DATASHEET

EXTEM™ RH1016UCL-1000 RESIN MATERIAL AND OPTICAL PROPERTIES

EXTEM™ RH1016UCL resin is a near-IR transparent thermoplastic with a glass transition temperature of 280°C. This injection moldable resin can produce complex optical lens assemblies while maintaining dimensional stability during 260°C peak temperature solder reflow assembly.

MATERIAL PROPERTIES	TYPICAL VALUES	UNITS	TEST METHODS
MECHANICAL			
Tensile Modulus , 5 mm/min	2870	MPa	ISO 527
Tensile Stress, break, type I, 5 mm/min	75	MPa	ISO 527
Tensile Strain, break, type I, 5 mm/min	4	%	ISO 527
Flexural Modulus, 3.2 mm thickness	3000	MPa	ASTM D790
Flexural Strength, yield	165	MPa	ASTM D790
IMPACT			
Izod Impact, notched, 3.2 mm, 23°C	50	J/m	ASTM D256
Izod Impact, unnotched, 3.2 mm, 23°C	900	J/m	ASTM D256
Izod Impact, notched 80*10*4 +23°C	2.5	kJ/m²	ISO 180/1A
Izod Impact, unnotched 80*10*4 +23°C	33	kJ/m²	ISO 180/1U
THERMAL			
Heat Deflection Temperature 0.455 MPa, 3.2 mm, unannealed	263	°C	ASTM D648
Heat Deflection Temperature 1.82 MPa, 3.2 mm, unannealed	252	°C	ASTM D648
CTE (-20 to 150°C), flow direction	49	10^{-6}/°C	ASTM E831
CTE (-20 to 150°C), cross-flow direction	53	10^{-6}/°C	ASTM E831
Vicat Softening Temp, rate B/50	272	°C	ASTM D 1525
PHYSICAL			
Specific Gravity	1.35		ASTM D792
Mold Shrinkage, flow, 3.2 mm	1.0 – 1.2	%	SABIC Method
Melt Flow Rate, 367°C, 6.6 kgf	10	g/ 10 min	ASTM D1238
Water Absorption, (23°C . 24 hr)	0.55	%	ASTM D570

OPTICAL PROPERTIES AND MODELING PARAMETERS

All ULTEM™ and EXTEM™ resins, when produced, have some variability in color which can affect percent transmission within a final product. Currently reported values are for average lots of resin and are subject to change.

OPTICAL PROPERTIES	TYPICAL VALUES	UNITS
Refractive Index, n_d	1.692	
Abbe Number	17.6	
Negative Anomalous Dispersion $\Delta P_{g,F}$	-0.12	
Stress-optic Coefficient	1.07×10^{-11}	cm^2/dyn
Density	1.35	g / cm^3
External Transmission, 850 nm, 1 mm (ASTM D1003)	80	%
Refractive Index, 850 nm	1.664	
dn/dT, 850 nm (T = 30 - 120°C)	-9.8×10^{-5}	$°C^{-1}$

Refractive Index Dependence with Wavelength or Temperature

- Sellmeier dispersion formula parameters are valid for a refractive index specified in wavelengths (µm) from 0.45 µm to 1.7 µm
- Temperature dependence of refractive index constants are valid for a refractive index with a temperature from 30 °C to 120 °C and a wavelength from 0.5 µm to 1.7 µm

SELLMEIER DISPERSION EQUATION FOR REFRACTIVE INDEX

$$n^2 - 1 = \frac{B_1\lambda^2}{\lambda^2 - C_1} + \frac{B_2\lambda^2}{\lambda^2 - C_2} + \frac{B_3\lambda^2}{\lambda^2 - C_3}$$

Constants of Sellmeier Dispersion Formula	
B_1	0.56262
B_2	0.56145
B3	0.56329
C_1	0.03324
C_2	0.03264
C_3	0.03307

