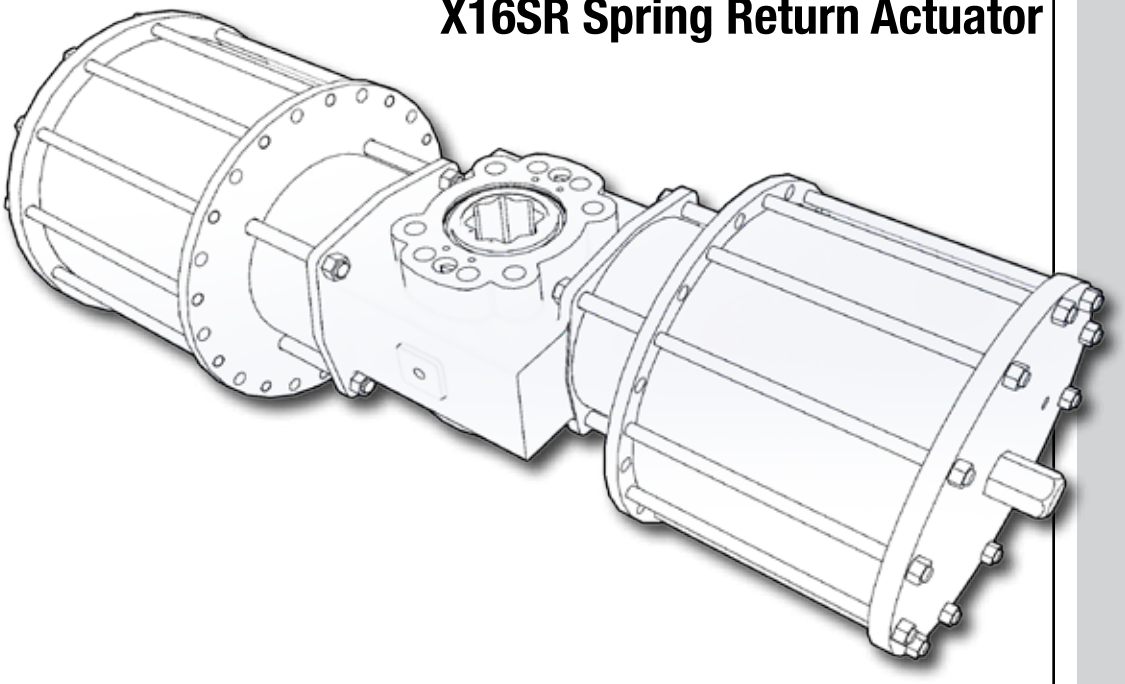
IOM

INSTALL-OPERATE-MAINTAIN

X16SR Spring Return Actuator



QTRCO X16SR actuators are Rack & Gear® quarter-turn type actuators with lengths of travel of 90+/- 5°.

These actuators adhere to QTRCO design standards for long, maintenance free life.

This manual describes the proper methods for installation, operation, and repair maintenance.

RACK & GEAR™ PNEUMATIC ACTUATORS

QTRCO

The Leader in Actuator Technology

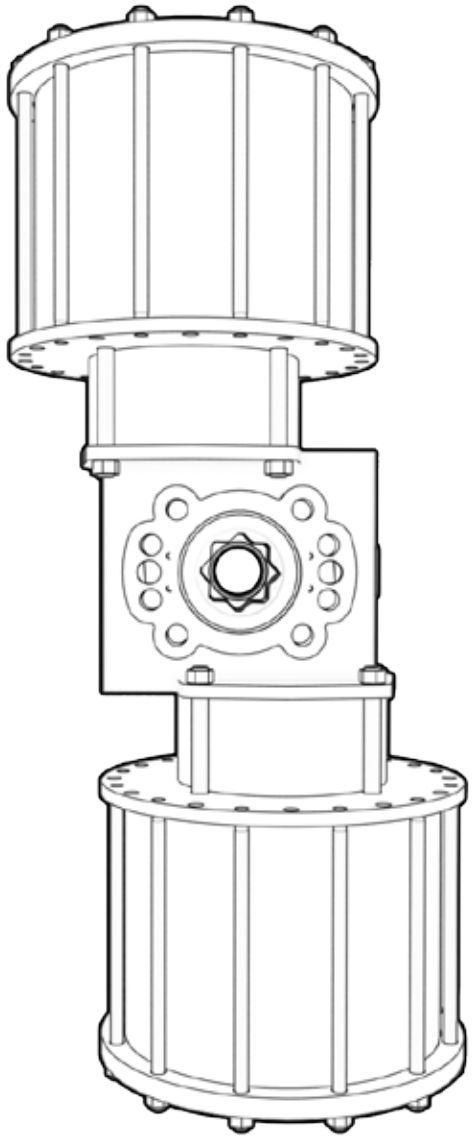
NOTE:

ALL ACTIVITIES MUST BE CARRIED OUT IN ORDER TO ENSURE PROPER ACTUATOR OPERATION.
ALWAYS READ ALL INSTRUCTIONS BEFORE BEGINNING MAINTENANCE.

QTRCO X16 actuators are composed of two or three basic sub-assemblies, one or two force modules and a torque module. The force modules contain the piston and rack which provide linear motion. The torque module contains the pinion gear which converts the force modules' linear motion into torque to operate the valve.

Every actuator assembled by QTRCO is tested prior to shipment to our customers.
Order specific documentation may be available upon request.

Contact QTRCO with any questions at info@qtrco.com or 281-516-0277.

