



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

API 602 Forged Steel Gate, Globe & Check Valves

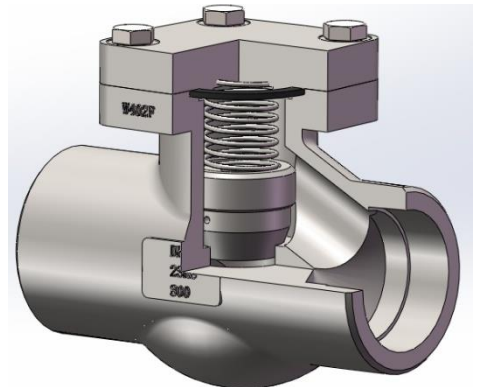
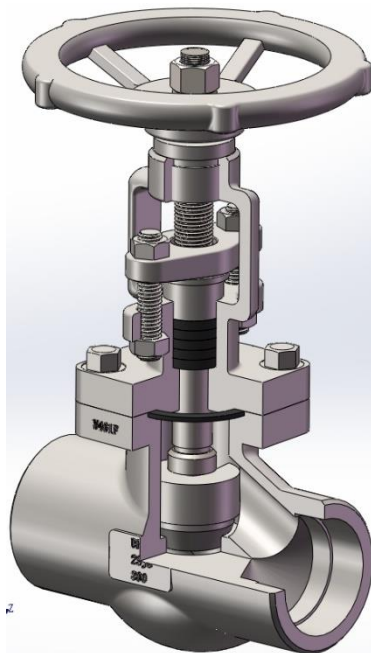
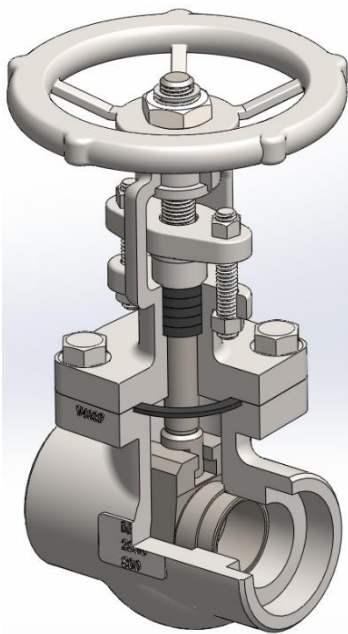


