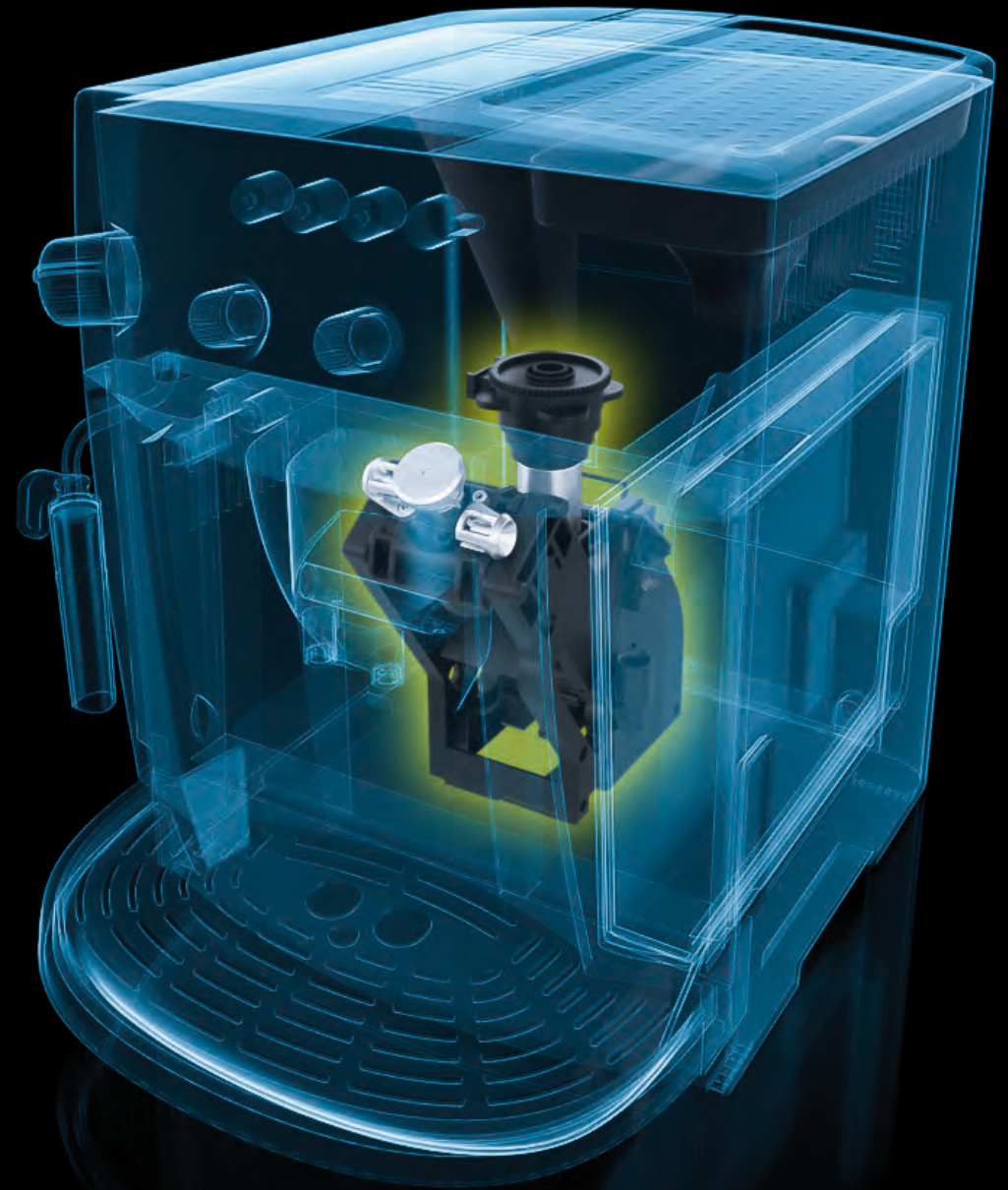




# Ultrason<sup>®</sup> E, S, P (PESU, PSU, PPSU)

High-Performance Plastic



# Ultrason® E, S, P (PESU, PSU, PPSU) – Specialty polymers for high-quality products

BASF's Ultrason® grades are transparent, high-temperature resistant, amorphous thermoplastics derived from polysulfone (PSU), polyethersulfone (PESU) and polyphenylsulfone (PPSU). Their wide spectrum of properties allows them to be molded into high-quality engineering parts and highly stressed mass-produced articles. They can be processed by almost all the techniques adopted for thermoplastics.

