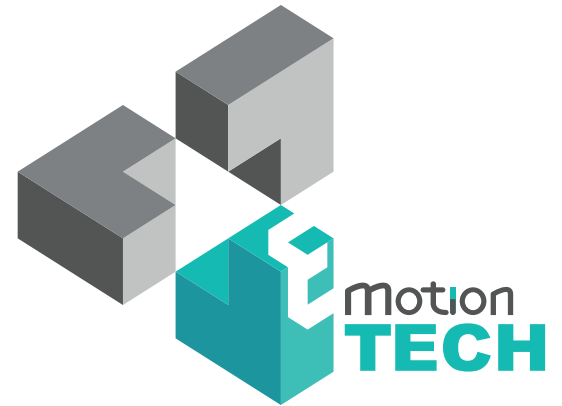


μdelta

ASSEMBLY INSTRUCTIONS
REV 1.2



INTRODUCTION

INTRODUCTION

• Target :

Propose a visual guide of the different steps to build a μ Delta printer.

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Hugo FLye
Thomas Batigne
Anthony Berna

• 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 :

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• Update :

Last Update : 28/12/2016

• 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/>



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INTRODUCTION

SUMMARY

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81

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)
- Motors : 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 option)
- Provided with Repetier-Host pre-configured 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 ajustement with the software
- Easy to reload the filament

OPTIMISATION AND UPGRADE (Options and developments available)

You can improve the μ delta 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 CHILDREN AND ANIMALS

Operate in a ventilated room. Plastic fumes effects are not known. In case of use in a closed room, 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 modification. The µdelta operate at voltage of 12V and is not concerned by the low voltage directive.

Further informations

Informations above are not exhaustive.

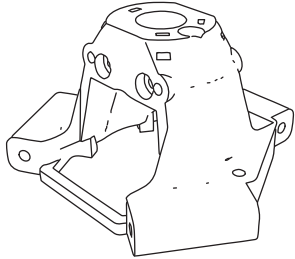
We used sources of informations we consider as reliable. However, we cannot guarantee that all these informations are true and complete.

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

ASSEMBLY

BILL OF MATERIALS

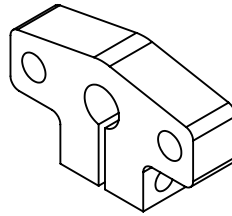
A. Printed parts



1x Core



1x Filament
Guide

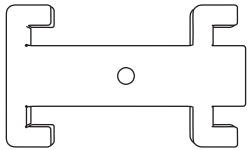


3x SHF8P

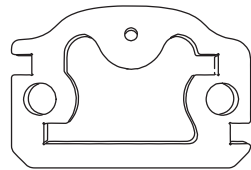
Acrylic parts can be covered with protection and it may remains pieces of plastic. Remove it before use.

We provide additionnal parts.

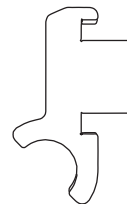
B. Acrylic parts



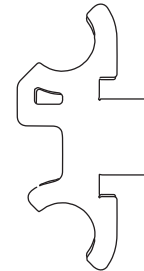
6x eM1
TENSIONER



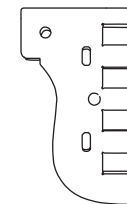
6x eM 2



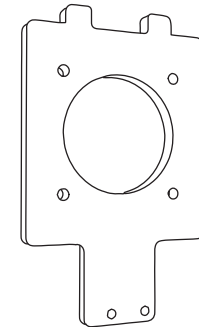
6x eM 3
SLIDER



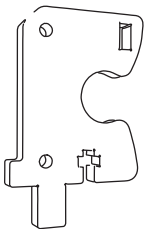
6x eM 4



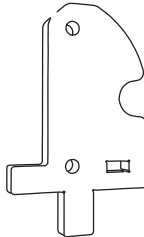
6x eM 5



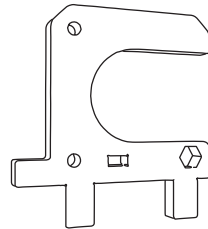
3x eM 14
MOTOR HOLDER



2x eM 8
EXTRUDER



1x eM 9



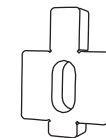
1x eM 10



2x eM 11

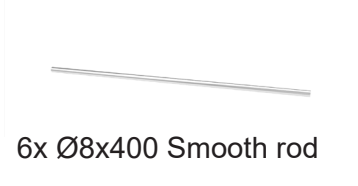


1x eM 12

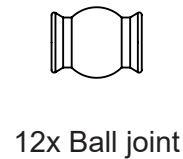


1x eM 13

C. Smooth rods and connecting rods



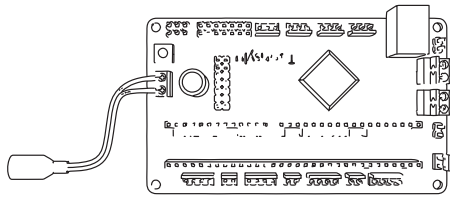
D. Mechanical parts



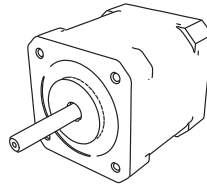
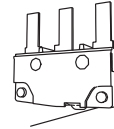
E. Screws, nuts and washers



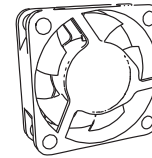
F. Electronic



1x Teensylu


4x Nema 17 motor
(3 shorts : 34 mm
1 long : 48 mm)


3x Endstop



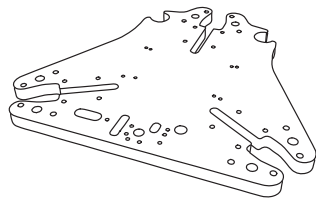
2x 3x3 Fan



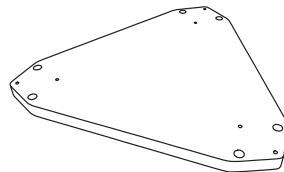
4x Stepstick


1x Power supply
1x USB Link

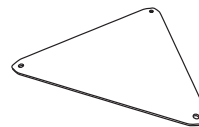
G. Others



1x Superior frame



1x Inferior frame



1x Print bed


1x Ø4xM6
Pneufit

1x Ø4x1/8"
Pneufit


1x PTFE tube



3x motor Bracket


1x Braided
sleeve
Ø 20 mm


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

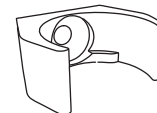
HEATED BED KIT



3x Idler



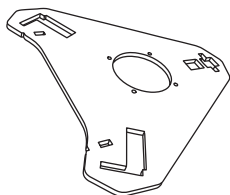
1x Tube



1x tube holder



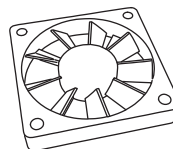
1x Polyimide tape



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

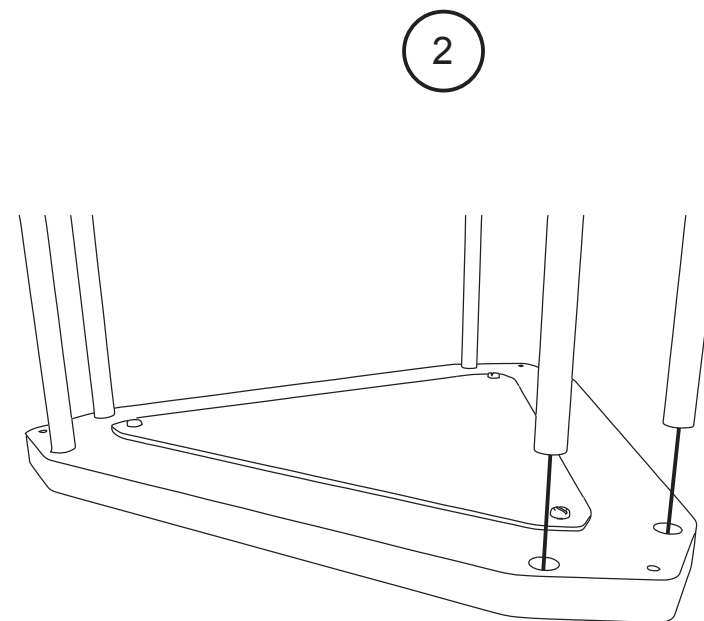
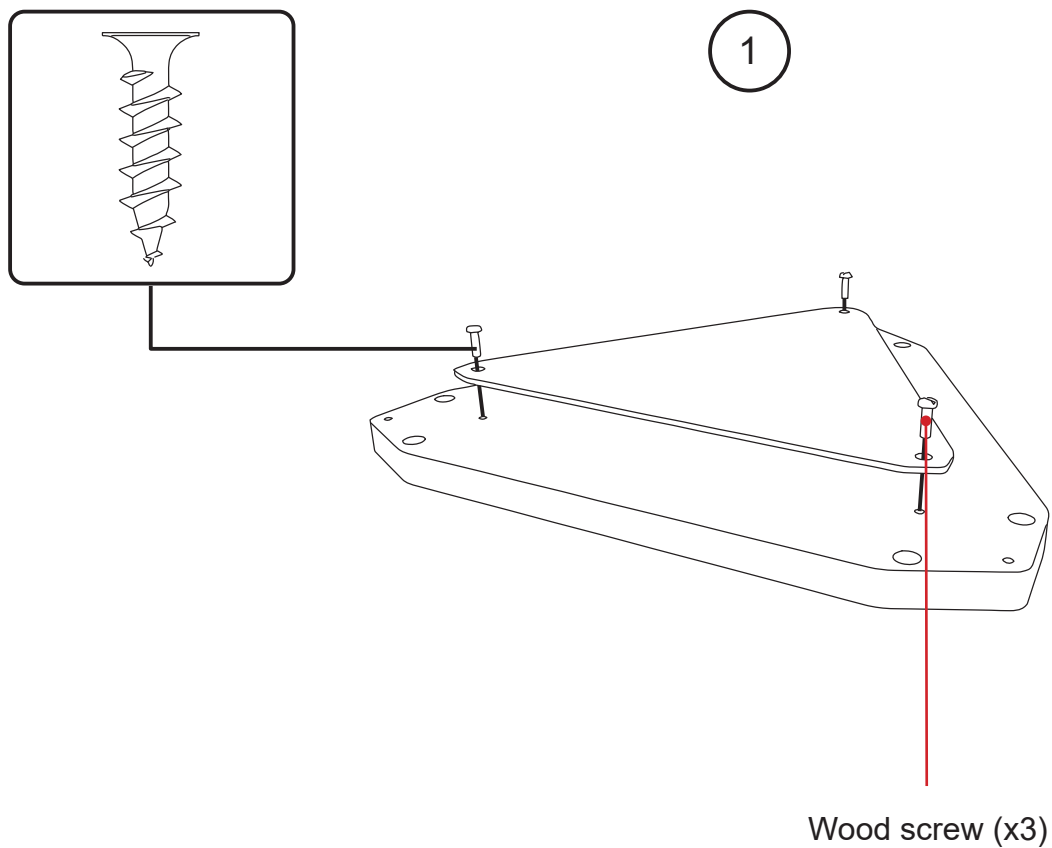
NEEDED TOOLS LIST

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

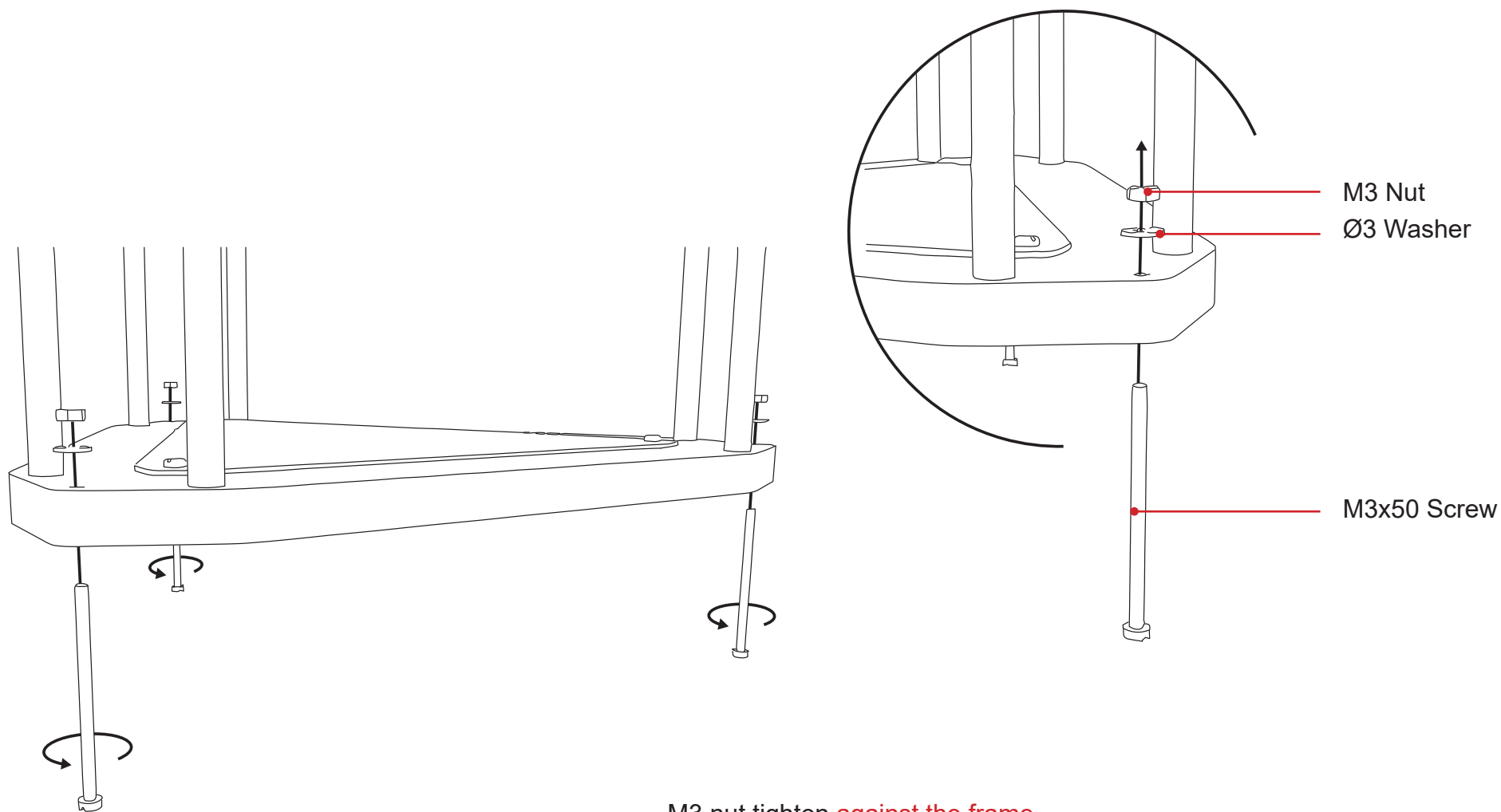


MECHANICAL ASSEMBLY

If you have a heated bed, please read the «Add-On» section to know how to mount and set it.

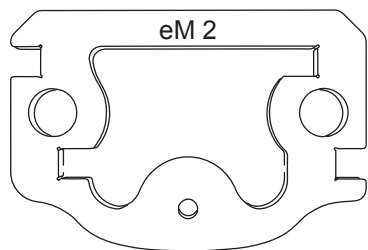


- Use a mallet to insert completely the rod **without exceeding the plate**
- **Smooth rods must be normal to the inferior frame**

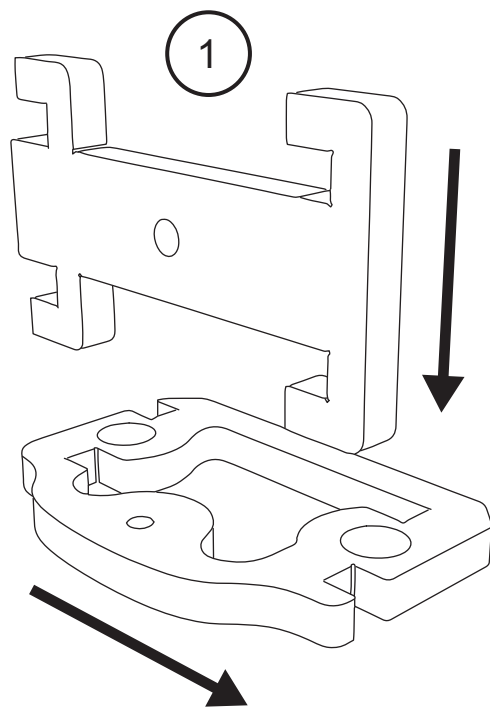


- M3 nut tighten **against the frame**
- Repeat this operation for each corners

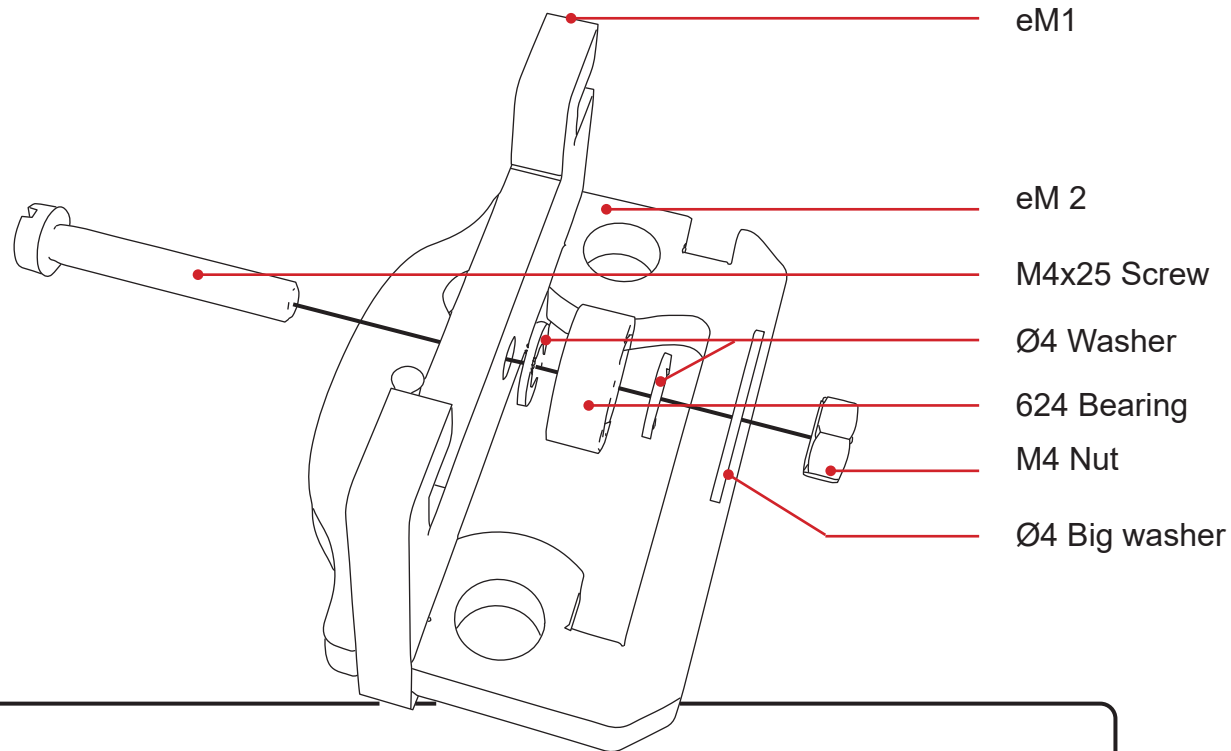
Inside the μ delta



Outside the μ delta



2



eM1

eM 2

M4x25 Screw

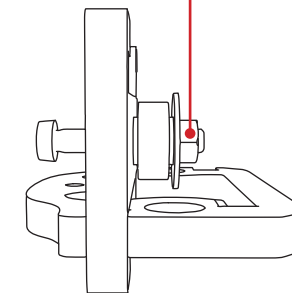
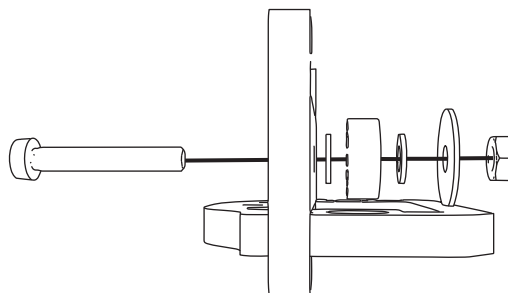
Ø4 Washer

624 Bearing

M4 Nut

Ø4 Big washer

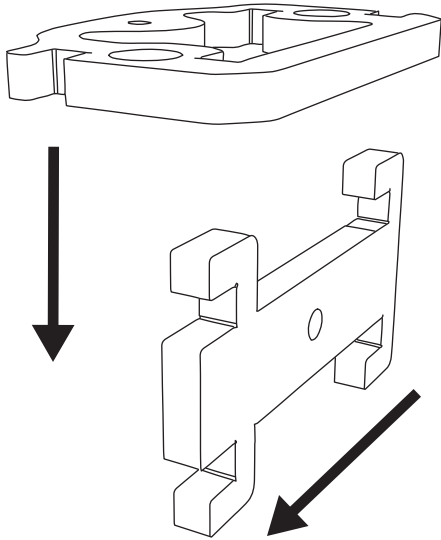
Nut at the end of the screw



Caution : for this step, take care of the tensioner's orientation

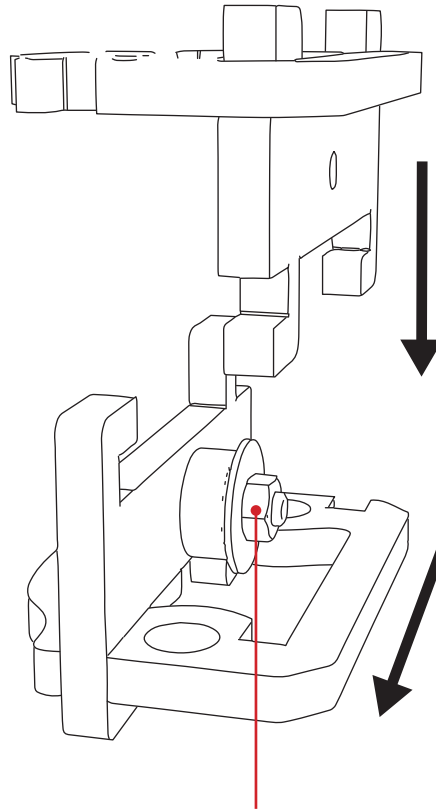
Acrylic parts can be covered with protection and it may remains pieces of plastic, remove it before use.

1



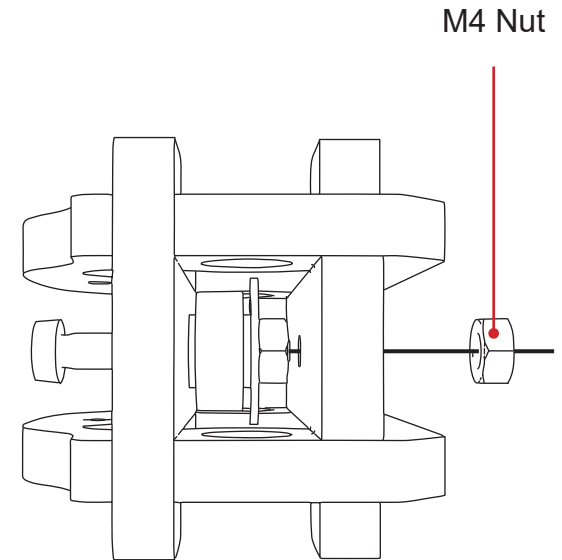
Tighten nuts moderately to avoid breaking acrylic parts

2

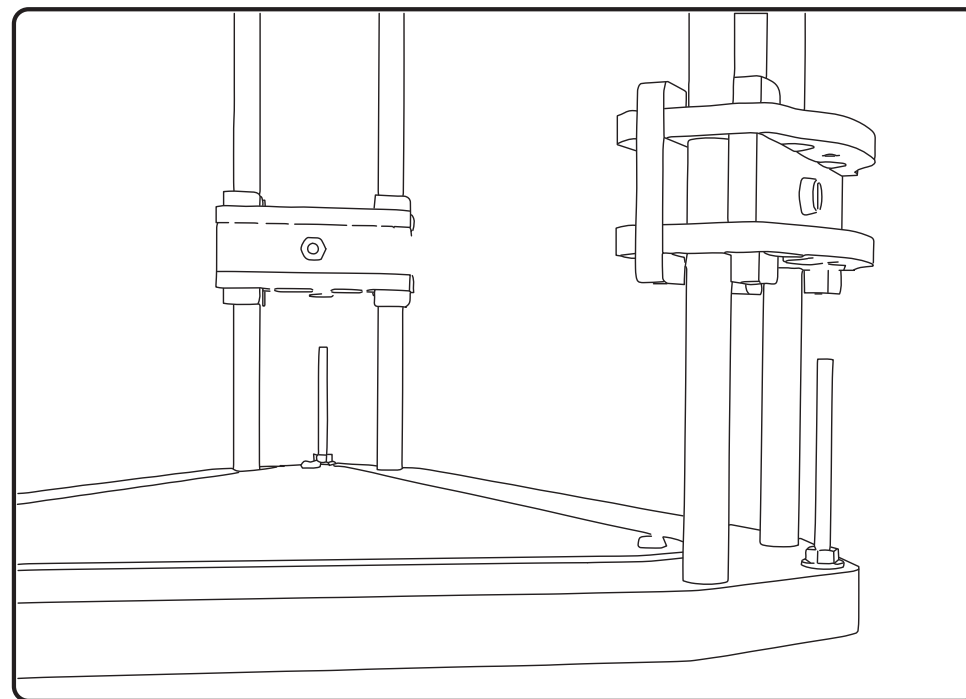
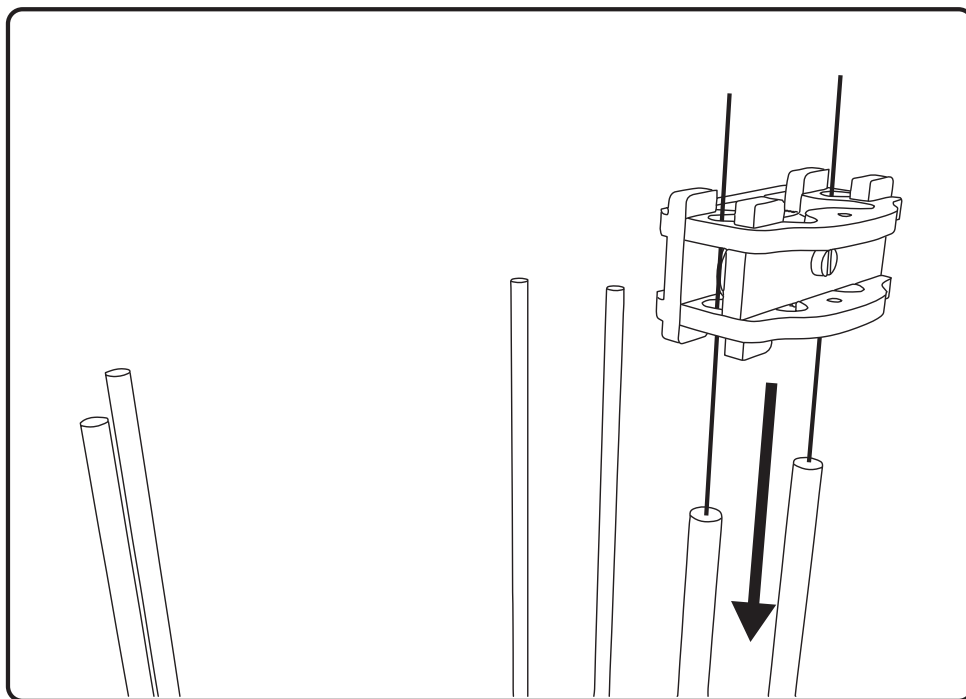


