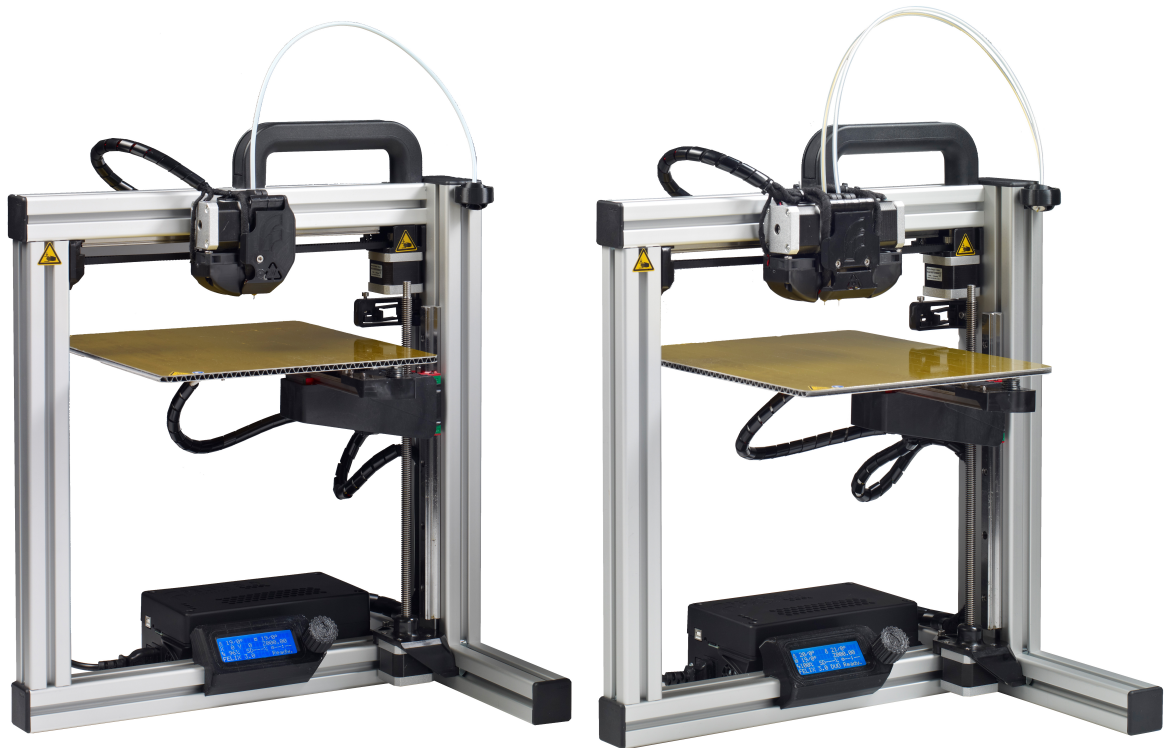


APRIL 22, 2016



User Manual

FELIX 3.1, 3D printer

VERSION 13

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1 Introduction

First of all, thank you choosing FELIXprinters! To get your Felix printer up and running as fast and painlessly as possible please follow this manual carefully. Don't compare this product with a television, where a user manual is normally not required to get it working properly.

Please follow the instructions carefully and take your time to get familiar with the product. Please don't take any shortcuts unless you know what you're doing. It's better to spend a few minutes extra on reading, than to wait a week for new parts.

When things are unclear or if you have any remarks or tips, please contact us at support@FELIXprinters.com. We also recommend to have a look on our forum and to get yourself a forum account. You will benefit from the ability to get downloadable and printable upgrades for your printer. Also it is a great source to obtain and share knowledge about your 3d printer and 3d printing in general.

2 Printer Specifications

Printing		Electrical		
Print Technology	Fused Filament Fabrication		AC input:	100-240V, 50-60 Hz
Build Volume	25.5 x 20.5 x 22 cm		Power Requirements	12V DC, 15 Amps
Print Quality	Low	250 microns	Connectivity	USB
	Normal	200 microns		
	High	150 microns		
	Very High	100 microns		
	Extreme	50 microns		
Positioning Resolution	XY: 13 microns Z: 0.4 microns		Power Usage	Max 250W
Filament Diameter	1.75 mm			
Nozzle Diameter	0.35 mm		Mechanical	
			Chassis	Aluminum profiles
Software			Build platform	Aluminum sandwich plate
Software Bundle:	FELIXbuilder RepetierHost + CuraEngine/Slic3r,Skeinforge/SFACT Kisslicer		XY Bearings	Linear ball bearings
File Types:	.STL .gcode		Z bearing	Linear ball bearings
Supports:	Windows, XP and newer		Stepper Motors	1.8 deg angle 1/16 micro-stepping
	Linux (Ubuntu 12.04+)			
	Mac OS X [10.6/10.7/10.8]			
Physical Dimensions				
Printer dimensions	40 x 44 x 52 cm			
Weight	8.7kg single, 9kg dual head			
Shipping Weight	11 kg			
Shipping Box	50x30x30 cm, DIY kit			
	58.4x50.8x55.5 cm, Assembled unit			
Temperature				
Ambient operating temperature	15-32 °C [60 – 90 °F]			
Storage temperature	0 – 32 °C			
Warmup time				
Heated bed (60 degC)	3 min			
Nozzle (200degC)	1 min			

3 Mechanical Setup

3.1 Calibration of table

For a successful print it is important that the table is properly calibrated. The distance between the nozzle and table should be the same at every x,y position. The leveling mechanism of the table can be adjusted by turning the 3 M4 nuts underneath the heated bed. For the assembled units the calibration should be good right of the box, but due to shipment it could be that the calibration is slightly off. Therefore it is important to check it first.

i IMPORTANT NOTES:

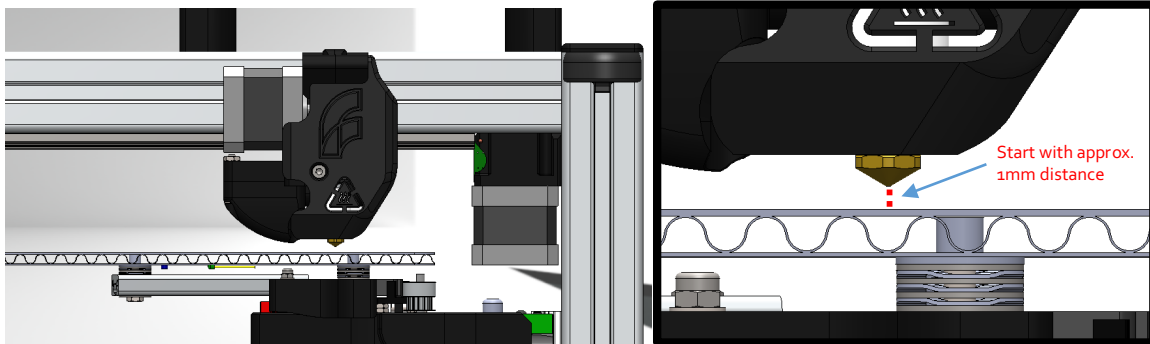
!!The leveling should be done by moving the axes by hand, not via computer interface!!

!!Never move the axis at a high rate by hand, because the motors could act like a generator (similar to your bicycle and potentially damage the electronics of the board.)!!

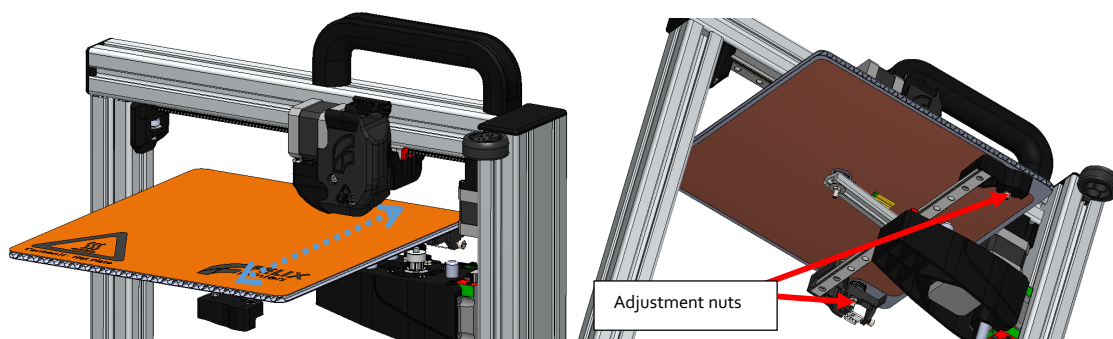
1. Step 1: Y-direction

Calibrate the table in the y-direction.

1. Move the X-axis carriage (extruder) close to the homing sensor as shown above, and move the table up until approximately 1 mm from the hot-end.



2. Move the Y-axis (heated bed) back and forth slowly. While doing this check the distance between the tip and bed. It should be the same over the whole movement. If it is not, turn the 2 nuts underneath the bed as indicated in the picture below.

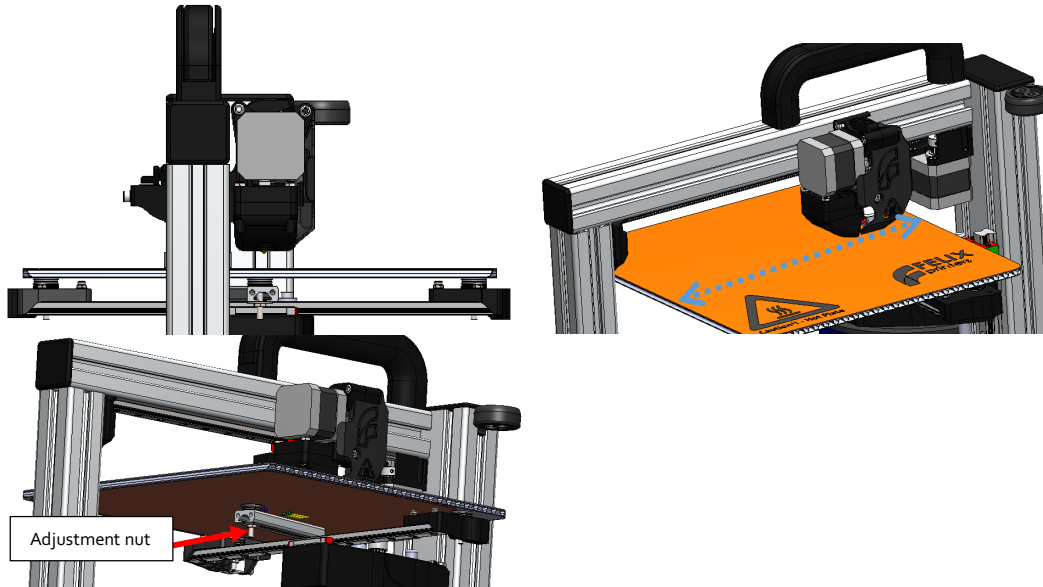


3. Move the table a little closer to the hot-end and repeat the previous step to more precisely determine the distance between the hot-end and the table over the whole length.

2. Step 2: X-direction

Calibration in x-direction

4. Make sure there is at least 1mm separation between table hot-end.
5. Move the table to the middle of its movement range slowly.



6. Move the X-axis carriage over its movement range slowly. While moving check the distance between the hot-end and bed. If the distance is not even, adjust it with the nut which supports the middle of the table.
7. Move the table a little closer to the hot-end and repeat the previous step to more precisely determine the distance between the hot-end and the table over the whole length.

You have successfully calibrated the table.

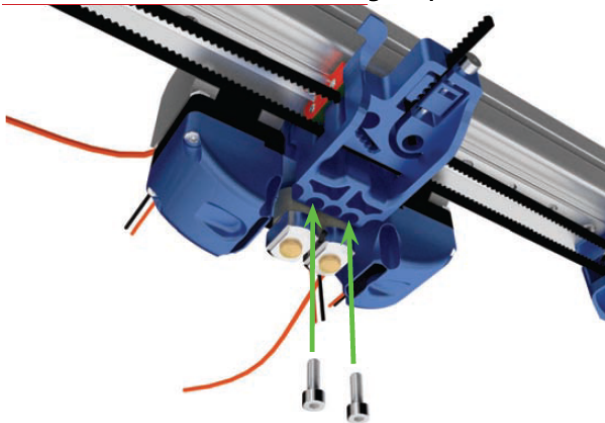
3.2 Extra calibration for dual extrusion printers

i NOTE:

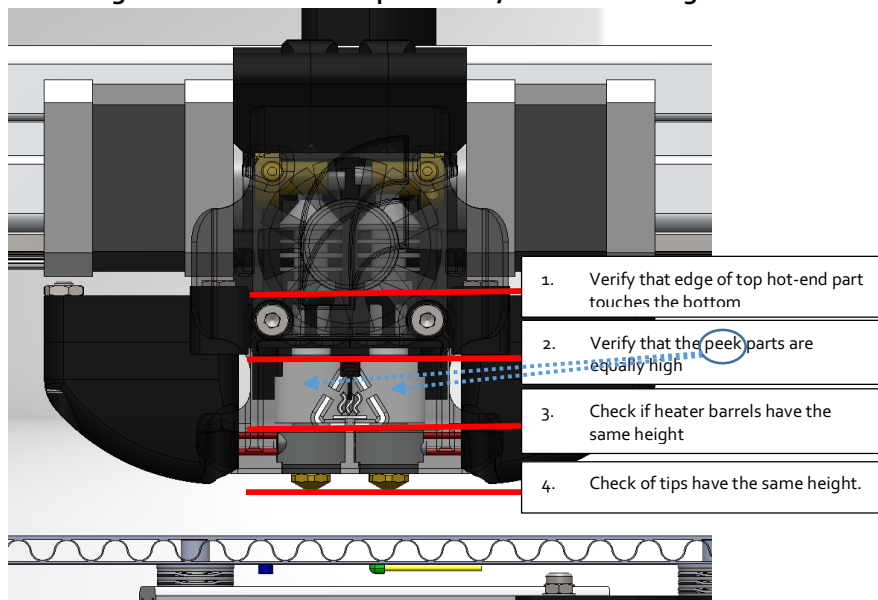
This step is only intended for people who bought a dual head DIY kit. Otherwise skip to next subchapter.

This section guides you through the process of mechanically calibrating your DUAL head setup. The following checks make sure the hot-ends will have the same height with respect to the just-leveled heated bed.

1. Make sure the heated bed is leveled correctly.
2. Make sure the hot-ends have the same revision. Otherwise, mechanical adjustment might be required.
3. Make sure the bottom bolts are gently fastened with an equal amount of torque.



4. Is the height of both hot-ends equal? If not, do the following checks to see what could be the cause.



If the hot-end tips have a different height, it could be that during assembly of the hot-ends the parts were not fastened with an equal amount of torque, or that the tolerances are out of spec with one of the two hot-ends. Please check with steps 1 to 4 to see where the difference lies. If necessary, you can slightly adjust the length by applying more torque to the parts of one of the hot-ends.

4 Installation Software – Microsoft Windows

i NOTE: Mac users should read to chapter 5

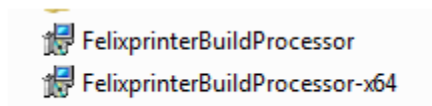
Multiple printer software tools are available for Windows and Mac. For example FELIXbuilder and Repetier Host. In this chapter the installation process of FELIXbuilder will be explained for Windows. Installation of Repetier Host can be found in the attachments. This chapter covers the installation of FELIXbuilder, drivers and firmware.

1. Installation and registration of FELIXbuilder on Windows

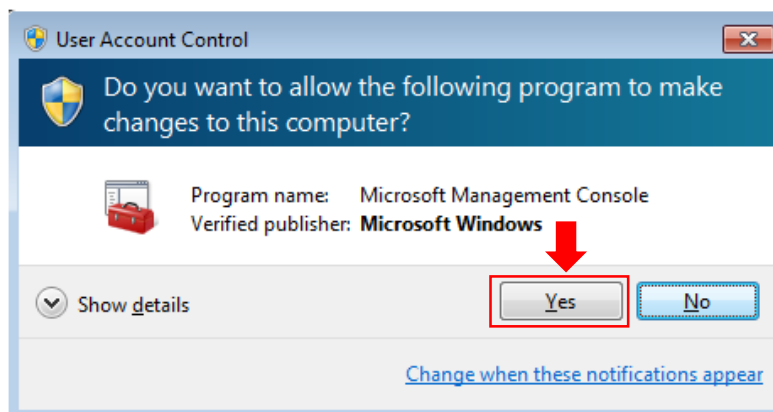
- Download the latest installer of the FELIXbuilder software on the FELIXprinters website:

<http://www.felixprinters.com/felixbuilder-3d-print-software>

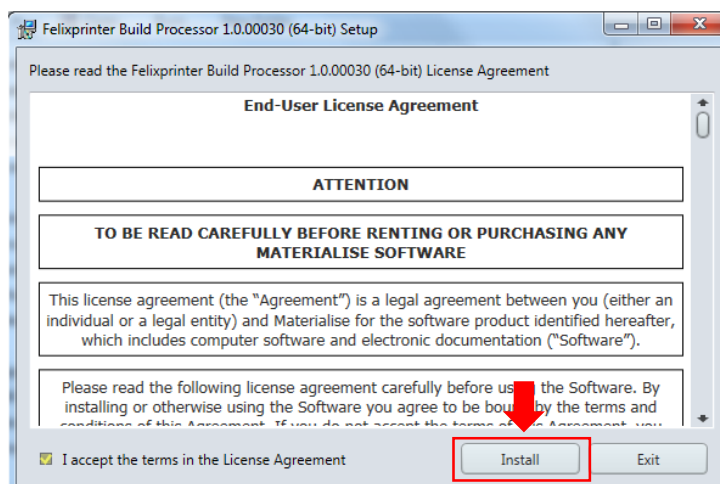
- Run the installer.
- Run the appropriate installer for your system by double clicking the installer



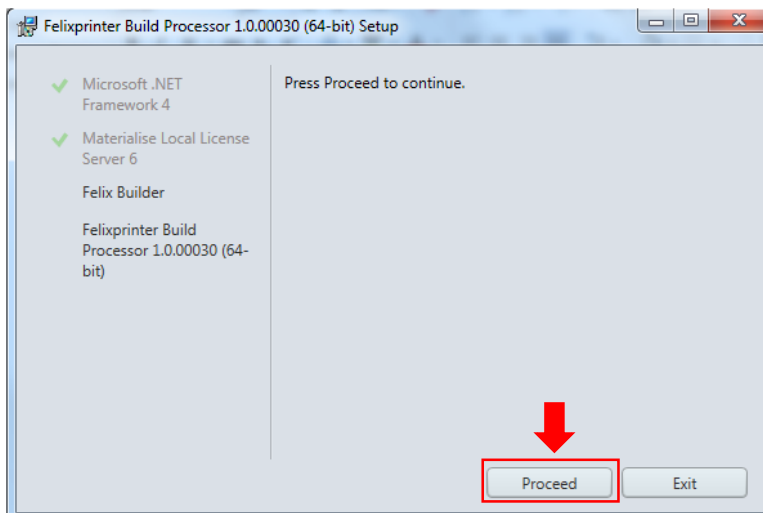
- Allow the installer to make changes to the computer



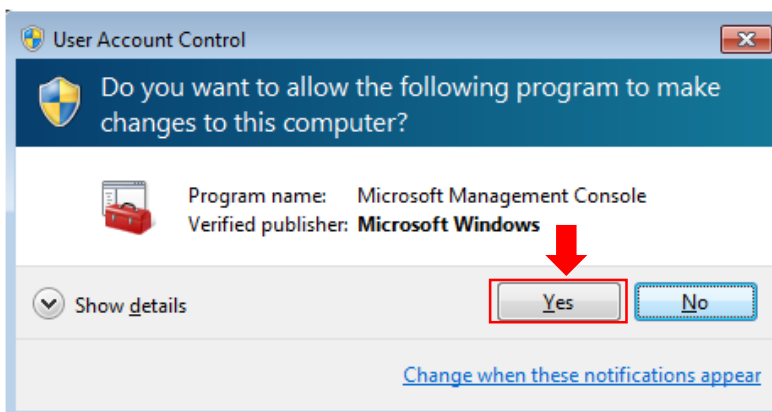
- Accept the terms of the End-user license agreement (EULA) and press install.



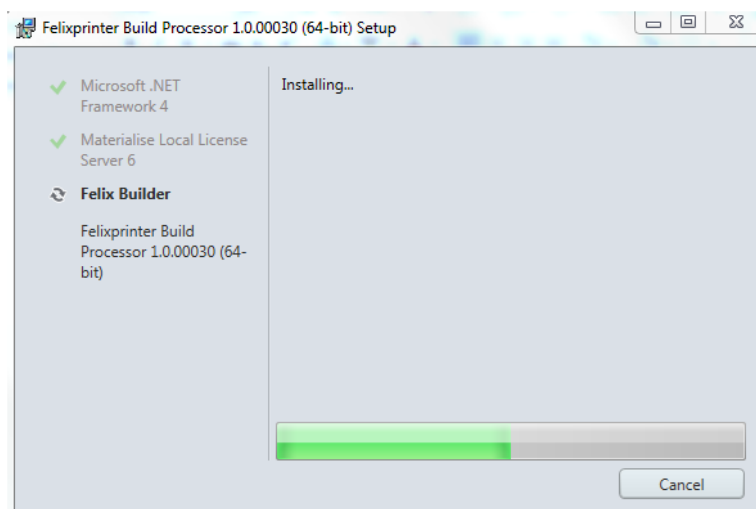
- **Activate the installation process by pressing the Proceed button**



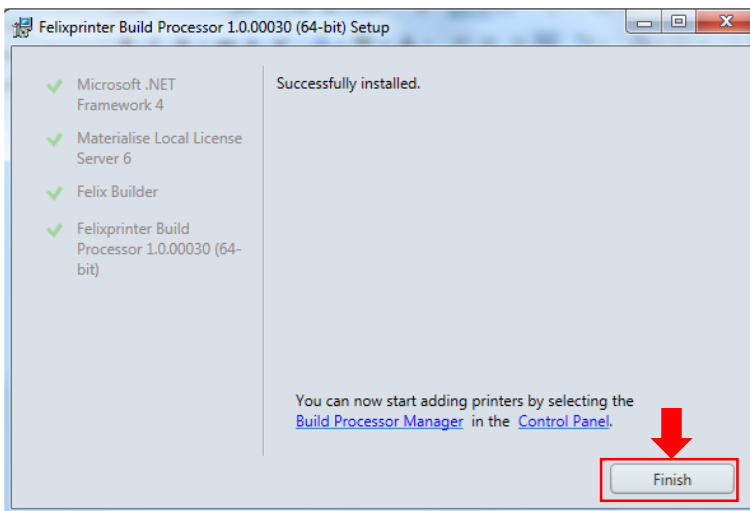
- **Allow the installer to make changes to the computer**



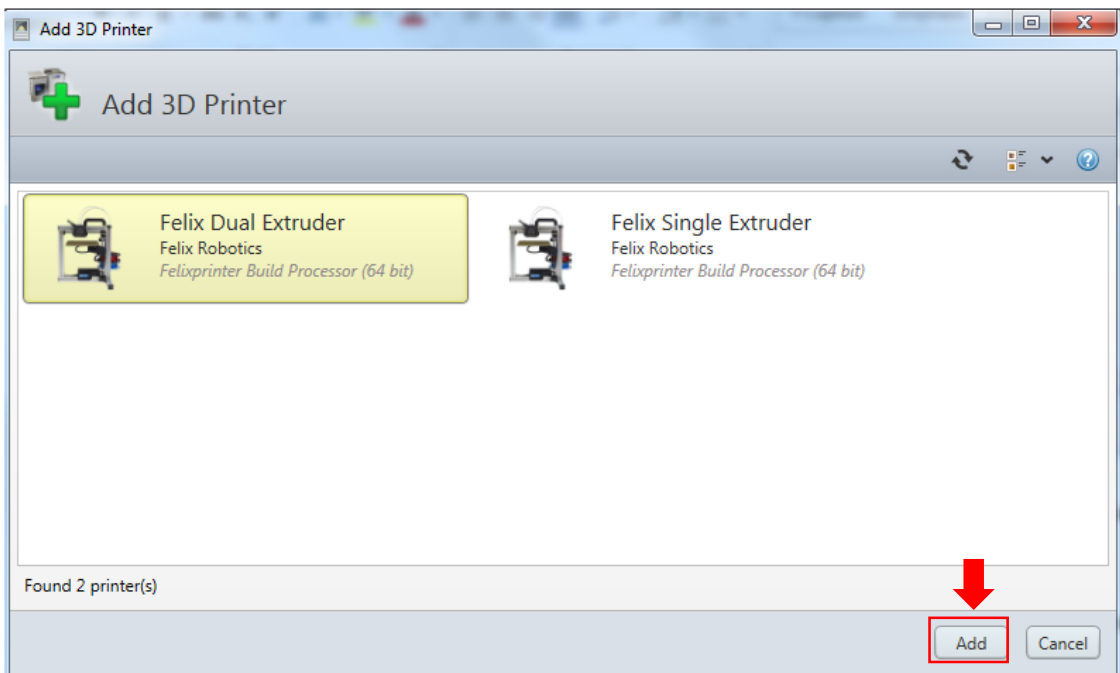
- **Monitor the installation process and wait for it to finish**



- Now the software is successfully installed so you can press the Finish button



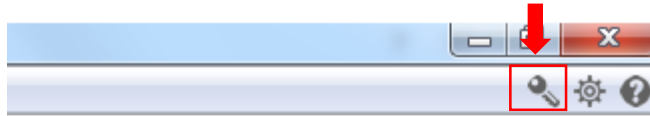
- Select the printer you want to use with the software and press the Add button



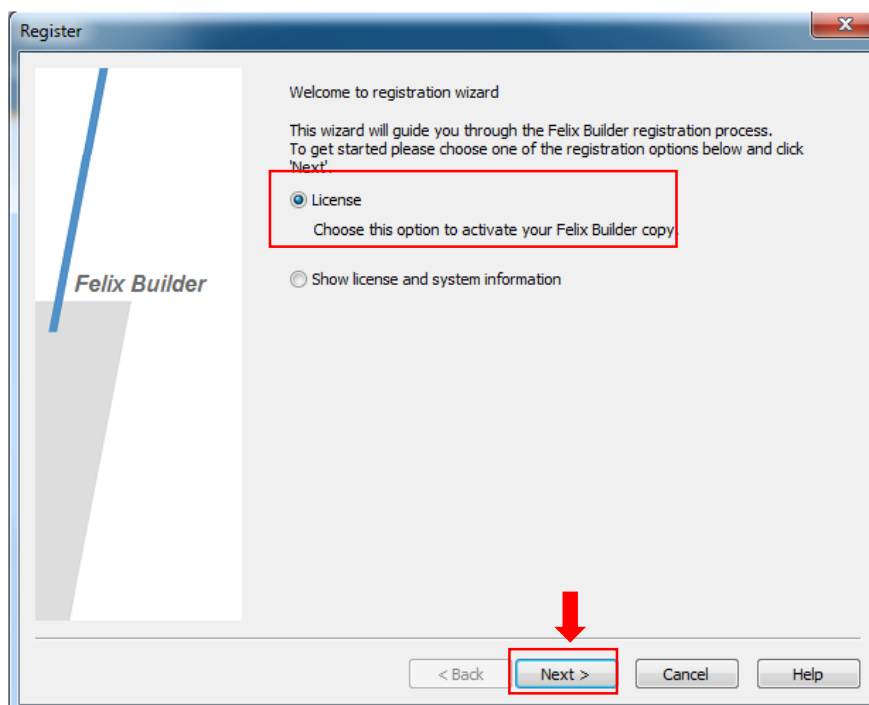
- The software is now completely installed and just need to be activated.

