GUIDE VALVE LIMITED

GVS® "DUAL SEAT DESIGN"

For 150# to 900# A.N.S.I. Class

Trunnion Mounted Ball Valves

Features and Benefits

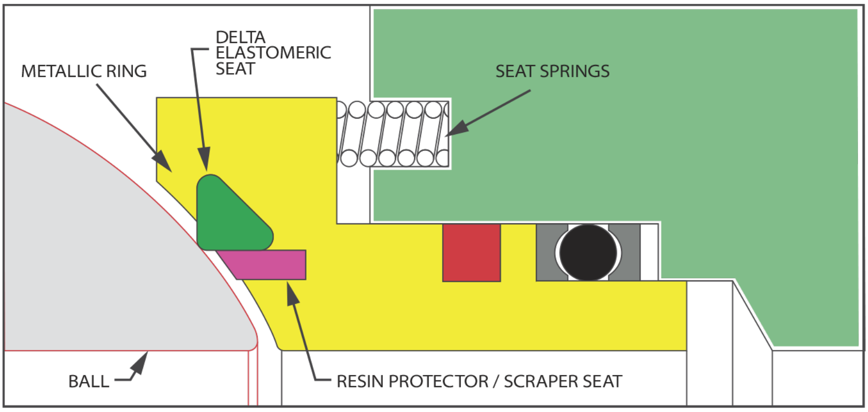
www.gvs-vci.com

SEAT RINGS WITH ELASTOMERIC INSERT

The elastomeric seat is named “Delta” after the Greek symbol Δ and is made of Viton and/or GLT, AED, Nitrile, Therban, etc.

The elastomeric **Delta** seat is mounted into its housing in the metallic seat ring and is held in place by a resin **Protector** seat.

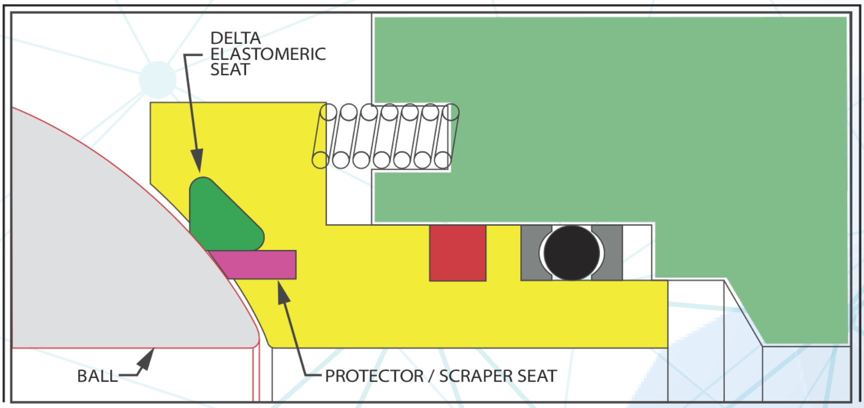
In cases when there is zero or minimal pressure, the metallic seat ring is pushed against the ball by pre-loaded seat springs with a force (Fm) [see Figure 1] and the **Delta** seat is subject to partial compression in its housing.



[Figure 1]

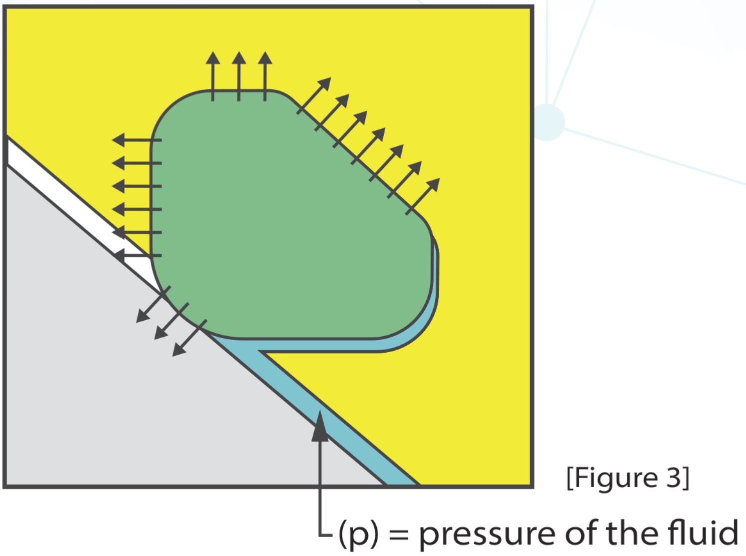
With the valve closed and a differential pressure between the upstream and downstream sides of the ball, the seat ring is further pushed against the ball by a differential pressure affecting the annular surface Ω (Fp).

