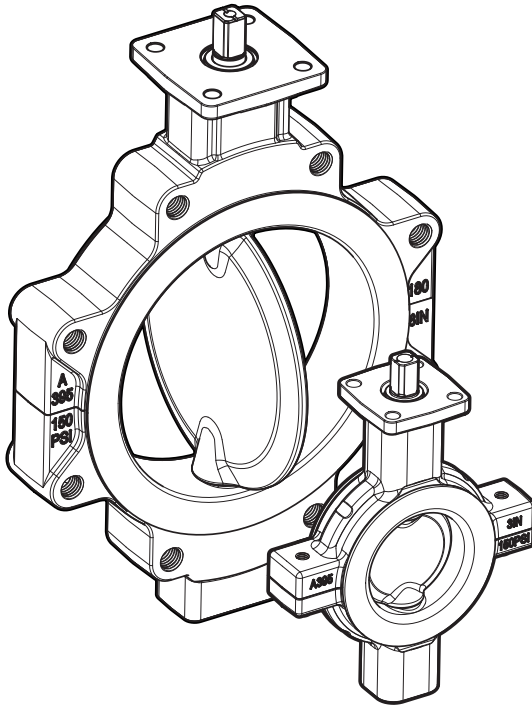


ACRIS

# PFA LINED BUTTERFLY VALVES

Installation, Operation and Maintenance Manual







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## Read and Follow These Instructions

### Save These Instructions

#### Safety Instructions – Definition of Terms

 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
<b>NOTICE</b>	Used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

#### Butterfly Valve Liner / Disc Function

The PFA over-molded disc and PFA liner are the chemically resistant barrier to the flowing media. The only wetted parts of the valve are the PFA disc and liner. The valve body, back-up liner, safety packing, springs, bearings, shafts, etc. are all isolated from the flowing media and are non-wetted parts.

The PFA liner extends over the face of the valve body and functions as the flange gasket. Additional gaskets are not normally required in installations where the flange strength allows maximum bolting torque (Steel and Alloy flanges for example). If sufficient bolting torque cannot be achieved due to flange type or material strength limits (FRP for example), a gasket may be required for proper flange sealing. Gaskets may be used when pipeline flange faces exhibit excess unevenness due to poor machining or weld distortion.

The PFA liner has a 360 degree, full width resilient back-up liner (Silicone or Viton), which provides the energy for proper sealing. The sealing force of the back-up liner is not dependent on flange compression and acts independently from the pipeline flanges. The PFA liner is the chemically resistant membrane that separates the media from the back up liner. Upstream / downstream sealing is achieved by an interference fit between the disc and liner, which in turn compresses the back-up liner.

Finally, the disc of a butterfly valve extends beyond the face-to-face dimension of the valve as it cycles towards the full open position. It is important to follow the recommended minimum and maximum flange inside diameters in the mounting instructions to avoid piping interference with the disc, and achieve proper sealing on the PFA flange face.



Prior to installation, verify that the inside diameter of the flanges are within the recommended minimum and maximum dimensions. This is to ensure that the piping offers sufficient clearance for the disc to open properly without piping interference.

## Shipment Handling and Storage

1. All Acris PFA Teflon lined valves are shipped with Polyethylene or Wooden flange protectors securely fastened to the valve bodies. The valves may also be wrapped in a Polyethylene or “Shrink Wrap” plastic, depending on what valve model was ordered. ***It is of the utmost importance, that the PFA surfaces of the valve (both the liner and shaft/disc) be protected prior to installation. The Flange Protectors should remain fastened to the valves, until just prior to installation.***
2. Use care when handling the valve. Do not drop or throw down the valves, as damage to the PFA could result. PFA offers the highest resistance to corrosion (in the pipeline), but can be damaged prior to installation by improper handling. Do not contact the PFA surfaces with any sharp or blunt object (knives, box cutters, screwdrivers, punches, etc.) as damage to the PFA could occur.
3. The disc should be placed in the partially open position (approximately 10 to 15 degrees open) during storage when possible. Valves with spring return actuators can be stored prior to installation as-is. Extra precautions should be taken with a fail open assembly to protect the open position disc.
4. Valves should be preferably stored indoors in a safe (clean and dry) environment, in or on their original shipping container or pallet prior to installation. Store away from any workshop activities such as grinding, sand blasting, welding or painting, for example.
5. When moving the valves, use Nylon straps either around the valve neck or around the body of the actuator or gear. Never lift a gear operated valve by the handwheel.
6. Ship and store the valves so that no heavy loads are applied to the valve bodies.

