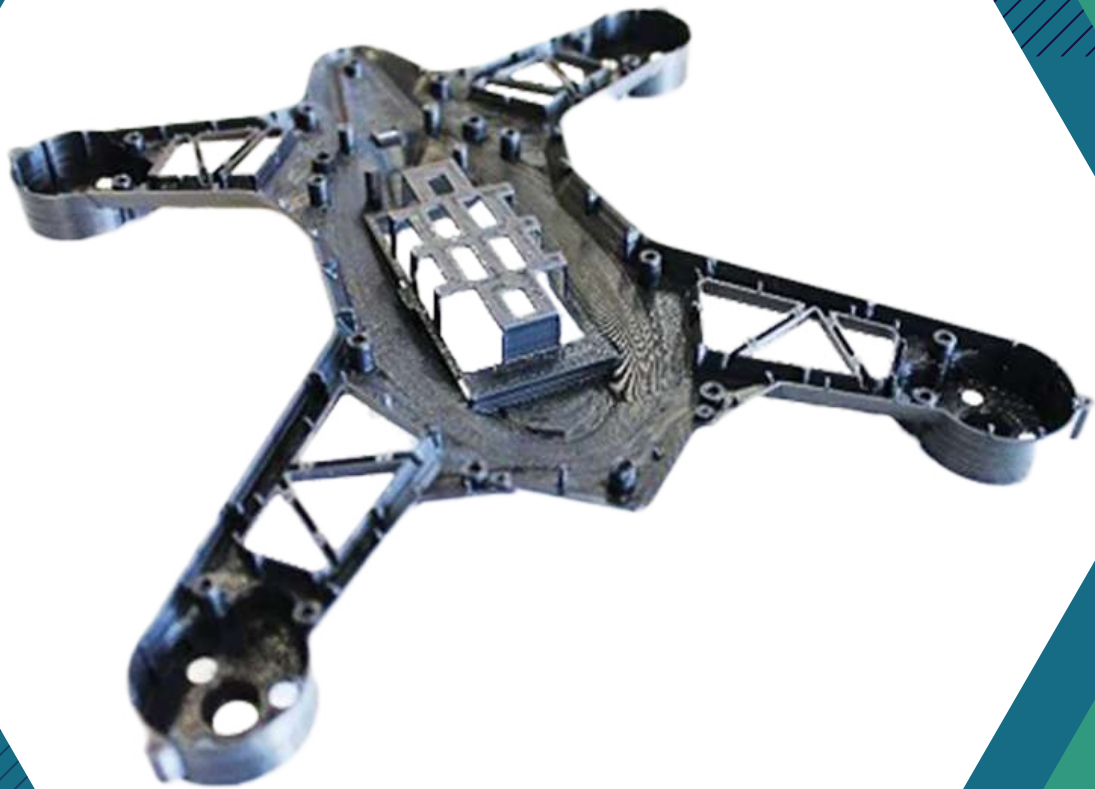


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MATERIAL **PC-ABS** OVERVIEW

