DRESSER Masoneilan

Instructions
EM39003
09/00

39003 Series

High Performance Butterfly Valves (HPBV)

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1.1 Valve Description

The Masoneilan 39003 Series High Performance Butterfly Valve (HPBV) is designed for ANSI Class 150, 300 and 600 piping systems and is available in both Wafer and Lug style body designs. The standard size range available is as follows:

ANSI Class 150 ..... 2” through 48”
ANSI Class 300 ..... 2” through 30”
ANSI Class 600 ..... 2” through 16”

1.2 Valve Design Features

- Masoneilan’s HPBVs feature a double offset (or double eccentric) shaft design to minimize seat abrasion and lower torque. This double offset design allows the disc to lift off and “cam” away from the seat as it rotates open.
- The 39003 Series valve always rotates clockwise to close (when viewed from above) and counterclockwise to open.
- The valve body has an overtravel stop which prevents the disc from over rotating into the wrong quadrant. This stop is not to be used as a disc position stop; if the disc contacts the overtravel stop, this means it has rotated beyond the seat.
- The 39003 Series valve is bi-directional, but the preferred installation position is with the seat in the upstream position (SUS). Note the arrow on the metal tag attached to the valve body for preferred direction of flow.

1.3 Flange Compatibility

The 39003 Series valve is designed to fit between flanges as follows:

ANSI Class 150 ..... 2” through 24”
MSS SP-44 Class 150 ..... 30” through 48”
ANSI Class 300 ..... 2” through 24”
MSS SP-44 Class 300 ..... 30”
ANSI Class 600 ..... 2” through 16”

1.4 Gasket Compatibility

The 39003 Series valve is designed to accommodate the use of standard fiber gaskets (such as non-asbestos, flexible graphite, asbestos or equivalent gasket materials) of 1/16” or less, meeting the dimensional requirements of ANSI/ASME B16.21. Thick elastomeric gaskets are not recommended. Metallic wound (Flexitallic) gaskets may be used with the wedge ring retainer configuration.

1.5 Pipe Schedule Compatibility

The 39003 Series valve is designed to allow the disc edge to rotate into the open position without interference with pipe of a schedule equal to or lighter to those shown below:

Size	ANSI 150	ANSI 300	ANSI 600
2” – 12”	SCH 80	SCH 80	SCH 120
14” – 24”	SCH 40	SCH 80	SCH 120
30”	SCH 30	SCH 80	
36” – 42”	STD WT		
48”	XS		

1.6 Numbering System

1st	2nd
3	3

Actuator Type

33 Spring Diaphragm (Air to extend action only with or without auxilliary handwheel)

1st	2nd	3rd	4th	5th
3	9			3

Body Series

39

Actuator Mounting

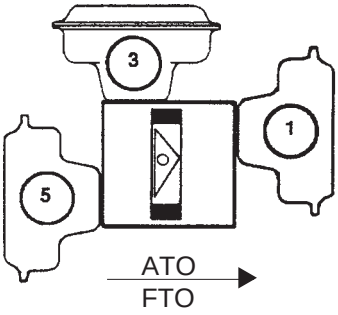
0. Undefined
1. Horizontal above center. Valve opens on stem extension (air-to-open action)
2. Horizontal above center. Valve closes on stem extension (air-to-close action)
*3. Vertical above center. Valve opens on stem extension (air-to-open action)
*4. Vertical above center. Valve closes on stem extension (air-to-close action)
5. Horizontal below center. Valve opens on stem extension (air-to-open action)
6. Horizontal below center. Valve closes on stem extension (air-to-close action)
7. Vertical above center. Valve opens on stem extension (air-to-open action)
8. Vertical above center. Valve closes on stem extension (air-to-close action)

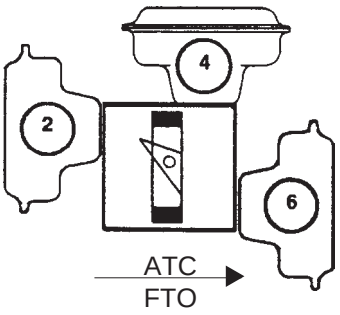
Seal Type

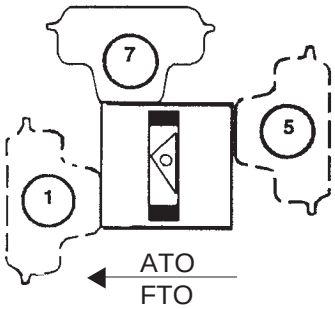
1. PTFE or RTFE Seal Ring
2. Inconel Seal Ring
3. Fire-Safe Seal Ring

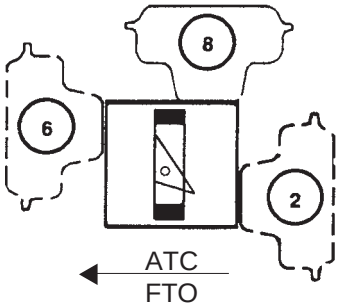
Design Series

3









*Standard Actuator Mounting Arrangement

Note 1: Looking at valve from actuator and bracket end, valve would not be visible.

Note 2: Positions 1, 2, 5 and 6 shown dotted and obtained by rotating the valve 180° about its shaft axis.

Caution: The valve must not be installed with the actuator mounted vertically below center.

Figure 1

1st	2nd
3	4

-

1st	2nd	3rd	4th	5th
3	9			3

Actuator Type		Body Series	Actuator Mounting	Seal Type	Design Series
34	Double acting or spring return piston actuator	39	0. Undefined *1. Parallel to pipe. Air to open action. *2. Parallel to pipe. Air to close action. 3. Perpendicular to pipe. Air to open action. 4. Perpendicular to pipe. Air to close action. 5. Parallel to pipe. Air to open action. 6. Parallel to pipe. Air to close action. 7. Perpendicular to pipe. Air to open action. 8. Perpendicular to pipe. Air to close action.	1. PTFE or RTFE Seal Ring 2. Inconel Seal Ring 3. Fire-Safe Seal Ring	3

*Standard Actuator Mounting Arrangement

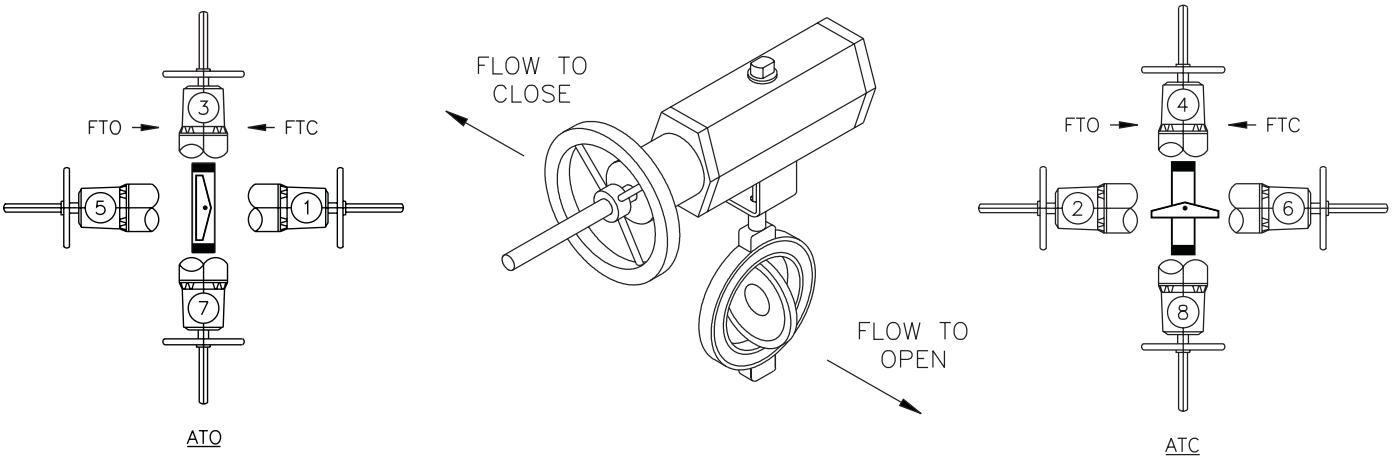


Figure 2

1.7 Operating Pressures

All Masoneilan HPBVs may be applied to full ANSI ratings. However, different materials of construction may affect the rated pressure. The shut-off pressure rating is determined by the valve shaft and disc materials as well as the seat design, and is reflected on the metal identification tag attached to the valve.

1.8 Seat Alternatives

Masoneilan HPBVs have three alternatives, all of which are bi-directional.

Soft Seats provide tight shut-off to zero leakage specifications. Standard Soft Seat material includes virgin TFE or reinforced TFE (RTFE).

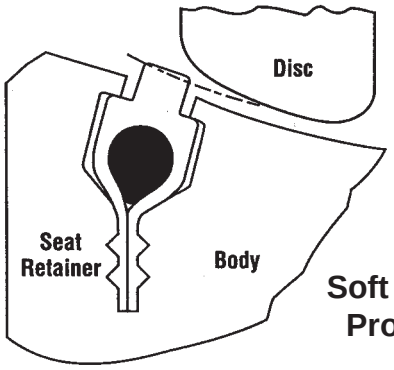


Figure 3

Fire-Safe Seats are designed for critical piping applications in installations such as Refinery and Petrochemical Plants. These seats are a combination of both metal and soft seats with the metal seat being designed to function during and after a fire. Valves of this type are referred to as "Fire-Safe" and are tested to meet API 607 "Fire-Safe" specifications and operation criteria.

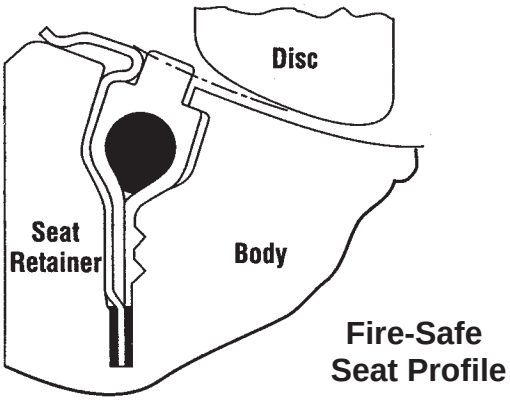


Figure 4

Metal Seats are well suited for higher temperature applications and provide shut-off to ANSI B16.104 Class IV.

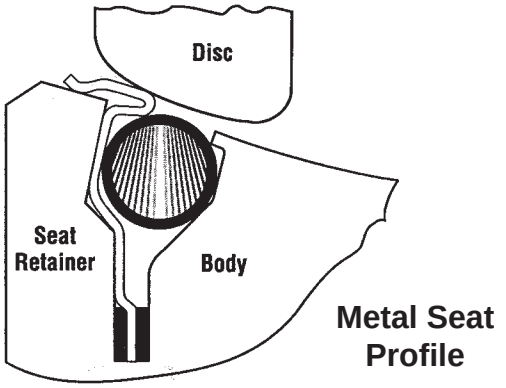


Figure 5

1.9 Offset Disc Design

All Masoneilan HPBVs have both off-set discs and eccentric shafts. The off-set is applicable to the disc edge seating surface relative to the shaft center line. By off-setting the seating surface from the rotational center line, a contact with the seat is possible throughout the 360° circumference. The shaft is eccentric in the body by 0.060 inches and this enhances seat life by imparting a camming action to the disc as it rotates both in and out of the seat. Seat wear points are eliminated at the top and bottom of the disc and operating torque is reduced.

