



DeZURIK DR 40B ROTARY DIAPHRAGM ACTUATOR

Instruction **D10506**

January 2019

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DR 40B Rotary Diaphragm Actuator

Instructions

These instructions provide information about DR 40B Rotary Diaphragm Actuators. They are for use by personnel who are responsible for installation, operation and maintenance of DR 40B Rotary Diaphragm Actuators.

Safety Messages

All safety messages in the instructions are flagged with an exclamation symbol and the word Caution, Warning or Danger. These messages indicate procedures that must be followed exactly to avoid equipment damage, personal injury or death. Safety label(s) on the product indicate hazards that can cause equipment damage, personal injury or death.

Safety label(s) on the product indicate hazards that can cause equipment damage, personal injury or death. If a safety label becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s).



WARNING!

Personnel involved in the installation or maintenance of valves should be constantly alert to potential emission of pipeline material and take appropriate safety precautions. Always wear suitable protection when dealing with hazardous pipeline materials. Handle valves, which have been removed from service with suitable protection for any potential pipeline material in the valve.

Inspection

Your DR 40B Rotary Diaphragm Actuator has been packaged to provide protection during shipment, however, it can be damaged in transport. Carefully inspect the unit for damage upon arrival and file a claim with the carrier if damage is apparent.

Parts

Recommended spare parts are listed on the assembly drawing. These parts should be stocked to minimize downtime.

Order parts from your DeZURIK sales representative, or directly from DeZURIK. When ordering parts, please include the 7-digit part number and 4-digit revision number (example: **9999999R000**) and serial number located on the data plate attached to the valve assembly. Also include the part name, the assembly drawing number, the balloon number and the quantity stated on the assembly drawing.

DeZURIK Service

DeZURIK service personnel are available to install, maintain and repair all DeZURIK products. DeZURIK also offers customized training programs and consultation services.

For more information, contact your local DeZURIK sales representative or visit our website at www.dezurik.com.

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DR 40B Rotary Diaphragm Actuator

Description

The DR 40B Rotary Diaphragm Actuator is a pneumatic spring-return rotary actuator used for on-off or modulating control of a quarter-turn valve. The spring action may be spring-to-close or spring-to-open, and is reversible without additional parts.

A choice of two spring ranges is available—35 or 60 psi (240 or 420 kPa). A lockable model of the actuator is available. Operation of the lockable model is on page 11.

Installation

One pneumatic signal line connection is required to the ¼ NPT port on the end of the actuator. The pneumatic signal pressure must equal—but not exceed by more than 10 psi (70 kPa)—the spring rating of 35 or 60 psi (240 or 420 kPa) as shown on the actuator label.

For high vibration installations, additional mounting support is recommended on the diaphragm end of the actuator to prevent damage to the actuator and/or the piping system. Mount the support from the pipeline to at least two of the diaphragm cover screws (B2) shown in Figure 1. Tighten the screws to 80 ± 2 inch pounds (9.0 ± 0.2 Nm).

Operation

The actuator is powered pneumatically, and rotates 90 degrees between the open and closed positions. The action of the actuator is either spring-to-close or spring-to-open, as determined by which side of the actuator is mounted to the valve, as shown in Figure 1. The action selected is shown on the actuator label. With spring-to-close, increasing signal pressure to the actuator opens the valve, and decreasing pressure closes the valve; with spring-to-open, increasing pressure closes the valve, and decreasing pressure opens the valve.

Lubrication

The actuator is lubricated at the factory, and does not require further lubrication.

