

Zytel® HTN51G35HSL NC010

HIGH PERFORMANCE POLYAMIDE RESIN

Zytel® HTN high performance polyamide resins feature high retention of properties upon exposure to elevated temperature, to high moisture, and to harsh chemical environments. Polymer families and grades of Zytel® HTN are tailored to optimize performance as well as processability.

Typical applications with Zytel® HTN include demanding applications in the automotive, electrical and electronics, domestic appliances, and construction industries.

Zytel® HTN51G35HSL NC010 is a 35% glass reinforced, heat stabilised, lubricated, hydrolysis resistant high performance polyamide resin. It is also a PPA resin.

Product information

| | | |
|----------------------|---------------------------------------|-----------|
| Resin Identification | PA6T/XT-GF35 | ISO 1043 |
| Part Marking Code | >PA6T/XT-GF35< | ISO 11469 |
| Part Marking Code | >PPA-GF35< | SAE J1344 |
| ISO designation | ISO 16396-PA6T/XT,GF35,M1GHNR,S10-120 | |

Rheological properties

| | dry/cond. | | |
|------------------------------|-----------|---|-----------------|
| Moulding shrinkage, parallel | 0.2/- | % | ISO 294-4, 2577 |
| Moulding shrinkage, normal | 0.6/- | % | ISO 294-4, 2577 |

Typical mechanical properties

| | dry/cond. | | |
|---------------------------------------|-------------|-------------------|--------------|
| Tensile modulus | 12000/12000 | MPa | ISO 527-1/-2 |
| Tensile stress at break, 5mm/min | 210/210 | MPa | ISO 527-1/-2 |
| Tensile strain at break, 5mm/min | 2.4/2.2 | % | ISO 527-1/-2 |
| Flexural modulus | 10300/10300 | MPa | ISO 178 |
| Flexural strength | 300/290 | MPa | ISO 178 |
| Tensile creep modulus, 1h | */11000 | MPa | ISO 899-1 |
| Tensile creep modulus, 1000h | */9500 | MPa | ISO 899-1 |
| Charpy impact strength, 23°C | 60/55 | kJ/m ² | ISO 179/1eU |
| Charpy impact strength, -30°C | 60/50 | kJ/m ² | ISO 179/1eU |
| Charpy notched impact strength, 23°C | 11/11 | kJ/m ² | ISO 179/1eA |
| Charpy notched impact strength, -30°C | 10/10 | kJ/m ² | ISO 179/1eA |
| Charpy notched impact strength, -40°C | 11/- | kJ/m ² | ISO 179/1eA |
| Izod notched impact strength, 23°C | 11/11 | kJ/m ² | ISO 180/1A |
| Izod notched impact strength, -30°C | 10.0/10.0 | kJ/m ² | ISO 180/1A |
| Izod impact strength, -30°C | 50/40 | kJ/m ² | ISO 180/1U |
| Hardness, Rockwell, M-scale | 108/- | | ISO 2039-2 |
| Hardness, Rockwell, R-scale | 124/- | | ISO 2039-2 |
| Poisson's ratio | 0.33/0.33 | | |

Tribological properties

| | dry/cond. | | |
|---|-----------|--|-----------|
| Coefficient of sliding friction, 1h against steel | -/0.35 | | ASTM 1894 |

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Thermal properties

| | dry/cond. | | |
|--|-----------|----------|----------------|
| Melting temperature, 10°C/min | 300/* | °C | ISO 11357-1/-3 |
| Melting temperature, first heat | 300/* | °C | ISO 11357-1/-3 |
| Temperature of deflection under load, 1.8 MPa | 264/* | °C | ISO 75-1/-2 |
| Temperature of deflection under load, 0.45 MPa | 284/* | °C | ISO 75-1/-2 |
| Vicat softening temperature, 50°C/h 50N | 290/* | °C | ISO 306 |
| Coeff. of linear therm. expansion, parallel, -40-23°C | 18/* | E-6/K | ISO 11359-1/-2 |
| Coefficient of linear thermal expansion (CLTE), parallel | 18/* | E-6/K | ISO 11359-1/-2 |
| Coeff. of linear therm. expansion, normal, -40-23°C | 55/* | E-6/K | ISO 11359-1/-2 |
| Coefficient of linear thermal expansion (CLTE), normal | 55/* | E-6/K | ISO 11359-1/-2 |
| Thermal conductivity of melt | 0.25 | W/(m K) | ISO 22007-2 |
| Specific heat capacity of melt | 1840 | J/(kg K) | ISO 22007-4 |
| RTI, electrical, 0.75mm | 150 | °C | UL 746B |
| RTI, electrical, 1.5mm | 150 | °C | UL 746B |
| RTI, electrical, 3.0mm | 150 | °C | UL 746B |
| RTI, impact, 0.75mm | 125 | °C | UL 746B |
| RTI, impact, 1.5mm | 125 | °C | UL 746B |
| RTI, impact, 3.0mm | 130 | °C | UL 746B |
| RTI, strength, 0.75mm | 130 | °C | UL 746B |
| RTI, strength, 1.5mm | 140/* | °C | UL 746B |
| RTI, strength, 3.0mm | 150 | °C | UL 746B |

Flammability

| | dry/cond. | | |
|---------------------------------------|-----------|--------|----------------------|
| Burning Behav. at 1.5mm nom. thickn. | HB/* | class | IEC 60695-11-10 |
| Thickness tested | 1.5/* | mm | IEC 60695-11-10 |
| UL recognition | yes/* | | UL 94 |
| Burning Behav. at thickness h | HB/* | class | IEC 60695-11-10 |
| Thickness tested | 0.85/* | mm | IEC 60695-11-10 |
| UL recognition | yes/* | | UL 94 |
| Oxygen index | 24/* | % | ISO 4589-1/-2 |
| Glow Wire Flammability Index, 0.75mm | 750/- | °C | IEC 60695-2-12 |
| Glow Wire Flammability Index, 1.5mm | 750/- | °C | IEC 60695-2-12 |
| Glow Wire Flammability Index, 3.0mm | 960/- | °C | IEC 60695-2-12 |
| Glow Wire Ignition Temperature, 1.5mm | 775/- | °C | IEC 60695-2-13 |
| Glow Wire Ignition Temperature, 3.0mm | 800/- | °C | IEC 60695-2-13 |
| FMVSS Class | B | | ISO 3795 (FMVSS 302) |
| Burning rate, Thickness 1 mm | 23 | mm/min | ISO 3795 (FMVSS 302) |

