SLA Resin Material List

RESIN	MICRON LAYER HEIGHT	FEATURES
STANDARD		
Clear	100 µm 50 µm	· High translucency and transparency
White	100 µm 50 µm	· Fine detail, matte white finish
Grey	100 µm 50 µm 25 µm	· Fine detail, matte grey finish
Black	100 µm 50 µm	· Fine detail, matte black finish
Color Kit	100 µm 50 µm	· Full range of custom colors
Draft	200 µm 100 µm	· Print up to 4 times faster
ENGINEERING		
Rigid 10K	100 µm 50 µm	· Rigid, strong, industrial-grade parts
Rigid 4000	100 µm 50 µm	· Stiff, strong, engineering-grade parts
Grey Pro	100 µm 50 µm	· Versatile prototyping material
Tough 2000	100 µm 50 µm	· Stiff, sturdy, rugged prototyping
Tough 1500	100 µm 50 µm	· Stiff, pliable, resilient prototyping
Durable	100 µm 50 µm	· Soft, pliable prototyping material
Flexible 80A	100 µm 50 µm	· Hard flexible parts with slow return
Elastic 50A	100 µm	· Soft flexible parts that spring back
SPECIALITY		
High Temp	100 µm 50 µm	· High thermal stability
JEWELRY		
Castable Wax 40	50 µm	· Crisp settings, sharp prongs, smooth shanks, fine surface detail
Castable Wax	50 µm	· Reliable casting with clean burnout

MATERIAL RESINS

Standard Resins

Materials for High-Resolution Rapid Prototyping

High Detail. For demanding applications, our carefully-engineered resins capture the finest features in your model.

Strong and Precise. Our resins create accurate and robust parts, ideal for rapid prototyping and product development.

Smooth Surface Finish. Perfectly smooth right out of the printer, parts printed on the Formlabs stereolithography printers have the polish and finish of a final product.

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

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V4 **CLEAR** **FLGPCL04**

V4 **WHITE** **FLGPWH04**

V4 **GREY** **FLGPGR04**

V4 **BLACK** **FLGPBL04**

V4 **COLOR** **FLGPCB01**

Prepared 04 . 09 . 2016
Rev 04 . 18 . 2017

MATERIAL PROPERTIES DATA

Standard Resins

The following material properties are comparable for Clear Resin, White Resin, Grey Resin, Black Resin, and Color Kit.

	METRIC [1]		IMPERIAL [1]		METHOD
	Green[2]	Post-Cured [3]	Green[2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	38 MPa	65 MPa	5510 psi	9380 psi	ASTM D638-14
Tensile Modulus	1.6 GPa	2.8 GPa	234 ksi	402 ksi	ASTM D638-14
Elongation at Break	12%	6%	12%	6%	ASTM D638-14
Flexural Properties					
Flexural Modulus	1.3 GPa	2.2 GPa	181 psi	320 psi	ASTM D 790-15
Impact Properties					
Notched IZOD	16 J/m	25 J/m	0.3 ft-lbf/in	0.46 ft-lbf/in	ASTM D256-10
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	43 °C	58 °C	109 °F	137 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	50 °C	73 °C	121 °F	134 °F	ASTM D 648-16

[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, Clear settings, without additional treatments.

[3] Data was obtained from parts printed using Form 2, 100 µm, Clear settings and post-cured with 1.25 mW/cm^2 of 405 nm LED light for 60 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:

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	< 1.0	Mineral oil (Heavy)	< 1.0
Acetone	Sample cracked	Mineral oil (light)	< 1.0
Bleach ~5% NaOCl	< 1.0	Salt Water (3.5% NaCl)	< 1.0
Butyl Acetate	< 1.0	Skydrol 5	1
Diesel Fuel	< 1.0	Sodium Hydroxide solution (0.025% PH 10)	< 1.0
Diethyl glycol Monomethyl Ether	1.7	Strong Acid (HCl conc)	Distorted
Hydraulic Oil	< 1.0	Water	< 1.0
Hydrogen peroxide (3%)	< 1.0	Xylene	< 1.0
Isooctane (aka gasoline)	< 1.0		
Isopropyl Alcohol	< 1.0		

HIGH DETAIL

For demanding applications, our carefully-engineered resins capture the finest features in your model.

STRONG AND PRECISE

Our resins create accurate and robust parts, ideal for our rapid prototyping and product development.

SMOOTH SURFACE FINISH

Perfectly smooth right out of the printer, parts printed on Formlabs printers have the polish and finish of a final product.

CLEAR

Clear Resin polishes to near optical transparency, making it ideal for showcasing internal features.

WHITE

White Resin emphasizes fine details and has a matte finish with a warm, slightly ivory color.

GREY

Grey Resin has a smooth, matte finish and shows details beautifully without primer.

BLACK

Black Resin's opaque matte finish rivals the look of injection-molded plastics, capable of producing incredible looks-like prototypes.

