NYLATRON[®] NSM

Nylatron NSM is a proprietary cast nylon 6 formulation containing solid lubricant additives which grant this material selflubricity, excellent frictional behaviour, superior wear resistance and outstanding pressure-velocity capabilities (up to 5 times higher than conventional cast nylons). Being particularly suited for higher velocity, unlubricated moving parts applications, it is the perfect complement to the oil-filled grade Ertalon LFX.

Physical properties (indicative values)

PROPERTIES Test methods. Units VALUES Colour - - grey Density ISO 1183-1 g/cm² 1.14 Water absorption: - - grey - at struction in air of 23 °C (10 % RH - % 0.59 (1.12 - at struction in water of 23 °C (10 % RH - % 6.3 Thermal Properties (2) - % 6.3 Mething temperature (DSC, O'Chrin) ISO 11357-1/.2 °C - Coefficient of Integrature (DSC, O'Chrin) ISO 11357-1/.2 °C - Coefficient of Integrature (DSC, O'Chrin) ISO 11357-1/.2 °C - Coefficient of Integrature (DSC, O'Chrin) ISO 11357-1/.2 °C - Coefficient of Integrature in air: - m(m.K) 80.40 % - - average value between 23 and 100 °C - m(m.K) 80.40 % - - method A: 1.8 MPa + ISO 75-1/.2 °C 165 - method A: 1.8 MPa + ISO 75-1/.2 % -	Physical properties (indicative values)			
ISO 1183-1 g/cm² 1.14 Water absorption: - after 2496 h immersion in water of 23 °C (1) ISO 62 mg 40 / 76 - after 2496 h immersion in water of 23 °C (1) ISO 62 mg 40 / 76 - at saturation in air of 23 °C / 50 % RH - % 2 - at saturation in water of 23 °C - % 2 - at saturation in water of 23 °C - - % 2 - at starting in water of 23 °C 0 '/ 76 - % 2 - astarting in water of 23 °C 0 '/ 76 - % 2 - astarting in water of 23 °C - - % 2 - astarting in water of 23 °C - - W(Km) 0.29 Coefficient of linear thermal expansion: - - m(m, K) 80 × 10 ⁶ - average value between 23 and 60 °C - m(m, K) 80 × 10 ⁶ - - average value between 23 and 100 °C - m(m, K) 80 × 10 ⁶ - - method A: 1.8 MPa + ISO 157.1/-2 %C	PROPERTIES		Test methods	Units	VALUES
Water absorption: - after 24/96 h immersion in water of 23 °C (1) ISO 62 mg 40/ 76 - at saturation in air of 23 °C (1) ISO 62 % 0.59/ 1.12 - at saturation in water of 23 °C - % 2 - at saturation in water of 23 °C - % 2 - at saturation in water of 23 °C - % 2 - astarget main water of 23 °C - % 2 - astarget main water of 23 °C - - % 2 - Collisist straintion in water of 23 °C - - WI(Km) 0.29 Coefficient of linear thermal expansion: - - m(m, K) 80 x 10.6* - average value between 23 and 60 °C - m(m, K) 80 x 10.6* 105 75-17.2 °C 75 Max allowable service temperature (6) - °C 165 - 00 °T - ontinuously, for 5,000 / 20,000 h (5) - °C 165 - 30/ - ensitie strain at yield (7) - °C 165 - - 30/ </td <td>Colour</td> <td></td> <td>-</td> <td>-</td> <td>grey</td>	Colour		-	-	grey
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- after 24/96 h immersion in water of 23 °C (1) ISO 62 mg 40,76 - at saturation in air of 23 °C / 50 % RH - % 6,3 Thermal Properties (2) - % 6,3 Melting temperature (DSC, 10 °C/min) (3) ISO 11357-11-2 °C 2 Thermal Properties (2) - W(K) 0.29 Coefficient of linear thermal expansion: - with (2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2			ISO 1183-1	g/cm ³	1.14
