phrozen

Phrozen Resin User Guide

Aqua-Clear Plus

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	-	Clear with slight yellow tone
Viscosity, 30	BROOKFIELD Viscometer(LV)	200 - 350 cps
Density (liquid resin)	ASTM D4052-18a	1.09 g/cm³
Tensile Properties	**Norm**	**Typical values (UV post-cured)**
Tensile Strength at Break	ASTM D638	34 MPa
Tensile Modulus	ASTM D638	2277.3 MPa
Elongation at Break	ASTM D638	13.6 %
Impact Properties	**Norm**	**Typical values (UV post-cured)**
Notched Izod (Machined), 23 °C	ASTM D256	42.9 J/m
Thermal Properties	**Norm**	**Typical values (UV post-cured)**
HDT at 0.45 MPa	ASTM D648	47.9 °C
Hardness	**Norm**	**Typical values (UV post-cured)**
Shore D	ASTM D2240	75–80 D

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

Section 2

Printing

Printing Parameters

Printer	Sonic Mini / Sonic Mini 4K
Layer Height	50 μm
Exposure Time	10 ± 1 s
Bottom Exposure Time	30 ± 5 s
Light-off Delay	13.5 ± 1.5 s
Lift Distance	7 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mini 8K
Layer Height	50 μm
Exposure Time	10.5 ± 1 s
Bottom Exposure Time	25 ± 5 s
Rest Time After Retract	4 ± 1 s
Lift Distance	7 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mini 8K S
Layer Height	50 μm
Exposure Time	9 ± 1s
Bottom Exposure Time	12.5 ± 2.5s
Rest Time After Retract	7 ± 1 s
Lift Distance	7 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 4K
Layer Height	50 μm
Exposure Time	10 ± 1 s
Bottom Exposure Time	30 ± 5 s
Light-off Delay	13.5 ± 1.5 s
Lift Distance	9 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 8K
Layer Height	50 μm
Exposure Time	11 ± 1 s
Bottom Exposure Time	30 ± 5 s
Rest Time After Retract	4 ± 1 s
Lift Distance	9 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty 12K (Upgrade Kit)
Layer Height	50 μm
Exposure Time	11 ± 1 s
Bottom Exposure Time	30 ± 5 s
Rest Time After Retract	4 ± 1 s
Lift Distance	9 ± 1 mm
Lifting Speed	45 mm/min

Printer	Sonic Mighty Revo
Layer Height	50 μm
Exposure Time	9.5 ± 0.5 s
Bottom Exposure Time	40 ± 5 s
Rest Time After Retract	3 s
Lift Distance	8 mm
Lifting Speed	45 mm/min

Printer	Sonic Mega 8K*
Layer Height	50 μm
Exposure Time	12 ± 1 s
Bottom Exposure Time	7.5 ± 2.5 s
Rest Time After Retract	5 ± 1 s
Lift Distance	9 ± 1 mm
Lifting Speed	37.5 ± 7.5 mm/min

Printer	Sonic Mega 8K S*
Layer Height	50 μm
Exposure Time	9 ± 1 s
Bottom Exposure Time	4 ± 1 s
Rest Time After Retract	5 ± 1 s
Lift Distance	9 ± 1 mm
Lifting Speed	40 ± 5 mm/min

測試機台	Sonic Mega 8K V2*
層厚	50 μm
一般層曝光時間	9 ± 1 s
底層曝光時間	7.5 ± 2.5 s
靜止時間	7.5 ± 2.5 s
抬升距離	9 ± 1 mm
抬升速度	37.5 ± 7.5 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 the Washing Station filled with 95% alcohol for 45–60 seconds to remove uncured resin from the surface. Do not soak models in alcohol or other solvent (such as IPA) for more than 60 seconds, 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 lamps (Phrozen Cure / Phrozen Cure Mega S) or other post-curing lamps with the same wavelength to cure printed objects.
2. Cure the printed objects for 40–60 minutes for the best results.

