

【Phrozen Resin User Guide】

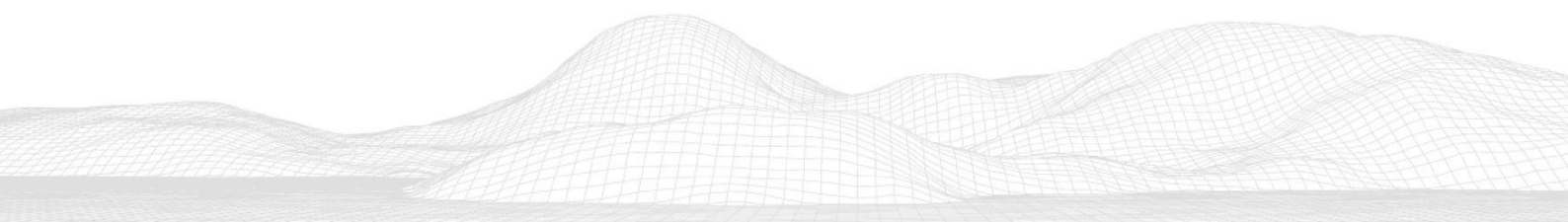
Elastomer Resin: EL400, Gray

Outline

Before printing the perfect object, it is important to first understand the material limitations we are handling and how it can be successfully printed under various conditions. With this in mind, Phrozen provides the following design suggestions to help you better understand the properties of each material and how you can best utilize them to bring your wildest creation to life.

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Section 1

TDS

General Properties	Norm	Typical values	
Appearance	-	Gray	
Viscosity, 30	BROOKFIELD Viscometer(LV)	2300–3000 cps	
Density (liquid resin)	ASTM D4052-18a	1.04 g/cm ³	
Tensile Properties	Norm	Typical values	
		UV post-cured	UV +Thermal
Tensile Strength at Break	ASTM D412	6.3 MPa	10.5 MPa
Elongation at Break	ASTM D412	391 %	357 %
Tear Strength	ASTM D624	31 kN/m	39.1 kN/m
Resilience testing	Norm	Typical values	
		UV post-cured	UV +Thermal
Rebound Resilience	ASTM D7121	40 - 45 %	50 - 55%
Ross Flex	ASTM D1052	-	>60,000
Hardness	Norm	Typical values	
		UV post-cured	UV post-cured
Shore A	ASTM D2240	70–75A	73–75A

** All testing specimens are printed using Phrozen Sonic Mighty 8K or Sonic Mini 8K, and post-cured using Phrozen Cure & Wash.*

** Regular UV post-curing for 60 minutes and additional thermal post-cure of 2h at 80°C*

** Heat curing can improve mechanical properties but also increase the risk of deformation.*

•Specimens are printed unless stated otherwise. The information in this TDS including product recommendations, is based on our current knowledge and experience.

Descriptions, drawings, photographs, data, proportions, weights, etc. provided may change without notice and do not establish the product's contractual quality.

Request the relevant MSDS from your supplier or contact Phrozen Tech Co., Ltd at sales@phrozen3d.com

Section 2

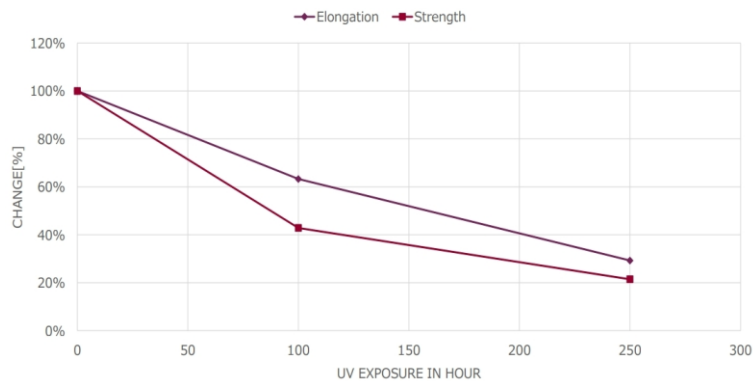
Long-Term Exposure Test

Durability is a desired key feature for the components utilized within many industries, as they expect the materials used to withstand years of exposure to the elements. However, through the effects of UV radiation, variation in temperatures, and exposure to moisture, photopolymers can degrade over time. The degree of degradation highly depends on the duration and intensity of the continued exposure.

