

PU Rigid 1000 Resin

For Stiff, Sturdy, and Unyielding Polyurethane Parts

PU Rigid 1000 Resin is a semi-rigid and tough polyurethane material that can handle high impacts and harsh environments repeatedly.

Protective casings, housings, and enclosures

Static jigs and fixtures undergoing high-stress

Sturdy consumer products



FLPU1001

* May not be available in all regions

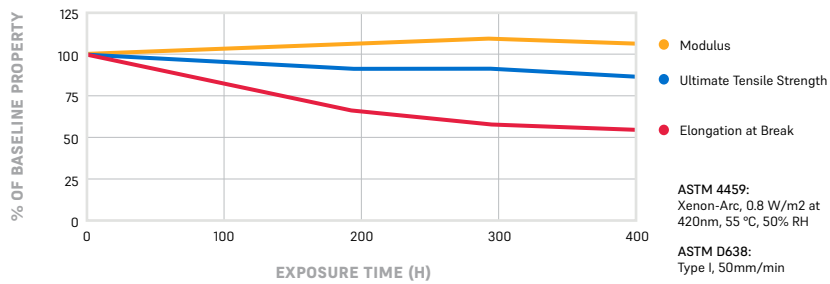
Prepared 28/04/2022

Rev. 01 28/04/2022

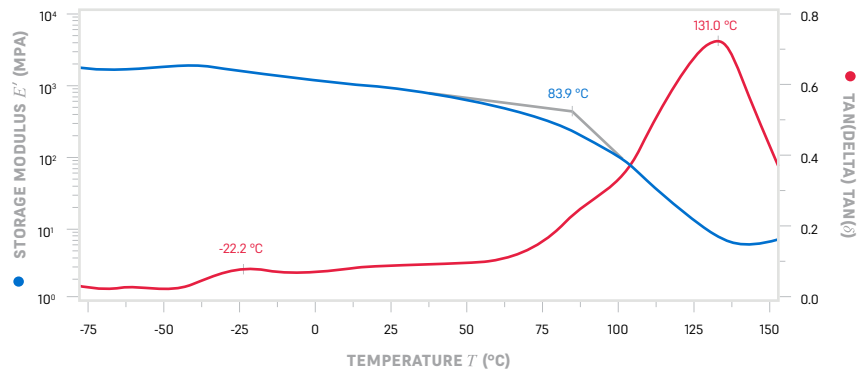
To the best of our knowledge the information contained herein is accurate. However, Formlabs, Inc. makes no warranty, expressed or implied, regarding the accuracy of these results to be obtained from the use thereof.

