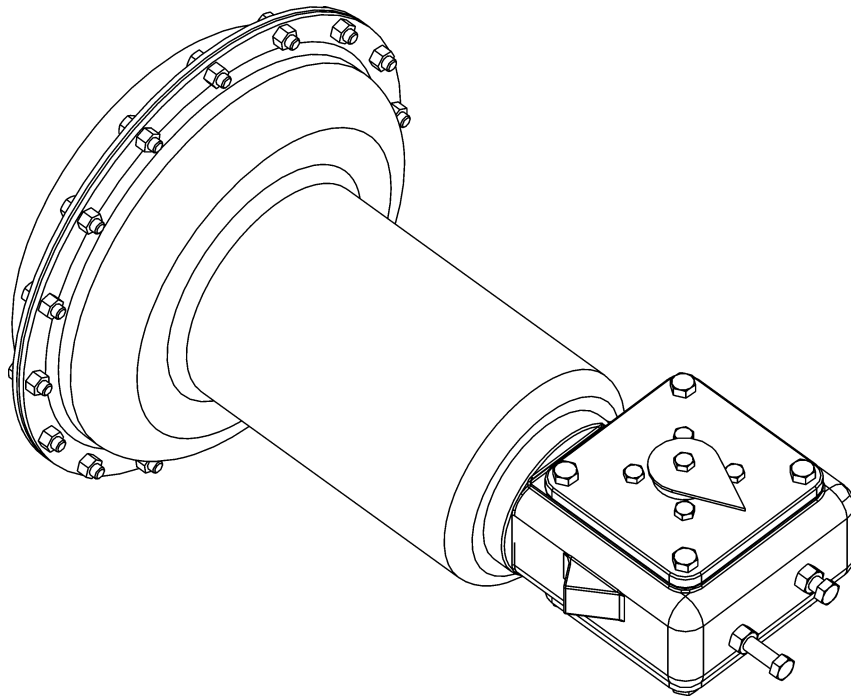




# DEZURIK DR 55 AND 85 ROTARY DIAPHRAGM ACTUATORS



Instruction **D10168**  
August 2012

# DeZURIK

## DR 55 and 85 Rotary Diaphragm Actuators

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### Instructions

These instructions provide information about DR 55 and 85 Rotary Diaphragm Actuators. They are for use by personnel who are responsible for installation, operation and maintenance of DR Model 55 and 85 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.**

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### Inspection

Your DR 55 or 85 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**) 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](http://www.dezurik.com).

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## DR 55 and 85 Rotary Diaphragm Actuators

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### Description

The DR 55 and 85 Rotary Diaphragm Actuators are a pneumatic spring-return rotary actuator used for on-off or modulating control of a quarter-turn valve. The model number—55 or 85—is the actuator size, and designates the effective pressure area in square inches of the spring-loaded diaphragm. The spring action may be spring-to-close or spring-to-open, and is reversible without additional parts.

A choice of three spring ranges is available—20, 35, or 60 psi (140, 240, or 420 kPa). A lockable model of the actuator is available. Operation of the lockable model is described in the *Lockable Model* section.

### 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 20, 35, or 60 psi (140, 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 12 ± 2 foot pounds (16 ± 3 Nm) for the Model 55, or to 18 ± 2 foot pounds (24 ± 3 Nm) for the Model 85.

