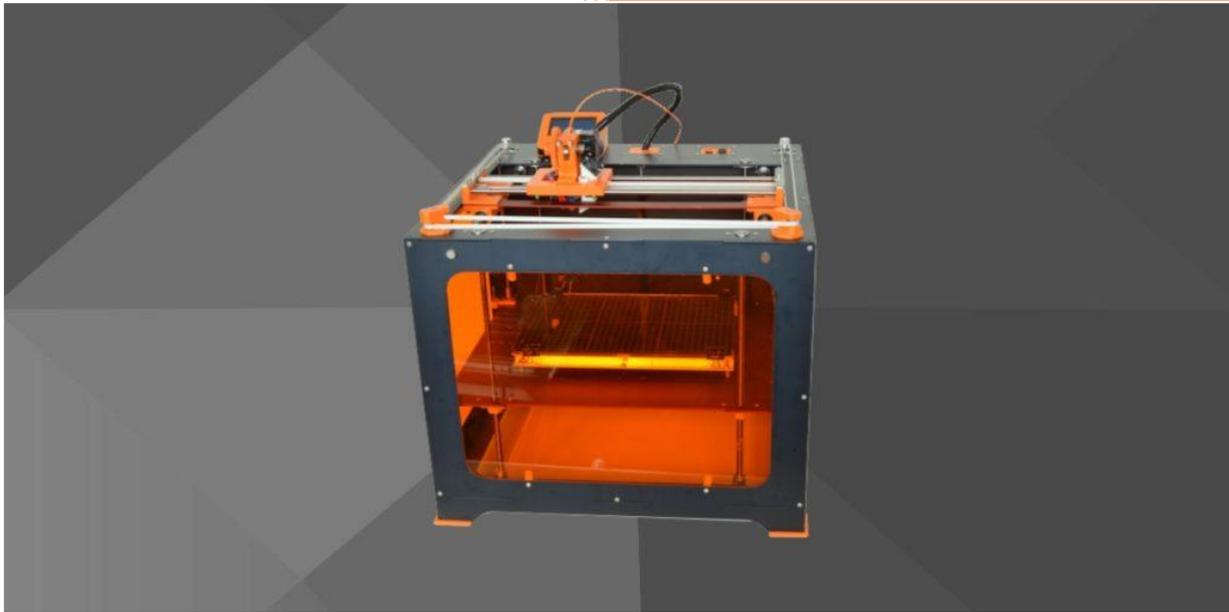


# Project „3D-Printer“

KnutPlot\_V6 manufacturing instruction



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Bremen; 08. Feb. 2017

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## Abstract:

This document describes how to produce and to source the required parts for Knut-Plot\_V6.

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## 1 Lasercut-Parts

### 1.1 Cutting

The printer-housing is made of lasercut-aluminum sheet metal. All parts have the same thickness (3mm) to cut productions costs. There are also some “optional” parts (acrylic windows and a cardboard back-cover).

#### **Material:**

There are no high requirements to mechanical strength, that’s why a relatively “soft” aluminum alloy can be used. For my printers I use:

Name: AlMg3 (EN AW 5754) (3.3535)

This alloy is widely used and often the cheapest option. It’s also great for anodizing!

#### **Lasercut-Shops**

You can easily order these parts in online shops like “247 Tailorsteel” (<http://www.247tailorsteel.de/>). You have to upload the .dxf-files you can find on <http://www.oekermann.com/portfolio/3d-printer/>. One set costs around 150€, or, if you order more, the price drops to around 110€.

Some lasercut-shops do not sell to private persons (business2business-shops). You can ask a local garage or workshop to order for you.

Here are some other shops:

<http://www.geerscutting.com>

<http://www.laserteileonline.de/>

<http://www.cutworks.de/de/>

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## 1.2 Anodizing

For a nice surface finish and against corrosion, all the aluminum-parts are anodized in different colors. You can also hard-elix to increase the hardness of the aluminum; this would also be a great option for aluminum – buildplates.

Important notice: When you anodize the aluminum-plates, a thin layer of material is removed; the material becomes “thinner”. How much material is removed strongly depends on the process.

You do have to do some test and to use offsets in the mechanical design to archive a good precision of the finger-joints.

## 1.3 Offsets

Lasercutting is a very precise process, although the precision may vary between different suppliers. For each supplier, you should do some test to find the right offset to compensate for tolerances.

In the “KnutPlot\_V6” CAD files, no offset is used. This is done for simplicity:

- Without anodizing, you do have to do some manual rework to make the parts fit perfectly.
- When anodized, the parts fit together with very small, tolerable gap.

Please do experiments with your local supplier!

