Installation, Operation and Maintenance Manual
RGS011110-1 Rev. 0
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Bettis RGS Q-Series Stainless Steel Spring-Return Actuators Single and Double-Cylinder Types

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Section 1: Overview

All Bettis RGS Q-Series actuators are designed and built with the intent that they will last forever. Numerous design features reduce friction for enhanced operation, less wear and longer life. Other features result in there being fewer dynamic seals - a seal that does not exist cannot fail. Also, we employ readily available off the shelf seals that cost far less than other's proprietary parts, and we do so in a design that allows seal replacement while the actuator remains in line (see Section 6, Maintenance Section).

Figure 1 Single-Cylinder Models Bettis RGS Q-Series 03SR, 04SR, 07SR, 12SR

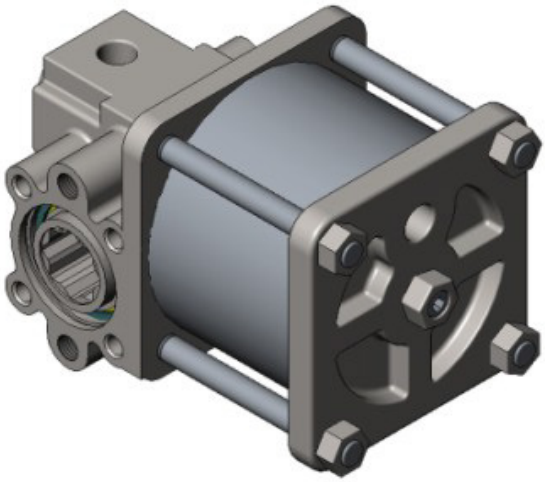


Figure 2 Double-Cylinder Models Bettis RGS Q-Series 05SR, 10SR, 14SR

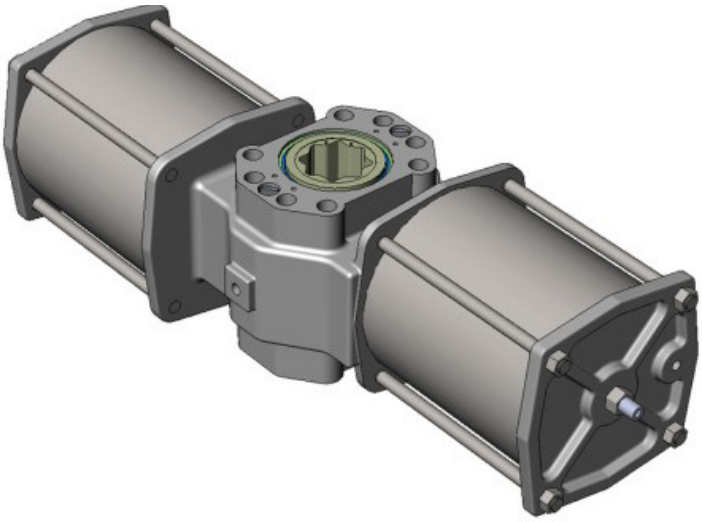


Figure 3 Single-Cylinder Model Section View

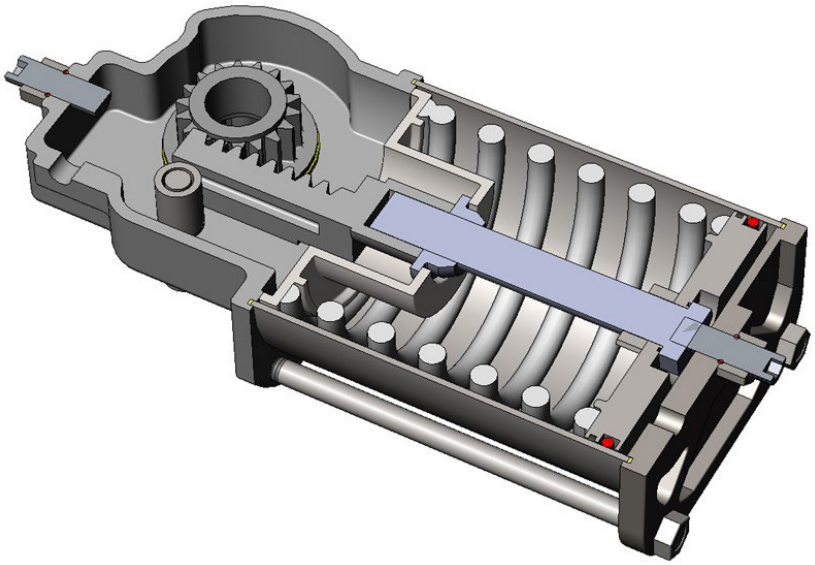
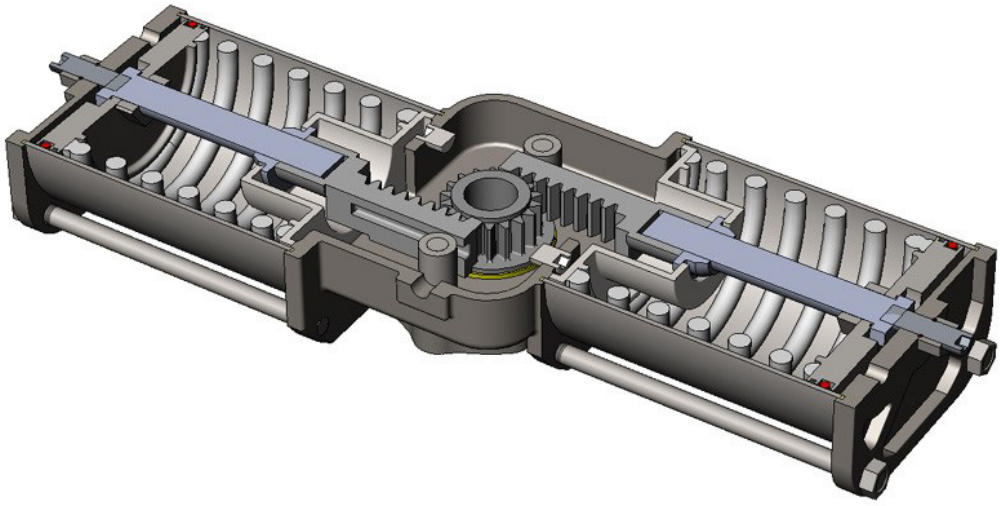