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- at saturation in air of 23 °C / 50 % RH - % 2 - at saturation in water of 23 °C - % 6.3 Thermal Properties (2) - % 6.3 Melting temperature (DSC, 10 °C/min) - (3) ISO 11357-11-2 °C - Idass transition temperature (DSC, 20 °C/min) - (3) ISO 11357-11-2 °C - Thermal conductivity at 23 °C - W(Km) 0.29 Coefficient of linear thermal expansion: - - m(m,K) 80 × 10 ⁶ - average value between 23 and 100 °C - m(m,K) 80 × 10 ⁶ - metiod A: 18 MPa + ISO 75-11-2 °C 75 Max. allowable service temperature in air: - °C 165 - - continuously: for 5,000 / 20,000 h (5) - °C 105 / 90 Min. service temperature (6) - °C 165 - - tensile strength (10) + ISO 4589-11-2 % Pa 80 - tensile strength (10) + ISO 527-11-2 MPa 80 - tensile strength 10) + ISO 527-11-2 MPa 50 <	 after 24/96 h immersion in water of 23 °C (1) 			•	
- at saturation in water of 23 °C - % 6.3 Thermal Properties (2) ISO 11357-1/-3 °C 215 Glass transition temperature (DSC, 20 °C/min) - (3) ISO 11357-1/-2 °C - Thermal conductivity at 23 °C - W(IK.m) 0.29 Coefficient of linear thermal expansion: - m(m.K) 80 x 10 ⁶ - average value between 23 and 60 °C - m(m.K) 95 x 10 ⁶ - average value between 23 and 100 °C - m(m.K) 95 x 10 ⁶ Temperature of deflection under load: - - (C 105 / 95 x 10 ⁶ - method A: 18 MPa + ISO 75-11/-2 °C 75 Max. allowable service temperature in air: - °C 105 / 90 - ontinuously: for 5,000 20,000 h (5) - °C 105 / 90 Min. service temperature (6) - °C 105 / 90 Tension test (9): - - HB / HB Mechanical Properties at 23 °C (3) Temperature of eace eace of eace of eace eace of eace of eace of eace of eace of ea			ISO 62		
Thermal Properties (2) ISO 11357-1/-3 °C 215 Glass transition temperature (DSC, 20 °C/min) - (3) ISO 11357-1/-2 °C - Coefficient of linear thermal expansion: - W/(K.m) 0.29 - average value between 23 and 100 °C - m/(m.K) 80 x 10 ⁶ Temperature of deflection under load: - m/(m.K) 95 x 10 ⁸ Temperature of deflection under load: - °C 165 - ontinuously: icn 5,000 / 20,000 h (5) - °C 105 / 90 Min. service temperature (6) - °C 105 / 90 Flammability (7): - °C 300 - according to U-94 (24 / 6 mm thickness) - °C 105 / 90 Methanizal Properties at 23 °C (3) Tension test (9): - HB / HB - tensile stress at yield / tensile stress at break (10) + ISO 527 / 1/2 MPa 50 - tensile strength (10) + ISO 527 / 1/2 MPa 50 5 - tensile strength (10) + ISO 527 / 1/2 MPa 55			-		
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Coefficient of linear thermal expansion: - ml(m,K) 80 x 10 ⁶ - average value between 23 and 100 °C - ml(m,K) 95 x 10 ⁸ Temperature of deflection under load: - ml(m,K) 95 x 10 ⁸ - method A: 18 MPa + ISO 75-1/-2 °C 75 Max. allowable service temperature in air: - °C 105 / 90 Max. allowable service temperature (6) - °C 105 / 90 Flammability (7): - 0xygen Index" - - - according to UJ 94 (3 / 6 mm thickness) - - - - - tensile stress at yield / tensile stress at break (10) + ISO 4589-1/-2 % - - tensile strain at yield (10) + ISO 527-1/-2 MPa 781 - tensile strain at yield (10) + ISO 527-1/-2 % 5 - tensile strain at yield (10) + ISO 527-1/-2 MPa 3150 + ISO 527-1/-2 % 5 5 5 - tensile strain at yield (10) + ISO 527-1/-2 % 5 5 - tensile strai	Glass transition temperature (DSC, 20 °C/min) - (3)		ISO 11357-1/-2	°C	-
