

# 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)
F190™CR	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)
F370®CR	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)
	T10 (5 slice)		
Fortus 450mc™	T12 (7 slice)	SR-30 / 35 (soluble)	T12SR30 (all slices)
	T16 (10 slice)		
	T20 (13 slice)		
	T10 (5 slice)		
Fortus 900mc™/F900™	T12 (7 slice)	SR-30 / 35 (soluble)	T12SR30 (5, 7, 10, 13 slice) T20B (20 slice)
	T16 (10 slice)		
	T20 (13 slice)		
	T40A (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

Red

Dark Gray

Light Gray

White

Ivory

Dark Blue

Green

Yellow

Orange

**Table 2. ASA Consumable Ordering Information**

Part Number	Description
<b>Printer Consumables</b>	
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
123-00402-S	F123 Standard Head (all layer heights)
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-S	F270/F190CR Build Tray
123-00304	F370/F370CR Build Tray



**Table 3. ASA Filament Ordering Information**

Part Number	Description
<b>Filament Canisters<sup>1 2</sup></b>	
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

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

<sup>2</sup> 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 $\mu\text{m}/[\text{m}^{\circ}\text{C}]$ (38.54 $\mu\text{in}/[\text{in}^{\circ}\text{F}]$ )	63.55 $\mu\text{m}/[\text{m}^{\circ}\text{C}]$ 35.31 $\mu\text{in}/[\text{in}^{\circ}\text{F}]$
Volume Resistivity	ASTM D257	> 6.89*10 <sup>14</sup> $\Omega^{\circ}\text{cm}$	
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 <sup>2</sup> /s 1.67*10 <sup>-4</sup> in <sup>2</sup> /s	
Thermal Diffusivity*	ASTM E1952 @30C	0.096 mm <sup>2</sup> /s 1.49*10 <sup>-4</sup> in <sup>2</sup> /s	
Thermal Diffusivity*	ASTM E1952 @60C	0.087 mm <sup>2</sup> /s 1.35*10 <sup>-4</sup> in <sup>2</sup> /s	
Thermal Diffusivity*	ASTM E1952 @90C	0.077 mm <sup>2</sup> /s 1.19*10 <sup>-4</sup> in <sup>2</sup> /s	
Specific Gravity	ASTM D257 @23 °C	1.08	

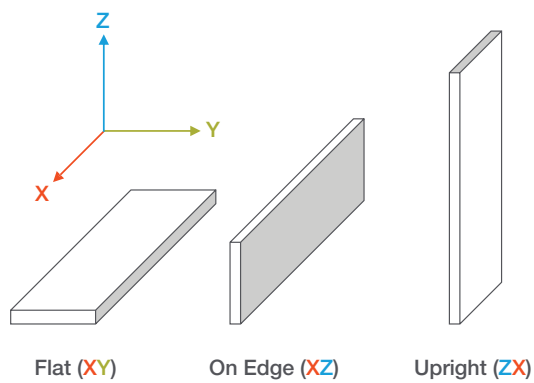
\* Testing done on ASA - natural material

## 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).

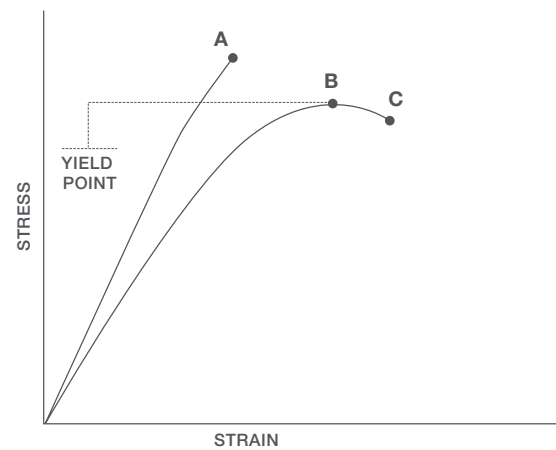
### Print Orientation

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.



