

# Hytrel® 4068

## 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® 4068 is a low modulus Hytrel® grade with nominal durometer hardness of 40D. It contains non-discoloring stabilizer. It can be processed by many conventional thermoplastic processing techniques like injection molding and extrusion.

Typical applications:

Moulded products, hose and tubing, wire and cable jackets, film and sheeting, belting and seals.

### Product information

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

### Rheological properties

|                                  |                            |                 |
|----------------------------------|----------------------------|-----------------|
| Melt volume-flow rate            | 8.8 cm <sup>3</sup> /10min | ISO 1133        |
| Melt mass-flow rate              | 8.5 g/10min                | ISO 1133        |
| Temperature                      | 220 °C                     |                 |
| Load                             | 2.16 kg                    |                 |
| Melt mass-flow rate, Temperature | 220 °C                     |                 |
| Melt mass-flow rate, Load        | 2.16 kg                    |                 |
| Moulding shrinkage, parallel     | 1.0 %                      | ISO 294-4, 2577 |
| Moulding shrinkage, normal       | 0.9 %                      | ISO 294-4, 2577 |

### Typical mechanical properties

|                       |         |              |
|-----------------------|---------|--------------|
| Tensile Modulus       | 45 MPa  | ISO 527-1/-2 |
| Stress at 5% strain   | 2.4 MPa | ISO 527-1/-2 |
| Stress at 10% strain  | 3.2 MPa | ISO 527-1/-2 |
| Stress at 50% strain  | 6.7 MPa | ISO 527-1/-2 |
| Stress at 100% strain | 7.5 MPa | ISO 527-1/-2 |
| Stress at break       | 29 MPa  | ISO 527-1/-2 |



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|                                       |                       |                    |
|---------------------------------------|-----------------------|--------------------|
| Nominal strain at break               | 800 %                 | ISO 527-1/-2       |
| Strain at break                       | >300 %                | ISO 527-1/-2       |
| Flexural Modulus                      | 45 MPa                | ISO 178            |
| Tensile creep modulus, 1000h          | 21 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 | N kJ/m <sup>2</sup>   | ISO 179/1eA        |
| Charpy notched impact strength, -40°C | N kJ/m <sup>2</sup>   | ISO 179/1eA        |
| Tensile notched impact strength, 23°C | 145 kJ/m <sup>2</sup> | ISO 8256/1         |
| Puncture - maximum force, -30°C       | 2100 N                | ISO 6603-2         |
| Puncture energy, -30°C                | 30 J                  | ISO 6603-2         |
| Shore D hardness, 15s                 | 33                    | ISO 48-4 / ISO 868 |
| Shore D hardness, max                 | 37                    | ISO 868            |
| Tear strength, parallel               | 100 kN/m              | ISO 34-1           |
| Tear strength, normal                 | 100 kN/m              | ISO 34-1           |
| Abrasion resistance                   | 180 mm <sup>3</sup>   | ISO 4649           |

### Thermal properties

|                                             |                           |                |
|---------------------------------------------|---------------------------|----------------|
| Melting temperature, 10°C/min               | 193 °C                    | ISO 11357-1/-3 |
| Glass transition temperature, 10°C/min      | -50 °C                    | ISO 11357-1/-3 |
| Vicat softening temperature, 50°C/h 10N     | 130 °C                    | ISO 306        |
| Coeff. of linear therm. expansion, parallel | 230 E-6/K                 | ISO 11359-1/-2 |
| Coeff. of linear therm. expansion, normal   | 230 E-6/K                 | ISO 11359-1/-2 |
| Thermal conductivity of melt                | 0.16 W/(m K)              | Internal       |
| Eff. thermal diffusivity                    | 5.44E-8 m <sup>2</sup> /s | Internal       |
| Spec. heat capacity of melt                 | 2140 J/(kg K)             | Internal       |
| TGA curve                                   | available                 | ISO 11359-1/-2 |

### Flammability

|                               |            |                      |
|-------------------------------|------------|----------------------|
| Burning Behav. at thickness h | HB class   | UL 94                |
| Thickness tested              | 3 mm       | UL 94                |
| UL recognition                | yes        | UL 94                |
| FMVSS Class                   | B          | ISO 3795 (FMVSS 302) |
| Burning rate, Thickness 1 mm  | <80 mm/min | ISO 3795 (FMVSS 302) |

