

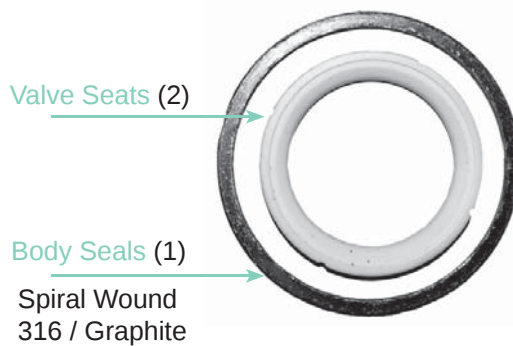


Valve Seat & Seal Selection Guide

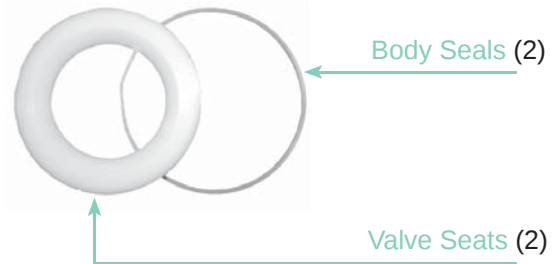
Choosing The Right Seat Material is the Most Challenging Decision in Ball Valve Selection.

Valve Soft Parts

Flanged End



3 Piece C Valves



Flanged End, 2 and 3 Piece Valves share the same stem packing.

V-Ring Stem Seals (5)



Thrust Washers (1 or 2)



VALVE REPAIR KITS INCLUDE ALL SOFT PARTS
Seats - Body Seals - Stem Packing - Thrust Washer

Flo-Tite ball valves are available with a variety of seat & seal options to allow use in a wide range of general as well as special services. The soft-seated ball valves are factory tested for tight shut-off and are built to last.

One of the most important factors affecting shut-off capability is the nature of media being handled. Service life is affected by all of the following factors:

- | | |
|----------------------------------|----------------------------|
| • Pressure | • Type of Media |
| • Temperature | • Cycling Frequency |
| • Degree of Pressure Fluctuation | • Velocity of the Media |
| • Degree of Thermal Fluctuation | • Speed of Valve Operation |

All of these factors are interrelated in actual service. Therefore, maximum service life can be gained by reducing the severity of any of these factors.

Our list of seat materials has been prepared to assist the specifying engineer or the end user in the proper seat and seal selection. This information should be used in conjunction with pressure \ temperature rating graph found in our catalog for the applicable valve.

