

# DuPont™ Zytel® MT409AHS NC010

## NYLON RESIN

### Product Information

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® MT409AHS NC010 is a Medium Toughened, high performance, heat stabilized polyamide 66 resin having good stiffness, improved knit line strength, surface appearance with outstanding processability.**

Product information	Value	Unit	Test Standard
Resin Identification	PA66-I	-	ISO 1043
Part Marking Code	PA66-I	-	ISO 11469
Rheological properties	dry / cond	Unit	Test Standard
Molding shrinkage, parallel	1.5 / -	%	ISO 294-4, 2577
Molding shrinkage, normal	1.7 / -	%	ISO 294-4, 2577
Mechanical properties	dry / cond	Unit	Test Standard
Tensile Modulus	348091 / 159542	psi	ISO 527-1/-2
Yield stress	8850 / 6240	psi	ISO 527-1/-2
Yield strain	5 / 28	%	ISO 527-1/-2
Nominal strain at break	25 / >50	%	ISO 527-1/-2
Stress at Break, 23°C, 50mm/min	7250 / -	psi	ISO 527-1/-2
Strain at Break, 23°C, 50mm/min	45 / -	%	ISO 527-1/-2
Flexural Modulus	319000 / 145000	psi	ISO 178
Flexural Strength	10900 / 7690	psi	ISO 178 C
Tensile creep modulus, 1000h	* / 119000	psi	ISO 899-1
Charpy impact strength			ISO 179/1eU
73°F	N / N	ftlb/in <sup>2</sup>	
-22°F	N / N	ftlb/in <sup>2</sup>	
Charpy notched impact strength			ISO 179/1eA
73°F	9.99 / 19	ftlb/in <sup>2</sup>	
-22°F	6.18 / 6.18	ftlb/in <sup>2</sup>	
-40°F	6.18 / -	ftlb/in <sup>2</sup>	
Izod notched impact strength			ISO 180/1A
73°F	8.56 / 13.8	ftlb/in <sup>2</sup>	
-22°F	7.14 / 7.14	ftlb/in <sup>2</sup>	
-40°F	6.18 / 5.23	ftlb/in <sup>2</sup>	
Ball indentation hardness, H 358/30	18100 / 8700 <sup>[1]</sup>	psi	ISO 2039-1 OT
1: 132/30 C: Calculated OT: One time tested			
Thermal properties	dry / cond	Unit	Test Standard
Melting temperature, 18°F/min	504 / *	°F	ISO 11357-1/-3
Glass transition temperature, 18°F/min	176 / -	°F	ISO 11357-1/-2
Temp. of deflection under load			ISO 75-1/-2
260 psi	151 / *	°F	
65 psi	401 / *	°F	
Coeff. of linear therm. expansion, parallel	5.56E-5 / *	in/in/°F	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	6.67E-5 / *	in/in/°F	ISO 11359-1/-2
Thermal conductivity of melt	0.14	W/(m K)	-

