# FrankenVinci User Manual

The FrankenVinci is a XYZ Printing  Da Vinci refitted with a RAMPS control board and new mechanical end stops. It is running Marlin firmware customised for the Da Vinci hardware.

This allows it to use any 1.75mm diameter filament as well as any of the common 3D printing software interfaces. The original controls and screen have been removed.

## Software to use

The FrankenVinci can use any software that a Reprap open source printer uses.  This **includes *Cura, ReplicatorG, Repetier***, and ***Printrun/Pronterface***.

- Cura:  https://ultimaker.com/en/products/cura-software
- ReplicatorG: http://replicat.org/
- Repetier:  https://www.repetier.com/
- Printrun/Pronterface:  http://www.pronterface.com/

It is recommended that ***Printrun/Pronterface*** is also installed alongside any of the other interfaces because this allows direct access to all controls for moving the printer bed and extruder as well as the control of the heaters. Printrun/Pronterface can also handle the processed gcode that other 3D printer interfaces produce.  This can be helpful for troubleshooting and raising the bed (z-axis) when levelling the bed
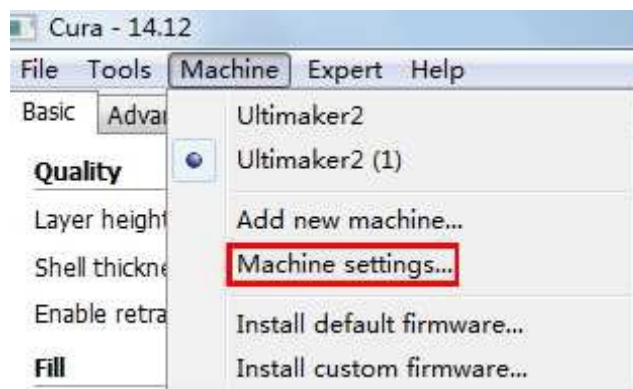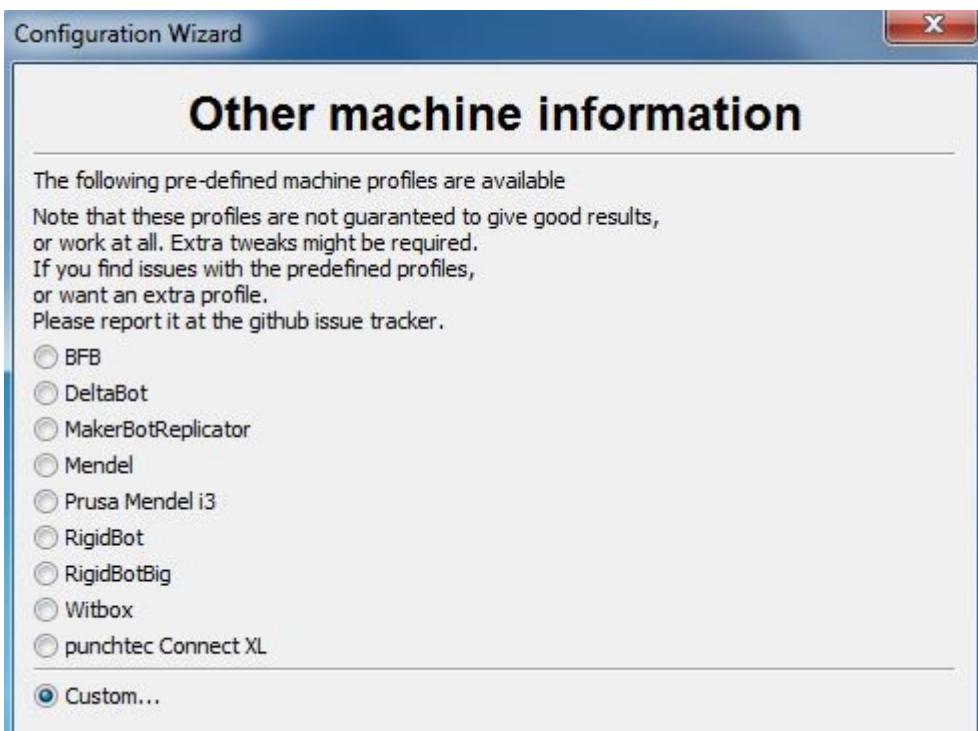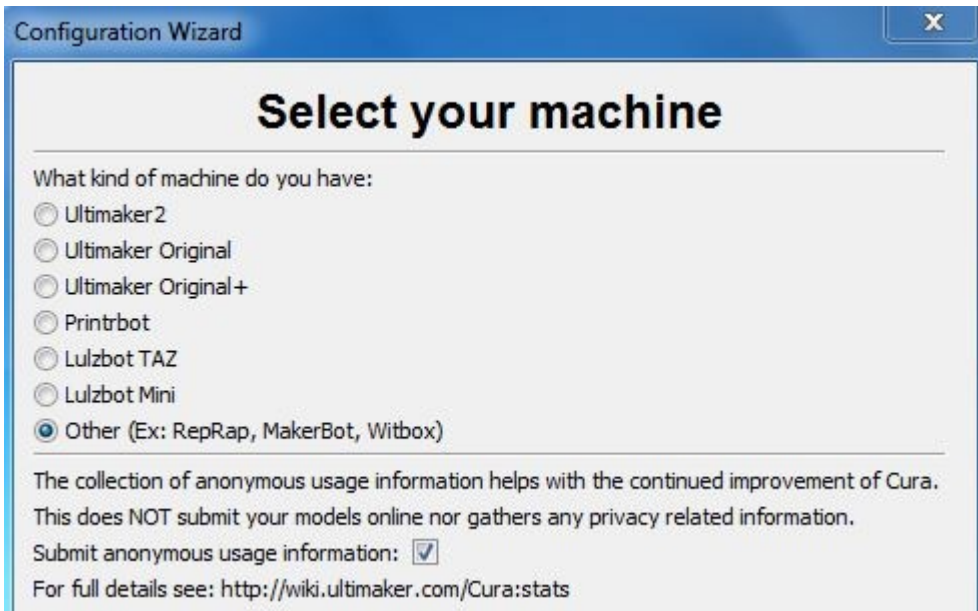
## Installing Cura

