

APEROLiker
HUGOliker



APEROLIKER BUILD GUIDE

Version 22.10.2023

PROLOG



Before you begin on your journey, a word of caution.

In the comfort of your own home, you are about to assemble a robot. This machine can burn or electrocute you if you are not careful. Please do not become the first APEROLIKER fatality. There is no special Reddit flair for that.

Please, read the entire manual before you start assembly.

Most of all, good luck!

THE APEROLIKER TEAM

Finally, thank you to Christoph, Kai and Jakob who always support my work.

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INTRODUCTION

PART PRINTING GUIDELINES

We recommend you follow these Guidelines.

3D PRINTING PROCESS:

Fused Deposition Modeling (FDM)

MATERIAL:

PLA / ABS

LAYER HEIGHT:

Recommended: 0.2mm

EXTRUSION WIDTH:

Recommended: Forced 0.4mm

INFILL TYPE:

Gyroid

INFILL PERCENTAGE:

Recommended: 40%

WALL COUNT:

Recommended: 4

SOLID TOP/BOTTOM LAYERS:

Recommended: 5

FILE NAMING

By this time you should have already downloaded our STL/3MF files. You might have noticed that we have used a unique naming convention for the files. This is how to use them.

PRIMARY COLOR:

Example: ControlPanelRing.3mf

These files will have nothing at the start of the filename.

ACCENT COLOR:

Example: [a]_Controlpanel_Aperoliker.3mf

We have added “[a]” to the front of any STL file that is intended to be printed with accent color.

QUANTITY REQUIRED:

Example: [a]_Foot_x4.3mf

If any file ends with “_x#”, that is telling you the quantity of that part required to build the machine.

SUPPORT AND MULTIMATERIAL:

Example: [MM]_HousingAperoliker.3mf

All files will print **without support**, if your 3D printer is well calibrated!

Except for the file of the housing. The "support structure above print bed" must be activated there!

In addition, you will notice the [MM]. The housing can be printed as a multi-material. No colour changer is necessary for this. See the chapter "Print housing multimaterial" for more information.

OVERVIEW OF TOOLS

TOOLS YOU WILL NEED

You will need the following tools. You should also be familiar with them and know how to use them.

SOLDERING IRON



SCREWDRIVER



SOLDERING TIN



HOT GLUE GUN



STRING CUTTER



BENCH VISE (OPTIONAL)



SCISSORS



SCALPEL



WIRE STRIPPER (OPTIONAL)



SUPER-GLUE



PARTS LIST

You can source your parts from amazon, aliexpress, ebay or from your local parts store.



Part	Quantity	Description	Part	Quantity	Description
M3x25 BHCS	1	Mounting the lever	DC-DC Converter 12->5V (Model MP1584)	1	Power source of the microprocessor
M3x6 BHCS	4	Mounting the control panel to the housing	DC-DC Converter 12->20V (Model MT3608)	1	Power source of the pumps
M3x10 BHCS	6	Mounting the pumps to the housing lid	Solder wires 0.14-0.25qmm	5m	Use different colors for recognizability
M3x8 FHCS	8	Mounting the housing lid to the housing	GROTHEN 12V pumps (OD ø5mm, ID ø3mm tube)	3	Peristaltic pumps
M3x8 FHCS	8	Mounting the feet to the housing	Tube OD ø5.5mm, ID ø3.5mm	3m	Tubing between bottles and aperoliker
M3x5.7mm heat set insert	31	For all screw holes (See Ruthex)	Rotary encoder aluminium knob	1	Control panel
6x6x150mm Aluminium profile	4	Extended Feet (optional)	Rotary encoder KY-040	1	Control panel
Stainless steel straws, OD ø5mm, ~240mm	3	Extension of the tubing	470µF, 35V capacitor	1	Voltage stabilization 20V
Rubber band 500mm	1	Used for holding the bottles (optional)			
M8 hex nut	4	Weight of the drip tray (optional)	17x7mm breadboard (4x2 holes)	2	Base board for power LEDs
100k Ohm resistor	4	Output stage parts	32x47mm breadboard (12x18 holes)	1	Custom output stage PCB
100 Ohm resistor	4	Output stage parts	Shrink tubing	30cm	Electrical insulation
470 Ohm resistor	1	LEDs resistor			
1N4148 diode	4	Output stage parts			
22µF, 35V capacitor	3	Output stage parts			
IRLU024N mosfet	4	Output stage parts			
Tactile switch 6x6mm	1	Lever switch for dispensing			
DC jack, OD ø7mm	1	Connector for power supply			
12V Power supply	1	Power supply for APEROLiker/HUGOliker			
Piezo buzzer, OD ø11.5mm	1	Sound output when operating			
Wemos S2 mini	1	Microprocessor			
GMT130-V1.0 display IPS 240x240	1	Display			
Power LED	2	For illuminating the bottles			

PARTS LIST

WHAT PUMP TO BUY:

With 3mm ID and 5mm OD tube



Volt: DC 12V

Tube size: 3*5mm

Flow rate: 150 ml/min (max)

Turning speed: 0.1-60 rpm

Driver size (Φx H): Dia. 32mm x Height 23mm

Install hole: 48.5mm

PRINT HOUSING MULTIMATERIAL

PRINT HOUSING

It is possible to print the housing with two colors without a multi material unit or color changer like the Prusa MMU or Bambu Lab AMS. The .3mf files are designed to print them as is, in two separate consecutive printing operations.

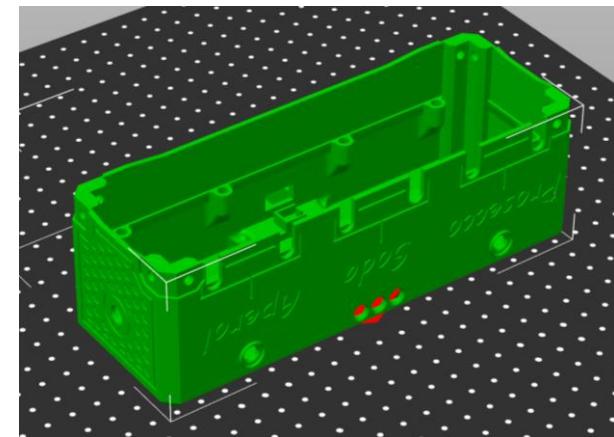
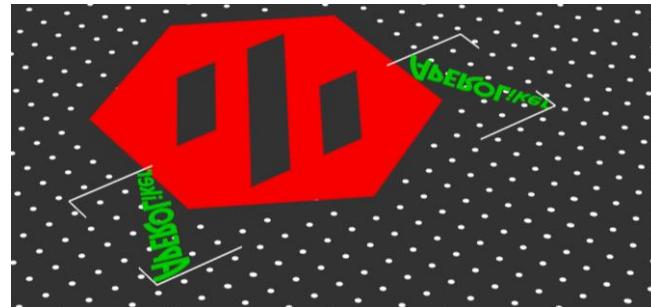
Step 1: Slice two different files. The first one only containing the characters **APEROLiker** or **HUGOliker** and the second with the remaining enclosure.

Step 2: Print the first file with the accent color you are using.

Step 3: Directly after the end of printing, go to the printer settings and set the bed temperature back to 55°C (PLA). This will prevent the printed characters from cooling down and from detaching from the print bed.

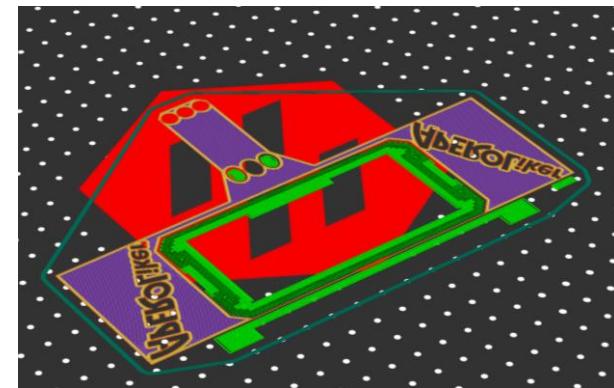
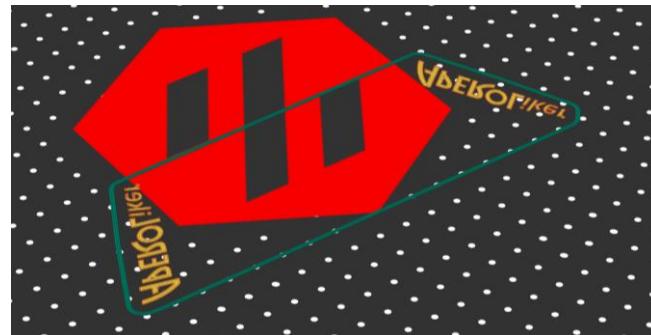
Step 4: Remove the skirt from the printer bed and change filament manually to your primary color.

Step 5: Print second file. The printer will wrap the letters and fuse them into a single first layer.

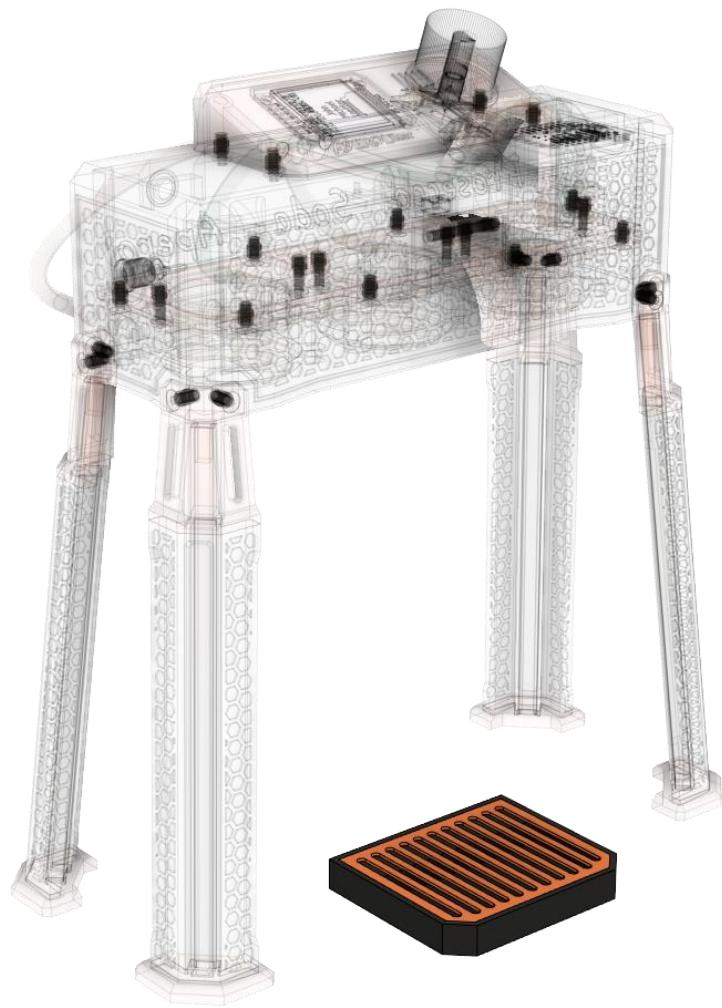


PRACTICE MAKES PERFECT

It's a bit challenging and you have to exercise patience and also start one or two more attempts. But it works and the result is stunning!



