

# 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.

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## 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)                           |
| Fortus 360mc™                 | T10 (5 slice)                  | SR-30™ / 35™ (soluble) | T12SR20 / 30 (all slices)                        |
|                               | T12 (7 slice)                  |                        |                                                  |
|                               | T16 (10 slice)                 |                        |                                                  |
|                               | T20 (13 slice)                 |                        |                                                  |
| Fortus 400mc™                 | T10 (5 slice)                  | SR-30 / 35 (soluble)   | T12SR20 / 30 (all slices)                        |
|                               | T12 (7 slice)                  |                        |                                                  |
|                               | T16 (10 slice)                 |                        |                                                  |
|                               | T20 (13 slice)                 |                        |                                                  |
| Fortus 380mc™/450mc™          | T10 (5 slice)                  | SR-30 / 35 (soluble)   | T12SR30 (all slices)                             |
|                               | T12 (7 slice)                  |                        |                                                  |
|                               | T16 (10 slice)                 |                        |                                                  |
|                               | T20 (13 slice)                 |                        |                                                  |
| Fortus 380mc CFE <sup>1</sup> | T10 (5 slice)                  | SR-30 / 35 (soluble)   | T12SR30 (all slices)                             |
|                               | T12 (7 slice)                  |                        |                                                  |
|                               | T16 (10 slice)                 |                        |                                                  |
|                               | T20 (13 slice)                 |                        |                                                  |
| Fortus 900mc™/F900™           | T10 (5 slice)                  | SR-30 / 35 (soluble)   | T12SR30 (5, 7, 10, 13 slices)<br>T20B (20 slice) |
|                               | T12 (7 slice)                  |                        |                                                  |
|                               | T16 (10 slice)                 |                        |                                                  |
|                               | T20 (13 slice)                 |                        |                                                  |
|                               | T40A (20 slice)                |                        |                                                  |

<sup>1</sup> CFE – Carbon Fiber Edition.

### 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)

0.02 x 14 x 16.5 in (0.51 x 355 x 420 mm)

0.03 x 16 x 18.5 in (0.76 x 406 x 470 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             |
| 123-00401-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) |
| 123-00302-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                                 |
|-----------------------------------------|---------------------------------------------|
| <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          |
| 331-20500                               | ASA (Ivory), 200 cu in. - F120              |
| 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      |

<sup>1</sup> Classic canisters are compatible with all Fortus 400mc and 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. DSC and TMA curves can be found in the Appendix.

**Table 4. ASA Physical Properties**

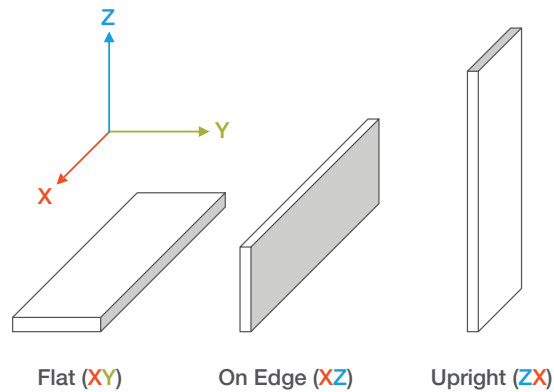
| Property            | Test Method                       | Typical Values                                                                                        |       |
|---------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------|-------|
|                     |                                   | XY                                                                                                    | XZ/ZX |
| HDT @ 66 psi        | ASTM D648<br>Method B             | 102.2 C (216.0 F)                                                                                     |       |
| HDT @ 264 psi       | ASTM D648<br>Method B             | 97.9 C (208.3 F)                                                                                      |       |
| Tg                  | ASTM D7426<br>Inflection Point    | 103.55 C (218.39 F)                                                                                   |       |
| Mean CTE            | ASTM E831<br>(-50 °C to 90 °C)    | 69.38 $\mu\text{m}/[\text{m}^{\circ}\text{C}]$<br>(38.54 $\mu\text{in}/[\text{in}^{\circ}\text{F}]$ ) |       |
| Volume Resistivity  | ASTM D257                         | > 6.89*10 <sup>14</sup> $\Omega\cdot\text{cm}$                                                        |       |
| Dielectric Constant | ASTM D150<br>1 kHz test condition | 3.14                                                                                                  | 4.74  |
| Dielectric Constant | ASTM D150<br>2 MHz test condition | 2.83                                                                                                  |       |
| Dissipation Factor  | ASTM D150<br>1 kHz test condition | 0.009                                                                                                 |       |
| Dissipation Factor  | ASTM D150<br>2 MHz test condition | 0.023                                                                                                 |       |
| Specific Gravity    | ASTM D257<br>@23 °C               | 1.08                                                                                                  |       |

# Mechanical Properties

ASA Black samples were printed with a 0.010 in. (0.254 mm) layer height on the F900.