Parts Identification

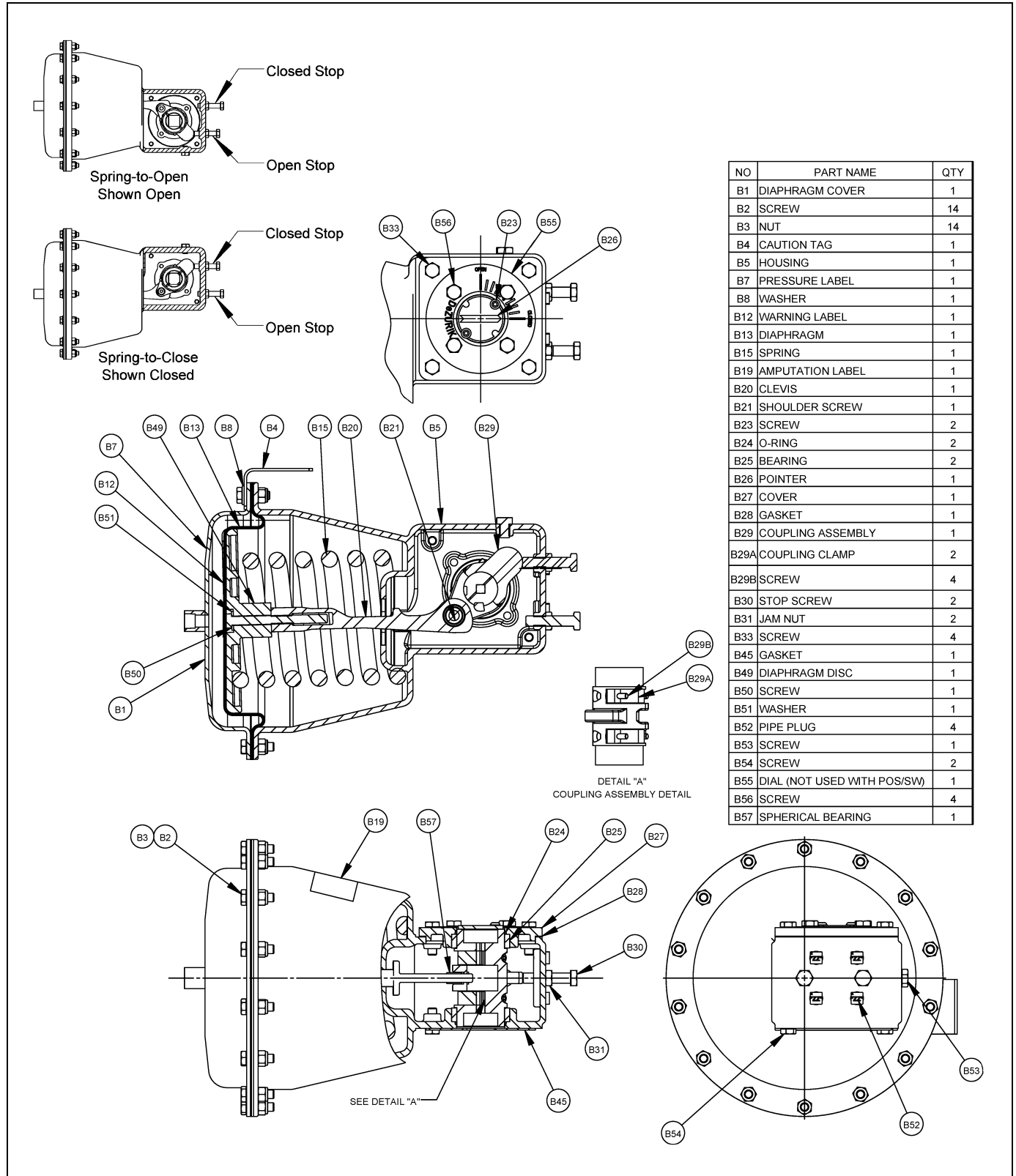


Figure 1—Parts Identification

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DR 40B Rotary Diaphragm Actuator

