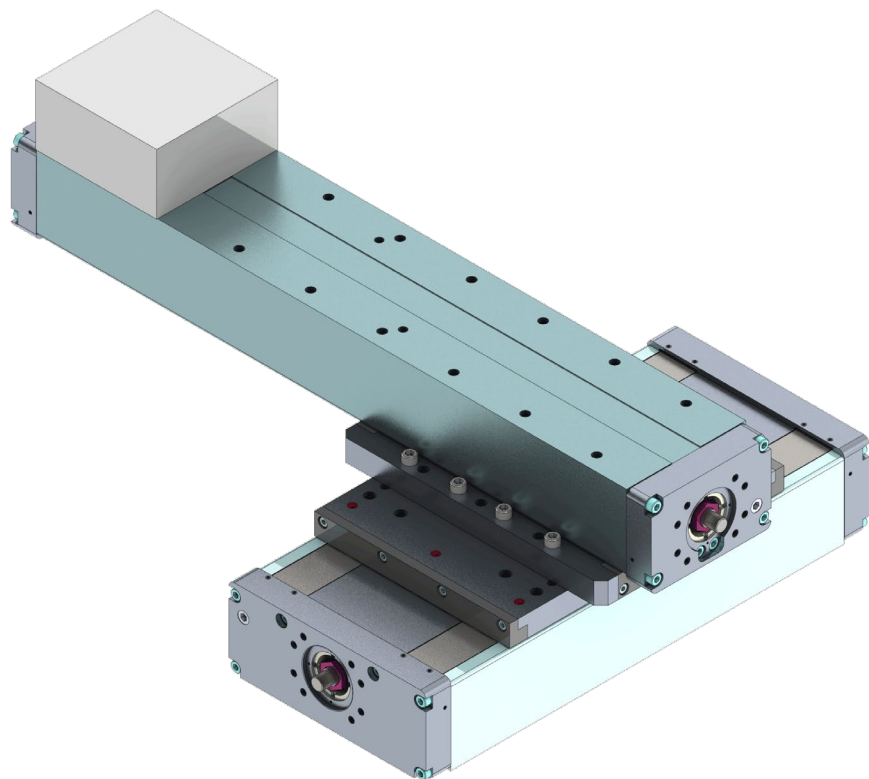


MANUAL

For Installation, Maintenance and Operation

TRS Series Actuators



LINEAR SOLUTIONS MADE EASY

Original instructions in English. Translations in community languages supplied as required.

Information furnished is believed to be accurate and reliable. However, Tolomatic assumes no responsibility for its use or for any errors that may appear in this document.

Tolomatic reserves the right to change the design or operation of the equipment described herein and any associated motion products without notice. Information in this document is subject to change without notice.

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1: SAFETY

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 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 WARNING!

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

CAUTION CAUTION!

Indicates a potentially hazardous situation which, if not avoided, may result in property damage, 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

Fail-Safe e-Stop Recommendations

After motor has been installed a means for a fail-safe e-stop is highly recommended to ensure equipment and personal safety. The e-stop should be able to remove power from the actuator to stop and/or prevent any undesired motion.

Device Damage Prevention

To prevent permanent damage to the device published speed and load ratings should never be exceeded. In addition, proper mechanical assembly should be verified and safety measures checked before applying power to the complete equipment package.

Personal Safety

During normal operation the motor can become hot. 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 carrier travels back and forth creating a possible point of collision or contact with personnel resulting in physical damage. Proper guarding and signage must be used to prevent the above.

Handling and Unpacking

When unpacking and handling the actuator, care should be taken not to drop the actuator as this can damage the internal mechanical components, electrical connectors or cause misalignment of feedback device, leading to poor performance or loss of functionality. Since this is an electro-mechanical device, proper ESD (Electro Static Discharge) measures should be taken to avoid static electricity from contacting the signal and power lines of the device.

Packing and Transport



NOTE!

Package actuator to prevent damage during transport. It is recommended that the actuator be returned in its original packaging. If the original packaging is not available, then follow these recommendations.

1. Make sure the actuator is clean, dry and protected from moisture.
2. Foam in place if possible.
3. Reinforce ends of box with multiple layers of cardboard or wood to prevent the actuator from breaking through the packaging during shipment.
4. It is best to ship one unit per container because individual items that are not isolated with stable packaging (foam in place) from each other often get damaged during shipment.
5. When shipping more than one unit in a single container, it is recommended to foam in place to prevent damage during shipping to both the units and the packaging.

Modifications to the Equipment



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.

Requirements Regarding Personnel



NOTE!

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



When installed, pinch points are generated capable of damaging forces. The risk area surrounding the TRS 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: TRS PRODUCT OVERVIEW

2.1 General Description

Tolomatic TRS Actuators

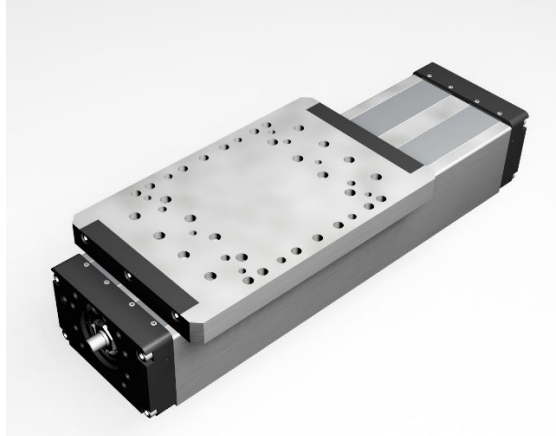


Figure 2.1: Tolomatic TRS Actuator

TRS series is a family of ball or roller screw driven mechanical rodless band 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 includes the following models: TRS100, TRS165, and TRS225.

