

# Nylon 12 Tough

A highly ductile and dimensionally accurate nylon powder.

**Nylon 12 Tough Powder offers the best-in-class refresh rate among Nylon powders, high ductility, and great dimensional accuracy across the build chamber. Print more durable parts for prototyping and small batch production that have reduced warpage without sacrificing strength.**

For best results, Nylon 12 Tough Powder is required to undergo a powder aging process prior to first build. Nylon 12 Tough Powder is specifically developed for use on the Fuse 1+ 30W printer.



Material properties testing was completed with parts printed using aged powder on a bed temperature tuned printer. Scan the QR Codes to learn more about Powder Aging and Bed Temperature Tuning.

Powder  
Aging



Temperature  
Tuning



FLP12T01

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To the best of our knowledge the information contained herein is accurate. However, Formlabs, Inc. makes no warranty, expressed or implied, regarding the accuracy of these results to be obtained from the use thereof.

| Mechanical Properties            | METRIC   | IMPERIAL     | METHOD              |
|----------------------------------|----------|--------------|---------------------|
| Ultimate Tensile Strength        | 42 MPa   | 6200 psi     | ASTM D638-14 Type 1 |
| Tensile Modulus                  | 1450 MPa | 215 ksi      | ASTM D638-14 Type 1 |
| Elongation at Break (X/Y)        | 25%      | 25%          | ASTM D638-14 Type 1 |
| Elongation at Break (Z)          | 15%      | 15%          | ASTM D638-14 Type 1 |
| Flexural Strength                | 42 MPa   | 6200 psi     | ASTM D790-17        |
| Flexural Modulus                 | 1100 MPa | 165 ksi      | ASTM D790-17        |
| Notched Izod                     | 60 J/m   | 1.1 ft-lb/in | ASTM D256-10        |
| Thermal Properties               | METRIC   | IMPERIAL     | METHOD              |
| Heat Deflection Temp. @ 1.8 MPa  | 46 °C    | 116 °F       | ASTM D648-16        |
| Heat Deflection Temp. @ 0.45 MPa | 161 °C   | 321 °F       | ASTM D648-16        |
| Vicat Softening Temperature      | 170 °C   | 337 °F       | ASTM D1525          |
| Other Properties                 | METRIC   | IMPERIAL     | METHOD              |
| Water Absorption (printed part)  | 0.30%    | 0.30%        | ASTM D570           |

Samples printed with Nylon 12 Tough have been evaluated in accordance with ISO 10993-1:2018, and has passed the requirements for the following biocompatibility risks:

| ISO Standard      | Description <sup>3,4</sup> |
|-------------------|----------------------------|
| ISO 10993-11:2017 | No systemic toxicity       |
| ISO 10993-5:2009  | Not cytotoxic              |
| ISO 10993-23:2021 | Not an irritant            |
| ISO 10993-10:2021 | Not a sensitizer           |
| ISO 10993-11:2017 | Nonpyrogenic               |

#### Flammability Properties

| Testing Standard | Rating |
|------------------|--------|
| UL 94 Section 7  | HB *   |

\* Thickness of the sample tested = 3.00mm

#### Solvent Compatibility

Percent weight gain over 24 hours for a printed 1 x 1 x 1 cm cube immersed in respective solvent:

| Solvent                         | 24 hr weight gain, % | Solvent                                    | 24 hr weight gain, % |
|---------------------------------|----------------------|--|----------------------|
| Acetic Acid 5%                  | 0.2                  | Mineral oil, heavy                         | 1.0                  |
| Acetone                         | 0.2                  | Mineral oil, light                         | 0.8                  |
| Bleach ~5% NaOCl                | 0.1                  | Salt Water (3.5% NaCl)                     | 0.2                  |
| Butyl Acetate                   | 0.1                  | Skydrol 5                                  | 0.8                  |
| Diesel Fuel                     | 0.6                  | Sodium hydroxide solution (0.025% pH = 10) | 0.1                  |
| Diethyl glycol monomethyl ether | 0.5                  | Strong Acid (HCl Conc)                     | 5.6                  |
| Hydraulic Oil                   | 0.9                  | TPM  | 0.8                  |
| Hydrogen peroxide (3%)          | 0.1                  | Water                                      | 0.1                  |
| Isooctane                       | 0.1                  | Xylene                                     | 0.2                  |
| Isopropyl Alcohol               | 0.3                  |  |                      |

<sup>1</sup> Material properties may vary with part geometry, print orientation and temperature.

<sup>2</sup> Parts were printed using Fuse 1+ 30W with Nylon 12 Tough Powder. Parts were conditioned at 23 °C, 50% R.H. for 48 hours.

<sup>3</sup> Material properties may vary based on part design and manufacturing practices. It is the manufacturer's responsibility to validate the suitability of the printed parts for the intended use.

<sup>4</sup> Nylon 12 Tough was tested at NAMSA World Headquarters, OH, USA.

# Outdoor Aging ASTM D4329

Nylon 12 Tough samples were aged by Applied Technical Services (ATS), a certified independent laboratory, using ASTM D4329-21, Cycle A. This standard outlines procedures for accelerated weathering of plastics using a Xenon arc light source, which simulates the full spectrum of sunlight (UV, visible, and infrared) and includes moisture cycles via water spray. The aged samples were then tested at Formlabs by a calibrated automatic tensile tester, as well as measured and analyzed with a spectrophotometer for color changes.

Read more about the results in the [whitepaper](#).

