CONVALVE

SPECIALIST IN VALVE AUTOMATION

PNEUMATIC ACTUATORS
USER MANUAL

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INTRODUCTION

Thank you for purchasing Convalve products. Each product has been thoroughly inspected after its production to offer you the highest quality and reliable performance. Please read the product manual carefully prior to installing and commissioning the product.

- Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly.
- The manual should be provided to the end-user.
- The manual can be altered or revised without any prior notice. Any changes in product's specification, design, and/or any components may not be printed immediately but until the following revision of the manual.
- The manual should not be duplicated or reproduced for any purpose without prior approval from Convalve.
- In case of any other problems that are not stated in this manual, please make immediate contact with Convalve for assistance.

TRANSPORTATION AND STORAGE

All Convalve actuators are meticulously factory lubricated to withstand 2,000,000 cycles under normal operating conditions. To ensure their integrity during shipment, the actuator ports are thoughtfully plugged, preventing any liquids or foreign materials from entering the actuator.

In the event that the actuators are planned to be stored for an extended period before installation, it is advisable to periodically stroke the units to prevent the seals from setting. Please note that to stroke the actuator, the plugs must be removed.

For optimal storage conditions, it is recommended to store the actuators indoors, safeguarding them against adverse weather conditions and other potentially harmful elements. At Convalve, we prioritize the longevity and performance of our products, and these storage guidelines are meant to preserve the actuators' functionality and reliability throughout their lifecycle.

Handling the actuator with care is of utmost importance to prevent any scratches, damage, or harm to the environment during transportation. Adequate protection should be provided to ensure the actuator remain intact throughout the transportation process.

PRODUCT DESCRIPTION

Air actuators in general are known in the industry to be very rugged, reliable and durable. Convalve quarter turn air actuators are prelubricated and tested to a minimum one million operations. Actuators are available in double acting and spring return models. They meets international ISO 5211 standards for easy valve mounting and replacement. Position confirmation switches and valve positioners can be easily mounted to the actuator with the standard VDI/VDE-3845 top mounting pad. Rotation adjustment +/- 5% in both open and closed position. Visual position indicator will monitor the open and closed position.

Convalve presents an extensive selection of pneumatic rack and pinion actuators, setting itself apart in the market. These actuators are purposefully designed to function with pressurized air and are equally efficient with hydraulic fluid, water, or inert fluids. Operating seamlessly within the pressure range of 2 Bar to 10 Bar, our actuators are available in two distinct styles: the Double Acting and the Single Acting model.

The Double Acting model offers flexible 90° rotation, while the Single Acting version is exclusively available as a 90° model. The flexibility of our actuators extends beyond their initial configuration, as they can be effortlessly field converted to other setups by inserting or removing the unique patented Convalve spring cartridges.

We take immense pride in our actuators' versatility, ensuring they meet the demands of different applications and industries. At Convalve, precision engineering and innovative design drive our commitment to delivering top-notch products that surpass industry standards. Whether you require reliable performance in pneumatic or hydraulic systems, our actuators are the perfect choice to enhance control and efficiency in your operations. Trust Convalve for unparalleled actuation solutions, catering to your diverse needs with unparalleled expertise and support throughout your journey.

PRECAUTIONS BEFORE INSTALLATION

Before proceeding with the actuator installation, it is of paramount importance to carefully read and fully comprehend the instruction manual. Pay special attention to the safety guidelines and precautions outlined in the manual before and during installation. Adhering to the instructions provided in the installation manual will facilitate a smooth and precise installation of the valve, ensuring its proper functioning and safe operation.

INSPECTION OF ACTUATOR

Actuator manufacturers take measures to minimize shipping damage, but despite their efforts, damage may still occur during transportation and storage. Therefore, it is imperative to thoroughly inspect the actuators before installation and promptly notify the manufacturer of any observed damage. Under no circumstances should actuators known to be damaged be installed.

Prior to commencing installation, carefully inspect the actuator, and remove any transport stops, protective plugs, or covers that might be in place. Additionally, ensure that the inside of the actuator body is completely free from any foreign objects or debris. This meticulous inspection will help guarantee the proper functioning of the actuator and prevent potential issues during its operation.

TRAVEL STOP ADJUSTMENT

Convalve actuators come equipped with open and close travel stops, allowing for +5°/-5° of travel adjustment.

When performing any adjustments, always ensure proper safety measures, and follow manufacturer guidelines for travel stop settings. Incorrect adjustments can lead to improper actuator operation and should be avoided.

A. SETTING THE STOPS ON DOUBLE ACTING UNITS:

1. Operate the actuator assembly to the closed position.
2. Remove or lockout the air supply to the actuator.
3. Loosen the locknut on the closed stop.
4. Turn the closed stop clockwise to reduce or counterclockwise to increase the travel as desired.
5. Retighten the locknut to secure the adjustment.
6. Reconnect the air supply to verify that the actuator's position is correct. If not, repeat steps 3 to 5 until the desired position is achieved.
7. Operate the actuator assembly to the open position.
8. Remove or lockout the air supply to the actuator.
9. Loosen the locknut on the open stop.
10. Turn the top clockwise to reduce or counterclockwise to increase the travel as needed.
11. Retighten the locknut to secure the adjustment.
12. Reconnect the air supply to check that the actuator's position is correct. Repeat steps 9 to 11 if necessary until the desired position is achieved.

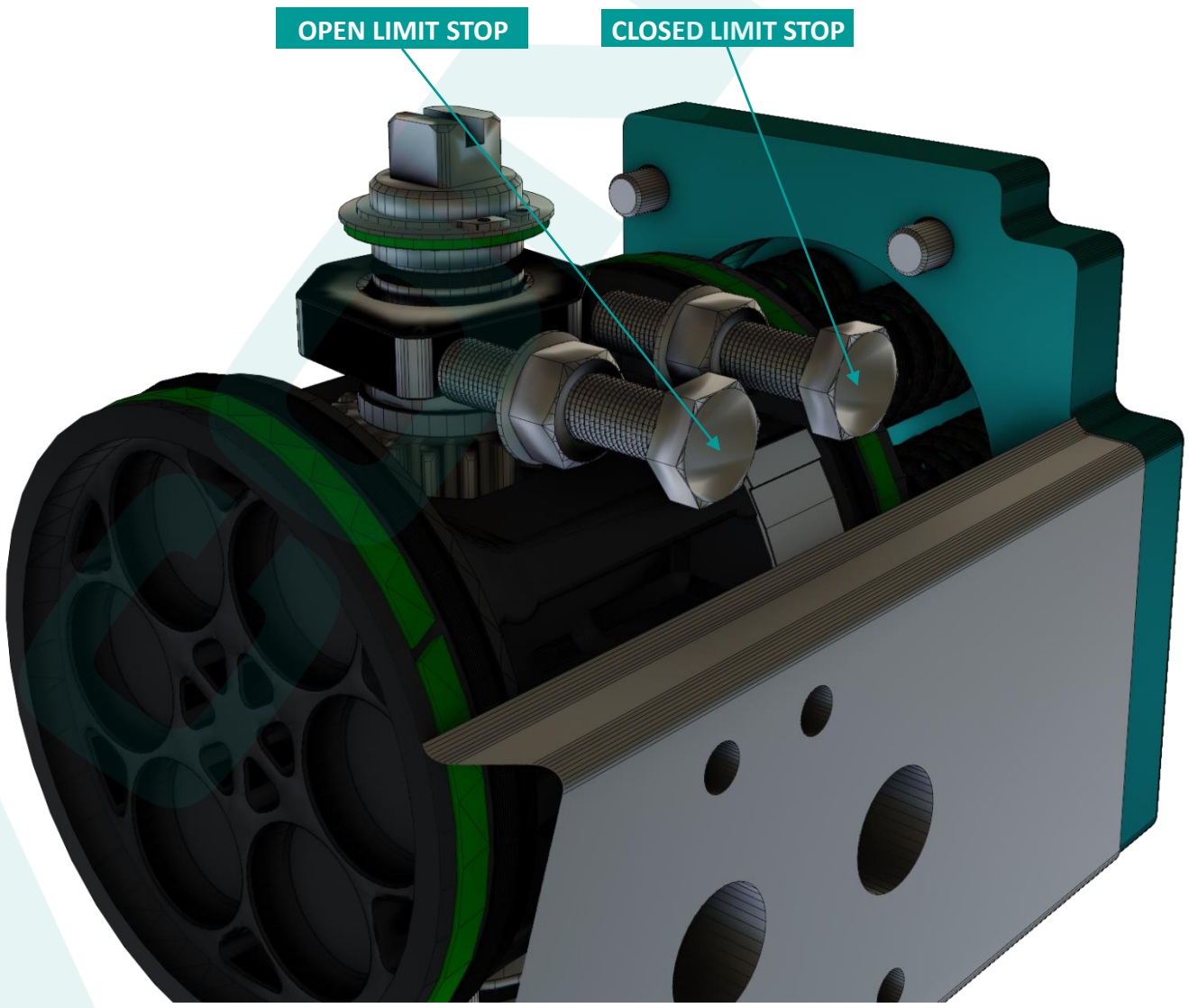


FIGURE 6.1

The above illustration shows a double acting actuator in the open position and identifies the opening and closing limit stops.

TRAVEL STOP ADJUSTMENT

B. SETTING THE STOPS ON SINGLE ACTING UNITS (FAIL CLOSED) :

1. Remove the air supply to the "A" port. The actuator will move to the closed position. Take note of the actuator's position in the closed state.
2. Apply air to open the actuator. Observe and record the position of the actuator in the fully open position.
3. While maintaining the air supply, carefully loosen the locknut on the closed stop and adjust the stop to the desired correct position.
4. Retighten the locknut to secure the adjustment.
5. Remove the air supply, and the actuator will return to the desired closed position. If the correct position is not achieved, repeat steps 1 to 5.
6. Loosen the locknut on the open stop and adjust the desired travel (clockwise adjustment decreases travel).
7. Retighten the locknut to secure the adjustment.
8. Apply air again and check the actuator's position in the fully open state. If the position is not correct, repeat steps 5 to 8 until the desired open position is achieved.

NOTE : Please exercise caution during the adjustment process and follow proper safety procedures. Always adhere to manufacturer guidelines and recommendations for setting the stops on single acting actuators. Improper adjustments may result in faulty actuator operation and should be avoided.

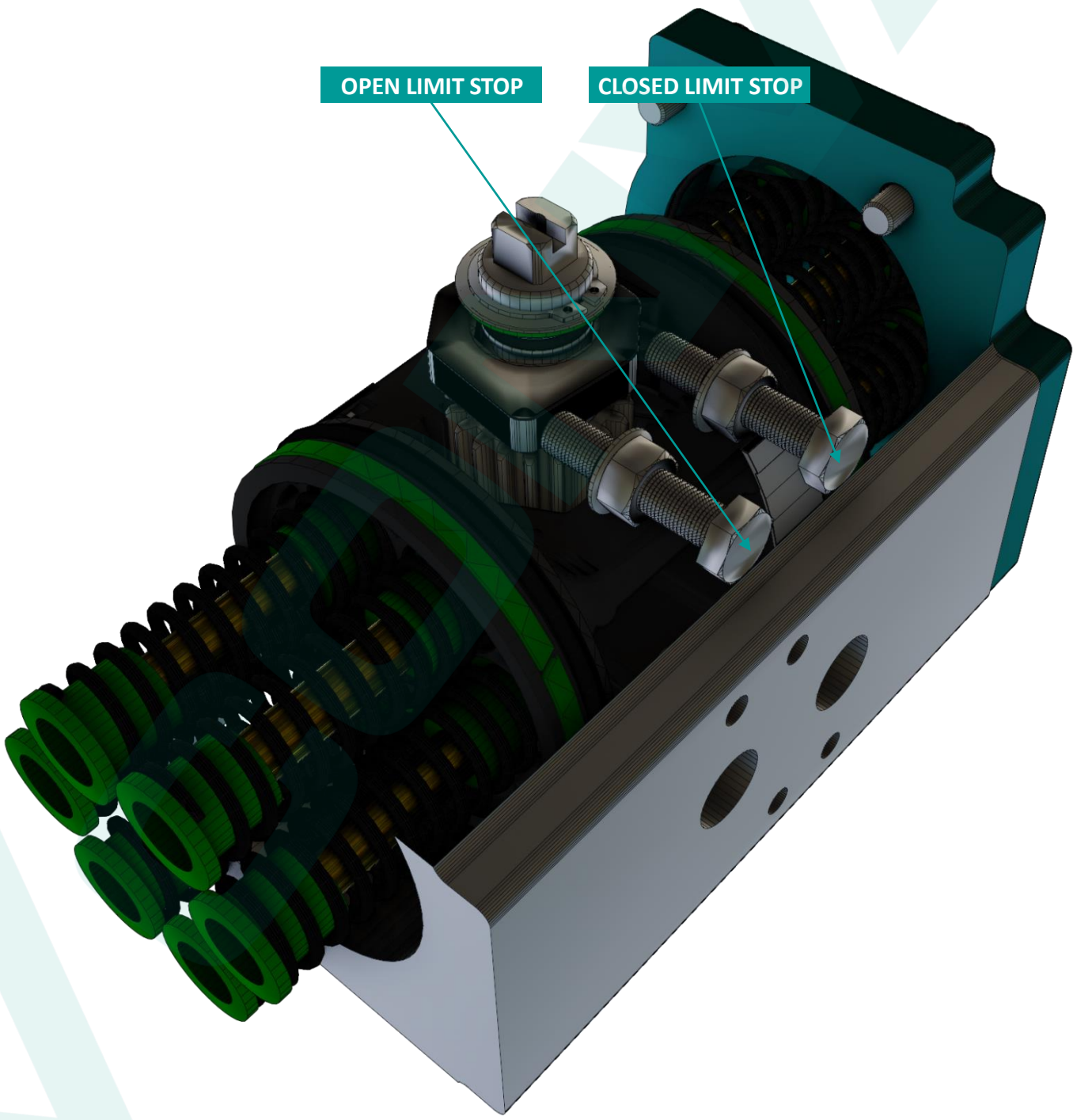


FIGURE 6.2

The above illustration shows a single acting actuator (FCW configuration) in the open position and identifies the opening and closing limit stops.