DRIP TRAY



DRIP TRAY ASSEMBLY

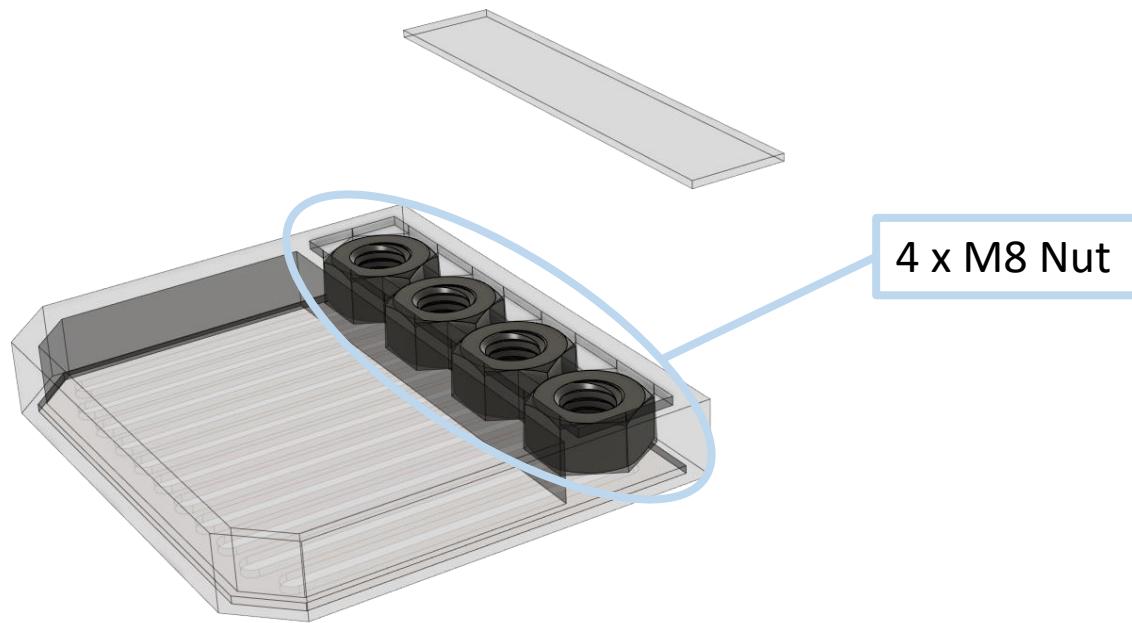
DRIP TRAY



GLUE INTO PLACE

Use a fast-acting glue, like super-glue.

DRIP TRAY



DRIP TRAY



GLUE INTO PLACE

Use a fast-acting glue, like super-glue.



TIP:

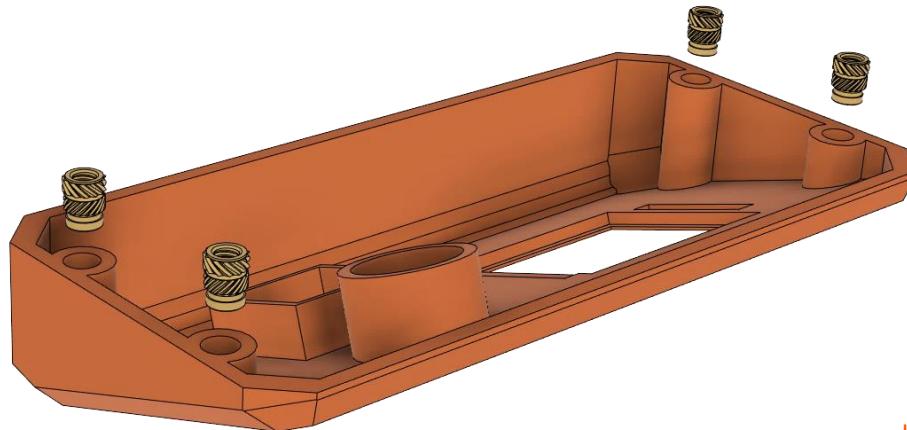
Use a bench vise to press the two pieces together directly after applying the glue.

CONTROL PANEL



CONTROL PANEL ASSEMBLY

CONTROL PANEL



Heat Set Inserts

HEAT SET INSERTS

This design relies heavily on heat set inserts. Make sure you have the proper inserts (check the hardware reference for a close-up picture and the BOM for dimensions).

If you've never worked with heat set inserts before we recommend you watch a video guide before.

CONTROL PANEL



Control Panel Ring

GLUE INTO PLACE

Use a fast-acting glue, like super-glue.

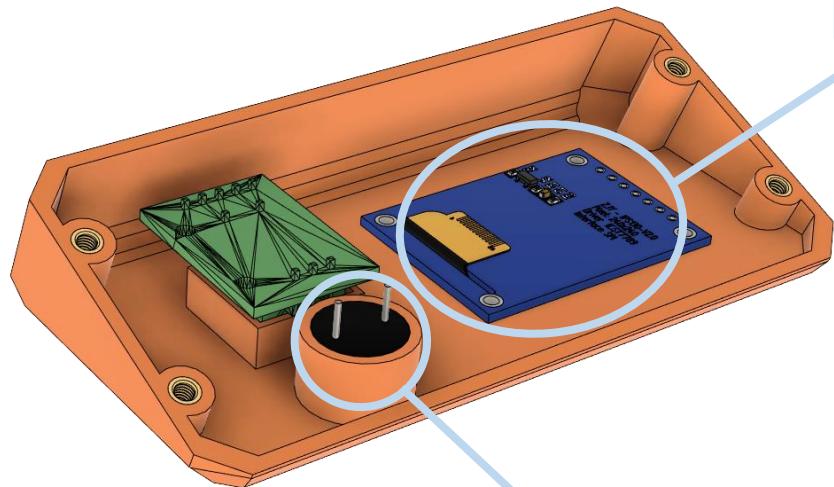


KY-040 Rotary Encoder

TIP:

Make sure you have soldered the cables before installing the encoder.
See chapter 'Electrical wiring'.

CONTROL PANEL



Display 1.3" IPS 240x240

GLUE INTO PLACE

Use a hot glue gun to glue in place.

TIP:

Make sure you have soldered the cables before installing the display and the buzzer. See chapter 'Electrical wiring'.

Piezo Buzzer

GLUE INTO PLACE

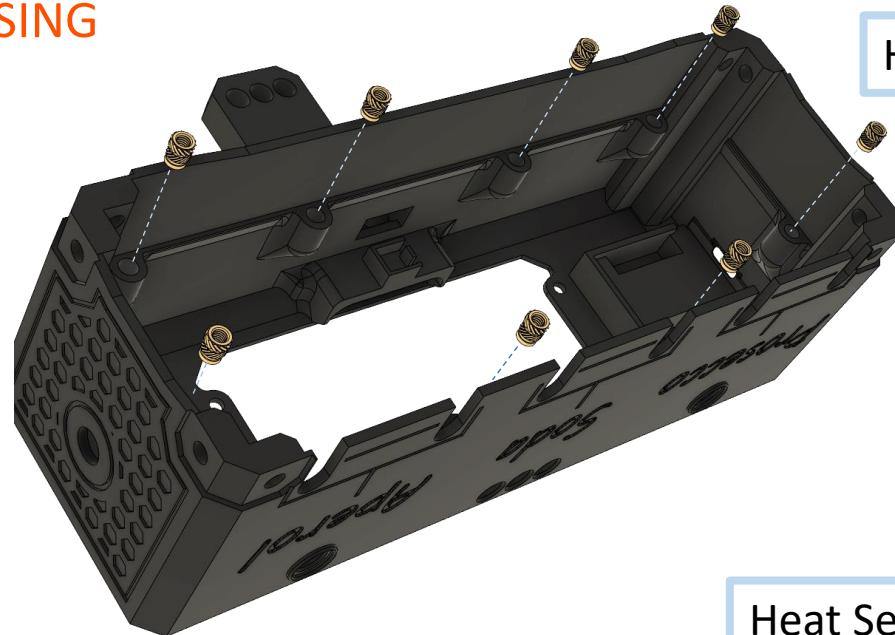
Use a fast-acting glue, like super-glue.