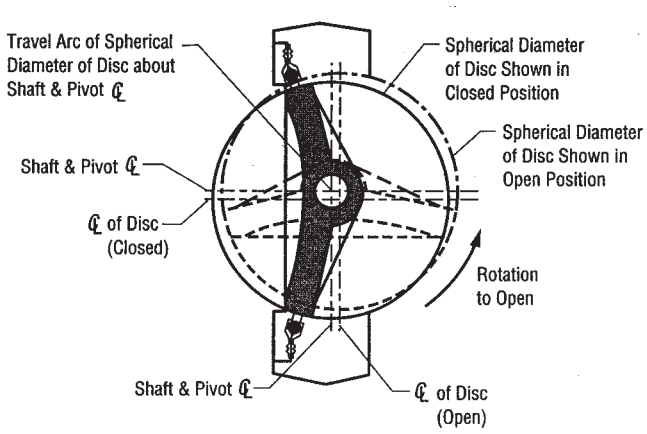


Figure 6

1.10 Seat Retainer Alternatives

Masoneilan HPBVs are designed to be easily maintained and, in particular, to allow rapid and simple replacement of the seat. The seat is held in the valve body by a seat retainer which, when assembled, becomes part of the raised face flange mating surface. Two types of seat retainer fastening designs are used in Masoneilan HPBVs.

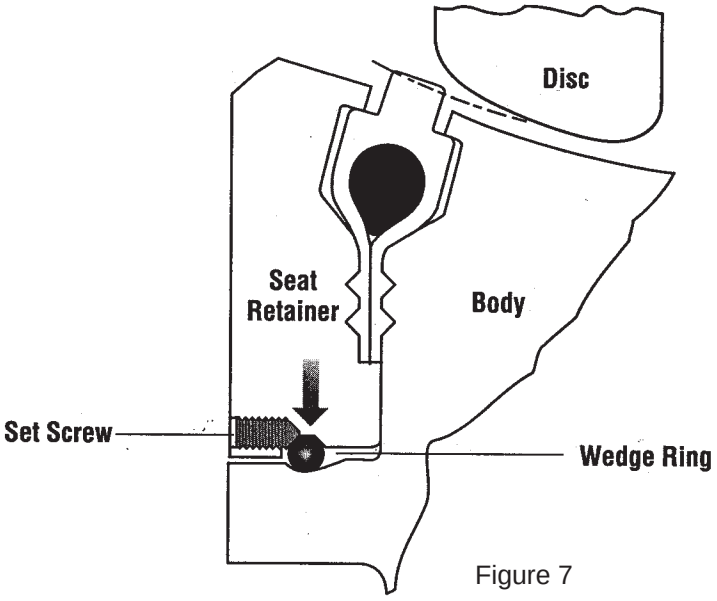


Figure 7

Wedge Ring Retainer

(A wedge ring is forced outward into a groove machined in the body by the insertion of set screws in the face of the retainer.)

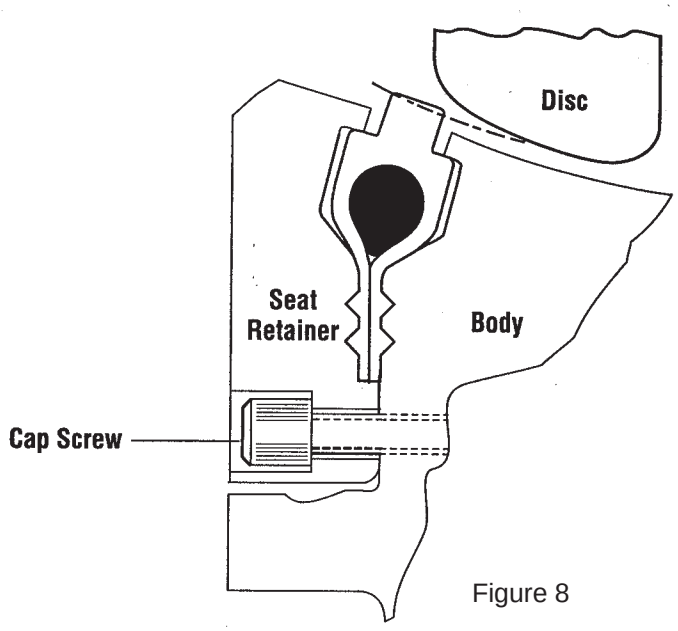


Figure 8

Cap Screw Retainer

(The retainer is held to the valve body by cap screws recessed in the retainer face.)

2.1 Valve Ratings

Masoneilan HPBVs are intended for use at the pressure and temperatures indicated on the metal nameplate attached to each individual valve. Check the valve operating temperature and pressure ratings on the valve nameplate before proceeding with installation.

2.2 Seat Upstream vs. Seat Downstream

Although all Masoneilan seat designs are completely bi-directional, every effort should be made to install the valve with pressure and flow from the seat side of the valve (seat upstream). Positive shutoff will be achieved with the valve in either orientation. However, installation with the seat in the upstream position will result in longer service life and lower torque values.

2.3 Disc Clearances

Prior to installing the valve, it is important to make sure the ID of the pipe and pipe flanges is large enough to allow the disc edge to swing into the opening without interference. Damage to the disc edge can severely affect the performance of the valve. Pipe schedule compatibility for Masoneilan valves is shown in Section 1.5 of this manual.

2.4 Opening Rotation

The Masoneilan valve is designed to open with counterclockwise rotation of the shaft, and to close with clockwise rotation of the shaft when viewed from above with the shaft in the vertical position. An overtravel stop is provided in the body to prevent overtravel of the disc in the wrong direction. This stop is not to be used as a disc position stop. Contact with this stop means the disc has travelled past the seat.

2.5 Installation Position

To prevent damage during installation, the valve disc must be fully closed before installing the valve in the line. It is preferable to install HPBVs with the shaft horizontal. This is important for valves applied to fluids which contain particulates. For HPBVs 16” and larger, installation should always be made with the shaft in the horizontal position.

2.6 Valve and Flange Preparation

If the valve and mating pipe are properly prepared for installation, future problems can be avoided. All valve and pipe flange faces should be free of dirt, grit, indentations, or surface irregularities which may disrupt flange sealing and cause external leakage. The valve seat and disc sealing surface should also be inspected to eliminate any dirt or foreign material that will adversely affect the operation of the valve.

2.7 Installation Tools

The only tool required in the installation of a Masoneilan HPBV is a wrench suitable for tightening the flange bolts and/or nuts required to secure the valve in-line. A hoist may be required for handling valves 10” and larger. Smaller sized valves can usually be installed by hand. Temporary pipe supports may be used to keep mating flange faces parallel in order to aid in valve installation.

2.8 Required Bolting

The tables outlined on the following pages are furnished to provide information regarding the size, type, and quantity of bolting recommended for the installation of Masoneilan HPBVs. These tables are intended for use as a planning and procurement guide. All recommendations are based on pipe flanges in accordance with ANSI B16.5 for 2” through 24” valves and ANSI B16.47 Class A for valves 30” and larger. Flange bolting is not included with the valve shipment.

2.9 Unpacking and Storage Instructions

1. Check the packing list against the valve received to verify that the size, material, and trim are correct.
2. Check to make sure that the valve and operator were not damaged during shipment.
3. When lifting the valve, take care to avoid damage to the flange faces, disc sealing edge, or operator. On larger valves, lifting holes are provided on the periphery of the valve body to aid in valve handling.
4. If the valve is to be stored before being installed, it should be protected from harsh environmental conditions.
5. Store the valve with the disc in the closed position to protect the sealing edge and the seat.

6. Keep the valve in a clean location, away from dirt, debris and corrosive materials.
7. Keep the valve in a dry area with the flange protectors attached and on a suitable skid or pallet.
8. Keep the valve in a cool location if possible, out of direct sunlight.

2.10 Pre-Installation Procedure

1. Remove the protective flange covers from the valve.
2. Inspect the valve to be certain the waterway is free from dirt and foreign matter. Be certain the adjoining pipeline is free from any foreign material such as rust and pipe scale or welding slag that could damage the seat and disc sealing surfaces.
3. Actuators should be mounted on the valve prior to installation to facilitate proper alignment of the disc in the valve seat.
4. The valve should be in the **closed position**. Make sure the open and closed positions of the actuator correspond to the counterclockwise to open direction of rotation of the valve.
5. Cycle the valve to the fully open position, then back to the fully closed position, checking the actuator travel stop settings for proper disc alignment.
6. Check the valve identification tag for valve class, materials, and operating pressure to be sure they are correct for the application.

   WARNING! Personal injury or property damage may result if the valve is installed where service conditions could exceed the valve ratings.

7. Check the flange bolts or studs for proper size, threading and length.

2.11 Valve Installation Procedure

The Masoneilan 39003 Series High Performance Butterfly Valve can be installed in the pipeline with the shaft in the vertical, horizontal, or other intermediate position. Based on applications experience, however, in media with concentrations of solid or abrasive particles or media subject to solidification buildup, valve performance and service life will be enhanced by mounting the valve with the shaft in the horizontal position.

All Masoneilan valves are bi-directional and can be mounted in the pipeline in either flow direction; however, the preferred flow direction for all seat styles and materials is with the seat retainer ring located upstream to provide maximum seat protection.

1. **For Wafer Style Valves:**
   - **A.** Loosely install the lower flange bolts to form a cradle between the flanges. (See Figure 9.)
   - **B.** Noting the flow direction arrow on the tag, place the valve and flange gaskets between the flanges, making sure the arrow on the tag points in the direction of the flow.
   - **C.** Install the remaining flange bolts, shifting the valves as necessary to permit the bolts to pass by or through the valve body.

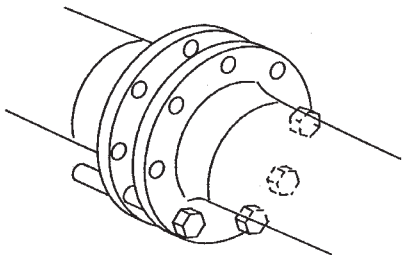


Figure 9

For Lug Style Valves:

- **A.** Noting the flow direction arrow on the tag, place the valve between the flanges, making sure the arrow on the tag points in the direction of the flow.
- **B.** Install the lower flange bolts loosely, leaving space for the flange gaskets.
- **C.** After inserting the flange gaskets, install the remaining bolts.

2. Using the sequence shown in Figure 10 tighten the flange bolts evenly to assure uniform gasket compression.

CAUTION! The valve should be centered between the flanges and gaskets to prevent damage to the disc edge and shaft as a result of the disc striking the flange, gasket, or pipe.