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

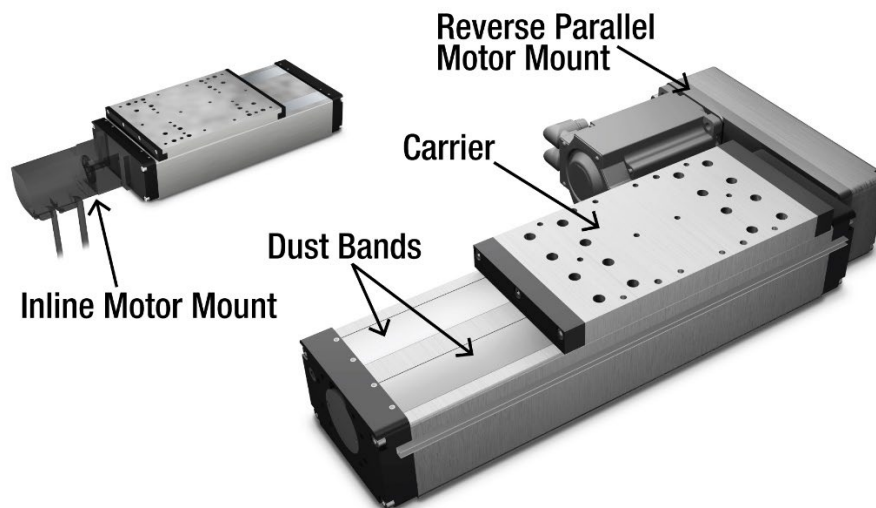


Figure 2.2: TRS major components

2.3 Installation

The TRS is a compact screw drive rodless band style linear actuator. The TRS provides linear motion of the carrier developing the required thrust force and velocity in a variety of applications.

⚠ WARNING WARNING!

Before installation and commissioning of the equipment, this manual and all accompanying manufacturer documents and manuals MUST be completely read by the appropriate personnel. All warning texts must be given special attention.

2.4 Identification Label



Figure 2.3: Tolomatic TRS Actuator identification label.

Do not remove the identification label. Do not render it unreadable.

2.5 Manufacturer

Tolomatic, Inc.
3800 County Road 116, Hamel, MN 55340, USA
Phone: 763-478-8000
Sales@Tolomatic.com

3: TRS ACTUATOR PRODUCT CONFIGURATION

3.1 Tolomatic TRS Actuator Series Configuration

TRS Series Standard Configurations and Options

- TRS series includes three actuator models: TRS100, TRS165, and TRS225
- Each of the TRS actuator models is available with a choice of a ball screw or a planetary roller screw;
- Each of the TRS actuator models is available with Inline or Reverse Parallel motor (gearhead) mounting configurations;
- Inline configuration of TRS225 actuator (LMI) is available in “standard torque” (ST) and “high torque” (HT) options. ST option supports motors and gearheads with flange sides up to 86mm (3.39”) long; HT option supports motors and gearheads with flange sides up to 120mm (4.72”) long.
- Reverse parallel configuration of TRS225 actuator is similarly available in 2 frame sizes. The first size supports motors and gearheads with flange sides up to 86mm (3.39”) long and is available in 1:1 timing belt reduction (RP1); the second size supports motors and gearheads with flange sides up to 120mm (4.72”) long and is available in 1:1 (RP1) and 2:1 (RP2) timing belt reduction.
- Orientation of the motor (gearhead) with respect to the actuator in a Reverse Parallel motor mounting configuration (“top”, “bottom”, “left” or “right”) is specified by the customer;
- Each of the TRS actuator models is available with either a standard (threaded holes on the bottom of the actuator base) or optional toe clamp mounting
- Each of the TRS actuator models is available with a choice of externally mounted positioning sensors (switches)



NOTE

For performance data and specifications please refer to the Tolomatic [TRS Product Catalog 3600-4222](#).

3.2 Standard Configurations and Options



NOTE

Please see Tolomatic [TRS Product Catalog 3600-4222](#) for complete information on ordering codes. Please use 3D CAD files available at www.tolomatic.com for critical dimensions.

TRS Twin Rail Stage Actuator

ORDERING

BASE MODEL SPECIFICATIONS

TRS 100 BNO5 SM200.50 RPL1

OPTIONS SPECIFICATIONS

TC6 C2C RY1 RK2 YM_x_x_x_x_x_x

MODEL
TRS Twin Rail Stage

SIZE
100 165 or 225

NUT/SCREW CONFIGURATION

Code	Description	TRS100 TRS165	TRS225
BNM05	Ball Nut, 5mm lead	Yes	Yes
BNM10	Ball Nut, 10mm lead	Yes	Yes
BNO1	Ball Nut, 1 in lead	–	Yes
RNO4	Roller Nut, 4mm lead	–	Yes
RNO5	Roller Nut, 5mm lead	Yes	Yes
RN10	Roller Nut, 10mm lead	Yes	Yes

STROKE LENGTH

SM Stroke, then enter desired stroke length in millimeters

	MAX. STROKE	
TRS100	750	29.5
TRS165	1,100	43.3
TRS 225	2,200	87.0
	mm	in

MODEL

ST1 Standard TRS actuator
HT1 High Torque Option (keyed motor)

MOTOR MOUNTING / REDUCTIONS

The length on the leadscrew and coupling device is determined by motor selection. Motor type and frame size must be specified when ordering.

