

Before printing checklist

- Your part is printable and supports are enabled (if needed?)
 - You selected PLA (generic) as the print material
 - The bed is correctly attached
 - The material is correctly loaded
 - You scheduled the print time and material usage
 - You wiped the bed with IPA just prior to printing
 - You will wait for the first layer to start before leaving the shop
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Safety

During printing the hot end and nozzle will reach temperatures around 210C and should never be touched.

The print bed will also reach warm temperatures of 60C and should be avoided during printing.

As the process involves heating plastic small particles will be released during printing. Do not spend extended periods next to a running printer in the shop.

The printer has many moving parts that can pinch. Do not touch the printer (except for the input wheel) in operation and make sure no objects are near the printer during operation.

Introduction

The Prusa mk3 is a FDM (fused deposition modeling) printer that constructs parts by depositing thin strands of molten plastic using an 3d (XYZ) movement system. The final shape is built by laying down many overlapping 2d layers. Please consult the excellent Prusa manual for a more detailed description of the printer and software:

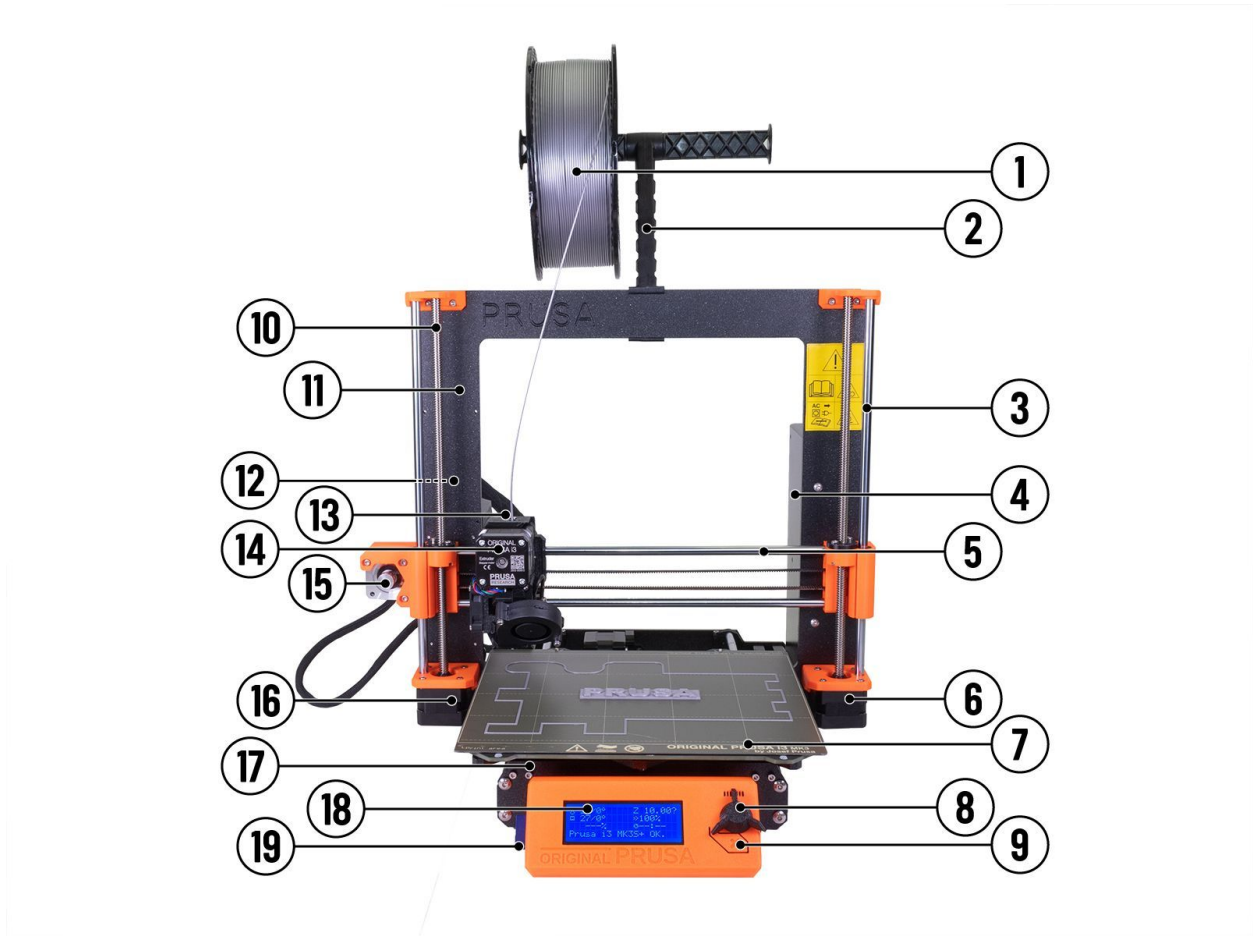
https://www.prusa3d.com/downloads/manual/prusa3d_manual_mk3s_en.pdf

