



Tough

Photopolymer Resin for Form 1+ and Form 2

FLTOTL04 MATERIAL PROPERTIES

Prepared: 04/18/2017

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.

Formlabs Tough Resin produces high quality prints that simulate ABS injection molded components while at room temperature and is specifically designed to work with your Form 2 or Form 1+ 3D Printer.

	METRIC ¹		IMPERIAL ¹		METHOD
	Green ²	Post-Cured ³	Green ²	Post-Cured ³	
Mechanical Properties					
Ultimate Tensile Strength	34.7 MPa	55.7 MPa	5040 psi	8080 psi	ASTM D 638-14
Young's Modulus	1.7 GPa	2.7 GPa	239 ksi	387 ksi	ASTM D 638-14
Elongation at Break	42 %	24 %	42 %	24 %	ASTM D 638-14
Flexural Strength at 5% Strain	20.8 MPa	60.6 MPa	3020 psi	8790 psi	ASTM D 790-15
Flexural Modulus	0.6 GPa	1.6 GPa	90.3 ksi	241 ksi	ASTM D 790-15
Notched IZOD	32.6 J/m	38 J/m	0.61 ft-lbf/in	0.71 ft-lbf/in	ASTM D 256-10
Thermal Properties					
Heat Deflection Temp. @ 1.8 MPa	32.8 °C	45.9 °C	91.1 °F	114.6 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	40.4 °C	48.5 °C	104.7 °F	119.3 °F	ASTM D 648-16
Thermal Expansion (23 – 50 °C)	159.7 µm/m/°C	119.4 µm/m/°C	88.7 µin/in/°F	66.3 µin/in/°F	ASTM E 831-13

NOTES:

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

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

³Data was obtained from parts printed using Form 2, 100 µm, Tough settings and post-cured with 2.5 mW/cm² of 405 nm LED light for 120 minutes at 60°C.

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:

Mechanical Properties	24 HR WEIGHT GAIN (%)
Acetic Acid, 5 %	2.8
Acetone	sample cracked
Isopropyl Alcohol	2.1
Bleach, ~5 % NaOCl	1.7
Butyl Acetate	1.6
Diesel	< 1
Diethyl glycol monomethyl ether	6.6
Hydraulic Oil	< 1
Skydrol 5	1.2
Hydrogen Peroxide (3 %)	2.1
Isooctane	< 1
Mineral Oil, light	< 1
Mineral Oil, heavy	< 1
Salt Water (3.5 % NaCl)	1.5
Sodium hydroxide (0.025 %, pH = 10)	1.5
Water	1.6
Xylene	< 1
Strong Acid (HCl Conc)	distorted