3D-Printed Android: A Tutorial
Part I of III

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Outline

- Preparing the hardware
  - Understanding the 3D printer specification
  - Preparing the tools
  - 3D Printing Instructions
    - Print settings for Guider II
    - Actuator Housing Profile for P1S
    - Actuator Shaft Profile for P1S
  - Building the Actuator
  - Setting up the Motor Controllers
  - Building the Robot
- Preparing the software
  - TBA
  - TBC

FlashForge Guider II

Print Technology	Fused Filament Fabrication(FFF)
Build Volume	280*250*300mm
Layer Resolution	0.05 - 0.4mm
Build Accuracy	±0.2mm
Positioning Accuracy	Z axis 0.0025mm; XY axis 0.011mm
Filament Diameter	1.75mm（±0.07）
Nozzle Diameter	0.4mm
Print Speed	10-100 mm/s

The FlashForge Guider 2 features a heated bed and a fully enclosed chamber, allowing for stable printing with PLA, ABS, PETG, and TPU with a 1.75mm filament. It uses a direct-drive extruder and a 0.4 mm nozzle by default. The printer is controlled via a 5-inch touchscreen and supports USB, Wi-Fi, and Ethernet for file transfer. We suggest using the Ethernet to communicate with the printer FlashPrint 5 is the recommended slicer software.

Link: User Manual

Bambu Lab P1S

Print Technology	Fused Filament Fabrication(FFF)
Build Volume	256 x 256 x 256 mm
Layer Resolution	0.05 - 0.4mm
Build Accuracy	±0.1mm
Positioning Accuracy	Z axis 0.0125mm; XY axis 0.0025mm
Filament Diameter	1.75mm（±0.07）
Nozzle Diameter	0.4mm (Swappable)
Print Speed	100-250 mm/s (Normal mode), 500 mm/s (Sport mode)

The Bambu Lab P1S features a textured heated bed and a fully enclosed chamber, allowing for stable printing with PLA, ABS, PETG, TPU, and industrial materials including those reinforced with fiber composites. It uses a direct-drive extruder and a 0.4 mm stainless steel nozzle by default. The printer supports print speeds up to 500 mm/s and is built on a CoreXY motion system with input shaping for high-speed performance. We use the Wi-Fi connection to communicate with the printer; Bambu Studio is the recommended slicer software.

Link: User Manual

Preparing the tools (1/5)

- Metal putty knives are used to remove models from the **FlashForge Guider II** heated bed. They should not be used on the textured heated bed of the **Bambu Lab P1S**, as this can damage the surface.

Preparing the tools (2/5)

