



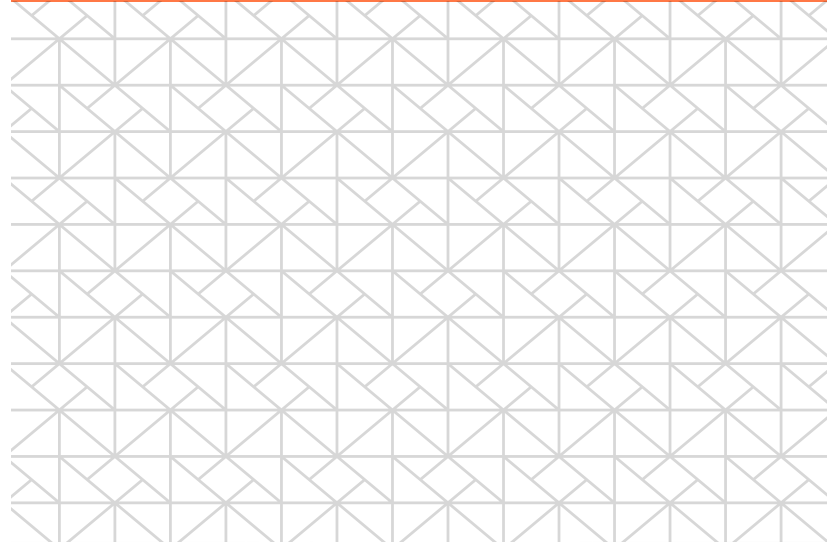
MATERIAL DATA SHEET
FDM

ULTEM™ 9085 Resin

FDM® Thermoplastic Filament

Fit for High-Performance
Applications

The information presented are typical values intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes.





Overview

ULTEM™ 9085 resin filament is a PEI (polyetherimide) thermoplastic FDM material. It features a high strength-to-weight ratio, high thermal and chemical resistance, and meets multiple aerospace and railway industry standards for flame, smoke and toxicity (FST) characteristics. Available colors are Natural, Black, Red, Jana White, White 7362, Dream Gray, Gunship Gray and Aircraft Gray.

ULTEM™ 9085 resin CG (Certified Grade - only available in Natural) meets more stringent test criteria and possesses documented traceability from filament back to raw material lot number. Included documentation:

- 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.
- Certificate of Conformance – confirms that the material is manufactured in compliance to approved Stratasys® and industry specifications.

Typical applications include production parts and functional prototypes.

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Ordering Information

Table 1: Printer and Support Material Compatibility

Printer	Model Tip	Layer Height	Support Material	Support Tip
Fortus 450mc™	T16	0.25 mm (0.010 in.)	SUP8500B™ Support	T16
	T16A	0.25 mm (0.010 in.)		
	T20	0.33 mm (0.013 in.)		
F900®	T16	0.25 mm (0.010 in.)	SUP8500B Support	T16
	T16A	0.25 mm (0.010 in.)		
	T20	0.33 mm (0.013 in.)		
	T40A	0.51 mm (0.020 in.)		T40A
F3300®	N350	0.19 mm (0.007 in.)	SUP8500B Support	N410S
	N500	0.25 mm (0.010 in.)		N410S ¹ , N410
	N750	0.51 mm (0.020 in.)		N750

¹ The N410S hot end has a nipple added for better bridging and support removal and is the recommended hot end for SUP8500B.

ULTEM™ 9085 resin colors (Red, Jana White, White 7362, Dream Gray, Gunship Gray, and Aircraft Gray) are only available on the F900 and Fortus 450mc with the T16 model tip using a 0.25 mm (0.010 in.) layer height. ULTEM™ 9085 resin colors Red and Aircraft Gray are enabled at a layer height of 0.33 mm (0.013 in.) with the T20 tip on the F900 and Fortus 450mc.

Build Sheet

Fortus High Temperature Build Sheets

- 0.51 x 660 x 965 mm (0.02 x 26 x 38 in.)
- 0.51 x 406 x 470 mm (0.02 x 16 x 18.5 in.)

F3300 High Temperature Build Sheets

- 0.51 x 660 x 711 mm (0.02 x 26 x 28 in.)

System Requirements¹

Fortus 450mc

- Hardened machine upgrade (only required for hardened head)
- Standard Fortus 450mc head (natural, black, CG, Validated Material colors)
- Hardened Fortus 450mc head (Validated Material colors)
- ULTEM™ 9085 resin material license (included if new system)
- All Materials license (required for Validated Material colors, included if new system)
- Fortus FDC™ (enables use of XTEND™ 250 Fortus® Plus spool)

F900

- Standard F900 head (natural, black, CG, Validated Material colors)
- Hardened F900 head (Validated Material colors)
- ULTEM™ 9085 resin material license
- Validated Materials license (required for Validated Material colors)
- Fortus FDC™ (enables use of XTEND™ 250 Fortus® Plus spool)

F3300

- F3000 Series Extruder Drive
- Standard Hot Ends
- No material licenses required

¹ Contact your Stratasys representative for ordering information.


Table 2: ULTEM™ 9085 Resin Ordering Information

Part Number	Description	System Compatibility
Filament Consumables		
Fortus Plus Canister (black snout)		
355-02310	ULTEM™ 9085 resin Natural, 92.3 cu in - Plus	
355-08310	ULTEM™ 9085 resin Natural, 184 cu in - Plus	
355-23101	ULTEM™ 9085 resin CG, 92.3 cu in - Plus	Fortus 450mc, F900, Fortus 900mc (S/N L502 and up)
355-02311	ULTEM™ 9085 resin Black, 92.3 cu in - Plus	
355-03220	SUP8500B Support, 92.3 cu in - Plus	
355-70050	ULTEM™ 9085 resin Red, 92 cu in - Plus	
355-70051	ULTEM™ 9085 resin Jana White, 92 cu in - Plus	
355-70052	ULTEM™ 9085 resin Dream Gray, 92 cu in - Plus	Fortus 450mc, F900
355-70053	ULTEM™ 9085 resin White 7362, 92 cu in - Plus	
355-70054	ULTEM™ 9085 resin Gunship Gray, 92 cu in - Plus	
355-70055	ULTEM™ 9085 resin Aircraft Gray, 92 cu in - Plus	
Fortus Spools		
361-00400	XTEND™ 250 Fortus® Plus ULTEM™ 9085 resin Natural	
361-00450	XTEND™ 250 Fortus® Plus ULTEM™ 9085 resin Black	Fortus 450mc and F900 with Fortus FDC™
361-00407	XTEND™ 250 Fortus® Plus ULTEM™ 9085 resin Aircraft Gray	
Fortus Classic Canister (gray snout)		
312-20000	ULTEM™ 9085 resin Natural, 92.3 cu in - Classic	
312-20018	ULTEM™ 9085 resin Natural, 184 cu in - Classic	
312-20001	ULTEM™ 9085 resin CG, 92.3 cu in - Classic	Fortus 900mc (S/N prior to L502)
312-20200	ULTEM™ 9085 resin Black, 92.3 cu in - Classic	
310-30600	SUP8500B Support, 92.3 cu in - Classic	
F3000 Series Spools		
363-00400	MTRL, F3000 Series, (M), ULTEM 9085 resin (Natural), 4100cc	
363-00500	MTRL, F3000 series, (M), ULTEM 9085 resin CG (Natural), 4100cc	F3300
363-00450	MTRL, F3000 Series, (M), ULTEM 9085 resin (Black), 4100cc	
363-00720	MTRL, F3000 Series, (S), SUP8500B, 4100cc	



Part Number	Description	System Compatibility
Printer Consumables		
Fortus		
511-10401	T16 tip, 0.010 in. (0.254 mm) layer height	
511-10410	T16A tip, 0.010 in. (0.254 mm) layer height	Fortus 450mc, F900, Fortus 900mc
511-10701	T20 tip, 0.013 in. (0.330 mm) layer height	
511-10750	T40A tip, 0.020 in. (0.508 mm) layer height	F900, Fortus 900mc
325-00275-S	High Temperature build sheet, 0.02 x 16 x 18.5 in. (0.51 x 406 x 470 mm), 20 pack	Fortus 450mc, F900, Fortus 900mc
325-00475-S	High Temperature build sheet, 0.02 x 26 x 38 in. (0.51 x 660 x 965 mm), 10 pack	F900, Fortus 900mc
F3000 Series		
533-00350-S	FDM, N350 Hot End (0.188 mm/0.007 in. layer height)	
533-00500-S	FDM, N500 Hot End (0.25 mm/0.010 in. layer height)	
533-00750-S	FDM, N750 Hot End (0.50 mm/0.020 in. layer height)	
533-00410-S	FDM, N410 Support Hot End (0.25 mm/0.010 in. layer height)	F3300
533-00420-S	FDM, N410S Support Hot End (0.188 mm/0.007 in. and 0.25 mm/0.010 in. layer height)	
363-30200-S	F3300 Sheet Bundle, high temp, 0.02 x 26 x 28 in., 10 pack	
Print Heads		
Fortus		
821725-XXXX	Standard Fortus 450mc head (silver handle)	Fortus 450mc
380-30300-S	OpenAM Standard Fortus 450mc head (silver handle, additional sticker)	
821726-XXXX	Hardened Fortus 450mc head (blue handle)	Fortus 450mc (Validated Materials only)
380-30400-S	OpenAM Hardened Fortus 450mc head (blue handle, additional sticker)	
404210-XXXX	Standard F900 head (formed rod handle)	F900, Fortus 900mc
325-63500	Hardened F900 head (folded sheet metal handle)	F900 (Validated Materials only)
F3000 Series		
533-10000-S	F3000 Series Extruder Drive	F3300



Physical Properties

Values are measured as molded and printed on the F900 with a 0.25 mm (0.010 in.) layer height using ULTEM 9085 resin Natural. ULTEM 9085 resin Black is used where specified in the table. XY and XZ orientations were tested. For full details refer to the [Stratasys Materials Test Procedure](#). DSC and TMA curves can be found in the Appendix.

