Hytrel® 4556

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® 4556 is a medium modulus grade with nominal hardness of 45D. It contains non-discoloring stabilizer. It can be processed by many conventional thermoplastic processing techniques like injection molding and extrusion.

Product information

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

Rheological properties

Melt volume-flow rate	7.5	cm³/10min	ISO 1133
Melt mass-flow rate	8.5	g/10min	ISO 1133
Temperature	220	°C	ISO 1133
Load	2.16	kg	ISO 1133
Melt mass-flow rate, Temperature	220	°C	ISO 1133
Melt mass-flow rate, Load	2.16	kg	ISO 1133
Moulding shrinkage, parallel	1.2	%	ISO 294-4, 2577
Moulding shrinkage, normal	1.1	%	ISO 294-4, 2577

Typical mechanical properties

Tensile Modulus	85	MPa	ISO 527-1/-2
Stress at 10% strain	5.7	MPa	ISO 527-1/-2
Stress at 50% strain	9.8	MPa	ISO 527-1/-2
Stress at 100% strain	11	MPa	ISO 527-1/-2
Stress at 300% strain	17	MPa	ISO 527-1/-2
Stress at break	34	MPa	ISO 527-1/-2
Nominal strain at break	740	%	ISO 527-1/-2

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Strain at break	>300	%	ISO 527-1/-2
Flexural Modulus	87	MPa	ISO 178
Charpy impact strength, 23°C	N	kJ/m²	ISO 179/1eU
Charpy impact strength, -30°C	N	kJ/m²	ISO 179/1eU
Charpy notched impact strength, 23°C	N	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -30°C	N	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -40°C	N	kJ/m²	ISO 179/1eA
Puncture - maximum force, 23°C	1600	N	ISO 6603-2
Puncture - maximum force, -30°C	2700	N	ISO 6603-2
Puncture energy, 23°C	19	J	ISO 6603-2
Puncture energy, -30°C	34	J	ISO 6603-2
Izod notched impact strength, 23°C	N	kJ/m²	ISO 180/1A
Izod notched impact strength, -40°C	N	kJ/m²	ISO 180/1A
Ball indentation hardness, H 358/30	11	MPa	ISO 2039-1
Poisson's ratio	0.49	-	
Brittleness temperature	-100	°C	ISO 974
Shore D hardness, 15s	42	-	ISO 48-4
Shore D hardness, max	45	-	ISO 48-4
Tear strength, parallel	122	kN/m	ISO 34-1
Tear strength, normal	123	kN/m	ISO 34-1
Abrasion resistance	130	mm³	ISO 4649

Thermal properties

Melting temperature, 10°C/min	193	°C	ISO 11357-1/-3
Glass transition temperature, 10°C/min	-45	°C	ISO 11357-1/-2
Temp. of deflection under load, 1.8 MPa	35	°C	ISO 75-1/-2
Temp. of deflection under load, 0.45 MPa	50	°C	ISO 75-1/-2
Vicat softening temperature, 50°C/h, 50N	60	°C	ISO 306
Vicat softening temperature, 50°C/h 10N	155	°C	ISO 306
CLTE, Parallel, -40-23°C	220	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, parallel	170	E-6/K	ISO 11359-1/-2
CLTE, Normal, -40-23°C	210	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, normal	190	E-6/K	ISO 11359-1/-2
Eff. thermal diffusivity	5.44E-8	m²/s	
RTI, electrical, 0.75mm	85	°C	UL 746B
RTI, electrical, 1.5mm	85	°C	UL 746B
RTI, electrical, 3mm	85	°C	UL 746B
RTI, impact, 0.75mm	50	°C	UL 746B
RTI, impact, 1.5mm	85	°C	UL 746B
RTI, impact, 3mm	85	°C	UL 746B
RTI, strength, 0.75mm	50	°C	UL 746B
RTI, strength, 1.5mm	75	°C	UL 746B
RTI, strength, 3mm	80	°C	UL 746B

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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
FMVSS Class	B	-	ISO 3795 (FMVSS 302)
Burning rate, Thickness 1 mm	21[DS]	mm/min	ISO 3795 (FMVSS 302)

