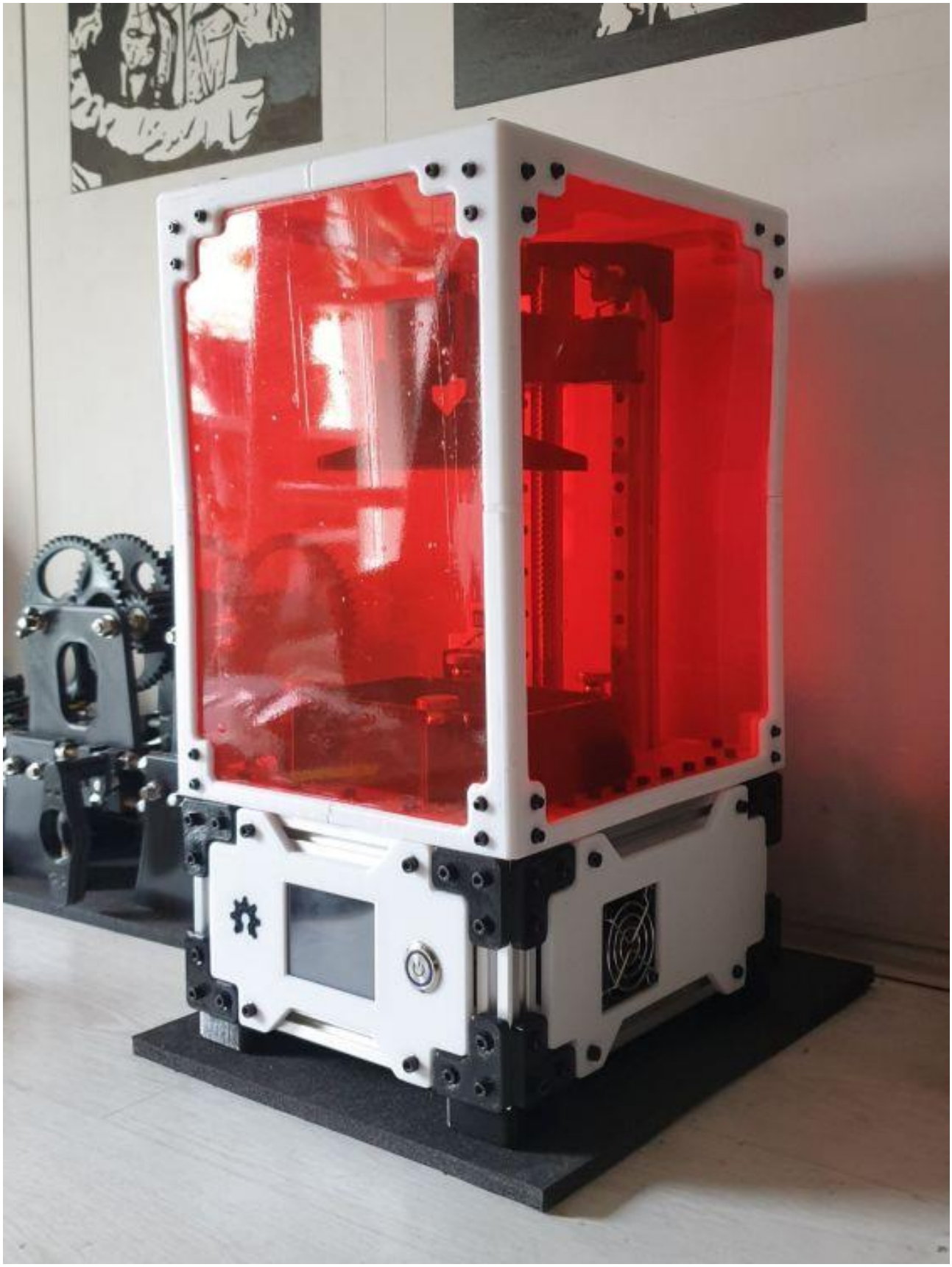
Cyclop MSLA Printer - Guide:



Time-lapse of a print: https://youtu.be/hayw6JKkwMY

Summary:

NanoDLP : *https://www.nano3dtech.com/nanodlp-download/*

Nextion TFT files (don't use Tibus version on Github) : *https://www.nano3dtech.com/nanodlp-nextion/*

NanoDLP Finder Tool : *https://www.nano3dtech.com/nanodlp-download/*

Win32DiskImager : *https://www.nano3dtech.com/nanodlp-download/*

PuTTY : *https://www.putty.org/*

GRBL (v0.9 patched for NanoDLP) : *https://github.com/GuillaumeGTHB/GBRL-for-NanoDLP*

Disclaimer : I am a 20 year old student who did this project as a hobby. I tried to summarize all the information that I understand in this guide, but I cannot affirm that all of this is fair and correct. I advise you to do your own research to complete your reading. Also there may be a lot of informations missing on some points, I didn't do much research on what I didn't need for building my home printer. Thanks ;)

Guide version :

V1.1 : First release → 28/08/2024

V1.2 : Second release → 30/08/2024

Approximate statistics of my time spent on the project :

- *6 months of work (early march to early september 2024)*
- *Approximately 200/250 hours spent on the project*
  - *about 80h of CAO design and revisions*
  - *20 hours of hassle to get the raspberry and the Nextion screen to work correctly ಥ_ಥ*

  (I try to be as close as possible to reality, I spent a lot of evenings and vacations on this project)

If you like my work, you can help me by buying me a coffee, thank you!

- *https://buymeacoffee.com/guillaumehy*
- *https://paypal.me/guillaumehaouy*

A)**Cyclop MSLA Printer :**

I. Introduction and general information

1. Preamble :

Well, I don't really know how this project emerged in my mind, but I would say that I became interested in making a resin 3D printer from the moment I realized that making one at home was faisable. This project started in February 2024 and more or less ended around July of the same year. I was quick for once !

Who am I ? I'm French, I'm 20 years old, and I'm a student in industrial product design (so I'm quite proficient in CAD, but it wasn't really necessary for this project). The biggest difficulty was to fully understand how resin printing technology works as well as to find all the necessary documentation, which is unfortunately quite discreet on the internet and which required long weeks of research on sites and forums of the whole world...

So I'm making this guide/report for you, but for myself too, to remember all the steps I had to go through to complete this project, and to try to summarize in one place all the information that took me weeks to find.

Good reading to one and all !

2. What you need to know before you start making a resin printer:

- Building a resin printer yourself (of decent quality) very often costs much more than buying a model from China, if you are considering building to save money you need to know exactly what you are doing and have a good start in the sector! (DLP printers are the cheapest craft printers to develop)

- The electronics are much simpler than you think and will not be a hindrance to your resin printer project. At a minimum, you need to be able to control a motor and a screen (and know how to use a soldering iron). The difficulty is not to obtain a functional printer, but to obtain an easy-to-use standalone printer

- Same for the IT part. For this project I used a Raspberry card (Linux & Python universe) and I had no knowledge about it, total ignorance of a subject is not a problem as long as you are not afraid to put a little your nose in it (it's always easier than you think once you get started)

- A resin printer is not the only essential element to be able to launch prints. Post-production is a laborious part, and you need to find a way to be able to clean and solidify your parts after they are printed. Resin printing requires much more material than 3D printing, **and also protective equipment because the resin is a substance dangerous for health!**

3. How does resin printing (stereolithography) work?

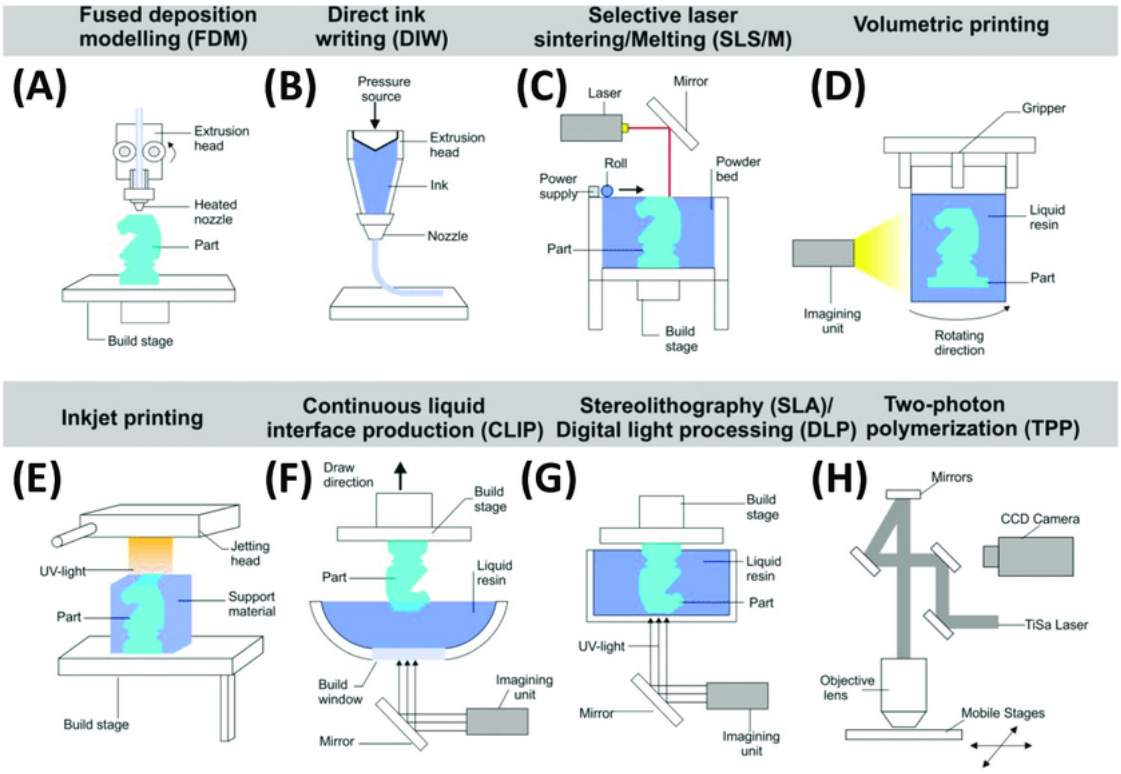
The resin used is a liquid resin, which hardens (polymerization) on contact with UV light (100-400nm). The goal is therefore, like FDM printing, to create layers of materials and then stack them. This is called additive manufacturing. The challenge is therefore to guide not a print head, but directly light (which is a wave!).

Stereolithography is a technique, often used for 3D printing, which allows solid objects to be manufactured from a digital model. The object is obtained by superimposing thin slices of material (additive method). The industrial development of this technique dates from the 1980s and was initiated in the United States by Charles W. Hull.

The materials used for SLA printing are commonly called "resins" and are thermosetting polymers. A wide variety of resins are available commercially and it is also possible to use "homemade" resins to test different compositions for example. The properties of parts obtained by SLA printing vary depending on the composition and characteristics of the resin used: "The parts can be soft or hard, heavily loaded with additional materials such as glass and ceramic, or equipped with mechanical properties such as high deformation temperature or impact resistance »1. It is possible to classify resins according to the following categories:

- *standard resins, for classic prototyping;*
- *so-called "engineering" resins, for specific mechanical and thermal properties;*
- *dental and medical resins, having biocompatibility certifications;*
- *resins for molding and casting, having zero ash content after combustion.*

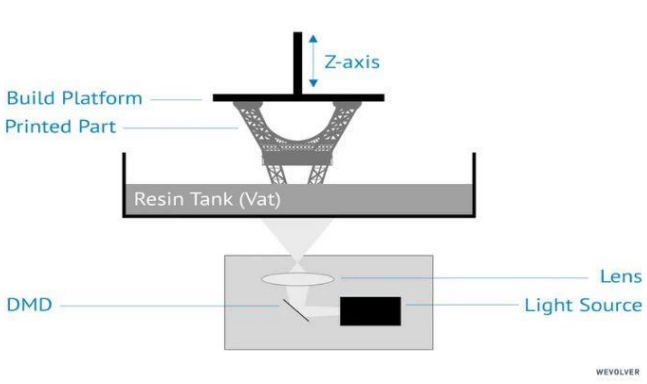
(Explanations coming from https://fr.wikipedia.org/wiki/St%C3%A9r%C3%A9olithographie)



4. The different resin printing technologies:

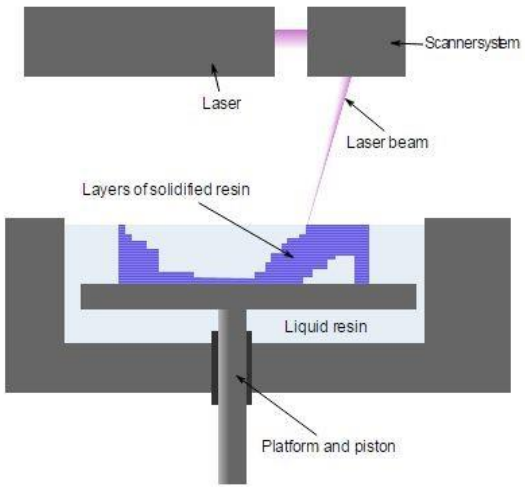
There are 3 main families of resin printing technologies: DLP, SLA, MSLA

- DLP (Digital Light Processing): DLP was created and patented by Texas Instruments for projectors. DLP 3D printers use a projector to shine UV light onto the resin tank. UV light is redirected using small mirrors to turn each pixel on or off, allowing selective polymerization of the resin.

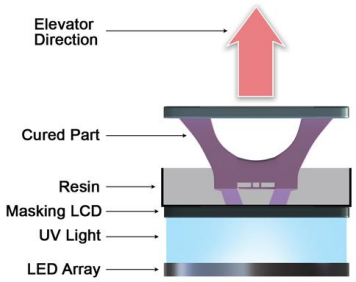


(DLP homemade from https://www.instructables.com/DIY-high-resolution-3D-DLP-printer-3D-printer/)

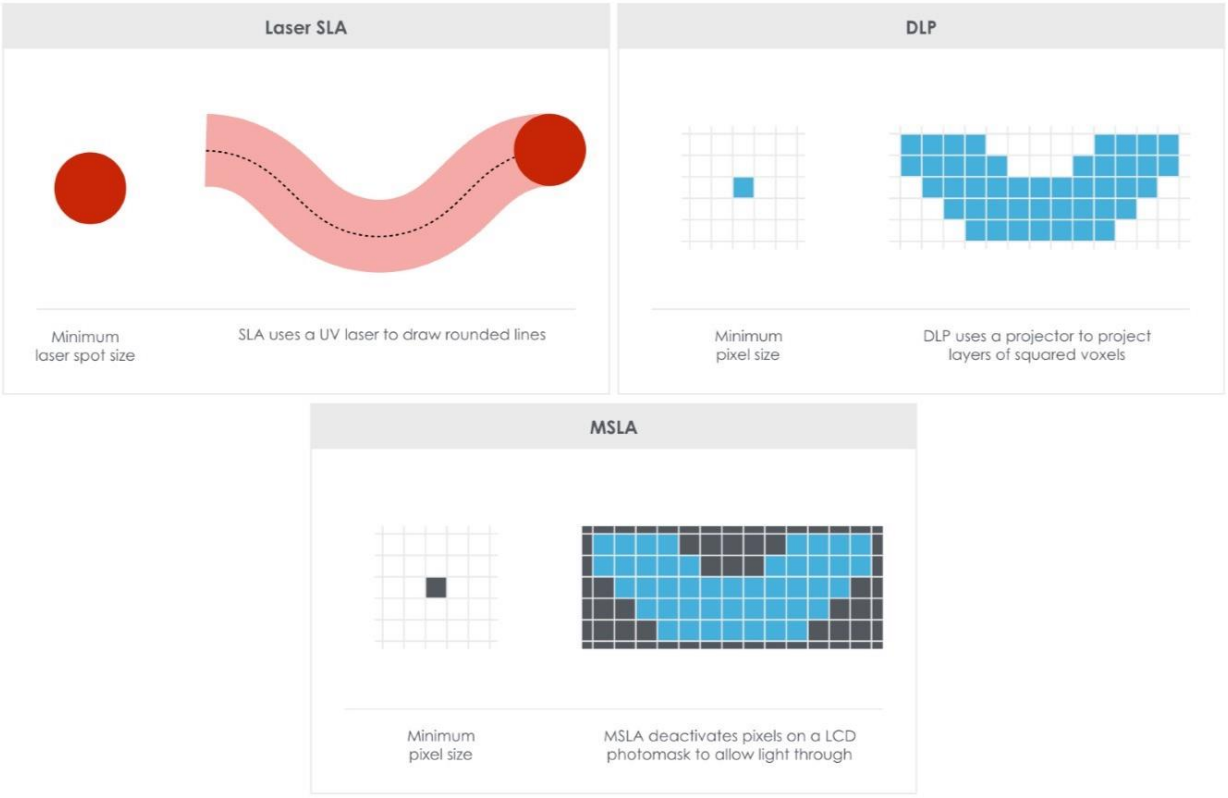
- SLA (Stereolithography) : SLA was introduced and patented in 1986 by Chuck Hull/3D Systems. This technology uses a laser directed by a galvanometer, which is a moving mirror to move the laser along the X and Y axes. The laser solidifies the photosensitive resin, layer by layer, to create the desired object.



- MSLA (Masked Stereo-Lithography Apparatuses): The MSLA uses an LCD screen to mask the UV light source. By turning each pixel on or off, the LCD screen acts like a stencil capable of creating 2D shapes to allow UV light to pass through and cure the resin.



5. How to make a choice?



In a simplified way (from what I also understood), DLP/MSLA technology is much faster than SLA technology, but gives a less "clean" surface finish (in practice not necessarily visible) due to Voxel lines, because layers are created from square or rectangular pixels.

6. More information on the basis of electronics and software :

As said above, you just need to be able to manage a motorized axis (Z) and a source providing an image (HDMI) to have the electronics necessary for the simplest resin printer.

There are two main methods

- You use **CreationWorkshop**: It is computer software, which will launch and control the engine (COM port) and the image source (HDMI -> LCD screen, projector, etc.) directly from your computer. You can use any card that can receive .gcode (Arduino Shield GRBL, MKS cards, BTT etc.). The downside is that your printer is dependent on your computer, and if the cable disconnects, it's ruined.

- You use **NanoDLP**: It is also software that can either be used on a computer or on a Raspberry microcomputer (in the majority of cases), which allows the printer to be autonomous. NanoDLP has a web interface, so you can start printing or change your printer settings from anywhere on earth. NanoDLP also contains an internal slicer, so you can directly print .stl files on a USB key connected to your Raspberry card (I chose this option because I wanted a standalone printer, if you add a Nextion screen, you don't you no longer even need to have a wifi connection to start printing). The Raspberry board has an HMDI port and therefore can directly control the projector or screen. For the motor, there are shields for Raspberry or simple DIY electronic assemblies, or you can use a control card, driven by cable by the Raspberry (I personally use an Arduino CNC v3 Shield with GRBL). More details as the guide progresses.

II. Specificities

1. Technical specifications:

- UV power: 37.8W (adjustable as needed)
- Printing area: 125*67*165mm
- Resolution: 47µm*47µm*50µm (around 1.25 µm for Z theoretically)
- Cost: about $450
- 3.2” Nextion home-screen
- Standalone use, you have just to place an .stl file on a USB key

2. Practical specifics:

- UV power easily adjustable by PWM (from 0 to 40W)
- Ease of replacement and upgrades to printed parts
- Easily accessible components, 4 screws per side plates
- Small hatch at the level of the 2K screen cable, no need for dismantling to replace it
- Display of the temperature of the LEDs and the screen surface on a display panel
- Purification of odors thanks to an activated carbon filter

III. BOM

A) Parts (available in .xlsx file)

/	Name	Quantity	Links	Price/pcs	Total price
	Raspberry PI3B	1	https://www.reichelt.com/fr/fr/raspberry-pi-3-b-4x-1-2-ghz-	34,37 €	34,37 €
	CNC Shield v3	1	https://fr,aliexpress,com/item/1005002756457153,html	2,28 €	2,28 €
	A4988	1			
	Arduino Uno	1	https://fr,aliexpress,com/item/1005006140137084,html	3,38 €	3,38 €
	10W Led UV	4	https://fr.aliexpress.com/item/4000150273569.html	2,23 €	6,17 €
	Nextion 2,8" screen	1	https://fr,aliexpress,com/item/1005003457376097,html	25,27 €	25,27 €
	DC Convertor	1	https://fr,aliexpress,com/item/1005002814189983,html	5,80 €	5,80 €
	PWM Mosfet	1	https://fr,aliexpress,com/item/1005005701820316,html	1,05 €	1,05 €
	2K 5,5" with pilot boards and protective glass	1	https://fr,aliexpress,com/item/4001119939934,html	53,15 €	53,15 €
	12V 10A Power supply	1	https://fr,aliexpress,com/item/4000594896227,html	21,29 €	21,29 €
	19mm Switch	1	https://fr,aliexpress,com/item/1005005792537720,html	2,83 €	2,83 €
	Radial Fan 4010 12V	1	https://fr,aliexpress,com/item/1005005585529880,html	1,69 €	1,69 €
	Fan 4010 12v	1	https://fr.aliexpress.com/item/1005003878405207.html	1,55 €	1,55 €
	Fan 5010 12V	1	https://fr,aliexpress,com/item/1005003886352415,html	1,38 €	1,38 €
	Fan guard 50mm	1	https://fr,aliexpress,com/item/32960062183,html	2,24 €	2,24 €
	MGN12C 250mm	2	https://fr,aliexpress,com/item/1005004031409270,html	13,03 €	26,06 €
	Bearing screw with nut SFU1204 250mm	1	https://fr,aliexpress,com/item/1005003123069076,html	14,24 €	14,24 €
	2020 Profile 240mm	4	https://fr,aliexpress,com/item/1005001604693930,html	4,84 €	19,36 €
	2020 Profile 70mm	4	https://fr,aliexpress,com/item/1005001604693930,html	3,03 €	12,12 €
	2020 Profile 400mm	2	https://fr,aliexpress,com/item/1005001604693930,html	7,05 €	14,10 €
	2020 Profile 170mm	4	https://fr,aliexpress,com/item/1005001604693930,html	4,17 €	16,68 €
	2020 Corner brackets	38	https://fr,aliexpress,com/item/1005005899867932,html	5,17/20pcs	10,34 €
	JST 2p	1	https://fr,aliexpress,com/item/1005004955655144,html	1,27 €	1,27 €
	DC Female 5,5x2,5	1	https://fr,aliexpress,com/item/1005001368469076,html	3,76 €	3,76 €
	T-nut 2020 M4	128	https://fr,aliexpress,com/item/1005005751429865,html	1,98/50pcs	5,94 €
	8x3mm Magnets	6	https://fr,aliexpress,com/item/1005006520197884,html	1,78/5pcs	1,78 €
	LM2596	1	https://fr,aliexpress,com/item/1005006133320882,html?	1,17 €	1,17 €
	Aluminium dissipator 40x20x100mm	1	https://fr,aliexpress,com/item/1005001555130897,html	4,27 €	4,27 €
	12mm led switch	1	https://fr,aliexpress,com/item/1005005578982626,html	1,54 €	1,54 €
	Temperature's screen	1	https://fr,aliexpress,com/item/1005005237855840,html	2,43 €	2,43 €
	Nema 17	1	https://fr,aliexpress,com/item/1005005882900046,html	6,31 €	6,31 €
	Coupler 5x8mm	1	https://fr,aliexpress,com/item/1005005637535350,html	2,13 €	2,13 €
	Endstop	1	https://fr,aliexpress,com/item/1005004934890302,html	1,85 €	1,85 €
	Carbon filter	1	https://fr,aliexpress,com/item/1005005393174709,html	6,97/5pcs	6,97 €
	Plexiglass 242x212x2mm	1			
	Plexiglass 238x300x2mm	2			
	Plexiglass 212x300x2mm	2			
	Vinyle 300x600mm	3	https://fr.aliexpress.com/item/1005004194562295.html		5,79 €
	double-sided thermal paste tape	1	https://fr,aliexpress,com/item/1005005857666664,html	2,29 €	2,29 €
	Filament	2 minimum		20,00 €	40,00 €
	HDMI to HDMI cable	1	https://fr.aliexpress.com/item/4000014554460.html	4,71 €	4,71 €
	SLA print plate 124x70mm	1	https://fr.aliexpress.com/item/1005004860158956.html	14,73 €	14,73 €
					382,29 €

