



ORTHOPUS

Your moves, your rules

Tutorial

CUSTOMISABLE SKINS

3D PRINTING





Hello and welcome to the 3D printing tutorial for the customisable parts of the ORTHOPUS Supporter, the robotic assistant for arm mobility developed by **ORTHOPUS**.

This document will help you to print your shells yourself. You just have to follow the steps of the tutorial : you'll find printing settings and all the necessary details to help you create your parts.

ENJOY !

GENERAL INFORMATION



The printer used internally at ORTHOPUS is a **Bambu Lab X1 Carbon** with a **0.4** mm nozzle.

The filament used is Francofil brand **PLA** with a diameter of **1.75 mm**.

All parts require a total of approximately 120 g of PLA.

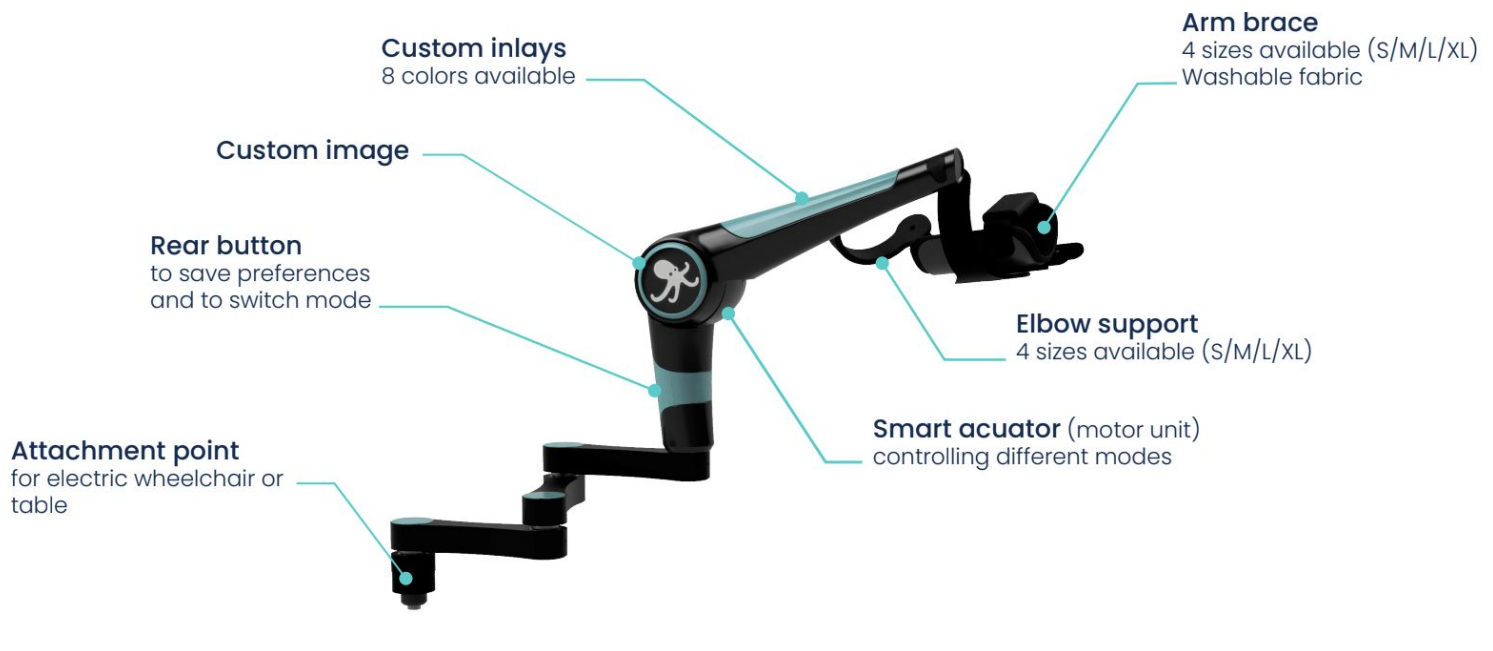


ORTHOPUS' COLORS



But you can choose your own PLA color on various websites!

USTOMIZABLE PARTS OF THE ORTHOPUS SUPPORTER:



Inventory of all parts :

Name of the file	Type of file	Quantity of parts	Filament used for printing
Long skin	STEP, STL and 3MF	1	PLA, 38g
Holding cap (and cleat)		2	PLA, 11g
Front skin		1	PLA, 6g
Back skin		1	PLA, 59g
Decorating cap		3	PLA, 8g

Total = 122 g

Sommaire

0. Required materials

1. Printing the files

- 1.1 Long skin
- 1.2 Holding caps
- 1.3 Front skin
- 1.4 Back Skin
- 1.5 Decorating caps

2. Finishing the parts

- 2.1. Removing the supports
- 2.2. Smoothing the parts
- 2.3. Placing the magnets