(must choose one)

LMI In-Line mount
RPL1 1:1 Reverse-Parallel mount left
RPR1 1:1 Reverse-Parallel mount right
RPB1 1:1 Reverse-Parallel mount bottom
RPT1 1:1 Reverse-Parallel mount top
RPL2 2:1 Reverse-Parallel mount left
RPR2 2:1 Reverse-Parallel mount right
RPB2 2:1 Reverse-Parallel mount bottom
RPT2 2:1 Reverse-Parallel mount top

FIELD RETROFIT

Dust Band Repair Kit | RK then Model & Stroke in millimeters DB
Example: RK TRS 100 SM200.50 DB

BASE MOUNTING

Blank Standard bottom threaded holes, no Toe clamp mounting slots
TCx Toe clamps + mounting slots*
*x = number of toe clamps

CARRIER MOUNTING

Blank Standard Carrier
C2C Carrier-to-carrier mounting**
**Only available with 100 size
C2B Carrier-to-base mounting†
†Only available with 225 size

⚠ Due to the complexity of the moment loads in a carrier to carrier system, Tolomatic recommends working with a Tolomatic representative to size the system

SWITCHES

RY_ Reed Switch (Normally Open) with 5-meter lead, & enter quantity desired
RK_ Reed Switch (Normally Open) with 5-meter lead/QD, & quantity
NY_ Reed Switch (Normally Closed) with 5-meter lead, & quantity
NK_ Reed Switch (Normally Closed) with 5-meter lead/QD, & quantity

TY_ Solid State Switch PNP (Normally Open) with 5-meter lead, & quantity
TK_ Solid State Switch PNP (Normally Open) with 5-meter lead/QD, & quantity
KY_ Solid State Switch NPN (Normally Open) with 5-meter lead, & quantity
KK_ Solid State Switch NPN (Normally Open) with 5-meter lead/QD, & quantity

PY_ Solid State Switch PNP (Normally Closed) with 5-meter lead, & quantity
PK_ Solid State Switch PNP (Normally Closed) with 5-meter lead/QD, & quantity
HY_ Solid State Switch NPN (Normally Closed) with 5-meter lead, & quantity
HK_ Solid State Switch NPN (Normally Closed) with 5-meter lead/QD, & quantity

MOTOR
YM_ Your Motor Here

⚠ Not all codes listed are compatible with all options.



tolomatic.com/ymh
YOUR MOTOR HERE
Motor Mounts
Made-to-Order



sizeit.tolomatic.com
for fast, accurate
actuator selection



tolomatic.com/ask
Technical support
before and after
purchase

Available FREE at www.tolomatic.com

Figure 3.1: Tolomatic TRS actuator ordering codes and descriptions

3.2.1 Motor (Gearhead) Mounting

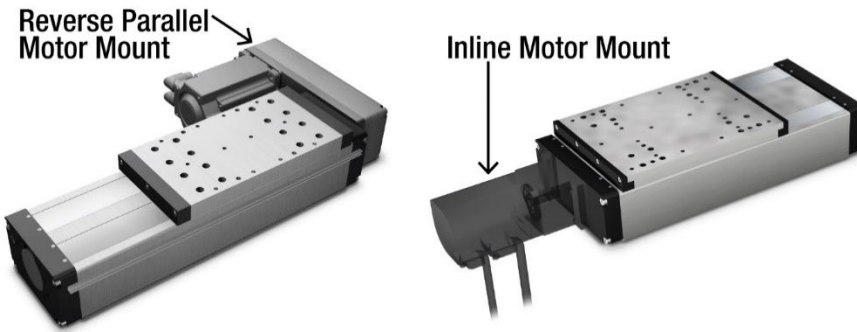


Figure 3.2: TRS actuator reverse parallel and inline motor choices

Each of the TRS 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 reduction ratio; Motor (gearhead) can be installed by the Customer at their facility or at Tolomatic.

3.2.2 Actuator Mounting

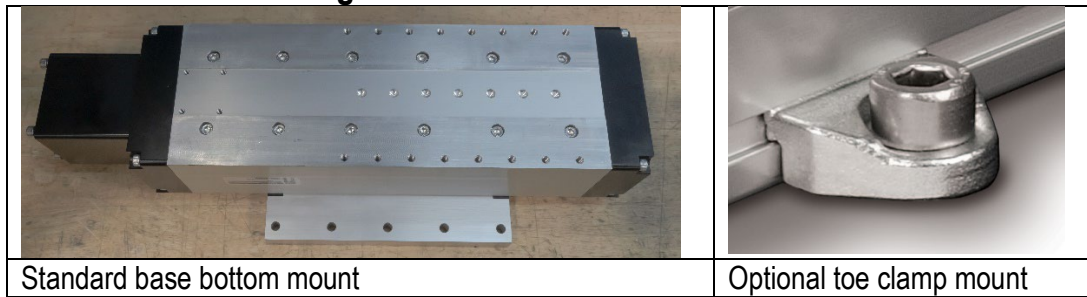


Figure 3.3: TRS actuator mounting

All of the TRS actuators are available with the following mounting options: Standard base bottom mount; Toe clamp mount.

