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RESIN 3D PRINTING

DESIGN GUIDELINES

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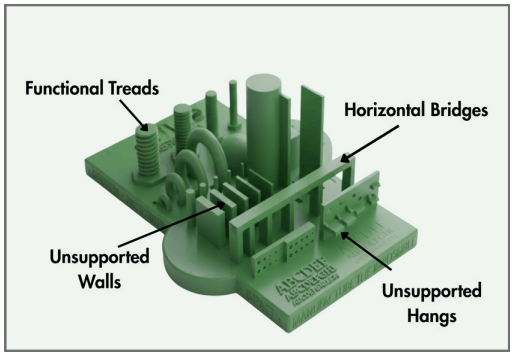
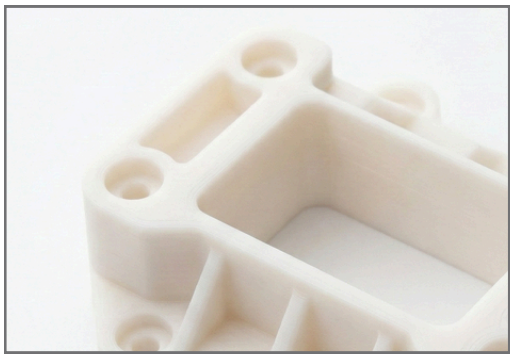
Overview – Resin

Resin 3D Printing is a high-precision process that uses projected light to cure liquid photopolymer resin layer by layer. The result is smooth surfaces, sharp detailing and dimensional accuracy suited for compact, intricate parts.



Resin 3D Printing is applied to produce fine-detailed parts with a maximum build size of 124 × 70 × 196 mm. This process supports small geometries, text features and complex shapes that require clean edges and consistent accuracy.



Wall thickness in the range of 0.8 to 1.0 mm is generally suitable for maintaining part stability and resolution. Proper orientation and support placement help reduce post-processing and improve surface quality.

Engraved or embossed features are typically defined around 0.4 mm wide and 0.4 mm high. For fine features such as holes and pins, a minimum size of 0.5 mm for holes and 0.8 mm for pins offers reliable formation and clean definition.

Dimensional accuracy is typically ± 0.2% with a minimum deviation of ± 0.13 mm, supporting consistent results for detailed, small-scale builds.

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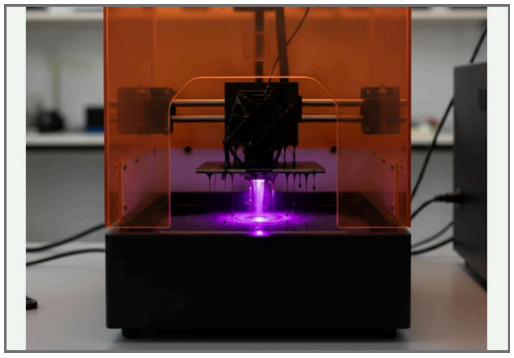
Printing Process

Every resin 3D printed part is produced through three key stages. Each stage plays a critical role in achieving the fine detail surface quality and dimensional accuracy that resin printing is known for.



Pre-Processing

The CAD model is oriented and prepared using slicing software, where supports and exposure settings are defined. Proper orientation reduces suction forces and improves surface quality during printing.

Production

Liquid photopolymer resin is cured layer by layer using projected light to form high-resolution features and smooth surfaces. The part is gradually built while maintaining dimensional accuracy and fine detail.

Post-Processing

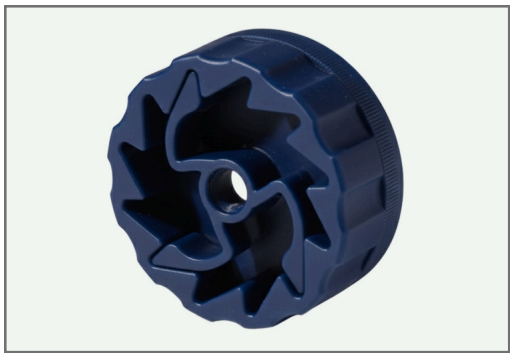
Printed parts are cleaned to remove uncured resin, supports are removed, and UV curing is performed to achieve final strength and stability. Optional finishing steps may be applied based on functional or cosmetic needs.

