Project Goals

Improve the resulting product in 3 direction:

- Packaging: make the closed lamp more compact and suitable for transportation.
- Energy: use a more powerful power bank (from 5Ah to 10 Ah).
- Flexibility: add a few fixture to attach cameras or phones, using a threaded bolt for 1/4-20UNC screw to connect Manfrotto mounting for Mobile Phone.
- Add Self Locking Nuts for better control of frictions along hinges.

Dimensions

Base Size: 140x90 mm

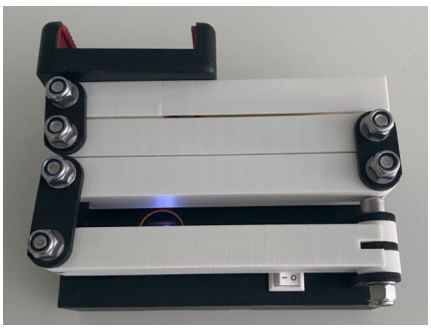
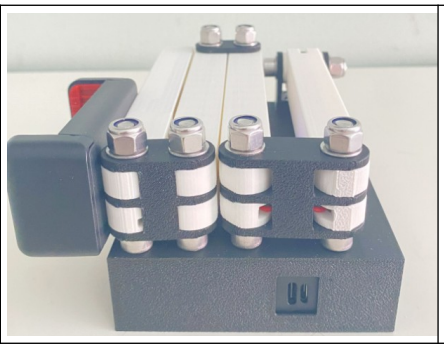
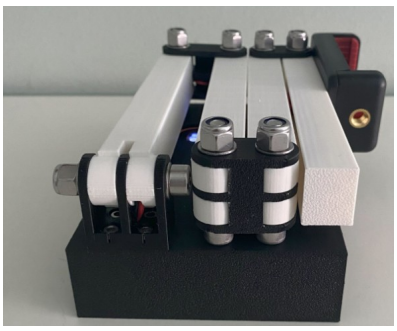
Closed Height: 75 mm

Total Height: 490 mm

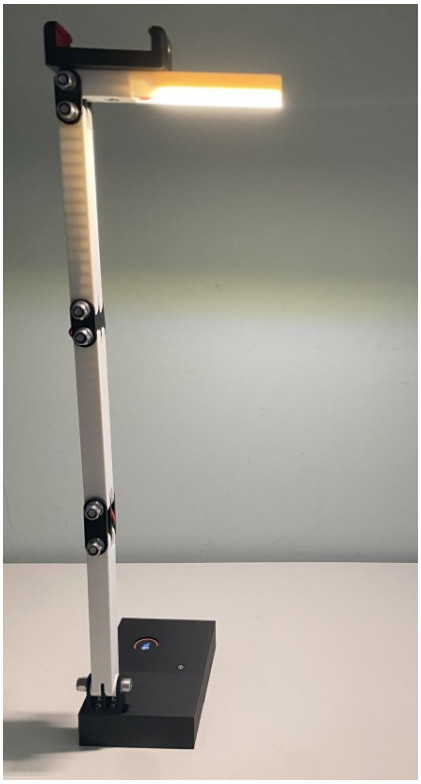
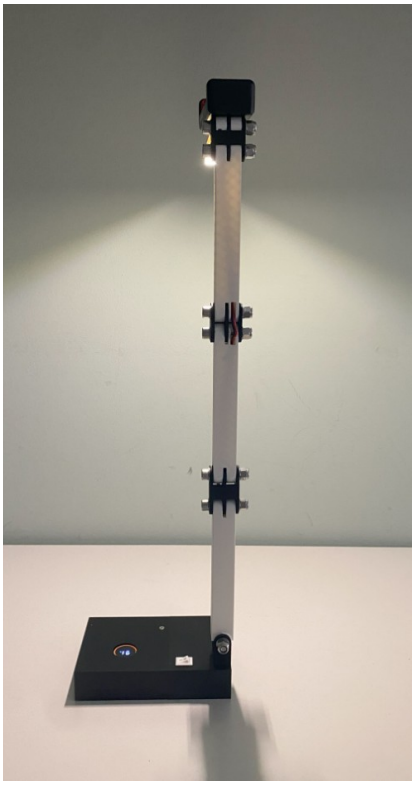
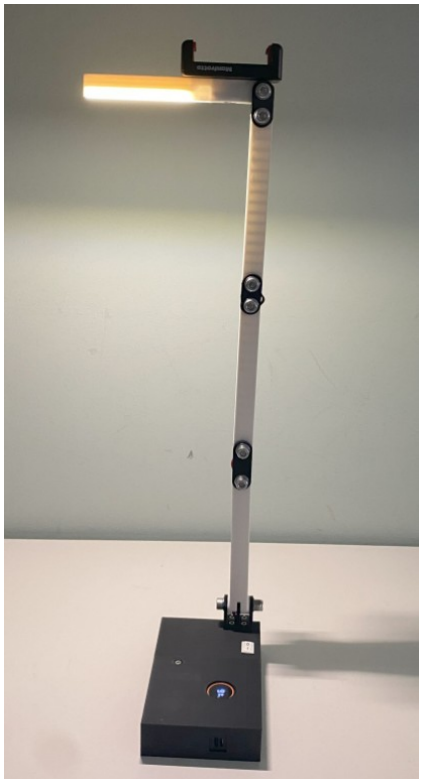
Weight: 494 g

Images

Below a set of images of the assembled lamp, closed and ready for transportation.

Open, in use:

State of charge Indicator and power switch detail

Recharge / Power Output detail

Components

Power bank

This is the power bank I have incorporated in the project.

Power Bank 10000 mAh, PD 22.5 W, Small But Strong USB C with LED Display, Power Bank, Portable Power Bank without Cable, External Battery is Suitable for Phone, iPad, Huawei, XiaoMi, Samsung and More

Brand: Bogseth

4.5 ★★★★½ 3,271 ratings

300+ bought in past month

Limited time deal

-15% €16[14]

RRP: ~~€18.99~~

Prices for items sold by Amazon include VAT. Depending on your delivery address, VAT may vary at Checkout. For other items, please see details.

Amazon Germany: https://amzn.eu/d/j4mhf3Z

Amazon Italy: https://amzn.eu/d/agR1Bto

Power bank 10000 mAh large capacity power supply

The high-efficiency lithium polymer battery provides enough power to keep you on the go for days.

Two entrances: Type C: 5V/2.4A 9V/2.0A 12V/1.5A

Micro: 5V2A 9V2A

Two outputs: USB: 5V/3A 9V/2.0A 12V/1.5A (18W max)

Type C: 5V/2.4A 9V/2.2A 12V/1.6(20Wmax)

USB1+Type-C = 5V/3A (MAX)

Box contents:

- 1 x 10,000 mAh power bank
- 1 x micro USB cable
- 1 x user manual (English language

Product weight: 172 g

Product dimensions: 8.15 x 5.96 x 2.6 cm

Capacity: 10,000 mAh

Battery type: Li-polymer battery

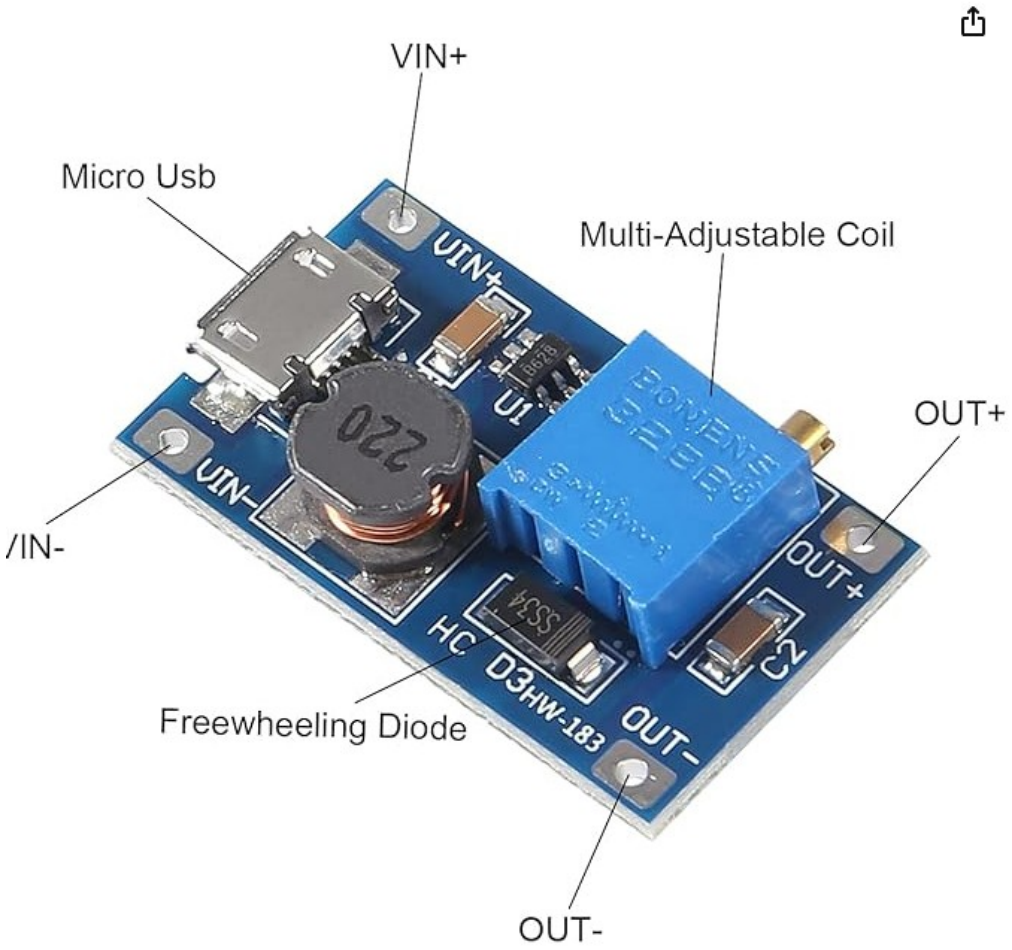
Why I choose it:

- Because it has a capacity of 10Ah
- Because it has a USB A on one side and USB-C / Micro USB for charging in the opposite side. This make possible the connection with the lamp on one side and leaves the charging connectors available on the other side

Switching regulator

This small circuit trigger the USB port of the Power Bank and then convert the USB Bus voltage up to 28 VDC. For this application I have adjusted the output to 24VDC.

The input cable is a USBA to Micro USB cable.



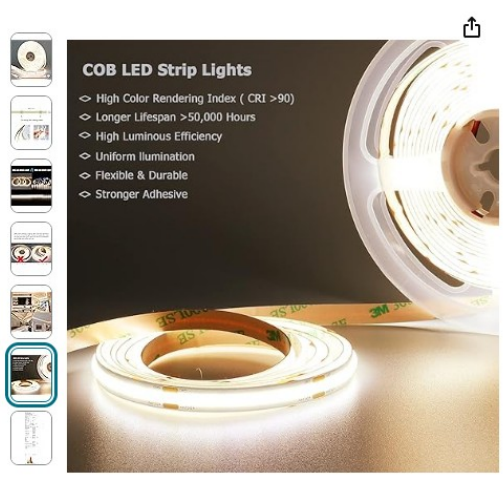
Since the required power consumption is very low (0.76W), I use directly the Bus Voltage (5V) to get the 24VDC for the LED.

The resulting input current should be 150 mA.

LED Strip

I use 2 Modules from 24 VDC COB Led Strip, Natural White. https://amzn.eu/d/dCH8eCl

2 modules => 0,76W



GOMING 24V COB Striscia LED Bianco Naturale 4000K 5M 312LED/M CRI 93+ Alta Densità 1560LED 4100lm Non Impermeabile IP20 Luci LED per Soggiorno Natale Bar Decorazioni(Senza Alimentazione) [Classe di efficienza energetica F]

Marca: GOMING

4,6 ★★★★½ 310 voti

Scelta Amazon

50+ acquistati nel mese scorso

17⁹⁹ €

✓prime Un giorno

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I prezzi degli articoli in vendita su Amazon includono l'IVA. In base all'indirizzo di spedizione, l'IVA potrebbe variare durante il processo di acquisto. Per maggiori informazioni clicca qui.

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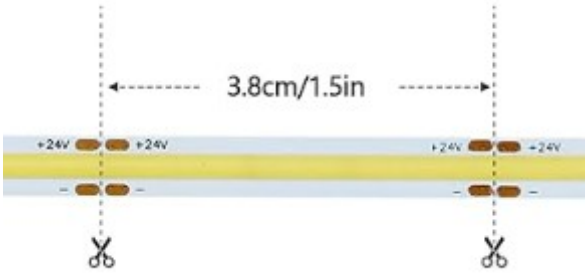
Colore: **Bianco Naturale**

I use 2 sections, the power is 50W/5m, so:

- every module we have: 50W/(5000/38) = 0,38W
- Since I use 2 modules, I have a max power of 0,76W



Mechanical Elements

The base of the lamp is made in 3 parts to contain:

- Battery Holder
- Battery Closure
- Battery Cover
- Base Joint

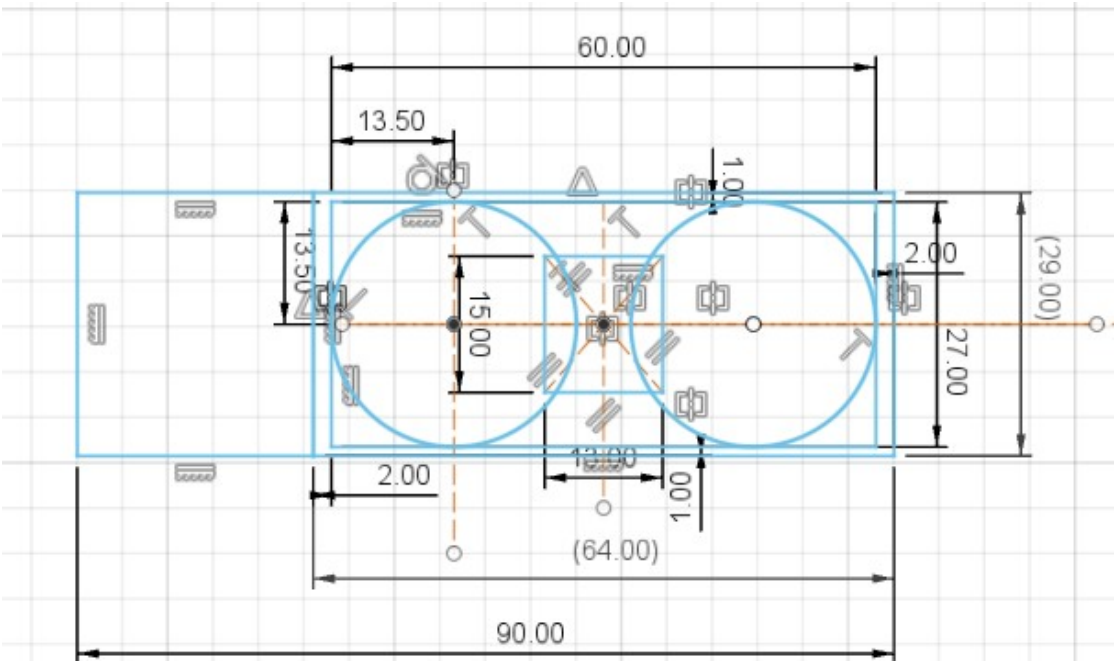
The arm is made by:

- 1 x Dual Axis Beam
- 1 x Long Joint
- 2 x Beams
- 2 x Short Joint
- 1 x Lamp

Battery Holder

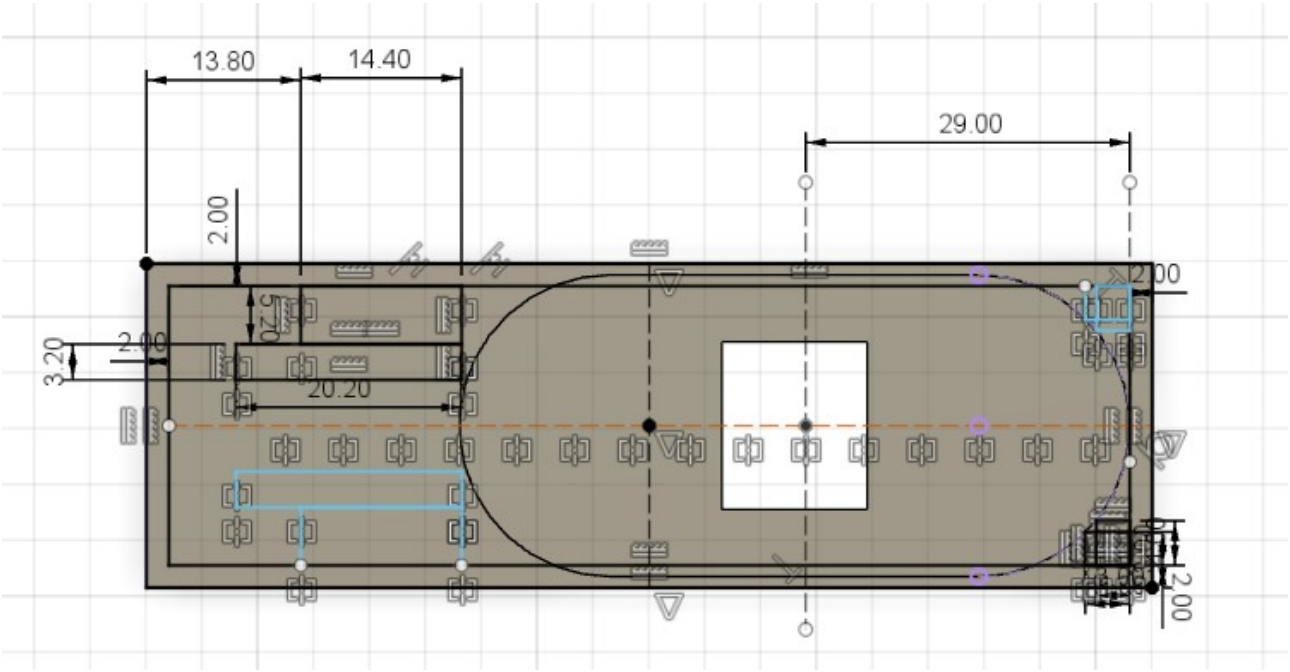
Top View

This is the base of the battery holder. It is 90 x 29 mm. The battery compartment is 60 x 29 mm.



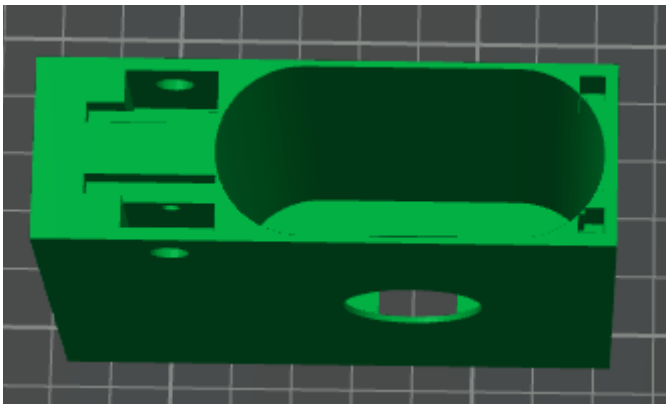
Battery closure side

This the battery holder as seen from the top.



Battery Holder Resulting 3D layout

This need to be printed vertically to maximize the precision for the battery holder and for the interlocking between base and cover.



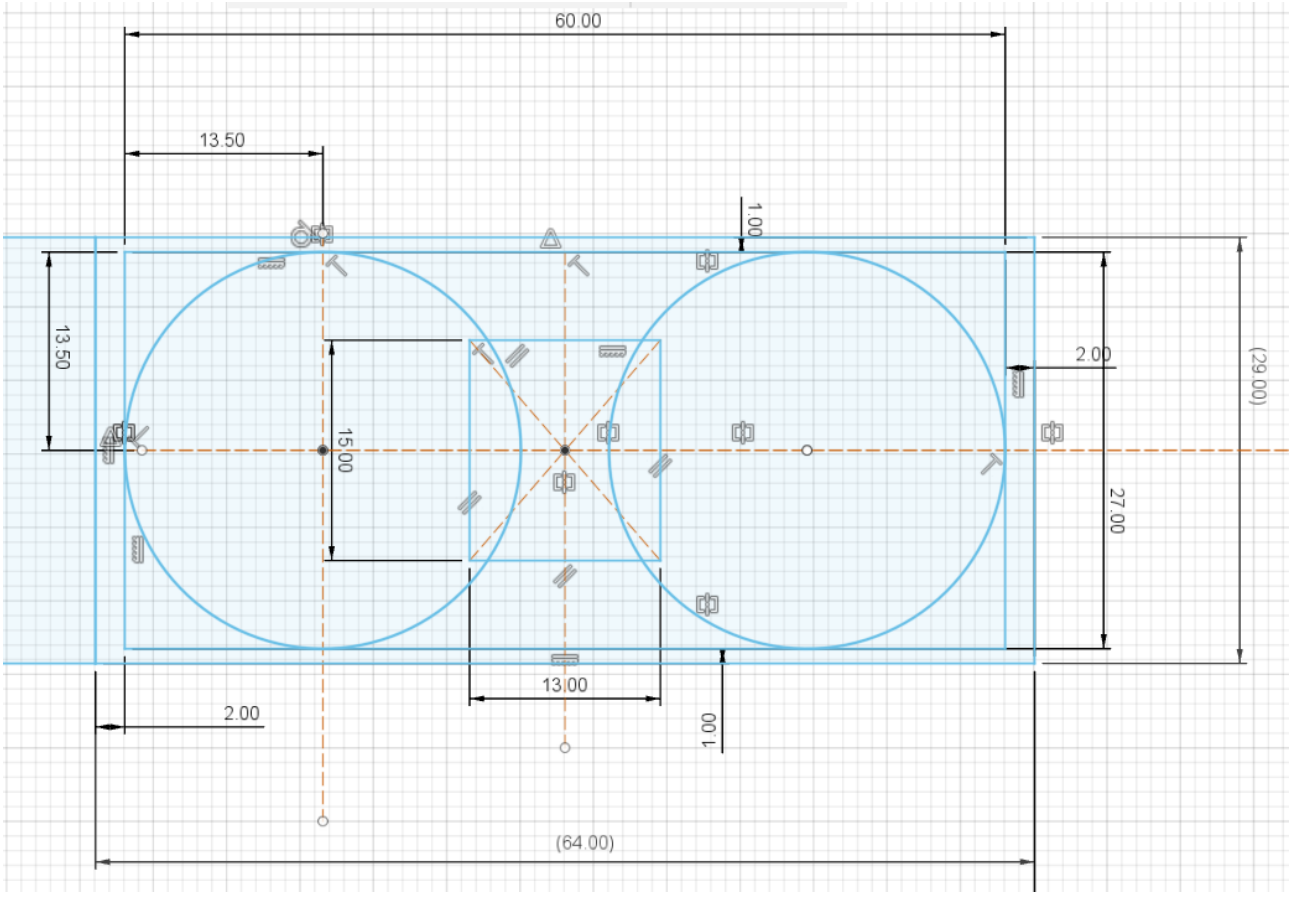
Battery Power Bank Dimensions details

The battery pack has the following dimensions:

64 mm width (60 +2+2 mm for wall thickness)

29 height (27 + 1+1 mm for wall thickness)

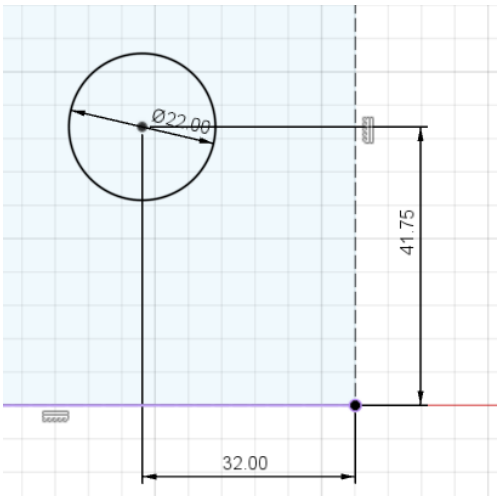
81.5 length not considering the walls



State of charge Display Hole

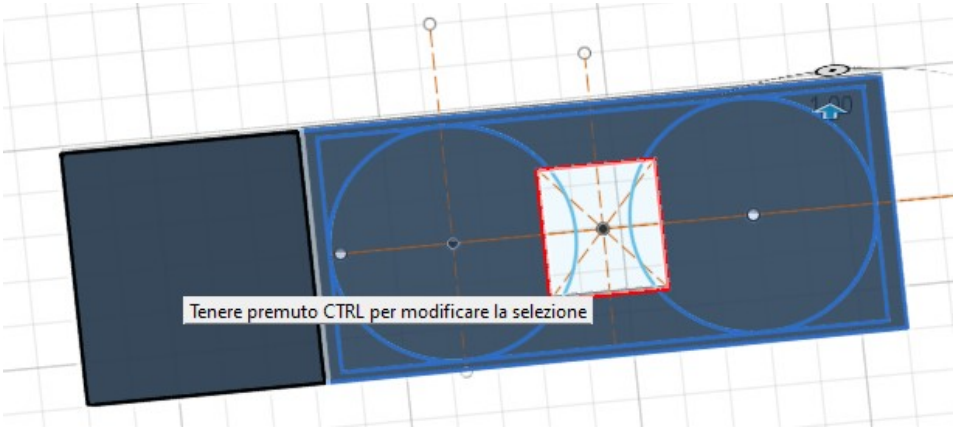
There is a hole in the top side of the base so the state of charge is visible.

Considering a side wall size of 1 mm, 41.75 is the distance from the USB-A connector



Charging slot details

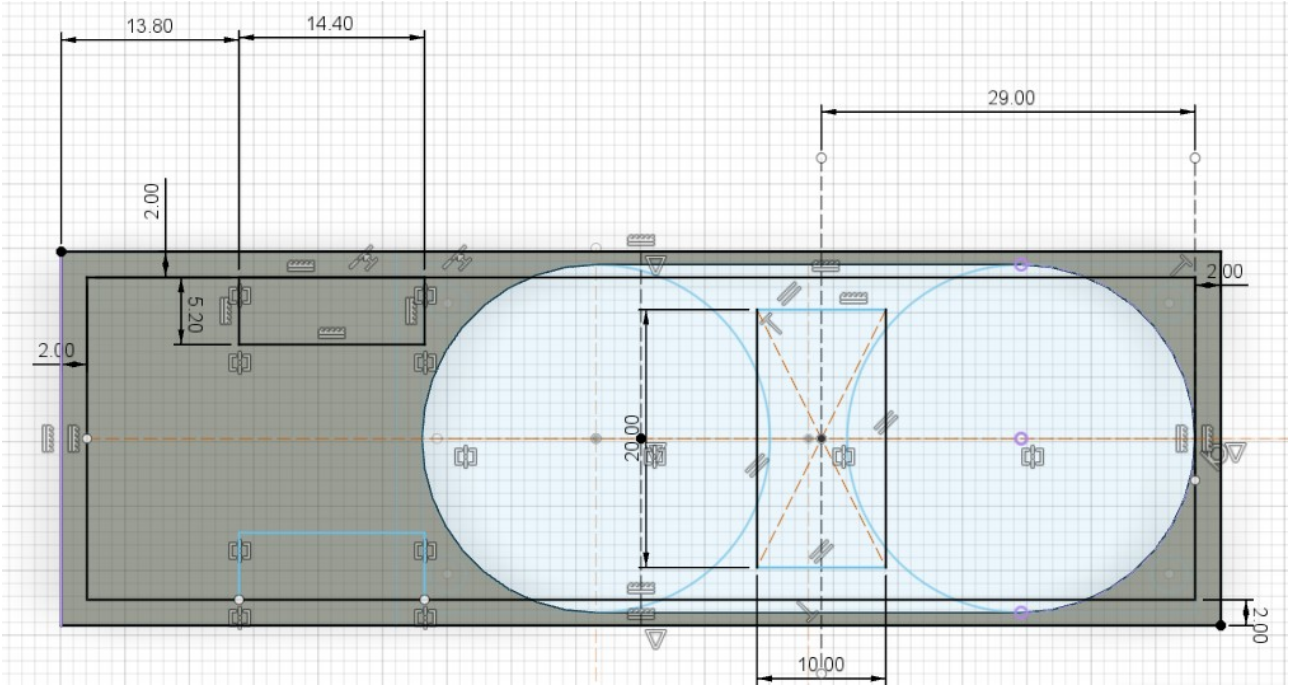
The charging slot is on the base of the 3D model and it is 13 x 15 mm in the center of the power bank.



