



FABRICATION INSTRUCTIONS OF THE PRINTED COMPONENTS OF THE PLECO

www.fablab-neuch.ch/pleco



BEFORE STARTING

Some components of the Pleco are fabricated using 3D printing techniques: the nozzle, the cover, the piston head and the push-button. The 3D files can be downloaded at the following address:
http://www.fablab-neuch.ch/pleco/files/Pleco_v1.2_en.zip

To assemble and use correctly the Pleco, it is important to achieve an optimal printing of the components using the guidelines and parameters compiled in this document.

This document also provides guidelines on how to remove burrs without damaging the components. The printing quality control and finishing parameters are given for each component.

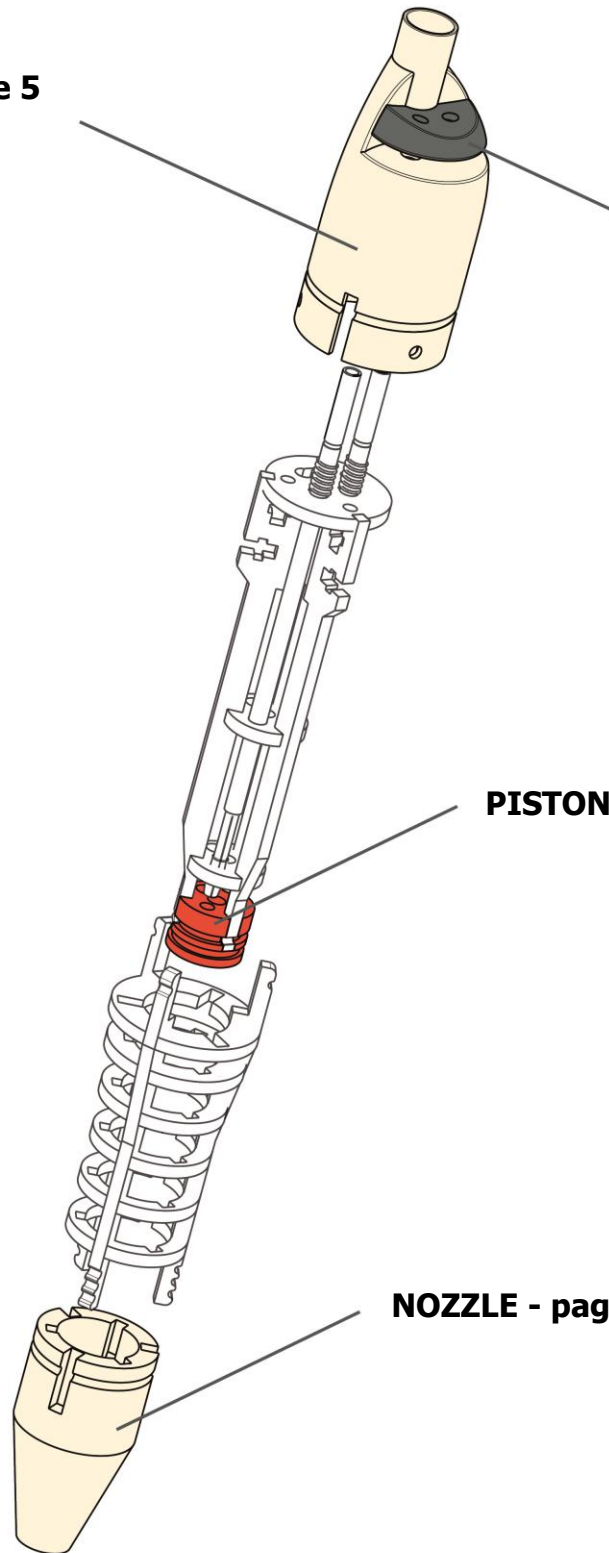
You are encouraged to consult the Pleco webpage before you start this work. A video of the finishing of the 3D printed components (<http://www.fablab-neuch.ch/pleco/plus.php?id=17&Lang=en>) is available and precise the operations to carry out.

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A. List of tools and consumables required for the fabrication and the finishing