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Spec. heat capacity of melt	2730	J/(kg K)	-
RTI, electrical			UL 746B
30mil	266	°F	
60mil	266	°F	
120mil	266	°F	
RTI, impact			UL 746B
30mil	149	°F	
60mil	221	°F	
120mil	221	°F	
RTI, strength			UL 746B
30mil	203	°F	
60mil	221 / *	°F	
120mil	230	°F	
<b>Flammability</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Burning Behav. at 60mil nom. thicken.	HB / *	class	IEC 60695-11-10
Thickness tested	0.0591 / *	in	IEC 60695-11-10
UL recognition	yes / *	-	UL 94
Burning Behav. at thickness h	HB / *	class	IEC 60695-11-10
Thickness tested	0.0315 / *	in	IEC 60695-11-10
Thickness tested	0.1181 / *	in	IEC 60695-11-20
UL recognition	yes / *	-	UL 94
Oxygen index	20 / *	%	ISO 4589-1/-2
Glow Wire Flammability Index, 40mil	1380 / -	°F	IEC 60695-2-12 DS
FMVSS Class	B	-	ISO 3795 (FMVSS 302)
Burning rate, Thickness 1 mm	1.14	in/min	ISO 3795 (FMVSS 302)
DS: Derived from similar grade			
<b>Electrical properties</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Relative permittivity			IEC 62631-2-1
100Hz	3.6 / 6.6	-	
1MHz	3.4 / 3.7	-	
Dissipation factor			IEC 62631-2-1
100Hz	50 / 1800	E-4	
1MHz	120 / 440	E-4	
Volume resistivity	>1E13 / 3E10	Ohm*m	IEC 62631-3-1
Surface resistivity	* / 1E13	Ohm	IEC 62631-3-2
Electric strength	584 / 559	kV/in	IEC 60243-1
Comparative tracking index	600 / -	-	IEC 60112
Electric Strength, Short Time, 2mm	584 / 559	V/mil	IEC 60243-1
<b>Other properties</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Humidity absorption, 80mil	2.1 / *	%	Sim. to ISO 62
Water absorption, 80mil	7.2 / *	%	Sim. to ISO 62 C
Density	1.11 / -	g/cm <sup>3</sup>	ISO 1183
Density of melt	58.1	lb/ft <sup>3</sup>	-
Water Absorption, Immersion 24h	1.3 / *	%	Sim. to ISO 62
C: Calculated			
<b>Film Properties</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Strain at yield, parallel	4.4 / *	%	ISO 527-3
<b>VDA Properties</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Emission of organic compounds	10	µgC/g	VDA 277
Odor test	4	class	VDA 270
Fogging, G-value (condensate)	0.1 / *	mg	ISO 6452
<b>Injection</b>	<b>dry / cond</b>	<b>Unit</b>	<b>Test Standard</b>
Drying Recommended	yes	-	-
Drying Temperature	≥176	°F	-
Drying Time, Dehumidified Dryer	2 - 4	h	-
Processing Moisture Content	≤0.2	%	-

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Melt Temperature Optimum	554	°F	-
Min. melt temperature	536	°F	-
Max. melt temperature	572	°F	-
Max. screw tangential speed	0.3 / *	m/s	-
Mold Temperature Optimum	176	°F	-
Min. mold temperature	122	°F	-
Max. mold temperature	212	°F	-
Hold pressure range	7250 - 14500	psi	-
Hold pressure time	0.102	s/mil	-
Ejection temperature	374	°F	-

### Characteristics

Processing	• Injection Molding	• Profile Extrusion
Delivery form	• Pellets	
Additives	• Release agent	
Special characteristics	• Heat stabilized or stable to heat	
Regional Availability	• North America • Europe	• Asia Pacific • South and Central America • Near East/Africa • Global

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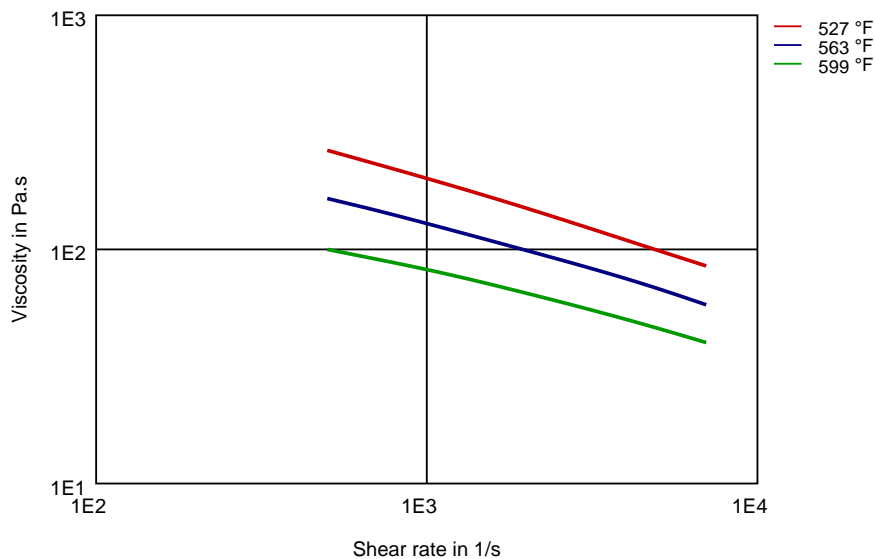


