ASA

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

ASA (acrylonitrile styrene acrylate) FDM® filament is a broad-use commodity thermoplastic. It is similar to ABS (acrylonitrile butadiene styrene) but exhibits better UV resistance, mechanical properties and aesthetics than ABS.

ASA is suitable for most general-purpose 3D printing applications involving prototyping, jigs and fixtures and low-volume production parts. ASA filament is available in the most colors of any FDM material.

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Ordering Information

Table 1. Printer and Support Material Compatibility

Printer	Model Tip (Slice)	Support Material	Support Tip
F120™	F123 Head (7, 10, 13 slice)	SR-30 (soluble)	F123 Head (all slices)
F170™	F123 Head (5, 7, 10, 13 slice)	QSR Support™ (soluble)	F123 Head (all slices)
F270™	F123 Head (5, 7, 10, 13 slice)	QSR Support (soluble)	F123 Head (all slices)
F370™	F123 Head (5, 7, 10, 13 slice)	QSR Support (soluble)	F123 Head (all slices)
F770™	F123 Head (7, 10, 13 slice)	SR-30 (soluble)	F123 Head (all slices)
Fortus 450mc™	T10 (5 slice) T12 (7 slice) T16 (10 slice) T20 (13 slice)	SR-30 / 35 (soluble)	T12SR30 (all slices)
Fortus 900mc™/F900™	T10 (5 slice) T12 (7 slice) T16 (10 slice) T20 (13 slice) T40A (20 slice)	SR-30 / 35 (soluble)	T12SR30 (5, 7, 10, 13 slice) T20B (20 slice)

Build Sheet

F123 Standard Build Trays

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)

F770 Build Sheets

- 0.01 x 30 x 41 in. (0.254 x 762 x 1041 mm)

Colors

Black	Ivory
Red	Dark Blue
Dark Gray	Green
Light Gray	Yellow
White	Orange

Table 2. ASA Consumable Ordering Information

Part Number	Description
Printer Consumables	
511-10501	T10 tip, 0.005 in (0.127 mm) layer height
511-10301	T12 tip, 0.007 in (0.178 mm) layer height
511-10401	T16 tip, 0.010 in (0.254 mm) layer height
511-10701	T20 tip, 0.013 in (0.330 mm) layer height
511-10750	T40A tip, 0.020 in (0.508 mm) layer height
511-10900	T12SR30 support tip, 0.005-0.013 in layer heights
511-10710	T20B support tip, 0.020 in (0.508 mm) layer height
123-00401-S	F123 Extrusion Head, 0.005 - 0.013 in layer height
325-00300	Low Temperature build sheet, 0.02x26x38in (0.51x660x965mm)
325-00100	Low Temperature build sheet, 0.02x16x18.5 in (0.51x406x470 mm)
310-00100	Low Temperature build sheet, 0.03x16x18.5 in (0.76x406x470 mm)
355-00100	Low Temperature build sheet, 0.02x14x16.5 in (0.51x355x420 mm)
123-50100	F770 build sheet, 0.01 x 30 x 41 in. (0.254 x 762 x 1041 mm), box of 20
123-00302-S	F120/F170 Build Tray
123-00303	F270 Build Tray
123-00304	F370 Build Tray, Standard

