



# Zytel® 103HSL 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® 103HSL NC010 is a heat stabilized, lubricated polyamide 66 resin for injection molding.

### Product information

Resin Identification	PA66	ISO 1043
Part Marking Code	>PA66<	ISO 11469
ISO designation	ISO 16396-PA66,,M1G1HNR,S14-030	

### Rheological properties

	dry/cond.		
Viscosity number	150/* <sup>[1]</sup>	cm <sup>3</sup> /g	ISO 307, 1157, 1628
Molding shrinkage, parallel	1.3/-	%	ISO 294-4, 2577
Molding shrinkage, normal	1.3/-	%	ISO 294-4, 2577

[1]: Sulfuric acid 96%

### Typical mechanical properties

	dry/cond.		
Tensile Modulus	3100/1400	MPa	ISO 527-1/-2
Yield stress	85/55	MPa	ISO 527-1/-2
Yield strain	4.3/25	%	ISO 527-1/-2
Nominal strain at break	20/>50	%	ISO 527-1/-2
Strain at break, 50mm/min	40/-	%	ISO 527-1/-2
Flexural Modulus	2800/1300 <sup>[DS]</sup>	MPa	ISO 178
Flexural Stress at 3.5%	95/65	MPa	ISO 178
Tensile creep modulus, 1h	*/1200	MPa	ISO 899-1
Tensile creep modulus, 1000h	*/650	MPa	ISO 899-1
Charpy impact strength, 73°F	N/N	kJ/m <sup>2</sup>	ISO 179/1eU
Charpy impact strength, -22°F	400/N	kJ/m <sup>2</sup>	ISO 179/1eU
Charpy notched impact strength, 73°F	5.5/12	kJ/m <sup>2</sup>	ISO 179/1eA
Charpy notched impact strength, -22°F	4.5/3.5	kJ/m <sup>2</sup>	ISO 179/1eA
Charpy notched impact strength, -40°F	2.5/2.5	kJ/m <sup>2</sup>	ISO 179/1eA
Izod notched impact strength, 73°F	5/10	kJ/m <sup>2</sup>	ISO 180/1A



# Zytel® 103HSL NC010

## NYLON RESIN

Izod notched impact strength, -22°F	4/4	kJ/m <sup>2</sup>	ISO 180/1A
Izod notched impact strength, -40°F	4/3.5 <sup>[DS]</sup>	kJ/m <sup>2</sup>	ISO 180/1A
Izod impact strength, 73°F	N/N	kJ/m <sup>2</sup>	ISO 180/1U
Izod impact strength, -22°F	300/N	kJ/m <sup>2</sup>	ISO 180/1U
Ball indentation hardness, H 358/30	180/85	MPa	ISO 2039-1
Ball indentation hardness, H 961/30	160/-	MPa	ISO 2039-1
Poisson's ratio	0.37/0.43	-	-

[DS]: Derived from similar grade

### Tribological properties

	dry/cond.		
Coefficient of sliding friction, 1h against steel	-/0.6		ASTM 1894

### Thermal properties

	dry/cond.		
Melting temperature, 18°F/min	262/*	°C	ISO 11357-1/-3
Glass transition temperature, 18°F/min	60/40	°C	ISO 11357-1/-2
Temp. of deflection under load, 260 psi	70/*	°C	ISO 75-1/-2
Temp. of deflection under load, 65 psi	200/*	°C	ISO 75-1/-2
Vicat softening temperature, 90°F/h, 11 lbf	240/*	°C	ISO 306
Coeff. of linear therm. expansion, parallel	100/*	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	110/*	E-6/K	ISO 11359-1/-2
Thermal conductivity of melt	0.16	W/(m K)	
Eff. thermal diffusivity	5E-8	m <sup>2</sup> /s	
Spec. heat capacity of melt	2790	J/(kg K)	
RTI, electrical, 30mil	140	°C	UL 746B
RTI, electrical, 60mil	140	°C	UL 746B
RTI, electrical, 120mil	140	°C	UL 746B
RTI, impact, 30mil	95	°C	UL 746B
RTI, impact, 60mil	110	°C	UL 746B
RTI, impact, 120mil	110	°C	UL 746B
RTI, strength, 30mil	115	°C	UL 746B
RTI, strength, 60mil	125/*	°C	UL 746B
RTI, strength, 120mil	125	°C	UL 746B
Temperature index, tensile strength, 20 000h	140/*	°C	IEC 60216-1
Temperature index, tensile strength, 5000h	155/*	°C	IEC 60216-1