TRAVEL STOP ADJUSTMENT

B. SETTING THE STOPS ON SINGLE ACTING UNITS (FAIL OPEN) :

1. Remove or lockout the air supply to the actuator, and it will drive to the open position. Take note of the actuator's position in the fully open state.
2. Apply air to close the actuator while maintaining the air supply. Note the position of the actuator during this process.
3. Carefully loosen the locknut on the open stop and adjust the stop to the desired correct position.
4. Retighten the locknut to secure the adjustment.
5. Remove or lockout the air supply to the actuator so that it opens again. If the actuator is not in the correct position, repeat steps 1 to 3 until the desired position is achieved.
6. Loosen the locknut on the close stop and adjust the travel by the desired amount to achieve the correct position (clockwise adjustment decreases travel).
7. Retighten the locknut to secure the adjustment.
8. Reapply air and check the closed position. If the desired closed position is not achieved, repeat steps 1 to 5 until the correct position is obtained.

NOTE : Please exercise caution during the adjustment process and follow proper safety procedures. Always adhere to manufacturer guidelines and recommendations for setting the stops on single acting actuators. Improper adjustments may result in faulty actuator operation and should be avoided.

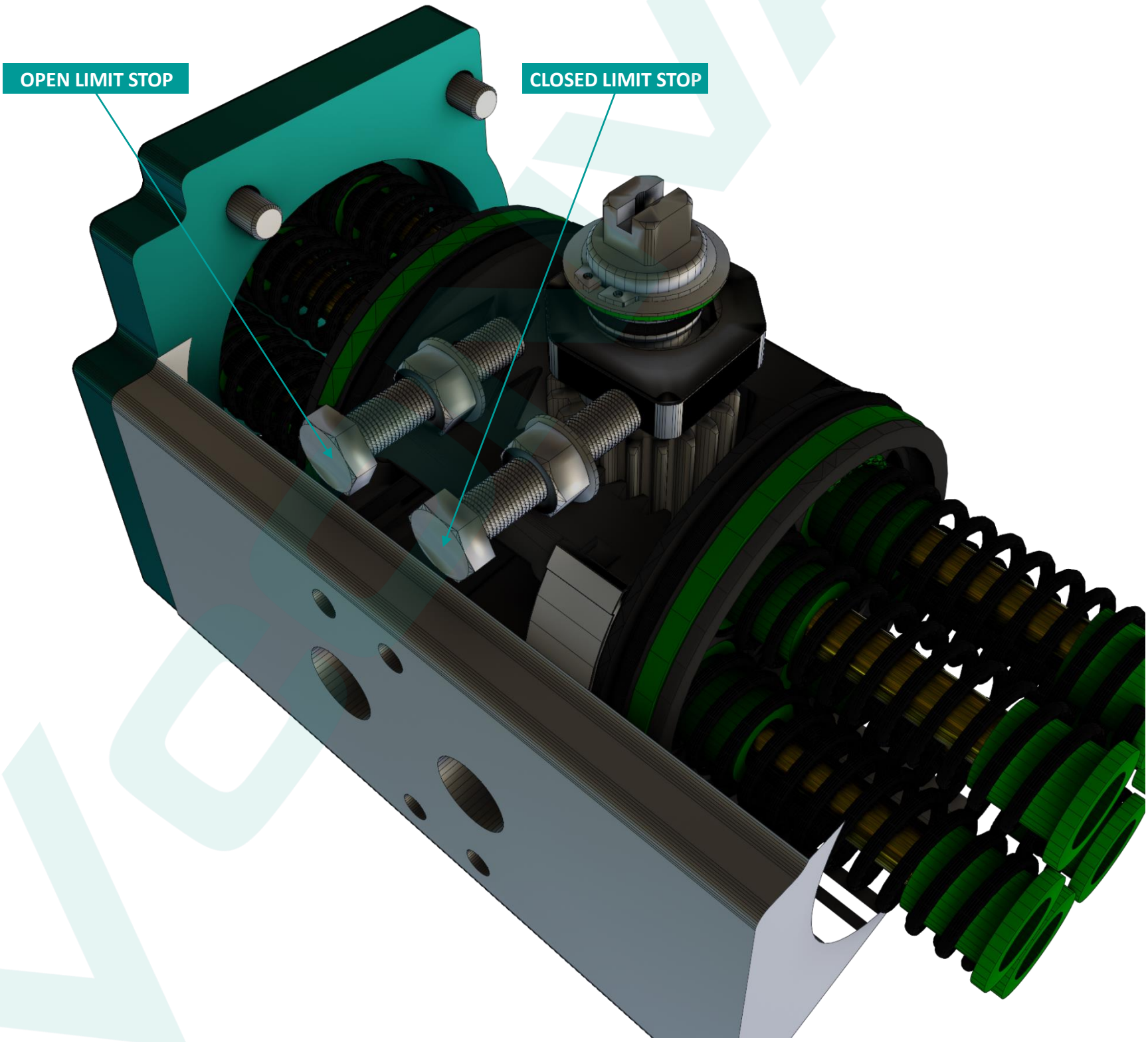


FIGURE 6.3

The above illustration shows a single acting actuators (FCCW configuration) in the open position and identifies the opening and closing limit stops.

ACTUATOR DISASSEMBLY

Disassembling an actuator can be a complex task and should only be performed by trained personnel familiar with the specific actuator model and manufacturer's guidelines. Improper disassembly may lead to damage or hazards. If unsure about the disassembly process or any aspect of actuator maintenance, it is recommended to consult the manufacturer's documentation or seek professional assistance.

STEPS TO ACTUATOR DISASSEMBLY :

1. Disconnect all electrical and air supplies from the actuator to ensure complete isolation.

2. Make sure the actuator is depressurized and in the fail position as per its design.

3. Remove the actuator from its mounting bracket and coupling, and also detach any limit switches, manual overrides, positioners, and other pneumatic accessories (where applicable). Place these components in a clean environment for further inspection or maintenance.

4. Carefully place the actuator on one end and evenly loosen all end cap screws until you can remove the end cap. Take caution not to damage any internal components during this process.

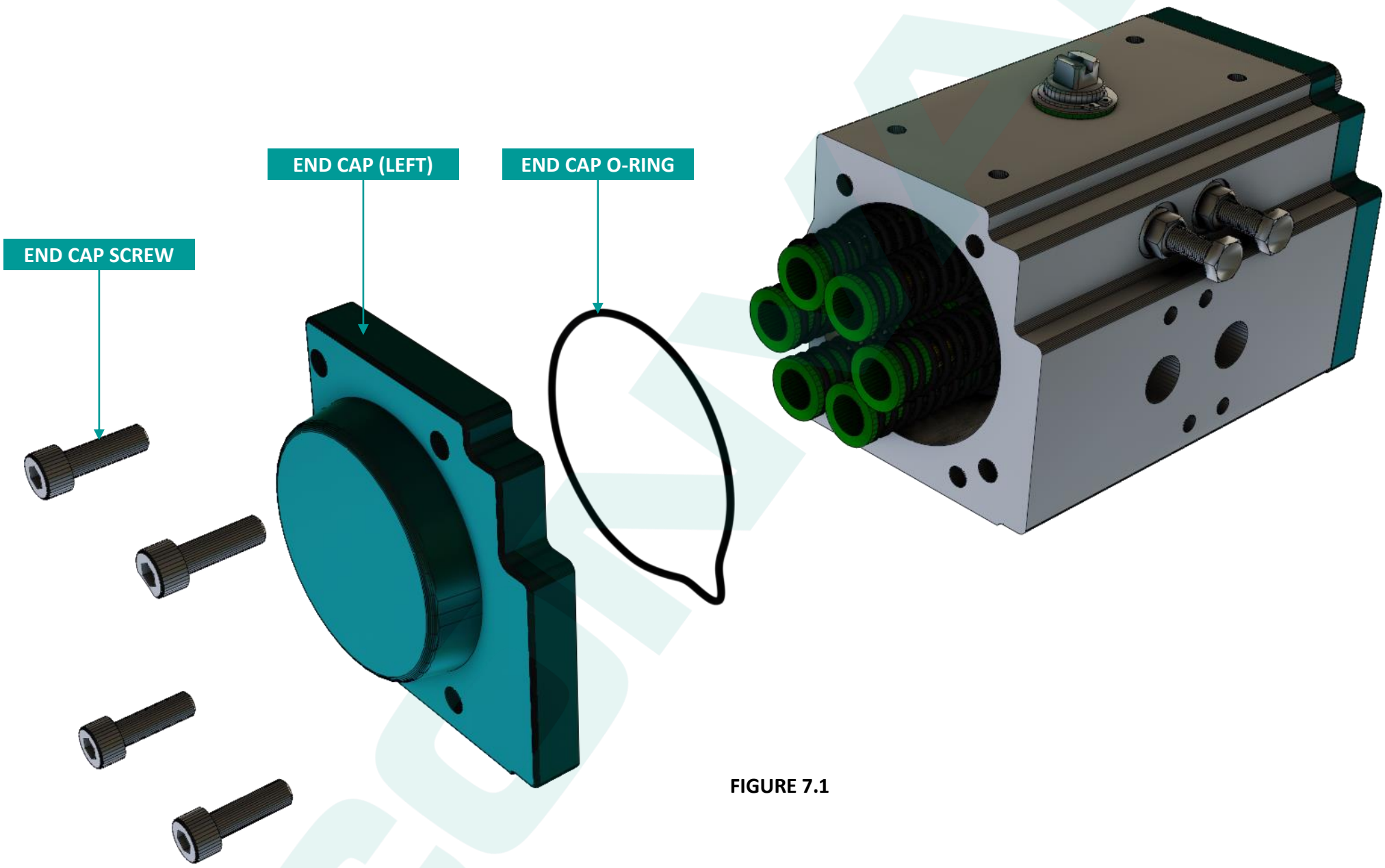


FIGURE 7.1

NOTE : During actuator disassembly, disconnect all electrical and pneumatic power. Make sure the actuator is in a depressurized state. When loosening the end cap bolt, be cautious as the springs may decompress after approximately 4-6 turns. This step releases stored energy, so wear proper PPE and follow safety guidelines. Avoid standing in front of the end cap and maintain a safe distance. For any concerns or uncertainties, seek guidance from experienced personnel or the manufacturer's documentation. Safety should always be the top priority when working with industrial equipment."

WARNING!

Safety is of paramount importance when working with actuators or any other industrial equipment. Assembling, disassembling, or modifying an actuator while it is still in service can be extremely dangerous and should never be attempted.

To ensure safety during any adjustments or maintenance:

1. Disconnect both pneumatic and electrical power from the actuator.
2. Make sure the actuator is completely exhausted and depressurized before proceeding with any adjustments or disassembly.

Taking these precautions helps prevent accidents, injuries, and damage to the equipment. Always follow the manufacturer's safety guidelines and best practices when working with actuators or any other machinery to ensure a safe working environment and successful maintenance procedures.