### 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 <sup>1</sup>	ZX Orientation <sup>1</sup>
<b>Tensile Properties: ASTM D638</b>			
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)
<b>Flexural Properties: ASTM D790, Procedure A</b>			
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)
<b>Compression Properties: ASTM D695</b>			
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)
<b>Impact Properties: ASTM D256, ASTM D4812</b>			
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)

<sup>1</sup> Values in parentheses are standard deviations.



**Table 6. ASA Black Mechanical Properties (F770)**

		XZ Orientation <sup>1</sup>	ZX Orientation <sup>1</sup>
<b>Tensile Properties: ASTM D638</b>			
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)
<b>Flexural Properties: ASTM D790, Procedure A</b>			
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)
<b>Impact Properties: ASTM D256, ASTM D4812</b>			
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)

<sup>1</sup> Values in parentheses are standard deviations.

## Appendix

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

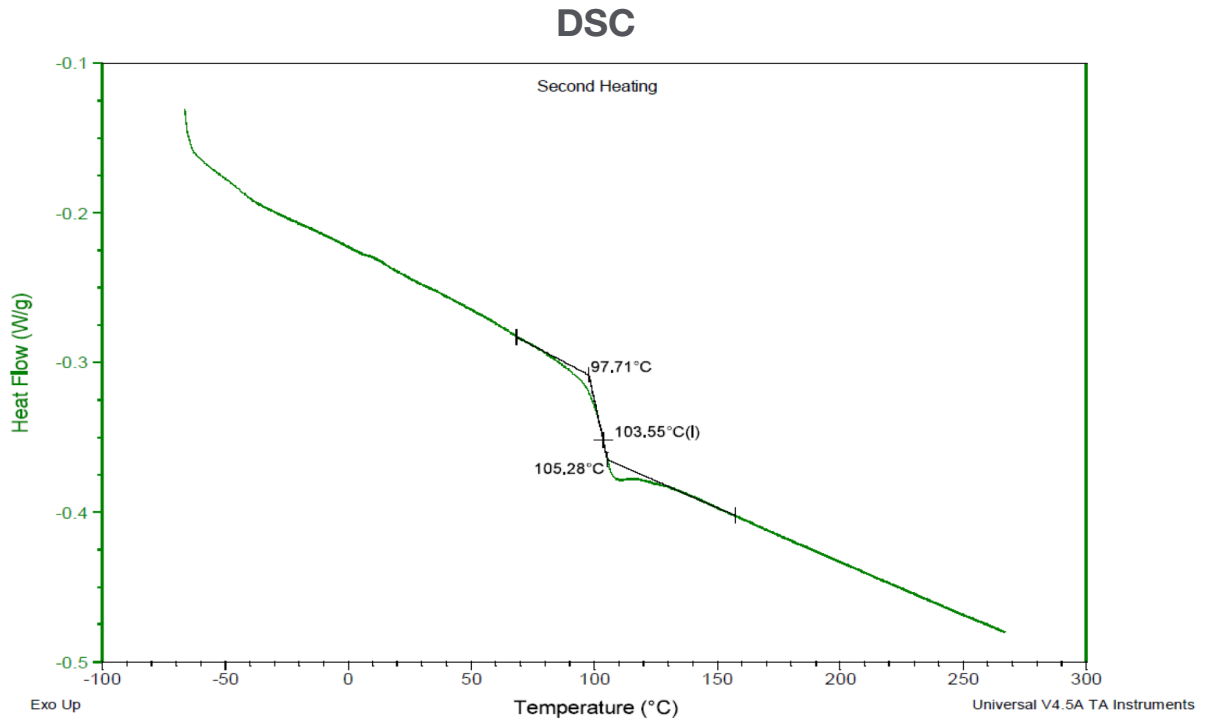


Figure 2. Dimension change data as a function of temperature for the ASA Black Flat (XY) sample.