Installing Cura is a straightforward process of just following the prompts.  At some point the Cura installer will ask whether you want to install **the Arduino Drivers**.  The Arduino drivers will allow you to connect to the printer with any of the software available and so the answer to this question, is **Yes – Install the Arduino Drivers**.
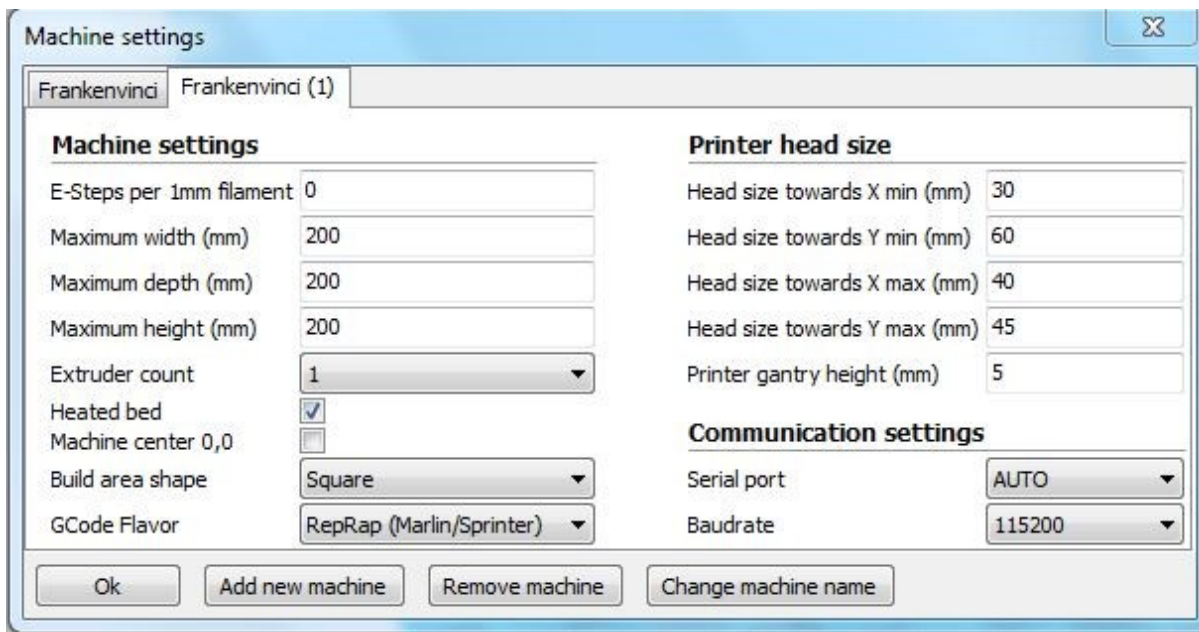
### The machine settings in Cura are;

When you first start Cura it will ask you to set up the 3D printer profile.