2. Registration of the software

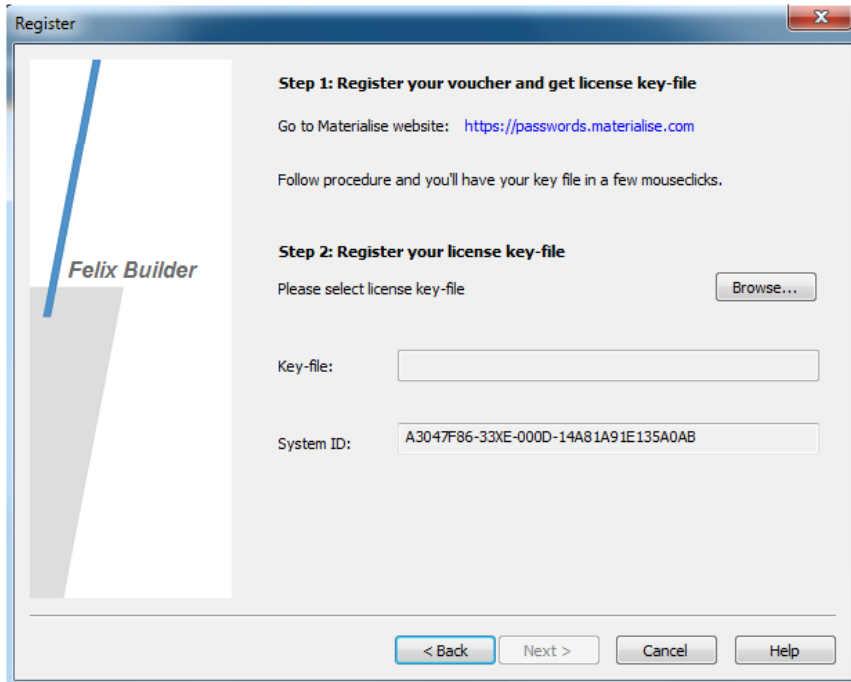
- Open the Registration Wizard in the FELIXbuilder software by pushing the tool icon. When installing the software for the first time this will happen automatically when you start the FELIXbuilder software.



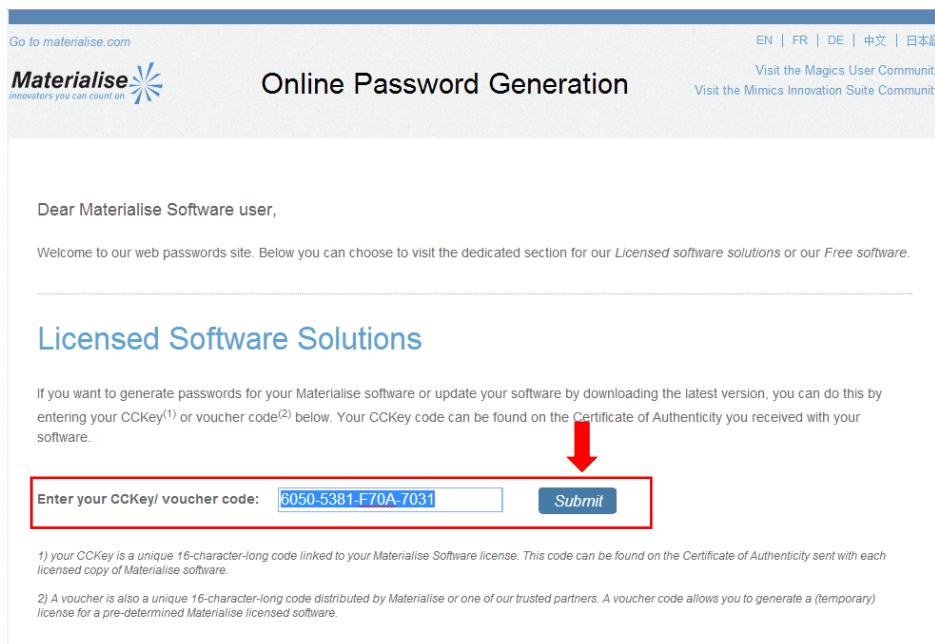
- Select the License Option and click next



- Copy the system ID from the registration wizard and go to the Materialise password website by clicking the link. Make sure you have your voucher code ready.



- In the licensed software solutions section fill in your voucher code you received from FELIXprinters and press the submit button.



- Fill in your system ID from your computer that is provided by the registration wizard into system ID field on the password website and your email address and press the next button.

Go to materialise.com

EN | FR | DE | 中文 | 日本語

Materialise
innovators you can count on

Online Password Generation

Visit the Magics User Community
Visit the Mimics Innovation Suite Community

Edit personal details // License details // Downloads

Voucher details

CCK: 6050-5381-F70A-7031

Type: Evaluation Current version:

Current system ID: Platform: x64

Module Name	Version	Floating	End Date
Materialise@home for Baoyan	17.5	0	

System ID:

Email:

HTML Plain text

Next >

- Check the registration details and press the request password button

Register

Step 1: Register your voucher and get license key-file

Go to Materialise website: <https://passwords.materialise.com>

Follow procedure and you'll have your key file in a few mouseclicks.

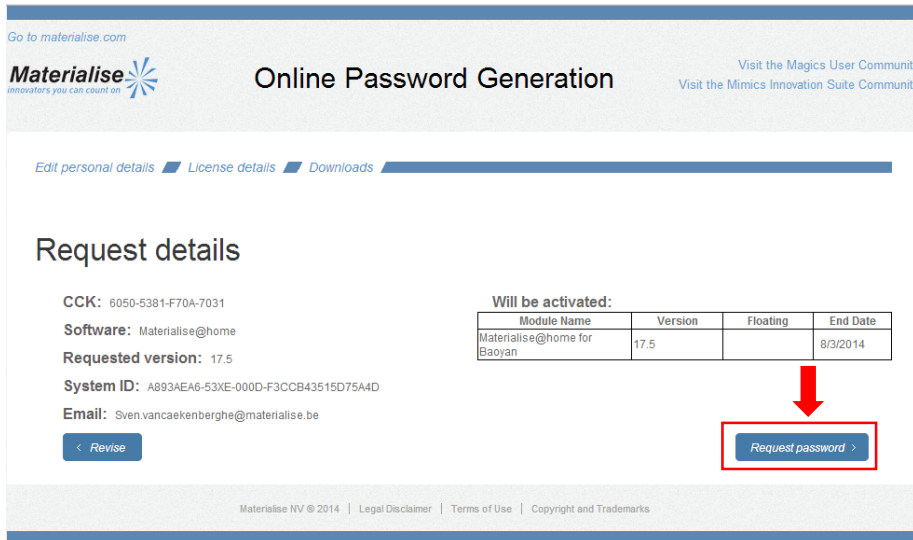
Step 2: Register your license key-file

Please select license key-file

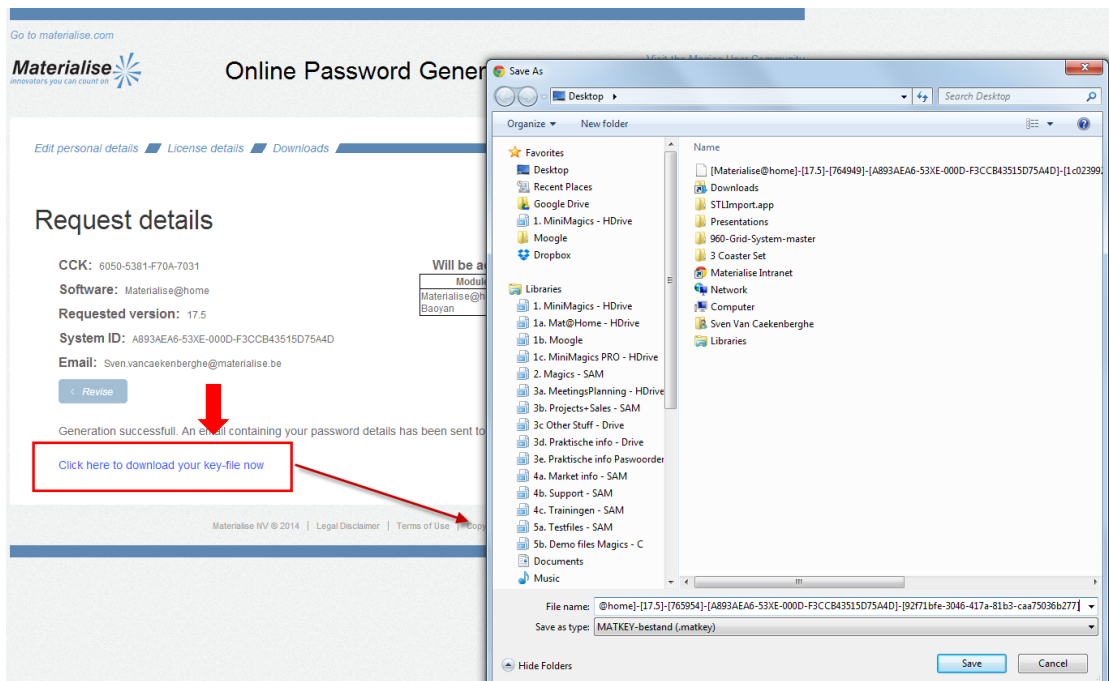
Key-file:

System ID:

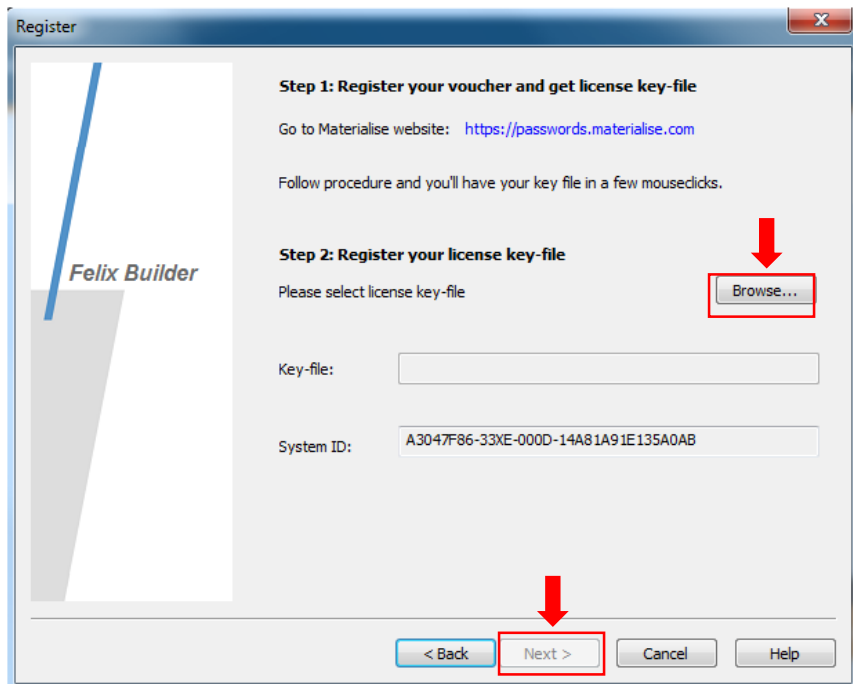
< Back Next > Cancel Help



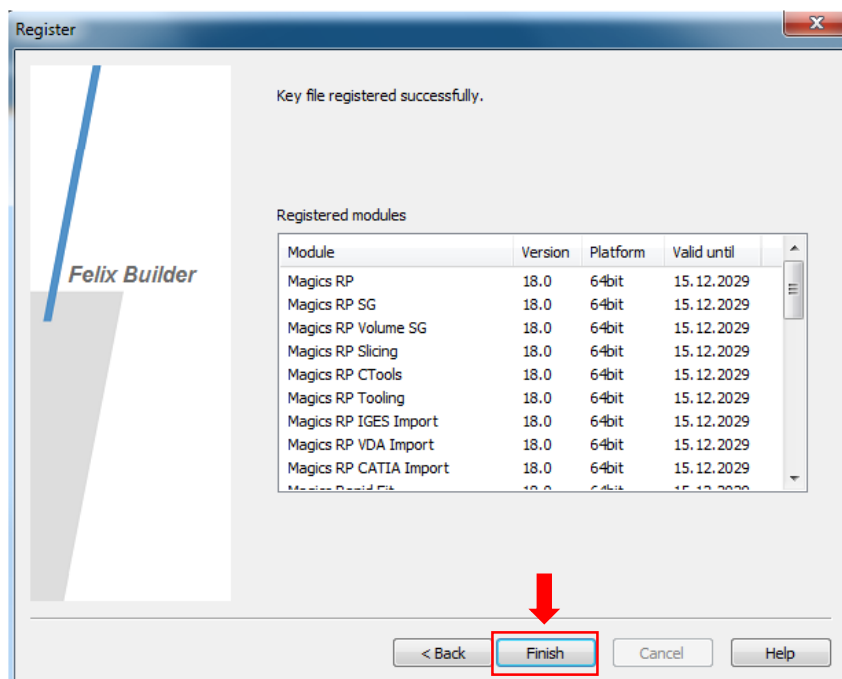
- Save the license key on your computer by clicking the download button



- Browse for the license key you stored on your computer in the previous step and press the next button



- Your license key is registered successfully and your software is ready to use. Press the finish button to exit the registration wizard. You can now use the FELIXbuilder software.



3. Installation of drivers and firmware for Windows

i NOTE: Mac users should go to chapter 19

In this chapter:

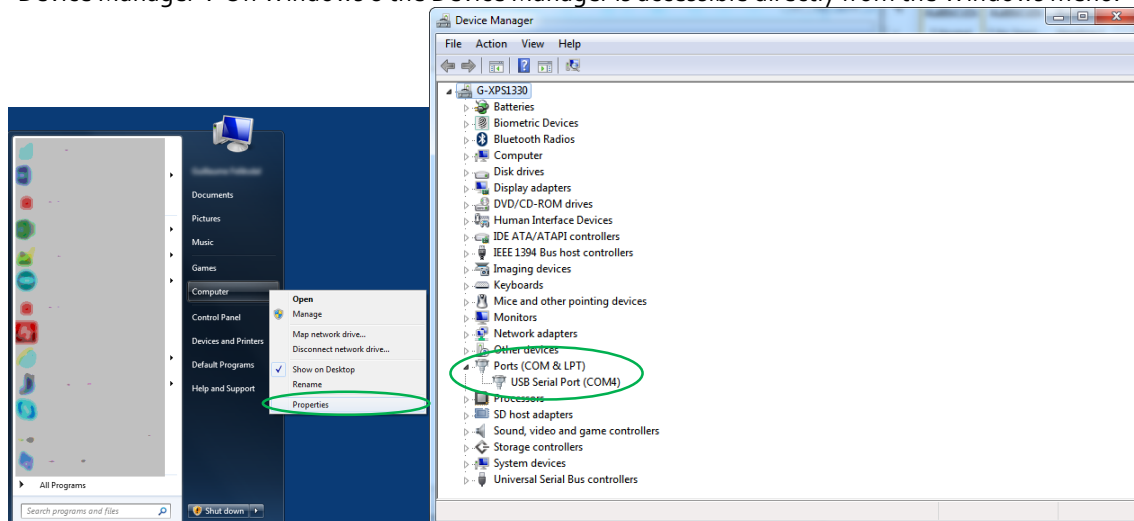
- Driver installation
- Firmware installation

4. Driver Installation

1. Plug in the power supply cable.

i NOTE: The electronics board is NOT USB powered, so without the power cable the electronics won't work. It needs the voltage of the purple wire to drive the logic of the board. The power to the rest of the board is controlled by the CPU when needed.

2. Plug the USB cable into the computer.
3. Your operating system should find the correct drivers automatically, or download them automatically with Windows update.
 - a. If the drivers are not found automatically, then download drivers from here: <http://www.ftdichip.com/Drivers/VCP.htm>.
4. Windows 7: Right-click on "Computer" in the Start Menu, then select "Properties". In the left pane, click "Device Manager". On Windows 8 the Device Manager is accessible directly from the Windows menu.



Note what COM-port is present. If there are more than one COM ports available, unplug the USB cable of the printer and then re-plug it in again. Check what port number is appearing and disappearing. This port number will be used for the next step.

i NOTE: Sometimes Windows is still not able to find the port. To fix this follow this tutorial: <http://forum.arduino.cc/index.php/topic,107098.o.html>

5. Firmware installation on Windows – Arduino

- i NOTE: Only continue with this subchapter if:**
1. You have just assembled your DIY kit DUAL extruder 3d printer or
 2. You want to update the firmware of your printer because there is new firmware available.

This chapter explains how to update the firmware on the electronics board of your printer.

This step requires the following software:

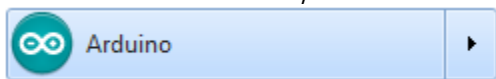
- Arduino version 1.0.6, <http://arduino.cc/en/Main/Software> platform to upload firmware to the printer.
- FELIXprinter firmware (check the revision of the printer). Contains printer settings for correct operation of your FELIXprinter.

Only use Arduino 1.0.6 for the installation of the firmware.

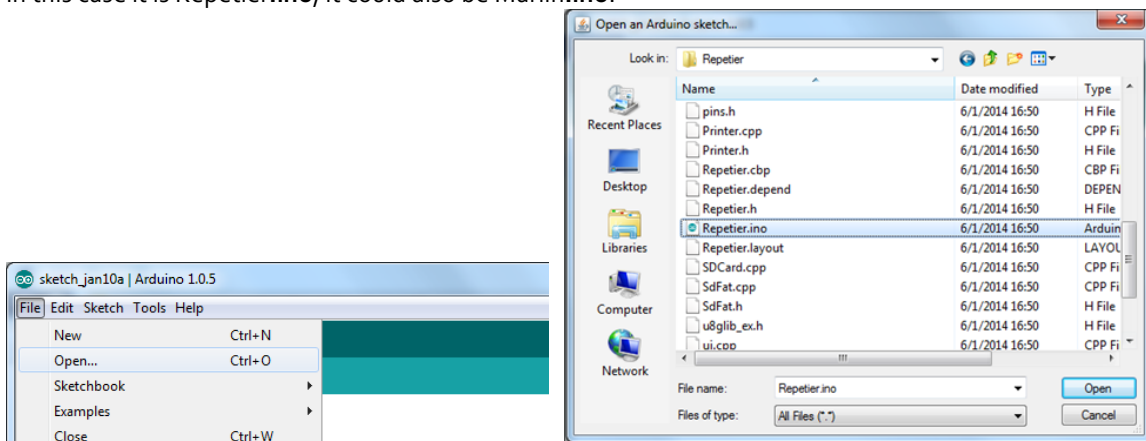
Steps to upload new firmware to the control board:

1. Download the latest firmware here:
<http://www.felixprinters.com/downloads/index.php?path=firmware/>
Be sure to download the printer firmware that matches your printer version.
Extract the firmware .zip file.

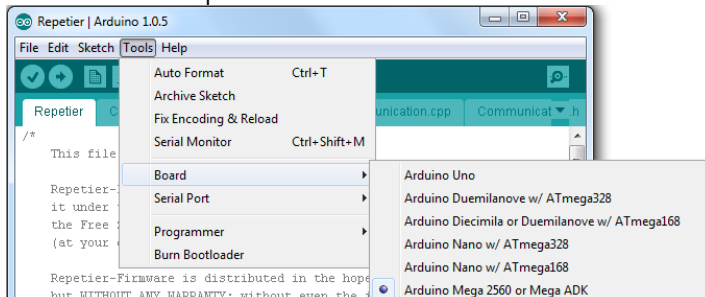
2. Install the Arduino software, and run it.



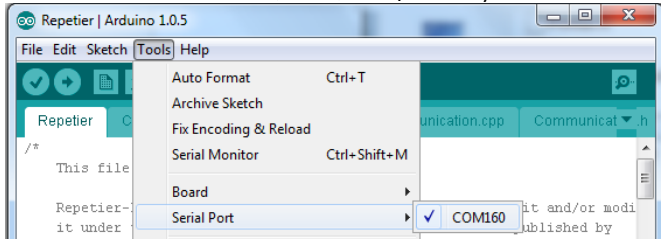
3. Open the firmware file from the extracted firmware folder.
In this case it is Repetier.ino, it could also be Marlin.ino.



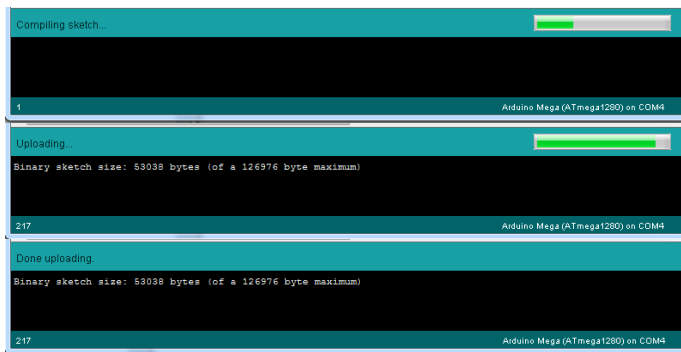
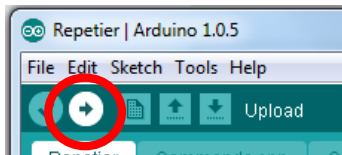
4. Select the correct platform:



5. Select the correct Serial (COM) Port, which you noted earlier.



6. Press the upload button, and wait till the upload is complete. This normally takes between 1 to 2 minutes.



The new firmware is now on your printer.

5 Installation Software - Mac OS

Multiple printer software tools are available for Windows and Mac. For example FELIXbuilder and Repetier Host. In this chapter the installation process of FELIXbuilder will be explained for Mac. Installation of Repetier Host can be found in the attachments. This chapter also covers the installation firmware.

This software package prepares your 3D model into machine instructions for your FELIXprinter. So together with your FELIX 3.1 3D-Printer, you received a voucher code. You should use this voucher code to register the software.

Installation of FELIXbuilder

1. Open the installer (.dmg) and drag and drop the application to your Applications folder.
2. After installing FELIXbuilder, right click the application and press open.
3. Click Open in the dialog box. If prompted, enter an administrator name and password.(not able to open the application? See note)



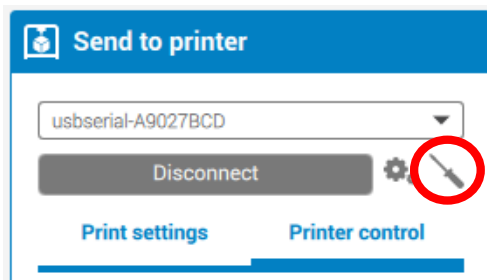
4. Approve the end-user license agreement.
5. Enter the voucher code that you have received with the FELIX 3D printer and press validate.
6. The software will be registered and you will get notified of the validity period of the voucher.
7. Press finish to complete the installation.



Note: for more info visit: <https://support.apple.com/en-gb/HT202491>

Load FELIXbuilder profiles

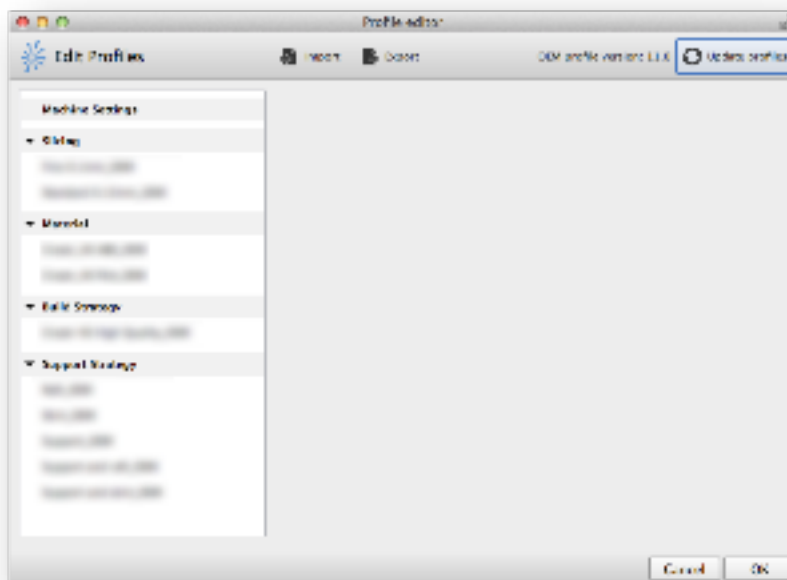
1. Navigate to the 'Print' tab and click on the gear wheels button.



2. Profile editor window opens
3. Press update profiles to get the latest FELIX profiles (internet connection is needed)



4. The latest FELIX profiles are loaded in the software



Note: If you don't have access to the internet you can load a default profile by clicking import

6. Firmware installation on Mac OS – Arduino

- i NOTE: Only continue with this subchapter if:**
3. You have just assembled your DIY kit DUAL extruder 3d printer or
 4. You want to update the firmware of your printer because there is new firmware available.

This chapter explains how to update the firmware on the electronics board of your printer.

This step requires the following software:

- Download Arduino, http://arduino.cc/download_handler.php?f=arduino-1.0.6-macosx.zip platform to upload firmware to the printer.
- FELIXprinter firmware (check the revision of the printer). Contains printer settings for correct operation of your FELIXprinter.

