

# FDM<sup>®</sup> Nylon 12

Production-Grade Thermoplastic for Fortus 3D Production Systems



FDM<sup>®</sup> Nylon 12 is the first material in Stratasys' new family of nylon offerings, complementing the current portfolio of FDM materials and enabling new applications requiring: repetitive snap fits, high fatigue resistance, strong chemical resistance and press (friction) fit inserts. Nylon 12 is primarily used in aerospace, automotive and consumer goods industries to take on everything from tooling, jigs and fixtures to covers, panels and vibration resistant components. For use with Fortus<sup>®</sup> 360mc<sup>™</sup>, 380mc<sup>™</sup>, 400mc<sup>™</sup>, 450mc<sup>™</sup> and 900mc<sup>™</sup> 3D Production Systems, FDM Nylon 12 offers unparalleled toughness and a simple, clean process – free of powders.

## CONDITIONED\*

| Mechanical Properties <sup>1</sup>                    | Test Method | English      |              | Metric    |           |
|---|-------------|--------------|--------------|-----------|-----------|
|   |             | XZ Axis      | ZX Axis      | XZ Axis   | ZX Axis   |
| Tensile Strength, Yield (Type 1, 0.125", 0.2"/min)    | ASTM D638   | 4,600 psi    | 4,100 psi    | 32 MPa    | 28 MPa    |
| Tensile Strength, Ultimate (Type 1, 0.125", 0.2"/min) | ASTM D638   | 6,650 psi    | 5,600 psi    | 46 MPa    | 38.5 MPa  |
| Tensile Modulus (Type 1, 0.125", 0.2"/min)            | ASTM D638   | 186,000 psi  | 165,000 psi  | 1,282 MPa | 1,138 MPa |
| Elongation at Break (Type 1, 0.125", 0.2"/min)        | ASTM D638   | 30%          | 5.4%         | 30%       | 5.4%      |
| Elongation at Yield (Type 1, 0.125", 0.2"/min)        | ASTM D638   | 2.4%         | 2.7%         | 2.4%      | 2.7%      |
| Flexural Strength (Method 1, 0.05"/min)               | ASTM D790   | 9,700 psi    | 8,800 psi    | 67 MPa    | 61 MPa    |
| Flexural Modulus (Method 1, 0.05"/min)                | ASTM D790   | 185,000 psi  | 171,000 psi  | 1,276 MPa | 1,180 MPa |
| Flexural Strain at Break                              | ASTM D790   | No Break     | >10%         | No Break  | >10%      |
| IZOD impact - notched (Method A, 23°C)                | ASTM D256   | 2.5 ft-lb/in | 1 ft-lb/in   | 135 J/m   | 53 J/m    |
| IZOD impact - unnotched (Method A, 23°C)              | ASTM D256   | 31 ft-lb/in  | 3.7 ft-lb/in | 1,656 J/m | 200 J/m   |
| Compressive Strength, Yield (Method 1, 0.05"/min)     | ASTM D695   | 7,400 psi    | 7,900 psi    | 51 MPa    | 55 MPa    |
| Compressive Strength, Ultimate (Method 1, 0.05"/min)  | ASTM D695   | 24,200 psi   | 800 psi      | 167 MPa   | 6 MPa     |
| Compressive Modulus (Method 1, 0.05"/min)             | ASTM D695   | 730,000 psi  | 155,000 psi  | 5,033 MPa | 1,069 MPa |

## UNCONDITIONED (DRY)\*\*

| Mechanical Properties                              | Test Method | English        |              | Metric     |           |
|--|-------------|----------------|--------------|------------|-----------|
|  |             | XZ Axis        | ZX Axis      | XZ Axis    | ZX Axis   |
| Tensile Strength, Yield (Type 1, 0.125", 0.2"/min) | ASTM D638   | 7,700 psi      | 6,900 psi    | 53 MPa     | 48 MPa    |
| Tensile Modulus (Type 1, 0.125", 0.2"/min)         | ASTM D638   | 190,000 psi    | 180,000 psi  | 1,310 MPa  | 1,241 MPa |
| Elongation at Break (Type 1, 0.125", 0.2"/min)     | ASTM D638   | 9.5%           | 5%           | 9.5%       | 5%        |
| Elongation at Yield (Type 1, 0.125", 0.2"/min)     | ASTM D638   | 6.5%           | 5%           | 6.5%       | 5%        |
| Flexural Strength (Method 1, 0.05"/min)            | ASTM D790   | 10,000 psi     | 8,600 psi    | 0 MPa      | 0 MPa     |
| Flexural Modulus (Method 1, 0.05"/min)             | ASTM D790   | 190,000 psi    | 180,000 psi  | 0 MPa      | 0 MPa     |
| Flexural Strain at Break                           | ASTM D790   | No Break       | >10%         | No Break   | >10%      |
| IZOD impact - notched (Method A, 23°C)             | ASTM D256   | 2.8 ft-lb/in   | 0.9 ft-lb/in | 150 J/m    | 50 J/m    |
| IZOD impact - unnotched (Method A, 23°C)           | ASTM D256   | >37.4 ft-lb/in | 5.1 ft-lb/in | >2,000 J/m | 275 J/m   |

