Is PETG waterproof?

Asked 3D Content Team
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Abstract. PETG is insoluble and takes up 0.45% water at saturation, about the same as PLA. Prints leak at the seams: Prusa needed 4 perimeters before PETG held water.

Keywords: petg, watertight, waterproofing

Table 1. The number

Property	PETG	PLA	PETG-CF
Saturated water absorption, Bambu Lab (25 °C, 55 percent RH)	0.45 percent	0.43 percent	0.30 percent
Absorption after 7 days, Prusament (24 °C, 22 percent RH)	0.10 percent	0.19 percent	not stated
Interlayer adhesion, Prusament	18 ± 4 MPa	17 ± 3 MPa	not stated
Perimeters that held water, Prusa vase test	4	4	not tested
Soluble in water	no	no	no

1 Is PETG waterproof?

The plastic is, but a print can leak. PETG (glycol-modified polyethylene terephthalate) is insoluble in water and absorbs 0.45 percent at saturation on Bambu Lab's data sheet, close to PLA (polylactic acid). Leaks come through the seams: Prusa Research needed 4 perimeters before PETG held water, and an epoxy coat sealed its leaking PETG box.

1.1 The number

Absorption figures come from the Bambu Lab PETG Basic, PLA Basic and PETG-CF data sheets and the Prusament PETG and PLA data sheets. They are measured in humid air (RH is relative humidity), not under water. The perimeter counts come from Prusa Research's Watertight 3D printing part 1 test. PETG-CF is PETG filled with chopped carbon fiber.

1.2 Is PETG more waterproof than PLA?

For holding water, no. The two data sheets disagree on which absorbs more, and both keep PETG and PLA below half a percent. Prusament's interlayer adhesion figures, 18 MPa for PETG and 17 MPa for PLA, overlap within their stated error.

In Prusa's leak tests, PETG tied PLA or did worse. In the vase test both needed 4 perimeters, and at 6 perimeters (a 2 to 3 mm wall) the material stopped mattering. Jakub Kočí, who wrote that post, said in its comments that the PETG had sat open in the office for several weeks and was printed on untuned settings.

In the closed-box test, PLA stayed dry 20 m underwater with no coating. Untreated PETG leaked fastest of the five materials, through the seams and where perimeters meet solid infill.

PETG wins on heat. Prusament lists a heat deflection temperature of 68 °C for PETG against 55 °C for PLA. The Prusa Knowledge Base rates PETG water and humidity resistant for

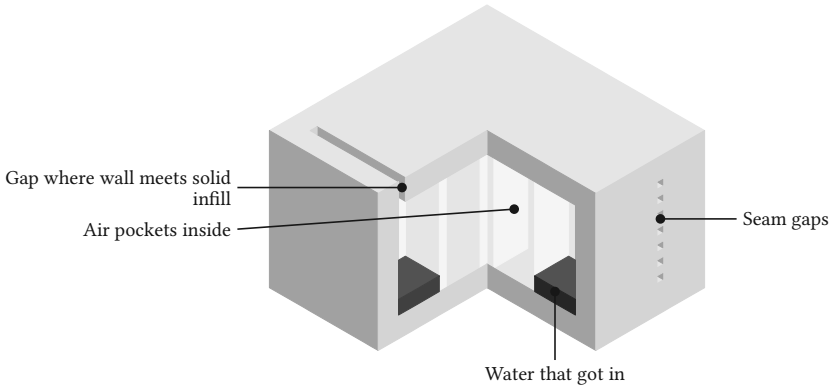


Figure 1. Untreated PETG leaked through the seams and where the perimeters meet solid infill, into the air pockets inside the print.

most exterior use below 80 °C. Outdoor use and the PETG-versus-ASA (acrylonitrile styrene acrylate) question are on the waterproof filament page.

1.3 Is PETG porous or hydrophobic?

Solid PETG has no pores. A print has gaps: Prusa's part 2 post warns of numerous air pockets and crevices that let water inside a visually solid print. Kočí added that PETG kept in a damp room absorbs moisture, which can leave tiny bubbles that make a print less waterproof.

PETG sits on the hydrophobic line. Kočí calls it hydrophobic and points to PET water bottles. Measured printed surfaces land either side of the 90° water contact angle that defines a hydrophobic surface.

Barrios and Romero printed 27 PETG samples. Their highest readings were 107.91° across the print lines and 86.42° along them, and print acceleration and flow rate moved the result most.

1.4 Does PETG degrade in water or salt water?

Not enough to weaken it. Gama and colleagues kept printed PETG in distilled and in saline water at 70 °C for ten weeks. Water uptake stayed below 1 percent, and tensile properties rose a little.

Stiffness and glass transition dropped slightly, which the authors read as reversible plasticization (water softening the plastic). They call PETG suitable for outdoor and marine use. Chemicals set the limit instead: Bambu Lab lists PETG Basic as resistant to most oils and greases but not to acids or alkalis.

1.5 Is PETG-CF waterproof?

The material is. Bambu Lab's PETG-CF sheet lists it as insoluble in water, with saturated absorption of 0.30 percent against 0.45 percent for PETG Basic. Its acid and alkali entries match PETG Basic. Neither Prusa post tests PETG-CF, so treat it like PETG: thick walls, then a leak test.

1.6 How to make a PETG print waterproof

1. **Dry the filament.** Bambu Lab specifies 65 °C for 8 h in a forced-air drying oven, and storage below 20 percent RH.
2. **Print at least 4 perimeters.** For an open vessel, vase mode (spiralize outer contour) held water with one wall in every material Prusa tested.
3. **Push flow up.** Prusa suggests an extrusion multiplier of 105 to 110 percent, a nozzle 5 to 10 °C hotter and 0.15 mm layers. Expect more stringing and oozing with PETG.
4. **Fill closed parts at 60 percent.** Prusa starts boxes that go underwater at 4 perimeters and 60 percent infill.
5. **Seal it if it still weeps.** One epoxy treatment made Prusa's leaking PETG box fully watertight. The procedure is on the epoxy sealing page.

Then fill it and wait. The overnight version with pass criteria is the leak test.

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