Electrical properties

| | dry/cond. | | |
|------------------------------|------------|-------|---------------|
| Relative permittivity, 100Hz | 4/- | | IEC 62631-2-1 |
| Relative permittivity, 1MHz | 4/- | | IEC 62631-2-1 |
| Dissipation factor, 1MHz | 120/- | E-4 | IEC 62631-2-1 |
| Volume resistivity | >1E13/1E13 | Ohm.m | IEC 62631-3-1 |
| Surface resistivity | */1E14 | Ohm | IEC 62631-3-2 |
| Electric strength | 36/36 | kV/mm | IEC 60243-1 |
| Comparative tracking index | 525/- | | IEC 60112 |

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| | | | |
|----------------------------|-------|-----|---------------|
| Dielectric Constant, 1 GHz | 3.9/- | | ASTM D 2520 B |
| Dissipation Factor, 1 GHz | 120/- | E-4 | ASTM D 2520 B |

Physical/Other properties

| | | | |
|---------------------------------|-----------|-------------------|----------------|
| | dry/cond. | | |
| Humidity absorption, 2mm | 1.4/* | % | Sim. to ISO 62 |
| Water absorption, 2mm | 4/* | % | Sim. to ISO 62 |
| Water absorption, Immersion 24h | 1/* | % | Sim. to ISO 62 |
| Density | 1470/- | kg/m ³ | ISO 1183 |
| Density of melt | 1230 | kg/m ³ | |

VDA Properties

| | | |
|-------|---------|---------|
| Odour | 4 class | VDA 270 |
|-------|---------|---------|

Injection

| | |
|---------------------------------|-----------------------|
| Drying Recommended | yes |
| Drying Temperature | 100 °C |
| Drying Time, Dehumidified Dryer | 6 - 8 h |
| Processing Moisture Content | ≤0.1 % |
| Melt Temperature Optimum | 325 °C |
| Min. melt temperature | 320 °C |
| Max. melt temperature | 330 °C |
| Mold Temperature Optimum | 145 °C |
| Min. mould temperature | 130 ^[1] °C |
| Max. mould temperature | 160 °C |
| Ejection temperature | 260 °C |

[1]: Higher temperature needed for thinner sections.

Characteristics

| | |
|-------------------------|---|
| Processing | Injection Moulding |
| Delivery form | Pellets |
| Additives | Release agent |
| Special characteristics | Heat stabilised or stable to heat, Hydrolysis resistant |

Additional information

| | |
|-------------------|---|
| Injection molding | During molding, use proper protective equipment and adequate ventilation. Avoid exposure to fumes and limit the hold up time and temperature of the resin in the machine. Purge degraded resin carefully with HDPE. |
|-------------------|---|

When lower mold temperatures are used, the initial warpage and shrinkage may be lower, but the surface appearance and chemical resistance may be reduced, and the dimensional change may be greater when parts are subsequently heated.

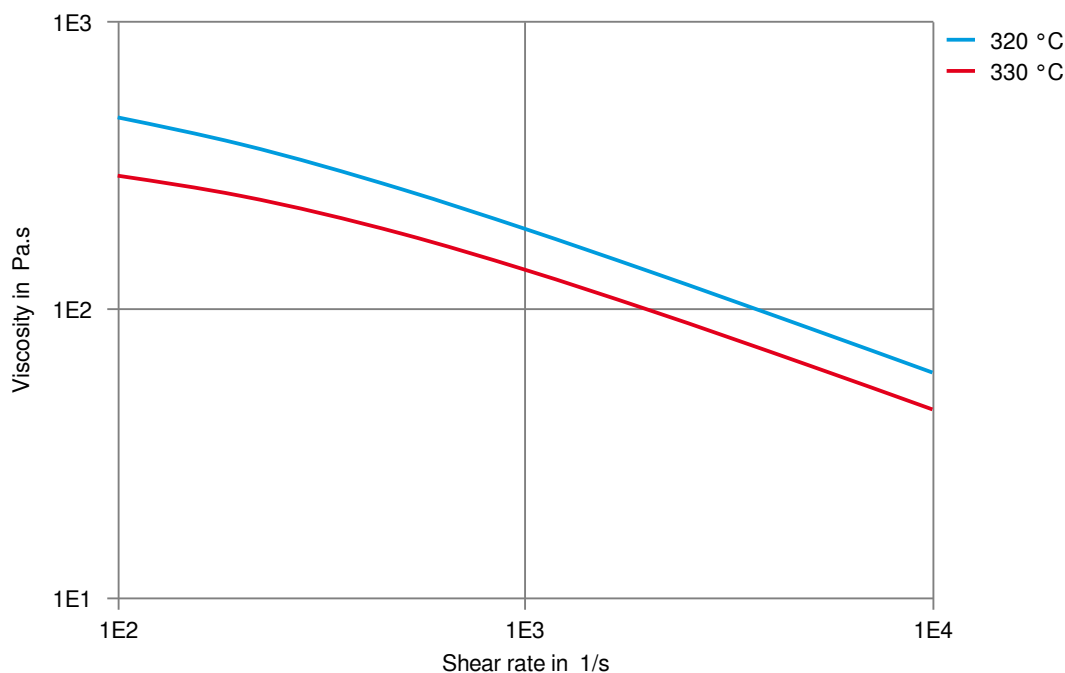
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Automotive

| OEM | STANDARD | ADDITIONAL INFORMATION |
|-----------------------|--|-------------------------|
| Ford | WSS-M98P14-A3 | |
| General Motors | GMW16356P-PPA-GF35 | Natural |
| Hyundai | MS941-03 Type N-4 | |
| Stellantis | B62 0300 / | Natural |
| Stellantis | 61/213M+/215F+/H113/4115/168h13/C1B MS.50156/PPA.GF30-35.100001.7C.HS | CPN4190, 01994_10_00119 |
| Stellantis - Chrysler | MS.50103 / CPN-4190 | Natural |

