

APPLICATIONS - VALVE SOFT SEAT/SEAL MATERIALS

One of the most important factors affecting shutoff capability is the nature of media being handled. Service life is affected by all of the following factors: - pressure, temperature, degree of pressure fluctuation and thermal fluctuation, type of media, cycling frequency, velocity of media & speed of valve operation.

The following seat & seal materials can be used in various valves such as ball, plug, butterfly, needle, etc.

BUNA-N (HYCAR or Nitrile) - Buna-N is a general-purpose polymer which has good resistance to oil, water, solvents and hydraulic fluids. It also displays good compression, abrasion resistance, and tensile strength. This material performs extremely well in process areas where paraffin base materials, fatty acids, oils, alcohols or glycerins are present, since it is totally unaffected. It should not be used around high polar solvents (acetones, ketones), chlorinated hydrocarbons, ozone or nitro hydrocarbons. Temperature range is 107°C maximum. Hycar is black in colour and should not be used where discolouration cannot be tolerated. It is regarded as a comparable replacement neoprene. Major differences are: Buna-N has a higher temperature limit; neoprene is more resistant to oils.

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 alkalines. It is susceptible to attacks by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalines. EPDM should not be used on compressed air lines. It has exceptionally good weather aging and ozone resistance. Temperature rating is from -29°C to 107°C (121°C intermittent service). It is fairly good for ketones and alcohols.

HYPALON® - Hypalon has very good resistance to oxidation, ozone and good flame resistance. It is similar to neoprene except with improved acid resistance where it will resist such oxidizing acids as nitric, hydrofluoric and sulfuric acid. Abrasion resistance of Hypalon is excellent, about the equivalent of the nitriles. Oil and solvent resistance is somewhat between that of neoprene and nitriles. Salts have little if any effect on Hypalon. Hypalon is not recommended for exposure to concentrated oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons. Not to be used in steam service. Temperature rating is from -18°C to 104°C. Seats are white food grade and may be used on food service as well as bleached paper lines.

NEOPRENE - Neoprene is an all-purpose polymer with many desirable characteristics. Neoprene features high resiliency with low compression set flame resistance and animal and vegetable oil resistance. It is principally recommended for use in pulp and paper applications. Generally, neoprene is not recommended and is attacked by strong oxidizing acids, most chlorinated solvents, esters, ketones, aromatic hydrocarbons and hydraulic fluids. Neoprene is not generally affected by moderate chemicals, fat, greases and many oils and solvents. Temperature rating is from -29°C to 82°C. Seats are black in colour and should not be used on bleached paper lines.

PTFE (TFE of Teflon®) - PTFE is the most chemically resistant of all plastics. It also has excellent thermal and electrical insulation properties. PTFE's mechanical properties are low compared to other engineering plastics, but its properties remain at useful levels over a great temperature range (-100°C to 204°C, depending on brand and application).

RTFE (Reinforced TFE) - RTFE is compounded with a selected percentage of fibre glass filler to improve strength and resistance to abrasive wear, cold flow, and permeation in molded seats. Reinforcement permits application at higher pressure and temperature than unfilled TFE. Typical temperature range is -60°C to 232°C. RTFE should not be used in applications that attack glass, such as hydrofluoric acid and hot strong caustics.

CARBON FILLED TFE - Carbon filled TFE is an excellent seat material for steam applications as well as high efficiency oil-based thermal fluids. Fillers including graphite enable this seat material to have a better cycle life than other filled or reinforced TFE seats. Temperature range is -50°C to 260°C. Chemical resistance is equal to other TFE seats.

TFM1600 - TFM1600 is a modified version of PTFE that maintains the exceptional chemical and heat resistance properties of PTFE, but has a significantly lower melt viscosity. The result is reduced cold flow, porosity, permeability and void content. Surfaces are smoother and reduce torques. Temperature range -56°C to 246°C. The theoretical service range for TFM1600 is -200°C to 260°C.

TFM1600+20%GF - TFM1600+20%GF is a fibre glass reinforced version of TFM1600. Similar to RTFE, but with the benefit of TFM1600, the glass filled version provides greater abrasion resistance and improves stability at higher pressures.

TFM4215 - TFM4215 is an electro graphitised carbon filled TFM material. The added carbon improves stability for higher pressure and temperature combinations.