This combination of features, coupled with ease of fabrication, has enabled Ultrason® to be applied in a wide and increasingly diversified range of applications. Ultrason® can be successfully used for applications in which other plastics, such as polyamide (PA), polycarbonate (PC), polyoxymethylene (POM) or polyalkylene terephthalates (PET, PBT), fail to meet the requirements. By virtue of their extraordinary versatility, Ultrason® resins can substitute thermosets, metals and ceramics.

## The key features of Ultrason® are:

- Specified range of temperature resistance -40 °C to 225 °C
- Excellent chemical resistance (e. g. to water, acids, NaOCl, caustic soda)
- Excellent hydrolysis resistance
- Temperature-independent properties
- High long-term service temperature up to 180 °C
- Good dimensional stability/High stiffness
- High mechanical strength
- Good electrical insulation properties
- Favorable dielectric properties
- Inherent anti-flame retardant properties



BASF plant in Yeosu, Korea

## Contents

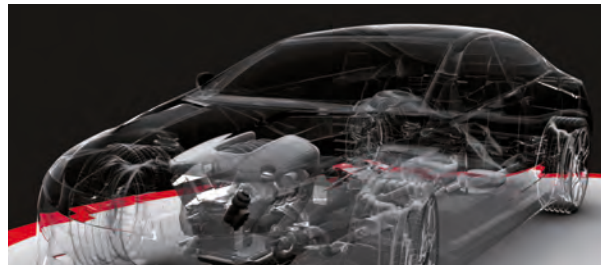
Product Overview 4

### Ultrason® Applications

Aerospace 6



Automotive 8



Electrical & Electronics 12



Household & Catering 14



Sanitary & Water 18



Other Applications 20



Nomenclature 22

# Product Overview

PESU	PSU	PPSU	Characteristic features
<b>unreinforced</b>			
E 1010			low viscosity, easy-flowing (injection molding)
E 2010*	S 2010		medium viscosity, standard grade (injection molding, film extrusion, blow molding)
E 2020 P			medium viscosity (coatings, membranes, toughness modification)
E 2020 P SR			medium viscosity with OH end groups (coatings, toughness modification of composites)
E 3010*	S 3010*	P 3010	higher viscosity, very good chemical resistance and toughness (injection molding, extrusion)
E 6020 P	S 6010		high viscosity, (membrane applications)
<b>reinforced</b>			
E 2010 G4	S 2010 G4		20 % GF; Increased stiffness and strength
E 2010 G6	E 2010 G6		30 % GF; Increased stiffness and strength
KR 4113			medium viscosity, carbon-fiber reinforced, tribologically optimized (injection molding)
E 0510 G9 Dimension			very low viscosity, excellent dimensional stability
E2010 C6			30% carbon-fiber reinforced, very high stiffness; metal substitutes (injection molding)

\*these products are also available with optimized demolding properties

---

# Ultrason® E, S, P

## Selection guideline

### Ultrason® E (PESU)

- Higher temperature requirements
- Higher requirements in mechanical properties (modulus, tensile)
- Parts are exposed to non-polar solvents or chemicals (gasoline, oil, fat etc.)
- Higher requirements in flame retardancy

### Ultrason® S (PSU)

- Less demanding temperature requirements
- Higher clarity required
- Good crack resistance towards repeated cycle of sterilization
- Parts are exposed to polar solvents/chemicals (i. e. water, salt)

### Ultrason® P (PPSU)

- High stress crack resistance is needed (especially with water and steam like in superheated steam sterilization)
- High notched impact resistance is needed
- Requirements in flame retardancy are higher

# Aerospace

The increasing trend toward metal replacement and lightweight engineering will provide a further stimulus for sulfone polymers. The aerospace industry has been showing keen interest in these materials as the inherent outstanding flame resistance of sulfone polymers is in great demand in this sector.