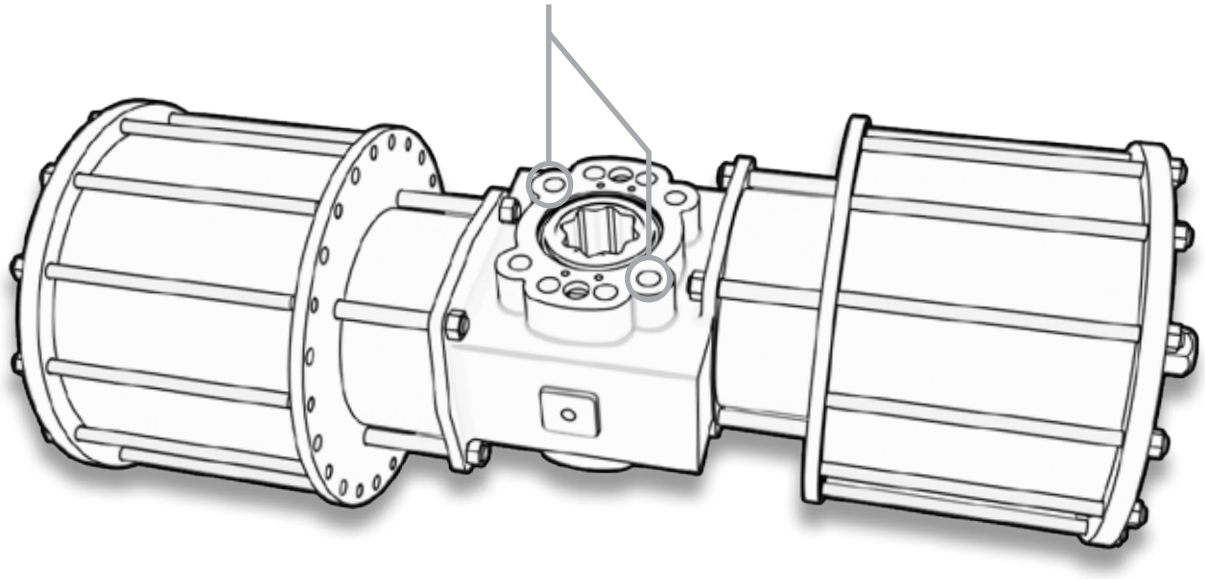


CONTENTS

1. INSTALLATION

QTRCO actuators may be mounted in any position/orientation.
NEVER lift the actuator by the cylinders, tie rods, or travel stops. Do not lift the actuator with the valve attached.

Threaded Lifting Eyes
lifting eyes may be threaded into the body section and be used to lift the actuator.



1.1 VALVE ATTACHMENT

NOTE:

PRIOR TO MOUNTING THE ACTUATOR, VERIFY ALIGNMENT OF COUPLER AND SHAFT TO ENSURE THAT THE VALVE WILL MOVE TO THE CORRECT POSITION.

Ensure the actuator is in the same position as the valve. It may be necessary to stroke the actuator to determine the correct mounting orientation. Attach the actuator to the valve using the proper bracket and coupler, or with a QTRCO Universal Mounting Plate (UMP) if provided. Using all mounting holes indicated on QTRCO dimensional drawings, tighten all fasteners hand tight then torque the fasteners to the corresponding value on the table below.

Thread Pattern	Ft-Lbs	Nm
M20	235	318

1.2 ACCESSORY MOUNTING

As a standard, the X16SR actuator is provided with NAMUR slotted accessory mounting geometry. When installing accessories, such as switchboxes or positioners, tighten accessory mounting bolts hand tight, stroke the actuator three times to ensure proper alignment then tighten the accessory mounting bolts to the proper torque. Check the dimensional drawing or associated product bulletin for exact dimensions.

1.3 PIPING AND OPERATION

The operation of an QB Spring Return (SR) actuator is comparable to any spring return, rack and pinion actuator.

Instrument air, water, and other power gases and fluids may be used to cycle the actuator so long as construction materials were chosen accordingly during assembly and max allowable pressure is not exceeded. Air driven stainless steel actuators with stainless steel or composite cylinders are not harmed by wet air (so long as freezing does not occur). Aluminum and chrome plated steel cylinders may be harmed over time by the presence of water.

WARNING

EXCEEDING THE STATED MAXIMUM PRESSURE MAY RESULT IN DAMAGE TO EQUIPMENT AND DANGER TO PERSONNEL INCLUDING SEVERE INJURY OR DEATH. CONSULT THE ACTUATOR LABEL FOR OPERATING LIMITS. IF AN ACTUATOR LABEL IS MISSING, CONTACT QTRCO TO REQUEST A REPLACEMENT.

WARNING

OPERATING OUTSIDE OF THE MINIMUM AND MAXIMUM TEMPERATURE RANGE MAY RESULT IN DAMAGE TO EQUIPMENT AND DANGER TO PERSONNEL INCLUDING SEVERE INJURY OR DEATH. CONSULT THE ACTUATOR LABEL FOR OPERATING LIMITS. IF AN ACTUATOR LABEL IS MISSING, CONTACT QTRCO TO REQUEST A REPLACEMENT. AN EXAMPLE OF AN ACTUATOR LABEL IS PROVIDED BELOW FOR YOUR REFERENCE.

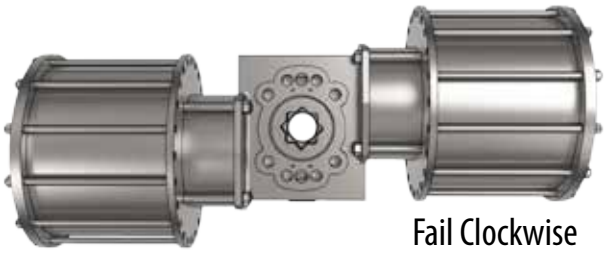
NOTE:

CE MARKING INDICATES PRODUCT CONFORMS TO THE REQUIREMENTS OF APPLICABLE DIRECTIVES AS LISTED ON THE ACTUATOR LABEL.