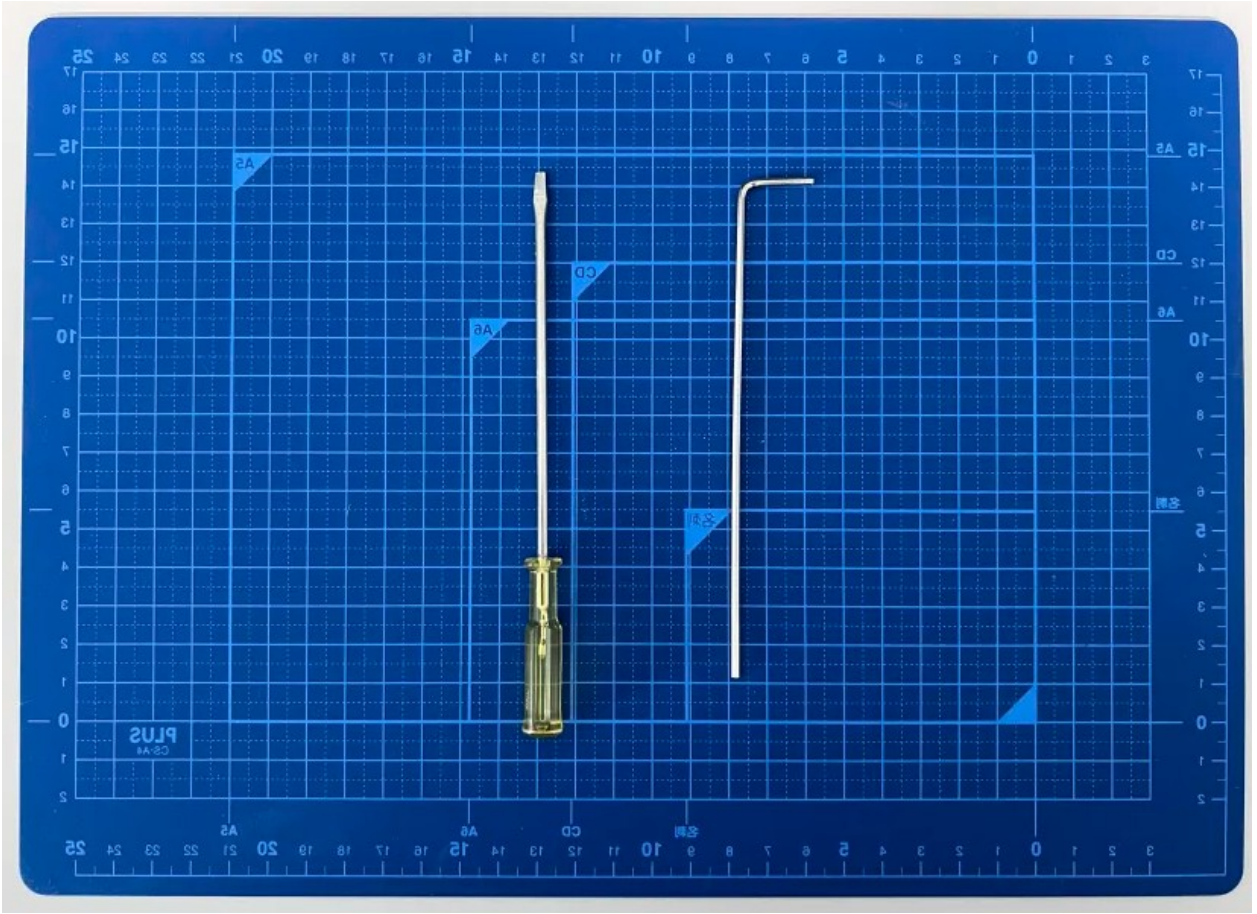
- Plastic scrapers are used for removing prints from the **Bambu Lab P1S** textured bed without damaging the surface. Replaceable blades should be kept sharp to reduce the risk of scratching the bed. Do not use excessive force during removal. Maintain a blade angle of at most 30 degrees relative to the bed surface when detaching the model.

Preparing the tools (3/5)

- Pliers are used for removing supports and cleaning up printed parts. Side