

# Hytrel® 5556

## 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® 5556 is a medium modulus Hytrel® grade with nominal durometer hardness of 55D. It contains non-discoloring stabilizer. It can be processed by many conventional thermoplastic processing techniques like injection moulding and extrusion.

Typical applications: Hose and tubing, wire and cable, film and sheeting, belting.

### Product information

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

### Rheological properties

|                                  |                          |                 |
|----------------------------------|--------------------------|-----------------|
| Melt volume-flow rate            | 7 cm <sup>3</sup> /10min | ISO 1133        |
| Temperature                      | 220 °C                   |                 |
| Load                             | 2.16 kg                  |                 |
| Melt mass-flow rate              | 7.8 g/10min              | ISO 1133        |
| Melt mass-flow rate, Temperature | 220 °C                   |                 |
| Melt mass-flow rate, Load        | 2.16 kg                  |                 |
| Moulding shrinkage, parallel     | 1.4 %                    | ISO 294-4, 2577 |
| Moulding shrinkage, normal       | 1.4 %                    | ISO 294-4, 2577 |

### Typical mechanical properties

|                                   |          |              |
|-----------------------------------|----------|--------------|
| Tensile modulus                   | 180 MPa  | ISO 527-1/-2 |
| Tensile stress at yield           | 15 MPa   | ISO 527-1/-2 |
| Tensile strain at yield           | 40 %     | ISO 527-1/-2 |
| Stress at 5% strain               | 6.9 MPa  | ISO 527-1/-2 |
| Stress at 10% strain              | 11 MPa   | ISO 527-1/-2 |
| Tensile stress at 50% strain, 1BA | 14.5 MPa | ISO 527-1/-2 |

# Hytrel® 5556

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|                                       |                                      |                    |
|---------------------------------------|--------------------------------------|--------------------|
| Tensile stress at 100% strain         | 16 MPa                               | ISO 527-1/-2       |
| Tensile stress at break               | 40 MPa                               | ISO 527-1/-2       |
| Nominal strain at break               | 600 %                                | ISO 527-1/-2       |
| Tensile strain at break               | >300 %                               | ISO 527-1/-2       |
| Flexural modulus                      | 190 MPa                              | ISO 178            |
| Tensile creep modulus, 1h             | 170 MPa                              | ISO 899-1          |
| Tensile creep modulus, 1000h          | 133 MPa                              | ISO 899-1          |
| Charpy impact strength, 23°C          | N kJ/m <sup>2</sup>                  | ISO 179/1eU        |
| Charpy impact strength, -30°C         | N kJ/m <sup>2</sup>                  | ISO 179/1eU        |
| Charpy notched impact strength, 23°C  | N kJ/m <sup>2</sup>                  | ISO 179/1eA        |
| Charpy notched impact strength, -30°C | 145 <sup>[P]</sup> kJ/m <sup>2</sup> | ISO 179/1eA        |
| Charpy notched impact strength, -40°C | 145 kJ/m <sup>2</sup>                | ISO 179/1eA        |
| Tensile notched impact strength, 23°C | 320 kJ/m <sup>2</sup>                | ISO 8256/1         |
| Puncture - maximum force, 23°C        | 2400 N                               | ISO 6603-2         |
| Puncture - maximum force, -30°C       | 3700 N                               | ISO 6603-2         |
| Puncture energy, 23°C                 | 27 J                                 | ISO 6603-2         |
| Puncture energy, -30°C                | 43 J                                 | ISO 6603-2         |
| Izod notched impact strength, 23°C    | N kJ/m <sup>2</sup>                  | ISO 180/1A         |
| Izod notched impact strength, -40°C   | N kJ/m <sup>2</sup>                  | ISO 180/1A         |
| Poisson's ratio                       | 0.48                                 |                    |
| Brittleness temperature               | -98 °C                               | ISO 974            |
| Shore D hardness, 15s                 | 51                                   | ISO 48-4 / ISO 868 |
| Shore D hardness, max                 | 55                                   | ISO 868            |
| Tear strength, parallel               | 140 kN/m                             | ISO 34-1           |
| Tear strength, normal                 | 130 kN/m                             | ISO 34-1           |
| Abrasion resistance                   | 120 mm <sup>3</sup>                  | ISO 4649           |

[P]: Partial Break

### Thermal properties

|  |                        |                |
|--|------------------------|----------------|
| Melting temperature, 10°C/min                            | 201 °C                 | ISO 11357-1/-3 |
| Glass transition temperature, 1 Hz                       | -27 °C                 | ISO 6721       |
| Temperature of deflection under load, 1.8 MPa            | 45 °C                  | ISO 75-1/-2    |
| Temperature of deflection under load, 0.45 MPa           | 70 °C                  | ISO 75-1/-2    |
| Vicat softening temperature, 50°C/h 50N                  | 75 °C                  | ISO 306        |
| Vicat softening temperature, 50°C/h 10N                  | 180 °C                 | ISO 306        |
| Coeff. of linear therm. expansion, parallel, -40-23°C    | 160 E-6/K              | ISO 11359-1/-2 |
| Coefficient of linear thermal expansion (CLTE), parallel | 180 E-6/K              | ISO 11359-1/-2 |
| Coeff. of linear therm. expansion, normal, -40-23°C      | 174 E-6/K              | ISO 11359-1/-2 |
| Coefficient of linear thermal expansion (CLTE), normal   | 180 E-6/K              | ISO 11359-1/-2 |
| Thermal conductivity of melt                             | 0.16 W/(m K)           | ISO 22007-2    |
| Effective thermal diffusivity, flow                      | 7E-8 m <sup>2</sup> /s | ISO 22007-4    |
| Specific heat capacity of melt                           | 2110 J/(kg K)          | ISO 22007-4    |
| RTI, electrical, 0.75mm                                  | 85 °C                  | UL 746B        |
| RTI, electrical, 1.5mm                                   | 85 °C                  | UL 746B        |
| RTI, electrical, 3.0mm                                   | 85 °C                  | UL 746B        |
| RTI, impact, 0.75mm                                      | 50 °C                  | UL 746B        |
| RTI, impact, 1.5mm                                       | 85 °C                  | UL 746B        |