B) Screws

Name	Quantity	Links	Price/pcs	Total price
M2x8mm	6	https://fr.aliexpress.com/item/32810872544.html	1,08	1,08
M2x20mm	2	https://fr.aliexpress.com/item/32810872544.html	1,71 €	1,71 €
M3x6mm	6	https://fr.aliexpress.com/item/32810872544.html	1,17 €	1,17 €
M3x8mm	30	https://fr.aliexpress.com/item/32810872544.html	1,31 €	1,31 €
M3x10mm	14	https://fr.aliexpress.com/item/32810872544.html	1,54 €	1,54 €
M3x12mm	27	https://fr.aliexpress.com/item/32810872544.html	1,64 €	1,64 €
M3x16mm	8	https://fr.aliexpress.com/item/32810872544.html	2,03 €	2,03 €
M3x20mm	4	https://fr.aliexpress.com/item/32810872544.html	2,28 €	2,28 €
M4x8mm	130	https://fr.aliexpress.com/item/32810872544.html	1,42 €	9,94 €
M4x10mm	85	https://fr.aliexpress.com/item/32810872544.html	1,57 €	6,28 €
M4x16mm	46	https://fr.aliexpress.com/item/32810872544.html	1,86 €	1,86 €
M4x20mm	8	https://fr.aliexpress.com/item/32810872544.html	2,01 €	2,01 €
M6x40mm	1	https://fr.aliexpress.com/item/32810872544.html	3,36 €	3,36 €
M6x50mm	4	https://fr.aliexpress.com/item/32810872544.html	3,80 €	3,80 €
Inserts M2x4mm long	6	https://fr.aliexpress.com/item/1005006071488810.html	2,10 €	2,10 €
Inserts M3x3mm long	2	https://fr.aliexpress.com/item/1005006071488810.html	2,88 €	2,88 €
Inserts M3x4.2mm long	94	https://fr.aliexpress.com/item/1005006071488810.html	3,22 €	3,22 €
Inserts M4x4.7mm long	24	https://fr.aliexpress.com/item/1005003582355741.html	2,72 €	2,72 €
Inserts M6x7.9mm long	4	https://fr.aliexpress.com/item/1005003582355741.html	2,91 €	2,91 €
M6 nut	1		- €	- €
Spacer M3x3mm	7	https://fr.aliexpress.com/item/1005005545724429.html	1,34 €	1,34 €
Spacer M3x5mm	16	https://fr.aliexpress.com/item/1005005545724429.html	1,48 €	1,48 €
M3 washers	4	https://fr.aliexpress.com/item/32975752411.html	0,95 €	0,95 €
M6 washers	5	https://fr.aliexpress.com/item/32975752411.html	1,41 €	1,41 €
				59,02 €

Total is around 430 euros (460$)

I designed few versions of the printer and it was hard to count the screws precisely (even with SolidWorks special option), so sorry if the right account isn't perfect (for inserts or T-nut).

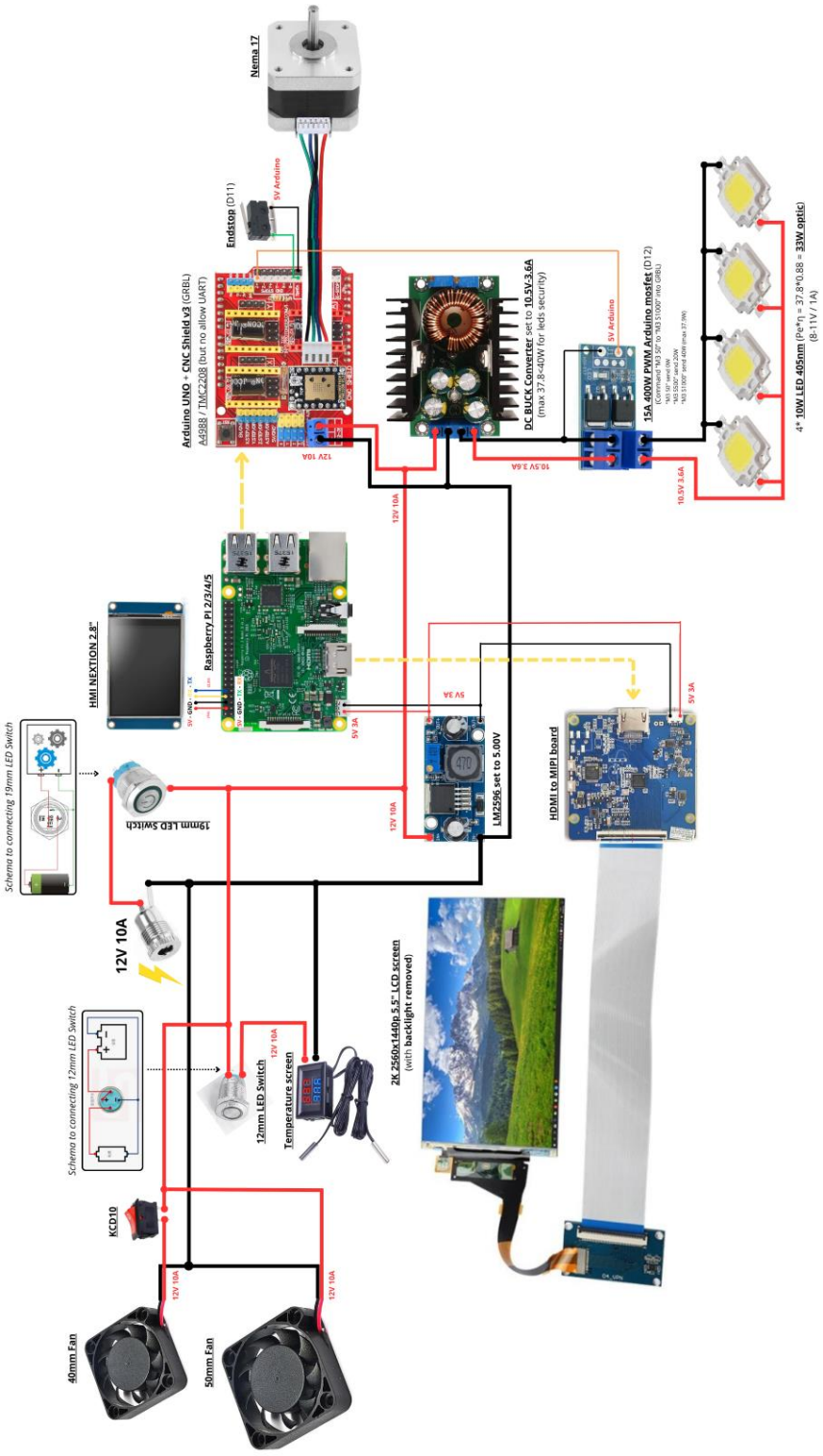
C) BOM for Helios – Curing Station (available in .xlsx file)

Name	Quantity	Links	Price	Total price	
Timer module	1	https://fr.aliexpress.com/item/1005005994998871.html	1,82 €	1,82 €	
LM2596	1	https://fr.aliexpress.com/item/1082500515.html?	0,94 €	0,94 €	
PWM 12V	1	https://fr.aliexpress.com/item/1005006462873434.html	1,40 €	1,40 €	
16mm Led switch	1	https://fr.aliexpress.com/item/1005005617484886.html	2,22 €	2,22 €	
3010 12V Fan	2	https://fr.aliexpress.com/item/1005003371996395.html	0,99 €	1,98 €	
DC Jack Socket	1	https://fr.aliexpress.com/item/1005001368469076.html	3,77 €	3,77 €	
Double side tape	/				
Mirror tape	5	https://fr.aliexpress.com/item/1005003341029080.html	3,17 €	3,17 €	
Turning Base	1	https://fr.aliexpress.com/item/1005006211006031.html	7,88 €	7,88 €	
405nm Leds 12V	2m	https://fr.aliexpress.com/item/4001062709706.html	4,59 €	4,59 €	
5x3mm magnets	8	https://fr.aliexpress.com/item/1005001998183752.html	1,24 €	1,24 €	29,01 €
M3x6	6				
M3x8	8				
M3x12	18				
Spacer M3x5	4				
M3 Inserts	26				

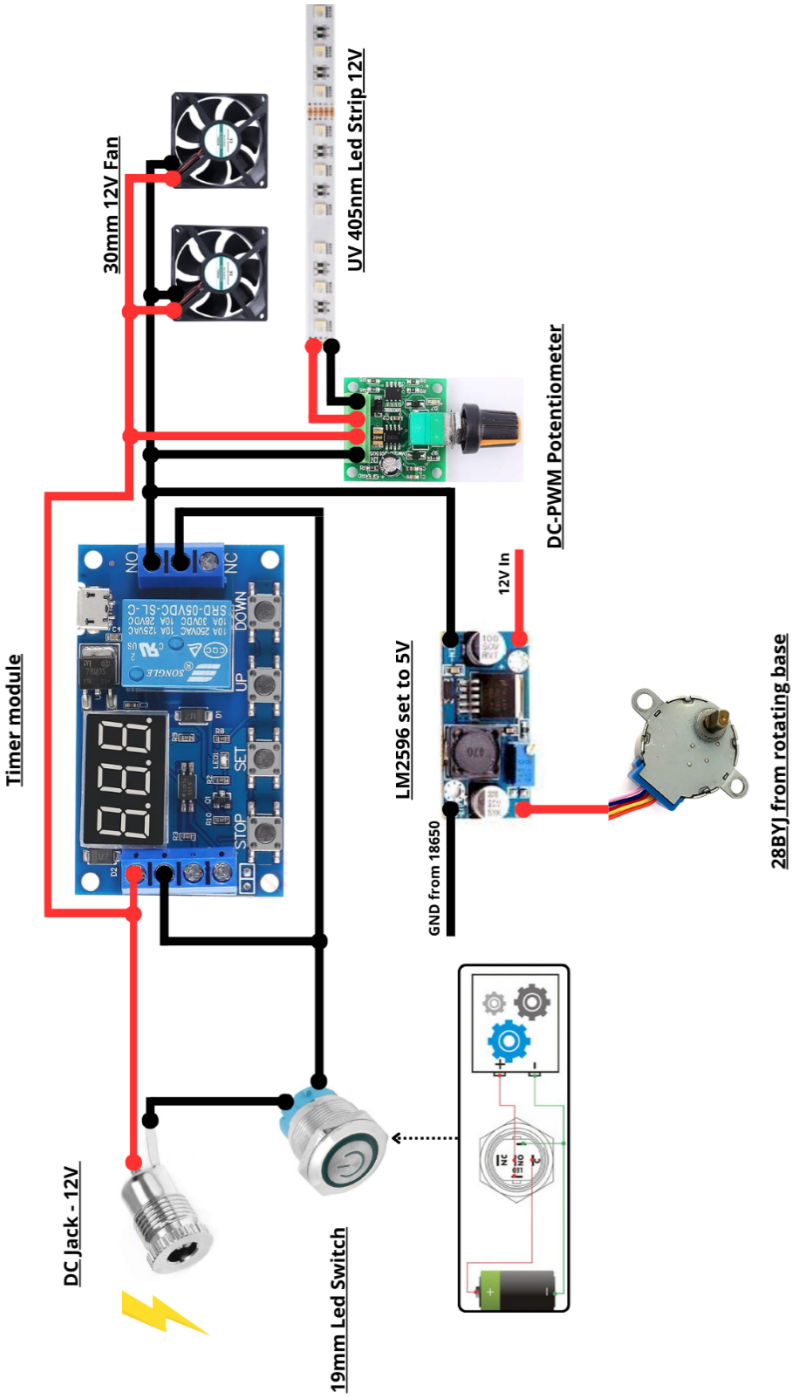
B) **Hardware configuration:**

IV. Wiring diagrams

A) Cyclop – MSLA Printer



B) Helios – Curing Station



V. Assembly Instructions

The parts may have been updated in the meantime, as well as the names of the files to print, but the instructions remain the same.

I didn't take any photos during construction, so the guide is based on the CAD design. Some steps may seem non-logical at first glance, so I strongly advise you to read this entire part before starting construction, so that you understand the connections between the different parts. "SA" means "Sub-Assembly", and "SE" means "Sub-Set" (from French, I don't know if you know/use these terms). SA is an assembly including SE, so we building SE before building SA.

To finish the introduction, I remind you that English is not my mother language, so forgive me if the translation may be meaningless.

Cyclop :

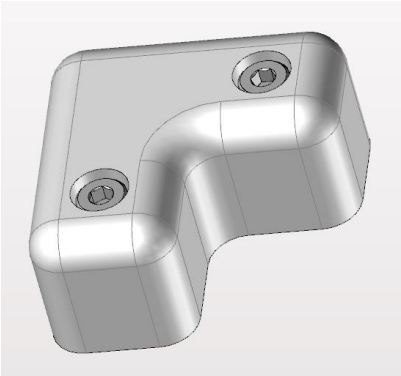
Helios :

A) Assembly instructions for Cyclop MSLA Printer

1. Feet

- Parts to print: **4*** *"Foot"*
- Parts:
  - **2*** M4x20mm
- Number to build: ***4**

Place the two screws in their locations



step completed! ✓

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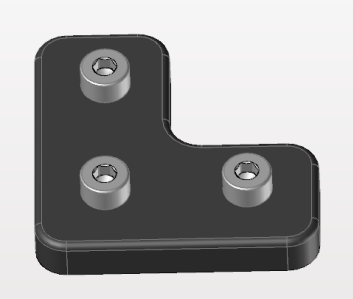
2. Corners

- Parts to print: **16*** "*Corner"*
- Parts:
  - **3*** M4x10mm
- Number to build: ***16**

Place the three screws in their locations

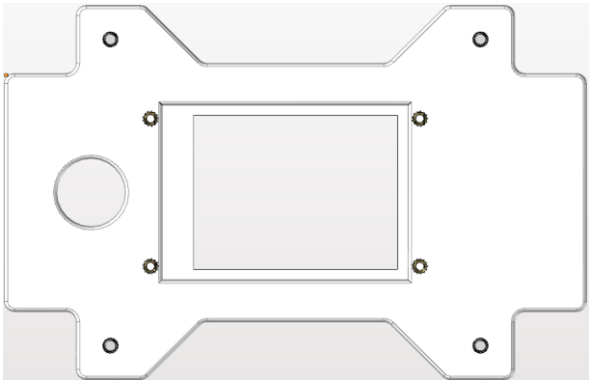


step completed! ✓

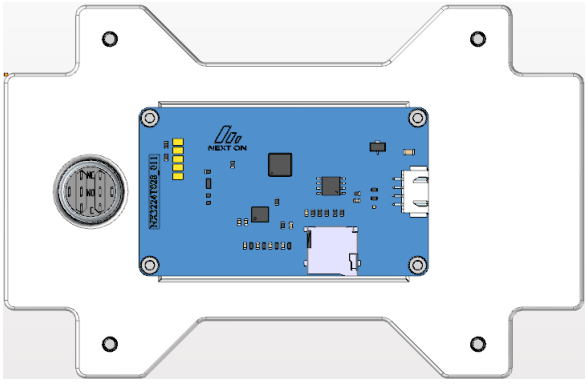
3. Front plate

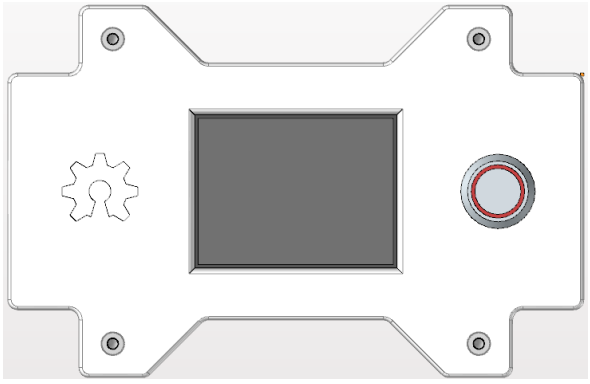
- Parts to print: "*Front_plate*"
- Parts:
  - **4***M3x10mm
  - **4***M4x10mm
  - **4***M3x4x4.2mm inserts
  - **1*** 19mm led switch
  - **1*** Nextion 2.8"

1) *Insert the 4 inserts into their slots to hold the Nextion screen*



2) *Tighten the screen with the 4 screws, secure the switch in its location with its nut, and slide the 4 screws into their locations*





step completed! ✓

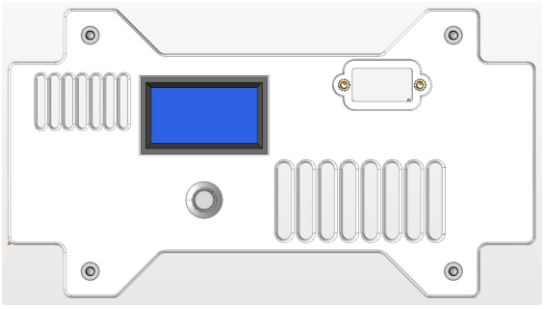
4. Left plate

Parts to print : *"Left_plate" + "Mipi_clamp"*

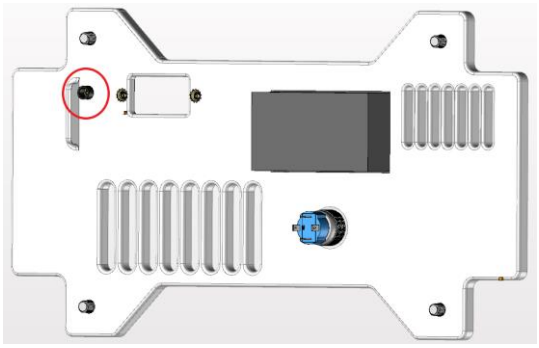
Parts :

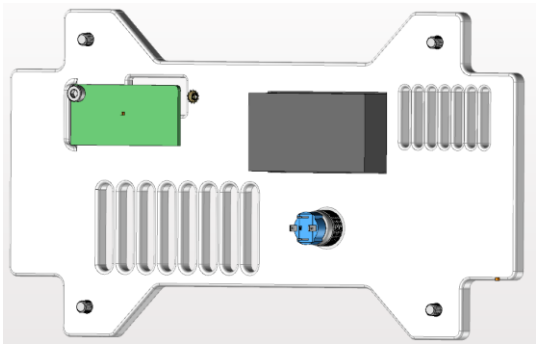
- **2***M3x6mm
- **1***M3x10mm
- **3*** M3x3mm inserts
- **1*** 5mm spacer
- **4***M4x10mm
- **1*** 12mm led switch
- **1*** Temperature screen

1) *Place the 4 M4x10 screws in their locations (on the edges), as well as the temperature screen and the 12mm switch (with its nut). Also insert the two M3x3mm inserts for the MIPI board cover.*

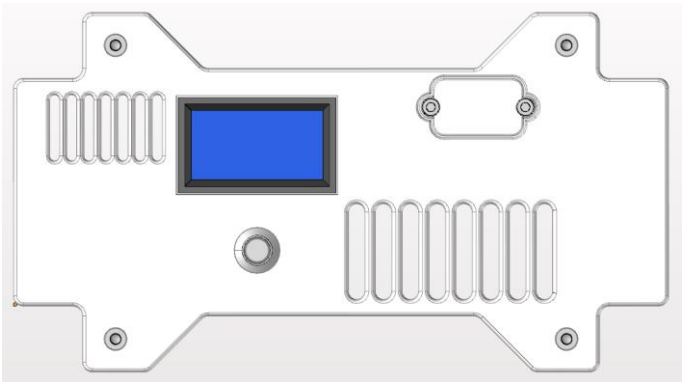


2) *Insert the M3x3mm insert for holding the MIPI board, and secure it with the M3x10mm screw, with a 5mm spacer to space the MIPI*





3) *You can place the cover, and secure it with two M3x6mm screws.*



step completed! ✓

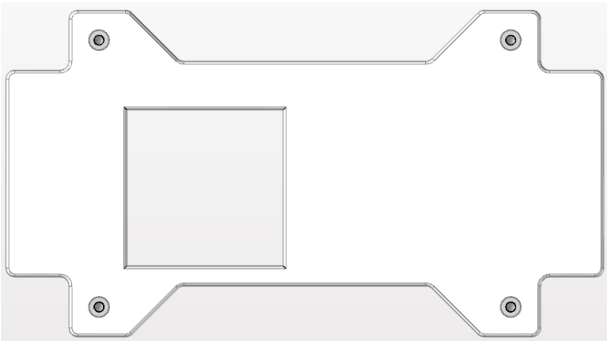
5. Right plate

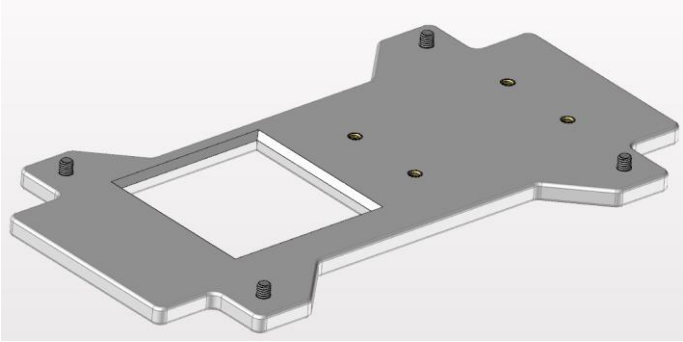
Parts to print: “*Right_plate”*

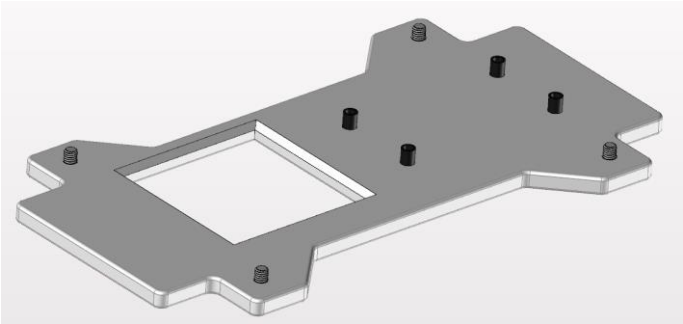
Parts:

