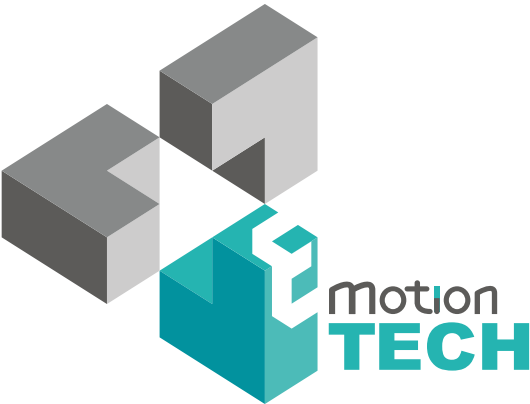# µdelta

ASSEMBLY INSTRUCTIONS

REV 1.1

motion TECH

INTRODUCTION

INTRODUCTION

• Target :

Prupose a visual guide of the differents steps to build and use a µdelta printer

• Designers :

Hugo Flye
Thomas Batigne
Antony Soury

• Autors :

eMotion Tech : http://www.reprap-france.com

Antony Soury
Loic Déchaseaux
Hugo FLye
Thomas Batigne

• Photographics Credits :

Pictures and 3D représentations made by eMotion Tech :
http://www.emotion-tech.com
Pictures Director : Antony Soury

• Sources :

http://reprap.org/wiki/reprap
http://www.repetier.com/

• Licenses :

µdelta : CC BY-NC-SA 4.0
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• Update :

Last Update : 03/12/2014

• Links:

You can found more informations on the following links :

RepRap community : http://reprap.org/wiki/reprap
Repetier-Host software : http://www.repetier.com/
3D models database : http://www.thingiverse.com/

RepRap

SUMMARY

µDELTA INTRODUCTION

µdelta is developed by eMotion Tech. This new 3D printer is easy to assemble and to operate without loss of performances.

Data sheet :

DATAS

• Printing surface Ø110x190mm
• Layer height [0.1-0.35]
• Electronic type Teesylu + 4 Stepsticks (integrated firmware)
• Motor NEMA 17
• Belt type GT2
• Extrusion Head Hexagon 0.4
• Dimensions : Height 440mm, Width 250mm, Depth 250mm
• Nominal printing speed 70mm/s
• Max speed : 200mm/s
• Nominal speed : 130mm/s
• Average precision (X,Y) 100 microns
• Average precision (Z) 50 microns
• Operating system Windows XP, Vista, 7,8, Ubuntu 12+
• Consumable PLA 1.75mm (or ABS and others plastics with heated bed opton)
• Provied with Repetier preset for µdelta
• Connectivity USB
• Power supply provided, 12V, 120W

STRUCTURE

• Lasercut Acrylic 5mm
• Extruder core printed in ABS 0.2mm
• Smooth rod 8mm
• Manufactured plate plywood 12mm

ERGONOMY

Easy to mount : A 3D printer kit with an intuitive assembly
• Simple electronic, no soldering
• Easy wiring and assembly
• Belt adjustment with ergonomic belt tensioners

Easy to calibrate : A simplified software
• Fully software calibration
• Pre-configured open-source software (no firmware upload required, Repetier Host and Slic3r pre-configured)

Easy to maintain
• Quick height adjustement with the software
• Easy to reload the filament

OPTIMISATION AND UPGRADE (Options and Développements soon avalaible)

You can improve the µdelta by adding the following options

• Spool holder with fan
• LCD screen controller to print without computer
• Lighting with circular LED
• Heated bed
_____

SAFETY INSTRUCTIONS

General safety instructions

NEVER LEAVE THE PRINTER WORKING WITHOUT SUPERVISOR.

The nozzle can reach 270°C, to avoid burning, do not touch the nozzle while the printer is working.

A supervisor is needed when the printer is used with young people.

KEEP PRINTER AWAY FROM CHILDRN AND ANIMALS

Operate un a ventilated room. Plastic fumes effets are not known. In case of use in a closed rom, we recommend the use of an extractor fan.

The addition of protections is your own responsibility. Safety can be improved by :

• An emergency stop button
• Housing protection
• Smoke detector

CE marking

µdelta is a 3D printed kit. It includes all the parts you need for assembling but does not include additional protections.

Electrical safety

The power supply provided is labelled CE. The power supply is protected against short-circuit and do not need any modifications. The µdelta operate at voltage of 12V and is not concerned by the low voltage directive.

Further informations

Information above are not exhaustive.

We used sources of informations we consider as reliable. However, we cannot guarantee that all these information are true and complete.

We assume no liability for loses, injuries or damages due to assembly, transporting, storage or removal of the product.

_____

ASSEMBLY

BILL OF MATERIALS
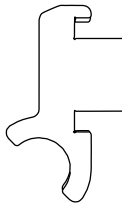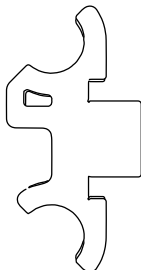
A. Printed parts
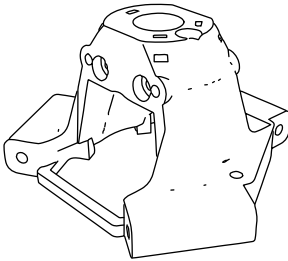
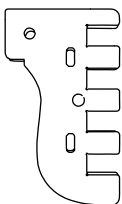1x Core

1x Filament Guide
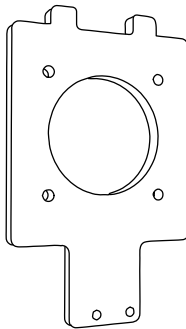
B. Acrylic parts
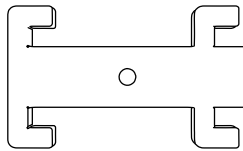
6x eM1
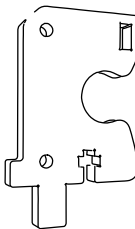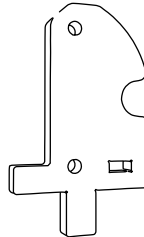TENSIONER
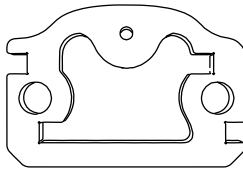
6x eM 2

6x eM 3
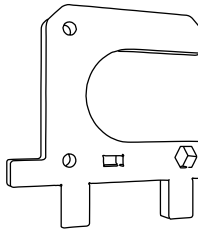SLIDER

6x eM 4
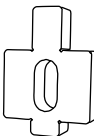
6x eM 5

3x eM 14
MOTOR HOLDER

2x eM 8
EXTRUDER

1x eM 9

1x eM 10

2x eM 11

1x eM 12

1x eM 13

C. Smooth rods and connecting rods

6x Ø8x400 Smooth rod

6x Connecting rod

D. Mechanical parts

9x Linear bearing

1x Spring

3x GT2 Pulley

3x GT2 Belt

3x 624 Bearing
1x 604 Bearing

1x Drive wheel

E. Screws, nuts and washers

6x M2.5x16 screw
15x M3x12 screw
12x M3x20 screw
4x M3x25 screw
3x M3x30 screw
10x M3x50 screw
16x M4x25 screw
1x M4x50 screw
12x M5x30 screw
3x Wood screw

6x M2.5 Nut
3x M3 Wing Nut
32x M3 Nut
20x M4 Nut
12x M5 Nut

1x M3 Nylstop Nut

45x Ø3 Washer
19x Ø4 Washer
4x Ø4 Big washer

4x M3x3 Grub Screw

F. Electronic
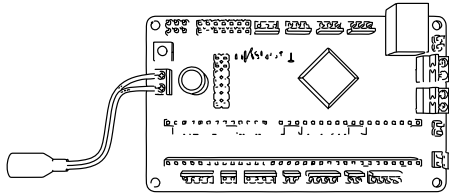
1x Teensylu
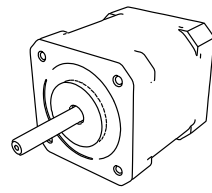
4x Nema 17 motor
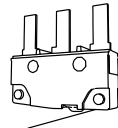
3x Endstop
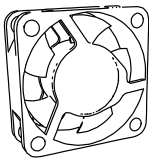
2x 3x3 Fan

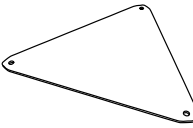4x Stepstick

1x Power supply
1x USB Link

G. Others
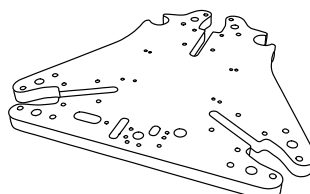
1x Superior frame
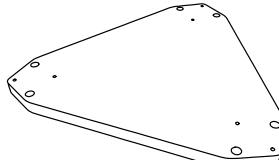
1x Inferior frame

1x Print bed

1x Ø4xM6 Pneufit

1x Ø4x1/8" Pneufit

1x PTFE tube

3x motor Bracket

6x Shaft Support

1x Braided sleeve

30x Zip tie

3x Pad

1x Adhesive tape

H. Hexagon Kit

1x Hexagon hot end

1x Cartridge heater

1x Thermistor

1x Allen key 3

1x Wrench 4.5

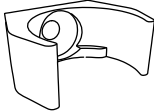## I. Options

1x Heated bed and thermistor

3x Idler

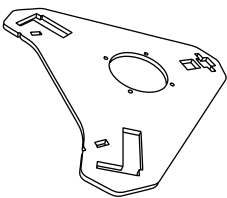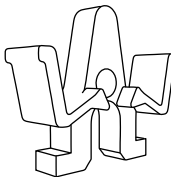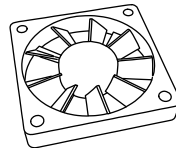1x Tube

1x tube holder

1x Polyimide tape

HEATED BED KIT

1x Spool holder frame

3x Spool blocks

1x 60x60 Fan

3x 624 Bearing

3x M4x20 Screw

3x M4 Nut

3x Ø4 Washer

SPOOL HOLDER KIT
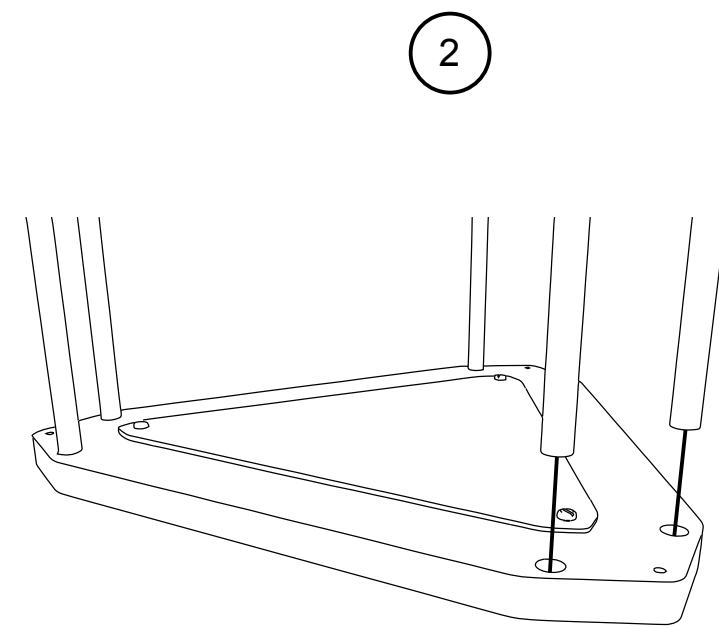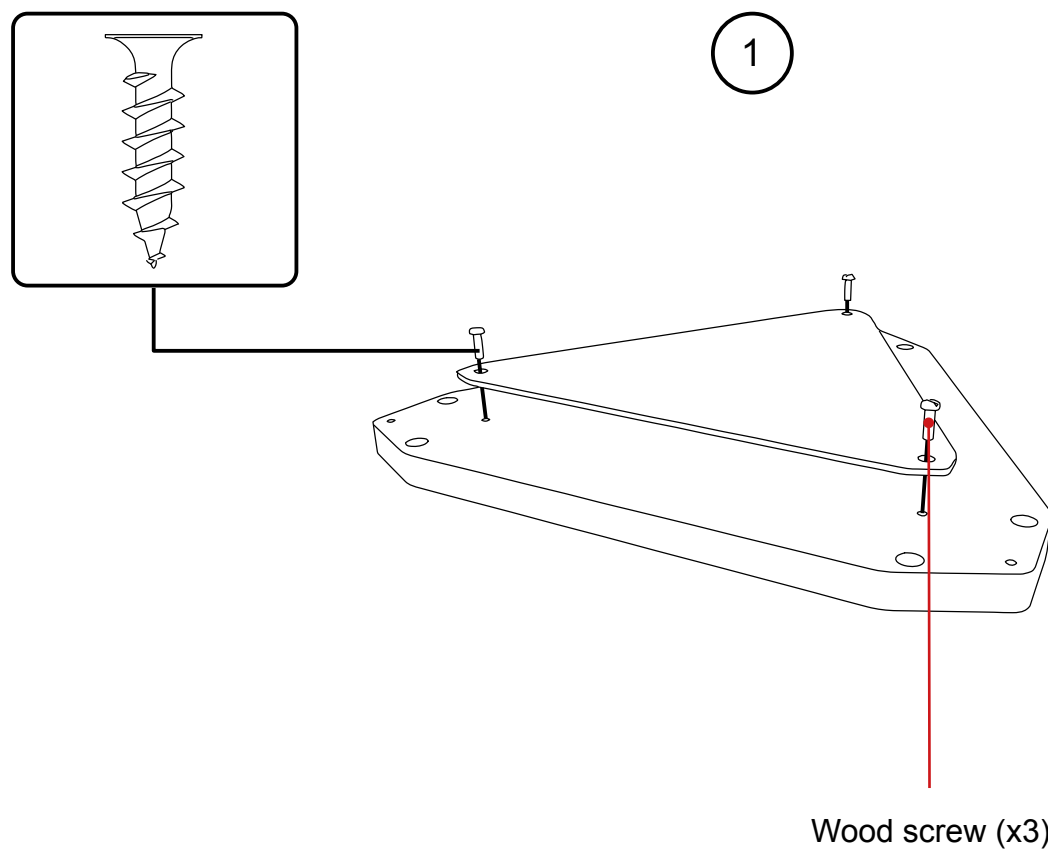
1x LED ring

LED KIT

TOOLS

- Mallet
- Slot screwdriver
- Philips screwdriver
- Wrench 5.5 et 7
- Allen key (fournie)
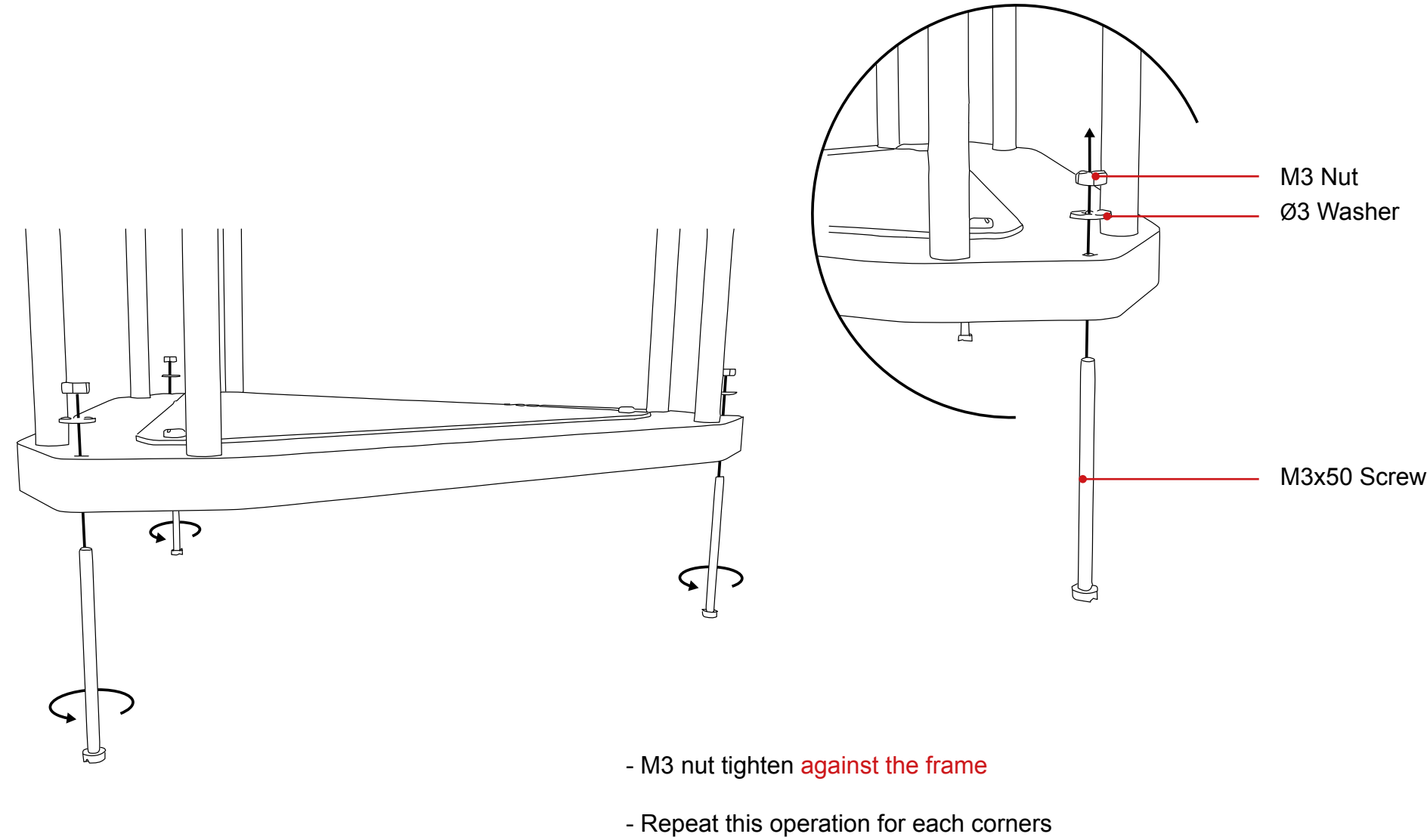- Long nose pliers
- Cutting pliers
- Utility knife
- Meter

MECHANICAL ASSEMBLY

①

②

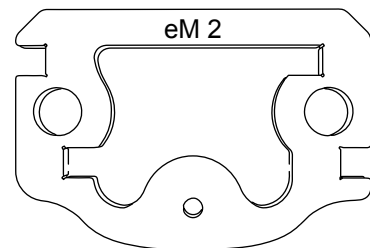Wood screw (x3)

