Technical Data Sheet

General Properties of P.T.F.E. (Polytetrafluoroethylene) $(CF_2)^n$

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.

Temperature Resistance ***-70ºC to +260ºC***

PTFE is extremely stable at high temperatures and can be used continuously at 260ºC. 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.

Chemical Resistance

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% N_aOH or KOH solutions (above 300ºC). 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).

Solvent Resistance

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.

Weathering

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.

Water Absorption	Max 0.01%

Flammability

PTFE is essentially non-flammable. It will sustain combustion only in an environment containing >95% oxygen. The flash point is 530ºC. 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.

Friction & Anti-Stick Properties

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.

Electrical Properties

PTFE has unique electrical properties; a very low dielectric constant and dissipation factor, excellent dielectric strength, and a very high volume and surface resistivity.

	Units	Value
Dielectric Constant	1 MHz	2.1
Dissipation Factor	1 MHz	<0.0001
Arc Resistance	Sec	>300
Volume Resistivity	ohm.cm	$>10^{18}$
Surface Resistivity	ohm/sq	$>10^{18}$
Mechanical Properties		
Specific Gravity		2.1 – 2.2
Tensile Strength	MPa	20 – 39
Elongation	%	230 – 600
Flexural Modulus	MPa	400 – 600
Flex Life (MIT)	Cycles	$> 10^6$
Impact Strength	J/m	180
Hardness	Rockwell	18 – 20
Dynamic Coefficient of Friction	<3 m/min	0.09
Thermal Properties		
Gel Transition Range (Melting Point)	ºC	320 – 340
Upper Service Temperature (20,000h)	ºC	260
Linear Thermal Expansion Coefficient	10^{-5}/ºC	9 – 11
Heat Distortion Temperature 4.6 kg/cm²	ºC	120
Heat Distortion Temperature 18.5 kg/cm²	ºC	50
UL94 Flame Rating		V-0
Limiting Oxygen Index	%	> 95
Heat of Combustion	MJ/kg	5.1

Shelf Life & Storage

No special requirements*
*PTFE Heat Shrink Dimensional Life: The dimensional life of a product applies to the expanded ID, recovered ID and wall thickness dimensions of the product as sold by the manufacturer, distributors and rebrand distributors. AS23053/12 products can be expected to have a minimum dimensional life of 4 years when stored between 0 – 35ºC. Products stored above these conditions may not meet the minimum expanded ID requirements of the detail specification. A product may be used by the final purchaser beyond the expected minimum dimensional life, as long as the expanded ID, recovered ID and wall thickness of the product meets the requirements of this specification at the time of use.

PRODUCT COMPLIANCE

European Regulation (EC) No. 1907/2006 The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
None of the Substances of Very High Concern (SVHC) included in the list of candidates for authorisation published by the European Chemicals Agency are present in concentrations greater than those permitted in any of the products manufactured and supplied by Grange Tubes LLP.
Directive (EU) 2017/2102 amending Directive 2011/65/EU - The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment – RoHS3
None of the substances restricted by RoHS3 are present in quantities above those permitted within the regulation in any of the products manufactured and supplied by Grange Tubes LLP.