

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 |
|----------------------------|---|
| 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 |
| 123-00402-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 |
|---|--|
| 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 $\mu\text{m}/[\text{m}^{\circ}\text{C}]$ (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 ¹⁴ $\Omega^{\circ}\text{cm}$ | |
| 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 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 | |

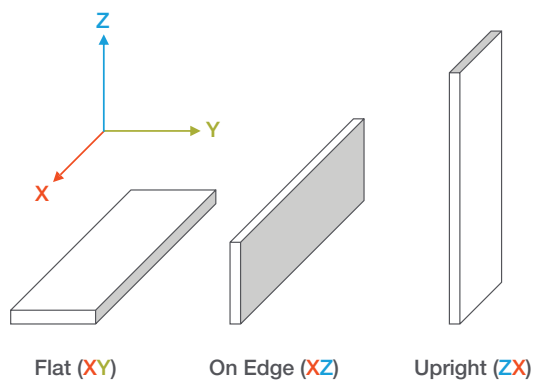
* Testing done on ASA - natural material

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).

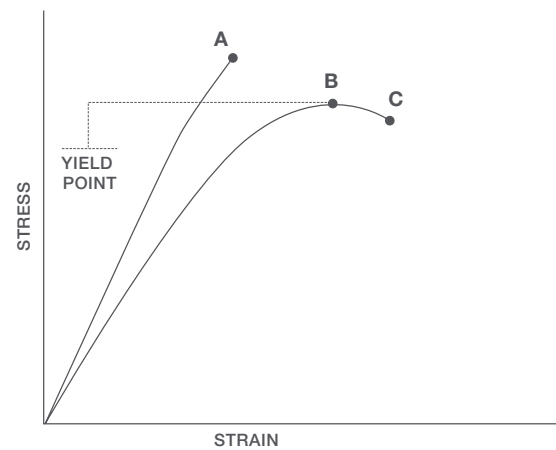
Print Orientation

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.



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.

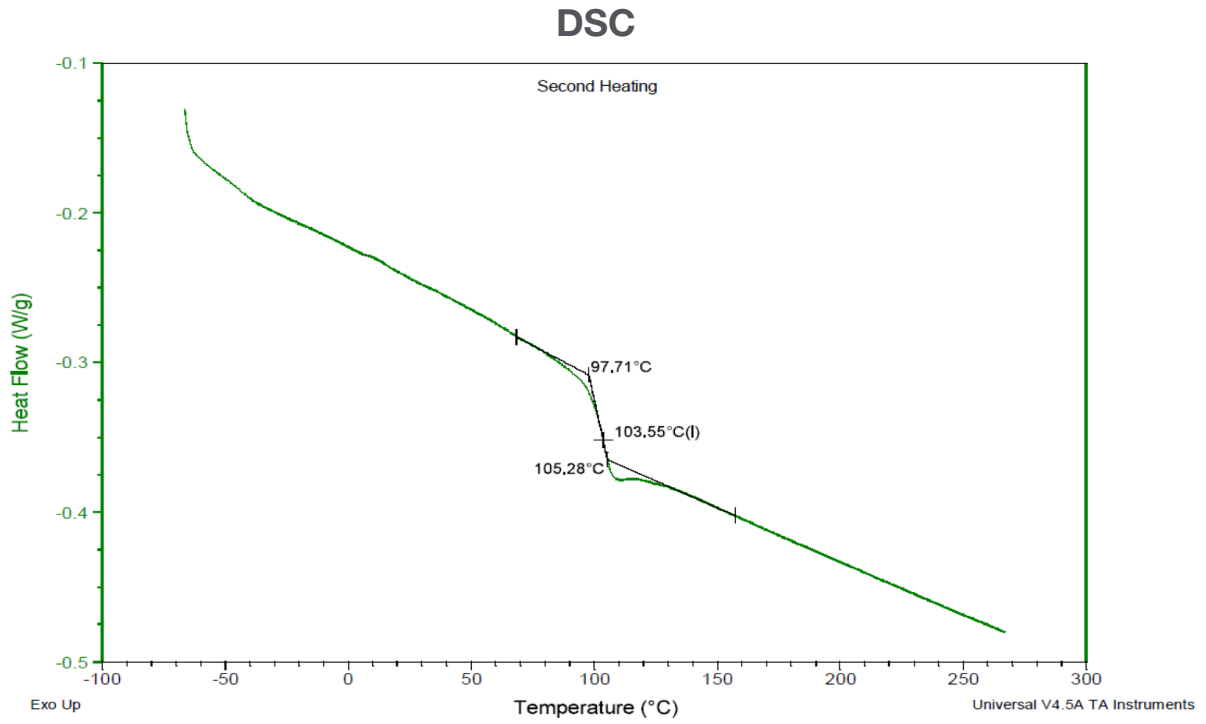


Figure 2. Dimension change data as a function of temperature for the ASA Black Flat (XY) sample.

