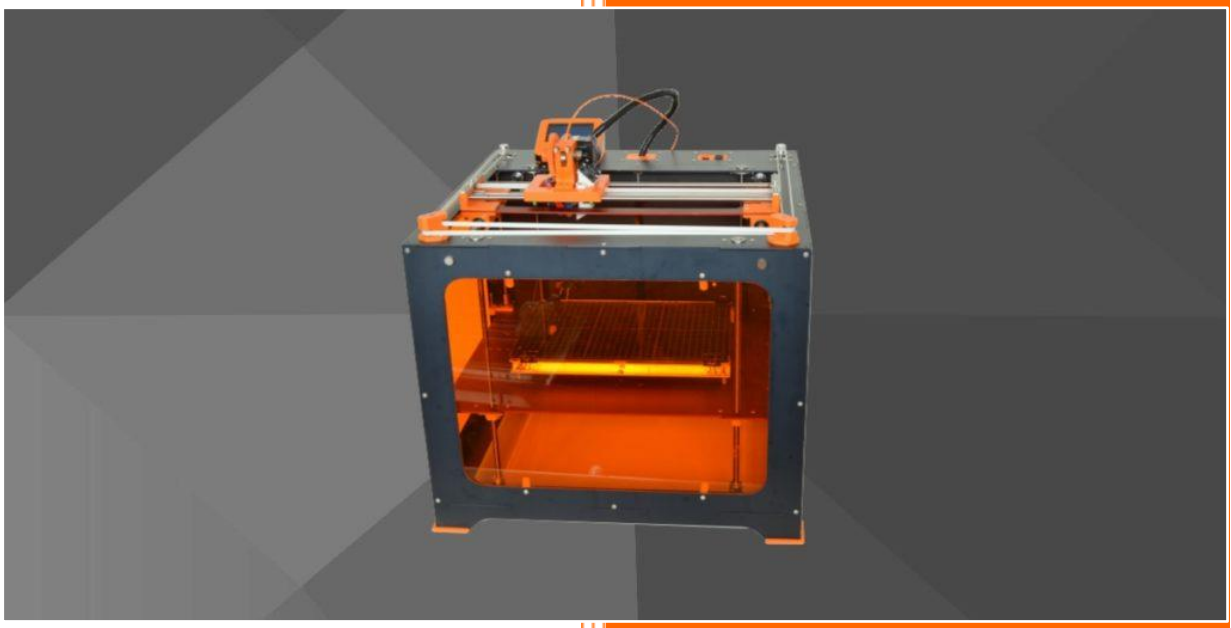
Project „3D-Printer"

KnutPlot_V6 assembly instruction



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Bremen; 08. Feb. 2017

Abstract:

This document describes the assembly of the 3D-Printer “KnutPlot_V6”. I is assumed that all required parts are readily available. For the parts preparation and productions please see the “manufacturing” instructions.

Version:

In this document, the “Basic Version” of KnutPlot_V6 is described. This printer uses a single Wade Extruder and a 12V “RepRap-Style” Heatbed. Modifications like the Dual Extruder or the 230V Heatbed are described in dedicated documents.

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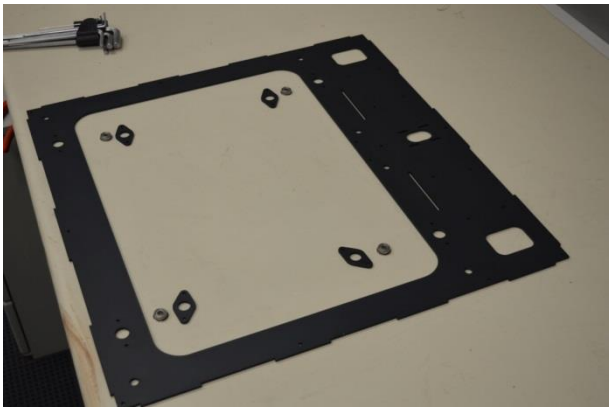
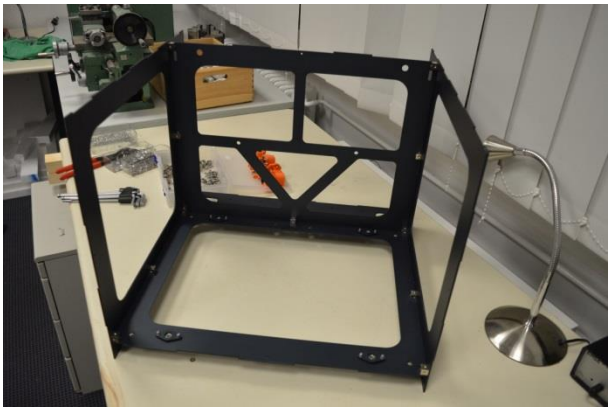
1 Mechanics