Figure 4 Double-Cylinder Model Section View

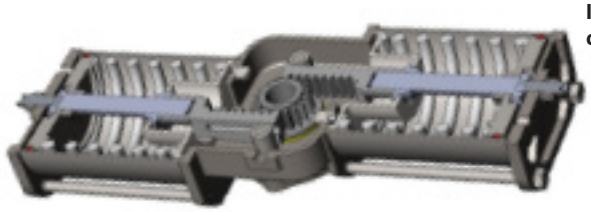


NOTE:
Single and Double-Cylinder models are identical except for the cylinder quantity.

Section 2: Installation

- Bettis RGS Q-Series actuators may be installed in any position/orientation.

Figure 5 Clockwise Shaft Rotation



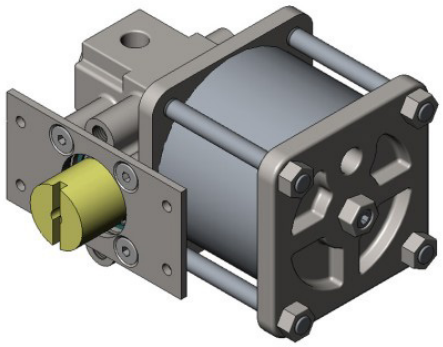
In this view, the spring causes clockwise shaft rotation.

Figure 6 Counterclockwise Shaft Rotation

In this view, the spring causes counterclockwise shaft rotation.

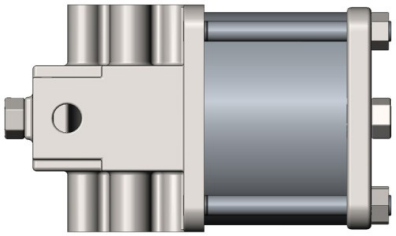
- Looking down on the actuator, a cylinder in Figure 6 will have the spring cause counterclockwise rotation of the actuator shaft when pressure is exhausted from the end cap port.
- The body port on all Bettis RGS Q-Series spring-return actuators is for breathing purposes only. Single and double-cylinder body ports may be pressurized to add to the spring forces, but provides minimal benefit and defeats the rationale for having a spring-return.
- All Bettis RGS Q-Series actuators have identical drive geometries on both faces of the body, therefore they may have their action reversed simply by turning the top side down.
- Single and double-cylinder actuators include NAMUR mounting pads and drive adapters, however, unlike competitor's actuators, the NAMUR drive may be mounted to either side of the single and double-cylinder models to enable action reversal.

Figure 7 NAMUR Mounting Pad



- Sizes 03, 04 and 05 have minimal body size, thus plate adapters provide the NAMUR mounting pattern. All other sizes incorporate NAMUR mounting patterns directly in the body machining - on both faces.

Figure 8 Sizes 03, 04 and 05



- Sizes 03, 04 and 05 have body mounting surfaces even with the cylinder flanges allowing all size brackets to mount. Sizes 07, 10, 12 and 14 have cylinder flanges that extend outward past the body mounting surface, but only when the actuator is provided without a Universal Mounting Plate (UMP). Bracket width is an important consideration unless a UMP is included in the assembly.

