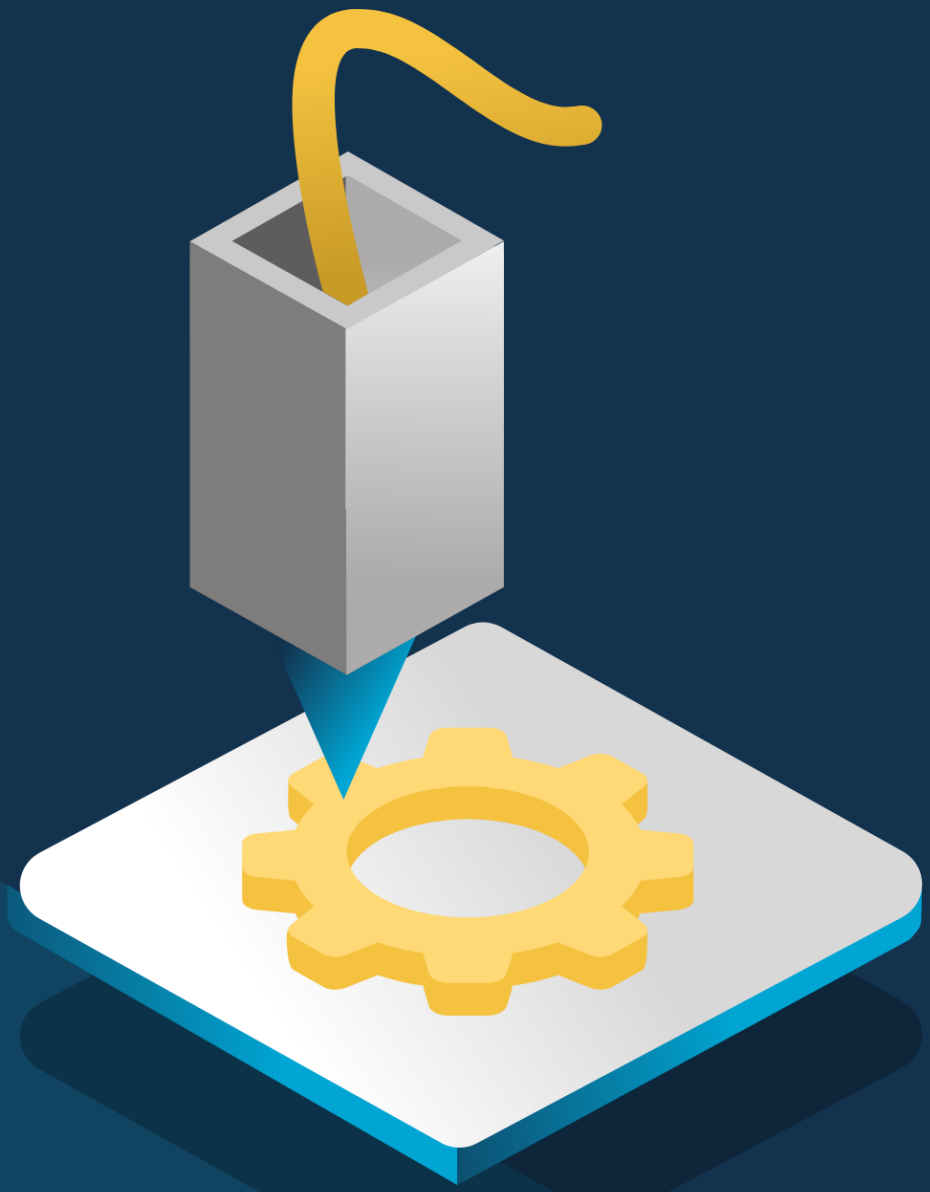
WIZ-PARTS



3D PRINTING DESIGN GUIDE

v1.0 September 2024

What Is 3D Printing?

3D printing, also known as additive manufacturing, is a cutting-edge process that creates three-dimensional objects from digital models. By adding material layer by layer, this technology can produce complex and detailed designs with precision. 3D printing is widely adopted in industries such as aerospace, automotive, and consumer goods enabling rapid prototyping, customized production, and efficient low volume manufacturing.