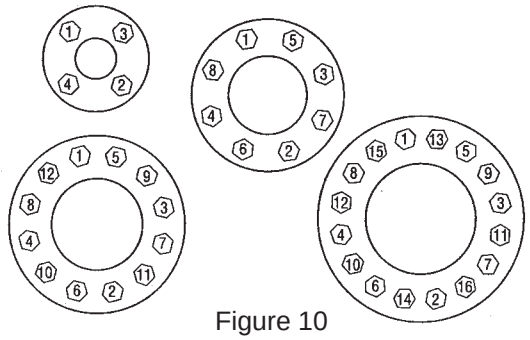


Figure 10

3. If an actuator is to be used, air hoses or electricity should be connected to the unit as specified.
4. The valve is now ready for operation.

Remember: Install the valve with the disc in the FULL CLOSED POSITION.

2.12 Actuator Installation

1. Actuator Air Piping

The Model 33 actuator used with the High Performance Butterfly Valve is designed to accept 1/4" NPT air supply piping. Use 1/4" OD tubing or equivalent for all air lines. If the air line exceeds 25 ft. in length, or the valve is equipped with volume boosters, 3/8" tubing is preferred. All connections must be free of leaks.

Caution: Do not exceed loading pressure indicated on a warning tag located on the upper diaphragm case.

2. Changing Actuator Position

For each valve action, air to open or air to close, the actuator and bracket may be mounted in any one of four recommended positions (see Figure 1). Actuator position is usually determined by adjacent piping, obstacles of various types or piping arrangements. Valves may be rotated 180° around the axis of the shaft, if necessary. In such a case, no disassembly is required, other than repositioning gauges so they are not upside down. (However, note caution in Figure 1). Note also that the preferred flow direction is reversed. If it becomes necessary to rotate the actuator position 90°, partial disassembly is required. Depending on whether the valve is or is not equipped with a handwheel, select the appropriate section in this instruction and proceed.

3. Changing Actuator Action

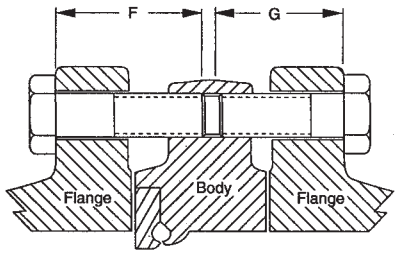
For the positions shown in Figure 1, the valve action is air to open or air to close. In both cases the actuator stem extends with admission of air to the actuator. Changing valve action requires partial disassembly in repositioning the actuator to the other hole in the bracket and reorientation of linkage. Refer to Figures 19 and 20. If the valve is equipped with a handwheel, it must be repositioned to the opposite side of the bracket.

Note: The handwheel is always installed so it operates against the actuator spring force. The handwheel is always located on the same side of the bracket as the actuator (see Figures 19 and 20). Depending on whether the valve is or is not equipped with a handwheel, select the appropriate section on disassembly and proceed.

2.13 Bolting Dimensions

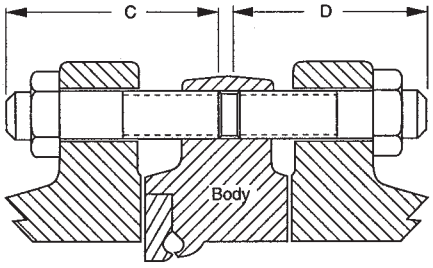
LUG BODY

HEX HEAD MACHINE BOLTS



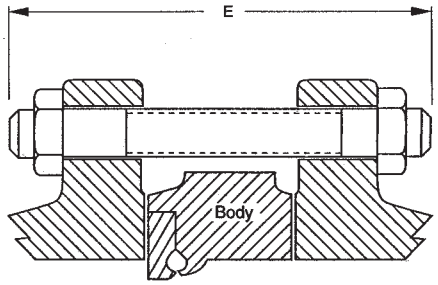
LUG BODY

STUDS & NUTS



WAFER BODY

STUDS & NUTS



Class 150 2" – 24" Class 150 30" – 48"												
			Lug Valves								Wafer Valves	
			Studs & Nuts				Machine Bolts				Studs & Nuts	
Valve Size	Valve Series	Thread Size	Qty C	Length C	Qty D	Length D	Qty F	Length F	Qty G	Length G	Qty E	Length E
2"	G	5/8-11	4	2.50	4	2.50	4	1.63	4	1.63	4	5.50
3"	G	5/8-11	4	3.25	4	2.50	4	2.25	4	1.63	4	6.00
4"	G	5/8-11	8	3.00	8	2.75	8	2.12	8	1.88	8	6.00
6"	G	3/4-10	8	3.50	8	3.00	8	2.50	8	1.88	8	6.50
8"	G	3/4-10	8	3.75	8	3.25	8	2.70	8	2.13	8	7.00
10"	G	7/8-9	12	4.25	12	3.50	12	3.00	12	2.25	12	7.50
12"	G	7/8-9	12	4.75	12	3.50	12	3.45	12	2.35	12	8.50
14"	G	1-8	12	5.00	12	4.00	12	3.75	12	2.70	12	9.50
16"	G	1-8	16	5.50	16	4.25	16	4.12	16	2.75	16	10.00
18"	G	1 1/8-8	16	5.75	16	4.75	16	4.38	16	3.25	16	11.00
20"	G	1 1/8-8	16	6.75	16	4.75	16	5.12	16	3.25	16	11.50
	G	1 1/8-8	4**	5.50	4**	4.75	4**	4.12	4**	3.25	4**	5.50
24"	G	1 1/8-8	20	7.25	20	5.75	20	5.63	20	4.25	20	13.00
30"	H	1 1/4-8	24	7.75	24	7.75	24	6.25	24	6.25	24	16.00
	H	1 1/4-8	4**	6.50	4**	6.25	4**	5.00	4**	4.63	4**	6.50
36"	H	1 1/2-8	28	9.50	28	9.50	28	7.75	28	7.75	28	19.50
	H	1 1/2-8	4**	7.50	4**	7.25	4**	5.75	4**	5.50	4**	7.50
42"	H	1 1/2-8	32	10.00	32	10.00	32	8.50	32	8.25	32	20.50
	H	1 1/2-8	4**	8.25	4**	7.50	4**	6.50	4**	5.75	4**	8.25
48"	H	1 1/2-8	40	11.75	40	11.00	40	9.88	40	9.25	40	23.00
	H	1 1/2-8	4**	9.00	4**	8.25	4**	7.12	4**	6.50	4**	9.00

Length of machine bolts based on:
1. Gasket thickness of 0.06 inches.
2. Minimum flange thickness of weld neck flanges per ANSI B16.5 and B16.47 Series A.

**Variation to specified bolting length may result in improper installation.

Every effort is made to provide accurate information, but no liability for claims arising from erroneous data will be accepted by Dresser.

2.13 Bolting Dimensions (cont.)

ANSI Class 300 2" – 24" MSS SP-44 Class 300 30"																	
			Lug Valves												Wafer Valves	
			Bolt Engagement in Valve*				Studs & Nuts				Machine Bolts				Studs & Nuts	
Valve Size	Valve Series	Thread Size	Qty A	Length A	Qty B	Length B	Qty C	Length C	Qty D	Length D	Qty F	Length F	Qty G	Length G	Qty E	Length E
2"	G	5/8-11	8	.940	8	.570	8	2.25	8	2.62	8	1.50	8	2.00	8	5.25
3"	G	3/4-10	8	1.034	8	.826	8	3.00	8	3.00	8	2.12	81	2.00	8	6.00
4"	G	3/4-10	8	1.196	8	.870	8	3.50	8	3.25	8	2.50	8	2.00	8	6.50
6"	G	3/4-10	12	1.301	12	.929	12	3.75	12	3.50	12	2.75	12	2.25	12	7.00
8"	G	7/8-9	12	1.702	12	1.128	12	4.50	12	4.00	12	3.25	12	2.75	12	8.25
10"	G	1-8	16	1.867	16	1.300	16	5.00	16	4.50	16	3.25	16	3.12	14	9.25
	G	1-8	-	-	-	-	-	-	-	-		-	-	-	4**	5.00
12"	G	1 1/8-8	16	2.057	16	1.475	16	5.50	16	5.00	16	4.00	16	3.38	12	10.00
	G	1 1/8-8	-	-	-	-	-	-	-	-	-	-	-	-	8**	5.25
14"	H	1 1/8-8	16	2.442	16	2.118	16	6.00	16	5.75	16	4.62	16	4.25	16	11.50
	H	1 1/8-8	4**	1.608	4**	1.267	4**	5.25	4**	4.75	4**	3.75	4**	3.44	8**	5.25
16"	H	1 1/4-8	16	2.562	16	2.628	16	6.50	16	6.50	16	4.88	16	4.88	16	13.00
	H	1 1/4-8	4**	1.538	4**	1.588	4**	5.25	4**	5.25	4**	3.88	4**	4.25	8**	5.25
18"	H	1 1/4-8	20	2.875	20	2.890	20	7.00	20	7.00	20	5.25	20	5.25	20	14.00
	H	1 1/4-8	4**	1.675	4**	1.437	4**	5.50	4**	5.50	4**	4.00	4**	3.88	8**	5.50
20"	H	1 1/4-8	20	3.184	20	3.006	20	7.50	20	7.25	20	5.69	20	5.69	20	14.50
	H	1 1/4-8	4**	1.681	4**	1.750	4**	5.75	4**	5.50	4**	4.19	4**	4.00	8**	5.75
24"	H	1 1/2-8	20	3.560	20	3.510	20	8.25	20	8.25	20	6.31	20	6.25	20	16.50
	H	1 1/2-8	4**	1.800	4**	1.750	4**	6.25	4**	6.25	4**	4.56	4**	4.50	8**	6.25
30"	H	1 3/4-8	24	4.331	24	4.429	24	10.25	24	10.50	24	7.88	24	7.88	24	20.50
	H	1 3/4-8	4**	2.039	4**	2.071	4**	8.00	4**	8.00	4**	5.44	4**	5.47	8**	8.00

ANSI Class 600 3" – 14"																
			Lug Valves												Wafer Valves	
			Bolt Engagement in Valve*				Studs & Nuts				Machine Bolts				Studs & Nuts	
Valve Size	Valve Series	Thread Size	Qty A	Length A	Qty B	Length B	Qty C	Length C	Qty D	Length D	Qty F	Length F	Qty G	Length G	Qty E	Length E
3"	G	3/4-10	8	1.034	8	1.026	8	3.50	8	3.50	8	2.25	8	2.38	8	7.00
4"	G	7/8-9	8	1.274	8	1.165	8	3.50	8	3.25	8	2.75	8	2.75	8	7.75
6"	G	1-8	12	1.274	12	1.306	12	4.75	12	4.75	12	3.25	12	3.25	12	9.50
8"	G	1 1/8-8	12	1.794	12	1.795	12	5.75	12	5.75	12	4.12	12	4.12	12	11.50
10"	H	1 1/4-8	12	2.495	12	2.000	12	6.75	12	6.25	12	5.00	12	4.50	12	13.00
	H	1 1/4-8	4**	1.375	4**	2.000	4**	5.50	4**	6.25	4**	3.88	4**	4.50	8**	6.25
12"	H	1 1/4-8	16	2.683	16	2.697	16	7.00	16	7.00	16	5.38	16	5.38	16	14.00
	H	1 1/4-8	4**	1.325	4**	1.765	4**	5.25	4**	6.00	4**	4.00	4**	4.38	8**	6.00
14"	H	1 3/8-8	16	2.994	16	2.996	16	7.50	16	7.50	16	CF	16	CF	16	15.00
	H	1 3/8-8	4**	1.506	4**	1.869	4**	6.00	4**	6.50	4**	CF	4**	CF	8**	6.50

*Bolt lengths "A" & "B" are from face of valve body to minimum depth in lug. Flange & gasket thickness must be added to calculate minimum bolt length.