Parts Identification *(continued)*

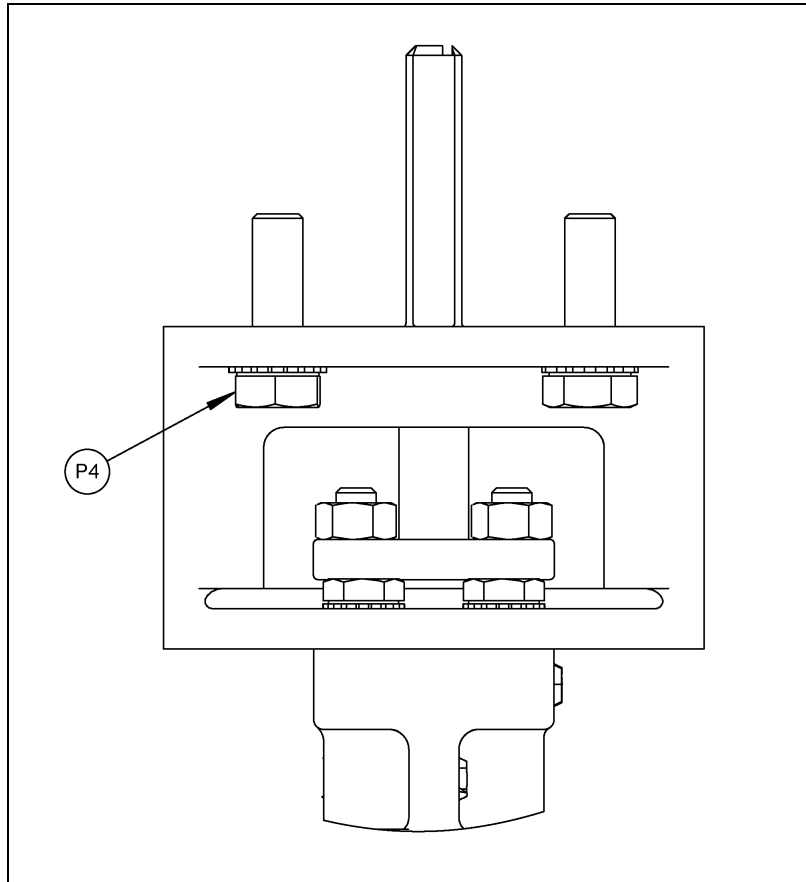


Figure 2— Connecting Parts Identification

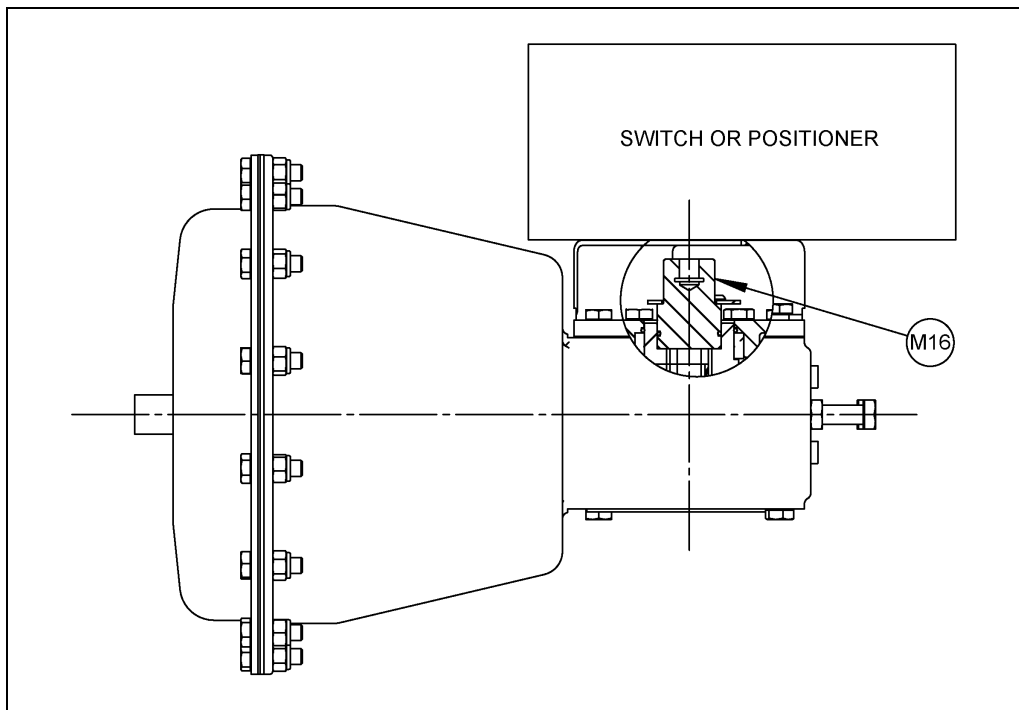


Figure 3— Accessory Parts Identification

Open and Closed Position Stops

The open and closed position stops are the two hex head cap screws (B30) shown in Figure 1. The stops are adjustable, and prevent the actuator from rotating beyond the open and closed positions of the valve. If the actuator is factory-mounted on the valve, the stops are preset and do not require further adjustment.