1.1 Box

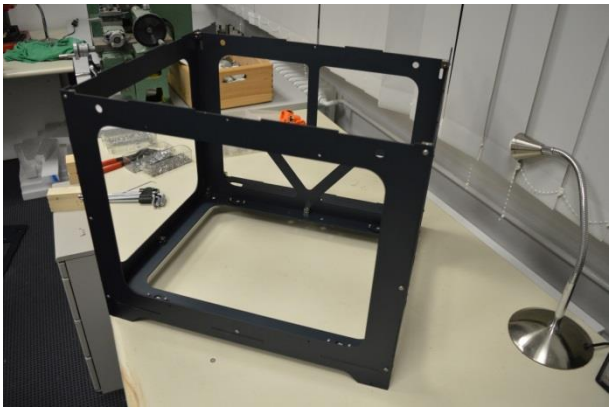


Install the bearings for the z-screw. Push them in carefully and secure them with the clamp. “Top” and “Bottom” are symmetric but watch out to mount the screws in the right direction, as shown in the picture above.

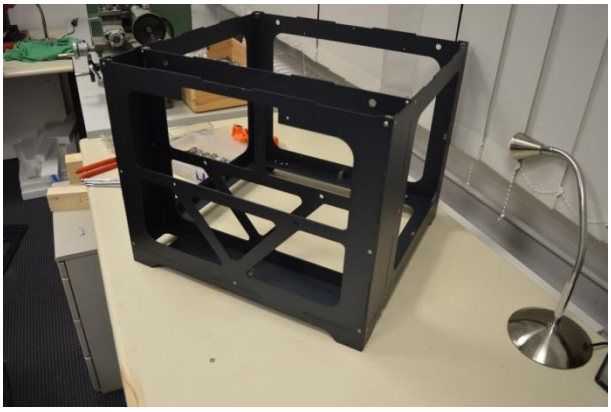
1. Mount “bottom” and “middle”



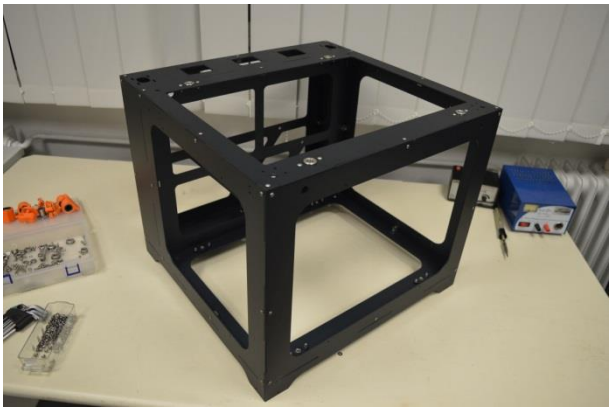
2. Mount “sides”



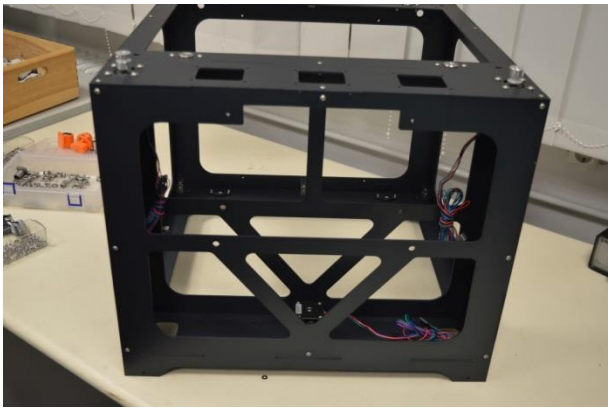
3. Mount “front”



4. Mount “rear”



4. Mount “Top”



Done! Rear view with installed Motors

The box is pretty easy to assemble, just follow the sequence as show above. Important notice: Do not tighten the screws in each step! After all panels are in place, all screw connections are tightened.

1.2 Table

Required parts for the table

Table “Top” side

Table “Bottom” side

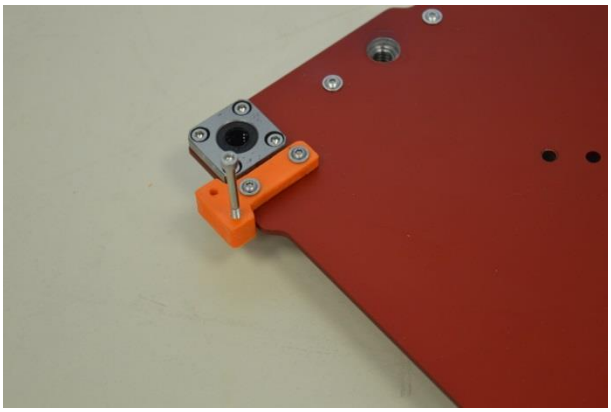
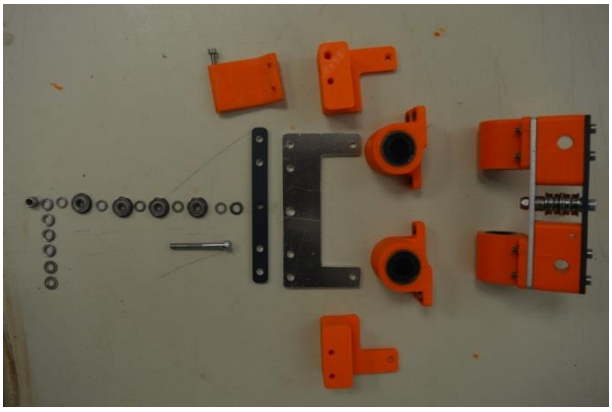
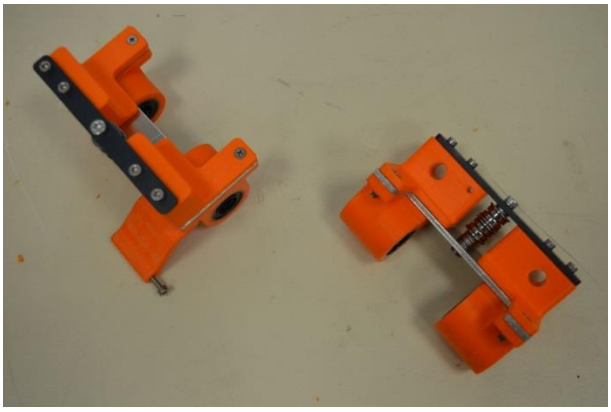