Tolerances

3.1 General Tolerances

Resin 3D Printing offers fine dimensional accuracy, typically around ±0.2%, with a minimum deviation of ±0.13 mm.

Maintaining uniform wall thickness and consistent orientation helps parts retain dimensional precision after curing.



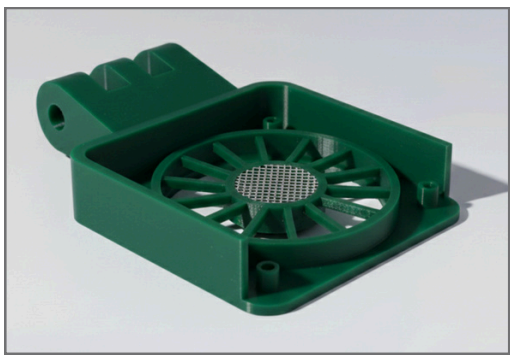
Design Tip

Allowing small clearances, generally around 0.5 mm, between mating or moving parts helps ensure smooth fitment after curing.

3.2 Wall Thickness

Wall thickness contributes to part strength and print quality. A range of 0.8 to 1.0 mm generally achieves a balance between detail resolution and mechanical stability.

Thinner sections may show slight variation during curing, while thicker areas can increase print time without significant gains in strength. Consistency across the part is key to maintaining reliable results.

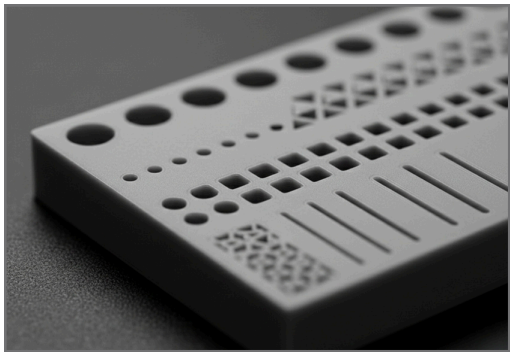


Design Tip

Slightly increasing wall thickness in areas exposed to stress or handling can enhance rigidity without affecting detail quality.

3.3 Holes

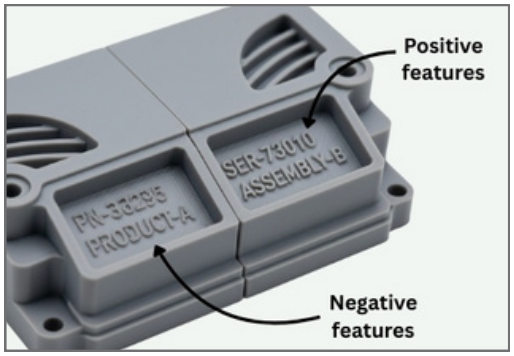
Features such as holes and micro channels can be sensitive to curing conditions.



- Very small through-holes may experience partial closure due to light overexposure.
- Printing holes perpendicular to the build platform often provides cleaner edges and more accurate results.
- For most applications, holes near 0.5 mm perform reliably across common resin materials.

3.4 Text and Small Details

Text and Small Details depend on the geometry, aspect ratio and resin type.



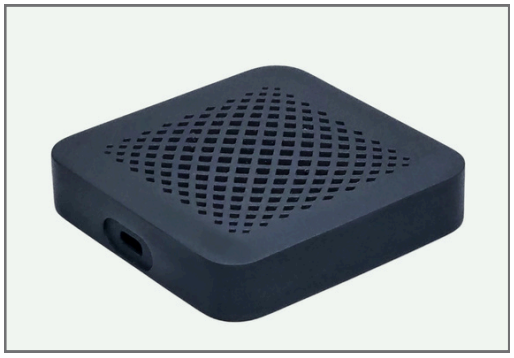
- Negative features (recessed details) typically print cleanly at around 0.4 mm.
- Positive features (raised details) are best defined at approximately 0.3–0.4 mm.