5. Remove any springs and repeat for the other side

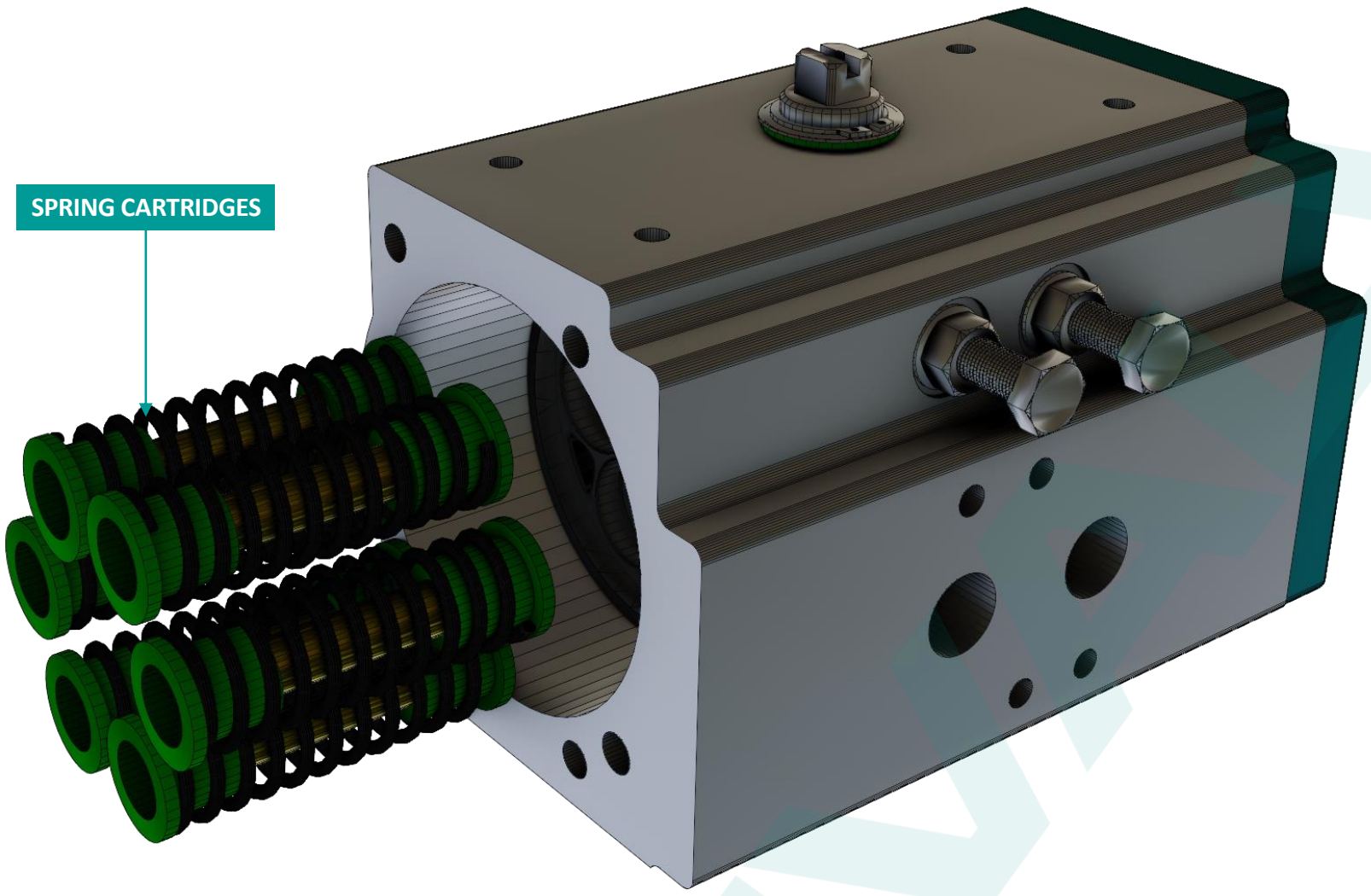


FIGURE 7.2

6. Remove pinion circlip, pinion washer, and flange bearing from top of the pinion.

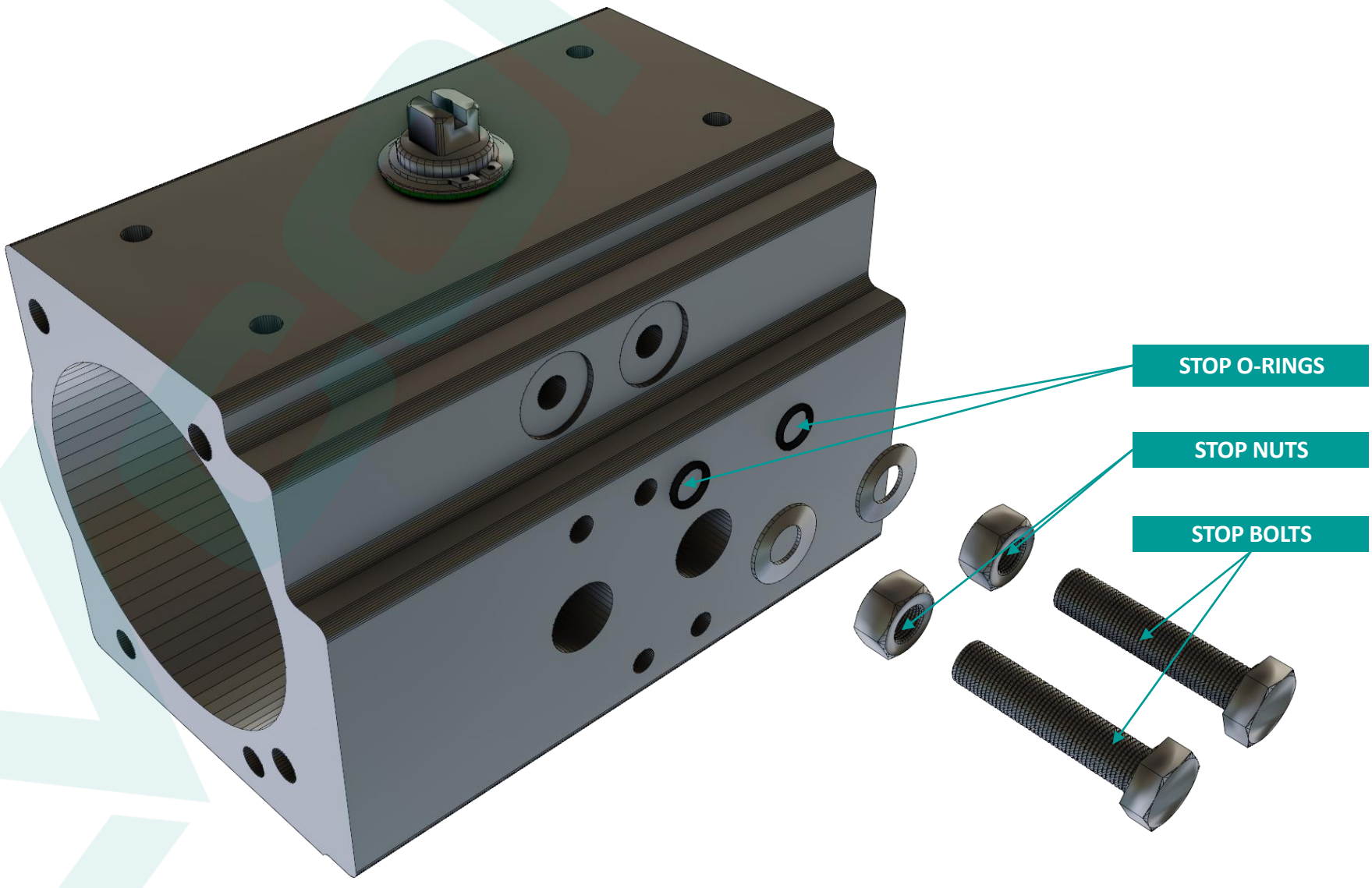


FIGURE 7.3

7. Rotate the pinion counterclockwise to push the pistons away from each other until they completely disengage from the pinion.

   NOTE : This is for standard FCW configuration actuators. For non-standard units, rotation may be reversed.

8. Remove both pistons noting their orientation so they can be replaced in the same orientation during reassembly.

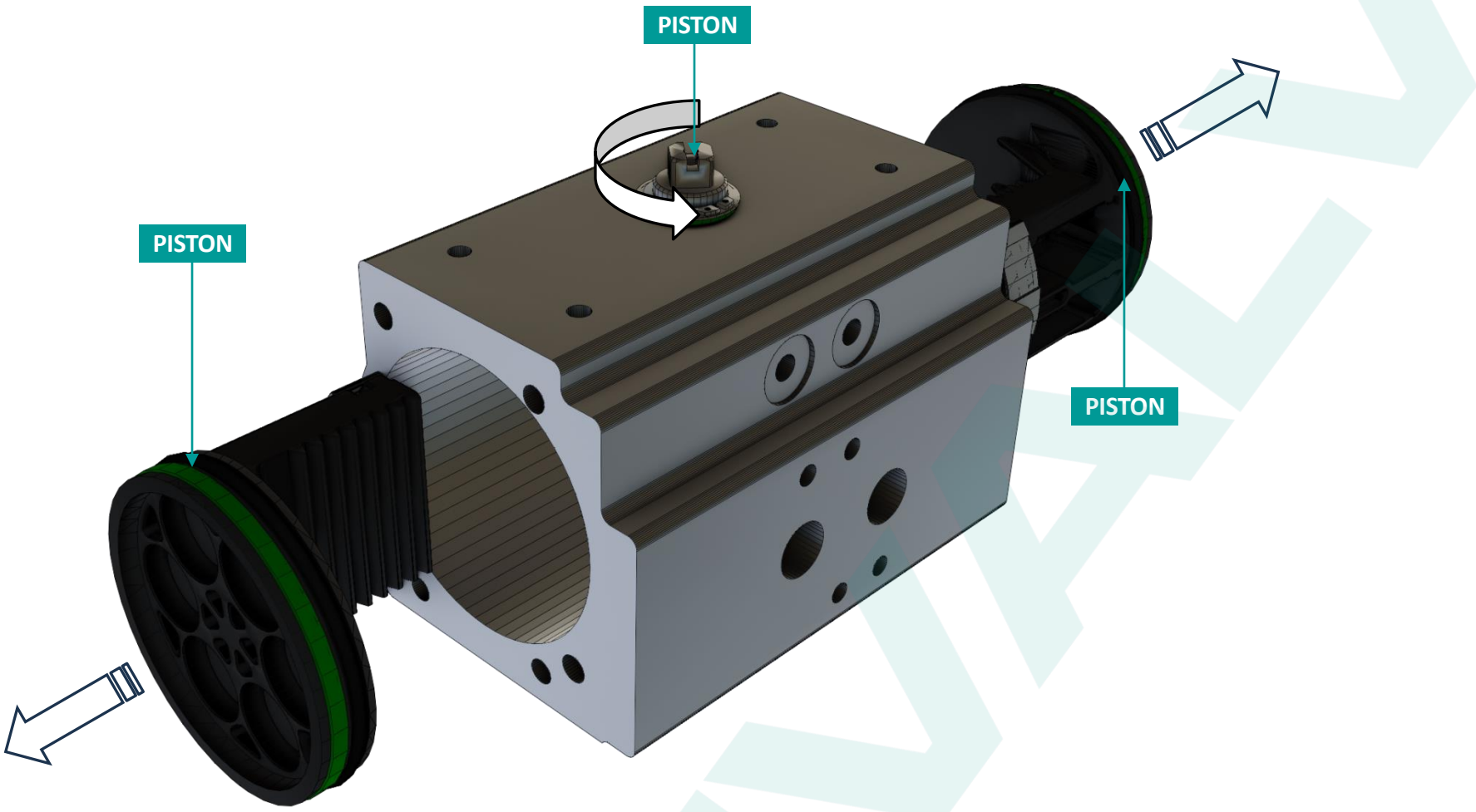


FIGURE 7.4

9. Remove pinion circlip, pinion washer, and flange bearing from top of pinion.

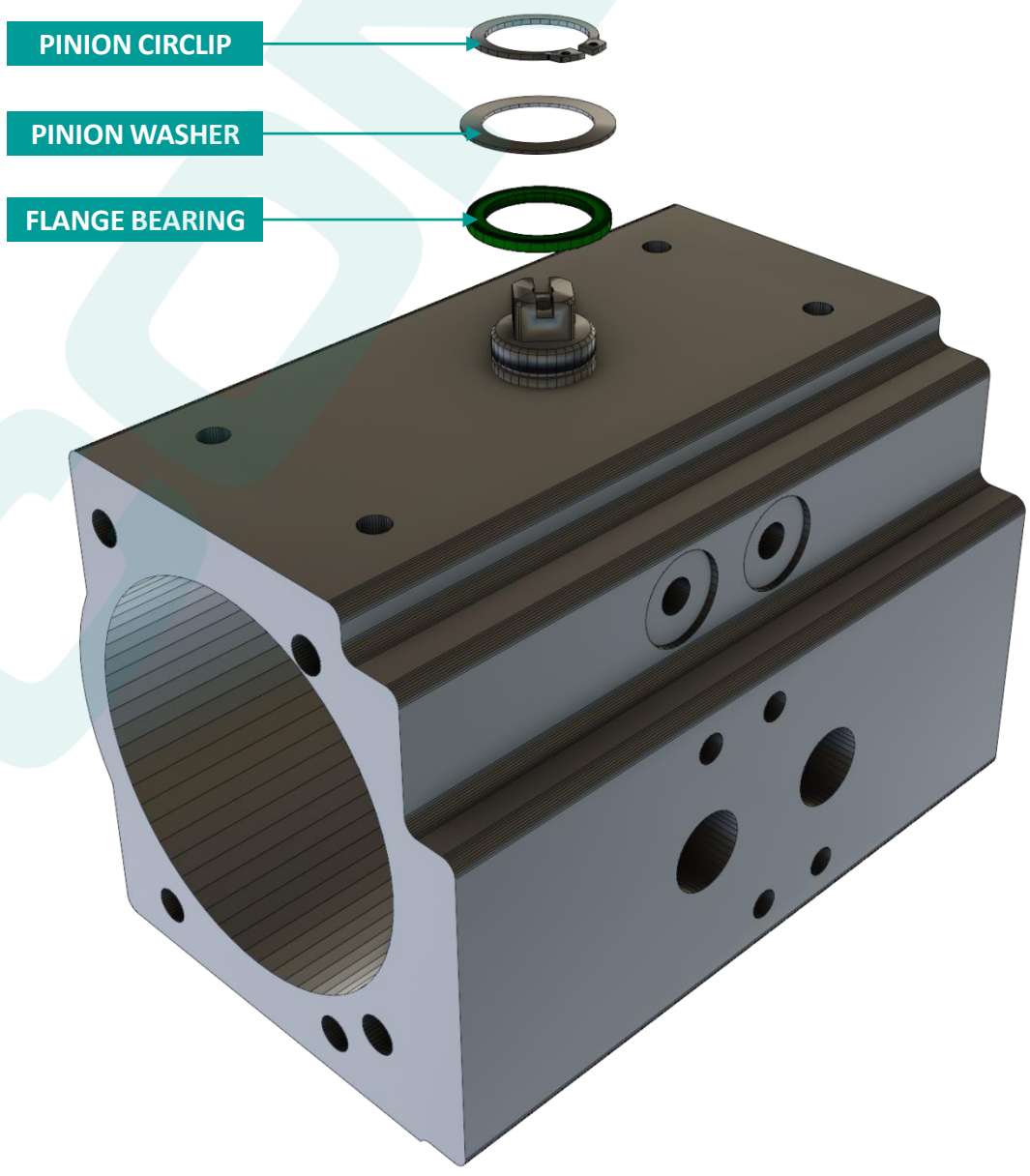


FIGURE 7.5

ACTUATOR DISASSEMBLY

10. To disassemble the actuator and remove the components mentioned, follow the steps below:

- Locate the slide pinion on the actuator, which should be accessible from the top.
- Slide the pinion down through the bottom of the actuator carefully. This will allow you to access the components on the top side of the pinion.
- Once the pinion is lowered, you should be able to see the pinion cam, upper pinion bearing, thrust bearing, and upper pinion o-ring.
- Remove the pinion cam by carefully lifting it off the pinion shaft.
- Next, remove the thrust bearing from the pinion. Depending on the design, it may be a separate component or integrated with the pinion cam.
- Finally, remove the upper pinion o-ring, which may be seated in a groove on the pinion shaft.
- As you proceed with disassembly, take note of the orientation of the pinion cam. Observe how it is positioned before removal so that you can reassemble it in the same orientation later.