# Hytrel® 5556

## THERMOPLASTIC POLYESTER ELASTOMER

|                       |           |                |
|-----------------------|-----------|----------------|
| RTI, impact, 3.0mm    | 85 °C     | UL 746B        |
| RTI, strength, 0.75mm | 50 °C     | UL 746B        |
| RTI, strength, 1.5mm  | 75 °C     | UL 746B        |
| RTI, strength, 3.0mm  | 80 °C     | UL 746B        |
| TGA curve             | available | ISO 11359-1/-2 |

### 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                          | 20 %                   | ISO 4589-1/-2        |
| Glow Wire Flammability Index, 2.0mm   | 700 <sup>[DS]</sup> °C | IEC 60695-2-12       |
| Glow Wire Ignition Temperature, 2.0mm | 675 <sup>[DS]</sup> °C | IEC 60695-2-13       |
| Glow Wire Temperature, No Flame, 2mm  | 650 <sup>[DS]</sup> °C | IEC 60335-1          |
| FMVSS Class                           | SE                     | ISO 3795 (FMVSS 302) |

[DS]: Derived from similar grade

### Electrical properties

|                              |            |               |
|------------------------------|------------|---------------|
| Relative permittivity, 100Hz | 4.8        | IEC 62631-2-1 |
| Relative permittivity, 1MHz  | 4.4        | IEC 62631-2-1 |
| Dissipation factor, 100Hz    | 90 E-4     | IEC 62631-2-1 |
| Dissipation factor, 1MHz     | 375 E-4    | IEC 62631-2-1 |
| Volume resistivity           | 4E11 Ohm.m | IEC 62631-3-1 |
| Surface resistivity          | >1E15 Ohm  | IEC 62631-3-2 |
| Electric strength            | 19 kV/mm   | IEC 60243-1   |
| Comparative tracking index   | 600        | IEC 60112     |

### Physical/Other properties

|                                 |                        |                |
|---------------------------------|------------------------|----------------|
| Humidity absorption, 2mm        | 0.2 %                  | Sim. to ISO 62 |
| Water absorption, 2mm           | 0.6 %                  | Sim. to ISO 62 |
| Water absorption, Immersion 24h | 0.6 %                  | Sim. to ISO 62 |
| Density                         | 1190 kg/m <sup>3</sup> | ISO 1183       |
| Density of melt                 | 1030 kg/m <sup>3</sup> |                |

### Film Properties

|  |   |                |
|--|---|----------------|
| WVTR, 23°C/85%r.h.                     | 300 g/(m <sup>2</sup> *d)                     | DIS 15106-1/-2 |
| Oxygen transmission rate, 23°C/85%r.h. | 6000 cm <sup>3</sup> /(m <sup>2</sup> *d*bar) | DIS 15105-1/-2 |
| Thickness of specimen                  | 0.025 mm                                      |                |

### VDA Properties

|                         |    |           |
|-------------------------|----|-----------|
| Light stability delta I | 3  | DIN 53236 |
| Light stability delta a | -2 | DIN 53236 |
| Light stability delta b | 13 | DIN 53236 |
| Light stability delta E | 14 | DIN 53236 |

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|                               |           |          |
|-------------------------------|-----------|----------|
| Emission of organic compounds | 8.5 µgC/g | VDA 277  |
| Odour                         | 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        | 235 °C  |
| Min. melt temperature           | 220 °C  |
| Max. melt temperature           | 250 °C  |
| Mold Temperature Optimum        | 50 °C   |
| Min. mould temperature          | 45 °C   |
| Max. mould temperature          | 55 °C   |
| Ejection temperature            | 122 °C  |

### Extrusion

|                                 |              |
|---------------------------------|--------------|
| Drying Temperature              | 90 - 110 °C  |
| Drying Time, Dehumidified Dryer | 2 - 3 h      |
| Processing Moisture Content     | ≤0.06 %      |
| Melt Temperature Optimum        | 225 °C       |
| Melt Temperature Range          | 220 - 235 °C |

### Characteristics

|                         |   |
|-------------------------|---|
| Processing              | Injection Moulding, Film Extrusion, Extrusion, Sheet Extrusion, Other Extrusion, Coatable, Casting, Thermoforming |
| Delivery form           | Pellets   |
| Special characteristics | Light stabilised or stable to light   |

