

# Vogt Forged Steel Gate, Globe and Check Valves

FCD VVAIM2000-01

Installation, Operation and Maintenance Manual



**FLowsERVE**

*Vogt Valves*



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# 1

## Recommended Spare Parts for Flowserve Vogt Valves

### 1.1 Packing and Gaskets

A high degree of standardization of Flowserve Vogt valves permits a small stock of replacement packing and gaskets to service your Vogt

valves. The following matrix and part number tables provide the details for the purchasing of replacement gaskets for your Vogt bolted bonnet valves and packing for our popular class 150, 300, 600, 800, 1500, 1690, and 2680 gate, globe and angle valves.\*

#### Packing Matrix

Pressure Class	NPS DN	½ 15	¾ 20	1 25	1¼ 32	1½ 40	2 50	2½ 65	3 80	4 100
150 Conventional Port		B	B	C	D	D	E	F	F	G
300 Conventional Port		B	B	C	D	D	E	F	F	G
600 Conventional Port		B	B	C	D	D	E	F	F	G
800 Conventional Port		B*	B	C	D	D	E	F	F	—
1500 Conventional Port		J	J	D	E	E	F	—	—	—
600 and 800 Full Port		B	C	D	—	E	F	—	—	—
1500 Full Port		B	D	E	E	F	—	—	—	—
Class 800 LTD Class		C	C	D	—	F	F	—	—	—
Class 1690 LTD Class		C	C	E	—	G	G	—	—	—
Class 2680 LTD Class		C	E	E	—	G	G	—	—	—

\*Also ¼ and ⅜ sizes.

*Packing Set Part Numbers*

Matrix	Flexible Graphite		Fluoropolymer
	Packing Set PN**	Packing Cartridge PN***	Packing Set PN**
B	55163	55175	55276
C	55166	55176	55286
D	55167	55177	55287
E	55169	55178	55288
F	55170	—	55289
G	55171	—	55285
J	55165	55179	55294

\*API 602/ASME B16.34 type valves—see valve description. For other valves consult your Flowserve distributor.

\*\*Order packing by Packing Set PN. Individual rings of complete set will be supplied.

\*\*\*One-piece or two-piece patented Packing Cartridge will be supplied when this PN is used.

*Gasket Matrix (Spiral-wound Type)*

Pressure Class	NPS DN	½ 15	¾ 20	1 25	1¼ 32	1½ 40	2 50	2½ 65	3 80	4 100
150 Conventional Port		A	A	B	C	C	D	E	E	F
300 Conventional Port		A	A	B	C	C	D	E	E	F
600 Conventional Port		A	A	B	C	C	D	E	E	F
800 Conventional Port		A*	A	B	C	C	D	E	E	—
1500 Conventional Port		A	A	B	C	C	D	—	—	—
600 & 800 Full Port		A	B	G	—	D	E	—	—	—
1500 Full Port		A	B	C	C	D	—	—	—	—

\*Also ¼ and ⅜ sizes.

*Gasket Part Numbers*

Gasket Matrix	Part Number	Spiral-Wound Gasket Description**
A	55002	304/Graphite-filled
	55003	316/Graphite-filled
	55004	316/fluoropolymer-filled
	55005	Monel/Graphite-filled
	55006	Monel/fluoropolymer-filled
B	55007	304/Graphite-filled
	55008	316/Graphite-filled
	55009	16/fluoropolymer-filled
	55010	Monel/Graphite-filled
	55011	Monel/fluoropolymer-filled
C	55025	304/Graphite-filled
	55026	316/Graphite-filled
	55027	316/fluoropolymer-filled
	55028	Monel/Graphite-filled
	55029	Monel/fluoropolymer-filled
D	55017	304/Graphite-filled
	55018	316/Graphite-filled
	55019	316/fluoropolymer-filled
	55020	Monel/Graphite-filled
	55021	Monel/fluoropolymer-filled
E	55030	304/Graphite-filled
	55031	316/Graphite-filled
	55032	316/fluoropolymer-filled
	55033	Monel/Graphite-filled
	55034	Monel/fluoropolymer-filled
F	55042	304/Graphite-filled
	55043	316/Graphite-filled
	55044	316/fluoropolymer-filled
	55045	Monel/Graphite-filled
	—	Monel/fluoropolymer-filled
G	55012	304/Graphite-filled
	55013	316/Graphite-filled
	55014	316/fluoropolymer-filled
	55015	Monel/Graphite-filled
	55016	Monel/fluoropolymer-filled

*Usage Table*

Gasket	Where Used
304/Graphite	A105, A182-F5, F9, F11 Cl 2, F22 Cl 3 Valves
316/Graphite	A182, F316 Valves
316/fluoropolymer	“T” Suffix Trimmed Valves
Monel/Graphite	MM & HF Acid Trimmed Valves
Monel/fluoropolymer	Chlorine Valves

## 1.2 Bonnet Replacement Assemblies

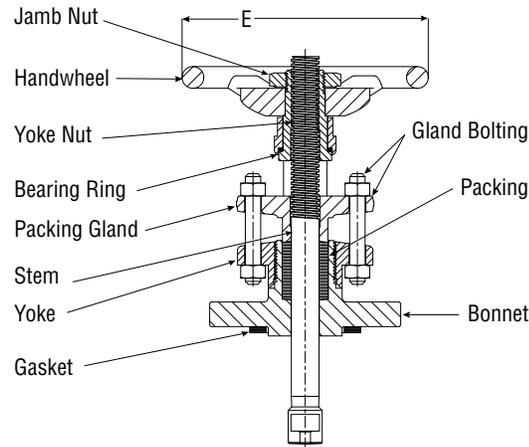
### Series 21000 – Vogt Valve Replacement Bonnet Subassemblies

Some valve end-users find it more expedient to replace the bonnet subassembly, complete with new packing, when repacking small-bore valves. To support this maintenance philosophy, Vogt valve users may purchase A105 bonnet subassemblies for replacement on their Vogt valves by specifying the Series Number noted below. The removed bonnet assemblies, if not damaged and still serviceable, can be repacked in a valve repair shop environment and be used during a later valve repacking cycle.

- Repacking made easy
- Promotes quick change
- Completely packed and ready to install
- Supports valve repacking in valve shop environment
- High degree of standardization permits retrofitting of popular Vogt Class 150, 300, 600, and 800, 13 Cr. trimmed, bolted bonnet valves.

The Replacement Bonnet Assembly Package can be easily installed on most existing in-line Compact Design Gate Valves in Classes 150, 300, 600, and 800, of A105 bolted bonnet design with 13 Cr. trim. Specify the desired replacement Bonnet Assembly Package for the valve size and series you intend to repack by replacing the bonnet subassembly.

Figure 1 – Series 21000 – A105/13 CR Trim (Gasket Included)



Order by this number



Valve Size	Valve Series No.	Retrofit Bonnet Assembly Package Series No.	Handwheel Diameter E
1/2, 3/4	353, 363, 373, 12111, SW12111, 12161, SW12161	21000 04	4.00
1	353, 363, 373, 12111, SW12111, 12161, SW12161	21000 06	4.75
1 1/4, 1 1/2	353, 363, 373, 12111, SW12111, 12161, SW12161	21000 08	5.75
2	353, 363, 373, 12111, SW12111, 12161, SW12161	21000 09	7.00

Consult Flowserve for Vogt's installation procedure covering instructions for proper field replacement of the series 21000 replacement bonnet subassemblies.

# 2 Valve Selection

## 2.1 Introduction

Flowserve Vogt Valves, is a world leader in the manufacture of forged steel, alloy steel, and stainless steel gate, globe and check valves. Since Vogt valves are used for a variety of applications and in various operating environments, it is reasonable to expect that the performance of a valve will reflect upon its selection and suitability for the specific service as well as proper installation and maintenance. As a long time member of the Manufacturers Standardization Society (MSS) of the Valve and Fitting Industry, Inc., Vogt engineers have participated in the development of MSS SP 92, *MSS Valve User Guide*. This guide was developed to recognize and offer recommendations to correct operating problems involving industrial valves that were not properly selected for the intended service, or were adversely affected by improper handling, installation, operation, or maintenance.

The purpose of this publication is to supply detailed information that relates specifically to selection, storage, installation, operation, and maintenance of Vogt gate, globe and check valves.

Flowserve Vogt Valves endorses the recommendations outlined in the following source as it pertains specifically to the selection, shipping, storage, installation, operation and maintenance of Vogt gate, globe and check valves:

*MSS SP 92, Current Edition, MSS Valve User Guide, available through Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street NE, Vienna, VA 22180-4602. Tel: 703-281-6613. Information in this Operation, Maintenance and Instruction Manual that was extracted from MSS SP 92, was done so with the permission of the MSS, and shall be denoted by footnote<sup>(1)</sup>. Copies of the Standard Practice 92 are available from MSS by request.*

## 2.2 Gate Valve Limitations

- Do not use for flow regulation or throttling.
- Do not use if frequent manual operation is required.
- Do not use for slurries or fluids containing solids that can build up in valve cavities.
- When packed or gasketed with low melting point materials such as fluoropolymer the full shell pressure/temperature rating and fire-safe design are sacrificed.
- Locked-in volume when closed.

## 2.3 Globe Valve Limitations

- Do not use if full flow at minimal pressure drop is required.
- Do not use for slurries or fluids containing solids that can build up in valve cavities.
- When packed or gasketed with low melting point materials such as fluoropolymer the full shell pressure/temperature rating and fire-safe design are sacrificed.

## 2.4 Check Valve Limitations

- Must be installed to agree with flow arrow on body.
- Zero leakage of metal-to-metal check valves cannot be readily achieved without an elastomeric element in the seating arrangement.
- Sizing and pressure drop is critical to ensure full lift of valve piston.
- Use swing check valve design for “boiler feedwater” and other services where internal rusting may occur in service.
- Use spring-controlled lift check valve for compressor service.
- Size non-spring control lift check valves so that a minimum 2 psi pressure drop is achieved.
- Size swing check valve so that a minimum 0.5 psi drop is achieved.
- Use swing check valves when maximum flow at minimal pressure drop desired.
- Do not use for slurries or fluids containing solids that can build up in valve cavities.
- When gasketed with low melting point materials such as fluoropolymer the full shell pressure/temperature rating and fire-safe design are sacrificed.

## 2.5 Pressure/Temperature Rating

Proper selection of the pressure/temperature rating of the valve shall meet service requirements. If the valve application involves temperatures above 100°F (38°C), then the valve pressure rating at the service temperature must be verified to meet the requirements of the application.

If system testing will subject the valve to a pressure in excess of its working pressure rating, then the intended testing pressure and a statement explaining whether the test pressure is through the opened valve or a differential across the closed valve, should be included in the purchase specification.

### Source Reference for Vogt valves pressure/temperature ratings

ASME B16.34 Valves, Flanged, Threaded, and Welded End VVACT0000, Vogt Catalog.

## 2.6 Bending Strength

Piping systems are subject to mechanical constraints at fixed support points such as rigid nozzles, anchors, etc. Cold springing at assembly, system temperature changes, together with gravity, possible inertia loads, landslides, non-uniform subsidence in buried lines, etc., all potentially affect the bending moment at various points in the piping. <sup>(1)</sup>

Valves are also subjected to the bending moment occurring in the adjacent pipe that is in addition to the normal pressure loading. Bending loads can cause deformation in valve bodies that can be detrimental to valve performance. It is therefore a recommended design practice to avoid locating valves at points of large bending loads. <sup>(1)</sup>

Class 150, 300, 600 and 800 Vogt valves have bodies with a nozzle section modulus (I/C) greater than Schedule 80 pipe. Class 1500 Vogt valve bodies have I/C section modulus greater than that of Schedule 160 pipe. If the connecting pipe meets the above or has a lesser wall thickness, it is expected that the piping would be the weaker element when connected to a Vogt valve and exposed to a bending load. If the schedule pipe to be used with the Vogt valves are greater than the above (pipe has a heavier wall thickness), the purchase order shall denote this and Flowserve will provide an I/C section modulus calculation for the valve body/adjoining pipe to ensure the piping is the weaker element, or will advise customer otherwise.

<sup>(1)</sup> Paragraph extracted from MSS SP 92.

## 2.7 Fire Safety

Flowserve Vogt Valves all metal-seated gate, globe and check valves come standard with flexible graphite packing and gaskets and are of a fire-safe design. If these valves are supplied with low melting point packing, or gaskets, such as fluoropolymer or elastomeric seals for sealing, the fire-safe design and full shell pressure/temperature ratings are sacrificed.

The purchase order should indicate when the customer requires fire-safe designs.

## 2.8 Pressure Surge

Closure of a valve in a flowing fluid line causes the velocity of the fluid to be reduced to zero. If the fluid is a relatively incompressible liquid, the inertia of an upstream column produces a pressure surge at the valve whose magnitude is inversely proportional to the time required for closure. The surge pressure is also proportional to the length of the upstream fluid column and the fluid velocity prior to closure initiation. If the application involves a long upstream line, a long downstream line, high velocity, or rapid closure, singly or in any combination, the possibility of an unacceptable pressure surge should be investigated. <sup>(1)</sup>

Also to be considered are condensation-induced pressure surges which occur when a fluid velocity change is caused by rapid condensation or when a slug of water is accelerated by contact with steam. An example would be when condensate collects on one side of a closed valve that has steam on the other side, then opening the valve will cause collapsing steam voids, sharp pressure surges and acceleration of condensate slugs. Condensation-induced pressure waves can result in pressure pulses that are significantly higher than those produced by a sudden valve closure. In such events, non-shock rated gray iron valves installed in steel piping systems are particularly vulnerable to catastrophic failure. Traps are required to prevent condensate accumulation and “blow-off” valves located at the low point in the system are needed to ensure condensate drainage. Operation and maintenance personnel must be aware of the function of these devices in relationship to the “shut-off” valve operation and the necessity for their being in proper working order. <sup>(1)</sup>

<sup>(1)</sup> Paragraph extracted from MSS SP 92.

## 2.9 Throttling Service

Flow control (throttling) valves may be subject to extreme fluid turbulence that may create a high-energy conversion within the valve and associated piping system. High noise levels usually indicate this energy conversion, either by cavitation of liquids or by shock waves from gases.

Therefore, it is possible to damage the valve and piping system when the throttling of liquid flow results in severe and continuous cavitation conditions. Likewise, with gas flow under severe throttling conditions, shock waves can possibly result in damage to the system.

Vogt “flow control valves” should be used when the user requires true flow regulation. Flowserve Vogt Valves should be consulted on proper valve selection for throttling and/or flow control applications.

## 2.10 Temperature Changes

Forged steel expands and contracts with rising and falling temperatures, and in general, an increase in temperature results in a decrease of mechanical strength that is regained on return to a lower temperature. A temperature gradient in a steel part may impose significant thermal stresses or deformity with a possible negative effect on valve performance.

Frequent temperature cycling may result in development of thermal stress fatigue. Any one or a combination of the following increases this possibility:

- An increase in temperature range, level, rate of change, an increase in the metal section thickness, or number of cycles.

- Thermal cycling has been determined to increase the tendency for stem seal leakage.

## 2.11 Trapped Pressure

When a closed valve containing liquid is heated (e.g., from process condition, radiation or solar heating) the cavity pressure will increase due to volumetric expansion or vaporization of the liquid. Conversely, cooling an un-drained cavity below the freezing point may also result in volumetric expansion of the media. These types of expansion can result in extremely high pressures in the valve. <sup>(1)</sup>

A bonnet cavity relief can be added to Vogt gate valves when the user determines that the conditions for over-pressurization of the “locked-in bonnet cavity” exist. Globe and check valves do not have a “locked-in volume” when the valves are closed and are not subject to this trapped pressure.

<sup>(1)</sup> Paragraph extracted from MSS SP 92.

## 2.12 Material Compatibility

It is significant that forged valve materials and lubricants used in construction be chemically consistent or compatible with the connecting piping system components, line fluids, applications and the environment. Flowserve, or the system design engineers, should be consulted whenever there appears to be reason for such concern.

Flowserve Vogt Valves has construction procedures for valves used in various applications, one being “food service”. These procedures ensure that valve materials, and lubrication used in manufacture are compatible with food standards. Flowserve should be consulted on proper valve selection when applications require special cleanliness, materials and/or lubricants.

