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Hytrel® 6356 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® 6356 ECO-B is a medium modulus grade with nominal hardness of 63D. It contains non-discoloring stabilizer. It can be processed by many conventional thermoplastic processing techniques like injection molding and extrusion. It has same performance and processing properties as Hytrel® 6356.

Hytrel® 6356 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, mandrels, wire and cable, film, profiles, seals, gears, sprockets, fuel tanks, containers with good permeation resistance to gases and liquids.

Rheological properties

Melt volume-flow rate	8.5	cm^3/10min	ISO 1133
Melt mass-flow rate	9	g/10min	ISO 1133
Temperature	230	°C	
Load	2.16	kg	
Melt mass-flow rate, Temperature	230	°C	
Melt mass-flow rate, Load	2.16	kg	
Moulding shrinkage, parallel	1.5	%	ISO 294-4, 2577
Moulding shrinkage, normal	1.5	%	ISO 294-4, 2577

Typical mechanical properties

Tensile Modulus	280	MPa	ISO 527-1/-2
Yield stress	20	MPa	ISO 527-1/-2
Yield strain	31	%	ISO 527-1/-2
Stress at 5% strain	12	MPa	ISO 527-1/-2
Stress at 10% strain	15	MPa	ISO 527-1/-2
Stress at 50% strain	18.8	MPa	ISO 527-1/-2

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Stress at 100% strain	19	MPa	ISO 527-1/-2
Stress at break	43	MPa	ISO 527-1/-2
Nominal strain at break	500	%	ISO 527-1/-2
Strain at break	>300	%	ISO 527-1/-2
Flexural Modulus	290	MPa	ISO 178
Tensile creep modulus, 1h	248	MPa	ISO 899-1
Tensile creep modulus, 1000h	182	MPa	ISO 899-1
Charpy notched impact strength, 23°C	120[P]	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -30°C	25	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -40°C	15	kJ/m²	ISO 179/1eA
Tensile notched impact strength, 23°C	300	kJ/m²	ISO 8256/1
Izod notched impact strength, 23°C	81	kJ/m²	ISO 180/1A
Izod notched impact strength, -40°C	19	kJ/m²	ISO 180/1A
Poisson's ratio	0.48		
Brittleness temperature	-96	°C	ISO 974
Shore D hardness, 15s	57		ISO 48-4 / ISO 868
Shore D hardness, max	63		ISO 868
Tear strength, parallel	160	kN/m	ISO 34-1
Tear strength, normal	140	kN/m	ISO 34-1
Abrasion resistance	110	mm³	ISO 4649

[P]: Partial Break

Thermal properties

Melting temperature, 10°C/min	210	°C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	-5	°C	ISO 11357-1/-3
Temp. of deflection under load, 1.8 MPa	45	°C	ISO 75-1/-2
Temp. of deflection under load, 0.45 MPa	80	°C	ISO 75-1/-2
Vicat softening temperature, 50°C/h, 50N	100	°C	ISO 306
Vicat softening temperature, 50°C/h 10N	200	°C	ISO 306
Coeff. of linear therm. expansion, parallel, -40-23°C	160	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, parallel	190	E-6/K	ISO 11359-1/-2
CLTE, Parallel, 23-55°C(73-130°F)	190	E-6/K	ASTM E 831
Coeff. of linear therm. expansion, normal, -40-23°C	150	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	176	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, Normal,23-55°C (73-130°F)	170	E-6/K	ASTM E 831
Thermal conductivity of melt	0.15	W/(m K)	Internal
Eff. thermal diffusivity	5.44E-8	m²/s	Internal
Spec. heat capacity of melt	2150	J/(kg K)	Internal
RTI, electrical, 1.5mm	85	°C	UL 746B
RTI, electrical, 3mm	85	°C	UL 746B
RTI, impact, 1.5mm	85	°C	UL 746B
RTI, impact, 3mm	85	°C	UL 746B
RTI, strength, 1.5mm	75	°C	UL 746B
RTI, strength, 3mm	80	°C	UL 746B

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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	3	mm	UL 94
UL recognition	yes		UL 94
Oxygen index	21	%	ISO 4589-1/-2
FMVSS Class	SE		ISO 3795 (FMVSS 302)

Electrical properties

Relative permittivity, 100Hz	4.6		IEC 62631-2-1
Relative permittivity, 1MHz	4.1		IEC 62631-2-1
Dissipation factor, 100Hz	120	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	360	E-4	IEC 62631-2-1
Volume resistivity	8E11	Ohm.m	IEC 62631-3-1
Surface resistivity	>1E15	Ohm	IEC 62631-3-2
Electric strength	20	kV/mm	IEC 60243-1

Other properties

Humidity absorption, 2mm	0.2	%	Sim. to ISO 62
Water absorption, 2mm	0.6	%	Sim. to ISO 62
Water absorption, Immersion 24h	0.5	%	Sim. to ISO 62
Density	1220	kg/m^3	ISO 1183
Density of melt	1060	kg/m^3	Internal

VDA Properties

Emission of organic compounds	2.5	µgC/g	VDA 277
Odour	2.5	class	VDA 270
Fogging, G-value (condensate)	0.1	mg	ISO 6452

Injection

Drying Recommended	yes		
Drying Temperature	100	°C	
Drying Time, Dehumidified Dryer	2 - 3	h	
Processing Moisture Content	≤0.08	%	
Melt Temperature Optimum	240	°C	Internal
Min. melt temperature	235	°C	
Max. melt temperature	260	°C	
Mold Temperature Optimum	45	°C	
Min. mould temperature	45	°C	
Max. mould temperature	55	°C	
Hold pressure range	≤70	MPa	

