



# Butterfly Valves Installation & Maintenance Service Instructions

BFV-3M-0205



This instruction covers general Installation and Maintenance Service for all Spears® PVC, CPVC, and PP Butterfly Valves, including Seat Repair Kit and Overhaul Kit Installtions. All applicable instructions and procedures should be read thoroughly before starting. Suitability of the intended service application should be determined prior to installation. Plastic piping systems should be engineered, installed, operated and maintained in accordance with accepted standards and procedures for plastic piping systems.

**IMPORTANT:** Read Precautions & Warnings for All Valve Installations at the end of these instructions. It is absolutely necessary that all design, installation, operation and maintenance personnel be trained in proper handling, installation requirements and precautions for installation and use of plastic piping systems before starting.

## Special Installation Information

Spears Butterfly Valves are designed for system connection either between two flanges (dual flange), or with single-side (flange one-side only) connection for dead-end service.

**CAUTION:** Standard Butterfly Valve (12" & smaller) can be installed for flow in either direction in a dual flange installation, but requires attention to direction of flow when installed with single-side flange connection.

Lug style valves (Standard or True Lug Valves) allow valves to be used for both dead end service and connection of a second flange to the open side without disassembly of the initial valve connection. Spears Standard Butterfly Valves (12" & smaller) accept field installable lug insert sets for quick conversion to a lug style, but require attention to direction of flow for single-side installation. Spears True Lug Butterfly Valves have factory installed lugs which allow flange connections from either side, regardless of flow direction.

**CAUTION:** Connecting flanges must have an inside diameter not less than that of PVC Schedule 80 pipe (ASTM D 1785) to maintain operation clearance with the disc. Flange bolt pattern conforms to ANSI Class 125/150.

The valve handle (or gear operator) is reversible 180° for either left or right side operation.

## PVC & CPVC Butterfly Valve Bolt Specification Table

Valve Size (in.)	No. of Bolt Holes	Bolt Torque (ft.-lb.)	Standard Valve					Valve with Lug Inserts					True Lug Valve			
			Bolt Lengths <sup>1</sup> (in.)		Bolt Diameter (in.)	Bolt Threads per Inch	Flat Washers O.D. (in.)	Bolt Lengths <sup>1</sup> (in.)		Bolt Diameter (in.)	Lug Insert Threads per Inch	Flat Washer O.D. (in.)	Bolt Lengths <sup>2</sup> (in.)	Bolt Diameter (in.)	Lug Threads per Inch	Flat Washer O.D. (in.)
			Single Side	Dual Flange <sup>3</sup>				Single Side	2nd Flange <sup>2</sup>							
1-1/2	4	12	3-1/4	4-1/4	1/2	13	1-3/8	1-3/4	1-1/2	1/2	13	1-3/8	1-1/2	3/8	16	1
2	4	25	3-3/4	4-3/4	5/8	11	1-3/4	2	1-3/4	5/8	11	1-3/4	2	1/2	13	1-3/8
2-1/2	4	25	4-1/4	5-1/4	5/8	11	1-3/4	2-1/4	2	5/8	11	1-3/4	1-3/4	1/2	13	1-3/8
3	4	25	3-3/4	5-1/2	5/8	11	1-3/4	2-1/4	2	5/8	11	1-3/4	2	1/2	13	1-3/8
4	8	25	4	5-3/4	5/8	11	1-3/4	2-1/2	2	5/8	11	1-3/4	2-1/4	1/2	13	1-3/8
6	8	40	4-3/4	6-1/2	3/4	10	2	3-1/4	2-1/4	3/4	10	2	2-1/2	5/8	11	1-3/4
8	8	40	5-1/4	7-1/4	3/4	10	2	3-1/2	2-1/4	3/4	10	2	2-3/4	5/8	11	1-3/4
10	12	64	5-3/4	8-1/4	7/8	9	2-1/4	4	3	7/8	9	2-1/4	2-3/4	3/4	10	2
12	12	95	6	8-1/2	7/8	9	2-1/4	4-1/4	3	7/8	9	2-1/4	2-3/4	3/4	10	2

- 1: Minimum bolt lengths based on use of Spears flanges, 1/8" full faced gaskets, standard S.A.E. hex bolts and Standard Plate "W" Series flat washers.
- 2: Specified bolt lengths are maximum allowable for maintaining proper clearance in initial Single-Side installation with Lugs where anticipated 2nd Flange installation option is to be retained without removal of valve.
- 3: Minimum bolt length through 2-flanges, 2-gaskets, 2-flat washers and 1-valve body.