## 2.13 Operating Effort

Vogt valves are designed to require a reasonable amount of physical effort applied to a handwheel to open or close at rated working pressure. Maximum handwheel torques at maximum pressure ratings are listed in Section 5 of this manual.

# 3

## Shipping And Storage

### 3.1 Introduction

Flowserve recognizes the importance of maintaining the as-built condition of valves, and has prepared this section to call attention to important considerations in the handling of valves prior to installation.

Vogt forged steel valves are tested and shipped ready for installation. These valves are well-designed, fabricated under an ISO 9001 Quality Program, and inspected and tested to provide years of satisfactory service. Vogt valves can withstand a variety of damages caused by impact, shock or incursion of detrimental materials after installation. However, the intermediate period between the factory production tests and the installation in the end-user's pipeline may involve exposure to damage during shipping that may adversely affect the subsequent service performance of the valves.

Vogt valves are packaged to rigorous procedures, depending upon end-user specifications, and are padded and boxed for full protection during shipment to our customers.

Attention to the recommendations and cautions here will provide enhanced assurance of a satisfactory valve when installed.

### 3.2 Handling

Appropriate care in handling valves should be complementary to the degree of protection provided in preparation for transport. A basic consideration in handling valves should be to avoid damaging the protection provided for shipment. An obvious general rule is that valves should never be thrown or dropped. It is advisable to keep the valve(s) in the shipping containers until the valve is to be installed.

Vogt valves are carefully made from selected materials to give long, trouble-free service when properly installed in applications for which they were designed. Proper care and maintenance in the field can contribute significantly to maximum performance.

The care the valve receives between the time it is shipped by the manufacturer and installed in the piping system is important. During this period, the valve can be handled many times and can be kept in storage for long periods. Industrial valves are not delicate, but they are mechanical devices, which should be treated as such and handled with care.

Flowserve always provides valves with appropriate end covers to protect the end connections and to prevent foreign material from entering the valve. In addition, small valves are shipped in sealed cartons while larger valves are usually palletized. If at all practical, keep the valves in the cartons or on the pallets with end covers in place until ready to be installed. Storing the valves off the ground and indoors is always preferable. When stored outside, valves should be off the ground and protected by a weatherproof cover.

### 3.3 Storage – Short Term Recommendations

Following acceptance testing and inspection at the factory, Vogt products are moved to storage. During movement to storage, Vogt products are protected from rain and snow, stored in a building that is provided with uniform heating and cooling control, and outdoor storage is not permitted.

Store products away from exposure to the outside environment, airborne contaminants, acceleration forces, and physical damage.

Store products within a fire-resistant, weathertight, and well-ventilated building or equivalent enclosure. This area should be situated and constructed so that it is not be subject to flooding; the floor should be paved or equal, and well drained.

Place items on pallets or shoring to permit air circulation. This area should be provided with uniform heating and temperature control or its equivalent to prevent condensation and corrosion.

Do not remove valve end protectors unless necessary for inspection and installation.

### 3.4 Storage – Long Term Recommendations

Keep Vogt Valves products in the as-shipped pallets and/or boxes as long as practical. Do not remove valve end protectors unless necessary for inspection and installation.

Upon receipt, inspect pallet and/or boxes for handling damage and/or exposure to rain and/or ocean spray. Report damage to the transport agent.

Store the pallets and/or boxes for protection against the weather. Ideally products should be kept indoors with actual storage temperature always higher than the dew point.

The storage area should be a fire-resistant, tear-resistant, weathertight, and well-ventilated building or equivalent enclosure.

The storage area should be located and constructed so that it will not be subject to flooding. The floor should be paved or equal and well drained.

Place individual valves or other product separated from its shipment pallet and/or box on pallets or shoring to permit air circulation. Keep the valve flow ports sealed with the Vogt-supplied plugs and/or covers.

If outdoor storage is unavoidable, support products off the ground or pavement, protected by a watertight enclosure.

Weatherproof covering, when used for outdoor storage, should be a flame-resistant type of sheeting or tarpaulins. Place them so as to provide drainage and to ensure air circulation to minimize condensation. Tie them down to prevent moisture from entering laps and to protect the covering from wind damage.

Since Vogt Valves' packing and gaskets have an indefinite shelf life, valves may be removed from storage and installed without further preparation. This procedure shall be supplemented with valve motor and/or air cylinder manufacturer's storage recommendations for Vogt valves modified with motor or air cylinder valve actuators.

# 4 Installation

## 4.1 Introduction<sup>(1)</sup>

A most critical point in time in the life of an industrial valve is installation. The possibilities for degradation of the valve are numerous. Conversely, the exercise of proper care in this process will assure increased probability of trouble-free valve service.

This Section has been prepared in order to provide useful information, warnings and reminders, in a format that will be helpful to all concerned. A judicious selection of these pages, delivered to the installation site with the valve itself, will provide the opportunity for the person having the greatest need to know to be informed or reminded of what is most important at the time such information can be the most useful.

<sup>(1)</sup> Paragraph extracted from MSS SP 92.

## 4.2 Inspection

Prior to installation, the following inspections are recommended:

- Valve(s) and nameplates should be checked for proper identification to be sure the valve is the proper type and of a suitable pressure class.
- Check the handwheel jamb nut to ensure that it is tight. After installation, periodically check the nut to ensure tightness.
- Actuate the valve full-open to full-closed to check for possible damage from shipping and handling.
- It is extremely important to inspect the interior of both the valve and the adjoining pipe for cleanliness, because foreign material in the line is the major cause of seat leakage and seat damage.
- Make a point of noting any special warning tags or plates attached to or accompanying the valve and take any appropriate action.
- Verify any marking indicating flow direction. Make sure that the valve is installed in the proper flow orientation when a flow direction is indicated on the valve.

- Inspect end connections to be sure that pipe threads and flange faces are free from scratches, nicks, or dents.

**▲ CAUTION:** Vogt valves are shipped with plastic threaded or welding end protectors. During inspection for installation, make sure these protectors have not been mishandled and displaced into the valve interior. If so they must be removed.

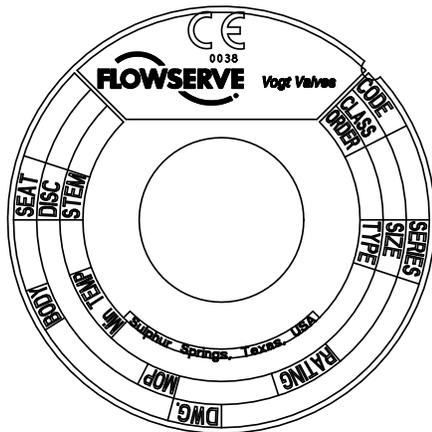
### 4.3 Valve Identification

All valves have a nameplate attached to the handwheel that include the series number, size, pressure class and material. The valve nameplate needs to be reviewed in conjunction with the installation, maintenance, and spare parts ordering instructions in this manual.

#### Valves Constructed Under The European Pressure Equipment Directive (PED)

A nameplate attached to the valve (as noted in the Illustration below) shall identify all Vogt PED Category III valves. This nameplate shall be placed on the valve at the factory. In addition to the nameplate, the Vogt PED valve will also have a lot tag to identify the date of manufacture. All nameplates for Category III valves shall have the **CE-mark** and shall also include the **Notified Body Number**.

Figure 2 – Vogt Valves PED Valve Nameplate



### 4.4 Threaded Valve – Pipe Assembly

Threaded pipe joints depend on a good fit between the external and internal pipe threads for tight sealing. Usually, a compatible soft or viscous material is used between the assembled threads to assist in ensuring a leak-free seal. The following installation practices are recommended:

- Check the threads on both the valve and the mating pipe for correct thread form and cleanliness. Be alert for any indication of an impact that might have deformed the thread either out-of-round or by a local indentation. Be sure no chips or grit are present.
- Note the internal length of the threads in the valve ends and the proximity of the valve internal seat to make sure the pipe end will not hit the seat when assembled. If there appears to be a possibility of a problem, carefully check the pipe end thread to make sure there is no extended straight portion beyond the standard tapered section.
- Apply an appropriate thread tape or thread compound to the external pipe threads except when dry seal threading is specified. Avoid getting the thread tape or thread compound into the internal flow area.
- Use care to align the threads at the point of assembly. Tapered pipe threads are inherently a loose fit at entry. Substantial wrenching force should not be applied until it is apparent that the threads are properly engaged.
- Assemble the joint wrench-tight. The wrench on the valve should be on the valve end into which the pipe is being threaded.

**▲ CAUTION:** Because there is no clear limit on the torque that may be developed in a tapered thread joint, it is possible to damage the valves or piping by applying excessive twisting forces through the body of the valve. If at all possible a wrench should be used on the same end of the valve to which the pipe is being threaded into. This way the torque load will not be applied throughout the valve body.

- Repeat the process at the second valve end. Again, apply the wrench at end of the valve to which the pipe is being assembled.

### 4.5 Flanged Joint Assembly

Flanged joints depend on compressive deformation of the gasket material between the facing flange surfaces for tight sealing. The bolting must provide the mechanical force necessary to maintain the compressive stresses on the gasket, as well as resist the normal pressure forces tending to separate the joint. It should be recognized that with “brute force” alignment of misaligned flanges, sufficient bolting force may not be available to sustain the required gasket loading and to resist the load caused by the pressure separating force, resulting in a joint leakage problem. The following practices should be observed for satisfactory flange joint make-up:

- Check the mating flange facings. Do not attempt to assemble the flanges if a condition is found which might cause leakage

(e.g., a deep radial groove cut by a retracting cutting tool or a dent across the face caused by mishandling), until the condition is corrected.

- b) Check the bolting for proper size, length, and material. A carbon steel bolt on a high-temperature flange joint can result in early joint failure. High-strength material is always required for flange bolting on steel flanges Class 400 or higher. Such bolting is usually stamped “B-7” on the end, but other grades may be used in some cases. The proper matching of flanges, bolting and gaskets is important. Specific requirements of ASME B16.5 should be satisfied. Low-strength bolting may be used for lower-pressure flanges, Classes 150 and 300 for operating temperatures not exceeding 400°F (204°C), when using approved gasket materials. See ASME B16.5 for gasket specification.
- c) Check the gasket materials. See ASME B16.5 for additional requirements for flange joints using low-strength bolting, (e.g., gray iron flanges or Class 150 steel flanges). Metal gaskets (flat, grooved, jacketed, corrugated, or spiral-wound), should not be used with these flanges.
- d) Check the gaskets for freedom from defects or damage.
- e) Use care to provide good alignment of the flanges being assembled. Use suitable lubricants on the bolt threads. Sequence the bolt tightening to make the initial contact of the flanges and gaskets as flat and parallel as possible. Tighten the bolts gradually and uniformly to avoid the tendency to twist one flange relative to the other. Use of a torque wrench is helpful to ensure correct and uniform final tightening of the flange bolting. Parallel alignment of flanges is especially important when assembling a valve into an existing system. It should be recognized that if the flanges are not parallel, then it would be necessary to bend something to make the flange joint tight. Simply forcing the flanges together with the bolting may bend the pipe or it may bend the valve. This is particularly true in large diameter piping. Such conditions should always be brought to the attention of someone capable of evaluating the bending condition and the corrective measures that need to be taken. The assembly of certain “short pattern” valves between mating flanges requires that the installation be checked for any possibility of interference between the moving parts of the valve and the adjacent pipe, fitting, or valve.

**▲ CAUTION:** Torque wrenches should always be used to assure proper tightening of the flange bolting. If, in the tightening process, the torque on a given bolt has been increasing with each part turn and then is observed to remain unchanged or increase a much lesser amount with an additional part turn, that bolt is yielding. That bolt should be replaced and scrapped since it is no longer capable of maintaining the proper preload.

## 4.6 Weld Joint Assembly

Welded joints that are properly made provide a structural and metallurgical continuity between the pipe and the valve body. It is important that the joint should not constitute a “notch” or “weak link” in the pipe-valve-pipe assembly. Therefore, the weld fillet for socket weld joints must always have more cross sectional area than the pipe.

Butt weld joints require full-penetration welds and a weld thickness at least equal to that of the pipe. Welding a pipe of a high strength alloy to a valve with body material of lower mechanical strength requires that the weld taper to a compensating greater thickness at the valve end.

Sound welds are obviously important.

**▲ CAUTION:** This guide is not a complete welding instruction. All welding should be in accordance with any Code or jurisdictional regulations applicable to the construction of the piping system. The welds must be made following approved welding procedures and be inspected as required by all applicable specifications. The following points are intended to be helpful as point-of-use reminders of important requirements of good welding practice:

- a) Consult the manufacturer for the correct installation procedure of a metal-seated valve prior to pre-heating, welding and postweld heat treatment of a butt weld or socket weld valve. To avoid the possibility of arcing always attach the ground directly to the body.
- b) Consult the manufacturer for the correct installation procedure before welding a soft-seated valve into a line. As a minimum, a soft-seated ball or plug valve should be in the full-open position prior to welding to prevent seat damage and/or weld splatter from adhering to the ball or plug. A means for venting the ball cavity is recommended to relieve any fluid pressure that might develop due to thermal effects.
- c) Check materials marking on the pipe and valve to confirm that they are as specified.
- d) Inspect the welding end surfaces for dimensions and cleanliness. Correct any condition that might interfere with assembly and satisfactory welding.
- e) Check all backing rings that may be used to confirm that the ring material is compatible with the pipe and valve materials and that the individual rings fit and are clean.
- f) Determine that all required welding parameters, including pre-heating and postweld heat treating, are in accordance with the approved welding procedure.
- g) Inspect the “valve to pipe end” alignment and adjust as required.

- h) Securely tack weld the mating parts when required if part of the approved procedure.
- i) Complete the weld using the approved welding procedure.
- j) Clean and inspect the finished weld.
- k) Repair any defects using an approved weld repair procedure when necessary.

## 4.7 Recommendations for Field Welding of Small Carbon Steel Socket Weld Valves

- 1. Evaluation of Code Requirements** Prior to welding, construction code requirements should be reviewed (ASME Section I, VIII, IX, B31.1, B31.3, etc.). Applicable code requirements may supersede these recommendations. In the absence of specific code requirements, the guidelines of ASME Section IX are recommended for qualification.
- 2. Selection of Process** Based on the size of the valve and the skill of the welder, either the SMAW (stick) or GTAW (Tig) process is recommended. SMAW is generally preferred, although, GTAW offers more control (at the expense of speed) and may be preferred for 3/4" and smaller valves.
- 3. Selection of Weld Filler Metal** For SMAW, use 3/32" electrode on the first pass with 1/8" for subsequent passes. 1/8" and 5/32" electrodes may be used effectively on larger valves. E7018 electrodes are recommended, although E6010 may be preferred, particularly on the first pass, if joint cleanliness is less than desirable.

Type ER70S-2 is preferred for GTAW. ER70S-3 and ER70S-6 may also be used. 3/32" size is recommended, although 1/16" and 1/8" may also be used successfully.

- 4. Selecting the Welder** Most construction codes require a welder to qualify prior to making a production weld. Welder performance qualification provides some assurance that the production weld will be of good quality since the welder has proven, through testing, that he can make a good weld. Care should be taken in comparing the welder's qualification with the code requirements to assure that the welder has qualified with an appropriate test for the intended production weld.
- 5. Joint Cleanliness** The area in-way-of welding should be cleaned to remove rust, scale, dirt, oil, and protective coatings. This should be done prior to fit-up or residue in the joint overlap will not be removed. Sanding, grinding, or wire brushing is usually adequate. Solvents may be necessary, if oil is to be removed.

- 6. Fit-up (Socket Weld Valves)** In order to gauge fillet weld size after welding place a circumferential mark 1" from the engaging pipe end prior to welding. Bottom out the pipe engagement into the socket and pull it back approximately 1/16" to allow for weld shrinkage. Note the dimension from the mark to the valve pipe end.

Tack welds should be contoured to allow for easy inclusion into the final weld.

## 7. Welding Technique

- a. Prior to welding, the valve should be lightly closed. Where possible, attach the electrical ground to the adjoining pipe on the same side of the valve as the weld being made. Do not attach the ground to the handwheel or upper structure of the valve or arcing across the valve seating surfaces could occur.
- b. Where possible, welding should be done in the flat or horizontal position. Where vertical welding is necessary, progression should be upward (vertical down welding is prone to lack-of-fusion).
- c. Welding parameters: The following welding parameters may be used as a guide.

