

# Nylon 12 Powder

## SLS MATERIAL FOR STRONG FUNCTIONAL PROTOTYPES AND END USE PARTS

Nylon 12 Powder combines high tensile strength, ductility, and environmental stability with low moisture absorption. Lucent Additive uses the material for complex assemblies, durable prototypes, and production parts manufactured on the Formlabs Fuse platform.

### Why Nylon 12

- Balanced strength and toughness for load-bearing polymer components
- Freedom to consolidate complex assemblies and produce internal channels without support structures
- Low printed-part water absorption for dimensional and environmental stability
- Suitable for prototypes, bridge production, fixtures, housings, and end-use components

### Mechanical and Thermal Properties

| PROPERTY                      | METRIC    | IMPERIAL      | METHOD             |
|-------------------------------|-----------|---------------|--------------------|
| Ultimate tensile strength     | 50 MPa    | 7,252 psi     | ASTM D638 Type I   |
| Tensile modulus               | 1,850 MPa | 268 ksi       | ASTM D638 Type I   |
| Elongation at break X Y       | 11%       | 11%           | ASTM D638 Type I   |
| Elongation at break Z         | 6%        | 6%            | ASTM D638 Type I   |
| Flexural strength             | 66 MPa    | 9,572 psi     | ASTM D790-15       |
| Flexural modulus              | 1,600 MPa | 232 ksi       | ASTM D790-15       |
| Notched Izod impact           | 32 J/m    | 0.60 ft-lb/in | ASTM D256-10       |
| Heat deflection at 1.8 MPa    | 87 C      | 189 F         | ASTM D648          |
| Heat deflection at 0.45 MPa   | 171 C     | 340 F         | ASTM D648          |
| Vicat softening temperature   | 175 C     | 347 F         | ASTM D1525         |
| Powder moisture content       | 0.25%     | 0.25%         | ISO 15512 Method D |
| Printed-part water absorption | 0.66%     | 0.66%         | ASTM D570          |

Representative material values. Actual performance can vary with part geometry, orientation, build conditions, post-processing, and service environment.

## Biocompatibility Screening

Samples printed with Nylon 12 Powder were evaluated in accordance with ISO 10993-1:2018. The source testing reported the following outcomes. These results do not establish that a finished device or application is biocompatible; the manufacturer remains responsible for application-specific validation.

| STANDARD                | ASSESSMENT                     | REPORTED RESULT                  |
|-------------------------|--------------------------------|----------------------------------|
| ISO 10993-5:2009        | Cytotoxicity                   | Not cytotoxic                    |
| ISO 10993-10:2010 R2014 | Irritation                     | Not an irritant                  |
| ISO 10993-10:2010 R2014 | Sensitization                  | Not a sensitizer                 |
| ISO 10993-11:2017       | Material-mediated pyrogenicity | Non-pyrogenic                    |
| ISO 10993-11:2017       | Acute systemic toxicity        | No evidence of systemic toxicity |

## Flammability

| TEST STANDARD   | RATING | TESTED THICKNESS |
|-----------------|--------|------------------|
| UL 94 Section 7 | HB     | 3.00 mm          |

## Solvent Compatibility

Percent weight gain after a printed 1 x 1 x 1 cm cube was immersed for 24 hours.

| SOLVENT                            | GAIN % | SOLVENT                              | GAIN % |
|------------------------------------|--------|--------------------------------------|--------|
| Acetic acid 5%                     | 0.1    | Mineral oil heavy                    | 0.7    |
| Acetone                            | 0.1    | Mineral oil light                    | 0.5    |
| Bleach approximately 5% NaOCl      | 0.2    | Salt water 3.5% NaCl                 | 0.2    |
| Butyl acetate                      | 0.2    | Skydrol 5                            | 0.6    |
| Diesel fuel                        | 0.4    | Sodium hydroxide solution pH 10      | 0.2    |
| Diethylene glycol monomethyl ether | 0.5    | Strong acid concentrated HCl         | 0.8    |
| Hydraulic oil                      | 0.6    | Tripropylene glycol monomethyl ether | 0.3    |
| Hydrogen peroxide 3%               | 0.2    | Water                                | 0.1    |
| Isooctane gasoline surrogate       | <0.1   | Xylene                               | 0.1    |
| Isopropyl alcohol                  | 0.2    |                                      |        |

## Environmental Aging

Nylon 12 specimens were subjected to accelerated outdoor aging by Applied Technical Services using ASTM D4329-21 Cycle A. The xenon-arc exposure simulates the sunlight spectrum and includes moisture cycles through water spray. Formlabs subsequently measured tensile properties and color change. The source report presents results through 1,000 hours of exposure; consult the Formlabs outdoor-aging white paper when detailed time-series values are required.

## Best Fit Applications

| USE CASE              | TYPICAL EXAMPLES                                                                                  |
|-----------------------|---------------------------------------------------------------------------------------------------|
| Production components | Housings, covers, brackets, clips, ducts, and mechanically loaded components                      |
| Functional prototypes | Fit, assembly, handling, environmental, and limited performance evaluation                        |
| Manufacturing aids    | Jigs, fixtures, inspection aids, protective components, and ergonomic tooling                     |
| Complex assemblies    | Part consolidation, internal passages, lattices, and geometry that benefits from support-free SLS |

## Design and Validation Considerations

- Orient parts and place critical features with the expected anisotropy in mind; the published elongation is 11% in X/Y and 6% in Z.
- Specify critical dimensions, mating interfaces, surface requirements, and inspection criteria during application review.
- Evaluate chemical exposure using the published screening values as a starting point, then test the actual service concentration, temperature, duration, and stress state.
- For regulated, safety-critical, or medical applications, validate the final printed and post-processed part in the intended use condition.

## Data Provenance

The numerical values and test outcomes in this sheet are reproduced from Formlabs document 2001447 TDS ENUS 0 for Nylon 12 Powder. Source specimens were printed on a Formlabs Fuse 1 and conditioned at 50% relative humidity and 23 C for seven days before testing, unless otherwise indicated. Nylon 12 biocompatibility testing was performed at NAMSA World Headquarters in Ohio. Formlabs states that material properties may vary with geometry, print orientation, temperature, part design, and manufacturing practices.

Lucent Additive provides manufacturing expertise and application support; this document does not create a material warranty or replace qualification of the customer's finished component.

## Start an Application Review

Send Lucent Additive your CAD model, quantity, performance requirements, inspection needs, and target schedule. Our team can review material fit, design considerations, production strategy, and validation needs before quoting.

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