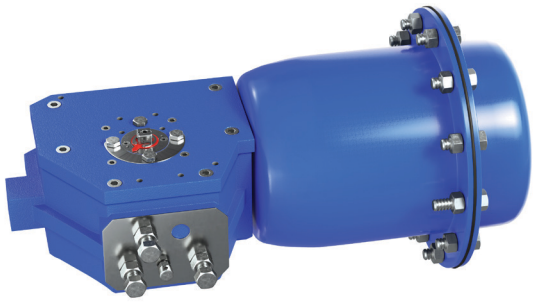
# ASD SERIES
PNEUMATIC ACTUATORS

## SPRING-DIAPHRAGM ROTARY ACTUATORS

This instruction manual includes installation, operation and maintenance information for FNW Pneumatic Spring-Diaphragm Actuators. Please read these instructions carefully and save them for future reference. It is important that only properly trained personnel disassemble or assemble the actuator.



### GENERAL PRODUCT DESCRIPTION

The FNW Spring-Diaphragm Actuator is specifically designed for the safe and reliable operation of quarter turn valves under minimal media supply pressure. The design separates the supply media chamber from the spring sets, allowing for usage of unfiltered air, gas, water or mineral-based hydraulic fluid. The housing is constructed from ductile iron and carbon steel castings coated in a UV-resistant polyester powder coating for exceptional corrosion resistance in the field. The independent media chamber is also equipped with a standard LNBR diaphragm reinforced with a special compound polyamine fabric. Optional diaphragm materials allow for working temperature ranges as low as -40°C (-40°F) or as high as 170°C (338°F).

## 1. CAUTION/IMPORTANT SAFETY WARNINGS

- Only authorized and properly trained personnel should perform installation and maintenance of the actuator. Proper PPE should be used as required.
- Before working on a FNW Spring-Diaphragm Actuator, please note that all fasteners and screw threads are metric except for the JB mount screw threads which are imperial.
- For correct and safe operation, pneumatic actuators must be sized adequately and with sufficient safety margin of torque output for the correct operating conditions of the valve or application.
- Operating the actuator beyond its stated maximum operating limits of temperature, pressure or recommended operating media can cause damage to the internal components, actuator housing or result in personal safety risks involving death or injury.
- Before carrying out any installation, repair or maintenance on the actuator, make sure that the electrical connections have been safely isolated, removed or disconnected by authorized personnel. All pneumatic supply lines should be shut-off, removed and completely bled. The actuator must not be pressurized at any time during installation, repair or maintenance unless otherwise noted in the instructions, as injury may result.
- Never put any part of your body in the opening or port of the controlled valve or device.
- Special attention and precautions should be observed due to the stored energy contained in the spring cartridge. Do not attempt to disassemble the spring cartridge. Disassembly may result in damage or personal injury. If maintenance is required for the spring cartridge, the entire actuator should be returned to FNW for assistance. Please contact FNW for additional information.
- When servicing a valve actuator assembly, the best practice is to remove the entire assembly from service. If the actuator is removed from the valve, it should be remounted on the same valve after servicing is completed. The actuator must be readjusted for proper open and close position each time it is remounted.
- Before installing the valve and actuator, be sure that the indicator pointer (2) on top of the actuator and the indicator plate (4) are correctly indicating the valve position. Failure to assemble the valve and actuator to the correct valve position could result in damage or personal injury.
- Do not lift actuators using the 1/4" NPT in the diaphragm cover. Actuators should be handled using lifting straps as seen in Section 5.
- Use only FNW-recommended spare parts for maintenance.
- To ensure safety and to maintain warranty, never modify the actuator in any way not indicated in this manual without prior approval from FNW.

# SPRING-DIAPHRAGM ROTARY ACTUATORS

## 2. STORAGE

**ATTENTION**: If the actuators are not destined for immediate use, the following storage precautions should be taken:

- Ensure the actuators are completely dry and water free.
- Protect openings of air passages by fitting the original or replacement plastic corks if required.
- If possible, leave the actuators in their packaging during storage. Actuators should be protected to safeguard against humidity, moisture, dust, dirt, sand, mud, salt spray, sea water or other forms of corrosive and erosive environments.

## 3. OPERATING CONDITIONS

The operating pressure, output torque and drive type are determined by the actuator designation as shown in the below table.

**Actuator designation example:**
ASD4C-MJ-FS-MN is an ASD4 spring diaphragm actuator that has a 50 - 70 psi (3.4 - 4.8 Bar) spring, an end of spring stroke output torque of 2752 in-lbs (311 Nm), uses a 27×27 mm female double square and F05 + JB51 + F07 mount configuration to connect and drive the valve. This actuator is with NAMUR stem.