[DS]: Derived from similar grade

Electrical properties

Relative permittivity, 100Hz	4.8	-	IEC 62631-2-1
Relative permittivity, 1MHz	4.5	-	IEC 62631-2-1
Dissipation factor, 100Hz	95	E-4	IEC 62631-2-1
Dissipation factor, 1MHz	300	E-4	IEC 62631-2-1
Volume resistivity	8E10	Ohm.m	IEC 62631-3-1
Surface resistivity	4E14	Ohm	IEC 62631-3-2
Electric strength	19	kV/mm	IEC 60243-1
Comparative tracking index	600	-	IEC 60112

Other properties

Humidity absorption, 2mm	0.2	%	Sim. to ISO 62
Water absorption, 2mm	0.6	%	Sim. to ISO 62
Density	1140	kg/m³	ISO 1183
Water Absorption, Immersion 24h	0.6	%	Sim. to ISO 62

Film Properties

WVTR, 23°C/85%r.h.	600	g/(m²*d)	DIS 15106-1/-2
Thickness of specimen	0.025	mm	

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
Min. melt temperature	220	°C
Max. melt temperature	250	°C
Mold Temperature Optimum	45	°C
Min. mould temperature	45	°C
Max. mould temperature	55	°C

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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 = 45°C
Mold temperature range = 45-55°C

Profile extrusion

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

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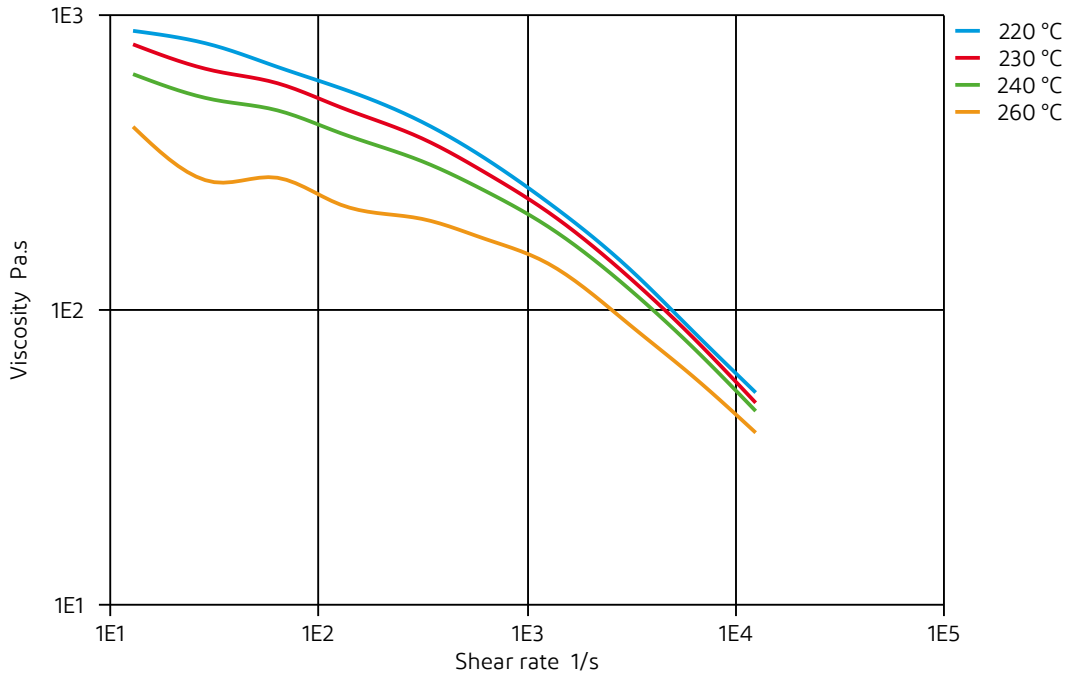
Viscosity-shear rate



