

DuPont™ Hytrel® 6356

THERMOPLASTIC POLYESTER ELASTOMER

Product Information

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.

General information	Value	Unit	Test Standard
Resin Identification	TPC-ET	-	ISO 1043
Part Marking Code	TPC-ET	-	ISO 11469
Rheological properties	Value	Unit	Test Standard
Melt volume-flow rate	8.5	cm ³ /10min	ISO 1133
Temperature	230	°C	ISO 1133
Load	2.16	kg	ISO 1133
Melt mass-flow rate	9	g/10min	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
Mechanical properties (TPE)	Value	Unit	Test Standard
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
Strain at break	>300	%	ISO 527-1/-2
Nominal strain at break	500	%	ISO 527-1/-2
Tear strength, parallel	158	kN/m	ISO 34-1
Tear strength, normal	145	kN/m	ISO 34-1
Abrasion resistance	110	mm ³	ISO 4649
Shore D hardness, max	63	-	ISO 7619-1
Shore D hardness, 15s	57	-	ISO 7619-1
Mechanical properties	Value	Unit	Test Standard
Tensile Modulus	280	MPa	ISO 527-1/-2
Flexural Modulus	290	MPa	ISO 178
Tensile creep modulus			ISO 899-1
1h	248	MPa	
1000h	182	MPa	

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Charpy notched impact strength			ISO 179/1eA
23 °C	120 ^[P]	kJ/m ²	
-30 °C	25	kJ/m ²	
-40 °C	15	kJ/m ²	
Tensile notched impact strength, 23 °C	300	kJ/m ²	ISO 8256/1
Brittleness temperature	-96	°C	ISO 974
Izod notched impact strength			ISO 180/1A
23 °C	81	kJ/m ²	
-40 °C	19	kJ/m ²	

P: Partial Break

Thermal properties	Value	Unit	Test Standard
Melting temperature, 10 °C/min	210	°C	ISO 11357-1/-3
Glass transition temperature, 10 °C/min	0	°C	ISO 11357-1/-2
Temp. of deflection under load			ISO 75-1/-2
1.8 MPa	45	°C	
0.45 MPa	80	°C	
Vicat softening temperature			ISO 306
50 °C/h, 50N	100	°C	
50 °C/h, 10N	195	°C	
Coeff. of linear therm. expansion, parallel	190	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion			
normal	176	E-6/K	ISO 11359-1/-2
Normal, 23-55 °C (73-130 °F)	170	E-6/K	ASTM E 831
Normal, -40-23 °C	150	E-6/K	ISO 11359-1/-2
Parallel, 23-55 °C (73-130 °F)	190	E-6/K	ASTM E 831
Parallel, -40-23 °C	160	E-6/K	ISO 11359-1/-2
Thermal conductivity of melt	0.15	W/(m K)	-
Spec. heat capacity of melt	2150	J/(kg K)	-
Eff. thermal diffusivity	5.44E-8	m ² /s	-
RTI, electrical			UL 746B
1.5mm	85	°C	
3mm	85	°C	
RTI, impact			UL 746B
1.5mm	85	°C	
3mm	85	°C	
RTI, strength			UL 746B
1.5mm	75	°C	
3mm	80	°C	
Flammability	Value	Unit	Test Standard
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
Flammability, 3.0mm	HB	-	IEC 60695-11-10
FMVSS Class	SE	-	ISO 3795 (FMVSS 302)
Electrical properties	Value	Unit	Test Standard
Relative permittivity			IEC 60250
100Hz	4.6	-	
1MHz	4.1	-	
Dissipation factor			IEC 60250
100Hz	120	E-4	
1MHz	360	E-4	
Volume resistivity	8E11	Ohm*m	IEC 60093