Figure 9 Sizes 07, 10, 12, 14 Without UMP

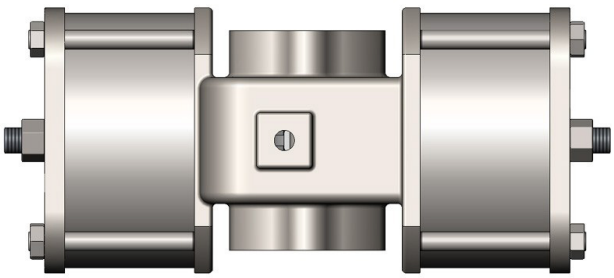
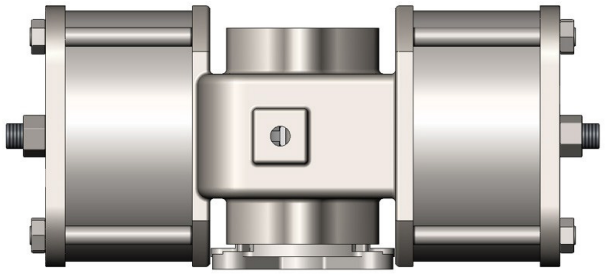


Figure 10 Sizes 07, 10, 12, 14 With UMP

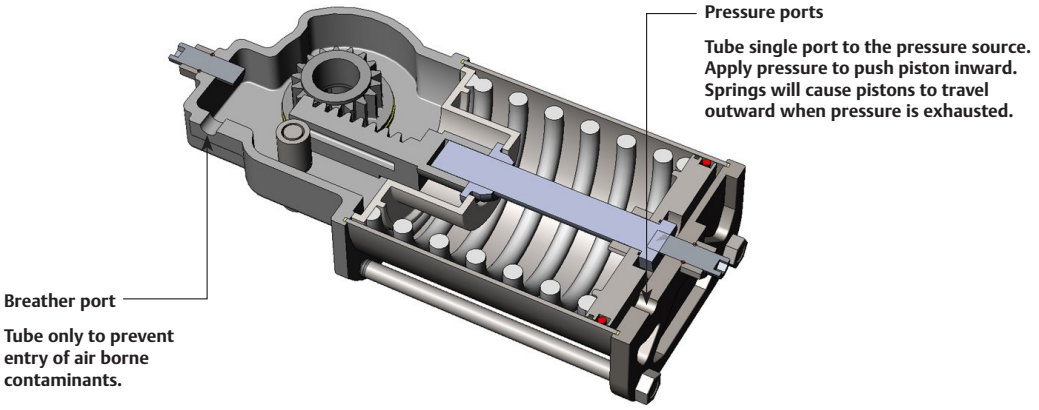


- UMPs are a standard option that permits actuator mounting bolt patterns to match that of the user's valve or to replicate the dimensions of a competitor's actuator for ease of replacement.
- Single and double-cylinder actuators require no user lubrication.
- Springs are captured for safe disassembly. Springs do not extend when end caps and cylinders are removed.

Section 3: Piping

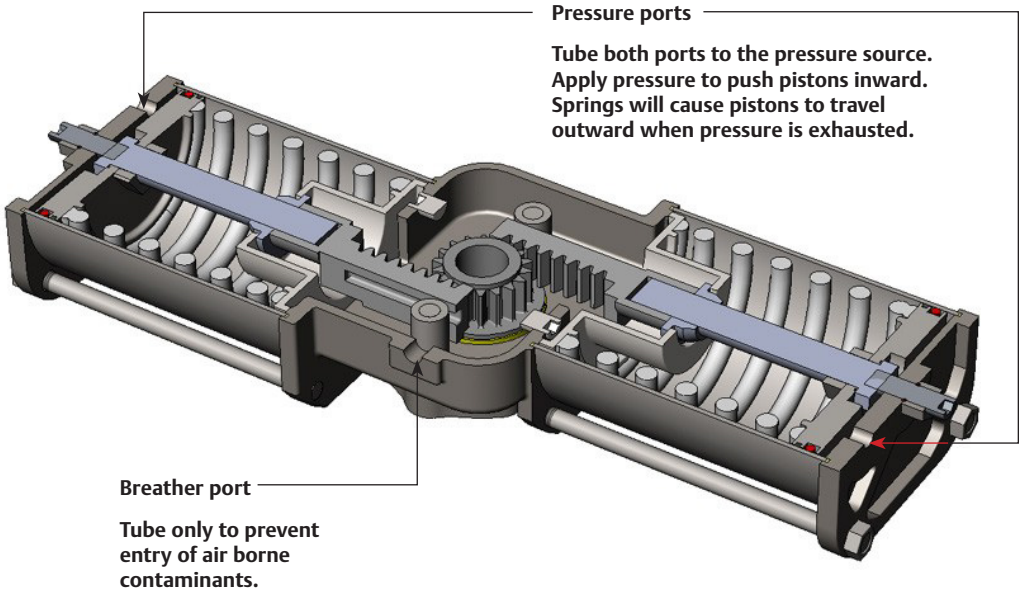
3.1 Single-Cylinder Types (Sizes 03, 04, 07 and 12)

Figure 11 Single-Cylinder Types (Sizes 03, 04, 07 and 12)



3.2 Double-Cylinder Types (Sizes 05, 10 and 14)

Figure 12 Double-Cylinder Types (Sizes 05, 10 and 14)



Section 4: Travel Adjustment

4.1 Single-Cylinder Types (Sizes 03, 04, 07 and 12)

- Travel adjustment screws are located on the end cap and the body.
- Hex nuts are provided with relief for a sealing O-ring that is forced into the screw threads when tightened, thereby preventing loss of pressure.
- Loosen the hex nuts before attempting to adjust the screws.
- Clockwise screw rotation reduces actuator travel, counterclockwise rotation increases travel.
- The end cap screw will be more difficult to adjust as the spring is pushing the piston against the screw end. If necessary, apply pressure to the end cap port to relieve the piston force.
- When travel adjustment is complete, retighten the hex nuts to seal the threads and to secure the screw position.