**Special length required for tapped blind holes on either side of the valve shaft at the top and bottom ends of the valve body.

3.1 Safety Precautions

Before removing the valve from the line or loosening any bolts, it is important to verify the following conditions:

1. Be sure the line is depressurized and drained.
2. Be sure of the pipeline media. Proper care should be taken for protection against toxic and/or flammable fluids.
3. Never install the valve without an Operator (Manual or Automatic) already attached to the valve shaft.
4. Never remove the Operator from the valve while the valve is in the pipeline under pressure. The eccentric valve design may allow line pressure to open the valve if the handle/actuator is not in place while the valve is under pressure.
5. Always be sure that the disc is in the full closed position before removing or installing the valve.
6. Take care in handling the valve. Personal injury or property damage may result if the valve is damaged or mishandled during maintenance operations.

3.2 General Maintenance

Normal maintenance for a Masoneilan HPBV is limited to adjustment of the shaft packing by tightening down evenly on the gland flange using the gland flange studs and nuts. Overtightening of the gland should be avoided since this will shorten the life of the packing. During commissioning, it is common for dirt and foreign objects to be left in the pipeline during construction. This debris can damage the HPBV seat or disc edge which will prevent the valve from providing tight shut-off. In such cases seat replacement may be necessary.

3.3 Packing Replacement

1. Remove the handle or actuator and the mounting hardware from the valve.
2. Remove the gland flange nuts and lockwashers.
3. Remove the gland flange and gland.
4. Replace the old packing with new packing. Correct packing selection is important. On larger valves it may be necessary to compress each stem seal into the stuffing box before adding the next one.
5. Reinstall gland, gland flange, lockwashers and nuts.
6. Tighten the gland flange nuts evenly to torque specified in Table 1.
7. Operate the disc several times.
8. Reinstall the handle or actuator and mounting hardware.
9. Set the actuator stops.

Table 1

Valve Size (in.)	Torque (in.-lb.)
2 to 8	25
10 to 12	35
14 to 20	50
24 to 30	75
36 to 48	100

3.4 End Cap Seal Replacement

(where applicable)

1. Remove the end cap bolts and lockwashers.
2. Rotate the end cap to break the seal, then pull the cap out.
3. Remove the old seal.
4. Clean the body and end cap prior to installing the new seal.
5. Slide the new seal into place, then guide the end cap into the body.
6. Align the bolt holes and reinstall the lockwashers and bolts.
7. Tighten the bolts evenly to the torque specified in Table 2.

Table 2

Valve Size (in.)	Torque (in.-lb.)
2 to 8	50
10 to 12	80
14 to 30	100

3.5 Standard Soft Seat Replacement

1. Place the valve on a bench with the seat retainer facing up. Use blocks to elevate the valve above the work surface to provide enough clearance to prevent the disc from being damaged when the valve is opened.
2. **A. Cap Screw Retainer:**
   Remove the cap screws and lift the seat retainer out of the valve.
   B. Wedge Ring Retainer:
   Unlock the retainer by removing the set screws. If difficulty is experienced in removing the retainer, open the disc approximately 20

degrees and then tap the retainer with a non metallic hammer. Lift the retainer from the body.

3. Remove the old seat from the seat retainer and discard.
4. Thoroughly clean the seat cavity in the body and the seat retainer prior to installing a new seat.
5. Carefully clean and polish the disc sealing surface with a soft cloth. The disc sealing surface should be free of all grooves and scratches.
6. Place the seat retainer on a flat surface with the seat locating area facing up.
7. Place the new preformed seat assembly (Seat and O-ring) on the seat retainer with the marked (tape) side facing down.
8. Using the balls of each thumb, press down on the seat engaging the shoulder of the seat behind the lip in the seat retainer. Stretch the seat into place by sliding each thumb around the circumference of the seat maintaining downward pressure and forcing the seat shoulder over the seat retainer lip.
9. With the disc in the closed position place the seat retainer with seat into the counterbore of the body.
   - **A. Cap Screw Retainer:**
     Apply lubricant to the cap screw threads and tighten them down uniformly.
   - **B. Wedge Ring Retainer:**
     Place the wedge ring in the groove on the outside edge of the retainer taking care to position the wedge ring gap away from any set screw. Using opposing C-clamps, pull the retainer into a position flush with body face. (The C-clamps should not block access to the set screw holes.)
10. Open the disc and relax the retainer pressure slightly to permit the seat to expand fully inward against the seat retaining lip machined in the retainer and body seat cavities. A positive “snap” action will be observed.
    - **A. Cap Screw Retainer:**
      Leaving the valve disc open, retighten the cap screws to the torques specified in Table 3.
    - **B. Wedge Ring Retainer:**
      Leaving the valve disc open, retighten the C-clamps and install the set screws. Remove the C-clamps after all screws have been tightened.
11. Operate the disc several times and inspect the seat for damage before reinstalling the valve in the pipeline.
12. Inspect the position of the disc in the closed position to determine whether the actuator stops are adjusted properly. The face of the disc should be parallel to the seat retainer face when the valve is in the fully closed position.

Table 3

Valve Size (in.)	Torque (in-lb.)
2 to 12	50
14 to 20	75
24 to 48	100

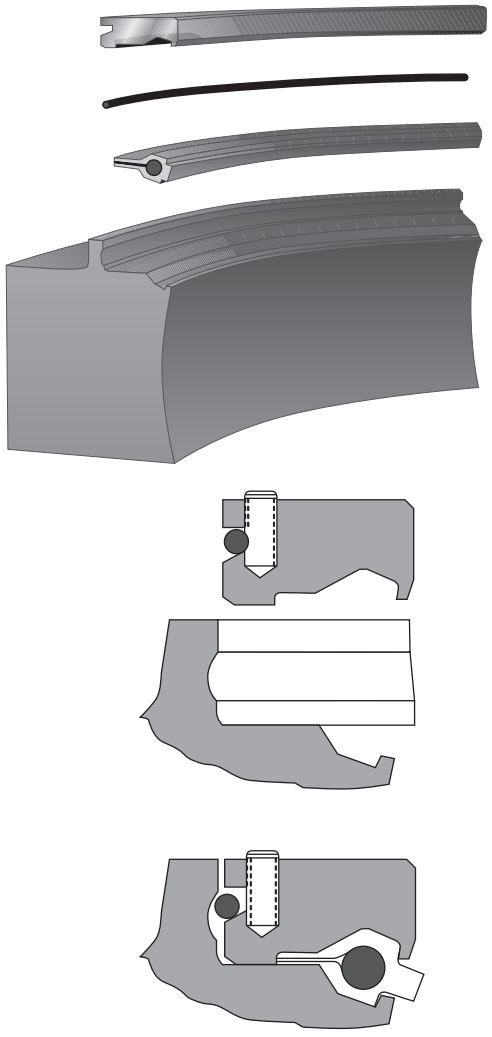


Figure 11

3.6 Fire-Safe and Metal Seat Replacement

1. Follow Steps 1 and 2 of Soft Seat Replacement instructions.
2. Remove old soft seat and graphite gaskets and discard. Clean and inspect the metal seat.
3. If metal seat is scored, bent or otherwise damaged it will require replacement.
4. Thoroughly clean the seat cavity in the body and the seat retainer prior to installing the new seat.
5. Carefully clean and polish the disc edge sealing surface with a soft cloth. The disc sealing surface should be free of all grooves and scratches.
6. A graphite gasket is required on both sides of the metal seat. Gaskets can be made from self-adhesive graphite tape as follows:
   - **A.** Suggested graphite tape size:
     2" – 12" valves – 1/2" wide
     14" – 48" valves – 1" wide
   - **B.** To install the tape, peel off 6" of backing paper at a time. Apply the tape to the metal seat covering the flat outer edge area on both sides. Overlap the two ends of the tape a minimum of 1/8 inch.

   Note: It is important that both sides have gaskets.

   - **C.** Smooth tape as much as possible by hand. Slight roughness is acceptable and will be pressed flat during final assembly. Avoid tearing tape. If a tear occurs, tape should be overlapped a minimum of 1/8 inch. Trim excess tape from outside diameter of the seat.
   - **D.** If cap screw retainer design, bolt holes in metal seat should be opened by slitting an "X" in the hole. Do not attempt to cut round holes.
7. For Fire-Safe valves, place the preformed seat assembly in the body seat cavity with the marked (tape) side up. For metal seated valves, place the 316SS back-up ring in the body seat cavity.
8. Place the metal seat with the graphite gaskets on the TFE seat or 316SS back-up ring already in the body. The metal seat should be installed with the rounded edge down against the TFE seat or the 316SS back-up ring.
9. Follow steps 9 thru 12 of Soft Seat Replacement instructions.

3.7 Disc, Shaft and Bearing Replacement

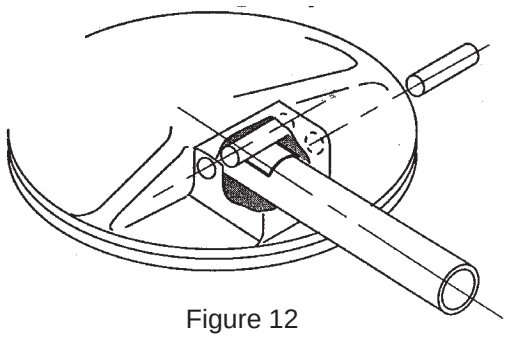


Figure 12

Masoneilan uses a wedge pin method of disc/shaft pinning. This method permits the replacement of either a disc or a shaft since they are not required to be matched sets.

1. Remove any actuator and mounting bracket from top of valve.
2. Remove all top and bottom packing and/or end seals as required.
3. To prepare for removal of existing wedge pins, grind away any disc material that has been peened over pin heads.
4. **A. For Through Shaft Design:**

2" - 24"	ANSI 150
2" - 12"	ANSI 300
2" - 8"	ANSI 600

   Using a punch approximately the same size as the wedge pins, drive each pin out of the disc hub from the non-peened side of the disc to the peened side of the disc.