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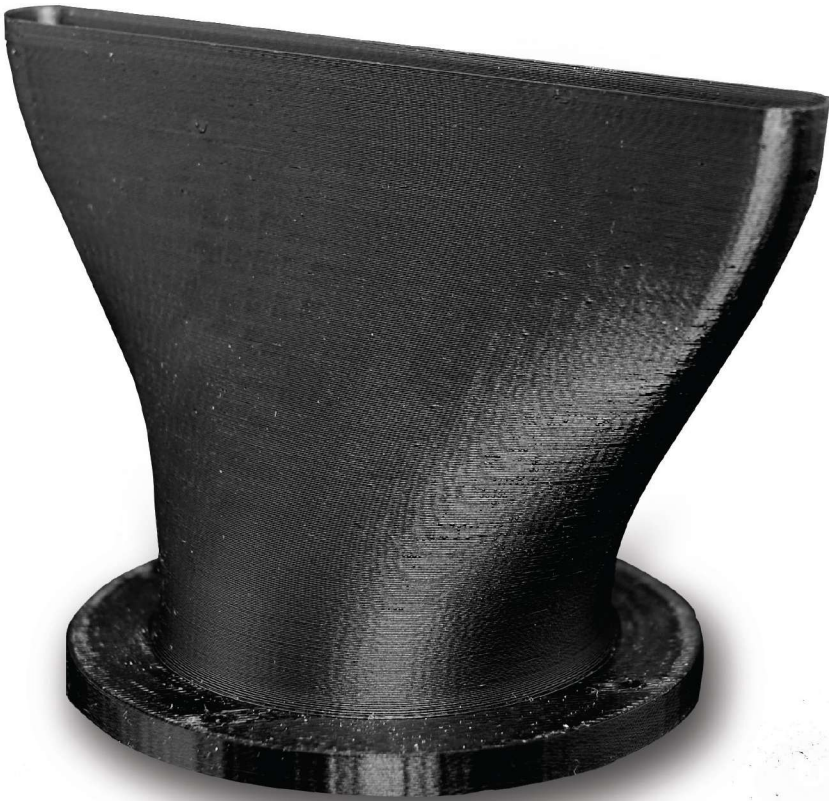
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PC-ABS



FDM Thermoplastic Filament

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

PC-ABS is a blend of polycarbonate (PC) and acrylonitrile butadiene styrene (ABS) thermoplastics. The result is an FDM filament that exhibits optimal characteristics of each – excellent strength, high toughness and heat resistance, and good flexural strength. Choose PC-ABS when you need the strength of PC but the impact resistance of ABS.

PC-ABS is suitable for a variety of applications that include prototyping, tooling and low-volume production. Available colors are black, white and red.

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Ordering Information

Table 1. Printer and Support Material Compatibility

Printer	Model Tip (Slice)	Support Material	Support Tip
F370™	F123 Head (5, 7, 10, 13 slice)	QSR Support (soluble)	F123 Head (all slices)
F370®CR	F123 Head (5, 7, 10, 13 slice)	QSR Support (soluble)	F123 Head (all slices)
Fortus 450mc™	T10 (5 slice)	SR-110™ (soluble)	T12SR100 (all slices)
	T12 (7 slice)		
	T16 (10 slice)		
	T20 (13 slice)		
Fortus 900mc™/F900®	T12 (7 slice)	SR-110 (soluble)	T12SR20 / 100 (all slices)
	T16 (10 slice)		
	T20 (13 slice)		

PC-ABS red is only available on the Fortus 450mc and F900 with the T16 model tip and SR-110 support material.

Build Sheet

Low Temperature

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

F370/F370CR Standard Build Trays

Table 2. PC-ABS Filament Ordering Information

Part Number	Description
Filament Canisters ^{1 2}	
355-02260	PC-ABS (black), 92.3 cu in - Plus
310-20500	PC-ABS (black), 92.3 cu in - Classic
333-90701	PC-ABS (black), 90 cu in - F123
333-60701	PC-ABS (black), 60 cu in - F123
333-60700	PC-ABS (white), 60 cu in - F123
355-70070	PC-ABS (red), 92.3 cu in - Plus
310-30500	SR-20 Soluble Support, 92.3 cu in - Classic
355-03130	SR-110 soluble support, 92.3 cu in - Plus
333-63500	QSR soluble support, 60 cu in - F123
Printer Consumables	
511-10501	T10 tip, 0.005 (0.127 mm) layer height
511-10301	T12 tip, 0.007 (0.178 mm) layer height
511-10401	T16 tip, 0.010 in. (0.254 mm) layer height
511-10701	T20 tip, 0.013 (0.330 mm) layer height
511-10901	T12SR20 tip, all layer heights
511-10100	T12SR100 tip, all layer heights
123-00402-S	F123 Standard Head (all layer heights)
325-00300 ³	Low Temperature build sheet, 0.02x26x38 in. (0.51x660x965 mm)
325-00100 ⁴	Low Temperature build sheet, 0.02x16x18.5 in (0.51x406x470 mm)
123-00304	F370 / F370CR Build Tray, Standard

¹ Classic canisters are compatible with all 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.

