SMITH VALVES

Engineering Department

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|---|---|---|---|---|---|
| DWG: | Jaime Reddic | 11/18/13 | **Smith Full Port Y-Pattern, Bolted Bonnet, Globe and Check Valve Operation, and Maintenance Manual** | | |
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# Revision

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SMITH VALVES


# Installation, Operation, and Maintenance Manual

## *Full Port Y-Pattern, Bolted Bonnet, Globe and Check Valves*

Globe Valve Series: YG80/YG15
Welded Bonnet Globe Valve Series: YG87/YG17
Piston Check Valve Series: YC80/YC15
Welded Cap Piston Check Valve Series: YC87/YC17
Ball Check Valve Series: YB80/YB15
Welded Cap Ball Check Valve Series: YB87/YB17

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## 1.0 General

The majority of this information is common knowledge to experienced forged steel valve users. This information applies to all standard Smith API Std 602 Forged valves. When properly installed in applications for which they were designed, Smith valves will give long, trouble-free service.


***We do recommend however that this entire document be read prior to proceeding with any installation or repair.***

### 1.1 Responsibility for Valve Application

The End User is responsible for ordering the correct valves. SMITH VALVES are to be installed in the observance of the pressure rating and design temperature. Prior to installation, the valves and nameplates should be checked for proper identification to be sure the valve is of the proper type, material, and is of a suitable pressure class and temperature limit to satisfy the application requirements.


***Do not use any valve in applications where either the pressure or temperature is higher than the allowable working values. Also valves should not be used in service media if not compatible with the valve material of construction, as this will cause chemical attacks.***

### 1.2 Receiving Inspection and Handling

Valves should be inspected upon receipt to determine:

- Compliance to purchase order requirements.
- Correct type, pressure class, size, body and trim materials and end connections. (This information may be found on the nameplate or may be stamped on the body of the valve.)
- Any damage caused during shipping and handling to end connections, handwheel or stem.


***The End User is advised that misapplication of the product may result in injuries or property damage. A selection consistent with the particular performance requirements is important for proper application.***

## 2.0 Installation


***Piping should be properly aligned and supported to reduce mechanical loading on the end connections.***

### 2.1 Installation Positions

Y-pattern globe valves are uni-directional and may be installed in any position or orientation.

Y-pattern globe valves have the direction of flow indicated on the valve body.

For check valves, it is recommended to mount in horizontal or vertical position.

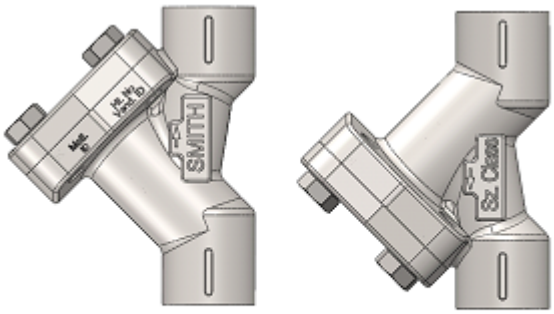


*FIG. 1*

When welding in-line, valves should be lightly closed to prevent damage to the seating surfaces and stem due to thermal expansion.

### 2.2 Preparation for Installation

Remove protective end caps or plugs, and inspect valve ends for damage to threads, socket weld or butt weld bores.

Thoroughly clean adjacent piping system to remove any foreign material that could cause damage to seating surfaces during valve operation.

Verify that the space available for installation is adequate to allow the valve to be installed and to be operated.


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***Insufficient clearance for the stem in the fully open position may cause the valve to be inoperable. Inadequate clearance for valves may add mechanical loading to the valve ends. Sufficient clearance should be allowed for threaded valves to be "swung" during installation.***

## 2.3 End Connections

2.3.1 Threaded Ends

Check condition of threads on mating piping. Apply joint compound to the male end of joint only. This will prevent compound from entering the valve flow path.

Smith valves have wrenching lugs forged onto the body ends. Wrenches should be used on the valve end closest to the joint being tightened.

2.3.2 Socket Weld Ends

Remove all grease, oil or paint from the pipe that is to be welded into the valve and from the valve end connections.

Insert the pipe into the valve end connection until it bottoms out in the socket weld bore. Withdraw the pipe 1/16" so that a gap remains between the pipe and the bottom of the socket weld bore to prevent cracks (ASME B16.11). Tack the pipe into the valve and complete the fillet weld.


