



McCANNA/MARPAC Valves

Product Data Bulletin
FCD MMAPS0004-00
(Part PDB-15)

McCANNA and MARPAC Ball Valves for Oxygen Service

All organic and inorganic materials will react with oxygen at some particular pressure and temperature condition. The reaction may be as mild as simple oxidation, or as violent as fire and even explosion.

The temperatures encountered in ordinary oxygen services are generally well below the ignition temperatures of common valve construction materials. The danger of combustion exists in materials being ignited by localized, higher temperatures or "hot spots" from other sources. A few such conditions include:

1. Rapid opening of the valve causing high temperature through adiabatic compression of the low pressure gas at the valve outlet.
2. Combustible contaminant's carried in the gas stream at higher velocities which ignite on contact and trigger further ignition of higher burning materials.
3. Heat generated by friction between two metal valve surfaces may cause a hot-spot igniting one of the materials.

From the above, it is evident that care must be taken in the selection of valve materials, in the preparation and assembly of the valve, and particularly in the application of the valve.

Materials

Metals

The selection of metals should be based on their resistance to ignition, their susceptibility to oxidation, and their non-sparking characteristic. Resistance to galling and frictional heating is also important where parts may rub together under high pressure. The more common metals in order of their resistance to ignition are copper and copper alloys, stainless steel (300 Series) carbon steel and aluminum.

Although carbon steel is used quite frequently, it is susceptible to oxidation particularly in the presence of moisture. It is not a non-sparking material, and it is low on the list of resistance to ignition.

The bronzes and other copper alloys, as well as stainless steel, are by far the more preferable materials.

Non-Metals

The commonly recommended seat materials used for oxygen service include TFE and reinforced TFE depending on the temperature and pressure conditions. TFE has the highest ignition temperature of the many plastics and elastomers used for seats and seals. Not recommended is nylon as it has one of the lowest ignition temperatures and is also subject to attack in oxidizing media.

Although Kel-F also has a relatively low ignition temperature, it is used for oxygen service in the cryogenic range of temperatures because of its ability to maintain desirable sealing properties even at low temperatures.

Oxygen compatible lubricants are generally restricted to the fluoro-carbon type. Ordinary petroleum base lubricants are not satisfactory and are particularly hazardous because of their high heat of combustion and high rate of reaction.

Special Features*

Because certain seat and seal materials are incompatible with oxygen, Flowserve recommends that you contact your sales and contract administrator with your requirements before purchasing either of these valves.

Another very important feature that should be incorporated in all valves handling oxygen is a means for safe discharge of possible electrostatic potential. In all McCANNA and MARPAC ball valves, a grounding washer is used on the stem. The internal diameter of the washer bears on the stem while the outside diameter contacts the stuffing box to form a metallic junction between the stem, bonnet and body thereby providing a path of electrostatic grounding.

* For High-pressure oxygen please consult factory.

Preparation and Assembly

Cleanliness of the valve and the system is probably the most important criteria. Oxygen ignition can occur not only from sparking or localized metal-to-metal hot spots, but from contact with hydrocarbon oils and greases, particles of metal or other sources of fine combustible material. It is necessary, therefore, to thoroughly clean all components of the valves to be used in oxygen services and assemble them in an isolated, clean room.

Internal body surfaces are vapor blasted, hand ground or wired brushed where necessary to obtain a smooth, particle free surface. Sharp edges and burrs are removed from all metal parts, which come in contact with oxygen. The parts are then vapor de-greased or hot detergent washed followed by a clean water rinse and dried with oil free air.

Software parts are washed in a detergent solution, thoroughly rinsed and dried. Flowserve has a self contained, fully equipped clean room for assembly. All tools used in the assembly of these valves are thoroughly cleaned with a detergent and do not leave the confines of the clean room for any reason.

There are two levels of inspection and assembly depending on the end use or customer requirements.

1. Commercial Oxygen – Where equipment must be free of grease, dirt and oil to prevent combustion (i.e. steel production, metal cutting, welding, etc.).
2. Critical Oxygen – Where ultra cleanliness of the oxygen itself must be maintained (i.e. breathing oxygen, fuel cell oxygen, etc.).

For commercial oxygen service, the parts are visually inspected under a bright light and must be free of any loose particles or visual evidence of oils, grease, etc. Cleanliness is confirmed by wiping with a clean white filter paper. Assembly is done in the clean room

and leak tests performed with clean, dry air. Finished valves are tagged and heat sealed in polyethylene bags.

For critical oxygen service, the parts are sent to the clean room. Authorized personnel wearing lint free clothing and gloves inspect the parts under ultraviolet light for contamination. After assembly and testing with clean, dry air, the valves are further tested for external leakage using a Halogen Sniffer lead detector. Finished valves are specially tagged, certified and heat sealed in polyethylene bags.

Ordering Information

Most models of McCANNA and MARPAC valves can be used for oxygen service. As pointed out earlier, the most desirable materials to prevent sparking are the copper alloys or stainless steels. Flowserve strongly recommends the use of either Monel, stainless steel or bronze for trim material. If Fire-Safe seats are used for high pressure or to prolong seat life, bronze seat rings and inserts are recommended.

It is imperative that the order includes the notation that the valves are to be prepared for either commercial or for critical oxygen service to assure proper cleaning.



WARNING The careful selection of materials, the special debarring, the care taken in cleaning, assembly, testing and packaging valves for use in oxygen is of little consequence if the system in which the valves are to be used is not “oxygen clean” as well. Foreign matter such as weld slag, weld rod particles, dirt or oils if carried into the valve may be locally heated through contact or trapping between moving parts. The hot-spot created may be enough to start a rapid sublimation or the TFE seats and may even attack some metals like carbon steel.

Marpac® is a registered trademark of Flowserve Corporation.

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

FLOWSERVE CORPORATION
FLOW CONTROL DIVISION
1978 Foreman Drive
Cookeville, Tennessee 38501 USA
Phone: 931 432 4021
Facsimile: 931 432 3105
www.flowserve.com