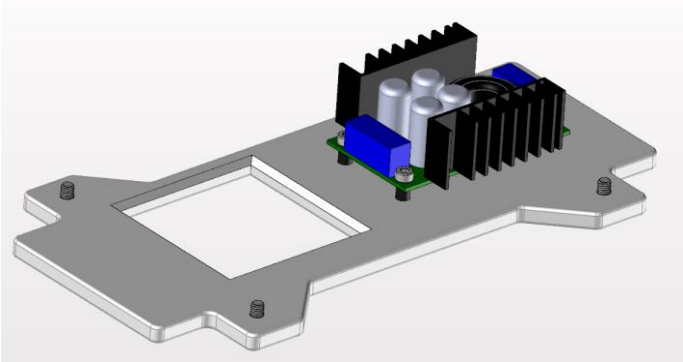
- **4*** M3x4.2x4mm inserts
- **4*** 5mm spacers
- **4*** M3x10mm
- **4***M4x10mm
- **1*** DC-DC Buck Converter (see the BOM)

As usual, place the 4x M4x10mm screws in their locations. Flip the plate over, insert the 4 inserts then secure the converter (output set to 10.5V - 3.6A) with the 4 M3x10mm screws, with a 5mm spacer between.









step completed! ✓

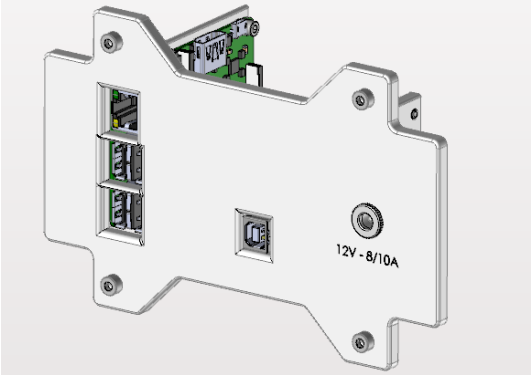
6. Back plate

Parts to print: “*Back_plate”*

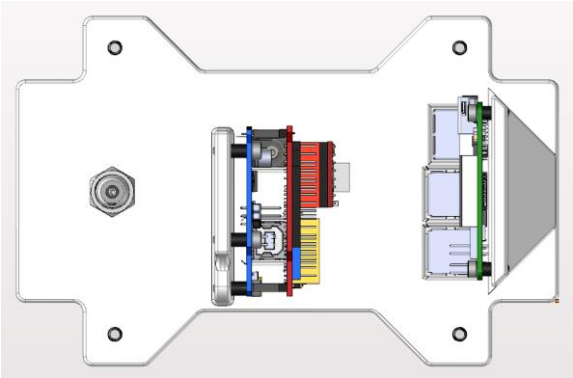
Parts:

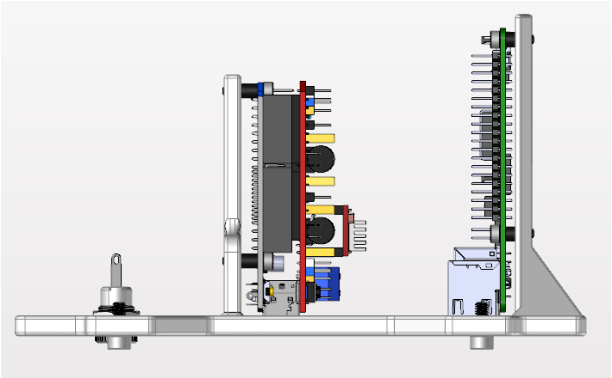
- **4*** M3x10mm
- **4*** 3mm spacer
- **3*** 5mm spacer
- **3*** M3x12mm
- **7*** M3x4x4.2mm inserts

Place the 4x M4 screws, insert 4x inserts for the Raspberry location and 3 inserts for the Arduino location. Place the DC jack connector with its nut on the other side (min. 8A resistant).



The Arduino is spaced 5mm from support, and the Raspberry 3mm with 4x M3x10mm screws, then secure the Arduino with 3 M3x12 screws.





step completed! ✓

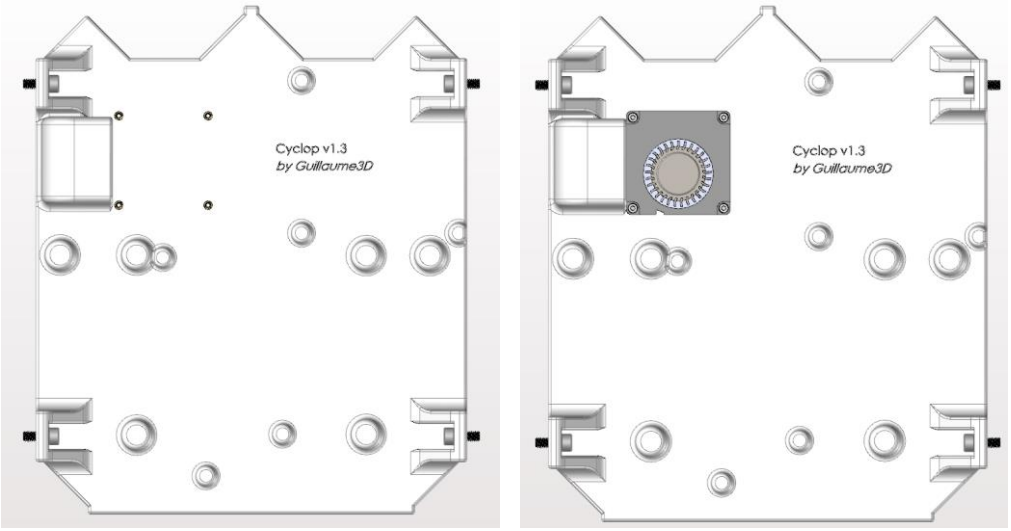
7. SE base

Parts to print: "*Base"*

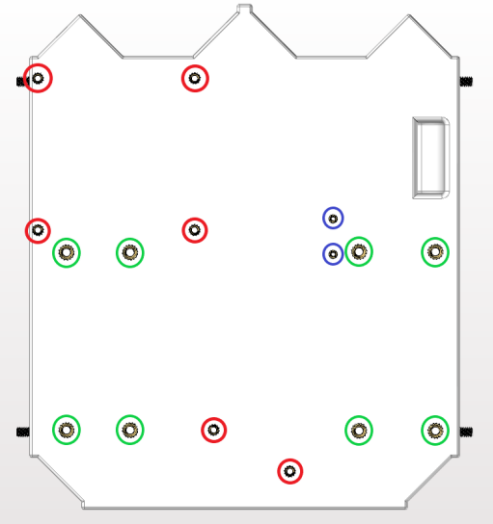
Parts:

- **2*** M2x4mm inserts
- **6*** M3x4.2x4mm inserts
- **8*** M4x4.7mm inserts
- **2*** 3mm spacers
- **6*** 5mm spacers
- **4*** M2x8mm
- **6*** M3x10mm
- **4***M4x10mm
- 4010 radial fan
- HDMI-MIPI board
- LM2596 regulator
- PWM Arduino regulator board

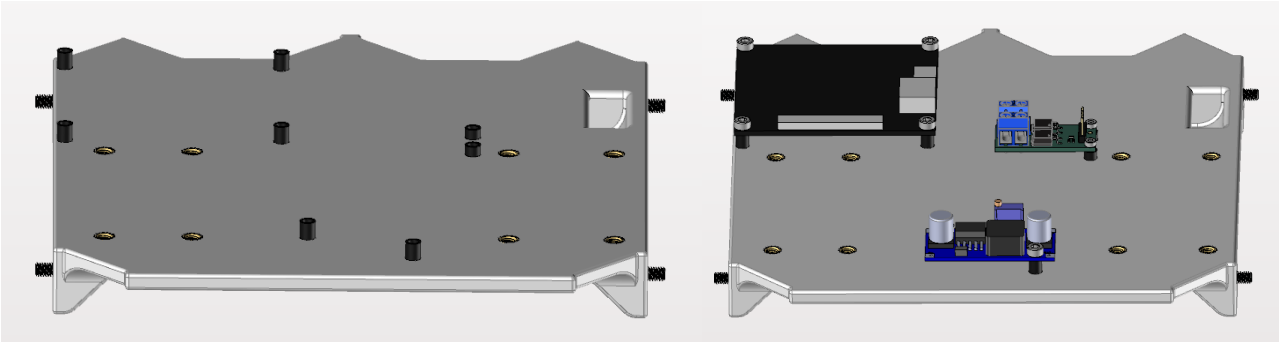
Place the 4 M4x10mm screws in the corners, then the 4 M2x4mm inserts in the fan location. Secure the fan to the inserts with 4 M2x8mm screws.



Place the 4 M3x4x4.2mm inserts at the location of the red circles. Place the 2 M2x4mm inserts at the location of the blue circles. Place the 8 M4x4.7mm inserts in the location of the green circles.



Place the 6 5mm spacers above the M3 inserts, then fix the HDMI-MIPI card and the LM2596 converter (set to 5.0V output, otherwise you will burn the Raspberry which will connect to it! with M3x10mm screws. Place the two 3mm spacers (3mm not 5mm, important!) then secure the PWM card with two M2x8mm screws.



step completed! ✔

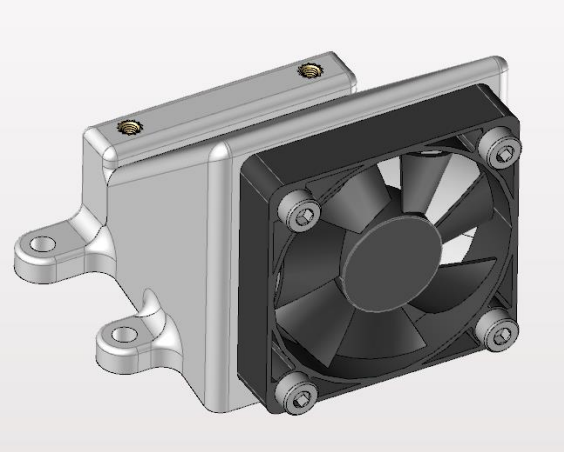
8. SE UV

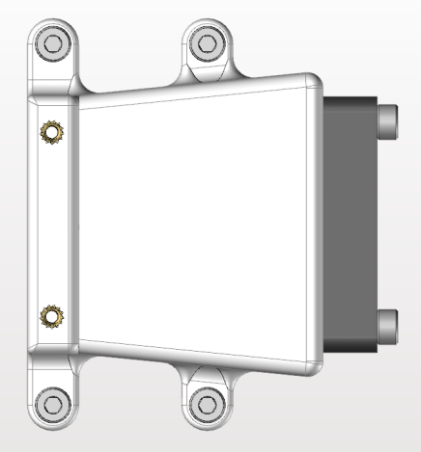
Parts to print: "*UV_cooling" + "UV_cooling_ending"*

Parts:

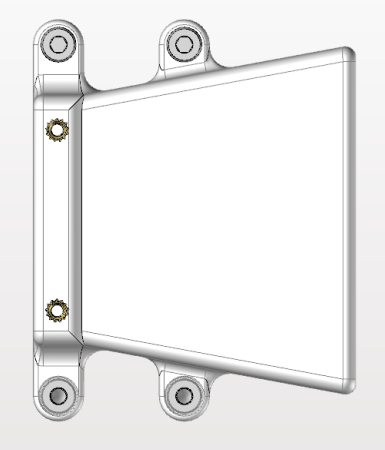
- **4*** M3x4.2x4mm inserts
- **4*** M4x16mm (or 4* M3x4x4.2mm + 4* M3x16mm) for 5010 fan
- **6*** M4x12mm
- **2*** M4x10mm
- 5010 fan

Place two M3x4x4.2mm inserts on top, then secure the 5010 fan with 4 M4x16mm screws (slots for M3x4x4.2mm inserts will surely be present on your version). Place 4 M4x12mm screws.





On the end piece, place the two M3x4x4.2mm inserts, then two M4x12mm screws on the upper part, and two M4x10mm screws on the part with the recesses.



step completed! ✓

9. SA Base

Parts to print: *"Reflector"*

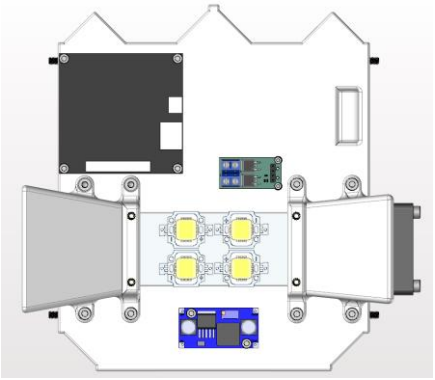
Parts:

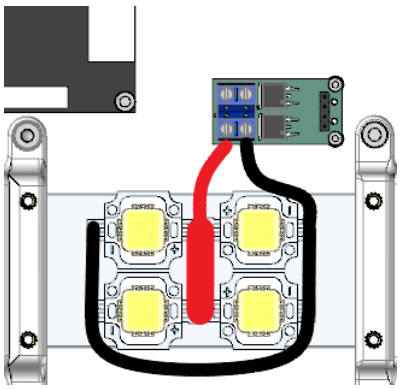
- **4*** M3x8mm
- 40x20x100mm aluminum dissipator
- **4*** 10W UV Leds
- 10A wires
- Thermal double-sided tape
- Cardboard (approx. 1mm thick)
- Aluminum foil

Mounted parts:

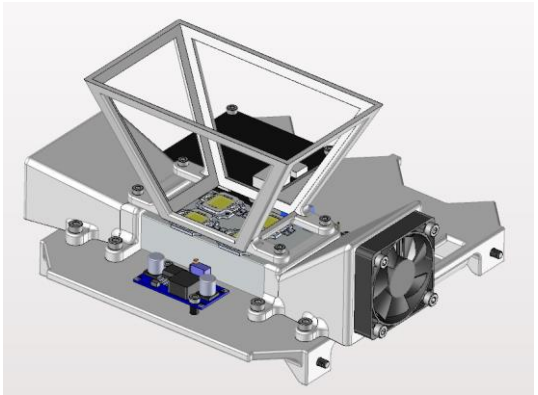
- *"SE Base"*
- *"SE UV"*

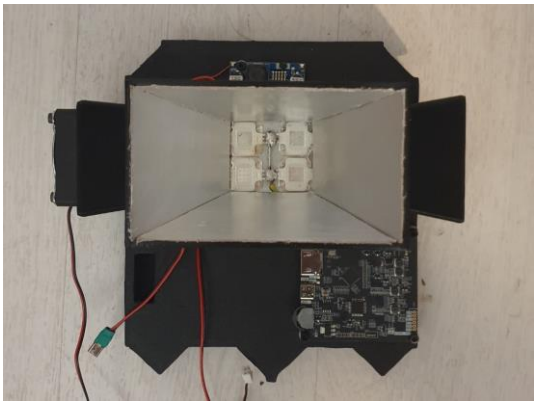
Place and screw the two parts onto the base, with the 40x20x100mm heatsink placed between the two. I advise you to immediately attach the 4 10W LEDs. Secure them with double-sided thermal tape, then solder them. Check the connections at the PWM output, depending on the manufacturer the ground and positive may be reversed. Take cable capable of holding 10A.





Screw the reflector with 4 M3x8mm screws, then glue cardboard with aluminum foil previously glued to the walls of the reflector. The shiny side of the paper must be glued to the cardboard, so that the matte side diffuses the light.





step completed! ✓

10. SE Frame

Parts:

- **2*** M2x16mm
- **20*** M3x10mm
- **78*** M4x8mm
- **54*** M4x10mm (+4 from "*SA Base")*
- **78*** M4 washers
- **38*** 2020 aluminium corners
- **2*** 200mm MGN12
- **4*** 70mm 2020 profile
- **4*** 170mm 2020 profile
- **4*** 240mm 2020 profile
- **2*** 400mm 2020 profile
- **20*** T-nut M3
- **132*** T-nut M4

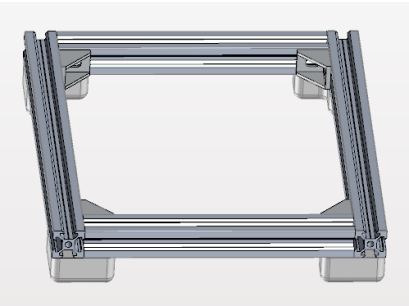
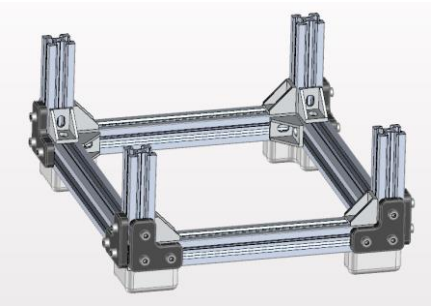
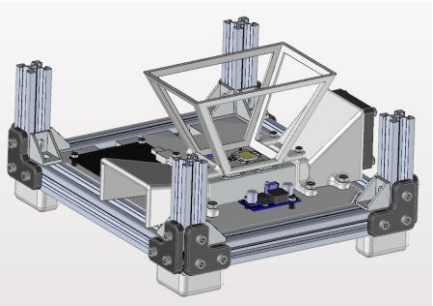
Mounted parts:

- **4*** "*Foot*
- **16* "***Corner"*
- *"SA Base"*

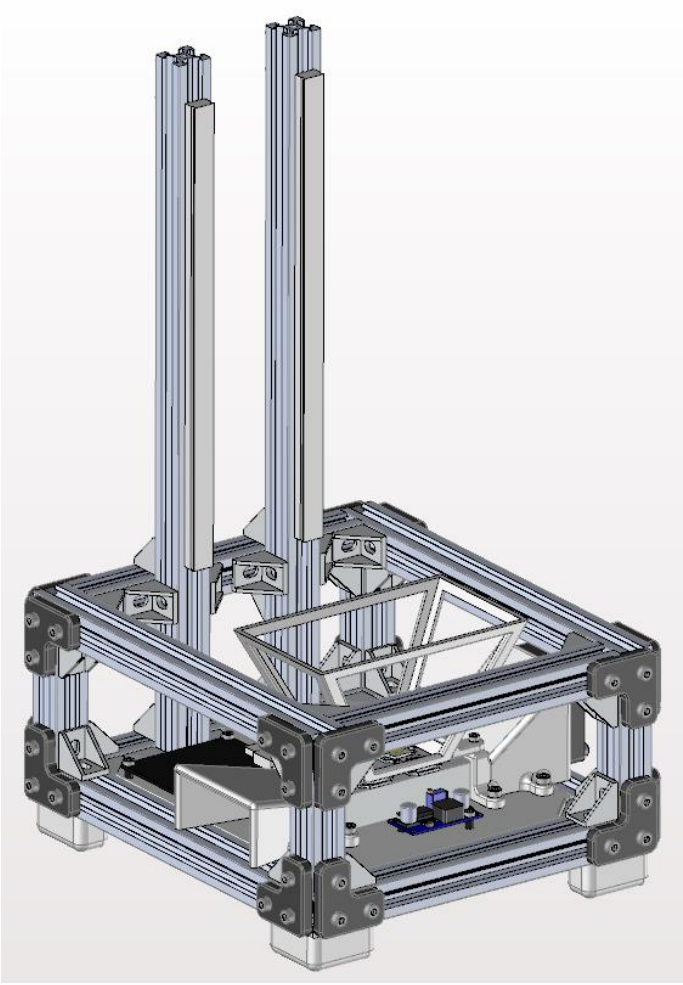
Good luck with this part, it's the longest! You need to assemble all the aluminum profiles. The aluminum right angles each use 2 M4x8mm screws, with washers. The printed corners use 3 M4x10mm screws (depending on the orientation, one of the screws will not have a thread to attach to, for example this is the case for the front panel).

Start by building the bottom square structure before gradually increasing in height. You will need to attach "SA Base" before mounting the second square structure on top otherwise you will not have the space to do it afterwards.

MGN rails use M3x10mm screws, so be careful to use M3 T-nuts and not M4.

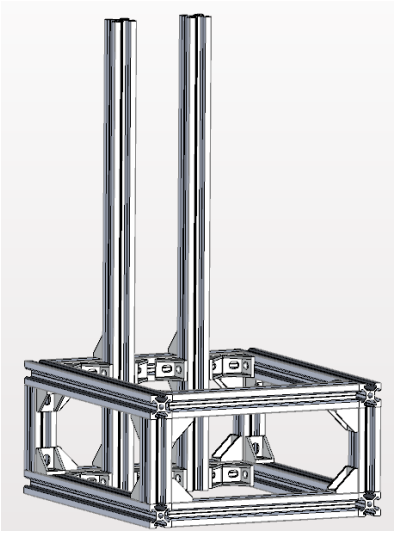




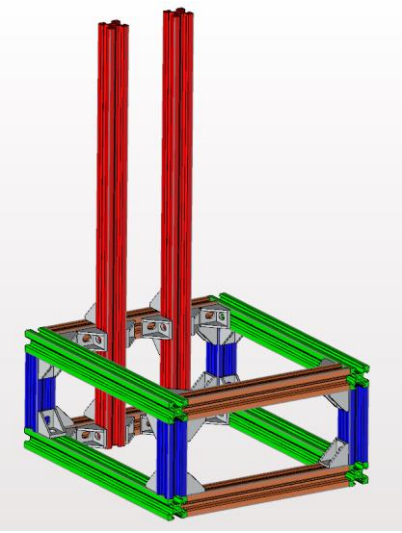
You should have this result:



(follower's pictures are there to illustrate the position of aluminum profiles)

- **Blue: 4*** 70mm
- **Orange: 4*** 170mm
- **Green: 4*** 240mm
- **Red: 2*** 400mm





step completed! ✓

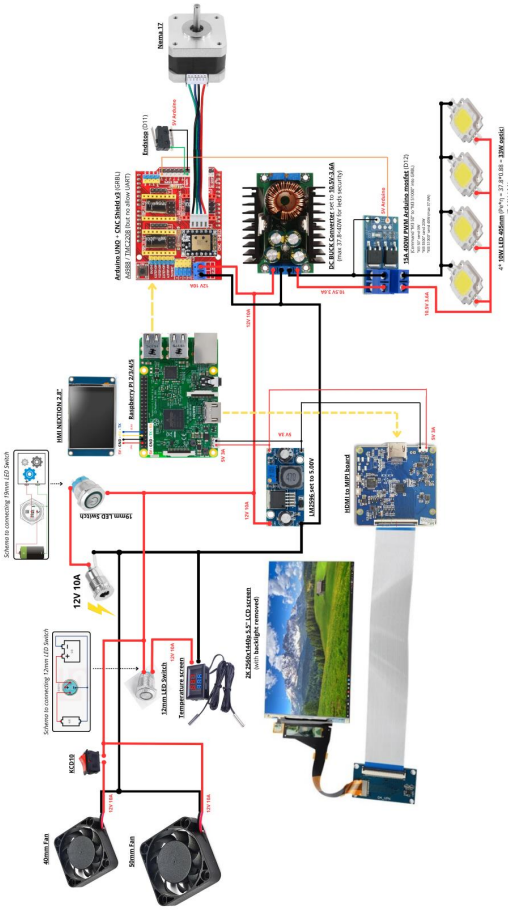
11. Electrical connections and mounting of side plates

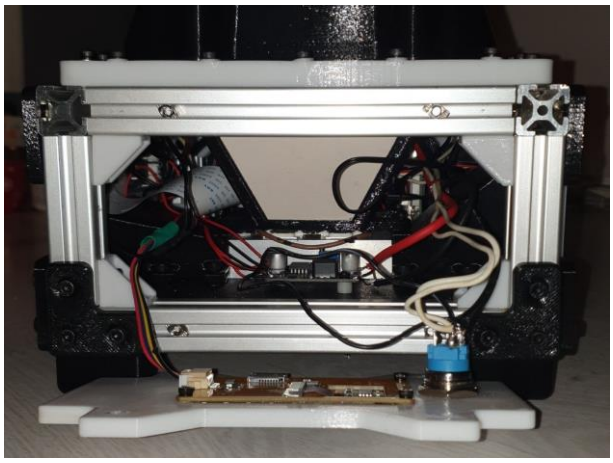
It's time to assemble all the plates and start connecting everything together! Adjust the length of the cables so that you still have enough room to remove the plates with some distance if necessary.

