

## VALVE SEATING TYPES SELECTION GUIDE

### VALVE SEATING STYLES

Before specifying and selecting isolation valves, for the seating mechanism, the different seating styles must be evaluated. There are seven basic categories: -

#### Self Energised Seating

Typically bi-directional and usually double block & bleed capable self energised piston action seating systems are instantly live loaded with the aid of springs or other mechanical systems to the gate or disc. This style of valve will seal independent of line pressure at very low pressures, as no line pressure is required to energise the seat. This style of seating system can also often accommodate thermal expansion better without jamming. Examples include: -

- Trunnion mounted ball valves which employ springs behind the seat. This style of valve also utilises line pressures to improve sealing, as well as being able to relieve excess differential pressure in the body cavity, hence this 'floating seat' design of valve also incorporates 'pressure assigned sealing'.
- Other examples are API6D and API6A 'through conduit' (parallel slide) gate valves which are available with spring energised seats or expanding split two piece gates that spread as they are closed to energise a seal.
- Parallel slide gate valves for steam are another example and employ two gates that are mechanically energised by springs or a mechanical wedge spreader mechanism.
- Soft seated expanding plug valves are yet another example.

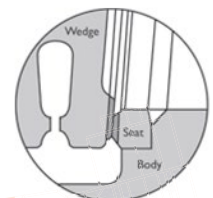
#### Friction/Interference Fit

Once again this style is typically bi-directional, and usually not double block & bleed capable and will totally seal independently of line pressure at low and high delta P.

For example: -

- 'Wedge' gate valves (flexible and solid wedge types)
- Butterfly valves (eccentric or centre lined)

Essentially, there is a wedging or squeezing (in the case of resilient seat valves) action that causes an interference to create a seal.



Seat Ring (welded)



Friction fit also can include resilient seated valves like Teflon lined or sleeved plug valves and diaphragm valves, that exert mechanical pressure on resilient seating material like Teflon or rubber. For lower pressure applications sometimes there may also be a degree of line pressure energising the down stream seat but the friction alone is all that is required for a low pressure seal.

#### Pressure Assigned Seating

This type of valve actually uses the pressure to assist in sealing the seat, so higher pressure will serve to improve the seal (within the capabilities of the seat material and tolerances) the ball, gate or plug and can therefore be pushed onto the down stream seat by the line pressure. Hence this valve type is not suitable for double block & bleed applications due to only one seat sealing. This style of valve also has the disadvantage of not being leak tight at very low pressure or under vacuum. This style can be bi-directional like a floating ball valve as it has upstream and down stream seats.

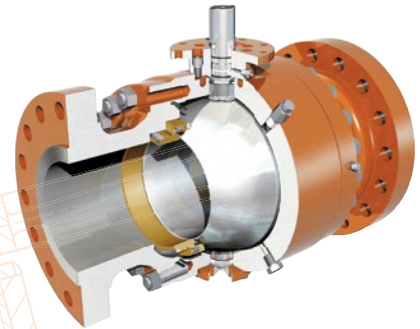
Pressure assisted sealing valves don't have the problem of pressure building up in the valve cavity due to the thermal expansion. Nor do they have the problem of the disc or seat expanding at higher temperatures and sticking. However, as the valves have no trunnion supporting the bottom of the disc they are less suitable for high pressure that can make them hard to turn, and can also exert too much pressure on the stem sealing area, causing leakage. Some API6A flowing slab through conduit gate valves also use this style (Australian Pipeline Valve offers 'FC', 'FL' style).



Some single seated, uni-directional knife gate, non-lubricated plug valves and single offset high performance butterfly valves also use this method of sealing. Care should be taken on vertical (upwards) service with these types of valves as gravity can cause them to act imperfectly, particularly at lower pressures.