### Flammability

	dry/cond.		
Burning Behav. at 60mil nom. thickn.	V-2/*	class	IEC 60695-11-10
Thickness tested	1.5/*	mm	IEC 60695-11-10
UL recognition	yes/*	-	UL 94
Burning Behav. at thickness h	V-2/*	class	IEC 60695-11-10
Thickness tested	0.71/*	mm	IEC 60695-11-10
UL recognition	yes/*	-	UL 94
Oxygen index	28/*	%	ISO 4589-1/-2
Glow Wire Flammability Index, 30mil	850/-	°C	IEC 60695-2-12



# Zytel® 103HSL NC010

## NYLON RESIN

Glow Wire Flammability Index, 60mil	960/-	°C	IEC 60695-2-12
Glow Wire Flammability Index, 120mil	960/-	°C	IEC 60695-2-12
Glow Wire Ignition Temperature, 30mil	725/-	°C	IEC 60695-2-13
Glow Wire Ignition Temperature, 60mil	725/-	°C	IEC 60695-2-13
Glow Wire Ignition Temperature, 120mil	725/-	°C	IEC 60695-2-13
Glow Wire Temperature, No Flame, 30mil	700/-	°C	IEC 60335-1
Glow Wire Temperature, No Flame, 40mil	700/-	°C	IEC 60335-1
Glow Wire Temperature, No Flame, 60mil	700/-	°C	IEC 60335-1
Glow Wire Temperature, No Flame, 80mil	700/-	°C	IEC 60335-1
Glow Wire Temperature, No Flame, 120mil	700/-	°C	IEC 60335-1
FMVSS Class	SE	-	ISO 3795 (FMVSS 302)

### Electrical properties

	dry/cond.		
Relative permittivity, 100Hz	3.8/12.8	-	IEC 62631-2-1
Relative permittivity, 1MHz	3.5/4	-	IEC 62631-2-1
Dissipation factor, 100Hz	75/5800	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	165/700	E-4	IEC 62631-2-1
Volume resistivity	1E13/1E11	Ohm.m	IEC 62631-3-1
Electric strength	31/28	kV/mm	IEC 60243-1
Comparative tracking index	600/-	-	IEC 60112
Comparative tracking index, 3.0mm	0/-	PLC	UL 746A

### Other properties

	dry/cond.		
Humidity absorption, 80mil	2.6/*	%	Sim. to ISO 62
Water absorption, 80mil	8.5/*	%	Sim. to ISO 62
Density	1140/-	kg/m <sup>3</sup>	ISO 1183
Density of melt	980	kg/m <sup>3</sup>	
Water Absorption, Immersion 24h	1.2/* <sup>[2]</sup>	%	Sim. to ISO 62
[2]: 3mm wall thickness			

### Film Properties

	dry/cond.		
Strain at yield, parallel	4.5/*	%	ISO 527-3

### VDA Properties

Emission of organic compounds	2.1	µgC/g	VDA 277
Odor test	2.5	class	VDA 270

### Injection

Drying Recommended	yes
Drying Temperature	80 °C
Drying Time, Dehumidified Dryer	2 - 4 h
Processing Moisture Content	≤0.2 %
Melt Temperature Optimum	290 °C



# Zytel® 103HSL NC010

## NYLON RESIN

Min. melt temperature	280 °C
Max. melt temperature	300 °C
Max. screw tangential speed	0.4 m/s
Mold Temperature Optimum	70 °C
Min. mold temperature	50 °C
Max. mold temperature	90 °C
Hold pressure range	50 - 100 MPa
Hold pressure time	4 s/mm
Ejection temperature	190 °C