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Extrusion

Drying Temperature	90 - 110	°C
Drying Time, Dehumidified Dryer	2 - 3	h
Processing Moisture Content	≤0.06	%
Melt Temperature Optimum	230	°C
Melt Temperature Range	225 - 240	°C

Characteristics

Additives	Biobased

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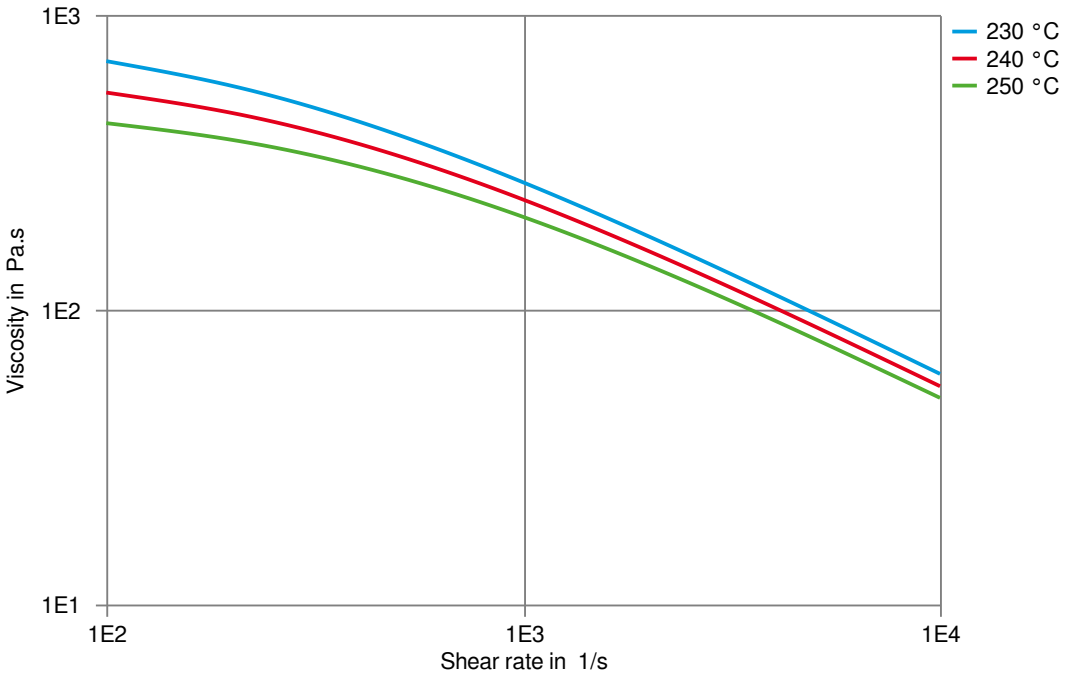
THERMOPLASTIC POLYESTER ELASTOMER

Viscosity-shear rate



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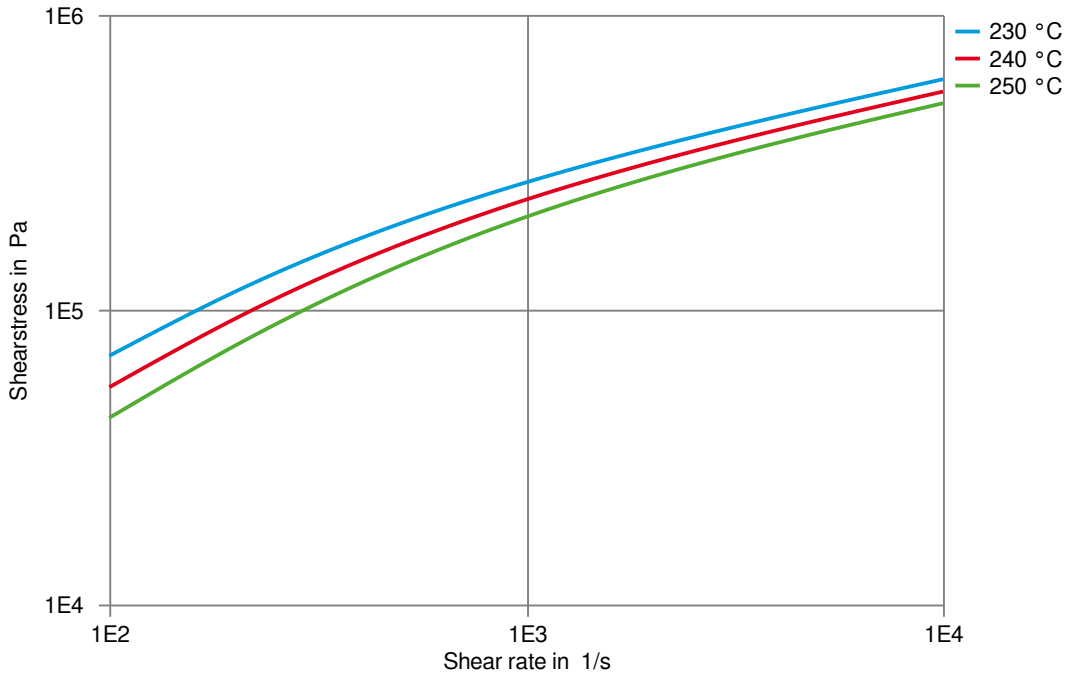
THERMOPLASTIC POLYESTER ELASTOMER

