Zytel® 70G33HS1L NC010

NYLON RESIN

Common features of Zytel® nylon resin include mechanical and physical properties such as high mechanical strength, excellent balance of stiffness and toughness, good high temperature performance, good electrical and flammability properties, good abrasion and chemical resistance. In addition, Zytel® nylon resins are available in different modified and reinforced grades to create a wide range of products with tailored properties for specific processes and end-uses. Zytel® nylon resin, including most flame retardant grades, offer the ability to be coloured.

The good melt stability of Zytel® nylon resin normally enables the recycling of properly handled production waste. If recycling is not possible, DuPont recommends, as the preferred option, incineration with energy recovery (-31kJ/g of base polymer) in appropriately equipped installations. For disposal, local regulations have to be observed.

Zytel® nylon resin typically is used in demanding applications in the automotive, furniture, domestic appliances, sporting goods and construction industry.

Zytel® 70G33HS1L NC010 is a 33% glass fiber reinforced, heat stabilized polyamide 66 resin for injection moulding.

Product information

Resin Identification	PA66-GF33	ISO 1043
Part Marking Code	>PA66-GF33<	ISO 11469
ISO designation	ISO 16396-PA66,GF33,M1GHNR,S14-110	

Rheological properties

	dry/cond.		
Viscosity number	153/*	cm³/g	ISO 307, 1157, 1628
Moulding shrinkage, parallel	0.3/-	%	ISO 294-4, 2577
Moulding shrinkage, normal	1.1/-	%	ISO 294-4, 2577

Typical mechanical properties

	dry/cond.		
Tensile Modulus	11000/8000	MPa	ISO 527-1/-2
Stress at break	200/140	MPa	ISO 527-1/-2
Strain at break	3.5/5	%	ISO 527-1/-2
Flexural Modulus	9500/6000	MPa	ISO 178
Flexural Strength	290/200	MPa	ISO 178
Tensile creep modulus, 1h	*/8000	MPa	ISO 899-1
Tensile creep modulus, 1000h	*/5500	MPa	ISO 899-1
Charpy impact strength, 23°C	85/100	kJ/m²	ISO 179/1eU
Charpy impact strength, -30°C	70/75	kJ/m²	ISO 179/1eU
Charpy notched impact strength, 23°C	13/17	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -30°C	10/10	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -40°C	10/10	kJ/m²	ISO 179/1eA
Izod notched impact strength, 23°C	12/15	kJ/m²	ISO 180/1A
Izod notched impact strength, -30°C	10/10	kJ/m²	ISO 180/1A
Izod notched impact strength, -40°C	10/10	kJ/m²	ISO 180/1A
Izod impact strength, 23°C	80/90	kJ/m²	ISO 180/1U

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Izod impact strength, -30°C	70 / 70	kJ/m²	ISO 180/1U
Hardness, Rockwell, M-scale	101 / -	-	ISO 2039-2
Ball indentation hardness, H 961/30	280 / -	MPa	ISO 2039-1
Poisson's ratio	0.34 / 0.34	-	

Thermal properties

	dry/cond.		
Melting temperature, 10°C/min	262 / *	°C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	80 / -	°C	ISO 11357-1/-2
Temp. of deflection under load, 1.8 MPa	252 / *	°C	ISO 75-1/-2
Temp. of deflection under load, 0.45 MPa	261 / *	°C	ISO 75-1/-2
CLTE, Parallel, -40-23°C	24 / *	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, parallel	18 / *	E-6/K	ISO 11359-1/-2
CLTE, Parallel, 55-160°C	13 / *	E-6/K	ISO 11359-1/-2
CLTE, Normal, -40-23°C	65 / *	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	83 / *	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, Normal, 55-160°C	140 / *	E-6/K	ISO 11359-1/-2
Thermal conductivity of melt	0.22	W/(m K)	
Spec. heat capacity of melt	2210	J/(kg K)	
Spec. heat capacity solid	1330	J/(kg K)	
RTI, electrical, 0.75mm	140	°C	UL 746B
RTI, electrical, 1.5mm	140	°C	UL 746B
RTI, electrical, 3mm	140	°C	UL 746B
RTI, impact, 0.75mm	125	°C	UL 746B
RTI, impact, 1.5mm	125	°C	UL 746B
RTI, impact, 3mm	125	°C	UL 746B
RTI, strength, 0.75mm	140	°C	UL 746B
RTI, strength, 1.5mm	140 / *	°C	UL 746B
RTI, strength, 3mm	140	°C	UL 746B

Flammability

	dry/cond.		
Burning Behav. at 1.5mm nom. thickn.	HB / *	class	IEC 60695-11-10
Thickness tested	1.5 / *	mm	IEC 60695-11-10
UL recognition	yes / *	-	UL 94
Burning Behav. at thickness h	HB / *	class	IEC 60695-11-10
Thickness tested	0.75 / *	mm	IEC 60695-11-10
UL recognition	yes / *	-	UL 94
Oxygen index	24 / *	%	ISO 4589-1/-2
Glow Wire Flammability Index, 0.75mm	725 / -	°C	IEC 60695-2-12
Glow Wire Flammability Index, 1.5mm	700 / -	°C	IEC 60695-2-12
Glow Wire Flammability Index, 3mm	800 / -	°C	IEC 60695-2-12
Glow Wire Ignition Temperature, 0.75mm	750 / -	°C	IEC 60695-2-13
Glow Wire Ignition Temperature, 1.5mm	725 / -	°C	IEC 60695-2-13
Glow Wire Ignition Temperature, 3mm	825 / -	°C	IEC 60695-2-13
FMVSS Class	SE / B	-	ISO 3795 (FMVSS 302)