Contents

FDM Printing

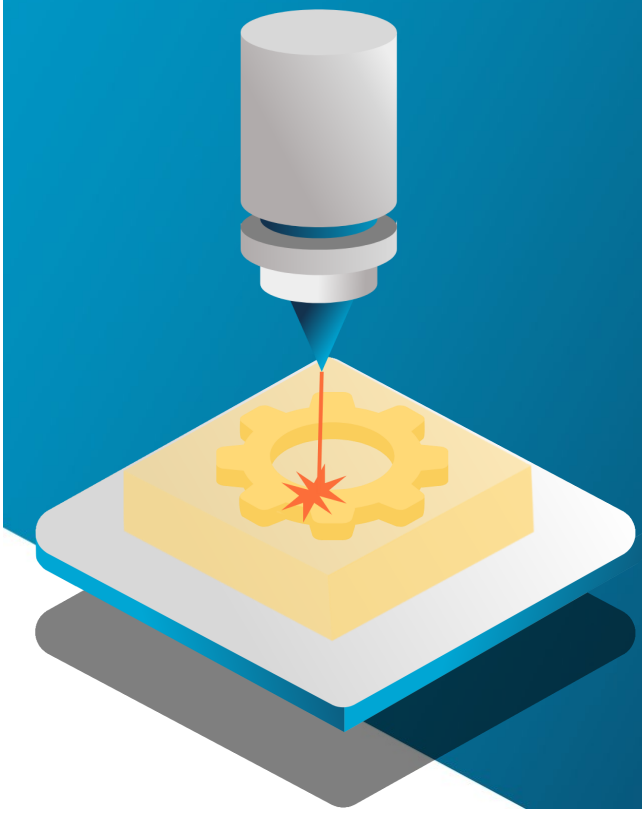
Fused Deposition Modeling (FDM) is a popular 3D printing technology that builds objects layer by layer using thermoplastic materials. In FDM printing, a plastic filament is heated and extruded through a nozzle, which moves in precise patterns dictated by a digital model.

Benefits of FDM Printing

Cost-Effective: FDM printing materials are generally less expensive compared to other 3D printing technologies

Material Variety: A wide range of thermoplastic filaments are available, including PLA, and Hyper PLA, providing options for different mechanical properties and finishes.

Durability: FDM-printed parts are strong and durable, suitable for functional prototypes, tooling, and end-use applications.



SLA Printing

Stereolithography (SLA) is a 3D printing technology that uses a laser to cure liquid resin into solid objects layer by layer. This process is guided by a digital model, with the laser selectively hardening the resin to form precise and detailed structures. SLA is renowned for its high resolution and accuracy, making it a preferred choice for creating intricate and finely detailed parts.

Benefits of SLA Printing

High Precision: SLA offers exceptional detail and accuracy, capable of producing intricate designs and smooth surfaces that are difficult to achieve with other methods.

Excellent Surface Finish: The fine layer resolution of SLA results in parts with smooth, high-quality surface finishes.

Complex Geometries: Capable of producing complex and delicate structures, SLA is suitable for applications requiring detailed features and intricate patterns.

Selecting The Right Filament

Choosing the right material, known as filament, for FDM 3D printing is crucial to achieving optimal results for your project. Filaments come in various materials, each with unique properties suited for different applications. Consider factors like strength, flexibility, durability when selecting your filament to ensure high-quality, functional, and durable 3D printed parts.

Comparison of Our FDM Filaments

	ABS	PLA	Hyper PLA
Strength	Average	Good	Very Good
Weight	Low	High	High
Durability	Very Good	Poor	Good
Shrinkage	High	Low	Low
Print Speed	Slow	Average	Fast
Cost	£	£	££

ABS

1.75mm Diameter

Available Colours v

- Black
- White*
- Grey*

PLA

1.75mm Diameter

Available Colours v

- Black
- White*
- Grey*
- Red*
- Yellow*
- Blue*
- Brown*
- Green*
- Orange*
- Gold*
- Purple*
- Skin*

Hyper PLA

1.75mm Diameter

Available Colours v

- Black
- White*
- Grey*
- Red*
- Yellow*
- Blue*
- Green*
- Orange*

*Additional costs apply

Selecting The Right Resin

Choosing the appropriate resin for SLA 3D printing is essential for achieving the desired properties and performance of your printed parts. SLA resins come in various types, each offering specific characteristics suited for different applications. Consider the specific requirements of your project, such as mechanical properties, flexibility, thermal resistance, and application-specific needs.

Comparison of Our SLA Resins

	Ultracur3D® EPD 1006	Ultracur3D® EPD 2006	Durable DL110HB
Tensile Strength	Average	Good	Good
Impact Strength	Good	Average	Very Good
Flexural Strength	Poor	Very Good	Good
Hardness	Good	Good	Very Good
Thermal Resistance	Poor	Very Good	Very Good
Water Absorption	Good	Very Good	Average
Cost	£	££	£££

Ultracur3D® EPD 1006

Available Colours v

Black

Ultracur3D® EPD 2006

Available Colours v

Black

Durable DL110H

Available Colours v

Black

White*

Smoky Translucent*

*Additional costs apply

3D Printing Tolerances

Tolerances refer to the allowable deviation in dimensions between the digital model and the actual manufactured part. Unlike CNC machining there are no international standards for 3D printing tolerances but tight tolerances can still be achieved with the correct technology and material choice.

