

Ultrason[®] E, S, P (PESU, PSU, PPSU)

Product Range



Ultrason[®] in the web: www.ultrason.de

 **BASF**

The Chemical Company

Ultrason® E, S, P

The Ultrason® resins are amorphous thermoplastics derived from polyethersulfone (PESU), polysulfone (PSU) and polyphenylsulfone (PPSU) and offer very high resistance to heat. Their wide spectrum of beneficial properties allows them to be molded into high-quality engineering parts and high-load mass-produced articles. They can be processed by almost all the techniques adopted for thermoplastics. Ultrason® can be successfully used for applications in which other plastics, e. g. polyamide, polycarbonate, polyoxymethylene and polyalkylene terephthalates, fail to meet the requirements. By virtue of their extraordinary versatility, Ultrason® resins can substitute thermosets, metals and ceramics.

Ultrason® E, S, P

ULTRASON® E, S, P	04
Main features	04
<hr/>	
ULTRASON® GRADES	06
Reinforced grades	06
Unreinforced grades	08
<hr/>	
NOMENCLATURE	10
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Ultrason® E, S, P

Main features

- Temperature independent properties
- Very high long-term service temperatures
- Good dimensional stability
- High modulus
- High mechanical strength
- Good electrical insulation properties
- Good dielectrical properties
- Very good fire behaviour
- Superior hydrolysis resistance



Headlight bezel



Firefighter's helmet

Unreinforced grades	
Ultrason® E 1010	Injection-molding grade of low viscosity and good flowability
Ultrason® E 2010	Standard injection-molding grade of medium viscosity
Ultrason® E 2020 P	Polyethersulfone flakes, for solvent based processes; product is soluble e. g. in N-Methylpyrrolidone and N,N-Dimethylacetamide
Ultrason® E 3010	Higher viscosity injection-molding and extrusion grade with improved toughness and chemical resistance (stress crack resistance)
Ultrason® E 6020 P	Polyethersulfone flakes of high molecular weight and good solubility in typical solvents (N-Methylpyrrolidone, Dimethylacetamide, Dichloro methane) used e. g. in the production of membranes or coatings
Ultrason® S 2010	Injection-molding grade of low viscosity and good flowability
Ultrason® S 3010	Medium viscosity injection-molding and extrusion grade with improved toughness and chemical resistance (stress crack resistance); with reduced oligomer content
Ultrason® S 6010	High molecular weight injection-molding and extrusion grade with excellent chemical resistance (stress crack resistance) and good solubility in typical solvents (N-Methylpyrrolidone, Dimethylacetamide, Dichloro methane) used e. g. in the production of membranes or coatings, with reduced oligomer content
Ultrason® P 3010	Medium viscosity injection-molding and extrusion grade with superior toughness and chemical resistance (stress crack resistance), resistant against superheated steam
Reinforced grades	
Ultrason® E 2010 G4	Medium viscosity injection-molding grade of high modulus and strength, reinforced with 20% glass fiber
Ultrason® E 2010 G6	Medium viscosity injection-molding grade of high modulus and strength, reinforced with 30% glass fiber
Ultrason® E 2010 C6	Polyethersulfone, 30% carbon-fiber-reinforced; grade with extreme high modulus also at temperatures up to 200°C
Ultrason® S 2010 G4	Low viscosity injection-molding grade of high modulus and strength, reinforced with 20% glass fiber
Ultrason® S 2010 G6	Low viscosity injection-molding grade of high modulus and strength, reinforced with 30% glass fiber