Electrode	Current	Voltage	Shielding Gas
3/32" E6010	55-75 A	—	N/A
3/32" E7018	70-90 A	*	N/A
1/8" E7018	90-110 A	*	N/A
3/32" ER70S-2	75-100 A	13-14 V	100% Argon at 15-20 CFH

\*Use as close and tight an arc as possible.

- d. A minimum of two layers should be used for all socket welds. This will decrease the chance of leaking even if one pass contains a weld defect.

## 4.8 Recommendations for Field Welding of Small Alloy Steel Socket Weld Valves

- 1. Evaluation of Code Requirements** Prior to welding, construction code requirements should be reviewed (ASME Section I, VIII, IX, B31.1, B31.3, etc.). Applicable code requirements may supersede these recommendations. In the absence of specific code requirements, the guidelines of ASME Section IX are recommended for qualification.
- 2. Selection of Process** Based on the size of the valve and the skill of the welder, either the SMAW (stick) or GTAW (Tig) process is recommended. SMAW is generally preferred, although,

GTAW offers more control (at the expense of speed) and may be preferred for 3/4" and smaller valves.

3. **Selection of Weld Filler Metal** For SMAW, use 3/32" electrode on the first pass with 1/8" for subsequent passes. 1/8" and 5/32" electrodes may be used effectively on larger valves. 3/32" is recommended for GTAW. 1/16" and 1/8" may also be used successfully. Based on the alloy type, the following filler metals are recommended:

Valve Material	SMAW Filler Material	GTAW Filler Material
A182 F5	E502-15 or 16 electrodes	ER502
A182 F11	E8018-B2	ER80S-B2
A182 F22	E9018-B3	ER90S-B3

Care should be taken to use only SMAW electrodes that have been kept essentially free of exposure to moisture. Exposure of coated electrodes to moisture can cause high levels of hydrogen in the weld which can result in delayed cracking, especially with hardenable alloys. Electrodes should be kept in heated electrode ovens operating at 250–300°F (120–150°C) when not being used. Limit atmospheric exposure to eight hours maximum without reheating. Electrodes may be used immediately following opening of the hermetically sealed containers in which they are normally supplied.

4. **Selecting the Welder** Most construction codes require a welder to qualify prior to making a production weld. Welder performance qualification provides some assurance that the production weld will be of good quality since the welder has proven, through testing, that he can make a good weld. Care should be taken in comparing the welder's qualification with the code requirements to assure that the welder has qualified with an appropriate test for the intended production weld.
5. **Joint Cleanliness** The area in-way-of welding should be cleaned to remove, dirt, oil, and protective coatings. This should be done prior to fit-up or residue in the joint overlap will not be removed. Sanding, grinding, or wire brushing is usually adequate. Solvents may be necessary, if oil is to be removed.
6. **Fit-up (Socket Weld Valves)** In order to gauge fillet weld size after welding, place a circumferential mark 1" from the engaging pipe end prior to welding. Bottom out the pipe engagement into the socket and pull it back approximately 1/16" to allow for weld shrinkage. Note the dimension from the mark to the valve pipe end.

Tack welds should be contoured to allow for easy inclusion into the final weld.

7. **Welding Technique**

- a. Prior to welding, the valve should be lightly closed. Where possible, attach the electrical ground to the adjoining pipe on the same side of the valve as the weld being made. Do not attach the ground to the handwheel or upper structure of the valve or arcing across the valve seating surfaces could occur.
- b. Where possible, welding should be done in the flat or horizontal position. Where vertical welding is necessary, progression should be upward (vertical down welding is prone to lack-of-fusion).
- c. Preheat: A minimum preheat of 350°F (175°C) is recommended for alloy steels.
- d. Welding parameters: The following welding parameters may be used as a guide:

Electrode	Current	Voltage	Shielding Gas
<b>SMAW</b>			
3/32"	70-90 A	*	N/A
1/8"	90-110 A	*	N/A
<b>GTAW</b>			
3/32"	75-100 A	13-14 V	100% Argon at 15-20 CFH

*\*Use as close and tight an arc as possible.*

- e. A minimum of two layers should be used for all socket welds. This will decrease the chance of leaking even if one pass contains a weld defect.
- f. Postweld Heat Treatment: Due to controls on thickness and chemical composition, postweld heat treatment of Vogt F11 and F22 alloy steel valves is not normally required. Postweld heat treatment can reduce weld hardness and weld stresses. However, it is also possible to damage valve components at high temperatures. Refer to applicable governing codes to determine if postweld heat treatment is required. Contact Flowserve for further information if postweld heat treatment is required.

## 4.9 Recommendations for Field Welding of Small Stainless Steel Socket Weld Valves

1. **Evaluation of Code Requirements** Prior to welding, construction code requirements should be reviewed (ASME Section I, VIII, IX, ANSI B31.1, B31.3, etc.). Applicable code requirements may supersede these recommendations. In the absence of specific code requirements, the guidelines of ASME Section IX are recommended for qualification.

**2. Selection of Process** Based on the size of the valve and the skill of the welder, either the SMAW (stick) or GTAW (Tig) process is recommended. SMAW is generally preferred, although, GTAW offers more control (at the expense of speed) and may be preferred for 3/4" and smaller valves.

**3. Selection of Weld Filler Metal** For SMAW, use 3/32" electrode on the first pass with 1/8" for subsequent passes. 1/8" and 5/32" electrodes may be used effectively on larger valves. E316L-16 electrodes are recommended.

3/32" type ER316L is recommended for GTAW. 1/16" and 1/8" may also be used successfully.

**4. Selecting the Welder** Most construction codes require a welder to qualify prior to making a production weld. Welder performance qualification provides some assurance that the production weld will be of good quality since the welder has proven, through testing, that he can make a good weld. Care should be taken in comparing the welder's qualification with the code requirements to assure that the welder has qualified with an appropriate test for the intended production weld.

**5. Joint Cleanliness** The area in-way-of welding should be cleaned to remove, dirt, oil, and protective coatings. This should be done prior to fit-up or residue in the joint overlap will not be removed. Sanding, grinding, or wire brushing is usually adequate. Solvents may be necessary, if oil is to be removed.

**6. Fit-up (Socket Weld Valves)** In order to gauge fillet weld size after welding, place a circumferential mark 1" from the engaging pipe end prior to welding. Bottom out the pipe engagement into the socket and pull it back approximately 1/16" to allow for weld shrinkage. Note the dimension from the mark to the valve pipe end.

Tack welds should be contoured to allow for easy inclusion into the final weld.

**7. Welding Technique**

- a. Prior to welding, the valve should be lightly closed. Where possible, attach the electrical ground to the adjoining pipe on the same side of the valve as the weld being made. Do not attach the ground to the handwheel or upper structure of the valve or arcing across the valve seating surfaces could occur.
- b. Where possible, welding should be done in the flat or horizontal position. Where vertical welding is necessary, progression should be upward (vertical down welding is prone to lack-of-fusion).
- c. Welding parameters: The following welding parameters may be used as a guide:

Electrode	Current	Voltage	Shielding Gas
3/32" E316L-16	70-90 A	*	N/A
1/8" E316L-16	90-110 A	*	N/A
3/32" ER316L	75-100 A	13-14 V	100% Argon at 15-20 CFH

*\*Use as close and tight an arc as possible.*

- d. A minimum of two layers should be used for all socket welds. This will decrease the chance of leaking even if one pass contains a weld defect.

## 4.10 Postweld Heat Treat (PWHT) Recommendations

The following recommendations are offered as they relate to the performance of postweld heat treatment on socket-welded or butt-welded valves during the installation stage.

Please note that ASME B31.1, B31.3, Section VIII and most other piping codes do not require PWHT of Vogt-designed ASTM A105, A182F11 class 2, F22 class 3 and F316/316l valves. Vogt F11 chemistry is restricted to meet the conditions for waiver of PWHT for this material in most ASME piping codes.

**For assembled valves (seal-welded design\*):**

- 1. Lightly close the assembled valve.
- 2. Use only localized heating equipment.
- 3. Do not wrap or insulate total valve during PWHT.
- 4. Wrap the localized heating equipment around the welded joint and heat to the desired temperature for the desired length of time.
- 5. Furnace heating of the total valve assembly, as part of a piping subassembly, is completely unacceptable. As supplied valve trim part material conditions can be impacted by this requirement and the packing and gasket may be damaged or destroyed.

*\*Vogt seal-welded design valves cannot be disassembled without removal of the seal weld. A seal-weld valve design should not be used if the valve must be part of an assembly undergoing PWHT in a furnace. For this application, a bolted bonnet design valve should be used.*

**For bolted bonnet valves (disassembly permitted):**

- 1. Localized heating equipment is preferred for the PWHT of these valves as well and the PWHT can be done with the valve fully assembled per the instructions above.
- 2. When the total valve must be furnace heated as part of a piping subassembly to PWHT temperature, the following procedure is recommended:

- A. Disassemble valve. Remove gate/disc, piston, gasket and bonnet assembly. The seat rings in gate valves cannot be removed and must be left in place.
- B. For a gate valve, during disassembly the gate and body shall be marked to ensure that the same gate goes back into the same valve body in the same orientation as it was when it was removed. The gate shall not be rotated when reassembled.
- C. Replace the bonnet gasket during assembly following PWHT.
- D. The furnace for PWHT should be a controlled atmospheric type to ensure that heat treat scale does not develop that

can adversely impact the gasket faces and/or threaded features of the valve.

- 3. Additionally, the above disassembly procedure may also be used with localized heating equipment, at the option of the heat treat provider.

The above represents our best recommendation but does not constitute a guarantee that the valve will not suffer some damage as a result of PWHT.

The following table offers recommendations relating to valves installed in horizontal and vertical pipes.

*Recommended Valve Orientation*

Valve Type	Stem Orientation Horizontal Line <sup>(1)</sup>	Stem Orientation Vertical Line <sup>(2)</sup>
Gate	Any (except vertical down) Preferred vertical stem upright	Any Preferred stem horizontal
Gate valve <sup>(3)</sup> Motor/air-operated	Any (except vertical down) Preferred vertical stem upright	Any Preferred stem horizontal
Globe-T pattern	Any (except vertical down) Preferred vertical stem upright	Any Preferred stem horizontal
Globe-T pattern <sup>(3)</sup> Motor/air-operated	Any (except vertical down) Preferred vertical stem upright	Any Preferred stem horizontal
Globe-Y pattern	Any Preferred stem at $\pm 50^\circ$ to pipe run in upright position.	Any Preferred stem at $\pm 50^\circ$ to normal of pipe run
Globe-Y pattern <sup>(3)</sup> Motor/air-operated	Any Preferred stem at $\pm 50^\circ$ to pipe run in upright position.	Any Preferred stem at $\pm 50^\circ$ to normal of pipe run
Angle	Any (except vertical down) Preferred stem vertical upright	Any Preferred stem vertical upright
Angle <sup>(3)</sup> Motor/air-operated	Any (except vertical down) Preferred vertical stem upright	Any Preferred stem vertical upright
Ball or Piston lift check valve-T pattern (no spring) (includes stop check valve)	Preferred vertical Upright Rotation off top dead center $\pm 40^\circ$	Not recommended
Ball or Piston lift check valve-T pattern (spring-controlled)	Preferred vertical upright Rotation off top dead center $\pm 90^\circ$	Any
Piston lift check valve-Y pattern (spring-controlled)	Preferred vertical upright Rotation off top dead center $\pm 90^\circ$	Any
Swing check valve	Preferred vertical upright Rotation off top dead center $\pm 30^\circ$	Any, but upward vertical flow required
Stop check valves	Preferred vertical Upright Rotation from top dead center $\pm 40^\circ$	Not recommended

*General:*

- Gate, globe, angle, and spring-controlled check valve designs oriented with stem or body run vertical down orient the valve body cavities in such a matter that debris can be collected and not get flushed out. This may cause unreliable valve operation. A vertical stem down or body run down orientation is not recommended for fluid service that may include debris.
- Recommended orientation of motor/air-operated valves may be changed by the recommended orientation of the actuator.

*Notes:*

- <sup>(1)</sup> A  $\pm 5^\circ$  variation off horizontal for the pipe would not change the recommendation except for swing check valves. This valve design will not close by gravity if the piping is off horizontal, which allows the swing check mechanism to swing away from the seat.
- <sup>(2)</sup> A  $\pm 5^\circ$  off variation vertical for vertical piping does not change the recommendations in the table.
- <sup>(3)</sup> For small-bore socket welding and threaded valves equipped with a motor or air operator mounted in a horizontal plane, it is recommended that external supports be added to the piping arrangement to remove the load from the connecting socket welds or threads of the valve.

## 4.11 Testing and Adjustment

It is reasonable to assume that a valve that has been properly inspected and installed will be in good condition and ready to operate. However, the actual operability of a valve can only be proved by testing.

A first observation can be made by actuating the valve through an open-close-open or close-open-close cycle. If no obvious problems are observed, an actual test at pressure may then be applied while tightness and operability are checked.

It is common practice, after the installation of a piping system, to clean the system by blowing through the system with a gas or steam or flushing with a liquid to remove debris and/or internal protective films and coatings. It should be recognized that valve cavities may form a natural trap in a piping system and material not dissolved or carried out by the flushing fluid may settle in such cavities and adversely affect valve operation.

# 5 Operation and Maintenance

## 5.1 Introduction

An industrial valve, reasonably matched to a particular service application and properly installed in a piping system, can be expected to have a long service life with a minimum of attention. Unlike totally passive components such as pipe fittings, vessels, etc., valves are a special kind of “machinery” having moving and wearing parts. The satisfactory performance of these working parts depends on the long-term preservation of various highly finished surfaces. Therefore, it is important to give adequate attention to the specific requirements for proper operation and reasonable maintenance of all valves throughout their service life.

## 5.2 Operation – Manual Valves

Most valves are actuated manually by causing rotational movement of a handwheel, wrench, handle, etc. Care is required to assure that such movement is in the correct direction, is not too fast or too slow and is applied through the proper distance. The terminal positions,

open and closed, have important functional significance. This is particularly true in the closed position where the internal closure element (disc, plug, gate, etc.) must be correctly positioned in relation to the seat to assure a positive seal.

Check the handwheel jamb nut to ensure that it is tight. After installation, periodically check the nut to ensure tightness.

Valves in which the closure element moves to and from the seat, such as in globe, angle, and wedge gate valves, depend to some degree on the mechanical force of the stem holding the closure element against the seat to make and maintain a tight shutoff. This is most important if the line pressure to be shut off acts on the closure element in a direction so as to push it off the seat. When globe valves are installed so that the line pressure then acts in the same direction as the stem force and also in wedge gate type valves, the line pressure then acts to increase the seating load, making valve stem loading less critical. However, substantial stem force will still be required at low line pressures. The stem force may even be more important at low line pressures than at high line pressures.

Globe valves (straight, angle or Y-pattern) and stop check valves with pressure under the disc, require sufficient stem loading to balance the line pressure and provide adequate net seat load. The higher the line pressure, the higher the required stem loading to achieve a leak-tight seal. Follow the manufacturer's recommendations on torque or handwheel rim force for seating of manually operated valves as well as impacting of impactor-type handles or handwheels.

**▲ CAUTION:** The use of valve wrenches on handwheels may lead to valve damage or injury to operators.

Most valves in which the internal closure elements slide across the seat as in ball, plug, non-wedging gates, butterfly etc., do not rely on stem actuating force to provide tight shutoff. However, the correct position of the closure element in these types of valves is very important. In some cases, the effort required to move the closure element may increase substantially during final approach to the closed position, giving a false impression of having reached the required position. Failure to reach and stop at the full-closed position can result in leakage and consequent damage to the seal elements.

Thermal expansion and contraction can cause solid wedge gate valves to "lock up" if closed while hot. As the relatively cooler stem heats up to body temperature, and/or the body cools down toward the stem temperature, the stem expansion and/or body contraction will cause stem thrust to increase. If the thrust increases sufficiently, the wedge may be "locked" between the tapered seats.

Vogt valve stems are provided with a backseat arrangement, that is, a shoulder on the stem or on another part of the stem-disc assembly, that engages a corresponding seat shoulder on the inner side of the bonnet.