4.2 Double-Cylinder Types (Sizes 05, 10 and 14)

- Travel adjustment screws are located on the end caps and the body such that each piston's travel is stopped independently but simultaneously.
- The end cap stops are readily adjusted but the body stops are for factory assembly adjustment and not intended for user adjustment unless absolutely necessary, as they require removal of the cylinders and springpaq.

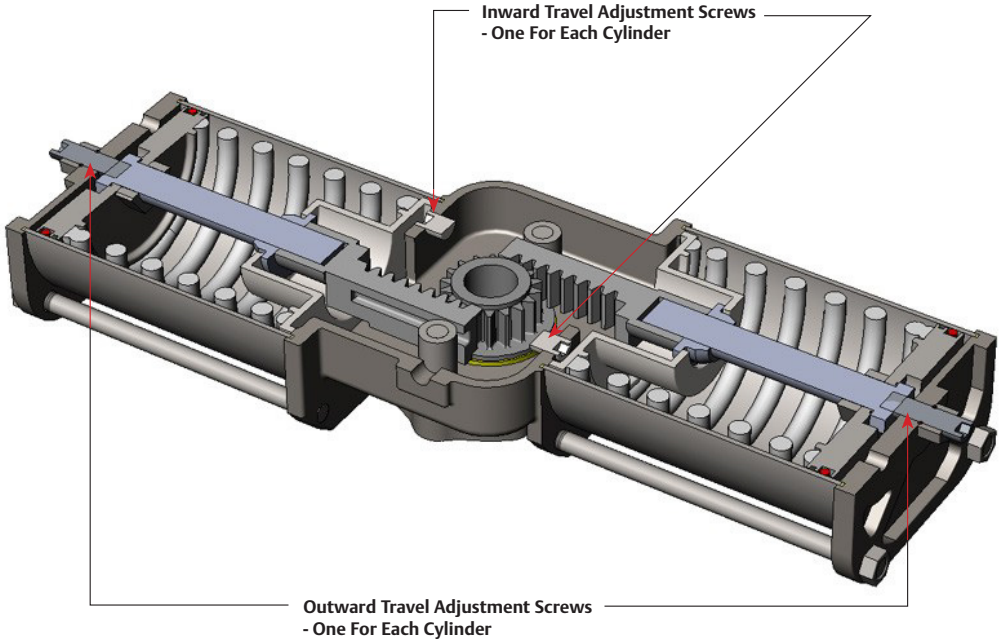
4.3 Outward Travel Adjustment

- End caps stops include hex nuts which are provided with relief for a sealing O-ring that is forced into the screw threads when tightened, thereby preventing loss of pressure.
- Loosen both hex nuts before attempting to adjust the end cap screws.
- Back off (turn counterclockwise) one of the stop screws, using the other to set travel.
- Clockwise screw rotation reduces actuator travel, counterclockwise rotation increases travel.
- The screw may be difficult to adjust as the spring is pushing the piston against the screw. If necessary, apply air pressure to the end cap port to relieve the piston force.
- When travel adjustment is complete using the one screw, turn the other screw clockwise until contact is made with the piston, then add 1/4 turn.
- Retighten the hex nuts to seal the threads and to secure the screw positions.

4.4 Inward Travel Adjustment

- Removal of both cylinders is required and multiple adjustments may be required - for this reason we recommend against attempting to adjust inward motion, preferring to achieve adjustment via bracket motion, followed by resetting the end cap travel screws.

Figure 13 Outward and Inward Travel Adjustment Screws



Section 5: Operation

- Water and hydraulic fluids may be used to pressurized single and double-cylinder actuators, provided the seal materials were selected accordingly.

- Air driven single-cylinder stainless-steel actuators with stainless-steel or Amalgon cylinders are not harmed by wet air (so long as freezing does not occur). Available aluminum and chrome-plated steel cylinders may be harmed by the presence of water.

- Prevent entry of solids into the cylinders as these may cause bore damage. Should damage occur, as pointed out in Section 6, Maintenance Section, damaged cylinders may be reversed end for end to present a new surface, essentially providing a spare cylinder on each end of the actuator.