Test Method and Specimens

According to ISO 4892-2:2013, xenon arc light was used to simulate sunlight, and testing was conducted with ASTM D412 Die C specimens.

Mechanical Testing



Change in mechanical properties after accelerated weathering.

Section 3

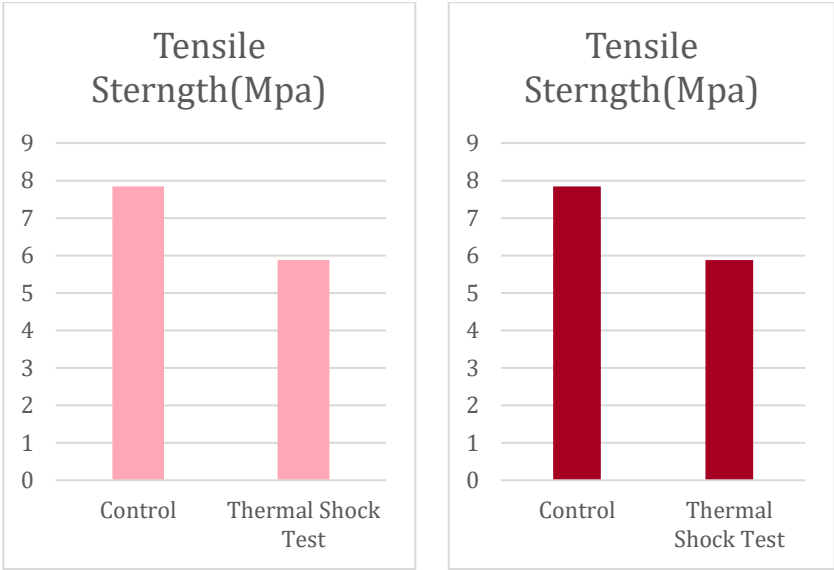
Thermal Shock Test

Test Method and Specimens

ASTM 412 Die C specimen with following conditions, conduct the test immediately after the cycle is accomplished. The test will reveal the changes in mechanical properties under extreme environmental conditions.

Thermal Shock Test:

- Low Temperature:-40°C,0.5hour
- High Temperature:85°C,0.5hour
- Temperature Transition Time:5minutes
- Total Cycles: 10 Cycles



Section 4

Printing

Printing Parameters

Printer	Sonic mini / Sonic mini 4K
Layer Height	100 μm
Exposure Time	11 ± 1
Bottom Exposure Time	22.5 ± 2.5
Light-off Delay	16.5 ± 3.5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mini 8K
Layer Height	100 μm
Exposure Time	12.5 ± 2.5
Bottom Exposure Time	22.5 ± 2.5
Light-off Delay	9 ± 1
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mini 8K S
Layer Height	100 μm
Exposure Time	11 $\pm$ 2
Bottom Exposure Time	22.5 $\pm$ 2.5
Light-off Delay	9 $\pm$ 1
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 4K
Layer Height	100 μm
Exposure Time	15 $\pm$ 2
Bottom Exposure Time	27.5 $\pm$ 2.5
Light-off Delay	21 $\pm$ 4
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 8K
Layer Height	100 μm
Exposure Time	12.5 $\pm$ 2.5
Bottom Exposure Time	27.5 $\pm$ 2.5
Light-off Delay	11.5 $\pm$ 3.5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 12K (Upgrade Kit)
Layer Height	100 μm
Exposure Time	12.5 $\pm$ 2.5
Bottom Exposure Time	27.5 $\pm$ 2.5
Light-off Delay	11.5 $\pm$ 3.5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty Revo 14K
Layer Height	100 μm
Exposure Time	12.5 $\pm$ 2.5
Bottom Exposure Time	27.5 $\pm$ 2.5
Light-off Delay	12 $\pm$ 5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty Revo 16K (Upgrade Kit)
Layer Height	100 μm
Exposure Time	10 $\pm$ 0.5
Bottom Exposure Time	27.5 $\pm$ 2.5
Light-off Delay	12 $\pm$ 5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mega 8K*
Layer Height	100 μm
Exposure Time	15 ± 2
Bottom Exposure Time	32.5 ± 2.5
Light-off Delay	14 ± 6
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mega 8K S*
Layer Height	100 μm
Exposure Time	11 ± 2
Bottom Exposure Time	22.5 ± 2.5
Light-off Delay	15 ± 5
Lift Distance	10 mm
Lifting Speed	45 mm/min

