



VSI SERIES 9000 HIGH PERFORMANCE BUTTERFLY VALVES

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**VSI**  
**2" - 12" SERIES 9000**  
**HIGH PERFORMANCE BUTTERFLY VALVES**

**INSTALLATION, OPERATION AND MAINTENANCE MANUAL**



Publication: **V9000-2**  
FEB 2022



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**INSTRUCTIONS:**

This installation, operation, and maintenance manual covers the VSI Series 9000 Butterfly valve and should be read and understood thoroughly by all parties responsible for installation and continued use/maintenance.

**WARNINGS:**

The critical safety messages within this manual are labeled with an exclamation symbol within a red triangle flag. Care should be taken to thoroughly read and understand these warnings before proceeding to ensure no damage to equipment occurs. Failure to follow all warnings could result in injury or death.

 **WARNING!**

All parties that take part in any installation or continued use/maintenance are cautioned to be vigilant in the possible exposure to media that is contained within the valve and its pipeline. Because of the vast range of media that could be within the valve, protection from pipeline media is not within the scope of this manual. All personnel should be aware of the media within the valve and take appropriate precautions when exposure is possible while installing or servicing the valve.

**RECEIVING:**

The Series 9000 Butterfly valve is rugged and will be packaged to provide protection during most shipping incidents, however care should be taken to inspect the valve on receipt for any possible shipping damage. Inspection should be performed as soon as practical. Failure to promptly notify VSI of any shipping damage may invalidate any claim for shipping damage. Most shipments from VSI will be made FOB Origin, unless noted on the sales documents, the purchaser will own the freight while in transit, assumes all risk while in transit, and will be responsible for reporting shipping damage promptly to the carrier.

 **WARNING!**

Read all applicable instructions and directions prior to any maintenance, installation or troubleshooting.

## **SECTION 1 - FUNCTIONAL DESCRIPTION**

The SERIES 9000 Butterfly Valve is a high performance offset butterfly valve for industrial and commercial applications. The valves are available in lugged end connections, and a variety of options in disc, shaft and seat materials.

Pressure ratings are shown on the valve tag. The valve disc rotates 1/4 turn and provides bubble tight shutoff in water pipelines. The valves can be used to regulate flow rates by positioning the disc between 10 and 90 degrees open.

## **SECTION 2 - INSTALLATION**

### **WARNING!**

Valves are a significant component of any piping system. Failure due to faulty installation, improper operation or maintenance in such systems could result in damage, down time, and costly repairs. Many problems can be traced to improper installation, operation or maintenance procedures.

### **Sec 2.1 Unloading**

Inspect valves upon receipt for any damage that may have occurred during shipping, as well as conformance with quantity, configuration and description from the shipping order. When removing valves from the shipping containers, be careful not to lift the valves using slings or chain around the operating shaft, actuator, or thru the waterway. Instead, lift the valves with eye bolts or rods thru the flange holes.

### **Sec 2.2 Storage**

The valves should be stored on a pallet or “skid” in a clean, dry warehouse. If the valves must be stored outside, the following should apply:

1. Valves must be kept off the ground high enough to avoid standing water.
2. Cover the valves with a water repellent cover (not included with the valve), to prevent dirt and water from compromising the valve body or seat.

### **Sec 2.3 Guidelines**

1. SERIES 9000 Butterfly Valves are designed for installation between ANSI Class 125/150 flat or raised face flanges. Appropriate gaskets as specified by the system engineer are required.
2. SERIES 9000 Butterfly Valves have been designed so that the disc, in the open position, will clear the inside diameter of schedule 40 and 80 steel pipe.

### **WARNING!**

When installing the valve adjacent to lined pipe, as-cast fittings, or schedule 80 plastic pipe. In some instances the disc in the open position will interfere with the adjacent component and could cause damage to the disc.

3. SERIES 9000 Butterfly Valves are a bidirectional seat design. Valves will perform at their optimum when installed with the flow indicator on the body of the valve pointing with the correct direction of the flow.
4. For the best results in slurry service, position the valve assembly so that the valve stem is in the horizontal

position, and the lower disc edge opens downstream. This will create a self-flushing effect, thereby extending the service life of the valve.

5. SERIES 9000 Butterfly Valves should be installed a minimum of six (6) pipe diameters upstream and four (4) pipe diameters downstream from other line components (valves, elbows, etc.). This is not always practical, but it is important to design in as much distance as possible.

