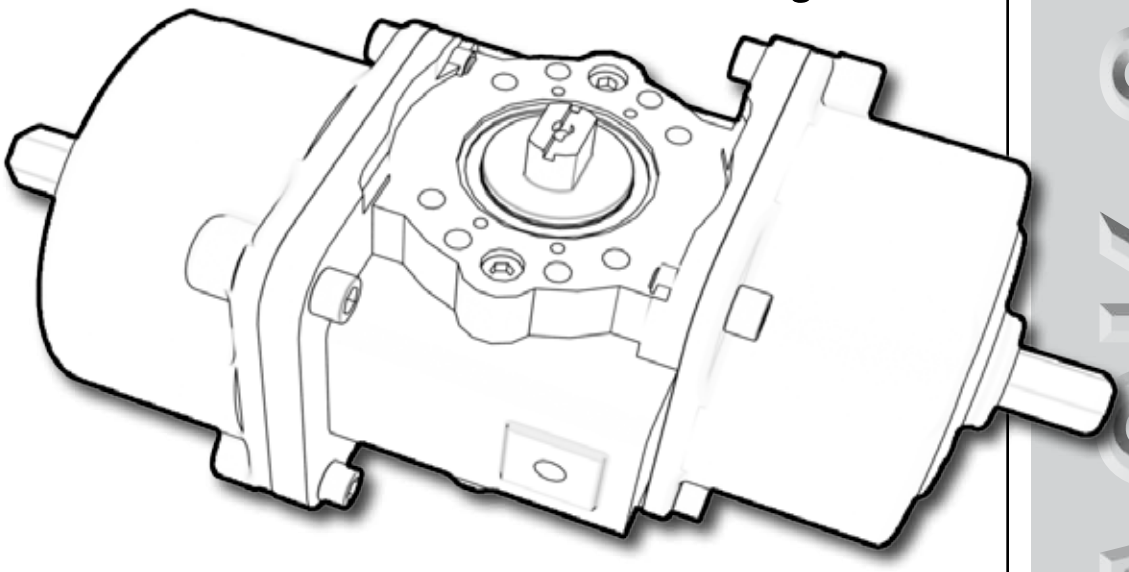
IOM

INSTALL-OPERATE-MAINTAIN

X/QB DA Double Acting Actuator



QTRCO X/QB DA 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

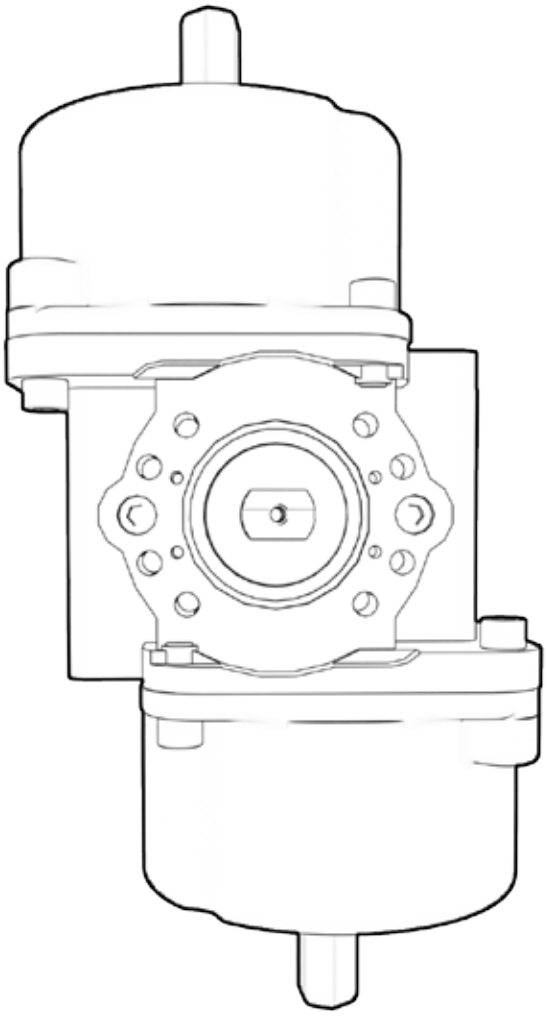
NOTE:

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

QTRCO X/QB DA 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.

