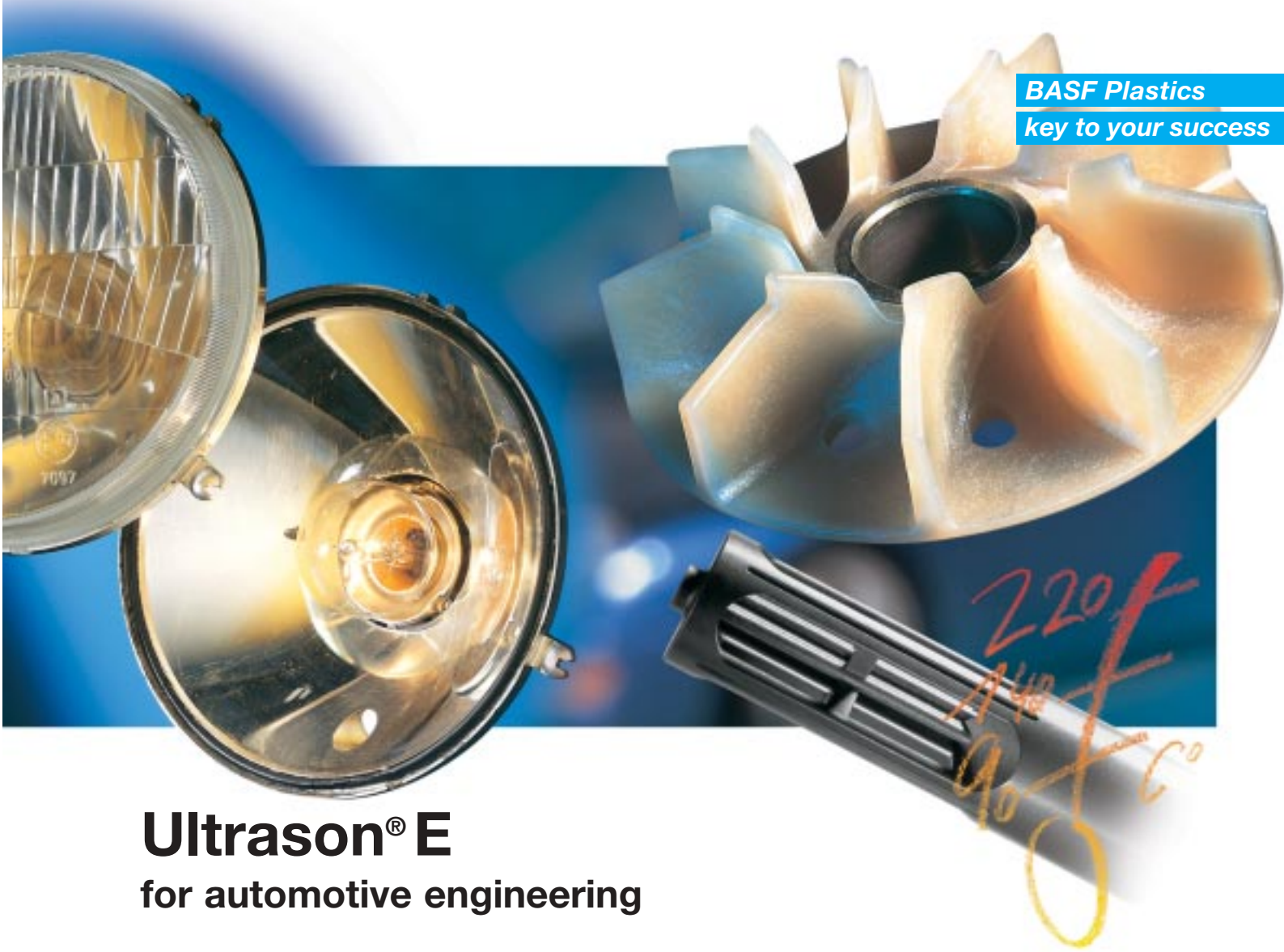
BASF Plastics
key to your success

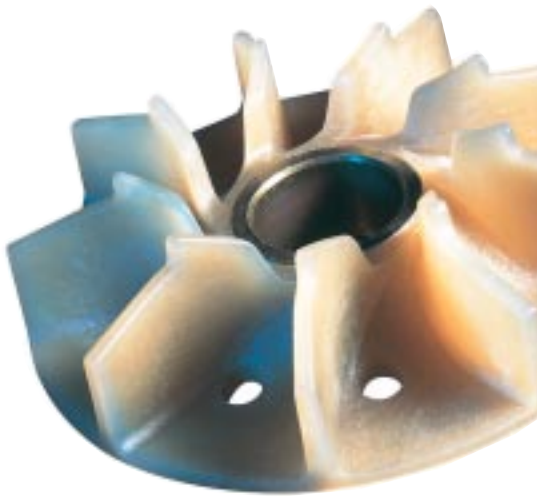


Ultrason® E

for automotive engineering

BASF

Properties of Ultrason E – reliable, even when it's hot



Ultrason E (PES, polyethersulfone) is a high performance material having a temperature profile which is unique among engineering thermoplastics. Apart from its outstanding heat resistance this construction material possesses a multitude of further performance characteristics which in the automotive sector have resulted in a series of applications using Ultrason.

The key features for successful use in the automotive sector are:

- Heat resistance up to 220 °C
- Long-term service temperature of 180 °C
- Dimensional stability
- Creep strength at high temperatures
- Resistance to hot water and coolants
- Resistance to oil, even at temperatures up to 170 °C
- Resistance to fuels
- Resistance to fluorine.

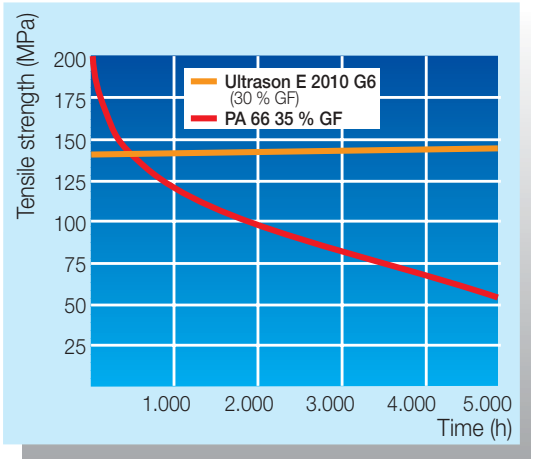


Fig. 1: Tensile strength after immersion in SAE 75 W 90 DES 5080 gear oil at 150 °C

Apart from meeting these preconditions for use in automobile construction, Ultrason affords all the advantages typical of plastics such as low weight and good sound insulation in dynamically stressed parts.

As in the case of other thermoplastics, parts with complex shapes can be produced from Ultrason at low cost by injection molding.

For applications in the areas of cooling water and oil circulation, automotive electronics and on through to areas subjected to high thermal stresses, such as in the heating system or headlights, Ultrason provides innovative and low-cost solutions to problems.

Modified Ultrason grades, such as Ultrason KR 4113 for example, fulfill even the highest demands on sliding and friction properties.

A low-cost polymer blend based on polyethersulfone has been developed in the form of Ultrason KR 4115 which offers many key properties of Ultrason.

Applications

Cooling water circuit

Ultrason E 2010 G6 (30 % glass fibers) is already used successfully in automobile cooling water circuits, e.g. in water pump impellers. The impellers pump the hot mixture of water and coolant (up to 50 % glycol) at temperatures up to 110 °C through the cooling water system. The most important selection criteria are resistance to hydrolysis, dimensional stability and outstanding surface quality.

Dimensional changes in the impellers would alter the narrow clearance between the water pump housing and the impeller and cause deterioration in the throughput and efficiency of the pump. The high toughness of Ultrason E prevents damage to the impeller due to cavitation effects and in this way prevents parts failure.

