Globe Valve Manual

1. Usage, Performance and Characteristic

Driven by the stem, the piston is along the shaft of the seat sealing face for lifting motion to achieve the purpose of the open and close valve.

Globe valves are mainly used for occasions of high pressure and small size. The function is to connect or truncation piping medium. The advantages are simple structure and easy manufacturing and maintenance. When opening and closing, the stem is twisted around the shaft for linear motion, there is nearly none friction between sealing faces, and the open height is small (Theoretically the opening height is 1/4 of the valve seat diameter), therefore, the total height of the valve is relatively small. The disadvantage is that due to the structural reasons for the valve, the flow resistance and torque of opening and closing is a little big, and the medium flow direction is required (usually low into the higher). The application of pressure and temperature range is large of globe valve, but it is generally used for medium and small size pipe.

According to the location of the stem thread, it can be divided into two types: up thread stem and down thread stem.

Up thread stem: The stem thread is outside of the medium. The stem is not eroded by the medium, and is easy to lubricate.

Down thread stem: The stem thread is in the valve body and in direct contact with the medium. The stem is easy eroded by the medium and does not need lubrication.

2. Working Principle and Main Structure

2.1. The Movement and Working Principle

This valve uses through way type structure.

The stem and wheel-nut make relative rotation through the drive mechanism. The stem drives

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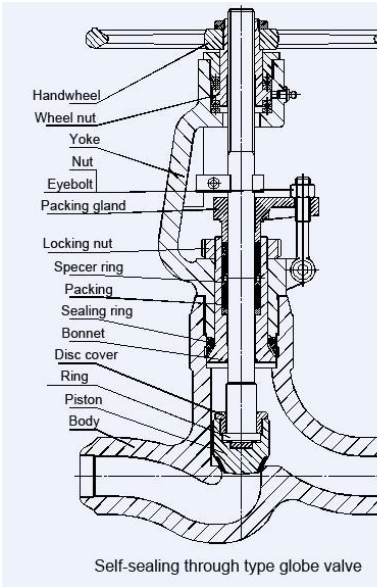
piston to make up and down movement along the axis, playing a role in switching. The seal is achieved by the mutual pre-tightening force between the valve stem and the nut, acting on the overlapping piston and valve seat sealing surface.

In order to ensure the sealing at the stem packing, flexible graphite packing is used. At the same time, it should consider the cavity fluid erosion and replace packing convenience under the working conditions. There is back seal structure in the bonnet, and the upper sealing surface contacts the valve stem sealing surface to ensure the sealing of the valve stem when the valve is opened.

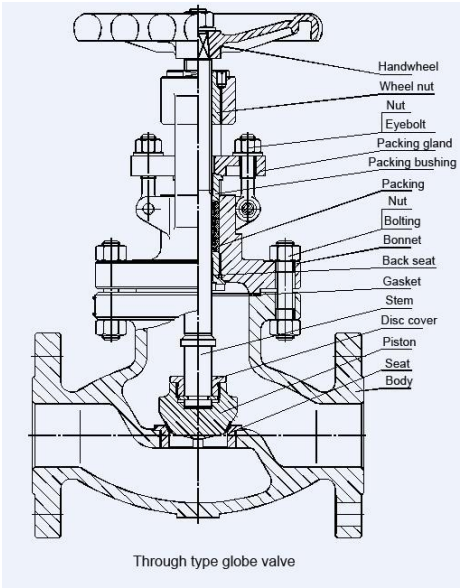
The valve stem and nut are rotated relative to each other through the transmission mechanism, and the valve stem drives the piston to move up and down along the axis to play a switch role. The seal is achieved by the mutual pre-tightening force between the valve stem and the nut, acting on the overlapping piston and valve seat sealing surface.

In order to ensure the seal of the valve stem packing, flexible graphite packing is used. At the same time, the erosion of the inner cavity fluid and the convenience of replacing the packing are taken into consideration under working conditions. A back seal structure is provided in the valve cover, and the upper sealing surface contacts the valve stem sealing surface to ensure the sealing of the valve stem when the valve is opened.

