

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 / *	cm³/g	ISO 307, 1157, 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
Stress at break, 5mm/min	160 / 97	MPa	ISO 527-1/-2
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/m²	ISO 179/1eU
Charpy impact strength, -30°C	40 / 40	kJ/m²	ISO 179/1eU
Charpy notched impact strength, 23°C	4.5 / 6.5	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -30°C	4 / 6	kJ/m²	ISO 179/1eA
Izod notched impact strength, 23°C	4 / 5	kJ/m²	ISO 180/1A
Izod notched impact strength, -30°C	4 / 4.5	kJ/m²	ISO 180/1A
Poisson's ratio	0.34 / 0.35		



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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
Temp. of deflection under load, 1.8 MPa	240 / *	°C	ISO 75-1/-2
Temp. of deflection under load, 0.45 MPa	256 / *	°C	ISO 75-1/-2
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
Coeff. of linear therm. expansion, 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
Coeff. of linear therm. expansion, 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)	Internal
Spec. heat capacity of melt	1900	J/(kg K)	Internal

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

Other properties

	dry/cond.		
Humidity absorption, 2mm	1.5 / *	%	Sim. to ISO 62
Water absorption, 2mm	5 / *	%	Sim. to ISO 62
Density	1470 / -	kg/m³	ISO 1183
Density of melt	1250	kg/m³	Internal

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	Internal
Min. melt temperature	285	°C	
Max. melt temperature	305	°C	
Screw tangential speed	≤0.15	m/s	
Mold Temperature Optimum	100	°C	
Min. mould temperature	70	°C	



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Max. mould temperature	120 °C
Hold pressure range	50 - 100 MPa
Hold pressure time	3 s/mm
Ejection temperature	210 °C