### **Sec 2.4 Pre-installation**

1. Remove any protective flange covers from the valve and the pipe flanges.
2. Remove all material such as weld splatter, oil, grease, and dirt from the valve, flanges, and pipeline.
3. Check the valve identification tag to make sure it is the appropriate valve for the location and service that it is being installed for.
4. See Table 1 to make sure you have the appropriate size, threading and length of bolts for the valve.

### **Sec 2.5 Installation**

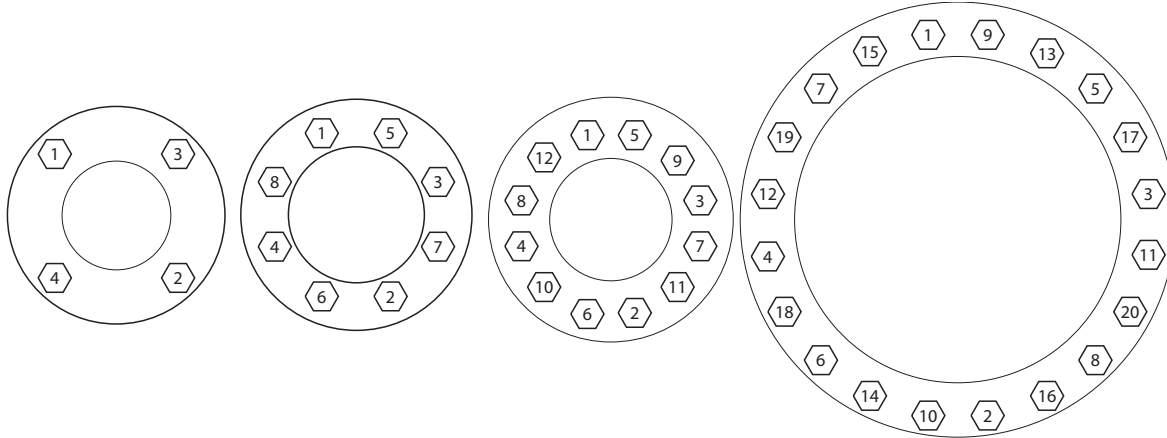
1. SERIES 9000 Butterfly Valves should be installed in the “Almost Closed” or closed position to avoid damaging the disc during installation.
2. Spread the flanges to exceed the valves face to face dimension.
3. Carefully place the valve into place between the flanges. Take care that the flange seating surface and the valve seats are not scratched.
4. Insert appropriate gaskets and ensure they are positioned properly
5. Line up, center and secure the valve between the flanges using the desired bolts or studs. Do not tighten bolts at this time.
6. Carefully open the valve to assure free and unobstructed disc movement.
7. While gradually removing the flange spreaders, center the valve body to the flanges and tighten the bolts hand tight. Slowly close the valve to check for adequate disc clearance.
8. Return the valve to the “Almost Closed” position.
9. Using an alternating cross-over pattern shown in Figure 1, tighten the bolts to the minimum torque values listed in Table 1. Tighten both sides of the valve evenly while still using the same cross-over pattern.
10. If an actuator is being used, connect any pneumatic or electrical connections as required by the actuator documentation.
11. Cycle the actuator fully, to the open and then to the closed position, checking the actuator travel stop settings for proper disc alignment. The valve should be operated to assure that no binding is taking place.
12. Pressurize the piping to the valve and inspect for leakage. If leakage occurs, tighten the bolts using the cross-over pattern, increasing the torque, till the leakage stops. Do not exceed maximum torques listed in Table 1.
13. The valve is now ready for service.

**TABLE 1: RECOMMENDED BOLT LENGTHS**

Valve Solutions Lug and Wafer Valves, 2" - 8", ASME 125/150 Bolt Pattern

Valve Size	Thread Size UNC	Number Required	Lug Bolt Length (in)	Wafer Stud Length (in)	Min Torque (ft-lbs)	Max Torque (ft-Lbs)
2" (DN50)	5/8 - 11	4	1.25	4.75	15	70
2.5" (DN65)	5/8 - 11	4	1.5	5.25	15	70
3" (DN75)	5/8 - 11	4	1.5	5.25	15	70
4" (DN100)	5/8 - 11	8	1.75	5.75	15	70
5" (DN125)	3/4 - 10	8	1.75	6	30	120
6" (DN150)	3/4 - 10	8	2	6.25	30	120
8" (DN200)	3/4 - 10	8	2.25	6.75	30	120
10" (DN250)	7/8-9	12	2.25	7.25	50	200
12" (DN300)	7/8-9	12	2.5	7.75	50	200

Bolting and torque recommendations are made without warranty, and apply only to steel weld-neck or slip-on flanges. The use of lock washers and/or lubrication with the bolting as well as the type of gasket used will affect stated torque values. Please consult gasket and bolt manufacturer for detailed recommended torques.



