

## Ball Valve Manual

### 1. Characteristics and Purpose

Ball valve is the same as the ordinary one that trim spring with the stem to reach the purpose of open/ close, which is mainly adopted to cut off the medium on pipe. It features for simple structure, good sealing capacity, flexibility, small blockage coefficient, and easy operation etc.

### 2. Structure Brief

#### 2.1 Structure of Trunnion Mounted Ball Valve

##### (a) Front Seal Structure

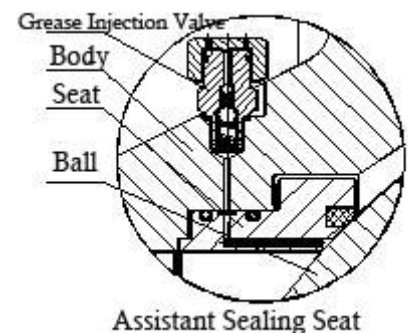
Valve seat is adopted with a front design structure, which has both-side sealing capacity and self-relieving function. The composite material seat is floating loaded with springs. When it is at a Close position, the sealing face keeps close contact with ball to make sure there is no leakage between high pressure and low pressure.

##### (b) Self-Relieving Structure

When abnormal high pressure appears at cavity, single sealing structure ball valve has the function of self pressure-relieving.

##### (c) Sealing Emergency Repair

The valve design is with emergent sealing system-assistant seat. Once sealing is damaged or sealing face capacity is damaged injection of sealant into the assistant system will be able to seal it emergently. An emergent sealing device will also be able to be used to clean or lubricate. Stem is also designed with an emergent sealing system.



##### (d) Fire-Proof Structure

According to the working conditions, ball valve has been designed to be a fire-proof structure. This design is as per API 607, once a fire occurs, the fire-proof structure will be able to prevent mass leakage.

**(e) Anti-Static Structure**

When operating a valve, the friction between ball and sealing face will generate the static charge and accumulate on the ball. In order to avoid static sparks, an anti-static device is designed on valve to lead out static charges.

**(f) Blockade and Relief**

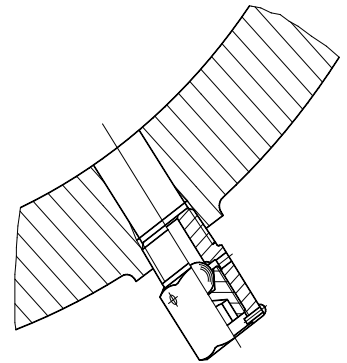
When the valve is under close status, seat blockades fluid, and dregs accumulated on body cavity will be able to relieved by the relieving device.

**(g) Lock Device of The Valve**

Manual operation for full open/close position designed with a locking device, thus, mal-operation and unpredicted line vibration to open/close the valve is avoided.

**(h) Body Relieving Device**

According to the customer's requirements or working system requirements, body is equipped with a relieving valve. Once two sides of valve are blocked and pressure added, dregs inside the cavity will be relieved.

**(i) Anti-Corrosive**

The wall thickness of a valve is designed to be thicker for corrosive purposes. Stem, trunnion, body seat and lower cover are plated as per ASTM B733 and ASTM B656.

**2.2 Characteristic of Floating Ball Valve**

Floating ball valve absorbs international techniques which have the newest design and will able to satisfy the needs of regular industrial standards, safety, and convenience.

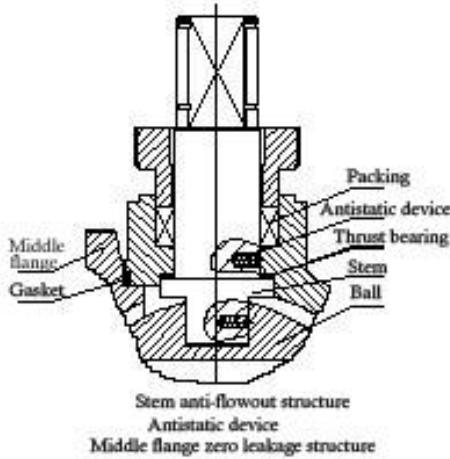
**(a) Switch Indication of Hand Operated Float Ball Valve**

As the moving parts of valve, the ball, valve stem and handle are an assembly unit. The head of valve stem is shaped as a diploid, thus to easily distinguish whether valve is in the "ON" position from the handle position. When the handle or stem diploid is in parallel with the pipe axis, the valve is in "ON" position, when the handle or stem diploid is vertical to the pipe axis, the valve is in "OFF" position.

**(b) Valves Locking Device**

In order to prevent the mal-operation of the valve, the open/close position can be equipped with a lock device, especially when they are used outdoors or process forbidden the malfunction.