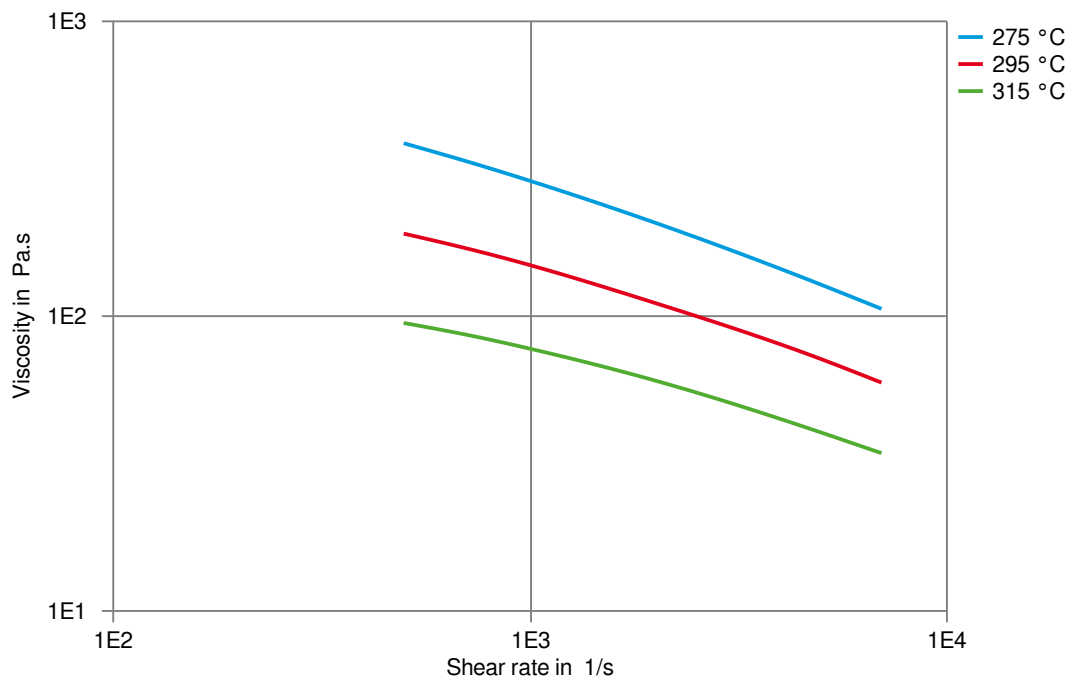
Internal

Characteristics

Additives

Release agent

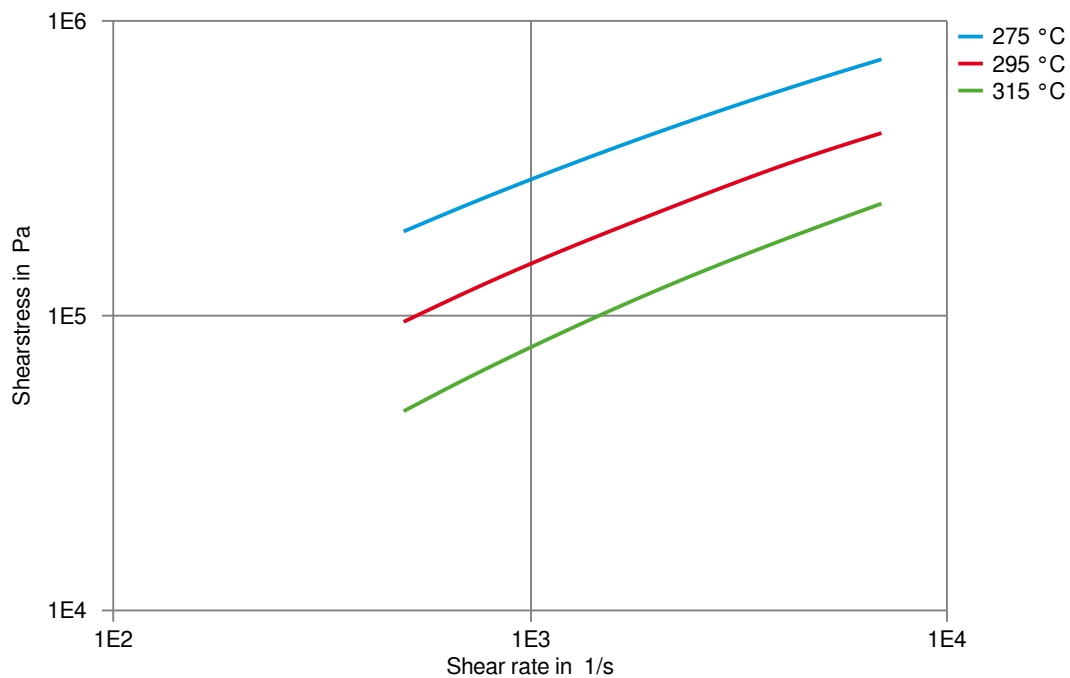
Viscosity-shear rate



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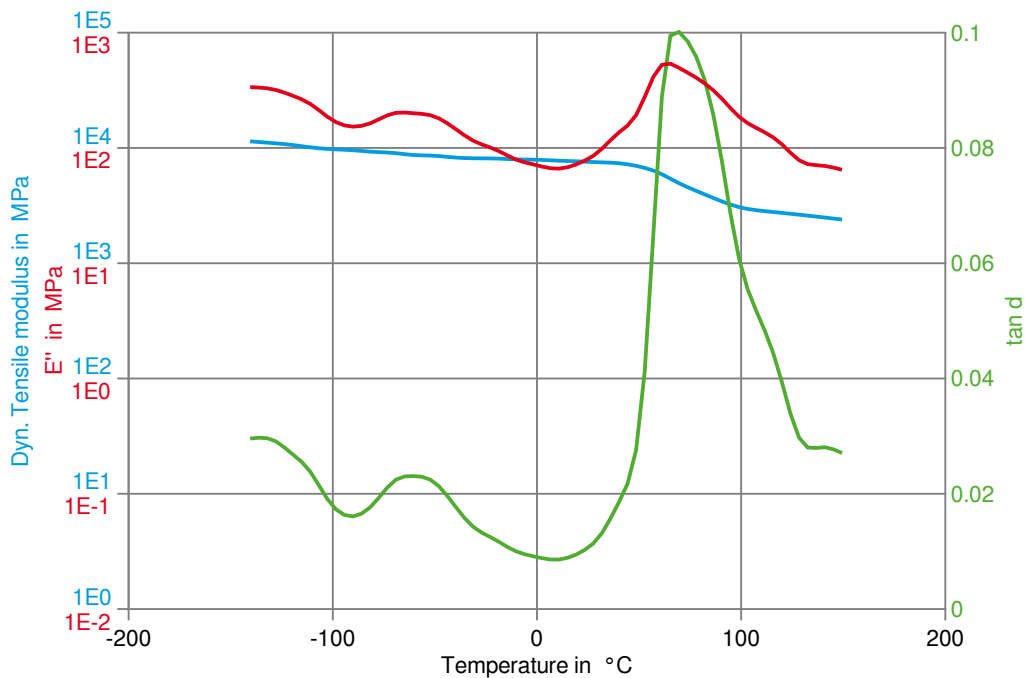
Shearstress-shear rate



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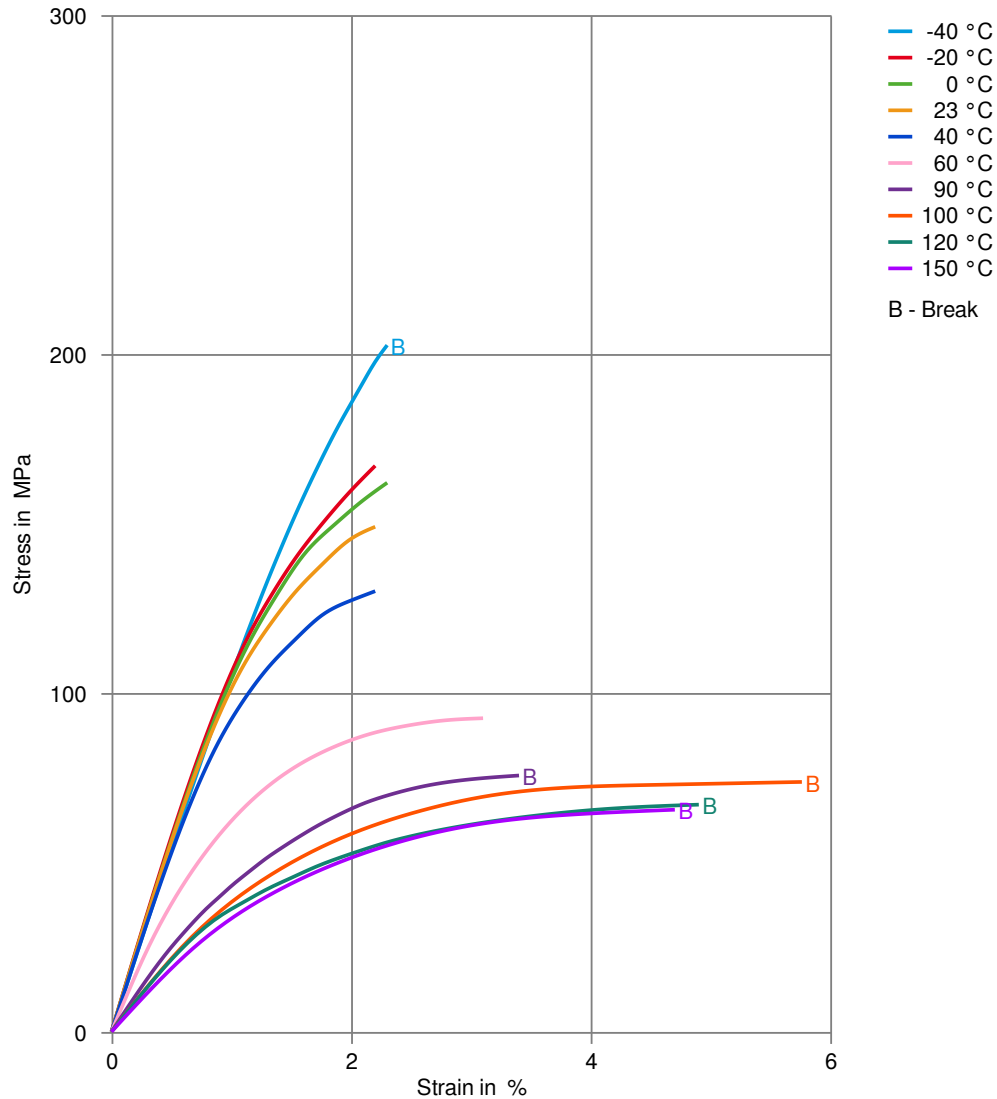
Dynamic Tensile modulus-temperature (dry)