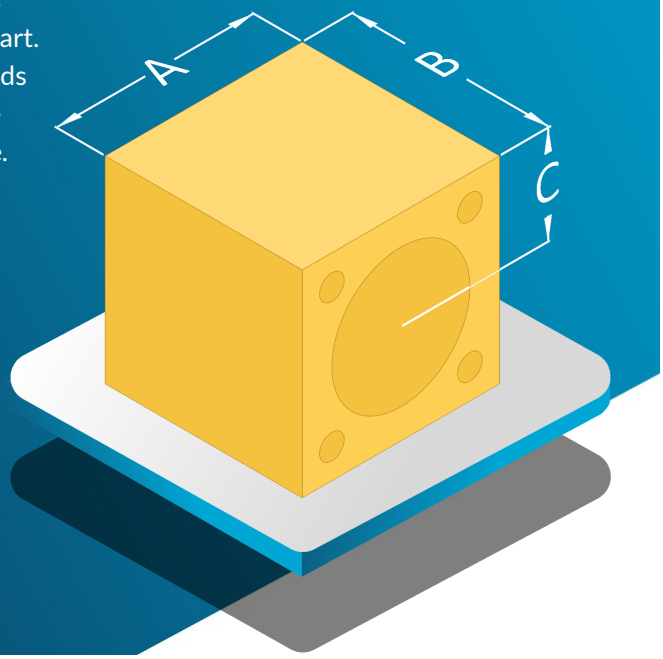
In 3D printing, several key factors affect tolerances:

Material Shrinkage: The change in volume as the material transitions from liquid to solid.

Layer Thickness: The height of each layer deposited during printing.

Minimum Feature Size: The smallest dimension that can be accurately printed.

Build Size: The maximum part size that can be printed, varying by technology.



	FDM Printing	SLA Printing
Tolerance	+/- 0.5% (+/- 0.5mm per 100mm)	+/- 0.2% (+/- 0.2mm per 100mm)
Build Volume	Up to 300 x 300 x 300mm	Up to 510 x 280 x 350mm
Layer Thickness	0.1 - 0.35mm	0.05 - 0.35mm
Minimum Feature Size	0.2mm	0.1mm

Build Volume

The larger the part printed, the more time it requires to cool down increasing material shrinkage due to uneven cooling.

Layer Thickness

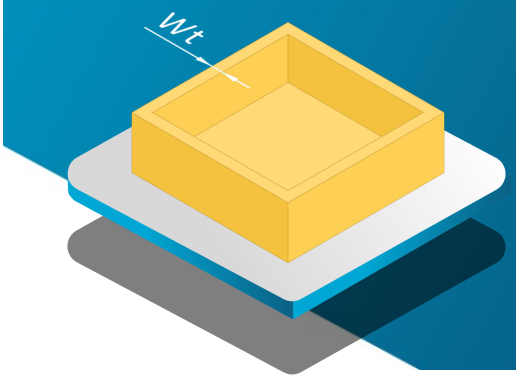
Layer thickness, or resolution, affects the dimensional accuracy of the part in the Z-direction.

Minimum Feature Size

The minimum feature size affects accuracy in the X & Y directions and limits the level of detail that can be achieved.

Maximise Bed Contact

Maximizing bed contact in 3D printing is important because it enhances print adhesion, reduces warping, and ensures greater stability during the printing process, leading to higher-quality prints and fewer failures.



Minimum Wall Thickness

It is recommended that 3D printed parts have a minimum wall thickness (Wt) of 1.6mm to reduce the risk of part warpage.

Wt ≥ 1.6mm

Maximum Bridge Length

If a bridge is required between two points it is recommended to keep its length (L) to less than 15mm. If a larger length is required, support material must be used ,increasing print time and cost.