COLOR KIT

Color Kit contains a Color Base cartridge and five Color Pigments. Use Color Kit to mix and print matte, opaque parts in a range of colors without the manual work of finishing and painting.

STANDARD RESIN

Draft

Draft Resin for Truly Rapid Prototyping

Draft Resin prints up to four times faster than Formlabs standard materials, making it ideal for initial prototypes and rapid iterations to help bring products to market faster. Parts printed with Draft Resin exhibit a smooth grey finish and high accuracy. Use 200 micron settings for fast print speeds, or use 100 micron settings for models with finer details.

Initial prototypes

Rapid design iterations

Live 3D printing demos

High throughput applications

V2 **FLDRGR02** * May not be available in all regions

formlabs

Prepared 10 . 07 . 2020
Rev 01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Draft V2 Resin

	METRIC [1]			IMPERIAL [1]			METHOD
	Green[2]	Post-Cured at Room Temperature [3]	Post-Cured at 60 °C[4]	Green[2]	Post-Cured at Room Temperature [3]	Post-Cured at 60 °C[4]	
Tensile Properties							
Ultimate Tensile Strength	24 MPa	36 MPa	52 MPa	3481 psi	5221 psi	7542 psi	ASTM D638-14
Tensile Modulus	0.8 GPa	1.7 GPa	2.3 GPa	122 ksi	247 ksi	334 ksi	ASTM D638-14
Elongation at Break	14%	5%	4%	14%	5%	4%	ASTM D638-14
Flexural Properties							
Flexural Modulus	0.6 GPa	1.8 GPa	2.3 GPa	87 ksi	261 ksi	334 ksi	ASTM D790-17
Impact Properties							
Notched IZOD	26 J/m	29 J/m	26 J/m	0.5 ft-lbf/in	0.5 ft-lbf/in	0.5 ft-lbf/in	ASTM D256-10
Temperature Properties							
Heat Deflection Temp. @ 1.8 MPa	37 °C	44 °C	57 °C	99 °F	111 °F	135 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	43 °C	53 °C	74 °C	109 °F	127 °F	165 °F	ASTM D 648-16

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

[2] Data was obtained from green parts, printed using Form 3, 200 µm, Draft Resin settings, washed for 5 minutes in Form Wash and air dried without post cure.

[3] Data was obtained from parts printed using a Form 3, 200 micron, Draft Resin settings, and post-cured with Form Cure at room temperature for 5 minutes.

[4] Data was obtained from parts printed using a Form 3, 200 micron, Draft Resin settings, and post-cured with Form Cure at 60 °C for 5 minutes.

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%	0.2	Mineral oil (Light)	< 0.1
Acetone	4.2	Mineral oil (Heavy)	< 0.1
Bleach ~5% NaOCl	0.1	Salt Water (3.5% NaCl)	0.3
Butyl Acetate	0.1	Skydrol 5	0.3
Diesel Fuel	0.1	Sodium Hydroxide solution (0.025% PH 10)	0.3
Diethyl glycol Monomethyl Ether	0.8	Strong Acid (HCl conc)	< 1.0
Hydraulic Oil	< 0.1	Tripropylene glycol monomethyl ether	0.3
Hydrogen peroxide (3%)	0.2	Water	< 0.1
Isooctane (aka gasoline)	< 0.1	Xylene	< 0.1
Isopropyl Alcohol	< 0.1		

MATERIALS LIBRARY

Engineering

Materials for Engineering, Manufacturing, and Product Design

Our library of versatile, reliable Engineering Resins is formulated to help you reduce costs, iterate faster, and bring better experiences to market.

*** Please note that resins may not be available in all regions.**

Rigid 10K
Rigid 4000
Grey Pro
Tough 2000
Tough 1500

Durable
Flexible 80A
Elastic 50A

formlabs

ENGINEERING RESIN

Rigid 10K

Rigid 10K 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

Aerodynamic test models

Simulates stiffness of glass and fiber-filled thermoplastics

V1 **FLRG1001**

* May not be available in all regions

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Prepared 10 . 07 . 2020
Rev 01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Rigid 10K Resin

