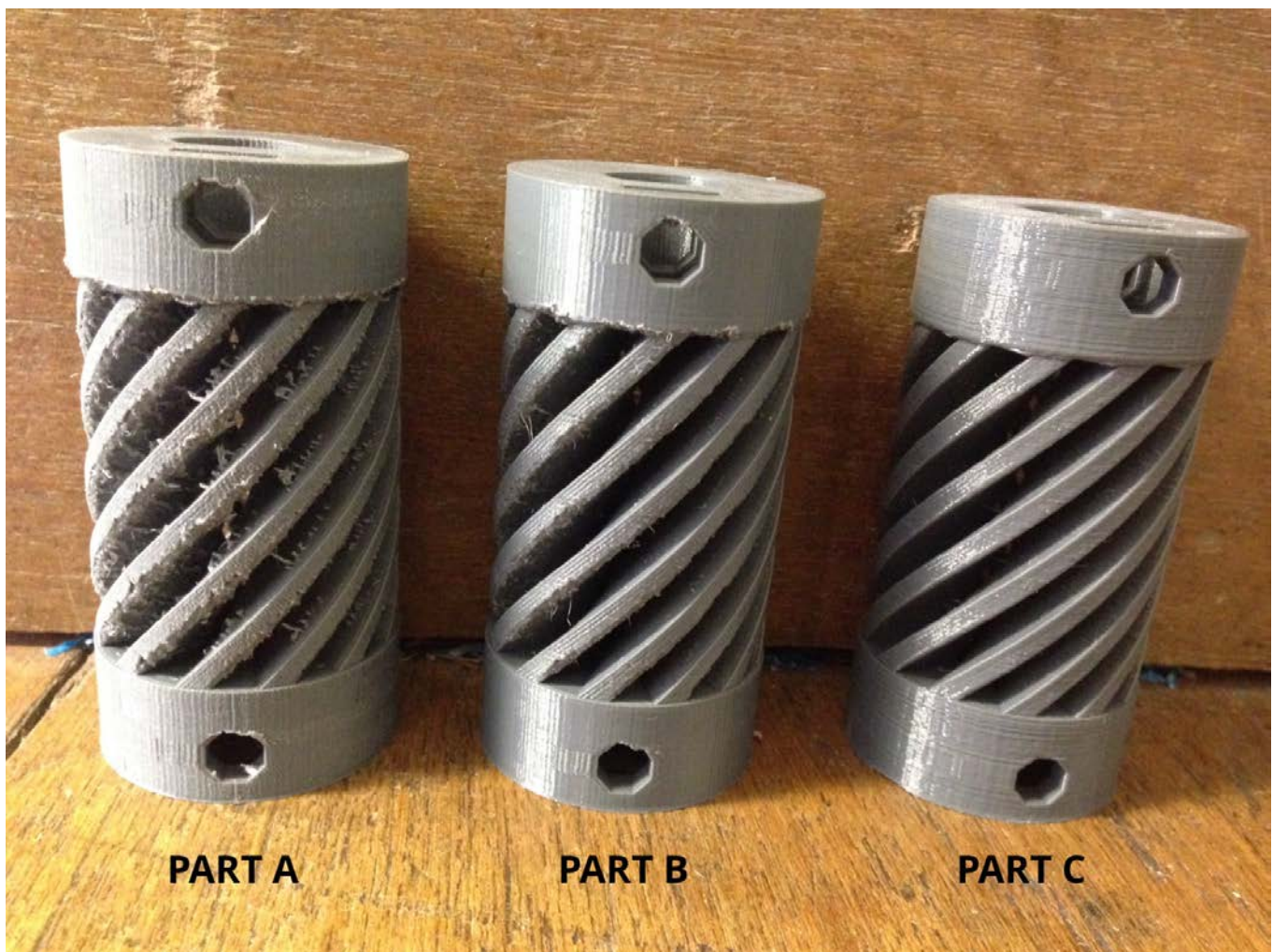


## CREAT3D 3D printing tips: microns, layer height & resolution explained

### What microns really mean in real-life

With plastic extrusion (FFF/FDM) desktop 3D printers, one of the most used, and perhaps, most mis-used terms acting as a means of comparing different machines is microns. Printer A can do 20 microns whereas Printer B can only do 100 microns, so A must be a better printer!

Right? Well our Technical Team have put it to the test to highlight what microns really mean in a real- world application.



### Back to basics

What is a micron? A micron is equal to one millionth of a metre. It is normally used to refer to the layer height, also known as print resolution or Z height. So 100 microns is equal to 0.1mm. The lower the micron, the higher the resolution.

FDM 3D printers vary in their layer height capability, generally we see machines running from 10 microns to 300 microns layer heights.



So in theory, if you always print at a lower layer heights (i.e. lesser microns) then you should always get better results. Right?

### Testing the micron theory

Take a look at the Coupling in the photo (part source: Thingiverse Thing 38678).

Same part, printed on the same printer, same material, same settings except for one thing - the layer height:

- One part is printed at 20 microns
- One part is printed at 60 microns
- One part is printed at 180 microns

Which one visibly looks the best? Easy answer: Part C. So which part was printed at which layer height? Was Part C printed at 20 microns?

No, in fact it may surprise some, but Part C was 3D printed at 180 microns. Part B was printed at 60 microns and Part A at 20 microns.

Confusing?!

### Why does lower layer height not always mean the best 3D printed result?

There are so many other factors that affect the finished output, these include (but aren't limited to) 3D printer set-up (build & configuration), accuracy, part geometry, part size and the type of material used.

In the case of the coupling above, one of the main reasons that printing at 20 micron layer height produced a worse finish was mainly due to the small surfaces in the main section. When printing at lesser microns, you are putting more layers down. As the surface area is relatively small on the grooves, what we see is the effect of heat transfer / disruption from the current layer on the layer previous, whereby the heat from the nozzle when applying layer 3 on top of layer 2, has distorted layer 2.

You can see this heat transfer effect reduces as you move up the micron ladder. So at 60 microns, there is some minor distortion and at 180 microns there is none, and we see a good quality print.

### Choose your layer height to suit your 3D printed part

In our experience, the best practice is to select your layer height according to the model shape and your desired output.



For example, the model such as the 3D Hubs Marvin keyring pictured on the left, due to its size and the fine detail is best 3D printed at a lower layer height, in this case 80 microns (part source: 3D Hubs Thingiverse Thing 215703). However, printing the same Marvin model in **colorFabb** woodFill needs to be printed at a increased layer height, in this case around 270 microns because of the material properties. Both outputs produce a good quality print but are from opposite ends of the micron scale.

### **Okay, I get microns now but where does this leave me?**

Think about microns in the same way as you would think about mega-pixels in cameras - more doesn't always mean better. There is a whole load of other factors that will impact on your output. The key is to find the printer that is designed to do the job you need, rather than hunting for the theoretical "best of everything".

If you already have a 3D printer, then it is a case of learning. In addition to the part's geometry and size, you also need to consider your printer's capabilities and set-up, as well as the properties of the material you are using. You also need to balance the required output versus time, as printing at a lower microns takes longer and as we have shown you above, doesn't necessarily give better results. Sometimes it can just be a case of experimentation until you find the right parameters.

If you are looking for advice on which printer is going to deliver the best results for your needs, or want to cover off additional training, contact the CREAT3D team and we can talk you through the options.