On the next page, some measured results are displayed:

Type	Name	Before	After	Designed	Manufakture	Difference	After Elox	Difference after Elox	Difference to Design	Mean
Holes	Bottom_1			37.50	37.51	0.01	37.63	0.12	0.13	0.115
	Bottom_2			48.03	48.30	0.27	48.32	0.02	0.29	
	Clamp_Hole			13.00	12.97	-0.03	13.07	0.10	0.07	
	Hole			10.00	10.00	0.00	10.11	0.11	0.11	
	Slot			3.00	3.08	0.08	3.15	0.07	0.15	
	Table_Hole			15.98	15.93	-0.05	16.14	0.21	0.16	
Thickness	Table_Thickness			3.00	2.98	-0.02	3.00	0.02	0.00	-0.045
	Stripe_Thickness			3.00	3.00	0.00	2.95	-0.05	-0.05	
	Clamp_Thickness			3.00	3.01	0.01	2.96	-0.05	-0.04	
Width	Stripe_Width			10.00	9.96	-0.04	9.91	-0.05	-0.09	-0.09
<p style="text-align: center;"> <b>Lasercutting: Very precise, almost like designed</b>  <b>Elox: Holes become app. 0.1mm bigger!</b>  <b>Elox: Material Thickness: -0.05mm</b> </p>										

**Figure 1 Offset-measurement**

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## 2 Printed Parts

All the printed parts can be produced on an FDM-Printer. You can use PLA for most parts (which is easier to print). But the gantry parts should be made of ABS (more stable at higher temperatures). The gears on the waste extruder last for years when made of ABS!

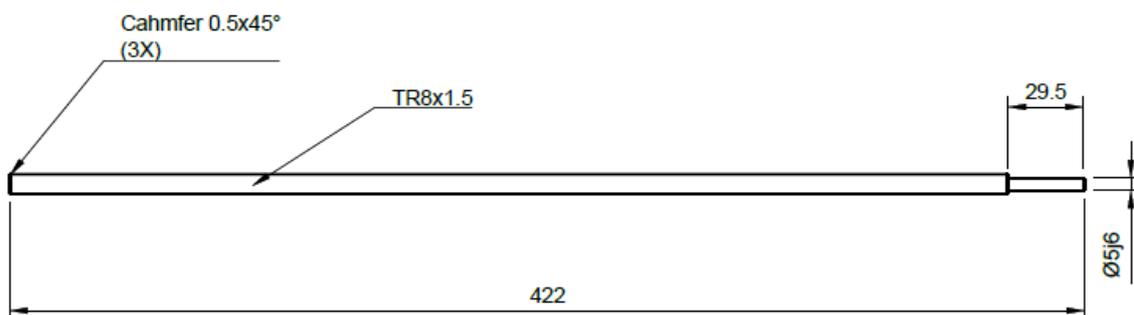
If you have no access to a 3D-printer, here are some options:

- Look for a “FabLab” close by.
- Find a “PrintHub”: <https://www.3dhubs.com/>
- Use online-service

## 3 Machined Parts

There is only one part that has to be machined, the leadscrew for the z-axis. This is a TR8x1.5mm leadscrew which has a reduced diameter of 5mm at one end.

Here is the drawing:



It's also a good idea to add a small flange for the setscrew, as shown in the picture. For these parts you need a turning machine, ask local shops or friends...



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## 4 “Off-the-shelf” parts

Buy quality parts! Especially the Extruder and the HotEnd’s are essential parts for print quality. Cheap copies of these products often lack quality and if you buy the original parts you support innovation!

### 4.1 Extruder

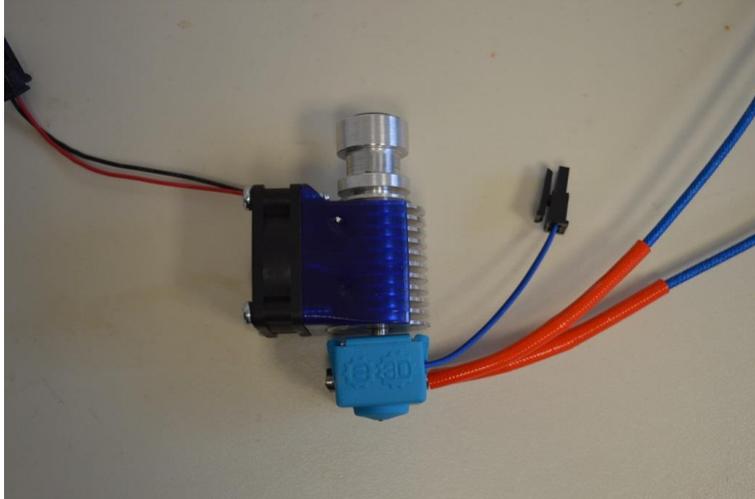


I am a big friend of the “BondTech” Extruder (<http://www.bondtech.se/en/start/>). These extruders offer most grip and extrusion force, great for “difficult” materials.

A great feature of the new version (V3) is the “quick-release-mechanism” for a fast filament exchange. They also come in a “left-hand” and “right-hand” design, as seen in the picture above.

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## 4.2 HotEnd



The “HotEnd” is one of the most crucial part for the printer.

I like to use original “E3D-V6” HotEnd’s, as shown in the picture above. Besides high quality and functionality, they offer a great modularity (different nozzle sizes and upgrades).

Using this system you can easily configure your printer to meet your requirements.