- Use a mallet to insert completely the rod without exceeding the plate

- Smooth rods must be normal to the inferior frame

M3 Nut

Ø3 Washer

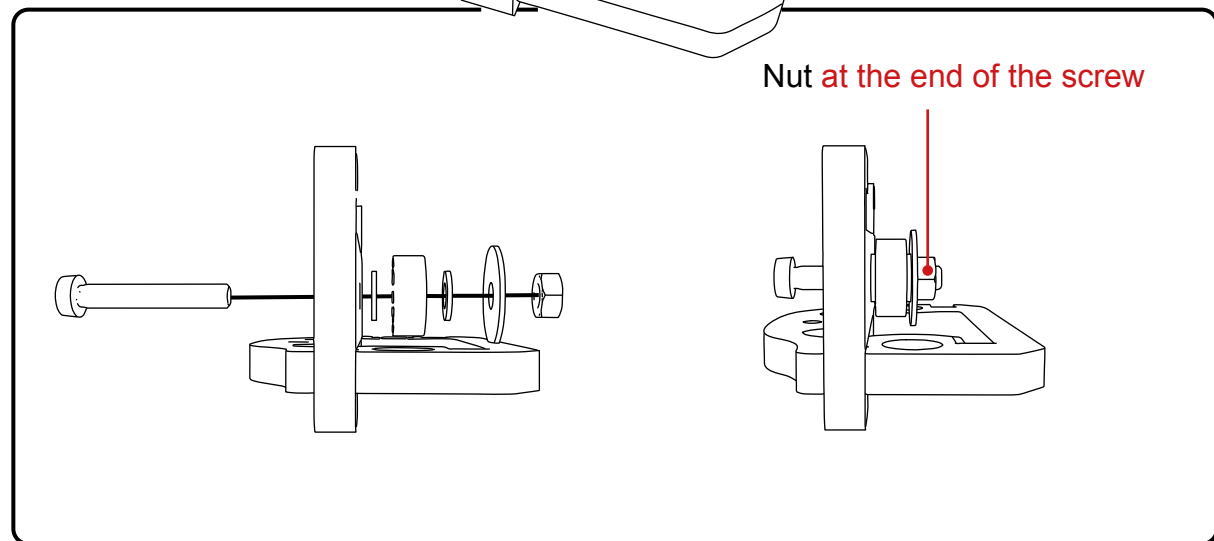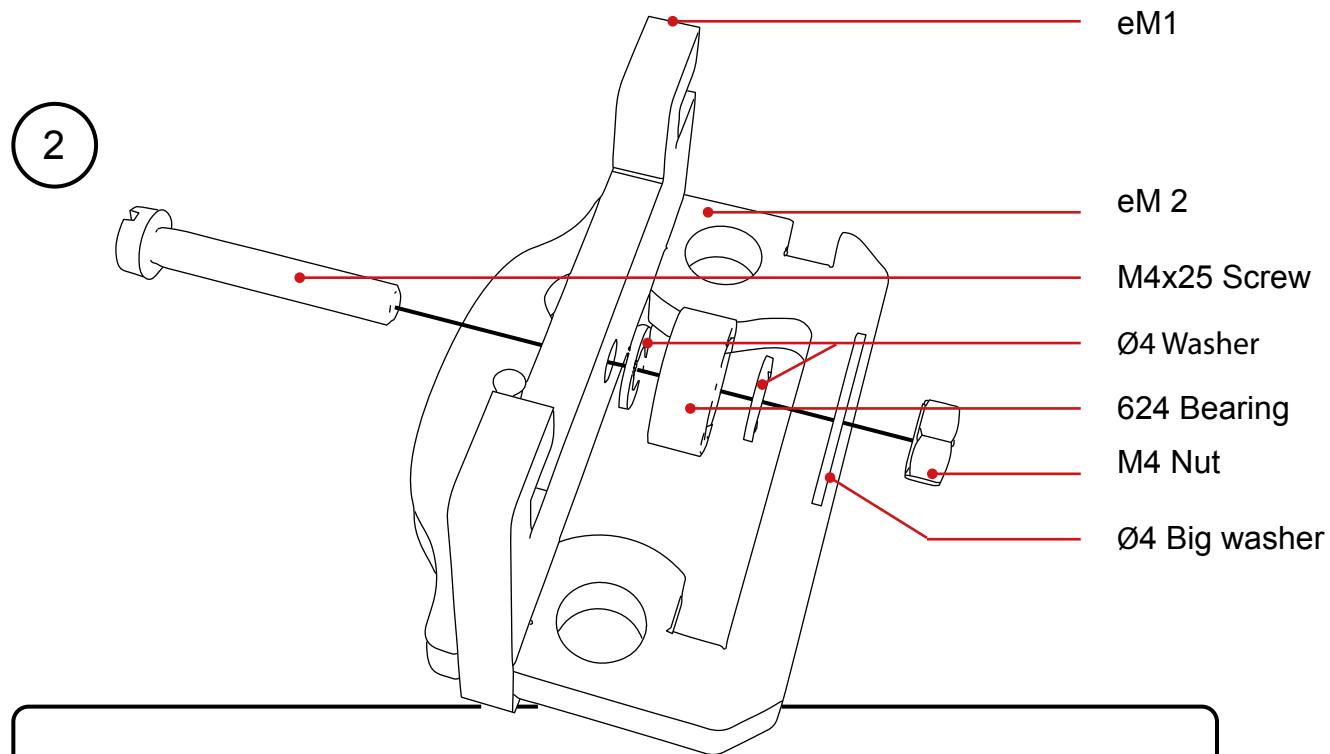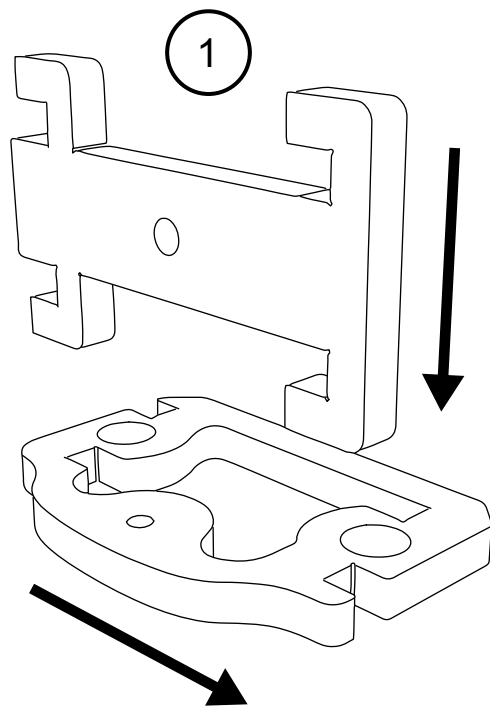M3x50 Screw

- M3 nut tighten against the frame

- Repeat this operation for each corners

Inside the µdelta

eM 2

Outside the µdelta

2

eM1

eM 2

M4x25 Screw

Ø4 Washer

624 Bearing

M4 Nut

Ø4 Big washer

Nut at the end of the screw
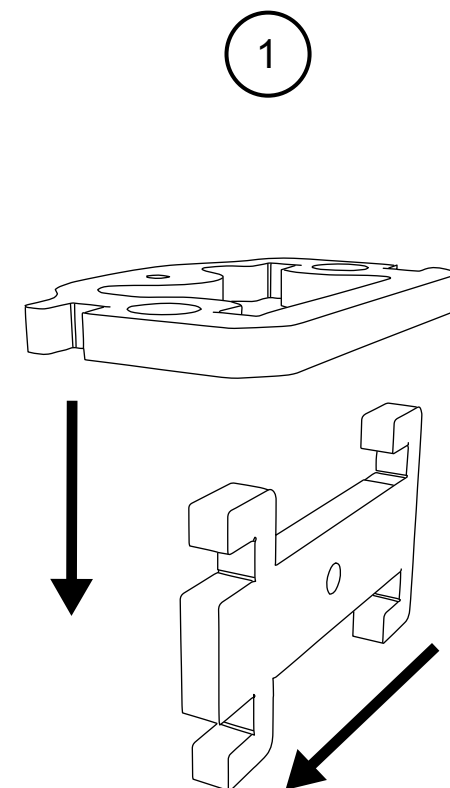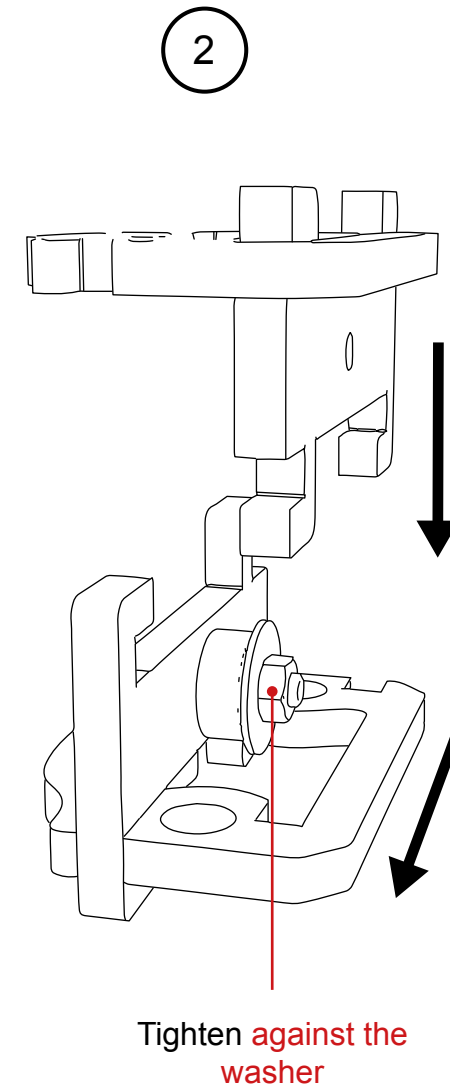
Caution : for thie step, take care of the orientation of the tensioner

Acrylic parts can be covered with protection and it may remain pieces of plastic, remove it before use.
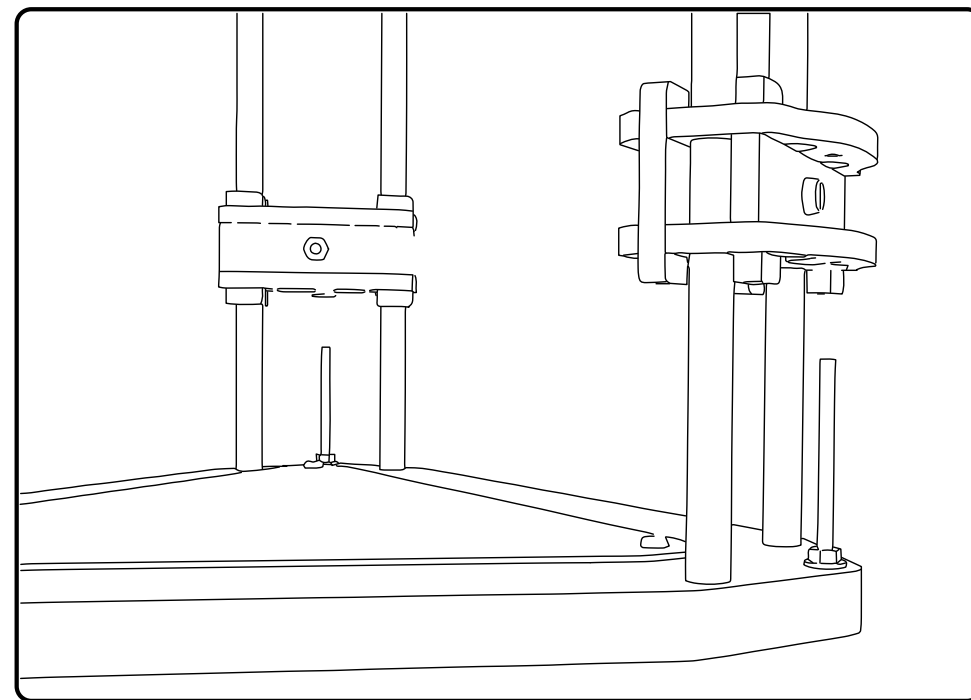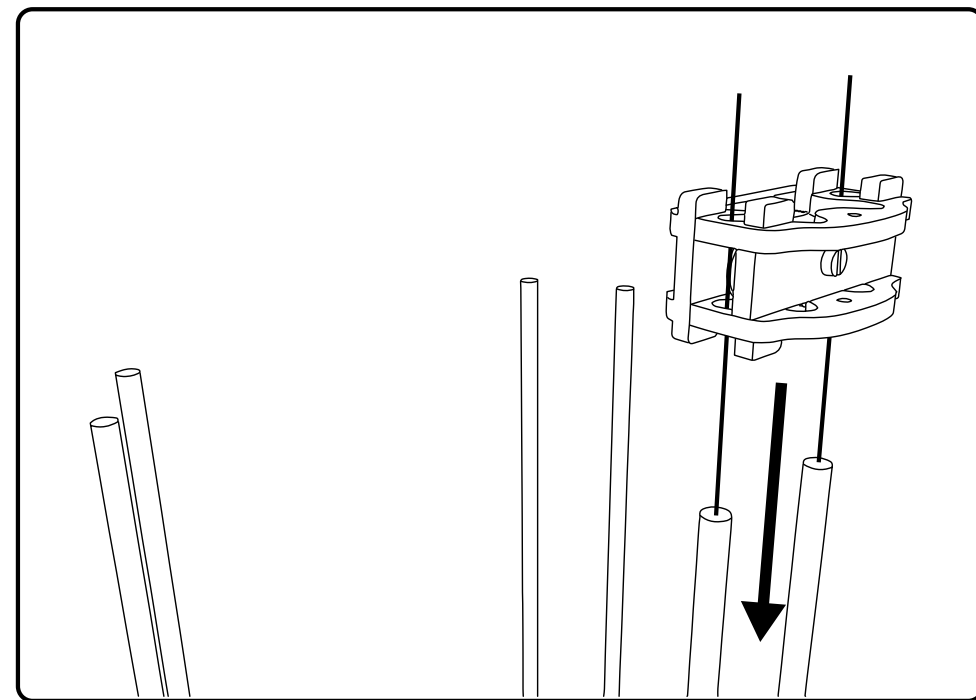
1

2

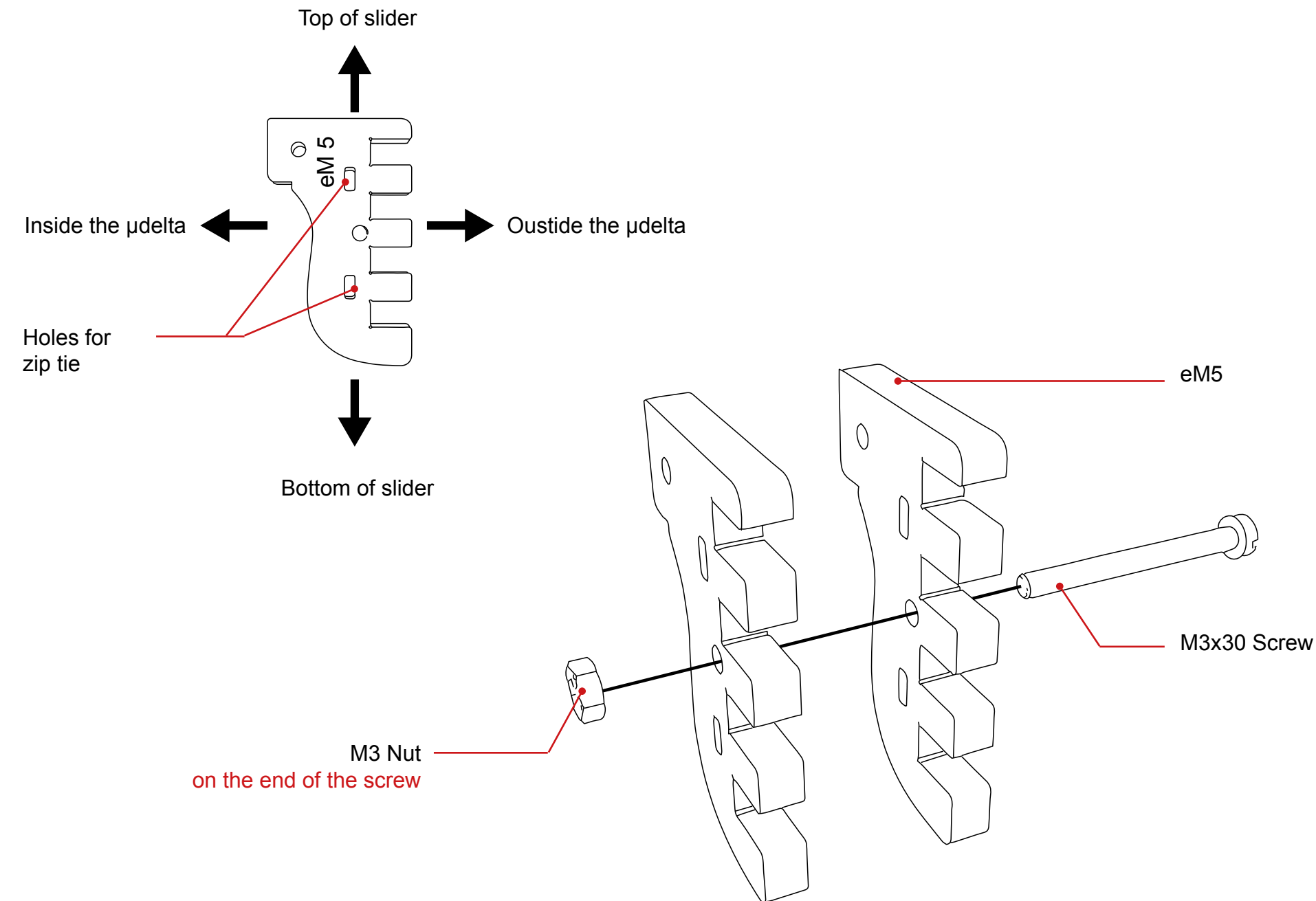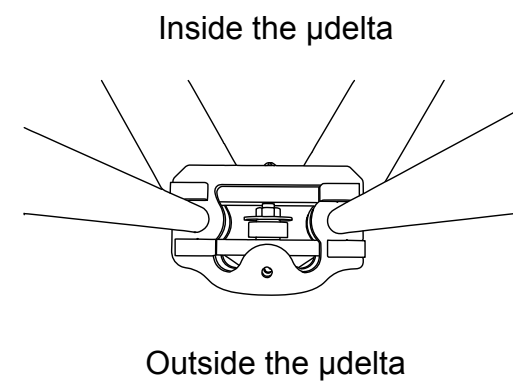**3**

M4 Nut

Tighten nuts moderately to avoid breaking acrylic parts
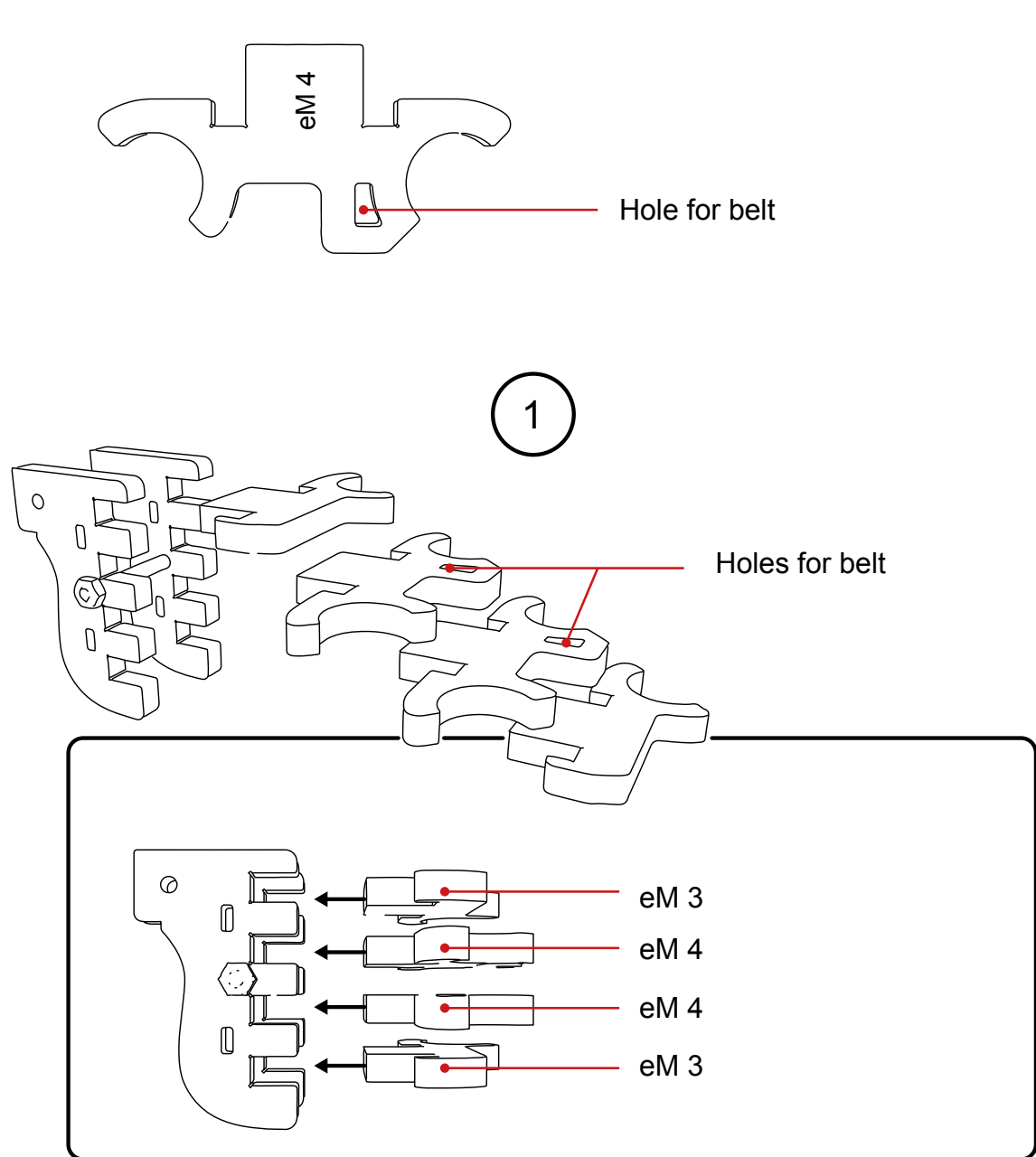
Tighten against the washer
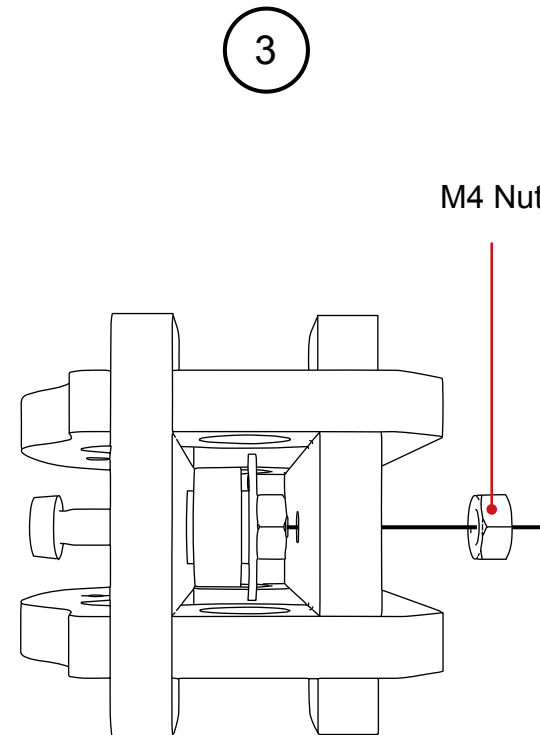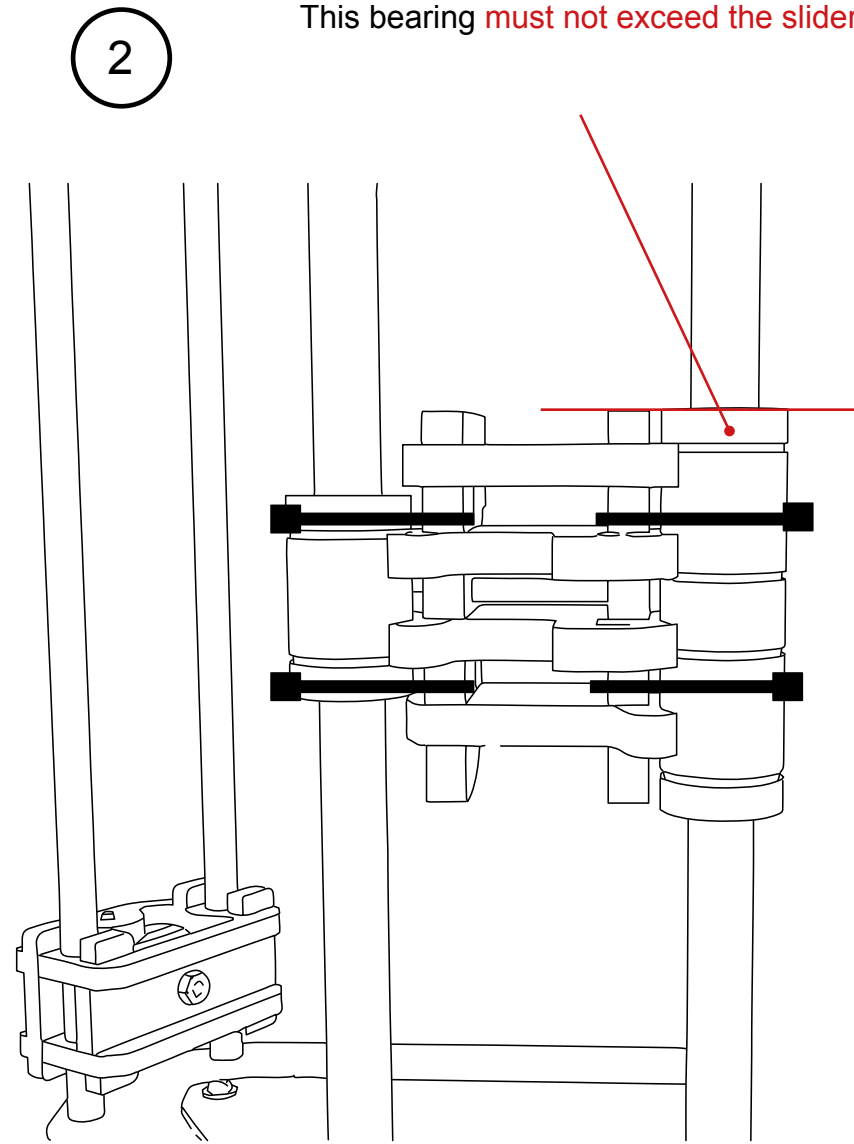
Tighten Moderately

