

ULTEM™ 9085 Filament and Carbon Fiber for ULTEM™ Filament

Aerospace-Ready Materials



Overview

ULTEM™ 9085 Filament is a high performance thermoplastic that exhibits excellent flame, smoke, and toxicity (FST) characteristics. Optimized for production aerospace applications, ULTEM™ Filament brings Markforged's CFR technology to a new realm of parts. ULTEM™ Filament is available in Markforged's new 3200cc XL spool — four times larger than our standard spools.

Carbon Fiber for ULTEM™ Filament is a specialized variant of Markforged's Continuous Carbon Fiber designed for use with ULTEM™ Filament. Capable of yielding aluminum strength parts, it can be precisely laid down in a wide variety of geometries. Users can trace curved features, reinforce holes, and mimic unidirectional fiber layups — all within a few clicks.

ULTEM™ 9085 Filament and Carbon Fiber for ULTEM™ Filament are only printed on the Markforged FX20. ULTEM™ 9085 Filament parts are compatible with Support for ULTEM™ Filament, a dedicated support material printed out of a second nozzle.

Material Performance

ULTEM™ 9085 Filament and Carbon Fiber for ULTEM™ Filament are used in a similar manner to Onyx and Carbon Fiber. Carbon Fiber for ULTEM™ Filament can enhance the mechanical properties of ULTEM™ 9085 Filament parts. The rule of mixtures can be used to approximate bulk mechanical properties of printed composites. Your results may vary based on a number of factors including environmental conditions, feature geometry, print orientation, and loading conditions.

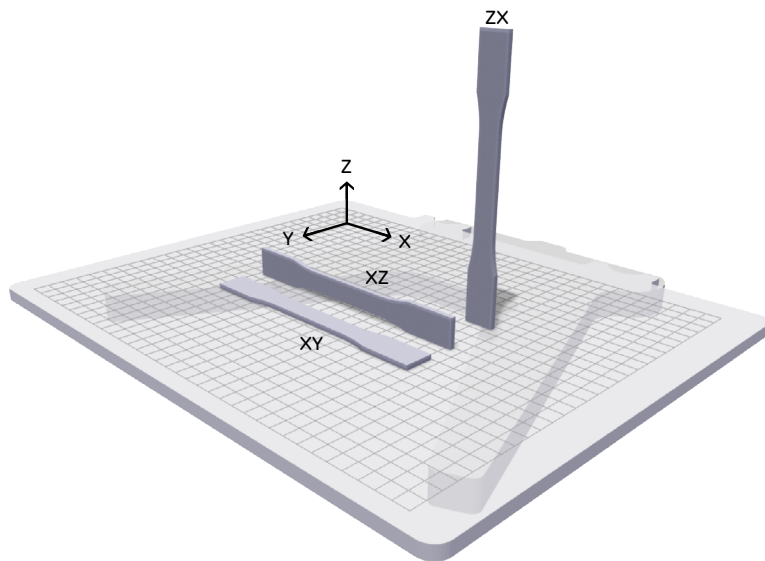
Mechanical Properties

Property	Unit	Test (ASTM)	ULTEM™ 9085 Filament (XZ Orientation)	Test (ASTM)	Carbon Fiber for ULTEM™ Filament
Tensile strength	MPa (ksi)	D638	68 (9.9)	D3039	760 (110)
Tensile modulus	GPa (ksi)	D638	2.52 (365)	D3039	57 (8280)
Tensile strain at break	%	D638	5.5	D3039	1.6
Flexural strength	MPa (ksi)	D790	105 (15.2)	D790	540 (78.3)
Flexural modulus	GPa (ksi)	D790	2.45 (355)	D790	50 (7250)
Flexural strain at break	%	D790	—	D790	1.6
Compressive strength	MPa (ksi)	D695	—	D695	300 (43.5)
Compressive modulus	GPa (ksi)	D695	—	D695	59 (8557)
Izod Impact - notched	J/m (ft•lb/in)	D256-10 A	70 (1.3)	D256-10 A	810 (15.2)
Density	g/cm ³	—	1.27	—	1.2
HDT (66 psi)	deg C (deg F)	D648 B	175 (347)	D648 B	190 (374)
HDT (264 psi)	deg C (deg F)	D648 B	173 (346)	D648 B	190 (374)

Directional Mechanical Properties of ULTEM™ 9085 Filament

The mechanical properties of 3D printed materials may vary with print orientation. In tension, most parts are strongest when the print orientation and loading direction are parallel, and weakest when the print orientation and loading direction are perpendicular.

Property	Print orientation	Average
Yield Strength (MPa)	XY	62
	XZ	68
	ZX	48
Tensile strength (MPa)	XY	61
	XZ	67
	ZX	48
Tensile modulus (GPa)	XY	2.32
	XZ	2.52
	ZX	2.11
Elongation at break (%)	XY	5.3
	XZ	5.6
	ZX	2.1



Printer & Material Compatibility

ULTEM™ 9085 Filament

Available for use on the FX20 and compatible with Support for ULTEM™ Filament.

Can only be reinforced with Carbon Fiber for ULTEM™ Filament.

Carbon Fiber for ULTEM™ Filament

Available for use on the FX20.

Only compatible as a reinforcement for ULTEM™ 9085 Filament.

Future Data

ULTEM™ 9085 Filament and Carbon Fiber for ULTEM™ Filament are undergoing more tests which will provide additional results after completion, including:

Full mechanical data

Glass transition temperature

Coefficient of thermal expansion (CTE)

UV exposure

Fluid sensitivity to common aerospace fluids including fuels, lubricants, and cleaning agents

ULTEM™ 9085
Filament

Carbon Fiber for
ULTEM™ Filament

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To learn more about specific testing conditions or to request test parts for internal testing, contact a Markforged representative. All customer parts should be tested in accordance to customer's specifications.

This data sheet is preliminary and includes some estimated values. Values will be updated when full material testing is complete.

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