Refer the the Cura website for detailed instructions on the use of Cura and its configuration.  Here are a few direct comments to help get your FrankenVinci  underway efficiently.  The following are snapshots from the Cura Startup wizard with the appropriate values shown.

## Configuration Wizard

## Select your machine

What kind of machine do you have:

- ○ Ultimaker2
- ○ Ultimaker Original
- ○ Ultimaker Original+
- ○ Printrbot
- ○ Lulzbot TAZ
- ○ Lulzbot Mini
- ● Other (Ex: RepRap, MakerBot, Witbox)

The collection of anonymous usage information helps with the continued improvement of Cura.
This does NOT submit your models online nor gathers any privacy related information.
Submit anonymous usage information: ☑
For full details see: http://wiki.ultimaker.com/Cura:stats

## Configuration Wizard

## Other machine information

The following pre-defined machine profiles are available

Note that these profiles are not guaranteed to give good results,
or work at all. Extra tweaks might be required.
If you find issues with the predefined profiles,
or want an extra profile.
Please report it at the github issue tracker.

- ○ BFB
- ○ DeltaBot
- ○ MakerBotReplicator
- ○ Mendel
- ○ Prusa Mendel i3
- ○ RigidBot
- ○ RigidBotBig
- ○ Witbox
- ○ punchtec Connect XL
- ● Custom…

The machine settings screen can be updated at any time and allows you to use different machines.  The Machines drop-down in the tool bar will allow you to select between the FrankenVinci and any other printers you may happen to run with the same interface.

In the *Machines Setting* screen the E-Steps per 1mm filament has been left a "0" because this will allow the software to leave it to the firmware to determine the appropriate federate.

When running the Cura getting started Wizard, it may ask whether you want to upgrade the 3D Printer's firmware. The correct answer is **"No"**.  The firmware has been specially tailored for making use of the Da Vinci hardware and modified endstops.  If you accidentally load the new firmware, you will need to look at the ***troubleshooting*** section to find out how to get the proper firmware back.

- Filament diameter = 1.75mm
- Nozzle diameter = 0.4mm.
- Print volume dimensions: 200mm x 200mm  x 200mm

- Maximum print speed: 150mm/sec
- Baudrate: 115200

# Installing Printrun/Pronterface

*Printrun/Pronterface* is a zipped up archive of the Windows Binaries with all of the necessary dependencies including the Slic3r software for converting models into gcode for the printer.  To install, just find a place on your computer where you want to put it and unzip the archive into that location.

