Is PLA safe for water containers?

Asked 3D Content Team
Published September 23, 2026 · Updated October 28, 2026 · Last verified September 23, 2026

Abstract. PLA holds cold water: Prusa's PLA pots showed no leaks and its boxes stayed dry at 20 m. It softens above 60 °C, and Prusa does not recommend prints as food containers.

Keywords: pla, watertight, food-safety

1 Is PLA safe for water containers?

For cold water, yes. PLA (polylactic acid) is insoluble in water, absorbs 0.43 percent at saturation on Bambu Lab's data sheet, and Prusa Research's PLA flower pots showed no leakage. Two limits apply: PLA softens above 60 °C, and Prusa does not recommend any print as a food container because layer grooves harbor bacteria.

1.1 PLA and water

The water itself does no harm. Bambu Lab lists PLA Basic as insoluble in water with a saturated water absorption of 0.43 percent at 25 °C and 55 percent relative humidity. Prusa's first watertight test addressed the claim that PLA partially dissolves: over a long test period its Prusament PLA flower pots showed no leakage at all. In the second test, PLA boxes stayed dry 20 m underwater with no coating.

PLA does need walls. Prusa's vase test found PLA needed 4 perimeters to hold water, against 2 for ASA or PP. The counts are on the perimeter page.

1.2 Where PLA fails: heat

The Prusa Knowledge Base says PLA gets soft and deforms at temperatures over 60 °C. Bambu Lab measures a glass transition of 60 °C and a heat deflection temperature of 57 °C at 0.45 MPa. Prusa's own yellow PLA print deformed in a car on a summer day.

That rules out hot water, a sunny windowsill for a filled container, and the dishwasher. Materials that survive a rinse cycle are on the dishwasher page. Prusa also notes PLA degrades under UV light, so an outdoor container is a job for PETG (glycol-modified PET) or ASA (acrylonitrile styrene acrylate). The filament table compares them.

1.3 Do 3D prints absorb water over time?

A little, and it plateaus. Data sheets give the saturated figure, the point past which the plastic takes up no more:

These are air-humidity figures, not immersion, and none of the sheets states a change in strength at saturation. Prusa's evidence for PLA in long contact with water is the flower pots, which stayed sound for the length of its test.

1.4 Is a PLA container food safe?

Prusa's answer is no by default. Its Knowledge Base states plainly that it does not recommend using 3D prints as food containers. The grooves between layers are almost impossible to clean and hold residue, so they become a seedbed for

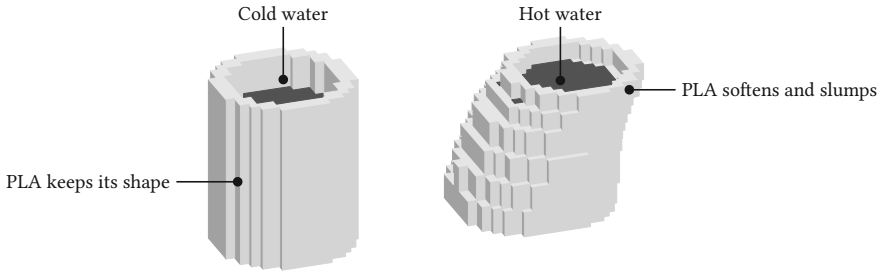


Figure 1. PLA holds cold water well, but it gets soft and deforms once it is heated past its softening point, so hot water is out.

Table 1. Do 3D prints absorb water over time?

Material	Saturated water absorption	Conditions	Source
PLA	0.43 percent	25 °C, 55 percent relative humidity (RH)	Bambu Lab PLA Basic
PETG	0.45 percent	25 °C, 55 percent RH	Bambu Lab PETG Basic
ASA	0.17 percent after 7 days	24 °C, 22 percent RH	Prusament ASA

bacteria. That applies to PLA, PETG and every other filament equally.

The material itself is not the problem. The Knowledge Base calls PLA food-safe as a material, and Prusa's food-grade study says most of its PLA and PETG colors use inorganic non-migratory pigments, with PLA Army Green the exception. Prusa holds no certification for them and says food-grade prints from its filaments are for personal use, not for sale. Most ABS and ASA filaments it calls rather unsafe for food contact.

Two more parts matter:

- **The nozzle.** Brass contains lead and wears into the print. Prusa recommends a stainless steel nozzle for food-contact parts.
- **The surface.** Prusa's lab test ran 14 days of simulated use. The untreated print grew the largest bacterial colonies. A print coated in Efkoresin Art UV, an epoxy certified to EU regulation 10/2011, grew none.

Even coated, Prusa limits the part to cold use: no chopping boards, hot soups, microwaves or dishwashers.

1.5 Are 3D printed water bottles safe?

You can print a bottle that holds water, but Prusa's guidance rules it out as an everyday drinking bottle. A bottle is a food container you refill and drink from, so the layer-groove problem comes back with every refill, and a PLA bottle cannot go in the dishwasher that would clean it.

If you print one anyway, apply all of Prusa's conditions: natural PLA or PETG, a stainless steel nozzle, a certified food-contact epoxy coating inside, cold water only and hand washing. A printed bottle cage, cap holder or funnel that never touches the water you drink carries none of these limits.

1.6 What to print for water

- **Cold water, no food:** PLA with 4 perimeters, tested with the leak test.
- **Outdoor or warm water:** PETG or ASA, per the Prusa outdoor ratings.
- **Drinking water or food:** a certified food-contact epoxy over the print, a stainless nozzle, personal use only, cold contents.

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Cite as: Asked 3D. "Is PLA safe for water containers?." October 28, 2026. https://asked3d.com/answers/pla-water-containers. Last verified September 23, 2026.