



### 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**

1 Toddot Illiottilation			
Resin Identification	TPC-ET		ISO 1043
Part Marking Code	>TPC-ET<		ISO 11469
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Rheological properties			
Melt volume-flow rate	8.8	cm <sup>3</sup> /10min	ISO 1133
Temperature	220	°C	
Load	2.16	kg	
Melt mass-flow rate		g/10min	ISO 1133
Melt mass-flow rate, Temperature	220	=	
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
Tensile stress at 50% strain, 1BA	6.7	MPa	ISO 527-1/-2
Tensile stress at 100% strain	7.5	MPa	ISO 527-1/-2
Tensile stress at break	29	MPa	ISO 527-1/-2
Nominal strain at break	800	%	ISO 527-1/-2
Tensile strain at break	>300	%	ISO 527-1/-2
Flexural modulus		MPa	ISO 178
Tensile creep modulus, 1000h		MPa	ISO 899-1
•			

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## THERMOPLASTIC POLYESTER ELASTOMER

Charpy impact strength, 23°C Charpy impact strength, -30°C Charpy notched impact strength, -30°C Charpy notched impact strength, -30°C Charpy notched impact strength, -40°C Tensile notched impact strength, 23°C Puncture - maximum force, -30°C Puncture energy, -30°C Shore D hardness, 15s Shore D hardness, max Tear strength, parallel Tear strength, normal	N N N 145 2100 30 33 37 100 100	J kN/m kN/m	ISO 179/1eU ISO 179/1eU ISO 179/1eA ISO 179/1eA ISO 179/1eA ISO 8256/1 ISO 6603-2 ISO 6603-2 ISO 48-4 / ISO 868 ISO 868
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		ISO 11357-1/-3
Vicat softening temperature, 50°C/h 10N	130		ISO 306
Coefficient of linear thermal expansion	230	E-6/K	ISO 11359-1/-2
(CLTE), parallel			
Coefficient of linear thermal expansion (CLTE),	230	E-6/K	ISO 11359-1/-2
normal			
Thermal conductivity of melt		W/(m K)	ISO 22007-2
Effective thermal diffusivity, flow	5.44E-8		ISO 22007-4
Specific heat capacity of melt		J/(kg K)	ISO 22007-4
TGA curve	available		ISO 11359-1/-2
Flammability			
•			150 00005 11110
Burning Behav. at thickness h		class	IEC 60695-11-10
Thickness tested		mm	IEC 60695-11-10
UL recognition	yes		UL 94
FMVSS Class	В		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		kV/mm	IEC 60243-1
Comparative tracking index	600	K V/IIIIII	IEC 60112
Comparative tracking index	000		120 00112
Physical/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		kg/m³	ISO 1183
Density of melt		kg/m <sup>3</sup>	
•		5	

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### THERMOPLASTIC POLYESTER ELASTOMER

### **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	230	°C
Min. melt temperature	220	°C
Max. melt temperature	240	°C
Mold Temperature Optimum	45	°C
Min. mould temperature	35	°C
Max. mould temperature	46	°C
Ejection temperature	80	°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

### Characteristics

Processing Injection Moulding, Film Extrusion, Extrusion, Sheet Extrusion, Other Extrusion,

Casting, Thermoforming

Delivery form Pellets

Special characteristics Light stabilised or stable to light

### 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 Mold temperature range = 30-40°C

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Profile extrusion

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## THERMOPLASTIC POLYESTER ELASTOMER

### **PREPROCESSING**

Drying temperature = 100 °C
Drying time, dehumidified dryer = 2-3 h
Processing moisture content = <0.06 %

### **PROCESSING**

Melt termperature range = 205-230 °C Melt temperature optimum = 215 °C

### **Automotive**

OEM STANDARD
Mercedes-Benz DBL5562.50 TPC

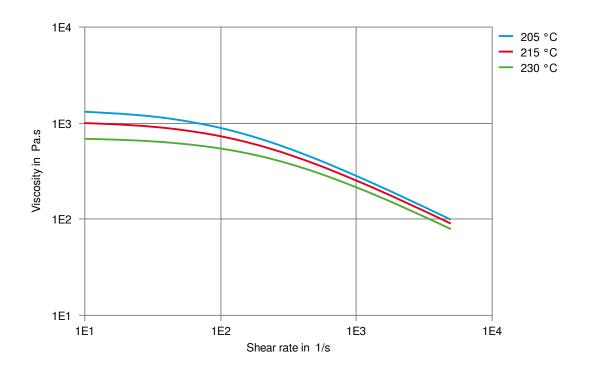
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## THERMOPLASTIC POLYESTER ELASTOMER

Viscosity-shear rate



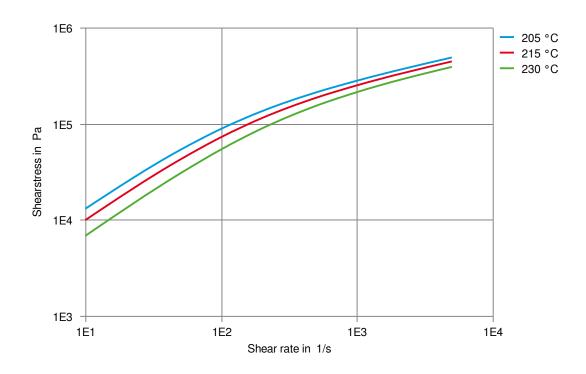
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## THERMOPLASTIC POLYESTER ELASTOMER