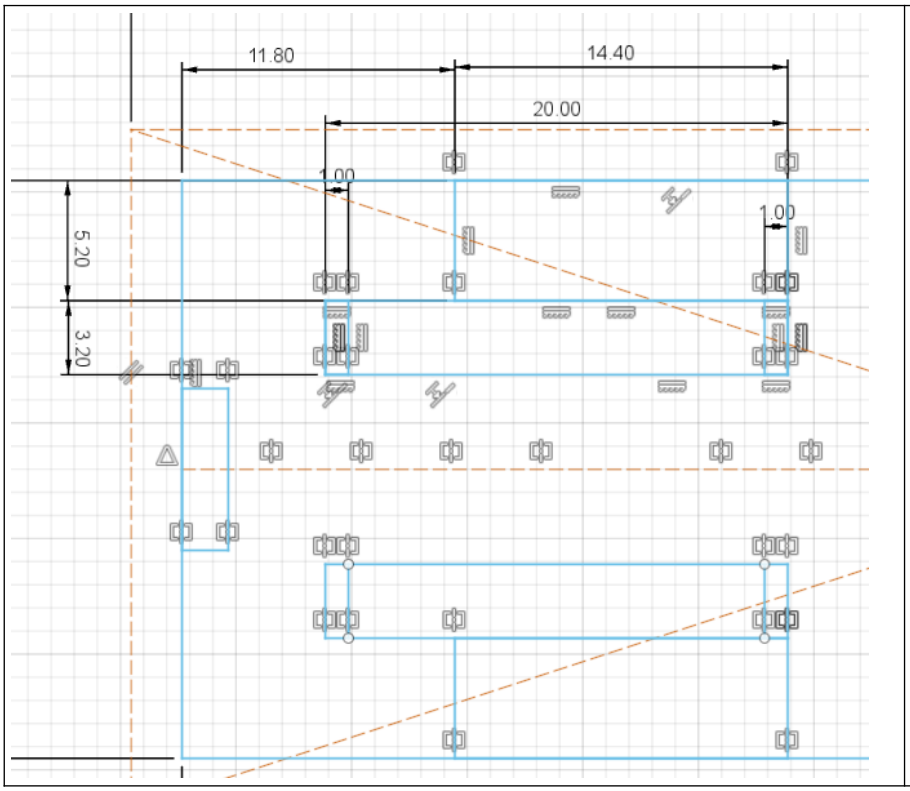
This is how it looks like in the final printed part.

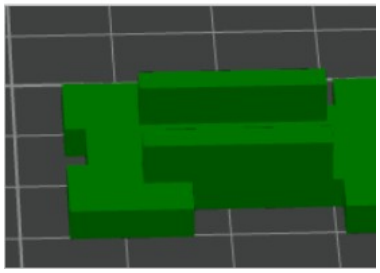
Battery closure

This is a cap for the battery compartment and it is used to keep the battery in place, while leaving space for the electronics and wire in the Cover.

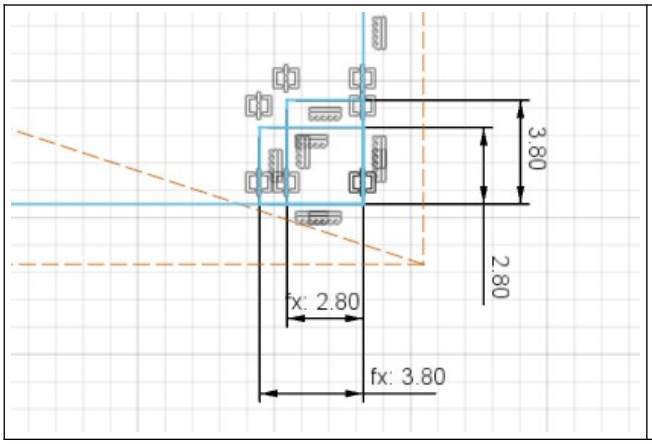


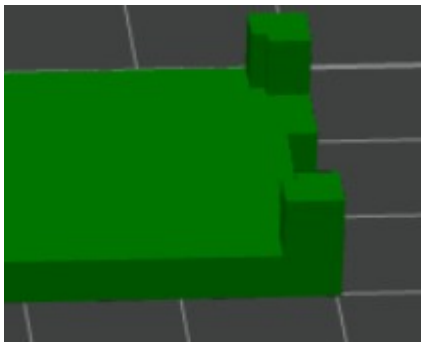
The Battery Closure is kept in place by 4 pins, 2 large (20 x 3,20 mm):





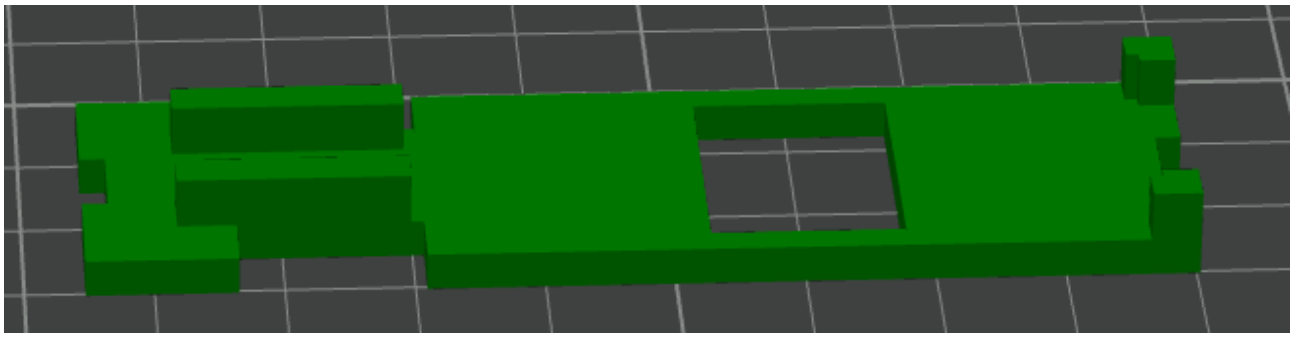
And 2 Small but L-Shaped (3.80 x 3.80 mm):





3D Layout

This component is printed in black, but I render it here in green because it is more understandable.



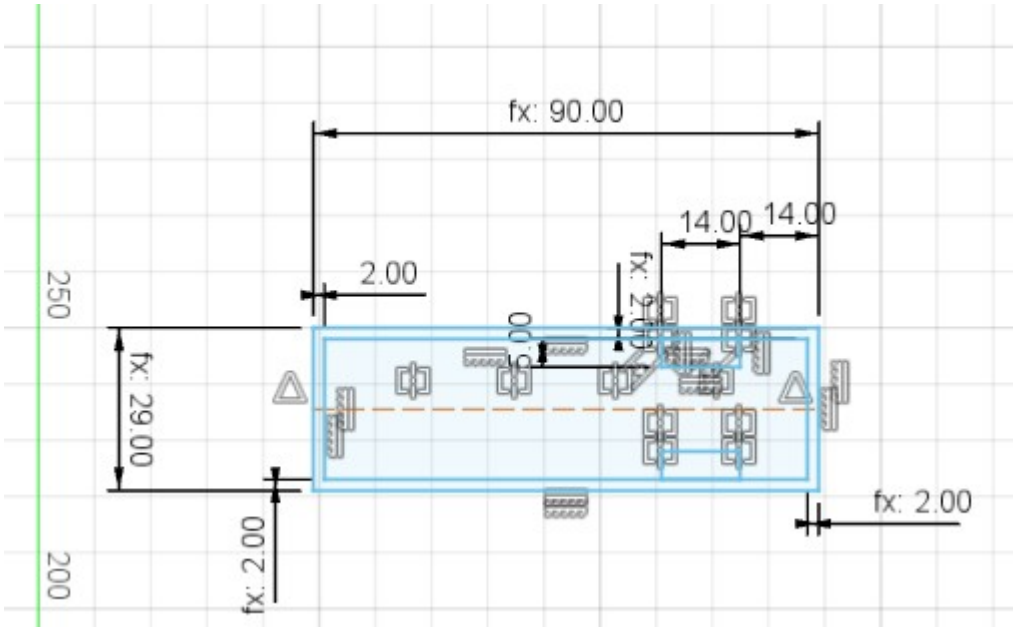
Battery Cover

This is the cover for the battery and it has space for wiring and electronics.

There is also the fixture for the base Joint.

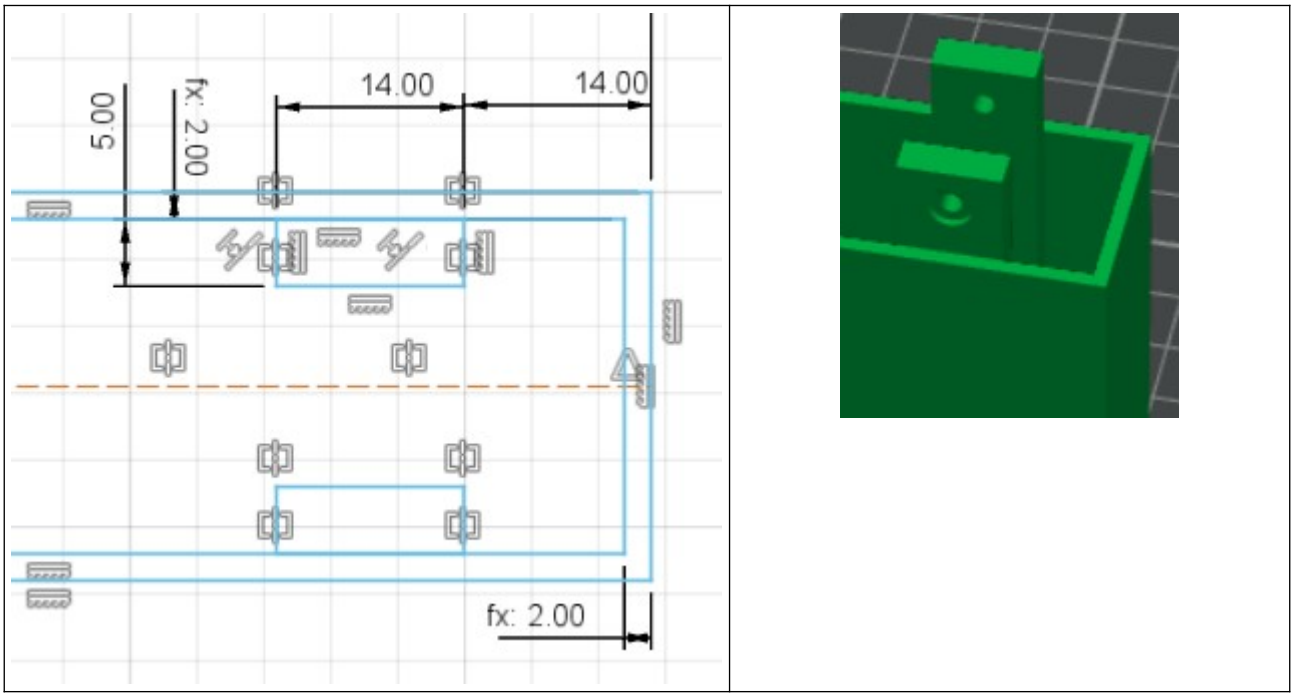
Is is locked to the Battery Holder using 2 screws and 2 pin that enter in the battery holder.

Top view

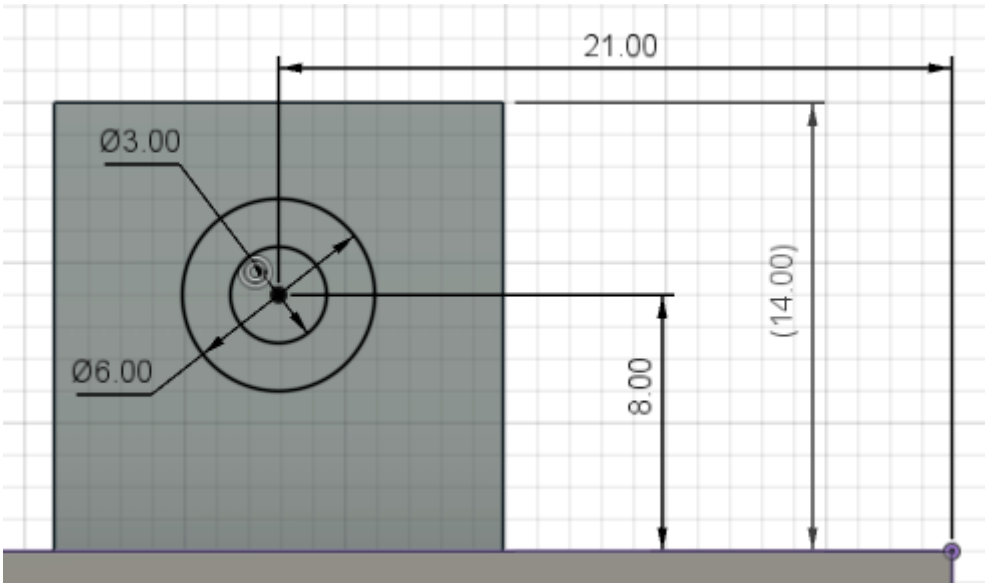


Locking pins

There are 2 pins 14 x 5 mm that enters in the Battery Holder

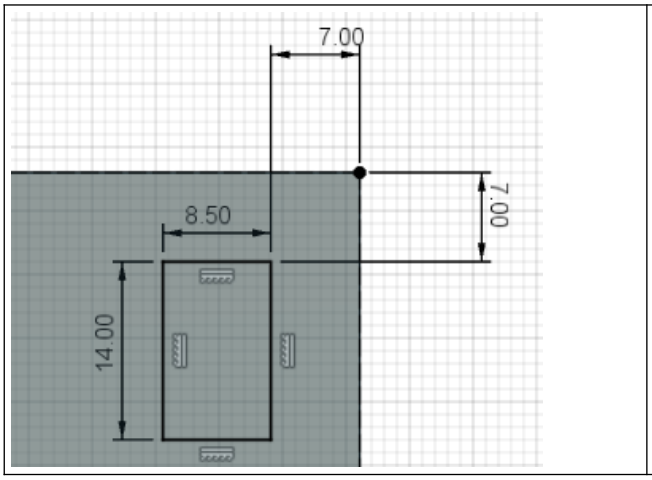


The 2 pins are 14 mm long and there is an hole to accommodate a 3 mm cylindrical screw.