# Meet the strict aerospace requirements

## Most used grades

- Ultrason® E
- Ultrason® E 2010 P SR
- Ultrason® P 3010

## Key features

- FAR 25 compliant (due to the inherent flame resistance)
- High stiffness and strength
- Extremely high toughness (Ultrason® P)
- High long-term service temperatures up to 180 °C
- Temperature-independent properties over a wide range

## Aerospace materials



Unreinforced	Natural, black, pigmented
Reinforced	Glass fiber, standard/long carbon fiber
Forms	Flakes, pellets, functionalized powder
Semi-finished	Foam, sheet, UD tape, RTL

## Applications

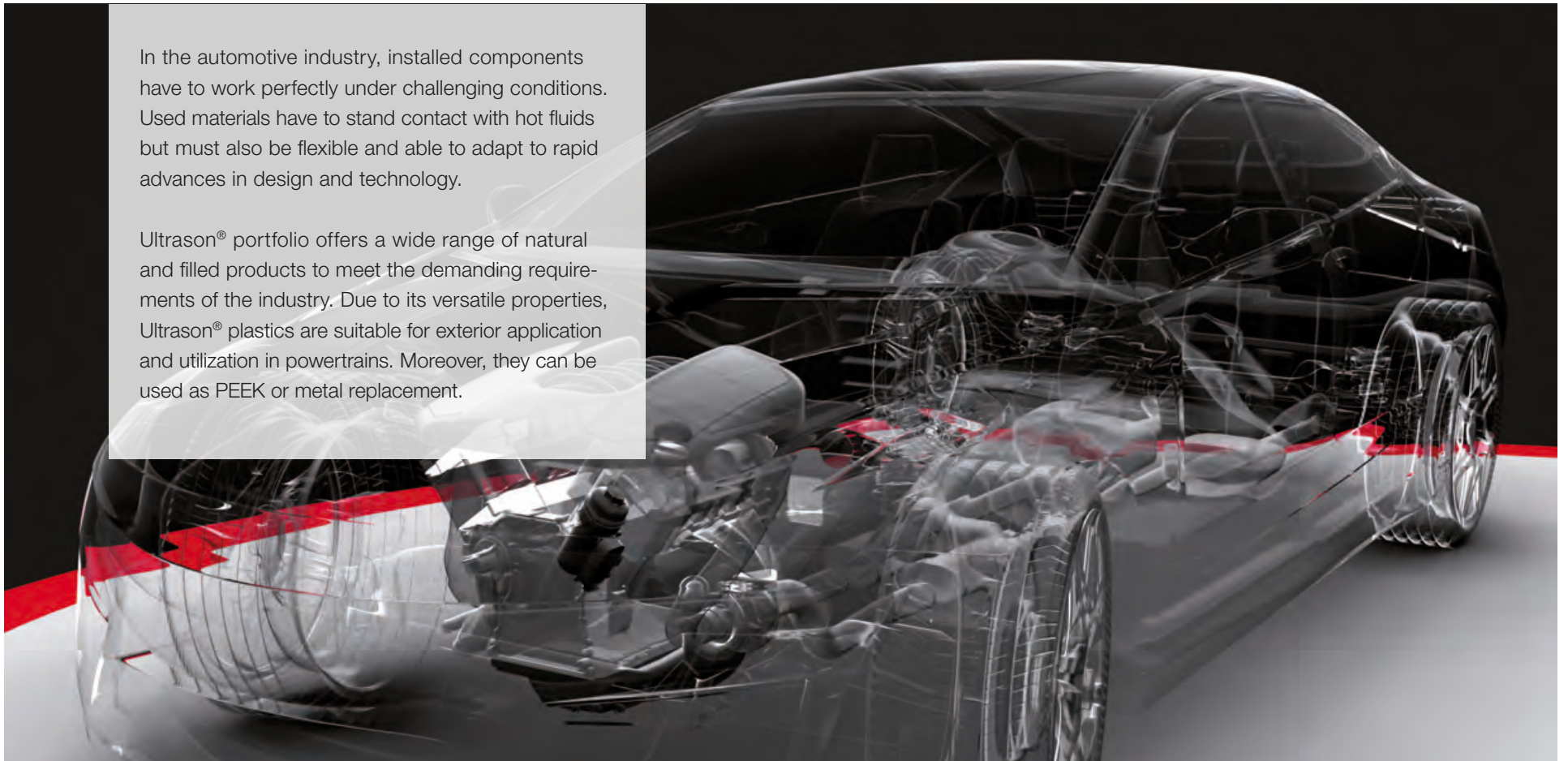
- Cabin interior, i. e. Divinylcell foam
- Seating components
- Food utensils
- Trolleys
- Insulation material