| Actuator Series | Flange Mount Configuration | | Spring Version | Operating Pressure psi (Bar) | End of Spring Stroke Torque in-lbs (N-m) | Drive Type | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MI | MJ | | | | Female Double Squares (FS) | Female Keyed (FK) | Female Double D Flat Dimension (FD) | Male Square / Star (MQ/ MT) | Male Double D Flat Dimension (MD) |
| ASD2 | F05 + F07 | F05 + JB51 + F07 | A | 12 - 20 (0.8 - 1.3)* | 133 (15) | 14 mm | 14 mm | 14 mm | 14 mm | 14 mm |
| | | | B1 | 30 - 50 (2.0 - 3.4) | 460 (52) | | | | | |
| | | | B2 | 40 -60 (2.8 - 4.1) | 593 (67) | | | | | |
| | | | C | 50 - 70 (3.4 -4.8) | 682 (77) | | | | | |
| | | | D | 60 - 90 (4.1 - 6.2) | 885 (100) | | | | | |
| ASD3 | F07 + F10 | JB76 + F10 | A | 12 - 20 (0.8 - 1.3)* | 310 (35) | 22 mm | 22 mm | 17 mm | 19 mm | 17 mm |
| | | | B1 | 30 - 50 (2.0 - 3.4) | 912 (103) | | | | | |
| | | | B2 | 40 -60 (2.8 - 4.1) | 1174 (133) | | | | | |
| | | | C | 50 - 70 (3.4 -4.8) | 1372 (155) | | | | | |
| | | | D | 60 - 90 (4.1 - 6.2) | 1752 (198) | | | | | |
| ASD4 | F10 + F12 | F10 + JB108 + F12 | B1 | 30 - 50 (2.0 - 3.4) | 1832 (207) | 27 mm | 36 mm | 22 mm | 25 mm | 22 mm |
| | | | B2 | 40 -60 (2.8 - 4.1) | 2366 (267) | | | | | |
| | | | C | 50 - 70 (3.4 -4.8) | 2752 (311) | | | | | |
| | | | D | 60 - 90 (4.1 - 6.2) | 3532 (399) | | | | | |
| ASD5 | F10 + F14 | F10 + JB108 + F14 | B1 | 30 - 50 (2.0 - 3.4) | 3664 (414) | 36 mm | 40 mm | 27 mm | 25 mm | 27 mm |
| | | | B2 | 40 -60 (2.8 - 4.1) | 4720 (533) | | | | | |
| | | | C | 50 - 70 (3.4 -4.8) | 5496 (621) | | | | | |
| | | | D | 60 - 90 (4.1 - 6.2) | 7045 (796) | | | | | |
| ASD6 | F16 | F16 | B1 | 30 - 50 (2.0 - 3.4) | 6595 (745) | 46 mm | 50 mm | 46 mm | 46 mm | 46 mm |
| | | | B2 | 40 -60 (2.8 - 4.1) | 8496 (960) | | | | | |
| | | | C | 50 - 70 (3.4 -4.8) | 9893 (1118) | | | | | |
| | | | D | 60 - 90 (4.1 - 6.2) | 12680 (1433) | | | | | |

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### Operating Media
Air (max particle size 50 µm), gas, water or mineral-based hydraulic fluid

### Air Supply Pressure
Minimum operating pressure: 1 bar (15 psi)
Maximum operating pressure: 7 bar (100 psi)

### Operating Temperature
Standard: -25°C to 70°C (-13°F to 158°F)
Low*: -40°C to 70°C (-40°F to 158°F)
High: -29°C to 170°C (-20°F to 338°F)

### Travel Adjustment
+/- 5° rotation adjustment at open or closed positions

### Application
Suitable for both indoor and outdoor use

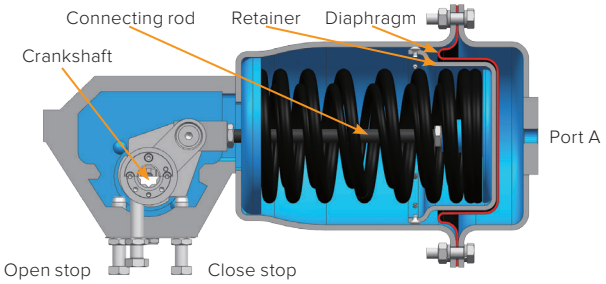
### Lubrication
The actuator comes pre-lubricated; no additional lubrication is required except during maintenance activities.

*Standard Construction

## 4. OPERATING PRINCIPAL

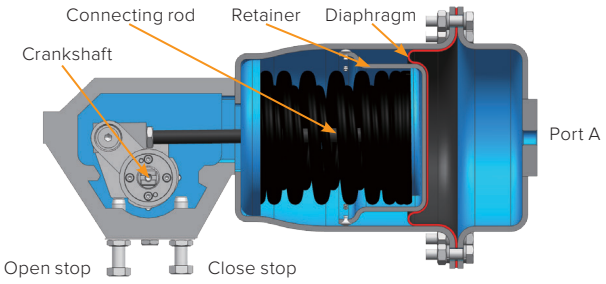
### Spring Stroke
Upon loss of pressure (air) on Port A, the stored energy in the compressed springs forces the diaphragm retainer and connection rod to move right and the crankshaft to rotate clock-wise. This movement can be limited by using the adjustable close stop.

**Field Reversible:** Fail-closed and Fail-open operation is achieved by inverting the actuator, as shown on page 5.




**Spring Stroke**

### Air Stroke
Upon the supply of media (air) to Port A, the pressure forces the diaphragm retainer and connection rod to move left, compressing the springs and rotating the crankshaft counter clock-wise. This movement can be limited by using the adjustable open stop.




**Air Stroke**

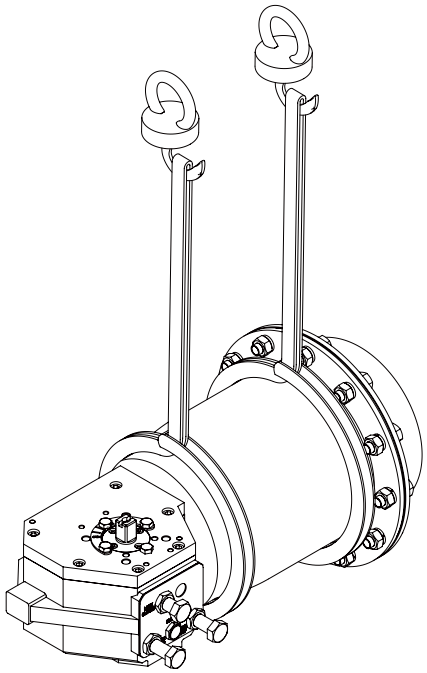
# SPRING-DIAPHRAGM ROTARY ACTUATORS

## 5. HANDLING

### Lifting Straps

Lifting straps should be used to safely handle the actuator as shown in the figure to the right. Approximate weights can be found in the below table. Lifting straps should be in good condition and of sufficient size and material to handle the load.