Table 3: ULTEM™ 9085 Resin Natural Physical Properties

Property	Test Method	Typical Values	
		XY	XZ
Physical Properties - Printed			
HDT @ 66 psi	ASTM D648 Method B	178.2 °C (352.8 °F)	178.4 °C (353.1 °F)
HDT @ 264 psi	ASTM D648 Method B	170.2 °C (338.3 °F)	172.6 °C (342.7 °F)
Mean CTE	ASTM E831 (-50 °C to 60 °C)	-	44.45 µm/[m*°C] (24.69 µin/[in*°F])
	ASTM E831 (60 °C to 160 °C)	-	32.31 µm/[m*°C] (17.95 µin/[in*°F])
	ASTM E831 (-50 °C to 80 °C)	44.89 µm/[m*°C] (24.94 µin/[in*°F])	-
	ASTM E831 (80 °C to 160 °C)	31.35 µm/[m*°C] (17.42 µin/[in*°F])	-
Mean CTE (Black)	ASTM E831 (-50 °C to 30 °C)	-	47.79 µm/[m*°C] (26.55 µin/[in*°F])
	ASTM E831 (30 °C to 165 °C)	-	38.55 µm/[m*°C] (21.42 µin/[in*°F])
	ASTM E831 (-50 °C to 80 °C)	51.88 µm/[m*°C] (28.82 µin/[in*°F])	-
	ASTM E831 (80 °C to 160 °C)	40.2 µm/[m*°C] (22.33 µin/[in*°F])	-
Dielectric Constant	ASTM D150 1 kHz test condition	2.80	2.87
	ASTM D150 2 MHz test condition	2.65	2.73
Dielectric Constant (Black)	ASTM D150 1 kHz test condition	2.79	2.87
	ASTM D150 2 MHz test condition	2.65	2.72
Dissipation Factor	ASTM D150 1 kHz test condition	0.002	0.002
	ASTM D150 2 MHz test condition	0.010	0.010
Dissipation Factor (Black)	ASTM D150 1 kHz test condition	0.002	0.002
	ASTM D150 2 MHz test condition	0.010	0.009
Physical Properties - Non Printed			
HDT @ 66 psi	ASTM D648 Method B	176.9 °C (350.4 °F)	
HDT @ 264 psi	ASTM D648 Method B	172.9 °C (343.2 °F)	
Tg	ASTM D7426 Inflection Point	177.3 °C (351.2 °F)	
Volume Resistivity	ASTM D257	> 6.89*10 ¹⁵ Ω*cm	
Volume Resistivity (Black)	ASTM D257	> 6.96*10 ¹⁵ Ω*cm	



Property	Test Method	Molded Plaques
Thermal Conductivity	ASTM E1952 @0 °C	0.2136 W/[m*K] (0.1234 BTU/[hr*ft*°F])
	ASTM E1952 @30 °C	0.2109 W/[m*K] (0.1219 BTU/[hr*ft*°F])
	ASTM E1952 @60 °C	0.2111 W/[m*K] (0.1220 BTU/[hr*ft*°F])
	ASTM E1952 @90 °C	0.2095 W/[m*K] (0.1211 BTU/[hr*ft*°F])
Thermal Diffusivity	ASTM E1952 @30 °C	0.132 mm ² /s (2.05*10 ⁻⁴ in ² /s)
	ASTM E1952 @60 °C	0.121 mm ² /s (1.88*10 ⁻⁴ in ² /s)
	ASTM E1952 @90 °C	0.111 mm ² /s (1.72*10 ⁻⁴ in ² /s)
Specific Gravity	ASTM D792 @23 °C	1.27

Mechanical Properties

Samples, natural and black, were printed with 0.25 mm (0.010 in.), 0.33 mm (0.013 in.), and 0.51 mm (0.020 in.) layer heights on the F900, Fortus 450mc, and F3300. For the full test procedure please see the [Stratasys Materials Test Procedure](#). For more information on compression testing and reporting please see the [Refining Compressive Yield Stress Measurement for FDM Materials](#) one pager.

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.

Flat (XY) On Edge (XZ) Upright (ZX)

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™ 9085 Resin Natural Mechanical Properties - F900 - T16 Tip

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	69.2 (1.0)	No yield
	psi	10,000 (150)	No yield
Elongation at Yield	%	5.4 (0.50)	No yield
Strength at Break	MPa	68.1 (1.6)	39.4 (8.7)
	psi	9,870 (230)	5,710 (1,300)
Elongation at Break	%	5.4 (0.50)	1.9 (0.51)
Modulus (Elastic)	GPa	2.52 (0.062)	2.41 (0.15)
	ksi	365 (8.9)	350 (22)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	104 (2.2)	73.1 (13)
	psi	15,000 (320)	10,600 (1,900)
Strain at Break	%	No break ²	3.67 (0.55)
Modulus	GPa	2.40 (0.032)	2.13 (0.081)
	ksi	348 (4.6)	309 (12)
Compression Properties: ASTM D695			
Peak Strength	MPa	139 (9.4)	342 (27)
	psi	20,100 (1,400)	49,600 (390)
Modulus	GPa	2.22 (0.047)	2.28 (0.080)
	ksi	321 (6.8)	331 (12)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	88.5 (21)	39.2 (4.3)
	ft*lb/in	1.66 (0.40)	0.735 (0.080)
Izod, Unnotched	J/m	647 (66)	187 (42)
	ft*lb/in	12.1 (1.2)	3.51 (0.79)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.


Table 5: ULTEM™ 9085 Resin CG Mechanical Properties - F900 - T16A Tip

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	76.2 (5.8)	54.2 (3.1)
	psi	11,100 (850)	7,870 (450)
Elongation at Yield	%	5.3 (0.2)	3.4 (0.9)
Strength at Break	MPa	73.9 (5.3)	55.3 (5.7)
	psi	10,700 (760)	8,020 (830)
Elongation at Break	%	5.8 (0.6)	3.5 (1.1)
Modulus (Elastic)	GPa	2.50 (0.15)	2.21 (0.22)
	ksi	363 (21.1)	321 (32.1)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	111 (3.2)	82.4 (4.6)
	psi	16,100 (470)	11,900 (670)
Strain at Break	%	No break ²	4.4 (0.35)
Modulus	GPa	2.55 (0.064)	2.12 (0.054)
	ksi	370 (9.3)	308 (7.8)
Compression Properties: ASTM D695			
Peak Strength	MPa	89.3 (4.3)	94.9 (2.9)
	psi	12,900 (310)	13,800 (210)
Modulus	GPa	1.85 (0.031)	1.93 (0.022)
	ksi	269 (4.5)	280 (3.2)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	140 (65)	46.7 (7.4)
	ft*lb/in	2.63 (1.2)	0.87 (0.14)
Unnotched	J/m	1,510 (190)	257 (49)
	ft*lb/in	28.4 (3.5)	4.81 (0.92)

¹ Values in parentheses are standard deviations.

² The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 6: ULTEM™ 9085 Resin Natural Mechanical Properties - F900 - T20 Tip

0.33 mm (0.013 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	78.7 (1.6)	48.7 (4.8)
	psi	11,400 (240)	7,100 (700)
Elongation at Yield	%	6.4 (0.2)	3.1 (0.4)
Strength at Break	MPa	72.8 (2.6)	48.0 (4.7)
	psi	10,600 (370)	7,000 (680)
Elongation at Break	%	8.7 (0.9)	3.1 (0.4)
Modulus (Elastic)	GPa	2.11 (0.052)	1.93 (0.059)
	ksi	306 (7.5)	279 (8.6)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	113 (1.9)	72.1 (5.0)
	psi	16,400 (270)	10,500 (720)
Strain at Break	%	No break ²	4.0 (0.4)
Modulus	GPa	2.61 (0.042)	2.00 (0.067)
	ksi	379 (6.1)	289 (9.7)
Compression Properties: ASTM D695			
Peak Strength	MPa	87.8 (3.5)	90.9 (2.13)
	psi	12,700 (510)	13,200 (310)
Modulus	GPa	1.83 (0.058)	1.75 (0.037)
	ksi	265 (8.43)	254 (5.3)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	118 (43)	45.4 (12)
	ft*lb/in	2.21 (0.81)	0.851 (0.23)
Izod, Unnotched	J/m	1,910 (240)	210 (40)
	ft*lb/in	35.8 (4.4)	3.94 (0.75)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



T40A Tensile Part Processing: XZ tensile coupon printed dimensions were 165 x 22 x 5 mm (6.500 x 0.875 x 0.200 in.). ZX tensile coupons were precision-cut via water jet machining from larger printed plaques to produce final coupon dimensions of 165 x 22 x 5 mm (6.500 x 0.875 x 0.200 in.). XZ and ZX tensile coupons were then tested using the standard D638 procedure, including coupon conditioning and pulling.

