What retraction settings should you use for ABS and ASA?

Asked 3D Content Team
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Abstract. Your printer's own: shipped ABS and ASA profiles use 0.7 to 0.8 mm on direct-drive Prusa and Bambu printers (0.4 mm for Bambu ABS) and 2.5 to 6.5 mm on Bowden.

Keywords: retraction, abs, asa, slicer-settings

1 What retraction settings should you use for ABS and ASA?

Keep your printer's own retraction: shipped ABS and ASA profiles mostly reuse its PLA values. Direct-drive Prusa and Bambu Lab printers get 0.7 to 0.8 mm at 30 to 45 mm/s, except Bambu Studio's ABS at 0.4 mm. Bowden machines use 2.5 to 6.5 mm. Where the length differs from PLA's, the gap is 0.5 mm or less.

1.1 The number

The Bambu rows are from Bambu Studio v02.08.02.61′s printer and filament profiles, and the Prusa rows from PrusaSlicer 2.9.6′s bundled Prusa profiles with every inherited section followed. The UltiMaker rows are from UltiMaker Cura 5.13.0′s definitions, nozzle variants and quality profiles. The last row is from Polymaker's technical data sheets. Extruder types come from Bambu Studio's printer profiles, the makers' product pages, the Prusa Knowledge Base and UltiMaker Support.

Deretraction is the push that reloads the filament after a retraction. The MK3S deretraction field is 0, which PrusaSlicer reads as the retraction speed. Cura names the deretraction speed Retraction Prime Speed. ABS is acrylonitrile butadiene styrene, ASA is acrylonitrile styrene acrylate and PLA is polylactic acid.

Table 1. The number

Printer and extruder	Profile (slicer)	Retraction length	Retract / deretract speed	Z hop	Against the same printer's PLA
Bambu Lab X1 Carbon, P1S, 0.4 mm standard hotend (direct drive)	Bambu ABS, Generic ABS (Bambu Studio)	0.4 mm	30 / 30 mm/s	0.4 mm, type Auto	Half PLA's 0.8 mm; speed and Z hop the same
Bambu Lab X1 Carbon, P1S, 0.4 mm standard hotend (direct drive)	Bambu ASA, Generic ASA (Bambu Studio)	0.8 mm	30 / 30 mm/s	0.4 mm, type Auto	Identical
Prusa CORE One, 0.4 mm (direct drive)	Generic ABS, Prusament ASA (PrusaSlicer)	0.7 mm	45 / 25 mm/s	Ramping lift, up to 1.5 mm	Same length and speeds; PLA caps the ramp at 0.6 mm
Original Prusa MK4S, 0.4 mm (direct drive)	Generic ABS, Prusament ASA (PrusaSlicer)	0.7 mm	35 / 25 mm/s	Ramping lift, up to 1.5 mm	Same length and speeds; PLA caps the ramp at 0.6 mm
Original Prusa i3 MK3S, MK3S+ (direct drive)	Generic ABS, Prusament ASA (PrusaSlicer)	0.8 mm	35 / 35 mm/s	0.4 mm	Identical
UltiMaker Method X, 1XA extruder (direct drive)	UltiMaker ABS, UltiMaker ASA (Cura)	0.5 mm	5 / 5 mm/s	0.4 mm	0.25 mm shorter than PLA's 0.75 mm on the 1A extruder
Original Prusa MINI, MINI+ (Bowden)	Generic ABS, Prusament ASA (PrusaSlicer)	2.7 mm	70 / 40 mm/s	0.2 mm	0.5 mm shorter than PLA's 3.2 mm
Original Prusa MINI, MINI+ with Input Shaper (Bowden)	Generic ABS; Prusament ASA (PrusaSlicer)	2.7 mm; 2.5 mm	70 / 40 mm/s	0.2 mm	ABS 0.2 mm longer than PLA's 2.5 mm; ASA identical
UltiMaker S5, AA 0.4 print core (Bowden)	UltiMaker ABS, Generic ABS (Cura)	6.5 mm	45 / 15 mm/s	Off with one extruder; 2 mm, over printed parts only, with two	Same length and retract speed; PLA primes at 45 mm/s
Any printer, 0.4 mm nozzle	Polymaker PolyLite ABS and ASA data sheets	1 to 3 mm	20 to 40 mm/s	Not given	Not given