3.2.3 Carrier Style Choices



Figure 3.4: TRS carrier styles

TRS100 is available with either a standard or an optional CTC (“carrier to carrier”) carrier design. CTC carrier allows a TRS100 actuator to be mounted “carrier to carrier” onto another TRS100 or a TRS165 actuator to create a 2-axis system with no need for transition plates.

4: TRS MECHANICAL INSTALLATION

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**

TRS series linear actuators function by translating rotary motion of an externally mounted electric motor into a linear motion of the load mounted on the carrier using a ball screw or a planetary roller screw mechanism. The carrier rides on linear bearings attached to the base of the actuator. 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:

Linear distance traveled (mm) = number of screw revolutions x screw lead (mm)

Linear speed (mm/sec) = screw RPM/60 x screw lead (mm)

Linear force (N) = [motor torque (N-m)/1000 x 2 x π x reduction ratio x screw efficiency]/screw lead (mm)

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 Loads and critical speed**

Exceeding the specified load limits of the bearing system will lead to reduction of its service life. Exceeding critical speed of the linear motion will lead to increased vibration and heat generation that may cause premature wear and reduced service life of the actuator.

■ **4.3 Mechanical Installation**

1. Open the crate and remove packaging material
2. Carefully remove linear actuator from the crate
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 Motor Installation

4.4.1 Reverse Parallel (RP) Configuration

When the motor (gearhead) is installed by the Customer at their facility, TRS actuator is shipped with socket head cap screws holding the RP Cover and the RP Plate “hand tight” and the motor (gearhead) fasteners, the timing belt and pulley and the Keyless Locking Device (KLD) separate.

To install the motor (gearhead):

- a. Remove the RP cover;
- b. Assemble the motor (gearhead) on the actuator RP plate by tightening the motor fasteners to the values below.

FASTENER SIZE	TORQUE	
	(N-m)	(lbf-in)
M3	0.8	7
M4	2.9	26
M5	5.6	50
M6	8.0	70
M8	21.5	190
M10	42.9	380

Table 4.1: Reverse Parallel (RP) motor fastener torque requirements

- c. Assemble the timing pulley on the motor (gearhead) shaft using the supplied KLD according to the following procedure:
 - Check to ensure that locking screws, taper, shaft and bore contact areas are clean and thoroughly lubricated with a coating of light machine oil;
 - The connector does not require a key for its operation; if the motor (gearhead) is supplied with a key, it needs to be removed. The radial slit of the locking connector’s inner ring should be positioned approximately opposite the keyway, and one of the locking screws should be positioned directly over the keyway;
 - Insert the KLD into the pulley bore and place the pulley onto the motor (gearhead) shaft. The pulley must be located on the shaft such that the distance between the back of the pulley and the face of the RP plate is equal to 1.60 mm (.063”);

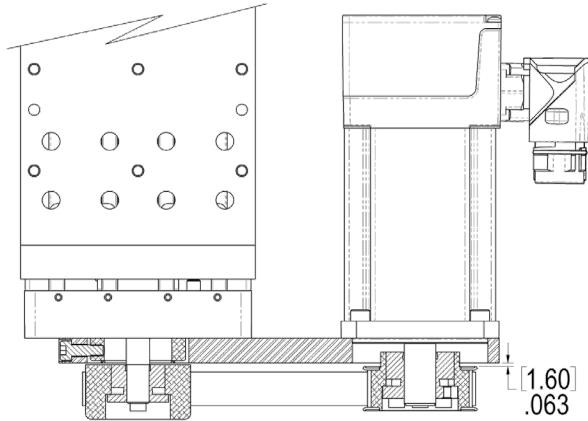


Figure 4.1: Reverse parallel (RP) belt clearance required

- Tighten all the locking screws until the screw heads are in contact with the face of the front flange;
- Use a torque wrench set approximately 5% higher than the specified tightening torque value from the table below:

MOTOR SHAFT DIAMETER	NUMBER OF FASTENERS	FASTENER SIZE	TORQUE	
			(N-m)	(lbf-in)
1/4"	3	M4	4.5	40
5/16", 3/8"; 6mm, 8mm, 10 mm	3	M4	5.0	44
1/2"; 3/4"; 11 mm; 12 mm	4	M4	5.0	44
5/8"; 14 mm; 15 mm; 16 mm	6	M4	5.0	44
7/8"; 20 mm; 22 mm	6	M5	10.1	89
1"; 24 mm; 25 mm	8	M5	10.1	89

Table 4.2: Motor fastener torque requirements

- Starting with a locking screw adjacent to the slit and moving in the direction away from the slit tighten the screws in a circular pattern using quarter turns for each screw several times until quarter turns can no longer be achieved. At this point apply the 5% overtorque for two more complete times around;
 - Reset the torque wrench to the specified torque value and ensure that none of the screws can be turned;
 - If at any point the KLD needs to be removed, take out the locking screws and use jacking holes located on the face of the front flange. The KLD is released by evenly and gradually tightening the screws inserted into the jacking holes, using quarter turns for each screw;
- Remove four M6 fasteners attaching the RP plate to the actuator one by one, apply medium strength thread adhesive (Loctite 242 or 248 or equivalent) and hand tighten them making sure they will allow the RP plate to move along the surface of the head;
 - Place the timing belt around both pulleys taking care to avoid contact with sharp corners or edges
 - Make sure that the fasteners attaching the RP plate to the actuator head are not tightened;
 - Tension the timing belt by rotating the tensioning screw located at the bottom of the Reverse

