Celanese
The chemistry inside innovation™

Hytrel® 4056 ECO-B

THERMOPLASTIC POLYESTER ELASTOMER

Common features of Hytrel® thermoplastic polyester elastomer include mechanical and physical properties such as exceptional toughness and resilience, high resistance to creep, impact and flex fatigue, flexibility at low temperatures and good retention of properties at elevated temperatures. In addition, it resists many industrial chemicals, oils and solvents. Special grades include heat stabilised, flame retardant, food contact compliant, blow molding and extrusion grades. Concentrates offered include black pigments, UV protection additives, heat stabilisers, and flame retardants.
Hytrel® thermoplastic polyester elastomer is plasticiser free.

The good melt stability of Hytrel® thermoplastic polyester elastomer normally enables the recycling of properly handled production waste. If recycling is not possible, we recommend, as the preferred option, incineration with energy recovery (-24 kJ/g of base polymer) in appropriately equipped installations.
For disposal, local regulations have to be observed.

Hytrel® thermoplastic polyester elastomer typically is used in demanding applications in the automotive, fluid power, electrical/electronic, consumer goods, appliance and power tool, sporting goods, furniture, industrial and off-road transportation/equipment industry.

Hytrel® 4056 ECO-B is a low modulus Hytrel® grade with nominal durometer hardness of 40D and with high impact resistance down to -40 °C. It contains a non-discoloring stabilizer. It is recommended for extrusion and compounding. It has same performance and processing properties as Hytrel® 4056.

Hytrel® 4056 ECO-B belongs to the Hytrel® ECO-B family. The products of this family are partially produced using bio-feedstock derived from waste*. This results in reduced lifecycle greenhouse gas emissions and lower fossil resource use.

*certified bio-circular according to ISCC Plus mass balance approach.
Typical applications:
Hose and tubing, hose jackets, wire and cable jackets, film and sheeting, belting and seals, .

Rheological properties

Melt volume-flow rate	5	cm^3/10min	ISO 1133
Melt mass-flow rate	5.6	g/10min	ISO 1133
Temperature	190	°C	
Load	2.16	kg	
Melt mass-flow rate, Temperature	190	°C	
Melt mass-flow rate, Load	2.16	kg	
Moulding shrinkage, parallel	0.2	%	ISO 294-4, 2577
Moulding shrinkage, normal	0.4	%	ISO 294-4, 2577

Typical mechanical properties

Tensile Modulus	60	MPa	ISO 527-1/-2
Stress at 5% strain	2.4	MPa	ISO 527-1/-2
Stress at 10% strain	4.6	MPa	ISO 527-1/-2
Stress at 50% strain	8.4	MPa	ISO 527-1/-2
Stress at break	22	MPa	ISO 527-1/-2
Nominal strain at break	500	%	ISO 527-1/-2
Strain at break	>300	%	ISO 527-1/-2

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Flexural Modulus	60	MPa	ISO 178
Tensile creep modulus, 1h	54	MPa	ISO 899-1
Tensile creep modulus, 1000h	40	MPa	ISO 899-1
Charpy impact strength, 23°C	N	kJ/m²	ISO 179/1eU
Charpy impact strength, -30°C	N	kJ/m²	ISO 179/1eU
Charpy notched impact strength, 23°C	N	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -30°C	N	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -40°C	N	kJ/m²	ISO 179/1eA
Tensile notched impact strength, 23°C	230	kJ/m²	ISO 8256/1
Puncture - maximum force, 23°C	1500	N	ISO 6603-2
Puncture - maximum force, -30°C	2800	N	ISO 6603-2
Puncture energy, 23°C	19	J	ISO 6603-2
Puncture energy, -30°C	37	J	ISO 6603-2
Izod notched impact strength, 23°C	N	kJ/m²	ISO 180/1A
Izod notched impact strength, -40°C	N	kJ/m²	ISO 180/1A
Poisson's ratio	0.5		
Brittleness temperature	-97	°C	ISO 974
Shore D hardness, 15s	37		ISO 48-4 / ISO 868
Shore D hardness, max	43		ISO 868
Tear strength, parallel	100	kN/m	ISO 34-1
Tear strength, normal	96	kN/m	ISO 34-1
Abrasion resistance	200	mm³	ISO 4649

Tribological properties

Coefficient of static friction, against steel	0.6		ISO 8295

Thermal properties

Melting temperature, 10°C/min	152	°C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	-50	°C	ISO 11357-1/-3
Temp. of deflection under load, 0.45 MPa	48	°C	ISO 75-1/-2
Vicat softening temperature, 50°C/h 10N	110	°C	ISO 306
Coeff. of linear therm. expansion, parallel	130	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	160	E-6/K	ISO 11359-1/-2
Eff. thermal diffusivity	8.5E-8	m²/s	Internal
RTI, electrical, 1.5mm	50	°C	UL 746B
RTI, impact, 1.5mm	50	°C	UL 746B
RTI, strength, 1.5mm	50	°C	UL 746B

Flammability

Burning Behav. at 1.5mm nom. thickn.	HB	class	UL 94
Thickness tested	1.5	mm	UL 94
UL recognition	yes		UL 94
Burning Behav. at thickness h	HB	class	UL 94
Thickness tested	0.8	mm	UL 94