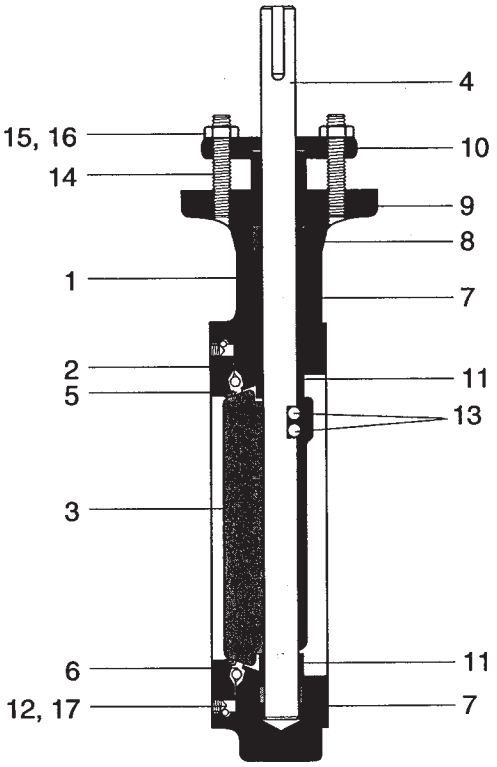
   B. For Split Shaft Design:

30" - 48"	ANSI 150
14" - 30"	ANSI 300
10" - 16"	ANSI 600

   Pull the wedge pins out of the disc hub using the threaded holes on top of each pin and a jack screw.
5. Support the valve body and disc on a flat surface in the horizontal position. Slowly remove shaft(s).
6. Remove the disc from the body.

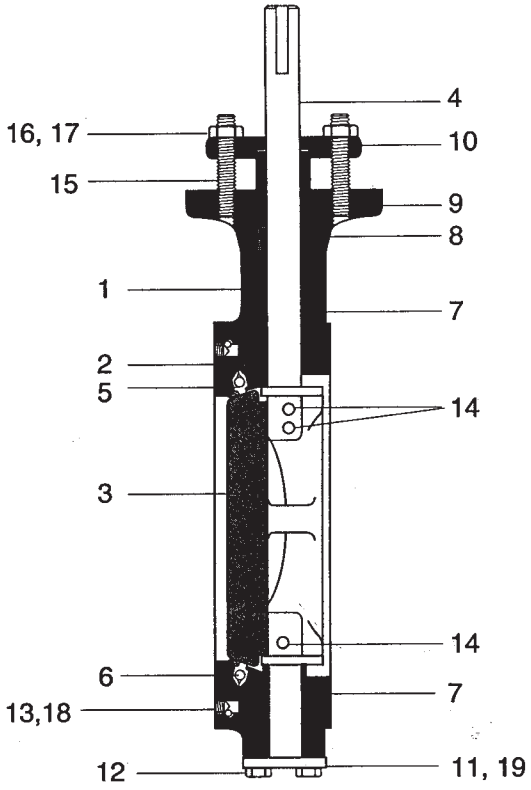
7. To remove bearings, cut or grind a slot lengthwise in each bearing in order to be able to collapse bearing prior to removal. Be careful not to damage bearing seating bore within the body.
8. Clean all components thoroughly.
9. Inspect all parts for damage prior to reassembly. Damaged parts should be repaired or replaced with new parts.
10. Carefully clean and polish the disc sealing surface with a soft cloth. The disc sealing surface should be free of all grooves and scratches.
11. Install the new bearings by gently tapping them into the body with a soft rod and hammer. The bearings should be installed into the shaft bore firmly against the counterbore or bottom of shaft hole.
12. **A. Valves 2" thru 12":**
    With the valve body on edge on the bench, shaft horizontal, and the body overtravel stop nearest to the bench, position the disc in the open position with the flat face upward. Present the disc to the valve body from the side opposite the seat retainer cavity.
    B. Valves 14" and larger:
    Support the disc on a bench, flat side down and elevated above the bench top to a height of approximately 4 inches. Lower the valve body over the disc, seat retainer side facing upward, until the bearing bore and disc hole are aligned. Install the shaft into the body and disc.
13. The shaft keyway when viewed from the top of the valve should be to the right, which is also the direction from which the pins are installed.
14. Line up the shaft flat to permit the insertion of the wedge pins. Install the first wedge pin in the disc hole closest to the top of the valve. Fingertight installation is appropriate.
15. Move the shaft fully into the valve and against this first installed pin. Insert the second pin. Tap both wedge pins in equal amounts until all play between shaft and disc is removed. Care should be taken not to attempt to over seat the wedge pins. If the pin is flush or protruding after tapping in, tack weld on the opposite side for security. Otherwise, peening of the installing side is recommended.
16. Install a new end seal if applicable with the end cap as described in Steps 4 through 7 of the End Cap Seal Replacement procedure.
17. Install new packing box components as described in Steps 4 through 10 of the Packing Replacement procedure.
18. Install new seat as described in the Seat Replacement procedure.
19. Cycle the valve several times to ensure the disc is pinned tightly to the shaft and there is no shaft binding or seat damage before reinstalling the valve in the pipeline.
20. Reinstall the actuator mounting hardware and actuator.
21. Set the actuator stops.

3.8 Valve Parts List



Through Shaft Design

Item	Description
1	Body
2	Seat Retainer
• 3	Disc
• 4	Shaft
• 5	Seat
• 6	Seat O-ring
• 7	Bearing
• 8	Packing
9	Gland
10	Gland Follower
11	Disc Thrust Spacer (2"-5")
12	Set Screws
13	Wedge Pins
14	Gland Flange Stud
15	Gland Flange Nut
16	Lockwasher
17	Wedge Ring



Split Shaft Design

Item	Description
1	Body
2	Seat Retainer
• 3	Disc
• 4	Shaft
• 5	Seat
• 6	Seat O-ring
• 7	Bearing
• 8	Packing
9	Gland
10	Gland Follower
11	End Cap
12	End Cap Bolts
13	Set Screws
14	Wedge Pins
15	Gland Flange Stud
16	Gland Flange Nut
17	Lockwasher
18	Wedge Ring
• 19	End Cap Seal

• Recommended Spare Parts

3.9 Remote Actuator (Male Drive) Mounting Procedure

1. Position the disc in the closed position.
2. Install the actuator mounting bracket on the valve body with the actuator mounting holes facing upward. Fasten the bracket securely in place with the appropriate machine bolts and lockwashers. Tighten to torque specified in Table 4.
3. Install the drivekey in the keyway of the shaft. Tap the key in place to ensure it is fully seated.
4. Install the drive coupling on the shaft by lining up the proper keyway in the coupling with the key in the shaft.
5. Rotate the actuator shaft to the full clockwise position. Align the drive coupling with the actuator shaft and install the actuator on the mounting bracket.
6. Fasten the actuator to the mounting bracket with the appropriate machine bolts and lockwashers. Tighten to torque specified in Table 4. It may be necessary to slightly rotate the actuator shaft to align the mounting holes in the actuator with the mounting bracket.
7. Adjust the stops in the actuator to position the face of the disc parallel with the face of the valve body in the closed position and perpendicular to the face of the valve body in the open position.

Caution: The overtravel stop in the valve body is not to be used as an actuator stop.

Changing the Quadrant:

If it is necessary to rotate the actuator 90° from standard position, complete the following steps:

1. Close the valve.
2. Remove the bolts and lockwashers holding the actuator to the mounting bracket. Lift the actuator off the mounting bracket.
3. Remove the drive coupling from the valve shaft and rotate it 90° to the adjacent keyway.
4. Reinstall the drive coupling on the valve shaft.
5. Align the drive coupling with the actuator shaft and install the actuator on the mounting bracket.
6. Reinstall the bolts and lockwashers to fasten the actuator to the mounting bracket. Tighten to torque specified in Table 4.
7. Adjust the actuator stops as described above.

If it is necessary to rotate the actuator 180° from standard position, complete the following steps:

1. Close the valve.
2. Remove the bolts and lockwashers holding the actuator to the mounting bracket.
3. Lift the actuator off the mounting bracket. Rotate the actuator 180°.
4. Align the drive coupling with the actuator shaft and install the actuator on the mounting bracket.
5. Reinstall the bolts and lockwashers to fasten the actuator to the mounting bracket. Tighten to torque specified in Table 4.
6. Adjust the actuator stops as described previously.

3.10 Remote Actuator (Female Drive) Mounting Procedure

1. Position the disc in the closed position.
2. Install the actuator mounting bracket on the valve body with the actuator mounting holes facing up. Fasten the bracket securely in place with the appropriate machine bolts and lockwashers.
3. Install the drive key in the shaft. Tap the key in place to ensure it is fully seated.
4. Install the drive coupling on the shaft by lining up the proper coupling keyway with the key in the shaft.
5. Install the drive key in the drive coupling. Tap the key in place to ensure it is properly seated.
6. Rotate the actuator to the full clockwise position. Align the keyway in the actuator bore with the key in the drive coupling and slide the actuator on the drive coupling.
7. Fasten the actuator to the mounting bracket with the appropriate machine bolts and lockwashers. It may be necessary to rotate the actuator slightly to align the actuator with the mounting bracket. Tighten to torque specified in Table 4.
8. Adjust the stops in the actuator to position the face of the disc parallel with the face of the valve body in the closed position and perpendicular to the face of the valve body in the open position.

Caution: The overtravel stop in the valve body is not to be used as an actuator stop.

Changing the Quadrant:

If it is necessary to rotate the actuator 90° from standard position complete the following steps:

1. Close the valve.
2. Remove the bolts and lockwashers holding the actuator to the mounting bracket.
3. Lift the actuator off the mounting bracket.
4. Remove the key from the drive coupling and reinstall in the adjacent keyway 90° away. Tap the key in place to ensure it is fully seated.
5. Align the keyway in the actuator bore with the key in the drive coupling and slide the actuator onto the drive coupling.
6. Reinstall the bolts and lockwashers to fasten the actuator to the mounting bracket. Tighten to torque specified in Table 4.
7. Adjust the actuator stops as described previously.

If it is necessary to rotate the actuator 180° from its standard position, complete the following steps:

1. Close the valve.
2. Remove the bolts and lockwashers holding the actuator to the mounting bracket.
3. Lift the actuator off the mounting bracket.
4. Remove the drive coupling from the valve shaft and rotate it 90°.
5. Reinstall the drive coupling on the valve shaft.
6. Remove the key from the drive coupling and reinstall the key in the adjacent keyway 90° away. Tap the key in place to ensure it is fully seated.
7. Align the keyway in the actuator bore with the key in the drive coupling and slide the actuator onto the drive coupling.
8. Reinstall the bolts and lockwashers to fasten the actuator to the mounting bracket. Tighten to torque specified in Table 4.
9. Adjust the actuator stops as described previously.