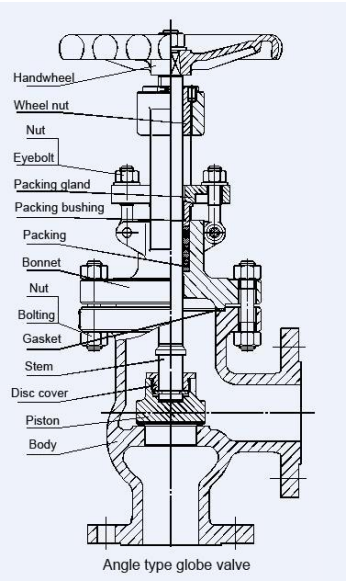
2.2.Main structure as follows:



Self-sealing through type globe valve



Through type globe valve



Angle type globe valve

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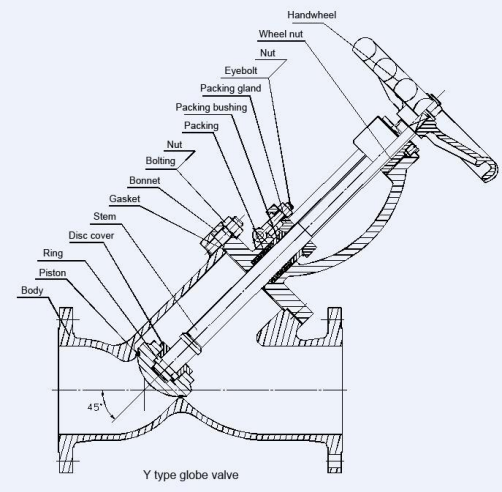
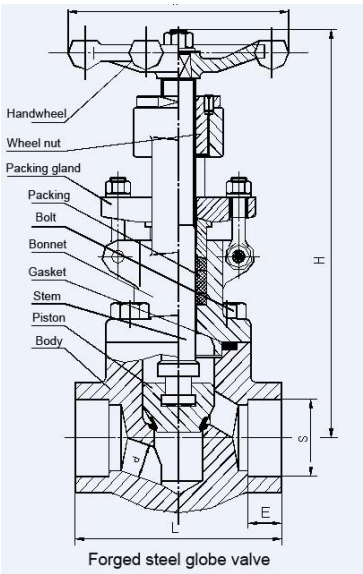


Y type globe valve



Forged steel globe valve

3. Globe Valve Classification (according to the location of the stem thread)

3.1.Up Thread Stem Globe Valve

The globe valve stem thread is outside of the body, the advantage is that the stem is eroded from the medium, which is easy to lubricate.

3.2. Down Thread Stem Globe Valve

The globe valve stem thread is in the body. This structure make the stem thread contact with the medium directly, which is easy to erode and does not need lubrication. It is generally used for small size and low temperature.

According to the direction of the globe valve access, it can be divided into: through way type globe valve, angle type globe valve and three way type globe valve.

4. The Characteristic of Globe Valve

4.1 Simple structure, easy manufacturing and maintenance.

4.2 The sealing face is hard to wear and abrasion. and the sealing performance is good. There is no relative sliding between the piston and the valve seat sealing surface when opening and closing, so the wear is not serious, the sealing performance is good, and the service life is long.

4.3 When opening and closing, the piston trip is small, so the height of the globe valve is smaller than that of the gate valve, but the structural length is longer than that of the gate valve.

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4.4 The torque of opening and closing is bigger, more labor-saving, longer time.

4.5 The resistance of fluid flowing is large.

4.6 The medium direction. The globe valve medium can only flow in one direction and cannot change the flow direction.

When the nominal pressure PN≤16Mpa, and the nominal dimension DN≤150mm, it generally uses downstream, that is, the medium from down to up form the piston. When the nominal pressure PN ＞ 16Mpa, and the nominal dimension DN ＞ 150mm, it generally uses countercurrent, that is, medium from up to down ,to add the sealing performance.

4.7 When fully open, the piston often subject to erosion.

5. Main Dimensions and Connecting Dimensions (See the sample picture)

6 Shipment and Storage

6.1 Prepare before transfer

The valve end channel and the exposed surface of the valve stem are key, and the following measures should be taken:

(a) The scale inside the valve should be removed to keep the valve cavity clean and dry.

(b) The exposed surface of the valve should be coated with anti-rust oil.

(c) Measures should be taken to prevent damage to the valve end thread, flange surface, welding groove and other parts.

(d) The valve piston should be closed.