Tighten against the washer

3

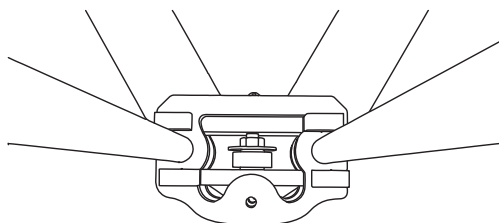


Tighten Lightly

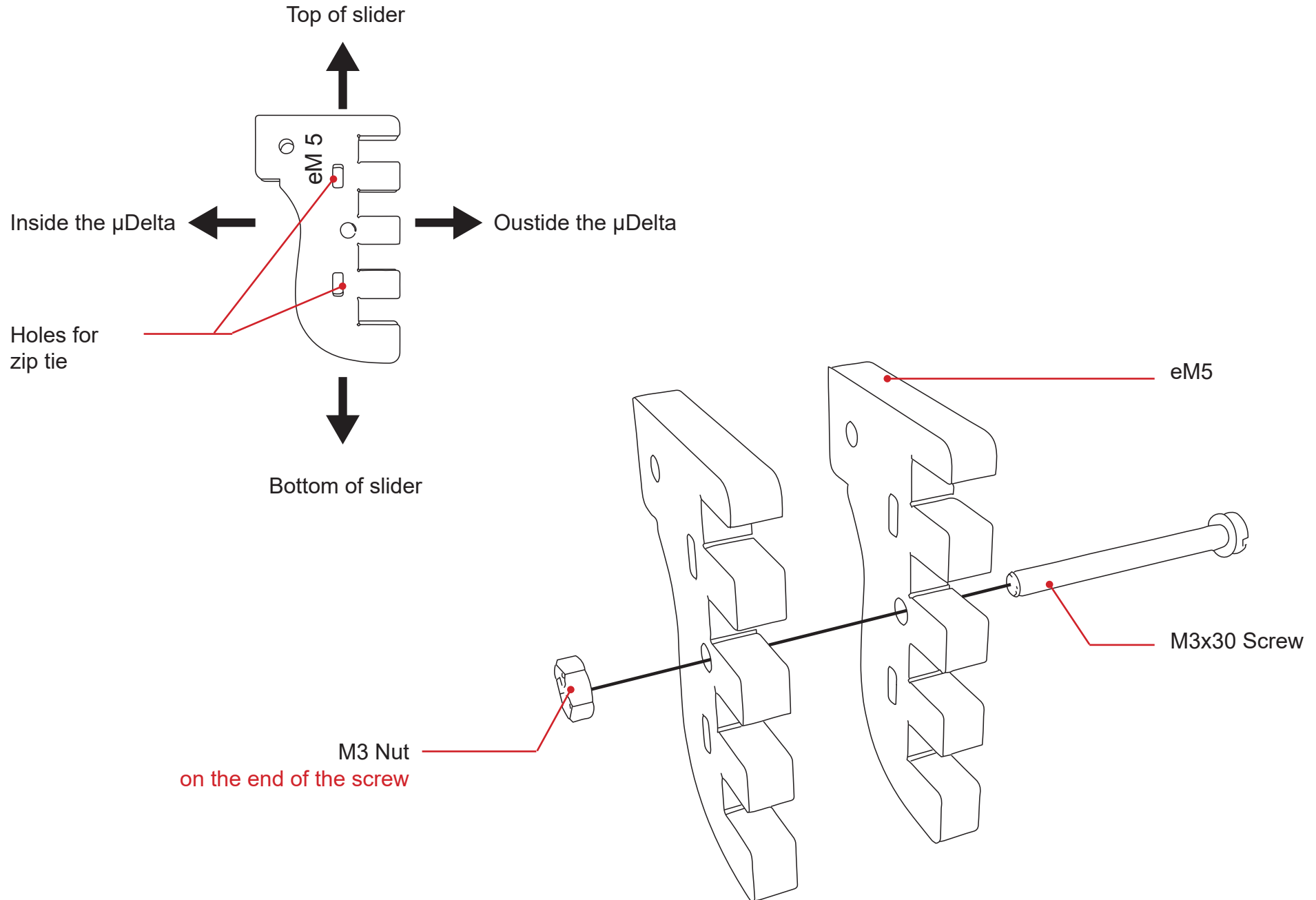


Repeat this operation for the other tensioners

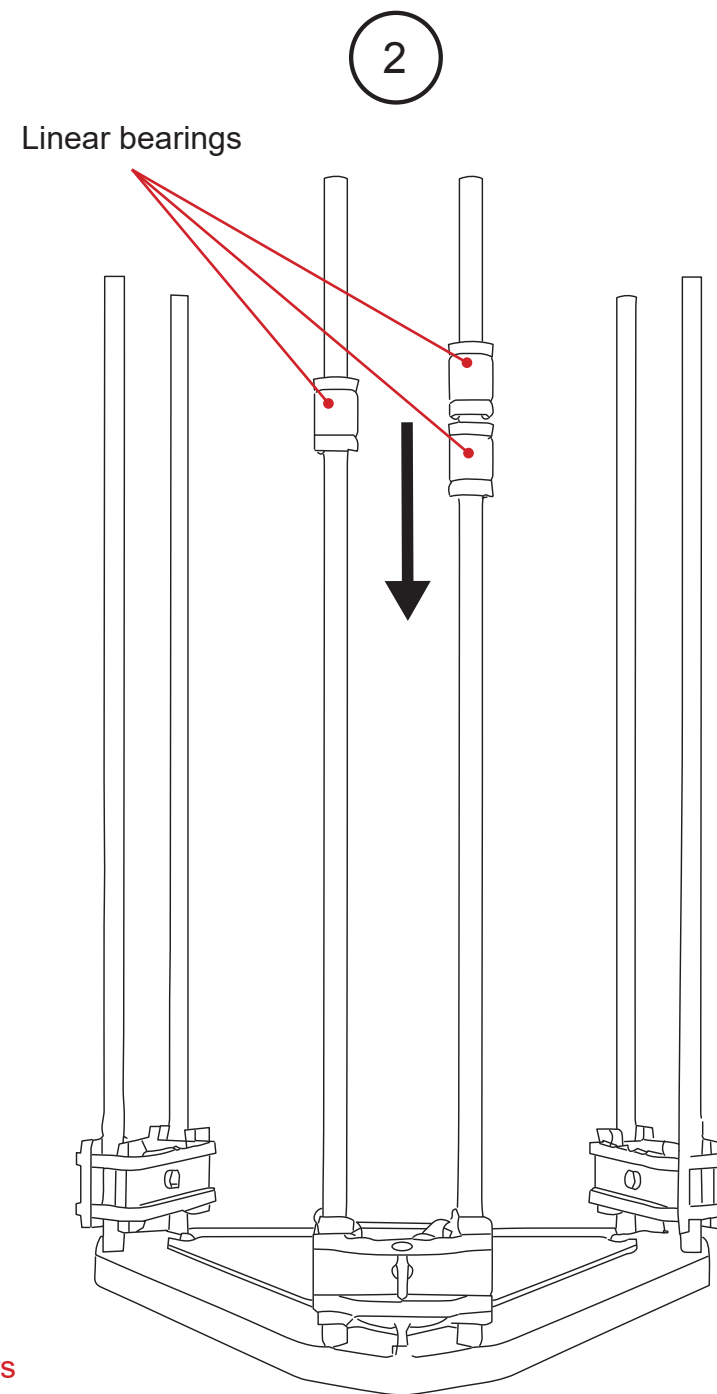
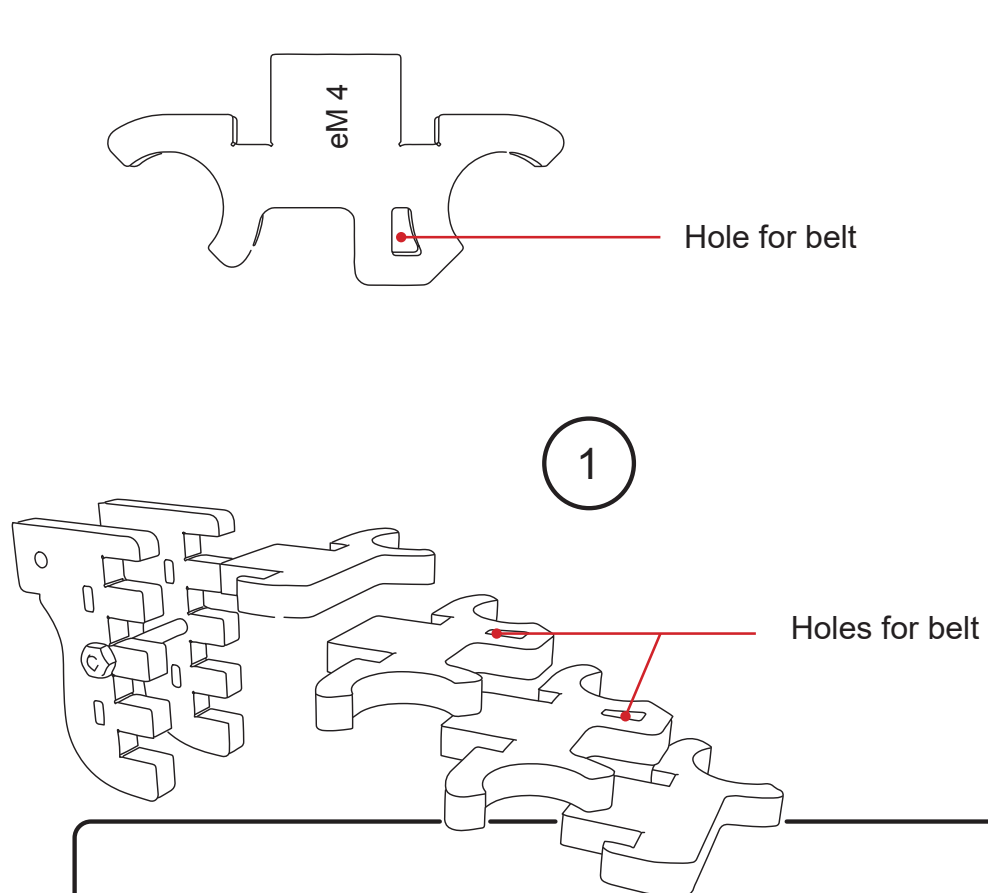
Inside the μ delta



Outside the μ delta



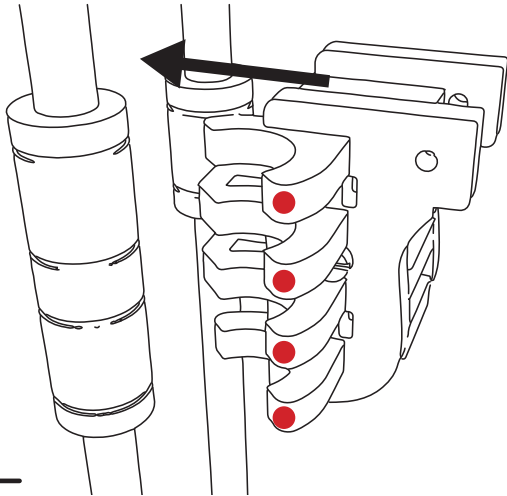
Caution : Assemble all sliders in the same way.



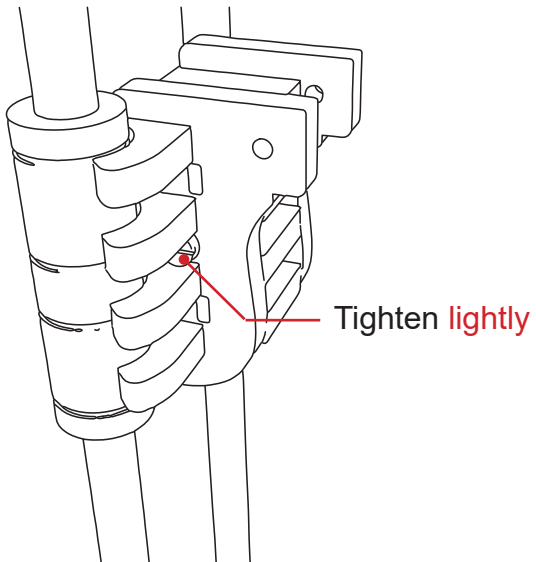
Note : After tightening screw, eM 3 parts may move, it is not a problem

Repeat this operation for the others sliders

1

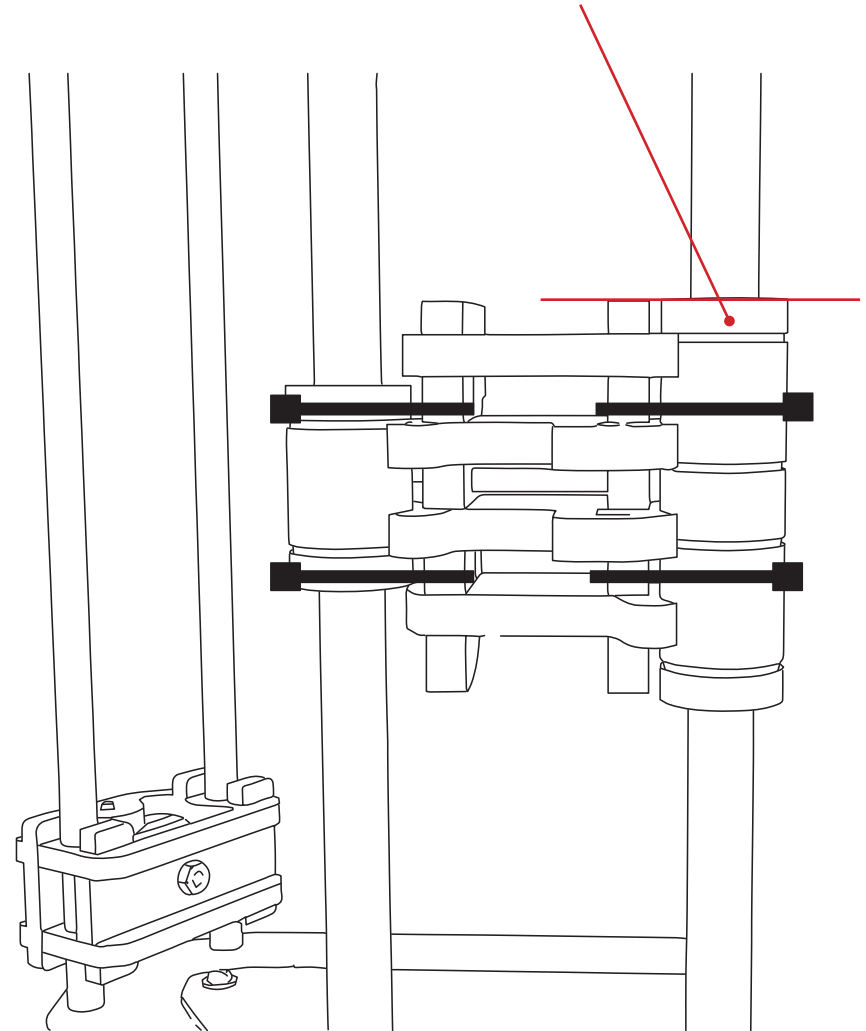


The 4 fixations must be on the **same side** than the 2 linear bearings



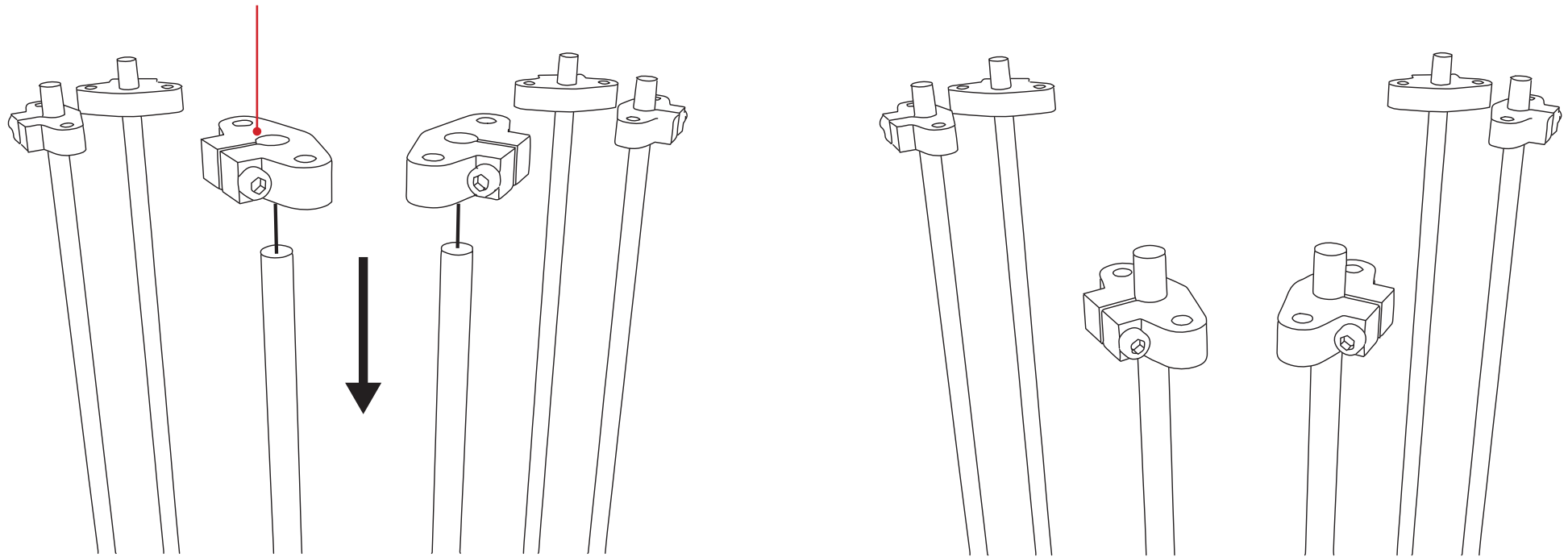
2

This bearing **must not exceed the slider**



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

Shaft Support

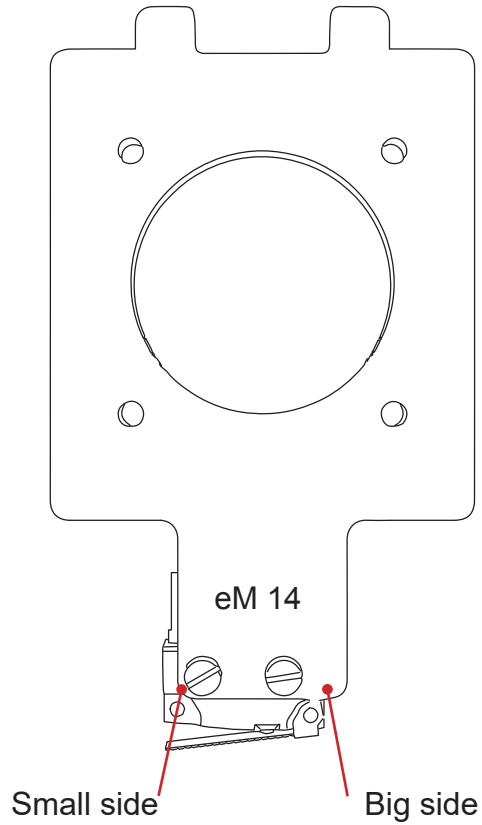


Take care of the way of shafts supports

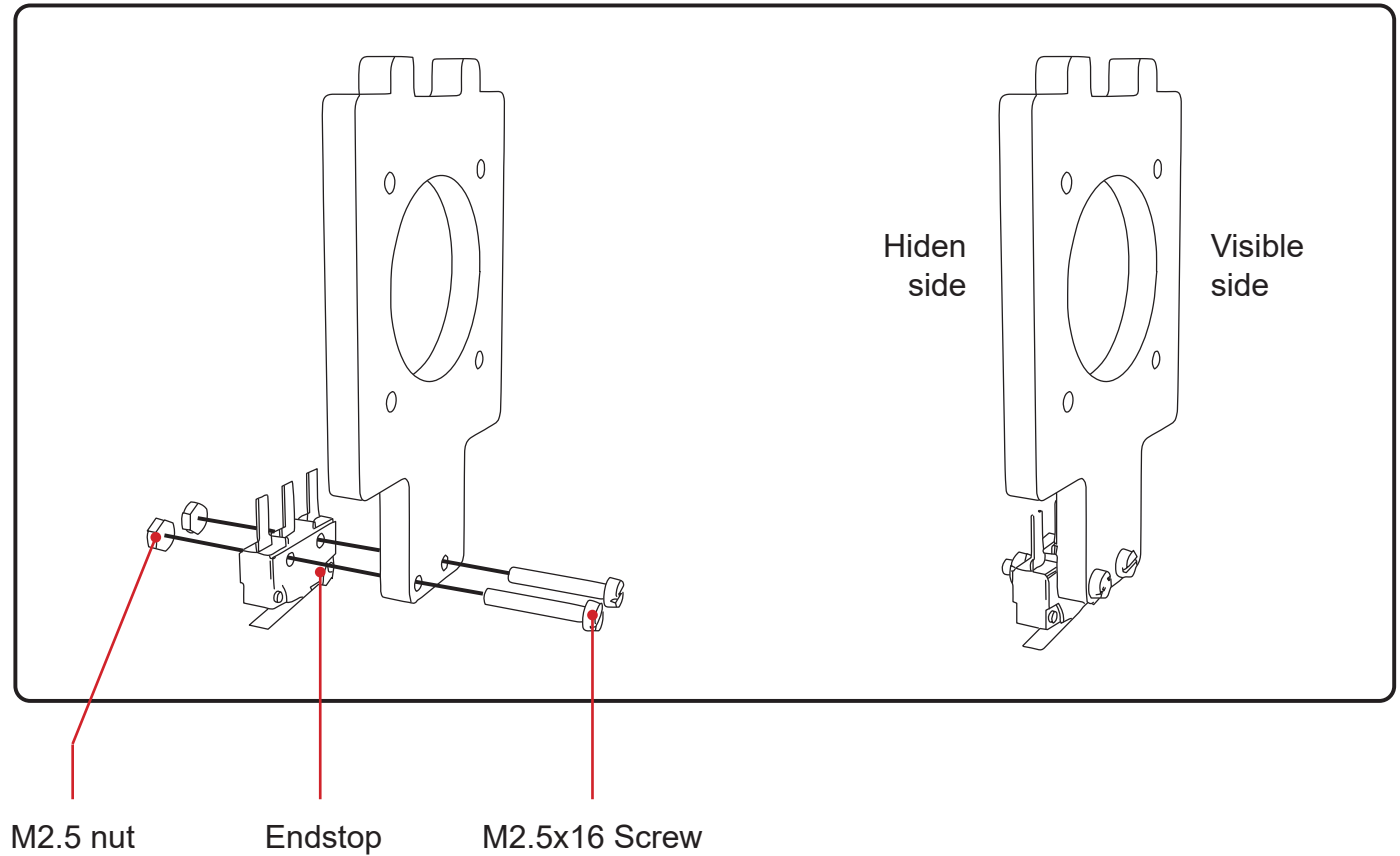
Note : Do not tighten

Note: If the smooth rods are struggling to enter the shaft support, don't drill those elements but help insertion by applying leverage with a flat screwdriver.

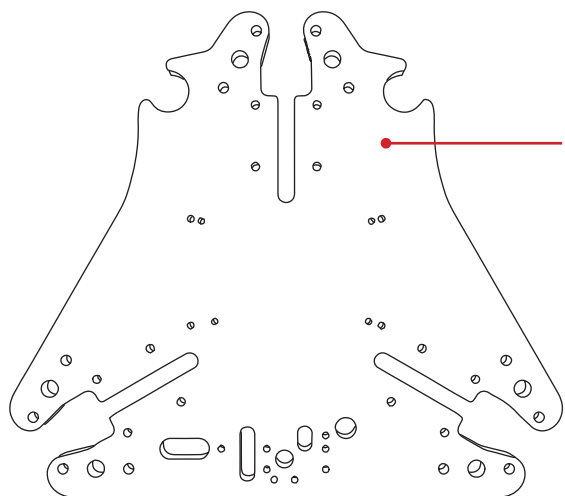
Assemble the endstop as it's show on the figure



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



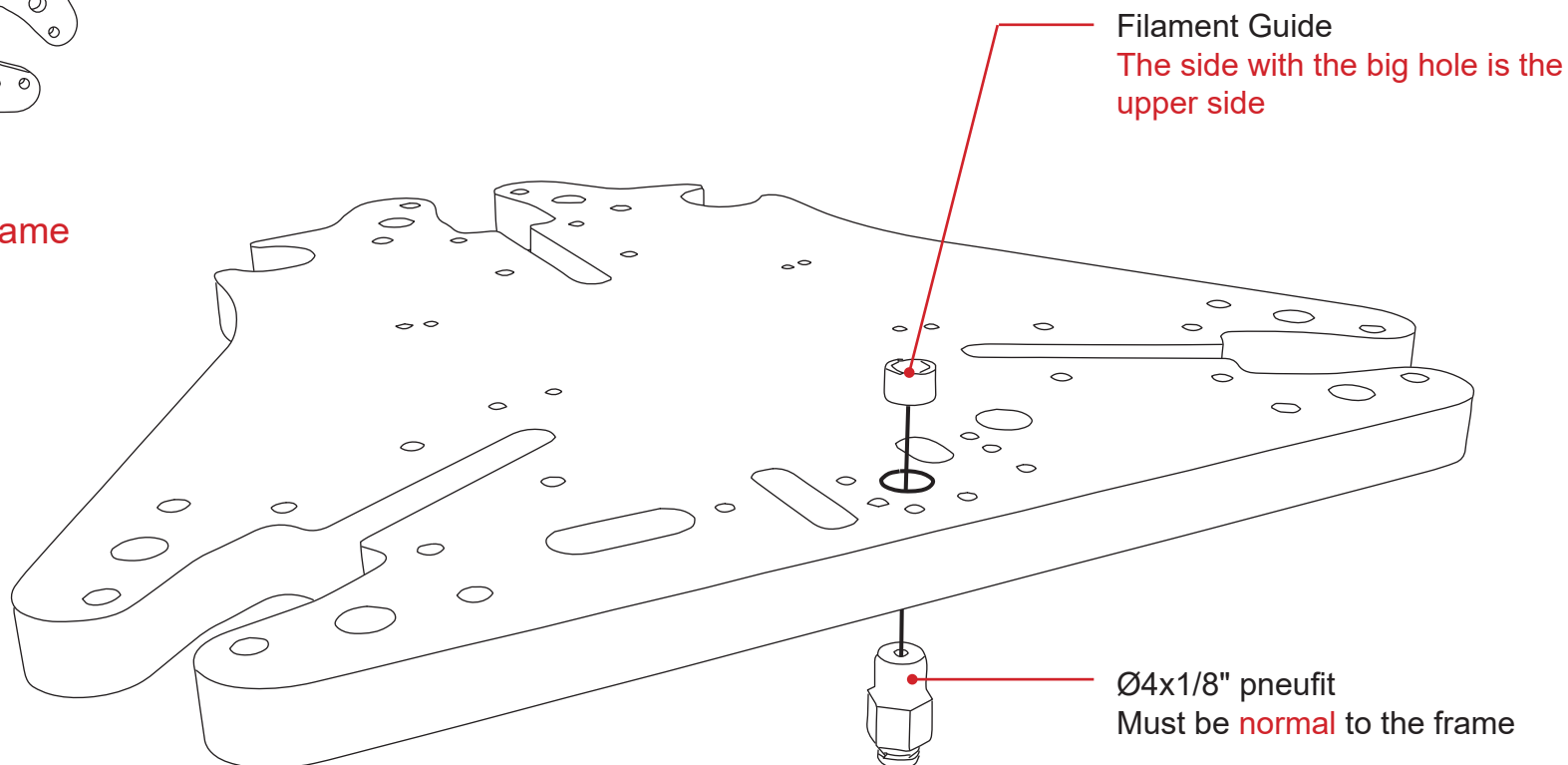
Back



Top view

Front

Take care to assemble the frame correctly

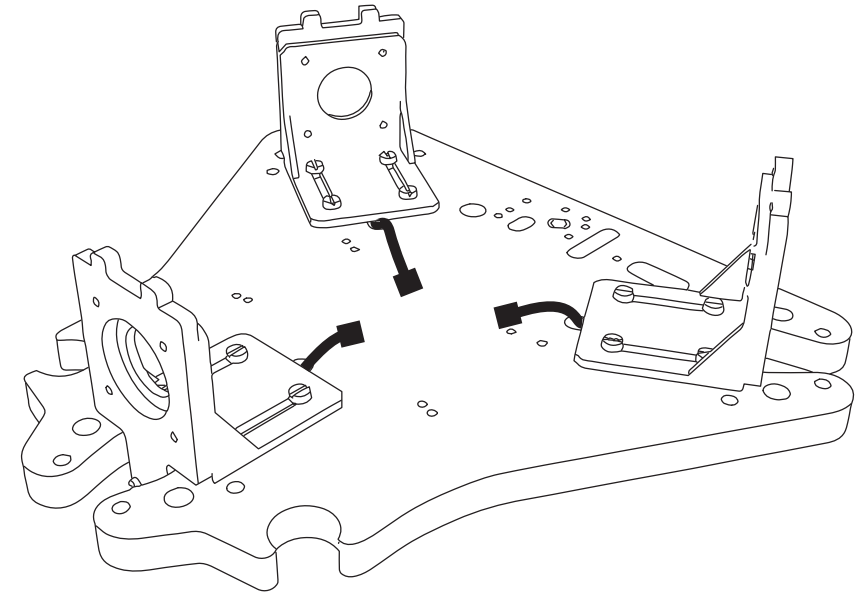
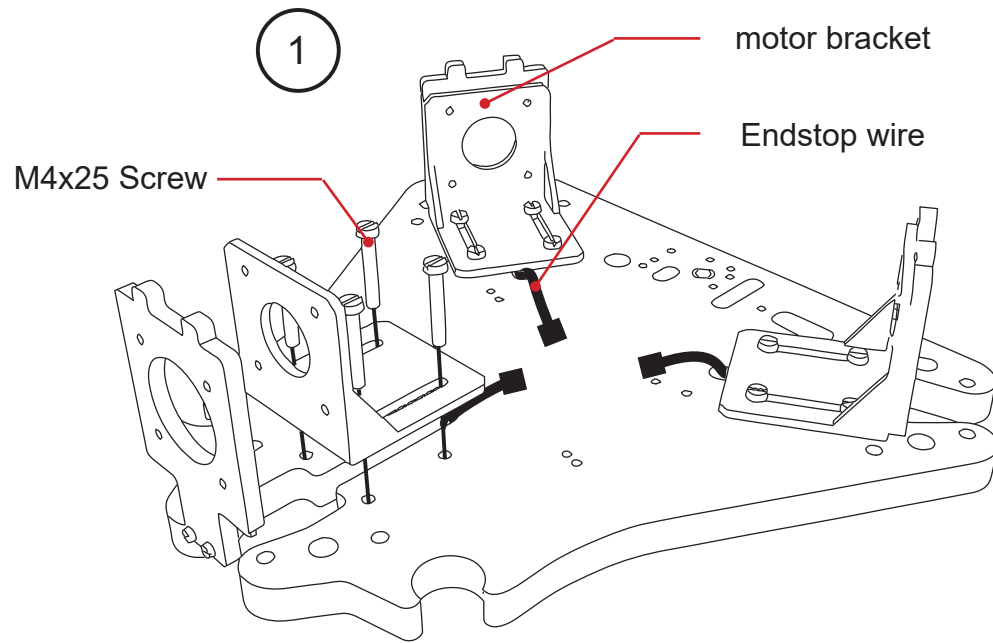


