

## PA 4.6 (POLYAMIDE)

### MATERIAL DATA SHEET

- High mechanical strength, stiffness, hardness and toughness
- Good fatigue resistance
- High mechanical damping ability
- Good sliding properties
- Excellent wear resistance
- Good electrical insulating properties
- Good resistance to high energy radiation (gamma- and X-rays)
- Good machinability

Compared with conventional nylons, PA 4.6 features a better retention of stiffness and creep resistance over a wide range of temperatures as well as superior heat aging resistance. Therefore, applications for PA 4.6 are situated in the "higher temperature area" (80 - 150°C) where stiffness, creep resistance, heat aging resistance, fatigue strength and wear resistance of PA 6, PA 66, POM and PET fall short.

PROPERTIES	Test methods	Units	VALUES
Colour	-	-	Reddish brown
Density	ISO 1183-1	g/cm <sup>3</sup>	1.18
Water absorption:			
- after 24/96 h immersion in water of 23°C	ISO 62	mg	90/180
	ISO 62	%	1.30/2.60
- at saturation in air of 23°C / 50% RH		%	2.8
- at saturation in water of 23°C		%	9.5
Thermal Properties			
Melting temperature (DSC, 10°C/min)	ISO 11357-1/-3	°C	290
Thermal conductivity at 23°C	-	W/(K.m)	0.30
Coefficient of linear thermal expansion:			
- average value between 23 and 60°C	-	m/(m.K)	80x 10 <sup>-6</sup>
- average value between 23 and 100°C	-	m/(m.K)	90x 10 <sup>-6</sup>
Temperature of deflection under load:			
- method A: 1.8 MPa	+ ISO 75-1/-2	°C	160
Max. allowable service temperature in air:			
- for short periods	-	°C	200
- continuously : for 5000 /20000 h	-	°C	150/130
Min. service temperature	-	°C	-40
Flammability:			
- "Oxygen Index"	ISO 4589-1/-2	%	24
- according to UL 94 (1.5 / 3 mm thickness)	-	-	HB / HB
Mechanical Properties at 23°C			
Tension test:			
- tensile stress at yield/ tensile stress at break	+ ISO 527-1/-2	MPa	105/-
	++ ISO 527-1/-2	MPa	55/-
- tensile strength	+ ISO 527-1/-2	MPa	105
- tensile strain at yield	+ ISO 527-1/-2	%	15
- tensile strain at break	ISO 527-1/-2	%	25
	++ ISO 527-1/-2	%	>100
- tensile modulus of elasticity	+ ISO 527-1/-2	MPa	3400
	++ ISO 527-1/-2	MPa	1350
Compression test			
- compressive stress at 1/2/5 % nominal strain	ISO 604	MPa	23 / 45 / 94
Creep test in tension to produce 1% strain in 1000 h ( $\bar{\sigma}_{1/1000}$ )			
	+ ISO 899-1	MPa	22
	++ ISO 899-1	MPa	7.5
Charpy impact strength - Unnotched	ISO 179/1eU	kJ/m <sup>2</sup>	No break
Charpy impact strength - Notched	ISO 179/1eA	kJ/m <sup>2</sup>	8
Izod impact strength – Notched	+ ISO 180/A	kJ/m <sup>2</sup>	8
	++ ISO 180/A	kJ/m <sup>2</sup>	25

Ball indentation hardness		ISO 2039-1	N/mm <sup>2</sup>	165
Rockwell hardness		ISO 2039-2	-	M92
<b>Electrical Properties at 23 °C</b>				
Electric strength	+	IEC 60243-1	kV/mm	25
	++	IEC 60243-1	kV/mm	15
Volume resistivity	+	IEC 60093	Ohm.cm	>10 <sup>14</sup>
	++			>10 <sup>12</sup>
Surface resistivity	+	IEC 60093	Ohm	>10 <sup>13</sup>
	++	IEC 60093	Ohm	>10 <sup>12</sup>
Relative permittivity $\epsilon_r$ : - at 100 Hz	+	IEC 60250	-	3.8
	++	IEC 60250	-	7.4
- at 1 MHz	+	IEC 60250	-	3.4
		IEC 60250	-	3.8
Dielectric dissipation factor $\tan \delta$ : - at 100 Hz	+	IEC 60250	-	0.009
	++	IEC 60250	-	0.13
- at 1 MHz	+	IEC 60250	-	0.019
	++	IEC 60250	-	0.06
Comparative tracking index	+	IEC 60112	-	400
	++	IEC 60112	-	400

Note: 1 g/cm<sup>3</sup> = 1,000 kg/m<sup>3</sup> ; 1 MPa = 1 N/mm<sup>2</sup> ; 1 kV/mm = 1 MV/m.

+ values referring to dry material

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

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