



# Hytrel® 6356

## 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, DuPont recommends, 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 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.

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.

### Product information

Resin Identification	TPC-ET	ISO 1043
Part Marking Code	>TPC-ET<	ISO 11469

### Rheological properties

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



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### 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
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 <sup>[P]</sup> kJ/m <sup>2</sup>	ISO 179/1eA
Charpy notched impact strength, -30°C	25 kJ/m <sup>2</sup>	ISO 179/1eA
Charpy notched impact strength, -40°C	15 kJ/m <sup>2</sup>	ISO 179/1eA
Tensile notched impact strength, 23°C	300 kJ/m <sup>2</sup>	ISO 8256/1
Izod notched impact strength, 23°C	81 kJ/m <sup>2</sup>	ISO 180/1A
Izod notched impact strength, -40°C	19 kJ/m <sup>2</sup>	ISO 180/1A
Poisson's ratio	0.48 -	
Brittleness temperature	-96 °C	ISO 974
Shore D hardness, 15s	57 -	ISO 48-4
Shore D hardness, max	63 -	ISO 48-4
Tear strength, parallel	158 kN/m	ISO 34-1
Tear strength, normal	145 kN/m	ISO 34-1
Abrasion resistance	110 mm <sup>3</sup>	ISO 4649

[P]: Partial Break

### Thermal properties

Melting temperature, 10°C/min	210 °C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	°C	ISO 11357-1/-2
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	195 °C	ISO 306
CLTE, 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
CLTE, 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)	

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Eff. thermal diffusivity	5.44E-8 m <sup>2</sup> /s	
Spec. heat capacity of melt	2150 J/(kg K)	
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

### Flammability

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	3 mm	IEC 60695-11-10
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
Density	1220 kg/m <sup>3</sup>	ISO 1183
Density of melt	1060 kg/m <sup>3</sup>	
Water Absorption, Immersion 24h	0.5 %	Sim. to ISO 62

### 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



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### 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
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

### Extrusion

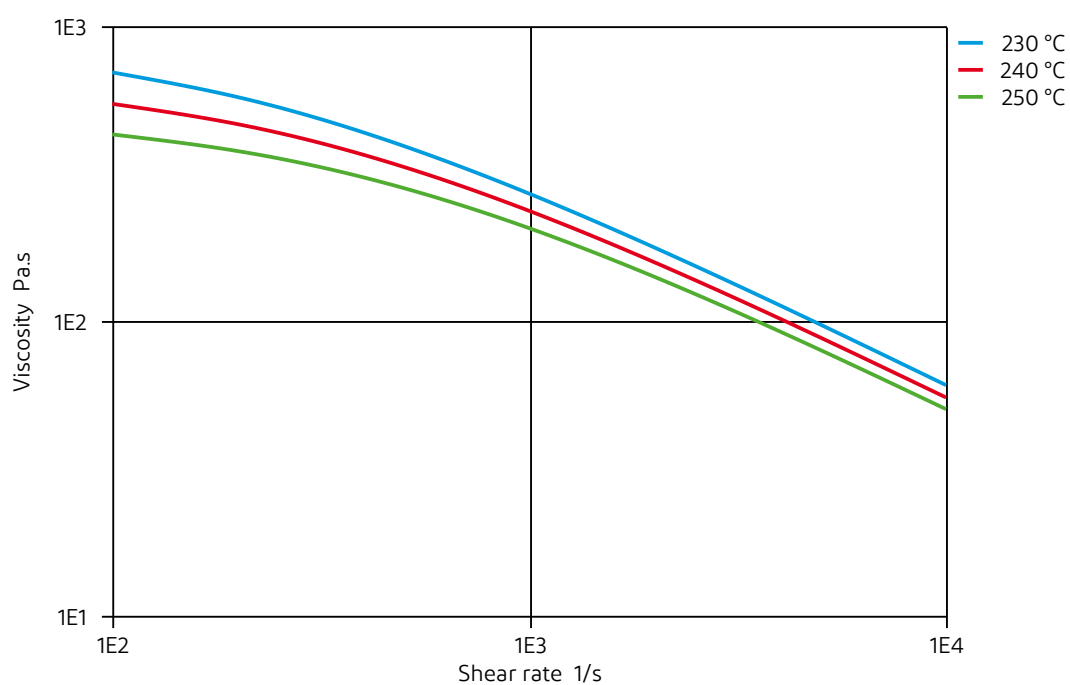
Drying Temperature	90 - 110 °C
Drying Time, Dehumidified Dryer	2 - 3 h
Processing Moisture Content	≤0.06 %
Melt Temperature Optimum	230 °C
Melt Temperature Range	225 - 240 °C



