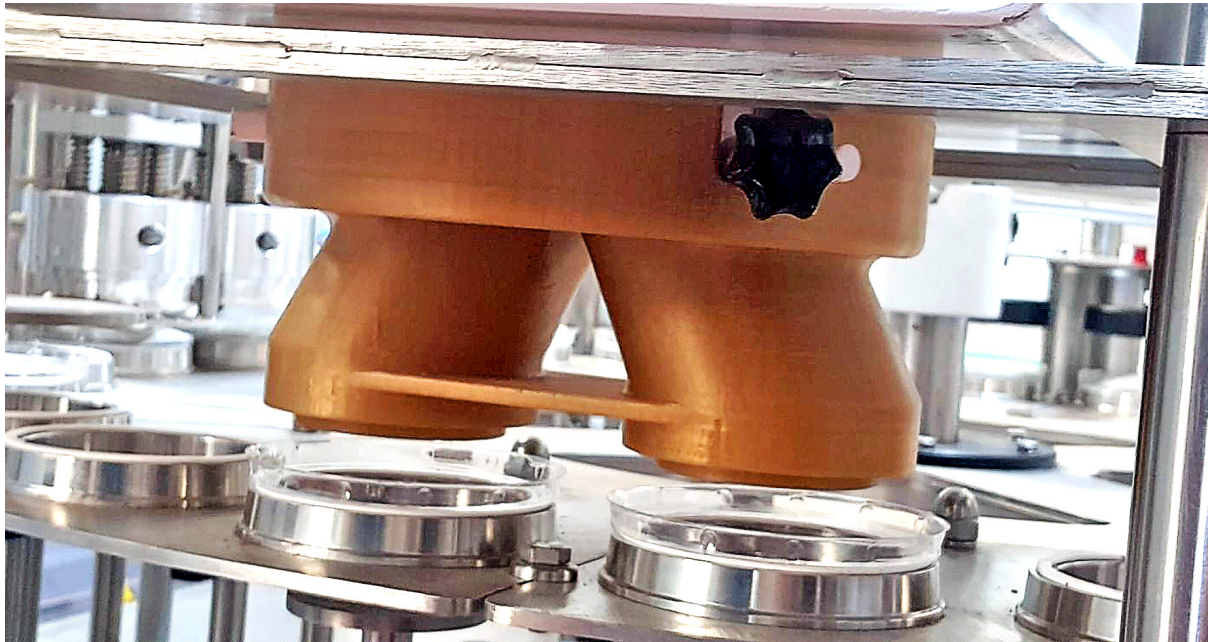


ULTEM 1010 Resin



FDM Thermoplastic Filament



Overview

ULTEM™ 1010 resin is a high-performance FDM® polyetherimide (PEI) thermoplastic. It exhibits high tensile strength in addition to broad chemical resistance and excellent thermal stability. Its high heat resistance makes it autoclave-capable for applications involving sterilization and composite lay-up tooling.

This material is available in both general-purpose and certified grades (CG). ULTEM 1010 resin is used with breakaway support material and is available in natural color.

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Ordering Information

Table 1. Printer and Support Material Compatibility

Printer	Model Tip (Slice)	Support Material	Support Tip
Fortus 400mc™	T14 (10 slice) T20 (13 slice)	1010 support (breakaway)	T16 (10, 13 slice)
Fortus 450mc™	T14 (10 slice) T20 (13 slice)	1010 support (breakaway)	T16 (10, 13 slice)
Fortus 900mc™/F900™	T14 (10 slice) T20 (13 slice) T40A (20 slice)	1010 support (breakaway)	T16 (10, 13 slice) T20 (20 slice)

Build Sheet

High Temperature

- 0.02 x 26 x 38 in.
- 0.02 x 16 x 18.5 in.