**FIGURE 1: RECOMMENDED BOLT TIGHTENING PATTERN**

### SECTION 3 - OPERATION

The Series 9000 closes by rotating the shaft clockwise which turns the disc clockwise till it is perpendicular to the pipe centerline blocking flow. The shaft is square and features a line cut into the top of the shaft indicating the plane of the disc. The travel of the shaft and disc is quarter turn (90 degrees).

The valve is typically operated by lever, gearbox, or a powered actuator. For a lever the travel is directly coupled to the disc travel. For a gearbox, closure is achieved by manually turning the input of the gearbox multiple turns until the valve is in the desired position. For a powered actuator either fluid or electric signals drive the valve to the desired position; please refer to the powered actuator’s manual for details.

In all instances, the valve's operator will be equipped with end of travel limits to protect the valve from being opened or closed past its natural limits. Indexing and adjustment of the operator's limits is critical, please refer to the actuator's manual for details on adjustment.

## **SECTION 4 - MAINTENANCE**

Routine maintenance or lubrication is generally not required.

### **Sec 4.1 Packing**

Visually inspect the packing area for leaks yearly and tighten packing gland bolts if leakage is observed. If leaking packing cannot be corrected by tightening gland bolts replacement of packing is necessary.

1. Remove line from service and isolate valve as necessary
2. Remove actuator following appropriate actuator manual.
3. Loosen and remove gland bolts/nuts (16, 17, & 21). Inspect for damage and replace if necessary.
4. Remove the gland flange(15) and gland(14). Inspect for damage and replace if necessary.
5. Using a packing removal tool or pick remove the packing rings(10) taking care not to scratch or damage the packing housing of the valve body or the valve shaft.
6. Carefully clean the packing housing with compressed air and brass brushes
7. Insert the new packing set, only using compatible grease if necessary.
8. Reinstall the gland(14), gland flange(15), and gland bolts/nuts(16, 17, & 21).
9. Tighten gland bolts/nuts(16, 17, & 21) snug.
10. Return valve to service and inspect packing for leakage. If leakage is observed tighten each packing bolt/ nut 1/2 turn at a time until leakage ceases.

### **Sec 4.2 End Cap Seal**

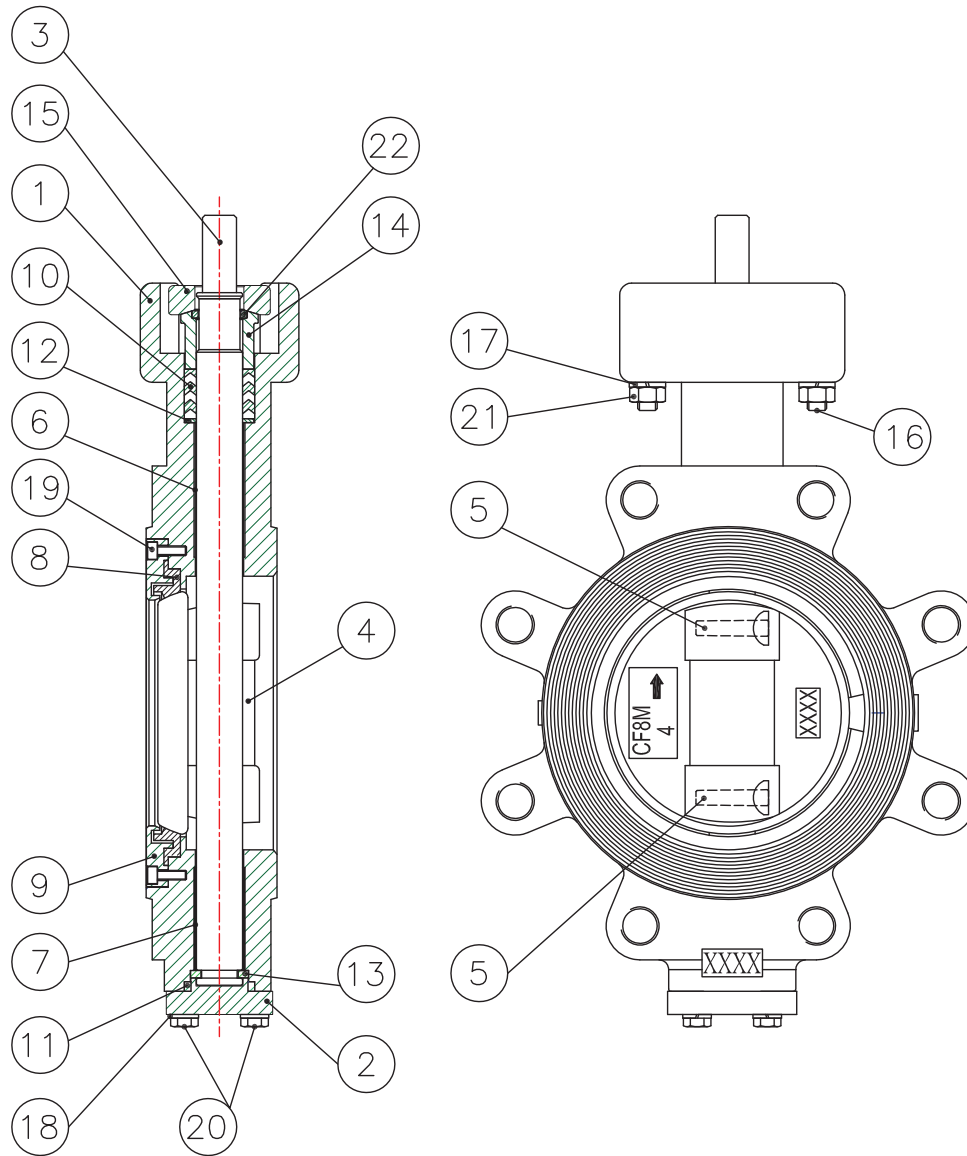
1. Remove line from service and isolate valve as necessary
2. Remove the end cap bolts(20) and end cap(2).
3. Using a packing removal tool or pick remove the end cap seal(11).
4. Install new end cap seal(11), reinstall end cap(2) and bolts(20).