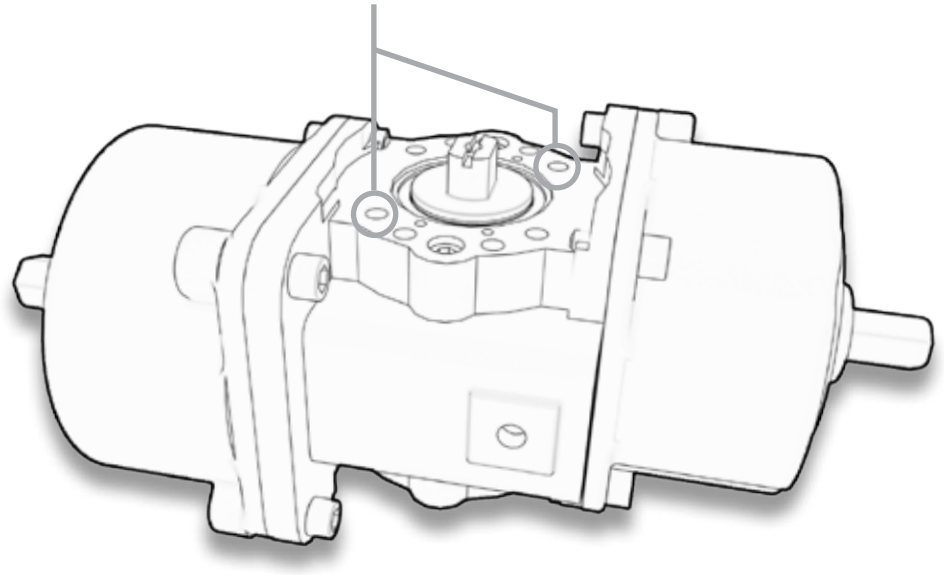


CONTENTS

1. INSTALLATION

QTRCO actuators may be mounted in any position/orientation.
NEVER lift the actuator by the cylinders, 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.

X/QB	Thread	Material	Ft-Lbs	Nm
03/04/05	M6	Stainless	7	9
		Aluminum	5	6
	M8	Stainless	16	22
		Aluminum	11	15
07/10	M10	Stainless	32	43
		Aluminum	21	29
12/14	M20	Stainless	235	318
		Aluminum	157	212

1.2 ACCESSORY MOUNTING

As a standard, the X/QB DA 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 a X/QB Double Acting (DA) actuator is comparable to any 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 QB actuators are not harmed by wet air (so long as freezing does not occur). X series actuators 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.

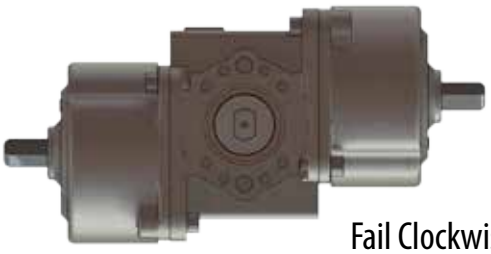
NOTE:

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 (Left-Hand) orientation unless ordered as fail counter-clockwise (Right-Hand). 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.

Double Acting (Left-Hand): pressure on the end cap ports pushes the pistons inward and causes counterclockwise rotation. Pressure to the base plate ports pushes the pistons outward resulting in a clockwise rotation.

Double Acting (Right-Hand): pressure on the end cap ports pushes the pistons inward and causes clockwise rotation. Pressure to the base plate ports pushes the pistons outward resulting in a counterclockwise rotation.



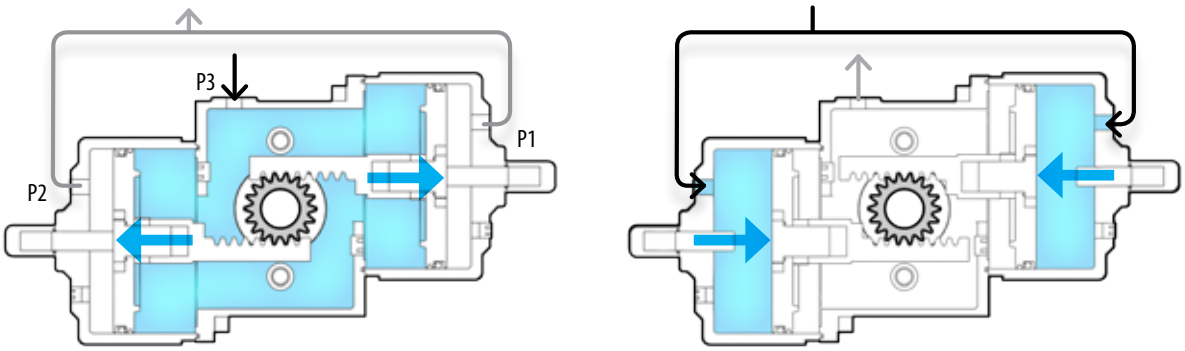
Fail Clockwise

Fail Counter Clockwise

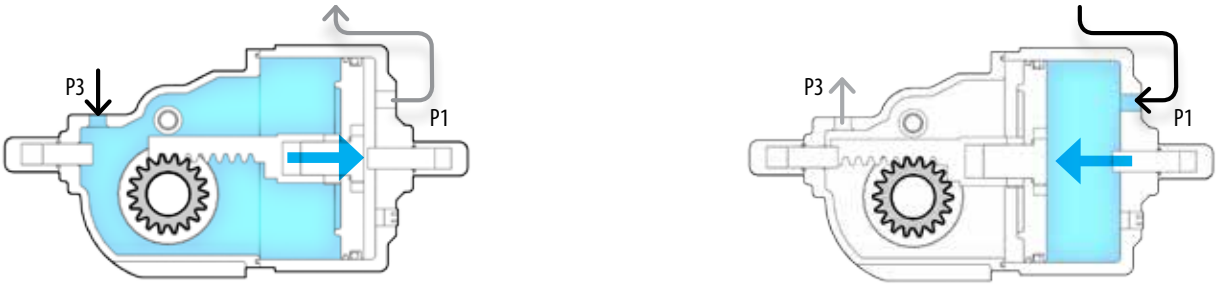
Piping guidelines:

- For dual cylinder models (05, 10, 14), 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.
- For single cylinder models (03, 04, 07, 12) P2 does not exist.
- P3 is a pressure port on the body.