Filament Guide

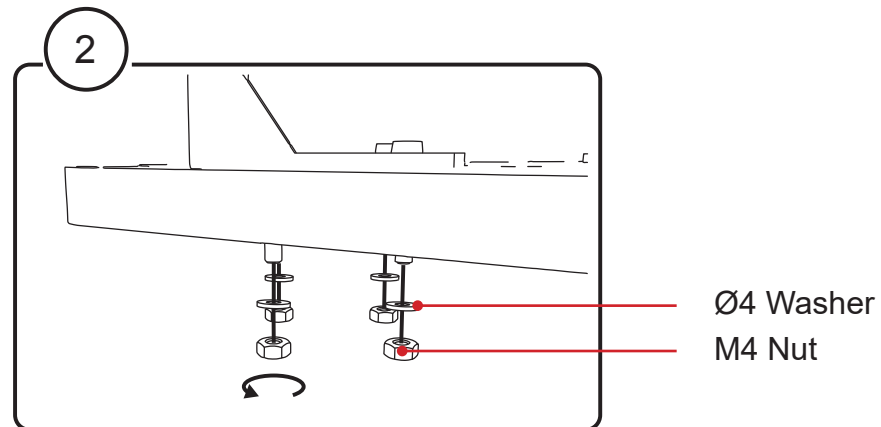
The side with the big hole is the upper side

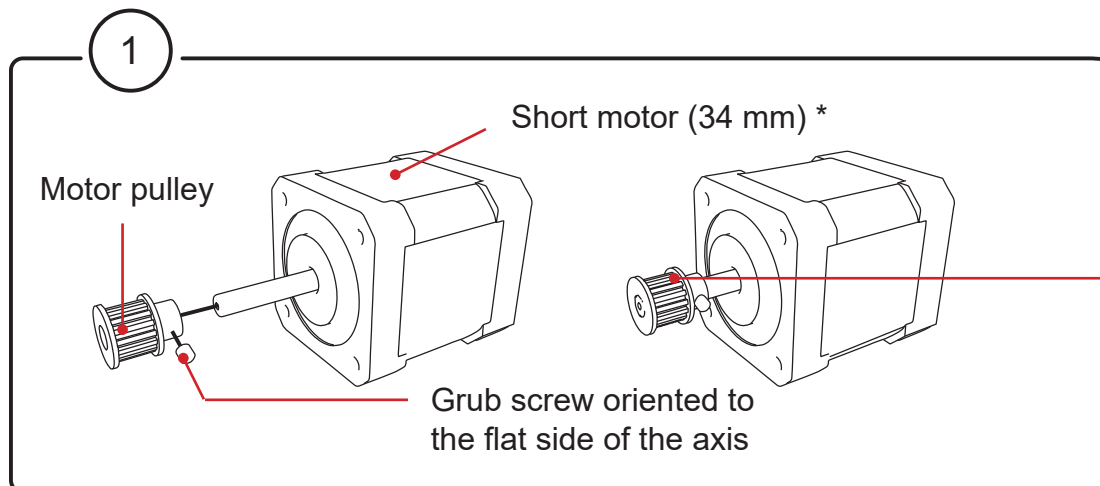
Ø4x1/8" pneufit

Must be **normal** to the frame



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



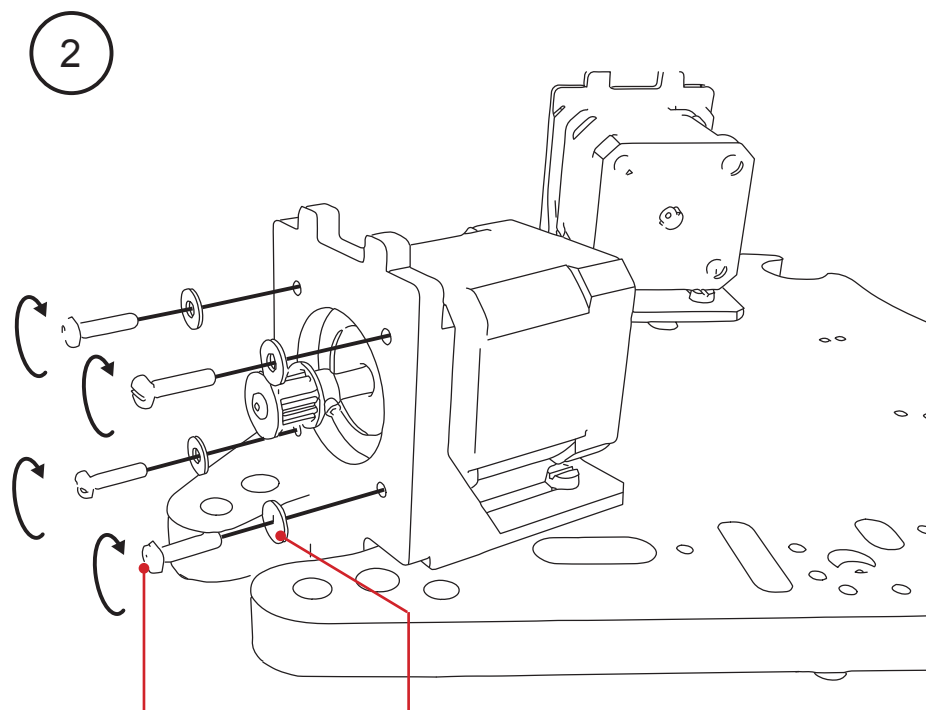


* : 2 motor models are supplied in the kit :

- 3 x 34 mm motor (axis)
- 1 x 48 mm motor (extrusion)

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

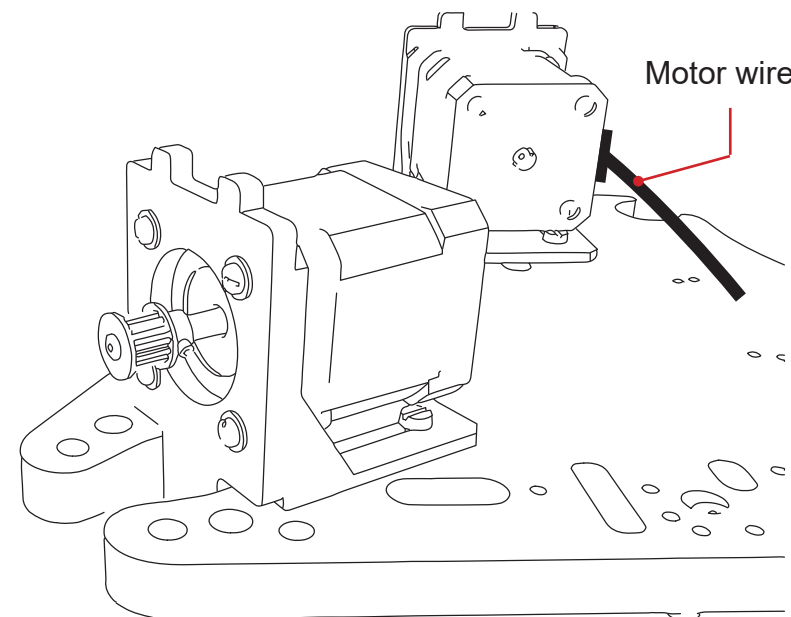
Note : Use the Allen key given in the kit to tighten the pulley



M3x12 Screw

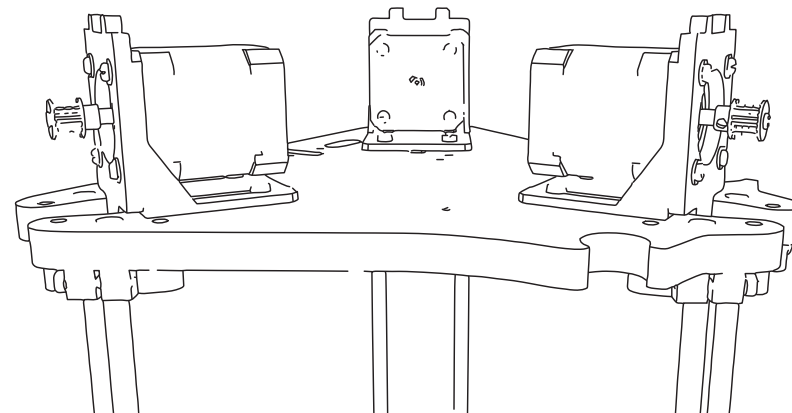
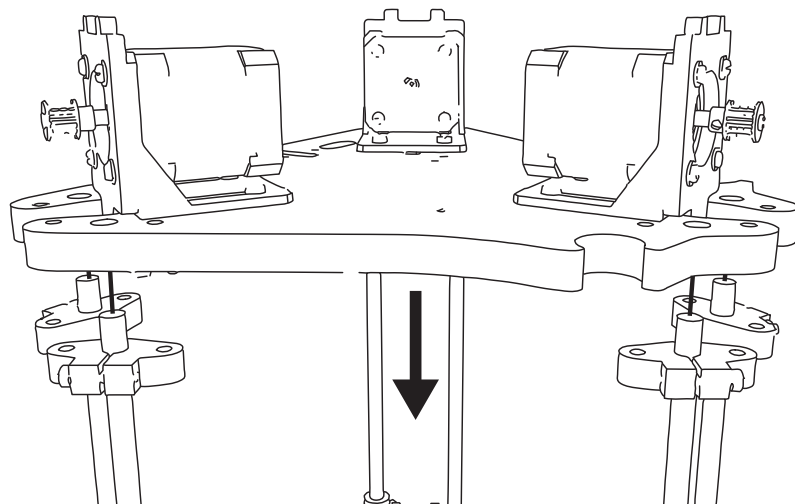
M3 Washer

