

# TPU 90A Powder

## TOUGH SLS ELASTOMER FOR RESILIENT SKIN CONTACT PRODUCTS

TPU 90A Powder combines high elongation, tear resistance, and 90A Shore hardness for flexible prototypes and durable end-use parts.

### Why TPU 90A

- Flexible 90A elastomer for resilient parts that bend, compress, cushion, or grip
- High X/Y elongation and strong tear resistance for demanding functional applications
- Support-free SLS processing enables complex flexible geometry and production nesting
- Biocompatibility screening supports evaluation for selected skin-contact applications

### Material Properties

| PROPERTY                      | METRIC                 | IMPERIAL                | METHOD                |
|-------------------------------|------------------------|-------------------------|-----------------------|
| Ultimate tensile strength X Y | 8.7 MPa                | 1,260 psi               | ASTM D412-16 Method A |
| Ultimate tensile strength Z   | 7.2 MPa                | 1,050 psi               | ASTM D412-16 Method A |
| Elongation at break X Y       | 310%                   | 310%                    | ASTM D412-16 Method A |
| Elongation at break Z         | 110%                   | 110%                    | ASTM D412-16 Method A |
| Stress at 50% elongation X Y  | 6.1 MPa                | 889 psi                 | ASTM D412-16 Method A |
| Stress at 50% elongation Z    | 5.9 MPa                | 860 psi                 | ASTM D412-16 Method A |
| Stress at 100% elongation X Y | 7.2 MPa                | 1,050 psi               | ASTM D412-16 Method A |
| Stress at 100% elongation Z   | 7.0 MPa                | 1,020 psi               | ASTM D412-16 Method A |
| Tear resistance X Y           | 66 kN/m                | 378 lb/in               | ASTM D624-00 2020     |
| Tear resistance Z             | 39 kN/m                | 247 lb/in               | ASTM D624-00 2020     |
| Compression set at 23 C       | 20.5%                  | 20.5%                   | ASTM D395-18 Method B |
| Compression set at 70 C       | 59.9%                  | 59.9%                   | ASTM D395-18 Method B |
| Shore hardness                | 90A                    | 90A                     | ASTM D2240-15 2021    |
| Taber abrasion                | 122 mm <sup>3</sup>    | 0.007 in <sup>3</sup>   | ISO 4649 40 rpm 10 N  |
| Vicat softening temperature   | 94.3 C                 | 201.7 F                 | ASTM D1525            |
| Powder moisture content       | 0.19%                  | 0.19%                   | ISO 15512 Method D    |
| Printed-part water absorption | 0.89%                  | 0.89%                   | ASTM D570             |
| Sintered bulk density         | 1.14 g/cm <sup>3</sup> | 71.2 lb/ft <sup>3</sup> | In-house method       |

Representative material values. Actual performance can vary with geometry, orientation, temperature, processing, and service conditions.

## Biocompatibility Screening

Samples printed with TPU 90A 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  | Non-cytotoxic   |
| ISO 10993-23:2021 | Irritation    | Non-irritant    |
| ISO 10993-10:2021 | Sensitization | Non-sensitizer  |

## Solvent Compatibility

Percent weight gain after a printed 1 x 1 x 1 cm cube was immersed for 24 hours. A negative value indicates measured weight loss.

| SOLVENT                            | GAIN % | SOLVENT                         | GAIN % |
|------------------------------------|--------|---------------------------------|--------|
| Acetic acid 5%                     | 1.3    | Isooctane gasoline surrogate    | 0.7    |
| Acetone                            | 28.6   | Mineral oil light               | 2.3    |
| Isopropyl alcohol                  | 4.8    | Mineral oil heavy               | 2.1    |
| Bleach approximately 5% NaOCl      | 0.8    | Salt water 3.5% NaCl            | 0.9    |
| Butyl acetate                      | 16.5   | Sodium hydroxide solution pH 10 | 0.9    |
| Diesel fuel                        | 2.0    | Water                           | 0.9    |
| Diethylene glycol monomethyl ether | 14.4   | Xylene                          | 20.8   |
| Hydraulic oil                      | 2.8    | Strong acid concentrated HCl    | -5.2   |
| Skydrol 5                          | 6.5    | TPM                             | 9.9    |
| Hydrogen peroxide 3%               | 1.0    |                                 |        |

## Interpreting Compatibility Results

Weight change is a screening indicator, not a complete compatibility determination. Acetone, xylene, butyl acetate, and diethylene glycol monomethyl ether produced comparatively large changes in the 24-hour source test. Validate the actual chemical concentration, temperature, exposure time, cyclic loading, swelling, hardness, dimensions, and strength before release.

## Best Fit Applications

| USE CASE                 | TYPICAL EXAMPLES                                                      |
|--------------------------|-----------------------------------------------------------------------|
| Wearables and soft touch | Wearable interfaces, flexible covers, grips, and soft-touch elements  |
| Sealing and flow         | Gaskets, seals, masks, belts, plugs, and tubes                        |
| Impact and vibration     | Padding, dampers, cushions, grippers, and protective sports equipment |
| Human support            | Soles, splints, orthotics, and prosthetic components                  |

## Design and Validation Considerations

- Account for anisotropy: published elongation is 310% in X/Y and 110% in Z, while tear resistance is 66 kN/m in X/Y and 39 kN/m in Z.
- Consider compression set and temperature together when designing seals, cushions, and components under sustained strain.
- Specify functional dimensions, hardness, surface requirements, sealing interfaces, and inspection criteria during application review.
- Test the final geometry after all cleaning and post-processing, especially for repetitive flexing, chemical contact, skin contact, or safety-critical use.

## Process and Material Notes

Formlabs reports equivalent Fuse 1 and Fuse 1+ 30W results within experimental uncertainty. The 20% refresh rate supports a blend containing 20% fresh powder and 80% reclaimed powder, subject to the manufacturer's process instructions and powder-management requirements.

## Data Provenance

The numerical values and test outcomes in this sheet are reproduced from Formlabs document 2301750 TDS ENUS 0 for TPU 90A Powder. Formlabs states that material properties may vary with part geometry, print orientation, temperature, part design, and manufacturing practices. TPU 90A biocompatibility testing was performed at NAMS World Headquarters in Ohio.

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, chemical or skin-contact conditions, and target schedule. Our team can review material fit, design considerations, production strategy, and validation needs before quoting.

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