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Viscosity-shear rate

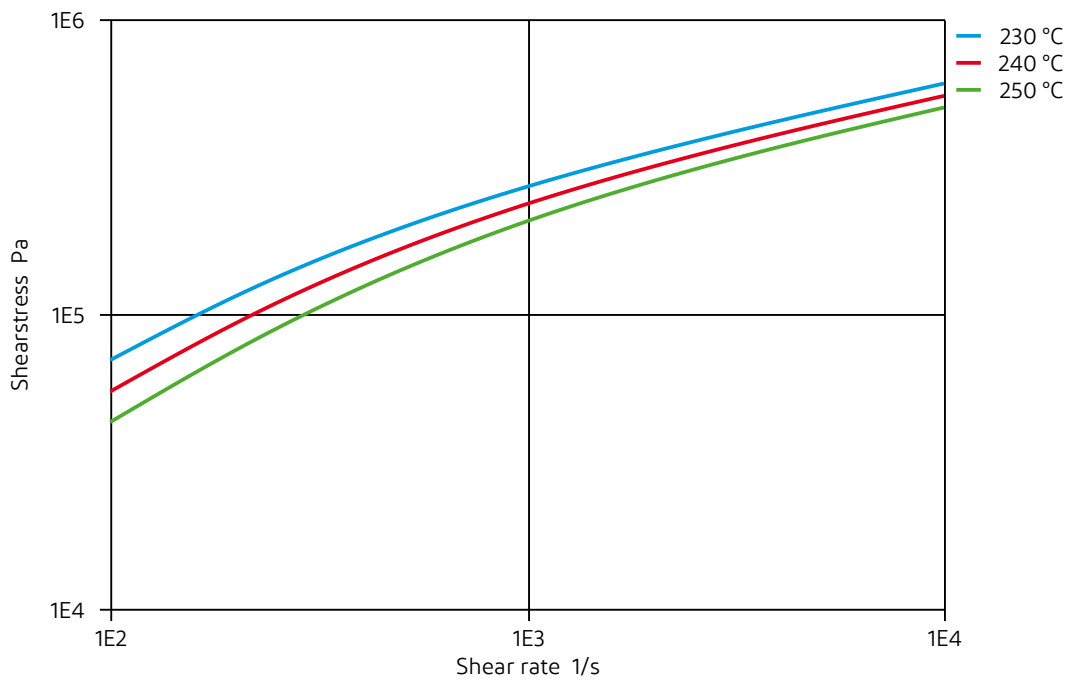




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THERMOPLASTIC POLYESTER ELASTOMER

Shearstress-shear rate

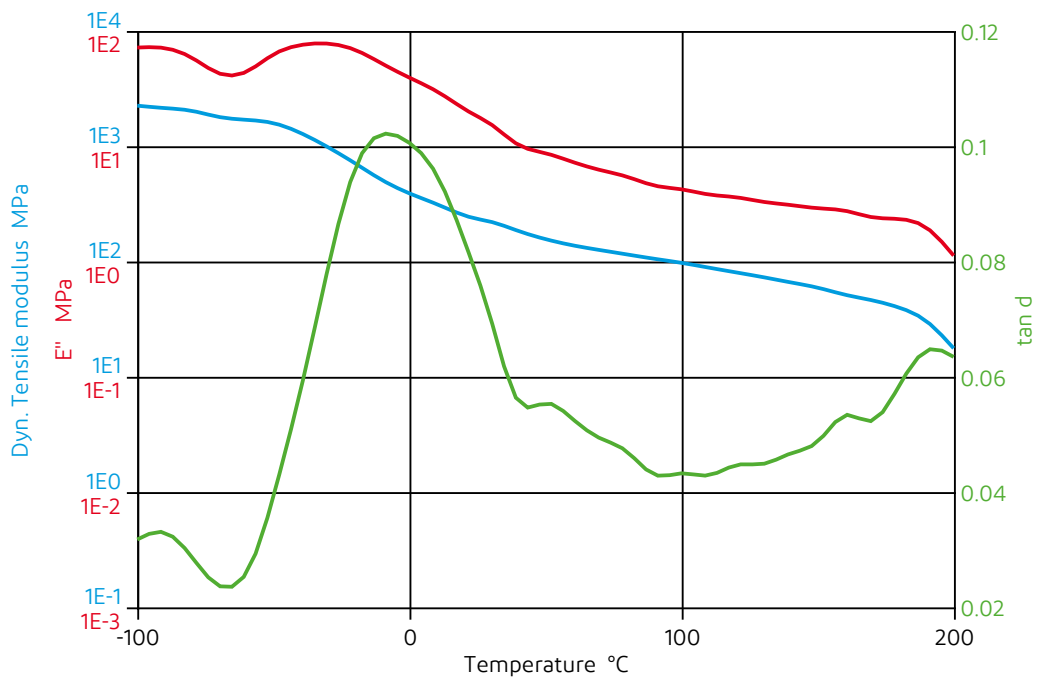




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THERMOPLASTIC POLYESTER ELASTOMER