The Pronterface interface looks like this:
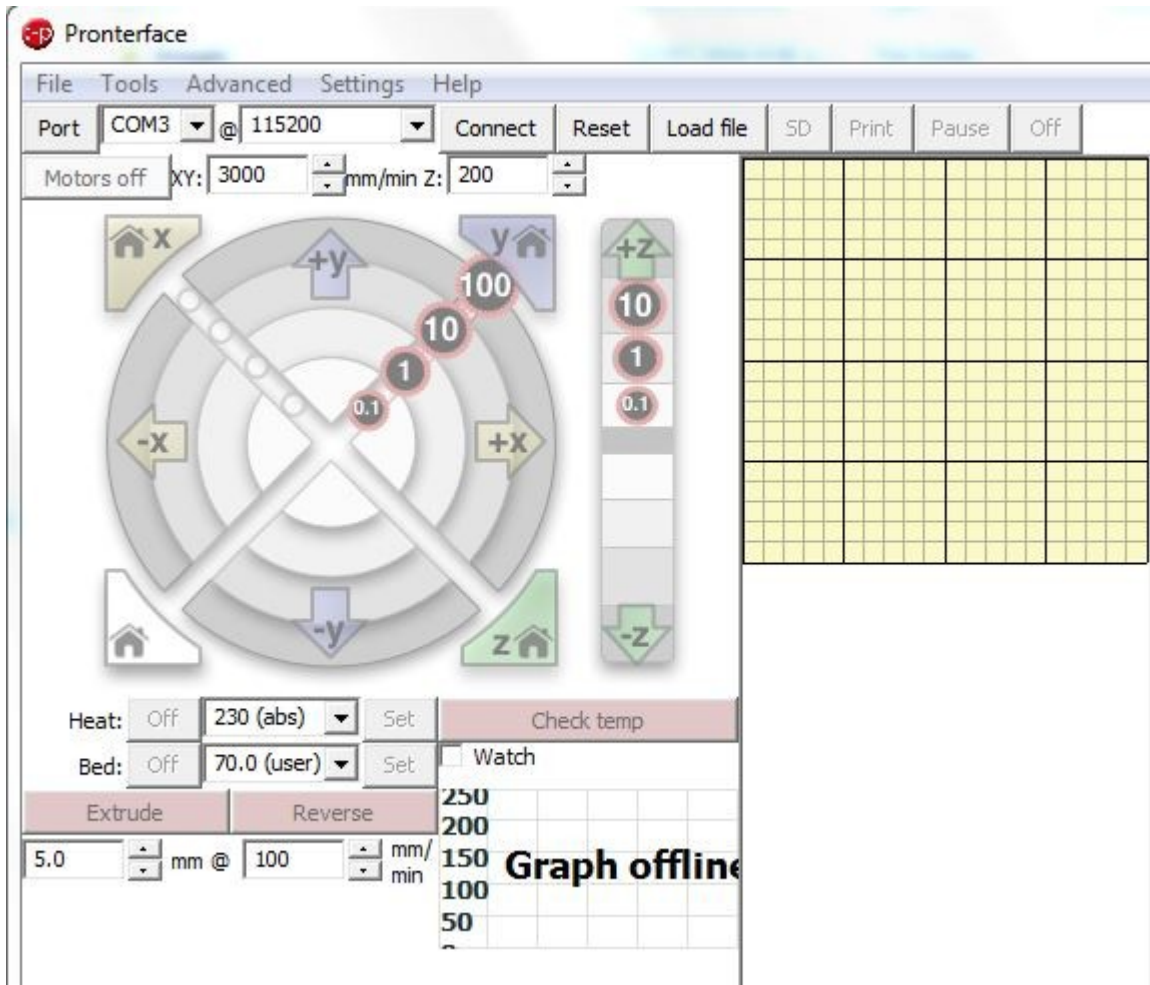


# Filament

Unlike the XYZ Printing Da Vinci, the FrankenVinci makes use of any 1.75mm diameter filament available and the 100% control over the extruder and bed temperatures mean it can be tuned to some of the more unusual filaments materials.  The FrankenVinci does not track filament use and so it will be up to the user to keep an eye on it.

The filament spools are dropped into the slot formerly occupied by the XYZPrinting cartridges.  The spool holder in the bottom of this slot is designed to carry spools of different widths and as it does not have a hub, it does not require spools with a particular centre hole size.

**The recommended filament is 1.75mm PLA or 1.75mm ABS on a spool withoutside diameter of 200mm and widths between 54 and 65mm.**

## To unload Filament

To unload a filament start **Printrun/Pronterface**, and connect to the printer.  Heat the extruder to 230°C (for ABS) by putting 230 into the dropdown box beside **"Heat:"** and click on the **"Set"** button.  For PLA the target temperature is 200 – 210°C.  This will heat the extruder nozzle.  You should see this being monitored on the Graph, but if this is not showing use the "**Check Temp**" button to see what the temperature is up to.  When it is around

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220-230°C click on the "**Reverse**" button beside the Extrude button.  This will drive the filament backwards.  Keep pressing this until you can pull the filament free.

### To load fresh filament

To load a filament start **Printrun/Pronterface**, and connect to the printer.  Heat the extruder to 230°C (for ABS) by putting 230 into the dropdown box beside **"Heat:"** and click on the **"Set"** button.  For PLA the target temperature is 200 – 210°C.  This will heat the extruder nozzle.  You should see this being monitored on the Graph, but if this is not showing use the "**Check Temp**" button to see what the temperature is up to.  When it is around 220-230°C put the new filament into the small tube at the top of the extruder and push it down as far as possible.  Click on the "**Extrude**" button.  This will drive the filament into the extruder.  Keep pressing this until plastic starts to come out of the nozzle.