cutters are best for trimming small support structures, while needle-nose and combination pliers help with gripping and breaking off larger sections. Always remove supports carefully to avoid damaging the model.

Preparing the tools (4/5)

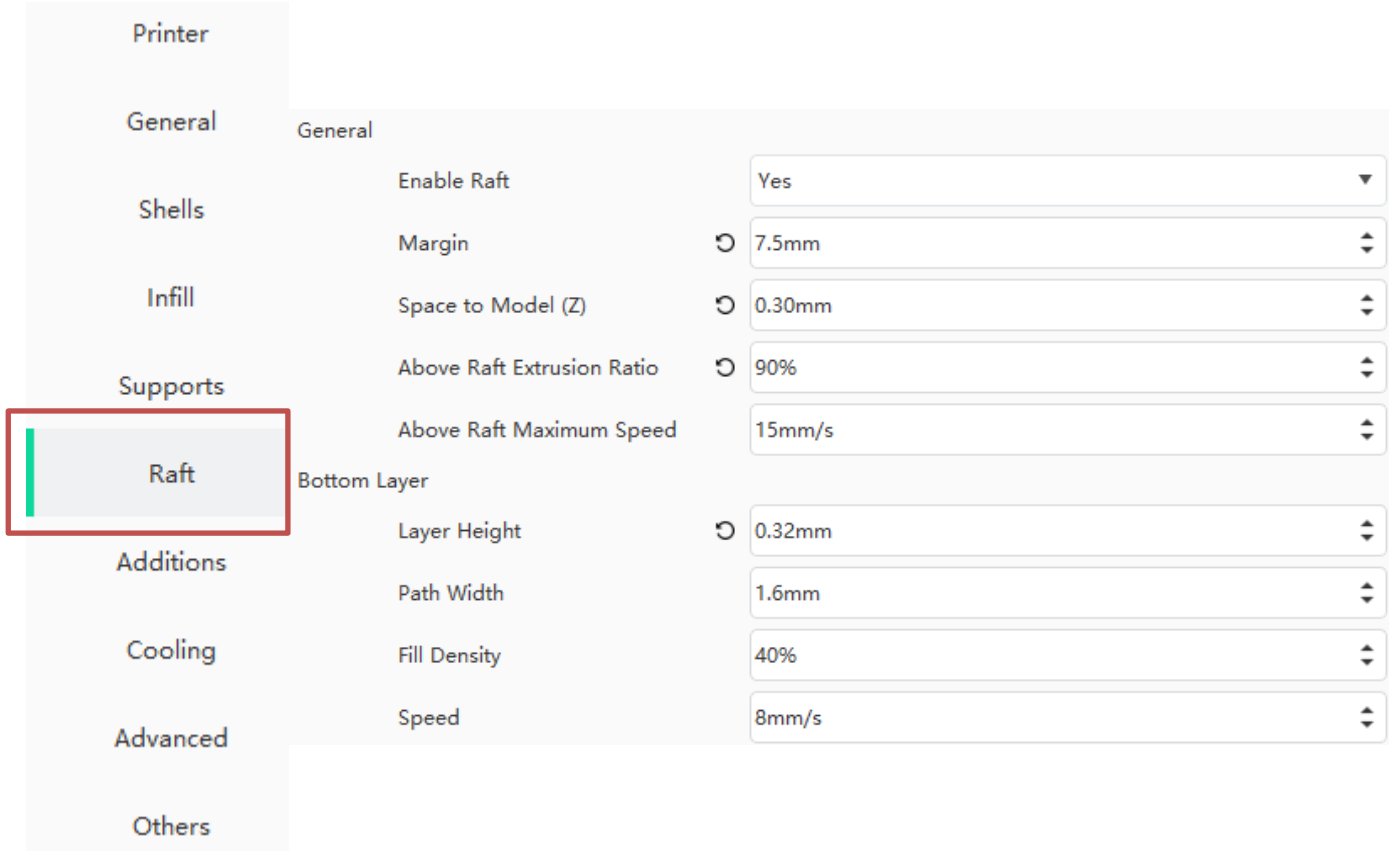
- The tool on the left is used for loosening internal supports for removal located in inside donut-shaped holes. The tool on the right is used to push out support material from narrow cylindrical cavities.