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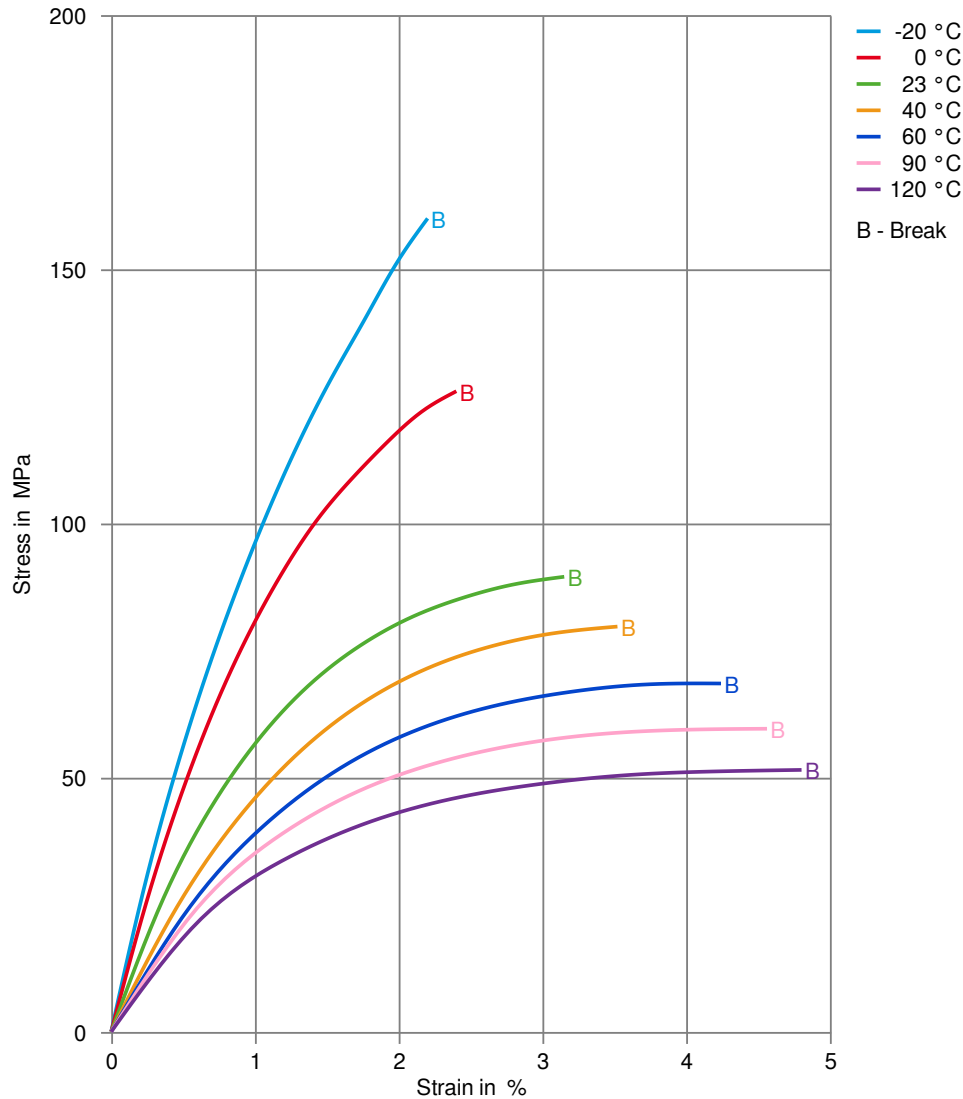
Stress-strain (dry)



