ULTEM™ Resin 1000

Polyether Imide

SABIC

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Technical Data

Product Description

ULTEM 1000 Resin is an unreinforced amorphous polyetherimide (PEI) resin that may offer a high glass transition temperature (Tg) of 217°C. Features are excellent mechanical, electrical and dimensional properties up to high temperatures. The material may offer very good chemical resistance for an amorphous material and is inherently flame retardant offering UL94 V0 and 5V ratings and aerospace FAR 25.853 compliance. The material is RoHS compliant and the natural, uncolored, material is halogen free according to standards IEC 61249-2-21 , IPC 4101E and JEDEC JS709B. For colored variants compliance needs to be checked case by case. The base material is transparent amber colored but is also available in custom colors - transparent and opaque.

ISCC+ certified renewable bio-based solutions are available for this grade via differentiated color nomenclature.

General

Material Status	• Commercial: Active		
Literature [1]	• Brochure - INNOVATIVE ULTEM™ RESINS FOR ADVANCED CONNECTORS (English) • Drones • EZISURG MEDICAL SCALPEL CASE STUDY • ISCC+ CERTIFIED RENEWABLE BIO-BASED ULTEM™ RESINS • SABIC-MOBILITY-ADAS CAMERA FLYER • SABIC-MOBILITY-ADAS LIDAR FLYER • THERMOPLASTIC SOLUTIONS FOR AUTOMOTIVE OIL PUMPS • ULTEM™ RESIN: AN ALTERNATIVE SOLUTION TO SULFONE POLYMERS		
UL Yellow Card [2]	• E121562-101048254		
Search for UL Yellow Card	• SABIC • ULTEM™ Resin		
Availability	• Africa & Middle East • Asia Pacific	• Europe • Latin America	• North America
Features	• Amorphous • Chemical Resistant • Corrosion Resistant • Creep Resistant • Electrically Insulating • Flame Retardant • Good Dimensional Stability • Good Processability	• Halogen Free • High Heat Resistance • High Stiffness • High Strength • Hydrolytically Stable • Low (to None) Ion Content • Low Shrinkage • Low Smoke Emission	• Low to No Outgassing • Low Toxicity • Low Warpage • Platable • Renewable Resource Content • UV Resistant
Uses	• Additive Manufacturing (3D Printing) • Aerospace Applications • Aircraft Applications • Aircraft Interiors • Appliances • Automotive Applications • Automotive Electronics • Automotive Instrument Panel • Automotive Lighting • Automotive Under the Hood • Bearings • Building Materials • Camera Applications • Cell Phones • Communication Applications • Composites • Computer Components • Consumer Applications • Displays • Drone Applications • Electrical Parts • Electrical/Electronic Applications • Energy Storage	• Eyeglasses • Filters • Fluid Handling • Food Packaging • Food Service Applications • Furniture • Gears • Heavy Transportation • Housings • Hygiene • Industrial Applications • Irrigation Applications • Kitchenware • Labware • LEDs • Lighting Applications • Material Handling • Medical Devices • Medical/Healthcare Applications • Military/Defense Applications • Motorcycle Applications • Oil/Gas Applications • Packaging	• Personal Care • Pharmaceutical Packaging • Pharmaceuticals • Piping • Plumbing Parts • Printer • Pump Parts • Rail Applications • Recreational Vehicle Applications • Safety Equipment • Safety Helmets • Sanitary Products • Seats • Semiconductor Applications • Speaker Applications • Sporting Goods • Surgical Instruments • Swimming Pools • Textile Applications • Trays • Water Management • Wire & Cable Applications
Agency Ratings	• ISCC PLUS		
Appearance	• Clear/Transparent	• Translucent	

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General

Processing Method	• Compounding Extrusion • Compression Molding • Extrusion	• Extrusion Blow Molding • Film Extrusion • Foam Extrusion	• Injection Molding • Profile Extrusion

Physical	Nominal Value (English)	Nominal Value (SI)	Test Method
Density / Specific Gravity			
--	1.27	1.27 g/cm³	ASTM D792
--	1.27 g/cm³	1.27 g/cm³	ISO 1183
Melt Mass-Flow Rate (MFR) (337°C/6.6 kg)	9.0 g/10 min	9.0 g/10 min	ASTM D1238
Melt Volume-Flow Rate (MVR) (360°C/5.0 kg)	13 cm³/10min	13 cm³/10min	ISO 1133
Molding Shrinkage			Internal Method
Across Flow : 0.126 in (3.20 mm)	0.50 to 0.70 %	0.50 to 0.70 %	
Flow : 0.126 in (3.20 mm)	0.50 to 0.70 %	0.50 to 0.70 %	
Water Absorption			
24 hr, 73°F (23°C)	0.25 %	0.25 %	ASTM D570 ISO 62
Saturation, 73°F (23°C)	1.3 %	1.3 %	ASTM D570 ISO 62
Equilibrium, 73°F (23°C), 50% RH [4]	0.20 %	0.20 %	ISO 62
Equilibrium, 73°F (23°C), 50% RH	0.70 %	0.70 %	ISO 62
Outdoor Suitability	f2	f2	UL 746C