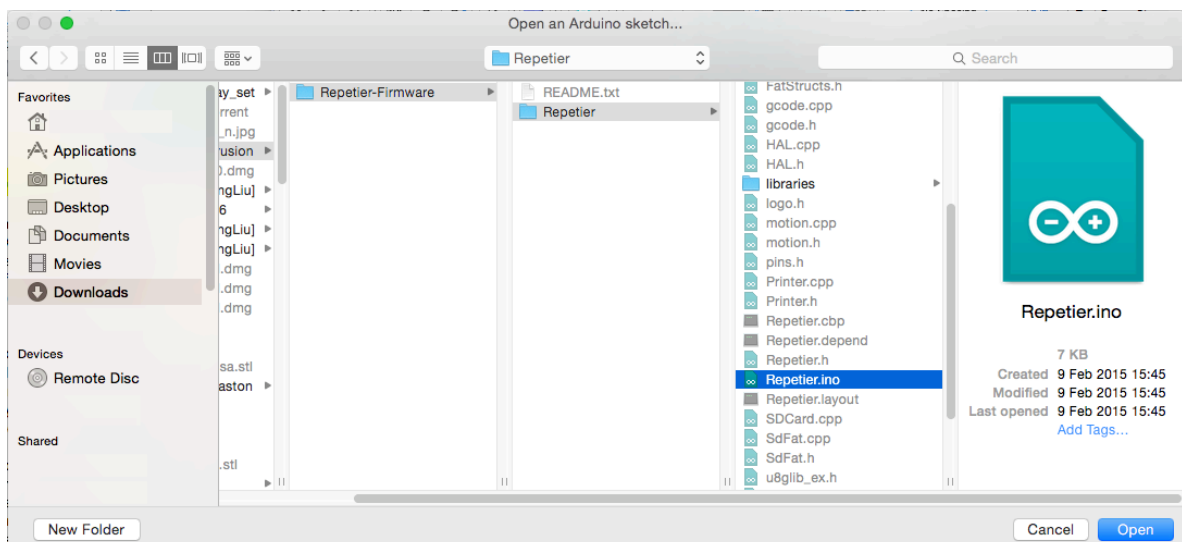
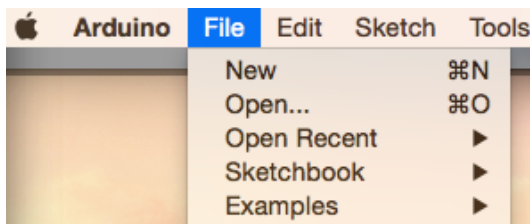
Steps to upload new firmware to the control board:

1. Download the latest firmware here:
<http://www.felixprinters.com/downloads/index.php?path=firmware/>
Be sure to download the printer firmware that matches your printer version.
Extract the firmware .zip file.
2. Install the Arduino software, and run it.

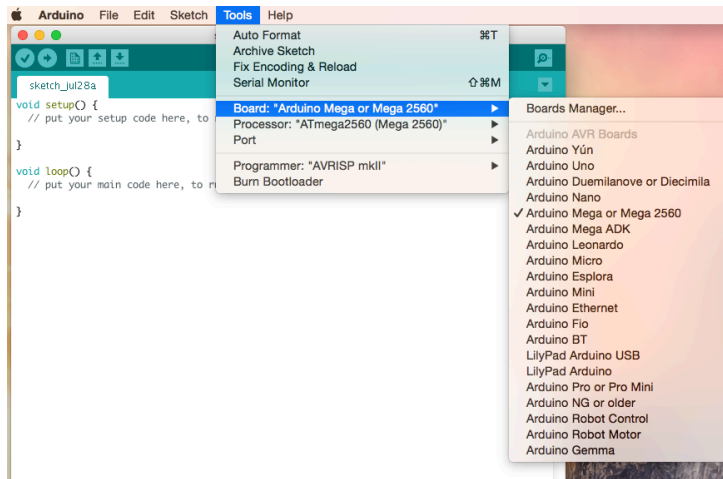


Arduino

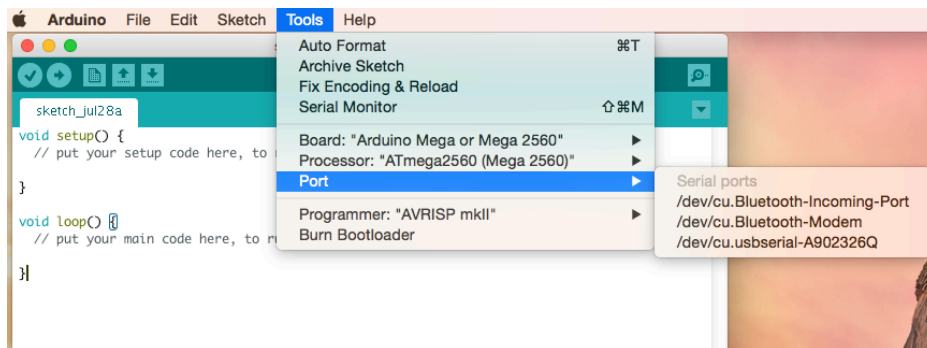
3. Open the firmware file from the extracted firmware folder.
In this case it is Repetier.ino, it could also be Marlin.ino.



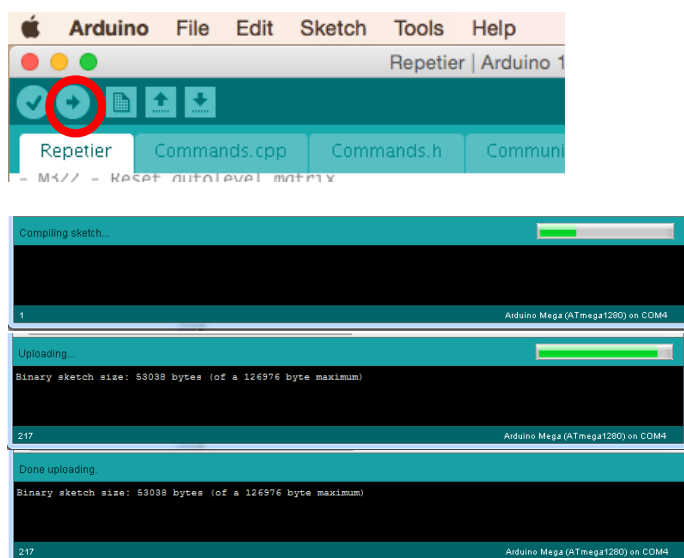
4. Select the correct platform:



5. Select the usbserial-XXXXXX from the list.



6. Press the upload button, and wait till the upload is complete. This normally takes between 1 to 2 minutes.



The new firmware is now on your printer.

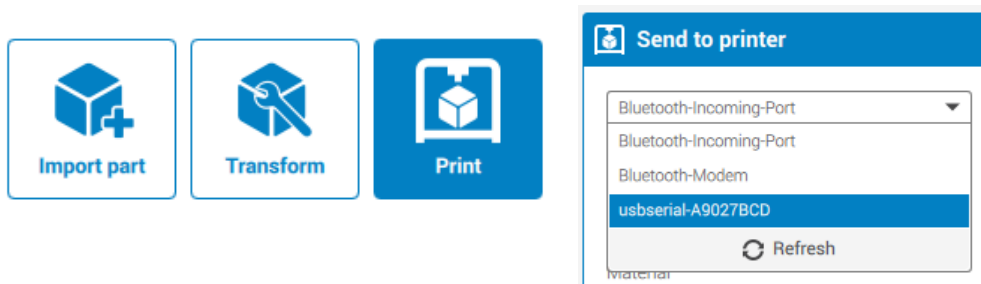
support@FELIXprinters.com
www.FELIXprinters.com

6 Calibrate the Z-Direction (with software assistance)

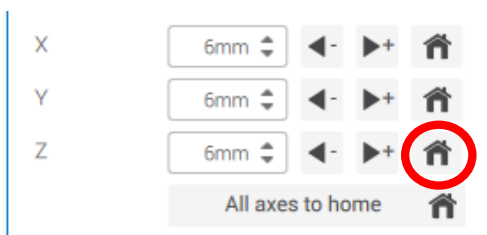
To obtain high quality prints it is essential that the heated bed is leveled and that the distance between the hot-end and the bed is optimal to achieve the best possible prints. The manual leveling was done prior to the software installation. Now it is time to calibrate the Z-axis height: this is done in a combination of manually adjusting the printer with the help of FELIXbuilder.

Note: The Z-axis of your FELIX can also be calibrated with Repetier Host. How you can do this, can be found in the attachments.

1. Start FELIXbuilder and connect your printer ('Print' tab, 'Send to printer', select the FELIX and click 'connect'.

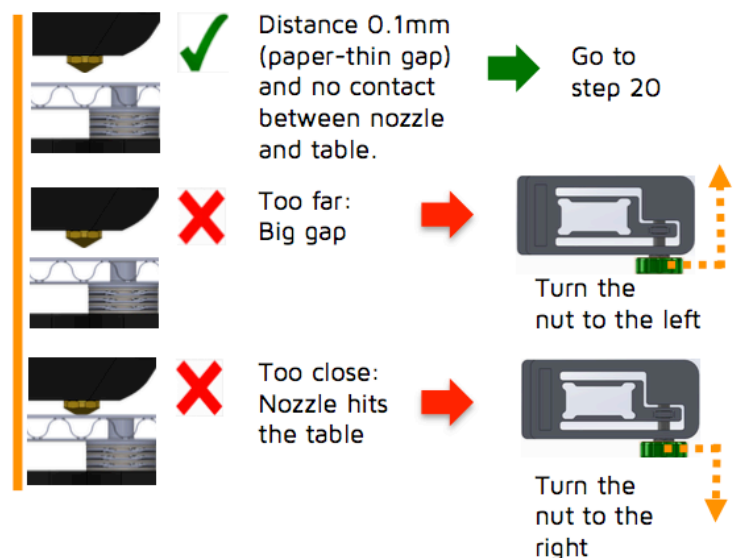


2. Click on the home button that belongs to the Z-axes, the heated bed will move towards the tip of the hot-end.



3. If the nozzle is too far from the print bed, manually turn the dial on the printer to the left. (Dial is displayed in the picture below)

When adjustment is done with the dial, press on the Home button (for the Z-axis) again. Repeat process till the Z-axis is perfectly calibrated.



5 Prepare a CAD file for printing with Repetier Host- (Slicing)

This chapter will prepare a CAD file for printing. It basically converts an STL file to a gcode file. This process is called slicing.

To keep things simple for your first print we recommend you get the test file from here:

http://shop.FELIXprinters.com/downloads/index.php?path=print_files%2Ftest_print_files/.

Choose the file. **FELIXprinters_gadget.STL**.

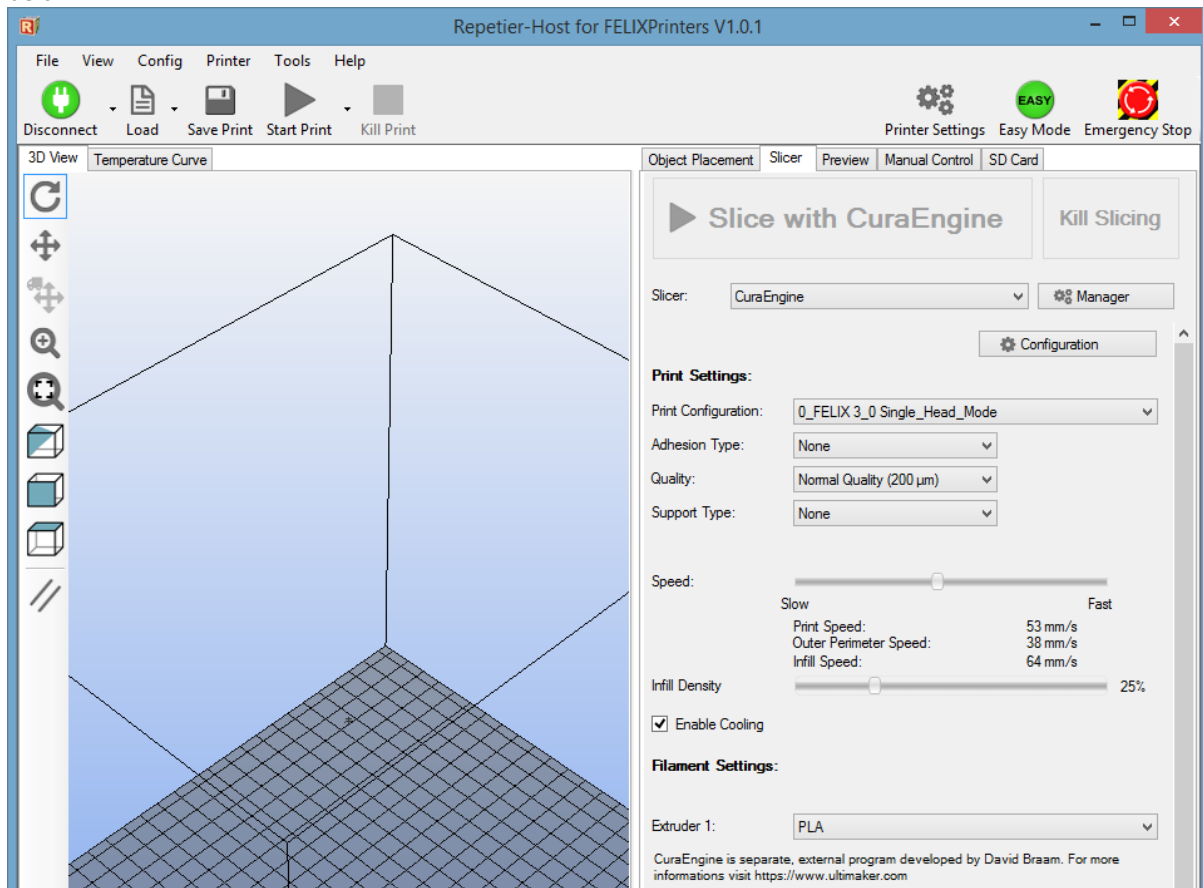
For slicing there are several options available. All have their strengths.

In the Repetier-Host application there are three slicers embedded.

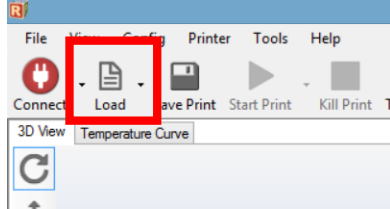
- **CuraEngine (recommended)**
- **Slic3r**
- **SFACT(Used in the previous Repetier-Host versions)**

Next to that we also recommend an external slicing program called Kisslicer. This program generates at the time of writing the best gcode- files for dual extrusion and also very good code for single extrusion.

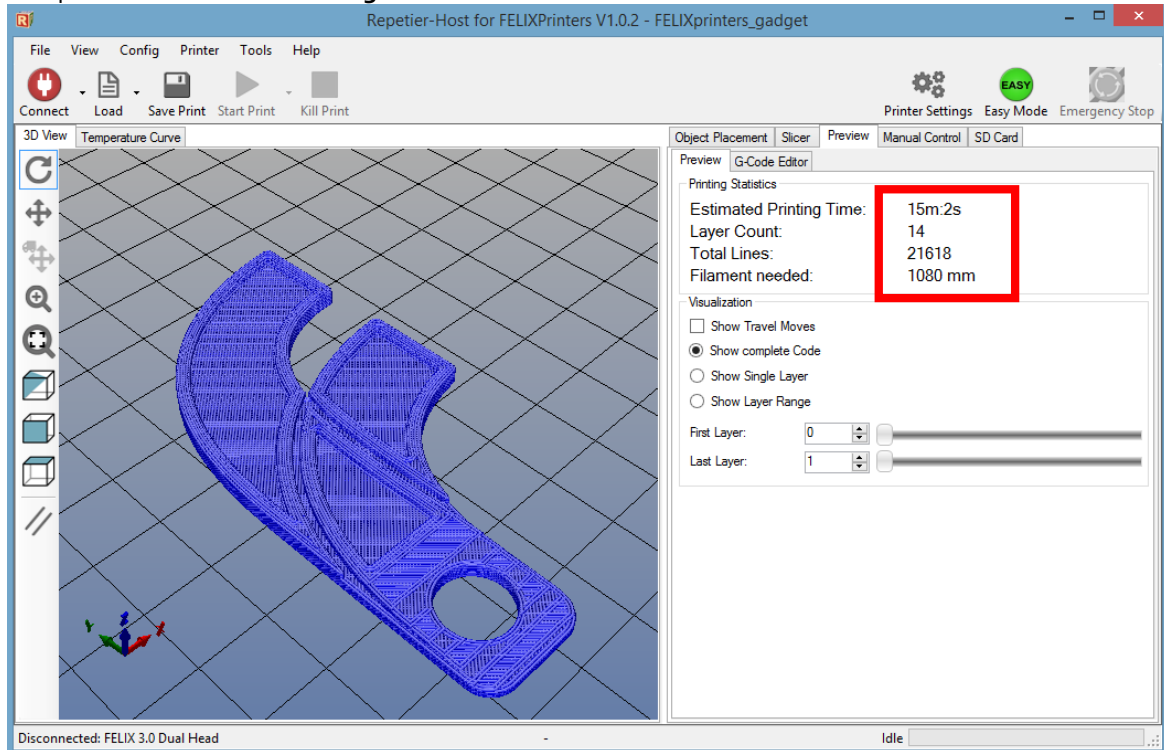
Go to the **Slicer** tab, you'll see the three different slicers. For this demo we'll take the recommended CuraEngine. For your first print, we will take the default settings. Please match the settings in the picture below.



Now load the downloaded STL file:



And press the **Slice with CuraEngine** button.



After slicing you'll see a preview of the generated g-code. Also note the printing time, it will take approx. 15 minutes to finish this object.

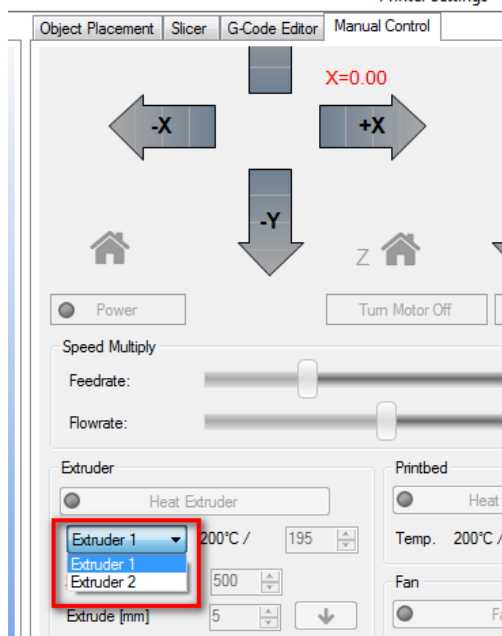
You have now sliced your first object and are ready to go to the next step.

6 Your first print

At this stage all we've done all preparations and we're at the final step to convert your idea or 3d file into reality.

In the manual control window do the following.

- In case of dual extrusion, select the extruder of choice.



- Heat up the extruder to 195 degC
- Heat up the heated bed to 55 degC
- Move the table down 10mm

If the extruder and heated bed are warmed up, check or make sure that the following is true:

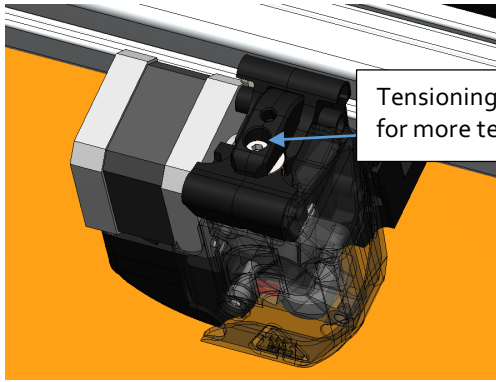
- ✓ Printer axes can move without obstructions
- ✓ Remove all plastic residues on the heated bed, preferably with the supplied tweezers
- ✓ The heated bed surface is clean and degreased.
- ✓ When all axes are homed, the hot-end is not touching the table.

Make sure the table is moved at least 10mm away from the extruder tip and insert the supplied **PLA** filament in the extruder.

Run the extruder until a steady flow of plastic comes out.

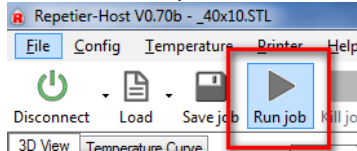
i NOTE: When there is not a continuous flow coming out of the nozzle, make sure the extruder arm is properly tensioned. Turn the m4 bolt **COUNTER CLOCKWISE** to put more tension on the filament, so the filament will be pulled into the hot-end better. But watch out, too tight and the motor will have a hard time turning, and in the worst case the filament might be squashed so wide that it gets clogged into the hot-end.



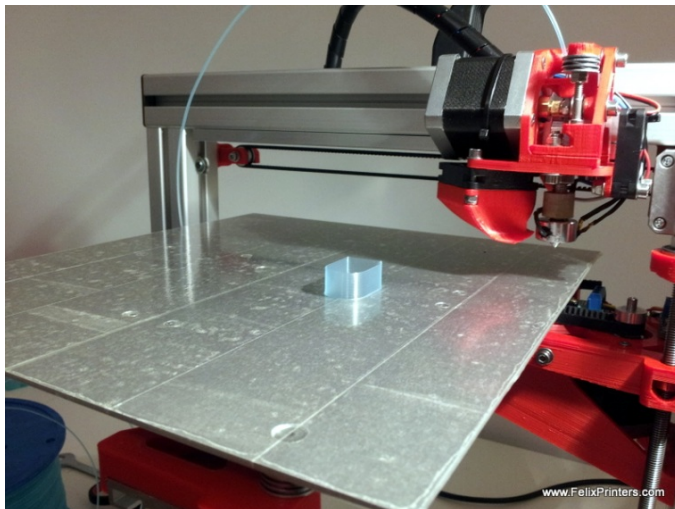


Tensioning bolt, turn counter clockwise for more tension on filament.

When these steps above are OK, you are ready to press that print button.



If the calibration was done correctly, the print should finish without any problem.



If the print looks like the picture above, then congratulations your printer setup is completed!!

If the print fails, it is usually because the distance between the bed and nozzle is too large. Try to adjust the z-axis limit switch vane to get the distance closer.

To know more about software please continue reading at chapter 7

i IMPORTANT: To keep the hot-end running as long as possible, let the filament run through a dust collector like a small piece of sponge. The filament picks quite a lot of dust due to static charge or dirt from the factory. This will all enter the hot-end and partially stick in there and finally clog the nozzle. When this happens the hot-end needs to be cleaned out while hot from both sides. A tutorial for this is available on the forum on the website.

i NOTE: If you have a dual extruder, continue to chapter 7

i NOTE: For owners who assembled the printer themselves it is strongly recommended to follow assembly checks in appendix 14.

7 Differences in Software

This chapter describes the supplied software in more detail. The goal is to give you more insight in how to set it up for different kind of printable objects.

7.1 FELIXbuilder

FELIXbuilder is the official software customized for FELIXprinters to process, adjust and slice digital, printable objects to print with the best possible outcomes on a FELIX 3D printer. FELIXbuilder has an intuitive workflow but without loosing any manual control features.

7.2 Repetier- Host

Repetier-host is an open-source software and is supplied software with our printers. The version distributed from our website is optimized for the FELIXprinter.

The software in general has the following functions.

- Control the printer. Move axes, set temperatures, alter settings.
- Prepare CAD (STL) files for printing. This process is called slicing.

Both will be explained in the following sub chapters.

7. Slicers

The slicers prepare your CAD STL-file printing. It basically cuts your object in layers and determines what paths to travel each layer to create the object.

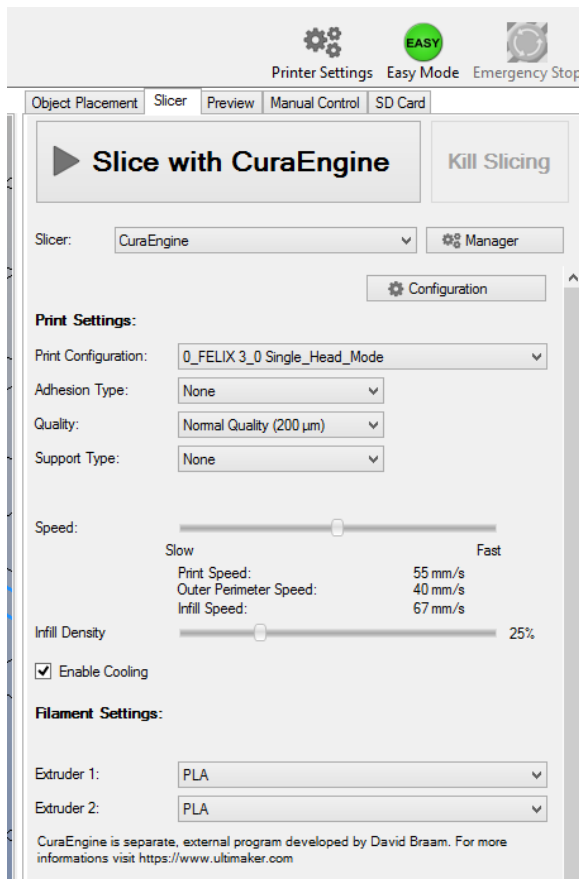
There are three slicing programs embedded in repetier-host that can be used:

- CuraEngine (recommended)
- Slic3r
- SFACT

For all slicer we have created optimized profiles for your FELIXprinter and they are described in more detail below.

7.2.1.1 CuraEngine

In the slicer-tab, you'll find the CuraEngine slicer with its settings. The screenshot below shows how it looks like and the available options.



Print Configuration:

Depending on the printer you have chosen, you can choose between two print configurations.

- o_FELIX3_o Single_Head_Mode
This enables single head printing. It takes the activated extruder to print with. Everything gets printed with one extruder.
- o_FELIX3_o Dual_Head_Mode
This enables dual head printing. It takes extruder 1 to print the object and extruder 2 to print the possibly required support structures. It also gives the ability to assign an extruder to an object.

Adhesion Type:

This is standard disabled, but for special cases where the object is very small or has a limited contact area with the build plate it is recommended to choose brim or in very special cases the raft to get extra adhesion.

Quality:

Quality here means basically layer height of each printed layer. The finer the layer height the more detailed the printed object will be.

For reference the 100 micron layer height is the same as the thickness of a human hair. We recommend to use the 150micron, which is a nice tradeoff between quality and print-time.

The extreme quality (50 micron) is experimental and might require some fine tuning for complex objects.

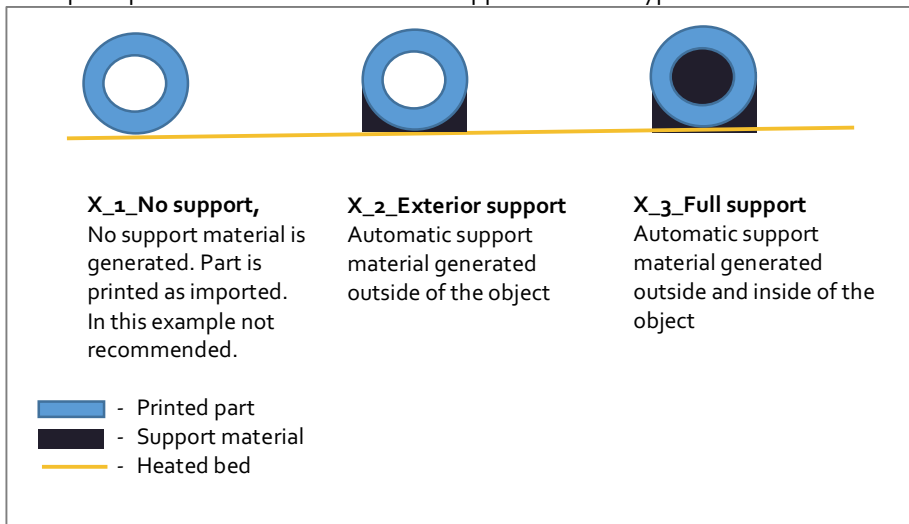
Support type:

Support structures are generated to support parts of the object when necessary. When printing layer after layer, each layer needs something to rest on to prevent it from sagging. Sometimes support structures are required to provide that.