**WARNING: Do not lift actuators using the 1/4" NPT in the diaphragm cover.**



| Handling ASD Actuators | |
|---|---|
| Actuator Series | Approx Weight Kg (lbs) |
| ASD2 | 21 (46) |
| ASD3 | 33 (73) |
| ASD4 | 61 (134) |
| ASD5 | 107 (236) |
| ASD6 | 177 (390) |

### Eyebolts

Eyebolts are available in actuator sizes ASD4, ASD5 and ASD6 to assist with proper lifting technique. The maximum weight load for the 2 eyebolts is 1.5 times the actuator weight. The eyebolts can only be used to lift the actuator itself.

**WARNING: The eyebolts cannot be used for handling of an actuator and valve assembly. This could lead to damage or personal injury.**

For sizes ASD2 and ASD3, the eyebolts are not available. Lifting straps should be used when handling the actuators.

## 6. VALVE AND ACCESSORY ASSEMBLY

The following should be noted prior to assembly to the valve:

- Verify that the position indicator on the actuator is assembled correctly for the desired failure mode, either spring-to-close or spring-to-open. In the spring-to-close mode, the actuator will cycle clockwise to close upon loss of pressure. In the spring-to-open mode, the actuator will cycle counterclockwise to open upon loss of pressure.
- If the actuator is not set up in the configuration desired, remove the hex head cap screws (3), indicator plate (4), indicator pointer (2), and remount them on the opposite mounting surface.
- Mount the actuator to the valve following ISO 5211 standards, the specific Valve Operating Manual, and the directions below:
  - Check that the valve and actuator are in the same position (open or closed). Check the correct positioning (alignment) of all the elements of the assembly, including the valve, connection piece, bracket, accessories and actuator.
  - In spring-to-close mode, close the valve and then mount the actuator on the valve.
  - In spring-to-open mode, open the valve, invert the actuator, and then mount the actuator on the valve.
  - Fit the square of the valve directly into the square of the actuator.
  - Ensure the actuator base is flat against the valve mounting flange and bolt together.
  - Torque the mounting screws in a diagonal pattern to equalize loading. Ensure all position indicators are correctly adjusted and show the correct positions.

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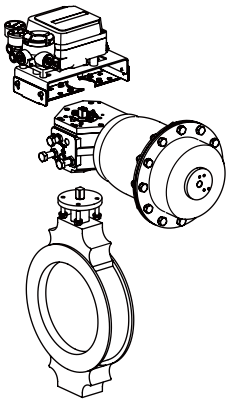
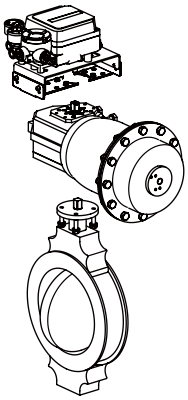
- Mount the accessories, such as a limit switch box or valve positioner, to the actuator following NAMUR (VDI/VDE 3845) standards. The accessory can be directly mounted on the cover (8) of the actuator in spring-to-close mode. In spring-to-open mode, the accessory can be directly mounted on the driver housing (13) of the actuator.
- Mount the NAMUR solenoid valve to the actuator following Namur (VDI/VDE 3845) standards for direct install on the diaphragm cover (38). A regulated air supply can be connected to the 1/4" NPT fitting in the diaphragm cover (38).

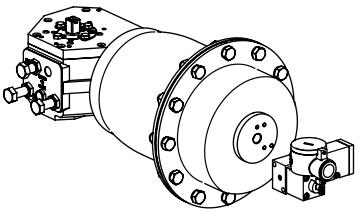
**CAUTION: The maximum operating pressure is 100 psi (7 BAR).**



**Spring-to-Close**



**Spring-to-Open**

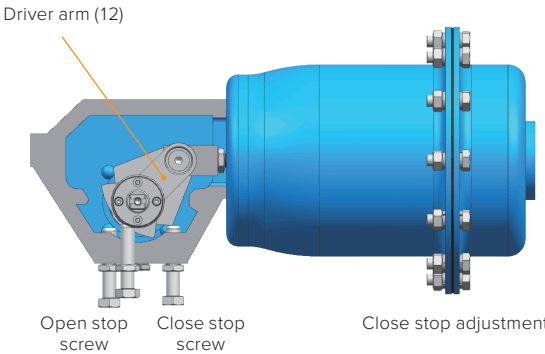


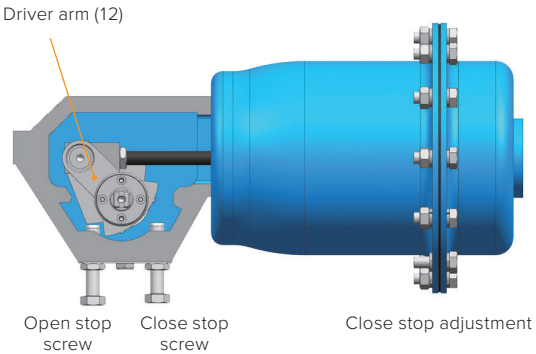
**Mount Namur Solenoid Valve**

## 7. VALVE POSITION LIMIT ADJUSTMENT

**CAUTION: The maximum rotation adjustment is ±5˚.**

Adjust the travel stop screws (17) by releasing the hex jam nut (17.1) and turning. Stops can only be adjusted when driver arm (12) is off the stop screw being adjusted. Be sure to re-tighten hex jam nut (17.1) after adjustment.

