Phrozen Resin User Guide

Engineering Resin: TR300, 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.

Table of Contents

Section 1
TDS

General Properties	Norm	Typical values		
Appearance	-	Gray		
Viscosity	BROOKFIELD Viscometer(LV)	110 - 160 mPas		
Density (liquid resin)	ASTM D4052-18a	1.17 g/cm³		
Tensile Properties	**Norm**	**Typical values**		
		UV post-cured	UV +Thermal (150°C)	UV +Thermal (200°C)
Tensile Strength at Break	ASTM D638	56.5	88.6	87.7
Tensile Modulus	ASTM D638	2745.4	4671.3	4883.3
Elongation at Break	ASTM D638	4.5	2.6	2.2
Impact Properties	**Norm**	**Typical values**		
		UV post-cured	UV +Thermal (150°C)	UV +Thermal (200°C)
Notched Izod	ASTM D256	20.1	31.5	31.8
Thermal Properties	**Norm**	**Typical values**		
		UV post-cured	UV +Thermal (150°C)	UV +Thermal (200°C)
HDT at 0.45 MPa	ASTM D648	65	149	160
Hardness	**Norm**	**Typical values**		
		UV post-cured	UV +Thermal (150°C)	UV +Thermal (200°C)
Shore D	ASTM D2240	80D	80 - 85D	80 - 85D

* All testing specimens are printed using Phrozen Sonic Mighty 8K or Sonic Mini 8K, and post-cured using Phrozen Wash & Cure.
* Regular UV post-curing for 30 minutes and additional thermal post-cure of 1h at 150°C / 200°C
* Heat curing can improve mechanical properties but also increase the risk of deformation.

Section 2

Printing

Printing Parameters

Printer	Sonic Mini / Sonic Mini 4K
Layer Height	50 μm
Exposure Time	1.8 ± 0.3
Bottom Exposure Time	20 ± 5
Light-off Delay	10 s
Lift Distance	6 mm
Lifting Speed	60 mm/min

Printer	Sonic Mini 8K
Layer Height	50 μm
Exposure Time	2.2 ± 0.4
Bottom Exposure Time	20 ± 5
Rest Time After Retract	2 s
Lift Distance	6 mm
Lifting Speed	60 mm/min

Printer	Sonic Mini 8K S
Layer Height	50 μm
Exposure Time	2 ± 1
Bottom Exposure Time	11 ± 4
Rest Time After Retract	2 s
Lift Distance	6 mm
Lifting Speed	60 mm/min

Printer	Sonic Mighty 4K
Layer Height	50 μm
Exposure Time	1.8 ± 0.3
Bottom Exposure Time	20 ± 5
Light-off Delay	13 s
Lift Distance	8 mm
Lifting Speed	60 mm/min

Printer	Sonic Mighty 8K
Layer Height	50 μm
Exposure Time	2.2 ± 0.4
Bottom Exposure Time	20 ± 5
Rest Time After Retract	2 s
Lift Distance	8 mm
Lifting Speed	60 mm/min

Printer	Sonic Mighty 12K (Upgrade Kit)
Layer Height	50 μm
Exposure Time	2 ± 0.5
Bottom Exposure Time	35 ± 5
Rest Time After Retract	2 s
Lift Distance	8 mm
Lifting Speed	60 mm/min

Printer	Sonic Mighty Revo
Layer Height	50 μm
Exposure Time	1.7 ± 0.3
Bottom Exposure Time	30 ± 5
Rest Time After Retract	3 s
Lift Distance	8 mm
Lifting Speed	60 mm/min

Printer	Sonic Mega 8K*
Layer Height	50 μm
Exposure Time	2.5 ± 0.5
Bottom Exposure Time	22.5 ± 2.5
Rest Time After Retract	3 s
Lift Distance	8 mm
Lifting Speed	45 mm/min

Printer	Sonic Mega 8K S
Layer Height	50 μm
Exposure Time	1.5 ± 0.5
Bottom Exposure Time	22.5 ± 2.5
Rest Time After Retract	3 s
Lift Distance	8 mm
Lifting Speed	60 mm/min