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UL recognition	yes		UL 94
Oxygen index	20	%	ISO 4589-1/-2
FMVSS Class	SE		ISO 3795 (FMVSS 302)

Electrical properties

Relative permittivity, 100Hz	5.2		IEC 62631-2-1
Relative permittivity, 1MHz	4.7		IEC 62631-2-1
Dissipation factor, 100Hz	110	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	525	E-4	IEC 62631-2-1
Volume resistivity	7E10	Ohm.m	IEC 62631-3-1
Surface resistivity	2E14	Ohm	IEC 62631-3-2
Electric strength	18	kV/mm	IEC 60243-1
Comparative tracking index	600		IEC 60112

Other properties

Humidity absorption, 2mm	0.2	%	Sim. to ISO 62
Water absorption, 2mm	0.7	%	Sim. to ISO 62
Water absorption, Immersion 24h	0.6	%	Sim. to ISO 62
Density	1160	kg/m³	ISO 1183
Density of melt	1020	kg/m³	Internal

Film Properties

WVTR, 23°C/85%r.h.	450	g/(m²*d)	DIS 15106-1/-2
Oxygen transmission rate, 23°C/85%r.h.	14000	cm³/(m²*d*bar)	DIS 15105-1/-2
Thickness of specimen	0.025	mm	

Injection

Drying Recommended	yes		
Drying Temperature	80	°C	
Drying Time, Dehumidified Dryer	2 - 3	h	
Processing Moisture Content	≤0.08	%	
Melt Temperature Optimum	180	°C	Internal
Min. melt temperature	170	°C	
Max. melt temperature	190	°C	
Mold Temperature Optimum	40	°C	
Min. mould temperature	30	°C	
Max. mould temperature	40	°C	

Extrusion

Drying Temperature	70 - 90	°C
Drying Time, Dehumidified Dryer	2 - 3	h
Processing Moisture Content	≤0.06	%
Melt Temperature Optimum	170	°C

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Melt Temperature Range	165 - 180 °C

Characteristics

Additives	Biobased

Additional information

Injection molding

Snake Flow Test , mm

Inject press 62MPa, 1mm	80
Inject press 62MPa, 2.5mm	330
Inject press 83MPa(12,000psi), 1mm	95
Inject press 83MPa(12,000psi), 2.5mm	430

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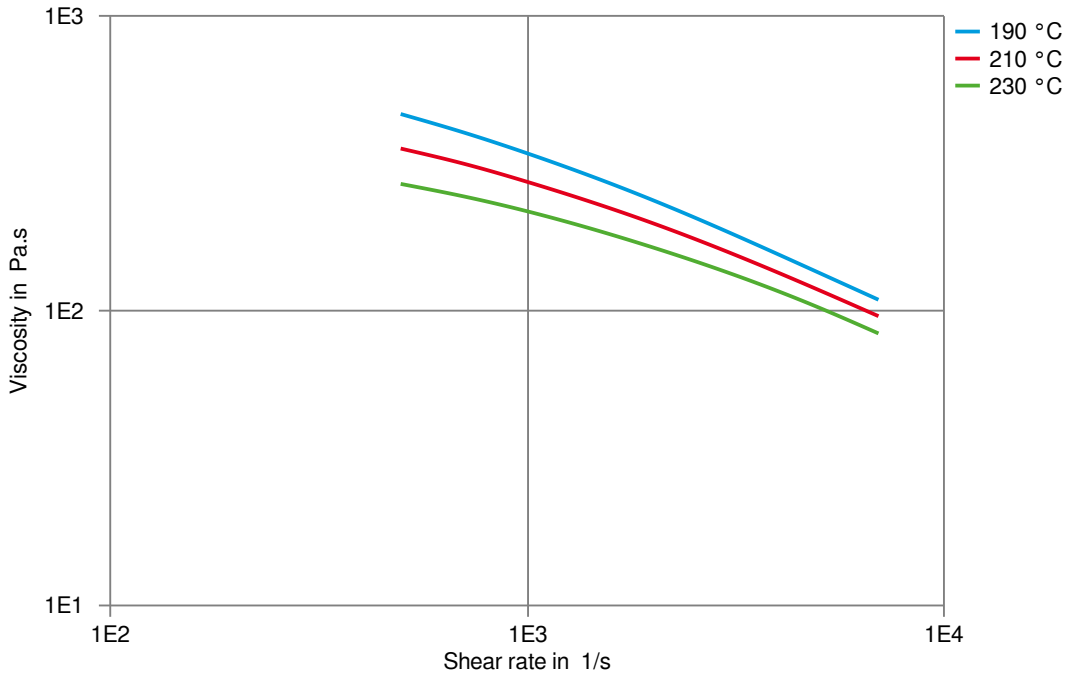
Viscosity-shear rate