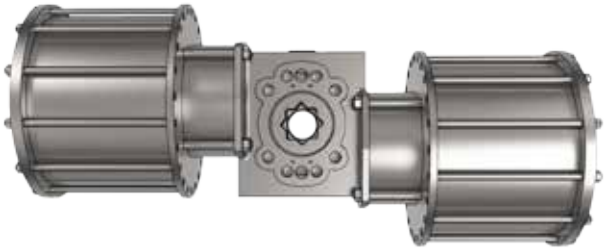
All Rack & Gear™ actuators are shipped in the fail clockwise orientation unless ordered as fail counter-clockwise. The orientation may be reversed in the field by moving all accessories to the opposite side of the shaft and turning the actuator top–side down.

Spring Return (Fail Clockwise): pressure on the end cap ports pushes the pistons inward and causes counterclockwise rotation. Springs push the pistons outward resulting in a clockwise rotation.

Spring Return (Fail Counter Clockwise): pressure on the end cap ports pushes the pistons inward and causes clockwise rotation. Springs push the pistons outward resulting in a counterclockwise rotation.



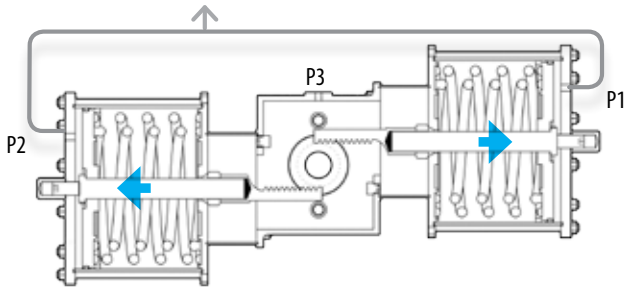
Fail Clockwise

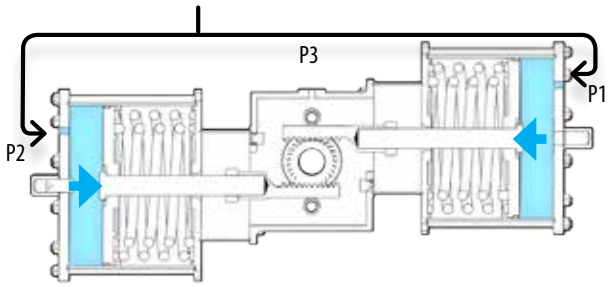


Fail Counter Clockwise

Piping guidelines:

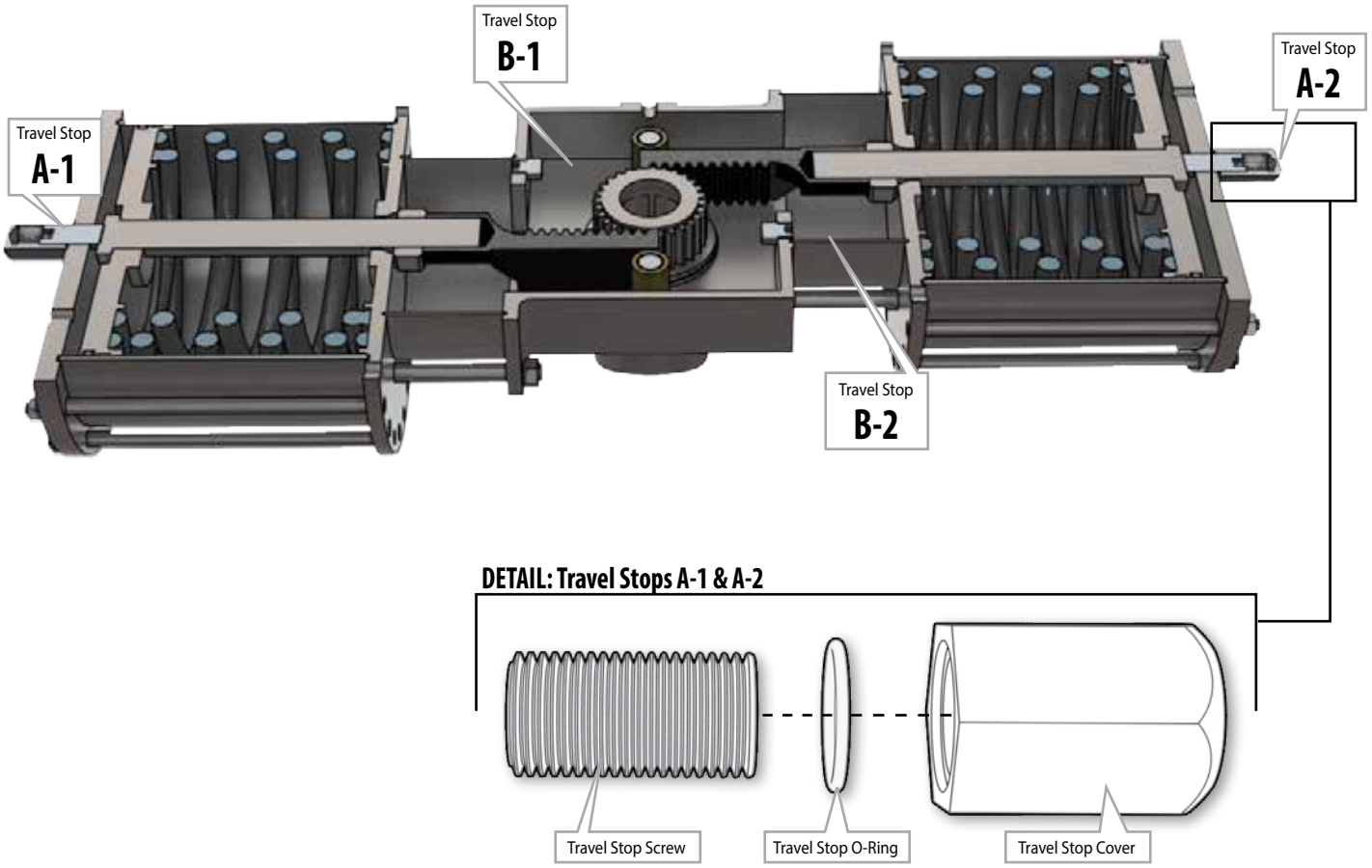
- Both end cap pressure ports (P1 and P2) must be utilized for proper operation.
- P1 and P2 are typically connected together and powered by a single air pathway.
- P3 is a breather port on the body and should be fitted with a strainer to prevent contaminants from entering the body. **Do not apply pressure to P3**