VITON® (Fluorocarbon, FKM, or FPM) - Fluorocarbon elastomers are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility which spans considerable concentration and temperature ranges, fluorocarbon elastomers have gained wide acceptance as a material of construction for knife gate valve seats. Fluorocarbon can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons and

petroleum oils. It is particularly good in hydrocarbon service. Temperature rating is from -29°C to 149°C. Colour is grey (black) or red and may be used on bleached paper lines. Fluorocarbon (VITON) is not suitable for steam or hot water service, however, in o-ring form it can be acceptable for hydrocarbon lines mixed with hot water depending on the type/brand. For seat materials FKM can offer more resistance to hot water - consult manufacturer.

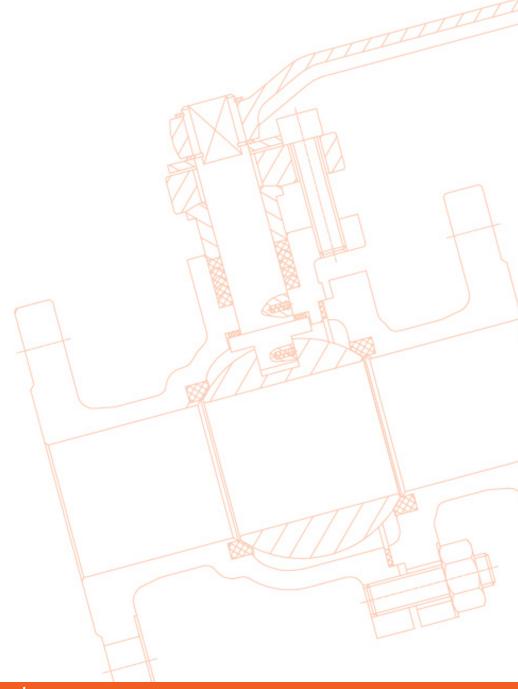
PEEK - Polyetheretherketone - high pressure semi-rigid elastomer. Best suited for high pressure and temperature service. Also offers very good corrosion resistance. Temperature rating -56.6°C to 288°C.

DELRIN/POM - Special Delrin seats offered for higher pressure and lower temperature service. Can be used in high pressure air, oil and other gas media but are not suited for strong oxidizing. Temperature rating -50°C to 100°C.

NYLON/DEVLON - Nylon (polyamide) seats are offered for higher pressure and lower temperature service. They can be used in high temperature air, oil and other gas media but are not suited for strong oxidizing. Not recommended for water. Temperature rating -50°C to 150°C.

KELF - Recommended for cold service with good resistance to violent temperature fluctuations. It is good for cryogenic service down to -198°C and has a higher deformation rating and density than PTFE.

UHMW POLYETHYLENE - Ultra-high molecular weight Polyethylene, ideal for use in low level radiation service. This eat also meets the requirements of the tobacco industry where TFE is prohibited and it offers excellent resistance to abrasive media. Temperature range -56.6°C to 93°C.