Table 3. ASA Filament Ordering Information

Part Number	Description
Filament Canisters[1] [2]	
355-02140	ASA (Natural), 92.3 cu in. - Plus
355-02141	ASA (White), 92.3 cu in. - Plus
355-02142	ASA (Black), 92.3 cu in. - Plus
355-02143	ASA (Dark Gray), 92.3 cu in. - Plus
355-02144	ASA (Red), 92.3 cu in. - Plus
355-02145	ASA (Blue), 92.3 cu in. - Plus
355-02146	ASA (Light Gray), 92.3 cu in. - Plus
355-02147	ASA (Green), 92.3 cu in. - Plus
355-02148	ASA (Orange), 92.3 cu in. - Plus
355-02149	ASA (Yellow), 92.3 cu in. - Plus
360-50240	ASA (Natural), Xtend 500 - Plus
333-60500	ASA (Ivory), 60 cu in. - F123
333-60501	ASA (Black), 60 cu in. - F123
333-60502	ASA (White), 60 cu in. - F123
333-60503	ASA (Red), 60 cu in. - F123
333-60504	ASA (Blue), 60 cu in. - F123
333-60505	ASA (Green), 60 cu in. - F123
333-60506	ASA (Yellow), 60 cu in. - F123
333-60507	ASA (Orange), 60 cu in. - F123
333-60508	ASA (Dark Gray), 60 cu in. - F123
333-60509	ASA (Light Gray), 60 cu in. - F123
333-90500	ASA (Ivory), 90 cu in. - F123
333-90501	ASA (Black), 90 cu in. - F123
333-90502	ASA (White), 90 cu in. - F123
333-90509	ASA (Light Gray), 90 cu in. - F123
331-20507	ASA (Ivory), 200 cu in., long lead - F770
311-21000	ASA (Natural), 92.3 cu in. - Classic
311-21100	ASA (White), 92.3 cu in. - Classic
311-21200	ASA (Black), 92.3 cu in. - Classic
311-21300	ASA (Light Gray), 92.3 cu in. - Classic
311-21390	ASA (Red), 92.3 cu in. - Classic
311-21500	ASA (Blue), 92.3 cu in. - Classic
311-21600	ASA (Dark Gray), 92.3 cu in. - Classic
311-21700	ASA (Green), 92.3 cu in. - Classic
311-21800	ASA (Orange), 92.3 cu in. - Classic
311-21900	ASA (Yellow), 92.3 cu in. - Classic
355-03110	SR30 Soluble Support, 92.3 cu in. - Plus
360-53110	SR30 Soluble Support, Xtend 500 - Plus
311-30200	SR30 Soluble Support, 92.3 cu in. - Classic
355-03135	SR35 Soluble Support, 92.3 cu in. - Plus
311-30235	SR35 Soluble Support, 92.3 cu in. - Classic
333-63500	QSR Soluble Support, 60 cu in. - F123
331-20200	SR30 Soluble Support, 200 cu in - F120
331-20207	SR30 Soluble Support, 200 cu in., long lead - F770

[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.

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 4. ASA Physical Properties

Property	Test Method	Typical Values	
		XY	XZ/ZX
HDT @ 66 psi	ASTM D648 Method B	102.2 C (216.0 F)	
HDT @ 264 psi	ASTM D648 Method B	97.9 C (208.3 F)	
Tg	ASTM D7426 Inflection Point	103.55 C (218.39 F)	
Mean CTE	ASTM E831 (-50 °C to 90 °C)	69.38 µm/[m*°C] (38.54 µin/[in.*°F])	63.55 µm/[m*°C] 35.31 µin/[in*°F]
Volume Resistivity	ASTM D257	> 6.89*10^14 Ω*cm	
Dielectric Constant	ASTM D150 1 kHz test condition	3.14	4.74
Dielectric Constant	ASTM D150 2 MHz test condition	2.82	2.83
Dissipation Factor	ASTM D150 1 kHz test condition	0.009	0.009
Dissipation Factor	ASTM D150 2 MHz test condition	0.022	0.024
Thermal Conductivity*	ASTM E1952 @0C	0.1685 W/m*K 0.0974 BTU/(hr*ft*F)	
Thermal Conductivity*	ASTM E1952 @30C	0.1642 W/m*K 0.0949 BTU/(hr*ft*F)	
Thermal Conductivity*	ASTM E1952 @60C	0.1622 W/m*K 0.0937 BTU/(hr*ft*F)	
Thermal Conductivity*	ASTM E1952 @90C	0.1563 W/m*K 0.0903 BTU/(hr*ft*F)	
Thermal Diffusivity*	ASTM E1952 @0C	0.108 mm^2/s 1.67*10^-4 in^2/s	
Thermal Diffusivity*	ASTM E1952 @30C	0.096 mm^2/s 1.49*10^-4 in^2/s	
Thermal Diffusivity*	ASTM E1952 @60C	0.087 mm^2/s 1.35*10^-4 in^2/s	
Thermal Diffusivity*	ASTM E1952 @90C	0.077 mm^2/s 1.19*10^-4 in^2/s	
Specific Gravity	ASTM D257 @23 °C	1.08	

