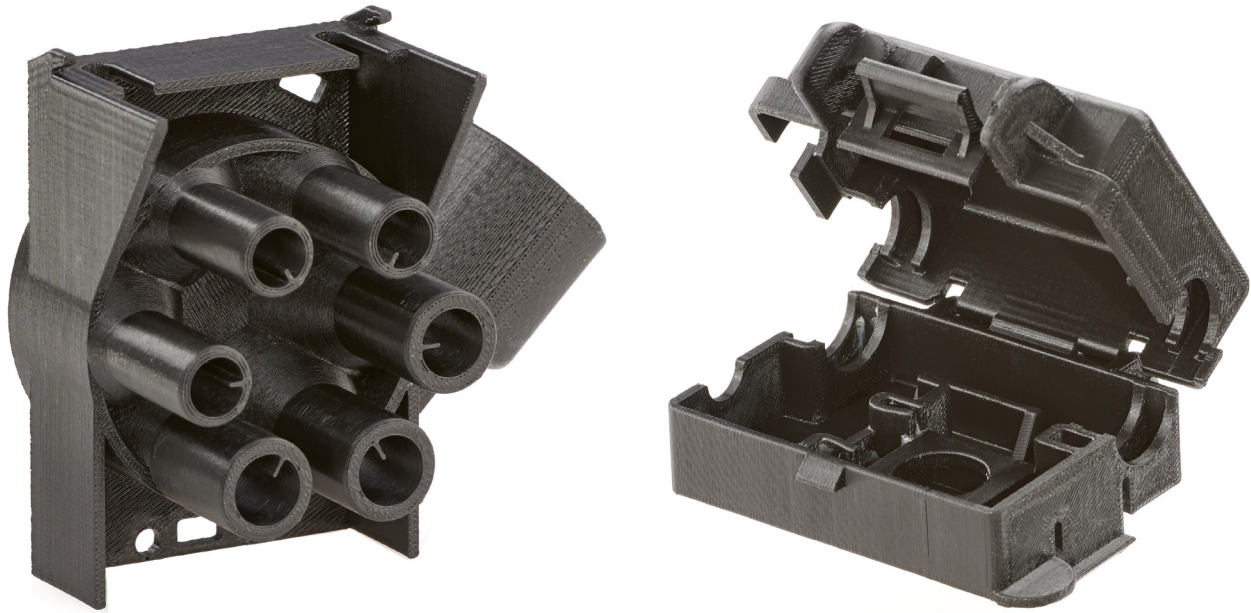


# FDM Nylon 12



## 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

FDM® Nylon 12 filament is the 3D printing equivalent of standard industrial PA12 (polyamide 12) material. A strong engineering thermoplastic, it exhibits toughness and high impact strength, without being brittle. Its excellent fatigue properties make it a good option for repetitive-flex applications such as snap-fit clips and closures and press-fit inserts.

Other applications include jigs, fixtures and low-volume production parts, as well as accurate prototyping of nylon 12 high-volume injection molded parts. FDM Nylon 12 is available in black.

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## Ordering Information

**Table 1. Printer and Support Material Compatibility**

| Printer             | Model Tip (Slice) | Support Material | Support Tip |
|---------------------|-------------------|------------------|-------------|
| Fortus 450mc™       | T12 (7 slice)     | SR-110 (soluble) | T12SR100    |
|                     | T16 (10 slice)    |                  |             |
|                     | T20 (13 slice)    |                  |             |
| Fortus 900mc™/F900™ | T12 (7 slice)     | SR-110 (soluble) | T12SR100    |
|                     | T16 (10 slice)    |                  |             |
|                     | T20 (13 slice)    |                  |             |

### Build Sheet

Nylon

- 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)