Printer	Sonic Mega 8K V2
Layer Height	50 μm
Exposure Time	1.5 ± 0.5
Bottom Exposure Time	32.5 ± 2.5
Rest Time After Retract	3 s
Lift Distance	8 mm
Lifting Speed	60 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 stage, use the Phrozen Wash & Cure Kit for post-processing.
2. Soak the object in Phrozen Washing Station filled with 95% alcohol for 45–60 seconds to remove uncured resin from the surface. Do not soak models for more than 60 seconds in alcohol (or other solvent such as IPA), as it may damage the surfaces.
3. Make sure to clean the inner parts of hollow objects completely.
4. After the object has been thoroughly cleaned, leave it in a cool, well-ventilated place for at least 30 minutes without exposure to light. Alternatively, you may gently apply compressed air 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 equipment (Phrozen Curing Station, Phrozen Mega Cure S) or other post-curing equipment with the same wavelength to cure printed objects.
2. The hot air circulation oven used in the Phrozen laboratory, with a temperature control accuracy of ±0.1℃ and a uniformity of ±3%, model: JA-72.
3. Regular UV post-curing for 60 minutes and additional thermal post-cure of 1h at 150°C / 200°C.

Section 4

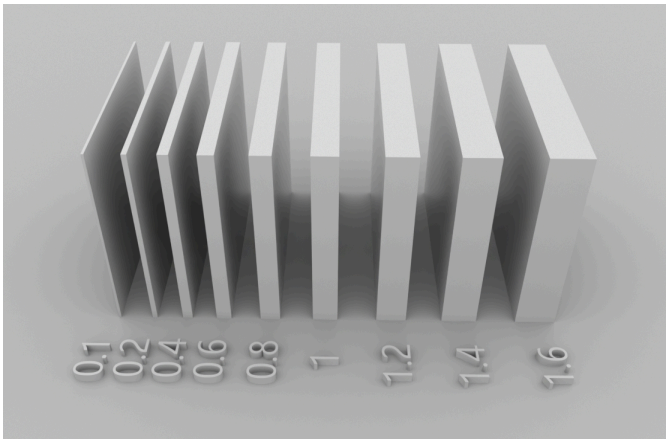
Design Specifications

※Note: All indicators are limited to each resin; the value will vary with different machines and environmental conditions.※

Minimum Unsupported Wall Thickness

This indicator shows the minimum wall thickness that can be printed independently with no support without causing any bending or breaking.

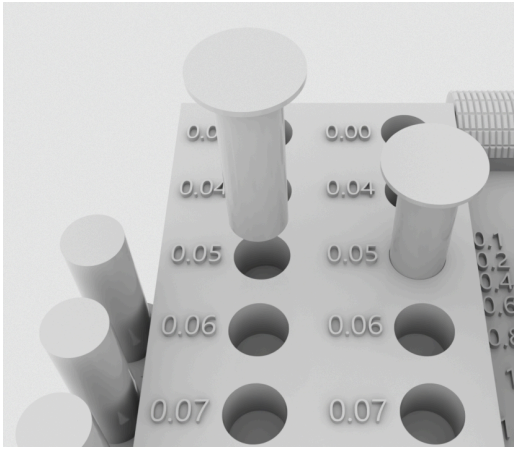
Recommended thickness: ≥ 0.4 mm



Size Tolerance, X-Y plane

This indicator shows the minimum dimensional tolerance between the hole and the column parallel to the XY plane.

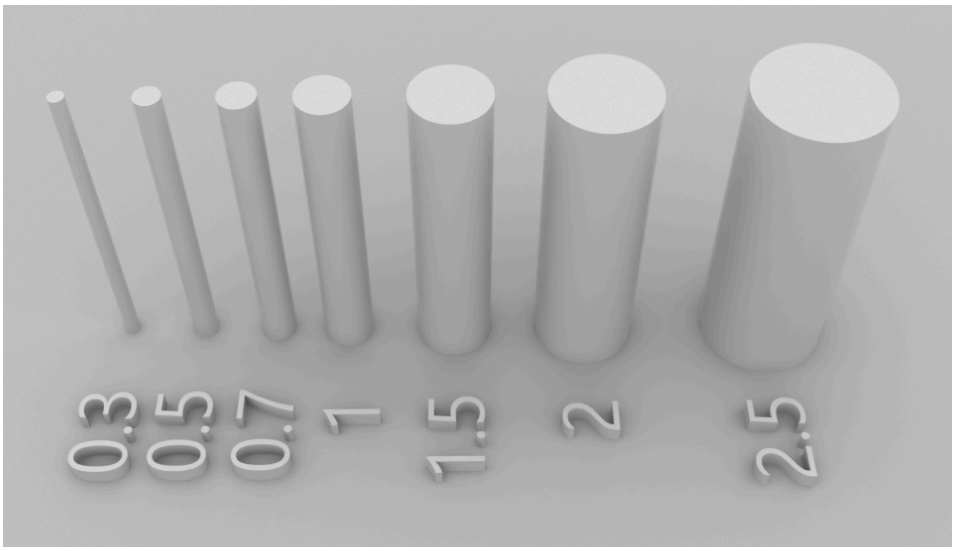
Recommended tolerance: ≥ 0.04 mm



Minimum Pin Diameter

This indicator shows the minimum column diameter of pillars and supports that can be printed independently without bending or breaking.