1.4 TRAVEL ADJUSTMENT

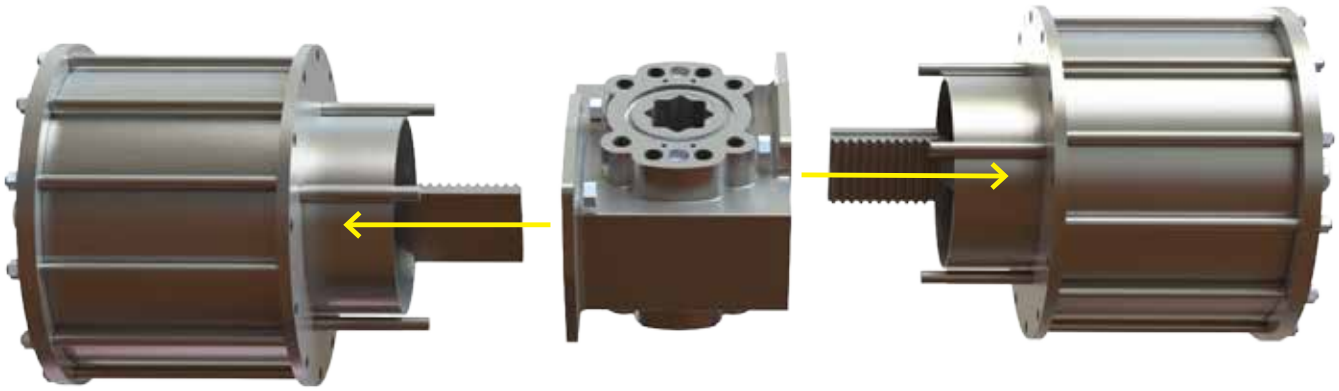
The following instructions are for fail clockwise orientated actuators. For counterclockwise actuators motion will be the inverse of what is described below. Check the actuator model and orientation before adjusting the Travel Stops.



SET CLOCKWISE ROTATION (Travel Stop(s) A)

1. Relieve all pressure from the actuator.
2. Remove Travel Stop Covers. Be careful not to misplace the travel stop o-ring(s).
3. Apply sufficient pressure to P1 and P2 to relieve the spring force on Travel Stops A.
4. Unthread Travel Stop A-2 four to five full turns.
5. Adjust Travel Stop A-1 until travel is set to the desired position. It will be necessary to exhaust all pressure between each adjustment to determine the final travel position of the actuator.

   Clockwise rotation of the travel stop will shorten actuator stroke (stroke < 90°), counterclockwise rotation will lengthen actuator stroke (stroke > 90°).
6. With pressure exhausted, thread Travel Stop A-2 in until it is in firm contact with the piston.
7. With pressure still exhausted tighten both travel stop nuts until they are in contact with the end cap then tighten and additional quarter turn.



SET COUNTERCLOCKWISE ROTATION (Travel Stop(s) B)

1. Apply full operating pressure to ports P1 and P2
2. Rotate the actuator and bracket to determine if this provides the required travel adjustment. If not, then the force modules must be removed to adjust inward travel position.
3. Measure degrees of motion adjustment needed
4. Exhaust pressure
5. Remove actuator from valve
6. Remove hex nute from Spacer cylinder tie rods.
7. Remove force modules.
8. Turn travel stop screw (B) inward to decrease travel or outward to increase travel. Degrees travel change per 1/4 turn = 0.8 degrees. Assure that both stop screws are identically positioned.

   These travel stops were installed with threadlocker and may require an application of heat before they may be adjusted. It is recommended the user reapply threadlocker after their adjustment.

WARNING

DO NOT REMOVE/LOOSEN TIE ROD NUTS UNLESS CYLINDER IS FULLY DEPRESSURIZED. COMPONENTS MAY EXIT THE ACTUATOR DANGEROUSLY IF DISASSEMBLY IS ATTEMPTED UNDER PRESSURE.

MODEL	Degrees of Travel per ¼ Turn
X16SR	0.8

9. Reattach force modules.
   (see 3.5 - Steps 9-15 for shaft alignment)

2. TROUBLESHOOTING

ISSUE	CAUSE	SOLUTION
Irregular or Stuttering Stroke	Supply pressure too low	Verify operating pressure is correct
	Worn internal components	See Section 3.4-3.5
	Damaged valve	Consult valve manufacturer
	Broken Springs	Replace Springpaq™
Leakage	Damaged cylinder seals	See Section 3.4
	Travel stop nuts not tightened.	Tighten travel stop nut.
	Piston o-ring damaged	See Section 3.4
Improper Travel	Travel stops not set correctly	See Section 1.4
	Internal cylinder contaminants preventing normal stroke	See Section 3.4-3.5
	Damaged valve	Consult valve manufacturer
	Insufficient torque/Broken Springs	Upgrade to a larger actuator, increase supply pressure
	Broken Springs	Replace Springpaq™
Operating/Stroking too slowly	Supply medium pressure too low	Verify operating pressure will produce torque needed to operate valve correctly
	Internal cylinder contaminants preventing normal stroke	See Section 3.4-3.5
	Damaged sticky valve	Consult valve manufacturer
	Damaged seals or o-rings causing loss of pressure	See Section 3.4-3.5
	Damaged supply lines	Inspect supply lines replace as needed
	Exhaust port on body of actuator is blocked	Inspect port, clean as needed
	Limitation of accessories or port size	Upgrade accessories or port size

