



Introduction to 3D printing at xHain's 3D lab

xHain hack+makespace



Outline

1. What's covered
2. Models
3. Slicing
4. How to print



Printers covered by this introduction



Prusa MK3S(+)



Prusa Core ONE+



Prusa MK3S(+)

We have five of them available:

- **nozzles:** 0.4, 0.6 and 0.8mm
- **nozzle materials:** brass, steel, hardened steel
- **printable volume:** 250x210x210mm (WxDxH)
- **input interface:** SD-card
- **type:** bed slinger
- **extruder:** direct-drive



Prusa Core ONE+

We have two of them available:

- **nozzles:** 0.4mm
- **nozzle materials:** brass, hardened steel
- **printable volume:** 250x220x270mm (WxDxH)
- **input interface:** USB key
- **type:** core xy
- **extruder:** direct-drive



Filaments covered by this presentation



(vanilla) PLA



(vanilla) PETG



Can I print a 1m tall, multi-material model of the Evangelion Unit 01?

For everything else like:

- using a printer not covered here
- using a special filament type for the first time
- anything labelled as *"requires authorization"*

or simply if you need help with some peculiar setup, **please** get in touch with one of the instructors listed here:

<https://wiki.x-hain.de/en/Governance/Intro-Authorized#h-3d-lab>



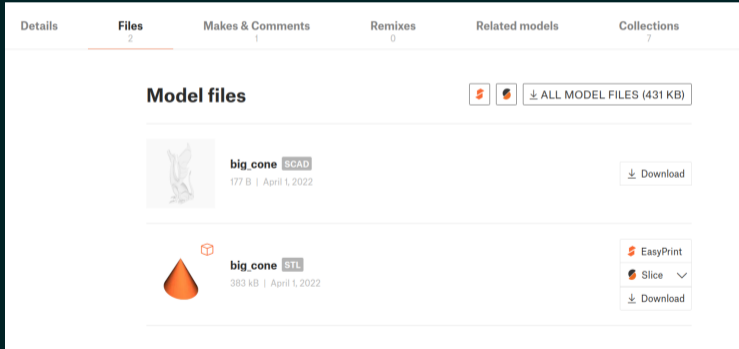
Where to get your models

- www.thingiverse.com
- www.printables.com
- grabcad.com
- www.yeggi.com



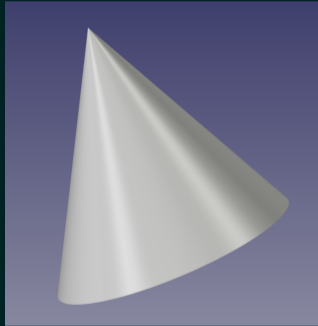
STL files

Typically we start from an STL file, containing a mesh.





STL files



Mesh imported into FreeCAD



A note on g-code files

Advice: don't download already sliced models (g-code files):

- it might be missing structural integrity or supports
- it might use the wrong printer profile

g-code is code :O

and as such can potentially contain malicious instructions

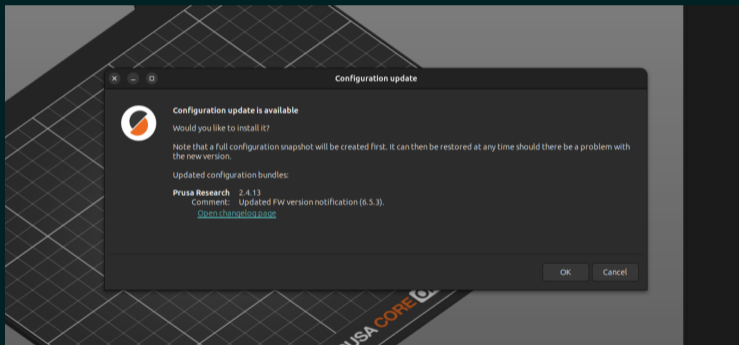


Prusa Slicer

- best choice for beginners and for the setup we have here.
- available on Linux, Mac OS X and Windows
- **endless documentation** that also helps with 3D printing concepts in general!



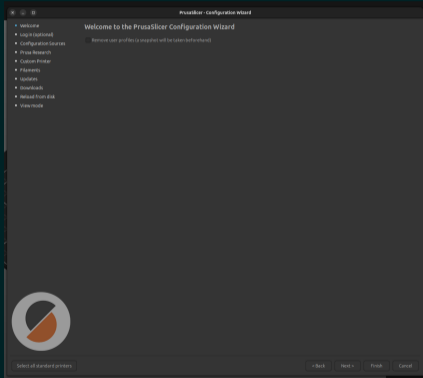
Configuration update



Configuration → Check for Configuration Updates



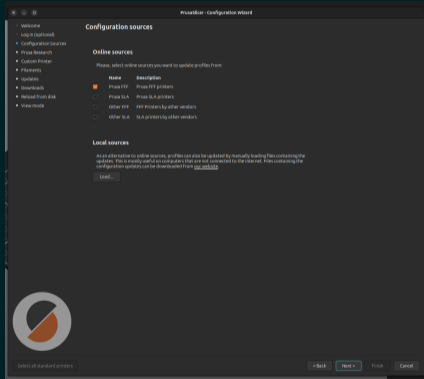
Add printer profiles



- Configuration → Configuration Wizard

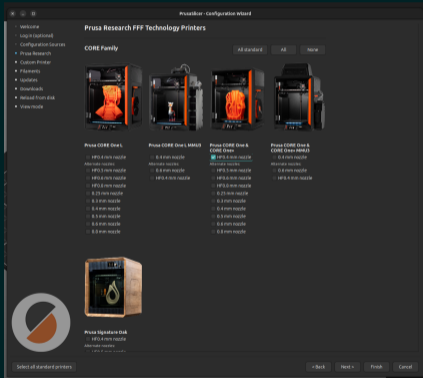


Add printer profiles



- Configuration → Configuration Wizard
- Click "Next" until you reach the printers' list