For a broader overview of 3d printing see this video series by Tom Sanlanderer:

<https://www.youtube.com/watch?v=nb-Bzf4nQdE&list=PLDJMid0IOOYnkcFhz6rfQ6Uj8x7meNJJx&index=1>

Machine overview

See page 8 of the Prusa manual for an overview of the machine.



Some key components are:

- 1: filament spool
- 7: removable flexible print bed
- 8: click wheel user input
- 9: reset button
- 14: extruder (above hot end and nozzle)
- 19: SD card slot

Designing your part

You will need a printable STL file. These can be designed in any 3D CAD package (Solidworks, Autodesk Inventor, Fusion 360, etc). Creating a printable 3D design can be a complex process as certain features cannot be produced by a 3D printer. Some key pointers are:

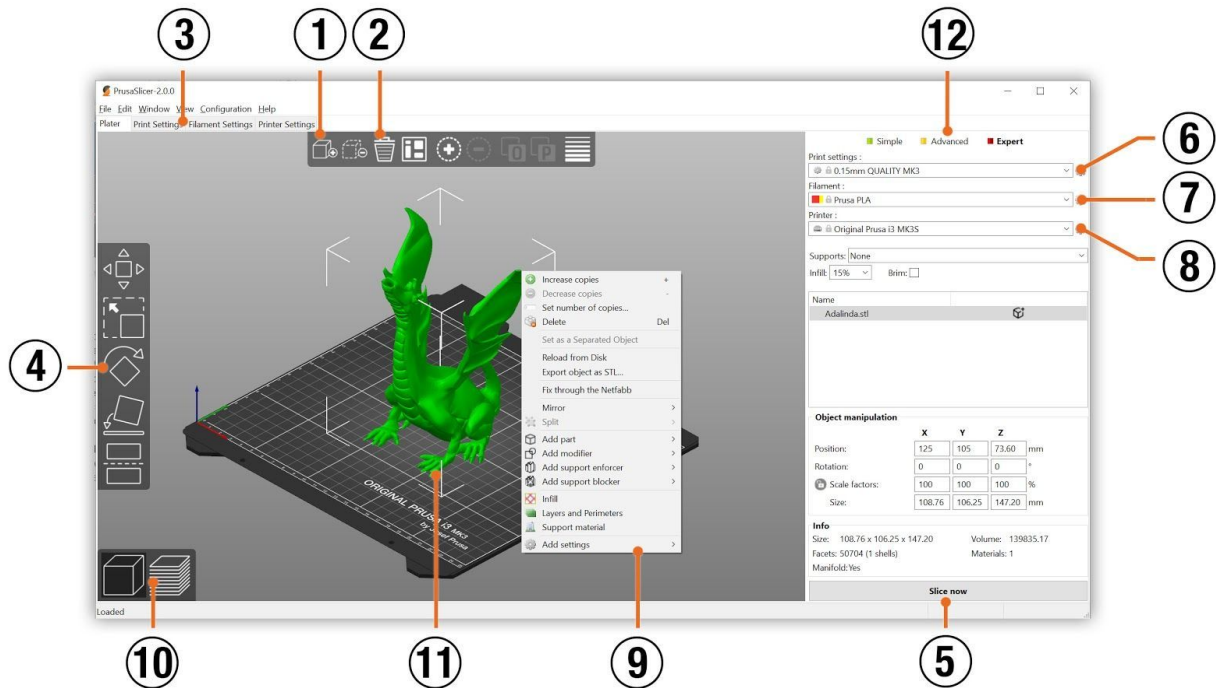
- Avoid overhangs over 45 degrees
- Avoid thin tall structures that cannot be printed laying down
- Make sure there is at least 1 flat face that can be positioned on the print bed and provide adequate bed adhesion

