

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 stabilised polyamide 66 resin for injection moulding.

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	

Rheological properties

	dry/cond.		
Viscosity number	143 / *	cm ³ /g	ISO 307, 1628
Moulding shrinkage, parallel	0.4 / -	%	ISO 294-4, 2577
Moulding shrinkage, normal	1.1 / -	%	ISO 294-4, 2577

Typical mechanical properties

	dry/cond.		
Tensile modulus	10000 / 6500	MPa	ISO 527-1/-2
Tensile stress at break, 5mm/min	160 / 97	MPa	ISO 527-1/-2
Tensile strain at break, 5mm/min	2.2 / 4.6	%	ISO 527-1/-2
Flexural modulus	9500 / -	MPa	ISO 178
Flexural strength	210 / -	MPa	ISO 178
Tensile creep modulus, 1h	* / 6000	MPa	ISO 899-1
Tensile creep modulus, 1000h	* / 3700	MPa	ISO 899-1
Charpy impact strength, 23°C	45 / 50	kJ/m ²	ISO 179/1eU
Charpy impact strength, -30°C	40 / 40	kJ/m ²	ISO 179/1eU
Charpy notched impact strength, 23°C	4.5 / 6.5	kJ/m ²	ISO 179/1eA
Charpy notched impact strength, -30°C	4 / 6	kJ/m ²	ISO 179/1eA
Izod notched impact strength, 23°C	4 / 5	kJ/m ²	ISO 180/1A
Izod notched impact strength, -30°C	4.0 / 4.5	kJ/m ²	ISO 180/1A
Poisson's ratio	0.34 / 0.35		

Thermal properties

	dry/cond.		
Melting temperature, 10°C/min	262 / *	°C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	70 / -	°C	ISO 11357-1/-3
Temperature of deflection under load, 1.8 MPa	240 / *	°C	ISO 75-1/-2
Temperature of deflection under load, 0.45 MPa	256 / *	°C	ISO 75-1/-2

Minlon® EFE6053 BK413

MINERAL REINFORCED NYLON RESIN

Vicat softening temperature, 50°C/h 50N	250/*	°C	ISO 306
Coeff. of linear therm. expansion, parallel, -40-23°C	22/*	E-6/K	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), parallel	28/*	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, parallel, 55-160°C	31/*	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal, -40-23°C	46/*	E-6/K	ISO 11359-1/-2
Coefficient of linear thermal expansion (CLTE), normal	87/*	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal, 55-160°C	127/*	E-6/K	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	28 mm/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	28/-	kV/mm	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	1470/-	kg/m ³	ISO 1183
Density of melt	1250	kg/m ³	

Injection

Drying Recommended	yes
Drying Temperature	80 °C
Drying Time, Dehumidified Dryer	2 - 4 h
Processing Moisture Content	≤0.2 %
Melt Temperature Optimum	292 °C
Min. melt temperature	280 °C
Max. melt temperature	305 °C
Screw tangential speed	≤0.15 m/s
Mold Temperature Optimum	105 °C
Min. mould temperature	90 °C
Max. mould temperature	120 °C
Hold pressure range	50 - 100 MPa
Hold pressure time	3 s/mm
Ejection temperature	225 °C

Minlon® EFE6053 BK413

MINERAL REINFORCED NYLON RESIN

Characteristics

Processing	Injection Moulding
Delivery form	Pellets
Additives	Release agent
Special characteristics	Heat stabilised or stable to heat