Parallel Plate while verifying the tension value by using either a sonic tension meter or a force deflection method. For proper operation timing belt should be tensioned:

- On TRS100 and TRS165 – to 90 - 110 N (20 - 25 lbf);
- On TRS225 – to 110 - 130 N (25 - 30 lbf);

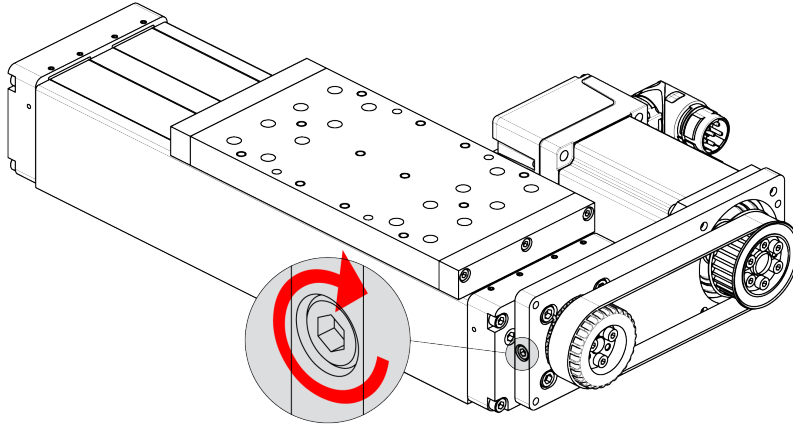


Figure 4.2: Reverse parallel (RP) tensioning screw

- Sonic tension meter
 - i. Based on the selected mounting configuration and the size of the actuator, enter the following sonic tension meter parameters:

PARAMETER	UNITS	TRS100/165	TRS225		
			RP1 (86mm)	RP1 (120mm)	RP2 (120mm)
TIMING BELT MASS	g/m	3.9	3.9	3.9	3.9
TIMING BELT WIDTH	mm	15	19	19	19
SPAN LENGTH	mm	125	165	188	185

Table 4.3: Sonic tension meter parameters

- ii. Measure the span tension using the sonic meter manufacturer's recommendations
- Force deflection method
 - i. Ensure one of the pulleys is free to rotate
 - ii. The force required to deflect the belt at the center of the span by 2 mm (0.08 in) should be
 - On TRS100 and TRS165 – 10 - 16 N (2.3 - 3.6 lbf);
 - On TRS225 – 12 - 18 N (2.7 - 4.0 lbf);

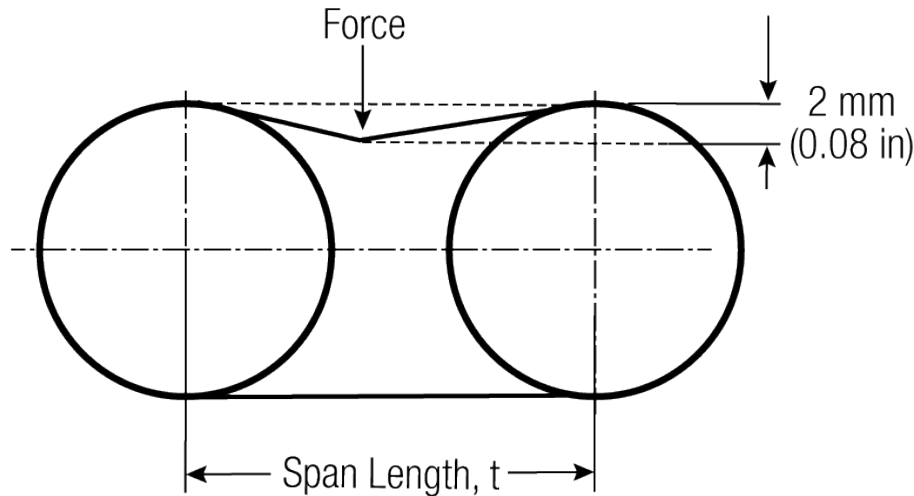


Figure 4.3: Belt pulley diagram

TRS100 and TRS165:

- h. Tighten the M6 fasteners attaching the RP plate to the actuator head to the torque value of 8.0 N-m (70 lbf-in);
- i. Reassemble the RP cover and tighten its M5 fasteners to 5.6 N-m (50 lbf-in).

TRS225:

- h. Tighten the M8 fasteners attaching the RP plate to the actuator head to the torque value of 40.0 N-m (350 lbf-in);
- i. Reassemble the RP cover and tighten its M6 fasteners to 8.0 N-m (70 lbf-in).

4.4.2 Inline (LMI) Configuration

When the motor (gearhead) is installed by the Customer at their facility, TRS 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 such that the end of the motor shaft is approximately 0.76 mm (.030") off the face of the coupling half (see the picture below). Secure the coupling half with fasteners tightened to the values below. Medium strength thread adhesive is recommended.

