

## Frequently Asked Questions

# What is Trunnion Mounted Ball Valves ?

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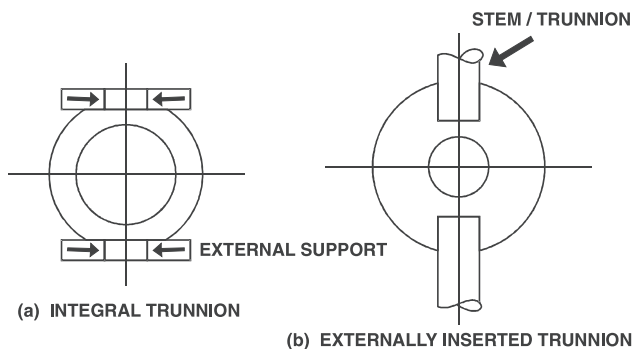


*This new column is being started from this issue. There are many queries related to valves- types, applications, construction & selection etc which comes across but are not easily answered, we will be covering such*

*queries answered by Mr S Ramachandran , a senior valve technocrat with more than 25 years of work experience in the valve industry in the field of design & development of various types of valves. Mr Ramachandran is B.Sc Engg (Mechanical) & M. Tech (Production Engineering) from IIT Madras. He worked with Audco India Limited from 1985 to 2010.*

*Valves India readers can send their queries to e-mail : [valveseditor@gmail.com](mailto:valveseditor@gmail.com) , it will be answered directly & will be published here also for the benefit of readers.*

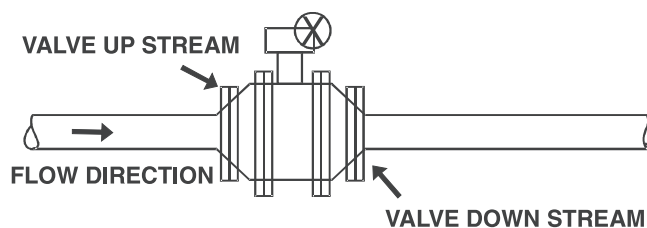
### Q. What is a Trunnion in a Trunnion Mounted Ball Valve?



A. Trunnion is a circular / cylindrical projection perpendicular to the flow bore axis of the ball, either integral with the ball OR externally inserted to ball centerline. The centerline of an integral trunnion is co-axial to the stem. Externally inserted trunnion is also the stem, which drives the ball, in such designs.

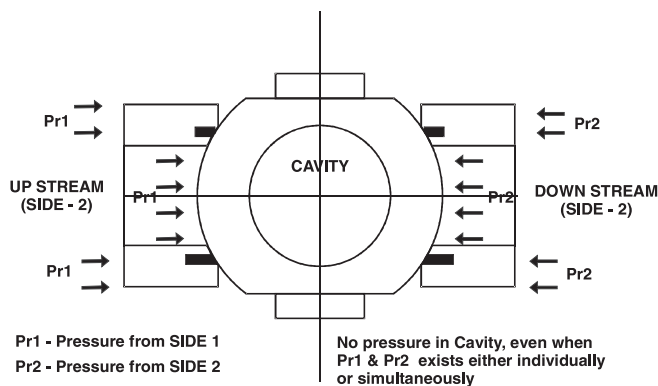
### Q. What is Upstream?

A. The direction from which the flow / pressure acts on the valve sealing member (Ball/ Plug / disc) is the upstream.



### Q. What is an upstream sealing valve?

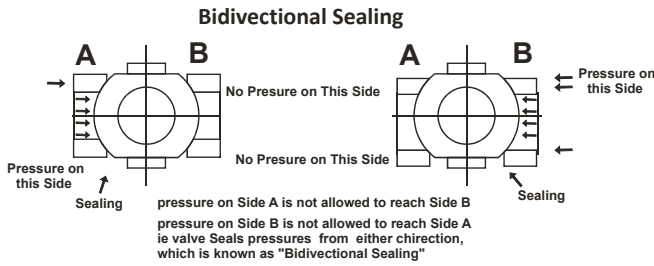
A. Upstream sealing valve is one in which the pressure



reaches only upto the upstream seat & sealing member and does not reach the valve cavity. TMBV is a typical upstream sealing valve. In a TMBV the seats are floating and they are pressed to ball by means of spring. Hence there is always pre-compression between the seats and the ball, so that the upstream seat itself blank off the pressure.