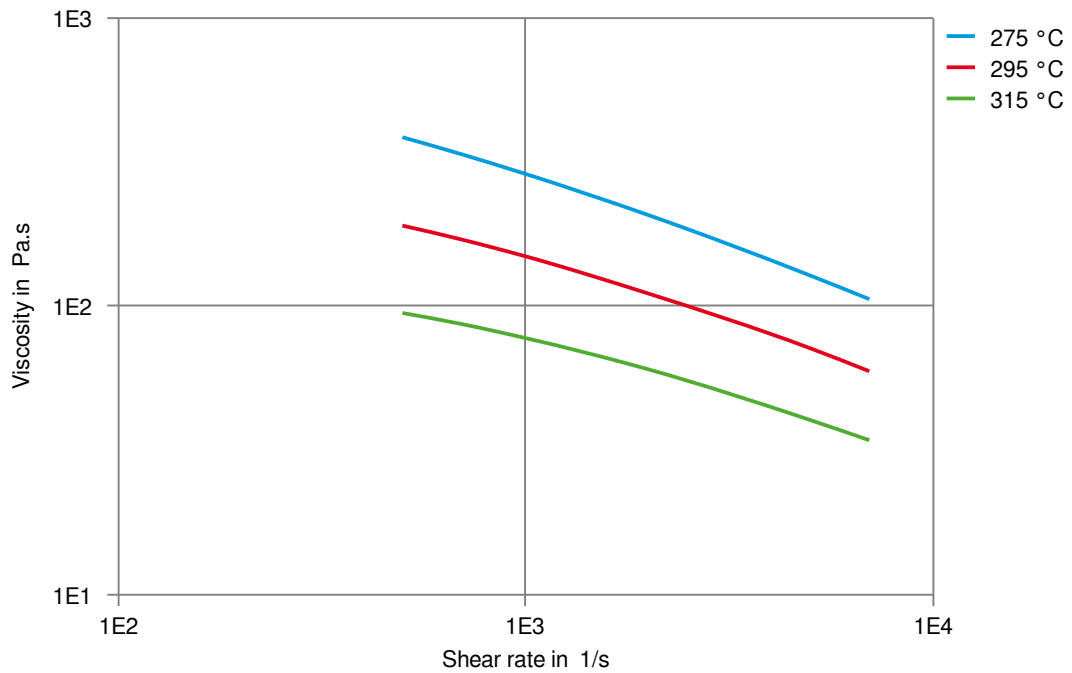
Automotive

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	

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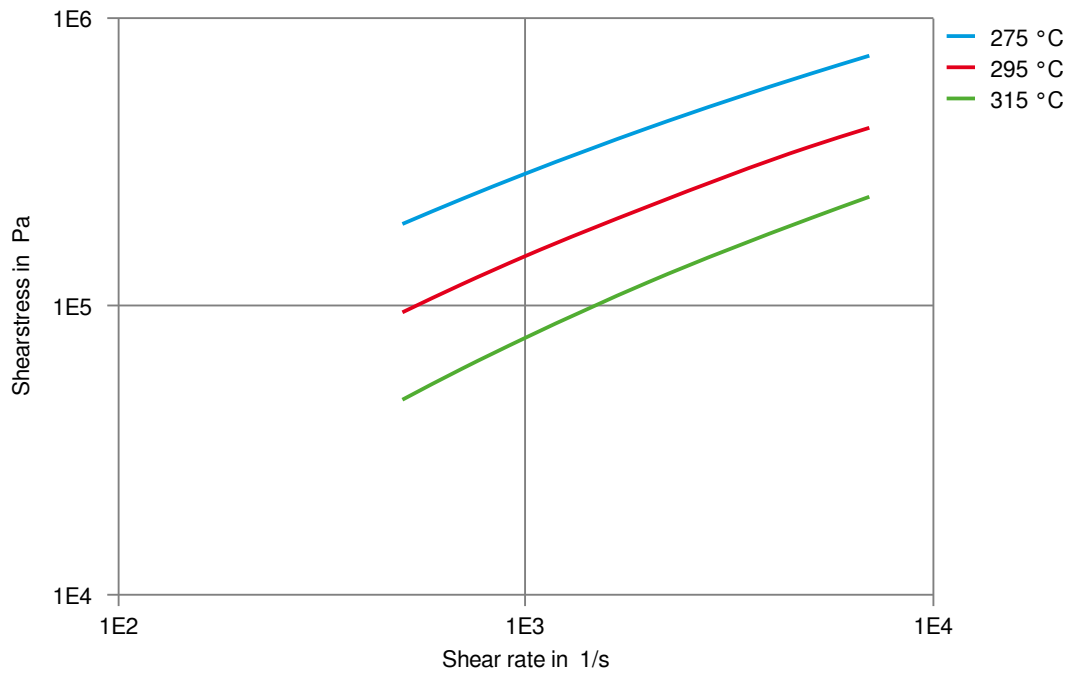
Viscosity-shear rate



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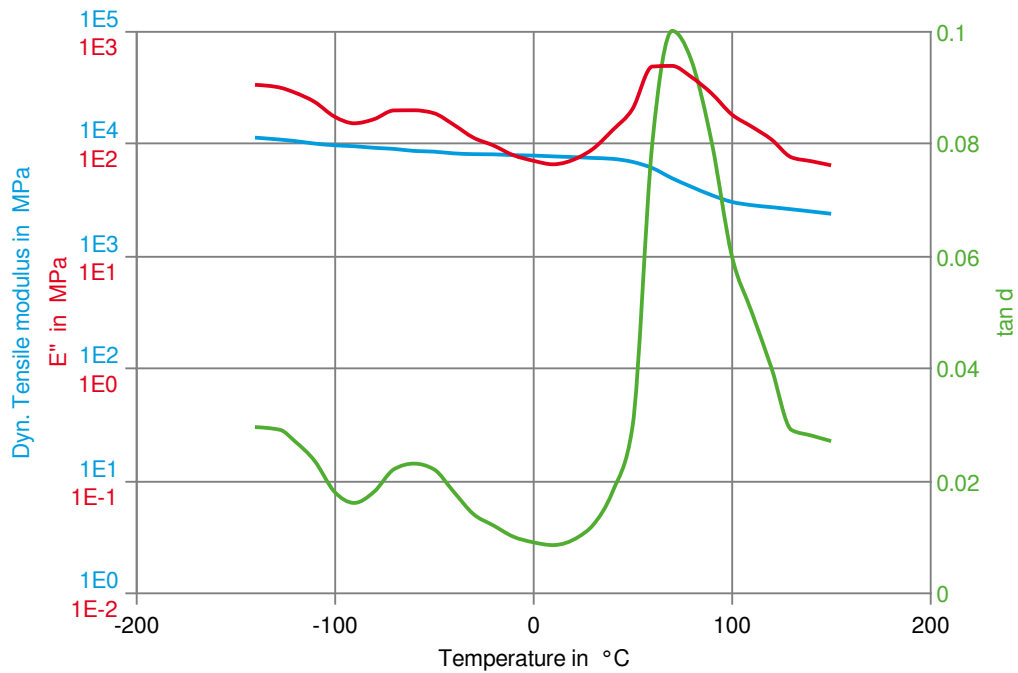
Shearstress-shear rate