- average value between 23 and 60 °C - m(m.K) 80 × 10 ⁶ - average value between 23 and 100 °C - m(m.K) 95 × 10 ⁶ Temperature of deflection under load: - m(m.K) 95 × 10 ⁶ - method A: 1.8 MPa + ISO 75-1/-2 °C 75 Max. allowable service temperature in air: - °C 165 - continuously: for 5,000 / 20,000 h (5) - °C 105 / 90 Min. service temperature (6) - °C 30 Flammability (7): - - °C 30 - according to UL 94 (3 / 6 mm thickness) - - HB / HB Mechanical Properties at 23 °C (8) Tension test (9): - HB / HB - tensile strength (10) + ISO 527-1/-2 MPa 78/ - tensile strength (10) + ISO 527-1/-2 MPa 50 - tensile strength (10) + ISO 527-1/-2 MPa 50 - tensile strength - Unnotched (13) + ISO 527-1/-2 MPa 50 - tensile strength - Unnotched (13) + ISO 527-1/-2 MPa 150<			-	W/(K.m)	0.29
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Flammability (7): - 'Svygen Index" ISO 4589-1/-2 % - according to UL 94 (3 / 6 mm thickness) - 'HB / HB Mechanical Properties at 23 °C (3) - 'HB / HB Tension test (9): + ISO 527-1/-2 MPa - tensile strength (10) + ISO 527-1/-2 MPa - tensile strain at yield (10) + ISO 527-1/-2 MPa - tensile strain at break (10) + ISO 527-1/-2 % - tensile strain at break (10) + ISO 527-1/-2 % - tensile modulus of elasticity (11) + ISO 527-1/-2 % - tensile modulus of elasticity (11) + ISO 527-1/-2 % - compressive stress at 1/2/5% nominal strain (11) + ISO 527-1/-2 % - compressive stress at 1/2/5% nominal strain (11) + ISO 604 MPa 31/59 / 87 Compressive stress at 1/2/5% nominal strain (11) + ISO 2039-1 MMa 31/59 / 87 Charpy impact strength - Unnotched (13) + ISO 2039-1 Nmm² 150 Rockwell hardness (14) + ISO 2039-1 Nmm² 150 Rockwell hardness (14) + IEC 60033 Ohmm<>10 ¹⁴ ++ IEC 60033 Ohmm<>10 ¹⁵ ++ IEC 60033			-		
- "Oxygen Index" ISO 4589-1/-2 % - according to UL 94 (3 / 6 mm thickness) - HB / HB Mechanical Properties at 23 °C (8) - HB / HB Tension test (9): - ISO 527-1/-2 MPa - tensile stress at yield / tensile stress at break (10) + ISO 527-1/-2 MPa 80 - tensile strain at yield (10) + ISO 527-1/-2 MPa 80 - tensile strain at break (10) + ISO 527-1/-2 MPa 50 - tensile strain at break (10) + ISO 527-1/-2 MPa 50 - tensile modulus of elasticity (11) + ISO 527-1/-2 MPa 150 - tensile modulus of elasticity (11) + ISO 527-1/-2 MPa 150 - tensile strength - Nontohed (13) + ISO 604 MPa 31 / 59 / 87 Compressive stress at 1 / 2 / 5 % nominal strain (11) + ISO 2039-1 Nmm² 150 Charpy impact strength - Nontohed (13) + ISO 2039-1 Nmm² 150 Relectrical Properties at 23 °C Electrical Properties at 23 °C Electrical Properties at 23 °C 16			-	°C	-30/