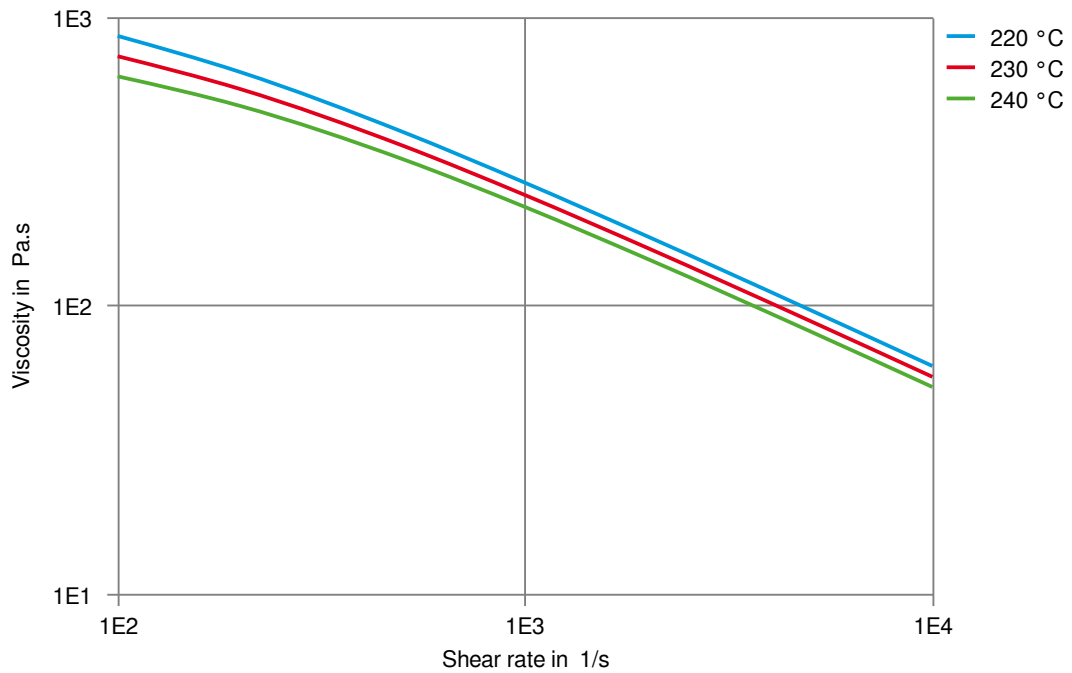
### Automotive

| OEM                   | STANDARD                  | ADDITIONAL INFORMATION |
|-----------------------|---------------------------|------------------------|
| Bosch                 | N28 BN34-OX067            |                        |
| General Motors        | GMW17327P-TPC-ET-Type 3M2 |                        |
| Mercedes-Benz         | DBL5562 TPC               |                        |
| Stellantis - Chrysler | MS-DB-448 / CPN-3042      | Natural                |
| VW Group              | VW 50123 TPC-ET           |                        |

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THERMOPLASTIC POLYESTER ELASTOMER

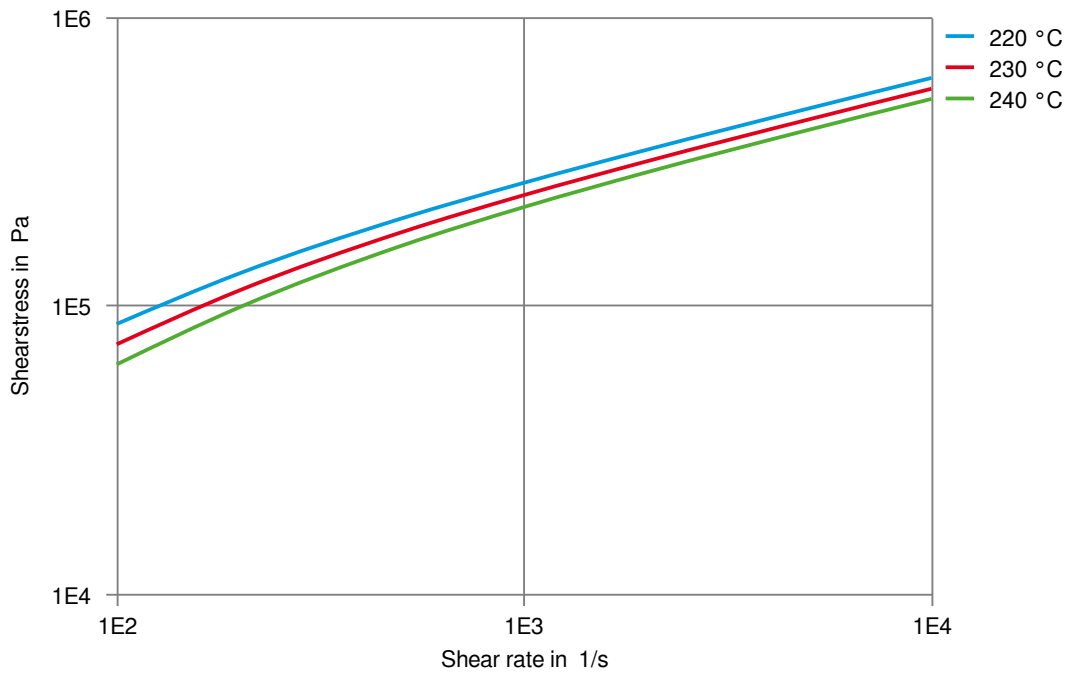
Viscosity-shear rate



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THERMOPLASTIC POLYESTER ELASTOMER