***Globe valves should be lightly closed to prevent damage to the seating surfaces and stem caused by thermal expansion during the socket welding process.***

2.3.3 Butt-Weld Ends

Remove all grease, oil or paint from the pipe that is to be welded into the valve and from the valve end connections.

## 2.4 Post-Installation Procedures

After installation, the line should be cleaned by flushing to remove any foreign material. When caustics are used to flush the line, additional flushing with clean water is required. The valve should be opened and closed after installation to ensure proper operating function.

With the line pressurized, check the valve end connections, body to bonnet/cover joints and stem packing area for leaks. The packing may have to be tightened to stop packing leakage at the system pressure.

## 3.0 Operation

Globe valves should not be used continuously at openings less than 25%.


***Globe valves should not be left in the fully back seated position under normal operating conditions. The packing may dry out under these conditions and leak as the valve is closed.***

A cool valve may leak through the gland when opened to hot fluid. Wait before tightening the packing as the problem may go away.

Metal seated check valves (piston and ball) are not zero leak devices and may "seep" in service. This type of valve should always be backed up with an isolation valve (either gate or globe)

## 4.0 Maintenance

Proper PPE should be worn when preparing to service a valve. Observe the following general warnings:


- ***A valve is a pressurized device containing energized fluids and should be handled with appropriate care.***
- ***Valve surface temperature may be dangerously too hot or too cold to the skin.***
- ***Upon disassembly, attention should be paid to the possibility of releasing dangerous and/or ignitable accumulated fluids.***
- ***Adequate ventilation should be available for service.***

### 4.1 Tools Required

Aside from standard wrenches, there are no other tools are required.

### 4.2 Packing (See page 15)

Special care is to be placed in the tightening of gland nuts (12) during maintenance, in order to get the proper packing adjustment and functionality.

The packing gland should be checked periodically in service and tightened as necessary to stop leakage around the stem (5). Tighten in a manner to develop uniform loading on the gland. Tighten only enough to stop the leak until maximum value is reached. See Table 11.b in Section 11 for packing gland stud torque values.

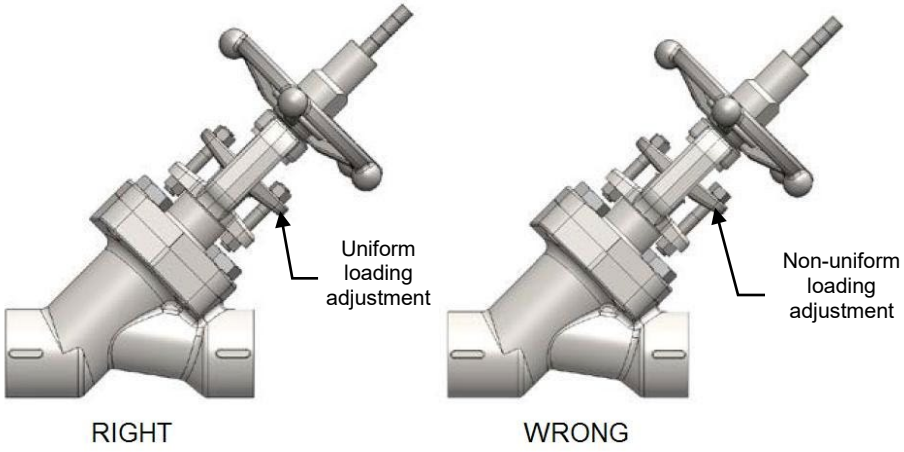



*FIG. 2*


***Over tightening will cause the packing to fail prematurely as well as increasing the force required to operate the valve.***

If the leak cannot be stopped by tightening the gland nuts, it is necessary to add additional packing rings or completely repack the valve. While Smith globe valves are equipped with a back-seat feature, it is NOT RECOMMENDED TO REPACK THEM UNDER PRESSURE.


***Back seating the valve and attempting to repack under pressure is hazardous and is not recommended. Rather than attempting to repack under pressure, it is preferable to use the backseat to control the stem leakage until a shutdown provides safe repacking conditions***

The end rings (top and bottom) of the standard Smith graphite packing set have a diagonal cut that will allow them to be installed around the stem of an assembled valve. However, the factory installed intermediate graphite packing rings are die formed and have no end cut. As a result, these rings cannot be replaced without removing the valve bonnet (2). If the valve is to be repacked without removing the bonnet (2) (see repacking the valve in line below), care must be taken not to scratch the valve stem (5) sealing surfaces and stuffing box when removing the original packing (8).