## Installation Considerations – Piping, Valve Orientation and Placement

### Before Installation

1. Verify that pipeline flanges are free from metallic chips and weld splatter.
2. Verify that pipeline flanges are located on the same centerline and are parallel.
3. Verify flange facing flatness is as follows:
  - a.  $\leq 0.004$  inches on a 4 inch length for valves  $\leq 4$  inch in size
  - b.  $\leq 0.008$  inches on a 4 inch length for valves  $\geq 5$  inch in size
4. Verify that the inside diameter of pipeline flanges is in accordance with Amresist documentation. This is necessary to prevent any valve disc / pipeline flange contact upon valve opening. Refer to Note 6 of “Installation” section.
5. Verify that the flange face finish is less than or equal to 250 micro-inch roughness.

## Valves with Spring Return Actuators

### Fail Closed Assemblies

Valves with fail closed actuators have the disc in the full closed position as there is no air pressure to the actuator. The valve/actuator assembly may be installed as-is in the full closed position.

### Fail Open Assemblies

Valves with fail open actuators have the disc in the full open position as there is no air pressure to the actuator. Caution must be taken to ensure that no damage occurs to the disc prior to installation. If damage occurs, the valve may leak when put in service. Repair may be necessary prior to installation.

Installing the fail open assembly can be done one of two ways.

- Introduce and maintain air pressure to the actuator to close the valve prior to installation.
- Remove the actuator from the valve. Close the valve disc and install the valve in the piping. Open the valve and reattach the actuator to the valve after installation.

## Valve Location

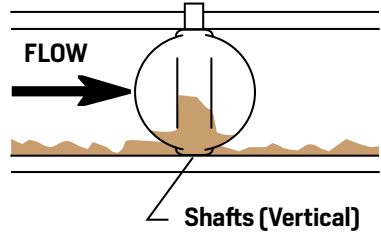
It is advisable to install a butterfly valve at least 5 to 6 diameters away from any change in piping direction or turbulence [i.e. from the exit of a tee, elbow, other valves, or on pump discharge]. This is not always possible but it is important to have as much piping distance as practical from any source of turbulent flow or a change in flow direction.

When installing a butterfly valve on any other piece of equipment [vessel, pump, check valve, etc.] it is important to verify that the disc will clear any internal parts of the adjacent equipment.

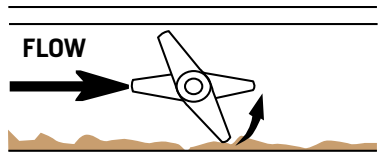
## Valve Orientation

In general, the Amrēsist Acris butterfly valve can be mounted in any position in the flanges.

For applications like slurries, pulp stock, or any media with considerable sediment build up or particles in horizontal pipe runs, it is recommended to install the valve with the shafts in the horizontal position with the lower portion of the disc opening towards the downstream piping. This orientation allows the media to self-flush through the valve upon opening.



**INCORRECT INSTALLATION**  
Sediment build up around lower disc hub



**Shafts (Horizontal)**  
**CORRECT INSTALLATION**  
Sediment flushes through valve

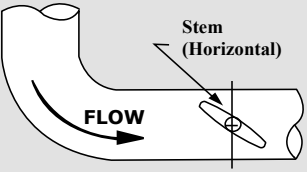
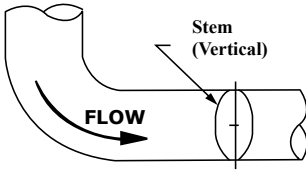
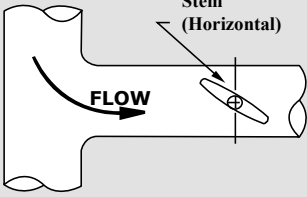
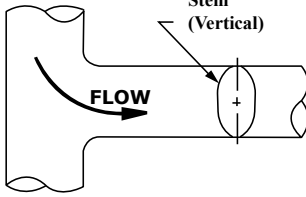
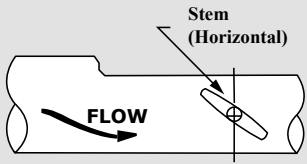
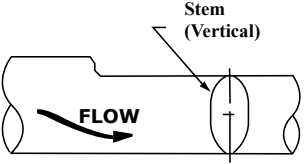
**Valve Orientation (Continued)**