STANDARD SEAT SELECTIONS

Seat Code	Material	Technical Description	Color	Approx. Torque Adders to the standard seats indicated in catalog page
F	Super-Tek (TFM)	Super-Tek, most popular seat material used by Flo-Tite. Super-Tek (TFM) offers most all of the properties of PTFE with improved thermo-mechanical properties offering lower coefficient of friction for lower torques and less permeability, reduced cold flow deformation, and enhanced deformation recovery. Temperature Range -50°F to 500°F.	Off-White	Standard seats in most valves Torques indicated in catalog pages.
K	Kel F (PCTFE)	This material is a fluorocarbon rubber. Kel F is a registered trademark of 3M Corp. It can be used for cryogenic service at temperatures of -400°F up to 500°F at pressures up to 1500 psi.	Translucent White	+50%
M	Metal	Recommended for service with severe flashing or hydraulic shock, abrasive media or where possible trapped metal may exist. Flo-Tite's metal seats are hand lapped to the ball as individually matched sets, assuring line contact between valve ball and seats, resulting in smooth operation and tight shut off class. Flo-Tite offers metal seats in different classes of Shut Off including Class IV, V and VI. Extreme series can reach temperature up to 1200°F.	Metallic	ANSI Class 150 +60% ANSI Class 300 +70% ANSI Class 600 +80%
P	Peek	This material offers a unique combination of chemical, mechanical, electrical, and thermal properties. The only solvents which will attack Peek is concentrated nitric acid & sulfuric acid. It will withstand temperatures up to 600°F and pressures up to 4500 psi.	Black	+60%
Q	Cryo-Tek	Cryo-Tek is a form of modified PTFE, which contains bronze and other cryogenic fillers, specially suitable for LOX service. Excellent seat material for difficult applications. Temperature Range -400°F to 400°F.	Bronze	+30%
R	Reinforced TFE	This is produced by adding 15% fibrous glass or carbon to Virgin Teflon and has a greater pressure temperature rating than Teflon up to 420°F. They also have a better cycle life than Teflon.	Off-White	Standard as indicated in literature
S	Stainless Filled PTFE (S-Tek)	S-Tek (stainless filled PTFE) combines the strength of metal with the lubricity of PTFE. 50% 316 powder combined with 50% PTFE. Offers the abrasion resistance of metal with higher pressure and temperature ratings than RPTFE. Temperature rating -20° to 550° / Steam rating 250 SWP.	Dark Gray	+50%
T	Virgin TFE	This is the most widely used seating material and is excellent for most services. It has excellent chemical resistance throughout valve industries and a low coefficient of friction. Temperature Range -50°F to 450°F.	White	Standard as indicated in literature
U	UHMW Polyethylene	UHMW polyethylene is used for highly radioactive materials where PTFE is not acceptable (> 104 rads) and is rated 2 x 10⁷ rads. These seats also meet the requirements of the tobacco industry whenever PTFE is prohibited, and are especially well-suited for handling highly abrasive media. Temperature Range -70°F to 200°F, not suitable for steam.	Opaque White	+40%
V	Devlon	Devlon material is one of the toughest and hardest wearing thermoplastics available. It provides wear resistance, impact strength, and moisture absorption properties. Devlon is used in many valve seats which require a broad range of working temperatures, excellent corrosion resistance and outstanding resistance in high pressure applications. Temperature Range -50°F to 350°F.	Yellow	+40% if not listed as standard material and indicated in literature
X	Super-Tek II	Carbon/Graphite Filled TFM offers exceptional chemical & heat resistance properties. It has a low coefficient of friction for lowering valve torque. It is good for service temperatures ranging from -320°F to 550°F	Black	+10%
Y	Super-Tek III	This is a Teflon base filled with glass amorphous carbon powder and graphite. It has lower thermal contraction-expansion rate than PTFE and is ideal for steam or thermal fluid applications up to 550°F. Super-Tek III is also good for Cryogenic applications as low as -300°F.	Black	+40%
C/F	Cavity Filler	Designed to reduce the possibility of contamination by entrapment of process fluids in the void normally found behind the ball between the valve body in conventionally designed ball valves. Ideal for application where cross contamination is a concern, such as paints or dyes. Available in most seating materials.	White	+50%

Seat Code	Material	Technical Description	Color	Approx. Torque Adds to the standard seats indicated in catalog page
D	DELIN	This seat is very rigid and does not undergo cold flow. It can withstand pressures of up to 6000 psi dependent on valve size and a temperature range of -70°F to 180°F. Delrin also withstands nuclear radiation at doses of up to 106 rads. Do not use for oxygen service or steam.	White	+50%
N	Nylon	Special Nylon seats are offered for higher pressure and lower temperature service. It can be used in high-pressure air, oil and other gas media but are not suited for strong oxidizing agents. Temperature rating -30°F to 200°F.	Translucent White	+40%