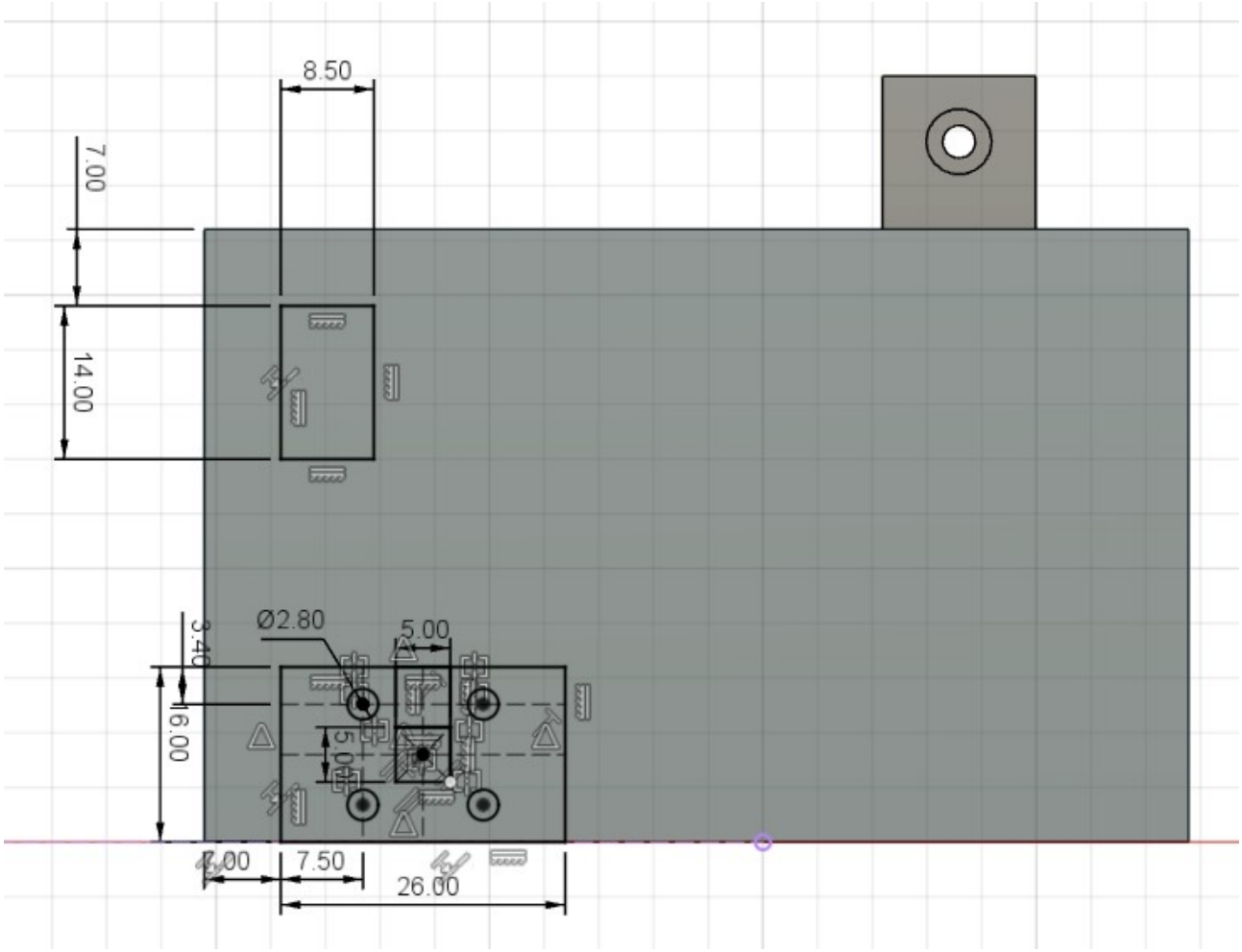
Power Switch Slot

Below the dimensions for the slot used to fix the power switch

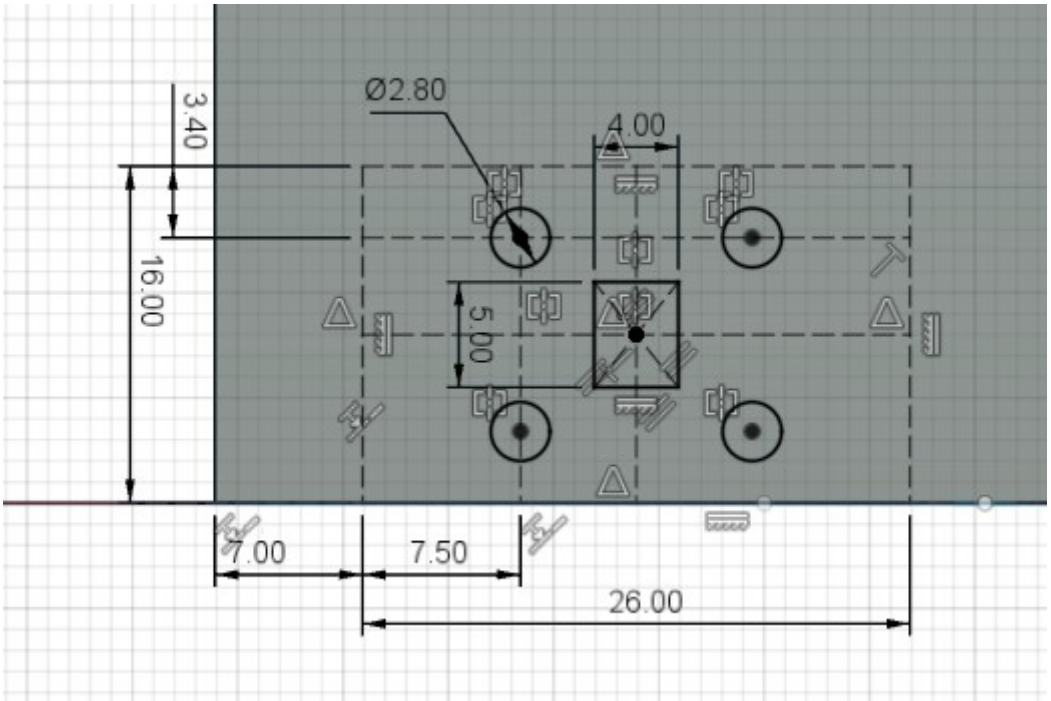


Side view

Here we can see the switch position and the Base Joint fixing holes.

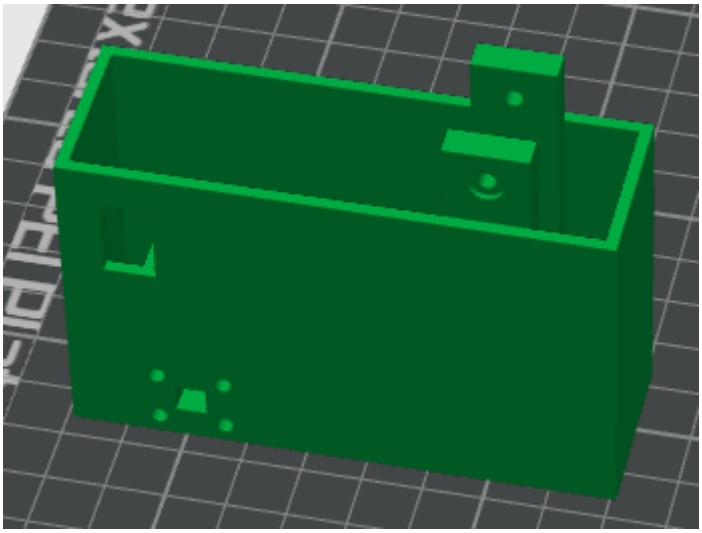


Base Joint Mounting Holes detail



3D Layout

This component is printed in black.



Base Joint

This is the connection between the base with the battery and the arm.

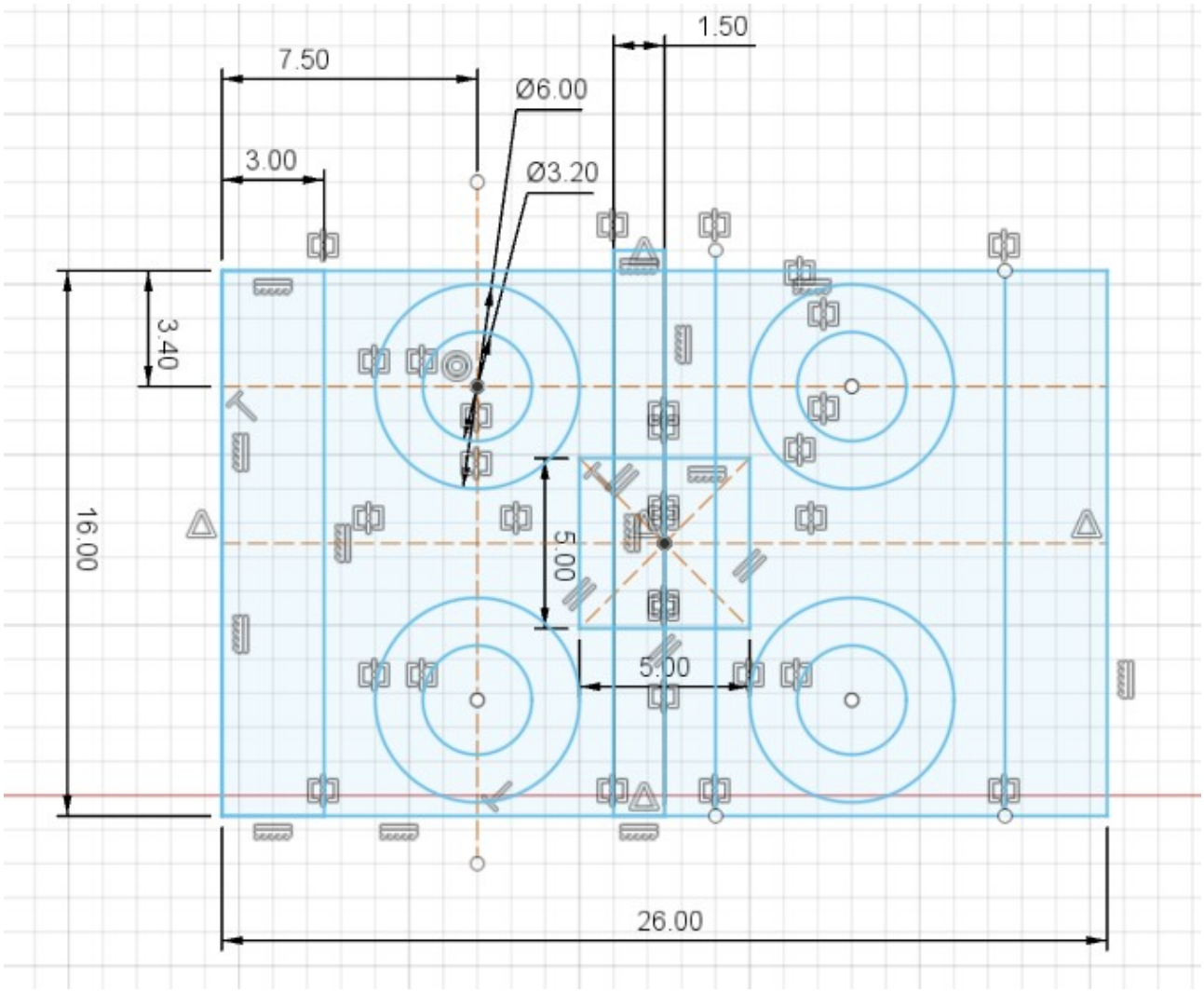
It is connected to arm using an M6 Screw

It is connected to the base using 4x M3 screws

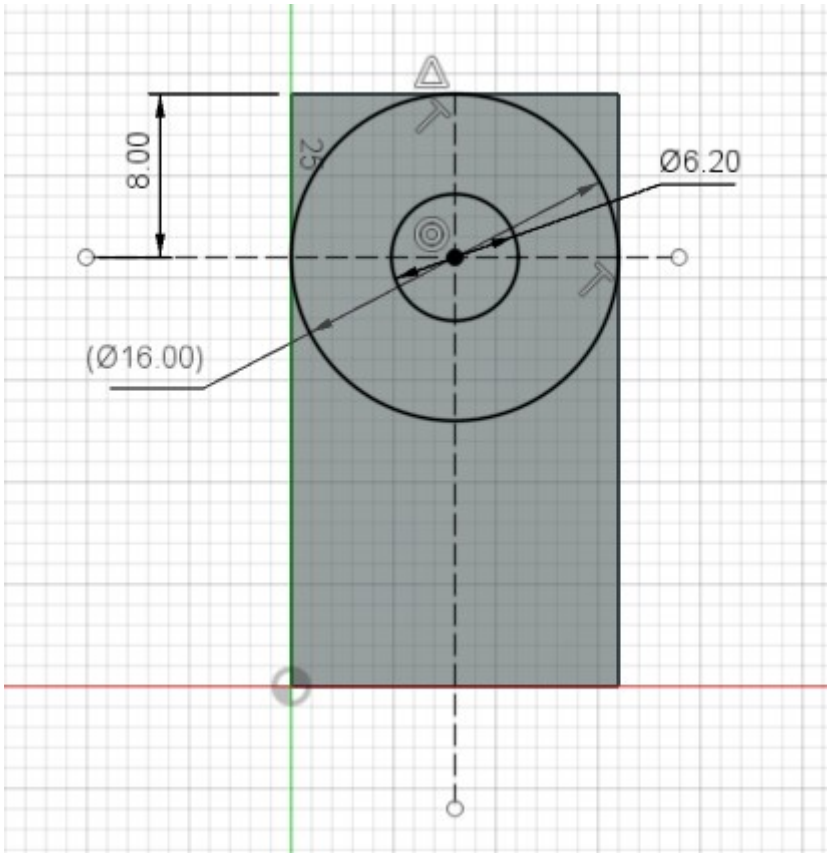
It has a 5x5 mm passage in the center to allow the cable move from the base to the arm.

The joint has a 26 x 16 mm base and it is 29 mm high.