Dynamic Tensile modulus-temperature

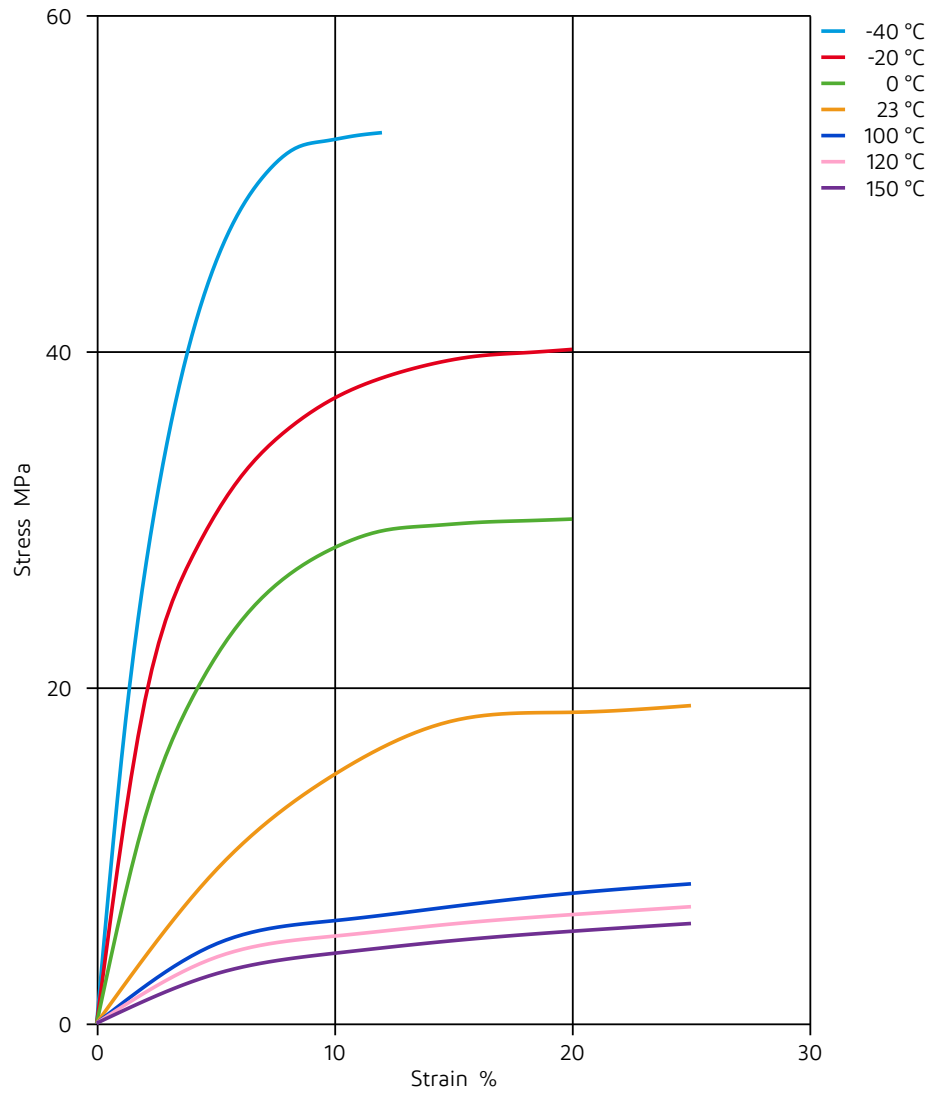




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THERMOPLASTIC POLYESTER ELASTOMER