L ≤ 15mm

Reduce Overhang Angle

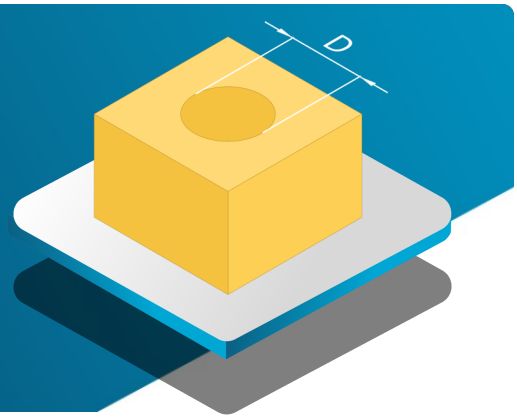
Where possible limit the angle of any overhangs (X) to 45 degrees. Below 45 degrees, overhangs can be printed without support material giving a high quality surface finish, above 45 degrees support material will be required.

X ≤ 45 Degrees

Oversize Vertical Holes

When 3D printing holes running vertically it is common to find these holes are undersized. To compensate for this, it is recommended to increase the hole diameter (D) in your models by 0.2mm over the required nominal diameter.

D = Nominal + 0.2mm



Consider Horizontal Holes

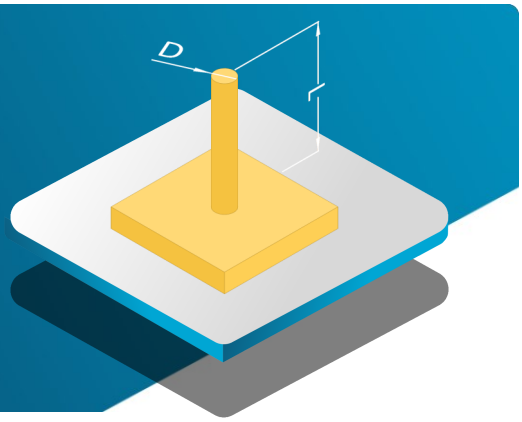
Horizontal holes often become squashed as the top section of the hole forms an overhang. Where possible, it is recommended to add a small peak to the top of the hole to compensate this and ensure correct hole clearance.

Creating Vertical Columns

When it is required to print vertical columns, we recommend using a minimum diameter (D) of 6mm. It is also import to consider the column length (L) which should be no greater than ten times its diameter (D).

D ≥ 6mm

L ≤ 10 x D



Add Strengthening Ribs

It is recommended to add ribs to your parts where possible to improve part strength and support features like columns and overhangs.

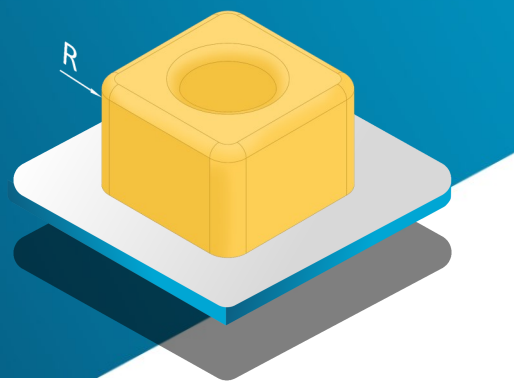
It is important that these ribs still follow the guidance on minimum wall thickness.

Add Edge Fillets or Chamfers

To reduce the risk of sharp edges, it is recommended that a small fillet or chamfer is applied to all exposed edges of the part.

A fillet or chamfer of 1mm is recommended though if possible, larger radii (R) will further benefit part quality.

R ≥ 1mm



Interlocking Part Clearances

If interlocking parts are required, it is recommend to leave a clearance gap (D) of 0.3mm between parts to ensure easy assembly once printed.

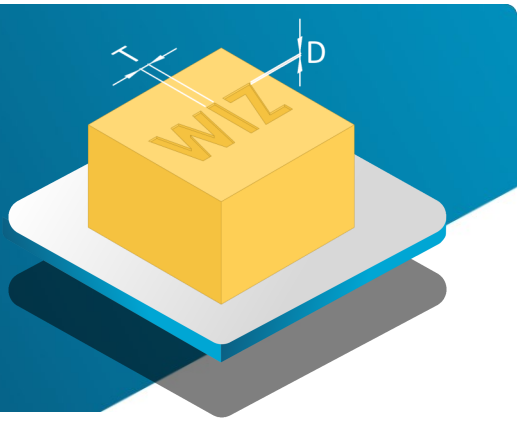
D = 0.3mm

Consider Text Size

When 3D printing parts where text will be required, it is recommend to select a sans serif font with a consistent stroke thickness.

A minimum stroke thickness (T) of 0.8mm is required and emboss or engrave text by 0.4mm or more in depth (D).

T ≥ 0.8mm **D ≥ 0.4mm**



And Remember to Make Sure Your Files Are in the Correct Format!

3D CAD Files

.STEP .IGES

.X_T .SLDPRT

.STL

WIZ-PARTS

Rapid Precision, Every Time

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