Prepare the cables for connecting the endstop and the purification fan. I advise you to put JST or Dupont connectors at the end to facilitate the connection of these elements which will be outside the chassis.

The connection diagram is available in large format in this guide, see the summary.

Be sure the LM2596 is set to 5.0V and the DC-Buck converter to 10.5V-3.6A.





step completed! ✔

12. SE Top

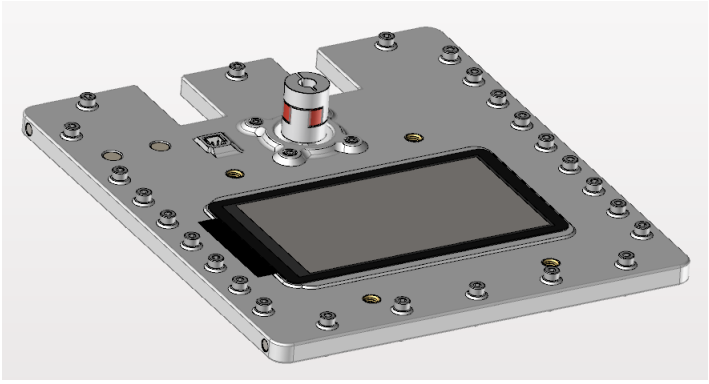
Parts to print: *"Top_plate"*

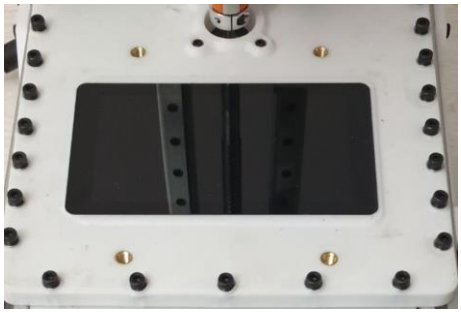
Parts:

- **4*** M3x16mm
- **25*** M4x16mm
- **25*** M4 washers
- **4*** M6x7.9mm inserts
- Nema 17
- 5mm to 8mm coupler
- Thermal double-tape
- **4*** 5x3mm magnet
- **2*** 8x3mm magnet
- 5.5" 2k LCD screen (with backlight removed)
- Superglue

Don't pay attention to the JST connector on the left of the motor, it's an old version!

Place the 25 M4 screws (with washers to prevent the screw from sinking into the plastic) on the top surface of the part. Secure the motor using the 4 M3x16mm screws (15 or 14mm would be better if you have them). Glue the two 8x3mm magnets to the upper surface, to the left of the motor, with superglue. On the left and right-side faces there are 2 slots at once. Glue the 4 5x3mm magnets to these 4 locations with superglue. Place the screen in its location, ensuring that the screen cable passes underneath. Be very careful, it is extremely delicate! Secure the screen with double-sided tape, the same as for sticking the LEDs.





step completed! ✓

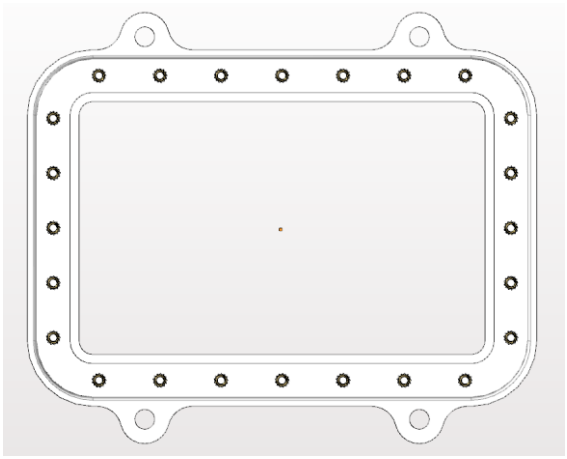
13. SE Tank

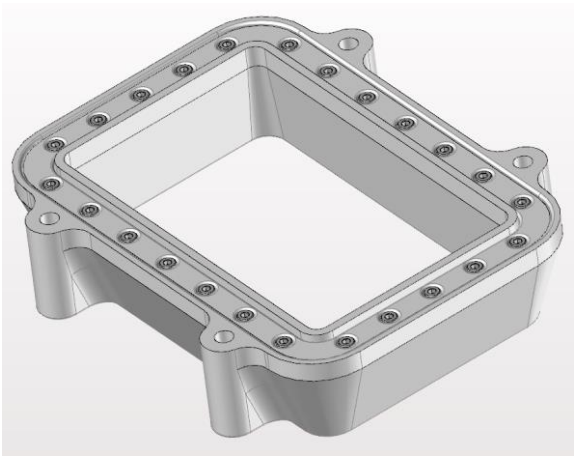
Parts to print: *“Tank” + “FEP_clamp”*

Parts:

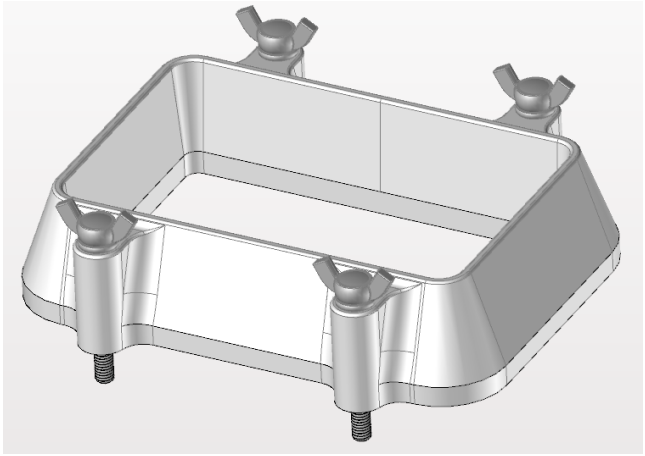
- **24*** M3x4x4.2mm inserts
- **24*** M3x8mm
- **4*** M6x50mm
- **1*** FEP film

Insert the 24 M3 inserts into “Tank”. Place “Fep_clamp” in the slot, then firmly tighten the 24 M3x8mm screws. Once done (to be sure that the inserts are well aligned), unscrew the 24 M3 screws (sorry, yes, it's long...) then put the FEP film in place. It must be well stretched; it is quite a complex manipulation. Help yourself to a video on YouTube, search for “FEP replacement Elegoo Mars” or something similar.





Position the 4 M6x50mm screws.



step completed! ✔

14. SA Top

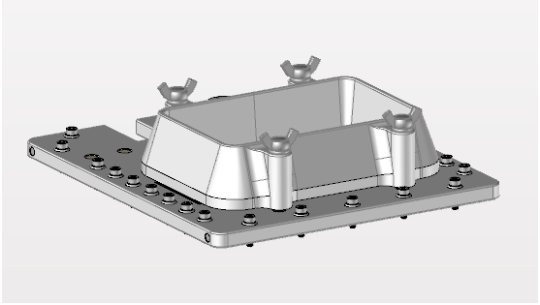
Parts:

- **25*** M4 T-nut

Mounted parts:

- *SE Top*
- *SE Tank*
- *SE Frame*

Screw in the 4 M6x50mm screws to attach "SE Tank" to "SE Top", then attach "SE Top" to "SE Frame" with the 25 screws (and M4x16mm T-nut). Don't forget to connect the screen cable to the "Left_plate" MIPI card! Same for the Nema 17 cable, connect it to its location on the Arduino CNC v3 shield (connection diagram, see summary). If the T-nuts are difficult to put on, remember that when the profile is horizontal, the T-nuts go in and are placed on the right side easily. Make sure that the cables to connect the endstop and the purifying fan will still be accessible once the top plate is mounted. You can slide these cables through the Z profiles.



step completed! ✔

15. SA Print Platform

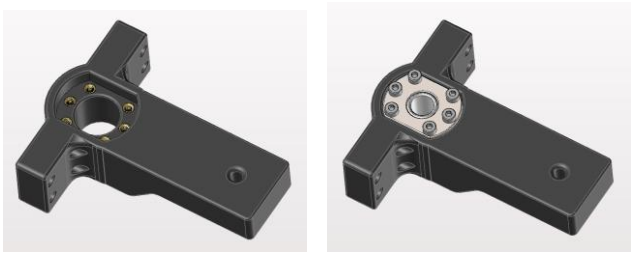
Parts to print: *"Z_axis" + "Platform_clamp" + "Print_platform"*

Parts:

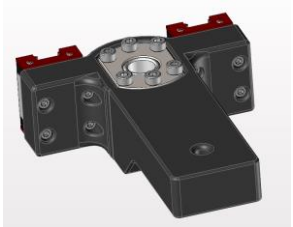
- **8*** M3x16mm
- **1*** M4x8mm
- **4*** M4x10mm
- **1*** M4x8mm
- **4*** M4x10mm
- **6*** M4x16mm
- **1*** M6x40mm
- **1*** M6 washer
- **1*** M6 nut
- **11*** Inserts M4x5x6mm
- **1*** SFU1204 nut
- **1*** SFU1204 250mm
- **2*** MGN12C carriage

The SFU1204 ball screw is normally linked to the nut, I have hidden it during the screenshots to allow better visibility

Insert 6 M4 inserts, then screw the SFU1204 nut into its location with 6 M4x16mm screws.

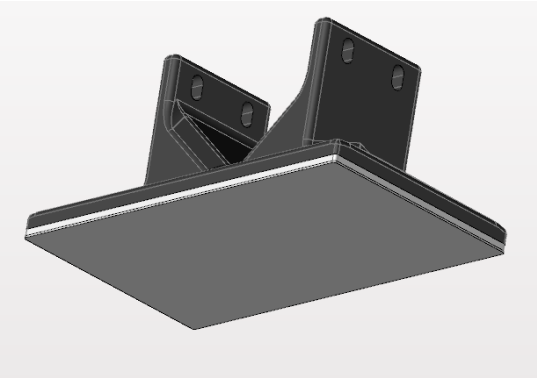


Secure the 2 MGN12C carriages using 4 M3x16mm screws each.

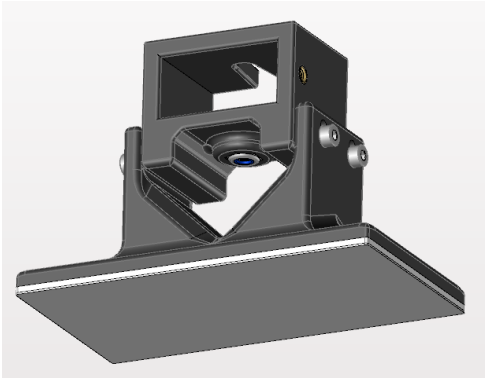


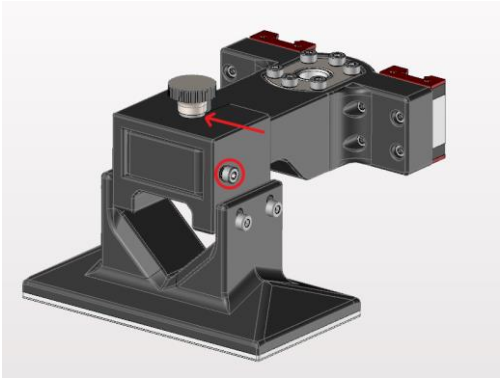
Insert 5 M4 inserts, then insert the M6 nut into its location (you can put a dot of glue so that it stays there)

Attach the magnetic print surface to the print platform:

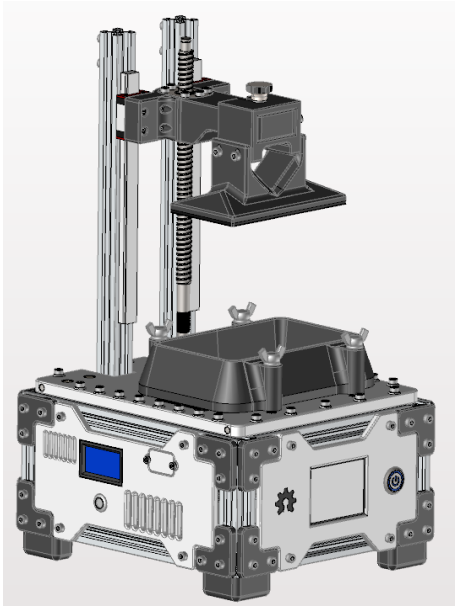


You can now assemble the 3 parts. The printing platform is held by 4 M4x10mm screws, and there is an M4x8mm screw (red circle) to hold the whole thing together. Don't forget to position the M6x40mm screw with its washer, in the nut below.





You can now slide "SA Print platform" onto the MGN12 rails, then connect the SFU1204 shaft to the coupler on the motor.



step completed! ✓

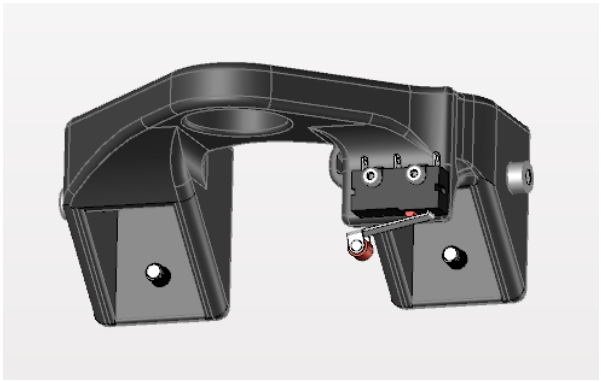
16. Z Top v2

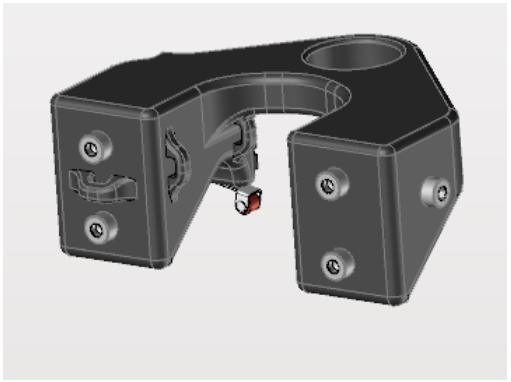
Parts to print: *"Z_Top_v2"*

Parts:

- **2*** M2x12mm
- **6*** M4x10mm
- **6*** T-nut M4
- **1*** Endstop

Secure the endstop with two M2x12mm screws, there is no need for inserts.





You can attach Z top to the chassis, with 6 M4x10mm screws. The electrical wires of the endstop pass from behind "Z_top", through the half-rings.

step completed! ✓

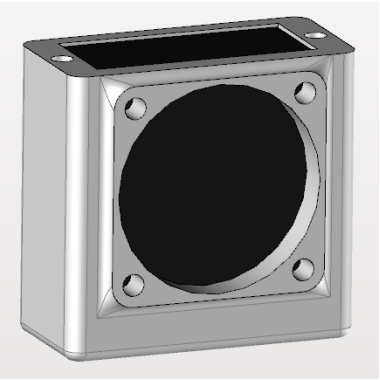
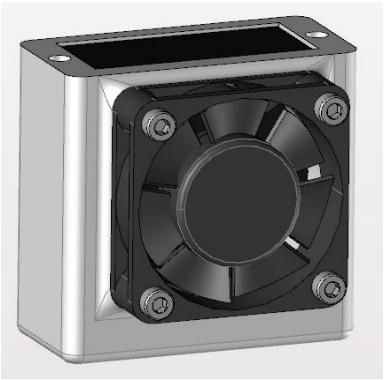
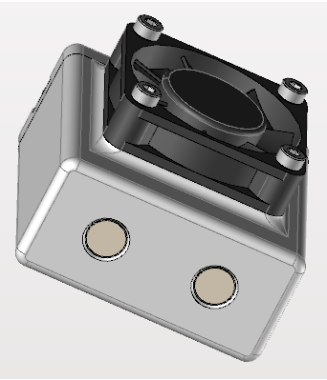
17. SA Carbon Filter

Parts to print: *"Filter_box" + "Filter_cap"*

Parts:

- **2*** M3x8mm
- **4*** M3x16mm
- **6*** Inserts M3x4x4.2mm
- **2*** Magnets 8x3mm
- **1*** KCD10/11
- **1*** Elegoo Mars active-carbon filter
- **1*** KCD10/11

Slide the activated carbon filter into its location, then screw the fan with 4 M3x16mm screws into the previously installed inserts. Glue 2 8x3mm magnets underneath.

Put 2 inserts in the upper location, then close the box by putting the cover on with 2 M3x8mm screws. Pass the fan wires through the KCD10 location, then solder the connections to the outside before clipping the switch back into its location, this will be easier.


step completed! ✔

18. SA_Plexiglass

Parts to print: ***2**** *"Plexiglass_base_left"* + ***2**** *"Plexiglass_base_right"* + ***2**** *"Plexiglass_top_left"* + ***2**** *"Plexiglass_top_right"* ***(there are 2 pieces per file, if you use PrusaSlicer, check "split to objects")***

Parts:

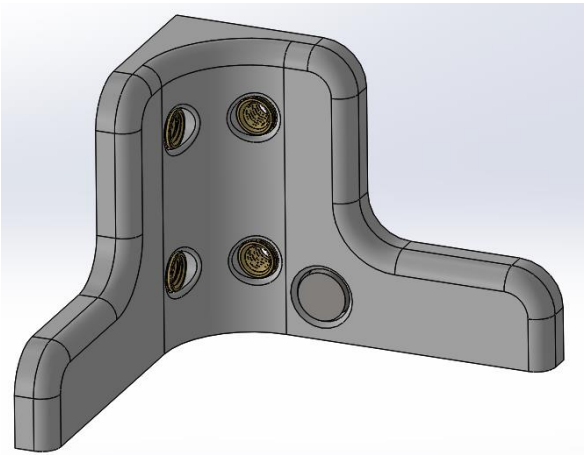
- **52*** M3x10mm
- **52*** Inserts M3x4x4.2mm
- **4*** Magnets 5x3mm
- **1*** 246x216x2mm Plexiglass panel (top)
- **2*** 216x300x2mm Plexiglass panels (front and back sides)
- **2*** 240x300x2mm Plexiglass panels (lateral sides)
- **3*** 300x600mm Red vinyl

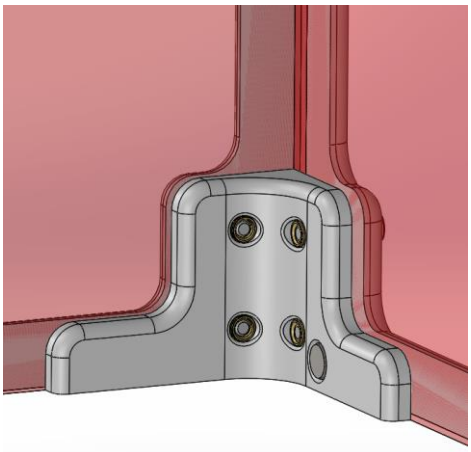
This is a difficult part, good luck 😉

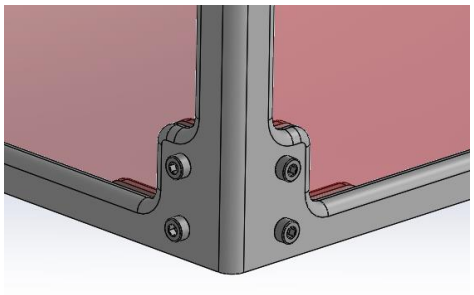
Cut the plexiglass panels to the correct dimensions, then glue the red vinyl films to the plexiglass panels, paying attention to air bubbles.

Insert 4 M3x4x4.2mm inserts into the small part of "Plexiglass_base_left", then stick a 5x3mm magnet into the round slot. You can now slide the two plexiglass plates from the sides, locate the location of the screws and drill the holes (d.4mm or d.5mm to have a little tightening clearance). You can then close the assembly with the large part, then tighten with 4 M3x10mm screws.

Pay attention to the polarity of the magnets! They must attract the magnets present on the sides of "SE_Top"! To do 2 times with "Plexiglass_base_left", then 2 times with "Plexiglass_base_right" (which is its symmetry). You should therefore obtain 4 assemblies.