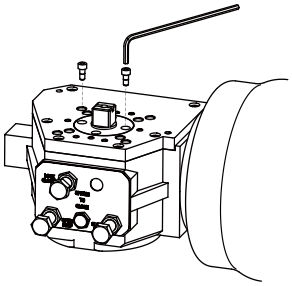


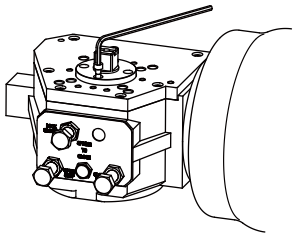
# SPRING-DIAPHRAGM ROTARY ACTUATORS

## 8. DRIVE BUSH DISASSEMBLY AND ASSEMBLY

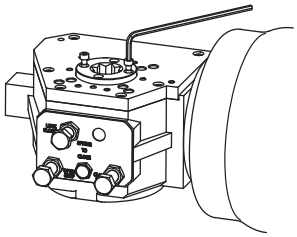
Using the removable drive bush (19), drive styles can be quickly changed to the desired type by following the below steps:



1, Remove the four socket head screws from the drive bushing.



2, Insert two of the socket head screws into the tapped holes to push out the drive bushing.

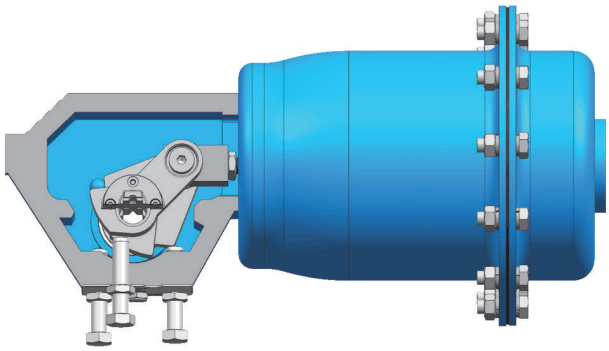


3, Install new drive bushing.

**NOTE:** Keep the drive bushing in equilibrium when pushing it out. After installing a new drive bush, retighten the socket head bushing screws (5).

## 9. MECHANICAL LOCKOUT

The actuator can be locked in the spring failure mode. Adjust the set screw (16) by releasing the hex jam nut (16.1) and turning. The actuator will be locked in any position from close to open.



Shown mechanically locked in the spring failure mode

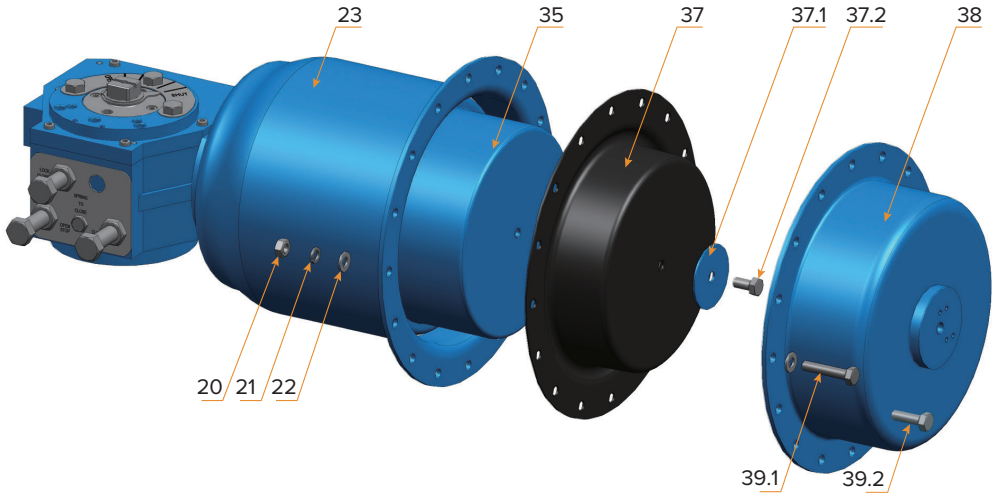
## 10. GENERAL MAINTENANCE

Under normal operating conditions, the FNW Spring-Diaphragm Actuator requires only periodic checks to ensure proper adjustment. Standard replacement items generally consist of bearings and diaphragms. These are numbered 9, 10, 25, 34 and 37 in the BOM.

## SPRING-DIAPHRAGM ROTARY ACTUATORS

### Replacing the Diaphragm

**CAUTION**: Ensure that pneumatic supply lines are properly bled and disconnected. All electrical connections should be safely isolated and removed.




- While safely holding the diaphragm casing and spring housing together, back off the nuts (20) from the hex head screws (39.1 and 39.2), until the nuts are flush with the hex head screw ends. Do not remove the nuts completely from the hex head screws. If tension still exists on the hex head screws, then the spring package is not properly contained. Stop disassembly, retighten nuts and return the actuator to FNW. If the spring package is intact, continue to remove the nuts (20), spring-washers (21), gaskets (22), and remove the hex head screws (39).
- Lift off the diaphragm cover (38). For ASD4, ASD5 and ASD6 models, remove hex head cap screw (37.1) and retaining washer (37.2) first. Remove the diaphragm (37).
- Inspect the inside of the diaphragm cover (38), the diaphragm retainer (35) and the spring housing (23) for any debris, rough spots, or other issues that could damage the diaphragm.
- Place the new diaphragm (37) on the diaphragm retainer (35). Do not pinch or stretch the diaphragm. For ASD4, ASD5 and ASD6 models, assemble the retainer washer (37.2) and retaining cap screw (37.1). Tighten to value shown in the torque requirements table on page 9. Ensure that the spring housing (23) holes are aligned with diaphragm (37) holes. Place the diaphragm cover (38) on the spring housing (23) such that all holes remain aligned across the spring housing, diaphragm, and cover.
- Insert hex head screws (39) into all holes. Caution: Do not force the hex head screws through the diaphragm. If necessary, realign all holes across the spring housing, diaphragm, and cover. Install spring-washers (21), gaskets (22) and nuts (20) on all screws and tighten. Standard practice bolt pattern tightening methods should be used with the torque requirements from the table on page 9.

