

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 (dielectric constant) 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 (CPI) and the semiconductor industry thanks to its virtually universal chemical resistance even at high temperatures (protective linings for pumps, valves, pipes scrubbing towers, tanks, vessels, reactors and heat exchangers).

Physical properties (indicative values [■])

PROPERTIES	Test methods	Units	VALUES
Colour	-	-	natural (white)
Density	ISO 1183-1	g/cm ³	2.14
Water absorption:			
- after 24/96 h immersion in water of 23 °C (1)	ISO 62	mg	0.6 / 1.4
- at saturation in air of 23 °C / 50 % RH	ISO 62	%	0.004 / 0.010
- at saturation in water of 23 °C	-	%	0.01
- at saturation in water of 23 °C	-	%	< 0.03
Thermal Properties (2)			
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 and 100 °C	-	m/(m.K)	135 x 10 ⁻⁶
- average value between 23 and 150 °C	-	m/(m.K)	150 x 10 ⁻⁶
- average value above 150 °C	-	m/(m.K)	250 x 10 ⁻⁶
Temperature of deflection under load:			
- method A: 1.8 MPa	ISO 75-1/-2	°C	40
Max. allowable service temperature in air:			
- for short periods (4)	-	°C	280
- continuously : for min. 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 (1.5 / 3 mm thickness)	-	-	V-0 / V-0
Mechanical Properties at 23 °C (8)			
Tension test (9):			
- tensile stress at yield / tensile stress 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 % nominal strain (11)	ISO 604	MPa	5.5 / 10 / 16
Charpy impact strength - unnotched (13)	ISO 179-1/1eU	kJ/m ²	no break
Charpy impact strength - notched	ISO 179-1/1eA	kJ/m ²	75P
Ball indentation hardness (14)	ISO 2039-1	N/mm ²	35
Rockwell hardness (14)	ISO 2039-2	-	R 70
Electrical Properties at 23 °C			
Electric strength (15)	IEC 60243-1	kV/mm	35
Volume resistivity	IEC 60093	Ohm.cm	> 10 ¹⁴
Surface resistivity	ANSI/ESD STM 11.11	Ohm/sq.	> 10 ¹³
Relative permittivity ε _r : - at 100 Hz	IEC 60250	-	2.1
- at 1 MHz	IEC 60250	-	2.1
Dielectric dissipation factor tan δ: - at 100 Hz	IEC 60250	-	< 0.0005
- at 1 MHz	IEC 60250	-	< 0.0005
Comparative tracking index (CTI)	IEC 60112	-	600

Note: 1 g/cm³ = 1,000 kg/m³; 1 MPa = 1 N/mm²; 1 kV/mm = 1 MV/m.

Symalit[®] is a registered trademark of the **Quadrant Group**.

This product data sheet and any data and specifications presented on our website shall provide promotional and general information about the Engineering Plastic Products (the "Products") manufactured and offered by Quadrant Engineering Plastic Products ("Quadrant") and shall serve as a preliminary guide. All data and descriptions relating to the Products are of an indicative nature only. Neither this data sheet nor any data and specifications presented on our website shall create or be implied to create any legal or contractual obligation.

Any illustration of the possible fields of application of the Products shall merely demonstrate the potential of these Products, but any such description does not constitute any kind of covenant whatsoever. Irrespective of any tests that Quadrant may have carried out with respect to any Product, Quadrant does not possess expertise in evaluating the suitability of its materials or Products for use in specific applications or products manufactured or offered by the customer respectively. The choice of the most suitable plastics material depends on available chemical resistance data and practical experience, but often preliminary testing of the finished plastics part under actual service conditions (right chemical, concentration, temperature and contact time, as well as other conditions) is required to assess its final suitability for the given application.

It thus remains the customer's sole responsibility to test and assess the suitability and compatibility of Quadrant's Products for its intended applications, processes and uses, and to choose those Products which according to its assessment meet the requirements applicable to the specific use of the finished product. The customer undertakes all liability in respect of the application, processing or use of the aforementioned information or product, or any consequence thereof, and shall verify its quality and other properties.

Legend:

- (1) According to method 1 of ISO 62 and done on discs Ø 50 mm x 3 mm.
- (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 for materials that do not show a melting temperature (PBI & PI).
- (4) Only for short time exposure (a few hours) in applications where no or only a very low load is applied to the material.
- (5) Temperature resistance over a period of min. 20,000 hours. After this period of time, there is a decrease in tensile strength - measured at 23 °C - of about 50-% as compared with the original value.

The temperature value given here is 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.

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 Symalit 1000 PFA stock shapes.

- (8) Most of the figures given for the mechanical properties are average values of tests run on test specimens machined out of 12 mm thick extruded plate.
- (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: 1 mm/min.
- (12) Test specimens: cylinders Ø 8 mm x 16 mm
- (13) Pendulum used: 4 J.
- (14) Measured on 10 mm thick test specimens.
- (15) Electrode configuration: Ø 25 mm / Ø 75 mm coaxial cylinders ; in transformer oil according to IEC 60296 ; 1 mm thick test specimens.

■ This table, mainly to be used for comparison purposes, is a valuable help in the choice of a 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 alone as the basis of design.**