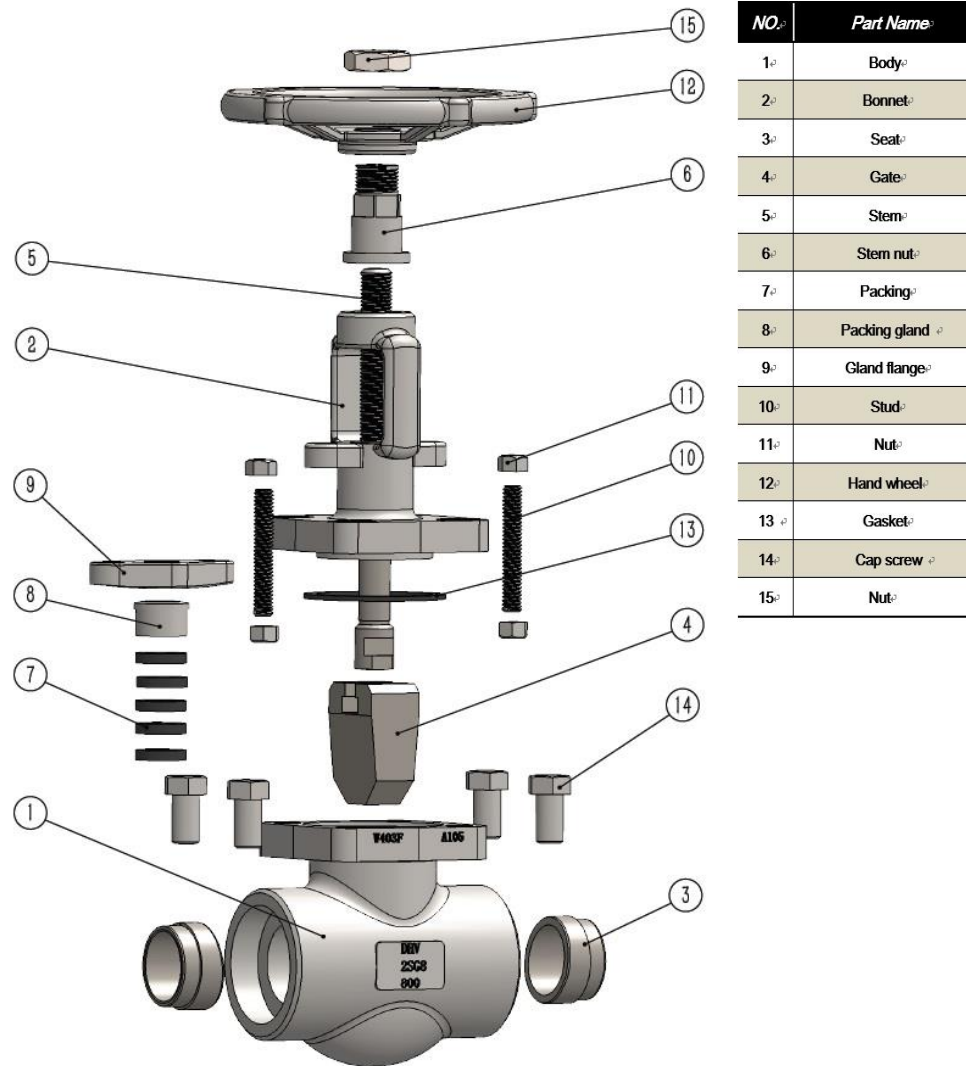


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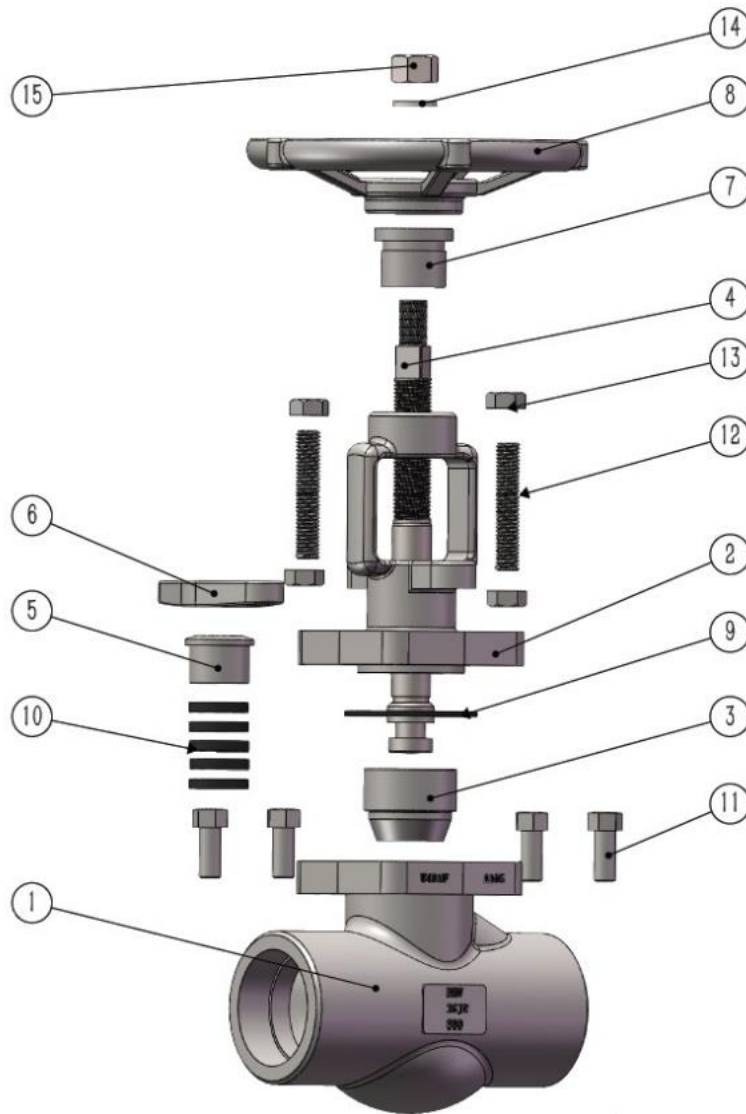
TYPICAL CONFIGURATION

API 602 Forged Steel Gate Valve



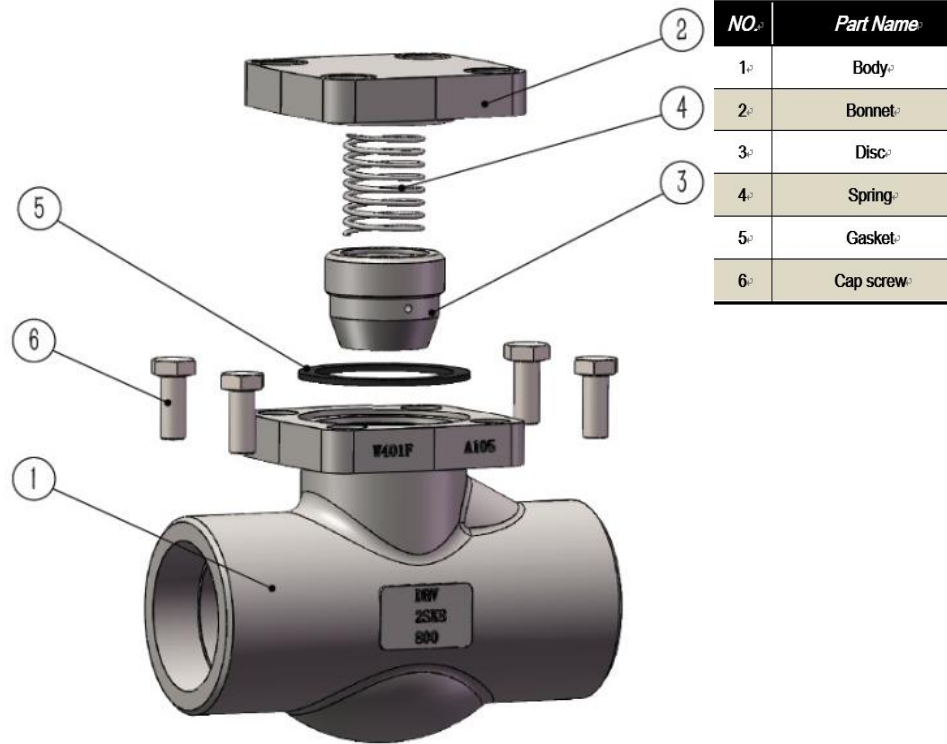
NO.	Part Name
1	Body
2	Bonnet
3	Seat
4	Gate
5	Stem
6	Stem nut
7	Packing
8	Packing gland
9	Gland flange
10	Stud
11	Nut
12	Hand wheel
13	Gasket
14	Cap screw
15	Nut

