

# UMA 90

UMA 90 is an easy-to-use single cure resin with enhanced toughness, appropriate for use in prototypes and manufacturing jigs and fixtures.

Tensile Properties—ASTM D638- Type V, 10mm/min	Metric		U.S.	
	GREEN STATE		UV-CURED	
Tensile Modulus	731 ± 120 MPa	106 ± 17 ksi	2000 ± 100 MPa	290 ± 15 ksi
Ultimate Tensile Strength	25 ± 2 MPa	3.6 ± 0.3 ksi	46 ± 3 MPa	6.7 ± 0.4 ksi
0.2% Offset Yield Strength	7 ± 1 MPa	1 ± 0.1 ksi		
Tensile Strength at Yield (Zero Slope)			46 ± 3 MPa	6.7 ± 0.4 ksi
Tensile Strain at Yield (Zero Slope)			5.7 ± 0.2%	5.7 ± 0.2%
Elongation-at-Break	33 ± 2 %	33 ± 2 %	17 ± 2 %	17 ± 2 %

Flexural Properties —ASTM D790, 0.1mm/mm-min	Metric		U.S.	
	GREEN STATE		UV-CURED	
Flexural Stress at 5% strain	26 ± 2 MPa	3.8 ± 0.3 ksi	79 ± 5 MPa	11.4 ± 0.7 ksi
Flexural Modulus (chord, 0.5%-1% strain)	656 ± 51 MPa	95 ± 7 ksi	2010 ± 119 MPa	291 ± 17 ksi

Impact Properties	Metric		U.S.	
			UV-CURED	
Notched Izod (Machined), ASTM D256	33 ± 4 J/m		0.62 ± 0.07 ft-lb/in.	
Unnotched Izod, ASTM D4812	496 ± 141 J/m		9.29 ± 2.64 ft-lb/in.	

Thermal Properties	Metric		U.S.	
			UV-CURED	
Heat Deflection Temperature @ 0.45 MPa/66 psi, ASTM D648	51 °C		124 °F	
Heat Deflection Temperature @ 1.82 MPa/264 psi ASTM D648	44 °C		111 °F	

General Properties	Metric		U.S.	
			UV-CURED	
Hardness, ASTM D2240	86, Shore D			
Density, ASTM D792	1.200 g/cm <sup>3</sup>			

**NOTES**—Test specimens were prepared using Carbon M1 printer and a Type C2 cassette. Print parameters were generated using software v.1.8 and v.1.9. Tensile dog bones were 4.0 mm thick. Three-point bending flexural bars were 3.2 mm thick. Notched and unnotched Izod impact bars were 6.3 mm thick. Tensile and Flexural data are average ± 1 standard deviation from 16 specimens. Impact data are from 10 specimens. The U.S. value are converted from Metric measurements and are for reference only. Green specimens were not washed with IPA. Liquid resin on specimen surface was wiped off using a paper towel. Tensile and flexural tests of Green specimens were conducted within 1 hour of printing. UV-cured test specimens were printed, cleaned, and post-processed per instructions provided in the Carbon User Manual. UV curing was 1 minute on each side in a Dymax 5000-EC UV chamber (225 mW/cm<sup>2</sup>). Specimens were placed near the center (horizontal and vertical) of the UV chamber. Results provided herein are representative of these processes and may vary if these protocols are not followed.