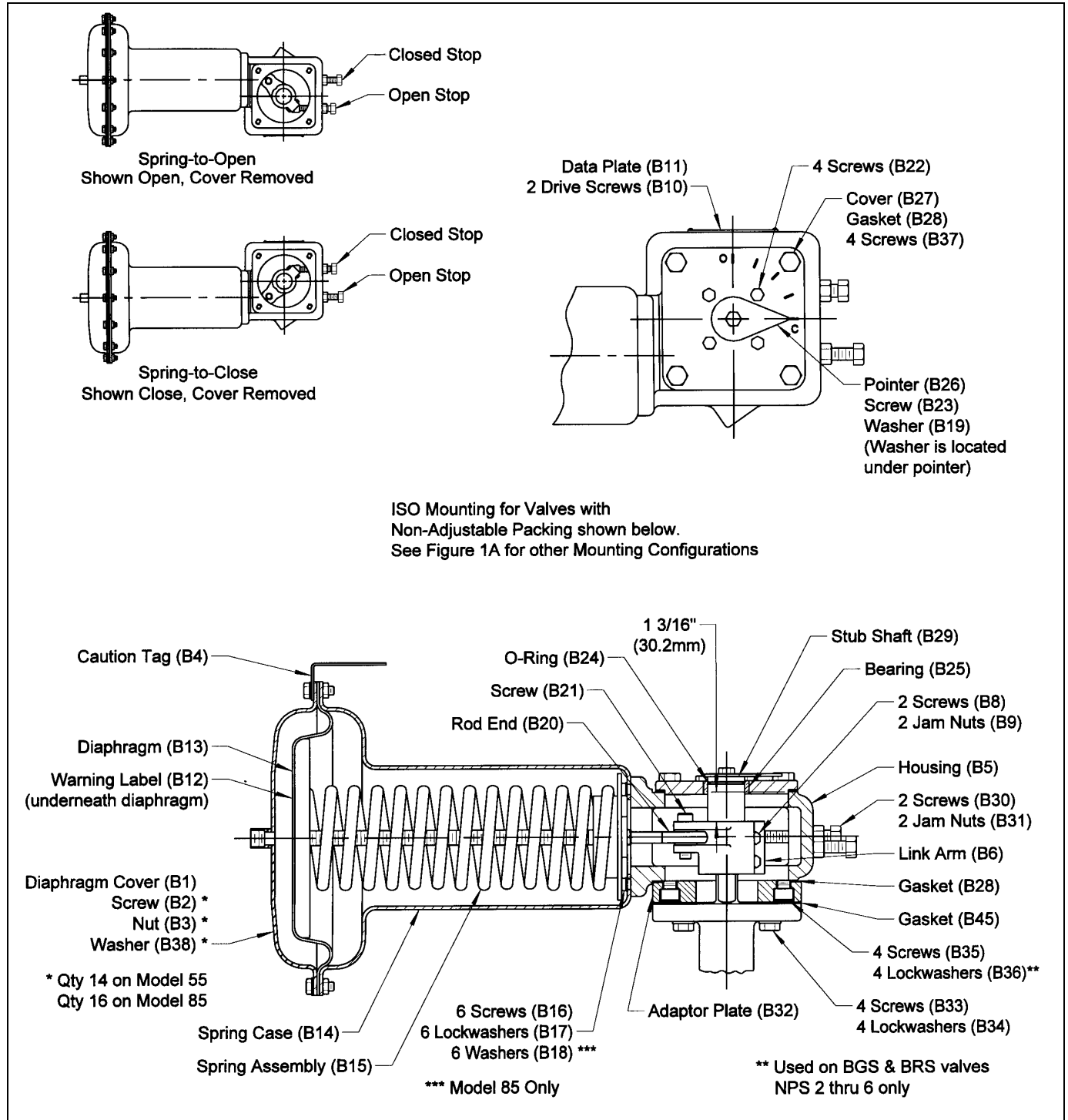
### Operation

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 55 and 85 Rotary Diaphragm Actuators

