Celanese
The chemistry inside innovation™

Minlon® EFE6053 BK413

MINERAL REINFORCED NYLON RESIN

Common features of Minlon® nylon resin include mechanical and physical properties such as high mechanical strength, excellent balance of stiffness /toughness, good high temperature performance, good chemical resistance, paintability, dimensional stability and low warpage.
Grades with improved electrical and flammability properties are available within the Zytel® nylon resin product line. In addition, Minlon® nylon resin is available in different modified and reinforced grades to create a wide range of products with tailored properties for specific processes and end-uses.

The good melt stability of Minlon® nylon resin normally enables the recycling of properly handled production waste. If recycling is not possible, we recommend, 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.
Minlon® nylon resin typically is used in demanding applications in the automotive, electrical, electronic, domestic appliances and construction industries.

Minlon® EFE6053 BK413 is a 40% mineral/glass reinforced, heat stabilized polyamide 66 resin for injection molding.

Product information

Resin Identification	PA66-(GF+MD)40	ISO 1043
Part Marking Code	>PA66-(GF+MD)40<	ISO 11469
ISO designation	ISO 16396-PA66,(MD+GF)40,M1CGHR,S14-100	
Infrared spectrum	available	

Rheological properties

	dry/cond.		
Viscosity number	3960 / *	in³/lb	ISO 307, 1628
Molding shrinkage, parallel	0.4 / -	%	ISO 294-4, 2577
Molding shrinkage, normal	1.1 / -	%	ISO 294-4, 2577

Typical mechanical properties

	dry/cond.		
Tensile modulus	1.45E6 / 943000	psi	ISO 527-1/-2
Tensile stress at break, 5mm/min	23200 / 14100	psi	ISO 527-1/-2
Tensile strain at break, 5mm/min	2.2 / 4.6	%	ISO 527-1/-2
Flexural modulus	1.38E6 / -	psi	ISO 178
Flexural strength	30500 / -	psi	ISO 178
Tensile creep modulus, 1h	* / 870000	psi	ISO 899-1
Tensile creep modulus, 1000h	* / 537000	psi	ISO 899-1
Charpy impact strength, 23°C	21.4 / 23.8	ftlb/in²	ISO 179/1eU
Charpy impact strength, -30°C	19 / 19	ftlb/in²	ISO 179/1eU
Charpy notched impact strength, 23°C	2.14 / 3.09	ftlb/in²	ISO 179/1eA
Charpy notched impact strength, -30°C	1.9 / 2.85	ftlb/in²	ISO 179/1eA
Izod notched impact strength, 23°C	1.9 / 2.38	ftlb/in²	ISO 180/1A
Izod notched impact strength, -30°C	1.9 / 2.14	ftlb/in²	ISO 180/1A

Thermal properties

	dry/cond.		
Melting temperature, 10°C/min	504 / *	°F	ISO 11357-1/-3
Glass transition temperature, 10°C/min	158 / -	°F	ISO 11357-1/-3
Temperature of deflection under load, 1.8 MPa	464 / *	°F	ISO 75-1/-2
Temperature of deflection under load, 0.45 MPa	493 / *	°F	ISO 75-1/-2

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Vicat softening temperature, 50 °C/h 50N	482 / *	°F	ISO 306
Coefficient of linear thermal expansion (CLTE), parallel	0.16 / *	E-4/°F	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), parallel, -40-23 °C	0.122 / *	E-4/°F	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), parallel, 55-160 °C	0.172 / *	E-4/°F	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), normal	0.483 / *	E-4/°F	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), normal, -40-23 °C	0.256 / *	E-4/°F	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), normal, 55-160 °C	0.706 / *	E-4/°F	ISO 11359-1/-2
Thermal conductivity of melt	0.27	W/(m K)	ISO 22007-2
Specific heat capacity of melt	1900	J/(kg K)	ISO 22007-4

Flammability

FMVSS Class	B		ISO 3795 (FMVSS 302)
Burning rate, Thickness 1 mm	1.1	in/min	ISO 3795 (FMVSS 302)

Electrical properties

	dry/cond.		
Relative permittivity, 100Hz	4.9 / 13.9		IEC 62631-2-1
Relative permittivity, 1MHz	4.8 / 5		IEC 62631-2-1
Dissipation factor, 100Hz	140 / 5400	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	130 / 700	E-4	IEC 62631-2-1
Electric strength	711 / -	kV/in	IEC 60243-1

Physical/Other properties

	dry/cond.		
Humidity absorption, 2mm	1.5 / *	%	Sim. to ISO 62
Water absorption, 2mm	5 / *	%	Sim. to ISO 62
Density	0.0531 / -	lb/in³	ISO 1183
Density of melt	78	lb/ft³	

Injection

Drying Recommended	yes	
Drying Temperature	176	°F
Drying Time, Dehumidified Dryer	2 - 4	h
Processing Moisture Content	≤0.2	%
Melt Temperature Optimum	558	°F
Min. melt temperature	536	°F
Max. melt temperature	581	°F
Max. screw tangential speed	≤0.15	m/s
Mold Temperature Optimum	221	°F
Min. mold temperature	194	°F
Max. mold temperature	248	°F
Hold pressure range	7250 - 14500	psi
Hold pressure time	0.0762	s/mil

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Hold Pressure Time (h is the max. wall thickness of the part in mm)	h^2+2	s
Ejection temperature	437	°F

Automotive

OEM	STANDARD	ADDITIONAL INFORMATION
BMW	GS93016-PA66-(GF25+MX15)	(High Heat Aging Resistant)
Ford	WSS-M4D823-B1	
General Motors	GMW8751P-PA66-M15GF25	Black
Mercedes-Benz	DBL5409.40 PA66-(GF+MD)40	
Stellantis	MS.50017 / PA66.GM40.7200F.30C.HS	CPN2554
Stellantis - Chrysler	MS.50017 / CPN-2554	Black
VW Group	VW 50127 PA66-13	