# Automotive

In the automotive industry, installed components have to work perfectly under challenging conditions. Used materials have to stand contact with hot fluids but must also be flexible and able to adapt to rapid advances in design and technology.

Ultrason® portfolio offers a wide range of natural and filled products to meet the demanding requirements of the industry. Due to its versatile properties, Ultrason® plastics are suitable for exterior application and utilization in powertrains. Moreover, they can be used as PEEK or metal replacement.





# Reliable, even when it's hot

## Most used grades

### Exterior

- Ultrason® E 2010 nat
- Ultrason® E 2010 MR black HM

### Powertrain

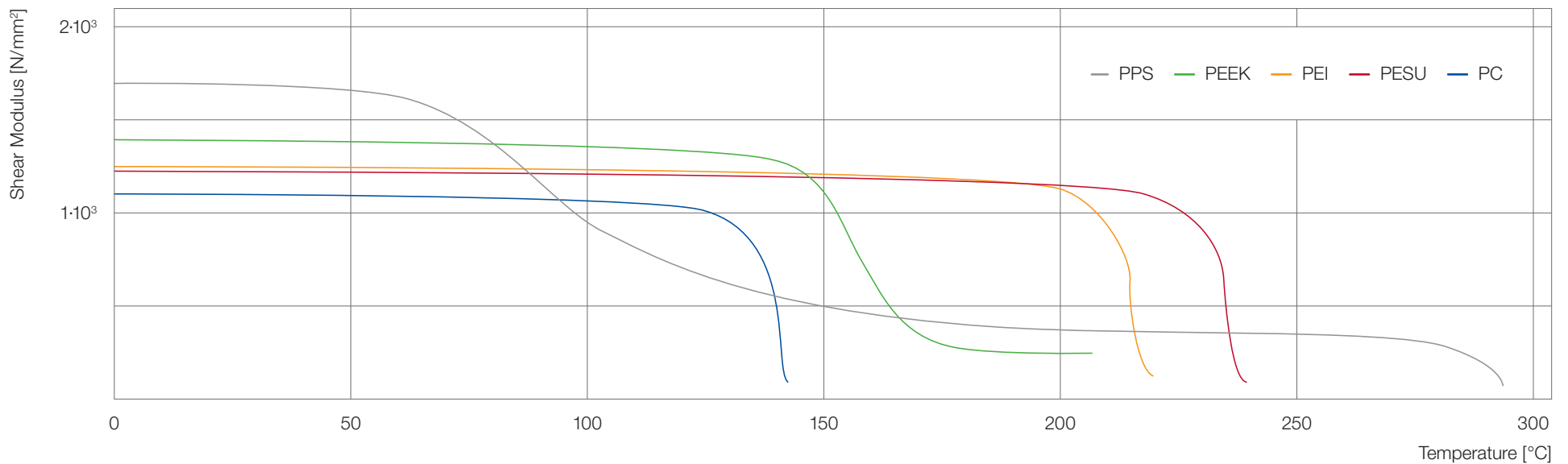
- Ultrason® E2010 G6
- Ultrason® KR 4113
- Ultrason® Dimension E 0510 G9 black