Butterfly valves located at the discharge of a pump should be oriented as follows:

	<b>INCORRECT INSTALLATION</b>	<b>CORRECT INSTALLATION</b>
i.) For centrifugal Pump – Pump shaft horizontal and stem vertical	<p>Pump Shaft (Horizontal) FLOW Stem (Horizontal)</p>	<p>Pump Shaft (Horizontal) FLOW Stem (Vertical)</p>
ii.) Centrifugal Pump – Pump shaft vertical & stem horizontal	<p>Pump Shaft (Vertical) FLOW Stem (Vertical) Suction</p>	<p>Pump Shaft (Vertical) FLOW Stem (Horizontal) Suction</p>
iii.) Axial Pump – Pump shaft vertical & stem vertical	<p>Pump Shaft (Vertical) FLOW Stem (Horizontal) Suction</p>	<p>Pump Shaft (Vertical) FLOW Stem (Vertical) Suction</p>

**Valve Orientation (Continued)**

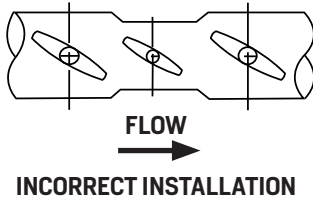
Butterfly valves located downstream of a bend or pipe reducer should be oriented as follows:

	<b>INCORRECT INSTALLATION</b>	<b>CORRECT INSTALLATION</b>
i.) Bend	 <p>Stem (Horizontal)</p> <p>FLOW</p>	 <p>Stem (Vertical)</p> <p>FLOW</p>
ii.) Tee	 <p>Stem (Horizontal)</p> <p>FLOW</p>	 <p>Stem (Vertical)</p> <p>FLOW</p>
iii.) Pipe Reducer	 <p>Stem (Horizontal)</p> <p>FLOW</p>	 <p>Stem (Vertical)</p> <p>FLOW</p>

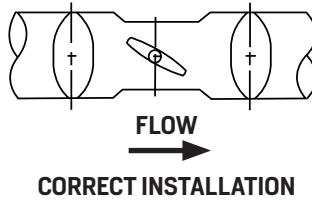


### Valve Orientation (Continued)

Butterfly valves in combination for control/isolation applications should be installed as follows:



Both block valves and control valve with shafts in the same orientation can promote increased noise, vibration and possible erosion damage.



Control valve shaft oriented 90 degrees from block valve shafts can reduce noise, vibration and possible erosion damage.

## Installation Procedure

### A. Before Installation

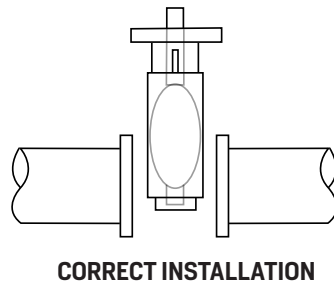
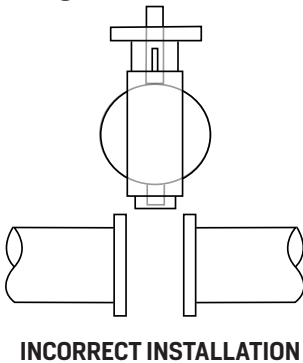
1. Place the valve in or very near the full closed position, so the disc does not protrude past the valve body.
2. Separate the pipeline flanges sufficiently to allow valve insertion without damaging the PFA liner or disc over-molding of the valve.



**WARNING**

Never pick up a valve/actuator or gear assembly by the actuator or gear. Instead, use nylon straps around the neck of the valve to pick up the entire assembly.

