WaterClear™ 10120

Optically Clear, Rigid, Durable Epoxy Resin For Stereolithography For Solid State (355 nm) Laser Systems

With Somos® 10120 WaterClear™ resin, clear stereolithography parts can be built early in the design process...as much as six months earlier than the previous approach using prototype or pre-production tooling. Multiple iterations of clear parts can easily be made as a design evolves.

Mike Rufo, President
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Description

DSM Somos® 10120 is a high-speed liquid photo-polymer that produces strong, rigid, and durable parts with optical clarity using stereolithography machines. This material is especially useful in applications requiring optical clarity such as fluid flow analysis, stress analysis and light pipes. Other applications include those that require a strong and durable product without the brittleness normally associated with a rigid stereolithography resin.

Application

Somos® 10120 Photopolymer is used in the solid imaging process to build three-dimensional parts. Somos® 10120 requires a minimal post-cure by UV fluorescent light. Prolonged exposure to UV light will create a yellow tinge to the parts.

Physical Properties – Liquid

Appearance	Optically clear
Viscosity	~130 cps at 30°C
Density	~1.12 g/cm³ at 25°C

Optical Properties at 355 nm

E_c	9.7 mJ/cm²	*[critical exposure]*
D_p	0.16 mm (0.0063 inch)	*[slope of cure-depth vs. ln(E) curve]*
E_{10}	48 mJ/cm²	*[exposure that gives 0.254 mm (.010 inch) thickness]*

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Mechanical Properties (Metric)

ASTM Method	Description	WaterClear™ 10120	ABS* (transparent)	Polycarbonate* (optical grade)	Nylon 66*
D638M	Tensile Strength	35 MPa	45.7 MPa	62.5 MPa	63.6 MPa
	Elongation at Break	23 %	41.6 %	110 %	82.8 %
	Elongation at Yield	4.1 %	N/A	6 %	10.7 %
	Modulus of Elasticity	1,960 MPa	2,000 MPa	2,300 MPa	2,100 MPa
D790M	Flexural Strength	39.5 MPa	73.5 MPa	94.2 MPa	88.4 MPa
	Flexural Modulus	2,250 MPa	2,300 MPa	2,300 MPa	2,400 MPa
D256A	Izod Impact-Notched	0.48 J/cm	1.6 J/cm	7.1 J/cm	1.5 J/cm
D542	Index of Refraction	1.51	1.52	1.59	NA
D2240	Hardness (Shore D)	81	N/A	N/A	N/A
D1004	Graves Tear	372 kg	N/A	N/A	N/A
D570-98	Water Absorption	0.85 %	0.20 – 0.45 %	0.17 %	2.3 %

* *http://www.matweb.com*

N/A: Not Available

Thermal & Electrical Properties (Metric)

ASTM Method	Description	WaterClear™ 10120	ABS* (transparent)	Polycarbonate* (optical grade)	Nylon 66*
E831-00	C.T.E. -40°C – 0°C	72 µm/m-°C	60 – 130 µm/m-°C *(no temp range given)*	66 µm/m-°C *(no temp range given)*	80 µm/m-°C *(no temp range given)*
	C.T.E. 0°C – 50°C	101 µm/m-°C			
	C.T.E. 50°C – 100°C	148 µm/m-°C			
	C.T.E. 100°C – 150°C	179 µm/m-°C			
D150-98	Dielectric Constant 60Hz	4.1	3.7	3.1	
	Dielectric Constant 1KHz	3.9			
	Dielectric Constant 1MHz	3.6	3.7	3	3.5 – 3.8
D149-97a	Dielectric Strength	15.4 kV/mm	13.8 – 19.7 kV/mm	26.4 kV/mm	95.7 kV/mm
E1545-00	Tg	28 °C		150 °C	
D648-98c	HDT @ 0.46 MPa	52.9 °C	94 – 207 °C	130 °C	210 °C
	HDT @ 1.81 MPa	45.7 °C	86.4 – 194 °C	130 °C	80.5 °C

* *http://www.matweb.com*

N/A: Not Available

Mechanical Properties (Imperial)

ASTM Method	Description	WaterClear™ 10120	ABS* (transparent)	Polycarbonate* (optical grade)	Nylon 66*
D638M	Tensile Strength	3,736 psi	6,628 psi	9,065 psi	9,224 psi
	Elongation at Break	32 %	41.6 %	110 %	82.8 %
	Elongation at Yield	4.2 %	N/A	6 %	10.7 %
	Modulus of Elasticity	248,000 psi	290,000 psi	334,000 psi	305,000 psi
D790M	Flexural Strength	5,726 psi	10,660 psi	13,663 psi	12,821 psi
	Flexural Modulus	190,580 psi	334,000 psi	334,000 psi	348,000 psi
D256A	Izod Impact-Notched	0.914 ft-lb/in	1.5 – 2.0 ft-lb/in	13 ft-lb/in	2.8 ft-lb/in
D542	Index of Refraction	1.51	1.52	1.59	N/A
D2240	Hardness (Shore D)	81	N/A	N/A	N/A
D1004	Graves Tear	821 lb	N/A	N/A	N/A
D570-98	Water Absorption	1.21 %	0.20 – 0.45 %	0.17 %	2.3 %

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Thermal & Electrical Properties (Imperial)

ASTM Method	Description	WaterClear™ 10120	ABS (transparent)	Polycarbonate (optical grade)	Nylon 66*
E831-00	C.T.E. -40°F – 32°F	40 µin/in-°F	33 – 72 µin/in-°F *(no temp range given)*	37 µin/in-°F *(no temp range given)*	44 µin/in-°F *(no temp range given)*
	C.T.E. 32°F – 122°F	56 µin/in-°F			
	C.T.E. 122°F – 212°F	82 µin/in-°F			
	C.T.E. 212°F – 302°F	99 µin/in-°F			
D150-98	Dielectric Constant 60Hz	4.2	3.7	3.1	
	Dielectric Constant 1KHz	4.0			
	Dielectric Constant 1MHz	3.5	3.7	3	3.5 – 3.8
D149-97a	Dielectric Strength	390 V/mil	350 – 500 V/mil	671 V/mil	1161 V/mil
E1545-00	Tg	82.4 °F (28°C)		302 °F (150°C)	
D648-98c	HDT @ 66 psi	112 °F (44.9°C)	201 – 405 °F (94-207°C)	266 °F (130°C)	410 °F (210°C)
	HDT @ 264 psi	116 °F (46.8°C)	187 – 381 °F (86-194°C)	266 °F (130°C)	177 °F (80.5°C)

* *http://www.matweb.com*

N/A: Not Available