HOUSING



HOUSING ASSEMBLY

HOUSING

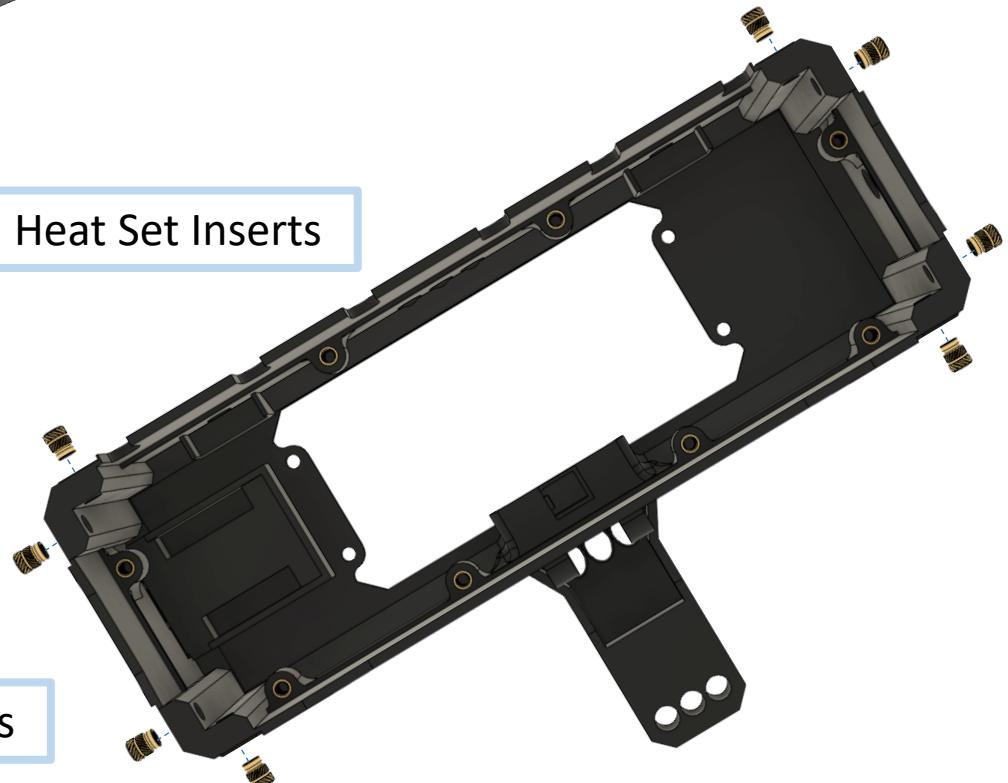


Heat Set Inserts

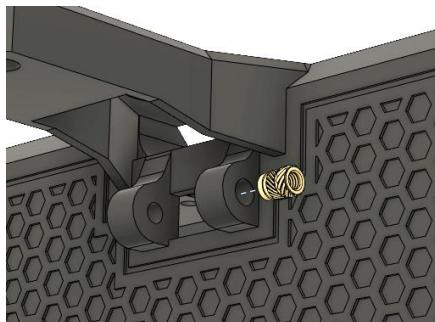
TIP:

If you printed with PLA, do not apply to much heat.

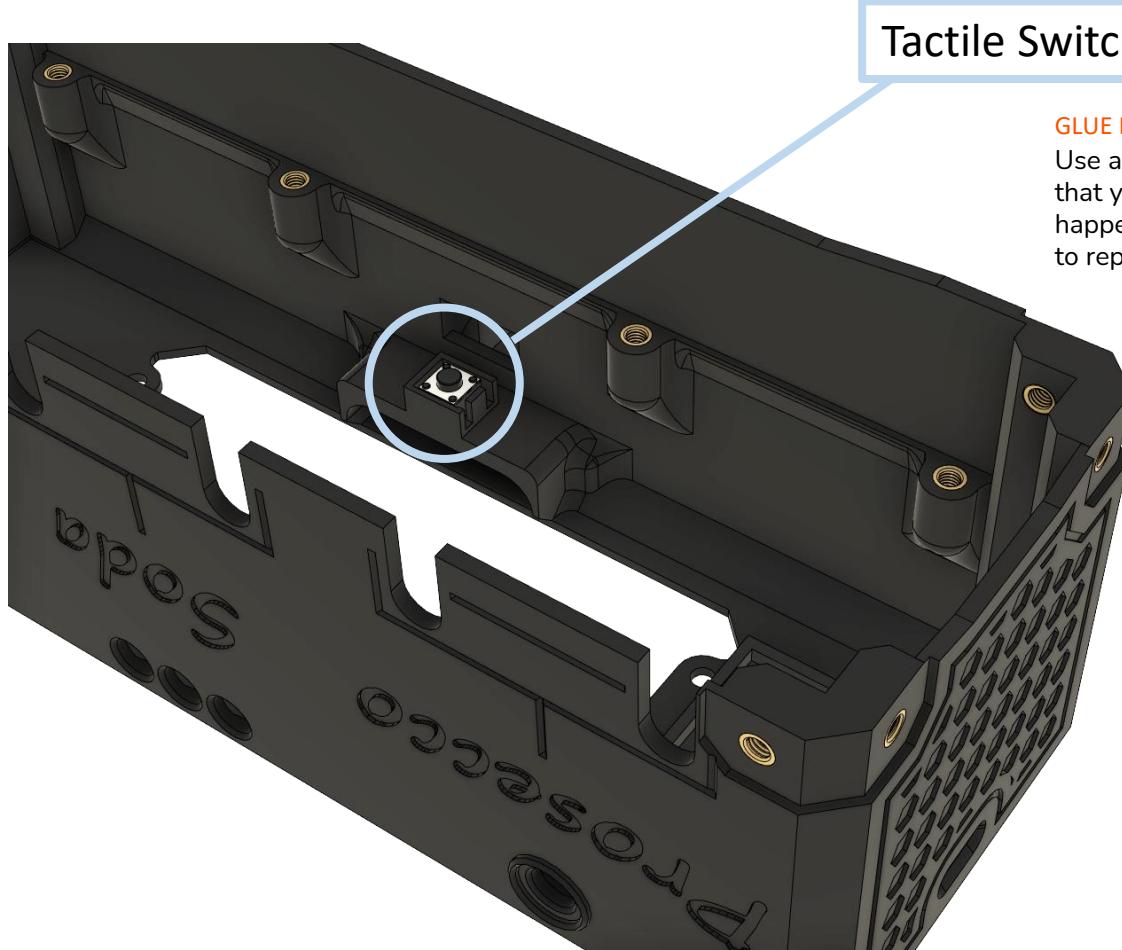
Heat Set Inserts



Heat Set Inserts



HOUSING



Tactile Switch

GLUE INTO PLACE

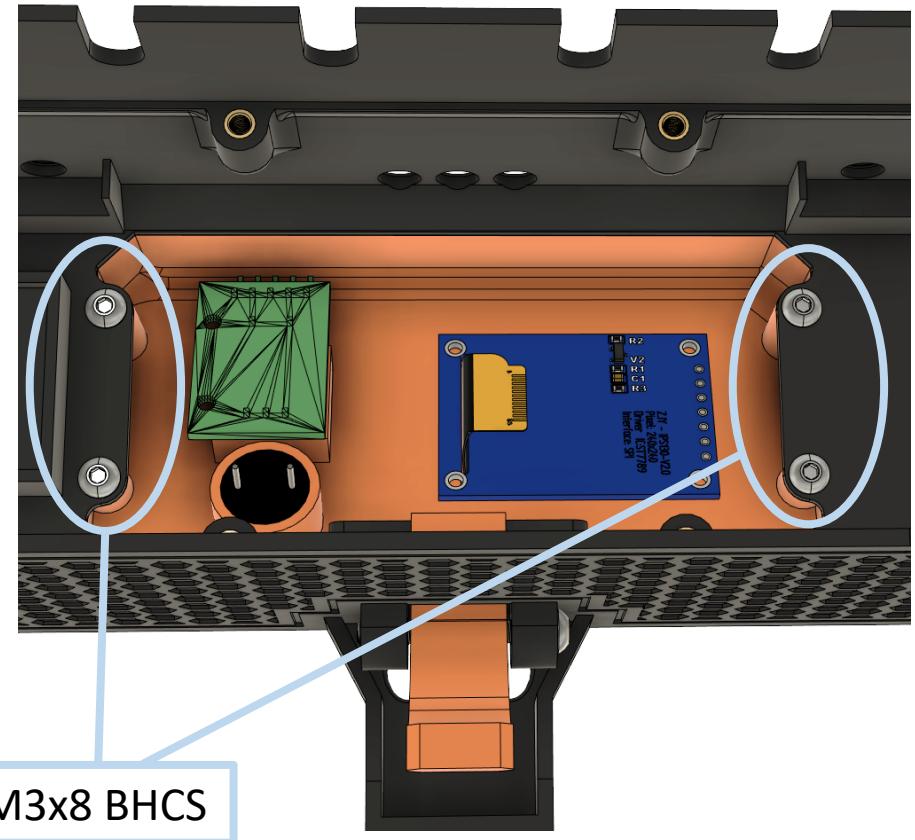
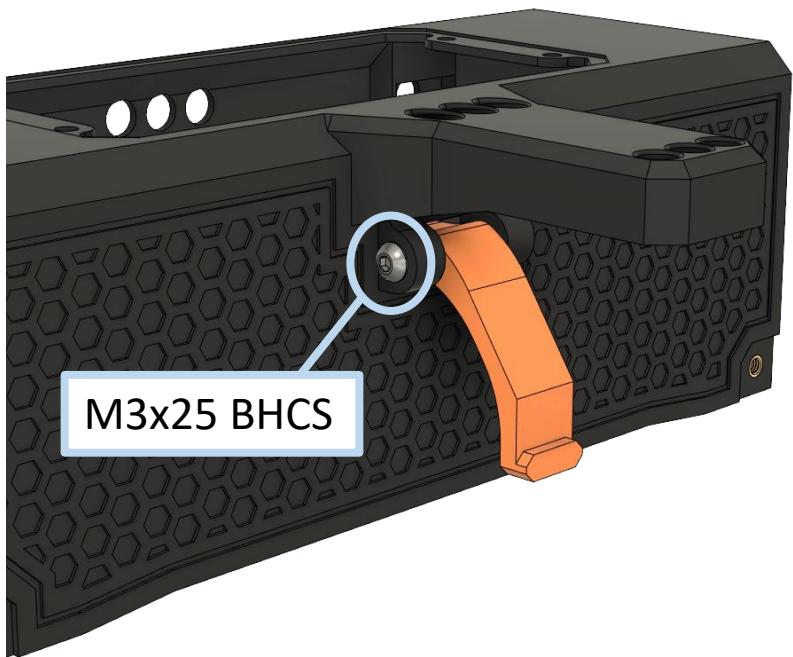
Use a fast-acting glue, like super-glue. Be careful so that you don't stick the switch as well. If this happens, the button is unusable, and you may have to reprint the entire housing.