### Electrical properties

|                              |          |               |
|------------------------------|----------|---------------|
| Relative permittivity, 100Hz | 4.8      | IEC 62631-2-1 |
| Relative permittivity, 1MHz  | 4.7      | IEC 62631-2-1 |
| Electric strength            | 18 kV/mm | IEC 60243-1   |
| Comparative tracking index   | 600      | IEC 60112     |



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### Other properties

|                                 |                        |                |
|---------------------------------|------------------------|----------------|
| Humidity absorption, 2mm        | 0.3 %                  | Sim. to ISO 62 |
| Water absorption, 2mm           | 0.7 %                  | Sim. to ISO 62 |
| Water absorption, Immersion 24h | 0.7 %                  | Sim. to ISO 62 |
| Density                         | 1110 kg/m <sup>3</sup> | ISO 1183       |
| Density of melt                 | 1030 kg/m <sup>3</sup> | Internal       |

### VDA Properties

|                               |          |         |
|-------------------------------|----------|---------|
| Emission of organic compounds | 10 µgC/g | VDA 277 |
| Odour                         | 4 class  | VDA 270 |

### Injection

|                                 |         |          |
|---------------------------------|---------|----------|
| Drying Recommended              | yes     |          |
| Drying Temperature              | 100 °C  |          |
| Drying Time, Dehumidified Dryer | 2 - 3 h |          |
| Processing Moisture Content     | ≤0.08 % |          |
| Melt Temperature Optimum        | 225 °C  | Internal |
| Min. melt temperature           | 220 °C  |          |
| Max. melt temperature           | 250 °C  |          |
| Mold Temperature Optimum        | 40 °C   |          |
| Min. mould temperature          | 30 °C   |          |
| Max. mould temperature          | 40 °C   |          |

### Extrusion

|                                 |              |
|---------------------------------|--------------|
| Drying Temperature              | 90 - 110 °C  |
| Drying Time, Dehumidified Dryer | 2 - 3 h      |
| Processing Moisture Content     | ≤0.06 %      |
| Melt Temperature Optimum        | 215 °C       |
| Melt Temperature Range          | 210 - 225 °C |

### Additional information

Injection molding

### PREPROCESSING

Drying recommended = Yes  
Drying temperature = 100 °C  
Drying time, dehumidified dryer = 2-3 h  
Processing moisture content = <0.08 %

### PROCESSING

Melt temperature range = 220-250 °C  
Melt temperature optimum = 225 °C  
Mold temperature optimum = 40 °C



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Mold temperature range = 30-40°C

