



McCANNA/MARPAC Valves

Product Data Bulletin
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(Part PDB-5)

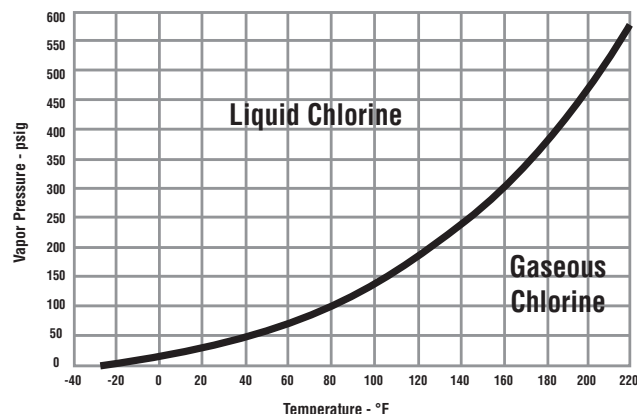
McCANNA Ball Valves for Dry Chlorine Service

General information

Chlorine is a chemical element which in commercial use is generally a liquefied gas. At atmospheric pressure, liquid chlorine will boil at approximately -30°F (-34.4°C) and freezes at approximately -150°F (-101°C). Chlorine has a very high vapor pressure, as illustrated in the graph following. One volume of liquid chlorine will vaporize to approximately 462 volumes of gas. Liquid chlorine is clear amber colored and chlorine gas is a green-yellow color, with an irritating, characteristic odor which can be detected by the normal person in concentrations as low as 3 parts per million (ppm) in air (by volume).

The term “dry chlorine” is defined as liquid or gaseous chlorine having less than 150 ppm water in containment. “Wet chlorine” or “moist chlorine” is defined as liquid or gaseous chlorine having more than 150 ppm water by weight. The terms “wet” or “dry” having nothing to do with the physical state of the chlorine, whether it is liquid or gas. Either state may be wet or dry, depending on the moisture content.

Chlorine is extremely reactive and toxic, causing skin burns on liquid contact and primarily respiratory irritation as a gas. It has other properties which make it uniquely difficult and hazardous to handle. The Chlorine Institute publishes The Chlorine Manual and various pamphlets to cover safe handling, materials, practices, and construction features which are recommended.



Dry Chlorine Service

At temperatures below 250°F (121°C), the more commonly used metals such as ductile iron, carbon steel, 304 and 316 stainless steel are resistant to dry chlorine, liquid or gaseous state. Certain other alloys such as Monel and Hastelloy C are also resistant to attack. Some nonmetallic materials with resistance to dry chlorine are Kynar, PTFE, and reinforced PTFE.

The Chlorine Institute publishes Pamphlet #6 which covers piping systems for dry chlorine and which includes valve recommendations. McCANNA Valves meets or exceeds all of the guidelines set forth in Pamphlet #6 regarding materials, cleaning, lubrication, construction features, and testing.

Construction Features

Due to the high coefficient of expansion of chlorine in the liquid state, and in the gaseous state near the liquid-gas transition pressure-temperature line (refer to the vapor graph), valves must be provided with a means of relieving expansion pressures which may develop when chlorine is confined within the valve body cavity and subjected to temperature increase. The Chlorine institute has approved two methods of relieving these potentially destructive pressures:

1. “Self-relieving” Seats - with this design configuration, the valve seat on the downstream side of the valve must always seal, while the seat of the upstream side must relieve pressure in the upstream direction before cavity pressure reaches a dangerous level. In this design highly controlled and repeatable seat flexure is required.
2. Upstream Vent - in this design configuration the upstream seat is bypassed by providing a hole in the valve ball which connects the body cavity to the upstream valve throat in the closed position, for by a hole which provides this path continuously. Valves which are so configured will seat unidirectionally only, however, positive relief of cavity pressure is assured without dependence on seat flexure.

*McCannaSeal® ball valves are available in chlorine-prepared configurations with either means of cavity pressure relief. There are cautions that the user must consider when determining the method of cavity relief to be specified.

Chlorine systems quite often have rust and scale present in the piping. Any loose material carried in the fluid stream may collect on sealing and seating surfaces, interfering with proper seat action of self-relieving seats in two ways. First, these seats must be somewhat "loose" in comparison to standard seats in order to permit the necessary flexure. Solids collecting on sealing surfaces may prevent proper seat flexure when relief is required. Second, this same packing of solids on sealing surfaces may cause leaks to develop due to scoring or simply because the seat is held away from its mating surface.

A self-relieving seat will relieve pressure to the upstream side only when the upstream pressure is distinctly higher than the downstream pressure. When both sides of the valve are depressurized, the chlorine trapped in the body cavity will relieve to the seat which by tolerance variation flexes easier than the other. This may be the downstream seat, in which case chlorine may be released into an area where work is being done, creating a hazardous condition.

A valve with an upstream vent will always relieve to the upstream side regardless of pressure conditions on either side of the valve.

Wherever the service does not require bidirectional sealing, Flowserve highly recommends the upstream vent because of the more rugged seat design and the positive control of cavity relief direction.

Cleaning and Lubrication

A dry chlorine system must be free of materials that may react with the chlorine, such as hydrocarbons, alcohols, moisture, among

others. All wetted parts of McCANNA ball valves prepared for dry chlorine service are cleaned to remove reactive materials and re-inspected for cleanliness. These parts are protected from contamination through assembly in a clean area. A minimum of fluorocarbon lubricant is used during assembly and valves are carefully dried after testing. Valves are packed in plastic with a desiccant to maintain cleanliness during shipment.

Testing

The Chlorine Institute, in Pamphlet #6, specifies that a representative sample of each size and model of valve with self-relieving seats be tested for seat relief which shall show that relief occurs at maximum of 5 times the CWP rating (150 and 300 Class up to 3" size) or 2.5 times the CWP rating (greater than 300 Class or over 3" size).

Flowserve exceeds these testing requirements in three respects:

1. Each McCANNA dry chlorine valve with self-relieving seats is tested for seat relief.
2. Flowserve employs a more stringent relief criterion in that acceptable relieving pressures are lower.

McCannaSeal (½" thru 8" size) - 100 psig (min) - 500 psig (max)

McCannaFlo® (¼" -2") - 100 psig (min) - 500 psig (max)

As discussed previously, accumulated scale and rust from the pipeline collected on seating surfaces may interfere with seat flexure, thus a relief point at or near the limit of body or seat material capability may not be sufficient in service, and may lead to seat extrusion or metal failure. Lower relief pressures are preferred.

3. Every valve is tested for seat tightness after the relief test is completed.

McCannaFlo®, McCannaLoc®, McCannaSeal®, and Marpac® are registered trademarks of Flowserve Corporation.

For more information about Flowserve Corporation, visit www.flowserve.com or call USA 1-800-225-6989.

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