Repeat this operation for the others tensioners

Inside the μdelta
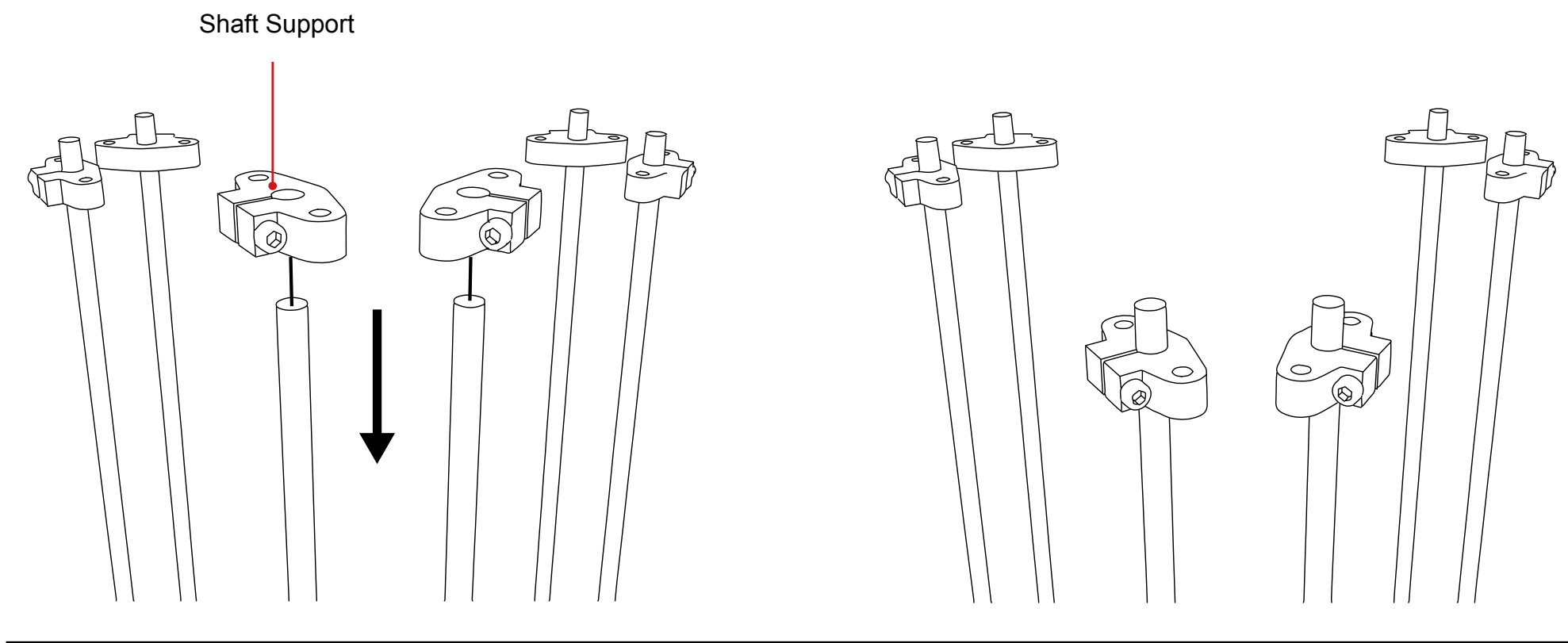

Outside the μdelta

Top of slider

Inside the μdelta

Oustide the μdelta

eM 5

Holes for
zip tie

Bottom of slider

eM5

M3x30 Screw

M3 Nut
on the end of the screw

Caution : Assemble all sliders in the same way.

eM 4

Hole for belt

1

Holes for belt

eM 3
eM 4
eM 4
eM 3

Note : After tightening screw, eM 3 parts may move, it is not a problem

2

Linear bearings

1

The 4 fixations must be on the same side than the 2 linear bearings

Tighten moderately

2

This bearing must not exceed the slider

Insert a zip tie in each holes, tighten the zip ties to fasten the slider
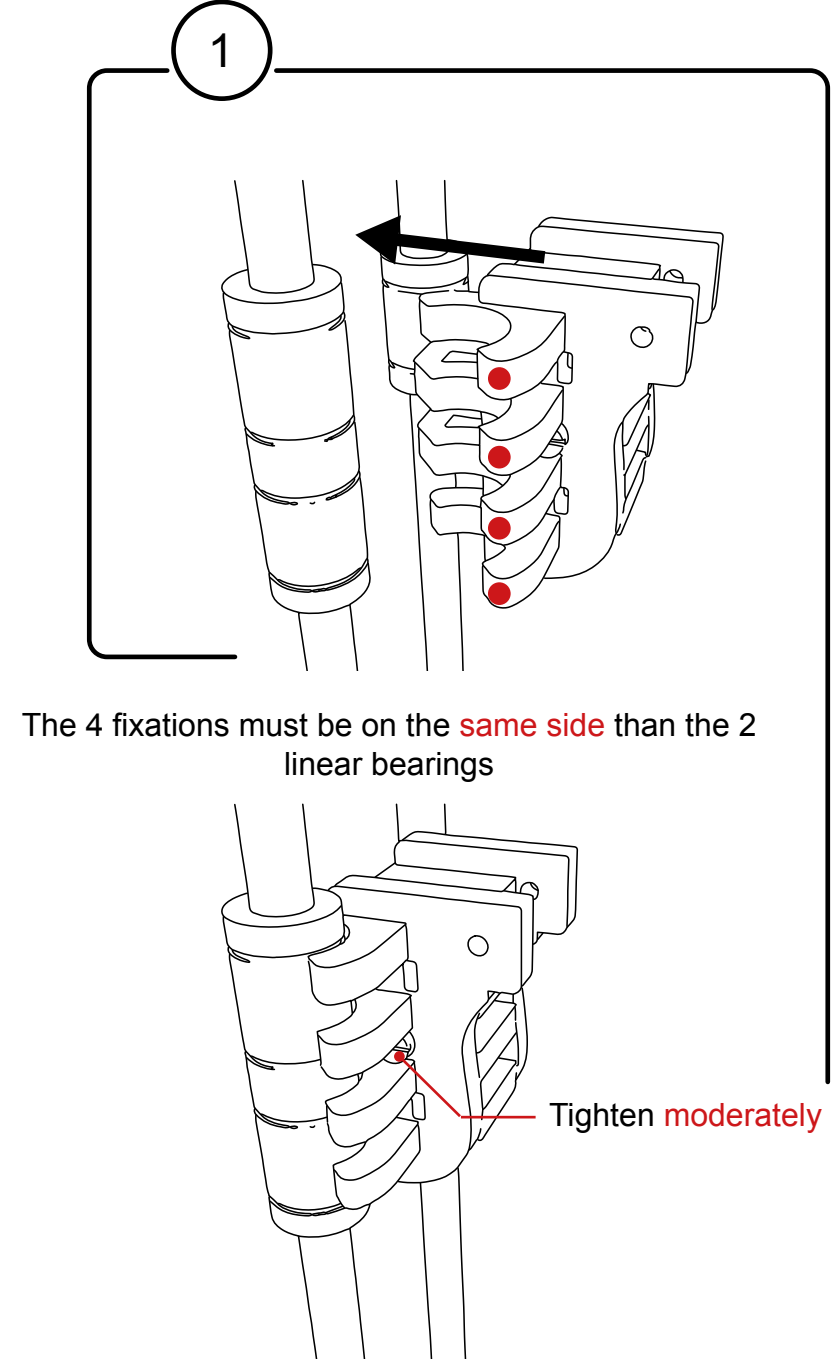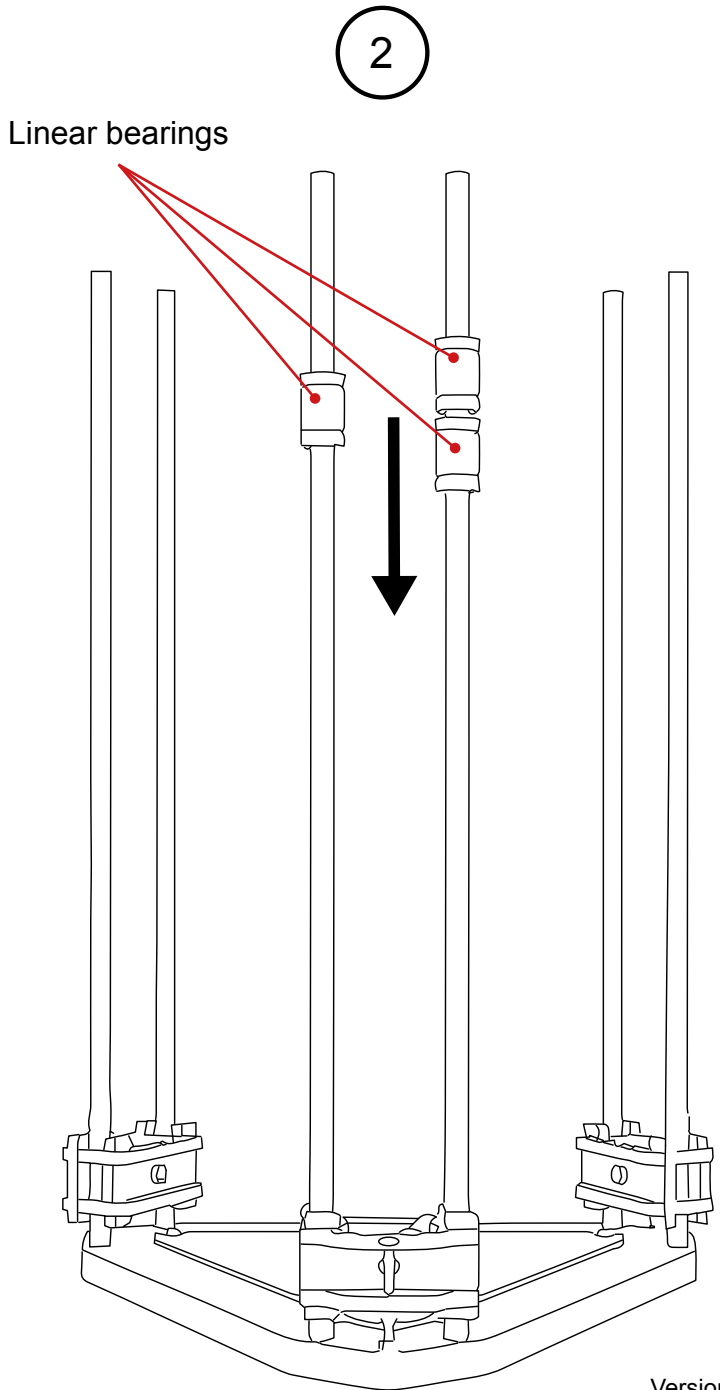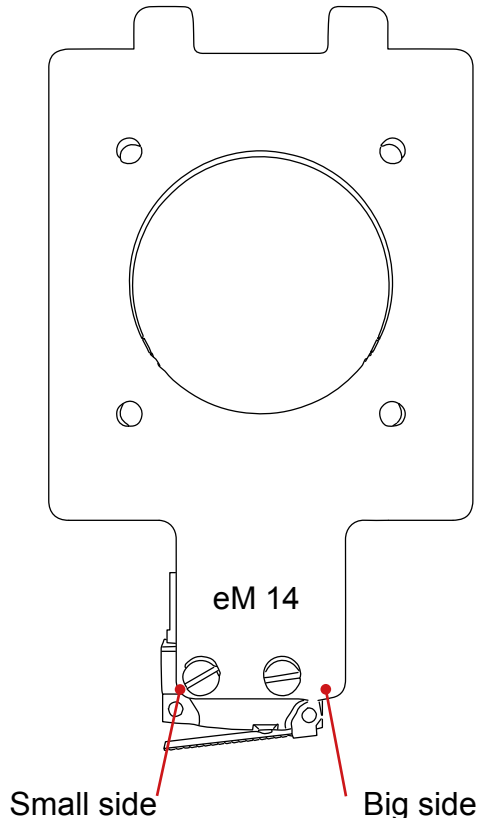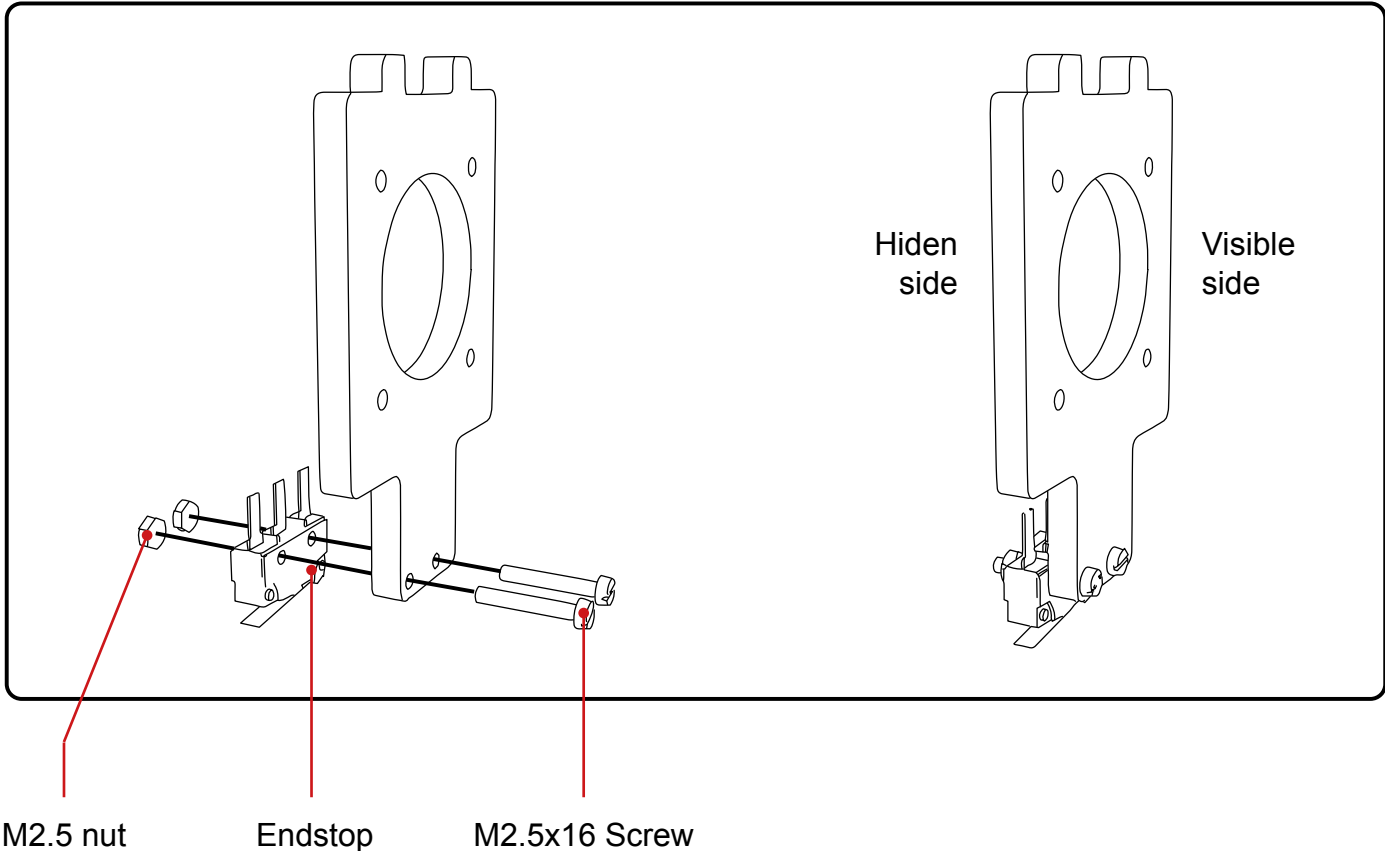
Shaft Support