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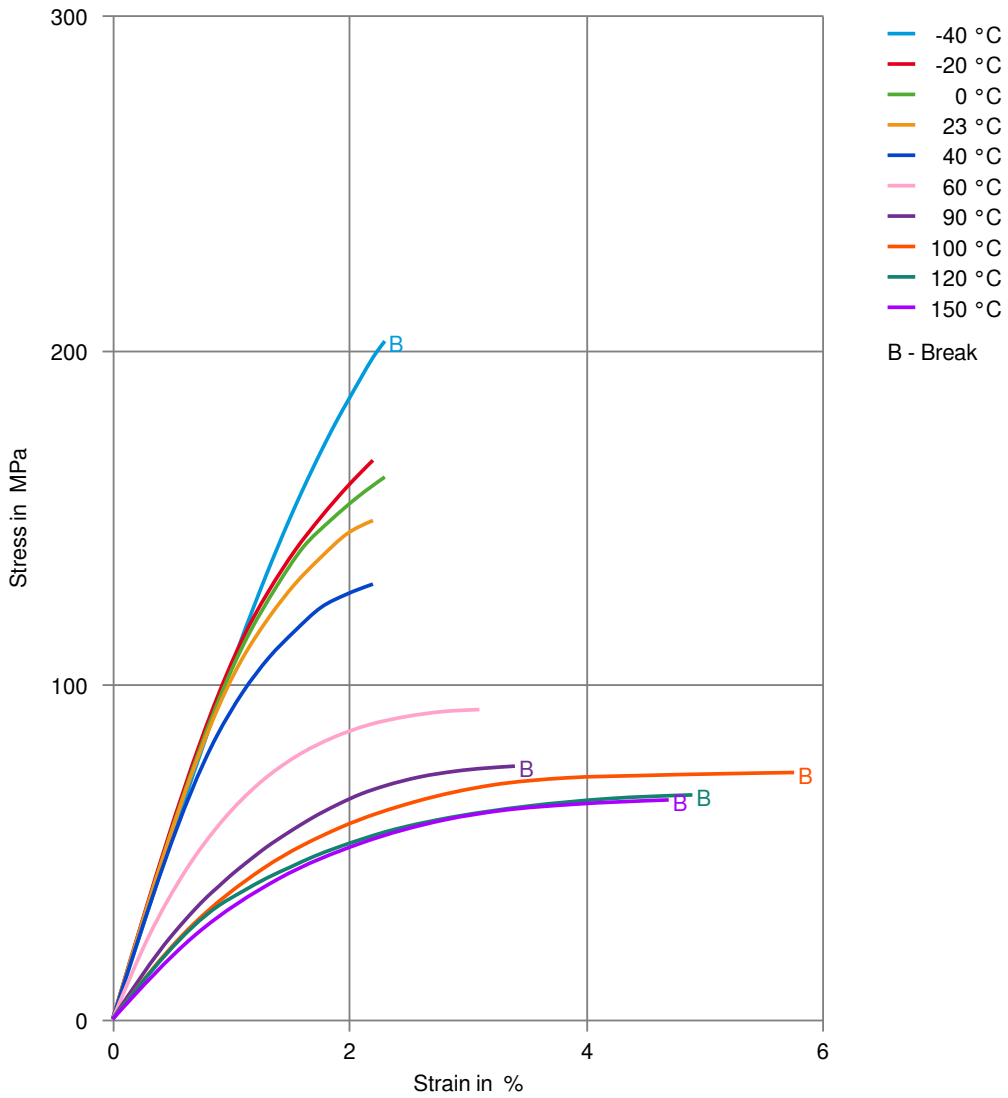
Dynamic Tensile modulus-temperature (dry)



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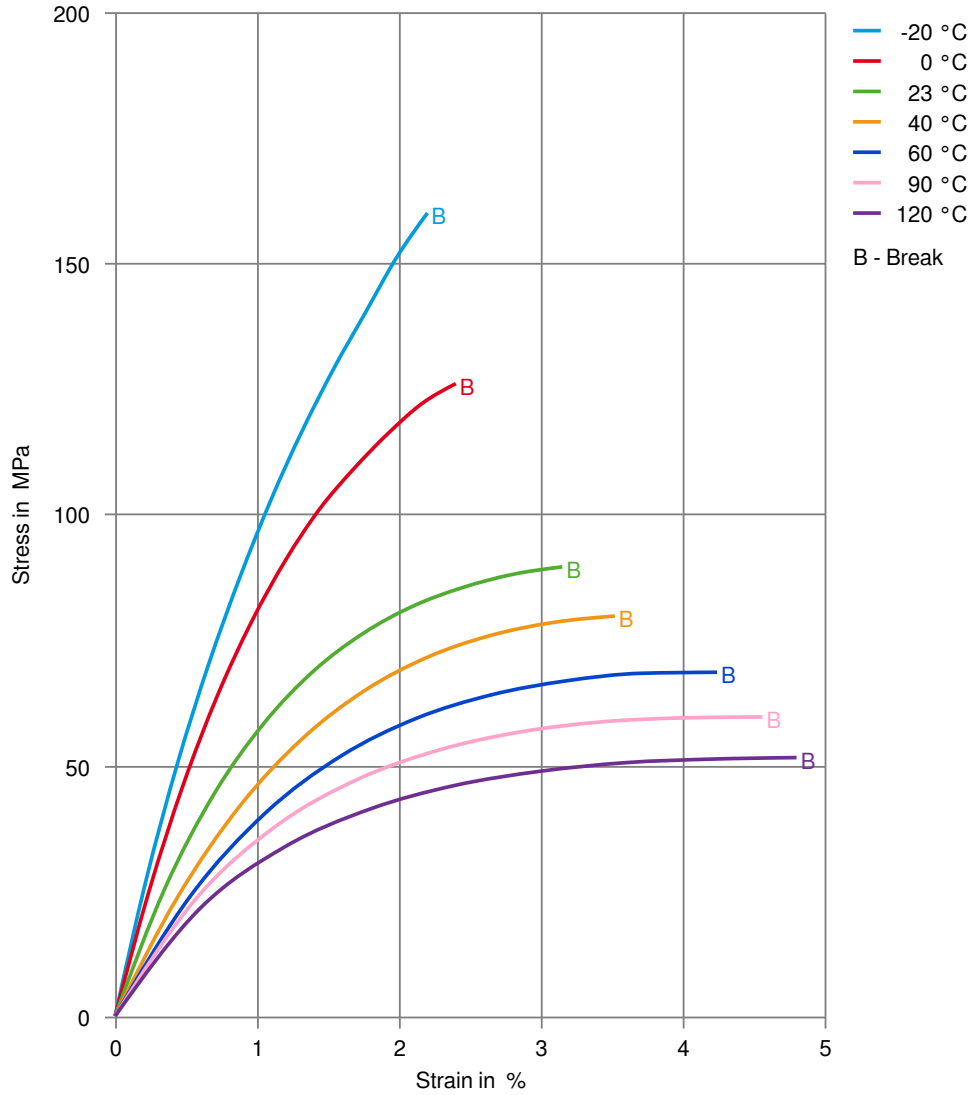
Stress-strain (dry)