※Note: Avoid direct sunlight.

Section 3

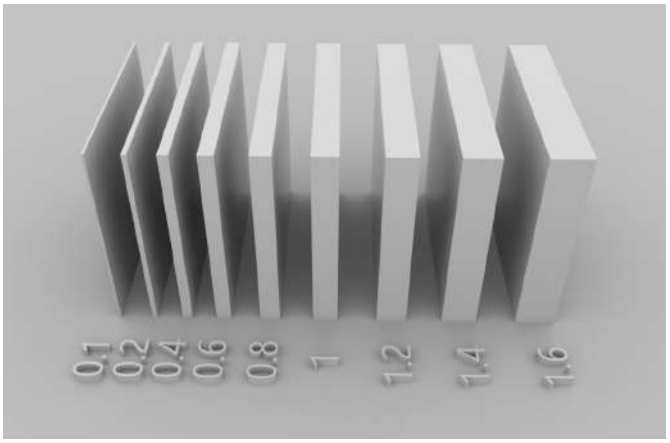
Design Specifications

※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.

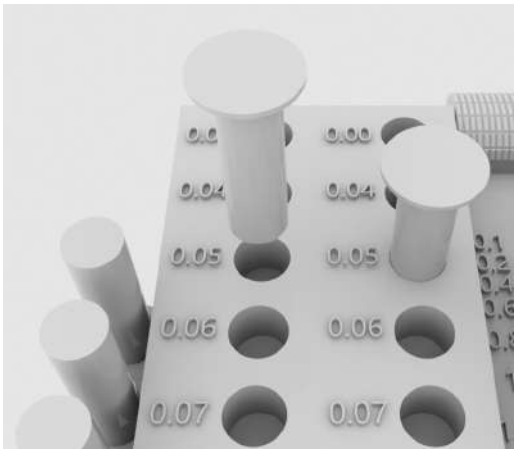
Recommended thickness：≥ 0.2 mm



Size Tolerance, X-Y Plane

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

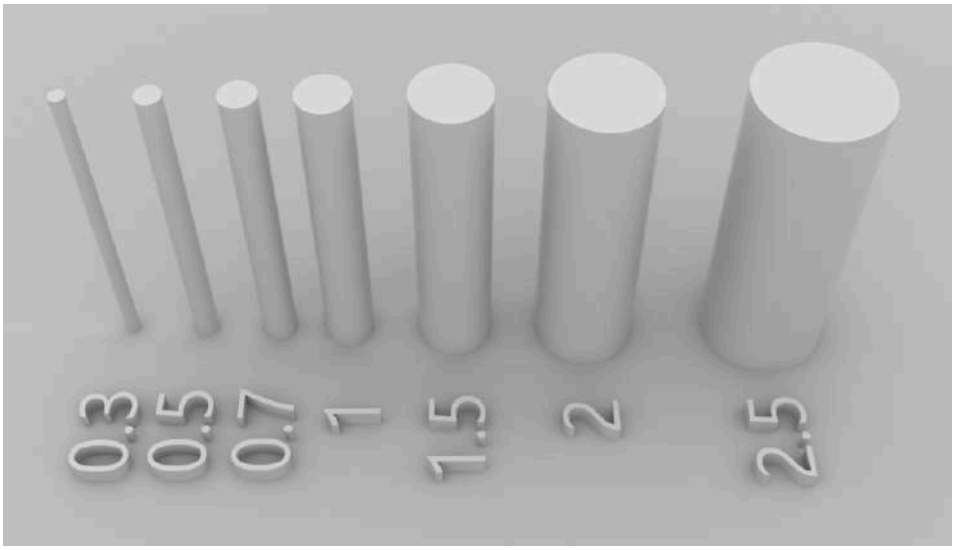
Recommended tolerance：≥ 0.04 mm



Minimum Pin Diameter

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