## Levelling the bed

There is no automated bed levelling process with the FrankenVinci (not that the Da Vinci's bed level calibration worked at all anyway).  To carry out a bed levelling process, turn on the printer and start **Printrun/Pronterface**.  Connect to the printer using the **"Connect"** button.  If Printrun/Pronterface fails to connect, try a different port with the port drop down where it says "COM3".

Jog the z-axis (bed position) up until it stops at the end stop, using the z-axis jog controls, or just click on the "home Z-axis" button.
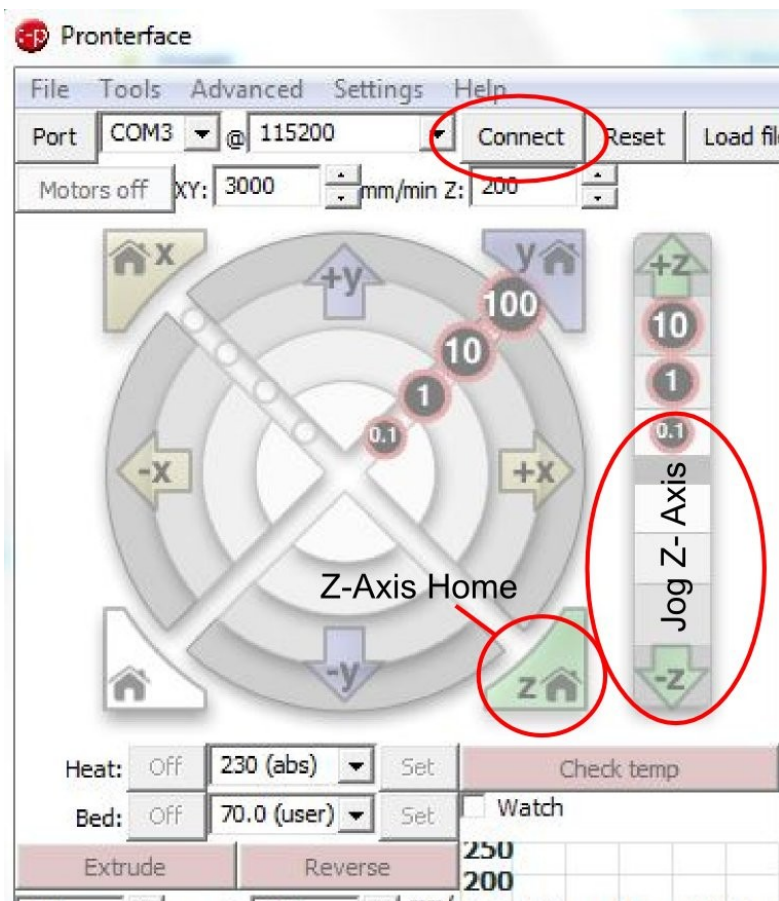


Turn off the 3d printer.

Now move the extruder around the print bed checking the gap between the printer nozzle and the top of the bed using a sheet of paper.  The paper should slide between the two with a little resistance.  If the gap is too much, let out the three adjustments around the printer bed to raise the bed surface relative to the Z-axis home position.  If the paper is clamped between the nozzle and the print bed tighten the adjusters to lower the bed away from the nozzle.

To **tighten the adjusters** and therefore **lower the printer bed** and **increase the gap between the nozzle and print bed**, rotate the **adjusters anticlockwise** (that is left to right as viewed from the front).


## Preparing a model to print

[**Note:** The recommended settings for temperatures may still need a little tweaking to get optimum performance]

Load the model with the File drop down or with the **Load Model** icon in the top left corner of the view screen. Cura will immediately process this and give a summary of the estimated print time and amount of filament used. Updating the settings in the panel to the left of the screen will be applied immediately and a new estimate created (it is a lot faster than Makerware or XYZware). The image below shows the recommended settings for ABS on a relatively course print. The layer height can be adjusted down to 0.1mm to get a finer print. While the printer can attain speeds of 150mm/s (in theory), it is better to leave it at 50mm/s.