API 602 Forged Globe Valve

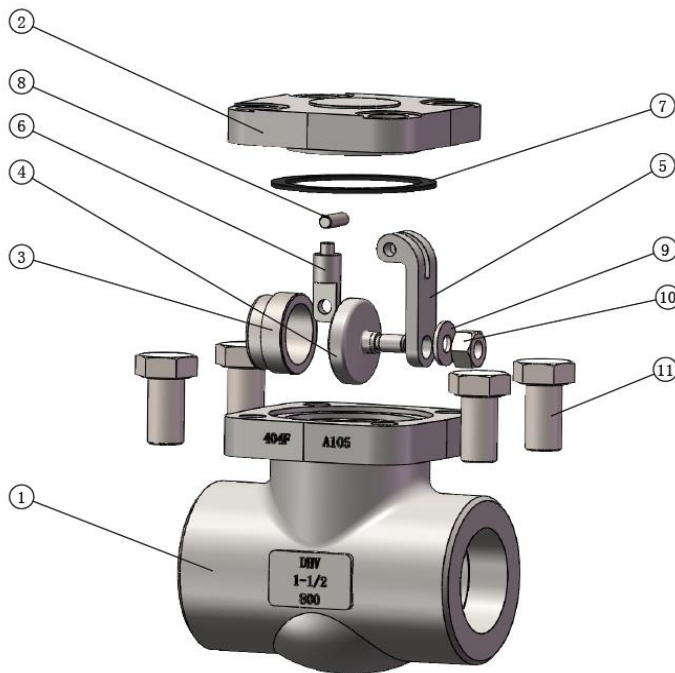


NO.	Part Name
1	Body
2	Bonnet
3	Disc
4	Stem
5	Packing gland
6	Gland flange
7	Stem nut
8	Hand wheel
9	Gasket
10	Packing
11	Cap screw
12	Stud
13	Nut
14	Spring washer
15	Nut

API 602 Forged Check Valve



NO.	Part Name
1	Body
2	Bonnet
3	Disc
4	Spring
5	Gasket
6	Cap screw



NO.	Part Name
1	Body
2	Bonnet
3	Seat
4	Disc
5	Hinge
6	Swing Arm
7	Gasket
8	Hinge Pin
9	Spring Washer
10	Nut
11	Cap screw



FOREWORD

Personal Safety and Long Term Ownership of your DHV API 602 Forged Steel Gate, Globe & Check Valves is the most important matter in reviewing our Installation, Operation & Maintenance Manual. This manual will provide all the necessary safety guidelines for our valve including information for valve transportation, storage, installation, operation and maintenance. Please read carefully before installing or servicing the valve.

DHV provides general guidelines in this manual, and cannot provide specific data and warnings for all possible applications. The purchaser/end user must therefore assume responsibility for proper valve selection, sizing, installation, operation, and maintenance of DHV valve products. The purchaser/end user should read and understand this document and any instructions provided with the product, and conduct training with its employees and contractors to ensure they are aware of the proper and safe use of DHV valve products in connection with the specific application.

1. END USER INSTRUCTION

Personnel safety is always the most important factor in the transportation, storage, installation, operation and maintenance of any valve. DHV valves are designed to meet the customer's order requirements and specifications. DHV disclaims all responsibility for problems that may be caused by applications other than the specified use. Valve service pressure/temperature information is detailed on the valve name plate. When selecting a valve, always consider the application, service and temperature for the intended service. Select the applicable valve material for anti-corrosion and anti-abrasive service. For safety of personnel and plant/environment: Prior to conducting any service on the valve, ensure the valve is not under pressure, properly vented, and drained. For all electric, hydraulic or pneumatic actuated valves, all power connections to the valve/actuator must be turned off before performing any maintenance and service. When performing any operation, maintenance or service, personal protective equipment should be used, such as protective clothing, oxygen masks, safety glasses, work gloves, etc. DHV will not be responsible for any loss or expense resulting from the failure of equipment, damage to any property, or death or injury to any person resulting in whole or in part from repairs or modifications performed by other than authorized DHV personnel. Such unauthorized repairs shall also serve to terminate any contractual or other warranty, if any, on the equipment and may result in the equipment no longer meeting applicable requirements.