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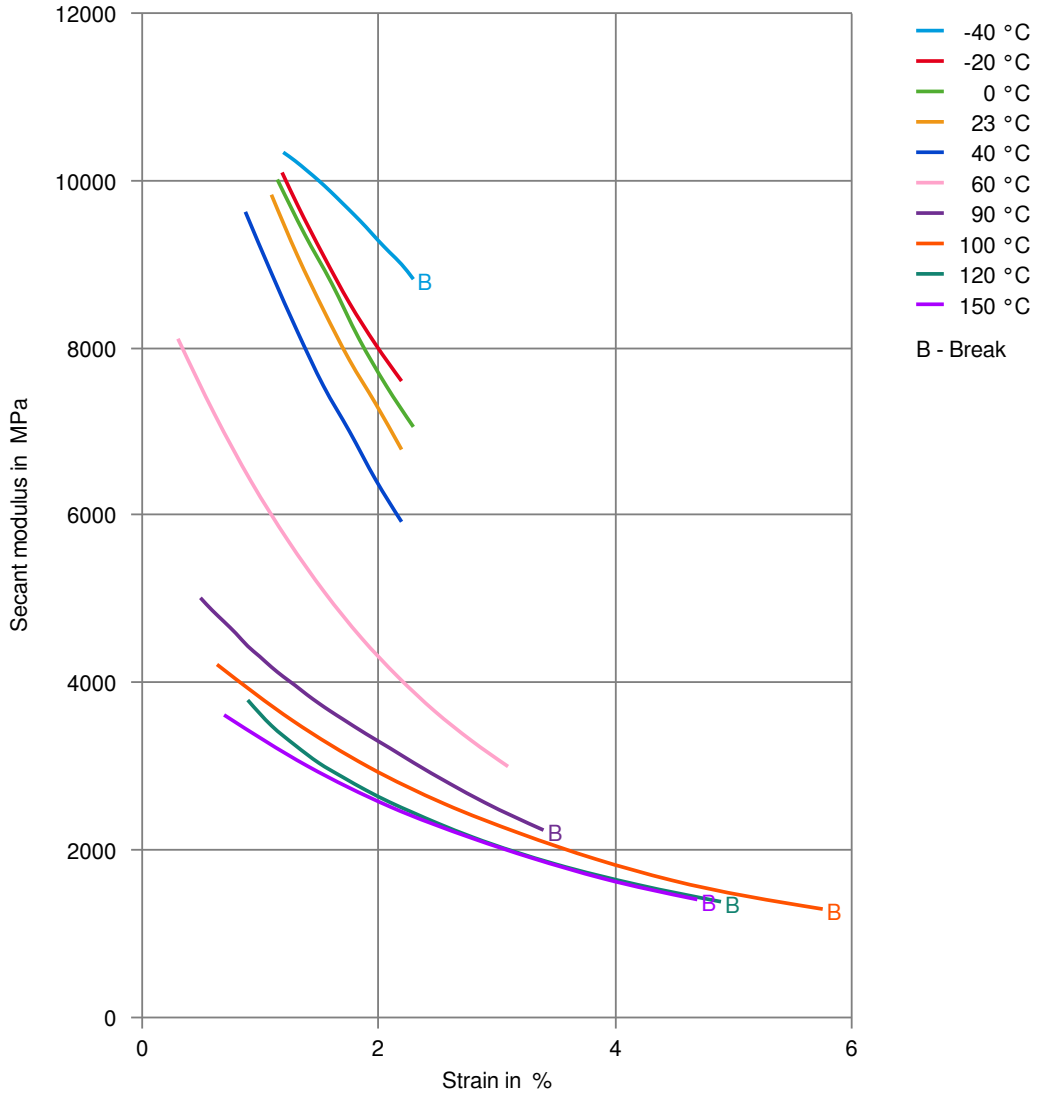
Stress-strain (cond.)



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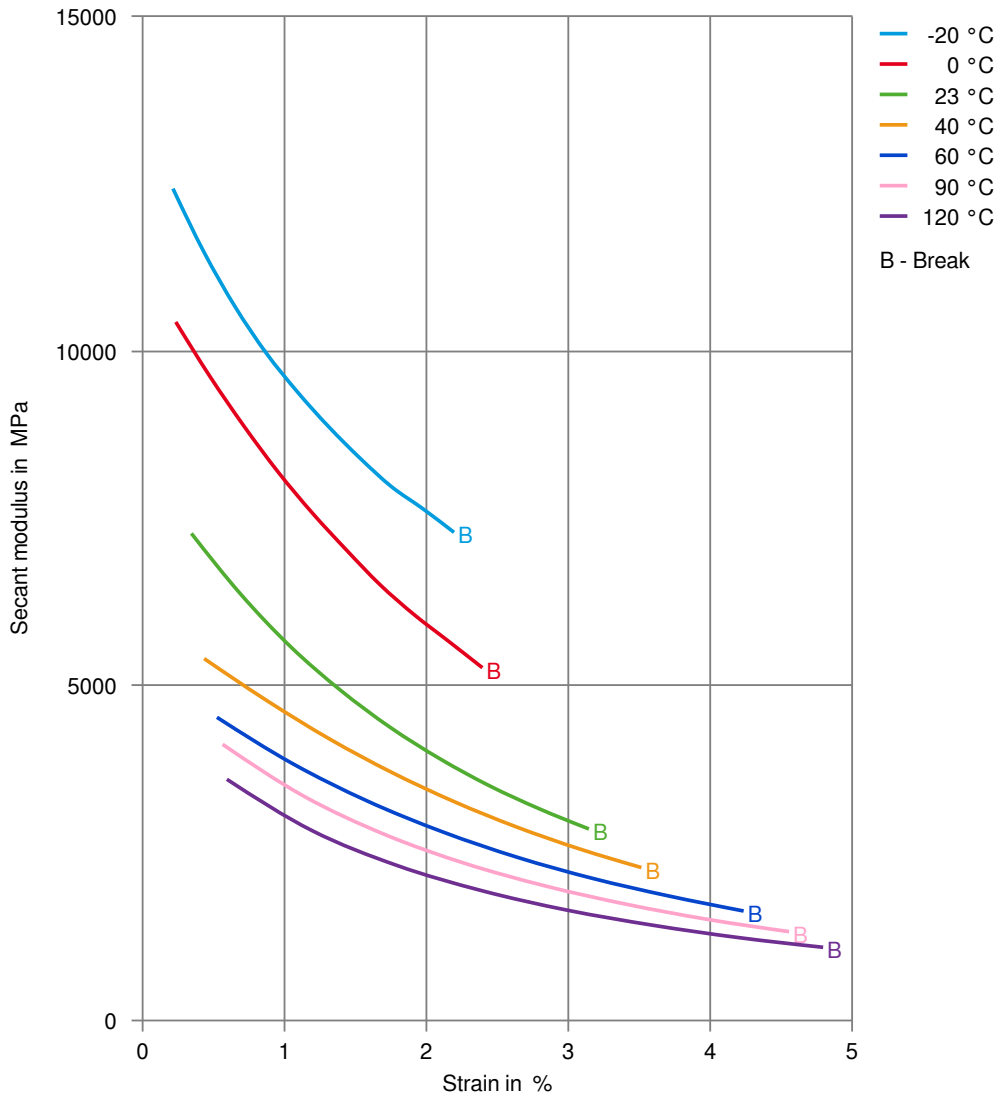
Secant modulus-strain (dry)



