

# Rigid 10K Resin

## Resin for Rigid, Strong, Industrial-Grade Prototypes

This highly glass-filled resin is the stiffest material in our engineering portfolio. Choose Rigid 10K Resin for precise industrial parts that need to withstand significant load without bending. Rigid 10K Resin has a smooth matte finish and is highly resistant to heat and chemicals.

**Short-run injection molds and inserts**

**Heat resistant and fluid exposed components, jigs, and fixtures**

**Simulates stiffness of glass and fiber-filled thermoplastics**

**Aerodynamic test models**



**FLRG1001**

\* 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

# Rigid 10K Resin

	METRIC				METHOD
	Green	UV Cure <sup>1</sup>	UV + Thermal Cure <sup>2</sup>	UV Cure + Media Blast	
<b>Tensile Properties</b>					
Ultimate Tensile Strength	55 MPa	65 MPa	53 MPa	88 MPa	ASTM D638-14
Tensile Modulus	7.5 GPa	10 GPa	10 GPa	11 GPa	ASTM D638-14
Elongation at Break	2%	1%	1%	1.7%	ASTM D638-14
<b>Flexural Properties</b>					
Flexural Strength	84 MPa	126 MPa	103 MPa	158 MPa	ASTM D 790-15
Flexural Modulus	6 GPa	9 GPa	10 GPa	9.9 GPa	ASTM D 790-15
<b>Impact Properties</b>					
Notched Izod	16 J/m	16 J/m	18 J/m	20 J/m	ASTM D256-10
Unnotched Izod	41 J/m	47 J/m	41 J/m	130 J/m	ASTM D4812-11
<b>Thermal Properties</b>					
Heat Deflection Temp. @ 0.45 MPa	65 °C	163 °C	218 °C	238 °C	ASTM D 648-16
Heat Deflection Temp. @ 1.8 MPa	56 °C	82 °C	110 °C	92 °C	ASTM D 648-16
Thermal Expansion, 0-150 °C	48 µm/m/°C	47 µm/m/°C	46 µm/m/°C	41 µm/m/°C	ASTM E 831-13

	IMPERIAL				METHOD
	Green	UV Cure <sup>1</sup>	UV + Thermal Cure <sup>2</sup>	UV Cure + Media Blast	
<b>Tensile Properties</b>					
Ultimate Tensile Strength	7980 psi	9460 psi	7710 psi	12700 psi	ASTM D638-14
Tensile Modulus	1090 ksi	1480 ksi	1460 ksi	1600 ksi	ASTM D638-14
Elongation at Break	2%	1%	1%	1.70%	ASTM D638-14
<b>Flexural Properties</b>					
Flexural Strength	12200 psi	18200 psi	15000 psi	22900 psi	ASTM D 790-15
Flexural Modulus	905 ksi	1360 ksi	1500 ksi	1440 ksi	ASTM D 790-15
<b>Impact Properties</b>					
Notched Izod	0.3 ft-lbf/in	0.3 ft-lbf/in	0.3 ft-lbf/in	0.37 ft-lbf/in	ASTM D256-10
Unnotched Izod	0.8 ft-lbf/in	0.9 ft-lbf/in	0.7 ft-lbf/in	2.5 ft-lbf/in	ASTM D4812-11
<b>Thermal Properties</b>					
Heat Deflection Temp. @ 0.45 MPa	149 °F	325 °F	424 °F	460 °F	ASTM D 648-16
Heat Deflection Temp. @ 1.8 MPa	133 °F	180 °F	230 °F	198 °F	ASTM D 648-16
Thermal Expansion, 0-150 °C	27 µin/in/°F	26 µin/in/°F	26 µin/in/°F	23 µin/in/°F	ASTM E 831-13

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## Electrical Characterization

Property	Frequency	Value	Standard
Dielectric Constant (D <sub>r</sub> )	1 GHz	3.4	ASTM D150-22
Dielectric Constant (D <sub>r</sub> )	10 GHz	3.3	ASTM D2520-21
Loss Tangent (D <sub>i</sub> )	1 GHz	0.036	ASTM D150-22
Loss Tangent (D <sub>i</sub> )	10 GHz	0.0074	ASTM D2520-21
Volume Resistivity	-	1.1 x 10 <sup>15</sup> Ω·cm	ASTM D257-14
Surface Resistivity	-	6.9 x 10 <sup>13</sup> Ω	ASTM D257-14
Dielectric Strength	-	458 V/mil	ASTM D149-20

## Toxic Gas Generation

Testing Standard BSS 7239 (comparable to NFPA No. 258)	Maximum allowed concentration per BSS 7239 (ppm)	Flaming Mode (ppm)	Non-Flaming Mode (ppm)
Hydrogen Cyanide (HCN)	150	1	0.5
Carbon Monoxide (CO)	3500	50	10
Nitrous Oxides (NOx)	100	< 2	< 2
Sulfur Dioxide (SO2)	100	< 1	< 1
Hydrogen Fluoride (HF)	200	< 1.5	< 1.5
Hydrogen Chloride (HCl)	500	1	< 1

## Smoke Density

## Specific Optical Density

Testing Standard	@ 90 sec	@ 4 min	Maximum
ASTM E662 Flaming Mode	2	95	132
ASTM E662 Non-Flaming Mode	0	1	63

## Flammability

Testing Standard	Rating
UL 94 Section 7 (3 mm)	HB

## 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%	< 0.1	Isooctane (aka gasoline)	0
Acetone	< 0.1	Mineral oil (light)	0.2
Isopropyl Alcohol	< 0.1	Mineral oil (Heavy)	< 0.1
Bleach ~5% NaOCl	0.1	Salt Water (3.5% NaCl)	0.1
Butyl Acetate	0.1	Sodium Hydroxide solution (0.025% PH 10)	0.1
Diesel Fuel	0.1	Water	< 0.1
Diethyl glycol Monomethyl Ether	0.4	Xylene	< 0.1
Hydraulic Oil	0.2	Strong Acid (HCl conc)	0.2
Skydrol 5	0.6	Tripropylene glycol monomethyl ether	0.4
Hydrogen peroxide (3%)	< 0.1		

All testing specimens were printed using Form 3.

<sup>1</sup> Data was obtained from parts printed using Form 3, 100 µm and post-cured with a Form Cure for 60 minutes at 70 °C.

<sup>2</sup> Data was obtained from parts printed using Form 3, 100 µm and post-cured with a Form Cure for 60 minutes at 70 °C and an additional thermal cure at 90 °C for 125 minutes.