- Your STL must contain a manifold mesh (see this reference for common STL errors: <https://www.3dhubs.com/knowledge-base/fixing-most-common-stl-file-errors/>)

Please contact us if you have any questions and/or would like to discuss your design.

Setting up your print

To make your STL printable it must be 'sliced' into many overlapping 2d shapes. Slicing is performed using PrusaSlicer (installed on the computer next to the printer). See section 11 of the prusa manual for a detailed description of this program.



After opening the program, insert your STL using #1.

STL size units often do not translate perfectly so verify the size of your imported part by comparing your design to the measurements at #5. If the size does not agree, use the resize tool in the toolbar #4 to resize your part.

Next, orient your part (using the rotate tool, #4) so that overhangs are minimized and a flat face with sufficient surface area is in contact with the print bed.

Adding a brim is an easy and simple way to increase the surface area of your first print layer (see the checkbox below #8). This brim is easy to remove and almost always a good idea.

If your part has overhangs over 45 degrees you will need to enable supports (everywhere) near #8.

Make sure generic PLA is selected as the material. If your part requires non-PLA material, the Ultimaker produces ABS parts and has some minor differences that will be covered in a short training. For other materials contact us.

Select the appropriate layer height. Shorter layers will take much longer to print but produce prints with higher resolution details and smoother surfaces.

After you've confirmed your settings, slice your model (#5). This will generate the overlapping 2d shapes and toolpath used to make your part. You can see a simulation of your part by toggling the preview mode at #10. Check that your first layer is complete (if not, your model may be slightly tilted and need to be reoriented). Also check that the preview doesn't contain any large unsupported overhangs.

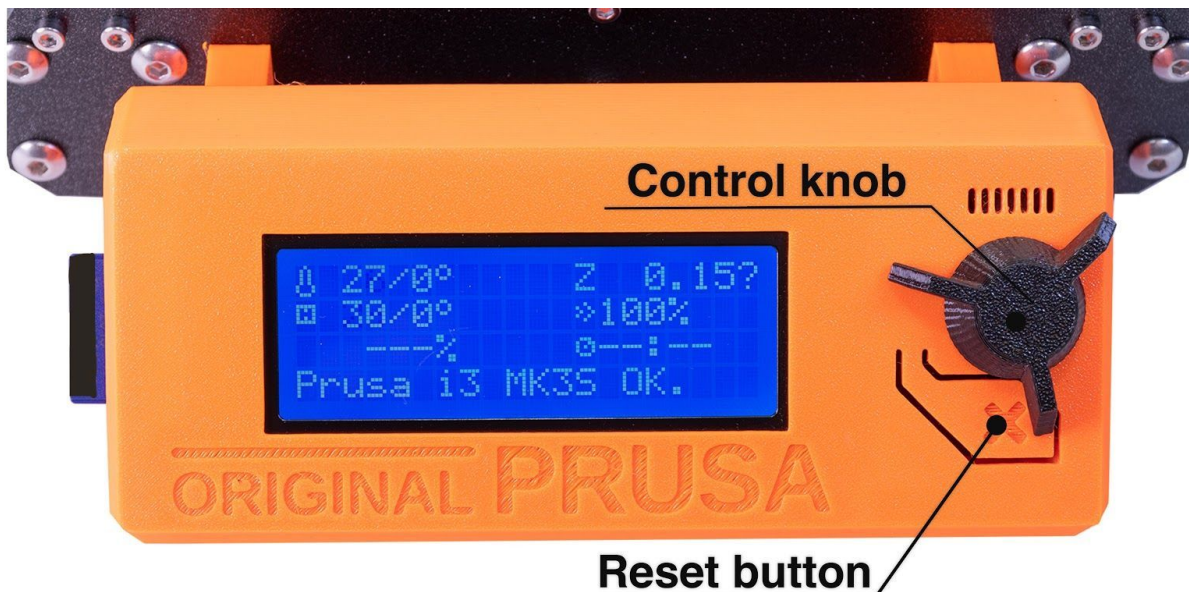
After slicing the program will show you an estimate for your print time and material used. Take note of both of these values and **schedule your print time** at <https://www.ntcore.org/prusa>