Small adjustments to design geometry and print orientation often help retain fine details while maintaining strength and visual quality.

Design Tip

When working with intricate or high-density features, orienting the part to minimize exposure overlap and ensuring even curing can significantly improve detail retention.

Features



The print quality and accuracy of fine features in Resin 3D Printing depend on several factors including material properties, orientation, and overall geometry. Resin type, exposure settings, and build direction all influence the way small features form and how consistently details are reproduced.

At Mech Power, Resin 3D Printing offers an XY resolution of approximately 50 microns, while the Z resolution is adjustable depending on the layer height selected. This balance of control supports fine feature reproduction with smooth surface finishes.

4.1 Pins & Moving Parts

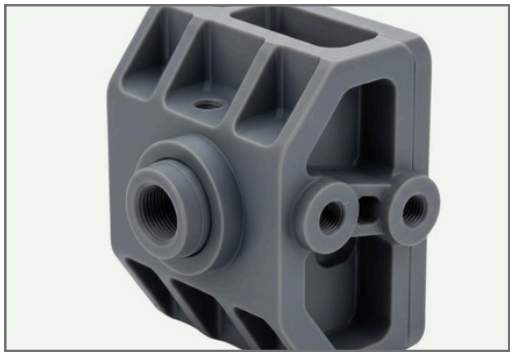
For connecting or moving features, maintaining pin diameters around 0.8 mm and clearances near 0.5 mm helps ensure motion and avoid fusion during curing.

Design Tip

Parts designed with consistent spacing across joints tend to move more freely and retain shape accuracy over time.

4.2 Fillets

Fillets are often helpful in resin printed parts to ease stress concentration and support smooth geometry transitions. Rounded edges may also reduce localized curing stress and improve surface continuity around corners and junctions.
In areas where supports attach or geometry changes abruptly, gentle fillets can contribute to cleaner surfaces and more predictable results after curing and finishing.



4.3 Orientation

Part orientation plays a significant role in resin printing, influencing surface quality, dimensional accuracy, and support interaction. Angled orientations are commonly preferred, as they can reduce peel forces during curing and help distribute supports more evenly.

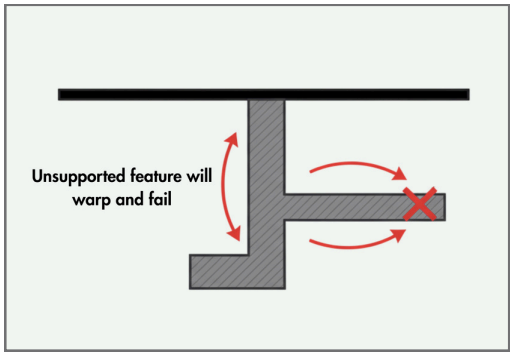
Orienting critical or cosmetic surfaces away from heavy support contact may help preserve surface appearance. Orientation decisions made early in the design stage often impact post-processing effort and overall part consistency.