## 11. ACTUATOR DISASSEMBLY AND MAINTANENCE

**CAUTION**: When the actuator is a spring return unit, make sure that the actuator is in the failed position before disassembling

**WARNING:**
DISASSEMBLY OF THE SPRING PACKAGE SHOULD NOT BE ATTEMPTED. SPECIAL EQUIPMENT IS REQUIRED. DISASSEMBLY OF THE SPRING PACKAGE MAY RESULT IN SERIOUS PERSONAL INJURY. IF MAINTENANCE IS REQUIRED, SHIP THE ENTIRE ACTUATOR TO FNW.

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Remove the actuator from service following all standard safety procedures. Move to a clean well-lit area, following the handling instructions in Section 5. Refer to the parts and materials list for identification.

### TOOL LIST

| | | | |
|---|---|---|---|
| Torque | Hex (Allen) wrench:<br>5 mm (ASD2/ASD3/ASD4)<br>6 mm (ASD5/ASD6) | Flathead screwdriver | Plastic faced mallet |

- Remove the drive bushing (19) by removing the socket head screws (5). Use the socket head cap screws (7) to push out the drive bush (19) from the actuator. Repeat for NAMUR Stem (6). Be sure to keep the drive bushing in equilibrium when pushed-out.
- Remove the cover (8) by removing the socket cap screws (7). If the cover cannot be removed, tap it with a plastic hammer to break any adhesion between the body and cover joint. Removing the spring housing (23) from the driver housing (13) is not always necessary. However, if removal is required, the information in the Torque Requirements table on page 9 must be followed upon reassembly. Inspect and clean all components.
- Use air pressure to remove any spring preload by partially stroking the actuator. If the diaphragm (37) is ruptured, replace as instructed in the previous section.
- To remove the socket shoulder screw (24) that holds the clevis (26) to the driver arm (12): Slowly increase air pressure until the driver arm (12) moves slightly off the stop screw (17).
- Remove the socket shoulder screw (24), per diagram B.
- Slowly relieve the air pressure in the actuator. The clevis (26) should be set against the spring retainer (30) and positioned symmetrically about the slot in the spring housing per diagram C.
- Shut off and bleed the air pressure to zero. Disconnect the air lines.
- While safely holding the diaphragm casing and spring housing together, back off the nuts (20) from the hex head screws (39.1 and 39.2) until the nuts are flush with the hex head screw ends. Do not remove the nuts completely from the hex head screws. If tension still exists on the hex head screws, then the spring package is not properly contained. Stop disassembly, retighten nuts and return the actuator to FNW. If the spring package is intact, continue to remove the nuts (20), spring-washers (21), gaskets (22), and remove the hex head screws (39).
- Lift off the diaphragm cover (38). For models ASD4, ASD5 and ASD6, remove the hex head cap screw (37.2) and retaining washer (37.1). Remove the diaphragm (37). Inspect the diaphragm for signs of wear, rupture or mechanical damage. Refer to Diagram D.
- Inspect the inside of the diaphragm cover (38), the diaphragm retainer (35) and the spring housing (23) for any debris, rough spots, or other issues that could damage the diaphragm.
- Lift the entire spring cartridge out of the unit. Do not attempt to disassemble the spring cartridge.

**DIAGRAM A**

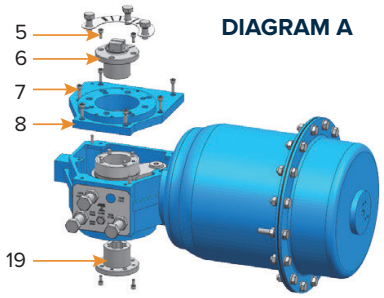



**DIAGRAM B**

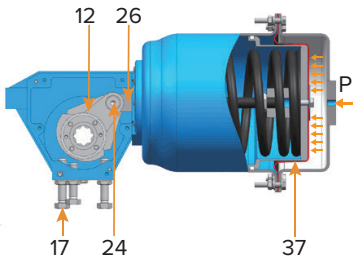



**DIAGRAM C**

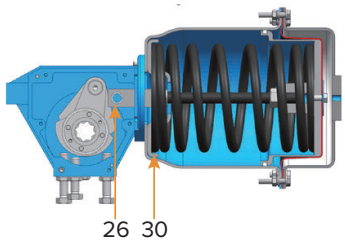
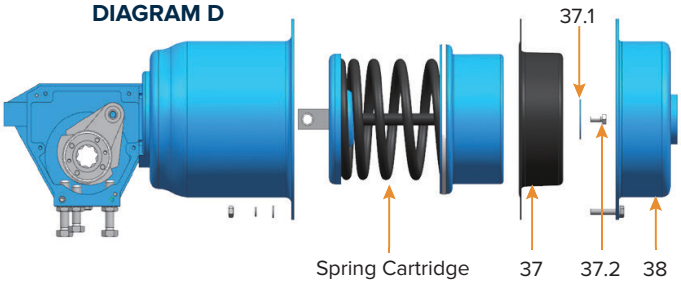
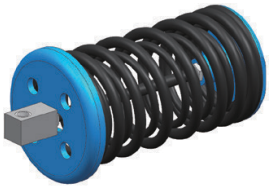
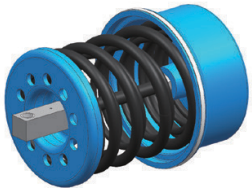



**DIAGRAM D**



Spring cartridge of ASD2 and ASD3



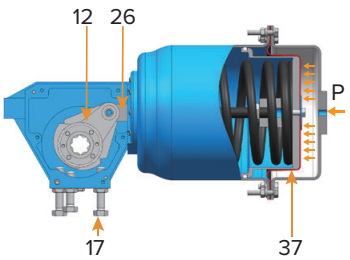
Spring cartridge of ASD4, ASD5,ASD6

# SPRING-DIAPHRAGM ROTARY ACTUATORS

## 12. ACTUATOR ASSEMBLY

**CAUTION**: To aid assembly, a commercial lubricant which is compatible with the gasket and diaphragm materials can be used.