It has become generally recognized that the use of the stem backseat for stem sealing may mask an unsatisfactory condition of the stem packing. For this reason, the use of the backseat for normal operational stem sealing is not recommended. It is recommended that the valve be opened against the backseat as a means of determining that the full-open position has been reached, and the stem should then be backed off slightly from the backseat.

If circumstances necessitate use of the backseat for stem sealing to permit system operation until a shutdown will allow replacement of the stem packing, it should be recognized that backseats are usually much smaller than "mainseats" and care should be exercised to avoid applying excessive stem force in back seating. Impactors, gears, or similar features provided to assist in main seating valves should not be used for backseating.

**▲ CAUTION:** Some users consider that backseats are provided for the purpose of repacking valves, which are under pressure. When the packing is removed in this situation, any leakage past the backseat escapes directly to the atmosphere and constitutes a potential safety hazard to personnel. The practice of repacking under pressure is not recommended. Further, if a valve is operated in the backseated position for any reason, exercise caution when moving the stem away from the backseat as the packing may have deteriorated while isolated from the line fluid and then leak when exposed to pressure.

Purchase specifications requiring restrictive maximum forces to be applied on levers or handwheel rims may also lead to damaging forces being applied to valves or actuators in actual practice as larger forces are sometimes applied in the field. Users should consider this fact in training of operating personnel.

## 5.3 Operation – Power Actuated Valves

Functionally, closure performance characteristics and backseat-ing considerations are associated with all valve types regardless of the means of operation. Satisfactory valve performance with power actuation requires appropriate programming of the various requirements and constraints into the actuator controls. Therefore, the actuator should be adjusted to deliver an adequate opening, running and closing force to suit the anticipated service conditions. For the position-sensitive valve types, the close control should be position controlled by external stops or limit switches. Be sure to contact the actuator manufacturer's operation manual for more detailed information.

Data required for selection and adjustment of power actuators should be delineated clearly in purchase specifications for actuated valves. This data shall include but not necessarily be limited to:

- a) Upstream pressure and differential pressure conditions at which both opening and closing shall be required. Specify direction if applicable. Additionally, specify if valve operation is required under high-flow "blow down" conditions.
- b) Speed of operation required or the maximum time for opening and/or closing. Also, specify a minimum time if required due to fluid dynamics.
- c) Electrical power supply available (AC or DC voltage, phase, frequency) for electrical power actuators or controls. Operating conditions for reduced voltages should also be considered.

- d) Pneumatic pressure available for pneumatic actuators (cylinders or diaphragms). Also, specify fail-open, fail-closed, fail-as-is, or any special requirements.
- e) Requirements for position indication signals.

Actuator selection and adjustments should normally be made by Flowserve based on published literature and/or technical advice of actuator manufacturer. Flowserve should be consulted when a manually operated valve must be retrofitted with a power actuator.

**▲ CAUTION:** Some valve actuators, when sized to provide specified loading, may have much higher output at maximum switch or control settings and therefore be capable of damaging valves if misadjusted. Valve and actuator manufacturer instructions should be followed closely to prevent overloading valve stems, backseats and other structural parts. Successful operation of power-operated valves requires a diligent coordination of the skills and efforts of the valve specifier, Flowserve and the actuator manufacturer. Most applications are problem-free, but miscommunication can lead to unreliable operation at one extreme and possible valve or actuator damage at the other extreme.

## 5.4 Fluid Dynamics of Shutoff Valve Operation

A flowing fluid in a piping system has mass and velocity. Anything that causes a moving mass to change its velocity will experience a reacting inertia force in proportion to the magnitude of the mass and the rate of the imposed velocity change.

However, in the flow of gases the reacting inertia forces are inherently moderated by the compressibility of the fluid that permits the instantaneous velocity change to be effectively limited to the mass of fluid in the immediate vicinity. This, in addition to the self-cushioning capacity of the fluid column in the upstream pipe, effectively precludes any significant problem of pressure surge in rapidly closed valves in gaseous fluid piping.

In contrast, the inertia of the fluid column in a liquid pipeline is not so easily overcome. Its relative incompressibility provides no such cushion or proximity-limiting mechanism. The entire upstream fluid mass is required to be decelerated at once by the closing valve, and the resulting pressure surge may be of sufficient magnitude to cause structural damage.

An additional potential problem can occur downstream from the closing valve. This may be described as fluid column rupture and involves the inertia of the fluid column carrying it away from the closed valve with the proximate space being occupied by a bubble of the fluid vapor or, simply, a substantial vacuum. If there is sufficient

backpressure in the line, the fluid column will reverse its velocity and close the void created by the fluid column rupture and cause another pressure surge when it reaches the valve.

It should be recognized that pressure surge intensity is roughly proportional to the length and velocity of the fluid column upstream of the closing valve and inversely proportional to the time taken to close the valve. Fluid column rupture and return surge intensity is proportional to the same condition on the other side of the valve in addition to the back pressure in that section of piping. Therefore, a slow closing is helpful in limiting the magnitude of the pressure surge phenomena.

In large, long distance liquid pipelines it is critically important to evaluate pressure surge possibilities and to establish limits on the speed of closure of the flow shutoff valves. In operating such valves or setting the speed of operation of power-actuated valves, design limits on speed of closure should be conscientiously observed.

Rapid closure of a valve in any flowing liquid pipeline can cause a substantial pressure surge that may manifest itself in a sharp “bang” or possibly a series of “bangs.” This is frequently referred to as water hammer. This phenomenon can occur in any flowing liquid line and is not limited to waterlines. Rapid closing of a shutoff valve in a flowing liquid line should be avoided especially during the last part of the stem travel.

## 5.5 Check Valves

Check valves are one-way valves that function to automatically stop a flow reversal in a flowing line. In most applications, the fastest possible closure is desirable. The speed of closure is understood in terms of the shortest possible time to achieve closure following the instant of flow reversal. It follows then, that the shorter that time interval can be made, the lower the velocity of the reverse flowing liquid will be.

The pressure surge resulting from a check valve closure is likely to be more severe than that in the case of the shutoff valve as the shutoff valve will usually provide a throttling action, while the check valve closure may be virtually instantaneous with little preliminary throttling.

A check valve closure can also cause downstream fluid column rupture just as in the case of shutoff valves. Furthermore, on fluid column reassembly, the pressure surge may be of sufficient magnitude to reopen the check valve, starting another sequence of closure, surge, etc. Under certain conditions a protracted succession of closure “hammers” may result.

The kinetic energy in flowing fluids present special problems regarding check valve performance. Quick closing is normally desirable,

but special features may be required for certain situations. Careful systems analysis may be required in complex applications.

While a rapid closure of a check valve is normally the best method of minimizing pressure surges due to flow reversal, some applications produce flow reversals that are too rapid to prevent excessive reverse velocity before the closure of a standard check valve could occur.

Such applications may require consideration of special valve features such as:

- a) A spring or method of other loading to provide more rapid closing.
- b) A dashpot or snubber to provide a slower, more controlled closure in order to reduce reverse flow velocity by a throttling action, as in a shutoff valve.

## 5.6 Noise

There are many different valve operating conditions that can result in noise. Such noise may be “normal” considering the nature of the fluid and the pressure, temperature and velocity of flow. There may be a “wind” noise in a flowing gas line. There may be clear or hoarse whistling sounds resulting from the shape of the flow passage, including the flow path through a valve. Cavitating conditions in a liquid line can cause a “white noise” that ranges from a whisper to a sound like rocks and gravel, to a deafening roar. There may also be mechanical noises as a result of movement of internal “things” acted on by the flowing fluid. Some of these noises may be relatively harmless insofar as system integrity and performance are concerned. Mechanical damage in lines with compressible fluid is generally limited to points of sonic or supersonic velocity, or where a vortex resonance with an internal component causes movement and wear or breakage.

Vortex resonance with an internal component may also cause problems in liquid service. In addition, noise may be evidence of cavitation, which has the potential for causing mechanical damage, including massive erosion of the metal walls of a valve or pipe walls and/or other internal components.

A full technical discussion of all sound-generating mechanisms is beyond the scope of this document. Nevertheless, it is recommended that an evaluation be made of any condition of remarkable noise in a piping system at least to the point of understanding its cause. If a valve is involved, a determination should be made as to whether the valve is the source or just happens to be the location of the noise. Usually, if the valve is the source, the noise can be “tuned” by slightly “throttling” the valve.

Mechanical or high-intensity fluid noise in the vicinity of a valve may be a warning of potentially serious trouble. Expert assistance should be obtained from system engineers or the valve manufacturer to determine the cause and evaluate possible need for action.

Noise emitted from a closed valve is a special case that may indicate seat leakage requiring repair. A whistling sound may indicate severe erosion of seating surfaces while “gurgling” or “popping” sounds may signify less severe leakage.

Consult Flowserve Vogt Valves when noise levels are desired for a Vogt valve. Flowserve will need pressure, temperature, flow rate, fluid details and pressure drop to determine the noise level.

## 5.7 Maintenance

Valves are properly considered to be a hybrid structure, a combination of a pressure vessel and operating machinery. Maintenance procedures therefore, must reflect the requirements of the occasional opening or closing of the “machinery” and the predominant operating condition of the valve where pressure is continuously applied and nothing is moving. The important performance parameters are pressure boundary integrity, actuating effort required and internal leak tightness. Maintenance should logically address the importance of preserving these performance parameters.

Valves that remain in one position for long periods of time may be hard to operate and/or not function as well as when originally installed. This reduction of operability can result from either a loss of effective lubricants, aging of packing, surface corrosion of moving parts, or an accumulation of deleterious solids. In some applications it may be desirable to schedule periodic partial or full cycle exercising of such valves.

Check valves require special consideration because they normally have no external stems, actuators, or packings that might indicate a pending operational problem. Complete internal failure may occur due to wear with no obvious advance warning. Preventive maintenance is recommended particularly where sudden check valve failure may require expensive plant or system shutdown.

Noise or vibration emitted at or near a closed check valve may be an indicator of leakage. Distinctive noises may also be produced from internal motion of the parts of check valves that are not fully open during forward flowing conditions. “Thumping” or “tapping” may indicate that the disc is impacting either on the seat or the full-open stop, or simply “rattling” in its guides. These types of conditions can lead to rapid wear and failure of the valve. Special non-intrusive diagnostics systems can be used to augment the evaluation of the noise. Periodic disassembly and internal inspection of selected

valves may be advisable, particularly where they are located close to upstream flow disturbances.

Stem seals may be a source of problems, particularly in valves that are frequently cycled or must operate at high pressures or temperatures. The stem seal must prevent or minimize leakage of line fluid between a movable stem and a stationary bonnet. While special mechanical arrangements, elastomers, or proprietary seals are used in some cases, the normal arrangement includes a cylindrical chamber in the bonnet surrounding the stem, with compression packing materials retained in the chamber by a gland and associated bolting.

Conventional compression packing requires that the gland bolting provide sufficient load to eliminate any communication porosity in the packing material and to compress it into intimate contact with the stem and bonnet. Clearances between the associated parts must be close enough to contain the packing material and minimize extrusion. Maintenance practices that increase clearances (e.g., machining of glands and/or bonnets to remove corrosion), may result in packing extrusion and leakage or “blowout”.

Pressure boundary integrity requires basically sound pressure-containing parts, a pressure-tight static seal at assembly joints and in most cases, an effective working seal between a moving stem and the valve body. Maintenance of pressure boundary parts and the static seal of assembly joints are not usually considered to be a problem. However, continuous monitoring is recommended to confirm that problems do not occur. The need for paint protection against corrosion of exposed piping should be obvious from normal observations of the system.

Wear and loss of packing material are normal expectations in frequently cycled valves. However, current packing materials and systems will minimize this deterioration particularly in new and well-maintained valves. Packing gland adjustment may be necessary from time to time but routine “repacking” should not be required in most valves that are otherwise well maintained. Packing replacement can usually be deferred until a time when other valve maintenance is required as long as the packing gland shows adequate room for further adjustment. The repacking of a backseated valve under pressure is not recommended.

Valve manufacturers and packing manufacturers should be consulted regarding the best design features and compression packing materials available to solve chronic packing problems. Ongoing developments in valve design and packing technology may offer improvements that can be implemented by retrofitting a valve with improved design, materials and installation procedures. For example, spacers may be used in the deep packing chambers common in old valves designed for use with old-style asbestos packings so that new packings/materials may be effectively installed.

Severe throttling service may cause the valve to be subjected to damage of the seating surfaces and other parts. Severe cavitation can cause gross damage of the internal parts, including the valve body and downstream piping. Good preventive maintenance procedures including periodic inspections may prevent serious failures that require expensive shutdowns. Methods of evaluation and solutions for maintenance problems are beyond the scope of this document. Flowserve should be consulted concerning design features and operating procedures for valves.

External valve mechanisms, actuators and accessories are generally readily accessible for inspection and maintenance. Reasonable protection should be provided to prevent mechanical damage and potentially degrading environmental exposure to such things as airborne grit, chemicals or moisture. Working surfaces such as stem threads, bearings, and gears should be lubricated on a reasonable schedule using the lubricants recommended or approved by the valve or actuator manufacturers.

Maintenance of valves must involve a good preventive maintenance program, particularly for check valves and valves in severe throttling service. Stem sealing problems may be alleviated by use of the newest technology in valve design, packing materials and installation procedures.

## 5.8 Valve Maintenance

### Notice

This manual is intended as a maintenance guide for Flowserve Vogt Valves. Before working on any Vogt valves or related products, the reader should review and fully comply with this manual and its warnings and with the reader’s company safety procedures.

If anything in this manual is unclear, contact the Flowserve Customer Service Department for assistance.

Flowserve and its employees are in no way responsible for damage to property or for personal injury or death which may result through the use or misuse of any Vogt product, publication, audio or visual aid.

### Warning

Vogt valves described in this manual may have been manufactured prior to September 1, 1986 and may have been equipped with gaskets that contained asbestos. When servicing, disassembling, or disposing of these products, avoid breathing the asbestos fibers or dust. Dispose of the material in accordance with local, state, and federal law.

## Customer Service

If at any time you require assistance from Flowserve in the maintaining of your Vogt valves, feel free to call your Customer Service Representative, at the appropriate number listed on the back cover of this manual. Or write us at:

Flowserve Sulphur Springs Operations  
1511 Jefferson Street  
Sulphur Springs, Texas 75482 USA

Or Fax us at: (903) 439-3386

## Field Service

Our Sales Representatives are the best in the business. They can provide you with technical information about your Vogt valves, and are available to visit your facility to conduct general maintenance seminars.

## When You Call or Write

Be sure you provide the correct information and/or part numbers for your Vogt valves. Over the years there have been design changes due to our continuing effort make great valves even better. It is very important that we are provided the information necessary to correctly identify your valve.

The following information, located on the valve nameplate, is required to ensure the correct information and/or parts are provided for your valve:

1. The valve size and series number (including any prefixes or suffixes).
2. The valve drawing number listed on the valve nameplate.

Please note: In early 2002, our parent company changed, so the nameplates on Vogt valves will show one of three company names:

- Henry Vogt Machine Co, Louisville, KY, or
- Edward Vogt Valve, Inc, Jeffersonville, Indiana.
- Flowserve, Inc, Sulphur Springs, TX.

## 5.9 Routine Inspection and Maintenance

Once the right valve is properly installed, field maintenance is of a generally routine nature and can be readily performed by the user. The critical areas of a valve include the stem threads and those locations where leakage will most likely occur—the stem packing, the bonnet joint, the seat and the end connections. It is desirable that a maintenance program be established which will include periodic

inspection of the noted critical areas. The most common location of a noticeable leak is at the stem seal. Leakage at the stem can usually be stopped by adjusting the packing. If leakage cannot be stopped by packing adjustment, repacking is indicated. However, backseating 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.

## 5.10 Major Field Repair

Maintenance involving rework or replacement of parts is considered major repair. When circumstances dictate field repair of Vogt valves, the following information is offered as an aid. It must be pointed out, however, that valves repaired in the field are no longer under “Product Warranty,” and in no event is Flowserve liable for any incidental or consequential damages resulting from any cause whatsoever. There are no warranties of any kind whatsoever, express or implied, other than those stated in Flowserve’s limited warranty provision.