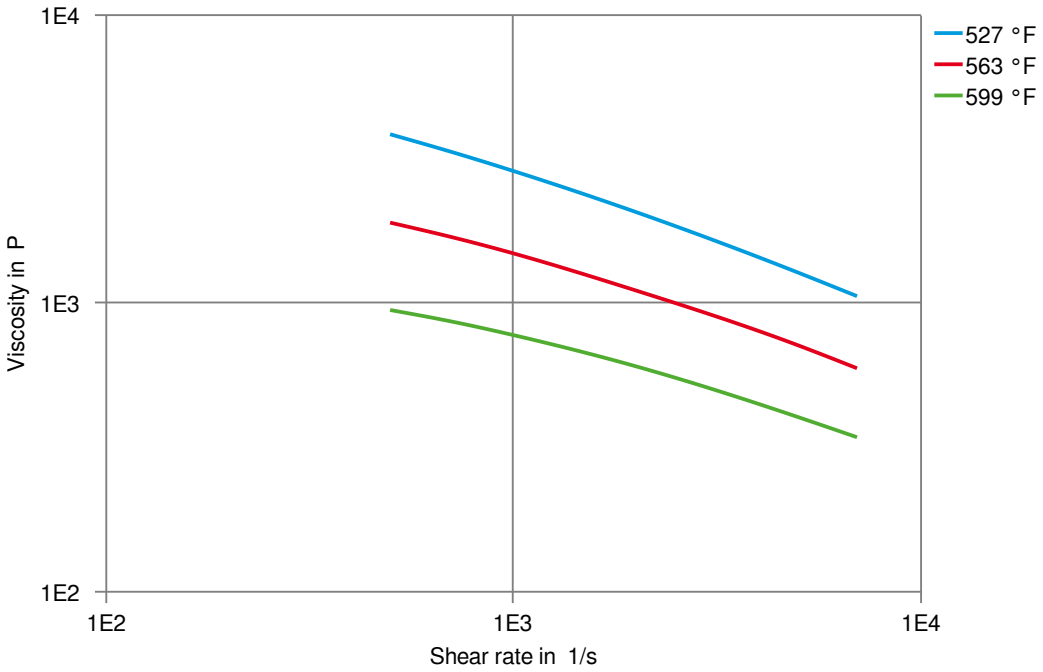
Characteristics

Processing	Injection Molding
Additives	Release agent
Special characteristics	Heat stabilized or stable to heat

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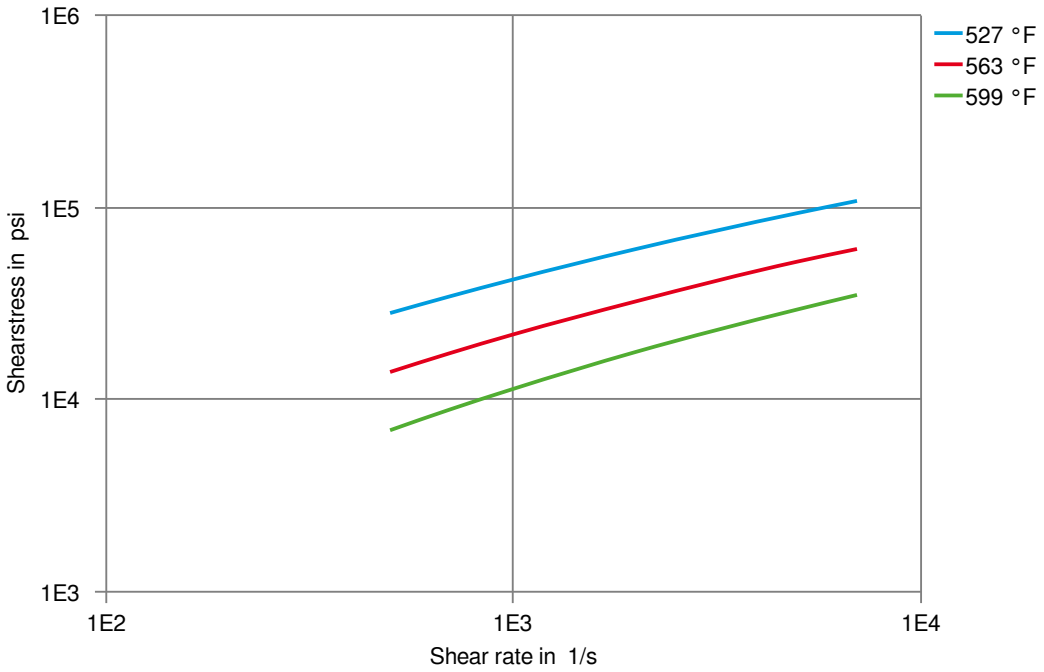
Viscosity-shear rate



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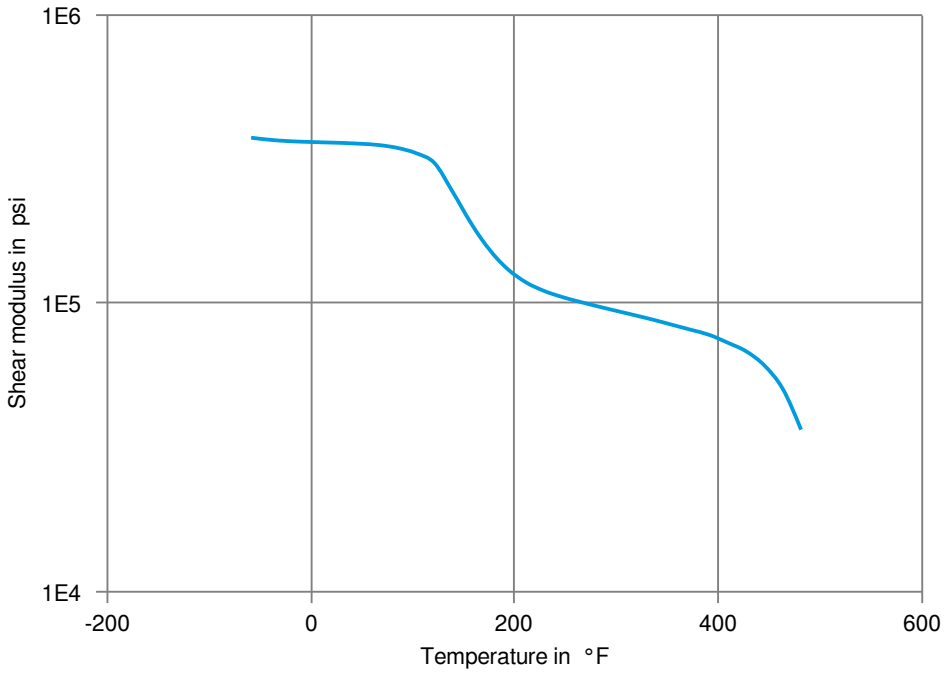
Shearstress-shear rate