**Table 2. FDM Nylon 12 Ordering Information**

| Part Number                              | Description   |
|--|---|
| <b>Filament Canisters <sup>1 2</sup></b> |   |
| 355-02230                                | Nylon 12, 92.3 cu in. - Plus                          |
| 310-21800                                | Nylon 12, 92.3 cu in. - Classic                       |
| 355-03130                                | SR-110 soluble support, 92.3 cu in. - Plus            |
| 310-32200                                | SR-110 soluble support, 92.3 cu in. - Classic         |
| <b>Printer Consumables</b>               |   |
| 511-10301                                | T12 tip   |
| 511-10401                                | T16 tip   |
| 511-10701                                | T20 tip   |
| 511-10100                                | T12SR-100 tip   |
| 355-00750-S                              | Nylon build sheet, 0.02x16x18.5 in. (0.51x406x470 mm) |
| 310-00450-S                              | Nylon build sheet, 0.03x16x18.5 in. (0.76x406x470 mm) |
| 325-00650-S                              | Nylon build sheet, 0.02x26x38 in. (0.51x660x965 mm)   |
| 325-00750-S                              | Nylon build sheet, 0.02x14x16.5 in. (0.51x356x420mm)  |

<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 3. FDM Nylon 12 Physical Properties**

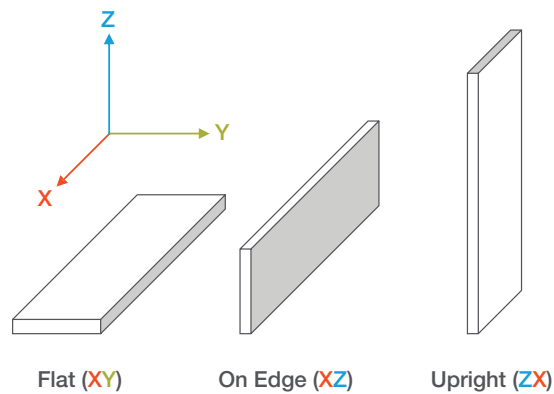
| Property            | Test Method                       | Typical Values                         |                                      |
|---------------------|-----------------------------------|--|--------------------------------------|
|                     |                                   | XY                                     | XZ/ZX                                |
| HDT @ 66 psi        | ASTM D648<br>Method B             | 94.7 C (202.5 F)                       | 91.9 C (197.5 F)                     |
| HDT @ 264 psi       | ASTM D648<br>Method B             | 84.3 C (183.8 F)                       | 75.3 C (167.5 F)                     |
| Tg                  | ASTM D7426<br>Inflection Point    | 34.03 C (92.25 F)                      |                                      |
| Mean CTE            | ASTM E831<br>(-50 °C to 10 °C)    | 84.35 µm/[m*°C]<br>46.86 µin/[in*°F]   | 85.56 µm/[m*°C]<br>47.53 µin/[in*°F] |
| Mean CTE            | ASTM E831<br>(10 °C to 45 °C)     | 89.12 µm/[m*°C]<br>49.51 µin/[in*°F]   | -                                    |
| Mean CTE            | ASTM E831<br>(45 °C to 70 °C)     | 98.23 µm/[m*°C]<br>55.83 µin/[in*°F]   | -                                    |
| Mean CTE            | ASTM E831<br>(70 °C to 95 °C)     | 60.08 µm/[m*°C]<br>(33.38 µin/[in*°F]) | -                                    |
| Mean CTE            | ASTM E831<br>(10C to 50C)         | -                                      | 97.08 µm/[m*°C]<br>53.93 µin/[in*°F] |
| Mean CTE            | ASTM E831<br>(50C to 70C)         | -                                      | 102.8 µm/[m*°C]<br>57.11 µin/[in*°F] |
| Volume Resistivity  | ASTM D257                         | > 6.87*10 <sup>13</sup> Ω*cm           |                                      |
| Dielectric Constant | ASTM D150<br>1 kHz test condition | 3.11                                   | 2.78                                 |
| Dielectric Constant | ASTM D150<br>2 MHz test condition | 2.48                                   | 2.52                                 |
| Dissipation Factor  | ASTM D150<br>1 kHz test condition | 0.066                                  | 0.009                                |
| Dissipation Factor  | ASTM D150<br>2 MHz test condition | 0.014                                  | 0.008                                |
| Specific Gravity    | ASTM D257<br>@23 °C               | 1.01                                   |                                      |

## Mechanical Properties

Nylon 12 samples were printed with a 0.010 in. (0.254 mm) layer height on the F900. For the full test procedure please see the [Stratasys Materials Test Procedure](#) (immediate download upon clicking the link).