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Surface resistivity	>1E15	Ohm	IEC 60093
Electric strength	20	kV/mm	IEC 60243-1
Other properties	Value	Unit	Test Standard
Humidity absorption, 2mm	0.2	%	Sim. to ISO 62
Water absorption, 2mm	0.6	%	Sim. to ISO 62
Density	1220	kg/m ³	ISO 1183
Density of melt	1060	kg/m ³	-
Water Absorption, Immersion 24h	0.5	%	Sim. to ISO 62
VDA Properties	Value	Unit	Test Standard
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	Value	Unit	Test Standard
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	Value	Unit	Test Standard
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			
Processing	<ul style="list-style-type: none"> • Injection Moulding • Film Extrusion • Profile Extrusion 	<ul style="list-style-type: none"> • Sheet Extrusion • Other Extrusion • Casting 	<ul style="list-style-type: none"> • Thermoforming
Delivery form	<ul style="list-style-type: none"> • Pellets 		
Special characteristics	<ul style="list-style-type: none"> • Light stabilised or stable to light 		
Regional Availability	<ul style="list-style-type: none"> • North America • Europe 	<ul style="list-style-type: none"> • Asia Pacific • South and Central America 	<ul style="list-style-type: none"> • Near East/Africa • Global

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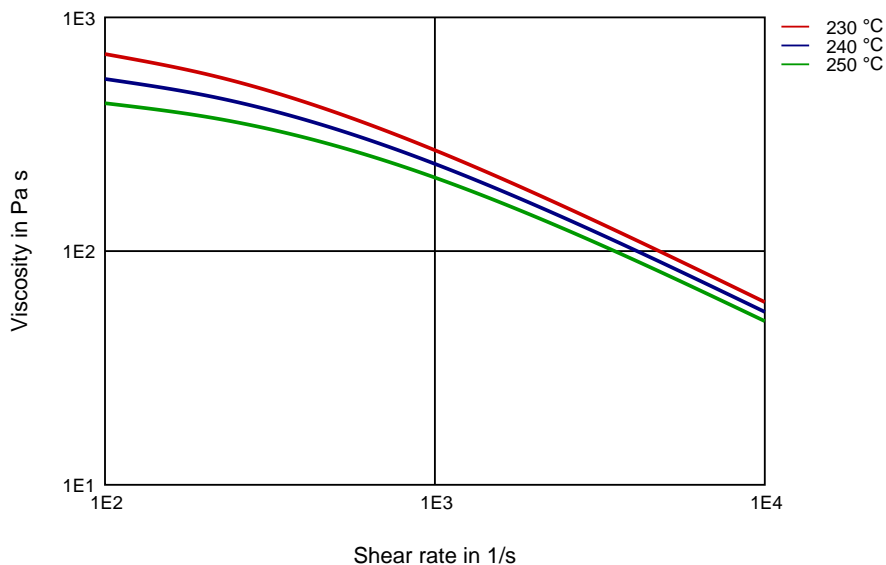
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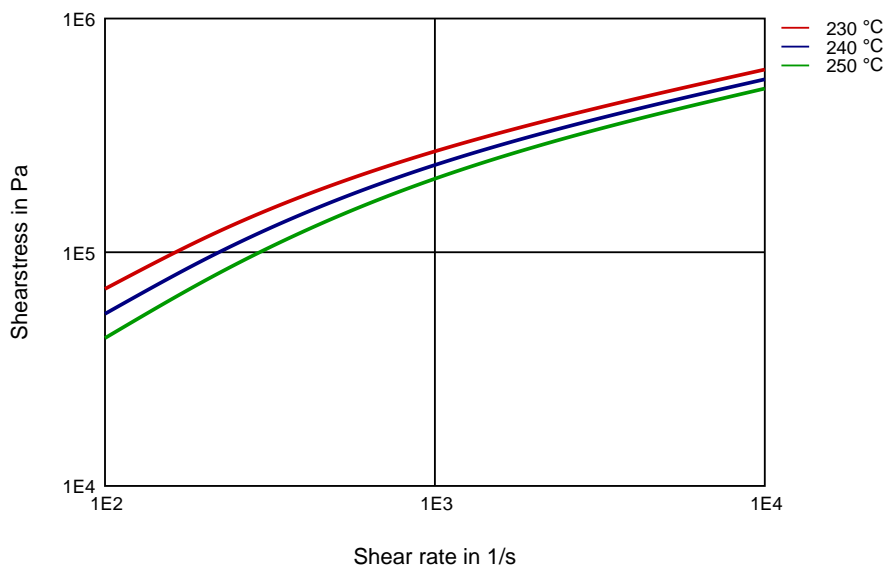
THERMOPLASTIC POLYESTER ELASTOMER

