What retraction settings should you use for PLA?

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Abstract. Shipped PLA profiles retract 0.4 to 0.8 mm at 30 to 50 mm/s on direct-drive printers and 2.5 to 6.5 mm at 45 to 70 mm/s on Bowden printers.

Keywords: retraction, pla, slicer-settings

1 What retraction settings should you use for PLA?

Start from your printer's shipped PLA profile: direct-drive printers retract 0.4 to 0.8 mm at 30 to 50 mm/s, Bowden printers 2.5 to 6.5 mm at 45 to 70 mm/s. Bambu Studio sends 0.8 mm at 30 mm/s with a 0.4 mm Z hop on a standard-nozzle X1 Carbon, P1S or A1. Then calibrate your own spool.

1.1 The number

The Bambu rows come from Bambu Studio's profiles at v02.08.02.61 and the OrcaSlicer row from OrcaSlicer v2.4.2. The Prusa rows come from PrusaSlicer 2.9.6′s bundled profiles (unchanged in Prusa's 2.5.13 bundle), and the Creality and UltiMaker rows from Cura 5.13.0′s machine, nozzle and quality profiles. Z hop is how far the nozzle lifts for travel moves. Cura calls deretraction speed Retraction Prime Speed, and PrusaSlicer reads the MK3S profile's Deretraction Speed of 0 as "same as retraction".

1.2 Why do Bowden printers retract PLA so much farther?

Because the pull starts at the drive gear. On the direct-drive printers in the table, the gear rides on the print head right over the hotend. On a Bowden printer such as the Prusa MINI or UltiMaker S5, it is fixed to the frame and pushes filament through a tube to the print head. Marlin's documentation treats the free filament between gear and nozzle as a spring, and the tube makes that spring far longer.

Prusa's knowledge base gives the Bowden extruder as the reason the MINI presets default to 3.2 mm, and says the direct-drive MK3S should stay at 2 mm or less. PrusaSlicer's own PLA profiles show the split: 0.7 to 0.8 mm on the direct-drive printers, 2.5 to 3.2 mm on the MINI.

Table 1. The number

Printer, 0.4 mm nozzle	Slicer and PLA profile	Retraction length	Retraction / deretraction speed	Z hop
Bambu Lab X1 Carbon, P1S, A1, Standard nozzle (direct drive)	Bambu Studio 2.8.2, Bambu PLA Basic	0.8 mm	30 / 30 mm/s	0.4 mm, type Auto
Bambu Lab X1 Carbon, High Flow nozzle (direct drive)	Bambu Studio 2.8.2, Bambu PLA Basic	0.4 mm	30 / 30 mm/s	0.6 mm, type Auto
Bambu Lab P1S, High Flow nozzle (direct drive)	Bambu Studio 2.8.2, Bambu PLA Basic	0.4 mm	50 / 50 mm/s	0.6 mm, type Auto
Bambu Lab X1 Carbon, P1S, Standard or High Flow nozzle (direct drive)	OrcaSlicer 2.4.2, Bambu PLA Basic	0.8 mm	30 / 30 mm/s	0.4 mm, type Auto
Prusa MK4S (direct drive)	PrusaSlicer 2.9.6, Prusament PLA or Generic PLA	0.7 mm	35 / 25 mm/s	Ramping lift, up to 0.6 mm
Prusa CORE One (direct drive)	PrusaSlicer 2.9.6, Prusament PLA or Generic PLA	0.7 mm	45 / 25 mm/s	Ramping lift, up to 0.6 mm
Prusa MK3S, MK3S+ (direct drive)	PrusaSlicer 2.9.6, Prusament PLA or Generic PLA	0.8 mm	35 / 35 mm/s	0.4 mm
Creality Ender-3 S1 (direct drive)	UltiMaker Cura 5.13, Generic PLA	0.8 mm	40 / 40 mm/s	Off (0.2 mm if switched on)
Prusa MINI, MINI+ (Bowden)	PrusaSlicer 2.9.6, Prusament PLA or Generic PLA	3.2 mm	70 / 40 mm/s	0.2 mm
Prusa MINI, MINI+ with Input Shaper firmware (Bowden)	PrusaSlicer 2.9.6, Prusament PLA or Generic PLA	2.5 mm	70 / 40 mm/s	0.2 mm
UltiMaker S5, AA 0.4 print core (Bowden)	UltiMaker Cura 5.13, UltiMaker PLA or Generic PLA	6.5 mm	45 / 45 mm/s	Off with one extruder; 2 mm, only over printed parts, with two

