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Engineering Bulletin

Ball Valve Seat and Seal Materials

Seat Materials / Applications

T – Virgin PTFE

Polytetrafluoroethylene- Is a Fluorocarbon-based polymer. This seating material has excellent chemical resistance and low coefficient of friction. PTFE is non-contaminating and accepted by FDA for use in food services. Not recommended for liquid alkalis and fluorine. Affected by radiation with maximum 1×10^4 rads lifetime dose. Its temperature range is -100°F to 450°F (-73°C to 232°C). Color - white

M- TFM® PTFE

Dyneon® TFM PTFE is a modified TFE Polymer. A second generation PTFE that maintains the exceptional chemical and heat resistance properties of first generation PTFE. It has denser polymer structure than conventional PTFE, and exhibits better stress recovery which is important for applications such as seals, seats and gaskets. Its temperature range is -100°F to 500°F (-73°C to 260°C) Color- white.

R- Reinforced Polytetrafluoroethylene (RTFE)

PTFE's mechanical properties are enhanced by adding percentage of filler material to provide improved strength, stability and wear resistance. Reinforcement such as glass fiber permits application at higher pressure and temperature than unfilled TFE. Affected by radiation with maximum 1×10^4 rads lifetime dose Its temperature range is from -320°F to 450°F (-196°C to 232°C). Color- off-white.

N- Nova

This is a Teflon base filled with glass amorphous carbon powder and graphite. It has a lower thermal contraction-expansion than PTFE and is ideal for steam or thermal fluid applications up to 550°F (288°C). Color- black.

D- Delrin®

DuPont's trademark for Polyoxy-methylene. This material is very rigid and does not undergo cold flow. It has a combination of strength, stiffness, hardness, dimensional stability, toughness, fatigue resistance, abrasion resistance, low wear and low friction. It can withstand pressure up to 5000 PSIG depending on valve size. Has a temperature range of -70°F to 180°F (-57°C to 82°C). Better radiation rating than PTFE with maximum 1×10^6 rads lifetime dose Do not use on oxygen service.
Color- glossy white.



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U- Ultra High Molecular Weight Polyethylene (UHMWPE)

Also known as High Modulus Polyethylene (HMPE) or High Performance Polyethylene (HPPE). Very tough material. It is highly resistant to corrosive chemicals, with the exception of oxidizing acids and organic solvents. It has very low coefficient of friction, and highly resistant to abrasion. This is rated to 1500 PSIG at temperatures from -70°F to 200°F (-57°C to 90°C). Color – white.

P- PEEK (Unfilled) Polyetheretherketone

Peek Polymer offers a unique combination of chemical, mechanical and thermal properties. Excellent for water and steam application at elevated temperatures up to 600°F and pressures up to 6000 PSIG. Not applicable for concentrated sulfuric acid.

Excellent resistance to radiation with maximum 1×10^9 rads lifetime dose.

Color- beige.

V- Vespel® SP 21

Vespel is manufactured by DuPont using high performance polyimide resin. SP 21 is 15% by weight graphite filler. Graphite is added to provide low wear and friction for bearings, thrust washers, and dynamic seals. Performs well in a variety of chemical environments and a variety of industrial fluids (fuels, oils, lubricants) at elevated temperatures. Temperature range- can operate continuously from cryogenic temperatures to 650°F (343°C) with brief incursions to 900°F (482°C). Limited to 500°F in oxidizing services. Performs well in **radioactive environments**, even at relatively high dosage rates of exposure levels up to 1×10^8 rads of gamma and electron beam radiation.

K- KEL-F® Polychlorotrifluoroethylene (PCTFE)

PCTFE is a fluorocarbon based polymer. It offers a unique combination of physical and mechanical properties non-flammability, chemical resistance, and near zero moisture absorption. It has a temperature range of -400°F to 400°F (-240°C to 204°C) which is suitable for **cryogenic** applications.



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Metal – Standard – Stainless Steel Type 316 hardened with Stellite ® 6, used with Electroless Nickel Plated Ball. Metal Seats are available in three configurations.

Metal- A Type A Seat Configuration:

This includes the standard metal seat with polymeric seat seals, body seals, and stem packing. It is intended for use in highly abrasive or corrosive applications where higher temperature is not an issue. The service temperature limit for this configuration is 450°F (232°C).

Metal- B Type B Seat Configuration

In this metal seat configuration the polymeric seals are replaced with die-formed flexible graphite seat seals and stem packing. The body seal is spiral wound SS316/flexible graphite in the Series M50; die-formed flexible graphite in the M84/M99. This configuration extends the temperature capability of the metal seated valves to 600°F (316°C), while retaining resistance to abrasion and corrosion. This configuration is suitable for On-Off saturated steam service up to 200 PSIG in Class 150 valves, and 600 PSIG in Class 300 valves (carbon steel construction).

Metal- C Type C Seat Configuration

This arrangement utilizes a downstream metal seat with flexible graphite seat seal, as in the Type B, The upstream seat is spring-loaded against the ball to assist in downstream sealing and to provide compensation for thermal expansion effects at high temperature. Type C configurations are therefore unidirectional and a flow direction arrow is provided on the valve body. The Type C configuration is suitable for temperatures up to 1000°F (538°C), and is recommended for high temperature fluids and gasses, and is suitable for saturated steam to 720 PSIG.



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Body Seal Materials / Applications

B- Buna N or Nitrile

This sealing material is widely used because of its compatibility with most hydraulic fluid media, including petroleum oils, water, water glycol, Di-Ester based fluids, air and inactive gases. Temperature range is from -65°F to 250°F (-54°C to 121°C). Color- black.

N- Neoprene

This sealing material is excellent for refrigerants, ammonia and Freon. Its temperature range is from -35°F to 225°F (-37°C to 107°C). Color- black.

E- Ethylene-Propylene EPDM

This material is recommended for low pressure steam, hot water, phosphate ester base fluid, weak alkalis and acids. Not recommended for petroleum service, hydrocarbons, alcohol and radiation. Its usable temperature range is -65°F to 300°F (-54°C to 149°C). Color- black

V- Viton- Fluorocarbon Rubber (FKM)

Viton is DuPont's trademark for Fluoroelastomer. It is well known for its excellent 400°F (200°C) heat resistance. Viton offers excellent resistant to aggressive fuels and chemicals. It has cold temperature rating of -15°F. Should not be used on steam. Color- red

T- PTFE

Teflon has excellent resistance to a wide range of chemicals. It is excellent at pressures below 1500 PSI. It can withstand temperature fluctuations in excess of 200°F (93°C) and are not reusable. Color- white.

G- Flexible Graphite

Is chemically resistant to attack from nearly all organic and inorganic fluids with exception of highly oxidizing chemicals, and concentrated, highly oxidizing mineral acids. Usable temperature from -70°F to 1000°F (-56°C to 538°C) on almost any media. It is Sharpe Valves standard seals in 1/2" to 4" fire rated valves. Color- shiny black