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Burning rate, Thickness 1 mm	28	mm/min	ISO 3795 (FMVSS 302)

Electrical properties

	dry/cond.		
Relative permittivity, 100Hz	4.2/-	-	IEC 62631-2-1
Relative permittivity, 1MHz	4/-	-	IEC 62631-2-1
Dissipation factor, 100Hz	100/-	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	150/-	E-4	IEC 62631-2-1
Volume resistivity	1E13/1E9	Ohm.m	IEC 62631-3-1
Surface resistivity	*/1E15	Ohm	IEC 62631-3-2
Electric strength	46/38	kV/mm	IEC 60243-1
Comparative tracking index	400/-	-	IEC 60112
Comparative tracking index, 3.0mm	1/-	PLC	UL 746A
Electric Strength, Short Time, 2mm	27/-	kV/mm	IEC 60243-1

Other properties

	dry/cond.		
Humidity absorption, 2mm	1.8/*	%	Sim. to ISO 62
Water absorption, 2mm	5.7/*	%	Sim. to ISO 62
Density	1390/-	kg/m³	ISO 1183
Water Absorption, Immersion 24h	1.2/*	%	Sim. to ISO 62

VDA Properties

	dry/cond.		
Emission of organic compounds	6	µgC/g	VDA 277
Odour	4.5	class	VDA 270
Fogging, F-value (refraction)	95/*	%	ISO 6452
Fogging, G-value (condensate)	0.3/*	mg	ISO 6452

Injection

Drying Recommended	yes	
Drying Temperature	80	°C
Drying Time, Dehumidified Dryer	2 - 4	h
Processing Moisture Content	≤0.2	%
Melt Temperature Optimum	295	°C
Min. melt temperature	285	°C
Max. melt temperature	305	°C
Max. screw tangential speed	0.2	m/s
Mold Temperature Optimum	100	°C
Min. mould temperature	70	°C
Max. mould temperature	120	°C
Hold pressure range	50 - 100	MPa
Hold pressure time	3	s/mm
Ejection temperature	210	°C

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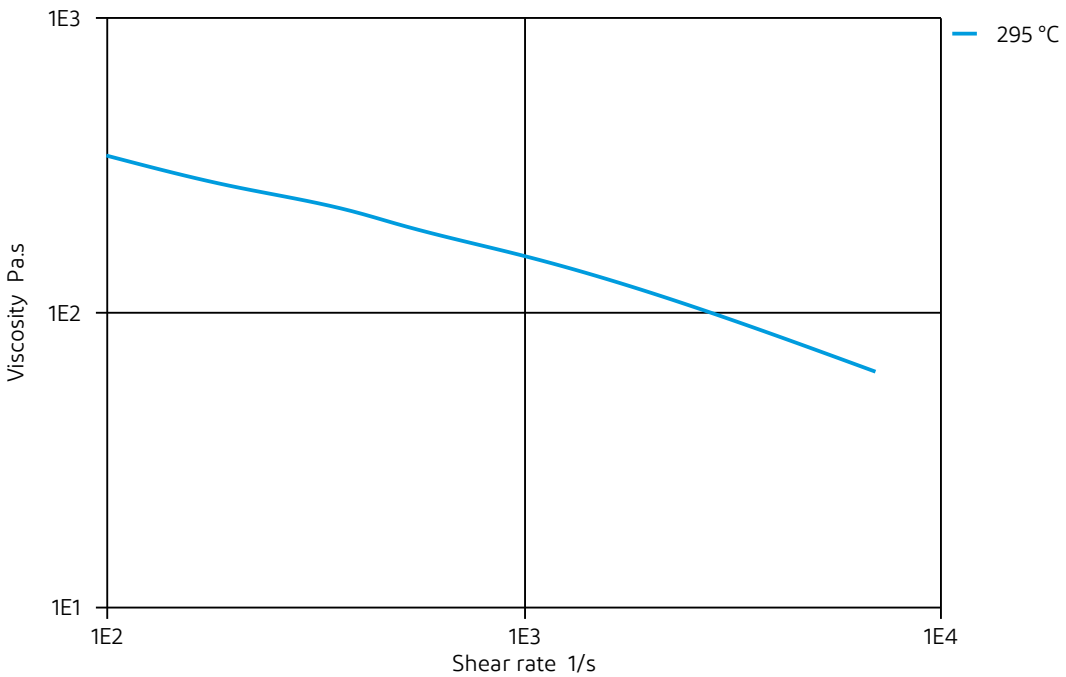
Characteristics