If the actuator is not factory-mounted on the valve, or if the actuator is removed and/or disassembled, the stops will require adjustment as described below. Refer to the valve Instructions for closed-position information, and adjust the stops with the actuator mounted on the valve. Refer to Figure 1 for parts identification.

For **closed** stop adjustment on spring-to-**close** actuators, or **open** stop adjustment on spring-to-**open** actuators:

1. Relieve the air pressure to the actuator.
2. Loosen the jam nut (B31) on the appropriate stop screw (B30). Refer to Figure 1.
3. Turn the stop screw in or out until the valve is in the correct position. The screw will turn easier if air pressure—just enough to relieve the force on the screw—is applied to the actuator. Relieve the pressure to check the stop screw adjustment.
4. Hold the stop screw from turning, and tighten the jam nut to 15 ± 2 foot pounds (20 ± 3 Nm).

For **closed** stop adjustment on spring-to-**open** actuators, or **open** stop adjustment on spring-to-**close** actuators:

1. Apply—but do not exceed—the maximum air pressure to the actuator, as determined by the spring rating shown on the actuator label.
2. Loosen the jam nut (B31) on the appropriate stop screw (B30). Refer to Figure 1.
3. Turn the stop screw in or out until the valve is in the correct position. The screw will turn easier if the air pressure to the actuator is reduced. Reapply the maximum pressure in step 1 above to check the stop screw adjustment.
4. Hold the stop screw from turning, and tighten the jam nut to 15 ± 2 foot pounds (20 ± 3 Nm).
5. Relieve the air pressure to the actuator.

Removing Actuator from Valve

Refer to Figure 1 and Figure 2 for parts identification.

1. Shut down the flow in the pipeline.



WARNING!

Flow in the pipeline with the actuator removed can slam the valve closed causing personal injury and damaging the flow system. Shut down the flow in the pipeline before removing the actuator from the valve.

2. Remove two of the pipe plugs (B52) that are closest to the valve..
3. Apply air pressure to the actuator to open the valve to approximately 50% open.
4. Insert a 5/32" hex Allen wrench through the 1/8" NPT tapped holes that the pipe plugs were removed from in step 2 to loosen the two coupling screws (B29B) several turns.
5. Relieve the air pressure to the actuator and disconnect the signal line from the actuator. Also turn off and disconnect all other pneumatic and electrical connections, if any, to the actuator or valve accessories. Remove any accessories.



WARNING!

Moving parts from unexpected operation of a powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to the actuator before servicing.

6. Remove the four actuator mounting screws (P4).
7. Remove the actuator from the valve shaft.

Replacing Actuator on Valve

1. Place the valve in the closed position for a spring-to-close actuator, or in the open position for a spring-to-open actuator.
2. Select the desired mounting orientation for mounting the actuator on the valve. Refer to limitations in the Changing Actuator Mounting Position on Valve section.
3. Align the shaft hole in the coupling (B29) with the valve shaft. Slide the actuator onto the valve so that the coupling is fully engaged with the shaft.
4. Fasten the actuator to the valve or adaptor with the four mounting screws (P4) and washers. Tighten the screws to 16 ± 2 foot pounds (22 ± 3 Nm).
5. Apply air pressure to the actuator to open the valve to approximately 50% open.
6. Insert a 5/32" hex Allen wrench through the 1/8" NPT tapped holes closest to the valve and tighten the two socket screws (B29B) to 7-9 foot pounds (9.5-12Nm).
7. Install two pipe plugs (B52).
8. Re-connect all pneumatic and electrical connections.
9. Operate the valve to check the open and closed positions. Adjust the stops, if necessary, as described in the Open and Closed Position Stops section.