## Stress-strain



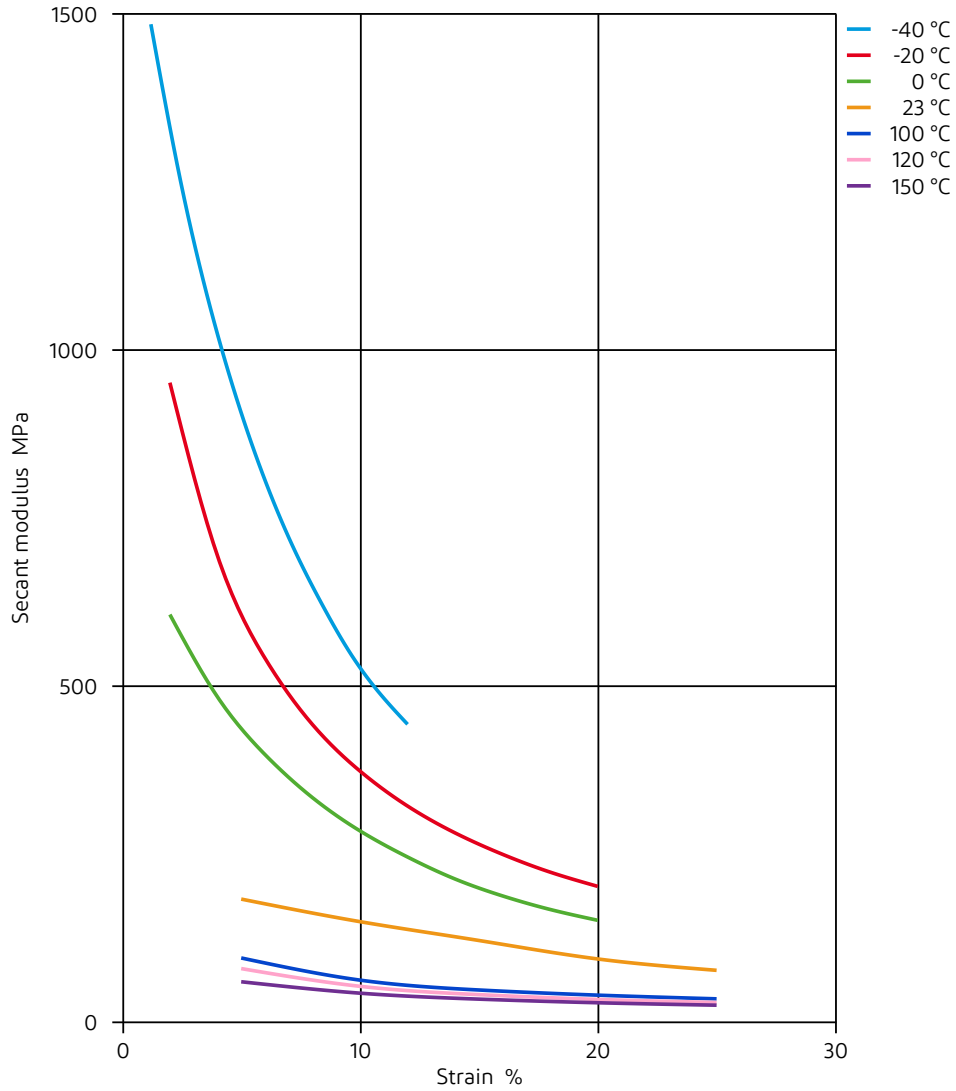




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THERMOPLASTIC POLYESTER ELASTOMER

## Secant modulus-strain

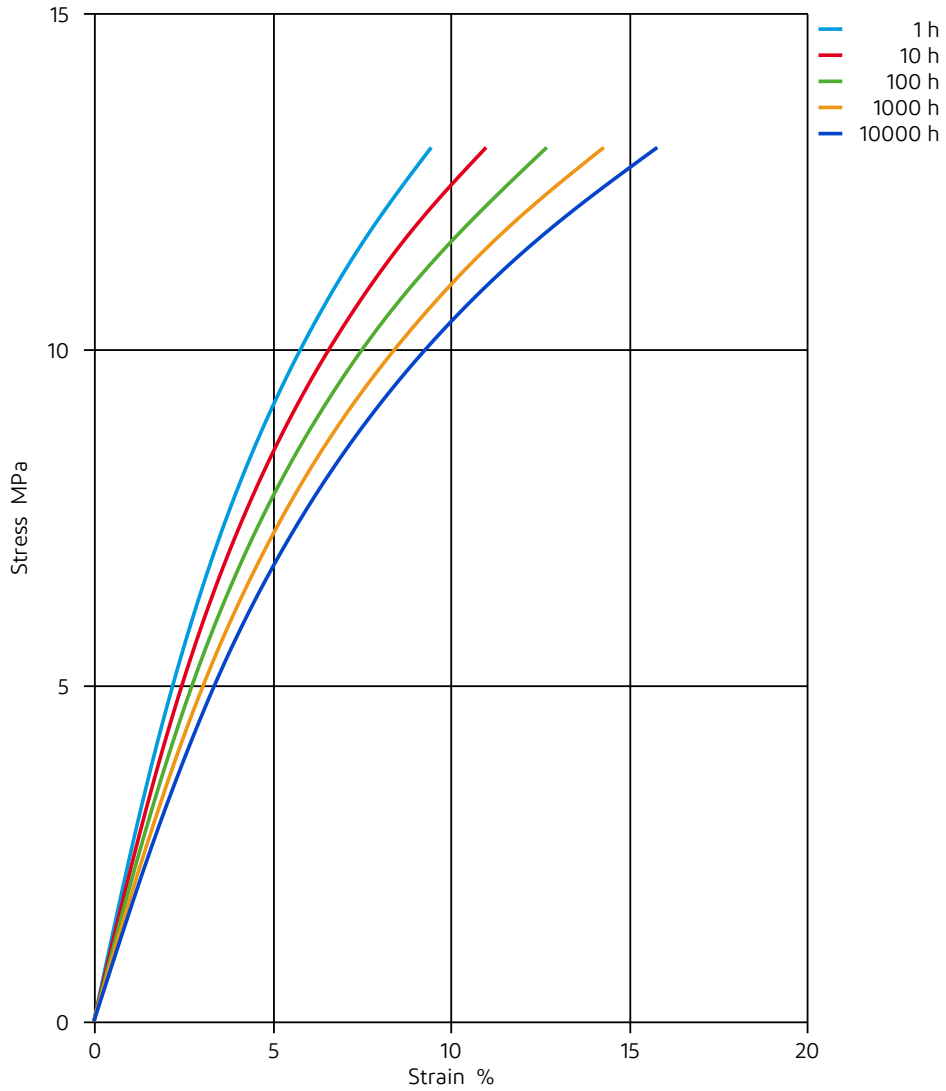




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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 23°C