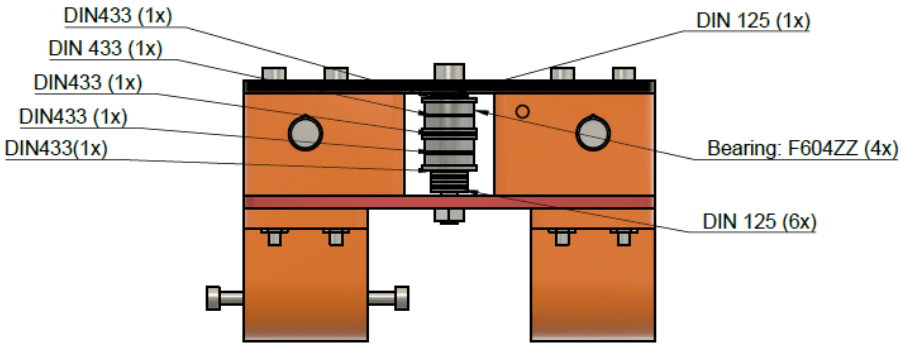
Table “Trimming Block” for z-endstop

1.3 Gantry

The “LM12UU” Bearings are pressed into the “bearing-holder” and secured with superglue. Afterwards apply some grease to the bearings.

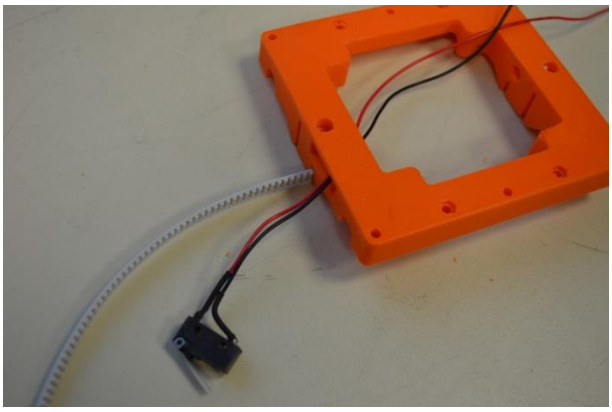
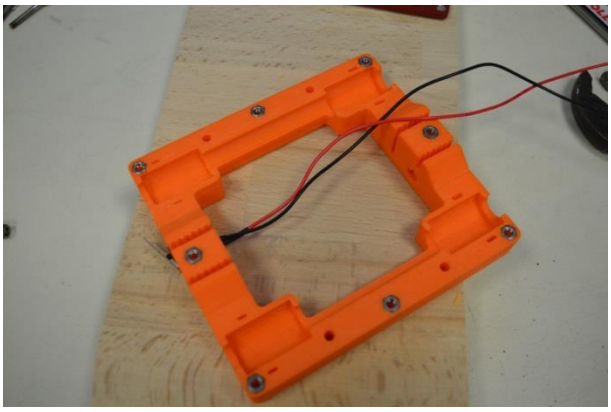




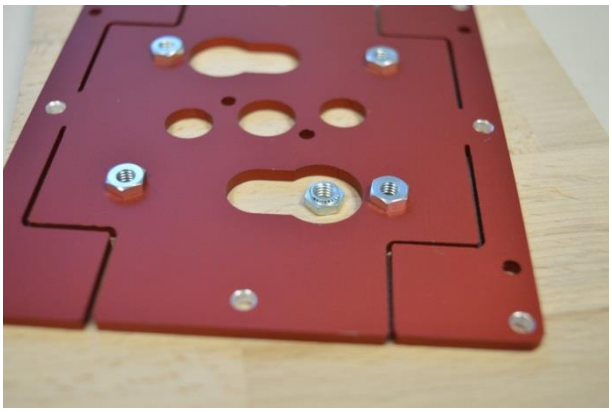
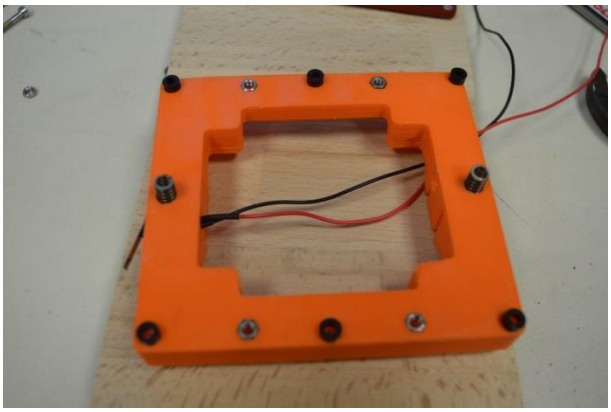