Actuator Maintenance

Refer to section 3.11 for model 33 installation and maintenance instructions. For other actuators, refer to specific manufacturers installation and maintenance manuals.

Table 4

Fastener Tightening Torque	
Fastener Thread Size	Required Torque (ft.lb.)
1/4"-20 UNC	3
5/16"-18 UNC	5.5
3/8"-16 UNC	10
1/2"-13 UNC	24
9/16"-12 UNC	35
5/8"-11 UNC	48.5
3/4"-10 UNC	87
7/8"-9 UNC	140.5
1"-8 UNC	211
1 1/8"-8 UN	276
1 1/4"-8 UN	392
1 3/8"-8UN	536
1 1/2"-8 UN	734

3.11 33 Actuator Maintenance

This section addresses the complete disassembly of the Model 33 Spring Diaphragm Actuator in order to gain access for repair or replacement of components. If only partial disassembly is required, such as when changing valve action, refer only to the appropriate section. It is highly recommended that the unit be removed from the line to perform maintenance.

1. Actuator Removal

Caution: When working on air to close units, be certain that the disc is not jammed in the closed position with the actuator spring exerting force to open the valve. In such a case, while disassembling, the disc could suddenly snap open possibly causing injury. When the actuator stem is fully extended, the spring is exerting force in the opposite direction. If the disc is jammed closed, on an air to close unit, use external air pressure to hold the actuator in a closed position and complete the necessary steps in this section to disconnect the pivot pin (5), then release air pressure from the actuator, insuring rod and bearing (71) separates from lever (14) and actuator stem (54) fully retracts.

A. If equipped with a handwheel, it must be rotated to the disengaged position.
B. Remove positioner and air piping to upper diaphragm case (61).
C. Remove side covers (38), front cover (6) and bottom cover (41).
D. Insure actuator stem is fully retracted (see caution above).
E. Remove retaining rings (4), pivot pin (5) and spacers (3).

Note: The spacers (3) are only used on units equipped with the handwheel.

F. Remove the hex nuts (52) and lock washers (53) and lift actuator from bracket.

2. Actuator Disassembly

Caution: The upper diaphragm case (61) is under spring tension. A warning tag (74) is attached to each of three long tension bolts (72). The tension nuts (73) attached to the tension bolts (72) must be removed evenly, and must also be the last items disassembled. The following procedure must be followed to avoid injury.

A. Loosen and remove all short cap screws (63) and hex nuts (64).
B. Loosen each tension nut (73) approximately three full turns.

Caution: The upper diaphragm case (61) should separate as the tension nuts are loosened the three turns. If it does not, before proceeding, separate the upper diaphragm case (61) by tapping around the circumference or inserting a screwdriver between the upper and lower case (61) and (68).

C. Continue loosening the tension nuts (73) evenly (approximately three turns each time) ensuring that the upper diaphragm case (61) and diaphragm (62) continue to separate.

Note: Continue Step C until the tension nuts (73) can be easily removed by hand indicating the upper diaphragm case (61) is not under spring tension.

D. Remove tension bolts (72) and upper diaphragm case (61).
E. Remove diaphragm/diaphragm plate sub-assembly from the actuator.
F. Remove retaining clips (57) and push out pin (56). Inspect for damage and/or wear in clevis (55), lever (14), clevis pins (56, 5) and rod end bearing (71). Replace if necessary.

3. **Handwheel Removal**
   - **A.** Rotate handwheel to the disengaged position.
   - **B.** Remove bottom cover (41).
   - **C.** Remove retaining clips (21) and clevis pin (20).
   - **D.** Loosen and remove cap screws (24), lock washers (25) and remove handwheel and bracket subassembly.
4. **Handwheel Disassembly**
   - **A.** Remove pivot pin (26) and remove bracket (23).
   - **B.** Remove handwheel subassembly from shaft (22).
   - **C.** Remove handwheel shaft subassembly (59). Remove retaining ring (28) then loosen and remove locknut (51).
   - **D.** Remove bearing brace (31) and bearing (30).
   - **E.** Remove handwheel pivot (27), O-ring (32) and thrust washer (29).
   - **F.** Refer to Section 3.13 for reassembly.
5. **Body Removal**
   - **A.** Refer to Section 1 (Actuator Removal) and complete Steps A through E.
   - **B.** If the unit is equipped with a handwheel, refer to Section 3 (Handwheel Removal) and complete Steps A through D.
   - **C.** Loosen indicator arm (2) by loosening clamp screw (13) and nut (50).

Note: At this time, using ink or a small dab of paint, mark the relative position of the shaft to the lever (14) or mark a line on the lever in line with the slot in the end of the shaft. During reassembly these marks will be used to simplify alignment of the lever on the shaft.

   - **D.** Loosen lever cap screw (15).
   - **E.** Remove nuts (46), washers (45) and bracket bolts (44), then remove bolts (43).
   - **F.** Remove set screw (81) from coupling (79).
   - **G.** Separate body subassembly and yoke (10) from bracket (1).
   - **H.** Slide shaft (77) out of yoke.

3.12 Actuator Diaphragm Replacement

Caution: The upper diaphragm case (61) is under spring tension. A warning tag (74) is attached to each of three long tension bolts (72). The tension nuts (73) attached to the tension bolts (72) must be removed evenly, and must also be the last items disassembled. The following procedure must be followed to avoid injury.

1. Isolate the valve, vent process pressure and shut off all electrical signal air and supply lines to the valve.
2. If equipped with a handwheel it must be rotated to the disengaged position.
3. Remove air supply piping to upper diaphragm case (61).
4. Remove side covers (38).
5. Verify actuator stem (54) and rod end (71) are securely connected to lever (14) through pivot pin (5) and retaining clips (4) are in place.
6. Loosen and remove all short cap screws (63) and hex nuts (64) in a criss-cross pattern.
7. Loosen each tension nut (73) approximately three full turns.

Caution: The upper diaphragm case (61) should separate as the tension nuts are loosened the three turns. If it does not, before proceeding, separate the upper diaphragm case (61) by tapping it around the circumference or inserting a screwdriver between the upper and lower case (61-68).

8. Continue loosening the tension nuts (73) evenly, approximately three turns each time and ensuring the upper diaphragm case (61) and diaphragm (62) continue to separate.

Note: Continue Step 8 until the tension nuts (73) can be easily removed by hand, which indicates that the upper diaphragm case (61) is no longer under spring tension.

9. Remove tension bolts (72) and upper diaphragm case (61).

10. Remove diaphragm.

11. Clean all mating/sealing surfaces which will come in contact, diaphragm (62), and diaphragm plate (65).

12. Install diaphragm (62) on diaphragm plate (65). Align bolt holes with holes in lower case (68).

13. Determine correct orientation for air inlet and replace upper diaphragm case (61).

14. Install three tension bolts (72) with warning plates (74) into upper case (61). Ensure bolts are spaced at 120° to each other.

15. Mount upper case (61) on diaphragm plate (65) such that tension bolts pass through holes in diaphragm (62) and lower case (68).

16. Install tension nuts (73) finger tight onto tension bolts (72).

17. Tighten each tension nut (73) three turns before proceeding to the next to ensure actuator spring (67) is evenly loaded. Continue until the diaphragm is firmly sandwiched between the flanges of the upper and lower diaphragm cases. Torque tighten tension bolts to 50 in. lb.

18. Install cap screws (63) and nuts (64). Torque tighten to 50 in. lb. in a criss-cross pattern. As this will tend to unload the tension bolts (72) repeat torque tightening of tension bolts and cap screws (63) to 50 in. lb. in a criss-cross pattern until joint is evenly loaded to specified torque values.

19. Reconnect air supply.

20. Stroke actuator to confirm operation.

3.13 33 Actuator Reassembly

1. Actuator Reassembly

A. Replace spring (67) into lower diaphragm case (68).

B. Replace locknut (70) on rod end bearing (71) and screw rod end bearing into actuator stem (54).

C. Replace actuator stem (54) into clevis (55).

D. Replace clevis pin (56) and secure with cap screws (58). Install clevis pin (56) and clips (57).

E. Refer to Section 3.12 and complete Steps 12 through 20.

2. Reassembly of Yoke and Bracket to Valve

A. Install ball bearing (9) into yoke (10).

B. Mount intermediate bracket (1) to yoke (10) with bolts (44), nuts (46), and lockwashers (45). Tighten to appropriate torque value per Table 4.

C. Install bearing (76) into yoke (if applicable).

D. Determine the required actuator action (air to close or air to open). Refer to the proper figure (Figure 19 to open, Figure 20 to close). To obtain proper alignment, the lever must be oriented on the shaft so that the slot in the end of the shaft and arrows or indicator lines are aligned as shown. The distance between the top of the yoke and the top of the pivot pin must be as shown. If the valve is equipped with a handwheel, proceed to step E. Slide shaft (77) through intermediate bracket (item 1 of Figure 15) and partially into yoke (1). With other hand, hold lever (14) and align with the shaft (77) in the desired orientation, slide shaft through lever.

E. If the valve is equipped with a handwheel, the lever consists of two separate arms that are a matched pair and the handwheel lever (refer to view c-c of Figure 17). Slide shaft (77) through intermediate bracket (item 1 of Figure 15) and partially into yoke. The sequence of assembly is to place one lever (item 4 of Figure 17) over the shaft (77) in the correct orientation (per Step D). Slide handwheel lever arm (18) onto shaft. Insert pin (17) and slide second lever arm over shaft in the same orientation as the first lever.

F. Slide indicator (item 2 as indicated in Figure 15) loosely over top of shaft (do not tighten clamp screw at this time). Then continue to slide shaft into yoke until step on shaft (77) contacts ball bearing (9) (as indicated in Figure 15).

G. Install woodruff key (80) in shaft (77). Align key (80) in shaft (77) with keyway in coupling then slide coupling onto shaft (77).

H. Install key into valve shaft.

I. Move valve to closed position. Rotate valve to required orientation, slide valve shaft through intermediate bracket. Aligning keyway in coupling with valve key, slide valve shaft into coupling (79). Tighten set screw (81).

J. Connect valve body to bracket using cap screws (43) and lockwashers. Tighten to appropriate torque value per Table 4.

3. **Reassembly of Actuator to Yoke**
   With the valve body assembled to the bracket, determine action desired and proceed as follows:
   - **A.** Insure stop (69) is in place in the actuator.
   - **B.** Replace the actuator on the bracket in the appropriate hole for desired action and ensure that the rod end bearing (71) is straddled by the lever (14) (or levers if handwheel is supplied).
   - **C.** Replace lock washers (53), hex nuts (52) and tighten securely per torque value in Table 4.
   - **D.** Rotate the disc to the fully closed position.
   - **E.** Depending on the valve action (air to close or air to open), proceed to the appropriate following section for final adjustment.

4. **Air to Close**
   - **A.** Rotate the disc to fully closed position.
   - **B.** Attach a temporary air supply line to the actuator and apply 20 psi of air pressure ensuring that when the rod end bearing (71) extends, it is straddled by the lever (14) (or levers if handwheel is supplied).
   - **C.** Align the hole in the rod end bearing (71) with the hole in the lever (14) by rotating the actuator stem (54) in the proper direction.
   - **D.** Install pivot pin (5) and retaining rings (4).