COUPLER HALF FASTENER SIZE	TORQUE	
	(N-m)	(lbf-in)
M4	4.5	40
M5	7.6	67
M6	15.3	135

Table 4.4: Coupler half fastener torque requirements

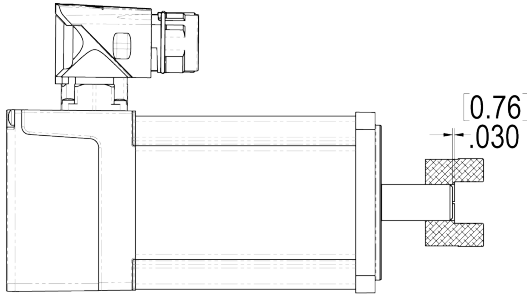


Figure 4.4: Placement of coupler half on motor shaft

- b. 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 spacer. Tighten the motor fasteners to the values below (medium strength thread adhesive recommended).

FASTENER SIZE	TORQUE	
	(N-m)	(lbf-in)
M3	0.8	7
M4	2.9	26
M5	5.6	50
M6	8.0	70
M8	21.5	190
M10	42.9	380

Table 4.5: Inline (LMI) motor fastener torque requirements

4.5 Actuator Mounting

4.5.1 Standard Bottom Mounting

TRS100 and TRS165 actuators may be located/aligned with M6 dowel pins and secured to a surface with M8 fasteners. M8x1.25 threaded mounting holes are located on the bottom of the actuator base, the number of holes varies with the length of the actuator. Dowel pins and fasteners are not included. Please see Tolomatic [TRS Product Catalog 3600-4222](https://www.tolomatic.com/Products/3600-4222) for the dimensional drawings.

MODEL	NUMBER OF DOWEL PINS	DOWEL PIN SIZE	NUMBER OF FASTENERS	PROPERTY CLASS	FASTENER SIZE	METRIC FASTENERS	
						TORQUE	
						lb-in	(N-m)
TRS100	2	6	AS REQUIRED	12.9	M8	350	40
TRS165	2	6	AS REQUIRED	12.9	M8	350	40
TRS225	2	6	AS REQUIRED	12.9	M8	350	40

Table 4.6: TRS bottom mounting torque requirements

4.5.2 Toe Clamp Mounting

TRS100 and TRS165 actuators may be supplied in a toe clamp mounting option (see picture). Toe clamps are used in pairs. After their tabs have been placed into grooves on the sides of the actuator base the toe clamps are secured to the surface with M10 fasteners (socket head cap or button head screws). Proper tension torque should be applied to the fasteners.

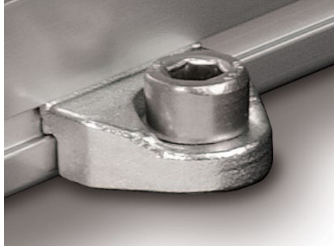


Figure 4.5: TRS toe clamp

4.5.3 “Carrier-To-Carrier” Mounting

Available “Carrier-To-Carrier” mounting used for constructing 2-axis motion actuator systems allows to mount a carrier of a TRS100 actuator directly to a carrier of another TRS100 or a TRS165 actuator and perpendicular to that actuator without help of transition plates (see the picture below) – or a carrier of a TRS225 actuator to the carrier of another TRS225 with the help of a transition plate.

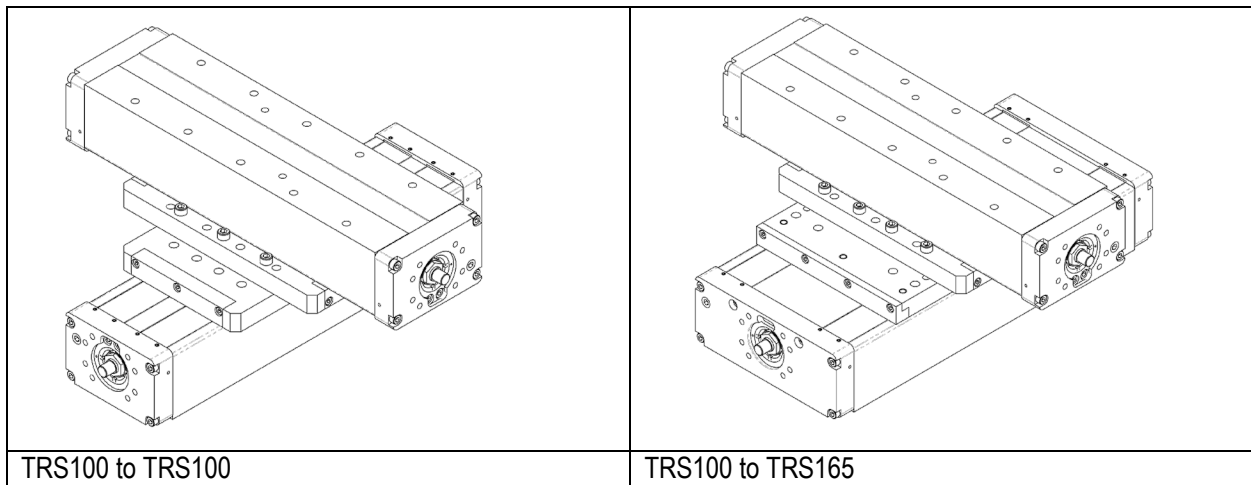


Figure 4.6: TRS carrier to carrier mounting examples

MODEL	NUMBER OF DOWEL PINS	DOWEL PIN SIZE	NUMBER OF FASTENERS	PROPERTY CLASS	METRIC FASTENERS		
					FASTENER SIZE	TORQUE	
						lb-in	(N-m)
TRS100 TO TRS100	2	6	6	12.9	M6x1.0	140	16.0
TRS165 TO TRS165	2	6	8	12.9	M6x1.0	140	16.0
TRS225 TO TRS225	4	8	20	12.9	M8x1.25	350	40.0

Table 4.7: TRS Carrier to Carrier torque requirements

4.5.4 “Carrier-to-Base” Mounting

Available on TRS225 “Carrier-to-Base” mounting used for constructing 2-axis motion actuator systems allows mounting a TRS225 base bottom to a carrier of another TRS225 with the help of a transition plate.