## Polypropylene Butterfly Valve Bolt Specification Table

Valve Size (in.)	No. of Bolt Holes	Bolt Diameter (in.)	Bolt Torque (ft.-lbs.)	Valve Lay Length (in.)	Bolt Lengths
1-1/2	4	1/2	12	1-9/16	<p>Bolt Lengths will vary according to thickness of valve, mating flanges, washers, nuts and gaskets used.</p> <p>The following formula may be used to calculate bolt length for installation with mating flange each side:</p> $L = V + 2(F + G + W) + N$ <p> L = Minimum Bolt Length  V = Valve Lay Length  F = Flange Thickness  G = Gasket Thickness  W = Washer Thickness  N = Nut Thickness </p>
2	4	5/8	25	1-5/16	
2-1/2	4	5/8	25	2	
3	4	5/8	25	2-3/32	
4	8	5/8	25	2-9/32	
6	8	3/4	40	2-3/4	
8	8	3/4	40	2-15/16	
10	12	7/8	64	3-1/4	
12	12	7/8	95	3-1/2	
14	12	1	110	6-1/4	
16	16	1	110	6-3/4	
18	16	1-1/8	110	7-1/8	
20	20	1-1/8	110	7-3/4	
24	20	1-1/4	110	8-7/16	

(Flange, bolts, nuts, washers and gaskets not included. Lug inserts may be ordered separately.)

### Flanged Connections

Use full faced, 1/8" thick gaskets having a Shore A durometer of approximately 60. Use required quantity of bolts, nuts and flat washers for each flanged connection. Lubricate bolts with an anti-seize lubricant (IMS Copper Flake or equivalent). Bolts must be tightened in a 180° opposing pattern.

### Lubrication

**WARNING:** SOME LUBRICANTS, INCLUDING VEGETABLE OILS, ARE KNOWN TO CAUSE STRESS CRACKING IN THERMOPLASTIC MATERIALS. A mild soap and water solution should be used where lubrication is needed for installation or maintenance service. Choice of other lubricants is at the discretion and responsibility of the installer.

### Installation Instructions

**Step 1:** Attach connecting flanges to system piping as required (use appropriate procedure for solvent cement welded or threaded connection of flange hub). **NOTE:** One-piece flanges will require precise alignment of bolt holes with desired valve position.

**Step 2:** Check flange face alignment and spacing. Faces of flanges should be parallel and spaced apart just enough to allow insertion of the flange gaskets and valve body.

FOR DUAL FLANGE (flange each side) INSTALLATION:

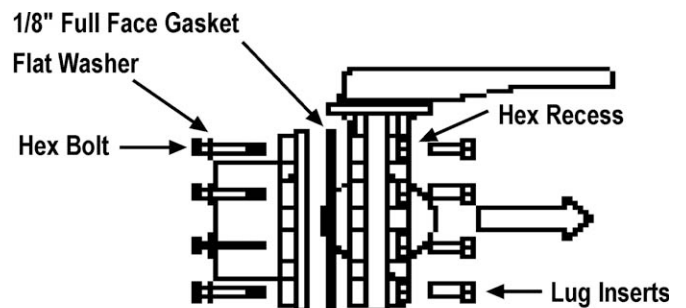
**Step 3:** With valve in closed position, place valve body with flange gasket each side between flanges and install all connecting bolts with flat washers and nuts. Tighten hand tight only.

FOR SINGLE-SIDE (flange one side) INSTALLATION USING STANDARD VALVE WITH LUG INSERTS:

**Step 3:** Install lug inserts through each bolt hole from the side of valve containing the hex recess. Press lightly until the lug insert is fully seated into the recess. With valve in closed position, locate flange and gasket on the side of valve opposite the hex nut recesses.

**Warning:** Flange must be installed on side of valve opposite the hex nut recesses for Single-Side Installation of Standard Valve to retain the valve and seal carrier under pressure (check flow arrow label on valve). Failure to do so may result in serious damage or injury.

Insert the proper size / length hex bolts with flat washers (see chart) through the flange and engage lug inserts (or hex nuts). Tighten hand tight only.



**Step 4:** Open valve and check axial displacement and disc clearance. No more than 1/8" displacement on the pipe centerline is allowed. Adjust valve position as necessary. Using a 180° opposing sequence, tighten flange bolts in 5 ft-lb increments to required specifications (see chart). **DO NOT** attempt to draw together any gaps without allowing free movement to one side of the system connection.