- according to UL 94 (3 / 6 mm thickness) - HB / HB Machanical Properties at 23 °C (8) - HB / HB Tensine stress at yield / tensile stress at break (10) + ISO 527-1/-2 MPa - tensile strength (10) + ISO 527-1/-2 MPa 507 - tensile strength (10) + ISO 527-1/-2 MPa 507 - tensile strength (10) + ISO 527-1/-2 MPa 507 - tensile strength (10) + ISO 527-1/-2 MPa 507 - tensile strength vield (10) + ISO 527-1/-2 MPa 507 - tensile strength vield (10) + ISO 527-1/-2 MPa 3150 - tensile modulus of elasticity (11) + ISO 527-1/-2 MPa 3150 - compressive stress at 1/2/5% nominal strain (11) + ISO 604 MPa 31/59/87 - compressive strength - Unnotched (13) + ISO 479-174eU KJ/m² 3.5 Ball indentation hardness (14) + ISO 2039-2 - M 81 Electrical Properties at 23 °C					
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$\begin{array}{c} ++ & \text{ISO } 527 \cdot 1/2 & \text{%} & > 50 \\ + & \text{ISO } 527 \cdot 1/2 & \text{MPa} & 3150 \\ ++ & \text{ISO } 527 \cdot 1/2 & \text{MPa} & 1525 \\ \hline \text{Compression test (12):} & + & \text{ISO } 604 & \text{MPa} & 31 / 59 / 87 \\ \hline \text{Charpy impact strength - Unnotched (13)} & + & \text{ISO } 604 & \text{MPa} & 31 / 59 / 87 \\ \hline \text{Charpy impact strength - Unnotched (13)} & + & \text{ISO } 604 & \text{MPa} & 31 / 59 / 87 \\ \hline \text{Charpy impact strength - Notched} & + & \text{ISO } 179 \cdot 176 & \text{kJ/m}^2 & 3.5 \\ \hline \text{Ball indentation hardness (14)} & + & \text{ISO } 179 \cdot 1716 & \text{kJ/m}^2 & 3.5 \\ \hline \text{Ball indentation hardness (14)} & + & \text{ISO } 2039 \cdot 1 & \text{N/mm}^2 & 150 \\ \hline \text{Rockwell hardness (14)} & + & \text{ISO } 2039 \cdot 2 & - & \text{M B1} \\ \hline \text{Electrical Properties at 23 °C} & & & & & & \\ \hline \text{Electric strength (15)} & + & \text{IEC } 60243 \cdot 1 & \text{kV/mm} & 25 \\ \hline \text{++} & \text{IEC } 60093 & \text{Ohm.cm} & > 10 \cdot 1^4 \\ \hline \text{++} & \text{IEC } 60093 & \text{Ohm.cm} & > 10 \cdot 1^2 \\ \hline \text{Surface resistivity} & + & \text{IEC } 60093 & \text{Ohm.cm} & > 10 \cdot 1^2 \\ \hline \text{Relative permittivity } \epsilon_r : - at 100 \text{ Hz} & + & \text{IEC } 60250 & - & 3.6 \\ \hline \text{-at 1 MHz} & + & \text{IEC } 60250 & - & 3.7 \\ \hline \text{Dielectric dissipation factor tan } \overline{\delta}: & -at 100 \text{ Hz} & + & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.012 \\ \hline \text{++} & \text{IEC } 60250 & - & 0.05 \\ \hline \text{Comparative tracking index (CTI)} & & \text{HEC } 60112 & - & 600 \\ \hline \end{array}$	- tensile strain at yield (10)	+		11 . 1.1	11-2
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- tensile modulus of elasticity (11)	+		V	3150