3. To go further

0. Required materials



To make your prints, you will need the following equipment:

- **PLA filament** in the desired color and diameter
- **3D printing machine** with a 0.4 mm nozzle
 - Available in most fablabs:
<https://www.makery.info/labs-map/> or
<https://www.fablabs.io/labs/map>
 - At home if you have one
- **.step, .stl, and .3mf files** of the parts, which can be found on [Thingiverse](#), [Makerworld](#), [Printables](#), [Thangs](#)
- **Magnets :**
 - 6 magnets Ø4 x 1 mm with a force of 530g
 - 7 magnets Ø4x3mm with a force of 530g
 - 6 magnets Ø4x 3 mm with a force of 530g
- Two **plexiglass discs** with a diameter of 61.5 mm

Tools :

- Pliers or screwdriver
- Flat or round file
- Scalpel
- Super glue (e.g., Loctite Super glue)
- Toothpick
- Marker
- Lighter

1. Printing the files

Recommended common settings

Nozzle temperature: **220°C**

Nozzle diameter: **0.4 mm**

Filament diameter: **1.75 mm**

Recommended material: **PLA**

Number of walls: **2**

Layer height: **0.2 mm**

Top layer thickness: **1 mm**

Lower layer thickness: **0.6 mm**

Fill pattern: **grid**

Fill density: **15%**

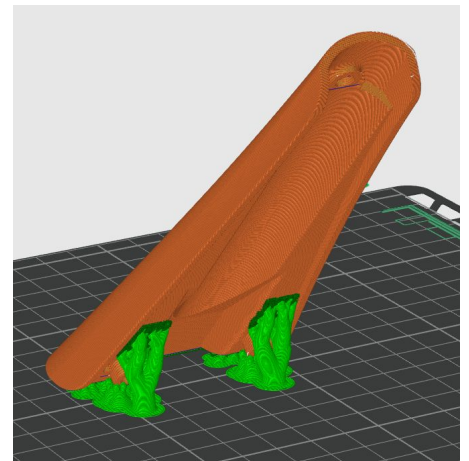
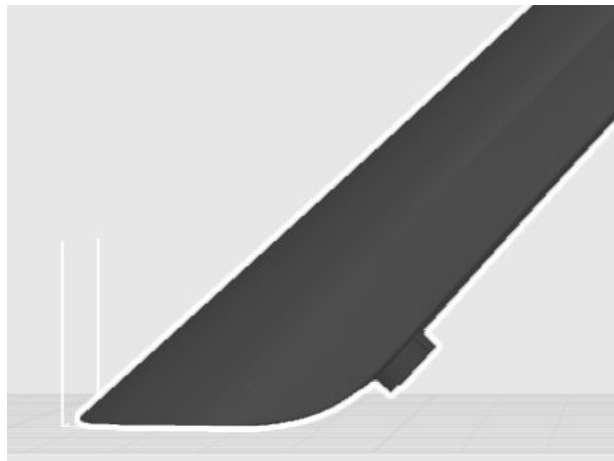
Print speed: **250 mm/s**

Travel speed: **500 mm/s**

Bed temperature: **45–55°C**
(depending on the bed)

1.1 Long skin

Positioning:
flat base on the
plate



Settings in Bambu Lab

Top layer pattern: **monotonic line**

Bottom layer pattern: **monotonic**

Supports: **yes, Tree auto**

Plate adhesion: **no**

Initial Bambu profile: **0,20 mm standard @BBL X1C**

Special settings:

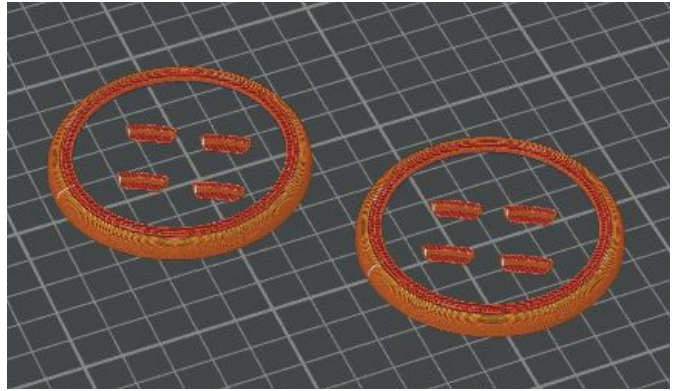
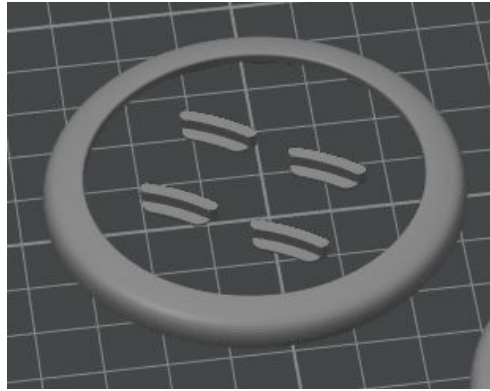
Wall generator: **Arachne**

