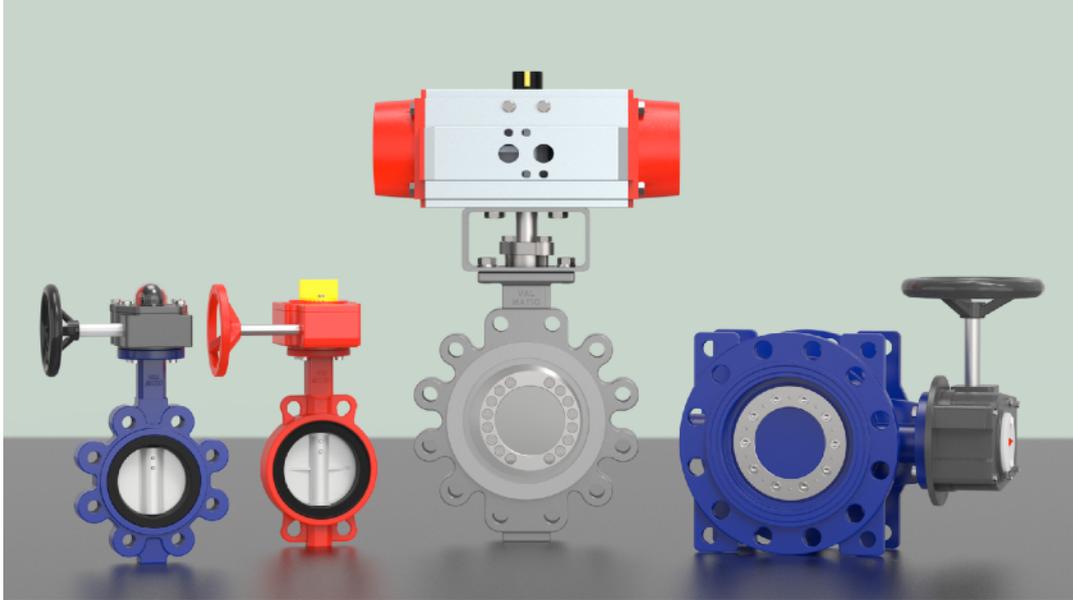


BUTTERFLY VALVES

When to use a concentric, double-offset or triple-offset butterfly valve?



What is butterfly valve?

A butterfly valve is a quarter-turn rotation motion valve.

Butterfly valves are easy and quick to open. A 90° rotation of the handle completely opens and closes the valve.

Types of Butterfly Valves

There are two types of butterfly valves, concentric and eccentric type. The most common eccentric types are double and triple offset butterfly valves. Different types of butterfly valves (concentric, double offset and triple offset) are used depending on the application and operating condition required.

1) Concentric Butterfly Valves

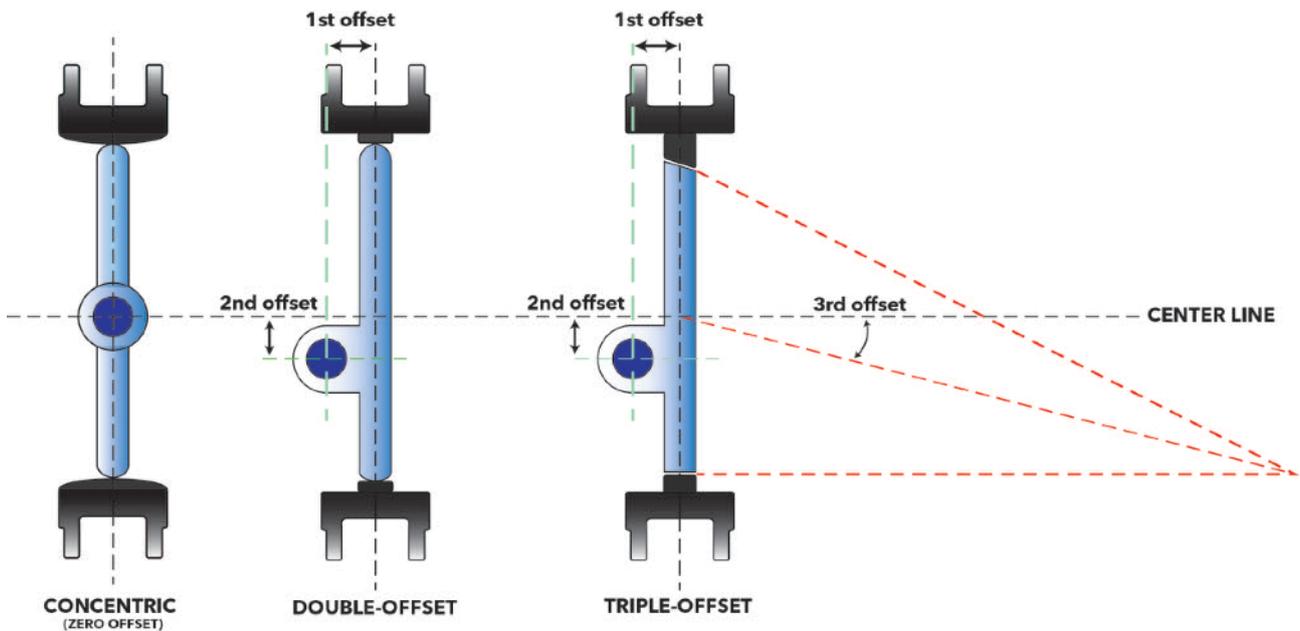
The concentric type is a standard and general use butterfly valves. The shaft is located in the centre of the disc and pipeline. The disc outer diameter is bigger than the inner diameter of the