# FDM Nylon 12



| Thermal Properties <sup>1</sup>            | Test Method | English | Metric |
|--|-------------|---------|--------|
| Heat Deflection (HDT) @ 66 psi annealed    | ASTM D648   | 207°F   | 97°C   |
| Heat Deflection (HDT) @ 66 psi unannealed  | ASTM D649   | 167°F   | 75°C   |
| Heat Deflection (HDT) @ 264 psi annealed   | ASTM D650   | 180°F   | 82°C   |
| Heat Deflection (HDT) @ 264 psi unannealed | ASTM D651   | 131°F   | 55°C   |
| Melting Point                              | -----       | 352°F   | 178°C  |

| Other                | Test Method | Value   |
|----------------------|-------------|---------|
| Specific Gravity     | ASTM D792   | 1.00    |
| Flame Classification | UL94        | HB      |
| UL File Number       | -----       | E345258 |

| System Availability  | Layer Thickness Capability  | Support Material | Color   |
|--|---|------------------|---------|
| Fortus 360mc<br>Fortus 380mc<br>Fortus 400mc<br>Fortus 450mc<br>Fortus 900mc | 0.013 inch (0.330 mm)<br>0.010 inch (0.254 mm)<br>0.007 inch (0.178 mm) | SR-110           | ■ Black |

\*Conditioned = 20°C and 50% RH for 72 hours  
 \*\*Unconditioned (Dry) = Direct from FDM system  
 — Annealed = 2 hours @ 140°C  
 — Unannealed = direct from FDM system

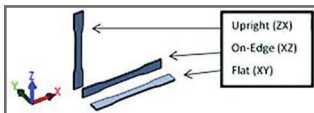
The information presented are typical values intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes. End-use material performance can be impacted (+/-) by, but not limited to, part design, end-use conditions, test conditions, etc. Actual values will vary with build conditions. Tested parts were built on Fortus 400mc @ 0.010" (0.254 mm) slice. Product specifications are subject to change without notice.

The performance characteristics of these materials may vary according to application, operating conditions, or end use. Each user is responsible for determining that the Stratasys material is safe, lawful, and technically suitable for the intended application, as well as for identifying the proper disposal (or recycling) method consistent with applicable environmental laws and regulations. Stratasys makes no warranties of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular use, or warranty against patent infringement.

<sup>1</sup>Literature value unless otherwise noted.

Orientation: See Stratasys Testing white paper for more detailed description of build orientations.

- XZ = X or "on edge"
- XY = Y or "flat"
- ZX = or "upright"



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## At the core: Advanced FDM Technology

Fortus 3D Production Systems are powered by FDM (fused deposition modeling) technology. FDM is the industry's leading additive manufacturing technology, and the only one that uses production-grade thermoplastics, enabling the most durable parts. Fortus systems use a wide range of thermoplastics with advanced mechanical properties so your parts can endure high heat, caustic chemicals, sterilization and high-impact applications.

## No special facilities needed

You can install a Fortus 3D Production System just about anywhere. No special venting is required because Fortus systems don't produce noxious fumes, chemicals or waste.

## No special skills needed

Fortus 3D Production Systems are easy to operate and maintain compared to other additive fabrication systems because there are no messy powders to handle and contain. They're so simple, an operator can be trained to operate a Fortus system in less than 30 minutes.

## Get your benchmark on the future of manufacturing

Fine details. Smooth surface finishes. Accuracy. Strength. The best way to see the advantages of a Fortus 3D Production System is to have your own part built on a Fortus system. Get your free part at:

[stratasys.com](http://stratasys.com).