FIGURE 7.6

MAINTENANCE AND TEMPERATURE CHANGE

A. REPAIR KIT OVERVIEW

Whenever maintenance is performed on an actuator, it is crucial to replace all O-rings, grease, and bearings to ensure the longest possible lifespan. During maintenance, it is essential to clean all parts by wiping them with a clean cloth to remove old grease. Before reassembly, all parts should be lubricated with fresh grease suitable for the correct temperature application. Below, you will find diagrams illustrating the assembly of these parts and the contents of the repair kit.

FIGURE 8.1

FIGURE 8.2

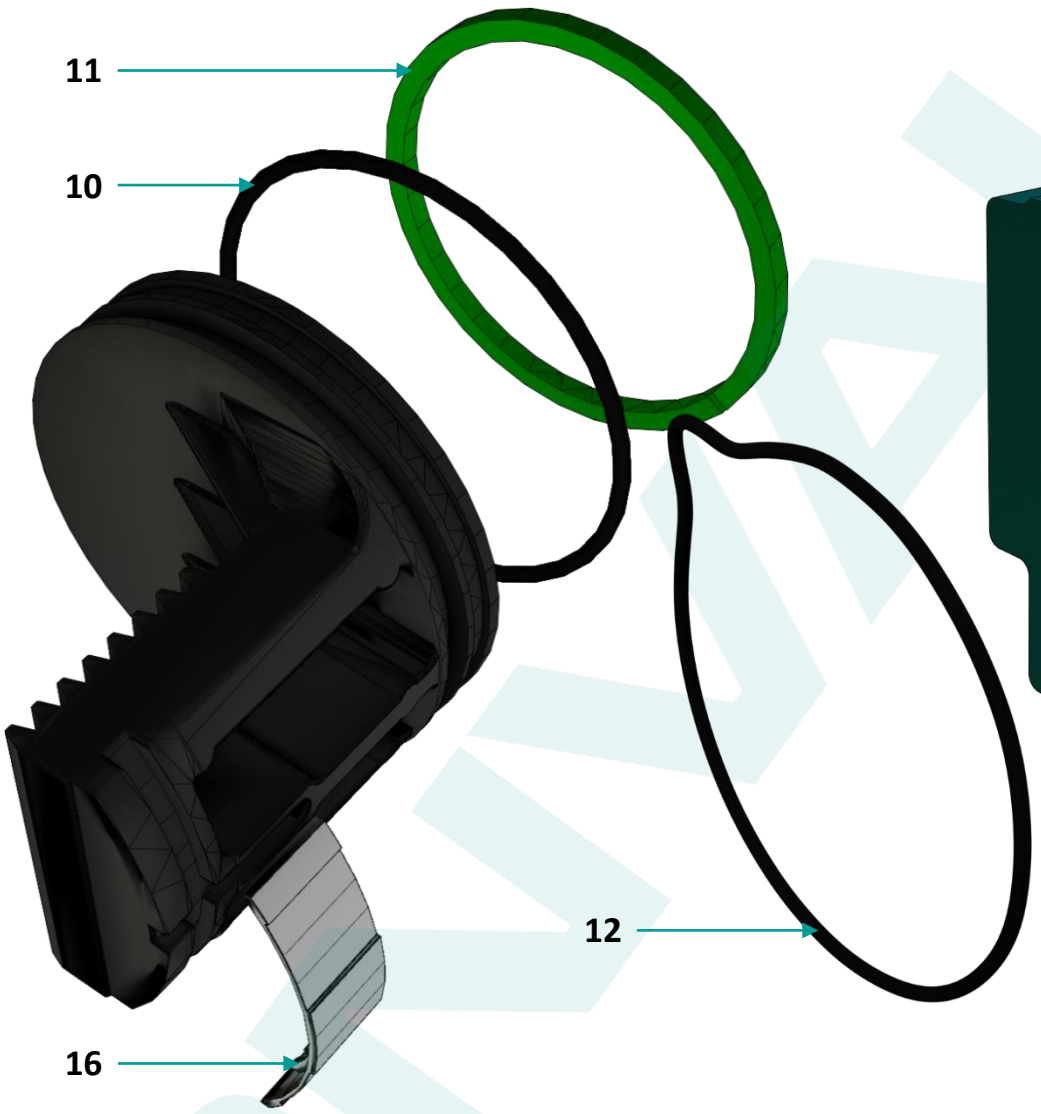


FIGURE 8.3

FIGURE 8.4

PARTS LIST FOR REPAIR KIT			
ITEM	QTY	PART	MATERIAL
3	1	Upper Pinion O-ring	NBR
4	1	Flange Bearing	POM
10	2	Piston O-ring	NBR
11	2	Piston Guide	POM
12	2	End Cap O-ring	NBR
17	2	Stop O-ring	NBR
16	2	Piston Skate	POM
21	1	Thrust Bearing	POM
24	1	Lower Pinion O-ring	NBR

- **For high-temperature applications, the material used will be Viton, which offers excellent heat resistance and can withstand elevated temperatures without significant degradation. Viton is a type of fluoroelastomer known for its exceptional thermal stability and chemical resistance.**
- **For low-temperature applications, a blend of NBR (nitrile butadiene rubber) with low-temperature properties will be used. NBR is already known for its resistance to low temperatures, but specific blends can further enhance its performance in colder environments.**
- **Additionally, for specific high-temperature applications that demand even greater heat resistance, the material will change to PPSU (polyphenylsulfone). PPSU is a high-performance engineering plastic that can withstand extreme temperatures while maintaining mechanical strength and chemical resistance.**
- **By selecting the appropriate materials based on the application's temperature requirements, the components will perform optimally and maintain their integrity under challenging conditions.**

B. INSTALLING REPAIR KIT OR CHANGING TEMPERATURE RATING

To install the repair kit or change the temperature rating of the actuator, follow the steps below:

Disassembly : Disassemble the actuator as described in the instructions on pages 15-18.

O-Rings and Bearings Removal : Remove the following components' O-rings and bearings from the actuator (See figüre 8.1-8.5 on the previous page)

1. Piston O-Rings (2)
2. End Caps (2)
3. Upper Pinion O-Ring (1)
4. Lower Pinion O-Ring (1)
5. Air Inlet Plugs (2)
6. Stop O-Rings (2)
7. Pinion Bearing (2)
8. Thrust Bearing (1)
9. Flange Washer (1)

Cleaning : Use mineral spirits or a mild solvent to clean all actuator components, ensuring they are free of old grease and debris. Thoroughly clean all surfaces before installing the new O-ring set.

O-Ring Installation : Separate the O-rings and install them in the following locations:

1. Piston O-Rings: The thickest O-rings, two pieces (Figure 8.2).
2. End Cap O-Rings: O-rings with the largest diameter, two pieces (Figure 8.3).
3. Pinion O-Rings: Install the largest O-ring in the lower pinion O-ring groove (Figure 8.1) and the second-largest on the top of the pinion (Figure 8.1).
4. Stop O-Rings: O-rings with the smallest diameter (Figure 8.4). Properly seat these O-rings to prevent potential leaks during reassembly.

Bearing Identification: Identify the bearing parts and their installation locations

1. Piston Skates (Figure 8.2)
2. Thrust Bearing (Figure 8.1)
3. Flange Bearing (Figure 8.4)

Greasing : Apply light grease to the internal portions of the actuator for easier reassembly. Grease should be applied to the following areas

1. Inner bore of the actuator
2. Piston wear surfaces (piston skate, piston bearing & piston O-Ring)
3. Piston rack (apply on the full length of the piston rack)
4. Pinion gear teeth
5. Pinion wear surfaces and O-Rings (both upper and lower areas)

Reassembly : Assemble the actuator following the instructions provided on pages 12-16. If the O-rings are difficult to install, slightly stretching and lubricating them will ease installation. Use the provided lubricant when lubricating the O-rings. When installing the end cap O-rings, ensure they are properly seated, and a thin layer of grease will help hold them in place.

By following these steps carefully, you can successfully install the repair kit or change the temperature rating of the actuator, ensuring its optimal performance and longevity.

ACTUATOR ASSEMBLY

A. STEPS TO ACTUATOR ASSEMBLY

Assuming the actuator has been disassembled, follow these steps for actuator assembly:

1. Inspection , Thoroughly inspect all wear surfaces for excessive wear or potential damage. Address any issues before proceeding with assembly.
2. Bearing and O-Ring Installation :

Pinion : Install the lower pinion bearing, lower pinion O-Ring, upper pinion bearing, thrust bearing and upper pinion O-Ring (Figure 9.1).

Pistons : On each piston, install the bearing, O-Ring, and skate (Figure 9.2).

Convalve Valve recommends replacing all seals and guides if the actuator has been in service. Refer to pg. 10 for available kits.

Ensure proper positioning and alignment of each component during installation.

NOTE : If the actuator has not been disassembled, please refer to pg. 6-9 for disassembly instructions before proceeding with the assembly steps mentioned above.

FIGURE 9.1

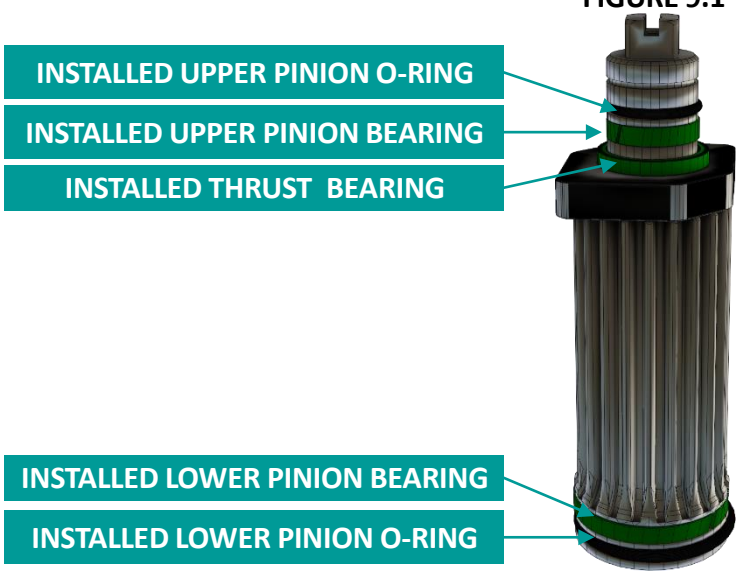
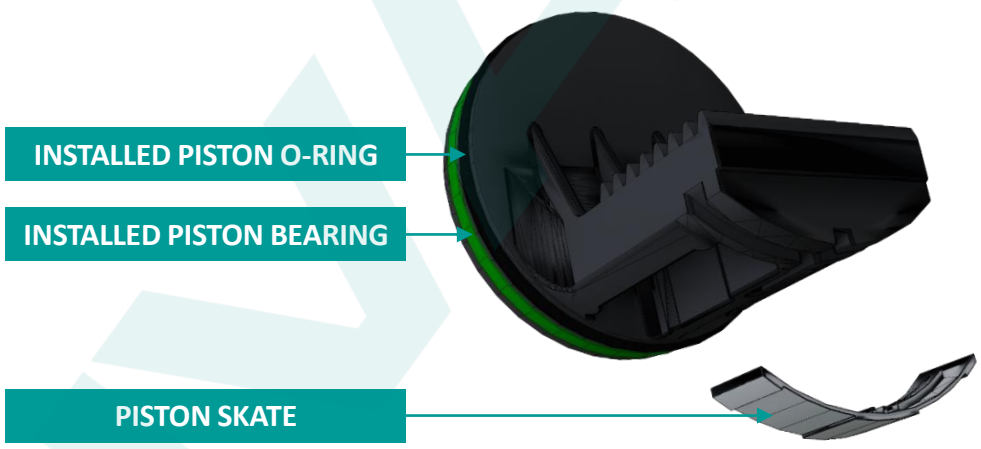


FIGURE 9.2



3. Apply the appropriate grease, ensuring it suits your specific temperature requirements (consult your Convalve Valve representative for guidance). Lubricate the inside of the cylinder, all O-Rings, piston skates, piston, and pinion guides with a light coating.