Material Properties	METRIC ¹	IMPERIAL ¹	METHOD
	Post-Cured ²	Post-Cured ²	
Tensile Properties	METRIC ¹	IMPERIAL ¹	METHOD
Ultimate Tensile Strength	35 ± 3.5 MPa	5 ± 0.5 ksi	ASTM D638
Young's Modulus	0.92 ± 0.09 GPa	133 ± 13 ksi	ASTM D638
Elongation at Break	80 ± 8%		ASTM D638
Flexural Properties	METRIC ¹	IMPERIAL ¹	METHOD
Flexural Strength	32 ± 1.6 MPa	4.6 ± 0.2 ksi	ASTM D790-15
Flexural Modulus	0.75 ± 0.03 GPa	109 ± 4.4 ksi	ASTM D790-15
Ross Flexing Fatigue (unnotched)	> 50,000 cycles (PASS-no crack propagation)		ASTM D1052 (23 °C)
Impact Properties	METRIC ¹	IMPERIAL ¹	METHOD
Notched Izod	170 J/m	3.18 ft-lbs/in	ASTM D256-10
Charpy Impact Test (Notched)	23 kJ/m²	11 ft-lbs/in²	ISO 179-1:2010(E)
Tabor Abrasion	177 mm³	0.01 in³	ISO 4649 (40rpm, 10N load)
Physical Properties	METRIC ¹	IMPERIAL ¹	METHOD
Hardness	74D		ASTM D2240
Density (solid)	1.16 g/cm³	72.42 lb/ft³	ASTM D792-20
Viscosity (@ 25 °C)	1193 cP		
Viscosity (@ 35 °C)	567 cP		
Thermal Properties	METRIC ¹	IMPERIAL ¹	METHOD
Heat Deflection Temp. @ 1.8 MPa	64 °C	147 °F	ASTM D648-16
Heat Deflection Temp. @ 0.45 MPa	79 °C	174 °F	ASTM D648-16
Thermal Expansion	142 µm/m/°C	78.9 µin/in/°F	ASTM E813-13
Glass Transition Temperature (Tg1)	-22 °C	-8 °F	DMA*
Glass Transition Temperature (Tg2)	131 °C	268 °F	DMA*
Electrical Properties	METRIC ¹	IMPERIAL ¹	METHOD
Dielectric Strength	1.8 x 10 ⁷ V/m	460 V/mil	ASTM D149-20
Dielectric Constant	3.9		ASTM D150, 0.5 MHz
Dielectric Constant	4.3		ASTM D150, 1.0 MHz
Dissipation Factor	0.077		ASTM D150, 0.5 MHz
Dissipation Factor	0.081		ASTM D150, 1.0 MHz
Volume resistivity	6.5 x 10 ¹¹ Ω·cm	2.56 x 10 ¹¹ Ω·cm	ASTM D257-14
Flammability Properties	METRIC ¹	IMPERIAL ¹	METHOD
Flammability rating	HB		UL 94
Smoke Density	(D ≤ 1.5) = 31 (PASS) (D ≤ 4.0) = 244 (FAIL)		ASTM E662-21
Automotive Specific Testing	METRIC ¹	IMPERIAL ¹	METHOD
Volatile Organic Compounds	199 µg/g	0.03 oz/lb	VOC VDA 278
Fogging	3.2 mg	1.1 x 10 ⁻⁴ oz	DIN 75201, Method B

ACCELERATED AGING



Dynamic mechanical analysis (DMA) is used to study the viscoelastic behavior of materials. Below is the DMA thermogram for PU Rigid 1000. Storage modulus and tan(delta) are plotted as function of temperature. Two glass transition temperatures are observed for PU Rigid 1000, which are -22.2°C and +131.0°C. A drop in storage modulus, indicating softening, is observed around 80°C.



PU R1000 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 ^{3, 4}
EN ISO 10993-5	Not cytotoxic
EN ISO 10993-10	Not an irritant
EN ISO 10993-10	Not a sensitizer

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%	0.4	Isopropyl Alcohol	1.7
Acetone	11.0	Castor Oil	< 0.1
Bleach ~5% NaOCl	0.3	Mineral oil, light	< 0.1
Butyl Acetate	3.5	Propylene Glycol Diacetate	0.1
Dichloromethane	95.9	Salt Water (3.5% NaCl)	0.2
Diesel Fuel	< 0.1	Skydrol 500B-4	0.2
Diethyl glycol monomethyl ether	3.5	Sodium hydroxide solution (0.025% pH = 10)	0.3
Gasoline	< 0.1	Strong Acid (HCl Conc)	-1.1
Hexane	< 0.1	Water	0.2
Hydraulic Oil	< 0.1	Xylene	2.7
Hydrogen peroxide (3%)	0.3		

¹ Material properties may vary based on part geometry, print orientation, print settings, temperature, and disinfection or sterilization methods used.

² Data for post-cured samples were measured on Type 1 tensile bars printed on a Form 2 printer with 100 µm PU R1000 Resin settings, washed in a Form Wash for 2 minutes in >99% PGDA, and post-cured.

³ ISO 10993 standard testing samples were printed on a Form 3 with 100µm PU Rigid 1000 Resin settings, washed in a Form Wash for 5 minutes in >99% PGDA, dried for at least 24 hours and post-cured at 46°C and 70%RH for 3 days in an oven.

⁴ PU R1000 Resin was tested at NAMS World Headquarters, OH, USA.