**Figure 1: Insert PFA Lined Butterfly Valve Between Flanges**



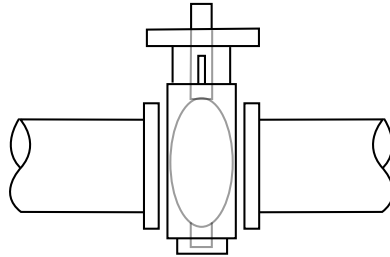
**CAUTION**

Flanges not spread apart enough to allow open valve disc to clear the piping. Disc damage will occur when disc contacts the flange.

Flanges spread apart enough to allow partially open or fully closed valve to be installed. Disc should not extend beyond the face to face dimension of the valve body during installation.

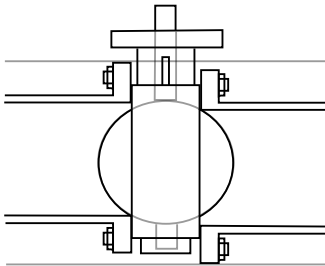
3. Insert the valve between the pipeline flanges, and center using several flange bolts.

**Figure 2: Initial Centering & Flanging of Valve**



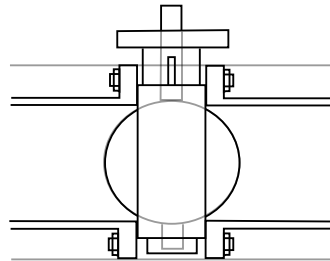
**CORRECT INSTALLATION**

Bolts partially tightened, valve centered in flanges, disc within the face to face of body, gaskets or no gaskets used (customer preference).



**INCORRECT INSTALLATION**

Piping mis-aligned, disc OD contacts flange ID causing disc damage and valve leakage.

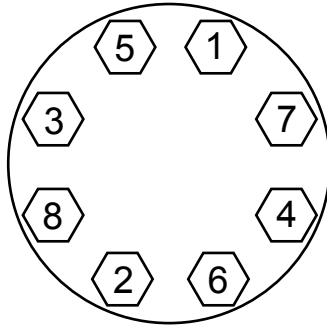


**CORRECT INSTALLATION**

Piping properly aligned when bolts tightened, disc clears adjacent piping when open, flanges or gaskets seal properly on PFA liner face.

4. Tighten stud-bolts nut progressively in an acceptable rotational pattern to a maximum torque in the following chart:

**Figure 3: Flange Bolt Tightening Pattern**



<b>Size (inches)</b>	<b>Maximum Torque (ft.-lb.)</b>
1 & 1-1/4	15
1-1/2	22
2	29
2-1/2	37
3	44
4	37
5	52
6	74
8	96
10	125
12	147
14	162
16	147
18	206
20	199
24	258

5. Gaskets are not normally required in installations where pipe flange strength allows maximum bolting torque (Steel and Alloy flanges for example). If sufficient bolting torque cannot be achieved due to flange type or material strength limits (FRP for example), a gasket may be required for proper flange sealing. Gaskets may be used when pipeline flange faces exhibit excess unevenness due to poor machining or weld distortion.
6. Verify that pipeline flange inside diameters conform to the following dimensions:

<b>ISO SERIES ACRIS FLANGE INSIDE DIAMETERS</b>		
<b>VALVE SIZE (inches)</b>	<b>MINIMUM (Inches)</b>	<b>MAXIMUM (Inches)</b>
1 & 1-1/4	0.62	1.69
1-1/2	1.12	1.96
2	1.56	2.40
2-1/2	2.11	3.11
3	2.79	3.57
4	3.52	4.53
5	4.56	5.62
6	5.68	6.68
8	7.63	8.78
10	9.68	10.90
12	11.50	12.90
14*	13.41	14.64
16	15.00	16.65
18*	17.22	18.58
20	19.26	20.62
24	22.35	24.56

\*14 and 18 inch are non-ISO face to face.