T40A Flexural Part Processing: XZ flexural coupon printed dimensions were 165 x 12.7 x 5 mm (6.500 x 0.500 x 0.200 in.). ZX flexural test coupons were precision-cut via water jet machining from larger printed plaques to produce final coupon dimensions of 165 x 12.7 x 5 mm (6.500 x 0.500 x 0.20 in.). XZ and ZX flexural coupons were then tested using the standard D790 procedure, including coupon conditioning.

Table 7: ULTEM™ 9085 Resin Mechanical Properties - F900 - T40A Tip

0.51 mm (0.020 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: Modified ASTM D638			
Yield Strength	MPa	82.3 (1.4)	55.7 (1.7)
	psi	11,900 (200)	8,080 (250)
Elongation at Yield	%	6.1 (0.1)	4.0 (0.3)
Strength at Break	MPa	64.9 (15.8)	55.5 (2.0)
	psi	9,410 (2,200)	8,050 (290)
Elongation at Break	%	7.4 (3.3)	4.0 (0.3)
Modulus (Elastic)	GPa	2.2 (0.1)	1.9 (0.1)
	ksi	321 (6)	273 (4)
Flexural Properties: Modified ASTM D790, Procedure A			
Strength at Break	MPa	110.4 (3.3)	83.6 (1.6)
	psi	16,000 (500)	12,100 (200)
Strain at Break	%	No break ²	4.8 (0.2)
Modulus	GPa	2.60 (0.06)	2.05 (0.04)
	ksi	371 (9)	298 (5)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 8: ULTEM™ 9085 Resin Black Mechanical Properties - F900 - T16 Tip

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	71.7 (1.6)	No yield
	psi	10,400 (240)	No yield
Elongation at Yield	%	5.5 (0.27)	No yield
Strength at Break	MPa	69.8 (1.7)	41.4 (9.0)
	psi	10,100 (240)	6,000 (1,300)
Elongation at Break	%	5.4 (0.65)	2.1 (0.58)
Modulus (Elastic)	GPa	2.54 (0.050)	2.42 (0.16)
	ksi	368 (7.2)	351 (23)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	107 (3.4)	72.1 (5.9)
	psi	15,500 (490)	10,500 (860)
Strain at Break	%	No break ²	3.78 (0.39)
Modulus	GPa	2.47 (0.059)	2.11 (0.039)
	ksi	358 (8.6)	305 (5.7)
Compression Properties: ASTM D695			
Peak Strength	MPa	142 (9.1)	349 (24)
	psi	20,600 (1,300)	50,600 (350)
Modulus	GPa	2.27 (0.043)	2.37 (0.097)
	ksi	329 (6.3)	343 (14)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	94.8 (22)	37.0 (8.3)
	ft*lb/in	1.78 (0.4)	0.693 (0.16)
Izod, Unnotched	J/m	771 (140)	169 (54)
	ft*lb/in	14.4 (2.7)	3.16 (1.0)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 9: ULTEM™ 9085 Resin Black Mechanical Properties - F900 - T20 Tip

0.33 mm (0.013 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	78.0 (2.2)	46.1 (4.8)
	psi	11,300 (320)	6,690 (690)
Elongation at Yield	%	6.4 (0.1)	2.7 (0.4)
Strength at Break	MPa	71.2 (3.8)	46.2 (4.8)
	psi	10,300 (550)	6,700 (690)
Elongation at Break	%	9.1 (0.1)	2.7 (0.4)
Modulus (Elastic)	GPa	2.13 (0.022)	2.06 (0.060)
	ksi	308 (3.2)	298 (8.8)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	114.6 (2.0)	74.9 (3.9)
	psi	16,600 (290)	10,900 (560)
Strain at Break	%	No break ²	4.0 (0.3)
Modulus	GPa	2.63 (0.040)	2.05 (75)
	ksi	381 (6.1)	297 (11)
Compression Properties: ASTM D695			
Peak Strength	MPa	89.2 (1.5)	93.9 (1.5)
	psi	12,900 (1.5)	13,600 (220)
Modulus	GPa	1.90 (0.059)	1.80 (0.033)
	ksi	275 (8.6)	261 (4.8)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	109 (31)	46.9 (8.3)
	ft*lb/in	2.05 (0.58)	0.88 (0.16)
Izod, Unnotched	J/m	1,910 (200)	199 (28)
	ft*lb/in	35.8 (3.7)	3.73 (0.52)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



T40A Tensile Part Processing: XZ tensile coupon printed dimensions were 165 x 22 x 5 mm (6.500 x 0.875 x 0.200 in.). ZX tensile coupons were precision-cut via water jet machining from larger printed plaques to produce final coupon dimensions of 165 x 22 x 5 mm (6.500 x 0.875 x 0.200 in.). XZ and ZX tensile coupons were then tested using the standard D638 procedure, including coupon conditioning and pulling.

T40A Flexural Part Processing: XZ flexural coupon printed dimensions were 165 x 12.7 x 5 mm (6.500 x 0.500 x 0.200 in.). ZX flexural test coupons were precision-cut via water jet machining from larger printed plaques to produce final coupon dimensions of 165 x 12.7 x 5 mm (6.500 x 0.500 x 0.20 in.). XZ and ZX flexural coupons were then tested using the standard D790 procedure, including coupon conditioning.

Table 10: ULTEM™ 9085 Resin Black Mechanical Properties - F900 - T40A Tip

0.51 mm (0.020 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: Modified ASTM D638			
Yield Strength	MPa	79.1 (0.8)	52.8 (2.8)
	psi	11,500 (100)	7,660 (410)
Elongation at Yield	%	6.2 (0.1)	3.6 (0.5)
Strength at Break	MPa	62.7 (9.9)	52.9 (2.8)
	psi	9,100 (1,440)	7,670 (400)
Elongation at Break	%	8.9 (3.5)	3.6 (0.6)
Modulus (Elastic)	GPa	2.20 (0.04)	1.88 (0.04)
	ksi	315 (6)	272 (6)
Flexural Properties: Modified ASTM D790, Procedure A			
Strength at Break	MPa	111.9 (2.7)	83.4 (3.5)
	psi	16,200 (400)	12,100 (500)
Strain at Break	%	No break ²	4.5 (0.4)
Modulus	GPa	2.6 (0.06)	2.05 (0.03)
	ksi	375 (9)	298 (5)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 11: ULTEM™ 9085 Resin Natural Mechanical Properties - F3300 - N500 Hot End

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	75.3 (2)	58.9 (7)
	psi	10,900 (290)	8,540 (1,000)
Elongation at Yield	%	6.4 (0.15)	4.2 (0.95)
Strength at Break	MPa	71.2 (2.7)	58.6 (6.5)
	psi	10,300 (390)	8,510 (950)
Elongation at Break	%	7.9 (0.57)	4.2 (0.96)
Modulus (Elastic)	GPa	2.2 (0.05)	2.17 (0.047)
	ksi	319 (7.3)	314 (6.8)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	108 (1.8)	91.7 (1.8)
	psi	15,600 (260)	13,300 (260)
Strain at Break	%	No break ²	No break ²
Modulus	GPa	2.51 (0.04)	2.15 (0.063)
	ksi	364 (5.8)	312 (9.1)
Compression Properties: ASTM D695			
Peak Strength	MPa	186 (33)	283 (15)
	psi	27,000 (4,800)	41,000 (2,100)
Modulus	GPa	1.97 (0.032)	1.91 (0.062)
	ksi	285 (4.6)	277 (9)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	95.1 (19)	76 (10)
	ft*lb/in	1.78 (0.35)	1.42 (0.19)
Unnotched	J/m	1,820 (97)	432 (52)
	ft*lb/in	34.2 (1.8)	8.09 (0.98)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 12: ULTEM™ 9085 Resin CG Mechanical Properties - F3300 - N500 Hot End

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	79.8 (3.5)	62.5 (1.1)
	psi	11,600 (500)	9,070 (160)
Elongation at Yield	%	6.2 (0.2)	4.3 (0.25)
Strength at Break	MPa	76.7 (3.3)	62.8 (1.5)
	psi	11,100 (480)	9,110 (220)
Elongation at Break	%	7.4 (0.43)	4.3 (0.32)
Modulus (Elastic)	GPa	2.34 (0.063)	2.18 (0.039)
	ksi	340 (9.2)	316 (5.6)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	116 (1.9)	98.1 (4)
	psi	16,800 (280)	14,200 (570)
Strain at Break	%	No break ²	No break ²
Modulus	GPa	2.67 (0.049)	2.29 (0.11)
	ksi	387 (7.1)	332 (16)
Compression Properties: ASTM D695			
Peak Strength	MPa	153 (23)	284 (6)
	psi	22,200 (3,400)	41,200 (870)
Modulus	GPa	1.93 (0.057)	1.88 (0.04)
	ksi	279 (8.3)	273 (5.8)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	117 (21)	80.2 (13)
	ft*lb/in	2.19 (0.39)	1.5 (0.24)
Unnotched	J/m	2,260 (320)	633 (87)
	ft*lb/in	42.4 (6)	11.9 (1.6)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 13: ULTEM™ 9085 Resin Natural Mechanical Properties - Fortus 450mc - T16A Tip