### Parts Identification *(continued)*

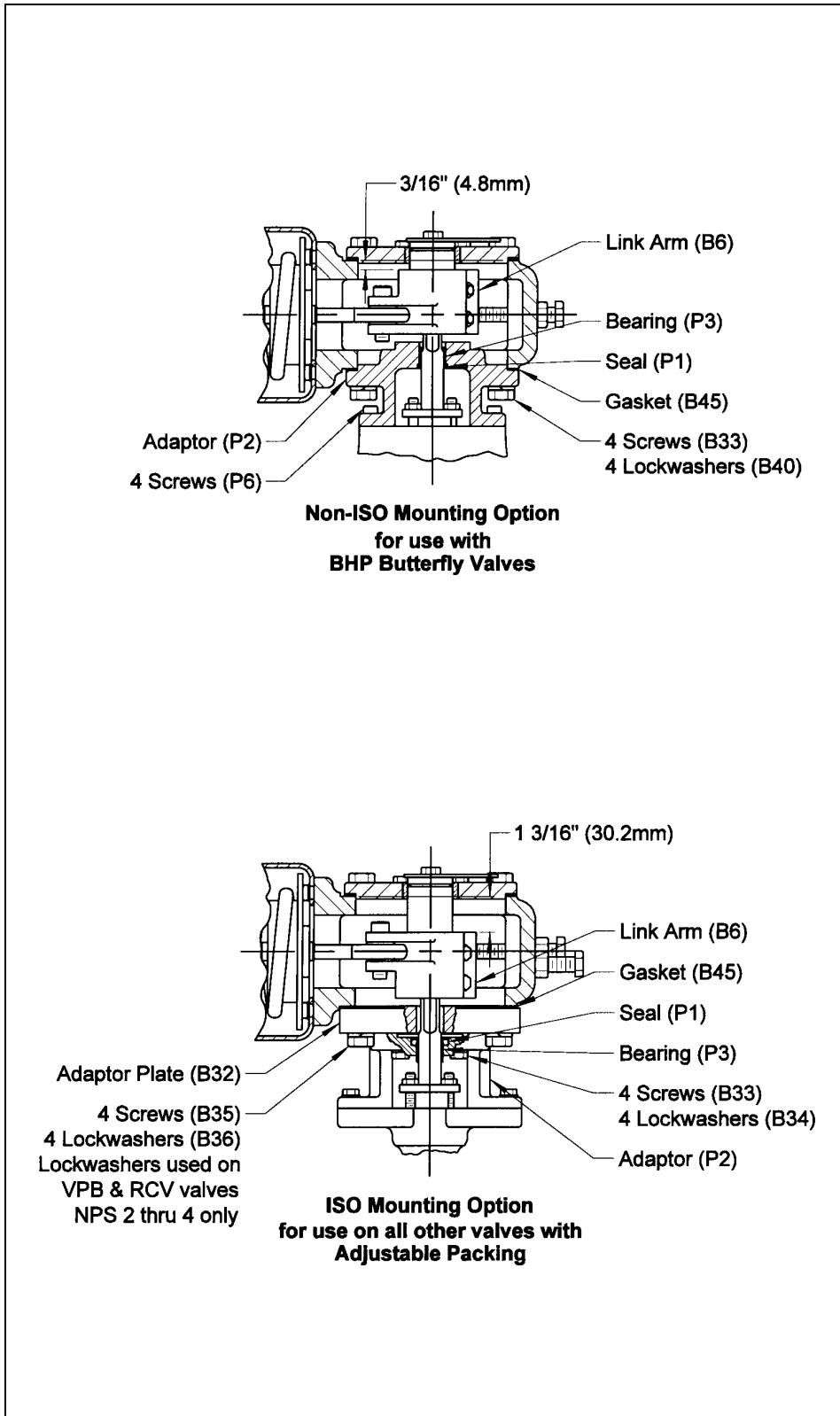


Figure 1A—Parts Identification

## **Open and Closed Position Stops**

The open and closed position stops are the two hx hd set 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 component 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  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.

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  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.
5. Relieve the air pressure to the actuator.

### Removing Actuator from Valve

Refer to Figure 1 and 1A for component 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.**

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2. Disconnect and lock out the pneumatic power to the actuator to prevent accidental operation of the actuator.



#### **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.**

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3. Remove the pointer screw (B23), pointer (B26), and washer (B19) from the actuator.
4. Apply about 10 psi (70 kPa) air pressure to the actuator, and remove the four top cover screws (B37) and the top cover (B27). Removal or replacement of the top cover without pressure on the actuator is very difficult, and could cause damage to the actuator or valve.
5. Remove the shoulder screw (B21) from the link arm (B6).
6. Relieve the air pressure to the actuator, and disconnect the actuator piping.
7. Remove the four actuator mounting screws (B33), and remove the actuator.
8. Loosen the two link arm screws (B8) and remove the link arm (B6) from the valve.

### Replacing Actuator on Valve

Refer to Figure 1 and 1A for component identification.

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 link arm (B6) with the valve shaft key and the valve shaft (the key is not used with a square or double-D valve shaft) and slide the link arm onto the shaft.
4. Fasten the actuator to the mounting surface with the four mounting screws (B35 on HPI Valves; B33 on others) and washers (B36 on HPI Valves, B40 on others). If the screws do not include washers, apply Loctite 242 to the threads. Tighten the screws as shown in Table A.