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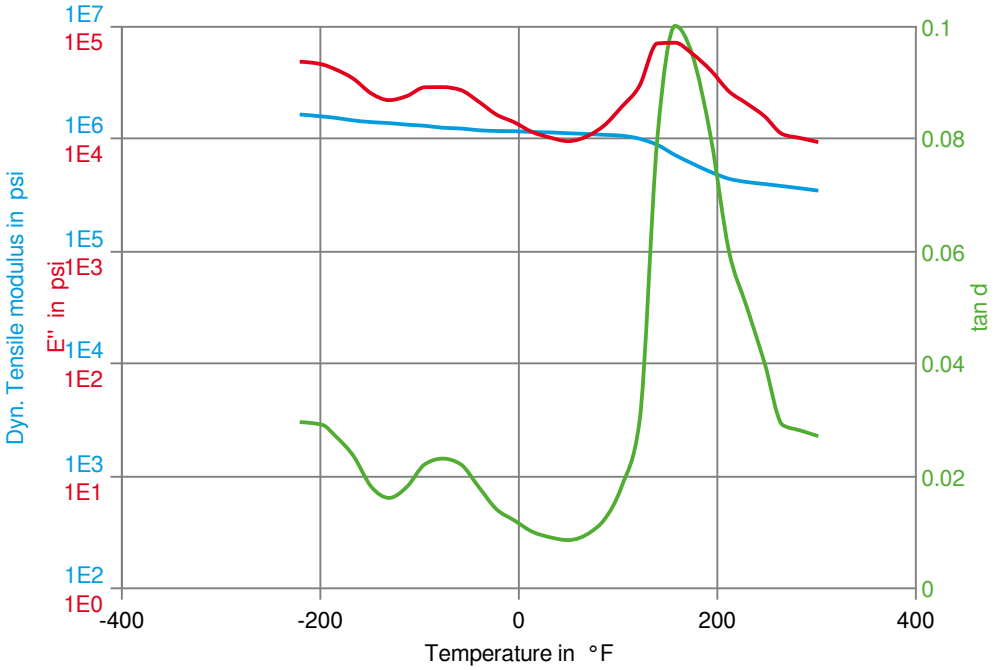
Dynamic Shear modulus-temperature (dry)



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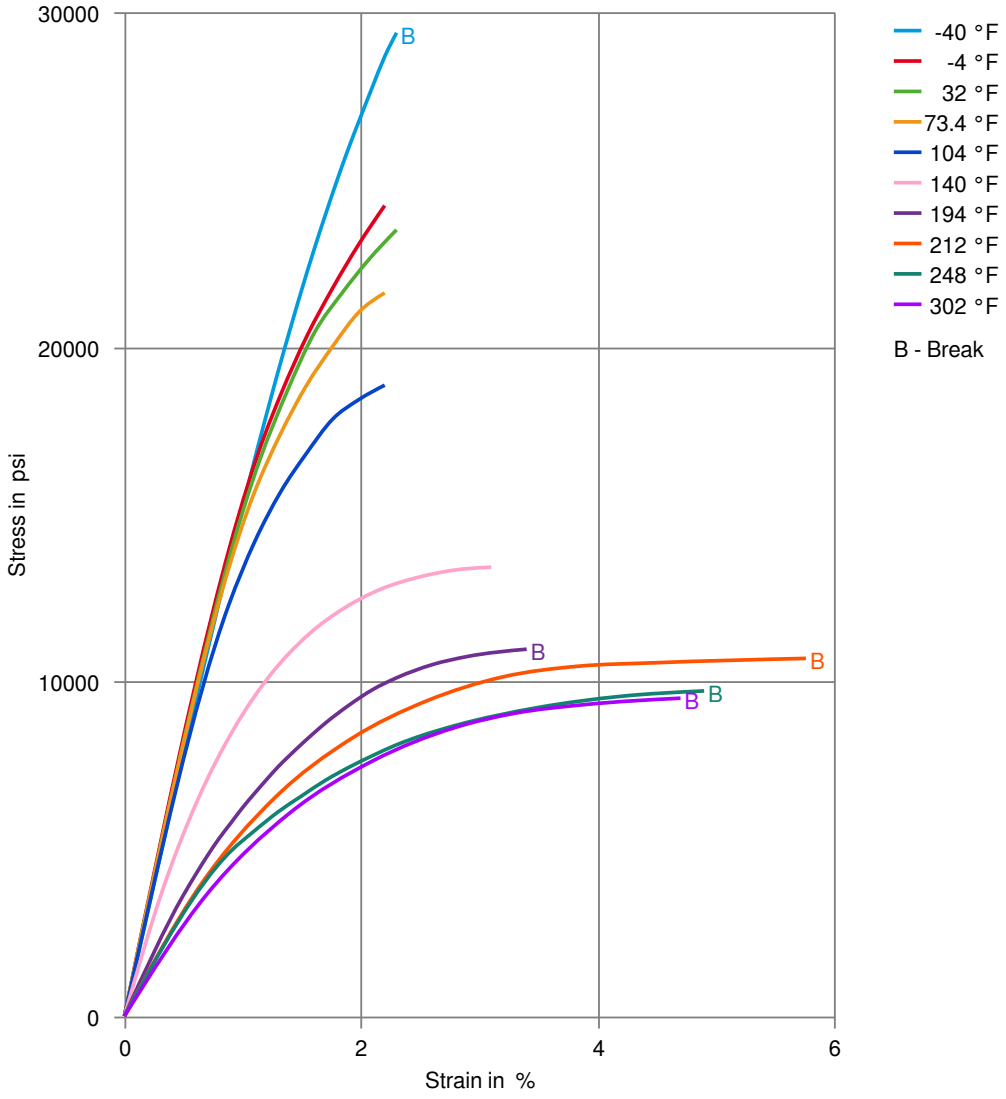
Dynamic Tensile modulus-temperature (dry)