Additives	Release agent

Viscosity-shear rate



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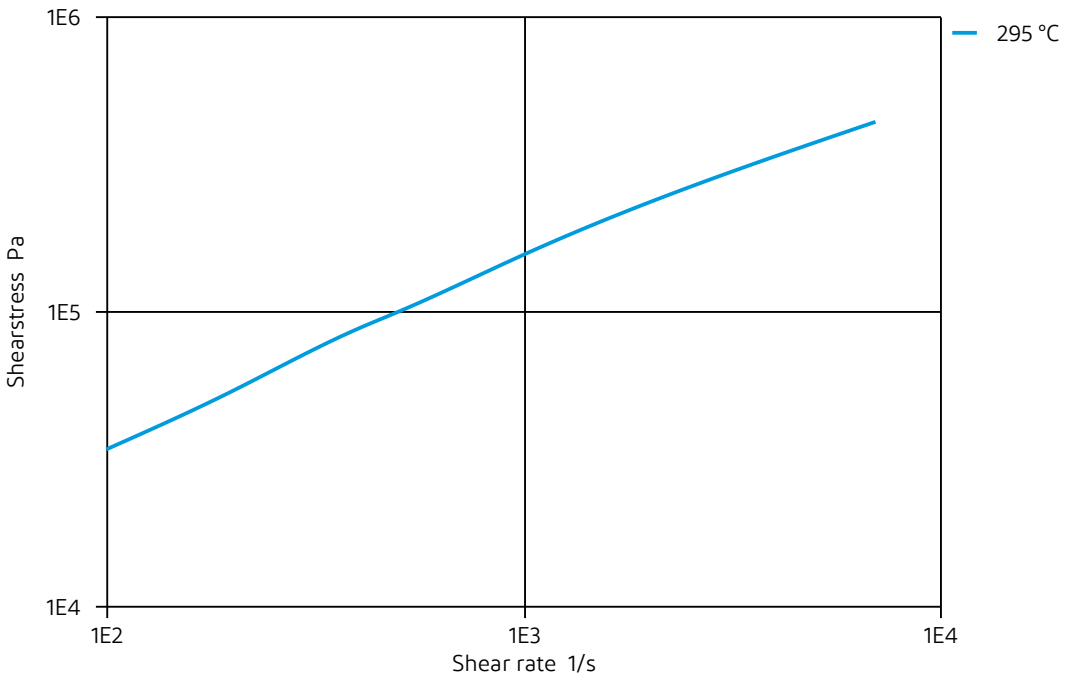
Shearstress-shear rate



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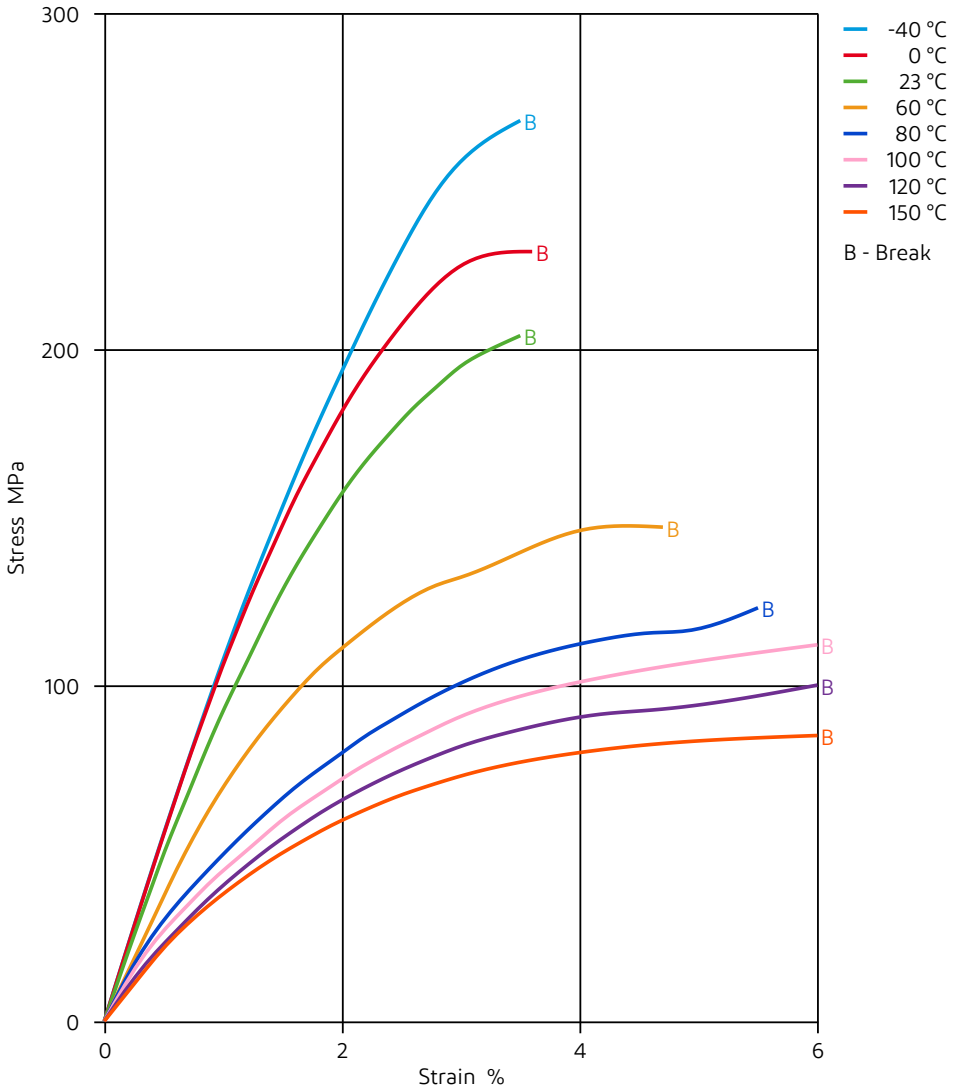
Stress-strain (dry)