Diaphragm Replacement

1. Remove three screws (B2) and nuts (B3) from the diaphragm cover (B1). The three screws removed must be equally spaced as shown in Figure 4.
2. Obtain three 5/16" diameter threaded rods, each at least 3" (75mm) long, and nine 5/16" nuts. As shown in Figure 2, assemble one rod and three nuts in each of the three holes from which the screws were removed in the previous step. Jam the double nuts together by tightening to 14 ± 2 foot pounds (19 ± 3 Nm); tighten the single nuts finger tight against the cover.
3. Remove the remaining 11 screws (B2) and nuts (B3) from the diaphragm cover (B1).
4. Turn the single nuts counterclockwise—carefully, evenly, and slowly—from each of the three threaded rods. Continue turning each nut until the spring force is fully relieved from the diaphragm cover (B1). Then remove the nuts, the threaded rods, and the diaphragm cover from the actuator.
5. Remove the rubber diaphragm (B13) from the spring case (B14).
6. Mount the diaphragm (B13) and the diaphragm cover (B1) to the spring case (B14) with screws (B2) and nuts (B3). Place the caution tag (B4) and washer (B8) under one of the screws. Tighten the screws evenly until the rubber diaphragm is in contact with the cover and the spring case. Then tighten the screws in a crisscross pattern to 80 ± 2 inch pounds (9.0 ± 0.2 Nm).
7. Re-connect all pneumatic and electrical connections.
8. Operate the valve to check the open and closed positions. Adjust the stops, if necessary, as described in the Open and Closed Position Stops section.