**Replacing Actuator on Valve** *(continued)***Table A: Torque Requirements for Actuator Mounting Screws**

<b>Screw Size</b>	<b>Carbon Steel</b>		<b>Stainless Steel</b>	
	<b>Foot Pounds</b>	<b>Newton Meters</b>	<b>Foot Pounds</b>	<b>Newton Meters</b>
3/8-16	26 ± 3	35 ± 4	15 ± 2	20 ± 3
1/2-13	63 ± 8	85 ± 11	38 ± 5	52 ± 7
M8 X 1.25	23 ± 3	31 ± 4	16 ± 2	22 ± 3
M12 X 1.75	83 ± 10	113 ± 14	58 ± 8	79 ± 11

5. If an adaptor is used for item 32, position the link arm (B6) 3/16" (4.8 mm) below the top of the actuator as shown in Figure 1; if a plate is used for item 32, or if the actuator mounts directly on the valve without item 32, position the link arm 1-3/16" (30.2 mm) below the top of the actuator as shown in Detail "A" of Figure 1.
6. Connect the actuator piping. Apply air pressure so that the rod end (B20) is aligned between the holes in the link arm (B6). Apply Loctite 242 to the threads of screw (B21), and connect the rod end to the link arm. Tighten the screw to 35 ± 5 foot pounds (47 ± 7 Nm).
7. Apply air pressure so that the link arm (B6) just touches the stop screw (B30), and turn the stub shaft (B29) so that the tapped holes in the end of the stub shaft align with the link arm (B6) as shown in Figure 1. Tighten the two link arm screws (B8) to 38 ± 5 foot pounds (52 ± 7 Nm).
8. Position the O-ring (B24) in the groove in the stub shaft (B29), and mount the gasket (B28) and cover (B27) to the actuator with the four screws (B33 on BHP Valves; B37 on others) and washers (B40). Tighten the screws to 63 ± 8 foot pounds (85 ± 11 Nm) if carbon steel, or to 38 ± 5 foot pounds (52 ± 7 Nm) if stainless steel.
9. Relieve the air pressure to the actuator. Mount the pointer (B26) to the stub shaft (B29) with the screw (B23) and washer (B19) under the pointer. Tighten the screw to 63 ± 8 foot pounds (85 ± 11 Nm) if carbon steel, or to 38 ± 5 foot pounds (52 ± 7 Nm) if stainless steel.
10. Re-mount any accessories that were removed, and connect all pneumatic and electrical connections.
11. 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.

### Spring Assembly Replacement

Refer to Figure 1 for parts identification.



#### **DANGER!**

**This actuator includes a compressed spring. Death or serious injury can result if the spring cover is removed incorrectly.**

**FOLLOW THE INSTRUCTIONS CAREFULLY TO ENSURE SAFETY!**

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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.**

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2. Disconnect and lock out the pneumatic power to the actuator to prevent accidental operation of the actuator.



#### **WARNING!**

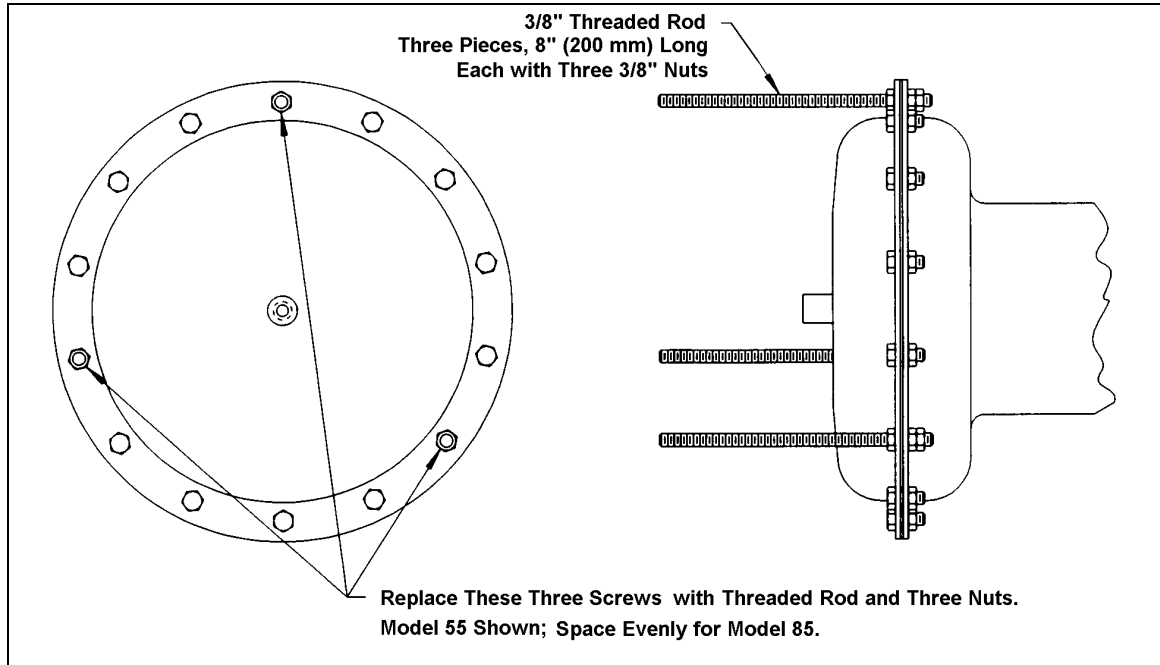
**Moving parts from unexpected operation of a powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to the actuator before servicing.**