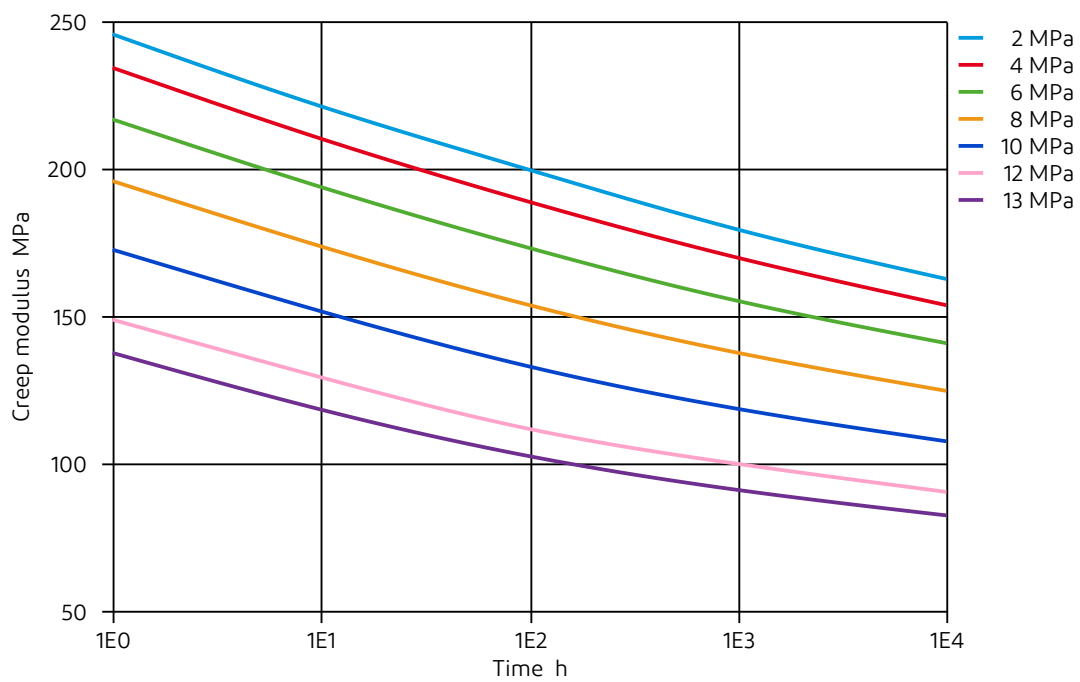




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THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 23°C