## Characteristics

Additives

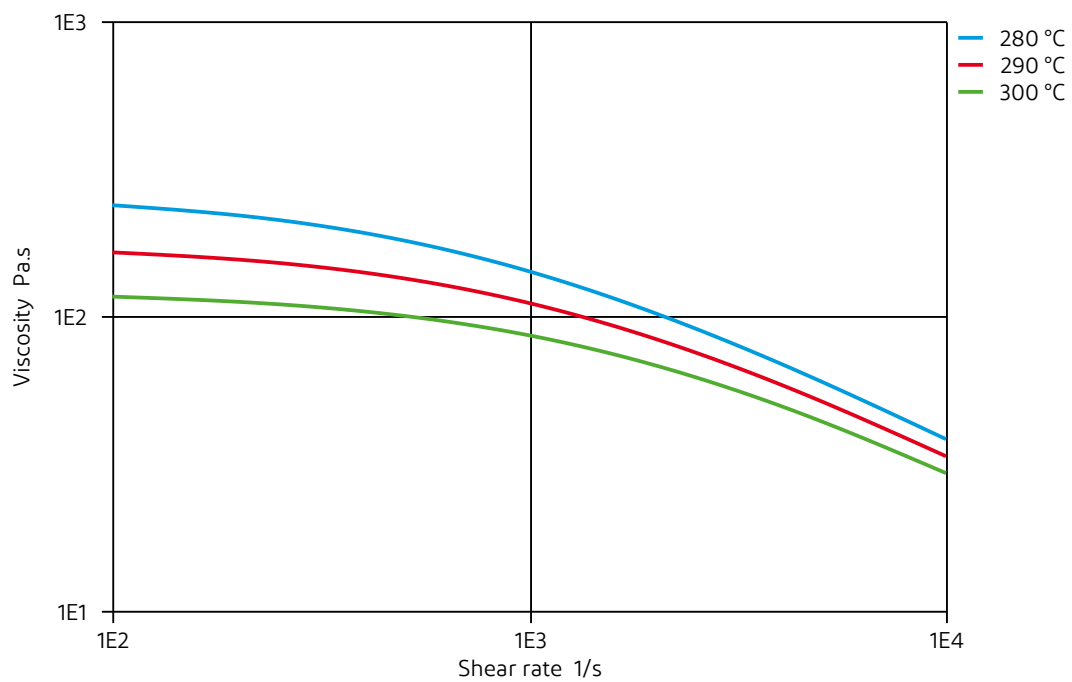
Release agent



# Zytel® 103HSL NC010

NYLON RESIN

Viscosity-shear rate

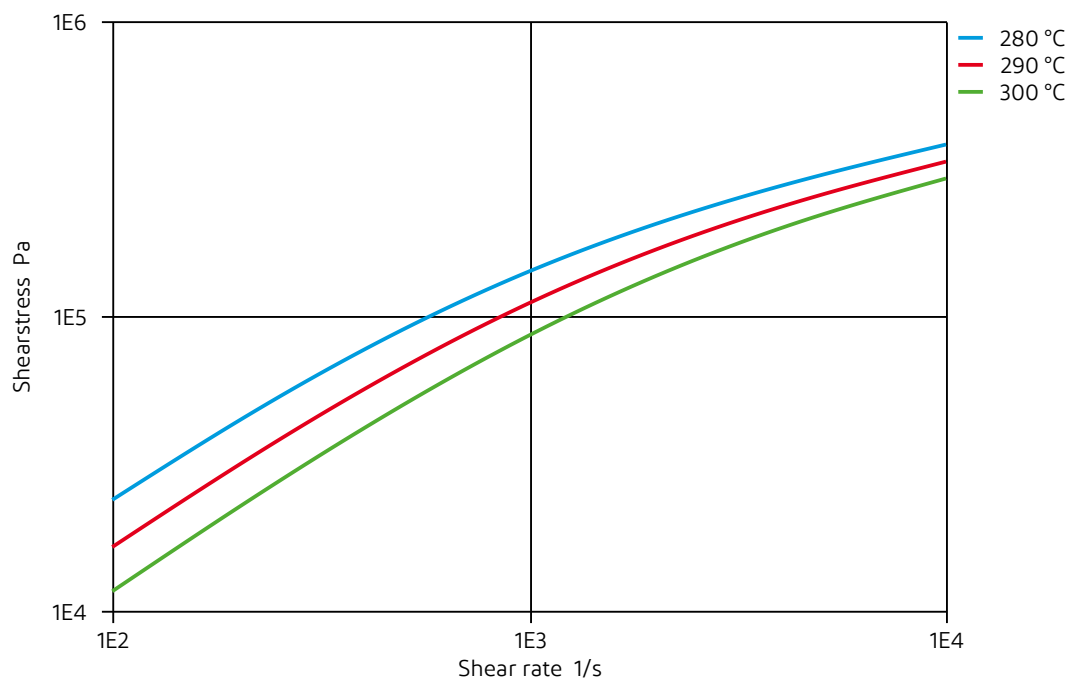