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	73.0 (2.2)	54.5 (4.1)
	psi	10,600 (320)	7,900 (590)
Elongation at Yield	%	5.8 (0.22)	3.1 (0.31)
Strength at Break	MPa	70.3 (2.3)	54.1 (4.1)
	psi	10,200 (330)	7,850 (590)
Elongation at Break	%	6.6 (0.59)	3.1 (0.31)
Modulus (Elastic)	GPa	2.11 (0.057)	2.11 (0.034)
	ksi	306 (8.2)	306 (5.00)
Flexural Properties: ASTM D790, Procedure A			
Strength at Break	MPa	No break	76.8 (6.5)
	psi	No break	11,100 (940)
Strength at 5% Strain	MPa	106 (3.9)	NA
	psi	15,400 (570)	NA
Strain at Break	%	No break ²	3.9 (0.4)
Modulus	GPa	2.45 (0.66)	2.19 (0.12)
	ksi	355 (9.6)	318 (17)
Compression Properties: ASTM D695			
Peak Strength	MPa	91.3 (1.9)	99.1 (2.9)
	psi	13,200 (270)	14,400 (420)
Modulus	GPa	1.89 (0.066)	1.94 (0.028)
	ksi	273 (9.6)	281 (4.1)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	106 (23)	53.0 (8.2)
	ft*lb/in	1.98 (0.42)	0.992 (0.15)
Unnotched	J/m	1,430 (110)	325 (88)
	ft*lb/in	26.8 (2.0)	6.09 (1.64)

¹Values in parentheses are standard deviations.

²The test is stopped when a strain of 5% is reached. "No break" is displayed.



Table 14: ULTEM™ 9085 Resin Black Mechanical Properties - Fortus 450mc - T20 Tip

0.33 mm (0.013 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	76.5 (1.4)	No Yield
	psi	11,100 (200)	No Yield
Elongation at Yield	%	6.2 (0.2)	No Yield
Strength at Break	MPa	74.0 (2.0)	41.6 (5.0)
	psi	10,700 (290)	6,030 (730)
Elongation at Break	%	6.6 (0.49)	2.6 (0.38)
Modulus (Elastic)	GPa	2.04 (0.048)	1.9 (0.032)
	ksi	295 (6.9)	275 (4.6)

¹ Values in parentheses are standard deviations.

UV Aging

ULTEM™ 9085 resin was tested before and after UV exposure. Ten ASTM D638 upright (ZX) dogbones were tested in tensile after UV exposure and an additional 10 ASTM D638 ZX dogbones were the control (no UV exposure). The UV exposed samples were cycled in the QUV chamber per ASTM G154 (Standard Practice for Operation Fluorescent UV Light Apparatus for Exposure of Nonmetallic Materials) for 1,000 hours, alternating for eight hours at 60 °C (140 °F) and four hours at 50 °C (122 °F) with humidity and condensation. The increase in stress at break is from the control samples. For more information see the [Impact of UV Exposure on FDM Materials white paper](#).

Table 15: UV Aging of ULTEM™ 9085 Resin CG - Fortus F900 - T16A Tip

Material	Conditioning	Yield Strength		Stress at Break		Elongation at break (%)	Increase in Stress at Break (%)	Modulus	
		(psi)	(MPa)	(psi)	(MPa)			(ksi)	(GPa)
ULTEM™ 9085 resin	No UV Exposure	8,130	56.0	8,080	55.7	3.5	-	293	2.02
	UV Exposure	8,060	55.5	8,070	55.6	3.7	-0.1	302	2.08



Performance at Temperature

ULTEM™ 9085 resin Natural coupons were built on the F900 using the T16 tip with 0.25 mm (0.010 in.) layer height and tested at various temperatures. Ten ASTM D638 upright (ZX) dogbone coupons were tested in tensile. The percent change from the reported room temperature results are listed below

For more information, see the [Impact of Temperature on High-Performance FDM Materials](#) white paper.

Table 16: Performance of ULTEM™ 9085 Resin at Temperatures - F900 - T16 Tip

Material	Temperature		Strength at Break	Elongation at Break	Modulus
	(°F)	(°C)			
ULTEM™ 9085 resin	-65	-54	157%	125%	137%
	-40	-40	156%	119%	147%
	120	49	122%	98%	137%
	180	82	102%	95%	121%
	220	104	87%	91%	100%
	270	132	70%	82%	100%
	300	149	55%	NA	NA



Flame, Smoke and Toxicity

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin, natural (T20 tip), CG (T16A tip), and black (T16 tip), were printed on the Stratasys F900 and tested per 14 CFR 25.853, BSS 7238 and 7239, and AITM 2.0007B and 3.0005. The testing establishes that this material meets requirements for:

- 60s and 12s Vertical Burn
- 15s Horizontal Burn
- Toxic Gas Emission
- Smoke Density
- Heat Release Rate of Cabin Materials

Table 17: ULTEM™ 9085 Resin Flame, Smoke and Toxicity Test Results

	Avg Time to Extinguish (seconds)	Avg Burned Length (inches)	Drip Time to Extinguish (seconds)
12 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(ii), Sample Thickness - 1.1 mm			
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	1.6	0.2	0 (no drips)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	1.7	0.5	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	2.0	0.2	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XZ	1.5	0.2	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	2.0	0.2	0 (no drips)
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	1.1	0.3	0 (no drips)
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	<1	0.4	0 (no drips)
60 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(i), Sample Thickness - 1.1 mm			
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	1.5	1.8	0 (no drips)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	<1	1.9	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	<1	0.4	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XZ	3.6	0.6	0 (no drips)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	<1	0.4	0 (no drips)
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	<1	1.2	0 (no drips)
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	<1	1.5	0 (no drips)
Avg Burn Rate (in/min)			
15 Second Horizontal Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(iv)(v), Sample Thickness - 1.1 mm			
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ		0	
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX		0	
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY		0	
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XZ		0	
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX		0	
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ		0	
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX		0	


Table 18: ULTEM™ 9085 Resin Flame, Smoke and Toxicity Test Results

	Test Mode	Average D_s (maximum) within 4 minutes, (${}^4D_{max}$)					
Smoke Density per BSS 7238, Rev. C, Sample Thickness - 1.32 mm (0.052 in.)							
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Flaming	4					
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Flaming	5					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Flaming	4					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Flaming	4					
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Flaming	10					
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Flaming	15					
Smoke Density per AITM 2.0007B, Issue 3, Sample Thickness - 1.32 mm (0.052 in.)							
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Flaming	5					
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Flaming	5					
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Non-Flaming	0					
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Non-Flaming	0					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Flaming	5					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Flaming	6					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Non-Flaming	0					
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Non-Flaming	0					
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Flaming	12					
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Flaming	14					
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Non-Flaming	0					
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Non-Flaming	0					
	Test Mode	CO ppm	SO ₂ ppm	NO _x ppm	HCN ppm	HCl ppm	HF ppm
Toxic Gas Emission per BSS 7239, Rev. A, Sample Thickness - 1.32 mm (0.052 in.)							
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Flaming	50	0 (NI)	2	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Flaming	50	0 (NI)	2	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Flaming	50	0 (NI)	2	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Flaming	50	0 (NI)	2	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Flaming	100	0 (NI)	1	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Flaming	75	0 (NI)	1	0 (NI)	0 (NI)	0 (NI)



Table 19: ULTEM™ 9085 Resin Flame, Smoke and Toxicity Test Results

	Test Mode	CO ppm	SO ₂ ppm	NO _x ppm	HCN ppm	HCl ppm	HF ppm
Toxic Gas Emission per AITM 3.0005, Issue 2, Sample Thickness - 1.32 mm (0.052 in.)							
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Flaming	92	0	2.8	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Flaming	102	0	4	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ	Non-Flaming	2.6	0	0	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX	Non-Flaming	2.2	0	0	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Flaming	61	0	2.3	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Flaming	78	0	3.2	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY	Non-Flaming	4	0	0	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX	Non-Flaming	5	0	0	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Flaming	93	0	1	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Flaming	103	0	3	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ	Non-Flaming	2	0	0	0 (NI)	0 (NI)	0 (NI)
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX	Non-Flaming	2	0	0	0 (NI)	0 (NI)	0 (NI)
		Peak HRR (kW/m ²)	Time to Peak Heat Release (seconds)	2 Minute Total HRR (kW-min./m ²)			
Heat Release Rate of Cabin Materials per 14 CFR 25.853(d), Appendix F, Part IV, Part IV, Sample Thickness - 1.1 mm (0.04 in.)							
ULTEM™ 9085 Resin, Natural, T20 Tip, Build XZ		54.5	73	35.5			
ULTEM™ 9085 Resin, Natural, T20 Tip, Build ZX		48.2	66	41.0			
ULTEM™ 9085 Resin, Natural, T16A Tip, Build XY		57.0	57	43.7			
ULTEM™ 9085 Resin, Natural, T16A Tip, Build ZX		56.6	57	52.8			
ULTEM™ 9085 Resin, Black, T16 Tip, Build XZ		55.4	48	32.7			
ULTEM™ 9085 Resin, Black, T16 Tip, Build ZX		41.8	51	34.1			



Outgassing

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin, natural (T20 tip), CG (T16A tip), and black (T16 tip), were printed on the Stratasys F900 and tested per ASTM E595. Full report available upon request.

