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TECHNICAL DATA SHEET, LAST UPDATED 01/23/2017

# 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. | 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. | 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 |
|---|---|
| | **UV-CURED** |
| Hardness, ASTM D2240 | 86, Shore D |
| Density, ASTM D792 | 1.200 g/cm$^3$ |

**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$^2$). 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.