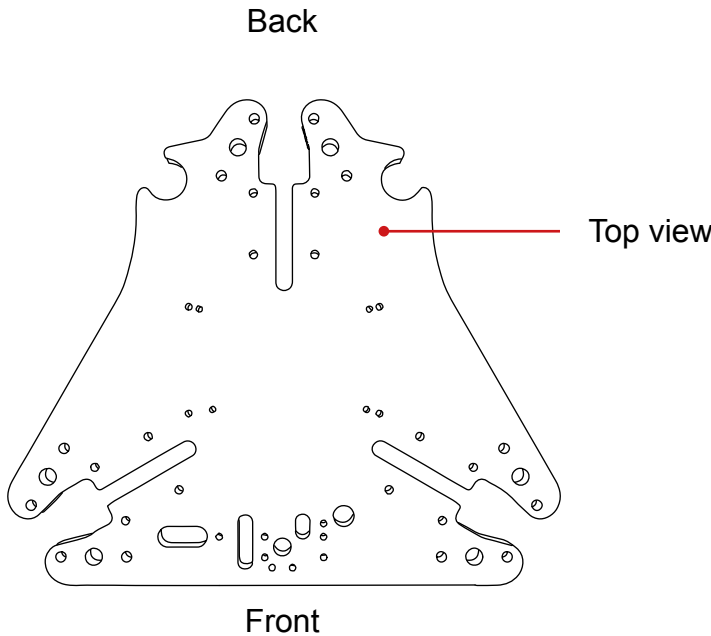Take care of the way of shafts supports

Note : Do not tighten
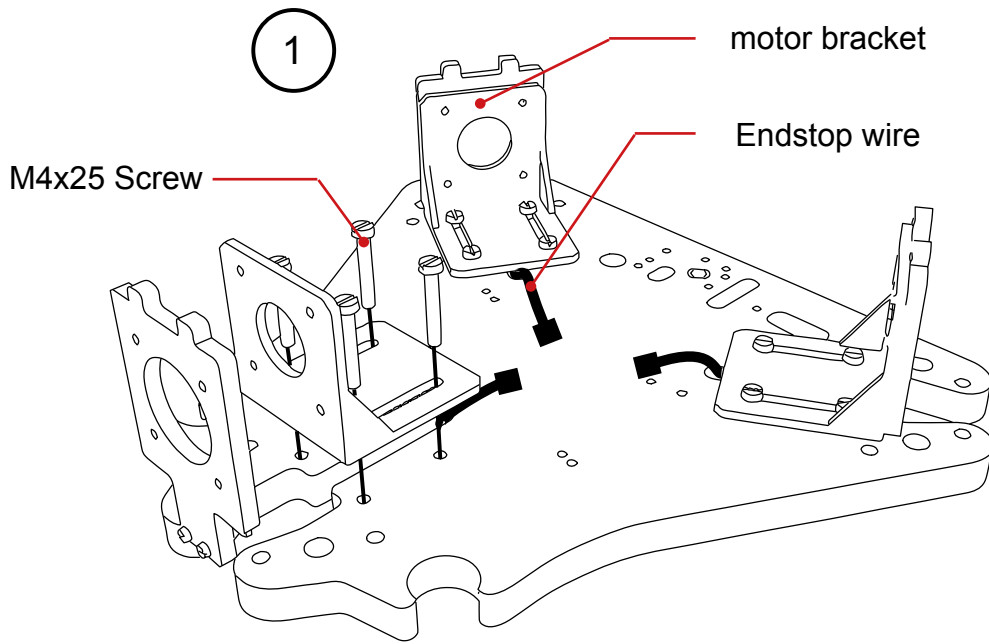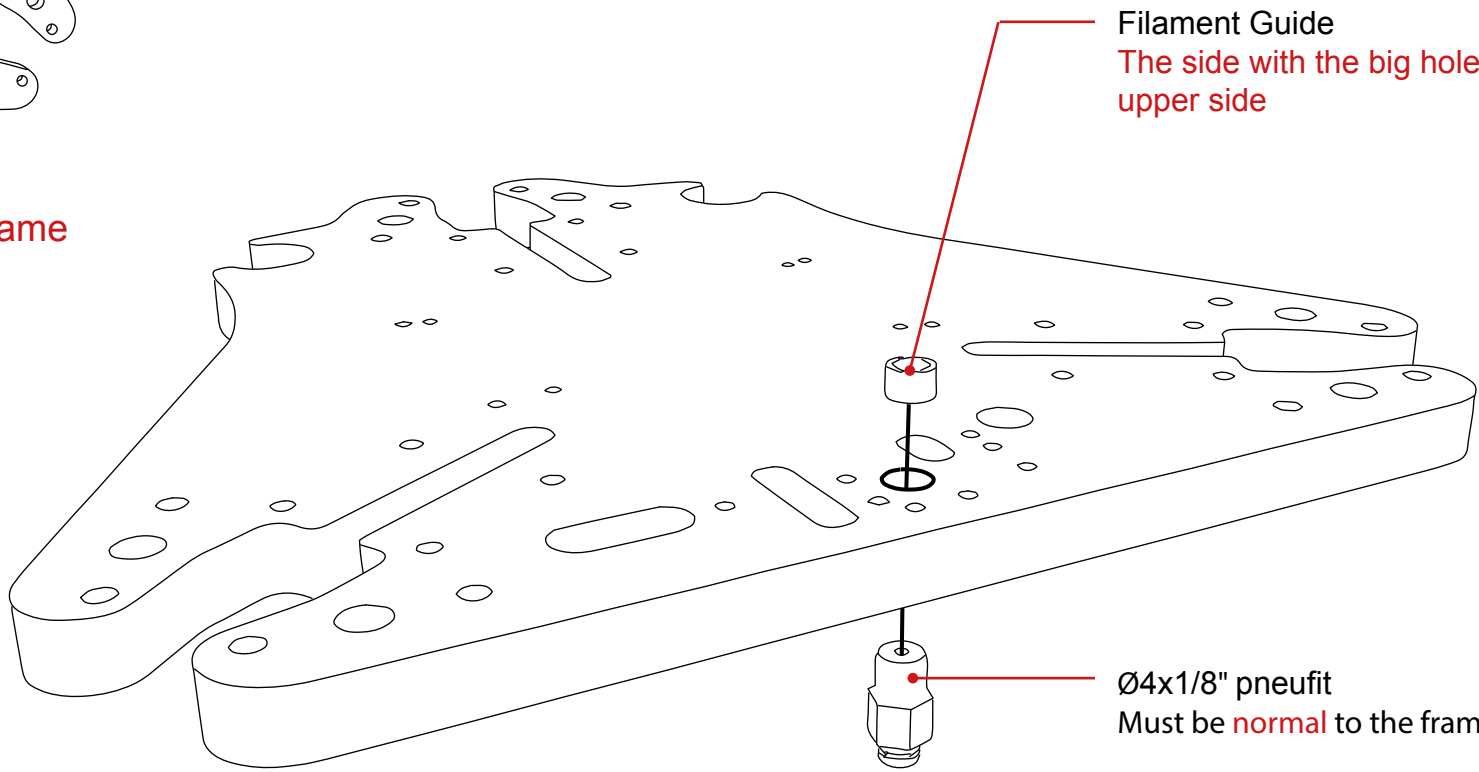
Assemble the endstop as it's show on the figure

Note : To improve the visibility, endstops wires were not represented

eM 14

Small side   Big side

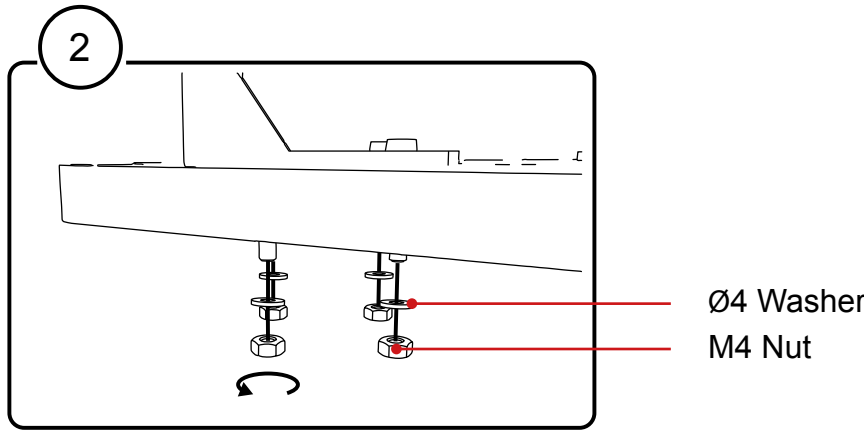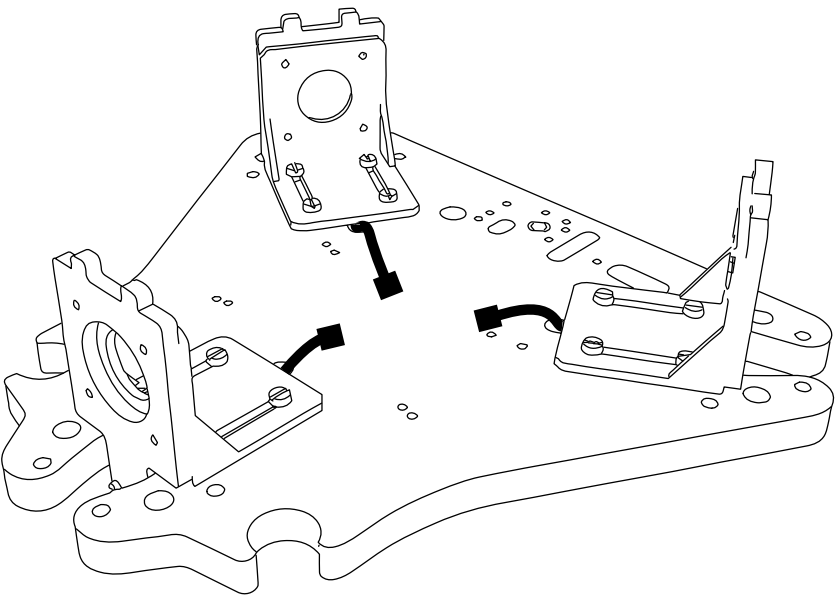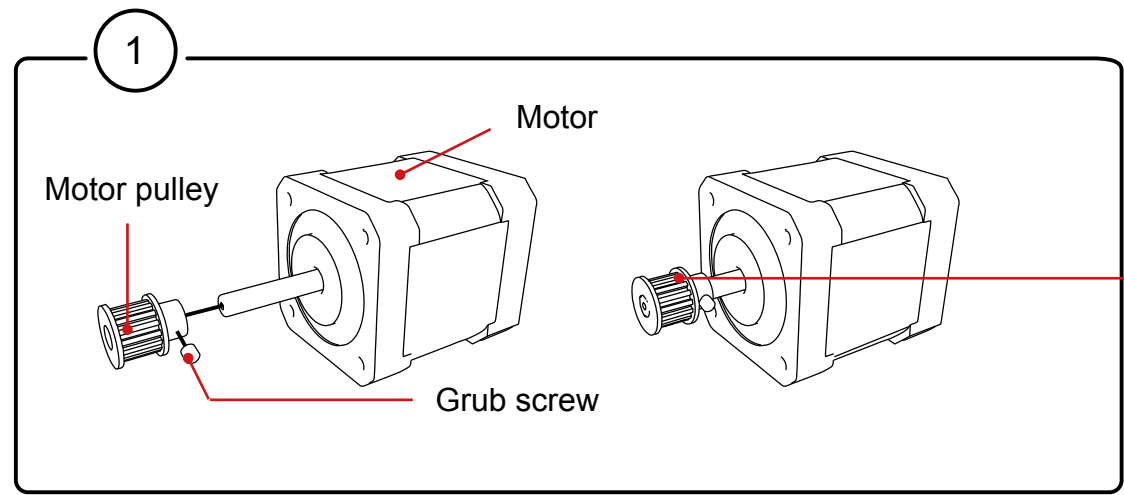Hiden side   Visible side

M2.5 nut   Endstop   M2.5x16 Screw

Back

Top view

Front

Take care to assemble the frame correctly

Filament Guide
The side with the big hole is the upper side

Ø4x1/8" pneufit
Must be normal to the frame

1

motor bracket

Endstop wire

M4x25 Screw

Put the endstop wires **before** the motors brackets

2

Ø4 Washer

M4 Nut

①

Motor pulley
Motor
Grub screw

Take care of the way of the pulley
Position the pulley at 3mm from the end of the motor axe

Note : Use the Allen key given in the kit to tighten the pulley

②

M3x12 Screw   M3 Washer   Tighten moderately

Motor wire

Motor wire must be on the side

①

②
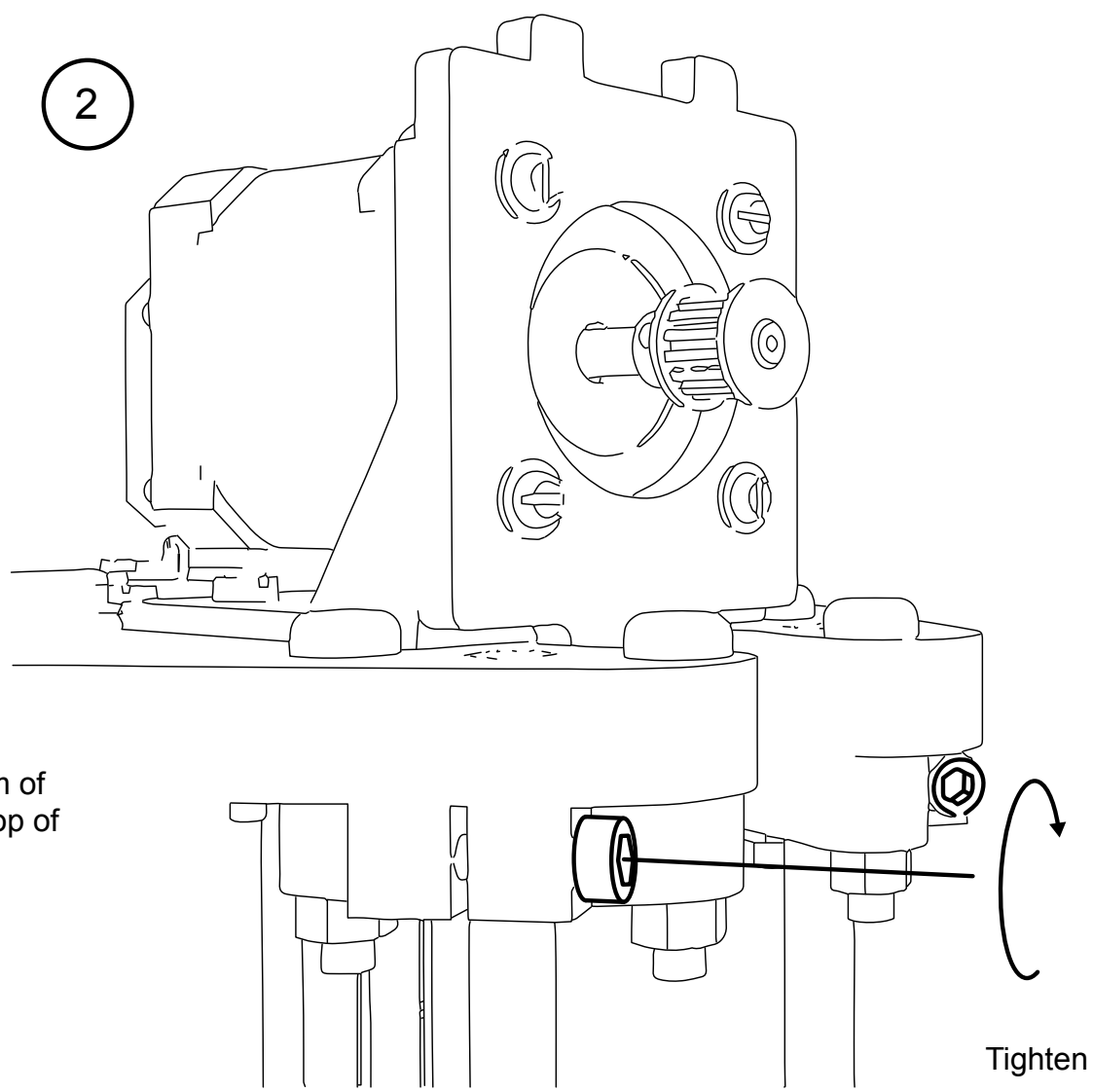

M5x30 Screw

M5 Nut
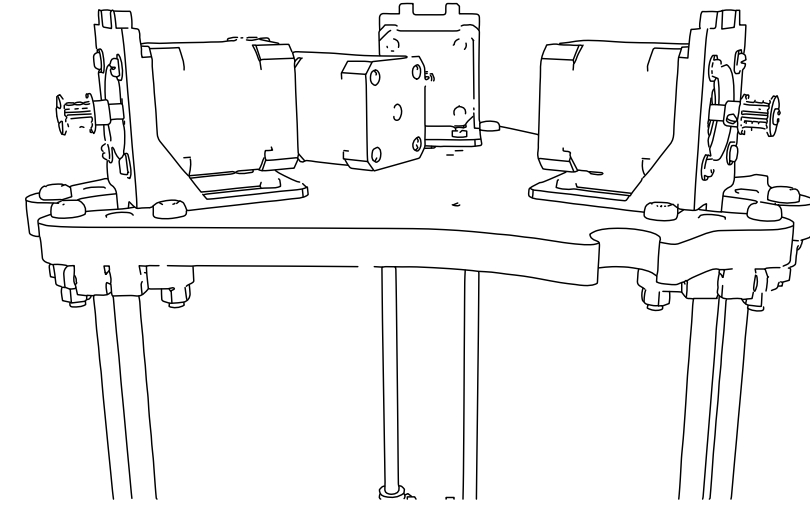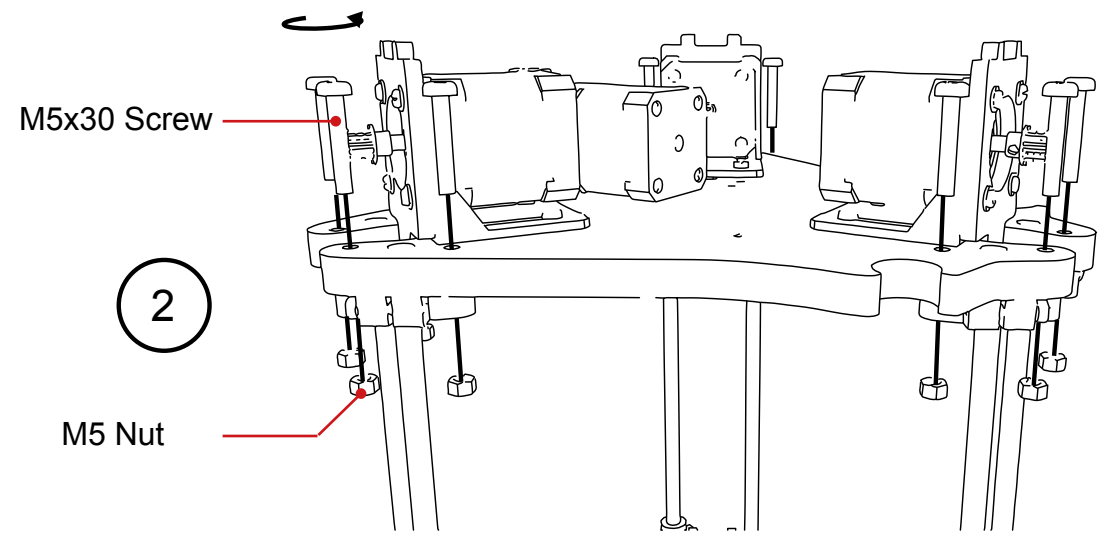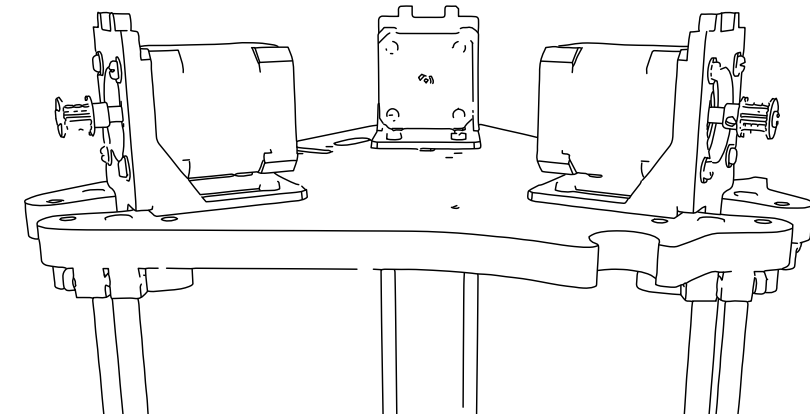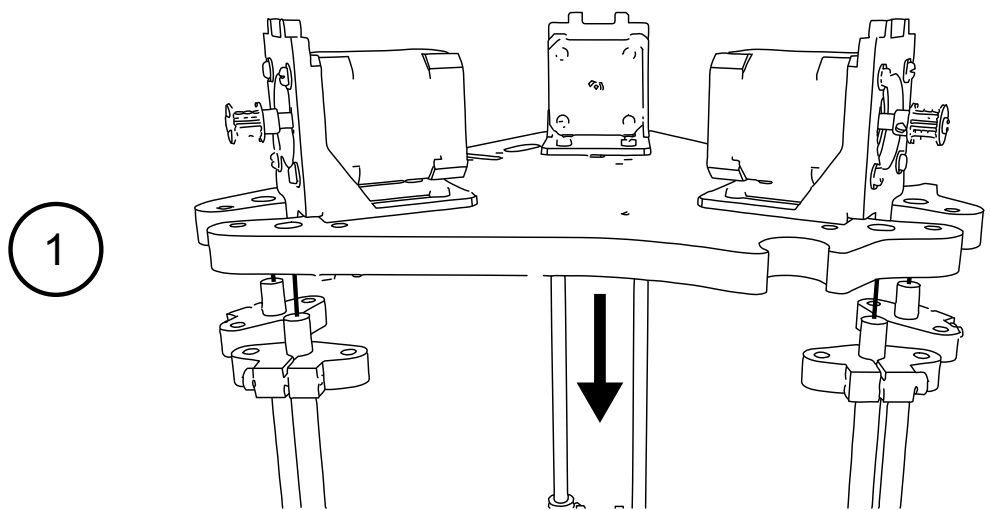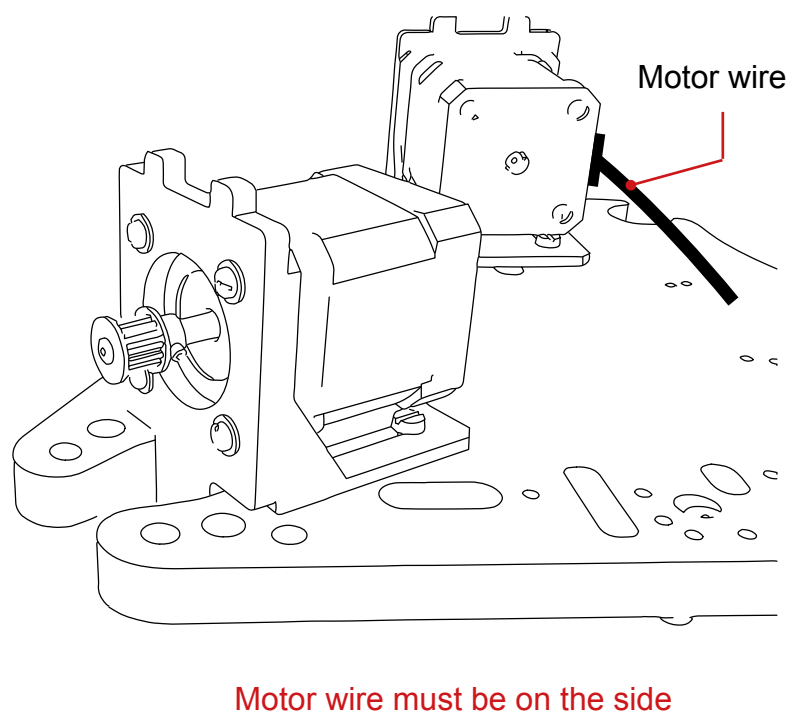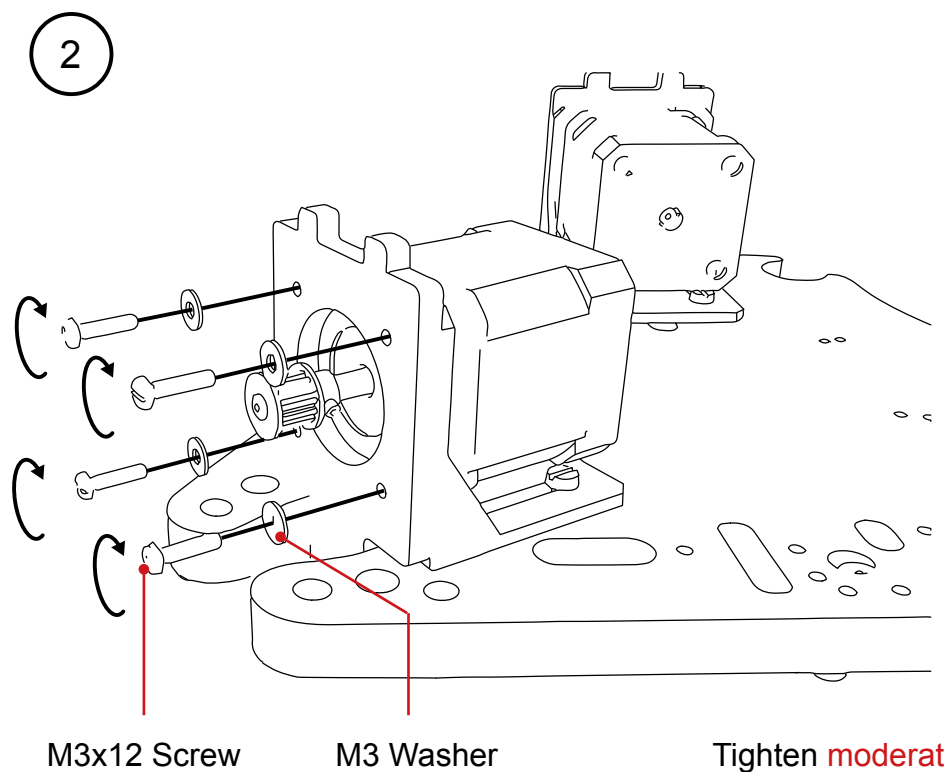
①