TIP:

Make sure you have soldered the cables before installing the tactile switch. See chapter 'Electrical wiring'.

HOUSING



HOUSING



DC Connector Jack

TIP:

Make sure you have soldered the cables before installing the DC jack and the power LEDs. See chapter 'Electrical wiring'.



GLUE INTO PLACE

Use a fast-acting glue, like super-glue.



SOLDER POWER LED

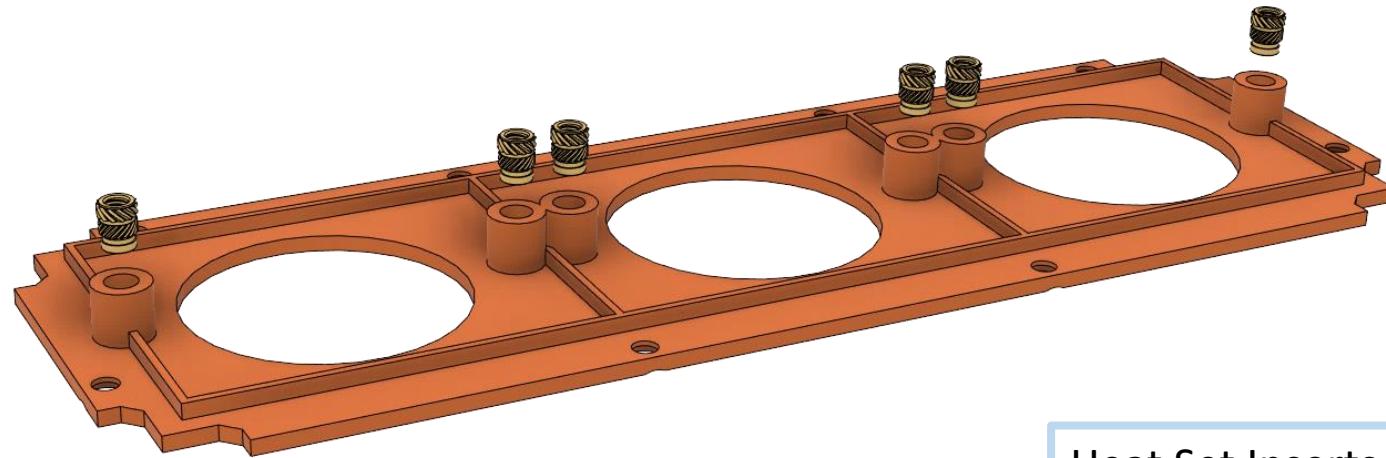
Use 17x7mm breadboard to solder the power LED on

HOUSING LID



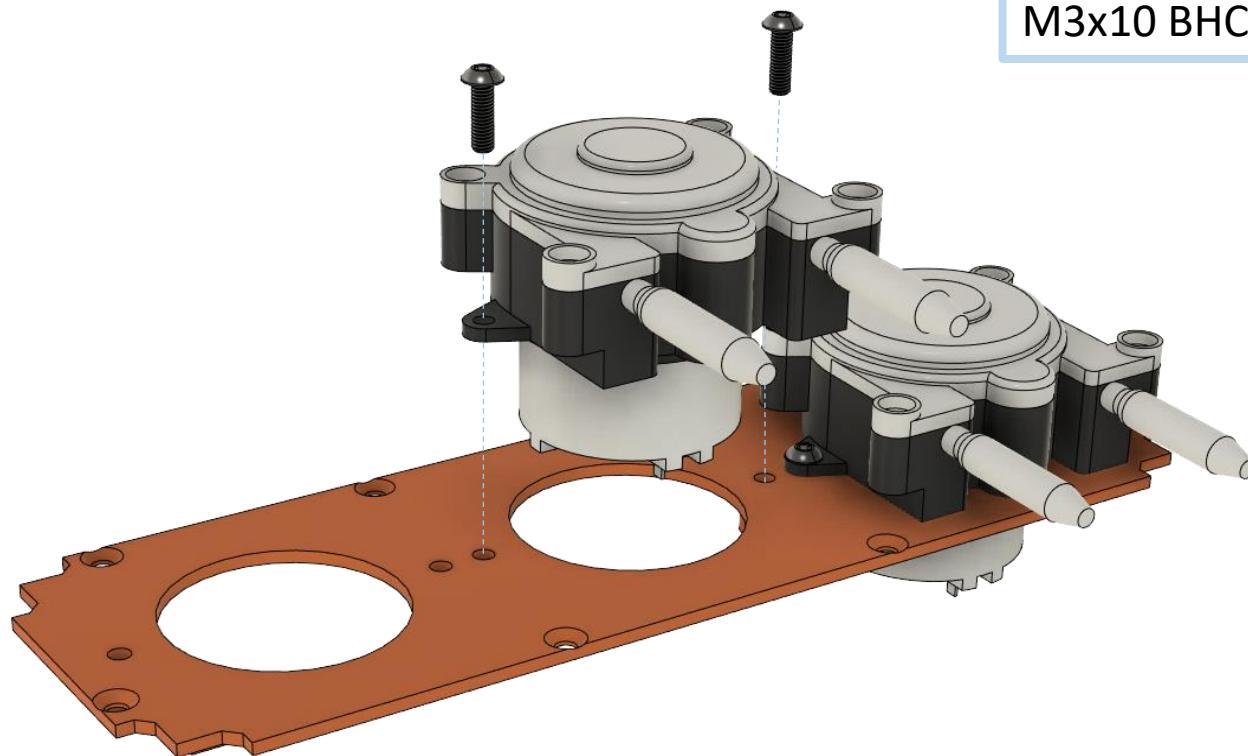
HOUSING LID ASSEMBLY

HOUSING LID



Heat Set Inserts

HOUSING LID



M3x10 BHCS

EXTENDED FEET



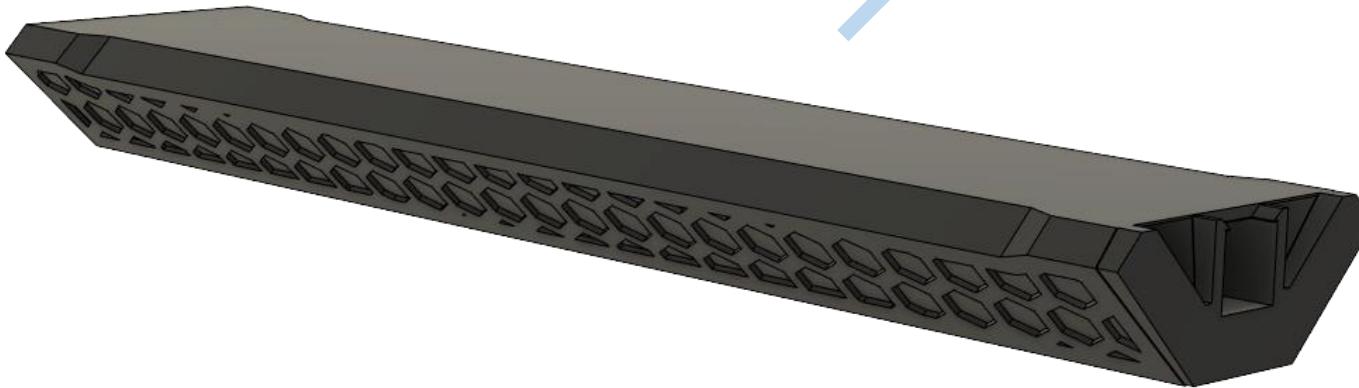
FEET ASSEMBLY

EXTENDED FEET

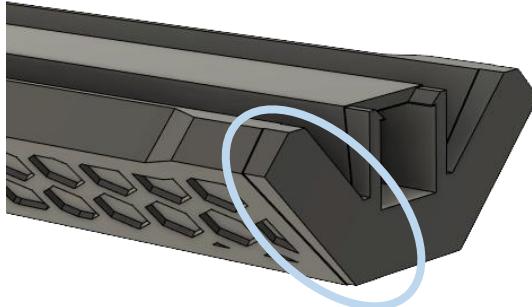
REMOVE SUPPORT

Use a scalpel to remove the support structure (optional).

Caution: Keep the middle part covered!



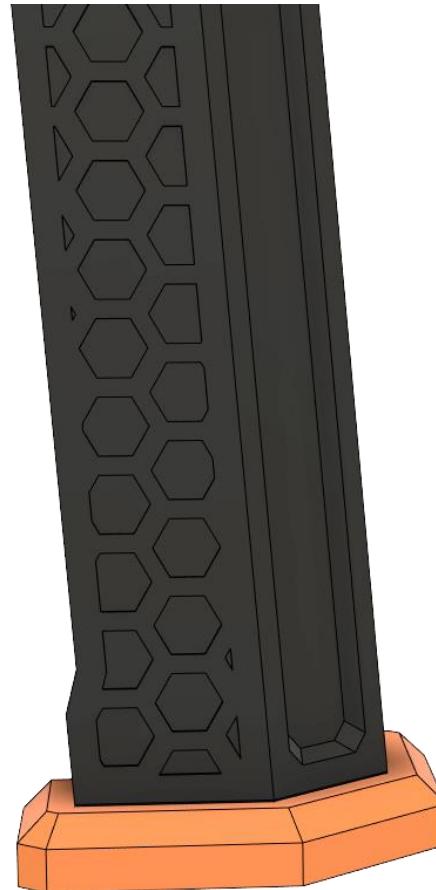
EXTENDED FEET



FIND CORRECT SIDE



Have a close look to find the correct side to glue on!
The right side has a notch.

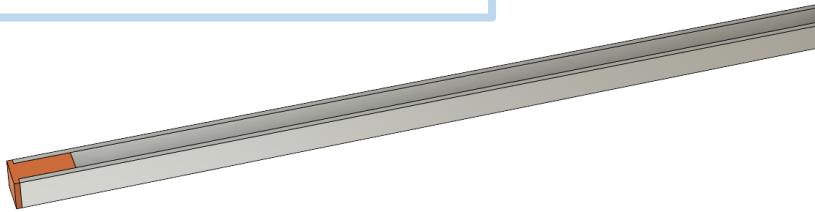


GLUE INTO PLACE

Use a fast-acting glue, like super-glue.