## Key features

- High thermal and chemical resistance (long-term up to 180°C)
- Oil resistant at high temperatures
- High dimensional stability
- Excellent surface quality
- Ease metallization
- Good demolding behavior

## Ultrason® E vs other thermoplastics

### Glass transition temperature



## Autolighting

### Foglamps and headlamps

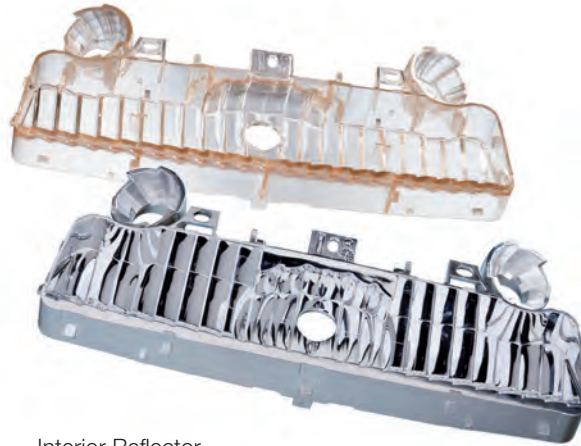
Ultrason® E 2010

Ultrason® E 2010 MR HM

- Reduced heat build-up and lower surface temperature with special pigmentation



Foglamp  
Golf 5 Volkswagen



Interior Reflector  
BMW 5 and 7 series



Bezel for head lamp



Oil pump with oil control piston



## Powertrain

### Engine oil circulation systems

Ultrason® KR 4113

- Tribological properties with improved wear resistance
- Wide temperature range from -30°C to 200°C

### Cooling water circuit

Ultrason® E 2010 G6

- Resistance to hydrolysis
- High toughness

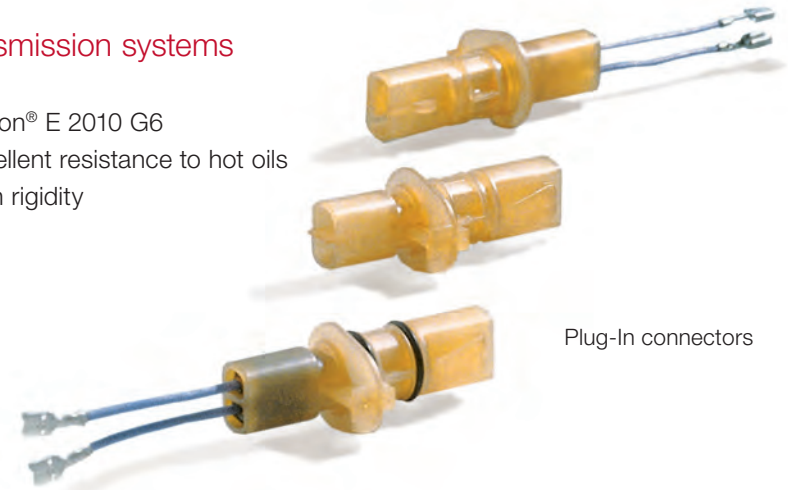


Pump impeller

### Transmission systems

Ultrason® E 2010 G6

- Excellent resistance to hot oils
- High rigidity



Plug-In connectors



### Fuse cover

Ultrason® E 2010

- Good transparency
- Inherent flame retardant properties

## Electrical & Electronics

In the field of electrical & electronics, the manufactured components have to work reliably and accurately while meeting safety requirements.

Therefore, Ultrason® is inherently flame-retardant and in many formulations requires no additional means of protection to achieve UL 94 V-0, starting at a thickness of 1.5mm. In combination with its versatile property profile including good electrical insulation or high heat-aging resistance and good hydrolysis, Ultrason® is particularly suitable for highly stressed components. A further advantage is the material's flexibility: It offers high accuracy and therefore allows the use in complex and innovative designs.