Caution : the distance must be
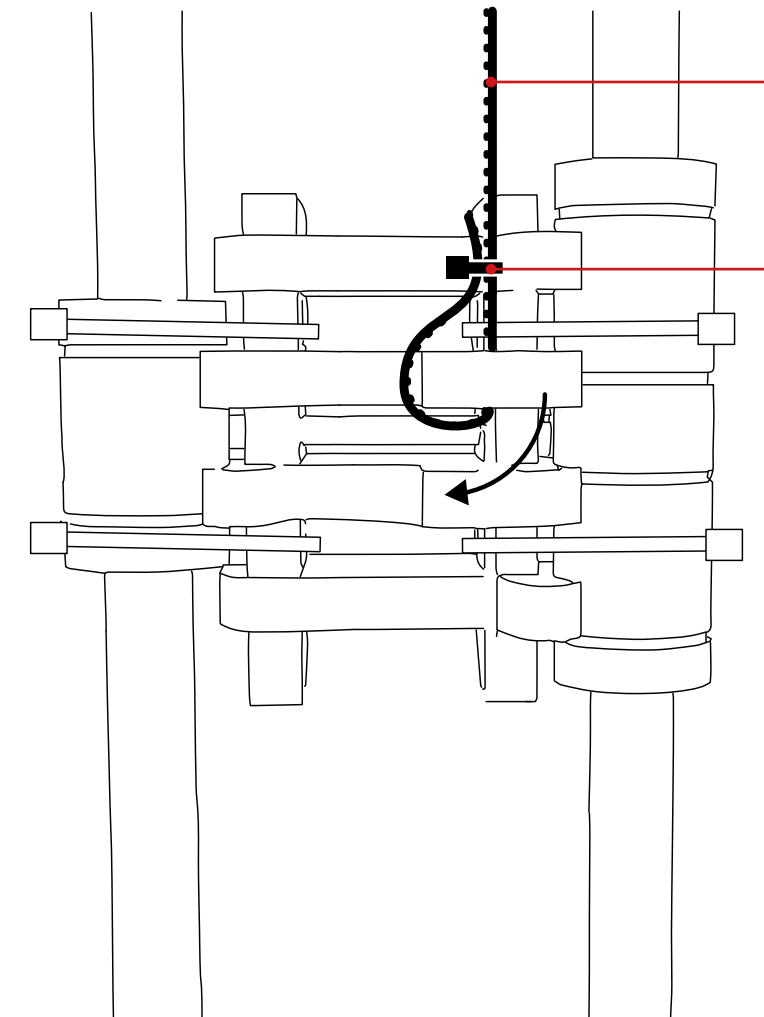the same for each smooth rod

②

39.8 cm
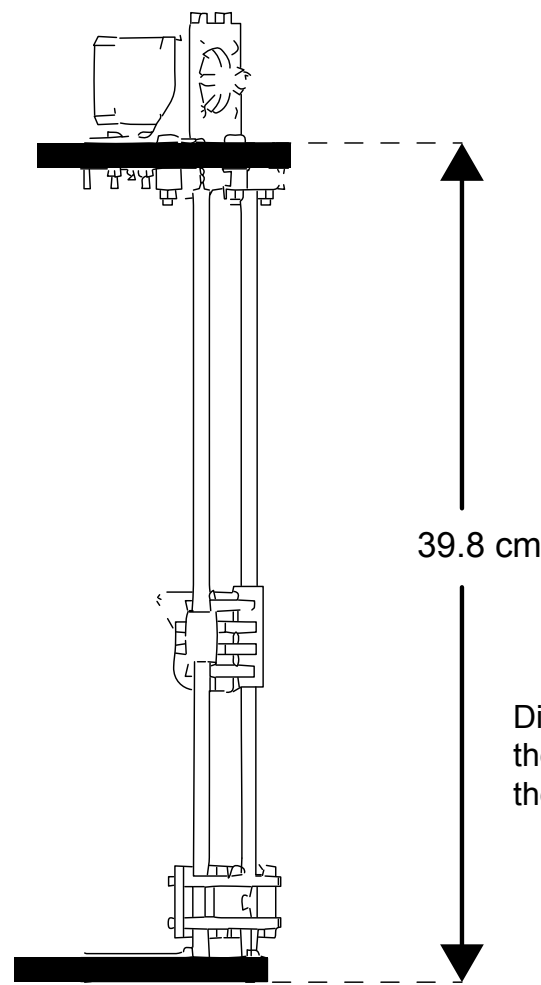
Distance betwen the bottom of
the bottom frame and the top of
the top frame
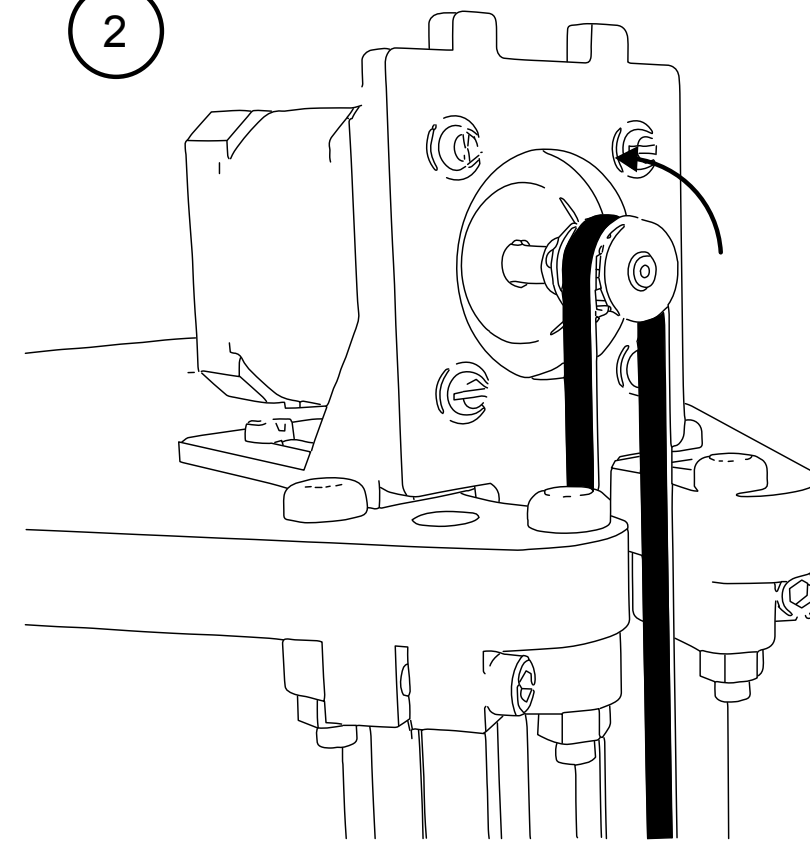
Tighten

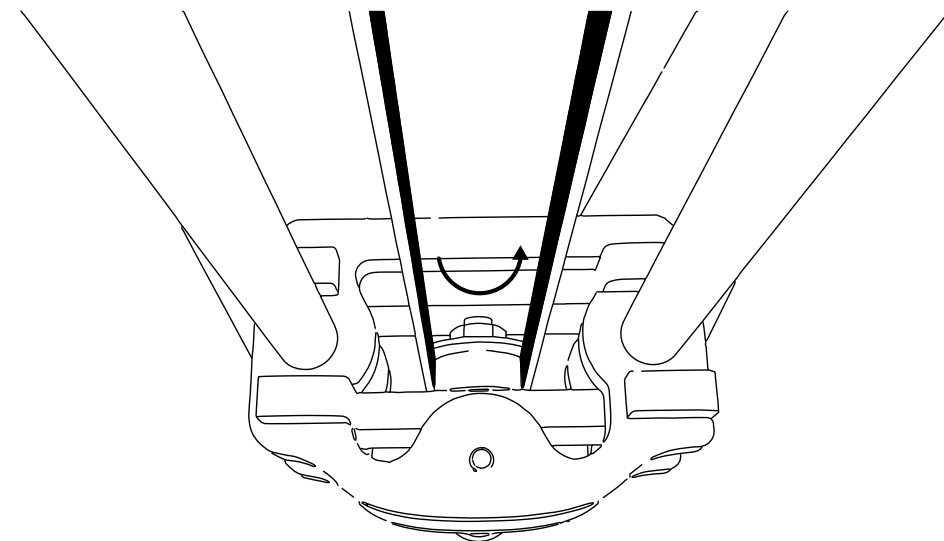①

Teeth in the direction of the
pulleys

Belt

Zip tie

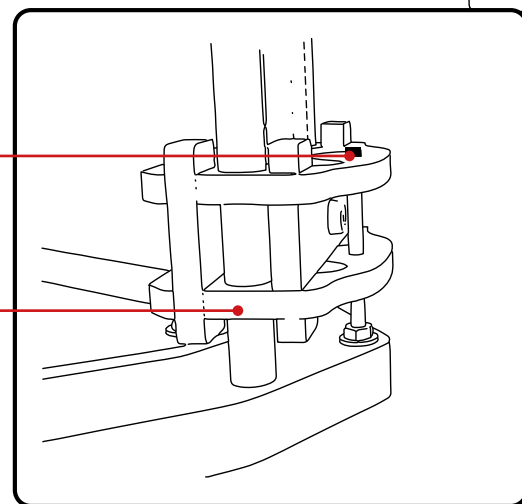Position the zip tie as
close as possible to
the slider

②

① ②

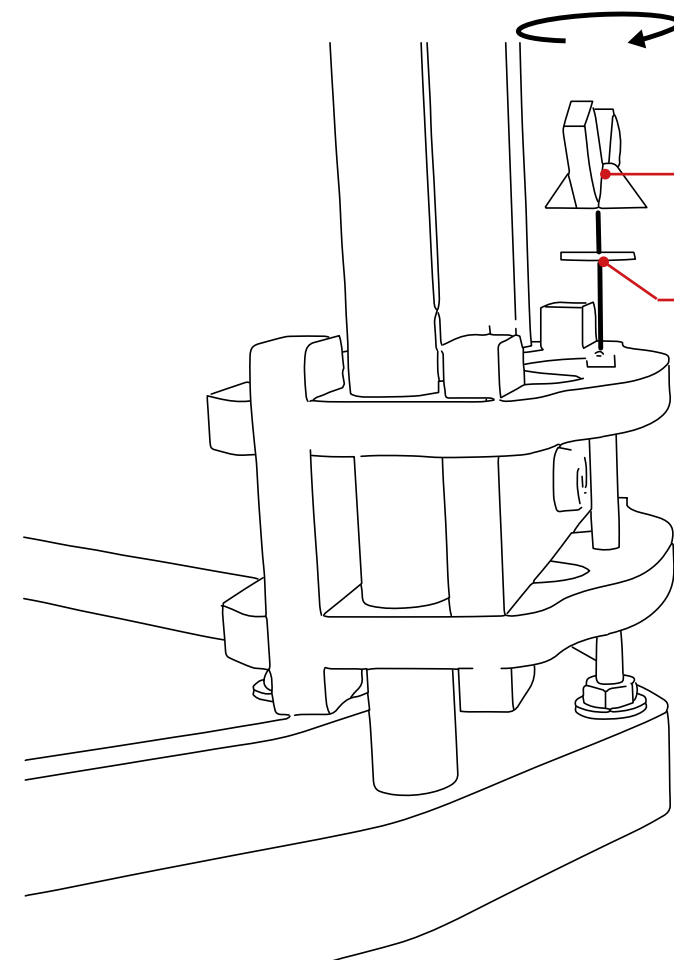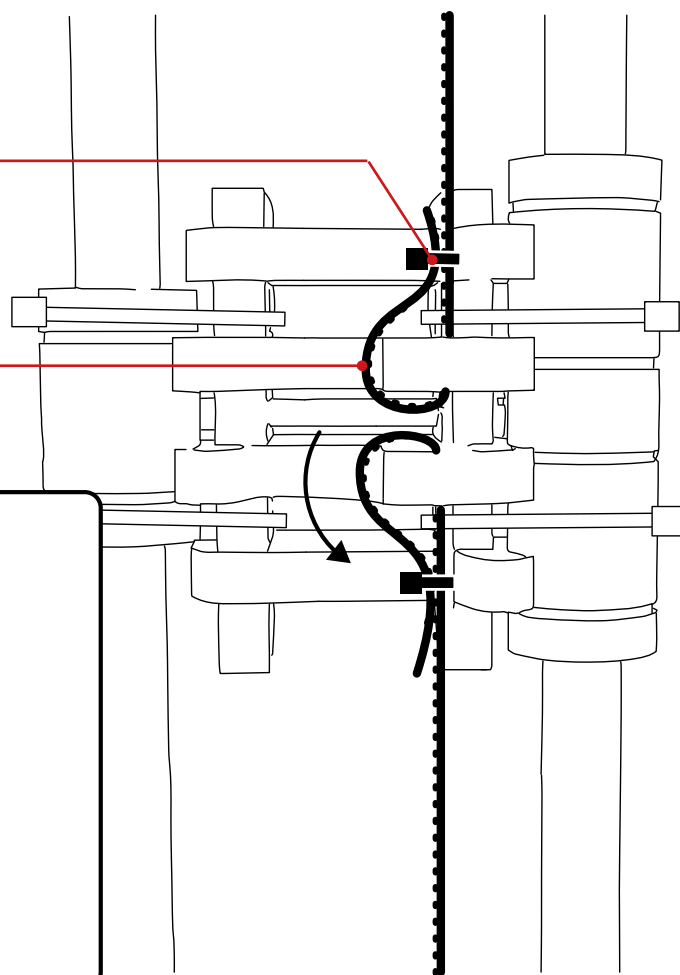Make sure the belt is slightly tight when the tensioner is on the top of the screw

M3x50 Screw

Tensioner

Zip tie

Belt

Wing nut

Ø3 Washer

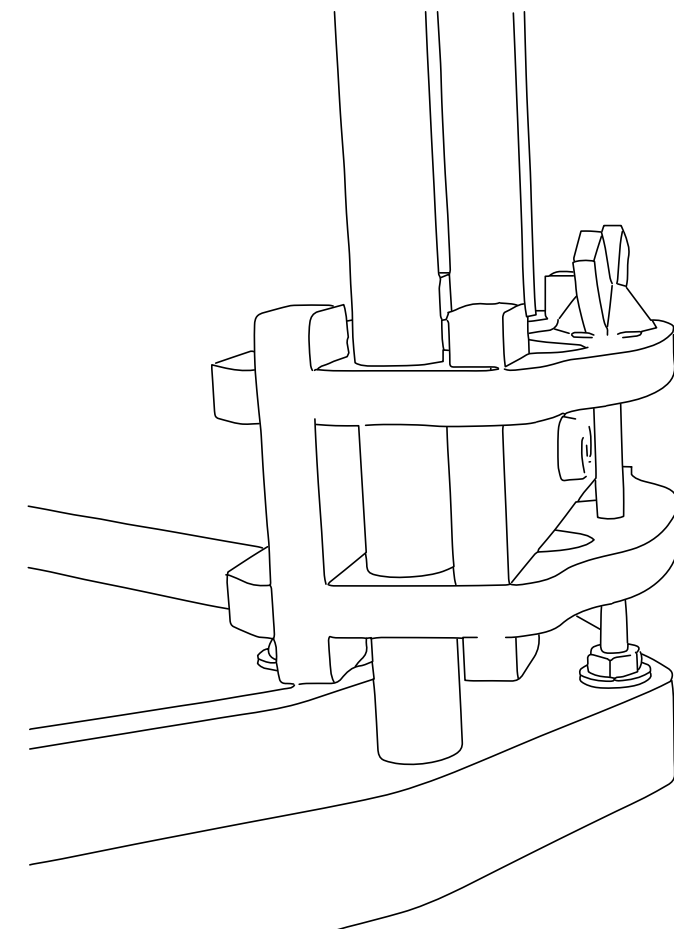Thigten the nut to tight the belt

The belt don't have to be too tight to avoid deformation

① Grub screw

Motor

Do not tighten

Drive wheel

②

M4x50 Screw

M3 Nut

M3 Nylstop Nut

M3x25 Screw

Ø3 Washer

- Position the M4 nut of the M3x50 screw between the two eM8

- Position the M3 nut into the eM8 "back"

eM 8   eM 9   eM 8   eM 10

①

eM 11

eM 13

Ø4 Washer

Ø4 Nut

604 Bearing

eM 12

M4x25 Screw

② Position the hollow of the drive wheel in front of the eM 9

Nylstop

* A wrench can be printed to simplify the tightening (avalaible on our download center)

The M3 Screw have to be tighten but the assembly should rotate

③

M3x25 Screw

Ø3 Washer

M4 Nut (or wing nut)

Ø4 Washer

Spring

Ø4 Big washer

①

Holes for etruder

Holes for screws

M3x25 Screw

Tighten moderately

②

M3 Nuts

Ø3 Washer

Ø3 Washer

M3 Nut

M3x20 Screw

Use a screwdriver to make it easier

Untighten the central pipe

key provided

Key 7 (not provided)