Tighten **lightly**

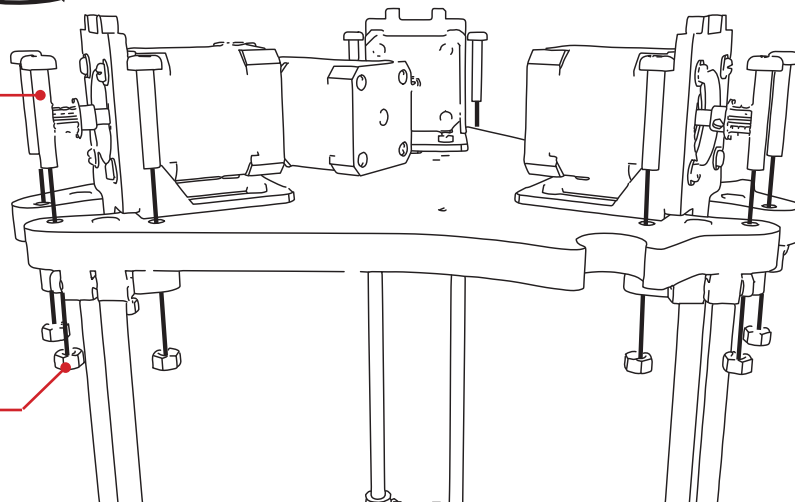


Motor wire must be on the side

1

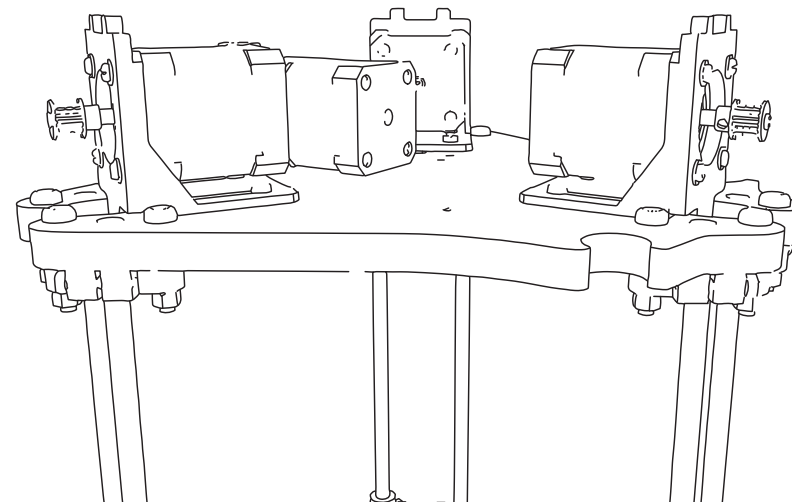


M5x30 Screw



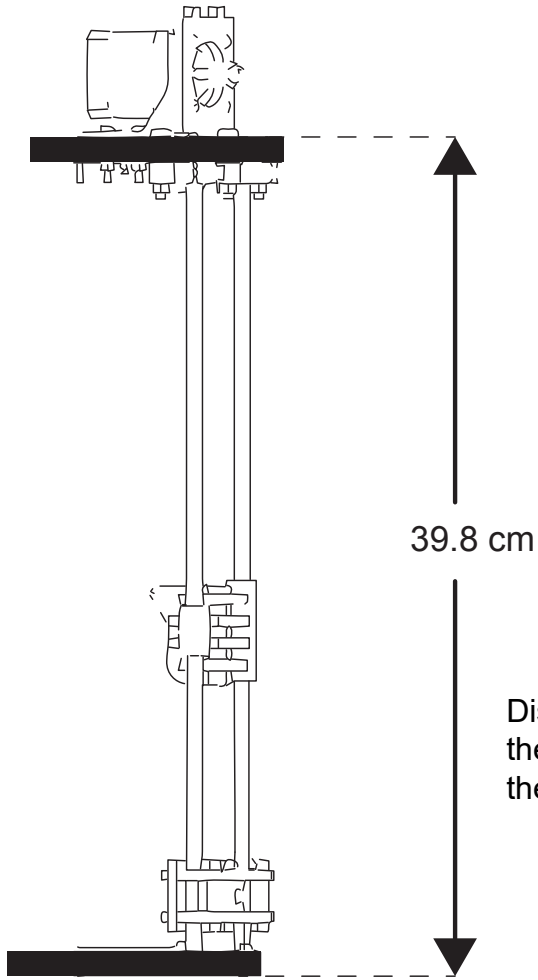
2

M5 Nut

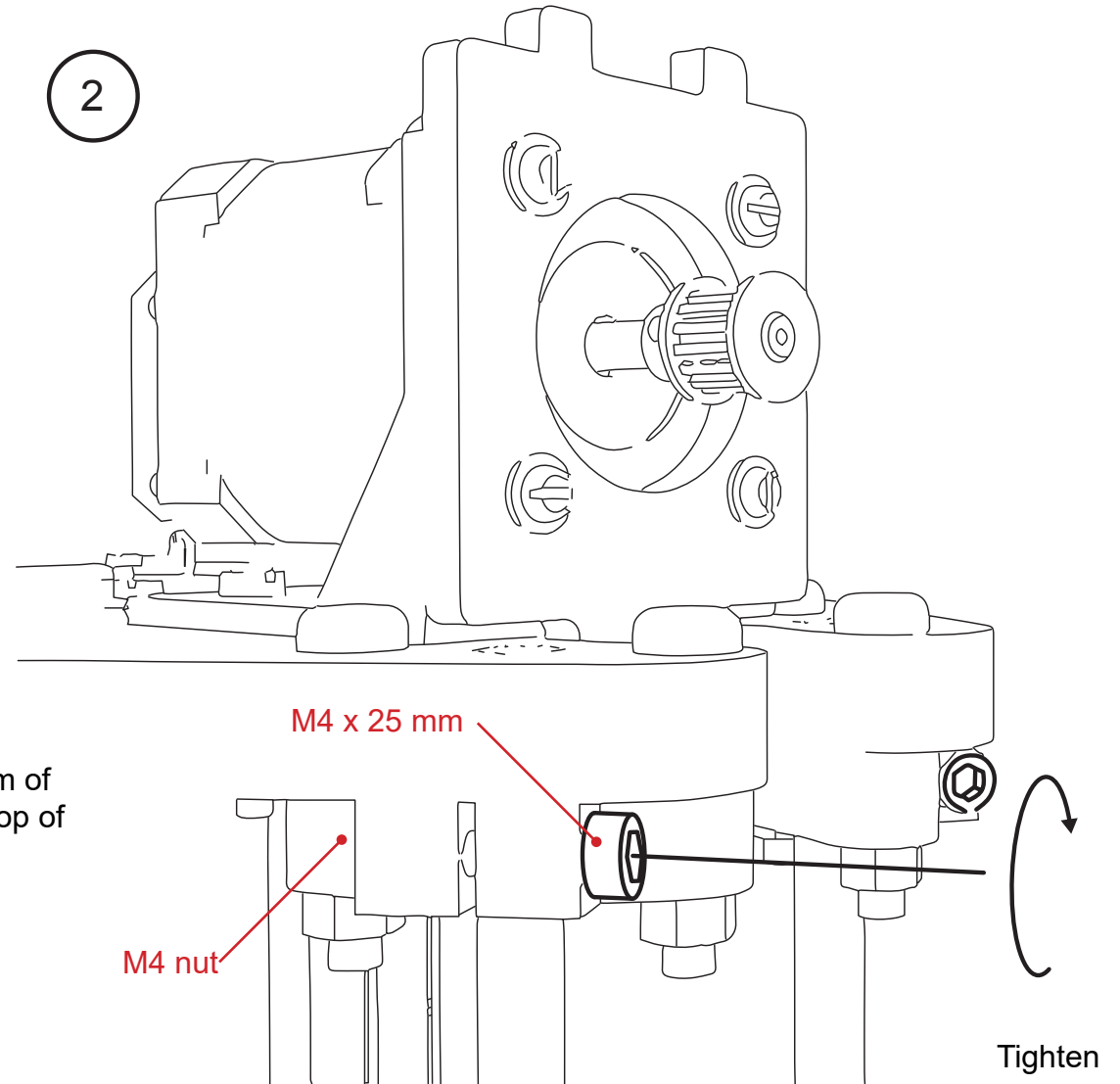


1

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

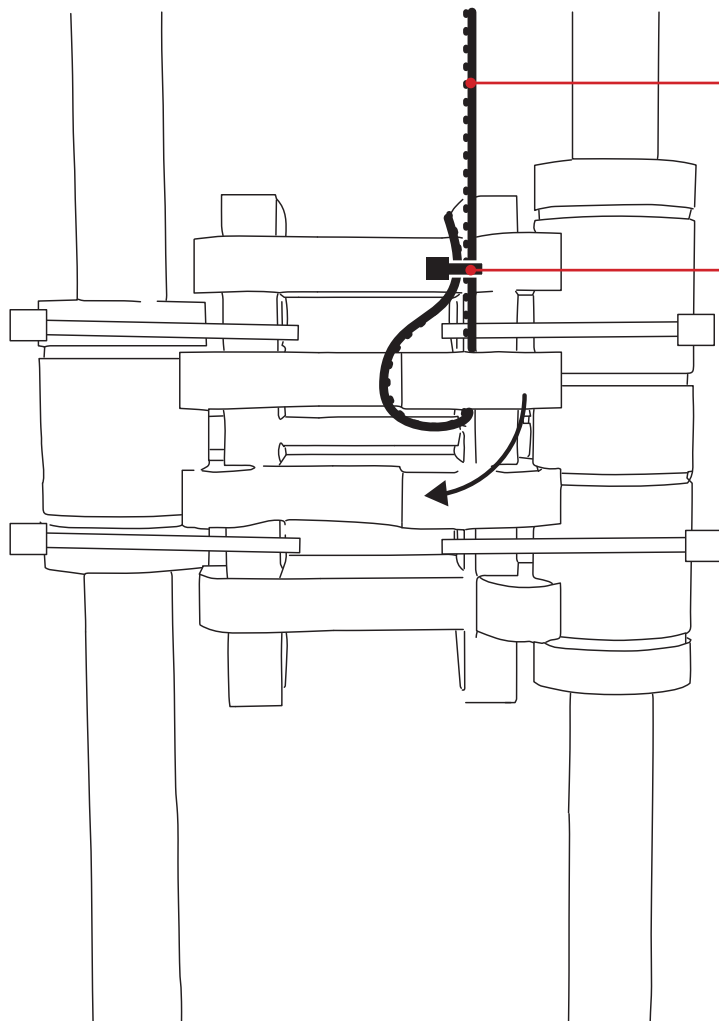


2



1

Teeth in the direction of the pulleys

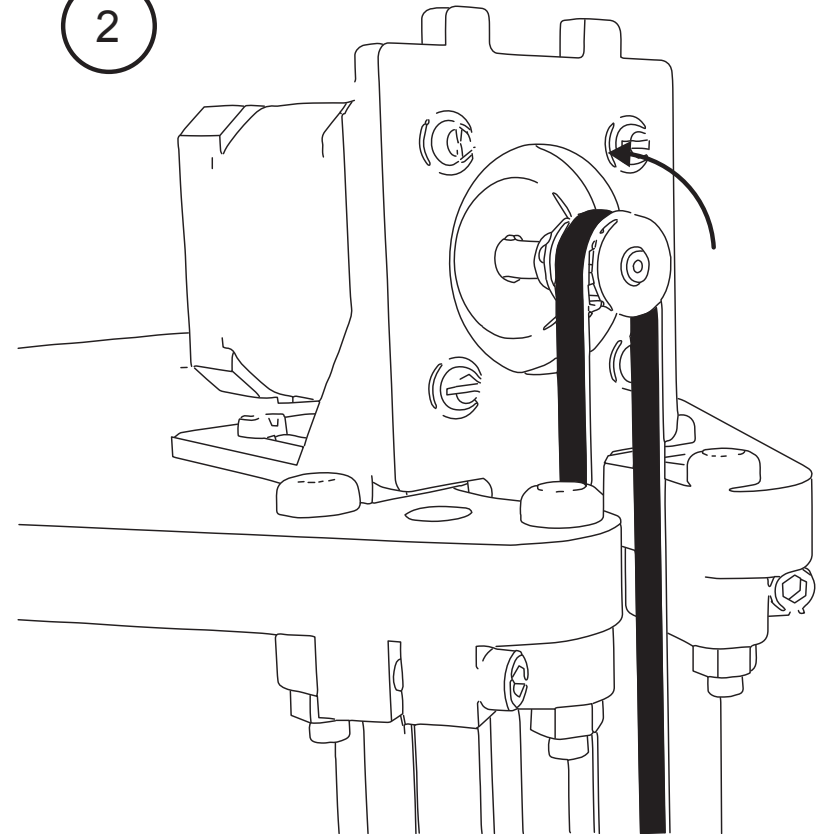


Belt

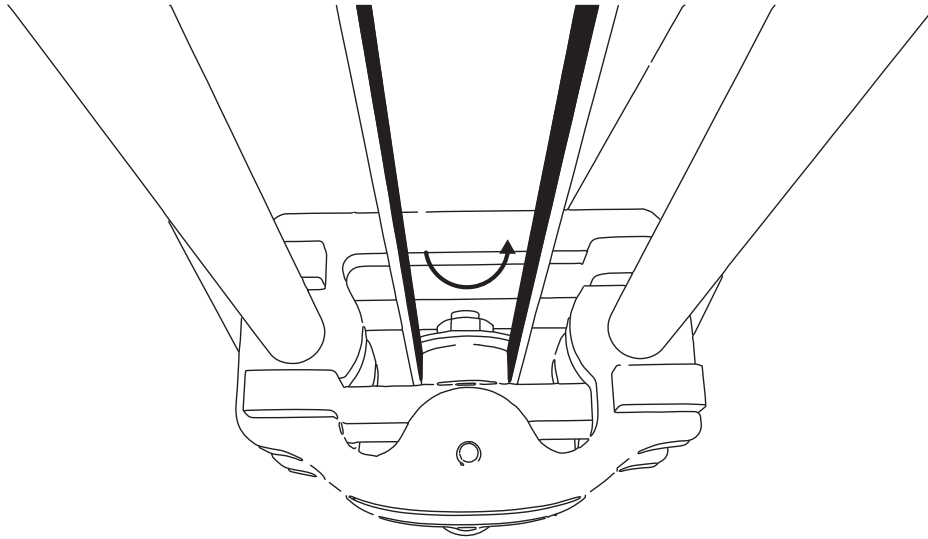
Zip tie

Position the zip tie as close as possible to the slider

2



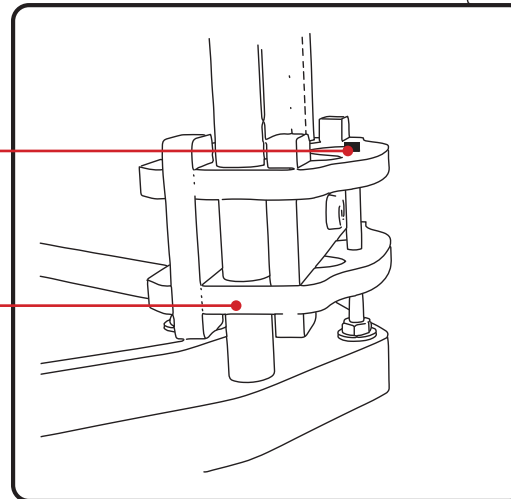
1



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

M3x50 Screw

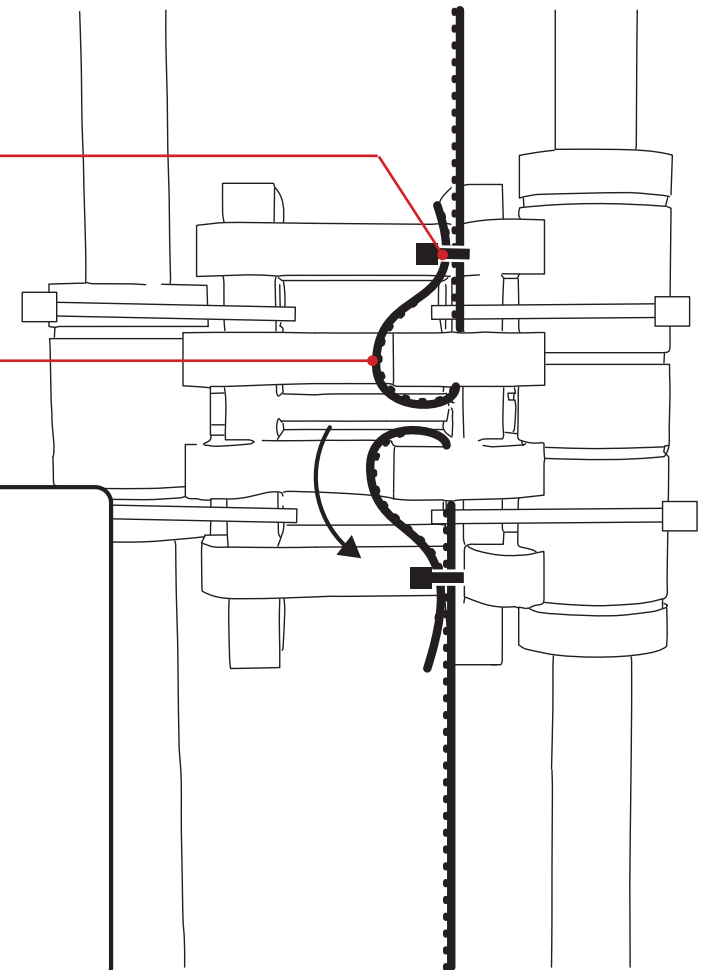
Tensioner

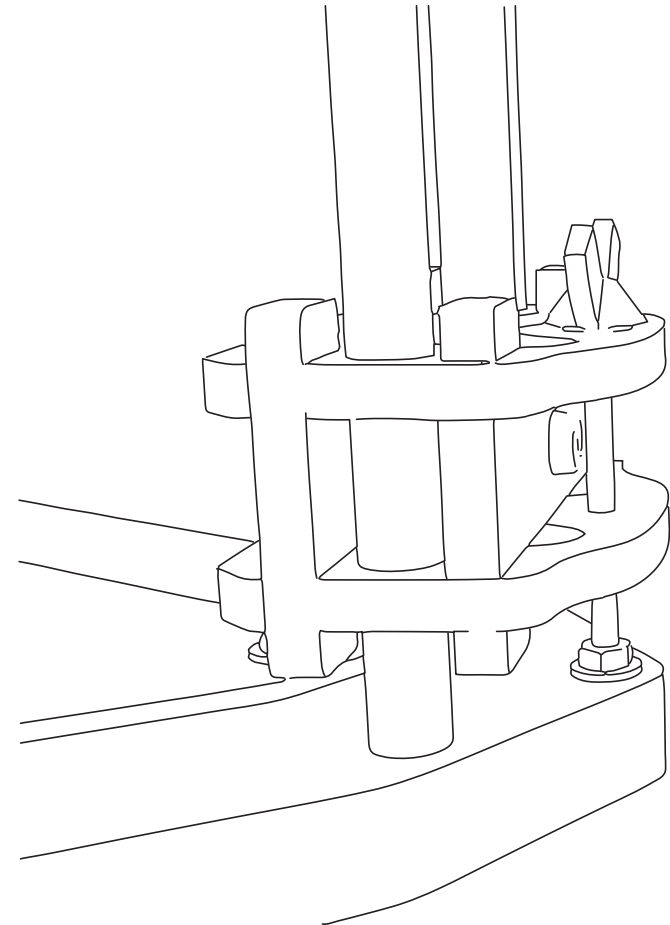
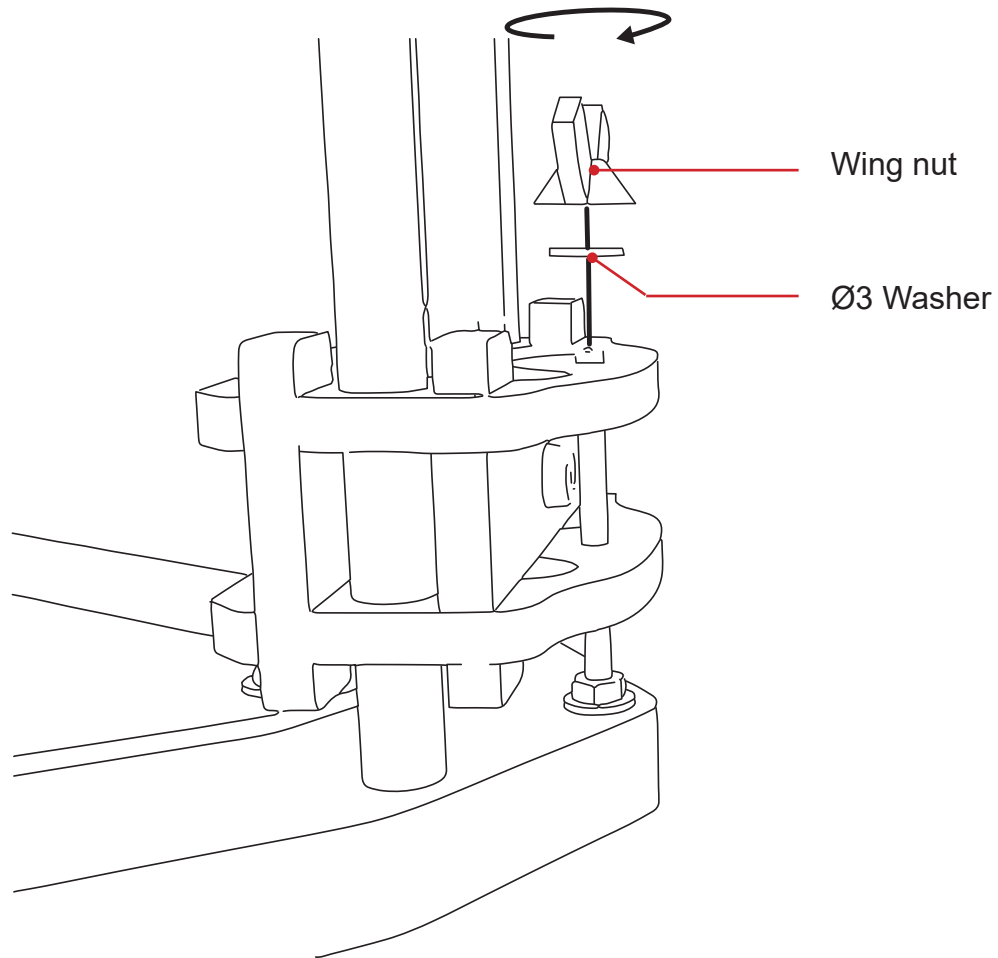


2

Zip tie

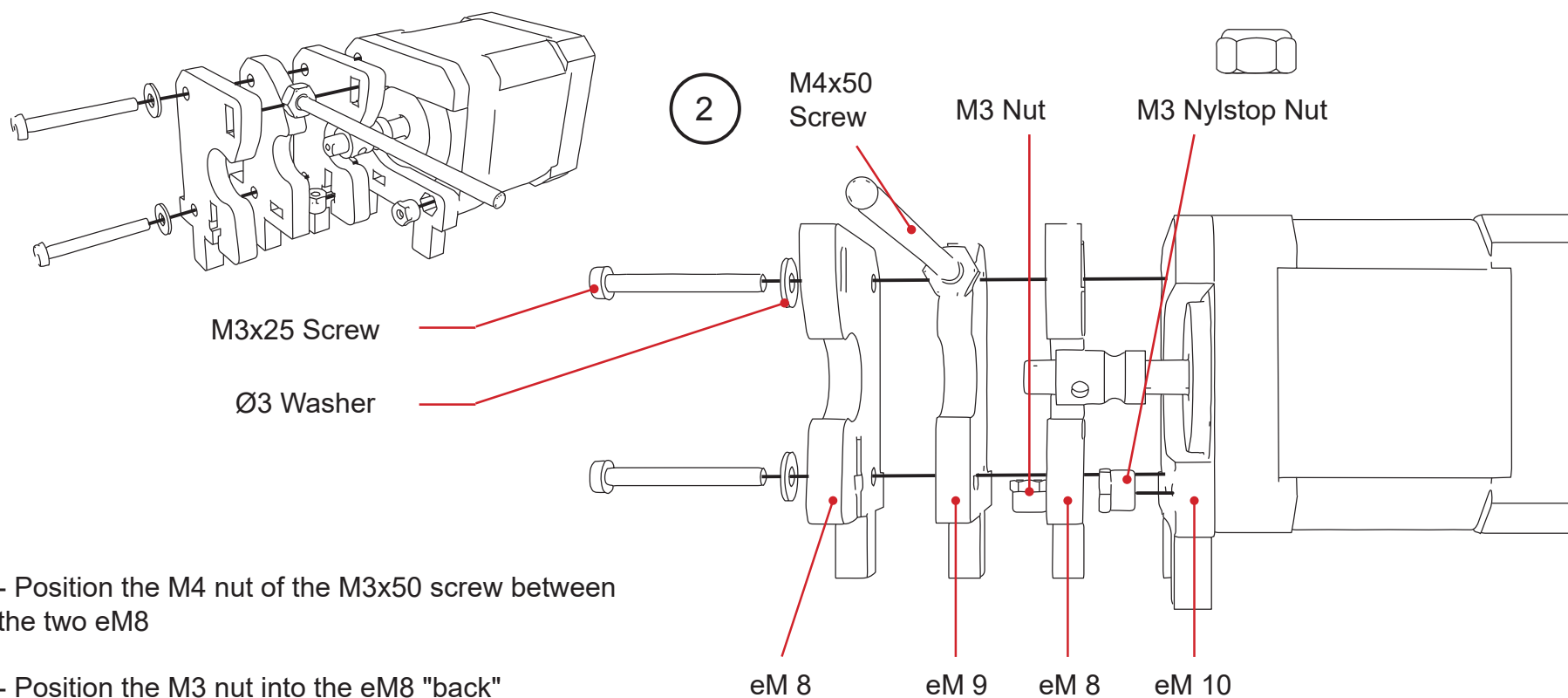
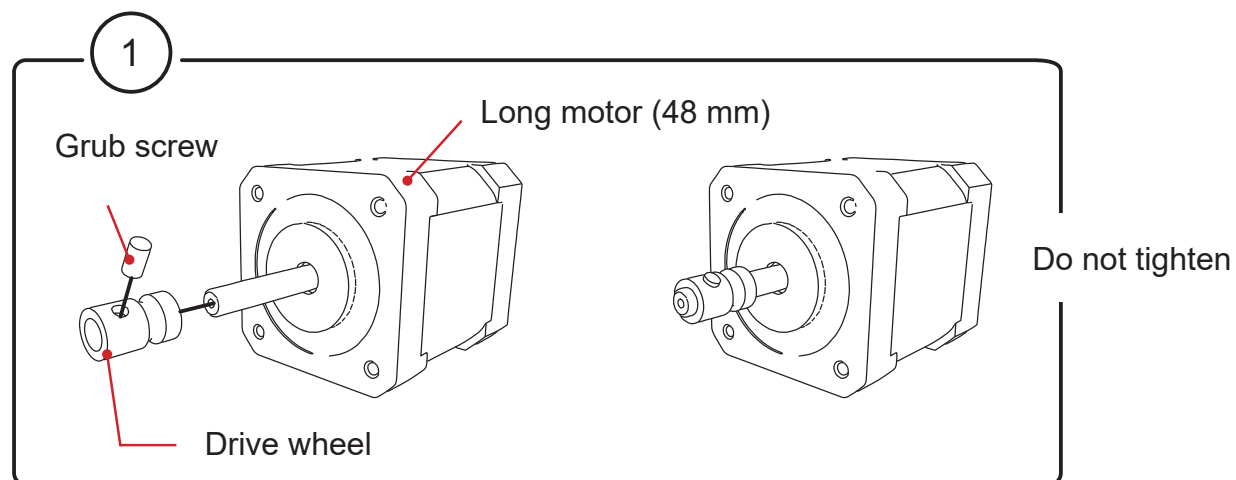
Belt

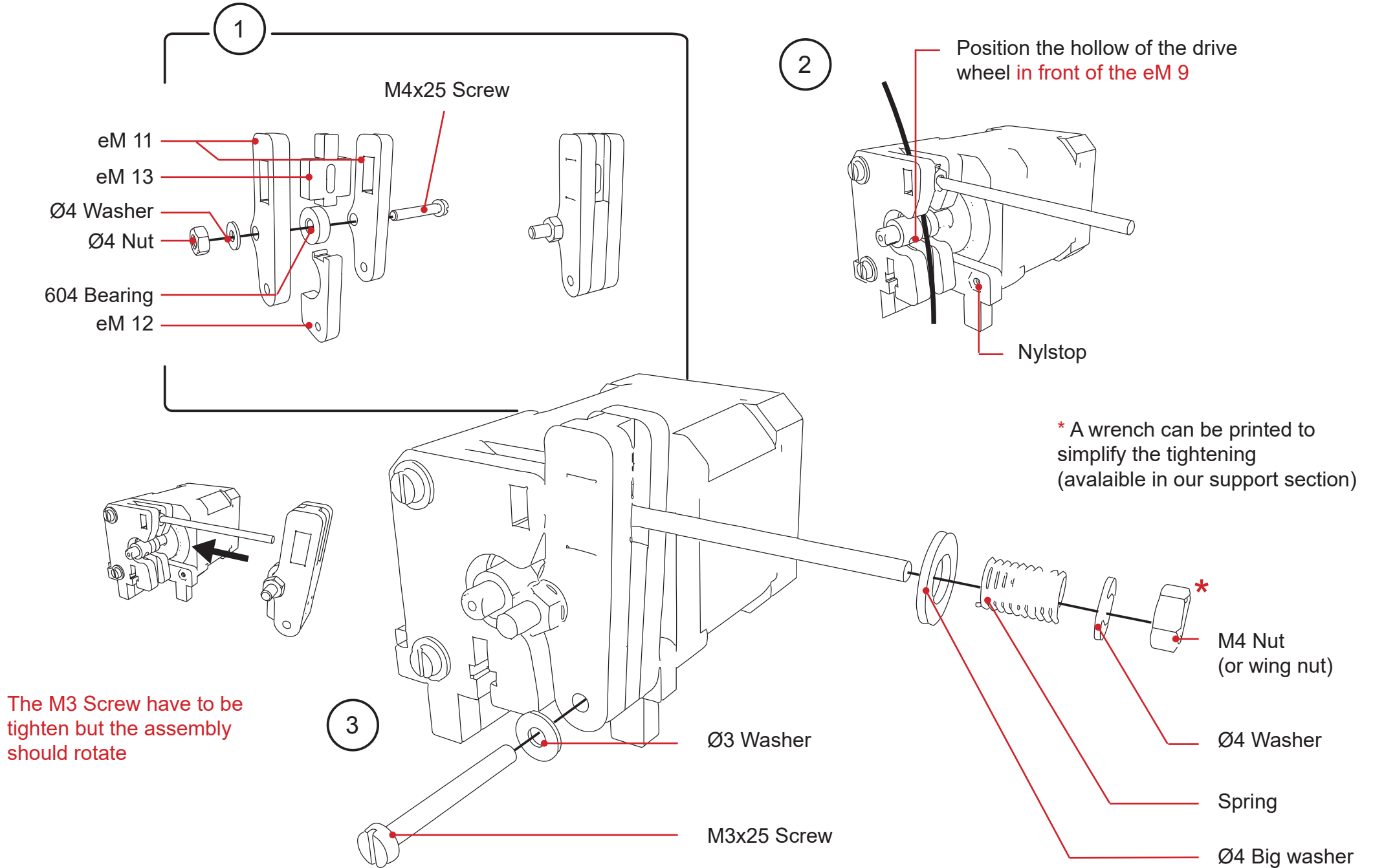


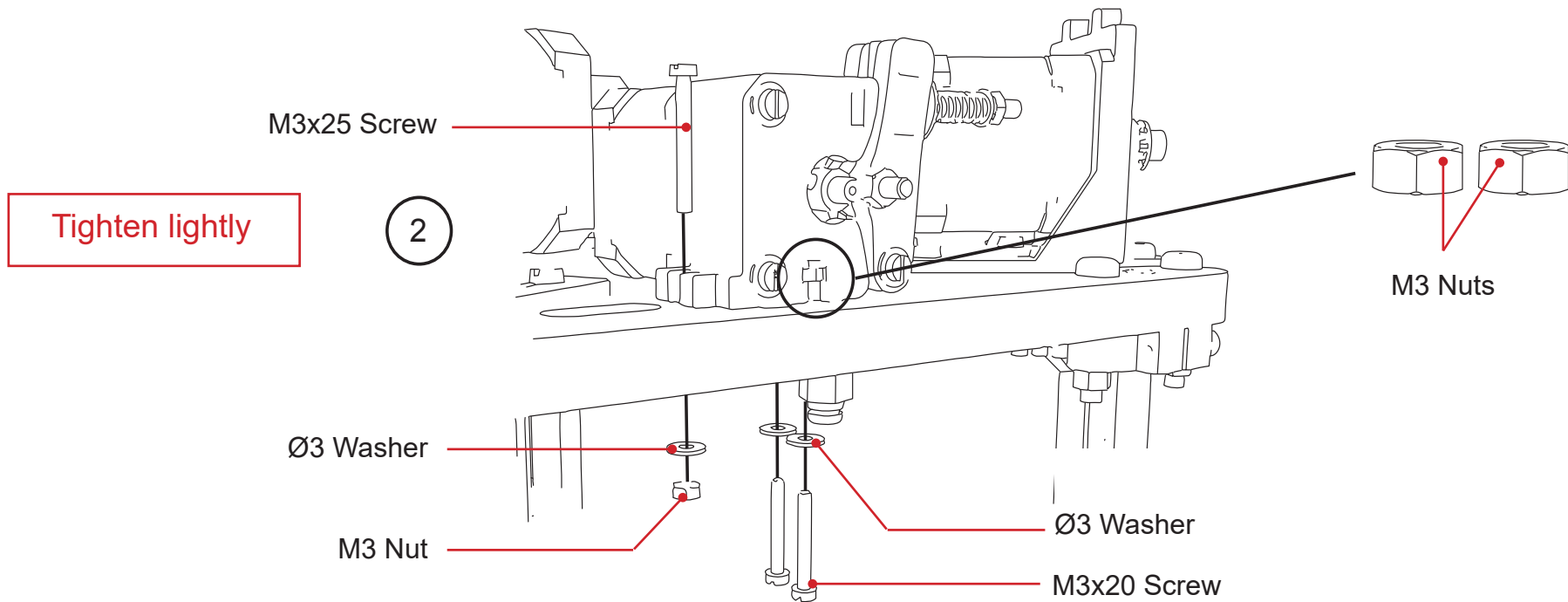
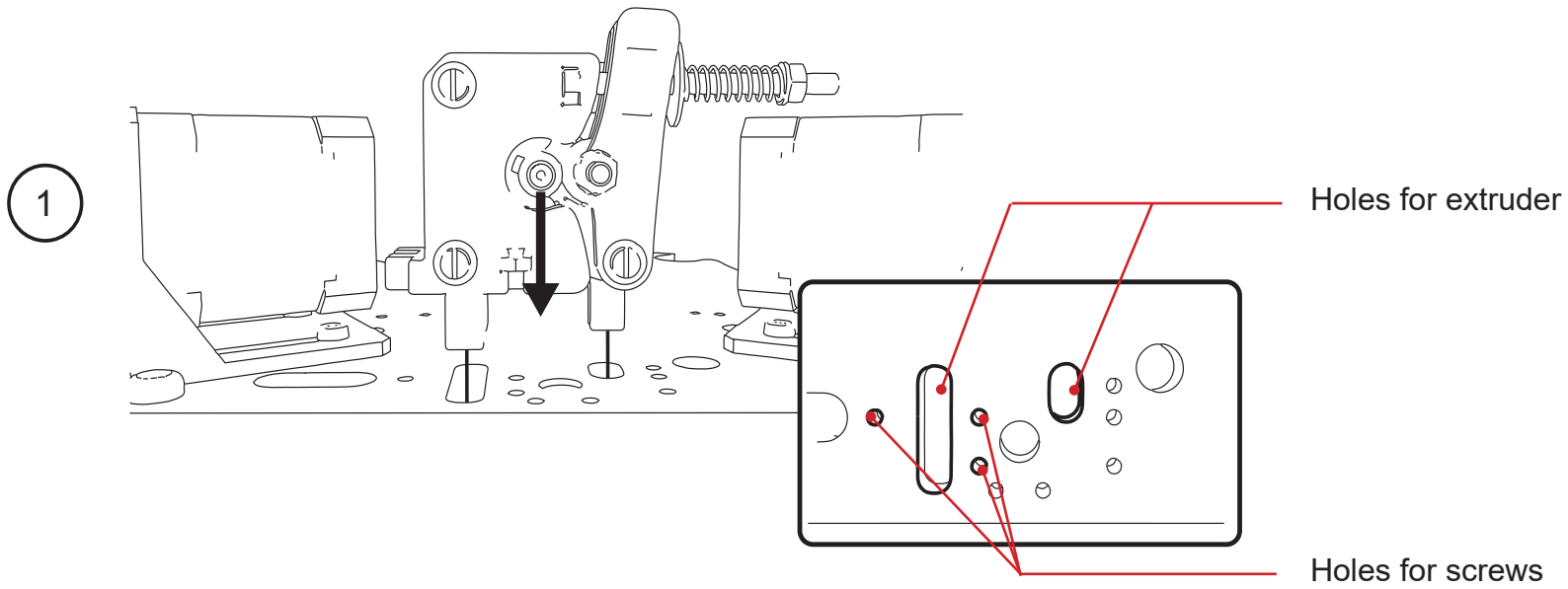


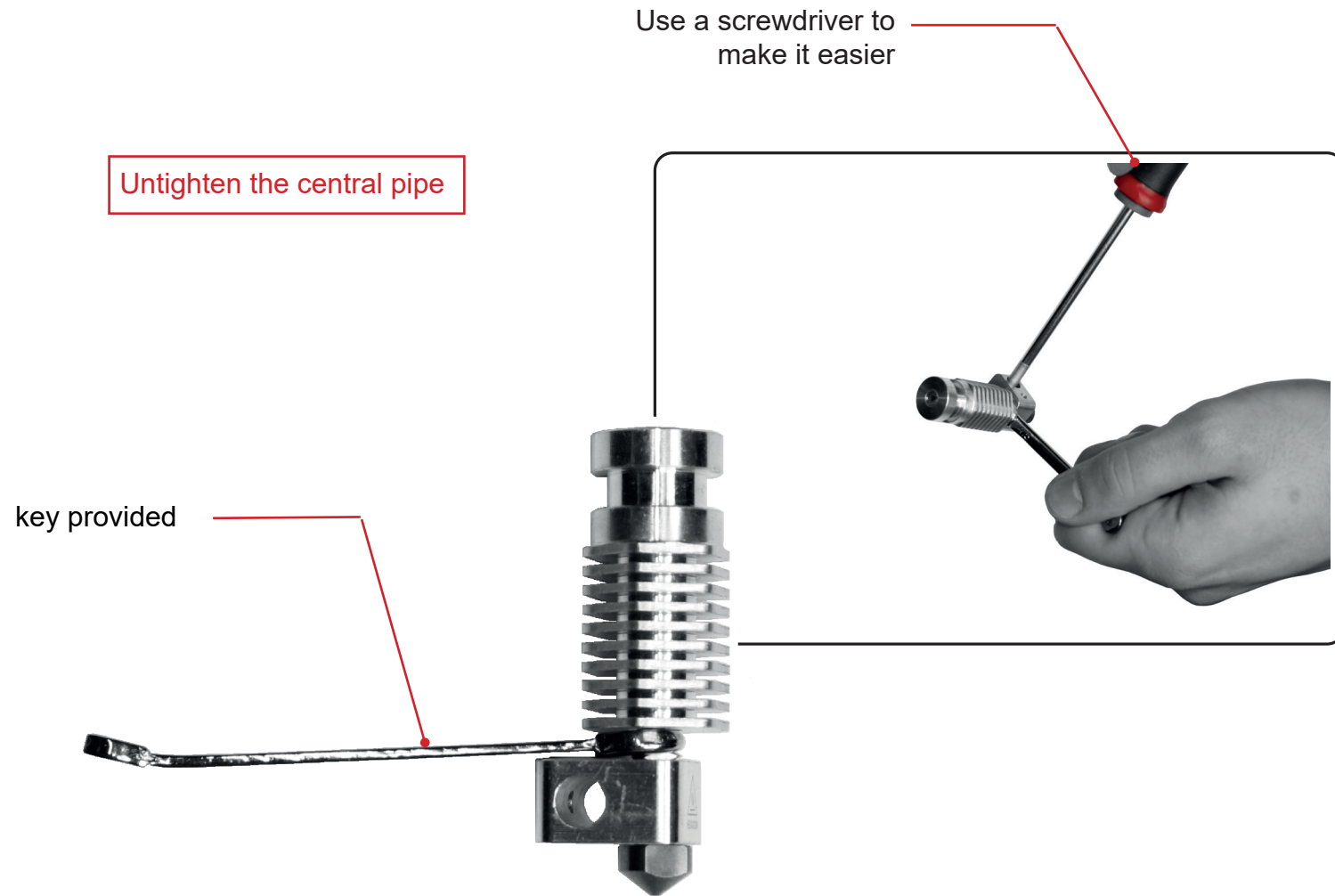
Tighten the nut to tight the belt

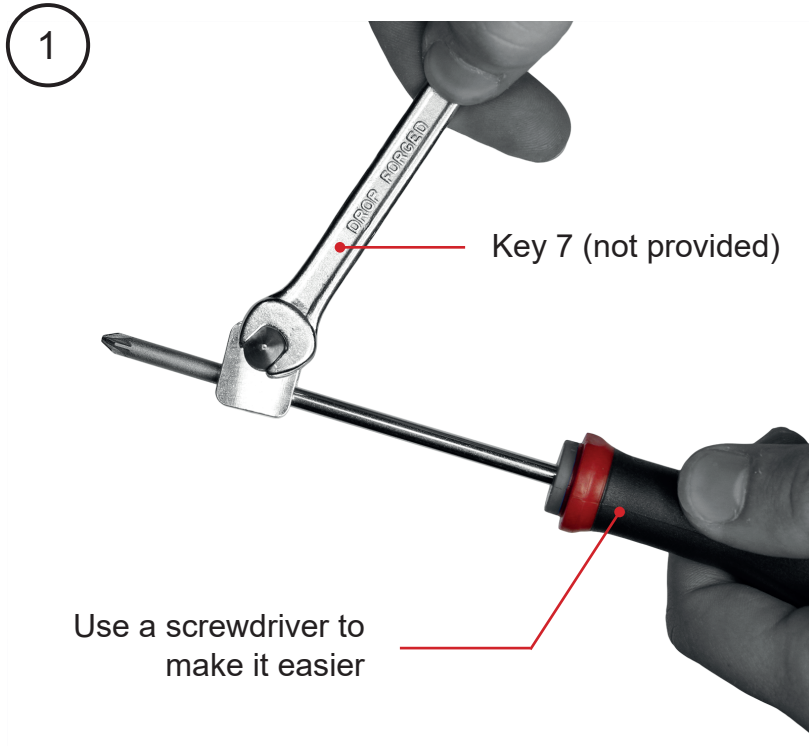
The belt doesn't have to be too tight to avoid deformation