- Press driver arm bearings (9) into the driver housing (13) and cover (8). An arbor press should be used as best practice; however, a vise can be used if care is taken not to damage the bearings or other components. Driver arm bearings should be pressed in until they are flush or 0.015 inch (0.38mm) below the driver housing counterbore or the inside cover surface. Press clevis bearings (25) into the clevis (26).
- Apply lubricant to inside of bearings for the driver arm only. Do not lubricate the clevis. Instead, lubricate the barrel of the shoulder screw (24).
- Place one thrust bearing (10) into the counterbore of the actuator drive housing (13). Slide the second thrust bearing (10) onto the trunnion of the driver arm (12). Place the driver into the driver housing (13).
- Lower the spring cartridge into the spring housing (23). Ensure the spring package is not resting on the hex head cap screws (36) that hold the spring housing and driver housing together. If the diaphragm retainer bearing (34) has separated from diaphragm retainer (35), hold in place ***while*** lowering spring cartridge into housing.
- Place the new diaphragm (37) on the diaphragm retainer (35) and attach. For ASD4, ASD5 and ASD6 models, assemble washer (37.1) and hex head cap screw (37.2). Torque to the value specified in the below Torque Requirements table.
- Insert the hex head bolts (39.1 and 39.2) in all holes. Do not force the bolts through the diaphragm. Install nuts (20) and tighten using standard bolt pattern tightening practice of tightening diametrically opposite bolts in sequence. Torque to the value specified in the below Torque Requirements table.
- Connect a clean, regulated air supply to the pressure port (17) and slowly increase the air pressure until the holes in the clevis (26) and driver arm (12) are aligned (refer to the Diagram C). If required, turn the clevis a few degrees to align the holes.