2. VALVE TRANSPORTATION AND STORAGE

2.1 TRANSPORTATION

1. Valves should remain in the closed position to prevent damage to the seating surface during shipping and handling. Each valve should be securely packaged either on a pallet or in a crate to avoid any damage during shipping.
2. Use the proper hoisting equipment to transport the valve, especially when lifting or lowering the valve. Special attention to personnel safety and the care of the valve should be made when transporting the valve. Avoid impacting or striking the valve during transportation. Lay the valve on a clean flat surface; avoid laying the valve on the flange face. Ensure there is adequate clearance around the valve for proper operation and maintenance.
When lifting the valve, use the valve lifting lugs; if the valve does not come with lifting lugs, use an appropriate sized sling through the valve yoke to lift the valve.

 **WARNING: NEVER USE THE HAND WHEEL OR VALVE STEM TO LIFT THE VALVE.**

3. During transportation, ensure the valve's paint, name plate and flange sealing surfaces are fully protected. Do not drag the valve across the floor, or place the valve flange sealing face on the floor.
4. For those valves not required to be immediately installed, do not open the end flange protective covers. Ensure the valves are stored in a safe, clean environment and are protected from rain and dust.

2.2 STORAGE

1. Valves should be stored in the closed position. Valve ports and flange serration surfaces should be kept sealed with protective flange covers.
2. Valves should be stored in a dust free, low humidity and well-ventilated room, not in direct contact to the floor. If possible, the valves shall be kept in the original packing crate. If the valves must be stored outdoors, keep them in the original crate or shipping container. Ensure the valve's packaging is stored on raised blocking to avoid moisture damage. Protective covering should be used for protection against dust and rain.
3. Valves should never be stacked on top of each other, to avoid any valve distortion which may affect valve performance and cause personnel injury.



4. Valves that have been stored for an extended time should be cleaned and inspected prior to installation. Inspect the sealing surface to ensure it is clean and free of any debris or damage.
5. Do not expose the valve to any corrosive environment as this may cause damage to the valve stem threads.

3. VALVE INSTALLATION

- Review all documentation to fully understand the valve and related information that will provide safe installation and a long service life for your valve.
- Valve information can be found on the valve body, and the name plate. Fig 1 is a typical nameplate.
- Valve ends should have a protective cover to protect the valve bore from any foreign particles and dust which will damage the gate and seat sealing surfaces.

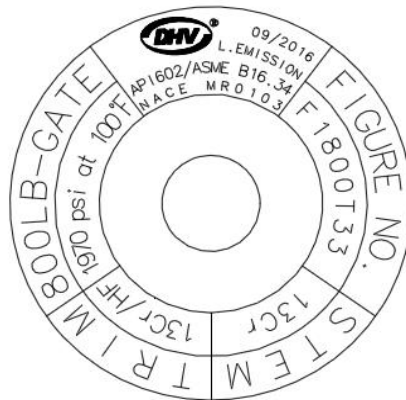


Figure 1 Typical Valve Nameplate

3.1 INSPECTION BEFORE INSTALLATION

3.1.1 Before installation, check the valve name plate and valve body information to ensure the valve is suitable for the intended service.

3.1.2 Before installation, remove the flange cover and the protective film on the flange sealing face, inspect the bore and the flange sealing surface, remove any dirt with a clean soft cloth, use an anti-corrosive cleaning liquid to clean if necessary, and never use any other chemical products.

3.1.3 Inspect the flange gasket (including ring gasket) sealing surface and ensure it is in acceptable condition for installation.

3.1.4 After cleaning the valve and before installation, open and close the valve one time. Ensure the valve operates smoothly. If abnormal operation is experienced, stop the operation and inspect the valve stem and valve bore for any obstructions that may be preventing normal operation.

3.1.5 After successfully cycling and assuring the proper operation of the valve, return the valve to the closed position until installation is complete. If for any reason the valve must remain in the open position, ensure the valve sealing surfaces are protected.

3.2 INSTALLATION

3.2.1 Position the valve into the pipe or the flange connection; ensure that any stress caused by improper pipe alignment is relieved first. Valves are not intended to be a means of aligning improperly fitted pipe.

3.2.2 Install the valve using qualified piping standards and practices. Valves marked with flow direction must be installed in line with the piping flow.

3.2.3 The recommended orientation for API 602 Forged Steel Gate, Globe & Check Valves is upright with the valve in a horizontal line with the hand wheel positioned vertically above the valve centerline.