TEMPERATURE DEPENDENCE OF REFRACTIVE INDEX

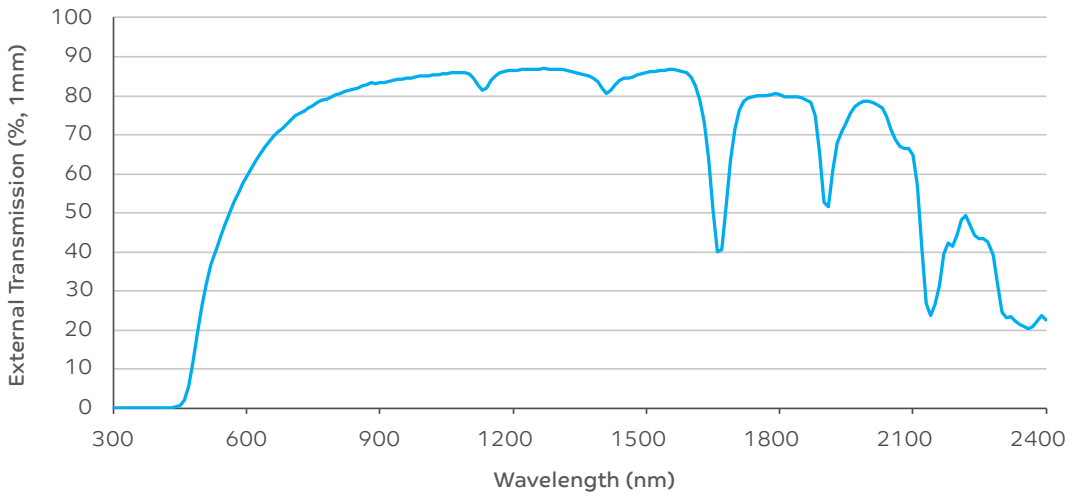
$$\Delta n_{abs} = \frac{n^2 - 1}{2n}\left[D_0\Delta T + D_1\Delta T^2 + D_2\Delta T^3 + \frac{E_0\Delta T + E_1\Delta T^2}{\lambda^2 - \lambda_{tk}^2}\right]$$

Constants of Dispersion dn/dT	
D_o	-1.78×10^{-4}
D_1	5.42×10^{-8}
D_2	2.89×10^{-10}
E_o	1.13×10^{-5}
E_1	-1.98×10^{-7}
λ_{tk}	0.00

OPTICAL TRANSMISSION

All ULTEM™ and EXTEM™ resins have color variability which can affect percent transmission. Reported values are representative for current resin performance.

- External transmittance of EXTEM RH1016UCL-1000 resin was measured using molded optical plaques at 1 mm thickness according to ASTM D1003
- Internal transmittance values are also provided for optical modeling software



TYPICAL OPTICAL PROPERTIES

INTERNAL TRANSMITTANCE AT 1 MM THICKNESS (T)							
λ (nm)	t = 1 mm	λ (nm)	t = 1 mm	λ (nm)	t = 1 mm	λ (nm)	t = 1 mm
300	0.00	660	0.73	900	0.90	1200	0.96
340	0.00	700	0.78	920	0.92	1250	0.97
380	0.00	740	0.83	940	0.92	1300	0.97
420	0.00	780	0.86	960	0.93	1350	0.96
460	0.02	800	0.87	980	0.93	1400	0.91
500	0.23	820	0.88	1000	0.94	1450	0.94
540	0.41	840	0.89	1050	0.95	1500	0.96
580	0.54	860	0.90	1100	0.95	1550	0.97
620	0.65	880	0.91	1150	0.93	1600	0.95

INJECTION MOLDING CONDITIONS

Injection molding conditions supplied are for representative ISO or ASTM sized test components. Contact SABIC for recommendations when using micro molding or modified injection molding techniques such as injection compression molding.

OPTICAL PROPERTIES	TYPICAL VALUES	UNITS
RESIN DRYING CONDITIONS		
Drying Temperature*	175	°C
Drying Time	6 to 8	hrs
Drying Time (Cumulative)	24	hrs
Maximum Moisture Content	0.02	%
INJECTION MOLDING		
Melt Temperature	385 - 415	°C
Nozzle Temperature	385 - 410	°C
Front - Zone 3 Temperature	390 - 410	°C
Middle - Zone 2 Temperature	390 - 405	°C
Rear - Zone 1 Temperature	380 - 400	°C
Mold Temperature	175 – 220	°C
Intake (Throat) Temperature	70 – 100	°C
Back Pressure (Plastic Pressure)	5 – 10	MPa
Screw Speed (Circumferential Speed)	< 0.2	m/s
Shot to Cylinder Size	40 – 70	%
Vent Depth	0.025 – 0.076	mm

SABIC Internal methods for shrinkage: Measured on ~100 mm diameter, 3.2 mm thickness disk versus molded metal dimensions
*The recommended drying temperature of 175°C is for dehumidifying dryer systems. Hot air dryer systems are not recommended if dehumidifying dryer systems are available. Hot air dryer systems at temperature of 200°C may be used provided maximum moisture content is not exceeded.

Please consult our website to find more information:
https://www.sabic.com/en/products/specialties/extem-resins

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