   For the teeth of the racks and pinion, grease them so that the grooves between teeth are roughly half-filled with grease. This promotes smooth movement and reduces friction during operation.

4. Next, insert the top half of the pinion into the bottom of the actuator. Orient the cam on top of the pinion according to your desired operating direction, as shown in Figure 9.4.

   By following these lubrication and assembly instructions and using the recommended grease, you can ensure optimal performance and longevity for your actuator, tailored to your specific temperature application. For further assistance, consult your Convalve Valve representative.

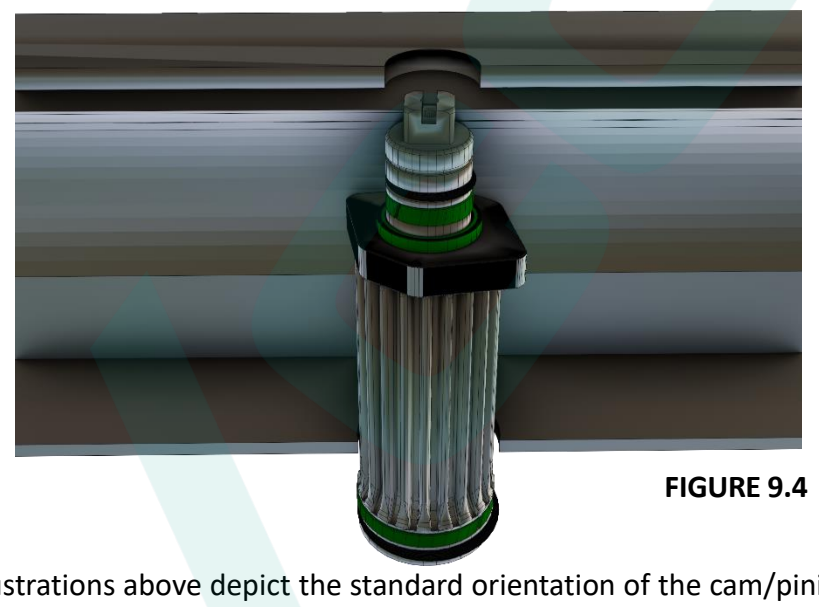


FIGURE 9.4

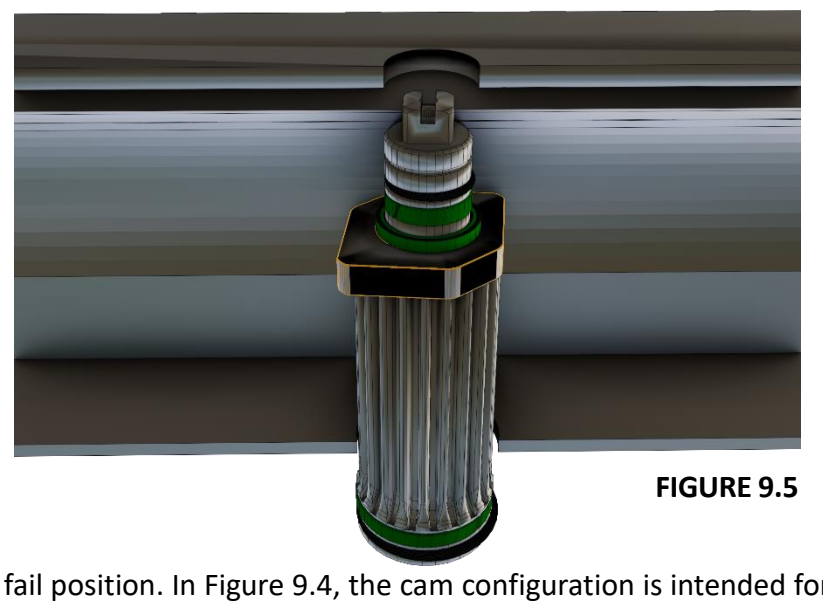


FIGURE 9.5

The illustrations above depict the standard orientation of the cam/pinion in the actuator fail position. In Figure 9.4, the cam configuration is intended for fail-closed applications, while in Figure 9.5, the configuration is intended for fail-open applications. Please note that the cutaway view assumes that the stops and air ports of the actuator are facing the viewer.

During installation, it is crucial to ensure proper alignment of the cam with both the top of the pinion and the pinion drive in both the closed and open positions. Look down the bore of the actuator to verify the cam's alignment for both fail-closed and fail-open positions.

Maintaining correct cam alignment is essential for the actuator's reliable performance, ensuring that it functions as intended in emergency situations when it needs to either fail closed or fail open based on the application requirements.

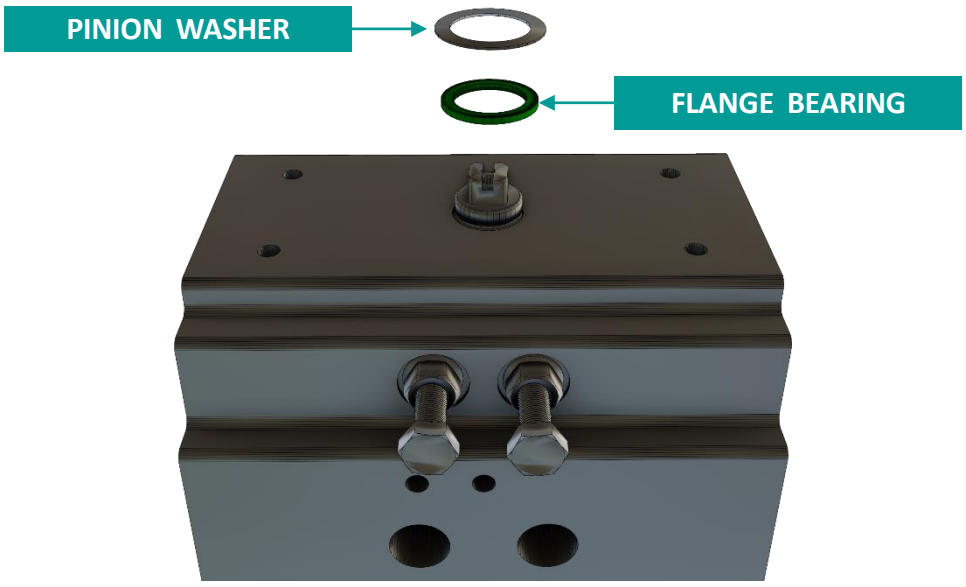


FIGURE 9.6

FIGURE 9.7

5. Flange Bearing and Top Pinion Washer: Install the flange bearing and top pinion washer (Figure 9.6) onto the pinion.

   Pinion Circlip: Using a pair of circlip pliers, carefully install the pinion circlip (Figure 9.7). Be cautious not to expand the **Pinion circlip** too much to avoid damaging it.

6. Assemble Actuator Stop Screws: Thread the stop nut onto the stop bolt and fit the stop O-Ring into the groove on the stop nut to assemble the actuator stop screws.

7. Cam Orientation: Use the proper-sized crescent wrench on the pinion and rotate the pinion to the closed position. Check the cam's correct orientation before threading in the closed limit stop until it touches the pinion cam. Tighten the locknut to secure the stop in place. This ensures that the cam remains in the correct orientation throughout the installation process.

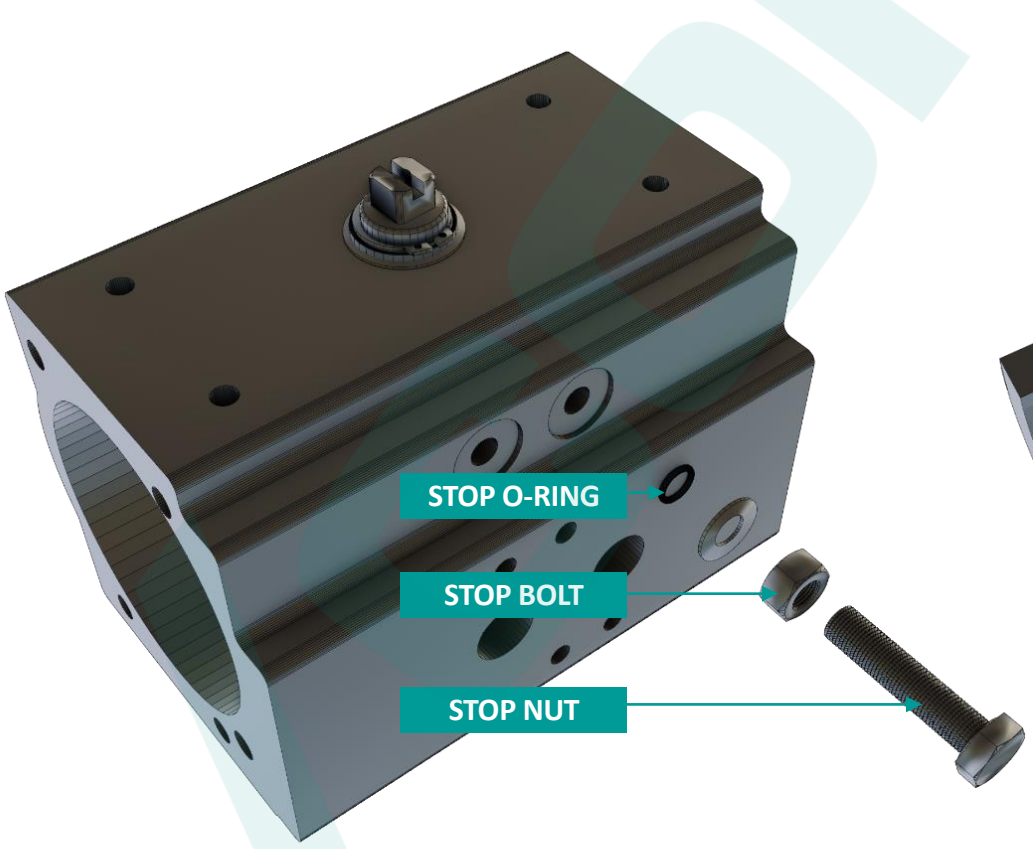


FIGURE 9.8

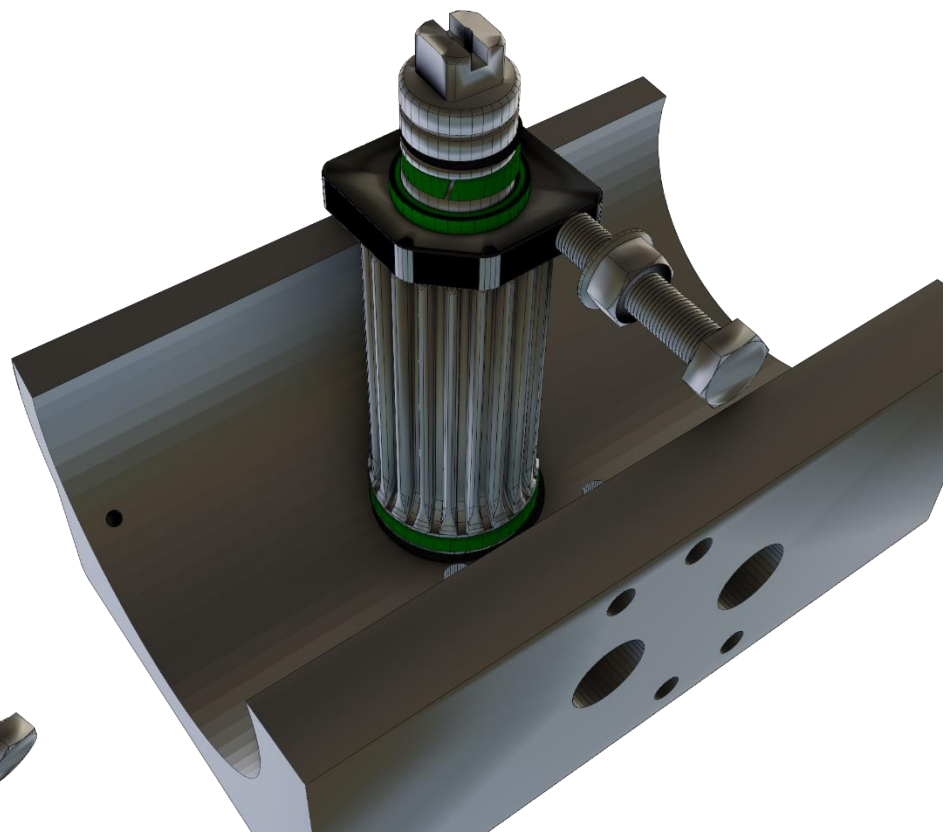


FIGURE 9.9

ACTUATOR ASSEMBLY

8. Rotate the pinion to the open position and align the pistons correctly based on the desired operation type, whether it's fail-closed or fail-open. Slide the pistons carefully into the actuator body until both racks engage smoothly with the pinion.

   Proper orientation of the pinion and alignment of the pistons are crucial for the actuator's efficient functioning. Once assembled following these steps, the actuator will be ready for operation in your specific technical application.