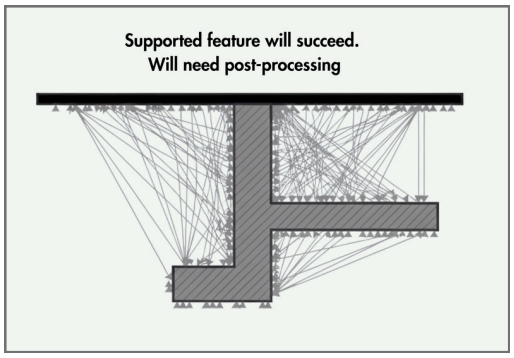
4.4 Support Considerations

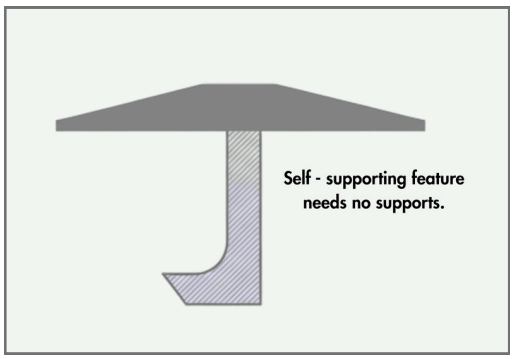
Resin 3D Printing relies on a bottom-up projection process, which requires temporary support structures to stabilize certain geometries during curing. Supports are primarily used for overhangs, islands, and undercut areas that cannot sustain themselves through the resin layers.

These supports help maintain dimensional accuracy, prevent warping, and ensure that features remain securely attached to the build platform throughout the printing process.

Support placement and density are influenced by part geometry and orientation. Designing parts with flat base surfaces or self-supporting angles can help reduce the number of supports required and minimize surface marks during removal. Angled features steeper than 30° can often print without support. Bridges spanning more than 10 mm may require light reinforcement.







Design Tip

When possible, position critical faces away from support contact areas. This helps preserve surface finish and reduces post-processing effort.

Overhangs, Bridges & Islands

Resin 3D Printing involves layer-by-layer curing, which means some geometries may need additional support depending on how they're oriented during the build. Understanding how overhangs, bridges, and islands behave helps in optimizing design and reducing unnecessary supports.

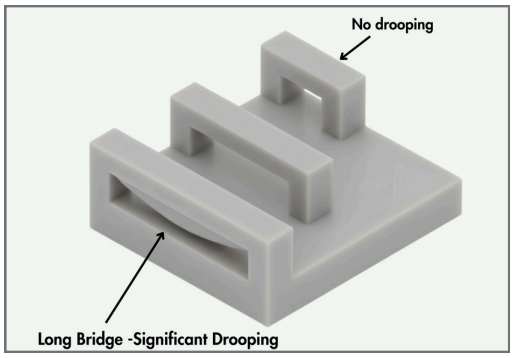
5.1 Overhangs

An overhang is a feature supported by the part only on one side.

- A horizontal overhang is fully perpendicular to the build surface, similar to the top of a "T."
- An angled overhang has some self-supporting structure, such as the arms of a "Y."

Overhangs with angles shallower than 30° often need support while steeper angles tend to build successfully without additional assistance.

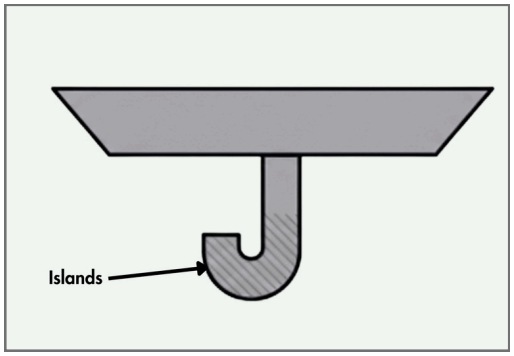
5.2 Bridges



A bridge is a feature that connects two supported points but is unsupported in the middle.

Bridges longer than around 10 mm may experience slight drooping depending on the material and exposure time. Keeping bridge spans shorter or incorporating fillets beneath them can help maintain cleaner geometry.

5.3 Islands



An island is a completely unsupported feature that begins printing in mid-air. Since islands do not attach to any previous layer, they require supports to prevent adhesion failure or detachment during printing.