## 2nd Flange Installation Option (System Add-On):

True Lug valve or Standard valve with Lug Inserts must have been installed with specified single-side bolt lengths to accommodate direct system add-on.

Note: Where flange connection is being disconnected or reversed to form a single-side of connection, the Standard valve must also be reversed, or use the True Lug style valve for such applications.

Place gasket between flange and valve body, insert specified size/length hex bolts (see "2nd Flange" bolt length on chart) with flat back-up washer through flange holes and engage with lug inserts. Tighten hand tight only. Repeat Step 4 above.

## Reversing Handle or Gear Operator Position

(for general installation only go to Step 3)

**Step 1:** Close valve. Remove the snap-in cover from the handle to expose retaining nut and handle bushing. Remove retaining nut and flat washer. For gear operator, remove four (4) mounting bolts and flat washers.

**Step 2:** Disengage handle and handle bushing assembly from valve stem. For gear operator, lift assembly and drive bushing from stem. NOTE: Drive bushing is timed to operator with large spline tooth and index mark. Rotate handle assembly, or gear operator and drive bushing, 180° and reinstall on valve stem.

CAUTION: Do not remove Disc Timing-Stop Plate located immediately below handle bushing.

**Step 3:** Reinstall retaining nut with flat washer, torque to 40 in.-lb. Snap cover back into place. For gear operator reinstall mounting bolts and flat washers, torque 10 ft.-lb.

## Maintenance Service Instructions for Butterfly Valves

Butterfly Valves can be easily removed from in-line position for quick seat replacement using the Butterfly Valve Seat Repair Kit with either Buna-N, EPDM or genuine Viton® O-rings for valve repair or to insure extended life as a part of a preventative maintenance program. Use Butterfly Valve Overhaul Kit for replacement of seat and internal components. Overhaul kits include Seat Repair Kit components and are available either with or without replacement Disc. Contact Spears® Technical Services for additional information on factory reconditioning available.

### Important Kit Selection Note

Ongoing Butterfly Valve design improvements have resulted in variations to repair kits. Standard cataloged kits are for current valve revision. Applicable previous revisions can be determined by valve serial number. When ordering repair kits, please include the serial number stamped on the bottom of the valve body to insure proper kit selection.

Seat Repair Kit for Standard valve includes 1-Seat and 1-Seal Carrier. Repair Kit for True Lug valves includes 1-Seat and Seal Carrier Flange O-ring. Kits for 14" & larger valves include 1-Seat, EPDM or Viton® only. Specify valve size, material (PVC, CPVC, PP), Standard or True Lug type valve, Buna-N, EPDM or Viton® elastomer material, and valve serial number when ordering.

Internal Overhaul Kit (basic) includes 1-Seat, 1-Seal Carrier, 1-Disc Timing Stop, 1-upper Stem Bushing, 1-Stem Nut, 1-Hex Washer, 1-Round Washer, 2-Stem O-rings, 2-Bushing O-rings, 1-upper Disc O-ring, 1-lower Disc O-ring, and 1-lower Stem Bearing (note: Disc O-rings are used on dry-stem 72 series part number valve design only). Kit with Disc (option) includes replacement Disc in same material as valve. Kit for 14" & larger PP valves includes 2-stem O-rings, EPDM or Viton® only and Disc O-rings. Specify valve size, material (PVC, CPVC, PP), Standard or True Lug type valve, Buna-N, EPDM or Viton® elastomer material, and valve serial number when ordering.

Stem does not normally need to be replaced but can be ordered separately. Standard Stem is Type 316L Stainless Steel. Specify any special Stem material or PTFE coating if required.

**CAUTION:** Before any servicing, system should be shut down, depressurized and drained.

### Valve Seat Replacement (Refer to Illustration Page 5)

**Step 1:** Close valve and remove flange bolts, nuts and washers. Slide valve from between flange connectors and remove gaskets. **FOR TRUE LUG VALVES:** Remove Round Nuts from Lug Inserts on seat-side of valve. Lift Seal Carrier Flange plate and Flange O-ring from valve. Examine all components for damage or debris. Clean and replace as necessary.

**Step 2:** The seat can be easily replaced without full valve disassembly. Place valve in full open position. From inside of valve, drive Seal Carrier out of body taking care not to damage body or disc. **NOTE:** Seal carrier and seat will most likely be damaged during removal and both are included in seat replacement kit. Examine Body seat area for damage or debris. Clean as necessary.