Table 1: Ultrason® commercial products



Bundle of hollow fibers

Ultrason® Grades

Reinforced grades

Typical values at 23°C for uncolored products	Unit	Test method	S 2010 G4	
Features				
Symbol	–	ISO 1043	PSU-GF20	
Density, apparent density*	g/cm ³	ISO 1183	1.38	
Viscosity number ¹⁾	cm ³ /g	ISO 1628	63	
Water absorption, equilibrium in water at 23°C	%	similar ISO 62	0.7	
Moisture absorption, equilibrium 23°C/50% r. H.	%	similar ISO 62	0.2	
Processing				
Injection Molding (M), Extrusion (E), Blow Molding (B)	–	–	M, E	
Glass transition temperature, DSC (10°C/min)	°C	ISO 11357-1/-2	187	
Melt volume rate MVR 360°C/10 kg	cm ³ /10 min	ISO 1133	40	
Melt temperature, injection molding	°C	–	350-390	
Mold temperature, injection molding	°C	–	130-180	
Molding shrinkage, in direction of flow	%	ISO 294	0.31	
Molding shrinkage, perpendicular to flow	%	ISO 294	0.52	
Fire behavior				
Burning behavior at 1.6 mm thickness	class	UL 94	V-1	
Burning behavior at 3.2 mm thickness	class	UL 94	V-0	
Mechanical properties				
Tensile modulus	MPa	ISO 527-2	6,600	
Tensile stress at yield (v=50 mm/min), stress at break* (v=5 mm/min)	MPa	ISO 527-2	115*	
Elongation at yield (v=50 mm/min), elongation at break* (v=5 mm/min)	%	ISO 527-2	2.9*	
Charpy impact strength ²⁾	+23°C	kJ/m ²	ISO 179/1eU	50
Charpy impact strength ²⁾	-30°C	kJ/m ²	ISO 179/1eU	55
Charpy notched impact strength	+23°C	kJ/m ²	ISO 179/1eA	8
Charpy notched impact strength	-30°C	kJ/m ²	ISO 179/1eA	8
Izod notched impact strength	+23°C	kJ/m ²	ISO 180/A	8
Izod notched impact strength	-30°C	kJ/m ²	ISO 180/A	8
Ball indentation hardness H 358/30	MPa	ISO 2039-1	–	
Ball indentation hardness H 961/30	MPa	ISO 2039-1	170	
Thermal properties				
Heat deflection temperature 1.8 MPa (HDT/A)	°C	ISO 75-2	184	
Temperature index (short cycle operations) ³⁾	°C	–	180	
Relative temperature index related to 50% decrease of tensile strength after 20,000 h	°C	UL 746B	160	
Coefficient of linear thermal expansion, longitudinal (23-80)°C	10 ⁻⁴ /K	ISO 11359-1/-2	0.26	
Coefficient of linear thermal expansion, longitudinal 140/180°C	10 ⁻⁴ /K	ISO 11359-1/-2	0.28/-	
Electrical properties				
Relative permittivity (100Hz/1MHz)	–	IEC 60250	3.5/3.5	
Dissipation factor (100Hz/1MHz)	E-4	IEC 60250	10/60	
Volume resistivity	Ω · cm	IEC 60093	> 10 ¹³	
Surface resistivity	Ω	IEC 60093	> 10 ¹⁴	
Dielectric strength K20/K20	kV/mm	IEC 60243-1 3	46	
Comparative tracking index, CTI, test liquid A	–	IEC 60112	125	
Comparative tracking index, CTI, test liquid B	–	IEC 60112	125	
Optical properties				
Refractive index (specimen thickness = 1 mm)	–	–	–	
Light transmission (specimen thickness = 2 mm)	%	ASTM D 1003	–	

Footnotes

¹⁾ Viscosity number, solution 0.01 g/ml phenol/1,2-dichloro benzene (1:1)

²⁾ N = no break

³⁾ Empirical values determined on articles repeatedly subjected to the temperature concerned for several hours at a time over a period of several years on condition that the articles were properly designed and processed according to BASF recommendations.

⁴⁾ 4-point method, acc. ISO 3915

⁵⁾ BASF measurement

⁶⁾ Flakes with good solubility for coatings and membranes. This grade is not suitable for injection molding and extrusion.

S 2010 G6	E 2010 G4	E 2010 G6	E 2010 C6
PSU-GF30	PESU-GF20	PESU-GF30	PESU-CF30
1.46	1.50	1.59	1.47
63	56	56	56
0.6	1.6	1.6	1.7
0.2	0.6	0.6	0.6
M, E	M, E	M, E	M, E
187	225	225	225
30	29	25	15
350-390	350-390	350-390	350-390
130-180	150-190	150-190	150-190
0.29	0.36	0.28	0.15
0.46	0.61	0.58	0.35
V-1	V-0	V-0	V-0 ⁵⁾
V-0	V-0	V-0	V-0 ⁵⁾
8,900	6,900	9,800	22,000
125*	130*	150*	185*
2.2*	3.2*	2.3*	1.5*
40	60	55	40
45	65	60	40
8.5	8	10	7.5
8.5	8	9.5	6.5
8.5	8	10	8
8.5	8	9.5	7
-	-	-	-
193	205	224	227
185	222	223	225
180	220	220	220
160	180	190	-
0.20	0.20	0.15	0.04
0.25/-	-/0.23	-/0.17	-/0.04
3.7/3.7	4.2/4.2	4.3/4.3	-
10/60	20/100	20/100	-
> 10 ¹³	> 10 ¹³	> 10 ¹³	1.9 ⁴⁾
> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	10 ³
45	37	37	-
125	125	125	-
125	125	125	-
-	-	-	-
-	-	-	-