Where it is necessary to repack the valve in line, a compatible ribbon packing system or equivalent braided packing stock should be used. The joints in the packing rings should be diagonally cut. When installing the rings, care should be taken to stagger the ring joints.

Other specialty packing such as V ring Teflon will require that the valve be disassembled if repacking is required.

### 4.3 Stem Thread Lubrication

The operating yoke nut (14) of Smith OS&Y Globe valves requires proper lubrication to stem threads and/or to bonnet. The recommended grease to be applied is Loctite 77164 or equivalent. The following is the proper grease application method:

- If valve is CLOSED:
  - Apply grease below the yoke nut (14) onto stem threads
  - Open valve to the fully open position
  - Remove indicator nut (19)
  - Apply grease to the stem thread protruding above the yoke nut (14)
  - Re-install indicator nut (19)
  - Close valve to the fully close position
  - Cycle 1 additional time fully open to fully close to evenly apply grease inside yoke nut

- If valve is OPEN:
  - Remove indicator nut (19)
  - Apply grease above the yoke nut (14) onto stem threads
  - Re-install indicator nut (19)
  - Close valve to the fully close position
  - Apply grease to the stem thread below the yoke nut (14)
  - Open valve to the fully open position
  - Cycle 1 additional time fully open to fully close to evenly apply grease inside yoke nut

### 4.4 Repairs

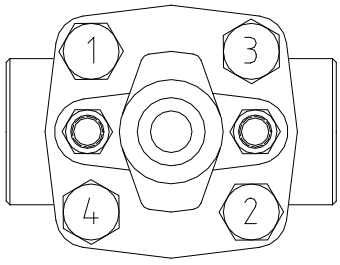
Due to the relatively low replacement cost of standard carbon steel valves, it is usually less expensive to replace the complete valve than to have maintenance personnel affect repairs. Generally, the only justifiable repairs are replacement of packing (8) and gaskets (6) as previously described.

Always replace the body gasket (6) whenever a valve is disassembled. Gasket seating surfaces should be scraped clean (avoid radial marks).

## 5.0 Body-Bonnet/Cover Bolting


- ***Only proceed to this operation once the valve has been depressurized and cooled down.***
- ***Upon disassembly, attention should be paid to the possibility of releasing dangerous and/or ignitable accumulated fluids.***

Body bolts (7) should be tightened (in the sequence as shown in Figure 3) at several different torque increments until the final recommended torque value is attained. See Table 11.a in Section 11 for recommended torque values.




BOLTING SEQUENCE

*FIG. 3*

## 6.0 Maintenance on Bolted Bonnet Globe Valves

### 6.1 Disc and Seat

The body seating surface is integral. To check the seal characteristics between the disc and body seating area, we suggest the “BLUING TEST”:

a. Proceed by completely opening the valve, assuring that the stem (5) is brought to the backseat position.
b. Loosen the body bolting (7).
c. Remove the bonnet assembly.
d. Ensure seat and disc (4) surfaces are clean and free of dirt and debris.
e. Apply some Prussian-Blue onto the disc (4).
f. Place the bonnet assembly in the original position, and hand tighten the body bolts (7).
g. Bring the valve to the closed position, wait 20 seconds, and repeat steps “a”, “b” and “c” above.
h. Check that the blue trace on the disc (4) and the body (1) is uniformly present on the contact surfaces. If this has not occurred there are two possibilities: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- There are incisions or marks on sealing surfaces, on either the disc (4) or the body (1). Check and, if any, use fine sand paper or emery cloth to eliminate them, taking care that the original planarity of these surfaces is not modified.
- If repair is not possible because great damage has occurred, contact our sales department to receive a new stem/disc assembly and body gasket (6).

i. Replace with a new body gasket (6).
j. Reassemble the bonnet/stem disc assembly and tighten body bolts (7) as described in Section 5.