   Note: If the unit is equipped with a handwheel, spacers (3) must be installed on each side of the rod end bearing (71).

   - **E.** Tighten hex nut (70) against the actuator stem (54).
   - **F.** Ensure lever (14) is vertically aligned with the rod end bearing and stem assembly and tighten lever cap screw (15).

   Note: On units equipped with a handwheel, ensure both levers are as close together as possible and in vertical alignment with the rod end bearing and actuator stem, then tighten cap screws (15).

   - **G.** With 20 psi of air pressure still on the actuator, rotate the actuator stem (54) to back off the disc so that the flat face of the disc is parallel to the face of the retaining ring.
   - **H.** Relieve air pressure and remove temporary air line.
   - **I.** Replace front cover (6).
   - **J.** Rotate the indicator arm (2) to indicate open position and secure in place by tightening clamp screw (13) and nut (50).
   - **K.** If the unit is equipped with a handwheel, proceed to Section 7 (Handwheel to Bracket Assembly).
   - **L.** Replace bottom cover (41), side cover (38) and boss cover (42).

5. **Air to Open**
   - **A.** With the disc in the fully closed position, align the hole in the rod end bearing (71) with the hole in the lever (14) by rotating the actuator stem (54) in the proper direction.
   - **B.** Install pivot pin (5) and retaining rings (4).

   Note: On units equipped with a handwheel, spacers (3) must also be installed on either side of the rod end bearing.

   - **C.** Ensure that the lever (14), rod end bearing, and actuator shaft are vertically aligned and tighten cap screw (15).

   Note: On units equipped with a handwheel, ensure that both levers are in vertical alignment with the rod end gearing and actuator stem. Then tighten cap screws (15).

   - **D.** Rotate the actuator stem (54) to back off the disc so that the flat face of the disc is parallel to the face of the retaining ring.
   - **E.** Tighten hex nut (70) against the actuator stem (54).
   - **F.** Replace front cover (6).
   - **G.** Rotate indicator arm to indicate position on the valve and secure in place by tightening clamp screw (13) and nut (50).
   - **H.** If the unit is equipped with a handwheel proceed to Section 7 below for handwheel to bracket assembly.
   - **I.** Replace bottom cover (41), side covers (38) and boss cover (42).

6. Handwheel Reassembly

To reassemble handwheel, proceed as follows:

A. Install O-ring (32) in the groove.

Note: Do not lubricate O-Ring.

B. Replace thrust washer (29) and handwheel pivot (27).

Note: The handwheel pivot is installed so that the recessed end is away from the thrust washer as shown in Figure 13.

C. Apply a liberal amount of lubricant to the bearing race (31) and bearing (30) and install ensuring there is one race on either side of the bearing.

D. Install locknut (51) and finger tighten only.

E. Install retaining ring (28).

7. Handwheel to Bracket Assembly

The handwheel is always installed on the same side of the bracket as the actuator. To install the handwheel assembly proceed as follows:

A. Insert handwheel shaft (22) through appropriate bracket hole and onto lever arm (18) and install clevis pin (20) and retaining clips (21).

B. Install handwheel bracket (23), lock washers (25) and cap screws (24) and tighten firmly.

C. Rotate the handwheel subassembly onto the shaft (22) far enough to allow alignment of the holes in the handwheel pivot (27) to align with the holes in the handwheel bracket (23) and install pivot pins (26) and tighten firmly.

D. Connect handwheel shaft S/A (59) to handwheel.

E. Rotate the handwheel to the disengaged position.

Note: The disengaged position is achieved when the handwheel shaft is fully visible in the slot on the end of the handwheel.

F. Install end cap (33).

G. Replace bottom cover (41), side covers (38) and boss cover (42).

8. Minor Adjustments

In some instances it may be required to shorten or lengthen the rod end bearing (71) to obtain the shutoff desired. The flat face of the disc must be parallel to the face of the retaining ring in the closed position. To adjust the rod end bearing length, refer to Figure 15. Remove one retainer (4) and slide out pivot pin (5) from lever (14). Pull or push rod end bearing out of retainer. Loosen hex nut (70). Rotate rod end to achieve desired length. Tighten hex nut. Align hole in lever (14) with hole in rod end bearing (71). Insert pivot pin (5) through lever and rod end bearing. Install retainer (4). Stroke valve and repeat above steps until desired shutoff is achieved.

Caution: Extension of the rod end bearing is limited to approximately 3/8" using this method for adjustment. Further extension could prevent sufficient thread engagement for satisfactory performance. Should more than 3/8" be required, lever (14) is not on the correct shaft spline; refer to appropriate section of this instruction and change as required.

3.14 Actuator Parts List

Ref. No.	Description
1	Bracket
2	Indicator Arm
3	Spacer
4	Retainer
5	Pivot Pin
6	Front Cover
7	Shaft Cover
8	Shaft Cover Screw
9	Bearing
10	Yoke
11	Guide
12	Cover
13	Clamp Screw
14	Lever
15	Cap Screw
16	Lock Washer
17	Lever Arm Pin
18	Lever Arm
19	Lever Arm Bearing
20	Clevis Pin
21	Retaining Clips
22	H/W Shaft S/A
23	Handwheel Bracket
24	Cap Screw
25	Lock Washer
26	Pivot Pin
27	Handwheel Pivot
28	Retaining Ring
29	Thrust Washer (H/W)
30	Needle Bearing
31	Bearing Race
32	O-Ring
33	End Cap
34	Handwheel Plate
35	H/W Plate Screw
36	Handwheel
37	Indicator Dot
38	Side Cover
39	Serial Plate
40	Drive Screw
41	Bottom Cover
42	Boss Cover
43	Bonnet Bolt
44	Bracket Bolt
45	Lock Washer
46	Nut
47	H/W Stop Bracket
48	Cap Screw
48A	Cap Screw
49	Stop Bolt
49A	Locknut
50	Nut
51	Locknut
52	Nut
53	Lock Washer
54	Actuator Stem
55	Clevis
56	Clevis Pin
57	Clip
58	Button Head Cap Screw
59	Handwheel Shaft S/A
59A	Handwheel Stop
59B	Cap Screw
59C	Spacer
61	Upper Diaphragm Case
62	Diaphragm
63	Cap Screw
64	Hex Nut
65	Diaphragm Plate
66	Spring Guide
67	Spring
68	Lower Case
69	Stop
70	Hex Nut
71	Rod End Bearing
72	Tension Bolt
73	Tension Nut
74	Warning Plate
75	Information Plate
76	Bearing
77	Shaft
78	Roll Pin
79	Coupling
80	Woodruff Key
81	Set Screw

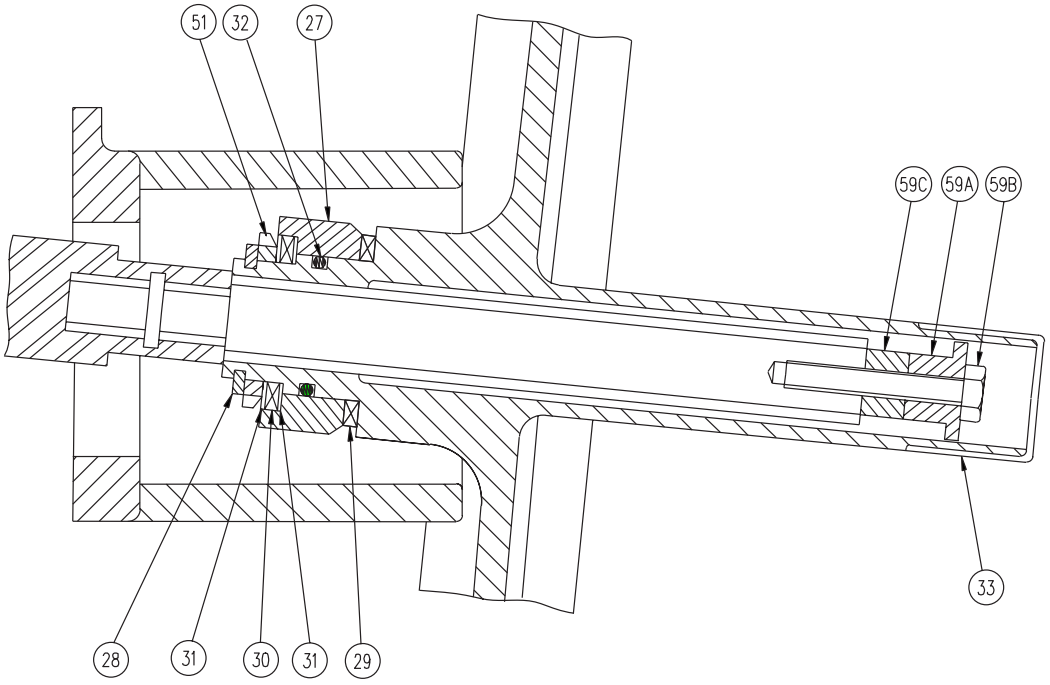
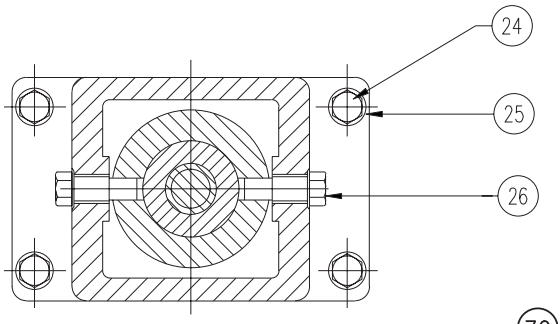
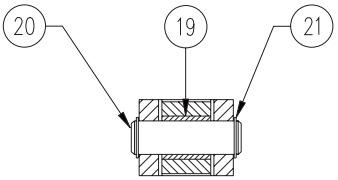