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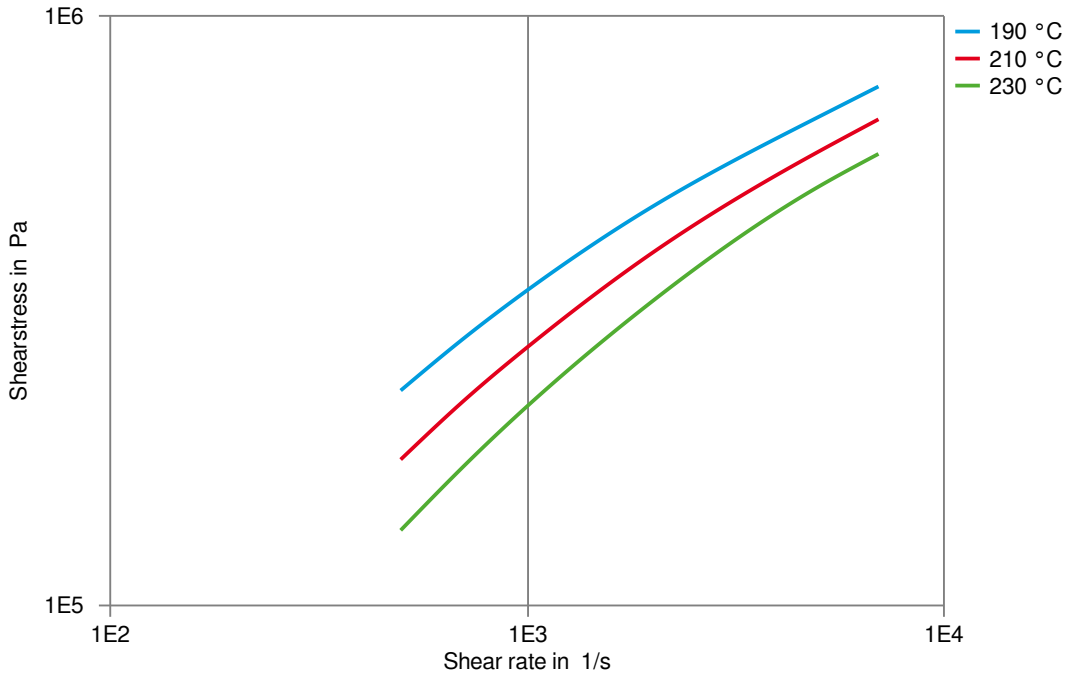
Shearstress-shear rate



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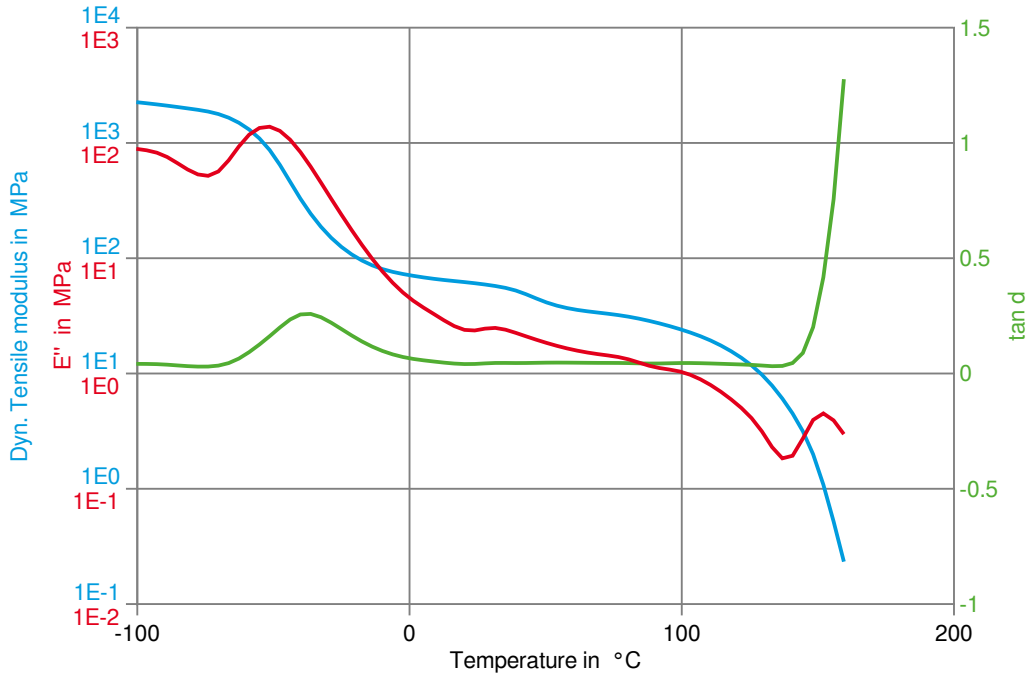
Dynamic Tensile modulus-temperature