Profile extrusion

### PREPROCESSING

Drying temperature = 100°C

Drying time, dehumidified dryer = 2-3 h

Processing moisture content = <0.06 %

### PROCESSING

Melt temperature range = 205-230°C

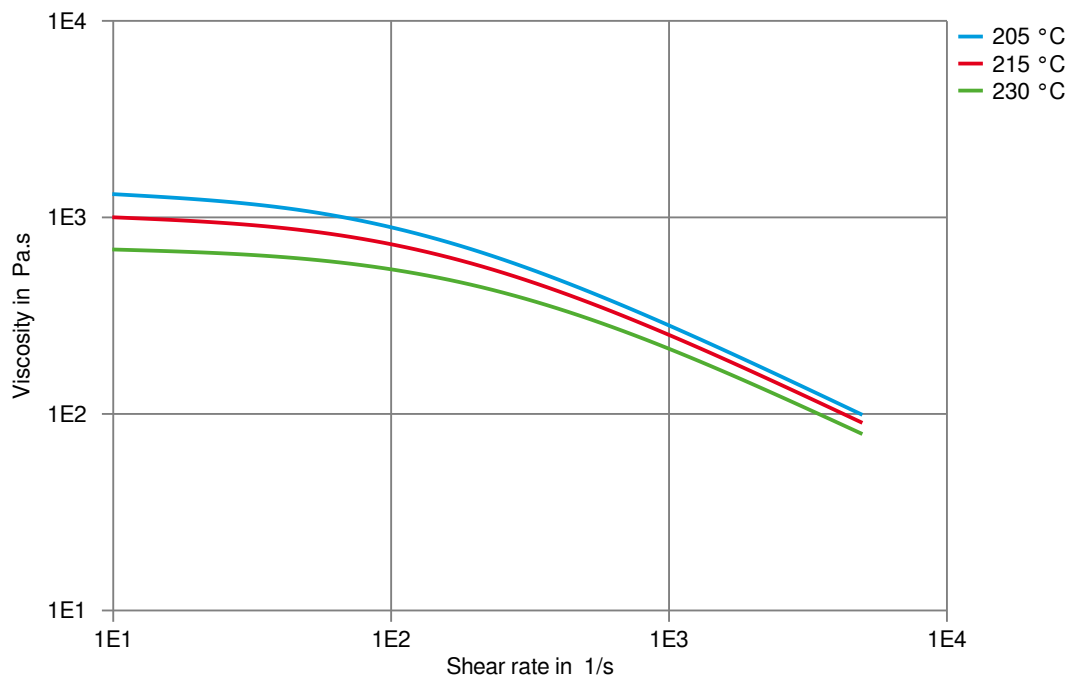
Melt temperature optimum = 215°C



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THERMOPLASTIC POLYESTER ELASTOMER

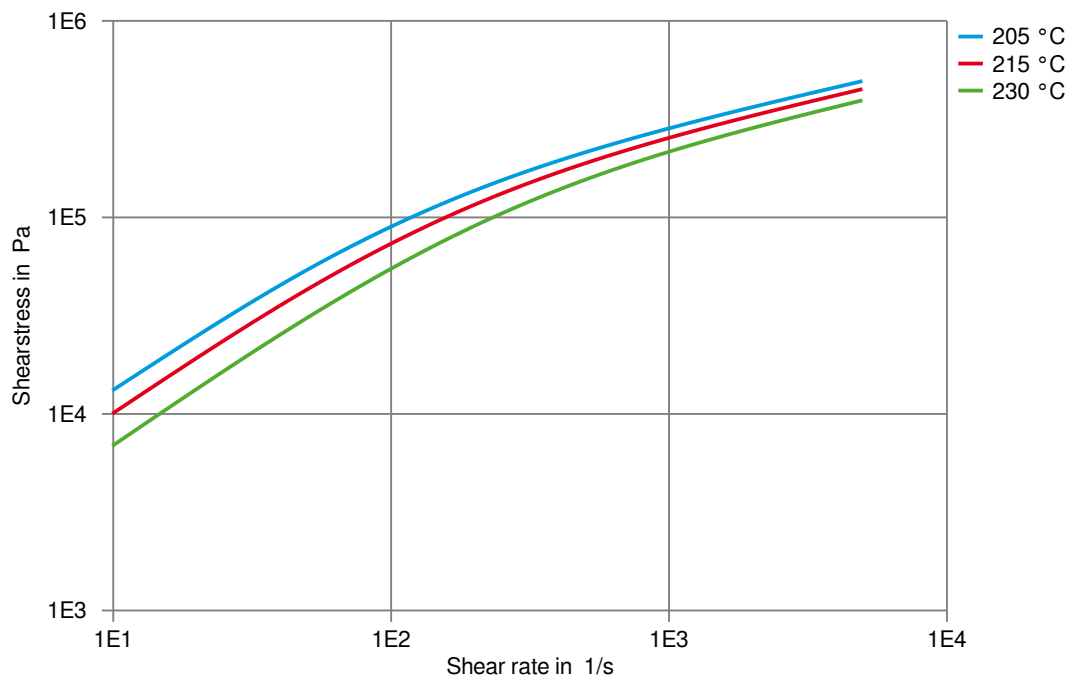
Viscosity-shear rate



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THERMOPLASTIC POLYESTER ELASTOMER