Order of walls: **ext/int**

Support critical regions only: **enabled**

1.2 Holding caps

Positioning:
flat base on the
plate



Settings in Bambu Lab

Top layer pattern: **monotonic line**

Bottom layer pattern: **monotonic**

Supports: **yes, Normal auto** (snug style)

Plate adhesion: **Brim type : No-brim**

Initial Bambu profile: **0,20 mm strength @BBL X1C**

Special settings: **Prime Tower**

Infill gap : **100%**

Rib wall: **disabled**

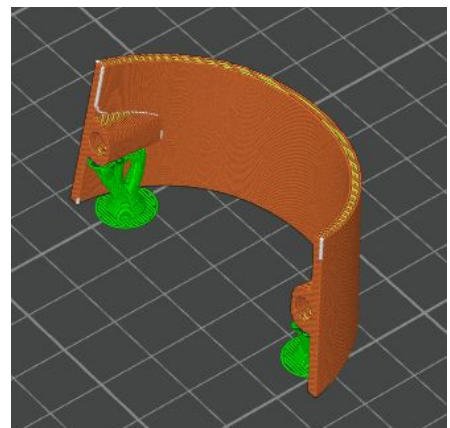
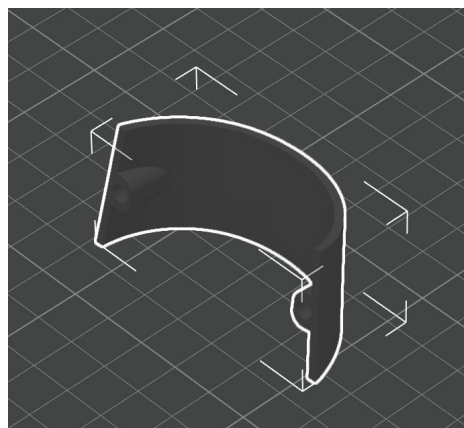
Support

Expansion of the first layer : **0 mm**

Support/object xy distance : **0.8 mm**

1.3 Front skin

Positioning:
large flat base on
the plate



Settings in Bambu Lab

Top layer pattern: **monotonic line**

Bottom layer pattern: **monotonic**

Supports: **yes, Tree auto**

Plate adhesion: **no**

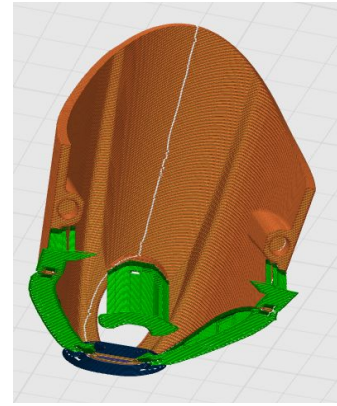
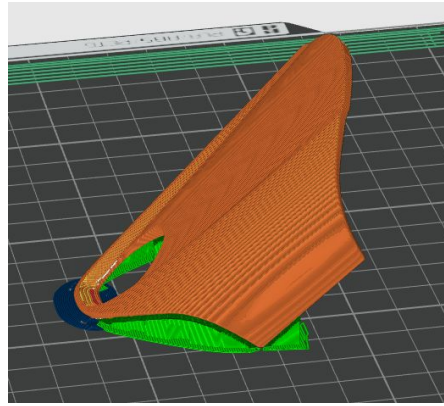
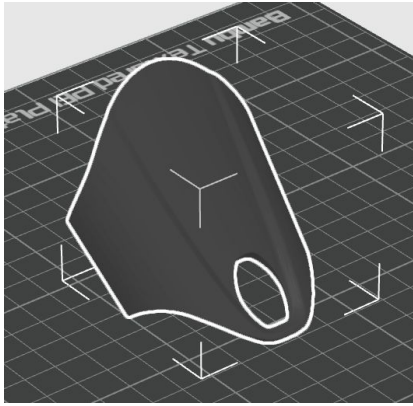
Initial Bambu profile: **0,20 mm standard @BBL X1C**

Special settings:

Wall generator: **Arachne**

1.4 Back Skin

Positioning:
bottom of the
button flat on the
plate



Settings in Bambu Lab

Top layer pattern: **monotonic line**

Bottom layer pattern: **monotonic**

Supports: **yes, classic auto**

Plate adhesion: **yes, 5mm brim**

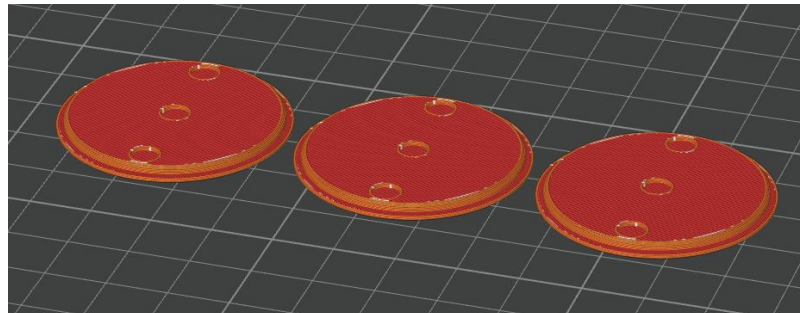
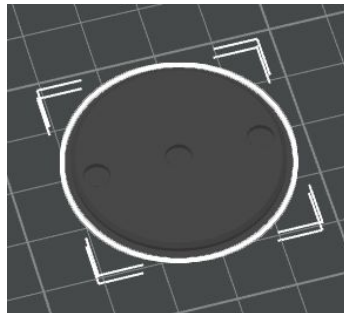
Initial Bambu profile: **0,20 mm standard @BBL X1C**

Special settings:

Wall generator: **Arachne**

1.5 Decorating caps

Positioning:
flat base on the
plate



Settings in Bambu Lab

Top layer pattern: **monotonic line**

Bottom layer pattern: **concentric**

Supports: **no**

Plate adhesion: **no**

Initial Bambu profile: **0,20 mm standard @BBL X1C**

Special settings: Prime Tower

Infill gap : **100%**

Rib wall: **disabled**

2. Finishing the parts

2.1 Removing the supports

Required materials

- 3D printed parts
- A cutter or scalpel
- Flat pliers
- A flat or rounded file

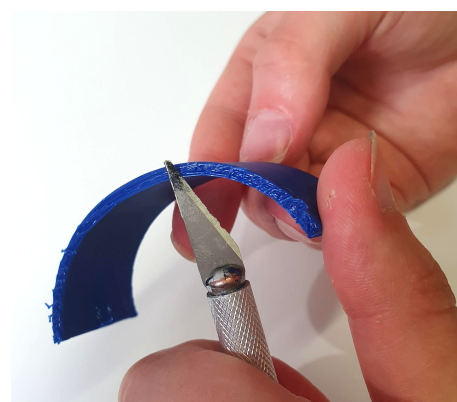


Steps

1) Take a pair of pliers and remove the supports. They should come off easily. You can also use a cutter or scalpel to remove them.



2) Using a scalpel, remove any excess supports remaining by scraping the surface of the parts.

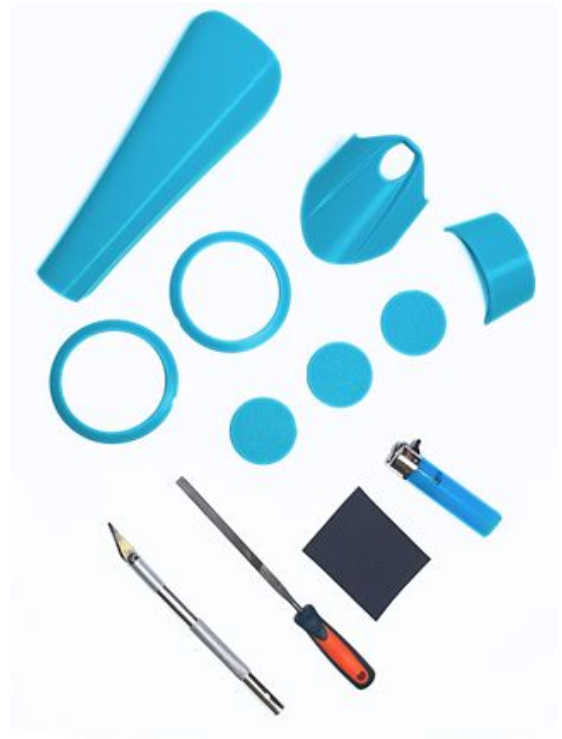


2. Finishing the parts

2.2 Smoothing the parts

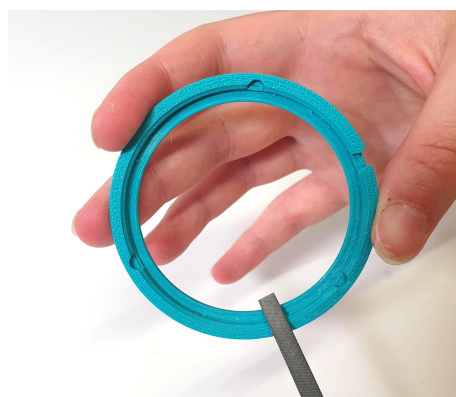
Required materials

- Skin set without support
- A flat file
- A scalpel
- 100-grit sandpaper
- Lighter (or a heat source)



Steps

1) Run the flat file over the previously supported areas to smooth the surfaces and remove any rough edges.