3. MAINTENANCE

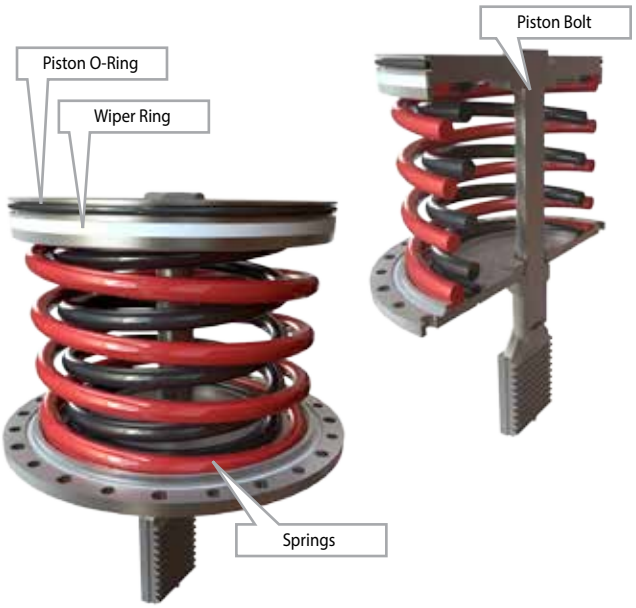
WARNING

TAKE A MOMENT TO VIEW THE SPRINGPAQ™ IMAGE. NOTE HOW THE SPRINGPAQ™ CANNOT EXPAND WHEN THE END CAP AND CYLINDER ARE REMOVED FROM THE ACTUATOR. THE PISTON AND SPRING RETAINER CONTAIN THE SPRING IN ITS INITIAL COMPRESSED POSITION.
THE SPRING COMPRESSES FURTHER DURING ACTUATOR OPERATION. THE PISTON BOLT EXTENDS FROM THE PISTON TO THE SPRING RETAINER AND IS SECURED BY THE SAFETY COLLAR.

DO NOT ATTEMPT TO DISASSEMBLE THE SPRINGPAQ™.

DISASSEMBLY OF THE SPRINGPAQ™ WILL EXPOSE YOU TO EXTREME DANGER, THE RESULT OF WHICH COULD BE SEVERE INJURY OR DEATH.

THERE IS NO REASON TO TAKE APART A SPRINGPAQ™. IF A SPRING IS BROKEN, REPLACE THE ENTIRE SPRING-PAQ™.



WARNING

DO NOT REMOVE/LOOSEN TIE ROD NUTS UNLESS CYLINDER IS FULLY DE-PRESSURIZED AND TRAVEL STOPS REMOVED
COMPONENTS MAY EXIT THE ACTUATOR DANGEROUSLY IF DISASSEMBLY IS ATTEMPTED UNDER PRESSURE.

ENSURE THAT ALL PROCESS LINES ARE SAFE / READ ALL MAINTENANCE INSTRUCTIONS BEFORE STARTING WORK.

3.1 PERIODIC MAINTENANCE SCHEDULE

General service actuators do not require periodic maintenance. Severe service actuators may require periodic maintenance based on operating conditions. Severe service may include but is not limited to high speed, high cycle, highly corrosive, explosive atmosphere, and others. Special applications may require individual maintenance schedules. Contact QTRCO for help developing a maintenance schedule for your application.

3.2 LUBRICATION

QTRCO actuators are lubricated for life. For special applications grease fittings may be provided. Use the grease fittings (if applicable) incorporated into the torque module of your actuator to apply additional lubricant. The frequency of this lubrication will depend on the application of the actuator. For any questions regarding the frequency of this operation or appropriate lubrication compounds contact your QTRCO distributor.

3.3 MAINTENANCE KIT

To purchase your actuator maintenance kit contact your QTRCO distributor. Please have the serial number of your actuator available. This number may be found on the actuator label or stamped into the body of the actuator.

NOTE:

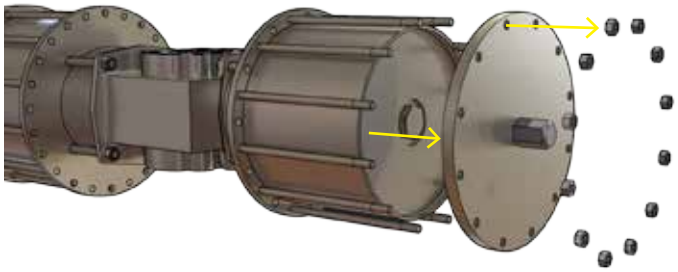
PERFORMING PISTON SEAL REPLACEMENT ON ONE CYLINDER AT A TIME TO ALLOW MAINTENANCE WHILE RETAINING TRAVEL STOP ADJUSTMENT. IF BOTH CYLINDERS ARE REMOVED AT THE SAME TIME (NOT RECOMMENDED), THE TRAVEL STOPS MUST BE FULLY UNTHREADED PRIOR TO REMOVING THE END CAPS. LEAVING THE TRAVEL STOPS IN PLACE WILL PUT SPRING PRESSURE ON THE END CAP WHEN IT IS REMOVED, WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