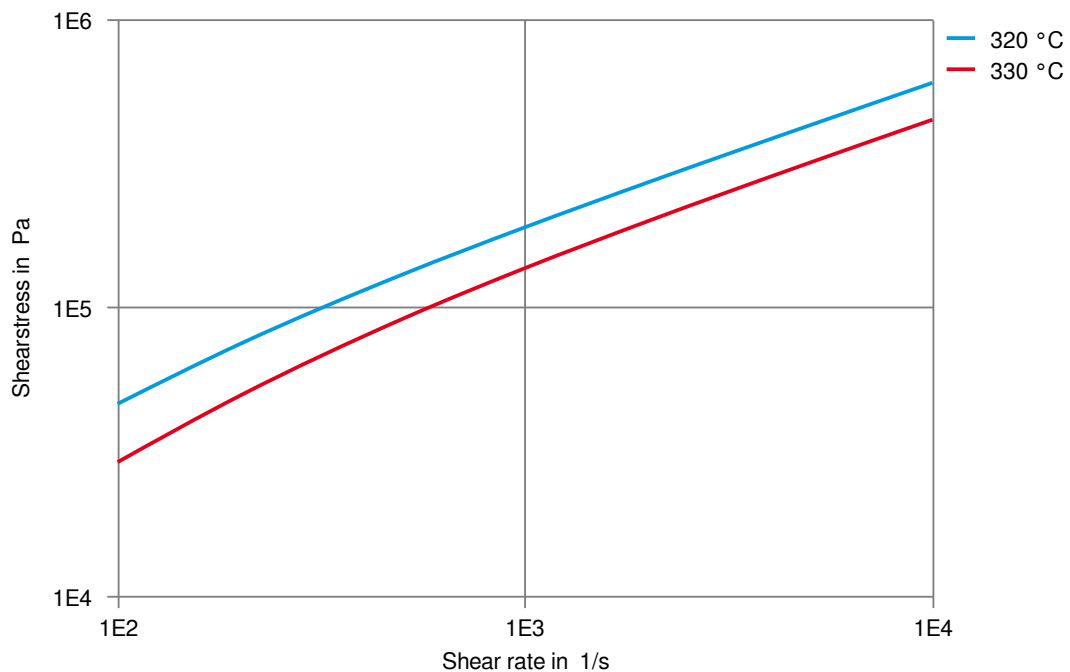
Viscosity-shear rate



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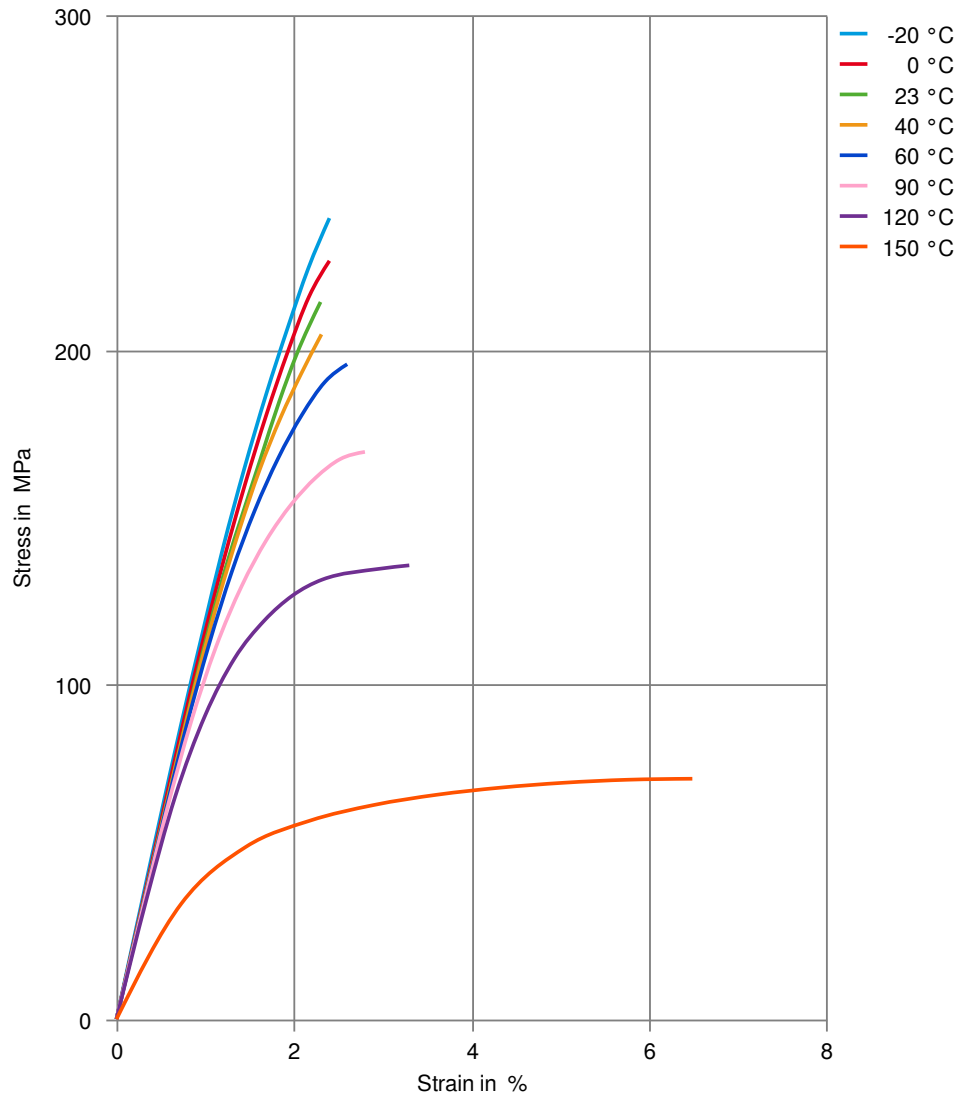
Shearstress-shear rate



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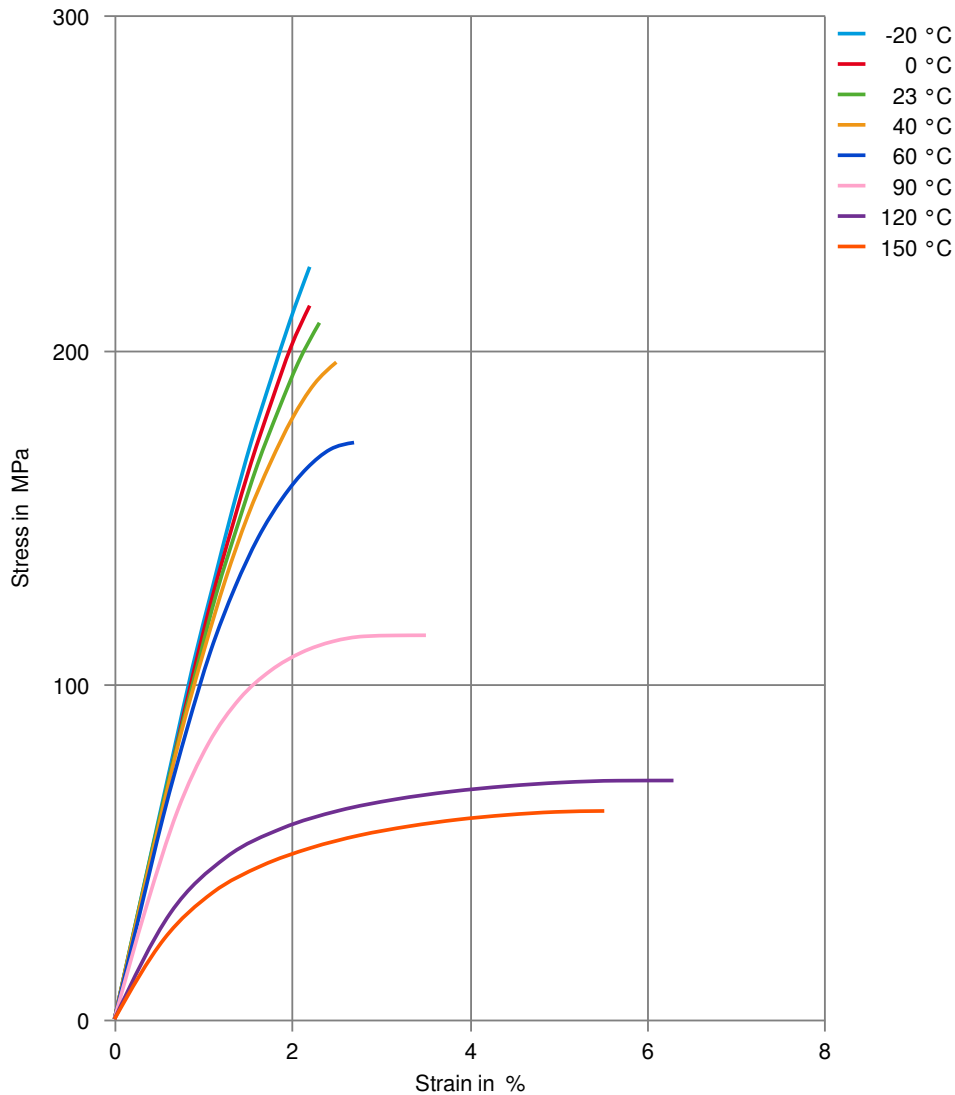
Stress-strain (dry)