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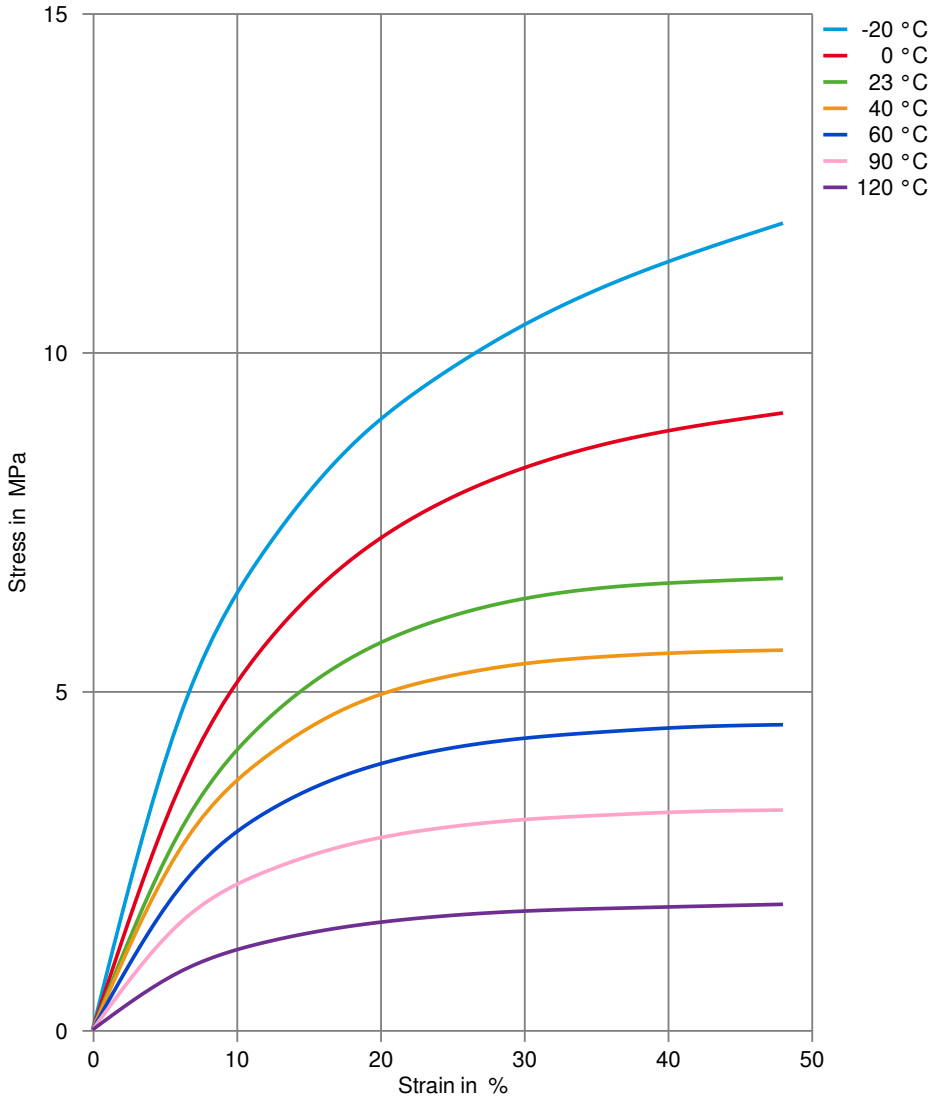
Stress-strain



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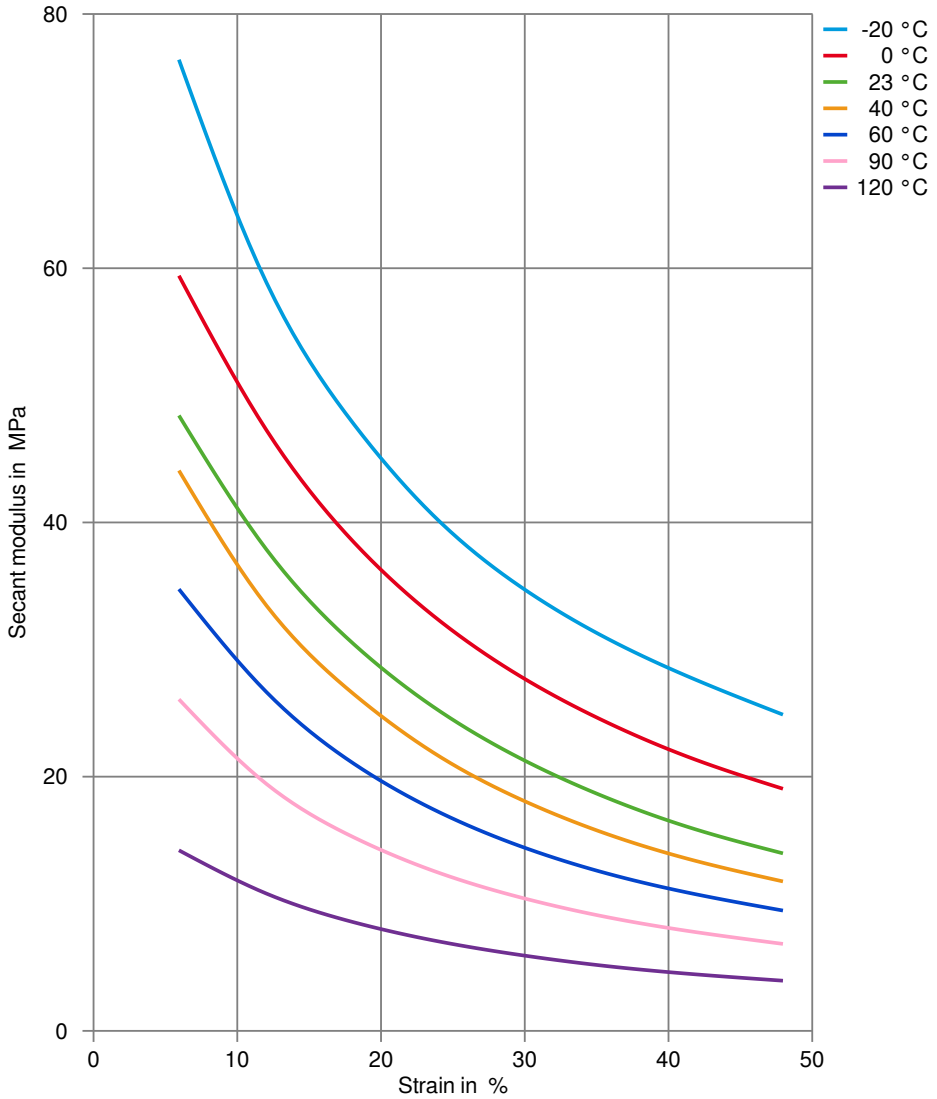
Secant modulus-strain