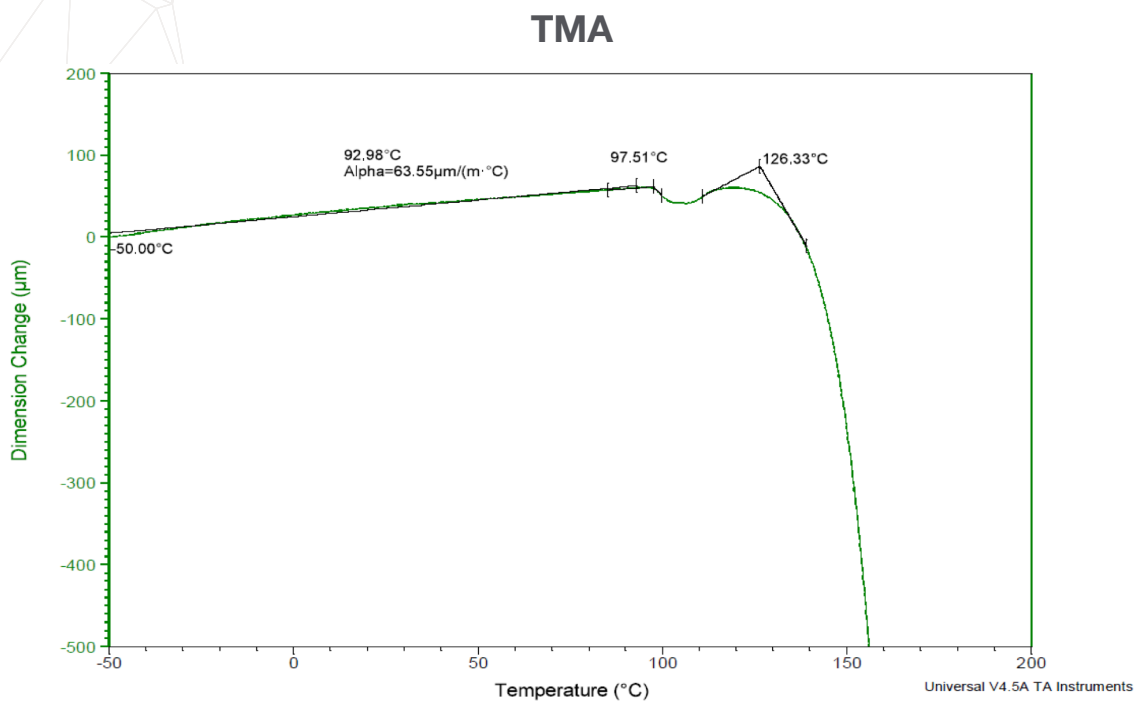


Figure 3. Dimension change data as a function of temperature for the ASA Black On Edge (XZ) sample.