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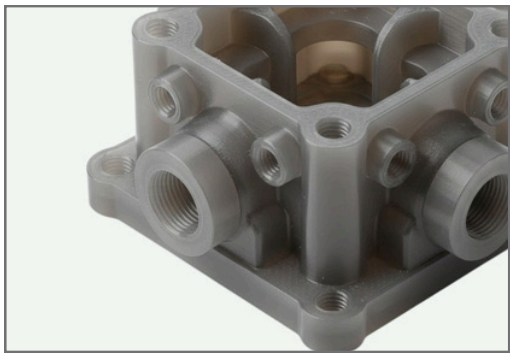
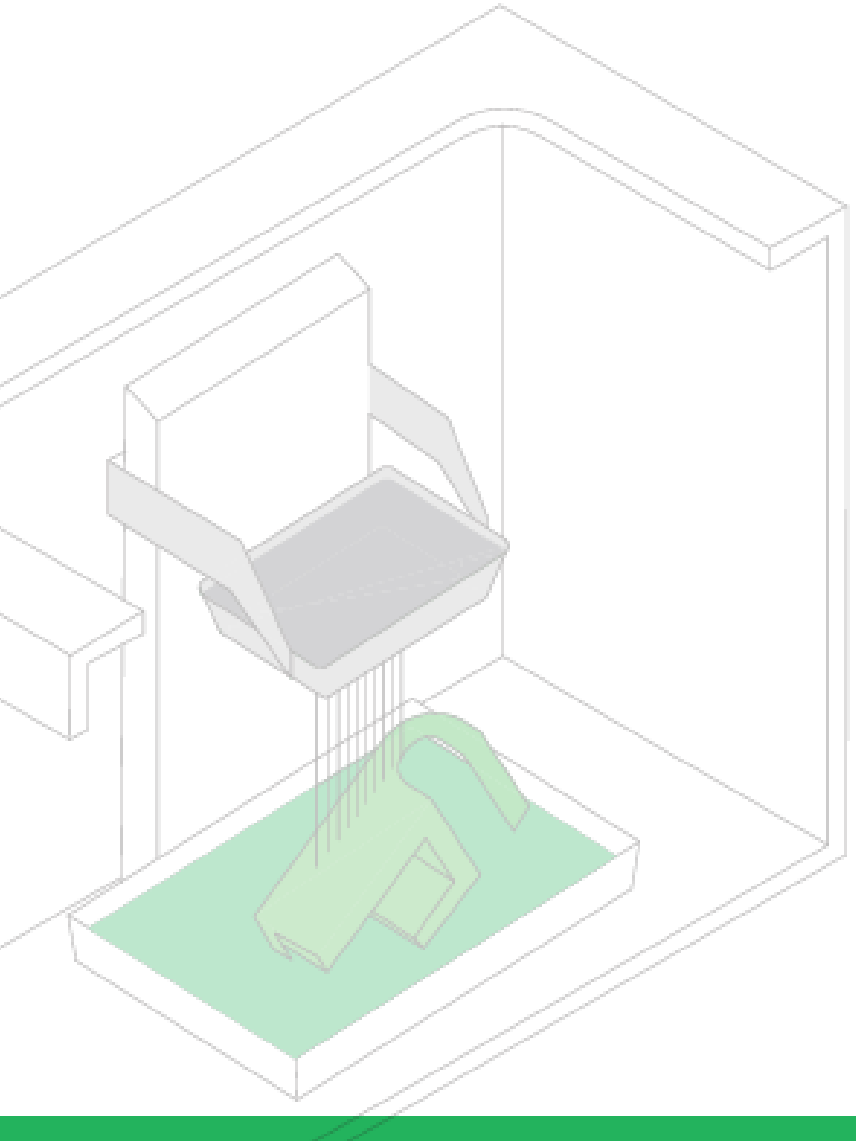
Surface Finish

Resin 3D Printing is generally associated with smooth surfaces and sharp details due to its light-based curing process. Surface appearance may vary based on part orientation, support placement, and feature geometry.