The picture above shows the assembly of the gantry-brackets. On the left side, a “trimmer-block” for the y-axis-endstop is attached. Important: All Washers that contact the bearings need to be “DIN 433” (these have a smaller diameter than DIN 125 and do not block the bearings).

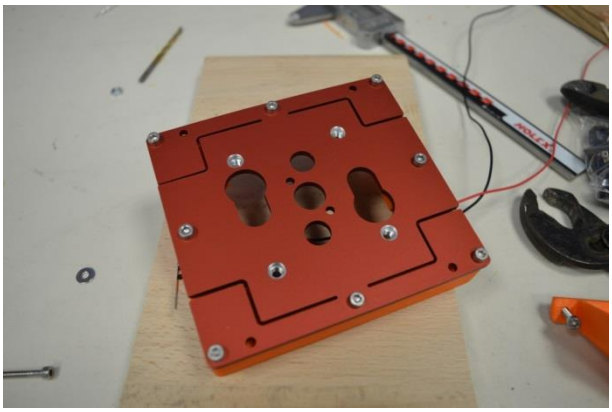
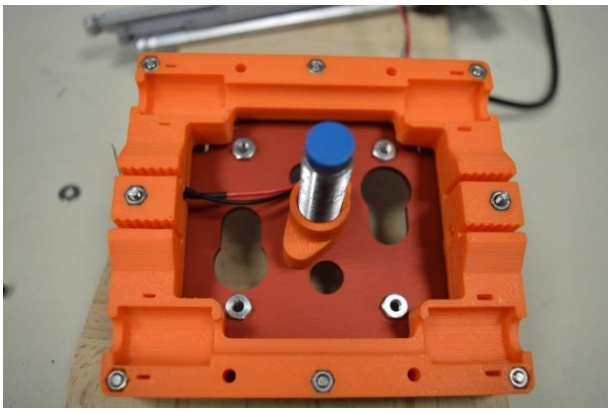
1.4 Carriage

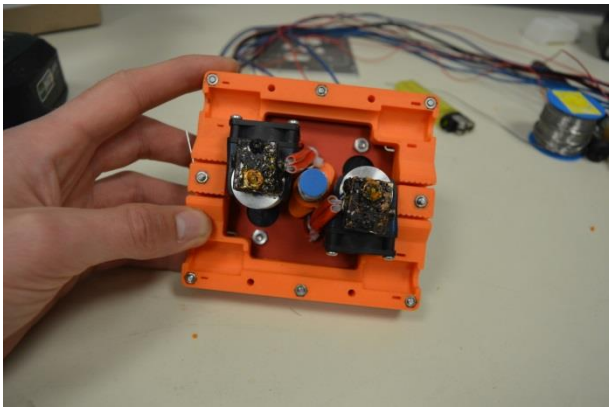
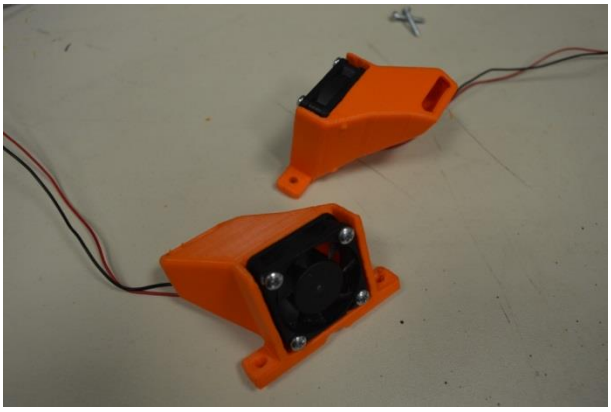
The first step is to install the x-axis Endstop. Watch out for the right direction, the carriage is not symmetric! Make sure that the timing-belt teeth are pointing forward, as shown in the picture above. Secure the switch with superglue. In the next step, M3 nuts are installed and secured with superglue (Don't get that stuff on the threads)