Figure 13



Section B-B
Figure 14



Section A-A

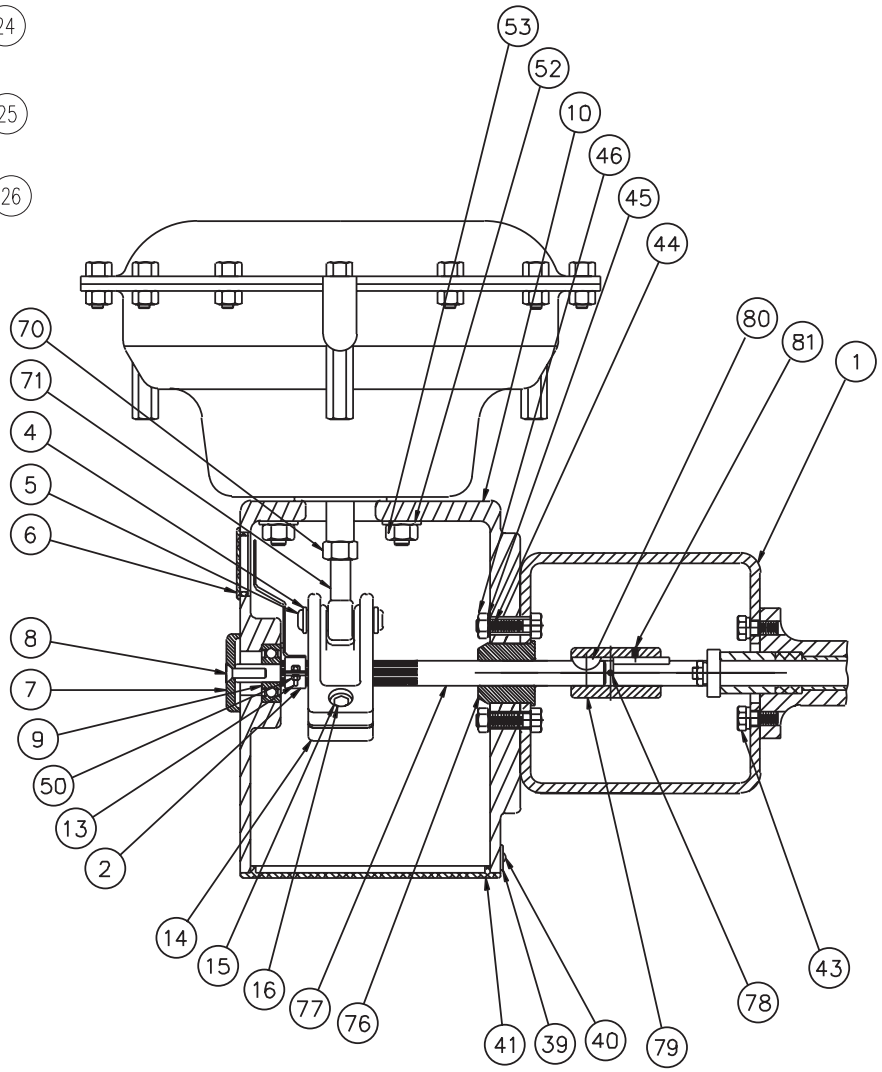


Figure 15

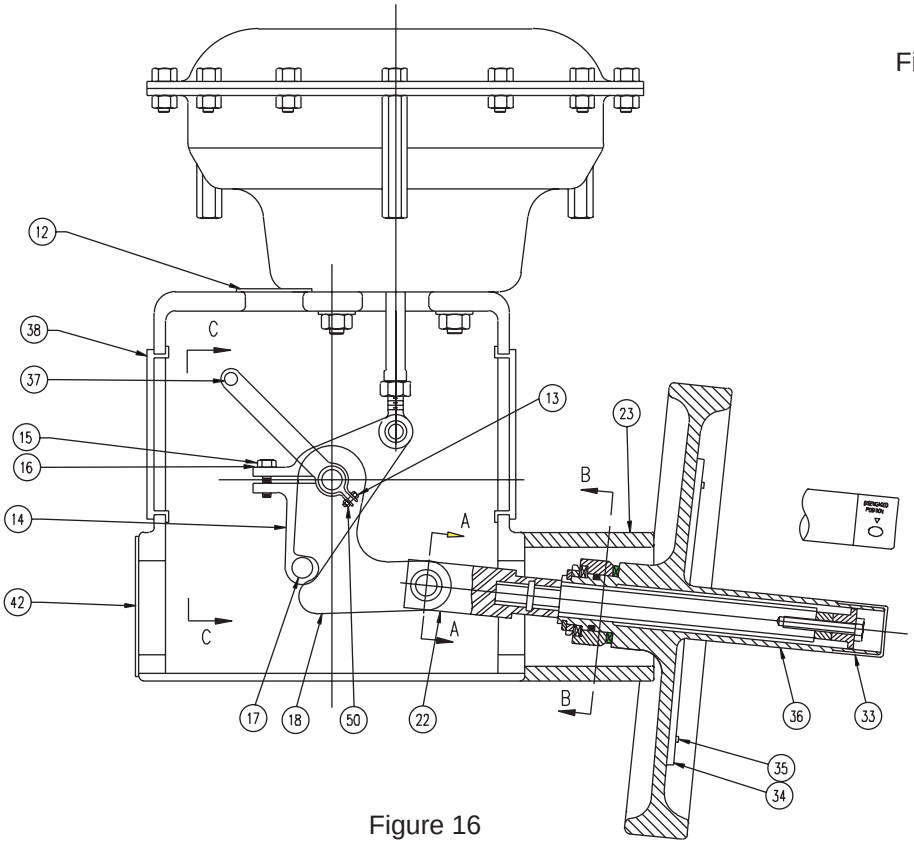
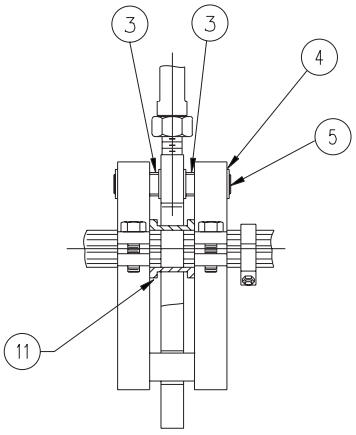


Figure 16



View C-C
Figure 17

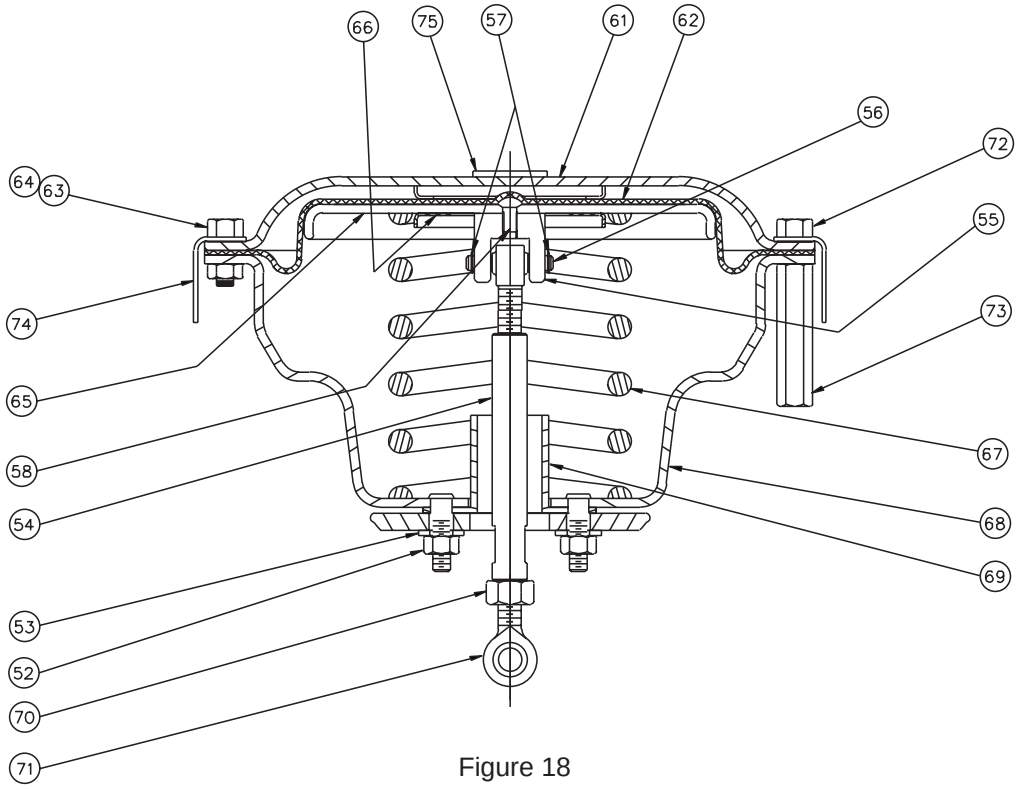


Figure 18

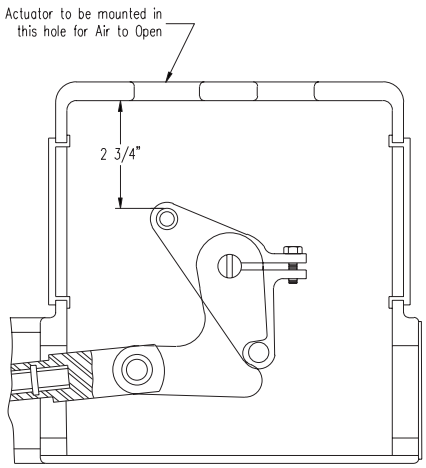


Figure 19

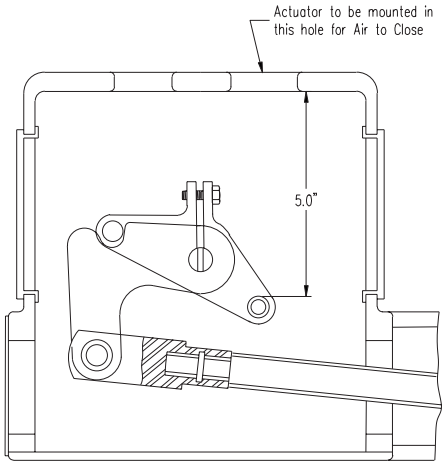


Figure 20

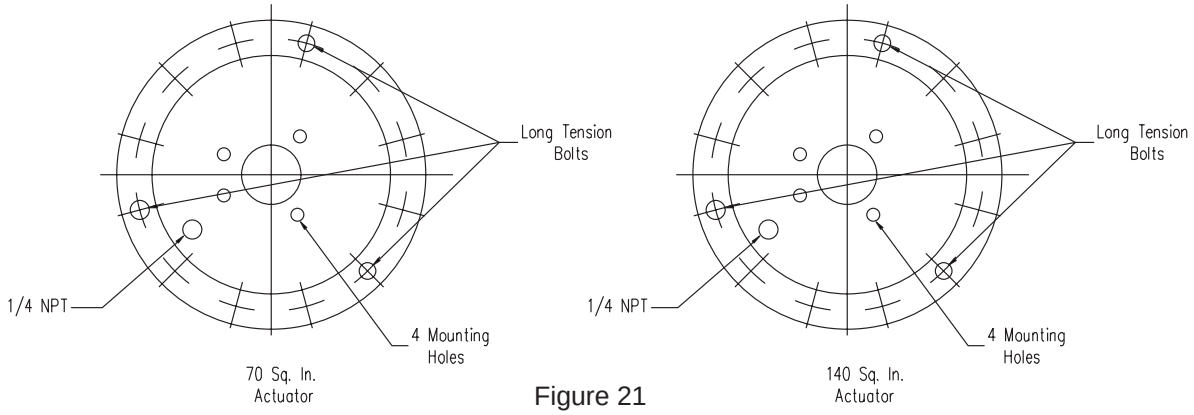


Figure 21

DIRECT SALES OFFICE LOCATIONS

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