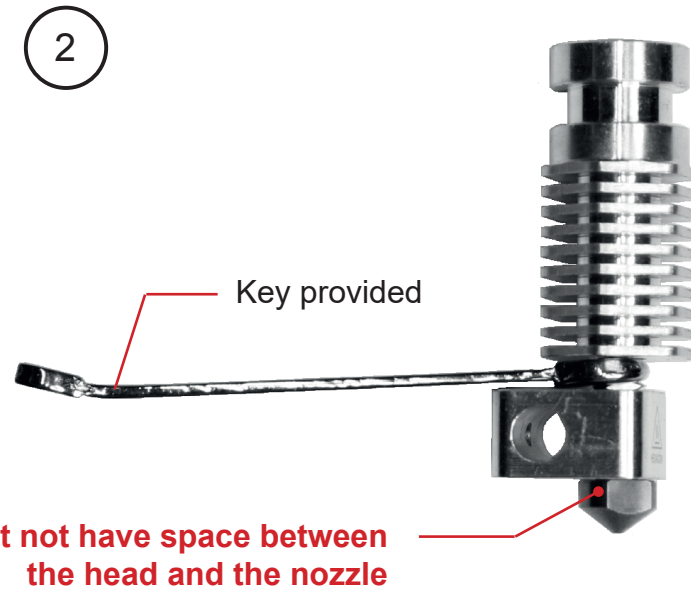








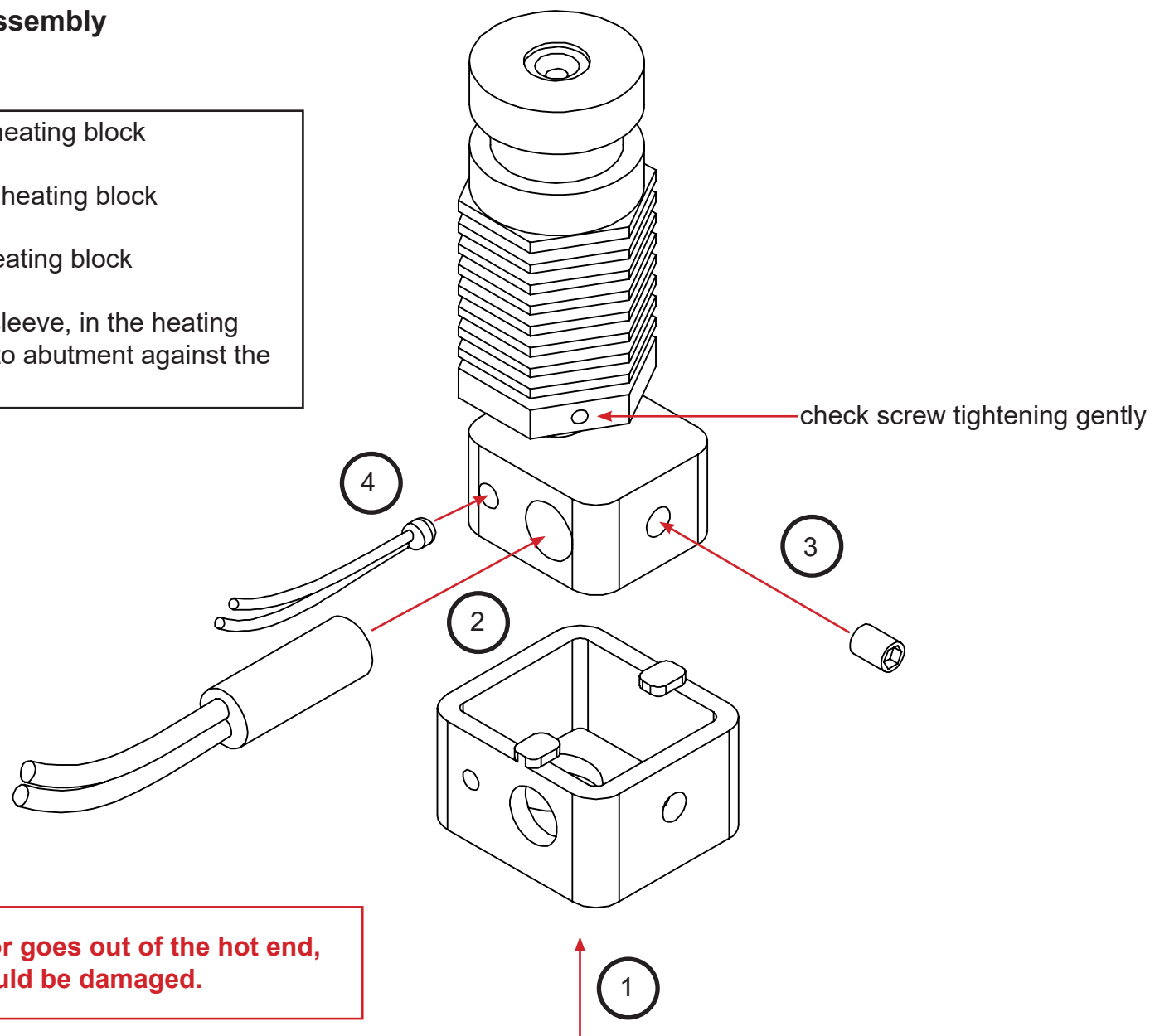
Tighten the nozzle



Tighten the central pipe

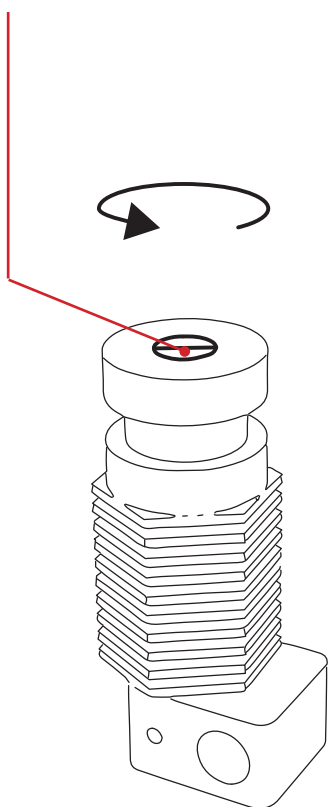
Print head : direction of assembly

- 1°) silicon sleeve on to the heating block
- 2°) heater cartridge into the heating block
- 3°) headless screw in the heating block
- 4°) thermistor through the sleeve, in the heating block, it must be pressed into abutment against the receptacle.

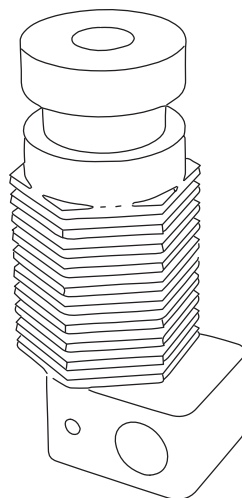


Caution ! If the thermistor goes out of the hot end, your printer could be damaged.

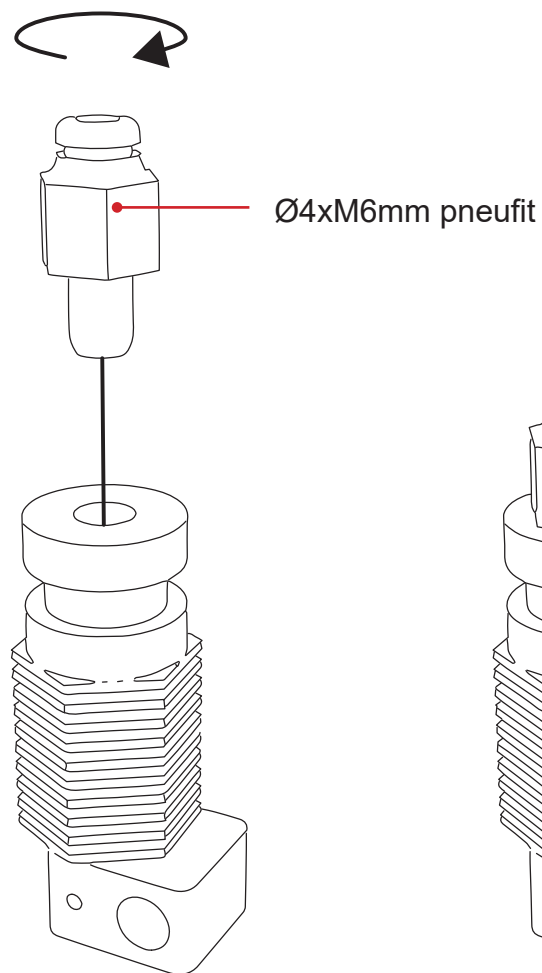
Unscrew the filament guide



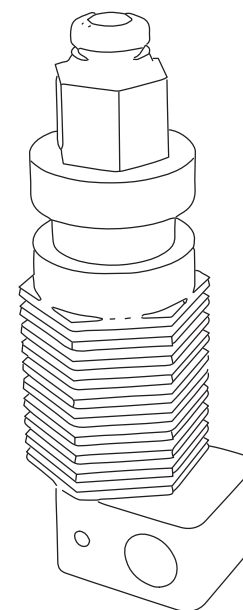
1



2

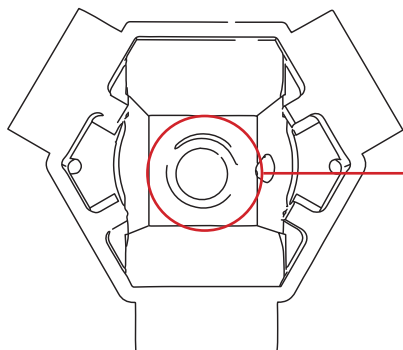


3

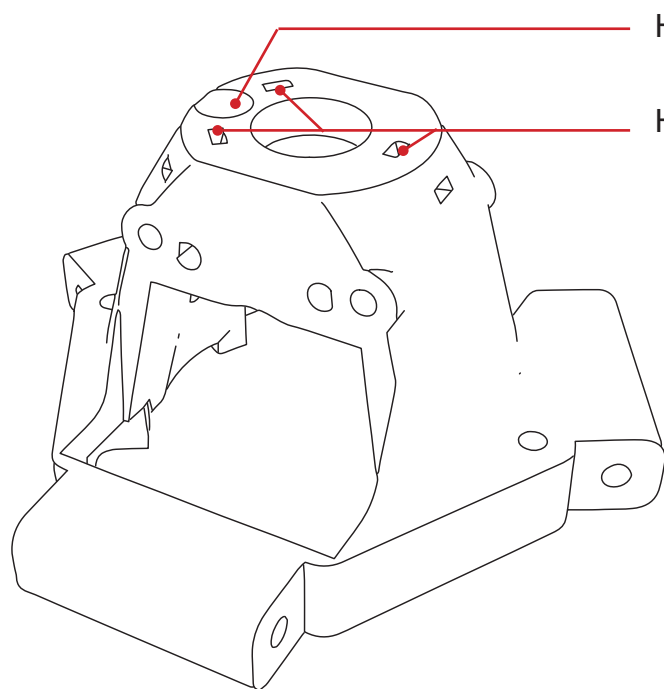


4

If you have a LED ring, please read the the «Add-On» section to know how to mount and set it.

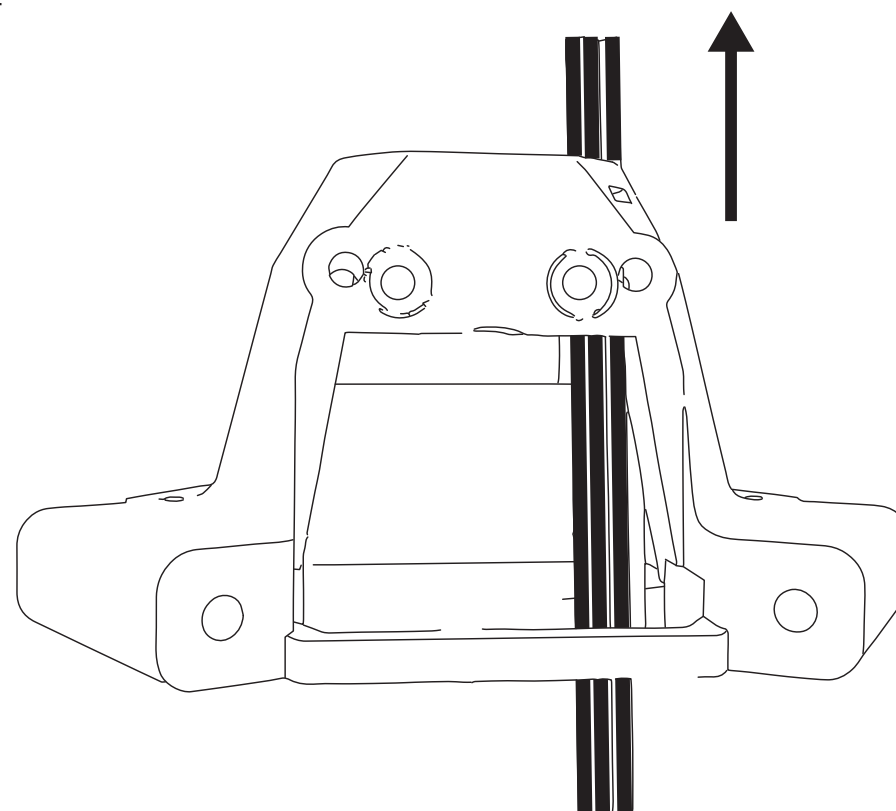


Make sure the core is free of impurities.



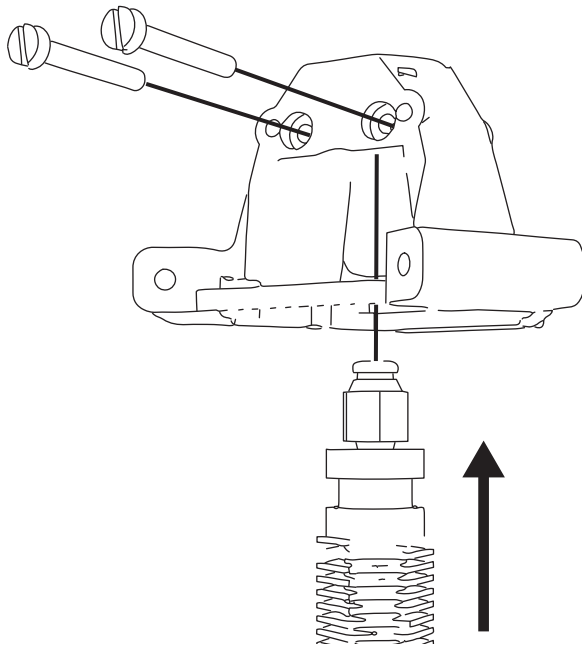
Hole for wires

Hole for Zip tie



Put cables through the wire hole.

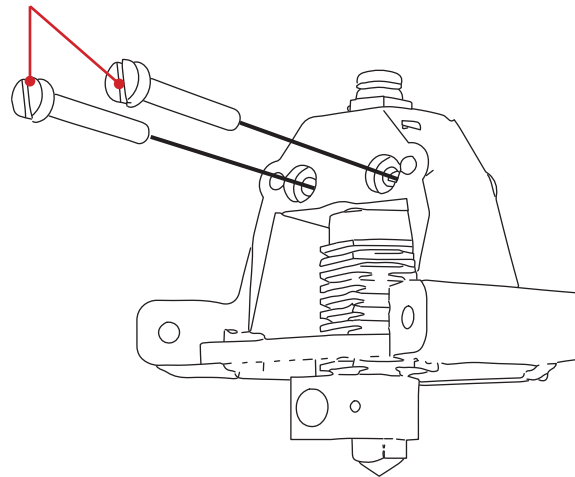
1



Position the Hexagon against the
core **before screwing**

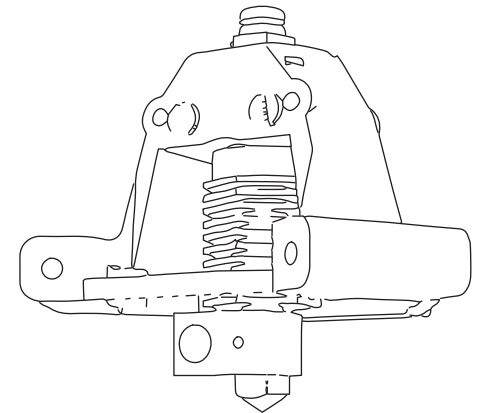
2

M3x20 screw

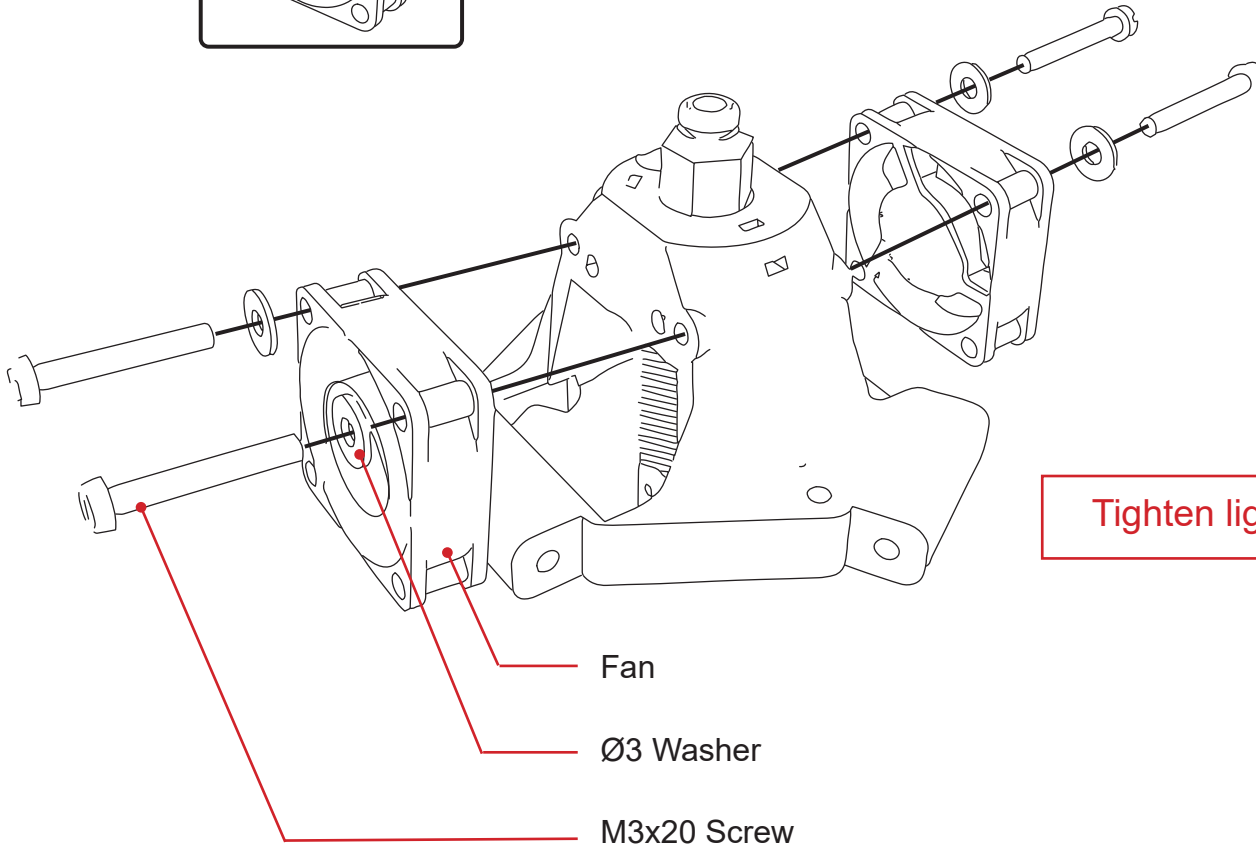
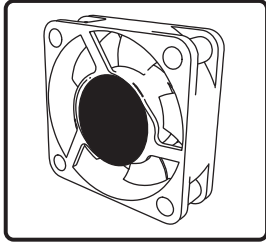


Tighten

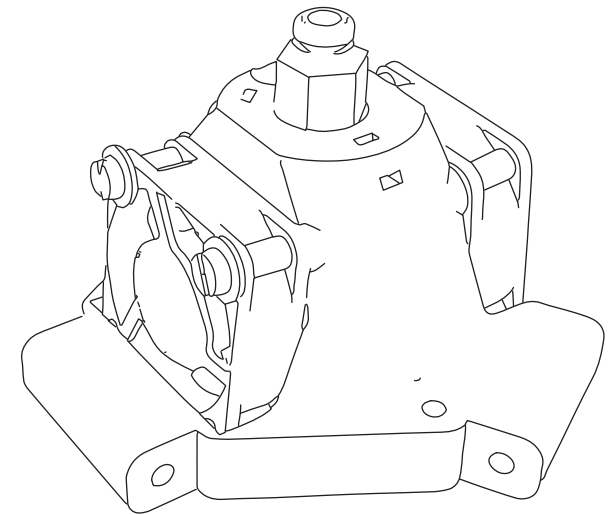
3



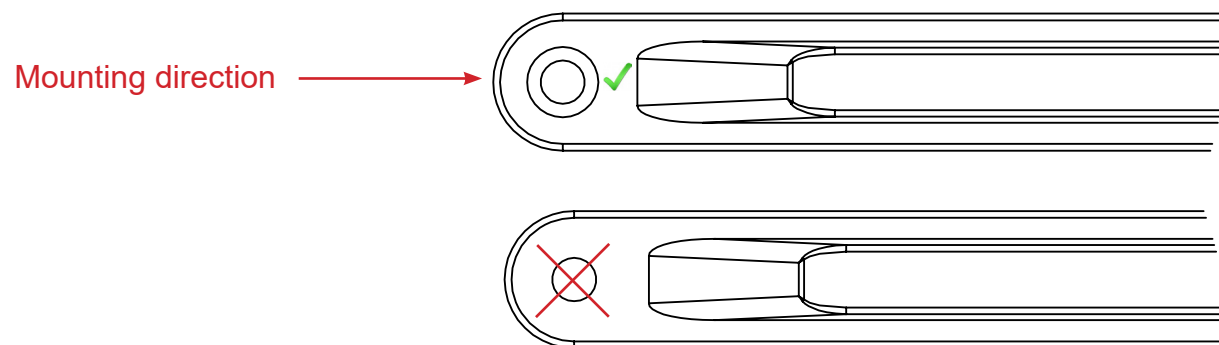
The side with the **sticker** must be oriented **toward the hotend**



Tighten lightly

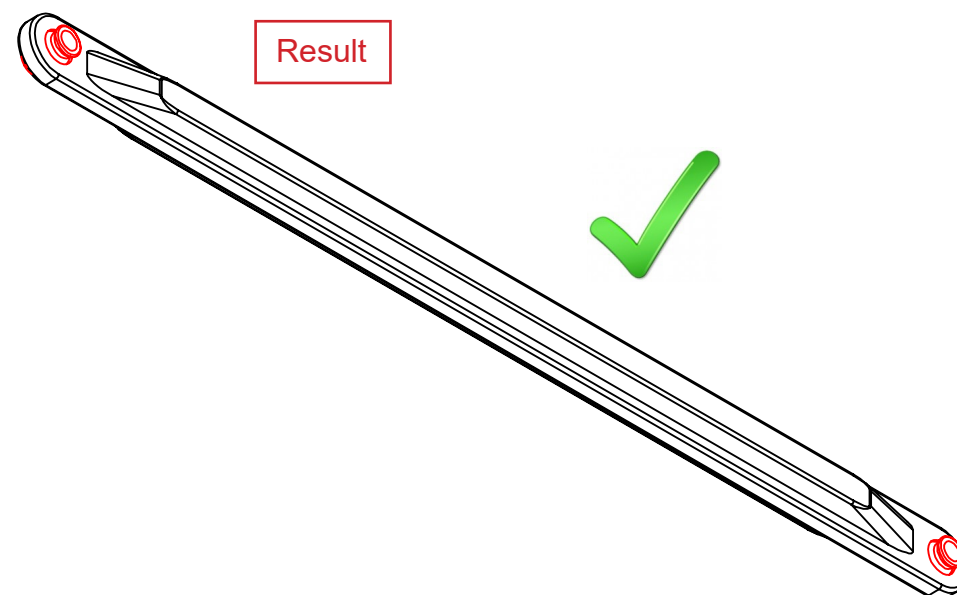
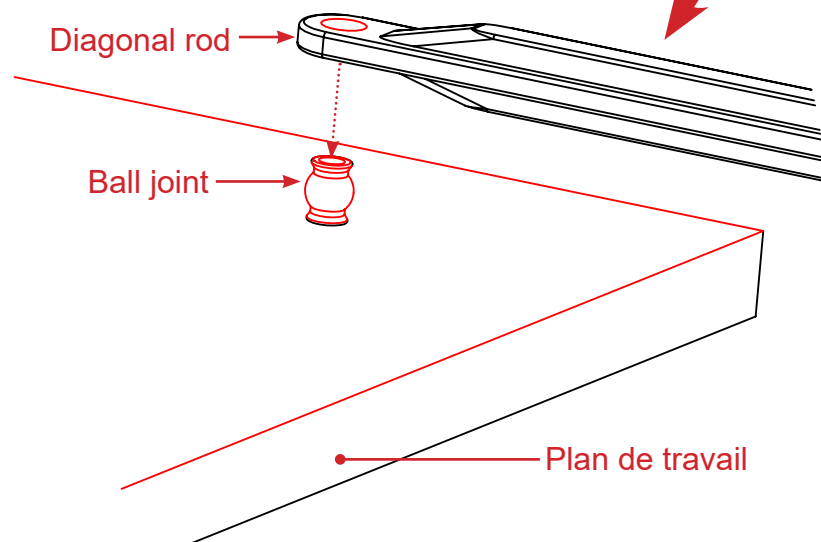


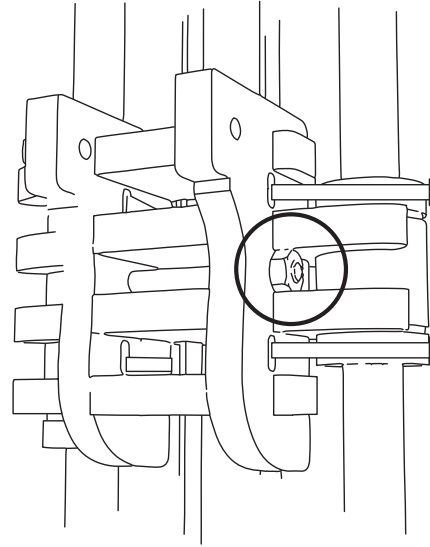
Assembly of ball joint with diagonal rods



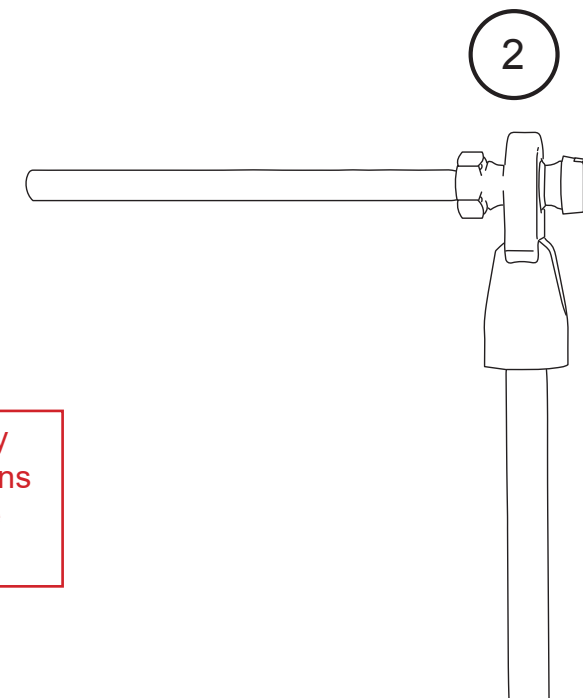
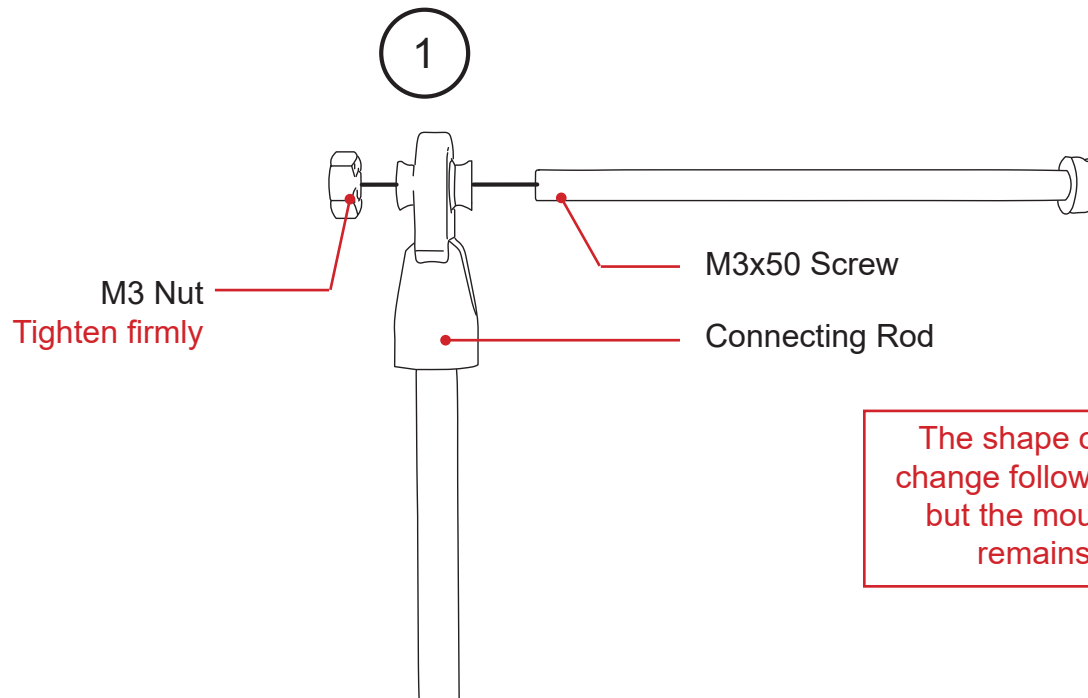
Place the ball on a sturdy work plan and press the rod above to clip the two elements together.

