

# Certified ULTEM 9085 Resin



ULTEM™ 9085 resin is a flame-retardant high-performance thermoplastic for digital manufacturing and rapid prototyping. It is ideal for the transportation industry due to its high strength-to-weight ratio and its FST (flame, smoke and toxicity) rating. This unique material's certifications make it an excellent choice for the commercial transportation industry – specifically aerospace, marine and ground vehicles. Combined with a Fortus® 3D Printer, ULTEM 9085 resin allows design and manufacturing engineers to produce fully functional parts that are ideal for advanced functional prototypes or end use without the cost or lead time of traditional tooling. Stratasys Certified ULTEM 9085 resin meets the extensive, more stringent test criteria and retains material traceability required by the aerospace industries and regulatory agencies.

- A Certificate of Analysis for both raw material and filament are supplied, documenting test results and identification to match filament manufacturing lot number to raw material batch number. This allows traceability from printed part back to raw material.
- A Certificate of Conformance confirms that the material is manufactured in compliance to approved Stratasys and Industry specifications.

| Mechanical Properties                                | Test Method | XY Orientation           | XZ Orientation           | ZX Orientation           | ZX-45 Orientation        |
|--|-------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Tensile Strength, Ultimate (Type 1, 0.130")          | ASTM D638   | 67 MPa<br>(9,700psi)     | 77 MPa<br>(11,200 psi)   | 59 MPa<br>(8,500 psi)    | 55 MPa<br>(8,000 psi)    |
| Tensile Strength, 0.2% offset yield (Type 1, 0.130") | ASTM D638   | 38 MPa<br>(5,500 psi)    | 45 MPa<br>(6,500 psi)    | 38 MPa<br>(5,500 psi)    | 37 MPa<br>(5,400 psi)    |
| Tensile Modulus (Type 1, 0.130")                     | ASTM D638   | 2.32 GPa<br>(337 ksi)    | 2.6 GPa<br>(377 ksi)     | 2.4 GPa<br>(347 ksi)     | 2.35 GPa<br>(341 ksi)    |
| Tensile Elongation at Break (Type 1, 0.130")         | ASTM D638   | 7.00%                    | 6.21%                    | 3.63%                    | 3.16%                    |
| Flexural Strength                                    | ASTM D790   | 115 MPa<br>(16,700 psi)  | 130 MPa<br>(18,900 psi)  | 83 MPa<br>(12,100 psi)   | 84 MPa<br>(12,200 psi)   |
| Flexural Strength 0.2% Offset                        | ASTM D790   | 85 MPa<br>(12,300psi)    | 98 MPa<br>(14,200psi)    | 79 MPa<br>(11,400 psi)   | 75 MPa<br>(10,900 psi)   |
| Flexural Modulus                                     | ASTM D790   | 2.4 GPa<br>(354 ksi)     | 2.6 GPa<br>(380.5 ksi)   | 2.3 GPa<br>(328.5 ksi)   | 2.2 GPa<br>(314 ksi)     |
| Compressive Strength Yield (modified type 6.7.2)     | ASTM D695   | 54 MPa<br>(7,800 psi)    | 75 MPa<br>(10,800 psi)   | 57 MPa<br>(8,300 psi)    | 56.5 MPa<br>(8,200 psi)  |
| Compressive Modulus (modified type 6.7.2)            | ASTM D695   | 2.7 GPa<br>(394 ksi)     | 3.1 GPa<br>(448 ksi)     | 2.8 GPa<br>(403 ksi)     | 2.65 GPa<br>(384 ksi)    |
| Shear Strength (V-notch In-Plane Shear)              | ASTM D5379  | 50 MPa<br>(7,200 psi)    |                          |                          |                          |
| Shear Modulus  | ASTM D5379  | 0.9 GPa<br>(131 ksi)     |                          |                          |                          |
| OHT Strength   | ASTM D5766  | 45 MPa<br>(6,550 psi)    | 61 MPa<br>(8,900 psi)    | 29 MPa<br>(4,200 psi)    | 34.5 MPa<br>(5,000 psi)  |
| OHT Modulus  | ASTM D5766  | 1.95 GPa<br>(285 ksi)    | 2.4 GPa<br>(343 ksi)     | 2.1 GPa<br>(310 ksi)     | 2.1 GPa<br>(300 ksi)     |
| FHT Strength   | ASTM D6742  | 52 MPa<br>(7,500 psi)    | 69 MPa<br>(10,000 psi)   | 50 MPa<br>(7,300 psi)    | 46 MPa<br>(6,700 psi)    |
| FHT Modulus  | ASTM D6742  | 2.4 GPa<br>(343 ksi)     | 2.83 GPa<br>(411 ksi)    | 2.6 GPa<br>(376 ksi)     | 2.4 GPa<br>(343 ksi)     |
| FHC Strength   | ASTM D6742  | 45 MPa<br>(6,500 psi)    | 72 MPa<br>(10,400 psi)   | 63 MPa<br>(9,100 psi)    | 48 MPa<br>(7,000 psi)    |
| FHC Modulus  | ASTM D6742  | 2.4 GPa<br>(346 ksi)     | 2.8 GPa<br>(400 ksi)     | 2.55 GPa<br>(370 ksi)    | 2.6 GPa<br>(373 ksi)     |
| Single Shear Bearing                                 | ASTM D5961  | 204 MPa<br>(29,600 psi)  | 196 MPa<br>(28,450 psi)  | 189 MPa<br>(27,350 psi)  | 158 MPa<br>(22,850 psi)  |
| IZOD Impact un-notched                               | ASTM D256   | 95 J/m<br>(1.8 ft-lb/in) | 74 J/m<br>(1.4 ft-lb/in) | 69 J/m<br>(1.3 ft-lb/in) | 79 J/m<br>(1.5 ft-lb/in) |