Section 6: Maintenance

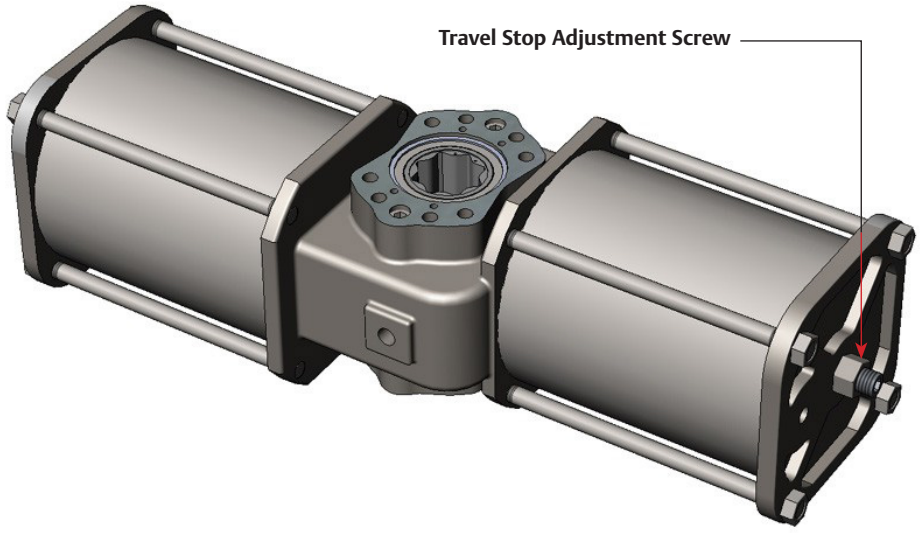
6.1 Piston Seal Replacement

- All Bettis RGS Q-Series actuator piston seals may be replaced while the actuator remains in line.
  - This offers the advantage of not having to remove the actuator from the valve and eliminates concern about valve damage as a result of having to disengage the actuator and valve shafts.
  - It also is beneficial because accessory settings are not disrupted and therefore should not require subsequent adjustment/calibration post repair.
  - When pressure is exhausted form the pressure ports in preparation for disassembly, the springs position the valve either open or closed as defined during original installation. When the end cap and cylinder are removed, the springs continue to hold the valve in this position.
  - Single and double-cylinder types require identical procedures for piston seal replacement, except that for the double-cylinder types, complete one cylinder prior to performing seal replacement on the second.

6.1.1 Procedure

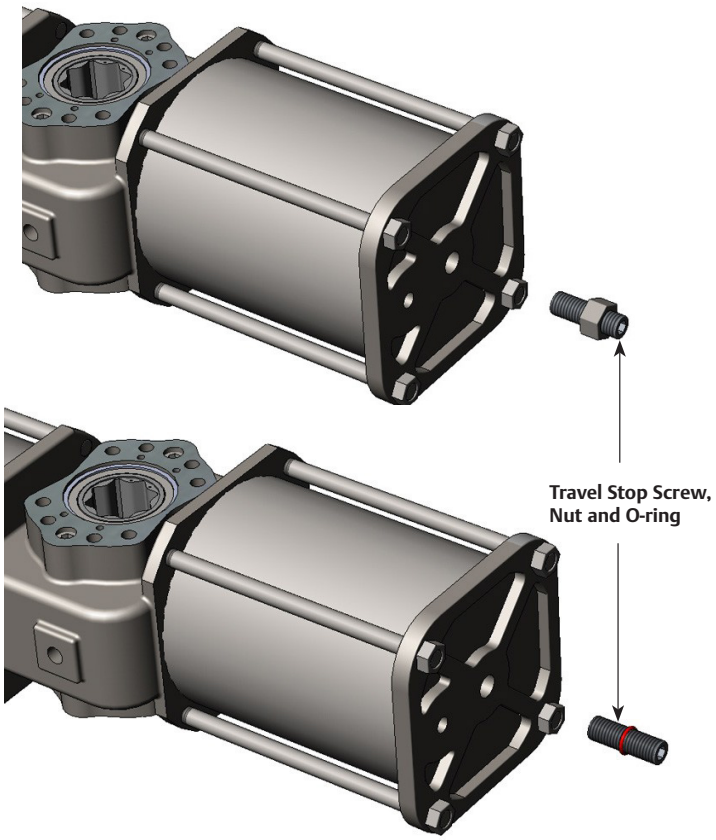
1. Exhaust pressure from all pressure ports.
2. Remove tubing/piping.
3. Measure height of travel stop adjustment screw.

Figure 14 Travel Stop Adjustment Screw



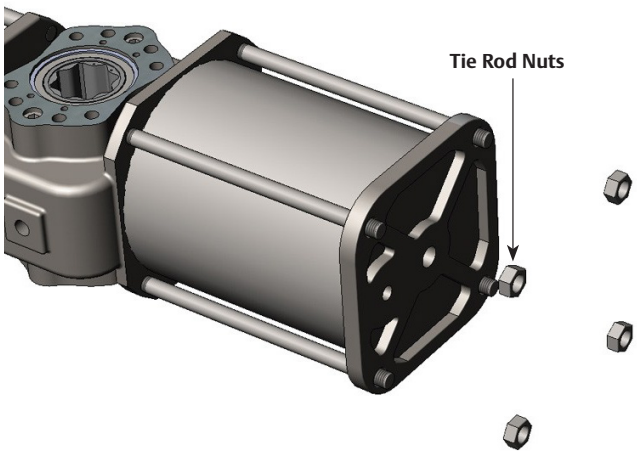
4. Remove travel stop adjustment screw, jam nut and O-ring.