**FOR LARGE DIAMETER (14" & UP) PP VALVES (not shown):** Remove Nylon Hex Bolts recessed on seat-side of valve. Lift Seal Carrier plate from valve. Remove Seat. Examine Body and Seal Carrier seat area for damage or debris. Clean as necessary.

**Step 3:** Install new Seat and Seal Carrier. Lay Body flat on a solid surface with seat side up. Install Seat centered in body groove. Carefully center Seal Carrier, rib side up, and press Seal Carrier evenly into Body until face is flush with body. **NOTE:** This can best be accomplished with an arbor press. However, Seal Carrier may be gradually tapped into place with a mallet and wood block, working incrementally around the perimeter of the seal carrier on alternating sides.

**FOR TRUE LUG VALVES:** Install new Seat and Seal Carrier as described above. Install new O-ring on seat side of Seal Carrier Flange plate. Reinstall Seal Carrier Flange plate O-ring side down onto valve. Reinstall Lug Round Nuts on Lug Inserts and tighten.

**FOR LARGE DIAMETER (14" & UP) PP VALVES (not shown):** Install Seat centered in body groove. Reinstall Seal Carrier plate flat-side up onto valve body. Reinstall Hex Bolts and tighten.

Valve is now ready for installation (see applicable installation procedure). Use new Gaskets.

### Internal Overhaul (Refer to Illustration Page 5)

**Step 1:** Remove valve and install Seat as described in preceding section.

**Step 2:** Removal of internal components requires paying close attention to orientation between the orange Disc Timing Stop and valve Disc for proper reassembly. Remove stem assembly by lifting the existing Disc Timing Stop from the Stem and unscrewing the Stem Nut recessed in the body stem bore.

**FOR LARGE DIAMETER (14" & UP) PP VALVES (not shown):** Disc Timing Stop and Stem Nut are not used. Remove the Stem Tower retaining bolts and lift Stem Tower from valve.

The Stem assembly is then pulled from the valve Body and Disc. Remove upper and lower O-rings from Disc.

**Step 3:** Remove Hex Washer, Stem O-rings, Bushing O-rings, then slide Stem Bushing from Stem. Remove Stem Bearing from recess in lower body (not used on 14" & larger valves). Examine all components for damage or debris. Clean and replace as necessary.

**FOR LARGE DIAMETER (14" & UP) PP VALVES (not shown):** These components are not used.

**Step 4:** Lubricate O-rings (see lubrication note). Reassemble Stem unit with new Hex Washer, Stem O-rings, Bushing O-rings and Stem Bushing. The new assembly should be checked for proper location of components and that the slotted washer is in place. Press new Stem Bearing into lower body recess. On sizes 2-1/2" & smaller, install the upper Disc O-ring on the gland of Stem Bushing and the lower Disc O-ring on the gland of the lower Stem Bearing. For sizes 3"-12", install upper and lower Disc O-rings on the gland of the Disc.

**Step 5:** Place Disc in a reverse position (facing away from seat) to allow components to align easily. Engage Disc and Disc O-ring with lower Stem Bearing and align shaft hole vertically in valve. Carefully insert Stem assembly through the valve stem bore and the Disc being sure to engage the upper Disc O-ring, and fully into the lower Stem Bearing. Install new Stem Nut hand tight. Rotate the Disc and assembly 180° to proper seating position (disc against seat). Tighten Stem Nut fully snug. Paying close attention to the orientation alignment of the orange Disc Timing Stop arrows with the Disc, press the stop is over the Stem until fully seated into the body recess.

**FOR LARGE DIAMETER (14" & UP) PP VALVES (not shown):** Lubricate and Install new Stem O-rings (see lubrication note). Place flat side of Disc facing the seat, slightly open. Insert Stem assembly through the valve stem bore, the Disc, and fully into the lower recess of the valve. Reinstall the Stem Tower with retaining bolts and tighten.

This completes assembly and the handle or gear operator can be reinstalled (see "Reversing Handle or Gear Operator" under Installation Instructions).. Valve is now ready for installation (see applicable installation procedure). Use new Gaskets.