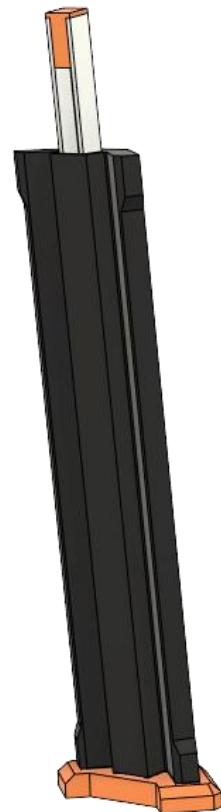
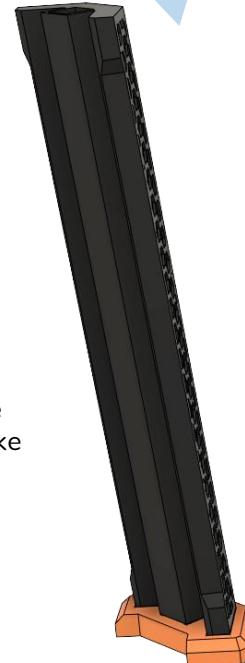
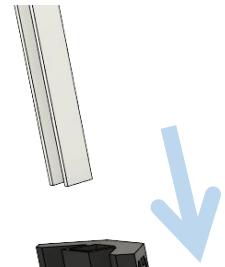
EXTENDED FEET

Aluminium rod 6x6x150mm



GLUE INTO PLACE

Use a fast-acting glue, like super-glue.



GLUE INTO PLACE

Fully insert into the inner part of the foot cover. Use a fast-acting glue, like super-glue.

ELECTRONICS



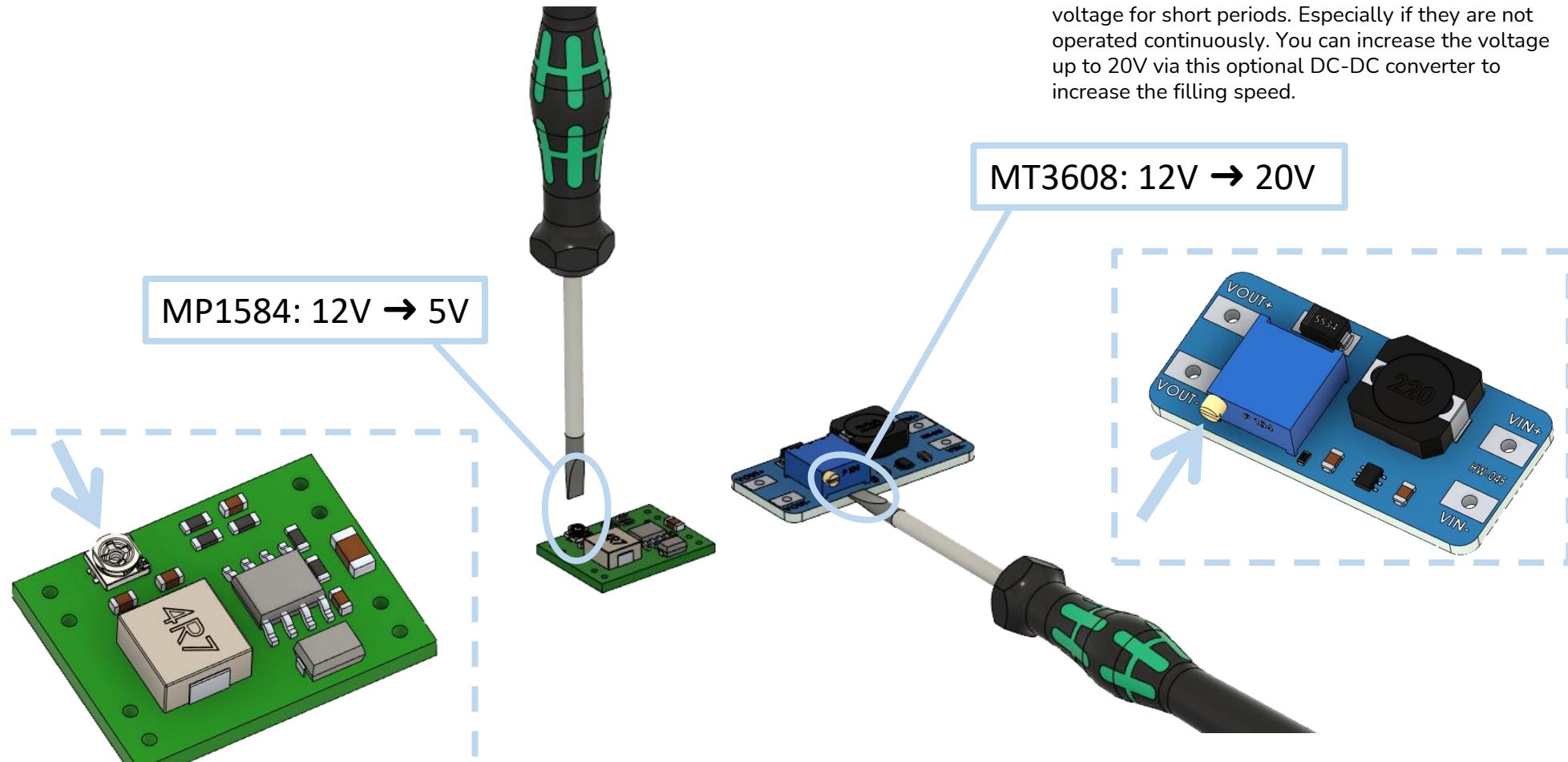
ELECTRONICS

ELECTRONICS



CALIBRATING THE DC-DC CONVERTERS:

Use a screwdriver and a 12V power source to calibrate the DC-DC converters **BEFORE** installing them.



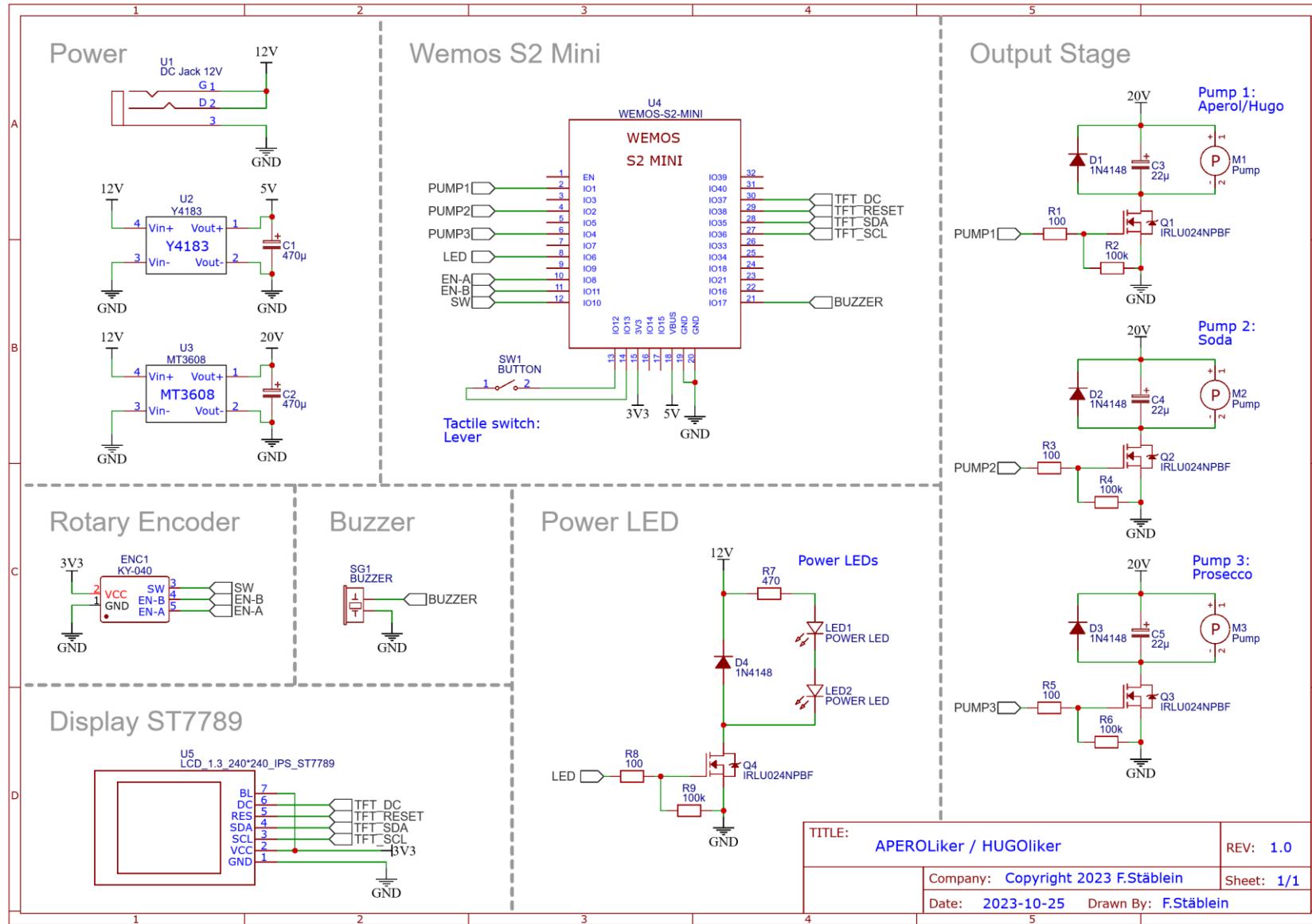
OPTIONAL: STEP-UP CONVERTER TO 20V

The pumps are typically 12V but can tolerate more voltage for short periods. Especially if they are not operated continuously. You can increase the voltage up to 20V via this optional DC-DC converter to increase the filling speed.