FLANGE ENDS:

- Select the proper gasket (including ring gasket) to install, line up the bolt holes between the valve flange and pipeline flange, then install the bolts and nuts and tighten to the accepted piping and bolting standards. The bolt threads should be lubricated first for ease of bolting.
- Use an appropriate sized torque wrench when tightening the bolt/nut, to avoid flange deformation. Please follow Fig 2 and Table 1 for bolting sequence and bolting torque. If the bolting quantity is different from the chart shown, please follow the same principle to get a new sequence to follow.
- For large diameter valves, the valve must be properly and safely supported during installation. After installation is completed, valve supports should be moved to the bottom of the valve flanges.
- After valve installation is complete, recheck and tighten the bolts including the gland bolts as necessary to the values provided in Table 1.
- It is recommended that the tightness of the joint bolt tension and gland bolts be inspected at least yearly. Refer to Table 1.


 **DURING INSTALLATION, IF VALVE IS NOT IN LINE WITH THE PIPELINE, FLANGE FACES ARE NOT PARALLEL TO EACH OTHER, OR BOLTING TORQUE IS NOT UNIFORM, VALVE LEAKAGE MAY BE EXPERIENCED.**

Table 1 Bolting Tightening Torque Chart

Stud Size (Inch)	Measurement: Newton-meters N·m Tolerance: +/- 10% (Conversion: 1 ft·lb= 1.36 N·m 1 N·m = .74 ft·lb)				
	B7M/L7M	B8 (I)/B8M(I)	B7/L7	B8 (II)/B8M (II)	B16
3/8-16UNC	28~32	12~14	33~38		
1/2-13UNC	67~78	28~33	80~93		
9/16-12UNC	96~113	41~48	114~134		
5/8-11UNC	133~156	56~66	159~186		
3/4-10UNC	237~278	100~118	282~331		

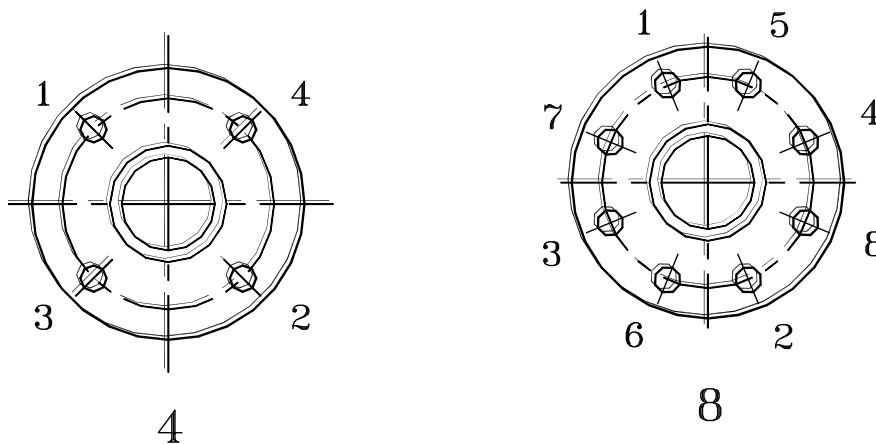


Figure 2 Bolt Tightening Sequence

THREADED ENDS:

- Check the threads on both the valve and the mating pipe for thread form and cleanliness. Check for any indication of an impact that might have deformed the thread either out-of-round or by a local indentation. Ensure no chips or grit is present.
- Threaded pipe joints depend on a good fit between the external and internal pipe threads for tight sealing. 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.



SOCKET AND WELD ENDS:

- The valves provided with socket-welding ends preparation are as per standard ASME B16.11 or as per customer requirements. Please refer to the general assembly drawings for the exact socket-welding ends dimensions.
- When welding socket weld end valves, be sure to leave 1.6 mm gap between end of pipe and bottom of valve socket.
- The valves provided with socket-welding ends preparation are as per standard ASME B16.25 or as per customer requirements. Weld ends must be kept clean with no burrs, oil, dirt or foreign objects.
- The valve end and pipe end must be in proper alignment for effective welding.
- Follow the approved WPS to perform the welding. During welding, insure the temperature near the seat area does not overheat which will cause sealing area distortion. Protect the valve bore to prevent welding slag and foreign matter from entering the valve.
- After welding, use approved and proper Non-Destructive Testing (NDT) method to check the welds; clean the welds thoroughly, and then perform local heat treatment if required.
- When installation is complete, and prior to system testing and start-up, clean the valve by flushing the line of debris and other materials that may have accumulated inside the valve and in the valve seating area and surfaces during construction. When flushing the valve, open the valve fully, flush for a determined time based on line size. Close the valve and allow fluid to fill the line, while opening and closing the valve while flushing. Fully close the valve, if seat leakage is noted after flushing, repeat flushing procedure. If leakage from the seat is still evident, the seating surface may be damaged and need repair.

4. VALVE OPERATION

- To assure maximum valve performance, only use a valve that is suitable for the rated pressure/temperature and corrosive environment.
- For your safety and normal operation, please read the following valve operation procedures:
 - 4.1** The valve must be kept either in the fully open or fully closed position. Never throttle or leave the valve at the half-open position as erosion of the disc and seating surface may occur and stem damage will result.
 - 4.2** Rotating the valve hand wheel clockwise will close the valve; counter-clockwise operation will open the valve, this is also applicable to gear or motor actuated operation. Closing the valve requires the specified stem torque to assure the closure of the valve at the rated pressure.