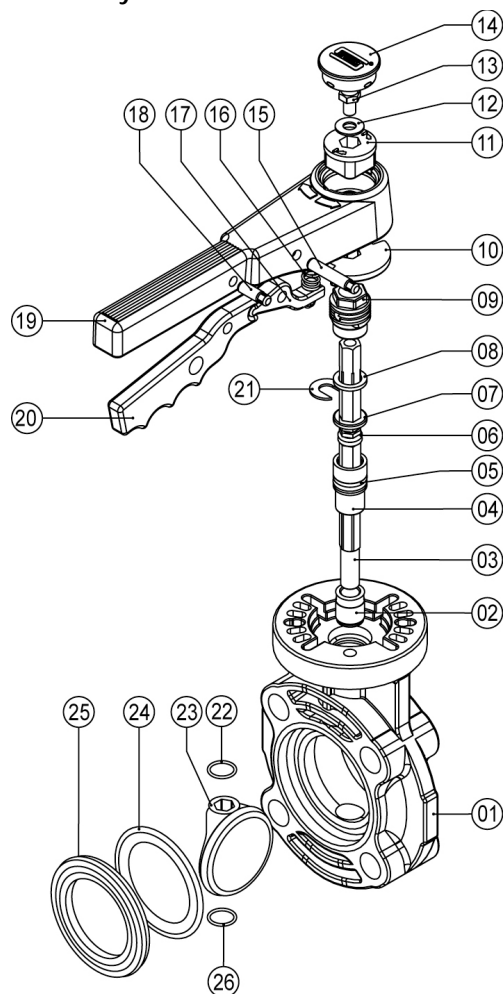
**Step 1:** Remove Handle Cover and hex head retaining bolt and washer. Lift Handle from Stem shaft. If handle components are being replaced, tap Grip Pin and Lock Pins from Handle. Remove Handle Grip, Handle Lock and Spring from Handle Body. Remove Handle Bushing from Handle Body. Examine all components for damage, wear and debris. Clean and replace as necessary.

**CAUTION:** Do not remove Disc Timing-Stop Plate located immediately below Handle Bushings.

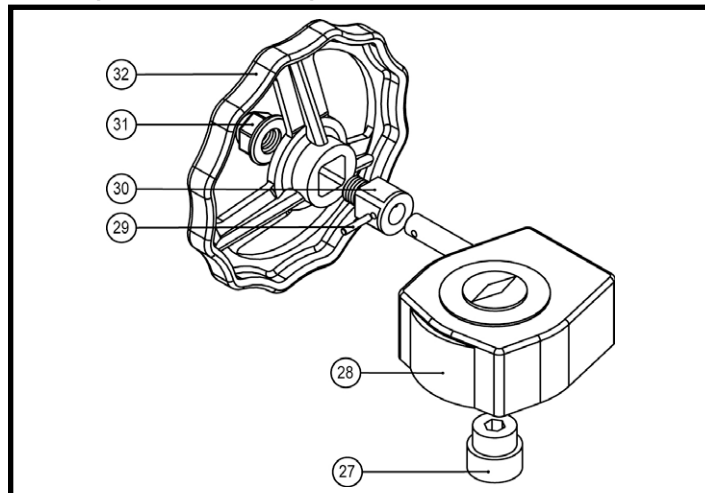
**Step 2:** Reassemble Handle: Install Spring over lug in Handle Body. Insert Handle Lock into Handle Body. Align holes and install Lock Pin through Handle Body and Handle Lock. **NOTE:** Both Lock Pin and Grip Pin have a smooth end and retaining ribs on opposite end of pin; engage smooth ends first — see illustration. Insert Handle Grip into Handle Body being sure to engage fork of grip with end-bar of Handle Lock. Align holes and install Grip Pin through Handle Body and Handle Grip. Install Handle Bushing in Handle Body. Handle is now ready for assembly to valve (see "Reversing Handle or Gear Operator" under Installation Instruction).