Use a screwdriver to
make it easier

Tighten the nozzle

Key provided

**It must not have space between
the head and the nozzle**

Tighten the central pipe

Hole for thermistor

Insert the resistor
**Wires must be on the same side
than the thermistor hole**

Tighten with a M3 grub screw

1

Zip ties

Thermistor

Caution ! If the thermistor goes out of the hot end, your printer could be damaged.
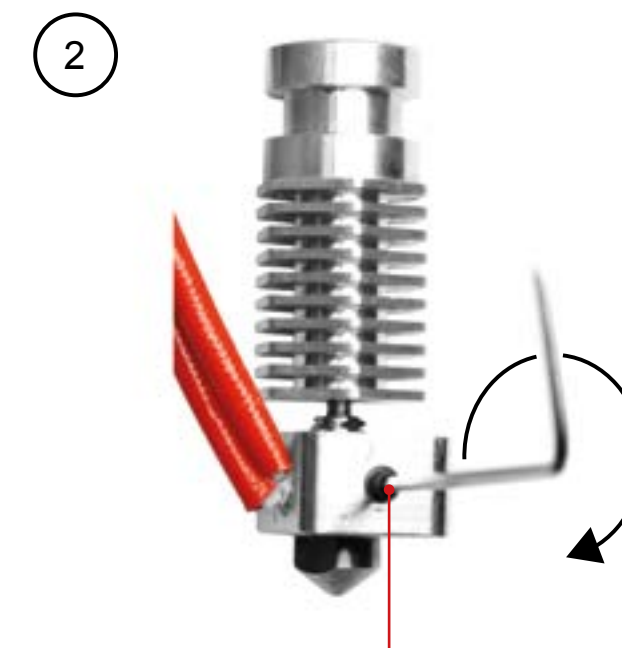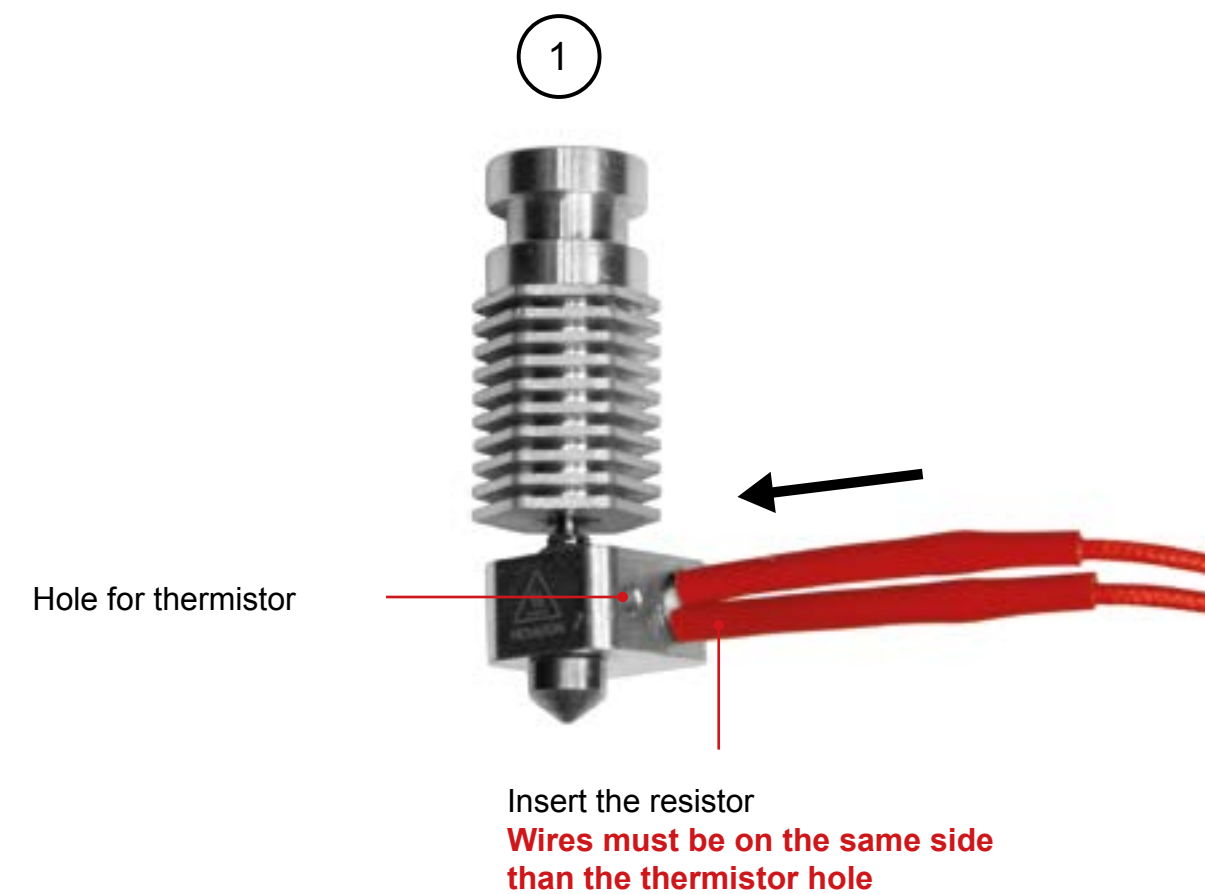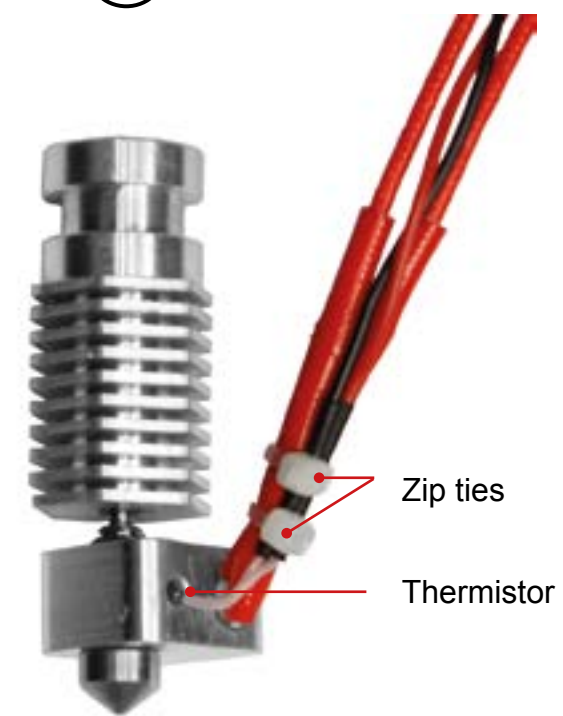
2
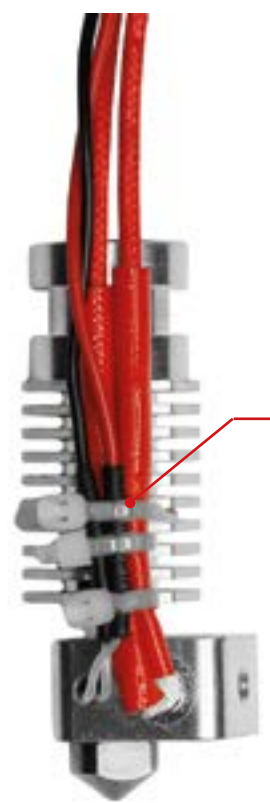

Fasten the cables to the hot end with zip tie.
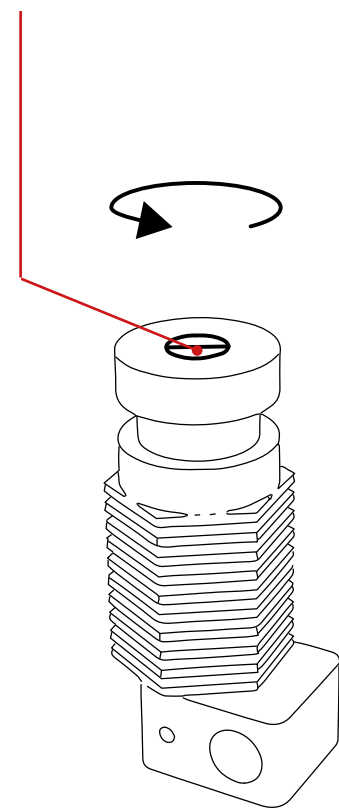
The zip tie must be positioned around the Hexagon

Don't position it to hight on the hexagon

Poliymide can be used to maintain the thermistor (optional)

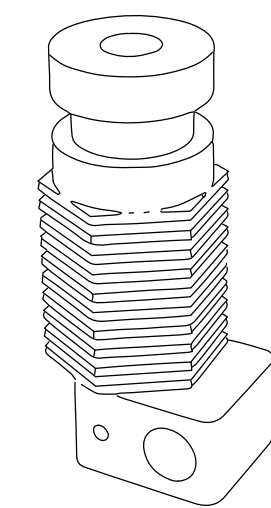* For printing ABS with heated bed option, protect you're heater bllock with polyimide
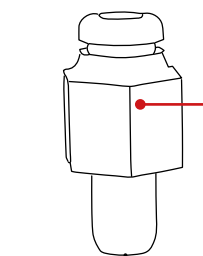
Unscrew the filament guide

Ø4xM6mm pneufit

1

2

3

4

Make sure the core is free of impurities.

Hole for wires

Hole for Zip tie

Put the cables through the wire hole.

1

2

3

M3x20 screw

Tighten

Position the Hexagon against the core before screwing
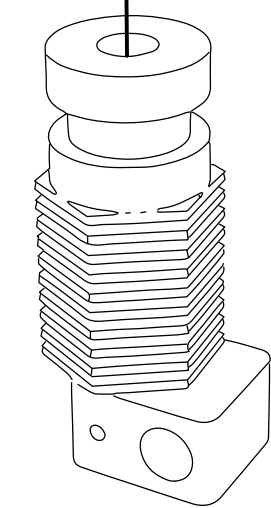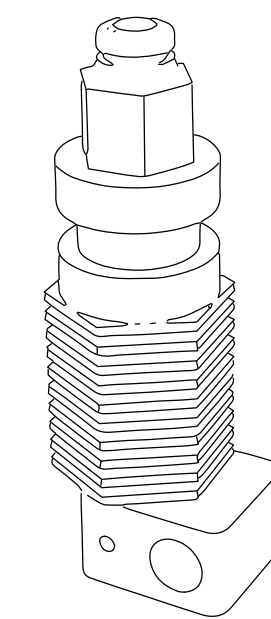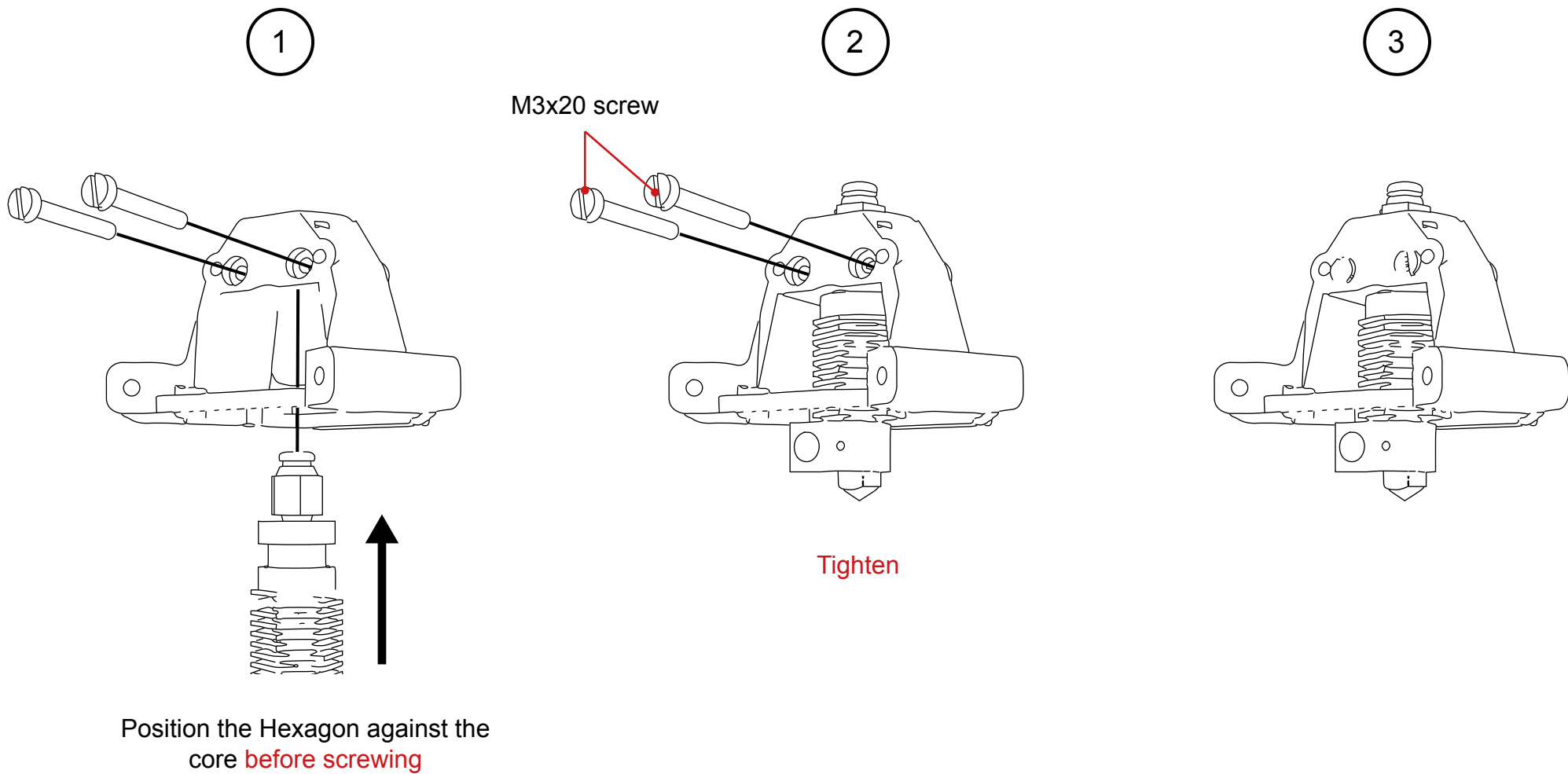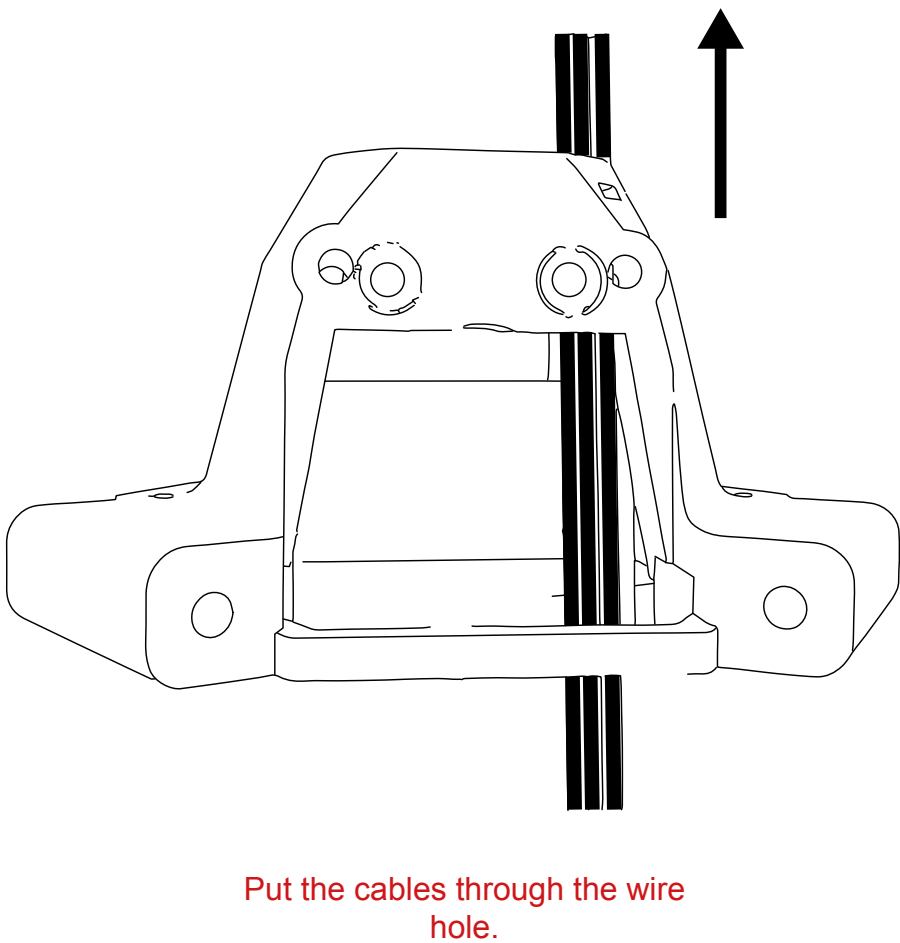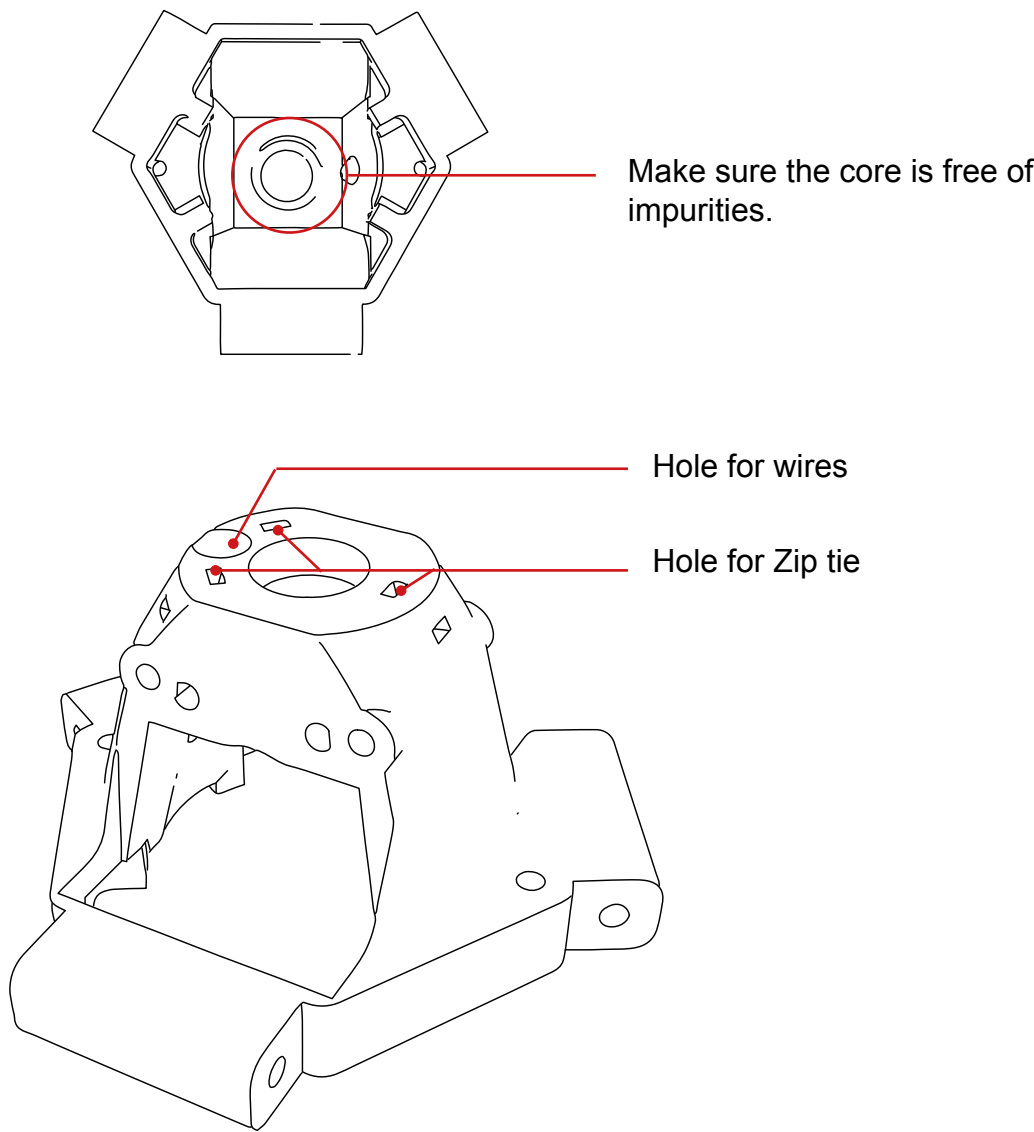
The side with the sticker must be oriented toward the hotend

Tighten moderately

Fan

Ø3 Washer

M3x20 Screw
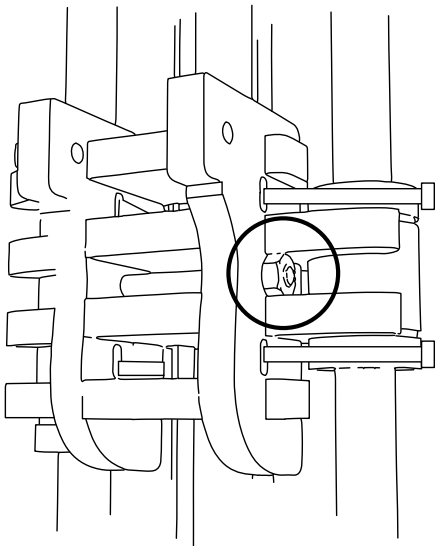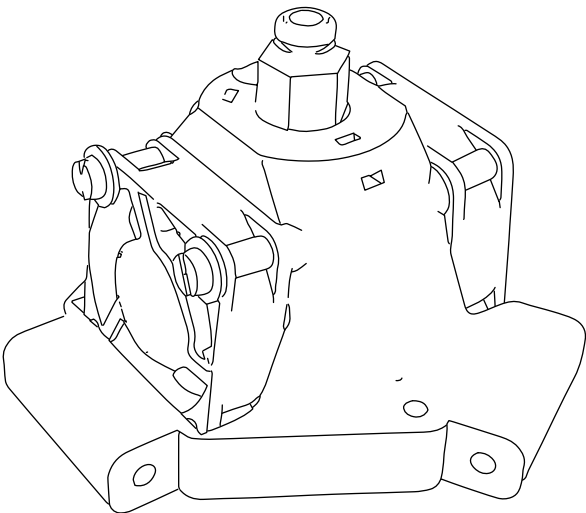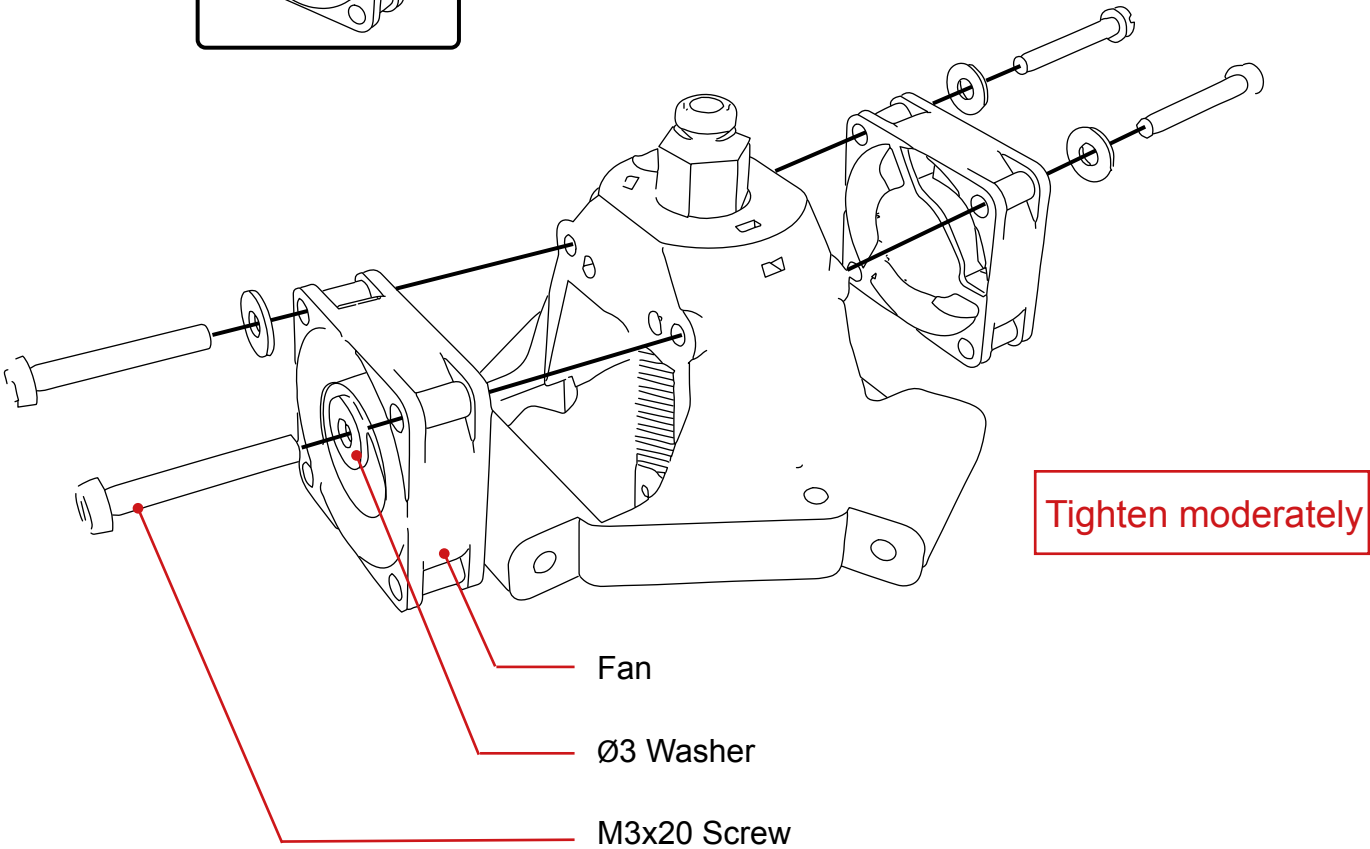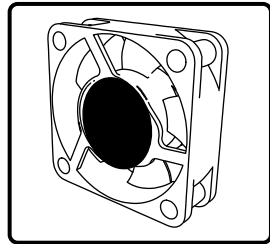
Note : Check this nut is tighten

①

②

M3 Nut
Tighten firmly

M3x50 Screw

Connecting Rod

Ø3 Washer

Ø3 Washer

M3 Nut

M3 Nut

(1)

Caution : The assembly must not twist the slider.