MODEL	NUMBER OF DOWEL PINS	DOWEL PIN SIZE	NUMBER OF FASTENERS	METRIC FASTENERS			
				PROPERTY CLASS	FASTENER SIZE	TORQUE	
						lb-in	(N-m)
TRS225 TO TRS225	2	8	20	12.9	M8x1.25	350	40.0

Table 4.8: TRS225 Carrier to Base torque requirements

4.5.5 Switch Mounting

Place switches in the groove in the switch rail at desired location with *Tolomatic* facing outward (see the picture below). While applying light pressure to the switch rotate the switch into the groove and lock it securely into place by tightening the screw on the switch.



Figure 4.7: Switch in rail of TRS actuator

5: TRS OPERATION AND START UP CONSIDERATIONS

5.1 Back Driving

⚠ WARNING WARNING!

TRS actuators are equipped with ball and 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 carrier 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 limits after installation of 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 1/8-27 NPTF port on the face of the actuator head can be used as a “purge port” for providing positive pressure to the interior of the actuator with the purpose 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.

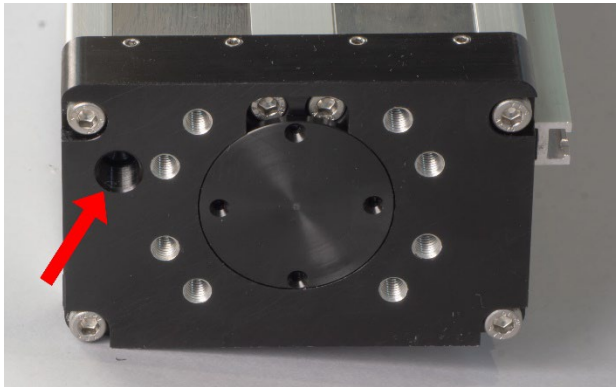


Figure 5.1: Breather/Purge port on TRS actuator

6: TRS REPAIR AND MAINTENANCE

6.1 Dust Bands Replacement

- a. Remove power and safely secure the actuator;
- b. Make sure that any tooling/load does not obstruct access to the plastic endcaps on both ends of the carrier;
- c. Take out M4 socket head cap screws securing the endcaps to the ends of the carriers (6 pieces in TRS100 -- 8 pieces in TRS165 and TRS225) and carefully remove the endcaps;
- d. Remove any debris/contamination from the whole surface of the dust bands;

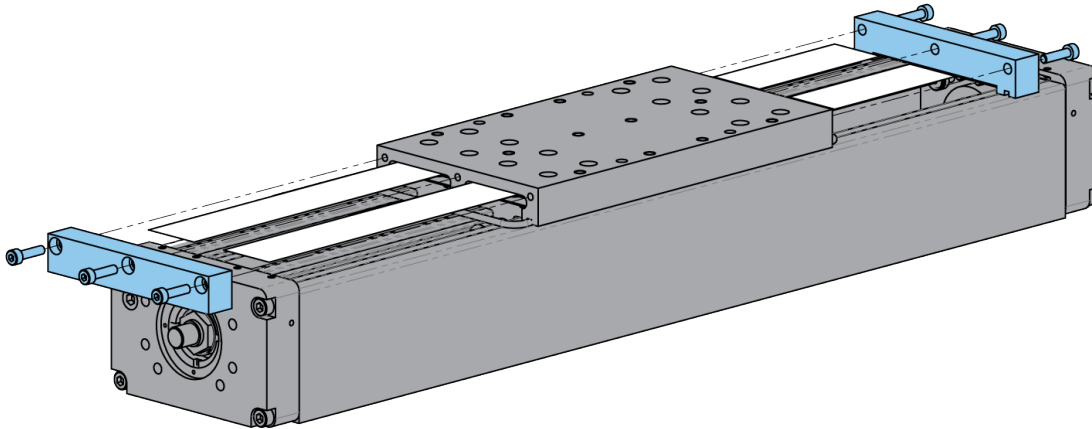


Figure 6.1: Dust band replacement illustration

- e. Loosen four M4 set screws holding the band to each head;
- f. Remove the dust bands (one at a time) by pulling the dust band ends out of the slots in the heads and pulling the dust bands out through the carrier;
- g. Carefully slide in the new dust bands (one at a time) through the carrier;
- h. Reattach both endcaps to the carrier with the M4 socket head cap screws (medium strength thread adhesive recommended) and tighten them to **1.7 N-m (15 lbf-in)**
- i. Move the carrier to the middle of the actuator;
- j. Insert one end of each band into the slots in the head that is closest to the motor end of the actuator while making sure the bands are aligned with the guiding edges of the base and the cover and secure them with the M4 set screws (medium strength thread adhesive recommended);
- k. Move the carrier to the non-motor end of the actuator;
- l. Secure both dust bands with the M4 set screws (medium strength thread adhesive recommended);
- m. Move the carrier the entire length of stroke several times and verify it is running smooth while making sure the dust bands are not buckling;

6.2 Lubrication (for TRS actuator equipped with optional access covers)



NOTE!