Please keep track of your material usage, when you've used roughly half a spool (each spool is 1 kg) contact us to arrange replacement.

Remove the SD card from the printer (it does not need to be ejected) and insert it into the computer. Transfer your design to the SD card, then eject the card and reinsert it into the printer.

Starting your print

See section 7.2 of the Prusa manual for a detailed description of the printer control interface

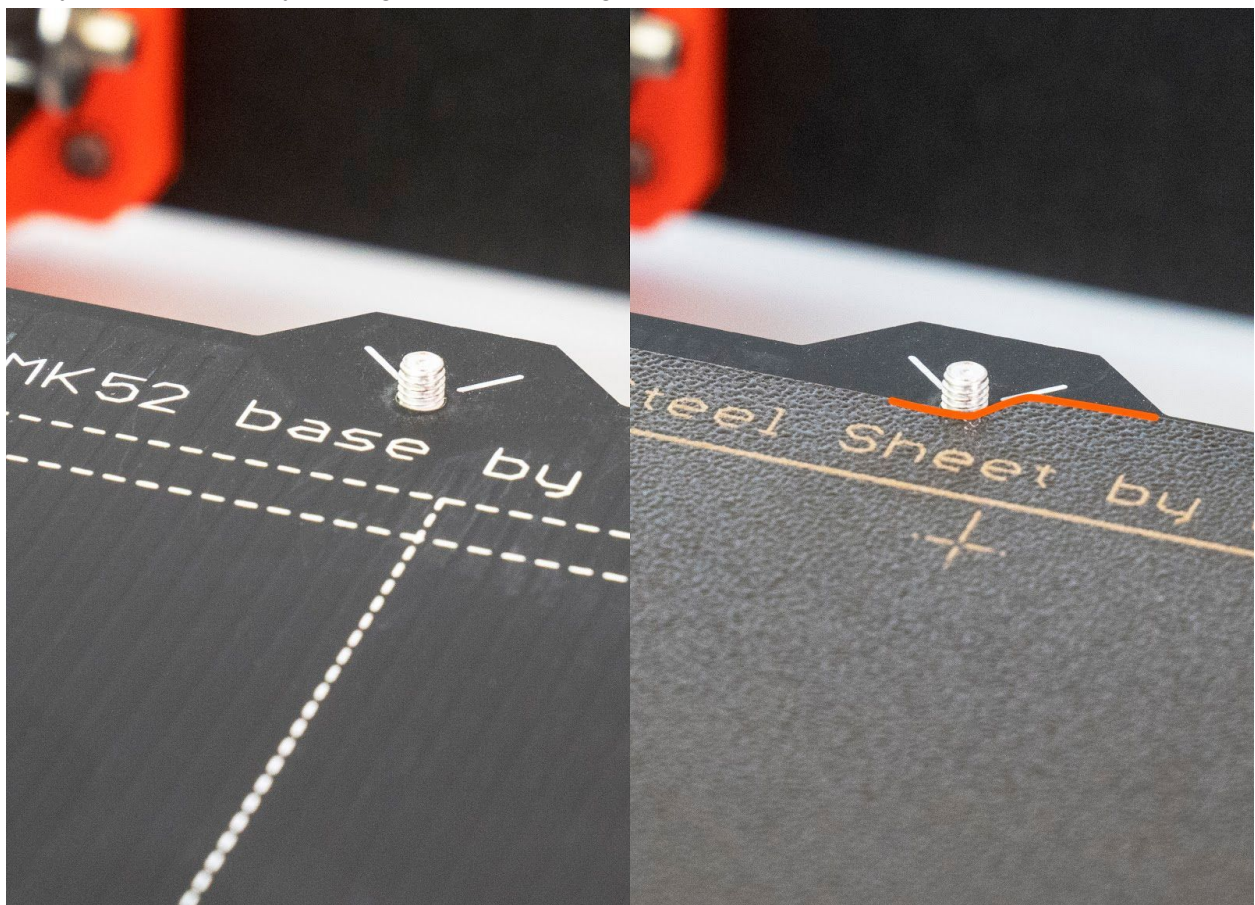


The control knob can be rotated (continuously) to change the selection and pressed to make a selection. The button below the knob is for resetting the printer and is generally not used.

The default screen (above) shows the status of the printer. The menu is accessed by pressing the control knob.

Before starting a print, verify that the material is loaded correctly, is not cracked, bent or broken, and sufficient material is on the spool for your print. See section 6.3.8 (page 24) for details on replacing the material. Please contact us if you need to replace the material (so we know the state of the printer) and **do not use any material other than high quality PLA**. If you remove material from the printer take care to not let the cut end of the filament hang loose. The loose filament can twist and tangle creating a knot in the filament that will cause a print failure. Always keep hold of the loose end and thread it through one of the fixation points on the spool for storage. Contact us before loading any of your own filament into the printer so we can verify the material is compatible.

Verify that the bed is correctly mounted on the printer. The removable spring steel sheet is attached with magnets to the printer and aligned to screws at the back of the printer. Take care that you do not pinch your fingers when placing the sheet onto the printer.