BALL VALVE SEAT/SEAL SELECTION GUIDE

STANDARD BALL VALVE SEAT SELECTIONS

Material	Technical Description	Typical Colour	Approx. Torque Adder vs PTFE*
DELRIN/POM	Delrin® is one trade name for POM. Competitors just market it as POM. This seat is very rigid and does not undergo cold flow. Delrin can withstand pressures of up to 6,000 psi dependant on valve size and temperature range of -57°C to 82°C. Delrin/POM also withstands nuclear radiation at doses of up to 106 rads. Delrin/POM has low water absorption. Do not use on oxygen service, or steam. Different brands may vary the PTFE filled percentage providing wider temperature & service range and a superior seal.		up to 50%
TFM	TFM offers all of the properties of reinforced TFE with greater strength, toughness, and improved thermal mechanical properties offering lower coefficient of friction for lower torques and less permeability, reduced cold flow deformation and enhanced deformation recovery. Temperature range -45°C to 260°C.	Off-White	10% Less than RPTFE
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 -240°C to 260°C at pressures up to 15,000 psi.		up to 45%
Metal to Metal	Recommended for service with severe flashing or hydraulic shock, abrasive media or where possible trapped metal may exist. APV'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. APV offers metal seats in different classes of Shut Off including Class I, V and VI.	Metallic	up to 50%
Nylon/Devlon	Special Nylon seats are offered for higher pressure and lower temperature service. They can be used in high-pressure air, oil and other gas media but are not suited for strong oxidising agents. Temperature rating -50°C to 150°C.	Translucent White	up to 35%
PEEK	This material offers a combination of chemical mechanical electrical and thermal properties. The only known solvent of PEEK is concentrated sulfuric acid. It will withstand temperatures up to 316°C and pressures up to 6,000 psi.	Brown	up to 50%
Reinforced TFE	This produced by adding at least 15% fibrous glass to virgin Teflon and has a greater pressure temperature rating than Teflon. RPTFE also has a better cycle life than Teflon.	Off-White	Standards as indicated in literature
Metal PTFE	Metal PTFE seats provide the combined strength of metal with the lubricity of TFE. These seats are 50% 316 powder combined with 50% TFE. Offer the abrasion resistance of metal with higher pressure and temperature ratings than RPTFE. Temperature rating -29°C to 288°C/ steam rating 250 SWP.	Grey	up to 50%
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 low coefficient of friction. Temperature range -45°C to 232°C.	Opaque White	Standards as indicated in literature
UHMW Polyethylene	UHMW polyethylene is used for highly radioactive materials where TFE is not acceptable (< 104 rads) and is rated 2 x 107 rads. These seats also meet the requirements of the tobacco industry whenever TFE is prohibited, and are especially well-suited for handling highly abrasive media. Temperature range -57°C to 93°C, not suitable for steam.	Off-White	up to 35%
Carbon PTFE	This is a Teflon base filled with carbon powder and graphite. It has a lower thermal contraction-expansion rate then PTFE and is ideal for steam or thermal fluid applications up to 302°C.	Black	up to 50%
* F I	the terral differential will be less	/ / - 1/1	

^{*} For larger sizes the torque differential will be less.

BALL VALVE SEAT GUIDE FOR STEAM USE

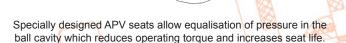
Service Pressure Corresponding Saturated Steam Temperature		Seat	Stem Seal	Body Seal
Pressure steam up to 150 psi	Maximum 186°C	PTFE or TFM	TFM	Graphite
Pressure steam up to 170 psi	Maximum 191°C	RPTFE	Graphite	Graphite
Pressure steam up to 250 psi	Maximum 208°C	Carbon PTFE or Metal PTFE	Graphite	Graphite
Pressure steam up to 300 psi	Maximum 217°C	Peek	Graphite	Graphite
Pressure steam above 300 psi	Higher than 217°C	Metal	Graphite	Graphite

BALL VALVE SEAT/SEAL SELECTION GUIDE

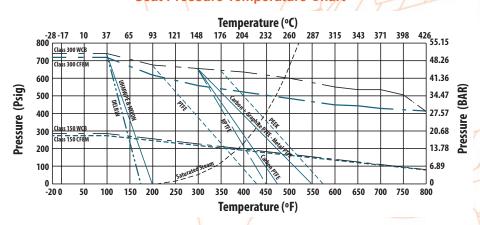
STANDARD BALL VALVE SEAL SELECTIONS

Material	Technical Description		
GRAPHOIL	Usable from -57°C to 538°C on almost any media. It is the standards seal on all fire rated valves.		
Reinforced TFE	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Stainless Filled TFE	apragion regigiance of metal with higher pressure and temperature ratings than RPTEE. Temperature rating		
Virgin TFE	Teflon is excellent as pressure below 1,500 psi & at temperatures from -29°C to 204°C. It will not withstand temperature fluctuations in excess of 93°C & are not reusable. It has excellent resistance to a wide range of chemicals.		
UHMW Poly- ethylene	radiation service and in applications where tillorocarbons can not be tolerated. Aprasion resistance is dilite		
Viton	These body seals are excellent at all rated pressures with a temperature range of -29°C to 204°C. Viton is the best elastomer seal for higher temperature applications, but it should not be used on steam. There are numerous grades of viton available including Anti Explosive Decompression (A.E.D.)	Black	
Spiral Wound Wire Graphite	ound Wire loading, pressure, temperature fluctuation, holt stress, relaxation, and creen. Temperature range from 160°C to		