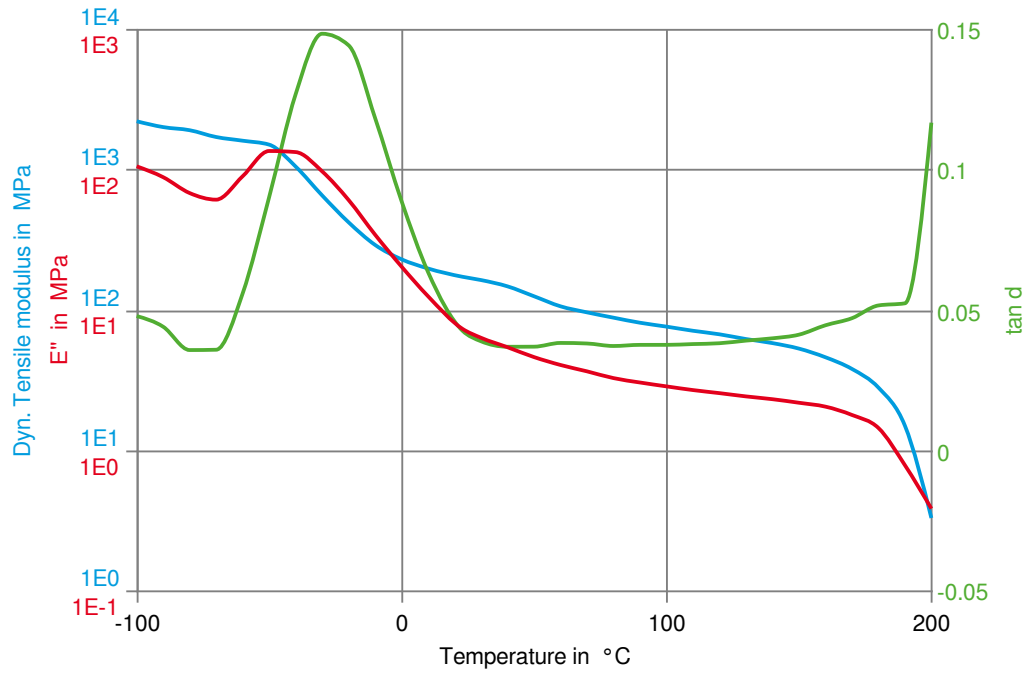
Shearstress-shear rate



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THERMOPLASTIC POLYESTER ELASTOMER

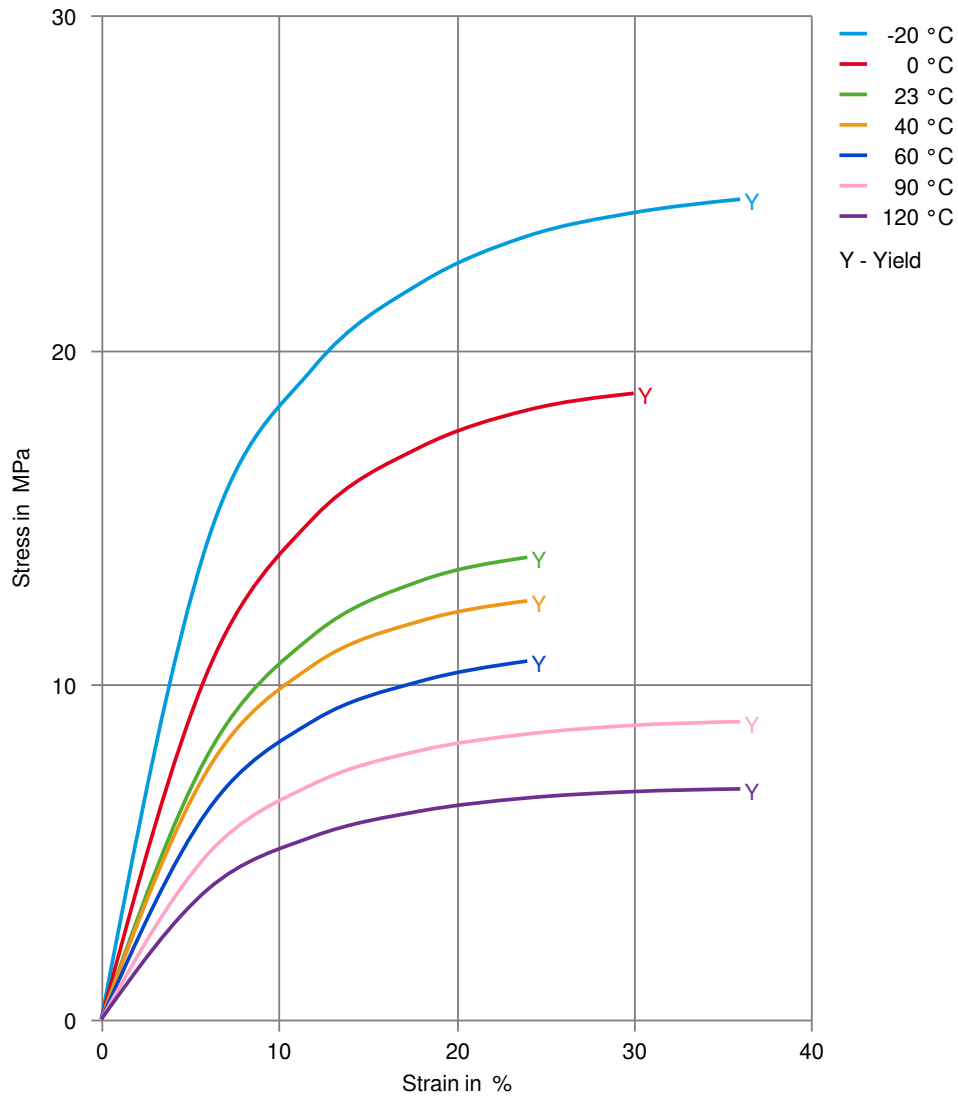
Dynamic Tensile modulus-temperature



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THERMOPLASTIC POLYESTER ELASTOMER