6.2 Carrying

When carrying valves, it should be careful that the valve must not be thrown or falling behind. In particular, the hand wheel and stem should not be used for large-scale lifting or hoisting points.

6.3 Storage

Pay attention that the problem of storage and transport preparation are usually the same.

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Time is very important, Generally the storage period of check valve is according to the shelf-life of seal ring material. If want to extend the storage of the valve for a few weeks or months, it needs to improve the conditions of the original storage. Generally, the actual temperature of valves stored indoors is always higher than the dew point temperature. If the valve must be stored outdoors, it should be supported, not allowed to touch the ground, and protected with a waterproof cover.

7. Installation

7.1 Installation is the key to determining the service life. Improper installation is likely to cause performance degradation. Therefore, the following items should be confirmed before installing the valve:

(a) Carefully unpack the cases. Read the material, specification, tags and so on to make sure the valve is qualified to install.

(b) Do pay attention to the warnings on a valve tag, and following instructions.

(c) Check the flow direction mark. If the valve is marked with flow direction, valve must be installed as per this direction.

(d) Check and find if the valve tunnel is clean, safe and without any corrosive substances. Get rid of packing and stuffings which blocks movement of a valve.

(e) Check if pipes to connect valve are clean. If not, clean before installation.

(f) Wash and clean the pipes to avoid the residual impurity particles to damage the sealing face.

(g) Spread lubricating oil on the trapezoidal thread parts of stem.

7.2 Flanged end valve and pipe installation

The sealing performance of the pipe valve connection depends on the compressive deformation of gasket material between pairing flanges. The mechanical force generated by the bolt connection must not only resist the normal pressure that loosens the joint, but also maintain the necessary compressive stress on the gasket. It should be recognized that "strong force" does not allow the flange to have sufficient bolt connection force and may not be able to withstand

Add: No.28, Yongxing Road, Jianshan New District, Haining city, Zhejiang, China

the load and pressure load maintained by the gasket, resulting in possible leakage at the connection. To ensure a good flange connection, the following points should be noted:

a) Check the flange fitting surface. If there are defects that may cause leakage (if lay off deep trench when retract or has surface dent when operate), should install after repair.

b) Check the bolt size, length and material to determine whether they are suitable. Using carbon steel bolts on the ends of high-temperature flanges may cause premature failure of the connection.

ASME 400 pound or higher pressure stage flange connect bolts are usually be required to make of high-strength materials. This kind of bolts are usually signed “B-7”on the ends, but can use other levels of material on some occasions. The reasonable matching of flange, bolts and gasket is very important and should meet the special requirement of ASME B16.5.

When using the permissible gasket material, low strength bolting can be used to operate low pressure flange that operation temperature ≤ 204°, 150 lb and 300lb. Gasket regulation see ASME B16.5.

c)The demand for installation of cast iron is higher than the installation of ductile cast iron flange. It is suggested use low strength iron bolt to decrease the possibility that the flange bolt precompact force is too big that make the flange stress higher than regulation.

The most important thing in cast iron flange connection is the top installation. Ensure that the gasket has proper compression force without excessive bolt load in this case.

d) Check the gasket material. For the use of low strength bolted flange connection, iron flange (See the above-mentioned C) or 150 lb lever steel flange, should not use metal gasket (flat gasket、trench gasket、coating gasket、wave form gasket or twist gasket) . Attached request see ASME B 16.5.

e) Check the gasket to see if it has anti-harmful defects or damage ability.

f) Carefully to ensure good neutrality when assembling the flange. Spread appropriate lubricant on bolt thread. Tighten the bolts in order during assembly so that the flange and gasket are flat and parallel when they first come into contact. Bolts should be tightened gradually and evenly to avoid twisting of the two flanges. Using torque wrench will help ensure the correctness of flange bolted connection and the last uniform tightened.

When installing the valve onto the original pipe, the parallelism of the flanges is very

Add: No.28, Yongxing Road, Jianshan New District, Haining city, Zhejiang, China

important. It should be realized that if the flanges are not parallel, some parts must be bent to make the flange connection seal. The forces on the flanges and bolts may bend the pipe, or the valve. Especially on large diameter pipes, this situation usually attracts the attention of the personnel who evaluate the bending strength conditions and take measures if necessary.