	METRIC			IMPERIAL			METHOD
	Green	UV Post-cured [1]	UV + Thermal [2]	Green	UV Post-cured [1]	UV + Thermal [2]	
Tensile Properties							
Ultimate Tensile Strength	55 MPa	65 MPa	53 MPa	7980 psi	9460 psi	7710 psi	ASTM D638-14
Tensile Modulus	7.5 GPa	10 GPa	10 GPa	1090 ksi	1480 ksi	1460 ksi	ASTM D638-14
Elongation at Break	2%	1%	1%	2%	1%	1%	ASTM D638-14
Flexural Strength	84 MPa	126 MPa	103 MPa	12200	18200	15000	ASTM D 790-15
Flexural Properties							
Flexural Modulus	6 GPa	9 GPa	10 GPa	905	1360	1500	ASTM D 790-15
Impact Properties							
Notched IZOD	16 J/m	16 J/m	18 J/m	0.3 ft-lbf/in	0.3 ft-lbf/in	0.3 ft-lbf/in	ASTM D256-10
Temperature Properties							
Heat Deflection Temp. @ 1.8 MPa	56 °C	82 °C	110 °C	133 °F	180 °F	230 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	65 °C	163 °C	218 °C	149 °F	325 °F	424 °F	ASTM D 648-16
Thermal Expansion, 0-150 °C	48 µm/m/°C	47 µm/m/°C	46 µm/m/°C	27 µin/in/°F	26 µin/in/°F	26 µin/in/°F	ASTM E 831-13

Material properties can vary with part geometry, print orientation, print settings, and temperature. All testing was done on Form 3.

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

[2] Data was obtained from parts printed using Form 3, 100 µm and post-cured with a Formcure for 60 minutes at 60 °C and an additional thermal cure at 90 °C for 125 minutes.

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	Mineral oil (Light)	0.2
Acetone	< 0.1	Mineral oil (Heavy)	< 0.1
Bleach ~5% NaOCl	0.1	Salt Water (3.5% NaCl)	0.1
Butyl Acetate	0.1	Skydrol 5	0.6
Diesel Fuel	0.1	Sodium Hydroxide solution (0.025% PH 10)	0.1
Diethyl glycol Monomethyl Ether	0.4	Strong Acid (HCl conc)	0.2
Hydraulic Oil	0.2	Tripropylene glycol monomethyl ether	0.4
Hydrogen peroxide (3%)	< 0.1	Water	< 0.1
Isooctane (aka gasoline)	0.0	Xylene	< 0.1
Isopropyl Alcohol	< 0.1		

ENGINEERING RESIN

Rigid 4000

Rigid 4000 Resin for Stiff, Strong, Engineering-Grade Prototypes

Glass-filled Rigid 4000 Resin prints with a smooth, polished finish and is ideal for stiff and strong parts that can withstand minimal deflection. Consider Rigid 4000 Resin for general load-bearing applications.

Mounts and brackets

Jigs and fixtures

Thin-walled parts

Simulates stiffness of PEEK

V1 **FLRGWH01** * May not be available in all regions

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Rigid 4000 Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green[2]	Post-Cured [3]	Green[2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	33 MPa	69 MPa	4786 psi	10007 psi	ASTM D638-14
Tensile Modulus	2.1 GPa	4.1 GPa	234 ksi	402 ksi	ASTM D638-14
Elongation at Break	23%	5.3%	23%	5.3%	ASTM D638-14
Flexural Stress at 5% Strain	43 MPa	105 MPa	6236 psi	15229 psi	ASTM D 790-15
Flexural Properties					
Flexural Modulus	1.4 GPa	3.4 GPa	203 ksi	493 ksi	ASTM D 790-15
Impact Properties					
Notched IZOD	16 J/m	23 J/m	0.3 ft-lbf/in	0.43 ft-lbf/in	ASTM D256-10
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	41 °C	60 °C	105 °F	140 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	50 °C	73 °C	121 °F	134 °F	ASTM D 648-16
Thermal Expansion (0-150°C)	64 µm/m/°C	63 µm/m/°C	36 µin/in/°F	35 µin/in/°F	ASTM E 831-13

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

[2] Data was obtained from green parts, printed using Form 3, 100 µm, Rigid settings, without additional treatments.

[3] Data was obtained from parts printed using Form 3, 100 µm, Rigid settings and post-cured with a Form Cure for 15 minutes at 80 °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:

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	0.8	Mineral oil (Light)	0.2
Acetone	3.3	Mineral oil (Heavy)	0.2
Bleach ~5% NaOCl	0.7	Salt Water (3.5% NaCl)	0.7
Butyl Acetate	0.1	Skydrol 5	1.1
Diesel Fuel	< 0.1	Sodium Hydroxide solution (0.025% PH 10)	0.7
Diethyl glycol Monomethyl Ether	1.4	Strong Acid (HCl conc)	5.3
Hydraulic Oil	0.2	Tripropylene glycol monomethyl ether	0.9
Hydrogen peroxide (3%)	0.9	Water	0.7
Isooctane (aka gasoline)	< 0.1	Xylene	0.1
Isopropyl Alcohol	0.4		

ENGINEERING RESIN

Grey Pro

Grey Pro Resin for Versatile Prototyping

Grey Pro Resin offers high precision, moderate elongation, and low creep. This material is great for concept modeling and functional prototyping, especially for parts that will be handled repeatedly.