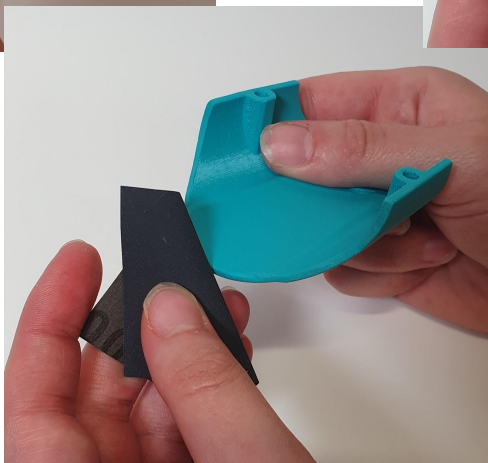
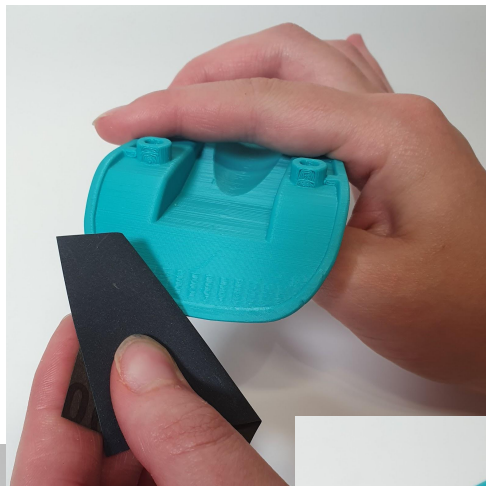
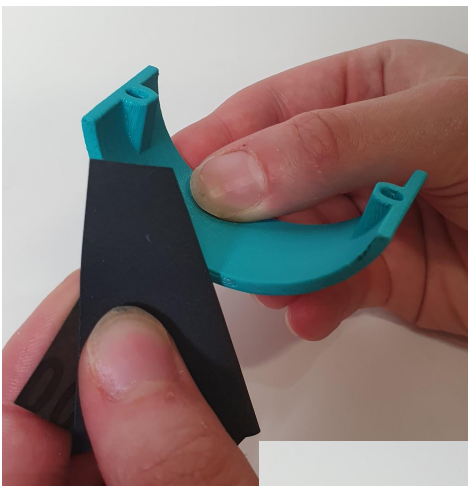
2. Finishing the parts

2.2 Smoothing the parts

Be sure to go into the corners and file down the area where the magnets are located, as well as the edges of the button.



2) To refine the filing, use very fine sandpaper (100 grit) on all parts.



2. Finishing the parts

2.2 Smoothing the parts

3) Heat your part along its entire length, where it was previously supported, using a lighter.



Be careful not to leave it on too long, otherwise the plastic will melt and deform!



4) Wait a few seconds so you don't burn yourself, and run your finger along the edge to smooth out your part.