valve seat. This arrangement creates an interference fit whereby part of the disc is in contact or rubs the seat during the opening or closing of the valve. As a result, a bubble-tight shut off is achieved.

The disc is made of metal whereas the seat is a softer material (NBR, EPDM, PTFE, VITON). Soft seat butterfly valves are suitable for low pressure and non-critical applications up to Class 150/PN16.

For high temperature and pressure applications, the disc and seat must be made of metal.

Rubbing of the valve disc and seat must be eliminated or reduced by offsetting the shaft from the valve centreline. Thus, creating double offset and triple offset butterfly valves.



2) Double Offset Butterfly Valves

The double offset butterfly valve has 2 offsets. This offset is the displacement of the shaft from the centreline. The first offset is the displacement of the shaft from the centreline of the disc seat and body seal. This maintains continuous sealing surface during the opening and closing of the valve.

The second offset is the displacement from the centreline of the pipe/bore. This is to allow the disc and seal right to easily lift off and away from the body seat.

The result is a cam like motion to lift the seat from the seal during operation. Friction between the disc and seal occurs during the first 10° of opening and final 10° of closing.

The double offset butterfly valve is also known as a high performance butterfly valve. This design is suitable for high temperature and pressure applications for on-off or throttling services.

3) Triple Offset Butterfly Valves

The triple offset butterfly valve has 3 offsets. In addition to the two offsets as in the double offset butterfly valve, the third offset is achieved by altering the geometry of the sealing component. Here, the seat is machined into an offset conical profile resulting in a right-angled cone.

The third offset eliminates rubbing and reduces wear between the seat and seal ring during operation. There will be no friction as the seal ring will immediately leave the valve seat when the valve is opened.

Contact is only made at the final point of closure. Once the seat and seal ring are in contact, torque is applied to create a bi-directional bubble tight seal. This is why triple offset butterfly valves are referred to as 'torque seated'.

The metal-metal design allows the valve to be used in high temperature and pressure environment and has a much longer lifetime than a double offset butterfly valve.

Specialised machining, grinding and assembly is required to achieve the oblique cone shape profile. Therefore, the cost of a triple offset butterfly valve will be higher than a double offset butterfly valve.

If the application is highly corrosive, abrasive or deals with high pressure and temperature, the triple eccentric butterfly valve is worth considering. Triple offset butterfly valve is often used for emergency safety operations or high cycling services for high pressure or superheated steam or high temperature gases and oils.

| Description | Concentric | Double Offset | Triple Offset |
|-----------------------|-------------------|----------------------|---|
| Seat Material | Soft Seat | Soft/Metal Seat | Metal Seat |
| Seat Friction | High | Low | Very Low |
| Class Rating | 150 | 600 | 600 |
| Applications | General Utilities | On-off or throttling | Crucial/emergency services and high cycling |
| Seat Lifetime | Short | Long | Very Long |
| Fluid Services | Clean | Clean | Clean to Dirty |
| Bubble-tight shut off | Yes | Yes | Yes |
| Pressure Drop | Lowest | Higher | Higher |
| Cost | Lowest | Moderate | Highest |