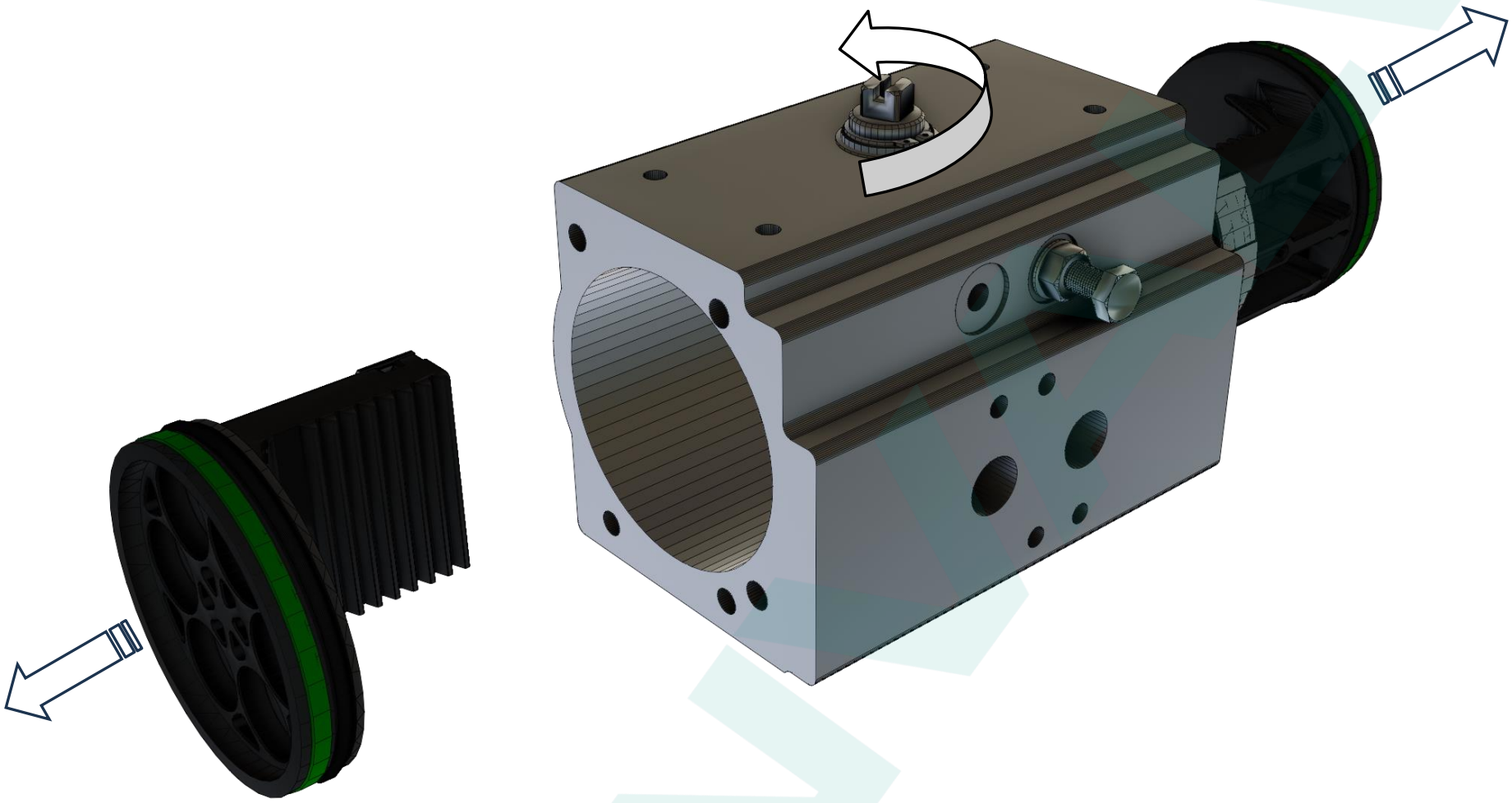


FIGURE 9.10

9. After checking the closed position, it's common to find the actuator stopping short due to uneven engagement of the racks or improper pinion orientation. In such cases, place the actuator on its end and gently apply pressure to the top piston while rotating the pinion to back the pistons out slowly. Continue until you feel the pinion skip a tooth. Apply even pressure to both pistons and recheck the closing position. The maximum overtravel at the close (closed stop disengaged) should be approximately 5 degrees.

   Repeat the process until the actuator operates correctly. Before proceeding, use the "Piston Calibration Checklist" below to ensure the actuator's proper operation. If any question in the checklist receives a "no" response, disengage the pinion from the pistons and repeat step 8.

Piston Calibration Checklist :

a) Are the pistons moving smoothly and evenly during actuation?

b) Does the actuator reach the closed position without obstruction?

c) Is the actuator overtravel at the closed position approximately 5 degrees?

d) Does the actuator function correctly in both fail-closed and fail-open operations?.

ACTUATOR ASSEMBLY

10. Once you have verified the correct installation of the pistons in the actuator, move the actuator to the open position. Adjust the open stop using the same method described for setting the closing stop in step 8. Make sure the open stop is accurately adjusted to allow the actuator to reach the fully open position smoothly and without any hindrance.

    After properly setting the open stop, close the actuator and ensure that it smoothly reaches the fully closed position. The maximum overtravel at the closed position should be approximately 5 degrees.

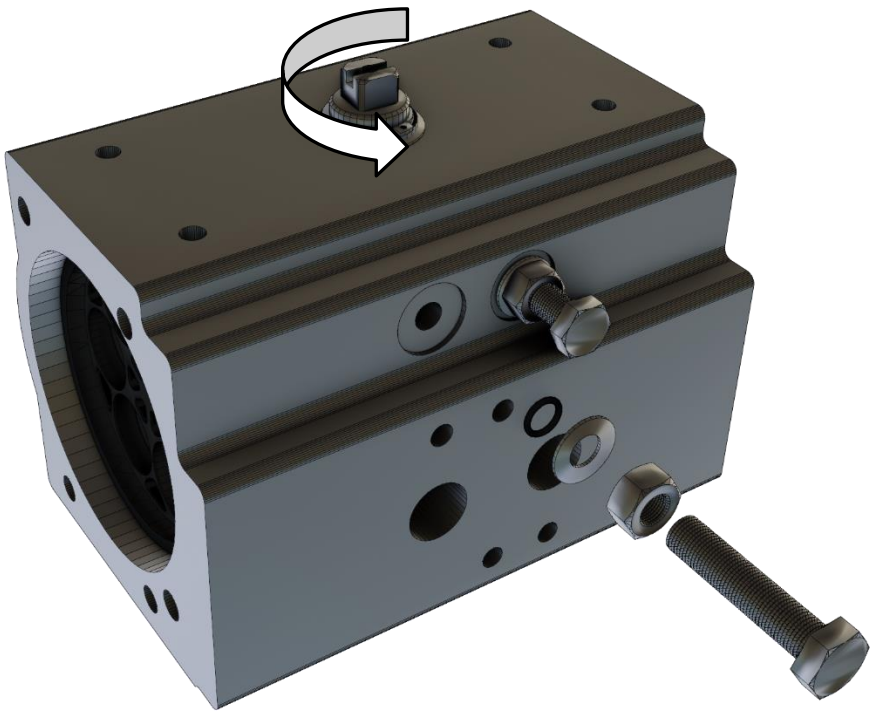


FIGURE 9.11

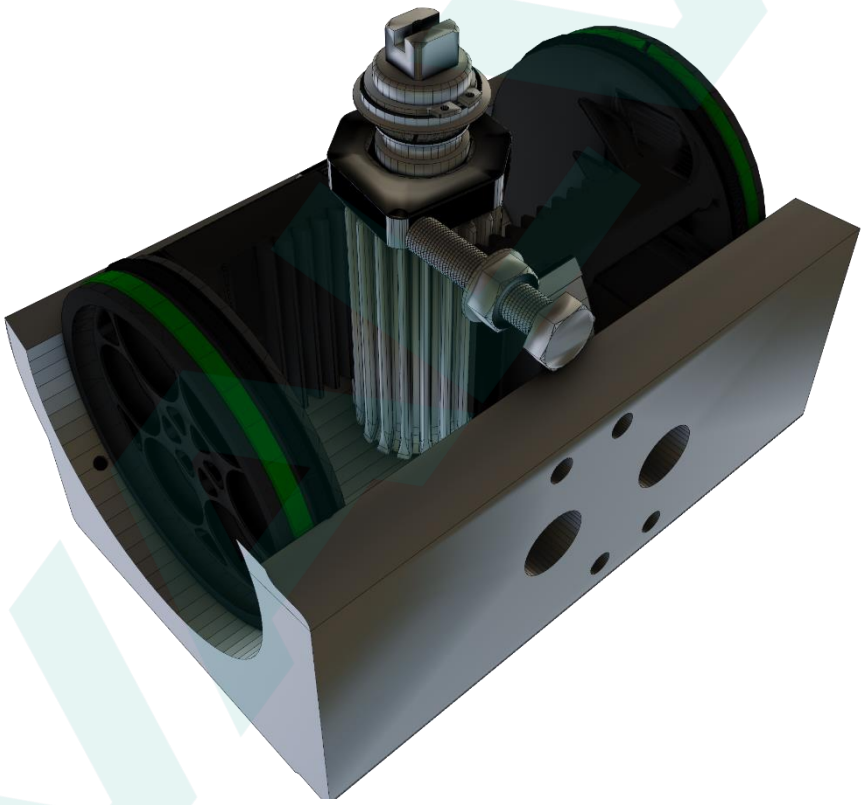


FIGURE 9.12

11. At this stage, if the actuator is a spring return type, proceed to install any springs that are intended to be used. For more detailed information on the installation of springs and other specifications, please refer to the Convalve Pneumatic Actuator Catalog. Following the manufacturer's guidelines and instructions will ensure proper installation and operation of the spring return actuator in your specific application.

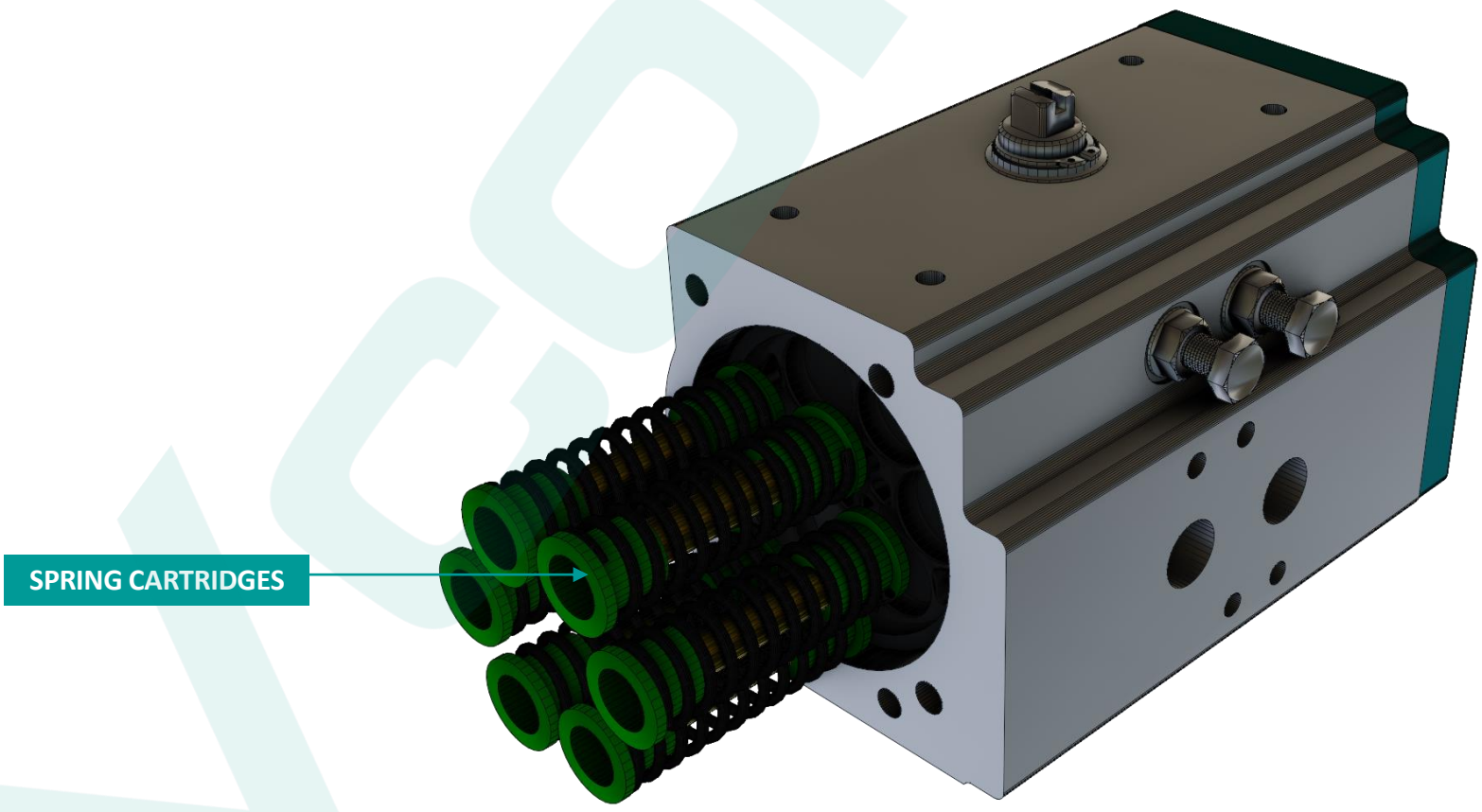


FIGURE 9.13

ACTUATOR ASSEMBLY

12. After confirming the presence and proper lubrication of the end cap O-Ring, carefully position the end cap on the actuator. Gradually tighten the end cap screws in the pattern illustrated in Figure 9.14 to evenly secure the end cap onto the actuator. Repeat this process for the opposing end cap.