ELECTRONICS

SCHEMATICS:

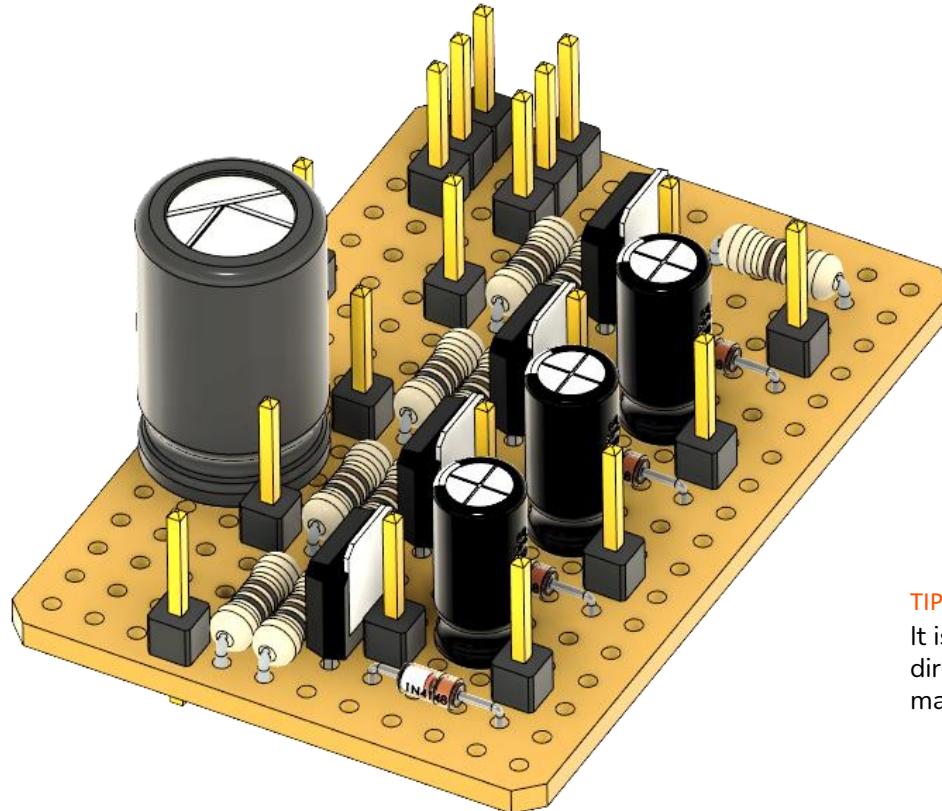
The schematics are for overview purposes only.
Use the electrical wiring diagram for wiring.



ELECTRONICS

CUSTOM OUTPUT STAGE PCB:

Solder custom PCB like shown:



TIP:

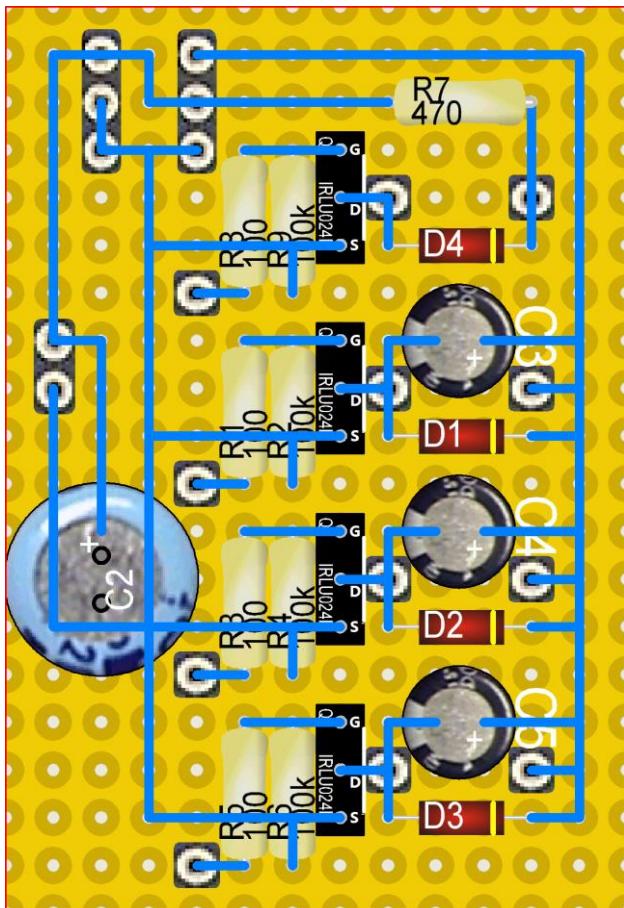
It is recommended to solder the cables directly into the PCB as the pin headers may come loose.

▼ SUGGESTED LAYOUT ON THE NEXT PAGE ▼

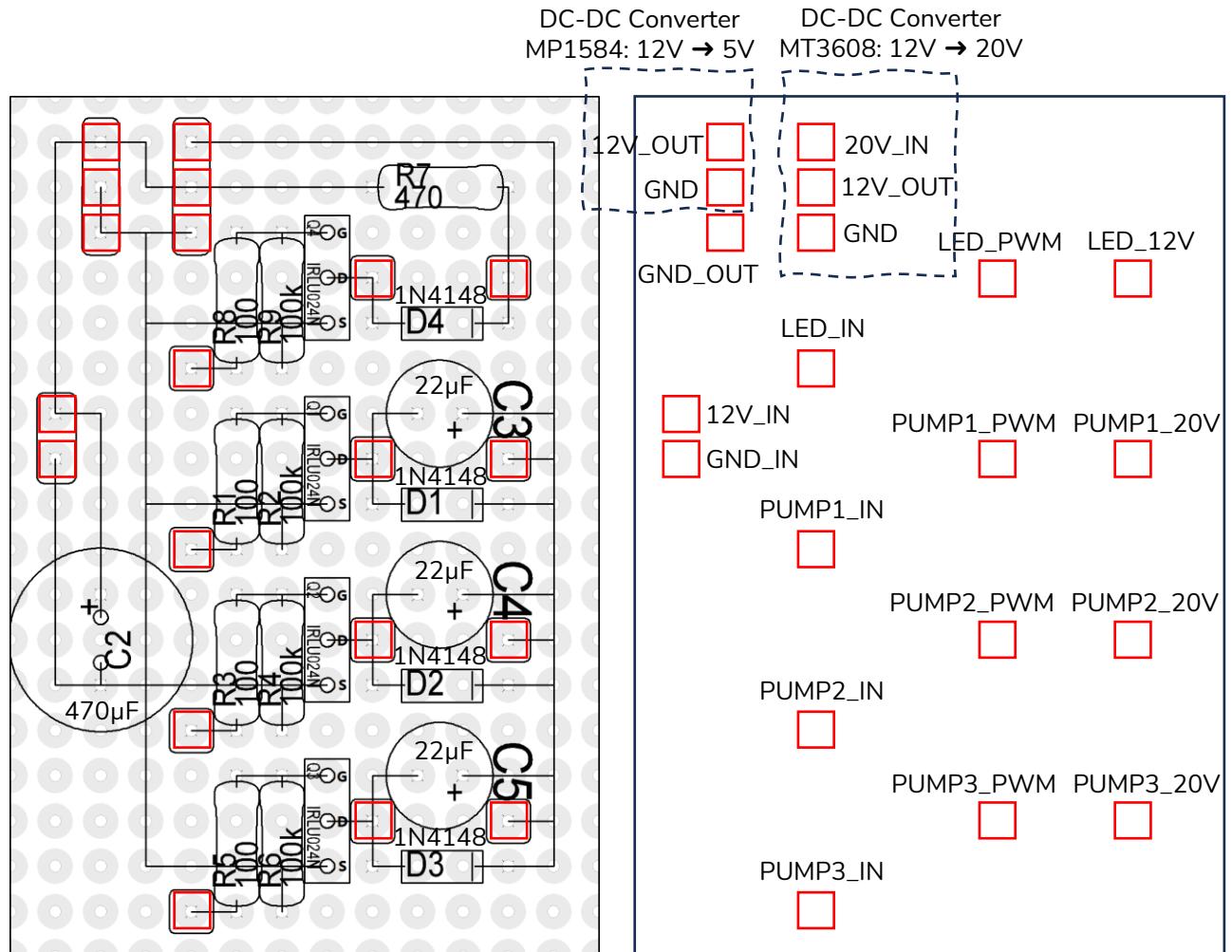
ELECTRONICS

CUSTOM OUTPUT STAGE PCB:

Solder custom PCB like shown:



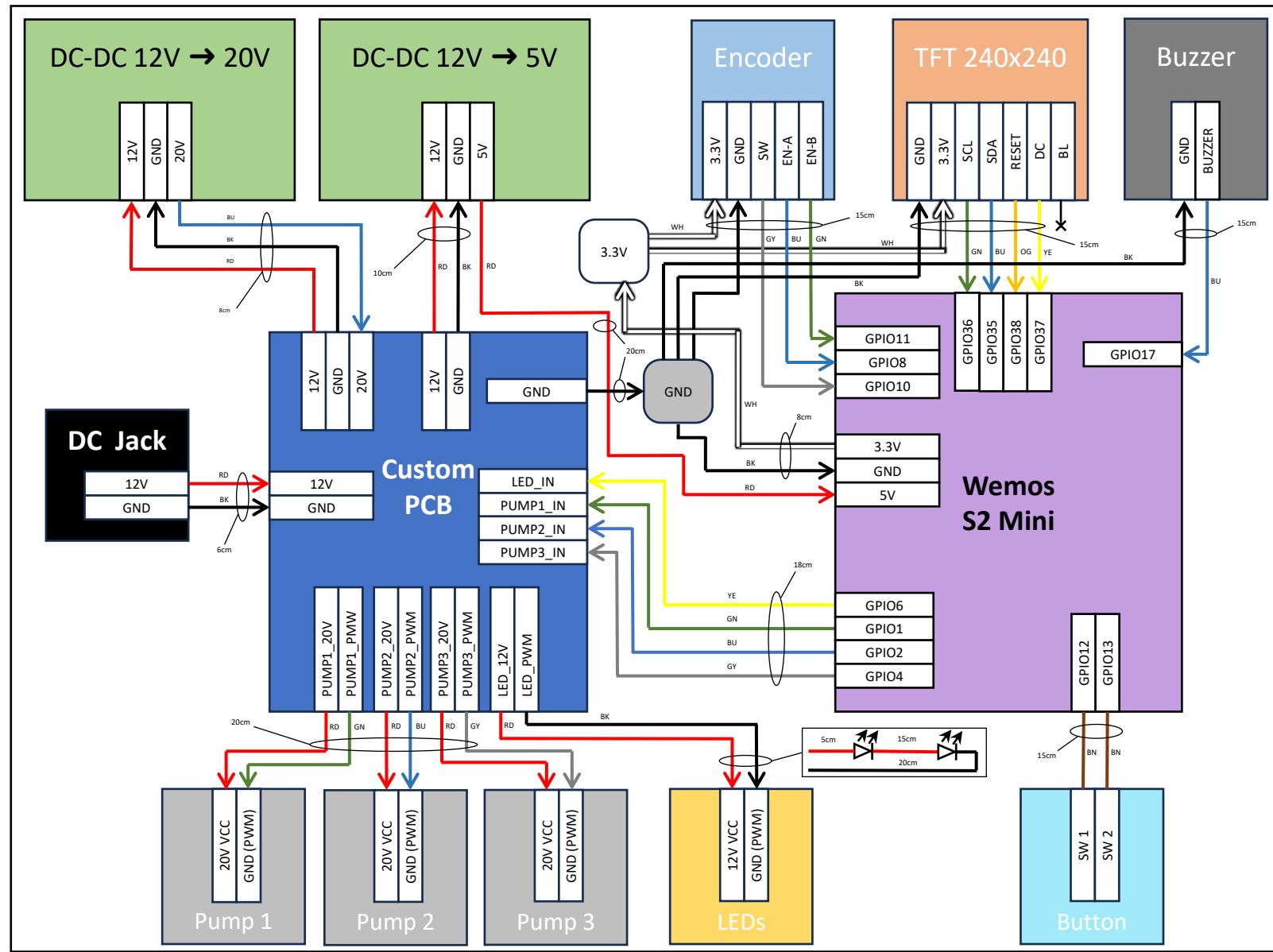
Breadboard: 32mm x
47,5mm (12x18 Holes)



ELECTRONICS

WIRING:

Use this electrical wiring diagram to solder all your parts together.



TIP:

Make sure your wires are long enough to fit for the correct length.

FINAL ASSEMBLY



FINAL ASSEMBLY

FINAL ASSEMBLY



SOLDER WIRES AND GLUE INTO PLACE

Solder all wires to the output stage PCB before gluing and use a fast-acting glue, like super-glue.



CHECK PUMP POLARITY

Be sure to check the polarity of the pump. It can happen that the pump is incorrectly labelled and then turns the wrong way round later.

FINAL ASSEMBLY

SOLDER WIRES

Solder all wires to the Wemos S2 mini and load Check-Firmware "ESP32S2_Check".



Pump 1 running



Pump 2 running



Pump 3 running



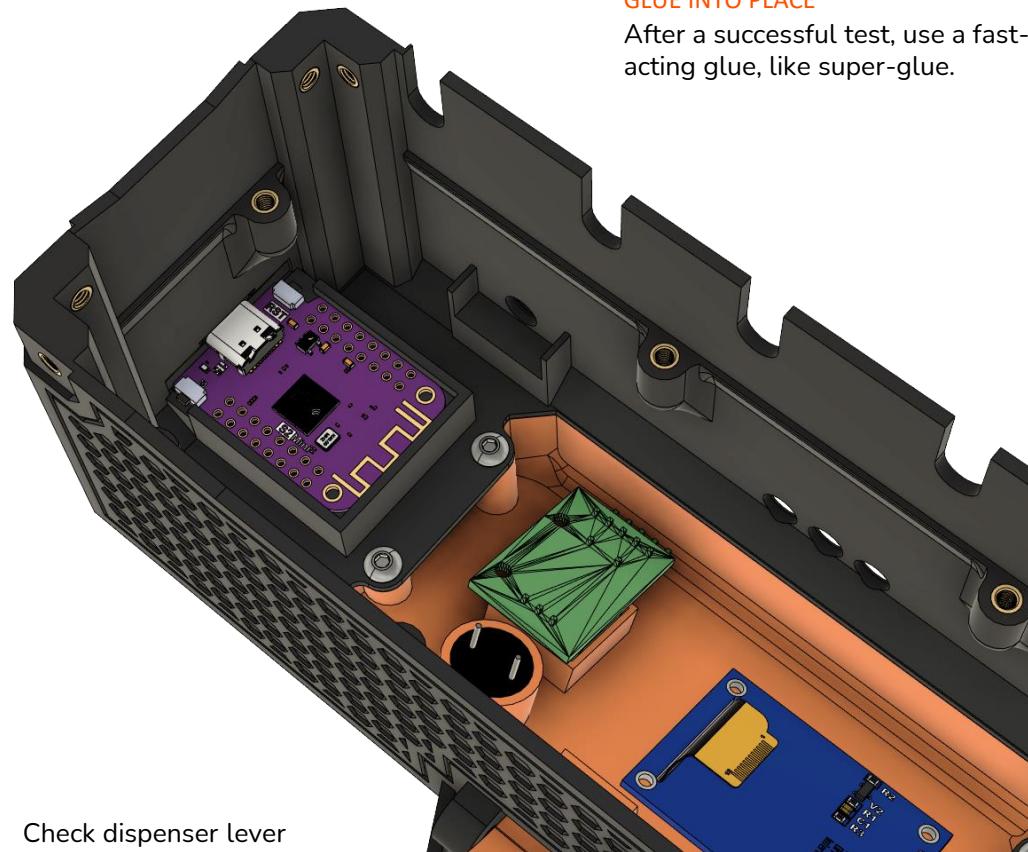
LEDs light up



Buzzer sound output



Display shows message 'OK'



GLUE INTO PLACE

After a successful test, use a fast-acting glue, like super-glue.



Check dispenser lever

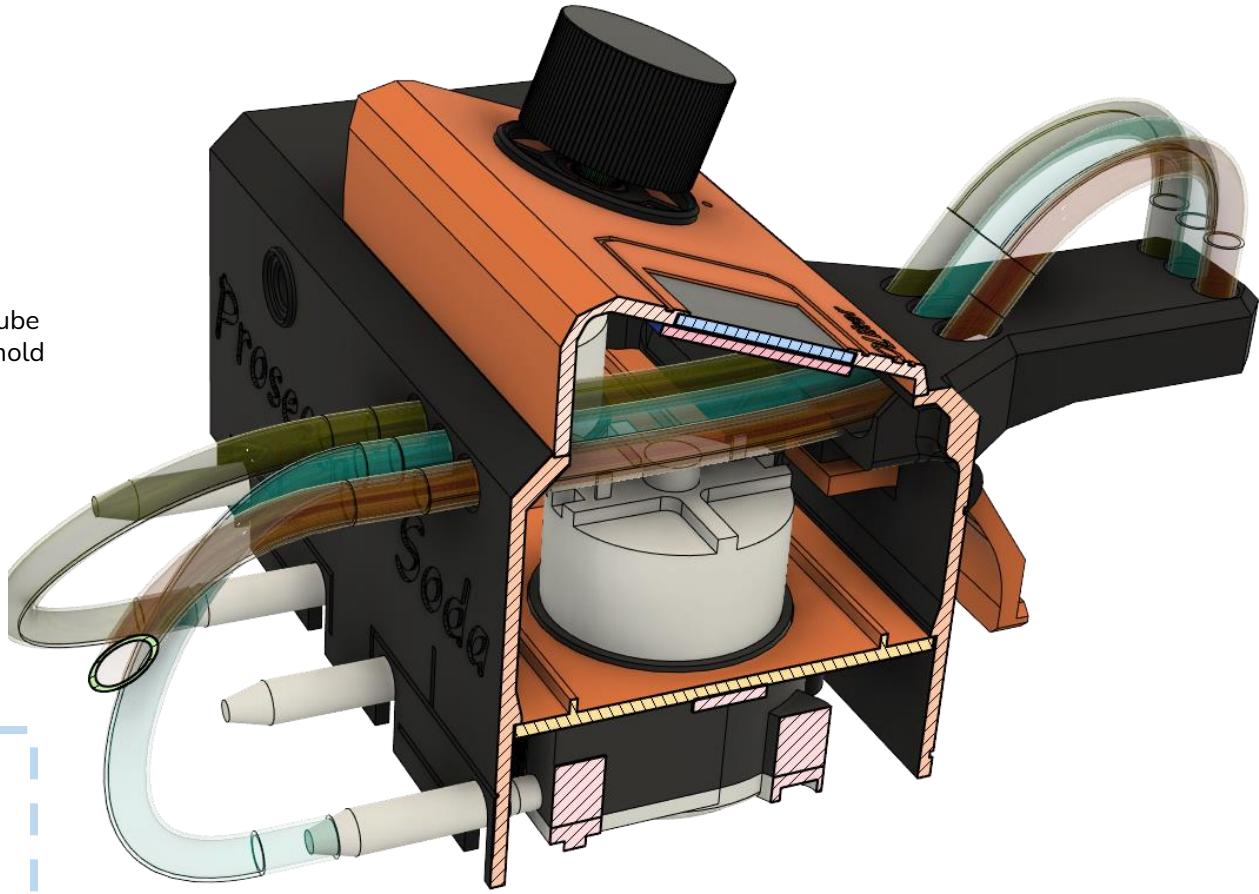
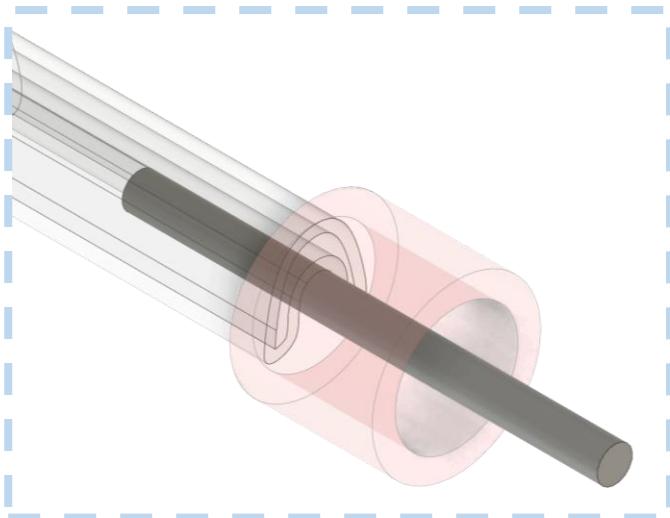


Check the rotary encoder by turning and pushing it.

