



## Symalit 1000 PFA

Symalit 1000 PFA is a semi-crystalline unreinforced fluoropolymer combining outstanding chemical and heat resistance with good mechanical properties. Another remarkable feature of this material is its outstanding electrical properties: a relative permittivity and dielectric dissipation factor coming very close to those of PTFE but an up to 4 times higher electric strength. Symalit 1000 PFA is used extensively in the chemical processing industries and the semiconductor industry thanks to its virtually universal chemical resistance even at high temperatures.

Properties	Test Methods	Units	Values
Colour	-	-	Natural
Density	ISO 1183-1	g/cm <sup>3</sup>	2.14
Water Absorption:			
After 24/96 h immersion in water of 23°C (1)	ISO 62	mg	0.6 / 1.4
	ISO 62	%	0.004 / 0.010
At saturation in air of 23°C / 50% RH	-	%	0.01
At saturation in water of 23°C	-	%	<0.03

Thermal Properties	Test Methods	Units	Values
Melting temperature (DSC, 10°C/min)	ISO 11357-1/-3	°C	305
Glass transition temperature (DSC, 20°C/min) -(3)	ISO 11357 -1/-2	°C	-
Thermal conductivity at 23°C	-	W/(K.m)	0.20
Coefficient of linear thermal expansion:			
Average value between 23 & 60°C	-	m/(m.K)	135 x 10 <sup>-6</sup>
Average value between 23 & 150°C	-	m/(m.K)	150 x 10 <sup>-6</sup>
Average value above 150°C	-	m/(m.K)	250 x 10 <sup>-6</sup>
Temperature of deflection under load:			
Method A: 1.8Mpa	+ ISO 75-1/-2	°C	40
Max allowable service temperature in air:			
For short periods (4)	-	°C	280
Continuously for 5,000 / 20,000 h (5)	-	°C	250
Min service temperature (6)	-	°C	-200
Flammability (7):			
"Oxygen Index"	ISO 4589-1/-2	%	≥95
According to UL 94 (3 / 6mm thickness)	-	-	V-0 / V-0



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Mechanical Properties at 23°C (8)	Test Methods	Units	Values
Tension test (9):			
Tensile strength at yield / tensile strength at break (10)	+ ISO 527-1/-2	MPa	15 / -
Tensile strength (10)	+ ISO 527-1/-2	MPa	30
Tensile strain at yield (10)	+ ISO 527-1/-2	%	50
Tensile strain at break (10)	+ ISO 527-1/-2	%	>50
Tensile modulus of elasticity (11)	+ ISO 527-1/-2	MPa	575
Compression test (12):			
Compressive stress at 1 / 2 / 5 & normal strain (11)	+ ISO 604	MPa	5.5 / 10 / 16
Charpy impact strength – Unnotched (13)	+ ISO 179-1/1eU	kJ/m <sup>2</sup>	No break
Charpy impact strength – notched (13)	+ ISO 179-1/1eA	kJ/m <sup>2</sup>	75P
Ball indentation hardness (14)	+ ISO 2039-1	N/mm <sup>2</sup>	35
Rockwell hardness (14)	+ ISO 2039-2	-	R 70

Electrical Properties at 23°C	Test Methods	Units	Values
Electrical strength (15)	+ IEC 60243-1	kV/mm	35
Volume resistivity	+ IEC 60093	Ohm.cm	>10 <sup>14</sup>
Surface resistivity	+ IEC 60093	Ohm	>10 <sup>13</sup>
Relative permittivity $\epsilon_r$ :- at 100 Hz	+ IEC 60250	-	2.1
At 1 MHz	+ IEC 60250	-	2.1
Dielectric dissipation factor $\tan \delta$ : - at 100 Hz	+ IEC 60250	-	<0.0005
At 1 MHz	+ IEC 60250	-	<0.0005
Comparative tracking index (CTI)	+ IEC 60112	-	600



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## Legend:

- + : values referring to dry material.  
++ : values referring to material in equilibrium with the standard atmosphere 23°C / 50% RH (mostly derived from literature).

1. According to method 1 of ISO 62 and done so on discs  $\varnothing$  50mm x 3mm.
2. The figures given for these properties are for the most part derived from raw material supplier data and other publications.
3. Values for this property are only given here for amorphous materials and not semi-crystalline ones.
4. Only for short time exposure (a few hours) in applications where no or only very low load is applied to the material.
5. Temperature resistance over a period of 5,000/20,000 hours. After these periods of time, there is a decrease in tensile strength – measured at 23°C – of about 50% as compared with the original value. The temperature values given here are thus based on the thermal-oxidative degradation which takes place and causes a reduction in properties. Note: however, that the maximum allowable service temperature depends in many cases essentially on the duration and the magnitude of the mechanical stresses to which the material is subjected.
6. Impact strength decreasing with decreasing temperature, the minimum allowable service temperature is practically mainly determined by the extent to which the material is subjected to impact. The value given here is based on unfavourable impact conditions and may consequently not be considered as being the absolute practical limit.
7. These estimated ratings, derived from raw material supplier data and other publications, are not intended to reflect hazards presented by the material under actual fire conditions. There is no 'UL File Number' available for Simalit 1000 PFA stock shapes.
8. The figures given for the properties of dry material (+) are for the most part average values of tests run on test specimens machined out of rods  $\varnothing$  40 – 60mm. Except for the hardness tests, the test specimens were then taken from an area mid between centre and outside diameter, with their length in longitudinal direction of the rod (parallel to the extrusion direction). Considering the very low water absorption of Simalit 1000 PFA the values for the mechanical and electrical properties of this material can be considered as being practically the same for dry (+) and moisture conditioned (++) test specimens.
9. Test specimens: Type 1 B
10. Test speed: 50 mm/min [chosen acc. To ISO 10350-1 as a function of the ductile behaviour of the material (tough or brittle)]
11. Test speed: 1mm/min.
12. Test specimens: cylinders  $\varnothing$  8mm x 16mm
13. Pendulum used: 4 J
14. Measured on 10mm thick test specimens (discs), mid between centre and outside diameter.
15. Electrode configuration:  $\varnothing$  25 /  $\varnothing$  75mm coaxial cylinders; in transformer oil according to IEC 60296; 1mm thick test specimens.

This table, mainly to be used for comparison purposes, is valuable help in the choice of material. The data listed here fall within the normal range of product properties. **However, they are not guaranteed and they should not be used to establish material specification limits nor used as the basis of design.**



The data are typical values and are not intended to represent specifications. Their aim is to guide the user towards a material choice. All statements, technical information and recommendations in this product datasheet are presented in good faith, based upon tests believed to be reliable and practical experience. However, Bay Plastics Ltd cannot guarantee accuracy or completeness of this information, and it is the buyer's responsibility to determine the suitability of products in any given application. Therefore no liability whatsoever shall attach to Bay Plastics Ltd for any infringement of the rights owned or controlled by a third party in intellectual, industrial or other property by reason of application, processing or use of the aforementioned information products by the buyer.

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