Diagrams

Viscosity-shear rate



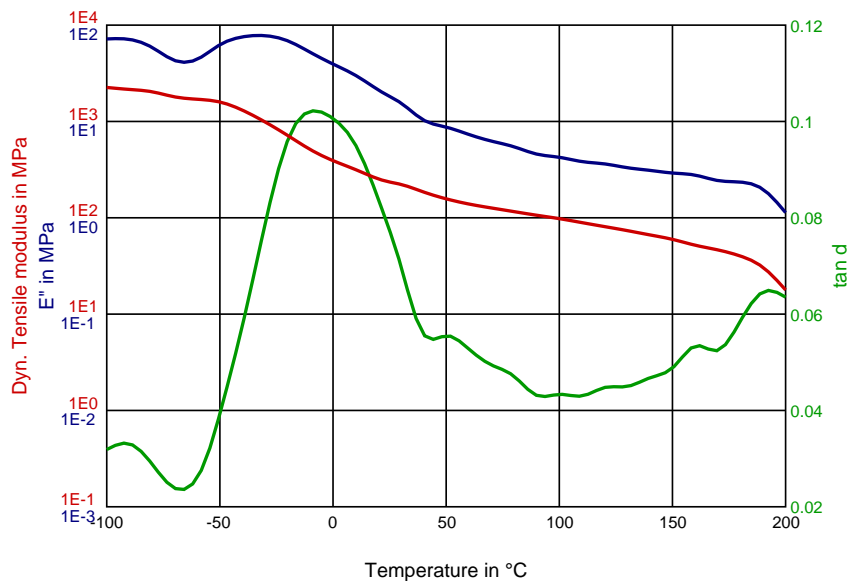
Shearstress-shear rate



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THERMOPLASTIC POLYESTER ELASTOMER

Dynamic Tensile modulus-temperature



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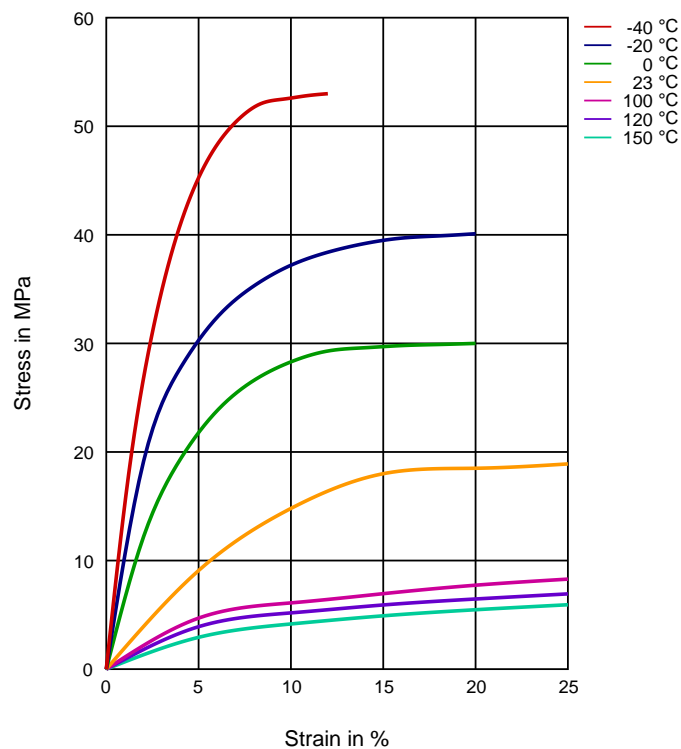
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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain