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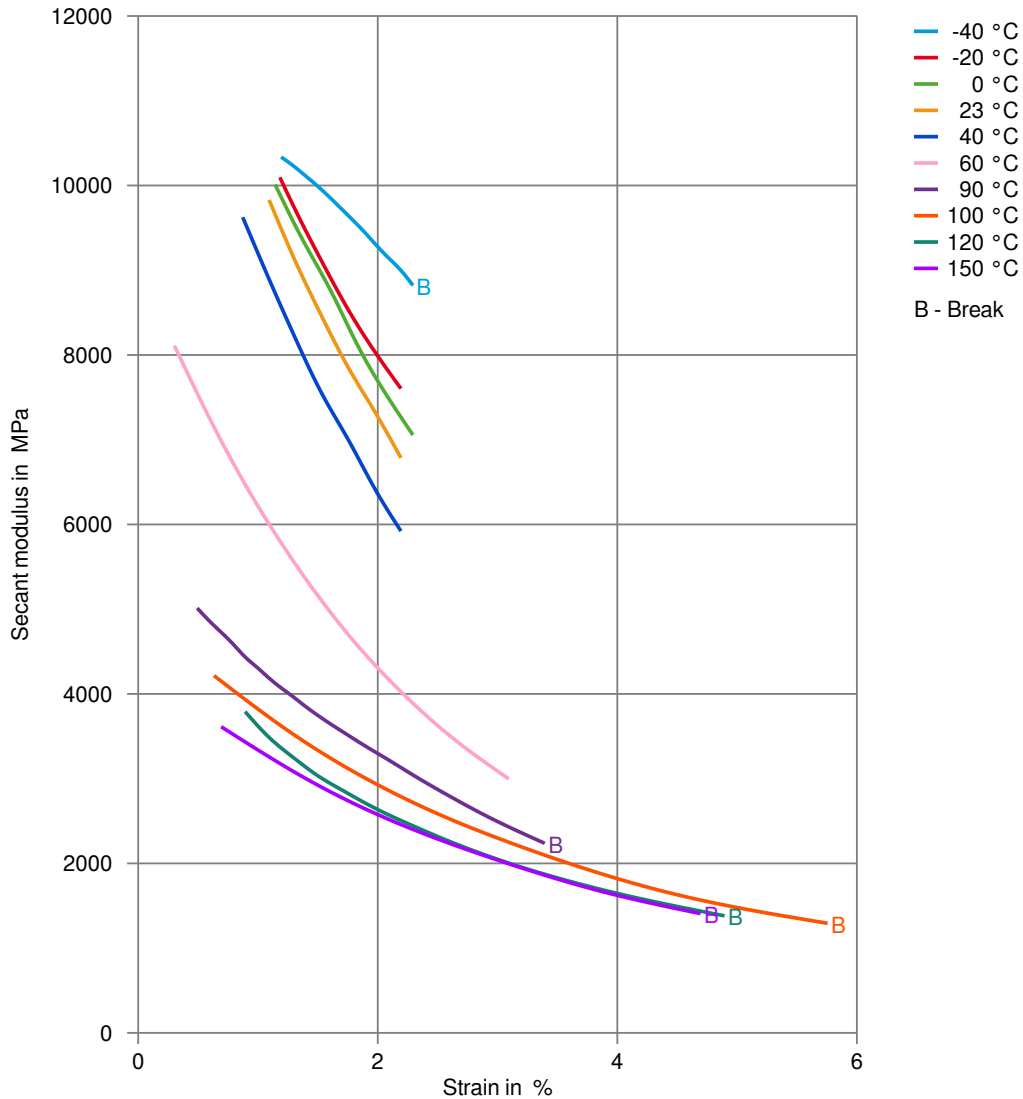
Stress-strain (cond.)



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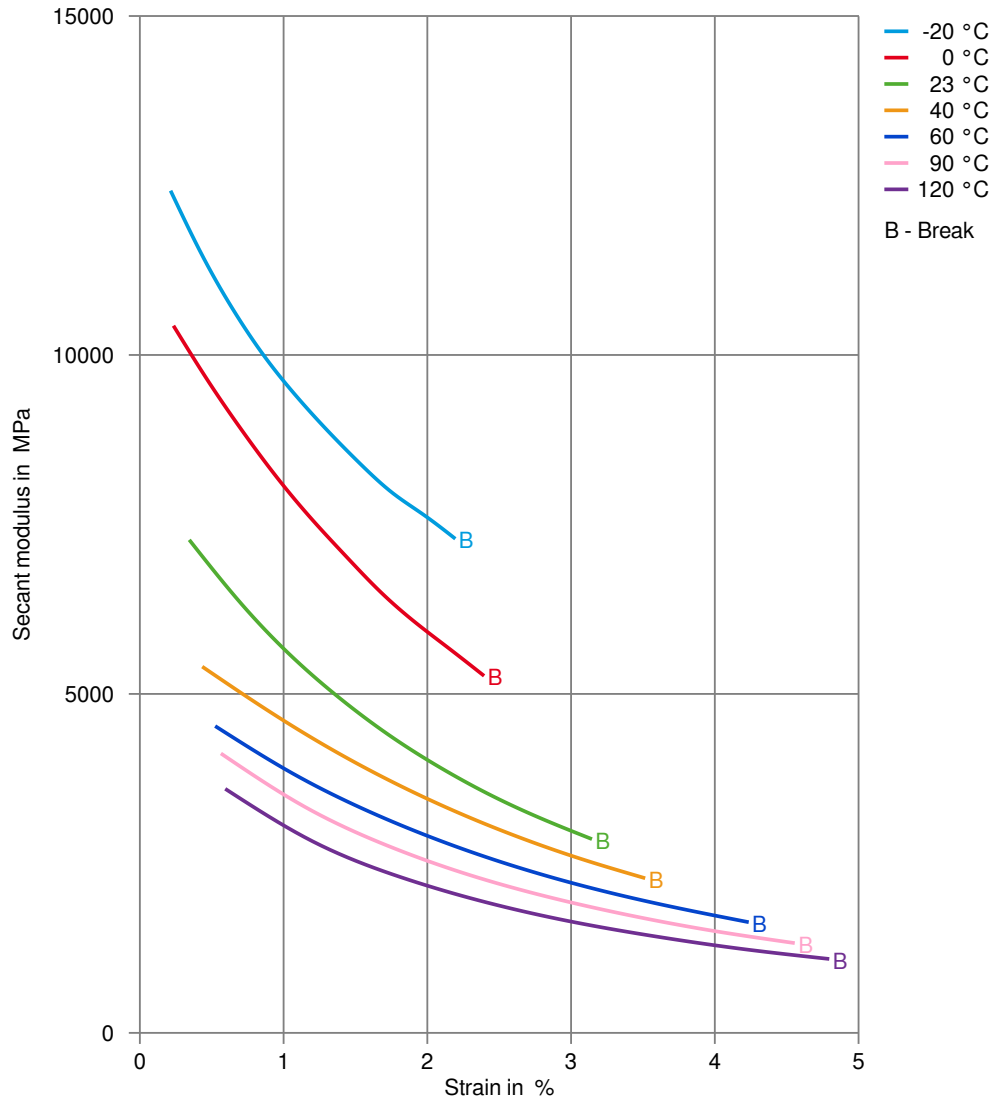
Secant modulus-strain (dry)