Oil circuit

Excellent resistance to motor and gear oils and high mechanical strength at temperatures up to 170 °C allow the use of Ultrason E in control units for oil pressure and flow rate, and functional parts in oil pumps.

The modified Ultrason KR 4113 employed here is characterized by low wear in sliding and frictional contact with metal. Compared to control parts made of metal which require expensive machining, production of the oil control piston from Ultrason by injection molding allows massive cost savings. In order to guarantee constant regulation at pressures of up to 20 bar and temperatures between –40 °C and +150 °C the exceptional dimensional stability of Ultrason is indispensable.

Oil control piston

Pump impeller

Automobile fuses

Automotive electrical systems
Excellent resistance to thermal and chemical effects combined with the typical electrical insulating properties of plastics mark out Ultrason E 2010 for use in highly stressed automotive fuse boxes. The transparency of the box permits simple diagnosis of faults by means of rapid visual inspection.

Headlight reflectors
High demands are made on light quality in automobiles and hence on the quality of the reflectors in the main headlights. High resistance to heat (up to 220 °C) and dimensional stability (low coefficient of expansion) over the entire temperature range guarantee adherence to the specification for light distribution from headlights. Dimensionally accurate free-form reflectors can also be produced without difficulty.

The excellent surface quality of Ultrason and the ease with which it can be metallized even without an undercoating are particularly important for this application.

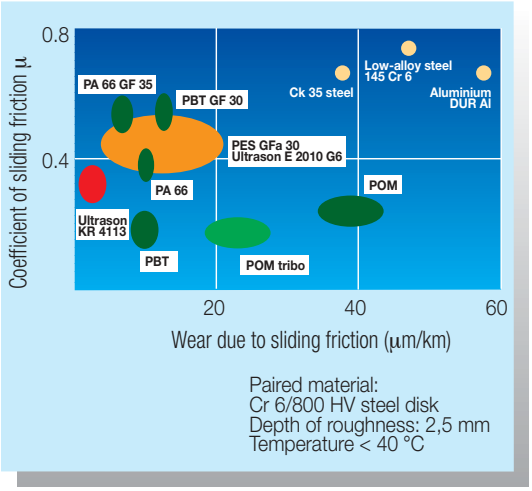
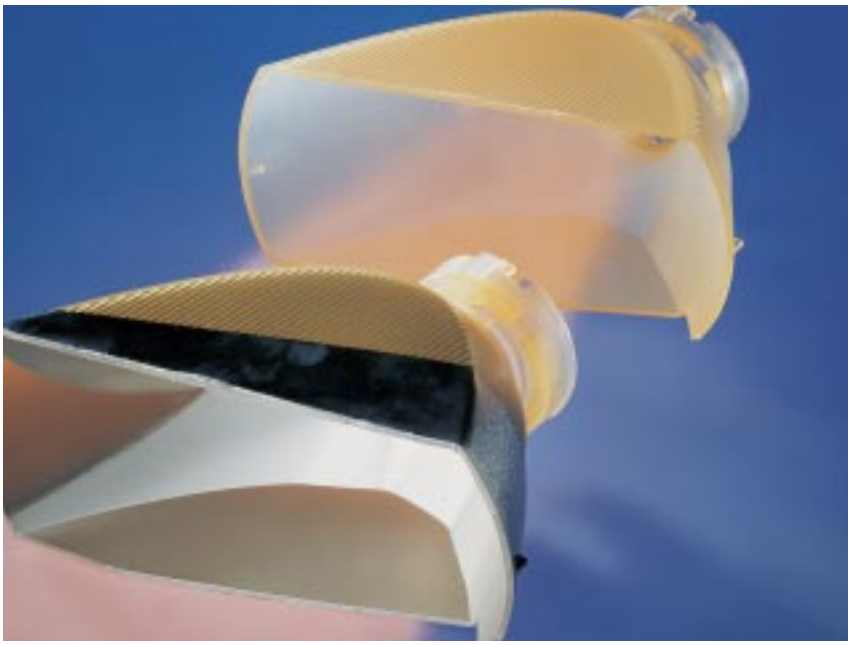