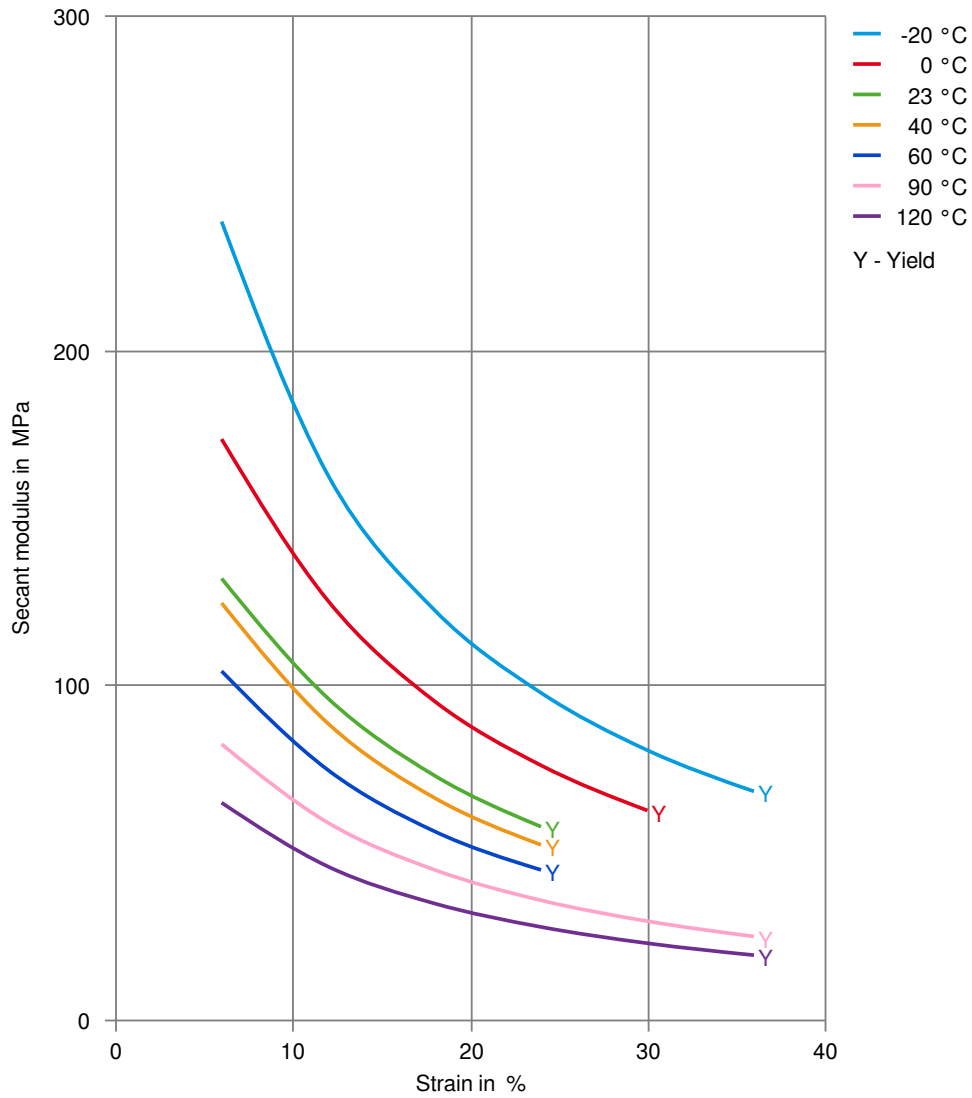
## Stress-strain



# Hytrel® 5556

THERMOPLASTIC POLYESTER ELASTOMER

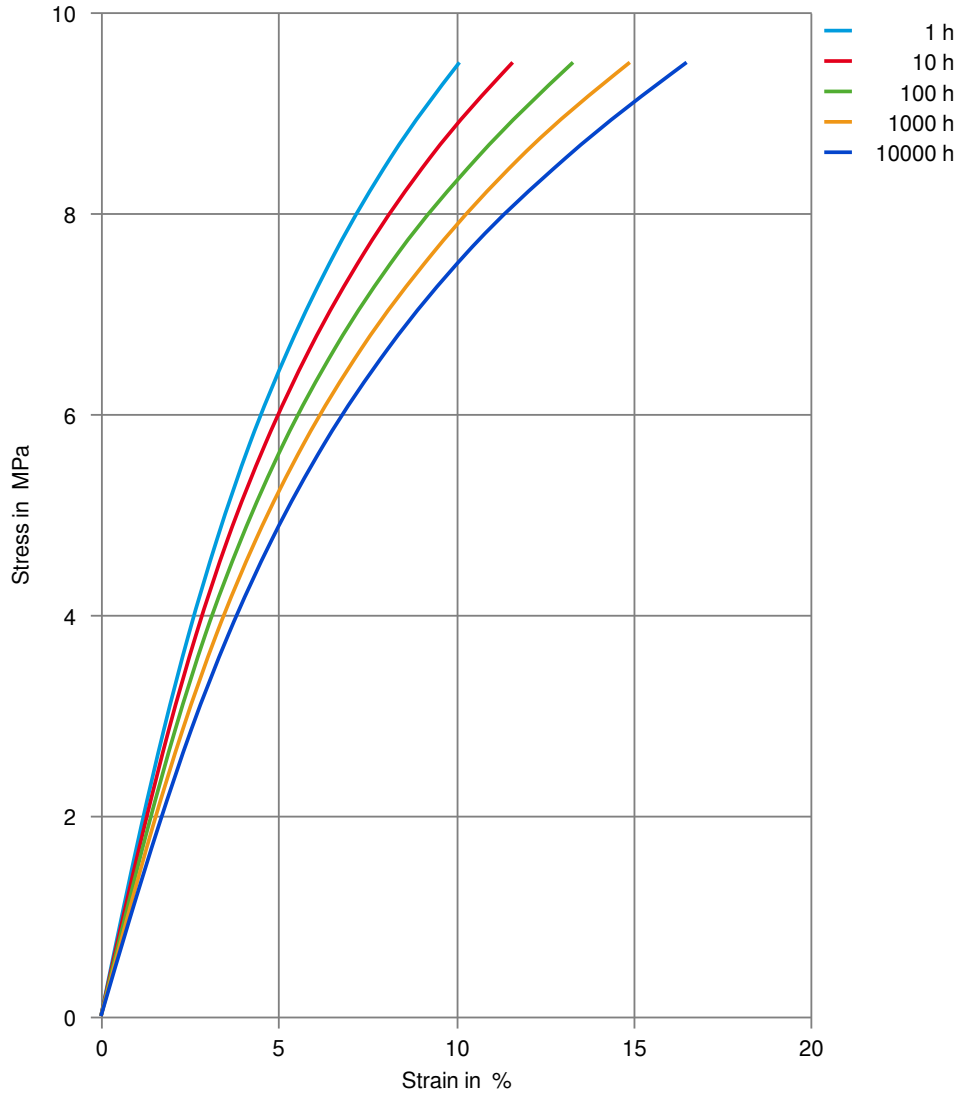
## Secant modulus-strain



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THERMOPLASTIC POLYESTER ELASTOMER