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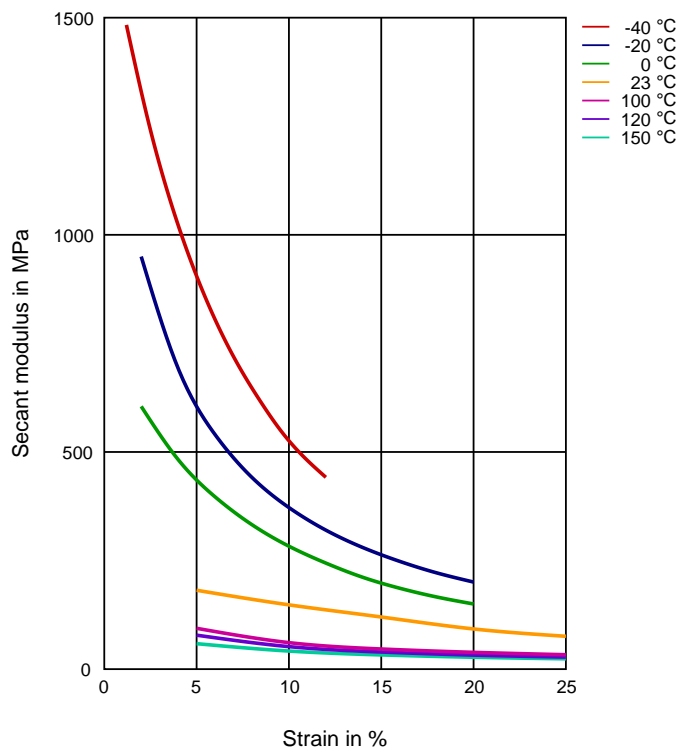
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THERMOPLASTIC POLYESTER ELASTOMER

Secant modulus-strain



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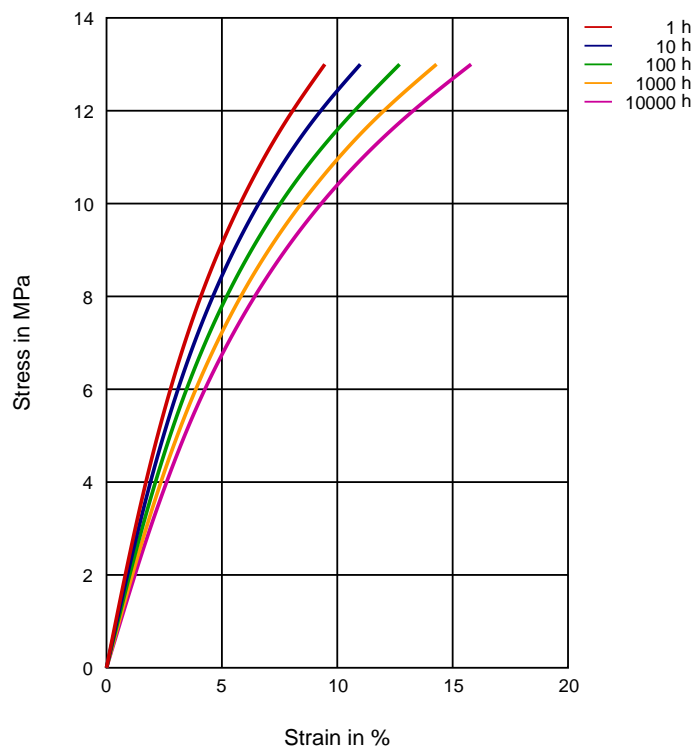
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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 23 °C