# Zytel® 103HSL NC010

NYLON RESIN

Shearstress-shear rate

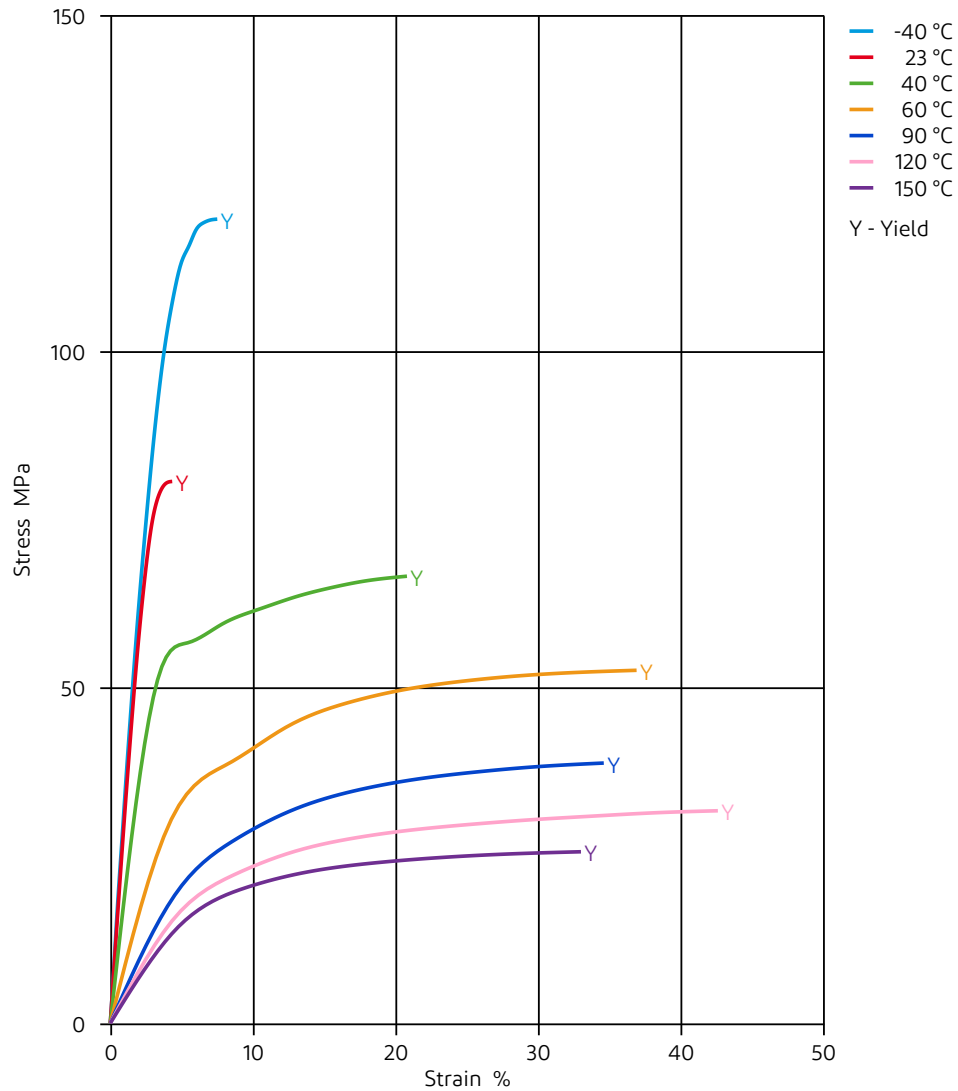




# Zytel® 103HSL NC010

NYLON RESIN

Stress-strain (dry)