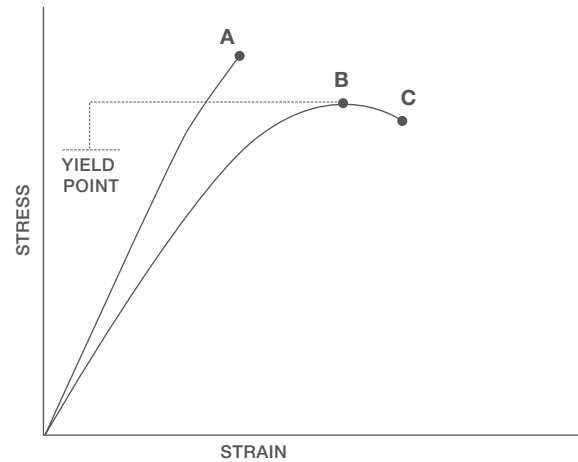
## Print Orientation

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 5. ASA Black Mechanical Properties (Fortus 900mc - 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.

## Appendix

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

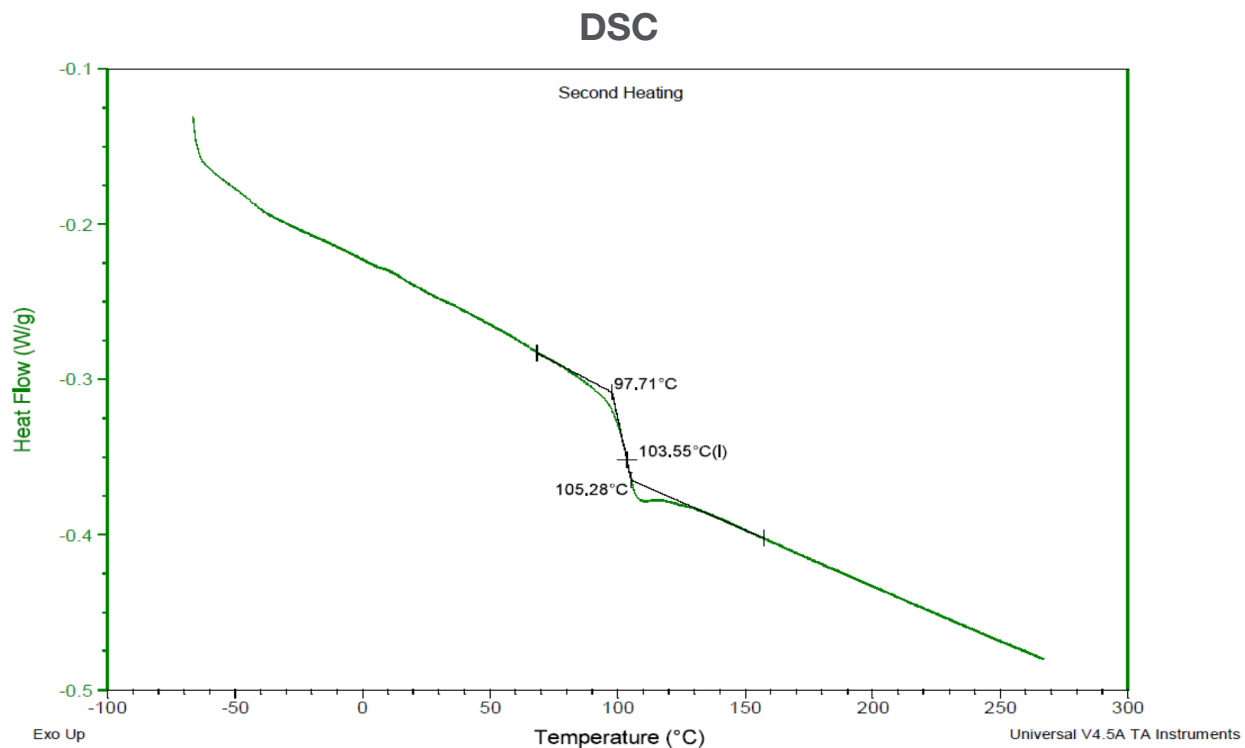


Figure 2. Dimension change data as a function of temperature for the ASA Black Flat (XY) sample.