$\begin{array}{c c} - \mbox{compressive stress at 1 / 2 / 5 \% nominal strain (11)} & ISO 604 & MPa & 31 / 59 / 87 \\ \hline Charpy impact strength - Unnotched (13) & + ISO 479-1/1eU & kJ/m^2 & 75 \\ \hline Charpy impact strength - Notched & + ISO 479-1/1eU & kJ/m^2 & 3.5 \\ \hline Ball indentation hardness (14) & + ISO 2039.7 & N/mm^2 & 150 \\ \hline Rockwell hardness (14) & + ISO 2039.2 & - & M 81 \\ \hline Electrical Properties at 23 °C & & & & & \\ \hline Electric strength (15) & + IEC 60243.1 & kV/mm & 25 \\ + IEC 60093 & Ohm.cm & > 10 ^{14} \\ + + IEC 60093 & Ohm.cm & > 10 ^{14} \\ + + IEC 60093 & Ohm & > 10 ^{12} \\ \hline Surface resistivity & + IEC 60093 & Ohm & > 10 ^{12} \\ \hline Relative permittivity $\epsilon_r: - at 100 \text{ Hz} & + IEC 60250 & - & 3.6 \\ - at 1 \text{ MHz} & + IEC 60250 & - & 0.012 \\ \hline HHz & + IEC 60250 & - & 0.012 \\ + + IEC 60250 & - & 0.05 \\ \hline Comparative tracking index (CTI) & + IEC 60112 & - & 600 \\ + + IEC 60112 & - & 600 \\ + + IEC 60112 & - & 600 \\ \hline \end{array}$		++	ISO 527-1/-2	MPa	1525
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Rockwell hardness (14) ISO 2039-2 M 81 Electrical Properties at 23 °C Electric strength (15) + IEC 60243-1 kV/mm 25 ++ IEC 60093 Ohm.cm > 10 ¹⁴ Volume resistivity + IEC 60093 Ohm.cm > 10 ¹² Surface resistivity + IEC 60093 Ohm.cm > 10 ¹² Relative permittivity ε_r : - at 100 Hz + IEC 60250 - 3.6 ++ IEC 60250 - 3.6 + IEC 60250 - 3.7 Dielectric dissipation factor tan δ : - at 100 Hz + IEC 60250 - 0.11 - at 1 MHz + IEC 60250 - 0.12 + IEC 60250 - 0.12 - 0.114 - at 1 MHz + IEC 60250 - 0.12 - at 1 MHz + IEC 60250 - 0.14 - at 1 MHz + IEC 60250 - 0.016 ++ IEC 60250 - 0.016 <		+			
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- at 1 MHz ++ IEC 60250 - 6.6 + IEC 60250 - 3.2 ++ IEC 60250 - 3.7 Dielectric dissipation factor tan δ: - at 100 Hz + IEC 60250 - 0.012 ++ IEC 60250 - 0.14 - 0.016 ++ IEC 60250 - 0.016 - at 1 MHz + IEC 60250 - 0.016 ++ IEC 60250 - 0.005 Comparative tracking index (CTI) + IEC 60112 - 600 ++ IEC 60112 - 600		+4		-	
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Comparative tracking index (CTI) + IEC 60112 - 600 ++ IEC 60112 - 600	- at 1 MHz	+		-	
++ IEC 60112 - 600				-	
	Comparative tracking index (CTI)			-	
		++	IEC 60112	-	600

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 on discs \varnothing 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 not for semi-crystalline ones.
- (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 5,000/20,000 hours. After
 - 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 mägnitude 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
 - 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 Nylatron NSM stock shapes.
 - 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 \emptyset 50 mm. 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.
 - 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)]
- Test speed: 1 mm/min
 Test specimens: cylinders Ø 8 mm x 16 mm
- (12) Pendulum used: 4 J

(8)

- (14) Measured on 10 mm thick test specimens (discs), mid between centre and outside diameter.
- (15) Electrode configuration: Ø 25 / 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.

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

AVAILABILITY: see "Delivery Programme"

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