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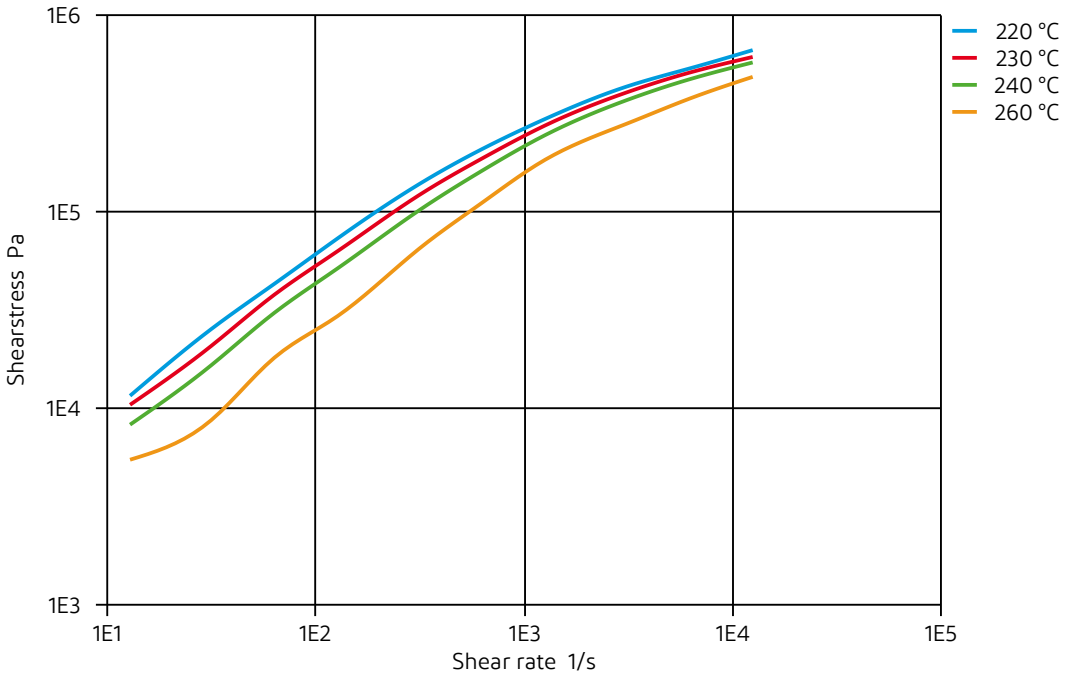
Shearstress-shear rate



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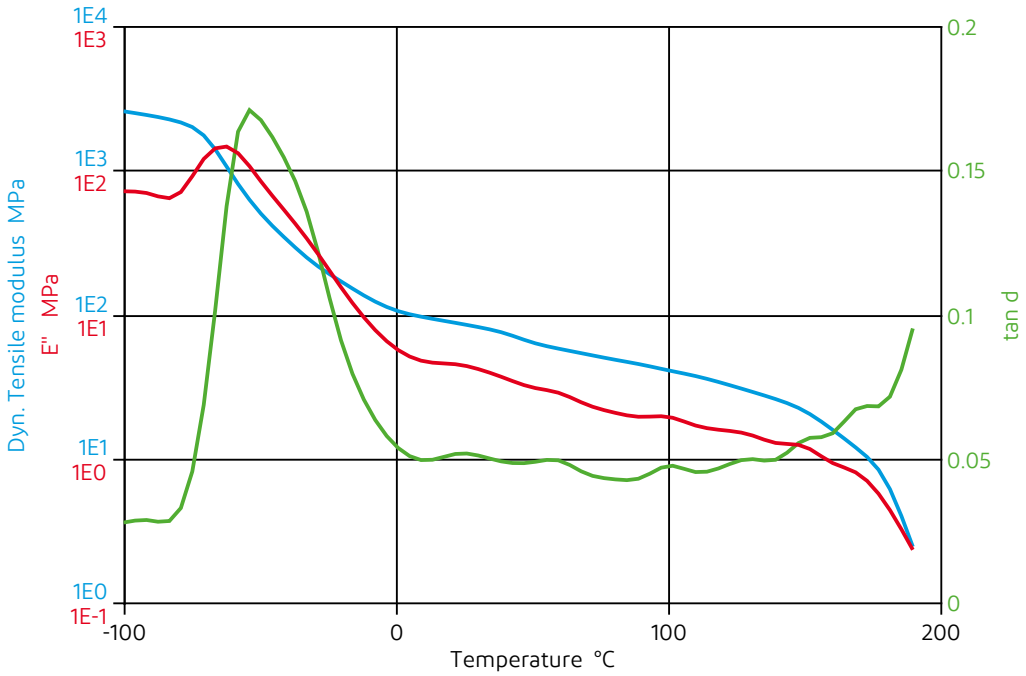
Dynamic Tensile modulus-temperature