Preparing the tools (5/5)

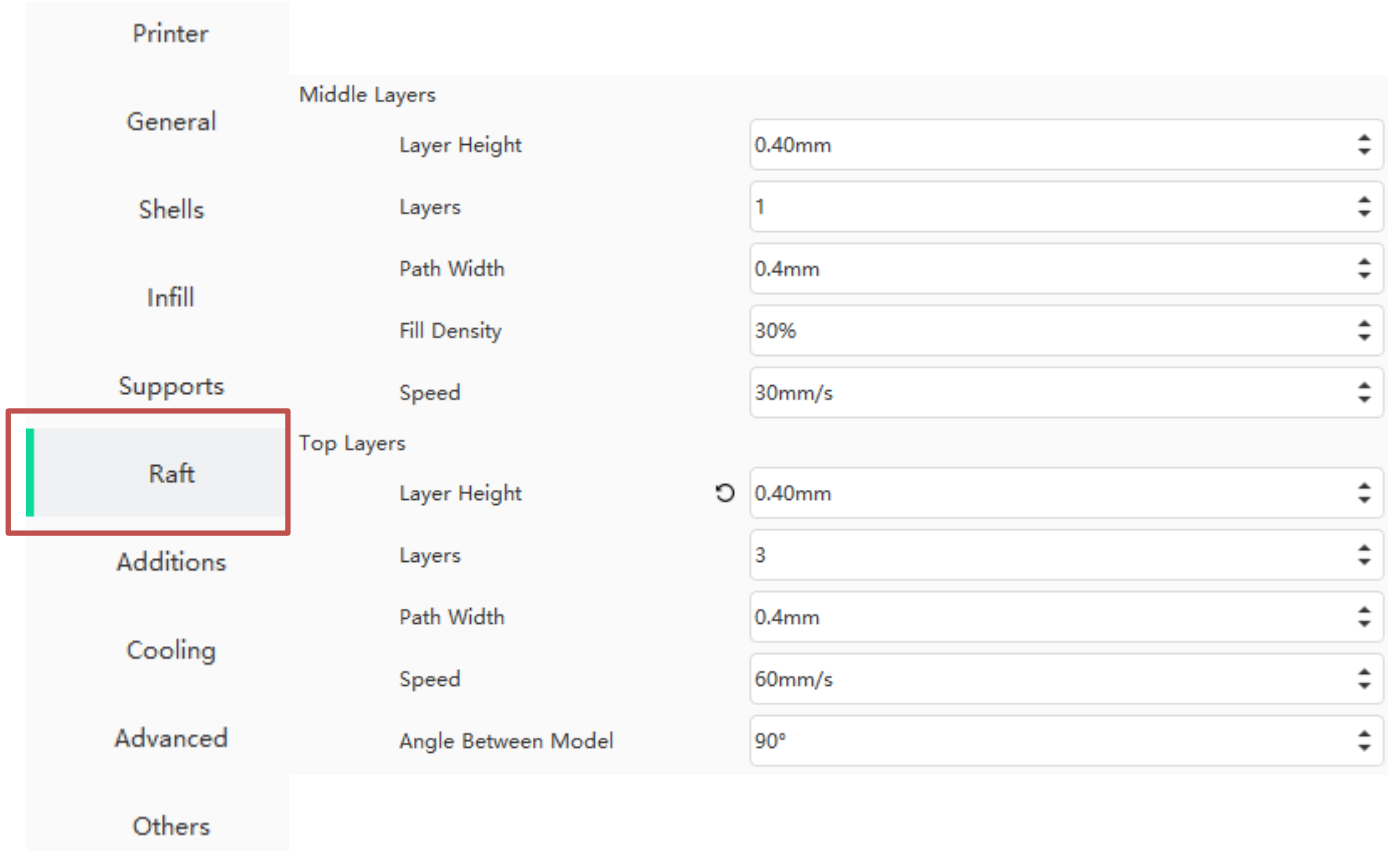
- Sanding sponges are used for removing residue and smoothing edges left after support removal. They also help reduce friction on moving parts, especially in models designed to house motors. Lower grits are for rough cleanup, while higher grits are used for fine finishing and surface polishing.