³ Compatible with Fortus 900mc and F900.

⁴ Compatible with Fortus 450mc, Fortus 900mc and F900.

Physical Properties

Values are measured as printed. XY, XZ, and ZX orientations were tested.

Table 3. PC-ABS Physical Properties

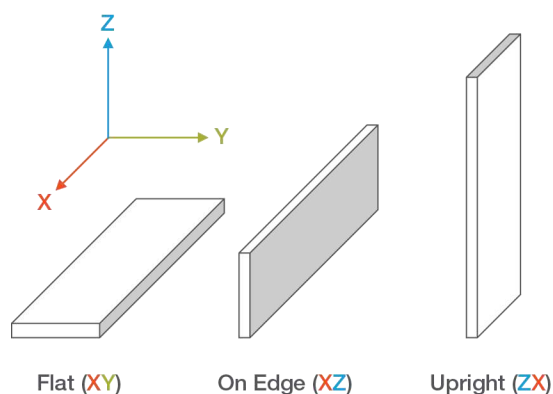
Property	Test Method	Typical Values	
		XY	XZ/ZX
HDT @ 66 psi	ASTM D648 Method B	117.9 °C (244.2 °F)	126.1 °C (259.0 °F)
HDT @ 264 psi	ASTM D648 Method B	107.5 °C (225.5 °F)	112.0 °C (233.6 °F)
Molded HDT @ 66 psi	ASTM D648 Method B	125.0 °C (257.1 °F)	
Molded HDT @ 264 psi	ASTM D648 Method B	102.9 °C (217.2 °F)	
Tg	ASTM D7426 Inflection Point	105.3 °C (221.6 °F)	
Mean CTE	ASTM E831 (-50 °C to 95 °C)	-	72.96 µm/[m*°C] (40.53 µin/[in*°F])
	ASTM E831 (-50 °C to 35 °C)	59.87 µm/[m*°C] (33.26 µin/[in*°F])	-
	ASTM E831 (35 °C to 50 °C)	0.4816 µm/[m*°C] (0.2676 µin/[in*°F])	-
	ASTM E831 (50 °C to 90 °C)	-61.76 µm/[m*°C] (-34.31 µin/[in*°F])	-
Volume Resistivity	ASTM D257	> 6.84*10 ¹⁴ Ω*cm	
Dielectric Constant	ASTM D150 1 kHz test condition	2.62	2.74
	ASTM D150 2 MHz test condition	2.74	2.88
Dissipation Factor	ASTM D150 1 kHz test condition	0.001	0.002
	ASTM D150 2 MHz test condition	0.002	0.001
Specific Gravity	ASTM D792 @23 °C	1.10	

Mechanical Properties

PC-ABS samples were printed with 0.010 in. (0.254 mm) layer heights on the F900.

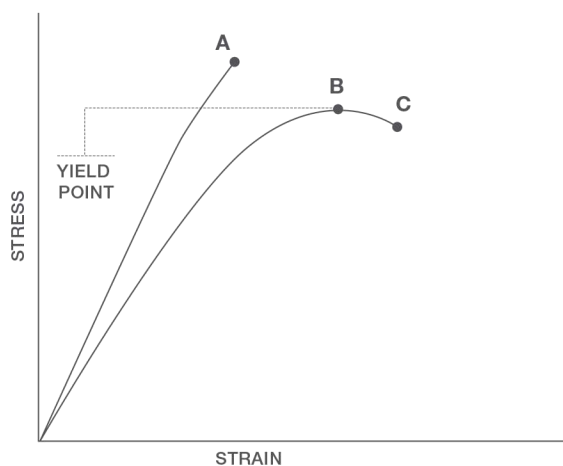
Print Orientation

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. PC-ABS Mechanical Properties (F900 - T16 Tip)