5) Do the same with the other parts



2. Finishing the parts

2.3. Placing the magnets



Required materials

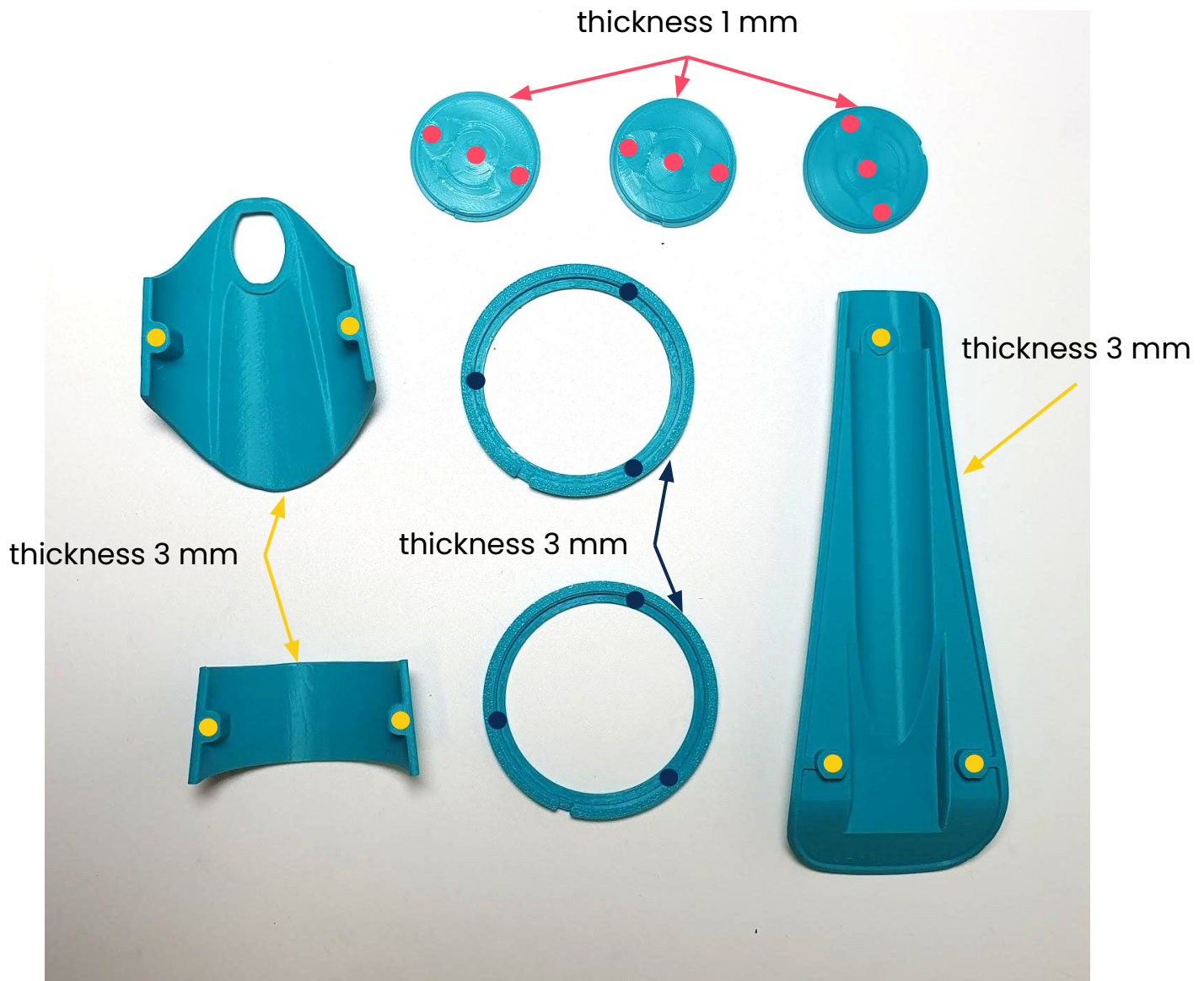
- Magnets :
 - 6 magnets $\varnothing 4 \times 1$ mm with a force of 530g
 - 7 magnets $\varnothing 4 \times 3$ mm with a force of 530g
 - 6 magnets $\varnothing 4 \times 3$ mm with a force of 530g

PS: To order your magnets, there are websites such as supermagnete, 123 Magnet, and others.

- Super glue (e.g., Loctite Super Glue-3)
- A toothpick

2. Finishing the parts

2.3. Placing the magnets



Magnets positions

-  6 Magnets Ø4 x 1mm
-  6 Magnets Ø4 x 2mm
-  7 Magnets Ø4 x 3mm

2. Finishing the parts

2.3. Placing the magnets

Steps



1) Position your magnets so that they are in contact with those on the ORTHOPUS Supporter.

This will allow you to determine the orientation of the magnetization of the magnets.

2) Mark the visible side of the magnet with a marker. The colored part of the magnet is the side that will be glued onto your printed pieces.



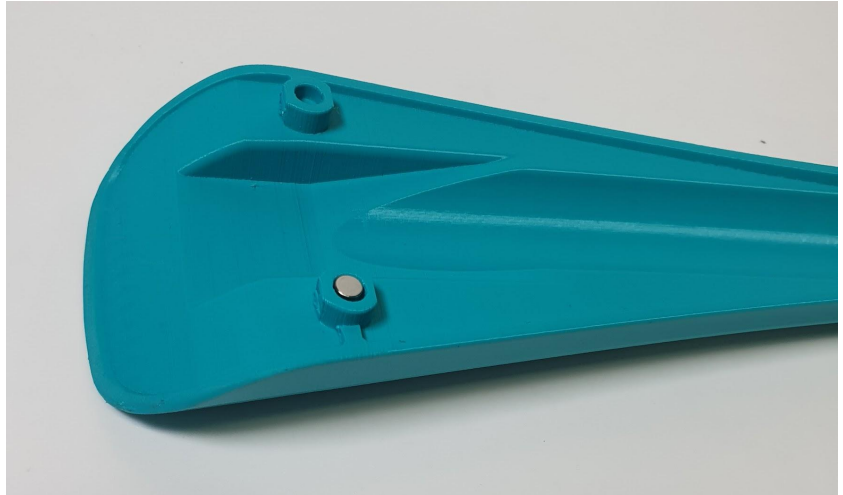
Repeat this step on the entire ORTHOPUS Supporter