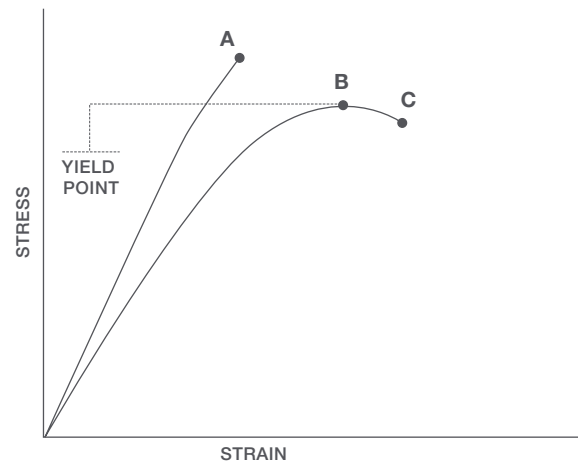
### Print Orientation

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 4. FDM Nylon 12 Mechanical Properties (F900 - T16 Tip)**

|  |           | XZ Orientation <sup>1</sup> | ZX Orientation <sup>1</sup> |
|--|-----------|-----------------------------|-----------------------------|
| <b>Tensile Properties: ASTM D638</b>               |           |                             |                             |
| Yield Strength                                     | MPa       | 49.3 (0.48)                 | 41.8 (0.67)                 |
|  | psi       | 7140 (70)                   | 6060 (97)                   |
| Elongation @ Yield                                 | %         | 6.1 (0.068)                 | 5.8 (0.16)                  |
| Strength @ Break                                   | MPa       | 33.4 (1.7)                  | 41.2 (0.72)                 |
|  | psi       | 4840 (240)                  | 5890 (100)                  |
| Elongation @ Break                                 | %         | 30 (23)                     | 6.5 (0.39)                  |
| Modulus (Elastic)                                  | GPa       | 1.51 (0.087)                | 1.25 (0.12)                 |
|  | ksi       | 218 (13)                    | 181 (18)                    |
| <b>Flexural Properties: ASTM D790, Procedure A</b> |           |                             |                             |
| Strength @ Break                                   | MPa       | No break                    | No break                    |
|  | psi       | No break                    | No break                    |
| Strength @ 5% Strain                               | MPa       | 56.5 (5.0)                  | 54.5 (4.7)                  |
|  | psi       | 8190 (720)                  | 7900 (690)                  |
| Strain @ Break                                     | %         | No break                    | No break                    |
| Modulus  | GPa       | 1.26 (0.13)                 | 1.20 (0.12)                 |
|  | ksi       | 182 (18)                    | 174 (17)                    |
| <b>Compression Properties: ASTM D695</b>           |           |                             |                             |
| Yield Strength                                     | MPa       | 327 (33)                    | 557 (48)                    |
|  | psi       | 47400 (4700)                | 80700 (7000)                |
| Modulus  | GPa       | 1.48 (0.069)                | 1.65 (0.091)                |
|  | ksi       | 215 (9.9)                   | 240 (13)                    |
| <b>Impact Properties: ASTM D256, ASTM D4812</b>    |           |                             |                             |
| Notched  | J/m       | 138 (22)                    | 71.0 (14)                   |
|  | ft*lb/in. | 2.58 (0.41)                 | 1.33 (0.27)                 |
| Unnotched  | J/m       | 1800 (240)                  | 322 (130)                   |
|  | ft*lb/in. | 33.8 (4.6)                  | 6.03 (2.4)                  |

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

# Appendix

Figure 1. 2nd heating scan DSC data for the Nylon 12 Flat (XY) sample.