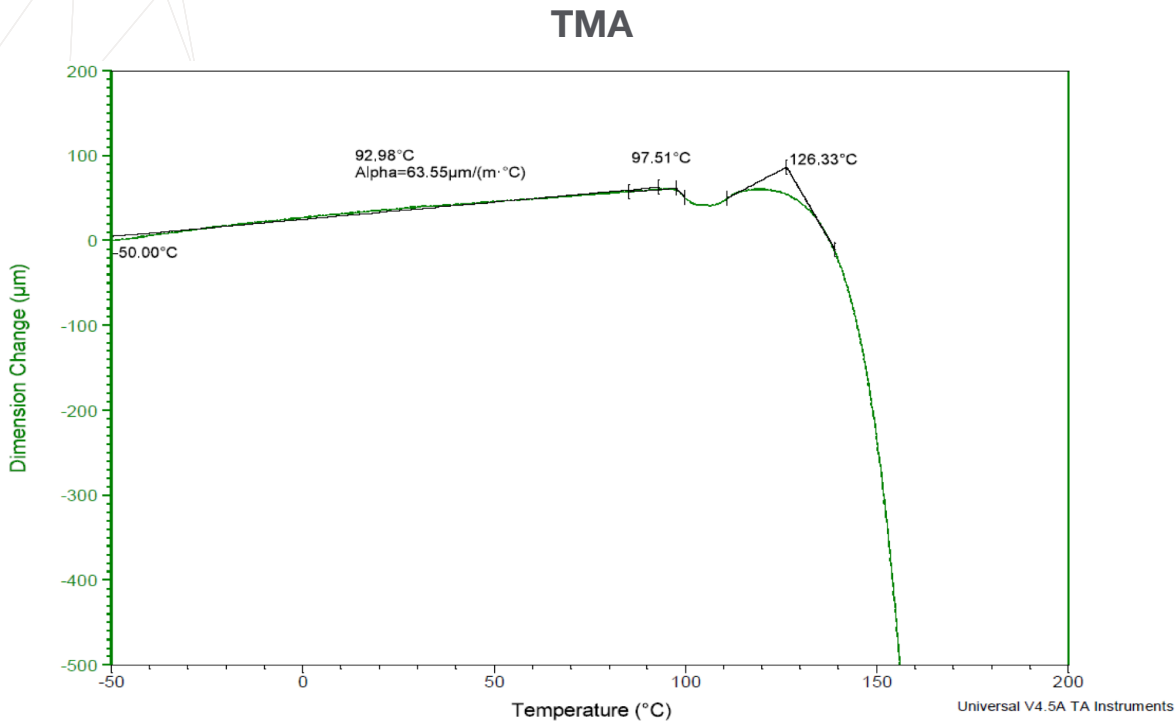


Figure 3. Dimension change data as a function of temperature for the ASA Black On Edge (XZ) sample.