### 6.2 Stem Assembly

a. Proceed by completely opening the valve, assuring that the stem (5) is brought to the backseat position.
b. Loosen the body bolting (7).
c. Remove the bonnet assembly.
d. Disassemble the stem assembly by holding the stem (5) and turning the handwheel (16) in the clockwise direction.
e. Make sure that the stem surfaces in contact with the packing (8) are not damaged. If the stem assembly is damaged beyond repair, contact our sales department for a new stem assembly (which includes the stem (5), disc (4), disc wire (13), and lock plate (20)) or consider replacing the entire valve.
f. Replace the stem assembly by inserting it through the bonnet (2) until the stem assembly comes in contact with the yoke nut (14).
g. Turn the handwheel (16) in the counter-clockwise direction to retract the stem (5) until it touches the back seat.
h. Replace with a new body gasket (6); place the bonnet assembly onto the body (1).
i. Bring the bonnet assembly to its original position and tighten the body bolts (7) as described in Section 5.

## 7.0 Maintenance on Bolted Cap Check Valves

There are two types of check valves: ball and piston. (See pages 16 and 17)

### 7.1 Ball, Piston and Their Seats

a. Seats are integral to the body (1).
b. Loosen the body bolting (7).
c. Remove all parts, taking note of the order of disassembly.
d. Do a visual check of all sealing surfaces.
e. No incisions or marks shall be on the sealing surfaces.

f. If there are any on the piston/ball (4) or the body (1), use emery cloth to eliminate them, assuring that the original planarity of the surface is not modified.
g. If there are any incisions or marks on the piston/ball (4), or the above step is not successful, contact our sales department to purchase a new ball (4), piston (4), or a replacement valve.
h. Replace with a new body gasket (6).
i. Reassemble the valve in the reverse order of the disassembly and tighten the body bolts (7) as described in Section 5.

## 8.0 Maintenance on Welded Bonnet Globe Valves and Welded Cap Check Valves

The only one difference with respect to the above-mentioned cases is that there is a weld between body and bonnet or cover.

For globe valves, maintenance is limited only to the packing area.

## 9.0 PWHT (Post Weld Heat Treatment)

### 9.1 PWHT Responsibility

Smith is responsible for all valve fabrication PWHT during manufacture of valve.
The end user is responsible for any PWHT required after welding the valve in line.

### 9.2 PWHT Requirements/Recommendations

PWHT shall be performed in accordance with the appropriate user's WPS-PQR instructions.

All heating shall be performed with localized heating equipment to minimize adverse effects to the rest of the valve. The heat band shall be extended to include the weld HAZ (heat affected zone) of the joints.

In the absence of a governing specification, the requirements of ASME B31.1 or B31.3 for PWHT shall be considered.

For NACE valves, a NACE qualified user's WPS shall be used.


***Furnace heating of a complete valve assembly is not recommended as supplied valve trim part material conditions can be adversely impacted and the packing and gasket may be damaged or destroyed.***

***Please note that welded bonnet valves cannot be disassembled without the removal of the weld. This design should not be used if the valve assembly must undergo PWHT in a furnace. In this case, a bolted bonnet design valve should be used.***

### 9.3 PWHT Procedure

The following steps relate to post weld heat treatment of valve welded in line

<u>For bolted and welded bonnet valves (localized heating):</u>

1. The valve to undergo PWHT shall be in the lightly closed position.
2. Place the localized heating equipment around the welded joint.
3. Heat to the desired temperature for the desired length of time.
4. Allow the heated assembly to cool before actuating the valve.
5. Make sure that no adverse effect has taken place during heating and that the valve is functional before proceeding.

<u>For bolted bonnet valves (furnace heating):</u>

Disassembly of bolted bonnet valves is permitted only when closed furnace PWHT is the only heating option. Care must be taken in that case in choosing a suitable controlled atmosphere type furnace in an effort to eliminate heat scale formation which may adversely impact the sealing surfaces. This procedure voids the API 598 pressure tests performed during manufacture of the valve.

1. Loosen and remove body bolting (7).
2. Remove bonnet/stem/disc/piston assembly.
3. Place only the valve body (1) and welded piping in the furnace.
4. Heat to the desired temperature for the desired length of time.
5. Allow the heated assembly to cool.
6. Replace with a new body gasket (6) during reassembly following PWHT.
7. Cap screws (7) should be re-installed using recommended bonnet cap screw torque values (Table 11.a) and practice from the IOM.
8. Cycle valve to ensure full open and close actuation.
9. It is recommended to pressure test the valve per API 598 in order to ensure there are no leaks from the seat, packing (8), or gasket (6).