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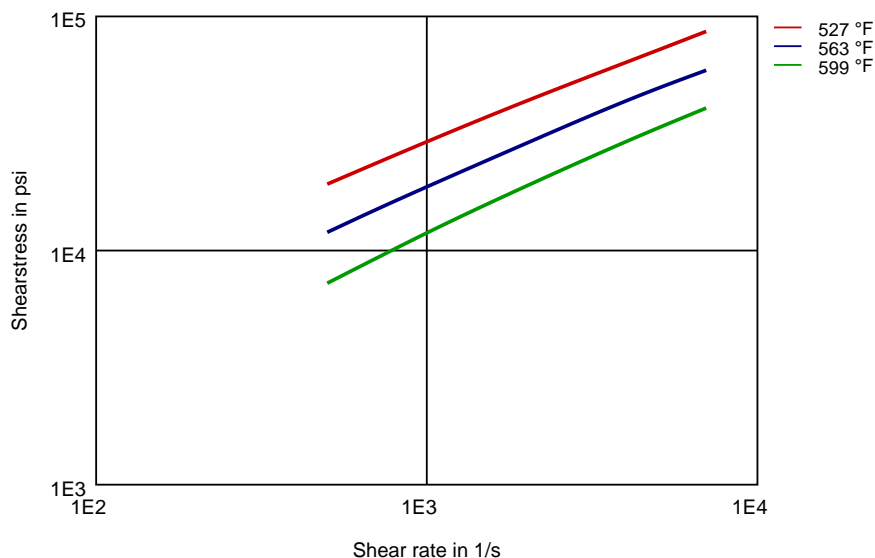
## NYLON RESIN