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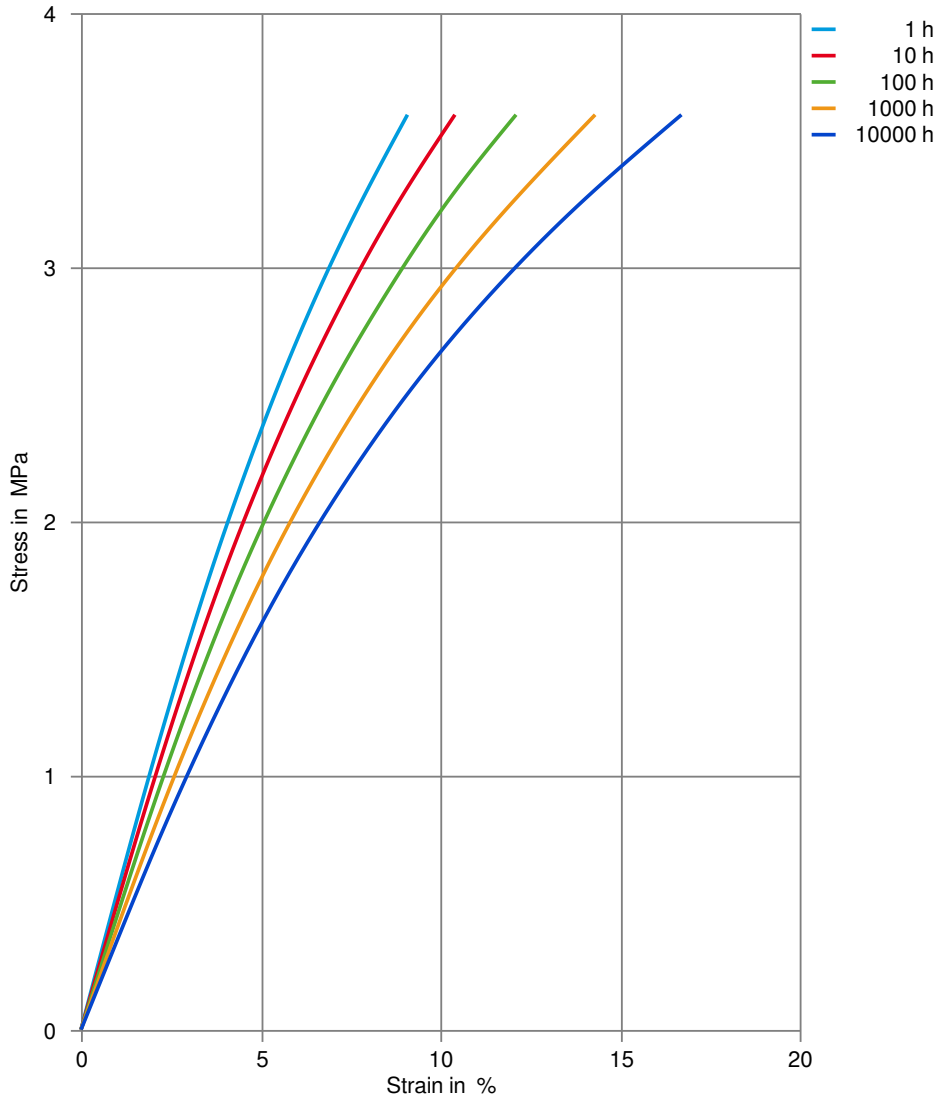
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 23 °C