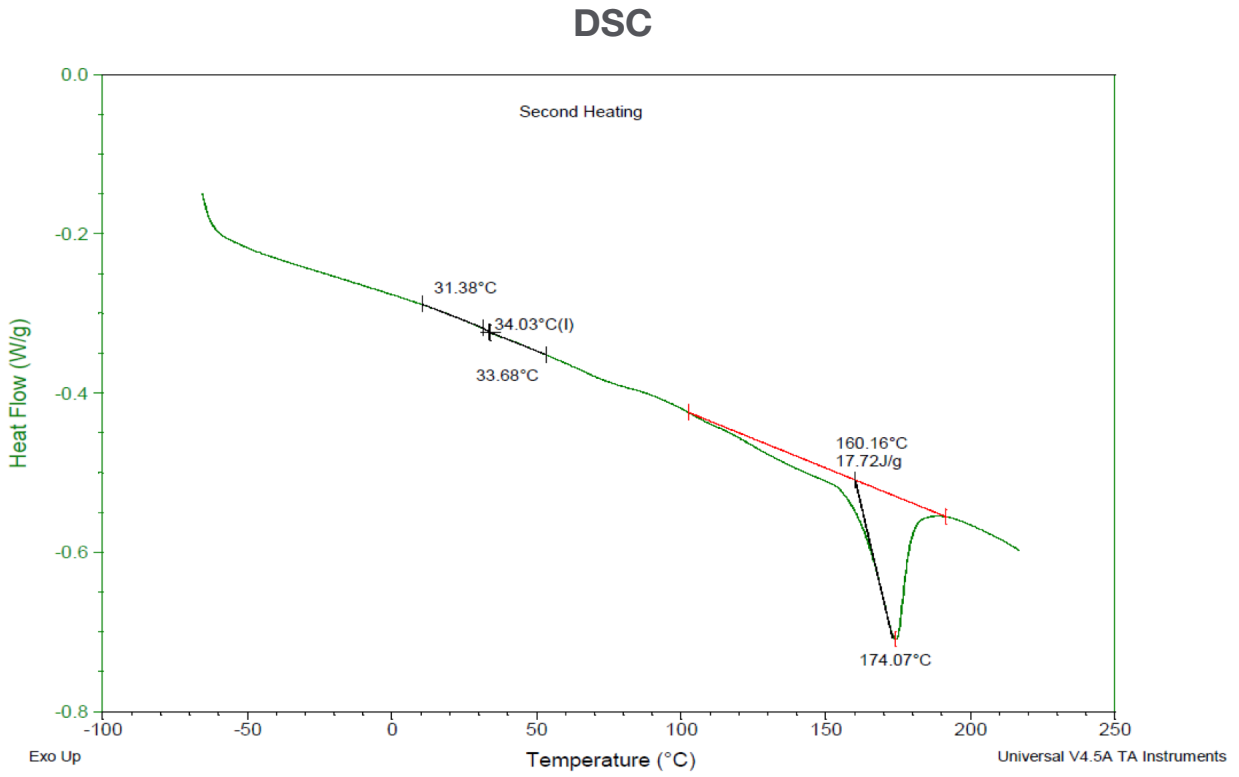


Figure 2. Dimension change data as a function of temperature for the Nylon 12 Flat (XY) sample.