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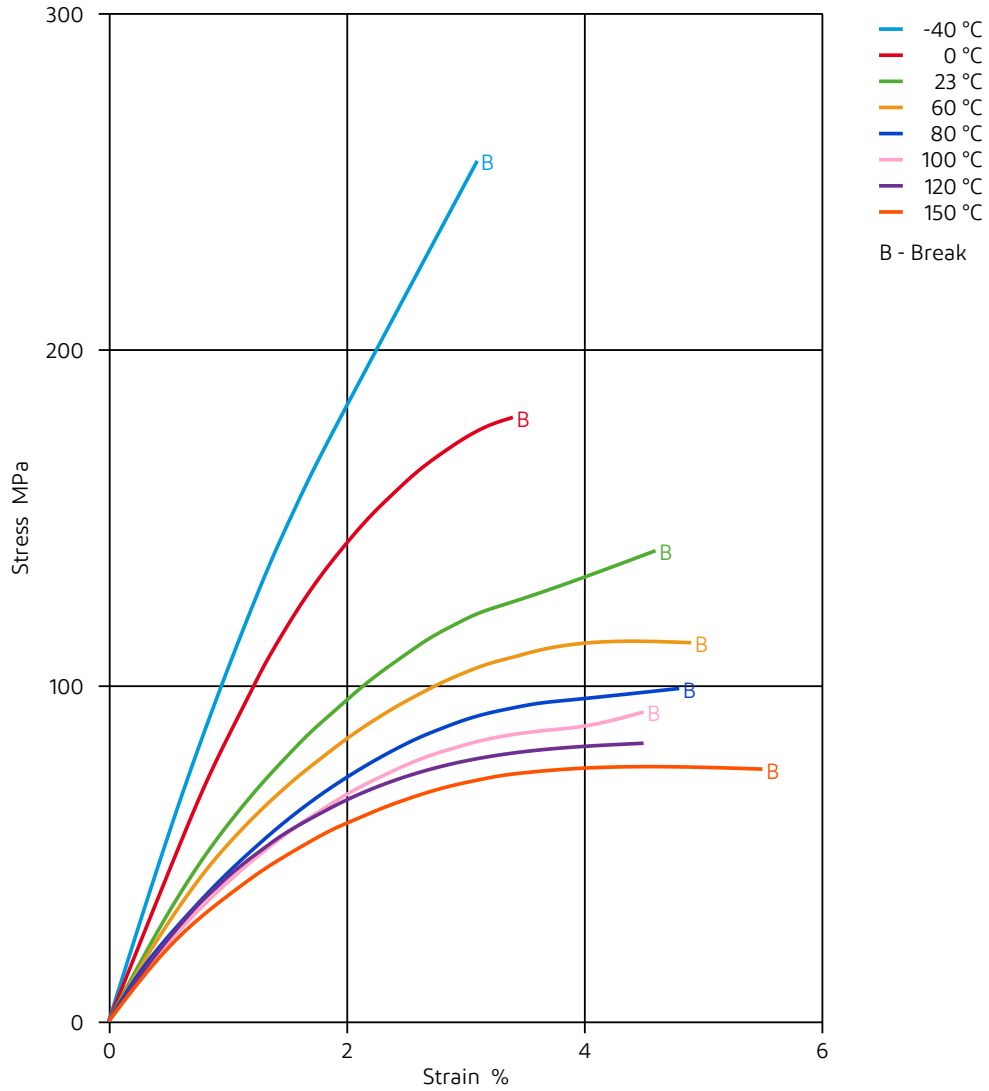
NYLON RESIN

Stress-strain (cond.)