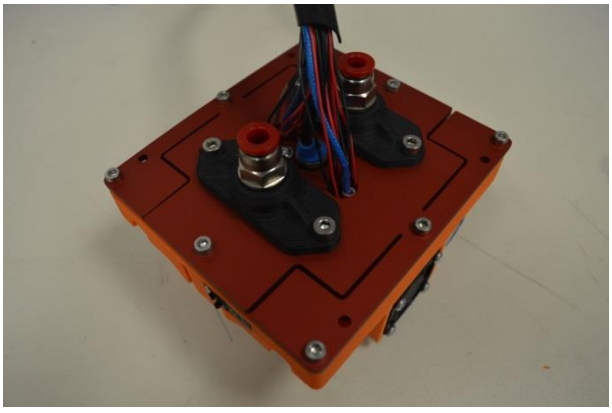
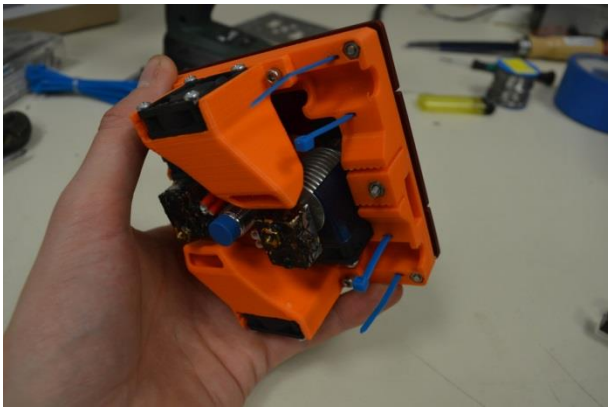
M3-set-nuts (https://www.buerklin.com/en/set-nut/p/16h584) are pressed into the mounting plate. These allow an easy disassembly of the unit for maintenance and changing the nozzles. Place distance-rollers and springs on top of the carriage before mounting the plate.

The plate and the distance-sensor are installed

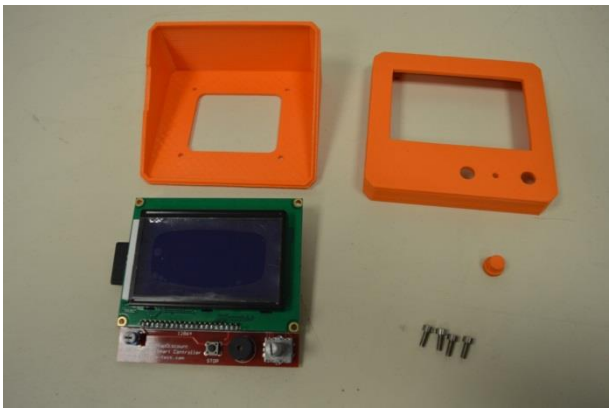



Mount the nozzles and the cooling-ducts

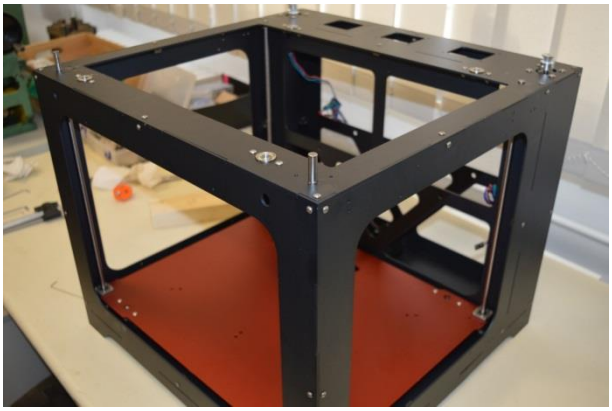
Done!

1.5 Display-Box

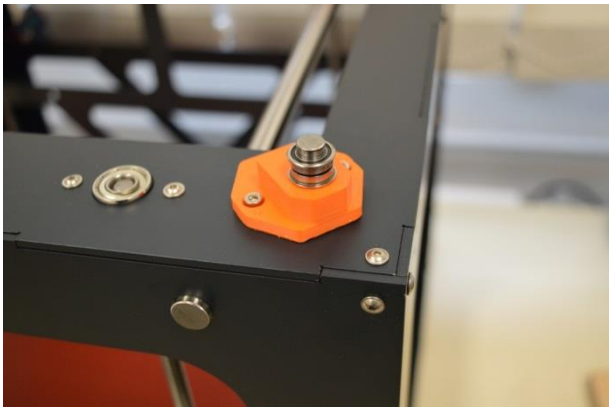
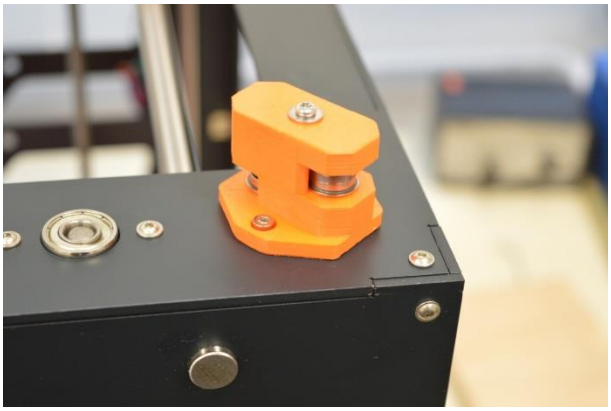


Pretty simple, mount the display to the top part, and don’t forget the knob. Top part and bottom part simply snap together.