Printer	Sonic Mega 8K V2*
Layer Height	100 μm
Exposure Time	12.5 ± 2.5
Bottom Exposure Time	32.5 ± 2.5
Light-off Delay	14 ± 6
Lift Distance	10 mm
Lifting Speed	45 mm/min

- ♦ Sonic Mega 8K / Mega 8K S / Mega 8K V2 has a higher peeling force. Therefore, a longer exposure time is necessary to increase the success rate.
- ♦ Be sure to cover the hood when printing to maintain the best printing condition of the resin.

Cleaning

1. After removing the printed object from the building plate, use the Phrozen Wash and Cure Kit for post-processing.
2. Soak the object in the Washing Station filled with 95% ethanol for 45–60 seconds to remove uncured resin from the surface. Do not soak models in solvent for more than 60 seconds as it may damage model surfaces. Make sure to clean the inner parts of hollow objects completely.
3. After thoroughly cleaning the object, leave it in a cool, well-ventilated place for at least 30 minutes. Alternatively, you may gently use a compressed air gun to dry the printed object.

*When printing flat on the building plate, remove the printed objects carefully to avoid deformation on the objects.

Post-Curing

1. Use Phrozen post-curing stations (Phrozen Wash & Cure Kit / Phrozen Cure Mega S) or other post-curing lamps with the same wavelength to cure printed objects.
2. Soak the models in glycerin and post-cure for about 60 minutes. Once completed, remove from glycerin immediately and clean up the models with water. Leave models in a cool, well-ventilated place for at least 60 minutes without exposure to light to dry.
3. If required, an additional thermal post-cure at 80°C for 2 hours can be performed to enhance the mechanical properties of the models.

Section 5

Suggestions for Printing

Before Use

Due to the high viscosity of the resin, thoroughly shake the resin before pouring it into the container to ensure a uniform distribution of the colorant.

Print Settings

1. The recommended printing thickness is 100 μm .
2. The model wall thickness needs to be 1.5 mm or more.
3. It is recommended to slow down the lifting and return speed, and increase the rest time. The return speed should be adjusted according to the type of model, with a recommended setting of 120–150 mm/min.
4. The recommended support thickness setting is 1.0 mm / 1.2 mm or more.
5. It's recommended to print models directly on the build plate to minimize deformation.
6. Please note that if the space between supports or within the model's structure is too small, the resin may solidify within the gaps.

Post Processing:

1. Soaking in glycerin can help improve the structural integrity of soft materials and reduce the stickiness of post-cured object surfaces.
2. After curing, the object should be promptly cleaned thoroughly. Please avoid soaking the models in any liquid (including alcohol, glycerin, and water) for a prolonged period (>60 minutes) to avoid absorption of liquid that may cause expansion and deformation.
3. Please make sure that there is space between the models when soaked in glycerin to prevent models from sticking together.
4. Thermal post-curing can help improve the mechanical properties of the material, especially the tensile and tear strength, but may reduce ductility. Please refer to the laboratory test data on the TDS at the beginning of this document. Choose the appropriate secondary post-curing method according to your application requirements and needs.