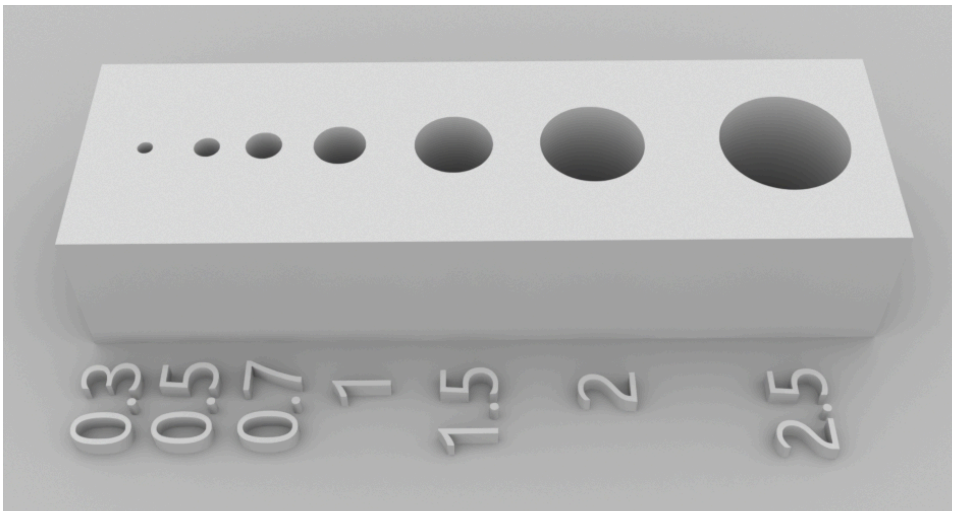
Recommended diameter: ≥ 0.7 mm



Minimum Hole Diameter, X-Y plane

This indicator shows the minimum hole diameter that can be successfully printed parallel to the XY plane.

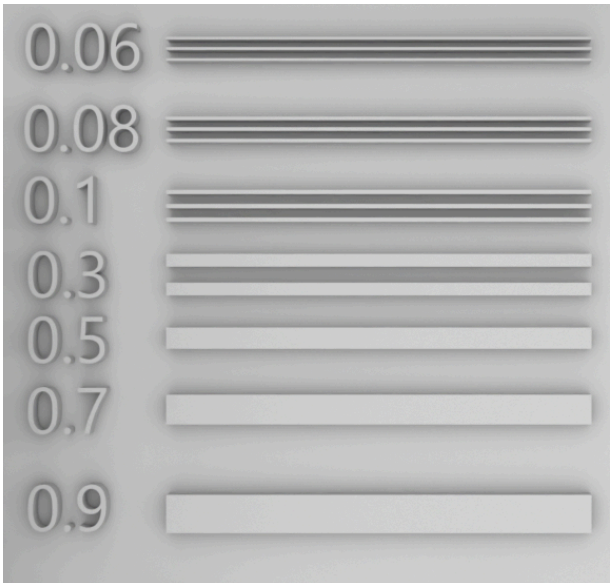
Recommended diameter: ≥ 0.7 mm



Minimum Embossed Detail Width, X-Y plane

This indicator shows the minimum line width that can successfully be printed with embossed details.