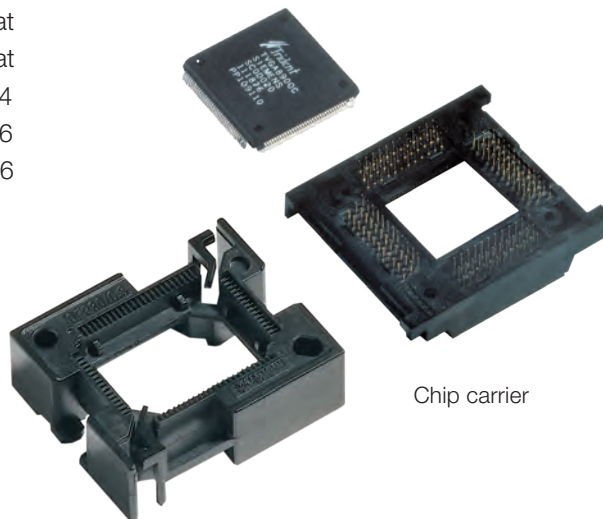
## Custom-fit to the smallest detail

### Key features

- Applicable over a wide temperature range from -50 to +180 °C
- High creep strength
- Excellent dimensional stability
- High heat deflection temperature
- High impact resistance
- Inherent flame retardancy

### Most used grades

- Ultrason® E 2010 nat
- Ultrason® E 3010 nat
- Ultrason® E 2010 G4
- Ultrason® E 2010 G6
- Ultrason® S 2010 G6



Chip carrier

### Applications

#### Latches for circuit breakers

- Ultrason® E 2010 G4

#### Chip carrier

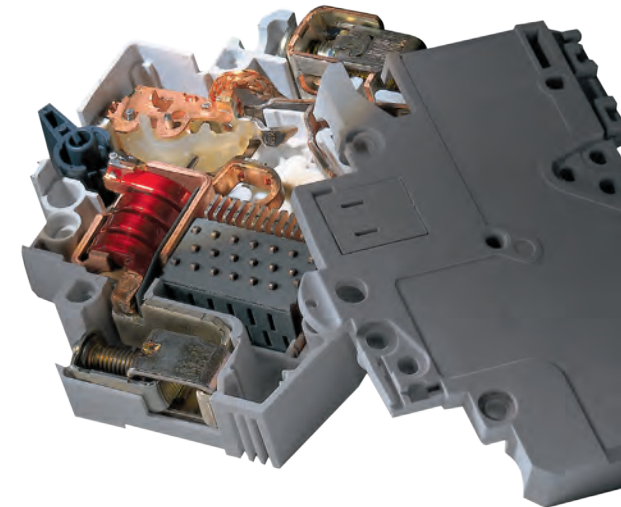
- Ultrason® E 2010 G4

#### Electrical

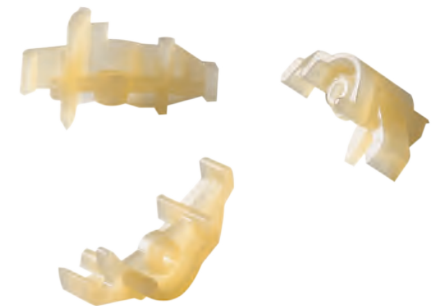
- MCB
- IC tray, test sockets
- Heat shields, sensors
- Plug connectors, cable jacketing

#### Electronics

- Base film for MEMS
- Flexible displays
- E-cigarette
- Impeller in vacuum cleaner



Latches for circuit breakers



## Household & Catering

Our food, it seems, is always touching plastic. Plastics play a part in every phase of food production and preparation. Ultrason® offers a safe option for product designs where aesthetics and functionality are equally important. On the one hand, its transparent color and good processability allow freedom of design. Once in use, Ultrason® products stay in shape and do not absorb odors and food stains.

On the other hand, processing Ultrason® creates a reusable and recyclable product that is able to withstand over 1,000 cycles of steam sterilization/cleaning without any significant loss of properties. The material is approved for direct food contact and can be used as a substitute for glass, metal ceramics and porcelain.