1.6 Assembly

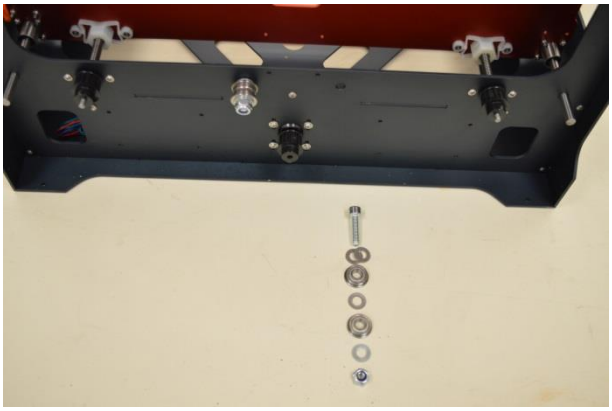


For mounting the table, put in the 8mm linear rails. There are two different lengths (400mm and 425mm), use the long rails on the front. These have to stick out ≈25mm on top, to hold the idlers for the core-xy mechanism.

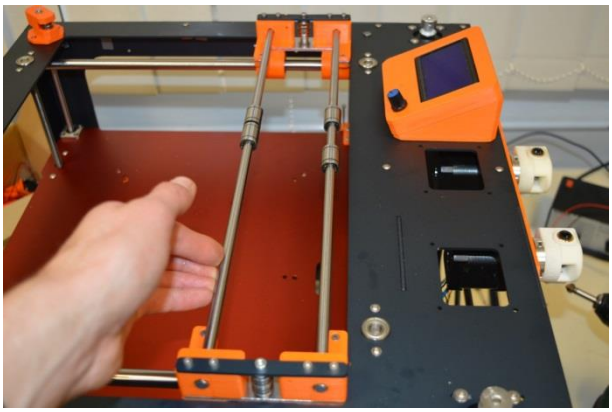



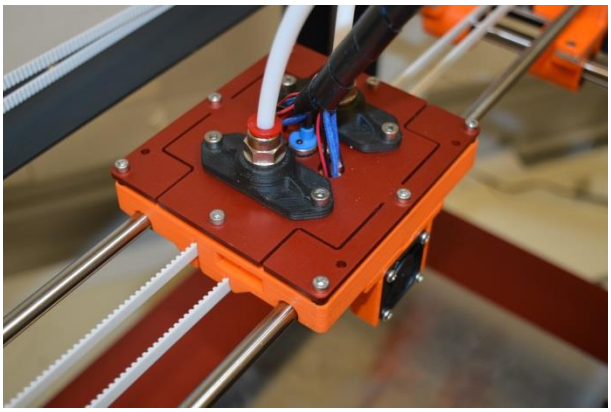
The core-xy-mechanism idlers are installed as shown above. Watch out, there is a right and a left version!


Put in the z-screws from top. The pulleys for the z-timing belt are used to hold the screws in place. Use 12 teeth pulleys for the leadscrew and 10 teeth pulley on the motor.




Install the z-belt idlers. Then move the table to a “leveled-position” by turning the screws to equal distances. At last, put on the timing belt.

