FUSED DEPOSITION MODELING

ULTEM 1010

Highest Heat Resistance, Chemical Resistance & Tensile Strength of Any FDM Material

ULTEM 1010 is a high-performance polyetherimide resin with exceptional heat resistance, tensile strength, dimensional stability, and chemical resistance. Its thermal stability and mechanical properties make it an excellent choice for high-performance prototyping, tooling, and production parts that will be exposed to high temperatures. The availability of a certified grade expands its applications to include biocompatible and food contact applications. ULTEM 1010's versatility and reliability make it a preferred material for industries seeking robust solutions that can withstand demanding environments. Stratasys ULTEM 1010 is UL 94 V-0 listed and low-outgassing for vacuum and space hardware, and a certificate of conformity traces every material lot.



BUILD VOLUME	LEAD TIME	LAYER HEIGHT	TOLERANCE
914 × 610 × 914 mm	**2-4 business days**	**0.254-0.330 mm**	**±0.25 mm or ±0.3%, whichever is greater**

MECHANICAL PROPERTIES

ULTEM 1010 delivers dependable strength and stiffness for composite lay-up tooling, surgical guides and high-temperature aerospace and automotive parts, from prototype to production. Its mechanical profile handles demanding load conditions.

Mechanical test parts were printed on a Stratasys F900. XZ samples are printed on edge and ZX samples stand upright, so the ZX values describe strength across the layers, where ULTEM 1010 is much weaker in tension. Stratasys reports no yield point in tension, so strength is given at break, and on-edge (XZ) samples bend past 5% strain without breaking. Orient load-bearing features so stress runs along the layers.

PROPERTY	VALUE	TEST STANDARD
Tensile Strength at Break (XZ)	**79.2 MPa**	ASTM D638
Tensile Strength at Break (ZX)	**28.2 MPa**	ASTM D638
Tensile Modulus (XZ)	**3040 MPa**	ASTM D638
Tensile Modulus (ZX)	**3000 MPa**	ASTM D638
Elongation at Break (XZ)	**4.0 %**	ASTM D638
Elongation at Break (ZX)	**1.1 %**	ASTM D638
Flexural Strength at 5% Strain (XZ)	**128 MPa**	ASTM D790, Procedure A
Flexural Strength at Break (XZ)	**No break**	ASTM D790, Procedure A
Flexural Strength at Break (ZX)	**81.6 MPa**	ASTM D790, Procedure A
Flexural Modulus (XZ)	**2910 MPa**	ASTM D790, Procedure A
Flexural Modulus (ZX)	**2640 MPa**	ASTM D790, Procedure A
Flexural Strain at Break (XZ)	**No break**	ASTM D790, Procedure A

Flexural Strain at Break (ZX)	**3.2 %**	ASTM D790, Procedure A
Compressive Modulus (XZ)	**2930 MPa**	ASTM D695
Compressive Modulus (ZX)	**3230 MPa**	ASTM D695
Izod Impact, Notched (XZ)	**26.6 J/m**	ASTM D256
Izod Impact, Notched (ZX)	**21.7 J/m**	ASTM D256
Izod Impact, Unnotched (XZ)	**260 J/m**	ASTM D4812
Izod Impact, Unnotched (ZX)	**68 J/m**	ASTM D4812

THERMAL PROPERTIES

ULTEM 1010 maintains dimensional stability through temperature swings and repeated thermal cycling, which suits aerospace tooling, sterilized medical parts and under-hood automotive components. Heat deflection is reported flat (XY) and on edge (XZ) at both loads, and sits close to the glass transition temperature, so parts keep their shape under load until the resin begins to soften.

ULTEM 1010 is amorphous, so it has no melting point. Glass transition, thermal conductivity and diffusivity are measured on moulded plaques, and thermal expansion is reported over the temperature range listed with each value.

PROPERTY	VALUE	TEST STANDARD
HDT @ 0.45 MPa / 66 psi (XY / XZ)	**216.9 / 217.1 °C**	ASTM D648 Method B
HDT @ 1.82 MPa / 264 psi (XY / XZ)	**215.1 / 214.5 °C**	ASTM D648 Method B
Glass Transition Temperature (moulded plaque)	**209 °C**	ASTM D7426
Mean CTE (XY, −50 to 60 °C)	**36.1 ×10^{-6}/K**	ASTM E831
Mean CTE (XY, 60 to 205 °C)	**29.8 ×10^{-6}/K**	ASTM E831
Mean CTE (XZ, −50 to 110 °C)	**32.5 ×10^{-6}/K**	ASTM E831
Mean CTE (XZ, 110 to 165 °C)	**16.2 ×10^{-6}/K**	ASTM E831
Mean CTE (XZ, 165 to 200 °C)	**4.3 ×10^{-6}/K**	ASTM E831
Thermal Conductivity (0 to 90 °C, moulded plaque)	**0.242–0.243 W/m·K**	ASTM E1952
Thermal Diffusivity (0 to 90 °C, moulded plaque)	**0.121–0.158 mm^2/s**	ASTM E1952

PHYSICAL PROPERTIES

Consistent density and surface quality keep critical features in tolerance and downstream finishing predictable. Parts are lighter than the metal tools and housings they replace, and the material's dimensional stability minimizes warpage.