Table 2. ULTEM™ 1010 Resin Ordering Information

Part Number	Description
Filament Canisters^{1 2}	
355-02330	ULTEM™ 1010 resin, 92.3 cu in - Plus
355-02320	ULTEM™ 1010 resin CG, 92.3 cu in - Plus
312-22100	ULTEM™ 1010 resin, 92.3 cu in - Classic
312-22000	ULTEM™ 1010 resin CG, 92.3 cu in - Classic
355-03240	ULTEM Support, 92.3 cu in. - Plus
310-31000	ULTEM Support, 92.3 cu in. - Classic
Printer Consumables	
511-12000	T14 tip
511-10701	T20 tip
511-10750	T40A tip
511-10401	T16 tip
325-00275-S	High Temperature build sheet, 0.2 x 26 x 38 in. (0.76 x 660 x 965 mm)
325-00475-S	High Temperature build sheet, 0.2 x 16 x 18.5 in. (0.76 x 406 x 470 mm)

¹ Classic canisters are compatible with Fortus 900mc printers prior to s/n L502.

² Plus canisters are compatible with all Fortus 450mc, all Stratasys F900, and Fortus 900mc printers s/n L502 and up.

Physical Properties

Values are measured as printed. XY, XZ, and ZX orientations were tested. For full details refer to the [Stratasys Materials Test Report](#) (immediate download upon clicking the link). DSC and TMA curves can be found in the Appendix.

Table 3. ULTEM™ 1010 Resin Physical Properties

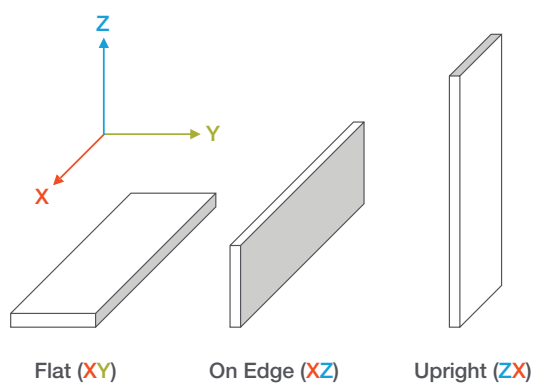
Property	Test Method	Typical Values	
		XY	XZ/ZX
HDT @ 66 psi	ASTM D648 Method B	215 °C (415 °F)	
HDT @ 264 psi	ASTM D648 Method B	210 °C (410 °F)	
Tg	ASTM D7426 Inflection Point	210 °C (410 °F)	
Mean CTE	ASTM E831 (-50 °C to 60 °C)	35 µm/[m*°C] (19.5 µin./[in.*°F])	-
	ASTM E831 (60 °C to 205 °C)	30 µm/[m*°C] (16.7 µin./[in.*°F])	-
	ASTM E831 (-50 °C to 110 °C)	-	30 µm/[m*°C] (16.7 µin./[in.*°F])
	ASTM E831 (110 °C to 165 °C)	-	15 µm/[m*°C] (8.3 µin./[in.*°F])
	ASTM E831 (165 °C to 200 °C)	-	5 µm/[m*°C] (2.7 µin./[in.*°F])
	ASTM D257	>7.0*10 ¹⁴ Ω*cm	
	ASTM D150 1 kHz test condition	2.85	
	ASTM D150 2 MHz test condition	-0.002	
Dissipation Factor	ASTM D150 1 kHz test condition	3.1	
	ASTM D150 2 MHz test condition	0	
Specific Gravity	ASTM D257 @23 °C	1.29	

Mechanical Properties

ULTEM 1010 resin samples were printed with a 0.010 in. (0.254 mm) layer height on the F900. For the full test procedure please see the [Stratasys Materials Test Procedure](#) (immediate download upon clicking the link).