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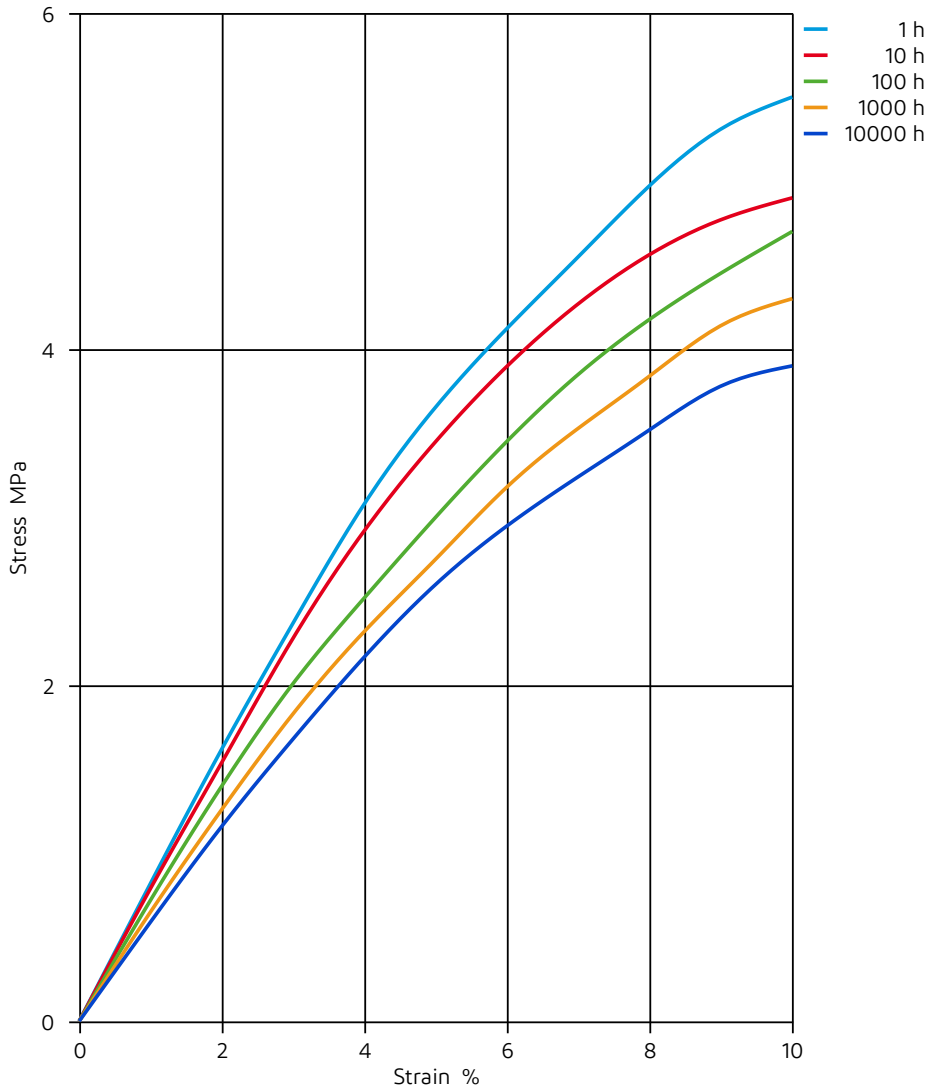
Stress-strain (isochronous) 23°C