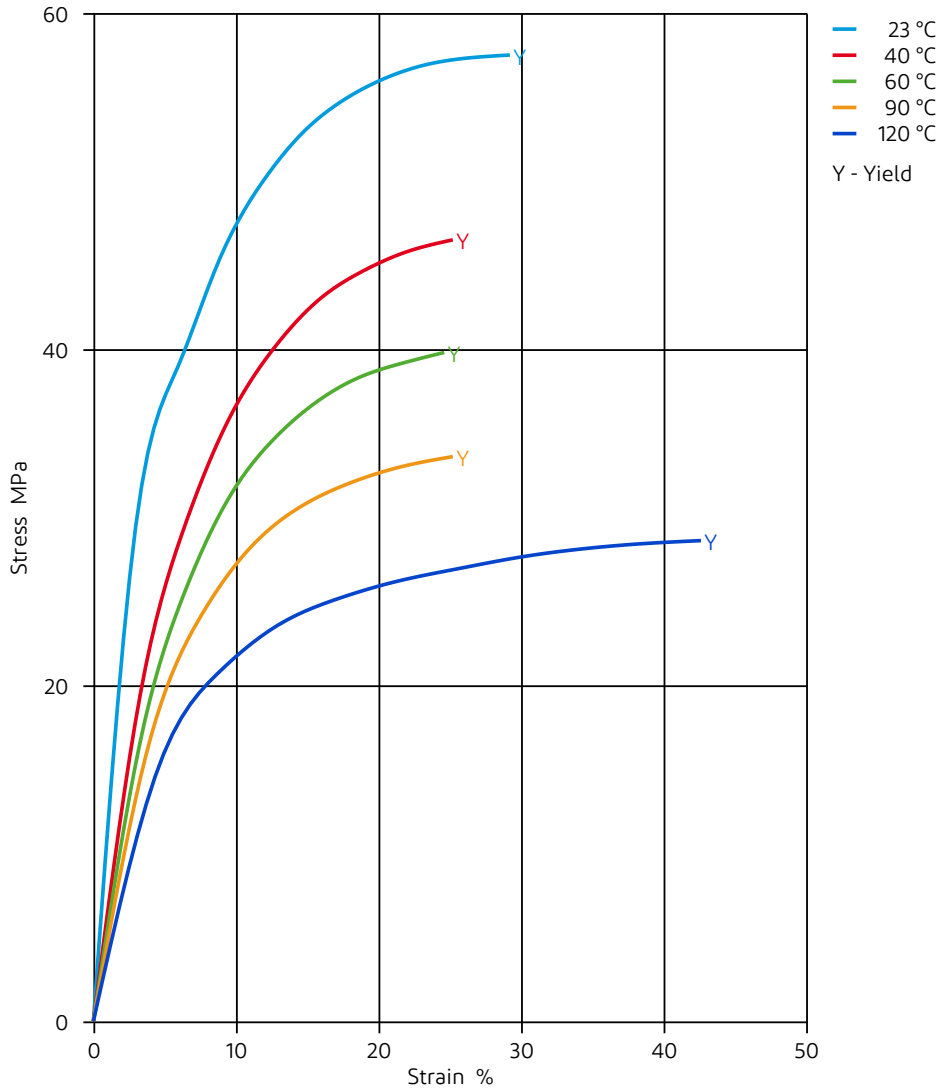




# Zytel® 103HSL NC010

NYLON RESIN

Stress-strain (cond.)



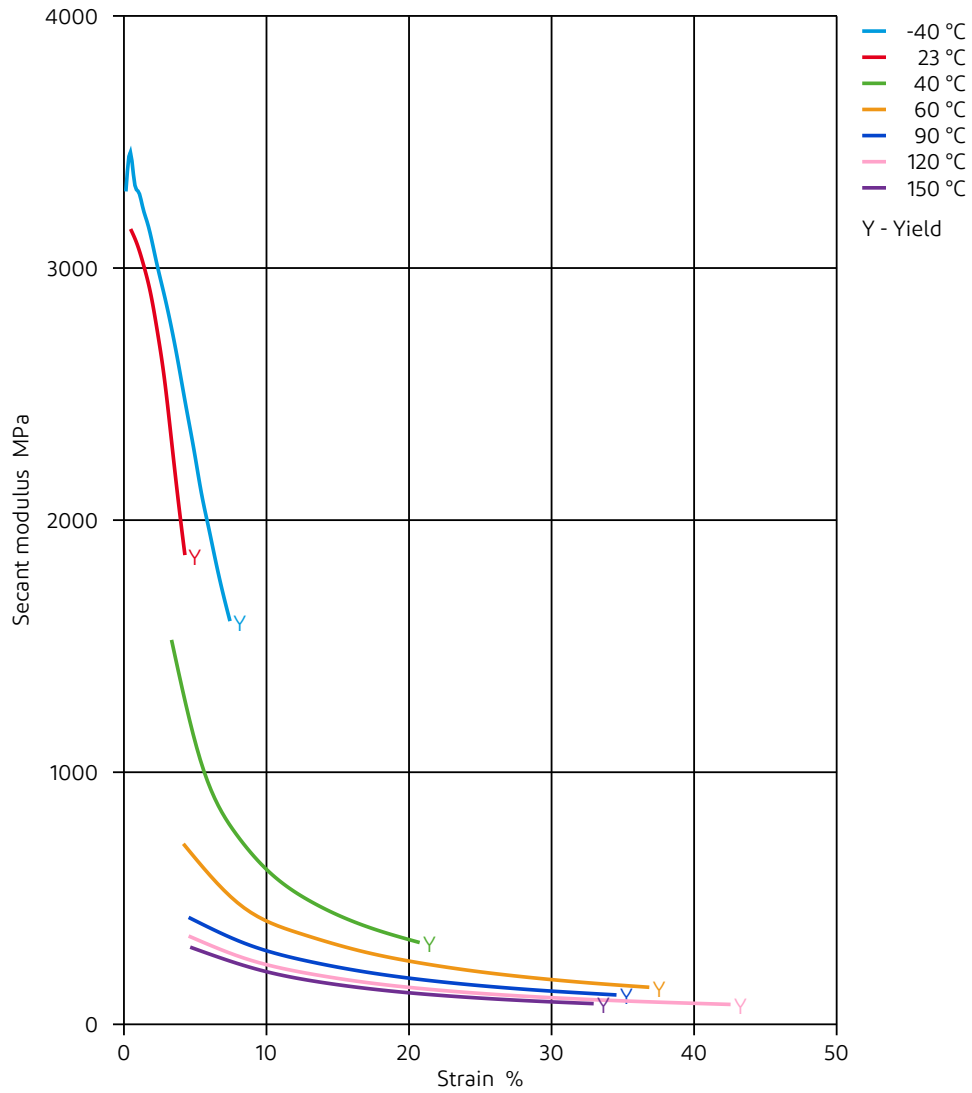




# Zytel® 103HSL NC010

NYLON RESIN

Secant modulus-strain (dry)