Pressure Relieving & Equalising Seat Design



Seat Pressure Temperature Chart



VALVE SEATS AND SEALS MATERIALS - TEMPERATURE RANGE

	SEALS MATERIALS						
MATERIAL TYPE		TEMPERATURE RANGE		APPLICATION	RECOMMENDATIONS		
		°C	°F AT LIGATION		REGOMMENDATIONS		
STANDARD	REINFORCED PTFE	-190	-310	Medium pressure	Higher temperature and Pressure than Virgin PTFE.		
	20% Carbon + 5% Graphite	+250	+482	Low/High temperature	Good for Steam Service		
	VIRGIN PTFE	-196 +200	-319 +392	Low pressure Low torque - Low temperature	All services subject to temperature limitation		
	REINFORCED PTFE + BRONZE	-196 +250	+310 +482	Medium pressure Low//High temperature	Auto lubricant properties - recommended for steam		
	DEVLON - V	-100	-148	High pressure	1100 111 -1 1		
-	POLYAMIDE - NYLON	+155	+311	High temp - Low temperature	H2S and Hydrocarbons		
	GRAPHITE	-90	-130	Low pressure	Not quitable for high quales or automated values		
		+350	+662	High temperature	Not suitable for high cycles or automated valves		
	DELRIN	-70	-94	High pressure	Hydrocarbons, NACE.		
[⁻	ACETAL RESIN	+95	+203	Low temperature	Co2. Do not use for oxygen		
PERFORMANCE	PEEK	-80	-62	High pressure	Hydrocarbons, NACE.		
≥	POLY ETHER KETONE	+250	+482	High temperature	For Tobacco and Nuclear Service		
Ö	VESPEL SP 21	-200	-328	High pressure	Good Chemical Resistance. For Gas, Oil, Petroleum.		
꿉	POLYIMIDE	+260	+500	High temperature	Not for Steam		
H	UHMWPE	-150	-240	Low pressure	Food and Tobacco industries.		
HIGH	POLYETHYLENE	+150	+300	Low torque	Nuclear Service.		
	KEL'F	-196	-319	High pressure	Like virgin PTFE but improved resistance to nitric		
	PCTFE	+150	+302	Low temperature	acid, hydrofluoric acid and liquid oxygen		
	PFA	-60	-76	Medium pressure	Lower porosity - Particularly Good to Avoid		
	PFA	+250	+482	Low/Medium temperature	Polymerisation		
	METAL SEAT	-200	-328	High pressure	Abrasion and high temperature applications		
	(Tungsten carbide or chrome carbide)	+500	+932	High temperature	Abrasion and high temperature applications		

SEATS MATERIALS						
MATERIAL TYPE			TEMPERATURE RANGE ℃		APPLICATION	
O-RINGS	NITRILE	NBR	-30	+120 CONTINUOUS +150 INTERMITTENT	Water	
	HYDROGENATED NITRILE	HNBR	-46	+160 CONTINUOUS +180 INTERMITTENT	H2S, crude oil, hydrocarbons, small concentration of methanol	
	MODIFIED HYDROGENATED NITRILE	HNBR-LT	-55	+160 CONTINUOUS +180 INTERMITTENT	H2S, crude oil, hydrocarbons, small concentration of methanol	
	FLUROELASTOMERS (VITON B)	FKM	-20	+220 CONTINUOUS +230 INTERMITTENT	Sour gas, hydrocarbons	
	FLUROELASTOMERS (VITON AED)	FKM	-29	+230 CONTINUOUS +250 INTERMITTENT	Sour gas, hydrocarbons	
	FLUROELASTOMERS (VITON GLT)	FKM	-46 (-40 continuous)	+220 CONTINUOUS +250 INTERMITTENT	Sour gas, hydrocarbons	
	PERFLUROELASTOMERS (CHEMRAZ 526)	FFKM	-25	+315 CONTINUOUS +350 INTERMITTENT	Sour gas, hydrocarbons, high % of methanol	
	PERFLUROELASTOMERS (KALREZ)	FFKM	-25	+325	Sour gas and corrosive fluids	
	AFLAS	FEPM	+5	+200	Amine / Methanol service	
	SILICON+PFA		-60	+250	Low temperature applications/ Good Chemical Resistance	
SPECIAL	EXPANDED GRAPHITE		-240	+680	Used on Metal Seated High Temperature valves	
SPE	LIP SEALS		-196	+260	Good for Chemical Resistance	

FIRE SAFE SEAL					
MATERIAL TYPE		TEMPERATURE RANGE °C		APPLICATION	
GRAPHITE		-200	+400	All - excluding clean services	

~ Fast Track Valve Manufacturer ~

Australian Pipeline Valve provides this technical information to assist the valve community. Please share and refer us to any specifiers or purchasers of valves/actuators within your network.

Click here for our full online stock list https://www.globalsupplyline.com.au/stock-list-valves/

© Copyright Australian Pipeline Valve 2024