## 5.11 Care and Maintenance of Vogt Forged Steel Valves

### Preliminary Considerations for Valve Repair:

1. Use experienced, trained personnel.
2. Observe all standard safety precautions
3. If possible, remove valve from line so that work can be done in a clean, well-lighted area.
4. Use genuine Vogt replacement parts.
5. Use proper tools.
6. Pressure test valve before reinstalling. This is particularly essential on valves intended for critical service.
7. Remember that improper repairs can be hazardous.

### Replacement Parts – How To Order

Genuine replacement parts are available for Vogt current standard valves and can usually be shipped from stock. All parts are made with the same careful inspection and laboratory control given original valves and parts. Orders for replacement parts should clearly identify the items required and should specify the correct name of the part, valve size and series number, drawing and revision number, material, etc. The drawing and revision number which appears on the identification disc attached to the handwheel is of particular value.

In the absence of an identification disc, series numbers may be found on the side of the valve body or drawing numbers may be found on the bonnet flange. The purchase date and/or purchase order number will further identify the parts and materials originally ordered, especially valves with custom-designed features.

The embossed number on each handwheel, having a prefix letter "V", is the pattern number of the handwheel and has no relation to the ordering of other valve parts. Prices for valve parts will be furnished on application.

## Tools For Installing Replacement Parts

Wrenches are available (price on application) for the removal and replacement of renewable seats for globe, angle, and check valves. The wrenches are machined to an accurate finish to fit the spline broach on the inside diameter of the seat and are properly heat treated for strength and toughness.

## Disassembly

Small valves of the union bonnet type or of the screw bonnet types are readily disassembled by unscrewing the union nut or the bonnet. In bolted bonnet valves, the nut should be removed from the bonnet stud bolts or hexagon head cap screws removed from the body. Tight bolt threads may be loosened by applying penetrating oil to the threads or by selectively heating the bolt at the point of thread engagement. On bonnet joints of the through-bolt type, the bolts may be cut between the body and bonnet flanges for removal.

## Stems

Tight stems in valves of the O.S. and Y. type are caused by either dry, worn packing, or nonlubrication of yoke nut threads. Applying a few drops of oil to the stem threads and packing, and opening and closing the valve a few times, may loosen the stem. At the same time, make sure the packing gland bolting is pulled down evenly so the gland will not bind against the stem; however, care should be taken not to overcompress the packing.

A tight stem in an inside screw valve may also result from worn or overcompressed packing, or the stem bonnet threads may "freeze" from excessive service temperatures or from corrosive fluids in the valve. If the stem turns freely after all packing is removed, and if the surface of the stem in contact with the packing is in good condition, new packing is the remedy. If stem is still tight, turn valve to upright position, fill the stuffing box with penetrating oil, and let soak. If stem remains tight, a new bonnet and stem are required, or, if practical, an O.S. and Y. type valve could be substituted.

## Bonnet Joints

On valves of the union bonnet type, repairs can be made without removing the valve from the line, provided there is enough wrench room for loosening and tightening the bonnet nut. Before loosening the bonnet nut, be sure valve is relieved of all pressure. A few hammer taps to the side of the bonnet nut or around the body neck of screw bonnet type valves will loosen nut or bonnet. Gasketed joints require smooth, clean surfaces on both the body and the bonnet gasket faces, and a new gasket is recommended for reassembly. On bolted bonnet valves in high-temperature service, and particularly where severe thermal cycling is involved, it is recommended that bolt torque be checked periodically. This recommendation applies to gland bolting as well.

## Packing – General

Vogt valves have well-proportioned stuffing boxes filled with the best grade of packing available. Before repacking, be sure to have the right grade, type, and size of packing.

**⚠ WARNING:** Repacking under pressure is hazardous and is not recommended. The backseat should be used as a temporary measure to control the stem leakage until a shutdown provides safe repacking conditions.

Partial disassembly of the valve is required if endless packing rings are to be placed in the valve. Split rings can be added without disassembly but is not the preferred method. Partial disassembly greatly facilitates the removal of old packing and the repacking with new packing.

Vogt makes maximum use of flexible graphite in the packing of its high temperature valves. This packing does not dry out and retains its compressibility. Valves packed with flexible graphite do not require full repacking except for severe blowing leaks, where erosion damage may have occurred to all rings of the flexible graphite packing. In this event all rings of packing shall be replaced. Otherwise, the maintenance of the valve packing can be maintained merely by the addition of one or two rings of flexible graphite without major valve disassembly.

Wipe all parts of the stuffing box, inside and out, before installing new packing. Vogt uses endless\* and split ring type packing. If split ring type is used for replacement, take care to stagger the ring slits so that they are not in line. After putting in a few rings, tamp them well into place, using the packing gland as a tamping tool. Then add enough packing to fill the stuffing box. Pressure on the packing is applied by the packing nut or gland flange bolting, depending on valve design, which bears on a gland in the stuffing box. Gland bolting should be tightened evenly to obtain the proper packing compression for leak-free service. Upon reassembling the valve, a few

turns of the handwheel and a few drops of oil applied on the stem just above the packing will help work in the packing to the stem.

*\* Vogt has used a patented one-piece endless cylinder of packing in its factory-made valves for several years, and if this packing is to be replaced it will be necessary to remove the cylinder packing from the valve before repacking. If individual rings have been used, the individual rings can be removed as necessary. If complete valve disassembly is used during packing of a valve, the patented packing cylinder can be used for replacement. See Section 1 for Packing Cartridge PN.*

## 5.12 Detailed Packing Instructions

### O.S. and Y. Bolted Bonnet Gate Valves (Typical Series 12111) (Partial Disassembly Required)

1. Loosen packing gland bolting and free up gland.
2. Remove bonnet bolts and bonnet subassembly.
  - ▲ **CAUTION:** Mark the gate and note orientation. The same gate and orientation shall be maintained upon replacement.
3. Spin handwheel until stem is removed from yoke nut thread.
4. Pull stem through packing. Rotating the stem during removal from the packing will aid in this process.
5. Remove packing gland and gland bolting.
6. Remove top ring of packing. This will be a braided graphite packing. Remove additional packing as required.
7. Add new rings of flexible graphite packing and one new top and bottom ring of braided packing as required.
8. Replace packing gland and snug up gland bolting evenly.
9. Insert new bonnet gasket. Insert gate/stem into body.
10. Place yoke bonnet subassembly back on stem and rotate handwheel to seat bonnet.
11. Replace bonnet bolts and torque bonnet bolts until bonnet joint becomes metal-to-metal. A .007" feeler gage may be used to gage joint. A bonnet/body joint that will accept a .007" feeler gage is not properly torqued and is not metal-to-metal. Additional torque should be applied.

▲ **CAUTION:** During the torquing of the bonnet joint, the valve should be slightly open. This will prevent the bonnet bolt torque from driving the disc or gate into the valve seat and will ensure the bonnet joint will go metal-to-metal.

12. Tighten packing gland bolting evenly.
13. Open and close valve to ensure free operation.
14. Place valve back in service.

### Alternate Method (No Major Disassembly Required)

1. Remove packing gland bolting and free up packing gland.
2. Remove top ring of packing. This will be a braided graphite packing. Prepare chamber to accept new ring or rings of packing.
3. Split a number of packing rings of flexible graphite as required and place individual ring in packing chamber using the gland to ram the packing into the chamber. Stagger packing ring's separations by 90° if more than one ring is required. Replace top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
4. Tighten packing gland bolting evenly.
5. Open and close valve to ensure free operation.
6. Place valve back in service.

## Packing

### O.S. and Y. Bolted Bonnet Globe Valve (Typical Series 12141) (Partial Disassembly Required)

1. Loosen packing gland bolting and free up gland.
2. Remove bonnet bolts.
3. Remove handwheel nut and nameplate.
4. Spin handwheel until stem moves through yoke nut loosening and pushing off handwheel.
5. Remove yoke/bonnet subassembly, rotate stem and totally remove stem from yoke thread.
6. Pull stem through packing. Rotating the stem during removal from the packing will aid in this process.
7. Remove packing gland and gland bolting.
8. Remove top ring of packing. This will be a braided graphite packing. Remove additional packing as required.
9. Add new rings of flexible graphite packing and one new top and bottom ring of braided graphite packing as required.
10. Replace packing gland and snug up gland bolting evenly.
11. Place stem back into yoke/bonnet subassembly.

12. Rotate stem to engage yoke nut thread. Stem should be rotated until stem broach is visible and the handwheel can be placed on the stem. Replace nameplate and handwheel nut, tighten nut.
13. Insert new bonnet gasket.
14. Place yoke/bonnet subassembly on valve and replace bonnet bolting.
15. Replace bonnet bolts and torque bonnet bolts until bonnet joint becomes metal-to-metal. A .007" feeler gage may be used to gage joint. A bonnet/body joint that will accept a .007" feeler gage is not properly torqued and is not metal-to-metal. Additional torque should be applied.
  - ▲ **CAUTION:** During the torquing of the bonnet joint, the valve should be slightly open. This will prevent the bonnet bolt torque from driving the disc into the valve seat and will ensure the bonnet joint will go metal-to-metal.
16. Tighten packing gland bolting evenly.
17. Open and close valve to ensure free operation.
18. Place valve back in service.

### Alternate Method (No Major Disassembly Required)

1. Remove packing gland bolting and free up packing gland.
2. Remove top ring of packing. This will be a braided graphite packing. Prepare chamber to accept new ring or rings of packing.
3. Split a number of packing rings of flexible graphite as required and place individual rings in packing chamber using the gland to ram the packing into the chamber. Stagger packing ring's separations by 90° if more than one ring is required. Replace top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
4. Tighten packing gland bolting evenly.
5. Open and close valve to ensure free operation.
6. Place valve back in service.

### O.S. and Y. Welded Bonnet Gate Valves (Typical Series 2801) Preferred Method (Requires Disassembly of Yoke/Bonnet Subassembly)

1. Loosen packing gland bolting and free up gland.
2. Remove tack weld(s) at yoke/bonnet interface. A hammer and a sharp chisel should be utilized for this operation.

3. Remove yoke/handwheel assembly from yoke/bonnet subassembly.

▲ **CAUTION:** The stem should be maintained in a near open position to ensure that the yoke/bonnet thread and the stem thread difference do not create a condition where the stem is locked against the backseat, making removal of the yoke impossible.

4. Remove top ring of packing. This will be a braided graphite packing. Remove additional packing as required.
5. Add new rings of flexible graphite packing and one new top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
6. Replace yoke/handwheel assembly to bonnet subassembly.

▲ **CAUTION:** When replacing yoke/handwheel assembly, the valve stem should be maintained in an open position to ensure the yoke thread advance does not drive the gate into the seats potentially making the yoke replacement impossible.

7. Tighten packing gland bolting evenly.
8. Tack weld yoke/bonnet subassembly at or near same location from which tack weld was removed. Tack weld in accordance with the manufacturer's recommended procedure.
9. Open and close valve to ensure free operation.
10. Place valve back in service.

### Alternate Method (No Major Disassembly Required)

1. Remove packing gland bolting and free up packing gland.
2. Remove top ring of packing. This will be a braided graphite packing. Prepare chamber to accept new rings or rings of packing.
3. Split a number of packing rings of flexible graphite as required and place individual rings in packing chamber using the gland to ram the packing into the chamber. Stagger packing ring's separations by 90° if more than one ring is required. Replace top ring of braided graphite ring as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
4. Tighten packing gland bolting evenly.
5. Open and close valve to ensure free operation.
6. Place valve back in service.

### O.S.and Y. Welded Bonnet Globe Valves (Typical Series 2821) Preferred Method (Requires Disassembly Of Yoke/ Bonnet Subassembly)

1. Loosen packing gland bolting and free up gland.
2. Remove handwheel nut, nameplate, and handwheel.
3. Remove tack weld(s) at yoke/bonnet subassembly. Remove yoke.

**▲ CAUTION:** The stem should be maintained in a near closed position to ensure that the yoke/bonnet thread and the stem thread difference do not create a condition where the stem is locked against the backseat, making removal of the yoke impossible.

4. Remove top ring of packing. This will be a braided graphite packing. Remove additional packing as required.
5. Add new rings of flexible graphite packing and one new top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
6. Replace the yoke to the bonnet.

**▲ CAUTION:** When replacing the yoke the valve stem should be maintained in an open position to ensure the yoke thread advance does not drive the disc into the seat, potentially making the yoke replacement near impossible.

7. Tighten packing gland bolting evenly.
8. Tack weld yoke/bonnet subassembly at or near the same location from which the tack weld was removed. Tack weld in accordance with the manufacturer's recommended practice.
9. Replace handwheel, nameplate, and handwheel nut and tighten nut.
10. Open and close valve to ensure free operation.
11. Place valve back in service.

### Alternate Method (No Major Disassembly Required)

1. Remove packing gland bolting and free up packing gland.
2. Remove top ring of packing. This will be a braided graphite packing. Prepare chamber to accept new rings or rings of packing.

3. Split a number of packing rings of flexible graphite as required and place individual rings in packing chamber using the gland to ram the packing into the chamber.

Stagger packing ring's separations by 90° if more than one ring is required. Replace top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.

4. Tighten packing gland bolting evenly.
5. Open and close valve to ensure free operation.
6. Place valve back in service.

### Inside Screw, Welded or Bolted Bonnet, Gate or Globe Valve (Typical Series 12161 and 12181)

1. Remove handwheel nut, nameplate, and handwheel.
2. Remove packing nut and packing gland.
3. Remove top ring of packing. This will be a braided graphite packing. Remove additional packing as required.
4. Add new rings of flexible graphite packing and one new top ring of braided graphite packing as required. If total replacement of packing is necessary, a bottom ring of braided packing shall be used.
5. Replace packing gland and packing nut.
6. Tighten packing nut.
7. Replace handwheel, nameplate, and handwheel nut and tighten nut.
8. Open and close valve to ensure free operation.
9. Place valve back into service.

## 5.13 Fluoropolymer Packing Instructions

For Vogt standard valves packed with Style C-VH packing, the detailed procedures above may be used as applicable. Fluoropolymer packing orientation shall be as outlined in Figure 3.

## 5.14 Vogt Valves Packed With Fluoropolymer for High-Pressure Applications – Standard

See solid assembly arrangement for method utilizing the C-VH packing rings. All fluoropolymer packing is used, even for the bottom ring. This is a standard fluoropolymer packing method and is designed to seal on internal pressure. See Figure 3.

## 5.15 For Vacuum Applications

The C-VH rings should be partially inverted for vacuum applications because leakage is from outside environment to inside of valve. Rings should be oriented per Figure 4.

## 5.16 For Combination Pressure/Vacuum Applications

The C-VH rings should be oriented per Figure 5.

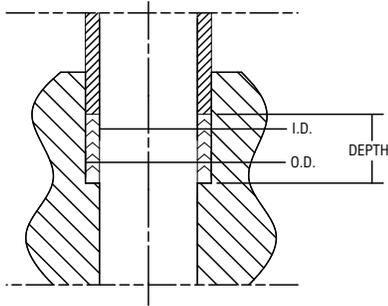
**NOTE:** In the event endless fluoropolymer rings are split, they may be cut at a 45° angle by the use of a razorblade. Install one ring at a time and stagger the splits in succeeding rings by 90°. Endless rings are preferred and this requires valves to be disassembled during repacking.

## 5.17 Style C-VH Rings for High-Pressure Service

This design incorporates a heavy wall and heel section necessary to withstand pressures up to 500 psi and greater.

C-VH rings are recommended for high-pressure applications such as hydraulic cylinders and pumps. See Figure 3.