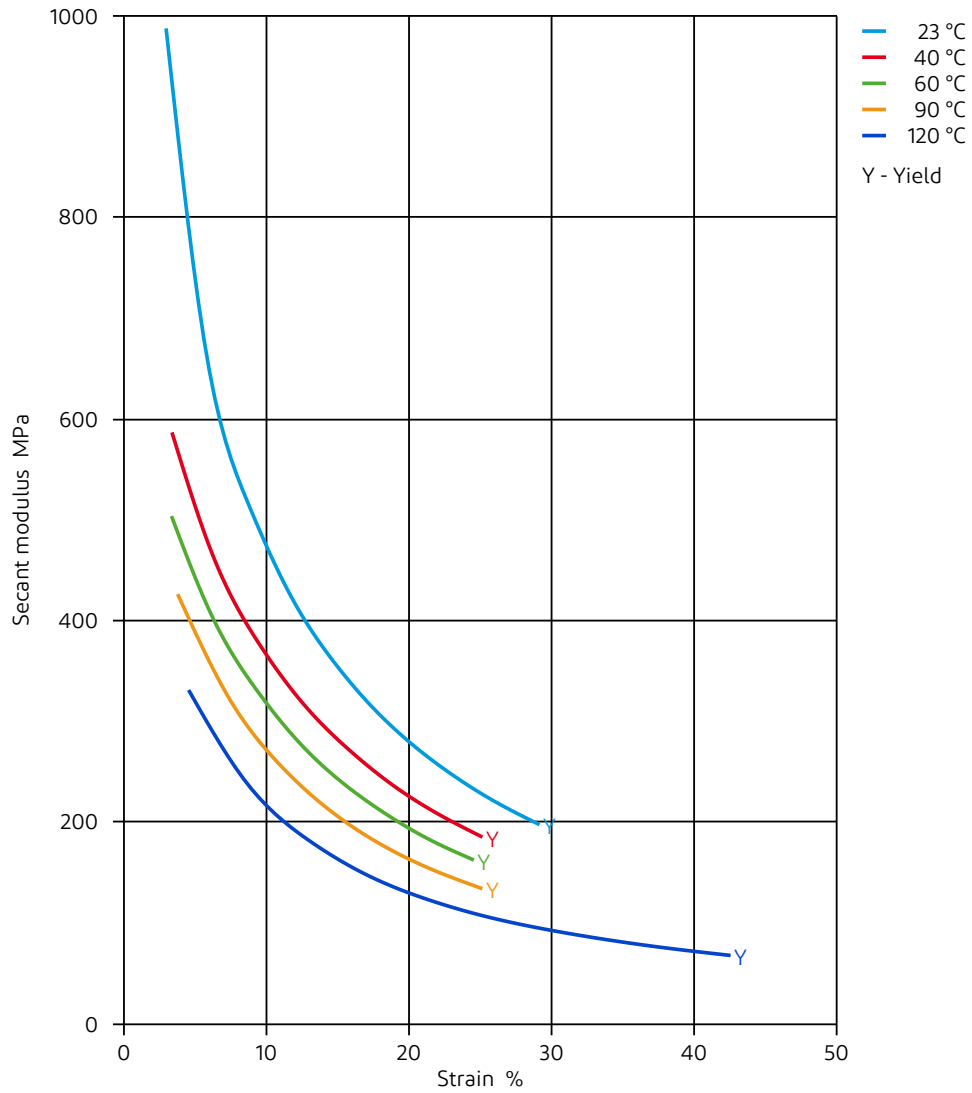




# Zytel® 103HSL NC010

NYLON RESIN

Secant modulus-strain (cond.)