**(c) Anti Blow-Out Structure**

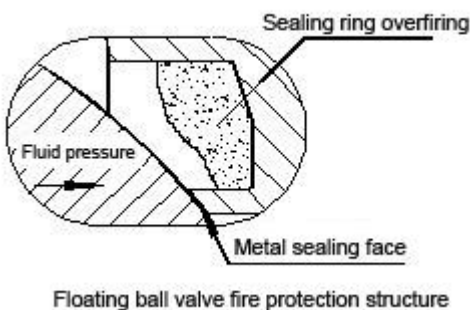


When the medium goes through the valve, the pressure in middle cavity would pull out the stem. In order to prevent the occasion from happening, a convexity is designed. At the same time, a lubricator device has been added, so even if the fire damage would happen to damage the o-ring, the lubricator device would inject sealing oil to prevent medium from leaking.

**(d) Anti-Static Device**

When operating the valve, the friction between the ball and the nonmetal seat, like PITE or etc. will produces electrostatic charge that can be accumulated on the ball, To prevent static sparks, an anti-static device is placed on the valves to derive the electric charge accumulated in the ball from the static channel between the ball and the stem, or between the stem and valve body.

**(e) Fire Protection Structure**



In case of fire, the nonmetal packing or seat (non-proof material) will be burnt. The considerable medium leakage may cause the fire to spread. At this time, the fire protection structure plays a role in preventing a large amount of medium leakage. As shown in the figure, once the seat is burnt, the ball will directly contact the metal face on valve body, thus preventing medium from leaking out from the burnt seat. The design of fire protection and anti-static structure shall conform to the requirements of API607, and the second part of BS6755.

**(f) Non-Leakage Structure of Middle Flange**

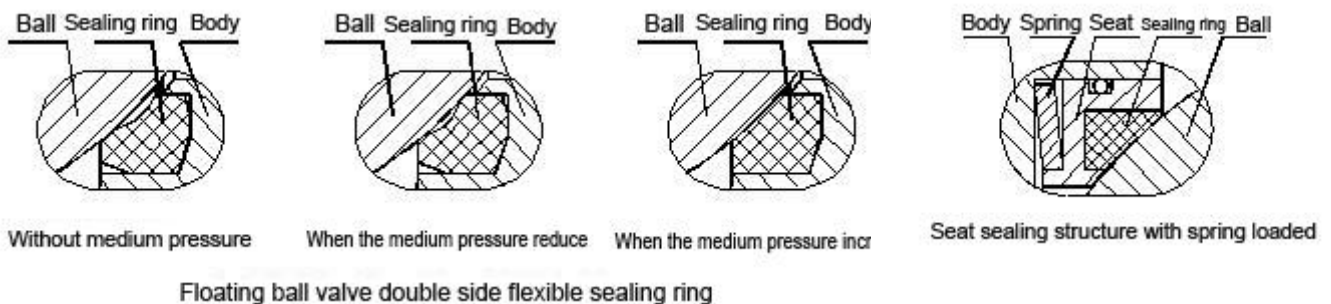
The connection between body and bonnet is sealed by O-ring, in order to prevent leakage by flam or high-temperature vibration, special steel-to-steel connection is designed to prove no leakage.

**(g) Reliable Seat Structure**

The newly designed seat combines advanced fabrication experience enables reliable sealing.

For low pressured ball valve, concerning that the low pressure will not guarantee reliable sealing, the spring loaded design is added to low pressure, extra low pressure or vacuum ball valve.

Middle pressure and high pressure valve seat structure are assembled with PPL which is able to bear pressure to 300°C. While metal to metal seat enables higher temperature. Such structure owns single direction sealing capacity.