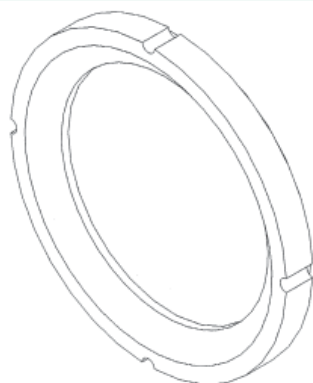
STANDARD SEAL SELECTIONS

Seal Code	Material	Technical Description	Color
G	GRAPHOIL	Usable from -418°F to 1022°F on almost any media. It is the standard seal on all fire-rated valves.	Black
R	Reinforced TFE	This is produced by adding 15% fibrous glass to Virgin Teflon and has a greater pressure temperature rating than Teflon. It also has a better cycle life than Teflon.	Off-White
S	Stainless Filled TFE	Combines the strength of metal with the lubricity of TFE. 50% 316 powder combined with 50% TFE. Offers the abrasion resistance of metal with higher pressure and temperature ratings than RPTFE. Temperature rating -20°F to 550°F / Steam rating 250 SWP.	Gray
T	Virgin TFE	Teflon is excellent at pressures below 1500 psi & at temperatures from -20°F to 400°F. It will not withstand temperature fluctuations in excess of 200°F & are not reusable. It has excellent resistance to a wide range of chemicals.	White
U	UHMW Polyethylene	This is rated to 1500 psi at temperatures from -70° to 200°F. This can be used in low to medium level radiation services and in applications where fluorocarbons can not be tolerated. Abrasion resistance is very good.	Opaque White
V	Viton	These body seals are excellent at all rated pressures with a temperature range of -20° to 400°F. Viton is the best elastomer seal for higher temperature applications, BUT IT SHOULD NOT BE USED ON STEAM.	Black
G	Spiral Wound Wire Graphite	Manufactured by spirally winding a preformed V shape SS316 metal strip and a graphite sealing filler in combination. This gasket has adequate flexibility and recovery to maintain a seal under variable and uneven loading, pressure, temperature fluctuation, bolt stress relaxation, and creep. Temperature range from -320° to +1000°F.	Black

New seat & seal materials and sealing techniques continuously become available through our dedicated research and development programs. For seat or seal application requirements not covered in this bulletin, please consult Flo-Tite. (910)738-8904

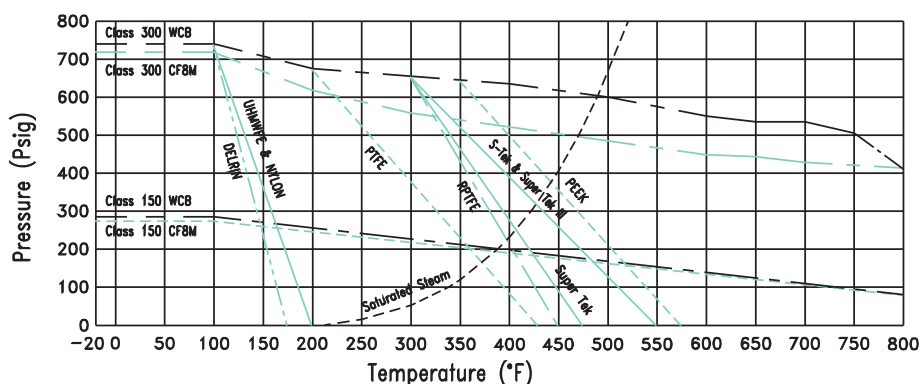
All products that contain plastics and elastomers comply with USP Biological Reactivity Test #87 & #88, Class VI plastics and FDA CFR21 Part 177.

Pressure Relieving & Equalizing Seat Design



Specially designed seats allow equalization of pressure in the ball cavity which reduces operating torque and increases seat life.

Pressure Temperature Chart



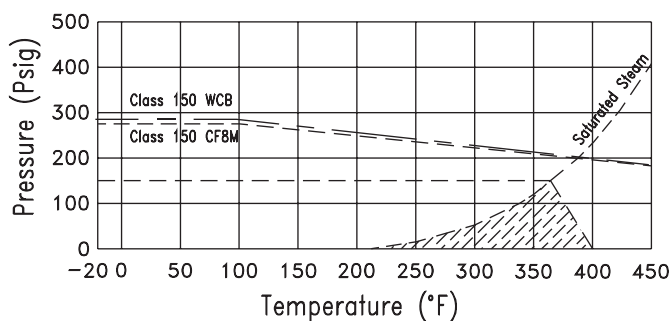
STEAM APPLICATION TECHNICAL DATA

Steam is damaging to valve parts at the moment of opening and closing or when throttling. High velocity of steam can erode the seat and metal parts. High speed steam may carry water droplets, dissolved gases, and other suspended solids, resulting in severe erosion and corrosion. In addition, steam systems will often go through a thermal cycle of start-up and shut down. This thermal cycle presents a special challenge to the sealing capability of the valves in steam service. Ball valves are well suitable for steam service if the material selection and valve design are properly selected. However, like all other valves, ball valves are generally rated at a lower pressure for steam service than for liquid or dry gaseous service.

