How do you read a pressure advance test?

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Abstract. Pick the band, line or corner that prints most evenly. On a tower, value = start + height x step: OrcaSlicer's example is 0 + 8 mm x 0.002 = 0.016.

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Table 1. The number

Test	Default start, end and step	What to pick	Your value
Klipper tuning tower, direct drive	`START=0 FACTOR=.005` (per mm of height)	The height with the best corners	0 + height x 0.005
Klipper tuning tower, Bowden	`START=0 FACTOR=.020`	Same	0 + height x 0.020; Klipper's example: 12.90 mm gives 0.258
OrcaSlicer PA Tower	0 to 0.1, step 0.002 per mm (Bowden: 0 to 1.0, step 0.02)	The height with the best corners and seam	Start + height x step
OrcaSlicer PA Line	0 to 0.1, step 0.002 (Bowden: 0 to 1.0, step 0.02)	The most even line	Its label; every other line is labeled
OrcaSlicer PA Pattern	0 to 0.08, step 0.005 (Bowden: 0 to 1.0, step 0.05)	The sharpest corner	Its label; every other corner is labeled
Bambu Studio manual flow dynamics, Line or Pattern	0 to 0.05, step 0.005; Bambu's wiki suggests a 0.002 step	The sharpest corner with no under-extrusion	Enter it as Factor K
Marlin K-factor generator	0 to 2, step 0.2	The line whose speed changes are barely visible	`M900 K<value>`

1 How do you read a pressure advance test?

Pick the tower band with the sharpest corners, the line with the most even width, or the sharpest pattern corner. Lines and corners carry printed value labels. On a tower, measure the band's height from the bed and calculate start plus height times step. OrcaSlicer's example: 0 + 8 mm x 0.002 = 0.016.

1.1 The number

The Klipper values come from its Pressure Advance guide, the OrcaSlicer and Bambu Studio defaults and labels from their calibration source code (OrcaSlicer v2.4.2, Bambu Studio v02.08.02.61), the 0.002 step from Bambu Lab's wiki, and the Marlin range from its online generator's default fields.

1.2 Why does the right value show up as the cleanest spot?

Every band, line or corner prints with a different pressure advance value, and only one compensates the nozzle's pressure lag correctly. Below it, pressure lags behind the toolhead: Klipper's guide describes blobbing at the corners. Above it, the extruder overcorrects: Klipper lists rounded corners and poor extrusion leading up to the corner. Each side has its own page: corners that bulge (too low) and signs it is too high.

1.3 How do you read a pressure advance tower?

Find the height where the corners are sharpest, measure it from the bed with calipers, and put it into the formula from the table. The value rises with every millimeter, so the height is your reading.

- **Ignore the layer-change corner.** Klipper notes the slicer often changes layers at one corner, which makes it look different; tune on the other three. OrcaSlicer's wiki judges the seam along with the corners.
- **Choose a height that suits all the remaining corners.** They can differ a little because the frame reacts differently in each direction.
- **Klipper:** if you added `SKIP=` to `TUNING_TOWER`, subtract it from the height before using the formula.
- **OrcaSlicer:** the tower is cut to your range, so its top is the end value.

1.4 How do you read a pressure advance line test?

Pick the line whose width stays the same through both speed changes, and read its label. Each line runs slow, then fast, then slow again; Marlin's generator prints 20 mm at 20 mm/s, 40 mm at 70 mm/s and 20 mm slow.

- **Too low:** the line thins where the fast section starts and thickens where it slows down (Marlin's diagram).
- **Too high:** the reverse, thick at the start of the fast section and starved at its end.
- **Right:** the transitions are barely visible or gone.