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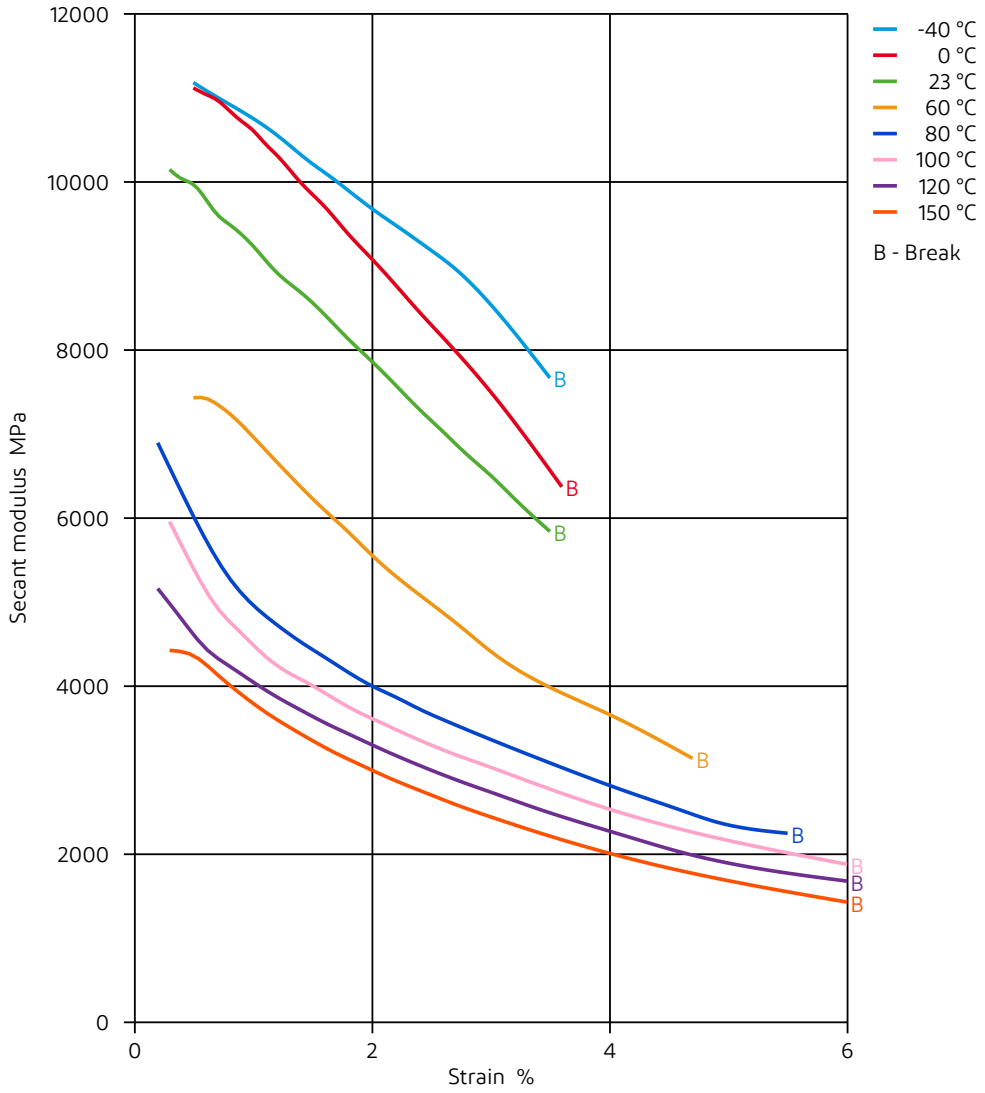
Secant modulus-strain (dry)



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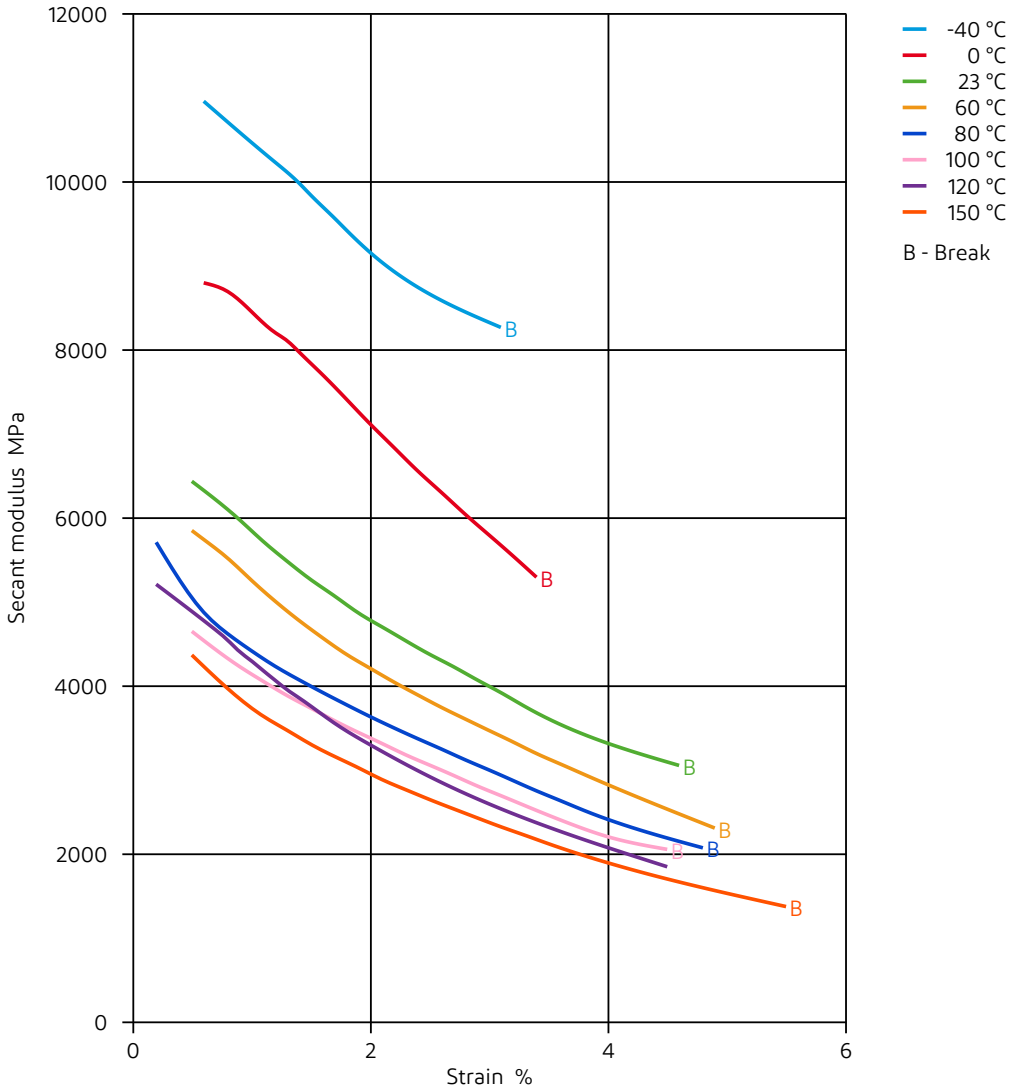
NYLON RESIN

Secant modulus-strain (cond.)