The **Delta** seat is additionally compressed into its housing in the seat ring, and over a certain Δp, the resin **Protector** seat is also in contact with the ball. [see Figure 2]



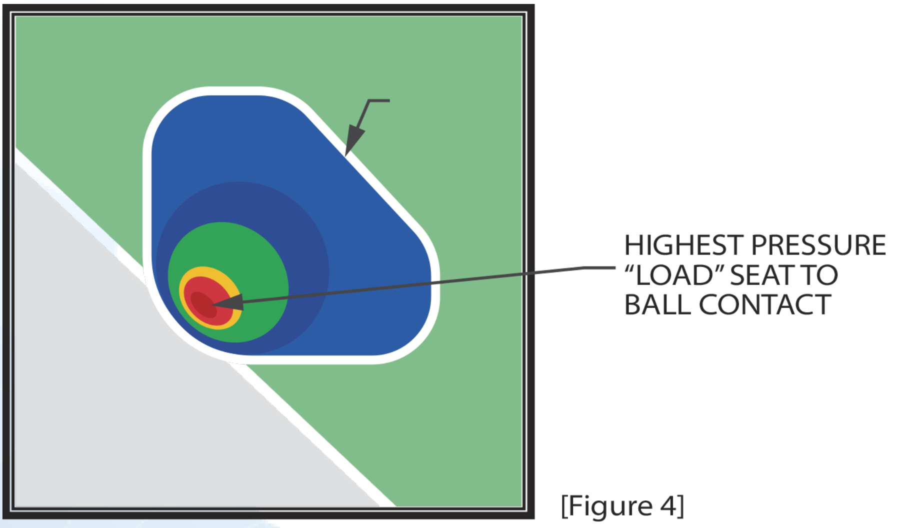
[Figure 2]

The unit pressure between the ball and the elastomeric **Delta** seat is partially due to the elastic deformation of the insert when it is completely compressed into its housing on the seat ring, and the pressure of the fluid that goes into the housing and compresses the **Delta** seat against the walls of the housing and the ball. The behavior of the elastomeric insert is similar to that of a liquid that, when subject to a certain pressure on a certain zone (contact with the process fluid), exerts the same pressure on the walls that are wetted by itself.



[Figure 3]

Mathematical models and experimental tests demonstrate that the pressures of contact are distributed as shown in the map [Figure 4]. The **Delta** seat is one of the family of "self-energized" seals, i.e. as the fluid pressure increases, the pressure due to contact between the **Delta** seat and the ball rises too, exceeding in certain zones the differential pressure Δp of the process fluid and thus creating the seal.



[Figure 4]

SEAT DESIGN FEATURES

SEATING TYPE

GVS ball valves of 150# to 900# A.N.S.I. class are designed with an elastomeric, special Delta shaped, seat, and with a **Protector** seat of hard resin material. Our valves have two shut-off sealing surfaces per seat against the ball. It could be stated that the "sweet spot" in a GVS valve is significantly greater.

Note: Soft seated trunnion mounted ball valves are strictly for fully opened and fully closed position/function. They are not to be used for control applications or left in any partially open or closed positions.

By our seat design having two shut - off seal contacts to the ball's outer surface, we are achieving the benefits of both the **resin** and **elastomeric** materials, with out the disadvantages.

We believe that valves relying on only Nylon, Teflon, Devlon, Peek, and other resin types of material seat inserts are predisposed to disadvantages affecting valve performance when in cold temperatures due to shrinking of the seat. Furthermore, resins have no memory and therefor cannot form into any scores or damages that the ball's surface may have.

SELECTION OF A SEAT SEAL INSERT MATERIAL

Selection of an appropriate seat material is based on the nature of the service fluid and service temperatures. For instance, Guide Valve Limited recommends using an elastomeric seat (i.e. Viton GLT AED) with a resin **Protector** seat (i.e. Peek) for low temperature service (-45°c / -49°f to + 220°c / 428°f) especially in Gas service.

Here are some technical comparisons between resins and elastomers:

ADVANTAGES OF RESIN SEATS

- Resins are inert to many types of fluids and their use has high flexibility.
- Resins are virtually impermeable to gases, so the risk of damage by explosive decompression is much lower.
- Resins have better mechanical properties that enable the seat to act as a spacer between the seat ring and the ball surface, preventing metal-to-metal contact between them.
- Resins have higher abrasion (wear) strength.

DISADVANTAGES OF RESIN SEATS

- Higher unit pressure – Resins need a higher working pressure to create a shut-off seal between the seat and ball, therefore, they require a greater force to push the seat ring against the ball in comparison to elastomeric seat materials.
- To provide the same level of sealing as elastomeric seats, resin seats require a better spherical profile, geometry, ball surface finish, and the machining costs are higher due to their stiffness and lack of memory. Therefore, it is very difficult to achieve a "perfect" seal at very low pressure in contrast with an elastomeric seat.
- Unlike elastomeric seats, the low elasticity (small compression set) of resin seats prevents metal contact between the seat ring and the ball when the resin is pushed against the ball for sealing, preventing any additional metal-to-metal sealing.
- In cases where small damage to the seat or ball surface (caused by solid particles in the service fluid) occurs, the more rigid resin seat is incapable of self-restoration or filling the grooves and scratches on the ball surface, both of which are possible with elastomeric seats.

CONCLUSION

We believe that the Delta elastomeric seat, with its special triangular shape, is a superior design when compared to a simple O-ring seat.

We furthermore believe that our "dual seat design", which houses both a resin seat and an elastomeric Delta shaped seat, can withstand more debris related abuse than a single, solid, resin seat while also providing for a greater seat-to-ball contact shut-off area.