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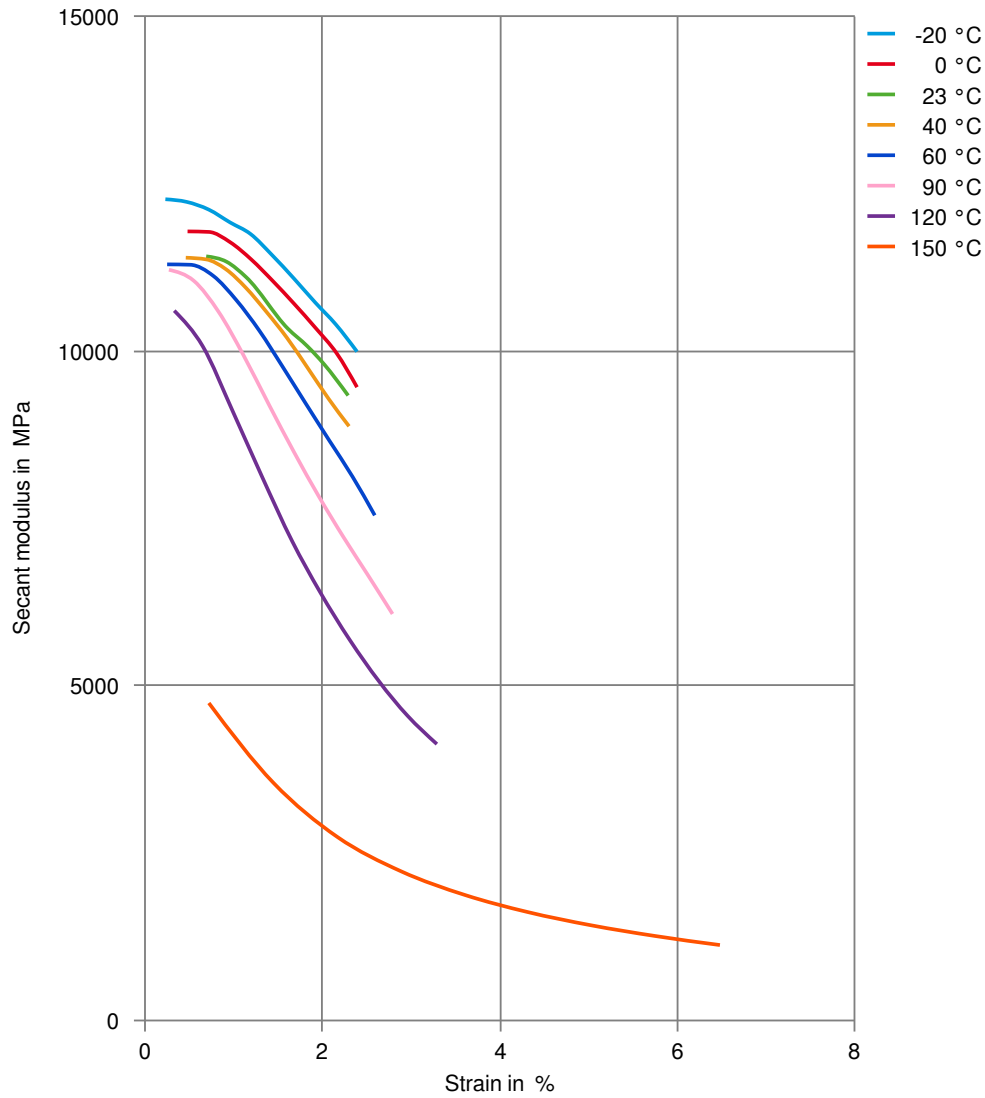
Stress-strain (cond.)



