



FDM Nylon-CF10

Carbon Fiber Filled 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-CF10 is a composite material combining a blended nylon polymer with 10% chopped carbon fiber (by weight), enhancing the material's strength and rigidity. The nylon base polymer also gives FDM Nylon-CF10 good chemical resistance.

Contents:

| | |
|----------------------------|---|
| Overview | 2 |
| Ordering Information | 3 |
| Physical Properties | 4 |
| Mechanical Properties..... | 5 |
| Chemical Resistance | 9 |





Ordering Information

Table 1: Printer and Support Material Compatibility

| Printer | Model Tip | Layer Height | Support Material | Support Tip |
|----------------|--------------------------------------|---|---|-----------------------|
| F190™CR | F123CR Hardened Extrusion Head | 0.178 mm (0.007 in.), 0.254 mm (0.010 in.), 0.330 mm (0.013 in.) | QSR Support™ (soluble support) SUP4000B™ (breakaway support) | F123 Standard Head |
| F370®CR | F123CR Hardened Extrusion Head | 0.178 mm (0.007 in.), 0.254 mm (0.010 in.), 0.330 mm (0.013 in.) | QSR Support (soluble support) SUP4000B (breakaway support) | F123 Standard Head |

Build Tray

- F190CR build tray
- F370CR build tray

System Requirements¹

F190CR

- F123CR Hardened Head for FDM Nylon-CF10 (white cover, T20H tip)

F370CR

- F123CR Hardened Head for FDM Nylon-CF10 (white cover, T20H tip)

¹Contact your Stratasys representative for ordering information.

Table 2: FDM Nylon-CF10 Ordering Information

| Part Number | Description |
|----------------------------|---|
| Filament Spools | |
| 333-90450 | FDM Nylon-CF10 90 cu. in. |
| 333-63500 | QSR Support 60 cu. in. |
| 333-60400 | SUP4000B 60 cu. in. |
| Printer Consumables | |
| 123-00602-S | F123CR Hardened Head for FDM Nylon-CF10 (white cover, T20H tip) |
| 123-00402-S | Standard Extrusion Head (Black Cover) |
| 123-00303-S | F190CR Build Tray, Standard |
| 123-00304 | F370CR Build Tray, Standard |



Physical Properties

Values are measured as printed. XY, XZ, and ZX orientations were tested. For full details refer to the [Stratasys Materials Test Report](#).

Table 3: FDM Nylon-CF10 Physical Properties

| Property | Test Method | Typical Values | |
|--|-----------------------------|-----------------|----------------|
| | | XY | XZ/ZX |
| HDT @ 66 psi | ASTM D648 Method B | 58 °C (136 °F) | 77 °C (171 °F) |
| HDT @ 264 psi | ASTM D648 Method B | 52 °C (126 °F) | 62 °C (144 °F) |
| Molded HDT @ 66 psi | ASTM D648 Method B | 109 °C (228 °F) | |
| Molded HDT @ 264 psi | ASTM D648 Method B | 105 °C (221 °F) | |
| Unidirectional Toolpaths HDT @ 66 psi | ASTM D648 Method B | 67 °C (153 °F) | - |
| Unidirectional Toolpaths HDT @ 264 psi | ASTM D648 Method B | 56 °C (133 °F) | - |
| Tg | ASTM D7426 Inflection Point | 109 °C (228 °F) | |
| CTE (XY) | ASTM E831 (RT to 60 °C) | 94 µm/[m*°C] | 79 µm/[m*°C] |
| CTE (Z) | ASTM E831 (RT to 60 °C) | 180 µm/[m*°C] | 148 µm/[m*°C] |
| Volume Resistivity | ASTM D257 | 1.88E+15 Ω*cm | 4.25E+13 Ω*cm |
| Specific Gravity | ASTM D792 @23 °C | 1.1411 | |

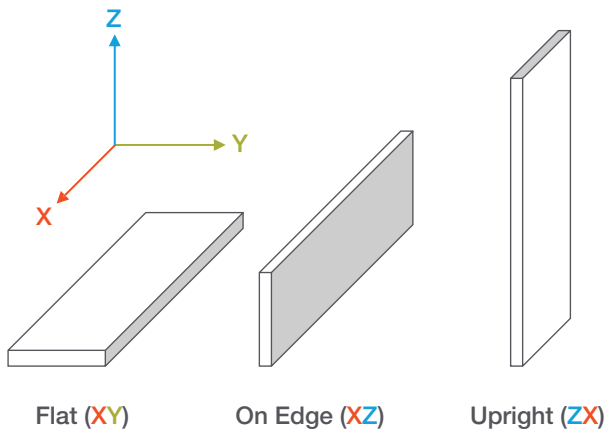


Mechanical Properties

FDM Nylon-CF10 samples were printed with a 0.254 mm (0.010 in.) layer height. For full test procedure please see the [Stratasys Materials Test Procedure](#).