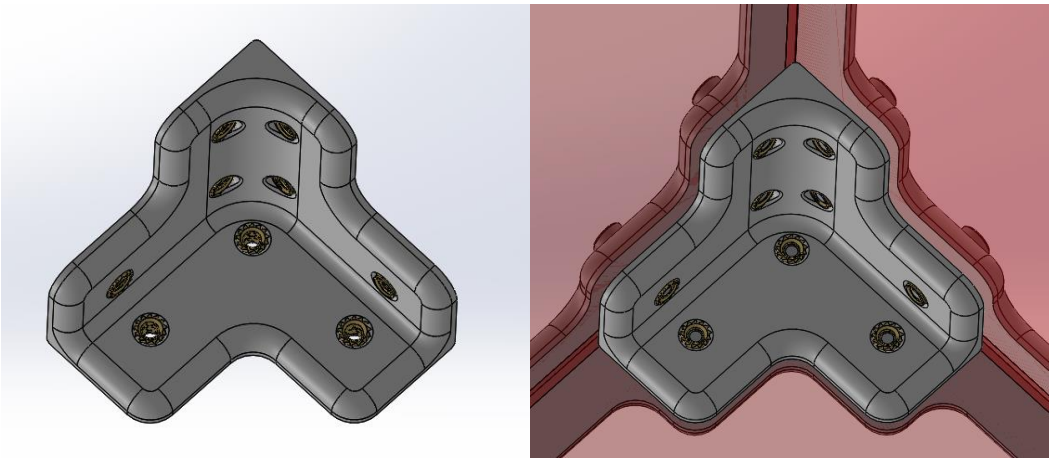






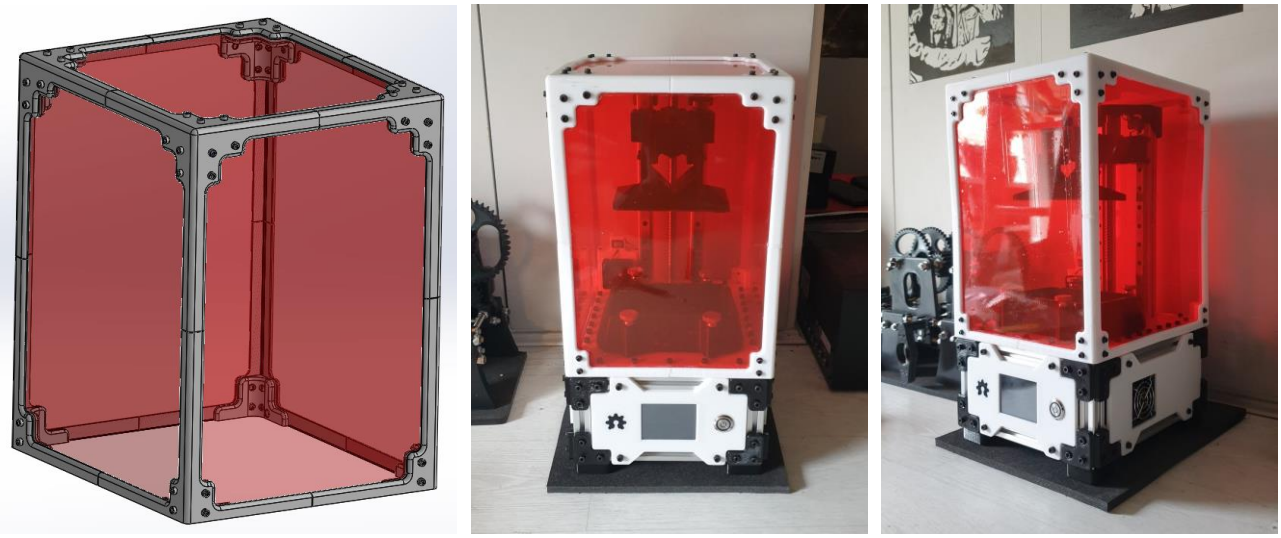
Do the same for “Plexiglass_top_left” and “Plexiglass_top_right”. Insert 9 M3x4x4.2mm inserts, slide the plates, locate the holes then drill them before securing with 9 M3x10mm screws.

Do this twice per piece, so you need 4 assemblies.

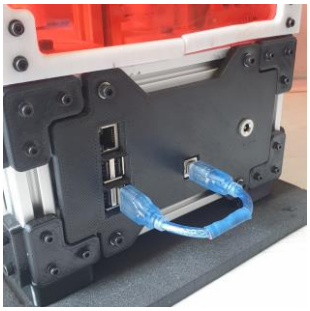


Some columns had offsets of several millimeters, so I pushed them and then glued them with superglue to the plexiglass panels.

Once everything is assembled, you should get this:



Don’t forget to connect the GRBl shield to the Raspberry with a cable!



step completed! ✔

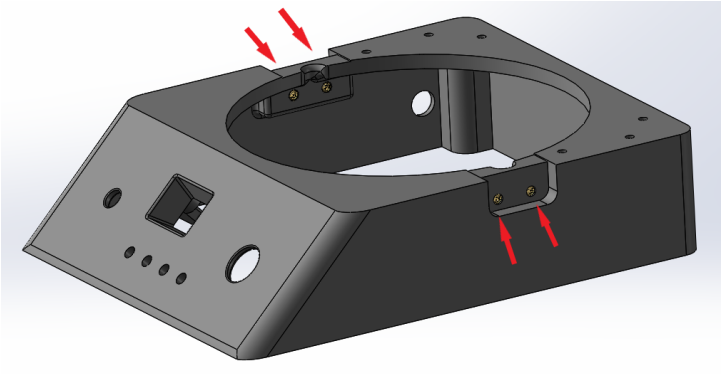
Cyclop MSLA printer is now assembled and functional, well done !!!

B) Assembly instructions for Helios Curing Station

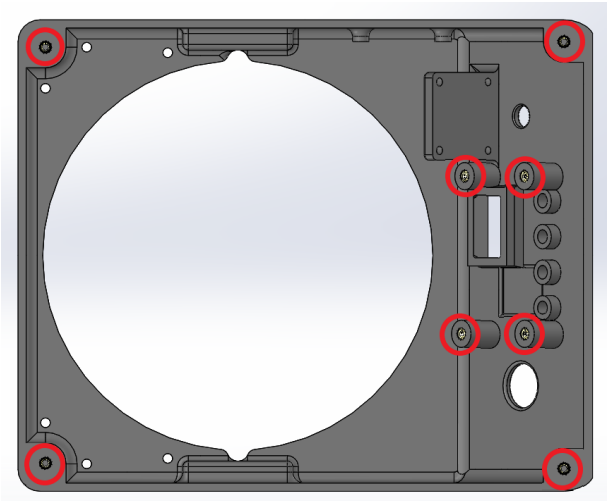
1. Base & Box

- Parts to print: **1*** *"Box"* + **4*** *"Spindle"* + **2*** *"Ear"* + **1*** *"Base"*
- Parts:
    - **1*** Timer module
    - **1*** LM2596
    - **1*** PWM DC-12V Potentiometer
    - **1*** 16mm Led Switch
    - **1*** Turning Base
    - **6*** M3x6mm
    - **8*** M3x8mm
    - **8*** M3x12mm
    - **4*** M3x5mm spacers
    - **20*** M3 Inserts
    - **2*** 30mm 12V Fan
    - **1*** DC Jack Socket
    - Double-sided tape

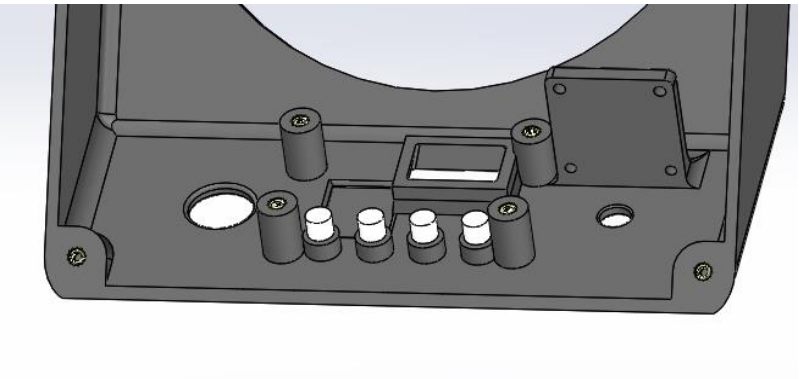
1) Place 4x M3 inserts on both sides



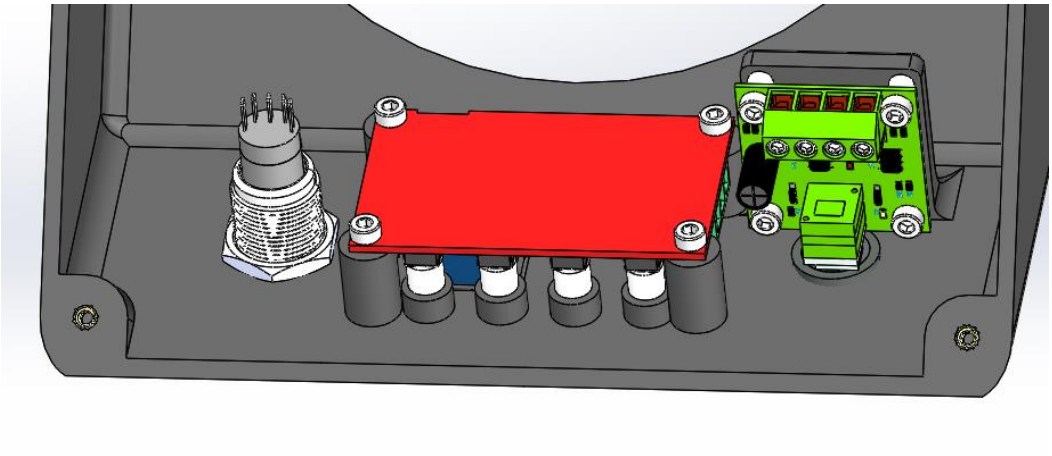
2) Place the 8* M3 inserts in the following locations:



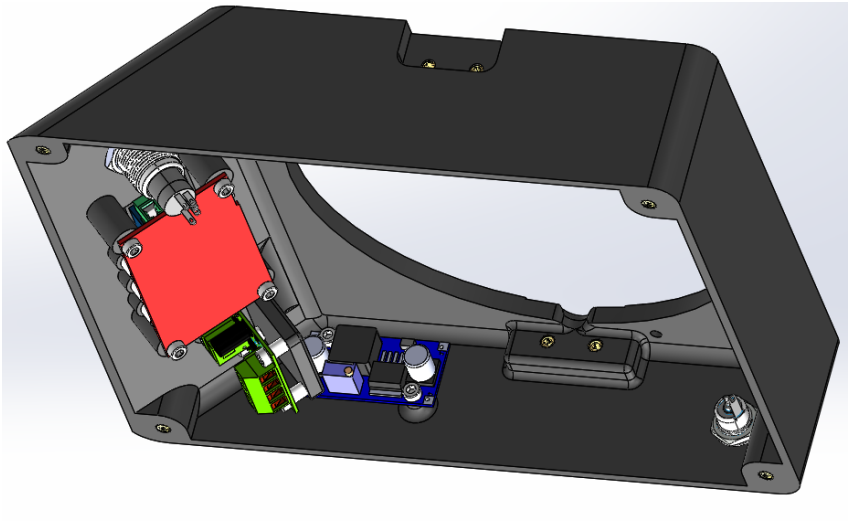
3) Place the 4 “*Spindles*” in their locations



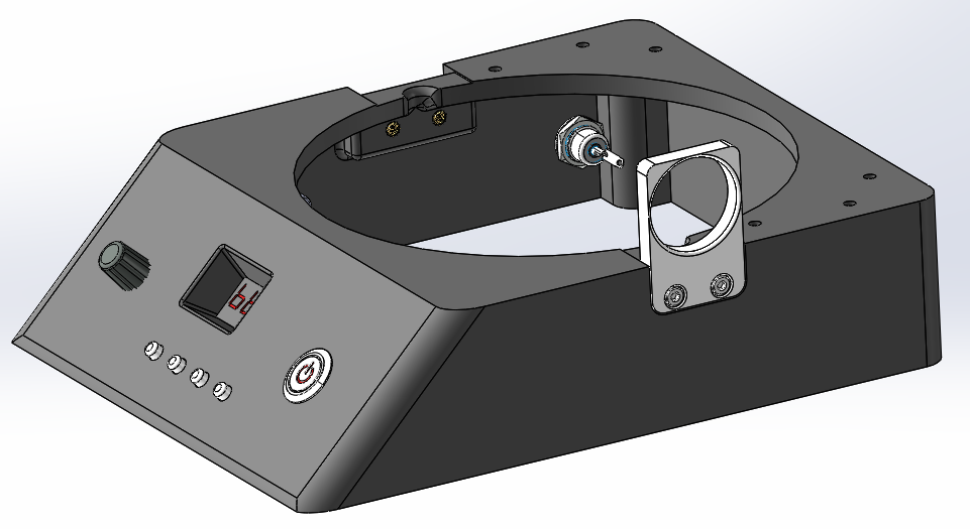
3) Place the 16mm switch in its location, place then secure the timer with 4* M3x6mm screws, and fix the potentiometer (screwed directly into the plastic) with 4* M3x8mm screws, and 4* M3x5mm spacers to raise it

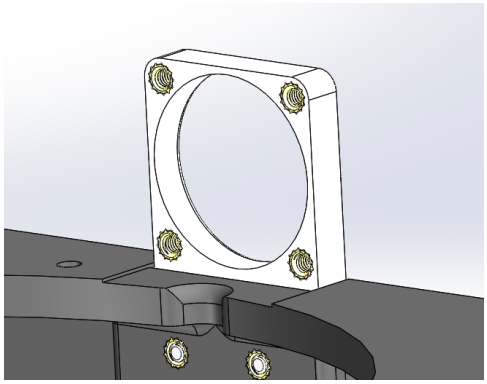


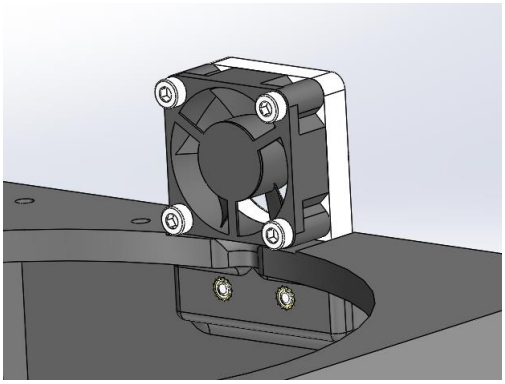
4) Insert the DC Jack Socket into its slot, then the LM2596 with 2* M3x6mm screws (screwed into fthe plastic)

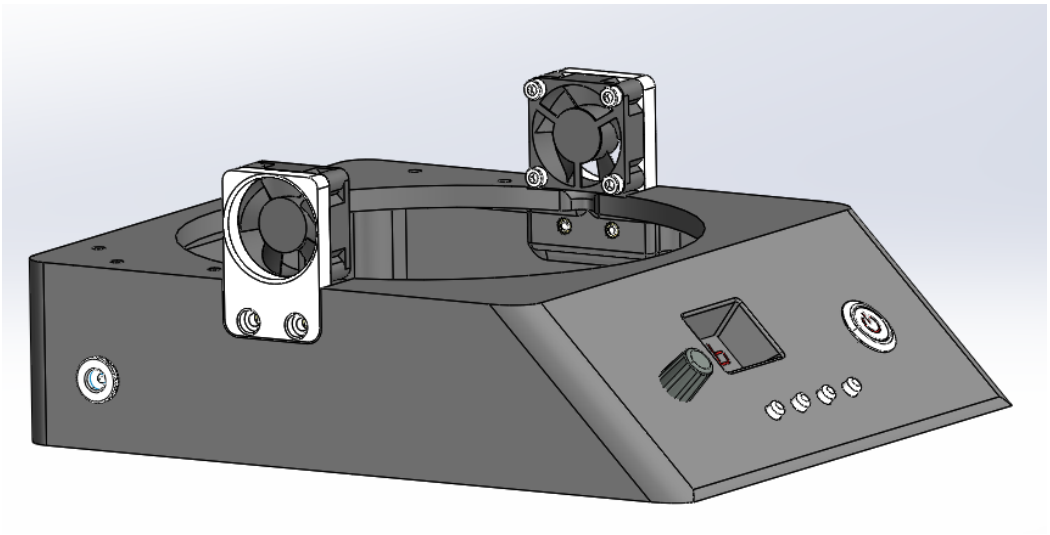


5) Place the “Ear” pieces on both sides and secure them with 2* M3x8mm. Place 4 M3 inserts on each of them, then install the 30mm fans with 4 M3x12mm screws. Do it twice.

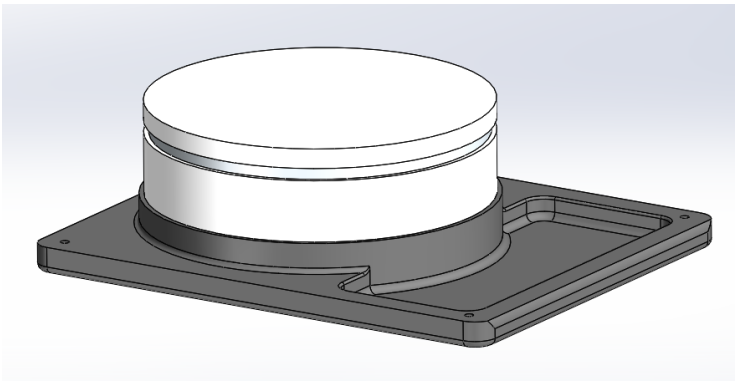


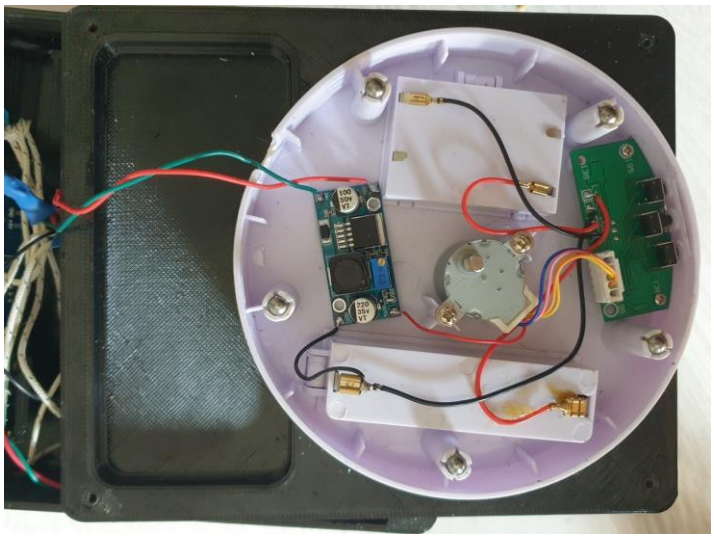


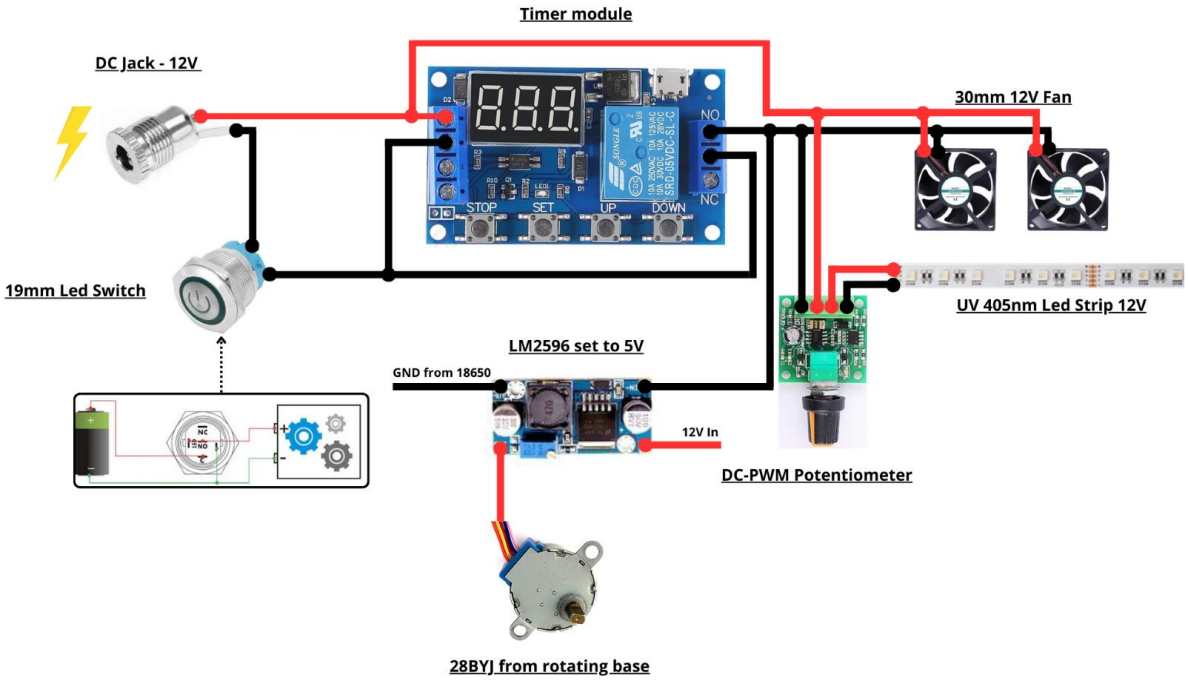




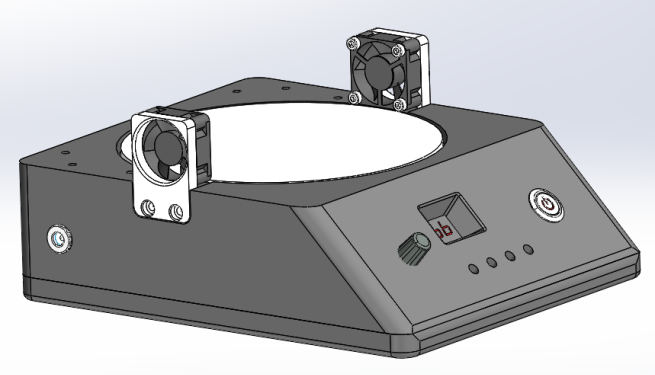
6) Place the turntable on "*Base*" (with double-sided tape), then start wiring. The turntable is directly connected to the circuit, because once the box is closed, we will no longer have access to its buttons.







You can reassemble the box and the base, but do not screw in the 4 retaining screws yet.