## Maintenance and Repair

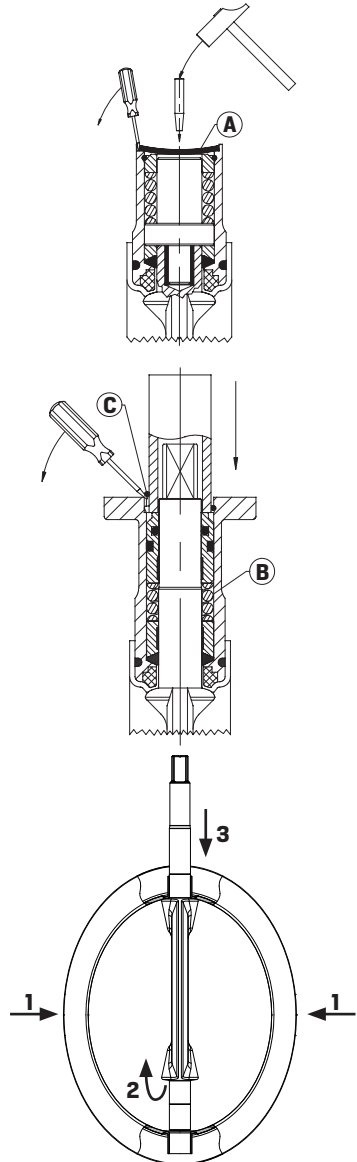
Amrēsist Acris butterfly valves are designed to minimize wear and maintenance. No routine lubrication or packing adjustments are required. All components of the valve (shaft/disc, liner, back-up liner, safety packings, springs, bearings, o-rings, etc.) are field replaceable. To replace components, the valve must be removed from the piping. Place the disc in or near the closed position, support the valve, then loosen and remove the flange bolts.

### Disassembly Procedure

1. Using a hammer and punch, remove the expansion dust cover (A) (3 to 14 inch only).
  - a. Flatten the dust cover (A) with the punch and hammer
  - b. Pry out the dust cover (A) with a screwdriver or suitable tool
2. Using a press and the Retaining Ring Tool (page 15), compress the safety spring (B) sufficiently to allow removal of the retaining ring (C) in the lower shaft area (3 to 14 inch) and on the top shaft area (1 to 14 inch).
3. Pry out the retaining ring (C) with a small screwdriver.
4. Release press and remove Retaining Ring Tool.
5. Mark both halves of the body to assure re-assembly exactly how they were taken apart. Both halves are mated for life and should be assembled exactly how they were taken apart.
6. Loosen and remove the body bolts.
7. Separate the body halves and remove the shaft/disc and back-up liner from the body halves.
8. Remove the upper and lower (where applicable) shaft area components from the body halves (1 to 14 inch).
9. Remove the Radial Spring, Spring Casing and Flat Spacer from the shafts (16 to 24 inch). See Safety Seal Arrangement on page 12.
10. Remove the back-up liner from the shaft/disc – liner assembly.



No valve maintenance, including removal of manual or power actuators, should be performed until the piping system is completely depressurized.



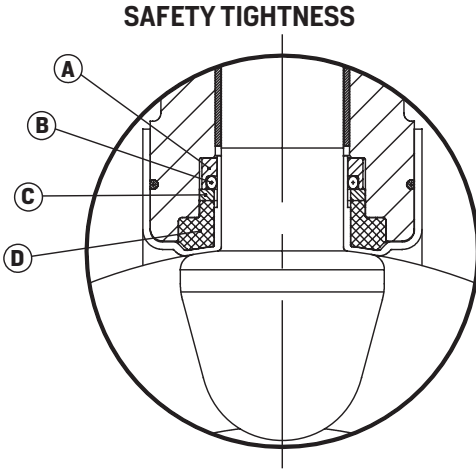
### 16 to 24 inch Safety Seal Arrangement

Upper and Lower Spring Casing [A]

Upper and Lower Spring [B]

Upper and Lower Flat Washer [C]

Back Up Liner [D]



### Disassembly of the shaft/disc and liner

11. On 1 to 16 inch valves, place the shaft/disc liner assembly in an oven and heat up the assembly to approximately 200°F. This softens the liner and makes it more pliable and easier to compress together at the horizontal centerline. Compress the liner together and slide out the lower shaft from the liner. Refer to bottom illustration on page 11. Next slide out the upper shaft.
12. On 18 to 24 inch valve, the liner does not require heating. Compress the liner together at the horizontal centerline, and slide out the lower shaft from the liner (18 to 24 inch). Refer to bottom illustration on page 11. Next slide out the upper shaft.