PRESS TO CLIP

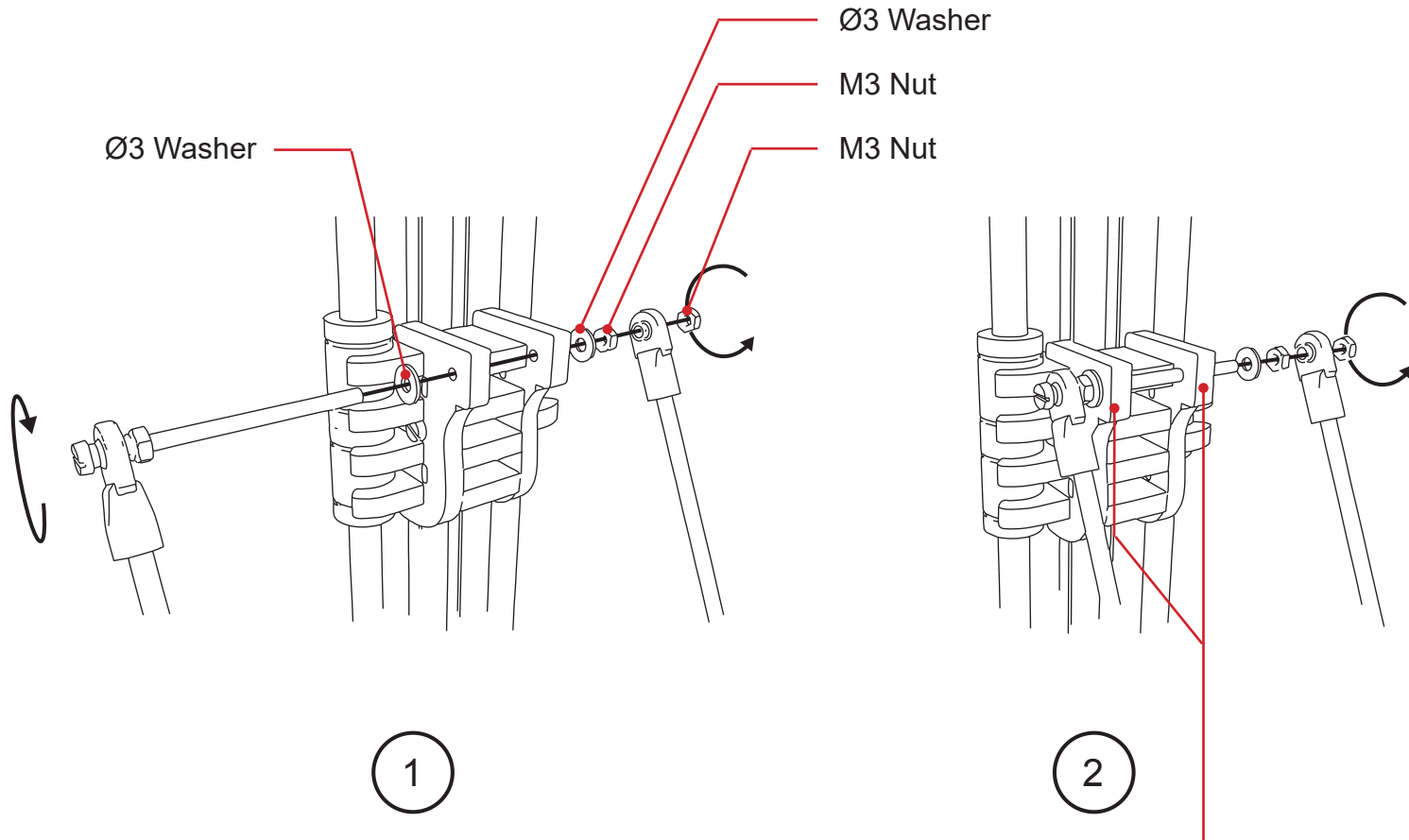




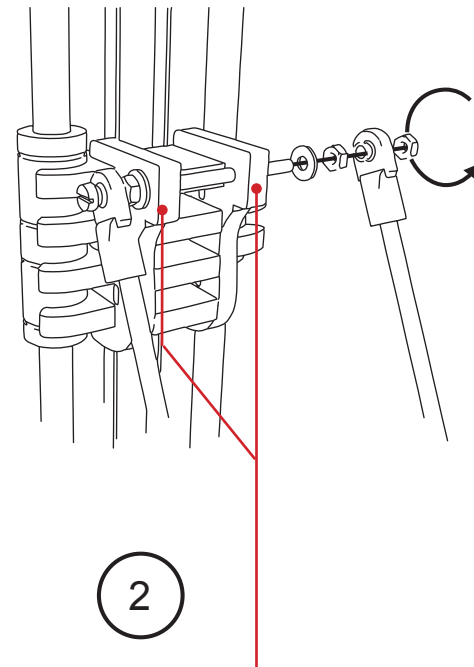
Note : Check this nut is tighten



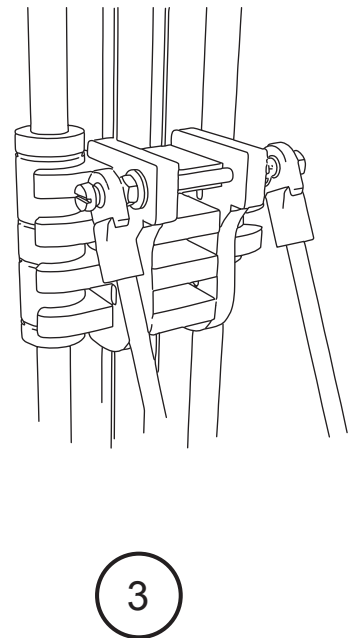
The shape of the rods may change following the revisions but the mounting principle remains the same.



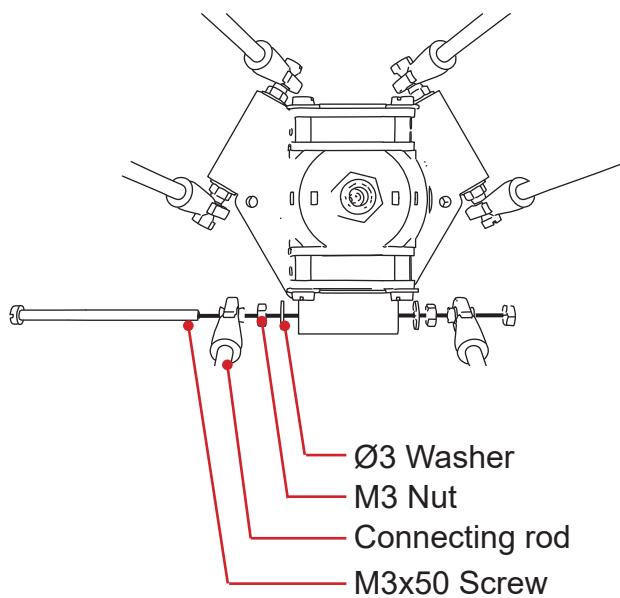
Caution : The assembly must not twist the slider.



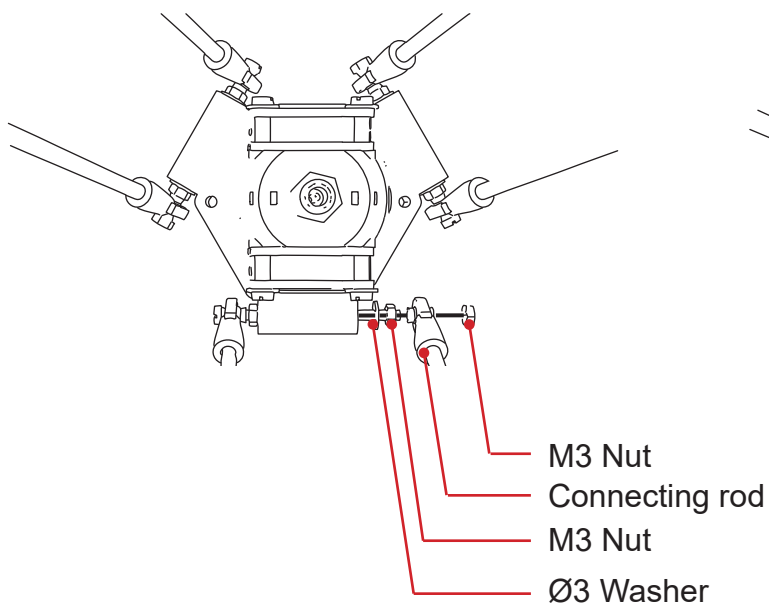
eM 5 must remain parallel



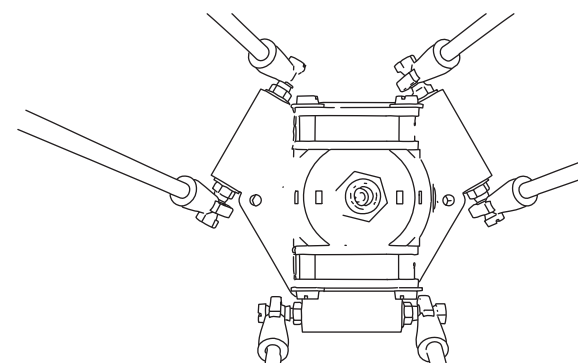
1



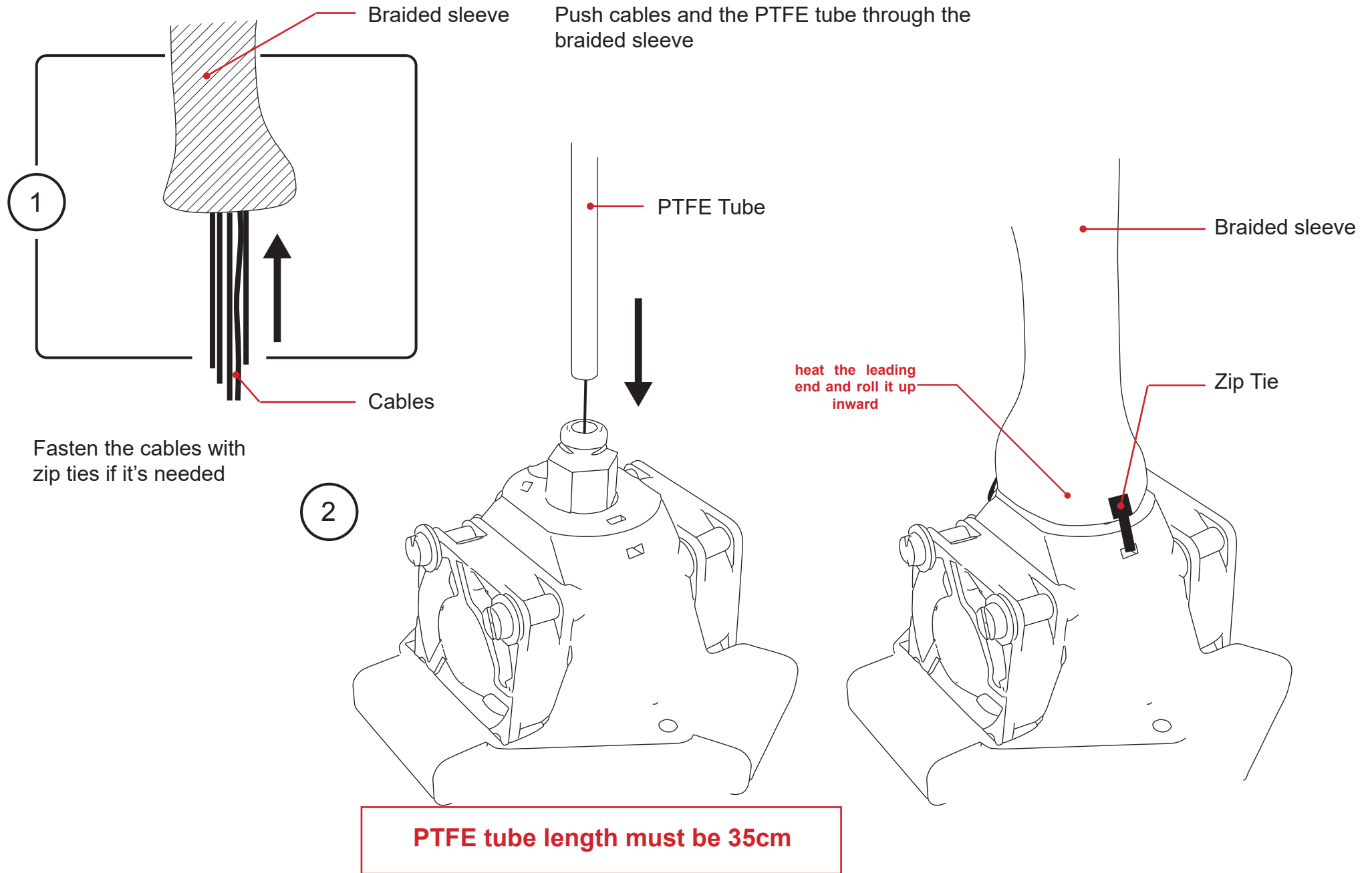
2



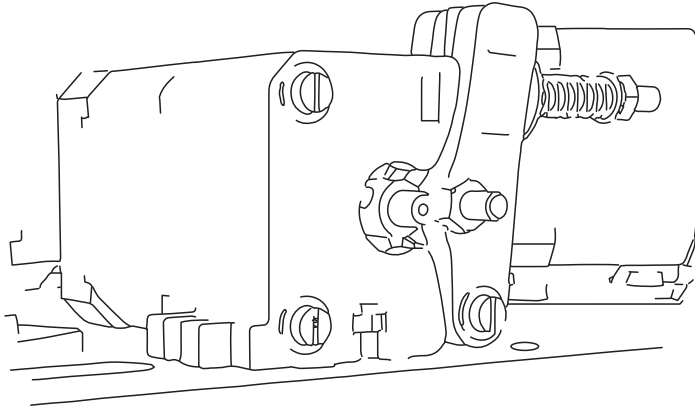
3



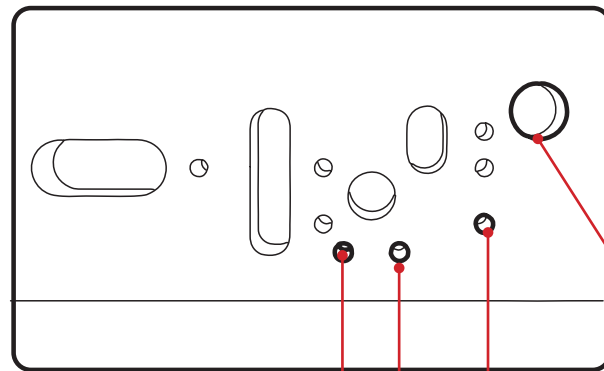
Repeat the operation with the others sides



1



PTFE Tube



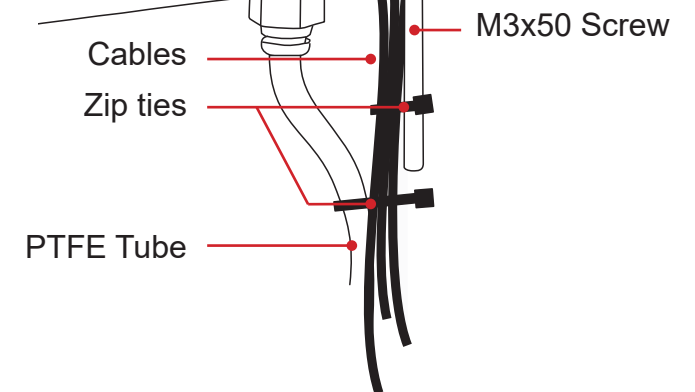
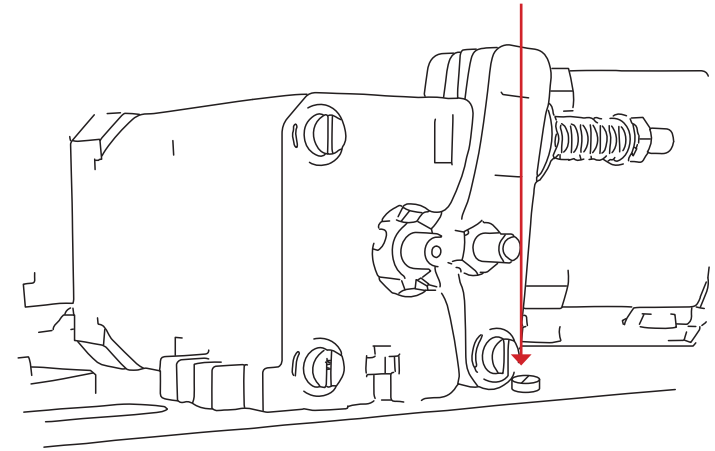
Holes for zip ties

Holes for M3x50
Screws

Hole for cables

2

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

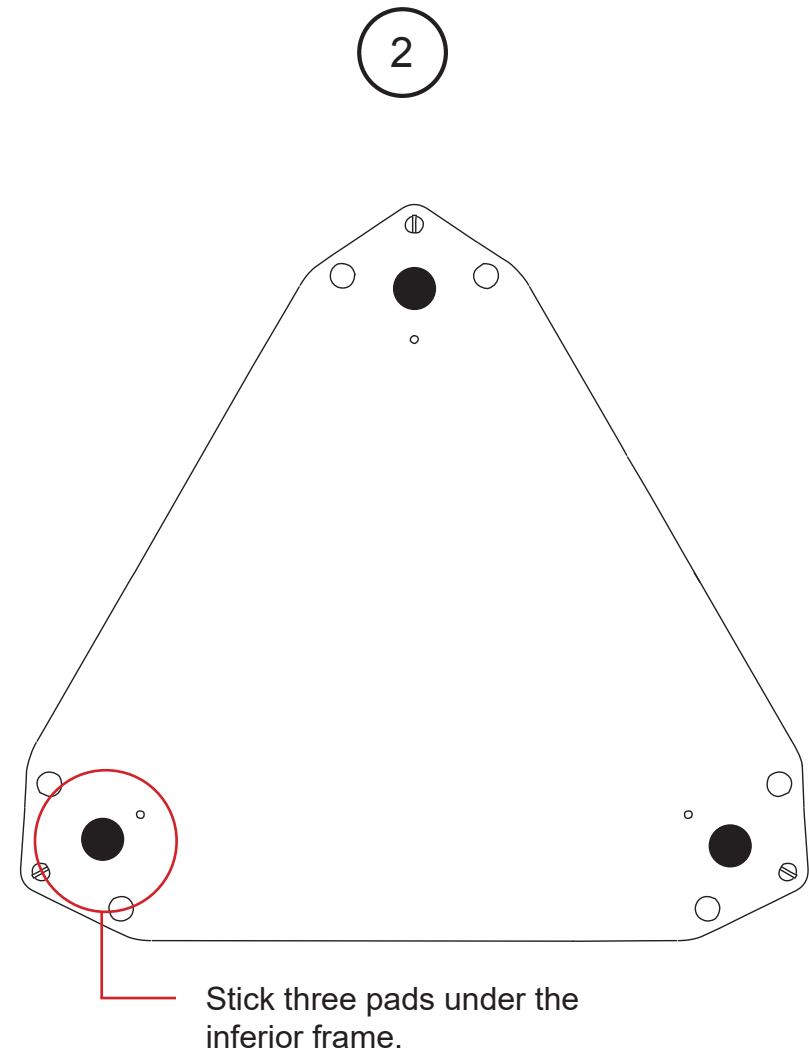
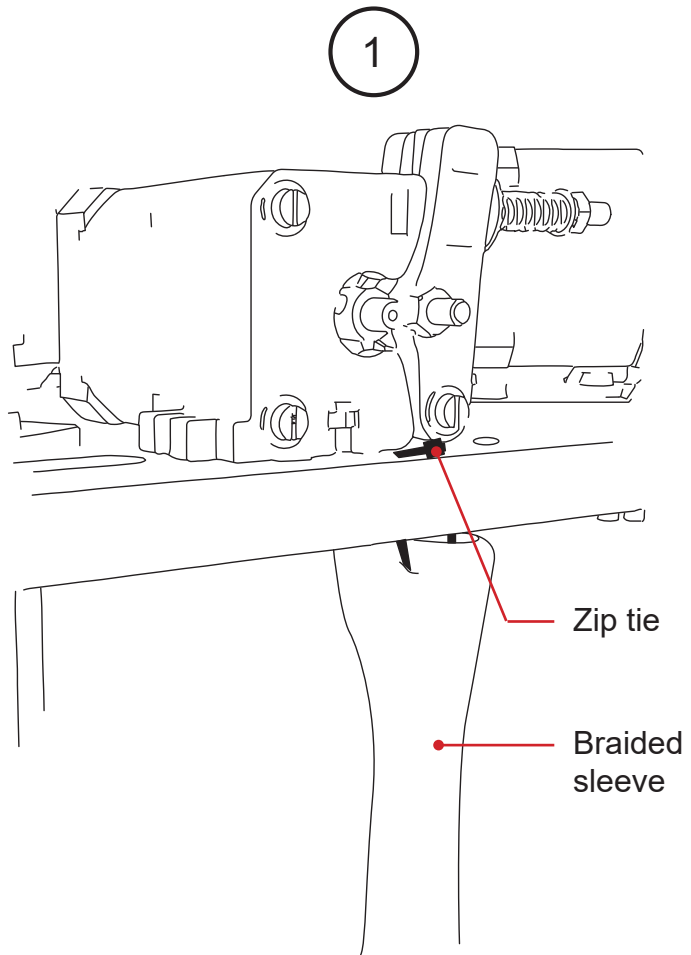