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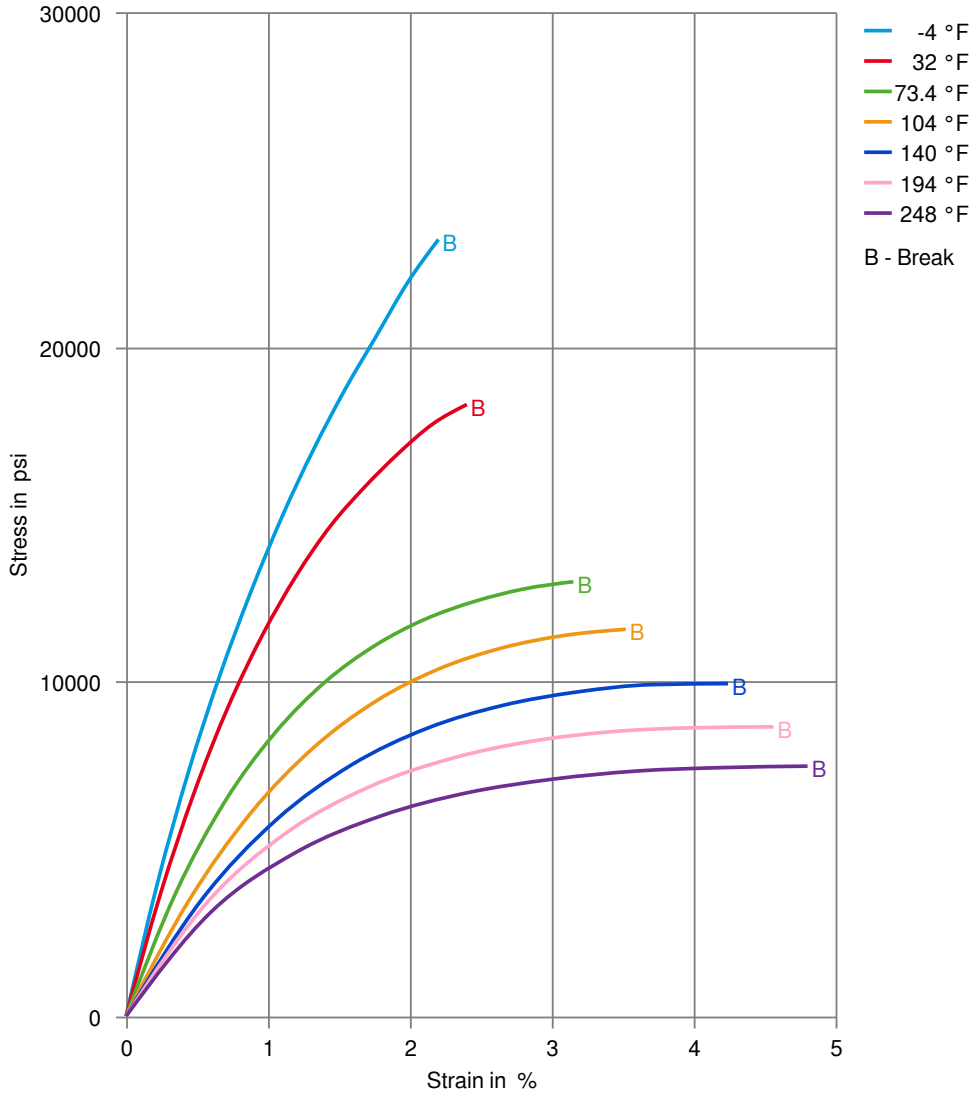
Stress-strain (dry)



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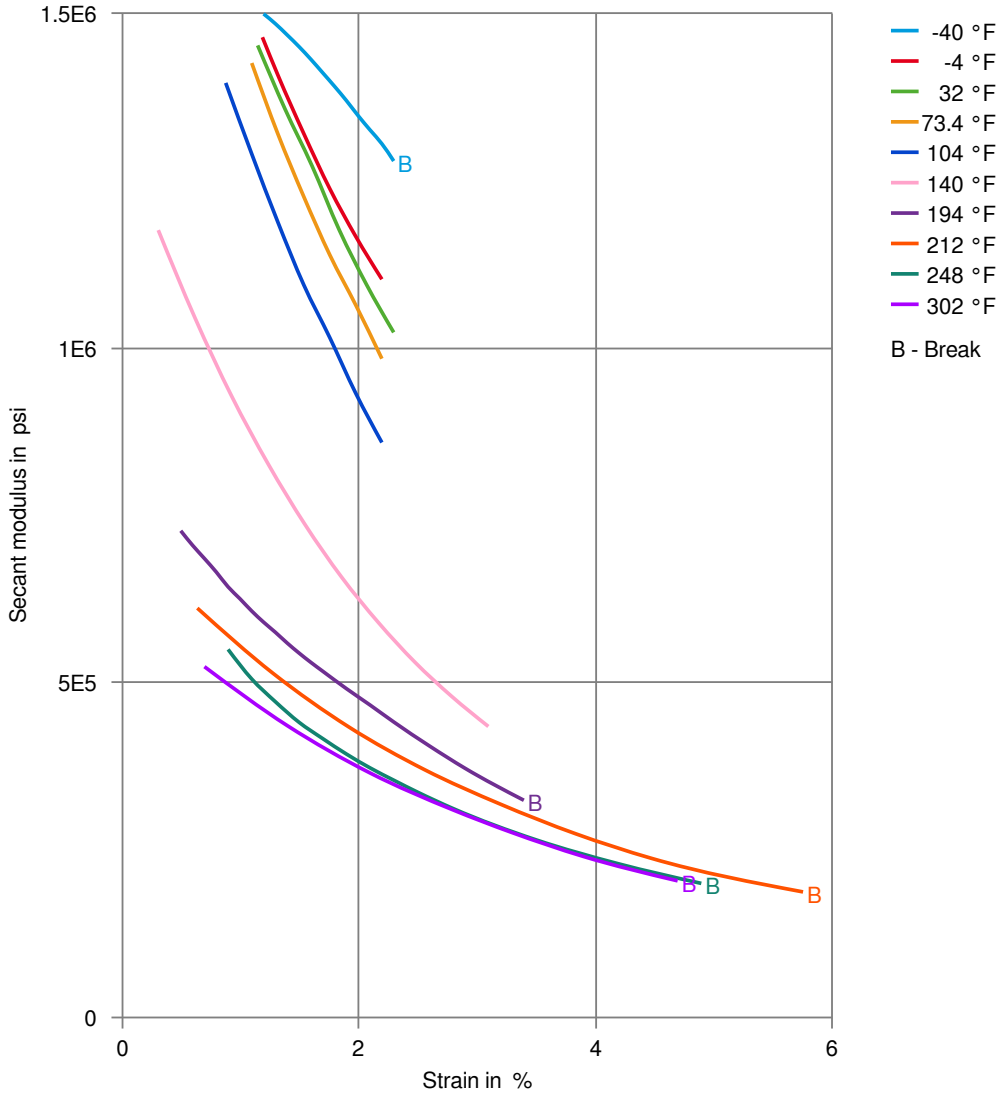
Stress-strain (cond.)