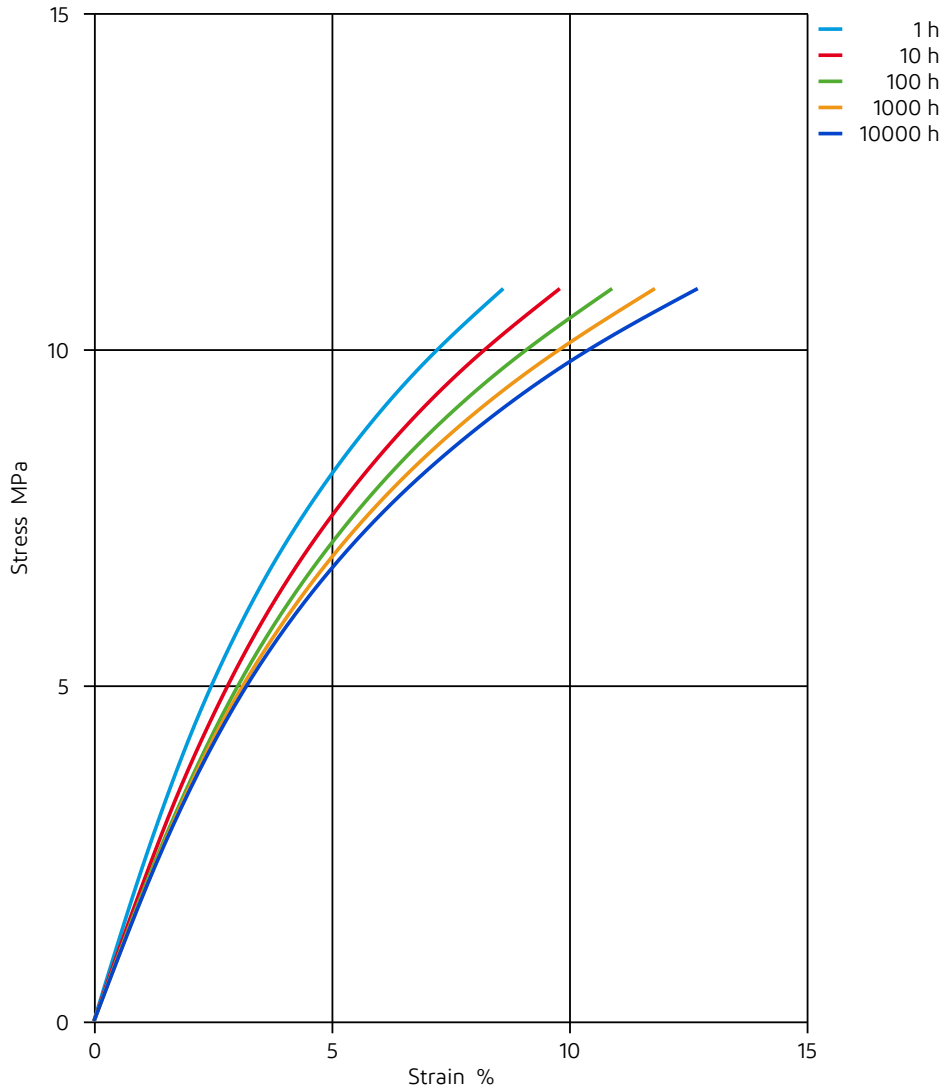




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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 40°C

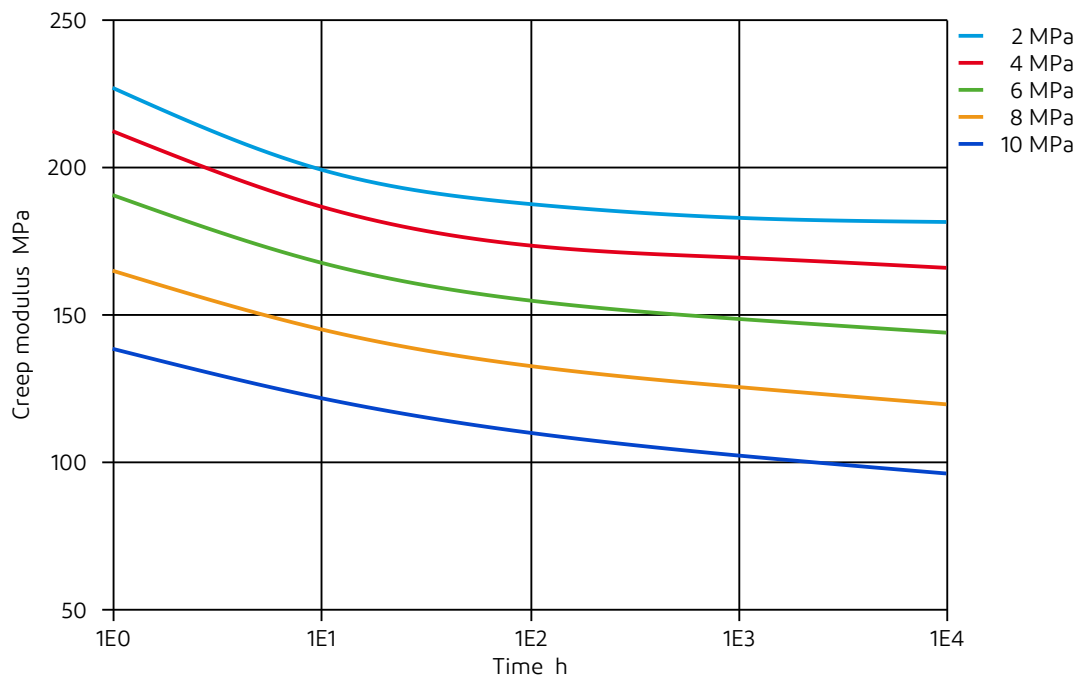




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THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 40°C