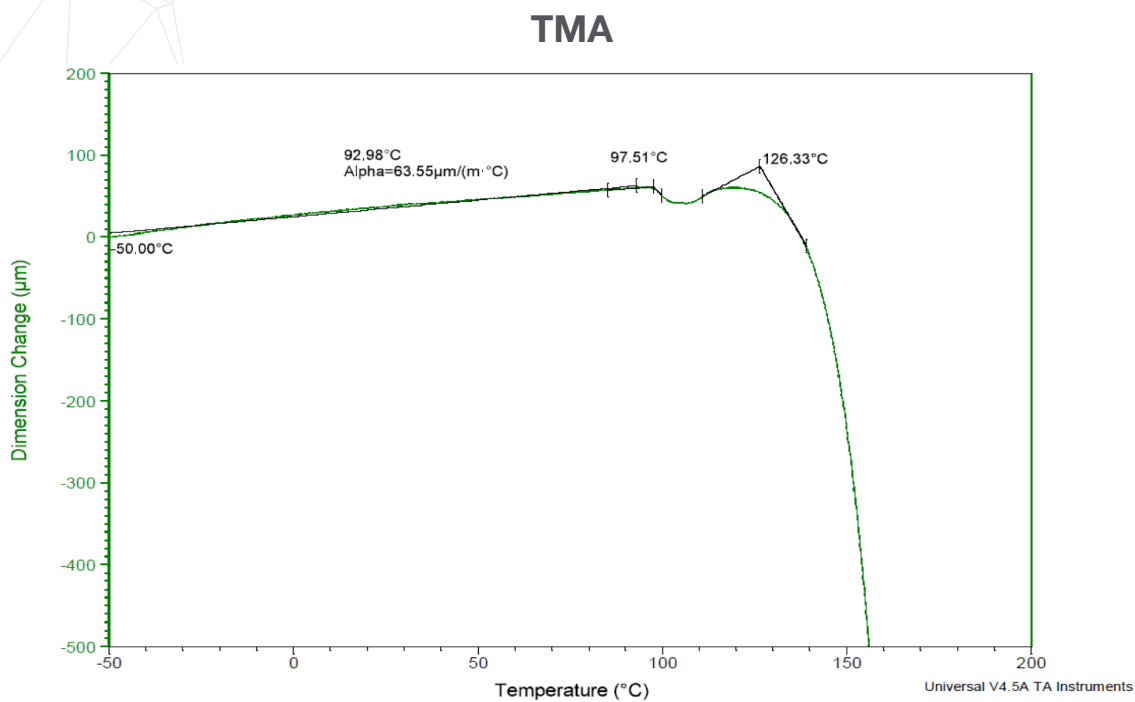


Figure 3. Dimension change data as a function of temperature for the ASA Black On Edge (XZ) sample.