Form and fit testing

High quality product prototypes

Mold masters for plastics and silicones

Jigs and fixtures for manufacturing

V1 **FLPRGR01** * May not be available in all regions

formlabs

Prepared 10 . 07 . 2020
Rev 01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Grey Pro Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green[2]	Post-Cured [3]	Green[2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	35 MPa	61 MPa	5076 psi	8876 psi	ASTM D638-14
Tensile Modulus	1.4 GPa	2.6 GPa	203 ksi	377 ksi	ASTM D638-14
Elongation at Break	33%	13%	33%	13%	ASTM D638-14
Flexural Stress at 5% Strain	39 MPa	86 MPa	5598 psi	12400 psi	ASTM D 790-15
Flexural Properties					
Flexural Modulus	0.94 GPa	2.2 GPa	136 ksi	319 ksi	ASTM D 790-15
Impact Properties					
Notched IZOD	not tested	19 J/m	not tested	0.35 ft-lbf/in	ASTM D256-10
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	not tested	62 °C	not tested	144 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	not tested	78 °C	not tested	171 °F	ASTM D 648-16
Thermal Expansion (0-150°C)	not tested	79 µm/m/°C	not tested	43 µin/in/°F	ASTM E 831-13

[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, Grey Pro settings, without additional treatments.

[3] Data was obtained from parts printed using Form 2, 100 µm, Grey Pro settings and post-cured with a Form Cure for 120 minutes at 80 °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:

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	0.8	Mineral oil (Light)	0.4
Acetone	10.8	Mineral oil (Heavy)	0.3
Bleach ~5% NaOCl	0.7	Salt Water (3.5% NaCl)	0.6
Butyl Acetate	0.8	Skydrol 5	0.5
Diesel Fuel	< 0.1	Sodium Hydroxide solution (0.025% PH 10)	0.7
Diethyl glycol Monomethyl Ether	2.4	Strong Acid (HCl conc)	8.2
Hydraulic Oil	0.2	Tripropylene glycol monomethyl ether	1.5
Hydrogen peroxide (3%)	0.8	Water	0.8
Isooctane (aka gasoline)	< 0.1	Xylene	0.4
Isopropyl Alcohol	1.6		

ENGINEERING RESIN

Tough 2000

Resin for Rugged Prototyping

Tough 2000 Resin is the strongest and stiffest material in our functional family of Tough and Durable Resins. Choose Tough 2000 Resin for prototyping strong and sturdy parts that should not bend easily.

Strong and stiff prototypes

Sturdy jigs and fixtures

ABS-like strength and stiffness

V1 **FLTO2001**

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

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Tough 2000 Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green[2]	Post-Cured [3]	Green[2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	29 MPa	46 MPa	4206 psi	6671 psi	ASTM D638-14
Tensile Modulus	1.2 GPa	2.2 GPa	174 ksi	329 ksi	ASTM D638-14
Elongation at Break	74%	48%	74%	48%	ASTM D638-14
Flexural Strength	17 MPa	65 MPa	2465 psi	9427 psi	ASTM D 790-15
Flexural Properties					
Flexural Modulus	0.45 GPa	1.9 GPa	65 ksi	275 ksi	ASTM D 790-15
Impact Properties					
Notched IZOD	79 J/m	40 J/m	1.5 ft-lbf/in	0.75 ft-lbf/in	ASTM D256-10
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	42 °C	53 °C	108 °F	127 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	48 °C	63 °C	118 °F	145 °F	ASTM D 648-16
Thermal Expansion (0-150°C)	107 µm/m/°C	91 µm/m/°C	59 µin/in/°F	50 µin/in/°F	ASTM E 831-13

[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 2000 settings, without additional treatments.

[3] Data was obtained from parts printed using Form 2, 100 µm, Tough 2000 settings and post-cured with a Form Cure for 120 minutes at 80 °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:

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	0.7	Mineral oil (Light)	0.2
Acetone	18.8	Mineral oil (Heavy)	0.1
Bleach ~5% NaOCl	0.6	Salt Water (3.5% NaCl)	0.6
Butyl Acetate	6.2	Skydrol 5	0.9
Diesel Fuel	< 0.1	Sodium Hydroxide solution (0.025% PH 10)	0.6
Diethyl glycol Monomethyl Ether	5.3	Strong Acid (HCl conc)	3.0
Hydraulic Oil	< 0.1	Tripropylene glycol monomethyl ether	1.0
Hydrogen peroxide (3%)	0.6	Water	0.6
Isooctane (aka gasoline)	< 0.1	Xylene	4.1
Isopropyl Alcohol	3.7		

ENGINEERING RESIN

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**

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

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 Strength	15 MPa	39 MPa	2175 psi	5656 psi	ASTM D 790-15
Flexural Properties					
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

[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.

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	19.1	Mineral oil (Heavy)	0.1
Bleach ~5% NaOCl	0.6	Salt Water (3.5% NaCl)	0.7
Butyl Acetate	5.1	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		

ENGINEERING RESIN

Durable

Resin for Pliable Prototyping

Durable Resin is the most pliable, impact resistant, and lubricious material in our functional family of Tough and Durable Resins. Choose Durable Resin for squeezable parts and low-friction assemblies.