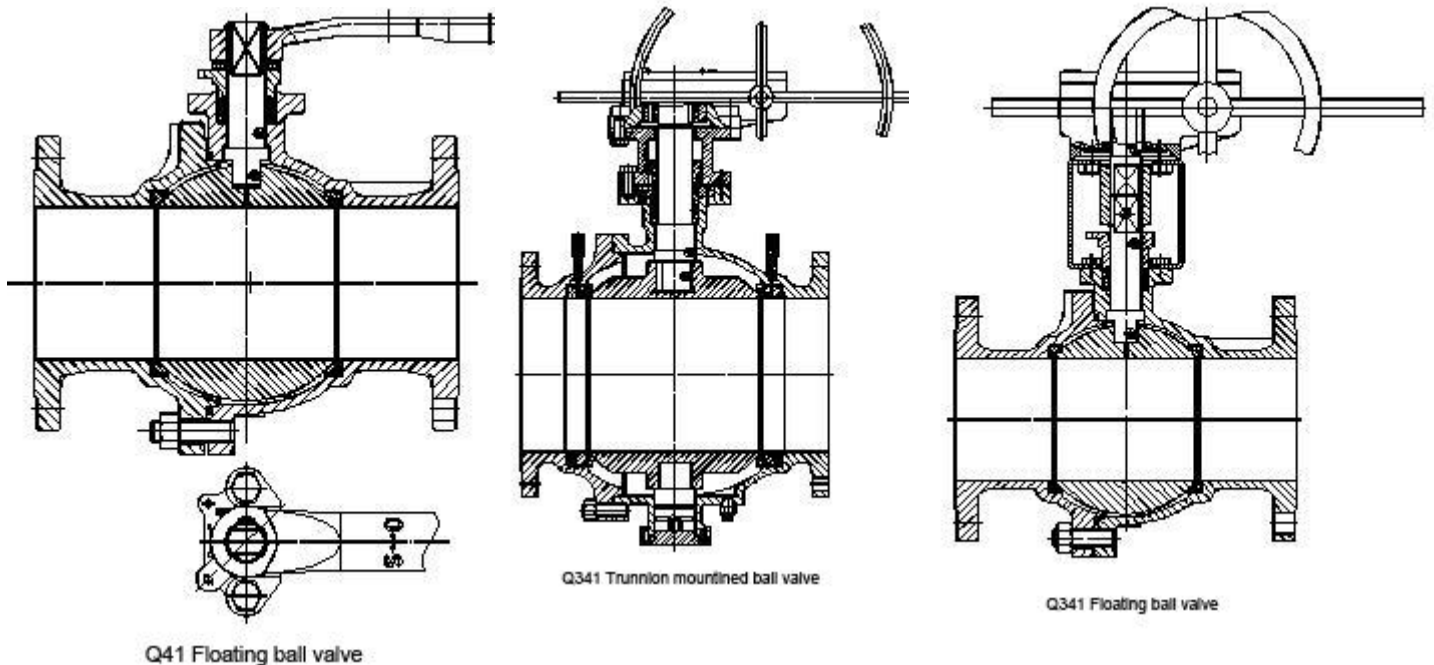
**3. Standard and Performance Test Specification**

**3.1 Standard Specification**

Design and Fabrication	API 6D
Face-to-face Dimension	API 6D
Flanges	ASME B16.5 (B16.47 A)
Inspection and Test	API 6D

### 3.2 Performance Test Specification

## 4. Structure Drawing and Main Part Material



## 5. Main Outside Dimension are Specified in Catalog

## 6. Shipping and Storage

### 6.1 Preparation before Shipping

Valve piping and valve surface are the key parts, so the following measures are adopted.

- (a) Water dregs inside the valve shall be cleaned to guarantee it is clean and dry.
- (b) Out surface of the valve shall be lubricated with anti-rust oil.
- (c) Trim of the valve shall be in the state of opening.

### 6.2 Movement of the Valve

When the valve is moved, pay attention that valve shall not be dropped, especially not to use the valve handle as a hanging point.

### 6.3 Storage

Questions raised by storage are the same to those of the preparation. But the factor of time is of vital importance; usually valve storage period is in accordance with the guarantee period of seal material, if the storage will be prolonged for several weeks or months, the original condition shall be promoted. Valve is usually stored indoors to prove that factual temperature is above dew point. If the valve is required to be stored outdoors, a yoked stage is required to guarantee no connection with ground and a water-proof cover is needed to protect them.

## **7. Installation**

Valve installation is a key factor in deciding the life extension of the valve. Improper installation will greatly damage the performance of the valve, so the following points shall be confirmed before installation.

- (a) Check the packing of the valve, check the specification, tag and brand.
- (b) Special warning tag and brand is required with valve and proper measures shall be adopted.
- (c) Check the flow direction mark, if there is a mark, valve shall be installed according to it.
- (d) Check both sides of the valve to prove there is no dreg and other harmful substances inside the valve.
- (e) Check the piping to prove there is no dreg and other harmful substances before installation.

### **7.1 Flanged Valve Installation to Pipe**

The capacity of piping flanges and valve depend on the deformation of gaskets. Acting force of bolting not only resists force to loosen the connection but also to keep necessary compressing stress. Take note that the force does not exceed the gasket load and pressure load. In order to ensure a good connection, the following instructions shall be noted.

- (a) Check the flange fitting surface. If find that it is probable has a defect to arose leakage (if laid off deep trench when retracted or has surface dent when operating), should be installed after repair.
- (b) Check dimensions, length and material to make sure they are fit for installation.

Low-temperature valves must be installed with the bolting that is made of low-temperature material.

(c) Check gasket material. For low strength bolting connected flanges, iron flanges or low pressure steel flanges, metal gasket shall not be used.

(d) Gasket has the capacity to resist deformation and damage.