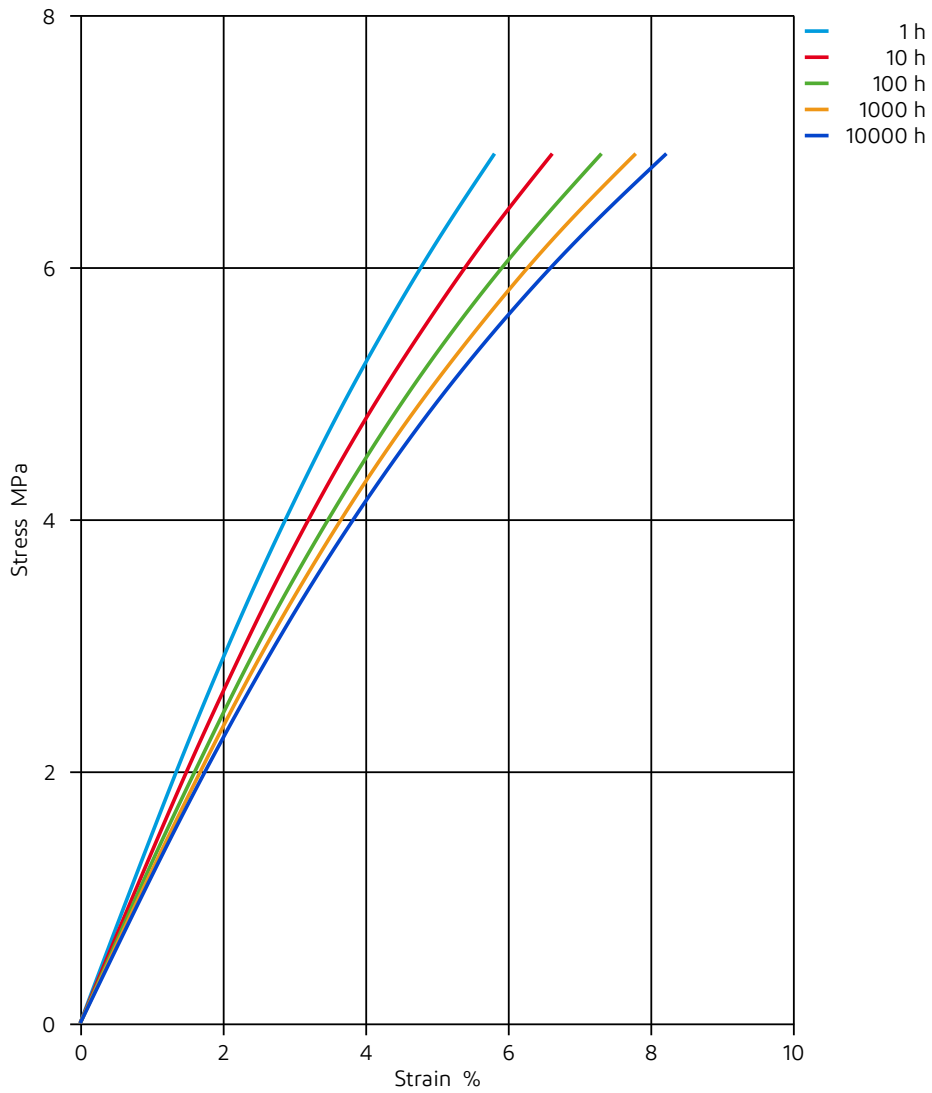




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Stress-strain (isochronous) 80°C

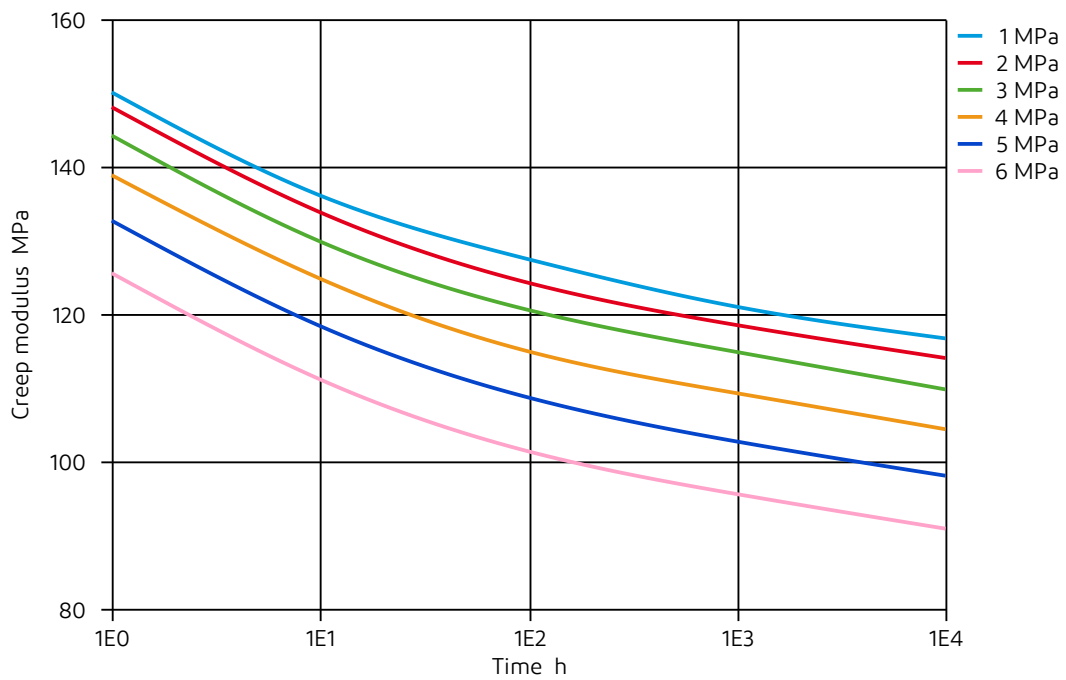




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THERMOPLASTIC POLYESTER ELASTOMER