## 10.0 Nameplate

Each SMITH valve is equipped with an identification nameplate placed over the handwheel for globe valves and on the cover of check valves.

SMITH nameplates are custom laser printed to prevent counterfeit or imitation nameplates.

The following is an example. The figure shows several descriptive data. The meaning of each data is given below:

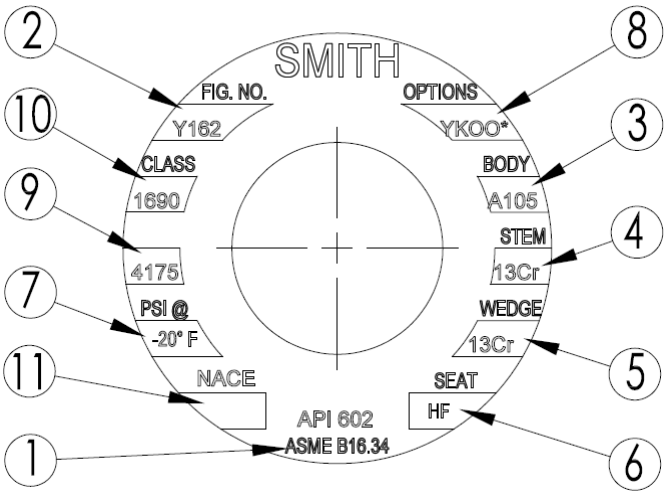



*FIG. 4*

1. Applicable standards.
2. Style code.
3. Shell material (body, bonnet, cover).
4. Stem material.
5. Closure member material. In case of hardface overlay, “HF” will be marked.
6. Seat material. In case of hardface overlay, “HF” will be marked.
7. Reference temperature per ASME B16.34
8. Valve material code option.
9. Maximum working pressure.
10. Class designation.
11. Applicable Design codes.

## 11.0 Torque Values

**TABLE 11.a: RECOMMENDED BODY/BONNET (CAP) BOLTING TORQUE**

| Valve Size (in.) | YG80/YC80/YB80 Class 800 | | | YG15/YC15/YB15 Class 1500 | | |
|---|---|---|---|---|---|---|
| | Bolt Size | Material | | Bolt Size | Material | |
| | | **Alloy Steel (ft-lbs)** | **Stainless Steel (ft-lbs)** | | **Alloy Steel (ft-lbs)** | **Stainless Steel (ft-lbs)** |
| 1/2 | 7/16-14 UNC | 16-45 | 16-18 | 7/16-14 UNC | 16-45 | 16-18 |
| 3/4 | 7/16-14 UNC | 16-45 | 16-18 | 1/2-13 UNC | 26-65 | 26-29 |
| 1 | 1/2-13 UNC | 26-65 | 26-29 | 5/8-11 UNC | 50-125 | 50-55 |
| 1-1/2 | 5/8-11 UNC | 50-125 | 50-55 | 3/4-10 UNC | 85-205 | 85-90 |
| 2 | 5/8-11 UNC | 50-125 | 50-55 | 3/4-10 UNC | 85-205 | 85-90 |