Fig. 2: Tribological properties of various materials



Headlight Reflector

Transmission systems
Ultrason E 2010 G6 (30 % glass fibers) is also employed for plugs in transmission systems. The reason for using Ultrason is its combination of electrical properties and excellent resistance to hot oils. Following successful tests there are plans to use further Ultrason parts in transmission systems. In this case the important considerations are its high rigidity, dimensional stability at high temperatures (up to 170 °C) and low oil absorption.

Fuel tank
In order to stay within the prescribed limits for gasoline permeability, plastic tanks are fluorinated. The materials used for fitted parts must, therefore, be resistant to fluorine. Parts made from Ultrason meet this requirement without difficulty.

Other applications

In addition to the examples quoted, Ultrason has proved to be effective in a large number of further applications. Whether used, for example, for cable clips or for lamp mountings in cigarette lighters Ultrason as design material stands up to the demanding technical conditions.

Products	Description			
	Extremely free-flowing injection molding grade	Free-flowing injection molding grade	Injection molding and -extrusion grade	Reinforced products
Ultrason E Polyethersulfone	E 1010	E 2010	E 3010	E 1010 + 20, 30% GF E 2010 + 20, 30% GF KR 4113 (E 2010+10 % CF +10 % C+10 % PTFE) KR 4115 (polymer blend based on PES, + 30 % GF)

Properties	Test method	Unit	E 2010	E 2010 G6	KR 4113	KR 4115
Filler content		%	–	30	30	30
Density	ISO 1183	g/cm^3	1.37	1.60	1.50	1.52
Moisture absorption, saturation at 23 °C, 50 % rel. humidity	ASTM D570	%	0.7	0.5	0.6	
Mechanical properties						
Tensile modulus of elasticity	ISO 527	MPa	2 700	10 200	10900	11500
Yield/breaking stress* 50 mm/min (5 mm*)	ISO 527	MPa	90	140*	104*	180*
Elongation at yield/break* 50 mm/min (5 mm*)	ISO 527	%	6.7	1.9*	1.3*	2.1*
Tensile creep modulus, 1000 h, elongation <0.5% 140 °C/160 °C*	ISO 899	MPa	900*	4 500*		
Charpy impact strength 23 °C/-30 °C	ISO 1791eU	kJ/m^2	NB / NB	37/30	18/-	50/-
Charpy notched impact strength at 23 °C	ISO 1791eA	kJ/m^2	6	8	5	8
Izod notched impact strength at 23 °C	ISO 180/1A	kJ/m^2	6	8		
Ball indentation hardness						
H358/30, H961/30*	ISO 2039/1	MPa	148	221*	174	
Thermal properties						
Heat deflection temperature under load 0,45 MPa (HDT B)	ISO 75	°C	208	215	224	201
Max. service temperature, for up to several hours		°C	220	220	220	210
Temperature limit for 50% loss in tensile strength after 20,000 h	ISO 2578	°C	180	190	180	
Coefficient of linear expansion, longitudinally 23 – 80 °C	DIN 53752	1/K	5.5 x 10^{-5}	2.1 x 10^{-5}	1.1 x 10^{-5}	1.6 x 10^{-5}
Electrical properties						
Dielectric constant at 100 Hz/1 MHz	ISO 250		3.9/3.8	4.3/4.3		
Dissipation factor 100 Hz/1 MHz	ISO 250		0.0017/0.014	0.002/0.01		
Volume resistivity	ISO 93	Ω · cm	>10^{16}	>10^{16}		
Surface resistivity	ISO 93	Ω	>10^{14}	>10^{14}		

Do you have any technical questions about Ultrason?

We will be happy to give you answers at our Ultra-Infopoint:

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Ultra-Infopoint

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Do you have any general questions about BASF plastics?
Visit our homepage:
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