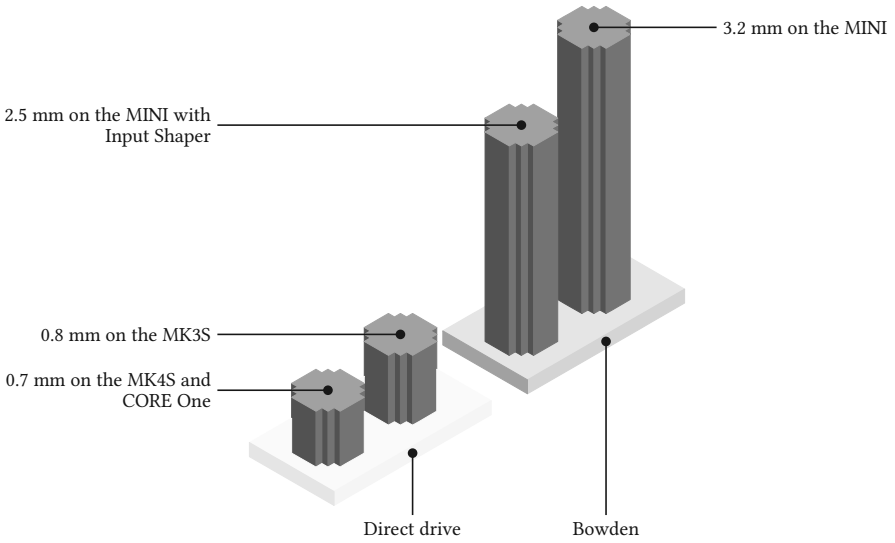


Figure 1. PrusaSlicer's PLA profiles pull back well under a millimetre of filament on the direct-drive printers and several millimetres on the Bowden MINI.

1.3 Does the PLA profile override the printer's retraction?

Mostly not. Retraction length and speed stay empty in Bambu PLA Basic on a Standard nozzle, in PrusaSlicer's Prusament PLA and Generic PLA, and in Generic PLA from OrcaSlicer's filament library. The printer profile's values apply. The exceptions:

- **Bambu Studio, High Flow nozzle:** Bambu PLA Basic sets 0.4 mm and a 0.6 mm Z hop on the X1 Carbon and P1S, plus 50 mm/s speeds on the P1S. OrcaSlicer 2.4.2′s copy of the profile has no such override.
- **PrusaSlicer, MK4S and CORE One:** the PLA profiles turn on ramping lift and cap it at 0.6 mm (Maximum ramping lift), down from the printer profile's 1.5 mm. With ramping lift on, PrusaSlicer uses that cap and ignores the 0.2 mm Lift height.
- **Cura, UltiMaker S5:** the PLA quality profiles set Retraction Prime Speed equal to Retraction Speed (45 mm/s). The printer profile's own prime speed is 15 mm/s.

1.4 What is a good retraction distance for PLA?

The length in your printer's own profile: 0.4 to 0.8 mm on the direct-drive printers above, 2.5 to 3.2 mm on the Bowden Prusa MINI and 6.5 mm on the UltiMaker S5. Raise it only if a test print still strings, in the steps OrcaSlicer's retraction test uses: 0.1 mm on direct drive, 0.2 mm on Bowden. Too long has its own failures (what happens when retraction distance is too high).

1.5 What is the recommended retraction speed for PLA?

Shipped PLA profiles retract at 30 to 50 mm/s on direct drive and 45 to 70 mm/s on Bowden. Deretraction (the push back in) is slower on some printers: 25 mm/s on the MK4S and CORE One and 40 mm/s on the MINI. Prusa's knowledge base says a higher retraction speed reduces stringing, but too high can make the extruder motor skip steps.