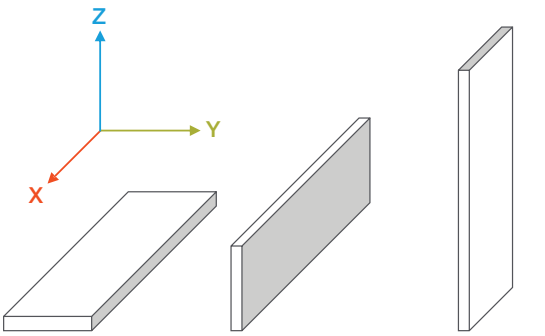
* Testing done on ASA - natural material

Mechanical Properties

ASA Black samples were printed with a 0.010 in. (0.254 mm) layer height on the F900 and F770. For the full test procedure please see Stratasys Materials Test Procedure (immediate download upon clicking the link).

Print Orientation

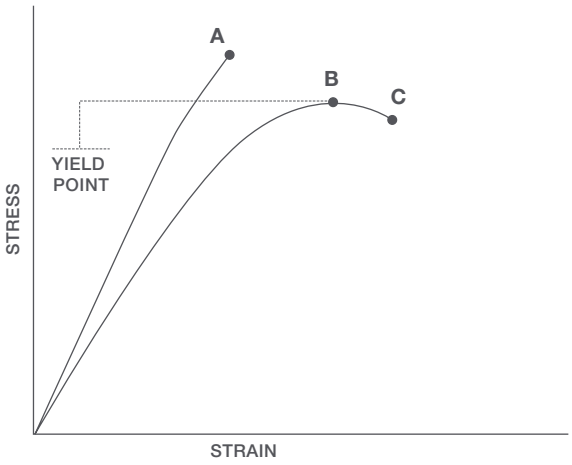
Parts created using FDM are anisotropic as a result of the printing process. Below is a reference of the different orientations used to characterize the material.



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 5. ASA Black Mechanical Properties (F900 - T16 Tip)

		XZ Orientation[1]	ZX Orientation[1]
Tensile Properties: ASTM D638			
Yield Strength	MPa	32.8 (1.0)	No yield
	psi	4750 (150)	No yield
Elongation @ Yield	%	2.5 (0.085)	No yield
Strength @ Break	MPa	31.9 (0.98)	28.3 (2.1)
	psi	4630 (140)	4110 (310)
Elongation @ Break	%	5.9 (0.76)	1.8 (0.31)
Modulus (Elastic)	GPa	2.14 (0.072)	2.05 (0.20)
	ksi	311 (10)	298 (29)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	MPa	No break	51.0 (1.4)
	psi	No break	7390 (200)
Strength @ 5% Strain	MPa	61.5 (1.1)	-
	psi	8930 (150)	-
Strain @ Break	%	No break	3.93 (0.25)
Modulus	GPa	1.98 (0.045)	1.76 (0.033)
	ksi	287 (6.5)	255 (4.8)
Compression Properties: ASTM D695			
Yield Strength	MPa	75.4 (3.8)	188 (28)
	psi	10900 (540)	27200 (4100)
Modulus	GPa	2.05 (0.060)	2.42 (0.26)
	ksi	297 (8.7)	351 (38)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	43.1 (3.8)	23.8 (3.8)
	ft*lb/in.	0.808 (0.071)	0.445 (0.052)
Unnotched	J/m	285 (61)	91.1 (18)
	ft*lb/in.	5.33 (1.1)	1.71 (0.34)

[1] Values in parentheses are standard deviations.

Table 6. ASA Black Mechanical Properties (F770)