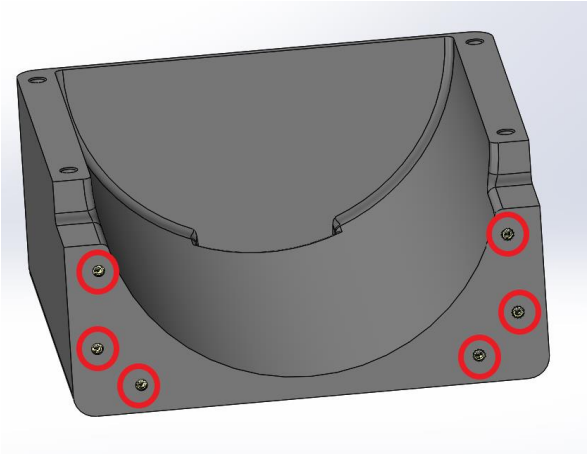


step completed! ✔

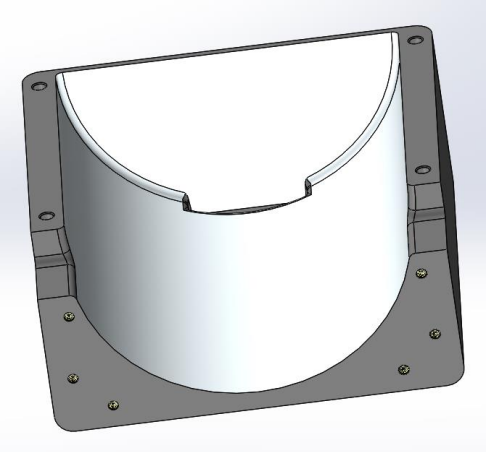
2. Back & Front

- Parts to print: **1*** *"Back"* + **1*** *"Front"*
- Parts:
  - **10*** M3x12mm
  - **6*** M3 Inserts
  - **8*** 5x3mm magnets
  - Mirror tape
  - **2m** of 405nm 12V Leds

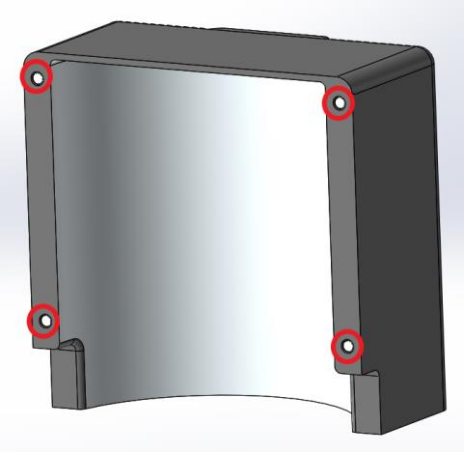
1) Place 6* M3 inserts in the locations shown



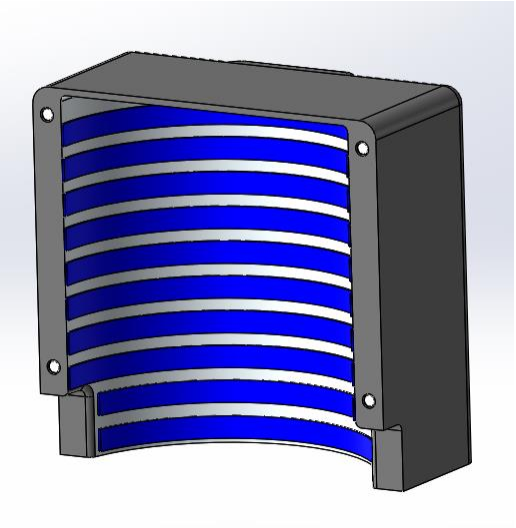
2) Cover the inside of “*Back*” with mirror effect sticker



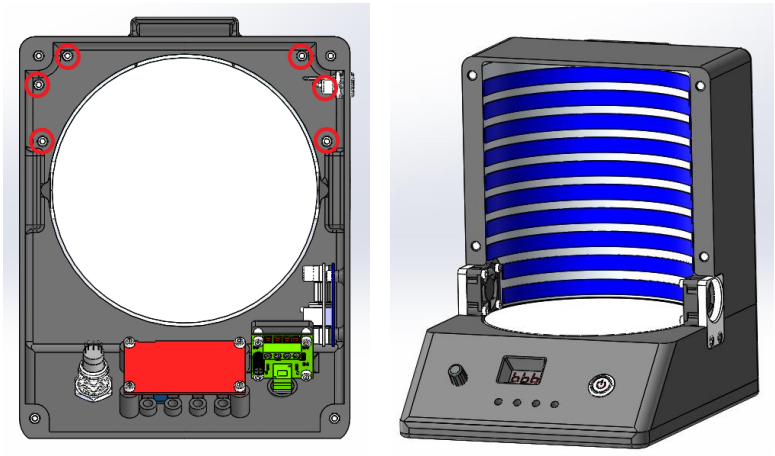
3) Place 4 5*3mm magnets at the 4 corners of “*Back*”. Do the same with “*Front*”.



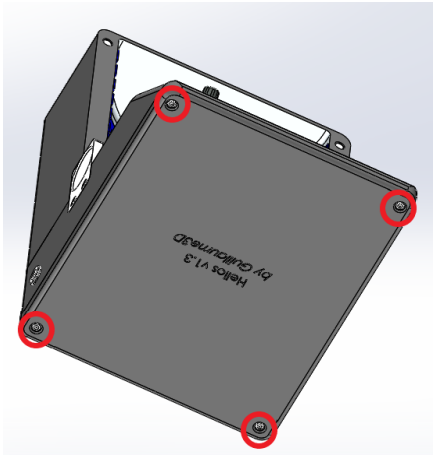
4) Cut LED strips and glue them to the top. Connect them together.



5) Reassemble the parts with 6* M3x12mm screws



6) Secure "*Base*" with 4 M3x12mm screws



step completed! ✓

Helios – Curing Station is now assembled and functional, well done !!!

C) Firmware configuration

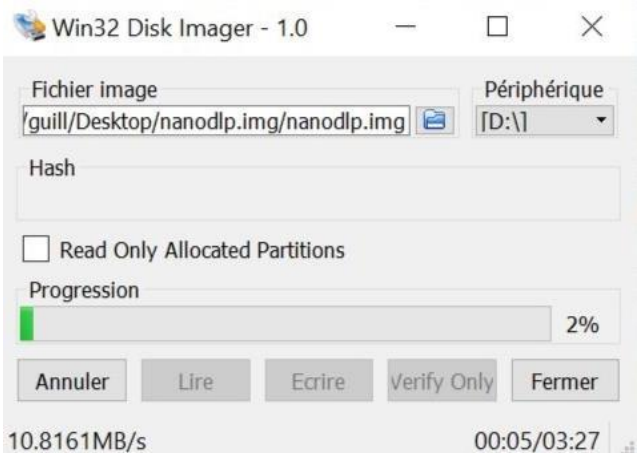
VI. Install NanoDLP on Raspberry

1) Download **NanoDLP** SD card image file (≈2go) at:

   https://www.nano3dtech.com/nanodlp-download/

2) Un-extract the file "**nanodlp.img.gz**"

3) Flash the SD Card (minimum 8go) of the Raspberry with **Win32DiskImager** software (you will have a readable partition and another unreadable, it's normal, don't format it if windows ask)



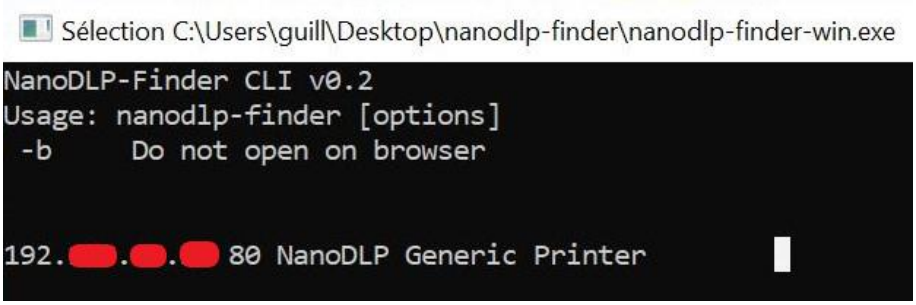
4) Once done, go to the file "**nanodlp-wifi.txt**", uncomment and refill with the name of your wifi and your password (remove "#" beyond each line)

```
#network={
#    ssid="Wifi Name/SSID"
#    psk="Password"
#}
```

5) Powering your Raspberry, and let it connect to your wifi on its own (≈30s)
6) Install **NanoDLP Finder Tool** on your PC:

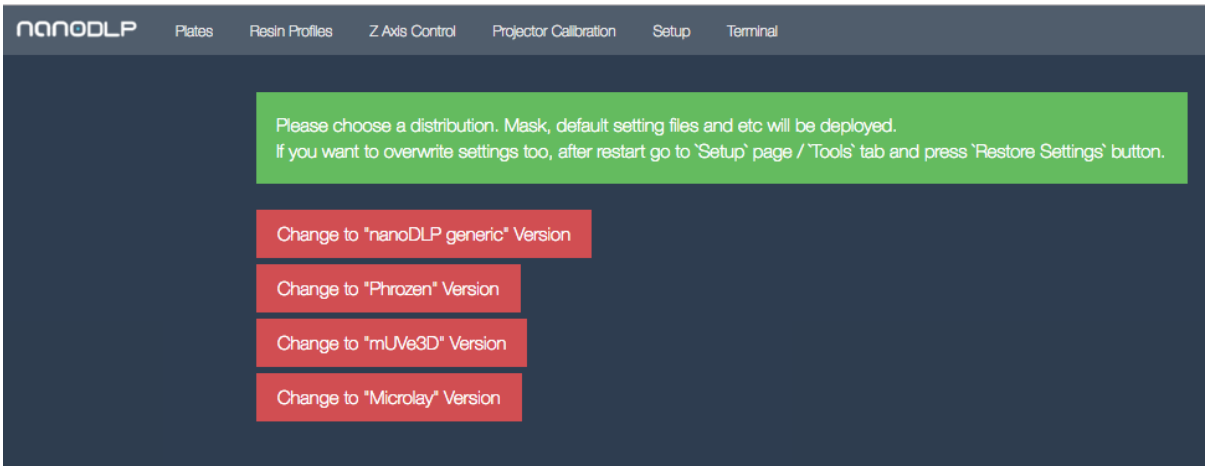
   https://www.nano3dtech.com/nanodlp-download/

7) Execute and take the IP address of your Raspberry (your Raspberry must be connected to the same Wi-Fi as your computer)



8) Paste the IP it in your internet navigator and press the enter key

9) Now you can access to NanoDLP page!



Select the first choice, **<Change to "nanoDLP generic" Version>**, then your Raspberry will reboot and you are ready to use NanoDLP !

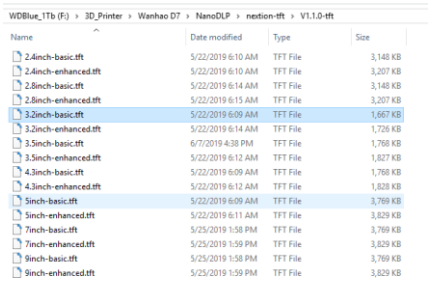
My parameters are at the ***th page of this document, but i advice you to wait until the end to fill them!

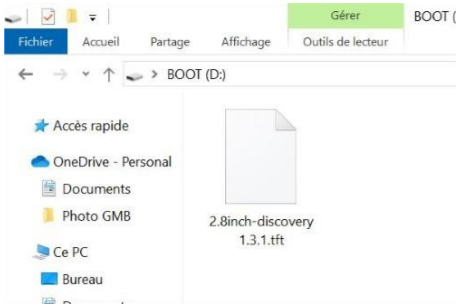
VII. Install the Nextion screen

1) Download the folder at: https://www.nano3dtech.com/nanodlp-nextion/

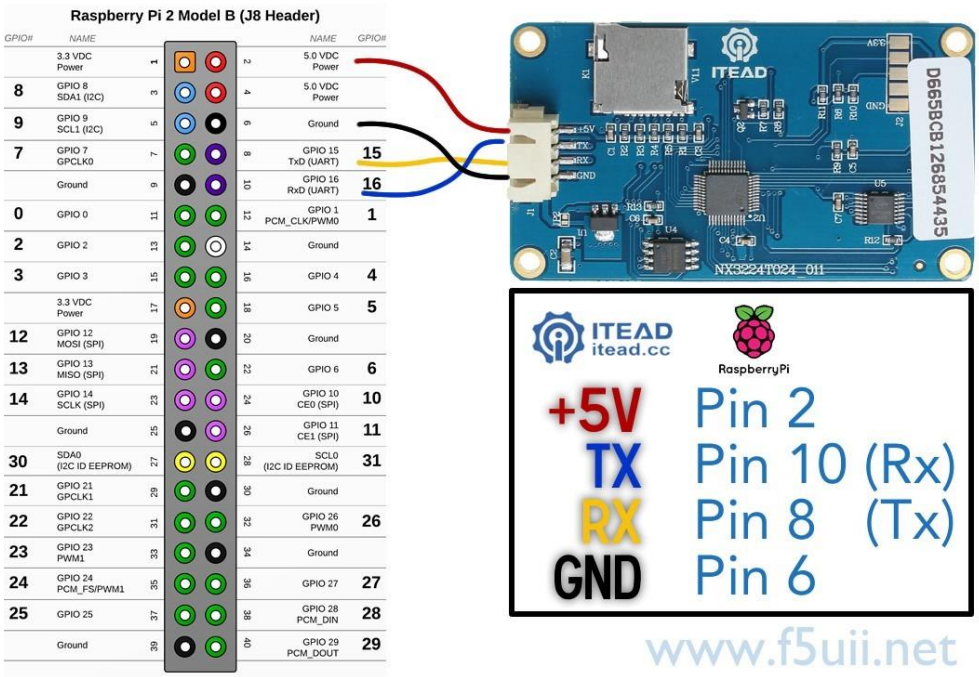
2) Copy and paste the right .tft file on an SD card, put it on the SD port's screen, and power it

   I had some issues for flashing the Nextion screen when this one was powered by the Rapsberry, so I advice you to use the small connector who's connect on a phone charger to power the screen (be very careful, if wirings are wrong and there are 5V on the TX/RX pins of the screen, he will die)





3) Once done ("Updated Successful!" or something like that), disconnect it from power, wait about 10s and connect it to your Raspberry but don't power it yet



4) Open the “config.txt” file on the raspberry’s nano card and ad theses lines (if you don’t already have it) :

```
dtoverlay=pi3-disable-bt
dtoverlay=pi3-miniuart-bt
```

Also, make sure than **“**dtoverlay=pi3-miniuart-bt-overlay" is inactive:

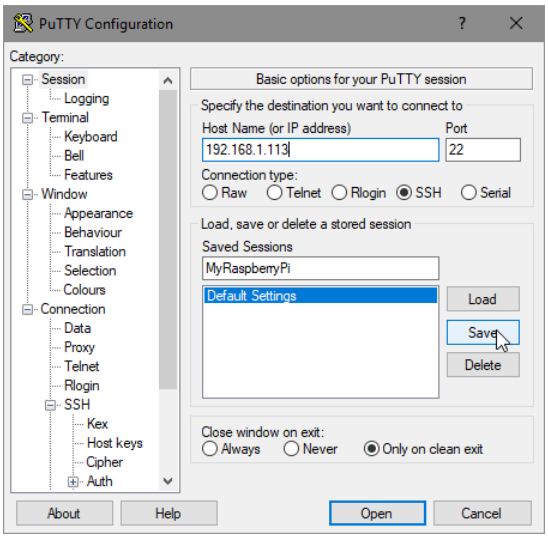
```
#dtoverlay=pi3-miniuart-bt-overlay
```

5) Open the “cmdline.txt” and remove this line

“console=ttyAMA0,115200" / "console=serial0,115200" / "console=ttyS0" or console=something

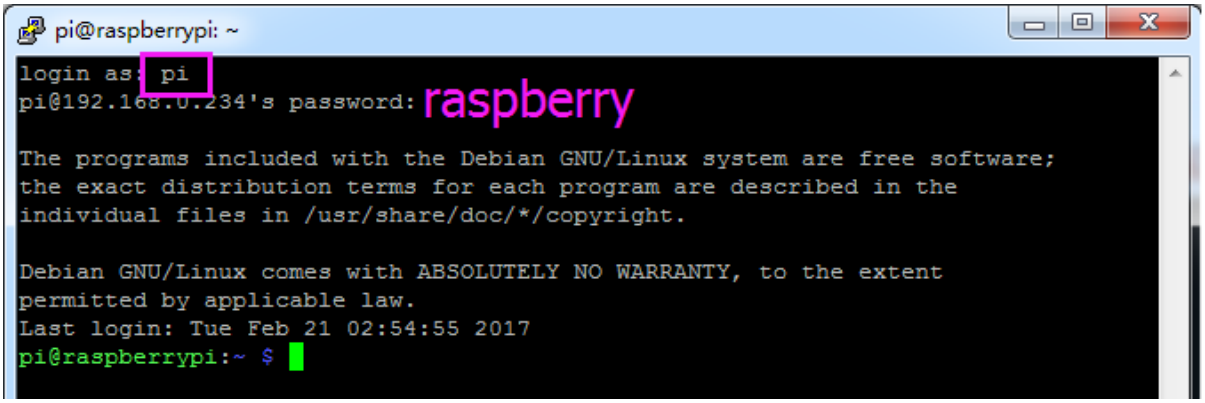
6) Install Putty: *https://www.putty.org/*

7) Power your raspberry with the SD card inserted, execute PuTTY -> write your Raspberry’s IP in the case (without https://)



and you’ll had to fill theses information to allow the connection to your raspberry

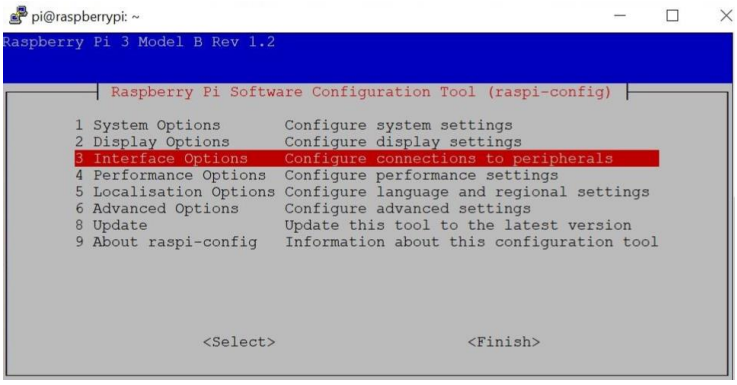
- Login -> **pi**
- Password -> **raspberry**



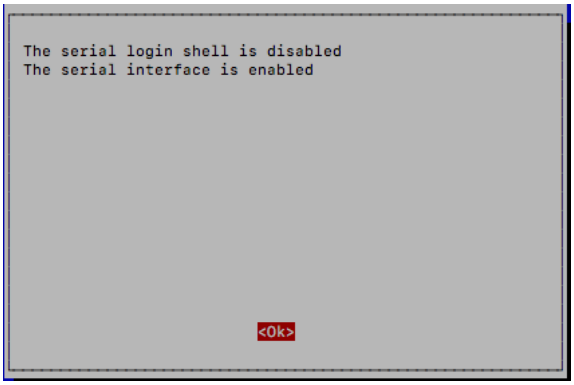
8) Send the command -> “sudo raspi-config"

```
pi@raspberrypi:~ $ sudo raspi-config
```

And this window will appear:



8) Select:
   - I) Interface Options
   - II) Serial Port
   - III) No
   - IV) Yes
   - V) Back
   - VI) Finish



9) And then, send the command “sudo reboot”

```
pi@raspberrypi:~ $ sudo reboot
```

10) Let your Raspberry reconnect to your Wi-Fi (if don't reconnect like for me, shut down it and power it again) and go to the NanoDLP page of the browser. Go to “Settings -> HMI”, and set the Nextion screen address to “/dev/ttyAMA0”.

If you’re lucky, now your screen is working!

If not, check all the steps, do some search and check your .tft/.img file

(Some pictures are from: http://web.bluecomtech.com/nanoDLP%202019/www.nanodlp.com/forum/viewtopic8a26.html?id=2069)

VIII. Install GrbL :

1) Download GRBL for NanoDLP : https://github.com/GuillaumeGTHB/GBRL-for-NanoDLP
(other GRBL versions can work but with some modifications to invert D11/D12 I guess)

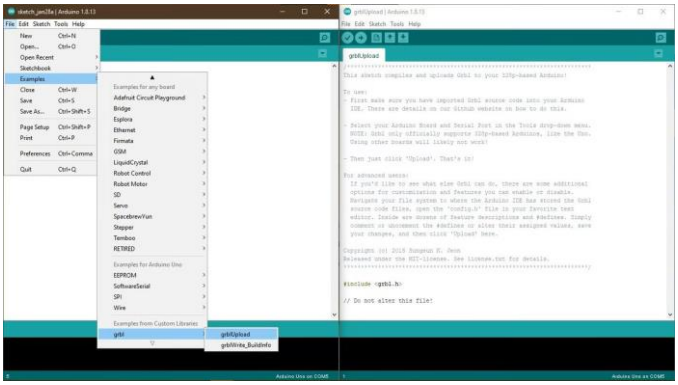
2) Un-extract the folder

3) Install IDE Arduino at: https://www.arduino.cc/en/software

4) Open the Arduino IDE and select Sketch > Include Library > Add .zip Library.

5) When the window opens, go to the extracted folder, there will be another "grbl" folder inside. Select.

6) Click the File menu. Then go to Examples > grbl > grbl upload. A new Arduino IDE window will appear.



7) Connect your Arduino to the computer.

8) Make sure the board appears as Arduino Uno (or whatever version you're using) in Tools > Maps. Also, make sure that the selected serial port is the correct one.

9) Click Download and your Arduino is now flashed with GRBL firmware.

10) You can modify the main GRBL parameters directly by sending a line via software with a terminal (I like using Pronterface, it works well, it's simple and light)

(Source: Pranav Gharge via All3DP)

IX. Configure GrbL

Right parameters for the Cyclop MSLA Printer:

```
$0=10 (step pulse, usec)
$1=255 (step idle delay, msec)
$2=0 (step port invert mask:00000000)
$3=0 (dir port invert mask:00000000)
$4=0 (step enable invert, bool)
$5=1 (limit pins invert, bool)
$6=0 (probe pin invert, bool)
$10=3 (status report mask:00000011)
$11=0.010 (junction deviation, mm)
$12=0.002 (arc tolerance, mm)
$13=0 (report inches, bool)
$20=0 (soft limits, bool)
$21=1 (hard limits, bool)
$22=1 (homing cycle, bool)
$23=0 (homing dir invert mask:00000000)
$24=100.000 (homing feed, mm/min)
$25=200.000 (homing seek, mm/min)
$26=250 (homing debounce, msec)
$27=4.000 (homing pull-off, mm)
$100=250.000 (x, step/mm)
$101=250.000 (y, step/mm)
$102=800.000 (z, step/mm)
$110=300.000 (x max rate, mm/min)
$111=300.000 (y max rate, mm/min)
$112=250.000 (z max rate, mm/min)
$120=10.000 (x accel, mm/sec^2)
$121=10.000 (y accel, mm/sec^2)
$122=10.000 (z accel, mm/sec^2)
$130=0.000 (x max travel, mm)
$131=0.000 (y max travel, mm)
$132=150.000 (z max travel, mm)
```

- Send the command “$$” by a COM terminal software (Repetier, Arduino, Pronterface...)