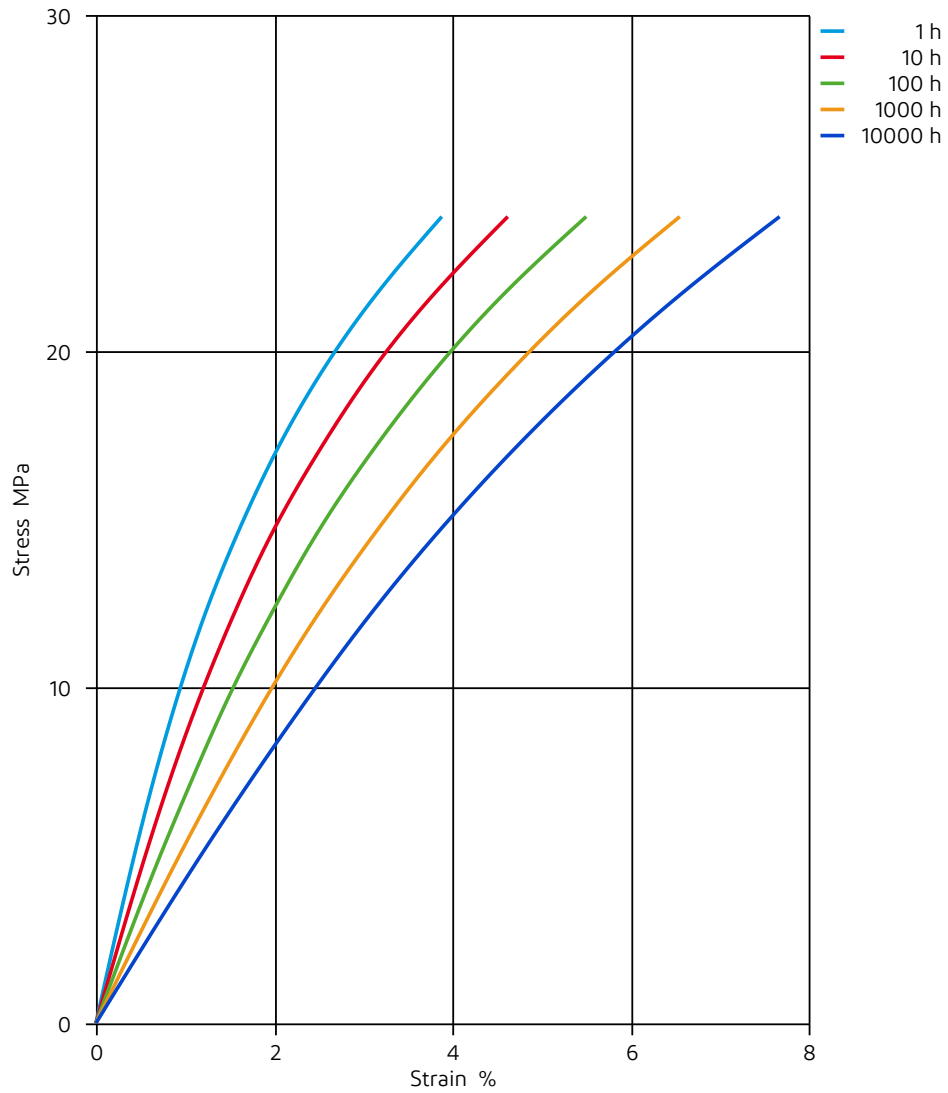




# Zytel® 103HSL NC010

NYLON RESIN

Stress-strain (isochronous) 23°C (cond.)