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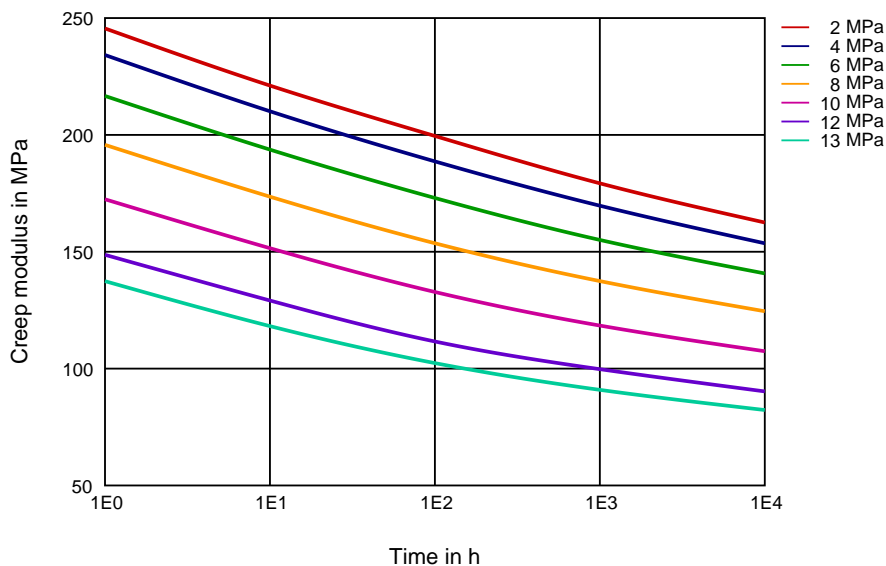
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THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 23 °C



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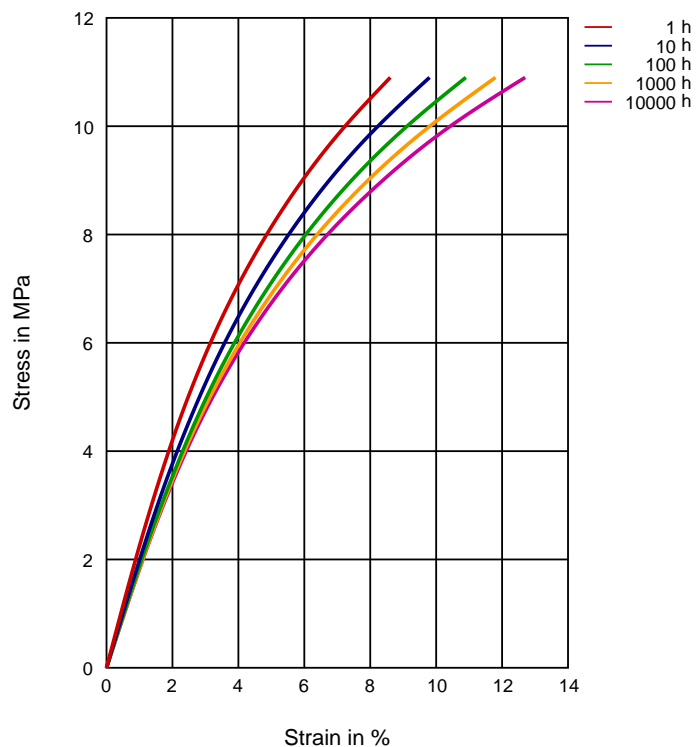
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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 40°C



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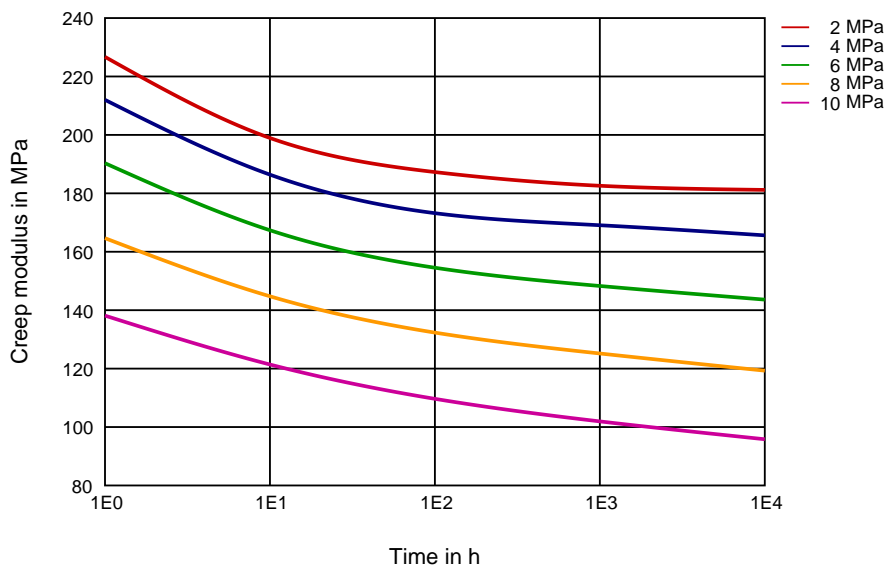
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THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 40 °C