Mechanical	Nominal Value (English)	Nominal Value (SI)	Test Method
Tensile Modulus			
-- [5]	486000 psi	3350 MPa	ASTM D638
--	464000 psi	3200 MPa	ISO 527-1/1
Tensile Strength			
Yield [6]	16700 psi	115 MPa	ASTM D638
Yield [7]	16000 psi	110 MPa	ASTM D638
Yield	16000 psi	110 MPa	ISO 527-2/50
Tensile Elongation			
Yield [7]	7.0 %	7.0 %	ASTM D638
Yield [6]	7.0 %	7.0 %	ASTM D638
Yield	6.0 %	6.0 %	ISO 527-2/50
Break [7]	60 %	60 %	ASTM D638
Break [6]	60 %	60 %	ASTM D638
Break	50 %	50 %	ISO 527-2/50
Flexural Modulus			
3.94 in (100 mm) Span [8]	493000 psi	3400 MPa	ASTM D790
1.97 in (50.0 mm) Span [9]	464000 psi	3200 MPa	ASTM D790
-- [10]	479000 psi	3300 MPa	ISO 178
Flexural Stress			
-- [10, 11]	23200 psi	160 MPa	ISO 178
Yield, 1.97 in (50.0 mm) Span [9]	23900 psi	165 MPa	ASTM D790
Yield, 3.94 in (100 mm) Span [8]	23200 psi	160 MPa	ASTM D790
Poisson's Ratio	0.36	0.36	ASTM E132
Taber Abrasion Resistance			ASTM D1044
1000 Cycles, 1000 g, CS-17 Wheel	10.0 mg	10.0 mg	

Impact	Nominal Value (English)	Nominal Value (SI)	Test Method
Charpy Notched Impact Strength [12]			ISO 179/1eA
-22°F (-30°C)	1.9 ft·lb/in²	4.0 kJ/m²	
73°F (23°C)	1.9 ft·lb/in²	4.0 kJ/m²	

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Impact	Nominal Value (English)	Nominal Value (SI)	Test Method
Notched Izod Impact			
-22°F (-30°C)	0.94 ft·lb/in	50 J/m	ASTM D256
73°F (23°C)	0.99 ft·lb/in	53 J/m	ASTM D256
-22°F (-30°C) [13]	2.9 ft·lb/in²	6.0 kJ/m²	ISO 180/1A
73°F (23°C) [13]	2.9 ft·lb/in²	6.0 kJ/m²	ISO 180/1A
Unnotched Izod Impact			
-22°F (-30°C)	29 ft·lb/in	1500 J/m	ASTM D4812
73°F (23°C)	34 ft·lb/in	1800 J/m	ASTM D4812
-22°F (-30°C) [13]	No Break	No Break	ISO 180/1U
73°F (23°C) [13]	No Break	No Break	ISO 180/1U
Reverse Notch Izod Impact			ASTM D256
0.126 in (3.20 mm)	25 ft·lb/in	1300 J/m	
Gardner Impact (73°F (23°C))	319 in·lb	36.0 J	ASTM D3029
Hardness	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Rockwell Hardness			
M-Scale	109	109	ASTM D785
M-Scale	106	106	ISO 2039-2
Ball Indentation Hardness (H 358/30)	20300 psi	140 MPa	ISO 2039-1
Thermal	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Deflection Temperature Under Load			
66 psi (0.45 MPa), Unannealed, 0.126 in (3.20 mm)	405 °F	207 °C	ASTM D648
66 psi (0.45 MPa), Unannealed, 0.252 in (6.40 mm)	410 °F	210 °C	ASTM D648
66 psi (0.45 MPa), Unannealed, 0.157 in (4.00 mm), 2.52 in (64.0 mm) Span [13]	408 °F	209 °C	ISO 75-2/Bf
264 psi (1.8 MPa), Unannealed, 0.126 in (3.20 mm)	374 °F	190 °C	ASTM D648
264 psi (1.8 MPa), Unannealed, 0.252 in (6.40 mm)	394 °F	201 °C	ASTM D648
264 psi (1.8 MPa), Unannealed, 0.157 in (4.00 mm), 2.52 in (64.0 mm) Span [13]	378 °F	192 °C	ISO 75-2/Af
Vicat Softening Temperature			
--	412 °F	211 °C	ASTM D1525 [14] ISO 306/B50 [14]
--	414 °F	212 °C	ISO 306/B120
--	419 °F	215 °C	ISO 306/A50
Ball Pressure Test			IEC 60695-10-2
253 to 261°F (123 to 127°C)	Pass	Pass	
CLTE			
Flow : -4 to 302°F (-20 to 150°C)	2.9E-5 in/in/°F	5.2E-5 cm/cm/°C	ASTM E831
Flow : -40 to 302°F (-40 to 150°C)	2.9E-5 in/in/°F	5.2E-5 cm/cm/°C	ISO 11359-2
Transverse : -4 to 302°F (-20 to 150°C)	2.9E-5 in/in/°F	5.2E-5 cm/cm/°C	ASTM E831
Transverse : -40 to 302°F (-40 to 150°C)	2.9E-5 in/in/°F	5.2E-5 cm/cm/°C	ISO 11359-2
Thermal Conductivity	1.5 Btu·in/hr/ft²/°F	0.22 W/m/K	ASTM C177 ISO 8302
RTI Elec	338 °F	170 °C	UL 746B
RTI Imp	338 °F	170 °C	UL 746B
RTI Str	338 °F	170 °C	UL 746B
Electrical	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Surface Resistivity	> 1.0E+15 ohms	> 1.0E+15 ohms	IEC 60093
Volume Resistivity			
--	1.0E+17 ohms·cm	1.0E+17 ohms·cm	ASTM D257
--	1.0E+15 ohms·cm	1.0E+15 ohms·cm	IEC 60093