Top View

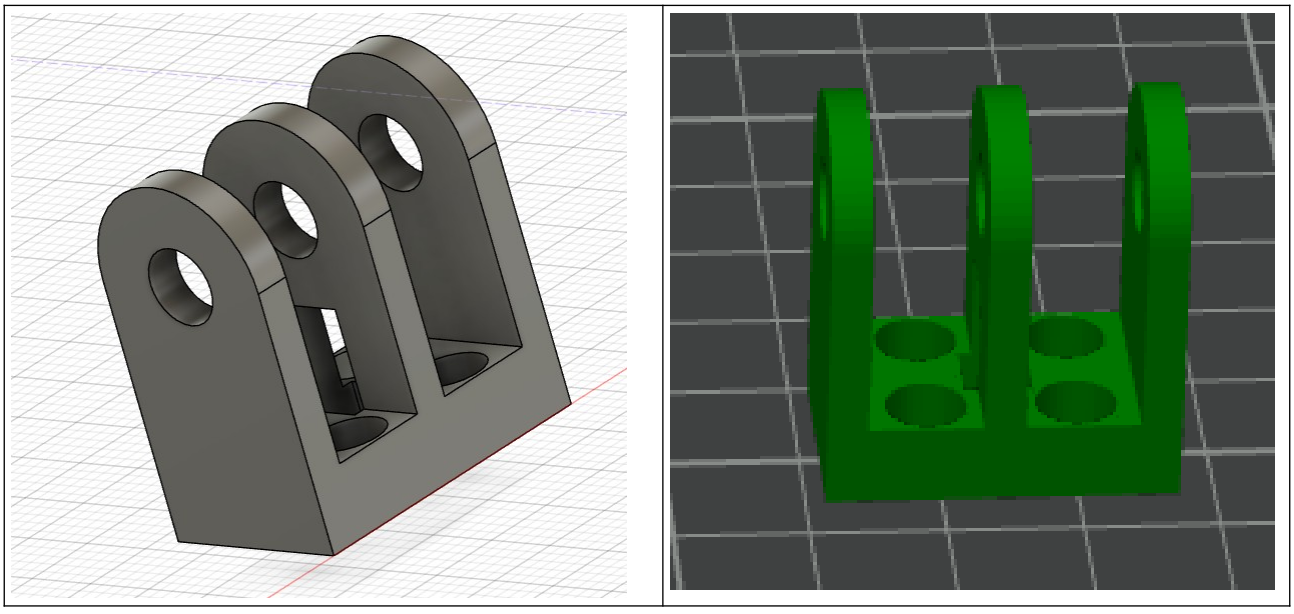


Base Joint – side view



3D Layout

The component is printed in black and in vertical position. There is no need for support during printing.

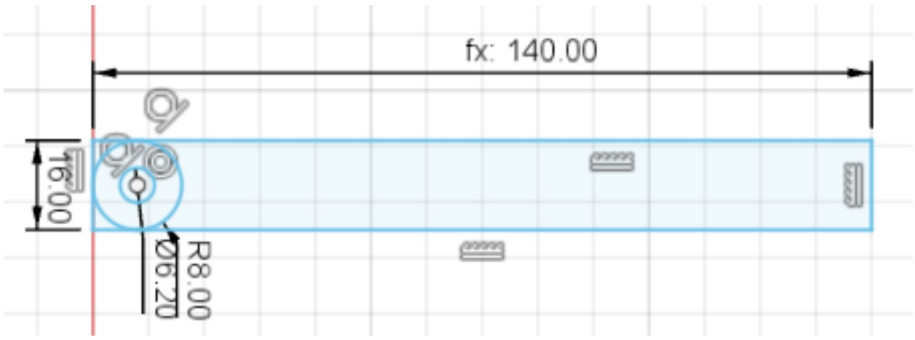


Double Axis Beam

This is the first beam and it has 2 rotation axis to allow the arm packed position.

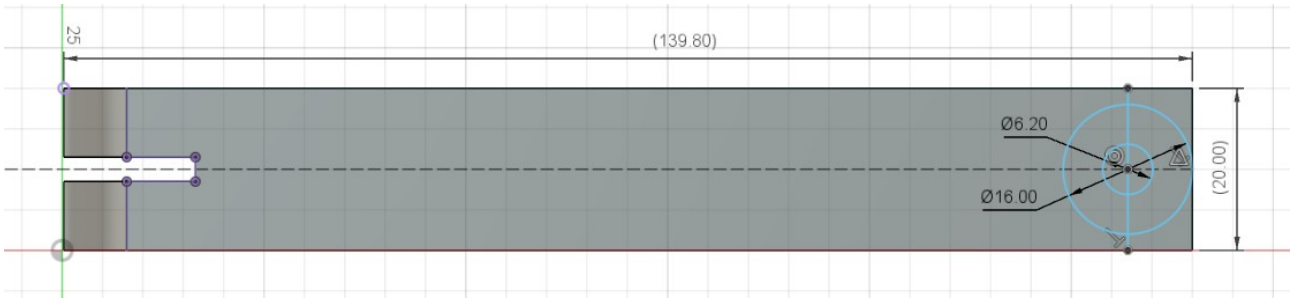
Drawings

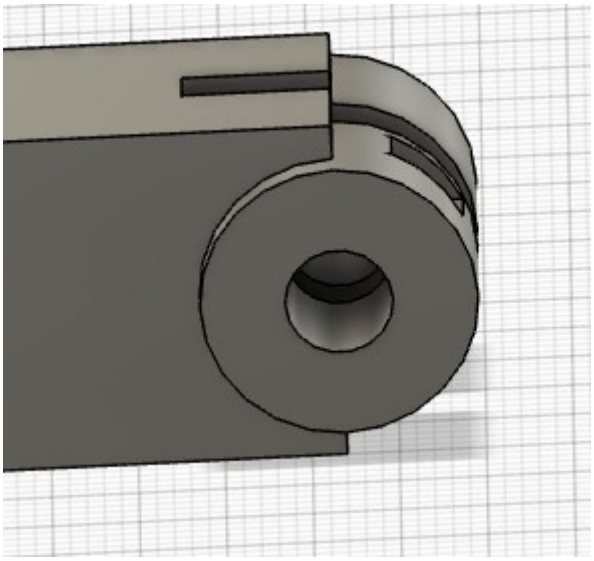
The beam is 140 long and 16 mm high. It will be extruded 20 mm to have the same size of the other beams.



Side View

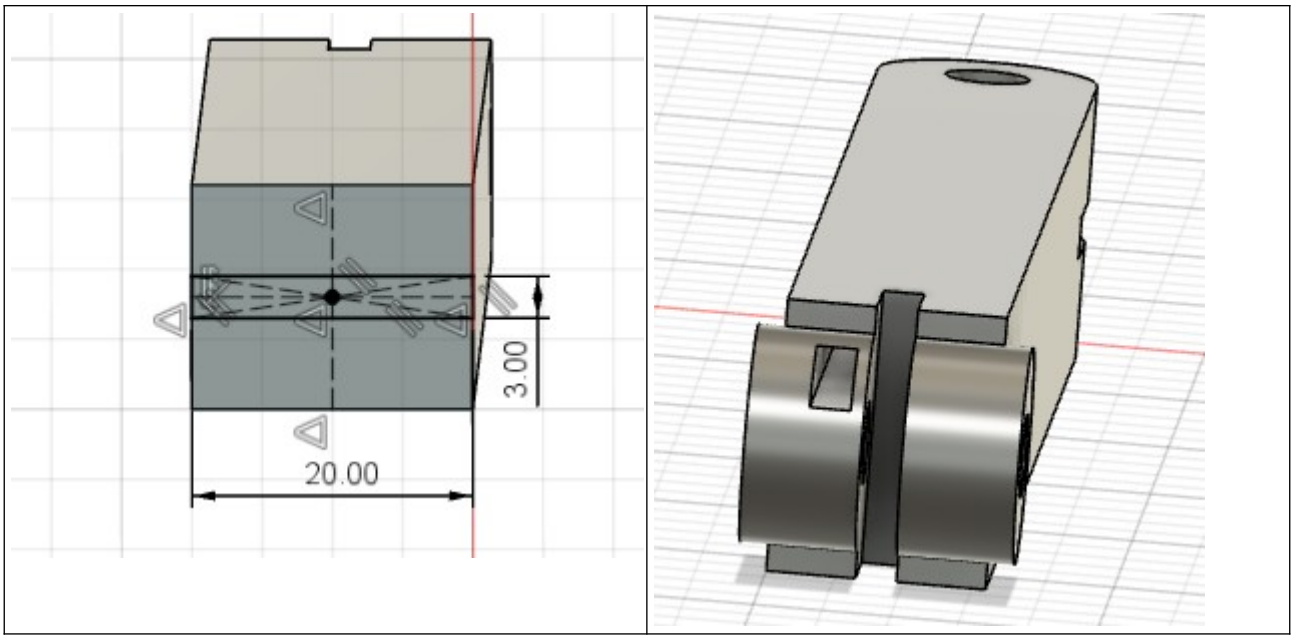
This is the sketch used for the base shaping





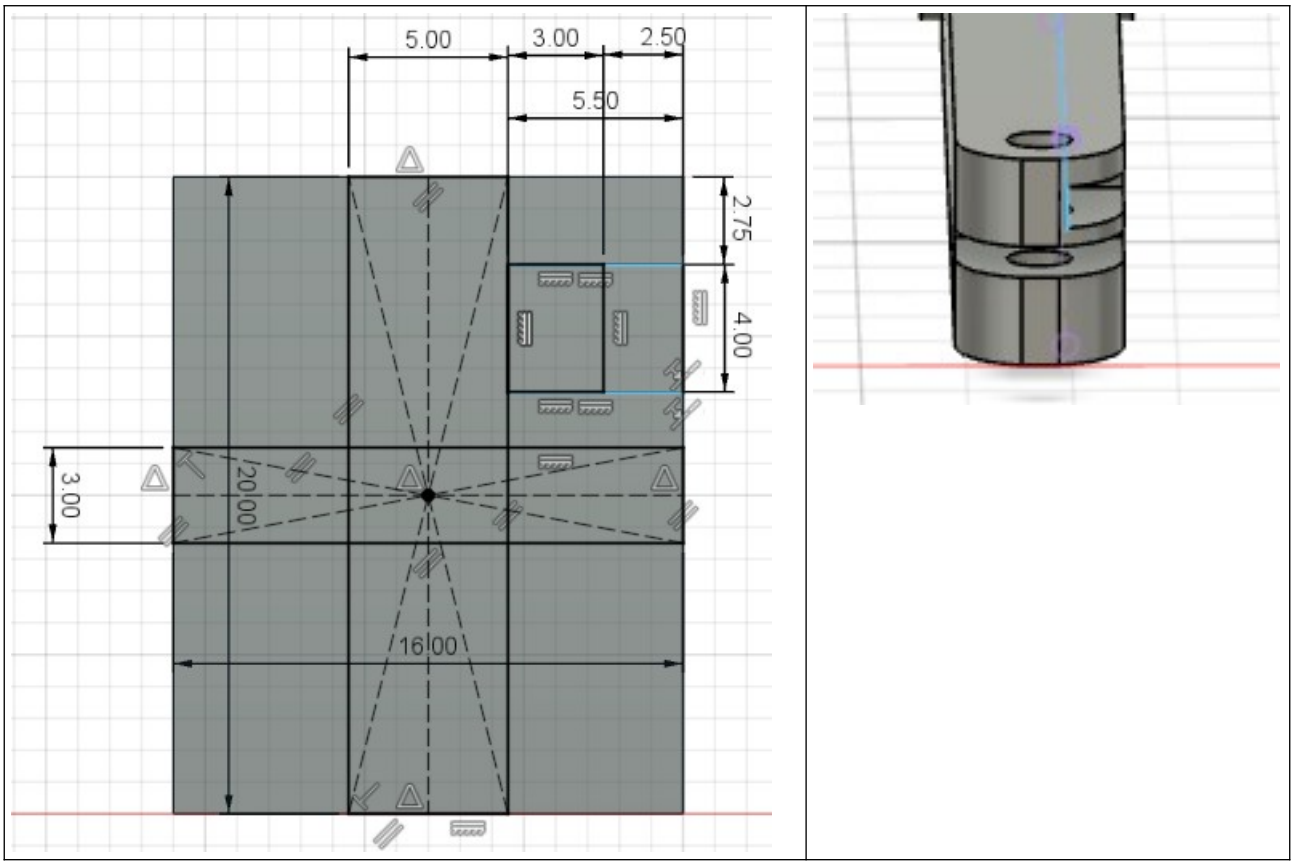
Base View

This is the sketch used to shape the base joint counter part.



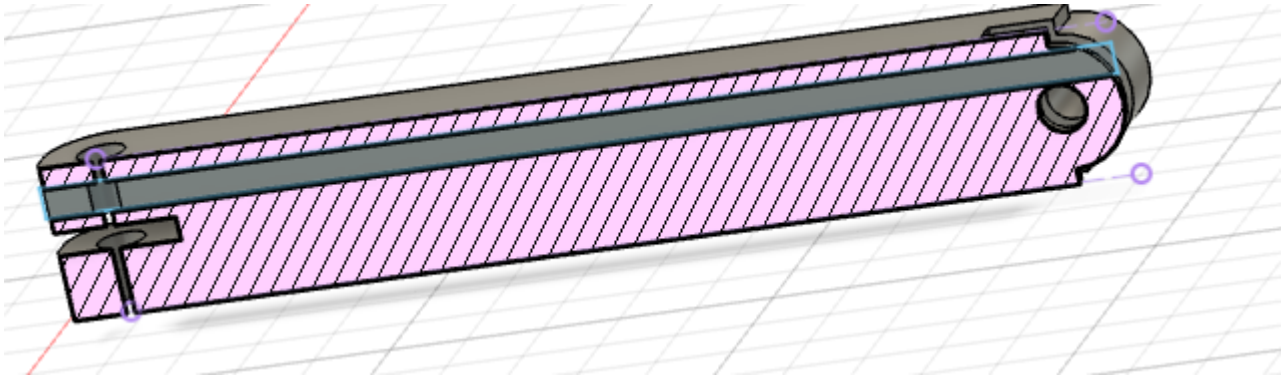
Top view

This is the base view used to shape the counter part for the long joint.



Cable passage

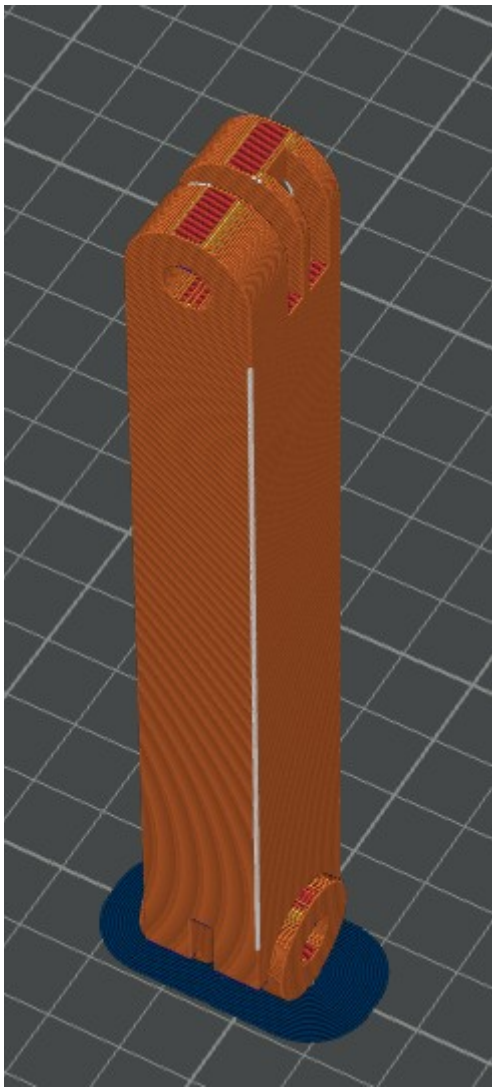
The cable passage is a straight tube across the beam. It is simpler if we create the passage using the raw shape, before adding the rounded ends.