05DA, 10DA, 14DA



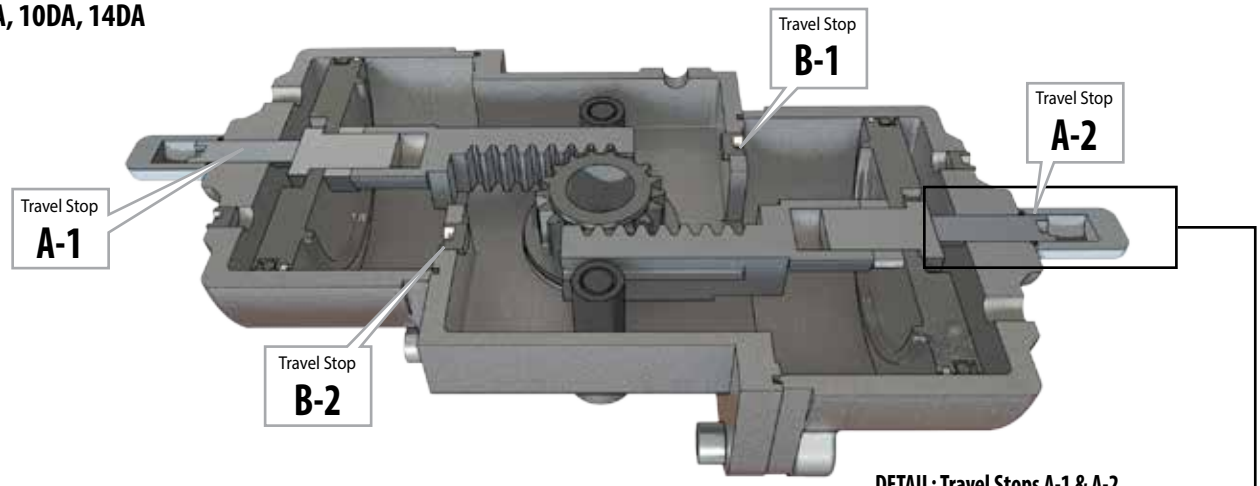
03DA, 04DA, 07DA, 12DA



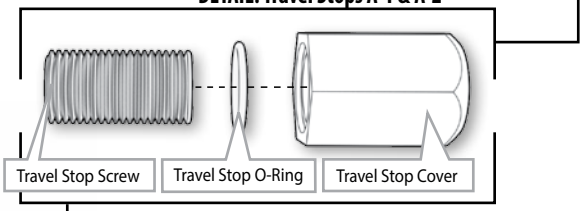
1.4 TRAVEL ADJUSTMENT

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.

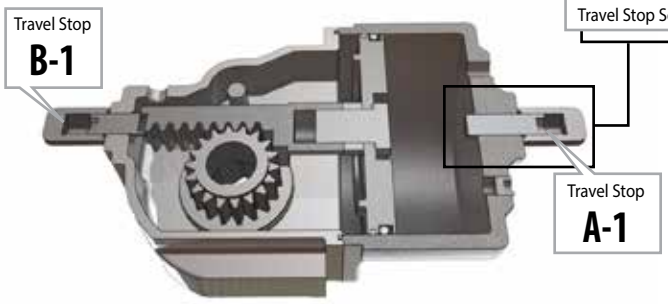
05DA, 10DA, 14DA



DETAIL: Travel Stops A-1 & A-2



03SR, 04SR, 07SR, 12SR



SET CLOCKWISE ROTATION (Travel Stop(s) A)

1. Relieve all pressure from the actuator.
2. Loosen Travel Stop Cover(s) on Travel Stop(s) A. Be careful not to misplace the travel stop o-ring(s).
3. Ensure actuator lockout (if provided) is disengaged.*

Single Cylinder Actuators:

i. Adjust Travel Stop A until set at the desired position. It may be necessary to stroke the actuator in the clockwise direction between each adjustment. This can be accomplished by applying pressure to P3.

ii. With pressure to P3 tighten the travel stop cover until it comes in contact with the end cap, then an additional quarter turn.

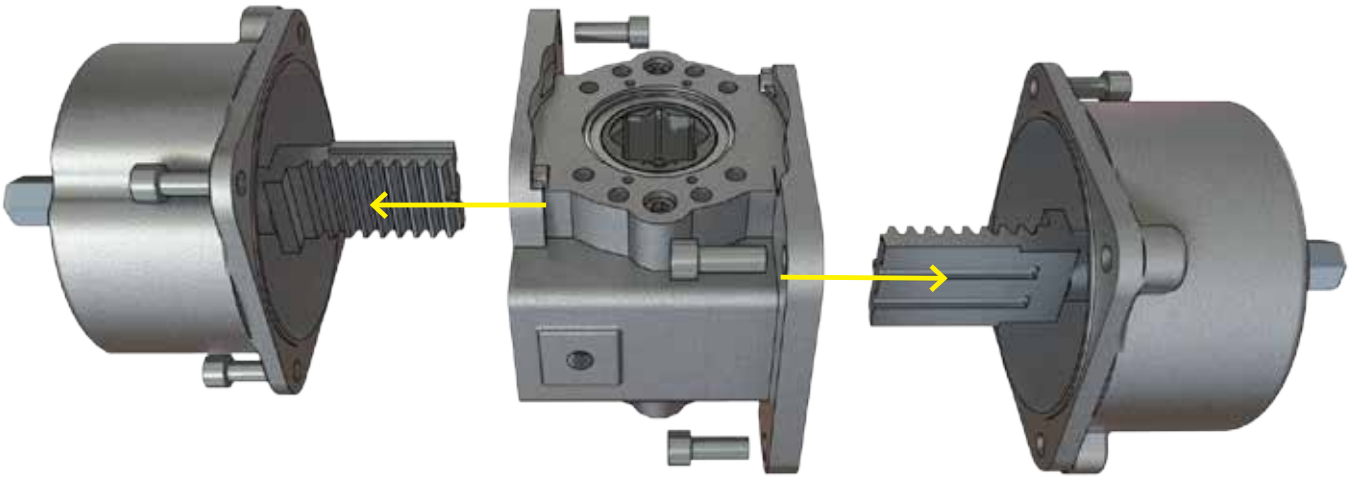
Dual Cylinder Actuators:

i. Unthread Travel Stop A-1 three to four full turns.

ii. Adjust Travel Stop A-2 until the stroke is set to the desired position. It may be necessary to stroke the actuator in the clockwise direction between each adjustment. This can be accomplished by applying pressure to P3.

iii. With pressure applied to P3, thread Travel Stop A-1 in until it is in firm contact with the piston.

iv. With pressure still applied to P3 tighten both travel stop nuts until it comes in contact with the end cap, then an additional quarter turn.



SET COUNTERCLOCKWISE ROTATION (Travel Stop(s) B)

1. Relieve all pressure from the actuator.
2. Ensure actuator lockout (if provided) is disengaged.*

On single cylinder actuators:

i. Loosen the travel stop nut on Travel Stop B. Be careful not to misplace the travel stop o-ring.

ii. Adjust Travel Stop B until the stroke is set to the desired position. It may be necessary to stroke the actuator in the counterclockwise direction between each adjustment. This can be accomplished by applying pressure to P1.

iii. With pressure applied to P1 tighten the travel stop nut until it comes in contact with the body.

Dual Cylinder Actuators:

If counterclockwise travel adjustment on a dual cylinder actuator is required in the field it is recommended the user accomplish this via bracket motion followed by resetting Travel Stops A via the directions listed above. If this cannot be accomplished follow the steps below.

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.

i. Follow section 3.4, Steps 1-3.

ii. Adjust each Travel Stop B the appropriate amount. Use the table below as a guide as travel cannot be checked without fully assembling the actuator.#

MODEL	Degrees of Travel per ¼ Turn
Q205	1.4
Q210	1.1
Q214	0.8

iii. Measure the height of both Travel Stops B protruding through the body and ensure that they are equal.

4. Reattach force modules.
(see 3.5 - Steps 8-16 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
Leakage	Travel stop nut is not tight	Tighten travel stop nut
	Damaged Piston O-ring	See Section 3.4
	Damaged shaft seals	See Section 3.5
	Damaged cylinder seals	See Section 3.4
Improper Travel	Travel stops are not correctly set	See Section 1.4
	Internal cylinder contaminants preventing normal stroke	See Section 3.4-3.5
	Damaged valve	Consult valve manufacturer
Operating/Stroking too slowly	Supply pressure too low	Verify operating pressure will supply torque needed to operate valve correctly
	Internal cylinder contaminants preventing normal stroke	See section 3.4
	Damaged valve	Consult valve manufacturer
	Damaged seals or o-rings causing loss of pressure	See Sections 3.4-3.5
	Damaged supply lines	Inspect supply lines and replace as needed
	Limitation of accessories or port size	Upgrade accessories or port size

3. MAINTENANCE

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

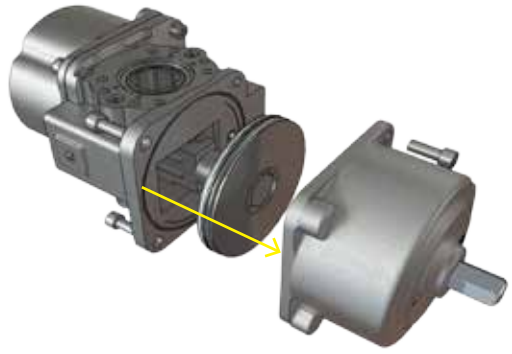
To purchase your actuator maintenance kit contact your QTRCO distributor. Please have the serial number of your actuator available. This number may be found on the actuator label or stamped into the body of the actuator.

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.

3.4 PISTON SEAL REPLACEMENT

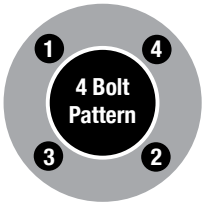
1. Exhaust all pressure and disconnect all supply lines.
2. Loosen the cylinder bolts.
3. Check that there is no pressure against the cylinder by verifying that the cylinder is not being forced against the bolts.



