FUSED DEPOSITION MODELING

# TPU 92A

Stratasys FDM TPU Elastomer (Shore 92A)

Stratasys FDM TPU 92A is an engineering elastomer for flexible, durable parts. With Shore A 92 hardness and high elongation, it delivers rubber-like behavior for functional gaskets, dampers, and protective components while preserving repeatable FDM manufacturing workflows.



| HARDNESS | LEAD TIME | LAYER HEIGHT | TOLERANCE |
|---|---|---|---|
| **Shore 92A** | **4 business days** | **0.178 or 0.254 mm** | **±0.25 mm or ±0.3%, whichever is greater** |

## MECHANICAL PROPERTIES

Strength, elongation and the tensile stress at 100% and 300% elongation show how far TPU 92A parts stretch and how firmly they pull back, the figures to use when sizing seals, boots and dampers. Values are given for parts built flat (XY) and on edge (XZ), and elongation at break is highest in parts built flat. FDM parts are weakest across their layer lines, so keep the direction that stretches hardest in the build plane.

Tear strength and compression set show how parts resist tearing at notches and recover after being held compressed. Compression set rises with temperature, so allow for creep in seals and dampers that stay loaded. Flexural specimens bend without breaking.

| PROPERTY | VALUE | TEST STANDARD |
|---|---|---|
| Shore Hardness (molded) | **92A** | ASTM D2240 |
| Tensile Strength, Yield (XY) | **15.6 MPa** | ASTM D638 |
| Tensile Strength, Yield (XZ) | **16.1 MPa** | ASTM D638 |
| Tensile Strength at Break (XY) | **16.8 MPa** | ASTM D638 |
| Tensile Strength at Break (XZ) | **17.4 MPa** | ASTM D638 |
| Tensile Modulus (XY) | **15.3 MPa** | ASTM D638 |
| Tensile Modulus (XZ) | **20.7 MPa** | ASTM D638 |
| Elongation at Yield (XY) | **466 %** | ASTM D638 |

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|---|---|---|
| Elongation at Yield (XZ) | **385 %** | ASTM D638 |
| Elongation at Break (XY) | **552 %** | ASTM D638 |
| Elongation at Break (XZ) | **482 %** | ASTM D638 |
| Tensile Stress at 100% Elongation (XY) | **6.9 MPa** | ASTM D638 |
| Tensile Stress at 100% Elongation (XZ) | **7.6 MPa** | ASTM D638 |
| Tensile Stress at 300% Elongation (XY) | **11.0 MPa** | ASTM D638 |
| Tensile Stress at 300% Elongation (XZ) | **11.9 MPa** | ASTM D638 |
| Flexural Strength, no break (XY / XZ) | **1.8 / 2.4 MPa** | ASTM D790 |
| Flexural Modulus (XY / XZ) | **25.6 / 36.9 MPa** | ASTM D790 |
| Compressive Strength, Yield (XY / XZ) | **2.6 / 2.6 MPa** | ASTM D695 |
| Compressive Modulus (XY / XZ) | **16.9 / 16.9 MPa** | ASTM D695 |
| Tear Strength, Stamped (XY) | **84.6 N/mm** | ASTM D624-C |
| Compression Set, XY (22 h at 23 °C) | **21 %** | ASTM D395 |
| Compression Set, XY (22 h at 70 °C) | **44 %** | ASTM D395 |

## THERMAL PROPERTIES

The low glass transition temperature keeps TPU 92A flexible and rubbery well below freezing, while heat deflection marks where parts start to soften under load. Heat deflection was measured on molded specimens and printed parts soften at lower temperatures, so compare it with the service temperature before specifying parts mounted near an engine.

Thermal expansion is high, as for most elastomers, and Stratasys publishes it for each axis, so allow for it in seals and fits that span temperature changes.

| PROPERTY | VALUE | TEST STANDARD |
|---|---|---|
| HDT @ 0.45 MPa / 66 psi (molded) | **38 °C** | ASTM D648 Method B |
| HDT @ 0.10 MPa / 15 psi (molded) | **56 °C** | ASTM D648 Method B |
| Glass Transition Temperature (Tg, inflection point) | **-42 °C** | ASTM D7426 |
| Vicat Softening Temperature (B/50) | **95 °C** | ASTM D1525 |
| Coefficient of Linear Expansion (X) | **139 ×10$^{-6}$/K** | ASTM E831 |
| Coefficient of Linear Expansion (Y) | **159 ×10$^{-6}$/K** | ASTM E831 |
| Coefficient of Linear Expansion (Z) | **176 ×10$^{-6}$/K** | ASTM E831 |

## PHYSICAL PROPERTIES

Specific gravity gives part weight for a given volume, a little above water for TPU 92A. After 1,000 hours of accelerated UV and condensation cycling, Stratasys measured a moderate loss of ultimate strength while elongation stayed high, a useful guide for flexible parts that see sunlight.

| PROPERTY | VALUE | TEST STANDARD |
|---|---|---|
| Specific Gravity (23 °C) | **1.135** | ASTM D792 |
| Ultimate Strength Change after 1,000 h UV (XY) | **-15.3 %** | ASTM G154 |

## ELECTRICAL PROPERTIES

Stratasys publishes volume resistivity for two build orientations, and it is about a thousand times higher for parts built on edge (XZ) than for parts built flat (XY). Use the value for the orientation you will print when a flexible part sits near electrical components.

| PROPERTY | VALUE | TEST STANDARD |
|---|---|---|
| Volume Resistivity (XY) | **$6.09\times10^{10}$ Ω·cm** | ASTM D257 |
| Volume Resistivity (XZ / ZX) | **$7.17\times10^{13}$ Ω·cm** | ASTM D257 |

## CHEMICAL PROPERTIES

Each chemical class is rated at room temperature, from excellent for prolonged exposure, through good for short-term contact, to poor. TPU 92A rates best with the oils, greases and coolants found around vehicles and machinery, and worst with acids and strong solvents.

Stratasys publishes these as relative ratings rather than results of a specific test, so treat them as screening guidance and confirm them with application-specific testing before production release.

| CHEMICAL | RATING |
|---|---|
| Transmission fluid | **Excellent** |
| Motor oil | **Excellent** |
| Petroleum greases | **Excellent** |
| Silicone greases and oils | **Excellent** |
| Antifreeze / engine coolant | **Excellent** |
| Deionized water | **Excellent** |
| Petroleum fuels | **Good** |
| Brake fluid | **Good** |
| Windshield washer fluid | **Good** |
| Alcohols (ethanol) | **Good** |
| Weak bases (pH 8–10) | **Good** |
| Strong bases (pH > 10) | **Good** |
| Aliphatic hydrocarbons (methane, propane, butane) | **Limited** |
| Aromatic hydrocarbons (benzene) | **Limited** |
| Esters | **Limited** |
| Halogenated hydrocarbons (CFCs) | **Poor** |
| Ketones (acetone, MEK) | **Poor** |
| Phenols | **Poor** |
| Weak acids (pH 3–6) | **Poor** |
| Strong acids (pH < 3) | **Poor** |

## MANUFACTURING

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|---|---|
| Colours & finishes | **Black; media finishing, light sanding and surface sealing** |