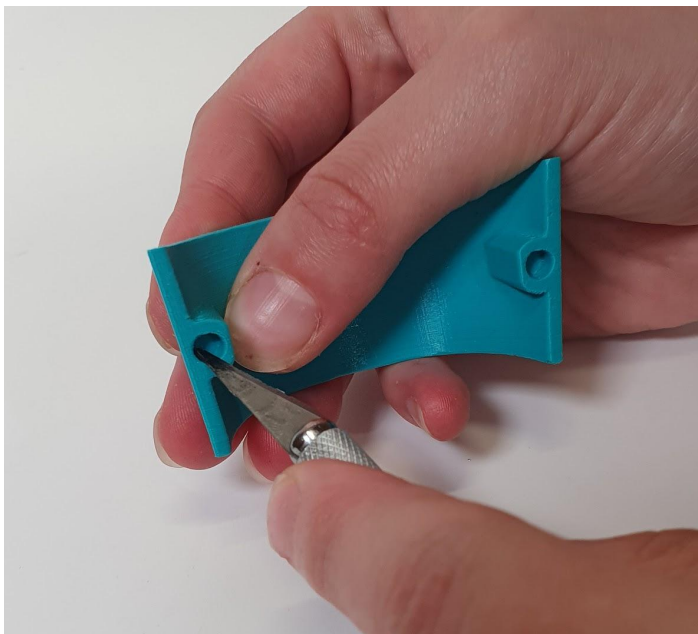
2. Finishing the parts

2.3. Placing the magnets

3) Then check that your magnets fit properly into the notches of the skins you have 3D printed.



There should be a slight gap in diameter between the round notch in the printed part and the magnet. The height of the magnet should not protrude beyond the notch in the 3D-printed skins.



If the magnets don't fit into the notches, you can trim the inside of the notch using a scalpel.

2. Finishing the parts

2.3. Placing the magnets



4) Apply liquid glue to the colored side of the magnet using a toothpick.



5) Apply liquid glue to the notch in the skin using the toothpick, then place your magnet inside.



Repeat steps 4 and 5 for the other two magnets.

Repeat the previous steps for all the other magnets on the skins except for the two **Holding caps!**

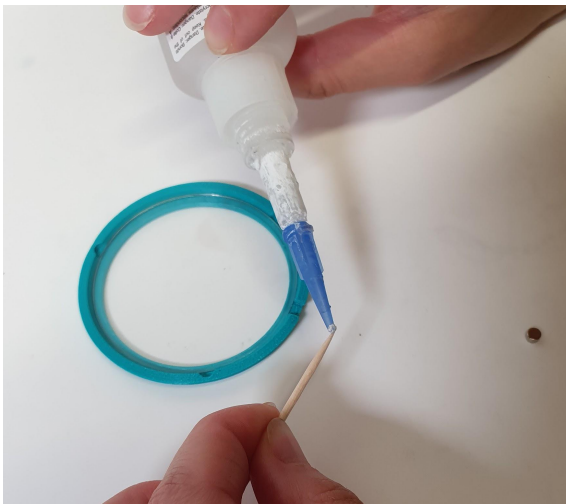


2. Finishing the parts

2.3. Placing the magnets

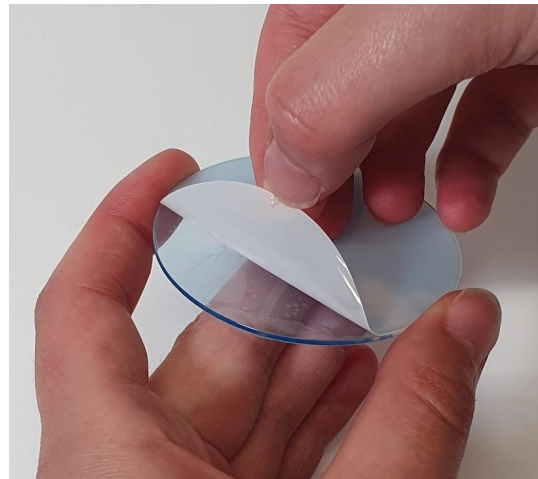
Assembling the holding caps

1) Apply liquid glue to the colored side of your $\varnothing 4 \times 2$ mm magnet. Also apply glue to the three round notches provided for this purpose on the holding cap. Place your three magnets: the colored part of the magnet must be in contact with your part.



Tip: allow to dry for 30 minutes before proceeding to the next step to avoid staining the plexiglas.

2) Remove the two films from the plexiglas, which serves to protect the image inside the badge.



Where can you find plexiglass?