3D Layout

This beam need to be printed vertically, with base brim to keep it in place.

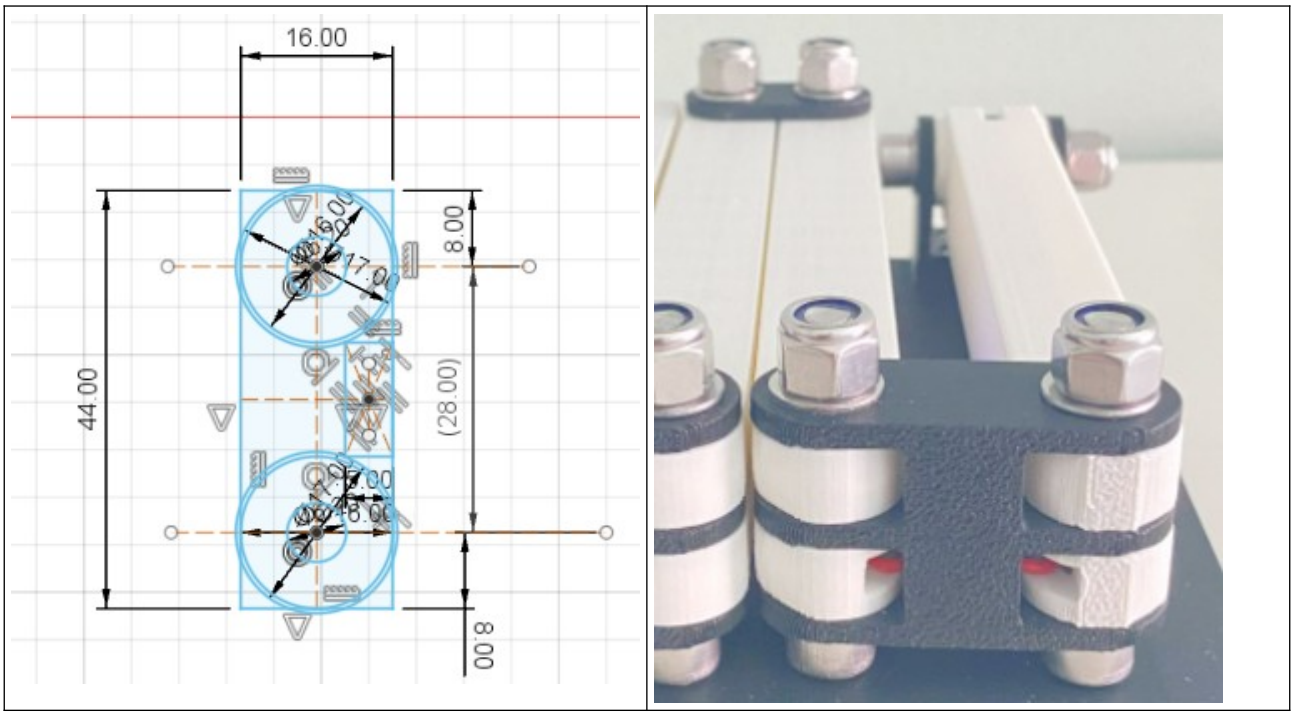
The printer fail to print it correctly multiple times.



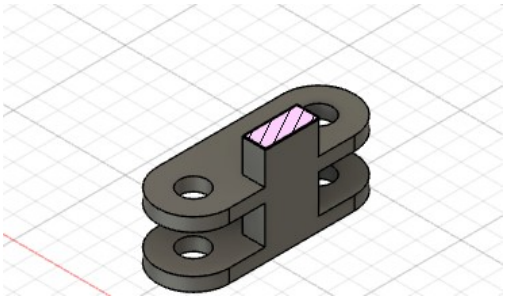
Long Joint

We need a long joint to accommodate the dual axis beam and to create the space for the self locking nut used in the base joint.

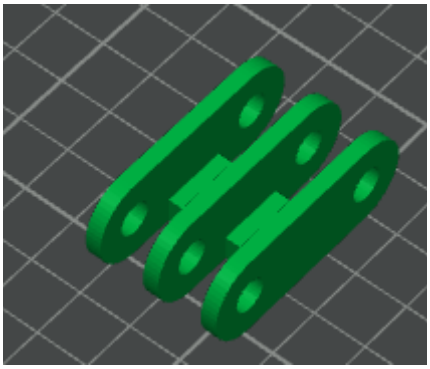
The inter axis distance is 28 mm



The conjunction between the 3 surface is a simple rectangular shape.



3D Layout

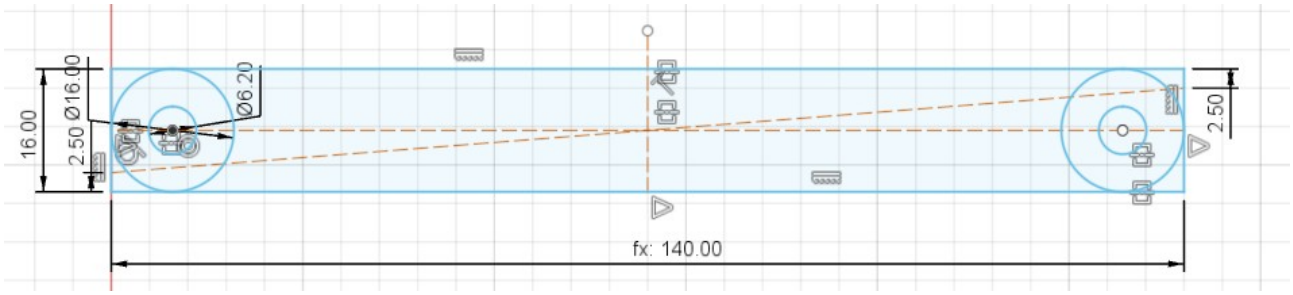


Beam

There are 2 identical beams. These are main dimensions

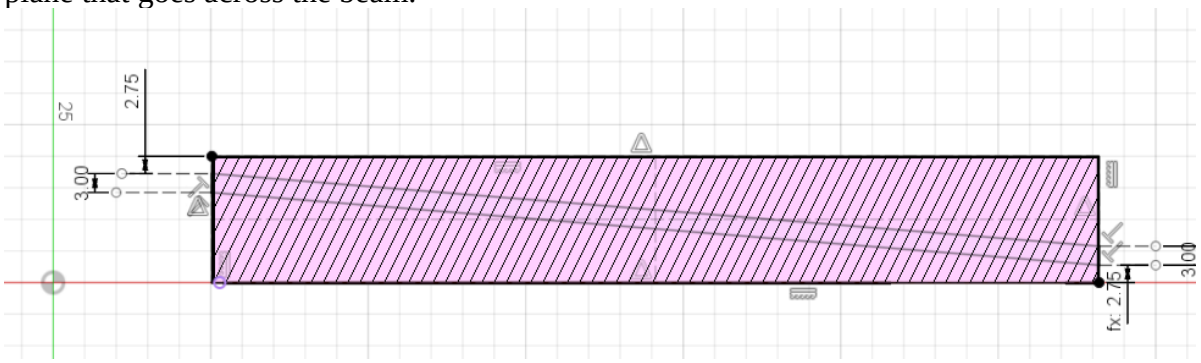
Section: 20 x 16 mm
Holes: 6.20 mm
Lenght: 140 mm
Cable Passage: 3 x 4 mm

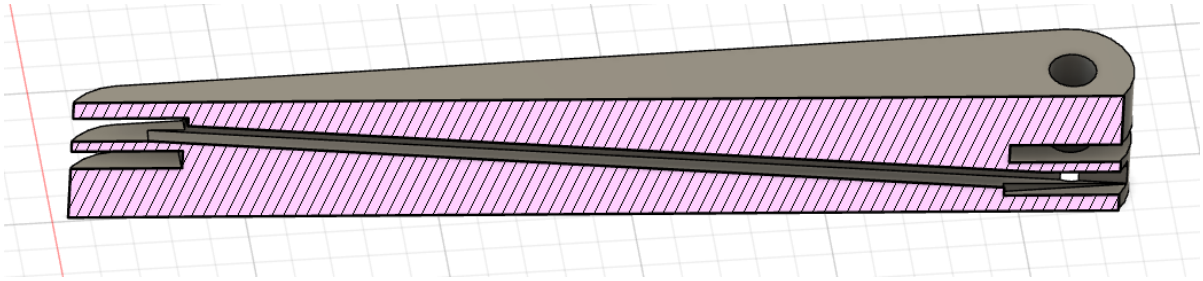
Beam Side View



Beam Cable Passage

The cable passage moves from one corner to the other. In order to create it I use a construction plane that goes across the beam.

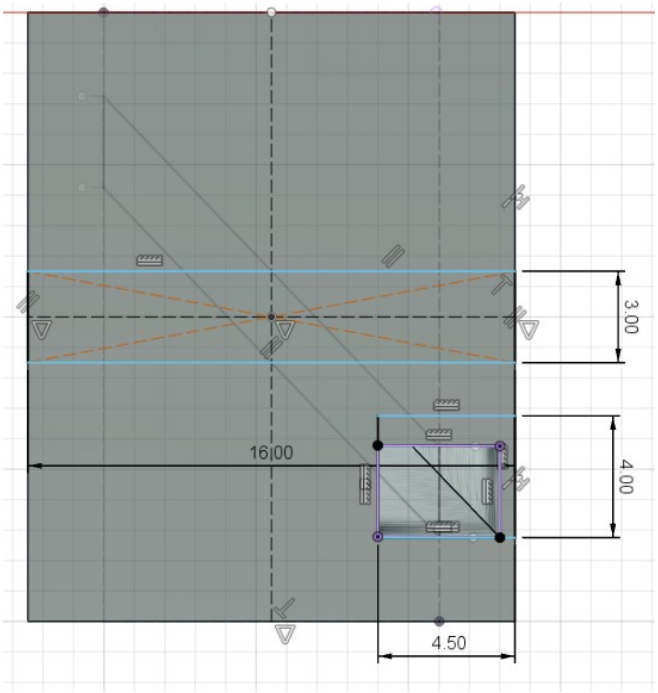




Beam Slot

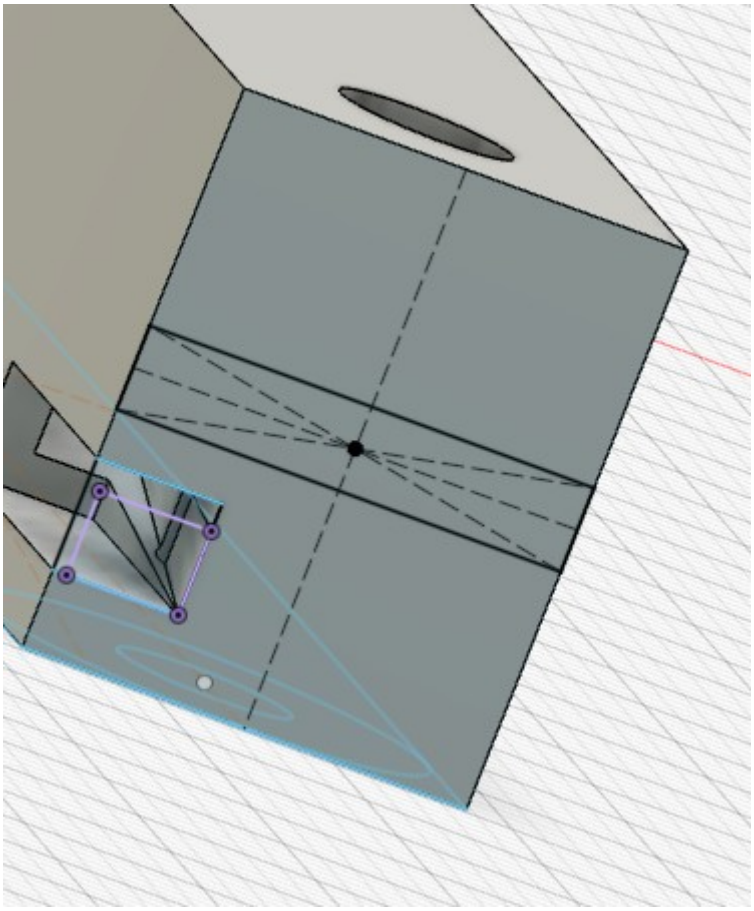
This is the entrance of the tube that allows the passage of the cable.

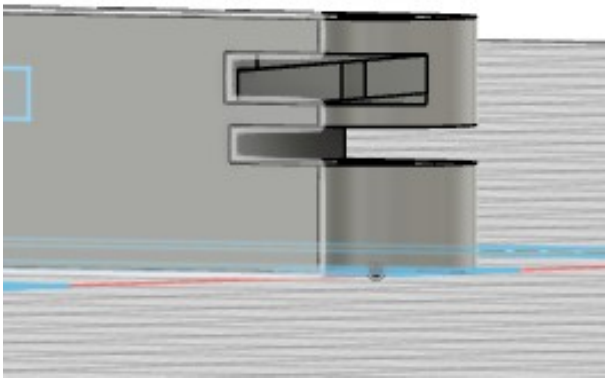
It is much easier if we cut it while it is not in use.

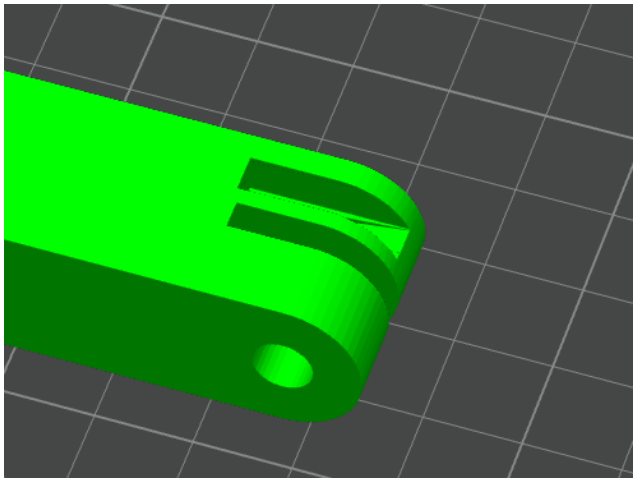


And there is also a wide slot in the beginning / end of the beam to accommodate the cable when the joint is closed.