Squeezable prototypes

Impact resistant jigs

Low friction and non-degrading surfaces

Polyethylene-like strength and stiffness

V2 **FLDUCL02** * **May not be available in all regions**

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Durable Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green[2]	Post-Cured [3]	Green[2]	Post-Cured [3]	
Tensile Properties					
Ultimate Tensile Strength	13 MPa	28 MPa	1900 psi	3980 psi	ASTM D638-14
Tensile Modulus	0.24 GPa	1.0 GPa	34 ksi	149 ksi	ASTM D638-14
Elongation at Break	75%	55%	75%	55%	ASTM D638-14
Flexural Strength	1.0 MPa	24 MPa	149 psi	3420 psi	ASTM D 790-15
Flexural Properties					
Flexural Modulus	0.04 GPa	0.66 GPa	5.58 ksi	94.1 ksi	ASTM D 790-15
Impact Properties					
Notched IZOD	127 J/m	114 J/m	2.37 ft-lbf/in	2.13 ft-lbf/in	ASTM D256-10
Unnotched IZOD	972 J/m	710 J/m	18.2 ft-lbf/in	13.3 ft-lbf/in	ASTM D4812-11
Temperature Properties					
Heat Deflection Temp. @ 1.8 MPa	-	-	-	-	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	< 30 °C	41 °C	< 86 °F	105 °F	ASTM D 648-16
Thermal Expansion (0-150°C)	124 µm/m/°C	106 µm/m/°C	69.1 µin/in/°F	59 µin/in/°F	ASTM E 831-13

[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, Durable settings, without additional treatments.

[3] Data was obtained from parts printed using Form 2, 100 µm, Durable settings and post-cured with a Form Cure 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:

Solvent	24 hr weight gain, %	Solvent	24 hr weight gain, %
Acetic Acid 5%	1.3	Mineral oil (Light)	< 1.0
Acetone	Sample cracked	Mineral oil (Heavy)	< 1.0
Bleach ~5% NaOCl	< 1.0	Salt Water (3.5% NaCl)	< 1.0
Butyl Acetate	7.9	Skydrol 5	1.3
Diesel Fuel	< 1.0	Sodium Hydroxide solution (0.025% PH 10)	< 1.0
Diethyl glycol Monomethyl Ether	7.8	Strong Acid (HCl conc)	Distorted
Hydraulic Oil	< 1.0	Tripropylene glycol monomethyl ether	1.2
Hydrogen peroxide (3%)	1.0	Water	< 1.0
Isooctane (aka gasoline)	< 1.0	Xylene	6.5
Isopropyl Alcohol	5.1		

ENGINEERING RESIN

Flexible 80A

Resin for Hard Flexible Prototypes

Flexible 80A Resin is the most stiff soft-touch material in our library of Flexible and Elastic Resins, with an 80A Shore durometer to simulate the flexibility of rubber or TPU.

Balancing softness with strength, Flexible 80A Resin can withstand bending, flexing, and compression, even through repeated cycles. This material is well-suited for cushioning, damping, and shock absorption.

Handles, grips, overmolds

Seals, gaskets, masks

Cartilage and ligament anatomy

V1 **FLFL8001**

* May not be available in all regions

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Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Flexible 80A Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green	Post-Cured [2]	Green	Post-Cured [2]	
Mechanical Properties					
Ultimate Tensile Strength[3]	3.7 MPa	8.9 MPa	539 psi	1290 psi	ASTM D 412-06 (A)
Stress at 50% Elongation	1.5 MPa	3.1 MPa	218 psi	433 psi	ASTM D 412-06 (A)
Stress at 100% Elongation	3.5 MPa	6.3 MPa	510 psi	909 psi	ASTM D 412-06 (A)
Elongation at Break	100%	120%	100%	120%	ASTM D 412-06 (A)
Shore Hardness	70 A	80 A	80 A	80 A	ASTM 2240
Compression Set (23°C for 22 hours)	Not Tested	3%	Not Tested	3%	ASTM D 395-03 (B)
Compression Set (70°C for 22 hours)	Not Tested	5%	Not Tested	5%	ASTM D 395-03 (B)
Tear Strength [4]	11 kN/m	24 kN/m	61 lbf/in	137 lbf/in	ASTM D 624-00
Ross Flex Fatigue at 23°C	Not Tested	>200,000 cycles	Not Tested	>200,000 cycles	ASTM D1052, (notched), 60° bending, 100 cycles/minute
Ross Flex Fatigue at -10°C	Not Tested	>50,000 cycles	Not Tested	>50,000 cycles	ASTM D1052, (notched), 60° bending, 100 cycles/minute
Bayshore Resilience	Not Tested	28%	Not Tested	28%	ASTM D2632
Thermal Properties					
Glass transition temperature (Tg)	Not Tested	27°C	Not Tested	27°C	DMA

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

[2] Data was obtained from parts printed using Form 3, 100 µm, Flexible 80A settings, washed in Form Wash for 10 minutes and post-cured with Form Cure at 60° for 10 minutes.