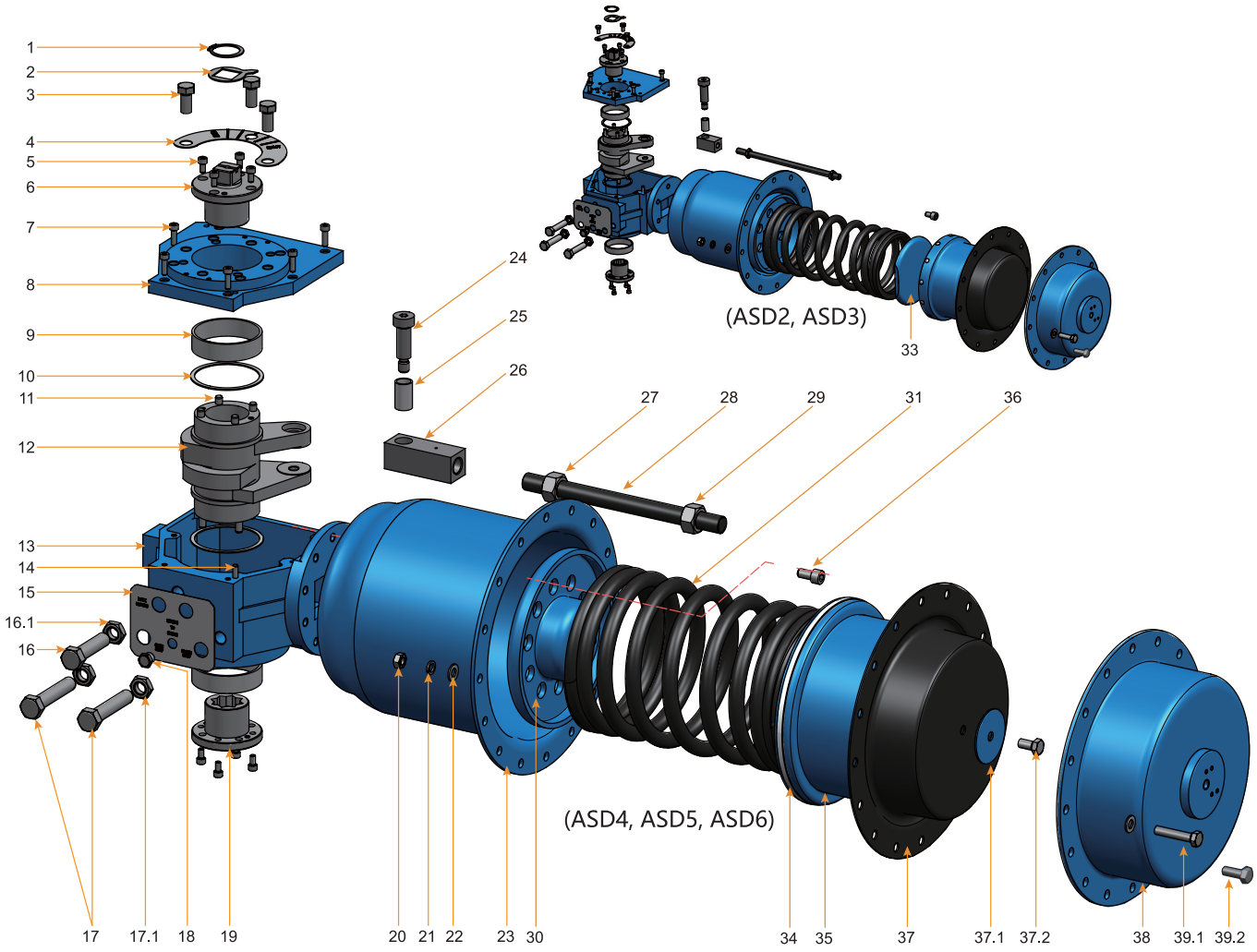

**CAUTION**: Do not exceed the max recommended air pressure.

- Lubricate the threads of the shoulder screw (24). Install it through the driver arm (12) and clevis (26). Firmly hold the clevis with a wrench or other appropriate tool while tightening the shoulder screw. Caution: An unsupported driver arm may tend to tip over. Tighten screws per the below Torque Requirements table.
- Slowly release the air pressure. Assemble the cover (8) with the socket head screws (7). Tighten screws per the below Torque Requirements table.
- Install the drive bush (19) onto the driver arm (12). Be sure that the cylindrical pins (11) are aligned with the cylindrical holes in the driver bush (19). Tap the bush with a plastic hammer to insert the bush into the correct position. Install the socket head bush screws (5) and tighten uniformly using the standard practice of tightening diametrically opposite bolts in sequence. Tighten screws per the below Torque Requirements table. Repeat process for the NAMUR stem (6).
- Install the indicator pointer (2) and indicator plate (4), if previously disassembled. Refer to the installation instructions for spring-to-close and spring-to-open configuration.

| Torque Requirements | | | | | |
|---|---|---|---|---|---|
| Required Tightening Torques in ft-lbs (N-m) for various fasteners | | | | | |
| | ASD2 | ASD3 | ASD4 | ASD5 | ASD6 |
| Nuts (20) for hex head screw assembly through diaphragm | 24 (32) | 24 (32) | 24 (32) | 24 (32) | 24 (32) |
| Socket head cover screws (7) | 6 (8) | 6 (8) | 6 (8) | 15 (20) | 24 (32) |
| Socket head shoulder screws (24) | 55 (75) | 132 (179) | 132 (179) | 132 (179) | 132 (179) |
| Socket head bush screws (5) | 4 (6) | 5 (7) | 6 (8) | 11 (15) | 15 (20) |
| Hex head screws (36) between driver housing and spring housing | 18 (24) | 30 (40) | 30 (40) | 55 (75) | 55 (75) |
| Hex head cap screws (37.1) for attaching the diaphragm to the retainer | NA | NA | 10 (14) | 17 (23) | 17 (23) |

## SPRING-DIAPHRAGM ROTARY ACTUATORS

### 13. PARTS AND MATERIAL LIST




| No | Part Name | Qty | | | Material | Surface Treatment |
|---|---|---|---|---|---|---|
| | | ASD2/3 | ASD4/5 | ASD6 | | |
| 1 | Snap Ring | 1 | 1 | 1 | Stainless Steel 304 | |
| 2 | Indicator Pointer | 1 | 1 | 1 | Stainless Steel 304 | |
| 3 | Hex Head Cap Screw | 3 | 3 | 3 | Stainless Steel 304 | |
| 4 | Indicator Plate | 1 | 1 | 1 | Stainless Steel 304 | |
| 5 | Socket Head Bushing Screw | 8 | 8 | 8 | Stainless Steel 304 | |
| 6 | NAMUR Drive Bushing | 1 | 1 | 1 | Carbon Steel | Chemically Coated Nickel |
| 7 | Socket Head Cap Screw | 6 | 6 | 6 | Stainless Steel 304 | |

