SUPERSEAL BUTTERFLY VALVE MATERIALS

BODY & DISC MATERIALS

The following is a general review of common valve materials used in general industrial, commercial and process valve construction.

Aluminum - A non-ferrous metal, very lightweight, approximately one-third the weight of steel. Aluminum exhibits excellent atmospheric corrosion resistance, but can be very reactive with other metals. In valves, aluminum is mainly used as for exterior components such as a hand wheels or identification tags.

Copper - Among the most important properties of wrought copper materials is their thermal and electrical conductivity, corrosion resistance, wear resistance, and ductility. Wrought copper performs well in high temperature applications and is easily joined by soldering or brazing. Wrought copper is generally only used for fittings.

Bronze - One of the first alloys developed in the Bronze Age is generally accepted as the industry standard for pressure rated bronze valves and fittings. Bronze has a higher strength than pure copper, is easily cast, has improved machinability, and is very easily joined by soldering or brazing. Bronze is very resistant to pitting corrosion, with general resistance to a wide range of chemicals.

Silicone Bronze - Has the ductility of copper but much more strength. Silicon bronze has equal or greater corrosion resistance to that of copper. Commonly used as a stem material in pressure-rated valves, silicon bronze has greater resistance to stress corrosion cracking than common brasses.

Aluminum Bronze - The most widely accepted disc material used in butterfly valves, aluminum bronze is heat treatable and has the strength of steel. Formation of an aluminum oxide layer on exposed surfaces makes this metal very corrosion resistant. Not recommended for high pH wet systems.

Brass - Generally good corrosion resistance. Susceptible to de-zincification in specific applications; excellent machinability. Primary uses for wrought brass are for ball valve stems and balls, and iron valve stems. A forging grade of brass is used in commercial ball valve bodies and end pieces.

Gray Iron - An alloy of iron, carbon and silicon; easily cast; good pressure tightness in the as-cast condition. Gray iron has excellent dampening properties and is easily machined. It is the standard material for bodies and bonnets of Class 125 iron body valves. Gray iron has corrosion resistance that is improved over steel in certain environments.

Ductile Iron - Has composition similar to gray iron. Special treatment modifies metallurgical structure, which yields higher mechanical properties; some grades are heat treated to improve ductility. Ductile iron has the strength properties of steel using similar casting techniques to that of gray iron and is used for class 250 (as well as class 125 in larger sizes).

Carbon Steel - Very good mechanical properties; good resistance to stress corrosion and sulfides. Carbon steel has high and low temperature strength, is very tough and has excellent fatigue strength. Mainly used in gate, globe, and check valves for applications up to 454ºC, and in one-, two-, and three-piece ball valves. Can be forged or cast, with forgings being superior especially for larges sizes in very high classes.

3% Nickel Iron - Improved corrosion resistance over gray and ductile iron. Higher temperature as well as corrosion resistance and mechanical properties. Very resistant to oxidising atmospheres.

Nickel Plated Ductile Iron - Nickel coatings have received wide acceptance for use in chemical processing. These coatings have very high tensile strength, 50 to 225 ksi. To some extent, the hardness of a material is indicative of its resistance to abrasion and wear characteristics. Nickel plating is widely specified as a disc coating for butterfly valves. For industrial and petroleum ball valves, superior electroless nickel plating (ENP) is used in carbon steel valve components and is in fact superior to stainless steel in hardness but with similar corrosion properties

400 Series Stainless Steel - An alloy of iron, carbon, and chromium. This stainless is normally magnetic due to its martensitic structure and iron-content. 400 series stainless steel is resistant to high temperature oxidation and has improved physical and mechanical properties over carbon steel. Most 400 series stainless steels are heat-treatable. The most common applications in valves are, for stem material in butterfly valves, and trim components such as seat, backseat bushings, discs, wedges etc. in cast steel gate, globe and check valves.