OrcaSlicer labels every other line, so an unlabeled line sits halfway between the labels on either side. Its wiki warns that

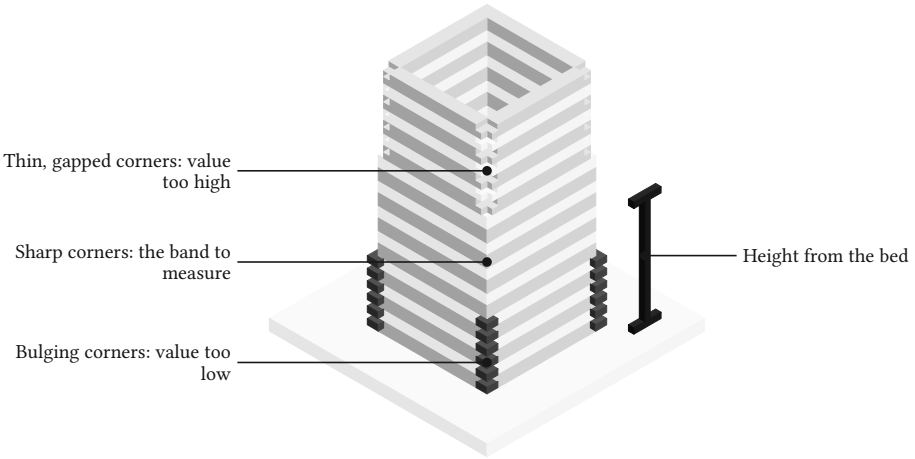


Figure 1. The value rises with height, so the band with the sharpest corners marks the height you measure from the bed.

accuracy depends heavily on your first layer and suggests turning on bed mesh leveling for this test.

1.5 Pressure advance line vs pattern: what's the difference?

The line test shows extrusion through straight speed changes; the pattern prints the corners themselves. OrcaSlicer's pattern is a row of 90 degree corners with 30 mm sides, four layers tall, labeled like the lines (every other corner). Read each corner by its tip:

- **Too low:** the corner bulges and rounds outward.
- **Too high:** the corner is under-extruded, thin or gapped at the tip.
- **Right:** the sharpest corner with the fewest gaps, bulges and divots.

In Bambu Lab's worked example, 0.006 bulged and 0.024 and up under-extruded. The pick was 0.018, between 0.016 and 0.020.

1.6 Which pressure advance test is best?

That depends on your printer and how much you trust your first layer:

- **Tower:** the method in Klipper's guide and the only one OrcaSlicer offers on belt printers. It takes longest and needs calipers, but OrcaSlicer notes it does not rely on the first layer.
- **Line:** the quickest, a single layer read off printed labels, if your first layer is good.
- **Pattern:** real corners like the tower, with printed labels instead of a measurement. Bambu's wiki prefers it: straight lines show corner problems less clearly and can give a lower, less reliable value.

1.7 How to check it on your own print

1. **Calibrate first.** Klipper says to tune the extruder's rotation distance and the nozzle temperature before pressure advance.
2. **Test the spool and nozzle you will print with.** Klipper notes that brands and pigments of the same filament often need significantly different values.
3. **On a Bambu printer running OrcaSlicer's test,** untick Flow calibration in the send dialog, as OrcaSlicer's wiki instructs.
4. **If the best spot sits at the very end of the range,** rerun with a new start or a larger step. Klipper says that if nothing improves up to 1.000, pressure advance is unlikely to help.
5. **Narrow it down.** Ellis' guide reruns at a 0.001 to 0.002 step once the range is known (direct drive).
6. **Two neighbors look equally good?** Klipper says to prefer the lower value; Ellis leans higher. Bambu reports about 10% jitter between repeated calibrations, so neighbors that close may differ only by noise.
7. **Gaps and bulges on the same corner** point to the extruder, not the value. Ellis names backlash as a common cause and says to check for anything loose.
8. **Save it.** Klipper: `pressure_advance = <value>` in `[extruder]`, then `RESTART`, which also restores normal acceleration. OrcaSlicer: in Filament settings, tick Enable pressure advance and enter the value in Pressure advance. Bambu Studio: enter it as Factor K, name it, then Finish. Marlin: `M900 K<value>` at the end of the start G-code.

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