There are two options:

- *Touching bed:*
Support material is only generated which is physically touching the build platform.
- *Everywhere:*
Here the support material is also generated inside a model

A simple representation of the different support material types material is shown here.



Speed slider:

This will set the print speed. Increasing the print speed, has as penalty a less nice print-quality.

Infill Density:

Objects are filled with a certain density, this can range from empty to fully filled. More than 70% infill is not recommended.

Enable cooling:

The just extruded filament is actively cooled, to ensure conservation of details especially useful for detailed objects.

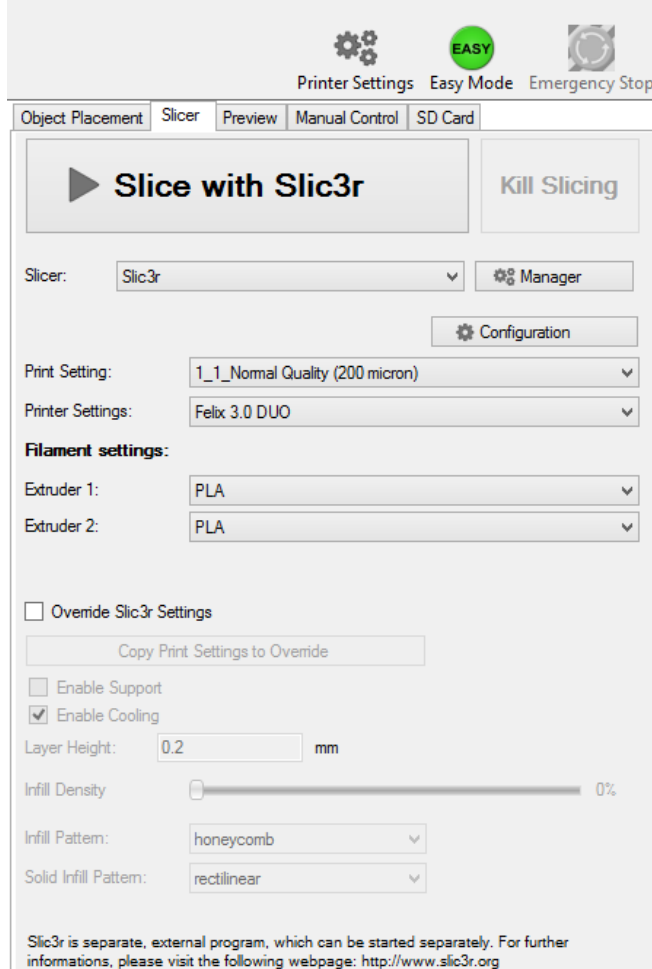
Filament settings:

Choose for each extruder the filament type you have currently in the extruder.

You can easily change settings of a selected profile if they still don't fit your needs, just click the **configuration** button.

7.2.1.2 SLIC3R

Slic3r is an alternative slicer to the recommended CuraEngine.



Print and printer settings:

With these settings you can print in two modes.

1. Single head printing
2. Dual head printing.

1. Single head printing:

To enable this, configure it like this:

Print settings: choose one of the qualities with where the second number is a 1.

So for instance 1_1_Normal Quality (200 micron). This enables single head mode.

Printer settings: Choose FELIX 3.0 Single

2. Dual head printing:

Print settings: choose one of the qualities with where the second number in the *print settings* is a 2.

So for instance 1_2_Normal Quality (200 micron) enables dual head mode.

Printer settings: Choose FELIX 3.0 Duo.

This will print support material with the second extruder.

Filament Settings:

Extruder 1: choose your filament type

Extruder 2: choose your filament type, this one will be ignored if you have the print and printer settings configured for single head mode.

Override Slic3r Settings

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Enabling this, overrides some settings of the selected print settings.

A brief description of the options:

Copy Print Settings to Override. This will copy the settings in the selected print setting to the fields of this current window.

Enable support, this enables the generation of support material where needed.

Enable cooling, enables cooling of the object during printing. This normally improves print quality especially for detailed objects.

Layer height, the height of each printed layer.

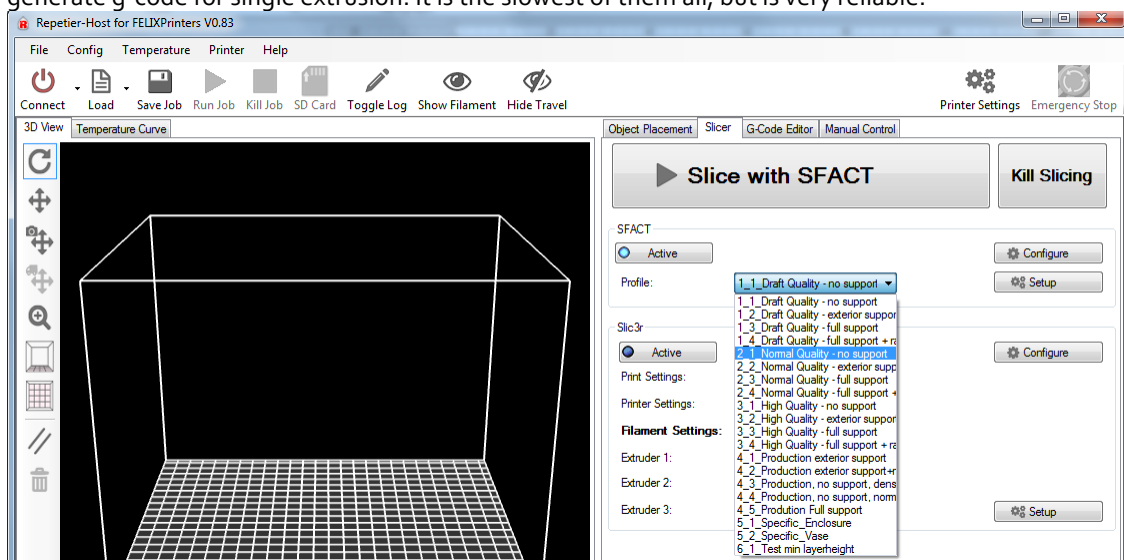
Infill density, the percentage of infill of the object. 0 means a hollow object. 100% means fully filled.

Infill pattern, pattern of the infill.

Solid infill pattern, patter of the infill for the bottom and top of the object.

7.2.1.3 SFACT

This slicer is an old slicer and has been used for older versions of Repetier-Host. This slicer is only able to generate g-code for single extrusion. It is the slowest of them all, but is very reliable.



There is a large choice of slicing profiles. For the first test it is recommended that you choose the **2_1_Normal Quality** profile.

Short explanation of the slicing profiles:

Profile 1_1 to 3_4: are profiles setup for everyday printing.

Profile 4_1 to 4_5: are profiles optimized for our production parts. These are the profiles used to produce the printed parts of your printer. When printer upgrades are provided, these are recommended to use for slicing the parts.

Profile 5_1 to 5_2: are used for specific cases

Profile 6_1 and further: are used for testing purposes.

The structure of the profiles 1 to 4 is done like this:

X_1_No support,
No support material is generated. Part is printed as imported. In this example not recommended.

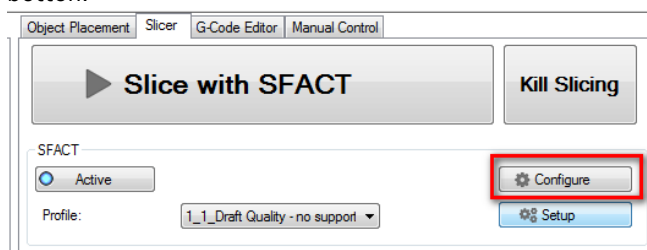
X_2_Exterior support
Automatic support material generated outside of the object

X_3_Full support
Automatic support material generated outside and inside of the object

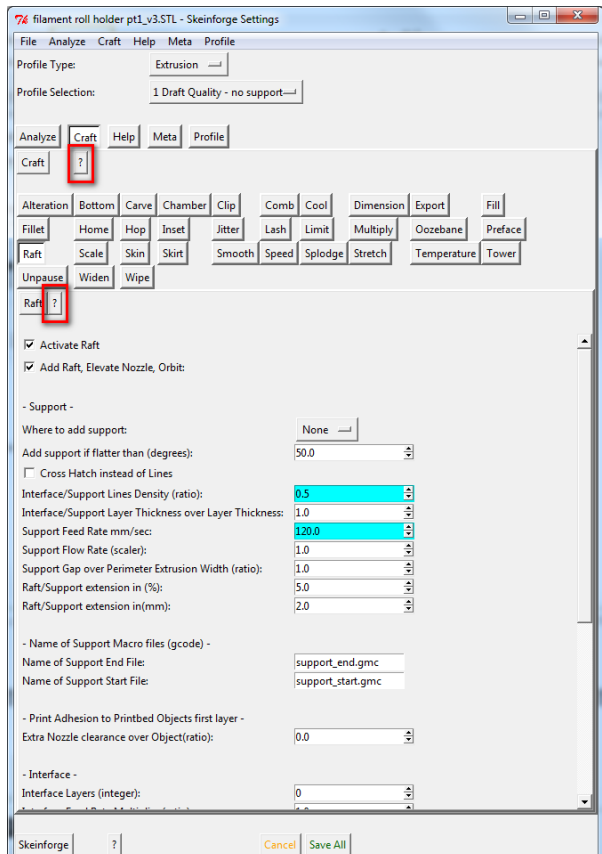
X_4_Full support + raft
Automatic support material generated outside and inside of the object + a raft to ensure good contact with the heated bed.

- Printed part
- Support material
- Raft
- Heated bed

The profiles are easy to adjust and tweak yourself for further improvement. To do this just click the configure button.



This will show a very large number of settings to tweak. Don't worry: every setting is well documented. If you are interested in knowing more just click the question mark button as indicated in the figure below.



8. Dual head printing

7.2.1.4 Calibration with FELIXbuilder

This chapter describes how to calibrate your dual extrusion printer with FELIXbuilder and describes additional steps to make a dual extrusion print. How to calibrate with Repetier Host can be found as an attachment.

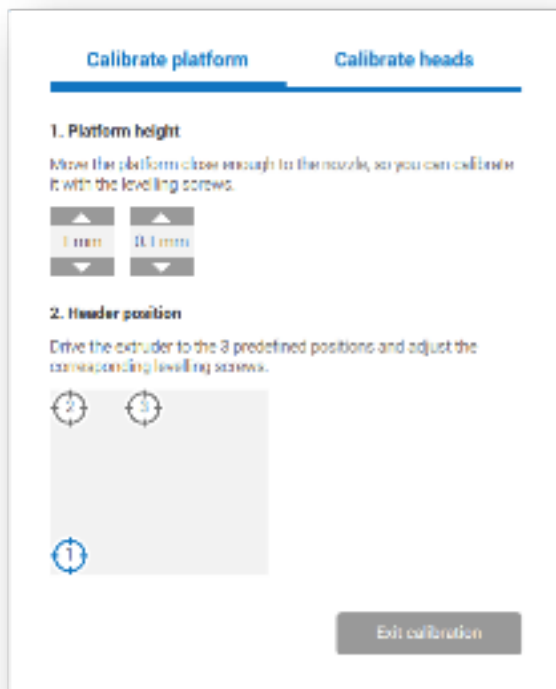
Calibration is only necessary when you have purchased a DIY kit. For the assembled printers, the calibration is already done during production. Only when you exchange a hot-end, re-calibration is then recommended.

This wizard consists out of 2 tabs: calibrate platform or calibrate heads.

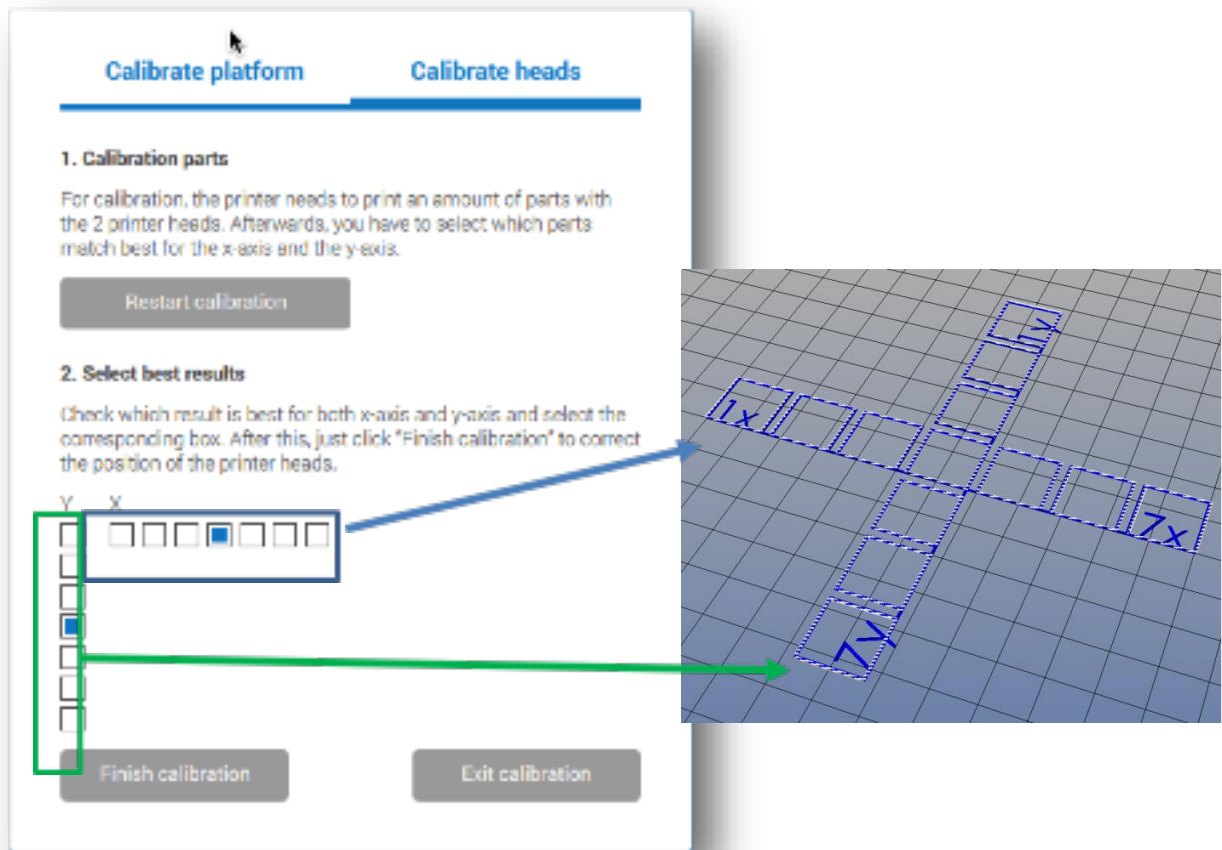
Calibrate platform

For a successful print it is important that the table is properly calibrated. The distance between the nozzle and table should be the same at every x,y position. The leveling mechanism of the table can be adjusted by turning the nuts underneath the heated bed. It is important to check it first, because the leveling can change during shipment.

Move the nozzle to all the points and check that the distance between the nozzle and the platform is equal across all the points. If it isn't adjust the nuts underneath the platform.



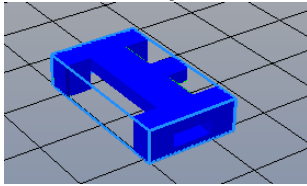
Calibrate heads (extra calibration for dual nozzle printers)



- If both separate extruders have proven to print well, it is time to calibrate the distances between them. Print out the calibration parts by pressing the print calibration parts button. In this print 2 layers of squares are printed. Layer one is printed with extruder 1 and layer 2 is printed with extruder 2 and shifted.
- After you have selected the squares that align on top of each other, you will send these settings to the eeprom of the printer by pressing the finish calibration button.
- You finished the calibration and you should be able to print successfully with your dual head printer.

7.2.1.5 Use second extruder for support material

We use this object for reference. This can only be printed well with support material



Repetier-Host has two options for dual extrusion. Both are described below.

Go to the *licer tab* and choose the following:

Slicer 1: CuraEngine

Print configuration: 1_FELIX_3_0 Dual_Head_Mode

Adhesion Type: ...

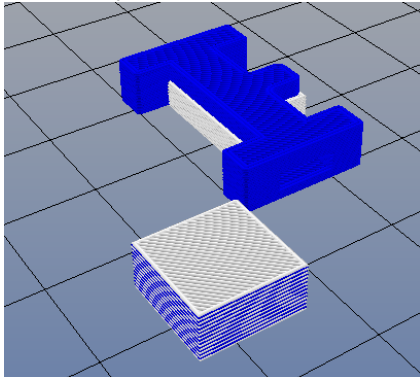
Quality: ...

Support type: Everywhere

Extruder 1: Your filament type loaded.

Extruder 2: Your filament type loaded.

Press slice, this should be the result.



The white colored lines are the support material and the blue lines are the object itself
Next to the object you see a square tower, this is used to clean the nozzle when switching.

Slicer 2: SLIC3R

Print Setting: x_2_ Quality (... micron)

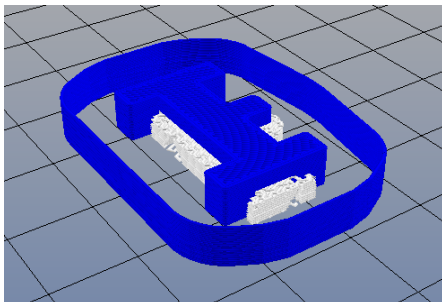
Printer Settings: Felix 3.0 DUO

Extruder 1: Your filament type loaded.

Extruder 2: Your filament type loaded.

Turn off override Slic3r Settings, unless you want to explicitly change things.

Press slice



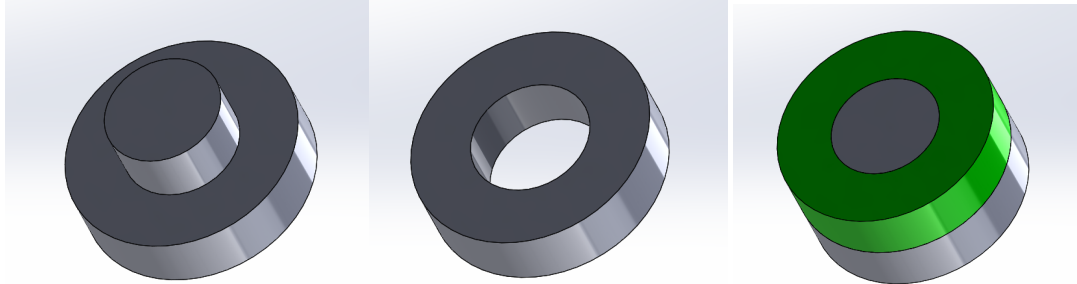
You will see that the white lines are the support material and the blue lines the object. There is an additional outer wall drawn, which is there to wipe the nozzle of the non-used extruder during printing.

7.2.1.6 Assign an extruder to an object.

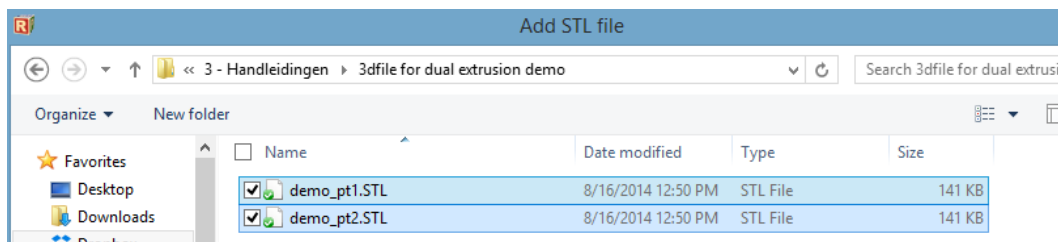
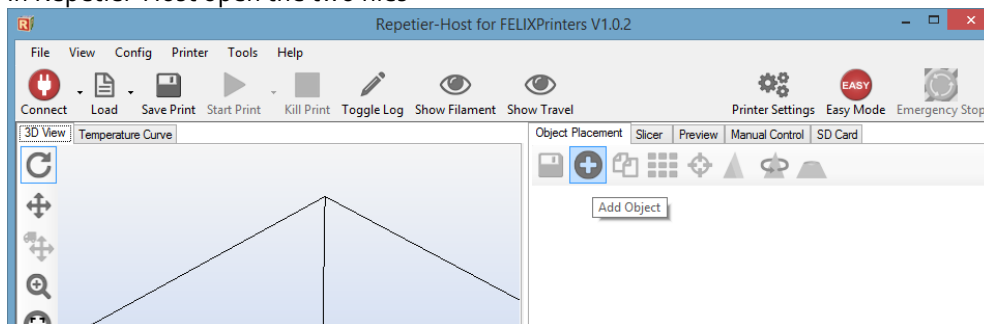
This short tutorial will show you how to print two objects in a single print with different extruders.

You basically need two STL files which are created in the same coordinate system and with exact needed distance with respect to each other.

For this example two simple parts are created, see picture below.

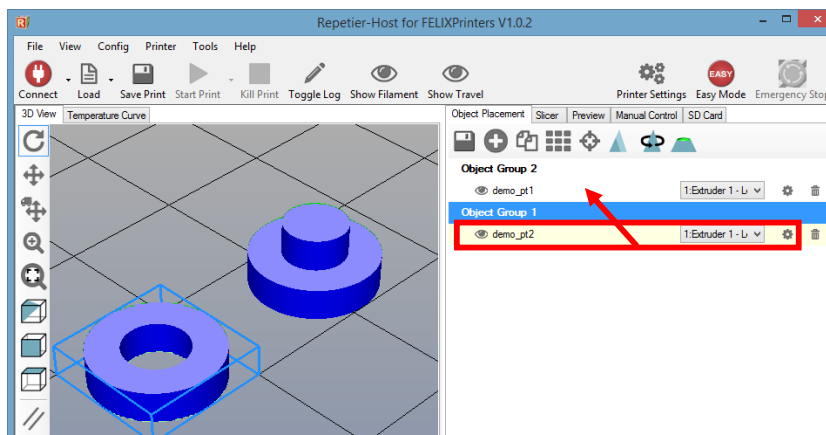


In Repetier-Host open the two files



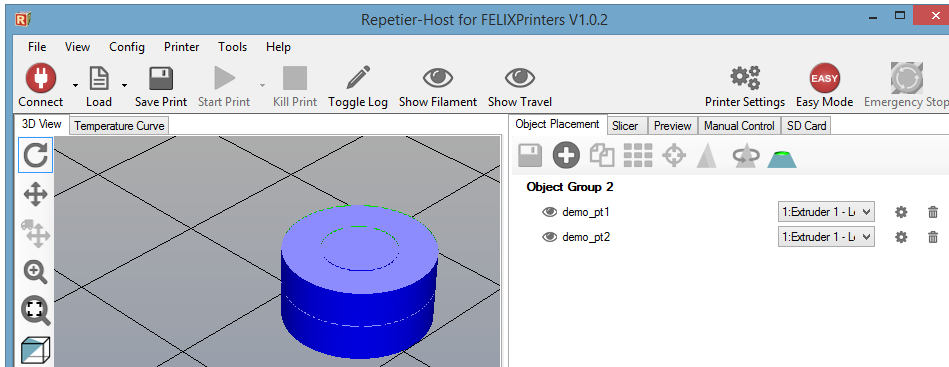
It should now look like this:

Select demo_pt2 and drag it into object group 2

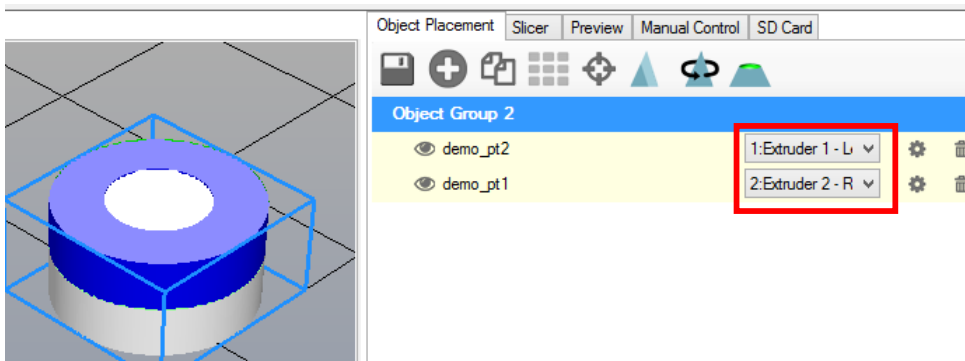


It looks like this:

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Select which object you want to print with which extruder.



Slice the objects with one of the two options:

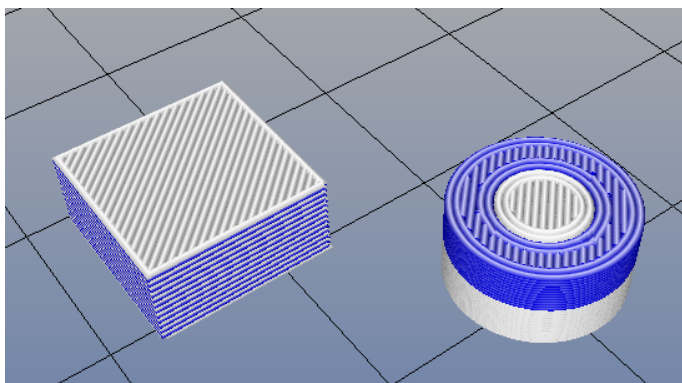
Option 1: CuraEngine

Goto the Slicer tab and select at least the following:

Print Configuration: **1_FELIX_3_o_Dual_Head_Mode**

Then press the *Slice* button. The result should look something like this:

The left is a square used for purging when switching from one extruder to the other.



Option 2: Slic3r

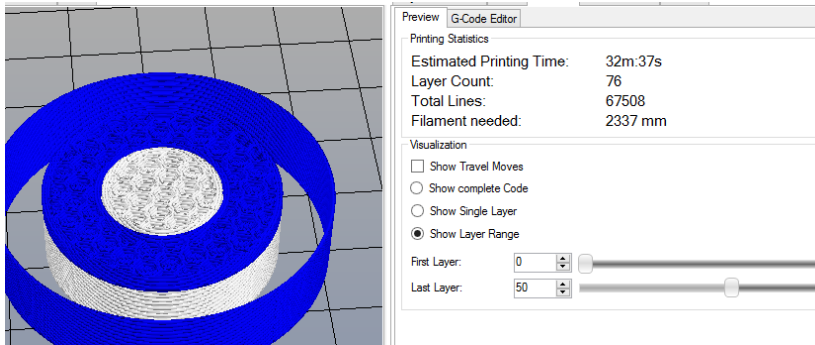
Choose the slic3r slicer and select some of the following:

Print settings: **x_2_x_Quality(x micron)**

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www.FELIXprinters.com

Printer Settings: Felix 3.0 Duo

Disable the override checkbox. Then press the slice button. It should now look like this:



After slicing press the print button.

7.3 Kisslicer

Kisslicer is a separate program to generate gcode. It is an extremely fast slicer and generates impressive g-codes. The program can be downloaded at our website in the download area. The package contains optimized slicing profiles for the FELIXprinter.