Print settings for Guider II (1/2)



- The following parameters are tuned for the FlashForge Guider II printer to improve raft removal. These settings allow the raft to peel away cleanly—like a banana skin—reducing the risk of injury to the operator.

Print settings for Guider II (2/2)



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Actuator Housing Profile for P1S (Quality)

Layer height

Layer height	0.2 mm
Initial layer height	0.2 mm

Line width

Default	0.42 mm
Initial layer	0.5 mm
Outer wall	0.42 mm
Inner wall	0.45 mm
Top surface	0.42 mm
Sparse infill	0.45 mm
Internal solid infill	0.42 mm
Support	0.42 mm

Seam

Seam position	Random
Smart scarf seam application	☑
Scarf application angle threshold	155 °
Scarf around entire wall	☐
Scarf steps	10
Scarf joint for inner walls	☑
Role-based wipe speed	☑

Precision

Slice gap closing radius	0.049 mm
Resolution	0.01 mm
Arc fitting	☑
X-Y hole compensation	0 mm
X-Y contour compensation	0 mm
Auto circle contour-hole compensation	☐
Elephant foot compensation	0.15 mm
Precise Z height	☐

Ironing

Ironing Type	No ironing

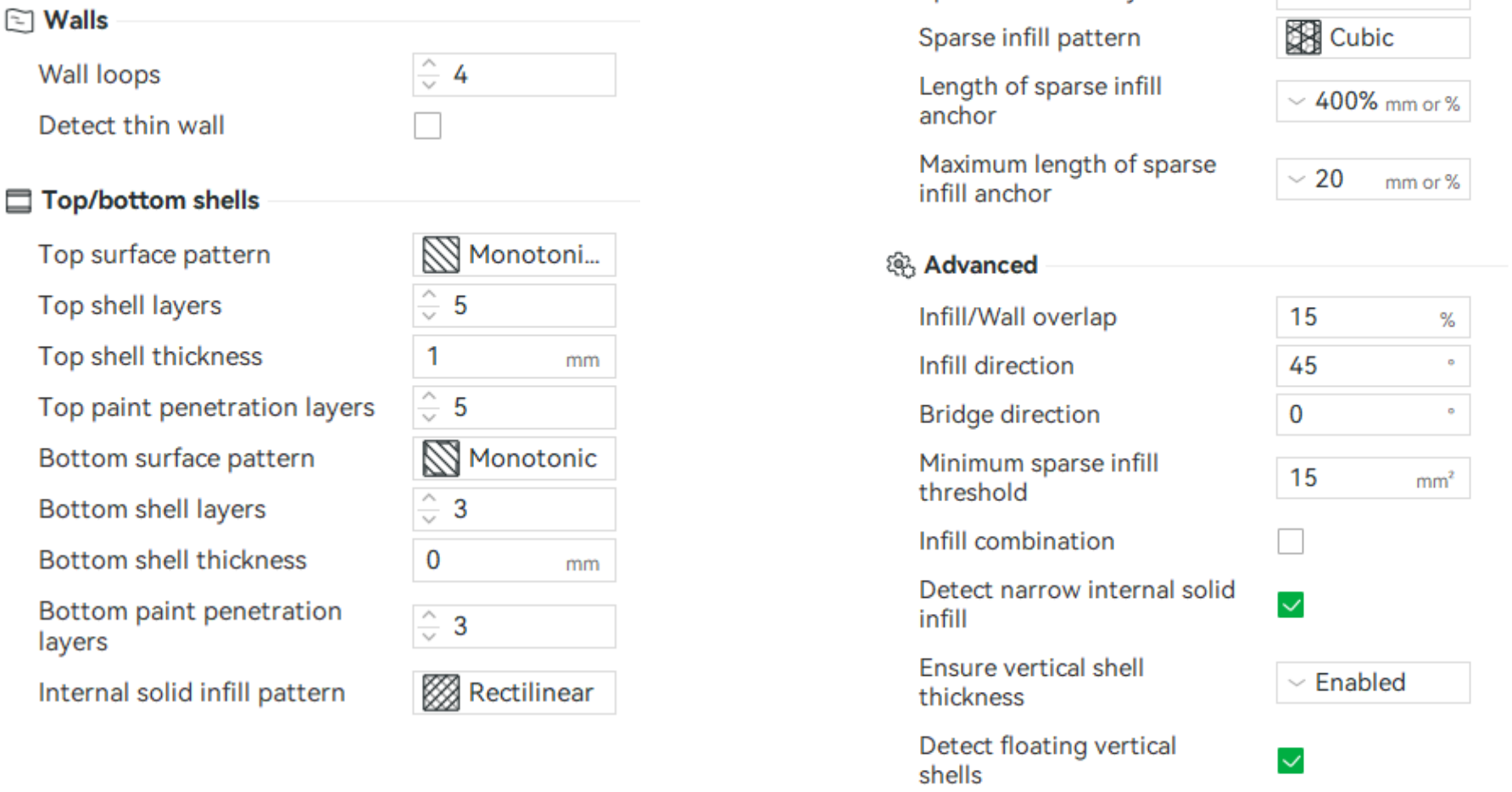
Wall generator

Wall generator	Classic

Advanced

Order of walls	inner/outer
Print infill first	☐
Bridge flow	1
Thick bridges	☐
Only one wall on top surfaces	Top surfaces
Only one wall on first layer	☐
Smooth speed discontinuity area	☑
Smooth coefficient	150
Avoid crossing wall	☐
Smoothing wall speed along Z(experimental)	☐

Actuator Housing Profile for P1S (Strength)



Actuator Housing Profile for P1S (Speed)

Initial layer speed

Initial layer	50 mm/s
Initial layer infill	105 mm/s

Other layers speed

Outer wall	200 mm/s
Inner wall	300 mm/s
Small perimeters	50% mm/s or %
Small perimter threshold	0 mm
Sparse infill	270 mm/s
Internal solid infill	250 mm/s
Vertical shell speed	80% mm/s or %
Top surface	200 mm/s
Slow down for overhangs	☑

Overhang speed	0 mm/s	10%
	50 mm/s	25%
	30 mm/s	50%
	10 mm/s	75%
	10 mm/s	100%
Bridge	50 mm/s	
Gap infill	250 mm/s	
Support	150 mm/s	
Support interface	80 mm/s	