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3. Remove the screw (B23), pointer (B26), and washer (B19).
4. Apply about 10 psi (70 kPa) air pressure to the actuator, and remove the four top cover screws (B33 on BHP Valves; B37 on others) and the top cover (B27). Removal or replacement of the top cover without pressure on the actuator is very difficult, and could cause damage to the actuator or valve.
5. Remove the shoulder screw (B21) from the link arm (B6).
6. Relieve the air pressure to the actuator, and disconnect the actuator piping.

## Spring Assembly Replacement *(continued)*

- Remove three screws (B2), nuts (B3), and washers (B38) from the diaphragm cover (B1). The three screws removed must be equally spaced as shown in Figure 2.



**Figure 2—Stud Requirements For Diaphragm Cover Removal**

- Obtain three 3/8" diameter threaded rods, each at least 8" (200 mm) long, and nine 3/8" nuts. As shown in Figure 2, assemble one rod and three nuts in each of the holes from which the screws were removed in the previous step. Jam the double nuts together by tightening to  $26 \pm 3$  foot pounds ( $35 \pm 4$  Nm); tighten the single nuts finger tight against the cover.
- Remove the remaining screws (B2), nuts (B3), and washers (B38) from the diaphragm cover (B1).
- 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.
- Remove the rubber diaphragm (B13) from the spring case (B14).
- Remove the spring assembly (B15) from the spring case (B14). Do not disassemble the spring assembly.



**DANGER!**

**The spring assembly includes a compressed spring. Death or serious injury can result if the spring is disassembled. DO NOT DISASSEMBLE THE SPRING ASSEMBLY!**

- Remove the rod end (B20) from the old spring assembly and screw the rod end into the new spring assembly so that about 1/4" (6 mm) of threads remain showing.

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## DR 55 and 85 Rotary Diaphragm Actuators

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### Spring Assembly Replacement *(continued)*

14. Slide the new spring assembly (B15) into the spring case (B14) so that the two pins in the spring fit into the two holes in the housing (B5).
15. 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 (B38) 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  $12 \pm 2$  foot pounds ( $16 \pm 3$  Nm) for the Model 55, or  $18 \pm 2$  foot pounds ( $24 \pm 3$  Nm) for the Model 85.
16. Connect the actuator piping. Apply air pressure so that the rod end (B20) is aligned between the holes in the link arm (B6). Apply Loctite 242 to the threads of screw (B21), and connect the rod end to the link arm. Tighten the screw to  $35 \pm 5$  foot pounds ( $47 \pm 7$  Nm).
17. Position the O-ring (B24) in the groove in the stub shaft (B29), and mount the gasket (B28) and cover (B27) to the actuator with the four screws (B33 on BHP Valves; B37 on others) and washers (B40). Tighten the screws to  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.
18. Relieve the air pressure to the actuator. Mount the pointer (B26) to the stub shaft (B29) with the screw (B23) and washer (B19) under the pointer. Tighten the screw to  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.
19. Re-connect all pneumatic and electrical connections.
20. 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

The diaphragm may be replaced by following steps 1 through 11 for disassembly, and then following steps 15 through 20 in the Spring Assembly Replacement section.

## Reversing the Diaphragm Action

Refer to Figure 1 and Figure 1A 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.**

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2. Disconnect and lock out the pneumatic power to the actuator to prevent accidental operation of the actuator.