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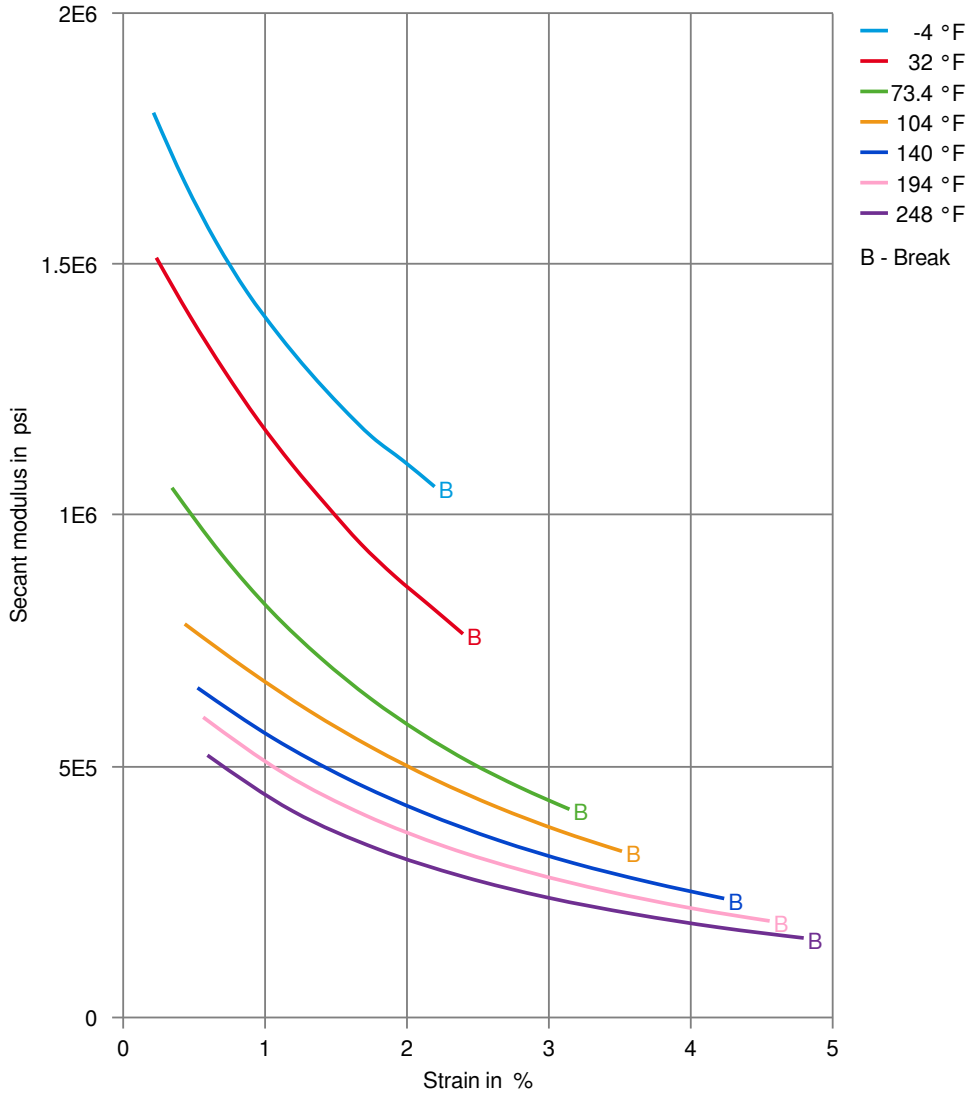
Secant modulus-strain (dry)



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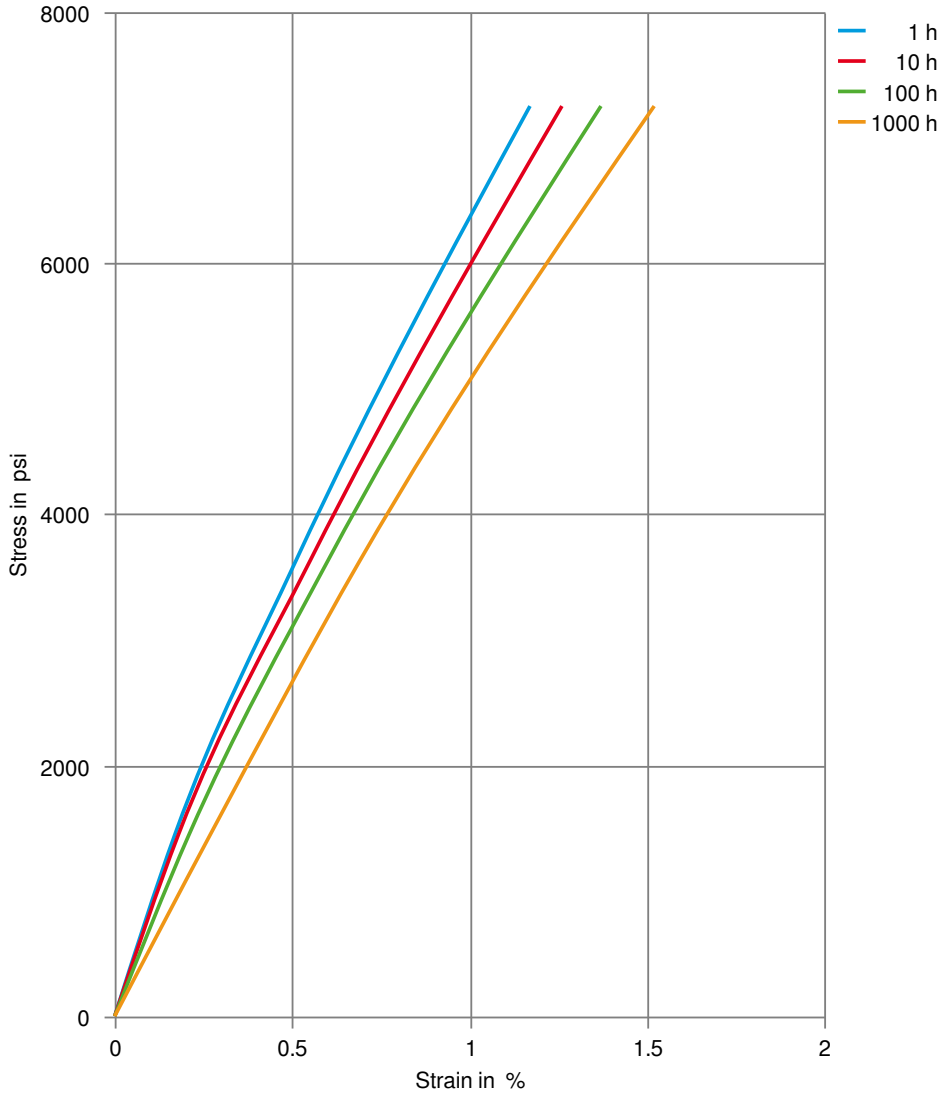
Secant modulus-strain (cond.)