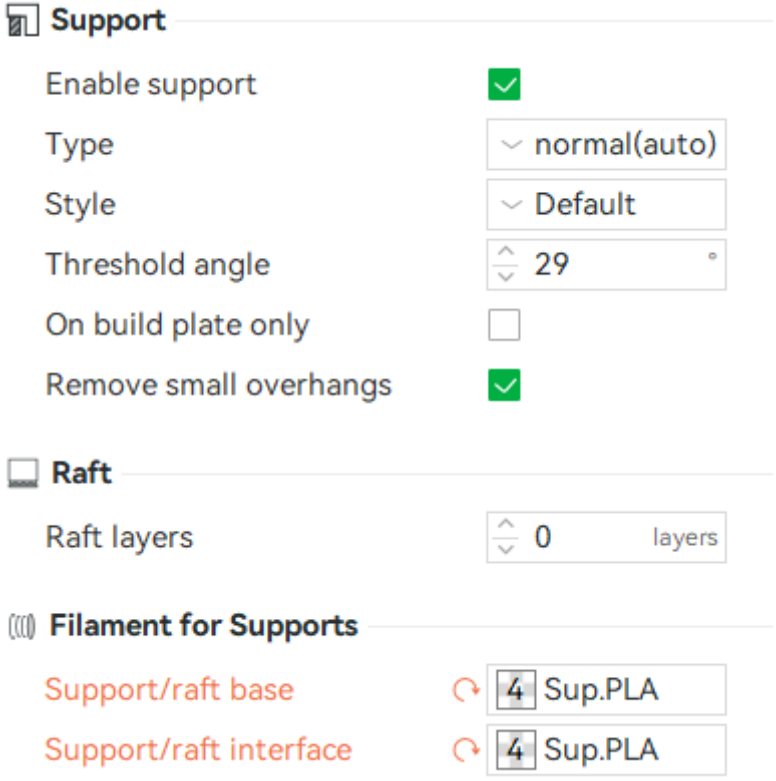
Travel speed

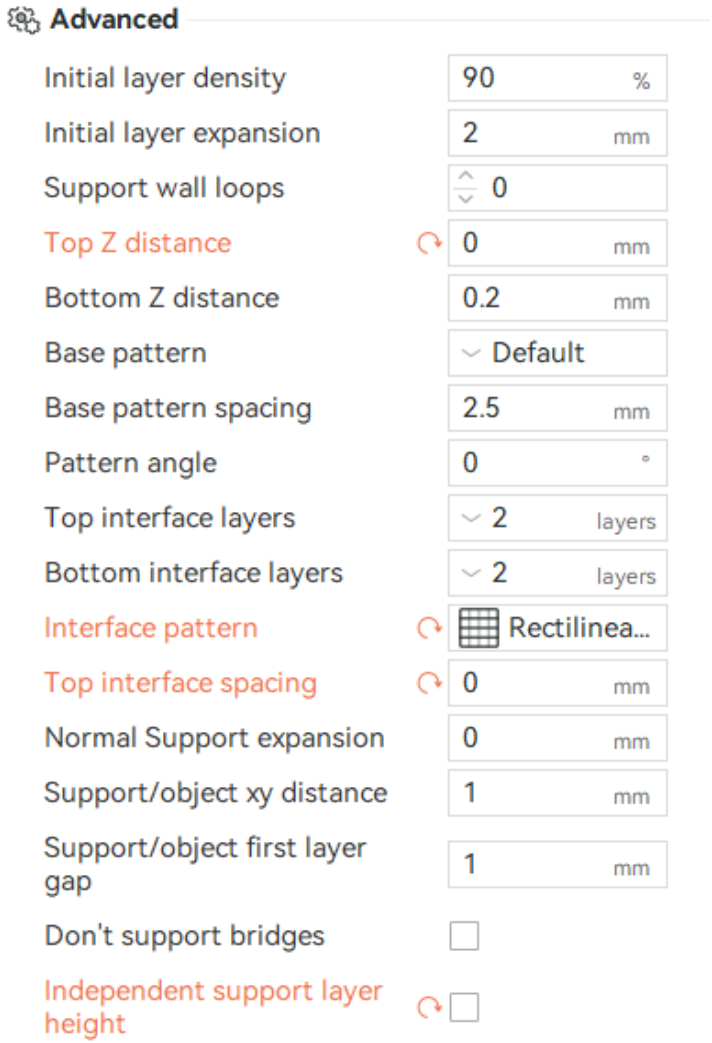
Travel	500 mm/s

Acceleration

Normal printing	10000 mm/s²
Travel	10000 mm/s²
Initial layer travel	6000 mm/s²
Initial layer	500 mm/s²
Outer wall	5000 mm/s²
Inner wall	0 mm/s²
Top surface	2000 mm/s²
Sparse infill	100% mm/s² or %

Actuator Housing Profile for P1S (Support)





Actuator Housing Profile for P1S (Others)

Bed adhesion

Skirt loops	0
Skirt height	1 layers
Brim type	Auto
Brim width	5 mm
Brim-object gap	0.1 mm

Prime tower

Enable	☑
Skip points	☑
Internal ribs	☐
Width	35 mm
Max speed	90 mm/s
Brim width	3 mm
Infill gap	150 %
Rib wall	☑
Extra rib length	0 mm
Rib width	8 mm
Fillet wall	☑

Flush options

Flush into objects' infill	☐
Flush into objects' support	☑

Special mode

Slicing Mode	Regular
Print sequence	By layer
Spiral vase	☐
Timelapse	Traditional
Fuzzy Skin	None

Advanced

Use beam interlocking	☐
Interlocking depth of a segmented region	0 mm

G-code output

Reduce infill retraction	☑

Post-processing scripts

Notes

Actuator Shaft Profile for P1S (Quality)

