
Gate valves

Gate valves are primarily designed to start or stop flow, and when straight-line flows of fluid and minimum flow restriction are needed. In service, these valves generally are either fully open or fully closed.

The disk of a Gate valve is completely removed when the valve is fully open; the disk is fully drawn up into the valve Bonnet. This leaves an opening for flow through the valve at the same inside diameter as the pipe system in which the valve is installed. A Gate valve can be used for a wide range of liquids and provides a tight seal when closed.

Construction of a Gate valve

Gate valves consist of three main parts: body, bonnet, and trim. The body is generally connected to other equipment by means of flanged, screwed or welded connections. The bonnet, which containing the moving parts, is attached to the body, usually with bolts, to permit maintenance. The valve trim consists of the stem, the gate, the disc or wedge and the seat rings.

Disks of a Gate valve

Gate valves are available with different disks or wedges. Ranging of the Gate valves is usually made by the type of wedge used.

The most common were:

- Solid wedge is the most commonly used disk by its simplicity and strength. A valve with this type of wedge can be installed in each position and it is suitable for almost all liquids. The solid wedge is a single-piece solid construction, and is practically for turbulent flow.
- Flexible wedge is a one-piece disc with a cut around the perimeter to improve the ability to correct mistakes or changes in the angle between the seats. The reduction will vary in size, shape and depth. A shallow, narrow cut gives little flexibility but retains strength. A deeper and wider cut, or cast-in recess, leaves little material in the middle, which allows more flexibility, but compromises strength.
- Split wedge is self-adjusting and self-aligning to both seats sides. This wedge type consists of two-piece construction which seats between the tapered seats in the valve body. This type of wedge is suitable for the treatment of non-condensing gases and liquids at normal temperatures, particularly corrosive liquids.

Stem of a Gate valve

The stem, which connects the handwheel and disk with each other, is responsible for the proper positioning of the disk. Stems are usually forged, and connected to the disk by threaded or other techniques. To prevent leakage, in the area of the seal, a fine surface finish of the stem is necessary.

Gate valves are classified as either:

- Rising Stem
- Non Rising Stem

For a valve of the Rising Stem type, the stem will rise above the handwheel if the valve is opened. This happens, because the stem is threaded and mated with the bushing threads of a Yoke. A Yoke is an integral part from a Rising Stem valve and is mounted to the Bonnet.

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For a valve of the non Rising Stem type, there is no upward stem movement if the valve is opened. The stem is threaded into the disk. As the handwheel on the stem is rotated, the disk travels up or down the stem on the threads while the stem remains vertically stationary.

Seats of a Gate valve

Seats for Gate valves are either provided integral with the valve body or in a seat ring type of construction. Seat ring construction provides seats which are either threaded into position or are pressed into position and seal welded to the valve body. The latter form of construction is recommended for higher temperature service.

Integral seats provide a seat of the same material of construction as the valve body while the pressed-in or threaded-in seats permit variation. Rings with hard facings may be supplied for the application where they are required.

Advantages and disadvantages of Gate valves

Advantages:

- Good shutoff features
- Gate valves are bidirectional and therefore they can be used in two directions
- Pressure loss through the valve is minimal

Disadvantages:

- They can not be quickly opened or closed
- Gate valves are not suitable for regulate or throttle flow
- They are sensitive to vibration in the open state