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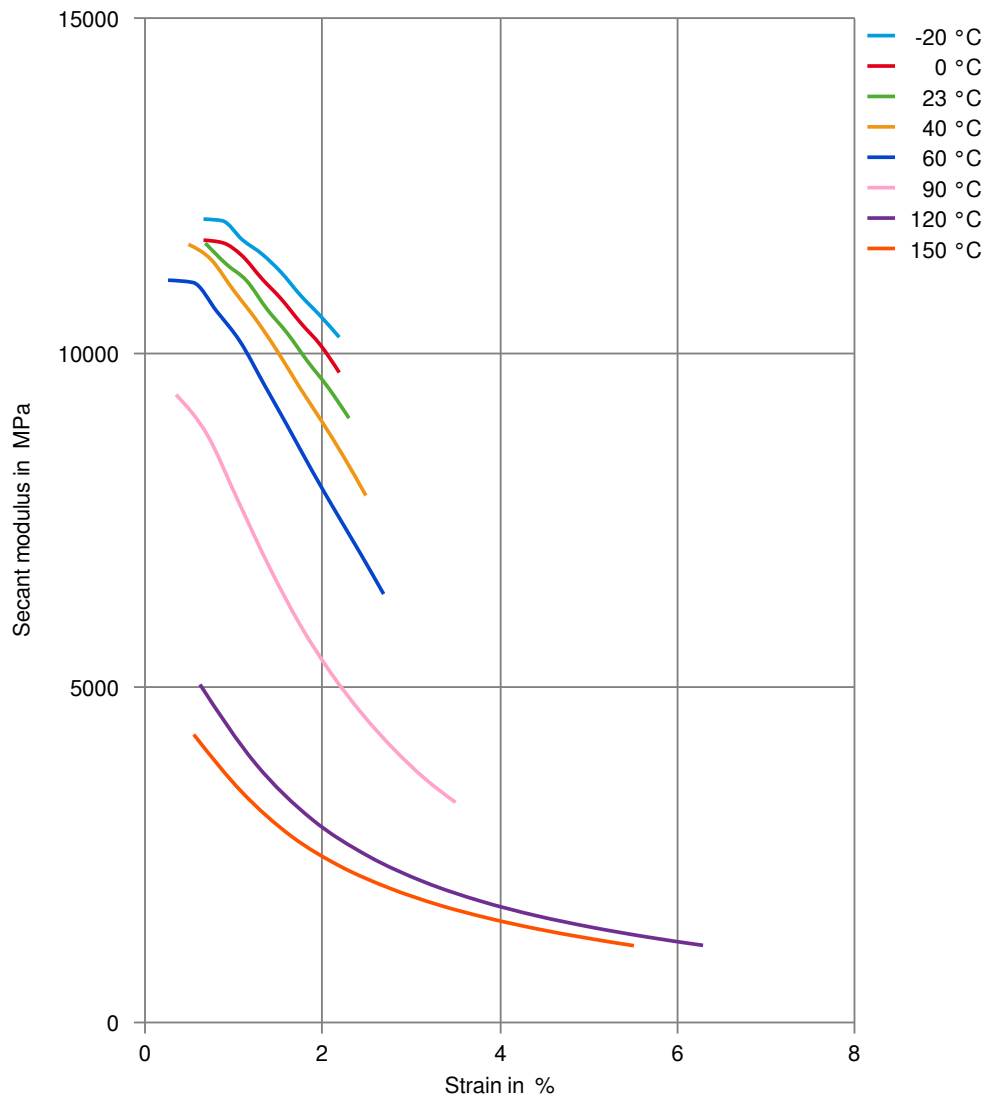
Secant modulus-strain (dry)



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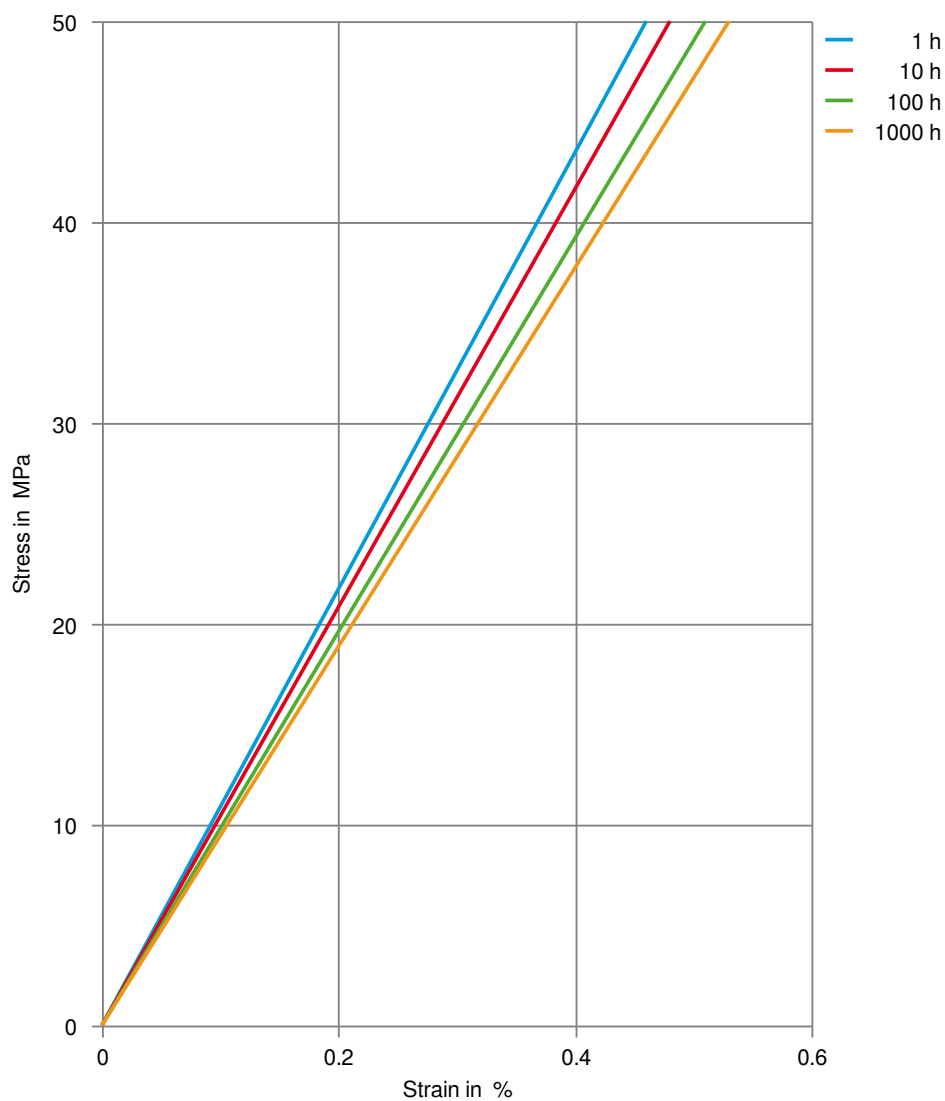
Secant modulus-strain (cond.)