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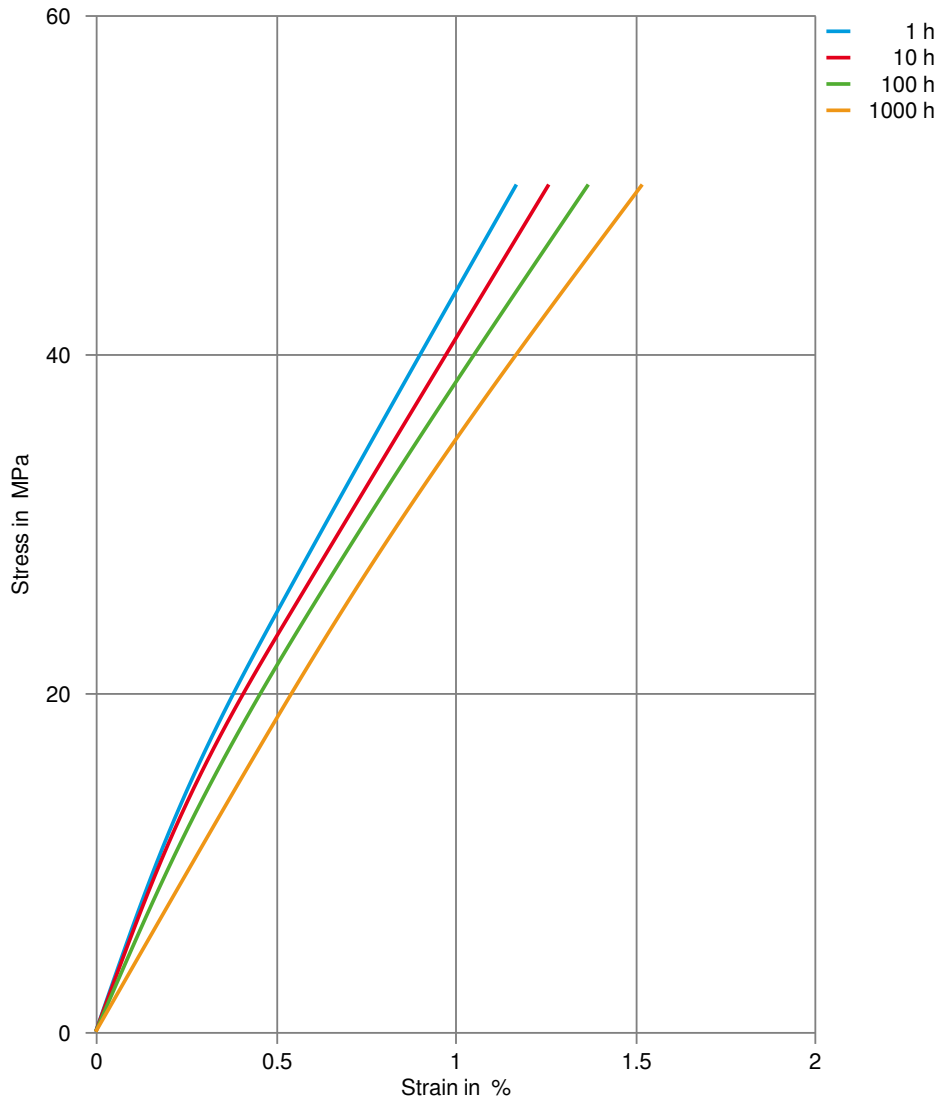
Secant modulus-strain (cond.)



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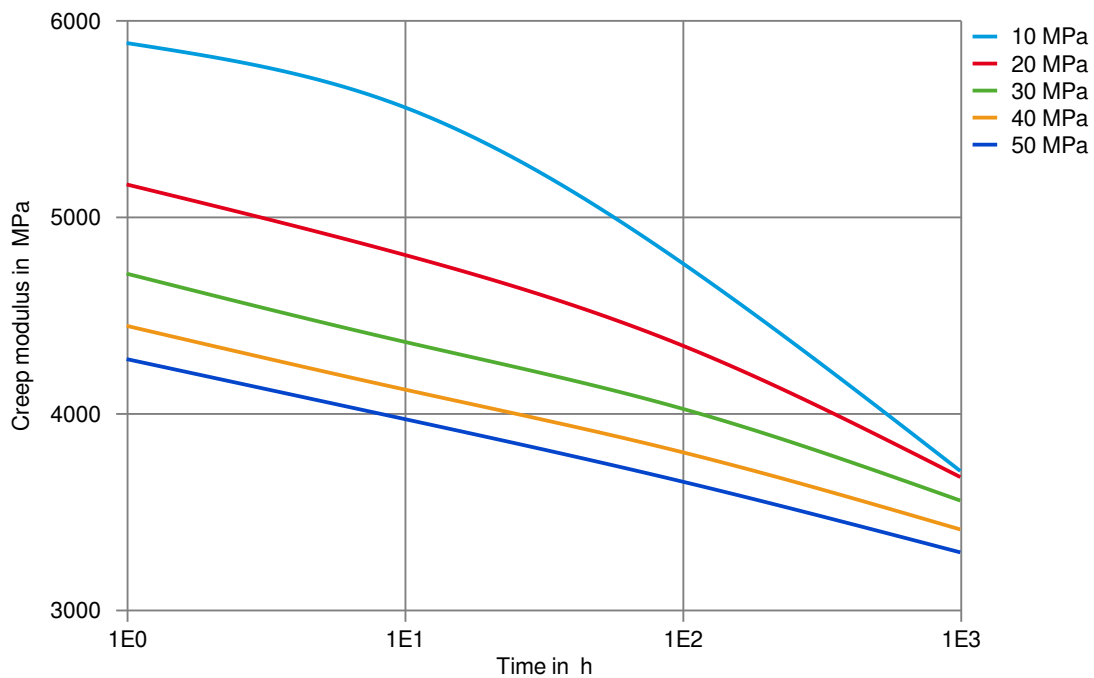
Stress-strain (isochronous) 23°C (cond.)