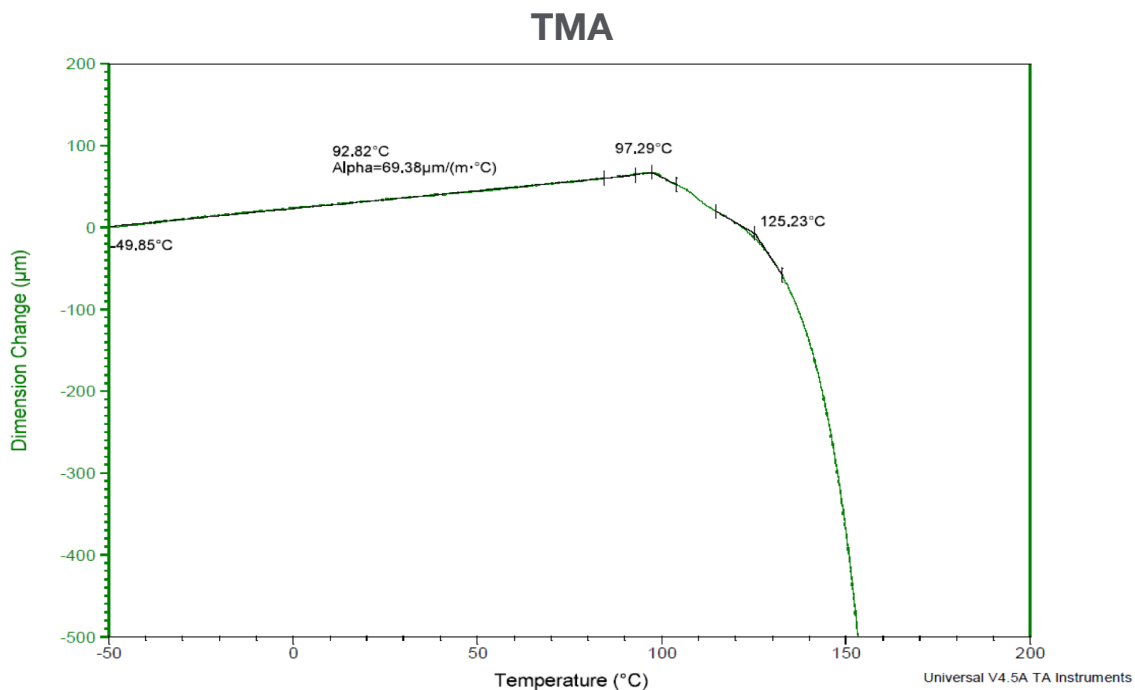
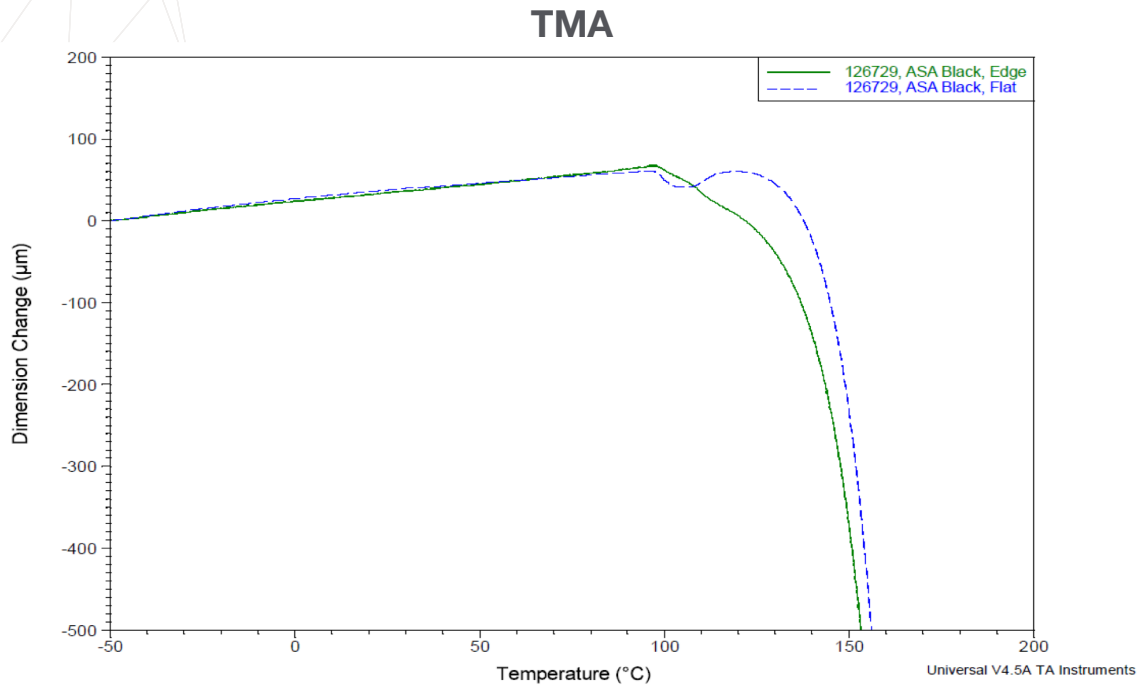


Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) ASA Black samples.



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