This slot is 16,5 mm deep and 4.50 x 4 mm wide.





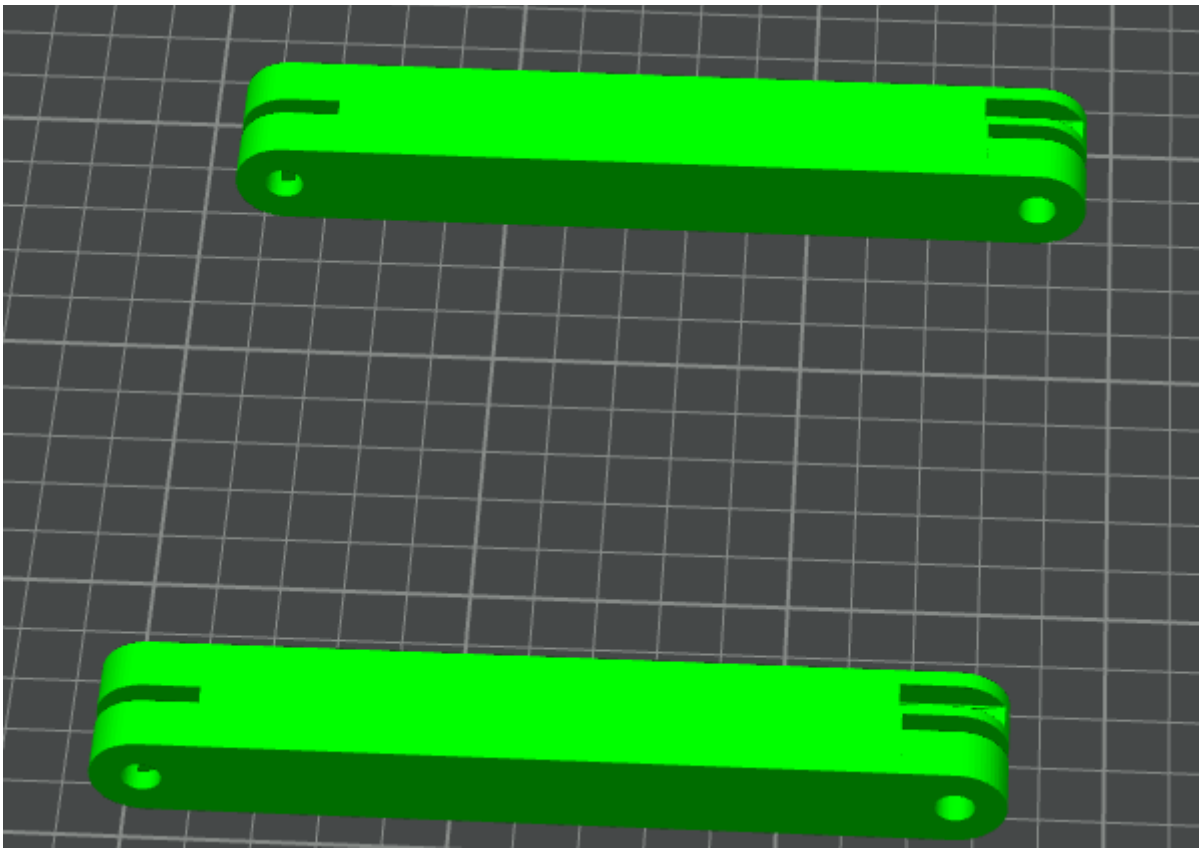


3D Layout

It is printed in white.

This part don’t need to be printed vertically.

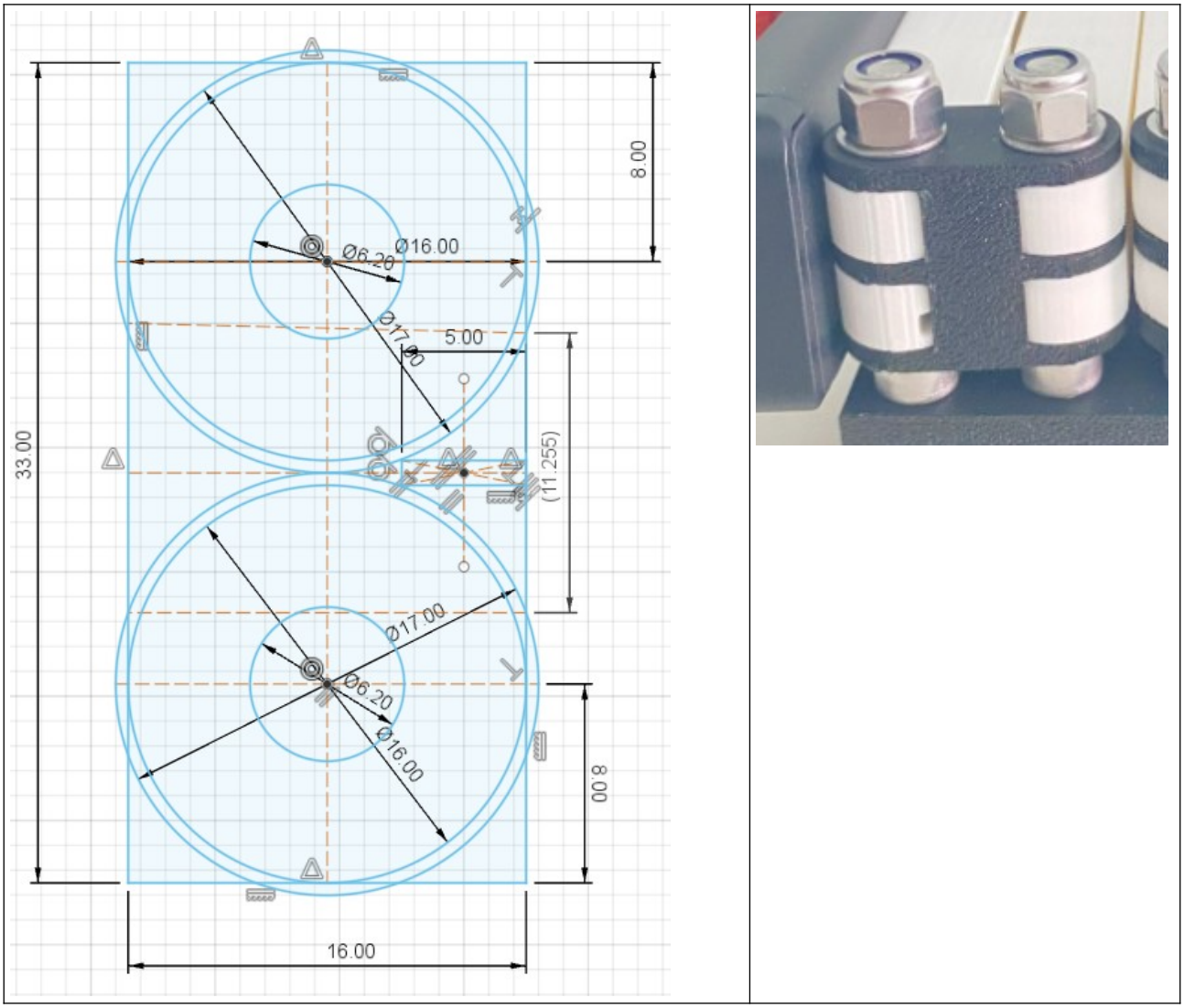
And of course we need 2 copies.



Short Joint

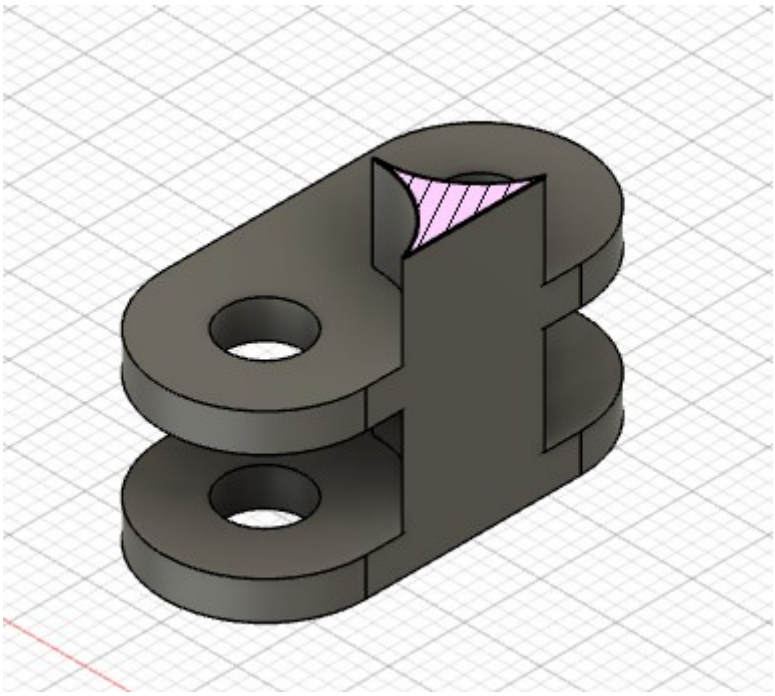
This joint minimize the distance between 2 beams when the lamp is closed

The inter axis distance is 16 mm + 1 mm as tolerance.



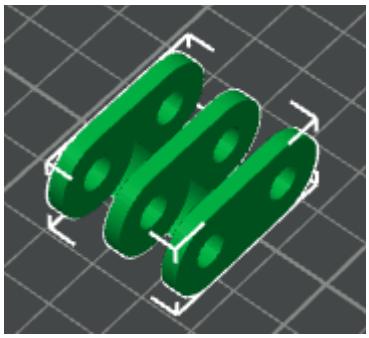
Connecting structure

The 3 blades are connected by a 5 mm deep and 11.255 mm long section created by the 17 mm circle around the center. The results is small but very robust.



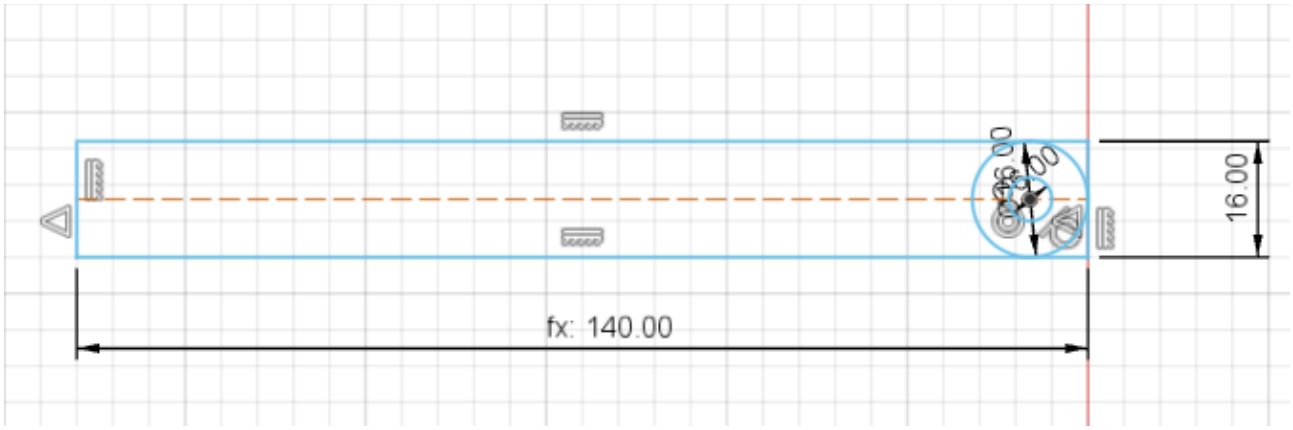
3D Layout

This is the best way to print the joint and it doesn’t require any support.



Lamp

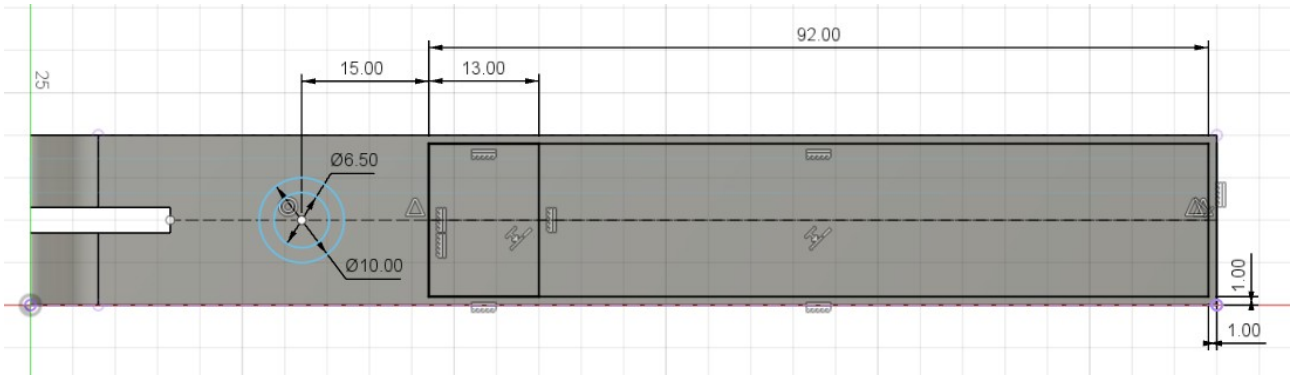
This is the mechanical part at the end of the arm that should support the LED strip section.