Minlon® EFE6053 BK413

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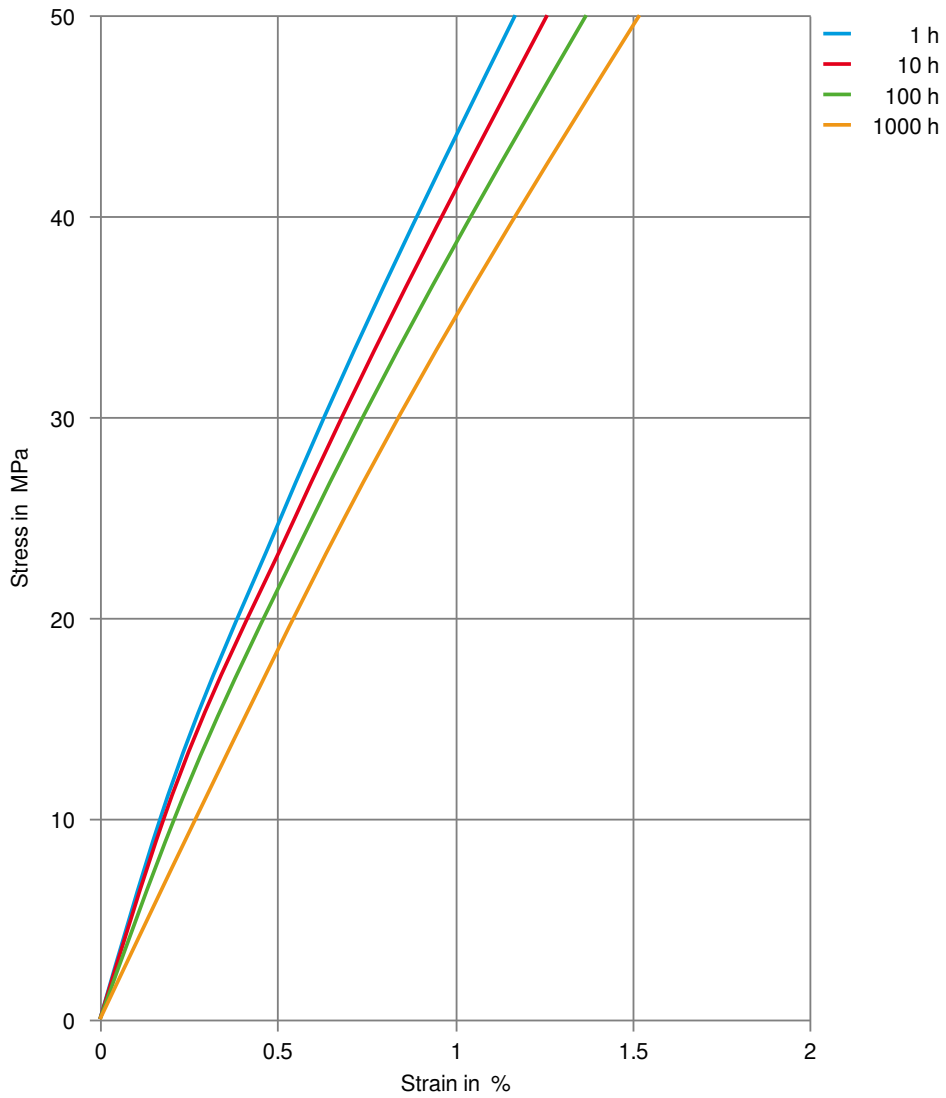
Secant modulus-strain (cond.)



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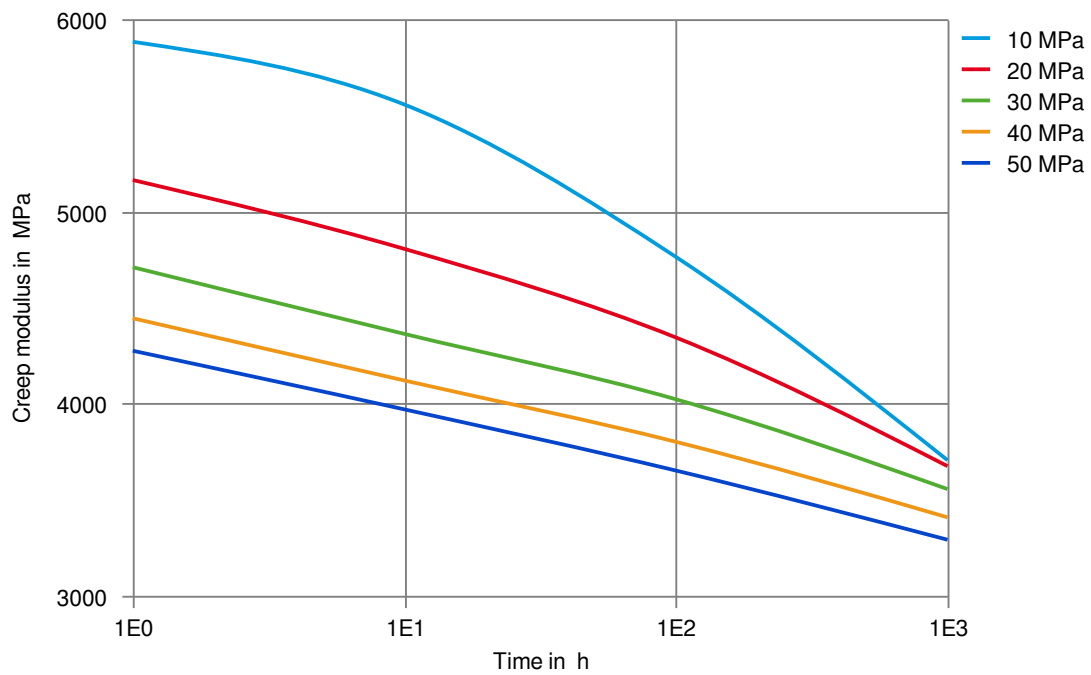
Stress-strain (isochronous) 23°C (cond.)