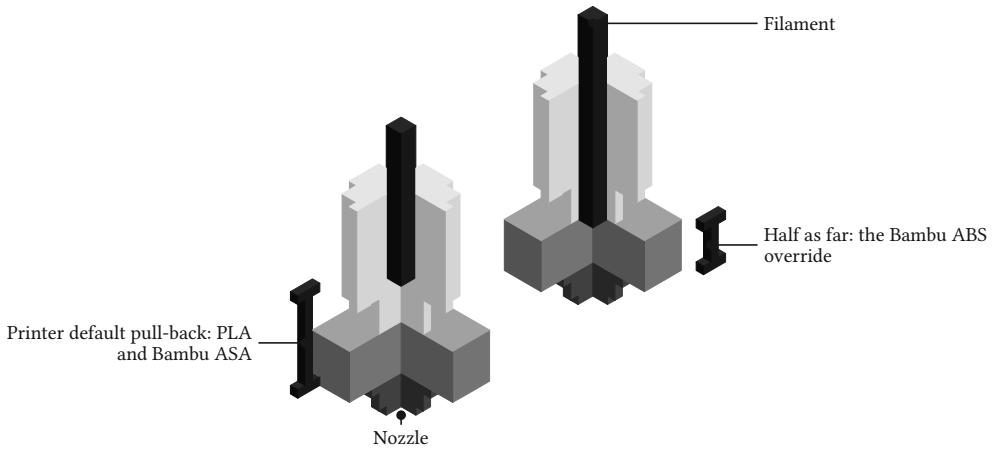


Figure 1. On a Bambu Lab X1 Carbon or P1S, Bambu Studio pulls Bambu ABS back half as far as the printer's default, which PLA and Bambu ASA keep.

1.2 Why does the printer change the number more than the plastic?

Because the extruder type sets most of the length, and the plastic only trims it. Prusa describes the move: when the head finishes one section, the filament is pulled back into the nozzle, then pushed out again at the next. Filament that keeps flowing while the head travels is left behind as a string.

On a Bowden machine, the extruder motor is fixed on the side and pushes filament through a PTFE (polytetrafluoroethylene) tube to the print head. The UltiMaker S5 takes 850 mm tubes. Prusa says its MINI presets retract much further because of the Bowden extruder, and caps MK3S retraction at 2 mm.

So the table spans 0.4 to 6.5 mm across printers, while switching one printer from PLA to ABS or ASA moves the length by 0.5 mm at most. The profile files do not explain the ABS changes.

1.3 What retraction should ABS and ASA use on a direct-drive printer?

Start from your profile's value, 0.4 to 0.8 mm. Every Prusa and Bambu Lab direct-drive row sits in that band at 30 to 45 mm/s; the UltiMaker Method X uses 0.5 mm at 5 mm/s. Polymaker's data sheets give 1 to 3 mm for both plastics without naming an extruder type. Every shipped direct-drive profile above sits below that range.

On a Bowden printer, ABS and ASA run 2.5 to 2.7 mm on the Prusa MINI and 6.5 mm on the UltiMaker S5. The general ranges for both extruder types are in what retraction distance should be.

1.4 Does ASA need different retraction from ABS?

Not in most shipped profiles. Bambu Studio is the exception: 0.4 mm for ABS, 0.8 mm for ASA.

PrusaSlicer gives Generic ABS and Prusament ASA the same retraction on the CORE One, MK4S, MK3S and MINI. Only the MINI with Input Shaper splits them: 2.7 mm for ABS, 2.5 mm for ASA. Cura sets both to 0.5 mm on the Method X, and Polymaker gives both the same range.

Prusa lists "detailed prints with no stringing" among ASA's advantages. Bambu Lab singles out its foamed ASA Aero, which oozes on excessive travel moves, and advises against models with many travel paths.

1.5 Does Z hop change for ABS and ASA?

Only in PrusaSlicer on the MK4S and CORE One. There, ABS and ASA keep the printer's ramping lift (the nozzle rises on a slope as the travel starts) of up to 1.5 mm, and PLA caps it at 0.6 mm. Bambu Studio keeps 0.4 mm, type Auto, for every plastic in the table. Prusa notes that a lower lift reduces stringing; Z hop height covers the trade-off.

1.6 How to check it on your own print

1. **Find the value your slicer sends.** In Bambu Studio, open the filament's **Setting Overrides** tab: a ticked **Length** replaces the machine value, and an unticked one uses **Retraction** on the printer's **Extruder** page. In PrusaSlicer, check **Filament Settings, Filament Overrides**, then **Printer Settings, Extruder 1**. In Cura, look under **Travel** for **Retraction Distance** and **Retraction Speed** (Bambu Studio, Cura).
2. **Dry the spool before you tune.** Bambu Lab lists stringing among the problems of ABS and ASA that have absorbed moisture (drying temperatures).
3. **Print a retraction test** that starts from your profile's value (how to calibrate retraction distance).
4. **Save the result as a filament override** (Bambu Studio's **Setting Overrides**, PrusaSlicer's **Filament Overrides**) so PLA keeps the printer's value.
5. **If strings remain at the profile value,** work through the other causes in why prints string.

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