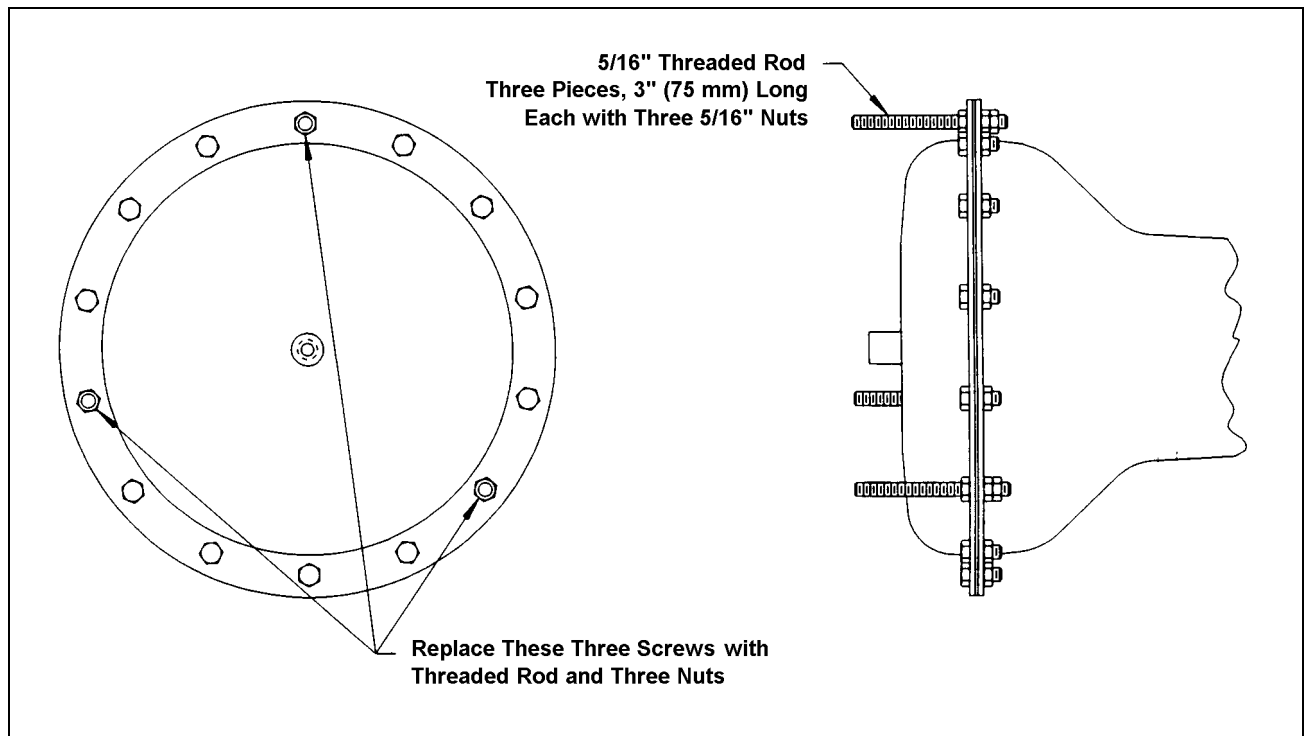


Figure 4—Stud Requirements For Diaphragm Cover Removal

Reversing the Diaphragm Actuator Action

Refer to Figure 1, 2 and 3 for parts identification.

1. Shut down the flow in the pipeline.



WARNING!

Flow in the pipeline with the actuator removed can slam the valve closed causing personal injury and damaging the flow system. Shut down the flow in the pipeline before removing the actuator from the valve.

2. Remove the four pipe plugs (B52).
3. Apply air pressure to the actuator to open the valve to approximately 50% open.
4. Insert a 5/32" hex Allen wrench through the 1/8" NPT tapped holes that the pipe plugs were removed from in step 2 to loosen the two coupling screws (B29B) several turns.
5. Relieve the air pressure to the actuator and disconnect the signal line from the actuator. Also turn off and disconnect all other pneumatic and electrical connections, if any, to the actuator or valve accessories. Remove any accessories.



WARNING!

Moving parts from unexpected operation of a powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to the actuator before servicing.

6. Remove the four actuator mounting screws (P4) and lockwashers.
7. Remove the actuator from the valve shaft.
8. Remove the pointer (B26), screws (B23) and (B56), dial (B55) (if present) and coupling (M16) (if present).
9. Place the valve in the closed position for a spring-to-close actuator, or in the open position for a spring-to-open actuator.
10. Turn the actuator upside down and mount the actuator on the valve with the four screws (P4) and lockwashers. Tighten the four actuator mounting screws (P4) to 16 ± 2 foot pounds (22 ± 3 Nm).
11. Apply air pressure to the actuator to open the valve to approximately 50% open.
12. Insert a 5/32" hex Allen wrench through all four 1/8" NPT tapped holes and tighten the socket screws (B29B) to 60 ± 8 inch pounds.
13. Relieve the pressure to the actuator.
14. Install the four pipe plugs (B52).

Reversing the Diaphragm Actuator Action *(continued)*

15. Loosen and then retighten the four actuator mounting screw (P4) to 16 ± 2 foot pounds (22 ± 3 Nm).
16. Reinstall the pointer (B26), screws (B23) and (B56), dial (B55) (if present) and coupling (M16) (if present).
17. Re-connect all accessories and all pneumatic and electrical connections.
18. Operate the valve to check the open and closed positions. Adjust the stops, if necessary, as described in the Open and Closed Position Stops section.

Changing Actuator Mounting Position On Valve

Before changing the actuator mounting position, check to assure that pipeline flange clearance and room clearance is available for the proposed actuator location.

The actuator may be mounted on the valve in any of four mounting positions— standard, 90°, 180°, or 270°—as shown on the Installation Drawing. To change the mounting position, follow the steps in the Removing Actuator from Valve section and the Replacing Actuator on Valve section.

Lockable Model

The DR 40B Rotary Diaphragm Actuator is available as a lockable model that allows the actuator to be locked in the open or closed position. The lockable model is identified by DRL in the catalog characteristic. The lockable spring-to-open actuator has three options—DF, DP, and DE; the lockable spring-to-close actuator has three comparable options—RF, RP, and RE. The six options are shown in Figure 5, and are described as follows:

Spring-to-Open Actuator

- The DF option allows the actuator to be locked in the open (fail) position, and includes a lock screw (S2), jam nut (S1), and lockout cover assembly (S5).
- The DP option allows the actuator to be locked in the closed (powered) position, and includes a manual override and a lockable chain.
- The DE option allows the actuator to be locked in either the open or closed position, and includes the same items as options DF and DP together.