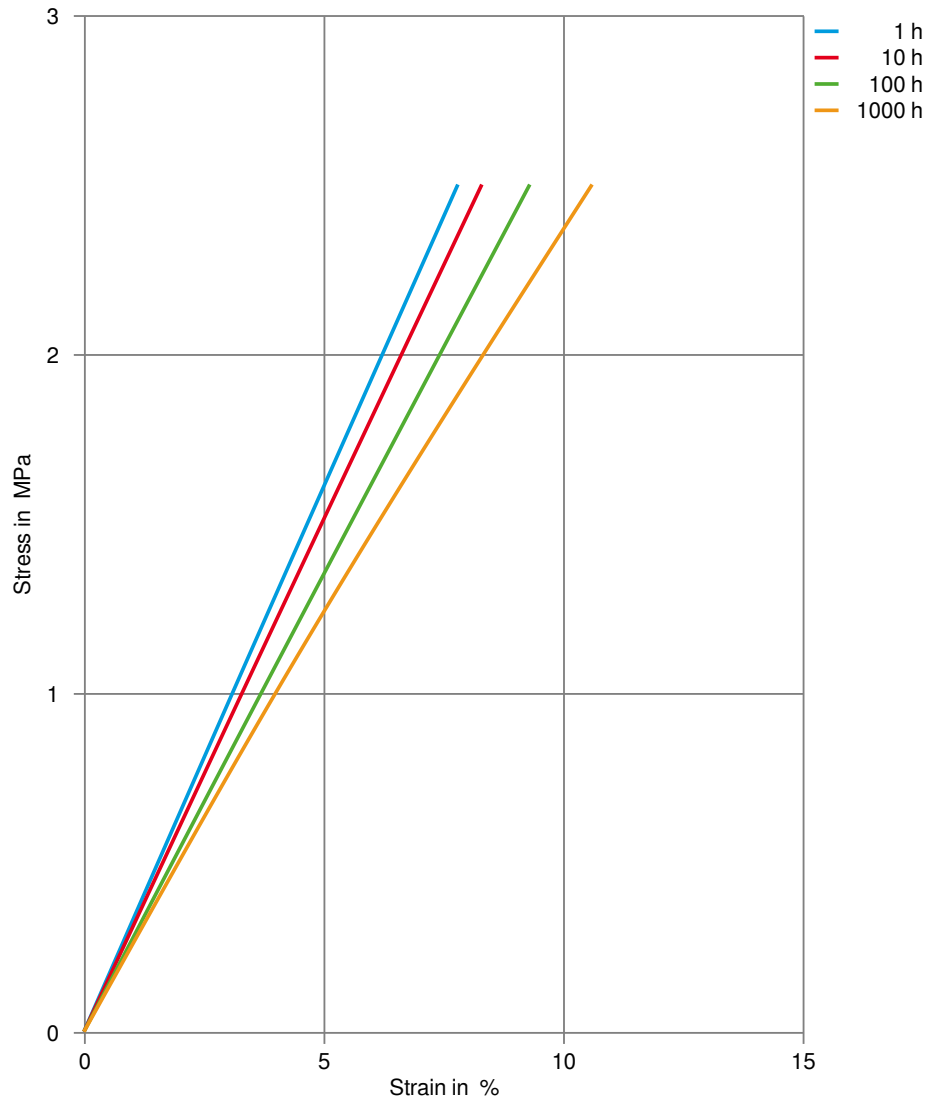
Shearstress-shear rate



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THERMOPLASTIC POLYESTER ELASTOMER