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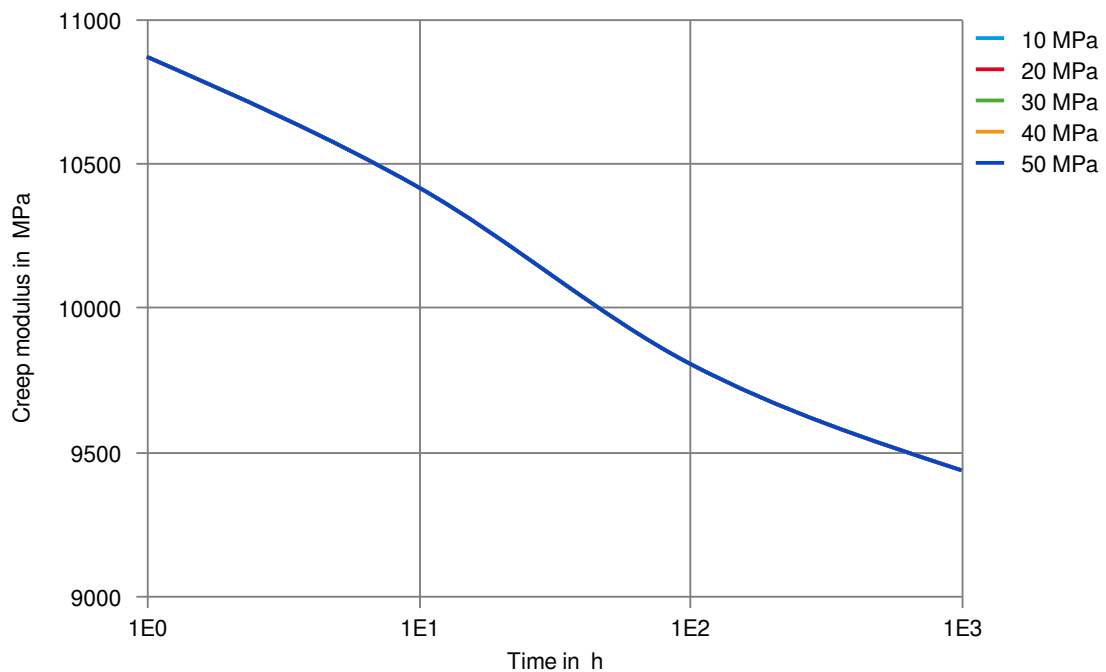
Stress-strain (isochronous) 23°C (cond.)



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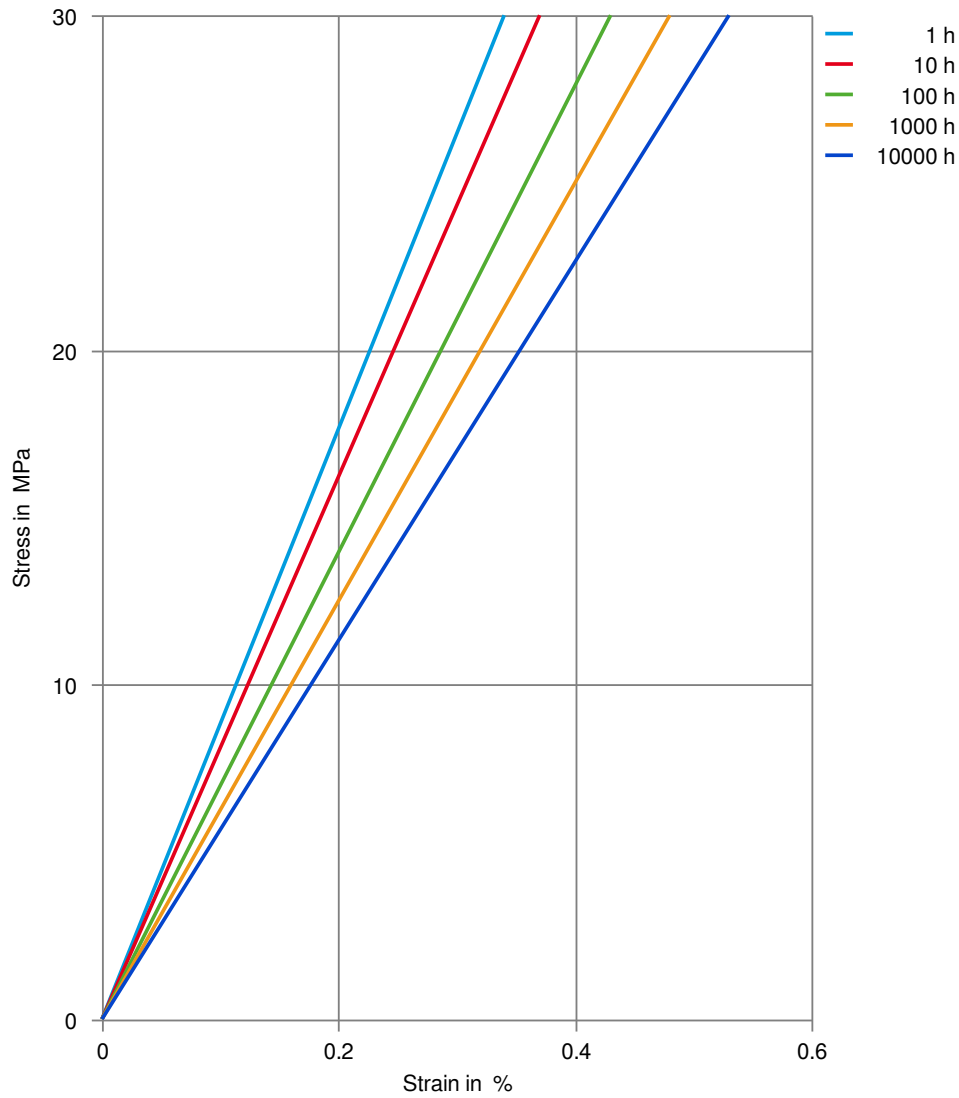
Creep modulus-time 23°C (cond.)



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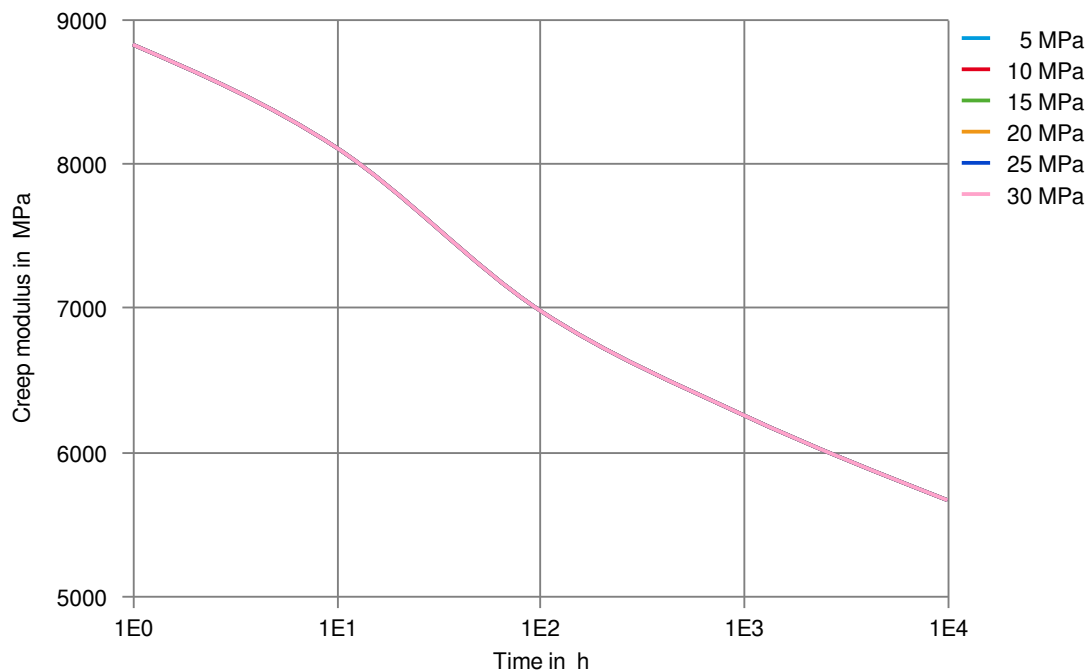
Stress-strain (isochronous) 100°C (dry)