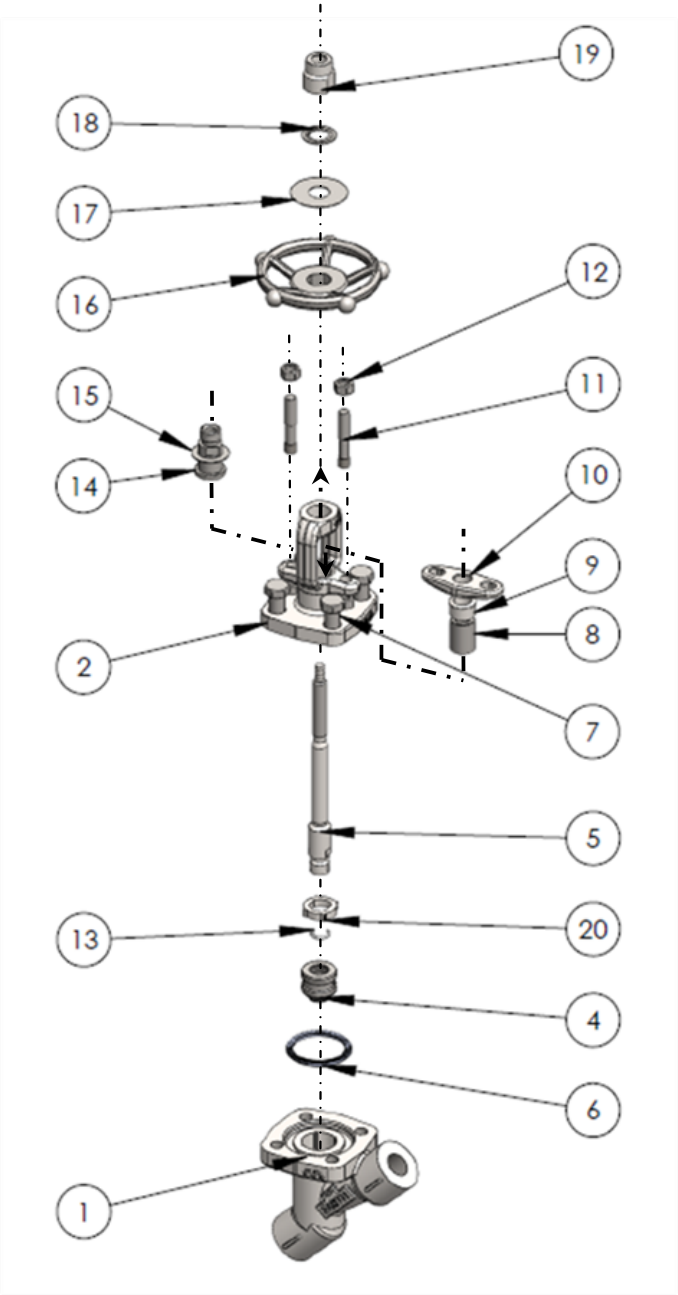
Notes:
1. Above values are based on lubricated bolt threads and bearing surfaces.
2. Non-lubricated bolt torque is 1.4 to 1.5 times above values.

**TABLE 11.b: MAXIMUM PACKING GLAND STUD TORQUE**

| Valve Size (in.) | YG80 | YG87 | YG15 | YG17 |
|---|---|---|---|---|
| | Class 800 | | Class 1500 | |
| | **Torque (in-lb)** | | **Torque (in-lb)** | |
| 1/2 | 35-52 | 38-57 | 78-117 | 71-106 |
| 3/4 | 35-52 | 38-57 | 121-181 | 78-117 |
| 1 | 54-81 | 35-52 | 226-354 | 121-181 |
| 1-1/4 | - | 54-80 | - | - |
| 1-1/2 | 100-151 | 54-80 | 226-354 | 226-354 |
| 2 | 105-155 | 100-151 | 226-354 | 226-354 |

Note:
Above torque values are based on a friction factor of 0.45 in dry conditions. Torque values may differ based on valve service conditions such as: corrosion due to environmental exposure and service temperature.