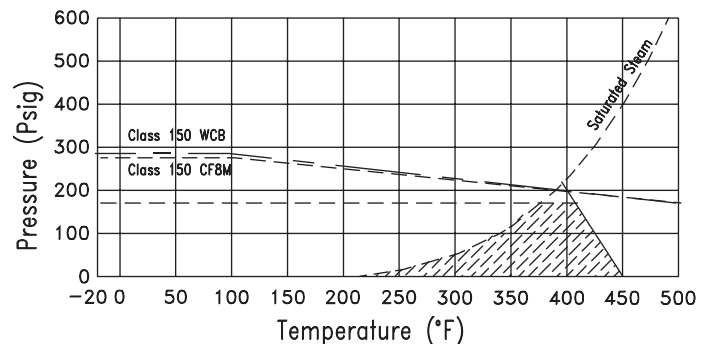
Flo-Tite Ball Valves are an excellent choice for a wide range of steam services. Graphite body seals are completely encapsulated and contained. Stem packings are live-loaded for all sizes. Live-loaded stem packing will compensate for thermal cycling and well-contained body seals will prevent extrusion into crevices during thermal cycle. Our standard design valves are provided with a 1/8" hole drilled in the stem tang slot. This feature is critical for steam service since it prevents excessive pressure build-up in the cavity from trapped liquid when the valve is in the open position. Flo-Tite ball valves are supplied with stainless steel balls and stems as standard. This is especially suitable for steam service since aggressive steam attacks coated carbon steel trims.

As a standard, Flo-Tite designs valves with stainless steel trim and Super-Tek TFM seats. These are good for 150 psig saturated steam. When equipped with S-Tek or Super-Tek III seats, Flo-Tite valves are good for 250 psig saturated steam. Other seat options will bring Flo-Tite valves to higher steam pressure rating. See chart below.

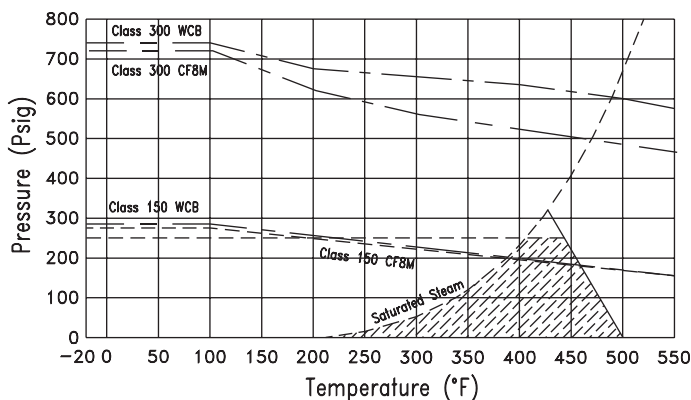
Service Pressure	Corresponding Saturated Steam Temperature	Seat	Stem Seal	Body Seal
Pressure Steam up to 150 psi	Maximum 366 °F	PTFE or Super-Tek	TFM	Graphite
Pressure Steam up to 170 psi	Maximum 375 °F	RPTFE	Graphite	Graphite
Pressure Steam up to 250 psi	Maximum 406 °F	S-Tek or Super Tek III	Graphite	Graphite
Pressure Steam up to 300 psi	Maximum 422 °F	Peek	Graphite	Graphite
Pressure Steam above 300 psi	Higher than 422 °F	Metal	Graphite	Graphite



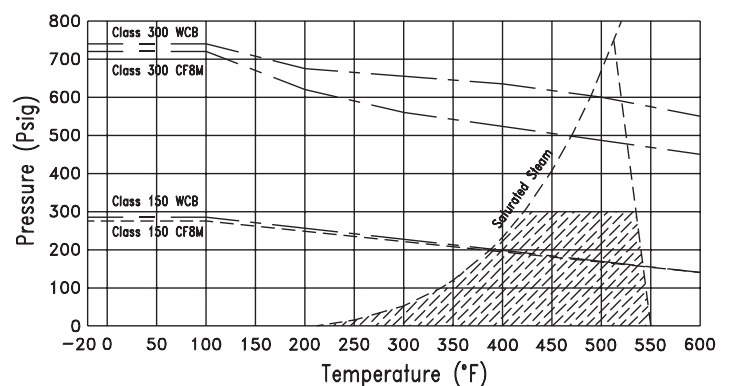
Steam Rating (PTFE & SuperTek)



Steam Rating (RPTFE)



Steam Rating (S-Tek & SuperTek III)



Steam Rating (PEEK), 6" & smaller



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