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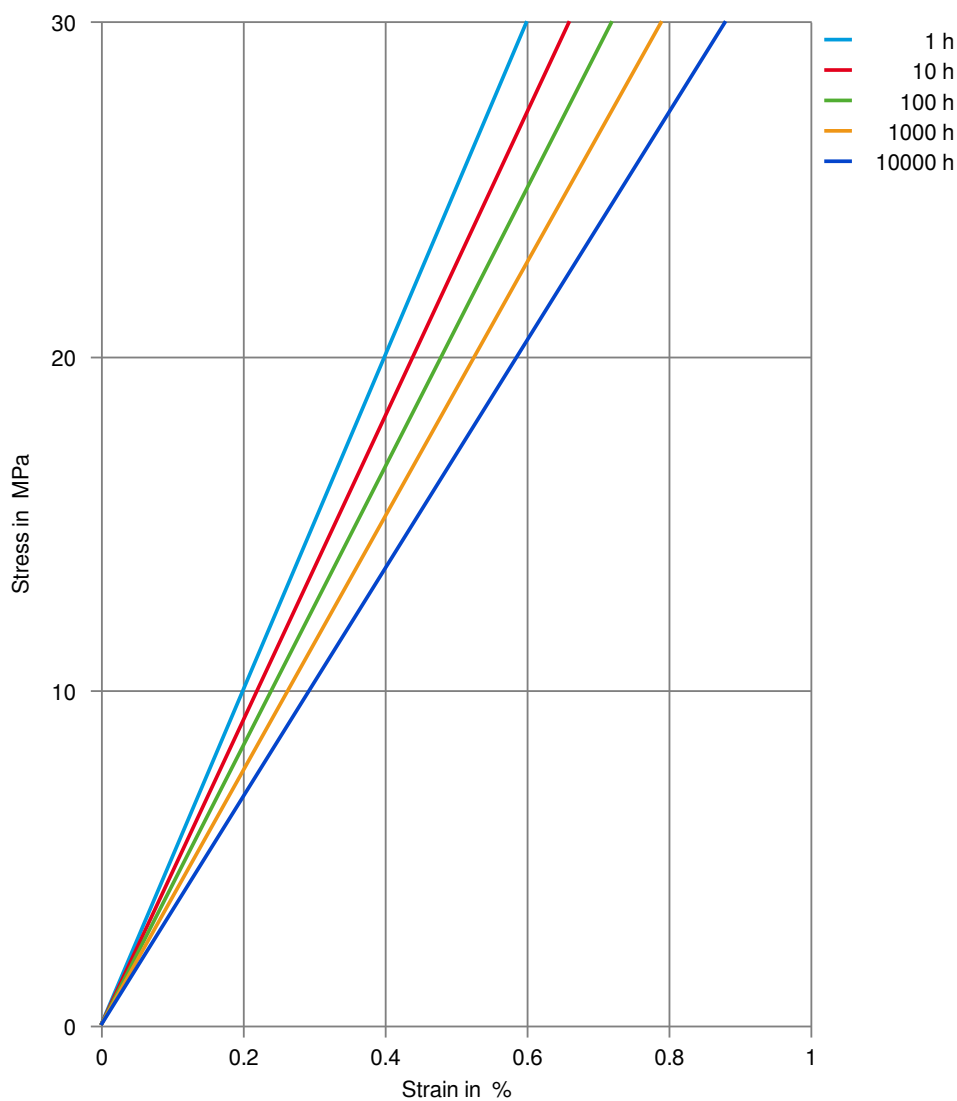
Creep modulus-time 100°C (dry)



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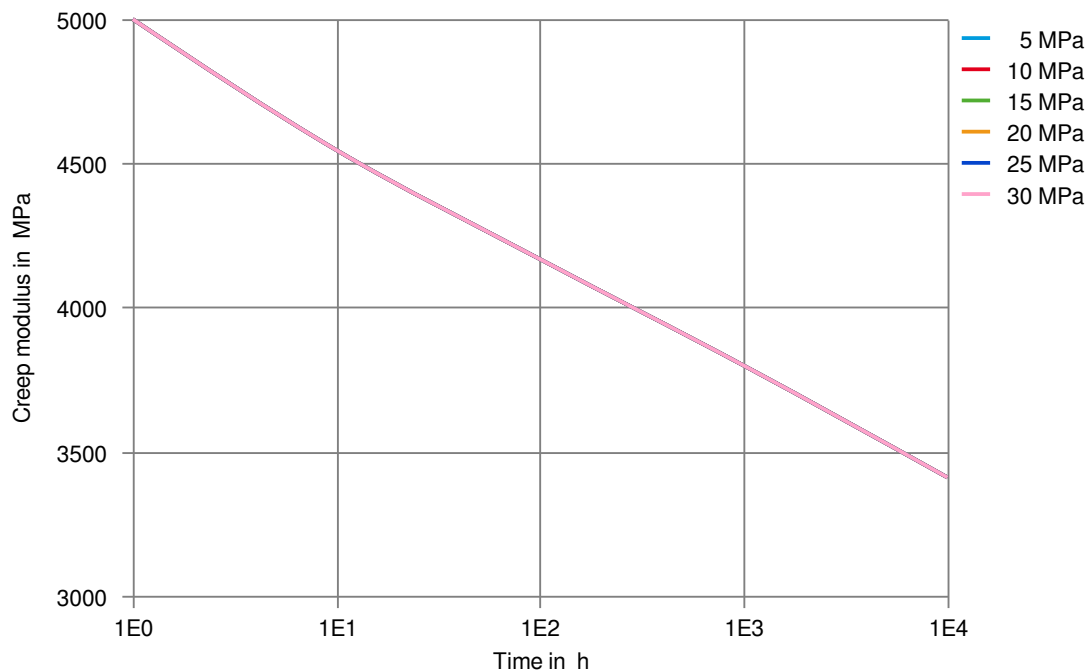
Stress-strain (isochronous) 150°C (dry)