Cables

Zip ties

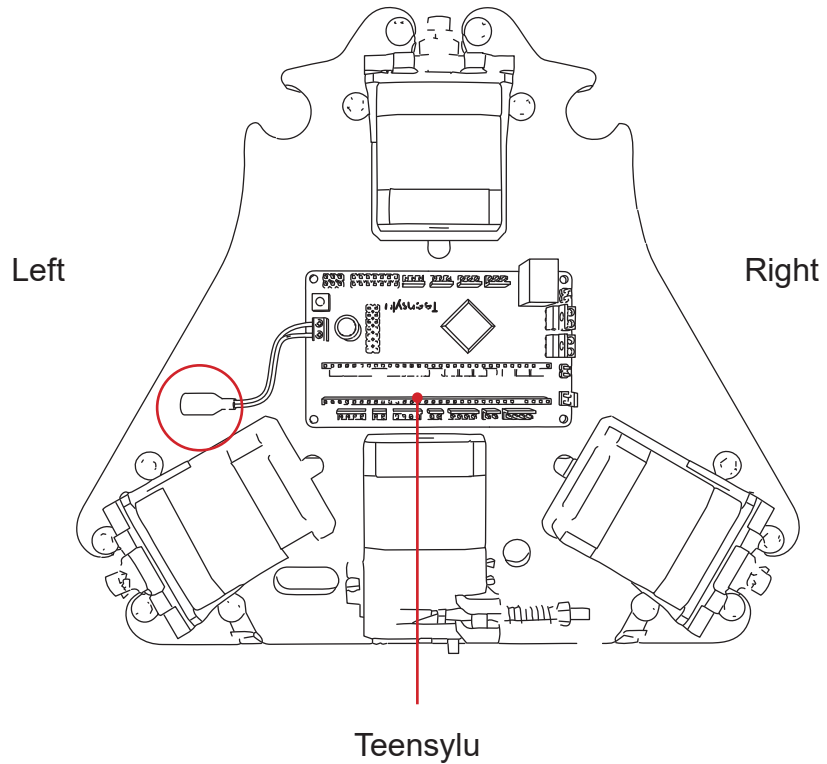
PTFE Tube

M3x50 Screw

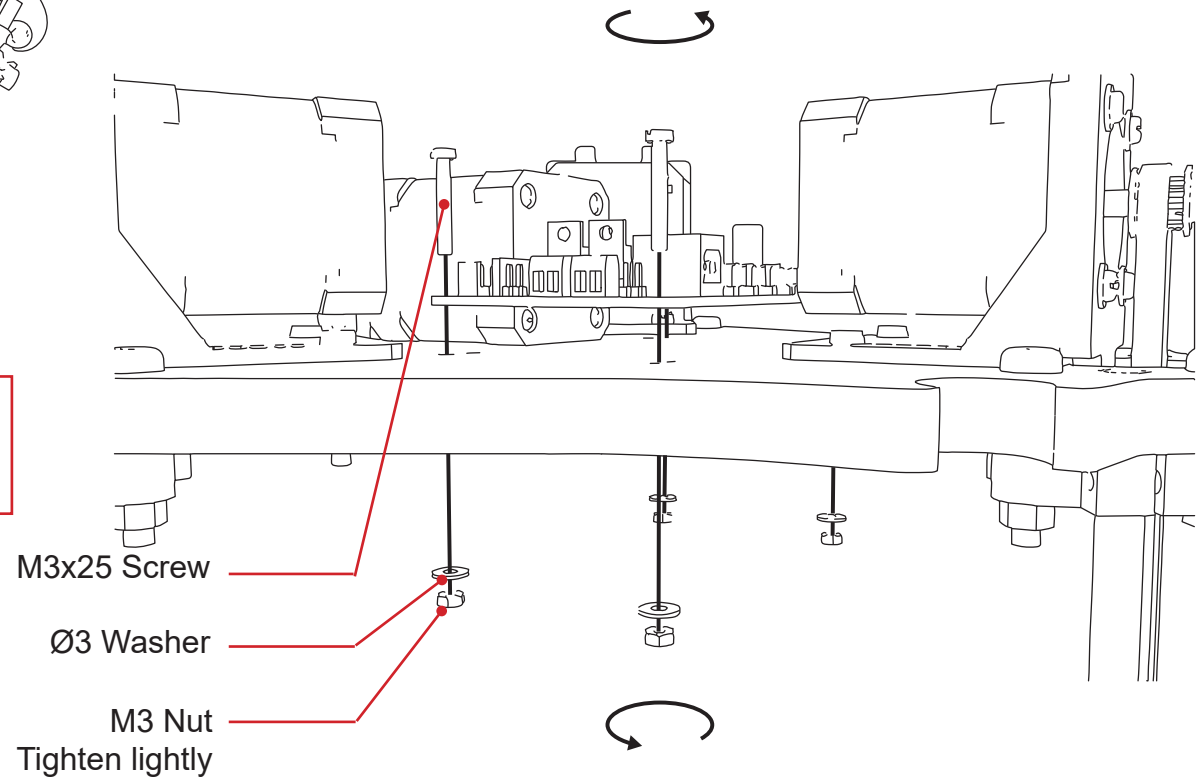


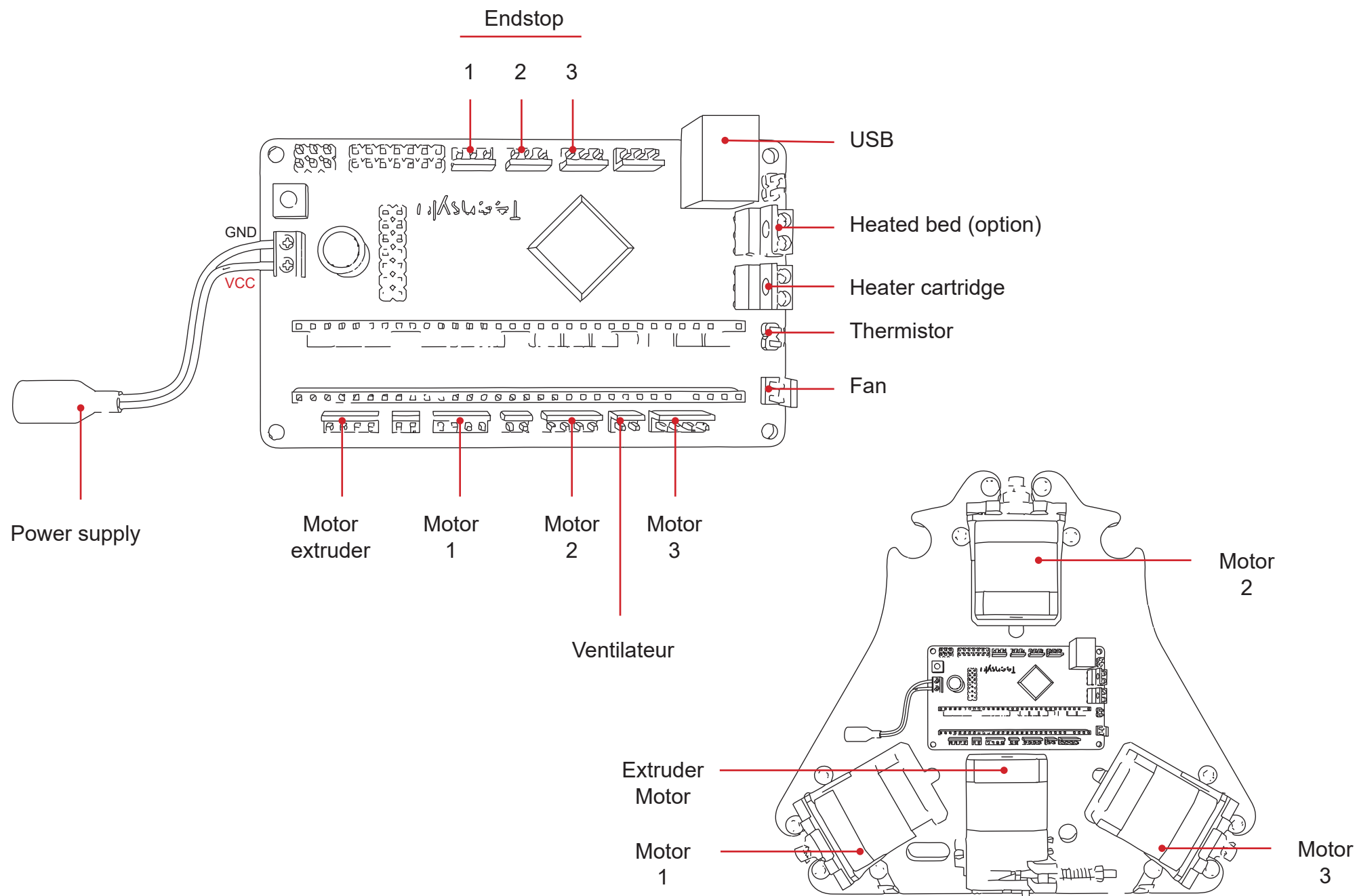


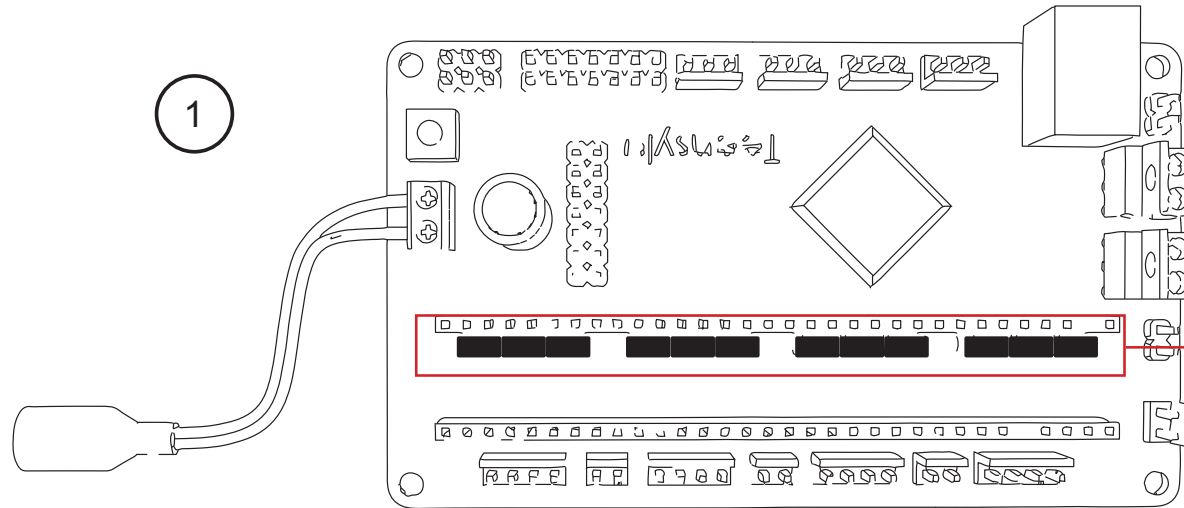
ELECTRONIC ASSEMBLY



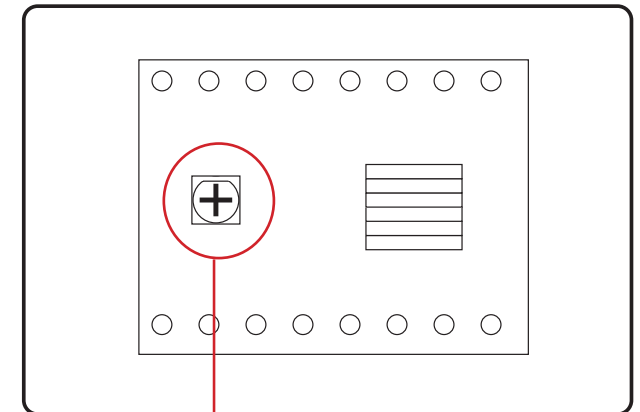
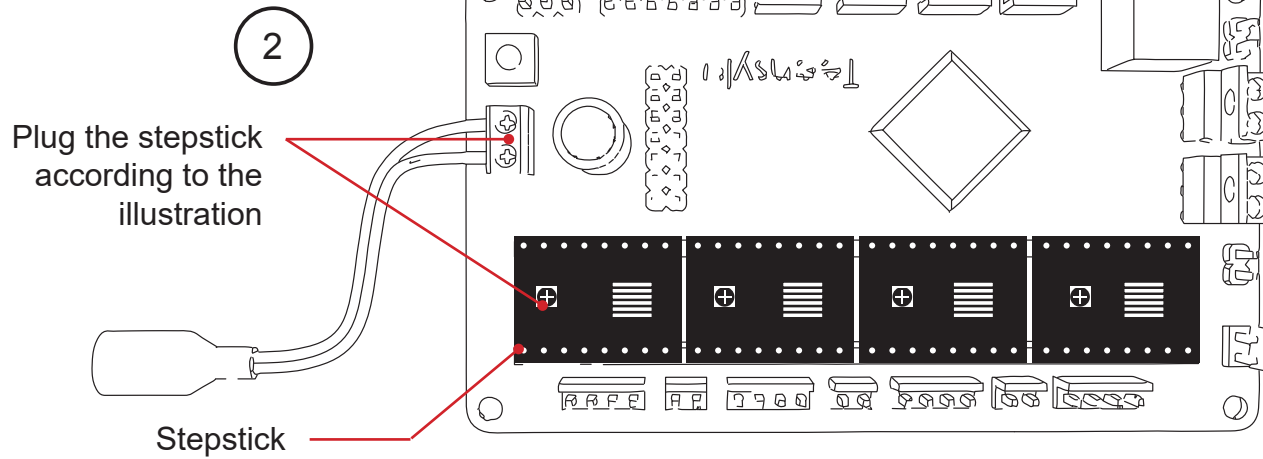
Pay attention to the teensylu orientation





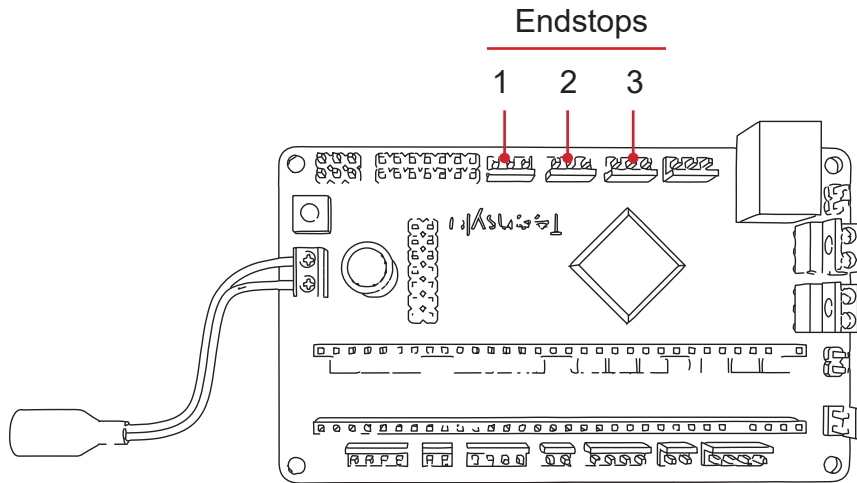


Make sure that you have 12 jumpers connected to the teensylu



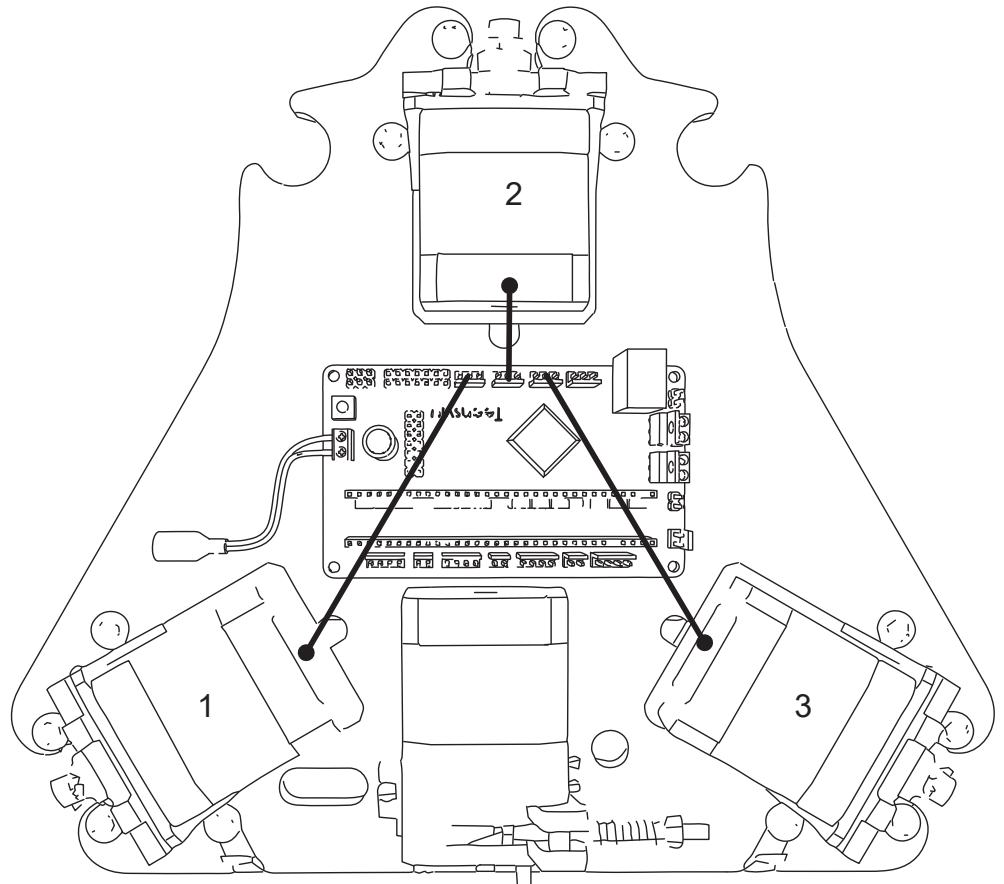
Make sure the flat side is positioned as shown in the image

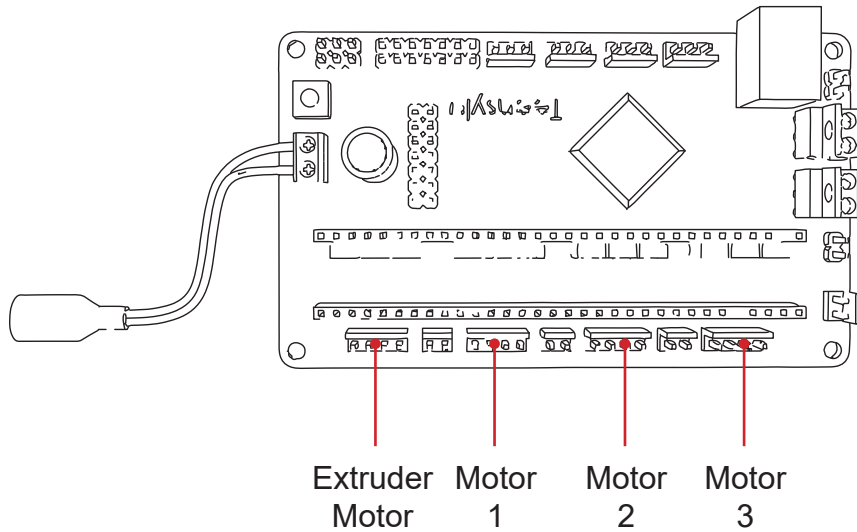
Be careful: The orientation is very important!
(A wrong connection of stepsticks could cause permanent damage)



- Plug endstops

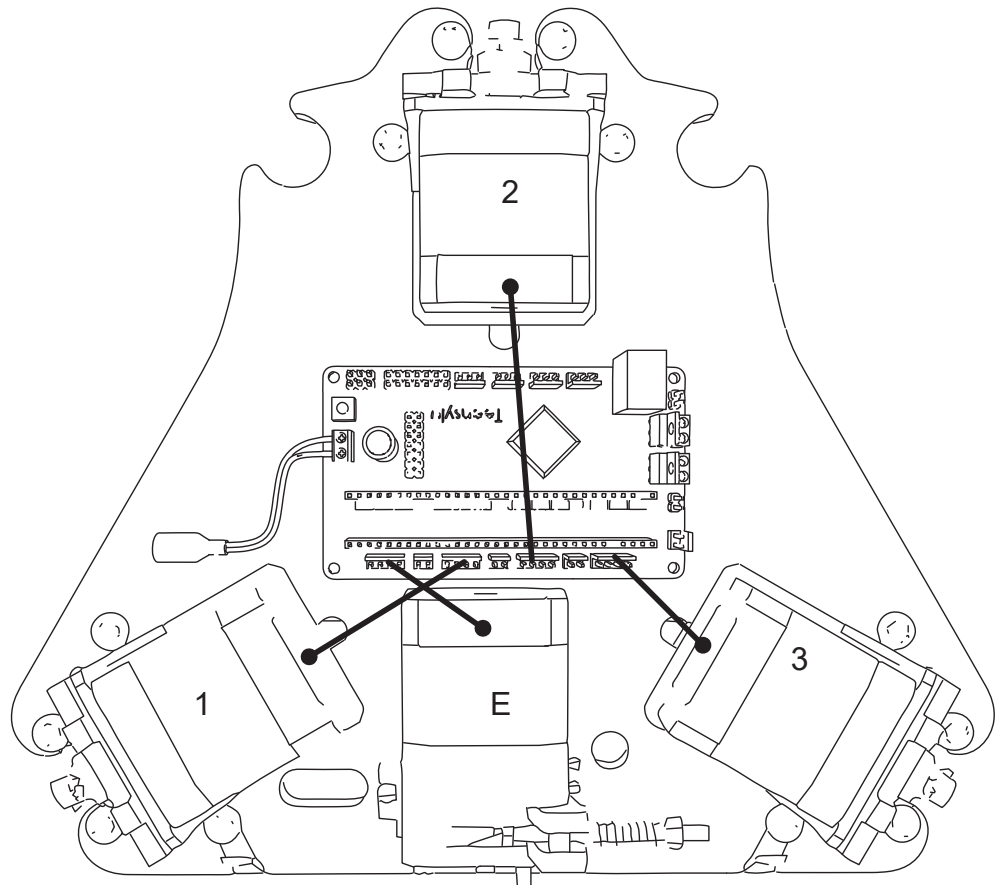
- Endstops can be plugged in only one orientation



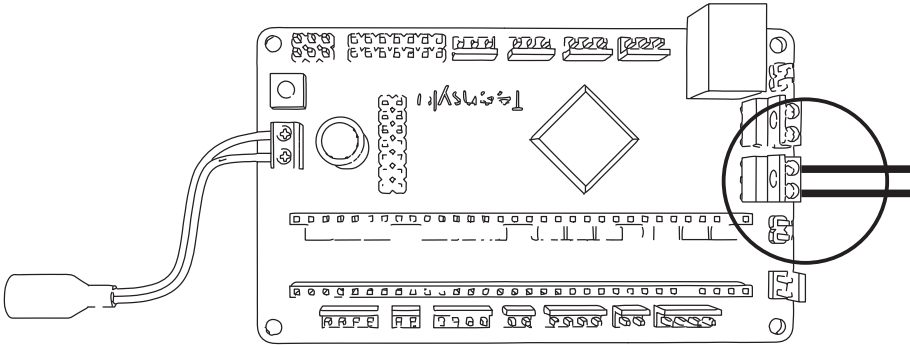


- Plug motors

- Motors can be plugged in only one orientation

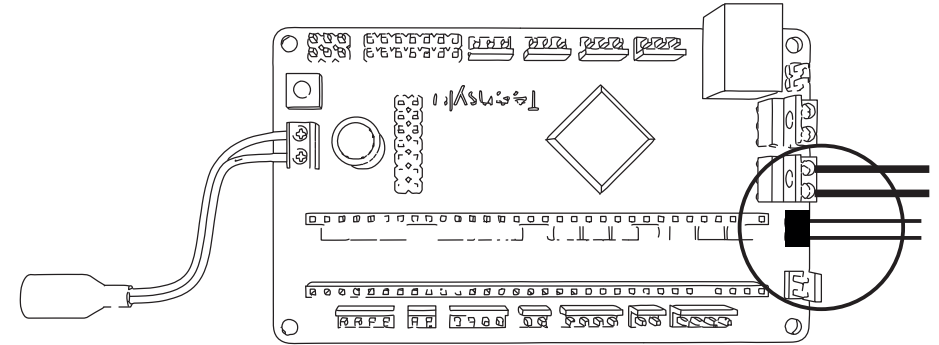


1



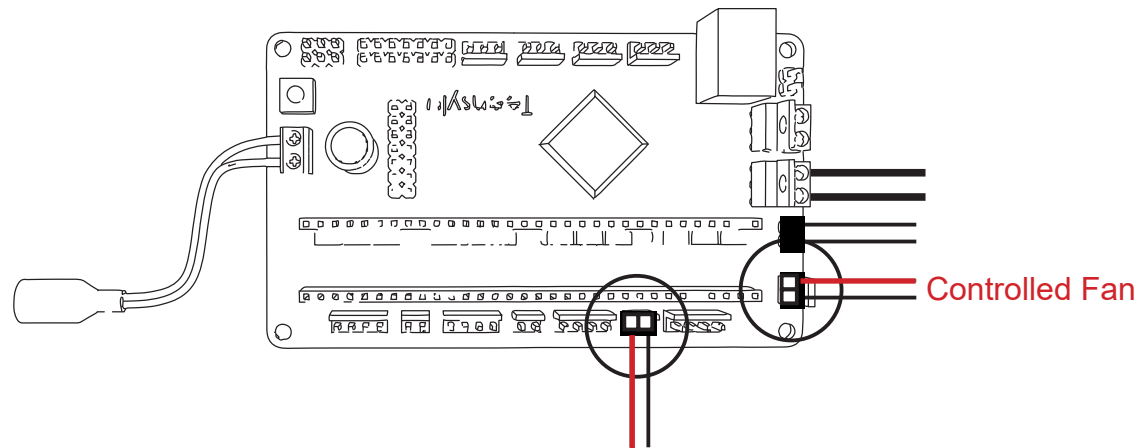
Screw cables of the heater cartridge
There is no specific way, don't forget to denude it

2



Plug the thermistor
There is no specific way

3



Plug fans
There is no specific way

CONGRATULATION !
You're printer is now operationnal



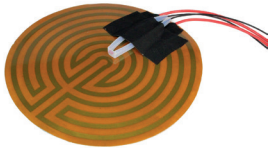


ADD-ONS

HEATED BED

1. Hardware update

Kit :



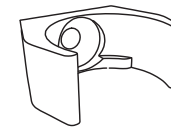
1x Adhesive heat patch



3x Idler



1x Tube

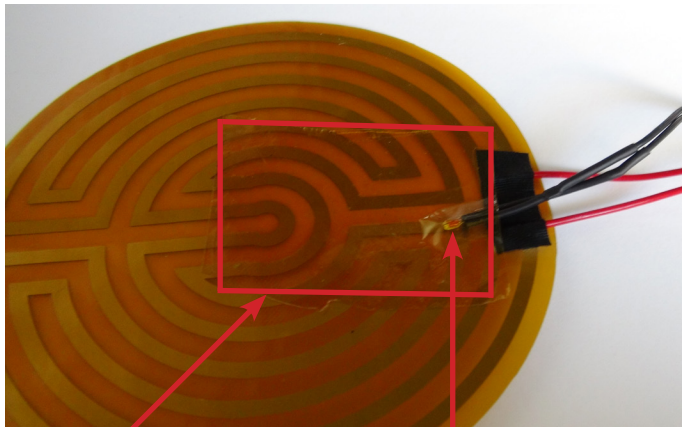


1x Tube mount



1x Polyimide tape

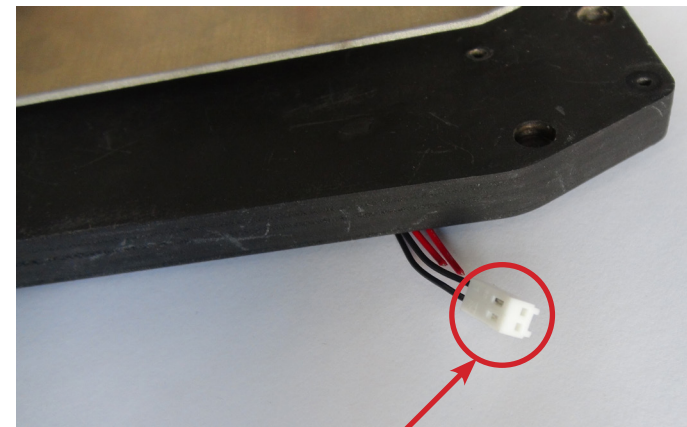
- 1 Fix the thermistor using polyimide tape as shown below (near the cable)



Polyimide tape

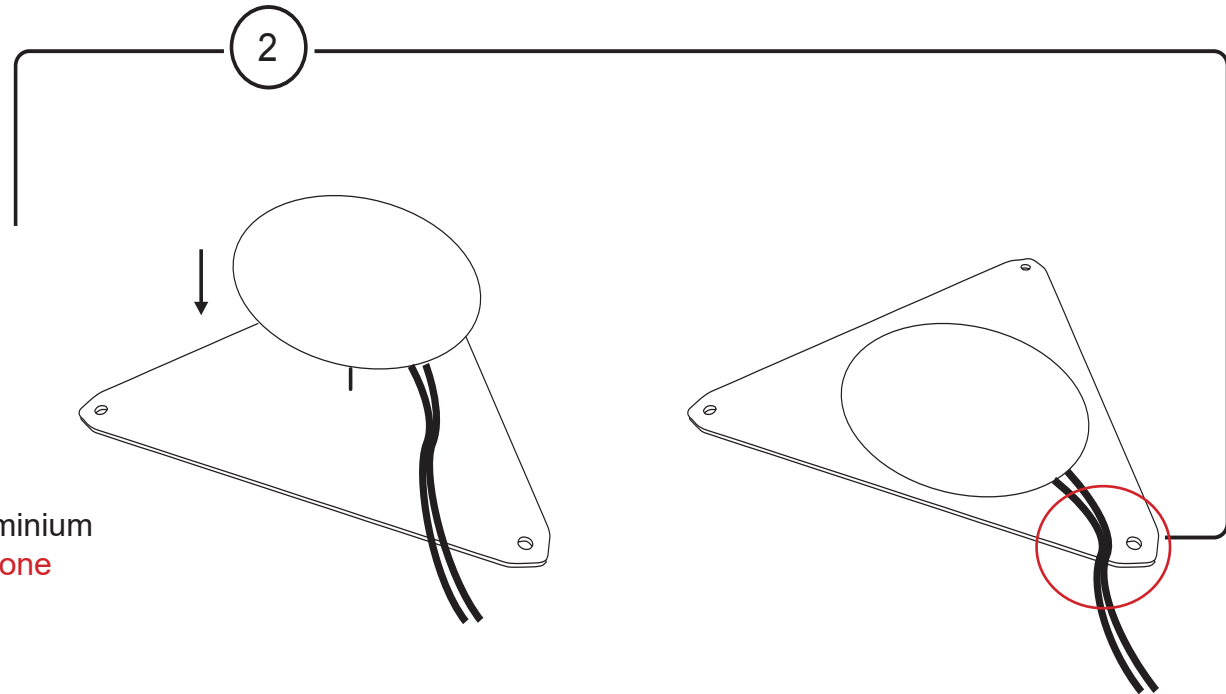
Thermistor

- 2 Check the thermistor's connector is located after the wood plate (needed for next steps)