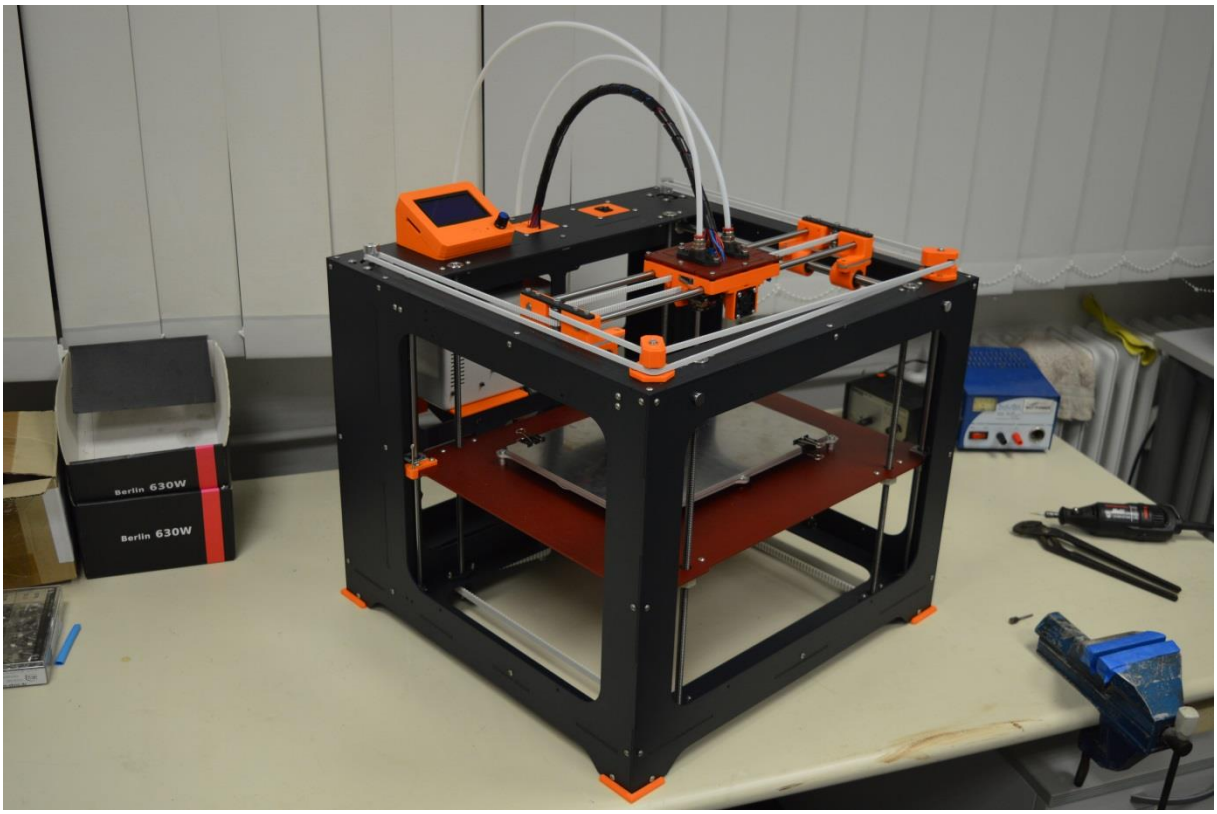




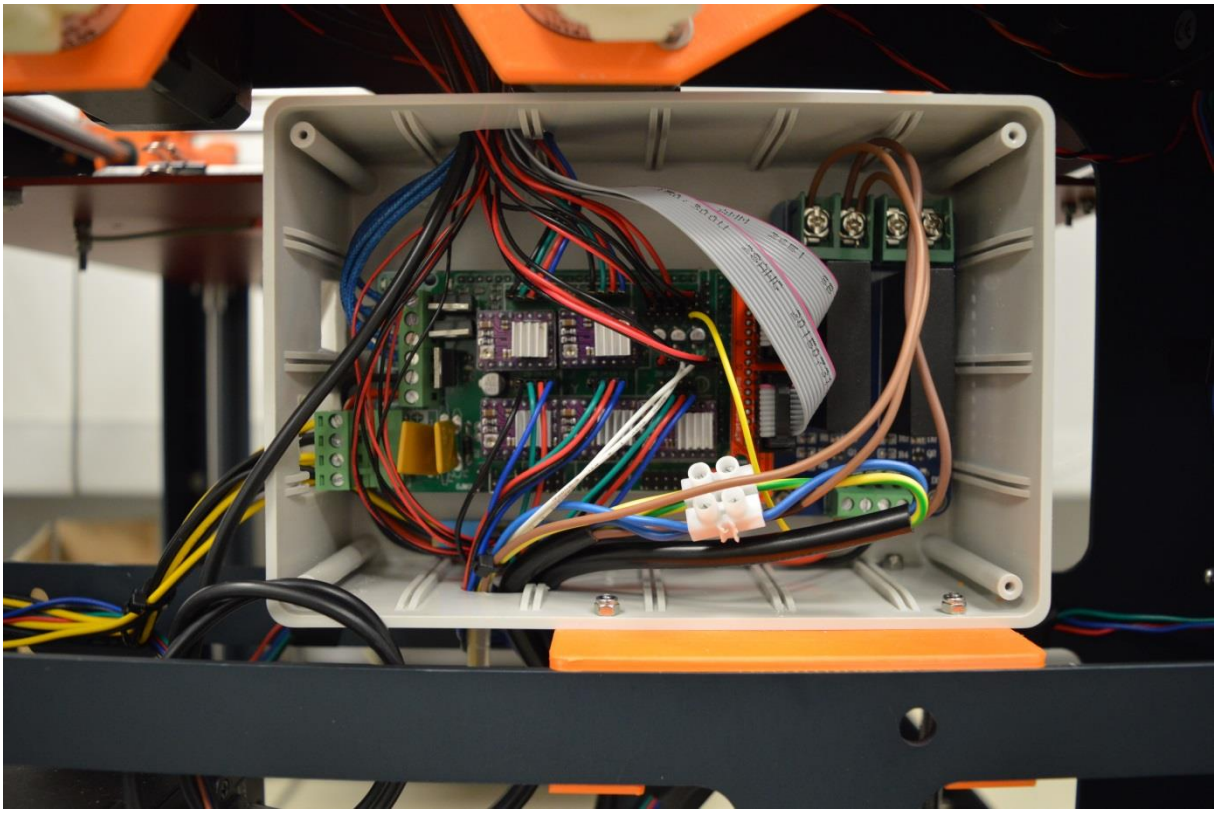
Install the gantry and the carriage. Watch out for the right position and direction of the timing belt for the core-xy-mechanism.

Important notice: Make sure that the timing belt tension on both sides is equal! Otherwise you will receive deformed print results!