- Yours parameters will appear, and for those who are different than my picture you can modificate them by sending the “$parameter_number = right_value”

- > So if your Z max travel parameter is set to 500 and you want to have 150, you have to send “$132=150” (or another value of your choice)

X. NanoDLP's parameters

1. config.txt file

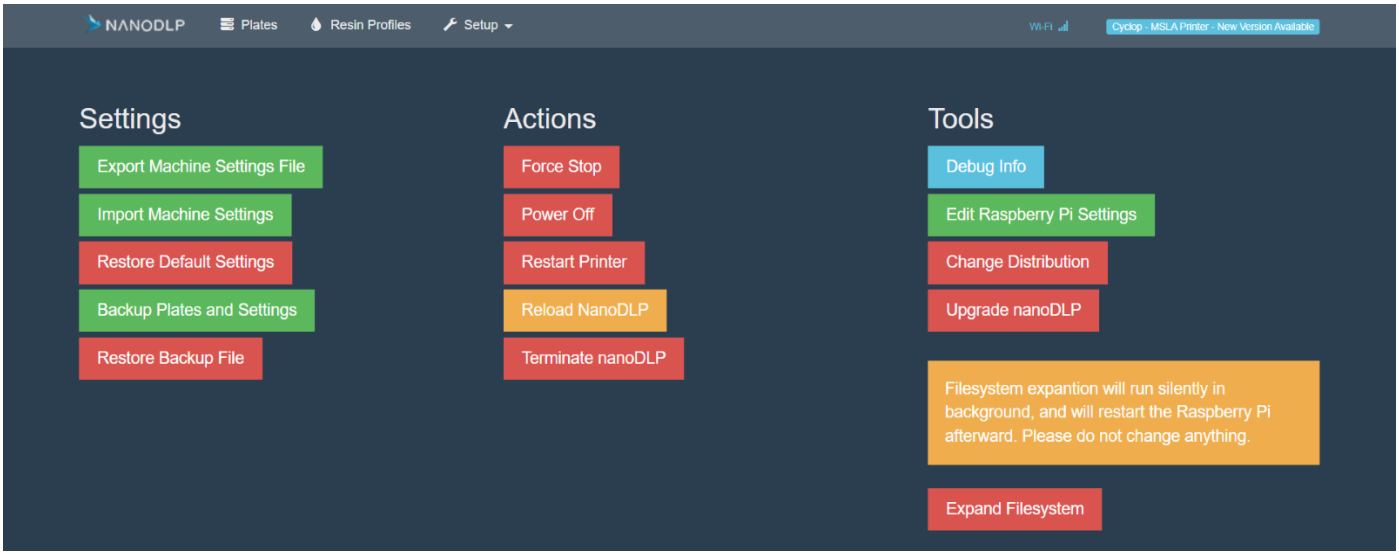
My "config.txt" for the Nextion 2.8" and a 2K 5.5" screen (LS055R1SX04)

You can check your configuration.h file to make sure everything is included, or copy and paste all the settings:

```
disable_splash=1
boot_delay=0
dtoverlay=pi3-disable-bt
dtoverlay=vc4-fkms-v3d
max_framebuffers=2
disable_camera_led=1
hdmi_pixel_encoding=2
start_x=0
gpu_mem=128
enable_uart=1
hdmi_timings=1440 0 70 10 45 2560 0 12 2 2 0 0 0 50 0 204000000 0
display_rotate=0x10000
hdmi_force_hotplug=1
hdmi_group=2
hdmi_mode=87
hdmi_pixel_freq_limit=500000000
hvs_priority=0x32ff
max_framebuffer_width=1440
max_framebuffer_height=2560
framebuffer_width=1440
framebuffer_height=2560
framebuffer_depth=24
framebuffer_ignore_alpha=1
config_hdmi_boost=4
gpu_mem=192
#dtoverlay=pi3-miniuart-bt-overlay
dtoverlay=pi3-miniuart-bt
force_turbo=1
enable_uart=1
hdmi_pixel_encoding=2
gpu_mem=128
disable_overscan=1
dtparam=i2c1=on
dtparam=i2c_arm=on
```

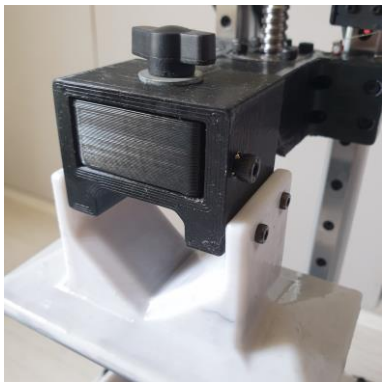
2. NanoDLP's Printer parameters

Connect you on NanoDLP web's interface. Go on **Setup** → **Tools** → **Import Machine Settings** → Select the file "*setup-cyclop-msla-printer.json*"

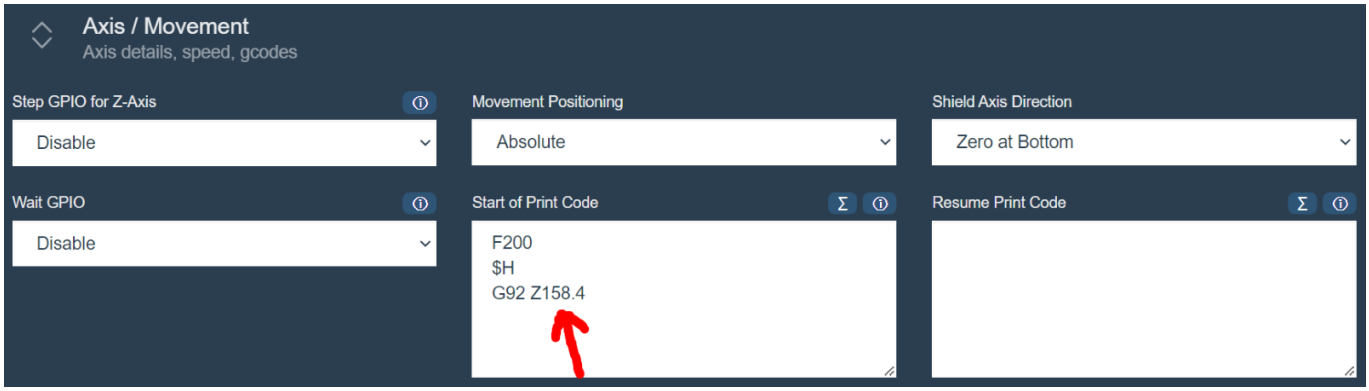


Before your first print, you must define the Z offset. Many tutorials are available on the internet, the logic remains the same but the configuration is a little different.

First, loosen the 4 screws of the Z plate then allow it a vertical play of several millimeters.

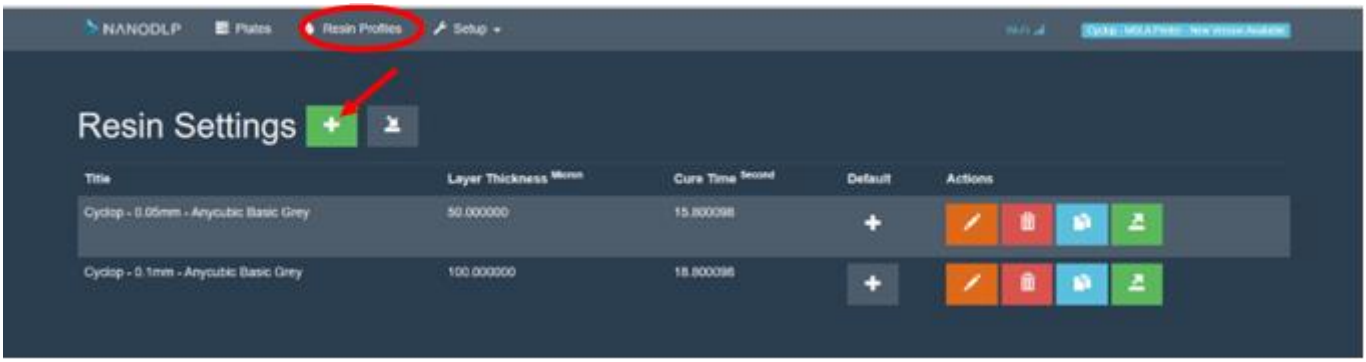


In the NanoDLP terminal (**Setup** → **RAMPS terminal**), send the command "$H". Then place a sheet of paper on the screen, then lower the Z axis in small increments (with the G1 Z-value F200 command) so that the plate touches the sheet. Tighten the deck screws, then add up the increments to place the value next to "G92" in **Setup** → **Machine Settings** → **Axis / Movement**. Personally, I had to go down -158.4mm, so I have to put "G92 Z158.4"



3. Resin’s profiles

Go to "**Resin Profiles**" then click on the arrow to import the files “*profile-cyclop-0.05mm-anycubic-basic-grey.json*” & “*profile-cyclop-0.1mm-anycubic-basic-grey.json*”.



The profiles are indicative following my tests, and I encourage you to modify them and then share them! The 0.1mm profile is the one I tested the most, the 0.05mm one probably still requires adjustments.

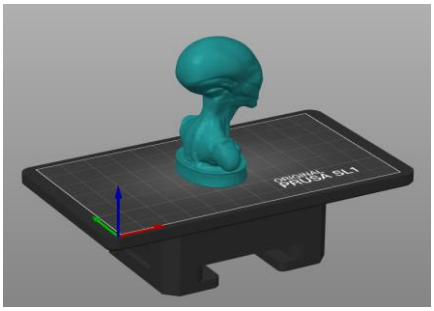
D) How to use

XI. How to slice + print

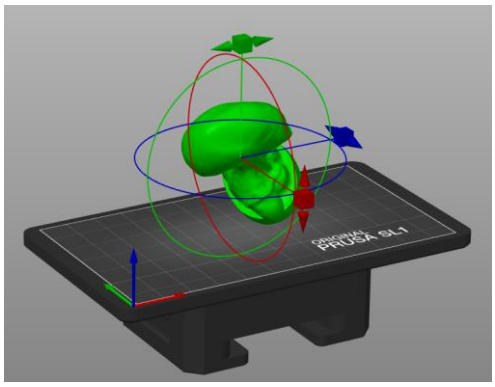
Personally, I use the PrusaSlicer slicer to prepare my .stl files. Unlike FDM printing which requires almost no preparation, for MSLA printing we have to spend a little time to optimize the printing of the parts. An important point is that print time is related to the height of the part and not the printed volume. Whether you print the same part once or 10 times, the printing time will be the same!

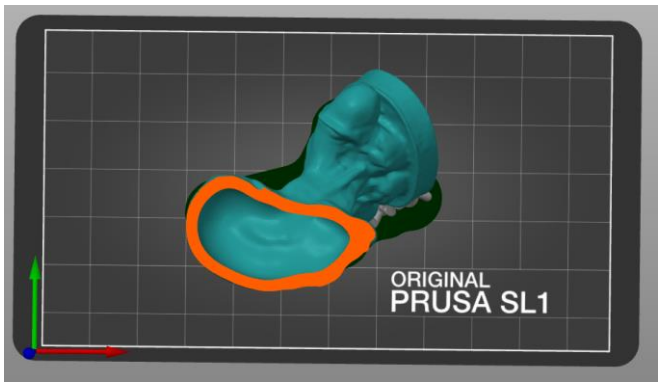
1) Import the .stl file (with the Original Prusa SL1 profile activated from PrusaSlicer)

   (Model link: https://cults3d.com/fr/mod%C3%A8le-3d/jeu/alien-bust-buste-d-alien)

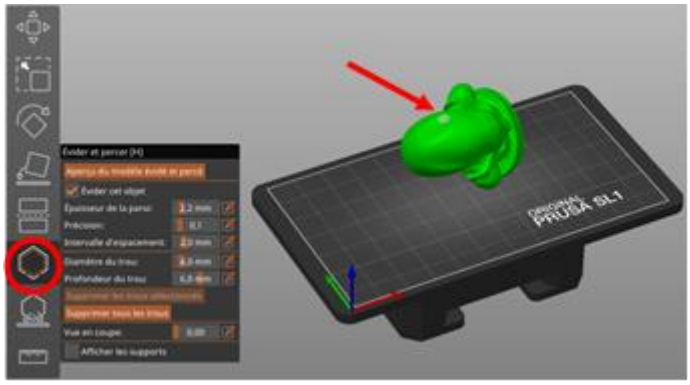


2) Orient the part on one or two axes from 25° to 45°, to try to minimize the surface which will be in contact with the plate (the orange surface on the right image)

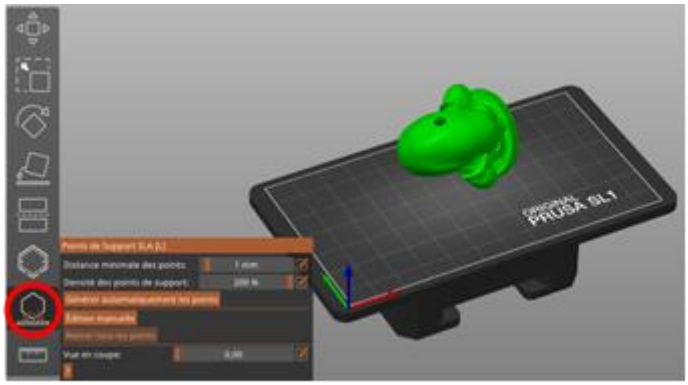




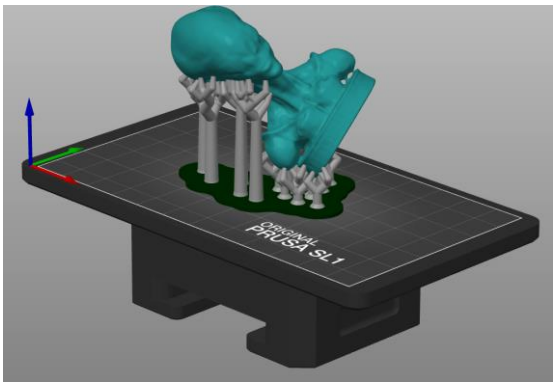
3) Hollow out the part (my settings work fine but you can adjust them, rely on the image or import the .ini files directly into PrusaSlicer). Don't forget to click on the part, so that the hollowing point activates correctly (red arrow)



4) Create supports with a base, the first layers will necessarily be deformed (due to the overexposure of the first layers for the adhesion of the tray)

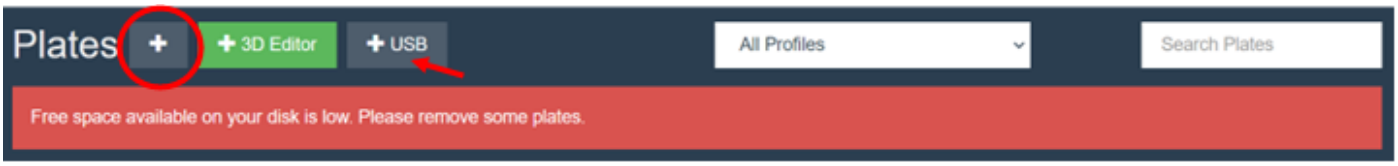


5) The .stl file is finished! Then do "**Menu → File → Export → Export the board in STL/OBJ including the supports**.



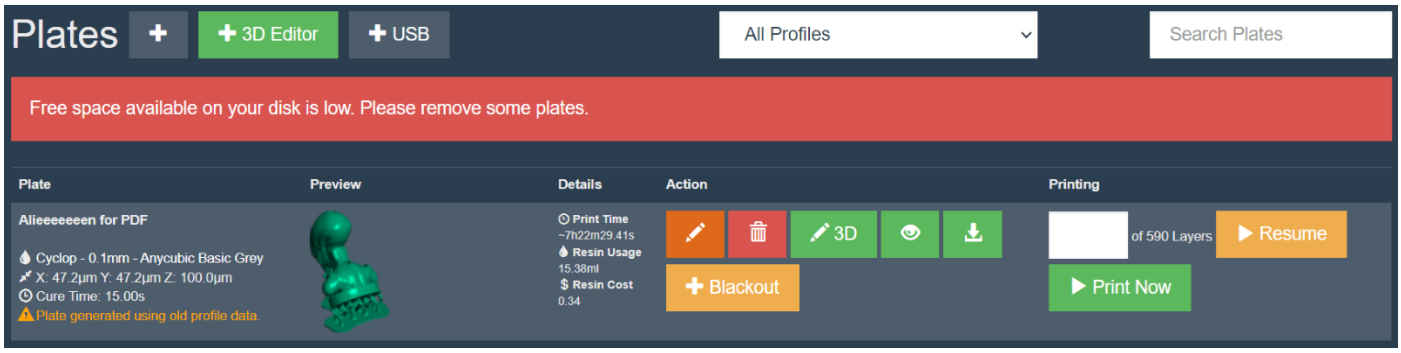
6) Import the file into the NanoDLP interface by choosing the profile that suits you (in the meantime, I changed the orientation of the model so that the recess hole is not visible).

7) Go to "Plates", then click on the cross to import your file (you can also do it from the Nextion screen, with the file previously placed on a USB key and inserted into the Raspberry USB port)

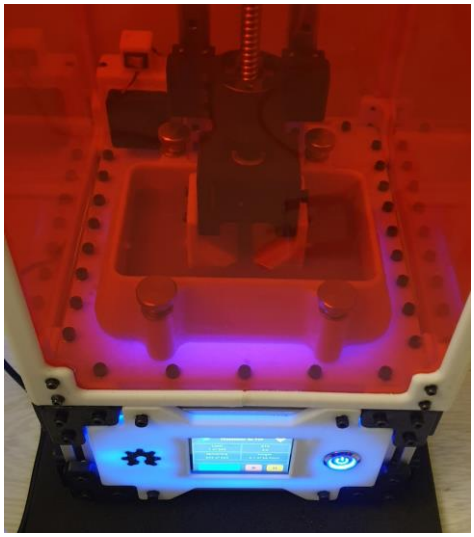


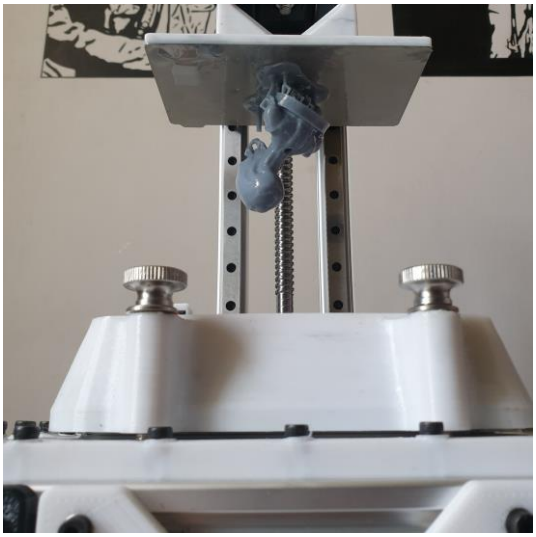
You can choose the name you want, as well as the profile you want to use.

8) Once the file has been sliced (this may take a few minutes), click on "**Print Now**"



Well done, printing is underway! The result in a few hours... That's it !





XII. Post-processing of parts

Once the part has been printed, remove it using a spatula.

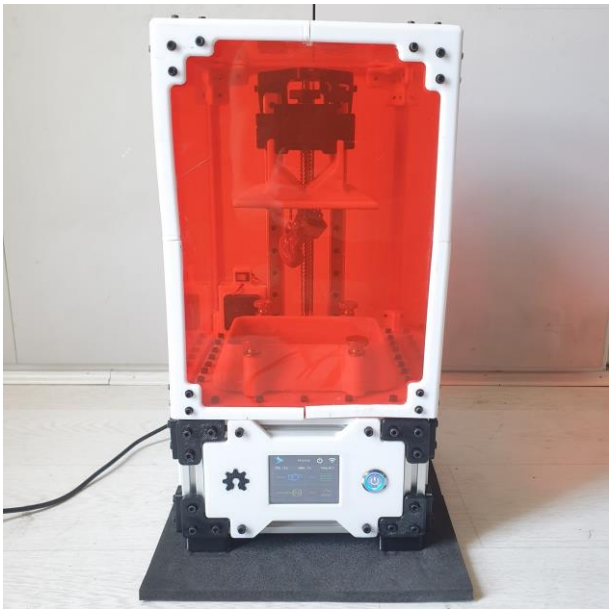
1) After printing, clean the part using isopropyl alcohol (IPA). I use an ultrasonic tank to agitate the active product, but keep in mind that IPA attacks a lot of plastic so be careful! Do not leave the IPA in the tray after use, to avoid any damage as much as possible. Don't forget to wear gloves to handle the piece!!!

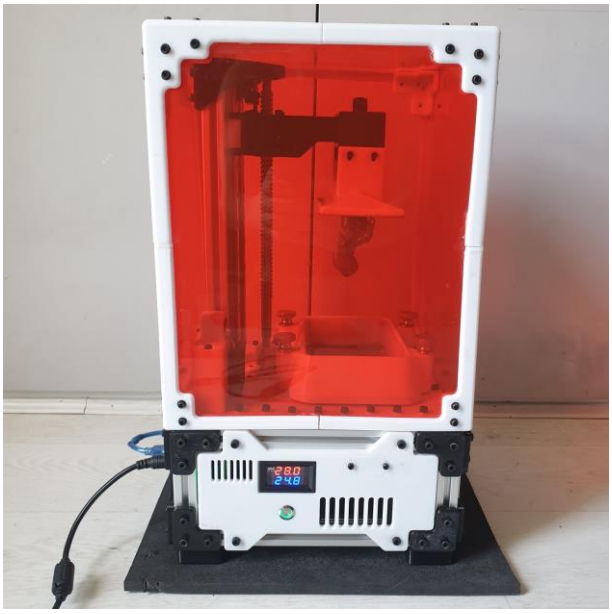
2) Remove the supports using forceps or a scalpel

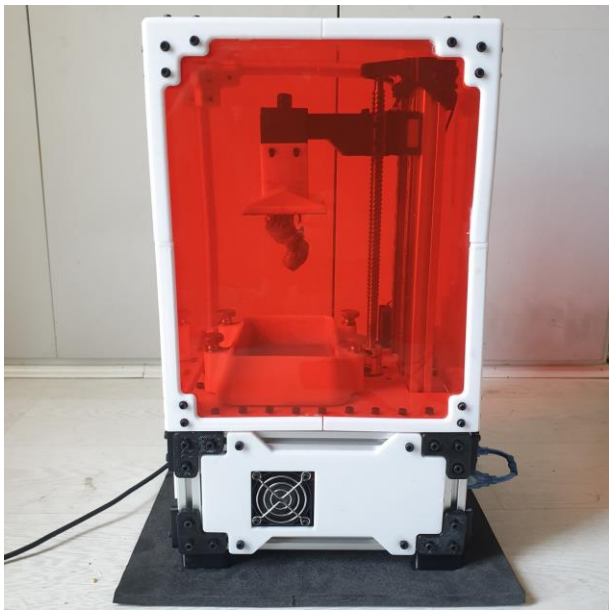
3) Place the piece in the center of the curing station, then turn it on. I leave it for around 8min, the power of the station is around 15W.

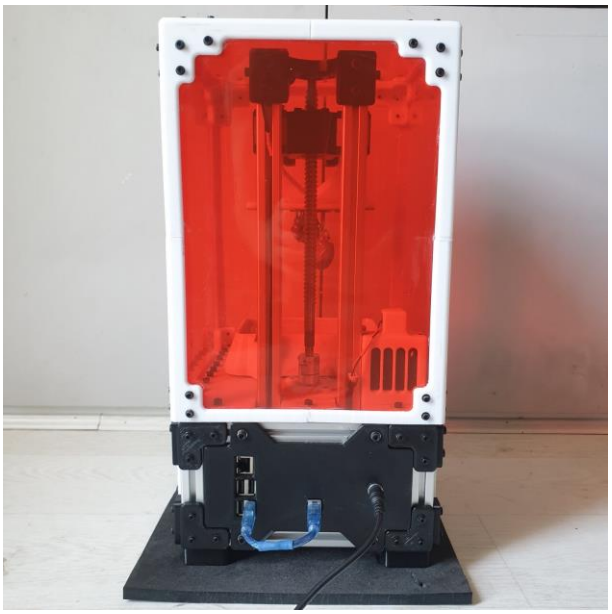
4) The room is ready!