When installing certain "wafer-type" or "short-type" valves, check whether the valve moving parts and the adjoin pipe, pipe or valve interfere with each other.

Attention: As mentioned above, the flange bolts are tightened with a torque wrench. When tightening the bolts, if the torque gradually increases, sometimes remains unchanged or increases slightly, it indicates that the bolts are bent and should be refuted and rejected.

7.3 The Installation Welding Valve

The welding gap between the pipe and the valve body is structurally continuous. When the pipe and the valve are assembled, there should be no "gap" or weak link in the joint, which is very important. Therefore, the socket welding connection generally requires the cross-sectional area of the gap to be larger than the cross-sectional area of the pipe.

The demand of butt weld gap is fully weld penetration, and the thickness is at least equivalent to the pipe wall thickness. If high strength alloy pipe welded with lower mechanical strength of the valve body material, the welding groove must be processed into tapered, in order to make up for the bigger wall thickness of valve end, or valve must be equipped with high-strength materials to make additional parts or "rebar".

When valves and pipe weld together, it must ensure the following:

a) Check the welding end faces, dimensions and cleanliness to eliminate factors that may hinder assembly and welding performance.

b) Check the welding end face, size and cleanliness, removal the factors that may hinder the performance of assembly and welding.

c) If a sealing ring is installed, check whether the sealing ring material is consistent with the pipe and valve material, and the matching and cleanliness of each sealing ring.

d) Determine the welding parameters according to the approved welding process, including preheating and post-weld heat treatment (when required).

e) Check whether the valve and pipe end faces are centered. If not, adjust them.

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f) Spot welding on hard place.

g) Use approved welding processes to complete the welding process.

h) Clean and check the welding gap.

i) If necessary, repair according to the welding process.

7.4 Thread Connect Valve and Pipe Installation

The sealing performance of thread pipe joint depends on good cooperation between female thread and male thread. It usually adds especially soft or sticky materials between assembled thread. To gain the most reliable leak-free system, the following points should be taken care of:

a) Check the form and cleanliness of valve and pipe thread. Pay attention that if the easily deformed cylindrical thread is collided or zigzag into local whether has debris or sand.

b) Pay attention to the length of valve end female thread and the distance near the internal seat or wall, it must be carefully considered the length of pipe thread which screw into the valve.

c) Use the matching part of thread when assembling. It is movable fit when the taper pipe thread screw into it, until the thread meshed good, wrench can imposed by force.

d) Wrapped around the outer pipe thread by sealing tape or spread thread adhesive (except thread sealing which is regulated). Avoid the tape or adhesive flowing into the runner.

e) Wrench assemble gap. Wrench on valve should be located in the body end. Pipes are screwed in to the end by thread. Pay attention: because there was no clear boundaries on the torque which formed by conical threaded connections, it may damage valves or pipe for the reason that the torque is too large on the body.

f) Repeat these steps on the other end of valve, make the wrench of the end screwed into the assembled pipe.

8. Operation and Maintenance

Pipeline valve is a kind of special product which has both moving parts and wear parts. In order to acquire satisfy valve performance, it shall take long-term protection to protect the finish machining surface of some parts.

Under the normal operation of state and accord with pressure, medium and temperature, for life of valve is not less than three years.

Add: No.28, Yongxing Road, Jianshan New District, Haining city, Zhejiang, China

8.1 Operation of Manual Valves

Like the majority of valves, manual operation through some kind of rotary motion like linear motion, hand-wheel, wrench and handle must be careful, it should not be too fast or too slow, and the effort should be on the appropriate distance. The position of the end is very important to performance. Before opening and closing, it should be opened or closed gradually to a tight seal.

When opening and closing the valve manually, the hand wheel should be opened and closed according to the direction arrow. Generally, clockwise is closed and counterclockwise is open.

In the closed position, the inside of the piston should be in the correct position with the valve seat.

(a) The piston in the valve makes the valve move towards and away from the valve seat, such as globe valves, angle valves, diaphragm valves and wedge gate valves. The sealing of these valves is maintained by the mechanical force generated by the valve stem driving the piston to move relative to the valve seat. If the closing pressure acts in one direction of the piston and pushes the piston away from the valve seat, the sealing of the valve seat cannot be achieved, so this force is very important.