**Q. What is a bidirectional valve?**

A. A valve which is capable of sealing the flow from both upstream and downstream is called a bi-directional valve. Such valves can be installed with any of the end flanges /

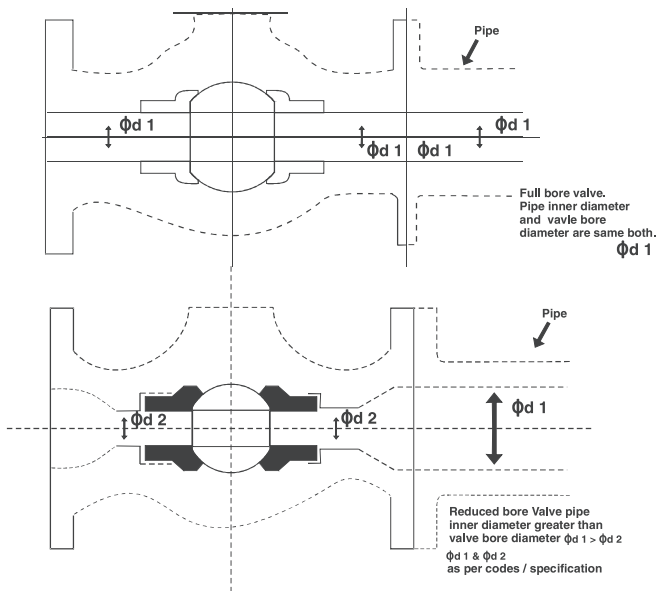


ends on the upstream OR downstream side.

**Q. What is full bore and reduced bore valve means**

A. A Full Bore Valve is one in which the flow bore, inside the valve, would be straight through, exactly like a pipeline. API 6D / ISO 14313 stipulates the minimum inside diameter of the valve. When a full bore ball valve is kept in open position, the flow path, through the valve, would be exactly like that inside the straight pipeline.

A Reduced Bore Valve is one in which the minimum bore



(Ball and Seat ring Inner Diameter) is lower than the end flange / pipeline bore.

The pressure drop across a full bore valve would be comparatively less as compared to a reduced bore valve of the same size.

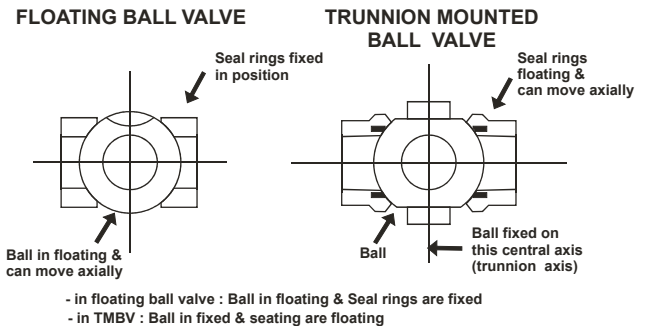
**Q. What is a floating ball valve and what is a trunnion mounted ball valve? What are the differences?**

A. Floating Ball Valves are the ones in which the Ball floats between two seat rings. Normally the Ball is kept jammed / pressed between upstream and downstream seats. This jamming action is responsible for sealing.

A floating ball valve seals by the jamming action of ball against the downstream seat. Hence, floating ball valves are also called 'downstream seated valves'. As the ball tends to move towards the downstream seat, a gap is likely to be generated between the upstream seat and the ball. Because of that the valve cavity is always pressurized and connected to the upstream.

These valves are most ideally suited for lower pressures (class 150 & class 300) and for smaller sizes (say, up to 8". some manufacturers extend the size up to 12"). The reasons for restricting the size and class ratings are due to higher operating torques. Temperatures are normally limited to 200 degree C, as generally, floating ball valves are Teflon seated.

Trunnion Mounted Ball Valves (TMBV) are the ones in which the ball is fixed in its trunnion axis (by external means) and the seat rings are the ones which are floating. Seat rings are always kept pressed to the ball by means of springs. The upstream sealing and down stream sealing are identical in a TMBV. Both of them are independent of each other and seal the fluid. Actually the line medium goes behind the seat rings and presses and pushes it forward and this jam with the ball surface. This



action happens simultaneously and independently on either side.