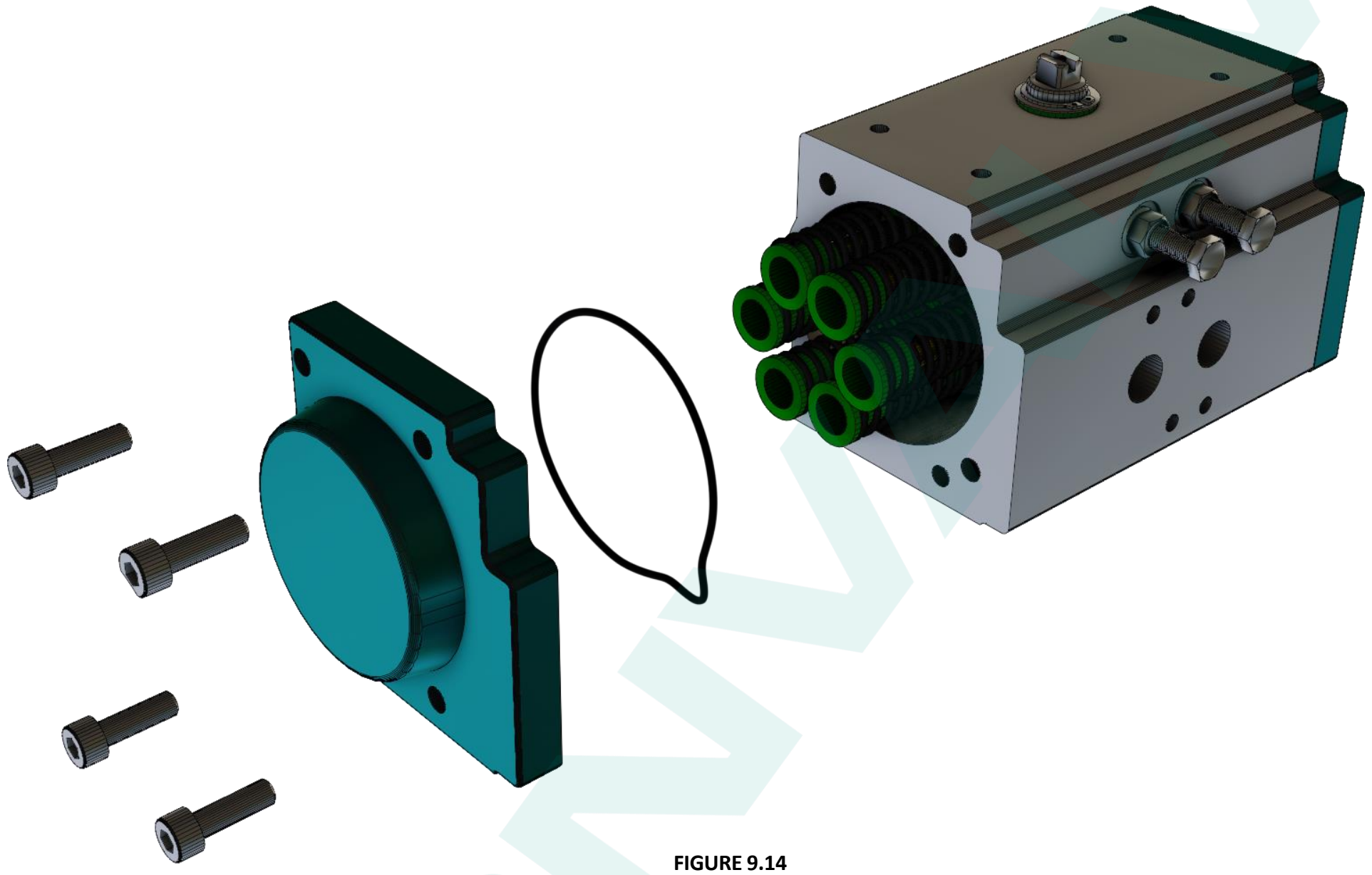
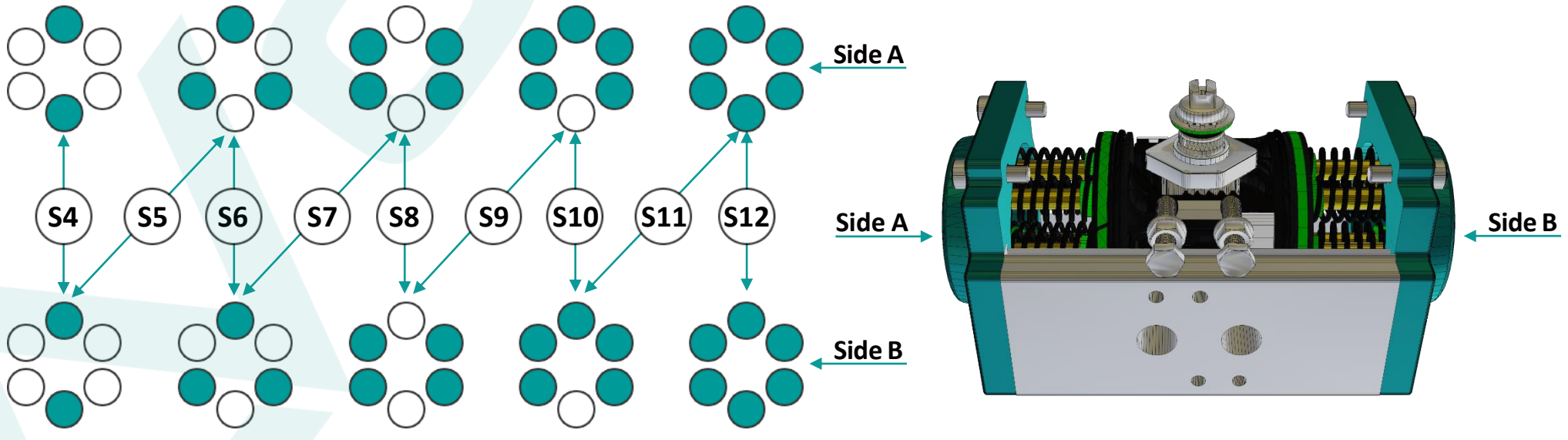


FIGURE 9.14

B. SPRING CONFIGURATIONS



C. AIR LEAK TEST

Whenever the actuator is modified or undergoes maintenance, it is essential to conduct a leak test to ensure it is airtight and functioning correctly.

To perform an air leak test, follow these steps:

1. Prepare Soap and Water Mixture : Create a soap and water mixture that will be used to detect leaks. Ensure the soap is suitable for this purpose.
   Coat Designated Points : Apply the soap and water mixture to the following designated points on the actuator:

   a) Around the base of the pinion neck (1).
   b) Around the base of the stops (2).
   c) Endcaps (3).
   d) The pinion base (4).

Observe for Bubbles : After applying the soap and water mixture, carefully observe the designated points for any sign of bubbles. Bubbles indicate air leakage and need to be addressed promptly.

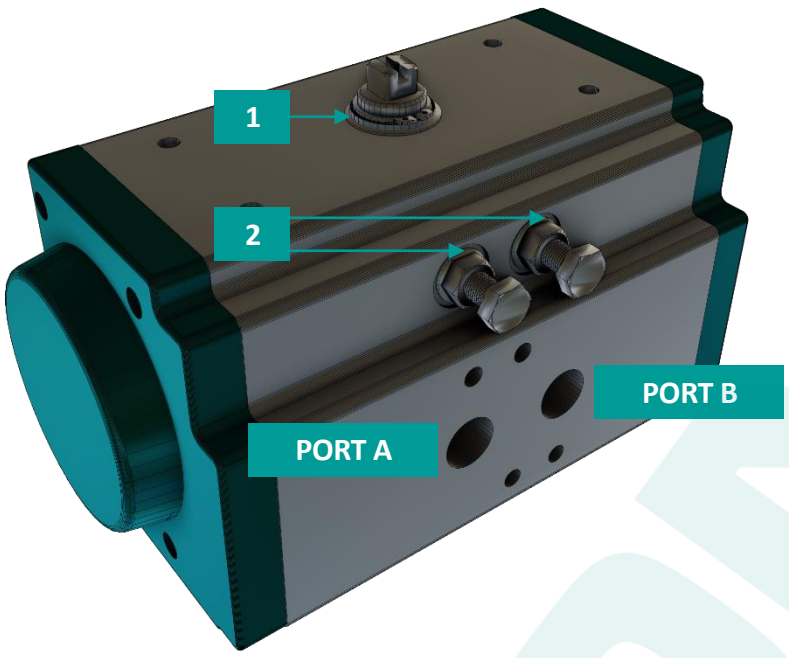


FIGURE 9.16

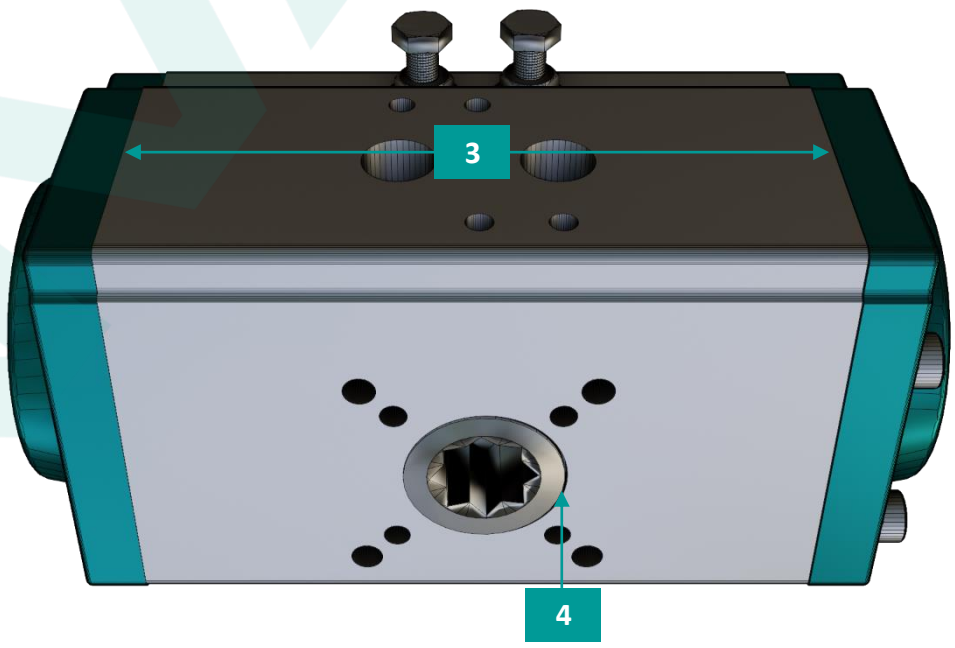


FIGURE 9.17

2. Apply Air Pressure : Connect the air supply to ports A and B on the actuator, maintaining the pressure within the recommended limit of 8 bar/120 psi.

3. Observe for Leaks : Carefully inspect the actuator for any signs of air leaks. If there are leaks, they will be indicated by soap bubbling at the specific points mentioned below:

   a) Limit Stop Bolts: Check for any damage to the O-rings. If there is no visible damage, tighten the lock nut until the leak stops.
   b) Endcaps : If there is leakage around the endcaps, disassemble them and inspect the O-rings for any damage. If the O-rings are intact, ensure that the endcaps are properly seated and securely tightened.
   c) Pinion Top or Bottom : If air leaks from the pinion top or bottom, disassemble the actuator, replace the O-rings in these areas, and then reassemble the actuator.

By conducting this thorough air leak test and addressing any detected leaks as described, you can ensure the actuator is airtight and in proper working condition for your specific technical application.

C. CHANGING FAIL CONFIGURATIONS

To change the fail configuration of the actuator, carefully follow these steps:

1. Disassembly : Disassemble the actuator following the instructions provided on page 12, steps 1-7.
2. Set New Closed Stop : Using the appropriate size crescent wrench, rotate the pinion to its new orientation for the "fail" position (actuator closed). Adjust and set the new closed stop accordingly.
3. Check Cam Alignment : Check the cam to ensure the flat side of the cam is making proper contact with the newly set stop.
4. Set New Open Position : Rotate the pinion to the new open position as per the desired fail configuration.
5. Rotate Pistons : Rotate the pistons 180 degrees from their original orientation and insert them back into the actuator.
6. Finish Assembly : Complete the actuator assembly by following the instructions provided on page 15, starting from step 10.