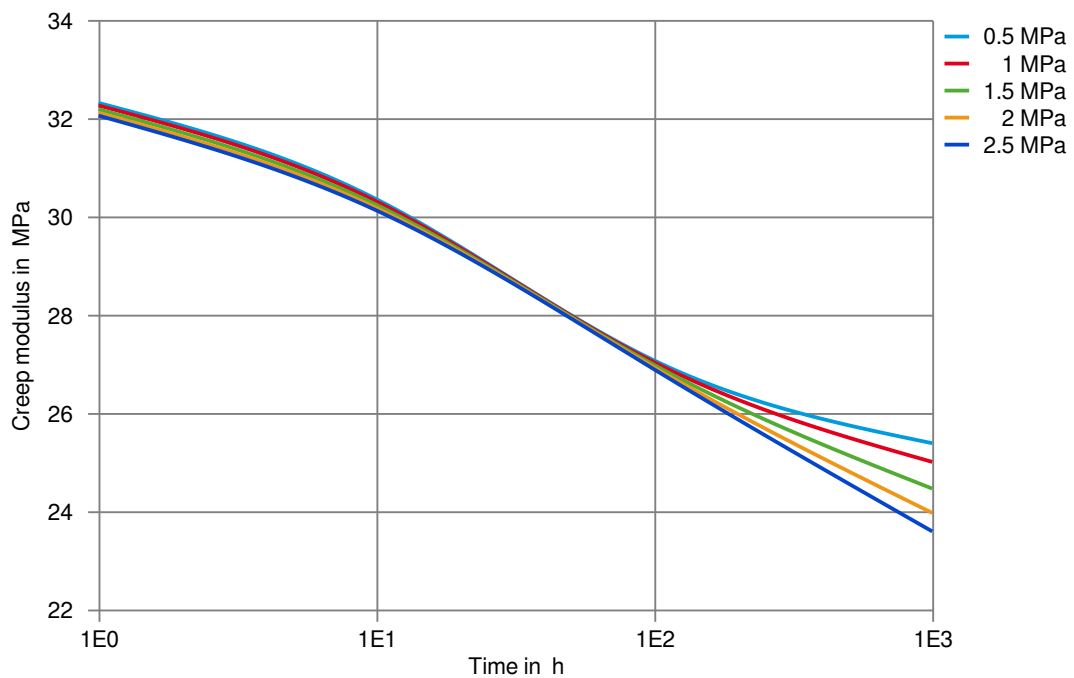
Stress-strain (isochronous) 23°C



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THERMOPLASTIC POLYESTER ELASTOMER