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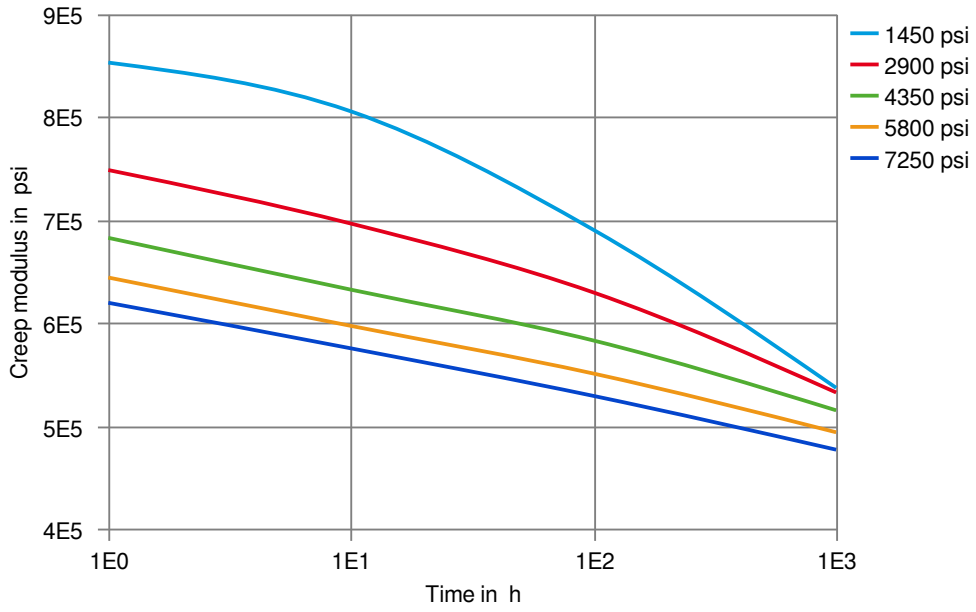
Stress-strain (isochronous) 73.4 °F (cond.)



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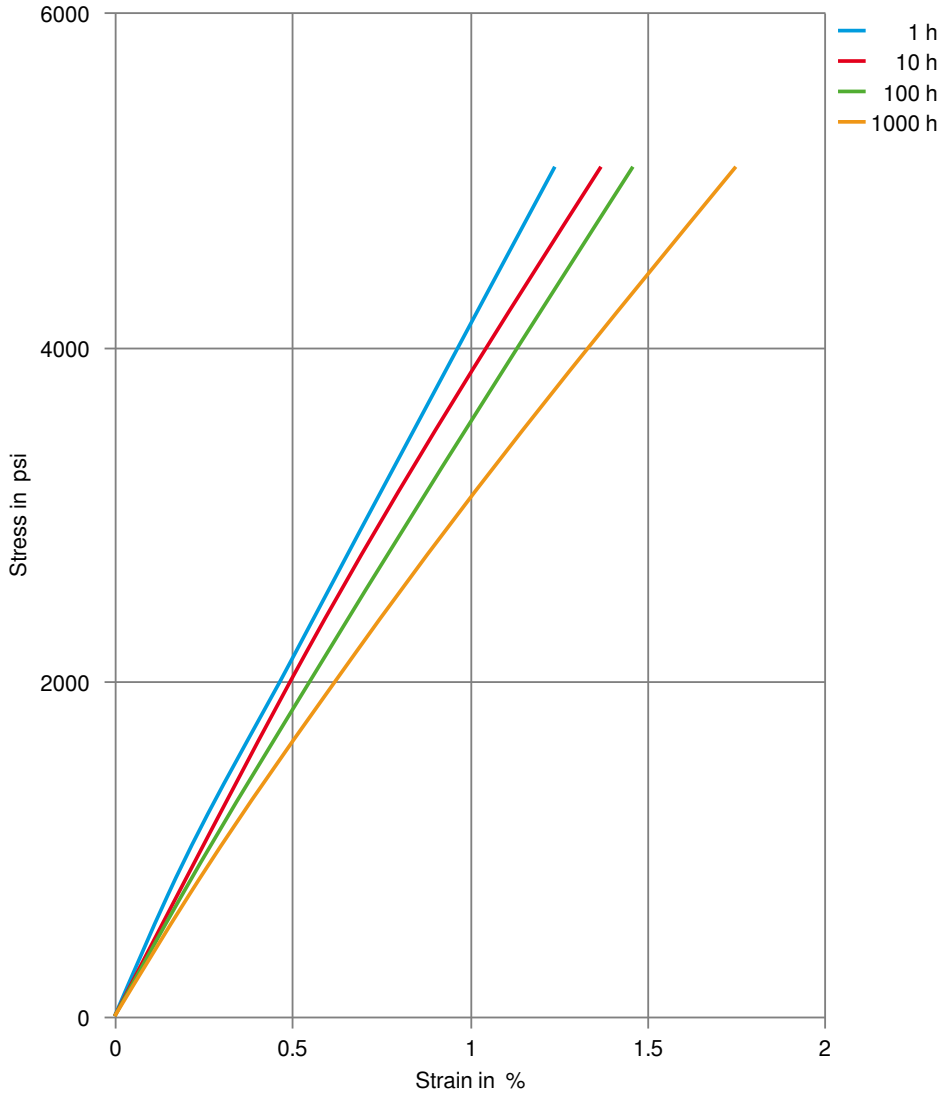
Creep modulus-time 73.4 °F (cond.)