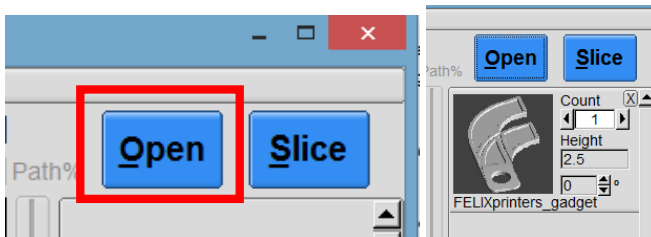
For single extrusion this program is free of charge, to get the full functionality and enable dual extrusion a license needs to be obtained from www.kisslicer.com.

The software is able to generate single and dual extrusion gcode. The program is able to create support material with the second extruder. This can be beneficial, because it can print the support material with a different material or the same material with a different temperature.

The following steps will guide you through the program.

9. Make a single extrusion print

1. Open kisslicer.exe and a STL file



2. Configure your slicing settings.

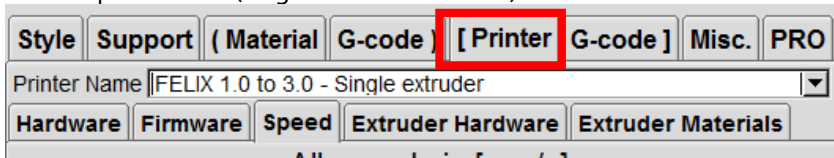
Choose quality:



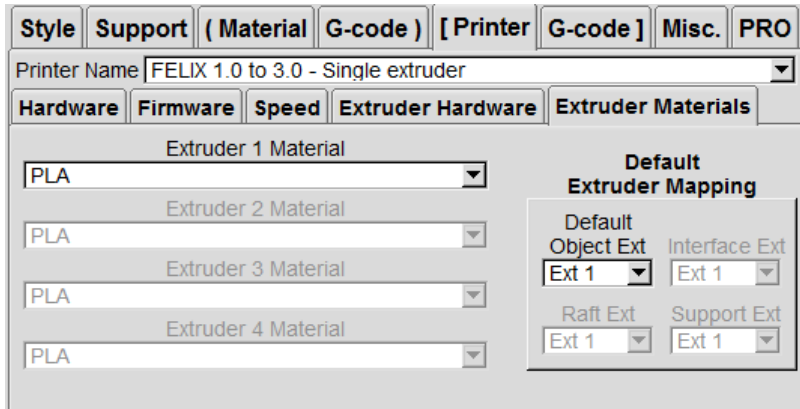
Choose support type:



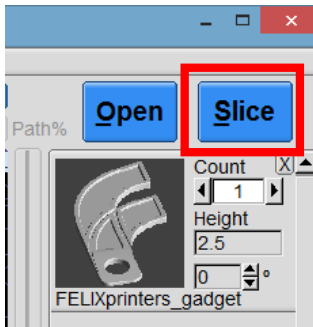
Choose print-mode (single or dual extrusion)



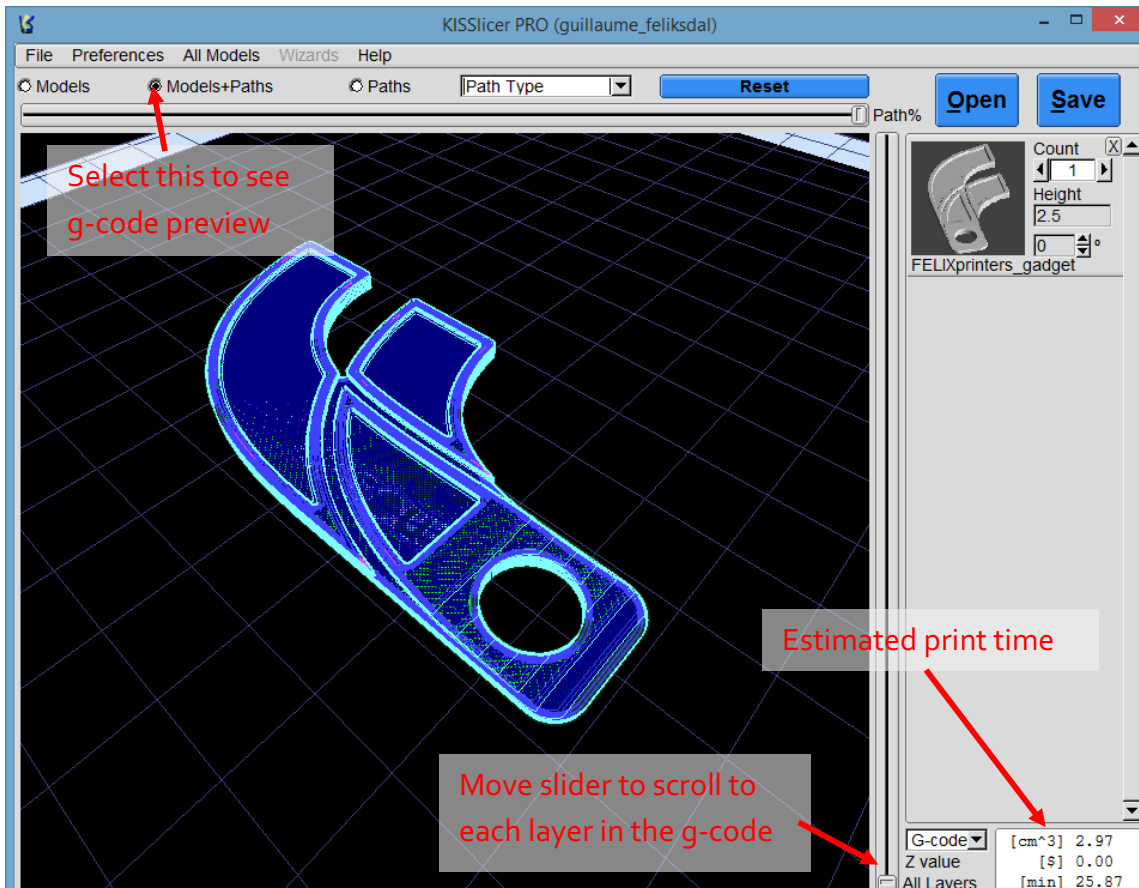
Choose what material the extruders are printing:



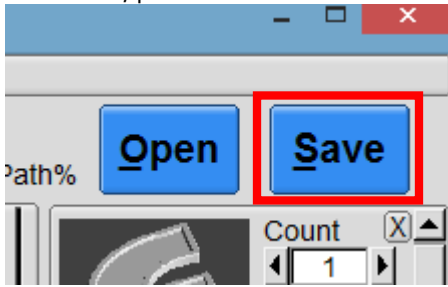
Press slice



Check results:



If satisfied, press save:



Load the just saved .gcode file in repetier-host to print it on your FELIXprinter.

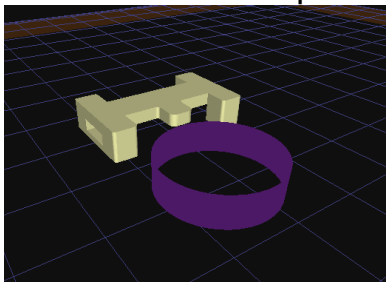
10. Make a dual extrusion print

These steps will demonstrate how to make a dual extrusion print with Kisslicer. Two examples will be shown.

- How to use the second extruder to print support material
- How to use the second extruder to print a selected object.
-

7.3.1.1 Support material with second extruder

Load a STL file which requires support material to print properly.

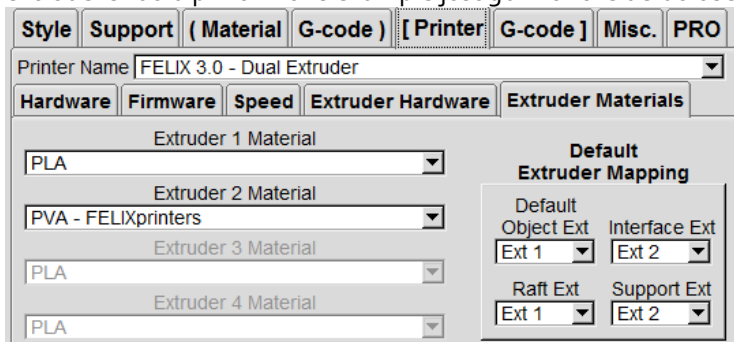


Choose a quality, it is recommended to start with normal quality.

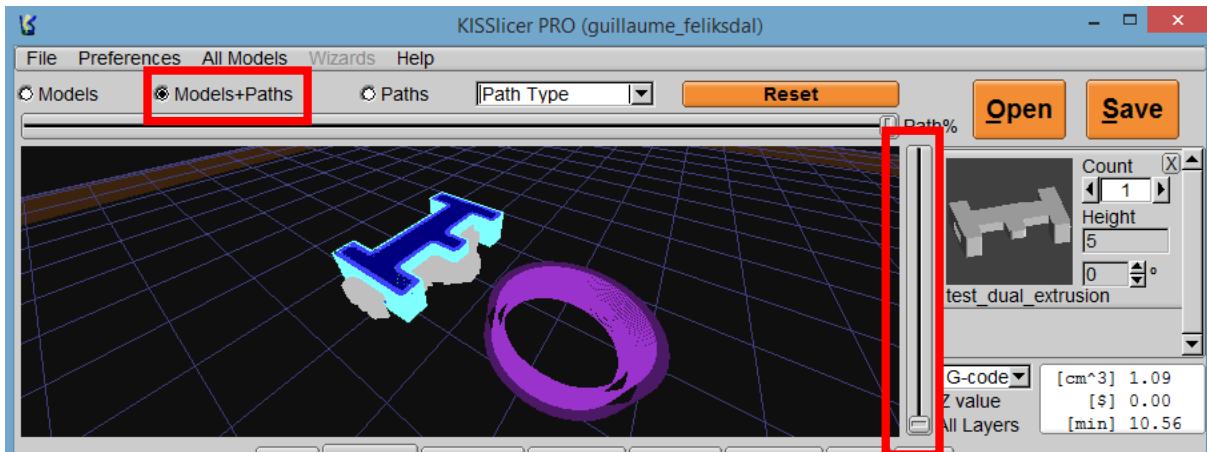
Support type: Normal – Dual extrusion

Printer: FELIX 3.0 – Dual Extruder

Inside the printer tab goto extruder material and choose the materials currently loaded in the extruders. Also note the default extruder mapping area. Here you can also select which structure types each extruder should print. In this example just go with the default settings.



Press slice and after slicing activate the models+path option and move the path % slider to 0%. This is the result:



The white lines are the support material and the other colors are the object itself. Next to the object there is a prime pillar. This functions as a wipe tower and also primes the extruder when switching to the new extruder.

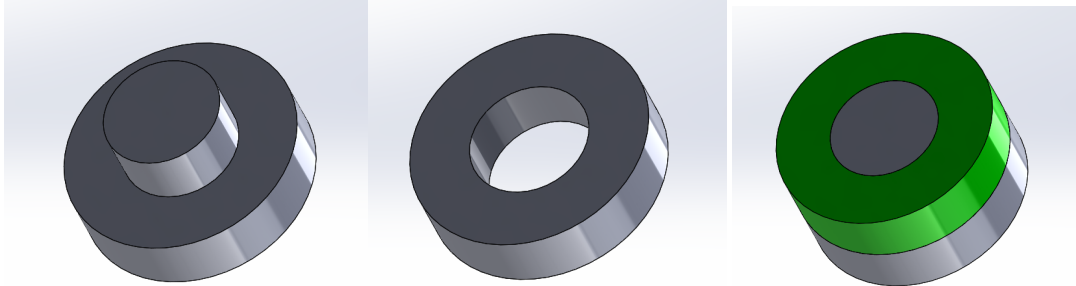
To print the generated gcode, press Save. Then open it in repetier-host or place it on a microSD card for directly printing it on your printer.

7.3.1.2 Use second extruder for different object or part of an object.

This short tutorial will show you how to print two objects in a single print with different extruders.

You basically need two STL files which are created in the same coordinate system and with exact needed distance with respect to each other.

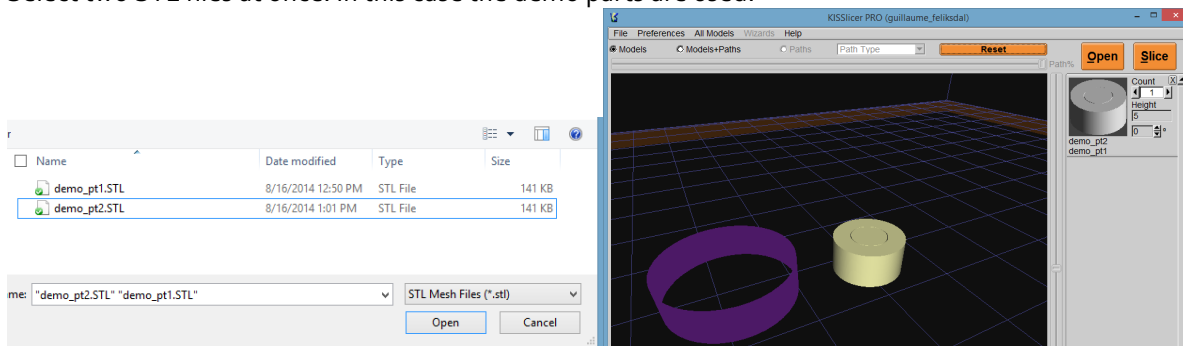
For this example two simple parts were created, see picture below.



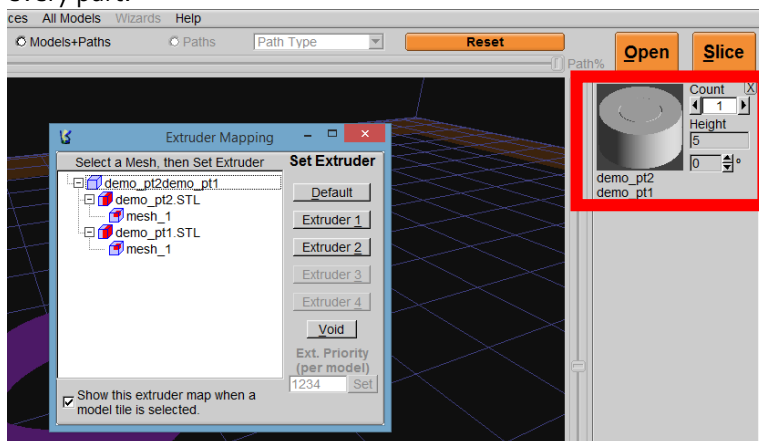
Press the open button

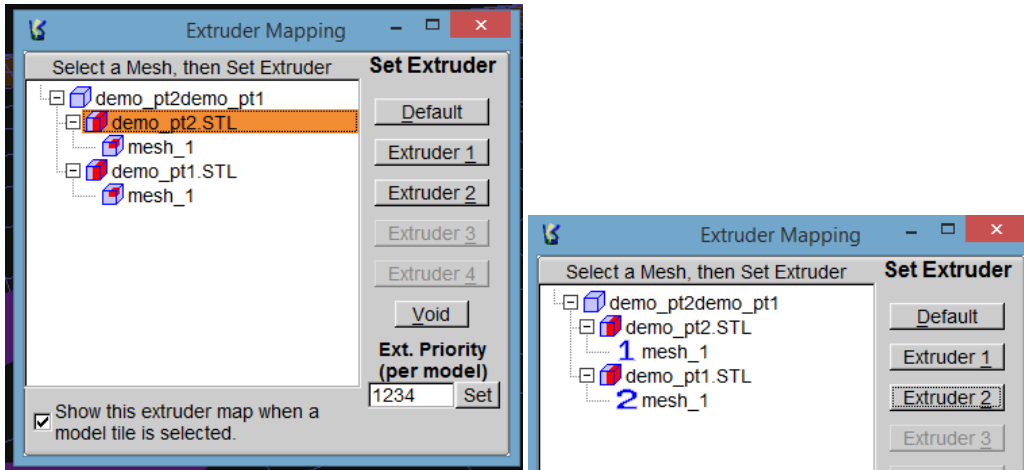
Assumed is that you configured the slicing settings as in previous section for dual extrusion.

Select two STL files at once. In this case the demo parts are used.

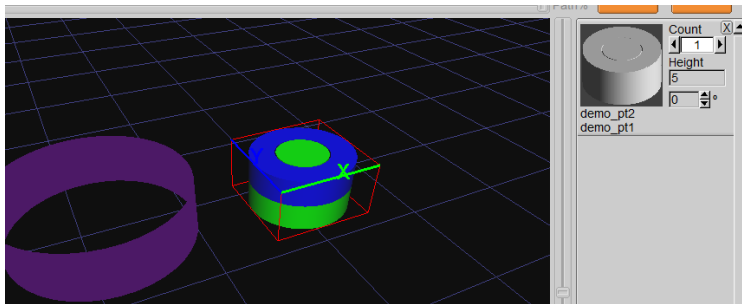


Click on the model in the right pane and a small window pops up. Here you can assign an extruder to every part.

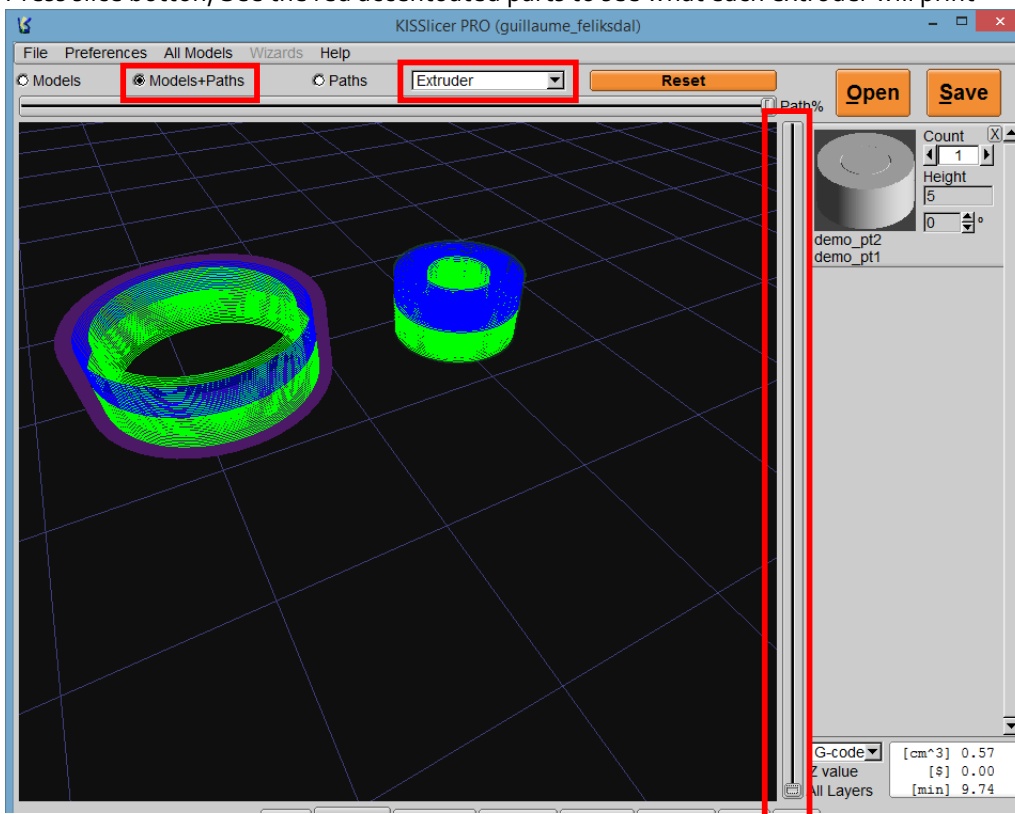




Close the window and it will look like this



Press slice button, See the red accentuated parts to see what each extruder will print



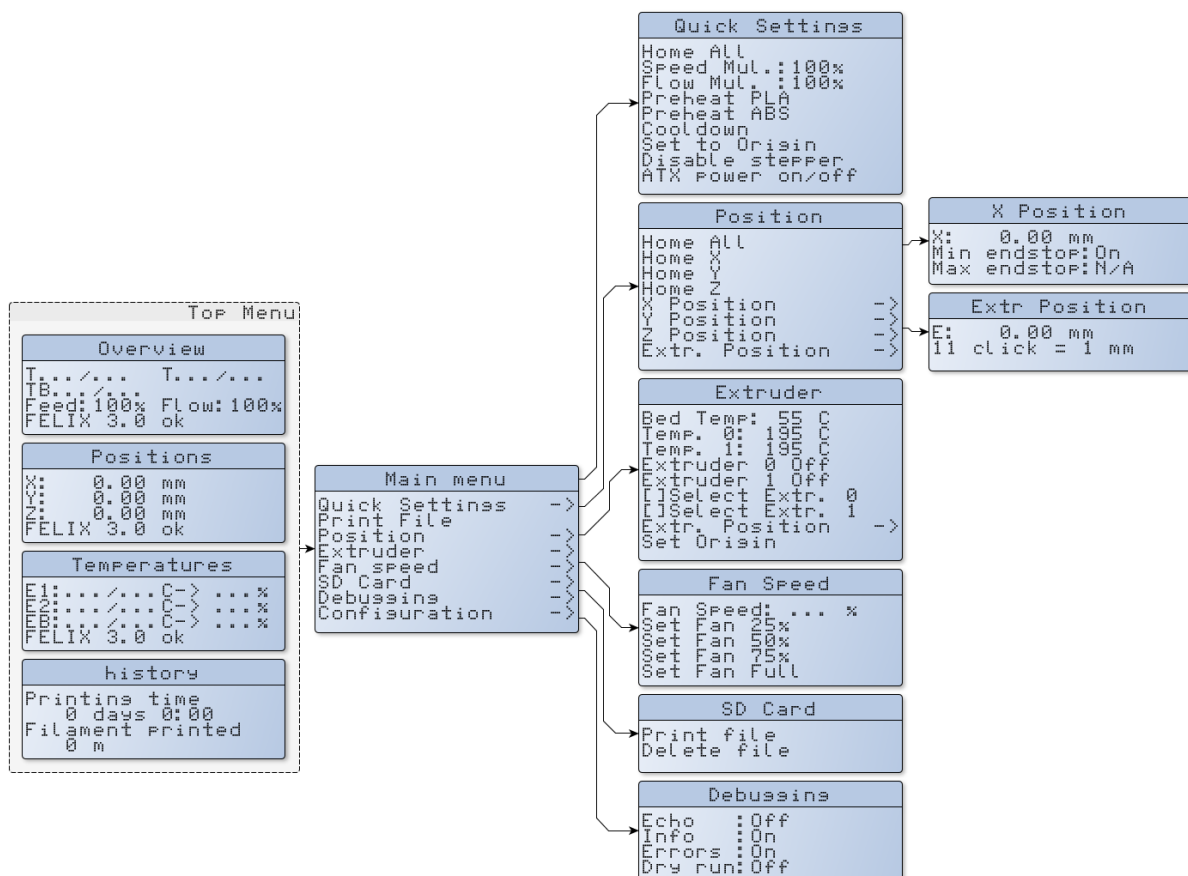
You can now save the file and open it in repetier-host or put it straight on a microSD card to print it directly on your printer.

8 Printer control with optional display unit

The printer can be fully controlled with the display unit. The menu structure is displayed below. We will describe each block and show some workflows for the most used functions.



Press the rotary button to go from display mode to the top menu. A cursor indicates the current menu selection; turn the knob to move up or down, and press it to select an item.



8.1 Workflow to start a print.

This subchapter shows how to start a print from the control interface. Before a print can be started it is mandatory to have a microSD card inserted in the SDcard slot of the electronics board of the printer. There must also be at least one correctly sliced .gcode file on it. To generate a gcode file, please follow the steps in chapter 2. The following steps basically set the temperatures and then load the file to print.

Single extruder printer:

Quick settings -> Preheat PLA -> go back -> Print File (wait till desired temperatures are reached) -> select the file to print.

Dual extruder printer:

This is more elaborate, because you might want to print with one of the two extruders. So these are the possibilities:

Print with one of the two extruders

Quick settings -> Preheat PLA -> go back -> Extruder -> []Select Extr. 0 or 1 -> go back 2x -> Print File -> select the file to print.

Print with two extruders

Quick settings -> Preheat PLA -> go back -> Print File (wait till desired temperatures are reached) -> select the file to print.

8.2 Workflow to stop or pause a print.

It is possible to stop or pause a print. This is useful to for instance change filament or to just abort a running print due to failure.

Pause a print:

Main menu -> SD Card -> Pause print

Stop a print:

Main menu -> SD Card -> Stop print

8.3 Switch filament.

This step explains how to change filament. Assumed is that the temperature of the nozzle is above 165 degC. Otherwise the extruder motors are not able to move. This is a safety setting.

If temp is not above 165 degC, set the temperature first by doing:

Main menu -> Extruder -> []Select Extr. 0 or 1 -> in the same menu select Temp. 0 or 1 and turn the wheel till required temp is reached.-> go back to Top menu and wait till temp has reached the target temp

Single extruder.

Main Menu -> Extruder -> Extr. Position -> now turn the rotary button clockwise to extrude and counterclockwise to retract the filament.

Dual extruder printer:

1. Select the desired extruder:
Main Menu -> Extruder -> []Select Extr. 0 or 1
2. In the same menu, choose:
Extr. Position -> now turn the rotary button clockwise to extrude and counterclockwise to retract the filament.

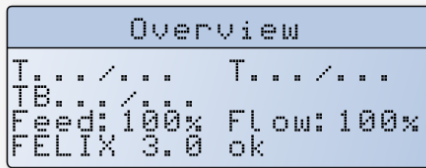
8.4 Menu description

This section describes the existing menu's in more detail.

Top Menu

By scrolling through the top menu with the knob, you will get several views.

The top menu



Line 1, describes the temperatures of the hot-ends in this format T (actual)/(desired)

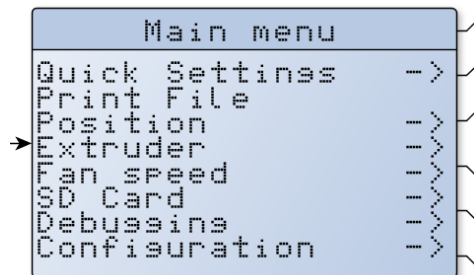
Line 2, describes the bed temperature

Line 3, Feed: ...%, is the printing speed override. By changing the feed rate you can override the current printing speed and finish your prints more quickly, but paying a penalty in print quality.

Flow ...%: This alters the amount of filament extruded compared to the calculated values.

Line 4, Status information.

Main menu



Quick Settings: Links to submenu with often used settings

Print File: If an SD card is present, you can select and print it. Make sure the temperatures of the hot-ends and bed are at the desired values already.

Position: Change the positions of the axes.

Extruder: Move and control the extruder

Fan speed: Change the fan speed of the fan blowing cool air on the bottom of the hot-ends

SD Card: If an SD card is present you can print or delete a file from the SDcard.