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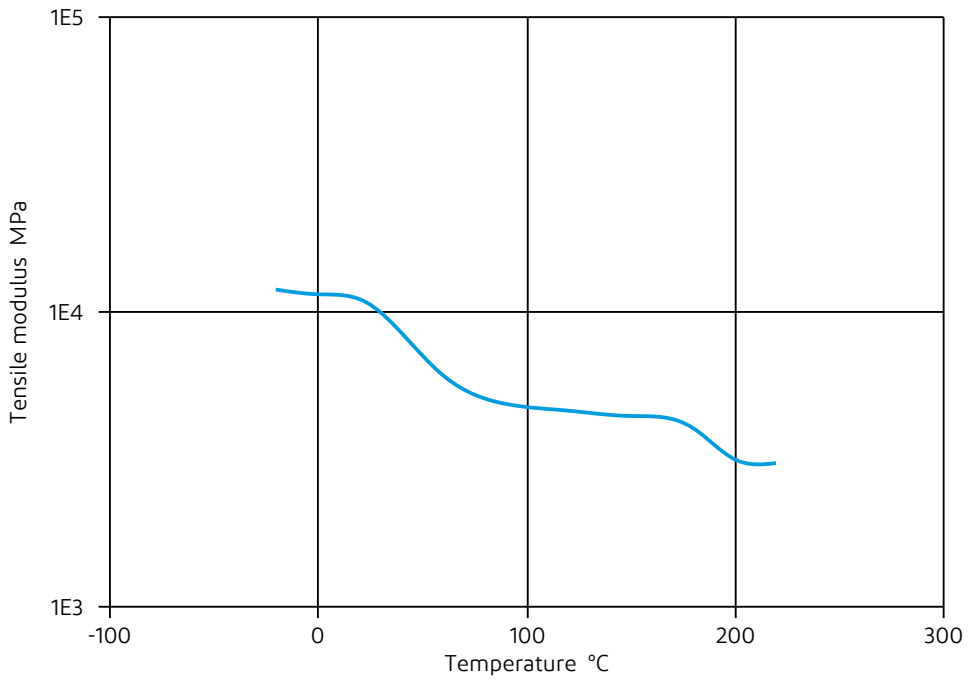
Tensile modulus-temperature (dry)
(measured on Zytel® 70G33HS1L BK031)



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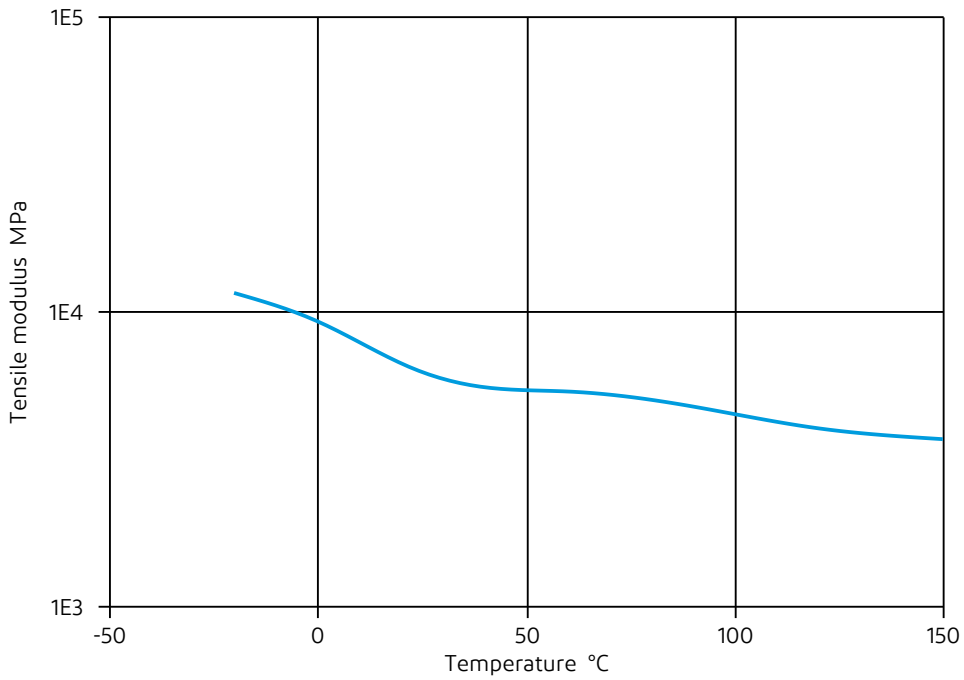
Tensile modulus-temperature (cond.)
(measured on Zytel® 70G33HS1L BK031)



