Why do you need a cold pull before printing TPU?

Asked 3D Content Team
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Abstract. TPU is too soft to push old filament out of the nozzle. Bambu Lab says cold pull with PLA or PETG first: flush at 250 °C, pull PLA at 70 to 100 °C.

Keywords: tpu, pla, petg

Table 1. The number

What the nozzle last printed	Flush temperature	Cold-pull filament	Pull temperature
PLA, PETG, TPU, PVA	250 °C	PLA or PETG (PETG for a high-flow nozzle)	20 to 30 °C above the pull filament's glass transition
ABS, ASA, PA (nylon), PC, PET	290 °C	PLA or PETG	same rule
PPS, PPA	320 °C	PLA or PETG	same rule
Carbon or glass fiber filament	as for its base plastic	PLA or PETG	several pulls, not one
Manual pull with PLA, X1	load at 220 °C	PLA	70 to 100 °C, start at 70 °C
Manual pull with PLA, P1S	load at 230 °C	PLA	70 °C
Manual pull with PLA, A1	load at 220 °C	PLA	100 °C

1 Why do you need a cold pull before printing TPU?

Because TPU (thermoplastic polyurethane) is too flexible to push leftover filament out of the nozzle. Bambu Lab calls TPU "highly sensitive to nozzle resistance" and recommends a cold pull whenever another material printed before it. Pull with PLA (polylactic acid) or PETG, not TPU: flush at 250 °C, then pull PLA at 70 to 100 °C.

1.1 The number

The flush temperatures, the glass-transition rule and the PLA or PETG choice come from Bambu Lab's H2D and H2S cold pull guides. The fiber row is from its TPU Printing Guide, and the manual rows are from its X1, P1S and A1 maintenance pages. Abbreviations: PETG, glycol-modified PET (polyethylene terephthalate); ABS, acrylonitrile butadiene styrene; ASA, acrylonitrile styrene acrylate; PA, polyamide; PC, polycarbonate; PVA, polyvinyl alcohol; PPS, polyphenylene sulfide; PPA, polyphthalamide.

Bambu Lab adjusts the pull temperature in 5 °C steps. Go hotter if the filament breaks under heavy resistance and cooler if it snaps with almost none.

1.2 Who says to cold pull before TPU

Bambu Lab says it in four places:

- **Printer guides (H2D, A2L).** Both list "Before Switching to TPU Filament" as a time to cold pull: "If other materials have been previously used, we recommend performing a cold pull before printing with TPU to ensure smooth extrusion."
- **X1 and P1S guides.** "TPU is flexible, and might not be able to push out the filament that has remained inside the hotend, which can lead to a clog."
- **TPU Printing Guide.** Use a brand-new nozzle or cold pull the old one before printing TPU. A nozzle that ran carbon or glass fiber filament needs "several cold pull cleanings", because residual fibers add resistance.
- **Bambu Studio.** The slicer's message catalog carries the warning users see: "Please cold pull before printing TPU to avoid clogging. You may use cold pull maintenance on the printer."

Prusa's flexible-filament rules open the same way: "Make sure the nozzle is unobstructed. If you're not sure, do a cold pull to clean it completely."

1.3 Why TPU needs a clean nozzle

A stiff filament pushes whatever is left in the nozzle out ahead of itself. TPU bends instead. Residue from harder or high-temperature filaments, burnt material or loose fibers adds resistance that TPU cannot push past, and the nozzle clogs. Bambu's A1 clog guide lists this exact failure: very different filaments in a row with the previous one "not purged completely", naming ASA followed by TPU.

A cold pull removes that layer. The new filament is melted in, cooled until it is part-solid, and pulled out. It comes out as a "plug" that carries burnt filament, dust and small clogs.