6.2.1 TRS actuators are designed for the grease lubricant in ball/roller nut and linear bearings to last for the full service life in majority of industrial applications

6.2.2 In a small number of applications with high frequency or highly stressed operating conditions TRS actuators may be configured to allow periodic relubrication.

6.2.3 If a TRS actuator is so configured, the relubrication is performed in the following order.

- a. Remove power from the actuator
- b. Remove the switches (if so equipped)
- c. Remove the switch rails (if so equipped) by removing the M4 button head screws at each end.
- d. Using an M10 hex key remove the access covers on both sides of the actuator



Figure 6.2: Optional access covers are located centered on each side of the actuator

- e. Position the carrier such that the grease fittings of the linear bearings on opposite sides of the actuator are visible through the access holes.



Figure 6.3: Position the carrier to permit lubrication of each of the 4 linear bearings

- f. Using a grease gun with a dispensing tip for flush style grease fittings supply fresh lubricant to the

- linear bearings in the quantity given in the table below.
- g. Repeat the process for the other pair of linear bearings
 - h. Move the carrier back a short distance until the ball/roller screw surface is visible through the access hole
 - i. Calculate the amount of grease required for the screw using the formula in the table below. Apply one third of the total amount to the surface of the screw. Move the carrier for a full length of stroke in both directions to distribute the grease along the length of the screw.
 - j. Repeat the process 2 more times.
 - k. Replace the access covers on both sides of the actuator
 - l. Replace the switch rails and the switches (if so equipped)

Recommended Lubricant: Mobil Mobilith® SHC220 Grease, NLGI 2 Grade.

	LUBRICANT QUANTITY			
	TRS100 and TRS165		TRS225	
	(g)	(oz)	(g)	(oz)
LINEAR BEARINGS (each)	2.0	0.07	4.0	0.14
BALL/ROLLER SCREW	$4.0 + 0.012 \times$ Stroke Length (mm)	$0.34 + 0.011 \times$ Stroke Length (in)	$8.0 + 0.024 \times$ Stroke Length (mm)	$16.0 + 0.022 \times$ Stroke Length (in)

Table 6.1: Lubrication quantity recommendations for TRS actuators

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.

APPENDIX A: PERFORMANCE & MECHANICAL SPECIFICATIONS



NOTE!

For Performance Data and Mechanical Specifications refer to the Tolomatic [TRS Product Catalog 3600-4222](#).

APPENDIX B: TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Carrier is not moving	Motor has insufficient torque capacity	Verify the motor selection
	Drive has insufficient current capacity	Verify the drive's setting
	The inline coupling is slipping on the motor shaft	Verify that the coupling fasteners are tightened to the proper torque value
	Misalignment of the load guidance system and the actuator's line of motion	Ensure proper alignment
	Actuator had an end of stroke collision of excessive force	Remove the tooling and manually jog away from the end of the actuator. If problem persists contact Tolomatic for service
Actuator body moves or vibrates during operation	Loose mounting	Check the actuator mounting
	Drive is improperly tuned	Tune drive
	Ball/roller screw rotational speed exceeds the critical level	Verify the application speed

APPENDIX C: WARRANTY

■ 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 RESPECT TO THE PRODUCTS. TO THE FULL EXTENT PERMITTED BY LAW, TOLOMATIC DISCLAIMS AND BUYER WAIVES ALL SUCH REPRESENTATIONS, WARRANTIES AND COVENANTS INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. BUYER'S SOLE REMEDY FOR BREACH OF WARRANTY IS STATED IN PARAGRAPH (d) ABOVE.

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.

Under no circumstances shall Tolomatic's liability to Buyer in connection with any purchase order or Products supplied to Buyer exceed an amount equal to the amount paid by Buyer for such Products.

Buyer agrees and understands that it is solely Buyer's responsibility to ensure that Products are suitable for Buyer's requirements and for the environment, facilities or machinery for which they are intended by Buyer or by its end-customer to be fitted or used. Even if Tolomatic is advised of Buyer's intended use, Tolomatic makes no representation or warranty that the Product will be suitable for that purpose. Any technical advice furnished by Tolomatic relating to the intended use of the Products is given for information only and Tolomatic assumes no obligation or liability for the advice given or the results obtained. Except insofar as specifications or drawings form part of a purchase order and the Product Warranty, to the full extent permitted by law, Tolomatic disclaims and Buyer waives all representations, warranties and covenants that may be implied from the provision by Tolomatic of technical advice or information about Product. All such advice and information are accepted by Buyer at its risk. Insofar as any liability or warranty of Tolomatic cannot be limited or excluded under applicable law, including any laws that do not permit limitations on liability relating to death or personal injury, the provisions of these terms and conditions shall be construed as being subject to such legal limitations, but only if those legal provisions have effect in relation to Tolomatic's liability notwithstanding the governing law provision

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.

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APPENDIX D: DECLARATION OF INCORPORATION



EU Declaration of Incorporation

No: 36004718_00

We the manufacturer,

Tolomatic
3800 County Road 116
Hamel, MN 55340
USA

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

TRS 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.

Brad Schulz
Director of Engineering & Technology

20.11.2023
Date (dd.mm.yyyy)

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