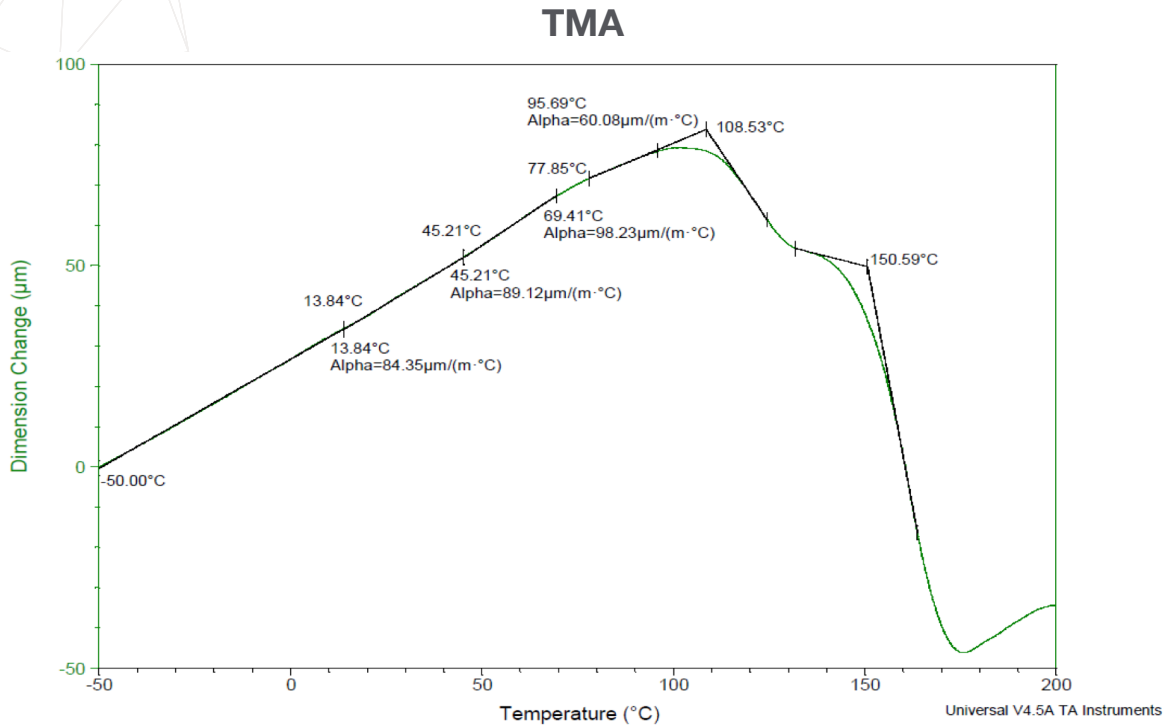


Figure 3. Dimension change data as a function of temperature for the Nylon 12 On Edge (XZ) sample.