Shearstress-shear rate



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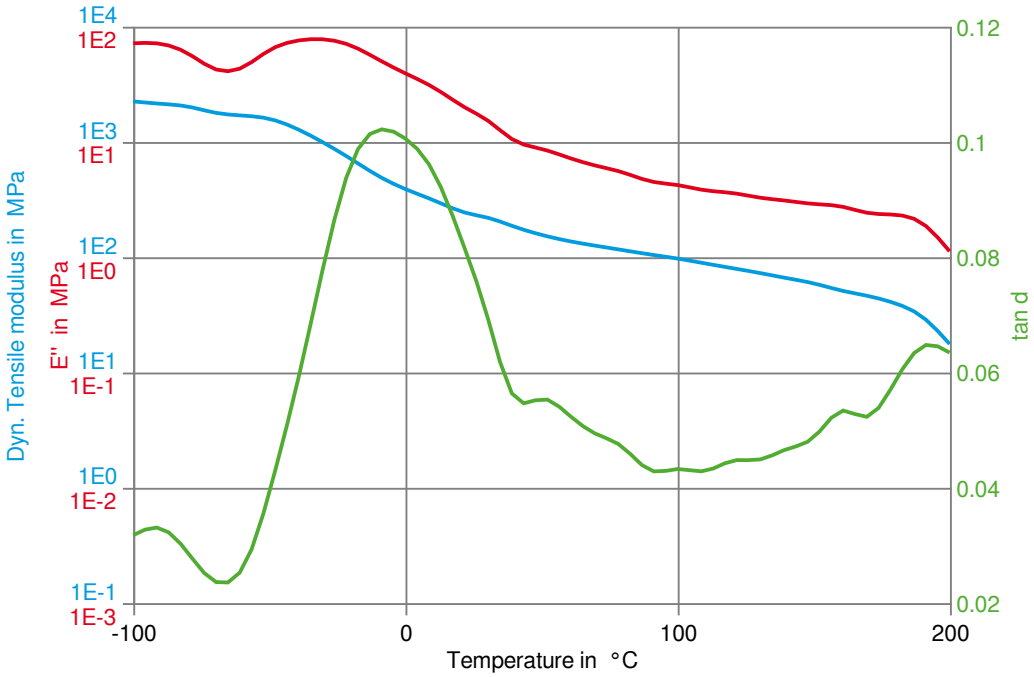
THERMOPLASTIC POLYESTER ELASTOMER

Dynamic Tensile modulus-temperature



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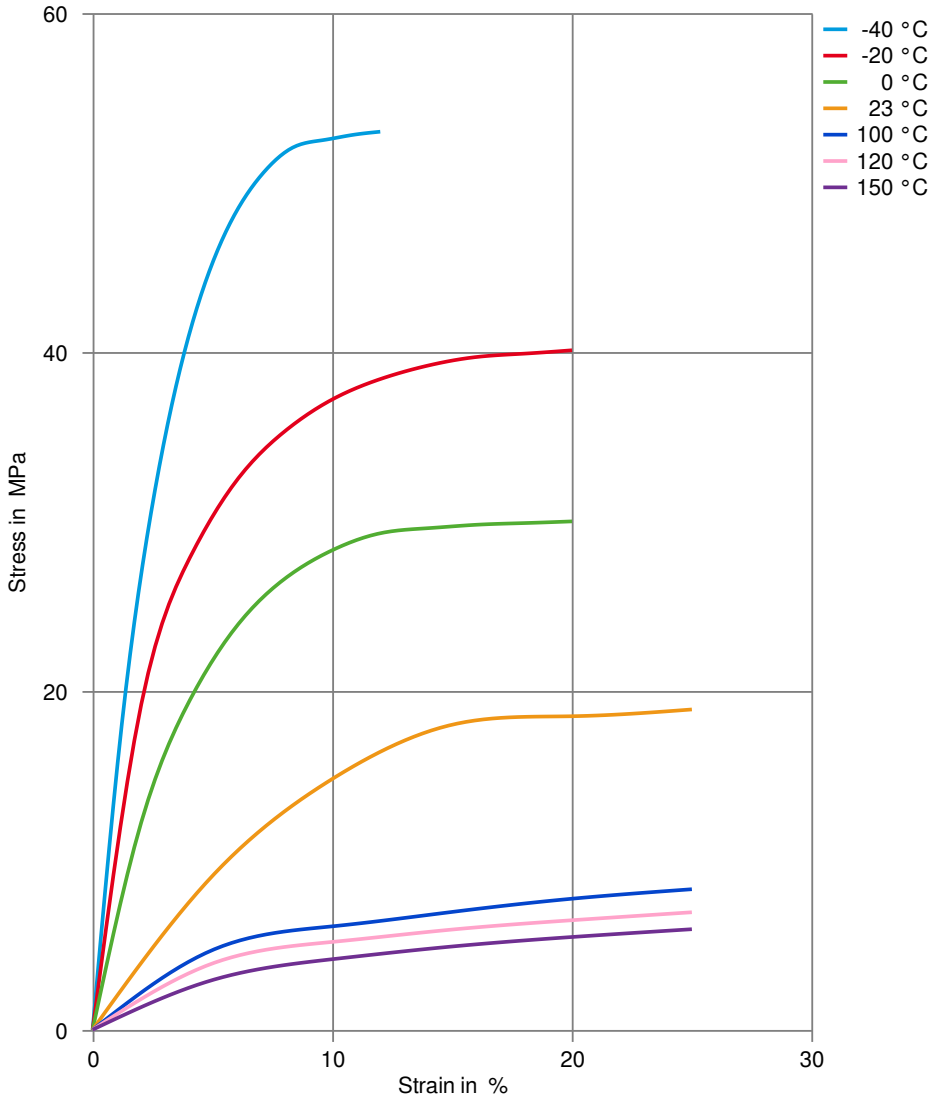
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain



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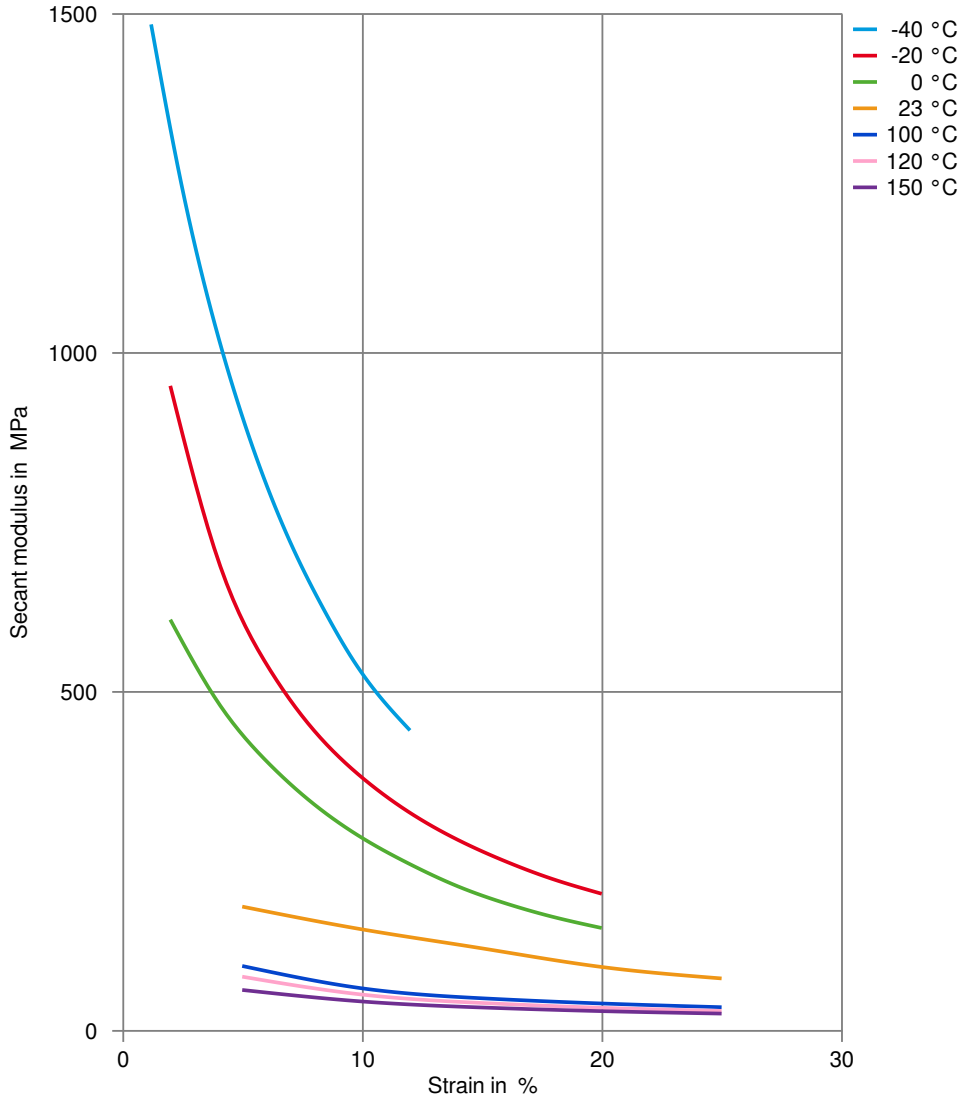
Secant modulus-strain