[3] Tensile testing was performed after 3+ hours at 23 °C, using a Die C specimen cut from sheets.

[4] Tear testing was performed after 3+ hours at 23 °C, using a Die C tear specimen directly printed.

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%	0.9	Mineral oil (Light)	0.1
Acetone	37.4	Mineral oil (Heavy)	< 0.1
Bleach ~5% NaOCl	0.6	Salt Water (3.5% NaCl)	0.5
Butyl Acetate	51.4	Skydrol 5	10.7
Diesel Fuel	2.3	Sodium Hydroxide solution (0.025% PH 10)	0.6
Diethyl glycol Monomethyl Ether	19.3	Strong Acid (HCl conc)	28.6
Hydraulic Oil	1.0	Tripropylene glycol monomethyl ether	13.6
Hydrogen peroxide (3%)	0.7	Water	0.7
Isooctane (aka gasoline)	1.6	Xylene	64.1
Isopropyl Alcohol	11.7		

ENGINEERING RESIN

Elastic 50A

Resin for Soft Flexible Parts

Our softest Engineering Resin, this 50A Shore durometer material is suitable for prototyping parts normally produced with silicone. Choose Elastic Resin for parts that will bend, stretch, compress, and hold up to repeated cycles without tearing.

Compliant features for robotics

Wearables and consumer goods prototyping

Medical models and devices

Special effects props and models

V1 **FLELCL01** * **May not be available in all regions**

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

Elastic 50A Resin

	METRIC [1]		IMPERIAL [1]		METHOD
	Green	Post-Cured [2]	Green	Post-Cured [2]	
Mechanical Properties					
Ultimate Tensile Strength [3]	1.61 MPa	3.23 MPa	234 psi	468 psi	ASTM D 412-06 (A)
Stress at 50% Elongation	0.92 MPa	0.94 MPa	133 psi	136 psi	ASTM D 412-06 (A)
Stress at 100% Elongation	1.54 MPa	1.59 MPa	233 psi	231 psi	ASTM D 412-06 (A)
Elongation at Break	100%	160%	100%	160%	ASTM D 412-06 (A)
Tear Strength [4]	8.9 kN/m	19.1 kN/m	51 lbf/in	109 lbf/in	ASTM D 624-00
Shore Hardness	40A	50A	40A	50A	ASTM 2240
Compression Set 23°C for 22 hours	2%	2%	2%	2%	ASTM D 395-03 (B)
Compression Set 70°C for 22 hours	3%	9%	3%	9%	ASTM D 395-03 (B)

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

[2] Data was obtained from parts printed using Form 2, 100 µm, Elastic settings, washed in Form Wash for 20 minutes and post-cured with Form Cure at 60 °C for 20 minutes.

[3] Tensile testing was performed after 3+ hours at 23 °C, using a Die C dumbbell and 20 in/min cross head speed.

[4] Tear testing was performed after 3+ hours at 23 °C, using a Die C tear specimen and a 20 in/min cross head speed.

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%	2.8	Mineral oil (Light)	< 1.0
Acetone	37	Mineral oil (Heavy)	< 1.0
Bleach ~5% NaOCl	2.0	Salt Water (3.5% NaCl)	< 1.0
Butyl Acetate	40	Skydrol 5	1.1
Diesel Fuel	4.2	Sodium Hydroxide solution (0.025% PH 10)	< 1.0
Diethyl glycol Monomethyl Ether	29	Strong Acid (HCl conc)	< 1.0
Hydraulic Oil	2.1	Tripropylene glycol monomethyl ether	23
Hydrogen peroxide (3%)	2.2	Water	< 1.0
Isooctane (aka gasoline)	3.5	Xylene	< 1.0
Isopropyl Alcohol	26		

SPECIALTY RESIN

High Temp

Resin for for Heat Resistance

High Temp Resin offers a heat deflection temperature (HDT) of 238 °C @ 0.45 MPa, the highest among Formlabs resins. Use it to print detailed, precise prototypes with high temperature resistance.