Figure 15 Travel Stop Screw, Nut and O-ring



5. Remove tie rod nuts (tie rods should remain in place for convenience, but no harm occurs should they be removed as well)

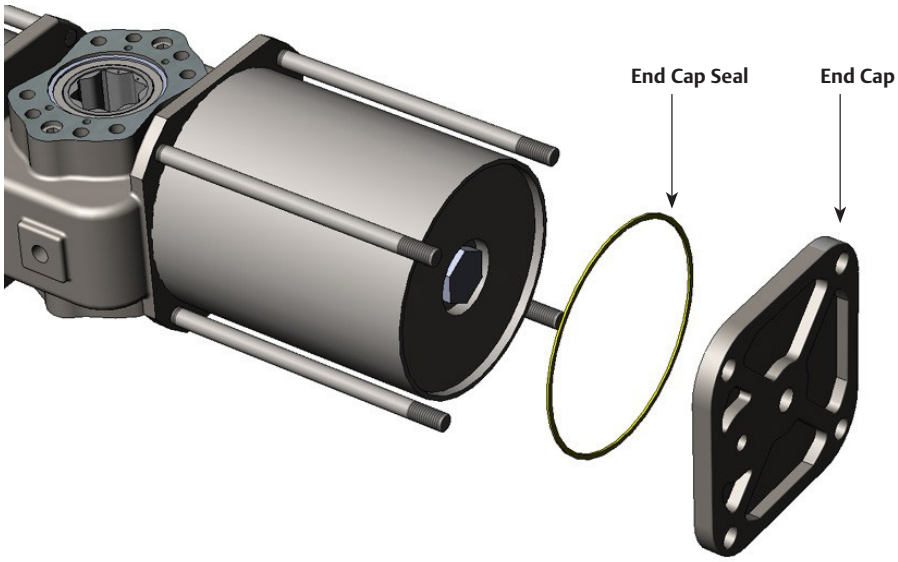
Figure 16 Tie Rod Nuts



6. Remove end cap and end cap seal. The seal is PTFE unless specified otherwise at time of initial assembly. This is a compression seal and is encapsulated on 4 sides by the end cap and cylinder, allowing no cold flow nor wear.

   Normally the seal remains in the end cap groove during disassembly. If necessary, replace it in the groove. It is almost never necessary to replace this seal.

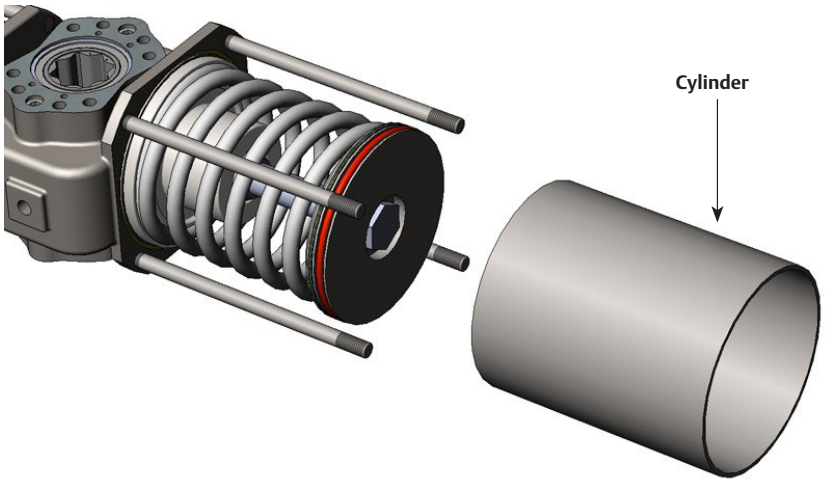
Figure 17 End Cap and End Cap Seal



7. Remove the cylinder. The cylinder should be able to be removed by hand. Do not use metal tools for impact. A rubber mallet may be used if necessary.

   There is also a seal ring between the cylinder and the body groove. It is identical to the end cap seal except that it is not pressured and primarily acts to exclude entry of atmospheric contaminants.

Figure 18 Cylinder



8. Clean and inspect the cylinder bore. If damaged from contaminants, turn cylinder around to use the spare other end.

9. Remove the piston O-ring clean groove, lubricate and install new O-ring.

10. Inspect wiper ring, replace if damaged. Clean groove, install original or new wiper ring.

11. Reinstall the cylinder taking care to ensure the piston O-ring remains with the piston groove.

12. Position the cylinder to seat within the body groove (not necessary that it remain in place).

13. Install end cap and tie rod nuts but tighten nuts only hand tight.

14. At this point, once again, position the cylinder in both the body and end cap grooves, again hand tightening the tie rod nuts.

15. Using diagonally alternate nuts, tighten each one turn until all are tightened to the specified torque.
    - For 03 size = 10 pound-feet torque
    - For 04 and 05 sizes = 15 pound-feet torque
    - For 07 and 10 sizes = 20 pound-feet torque
    - For 12 and 14 sizes = 25 pound-feet torque

16. Reinstall travel stop screw, O-ring and nut. Turn travel stop screw until the height is the same as prior to disassembly.