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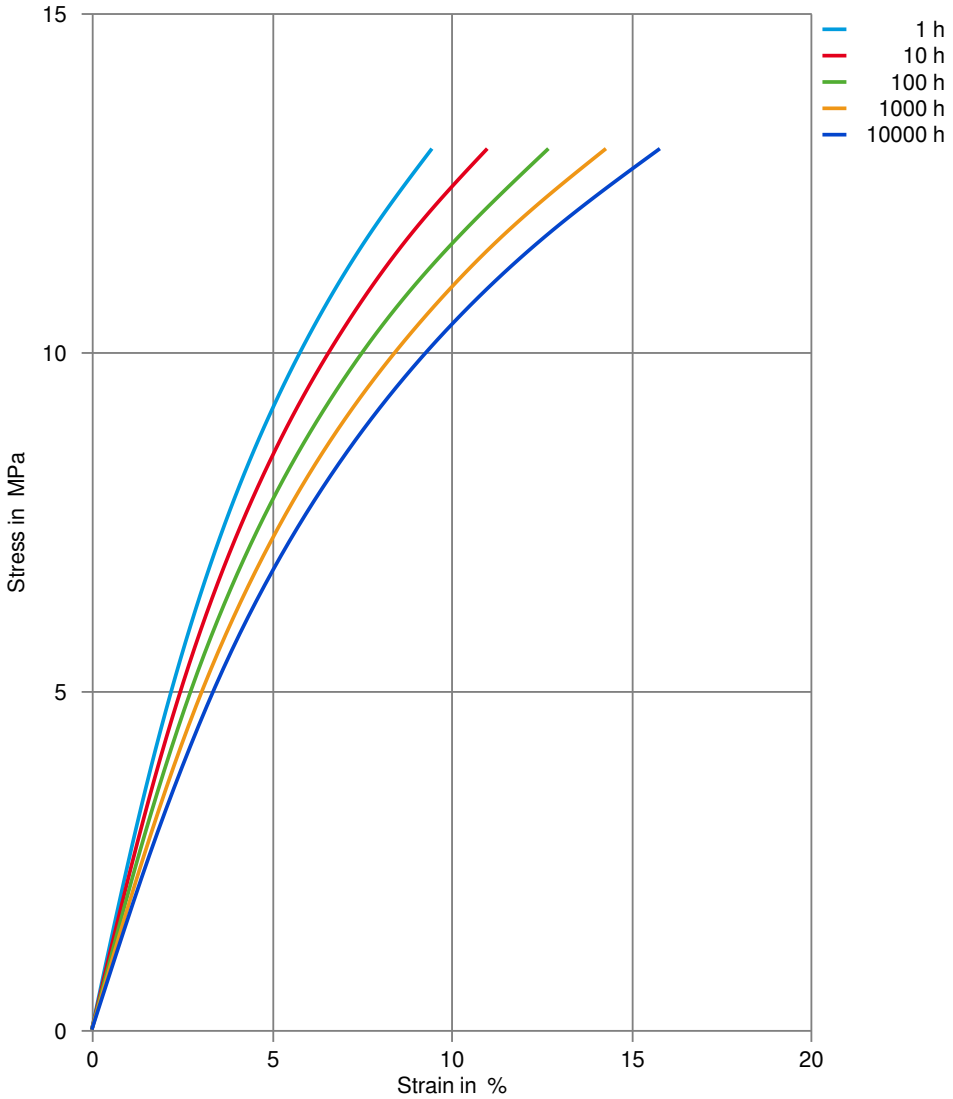
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 23 °C



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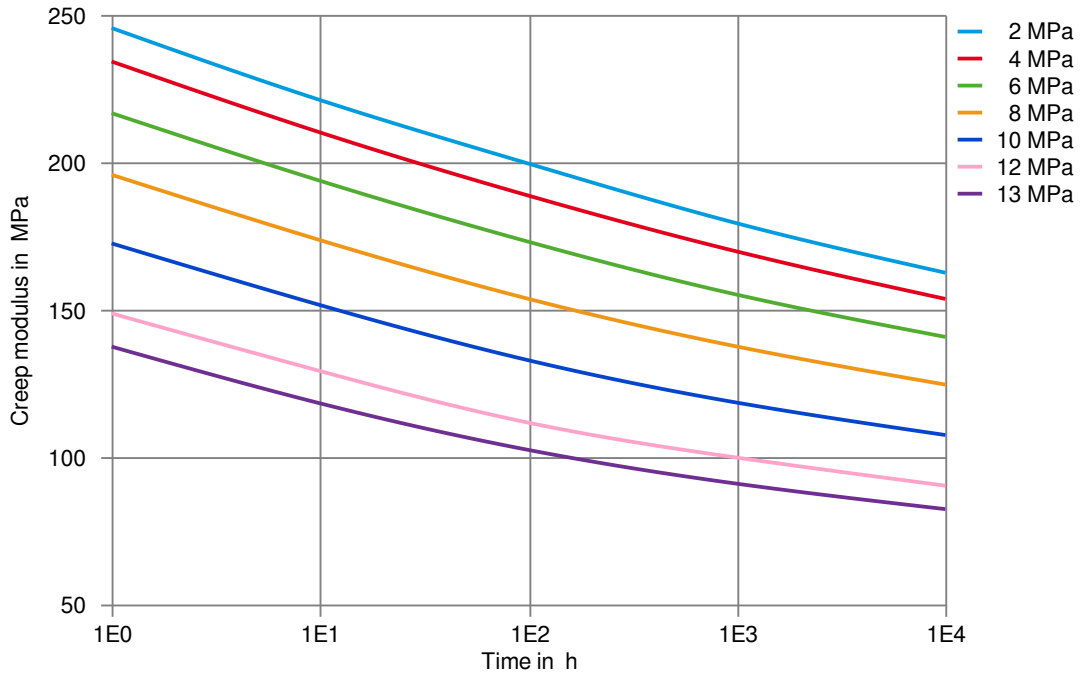
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 23 °C