## Safety and aesthetics, always like new

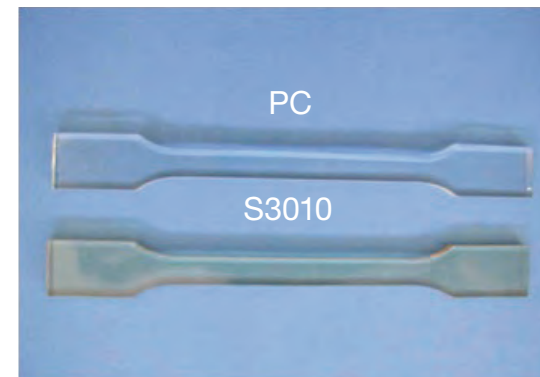
### Most used grades

- Ultrason® E 1010 unc.
- Ultrason® E 2010 nat
- Ultrason® E 2010 Q26
- Ultrason® E 2010 white
- Ultrason® E 2020 P SR
- Ultrason® E 3010 nat
- Ultrason® S 3010
- Ultrason® P 3010

### Key features

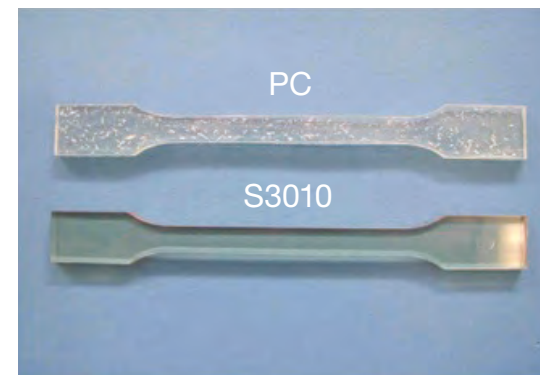
- Transparency
- Excellent resistance to grease, fats, steam and detergents
- Dimensional stability
- High temperature resistance
- Dish washer and microwave proof
- Tough, high strength and stiffness
- Food contact compliance (FDA and EU)

Excellent hydrolysis resistance in 100 °C water for  $\geq 1000$  hr  
Ultrason® S3010 vs Polycarbonate (PC)



Reference sample

Internal Stress Cracks within 1000h in PC  
No visible change in Ultrason



After 1000h at 100 °C

## Applications



Airplane dishes

### Cover of handpresso

- Ultrason® E 2010
- Good transparency
  - High impact resistance



Handpresso

### Pan/Lid of microwave container

- Ultrason® E2010/E3010
- Permeability to microwave



Microwave dish



### Cover of air fryer

- Ultrason® E 2010
- Good transparency
  - High temperature resistance



## Special grade: Ultrason® E 2020 P SR



### Requirements

- High Tg of 225 °C
- Limiting oxygen index (LOI): 38 %
- Solubility in NMP, DMAc, DMF etc.
- SR and SR micro: OH-groups of total end groups > 50 % ( typically > 70 %)
- SR micro: powder for easier dissolution with particle size < 100 μm

### Non-stick applications and coatings

- Coupling agent to metal surfaces, i.e. PTFE
- Chemically resistant coating component



Non-stick coated pan

## Sanitary & Water

Considering prudent public health, global regulations restrict the use of lead and heavy metals in drinking water systems. Ultrason® eliminated them entirely to offer a safer and more durable alternative choice of highly stressed and longevity requirements.

Ultrason® S (PSU) displays excellent hydrolysis resistance even at high temperatures. Ultrason® P (PPSU) also has an exceptionally high level of impact strength which is shown among other things in very high stress cracking resistance. The portfolio therefore includes materials which are approved for contact with cold, warm or hot water.