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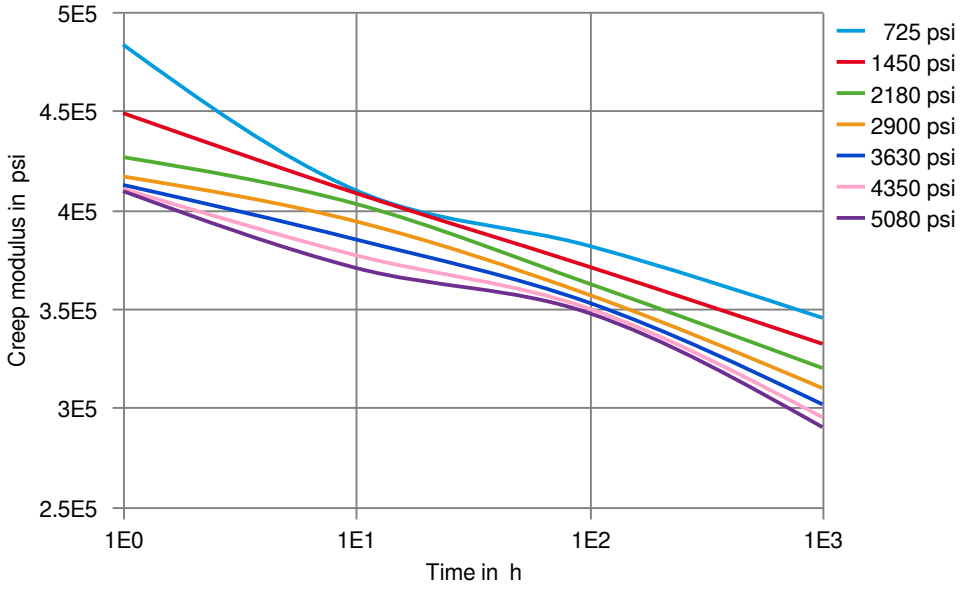
Stress-strain (isochronous) 140 °F (cond.)



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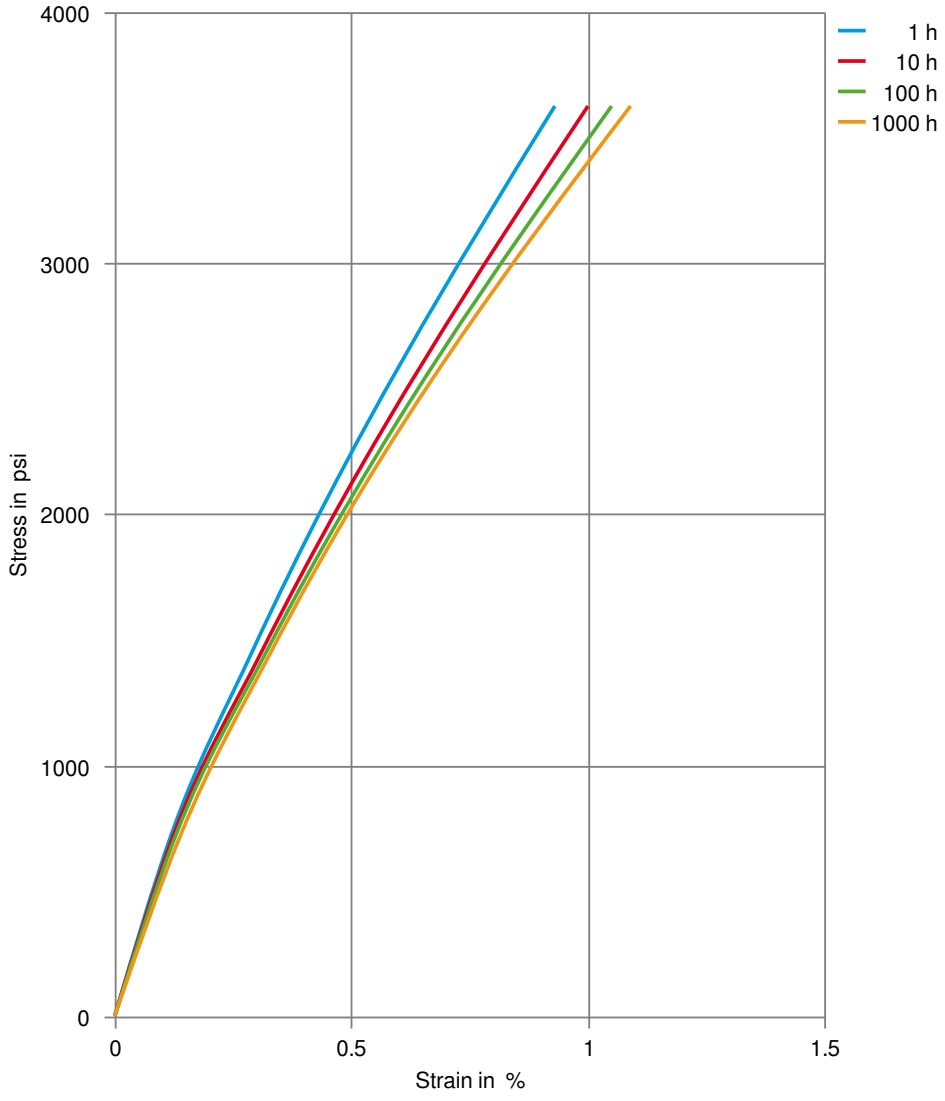
Creep modulus-time 140 °F (cond.)



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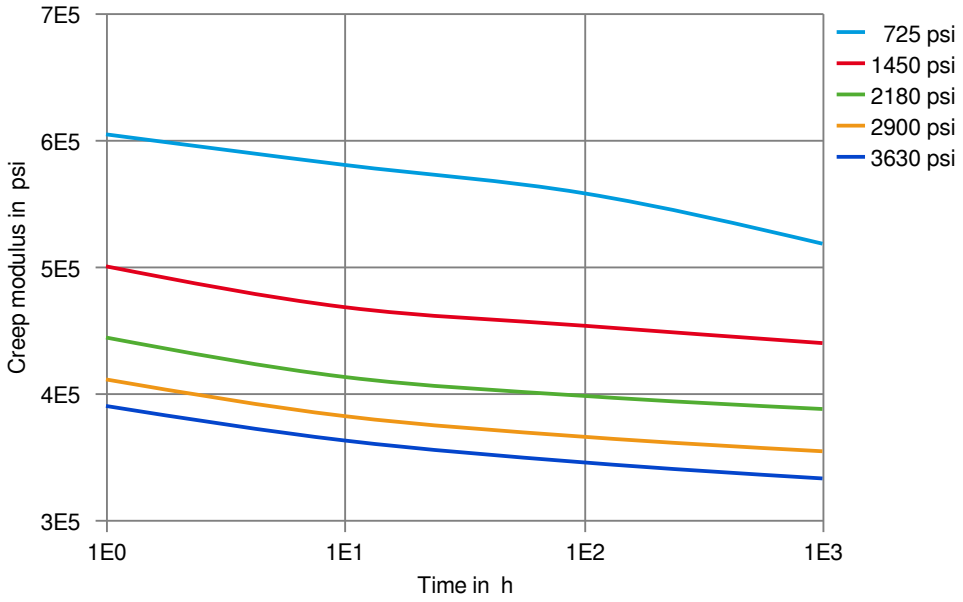
Stress-strain (isochronous) 248 °F (dry)