- For **ABS** the recommended extruder temperature is 230°C, but the bed temperature should be set to 65-70°C (in reality the bed temperature will end up being around 100°C for this setting).
- For **PLA** the extruder temperature should be set to 205°C and the bed temperature either set to around 30-40°C or just left unheated (setting 0°C).
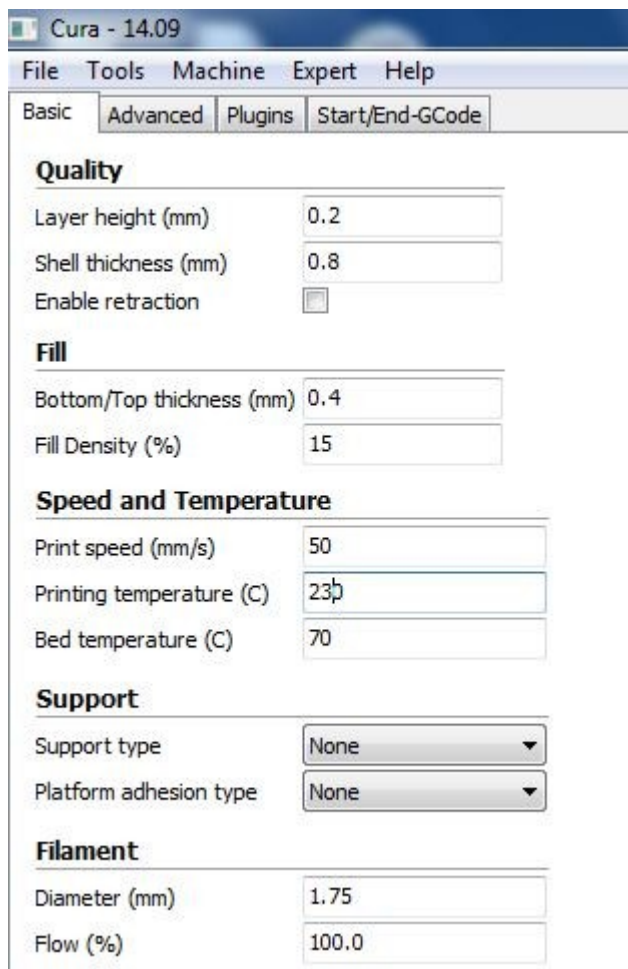