		XZ Orientation ¹	ZX Orientation ¹
Tensile Properties: ASTM D638			
Yield Strength	MPa	36.5 (0.73)	No yield
	psi	5300 (110)	No yield
Elongation @ Yield	%	3.0 (0.083)	No yield
Strength @ Break	MPa	34.7 (0.83)	25.9 (1.6)
	psi	5040 (120)	3760 (230)
Elongation @ Break	%	4.7 (0.75)	1.8 (0.22)
Modulus (Elastic)	GPa	1.99 (0.038)	1.87 (0.19)
	ksi	288 (5.5)	270 (27)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	MPa	No break	46.2 (2.0)
	psi	No break	6700 (290)
Strength @ 5% Strain	MPa	61.9 (1.2)	-
	psi	8970 (170)	-
Strain @ Break	%	No break	3.51 (0.30)
Modulus	GPa	1.86 (0.14)	1.68 (0.069)
	ksi	269 (20)	244 (10)
Compression Properties: ASTM D695			
Yield Strength	MPa	96.5 (3.6)	172 (13)
	psi	14000 (530)	25000 (1900)
Modulus	GPa	2.14 (0.19)	1.85 (0.050)
	ksi	310 (27)	269 (7.3)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	241 (40)	34.0 (6.0)
	ft*lb/in.	4.52 (0.75)	0.637 (0.11)
Unnotched	J/m	655 (127)	101 (23)
	ft*lb/in.	12.3 (2.4)	1.89 (0.43)

¹ Values in parentheses are standard deviations.

UV Aging

PC-ABS was tested before and after UV exposure. Ten ASTM D638 upright (ZX) dogbones were tested in tensile after UV exposure and an additional ten 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 Operating Fluorescent UV Light Apparatus for Exposure of Nonmetallic Materials) for 1,000 hours, alternating for eight hours at 60 °C (140 °F) and 4 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 5. PC-ABS UV Exposure Test Results

Material	Conditioning	Yield Strength		Stress at Break		Elongation at break	Increase in Stress at Break	Modulus	
		(psi)	(MPa)	(psi)	(MPa)	(%)	(%)	(ksi)	(GPa)
PC	No UV Exposure	3880	26.7	3870	26.7	2.4		224	1.54
	UV Exposure	3710	25.6	3720	25.7	2.1	-3.80%	230	1.59

PC-ABS coupons were built on the F370 using the F123 head.

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 printer.

Table 6. Mechanical Properties of PC-ABS Red, Fortus 450mc, T16

		XZ Orientation	ZX Orientation
Tensile Properties: ASTM D638			
Yield Strength	MPa	37.5 (0.43)	29.9 (1.6)
	psi	5440 (62)	4330 (230)
Elongation @ Yield	%	3.2 (0.06)	2.0 (0.17)
Strength @ Break	MPa	35.3 (0.64)	30.2 (1.3)
	psi	5120 (93)	4380 (190)
Elongation @ Break	%	6.0 (0.99)	2.0 (0.14)
Modulus (Elastic)	GPa	1.73 (0.017)	1.75 (0.015)
	ksi	251 (2.5)	253 (2.2)

Values in parentheses are standard deviations.

Table 7. Mechanical Properties of PC-ABS Red, F900, T16

		XZ Orientation	ZX Orientation
Tensile Properties: ASTM D638			
Yield Strength	MPa	32.7 (0.46)	26.9 (0.60)
	psi	4740 (67)	3900 (87)
Elongation @ Yield	%	3.3 (0.070)	2.1 (0.030)
Strength @ Break	MPa	31.0 (0.50)	26.3 (0.59)
	psi	4500 (72)	3820 (85)
Elongation @ Break	%	9.8 (1.0)	2.4 (0.17)
Modulus (Elastic)	GPa	1.65 (0.020)	1.63 (0.035)
	ksi	240. (3.0)	237 (5.1)

Values in parentheses are standard deviations.

Figure 1. 2nd heating scan DSC data for the PC-ABS Flat (XY) sample.