Figure 3 – Stuffing Box: Standard and High Pressure Applications



Standard and High Pressure Applications

Valve Size (in.)	Stuffing Box Space			Cross Section (in <sup>2</sup> )	Number Of C-VH Rings		
	O.D. (in.)	I.D. (in.)	Depth (in.)		Top Rings	Bottom Rings	Center Rings
½	.62	.38	.62	.125	1	1	4
¾	.62	.38	.62	.125	1	1	4
1	.88	.50	1.12	.188	1	1	6
1¼	.94	.56	1.12	.188	1	1	6
1½	.94	.56	1.12	.188	1	1	6
2	1.12	.62	1.50	.250	1	1	6
3	1.25	.75	1.50	.250	1	1	6
4	1.38	.88	1.75	.250	1	1	7

Figure 4 – Stuffing Box: Vacuum Applications

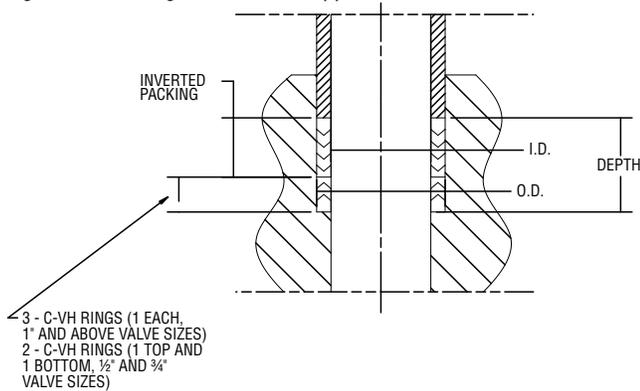
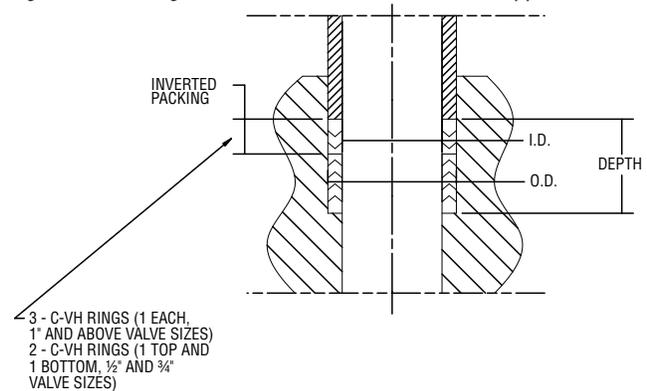


Figure 5 – Stuffing Box: Combined Pressure/Vacuum Applications



Combined Pressure/Vacuum Applications

Valve Size (in.)	Stuffing Box Space			Cross Section (in <sup>2</sup> )	Number Of C-VH Rings		
	O.D. (in.)	I.D. (in.)	Depth (in.)		Top Rings	Bottom Rings	Center Rings
½	.62	.38	.62	.125	2	2	2
¾	.62	.38	.62	.125	2	2	2
1	.88	.50	1.12	.188	2	2	4
1¼	.94	.56	1.12	.188	2	2	4
1½	.94	.56	1.12	.188	2	2	4
2	1.12	.62	1.50	.250	2	2	4
3	1.25	.75	1.50	.250	2	2	4
4	1.38	.88	1.75	.250	2	2	5

## 5.18 Disc and Seat

Leakage through the seat and disc is not always easy to detect, but when definitely known to exist, immediate repair is recommended since delay may permanently damage the disc, seat or both.

The internal repair of gate valves 2" and smaller is usually found to be uneconomical. However, if a gate valve is disassembled for inspection or cleaning, care should be taken when removing the wedge to note and mark its orientation with respect to the valve body so that when the wedge is reinserted in the valve, it will have precisely the same relationship to the seats that it had in the original assembly.

The seat threads in angle, globe, and check valve bodies should be carefully inspected to make sure they are in useable condition. When installing new seats by using proper seat tools, the seats should be screwed tightly into the valve body, then unscrewed and examined to make sure they are making continuous contact for tight seal.

If seating surfaces show galling, slight pitting, grooving, or indentations not deeper than 0.010", lapping will usually restore the surfaces sufficiently to permit tight closure. Defects deeper than 0.010" can seldom be corrected by lapping, but seating surfaces can be remachined or new parts installed. For relapping the seat and disc of Vogt globe, angle, or check valves, use a fine and a coarse grade emery base compound such as Clover Compound A and D. Apply a light coat of fine, or A, compound to the seating surface of the disc or one-piece stem, insert disc or one-piece stem into seat, and lap using an oscillating motion. Lap a few minutes and then wipe seating surfaces clean. This will clearly show the extent of damage. If severe damage is noted, use the coarse, or D, compound and lap until all defects are removed. Then finish with the fine, or A, compound. It is recommended that the face of the disc be "blued" to check for contact between seating surfaces after final lapping.

Globe and angle valves require a lapping guide fixture to maintain alignment during the lapping operation. A fixture as shown in Figure 6 may be made or, for O.S. and Y. valves, a valve bonnet with yoke nut removed may be used. For relapping loose disc globe valves, place a washer between the disc and head of the stem and retighten the disc nut, as shown in Figure 6.

Vogt piston check valves require an adapter to screw or mate into the piston for lapping the piston seating surface to the seat. The bore of the valve body serves as a guide for lapping, see Figure 7. Ball check valves are primarily used for fluids of high viscosity and the rolling action of the ball maintains seating surfaces in good condition until ball size or ball guide is worn and replacement parts are needed.

Figure 6

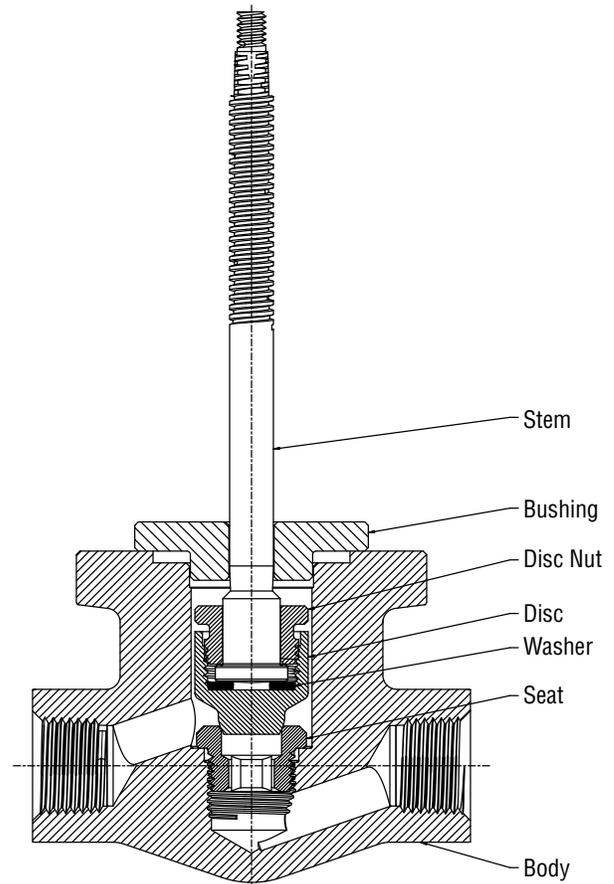
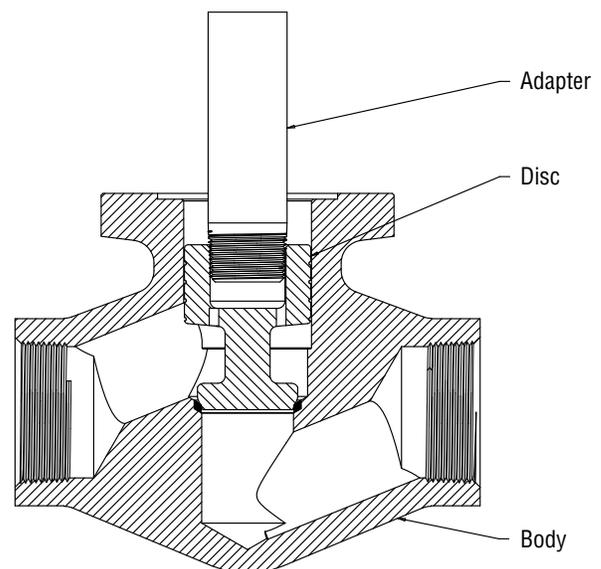


Figure 7



## 5.19 Gate Valve Maintenance

### Bolted Bonnet Gate Valves

The repair of such valves can be accomplished as follows:

#### Recommended Spare Parts

1. Bonnet gasket—See Section 1 for part numbers. Listed or unlisted gaskets are available from Flowserve distribution on short notice.
2. Packing—See Section 1 for part numbers. Listed or unlisted gaskets are available from Flowserve distribution on short notice.

#### ▲ CAUTION

1. The system pressure shall be totally isolated and vented from the valve to ensure that the valve is at zero pressure while being repaired.
2. For small valves valve replacement may be the most economical way to facilitate repair.

#### Bonnet Gasket Leaker

1. Remove bonnet.
2. Clean and inspect gasket recess and gasket surface on the bonnet. Erosion in the gasket seating area greater than 0.030" deep will require replacing the valve body and/or bonnet. A machining allowance of 0.030" is allowed to refurbish the gasket seating area of the bonnet and body.

- ▲ **CAUTION:** Ensure that any metal removed from the bottom of the depth of the body gasket recess is duplicated by removing the same amount from the top of the body. This is required to ensure that the depth of the gasket recess (0.095–0.100") in the body is maintained.

The bonnet gasket surface can be machined by up to 0.030" without any additional removal. Body/bonnet gasket surface metal removal will reduce the thickness of body/bonnet thickness.

3. Inspect the bonnet bolting to ensure it is proper and bolting is not damaged or stretched. If bolting is bad it shall be replaced. Bolting is available from Flowserve distribution on short notice.
4. If the gasket surface is not damaged and/or has been refurbished, replace the gasket with a gasket part number noted in the Recommended Spare Parts Table of Section 1. Gaskets are available from distribution on short notice.
5. Place the bonnet back on the valve and install the bonnet bolting. Torque the bonnet bolting in accordance with the torque requirements of Bonnet Torque Requirements of Section 1.

6. Test the valve and, if acceptable, place valve back in service.

#### Valve Seat Leaker

1. Remove the bonnet subassembly. Inspect body, seat rings, gate, and bonnet bolting.
2. If the gate is badly damaged it can be replaced. Since Vogt gate valves are selectively assembled with matching gates/seat rings a new gate may not correct a leaking valve. New gates are available from Flowserve distribution on short notice.
3. If the seat rings are damaged, a loose and leaking valve in service cannot be repaired without removal from the line. Special equipment will be required to replace the seat rings and replacement of the valve is recommended instead of seat replacement. In the event the user intends to repair the valve, call Flowserve distribution for seat ring part numbers and availability. Such parts are available on short notice.

### Seal Welded Bonnet Gate Valves

The Vogt valves in this category include valves with threaded bonnets that, once assembled, are seal welded. They contain no gaskets. Replacement may be more economical than repair for these valves.

#### Bonnet Gasket Leaker

This would be a very unusual event, but if a seal weld leaks, it should be ground out while the valve is not under pressure, and a weld repair at the point of leakage shall be performed. See Section 4 for typical weld metal that can be used to weld repair carbon, alloy and stainless steel valves.

#### Valve Seat Leaker

Replacement instead of repair is recommended. Seat replacement will require removal of the valve from the service line. Special equipment will be required to replace seat rings. Call Flowserve for seat ring part numbers and availability. Such parts are available on short notice.

## 5.20 Globe Valve Maintenance

### Bolted Bonnet Globe Valves

The repair of Vogt valves with spiral-wound gasket bonnet joints can be accomplished as follows:

#### Recommended Spare Parts

1. Bonnet gasket—See Section 1 for part number. Listed gaskets are available from Flowserve distribution on short notice.
2. Packing—See Section 1 for part number. Listed packing is available from Flowserve distribution on short notice.

**▲ CAUTION**

1. The system pressure shall be totally isolated and vented from the valve to ensure that the valve is at zero pressure while being repaired.
2. For small valves valve replacement may be the most economical way to facilitate repair.

**Bonnet Gasket Leaker**

1. Remove bonnet subassembly. Four or eight bonnet bolts must be removed to remove the bonnet subassembly.
2. Clean and inspect gasket recess and gasket surface on the bonnet. Erosion in the gasket seating area greater than 0.030" deep will require the valve body and/or bonnet to be replaced. A machining allowance of 0.030" is allowed to refurbish the gasket seating area of the bonnet and/or body.

- ▲ CAUTION:** Ensure that any metal removed from the depth of the body gasket recess is duplicated by removing the same amount from the top of the body. This is required to ensure that the depth of the gasket recess (0.095–0.100") in the body is maintained.

The bonnet gasket surface depth can be machined by up to 0.030" without damage to the valve. Bonnet gasket surface removal shall be across the full surface of the bonnet that contacts the gasket and body-mating surface when the valve is assembled. Body or bonnet gasket surface metal removal will reduce the thickness of body or bonnet thickness by a maximum acceptable 0.030".

3. Inspect the bonnet bolting to ensure it is proper and bolting is not damaged or stretched. If bolting is bad it shall be replaced. Bolting is available from Flowserve distribution on short notice.
4. If the gasket surface is not damaged and/or has been refurbished per the above machining process, replace the gasket with a gasket part number noted in the Recommended Spare Parts List of Section 1. Gaskets are available from Flowserve distribution on short notice.
5. Place the bonnet subassembly back on the valve and install the bonnet bolting. Torque the bonnet bolting in accordance with the torque requirements of Bonnet Torque Requirements of Section 5.
6. Test the valve and, if acceptable, place back in service.

**Valve Seat Leaker**

1. Remove the bonnet subassembly. Inspect body, disc, and bonnet bolting.
2. If the disc is badly damaged it can be replaced. Discs are available from Flowserve distribution on short notice.

3. Note any rust on the body and disc area. Internal rusting may cause the valve to close improperly.
4. Clean rust from valve.
5. Inspect the valve body seat. If the seat has imperfections deeper than 0.010", repair may not be economical and may be impossible. A replacement body is readily available from Flowserve distribution on short notice.
6. If the imperfections are less than 0.010", the valve seating surfaces can be brought back into like-new seating condition by lapping the disc to the body seat.
7. No special lapping tools are required. The bonnet subassembly can be modified to serve as a lapping tool. (See Figure 6, Section 5.) The packing shall be removed from the bonnet subassembly and the yoke nut shall also be removed and/or modified.
8. The disc/disc nut arrangement shall be assembled with an O-ring, or washer as noted in Figure 6, Section 5. This O-ring/washer fixes the disc to the stem and causes it to rotate when the stem is rotated.
9. The lapping process requires the disc to be rotated against the body seat with a lapping compound between the two parts. The rotation of the disc can be done manually or with a low speed air tool. Rotation of the piston with an air tool should be on the order of 40 rpm. Downward force should be limited to the weight of the tool.
10. For the lapping process, two grades of lapping compounds shall be used. The first lapping (rough) shall be done with the following grade of compound:

Fel Pro  
Clover Sharpening Compound  
Silicon Carbide  
Water Soluble Gel  
120 grit Part No. 51846 E  
Coarse

This compound removes a considerable amount of metal and should take 3–5 minutes to refurbish the seating surfaces. Discontinue when the disc and body have continuous lapping lines on the seating surfaces.

The final lap shall be done with the following grade of compound:

Clover Grade 1A  
320 Grit  
Very Fine

This polishes the seating surface of the disc/body seating surface.

The final lap should be 3–5 minutes depending on the appearance of the lapping line on the piston. Since Vogt globe valves have a line contact, a continuous lapped line of width 0.040–0.050" is normal. The lapped body shall have a similar continuous line. The disc and body that have been lapped to each other shall be assembled together.

A normal appearance of a properly lapped valve would be as follows:

The disc would have a continuous black line when it is cleaned of the lapping compound. The lapping compound above is a water-soluble and can be cleaned with water. The black line represents the lapped surface.

The body should have a similar continuous black line as well of similar width. The lapping compound can be cleaned with water.

Once the body and disc have a continuous lapped line of contact, the O-ring shall be removed from the stem/disc/disc nut arrangement. The stem/disc/disc nut shall be reassembled. The disc/disc nut shall be staked per Figure 13, Section 5. This locks the disc nut to the disc. Once this is complete the valve can be reassembled, tested, and placed back in service.

## Seal Welded Bonnet Globe Valves

The valves in this category include valves with threaded bonnets that, once assembled, are seal welded. They contain no gaskets. Valve replacement may be more economical than repair for these valves.

### Bonnet Gasket Leaker

This would be a very unusual event, but if a seal weld leaks, it should be ground out while the valve is not under pressure, and a weld repair at the point of leakage shall be performed. See Section 4 for typical weld metal that can be used to weld repair carbon, alloy and stainless steel valves.