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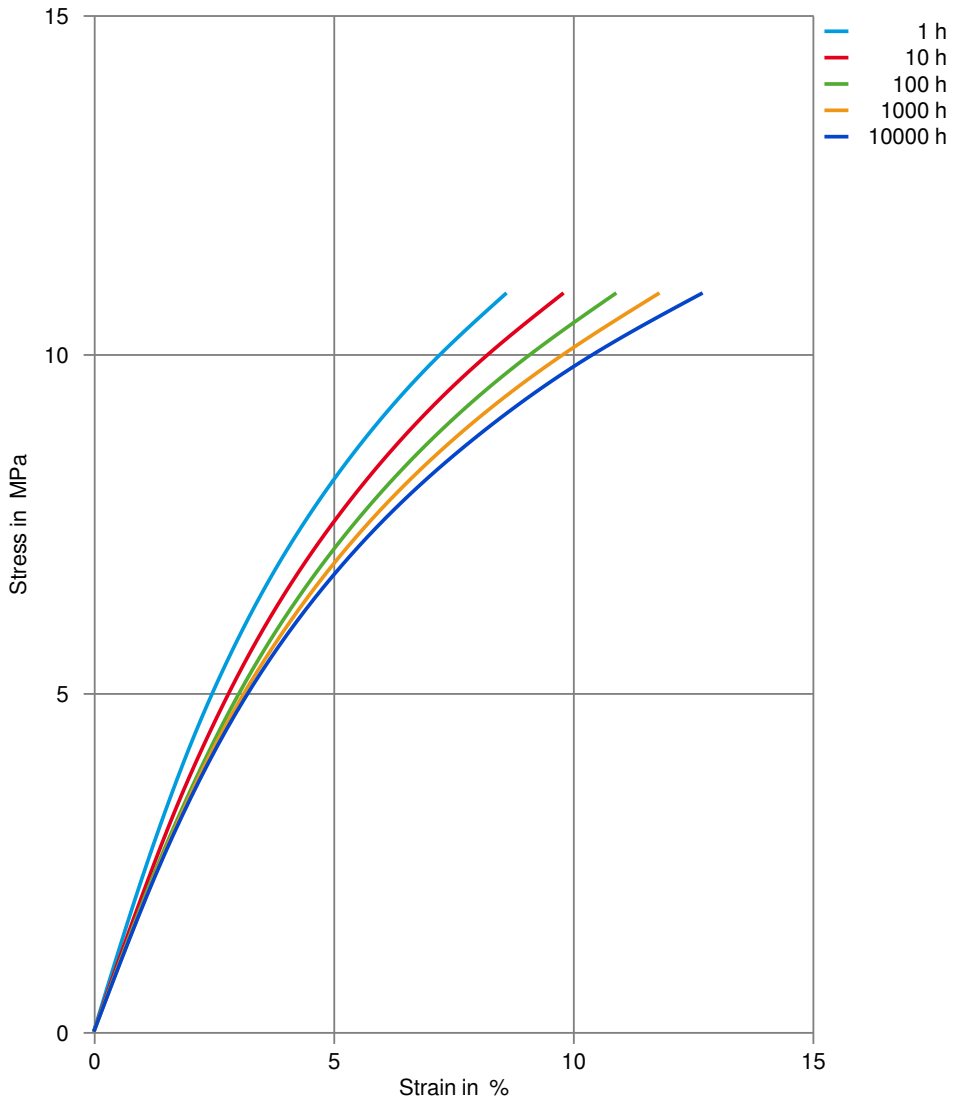
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 40 °C



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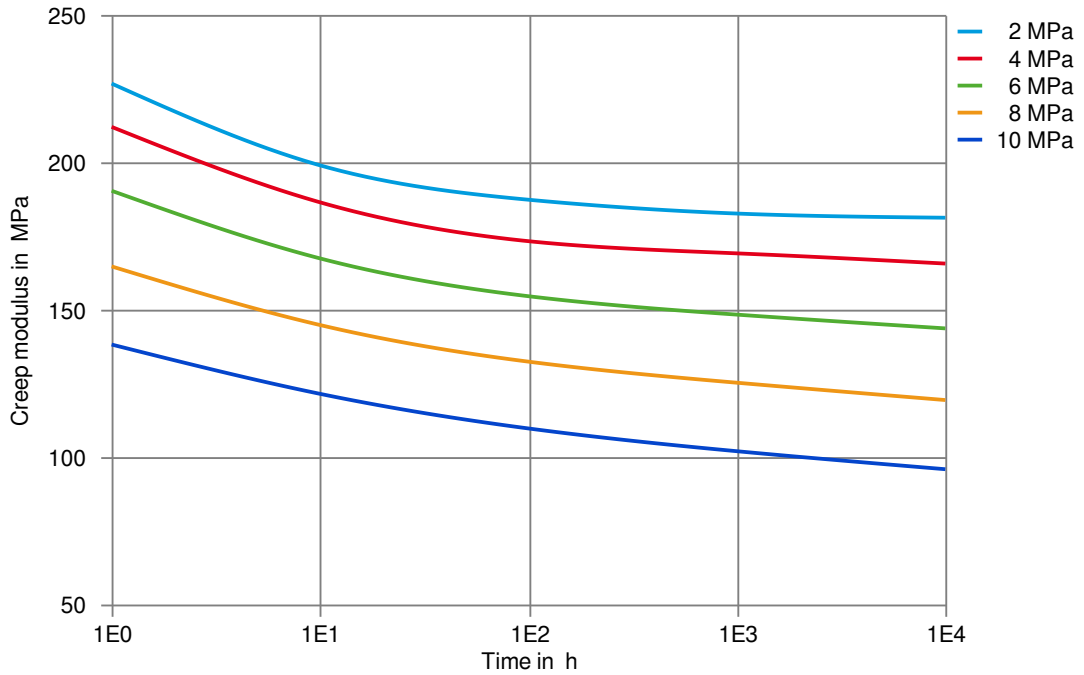
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 40 °C