Table 20: ULTEM™ 9085 Resin Outgassing Test Results

Sample	TML (%)	CVCM (%)	WVR (%)
ULTEM™ 9085 Resin, Natural, T20 Tip	0.34	0.02	0.35
ULTEM™ 9085 Resin, Natural, T16A Tip	0.37	< 0.01	0.38
ULTEM™ 9085 Resin, Black, T16 Tip	0.33	< 0.01	0.22
Testing Observations ¹			
Visible Condensate	No	Opaque	N/A
Percent Covered	0%	Interference Fringes	N/A
Thin	N/A	Colored Fringes	N/A
Heavy	N/A	Sample appearance after test	No change
Transparent	N/A		

¹ Observations apply to all tested samples.

Fire Protection of Railway Vehicles NFPA 130

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin and ULTEM™ 9085 resin CG was printed in the XY and ZX orientations with a T16 and T16A tip on the Stratasys F900 using default settings and tested per NFPA 130 testing standards. To use this data for your applications, please reference NFPA 130 table 8.4.1.

* It should be noted that products printed with different settings or on different machines may perform differently

* Further testing should be done by the end user to make sure the material fits their final application

Table 21: ULTEM™ 9085 Resin and ULTEM™ 9085 Resin CG NFPA 130 Flammability Test Results

Thickness (mm)	Orientation	Classification						
		ASTM E162	ASTM E662				ASTM E1354	
		I _s	D _s (1.5) non-flaming	D _s (1.5) flaming	D _s (4) non-flaming	D _s (4) flaming	Heat Release Rate (kW/m ²)	Smoke Extinction Area (m ² /kg)
3	XY	-	0.18	0.62	0.31	6.92	55.6	146.1
10	XY	-	0.41	0.7	0.49	6.22	27.9	342.7
12.7 ¹	XY	0	-	-	-	-	-	-
	ZX	0	-	-	-	-	-	-

¹ Data from printed ULTEM™ 9085 CG



Fire Protection of Railway Vehicles

EN 45545-2

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin and ULTEM™ 9085 resin CG was printed in the XY orientation with a T16 and T16A tip on the Stratasys F900 using default settings and tested per EN 45545-2 testing standards. Results were given for requirement sets R1, R2, R3, R6, R7, R17, R22 and R23.

* It should be noted that products printed with different settings or on different machines may perform differently

* Further testing should be done by the end user to make sure the material fits their final application

Table 22: ULTEM™ 9085 Resin EN 45545-2 Fire Safety Classification Matrix

Requirement Set	0.55 mm	1 mm	10 mm	10.5 mm
R1	-	HL2	HL3	-
R2	-	HL3	HL3	-
R3	-	HL3	HL3	-
R6	-	HL2	HL3	-
R7	-	HL2	HL3	-
R17	-	HL2	HL3	-
R22	HL3	-	-	HL2
R23	HL3	-	-	HL3

Table 23: ULTEM™ 9085 Resin CG Fire Protection of Railway Vehicles Test Results for R1, R2, R3, R6, R7, and R17 Requirement Sets

Test Standard	Results	1 mm XY	10 mm XY
ISO 5659-2 (smoke opacity) 50 kW/m ²	Ds(4)	58.1	40.9
	VOF4	126.1	61.4
	Dm	145.3	144.8
ISO 5659-2 + EN 45545-2 Appendix C (smoke toxicity)	ITC 4 minutes	0.03	0.01
	ITC 8 minutes	0.09	0.02
ISO 5660-1 (heat release)	MAHRE (kW/m ²)	67.9	27
ISO 5658-2 (vertical critical flux at extinguishment)	CFE (kW/m ²)	30.5	24.2

Table 24: ULTEM™ 9085 Resin Fire Protection of Railway Vehicles Test Results for R22 and R23 Requirement Sets

Test Standard	Results	0.55 mm XY	10.5 mm XY
ISO 5659-2 (smoke opacity) 25 kW/m ²	Ds(4)	1	0.6
	VOF4	1.8	0.8
	Dm	5.5	10.2
NF X 70-100 - EN 17084 Method 2 (smoke toxicity)	ITC _{PNL} /CIT _{NPL}	0.73	0.8
ISO 4589-2 (limit oxygen index)	CFE (kW/m ²)	37.2	47.9



Fire Protection for Devices and Appliances UL Blue Card

ULTEM™ 9085 resin was printed on the Fortus 400mc, Fortus 450mc, Fortus 900mc, and the F900 printers with a T16 and T20 model tip. For more information reference file number E345258 on the iq.ulprospector.com website (login required).

Table 25: ULTEM™ 9085 resin, ULTEM™ 9085 resin CG UL Blue Card Overview

Build Direction	Layer Height	Model Tip	Minimum Sample Thickness	Rating
Horizontal	0.254 mm (0.010 in.)	T16	0.508 mm (0.020 in.)	V-0
	0.330 mm (0.013 in.)	T20	0.66 mm (0.026 in.)	V-0
Vertical	0.254 mm (0.010 in.)	T16	1.016 mm (0.040 in.)	V-0
	0.330 mm (0.013 in.)	T20	1.32 mm (0.052 in.)	V-0



Fire Protection of Buses UN ECE Regulation 118

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin CG was printed with a T16 tip on the Stratasys F900 using single contour and +45/-45 solid rasters, which are typical default settings and tested per EN-45545-2.

- Orientation: Flat XY
- Sample thickness: 3mm

Table 26: ULTEM™ 9085 Resin CG Fire Protection of Buses Test Results

Horizontal Burning Annex VI	Melting Behavior Annex VII	Vertical Burn Annex VIII
Passed	Passed	Passed
The tested samples do not ignite, the burning rate is 0 mm/min.	No drop is formed that ignites the cotton wool during testing.	The tested samples do not ignite, the burning rate is 0 mm/min.



Appendix

Validated Materials

Stratasys Validated Materials are developed by Stratasys or a third-party provider, meet Stratasys quality standards, and have received basic reliability testing for use with Stratasys FDM printers.

Table 27: Colored ULTEM™ 9085 Resin Validated Materials

0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Validated Material - ULTEM™ 9085 Resin Aircraft Gray, Fortus 450mc, T16			
Yield Strength	MPa	78.8 (0.57)	56.4 (3.2)
	psi	11,400 (82)	8,180 (460)
Elongation @ Yield	%	6.2 (0.070)	3.2 (0.35)
Strength @ Break	MPa	75.1 (1.6)	55.9 (3.0)
	psi	10,900 (230)	8,110 (440)
Elongation @ Break	%	7.9 (0.34)	3.1 (0.32)
Modulus (Elastic)	GPa	2.25 (0.026)	2.18 (0.026)
	ksi	326 (3.8)	316 (3.7)
Validated Material - ULTEM™ 9085 Resin Aircraft Gray, F900, T16			
Yield Strength	MPa	70.6 (2.4)	No yield
	psi	10,200 (350)	No yield
Elongation @ Yield	%	5.6 (0.13)	No yield
Strength @ Break	MPa	69.5 (2.2)	56.0 (2.3)
	psi	10,100 (310)	8,120 (340)
Elongation @ Break	%	6.1 (0.26)	3.3 (0.29)
Modulus (Elastic)	GPa	2.09 (0.042)	2.12 (0.018)
	ksi	303 (6.1)	308 (2.6)
Validated Material - ULTEM™ 9085 Resin Gunship Gray, Fortus 450mc, T16			
Yield Strength	MPa	81.0 (0.50)	47.2 (9.6)
	psi	11,700 (73)	6,850 (1400)
Elongation @ Yield	%	6.2 (0.09)	2.5 (0.65)
Strength @ Break	MPa	78.5 (3.2)	48.7 (8.2)
	psi	11,400 (460)	7,060 (1,200)
Elongation @ Break	%	7.1 (0.81)	2.7 (0.58)
Modulus (Elastic)	GPa	2.27 (0.022)	2.19 (0.0096)
	ksi	330 (3.2)	318 (1.4)

¹ Values in parentheses are standard deviations.



0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Validated Material - ULTEM™ 9085 Resin Gunship Gray, F900, T16			
Yield Strength	MPa	69.9 (2.3)	No yield
	psi	10,100 (330)	No yield
Elongation @ Yield	%	5.7 (0.13)	No yield
Strength @ Break	MPa	68.8 (2.2)	55.6 (2.9)
	psi	9,970 (320)	8,070 (430)
Elongation @ Break	%	6.2 (0.28)	3.4 (0.37)
Modulus (Elastic)	GPa	2.08 (0.055)	4.17 (0.035)
	ksi	302 (7.9)	605 (5.1)
Validated Material - ULTEM™ 9085 Resin White 7362 (AIC 12.16), Fortus 450mc, T16			
Yield Strength	MPa	76.6 (1.4)	36.8 (3.2)
	psi	11,100 (200)	5,340 (470)
Elongation @ Yield	%	5.8 (0.22)	1.9 (0.23)
Strength @ Break	MPa	75.1 (1.4)	36.4 (6.2)
	psi	10,900 (200)	5,270 (900)
Elongation @ Break	%	6.1 (0.34)	1.9 (0.40)
Modulus (Elastic)	GPa	2.22 (0.033)	2.26 (0.066)
	ksi	322 (4.8)	328 (9.6)
Validated Material - ULTEM™ 9085 Resin White 7362 (AIC 12.16), F900, T16			
Yield Strength	MPa	64.4 (2.6)	No yield
	psi	9,340 (380)	No yield
Elongation @ Yield	%	5.1 (0.19)	No yield
Strength @ Break	MPa	63.5 (2.6)	40.2 (2.1)
	psi	9,210 (380)	5,830 (300)
Elongation @ Break	%	5.5 (0.40)	2.3 (0.18)
Modulus (Elastic)	GPa	2.04 (0.055)	2.10 (0.042)
	ksi	296 (8.0)	304 (6.1)

¹ Values in parentheses are standard deviations.