(e) Carefully operate in order to supply flange assembly good neutral. Spread appropriate lubricant on bolt thread. Tight bolts in sequence when assembling, to make it level off and parallel when flange and gasket have initial contact. Bolts should be tightened gradually uniformly, to avoid distortion of the two flanges. Using a torque wrench contributes to ensuring the correctness of the flange bolted connection and the last uniform tightened.

Installing the valve to the original pipe, and the flange parallel is very important. Should realize that, if the flanges are not parallel, some parts must be bent to make the flange connection sealing. The power on the flange and bolt may make the pipe bent, or bent the valve. Especially on the big diameter pipes, this occasion usually aroused the attention of staff who estimate the bent strength condition, Should take 1 measures if needed.

Additionally, as described above, bolting shall be fastened by a torque wrench. If the torques change when fastening, bolting must be deformed, it must be abandoned.

## **8. Operation and Maintenance**

Ball Valve is a kind of special product that has both moving parts and wear parts. In order to acquire satisfied valve performance, shall take long-term protection to protect the finished machining surface of some parts.

In the proper state of pressure, medium, and temperature, consecutive life-extension of a valve will be no less than 3 years.

### **8.1 Manual Valve Operation**

Most valves are operated by handwheel, wrench and handle. Pay attention to the operation speed, neither too fast nor too slow, and exert force at proper position. The end position is vitally important to valve performance. In a Close position, ball shall be at the right position to seat.

(a) Piston in valves make the valve do approach and leave seat movement, such as globe



valve, angle valve, diaphragm valve and wedge gate valve. The sealing performance on such kind of valves depends on the mechanical force made by the stem drive Piston which relative to seat and make it keep sealing. 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) Most trims slide on the seat and the seal is not dependent on the stem. For such kind of valve, the right position of the trim is very important. Under certain circumstances, as the trim approaches its final position, the force to drive increased to realize an assistant compression. If the trim does not reach its final position, leakage or seal damage may occur.

(c) Ball valve requires right position to guarantee sealing. When the indicator shows a Close position, movement shall be stopped.

(d) Ball valve with composite material seat and packing, the ball and stem are electrically insulated. So it is equipped with anti-static device, one is installed between ball and stem, and another is installed between stem and body.

(e) Flammable seat shall provide emergent sealing when it is damaged.

We advise better not use upper sealing on the normal operated stem. Open to upper sealing, may be used as a method of making sure that the valve achieves full position, and then the stem should back point on the up sealing. Actually, supply up sealing can realize change stem packing without pressure, if there is leakage outside, and constitutes a potential hazard to personnel, must stop and change stem packing in practice.

For the ball valve, the turn of the stem is a quarter, and flow pressure on ball shall generate great open torque or close torque, if not properly confined it, the valve shall open/close spontaneously, and following actions will consequently damage valve or hurt human.

## **8.2 Actuated Valve Operation**

From the function, sealing capacity is closely related to valve, but actuated mode does not. Programmes are concluded inside the monitor and controller. Actuator shall be adjusted to properly open, close or move the sealing parts to get the expected purpose. Strict position for certain valves, outer position limit device shall be installed.



### 8.3 Maintenance

Valve has the complex structure for a pressure vessel and operational machine, when maintaining the valve, occasional open/close shall be put into consideration. At the same time, static pressure state of valve shall also be considered.

When keeping the valve to a certain position, operational capacity of valve may be reduced. This is caused by accumulation of corrosive substances on moving parts. Under some circumstances, valve shall be circulated open/close periodically.

The intactness of pressure boundary requires the intactness of pressure-bearing parts, pressure-bearing shall be checked regularly.

The leakage of stem sealing 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. The good sealing performance of the valve can also be affected by damage or normal abrasion. For the harsh working conditions, the estimation and repairment are beyond the scope of this manual. Due to the different types of structures, if prior knowledge is required, work with the manufacturer to find a suitable method.

The external construction of valve is easy to check 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 cause its quality to deteriorate. Working interfaces such as threads, bearings or gears should be lubricated regularly.

### 9. Possible Failure, Reason and Maintenance

Possible Failures	Reasons	Methods to Repair
1. Packing leakage	1. Stem packing is not fastened 2. Packing Consumption 3. Packing failure because of overlong usage or bad stocking	1. Fasten the bolting evenly 2. Add more packing 3. Renew packing

2. Seal leakage	4. Dregs adhered on sealing face or sealing damaged	4. Clean dregs or renew sealing parts
3. Middle gasket leakage	5. Bolting is not pre-tightened	5. Fasten or pre-tightened bolting
4. Dumb movement or trim not moved	6. Packing over-tightened 7. Stuffing cover deflection 8. Actuator or connection parts damaged 9. Stem curved	6. Loosen bolting of stuffing box 7. Proofread Stuffing box cover 8. Repair actuator or connection parts 9. Proofread stem