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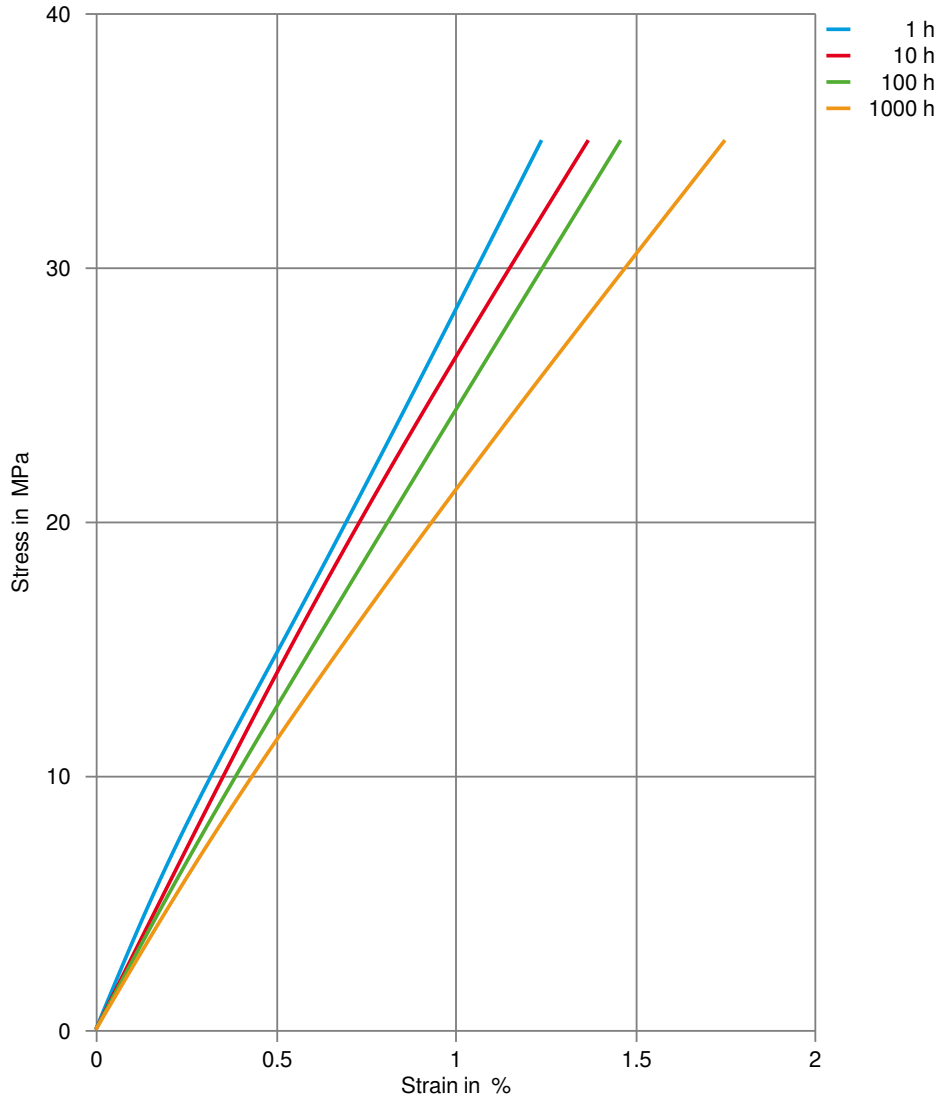
Creep modulus-time 23°C (cond.)



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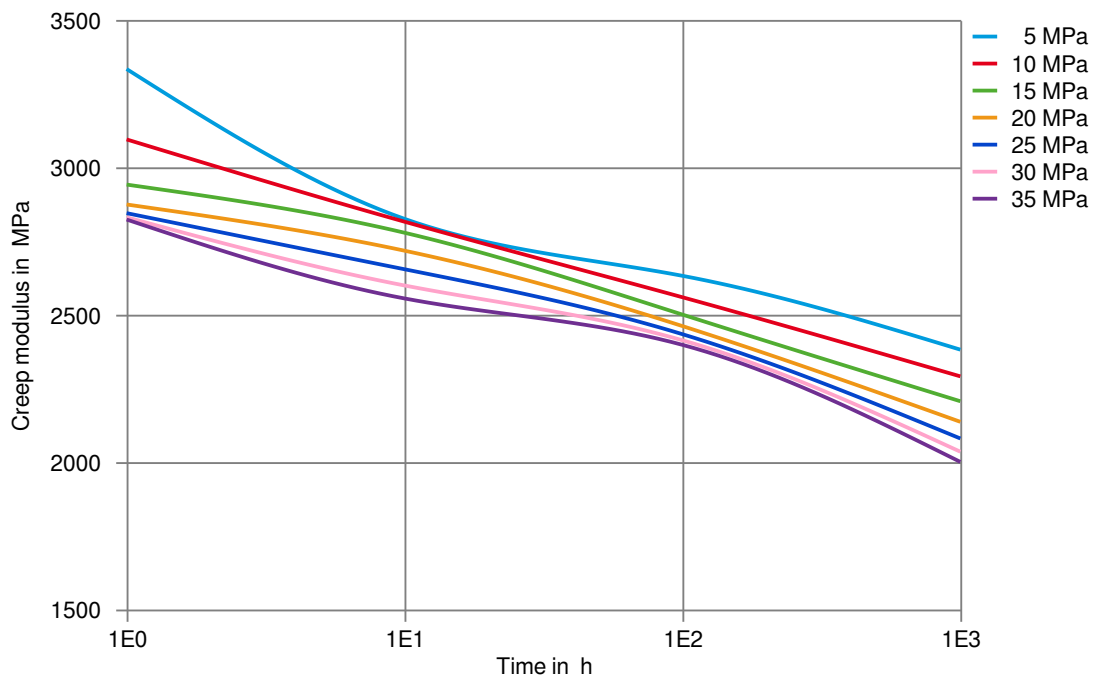
Stress-strain (isochronous) 60°C (cond.)