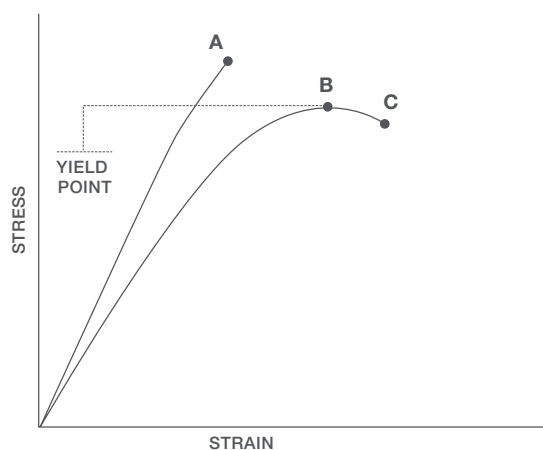
Print Orientation

Parts created using FDM are anisotropic as a result of the printing process. Below is a reference of the different orientations used to characterize the material.



Tensile Curves

Due to the anisotropic nature of FDM, tensile curves look different depending on orientation. Below is a guide of the two types of curves seen when printing tensile samples and what reported values mean.



A = Tensile at break, elongation at break (no yield point)

B = Tensile at yield, elongation at yield

C = Tensile at break, elongation at break

Table 4. ULTEM™ 1010 Resin Mechanical Properties (Fortus 900mc - T14 Tip)

		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	No yield	No yield
	psi		
Elongation @ Yield	%	No yield	No yield
Strength @ Break	MPa	80 (5)	30 (10)
	psi	11,490 (710)	4,080 (1280)
Elongation @ Break	%	4.0 (0.4)	1.1 (0.4)
Modulus (Elastic)	GPa	3.0 (0.1)	3.0 (0.4)
	ksi	440 (25)	435 (65)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	MPa	No break	80 (13)
	psi	No break	11,830 (1940)
Strength @ 5% Strain	MPa	130 (4)	-
	psi	18,475 (570)	-
Strain @ Break	%	No break	3.2 (0.5)
Modulus	MPa	2.91 (0.05)	2.6 (0.1)
	ksi	420 (7)	380 (20)
Compression Properties: ASTM D695			
Yield Strength	MPa	245 (50)	440 (30)
	psi	35,585 (7245)	63,520 (4460)
Modulus	GPa	2.9 (0.1)	3.2 (0.5)
	ksi	425 (20)	470 (80)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	25 (3)	20 (5)
	ft*lb/in.	0.50 (0.06)	0.41 (0.09)
Unnotched	J/m	260 (60)	70 (30)
	ft*lb/in.	4.9 (1.1)	1.3 (0.5)

¹ Values in parentheses are standard deviations.

Appendix

Figure 1. 2nd heating scan DSC data for the ULTEM™ 1010 resin Flat (XY) sample.