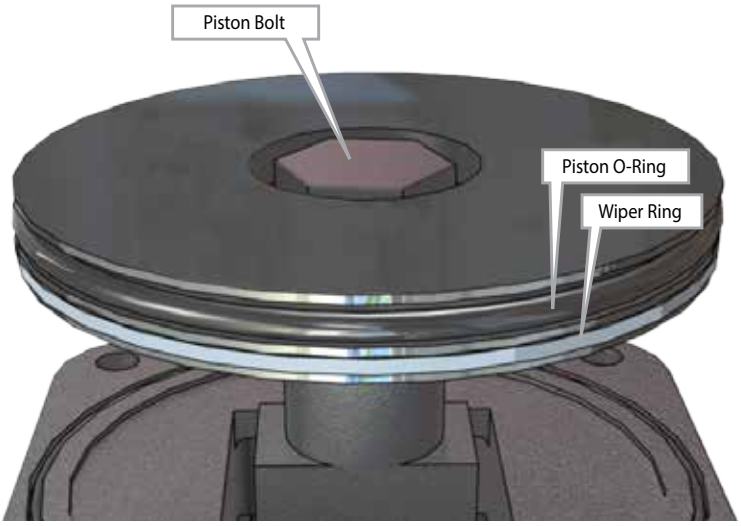
WARNING IF THERE IS FORCE AGAINST THE CYLINDER, STOP. DO NOT CONTINUE FURTHER UNTIL IT IS ASSURED THAT THE UNIT IS SAFE TO DISASSEMBLE.

4. Remove the cylinder. Be careful not to lose the cylinder seal located on the internal side of the cylinder. Be careful not to damage the internal surface of the cylinder as this will compromise the piston's ability to seal.
5. 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.
6. Inspect the cylinder bore and insure cylinder seal is properly seated in body groove.
7. 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 body, taking care not to pinch the piston o-ring.
8. Secure the cylinder with the bolts previously removed. Hand tighten, and then torque the socket head cap screws to half and then full values according to the table below using the pattern designated.

MODEL	LB* FT	Nm
03	10	14
04/05	10	14
07/10	20	27
12/14	35	48



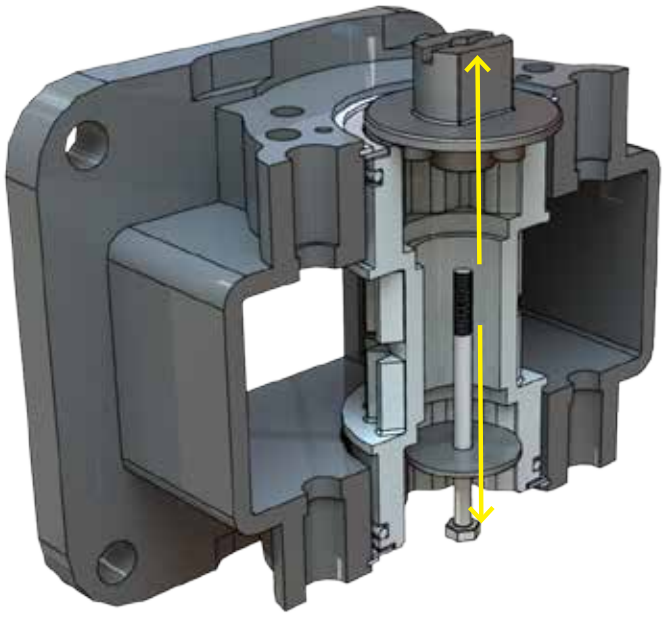
9. Complete steps 1-9 on the second force module of the actuator. (dual cylinder models)
10. Leak Test and Reinstate the actuator to service.