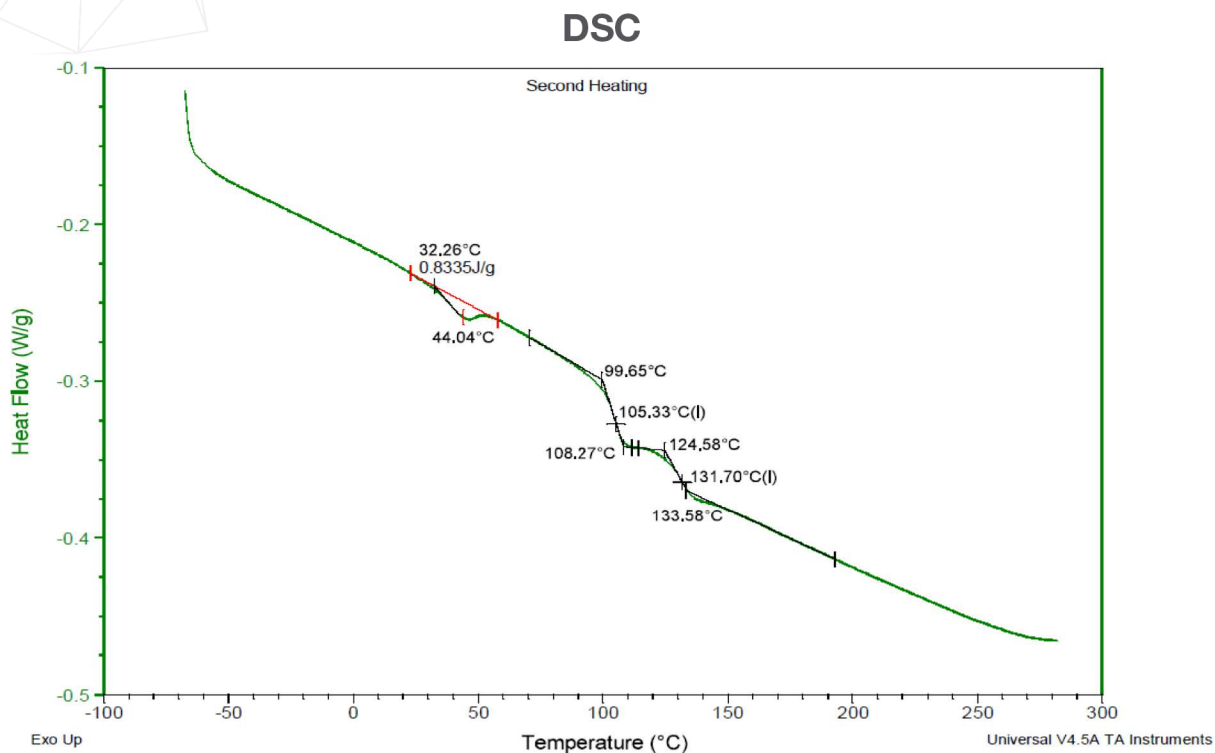


Figure 2. Dimension change data as a function of temperature for the PC-ABS Flat (XY) sample.