3.4 PISTON SEAL REPLACEMENT

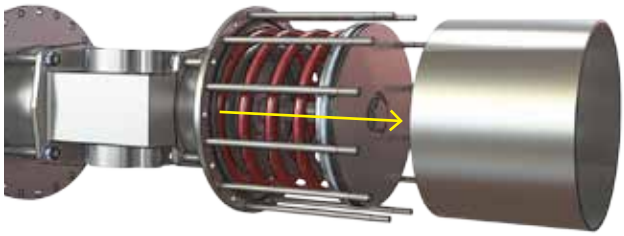
1. Exhaust all pressure and disconnect all supply lines.
2. Loosen all tie rod nuts until they are flush with the ends of the tie rods.
3. Check that there is no pressure against the end cap by verifying that the end cap is not being forced against the tie rod nuts.

WARNING	IF THERE IS FORCE AGAINST THE END CAP, STOP. DO NOT CONTINUE FURTHER UNTIL IT IS ASSURED THAT THE UNIT IS SAFE TO DISASSEMBLE.

4. Remove the end cap. Be careful not to lose the cylinder seal located on the internal side of the end cap.
5. Remove the cylinder. Be careful not to damage the internal surface of the cylinder as this will compromise the piston's ability to seal.

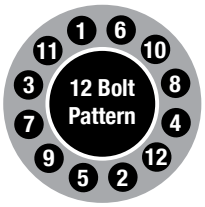


6. Replace the piston o-ring and wiper ring as needed. Be sure to lubricate the new o-ring and wiper ring with the correct QTRCO approved lubricant if they are replaced.

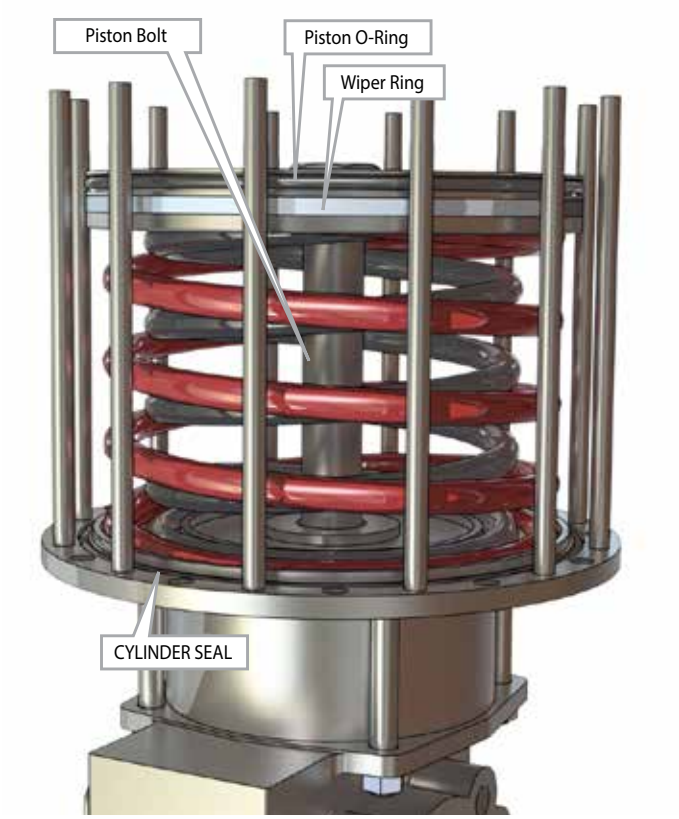


7. Inspect the cylinder bore. If scratched or damaged, reinstall in opposite direction.
8. Clean and lubricate the internal surface of the cylinder with a light coat of the correct QTRCO approved lubricant and slide the cylinder back over the piston and into the cylinder seal groove of the base plate, taking care not to pinch the piston o-ring.
9. Place the end cap back over the tie rods. Be sure that the cylinder is seated in the cylinder seal groove of the end cap with the cylinder seal still in place between the cylinder and the end cap.
10. Secure the end cap with the tie rod hex nuts you removed in step two. Hand tighten, and then torque the hex nuts to half and then full values according to the table below using the pattern designated.