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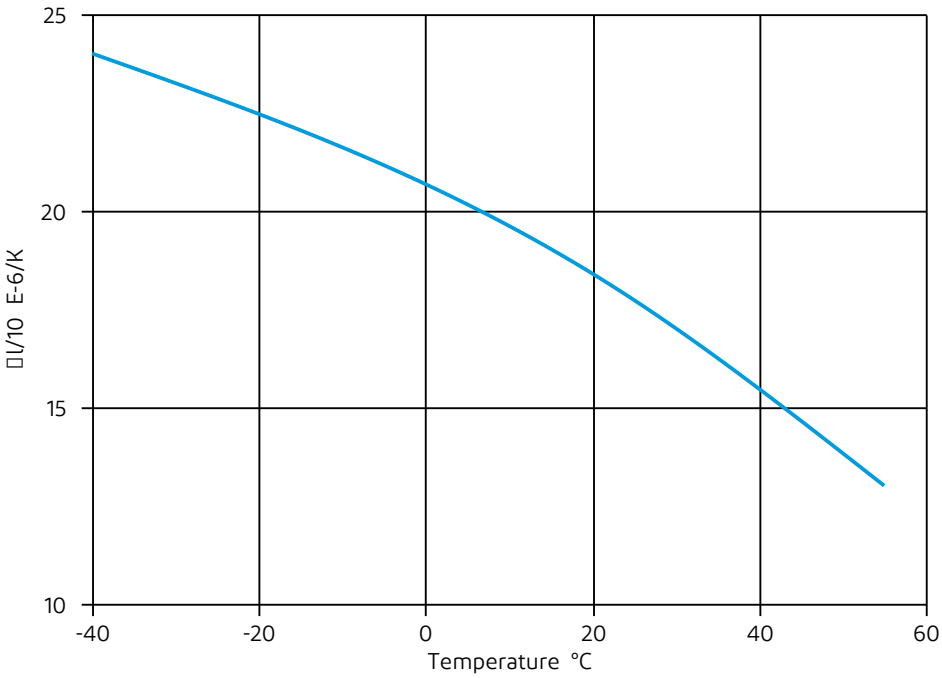
Coeff. of linear thermal expansion



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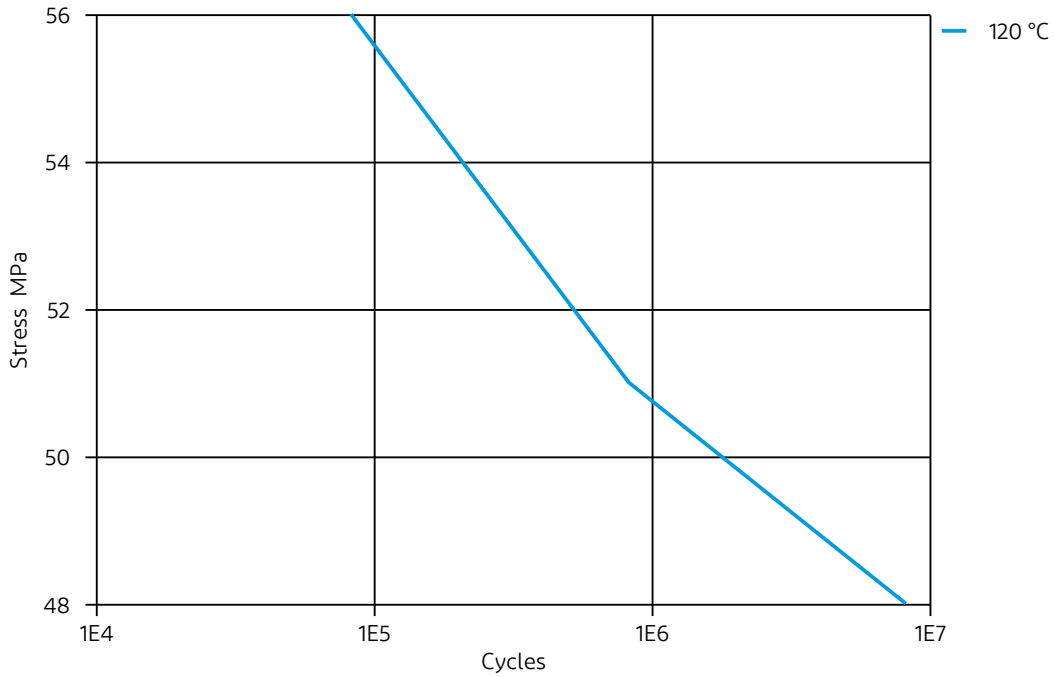
Tensile Fatigue, 10Hz, R=0.1 @ mm (dry)