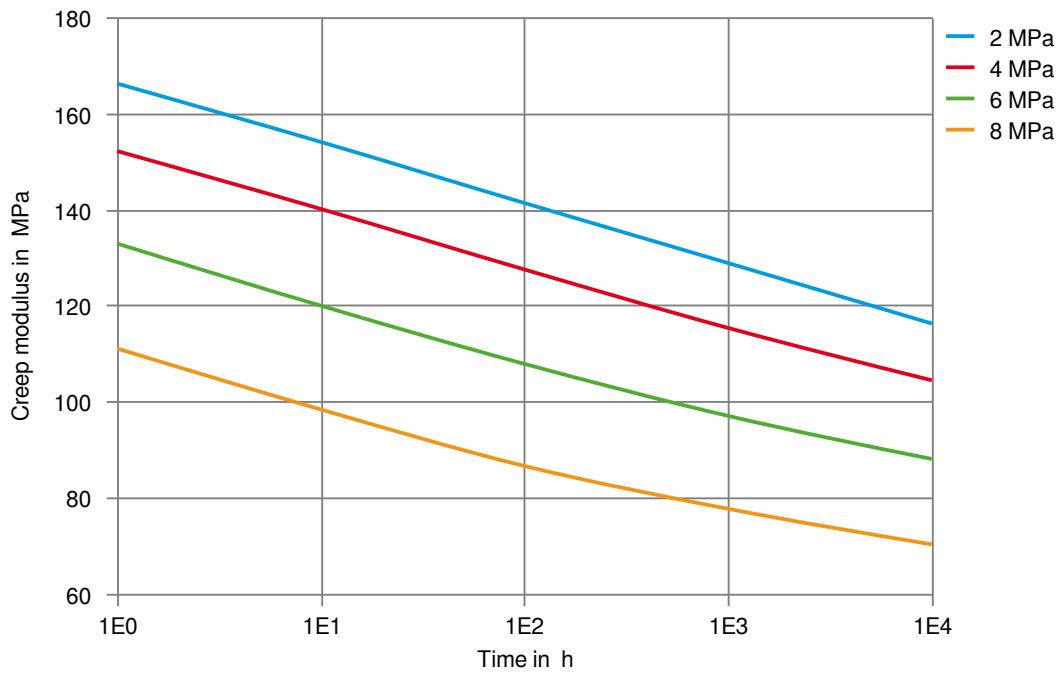
Stress-strain (isochronous) 23°C



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THERMOPLASTIC POLYESTER ELASTOMER