### Valve Seat Leaker

1. Remove the seal weld by grinding and/or machining. This will require removal of the weld metal which will be ¼" thick at a minimum.
2. Once the seal weld is totally removed, use a pipe or strap wrench to remove the bonnet.
3. The lapping of the disc to body seat shall be per the previous procedure.
4. Reassemble the bonnet to the valve.
5. Test the valve. If acceptable, proceed with replacing the seal weld.

6. Test the valve for seal weld integrity and, if acceptable, place valve back in service.
7. Persistent leakage may be the result of "cracked hard facing" on the valve body seat. If so, the body and/or valve have to be replaced. Cracked hard facing cannot be repaired.

## 5.21 Check Valve Maintenance

### Bolted Bonnet Piston Lift Check Valves

The repair of Vogt valves with spiral-wound gasket bonnet joints can be accomplished as follows:

#### Recommended Spare Parts

1. Bonnet gasket—See Section 1 for part number. Listed gaskets are available from Flowserve distribution on short notice.

#### ▲ CAUTION

1. The system pressure shall be totally isolated and vented from the valve to ensure the valve is at zero pressure while being repaired.
2. For small valves, replacement may be more economical than repair.

#### Bonnet Gasket Leaker

1. Remove bonnet subassembly. Four or eight bonnet bolts must be removed to remove the bonnet subassembly.
2. Clean and inspect gasket recess and gasket surface on the bonnet. Erosion in the gasket seating area greater than 0.030" deep will require the valve body and/or bonnet to be replaced. A machining allowance of 0.030" is allowed to refurbish the gasket seating area of the bonnet and/or body.

- ▲ **CAUTION:** Ensure that any metal removed from the depth of the body gasket recess is duplicated by removing the same amount from the top of the body. This is required to ensure that the depth of the gasket recess (0.095–0.100") in the body is maintained.

The bonnet gasket surface depth can be machined by up to 0.030" without damage to the valve. Bonnet gasket surface removal shall be across the full surface of the bonnet that contacts the gasket and body-mating surface when the valve is assembled. Body or bonnet gasket surface metal removal will reduce the thickness of body or bonnet thickness by a maximum acceptable 0.030".

3. Inspect the bonnet bolting to ensure it is proper and bolting is not damaged or stretched. If bolting is bad it shall be replaced. Bolting is available from Flowserve distribution on short notice.

4. If the gasket surface is not damaged and/or has been refurbished per the above machining process, replace the gasket with a gasket part number noted in the Recommended Spare Parts List of Section 1. Gaskets are available from distribution on short notice.
5. Place the bonnet subassembly back on the valve and install the bonnet bolting. Torque the bonnet bolting in accordance with the torque requirements of Bonnet Torque Requirements of Section 5.
6. Test the valve and, if acceptable, place back in service.

**Valve Seat Leaker**

1. Remove the bonnet. Inspect body, bonnet, and bonnet bolting.
2. Note any rust on the body, piston or disc. Internal rusting may cause the valve to stick and close improperly.
3. Clean rust from valve.
4. Inspect the valve seat. If the seat has imperfections deeper than 0.010", repair may not be economical and may be impossible.
5. If the imperfections are less than 0.010" the valve seating surfaces can be brought back into like-new seating condition by lapping the piston/disc to the body seat.
6. Flowserve has a special lapping tool that will engage the piston and allow it to be rotated during the lapping process. Tool numbers are available from Flowserve.
7. The lapping process requires the piston/disc to be rotated against the body seat with a lapping compound between the two parts. The rotation of the piston can be done manually or with a low-speed air tool. Rotation of the piston with an air tool should be on the order of 40 rpm. Downward force should be limited to the weight of the tool.
8. For the lapping process two grades of lapping compounds shall be used. The first lapping shall be done with the following grade of compound:

- Fel Pro
- Clover Sharpening Compound
- Silicon Carbide
- Water Soluble Gel
- 120 grit Part No. 51846 E
- Coarse

This compound removes a considerable amount of metal and should take 3–5 minutes to refurbish the seating surfaces. Discontinue when the disc and body have continuous lapping lines on the seating surfaces.

The final lap shall be done with the following grade of compound:

- Clover Grade 1A
- 320 Grit
- Very Fine

The final lap should be 3–5 minutes depending on the appearance of the lapping line on the piston. Since Vogt check valves have a line contact, a continuous lapping line of width 0.040–0.050" is normal. The lapped body shall have a similar continuous line. The piston and body that have been lapped to each other shall be assembled together.

The normal appearance of a properly lapped valve would be as follows:

The disc would have a continuous black line when it is cleaned of the lapping compound. The lapping compound is water-soluble and can be cleaned with water. The black line represents the lapped surface.

The body should have a similar continuous black line as well, of similar width. The lapping compound can be cleaned with water. Once the body and piston have a continuous lapped line of contact, the valve can be reassembled, tested and placed back in service.

**Bolted Bonnet Ball Check Valves**

The previous procedures apply except that the lapping of the body seat shall be done with a Vogt piston normally used with the valve. This restores the seat in the valve body. The ball shall be inspected and replaced if it contains any nicks that would cause leakage.

**Bolted Bonnet Swing Check Valves**

Bonnet leakers shall be handled per the above. Call Flowserve for gasket part numbers. Seat leakers for removable seat valves shall be corrected as follows:

1. Remove the seats.
2. Lap the seats on a flat plate.
3. Remove the clapper and lap on a flat plate.
4. Reassemble the bonnet subassembly and valve body. Ensure that the clapper mechanism has the correct orientation to the seat. Rotate bonnet slightly to ensure that clapper and seat have good contact.
5. Reassemble, test and place back in service.

A persistent leakage may be the result of "cracked hard facing" on the valve body seat. If so, the body and/or valve have to be replaced. Cracked hard facing cannot be repaired.

## Seal Welded Bonnet Piston Lift Check Valves

The valves in this category include those with threaded bonnets that, once assembled, are seal welded. They contain no gaskets.

### Bonnet Gasket Leaker

This would be a very unusual event, but if a seal weld leaks, it should be ground out while the valve is not under pressure, and a weld repair at the point of leakage shall be performed. See Section 4 for typical weld metal that can be used to weld repair carbon, alloy and stainless steel valves.

### Valve Seat Leaker

1. Remove the seal weld by grinding and/or machining.
2. Once the seal weld is removed, use a pipe or strap wrench to remove the bonnet.
3. Lapping of the disc to body seat shall be per the previous procedure.
4. Reassemble the bonnet to the valve.
5. Test the valve. If acceptable, proceed with replacing the seal weld.
6. Test the valve for seal weld integrity, and if acceptable, place valve back in service.

## 5.22 Vogt Motor-Operated Valve (MOV) Installation and Maintenance Instruction

References – Vogt MOV Installation And Maintenance Documents

1. VVAIM2000—Installation, Operation and Maintenance Manual for Vogt Valves. Shipped with each MOV valve.
2. Applicable valve actuator installation and maintenance manual, shipped with each Vogt MOV valve. Reference documents #1 and #2 are attached to the actuator.
3. Wiring diagram supplied with each Vogt MOV valve. Located within the instrument panel of the valve actuator.

### Valve Identification

The following information shall be provided for the Vogt MOV valve when requesting information from Flowserve relating to the valve and/or actuator.

1. The valve has a nameplate on the actuator mounting flange that gives the details of the valve, such as pressure class, maximum delta pressure, and drawing number. The drawing number shall be used when making inquiry to Flowserve.

2. The actuator has a separate nameplate with details of the actuator. A serial number is normally supplied and this number shall be provided to Flowserve when making inquiry.

### Vogt MOV Valve Installation

The installation of Vogt MOV valves shall be in accordance with the following procedures:

1. **General** The Vogt MOV valve has been assembled and performance-tested at the factory. All torque and limit switches have been set to operate the valve at a seat closure pressure of 110 percent of the design pressure for which the actuator was designed. The as-shipped Vogt MOV valve shall be installed and maintained in accordance with the above reference documents. The Vogt MOV valve is shipped complete with the reference document package for the appropriate valve actuator. These documents shall be used for the installation and maintenance of the Vogt MOV valve.
2. **Storage** The Vogt MOV valve shall be stored in accordance with the applicable Short Term and/or Long Term Storage procedures in this manual. Reference document #2 for any special storage requirement unique to the valve actuator. The valve stem opening in the valve actuator has been sealed at the factory. Other actuator wiring conduit openings in the actuator have not been disturbed by Flowserve.
3. **Welding** Vogt MOV socket and butt-welding end valves shall be installed using the applicable Recommended Installation Welding Procedures provided in this manual.
4. **⚠ WARNING** Any change in orientation of the actuator to the as-shipped valve mounting during field installation, including removal of the actuator from the valve, voids the actuator limit switch settings that were set during final performance testing at the factory. In the event the valve operator is removed from the valve, the actuator is rotated on the valve, or the bonnet assembly is rotated on the as-shipped valve, all actuator limit switches shall be reset to the actuator drawing limit switch development chart noted on Reference document #3. The procedures to set the limit switches on the actuator are detailed in Reference #2 document. Damage to valve and/or actuator can occur if limit switches are not properly set before installation.
5. **Bonnet Gasket/Gate Replacement** It is recommended that the bonnet gasket be replaced if any disassembly of the valve body/bonnet joint takes place. See Recommended Spare Parts for the proper gasket. For MOV gate valves that are selectively assembled by Flowserve, if the gate is removed from the MOV valve place it back in the same valve and in the same orientation as it was removed. Failure to follow this practice can lead to permanent seating damage of the gate valve.

**6. Water Entry** During installation, all the openings to the actuator shall be maintained to ensure that water does not enter into the actuator electrical control compartment. The valve actuator is most vulnerable to water entry during the electrical wiring stage when wiring conduit openings are left open and subject to rainfall. In the event water is unintentionally allowed to collect in the electrical compartment of the actuator the valve actuator manufacturer shall be contacted for maintenance instructions if not detailed in the maintenance instructions.

**7. Valve Or Actuator Field Replacement** In the event that the valve is replaced or the valve actuator interfaced with the Vogt MOV valve at the field job site, all torque and limit switches shall be set prior to operating. The torque and limit switch setting procedure is detailed in Reference #2. Unless otherwise specified, all Vogt as-shipped MOV valves are torque-seated on the shutoff seat and limit-seated on the backseat. Failure to do so can result in severe damage to valve and/or actuator.

**8. Wiring** The installation of the electrical wiring to the actuator shall be done in accordance with the Reference documents #2 and #3.

**9. Initial Electrical Operation** The actuator initial operation and setting of torque and limit switches disturbed during valve assembly installation shall be done in accordance with document #2. Unless otherwise specified, all Vogt as-shipped MOV valves are torque-seated on the shutoff seat and limit-seated on the backseat.

**▲ CAUTION:** During the electrical start-up phase, “phase rotation” of the actuator (electrical motor) is most critical and, if the actuator rotation is incorrect, serious damage can occur to the valve. Reference document #2 has instructions on how to check and correct phase rotation.

**10. System Pressurization** Once the system is under pressure, the final setting on the actuator torque switches may need to be adjusted. During performance testing at Flowserve the closing torque switch is set to the lowest level to acceptably pass a seat test of 110 percent of the pressure for which the actuator was sized. When in operation, the torque switch may need to be adjusted upward to ensure that the valve is fully closed under field conditions. Torque switch adjustment shall be performed in accordance with the instructions in Reference #2.

## Vogt MOV Valve Maintenance

### Recommended Spare Parts

1. Bonnet gasket—See Section 1 for part number. Listed gaskets are available from Flowserve distribution on short notice.
2. Packing—See Section 1 for part number. Listed packing is available from Flowserve distribution on short notice.
3. Actuator—See applicable Installation, Operation and Maintenance Manual supplied with each Vogt MOV valve or request a Recommended Spare Parts for Actuators when ordering.

### ▲ CAUTION:

1. The system pressure shall be totally isolated and vented from the valve to ensure it is at zero pressure while being repaired.

2. Consult the reference document #2 for safety precautions when troubleshooting the actuator.

3. For small valves, valve replacement may be the most economical way to facilitate repair. Vogt Valves can replace the valve that will interface with the existing actuator. The valve nameplate gives the drawing number for the valve. Provide this to the authorized Vogt distributor for replacement.

### Bonnet Leaker/Seat Leaker for Vogt MOV Gate, Globe or Angle Valve

1. See the applicable procedure for Gate, Globe or Angle valve detailed in this manual for repair of bonnet and/or seat leakers.
2. Stem breakage is common with MOV valves during the early stages of operation. To replace, remove the bonnet, remove the broken stem and insert a new stem. Make sure that the broken stem is removed from the stem nut in the valve actuator before replacing the new stem.
3. Replace the bonnet and torque bonnet bolts to the values noted in Section 5 for the appropriate bolting size.
4. Since the bonnet has been removed, the torque and limit switches will have to be reset on the actuator. See Reference document #2 for instructions.
5. After setting the switches, place valve back in operation.

## Actuator Troubleshooting

1. The orientation of the valve may require that the Torque switch on the actuator be adjusted upon placement in service. The referenced document shall be consulted to increase/decrease the torque output of the actuator.

## 5.23 Vogt Air-Operated Valve (AOV) Installation and Maintenance Instruction

### References – Vogt AOV Installation and Maintenance Documents

1. VVAIM2000 – Installation, Operation and Maintenance Manual for Vogt Valves. Shipped with each AOV valve.
2. Applicable valve actuator installation and maintenance manual, shipped with each Vogt AOV valve. Reference documents #1 and #2 are attached to the actuator.
3. Actuator accessories manuals. Examples—positioner, limit switch, solenoid valve, etc., manuals.

#### Valve Identification

The following information shall be provided for the Vogt AOV valve when requesting information from Flowserve relating to the valve and/or actuator.

1. The Vogt AOV valve has a nameplate on the actuator-mounting flange that gives the details of the valve, such as pressure class, maximum delta pressure, and drawing number. The drawing number shall be used when making inquiry to Flowserve.
2. The actuator has a separate nameplate with details of the actuator. A serial number is normally supplied and this number shall be provided to Flowserve when making inquiries.

#### Vogt AOV Valve Installation

The installation of Vogt AOV valves shall be in accordance with the following procedures:

1. **General** The Vogt AOV valve has been assembled and performance-tested at the factory. All applicable open and closed limit switches have been set to actuate during opening and closing of the valve. The Vogt AOV valve has been performance-tested at a seat closure pressure of 110 percent of the design pressure for which the actuator was designed. The as-shipped Vogt AOV valve shall be installed and maintained in accordance with the reference documents. The Vogt AOV valve is shipped complete with the reference document package for the appropriate valve actuator. These documents shall be used for the installation and maintenance of the Vogt AOV valve.
2. **Storage** The Vogt AOV valve shall be stored in accordance with the Short-Term and/or Long-Term Storage Procedures in this manual. Refer to the Reference document #2 for any special storage requirement unique to the valve actuator.

3. **Welding** Vogt AOV socket and butt-welding end valves shall be installed using the applicable Recommended Installation Welding Procedures provided in this manual.
4. **⚠ WARNING** Any change in orientation of the actuator to the as-shipped valve mounting during field installation, including removal of the actuator from the valve, voids the open and closed actuator limit switch settings that were set during final performance testing by Flowserve. In the event the valve operator is removed from the valve or the actuator is rotated on the as-shipped valve, reset the limit switch to actuate when the valve is fully open and fully closed. Removing the air actuator from the Vogt AOV also violates the valve stem/actuator coupling nut thread engagement and can cause the valve to not fully close. The stem/actuator coupling nut final assembled thread engagement geometry must be duplicated on reassembly of the actuator to the valve, otherwise the valve will not fully close when valve closure signal is given or the full thrust of the actuator on the stem may damage the stem or actuator coupling engagement threads.
5. **Valve Stem/Actuator Coupling Nut Adjustment** When the actuator is removed from the valve, the closure mechanism of the valve has been altered from the as-shipped condition. The valve stem and coupling nut are designed to permit the stem to be adjusted to ensure that the actuator actually preloads the stem and closure mechanism on closure to ensure the valve does not leak. In the event the actuator closes the valve but the valve continues to pass flow, the stem needs to be lengthened by adjusting the stem and/or the coupling nut in order to ensure that the actuator has placed enough preload on the closure mechanism, (spring force for fail-closed valves or air pressure for fail-open valves) to seat the valve against the design pressure.
6. **Bonnet Gasket/gate Replacement** It is recommended that the bonnet gasket be replaced if any disassembly of the valve body/bonnet joint takes place. See Section 1 for the proper gasket. For AOV gate valves, that are selectively assembled by Flowserve, if the gate is removed from the AOV valve, place it back on the same valve and in the same orientation as it was removed. Failure to follow this practice can lead to permanent seating damage of the gate valve.
7. **Valve Or Actuator Field Replacement** In the event that the valve is replaced or the valve actuator is interfaced with the Vogt MOV valve at the field job site, set the open and closed limit switches prior to operating. The open and close limit switch setting procedure is typically done as follows:
  - a. **Close Switch:** Stroke the valve to the fully closed position by application of an air supply for “spring-to-open” actuators. With the air applied to the actuator, the close limit switch

actuator arm shall be adjusted to cause the close switch to trip in the closed position. For “spring-to-close” actuators, the air supply to actuator shall be vented and the spring allowed to close the valve. The close switch actuator arm shall be adjusted to cause the switch to trip.