FINAL ASSEMBLY

MOUNT TUBING

Insert the cut to length tubing into the APEROLiker/HUGOLiker like shown. If it is a tube with the appropriate outside diameter it will hold inside the holes without any glue.

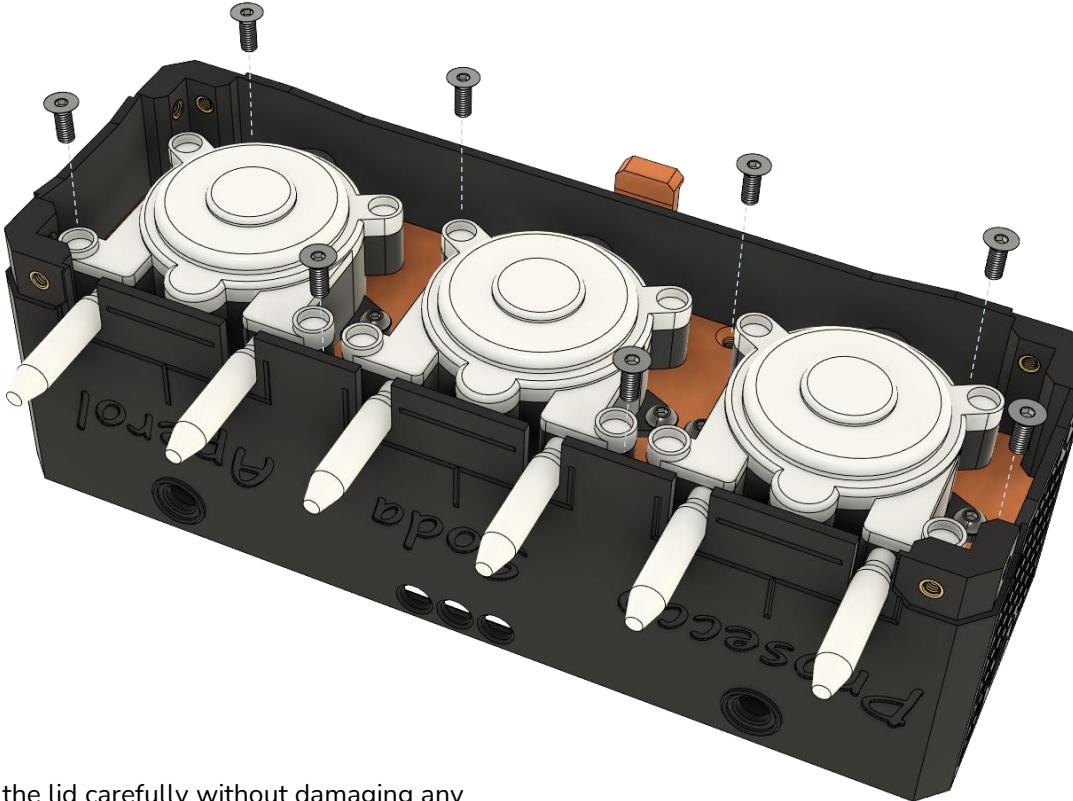


TIP:

Use the back of a 1.5mm drill to fold in the tube as shown. This makes it very easy to push it into the hole. Let it unfold in the correct position.

FINAL ASSEMBLY

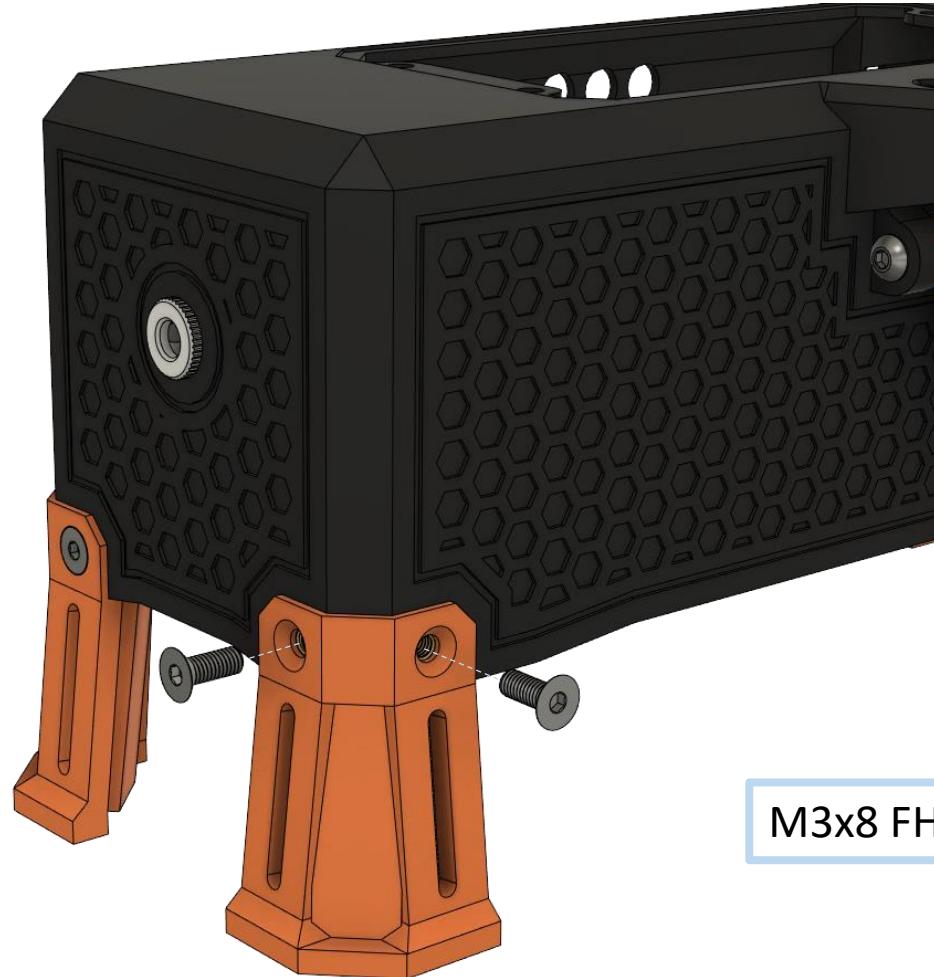
M3x8 FHCS



TIP:

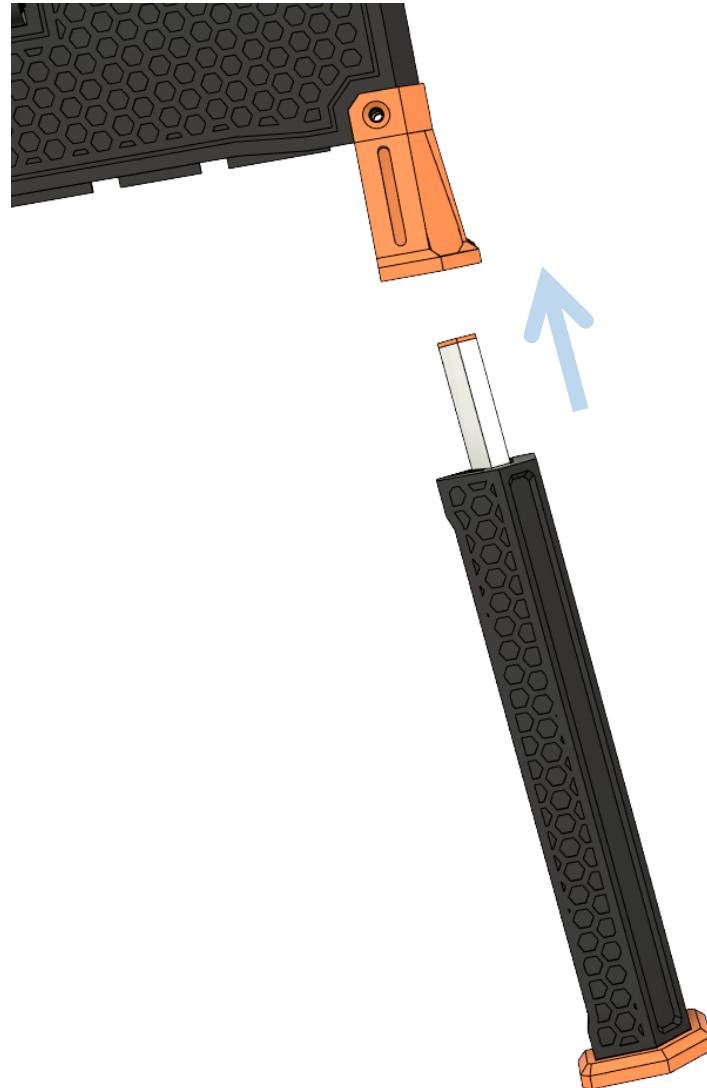
Close the lid carefully without damaging any wires. Always double check – the screw is always stronger than any wire.

FINAL ASSEMBLY



M3x8 FHCS

FINAL ASSEMBLY



INSERT FOOT

Insert the foot extension into the foot.
Caution: Do not glue the extension foot
to the standard foot, so you can
remove it for transport.

NEXT STEPS

ASSEMBLY COMPLETED! ... NEXT STEP: SETUP & TEST

This manual is designed to be a reference manual for the build process. Next step is to upload the firmware to the Wemos S2 mini and start testing each pump for its function.

You can find the correct firmware here:



<https://www.github.com/xxxxxxxx/xxxxxx>

APEROLiker HUGOliker

Enjoy your APEROLiker / HUGOliker.

And please send the pictures of your build to: aperoliker.hugoliker@gmail.com ☺