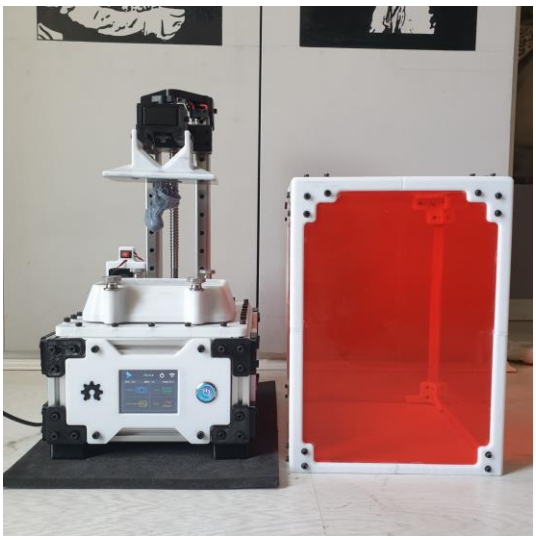
E) Some pictures

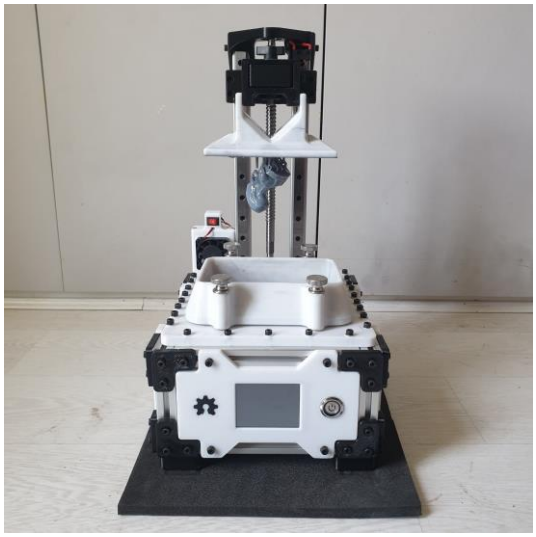


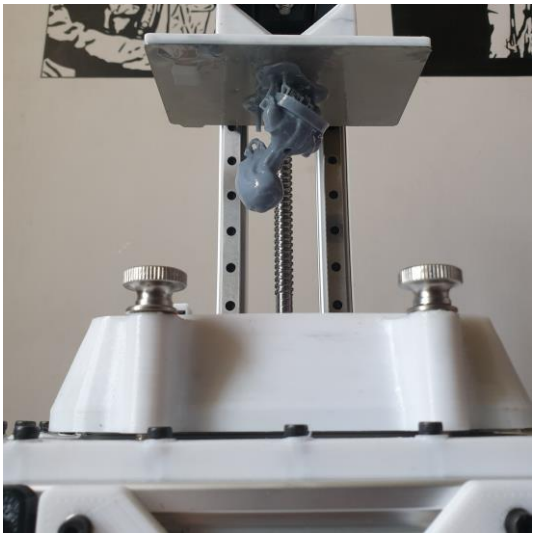


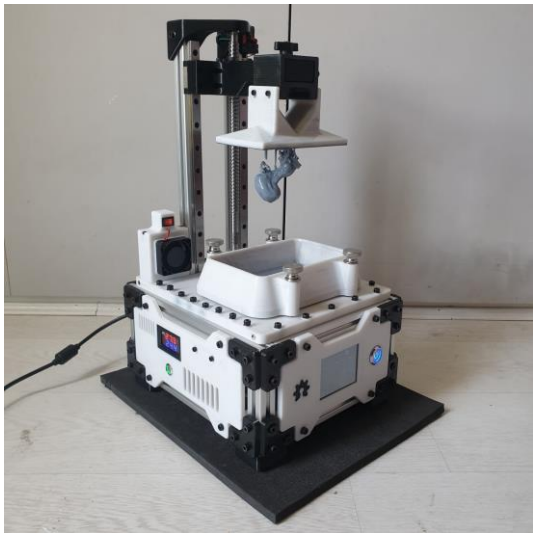


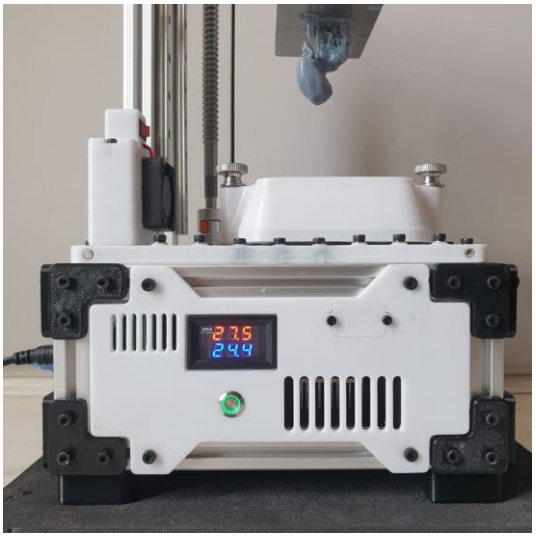











27.5
24.4


Home

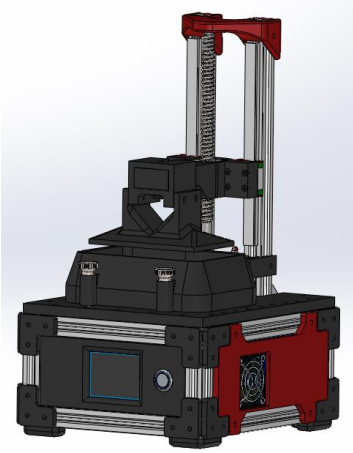
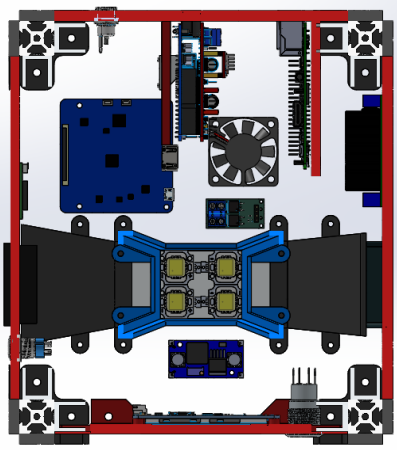
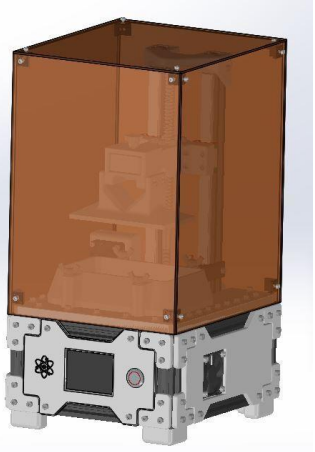
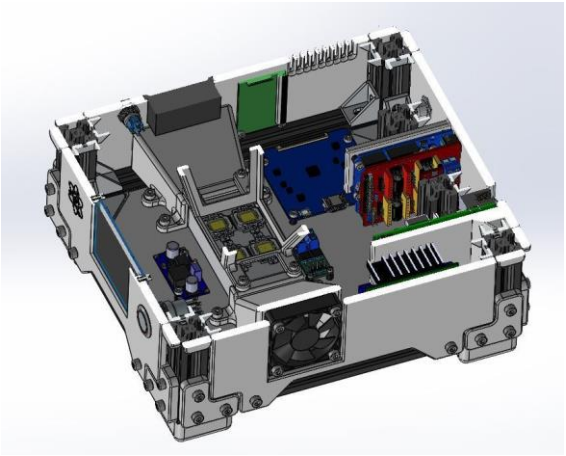
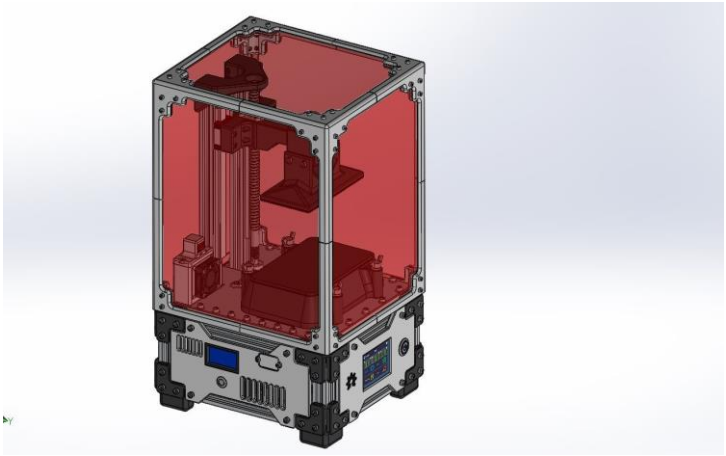
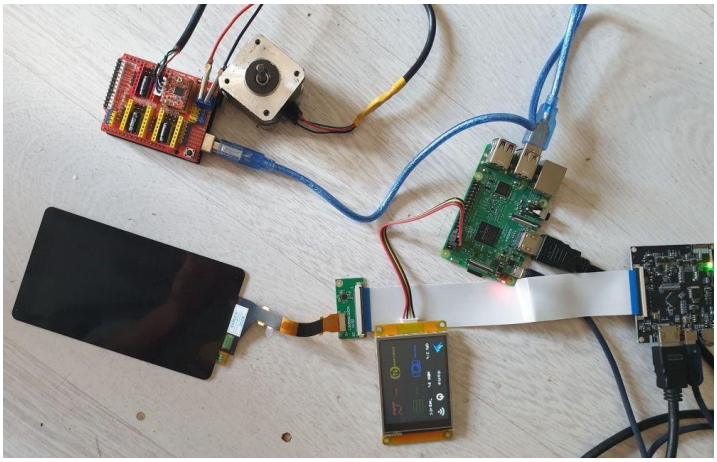
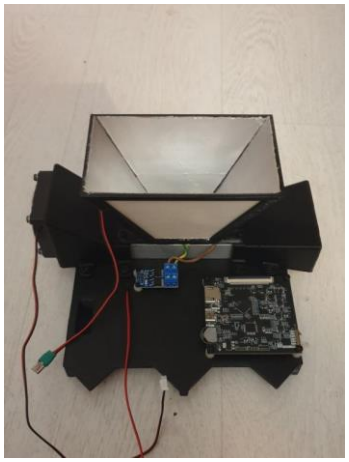
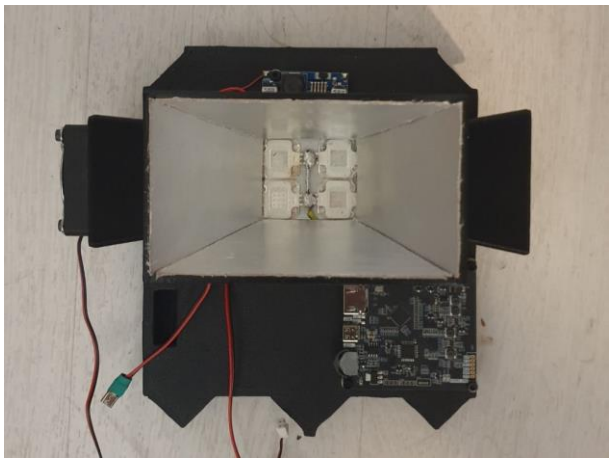
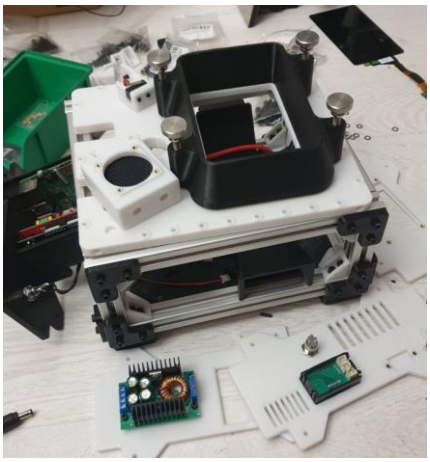

023

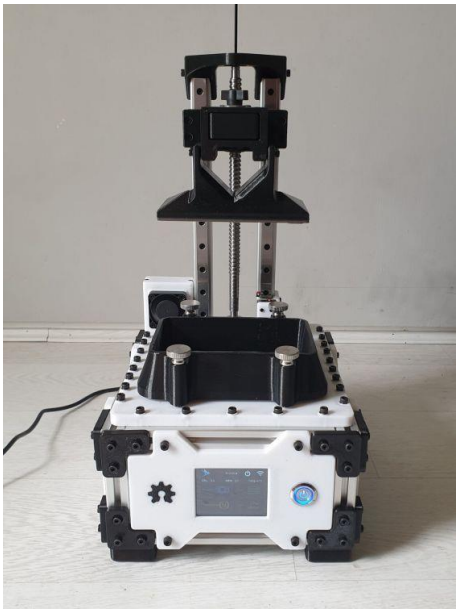
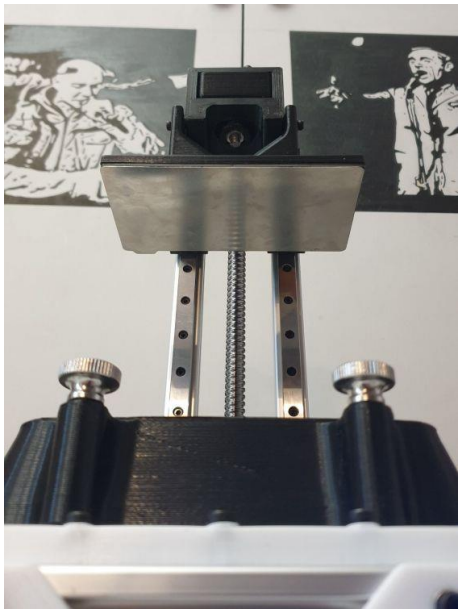
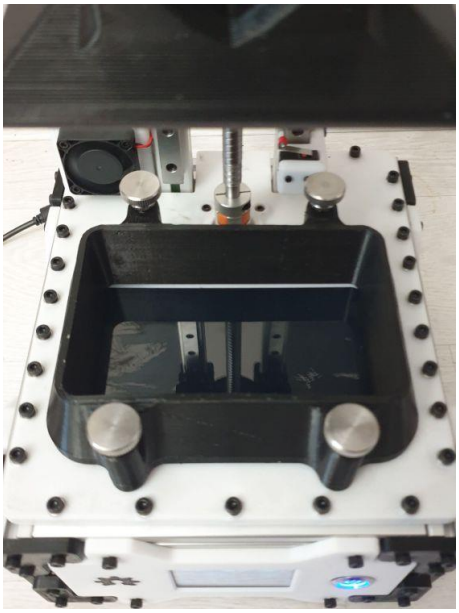
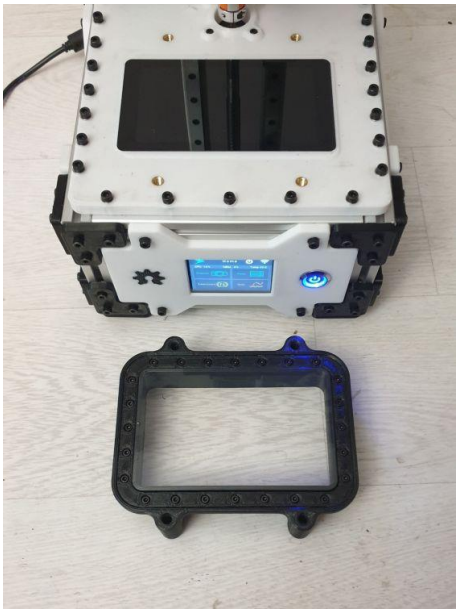
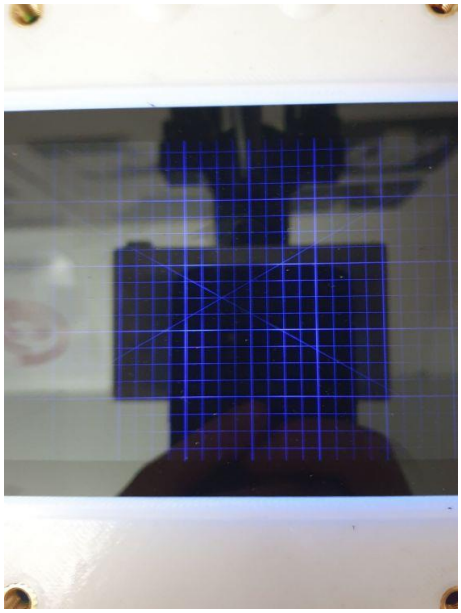
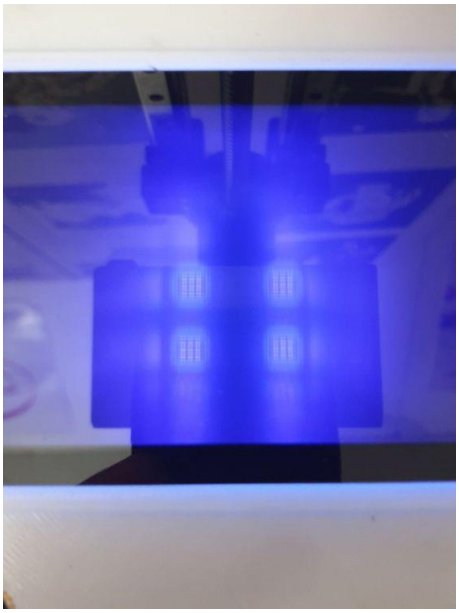
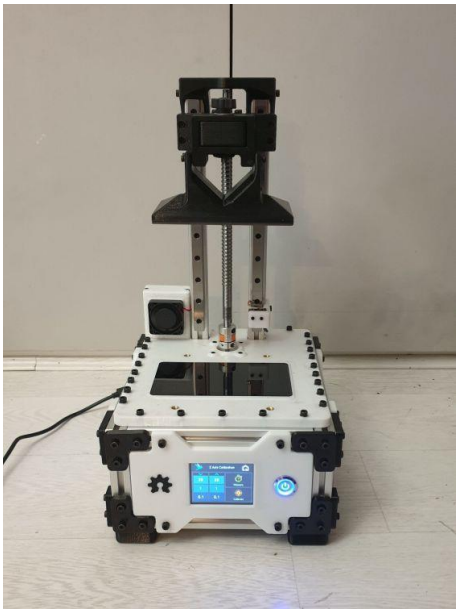
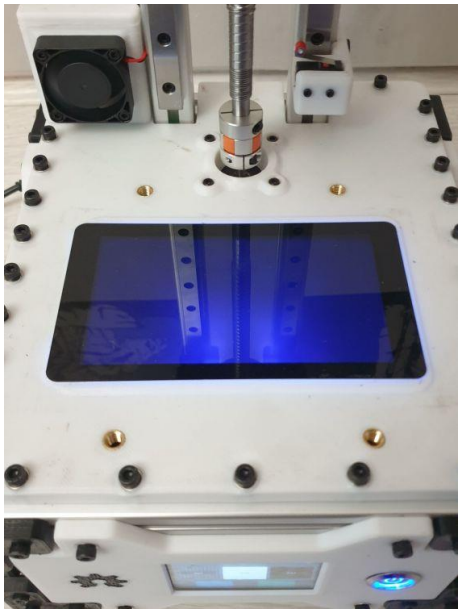
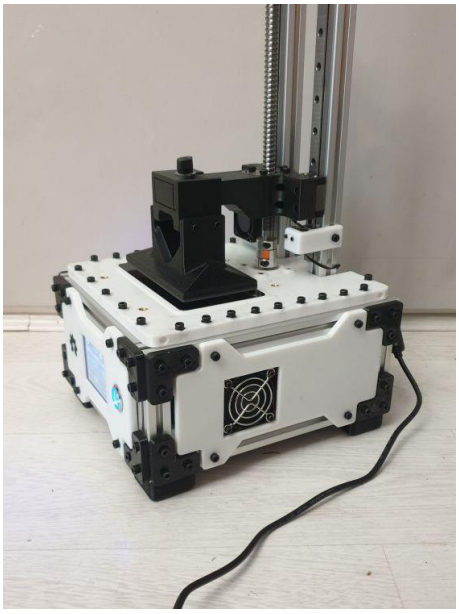


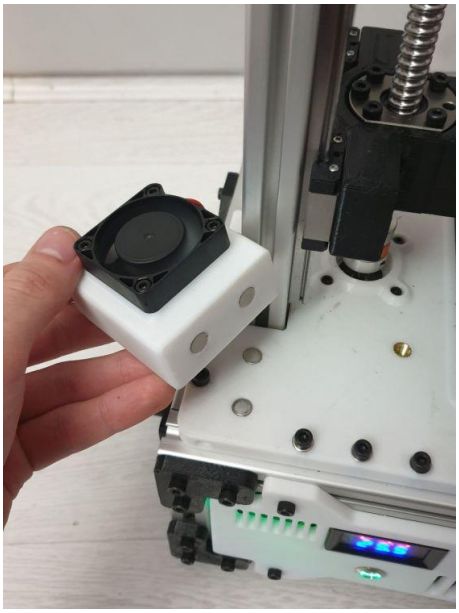


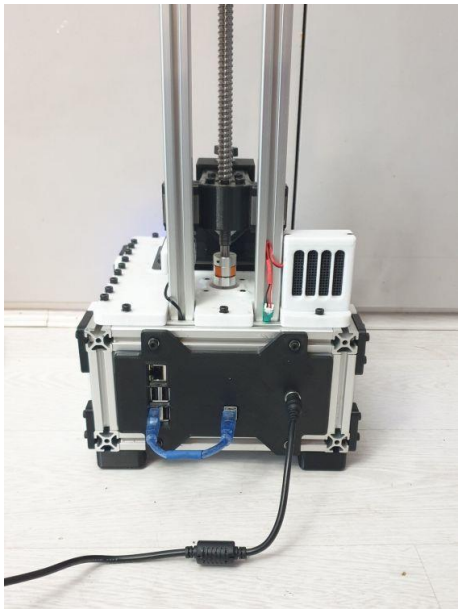


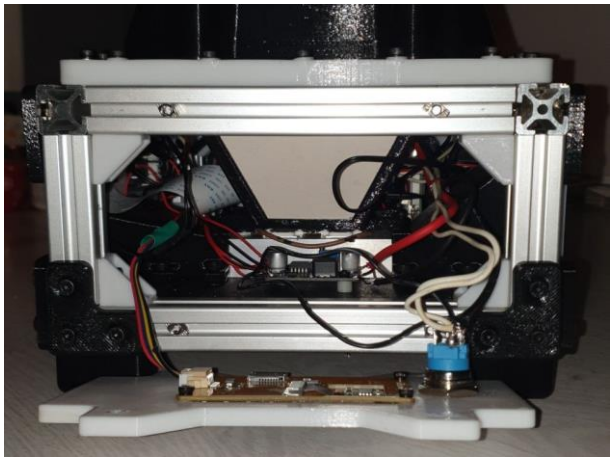








F) Contact me or find me on:

- Mail address: guillaumehaouy + @ + gmail.com
- Printables: https://www.printables.com/@Guillaume3D3_1889993
- Cults3D: https://cults3d.com/fr/utilisateurs/Guillaume3D3/fichiers-3d
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