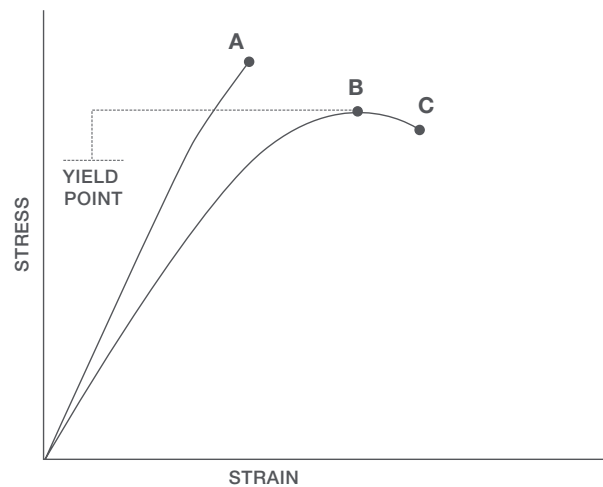
Print Orientation

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-CF10 Mechanical Properties with QSR Support

| 0.254 mm (0.010 in.) Layer Height | | XZ Orientation ¹ | ZX Orientation ¹ |
|--|----------|-----------------------------|-----------------------------|
| Tensile Properties: ASTM D638 | | | |
| Yield Strength | MPa | 69.1 (3.74) | 25.4 (3.61) |
| | psi | 10034 (543) | 3684 (524) |
| Elongation @ Yield | % | 4.44 (0.61) | 2.52 (0.60) |
| Strength @ Break | MPa | 67.6 (4.12) | 24.7 (3.81) |
| | psi | 9809 (598) | 3576 (552) |
| Elongation @ Break | % | 4.74 (0.73) | 2.41 (0.62) |
| Modulus (Elastic) | GPa | 4.15 (0.12) | 1.57 (0.071) |
| | ksi | 602 (16.7) | 228 (10.3) |
| Flexural Properties: ASTM D790, Procedure A | | | |
| Strength @ Break | MPa | 123.7 (2.74) | 39.7 (3.49) |
| | psi | 17940 (398) | 5751 (506) |
| Strain @ Break | % | 4.61 (0.24) | 3.16 (0.44) |
| Modulus | GPa | 5.37 (0.17) | 1.54 (0.101) |
| | ksi | 779 (24.7) | 223 (14.7) |
| Compression Properties: ASTM D695 | | | |
| Yield Strength | MPa | No Yield | No Yield |
| | psi | No Yield | No Yield |
| Peak Strength | MPa | 76.1 (40.0) | 124.2 (12.15) |
| | psi | 11034 (5801) | 18016 (1762) |
| Modulus | GPa | 2.13 (0.041) | 1.57 (0.045) |
| | ksi | 309 (5.9) | 228 (6.5) |
| Impact Properties: ASTM D256, ASTM D4812 | | | |
| Notched | J/m | 202.7 (8.6) | 36.4 (13.4) |
| | ft*lb/in | 3.79 (0.16) | 0.68 (0.25) |
| Unnotched | J/m | 1030.5 (74.3) | 117.11 (17.1) |
| | ft*lb/in | 19.27 (1.39) | 2.19 (0.32) |

¹ Values in parenthesis are standard deviations.