316 Stainless Steel - An alloy of iron, carbon, nickel, and chromium. A non-magnetic stainless steel with more ductility than 400 series SS. Austenitic in structure, 316 stainless steel has very good corrosion resistance to a wide range of environments, is not susceptible to stress corrosion cracking (however it is not suitable for higher levels of H2S typically found in wellhead applications) and is not affected by heat treatment. Very commonly used in valve body and/or trim material.

17-4 PH Stainless Steel - Is a martensitic precipitation/age hardened stainless steel offering high strength and hardness. 17.4 PH withstands corrosive attack better than any of the 400 series stainless steels and in most conditions its corrosion resistance closely approaches that of 300 series stainless steel. 17.4 PH is primarily used as a stem material for butterfly and ball valves as well as any valve application requiring a superior strength stem.

Alloy 20Cb-3 - This alloy has higher amounts of nickel and chromium than 300 series stainless steel and with the addition of columbium, this alloy retards stress corrosion cracking and has improved resistance to sulfuric acid. Alloy 20 is widely used in all phases of chemical processing.

Monel - Is a nickel-copper alloy used primarily as interior trim on all types of valves. One of the most specified materials for corrosion resistance to sea and salt water. Monel is also very resistant to strong caustic solutions.

Stellite - Cobalt base alloy, one of the best all-purpose hard facing alloys. Very resistant to heat, abrasion, corrosion, impact, galling, oxidation, thermal shock and erosion. Stellite takes a high polish and is used in steel valve seat rings. Normally applied with transfer plasma-arc; Stellite hardness is not affected by heat treatment.

Hastelloy C - A high nickel-chromium molybdenum alloy, which has outstanding resistance to a wide variety of chemical process environments including strong oxidisers such as wet chlorine,

chlorine gas, and ferric chloride. Hastelloy C is also resistant to nitric, hydrochloric, and sulfuric acids at moderate temperatures.

RESILIENT LINER MATERIALS

EPDM – EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalies. It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalies. EPDM should not be used on compressed air lines. It has exceptionally good weather aging and ozone resistance. It is fairly good in ketones and alcohols.

Buna-N (Nitrile) (NBR) – Buna-N is a general purpose oil resistant polymer known as nitrile rubber. Nitrile is a copolymer of butadiene and acrylonitrile. Buna-N has good solvent, oil, water and hydraulic fluid resistance. It displays good compression set, abrasion resistance and tensile strength. Buna-N should not be used in highly polar solvents such as acetone and methyl ethyl ketone, nor should it be used in chlorinated hydrocarbons, ozone or nitro hydrocarbons. Some aviation fuels may not be compatible. NBR is very similar but not identical. NBR is the most common grade used for butterfly valve liners where a wide range of resistance is required, including hydrocarbons.

Fluoroelastomer (Viton*) (FKM) – Fluoroelastomers are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility which spans considerable concentration and temperature ranges, fluoroelastomers have gained wide acceptance as a material of construction for butterfly valve O-rings and seats. Fluoroelastomer can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons and petroleum oils. It is particularly good in hydrocarbon service. FKM is not recommended for use in high temperature water.

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Temperature Ratings

Liner Material	Temperature
EPDM**	-29ºC to +121ºC (-20ºF to +250ºF)
Nitrile (Buna-N)	-29ºC to +82ºC (-20ºF to + 180ºF)
Fluoroelastomer	-29ºC to +148ºC (-20ºF to +300ºF)

Proprietary compound formulas are used for each of the elastomers to provide the right combination of seat compression, abrasion resistance and chemical resistance to match your application. Elastomeric seat materials are not suitable for steam service.

**EPDM is rated at 121.11ºC (250ºF) intermittent service and 107.22ºC (225ºF) continuous service

Superseal Liner Materials												
B	E	H	N	NA	NE	S	V	NB	CB	CA	EC	EA
Butyl	EPDM	Hypalon	NBR	Natural rubber	Neoprene	Silicon	Viton	White NBR	Non toxic Natural rubber	Anti-abrasive Natural rubber	High temperature EPDM	Non toxic EPDM