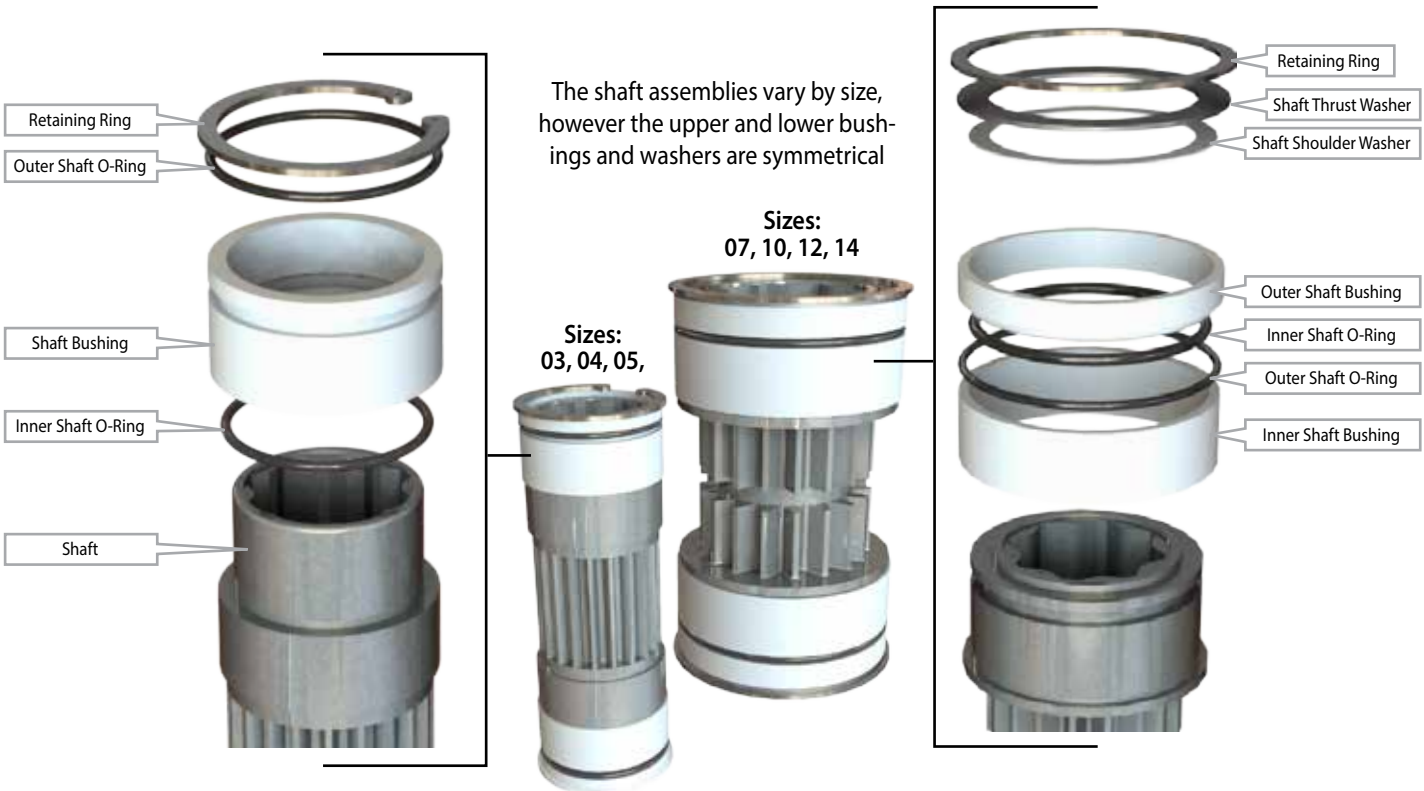


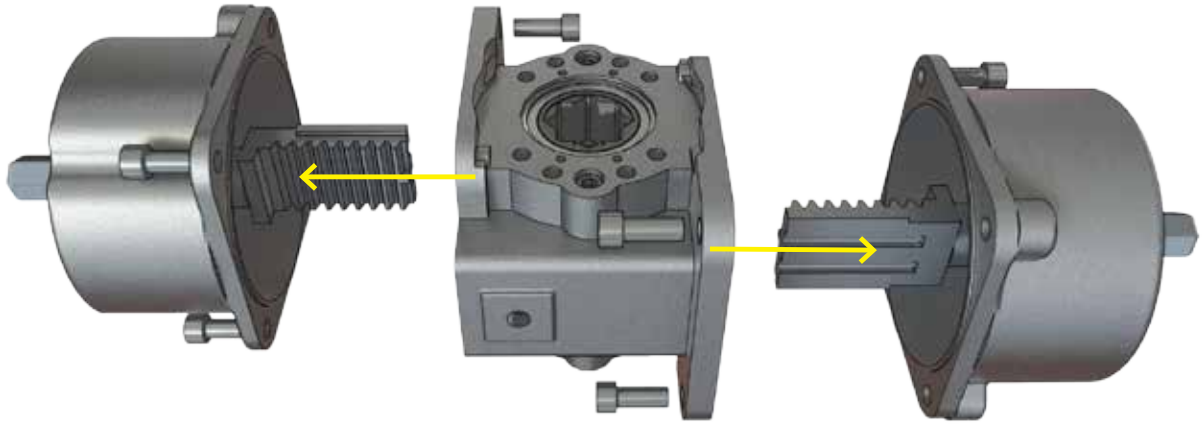
3.5 BODY MAINTENANCE

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

1. Follow Section 1.4 Travel Adjustment, SET COUNTERCLOCK-WISE 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. 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.







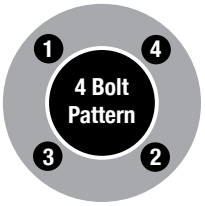
Reassembly

8. Lightly coat all o-rings and bushings with lubricant.
9. Install o-rings in respective o-ring grooves.
10. With bottom side retaining ring in place insert shaft through top of shaft hole. Install upper o-rings and bushings then secure with retaining ring.
11. Flip body over and remove retaining ring. Install the lower bushings and o-rings then secure with retaining ring.
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. Press the force module(s) into the body engaging the rack and shaft teeth until the point of refusal.