Debugging: Here you can change debugging settings. Only for expert use.

Configuration: Change the configuration of the printer. Only use this if you know what you are doing, changing settings here can seriously damage the printer.

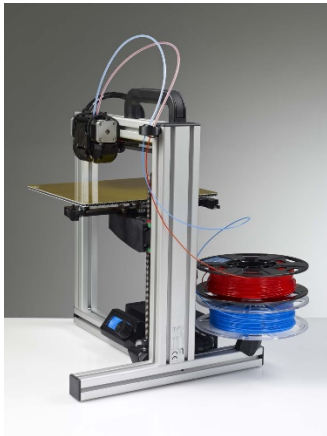
9 Printer accessories

To improve the user experience, we provide several accessories to the printer. The accessories basically enable a good filament guiding.

The basic parts are provided in the kit, but the plastic parts have to be printed (only for the DIY kits).

Accessories for the printer can be downloaded and printed out here:

http://shop.felixprinters.com/downloads/index.php?path=print_files%2Faccessoires%2FF3_o/

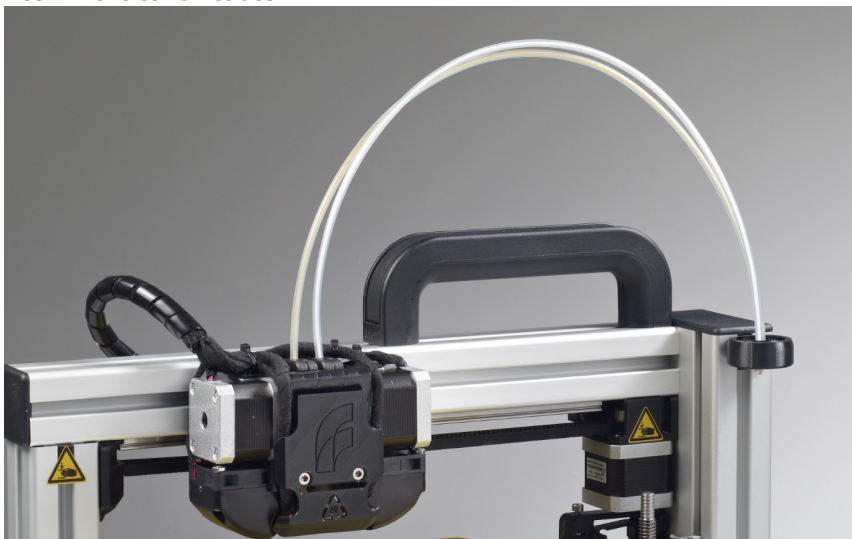


9.1 Filament cleaner mechanism.

Push the white filament cleaner discs into the black part, and click it into the frame.



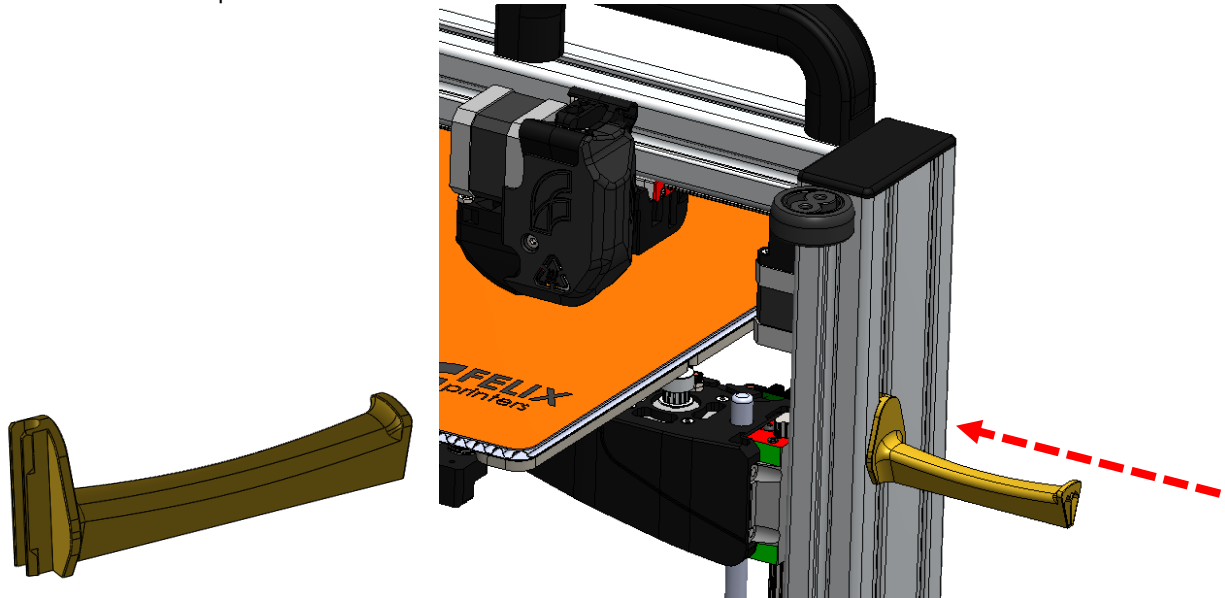
Push in the teflon tubes



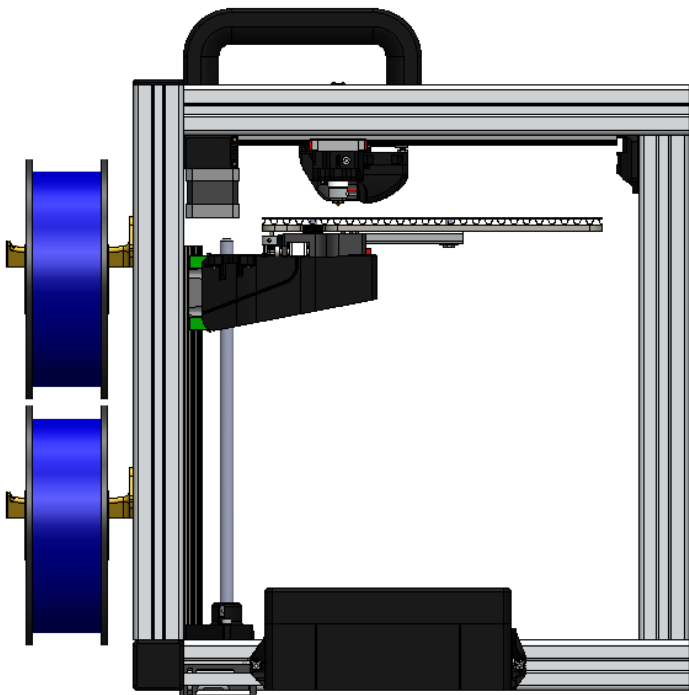
9.2 Filament roll off mechanism (vertical)

The function of the roll off mechanism is to have the filament roll off smoothly from the spool and to prevent knots during printing. Steps to install the vertical filament roll off mechanism:

Mount the clickable part:



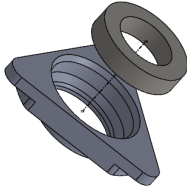
For more spools just print out another one and mount it like below. The part can be downloaded here: http://shop.felixprinters.com/downloads/index.php?path=print_files%2Faccessoires%2FF3_0%2F&download=filament_arm_v5.gcode



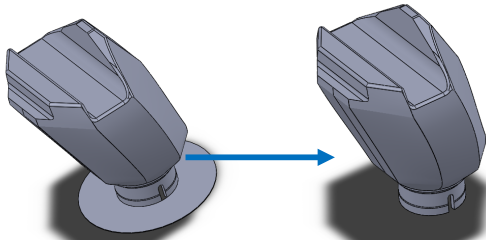
9.3 Filament roll off mechanism (horizontal)

The function of the roll off mechanism is to have the filament roll off smoothly from the spool and to prevent knots during printing. Steps to install the filament roll off mechanism:

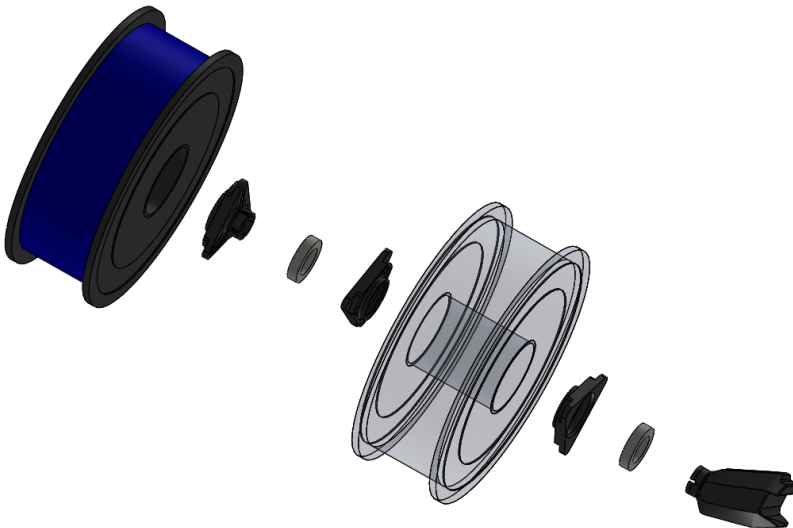
1. Press the large bearing (there are two needed for dual extruder printers) into the printed part first. Pliers could be needed.



Break away the thin flange of the part below. (The flange was used to get better adhesion to the heated bed.)



2. The relation of the parts for the filament roll off mechanism.



3. Place the parts onto the frame. Notice how the filament rolls off before it goes to the dust cleaner



10 FAQ

Q: Which hot-end nozzle temperature do you recommend?

A: For small detailed parts in PLA we recommend printing as cold as possible (180 to 190 degC), but for our production prints we print with as high a temperature as possible (195-200 degC), because that increases the strength of the parts.

The optimal temperature depends on the type of filament used. When using PLA check if the temperatures of the hot-end and the heated bed are between 180-205 and 30-60 degrees C respectively. When using ABS these temperatures should be somewhere around 210-250 and 70 – 100 degrees respectively. The heated bed temperatures can be much lower with painters tape. Only use PLA or ABS as filament. If you wish to use any other kind of material, consult FELIXprinters first.

i NOTE: Each supplier provides PLA with slightly different properties: even different colors have different properties. To find the optimal temperature for optimal extrusion, start with a low temperature. Then go up slightly. When the temperature is too high, you might hear some pops and sisses coming from the hot-end. When the temperature is too low the extruder motor will have a hard time extruding. When printing at high speed, the extruder temperature should be a little higher.

Q: How would you recommend changing the filament?

It is possible to change filament in the following ways.

1. Retract/Replace. This is the safest way to change filament.

- Retract the old filament at a high speed, 1000mm/min for 100mm. The high speed prevents development of a long string, which can potentially jam the hot-end.
- Now extrude the new filament 70mm at a time at low speed 200mm/min, until filament comes out of the nozzle.

2. Feed through. In this method filament is cut off near the extruder.

- Cut the filament off as straight as possible. The new filament will push it down, if the cut is not straight, the new filament will slip off the end of the remaining old filament, resulting in an extruder jam.
- Extrude the filament long enough at a low speed 200mm/min. When the filament is just cut off above the extruder entrance, 50mm should be sufficient to push the new filament into the hot-end.
- Extrude it another 50mm to flush out the old filament.

Q: How can I extend the lifetime of the hot-end?

A: The hot-end is robust; seldomly have we experienced a jam or failed operation. But after 2-3 months of 24/7 printing, we did have a hot-end that stopped working. The reason was contamination

Ways to prevent this from happening.

- Make sure the filament enters the hot-end is clean from dust. You can do this by letting it run through a piece of sponge before it enters the hot-end. You will be surprised how much dust will accumulate during a 5 hour print. That would have all entered the hot-end and formed a layer of contaminants, which would interfere with the heat going into the filament. A filament-cleaning accessory is provided, as described in Chapter 9.
- Do not use too high temperatures. They will make the filament decompose and contaminate the inside of the nozzle.
- Do not leave the hot-end heated for hours. The filament might decompose after leaving it at high temperatures, leaving a layer of contaminants behind in the hot-end nozzle.
- Use good quality filament.

11 Maintenance/Optimal operational tips

The FELIXprinter is an easy product to maintain and clean. To keep enjoying your FELIXprinter and ensure optimal print performance, regular maintenance is very important.

11.1 General tips for optimal operation

- Make sure the filament enters the hot-end is clean from dust. You can do this by letting it run through a piece of sponge before it enters the hot-end. You will be surprised how much dust will accumulate during a 5 hour print. That would have all entered the hot-end and formed a layer of contaminants, which would interfere with the heat going into the filament. A filament-cleaning accessory is provided, as described in Chapter 9.
- Do not use too high temperatures. They will make the filament decompose and contaminate the inside of the nozzle.
- Do not leave the hot-end heated for hours. The filament might decompose after leaving it at high temperatures, leaving a layer of contaminants behind in the hot-end nozzle.
- Use good quality filament.

11.2 Cleaning

- To ensure good bed adhesion of prints we recommend cleaning the heating bed with spirit, alcohol, thinner or nail polish remover. We recommend doing this before each print, especially for long prints.
- Be careful not to get any liquid onto the electric board, as it can damage the electronics permanently.
- Dust the printer off with a moist piece of cloth.

11.3 Regular maintainance

- Lubricate the vertical spindle and the linear railings; we recommend doing this every 3 months.
- After some time the belts might lose a little tension. Tighten the screw in the belt tensioning part until a healthy tension is back on the belt. For an indication of how to tension the belt check out this video:

<http://www.youtube.com/watch?v=dpS6nWn5rE8>

12 Troubleshooting

This chapter helps to troubleshoot common problems with the printer. Each common issue is described in a table. The tables are organized with the highest probability solutions at the top.

PROBLEM: Stopped extrusion after x-layers/Skipped layers/weak strength of parts/Extruder jammed.	
Possible cause	Possible solution
1. Is temperature setting OK?	<p>Recommended hot-end temperatures are: PLA: 180 – 200 degC ABS: 210 -240 degC</p> <p>Too hot extrusion causes two things. First, the filament in the nozzle tip gets very fluid. When there are fast extrusions, the molted filament could creep up the barrel, cool down, and solidify causing a jam. Second, the temperature of the top part of the hot-end, which should be as cool as possible will get critically hot-and the filament starts to melt/re-solidify in an unwanted part of the hot-end.</p> <p>Too cold extrusion, can require an extremely high torque from the extruder motor to push the filament down the hot-end. This can cause a ticking noise coming from the extruder stepper motor, due to lack of power. (This cannot cause any damage to the motor or electronics).</p>
2. Is fan blowing on top of hot-end working?	The fan blowing on top of hot-end should always be working. When there is a loose contact the fan might stop working at some points of the movement. This could cause the top part of the hot-end to get too hot.
3. Ambient temperature OK?	Ambient temperature must be between 15 and 30 degC
4. Filament quality within tolerance?	Check if the filament diameter is within the 1.6 to 1.8mm. Sometimes filament substance is not consistent; try different filament to see if it solves the issue.
5. Are all bolts to assemble the extruder tightened sufficiently?	Make sure bolts are all tightened sufficiently.
6. Extruder arm tension OK?	<p>The extruder arm must be able to exert enough pressure on the filament. Turn the bolt on top of the extruder-arm counter-clockwise for more pressure.</p> <p>Turn it clockwise to exert less pressure. With too much pressure on the arm the filament will be squashed too wide and cause a lot of friction inside the hot-end; eventually it might get stuck.</p>
7. Extruder arm in good shape?	Check if the extruder arm is broken. Replace if broken or deformed too much.
8. Contaminants inside the hot-end.	<p>Filament attracts a lot of dust, which without filtering all has to go through the tiny nozzle. In time this could cause a layer of dirt inside which acts as a thermal barrier, preventing the filament from melting properly.</p> <p>Try to clean nozzle exit with 0.35mm drill, guitar string, or other thin wire.</p> <p>If this doesn't work it means there is heavy contamination inside. Take the hot-end apart and clean it carefully with a 2mm drill from the inside. This will only work when the hot-end is hot. Please follow the instructions downloadable here: http://shop.FELIXprinters.com/downloads</p>
9. The hot-end parts are not tight enough	When filament could leak through the components.

10. Fabrication error in hot-end	It could be that due to fabrication tolerances the hot-end parts are not fully up to spec, maybe not aligned perfectly or the holes are not the same. Most issues occur with the PEEK middle isolation part. Try to post drill it with a 2mm drill.
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PROBLEM: Objects don't stick to the heated build platform	
Possible cause	Possible solution
1. Is the bed clean?	<p>For good bed adhesion of the object the bed must be clean from dirt, dust and grease. A recommended cleanser is blue spirit/alcohol/thinner.</p> <p>An alternative way to get good adhesion is to use blue painters tape. This can be a good idea for small objects. Downside is that it sometimes sticks too well and takes an enormous effort to get your part from the build plate after printing. Which could cause damage to the printer.</p> <p>Other people have obtained good adhesion by using hairspray on the heated bed.</p>
2. Is the heated bed on?	The recommended bed temperature for PLA is 55 degC
3. Is the bed level?	The distance between nozzle and bed must be the same everywhere.
4. Distance from head to bed ok?	Make sure the distance between bed and hot-end tip is close enough for first layer. Adjust fine-tuning mechanism accordingly.
5. Is the print speed of the first layer low enough?	Try reducing the speed for the first layer, by for instance adjusting the feedrate override in the Repetier-Host software or on the display unit.
6. Is the bed flat?	When the bed is not flat, due to assembly, damage or from the factory, it is impossible to have the same distance from bed to nozzle over the whole surface. If this is the case, try to bend the bed by hand. Make sure you don't introduce forces into the bearing of the y-axis.
7. Dual extrusion: Do both extruder-heads have the same height?	Another possibility for dual-extrusion printers is that the two hot-ends are not leveled closely enough relative to each other. This can cause the lower hot-end to adhere to filament deposited by the other one and push it aside.

PROBLEM: Bad print quality	
Symptom	Possible solution
Changing slicing settings in Repetier-Host doesn't have effect.	Make sure you have selected/activated the correct slicer settings. SFACT is the slicer of preference. Slic3r is not configured out of the box.
Circles are not round/Dimensions differ	<p>Check belt tension</p> <p>Make sure y-axis bearing is fastened enough to the z-axis carrier and also make sure the 4 bolts are mounted with washers.</p> <p>Are pulley's set screws fastened?</p>
Printed parts with sharp corners have large vibrations/waves visible.	Make sure all parts are fastened correctly, to ensure optimal stiffness of the construction and mechanics. When certain bolts are loose the printer might vibrate more than normal causing bad quality prints.
The part sags after a few layers; this happens mostly to smaller parts with thin walled features.	<p>The temperature of the filament is way too high.</p> <p>The extrusion is not good enough. Make sure nozzle exit is clean and also extrusion mechanism is working properly.</p> <p>Slow down the print speed to give part more time to cool down.</p>
Quality of small parts is really bad	<p>Decrease temperature</p> <p>Slow down speed.</p>

	Print multiple parts in the same print. Use the multiply plugin in SFACT/Skeinforge.
--	--

PROBLEM: Display screen is appearing blank	
Symptom	Possible solution
No characters are displayed on the screen	Make sure connector is placed correctly on control board.
Lighting is on, but no characters are displayed.	Contrast of the display is not set-up correctly. Turn the potentiometer on the FELIXprinters electronics board according to the assembly manual.
Strange characters displayed.	Contact FELIXprinters to obtain a replacement LCD screen.

13 Safety

To safely operate the FELIXprinter, we advise that you keep the following safety recommendations in mind:

1. Keep children under the age of 14 out of reach of the FELIXprinter
2. Caution with any moving parts that move in the X, Y and Z direction. At the end of each moving part there is a pinching hazard.
3. Watch out for any other non-protected sharp edges of the printer.
4. Don't lay objects on the heated bed that are not being printed, not even when the printer is turned off.
5. Only use the materials polyactide (PLA), Acrylonitrile butadiene styrene (ABS) or Arnitel as printing material. Consult FELIXprinters if you want to use a different material.
6. FELIXprinters are only suitable for professional use.
7. When removing or feeding material to the hot end, wearing heat-resistant gloves is recommended.
8. Only operate the FELIXprinter in a sufficiently ventilated environment (fumes from ABS and PLA aren't toxic, but can cause respiratory irritation).
9. Don't lean on the FELIXprinter when it is operating.
10. Make sure all moving parts can move without any obstructions.
11. Don't remove any objects from the hot plate while the printer is still printing objects.
12. Don't transport the FELIXprinter when it is in operation.
13. Do not use a different power supply than the provided power supply, it can be dangerous and cause electrical malfunctions.
14. Use the FELIXprinter in a dry environment.
15. Use the FELIXprinter on a stable and leveled surface.
16. When moving the FELIXprinter only use the handle on top.
17. Turn off the FELIXprinter when errors occur.
18. When operating the FELIXprinter, be careful with long hair and loose clothes.
19. When unattended, turn off the FELIXprinter.
20. Place the FELIXprinter on a table/Desk or something with a similar height. This will keep it safe from small children.

14 Appendix: Extra checks after assembling DIY kit for optimal operation

The following checks are done by our assembly team. The checks are of great importance and ensure optimal operation of your 3d printer.

No	Mechanical tests	Check
1.	Belt tension for x and y-axis is ok <i>Tension must be high enough that : You don't feel the teeth of the belts when moving the axis by hand You don't see sideways movement of the belt when you turn direction.</i>	
2.	Belt of x-axis is parallel to top beam, when looking from the side. <i>If not parallel, pulley is probably mounted too high on motor)</i>	
3.	Pulleys are fixed ok with the setscrews.	
4.	Washers are placed underneath the nuts which hold the y-axis brackets onto the y-axis rail.	
5.	Four screws fixing the linear y-rail onto z-axis carrier, must have rings and must be firmly tightened.	
6.	Stacked guide bearings in z-axis bracket are fixed and perpendicular to bracket.	
7.	Check if washers are present under the 4 m3 bolts to mount y-axis rail. <i>(Without washers the rail cannot be fixed properly.)</i>	
8.	Make sure M4x25 bolts are used for tensioning mechanism of x and y axes	
9.	Hot-end must be flat on extruder base	
10.	Hot-ends have the same height (only for dual extrusion)	
11.	Hot-end should be firmly in place, no movement/rocking is allowed after mounting. The bolts that mount the hot-end clamps onto the base must be fixed firmly to ensure this.	
12.	Extruder tensioning arm adjustment. <i>Tension must be strong enough that the filament is very hard to stop by hand. Not too tight that the filament is squashed very wide.</i>	
13.	Table is aligned properly	
14.	Leveling springs underneath bed are sufficiently compressed, <i>to prevent loosening during printing</i>	
15.	Frame bolts are fixed firmly. <i>It can be disastrous if frame bolts are not tight during transport</i>	
16.	Put grease on z-axis spindle	
17.	All cable-ties are neatly cut off	
18.	Finished testprint, belt_guide, filament holder. 3-4hr Must be clean, straight walls, no gaps.	
19.	After test prints do a quick check if all bolts are still properly tightened	

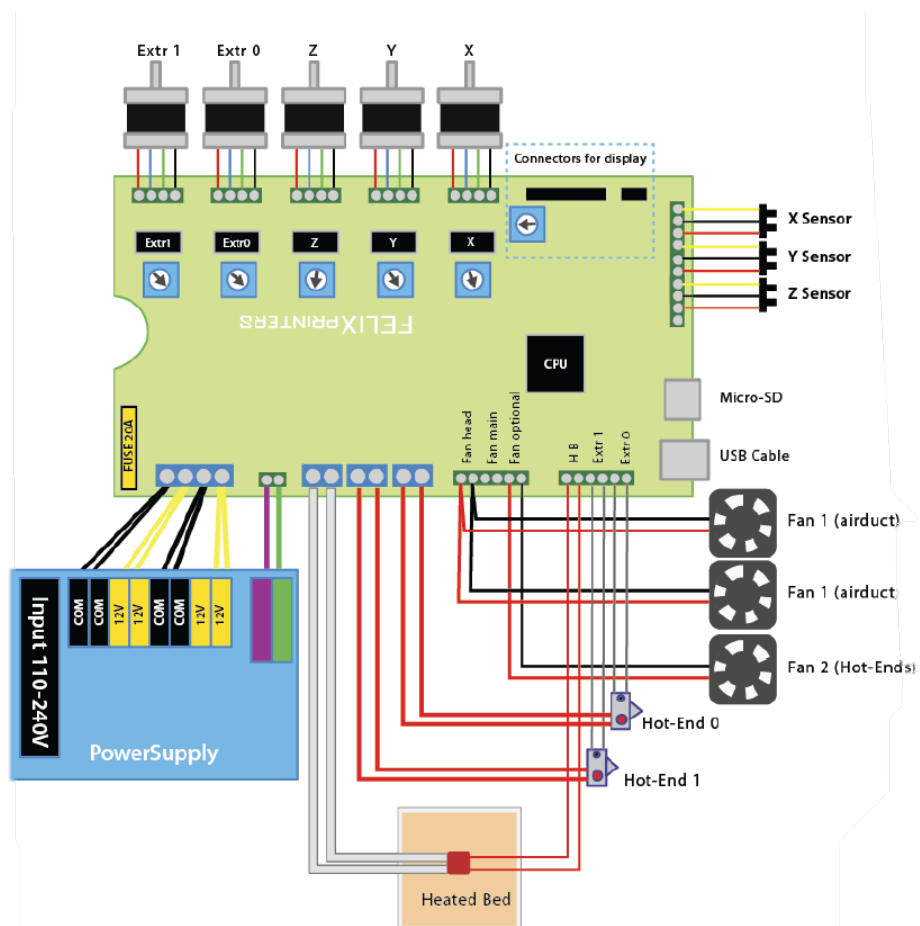
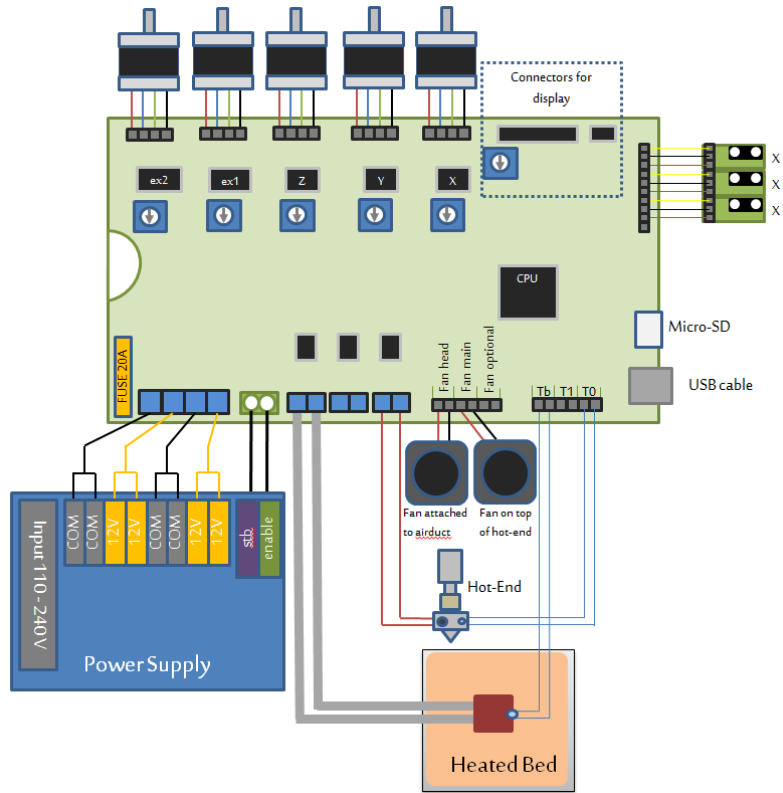
The following checks are endurance tests which are done before assembled printers are released to our customers. For assembled printers the printed parts generated are supplied with the printer.