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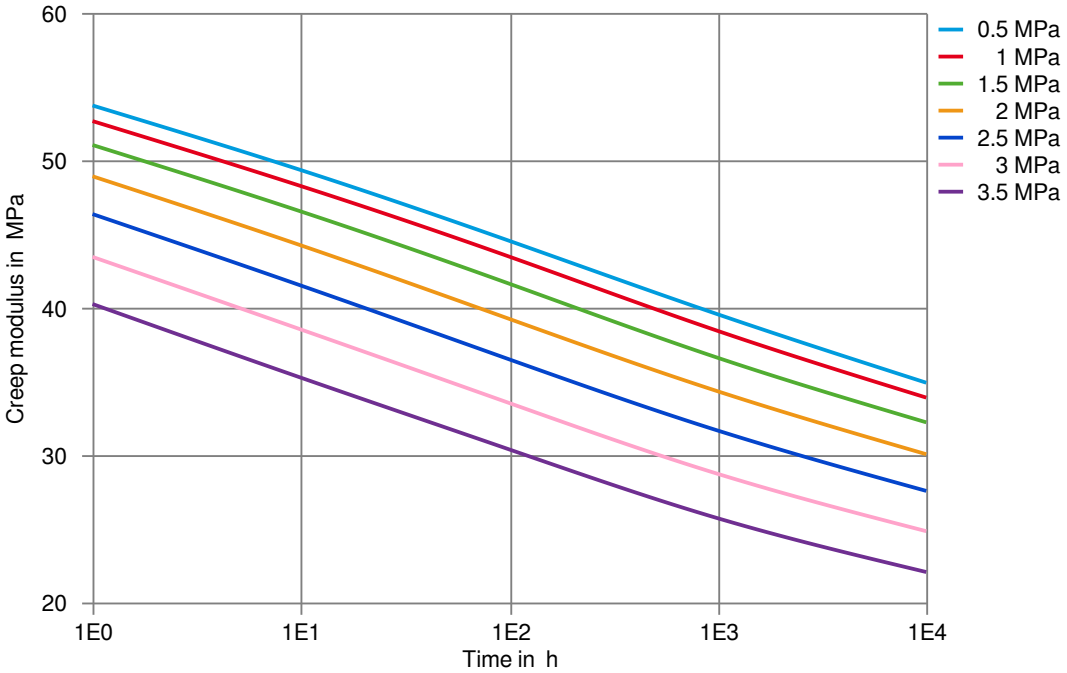
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 23 °C



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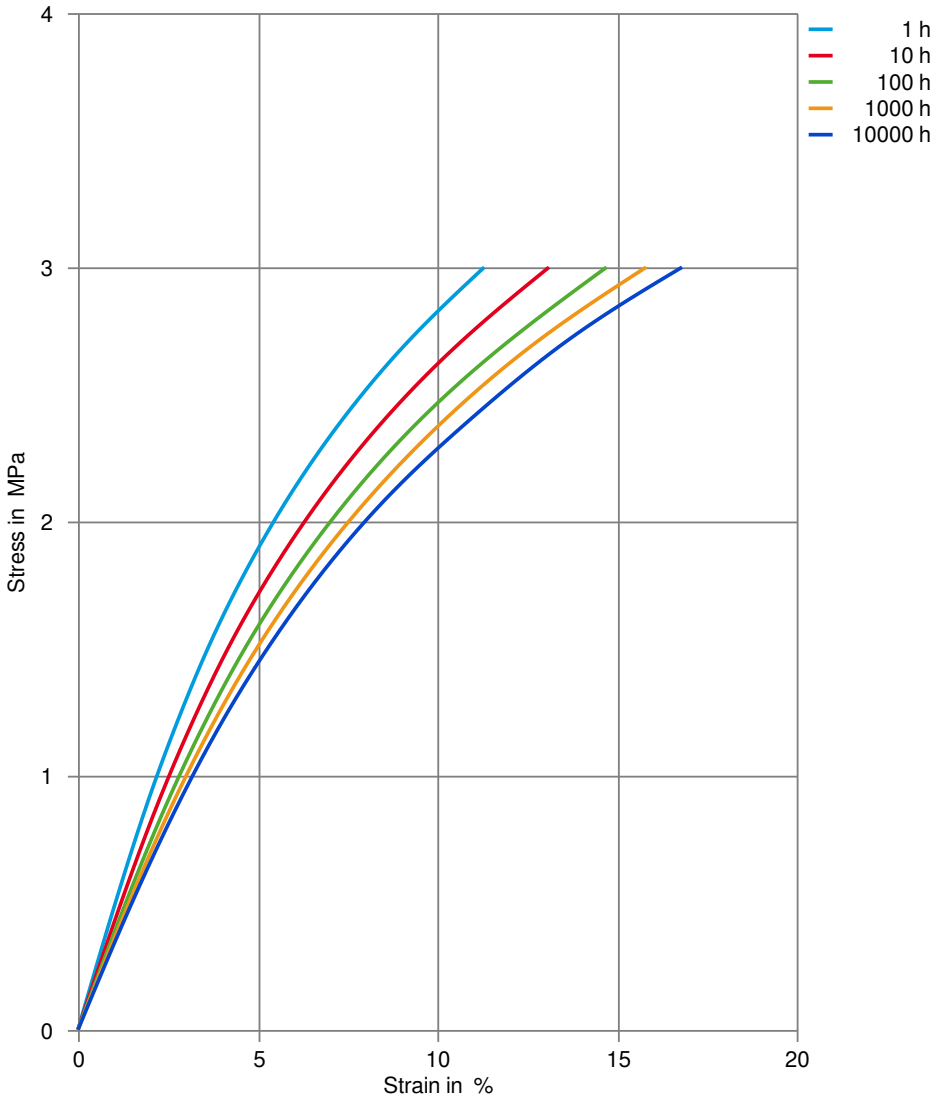
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 40 °C