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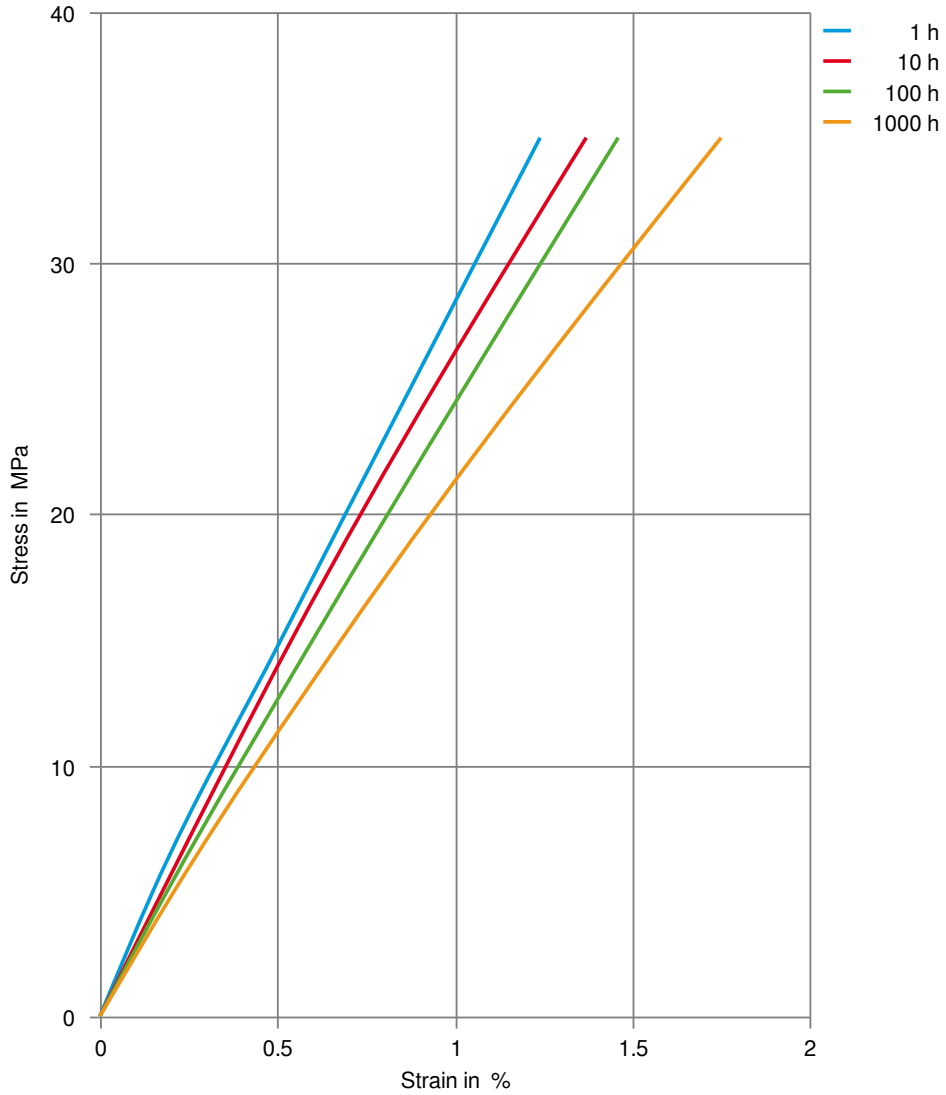
Creep modulus-time 23°C (cond.)



Minlon® EFE6053 BK413

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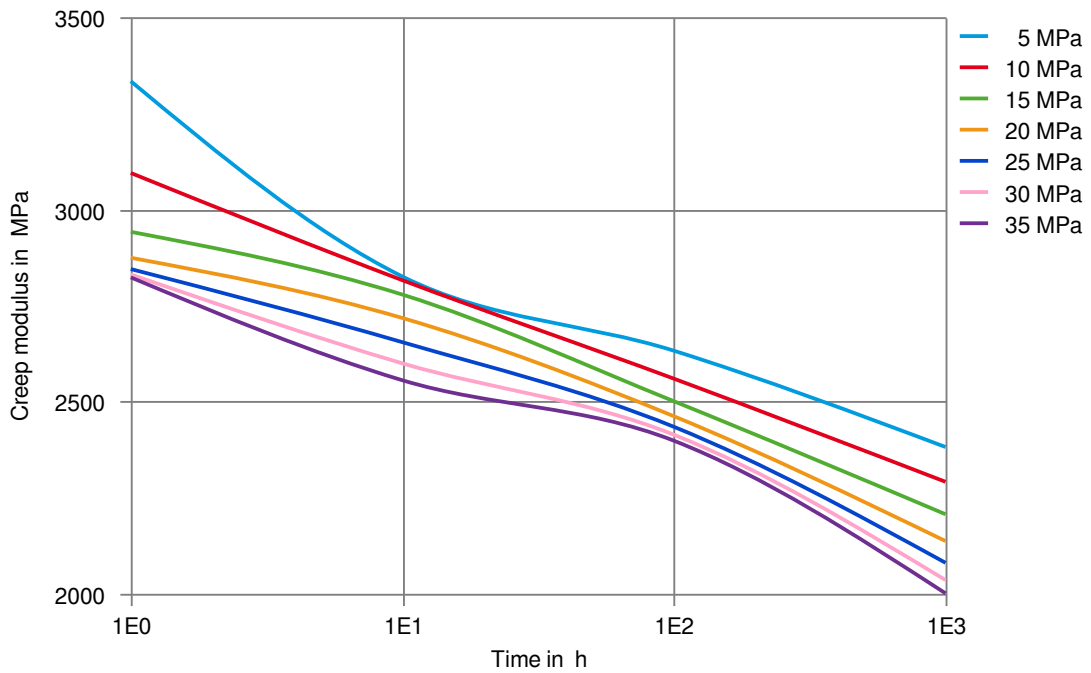
Stress-strain (isochronous) 60°C (cond.)