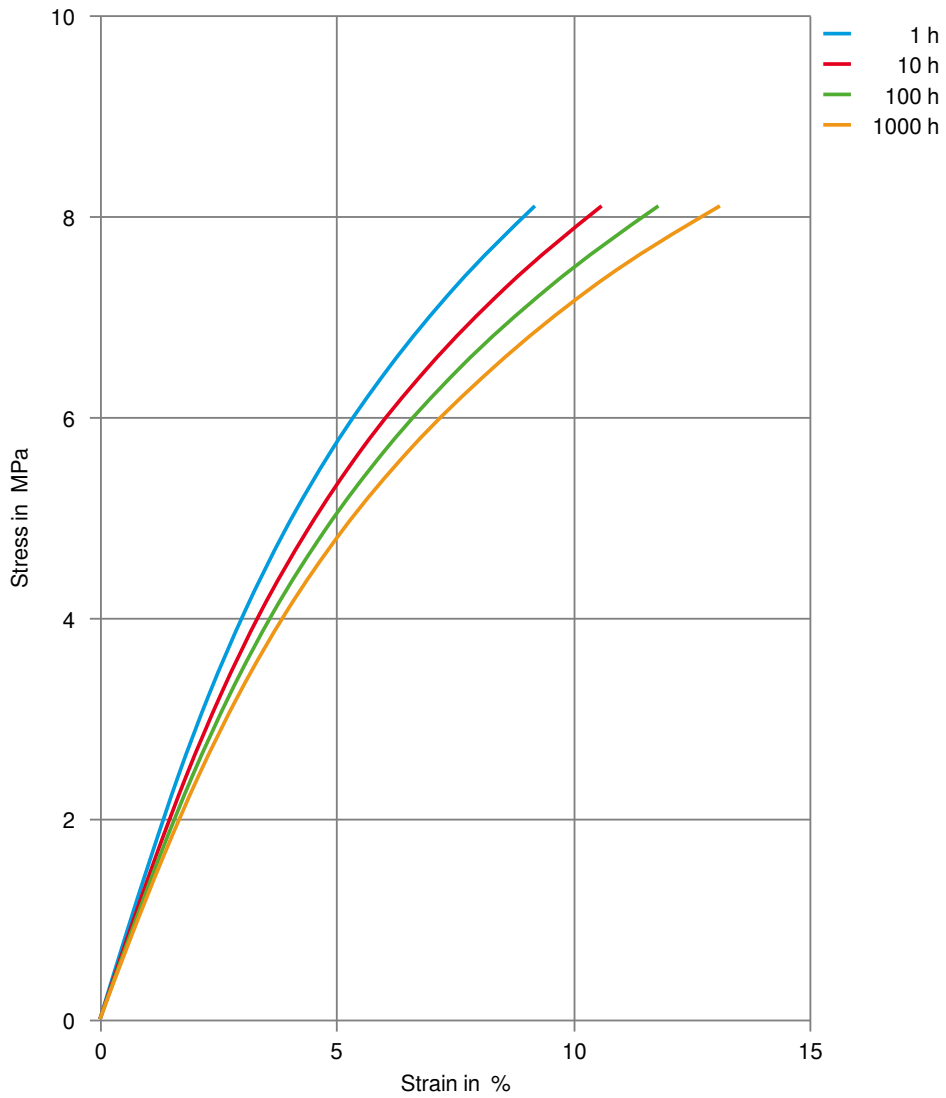
Creep modulus-time 23°C



# Hytrel® 5556

THERMOPLASTIC POLYESTER ELASTOMER

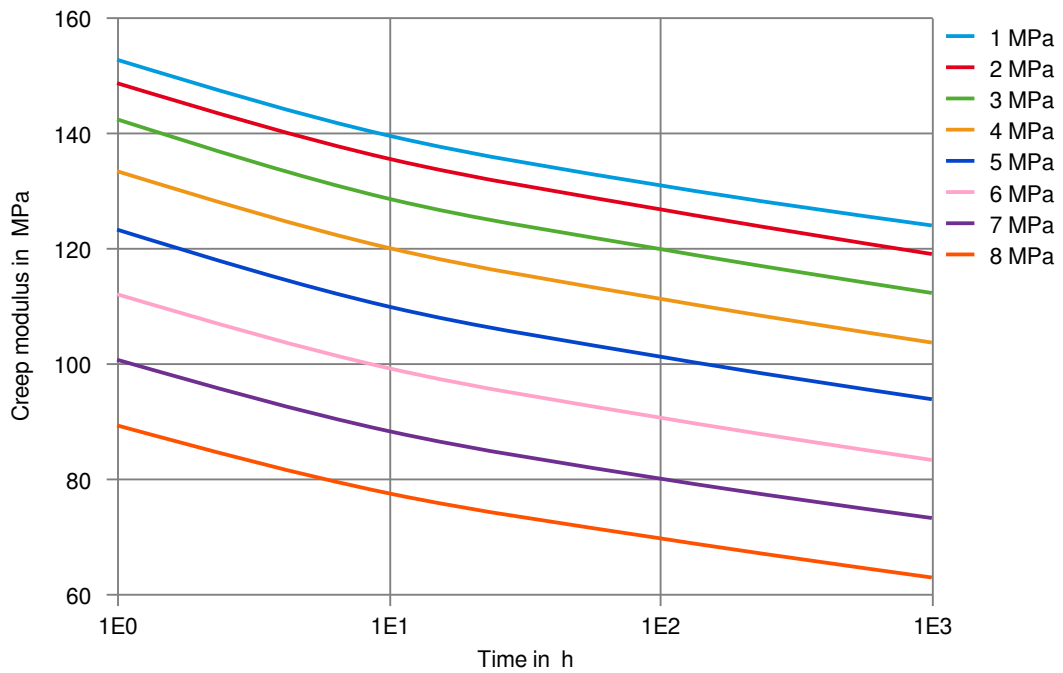
Stress-strain (isochronous) 40°C



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THERMOPLASTIC POLYESTER ELASTOMER