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Electrical	Nominal Value (English)	Nominal Value (SI)	Test Method
Dielectric Strength			
0.0630 in (1.60 mm), in Air	830 V/mil	33 kV/mm	ASTM D149
0.0630 in (1.60 mm), in Oil	710 V/mil	28 kV/mm	ASTM D149
0.126 in (3.20 mm), in Oil	500 V/mil	20 kV/mm	ASTM D149
0.0315 in (0.800 mm), in Oil	840 V/mil	33 kV/mm	IEC 60243-1
0.0630 in (1.60 mm), in Oil	640 V/mil	25 kV/mm	IEC 60243-1
0.126 in (3.20 mm), in Oil	410 V/mil	16 kV/mm	IEC 60243-1
Dielectric Constant			
100 Hz	3.15	3.15	ASTM D150
1 kHz	3.15	3.15	ASTM D150
1.10 GHz	3.01	3.01	Internal Method
5.00 GHz	3.02	3.02	Internal Method
10.0 GHz	3.02	3.02	Internal Method
50 Hz	2.90	2.90	IEC 60250
60 Hz	2.90	2.90	IEC 60250
1 MHz	2.90	2.90	IEC 60250
Dissipation Factor			
100 Hz	1.5E-3	1.5E-3	ASTM D150
1 kHz	1.2E-3	1.2E-3	ASTM D150
1.10 GHz	1.2E-3	1.2E-3	Internal Method
5.00 GHz	2.4E-3	2.4E-3	Internal Method
10.0 GHz	2.7E-3	2.7E-3	Internal Method
50 Hz	5.0E-4	5.0E-4	IEC 60250
60 Hz	5.0E-4	5.0E-4	IEC 60250
1 MHz	6.0E-3	6.0E-3	IEC 60250
Arc Resistance [15]	PLC 5	PLC 5	ASTM D495
Comparative Tracking Index (CTI)	PLC 4	PLC 4	UL 746A
Comparative Tracking Index [16]			IEC 60112
--	150 V	150 V	
Solution B	100 V	100 V	
High Amp Arc Ignition (HAI)			UL 746A
> 0.030 in (> 0.75 mm)	PLC 4	PLC 4	
> 0.12 in (> 3.0 mm)	PLC 3	PLC 3	
High Voltage Arc Resistance to Ignition (HVAR)	PLC 2	PLC 2	UL 746A
Hot-wire Ignition (HWI)			UL 746A
> 0.030 in (> 0.75 mm)	PLC 2	PLC 2	
> 0.12 in (> 3.0 mm)	PLC 1	PLC 1	

Flammability	Nominal Value (English)	Nominal Value (SI)	Test Method
Flame Rating			UL 94
> 0.016 in (> 0.40 mm)	V-2	V-2	
> 0.030 in (> 0.75 mm)	V-0	V-0	
> 0.12 in (> 3.0 mm)	5VA	5VA	
Glow Wire Flammability Index			Internal Method
0.13 in (3.2 mm)	1760 °F	960 °C	
Oxygen Index	47 %	47 %	ASTM D2863 ISO 4589-2
NBS Smoke Density - Flaming, Ds [17]	0.700	0.700	ASTM E662

