
Valves Overview

A **valve** is a device that regulates the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways. Valves are technically pipe fittings.

Gate Valve:

The gate valve is a general service valve used primarily for on - off, non-throttling service. The valve is closed by a flat face, vertical disc, or gate that slides down through the valve to block the flow.

Globe Valve:

The globe valve effects closure by a plug with a flat or convex bottom lowered onto a matching horizontal seat located in the center of the valve. Raising the plug opens the valve, allowing fluid flow. The globe valve is used for on - off service and handles throttling applications.

Pinch Valve:

The pinch valve is particularly suited for applications of slurries or liquids with large amounts of suspended solids. It seals by means of one or more flexible elements, such as a rubber tube, that can be pinched to shut off flow.

Diaphragm Valve:

The diaphragm valve closes by means of a flexible diaphragm attached to a compressor. When the compressor is lowered by the valve stem onto a weir, the diaphragm seals and cuts off flow. The diaphragm valve handles corrosive, erosive and dirty services.

Needle Valve:

The needle valve is a volume-control valve that restricts flow in small lines. The fluid going through the valve turns 90 degrees and passes through an orifice that is the seat for a rod with a cone-shaped tip. The size of the orifice is changed by positioning the cone in relation to the seat.

Plug Valve:

The plug valve is used primarily for on-off service and some throttling services. It controls flow by means of a cylindrical or tapered plug with a hole in the center that lines up with the flow path of the valve to permit flow. A quarter turn in either direction blocks the flow path.

Ball Valve:

The ball valve is similar in concept to the plug valve but uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90 degrees to block the flow passage. It is used for on-off and sometimes for throttling services.

Butterfly Valve:

The butterfly valve controls flow by using a circular disc or vane with its pivot axis at right angles to the direction of flow in the pipe. The butterfly valve is used both for on-off and sometimes for throttling services.

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Control Valve:

The control valve is designed to ensure accurate proportioning control of flow. It automatically varies the rate of flow based on signals it receives from sensing devices in a continuous process. Some valves are designed specifically as control valves.

However, most types of valves can be used as control valves, both linear and rotary motion, by the addition of power actuators, positioners and other accessories.

Safety Valve:

The safety valve is a valve mechanism for the automatic release of a substance from a boiler, pressure vessel, or other system when the pressure or temperature exceeds preset limits. It is part of a bigger set named pressure safety valves (PSV) or pressure relief valves (PRV). The other parts of the set are named relief valves, safety relief valves, pilot-operated safety relief valves, low pressure safety valves, vacuum pressure safety valves.

Sluice Gate Valve:

The sluice is a water channel that is controlled at its head by a gate (from Dutch word 'sluis').

Sluice gate is traditionally a wooden or metal plate which slides in grooves in the sides of the channel. Sluice gates are commonly used to control water levels and flow rates in rivers and canals. They are also used in wastewater treatment plants and to recover minerals in mining operations, and in watermills.

Types of Sluice Gates:

Flap sluice gate

A fully automatic type, which is controlled by the pressure head across it; operation is similar to a check valve. It is a gate hinged at the top. When pressure is from one side, the gate is kept closed; a pressure from the other side opens the sluice when a threshold pressure is surpassed.

Vertical rising sluice gate

A plate sliding in the vertical direction, controlled by machinery.

Radial sluice gate

A structure, where a small part of a cylindrical surface serves as the gate, supported by radial constructions going through the cylinder's radius. Occasionally a counterweight is provided.

Rising sector sluice gate

Also a part of a cylindrical surface, which rests at the bottom of the channel and rises by rotating around its centre.

Needle sluice

A sluice formed by a number of thin needles held against a solid frame through water pressure as in a needle dam

Solenoid Valve:

The solenoid valve is an electromechanical valve for use with liquid or gas. The valve is controlled by an electric current through a solenoid coil. Solenoid valves may have two or

more ports: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design

Check Valve (clack valve, non-return valve or one-way valve):

The check valve is a mechanical device, a valve, which normally allows fluid (liquid or gas) to flow through it in only one direction.

Types of Check Valves:

A ball check valve is a check valve in which the closing member, the movable part to block the flow, is a spherical ball. In some (but not all) ball check valves, the ball is spring-loaded to help keep it shut. For those designs without a spring, reverse flow is required to move the ball toward the seat and create a seal. The interior surface of the main seats of ball check valves are more or less conically-tapered to guide the ball into the seat and form a positive seal when stopping reverse flow.

A diaphragm check valve uses a flexing rubber diaphragm positioned to create a normally-closed valve. Pressure on the upstream side must be greater than the pressure on the downstream side by a certain amount, known as the pressure differential, for the check valve to open allowing flow. Once positive pressure stops, the diaphragm automatically flexes back to its original closed position.

A swing check valve or **tilting disc check valve** is check valve in which the disc, the movable part to block the flow, swings on a hinge or trunnion, either onto the seat to block reverse flow or off the seat to allow forward flow. The seat opening cross-section may be perpendicular to the centerline between the two ports or at an angle. Although swing check valves can come in various sizes, large check valves are often swing check valves.

A stop-check valve is a check valve with override control to stop flow regardless of flow direction or pressure. In addition to closing in response to backflow or insufficient forward pressure (normal check-valve behavior), it can also be deliberately shut by an external mechanism, thereby preventing any flow regardless of forward pressure.

A lift-check valve is a check valve in which the disc, sometimes called a lift, can be lifted up off its seat by higher pressure of inlet or upstream fluid to allow flow to the outlet or downstream side. A guide keeps motion of the disc on a vertical line, so the valve can later reseal properly. When the pressure is no longer higher, gravity or higher downstream pressure will cause the disc to lower onto its seat, shutting the valve to stop reverse flow.

Piston Valve is a device used to control the motion of a fluid along a tube or pipe by means of the linear motion of a piston within a chamber or cylinder.

Choke Valve is a type of valve designed to create choked flow in a fluid. Over a wide range of valve settings the flow through the valve can be understood by ignoring the viscosity of

the fluid passing through the valve; the rate of flow is determined only by the ambient pressure on the upstream side of the valve.

Rupture Disc or **Bursting Disc** is a non-reclosing pressure relief device that protects a pressure vessel, equipment or system from over-pressurization or potentially damaging vacuum conditions. A rupture disc is a type of sacrificial part because it has a one-time-use membrane that fails at a predetermined differential pressure, either positive or vacuum. The membrane is usually made out of metal, but nearly any material (or different materials in layers) can be used to suit a particular application. Rupture discs provide instantaneous response (within milliseconds) to an increase or decrease in system pressure, but once the disc has ruptured it will not reseal. Major advantages of the application of rupture discs compared to using pressure relief valves include leak-tightness and cost.

Pilot Valve is a small valve that controls a limited-flow control feed to a separate piloted valve. Typically, this valve controls a high pressure or high flow feed. Pilot valves are useful because they allow a small and easily operated feed to control a much higher pressure or higher flow feed, which would otherwise require a much larger force to operate; indeed, this is even useful when a solenoid is used to operate the valve.