Layer height

Layer height	0.2 mm
Initial layer height	0.2 mm

Line width

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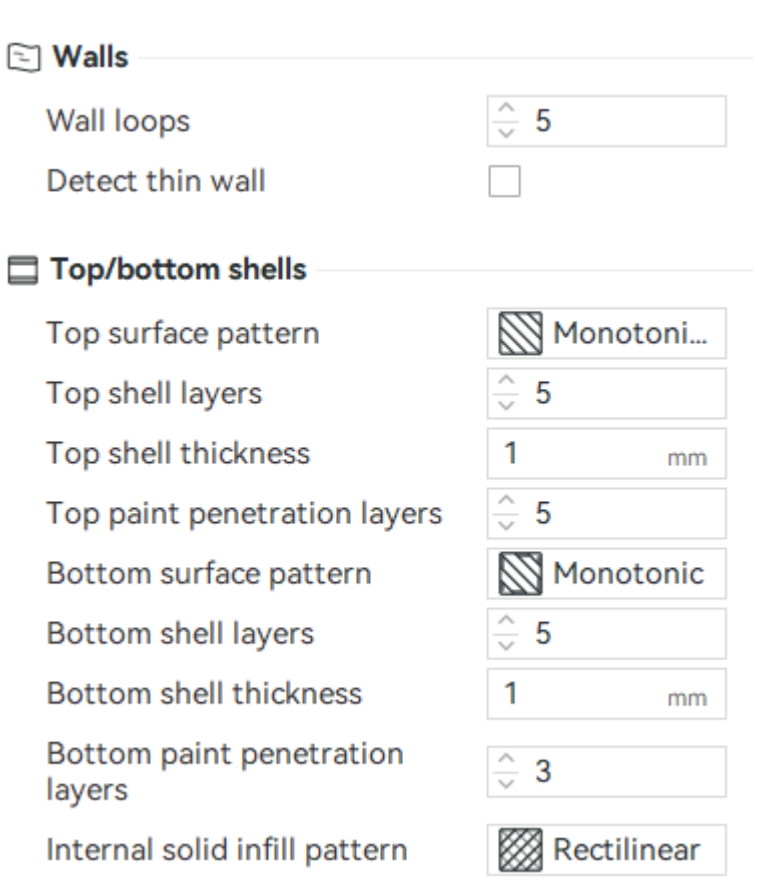