Shearstress-shear rate



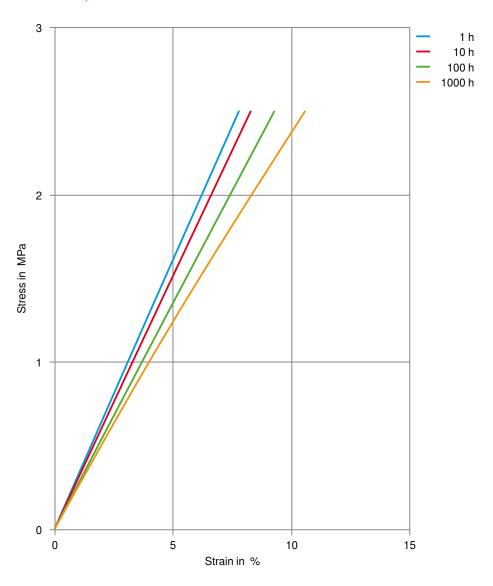
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## THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 23°C



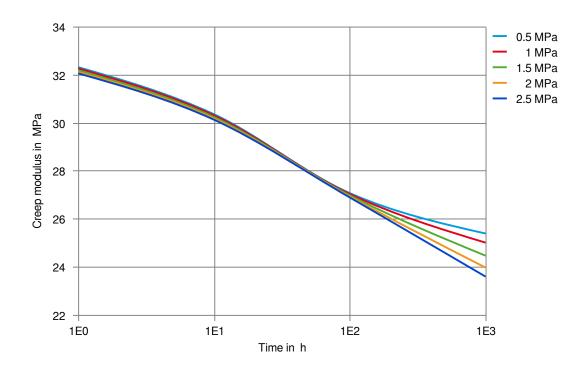
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# Hytrel® 4068 THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 23°C



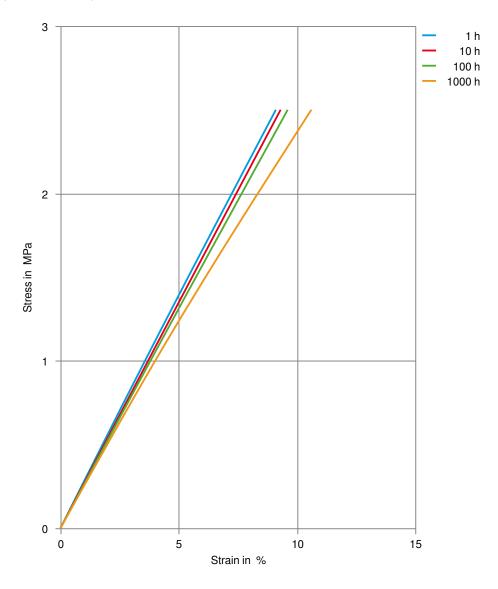
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## THERMOPLASTIC POLYESTER ELASTOMER

Stress-strain (isochronous) 40°C



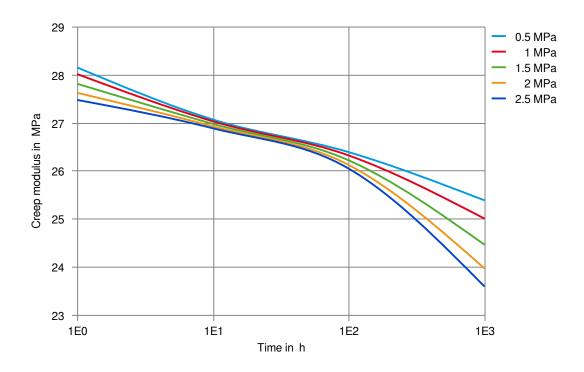
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## THERMOPLASTIC POLYESTER ELASTOMER

Creep modulus-time 40°C



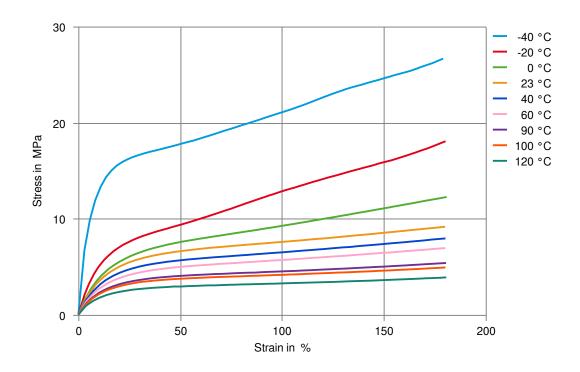
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# Hytrel® 4068 THERMOPLASTIC POLYESTER ELASTOMER

Stress-Strain (Flexible Materials)



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## Hytrel® 4068

### 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
- X Hydrochloric Acid (36% by mass), 23°C
- X Nitric Acid (40% by mass), 23°C
- X Sulfuric Acid (38% by mass), 23°C
- ✓ Sulfuric Acid (5% by mass), 23°C
- X 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

X Acetone, 23°C

### **Ethers**

X Diethyl ether, 23°C

### Mineral oils

- ✓ SAE 10W40 multigrade motor oil, 23°C
- X SAE 10W40 multigrade motor oil, 130°C
- X SAE 80/90 hypoid-gear oil, 130°C
- ✓ Insulating Oil, 23°C

### Standard Fuels

- X ISO 1817 Liquid 1 E5, 60°C
- X ISO 1817 Liquid 2 M15E4, 60°C
- X ISO 1817 Liquid 3 M3E7, 60°C
- X 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

### Salt solutions

- ✓ Sodium Chloride solution (10% by mass), 23°C
- ★ Sodium Hypochlorite solution (10% by mass), 23°C

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### THERMOPLASTIC POLYESTER ELASTOMER

- ✓ 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
- X Hydrogen peroxide, 23°C
- X 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).

x 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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NOTICE TO USERS: Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colourants or other additives may cause significant variations in data values. Properties of moulded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Other than those products expressly identified as medical grade (including by MT® product designation or otherwise), Celanese's products are not intended for use in medical or dental implants. Regardless of any such product designation, any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any e

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