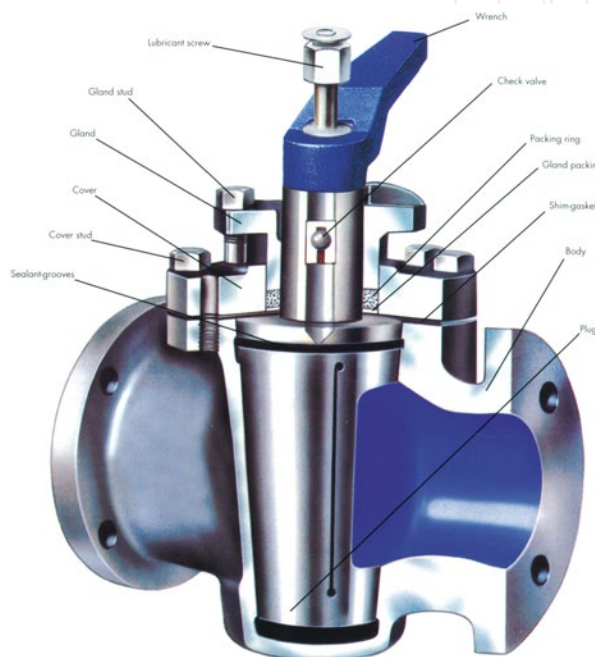
### Combination Self Energised & Pressure Assisted Seating

Trunnion mounted ball valves utilise both of the afore mentioned seating systems. Typically fitted with self energised 'floating' seat retainers with backing springs, the unique standard two way seat retainer design utilises line pressure to further increase the seating seal. This 2 way seat design also automatically relieves body cavity over-pressure. Once again they are bi-directional, double block & bleed capable and utilise energised seating systems which are instantly live loaded with the aid of springs behind the seats.



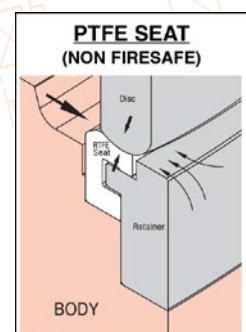
### Lubricated Valves

'Metal to metal seated' lubricated API6D plug and even some lubricated API6A gate valves utilise the grease to obtain a drip tight seal, in addition to a friction interference fit. This is not to be confused with other types of valves that have emergency sealant injection.



### Positioning Seating

This style of seating system must be in a fairly acute position to effect a seal. Over closing (which can be avoided with gearbox 'stops') is possible, and 'cheating' will move the valve away from the optimum seating sweet spot and can even cause excess wear or damage to the seating area. Many manufacturers like Australian Pipeline Valve have inbuilt stops to ensure this doesn't happen. This style of valve requires no line pressure to affect the seat. Examples of this style of seating are double offset (double eccentric) butterfly valves. This style of valve has minimal interference during opening or closing and the disc 'cams' closes against the seat. This style of valve needs to sit right on the closing position,

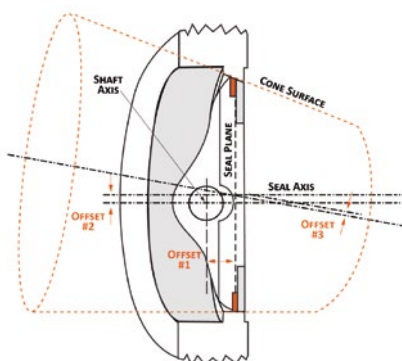


unlike a rubber lined butterfly valve for instance that has a wider closing tolerance. Some parallel, non energised gate valves can easily be under or over tightened.

APV Twin seal wedge plug valves also utilise a combination of cam action, positional seating action of a plug plus resilient soft seat inserts which provide an oversized seal for bubble tight shut off.

### Torque Seating

This type of seating system is still positionally seated with an optimum closed position but also requires a certain amount of torque to energise an effective seal. This is because it is often used for higher pressures and/ or metal to metal minimal friction fit applications that still require a tight shut off without the benefit of resilient seats or true interference fits like wedging action, etc. A typical example of this style of seating are triple offset (triple eccentric) butterfly valves. This style of valve has minimal interference during opening or closing and the disc 'cams' and closes against the seat rather than scraping friction fit seal.



Triple Offset Design

This style of valve is designed to close tight at a set torque tension. Gear box stops ensure this point cannot be passed. For this reason triple offset butterfly valves when refitted with automatic actuators cannot have a safety factor of over 50% as the seats will not function correctly or could be damaged if over tightened. These types of valves are bi-directional but do have a preferred flow direction in which they are drip tight or even bubble tight. The preferred direction also has reduced closing torque against line pressure.