Injection	Nominal Value (English)	Nominal Value (SI)
Drying Temperature	302 °F	150 °C
Drying Time	4.0 to 6.0 hr	4.0 to 6.0 hr
Suggested Max Moisture	0.020 %	0.020 %
Suggested Shot Size	40 to 60 %	40 to 60 %

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Injection	Nominal Value (English)	Nominal Value (SI)
Rear Temperature	626 to 752 °F	330 to 400 °C
Middle Temperature	644 to 761 °F	340 to 405 °C
Front Temperature	653 to 779 °F	345 to 415 °C
Nozzle Temperature	653 to 761 °F	345 to 405 °C
Processing (Melt) Temp	662 to 770 °F	350 to 410 °C
Mold Temperature	275 to 356 °F	135 to 180 °C
Back Pressure	43.5 to 102 psi	0.300 to 0.700 MPa
Vent Depth	9.8E-4 to 3.0E-3 in	0.025 to 0.076 mm

Injection Notes

- Drying Time (Cumulative): 24 hr
- Screw speed (Circumferential speed): 0.2 to 0.3 m/sec

Extrusion Notes

Extrusion Blow Molding Parameters

- Drying Temperature: 140 to 150°C
- Drying Time: 4 to 6 hr
- Drying Time (Cumulative): 24 hr
- Maximum Moisture Content: 0.01 to 0.02%
- Melt Temperature (Parison): 320 to 355°C
- Barrel - Zone 1 Temperature: 325 to 350°C
- Barrel - Zone 2 Temperature: 330 to 355°C
- Barrel - Zone 3 Temperature: 330 to 355°C
- Barrel - Zone 4 Temperature: 330 to 355°C
- Adapter - Zone 5 Temperature: 330 to 355°C
- Head - Zone 6 - Top Temperature: 330 to 355°C
- Head - Zone 7 - Bottom Temperature: 330 to 355°C
- Screw Speed: 10 to 70 rpm
- Mold Temperature: 65 to 175°C
- Die Temperature: 325 to 355°C

Notes

[1] These links provide you with access to supplier literature. We work hard to keep them up to date; however you may find the most current literature from the supplier.

[2] A UL Yellow Card contains UL-verified flammability and electrical characteristics. UL Prospector continually works to link Yellow Cards to individual plastic materials in Prospector, however this list may not include all of the appropriate links. It is important that you verify the association between these Yellow Cards and the plastic material found in Prospector. For a complete listing of Yellow Cards, visit the UL Yellow Card Search.

[3] Typical properties: these are not to be construed as specifications.

[4] 24 hrs

[5] 0.20 in/min (5.0 mm/min)

[6] Type I, 2.0 in/min (50 mm/min)

[7] Type I, 0.20 in/min (5.0 mm/min)

[8] 0.10 in/min (2.6 mm/min)

[9] 0.051 in/min (1.3 mm/min)

[10] 0.079 in/min (2.0 mm/min)

[11] at Yield

[12] 80*10*4 sp=62mm

[13] 80*10*4 mm

[14] Rate A (50°C/h), Loading 2 (50 N)

[15] Tungsten Electrode

[16] Value shown here is based on internal measurement.

[17] 4 min

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Where to Buy

Supplier
SABIC Web: http://www.sabic.com/

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Distributor

AECTRA
Telephone: +33-4-72-54-36-42
Web: https://www.aectra.fr/
Availability: Bulgaria, Romania

AGI-Augusto Guimarães & Irmão
Telephone: +351-22753-7400
Web: https://www.agi.pt/en/
Availability: Portugal

Amco Polymers
Telephone: 800-262-6685
Web: http://www.amcopolymers.com/
Availability: North America

Chase Plastic Services, Inc.
Chase Plastics Services is a North American distributor with representatives throughout the region. Please find your rep here: http://www.chaseplastics.com/contact/locations
Telephone: 800-232-4273
Web: http://www.chaseplastics.com/
Availability: North America

GRÄSSLIN
Telephone: +49-7721-4040-261
Web: https://www.graesslin-kunststoffe.de
Availability: Germany

Guangzhou Hua Xiu Plastics Co. Ltd
Telephone: +86-20-82582555
Web: http://www.va-so.cn/
Availability: Asia Pacific

Guzmán Polymers
Telephone: +34-963-992-400
Web: https://www.guzmanglobal.com/en/productos/plastics/
Availability: Italy, Spain, Turkey

Lenorplastics
Telephone: +41-61-706-11-11
Web: https://www.lenorplastics.ch
Availability: Switzerland

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Availability: North America

Plastoplan
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Availability: Austria, Czech Republic, Hungary, Slovakia

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Telephone: +33-3-8920-1380
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Web: http://www.ultrapolymers.com/
Availability: Belgium, Netherlands, South Africa

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