Spring-to-Close Actuator

- The RF option allows the actuator to be locked in the closed (fail) position, and includes a lock screw (S2), jam nut (S1), and lockout cover assembly (S5).
- The RP option allows the actuator to be locked in the open (powered) position, and includes a manual override and a lockable chain.
- The RE option allows the actuator to be locked in either the open or closed position, and includes the same items as options RF and RP together.

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Unlocked Condition

Under normal unlocked running conditions, the lockable features must be positioned “away” from the inside of the actuator so that the actuator stroke is limited only by the open and closed position stops as described in the Open and Closed Position Stops section.

The fail position of the actuator is lockable with the lock screw (S2) and jam nut (S1) as shown in Figure 3. In the unlocked position, the lock screw must be turned counterclockwise until the distance from the housing (B5) to the end of the lock screw is at least 1 ¾” (44 mm). To hold the lock screw in position, tighten the jam nut to 38 ± 5 foot pounds (52 ± 7 Nm).

The powered position of the actuator is lockable with the manual override as shown in Figure 3. In the unlocked position, the manual override handwheel must be turned to the extreme counterclockwise position. To hold the handwheel in position, the chain may be fastened or locked to the handwheel.

Locked Fail Position

Follow the steps below to change the unlocked condition to the locked fail position. Refer to Figure 5 for parts identification. Before proceeding, the open and closed position stops must be correctly adjusted as described in the Open and Closed Position Stops section.

1. Relieve the air pressure to the actuator so that the actuator moves to the extreme fail position.
2. Hold the lock screw (S2) from turning, and loosen the jam nut (S1) several turns counterclockwise, to the head of the lock screw.
3. Turn the lock screw clockwise several turns until resistance is felt from the stop screw contacting the coupling (B29) inside the actuator. Tighten the lock screw to 5 to 10 foot pounds (7 to 14 Nm) to assure that the lock screw is contacting the link arm.
4. Turn the jam nut against the housing. While holding the lock screw from turning, tighten the jam nut to 38 ± 5 foot pounds (52 ± 7 Nm).
5. Place and lock the lockout cover assembly (S5) on the head of the lock screw.

Locked Powered Position

Follow the steps below to change the unlocked condition to the locked powered position. Refer to Figure 5 for parts identification. Before proceeding, the open and closed position stops must be correctly adjusted as described in the Open and Closed Position Stops section.

1. Apply air pressure to the actuator so that the actuator moves to the extreme powered position.
2. For a spring-to-open actuator, turn the handwheel clockwise several turns until resistance is felt, and apply torque so that the mechanism firmly contacts the inside the actuator. For a spring-to-close actuator, turn the handwheel counterclockwise until resistance is felt.
3. Place and lock the chain between the spokes in the handwheel so that the chain will prevent the handwheel from being turned counterclockwise.

Fastener Torque Requirements

Fastener	Torque
Diaphragm Cover Screws (B2)	15 ± 2 foot pounds
Diaphragm Disc Screw (B50)	33 foot pounds minimum
Screw (B21)	21 foot pounds (apply Loctite 263 or equivalent before assembly)
Top Cover Screws (B56) and Screws (B54)	14 foot pounds minimum
Screw (B53)	18 foot pounds minimum

Lockable Model (continued)