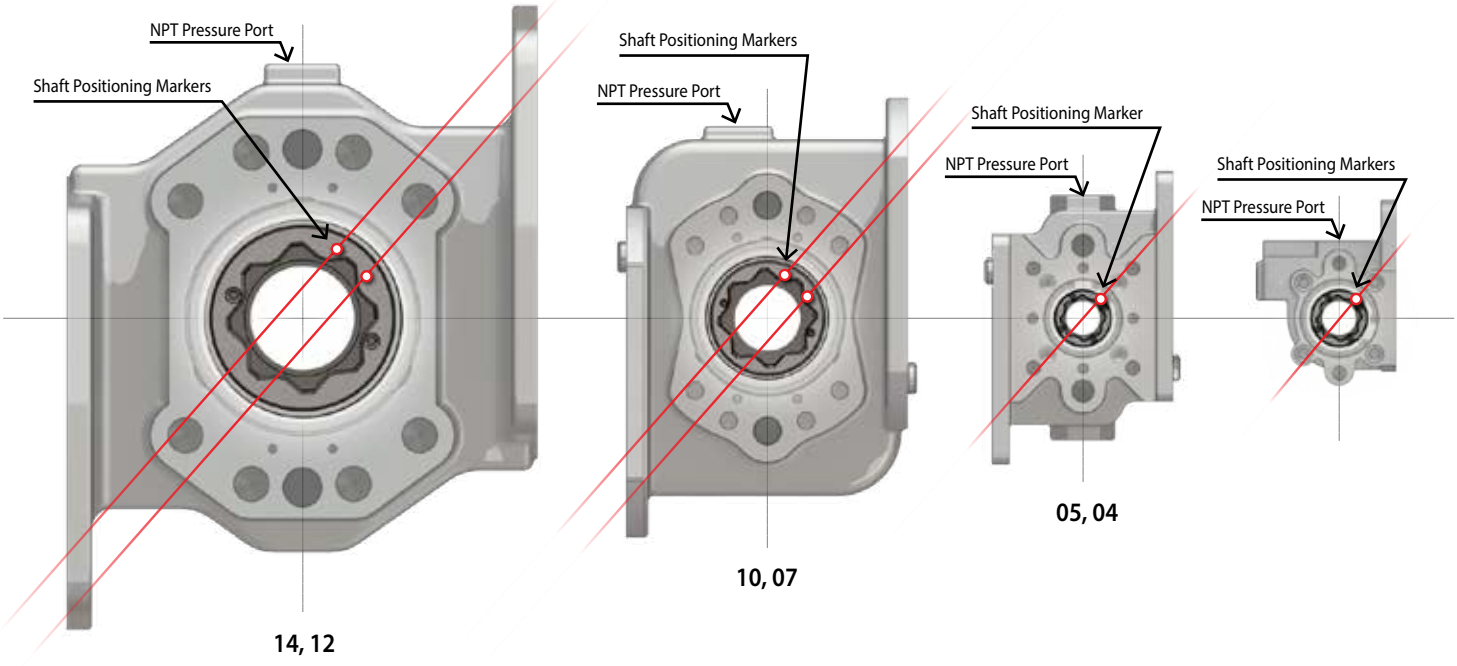
* Dual cylinder modules should contact the body simultaneously. If they do not, remove piston assemblies, reset shaft into correct position and try again.

15. Secure the cylinders with the bolts previously removed. Hand tighten, and then torque the socket head cap screws to half and then full values according to the table below using the pattern designated.

MODEL	LB* FT	Nm
03	10	14
04/05	10	14
07/10	20	27
12/14	35	48



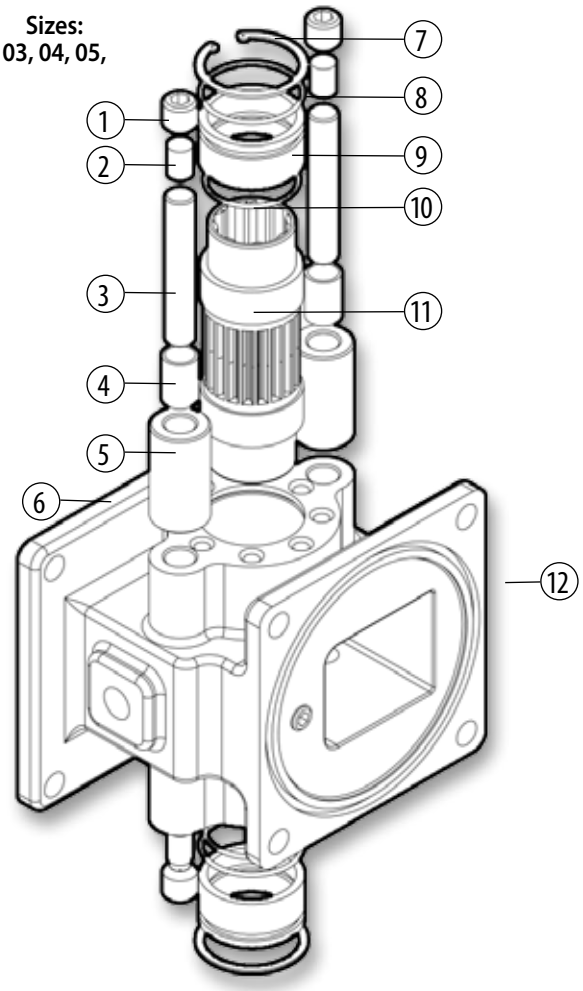
16. Leak Test and Reinstate the actuator to service.