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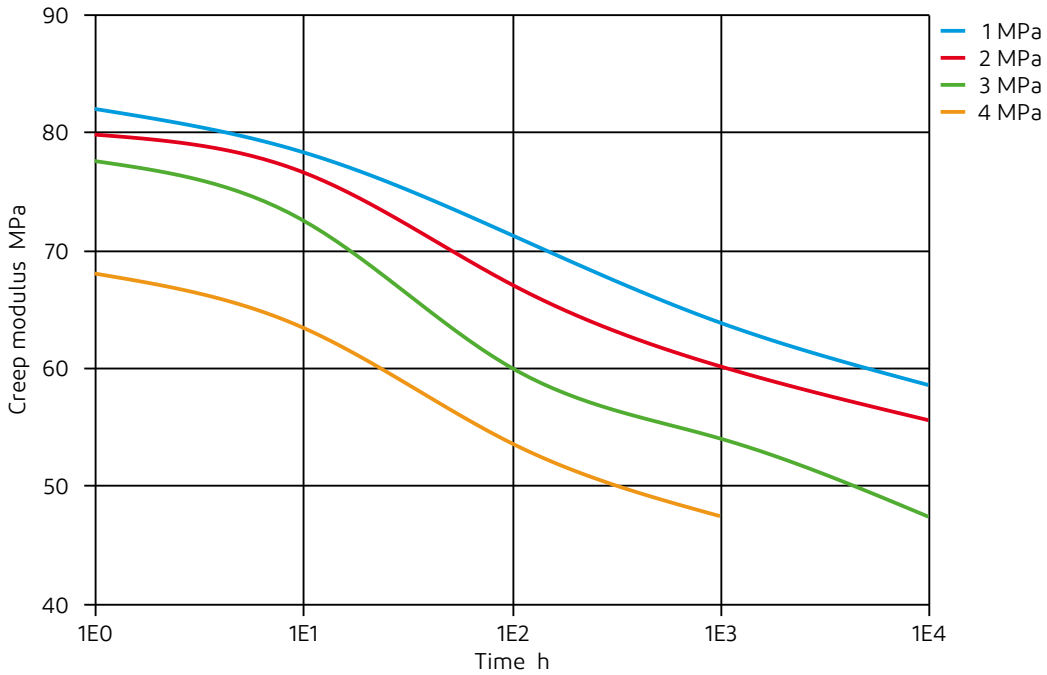
Creep modulus-time 23°C



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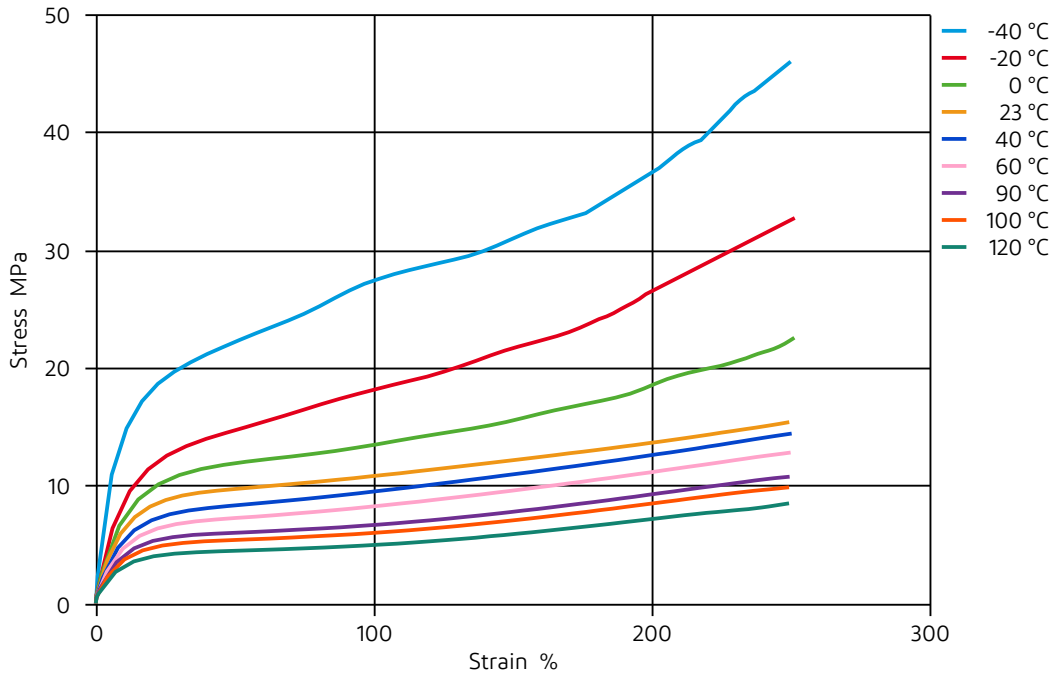
Stress-Strain (Flexible Materials)



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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
- ✘ 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

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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

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).