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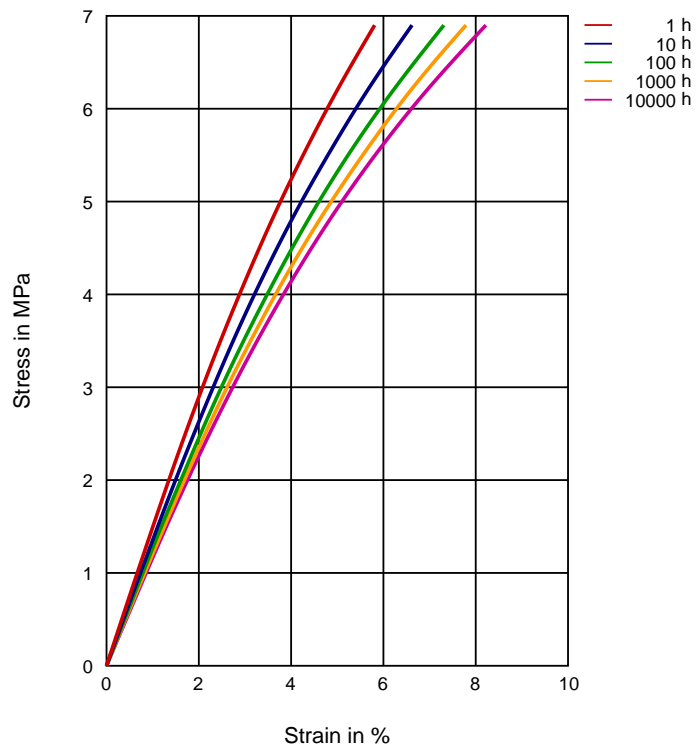
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THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 80°C