- b. Open Switch: Stroke the valve to the fully open position by application of an air supply for “spring-to-close” actuators. With the air applied to the actuator, the open limit switch actuator arm shall be adjusted to cause the open switch to trip in the fully open position. For “spring-to-open” actuators, the air supply to actuator shall be vented and the spring allowed to open the valve. The close switch actuator arm shall be adjusted to cause the switch to trip.
- c. Final Cycling: Following the setting of the open and closed switches, the actuator shall be fully closed and opened to ensure the limit switches trip as required.

**8. System Pressurization** Once the system is under pressure, the stem/actuator coupling nut thread engagement may need further adjustment. During performance testing at Flowserve, the stem/coupling nut thread engagement is set to a level to acceptably pass a seat test of 110 percent of the pressure for which the actuator was sized. (See #5 above.)

**9. Supply Pressure**

**▲ CAUTION:** The actuator nameplate contains a “Maximum Air Supply” that should be used. In the event the actuator is not supplied with a supply air regulator to make this adjustment, it is the responsibility of the end-user to provide an air supply regulator. Over-pressurization of the actuator can damage the unit, requiring major repair.

**10. Accessories** Accessories for the air actuators shall be supplied with the Installation, Operation and Maintenance Manual applicable to each unit.

**Vogt AOV Valve Maintenance**

**Recommended Spare Parts**

- 1. Bonnet gasket—See Section 1 for part number. Listed gaskets are available from Flowserve distribution on short notice.
- 2. Packing—See Section 1 for part number. Listed packing is available from Flowserve distribution on short notice.
- 3. Actuator—See applicable Installation, Operations and Maintenance Manual supplied with each Vogt AOV valve. It is recommended that *Recommended Spare Parts for Actuators* be requested when ordering a Vogt AOV valve.

**▲ CAUTION:**

- 1. The system pressure shall be totally isolated and vented from the valve and supply pressure removed from the actuator when the valve is being repaired.
- 2. Consult Reference document #2 for safety precautions when troubleshooting the actuator.
- 3. For small valves, replacement may be more economical than repair. Vogt Valves can replace the valve with one that will interface with the existing actuator. The valve nameplate gives the drawing number for the valve. Provide this to the authorized Vogt distributor for replacement.

**Bonnet Leaker/Seat Leaker for Vogt AOV Gate, Globe or Angle Valve**

- 1. See the applicable procedure for Gate, Globe or Angle valve detailed in this manual for repair of bonnet and/or seat leaker.
- 2. Stem breakage is common with AOV valves during the early stages of operation. To replace the stem, it is recommended that the bonnet be removed and the old stem be replaced. Please note the length of the old stem and new stem and the thread engagement geometry of the valve stem and actuator coupling nut. Make sure that the broken stem is totally removed from the actuator coupling nut before replacing the new stem. If the stems are the same length, make every effort to duplicate the stem and actuator coupling nut engagement geometry noted before old stem was removed. This will ensure that the final stem/actuator coupling nut thread engagement adjustment will be kept to a minimum.
- 3. For an AOV gate valve, the gate orientation shall be noted and marked with the body to ensure that the same gate goes back into the same valve in the same orientation as it was when it was removed.
- 4. Replace the bonnet and torque bonnet bolts to the values noted in Section 5 for the appropriate bolting size.
- 5. After resetting the open and close switches, place valve back in operation.

**Actuator Troubleshooting**

The orientation of the valve may require that the stem/actuator coupling nut have an additional adjustment before the valve is placed back in service. If the valve is leaking across the closure seat, an adjustment is necessary for a “fail-closed” valve and/or an increase in supply pressure if the valve is a “fail-open” design.

For air actuator accessories, separate manuals may have to be consulted to properly troubleshoot any issues.

## 5.24 Vogt Valve Lubrication Points

### Recommended Lubricant

Flowserve recommends a high-pressure and temperature lubricant such as Dow Corning Molykote™ G-N Paste or similar.

#### Gate Valves, O.S. and Y. Design (Figures 8-12)

There are two points to be lubricated for Vogt Gate Valves, the stem/yoke nut threads and the yoke nut/bearing ring area. Lubricate as follows:

1. For those Vogt Gate Valves with a single grease fitting (figure 9), note that lubricating through this fitting only reached one of the lubrication points, which is the yoke nut/ bearing ring area. The stem and yoke nut threads shall be lubricated as noted in (3) below.
2. For those valves with double grease fittings (figure 10) both lubrication points can be reached through these fittings. Both fittings must be used to lubricate the two points.
3. For those Vogt Gate Valves with no grease fitting (figure 8), lubricate the two reached points as follows:
  - a) Open the valve to mid-stroke. Brush lubricant on the stem thread that protrudes through the handwheel and on the stem thread under the yoke. Fully open and close the valve. The stem/yoke thread is now lubricated.
  - b) Open the valve slightly, this creates a clearance at the bearing ring area. Liberally brush lubricant on the bearing ring area. Close the valve. This distributes the lubricant to the bearing ring and the outside diameter area of the yoke nut.

**Note:** The approach detailed in #3 can also be used for those Vogt Gate Valves with a single or double grease fitting, at the option of the end-user.

#### Globe/Angle Valves, O. S. and Y. Design (Figure 4)

With one exception, Vogt Globe Valves have one point of lubrication: the stem/yoke nut threads. The one exception is the Vogt Series 810, 811 and 822 valves, which shall be lubricated per the Gate Valve instruction #3 above. Lubricate globe valves as follows:

1. For those Vogt Globe Valves with a grease fitting (Figure 9), lubricate through the fitting.
2. For those Vogt Globe Valves with no grease fitting (Figure 8) open the valve to mid-stroke and brush lubricant on the stem thread both above and below the yoke nut. Fully opening and closing the valve will lubricate the stem threads.

#### Gate/Globe/Angle Valves, Inside Screw Stem (ISS) Design

These valves have no lubrication points. They shall be used in applications in which the service fluids lubricate the valve.

#### Check Valves, All Vogt Types

These valves have no lubrication points.

#### Motor-Operated Gate/Globe/Angle Valves

These valves are supplied with an actuator that includes a thrust base with mating stem nut. There is only one lubrication point, the stem thread/actuator stem nut. To lubricate the stem thread, proceed as follows:

Using the actuator, fully open the valve. Remove the plug from the top side of the actuator, and use a long brush inserted through the actuator opening to brush lubricant onto the valve stem threads. Stroke the valve closed. The stem thread is now lubricated. Replace the pipe plug back into the actuator opening.

Lubrication of the actuator shall be done in accordance with the maintenance provisions in the actuator manual.

Figure 8 – Gate Valve Top Works (no grease fitting)

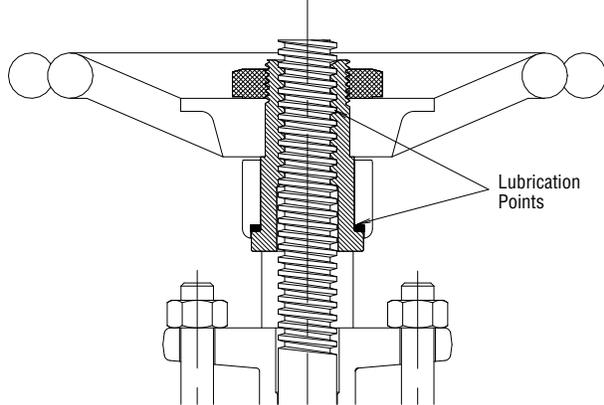


Figure 9 – Gate Valve Top Works (single grease fitting)

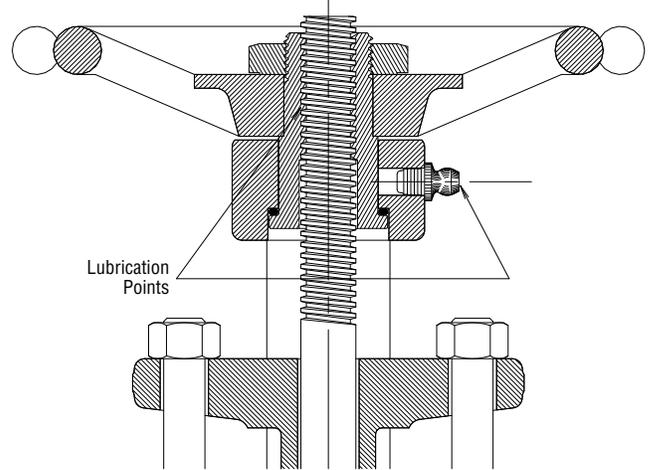


Figure 10 – API-600 Gate Valve Top Works (double grease fittings)

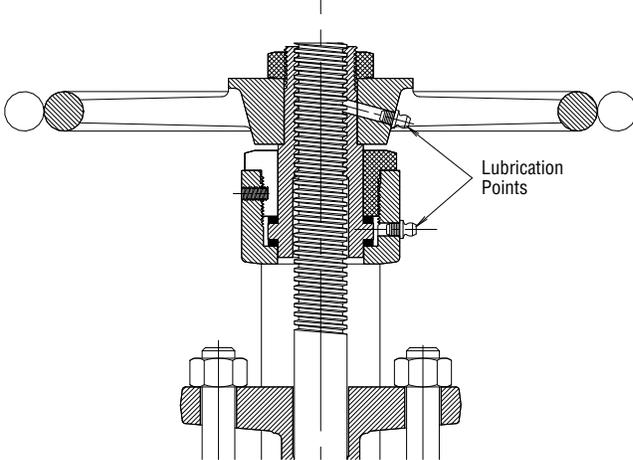


Figure 11 – Globe Valve Top Works (no grease fitting)

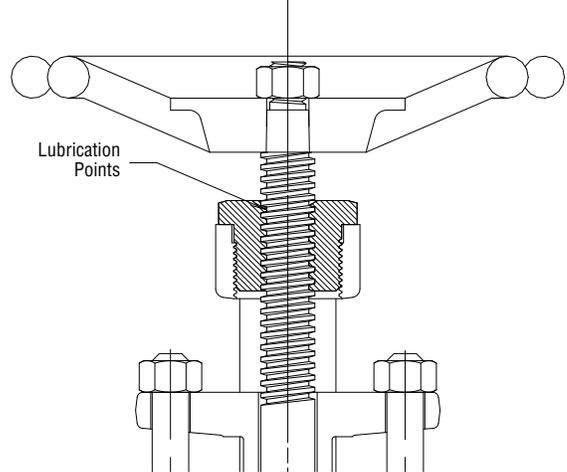


Figure 12 – Globe Valve (single grease fitting)

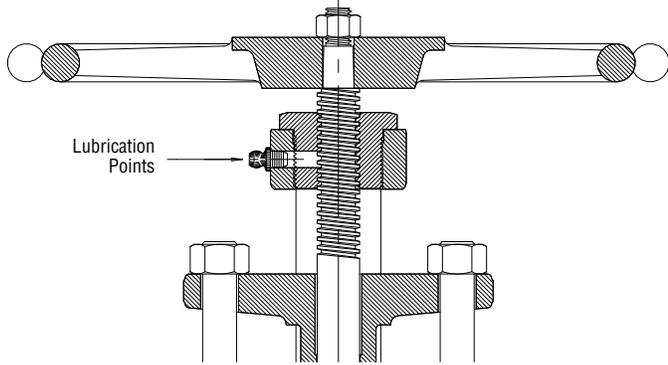
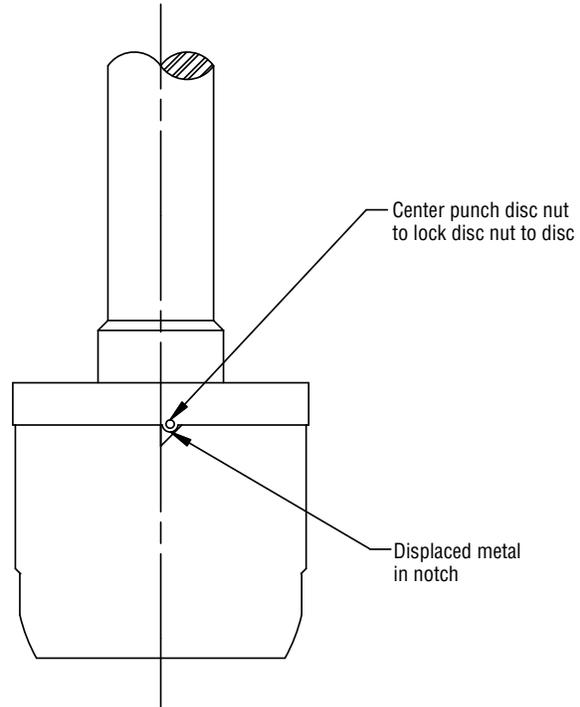


Figure 13 – Globe Valve Staked Disc



## 5.25 Engineering Information

Check Valve Cracking/Opening Pressures  
(Vogt Valve Series 701, 15701, 573, 583, 593, etc.)

Size, NPS	Pressure (psi)
½	0.61
¾	0.61
1	0.52
1¼	0.57
1½	0.57
2	0.58

Maximum Packing Gland Bolting Torque (ft-lb)

Size, NPS	Class 150, 300, 600 & 800 Conventional Port	Class 600 & 800 Full Port	Class 1500	Class 1500 Full Port
½	1.8	1.8	4.2	4.2
¾	1.8	3.7	4.2	7.5
1	3.7	4.0	7.5	13.9
1¼	4.0	—	13.9	13.9
1½	4.0	7.5	13.9	15.9
2	7.5	8.5	15.9	—
2½	8.5	—	—	—
3	8.5	—	—	—
4	12.0	—	—	—

Maximum Handwheel Closing Torques, Typical (ft-lb)\*

Size, NPS	Class 800 Conventional Port Gate Valve	Class 800 Full Port Gate Valve	Class 1500 Conventional Port Gate Valve	Class 1500 Full Port Gate Valve	Class 2500 Full Port Gate Valve
1/4"	8	—	—	—	—
3/8"	8	—	—	—	—
1/2"	15	15	25	25	30
3/4"	15	20	25	35	75
1"	20	40	35	55	75
1 1/4"	50	50	75	75	—
1 1/2"	50	70	75	115	175
2"	70	100	115	—	175

\*Torque based on valve pressure rating at 100°F.

Maximum Handwheel Closing Torques, Typical (ft-lb)\*

Size, NPS	Class 800 Conventional Port Globe Valve	Class 800 Full Port Globe Valve	Class 1500 Conventional Port Globe Valve	Class 1690 Conventional Port Globe Valve <sup>(1)</sup>	Class 2680 Full Port Globe Valve <sup>(1)</sup>
1/2"	15	15	25	25	30
3/4"	15	30	25	25	75
1"	30	40	35	40	75
1 1/4"	—	—	60	—	—
1 1/2"	40	75	60	125	175
2"	75	125	100	125	175

\*Torque based on valve pressure rating at 100°F.

<sup>(1)</sup>The NPS 1.5 and 2 have hammer blow-type handwheels.

Recommended Maximum Bonnet Bolt Torques  
(Dry, Unlubricated Values)

Bolt Diameter	Torque (ft-lb) B7 & B16	Torque (ft-lb) B8M
5/16"	25	22
3/8"	40	36
7/16"	50	45
1/2"	85	75
9/16"	144	130
5/8"	125	115
3/4"	175	156
7/8"	530	480
1"	795	710

Note: Reduce above values by 25 percent to 30 percent if any type of lubrication is used on bolting.





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