(2)

eM 5 must remain parallel

(3)

(1)

Ø3 Washer
M3 Nut
Connecting rod
M3x50 Screw

(2)

M3 Nut
Connecting rod
M3 Nut
Ø3 Washer

(3)

Repeat the operation with the others sides

① Braided sleeve

Push the cables and the PTFE tube trough the braided sleeve

Cables

Fasten the cables with zip ties if it's needed

② PTFE Tube

Braided sleeve

Zip Tie

PTFE tube length must be 35cm

①

PTFE Tube

Holes for Zip ties

Hole for cables

Holes for M3x50 Screws

②

Screw is tighten with a Ø3 washer and M3 Nut to the plate

M3x50 Screw

Cables

Zip ties

PTFE Tube

1

Zip tie

Braided
sleeve

2

Stick the three pads under the
inferior frame.

ELECTRONIC ASSEMBLY

Left

Right

Teensylu

Pay attention to the teensylu orientation

M3x25 Screw

Ø3 Washer

M3 Nut
Tighten moderately

Endstop

1 2 3

USB

Heated bed (option)

Cartridge heater

Thermistor

Fan

Power supply

Motor extruder

Motor 1

Motor 2

Motor 3

Ventilateur

Motor 2

Extruder Motor

Motor 1

Motor 3

1

Make sure that you have 12 jumpers connected to the teensylu

2

Plug the stepstick according to the illustration

Stepstick

Make sure the flat is positioned as shown the image

Be careful: The orientation is very important!
(A wrong connection of the stepstick could cause permanent damage)

Endstops

1   2   3

- Plug the endstops

- The endstops can be plugged in only one orientation

2

1   3

Extruder Motor | Motor 1 | Motor 2 | Motor 3

- Plug the motors

- The motors can be plugged in only one orientation

1

Screw the cables of the cartridge heater
There is no specific way, don't forget to denude it

2

Plug the thermistor
There is no specific way

3

Plug the fans
There is no specific way

CONGRATULATION !
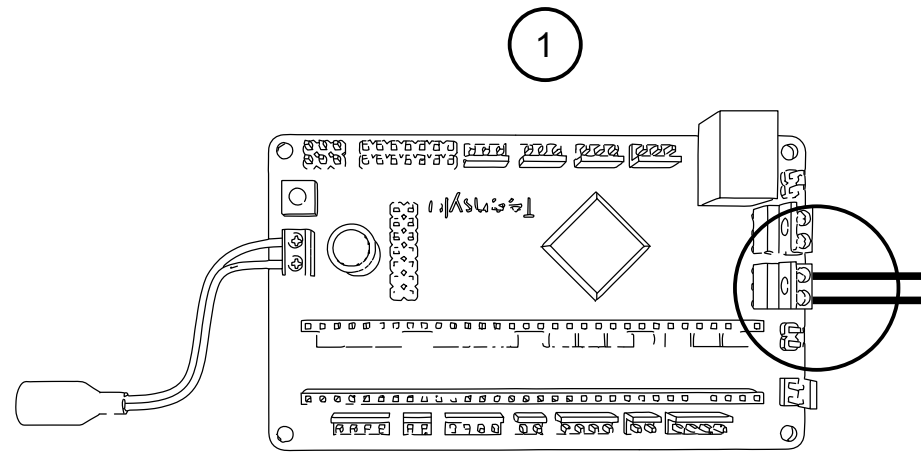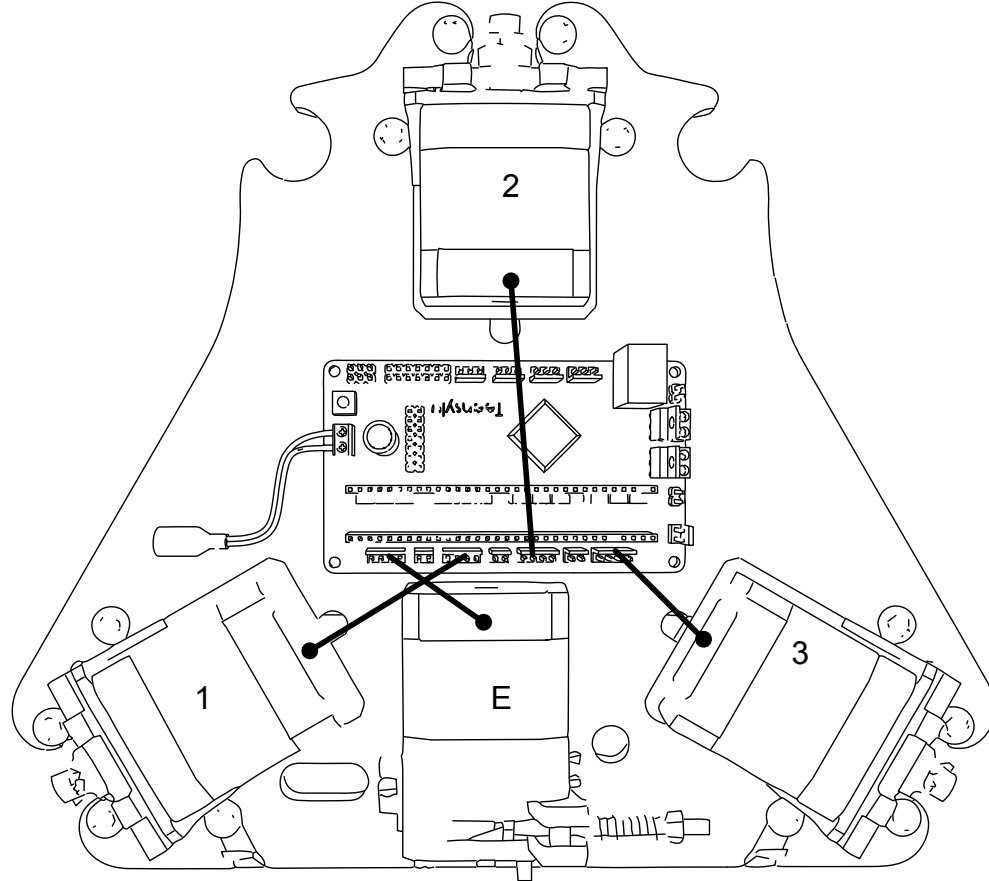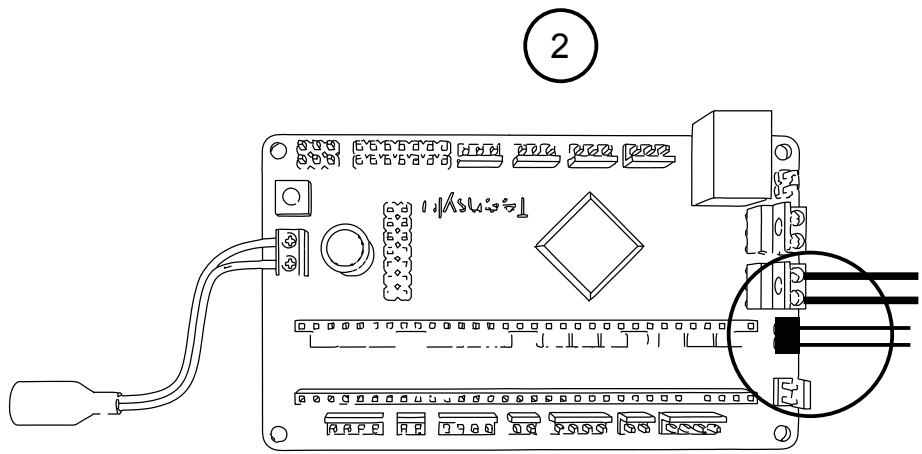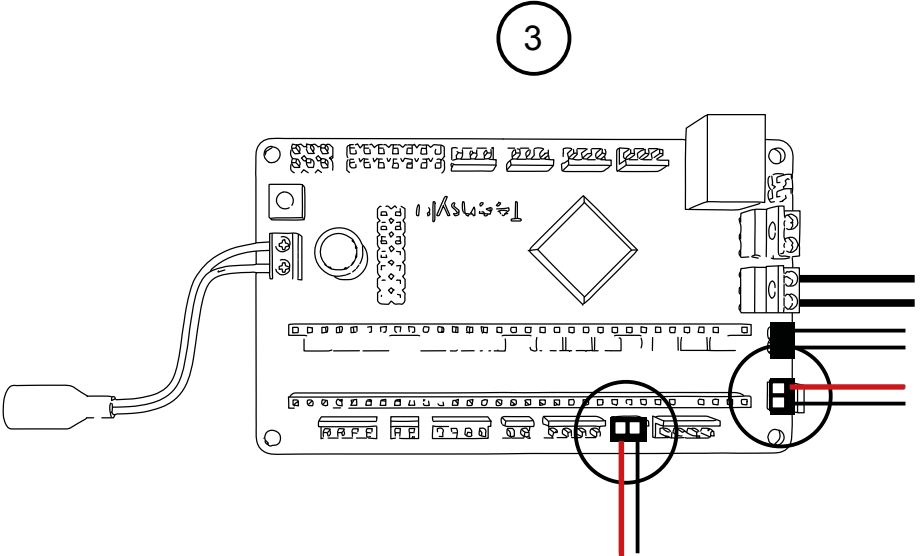You're printer is now operationnal
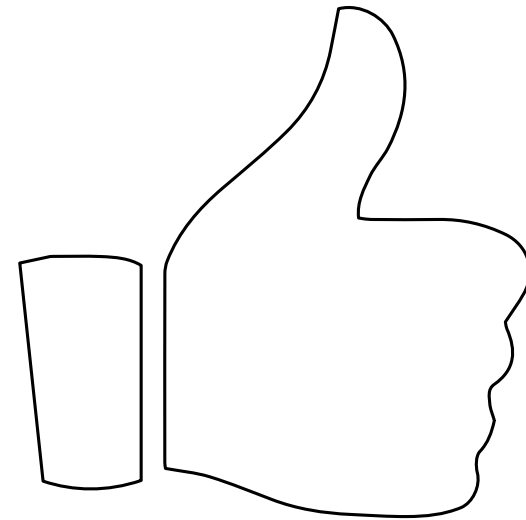
ADD-ONS

HEATED BED

1. Hardware update

Kit :

| 1x Adhesif heat patch | 3x Idler | 1x Tube | 1x Tube mount | 1x Polyimide tape |

Prerequirement, you need an operational 3D printer

① Remove the adhesif protection

②

Patch the heatbed in the center of the aluminium sheet. Place the wire output close to one hole.

Place the idler and align all holes

Wire pass-trough holes

Heat patch under

①

Wood screw

Aluminium sheet

Idler

②

Tube mount

Wood screw
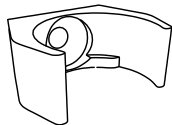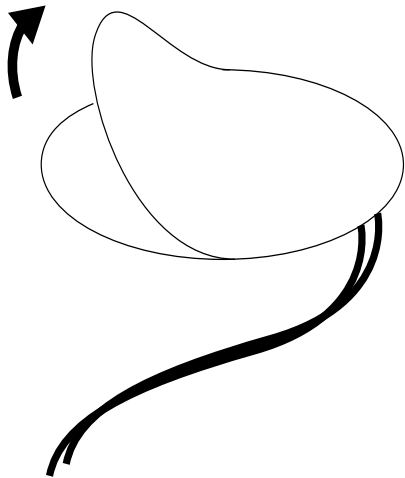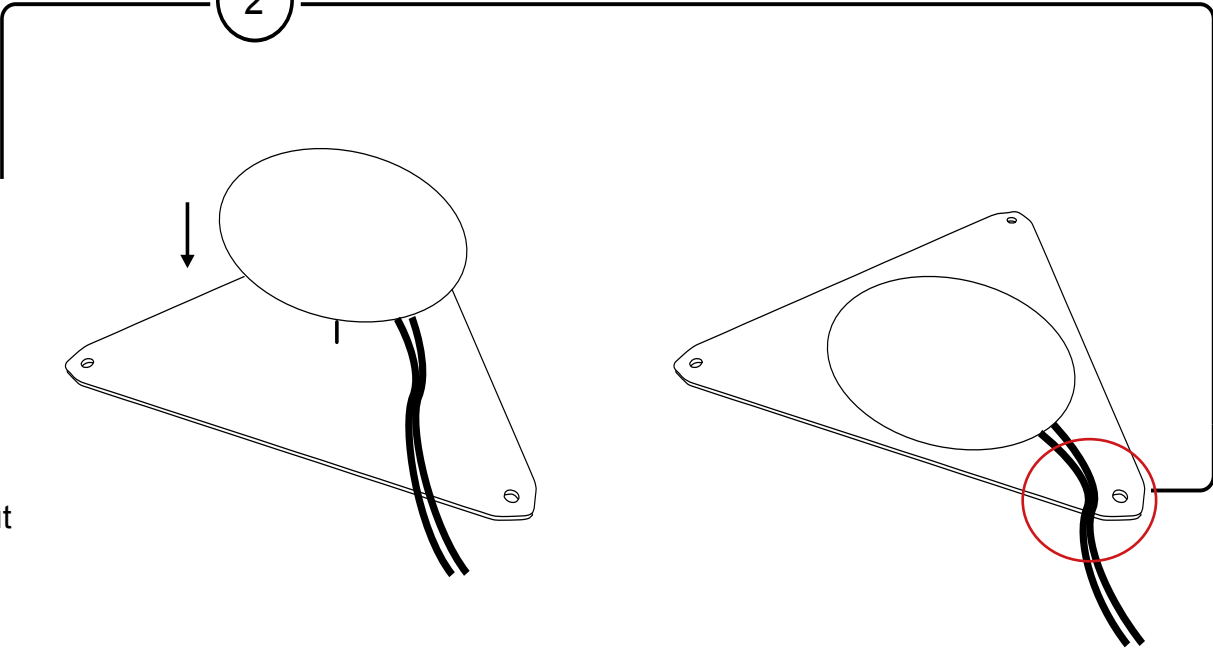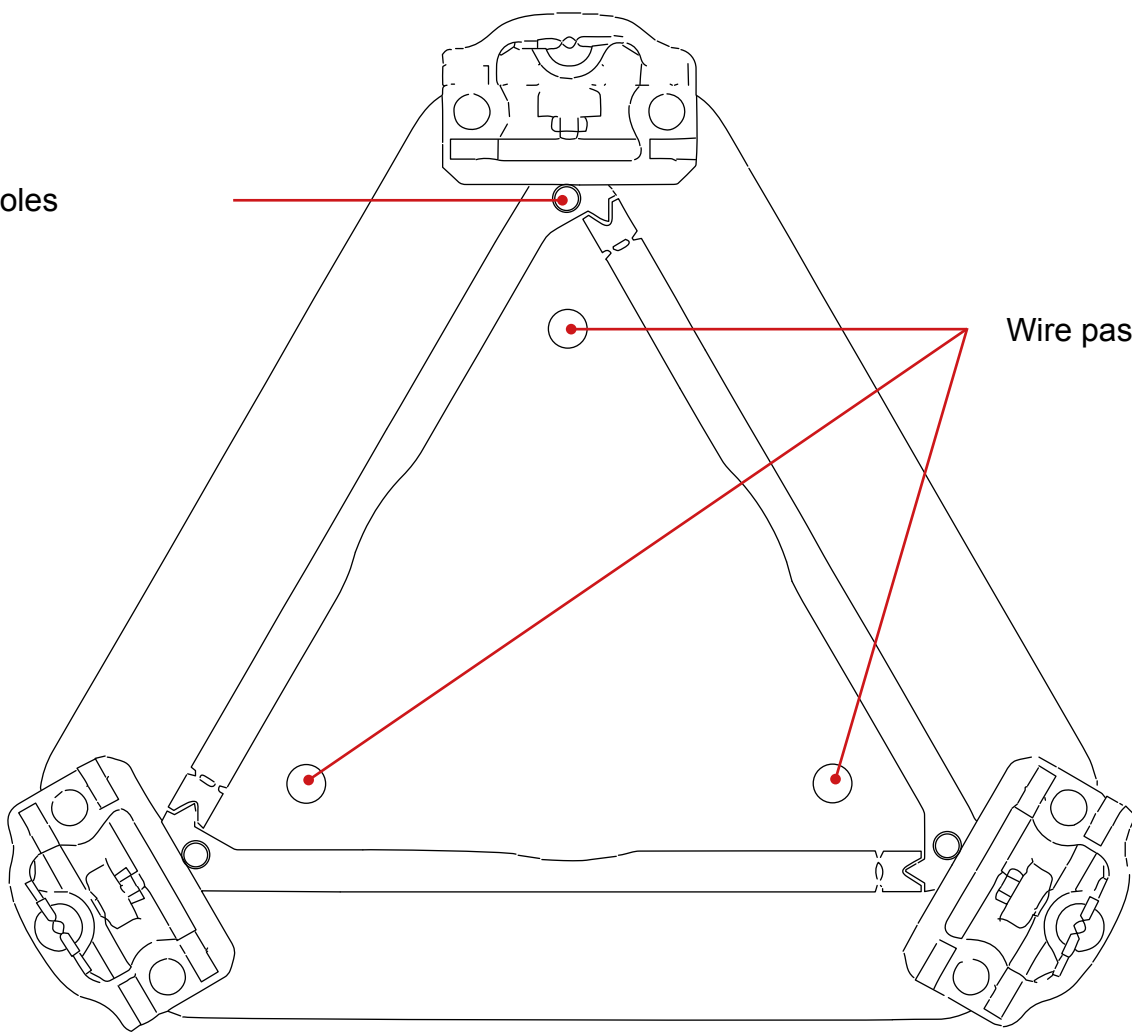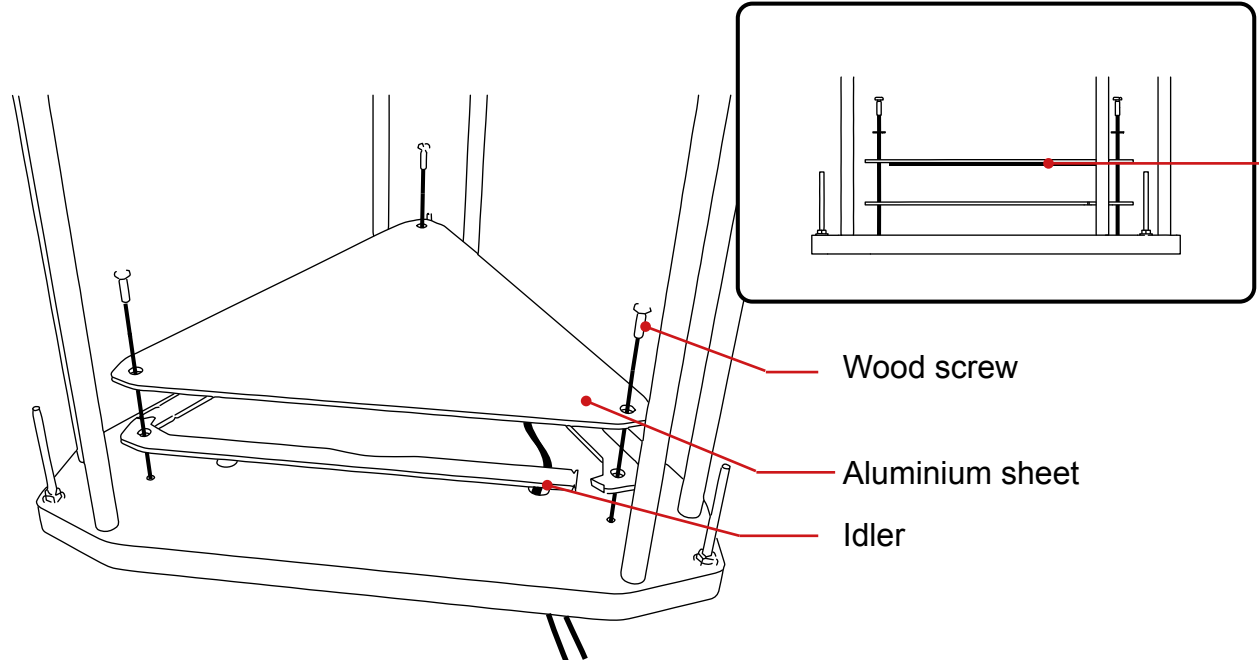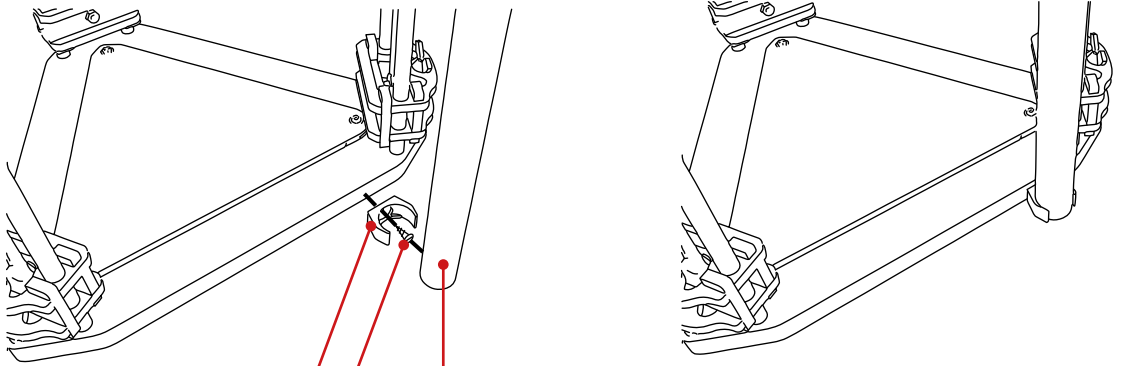
Tube