17. Tighten jam nut securely.

18. If model is a double-cylinder actuator, repeat the process on the second cylinder.

NOTE:

This product is only intended for use in large-scale fixed installations excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

⚠ CAUTION: DO NOT DISASSEMBLE SPRINGPAQ ITSELF

Take a moment to view the springpaq image. Note how the springpaq cannot expand (explode) 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. A rod (bolt) extends from the piston to the spring retainer and a safety collar is threaded onto the rod to secure the assembly. The safety collar is recessed below the surface of the spring retainer to prevent access and is designed so as to offer no ability to remove it unless the springpaq is compressed in a press.

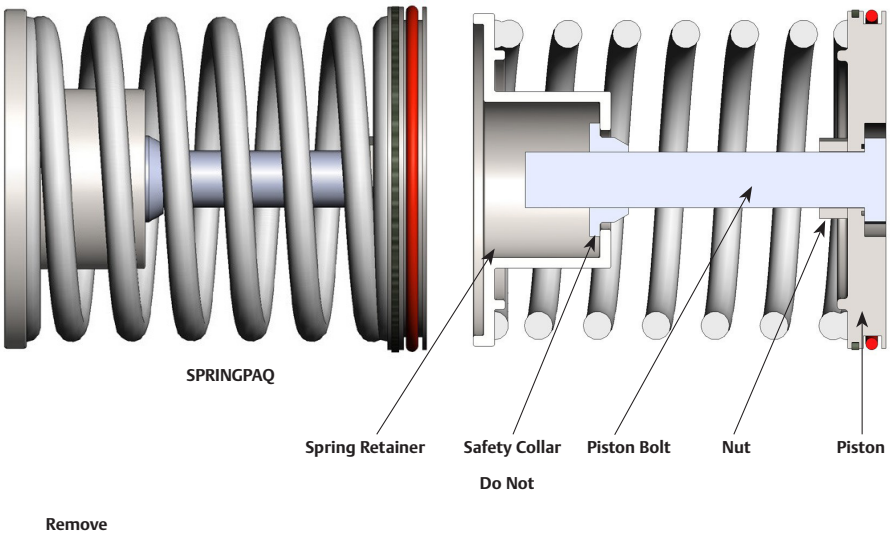
The springpaq was designed to prevent disassembly.

Do not attempt to disassemble springpaq. Disassembly of springpaq may expose yourself
to extreme danger, the result of which could be severe injury or death.

There is no reason to take apart a sprinpaq. If a springpaq is broken, we will replace the entire springpaq.

A springpaq can be safely removed from an actuator but
Do Not For Any Reason Disassemble The Springpaq Itself.

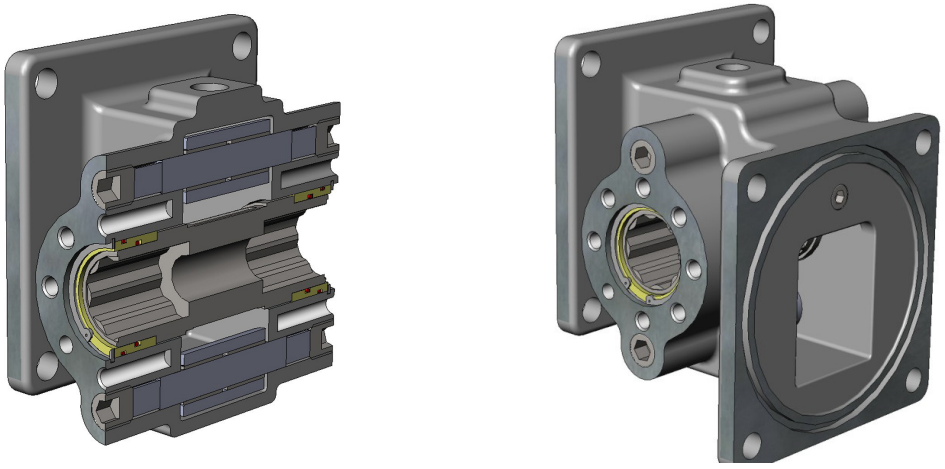
Figure 19 Springpaq



6.2 Shaft Seal Replacement

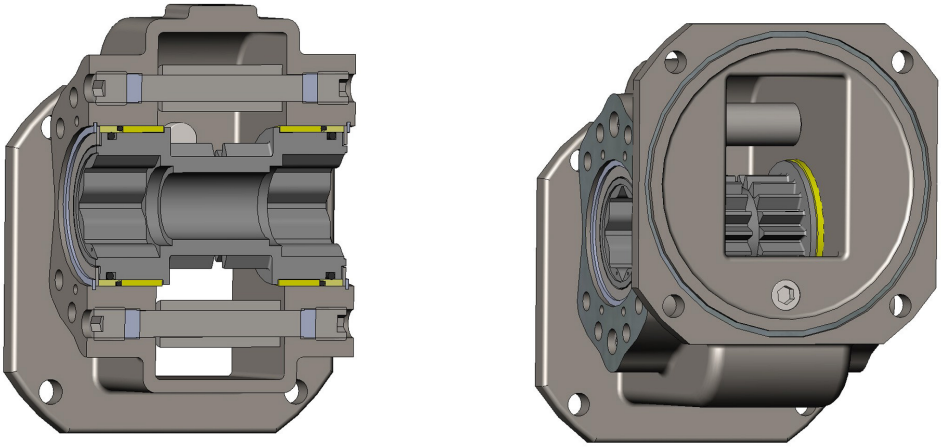
- Because Bettis RGS Q-Series actuator springs are located inward of the pistons, there is no pressure applied to the shaft seals. If they should wear, there is no negative consequence.
- Should you decide to replace the shaft seals, the actuator must be removed from the valve.
- Parts required
  - Kit - Retaining rings, bushings and seals
- Shaft seal differences between assemblies
  - Size 03, 04 and 05 place shaft O-rings in grooves in the bushings