(b) When the pressure direction is consistent with the direction of the valve stem force, that is, when the pressure on the piston is large (high-inlet and low-out stop valve), the pressure on the stop valve increases the sealing force of the valve seat, and the load applied by the valve stem is not large; but when the pressure direction is opposite to the direction of the valve stem force, that is, when the pressure on the piston is small (low-inlet and high-out stop valve), the pressure on the stop valve reduces the sealing force of the valve seat, which requires that the load applied by the valve stem matches the pressure. The higher the pressure, the greater the load applied by the valve stem and the greater the valve stem force.

Some valves have an upper seal structure, which is formed by the protrusion of the valve stem and the rest of the valve stem piston assembly, which cooperates with the valve seat flange inside the valve bonnet.

It had better not to use upper sealing on normal operated stem. Opening the upper seal can

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be used as a way to ensure that the valve reaches the fully open position, at which time the valve stem should return to the upper seal point. In fact, providing an upper seal can achieve pressure-free replacement of the valve stem packing. If there is leakage to the outside, it poses a potential danger to personnel. In actual operation, the operation must be stopped and the valve stem packing must be replaced.

8.2 The operation of the driving valve

8.2.1 Functional

Closing conditions and upper sealing performance are mainly related to the valve type itself, not to the operation. To achieve satisfactory results in the operation of the driven valve, it is necessary to store a variety of reasonable programs in the drive controller. The driver should be adjusted to be able to adapt to the predetermined working conditions and valve types through appropriate opening, opening and closing. For valves with strict closing conditions, position control should be used for closing, such as using external limit switches. If the valve has an upper seal, the upper seal should be adjusted to be lower than the position of the upper seal seat.

8.2.2 Maintenance

The valve is a mixed structure of pressure vessel and operate machine. Its maintenance requirements must take into account both the opportunities for the valve to open and close and the fact that the valve is in a fixed pressure state most of the time.

Kept at a fixed location of the valve may be operable to decline the operate performance to some extent due to loss of effective lubrication of the joint threads, aging of the packing, corrosion on the surfaces of moving parts or accumulation of harmful substances. In some cases, a periodic and final recycling program for part or all of such valves is developed.

The leakage of stem sealing is usually caused by packing abrasion, which can make up for tightening the packing gland. Too large packing force may increase the stem friction, and make stem to be hard operated and accelerate the abrasion of packing. Good sealing inside valve will be affected the sealing performance because of the damage or normal abrasion. The estimation and repair of severe working conditions are beyond the scope of this manual. Due to

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the different structural forms, if prior knowledge is required, you should cooperate with the manufacturer to find a suitable method.

The external structure of the valve is easy to inspect and maintain. Therefore, reasonable measures should be taken to prevent mechanical damage to the valve and to prevent the valve from being corroded by atmospheric sediment, chemicals or moisture, which may lead to its quality degradation. Working interfaces such as threads, bearings or gears should be lubricated regularly.

9. Contingent failure, Reason and Elimination Method

Contingent failure	Reasons	Elimination method
1.Leakage between piston and seat sealing face	1. There is dirt in sealing face 2. Abrasion on sealing face, damaged by erosion 3. The closing torque is too large to make the piston deformation	1. Clean dirt 2. Overlay after re-grinding sealing face and process until sealing surface to meet the requirement 3. Change the piston
2.Leakage between bolted bonnet body	1. Uneven on connecting with stud fastening 2. Damage on flange connect sealing face 3. Gasket damaged or failure	1. Fastening uniform 2. Re-repair 3. Change the gasket
3.Leakage on stem packing	1. Not pressed on packing gland 2. Packing cycles are not enough 3. Damage on the stem and packing contacting surface	1. Can screw nut to be pressed evenly on the packing gland 2. Increase packing appropriately 3. Polish stem surface or change stem

Add: No.28, Yongxing Road, Jianshan New District, Haining city, Zhejiang, China

4.Stem fluctuation is not flexible	1. Packing gland is too tight 2. Skew gland packing 3. There are junk folder on rotating parts 4. Damages on stem and wheel-nut thread 5. Bent stem	1. Relax gland packing appropriately 2. Correction packing gland 3. Removal of debris, spread lubricants 4. Repair thread or change stem and wheel-nut 5. Correct or change stem