# ASD SERIES
PNEUMATIC ACTUATORS

## SPRING-DIAPHRAGM ROTARY ACTUATORS

| No | Part Name | Qty | | | Material | Surface Treatment |
|---|---|---|---|---|---|---|
| | | ASD2/3 | ASD4/5 | ASD6 | | |
| 8 | Cover | 1 | 1 | 1 | Carbon Steel | Polyester Powder Coated |
| 9 | Driver Arm Bearing | 2 | 2 | 2 | Stainless Steel w/Acetal Lining | |
| 10 | Thrust Bearing | 2 | 2 | 2 | Nylon | |
| 11 | Cylindrical Pin | 8 | 8 | 8 | Carbon Steel | |
| 12 | Driver Arm | 1 | 1 | 1 | Ductile Iron | Chemically Coated Nickel |
| 13 | Driver Housing | 1 | 1 | 1 | Ductile Iron | Polyester Powder Coated |
| 14 | Cylindrical Pin | 2 | 2 | 2 | Stainless Steel 304 | |
| 15 | Nameplate | 1 | 1 | 1 | Stainless Steel 304 | |
| 16 | Set Screw | 1 | 1 | 1 | Stainless Steel 304 | |
| 16.1 | Hex Jam Nut | 1 | 1 | 1 | Stainless Steel 304 | |
| 17 | Travel Stop Screw | 2 | 2 | 2 | Stainless Steel | |
| 17.1 | Hex Jam Nut | 2 | 2 | 2 | Stainless Steel 304 | |
| 18 | Breather | 1 | 1 | 1 | Stainless Steel 316 | |
| 19 | Drive Bushing | 1 | 1 | 1 | Carbon Steel | Chemically Coated Nickel |
| 20 | Lock Nut | 12 | 12 | 24 | Stainless Steel | |
| 21 | Spring Washer | 12 | 12 | 24 | Stainless Steel | |
| 22 | Gasket | 24 | 24 | 48 | Stainless Steel | |
| 23 | Spring Housing | 1 | 1 | 2 | Carbon Steel | Polyester Powder Coated |
| 24 | Shoulder Screw | 1 | 1 | 2 | Carbon Steel | |
| 25 | Clevis Bearing | 1 | 1 | 2 | Stainless Steel w/Acetal Lining | |
| 26 | Clevis | 1 | 1 | 2 | Carbon Steel | |
| 27 | Hex Jam Nut | 1 | 1 | 2 | Stainless Steel 304 | |
| 28 | Actuator Rod | 1 | 1 | 2 | Carbon Steel | |
| 29 | Hex Jam Nut | 1 | 1 | 2 | Carbon Steel | |
| 30 | Spring Retainer | 1 | 1 | 2 | Carbon Steel | Polyester Powder Coated |
| 31/32 | Compression Springs | 1 | 1 | 2 | 55 Mn Spring Steel | Polishing Capacitance Coated |
| 33 | Spring Retainer Plate | 1 | | | Carbon Steel | Polyester Powder Coated |
| 34 | Diaphragm Retainer Bearing | 1 | 1 | 2 | POM | |
| 34.1 | Diaphragm Retainer Bearing Pin | 12 | | | UHMWPE | |
| 35 | Diaphragm Retainer | 1 | 1 | 2 | Carbon Steel | Polyester Powder Coating |
| 36 | Hex Head Cap Screw | 4 | 4 | 8 | Carbon Steel | |
| 37 | Diaphragm (Optional) | 1 | 1 | 2 | NBR/Nylon 66 Fabric Blend (-25°C – 70°C) | |
| 37 | Diaphragm* | 1 | 1 | 2 | LNBR/Nylon 66 Fabric Blend (-40°C – 70°C) | |
| 37 | Diaphragm (Optional) | 1 | 1 | 2 | EPDM4/Polyester Fabric Blend (-29°C – 170°C) | |
| 37 | Diaphragm (Optional) | 1 | 1 | 2 | Viton/NOMEX Fabric Blend (-15°C – 200°C) | |
| 37.1 | Retainer Washer | NA | 1 | 2 | Stainless Steel | |
| 37.2 | Hex Head Cap Screw | NA | 1 | 2 | Stainless Steel | |
| 38 | Diaphragm Cover | 1 | 1 | 1 | Carbon Steel | Polyester Powder Coated |
| 39.1 | Hex Head Cap Screw (Long) | 2 | 2 | 4 | Stainless Steel 304 | |
| 39.2 | Hex Head Cap Screw (Short) | 10 | 10 | 20 | Stainless Steel 304 | |

*Standard Construction

## 14. LIMITED WARRANTY

### Warranty

Subject to the limitations expressed herein, Seller warrants that products manufactured by Seller shall be free from defects in design, material and workmanship under normal use for a period of one year from installation but in no case shall the warranty period extend longer than eighteen months from the date of sale. This warranty is void for any damage caused by misuse, abuse, neglect, acts of God, or improper installation. For the purpose of this section, “Normal Use” means in strict accordance with the installation, operation and maintenance manual. The warranty for all other products is provided by the original equipment manufacturer.

### Claim Process and Remedies

Seller shall repair or replace, at its option, any non-conforming or otherwise defective product, upon receipt of notice from Buyer during the Manufacturer’s warranty period at no additional charge. SELLER HEREBY DISCLAIMS ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OR FITNESS FOR A PARTICULAR PURPOSE.

In order to file a claim under the terms of this Warranty, a claimant must promptly notify FNW that a product may be defective within 30 days of the suspected failure or defect via the telephone number, mail or website listed below and may be required to submit proof of purchase and/or photographs.

- Telephone: 1-800-221-3379
- Mailing Address:
  751 Lakefront Commons, Newport News, VA 23606
- Website: fnw.com

All products alleged to be defective must be sent to FNW for inspection and testing for determination of the cause of the alleged defect or failure.

### Limitation of Liability

UNDER NO CIRCUMSTANCES SHALL EITHER PARTY BE LIABLE TO THE OTHER FOR INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND. BUYER HEREBY ACKNOWLEDGES AND AGREES THAT UNDER NO CIRCUMSTANCES, AND IN NO EVENT, SHALL SELLER’S LIABILITY, IF ANY, EXCEED THE NET SALES PRICE OF THE DEFECTIVE PRODUCT(S) PURCHASED DURING THE PREVIOUS CONTRACT YEAR.

### Labor Allowance

Seller makes NO ADDITIONAL ALLOWANCE FOR THE LABOR OR EXPENSE OF REPAIRING OR REPLACING DEFECTIVE PRODUCTS OR WORKMANSHIP OR DAMAGE RESULTING FROM THE SAME.

### Recommendations by Seller

Seller may assist Buyer in selection decisions by providing information regarding products that it manufactures and those manufactured by others. However, Buyer acknowledges that Buyer ultimately chooses the product’s suitability for its particular use, as normally signified by the signature of Buyer’s technical representative. Any recommendations made by Seller concerning the use, design, application or operation of the products shall not be construed as representations or warranties, expressed or implied. Failure by Seller to make recommendations or give advice to Buyer shall not impose any liability upon Seller.

### Excused Performance

Seller will make a good faith effort to complete delivery of the products as indicated by Seller in writing, but Seller assumes no responsibility or liability and will accept no back charge for loss or damage due to delay or inability to deliver, caused by acts of God, war, labor difficulties, accidents, inability to obtain materials, delays of carriers, contractors or suppliers or any other causes of any kind whatever beyond the control of Seller. Under no circumstances shall Seller be liable for any special, consequential, incidental, or indirect damages, losses, or expense (whether or not based on negligence) arising directly or indirectly from delays or failure to give notice of delay.