FDM TPU 92A

FDM® TPU 92A is a thermoplastic polyurethane with a Shore A value of 92. The material exhibits high elongation, superior toughness, durability and abrasion resistance.

FDM TPU 92A brings the benefits of elastomers to FDM 3D printing and offers the capability to quickly produce large and complex elastomer parts. Typical applications include flexible hoses, tubes, air ducts, seals, protective covers and vibration dampeners.

FDM TPU 92A is available on the F123 and F123CR (composite-ready) Series 3D printers and is compatible with QSR™ soluble support material.

Mechanical Properties	**Test Method**	**Value**	
		XY Orientation	XZ Orientation
Shore Hardness (molded)	ASTM D2240	92 Shore A	92 Shore A
Tensile Strength, Yield (Type 1, 0.125”, 0.2”/min)	ASTM D412	15.6 MPa (2,265 psi)	16.1 MPa (2,332 psi)
Tensile Strength, Ultimate (Type 1, 0.125”, 0.2”/min)	ASTM D412	16.8 MPa (2,432 psi)	17.4 MPa (2,519 psi)
Tensile Modulus (Type 1, 0.125”, 0.2”/min)	ASTM D412	15.3 MPa (2,212 psi)	20.7 MPa (3,000 psi)
Elongation at Break (Type 1, 0.125”, 0.2”/min)	ASTM D412	552%	482%
Elongation at Yield (Type 1, 0.125”, 0.2”/min)	ASTM D412	466%	385%
Tensile Stress at 100% Elongation (PSI)	ASTM D412	6.9 MPa (999 psi)	7.6 MPa (1,096 psi)
Tensile Stress at 300% Elongation (PSI)	ASTM D412	11.0 MPa (1,598 psi)	11.9 MPa (1,722 psi)
Flexural Strength (Method 1, 0.05”/min)	ASTM D790	1.8 MPa (255 psi)	2.4 MPa (351 psi)
Flexural Modulus (Method 1, 0.05”/min)	ASTM D790	25.6 MPa (3,719 psi)	36.9 MPa (5,349 psi)
Flexural Strain at Break (Method 1, 0.05”/min)	ASTM D790	No break	No break
Tear Strength - Stamped	ASTM D624-C	84.6 N/mm (483 lbF/in)	NA
Compressive Strength, Yield (Method 1, 0.05”/min)	ASTM D695	2.6 MPa (384 psi)	2.6 MPa (384 psi)
Compressive Strength, Ultimate (Method 1, 0.05”/min)	ASTM D695	2.6 MPa (384 psi)	2.6 MPa (384 psi)
Compressive Modulus (Method 1, 0.05”/min)	ASTM D695	16.9 MPa (2,457 psi)	16.9 MPa (2,457 psi)
Compression Set at 22 Hours @ 23 ºC	ASTM D395	21%	NA
Compression Set at 22 Hours @ 70 ºC	ASTM D395	44%	NA

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Thermal Properties	Test Method	Value
Heat Deflection (HDT) @ 66 psi	ASTM D648	38 °C (100.4 °F)
Heat Deflection (HDT) @ 15 psi	NA	56 °C (132.8 °F)
Vicat Softening Temperature (Rate B/50)	ASTM D1525	95 °C (203 °F)
Glass Transition Temperature (Tg)	DMA (SSYS)	-42 °C (-43.6 °F)
Coefficient of Thermal Expansion (x-direction)	ASTM E831	139 µm/(m·°C) (7.72E-05 in/(in·°F))
Coefficient of Thermal Expansion (y-direction)	ASTM E831	159 µm/(m·°C) (8.83E-05 in/(in·°F))
Coefficient of Thermal Expansion (z-direction)	ASTM E831	176 µm/(m·°C) (9.78E-05 in/(in·°F))

Electrical Properties	Test Method	Value	
		XY Orientation	XZ Orientation
Volume Resistivity	ASTM D257	6.09E+10 ohm-cm	7.17E+13 ohm-cm

Other	Test Method	Value
Specific Gravity	ASTM D792	1.13502

UV Aging

FDM TPU 92A was tested before and after UV exposure. Ten ASTM D638 upright (XY) dogbones were tested in tensile after UV exposure and an additional 10 ASTM D638 XY dogbones were the control (No UV Exposure). The UV exposed samples were cycled in the QUV chamber per ASTM G154 (Standard Practice for Operation Fluorescent Light Apparatus for UV exposure of Nonmetallic Materials) for 1000 hours, alternating for 8 hours at 60 °C (140 °F) and 4 hours at 50 °C (122 °F) with humidity and condensation. The increase in ultimate strength is from the control samples. For more information see the Impact of UV Exposure on FDM Materials white paper.

Conditioning	Yield Strength	Ultimate Strength	Elongation at Ultimate Strength	Increase in Ultimate Strength	Modulus
No UV Exposure	18.8 MPa (2730 psi)	18.9 MPa (2740 psi)	512%		0.0223 GPa (3.23 ksi)
UV Exposure	16.0 MPa (2330 psi)	16.0 MPa (2330 psi)	470%	-15.30%	0.0218 GPa (3.16 ksi)

FDM TPU 92A coupons were built on the F370 using the F123 Elastomeric Head.

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 a Stratasys F370™ @ 0.010" (0.254 mm) slice.

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.

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