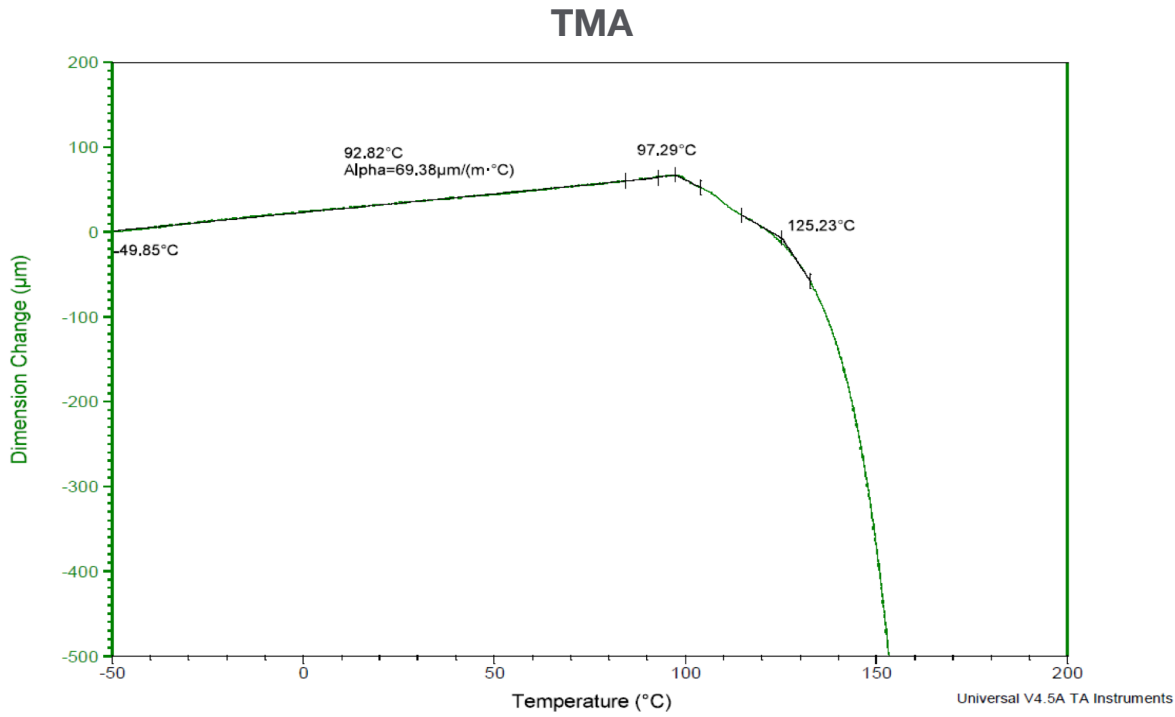
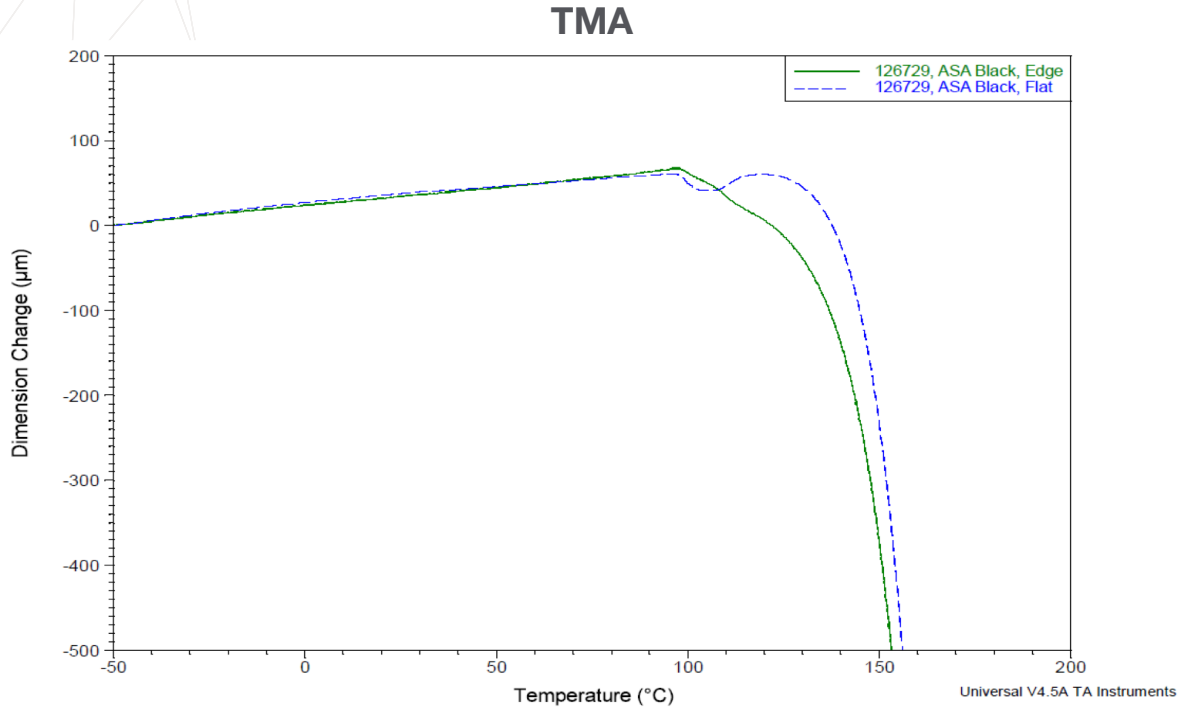


Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) ASA Black samples.



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