## Reassembly Procedure

13. On 1 to 16 inch valves, place the liner in an oven and heat up the to approximately 200°F. This softens the liner and makes it more pliable and easier to compress together at the horizontal centerline. Slide in the upper shaft. Compress the liner together and slide the lower shaft into the liner. Refer to illustration at right.
14. On 18 to 24 inch valves, slide the upper shaft into the liner. Compress the liner together at the horizontal centerline, and slide the lower shaft into the liner. Refer to illustration at right.
15. Clean all internal surfaces of the valve body with isopropyl alcohol prior to reassembly.

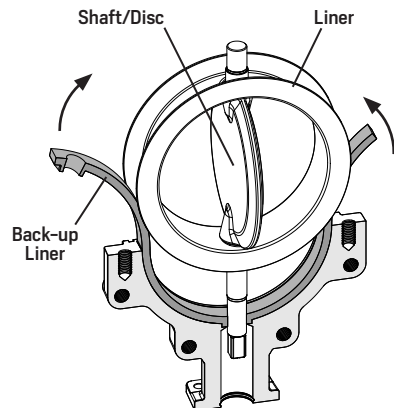
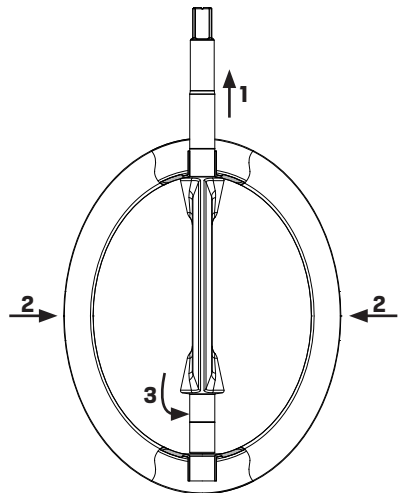
### 1 to 14 inch valves

16. Place the top half of the valve body onto a table. The table should have a hole in it allow the top shaft to pass through during assembly. Apply the proper lubricant to the machined bed of the body (where the back-up liner sits) and the shaft area counterbores where the back-up liner collars insert. The lubricant will vary depending on the valve model. Standard and S9 valves use silicone grease, Dow Corning #4 or equal. S9C valves use Halocarbon #25-5S or equivalent. SC1 use no lubricant and is assembled dry. Be sure to spread the lubricant evenly on all areas where the rubber back-up liner makes contact.
17. Insert the back-up liner collar into the shaft area counterbore of the valve body in step 16, above. Be sure that the back-up liner collar is properly seated.
18. Allow the back-up liner to drape over the body half on the table. Insert the shaft/disc – liner assembly (upper shaft first) into the back-up liner shaft hole. Firmly push and move around to ensure that the back-up liner collar is properly positioned in the valve body.
19. Pull the back-up liner half with the lower shaft hole up and around the lower shaft of the shaft/disc – liner assembly. Attach the two halves of the back-up liner together.
20. Apply the appropriate lubricant to the lower body half and install onto the shaft/disc–liner / top half body assembly. Be sure to install the lower body half in the proper orientation, as it was disassembled and marked. Failure to do so may cause the body halves to not properly align. Firmly press the lower body half down onto the back-up liner collar. Move the lower half of the body sufficiently to seat the liner collar properly in the valve body.

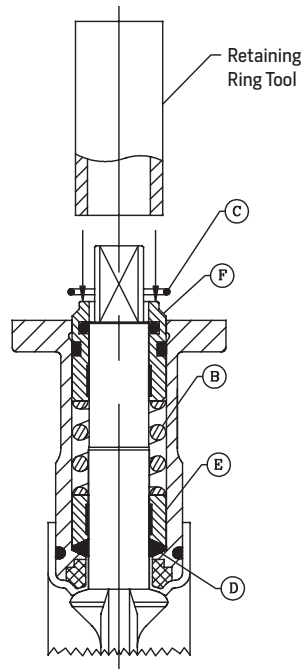
### NOTICE

If the back-up liner has any evidence of chemical attack, tears, cuts or wear; replacement is required. Clean all valve parts with isopropyl alcohol before assembly.

If the shaft/disc and liner were previously disassembled, or these parts are being replaced, they must be reassembled prior to further valve assembly.