Figure 20 Sizes 03, 04, 05 Shaft Seal



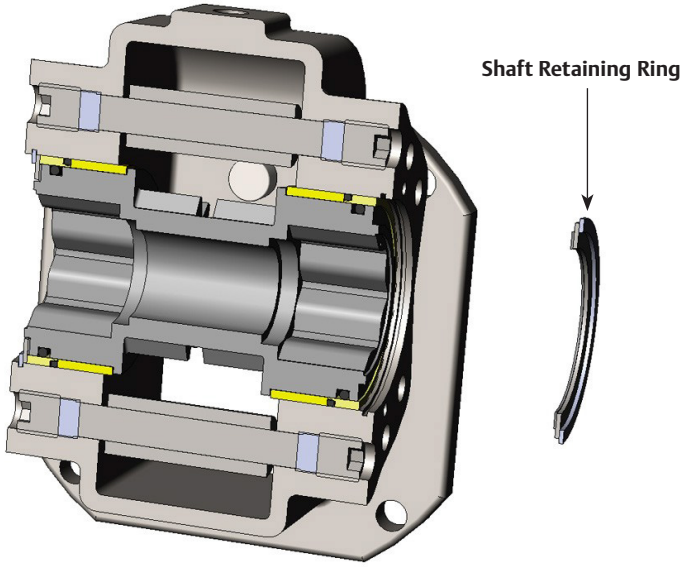
  - Size 07, 10, 12 and 14 place the dynamic O-ring in a shaft groove. The static O-ring is captured between two separate bushings.

Figure 21 Sizes 07, 10, 12, 14 Shaft Seal



6.2.1 Procedure

Figure 22 Shaft Seal Replacement



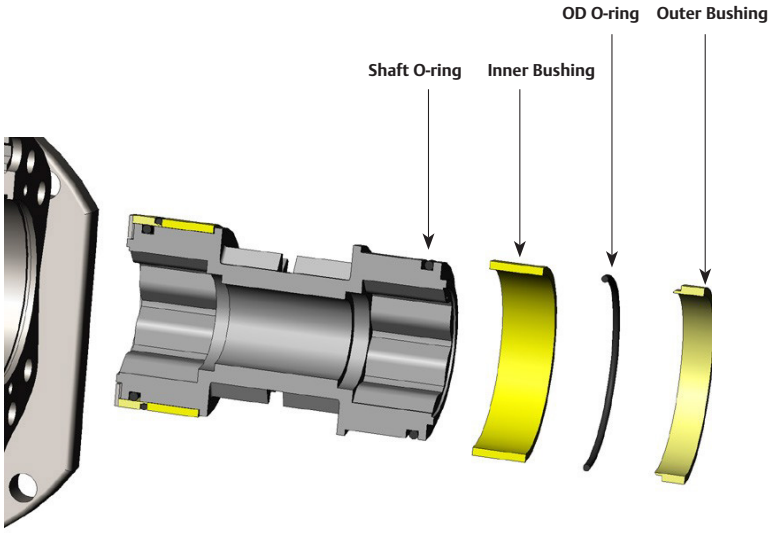
1. Remove shaft retaining ring. Size 12 and 14 have locking rings, requiring care to prevent ring damage. Along with the ring is a thrust bushing.
2. Push entire shaft assembly out through one side of body.
3. Remove bushings from shaft and remove O-rings from bushings.

NOTE:
Sizes 07, 10, 12 and 14 have two bushings on each end.

4. Clean shaft. Smooth any imperfections with a scotch brite pad.
5. Remove saddle pin and bushing.
6. Remove set screws.
7. Push pin and end plugs (rubber) through. Use hammer and punch to force through.

6.2.2 Reassembly

Figure 23 Shaft Seal Reassembly



1. Install saddle pins and bushings with rubber plugs at pin ends. Tighten set screws securely and evenly on each end.
2. Install one shaft retaining ring (temporary).
3. Stand body on end with shaft bore vertical. Drop thrust washer and bare shaft onto the temporary retaining ring (no lower bushings).
4. Insert lower bushing into top end of shaft bore followed by lubricated shaft O-ring which falls into the shaft groove.
5. Insert lubricated OD O-ring using thin rod to seat it against face of first bushing.
6. Insert outer bushing with lip end first. Lip slides under OD O-ring, forcing a seal between the bushings and body.
7. Insert thrust washers, this end followed by retaining ring.
8. Turn actuator over, remove temporary retaining ring.
9. Insert lower bushing, shaft O-ring, OD O-ring outer bushing, thrust washers and permanent retaining ring in same sequence.

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