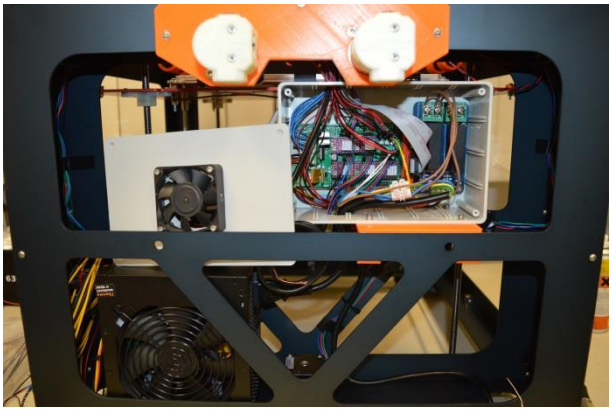
Install heatbed, display, plugs and extruders until you printer looks like this:

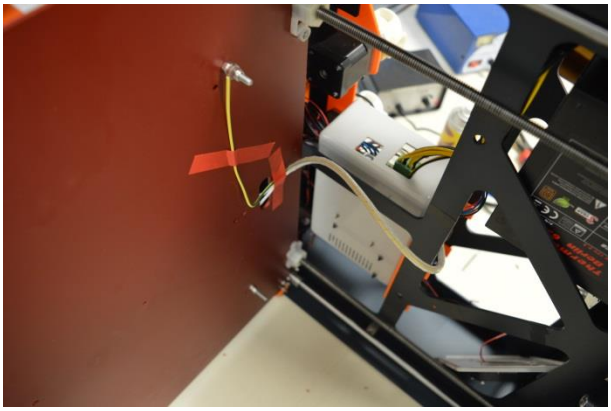


2 Electronics



This picture shows the electric installation of a printer with a solid-state relays (for the 230V-heatbed).





Please notice the cooling fan for the electronics (in the lid of the electronic-box) and the green/yellow cable for the protective connection (earth) for the 230V heatbed.

2.1 Connections

This connection-list is for a setup using the Ramps 1.4 board, dual extruder and 230V heatbed with solid-state relays

Name	Connection	Comment
Motors		
Motor “left”	Ramps “Motor Y”	BLK pointing to Ramps-Power-Plug
Motor “right”	Ramps “Motor X”	BLK pointing to Ramps-Power-Plug
Motor “z”	Ramps “Motor Z”	BLK pointing to Ramps-Power-Plug
Extruder 1	Ramps “Motor E1”	BLK pointing to Ramps-Power-Plug
Extruder 2	Ramps “Motor E2”	BLK pointing to Ramps-Power-Plug
Temp-Sensors		
Temp HotEnd 1	Ramps “T0”	Polarity doesn’t matter
Temp HotEnd 2	Ramps “T2”	Polarity doesn’t matter
Temp Heat Bed	Ramps “T1”	Polarity doesn’t matter
Endstops		
Endstop “x”	Ramps “x_min”	Connect “Ground” and “Signal” Endstop: “Normally closed” Watch out, don’t connect to “+” on Ramps!
Endstop “y”	Ramps “y_min”	
Endstop “z”	Ramps “z_min”	
Heaters		
HotEnd_1	Ramps “D10”	Polarity doesn’t matter
HotEnd_2	Ramps “D09”	Polarity doesn’t matter
Heatbed	Ramps “D08”	Polarity doesn’t matter
Cooling Fans		
Constantly running Fans	12V from power-supply	HotEnd_1; HotEnd_2; Electronics-cooling
Fans for cooling-ducts	Ramps RRD Fan Extruder	Check out: (Thank you dintid!) http://www.instructables.com/id/Configuring-and-using-Reprap-Ramps14-RRD-Fan-Exten/
Power-Supply		
Power Supply	Both Power inputs	
Optional		
Auto-Bed-Leveling		Check out: (Thank you Tom!) https://www.youtube.com/watch?v=EcGFLwj0pnA
HeatBed Solid-State-Relay		Check out: (Thank you Tom!) https://www.youtube.com/watch?v=TiEwNf1H_Tc&list=PLDJMid0lOOYnRCAdbFfzECor3EbgF8euw

3 Software

KnutPlot uses Open-Source Software!

3.1 Firmware

The firmware runs on the printer. Here is what it does:

- Connect the printer to you PC
- Read the SD-Cards
- “Defining” the printer: How many Extruders, which Temperature Sensors, Controlling the movement of the stepper motors and much more!

KnutPlot uses a firmware called “Marlin” (http://marlinfw.org/)

You can download the latest firmware with the settings for KnutPlot_V6 here: http://www.oekermann.com/portfolio/3d-printer/

3.2 Slicer

This software runs on your computer. It does:

- Create the code for the printer
- Slices the 3D-Model in Layers do define the path for the HotEnd
- Set Layer-heights, Infill patterns etc.

I prefer using “Slic3r”, a free software with many parameters to tweak. You can download here: http://slic3r.org/

In “slic3r”, you must define which printer you are using. For “KnutPlot_V6” import the settings you can download here: http://www.oekermann.com/portfolio/3d-printer/