### Diagrams

#### Viscosity-shear rate



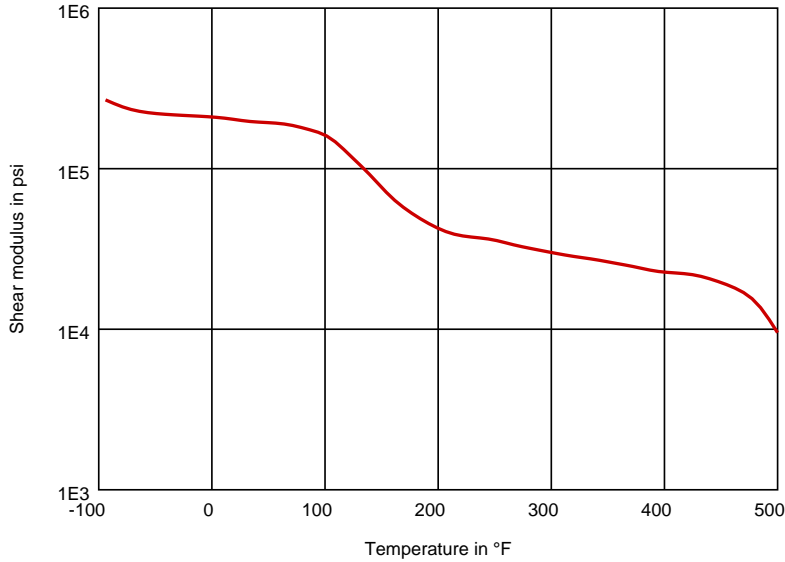
#### Shearstress-shear rate



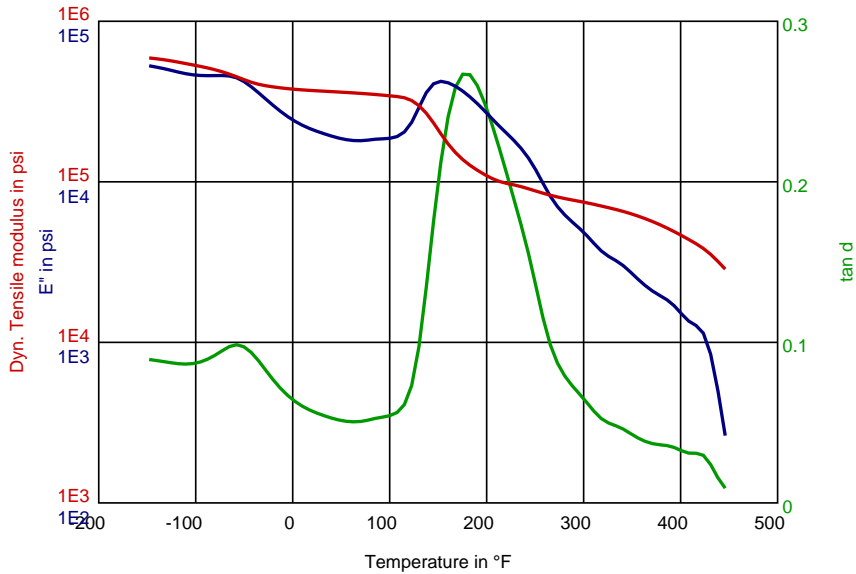
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Dynamic Shear modulus-temperature (dry)



Dynamic Tensile modulus-temperature (dry)



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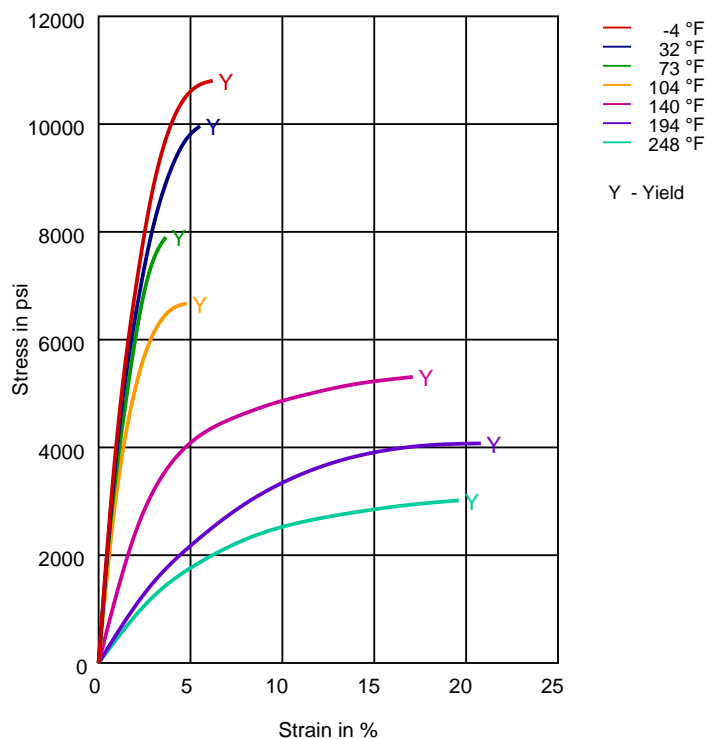
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Stress-strain (dry)