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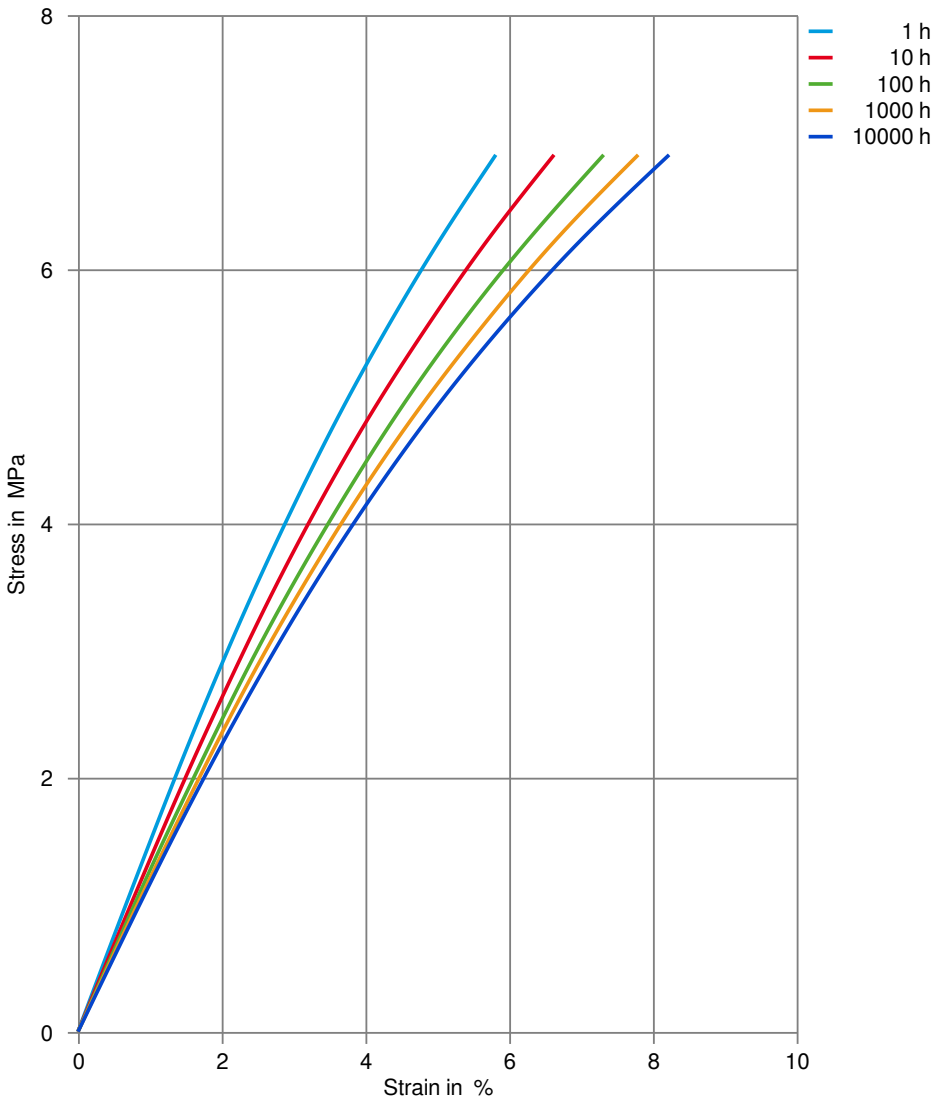
THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 80 °C



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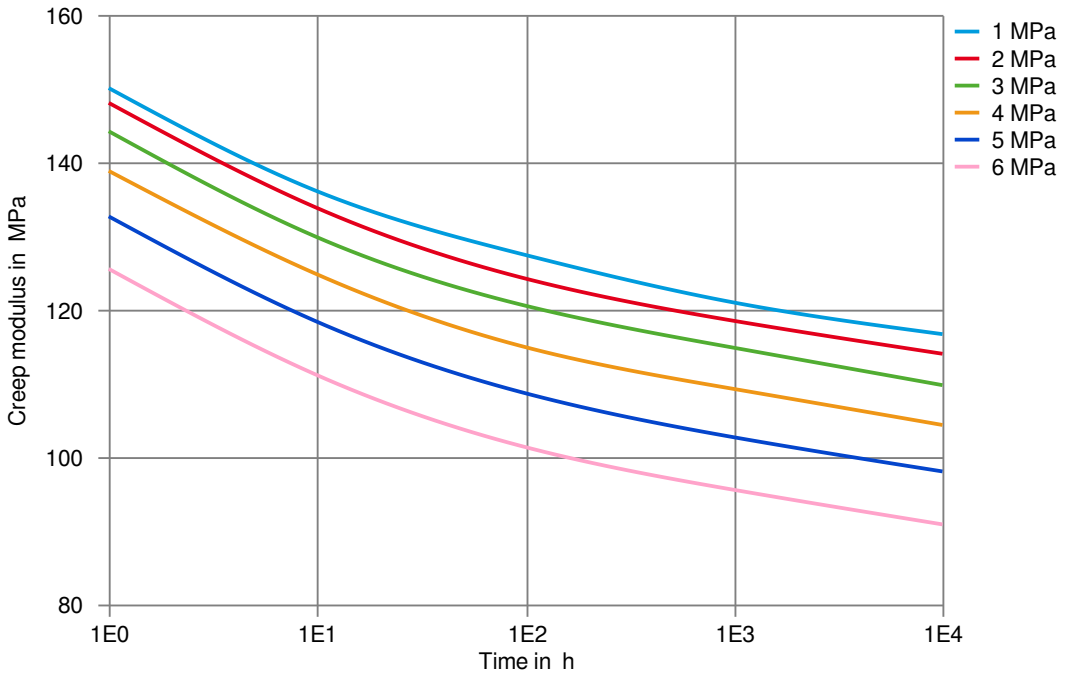
THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 80 °C



