formlabs

Tough 1500

Resin for Resilient Prototyping

Tough 1500 Resin is the most resilient material in our functional family of Tough and Durable Resins. This resin produces stiff and pliable parts that bend and spring back quickly under cyclic loading.

Springy prototypes and assemblies

Snap fit and press fit connectors

Polypropylene-like strength and stiffness

V1 **FLTO1501**

* **May not be available in all regions**

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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.

MATERIAL PROPERTIES DATA

Tough 1500 Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green [2]	Post-Cured [3]	Green [2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	26 MPa	33 MPa	3771 psi	4786 psi	ASTM D638-14
Tensile Modulus	0.94 GPa	1.5 GPa	136 ksi	218 ksi	ASTM D638-14
Elongation at Break	69%	51%	69%	51%	ASTM D638-14
Flexural Properties					
Flexural Strength	15 MPa	39 MPa	2175 psi	5656 psi	ASTM D 790-15
Flexural Modulus	0.44 GPa	1.4 GPa	58 ksi	203 ksi	ASTM D 790-15
Impact Properties					
Notched IZOD	72 J/m	67 J/m	1.3 ft-lbf/in	1.2 ft-lbf/in	ASTM D256-10
Unnotched IZOD	902 J/m	1387 J/m	17 ft-lbf/in	26 ft-lbf/in	ASTM D4812-11
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	34 °C	45 °C	93 °F	113 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	42 °C	52 °C	108 °F	126 °F	ASTM D 648-16
Thermal Expansion (0-150 °C)	114 µm/m/°C	97 µm/m/°C	63 µin/in/°F	54 µin/in/°F	ASTM E 831-13

Tough 1500 Resin has been evaluated as a **skin contacting device** in accordance with ISO 10993-1, and passed the requirements for the following biocompatibility endpoints:

ISO Standard	Description [4,5]
ISO 10993-5	Not Cytotoxic
ISO 10993-10	Not an Irritant
ISO 10993-10	Not a Sensitizer

[1] Material properties can vary with part geometry, print orientation, print settings, and temperature.

[2] Data was obtained from green parts, printed using Form 2, 100 µm, Tough 1500 settings, without additional treatments.

[3] Data was obtained from parts printed using Form 2, 100 µm, Tough 1500 settings and post-cured with a Form Cure for 60 minutes at 70 °C.

[4] ISO 10993 standard testing samples were printed on a Form 3 with 100um Tough 1500 Resin settings, washed in a Form Wash for 20 minutes in ≥99% Isopropyl Alcohol, dried for at least 30 minutes and post-cured at 70°C for 60 minutes in a Form Cure.

[5] Tough 1500 Resin was tested at NAMSA World Headquarters, OH, USA.

SOLVENT COMPATIBILITY

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

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	0.8	Mineral oil (Light)	< 0.1
Acetone	19.0	Mineral oil (Heavy)	< 0.1
Bleach ~5% NaOCl	0.6	Salt Water (3.5% NaCl)	0.7
Butyl Acetate	5.0	Skydrol 5	0.5
Diesel Fuel	0.1	Sodium Hydroxide solution (0.025% PH 10)	0.7
Diethyl glycol Monomethyl Ether	5.3	Strong Acid (HCl conc)	4.4
Hydraulic Oil	0.2	Tripropylene glycol monomethyl ether	0.6
Hydrogen peroxide (3%)	0.7	Water	0.7
Isooctane (aka gasoline)	< 0.1	Xylene	3.2
Isopropyl Alcohol	3.2		