**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.**

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3. Remove the pointer screw (B23), pointer (B26), and washer (B19) from the actuator.
4. Apply about 10 psi (70 kPa) air pressure to the actuator, and remove the four top cover screws (B33) and the top cover (B27). Removal or replacement of the top cover without pressure on the actuator is very difficult, and could cause damage to the actuator or valve.
5. Remove the shoulder screw (B21) from the link arm (B6).
6. Relieve the air pressure to the actuator, and disconnect the actuator piping.
7. Remove the four actuator mounting screws (B35 on HPI Valves; B33 on others) and washers (B40), and remove the actuator.
8. Loosen the two link arm screws (B8) and remove the stub shaft (B29) from the link arm (B6); remove the link arm from the valve shaft, and replace the link arm on the valve shaft in the appropriate position as shown in Figure 1.
9. Turn the actuator upside down, and re-mount the actuator to the adaptor with the same screws (B35 on HPI Valve; B33 on others) and washers (B40). If the screws do not include washers, apply Loctite 242 to the threads. Tighten the screws as shown in Table A.
10. If an adaptor is used for item 32, position the link arm (B6) 3/16" (4.8 mm) below the top of the actuator as shown in Figure 1; if a plate is used for item 32, or if the actuator mounts directly on the valve without item 32, position the link arm 1-3/16" (30.2 mm) below the top of the actuator as shown in Detail "A" of Figure 1.
11. Connect the actuator piping. Apply air pressure so that the rod end (B20) is aligned between the holes in the link arm (B6). Apply Loctite 242 to the threads of screw (B21), and connect the rod end to the link arm. Tighten the screw to 35 ± 5 foot pounds (47 ± 7 Nm).

### Reversing the Diaphragm Action *(continued)*

12. Apply air pressure so that the link arm (B6) just contacts the stop screw (B30), and turn the stub shaft (B29) so that the tapped holes in the end of the stub shaft align with the link arm (B6) as shown in Figure 1. Tighten the two link arm screws (B8) to  $35 \pm 5$  foot pounds ( $47 \pm 7$  Nm).
13. Position the O-ring (B24) in the groove in the stub shaft (B29), and mount the gasket (B28) and cover (B27) to the actuator with the four screws (B33 on BHP Valves; B37 on others) and washers (B40). Tighten the screws to  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.
14. Relieve the air pressure to the actuator. Mount the pointer (B26) to the stub shaft (B29) with the screw (B23) and washer (B19) under the pointer. Tighten the screw to  $63 \pm 8$  foot pounds ( $85 \pm 11$  Nm) if carbon steel, or to  $38 \pm 5$  foot pounds ( $52 \pm 7$  Nm) if stainless steel.
15. Re-mount any accessories that were removed, and connect all pneumatic and electrical connections.
16. 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. Refer to the Valve Assembly Drawing to determine the valve shaft configuration—square, keyed, or double-D (two flats)—and follow the appropriate steps below.

#### ***For Actuator on Valve with Square Shaft or Keyed Shaft***

The actuator may be mounted on the valve in any of four mounting positions—standard,  $90^\circ$ ,  $180^\circ$ , or  $270^\circ$ —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.

#### ***For Actuator on Valve with Double-D Shaft***

The actuator may be mounted  $180^\circ$  from the original position with existing components. To change the original position by  $180^\circ$ , follow the steps in the Removing Actuator from Valve section and the Replacing Actuator on Valve section.

The actuator may be mounted  $90^\circ$  or  $270^\circ$  from the original position with a new alternative link arm (B6). Obtain the link arm, and follow the steps in the Reversing the Diaphragm Action section, except: In step 9, use the new link arm, and in step 10, do not turn the actuator upside down.

## **Lockable Model**

The DR 55 and 85 Rotary Diaphragm Actuators are each 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 3, 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 (B64), jam nut (B65), and lockout cover assembly (B60).
- 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 (B64), jam nut (B65), and lockout cover assembly (B60).
- 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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## DR 55 and 85 Rotary Diaphragm Actuators