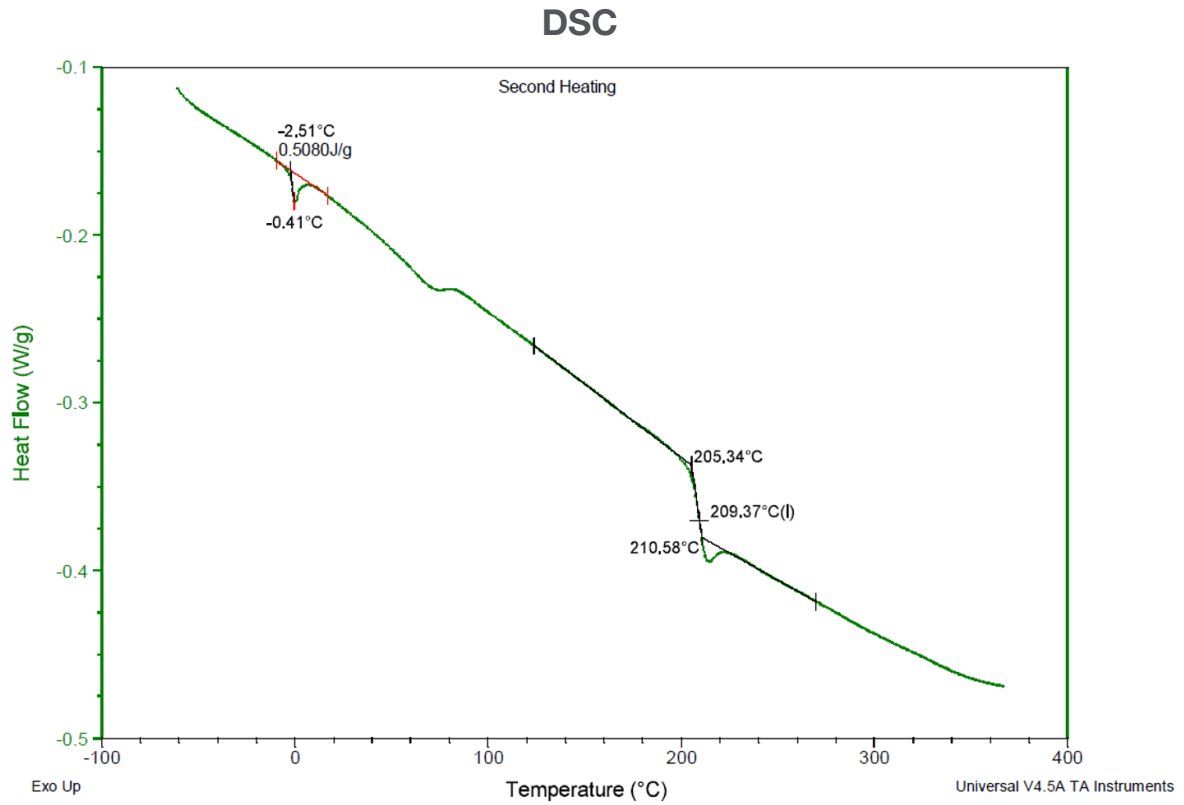


Figure 2. – Dimension change data as a function of temperature for the ULTEM™ 1010 resin Flat (XY) sample.