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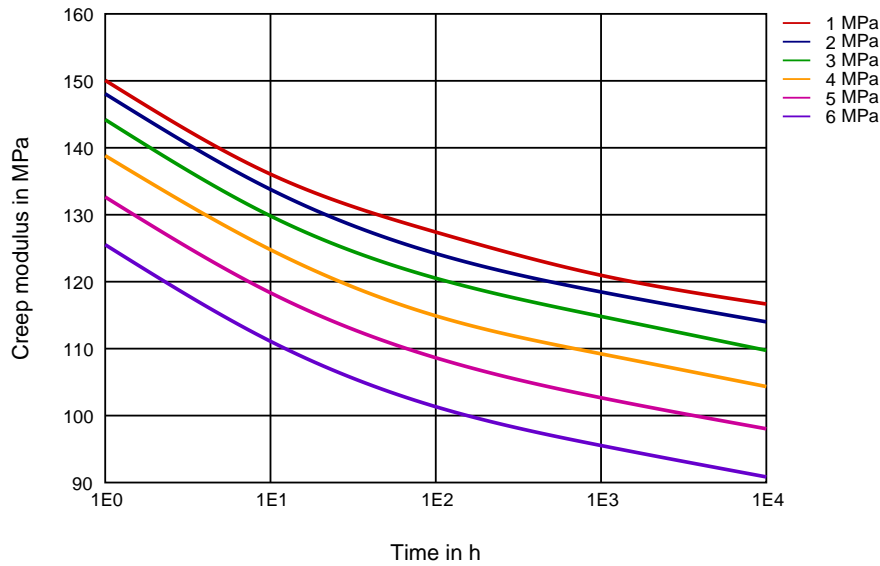
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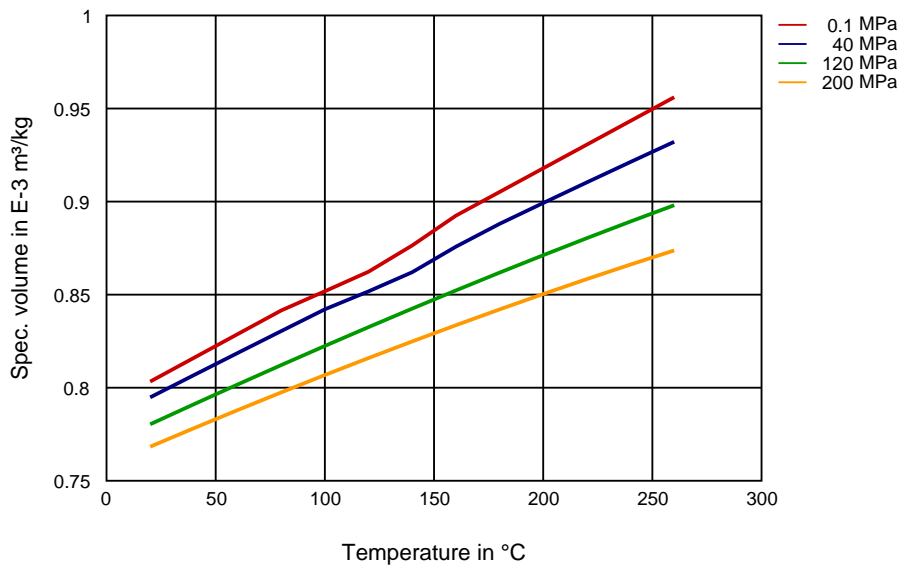
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THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 80 °C



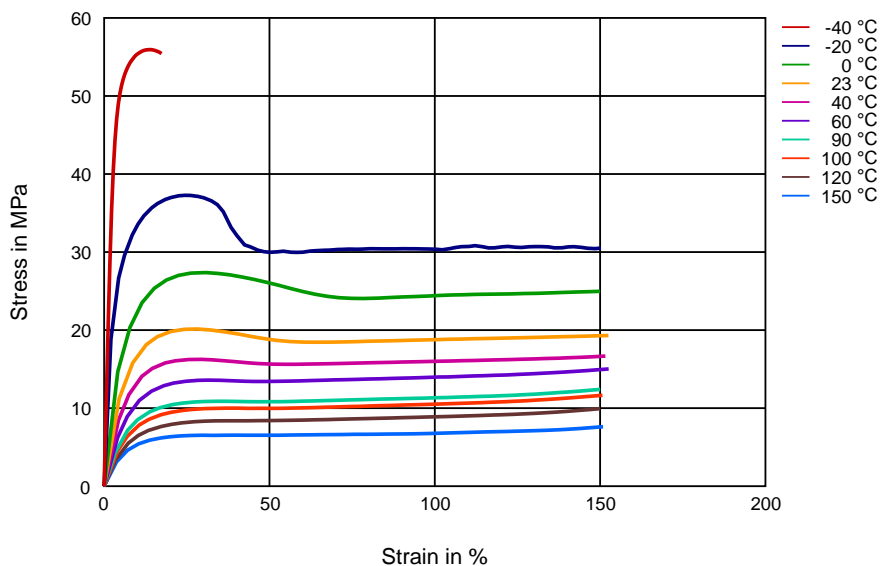
Specific volume-temperature (pvT)



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THERMOPLASTIC POLYESTER ELASTOMER

Stress-Strain (TPE)



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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)

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- ✓ 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)

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).

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc. ISO Mechanical properties measured at 4mm (Hytrel® measured at 2 mm), IEC Electrical properties measured at 2mm, all ASTM properties measured at 3.2mm, and test temperatures are 23°C unless otherwise stated.

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