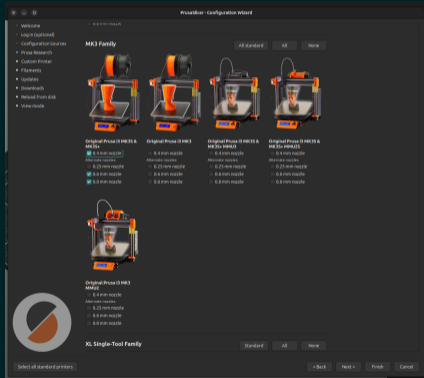
Add printer profiles



- Configuration → Configuration Wizard
- Click "Next" until you reach the printers' list
- Select the Prusa "Core One+" profile for the 0.4mm **high flow** nozzle



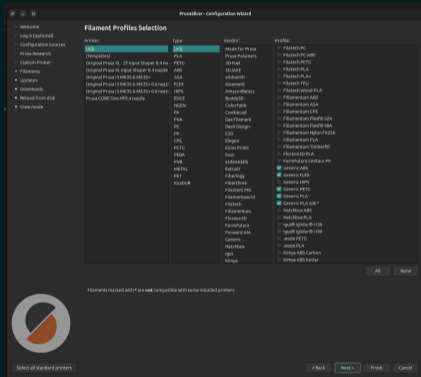
Add printer profiles



- Configuration → Configuration Wizard
- Click "Next" until you reach the printers' list
- Select the Prusa "Core One+" profile for the 0.4mm **high flow** nozzle
- Select the Prusa "MK3S and MK3S+" profiles for the 0.4, 0.6 and 0.8mm nozzles



Add filament profiles



- Select at least the **Generic** profiles for PLA and PETG
- Select the profiles of any other filament you want to use (optional)
- You can come back to this wizard any time you need to add a new profile

Let's slice!



Model Preparation

- Scale and position the part on the sheet
- Cut your model into parts (possibly with pins)
- Rotate the part to leverage printing direction / movement
- Duplicate part (copies VS instances)

Toolbars' documentation



Layers, Perimeters and Infill

- Set layer height / print resolution ([docs](#))
- Set infill type and amount ([docs](#))
- Change surface properties with seam position and fuzzy skin ([docs](#) and [docs](#))



Skirt, Brim and Supports

- Test extrusion with the skirt
- Add a brim to avoid tip-over ([docs](#))
- Add supports for overhangs and to stabilize your print ([docs](#))
- Add a raft if you have thin contact surfaces ([docs](#))



Export the g-code

When you are happy with the slicing, click "Export g-code" and save the file to:

- SD-Card for the MK3S(+)
- USB key for the Core One+

We have SD-cards and USB keys in the lab.



Setting up the printer

- load or swap the correct filament if necessary ([wiki](#))
- **IMPORTANT:** check that the correct sheet profile is selected ([wiki](#))
- check that the sheet is horizontal and if it feels crooked remove it and clean any debris that might be stuck under it or on the bed
- clean the sheet with isopropyl alcohol and a paper tissue to get better adhesion
- remove any debris or build-up from the nozzle (careful! it might be hot) and gently brush it if necessary



Filament Storage and Drying

- space-owned PLA and PETG spools are in the "fridge" near the entrance, **on the first and second shelf from the top** respectively
- after swapping filaments **lock the one you removed on the spool and put it back in the "fridge"**
- you can store your own filament in the members' rack **for a maximum of two weeks** at a time (labeled with your name and a date)
- you can **dry filament using one of the two driers available**, which can be also hold the spools while printing



Printers' interface

Currently printing is managed directly from the printers using the built-in control panel.

Both printer types have:

- **a rotary encoder knob**, press it to confirm (or "click") and rotate it to scroll around in the menus
- **a reset button** which if pressed reboots the printer aborting anything it was doing



Print with an MK3S(+)

- select a printer with the **right nozzle size**
- gently **insert the SD-card** on the left side of the control panel, contacts facing you
- navigate to the "**Print from SD-card**" menu
- navigate to your print file and **press the knob once to start the print**
- adjust the nozzle and bed temperature according to your filament or print needs if necessary



Print with a Core ONE+

- **insert the USB key** on the right side of the control panel
- select "**Print**" from the main menu, navigate to your file and start the print
- follow the instructions on the screen
- adjust the nozzle and bed temperature according to your filament or print needs if necessary

Congratulations!
You are printing!



Some recommendations

- **please** do not use more than two printers at the same time
- **please** stick around the printer until the first two layers are completed
- don't use a printer if there's an "**out of order**" sign on it (and **don't try to fix it** without contacting the curator first)



Once the print is done

- wait for the printer bed to cool down a bit
- gently pull the print off the sheet **with your hands or with the plastic scrapers only**
- try slightly bending the sheet if the print does not come loose
- remove all the remaining trace of filament from the sheet and put it back in the printer for the next person



The money talk

The lab is supported by donations:

- **3 cents per gram** if using the lab's filament
- **1 cent per gram** if using your own filament
- weigh the finished print including supports using the scale
- put your donation in the donation box near the scale

These donation guidelines apply to failed prints as well.

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