0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Validated Material - ULTEM™ 9085 Resin Dream Gray (AIC 2.49), Fortus 450mc, T16			
Yield Strength	MPa	73.2 (0.75)	39.1 (6.2)
	psi	10,600 (110)	5,680 (900)
Elongation @ Yield	%	5.5 (0.20)	2.0 (0.39)
Strength @ Break	MPa	72.1 (0.73)	40.2 (5.1)
	psi	10,500 (110)	5,830 (740)
Elongation @ Break	%	5.9 (0.41)	2.1 (0.34)
Modulus (Elastic)	GPa	2.22 (0.051)	2.30 (0.29)
	ksi	321 (7.4)	334 (41)
Validated Material - ULTEM™ 9085 Resin Dream Gray (AIC 2.49), F900, T16			
Yield Strength	MPa	63.9 (2.5)	46.6 (2.8)
	psi	9,270 (360)	6,770 (410)
Elongation @ Yield	%	5.6 (0.21)	2.7 (0.23)
Strength @ Break	MPa	63.9 (2.5)	26.0 (2.8)
	psi	9,270 (360)	3,770 (410)
Elongation @ Break	%	5.6 (0.21)	2.7 (0.23)
Modulus (Elastic)	GPa	1.98 (0.051)	2.11 (0.024)
	ksi	288 (7.3)	307 (3.4)
Validated Material - ULTEM™ 9085 Resin Jana White (AIC 12.36), Fortus 450mc, T16			
Yield Strength	MPa	77.4 (0.44)	40.2 (5.7)
	psi	11,200 (63)	5,830 (830)
Elongation @ Yield	%	6.2 (0.09)	2.1 (0.41)
Strength @ Break	MPa	75.3 (2.1)	40.2 (5.7)
	psi	10,900 (310)	5,830 (830)
Elongation @ Break	%	7.0 (0.37)	2.1 (0.41)
Modulus (Elastic)	GPa	2.30 (0.053)	2.27 (0.068)
	ksi	334 (7.7)	329 (9.9)
Validated Material - ULTEM™ 9085 Resin Jana White (AIC 12.36), F900, T16			
Yield Strength	MPa	65.9 (2.8)	No yield
	psi	9,550 (410)	No yield
Elongation @ Yield	%	5.3 (0.18)	No yield
Strength @ Break	MPa	64.7 (2.8)	56.0 (2.3)
	psi	9,390 (400)	8,120 (340)
Elongation @ Break	%	5.8 (0.40)	3.3 (0.29)
Modulus (Elastic)	GPa	2.06 (0.051)	2.12 (0.018)
	ksi	299 (7.3)	308 (2.6)

¹ Values in parentheses are standard deviations.



0.25 mm (0.010 in.) Layer Height		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Validated Material - ULTEM™ 9085 Resin Red, Fortus 450mc, T16			
Yield Strength	MPa	74.7 (3.3)	53.3 (4.1)
	psi	10,800 (480)	7,730 (600)
Elongation @ Yield	%	6.0 (0.21)	3.1 (0.35)
Strength @ Break	MPa	72.7 (4.0)	53.7 (4.0)
	psi	10,500 (580)	7,790 (580)
Elongation @ Break	%	6.7 (0.55)	3.1 (0.33)
Modulus (Elastic)	GPa	2.15 (0.037)	2.12 (0.028)
	ksi	312 (5.4)	307 (4.1)
Validated Material - ULTEM™ 9085 Resin Red, F900, T16			
Yield Strength	MPa	68.9 (2.2)	No yield
	psi	9,990 (320)	No yield
Elongation @ Yield	%	5.7 (0.11)	No yield
Strength @ Break	MPa	67.1 (2.1)	53.3 (2.8)
	psi	9,730 (310)	7,730 (400)
Elongation @ Break	%	6.6 (0.37)	3.0 (0.25)
Modulus (Elastic)	GPa	2.06 (0.048)	2.15 (0.035)
	ksi	299 (6.9)	311 (5.1)

¹Values in parentheses are standard deviations.

Flame, Smoke, and Toxicity

These tests were done to show that ULTEM™ 9085 resin complies to the tested standard, not to show certification to any specific standard. It is suggested that additional testing be conducted if there are any questions about how ULTEM™ 9085 resin will perform for a specific part.

ULTEM™ 9085 resin White, Jana White, Aircraft Gray, Dream Gray, Gunship Gray, and Red were all printed on the Stratasys F900 with the T16 tip. For more information or for a detailed test report please contact a Stratasys representative.

Table 28: ULTEM™ 9085 Flame, Smoke, and Toxicity Test Results

0.25 mm (0.010 in.) Layer Height	Avg Time to Extinguish (seconds)	Avg Burned Length (inches)	Drip Time to Extinguish (seconds)
12 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(ii)			
ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	3.4	1.9	0 (no drips)
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	6	2	0 (no drips)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	4.4	2	0 (no drips)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	4.3	2	0 (no drips)
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	1.8	1.8	0 (no drips)



0.25 mm (0.010 in.) Layer Height	Avg Time to Extinguish (seconds)	Avg Burned Length (inches)	Drip Time to Extinguish (seconds)
12 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(ii)			
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	2.2	1.7	0 (no drips)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	3.8	2	0 (no drips)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	3.8	1.9	0 (no drips)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	1.9	1.9	0 (no drips)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	1.3	1.6	0 (no drips)
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	4.6	2.1	0 (no drips)
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	3.1	2.1	0 (no drips)
60 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(i)			
ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	0	3.5	0 (no drips)
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	0	4.1	0 (no drips)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	0	3.7	0 (no drips)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	0	4	0 (no drips)
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	0	3	0 (no drips)
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	1.5	3.8	0 (no drips)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	0	3.5	0 (no drips)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	0	4.1	0 (no drips)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	0	2.9	0 (no drips)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	0	4	0 (no drips)
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	0	3.3	0 (no drips)
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	0	4.4	0 (no drips)
0.25 mm (0.010 in.) Layer Height	Avg Burn Rate (inches/minute)		
15 Second Horizontal Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(iv)(v)			
ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	0		
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	0		
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	0		
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	0		
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	0		
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	0		
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	0		



0.25 mm (0.010 in.) Layer Height	Test Mode	Average Ds (maximum) within 4 minutes, (⁴ Dmax)
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Smoke Density per BSS 7238, Rev. C

ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	Flaming	10.6 (14.5)
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	Flaming	12.4 (14.9)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	Flaming	18.1 (21.3)
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	Flaming	12.5 (19.3)
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	Flaming	9.7 (11.5)
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	Flaming	11.0 (12.7)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	Flaming	12.8 (15.3)
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	Flaming	9.1 (12.0)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	Flaming	9.9 (11.8)
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	Flaming	8.6 (9.8)
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	Flaming	18.3 (23.3)
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	Flaming	22.9 (27.7)

0.25 mm (0.010 in.) Layer Height	Test Mode	CO ppm	SO ₂ ppm	NO _x ppm	HCN ppm	HCl ppm	HF ppm
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Toxic Gas Emission per BSS 7239, Rev. A

ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	Flaming	82	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	Flaming	61	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	Flaming	66	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	Flaming	76	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	Flaming	52	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	Flaming	79	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	Flaming	75	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	Flaming	63	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	Flaming	53	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	Flaming	60	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	Flaming	74	<5	<5	<5	<5	<5
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	Flaming	99	<5	<5	<5	<5	<5

0.25 mm (0.010 in.) Layer Height	Peak HRR (kW/m ²)	Time to Peak Heat Release (seconds)	2 Minute Total HRR (kW-min/m ²)
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Heat Release Rate of Cabin Materials per 14 CFR 25.853(d), Appendix F, Part IV

ULTEM™ 9085 Resin, White, T16 Tip, Build XZ	39.6	53	36.1
ULTEM™ 9085 Resin, White, T16 Tip, Build ZX	39.6	55	35.5
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build XZ	36.3	51	29.7
ULTEM™ 9085 Resin, Jana White, T16 Tip, Build ZX	35.3	53	32.6
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build XZ	38.6	55	29.6
ULTEM™ 9085 Resin, Aircraft Gray, T16 Tip, Build ZX	38.3	52	30
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build XZ	36.2	55	34.1
ULTEM™ 9085 Resin, Dream Gray, T16 Tip, Build ZX	37.5	55	30.9
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build XZ	31.7	115	24
ULTEM™ 9085 Resin, Gunship Gray, T16 Tip, Build ZX	33.7	52	28.2
ULTEM™ 9085 Resin, Red, T16 Tip, Build XZ	41.9	54	41.2
ULTEM™ 9085 Resin, Red, T16 Tip, Build ZX	46.6	59	45.9



Figure 1: 2nd heating scan DSC data for ULTEM™ 9085 resin, natural.