Stratasys measures specific gravity on a moulded plaque, the reference value for the resin itself.

PROPERTY	VALUE	TEST STANDARD
Specific Gravity (moulded plaque)	**1.29**	ASTM D792

ELECTRICAL PROPERTIES

ULTEM 1010 offers high resistivity and a stable dielectric constant for electrical housings, connectors, insulating features and functional prototypes, and gives enclosures in integrated electrical systems dependable insulation.

Stratasys reports dielectric constant at 1 kHz and 2 MHz for flat and on-edge samples and volume resistivity on a moulded plaque. Dielectric losses were below the resolution of its measurement, so no dissipation factor is listed. Dielectric strength comes from Stratasys's earlier ULTEM 1010 specification sheet.

PROPERTY	VALUE	TEST STANDARD
Volume Resistivity (moulded plaque)	**> 7.0×10^{14} Ω·cm**	ASTM D257
Dielectric Constant, 1 kHz (XY / XZ)	**2.84 / 2.89**	ASTM D150
Dielectric Constant, 2 MHz (XY / XZ)	**3.09 / 3.16**	ASTM D150
Dielectric Strength	**240 V/mil**	ASTM D149, Method A

CHEMICAL PROPERTIES

Stratasys rates ULTEM 1010 by chemical class at room temperature. It stands up best to fuels, engine coolant, washer fluid and aromatic hydrocarbons, and handles short-term contact with oils, greases, brake and transmission fluid and alcohols. Ketones, strong acids and halogenated hydrocarbons, shown as poor, carry Stratasys's limited rating (likely to degrade the part in short-term exposure), and phenols attack it.

Chemical ratings are screening guidance; confirm them with application-specific testing before production release.

CHEMICAL	RATING
Petroleum fuels	**Excellent**
Aromatic hydrocarbons (e.g. benzene)	**Excellent**
Antifreeze / engine coolant	**Excellent**
Windshield washer fluid	**Excellent**
Weak bases (pH 8–10)	**Excellent**
Deionized water	**Excellent**
Aliphatic hydrocarbons (e.g. propane, butane)	**Good**
Motor oil	**Good**
Transmission fluid	**Good**
Brake fluid	**Good**
Petroleum greases	**Good**
Silicone greases and oils	**Good**
Alcohol / ethanol	**Good**
Esters	**Good**
Weak acids (pH 3–6)	**Good**
Strong bases (pH > 10)	**Good**
Strong acids (pH < 3)	**Limited**
Ketones (e.g. MEK, acetone)	**Limited**
Halogenated hydrocarbons (e.g. CFCs)	**Limited**
Phenols	**Poor**

COMPLIANCE

Stratasys ULTEM 1010 is rated UL 94 V-0 on its UL listing and has inherent flame retardant properties. In ASTM E595 testing it showed low outgassing, inside the common screening limits for vacuum and space hardware.

The Stratasys certified grade (CG) is approved for food contact under NSF 51 and meets ISO 10993 and USP Class VI, so teams can start regulatory reviews from supplier data. ULTEM 1010 carries no current FAR 25.853 data, so aircraft cabin parts use ULTEM 9085 or Antero 800NA.

STANDARD	STATUS
UL 94 flammability UL Blue Card (file E345258): V-0 at 1.0 mm on F900 and Fortus 900mc for T14 parts built vertically; the T14 horizontal and T20 listings (1.5 to 3.0 mm) cover Fortus 400mc and 450mc builds	V-0
ASTM E595 (Outgassing) TML 0.55–0.58%, CVCM 0.02–0.03% on printed samples; full report available from Stratasys	Stratasys tested
NSF 51 (Food equipment materials) Certified grade (CG) filament is approved for food contact	Stratasys CG grade
ISO 10993 / USP Class VI (Biocompatibility) Certified grade (CG) filament is biocompatible	Stratasys CG grade

MANUFACTURING

Colours & finishes	**Natural amber; support removal, machining, sanding, drilling, tapping and vapor polishing**