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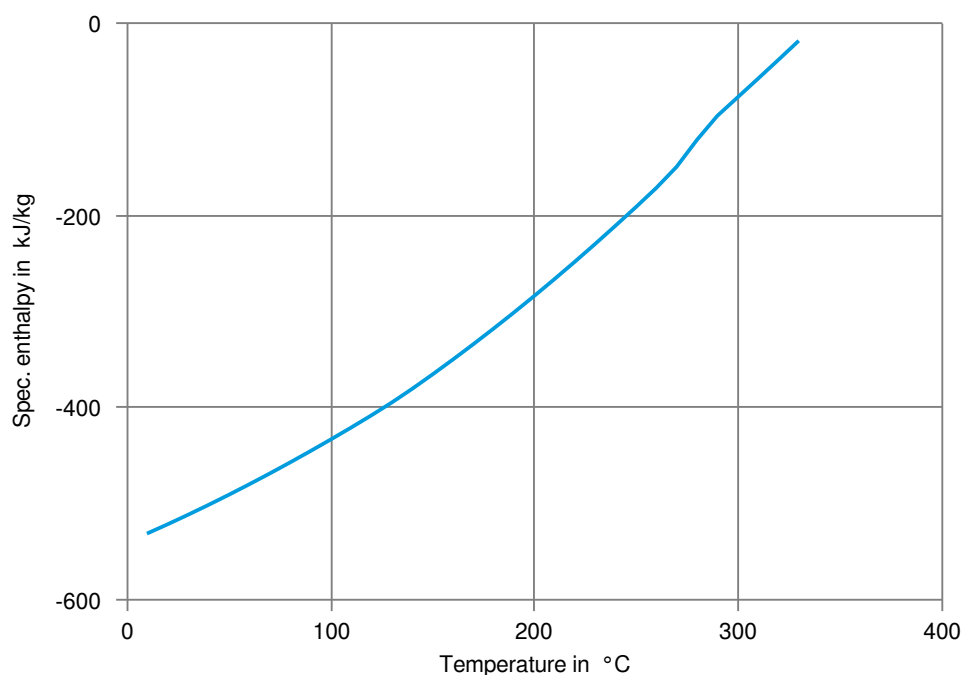
Creep modulus-time 150°C (dry)



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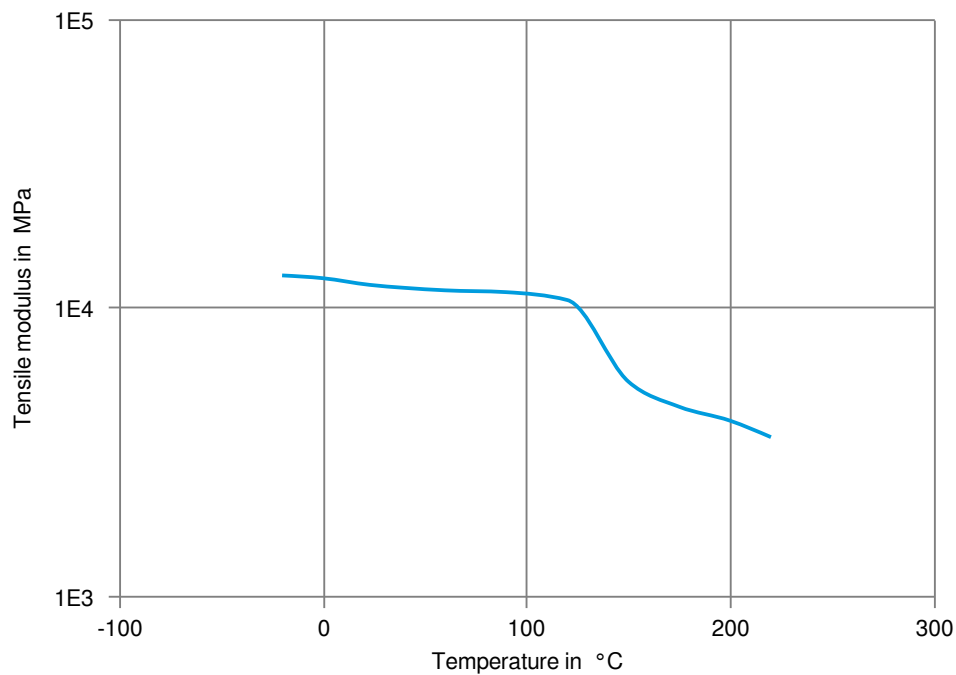
Spec. enthalpy/mass-temp. (DSC)



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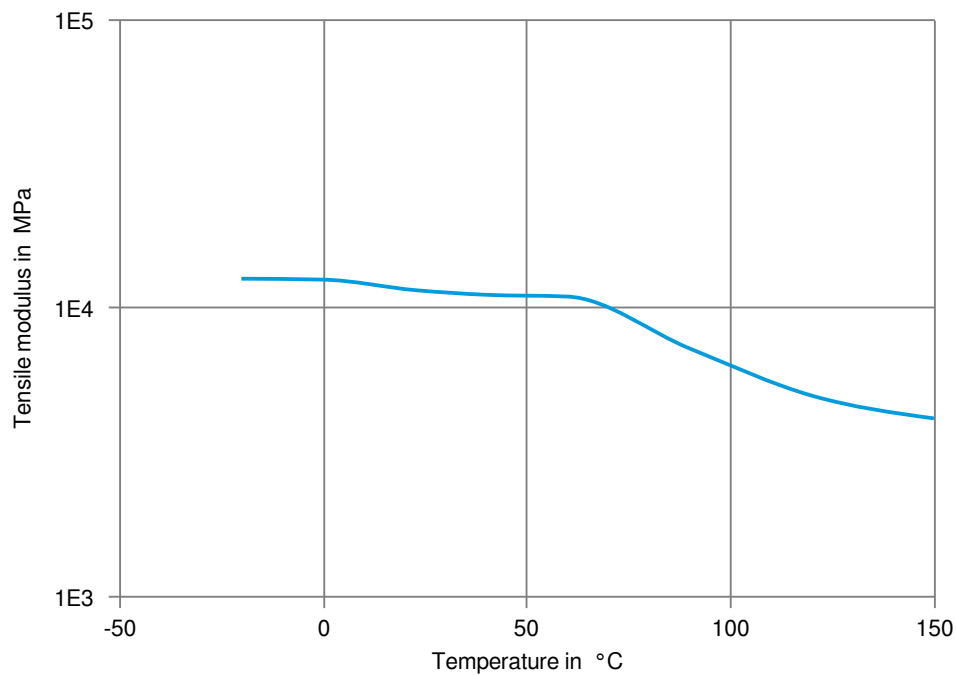
Tensile modulus-temperature (dry)



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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

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
- ✓ 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
- ✓ Diesel EN 590, 100°C

Other

- ✓ Ethylene Glycol (50% by mass) in water, 108°C
- ✓ Water, 23°C
- ✓ Water, 90°C
- ✓ Coolant Glysantin G48, 1:1 in water, 125°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).

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