The shell thickness is the thickness of the outside perimeter of the shape. In this case with a nozzle size of 0.4mm the *0.8mm Shell thickness* specified above means this print will have two layers on the outside of the printed object.
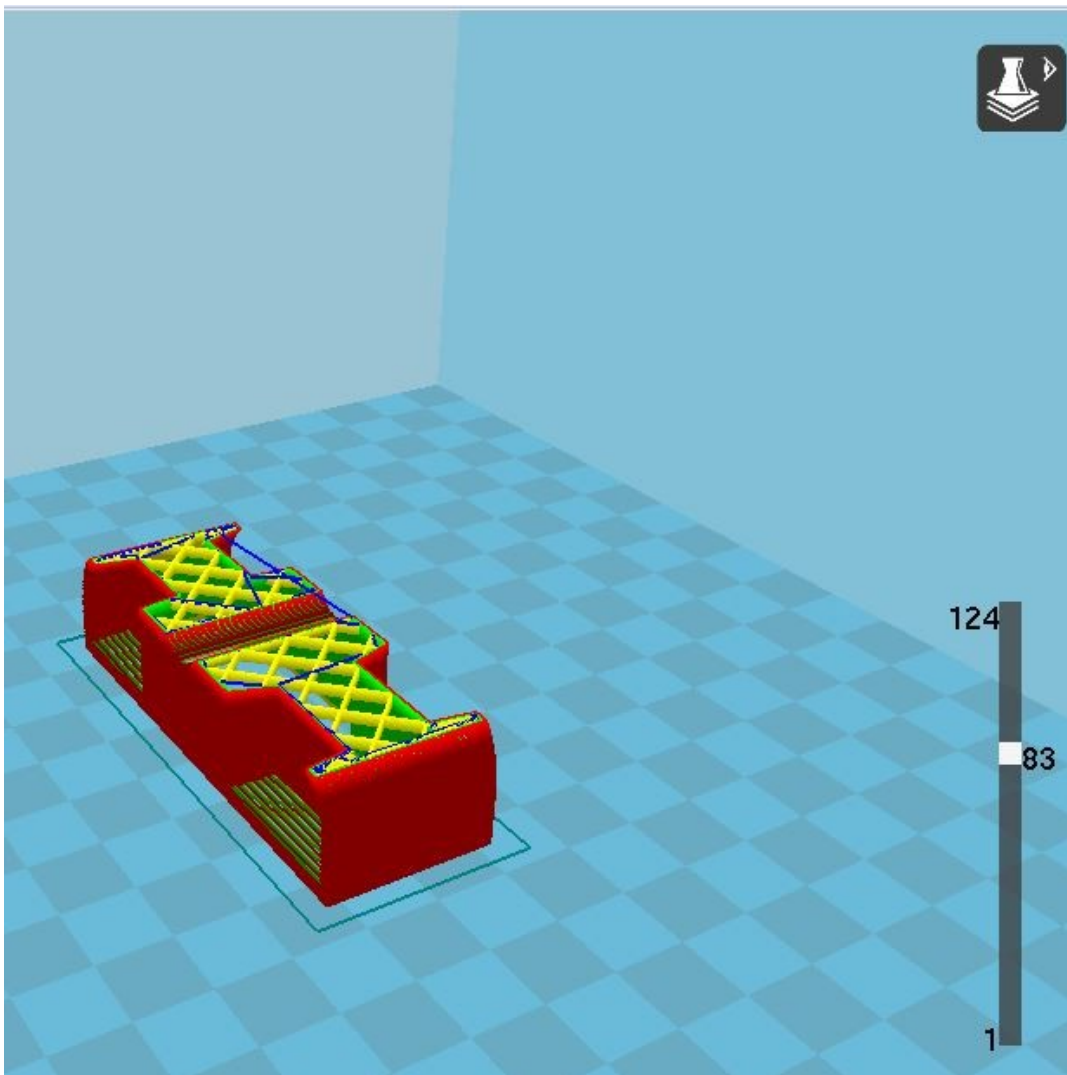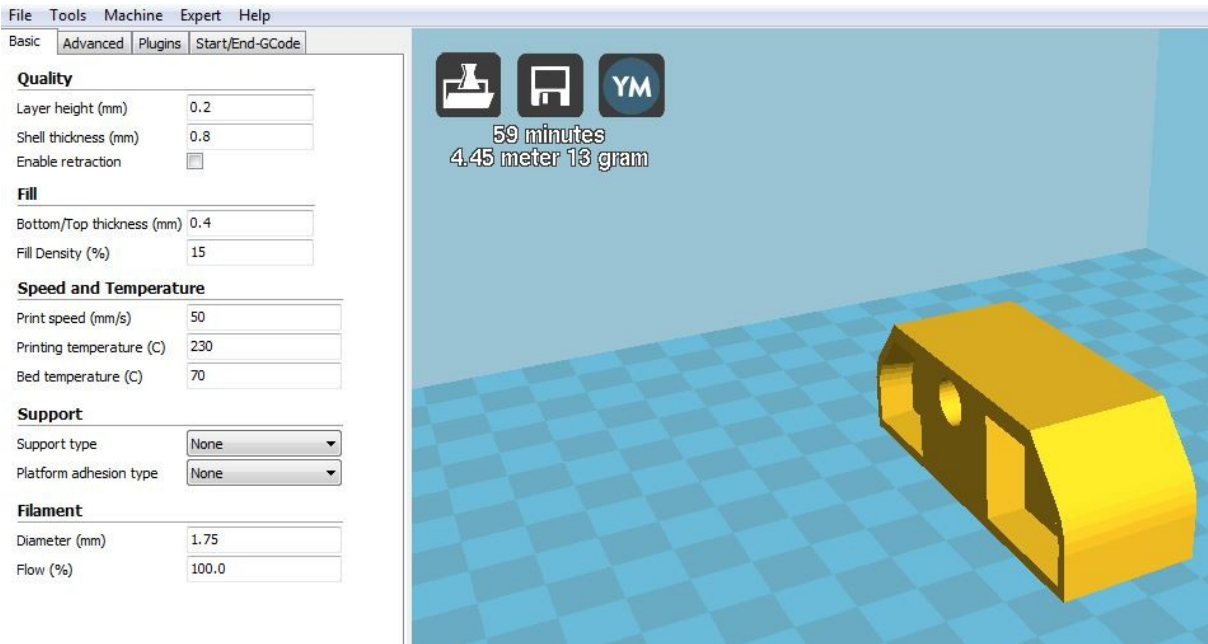
There are various view modes you can use to check you model, including a representation of the paths the nozzle will follow. These can be accessed using the *view mode* icon on the top right-hand side of the view screen.

