

## General Properties of P.T.F.E. (Polytetrafluoroethylene) (CF<sub>2</sub>)<sup>n</sup>

IMPORTANT NOTE: This data is intended as a guide and is taken from polymer manufacturers' data. Grange Tubes LLP cannot take responsibility for the accuracy of the data, and customers must evaluate the material under the relevant conditions if the properties are critical to their applications.

<b>Temperature Resistance</b> -70°C to +260°C	PTFE is extremely stable at high temperatures, and can be used continuously at 260°C. Although it is stable at high temperatures, its mechanical properties decrease with increasing temperature. PTFE is one of the few polymers that retain a measure of toughness and strength even at cryogenic temperatures. It has been used safely in outer space at temperatures approaching absolute zero.			
<b>Chemical Resistance</b>	PTFE is virtually inert to all chemicals. It is resistant to fuming sulphuric and nitric acids, aggressive peroxides, amines, antioxidants (as used in high temperature oils), and methanol (as used in fuel). The only materials known to react with PTFE are: Elemental alkali metals (molten or in solution); Finely divided metal powders (only when ignited); Finely divided mixtures of bronze powder and molybdenum disulphide; Fluorine; Chlorine trifluoride; 80% NaOH or KOH solutions (above 300°C). It is resistant to fuming sulphuric and nitric acids, aggressive peroxides, amines, antioxidants (as used in high temperature oils), and methanol (as used in fuel).			
<b>Solvent Resistance</b>	Organic solvents do not attack or dissolve PTFE, although some permeation may occur as a result of both absorption and diffusion. Obviously, the void content of a finished part will affect permeability significantly. PTFE contains no extractables which can leach out and interact unfavourably with adjacent materials.			
<b>Weathering</b>	PTFE is extremely hydrophobic, and sheds water almost totally. PTFE is also virtually unaffected by oxygen, ozone and visible or UV light. It shows no ageing since no plasticisers, antioxidants or other additives are used during its processing.			
<b>Water Absorption</b>	Max 0.01%			
<b>Flammability</b>	PTFE is essentially non-flammable. It will sustain combustion only in an environment containing >95% oxygen. The flash point is 530°C. It has a UL 94 rating V-0. PTFE does not drip when heated over its gel transition point. This provides an additional safety margin in case of fire.			
<b>Friction &amp; Anti-Stick Properties</b>	PTFE has an extremely low coefficient of friction. The lowest values are obtained under conditions of high pressure and low velocity. Unfilled PTFE wears relatively fast, and is unfit for dynamic bearing applications. Due to its very low surface energy PTFE has excellent anti-stick properties, preventing the build up of sediment or carbon.			
<b>Electrical Properties</b>	PTFE has unique electrical properties; a very low dielectric constant and dissipation factor, excellent dielectric strength, and a very high volume and surface resistivity.			
	Dielectric Strength	40 - 80 kV/mm (Safe Figure 40 kV/mm)	ASTM D149	
	Volume Resistivity	10 <sup>18</sup> Ωcm	ASTM D257	
<b>Mechanical Properties</b>	Surface Resistance	10 <sup>17</sup> Ω	ASTM D257	
	Tensile Strength	Longitudinal	33 N/mm <sup>2</sup>	DIN 53455
		Transverse	31 N/mm <sup>2</sup>	ASTM D1457-81
	Elongation at Break	Longitudinal	350%	DIN 53455
		Transverse	610%	ASTM D1457-81
	Density	2.15 g/cm <sup>3</sup>		ASTM D1457-81
	Shrinkage	Longitudinal	11%	
		Transverse	15%	
Shore Hardness	D 55		ASTM D2240	
<b>Thermal Properties</b>	Service Temperature Range	-70°C to +260°C		
	Gel Transition Range	320°C to 340°C	DTA	
	Thermal Conductivity	0.25 - 0.50W/m.K		DIN 52612
<b>Shelf Life &amp; Storage:</b>	No special requirements* *PTFE Heat Shrink conforming to AMS-DTL-23053/12 specifies a shelf life of 4 years when stored at +18 to +35°C			

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