DSC

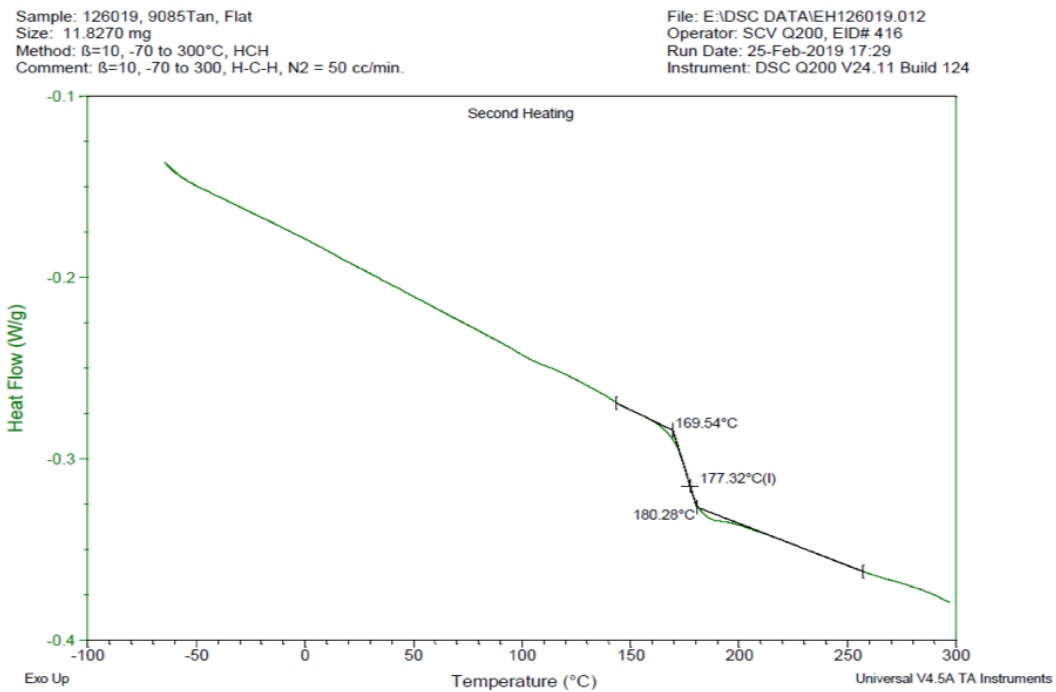


Figure 2: 2nd heating scan DSC data for ULTEM™ 9085 resin, black.

DSC

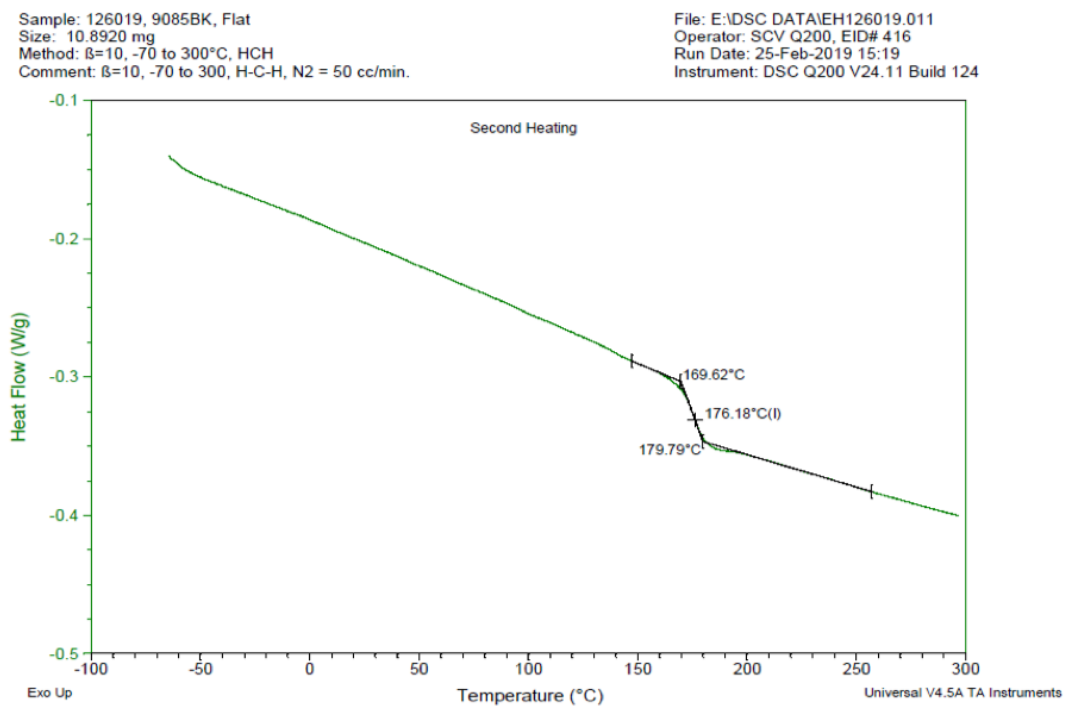




Figure 3: Dimension change data as a function of temperature for ULTEM™ 9085 resin, natural, flat (XY).

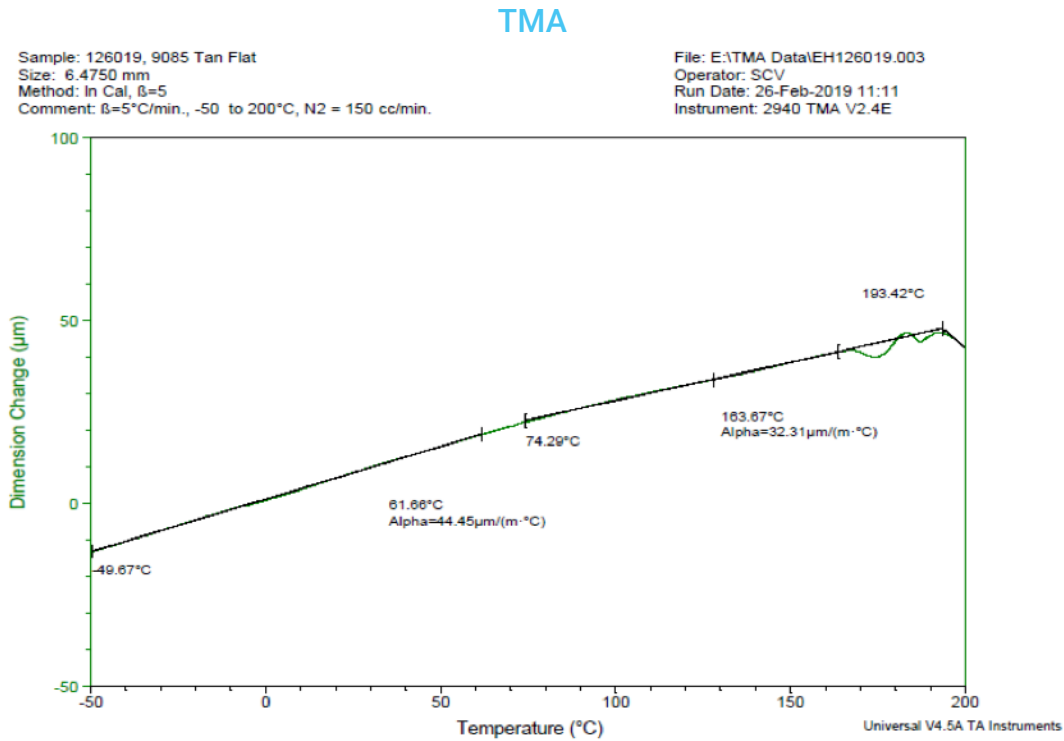


Figure 4: Dimension change data as a function of temperature for ULTEM™ 9085 resin, natural, upright (XZ).