No	Printing checks	Check
20.	All I/O working properly	
21.	00_test_thinwall_v3_export.gcode, <i>print small test with extruder 1</i>	
22.	02b_print_assy_display_unit_F3_o.gcode, <i>print display unit case with extruder 1</i>	
23.	03_print_assy_felix_single_extruder_V3.gcode, <i>print accessory set part 1, with extruder 1</i>	
24.	NOTE: Only print for single extruder printer. 05_Extruder_cover_single_extruder_V2.gcode, <i>with extruder 1</i>	
NOTE: Following prints are only needed for Dual extruder printer		
25.	00_test_thinwall_v3_export.gcode, <i>print small test with extruder 1</i>	
26.	06_cover_dual_extruder_V7.gcode, <i>with extruder 2</i>	
27.	NOTE: Before printing this, make sure extruder cover is already mounted. 01_calibration_dual_extruder.gcode, <i>calibrate distance between nozzles</i>	
28.	04_print_assy_felix_accessoires_dual_extruder.gcode, <i>print accessory set part 2</i>	

The following checks are required for CE safety.

No	CE safety checks	Check
29.	Heat shield mounted onto extruder.	
30.	Heat warning signs placed according to manual	
31.	Usage of gloves warning signs placed according to manual	
32.	Pinching danger warning signs placed according to manual	
33.	Handle is mounted properly	
34.	Check if damping feet are placed underneath printer	
35.	All four bolts tight on electronics enclosure?	
36.	CE label is mounted according to instructions?	
37.	Serial number sticker is mounted onto CE sticker?	
38.	Checklist signed by authorized person.	

15 Appendix: Electronic schematics



16 Appendix: Material Data Safety Sheet

16.1 PLA

Hazards Identification

Appearance: Clear, translucent, opaque, pellets.
Physical state: Solid
Odor: Sweet

Potential health effects:

Eye contact: Contact with eyes may cause irritation.
Skin contact: Substance may cause slight skin irritation.
Ingestion: Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Inhalation: Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Low hazard for usual industrial or commercial handling.
Target organ effects: There were no target organ effects noted following ingestion or dermal exposure in animal studies.
Sensitization: Did not cause sensitisation on laboratory animals
Flammability: Fine dust dispersed in air may ignite.

First-aid measures

Eye contact: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

Skin contact: Rinse immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician. Cool skin rapidly with cold water after contact with hot polymer.

Inhalation: Move to fresh air. Call a physician immediately.

Ingestion: Drink water as a precaution. Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Call a physician immediately.

Notes to physician: Treat symptomatically.

Fire Fighting Measures

Flammability:

Autoignition temperature: 388°C

Flammability Limits in Air

Flammable limits in air - lower (%): Not determined

Flammable limits in air - upper (%): Not determined

Suitable extinguishing media: Foam. Water. Carbon dioxide (CO₂). Dry chemical. Alcohol resistant foams are preferred if available. General-purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively.

Extinguishing media which must not be used for safety reasons: No information available
Hazardous decomposition products: Burning produces obnoxious and toxic fumes Aldehydes Carbon monoxide (CO) carbon dioxide (CO₂)

Special protective equipment for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Under fire conditions: Cool containers / tanks with spray water. Water mist may be used to cool closed containers.

Other information: Fine dust dispersed in air may ignite. Risks of ignition followed by flame propagation or secondary explosions shall be prevented by avoiding accumulation of dust, e.g. on floors and ledges.

Handling and Storage

Safe handling advice: Avoid contact with skin and eyes. Avoid dust formation. Workers should be protected from the possibility of contact with molten material during fabrication. Low hazard for usual industrial or commercial handling. Use personal protective equipment.

Storage:

Store in cool place. Keep at temperatures below 122F (50 °C). No special restrictions on storage with other products.

Toxicological Information

Principle Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion.

Acute toxicity: There were no target organ effects noted following ingestion or dermal exposure in animal studies.

Local effects: May cause eye/skin irritation. Product dust may be irritating to eyes, skin and respiratory system.

Caused mild to moderate conjunctival irritation in eye irritation studies using rabbits. Caused very mild redness in

dermal irritation studies using rabbits (slightly irritating). Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Long term toxicity: Did not cause skin allergic reactions in skin sensitization studies using guinea pigs.

Specific effects: May cause skin irritation and/or dermatitis. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Burning produces irritant fumes.

Target organ effects: There were no target organ effects noted following ingestion or dermal exposure in animal studies.

Skin: LD50/dermal/rabbit > 2000 mg/kg

Ingestion: LD50/oral/rat > 5000 mg/kg.

Ecological Information

Bioaccumulation: Does not bioaccumulate. Inherently biodegradable.

Ecotoxicity effects: EC50/72h/algae > 1100 mg/L

Disposal Considerations

Waste from residues / unused products: In accordance with local and national regulations. Do not contaminate ponds, waterways or ditches with chemical or used container. Contact manufacturer.

THE COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION.

(Composition/Information On Ingredients).

Contaminated packaging: Empty remaining contents. Do not re-use empty containers. Empty containers should be transported/delivered using a registered waste carrier to local recyclers for disposal.

16.2 ABS

Hazards Identification

This product is not classified as dangerous according to EC criteria.

First-aid measures

Eye Contact: Flush eyes with plenty of water; remove contact lenses after the first 1-2 minutes then continue flushing for several minutes. Only mechanical effects expected. If effects occur, consult a physician, preferably an ophthalmologist.

Skin Contact: If molten material comes in contact with the skin, do not apply ice but cool under ice water or running stream of water. DO NOT attempt to remove the material from skin. Removal could result in severe tissue damage. Seek medical attention immediately.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Ingestion: If swallowed, seek medical attention. May cause gastrointestinal blockage. Do not give laxatives. Do not induce vomiting unless directed to do so by medical personnel.

Notes to Physician: If burn is present, treat as any thermal burn, after decontamination. No specific antidote.

Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam.

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Soak thoroughly with water to cool and prevent re-ignition. If material is molten, do not apply direct water stream. Use fine water spray or foam.

Cool surroundings with water to localize fire zone. Hand held dry chemical or carbon dioxide extinguishers may be used for small fires

Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

Unusual Fire and Explosion Hazards: Pneumatic conveying and other mechanical handling operations can generate combustible dust. To reduce the potential for dust explosions, do not permit dust to accumulate. Dense smoke is produced when product burns.

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Carbon monoxide. Carbon dioxide.

Combustion products may include trace amounts of: Styrene. Hydrogen cyanide

Handling and Storage

Handling

General Handling: No smoking, open flames or sources of ignition in handling and storage area. Good housekeeping and controlling of dusts are necessary for safe handling of product. Avoid breathing process fumes. Use with adequate ventilation. When appropriate, unique handling

information for containers can be found on the product label. Workers should be protected from the possibility of contact with molten resin. Do not get molten material in eyes, on skin or clothing. Pneumatic conveying and other mechanical handling operations can generate combustible dust. To reduce the potential for dust explosions, electrically bond and ground equipment and do not permit dust to accumulate. Dust can be ignited by static discharge.

Storage

Store in accordance with good manufacturing practices

Personal Protection

Eye/Face Protection: Use safety glasses. If there is a potential for exposure to particles which could cause eye discomfort, wear chemical goggles. If exposure causes eye discomfort, use a full-face respirator. Use safety glasses. Safety glasses should be consistent with Directive 89/686/EEC

Category 2. If there is a potential for exposure to particles which could cause eye discomfort, wear chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent. If exposure causes eye discomfort, use a full-face respirator.

Skin Protection: No precautions other than clean body-covering clothing should be needed.

Hand protection: Chemical protective gloves should not be needed when handling this material. Consistent with

general hygienic practice for any material, skin contact should be minimized. Use gloves with insulation for thermal protection (EN 407), when needed. Use gloves to protect from mechanical injury. Selection of gloves will depend on the task.

Respiratory Protection: In dusty or misty atmospheres, use an approved particulate respirator. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. Use the following CE approved air-purifying respirator: When dust/mist are present use a/an Particulate filter, type P2. When combinations of vapors, acids, or dusts/mists are present use a/an Organic vapor cartridge with a particulate pre-filter, type AP2.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations

Toxicological Information

Acute Toxicity

Ingestion

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. May cause choking if swallowed.

Estimated LD₅₀, Rat > 5,000 mg/kg

Eye Contact

Solid or dust may cause irritation or corneal injury due to mechanical action. Elevated temperatures may generate vapor levels sufficient to cause eye irritation. Effects may include discomfort and redness.

Skin Contact

Essentially nonirritating to skin. Mechanical injury only. Under normal processing conditions, material is heated to elevated temperatures; contact with the material may cause thermal burns.

Skin Absorption

No adverse effects anticipated by skin absorption. Estimated LD₅₀, Rabbit > 2,000 mg/kg

Inhalation

No adverse effects are anticipated from single exposure to dust. Vapors/fumes released during thermal processing may cause respiratory irritation.

Repeated Dose Toxicity

Additives are encapsulated in the product and are not expected to be released under normal processing conditions or foreseeable emergency.

Ecological Information

CHEMICAL FATE

Movement & Partitioning

No bioconcentration of the polymeric component is expected because of its high molecular weight. In the terrestrial environment, material is expected to remain in the soil. In the aquatic environment, material will sink and remain in the sediment.

Persistence and Degradability

This water-insoluble polymeric solid is expected to be inert in the environment. Surface photo degradation is expected with exposure to sunlight. No appreciable biodegradation is expected.



ECOTOXICITY

Not expected to be acutely toxic, but material in pellet or bead form may mechanically cause adverse effects if ingested by waterfowl or aquatic life.

Disposal Considerations

For uncontaminated material the disposal options include mechanical and chemical recycling or energy recovery. In some countries landfill is also allowed. For contaminated material the options remain the same, although additional evaluation is required. For all countries the disposal methods must be in compliance with national and provincial laws and any municipal or local by-laws. All disposal methods must be in compliance with the EU framework Directives 91/156/EEC, 91/689/EEC and their subsequent adaptations, as implemented in National Laws and Regulations, as well as EU Directives dealing with priority waste streams. Transboundary shipment of wastes must be in compliance with EU Regulation 259/93 and subsequent modifications.

17 Appendix: Symbol- and indicator lights explanation

Symbol/indicator	Explanation
	<p>Warning: High temperatures</p>
	<p>Pinch hazard.</p>

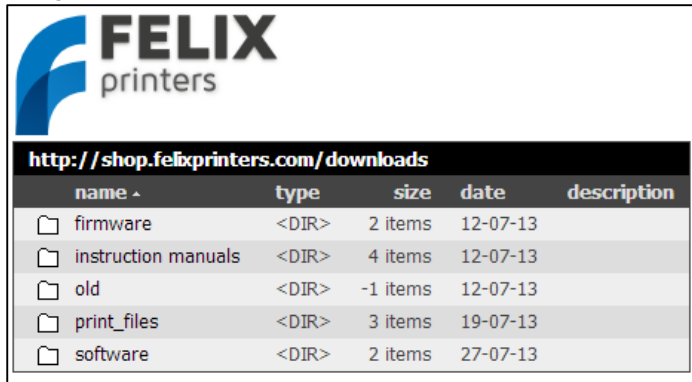
18 Appendix: Installation of Repetier Host - Windows

Repetier-Host provides the following functions:

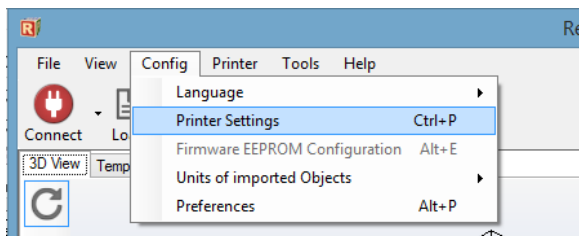
- Control your printer, move axes and set temperatures, monitoring etc.
- Process your CAD files (STL files) and make them printable.

To install Repetier-Host on your PC take the following steps:

1. Download the latest version of Repetier-Host from www.FELIXprinters.com/downloads
 Navigate to the software folder and download **setupRepetierHostFELIXprinters*.exe**



2. Run the **setupRepetierHostFELIXprinters*.exe** file and follow the installation instructions.
 - During installation it will ask to install a driver. This is recommended to do.
3. Make sure the power cable and USB cable of the printer are connected.
4. Start Repetier-Host.
5. Go to Config -> Printer settings.

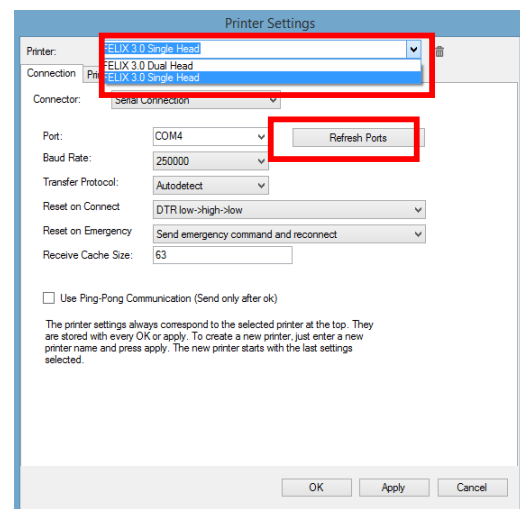


6. Select your printer type, single or dual head
 In the configuration window press the **Refresh Ports** button.

Choose the COM-port which belongs to your printer. If no port shows up, it could be because of the following:

- your printer might not be plugged into the USB port.
- The driver is not installed, or currently installing by windows.

If this is not the case, please install the driver manually according to next chapter.



19 Appendix: Installation of Repetier Host – Mac OS

1. Plug in the power supply cable.

i NOTE: The electronics board is NOT USB powered, so without the power cable the electronics won't work. It needs the voltage of the purple wire to drive the logic of the board. The power to the rest of the board is controlled by the CPU when needed.

2. Plug in the USB cable into the computer
3. Download Mac-drivers from: <http://www.ftdichip.com/Drivers/VCP.htm>.
4. Download repetier software (.dmg file) from: <http://www.repetier.com/download/> or from <http://shop.felixprinters.com/downloads/index.php?path=software/>



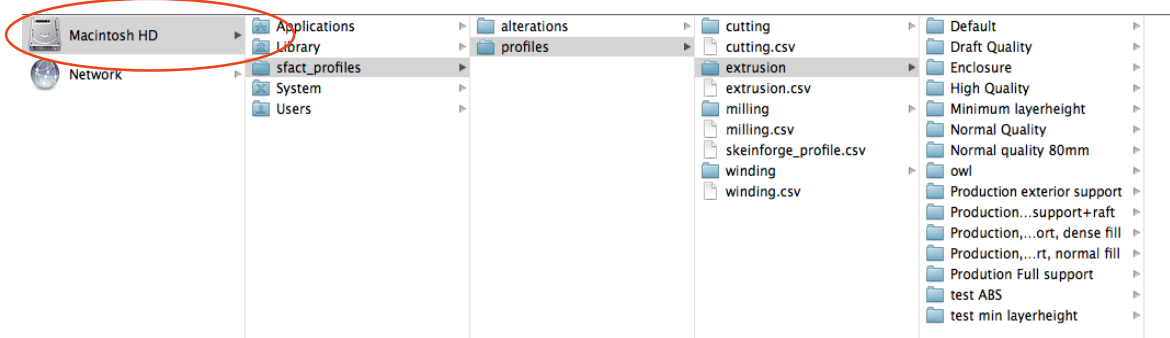
http://shop.felixprinters.com/downloads/software				
name ^	type	size	date	description
[back]	<DIR>		12-07-13	
old	<DIR>	6 items	12-07-13	
sfact slicing profiles	<DIR>	1 item	27-07-13	
Repetier-Host-Mac_0_56.dmg	dmg	12.4 MB	04-09-13	
setupRepetierHostFELIXPrinters_0_90.exe	exe	37.2 MB	08-07-13	

5. Open .dmg file and copy Repetier-Host.app to your Application folder
6. Download latest printer profiles from <http://shop.felixprinters.com/downloads/index.php?path=software%2Fsfact+slicing+profiles/>

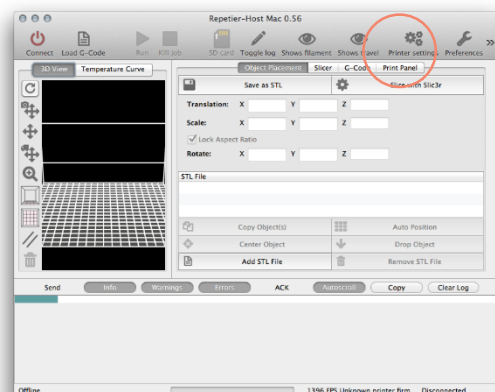


http://shop.felixprinters.com/downloads/software/sfact slicing profiles				
name ^	type	size	date	description
[back]	<DIR>		04-09-13	
sfact.zip	zip	3.4 MB	10-09-13	

7. Extract sfact.zip file (containing 1 folder with 2 subfolders: "sfact" and "sfact_profiles")
8. Copy sub-folder "sfact_profiles" to Macintosh H



9. Copy the "sfact" sub-folder to Applications folder (where the Repetier-Host.app is as well)
10. Open the Repetier-Host Mac Application and go to Printer Settings
11. Configure printer settings:
12. Configure Skeinforge settings under Preferences -> Slicer -> Skeinforge



13. Click "Browse" to direct to the correct files

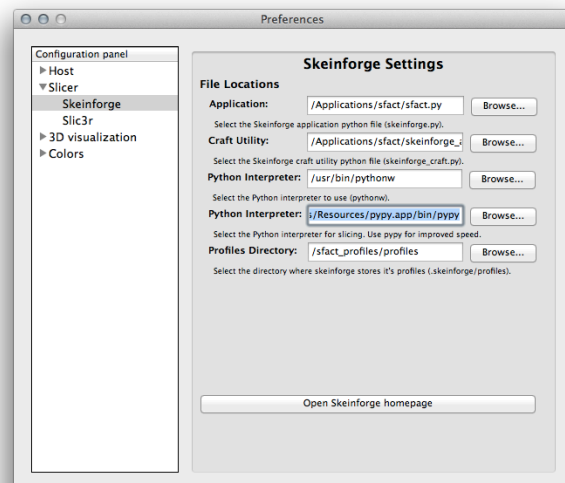
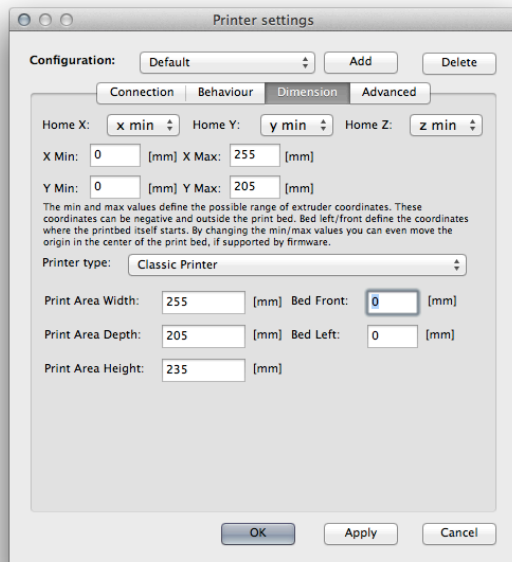
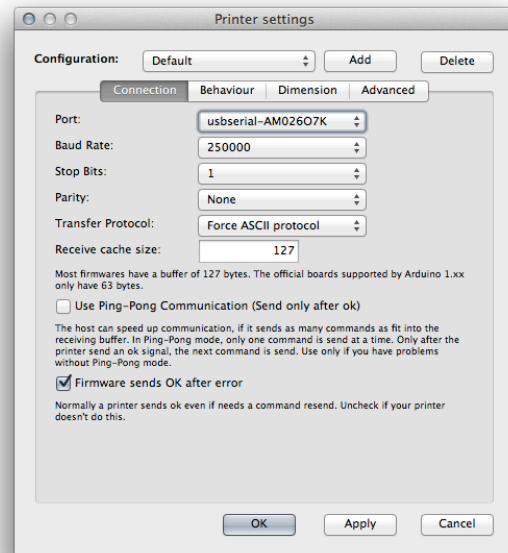
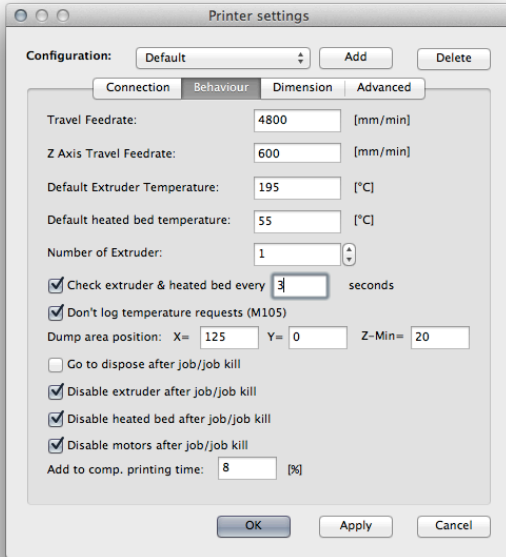
Application: /Applications/sfact/sfact.py

Craft Utility: /Applications/sfact/skeinforge_application/skeinforge_utilities/skeinforge_craft.py

Python Interpreter: /usr/bin/pythonw

Python Interpreter: /Applications/Repetier-Host Mac.app/Contents/Resources/pypy.app/bin/pypy

Profiles Directory: /sfact_profiles/profiles

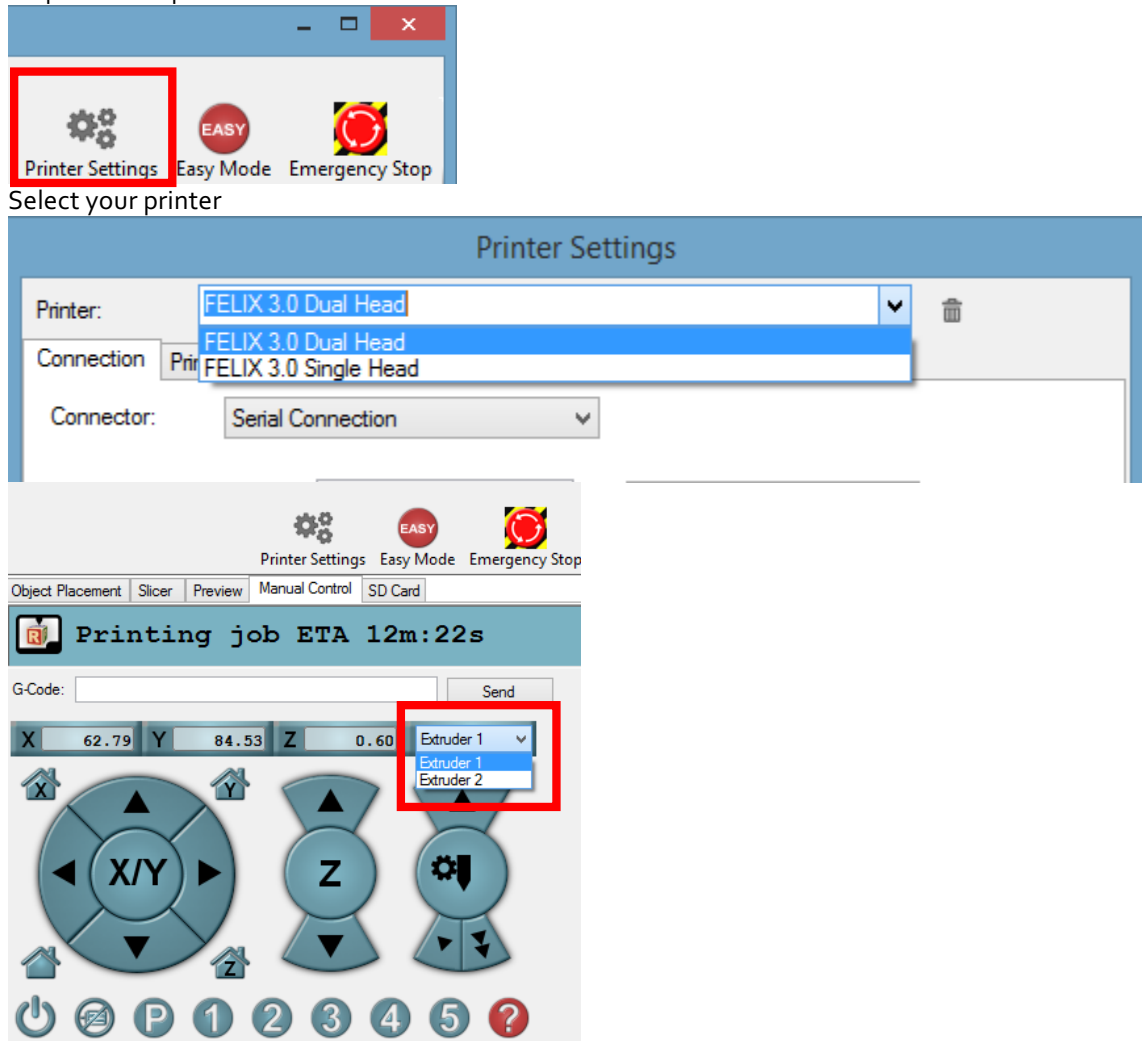


20 Calibration with Repetier Host (Windows)

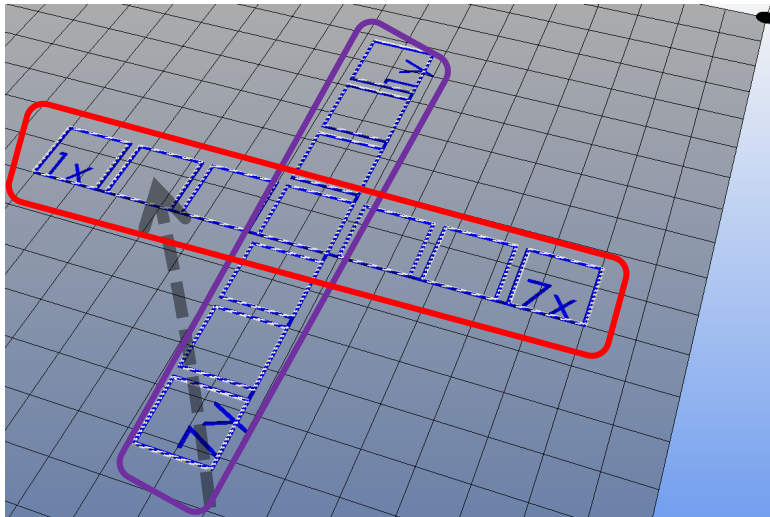
Assumed in the following steps is that repetier-host is already installed, that the hot-ends are calibrated correctly to have the same height and that you just finished assembling your DIY kit.