4.3 CAUTION: For personal safety, always use an appropriate sized valve wrench to open and close the valves (Recommendation: A valve wrench no larger than twice the diameter of the hand wheel should be used when opening or closing a valve). Never use an oversized torque wrench (with higher torque output) to operate the valve, as over torquing may result in permanent distortion to the internal valve components resulting in the valve malfunctioning. The use of pneumatic impact wrenches for the quick opening or closing of the valve is not recommended; binding or stem damage may occur.

4.4 Never operate the valve without authorization and a full understanding of the safe operation procedures, inspections and proper handling instructions.

4.5 When a valve is in the fully open position, rotate the hand wheel one quarter turn from the fully open position. This action will ensure that packing tightness is verifiable.

4.6 Back seating a valve is means of stopping or reducing packing leakage until the packing can be replaced. Valve packing should only be replaced when the valve is NOT under pressure. It is not recommended to repack a valve under pressure. To backseat the valve, rotate the hand wheel to the fully open position; do not over torque as this will cause thermal binding.

5. VALVE MAINTENANCE

Valves should be inspected regularly during operation and any findings should receive immediate attention in order to avoid any further damage to the valve or the system. Regular inspection and maintenance should be scheduled at a minimum of twice per year, or more often if required.

5.1 Valve surfaces and other moving parts such as the stem, hand wheel or gear operators, are areas that will easily accumulate dust, corrosion, oil and debris, thus resulting in excessive wear and damage. Therefore regular inspection and cleaning of these components is necessary. Stem threads should be lubricated regularly with a lubricant containing copper, molybdenum disulfide lubricant.

5.2 Regular maintenance of the valve is required to assure smooth operation. Stem threads should be inspected and lubricated frequently to ensure ease of operation. Lubrication of the stem should be conducted every six months or more often as needed, based on the environment the valve is installed. Inspection should confirm that the valve is sealing properly. Stem packing should be inspected at least every six months to ensure zero leakage from the packing chamber. For water & oil service, regular maintenance should be scheduled every 3 months. For more corrosive mediums, inspection and maintenance should be completed once a month.

5.3 Valves that are not operated frequently; remaining in the open or closed positions for long periods of time should be partially operated on a monthly basis to expel lubricant throughout the stem nut, bearings or gears. Excessive effort to open or close the valve may indicate the valve stem needs to be lubricated, or the valve packing compression is too tight, or if debris and particle matter on the threads are preventing the operation of the stem. Damaged components should be considered when the valve will not operate after all efforts of adjustments and lubrication has been completed.

5.4 During maintenance or servicing of the valve, all replacement parts must be the same as the original specification (parts dimensions and materials). End user may also purchase the spare parts such as packing, gaskets, bolts/nuts etc. when ordering the valve. With the new packing, gasket or bolt/nuts installed, the valve must pass the applicable pressure testing prior to installation and service.

5.5 If the seating surfaces of the disc or the seats are scratched or show slight pitting of less than 0.005" (0.1 mm): these can be removed by lapping. If defects are deeper than 0.005", proper machining practices of grinding and machining by qualified machinist should be implemented. For soft seated valve, if the seat insert is scratched, or damaged, change a new seat insert. To assure the sealing capability, the valve must pass all required applicable pressure tests before returning to service. If all pressure containing parts are in need of repair, consider replacing the entire valve.

5.6 At NO time shall any weld repair be conducted on the valve while in service. Never strike the valve with a hammer or other impact device. Ensure that no excess weight is placed on the valve that was not part of the original manufacturer design.

 **WARNING! ANY MAINTENANCE OR REPAIR MUST NOT OCCUR UNTIL THE VALVE BODY PRESSURE IS COMPLETELY RELEASED. NO REPAIR WORK SHALL BE CONDUCTED WHILE THE VALVE IS UNDER PRESSURE.**

6. DETAILED DISASSEMBLY AND ASSEMBLY

6.1 DISASSEMBLY PROCEDURE

6.1.1 Gate and Globe valves can be inspected by removing the bonnet assembly. However, the valves shall be kept in fully open or partially open position to relieve body cavity pressure before removing the bonnet assembly.

6.1.2 Check valves can be inspected by removing the cover assembly.



6.1.3 In case of Check valve, there is no stem and hence only the cover is to be removed. The disc is inside the body. For ease of illustration only the word bonnet is used below in the dismantling and reassembly procedure. This may be changed to read as cover with respect to Check valves.

6.1.4 Keep the valve in mid position and remove the hand wheel / actuator from the top of the valve

6.1.5 Loosen the body-bonnet bolting and remove the cap screw.

6.1.6 Lift the bonnet assembly including stem and disc out of the body. Care shall be taken not to drop the gate/disc while lifting out.

6.1.7 Mark the matching surfaces of the gate and body seat rings of Gate valves so that they are not interchanged during assembly.