When ready, you can hit the *Print* icon in the top left corner of the view screen or *Save* icon in the top left corner.  If the printer is not connected, the *Print* icon will not appear.

> **Please note:**  At this time there are still a few teething problems with printing directly from Cura, so it may not work. If it doesn't, just save the gcode to file using the Save icon, (or File>Save Gcode) and use *Printrun/Pronterface* to load the gcode and send it to the printer.

# Printing

Printing with the FrankenVinci is no different from printing with any of the other 3d printers.  It is still worth watching the first layer go down to make sure it sticks.  At this stage we are not using Kapton tape (ABS and PLA) or Blue Painters Tape (PLA) on the printer bed.  It may be worth experimenting with this.  With ABS use a **SMALL** amount of glue stick glue on the printer bed.  You can spread this out with a wet cloth or tissue.

You can preheat the printer bed and extruder with Printrun/Pronterface by using the "*Heat:*" and "*Bed:*" temperature "*Set*" buttons once you have put in the appropriate temperature for your filament material.   This is not necessary but can help to ensure the extruder does not sit at a high temperature doing nothing for an extended period of time.

If the print fails to stick in the first layer or two, and you are using *Printrun/Pronterface*, hit the *Pause* button.  To give yourself more room to work with use the Z-axis jog control to lower the print bed.  Clean the failed print debris off the bed and hit the *Restart* button.

# Trouble Shooting

### Print is not sticking to the bed
Often failure of the print to stick to the bed will be due to the bed temperature needing to be set to a higher temperature (with ABS).  Otherwise if printing with PLA make sure there are no oily residues on the printer bed.  Wipe it down with meths.  We have not tested what the effect of the gluestick glue is on PLA prints, and so it may be that the glue will need to be cleaned off the bed.

The Da Vinci extruder head is not that well designed and so is prone to getting gummed up with plastic which can stick to the print and lift it.  Keep an eye on the build up of plastic around the nozzle and give it a light brush with the wire brush to remove it if need be.  CARE MUST BE TAKEN WITH THE BRUSH TO ENSURE THE THERMISTOR CONNECTION ON THE SIDE OF THE NOZZLE IS NOT DAMAGED.

### Finding the right port
Windows creates a new port each time a printer is connected to the computer using a different USB port from the one it was previously used for.  Try to assign a single port on each computer that will only be used for connecting the 3d printers.

To find the port in Printrun/Pronterface, step through the various COM ports in the dropdown and hit *"Connect"* to see if the 3d printer reports back.  One of them will work.

### Cleaning up unused ports
There is a process available for cleaning up the unused ports.  You can find a guide here:

https://learn.adafruit.com/how-to-find-hidden-com-ports/overview

### Should the firmware accidentally get erased…
You will need to reinstall it.  This will require the Arduino IDE which can be downloaded from here: https://www.arduino.cc/

The customised firmware is available through www.techmonkeybusiness.com.  With this in hand, open the Arduino IDE and open the firmware "Marlin.ino" file from the unzipped archive.  Connect the FrankenVinci (it does not need

to be turned on). Check the Arduino settings are for an Arduino Mega, and the appropriate port is set.  Upload the sketch to the FrankenVinci microcontroller and it will all be wonderful and happy again.  Just don't do it again.

## Component Failure

In the very unlikely event of the mainboard failing, new parts can be purchased from the online stores such as Banggood or DX.  To replace all of the control boards will typically cost about $50NZ.  Links to the components are provided below.

http://www.banggood.com/3D-Printer-RAMPS-1_4-Controller-MEGA2560-R3-A4988-With-Heat-Sink-Kit-p-984594.html

http://www.dx.com/p/geeetech-iduino-mega-2560-r3-board-ramps1-4-shield-4-x-4988-stepstick-driver-for-3d-printer-red-380684#.V4R1V7_D_1g

For the end stop sensors, and spool holder, the parts were all 3d printed.  It is unlikely they will break, but if they do then the model files will be made available on the web through www.techmonkeybusiness.com.

The information provides is accurate to the best of my knowledge, but describes what I did and what worked for me.  No responsibility is accepted for any failure of equipment or damage caused by attempting to follow these instructions.  The information is also provided in an as-is-where-is basis and as such I cannot provide support to help you solve your own problems you may encounter while setting up the FrankenVinci 3D printer.  If you have problems, look it up on the web and use good problem tracking methods as I did.

## www.techmonkeybusiness.com