### **Sec 4.3 Seat Replacement**

1. Remove line from service and isolate valve as necessary
2. Remove bolts holding valve in line and remove valve
3. Once valve is removed from the line open the valve approximately 10-15 degrees
4. Remove the cap screws(19) that hold the seat retainer ring(9)
5. Remove the seat retainer ring(9) and seat(8)
6. Inspect the seat retainer ring(9) and seat(8) for damage, replace if necessary
7. Clean the seat retainer ring(9) and the valve body(1) in the area where the valve seat resides
8. Install new seat(8) in valve body(1) then the seat retainer ring(9)
9. Reinstall and tighten seat retainer cap screws(19) in a alternating pattern as shown on Figure 1
10. Reinstall valve in line as outlined in Section 2

### **Sec 4.4 Parts**

Order parts from your VSI, LLC. sales representative. Please include the serial number, located on the valve tag, when ordering parts.



NO.	PART	QTY
1	BODY	1
2	CAP	1
3	STEM	1
4	DISC	1
5	PIN	2
6	UPPER BEARING	1
7	LOWER BEARING	1
8	SEAT	1
9	SEAT RETAINER	1
10	PACKING	1 SET
11	SEAL	1

NO.	PART	QTY
12	WASHER #1	1
13	WASHER #2	1
14	GLAND	1
15	GLAND FLANGE	1
16	GLAND BOLT	2
17	LOCK WASHER	2
18	LOCK WASHER	4
19	SOCKET HEAD CAP SCREW	12
20	HEX HEAD SCREW	4
21	HEX NUT	2
22	SHAFT WASHER	1



## **SECTION 5 - TROUBLESHOOTING**

SYMPTOM	PROBLEM	SOLUTION
The valve opens only a few degrees and stops. (The valve will not open fully.)	Improper installation. The valve is improperly aligned.	Loosen the flange bolts, realign the valve with the flanges, and retighten the bolts to the recommend torques.
Leakage past the flange face.	The flange bolts are not evenly torqued.	Loosen the flange bolts and retighten them in the recommended order and toques.
	Improper flanges.	Please refer to Installation Guidelines in Section 2 for proper flange requirements.
Leakage in the closed position. (Leakage in the pipeline).	The disc is not closing fully. The actuator is not adjusted properly	See actuator documentation for proper adjustment of travel stops on the actuator.
	Damaged seat.	Replace seat as outlined in Section 4.3
	Line pressure exceeds valve's working pressure.	Reduce the line pressure to the valve's working pressure.
	Damaged disc.	Replace valve.
Water hammer	The valve is closing too quickly.	Adjust actuator.
Excessively high torque.	Obstruction in the pipeline.	Remove the valve from the pipeline and remove obstruction.
	Valve stem or disc bent.	Replace valve. Check the pipeline for water hammer or freezing of line material.
	Scale build-up on stem or seat.	Open and close the valve several times. Operate the valve at least once a month. Check the valve seat for deterioration.