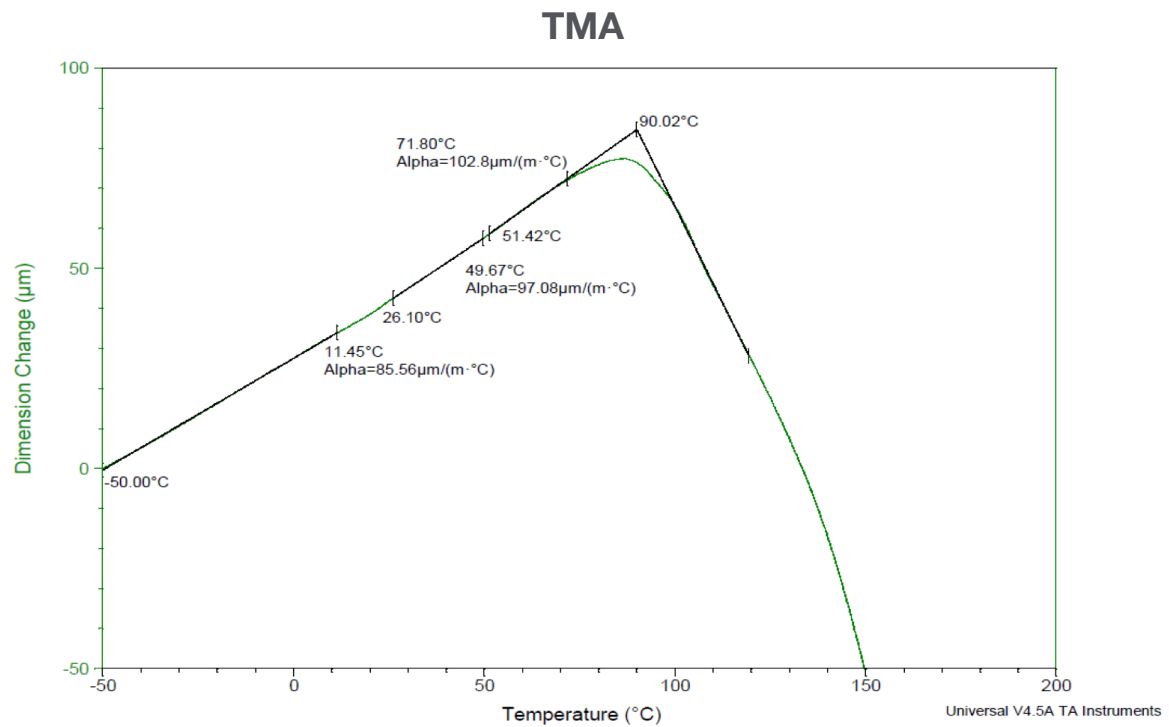
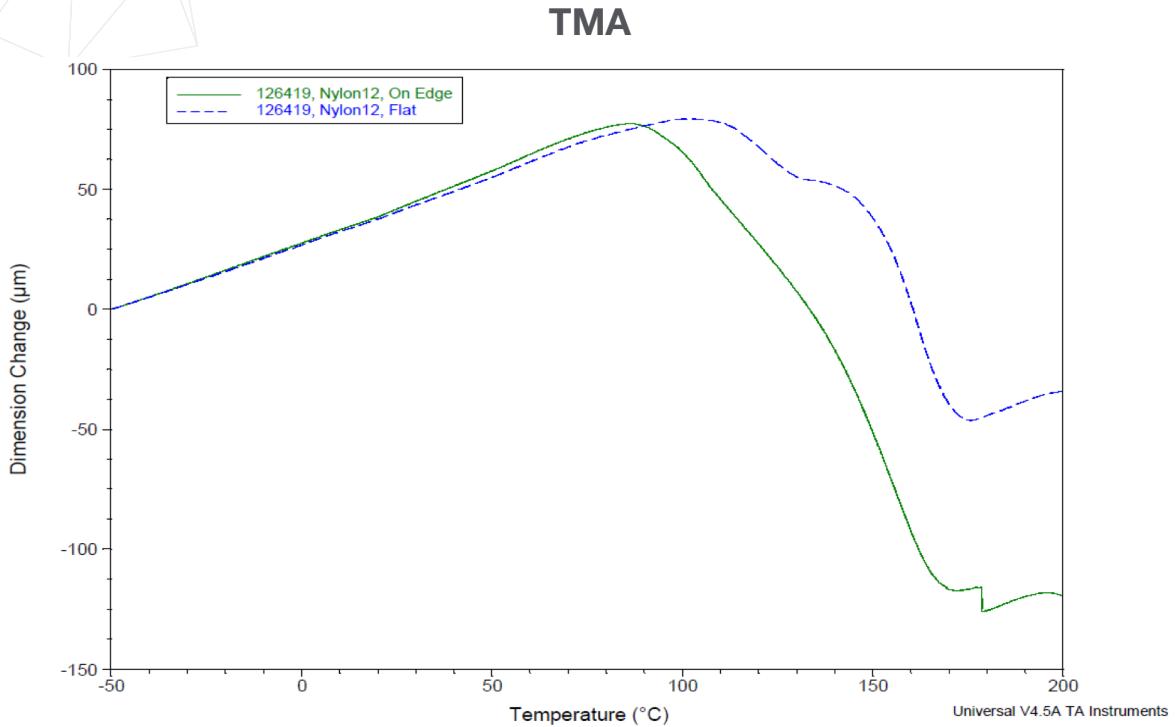




Figure 4. Overlay of the dimension change data for the Flat (XY) and On Edge (XZ) Nylon 12 samples.



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