It is this feature which makes the valve an upstream sealing valve and also makes it an ideal Double Block and Bleed Valve.

**Q. What is double block and bleed & what is its significance to user**

A. Double Block and bleed literally means blocking the two sides (of the valve) and bleeding off the valve cavity. It means a medium on either side of a closed valve does not enter the cavity. The drain / vent ports can be opened and medium from either side will not reach the drain / vent opening.

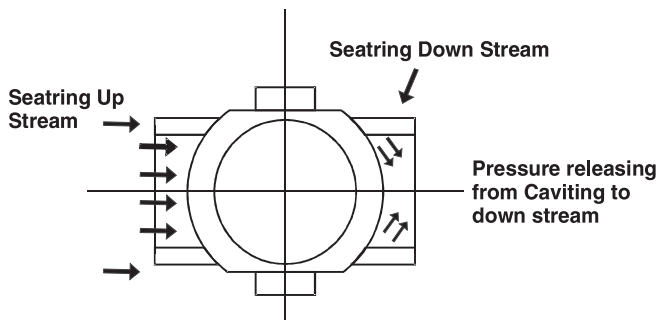
TMBV are double block and bleed valves, in open as well as in closed positions, as explained earlier.

**Q. What is 'Automatic cavity relief' and its significance?**

A. Cavity in a TMBV gets isolated from the bore & pipeline, when the valves are in fully closed OR open position. The entrapped volume of medium, in the cavity, would become a totally enclosed pressure chamber. Due to temperature rise, the medium pressure would increase, when they are incompressible (liquid). To avoid dangerous build up of pressure, the seats are designed as "Automatic Cavity Relieving Design". The cavity pressure, beyond a threshold value, would push the seats away from the ball, temporarily,

Enabling the medium to flow into the valve bore. The moment the cavity pressure reduces, the seats are pushed back, into its original position, by the over compressed springs.

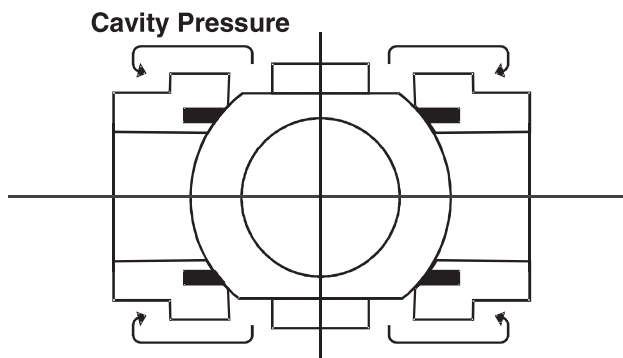
**AUTOMATIC CAVITY RELIEF**



**Cavity over pressure with push downstream seat away from ball. Momentarily a gap in created between ball & seatings. Once cavity pressure drops seatings are pushed back, by the springs to make contact with ball, once again**

This is a safety feature and is mandatory in all pipeline valves, especially when they carry liquid hydrocarbons. In case valve designs are not with Automatic Cavity relieving design, pressure relief valves are fitted to the cavity. Standards / customer specifications specify 33% overpressure than the rated pressure, as the maximum allowed cavity pressure, within which, they should relieve. In any case cavity should never get pressurized beyond 50% over the rated pressure, this being the shell test

**Double Piston Design**



- Pressure from the cavity goes behind the Seatings and push them towards the ball. Hence more cavity pressure gives more hightness between ball & seatings.
- The above concept can be applied only to downstream seat or can be applied to both seats.
- The concept applicable only to gaseous medium.
- When applied to liquid medium, external cavity relieving meehanisms do be employed.

pressure to which the valve body is tested.

**Q. What is a "Double piston design"?**

A. As against a normal cavity relief design of a TMBV, they can be designed to have the ball, causing tighter shut off. That means, more the pressure better would be the sealing.

Note that double piston designs are acceptable only for Gas application (compressible medium). When the medium is liquid, which are incompressible, only cavity relief designs should be used. However customized designs wherein the upstream seat can be designed for auto cavity relief and downstream can be designed for Piston effect, in the same valve. Such a valve would become unidirectional and flow directions shall be marked by an arrow on the valve body.