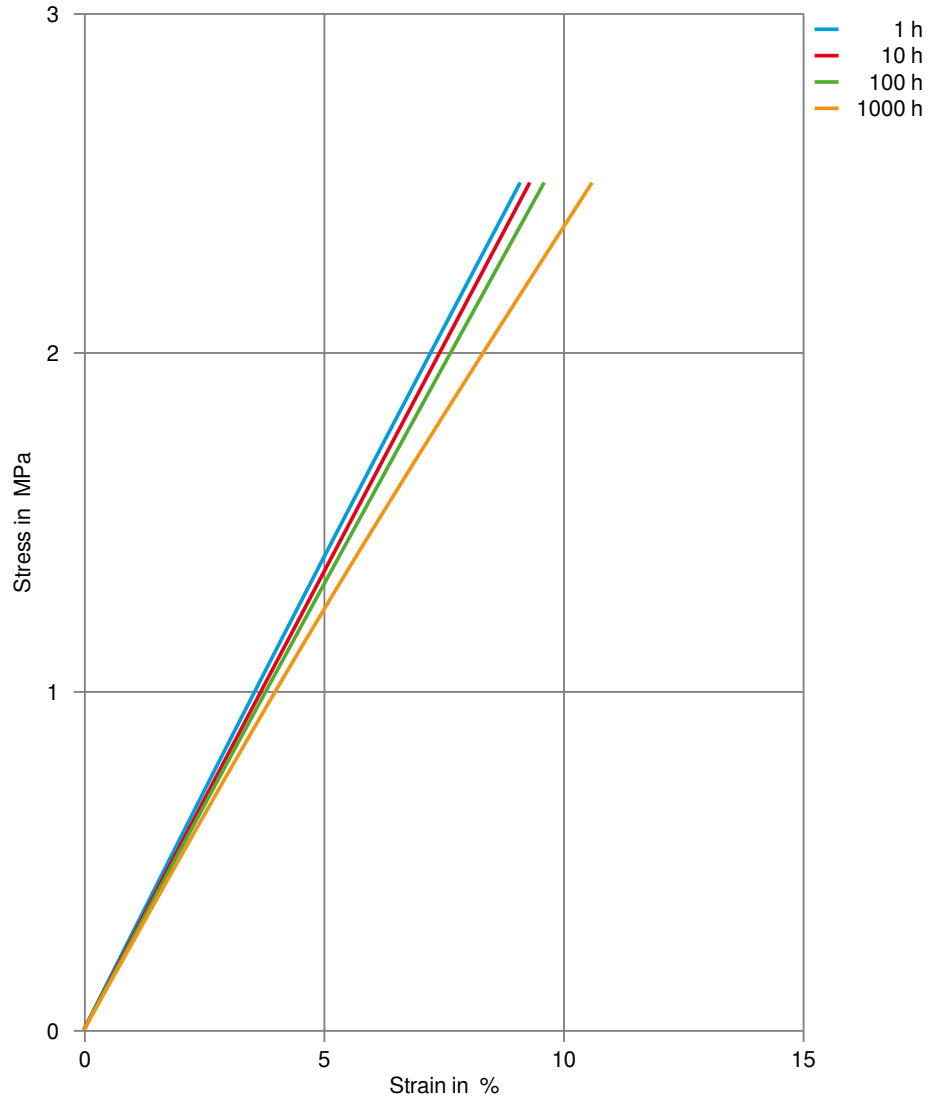
Creep modulus-time 23°C



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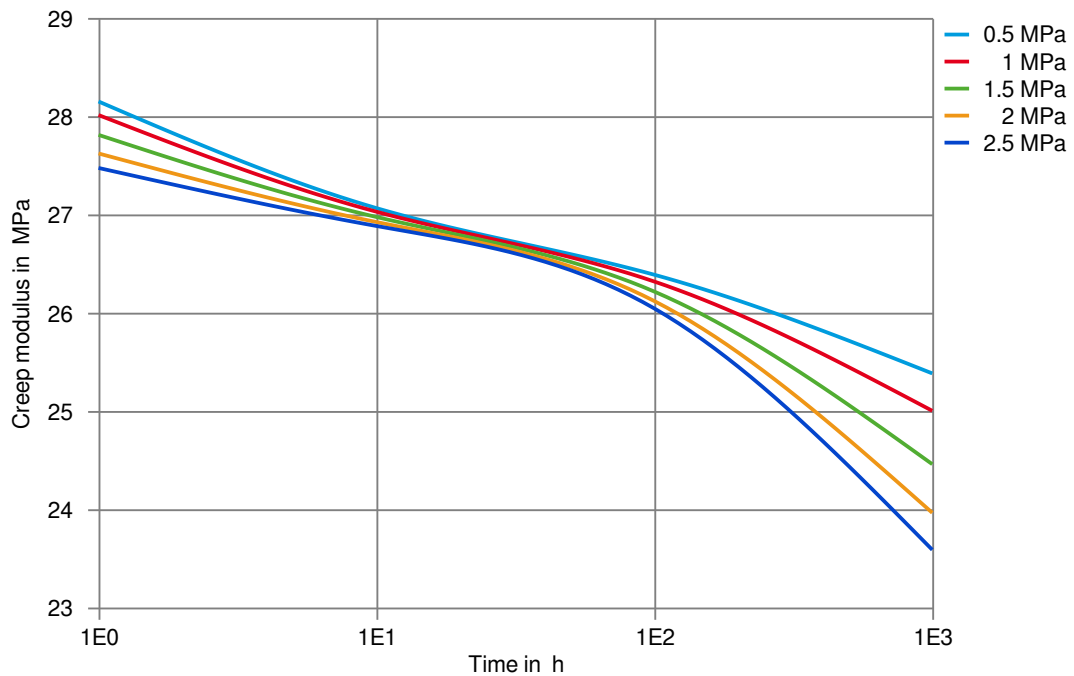
Stress-strain (isochronous) 40°C



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THERMOPLASTIC POLYESTER ELASTOMER