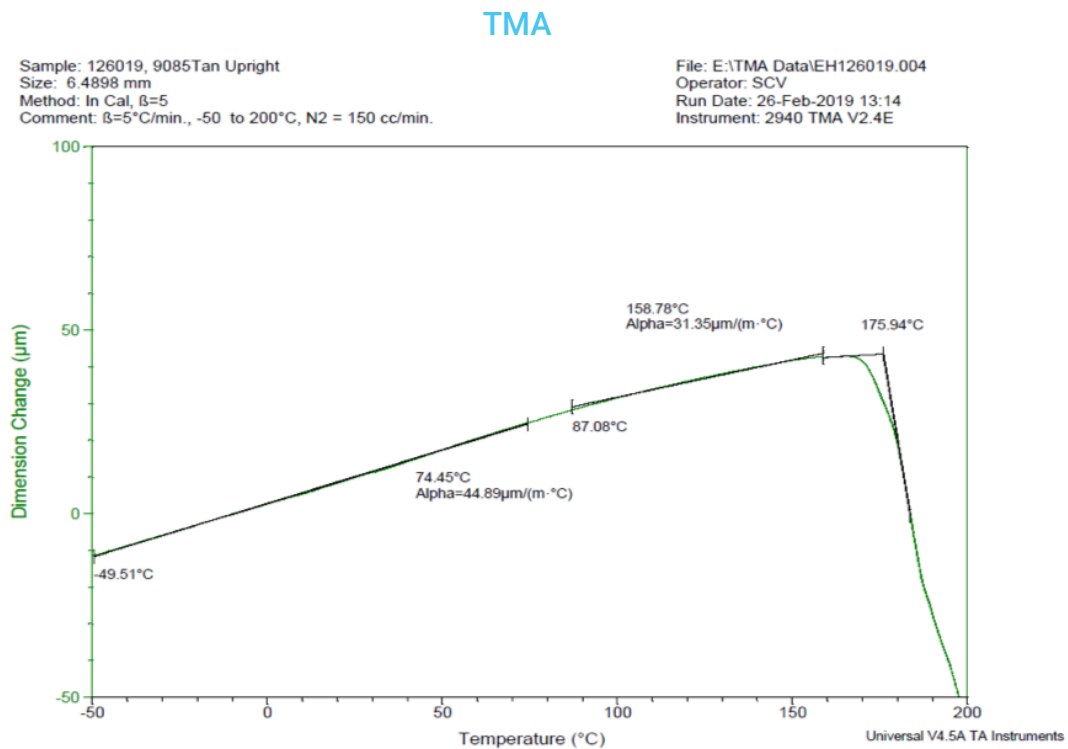




Figure 6: Dimension change data as a function of temperature for ULTEM™ 9085 resin, black, upright (XZ).

TMA

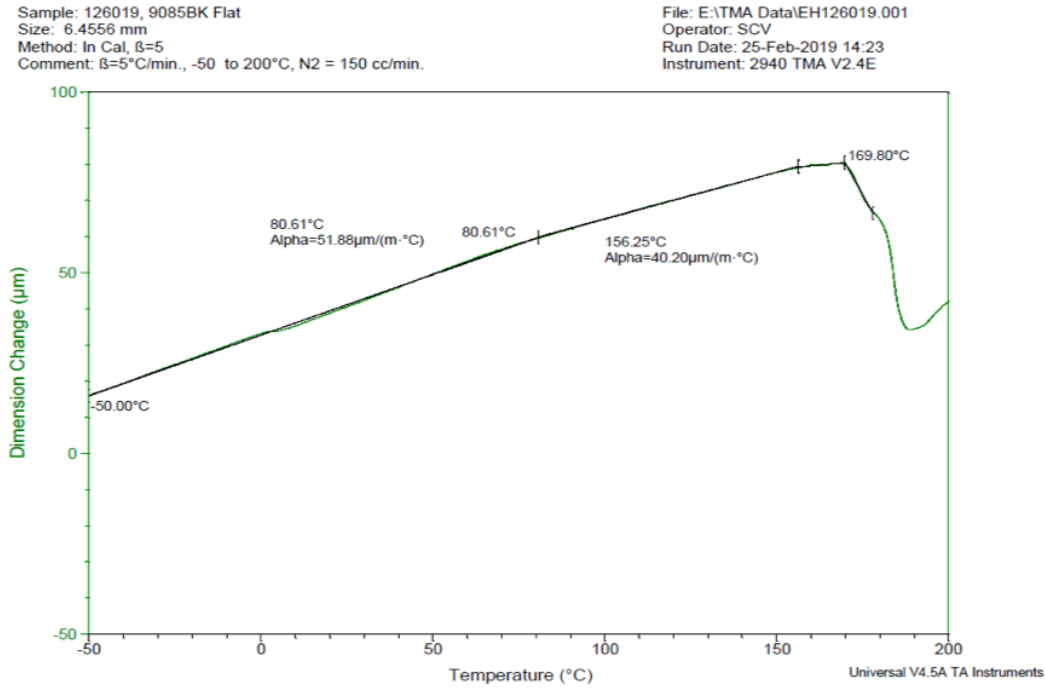


Figure 6: Dimension change data as a function of temperature for ULTEM™ 9085 resin, black, upright (XZ).

TMA

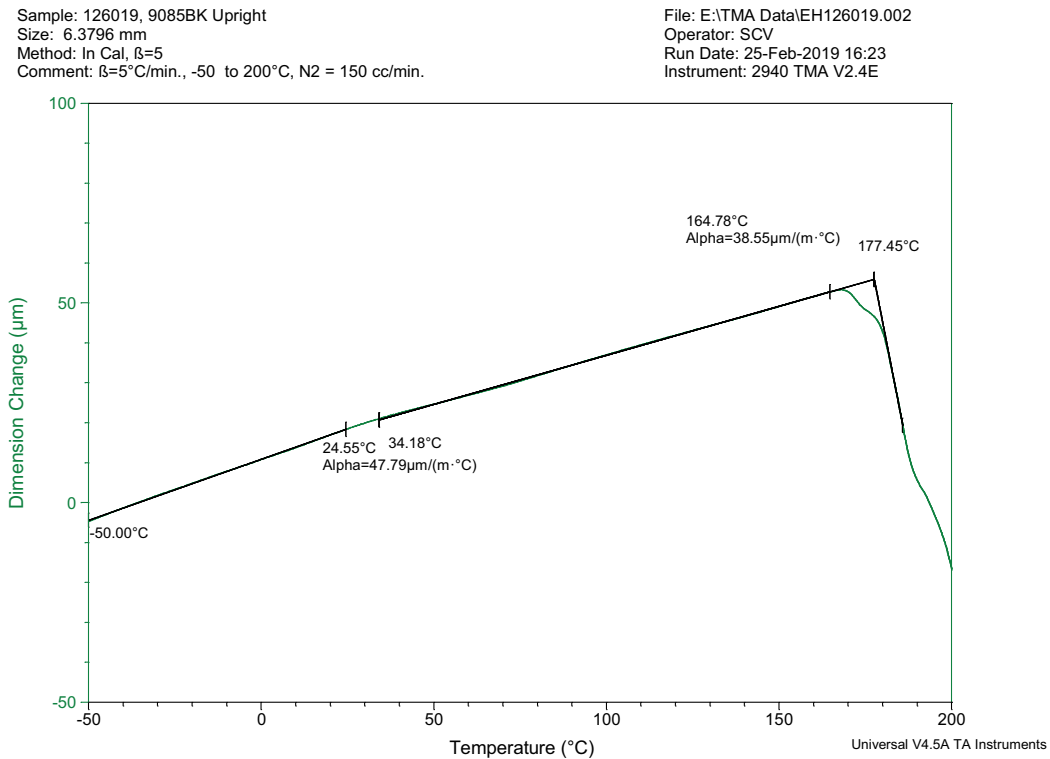
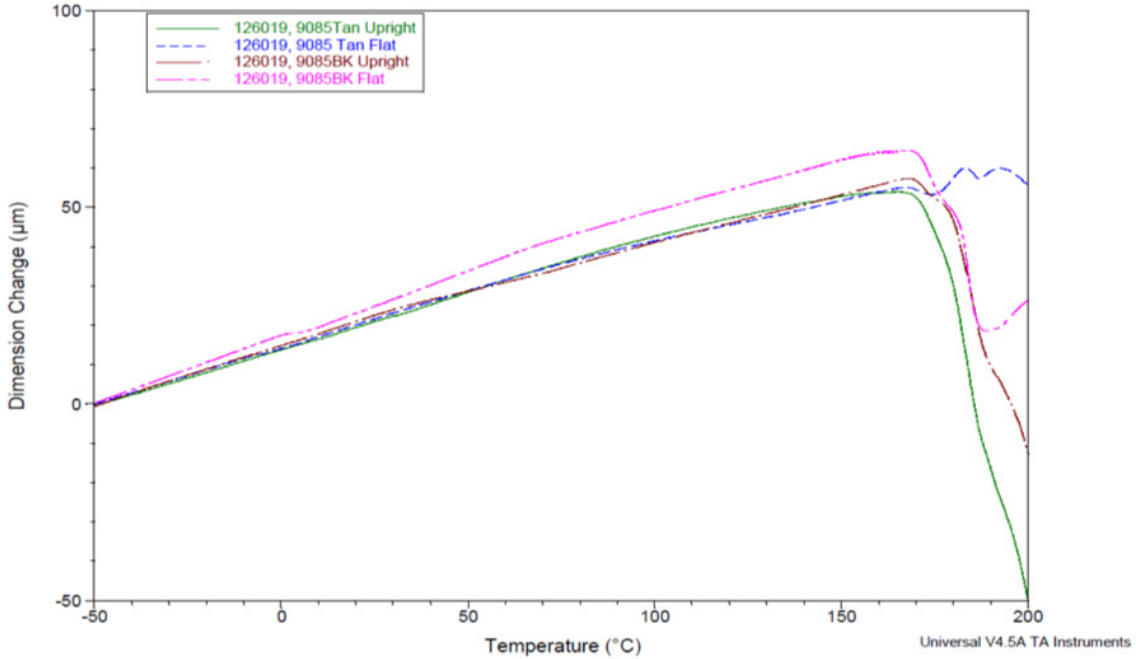




Figure 7: Overlay of the dimension change data for all the ULTEM™ 9085 resin samples.



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MATERIAL DATA SHEET
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