Why does my 3D printed vase leak?

Asked 3D Content Team
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Abstract. A vase-mode wall is one line thick, so any gap leaks. Fix: 105 to 110 percent flow, a 0.6 mm outer wall, 5+ bottom layers, or coat the inside or add a liner.

Keywords: watertight, waterproofing, slicer-settings

1 Why does my 3D printed vase leak?

A vase printed in vase mode has a wall only one extrusion line thick. One thin or under-extruded stretch lets water out, and so does a weak joint where the wall meets the base. The usual fix is more plastic: 105 to 110 percent flow, an outer wall widened to 0.6 mm and 5 or more bottom layers.

1.1 Settings that make a vase hold water

Table 1. Settings that make a vase hold water

Setting	Value	Source
Outer wall width in vase mode, 0.4 mm nozzle	Raise from 0.45 to 0.6 mm	Prusa Knowledge Base
Flow (extrusion multiplier)	105 to 110 percent	Prusa Research blog
Flow ratio in Bambu Studio	Up 0.02 to 0.05: from 0.98 to 1.00 through 1.03 for PLA Basic	Bambu Lab Wiki
Nozzle temperature	5 to 10 °C hotter	Prusa Research blog
Layer height	0.15 mm or lower	Prusa Research blog
Bottom solid layers	5 or more	Prusa Research blog
Bottom surface pattern	Concentric	Bambu Lab Wiki

The flow, temperature, layer and bottom-layer figures come from Prusa Research's Watertight 3D printing PT1 tests on vases and cups. The 0.6 mm outer wall is the Prusa Knowledge Base's vase-mode example. The flow-ratio step and concentric bottom come from Bambu Lab's leak guide. Bambu warns that these settings cut the risk but cannot guarantee a leak-proof print.

1.2 Are 3D printed vases waterproof?

They can be, but not by default. Prusa Research found thin-walled vases printed with its regular 0.15 mm profile leaked a lot, while thick-walled ones mostly held. In the same tests, one wall in vase mode held water in every material tried. Prusa's conclusion is that the right settings, plus a little post-processing, make nearly any print waterproof.

Bambu Lab's leak-guide vase profile does not use vase mode. It prints PLA (polylactic acid) Basic with 2 wall loops and a 0.5 mm line width on a 0.4 mm nozzle, at 0.1 mm layers with no infill. With ink-dyed water inside, the tissue under the vase stayed dry for 48 hours. If a single spiral wall keeps failing, switch vase mode off and print normal walls. The per-material wall counts are on how many walls make a print watertight.

1.3 Why a one-line wall leaks

In vase mode (Spiral Vase in Bambu Studio) the slicer prints the wall as one continuous spiral: one perimeter, no infill, no top layers. Bambu Lab's spiral-vase page notes there is no seam above the bottom layers. That removes the main leak path Prusa found: the seam where each layer starts and ends. It also removes any backup. A normal wall has several overlapped lines that would all have to fail in the same spot. A spiral wall has one. Prusa calls extra flow probably the only way to seal a vase-mode wall without post-processing.

The base is the second weak point. The bottom is solid layers with the single wall laid around them, and Prusa traced leaks to the transition between solid infill and perimeters. Prusa's test bottoms held with 2 to 7 solid layers and 8 perimeters. Prusa suspects the first layer, squished into the bed, did most of the sealing. A vase with one wall has less margin, so Prusa's advice of 5 or more bottom layers applies.

1.4 Where it leaks tells you why

Fill the vase, stand it on a dry paper towel and see where the water shows up.

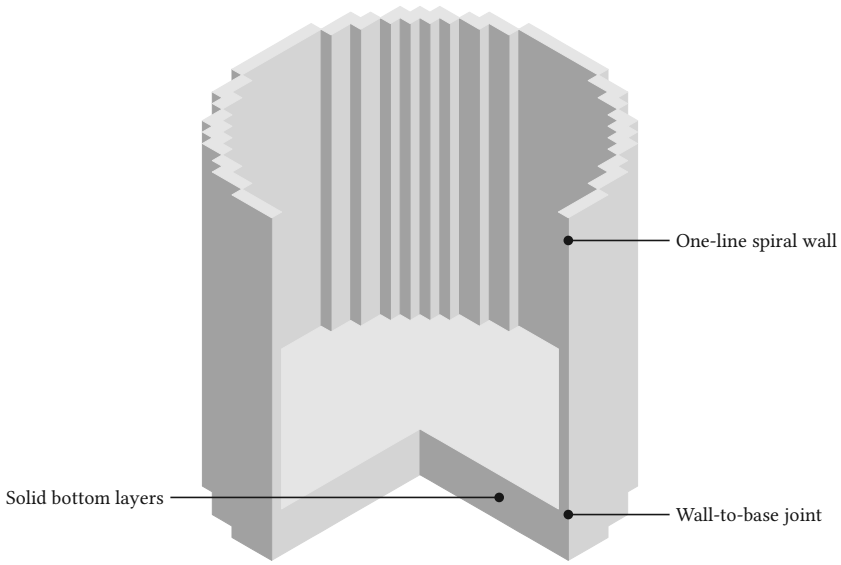


Figure 1. The wall is one extrusion line wide, so the ring where it joins the solid bottom layers carries the whole seal.

Table 2. Where it leaks tells you why

Where the water shows	Likely cause	Fix
A vertical stripe down one side	The layer seam on a normal-wall print	Print in vase mode, or add walls and flow
A ring at the bottom edge	Weak bond between the bottom layers and the wall	Raise flow; raise infill/perimeter overlap to 25 to 35 percent (default 10); use a concentric bottom pattern
Through the middle of the base	Too few bottom layers or a poor first layer	5 or more bottom layers
Beads all over the wall	Under-extrusion or a too-thin line	Raise flow and temperature, widen the outer wall, dry the filament
A few pinholes	Dirt or a partial clog in the nozzle, or moisture bubbles	Clean the nozzle, dry the filament
Dry at first, damp after weeks (PLA)	PLA swelling and wicking water	Coat the inside or use a liner

The overlap figures are from the Prusa Knowledge Base; the nozzle cause is from the Prusa blog. Bambu Lab's guide recommends pre-drying the filament to avoid holes in the extruded lines.

1.5 Is a PLA vase waterproof?

Yes, when printed right. Prusa found that PLA does not dissolve in water, but it can swell and act as a wick, so in theory a filled PLA vase could start leaking after several weeks. That never happened with Prusament PLA in Prusa's own tests, including PLA flower pots watched over a long test period. A single vase-mode wall in PLA held water, while with normal walls PLA needed 4 perimeters. Bambu Lab's leak guide includes vase profiles for PLA Basic and generic PLA.

1.6 How to seal or waterproof a 3D printed vase

If the settings fixes still leave a damp towel, seal it or line it:

- **Acrylic lacquer spray.** Prusa calls clear acrylic varnish the simplest method: spray the vase inside and outside a few times and let it dry. Spray types are compared on waterproof spray for 3D prints.
- **Brush-on epoxy.** Prusa warns it is messy, gives off fumes that call for gloves and a respirator, and can take several days to cure. Mixing, pot life and cure times are on sealing a print with epoxy.
- **A liner.** Drop a glass jar or a plastic cup inside, and the printed vase only has to look good. It needs no special settings or coating.

Before the vase goes on furniture, run the overnight leak test.

References

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