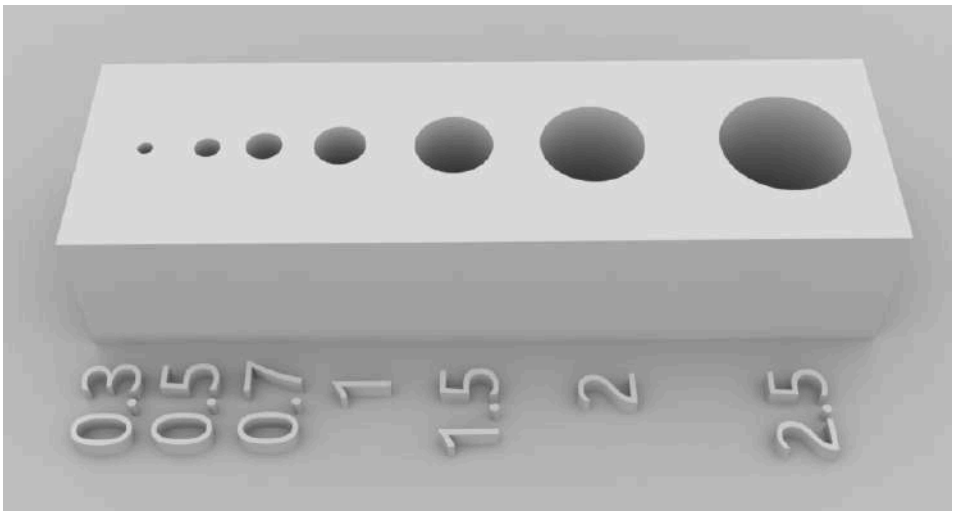
Recommended diameter: ≥ 0.3 mm



Minimum Hole Diameter, X-Y Plane

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

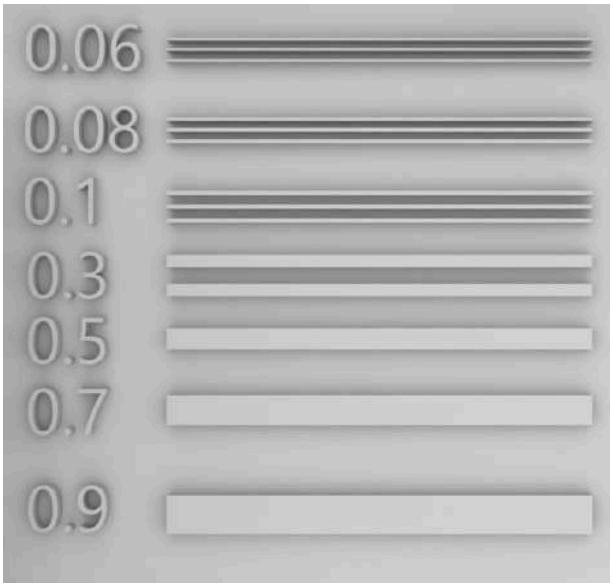
Recommended diameter: ≥ 0.7 mm



Minimum Embossed Detail Width, X-Y Plane

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

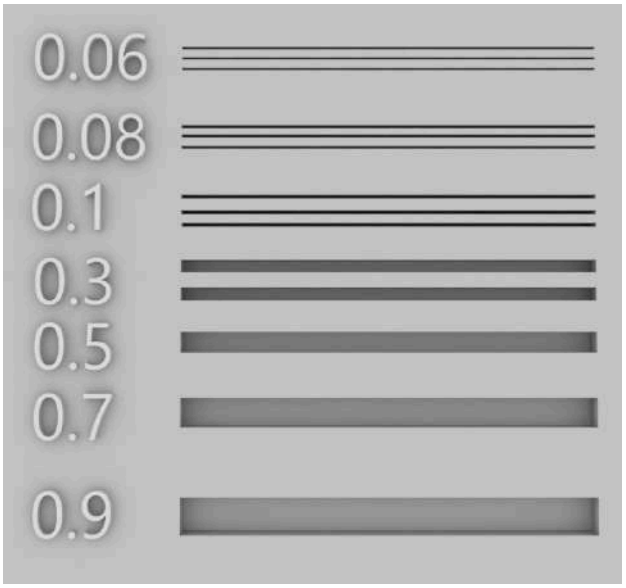
Recommended width: ≥ 0.08 mm



Minimum Engraved Detail Width, X-Y Plane