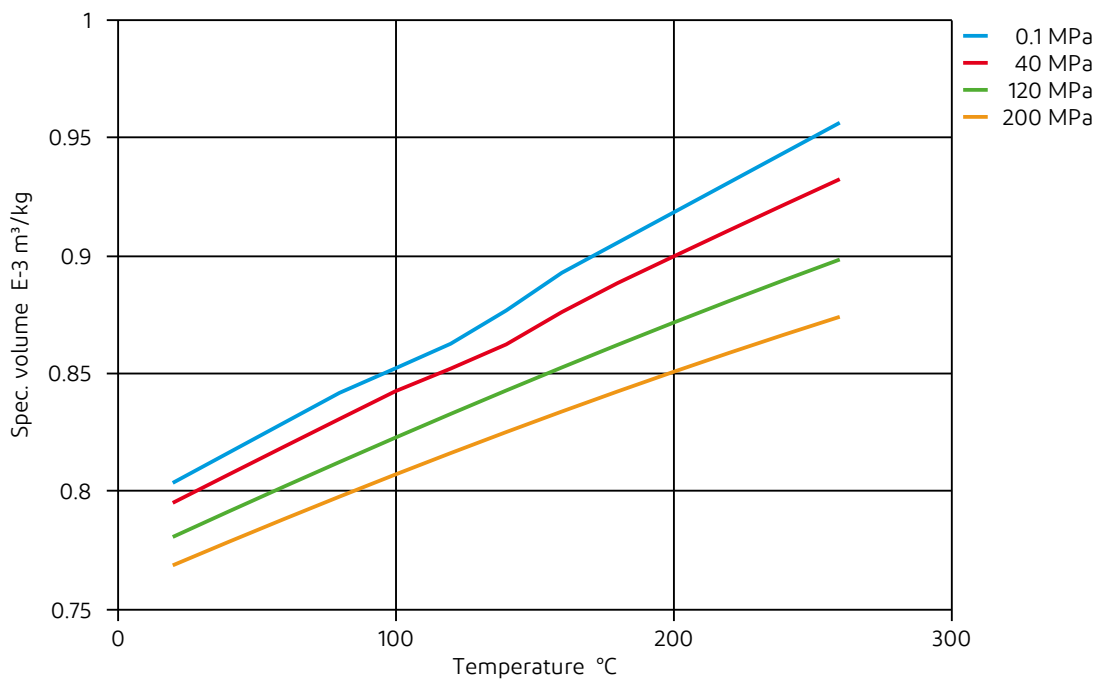
Creep modulus-time 80°C



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THERMOPLASTIC POLYESTER ELASTOMER

Specific volume-temperature (pvT)



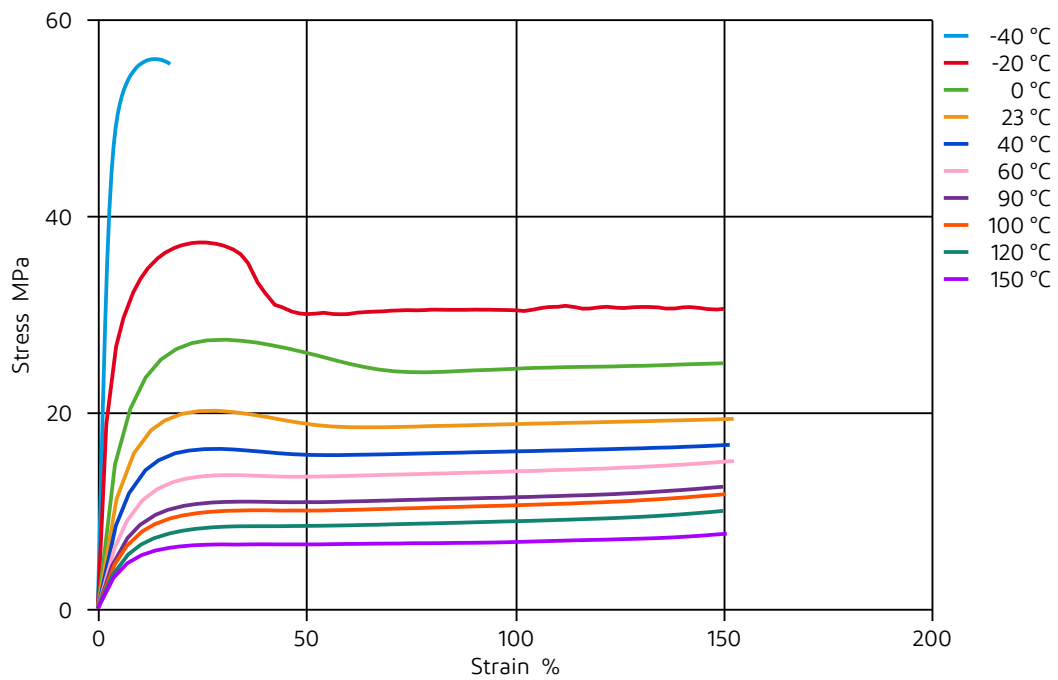




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Stress-Strain (Flexible Materials)



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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).

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