Thermistor
There is no specific way

Heat patch
There is no specific way
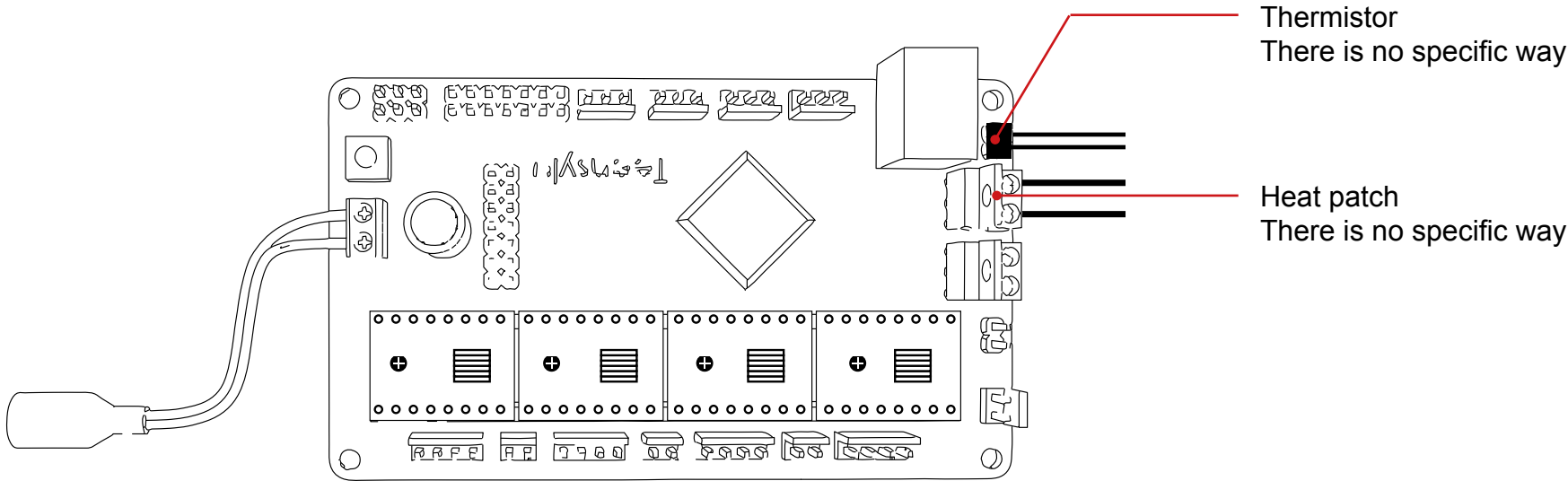
2. Software update

Prerequirement :

    Computer with window 7+ (others OS coming soon)

    Download and install the Serial_install.exe from our download center on our website

Where download :

    All files can be found on our download center or on our github

1/ Download the Manual_update_vx_xx.zip

2/ Unzip the file and open the folder

Name	Date modified	Type	Size
firmwares_emt	16/10/2014 16:58	File folder	
avrdude.conf	22/09/2014 17:53	CONF File	538 KB
avrdude.exe	22/09/2014 17:10	Application	502 KB
libusb0.dll	08/11/2011 21:19	DLL File	43 KB
manual_update.bat	29/10/2014 18:25	Windows Batch File	2 KB

3/ Run the batch script .bat

Choose the Firmware

Choose the firmware n°2,
head bed without LCD ⟶
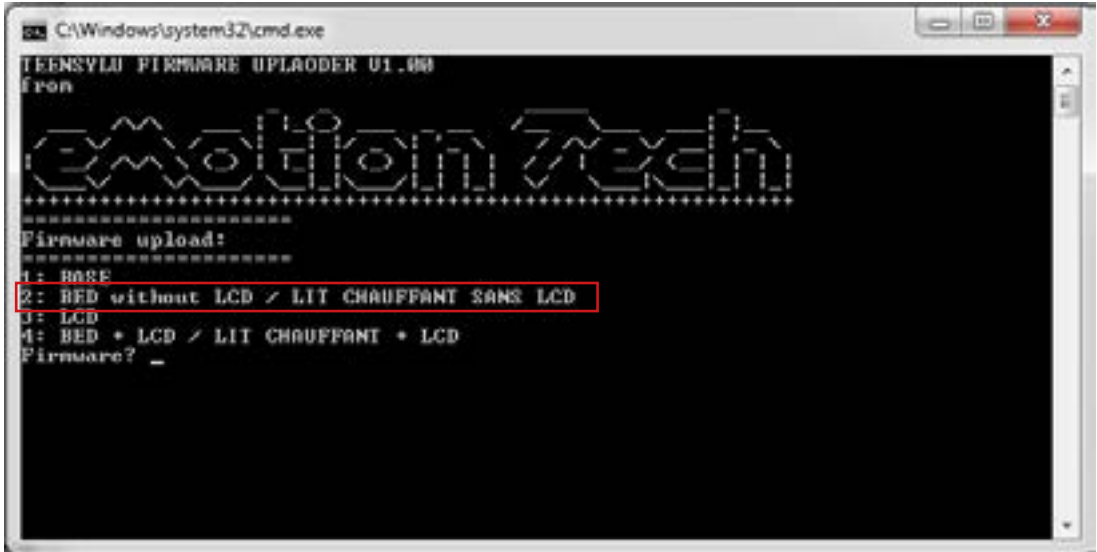
Press 2, and enter ⟶

Select the programming mode

1/ Remove the jumper

2/ Press the reset button
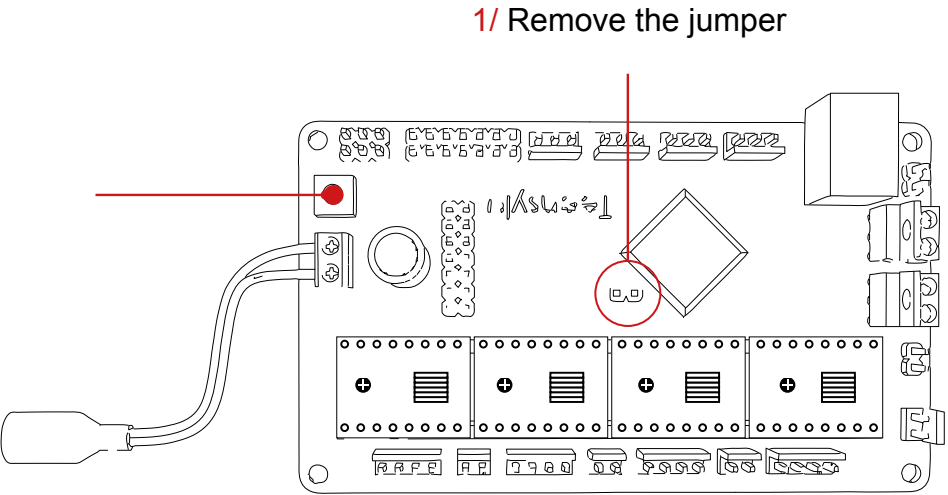
Please wait patiently before you computer detect and install the new COM port

Press Enter key and check your COM port name :
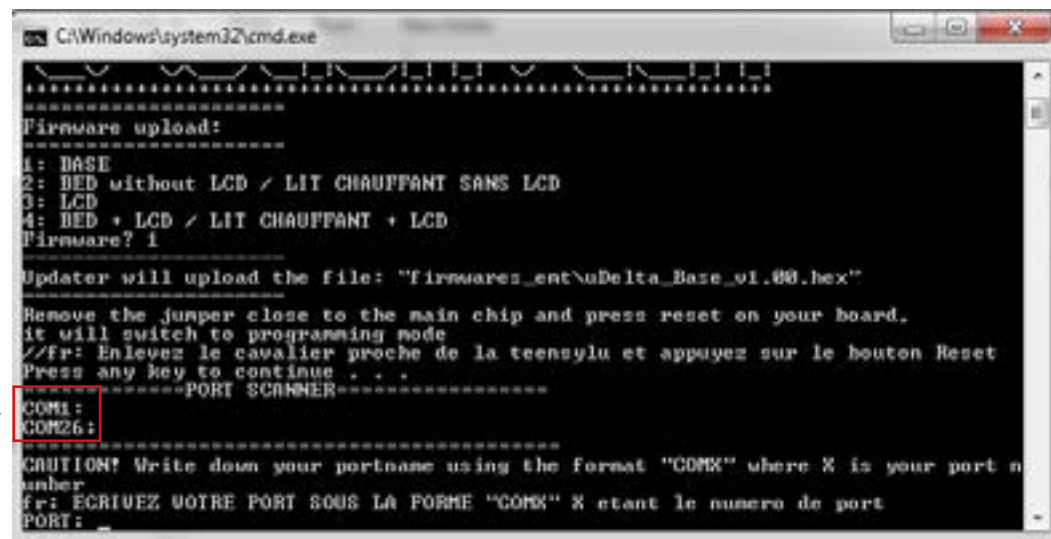
Ports are detected here →

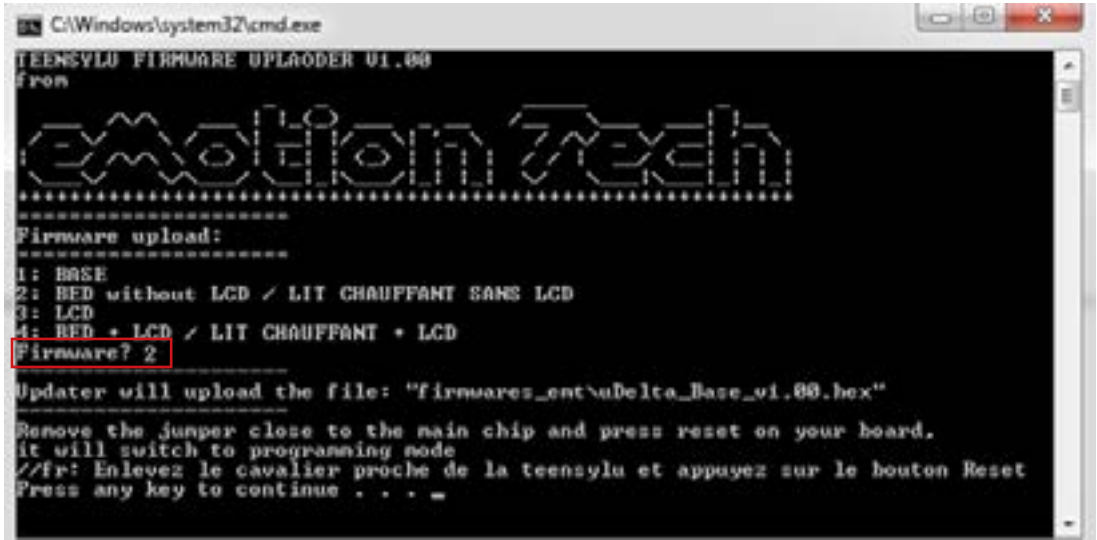Note : Usually, the COM1 is your internal modem device, COM1 might not be the right port.

Caution: the syntax have to be perfect, ex: COM2

Type your COM port name (COM26 in our case) then press Enter key →

Your screen will be filled with the hexadecimal data transfer →

Final screen :

```
C:\Windows\system32\cmd.exe
avrdude.exe: safemode: hfuse reads as D8
avrdude.exe: Send: Q [51]
avrdude.exe: Recv: . [f0]
avrdude.exe: safemode read 1, efuse value: f0
avrdude.exe: Send: Q [51]
avrdude.exe: Recv: . [f0]
avrdude.exe: safemode read 2, efuse value: f0
avrdude.exe: Send: Q [51]
avrdude.exe: Recv: . [f0]
avrdude.exe: safemode read 3, efuse value: f0
avrdude.exe: safemode: efuse reads as F0
avrdude.exe: safemode: Fuses OK
avrdude.exe: Send: L [4c]
avrdude.exe: Recv: . [0d]
avrdude.exe: Send: E [45]
avrdude.exe: Recv: . [0d]

avrdude.exe done.  Thank you.

001001
PS: Do not forget to restore the jumper and press reset to switch to normal mode

PS: //fr: oubliez pas de remettre le cavalier et rappuyer sur reset...
Enjoy!
Press any key to continue . . . _
```
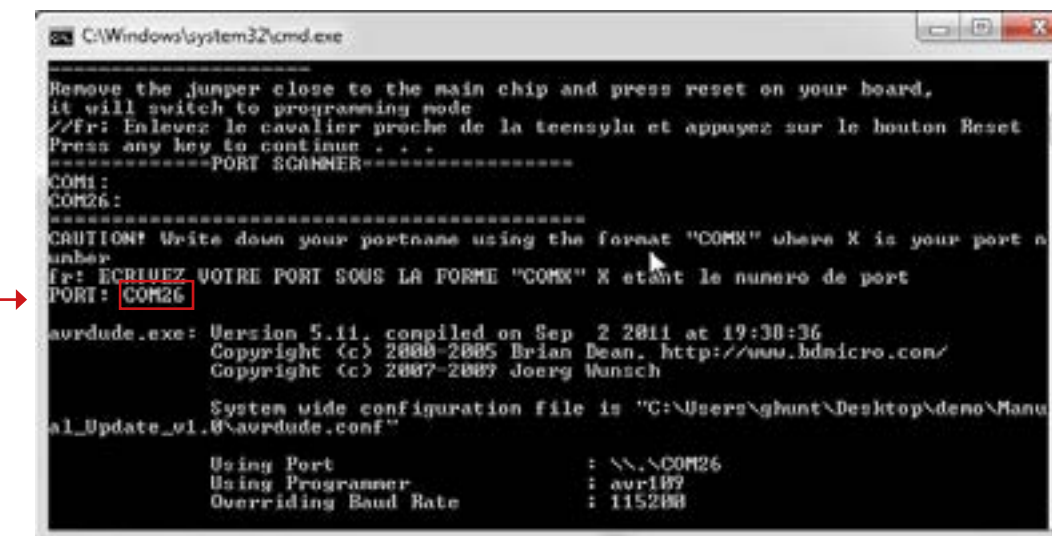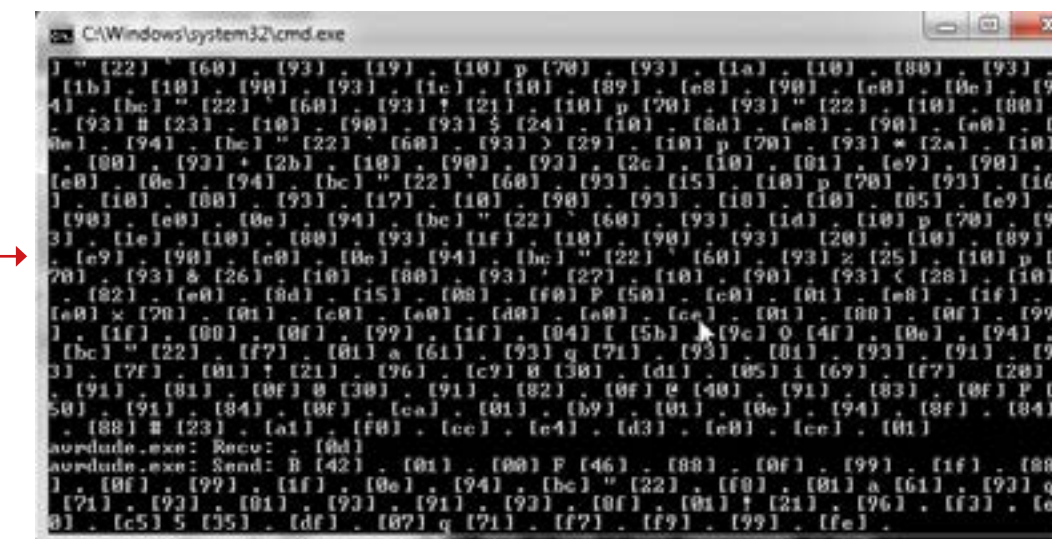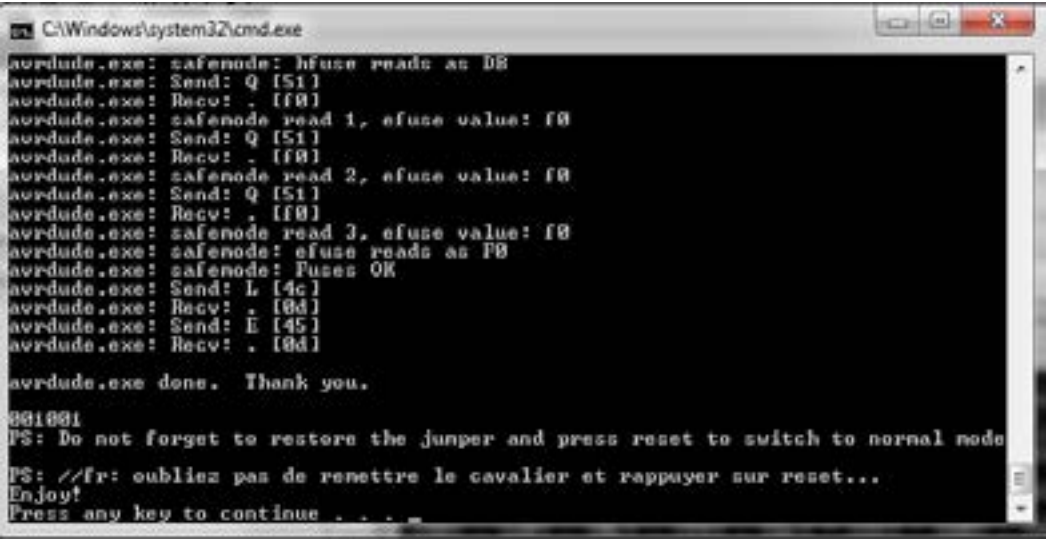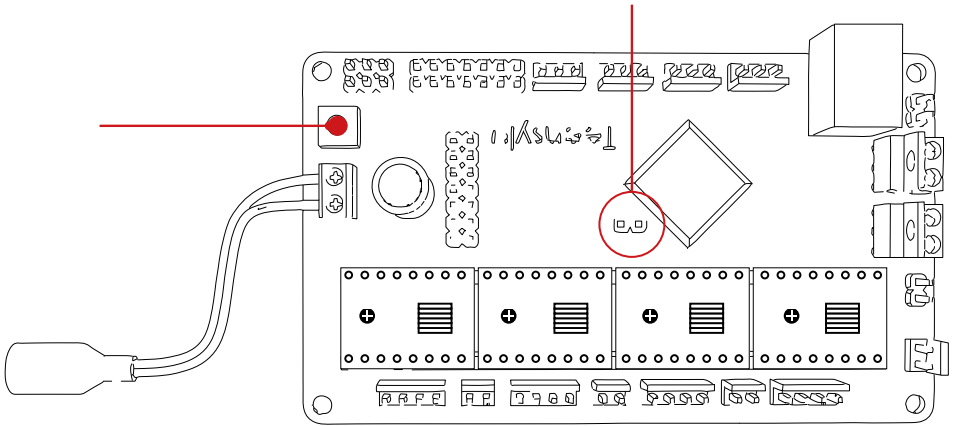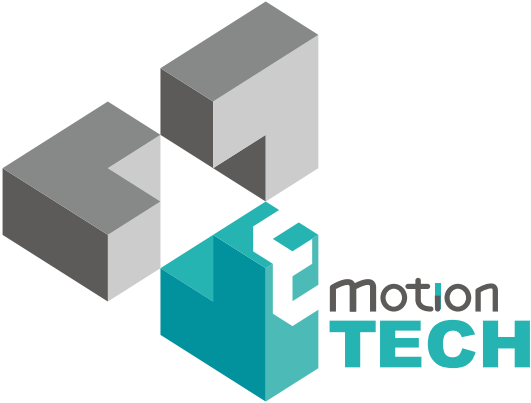
Leave the programming mode :

1/ Set up the jumper back in place

2/ Press the reset button

Your printer is now ready to print with the heated bed !

Thank you to choose the µdelta

www.reprap-france.com

Version 1.4