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

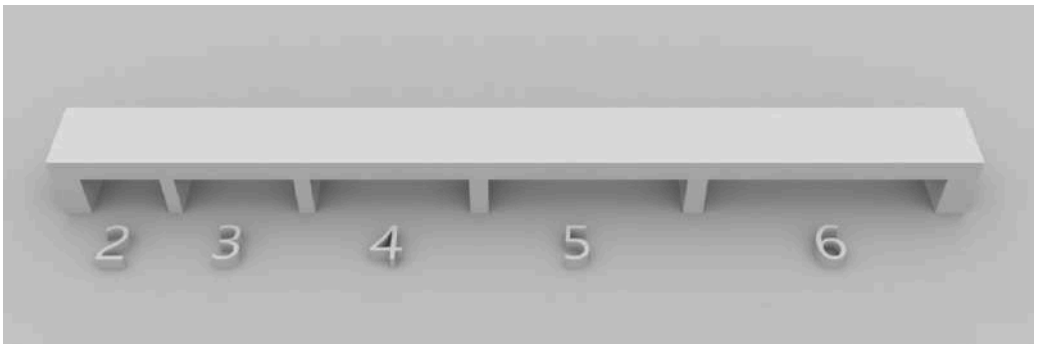
Recommended width: ≥ 0.06 mm



Maximum Horizontal Bridge Span

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

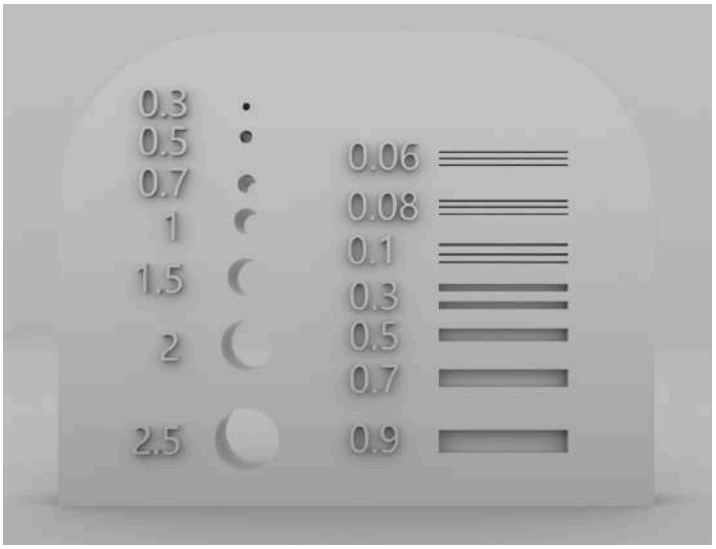
Recommended width: ≤ 6 mm



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 0.05 mm.

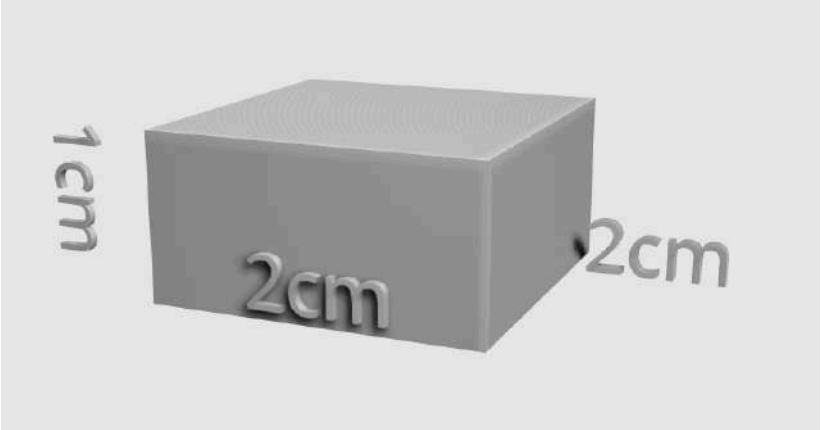
Recommended diameter: ≥ 0.7 mm
Recommended width: ≥ 0.06 mm