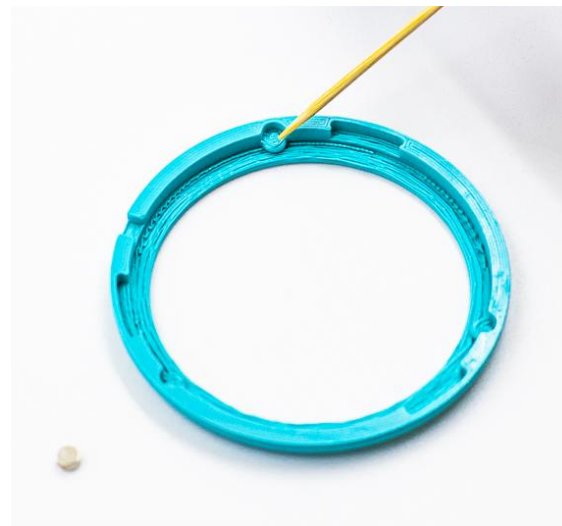
You can cut two 61.5 cm circles out of a sheet of plexiglas or reuse the old plexiglas from your old holding caps.

2. Finishing the parts

2.3. Placing the magnets

Assembling the holding caps

1) Apply liquid glue to the colored side of your Ø4x2mm magnet. Also apply glue to the three round notches provided for this purpose on the holding cap. Place your three magnets: the colored part of the magnet must be in contact with your part.



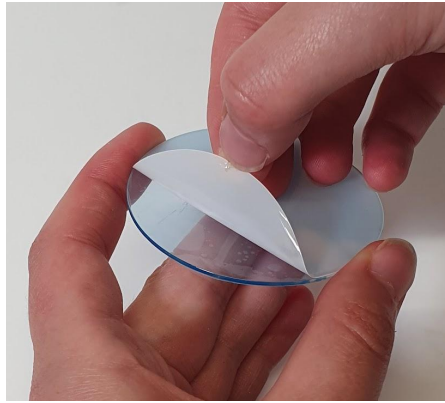
Tip: allow to dry for 30 minutes before proceeding to the next step to avoid staining the plexiglas.



2. Finishing the parts

2.3. Placing the magnets

2) Remove the two protective films from the plexiglass, which protect the image inside the badge.



Where can you find the plexiglass?

You can cut two 61.5 cm circles from a sheet of plexiglass, or reuse the old plexiglass from your previous badges.

3) Then place your plexiglas inside the holding cap, as deep as possible.



4) Apply liquid glue to the three wider notches on the badge; this step is tricky, try to avoid getting glue on the plexiglas.

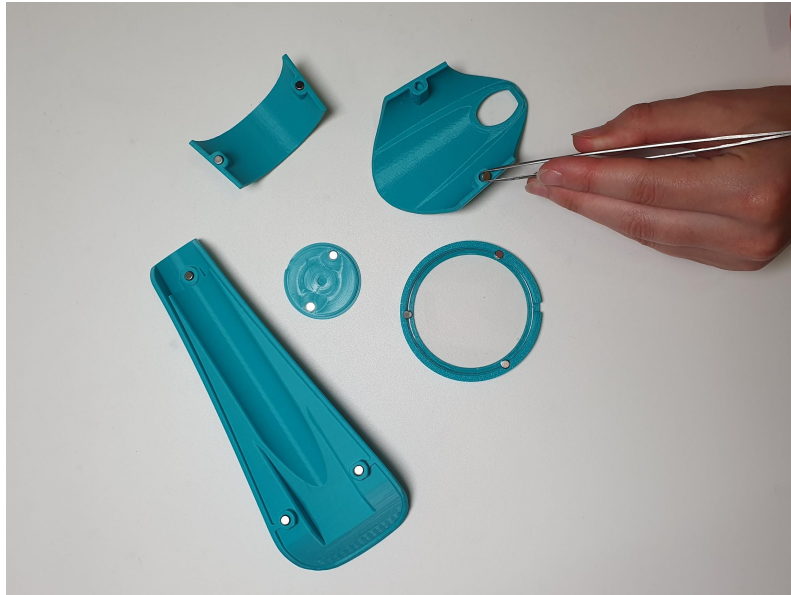


Repeat these steps with the second holding cap.

2. Finishing the parts

2.3. Placing the magnets

Once all your magnets are in place, let the glue dry for at least 30 minutes, and you're done!



You can then place your parts on the ORTHOPUS Supporter.



3. To go further

The steps for customising your skins when purchasing an **ORTHOPUS Supporter** end here.

However, you can continue customising your cases with color, acrylic paint, or by smoothing the outer surface of the cases using specific products. There's nothing stopping you from printing them in wood filament, multicolor, phosphorescent, adding fur, or anything else!

To give you an idea, here are a few examples of our **custom designs**:



If you want to change the image in your **holding cap**, please follow the tutorial on our website.

Feel free to share your creations with us via **usercare@orthopus.com** or with the hashtag **#monorthopussupporter** on social media! You are also welcome to contribute to improving this document. If you would like more information, please visit our website: <https://orthopus.com/>

The ORTHOPUS team