MODEL	LB* FT	Nm
X16SR	35	48



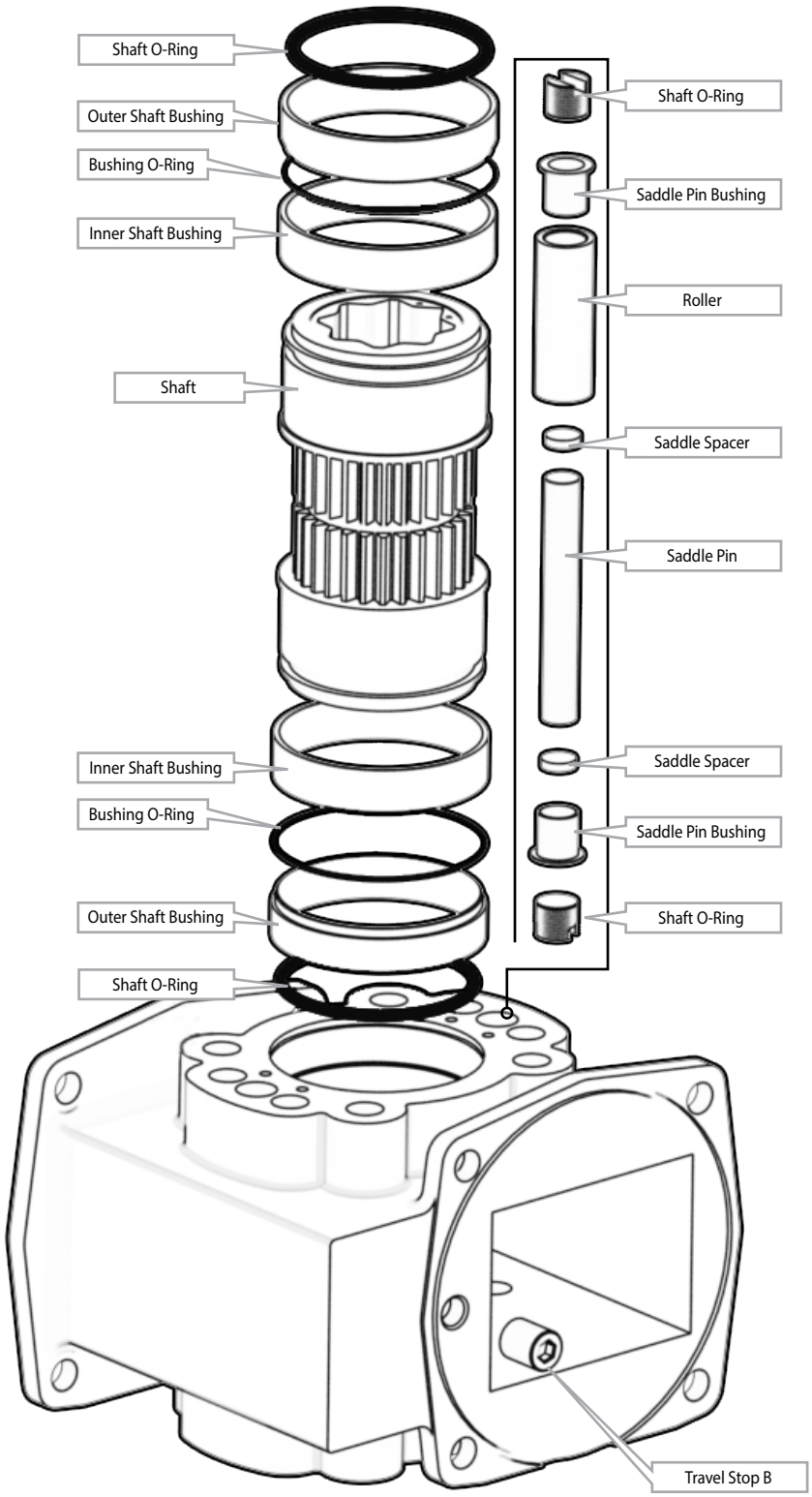
11. Complete steps 1-10 on the second force module of the actuator. (dual cylinder models)
12. Leak Test and Reinstate the actuator to service.



3.5 BODY MAINTENANCE

To perform this maintenance the actuator must be removed from the valve.

1. Follow Section 1.4 Travel Adjustment, SET COUNTERCLOCKWISE ROTATION (Travel Stop(s) B), steps 1-7
2. Remove the top hat assembly.
3. Clean and inspect rack teeth for wear. If teeth are excessively worn a new rack(s) may be necessary for continued reliable/safe operation.
4. Remove the retaining ring holding the shaft assembly in the torque module.
5. Push shaft through top of shaft hole (shaft will only exit body in one direction). If necessary a drive key may be inserted into the bottom of the shaft and tapped with a hammer to free the shaft from the body.
6. Remove bushings and o-rings from shaft and actuator body.
7. Clean and inspect the shaft for wear. If wear is found a new shaft or actuator may be necessary for further safe/reliable operation.

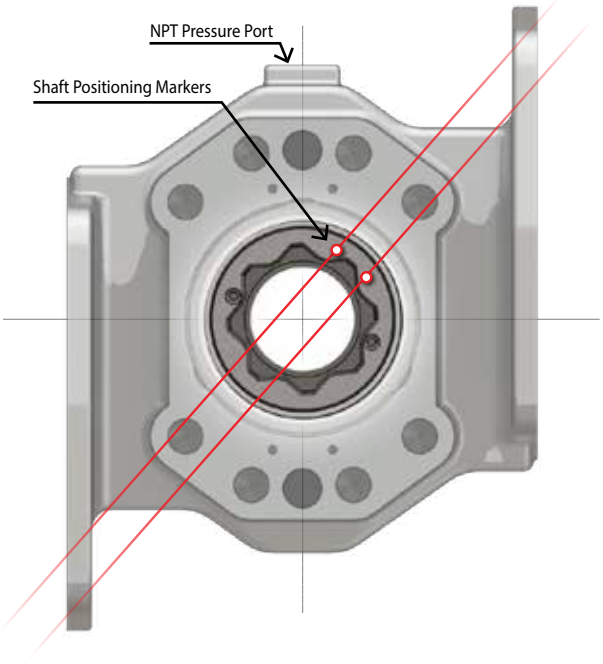


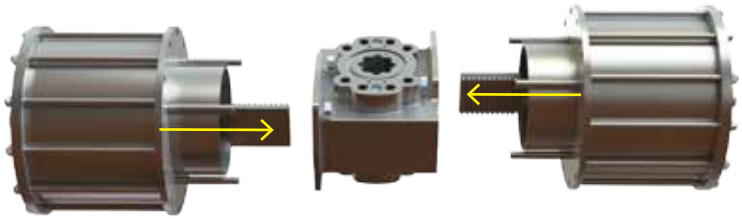
Reassembly

8. Lubricate and install saddle pinassaemblies as shown.
9. Lightly coat all o-rings and bushings with lubricant.
10. Install o-rings in respective o-ring grooves.
11. Insert shaft and bushings through top of shaft hole.
12. Rotate shaft until positioning markers are in the position shown below. Note the orientation of the body NPT port as well as the orientation of the high and low sides of the actuator.
13. Align teeth on racks and shafts.
14. Simultaneously press both force modules into the body engaging the rack and shaft teeth until the point of refusal.