FIGURE 9.18

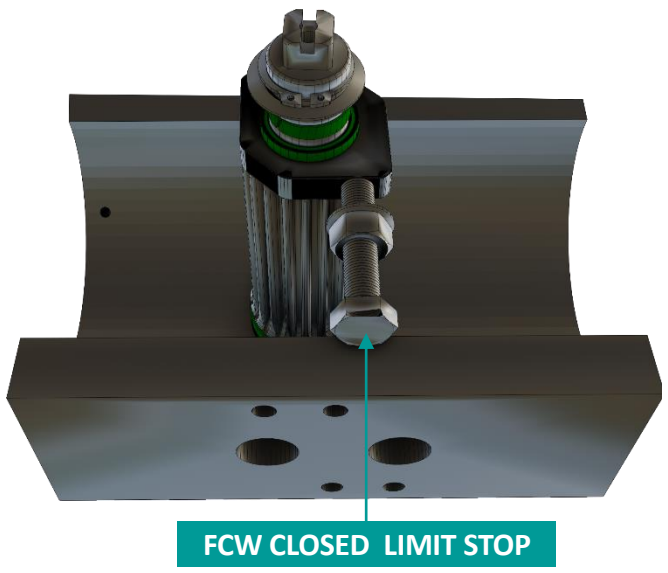


FIGURE 9.19

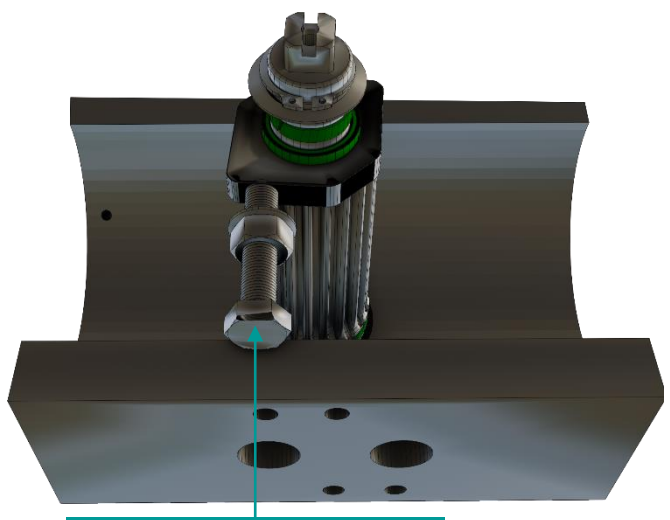


FIGURE 9.20

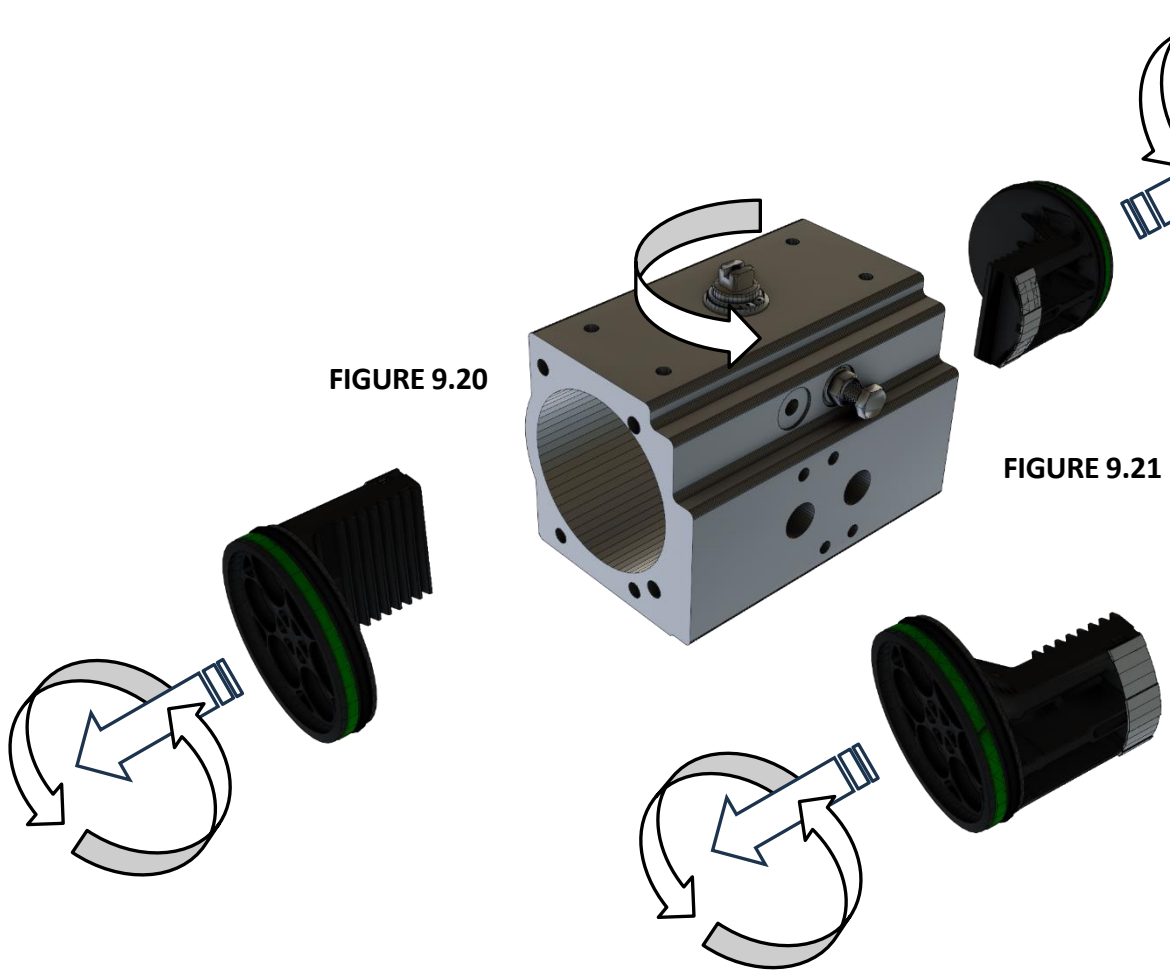
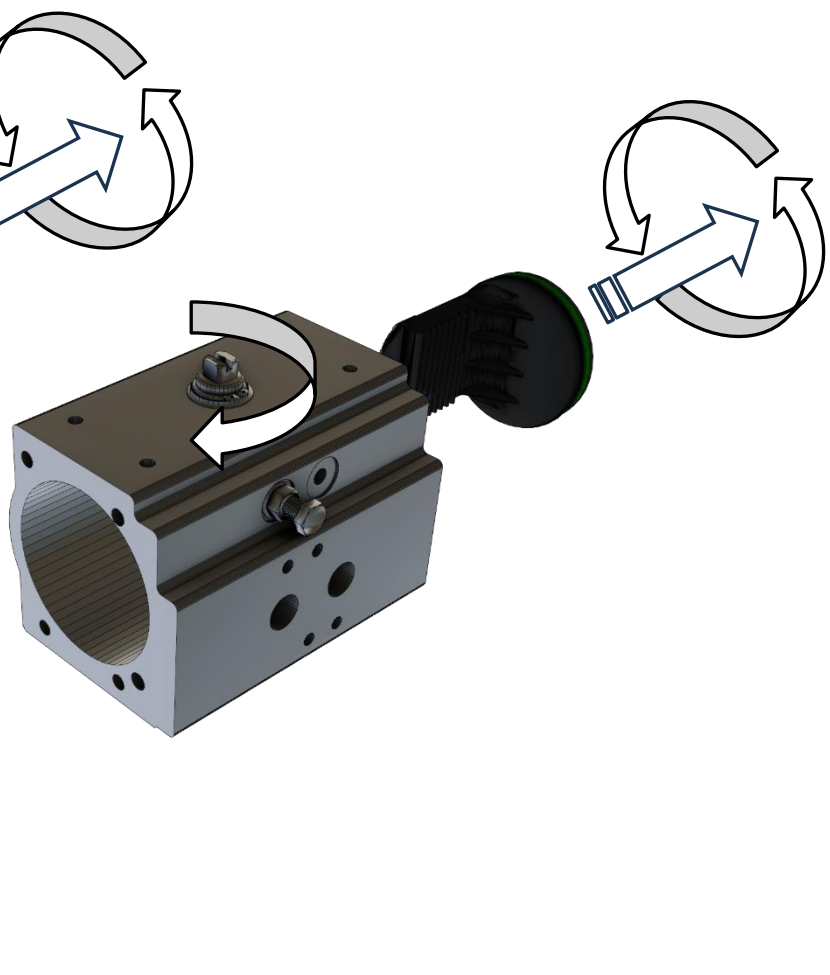


FIGURE 9.21



The provided illustrations display the "fail" orientation of the pinion for two configurations: FCW (Figure 9.18) and FCCW (Figure 9.19), as explained in step 2. The correct location of the closed limit stops for each configuration is also indicated. Figures 9.20 and 9.21 illustrate the necessary adjustments when transitioning from FCCW to FCW (Figure 9.20) or from FCW to FCCW (Figure 9.21). It is important to note that the pinion has been rotated to its new opening position, and the pistons have been rotated 180° from their original position before being inserted into the actuator body. These adjustments are essential for achieving the desired fail configuration and ensuring the actuator functions correctly in your specific technical application.

MODEL SELECTION

1. Determine Required Torque:

    - First, determine the torque required to open and close the valve.
    - For normal service conditions, it is recommended to have a safety coefficient of 15% to 20%.

2. Adjust Safety Values:

    - Depending on the media being controlled, adjust the safety value accordingly:
    - For steam or non-lubricating liquid media, increase the safety value by 25%.
    - For non-lubricating slurry and liquid media, increase the safety value by 40%.
    - For non-lubricating granular powdery media, increase the safety value by 80%.

3. Check Output Torques Table:

    - Next, refer to the table of output torques for both double-acting and single-acting pneumatic actuators.
    - Determine the accurate type of pneumatic actuator based on the service pressure of the air supply.

4. Single-Acting Actuators:
    - In the table for single acting actuators, the torque value in the terminal column of spring output torque is the torque required to close the valve.

SELECTING AN EXAMPLE OF A DOUBLE-ACTING ACTUATOR

1. Required Torque of Butterfly Valve : 280 N.m
2. Service Medium : Water
3. Safety coefficient(20%) : 280 N.m * (1 + 0.20) = 336 N.m
4. Air Supply Pressure : 4 Bar
5. From the table of output torques for the double-acting type, the selected model is **PAC140DA.**
6. The output torque for this actuator under the air supply pressure of 4 bar is **369.5 N.m.**

COMMON FAULTS, CHECKS AND SOLUTIONS

FAULT PHENOMENA	CHECK ITEMS	SOLUTIONS
PNEUMATIC VALVE UNABLE TO WORK	1. Whether solenoid valve in good conditions or not, coil burnt out or not, the spool of solenoid valve blocked by dirt or not?	Replace the solenoid valve or coil, or clear away the dirt.
	2. Carry out air supply test solely on pneumatic actuator to check whether sealing ring and cylinder are damaged or not?	Replace the damaged sealing ring and cylinder.
	3. Valve spool blocked by impurities.	Clear away the impurities and replace the damaged parts
	4.The handle of manual operating mechanism placed in manual position.	Place the handle into pneumatic position.
SLOW AND CREEPING ACTION	1.Air supply pressure not enough.	Increase the air supply pressure(4 ~ 7 Bar)
	2.The output torque of pneumatic actuator being too low.	Increase the model and specifications of pneumatic actuator
	3.Valve spool or other components being too compactly installed.	Reinstall and readjust.
	4.Air supply pipe blocked and flow rate too low.	Clear away the blockage and replace the filter element.
NO SIGNAL FROM SIGNAL FEEDBACK DEVICE	1.Short or open circuitin power circuit.	Check and repair the power circuit.
	2.The cam in signal feedback device in a wrong position.	Adjust the cam to the accurate
	3.Micro switch damaged	Replace the micro switch

FUNCTION AND APPLICATION OF PNEUMATIC ACTUATOR AND ACCESSORIES

1. Double acting pneumatic actuator: to control the open and close of the valve.
2. Single acting pneumatic actuator : to close valve automatically in case of cutoff or failure of electric and gas circuit.
3. Single electric control solenoid valve: opened or closed when power is on, closed or opened when power is off.
4. Dual electric control solenoid valve: opened when one coil is electrified and closed when another coil is electrified, provide with memory function.
5. Signal feedback device: remote transmission of valve open or close position signal.
6. Electropneumatic positioner: regulation control on the open of valve(i.e. the flow rate of media) according to the size of the current signal(4-20mA).
7. Electropneumatic transducer: to turn current signal into the pneumatic signal, used in a match with pneumatic positioner.
8. Pneumatic positioner: regulation control on the opening of the valve according to the size of the pneumatic signal (0.2~1 Bar).
9. Pneumatic triple pieces: reducing valve, filter, and oil atomizer to maintain constant and clean air supply and to lubricate the moving parts.
10. Manual operating mechanism

ORDERING INSTRUCTIONS

1. Pneumatic actuator: double acting type and single acting type.
2. Valve working pressure, service media, and operating ambient temperature, hard or soft seal.
3. Solenoid valve: dual electric control solenoid valve, single electric control solenoid valve, service voltage, explosion proof or not.
4. Signal feedback: mechanical switch, approach switch, service voltage, output current signal, explosion proof.
5. Positioner: pneumatic positioner, electric positioner, current signal, pneumatic signal, electro-pneumatic transducer, explosion proof.
6. Air supply treatment triple pieces
7. Manual operating device
8. Special requirements
9. Home-made or imported accessories.