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| Thermal Properties <sup>1</sup>         | Test Method   | Value                                 |
|---|---------------|---------------------------------------|
| Heat Deflection (HDT) @ 264 psi, 0.125" | ASTM D648     | 153 °C<br>(307 °F)                    |
| Glass Transition Temperature (Tg)       | ASTM D7426-08 | 186 °C<br>(367 °F)                    |
| Coefficient of Thermal Expansion        | ASTM E831     | 65.27 µm/(m·°C)<br>(36.7 µin/(in·°F)) |

| Electrical Properties <sup>2</sup> | Test Method            | Value Range   |
|------------------------------------|------------------------|---|
| Volume Resistivity                 | ASTM D257              | 4.9 x10 <sup>15</sup> - 8.2x10 <sup>15</sup> ohm-cm |
| Dielectric Constant                | ASTM D150-98           | 3.0 - 3.2   |
| Dissipation Factor                 | ASTM D150-98           | 0.0026 - 0.0027                                     |
| Dielectric Strength                | ASTM D149-09, Method A | 110 - 290 V/mil                                     |

| Outgassing                                     | Test Method | Value                    |
|--|-------------|--------------------------|
| Total Mass Loss (TML)                          | ASTM E595   | 0.41%<br>(1.00% maximum) |
| Collected Volatile Condensable Material (CVCM) | ASTM E595   | 0.1%<br>(0.10% maximum)  |
| Water Vapor Recovered (WVR)                    | ASTM E595   | 0.37%<br>(report)        |

| Burn Testing                    | Test Method       | Value                    |
|---------------------------------|-------------------|--------------------------|
| Horizontal Burn (15 sec)        | 14 CFR/FAR 25.853 | Passed<br>(0.060" thick) |
| Vertical Burn (60 sec)          | 14 CFR/FAR 25.853 | Passed<br>(0.060" thick) |
| Vertical Burn (12 sec)          | 14 CFR/FAR 25.853 | Passed<br>(0.060" thick) |
| 45° Ignition                    | 14 CFR/FAR 25.853 | Passed<br>(0.060" thick) |
| Heat Release                    | 14 CFR/FAR 25.853 | Passed<br>(0.060" thick) |
| NBS Smoke Density (flaming)     | ASTM F814/E662    | Passed<br>(0.060" thick) |
| NBS Smoke Density (non-flaming) | ASTM F814/E662    | Passed<br>(0.060" thick) |


| Other  | Test Method                | Value                    |
|--|----------------------------|--------------------------|
| Specific Gravity                                 | ASTM D792                  | 1.34                     |
| Oxygen Index                                     | ASTM D2863                 | 0.49                     |
| OSU Total Heat Release (2 min test, .060" thick) | FAR 25.853                 | 16 kW min/m <sup>2</sup> |
| Fungus Resistance                                | MIL-STD-810G; Method 508.6 | Passed                   |

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## Coefficient of Variance

|                                  | XY Orientation | ZX Orientation |
|----------------------------------|----------------|----------------|
| <b>Tensile Modulus</b>           | 2.51%          | 1.84%          |
| <b>Ultimate Tensile Strength</b> | 3.37%          | 2.13%          |

| System Availability | Layer Thickness Capability | Support Structure | Available Colors  |
|---------------------|----------------------------|-------------------|---|
| Stratasys F900mc™   | 0.010 inch (0.254 mm)      | Breakaway         |  Tan (Natural) |

Data contained in this data sheet only applies to certified ULTEM 9085 resin printed on an AICS Fortus 900mc or Fortus Pro 900 system using a T16A tip. Certified ULTEM 9085 resin is supported by an extensive set of multi batch (3), multi-location (5), and multi-machine (2) mechanical and physical property databases. Data is available from Stratasys upon request.

The performance characteristics of these materials may vary according to application, operating conditions, or end use. Each user is responsible for determining that the Stratasys material is safe, lawful, and technically suitable for the intended application, as well as for identifying the proper disposal (or recycling) method consistent with applicable environmental laws and regulations. Stratasys makes no warranties of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular use, or warranty against patent infringement.

The information presented in this document are typical values intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes. End-use material performance can be impacted (+/-) by, but not limited to, part design, end-use conditions, test conditions, color, etc. Actual values will vary with build conditions. Test specimens were built on the AICS Fortus 900mc @ 0.010" (0.254 mm) slice using NCAMP specification configured parameter. Product specifications are subject to change without notice.

<sup>1</sup>Literature value unless otherwise noted.

<sup>2</sup>All Electrical Property values were generated from the average of test plaques built with default part density (solid). Test plaques were 4.0 x 4.0 x 0.1 inches (102 x 102 x 2.5 mm) and were built both in the flat and vertical orientation. The range of values is mostly the result of the difference in properties of test plaques built in the flat vs. vertical orientation.

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