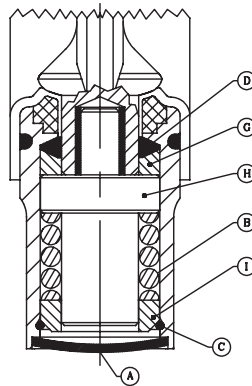
21. Lightly coat the body bolts with a thread lubricant, install into the body halves and partially tighten. At this point it is best to use a press to compress the body halves together, and tighten the bolts completely.
22. Install the shaft area components into the upper shaft area (1 to 14 inch) in the following order:
  - a. Safety Packing (D)
  - b. Bearing (E) with bevel facing safety packing
  - c. Spring (B)
  - d. Upper atmospheric seal (2 o-rings) / bearing (F) with bevel facing out
23. Use the Retaining Ring tool (Page 15) and a press to aid in shaft area component assembly. Place the tool over the valve top shaft. Slide the Retaining Ring (C) over the tool. Use the press to push down and compress the shaft area components just enough to allow installation of the Retaining Ring (C) into the machined groove of the valve body. The Retaining Ring (C) should be firmly seated in the groove before the press is released. Slowly release the press.
24. Flip the valve over and (3 to 14 inch) and repeat the process for the lower shaft area.
25. Install the shaft area components into the lower shaft area in the following order:



**3 to 6 inch**

- Safety Packing (D)
- Spacer Ring (G) with bevel facing safety packing
- Lower Shaft Insert (H)
- Spring (B)
- Lower Stop Ring (I) with bevel facing out

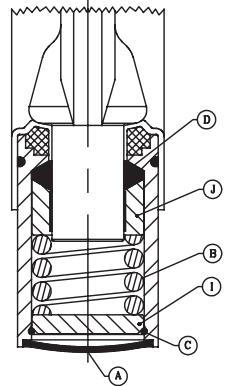
3 to 6 Inch



8 to 14 Inch

**8 to 14 inch**

- Safety Packing (D)
- Lower Bearing (J) with bevel facing safety packing
- Spring (B)
- Lower Stop Ring (I) with bevel facing out



Refer to step 23 above and repeat for the lower shaft area Retaining Ring installation.

26. Install expansion type Dust Cover (A). Apply red thread sealant to machined step in body at lower shaft area. Place Dust Cover (A) into position and flatten with a hammer. Dust Cover OD will expand into position.



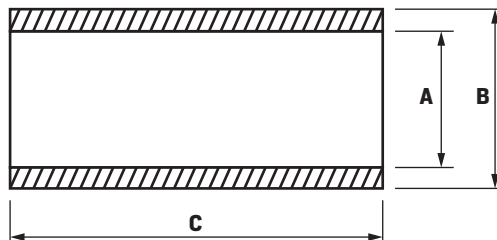
**16 to 24 inch valves** (refer to illustration on page 12)

27. Place the top half of the valve body onto a table. The table should have a hole in it allow the top shaft to pass through during assembly. Apply the proper lubricant to the machined bed of the body (where the back-up liner sits) and the shaft area counterbores where the back-up liner collars insert. The lubricant will vary depending on the valve model. Standard and S9 valves use silicone grease, Dow Corning #4 or equal. S9C valves use Halocarbon #25-5S or equivalent. SC1 use no lubricant and is assembled dry. Be sure to spread the lubricant evenly on all areas where the rubber back-up liner makes contact.
28. Install the back-up liner onto the shaft/disc – liner assembly. Attach both ends of the back-up liner together once wrapped around both shafts.
29. Install the upper Spring (B) into the Spring Casing (A). Slide upper Flat Washer (C) onto the upper shaft until it contacts the back-up liner collar. Slide the Spring / Spring Casing assembly down onto the Flat Washer. Both upper and lower valve shafts are identical in diameter, so the Safety Seal parts are identical.
30. Insert the upper shaft of the shaft/disc – liner – back-up liner with Safety Seal Arrangement into the valve body on the table.
31. Firmly push and move around the assembly to ensure that the back-up liner collar is properly positioned in the valve body.
32. Install the lower Spring (B) into the Spring Casing (A). Slide lower Flat Washer (C) onto the lower shaft until it contacts the back-up liner collar. Slide the Spring / Spring Casing assembly down onto the Flat Washer.
33. Apply the appropriate lubricant to the lower body half and install onto the shaft/disc-liner / top half body assembly. Be sure to install the lower body half in the proper orientation, as it was disassembled and marked. Failure to do so may cause the body halves to not properly align. Firmly press the lower body half down onto the back-up liner collar. Move the lower half of the body sufficiently to seat the liner collar properly in the valve body.
34. Lightly coat the body bolts with a thread lubricant, install into the body halves and partially tighten. At this point it is best to use a press to compress the body halves together, and tighten the bolts completely.