### Lockable Model *(continued)*

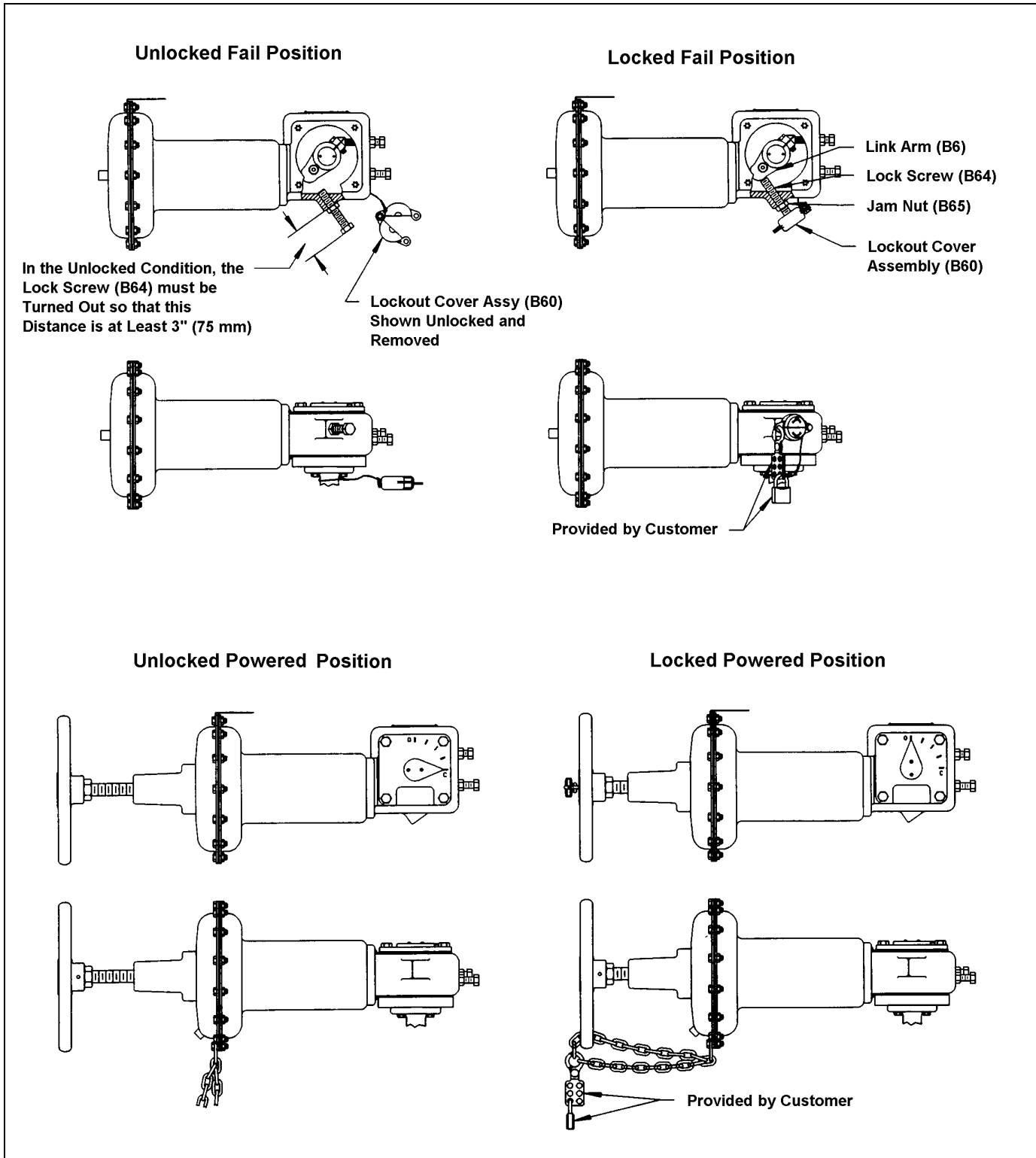


Figure 3—Lockable Model, Component Identification



## **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 (B64) and jam nut (B65) as shown in Figure 3. In the unlocked position, the lock screw must be turned counterclockwise until the distance from the housing to the end of the lock screw is at least 3" (76 mm). To hold the lock screw in position, tighten the jam nut to  $77 \pm 10$  foot pounds ( $104 \pm 14$  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 3 for component 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 (B64) from turning, and loosen the jam nut (B65) 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 link arm (B6) 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 cover. While holding the lock screw from turning, tighten the jam nut to  $77 \pm 10$  foot pounds ( $140 \pm 14$  Nm).
5. Place and lock the lockout cover assembly (B60) 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 3 for component 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. Turn the handwheel clockwise several turns until resistance is felt, and apply torque so that the mechanism firmly contacts the inside the actuator.
3. Place and lock the chain between the spokes in the handwheel so that the chain will prevent the handwheel from being turned counterclockwise.

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## DR 55 and 85 Rotary Diaphragm Actuators

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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 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.