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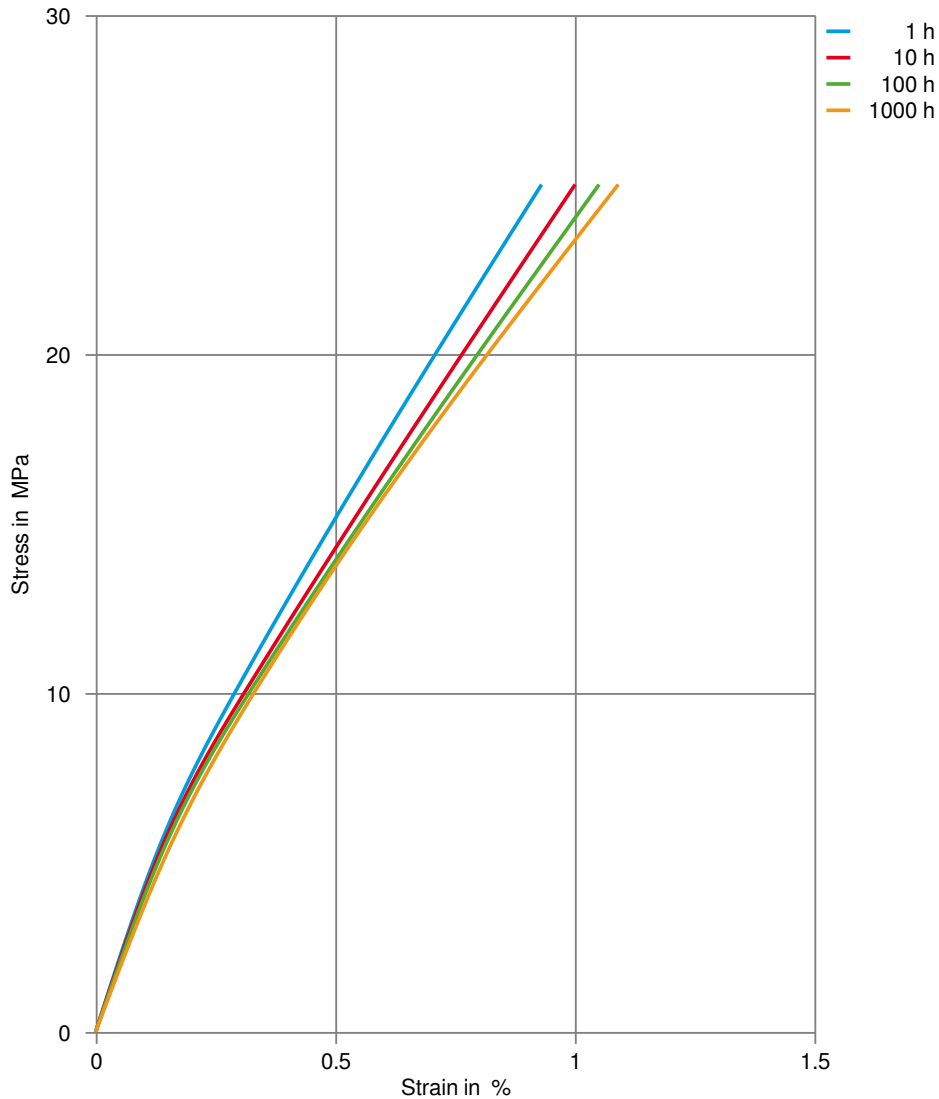
Creep modulus-time 60°C (cond.)



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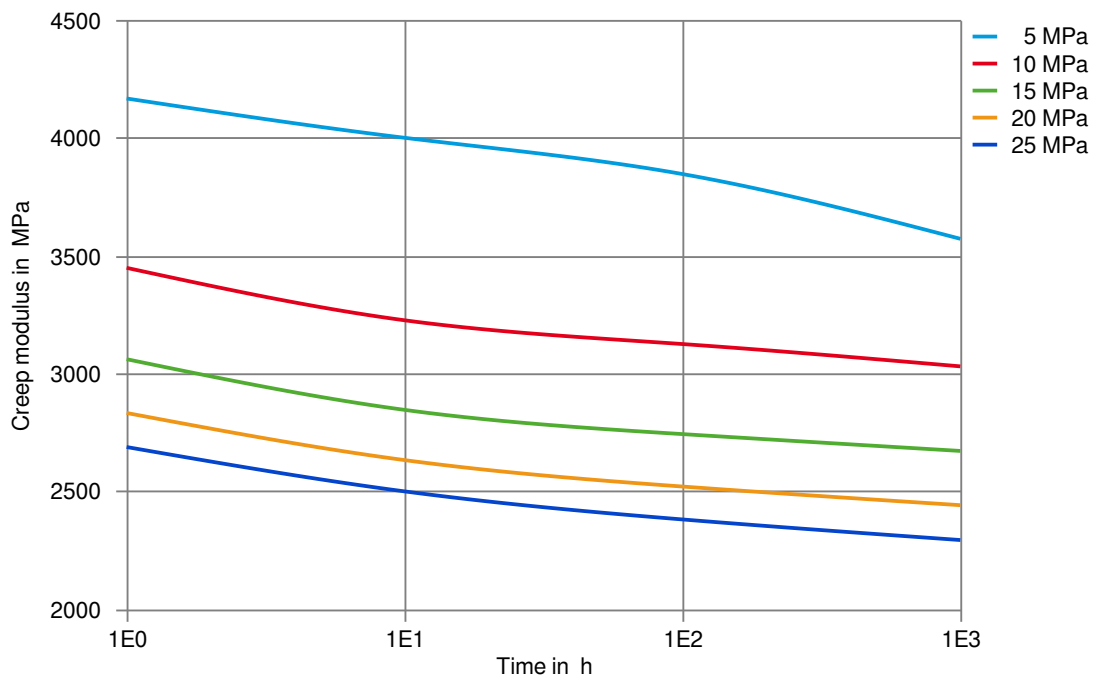
Stress-strain (isochronous) 120°C (dry)