1. Make sure you have the latest dual extrusion firmware loaded. Download it here www.felixprinters.com/downloads

2. Prepare the Repetier-Host interface for dual extrusion.



3. Print `test_thinwall_v3.gcode` with extruder 1.
 - a. Go to repetier interface and select extruder 1. Heat up extruder and heated bed.
 - b. Printed output must show a smooth straight wall. Possible issues:
 - Wall is not straight. Check if hot-end is correctly fastened. Check if pulley is fixed correctly on motor axis
 - Gaps in part. Make sure the extruder arm exerts enough tension on filament. When extruding manually, it should be very hard to hold back the filament by hand.
4. Repeat now with extruder 2.
 - a. Select extruder number 2. Heat it up in a similar fashion to extruder 1 and print the test part.
5. If both separate extruders have proven to print well, it is time to calibrate the distances between them. Print out the `calibration_dual_extruder_v4.gcode` file as shown below. In this print 2 layers of squares are printed. Layer one is printed with extruder 1 and layer 2 is printed with extruder 2 and shifted slightly wrt layer 1.

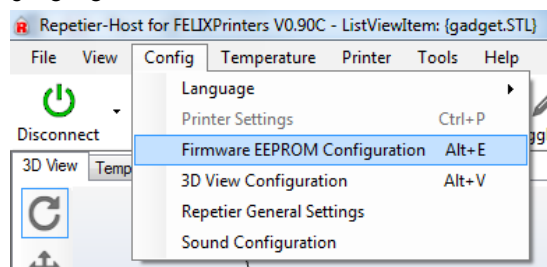


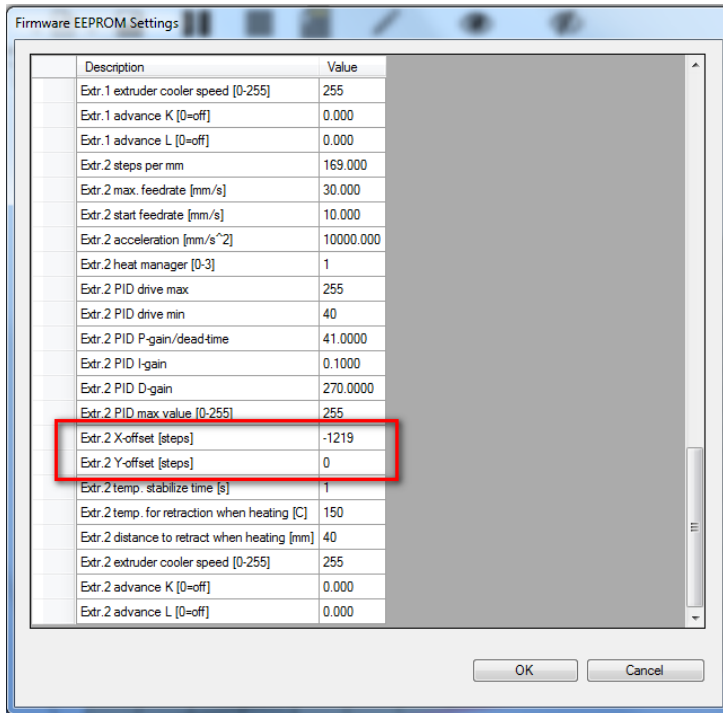
a. Check which squares fit best in x and y-direction note the calibration values.

		Offset X direction						
		1	2	3	4	5	6	7
Offset Y direction	1				23 (y)			
	2				15 (y)			
	3				8 (y)			
	4	-23 (x)	-15 (x)	-8 (x)	0 (x) 0 (y)	8 (x)	15 (x)	23 (x)
	5				-8 (y)			
	6				-15 (y)			
	7				-23 (y)			

b. Fill in these values like the pictures below.:

The default values already present in the settings are -1219 and 0 for x-offset and y-offset respectively. In the example above the values should become for x: $-1219 + -15 = -1234$ and for y: $0 + 8 = 8$





6. Press the OK button to save the new calibration values and print out the calibration part again to verify calibration values give the desired result. The two squares located at 4,4 (highlighted in blue) should be perfectly aligned on top of each other.
If not perfectly aligned, repeat the process and add the new found calibration values to the previously found values.
7. If this is successful, you are done with the calibration and you can now successfully print with your dual head printer.
8. On our webpage a pre-sliced dual head print-file is available which will print a part of the accessories set of the printer.

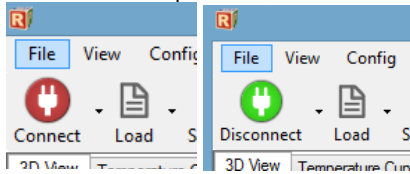
http://shop.felixprinters.com/downloads/print_files/accessoires/F3_o/print_assy_felix_F3_o_dual_extruder_accessory_V6.gcode

21 Calibrate the Z-Direction/Connect to printer

To obtain good quality prints it is **essential** that the heated bed is **level** and that the distance between the hot-end and the bed is close enough when printing the first layer.

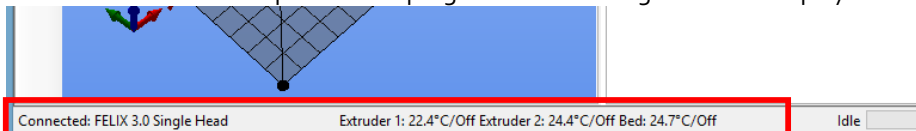
The leveling was done prior to the software installation. So now it is time to calibrate the z-axis height with the z-axis limit switch vane.

1. Connect to the printer. (The connect button should turn green)

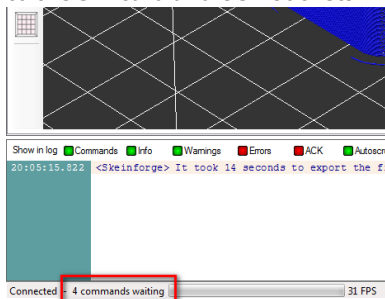


Other checks to see if the printer is connected properly:

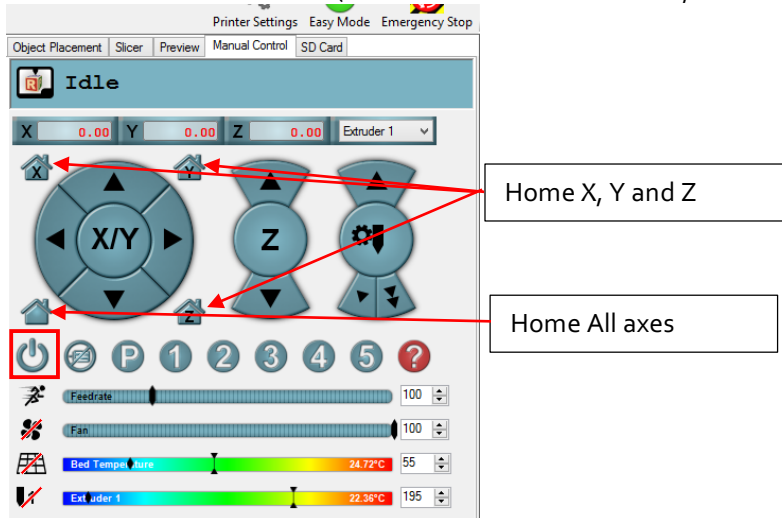
On the bottom of the Repetier-Host program the following should be displayed



If you see ... **commands waiting**, press the reset button, which is on the side of the electronics case next to the SD-card and USB sockets.



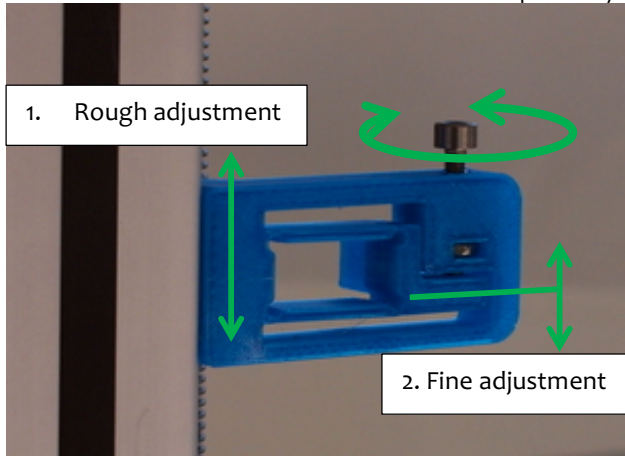
2. Go to the *manual control* tab. (This looks different on the Mac, but has the same functionality)



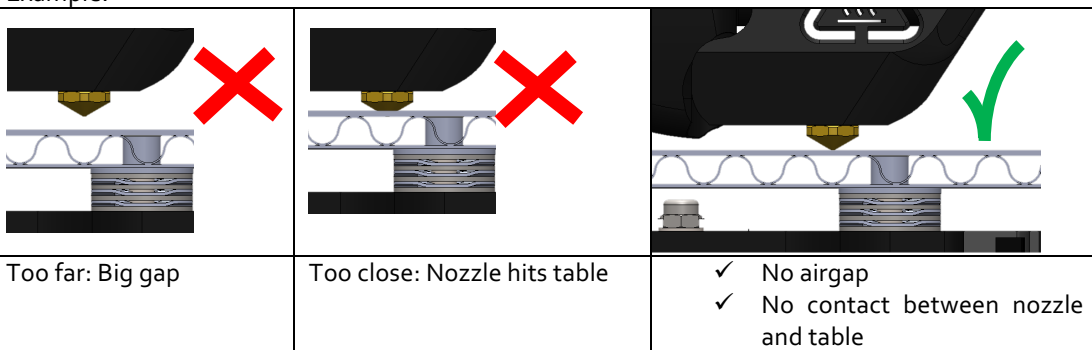
3. Now it is time to calibrate the z-height:
When doing the following steps, hold your hands on the power switch of the power supply. Flip the switch if something goes wrong.

- Press the Power button. This will turn on the power circuit of the electronics board.
 If you have built a DIY kit: Do the following checks to ensure you have connected the wires correctly.
 - o Make sure the fan which blows air on top of the hot-end is spinning

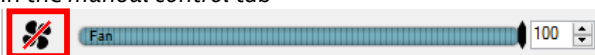
- Make sure the LEDs of the opto-sensors on the electronics board are reacting by checking to see that the appropriate lights go out when they are triggered. When a limit switch vane goes between the sensor flanges, the correct light should turn off.
- Make sure the bed is at least 5 cm from the hot-end, to give you enough reaction time to respond if something goes wrong.
- Press Home X, then move the x axis back and forth.
- Press Home Y, move the y axis back and forth.
- Press Home Z
- The distance between the table and hot-end is probably too large.



- Turn the screw in such a way that the flexible vane mechanism goes downwards. Do this approx. till $\frac{3}{4}$ of the possible stroke. Move the complete part a little bit up and press Home Z again.
- Repeat this process until the table is approx. 3 mm from the nozzle. Now fix the bracket to the frame and start homing again. Repeat this procedure to get the nozzle closer and closer by turning the little screw as shown in the picture above.
- Do this a couple of times until the distance is less than the thickness of a piece of normal paper.



In the *manual control* tab



- Check if the switchable fan mounted to the airduct is working.

Move the slider to 100% and press the fan button

22 Appendix: Terms Of Service

1. Scope

a) These Terms and Conditions shall apply to all purchases submitted or to be submitted by you for any item, service or subscription offered to you on or via the FELIXprinters website, a FELIXprinters device or other FELIXprinters application (referred to in these Terms and Conditions as the “Products”), including, but not limited to, (i) hardware devices, accompanying items and accessories including devices, items or accessories containing pre-installed software (“Hardware”), (ii) FELIXprinters software, including content and content programs offered by FELIXprinters and all Internet-based downloadable (“Software”) and (iii) services offered by FELIXprinters from time to time (“Services”), which may include (separately or bundled) Internet-based services, (third party) functionality or content, whether offered to you on a subscription basis (“Subscription”) or on a pre-paid basis and delivered in one or more parts.

2. Orders

- a) Any purchase order submitted is subject to acceptance by FELIXprinters. Only upon acceptance by FELIXprinters by way of an order confirmation is the agreement concluded.
- b) FELIXprinters reserves the right to reject any orders in full or in part or to apply a maximum order amount.
- c) All orders for Hardware are subject to stock availability.

3. Price and payment

- a) Prices indicated on the website are exclusive of state and local sales and use taxes. You are responsible for any such state and local sales and use taxes, and any other taxes and government levies, if any, associated with your order. Shipping and handling charges (if any) will apply in addition to the sale price indicated on the website and the applicable sales and use taxes. Prices are subject to change at any time but will not affect orders for Hardware, Software, or Services made prior to the date of the change (subject to clause 7c).
- b) All orders must be paid for through the payment service as made available by FELIXprinters (“Payment Service”). In order to submit orders and use the Payment Service you must supply details of your preferred payment method, billing and shipping address (if applicable) and/or any other details necessary to complete the order.

4. Delivery and risk of loss

- a) FELIXprinters will endeavor to deliver or activate the Product within thirty (30) days of order acceptance. If multiple Products are ordered, FELIXprinters reserves the right to deliver or activate each Product separately.
- b) Products will be delivered either to your delivery address or possession, or electronically. The risk of loss or damage to the Products will pass to you at the moment the Products are delivered to your delivery address or possession.
- c) If you refuse or neglect to take delivery of the Products, FELIXprinters reserves the right to charge you for the reasonable cost of storing and shipping the Products until delivery can be made.
- d) If delivery to you should fail for any reason outside of FELIXprinters’s control, FELIXprinters reserves the right to cancel the purchase agreement and refund any moneys paid
- e) If FELIXprinters delivers a Product or an amount of a Product that you did not order or activates a Product on your device by mistake, you shall immediately inform FELIXprinters of its mistake by email via info@FELIXprinters.com and you shall, at FELIXprinters’s request, immediately arrange for the return of the Product (the costs of which shall be met by FELIXprinters), de-install or destruct the Product.
- f) Acceptance of a non-ordered Product or amount of a Product does not relieve you from acceptance and payment of the Product you initially ordered, unless otherwise agreed with FELIXprinters.

5. Return Policy

- a) FELIXprinters allows you to return Hardware for any reason provided that it has not yet been used at any time during the fourteen (14) business days following the date of receipt at your delivery address. If the item has not been opened, FELIXprinters will refund the purchase price actually paid minus shipping and handling charges. If the item has been opened, FELIXprinters will charge a 15% restocking fee in addition to shipping and handling charges. FELIXprinters will not issue refunds for products that have been defaced, altered, used, or damaged in any way. All requests for refunds are subject to inspection by FELIXprinters of the returned item. FELIXprinters will issue refunds through a bank transfer or PayPal. If you choose to return any Hardware, you must contact FELIXprinters during the fourteen (14) business days following receipt by email via info@FELIXprinters.com to obtain a Return Materials Authorization number and return the Hardware in its original packaging, free of all interests, liens, or claims otherwise, to the address provided by FELIXprinters. FELIXprinters will not issue any refunds in response to requests made more than fourteen (14) business days following receipt of the item. FELIXprinters will only accept returns on items purchased directly from the FELIXprinters store.
- b) Purchases of Software may be cancelled in accordance with clause 5(a) provided that the seal has not been broken nor tie wraps are cut loose. Downloading, installing or activating Software are all considered as breaking the seal.

- c) You agree that the supply of Services by FELIXprinters will commence immediately on FELIXprinters's acceptance of your purchase order or placed order via the website. You will not be able to cancel the purchase agreement after supply of the Services commences.
- d) All sales of products sold as Refurbished are final.

6. License, Copyright & Confidentiality

- a) Subject to these Terms and Conditions, you are granted a license to reproduce in order to install and execute the Software, Services and/or the data, information, functionality or other content ("Content") provided to you as part of the Hardware or via for personal and private use only on the terms set out in this article 6 ("License"). You may install and use the Software, Services and Content on only one computer device at any time and in combination with only one Product. You may not provide the Software, Services or Content to others, directly or indirectly for their or anyone else's use. This License is non-exclusive and non-transferable which means that FELIXprinters is free to license the Software, Services and Content to other customers and that your right to use the Software, Services and Content cannot be transferred by you to someone else or to another piece of Hardware. This License does not include any right to obtain future upgrades, updates or supplements to the Software, Services or Content. If upgrades, updates or supplements to the Software, Services or Content are obtained, however, the use of such upgrades, updates or supplements will be governed by these Terms and Conditions or such other terms and conditions as you shall be asked to accept prior to FELIXprinters supplying you with the relevant upgrade, update or supplement.
- b) FELIXprinters reserves the right, with or without notice, to discontinue update, upgrade and supplement services provided to you or made available to you through the use of the Software, Services or Content, unless the provision of such updates, upgrades or supplements forms an integral part of the Product, as indicated by FELIXprinters at the time of sale.
- c) Without prejudice to any other rights, FELIXprinters may immediately terminate the License without notice of default being required if you fail to comply with any material term of these Terms and Conditions which shall be understood to include clauses 6 and 9. In such event, you must destroy all copies of the Software and all of its component parts as well as any Content.
- d) Copyright and other intellectual, industrial and/or proprietary rights to the Software, to the Content, the Services and to any copies made of it are owned by FELIXprinters and/or its suppliers. FELIXprinters permits you to use the Software, Services and Content only in accordance with these Terms and Conditions. All rights not specifically granted in these Terms and Conditions are reserved by FELIXprinters. You may either (a) make one copy of the Software solely for backup or archival purposes, or (b) transfer the Software to a single medium provided the original is kept solely for backup or archival purposes. Product manual(s) or written materials may not be copied, except for your own use. You may not copy, download, upload or in any other way reproduce Content, except for creating one copy solely for backup or archival purposes. You do not acquire ownership of the Software or Content.
- e) You acknowledge and agree that the Products were developed at considerable time and expense by FELIXprinters and are confidential to, and a trade secret of, FELIXprinters and/or other third parties. You undertake to maintain the Products in strict confidence and not to disclose or provide access to the Product to any third party.

7. Third Party Software Materials

FELIXprinters Products may make use of third party software codes, data, information functionality, other content and algorithms ("Third Party Materials"). The use of Third Party Materials included in the Products may be subject to other terms and conditions. The official copyright notices and specific license conditions of these Third Party Materials are to be found in or via our website. You hereby agree that the submission of any order implies that you have read and accepted the terms and conditions for any Third Party Materials included in the Products ordered.

8. Other Restrictions

Renting, lending, public presentation, performance or broadcasting or any other kind of distribution of the Products is prohibited. Other than as permitted by applicable legislation, you will not, and will not allow any person to, modify the Products or any part thereof, to analyze it by means of reverse engineering, to decompile or disassemble the Products, or to break or circumvent encryption or to allow or enable third parties to do so.

9. Limited Warranty

- a) FELIXprinters does not and cannot warrant that the Products operate in a manner that is completely error-free nor that any information provided is always accurate. Calculation errors may occur when using systems such as those caused by local environmental conditions and/or incomplete or incorrect data.
- b) FELIXprinters offers a limited warranty that the Hardware will be free from defects in workmanship and materials under normal use ("Defects") for a period of one (1) year from the date the Hardware was purchased ("Warranty Period"). Any warranty obligation of FELIXprinters under this Section is expressly conditioned on your compliance with this Agreement. During the Warranty Period, the Hardware will be repaired or replaced by FELIXprinters ("Limited Warranty") without charge for either parts or labor. If the Hardware is repaired after the Warranty Period

has expired, the Warranty Period for the repair will expire six (6) months after the date of repair. This warranty does not cover Software or Services.

c) This Limited Warranty does not cover damage caused by normal wear and tear or as a result of the Hardware being opened or repaired by someone not authorized by FELIXprinters, and does not cover damage caused by: misuse, moisture, liquids, proximity or exposure to heat and accident, abuse, non-compliance with the instructions supplied with the Hardware, neglect or misapplication. The Limited Warranty does not cover physical damage to the surface of the Hardware.

d) EXCEPT FOR THIS LIMITED WARRANTY, AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, FELIXprinters AND ITS SUPPLIERS PROVIDE THE PRODUCTS “AS IS AND WITH ALL FAULTS”, AND HEREBY DISCLAIM ALL OTHER WARRANTIES AND CONDITIONS, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY (IF ANY) IMPLIED WARRANTIES, DUTIES OR CONDITIONS OF MERCHANTABILITY, NON-INFRINGEMENT, QUIET ENJOYMENT, SYSTEM INTEGRATION, TITLE, SATISFACTORY QUALITY, OF FITNESS FOR A PARTICULAR PURPOSE, OF RELIABILITY OR AVAILABILITY, OF ACCURACY OR COMPLETENESS OF RESPONSES, OF RESULTS, OF WORKMANLIKE EFFORT, OF LACK OF VIRUSES, AND OF REASONABLE CARE AND SKILL, ALL WITH REGARD TO THE PRODUCTS; AS WELL AS THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT OR OTHER SERVICES, INFORMATION, SOFTWARE, AND RELATED CONTENT THROUGH THE PRODUCTS OR OTHERWISE ARISING OUT OF THE USE OF THE PRODUCTS. ALSO, THERE IS NO WARRANTY OR CONDITION OF QUIET ENJOYMENT, QUIET POSSESSION, OR NON-INFRINGEMENT WITH REGARD TO THE PRODUCTS.

e) In order to make a claim under the Limited Warranty of a Defect, you must contact FELIXprinters by email during the Warranty Period via to explain the Defect and to obtain a Return Materials Authorization number if necessary. The Hardware must be returned to FELIXprinters as soon as possible following your notification of the Defect, along with an explanation of the Defect, to the address provided by FELIXprinters. You must comply with any other return procedures stipulated by FELIXprinters, if any.

f) This Limited Warranty is the only express warranty made to you and is provided in place of any other express warranties or similar obligations (if any) created by any advertising, documentation, packaging, or other communications.

g) If applicable law requires any implied warranties with respect to the Hardware, all such warranties are limited in duration to one (1) years. Some states and/or jurisdictions do not allow limitations on how long an implied warranty lasts, so the above may not apply to you. The provisions of this clause 9 do not affect any of your legal rights under applicable national legislation governing the sale of consumer goods.

h) This Limited Warranty is not transferable.

i) This clause 9 sets forth your sole and exclusive remedy in connection with any warranties granted by FELIXprinters hereunder.

10. Limitation of Liability

a) NEITHER FELIXPRINTERS NOR ITS SUPPLIERS SHALL BE LIABLE TO YOU OR TO ANY THIRD PARTY FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, PUNITIVE, OR EXEMPLARY DAMAGES (INCLUDING IN EACH CASE, BUT NOT LIMITED TO, DAMAGES FOR THE INABILITY TO USE OR ACCESS THE PRODUCTS, LOSS OF DATA, LOSS OF BUSINESS, LOSS OF PROFITS, BUSINESS INTERRUPTION OR THE LIKE) ARISING OUT OF THE USE OF OR INABILITY TO USE THE PRODUCTS, EVEN IF FELIXPRINTERS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

b) NOTWITHSTANDING ANY DAMAGES THAT YOU MIGHT INCUR FOR ANY REASON WHATSOEVER (INCLUDING, WITHOUT LIMITATION, ALL DAMAGES REFERENCED HEREIN AND ALL DIRECT OR GENERAL DAMAGES IN CONTRACT OR ANYTHING ELSE), THE ENTIRE LIABILITY OF FELIXPRINTERS AND ANY OF ITS SUPPLIERS ARISING FROM OR RELATED TO THE USE OF THE PRODUCTS SHALL BE LIMITED TO THE AMOUNT ACTUALLY PAID BY YOU FOR THE PRODUCTS CONCERNED.

c) Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. The above limitation of liability does not affect any legal rights under the applicable national legislation.

11. Export Controls

You will comply with all applicable laws and regulations, including without limitation the Dutch Administration Act, regarding the export of technology with respect to the Products.

12. Force Majeure

Force majeure means circumstances that impede the fulfillment of FELIXprinters’s obligations under these Terms and Conditions which are not within FELIXprinters’s reasonable control, including late and/or delayed deliveries and incomplete deliveries by FELIXprinters caused by circumstances beyond FELIXprinters’s reasonable control. In a force majeure situation all of FELIXprinters’s obligations shall be suspended. Should the period in which FELIXprinters cannot fulfill its obligations as a result of force majeure continue for longer than ninety (90) calendar days, both parties shall be entitled to dissolve the purchase agreement in writing without there being an obligation to pay any compensation whatsoever arising out of or in connection with that dissolution.

13. Privacy

support@FELIXprinters.com
www.FELIXprinters.com

FELIXprinters will not disclose information regarding your personal details, account or transactions to any third party other than in accordance with the privacy policy from Dutch law.

FELIXprinters holds the right to show your company name and logo in FELIXprinters's promotions, only in the context of you being one of FELIXprinters's customers. ("Our customers include ... [Buyer company name and logo]")

14. Links to Third Party Websites

FELIXprinters is not responsible for the content of any third-party websites or services, any links contained in third-party websites or services, or any changes or updates to third-party websites or services. Where FELIXprinters provides links and/or access to third-party websites and/or services it is only as a convenience to you, and the inclusion of any link or access does not imply an endorsement by FELIXprinters of the third-party site or service.

15. Third Party Rights

Third parties have no rights under applicable legislation in relation to the rights of third parties to rely upon or to enforce any term of these Terms and Conditions but that does not affect any right or remedy of a third party which exists or is available apart from such applicable legislation.

16. Survival

Any provisions in these Terms and Conditions which by their nature extend beyond the termination or expiration of any sale or license of the Products will remain in effect.

17. Severability

If any provision of these Terms and Conditions is deemed to be void, invalid, unenforceable or illegal, the other provisions shall continue in full force and effect. You and FELIXprinters are deemed to have agreed to new terms and conditions in substitution for such invalid provisions. These new terms and conditions shall be interpreted, as regards their contents and effect, as closely as possible to the original text as written but in such a way that rights can indeed be derived from them.

18. Governing law

These Terms and Conditions and any disputes related to these Terms and Conditions or to the purchase and use of the Products or otherwise are subject to the laws of The Netherlands. The United Nations Convention on Contracts for the International Sales of Goods is hereby excluded from application to these Terms and Conditions. All disputes arising out of these Terms and Conditions shall be settled by courts venued in Amsterdam, which will have exclusive jurisdiction in respect of any such disputes.

19. Translations

This English version of these Terms and Conditions is the version that governs your purchase, of Products from FELIXprinters if you are located in the United States of America. Should you have any questions, suggestions or complaints concerning your order, your purchase, these Terms and Conditions, or if you desire to contact FELIXprinters for any reason, please do so by email by visiting FELIXprinters's website.