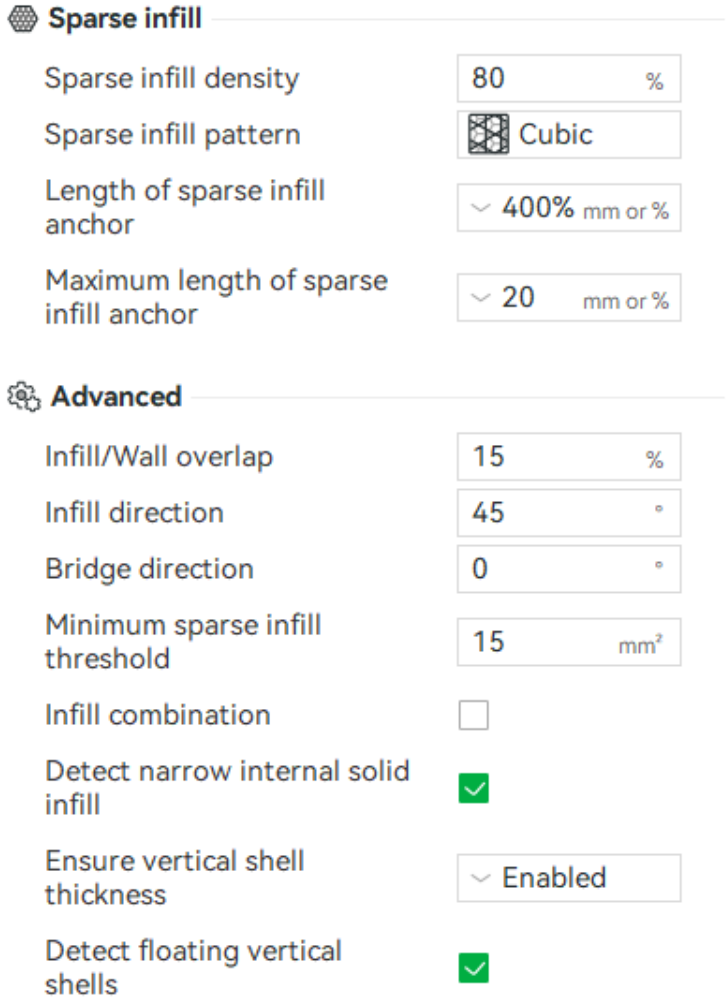

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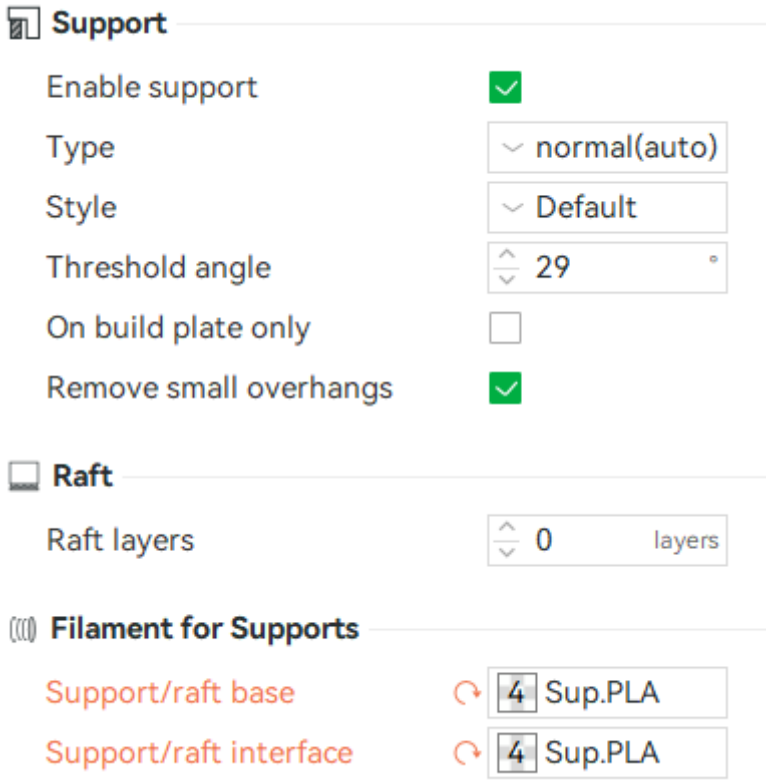
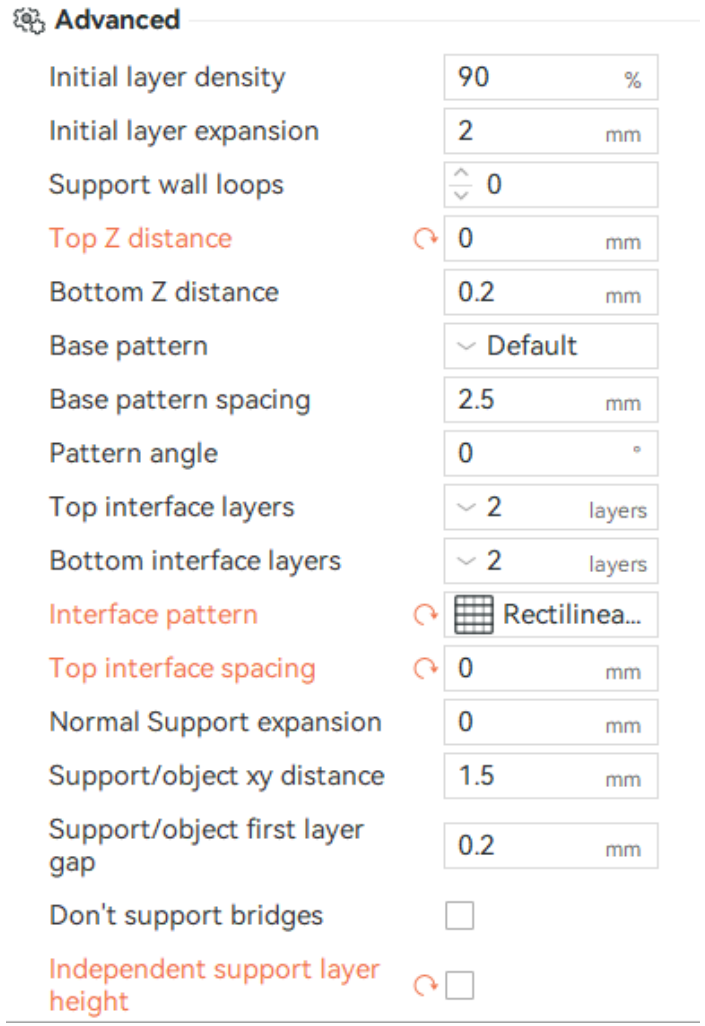
Actuator Shaft Profile for P1S (Support)





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