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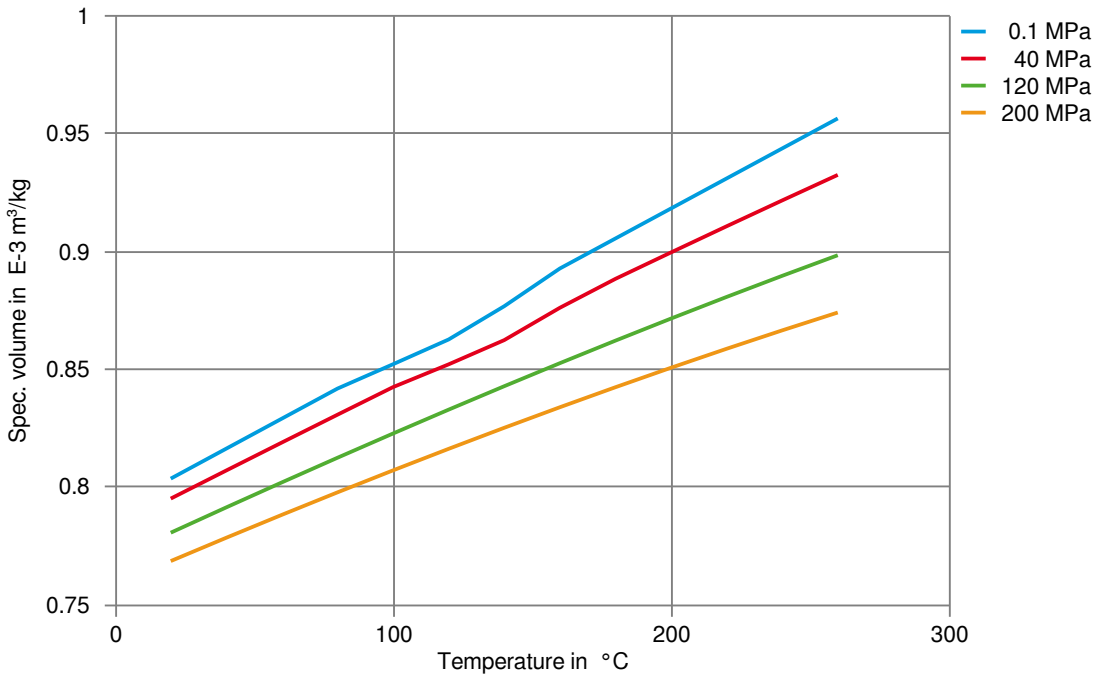
THERMOPLASTIC POLYESTER ELASTOMER

Specific volume-temperature (pvT)



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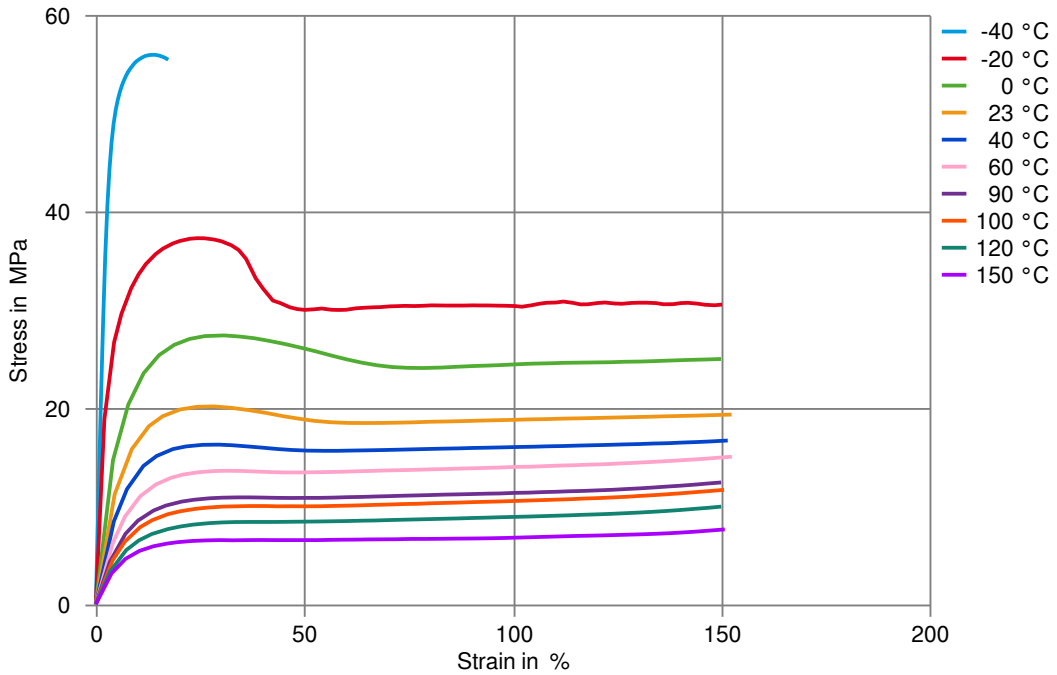
Stress-Strain (Flexible Materials)



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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

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
- ✘ 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).