Orienting cosmetic or curved surfaces away from support contact areas can help reduce visible marks. Thoughtful orientation and controlled post-processing often contribute to more consistent and visually refined results, especially for enclosure and cosmetic components.





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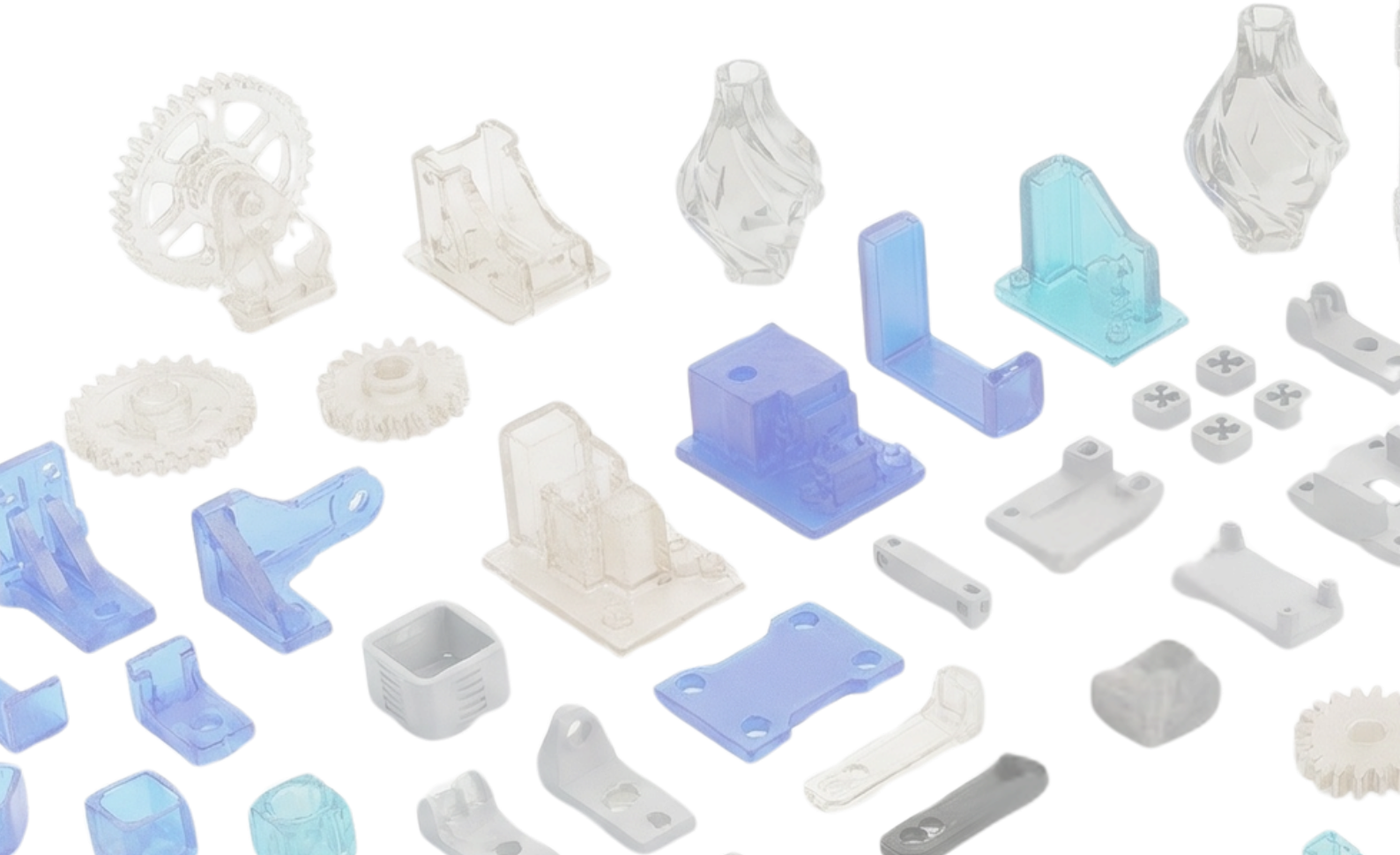
Finishes & Post-Processing

After printing, parts are cleaned to remove residual resin and UV-cured for final hardness and stability. Optional processes like sanding, painting, or coating can be used to enhance finish and durability.