1.6 How to check it on your own print

1. **Read what your slicer sends now.** Bambu Studio and OrcaSlicer: Printer settings, Extruder page, Retraction group, then the filament's Setting Overrides page. PrusaSlicer: Printer Settings, Extruder 1, Retraction and Travel lift groups, then Filament Settings, Filament Overrides. Cura: the Travel category (Retraction Distance, Retraction Speed, Z Hop When Retracted).
2. **Print a retraction test** with the PLA spool you will use. In OrcaSlicer, open Calibration, Retraction. The defaults run 0 to 2 mm in 0.1 mm steps, which OrcaSlicer's guide calls right for most direct-drive extruders. For Bowden it suggests 1 to 6 mm in 0.2 mm steps. Take the shortest length that leaves the tower clean (full method).
3. **Save the result in the filament's overrides** (Setting Overrides in Bambu Studio and OrcaSlicer, Filament Overrides in PrusaSlicer). A change in the printer profile applies to every material.
4. **If PLA still strings at the tuned length,** lower the nozzle temperature a little and try a different spool. Prusa lists high temperature and moisture in the filament as causes of stringing.
5. **If you use pressure advance (Linear Advance),** calibrate it before retraction (starting values for PLA). Marlin says to recheck retraction distance afterwards, since it may need much less.

References

[1] resources/profiles/BBL/machine/Bambu Lab X1 Carbon 0.4 nozzle.json at v02.08.02.61, Bambu Studio on GitHub. https://

github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/machine/Bambu%20Lab%20X1%20Carbon%200.4%20nozzle.json. Accessed October 30, 2026.
[2] resources/profiles/BBL/machine/Bambu Lab P1S 0.4 nozzle.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/machine/Bambu%20Lab%20P1S%200.4%20nozzle.json. Accessed October 30, 2026.
[3] resources/profiles/BBL/machine/Bambu Lab A1 0.4 nozzle.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/machine/Bambu%20Lab%20A1%200.4%20nozzle.json. Accessed October 30, 2026.
[4] resources/profiles/BBL/machine/fdm_bbl_3dp_001_common.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/machine/fdm_bbl_3dp_001_common.json. Accessed October 30, 2026.
[5] resources/profiles/BBL/filament/Bambu PLA Basic @BBL X1C.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/filament/Bambu%20PLA%20Basic%20%40BBL%20X1C.json. Accessed October 30, 2026.
[6] resources/profiles/BBL/filament/Bambu PLA Basic @BBL P1S 0.4 nozzle.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/filament/Bambu%20PLA%20Basic%20%40BBL%20P1S%200.4%20nozzle.json. Accessed October 30, 2026.
[7] resources/profiles/BBL/filament/Bambu PLA Basic @BBL A1.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/filament/Bambu%20PLA%20Basic%20%40BBL%20A1.json. Accessed October 30, 2026.
[8] resources/profiles/BBL/filament/fdm_filament_template_direct_dual.json at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/resources/profiles/BBL/filament/fdm_filament_template_direct_dual.json. Accessed October 30, 2026.
[9] src/libslic3r/PrintConfig.cpp at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/src/libslic3r/PrintConfig.cpp. Accessed October 30, 2026.
[10] src/slic3r/GUI/Tab.cpp at v02.08.02.61, Bambu Studio on GitHub. https://github.com/bambulab/BambuStudio/blob/v02.08.02.61/src/slic3r/GUI/Tab.cpp. Accessed October 30, 2026.
[11] resources/profiles/BBL/machine/Bambu Lab X1 Carbon 0.4 nozzle.json at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/resources/profiles/BBL/machine/Bambu%20Lab%20X1%20Carbon%200.4%20nozzle.json. Accessed October 30, 2026.
[12] resources/profiles/BBL/machine/Bambu Lab P1S 0.4 nozzle.json at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/resources/profiles/BBL/machine/Bambu%20Lab%20P1S%200.4%20nozzle.json. Accessed October 30, 2026.
[13] resources/profiles/BBL/filament/Bambu PLA Basic @BBL X1C.json at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/resources/profiles/BBL/filament/Bambu%20PLA%20Basic%20%40BBL%20X1C.json. Accessed October 30, 2026.
[14] resources/profiles/OrcaFilamentLibrary/filament/Generic PLA @System.json at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/resources/profiles/OrcaFilamentLibrary/filament/Generic%20PLA%20%40System.json. Accessed October 30, 2026.