Poor bed adhesion is one of the most common ways a print can fail. To help your part stick, clean the bed with IPA (available in the blue solvent dispenser next to the printer) and a clean paper towel immediately before a print.

If you need to raise the print head, hold the control knob for a few seconds and the screen will display the z coordinate. Rotate the knob to move the head. Start with small movements and be careful to not run the head into the bed.

Finally, select your design using the menu and control knob.

Monitoring your print

You must stay in the shop and watch the printer until your first layer has started. Most print failures happen during the start of the print because:

- The nozzle is clogged and no plastic is extruded
- The extruded plastic does not stick to the bed

After your first layer has started and plastic is sticking to the bed you can leave the printer unattended.

Schedule all risky (new design) prints during a weekday (not overnight or a weekend) so shop users can catch any failures.

If you see a print failing contact us immediately and stop the printer (press the control knob and select 'Stop Print').

For long (>12 hour) prints, periodically check the printer to be able to stop failures before the printer harms itself.

Cleaning up after your print

When your print finishes, remove the bed from the printer and remove your parts from the print bed (you can lightly flex the print bed, **do NOT scrape the bed with any material**).



Reinstall the bed onto the printer making sure the bed is correctly mounted

Sharing the equipment

Every tool in the shop is shared equipment.

Leave the printer and area cleaner than you found it.

If you want to start a print and finished parts are on the printer, remove them and place them in an obvious spot next to the printer.

Do not schedule time that overlaps with another user's scheduled print time.

If you find the printer in operation and it is unscheduled please contact us before proceeding.