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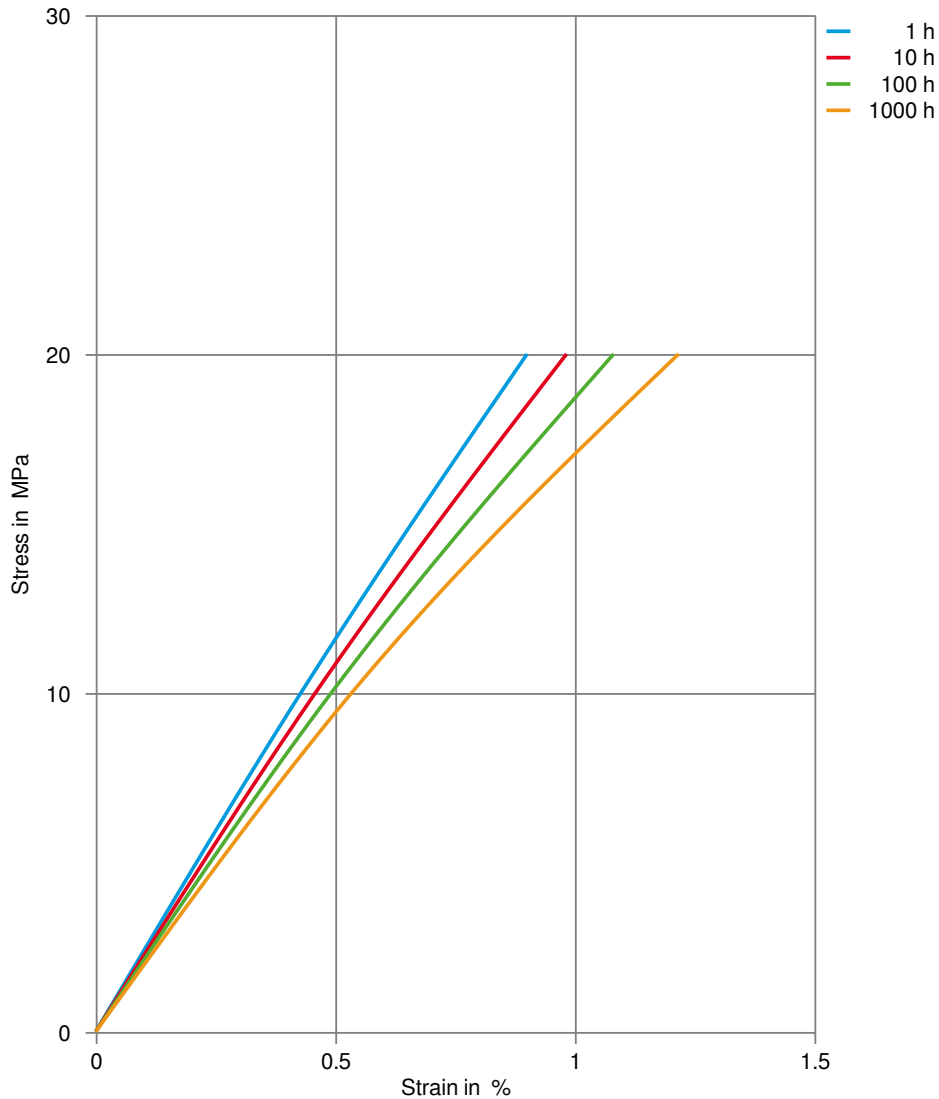
Creep modulus-time 120°C (dry)



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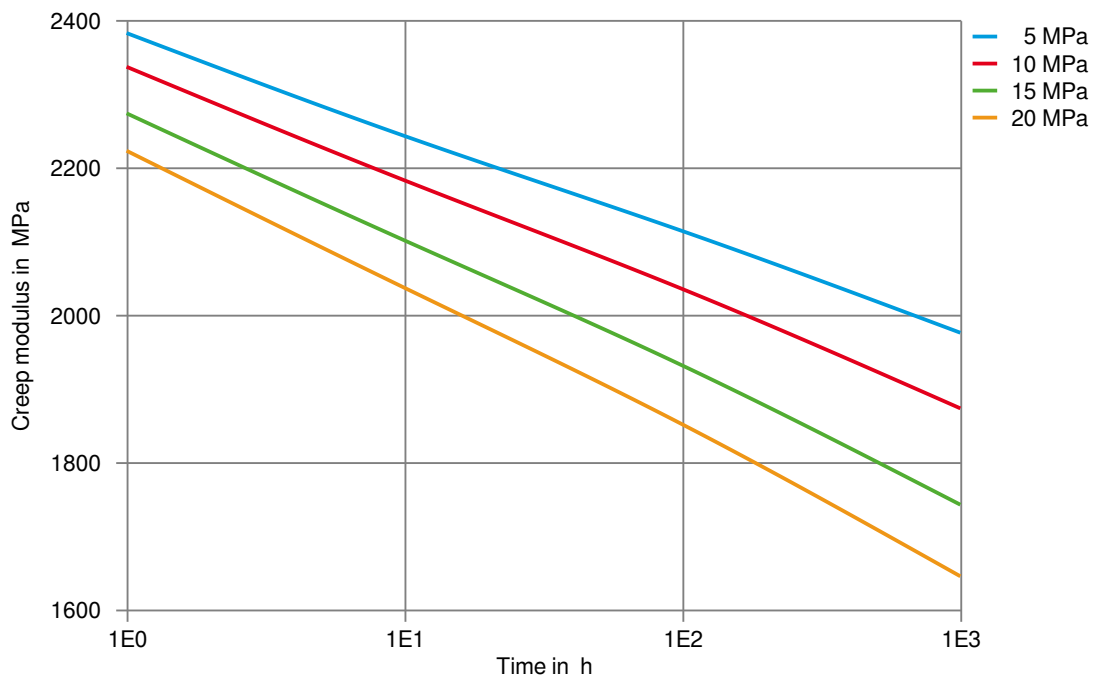
Stress-strain (isochronous) 140°C (dry)



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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



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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).