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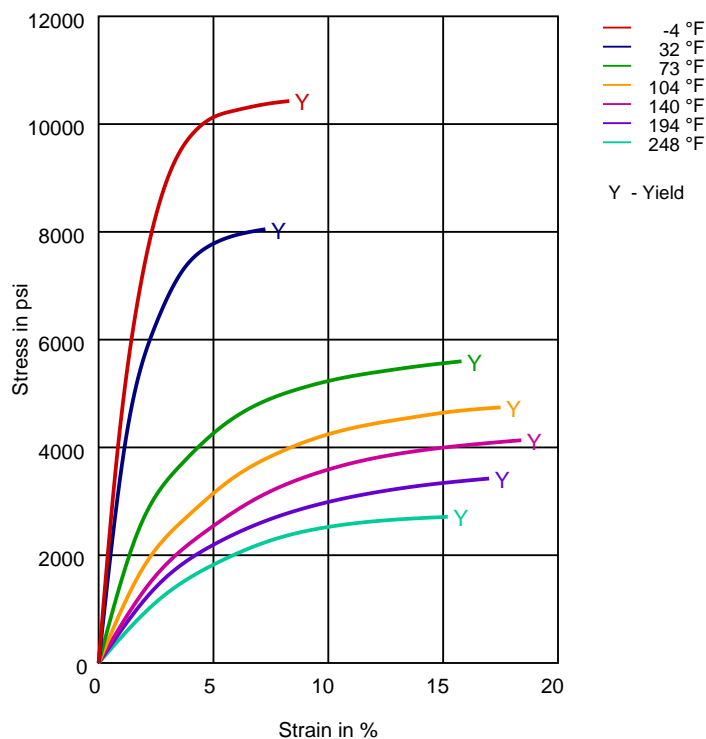
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## NYLON RESIN

Stress-strain (cond.)



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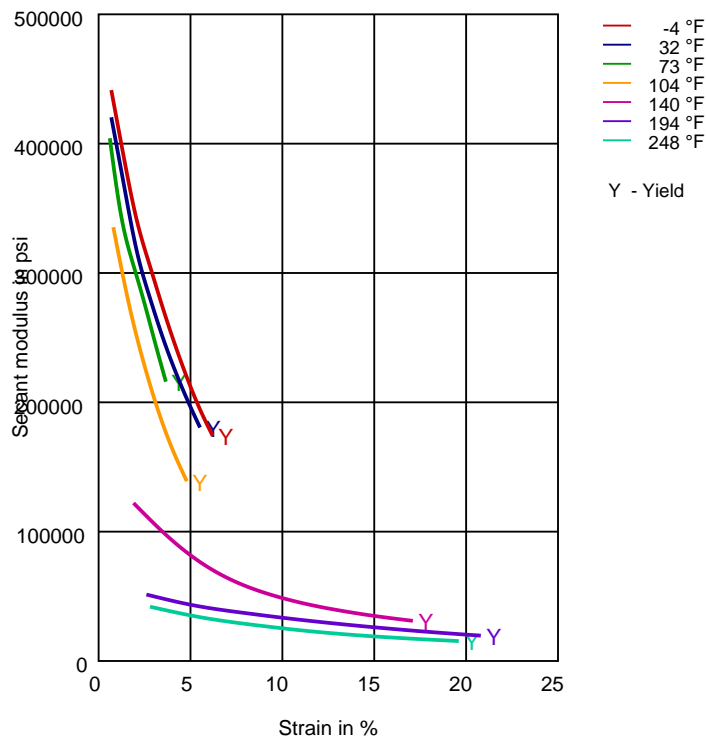
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## NYLON RESIN

Secant modulus-strain (dry)



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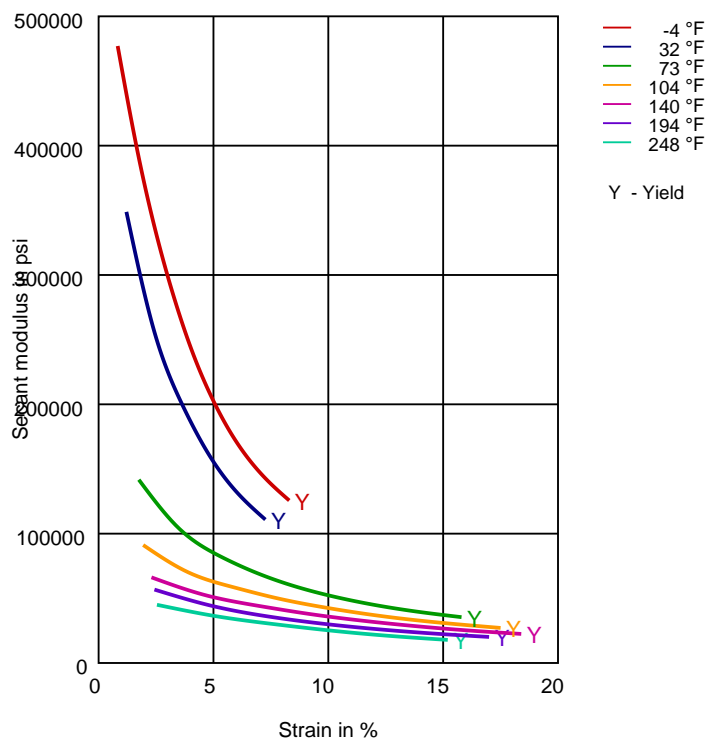