		XZ Orientation[1]	ZX Orientation[1]
Tensile Properties: ASTM D638			
Yield Strength	Mpa	26.9 (1.4)	35.2 (0.37)
	psi	3910 (200)	5100 (53.9)
Elongation @ Yield	%	2.3 (0.4)	3.0 (0.08)
Strength @ Break	Mpa	27.0 (1.3)	33.7 (0.81)
	psi	3910 (190)	4900 (120)
Elongation @ Break	%	2.3 (0.4)	8.9 (1.5)
Modulus (Elastic)	GPa	1.62 (0.0186)	1.85 (0.0195)
	ksi	235 (2.70)	268 (2.83)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	Mpa	No Break	48.2 (4.8)
	psi	No Break	6980 (700)
Strength @ 5% Strain	Mpa	60.6 (2.3)	-
	psi	9190 (340)	-
Strain @ Break	%	No Break	3.7 (0.7)
Modulus	GPa	1.90 (0.099)	1.72 (0.046)
	ksi	276 (14.3)	250 (6.67)
Impact Properties: ASTM D256, ASTM D4812			
Notched	J/m	60.9 (4.8)	28.5 (5.7)
	ft*lb/in	1.14 (0.091)	0.534 (0.11)
Unnotched	J/m	732 (140)	110 (22)
	ft*lb/in	13.7 (2.6)	2.07 (0.41)

[1] Values in parentheses are standard deviations.

Appendix

Figure 1. 2nd heating scan DSC data for the ASA Black Flat (XY) sample.

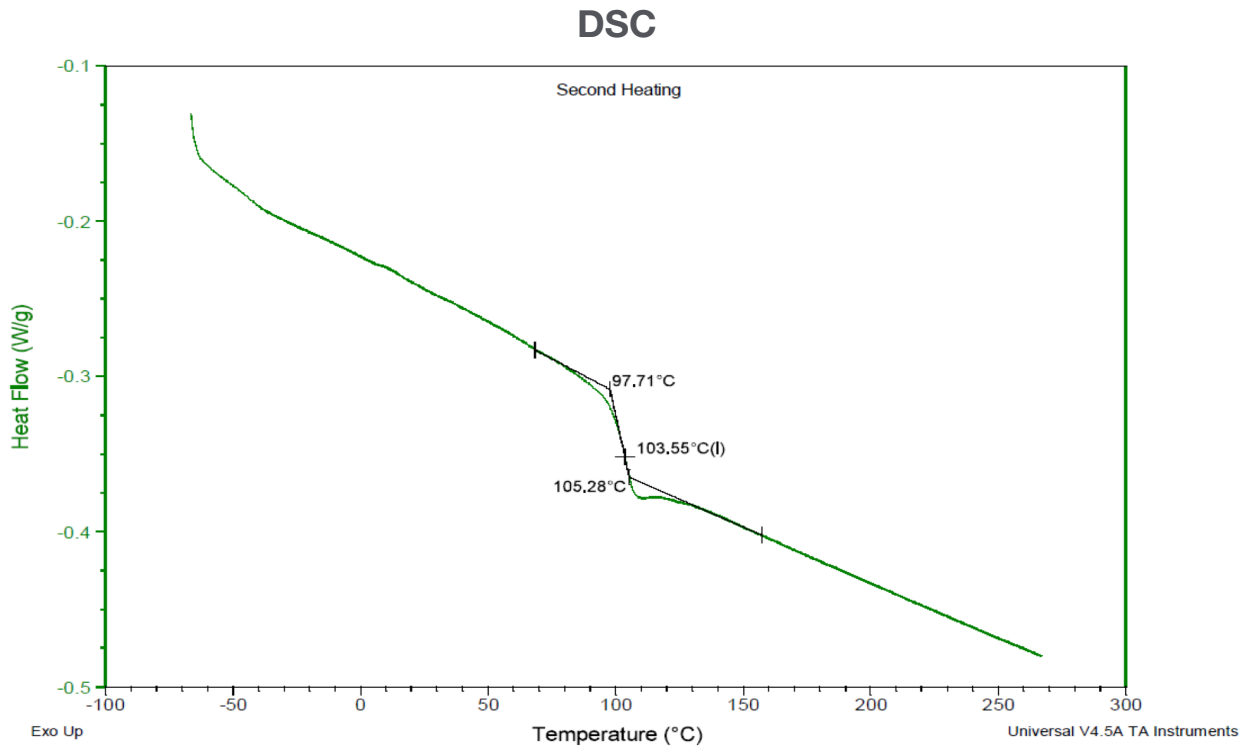


Figure 2. Dimension change data as a function of temperature for the ASA Black Flat (XY) sample.