3D PRINTING

- Ultimaker® Original + printer

Printer filaments

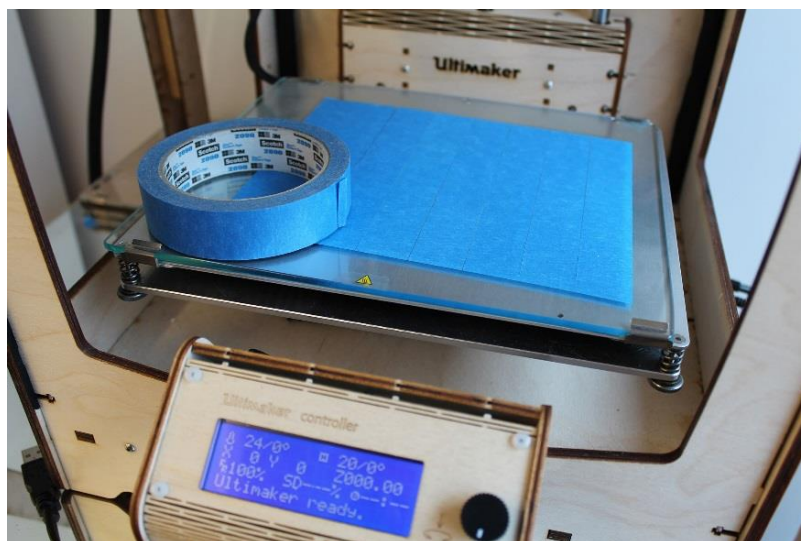
- Roll of transparent PLA printer filament
- Roll of black PLA printer filament
- Roll of red PLA printer filament

Other tools and consumables

- Masking tape 3M® long life 2090
- Scalpel/Cutter and small round file
- 1x sheet of coarse sandpaper (around 120)
- 1x sheet of fine sandpaper (around 280)

Remarks

All components are printed with the Ultimaker® Original + printer equipped with a heating plate¹. The Cura² software has been used for the printing setup. Good results were obtained with Ultimaker® or ColorFabb® filaments. Therefore we highly recommend to use them. The printing plate should be covered with a masking tape for a better gripping of the components.



¹ The printing of the Pleco components is also possible on an Ultimaker® printer without heating plate.

² Currently we use the 15.04.2 version of the software. We cannot guaranty that a previous version or any updating will guaranty the final dimensions of the components.

I. COVER

Printing parameters

Consumable: transparent PLA

Cura setup for simple mode:

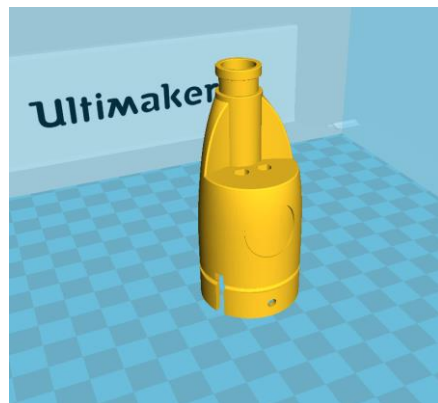
Printing profile: normal quality

Consumable: PLA

Cura setup for expert mode:

Gripping type to the plate: Border (Brim)

Component orientation:



Quality control of the printing

Below, a cover after printing (image (a)):



(a)



(b)

Finishing

Using a cutter or a scalpel, deburr the excess material from the gripping process and without too much pressure any residue around the cover and inside the notches as shown on image (b). The component is thin and breakable.

II. NOZZLE

Printing parameters

Consumable: transparent PLA

Cura setup for simple mode:

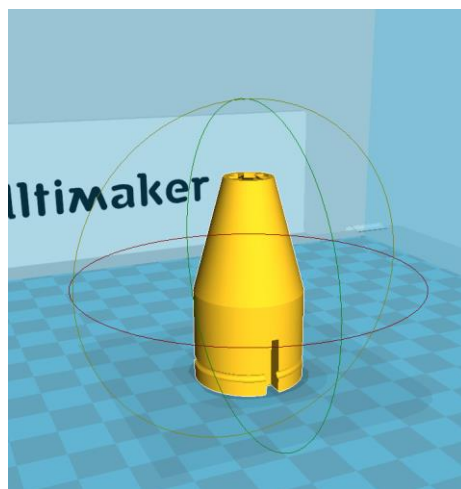
Printing profile: high quality

Consumable: PLA

Cura setup for expert mode:

Gripping type to the plate: without

Component orientation:



Quality control of the printing

WARNING: this component has to be absolutely waterproof to ensure the good working of the Pleco.

To check this, observe first the general surface appearance of the component. It should be similar to the appearance given on the images below.



The internal cylindrical section should have no residue of printing material, as shown on image (a) below. The printing layers of the conical section should be clean and well soldered. There should be no hole on the surface. Even if it looks closed with naked eyes, it is recommended to control the waterproofness by filling the nozzle with water and closing the basis with a finger as shown on image (b) below. A second control might be done by blowing air from the top of the nozzle and closing the basis with a finger in a similar way as before with water. Water or air going through the section of the component indicates some leakage. In that case the component should be printed again after checking the printer parameters (nozzle height, axes alignment, etc.).