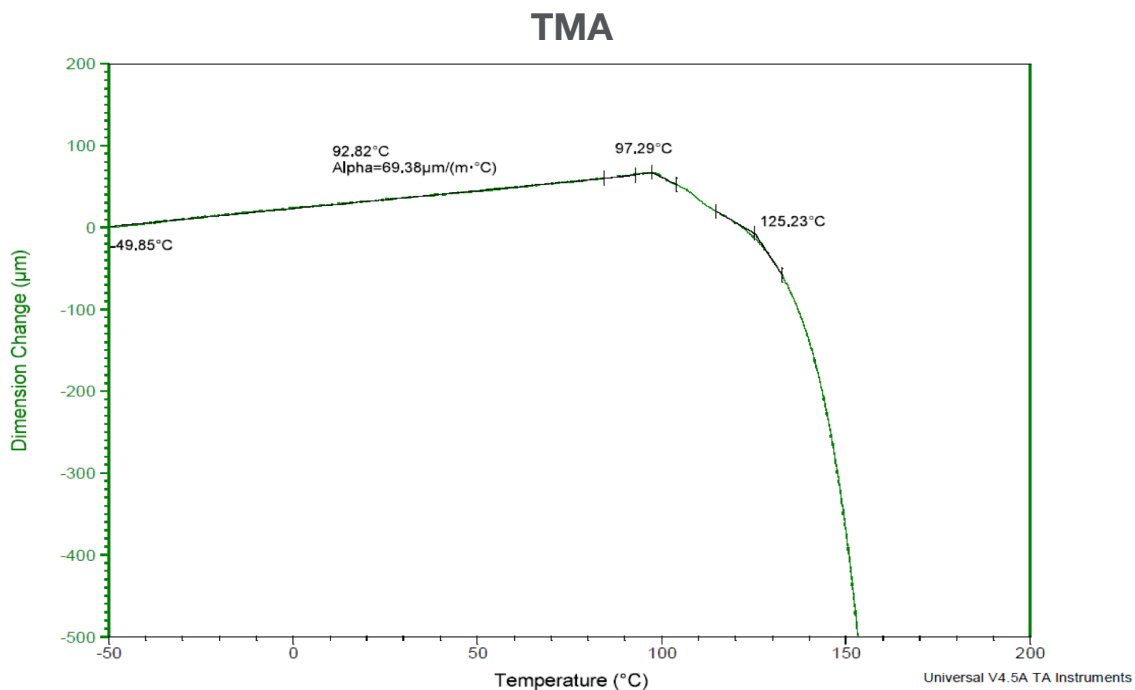
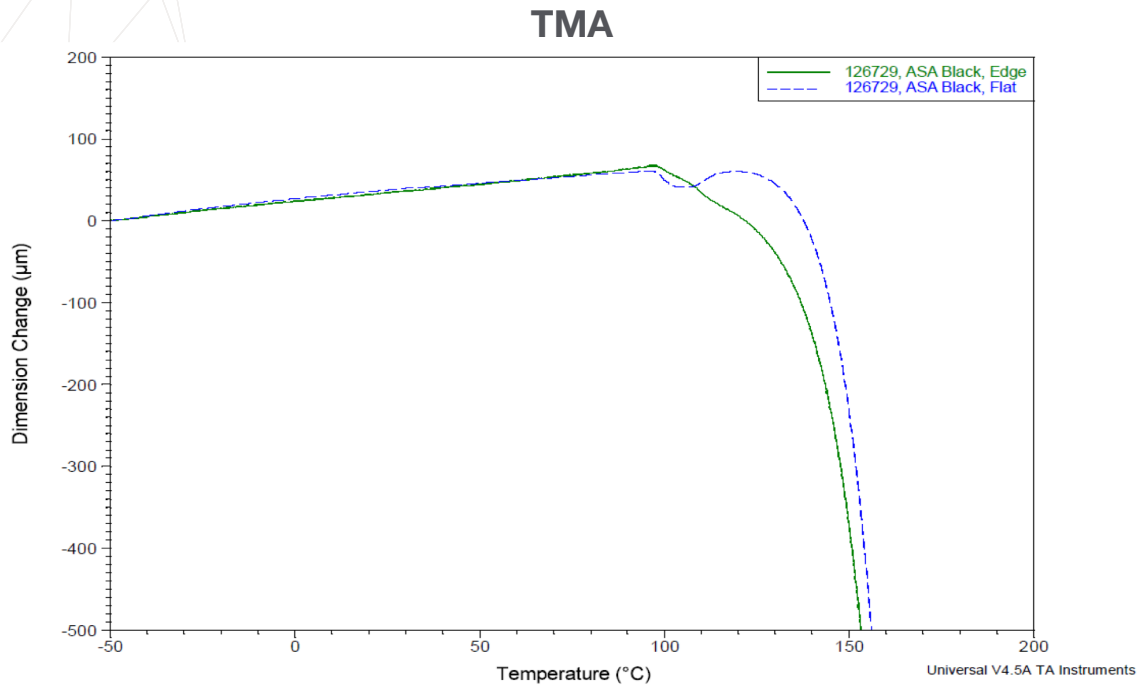


Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) ASA Black samples.



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