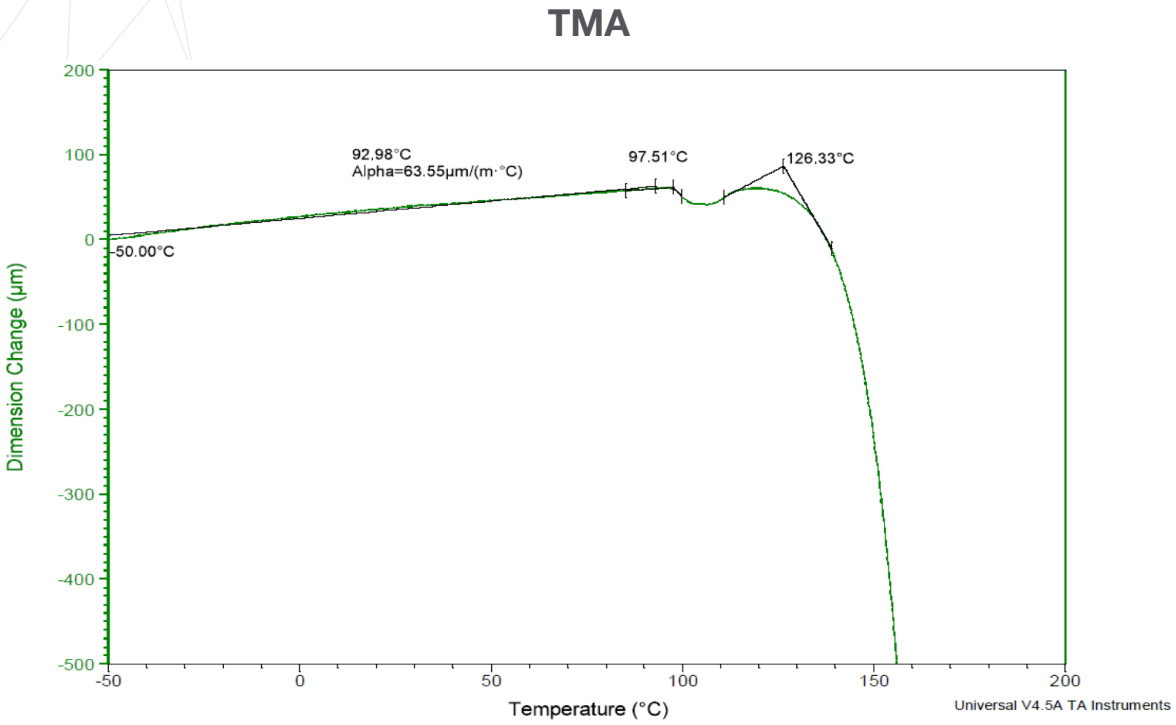


Figure 3. Dimension change data as a function of temperature for the ASA Black On Edge (XZ) sample.