**Certificates:**

KTW | DVGW W270 | WRAS | ACS | NSF



## Clean water, healthy future

### Most used grades

- Ultrason® E 2010 nat
- Ultrason® E 2010 G6 unc.
- Ultrason® S 2010 nat
- Ultrason® S 3010 nat
- Ultrason® S 6010
- Ultrason® P 3010 MR bk, wt, gr

### Key features

- Resistance to hydrolysis at over 110°C
- High dimensional stability when immersed in water
- Good resistance to anti corrosion additives
- High level of mechanical properties, i.e. impact resistance
- High long-term hydrostatic strength (LTHS)



Pump impeller

### Applications

- Faucets
- Circulator pumps (heating system)
- Fittings for water supply and waste water
- Fittings for heating system
- Flow meter and components of flow meter
- Drinking water filter



Fittings

### Fitting

Ultrason® P 3010

- Excellent resistance to superheated steam (134°C)
- High toughness

## Other Applications

Ultrason® mechanical properties in combination with its thermal and chemical resistance make Ultrason® superior to most other polymers. Due to the material's flexible characteristics, it is used in a wide range of applications. As we are constantly improving our products and portfolio, further possibilities grow every day and the list of exemplary applications keeps getting longer.



## Integrated Solutions

BASF offers its customers more than just products. You will find technical resources & consulting aimed at helping you in answering technical questions related to BASF Plastics, e.g.

- Ultrajoin™ and Ultratest™, providing a complete development environment starting from design support and CAE methods in the early stages up to validation experiments and experimental parts optimization in the later phases.
- Ultrasim®, the versatile and flexible CAE tool from BASF for innovative parts using BASF plastics.

### Spectacle frame

Ultrason® E 2010

- High rigidity and flexibility



### Firefighter's helmet

Ultrason® E 2010

- High transparency
- Very good fire behavior

# Nomenclature

## Structure

The nomenclature adopted for the products consists of an alphanumeric code, the key to which is given below. An appended “P” signifies that the product concerned is a specialty intended for the preparation of solutions.

### 1<sup>st</sup> digit (letter): type of polymer

E = Polyethersulfone (PESU)  
S = Polysulfone (PSU)  
P = Polyphenylsulfone (PPSU)

### 2<sup>nd</sup> digit (number): viscosity class

1 ... = low viscosity  
6 ... = high viscosity

### 6<sup>th</sup> digit (letter): reinforcements

G = glass fibers  
C = carbon fibers

### 7<sup>th</sup> digit (number): proportion of additives

2 = mass fraction of 10%  
4 = mass fraction of 20%  
6 = mass fraction of 30%

## Example

E	2	0	1	0	G	6
1 <sup>st</sup> digit	2 <sup>nd</sup> digit	3 <sup>rd</sup> digit	4 <sup>th</sup> digit	5 <sup>th</sup> digit	6 <sup>th</sup> digit	7 <sup>th</sup> digit

e. g. Ultrason® E 2010 G6

E = Polyethersulfon (PESU)  
2 = of medium viscosity  
(standard injection-molding grade)  
G6 = 30 % by weight of glass fibers



## Selected Product Literature for Ultrason®:

- Ultrason® E, S, P – Product Range
- Ultrason® – Resistance to Chemicals
- Ultrason® – Products for the Automotive Industry
- Ultrason® – Injection Molding
- Ultrason® – Special Products
- Ultrason® – A Versatile Material for the Production of Tailor-made Membranes
- Engineering Plastics for the E&E Industry – Standards and Ratings
- Engineering Plastics for the E&E Industry – Products, Applications, Typical Values
- Engineering Plastics for Automotive Electrics – Products, Applications, Typical Values
- From the Idea to Production – The Aqua® Plastics Portfolio for the Sanitary and Water Industries

### Please visit our websites:

[www.plasticsportal.com](http://www.plasticsportal.com) (World)  
[www.plasticsportal.eu](http://www.plasticsportal.eu) (Europe)

### Additional information on specific products:

[www.plasticsportal.eu/name\\_of\\_product](http://www.plasticsportal.eu/name_of_product)  
e.g. [www.plasticsportal.eu/ultrason](http://www.plasticsportal.eu/ultrason)

### Request of brochures:

PM/K, F204  
Fax: +49 621 60-49497

**If you have technical questions on the products,  
please contact the Ultra-Infopoint:**



### Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (October 2017)