6.1.8 Remove the bonnet gasket.

6.1.9 Carry out the required replacement of the parts and reassemble the valve with new parts

6.2 ASSEMBLY PROCEDURE

6.2.1 Place the gasket on body correctly. It is recommended to use fresh gasket.

6.2.2 Lower the bonnet assembly including the disc smoothly into the body, keeping the disc in open position. Remember to match the marking done earlier on disc and body seat rings.

6.2.3 A blue bearing test will confirm if there is a uniform contact between disc and body seat rings.

6.2.4 If required replace the gland packing, refer to 6.3.

6.2.5 Fit the bonnet studs and tighten the nuts as per torque figures shown in Table 1, evenly working at diagonally opposite pairs. Do not over tighten as the gasket may get damaged. Assemble the Hand wheel.

6.2.6 Operate the valve from fully closed to fully open position manually and ensure smooth operation.

6.3. PACKING INSTALLATION SEQUENCE

 **WARNING: NEVER REPLACE PACKING WHILE THE VALVE IS UNDER PRESSURE**

When replacing the stem packing, please follow the sequences below:

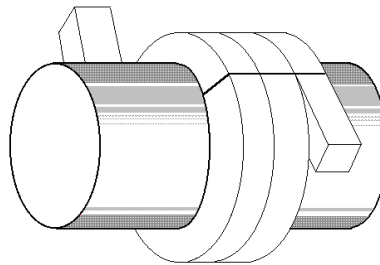
6.3.1 Relieve valve body internal pressure, loosen the eye bolts, and remove the gland flange and packing gland (see Figure 4). Lift the flange and gland as high as possible and secure for easy access to the valve packing.

6.3.2 Remove all old packing using a packing hook or other proper tooling; ensure that you do not damage the stem or the packing chamber. Scratches to the stem and the packing chamber no

deeper than 0.010" (0.25 mm) can be removed by polishing the surface with a buffing wheel. The surface finish of the packing chamber and the stem should be 16 RMS or better. Clean the packing chamber area thoroughly of all old packing and debris.

Measure the stem diameter, packing chamber bore and the packing chamber depth. To assure the correct packing size is installed, measure the diameter of the stem, if possible inside the packing chamber bore area, and then measure the diameter of the packing chamber bore. Subtract the ID measurement from the OD measurement, and divide the difference by two. This is the required cross-sectional size of the packing.

6.3.3 When using spool packing, always cut the packing into individual rings. Never wrap the packing into a coil and insert into the packing chamber. Always cut the packing into individual rings. Using a round bar or wooden dowel that is the same diameter as the valve stem, hold the packing tightly on the bar or dowel, avoid stretching the packing. Using a sharp knife, cut the ring and insert it into the packing chamber, assure that it fits the packing space properly. Cut each additional ring in the same manner.



BUTT CUT

6.3.4 IMPORTANT: Install one ring of packing at a time. Insert the packing ring into the packing chamber following the below requirements:

1. Install the first packing ring into the packing chamber, use the packing gland to push down the packing firmly.
2. Apply the same above method to the installing the second graphite ring, however when installing rotate the graphite ring 120° from the first ring. Each additional packing ring should be staggered in the same method of 120°, which will result in the fourth ring installed having its lap back at the starting point. Additional rings should be installed in the same manner. When starting the 3rd graphite ring, it will require compression on the packing gland to the graphite packing to achieve a 20% ~ 25% packing compression.
3. Packing cut position should follow Figure 6. Use the same above method to install rest of the packing, one ring at a time, make sure the packing ring is totally in place before starting next one. During the installation process, keep all packing rings clean without touching any foreign material.

4. After installation of the 5th ring (4th ring for 150LB and 300LB), you must use the packing gland to compress the packing to allow more room to install the 6th ring (5th ring for 150LB and 300LB).
5. After installing the 6th ring (5th ring for 150LB and 300LB), install the packing gland to the packing bore, then install the gland flange, eye bolt and eye bolt nut. Apply the recommended torque to the eye bolt nut per Table 3. Note: as a general rule, ¼” (6 MM) minimum engagement of the gland bushing inside of the packing chamber is required.
6. To assure the valve is functioning properly and the packing is firmly seated after following the required torque of the packing bolt/nut, cycle the valve once, for the approximate length of the packing chamber. Cycle the valve fully open and closed, retightening the packing bolt/nut to the required torque, if necessary.