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: -0.25%
Y-Axis Recommended Shrinkage Rate: -0.05%



Section 4

Aesthetic Suggestions

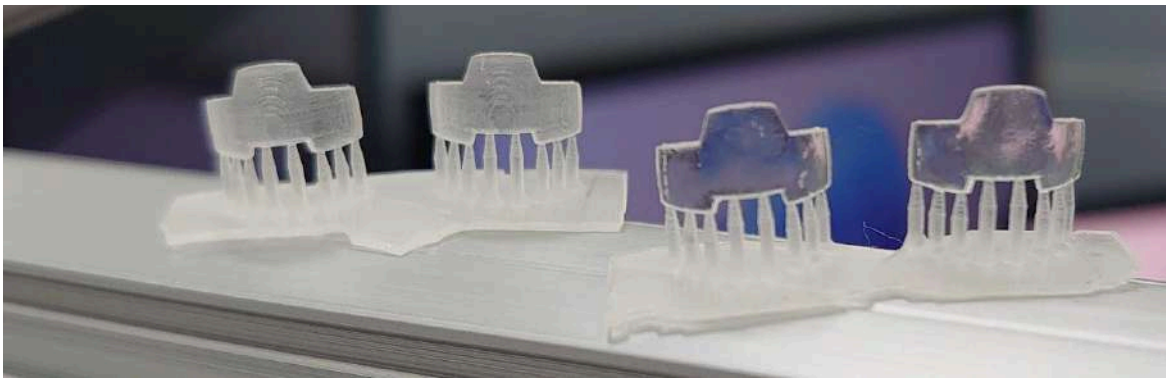
Achieving Transparency

Method 1: Resin Coat

There are 2 ways to do resin coat method:

1. After the model is washed and post-cured, apply a thin, even layer of clear resin on the clean dust-free surfaces of the model. Then, re-cure the model until it is fully dried.
2. After printing, allow the models to drip dry from the build plate without cleaning and cure directly.

※Note: Models transparency might differ based on the thickness of the clear resin applied, make sure to apply an even coat.



Method 2: Glossy Varnish

1. Thoroughly clean the object and leave it in a cool, well-ventilated place for at least 30 minutes without post-curing.
2. Spray a thin, even layer of gloss varnish over the surfaces and let it air dry.

※Note:
1. While waiting for the gloss varnish to air dry, place the model in a clean, dust-free environment to avoid dirt and dust accumulating on the surfaces.
2. The inner parts of the model might take longer to be fully cured.

Method 3: Polishing

Gently sand the model gradually with low-grit sandpaper to high-grit sandpaper until the desired effect is achieved.

※Note: Only suitable for models with smooth, texture-free surfaces.

Before

After

Reduce Bubbles

Tips on reducing the amount of bubbles trapped in the objects printed with clear resin:

1. Before printing, leave the resin on the vat for at least 30–60 minutes until the bubbles are gone.

2. Reduce the lift and return speed to 30 mm/min to minimize the formation of bubbles caused by Z-axis movement during printing.

※Note: Bubble formation is normal during resin printing, however, transparent resin makes it look more obvious compared to when printing with opaque resin. Reduce the speed of Z-axis movement to reduce bubble formation.

Reduce Resin Buildup

To reduce the possibility of resin buildup on models:

1. Increase the distance between the model and the platform.
2. Reducing support density to reduce resin buildup between support columns and scaffolding.
3. Increase rest time after retract.