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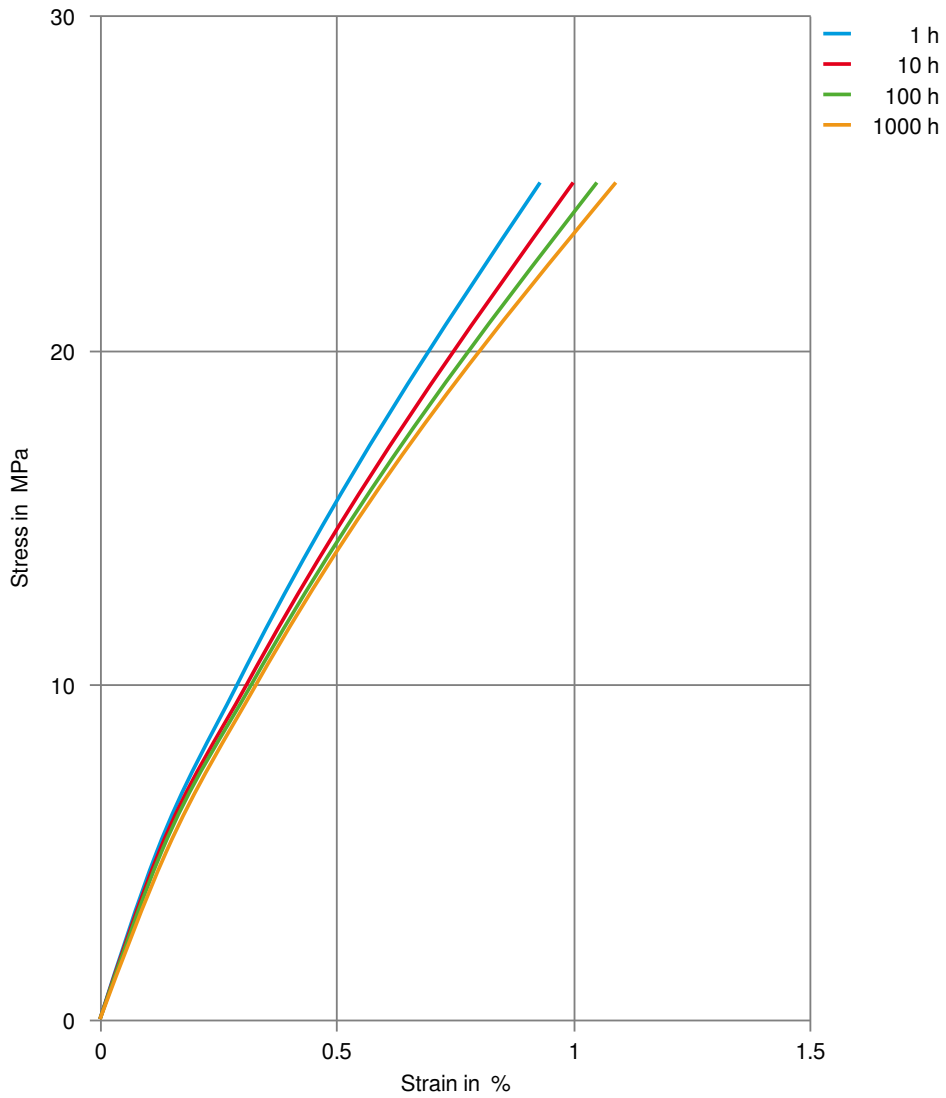
Creep modulus-time 60°C (cond.)



Minlon® EFE6053 BK413

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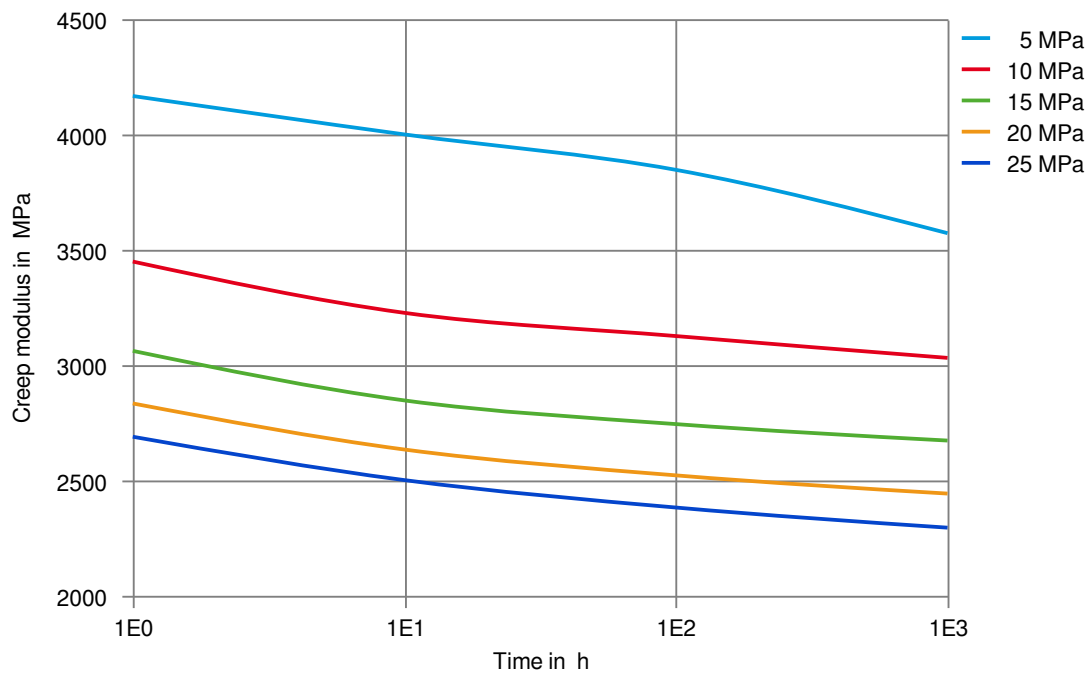
Stress-strain (isochronous) 120°C (dry)