4. APPENDIX

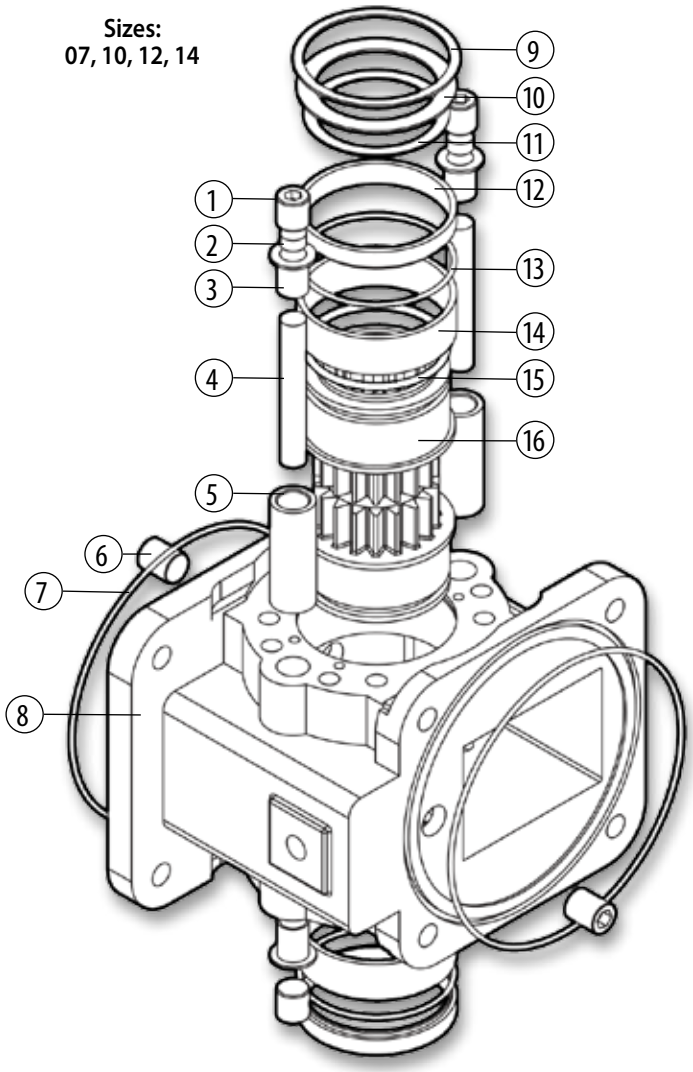
TORQUE MODULE

Sizes:
03, 04, 05,



NUMBER	PART
1	Saddle Pin Set Screw
2	Saddle Pin Seal Plug
3	Saddle Pin
4	Saddle Pin Bushing
5	Roller
6	Body
7	Retaining Ring
8	Outer Shaft O-Ring
9	Shaft Bushing
10	Inner Shaft O-Ring
11	Shaft
12	Cylinder Seal

Sizes:
07, 10, 12, 14

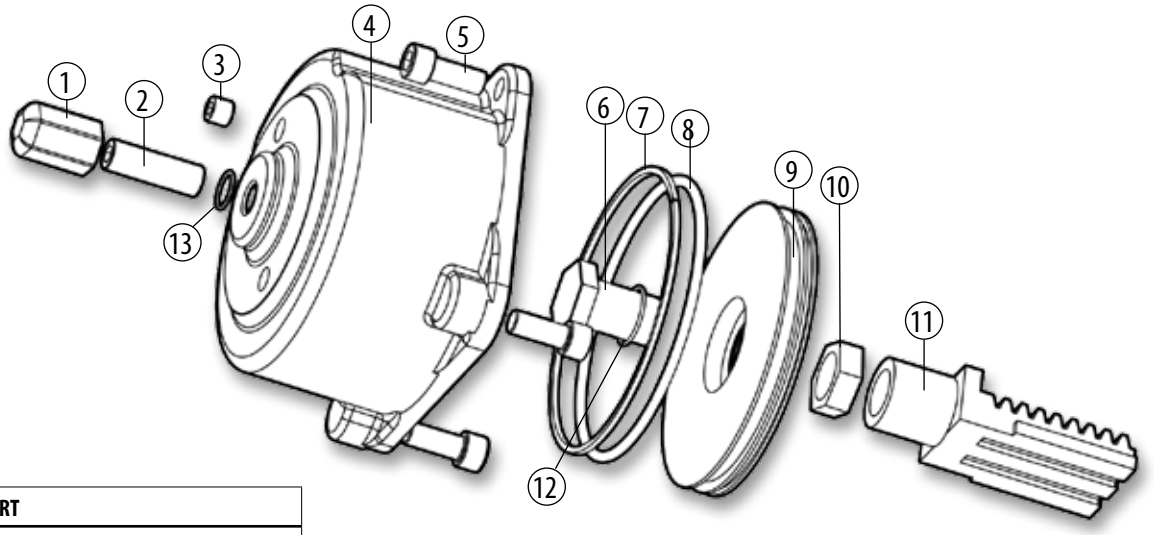


NUMBER	PART
1	Saddle Pin Set Screw
2	Saddle Pin Seal Plug
3	Saddle Pin Bushing
4	Saddle Pin
5	Roller
6	Travel Stop B
7	Cylinder Seal
8	Body

NUMBER	PART
9	Retaining Ring
10	Shaft Thrust Washer
11	Shaft Shoulder Washer*
12	Outer Shaft Bushing
13	Inner Shaft O-Ring
14	Inner Shaft Bushing
15	Outer Shaft O-Ring
16	Shaft

*May not be present on all models

FORCE MODULE



NUMBER	PART
1	Travel Stop Cover
2	Travel Stop Screw
3	Plug
4	Cylinder
5	Cylinder Bolt
6	Piston Bolt
7	Wiper Ring
8	Piston O-Ring
9	Piston
10	Piston Bolt Nut
11	Rack
12	Piston Bolt O-Ring
13	Travel Stop O-Ring

The Leader in Actuator Technology

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