Why is my 3D print stringing?

Asked 3D Content Team
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Abstract. Stringing is plastic leaking from the nozzle on travel moves. Check a wet spool first, then heat (UltiMaker: 5 °C lower per print), retraction and long travels.

Keywords: stringing, retraction, slicer-settings

1 Why is my 3D print stringing?

Stringing is molten plastic leaking from the nozzle during travel moves and stretching into threads between features. Check the causes in this order: a wet spool, a nozzle that is too hot (lower it 5 °C per print, as UltiMaker advises), retraction that is too short, too slow or not firing, and long travel moves across open gaps.

1.1 The number

Causes and fixes come from UltiMaker's "How to fix stringing", the Prusa Knowledge Base and Bambu Lab Wiki stringing articles, Polymaker's Hairy or Stringy Prints and Blobs and Oozing pages, and the OrcaSlicer wiki. Bambu Studio's setting name is from its v02.08.02.61 source.

1.2 Why does plastic leak out on travel moves?

Polymaker's material science notes split the problem in two. A string forms when the line just printed stays joined to the melt in the nozzle and gets drawn out as the head moves away. Ooze is melt pushed out by leftover pressure and gravity, and the longer the nozzle sits idle, the more escapes. Retraction pulls the filament back to drop that pressure, UltiMaker explains. Heat works against it: hotter plastic is more liquid and drips even when retracted. Water in the filament evaporates in the nozzle and pushes melt out from inside. So the checks start with the spool and the temperature.

1.3 What causes stringing even with retraction enabled?

Often the moves that string are not retracted at all: UltiMaker notes that other settings still decide whether each travel retracts. Each slicer has its own:

- **UltiMaker Cura 5.13:** Combing Mode defaults to All and Max Comb Distance With No Retract to 0, which means travel inside the part never retracts. Retraction Minimum Travel is twice the line width, and Maximum Retraction Count ignores any retraction past 90 in one extrusion window.
- **PrusaSlicer:** Only retract when crossing perimeters skips travel that stays inside the walls, and Minimum travel after retraction skips shorter hops.

Table 1. The number

What the strings look like	When they appear	Likely cause	First change
Fine hairs all over the part; thin pins look fuzzy	On almost every travel move	Nozzle too hot	Lower the nozzle 5 °C per test print (UltiMaker); Prusa suggests trying 5 to 10 °C lower
Strings only between separate parts or features	When the nozzle crosses open air	Long travel moves	Place parts closer and turn on Avoid crossing walls (OrcaSlicer), Avoid crossing wall (Bambu Studio) or Avoid crossing perimeters (PrusaSlicer). Raise travel speed: UltiMaker calls 150 mm/s fine for most prints
Blobs, or strands heavy enough to leave lumps	Where the head paused, or after a long travel	More melt leaving the nozzle than the move needs	Polymaker: cut Minimum layer time to about 3 s, because pauses ooze. Bambu Lab: match the slicer profile to the nozzle fitted and replace a worn one
Stringing that started with no setting change	From one print to the next	The spool: damp, or a different material or color	Listen for popping at the nozzle (Polymaker) and dry the spool
Strings even though retraction is on	Inside the part, on short hops, or everywhere	Travel moves that skip retraction, or melt runny enough to drip anyway	In Cura's Layer view, retracted travel is light purple and unretracted travel rich blue (UltiMaker). If every move retracts, lower the temperature

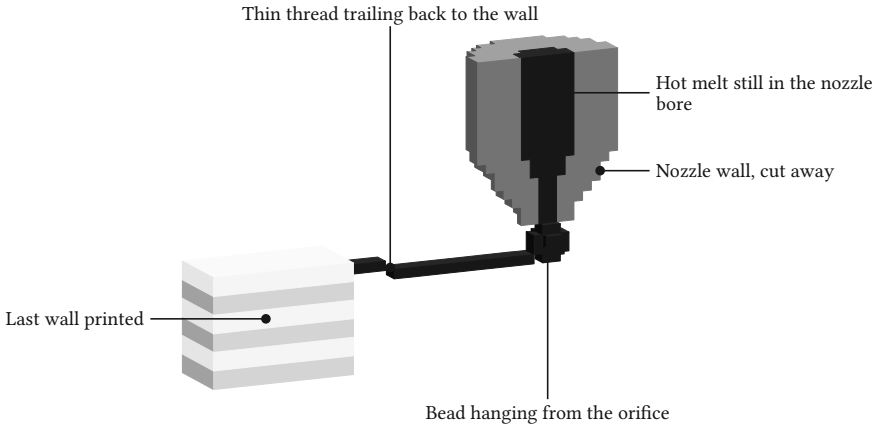


Figure 1. The line just printed stays joined to the melt in the nozzle, so a thread is drawn out as the head moves away.