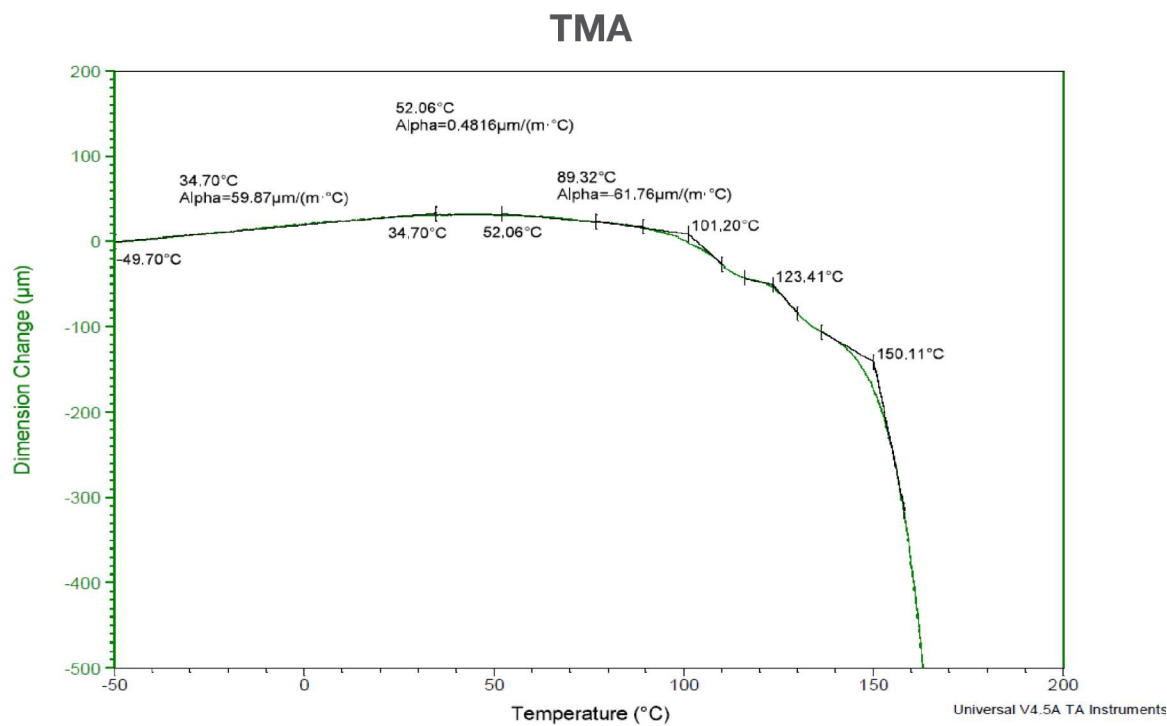


Figure 3. Dimension change data as a function of temperature for the PC-ABS On Edge (XZ) sample.

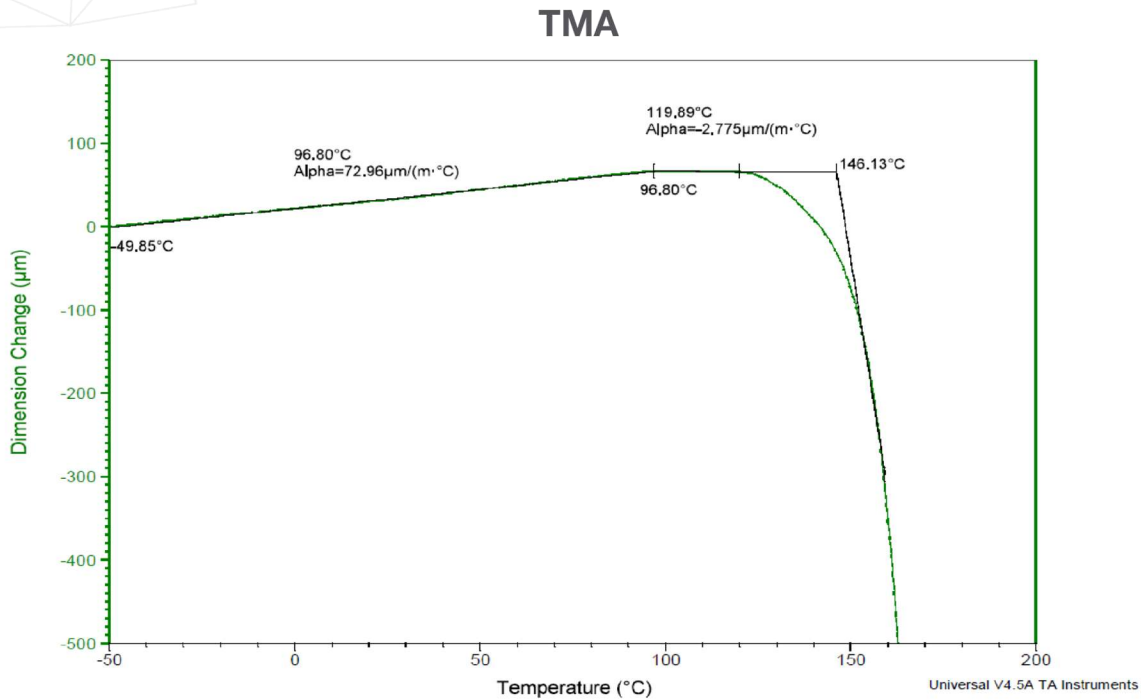


Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) PC-ABS samples.