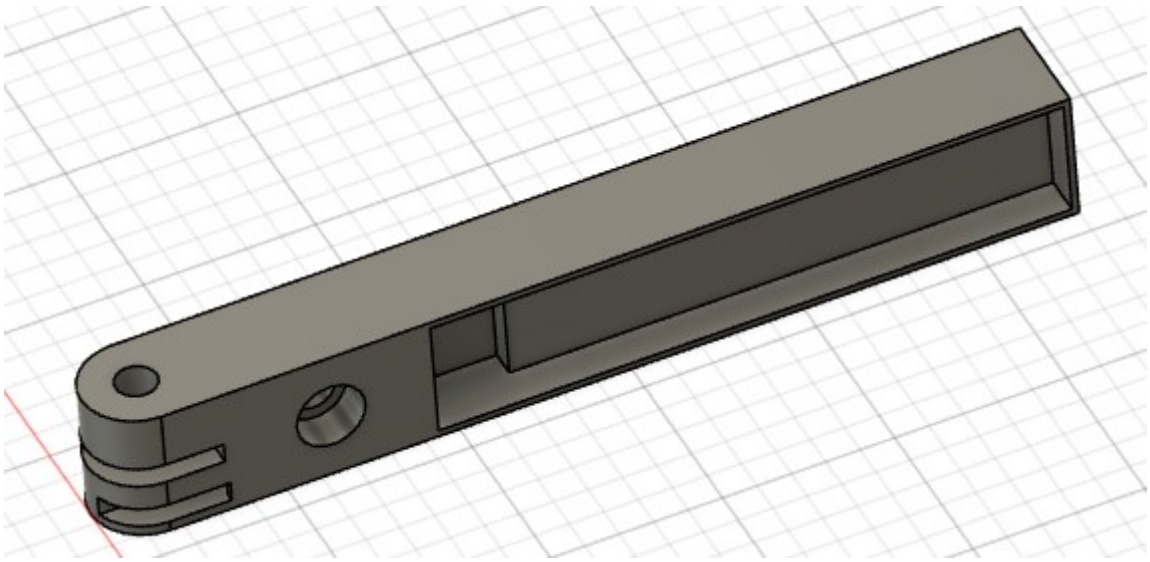


The width is 20 as all others arm components.

The part where the LED are mounted, is 6 mm deep, in a rectangle of 92x18.

The wall thickness is just 1 mm. There is a 13x18 mm relief to store some excess cable, 10 mm deep.

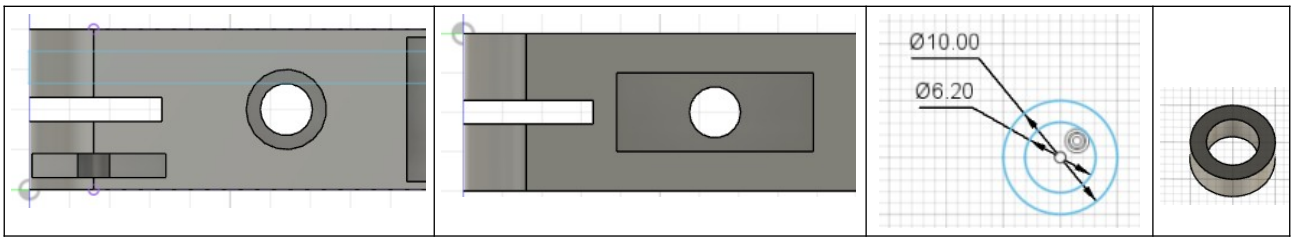




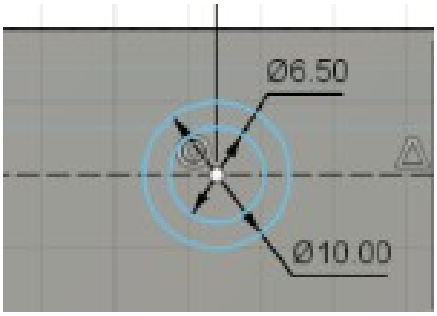
Phone Holder Screw

A Manfrotto Phone Holder can be mounted on the top of the lamp

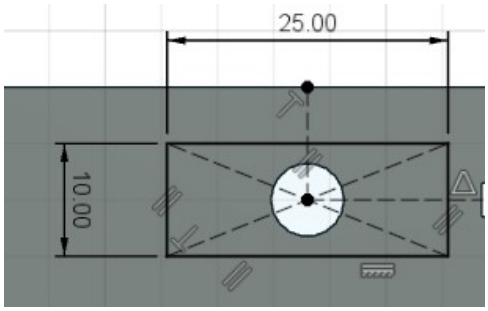
This thanks to a mounting screw UNC 1/4-20 looked in position by a plastic washer



To accommodate the plastic washer we need a slot big enough to use pliers to keep it in place while screwing.



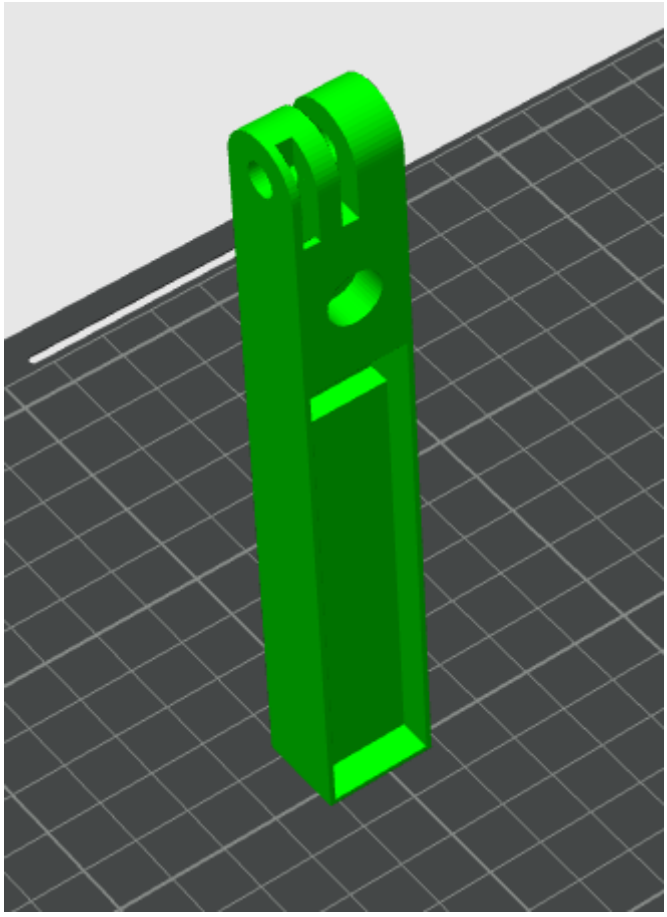
Bottom Side



Top Side

3D Layout

The best option is to print the lamp vertically, without support.



BOM

Nuts and Bolts

For the battery compartment:

- M3x16 mm Bolts used 2

For the arm joint to be fixed to the base:

- M3x16 mm Bolts used 4

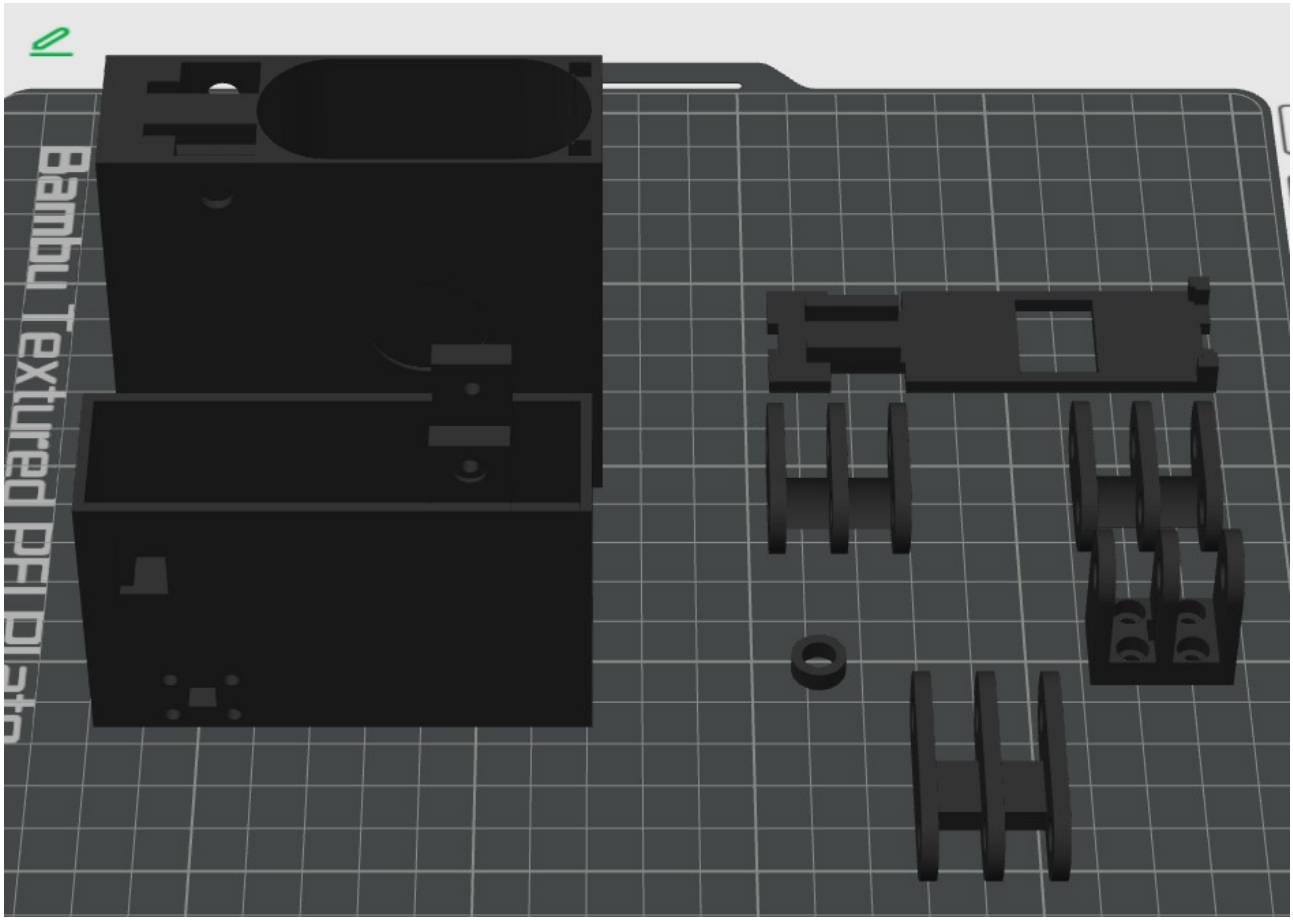
For the arm:

- M6 x 35mm Cylindrical Head Screws 7
- M6 Self Locking Nuts 7
- 6 mm Washers 14

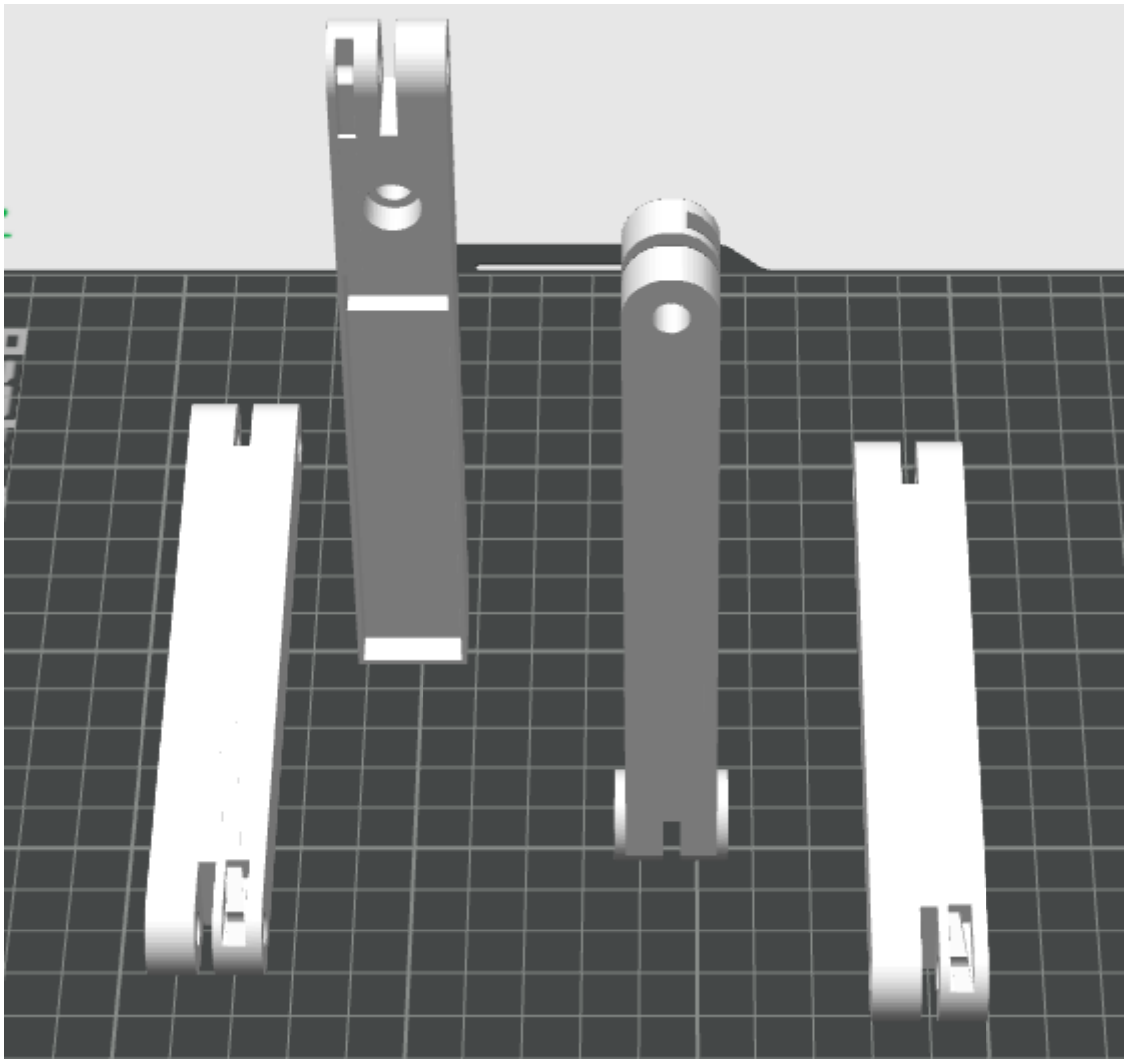
Power:

- Power Bank
- USB to 24VD step-up converter
- USB A to C Cable
- Switch
- LED
- UTF Screw for the Manfrotto Telephone Holder
- 2 x 0,13 red and black cable: 1 mt

3D Printer Layout – Black



3D Printer Layout – White



Suggestions for next iteration

Change screws! The table lamp is very light and rigid. It doesn’t need to be heavy, since the battery in the base guarantee the static balance.

If we get rid of the clumsy M6 Screws we can save a lot of weight.

Find a better way to handle the storage and deployment of the arm.

In current version the base and the light looks weird since they are 90° tilted.

Improve the cover assembly

Maybe we can use just one screw or even make the assembly without screws