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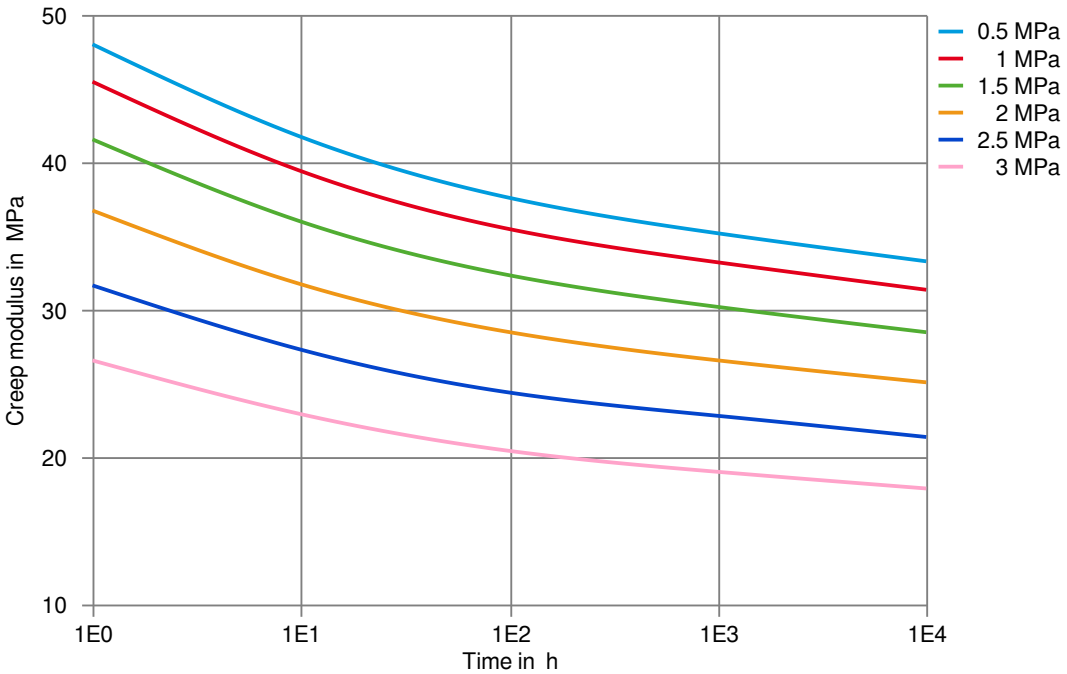
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 40 °C



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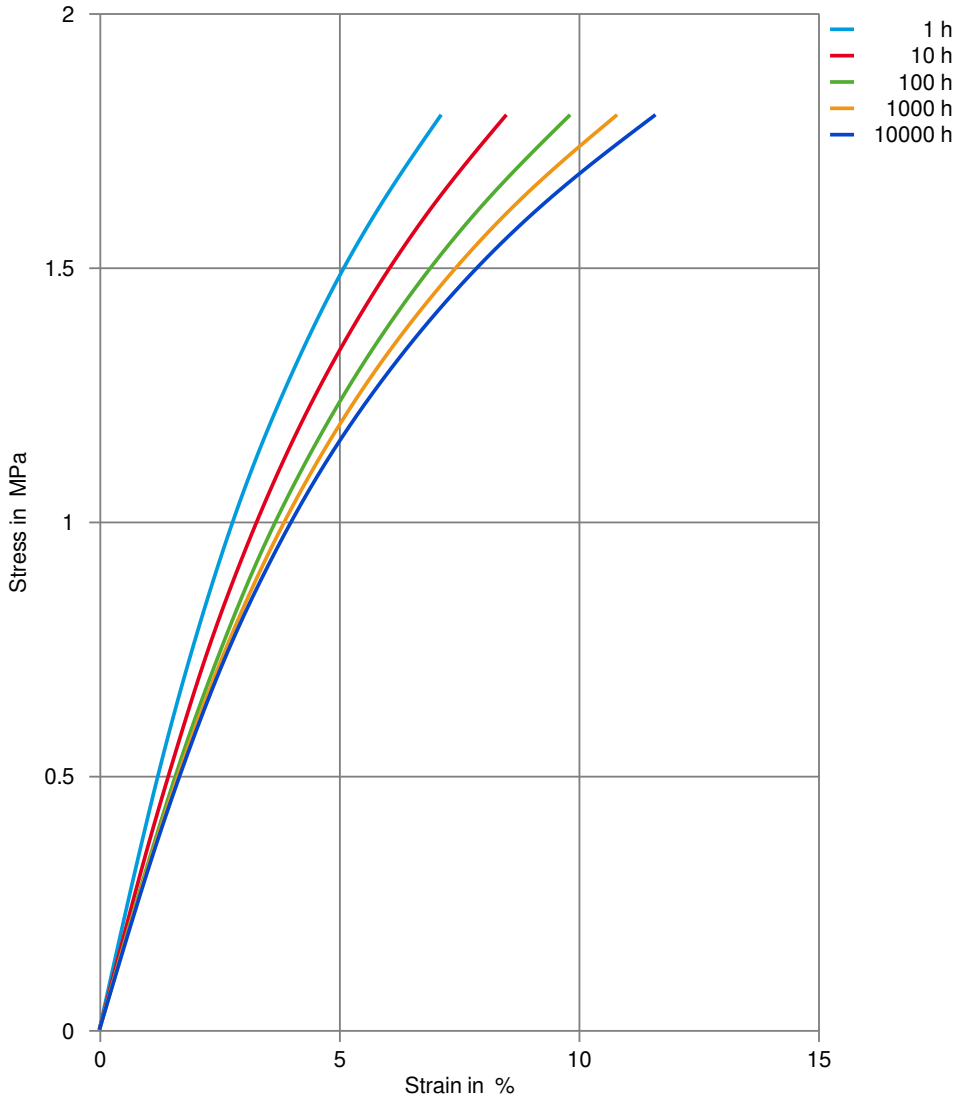
Stress-strain (isochronous) 80 °C