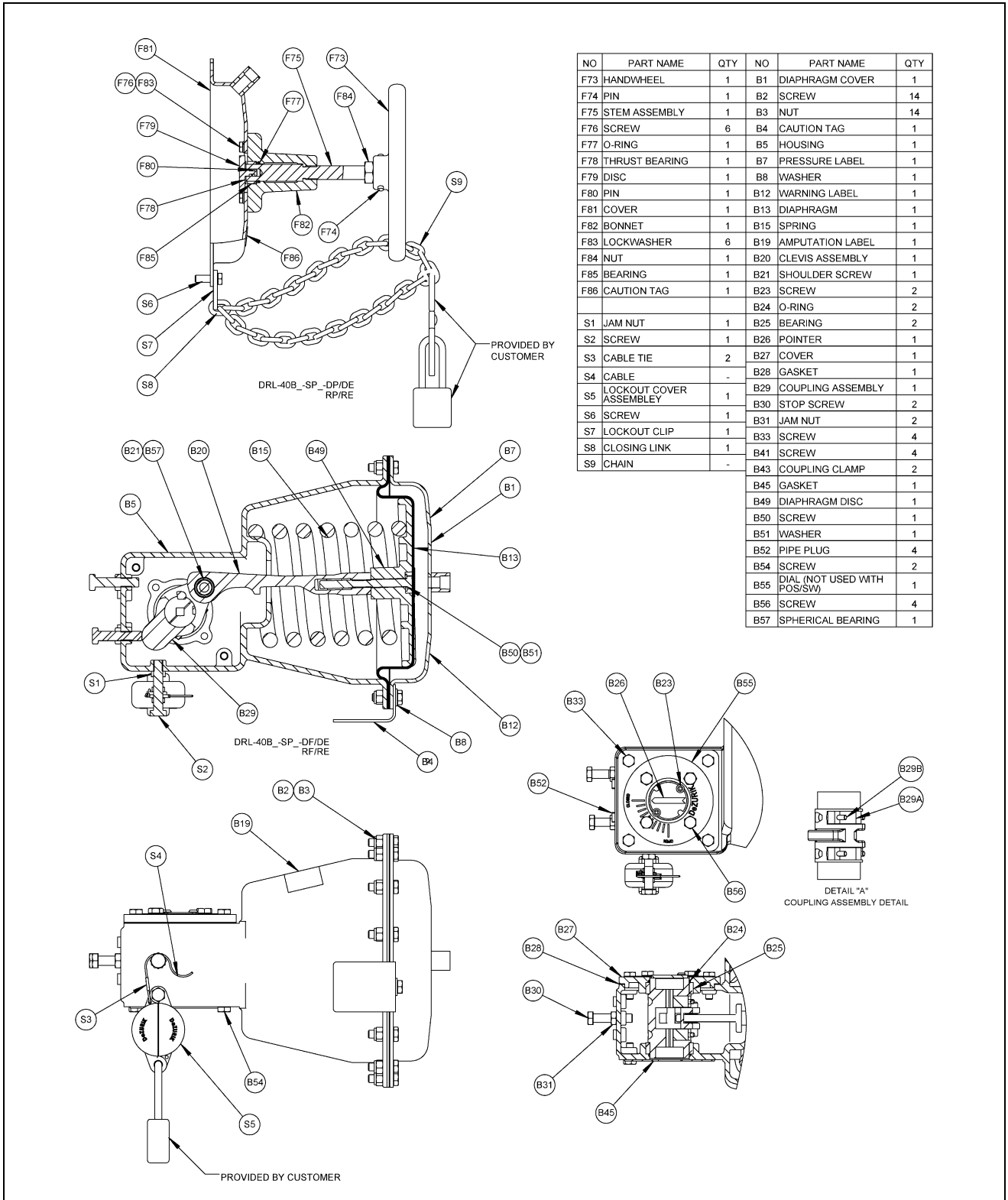


Figure 5—Lockable Model, Parts Identification

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Troubleshooting

Condition	Possible Cause	Corrective Action
Actuator will not operate valve.	Rubber diaphragm is ruptured.	Replace diaphragm. See <i>Diaphragm Replacement</i> section.
	Lockable model is locked.	Place in unlocked condition. See <i>Lockable Model</i> section.
Actuator closes to wrong position.	Closed position stop is set incorrectly.	Adjust closed position stop. See <i>Open and Closed Position Stops</i> section.
Actuator opens to wrong position.	Open position stop is set incorrectly.	Adjust open position stop. See <i>Open and Closed Position Stops</i> section.
Actuator will not fully operate valve.	Actuator air pressure is low.	Increase air pressure. Do not exceed 10 psi over the spring rating.
	Actuator is sized incorrectly.	Use spring with increased rating, or use larger actuator.
	Pipeline obstruction in valve is preventing closure.	Remove obstruction.
Spring operates valve in wrong direction.	Spring-to-close should be spring-to-open or vice versa.	Reverse the action. See <i>Reversing Actuator Action</i> section.