## Butterfly Valve Component List

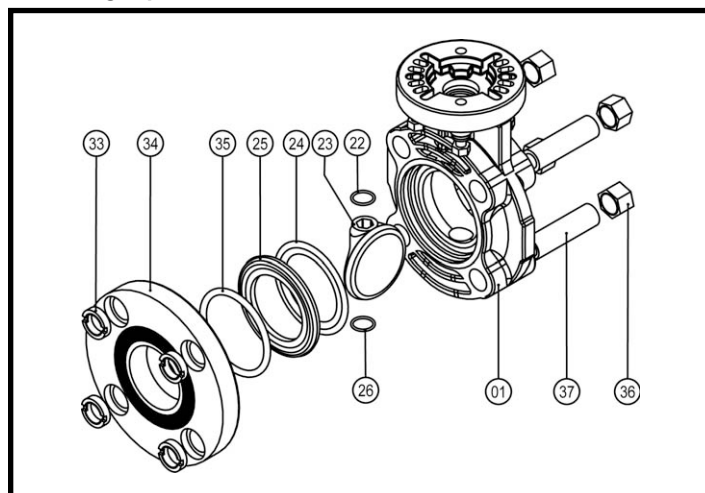
### Standard Butterfly Valve



### Gear Operator Handle Option



### True Lug Option



NO.	COMPONENT	QUANTITY
01	BODY	1
02	STEM BEARING	1
03	STEM	1
04	STEM BUSHING	1
05	STEM BUSHING O-RING	2
06	STEM O-RING	2
07	HEX WASHER	1
08	ROUND WASHER	1
09	STEM NUT	1
10	DISC TIMING STOP	1
11	HANDLE BUSHING	1
12	FLAT WASHER	1
13	HEX BOLT	1
14	HANDLE COVER	1
15	LOCK PIN	1
16	SPRING	1
17	HANDLE LOCK	1
18	GRIP PIN	1
19	HANDLE BODY	1

NO.	COMPONENT	QUANTITY
20	HANDLE GRIP	1
21	SLOTTED WASHER	1
22	UPPER DISC O-RING	1
23	DISC	1
24	SEAT	1
25	SEAL CARRIER	1
26	LOWER DISC O-RING	1
27	DRIVE BUSHING	1
28	GEAR OPERATOR	1
29	DRIFT PIN	1
30	HANDLE ADAPTER	1
31	ADAPTER NUT	1
32	HANDWHEEL	1
33	LUG ROUND NUT	*
34	SEAL CARRIER FLANGE	1
35	SEAL CARRIER FLANGE O-RING	1
36	LUG HEX NUT	*
37	LUG INSERT	*

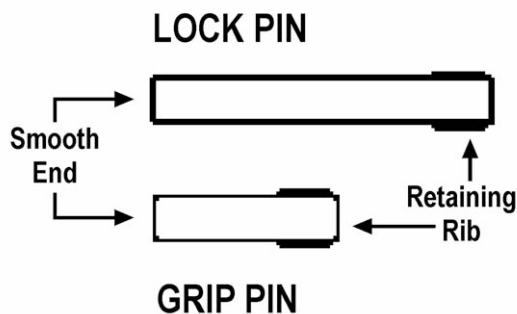
\* - QUANTITY VARIES ACCORDING TO SIZE

## Handle Service

**Step 1:** Remove Handle Cover and hex head retaining bolt and washer. Lift Handle from Stem shaft. If handle components are being replaced, tap Grip Pin and Lock Pins from Handle. Remove Handle Grip, Handle Lock and Spring from Handle Body. Remove Handle Bushing from Handle Body. Examine all components for damage, wear and debris. Clean and replace as necessary.

**CAUTION:** Do not remove Disc Timing-Stop Plate located immediately below Handle Bushings.

**Step 2:** Reassemble Handle: Install Spring over lug in Handle Body. Insert Handle Lock into Handle Body. Align holes and install Lock Pin through Handle Body and Handle Lock. **NOTE:** Both Lock Pin and Grip Pin have a smooth end and retaining ribs on opposite end of pin; engage smooth ends first — see illustration. Insert Handle Grip into Handle Body being sure to engage fork of grip with end-bar of Handle Lock. Align holes and install Grip Pin through Handle Body and Handle Grip. Install Handle Bushing in Handle Body. Handle is now ready for assembly to valve (see "Reversing Handle or Gear Operator" under Installation Instruction).



## Precautions & Warnings for All Valve Installations

**CAUTION:** The system shall be designed and installed so as not to pull the valve in any direction. Pipe must be cut and installed in such a manner as to avoid all stress loads associated with bending, pulling, or shifting. Valve shall be supported.

**CAUTION:** All valve connectors and connecting pipe should be inspected for any breaking, chipping, gouging or other visible damage before proceeding. All joining components must be clean and dry. All valves and pipe shall be removed from their packaging or containers and exposed to the environment for a minimum of one hour in order to thermally balance all components. Installation temperatures should be between 40°F and 110°F.

**CAUTION:** BEFORE THE VALVE IS CYCLED, all dirt, sand, grit or other material shall be flushed from the system. This is to prevent scarring of internal components.

**WARNING:** DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING AND COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY. All air must be bled from the system during initial fluid fill. Pressure testing of the system should not be made until all solvent cement joints have properly cured. Initial pressure testing should be made at approximately 10% of the system hydrostatic pressure rating to identify potential problems, prior to testing at higher pressures.

**WARNING:** Systems should not be operated or flushed out at flow velocities greater than 5 feet per second.



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