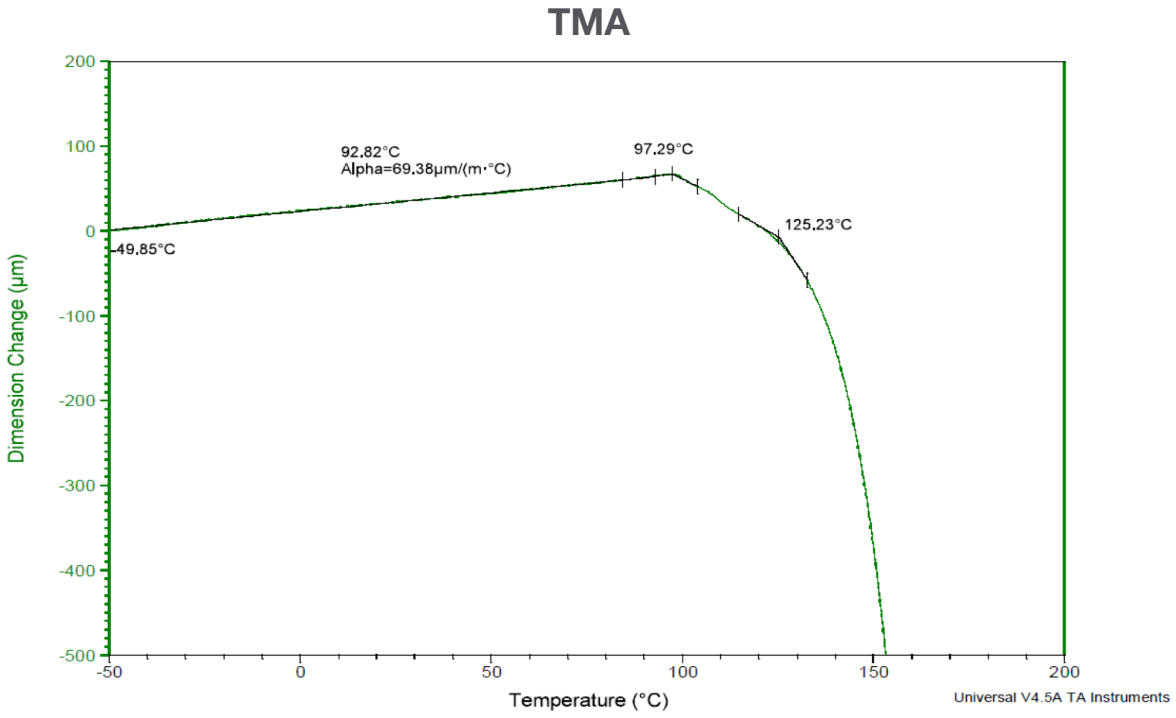
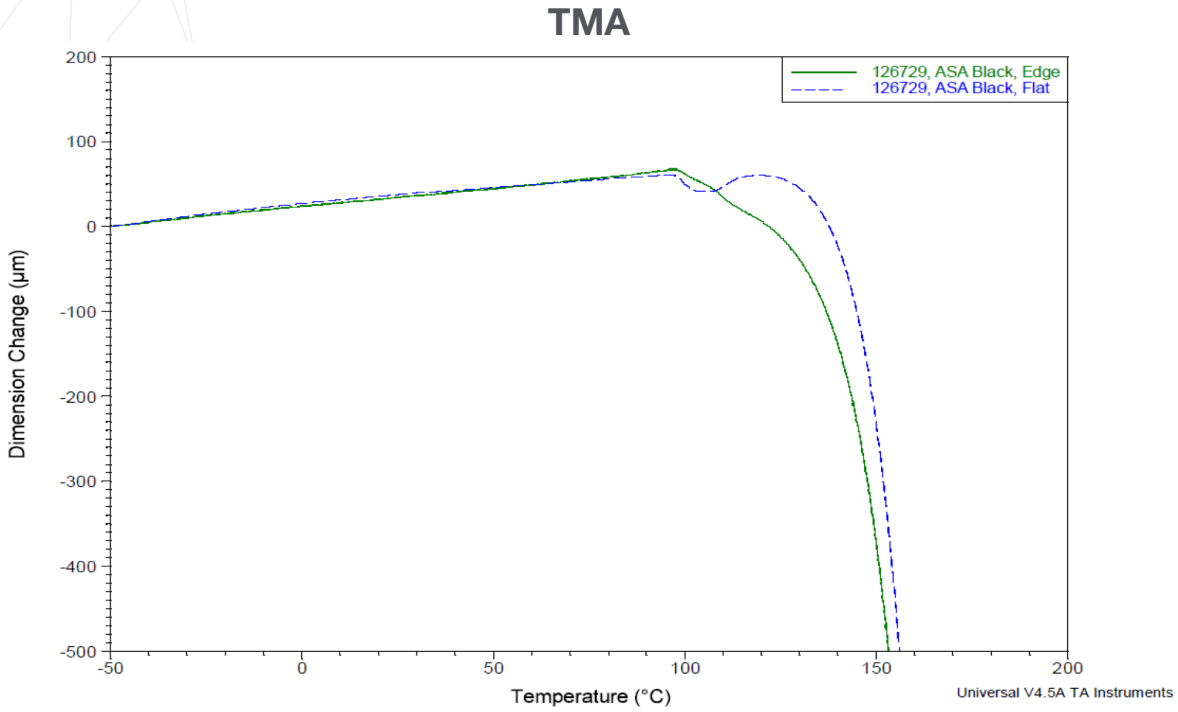


Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) ASA Black samples.



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