1.4 Can you cold pull with TPU?

No maker lists TPU as a cold-pull filament. In testing for the H2D's automatic cold pull, Bambu Lab found PLA and PETG "perform excellently". Others "are prone to tearing, leaving

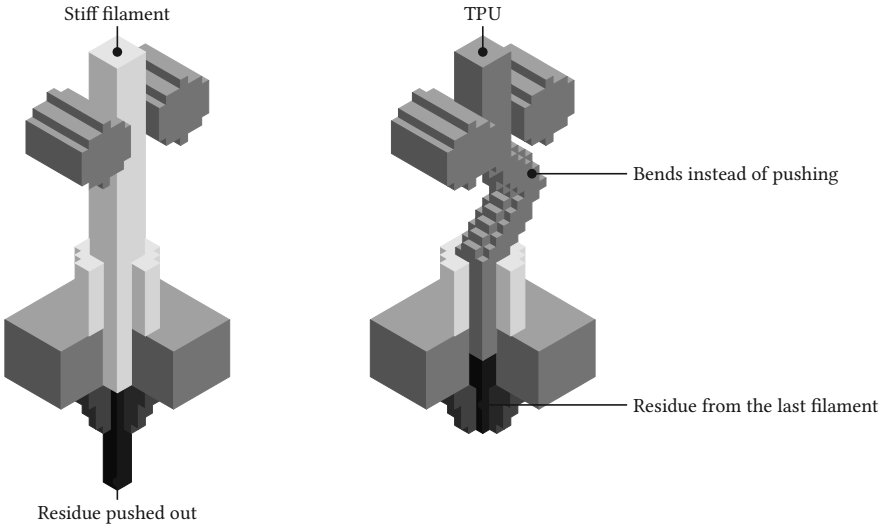


Figure 1. A stiff filament pushes leftover residue out of the nozzle ahead of itself, while TPU bends against it and the nozzle clogs.

residue inside the nozzle". Its X1 guide adds nylon, ABS and ASA as options. Creality's list is nylon, PLA, ABS and PETG. None of the three names TPU.

The temperature rule does not help either. Bambu sets the pull 20 to 30 °C above the filament's glass transition, and its TPU for AMS data sheet gives the glass transition as "N/A". To clear TPU from a nozzle, Bambu flushes at 250 °C and pulls with PLA or PETG.

1.5 Does TPU for AMS need a cold pull too?

Yes. Bambu's TPU guide gives the new-nozzle-or-cold-pull rule for TPU filaments as a group, and TPU for AMS is in its nozzle table. It is a harder TPU, Shore 68D, that feeds through the standard path of Bambu's AMS (Automatic Material System). Its data sheet lists a 220 to 240 °C nozzle and pitches it for multicolor projects, so it often shares a nozzle with other filaments. The Bambu Studio warning names TPU in general, not one product.

1.6 How to check it on your own print

- **Check the nozzle's history.** If the last spool was TPU, Bambu's condition ("if other materials have been previously used") does not apply. If it was anything else, pick the flush temperature from the table by the hottest filament that nozzle has run. Bambu's clog guide also asks for a cold pull at least once a month.
- **Use the printer's routine if it has one.** H2S and P2S: Toolbox, then Nozzle Cold Pull Maintenance; the H2D has the same function. A2L: Settings, Maintenance, Nozzle Cold Pull Maintenance. Pick the nozzle and filament, remove the PTFE (polytetrafluoroethylene) feed tube when asked, and insert at least 30 cm of PLA or PETG. The printer flushes, cools and retracts.
- **On X1, P1S or A1, do it by hand.** Load PLA at the temperature in the table, then set the hotend to the pull temperature (70 °C on X1 and P1S, 100 °C on A1). Keep pressing extrude every 2 to 3 seconds as it cools. On X1 and P1S the extruder starts skipping around 150 °C, which is where you stop. Once it reaches the pull temperature, retract with the on-screen button while pulling the filament gently upward. The step-by-step is on the cold pull page.
- **Read the tip.** A clean pull has a slight cone shaped like the inside of the nozzle. Black specks, a foreign color or grainy, sintered bits mean pull again. After fiber filaments, expect several pulls.
- **Test before you load TPU.** Extrude PLA or PETG by hand: it should come out straight, not curling. On an A1, do not press the load button more than three times with TPU in the extruder.
- **If TPU still under-extrudes,** Bambu's TPU guide lists three more causes: wet filament, too much feeding resistance, and speed. For TPU for AMS its data sheet says dry at 70 °C for 8 h in a forced-air oven, or 12 h on an X1 heatbed at 80 to 90 °C. Turn off flow dynamics calibration before TPU prints. A full clog that a cold pull cannot clear needs the steps on the unclogging page.

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