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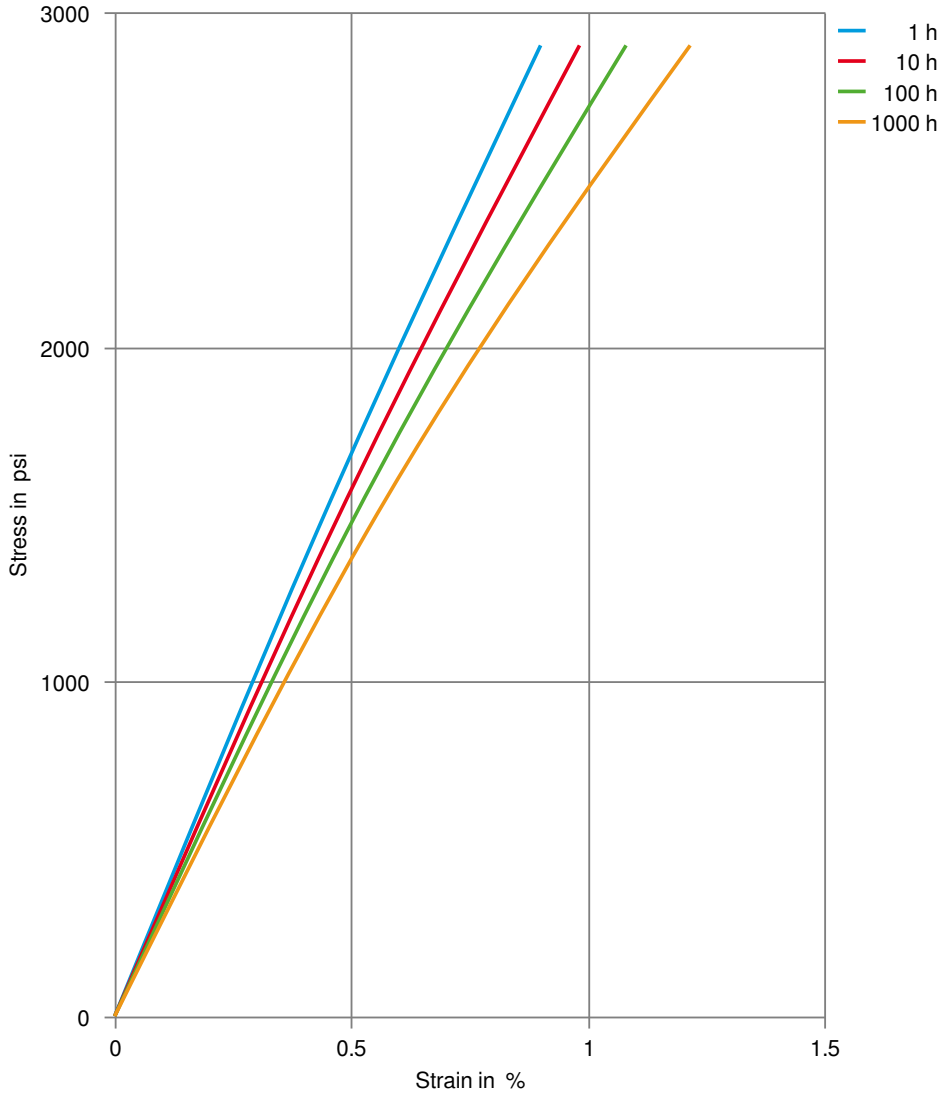
Creep modulus-time 248 °F (dry)



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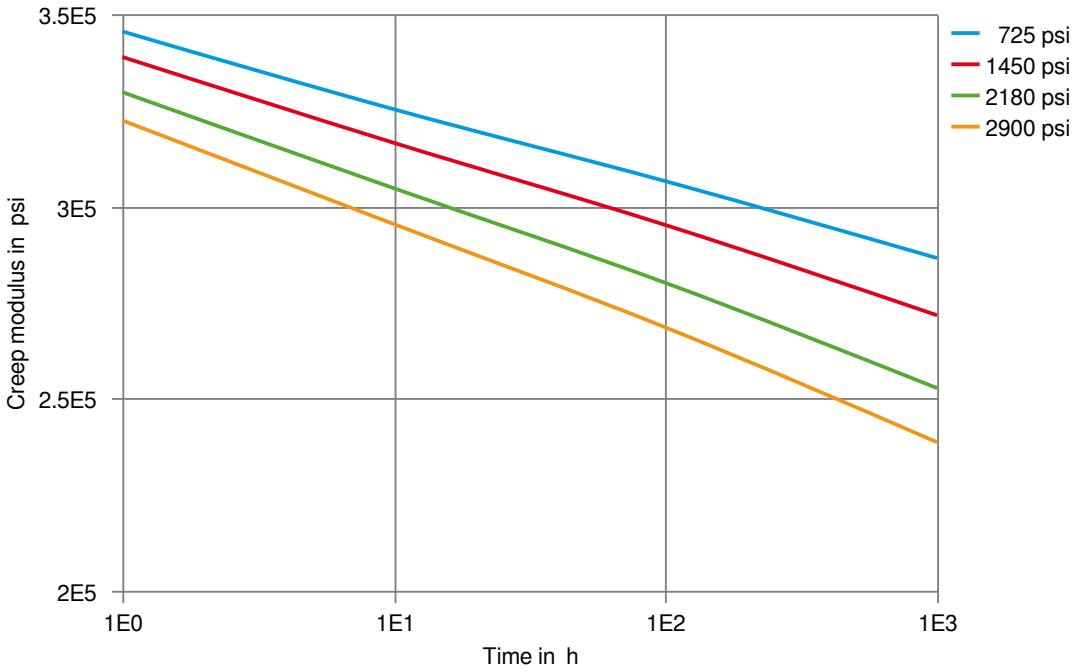
Stress-strain (isochronous) 284 °F (dry)



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Creep modulus-time 284 °F (dry)



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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

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
- ✔ 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

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- ✔ 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).

NOTICE TO USERS: Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colorants or other additives may cause significant variations in data values. Properties of molded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Other than those products expressly identified as medical grade (including by MT® product designation or otherwise), Celanese's products are not intended for use in medical or dental implants. Regardless of any such product designation, any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any equipment, processing technique or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards. We strongly recommend that users seek and adhere to the manufacturer's current instructions for handling each material they use, and entrust the handling of such material to adequately trained personnel only. Please call the telephone numbers listed for additional technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before attempting to process our products.
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