Ultrason® Grades

Unreinforced grades

Typical values at 23°C for uncolored products	Unit	Test method	S 2010	
Features				
Symbol	–	ISO 1043	PSU	
Density, apparent density*	g/cm ³	ISO 1183	1.23	
Viscosity number ¹⁾	cm ³ /g	ISO 1628	63	
Water absorption, equilibrium in water at 23°C	%	similar ISO 62	0.8	
Moisture absorption, equilibrium 23°C/50% r.H.	%	similar ISO 62	0.3	
Processing				
Injection Molding (M), Extrusion (E), Blow Molding (B)	–	–	M, E, B	
Glass transition temperature, DSC (10°C/min)	°C	ISO 11357-1/-2	187	
Melt volume rate MVR 360°C/10 kg	cm ³ /10 min	ISO 1133	90	
Melt temperature, injection molding	°C	–	330-390	
Mold temperature, injection molding	°C	–	120-160	
Molding shrinkage, in direction of flow	%	ISO 294	0.68	
Molding shrinkage, perpendicular to flow	%	ISO 294	0.72	
Fire behavior				
Burning behavior at 1.6 mm thickness	class	UL 94	HB	
Burning behavior at 3.2 mm thickness	class	UL 94	V-2	
Mechanical properties				
Tensile modulus	MPa	ISO 527-2	2,550	
Tensile stress at yield (v=50 mm/min), stress at break* (v=5 mm/min)	MPa	ISO 527-2	75	
Elongation at yield (v=50 mm/min), elongation at break* (v=5 mm/min)	%	ISO 527-2	6	
Charpy impact strength ²⁾	+23°C	kJ/m ²	ISO 179/1eU	N
Charpy impact strength ²⁾	-30°C	kJ/m ²	ISO 179/1eU	N
Charpy notched impact strength	+23°C	kJ/m ²	ISO 179/1eA	5.5
Charpy notched impact strength	-30°C	kJ/m ²	ISO 179/1eA	6
Izod notched impact strength	+23°C	kJ/m ²	ISO 180/A	5.5
Izod notched impact strength	-30°C	kJ/m ²	ISO 180/A	6
Ball indentation hardness H 358/30	MPa	ISO 2039-1	135	
Ball indentation hardness H 961/30	MPa	ISO 2039-1	–	
Thermal properties				
Heat deflection temperature 1.8 MPa (HDT/A)	°C	ISO 75-2	176	
Temperature index (short cycle operations) ³⁾	°C	–	180	
Relative temperature index related to 50% decrease of tensile strength after 20,000 h	°C	UL 746B	155	
Coefficient of linear thermal expansion, longitudinal (23-80)°C	10 ⁻⁴ /K	ISO 11359-1/-2	0.53	
Coefficient of linear thermal expansion, longitudinal 140/180°C	10 ⁻⁴ /K	ISO 11359-1/-2	0.6/-	
Electrical properties				
Relative permittivity (100Hz/1MHz)	–	IEC 60250	3.1/3.1	
Dissipation factor (100Hz/1MHz)	E-4	IEC 60250	8/64	
Volume resistivity	Ω · cm	IEC 60093	> 10 ¹³	
Surface resistivity	Ω	IEC 60093	> 10 ¹⁴	
Dielectric strength K20/K20	kV/mm	IEC 60243-1 3	40	
Comparative tracking index, CTI, test liquid A	–	IEC 60112	125	
Comparative tracking index, CTI, test liquid B	–	IEC 60112	125	
Optical properties				
Refractive index (specimen thickness = 1 mm)	–	–	1.63	
Light transmission (specimen thickness = 2 mm)	%	ASTM D 1003	89	

Footnotes

¹⁾ Viscosity number, solution 0.01 g/ml phenol/1,2-dichloro benzene (1:1)

²⁾ N = no break

³⁾ Empirical values determined on articles repeatedly subjected to the temperature concerned for several hours at a time over a period of several years on condition that the articles were properly designed and processed according to BASF recommendations.