**Retaining Ring Tool Dimensions**

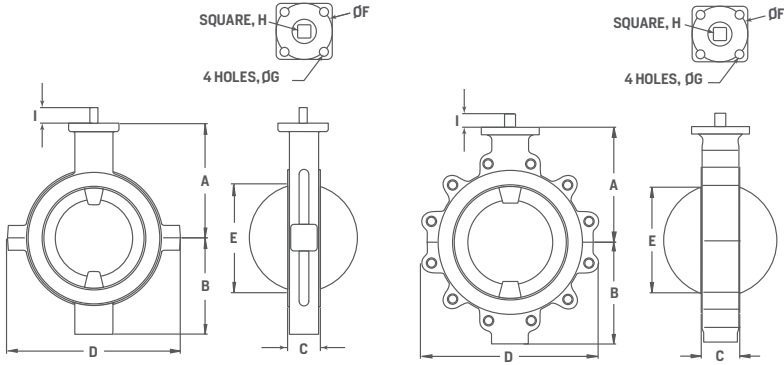
(all dimensions in inches)

Valve Size	1,1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14
A	0.50	0.61	0.65	0.81	.81	0.86	0.96	1.02	1.02	1.40	1.59	1.75
B	0.71	0.79	0.91	1.12	1.12	1.28	1.34	1.46	1.46	2.01	2.28	2.56
C	4	4	4	4	4	4	4	4	4	4	4	4



## Dimensions

(all dimensions in inches, weight in pounds)



Size	A	B	C	D wafer	D lug	E	F	G	H	I	ISO	weight wafer	weight lug	Cv
1	3.74	1.69	1.35	3.38	3.38	0.0	1.969	0.312	0.630	1.02	F05	4	4	50
1.25	3.74	1.69	1.35	3.38	3.38	0.0	1.969	0.312	0.630	1.02	F05	4	4	50
1.5	3.93	1.88	1.35	3.74	3.74	0.874	1.969	0.312	0.630	1.02	F05	5	6	100
2	4.25	2.24	1.69	3.97	4.56	1.312	1.969	0.312	0.630	1.02	F05	5	6	209
3	4.88	4.05	1.83	5.23	5.55	2.539	2.756	0.375	0.630	1.02	F07	10	12	580
4	5.62	4.80	2.12	6.73	7.99	3.271	2.756	0.375	0.630	1.02	F07	12	17	916
6	6.88	6.25	2.25	8.62	10.11	5.428	2.756	0.375	0.630	1.02	F07	25	29	2320
8	8.85	7.75	2.51	10.86	12.24	7.403	4.016	0.437	0.748	1.22	F10	42	50	5800
10	10.03	8.93	2.82	13.22	15.43	9.432	4.921	0.562	0.984	1.22	F12	70	78	9396
12	11.41	10.43	3.19	15.98	18.03	11.252	4.921	0.562	1.181	1.61	F12	110	116	15892
14*	13.54	13.11	4.12	20.98	20.35	13.127	5.511	0.708	1.181	1.61	F14	172	195	21344
16	14.48	14.13	4.12	23.50	23.62	14.747	5.511	0.708	1.417	1.45	F14	231	229	26912
18*	16.49	16.81	5.08	25.00	24.40	16.974	5.511	0.708	1.417	1.85	F14	330	344	34104
20	17.48	17.12	5.08	27.48	28.74	19.019	6.496	0.866	1.575	1.85	F16	440	400	41760
24	19.68	19.92	6.06	32.67	32.99	22.101	6.496	0.866	1.968	2.20	F16	565	649	60500

\*14 and 18 inch are non-ISO face to face.

**Amrēsist**<sup>®</sup>

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