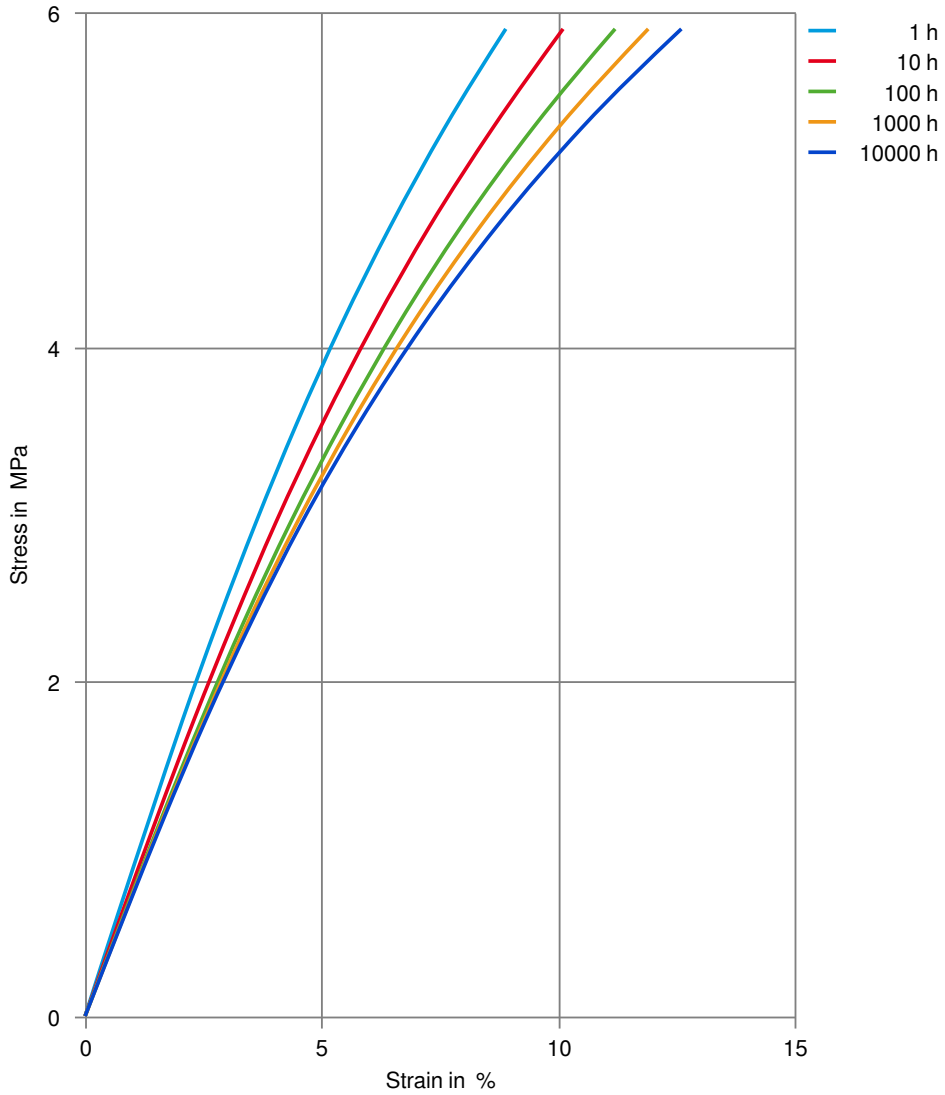
Creep modulus-time 40°C



# Hytrel® 5556

THERMOPLASTIC POLYESTER ELASTOMER

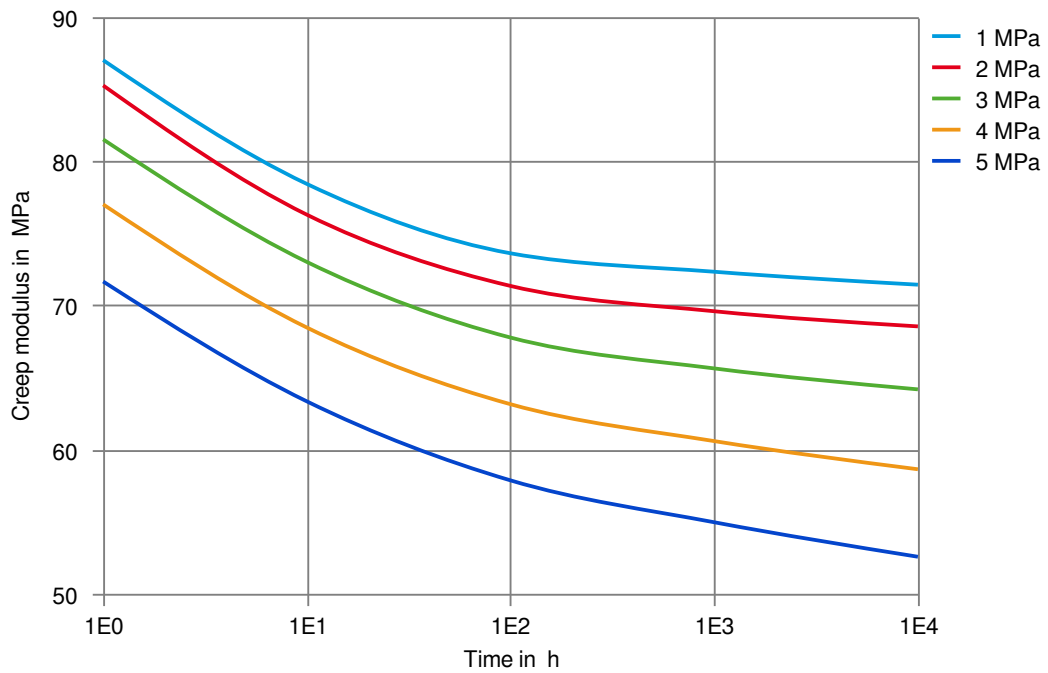
Stress-strain (isochronous) 80°C



# Hytrel® 5556

THERMOPLASTIC POLYESTER ELASTOMER

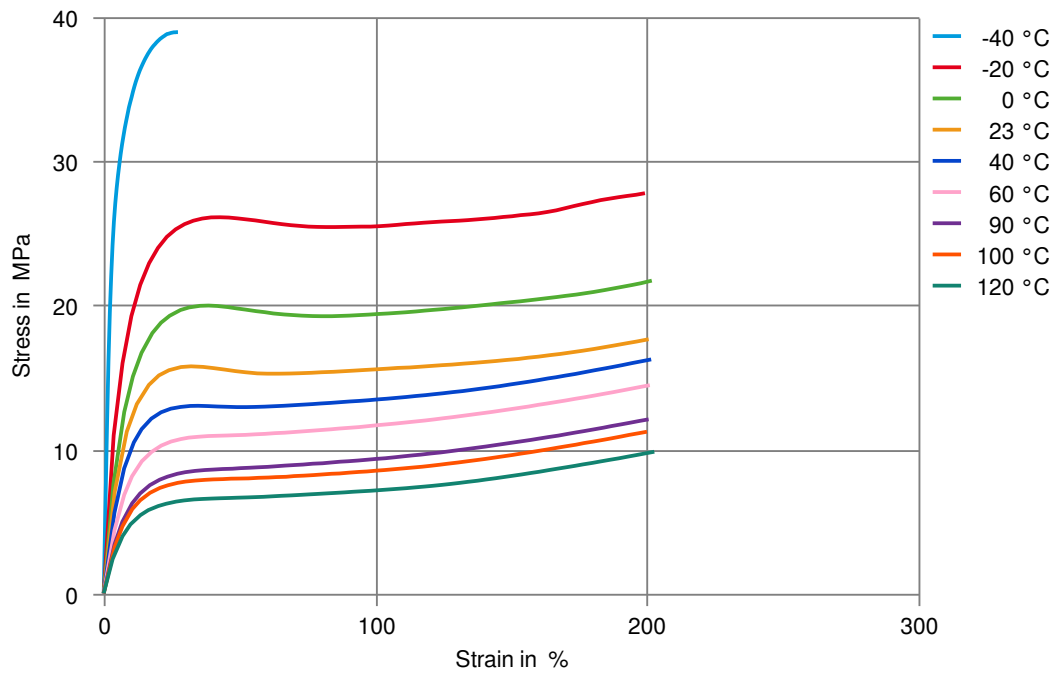
Creep modulus-time 80°C



# Hytrel® 5556

THERMOPLASTIC POLYESTER ELASTOMER

Stress-Strain (Flexible Materials)



# Hytrel® 5556

## THERMOPLASTIC POLYESTER ELASTOMER

### 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
- ✗ 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

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## THERMOPLASTIC POLYESTER ELASTOMER

### 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
- ✓ 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).