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## NYLON RESIN

Secant modulus-strain (cond.)



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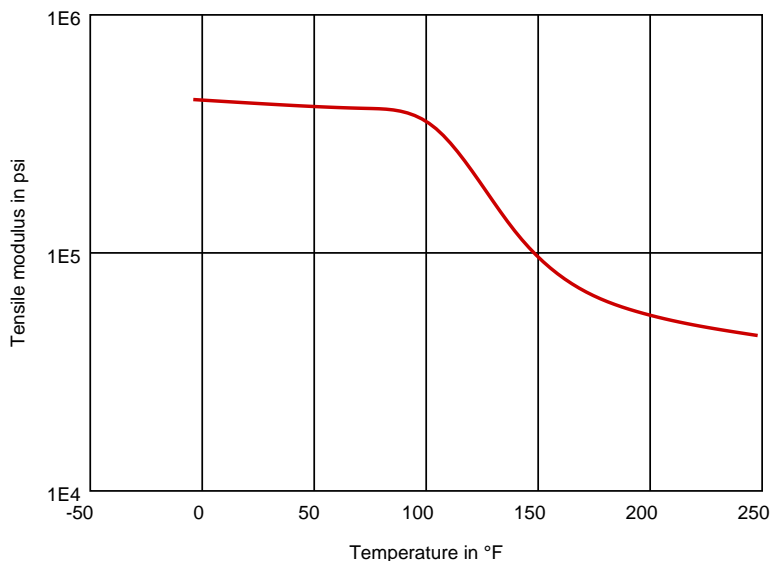
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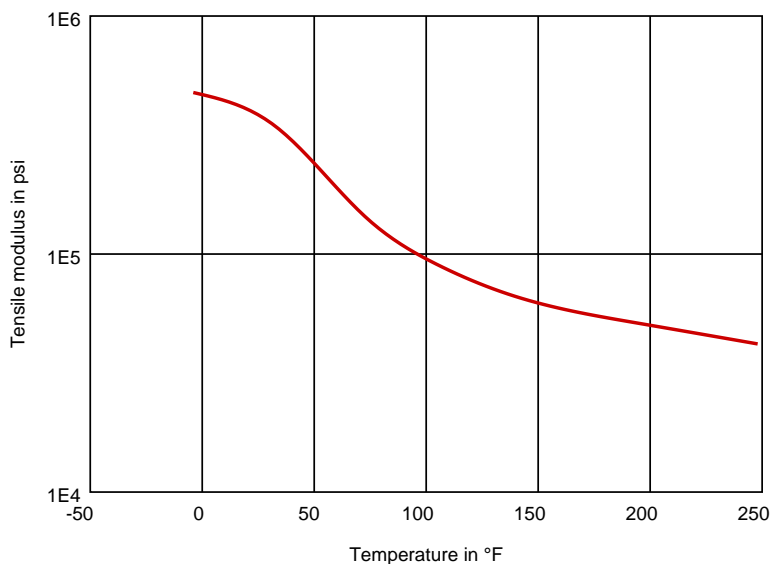
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## NYLON RESIN

Tensile modulus-temperature (dry)



Tensile modulus-temperature (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)

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- ✓ 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)
- ✓ 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)

### 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).

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc. ISO Mechanical properties measured at 160 mil (Hytrek® measured at 80 mil), IEC Electrical properties measured at 80 mil, all ASTM properties measured at 120 mil, and test temperatures are 73°F unless otherwise stated.

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