[15] resources/profiles/OrcaFilamentLibrary/filament/base/fdm_filament_common.json at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/resources/profiles/OrcaFilamentLibrary/filament/base/fdm_filament_common.json. Accessed October 30, 2026.
[16] src/slic3r/GUI/Tab.cpp at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/src/slic3r/GUI/Tab.cpp. Accessed October 30, 2026.
[17] src/slic3r/GUI/calib_dlg.cpp at v2.4.2, OrcaSlicer on GitHub. https://github.com/OrcaSlicer/OrcaSlicer/blob/v2.4.2/src/slic3r/GUI/calib_dlg.cpp. Accessed October 30, 2026.
[18] Retraction test, OrcaSlicer wiki. https://www.orcaslicer.com/wiki/calibration/retraction_calib.html. Accessed October 30, 2026.
[19] resources/profiles/PrusaResearch.ini at version_2.9.6, PrusaSlicer on GitHub. https://github.com/prusa3d/PrusaSlicer/blob/version_2.9.6/resources/profiles/PrusaResearch.ini. Accessed October 30, 2026.
[20] PrusaResearch/2.5.13.ini, Prusa profile bundle 2.5.13 (PrusaSlicer-settings-prusa-fff on GitHub, commit 12016ce). https://github.com/prusa3d/PrusaSlicer-settings-prusa-fff/blob/12016ce651bff04ff06f39e42d6fd85ff9446e54/PrusaResearch/2.5.13.ini. Accessed October 30, 2026.
[21] src/libslic3r/PrintConfig.cpp at version_2.9.6, PrusaSlicer on GitHub. https://github.com/prusa3d/PrusaSlicer/blob/version_2.9.6/src/libslic3r/PrintConfig.cpp. Accessed October 30, 2026.
[22] src/libslic3r/GCode/Travels.cpp at version_2.9.6, PrusaSlicer on GitHub. https://github.com/prusa3d/PrusaSlicer/blob/version_2.9.6/src/libslic3r/GCode/Travels.cpp. Accessed October 30, 2026.
[23] src/slic3r/GUI/Tab.cpp at version_2.9.6, PrusaSlicer on GitHub. https://github.com/prusa3d/PrusaSlicer/blob/version_2.9.6/src/slic3r/GUI/Tab.cpp. Accessed October 30, 2026.
[24] Stringing and oozing, Prusa Knowledge Base. https://help.prusa3d.com/article/stringing-and-oozing-issues_1805. Accessed October 30, 2026.
[25] Extruder / Extruder motor (MINI), Prusa Knowledge Base glossary. https://help.prusa3d.com/glossary/extruder-extruder-motor-mini_142004. Accessed October 30, 2026.
[26] Glossary i3-Series (Extruder entry), Prusa Knowledge Base. https://help.prusa3d.com/article/glossary-i3-series_125064. Accessed October 30, 2026.
[27] Original Prusa MK4S 3D Printer, technical parameters, Prusa Research. https://www.prusa3d.com/product/original-prusa-mk4s-3d-printer/. Accessed October 30, 2026.
[28] Prusa CORE One+ (Gen 2), technical parameters (Nextruder, Direct Drive), Prusa Research. https://www.prusa3d.com/product/prusa-core-one/. Accessed October 30, 2026.
[29] resources/definitions/fdmprinter.def.json at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/definitions/fdmprinter.def.json. Accessed October 30, 2026.
[30] resources/definitions/ultimaker_s5.def.json at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/definitions/ultimaker_s5.def.json. Accessed October 30, 2026.
[31] resources/variants/ultimaker_s5_aa04.inst.cfg at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/variants/ultimaker_s5_aa04.inst.cfg. Accessed October 30, 2026.
[32] resources/quality/ultimaker_s5/um_s5_aa0.4_um-pla_0.2mm.inst.cfg at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/quality/ultimaker_s5/um_s5_aa0.4_um-pla_0.2mm.inst.cfg. Accessed October 30, 2026.

[33] resources/quality/ultimaker_s5/um_s5_aa0.4_pla_0.2mm.inst.cfg at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/quality/ultimaker_s5/um_s5_aa0.4_pla_0.2mm.inst.cfg. Accessed October 30, 2026.
[34] resources/definitions/creality_base.def.json at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/definitions/creality_base.def.json. Accessed October 30, 2026.
[35] resources/definitions/creality_ender3s1.def.json at 5.13.0, UltiMaker Cura on GitHub. https://github.com/Ultimaker/Cura/blob/5.13.0/resources/definitions/creality_ender3s1.def.json. Accessed October 30, 2026.
[36] S series - Replace the Bowden tubes, UltiMaker Support. https://support.ultimaker.com/articles/Knowledge/1667417403331. Accessed October 30, 2026.
[37] Ender-3 S1 3D Printer, Creality. https://www.creality.com/products/creality-ender-3-s1-3d-printer. Accessed October 30, 2026.
[38] Linear Advance, Marlin Firmware documentation. https://marlinfw.org/docs/features/lin_advance.html. Accessed October 30, 2026.

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