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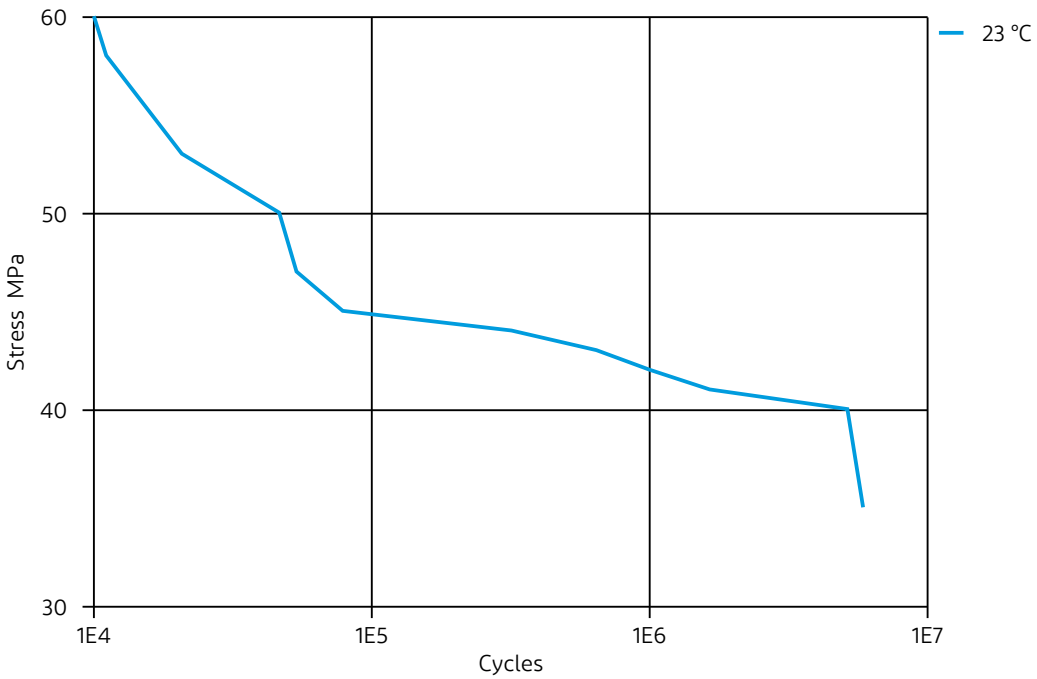
Tensile Fatigue, 10Hz, R=0.1 @ mm (cond.)



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Chemical Media Resistance

Acids

- ✔ Acetic Acid (5% by mass), 23°C
- ✔ Citric Acid solution (10% by mass), 23°C
- ✔ Lactic Acid (10% by mass), 23°C
- ✘ Hydrochloric Acid (36% by mass), 23°C
- ✘ Nitric Acid (40% by mass), 23°C
- ✘ Sulfuric Acid (38% by mass), 23°C
- ✘ Sulfuric Acid (5% by mass), 23°C
- ✘ Chromic Acid solution (40% by mass), 23°C

Bases

- ✘ Sodium Hydroxide solution (35% by mass), 23°C
- ✔ Sodium Hydroxide solution (1% by mass), 23°C
- ✔ Ammonium Hydroxide solution (10% by mass), 23°C

Alcohols

- ✔ Isopropyl alcohol, 23°C
- ✔ Methanol, 23°C
- ✔ Ethanol, 23°C

Hydrocarbons

- ✔ n-Hexane, 23°C
- ✔ Toluene, 23°C
- ✔ iso-Octane, 23°C

Ketones

- ✔ Acetone, 23°C

Ethers

- ✔ Diethyl ether, 23°C

Mineral oils

- ✔ SAE 10W40 multigrade motor oil, 23°C
- ✔ SAE 10W40 multigrade motor oil, 130°C
- ✔ SAE 80/90 hypoid-gear oil, 130°C
- ✔ Insulating Oil, 23°C
- ✔ Motor oil OS206 304 Ref.Eng.Oil, ISP, 135°C
- ✔ Automatic hypoid-gear oil Shell Donax TX, 135°C
- ✔ Hydraulic oil Pentosin CHF 202, 125°C

Standard Fuels

- ✔ ISO 1817 Liquid 1 - E5, 60°C
- ✔ ISO 1817 Liquid 2 - M15E4, 60°C
- ✔ ISO 1817 Liquid 3 - M3E7, 60°C
- ✔ ISO 1817 Liquid 4 - M15, 60°C
- ✔ Standard fuel without alcohol (pref. ISO 1817 Liquid C), 23°C
- ✔ Standard fuel with alcohol (pref. ISO 1817 Liquid 4), 23°C

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- ✔ Diesel fuel (pref. ISO 1817 Liquid F), 23°C
- ✔ Diesel fuel (pref. ISO 1817 Liquid F), 90°C
- ✔ Diesel fuel (pref. ISO 1817 Liquid F), >90°C
- ✔ Diesel EN 590, 100°C

Salt solutions

- ✔ Sodium Chloride solution (10% by mass), 23°C
- ✘ Sodium Hypochlorite solution (10% by mass), 23°C
- ✔ Sodium Carbonate solution (20% by mass), 23°C
- ✔ Sodium Carbonate solution (2% by mass), 23°C
- ✘ Zinc Chloride solution (50% by mass), 23°C

Other

- ✔ Ethyl Acetate, 23°C
- ✘ Hydrogen peroxide, 23°C
- ✔ DOT No. 4 Brake fluid, 130°C
- ✔ Ethylene Glycol (50% by mass) in water, 108°C
- ✔ 1% nonylphenoxy-polyethyleneoxy ethanol in water, 23°C
- ✔ 50% Oleic acid + 50% Olive Oil, 23°C
- ✔ Water, 23°C
- ✔ Water, 90°C
- ✘ Phenol solution (5% by mass), 23°C

Symbols used:

✔ possibly resistant
Defined as: Supplier has sufficient indication that contact with chemical can be potentially accepted under the intended use conditions and expected service life. Criteria for assessment have to be indicated (e.g. surface aspect, volume change, property change).

✘ not recommended - see explanation
Defined as: Not recommended for general use. However, short-term exposure under certain restricted conditions could be acceptable (e.g. fast cleaning with thorough rinsing, spills, wiping, vapor exposure).