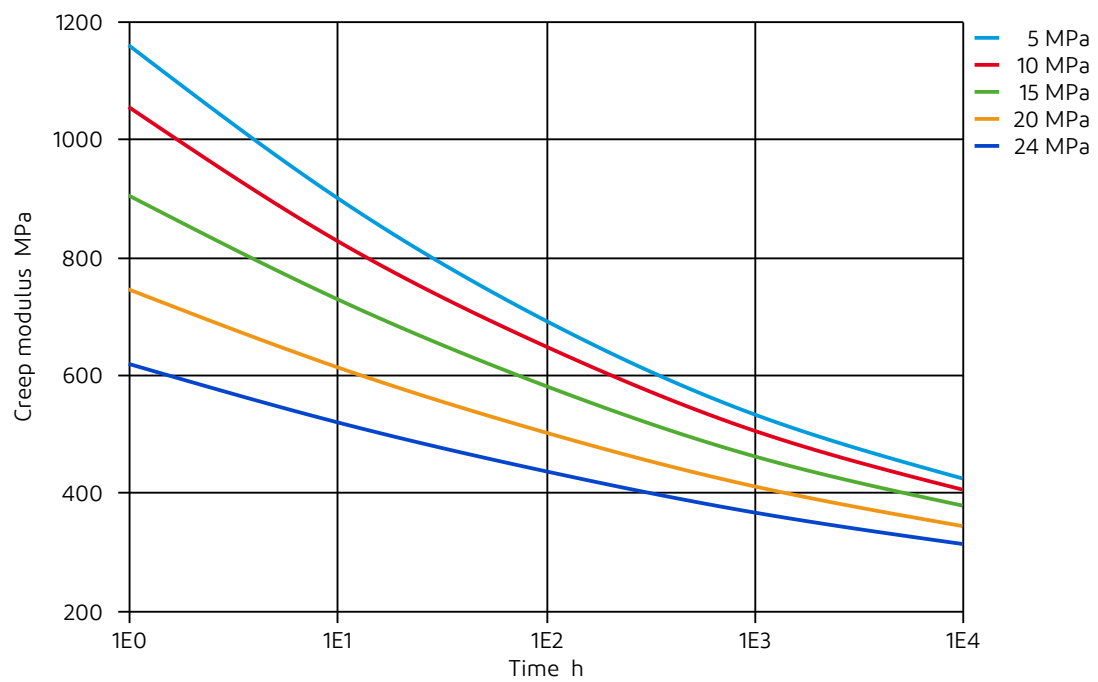




# Zytel® 103HSL NC010

NYLON RESIN

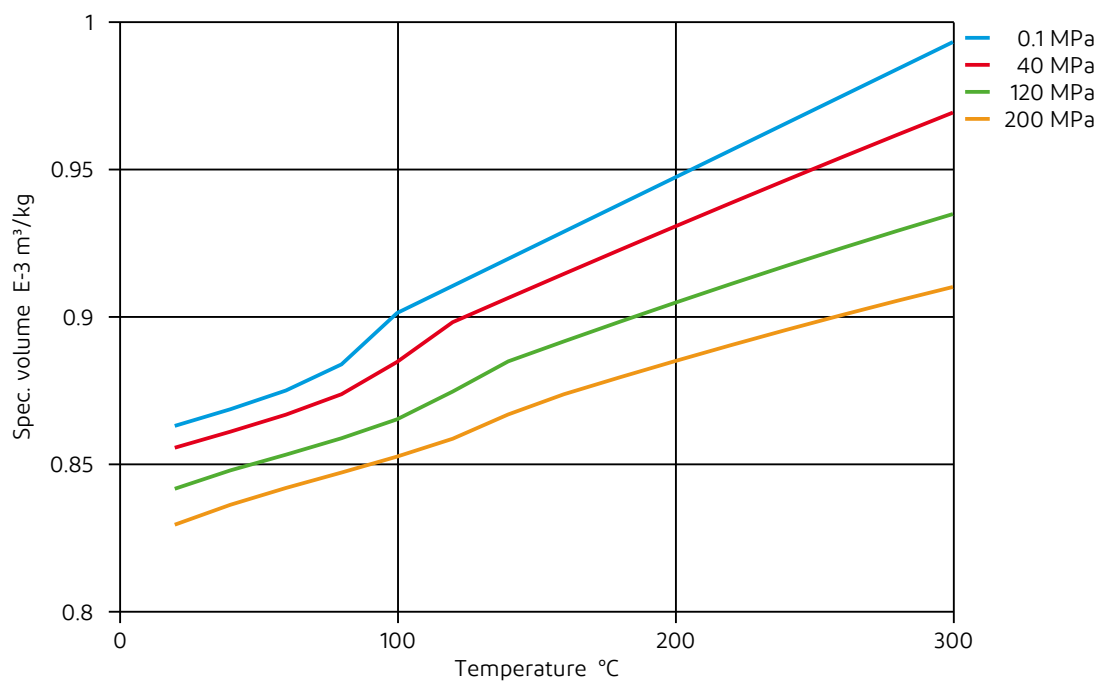
Creep modulus-time 23°C (cond.)



# Zytel® 103HSL NC010

NYLON RESIN

Specific volume-temperature (pvT)



# Zytel® 103HSL NC010

## NYLON RESIN

### 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

#### 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
- ✓ Diesel fuel (pref. ISO 1817 Liquid F), 23°C

# Zytel® 103HSL NC010

## NYLON RESIN

- ✓ 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).

The information set forth herein is furnished free of charge, is based on technical data that DuPont believes to be reliable, and represents typical values that fall within the normal range of properties. This information relates only to the specific material designated and may not be valid for such material used in combination with other materials or in other processes. It is intended for use by persons having technical skill, at their own discretion and risk. This information should not be used to establish specification limits nor used alone as the basis of design. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards and comply with applicable law. Since conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any product, evaluation under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on patents.

CAUTION: Do not use DuPont materials in medical applications involving implantation in the human body or contact with internal body fluids or tissues unless the material has been provided from DuPont under a written contract or other acknowledgement that is consistent with the DuPont policy regarding medical applications and expressly acknowledges the contemplated use. For further information, please contact your DuPont representative.

DuPont's sole warranty is that our products will meet our standard sales specifications in effect at the time of shipment. Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DUPONT SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR NON-INFRINGEMENT. DUPONT DISCLAIMS LIABILITY FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.