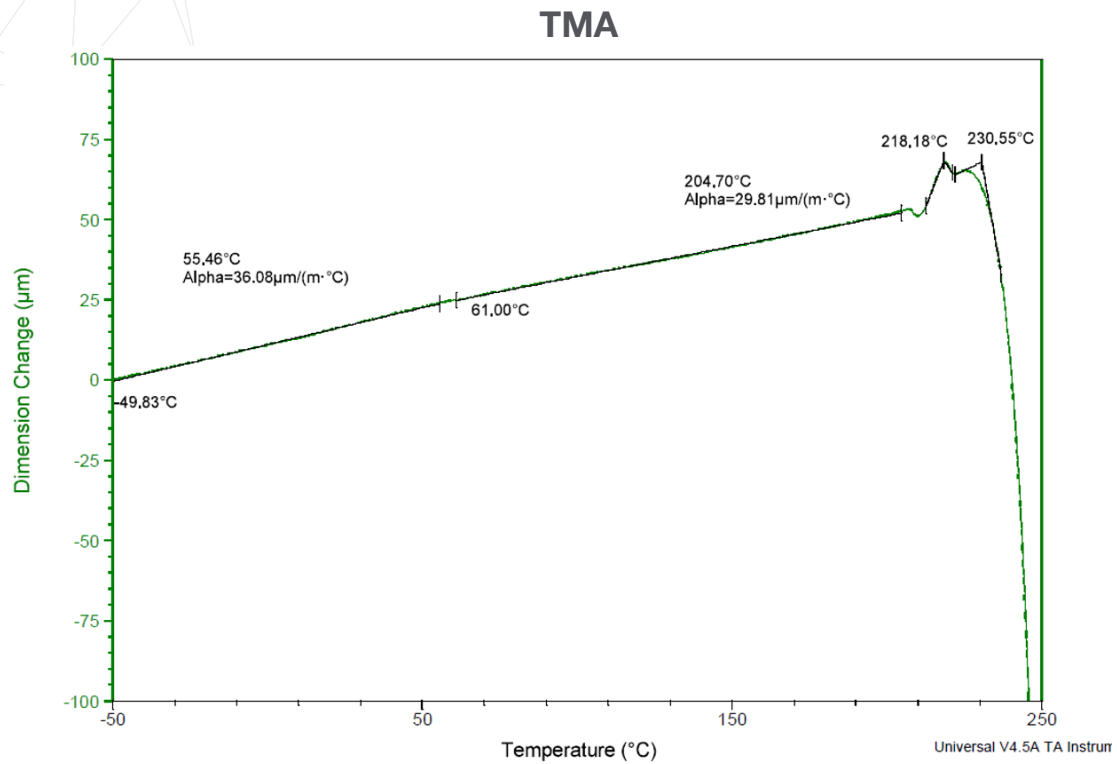


Figure 3. Dimension change data as a function of temperature for the ULTEM™ 1010 resin On Edge (XZ) sample.

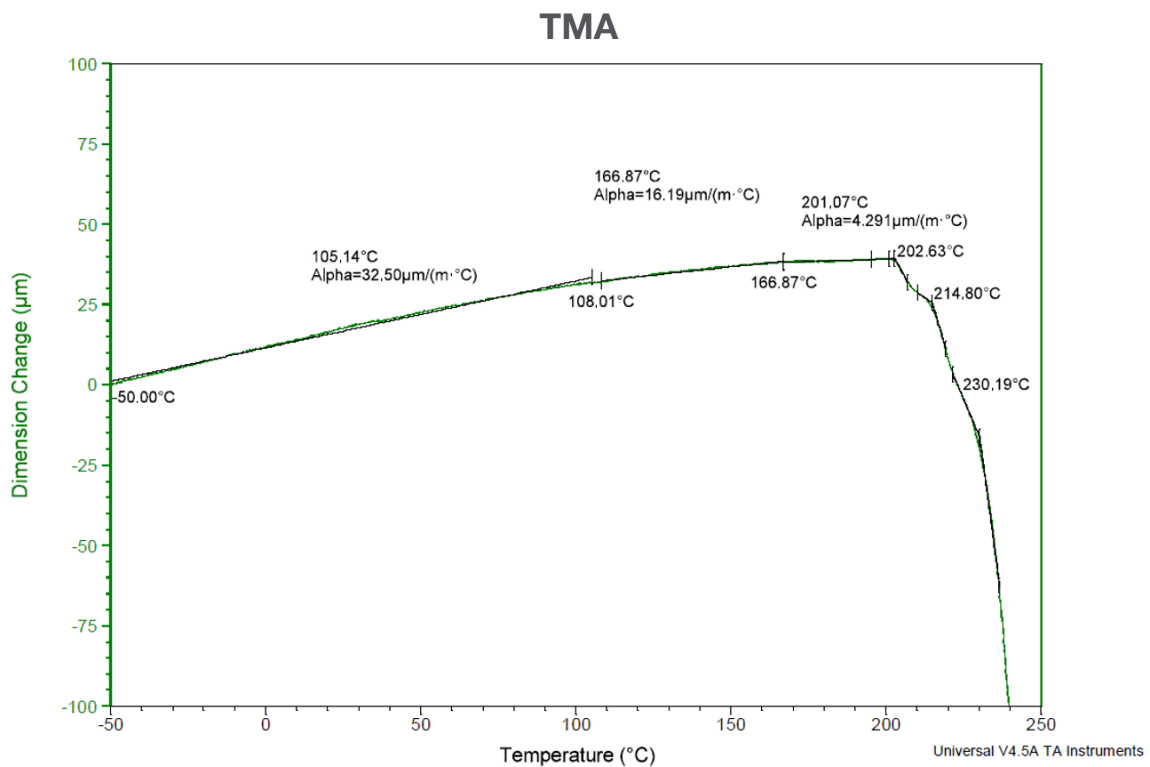


Figure 4. – Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) ULTEM™ 1010 resin samples.