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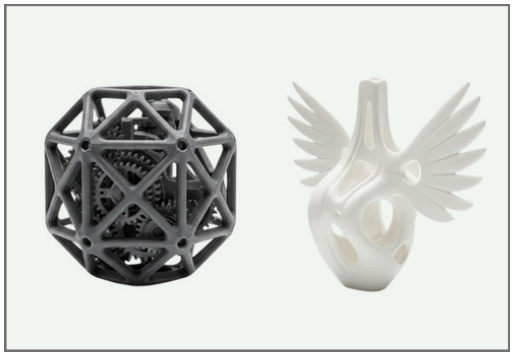
Supported Materials

We offer a range of resin materials selected to support high-detail prototypes, functional components, and short-run production parts. Material choice depends on surface finish expectations, mechanical requirements, and end-use conditions.

- **PRO-BLK 10:** High-performance black resin suitable for precision components requiring dimensional stability and consistent surface quality.
- **Rigid White:** Production-grade white resin used for parts requiring stable color and smooth surface finish.



- **Tough 60C White:** Biocompatible resin with improved impact resistance, suitable for functional parts under higher mechanical load.
- **Rigid Gray:** Rigid gray resin offering fine feature definition and surface quality similar to injection-molded parts.
- **Tough Gray 15**: Strong, rigid resin with good humidity resistance, commonly used for prototypes and snap-fit features.
- **Flex-BLK 20:** Flexible and fatigue-resistant resin suitable for functional prototypes and short-run components.

Material selection is influenced by geometry, wall thickness, surface finish requirements, and application needs. Our team supports material selection to help align resin choice with design intent and performance expectations.

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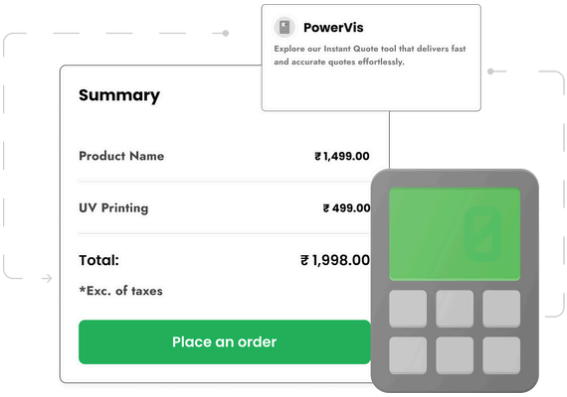
Resources at Mech Power

[Get Instant Quotes](#) for your [3D Printing](#) projects directly from our website.

Simply upload your CAD file and receive pricing and lead time instantly.

Explore our online Resin 3D Printing Service:
https://mechpowertech.com/resin-3d-printing



Accepted File Types:

.stl, .obj, .wrl, .step (.stp), .iges (.igs), .3mf, .dxf, .dwg and .zip (with models and textures) files up to 300 MB.

Available Services:

- Enclosure Design
- Sheet Metal Fabrication
- CNC Machining
- 3D Printing (FDM & 3D Resin Printing)
- Injection Molding

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Engineering & Support

Our technical and sales teams are here to help you at every stage of your build from design guidance to final delivery.

Email: sales@mechpowertech.com **Website Support:** https://mechpowertech.com/contact-us

Hours: Monday to Sunday, 9:00 AM – 6:00 PM IST (Tuesday Closed)
Phone: +91 9898412126

You can also access FAQs, design tips, and technical resources directly from our **Resources Section** on the website including design guidelines, material data, and process insights to help you optimize every enclosure you build.