Table 5: FDM Nylon-CF10 Mechanical Properties with SUP4000B Support

| 0.254 mm (0.010 in.) Layer Height | | XZ Orientation ¹ | ZX Orientation ¹ |
|--|----------|-----------------------------|-----------------------------|
| Tensile Properties: ASTM D638 | | | |
| Yield Strength | MPa | 75.2 (2.0) | 35.8 (1.1) |
| | psi | 10900 (280) | 5190 (160) |
| Elongation @ Yield | % | 5.0 (0.29) | 3.7 (0.33) |
| Strength @ Break | MPa | 74.3 (2.1) | 35.7 (1.1) |
| | psi | 10800 (300) | 5170 (160) |
| Elongation @ Break | % | 5.4 (0.59) | 3.7 (0.33) |
| Modulus (Elastic) | GPa | 4.20 (0.086) | 1.73 (0.031) |
| | ksi | 609 (12) | 251 (4.4) |
| Flexural Properties: ASTM D790, Procedure A | | | |
| Strength @ Break | MPa | 132 (2.1) | 57.7 (1.7) |
| | psi | 19100 (310) | 8370 (250) |
| Strain @ Break | % | 4.7 (0.16) | 4.6 (0.20) |
| Modulus | GPa | 5.24 (0.084) | 1.67 (0.039) |
| | ksi | 760. (120) | 243 (5.6) |
| Compression Properties: ASTM D695 | | | |
| Peak Strength | MPa | 80.6 (2.7) | 139 (1.7) |
| | psi | 11700 (390) | 20100 (250) |
| Modulus | GPa | 1.85 (0.036) | 1.43 (0.034) |
| | ksi | 268 (5.2) | 208 (4.9) |
| Impact Properties: ASTM D256, ASTM D4812 | | | |
| Notched | J/m | 187 (7.2) | 41.2 (6.3) |
| | ft*lb/in | 3.50 (0.13) | 0.772 (0.12) |
| Unnotched | J/m | 1030 (73) | 145 (15) |
| | ft*lb/in | 19.4 (1.4) | 2.71 (0.28) |

Values in parenthesis are standard deviation.



Nylon-CF10 was tested using unidirectional toolpaths to showcase the increased mechanical properties this method of printing yields compared to the standard 45°/-45° toolpaths.

For further details read the [Unidirectional Material Testing May Mislead Manufacturing White Paper](#)

Table 6: FDM Nylon-CF10 Mechanical Properties with Unidirectional Toolpaths and QSR Support

| 0.254 mm (0.010 in.) Layer Height | | XY Orientation ¹ |
|--|----------|-----------------------------|
| Tensile Properties: ASTM D638 | | |
| Yield Strength | MPa | 68.1 (1.1) |
| | psi | 9880 (160) |
| Elongation @ Yield | % | 4.8 (0.48) |
| Strength @ Break | MPa | 64.4 (0.73) |
| | psi | 9330 (110) |
| Elongation @ Break | % | 5.1 (0.91) |
| Modulus (Elastic) | GPa | 6.03 (0.15) |
| | ksi | 875 (22) |
| Flexural Properties: ASTM D790, Procedure B | | |
| Strength @ Break | MPa | 138 (0.034) |
| | psi | 20000 (720) |
| Strain @ Break | % | 3.4 (0.25) |
| Modulus | GPa | 6.96 (0.16) |
| | ksi | 1010 (24) |
| Impact Properties: ASTM D256 | | |
| Notched | J/m | 272 (7.5) |
| | ft*lb/in | 5.1 (0.14) |

¹Values in parenthesis are standard deviation.





Chemical Resistance

Nylon-CF10 coupons were built on the F370CR with 0.254 mm (0.010 in.) layer height and QSR support material. The coupons were tested for resistance to chemical exposure by soaking in reagents for 72 hours. Afterwards the coupons were tensile tested following ASTM D638. Chemicals tested and percent change from control is listed below.

Table 6: Change in Mechanical Properties - 72 hour Chemical Exposure

| | Reagent | XZ | ZX |
|----------------------|----------------------|------|------|
| Tensile Strength | 30% Nitric Acid | -32% | -43% |
| | 30% Sulfuric Acid | -24% | -23% |
| | 40% Sodium Hydroxide | -1% | -5% |
| | Concentrated Ammonia | -33% | -34% |
| % Elongation @ break | 30% Nitric Acid | 132% | -33% |
| | 30% Sulfuric Acid | 59% | -9% |
| | 40% Sodium Hydroxide | -9% | -20% |
| | Concentrated Ammonia | 90% | -1% |
| Tensile Modulus | 30% Nitric Acid | -21% | 6% |
| | 30% Sulfuric Acid | 3% | 13% |
| | 40% Sodium Hydroxide | 17% | 38% |
| | Concentrated Ammonia | 2% | -12% |



stratasys.com
ISO 9001:2015
Certified

Stratasys Headquarters
7665 Commerce Way,
Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

1 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)

MATERIAL DATA SHEET FDM

© 2024 Stratasys. All rights reserved. Stratasys, the Stratasys Signet logo, FDM and F370CR are registered trademarks of Stratasys Inc. F190CR, QSR Support, and SUP4000B are trademarks of Stratasys, Inc. All other trademarks are the property of their respective owners, and Stratasys assumes no responsibility with regard to the selection, performance, or use of these non-Stratasys products. Product specifications subject to change without notice. MDS_FDM_Nylon-CF10_0724a