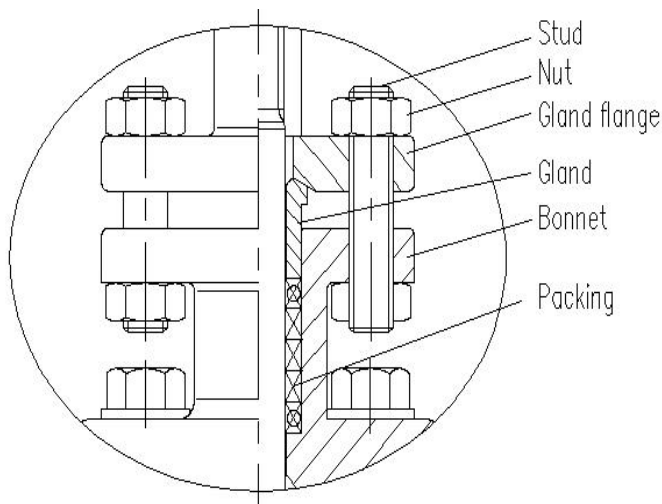


Figure 4 Valve Packing Bore Details

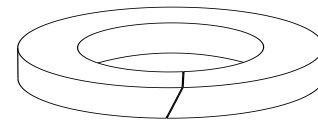


Figure 5 Packing cut (45° cut)

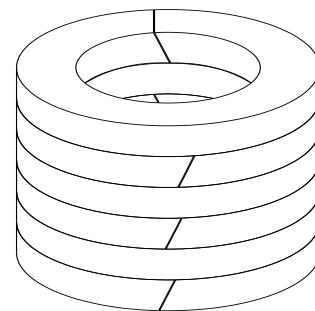


Figure 6 Packing cut position

Table 2 Eye Bolt Tightening Torque Chart

Stud Size	Measurement: Newton-meters N·m Tolerance: +/- 10%	
	(Conversion: 1 ft·lb= 1.36 N·m 1 N·m = .74 ft·lb)	
M8	7	
M10	11	
M12	20	

7. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Packing Chamber Leakage	Eye bolts are loose	Evenly tighten the eyebolts
	Not enough packing / Gland bushing binding	Increase packing ring quantity
	Packing worn / Packing chamber damaged	Replace with new packing
	Stem sealing surface damaged	Replace or repair the stem
Leakage at sealing surface	Dirt on the sealing surface	Clean the sealing surface
	Sealing surface damaged	Repair the sealing surface
Cannot operate normally	Packing compressed too tight	Adjust eye bolt torque
	Stem threads and stem nut threads worn out	Replace stem nut
	Dirt may be trapped between stem/stem nut, or gland flange/gland	Remove dirt
Bonnet gasket leakage	Loosen flange bolt/nut	Re-torque the flange bolt/nut
	Bonnet gasket failed	Replace new gasket



8. WARRANTY AND SERVICE

8.1 VALVE WARRANTY PERIOD

8.1.1 Valve warranty period is 12 months from the date shipped from the factory.

8.1.2 In the event the end user encounters an issue of quality, please notify DHV immediately. DHV reserve the right to investigate and settle all issues of quality concerns directly with the end user. Refer to DHV's standard warranty policies for questions or concerns regarding warranty concerns.

8.1.3 Addressing a valve quality issue within the warranty period:

DHV reserves the right to review and respond to all requests for warranty repair or replacement, prior to making any replacement or repairs by the end user.

8.1.4 DHV will not be held responsible for any damage due to natural disaster, such as earthquake, hurricane etc. during valve shipment.

8.1.5 DHV must to be consulted for any warranty issue before being held responsible for any repairs or valve replacement.

8.2 SERVICE

8.2.1 If required by the contract, DHV may provide and perform field installation and start up testing.

8.2.2 Upon end user request, DHV can provide services in monitoring the valve quality and history for Long Term Ownership. Additionally, DHV can provide all the necessary training of repair services to the valve, as well as training on safe valve operations.



APPENDIX I – INSTALLATION REQUIREMENTS

Installation Requirements for DHV brand API 602 Forged Steel Gate, Globe & Check Valves

Vertical orientation requirement of valves during operation, testing, and installation is prescribed to all API 602 Forged Steel Gate, Globe & Check Valves.

Assembly

Includes all hand wheels, gearboxes, or actuators.

- All API 602 Forged Steel Gate, Globe & Check Valves operators must be assembled in the upright position vertically above the valve's centerline.
- Gearboxes, actuators and necessary adapters must conform to the valve's ISO pad top works design.
- Adapter plates and gears must be bolted to the valve top works plate using the correct bolt size, torque, and tightening pattern.
- The stem must be protected at all times from unnecessary movement, stress, force or other potential damage while insuring the stem remains centered in the yoke tube during installation

Operation

API 602 Forged Steel Gate, Globe & Check Valves must be oriented in the vertical position any time the valve is operated or cycled.

- Personnel installing the operator must ensure there is no abnormal stem movement or run out during operation.
- All "stops" and or "limits" must be correctly set to prevent damage or unnecessary wear to the valve.

Testing

Applies to all methods of hydro testing and pre-commissioning testing.

- API 602 Forged Steel Gate, Globe & Check Valves must be oriented in the vertical position during any operation and testing processes.
- Procedures must be compliant to API specifications.

Installation

- API 602 Forged Steel Gate, Globe & Check Valves must be installed and operated in the vertical position only.
- API 602 Forged Steel Gate, Globe & Check Valves must always be either fully open, or fully closed once installed and are not designed or intended for throttling applications.

Shipping

Valves need to be fully closed during shipment and actuators need to be braced to support the extra weight at the top end of the valve.

Failure to follow these manufacturer prescribed requirements will void any warranties



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