Hot air, gas, and fluid flow

Heat resistant mounts, housings, and fixtures

Molds and inserts

V2 **FLFLGR02**

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

formlabs

Prepared	10 . 07 . 2020
Rev	01 - 10 . 07 . 2020

MATERIAL PROPERTIES DATA

High Temp Resin

	METRIC [1]			IMPERIAL [1]			METHOD
	Green[2]	Post-Cured [3]	Post-Cured + additional Thermal Cure [4]	Green[2]	Post-Cured [3]	Post-Cured + additional Thermal Cure [4]	
Tensile Properties							
Ultimate Tensile Strength	21 MPa	58 MPa	49 MPa	3031 psi	8456 psi	7063 psi	ASTM D638-14
Tensile Modulus	0.75 GPa	2.8 GPa	2.8 GPa	109 ksi	399 ksi	406 ksi	ASTM D638-14
Elongation at Break	14%	3.3%	2.3%	14%	3.3%	2.3%	ASTM D638-14
Flexural Properties							
Flexural Strength at Break	24 MPa	95 MPa	97 MPa	3495 psi	13706 psi	14097 psi	ASTM D 790-15
Flexural Modulus	0.7 GPa	2.6 GPa	2.8 GPa	100 ksi	400 ksi	406 ksi	ASTM D 790-15
Impact Properties							
Notched IZOD	33 J/m	18 J/m	17 J/m	061 ft-lbf/in	0.34 ft-lbf/in	0.32 ft-lbf/in	ASTM D256-10
Temperature Properties							
Heat Deflection Temp. @ 1.8 MPa	44 °C	78 °C	101 °C	111 °F	172 °F	214 °F	ASTM D 648-16
Heat Deflection Temp. @ 0.45 MPa	49 °C	120 °C	238 °C	120 °F	248 °F	460 °F	ASTM D 648-16
Thermal Expansion	118 µm/m/ °C	80 µm/m/ °C	75 µm/m/ °C	41 µin/in/ °F	44 µin/in/ °F	41 µin/in/ °F	ASTM E 831-13

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

[2] Data was obtained from green parts, printed using Form 2, 100 µm, High Temp settings, washed for 5 minutes in Form Wash and air dried without post cure.

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

[4] Data was obtained from parts printed using a Form 2, 100 micron, High Temp settings, and post-cured with Form Cure at 80 °C for 120 minutes plus an additional thermal cure in a lab oven at 160 °C for 180 minutes.

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 size gain (%)	24 hr weight gain (%)	Solvent	24 hr size gain (%)	24 hr weight gain (%)
Acetic Acid 5%	< 1	< 1.0	Mineral oil (Light)	< 1	< 1.0
Acetone	<1	< 1.0	Mineral oil (Heavy)	< 1	< 1.0
Bleach ~5% NaOCl	< 1	< 1.0	Salt Water (3.5% NaCl)	< 1	< 1.0
Butyl Acetate	< 1	< 1.0	Skydrol 5	< 1	< 1.0
Diesel Fuel	< 1	< 1.0	Sodium Hydroxide solution (0.025% PH 10)	< 1	< 1.0
Diethyl glycol Monomethyl Ether	< 1	< 1.0	Strong Acid (HCl conc)	1.2	1.2
Hydraulic Oil	< 1	< 1.0	Tripropylene glycol monomethyl ether	< 1	< 1.0
Hydrogen peroxide (3%)	< 1	< 1.0	Water	< 1	< 1.0
Isooctane (aka gasoline)	< 1	< 1.0	Xylene	< 1	< 1.0
Isopropyl Alcohol	< 1	< 1.0			

MATERIALS LIBRARY

Jewelry

High-Detail Materials for Jewelry Design and Manufacturing

Reliably reproduce crisp settings, sharp prongs, smooth shanks, and fine surface detail with Formlabs Jewelry Resins and the world's best-selling desktop stereolithography 3D printers. Whether you are 3D printing try on pieces for customers, ready to cast custom jewelry, or masters for reusable jewelry molds, Formlabs offers a material up to the task.

*** Please note that resins may not be available in all regions.**

Castable Wax 40
Castable Wax

formlabs

JEWELRY RESIN

Castable Wax 40

From intricate bridal jewelry to large demanding pieces, Castable Wax 40 Resin offers the easiest workflow on the market for 3D printing and casting challenging, highly detailed designs.

Castable Wax 40 resin offers high detail and surface smoothness, with handling characteristics similar to blue carving wax. With a 40% wax fill and low expansion, Castable Wax 40 Resin supports a wide range of lost wax casting conditions and is compatible with leading gypsum investments.

V1 **FLCW4001** * **May not be available in all regions**

formlabs

Prepared	12 . 10 . 2020
Rev	01 - 03 . 02 . 2018

MATERIAL PROPERTIES DATA

Castable Wax 40 Resin

	METRIC [1]	IMPERIAL [1]	METHOD
	Green [2]	Green [2]	
Burnout Properties			
Temperature @ 5% Mass Loss	249 °C	480 °F	ASTM E 1131
Ash content (TGA)	0.0 - 0.1 %	0.0 - 0.1 %	ASTM E 1131

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

[2] Data was obtained from green parts, printed using Form 3, 50 µm, Castable Wax 40 Resin settings, without post-cure.

