

Calibrate a printer for accurate quotes

Measure a printer's real throughput from a job you've already run, and set an hourly rate that pays for the machine.

On small and medium prints, machine time often costs more than the material. In Shr3Dt it comes from two numbers you enter for each printer: throughput and hourly rate. A guessed throughput gets quotes into the right range. A measured one gets them close enough to send without checking each one by hand.

A printer added from a preset starts with typical values for that kind of machine, a fair starting point until you measure your own.

What throughput means

Throughput is the volume of material, in cm^3 , that a printer lays down per hour on a typical job. It is an average over a real print, so it includes travel, slower outer walls, small-feature slowdowns and everything else that happens while the job runs. That is why it is much lower than the peak flow rate on a spec sheet.

Shr3Dt adds one thing on top: a fixed time per layer, for the moves that don't depend on volume. More on that below.

Measure it from a job you've already run

1. **Pick a typical job.** A part or a full plate like the work you usually quote, printed at your normal layer height and speed, in one material and without a purge tower. A job of several hours gives a steadier number than a 20-minute test.
2. **Find the grams used.** Take the weight your slicer reported for that job, or weigh the finished parts and supports for a real figure.
3. **Convert to cm^3 .** Divide the grams by the material's density in g/cm^3 .
4. **Divide by the hours.** Use the wall-clock print time from start to finish, as the printer reported it.

For example, say a plate of PETG brackets used 212 g and took 9 hours 15 minutes:

$$\begin{aligned} 212 \text{ g} / 1.27 \text{ g/cm}^3 &= 167 \text{ cm}^3 \\ 167 \text{ cm}^3 / 9.25 \text{ h} &= 18 \text{ cm}^3/\text{h} \end{aligned}$$

Open the printer on the Machines page and enter 18 as **Throughput (cm³/h)**. Set **Measured at layer (mm)** to the layer height that job used, for example 0.2. A quote line at 0.1 mm layers then takes twice as long for the same volume, and one at 0.3 mm two thirds of the time.

Measured at speed

This field tells Shr3Dt which print speed your throughput belongs to. Quote lines start at 60 mm/s, and your website form always prices at that default. Shr3Dt scales the volume time by the ratio of the two speeds, so:

- Leave **Measured at speed (mm/s)** at 60. Your measured throughput then counts as your normal speed, and applies unchanged to default quote lines and to the website form.
- To price one job slower or faster than normal, change the print speed on that quote line: 30 mm/s doubles the volume time, 120 mm/s halves it.

If you entered the real speed of your test job instead, say 200 mm/s, every default line at 60 mm/s would be priced as if it printed more than three times slower.

Overhead per layer

Every layer costs some time however much material is in it: travel to the start, a z-hop, a wipe, a peel on a resin printer, a recoat on a powder printer. Shr3Dt multiplies **Overhead per layer (s)** by the number of layers, which is the part height divided by the layer height.

It mostly affects tall, thin parts. Say a part is 150 mm tall and printed at 0.2 mm: that is 750 layers, and at 4 seconds each, 50 minutes before any material is counted. A few seconds is typical for FDM. Resin and powder printers usually need more, because every layer involves a peel or a recoat.

Slicer speeds

Throughput drives the instant estimate. The real slicer check works differently: it prints the actual file at the speeds under **Slicer speeds** on the machine, so set those to match the profile you really print with. A printer added from a preset already holds the speeds from its standard 0.20 mm profile. On a fast printer, set Acceleration too, or the slicer will work the job out as slower than it really runs.

Check it against the same job

Upload the file you measured from to a new quote. Choose the same machine and material, and the same layer height, infill and supports. Compare the print time on the line with the real one. Within 10% or so is close enough to quote on.

- If flat and tall parts are both off by about the same amount, adjust throughput.
- If flat parts come out right but tall parts come out too long, lower the overhead per layer. If tall parts come out too short, raise it.
- For FDM parts, New quote slices the actual file once when you add it, and again when you press “Slice again”. Comparing its print time with the estimate shows how far the model is from a real slice of that part. If the sliced time is itself off from the real job, check the machine's slicer speeds and acceleration.

Recheck after a few weeks of jobs, and whenever you change nozzle, material or print profile; when the profile changes, update the machine's slicer speeds too. If you run one printer in two very different setups, such as a 0.4 mm and a 0.8 mm nozzle, add it twice, each with its own throughput.

Set an hourly rate that pays for the machine

The hourly rate is what an hour of printing costs you in machine terms. Operator time is not part of it: that is the labour rate in Settings. Build the rate from three parts:

- **Depreciation:** the purchase price divided by the printing hours you expect from the machine before you replace it.
- **Power:** the average draw in kW times your price per kWh.
- **Maintenance:** nozzles, build plates, belts, other spares and servicing per year, divided by the hours it prints per year.

Count the hours the printer actually prints, not the hours in a year. A printer that prints 1,500 hours a year carries twice the depreciation per hour of one that prints 3,000.

For example, say a printer costs €1,400 and you expect two years from it at 1,500 printing hours a year:

Part	Working	Per hour
Depreciation	€1,400 / 3,000 h	€0.47
Power	0.15 kW x €0.25 per kWh	€0.04
Maintenance	€200 a year / 1,500 h	€0.13
Hourly rate		€0.64

That is the bare cost of the machine. You can set a higher rate to also cover idle time, floor space or a share of the rent. Either way, count each cost once: failed material is already in the waste factor, operator time in the labour rate, and profit in the margin.

Tip: keep a note of the jobs you calibrate from: file, material, layer height, grams and hours. When a quote looks wrong months later, you can rerun the check in a few minutes.

Resin and powder printers

The method is the same. Take the volume of resin or powder that ended up in the parts, from your print preparation software or from weight divided by density, and divide it by the full job time. For SLS and MJF, measure on a full build: those printers pack many parts into one job, and a half-empty build understates throughput.

Put the hands-on time per build into **Setup (min)**: washing and curing for resin, unpacking and depowdering for powder. Shr3Dt spreads it across the quantity on each line.

Your website form prices resin, SLS and MJF parts at the machine's **Measured at layer** height, so set that to the layer height you normally print at.

Next steps

With throughput and hourly rate measured, the rest of the cost comes from your materials and settings. [Set up your shop in Shr3Dt](#) covers those. To see how these numbers turn into a price, read [How to price a 3D print](#).