Valves

How It Works

Check Valves

Check valves, also known as nonreturn or one-way valves, are designed to enable fluid flow one way in a pipeline. In these valves, a clapper hangs from hinge, a clapper shaft, or pin mounted to the underside of the bonnet. The basic design of a check valve inhibits backflow in a line.

Because of their simple design, check valves generally operate without automation or human interaction and instead rely on the flow velocity of the fluid to open and close. This means they generally do not have a method of outside operation like a handle or lever. The minimum upstream pressure required to operate the valve is called cracking pressure. Check valves are generally designed specifically with this number in mind, depending on the size and style of check valve, this number is between 1 and 5 psi.

The degree of opening on a check valve is determined by the flow rate. The higher the flow rate, the more open the valve will be until it reaches its maximum, full-open position. On many check valves, the full open position is approximately 85°.

Types

Swing check or tilting-disc check valves

Consist of a clapper with a disc that is convex on the upstream inlet side and flat on the downstream outlet side. For API 600 valves, this disc swings on a hinge that is mounted to the bottom of the valve bonnet. For API 6D valves, the typical construction is a cast pocket in the valve body with a drop-in shaft or pin-and-bushing arrangement that the clapper will turn on. This traditional type of construction requires some sort of restraint to keep the clapper in the pocket. The new design features improved modularity and facilities easier assembly, enabling different configurations to be assembled with a base design.

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Nozzle check valves

Or otherwise known as axial flow check valves, are design with a spring loaded disc that translates horizontally. The spring allows for a nonslam design in that the effects of water hammer are eliminated. These are designed to be in the full open position even at minimum flow rate conditions to ensure performance. Nozzle check valves can be installed in both buried and above grade applications and are ideal for gas applications

Ball check valves

Include a spherical ball clapper that is sometimes spring loaded to seal at pressures below the cracking pressure. Because of the spherical design, these valves can easily wear from prolonged use and require frequent maintenance, therefore, they should be installed in places that are easy for repair teams to access.

Diaphragm check valves

Consist of a rubber diaphragm clapper that flexes open when the pressure on the upstream side is greater than the pressure on the downstream side and closes when this pressure is equalized or lowered below a set pressure differential.

Stop-check valves

Are usually constructed similar to a swing check valve but have an additional external control mechanism -such as an actuator, lever or handwheel -that enables the valve to be deliberately closed regardless of flow pressure.

Duckbill valves

Enable flow to proceed through a soft tube that feeds into the downstream side of the valve wherein backpressure collapses the tube and cuts off the flow.

Features

The main advantage of a check valve is its simple design. Generally, check valves also are smaller and easier to install compared to other valve types, making maintenance easier and more efficient.

Check valves can be designed with specific nonslam features to reduce noise and seal wear. Nozzle check valves are commonly selected for this feature in LNG pump stations and gas compressor stations. Additionally, because of their simple, streamlined design, check valves and check valves have lower pressure drops (less than 1 psi) than comparable piston check valves.

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Applications

Because of their simple design and versatile materials options, check valves are used in a variety of markets and applications. Check valves can be designed to API 600 or API 6D standards. Typically, check valves designed to API 600 specifications are used in the industrial market. Usually designed with reduced port sizes, these valves have special bolting and cover sealing, angle seating, a two-piece clapper and arm unit and hard chrome trims. Check valves can be designed to various wall thickness requirements and feature pressure and temperature ratings per ASME B16.34 API 600 and 6D check valves, which are generally designed for use in the oil and gas industry, typically have removeable seats as well as bonnet-to-body joint connections for seals, bonnet gaskets, and cover bolting.

Specialty valves for subsea operation at extremely high pressures and low temperatures can be designed into a system. The check valve features a unique, free-swinging clapper. If reverse flow or a critical pigging operation is required, the clapper can be actuated manually, hydraulically, or via ROV and held in the full-open position. This feature is also available in non-subsea applications as well.

NEWCO gate, globe and check valves are ideal for standard and critical power industry applications. The pressure-seal bonnet joint eliminates the body and bonnet flanges, reducing weight and simplifying the application of exterior insulation. Contrary to bolted bonnet valves, internal pressure applied to a pressure, the tighter the seal. The tilt-disc check valve design yields minimal restriction in low-velocity environments and is ideal for preventing backflow in unidirectional flow applications in horizontal flow. Additionally, the tilting-disc design offers closing that reduces slamming.