CASTABLE WAX 40 BURNOUT SCHEDULE 2021

The following burnout schedule is designed to help reduce thermal expansion of resin in the mold, while ensuring a complete burnout for thick jewelry parts. Formlabs recommends Certus Prestige Optima™ investment powder.

Use this schedule as a starting point and make adjustments as needed.

Learn how to fine tune burnout and investment preparation for best performance on the support page.

		PHASE	TIME	SCHEDULE °C	SCHEDULE °F
	Heated Bench Rest Place flasks into oven for heated drying after investment set period (30-60 min). Elevated temperature melts solid wax in resin to reduce expansion.	Hold	180 minutes	55 °C	131 °F
A	**Thermal Transition** Wax sprue melts out, increasing airflow to the resin pattern. Wax in resin diffuses out into investment. Burnout begins gently, breaking down pattern without forceful expansion.	Ramp	48 minutes	2 °C / min	3.6 °F / min
		Hold	180 minutes	150 °C	302 °F
		Ramp	75 minutes	2.0 °C / min	3.6 °F / min
		Hold	180 minutes	300 °C	572°F / min
B	**Burnout** Eliminates the remaining resin and ash in the investment.	Ramp	108 minutes	4.0 °C / min	7.2 °F / min
		Hold	180 minutes	732 °C	1350 °F
C	**Casting Temperature** Cool the flask to casting temperature of the selected metal.	Ramp	44 minutes	- 5 °C / min	- 9 °F / min
		Casting Window	Up to 2 hours	Desired casting temp	Desired casting temp

Washing Info:
Wash Castable Wax 40 prints in isopropyl alcohol (IPA) for 5 minutes. Rinse for 5 minutes in a second, cleaner IPA bath to eliminate any remaining uncured material. Fully dry parts with compressed air. Do not use TPM to wash.

Post-Curing Info:
Post-curing is not required for bulky Castable Wax 40 prints, but can increase handling strength if desired. Cure parts for up to 30 minutes with no heat.

JEWELRY RESIN

Castable Wax

Sharp Detail and Clean Casting Every Time

A 20% wax-filled photopolymer for reliable casting with zero ash content and clean burnout, Castable Wax Resin accurately captures intricate features and offers the smooth surfaces stereolithography 3D printing is known for.

V1 **FLCWPU01** * **May not be available in all regions**

formlabs

Prepared	07 . 05 . 2018
Rev	01 - 07 . 05 . 2018

MATERIAL PROPERTIES DATA

Castable Wax Resin

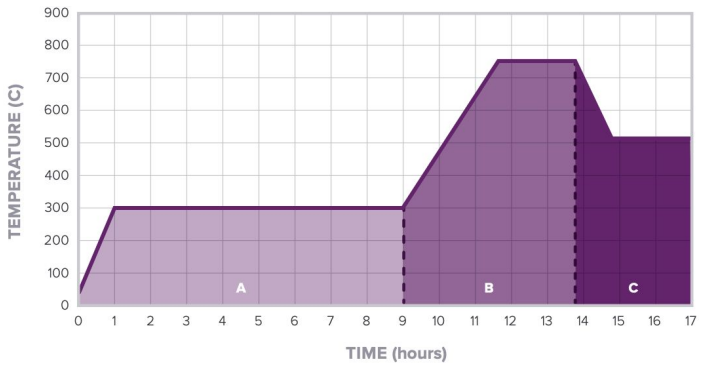
	METRIC [1]	IMPERIAL [1]	METHOD
	Green [2]	Green [2]	
Tensile Properties			
Ultimate Tensile Strength	12 MPa	1680 psi	ASTM D 638-10
Tensile Modulus	220 MPa	32 ksi	ASTM D 638-10
Elongation at Break	13%	13%	ASTM D 638-10
Burnout Properties			
Flexural Strength	249 °C	480 °C	ASTM E 1131
Flexural Modulus	0.0 - 0.1%	0.0 - 0.1%	ASTM E 1131

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

[2] Data was obtained from parts printed using Form 2, Castable 50 µm Fine Detail settings and washed without post-cure.

STANDARD BURNOUT SCHEDULE

The Standard Burnout Schedule is designed to provide the maximum possible investment strength and complete burnout of the finest details using Certus Prestige Optima or similar investment materials. Use this schedule as a starting point and make adjustments as needed.



	PHASE	TIME	SCHEDULE °C	SCHEDULE °F
A	Insert Flasks	0 min	21 °C	70 °F
	Ramp	60 min	4.7 °C / min	8.4 °F / min
	Hold	480 min	300 °C	572 °F
B	Ramp	100 min	4.5 °C / min	8.1 °F / min
	Hold	180 min	750 °C	1382 °F
C	Ramp	60 min	- 4.0 °C / min	- 7.1 °F / min
	Casting Window	Up to 2 hours	512 °C (or desired casting temp)	954 °F (or desired casting temp)

Post-Curing Info:
No post-cure required.