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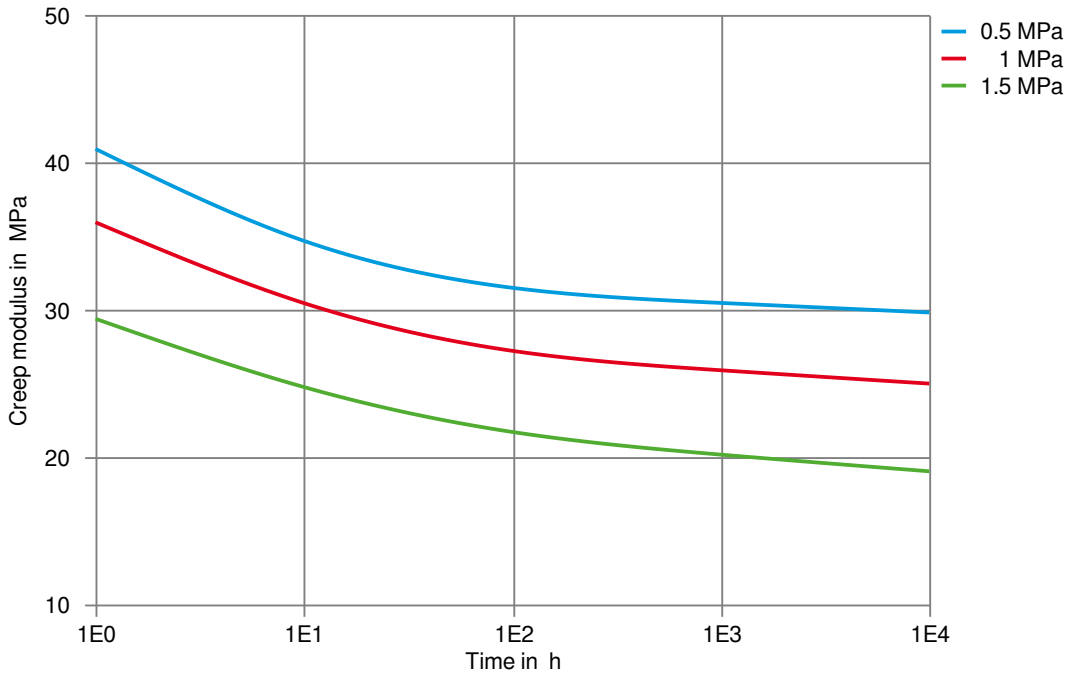
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 80 °C



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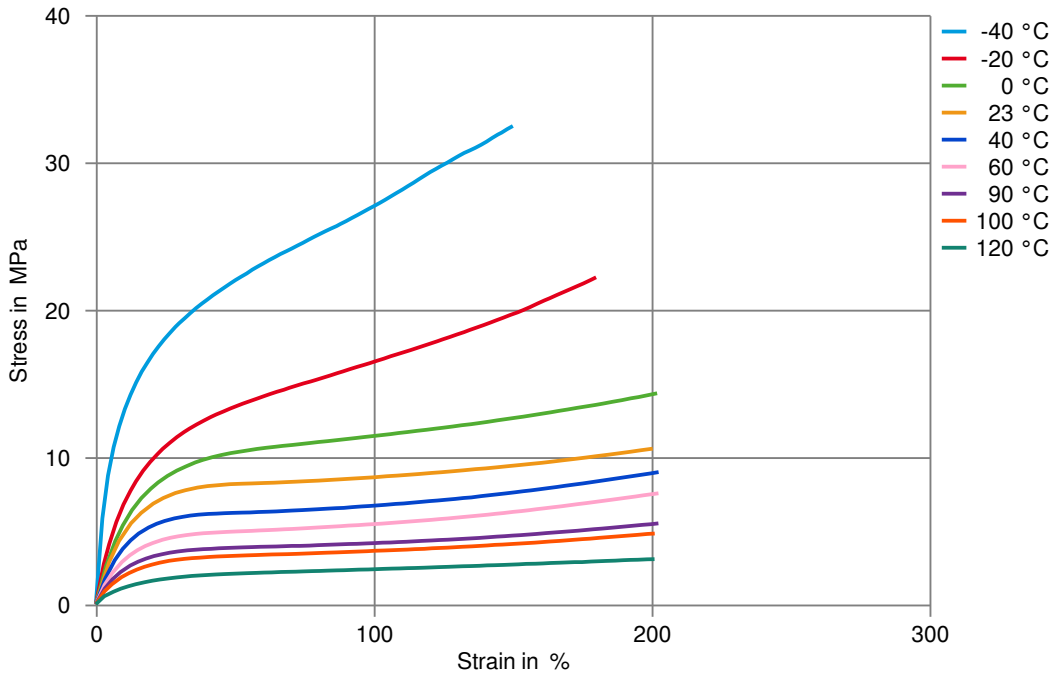
Stress-Strain (Flexible Materials)



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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
- ✘ 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

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- ✔ 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
- ✘ 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).