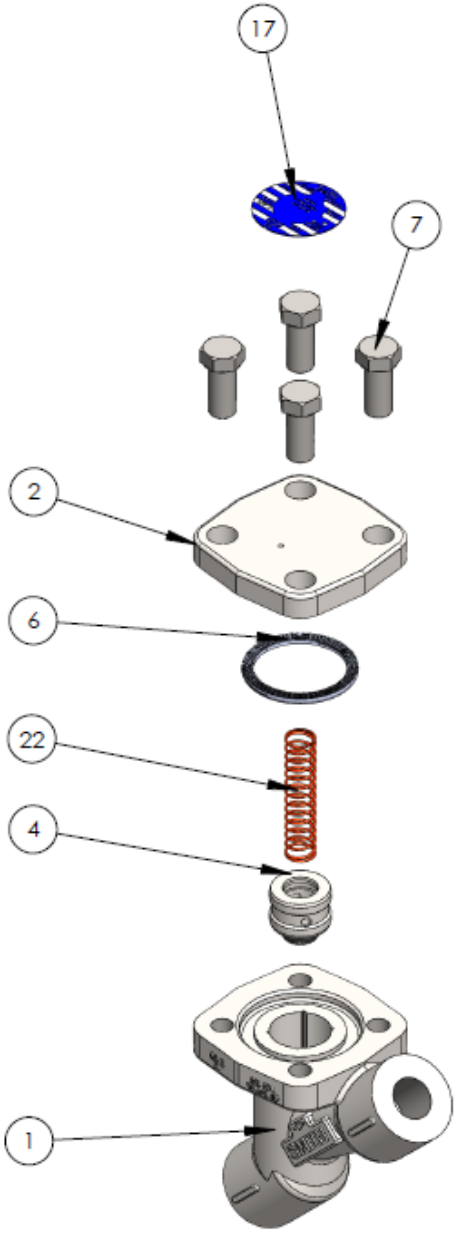
## 12.0 Valve Components




| Globe Valve | |
|---|---|
| Item | Description |
| 1 | Body |
| 2 | Bonnet |
| 4 | Disc (Note 1) |
| 5 | Stem (Note 1) |
| 6 | Gasket |
| 7 | Capscrew |
| 8 | Packing |
| 9 | Gland Bushing |
| 10 | Gland Flange |
| 11 | Gland Bolt |
| 12 | Gland Nut |
| 13 | Disc Wire (Note 1) |
| 14 | Yoke Nut |
| 15 | Thrust Washer |
| 16 | Handwheel |
| 17 | Nameplate |
| 18 | Lock Washer (Note 1) |
| 19 | Indicator Nut |
| 20 | Lock Plate |

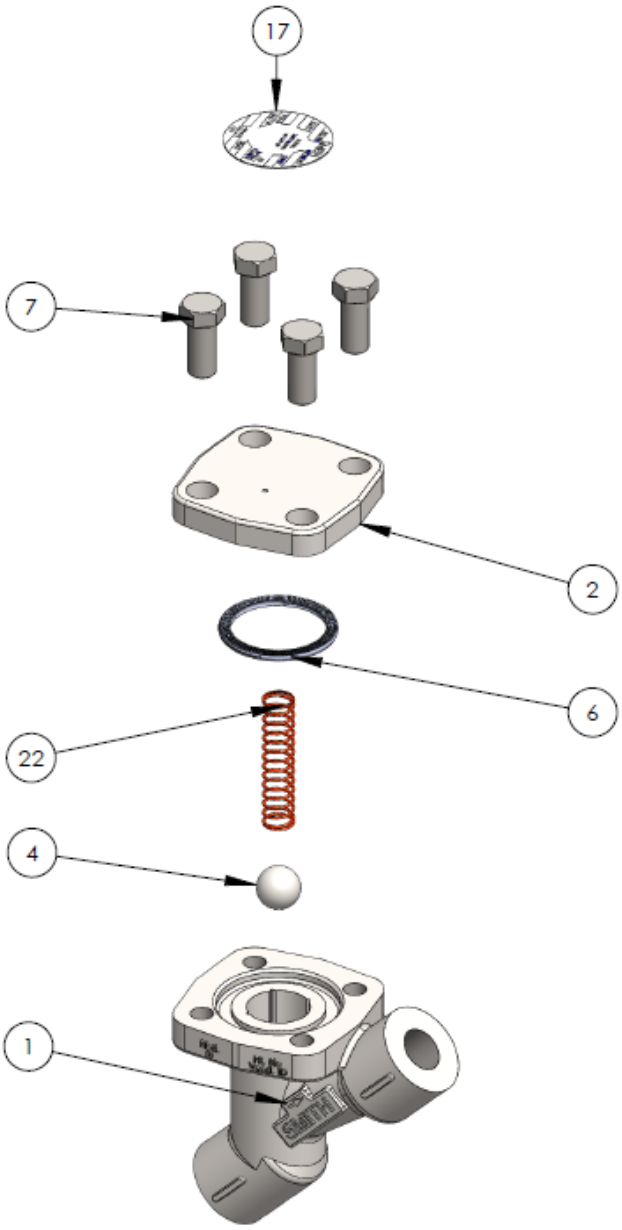
Globe Valve

Note (1): Replacement of stem would require replacement of entire stem assembly which includes: stem, disc, disc wire, and lock plate. In addition, the gasket should be replaced as well.




| Piston Check Valve | |
|---|---|
| Item | Description |
| 1 | Body |
| 2 | Cap |
| 4 | Disc |
| 6 | Gasket |
| 7 | Capscrew |
| 17 | Nameplate |
| 22 | Spring |

Piston Check Valve




| Ball Check Valve | |
|---|---|
| Item | Description |
| 1 | Body |
| 2 | Gasket |
| 4 | Ball |
| 6 | Gasket |
| 7 | Capscrew |
| 17 | Nameplate |
| 22 | Spring |

Ball Check Valve

Note: Ball cage only available on some sizes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