⁴⁾ 4-point method, acc. ISO 3915

⁵⁾ BASF measurement

⁶⁾ Flakes with good solubility for coatings and membranes. This grade is not suitable for injection molding and extrusion.

S 3010	S 6010	E 1010	E 2010	E 2020 P	E 3010	E 6020 P	P 3010
PSU	PSU	PESU	PESU	PESU	PESU	PESU	PPSU
1.23	1.23	1.37	1.37	0.23*	1.37	0.23*	1.29
72	81	48	56	56	66	82	71
0.8	0.8	2.2	2.2	–	2.2	–	1.2
0.3	0.3	0.8	0.8	1.0	0.8	1.0	0.6
M, E, B	M, E	M, E	M, E, B	⁶⁾	M, E, B	⁶⁾	M, E
187	187	222	225	225	228	225	220
40	30	150	70	–	35	–	20
330-390	330-390	340-390	340-390	–	350-390	–	350-390
120-160	120-160	140-180	140-180	–	140-180	–	140-180
0.70	0.72	0.79	0.82	–	0.85	–	0.90
0.74	0.77	0.82	0.86	–	0.90	–	1.00
HB	–	V-1	V-0	–	V-0	–	V-0 ⁵⁾
V-2	–	V-0	V-0	–	V-0	–	V-0 ⁵⁾
2,550	2,550	2,650	2,650	2,650	2,650	2,650	2,270
75	75	85	85	85	85	85	74
6	5.7	6.8	6.9	6.9	6.9	6.9	7.8
N	N	N	N	–	N	–	N
N	N	N	N	–	N	–	N
5.5	6	6.5	7	–	8	–	75
6	6.5	7	7.5	–	8	–	25
5.5	6	6.5	7	–	8	–	55
6	6.5	7	7.5	–	8	–	25
135	135	154	154	–	154	–	124
–	–	–	–	–	–	–	–
177	177	203	205	205	207	207	198
180	180	220	220	–	220	–	–
155	–	190	190	–	190	–	–
0.53	0.53	0.52	0.52	–	0.52	–	0.55
0.6/-	0.6/-	-/0.59	-/0.59	–	-/0.59	–	-/0.63
3.1/3.1	3.5/3.4	3.9/3.8	3.9/3.8	–	3.9/3.8	–	3.8/3.7
8/64	11/71	17/140	17/140	–	17/140	–	17/89
> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	–	> 10 ¹³	–	> 10 ¹³
> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	–	> 10 ¹⁴	–	> 10 ¹⁴
37	37	37	37	–	34	–	44
125	125	125	125	–	125	–	150
125	–	125	125	–	125	–	–
1.63	–	1.65	1.65	–	1.65	–	–
89	87	88	88	–	88	–	–

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.

1st digit (letter):

type of polymer

E = Polyethersulfone (PESU)

S = Polysulfone (PSU)

P = Polyphenylsulfone (PPSU)

2nd digit (number):

viscosity class

1 ... = low viscosity

6 ... = high viscosity

6th digit (letter):

reinforcements

G = glass fibers

C = carbon fibers

7th 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 st digit	2 nd digit	3 rd digit	4 th digit	5 th digit	6 th digit	7 th digit

e.g. Ultrason® E 2010 G6

E = Polyethersulfone (PESU)

2 = of medium viscosity

(standard injection-molding grade)

G6 = 30% by weight of glass fibers



Membranes

Selected Product Literature for Ultrason®:

- Ultrason® E, S, P – Product Brochure
- Ultrason® – Injection molding
- Ultrason® – Resistance to Chemicals
- Ultrason® – Products for the automotive industry
- Ultrason® – Special Products
- Ultrason® – A Versatile Material for the Production of Tailor-made Membranes

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. (July 2013)

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www.plasticsportal.com (World)

www.plasticsportal.eu (Europe)

Additional information on specific products:

[www.plasticsportal.eu/name of product](http://www.plasticsportal.eu/name%20of%20product)

e.g. www.plasticsportal.eu/ultrason

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If you have technical questions on the products,
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