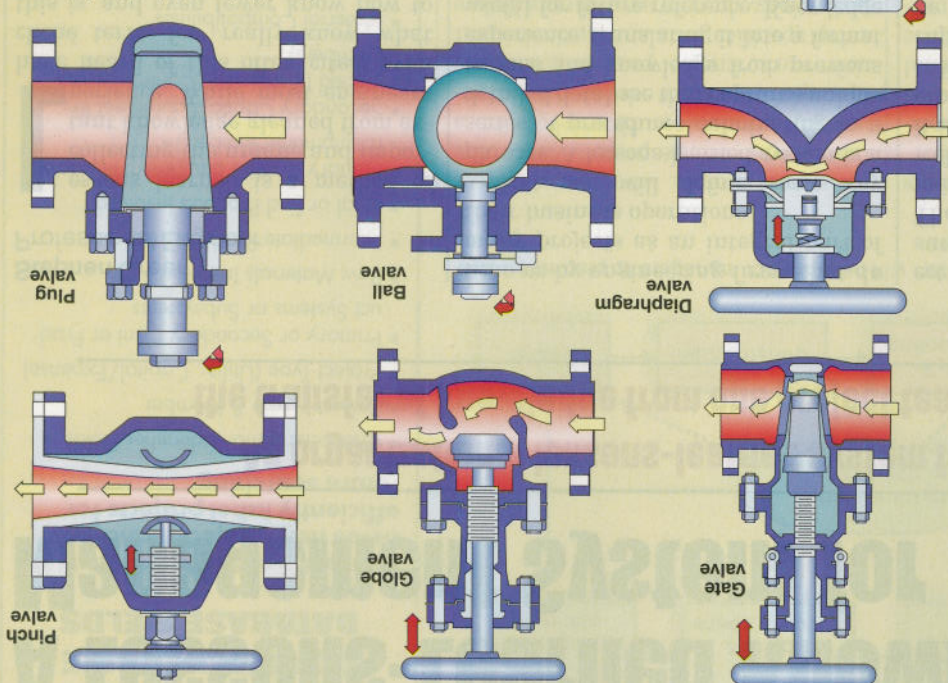


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### Valves



Source for figures: Valve Manufacturers Association of America, Washington, D.C.

Butterfly valves get their name from the winglike action of the flow-controlling disk that opens and closes at right angles to the flow path. Butterfly valves were introduced to counteract the problems associated with linear-valve designs (especially gate valves), such as the relatively large size and weight, the high operating force required, and the tendency to leak. Instead of a long stroke, the butterfly valve requires a quarter turn to cycle from a fully open to fully closed position. Butterfly valves can be used for both on/off and throttling applications.

### BUTTERFLY

The purpose of a check (or non-return) valve is to allow fluid flow in one preferred direction and to prevent back flow, or flow in the opposite direction. Ideally, a check valve will begin to close as the pressure drops in a pipeline and the fluid momentum reverses. When the flow direction reverses, the check valve should close completely. Check valves can be of the following types: swing, lift and lifting disk.

### CHECK

Plug valves have a cylindrical or tapered plug with a hole bored through. As with ball valves, fluid flows when the hole in the plug is aligned with the pipe, and a quarter turn of the plug stops the flow. Plug valves often have fluorocarbon sealing materials and in some cases are fully lined with fluorocarbons, which provides excellent protection for corrosive applications that require bubble-tight shutoff. There are several different types of plug valves commonly used in the CPI, including lubricated, nonlubricated and eccentric types.

### PLUG

Ball valves are available in Venturi, reduced and full-port patterns. The full-port pattern has a ball with a bore equal to the inside diameter of pipe. Most ball valves instead have a reduced bore with a Venturi shaped flow passage of about three quarters of the nominal valve size.

This rotational-motion valve uses a ball-shaped disk with a hole bored through to stop or start fluid flow. When the valve handle is turned to the open position, the ball is rotated so that the hole lines up with the valve body's inlet and outlet. When the ball is rotated so the hole is perpendicular to the flow, the valve is closed. Because the ball moves across the seats with a wiping motion, ball valves can handle fluids with suspended solids.

### BALL

Gate valves are designed to operate fully open or fully closed. When fully opened, there is very little pressure drop across the valve, and when fully closed there is good sealing against pressure. With the proper mating of a disk to the seat ring, very little or no leakage occurs across the disk when the gate valve is closed. Gate valves open or close slowly, which prevents fluid hammer and subsequent damage to the piping system. Gate valves are usually classified by the type of disk used, and a variety of disk types are available, such as solid wedge, split wedge or parallel disk.

### GATE

The basic principle of globe valve operation is the perpendicular movement of the disk toward, or away from, the seat. This causes the annular space between the disk and seat ring to gradually close as the valve is closed. It is this characteristic that gives the globe valve good throttling ability. When the valve is closed, there is no blocked-in volume, as occurs in a gate valve, so a globe valve has much less leakage around the seat. Also, the disk-to-seat-ring contact is much closer to forming right angles, so the force of closing highly seats the disk.

### PINCH

This valve consists of a flexible tube that is mechanically pinched from the outside of the valve body. The principal advantages of this type of valve are that the flow passage is straight without any crevices, and there are no internal moving parts. The soft valve body has the ability to seal around trapped solids, so pinch valves are suitable for handling slurries and solids, which would clog in the obstructed flow passages of other valve types. They are also used for the sanitary handling of foodstuffs and pharmaceuticals because the media are isolated from the working parts.

### DIAPHRAGM

The flow passage in diaphragm valves is free of crevices and is unobstructed by moving parts, making them suitable for applications where cleanliness, bubble-tight shutoff and chemical compatibility are important. The diaphragm valve is considered