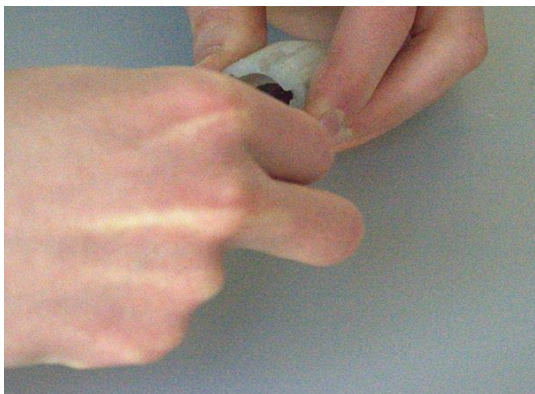
(a)



(b)

Finishing

Rub down the inside of the nozzle with coarse sandpaper until the surface is smooth and regular. Do not damage the conical section. To guarantee waterproofness of the electrolytic cell, the different components are tightly adjusted. This is why it is necessary to refine the surface finish around this area. Fine sandpaper can then be used to finally smoothen the surface.



During the assembling of the Pleco the insertion of the piston in the nozzle has to be tested. It must slide (with force applied). If not, rub again the inside of the nozzle with coarse sandpaper. This step might be long and tedious if the printing quality is not optimal. In that case, the addition of Teflon tape around the piston might facilitate the sliding of the nozzle.

Tip: Wrap sandpaper around a pen to help the sanding process.

III. PUSH-BUTTON

Printing parameters

Consumable: black PLA

Cura setup for simple mode:

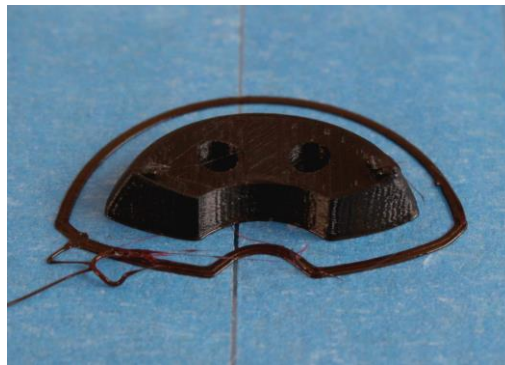
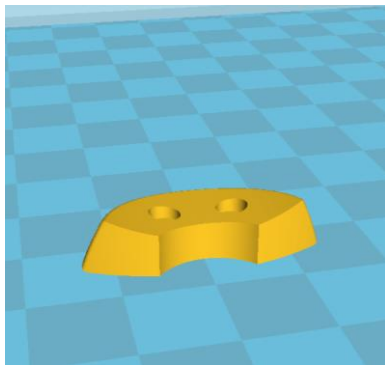
Printing profile: high quality

Consumable: PLA

Cura setup for expert mode:

Gripping type to the plate: without

Component orientation:

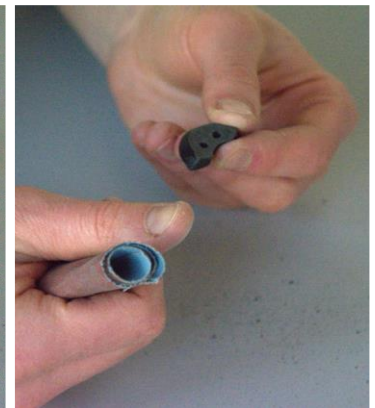


Quality control of the printing

Below, a push-button after printing (left component on image (a)):



(a)



(b)

Finishing

Using a cutter or a scalpel, deburr the borders and with a small round file deburr the inside of the holes. Rub down the concave surface with coarse sandpaper and then fine sandpaper until the surface is smooth (image (b)).

IV. PISTON HEAD

Printing parameters

Consumable: red (or any other colour) PLA

Cura setup for simple mode:

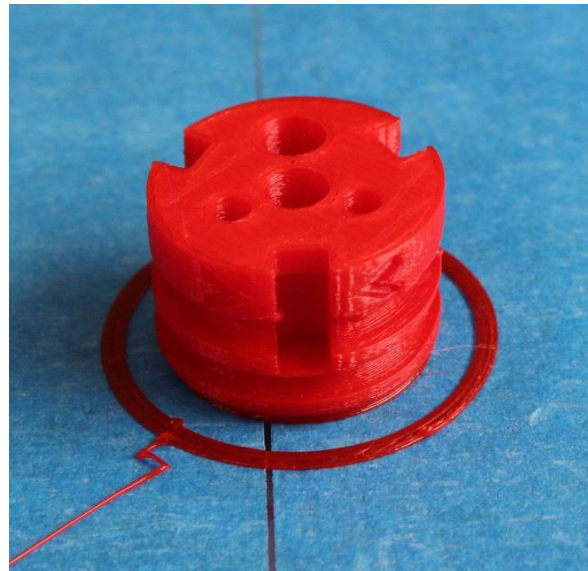
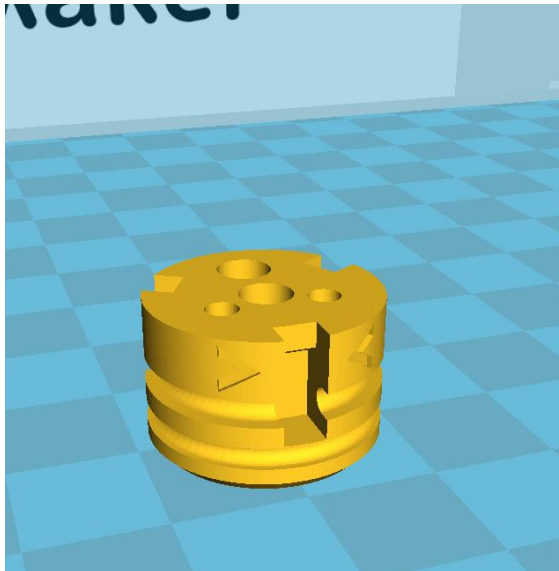
Printing profile: normal quality

Consumable: PLA

Cura setup for expert mode:

Gripping type to the plate: without

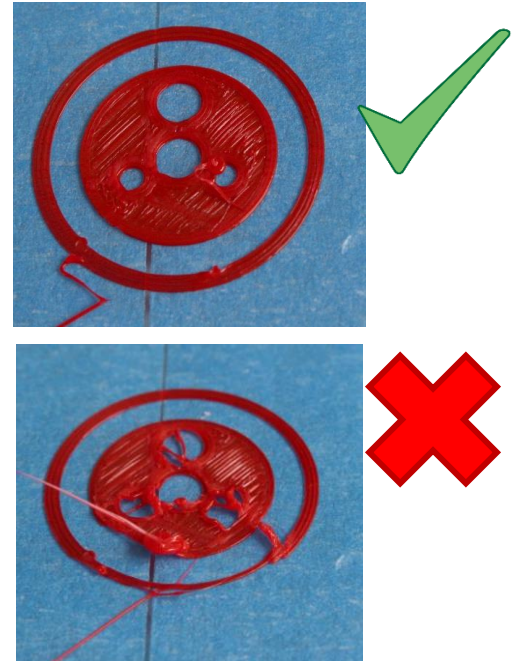
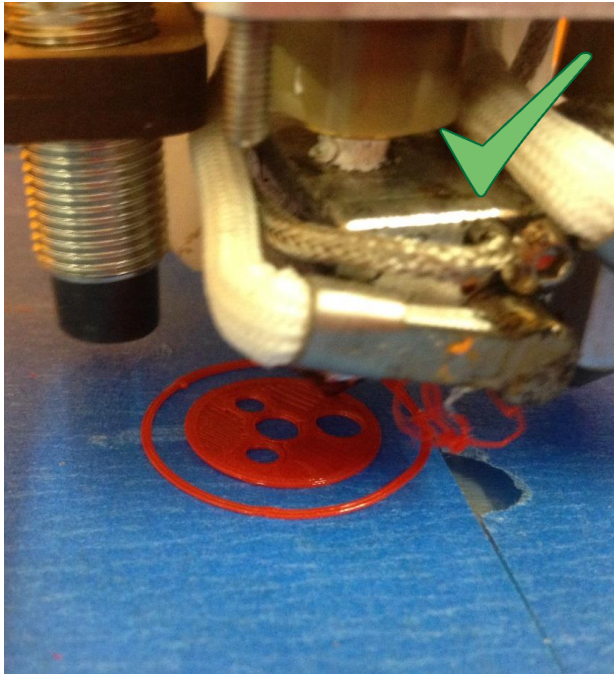
Component orientation:



Printing quality control

WARNING: this component has to be absolutely waterproof to ensure the good working of the Pleco.

The state of the first layer must be controlled when starting the printing. The distance between the nozzle of the printer and the plate must be setup so that the filament is slightly flattened during the printing. If the first layer is not deposited in an optimal way, holes will be observed that will decrease the waterproofness. The images below show the difference between a good printing start and a wrong one.



Once the printing completed, one can clearly see the difference between a waterproof surface (right component, image (a) below) and a porous surface (left component, image (a) below).



(a)



(b)

Finishing

Using a cutter or a scalpel, deburr the borders and with a small round file deburr the inside of the holes.

It is possible to find a hole in the O-ring lower groove of the head (image (b)). It is a fabrication defect that might occur due to the thinness of the section. This surface is not in contact with the solution and does not contribute then to the waterproofness. Therefore this defect is not a problem for the good working of the Pleco.