Minlon® EFE6053 BK413

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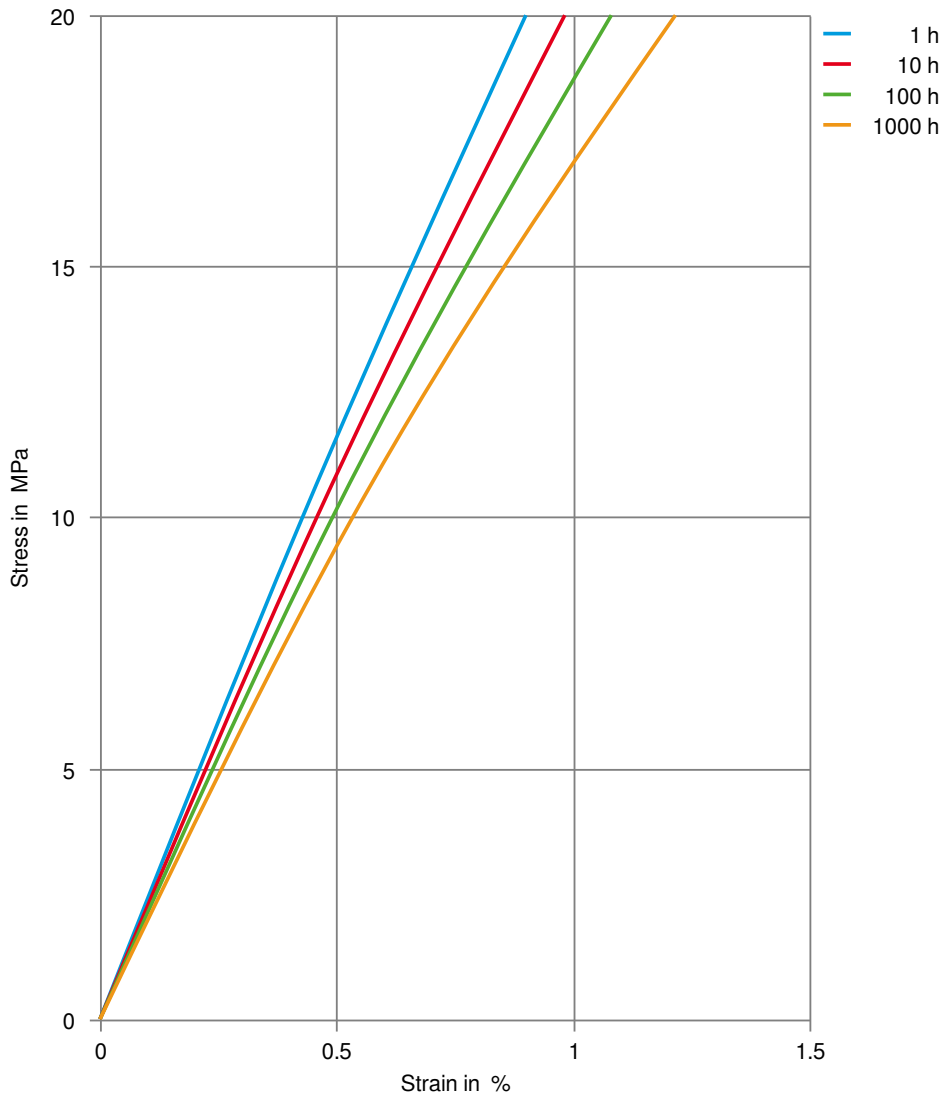
Creep modulus-time 120°C (dry)



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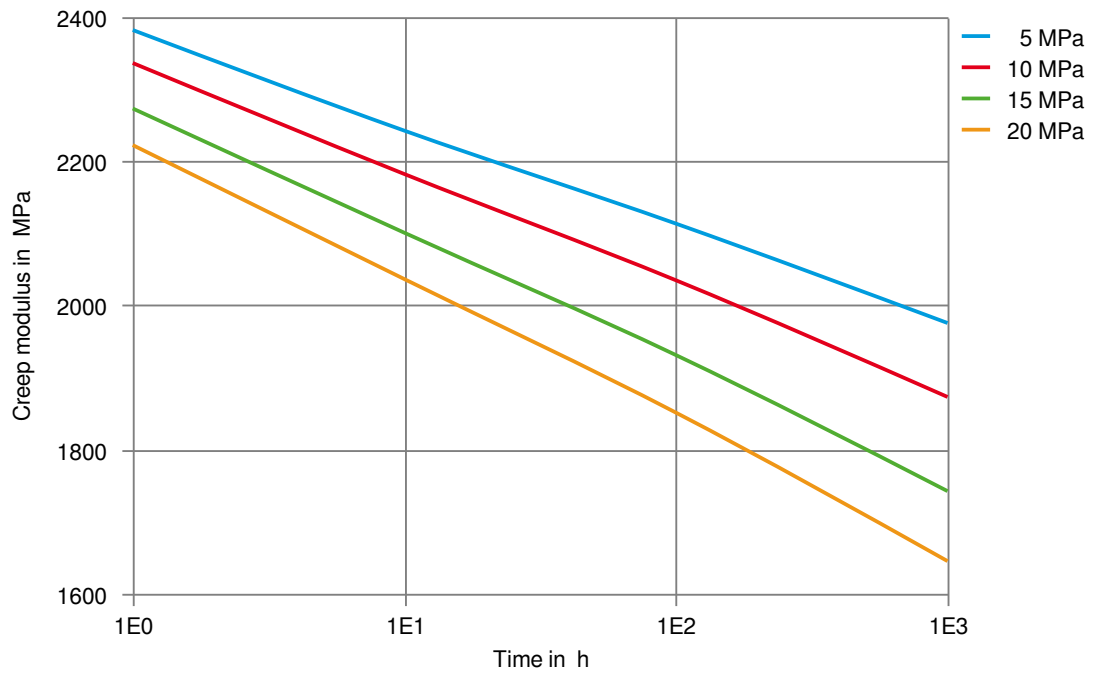
Stress-strain (isochronous) 140°C (dry)



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Creep modulus-time 140°C (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).