- **OrcaSlicer and Bambu Studio:** Travel distance threshold sets the shortest travel that retracts.

If every move retracts and it still strings, the melt is too runny to hold back. Lower the temperature next. Z hop (lifting the nozzle for travel) can also add strings: Prusa says a lower Lift Z improves stringing (can Z hop cause stringing).

1.4 Does nozzle temperature cause stringing more than retraction?

None of the five makers' guides ranks one above the other, and they split on which to change first. UltiMaker calls temperature key, because hotter melt drips even when retracted. OrcaSlicer's calibration guide tunes temperature first and retraction last, since the default retraction usually works well. Prusa's article opens with retraction, and Bambu Lab lists retraction and travel ahead of temperature.

If your retraction is still at the profile default, change the temperature first. A cooler nozzle adds no wear, and more retraction does. Bambu Lab warns that too long a retraction can clog and recommends 2 mm or less. UltiMaker says longer and more frequent retractions wear the filament in the feeder until it flattens and under-extrudes. Do not overshoot: OrcaSlicer notes that too low a temperature can also cause stringing.

1.5 How do you reduce stringing without adding more retraction?

- **Lower the temperature in 5 °C steps and slow down to match.** UltiMaker warns that a cooler nozzle at full print speed under-extrudes.
- **Keep travel inside the part** with the avoid-crossing setting named in the table. Cura's Avoid Printed Parts When Traveling detours around parts, but UltiMaker warns longer detours give melt more time to ooze.
- **Travel faster.** Polymaker suggests 200 mm/s or more with about 2,500 mm/s² travel acceleration on CoreXY machines (two belts move the head in X and Y). Back off if the frame rattles or the steppers skip.
- **Wipe.** Wipe while retracting moves the nozzle along the last line to clean off leaked plastic. Polymaker says a wipe cuts the string before the travel starts, and Prusa recommends keeping the setting enabled.
- **Coast on a Bowden printer** (one whose extruder feeds the hotend through a long tube). Coasting (Enable Coasting in Cura, off by default) replaces the end of each line with travel so the ooze finishes the line. Polymaker warns it leaves holes when there is no stringing to fix.
- **Print parts closer together, or one at a time** (Sequential printing in PrusaSlicer).

1.6 Why did my printer suddenly start stringing?

If no setting changed, something else did:

- **The spool.** Damp filament pops or crackles at the nozzle, per Polymaker. Dry it and keep it in a sealed box with desiccant, as Bambu Lab advises (how to tell if filament is wet). If a dried spool still strings, see why filament still strings after drying.
- **The material.** UltiMaker says the right temperature depends on the material type and even the color, so a new brand or color can need a cooler nozzle.
- **The nozzle.** Prusa traces strands to a film that builds up in the nozzle after long runs of one filament, such as PETG (glycol-modified polyethylene terephthalate), and says to clean the nozzle thoroughly. Bambu Lab says a worn nozzle lets out too much melt and needs replacing.
- **The hotend.** After hotend work, Prusa says to check the parts against the assembly instructions and to reapply thermal paste between the heatbreak and heatsink.

1.7 How to check it on your own print

1. **Match the strings to a row** in the table above.
2. **Listen during extrusion.** Popping means a wet spool, so dry it before touching any setting.

3. **Lower the nozzle 5 °C and reprint.** Repeat while the strings shrink, and stop before walls under-extrude. An OrcaSlicer temperature tower tests several steps in one print.
4. **Compare retraction with the starting values** for your extruder (retraction distance, direct drive vs Bowden) and filament (PLA, PETG). On a retraction tower, OrcaSlicer says to keep the shortest length that prints clean.
5. **Clean up the print you have** (removing stringing from a print).

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