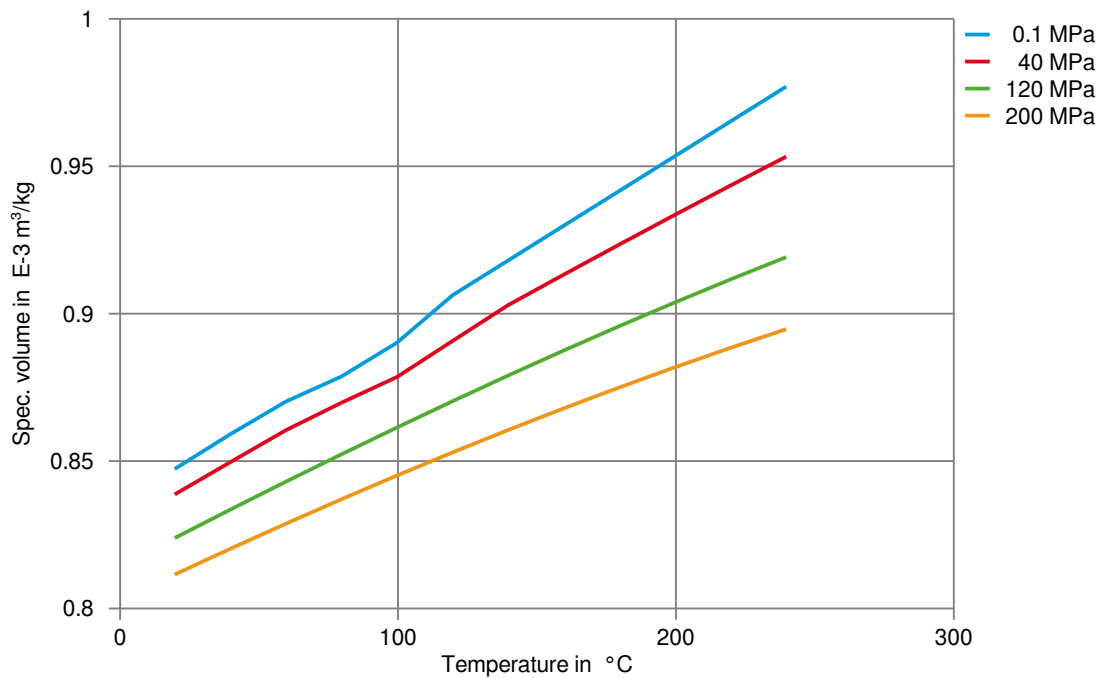
Creep modulus-time 40°C



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THERMOPLASTIC POLYESTER ELASTOMER

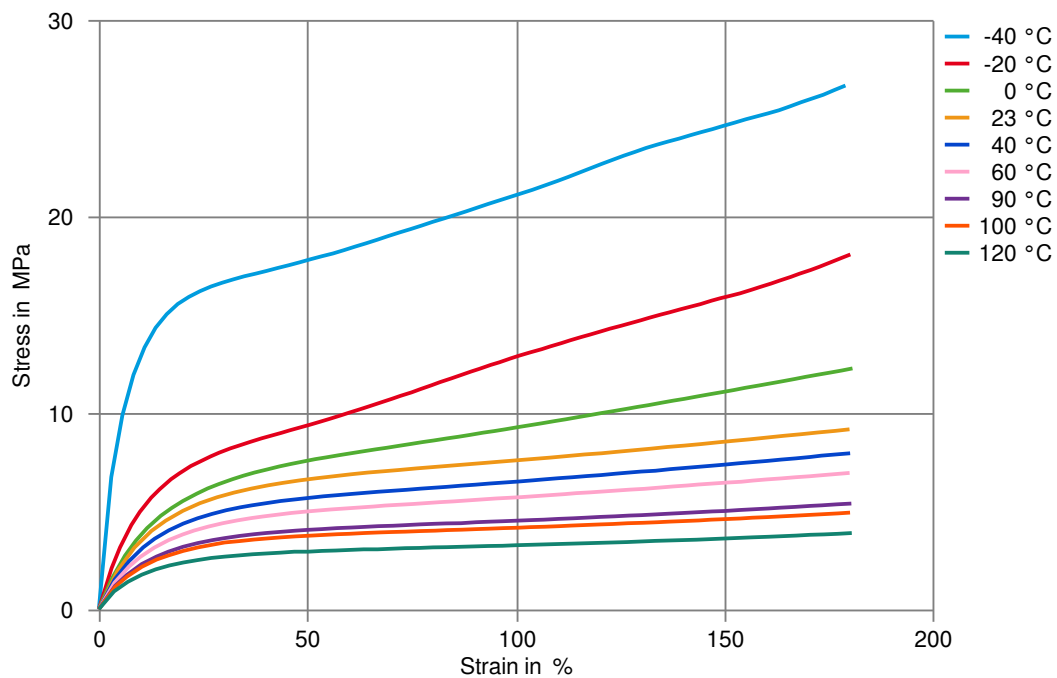
Specific volume-temperature (pvT)



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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

### 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).