* Both modules should contact the body simultaneously. If they do not, remove piston assemblies, reset shaft into correct position and try again.

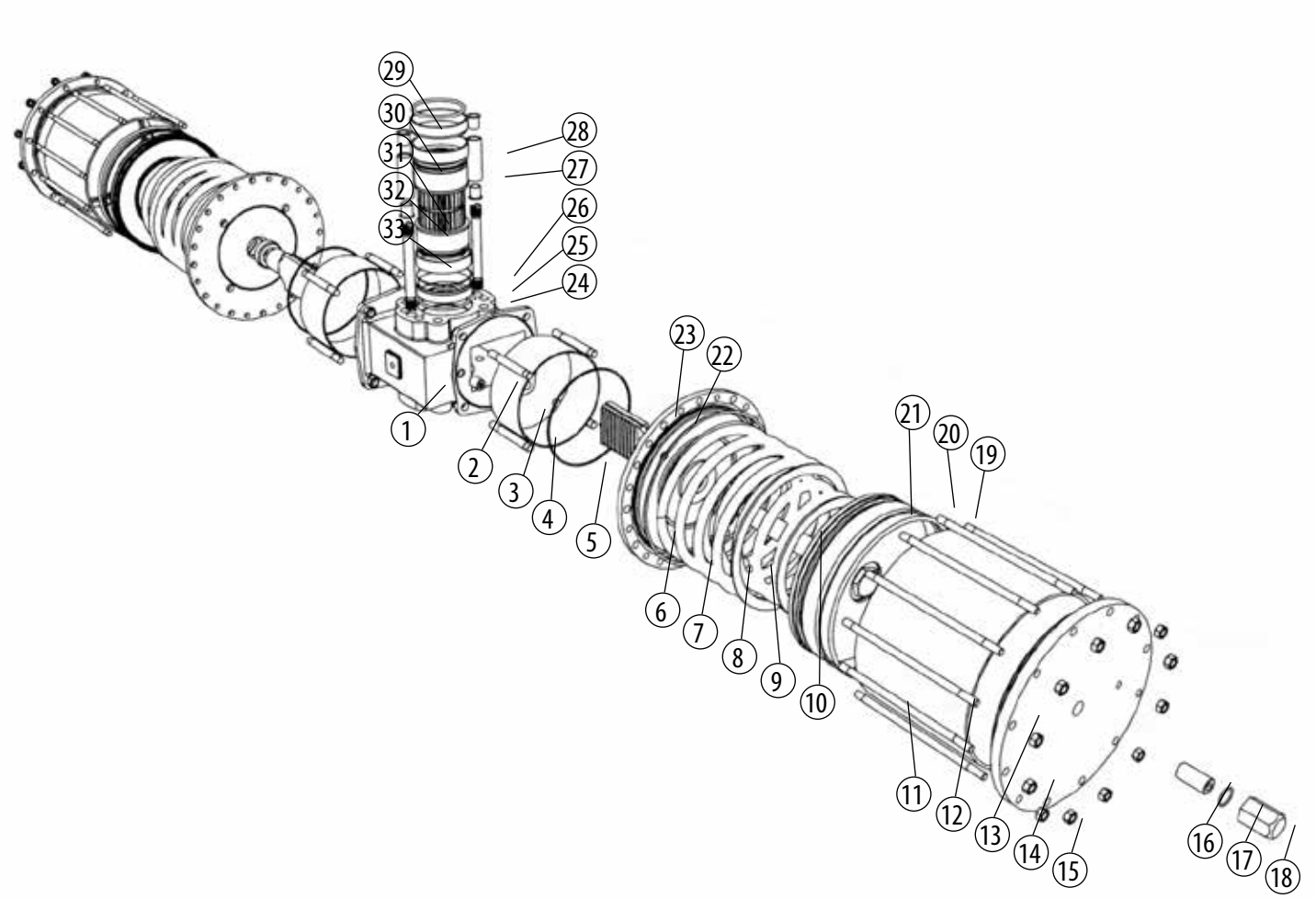
15. Thread hex nuts on to spacer tie rods and tighten.





This page intentionally blank

4. APPENDIX



NUMBER	PART
1	Body
2	Travel Stop B
3	Spacer Cylinder
4	Spacer Tie Rod
5	Spacer Cylinder Seal
6	Spring Retainer
7	Cylinder Seal
8	Outer Spring
9	Inner Spring
10	Piston Bolt
11	Tie Rod
12	Cylinder

NUMBER	PART
13	Cylinder Seal
14	End Cap
15	Hex Nut
16	Travel Stop (A) screw
17	Travel Stop O-Ring
18	Travel Stop Cover
19	Piston O-Ring
20	Wiper Ring
21	Piston
22	Safety Collar
23	Rack
24	Shaft O-Ring

NUMBER	PART
25	Outer Shaft Bushing
26	Bushing O-Ring
27	Shaft
28	Inner Shaft Bushing
29	Saddle Pin Bushing
30	Roller
31	Saddle Pin Screw
32	Saddle Spacer
33	Saddle Pin

*May not be present on all models

The Leader in Actuator Technology

QTRCO, Inc. | phone (281) 516-0277
13120 Theis Lane • Tomball, TX 77375 USA

888.ACTU.8.IT
888.228.8848

QTRCO-SG C/O Severn Glocon FZE | phone +971 (0) 4 880 7330
Unit HC06, RA08 • North Zone, Jebel Ali Freezone UAE

www.qtrco.com
Email: actu8it@qtrco.com

DCN00728