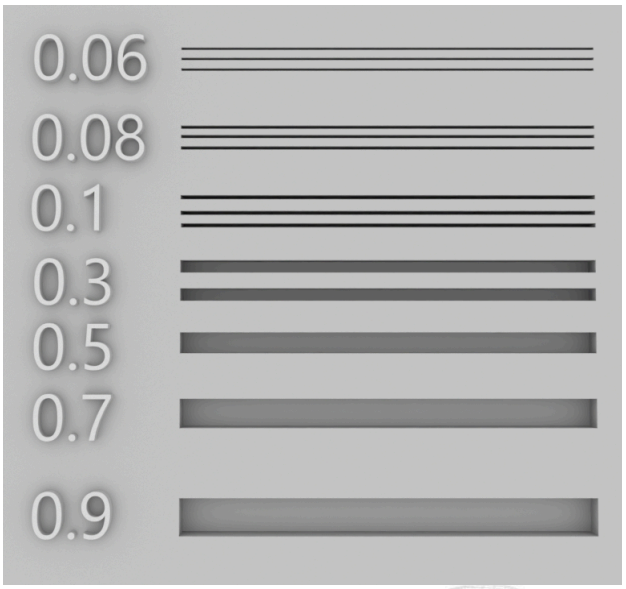
Recommended width: ≥ 0.1 mm



Minimum Engraved Detail Width, X-Y plane

This indicator shows the minimum line width that can successfully be printed with engraved details.

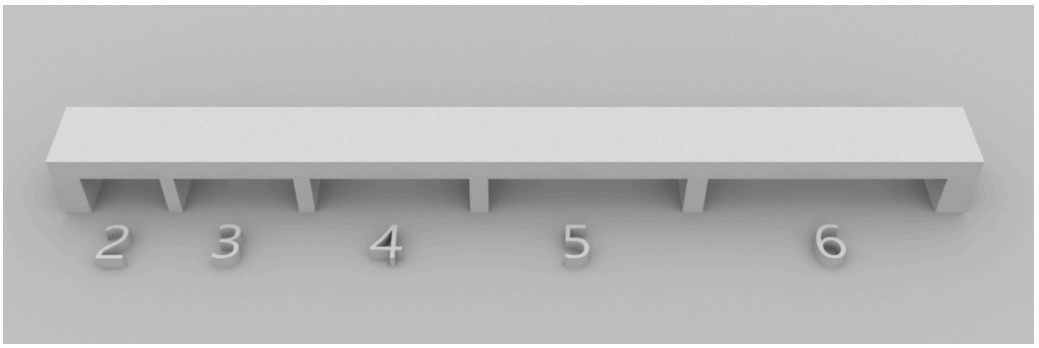
Recommended width: ≥ 0.1 mm



Maximum Horizontal Bridge Span

This indicator shows the maximum width between the supporting walls that can be printed without deforming the bridge.

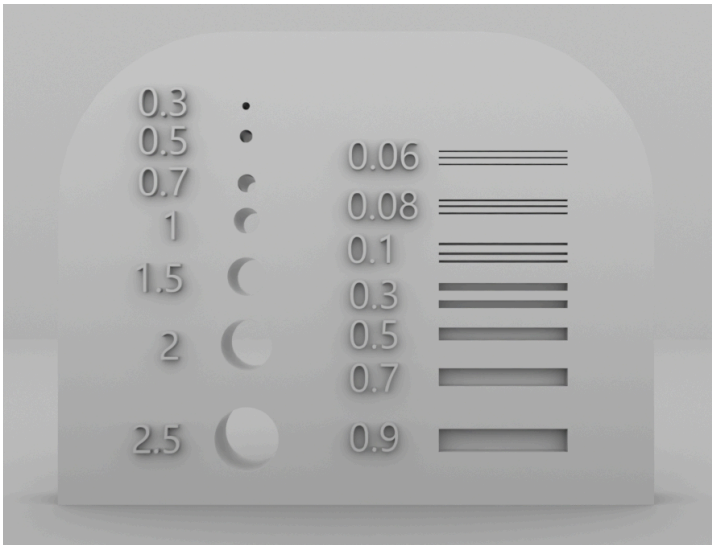
Recommended width: ≤ 6 mm



Minimum Hole Diameter and Engraved Detail Width, Z-Axis, at 0.05mm Layer Height

This indicator shows the minimum hole diameter and engraving groove width that can be successfully printed on the Z-axis with a layer thickness of 0.05mm.

Recommended diameter: ≥ 0.7 mm
Recommended width: ≥ 0.06 mm



Block Shrinkage Test, at 0.05 mm Layer Height

This indicator shows the possible deformation for a 2x2x1 cm cuboid printed parallel to the XY plane. A Vernier caliper is used to measure the cuboid after post-curing to calculate the shrinkage rate. (This test result is only for reference purposes. Different machines and models may affect results.)

Calculation method: [(Cured size-Original size) / Original size] x 100%
X-Axis Recommended Shrinkage Rate: -0.6%
Y-Axis Recommended Shrinkage Rate: -0.3%
UV +Thermal(200°C)