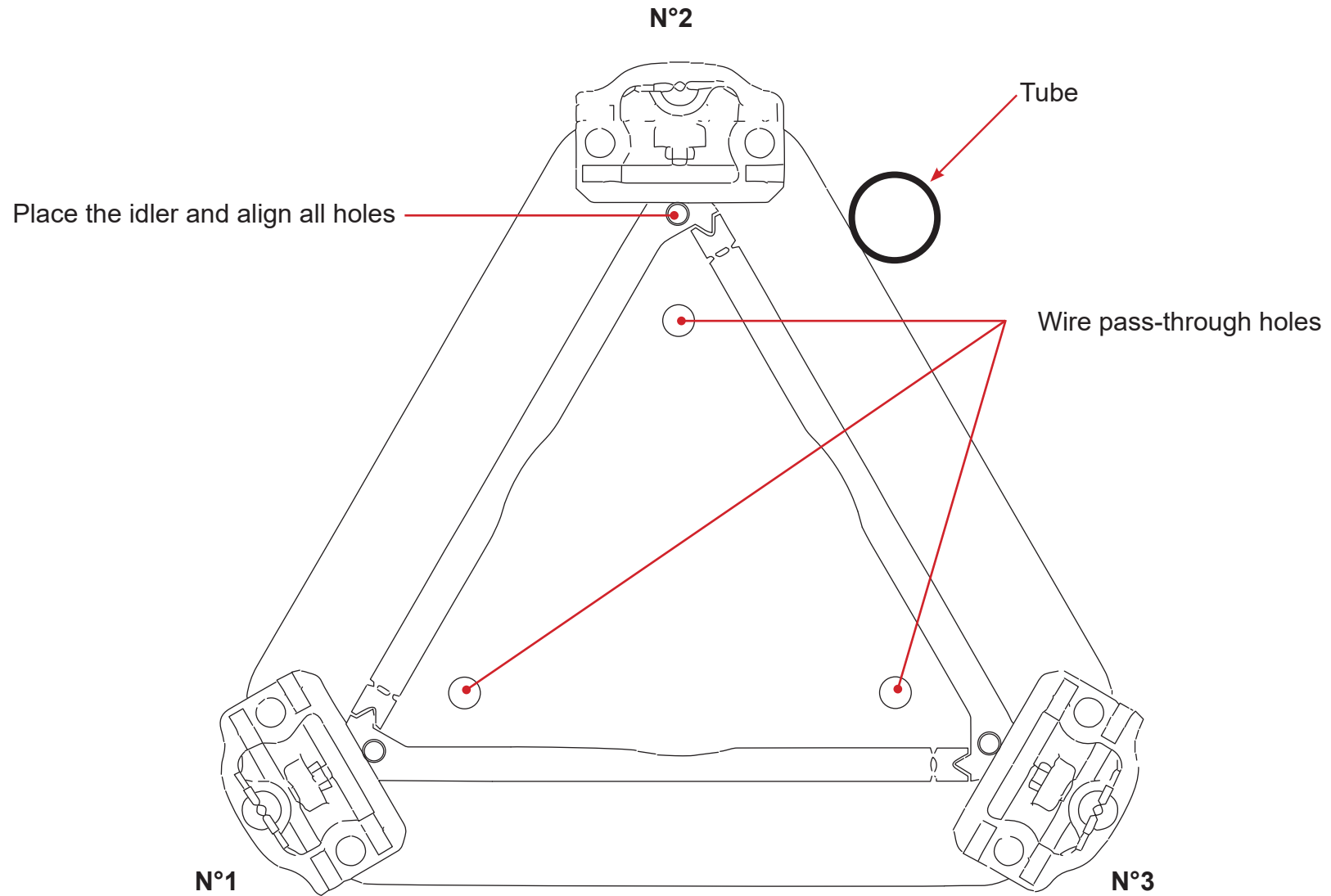


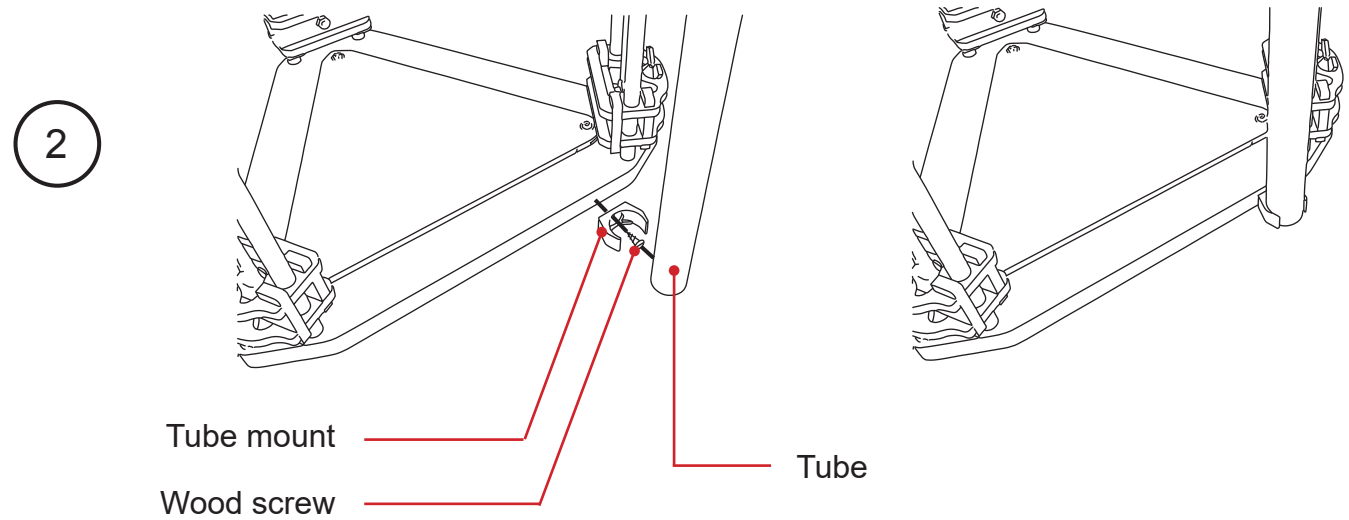
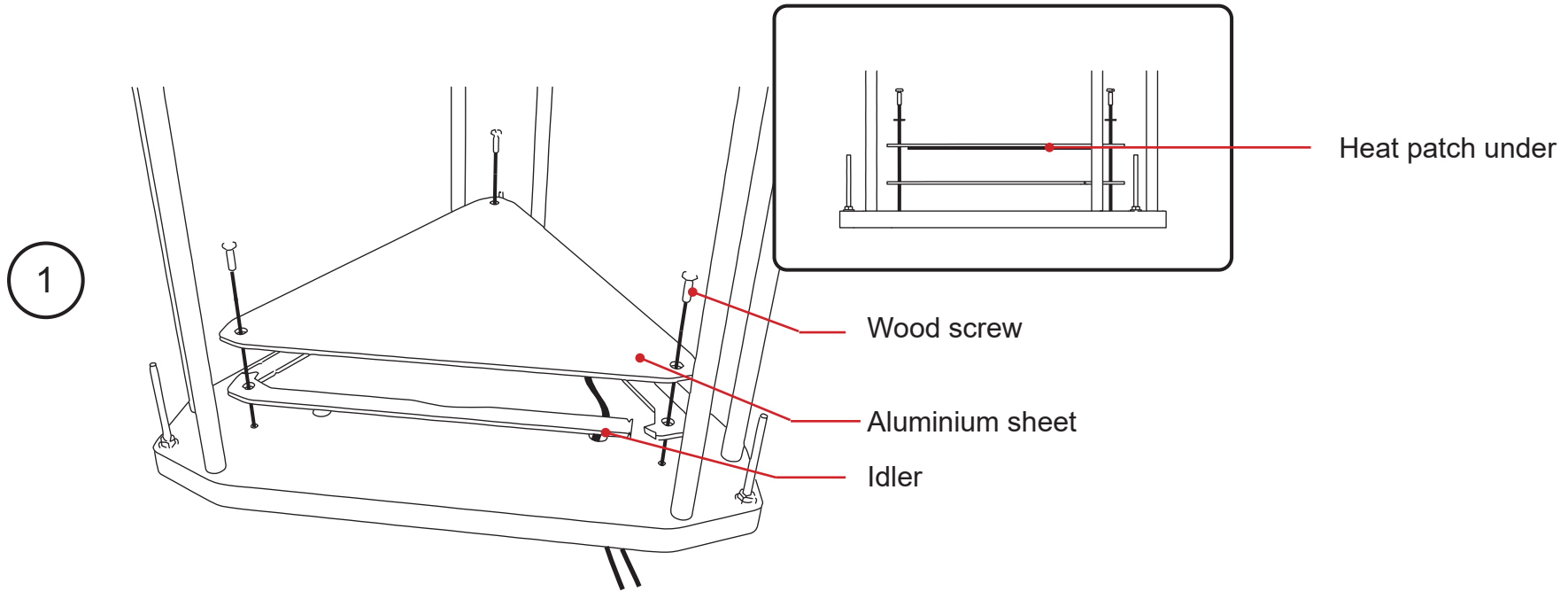
Thermistor's connector

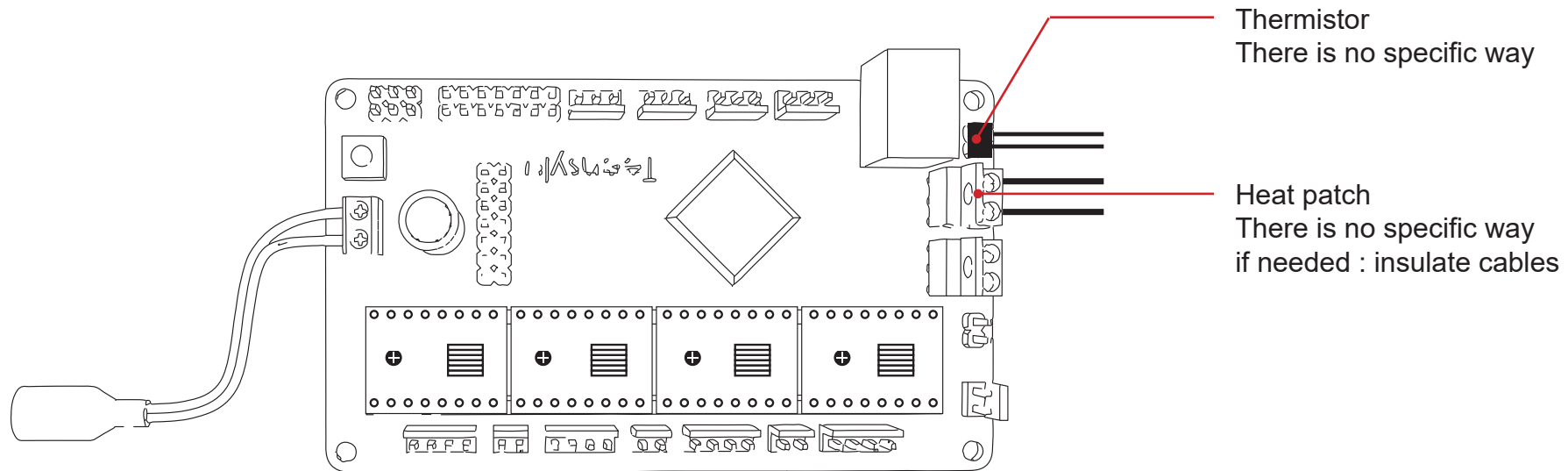
1 Remove the adhesive protection



Put the patch in the **center** of the aluminium sheet. Place the wire output **close to one hole**.







2. Software update

Pre-requirement :

Computer with window 7+ (others OS coming soon)

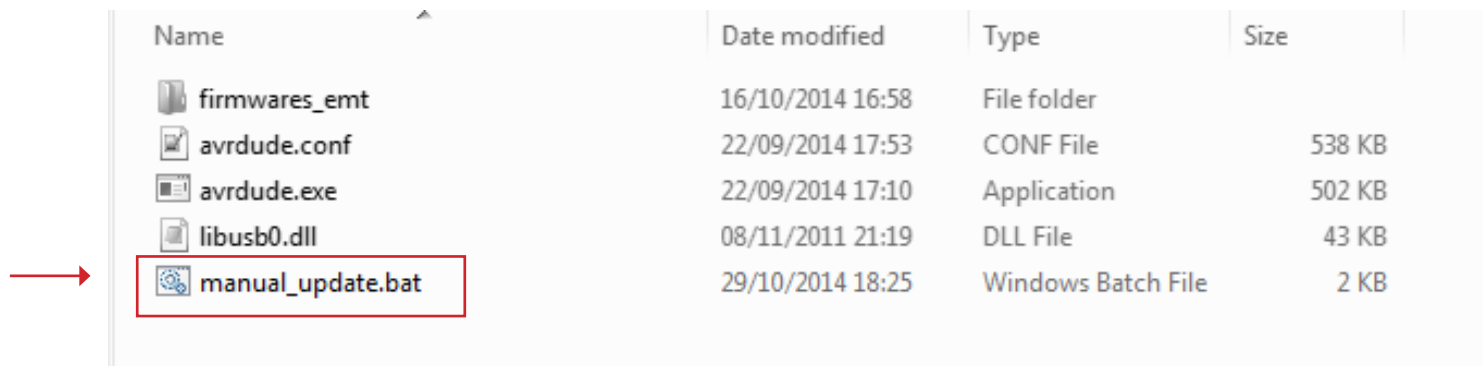
Download and install the Serial_install.exe from our download center on our website






Where to download :

All files can be found on [our support section](#) 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

```
C:\Windows\system32\cmd.exe
TEENSILU FIRMWARE UPLOADER V1.00
from
=====
Exotion Tech
=====
Firmware upload:
=====
1: BASE
2: BED without LCD / LIT CHAUFFANT SANS LCD
3: LCD
4: BED + LCD / LIT CHAUFFANT + LCD
Firmware? _
```

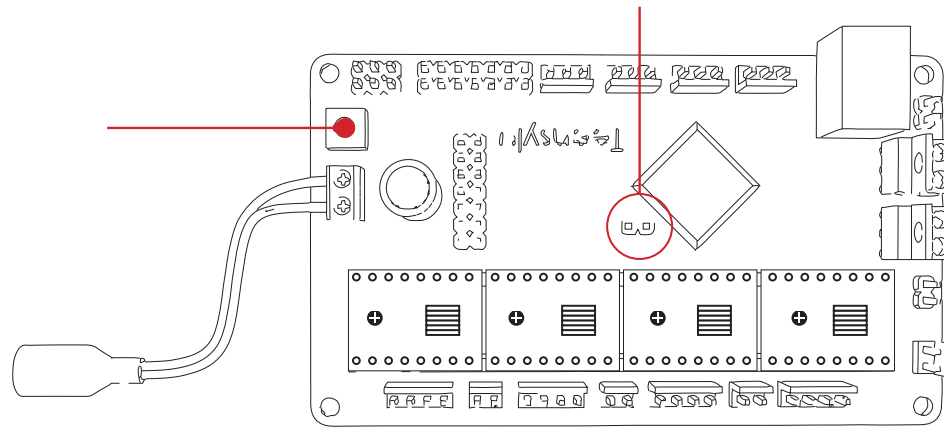
Press 2, and enter

```
C:\Windows\system32\cmd.exe
TEENSILU FIRMWARE UPLOADER V1.00
from
=====
Exotion Tech
=====
Firmware upload:
=====
1: BASE
2: BED without LCD / LIT CHAUFFANT SANS LCD
3: LCD
4: BED + LCD / LIT CHAUFFANT + LCD
Firmware? 2
Updater will upload the file: "firmwares_ent\uDelta_Base_v1.00.hex"
Remove the jumper close to the main chip and press reset on your board,
it will switch to programming mode
//fr: Enlevez le cavalier proche de la teensylu et appuyez sur le bouton Reset
Press any key to continue . . . _
```

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 and check your COM port name :

Ports are displayed here →

```

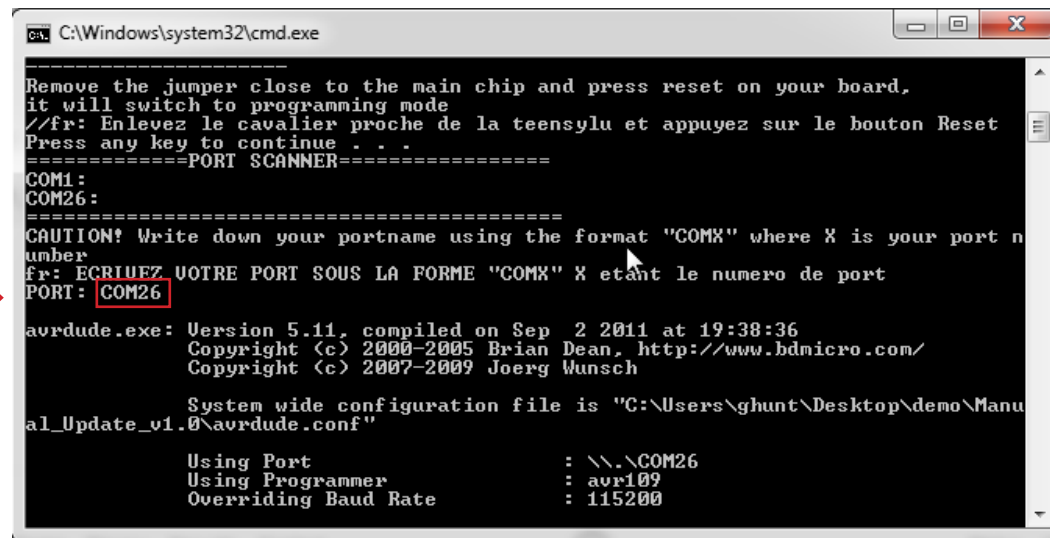
C:\Windows\system32\cmd.exe
+++++
=====
Firmware upload:
=====
1: BASE
2: BED without LCD / LIT CHAUFFANT SANS LCD
3: LCD
4: BED + LCD / LIT CHAUFFANT + LCD
Firmware? 1
=====
Updater will upload the file: "firmwares_empt\Delta_Base_v1.00.hex"
Remove the jumper close to the main chip and press reset on your board,
it will switch to programming mode
//fr: Enlevez le cavalier proche de la teensylu et appuyez sur le bouton Reset
Press any key to continue . . .
=====PORT SCANNER=====
COM1:
COM26:
=====
CAUTION! Write down your portname using the format "COMX" where X is your port n
umber
fr: ECRIVEZ VOTRE PORT SOUS LA FORME "COMX" X etant le numero de port
PORT:

```

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



```

C:\Windows\system32\cmd.exe

Remove the jumper close to the main chip and press reset on your board,
it will switch to programming mode
//fr: Enlevez le cavalier proche de la teensylu et appuyez sur le bouton Reset
Press any key to continue . . .
=====PORT SCANNER=====
COM1:
COM26:
=====
CAUTION! Write down your portname using the format "COMX" where X is your port n
umber
fr: ECRIVEZ VOTRE PORT SOUS LA FORME "COMX" X étant le numero de port
PORT: COM26
avrdude.exe: Version 5.11, compiled on Sep  2 2011 at 19:38:36
          Copyright (c) 2000-2005 Brian Dean, http://www.bdmicro.com/
          Copyright (c) 2007-2009 Joerg Wunsch

          System wide configuration file is "C:\Users\ghunt\Desktop\demo\Manu
al_Update_v1.0\avrdude.conf"

          Using Port                : \\.\COM26
          Using Programmer           : avr109
          Overriding Baud Rate       : 115200
  
```

Final screen :

```

C:\Windows\system32\cmd.exe

avrdude.exe: safemode: hfuse reads as DB
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]

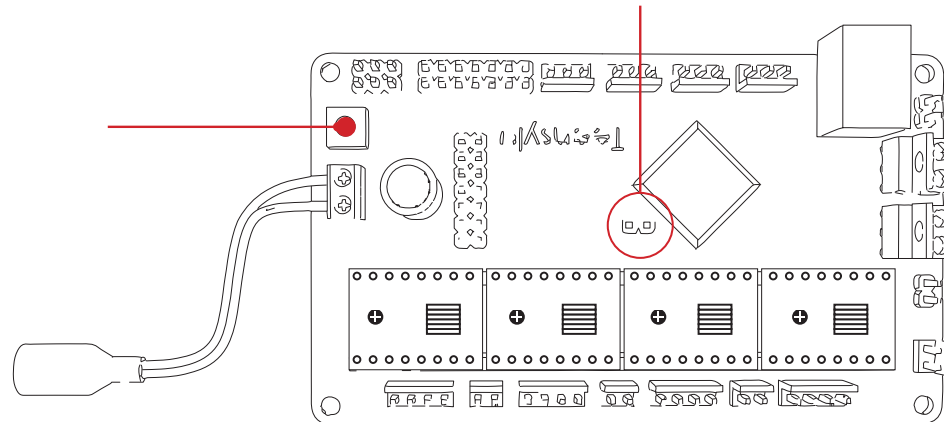
avrdude.exe done. Thank you.

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 . . .
  
```

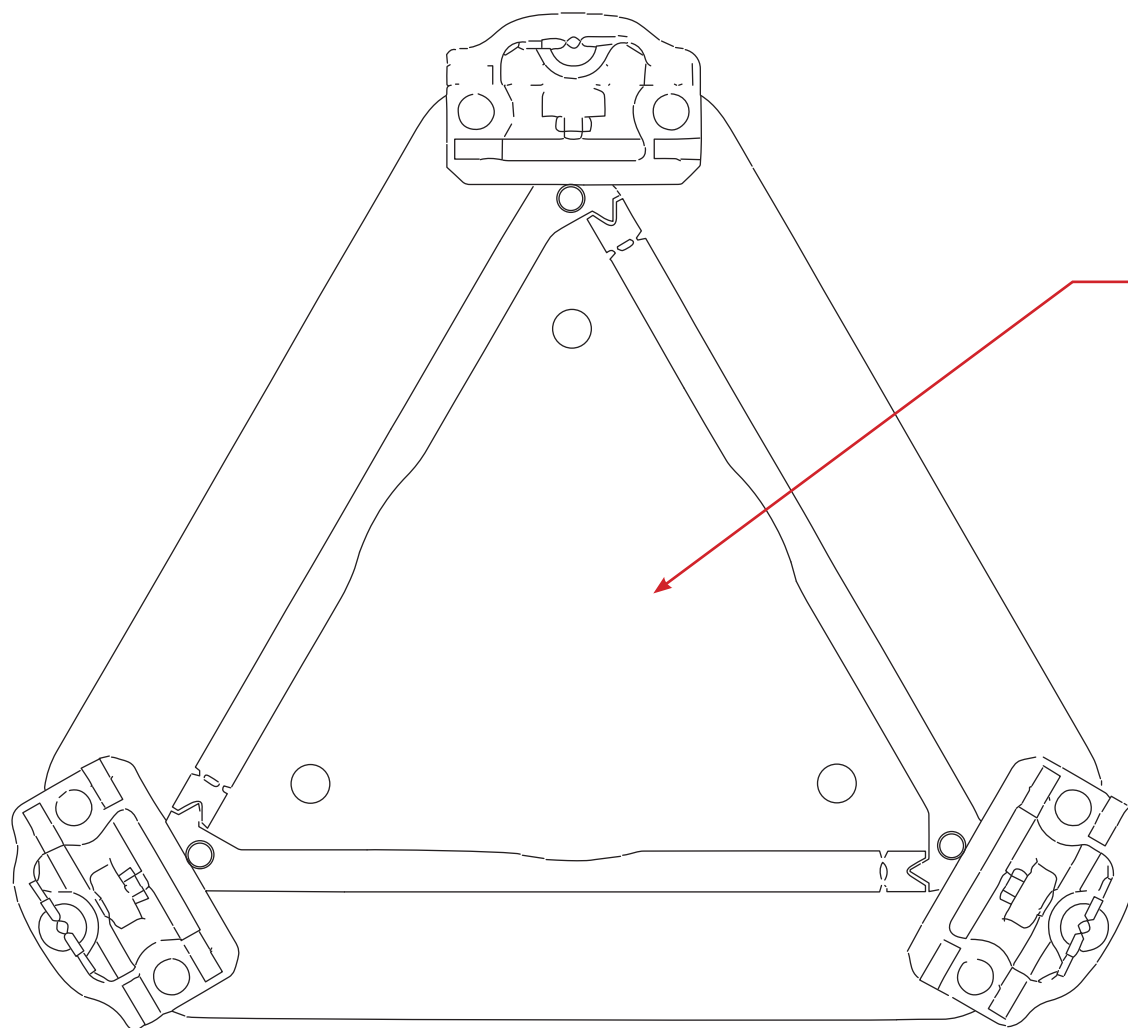
Leave the programming mode :

1/ Set up the jumper back in place

2/ Press the reset button

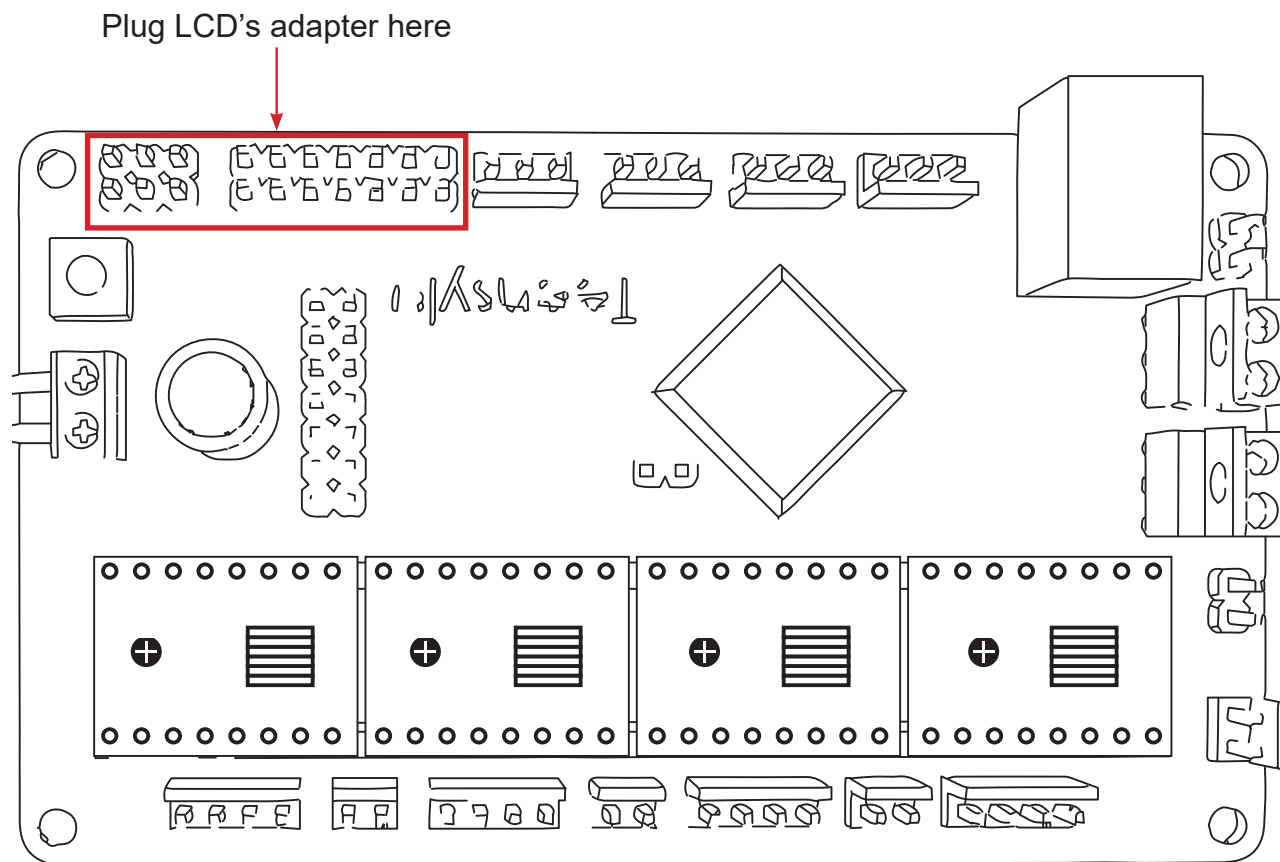


Your printer is now ready to print with the heated bed !



Applying the polyimide tape on the aluminum surface in order to optimize the grip of the material

LCD Screen

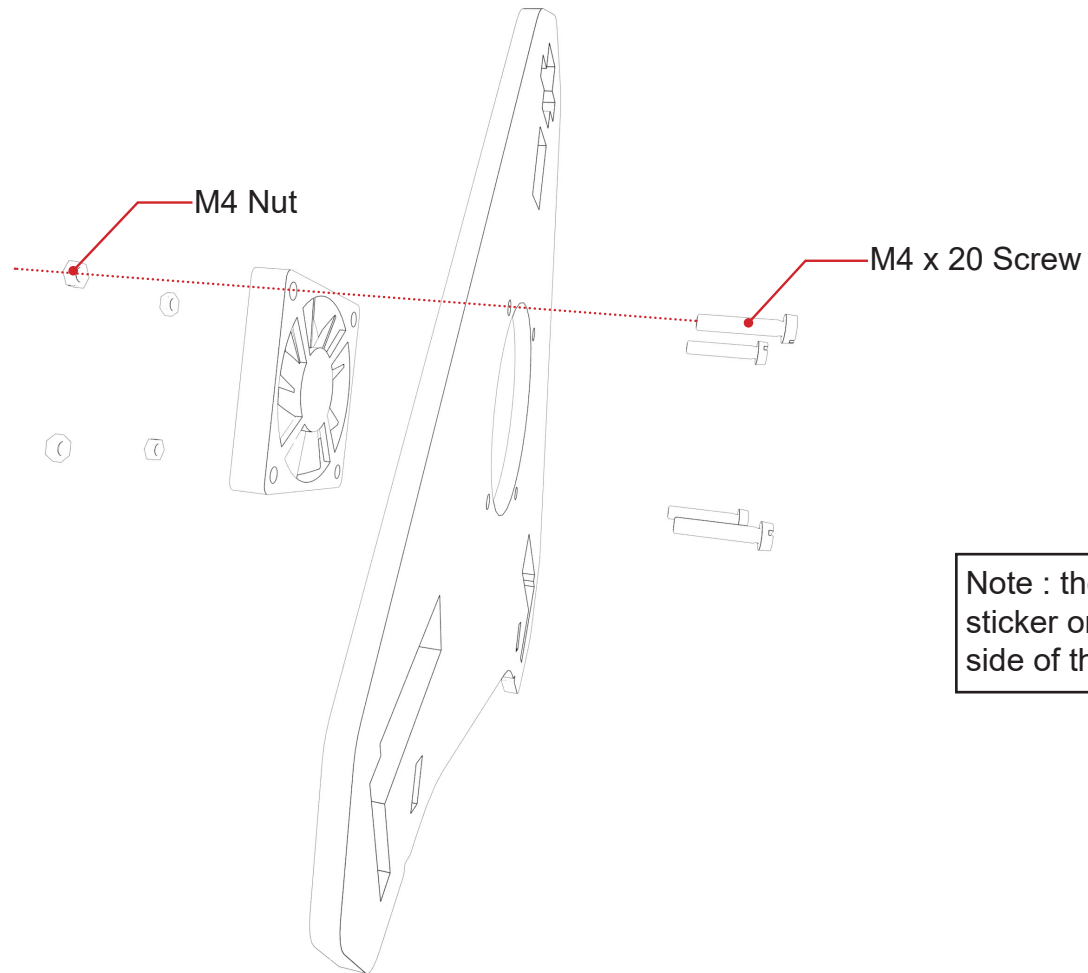


Then perform a «Manual Update» and select choice with your options.

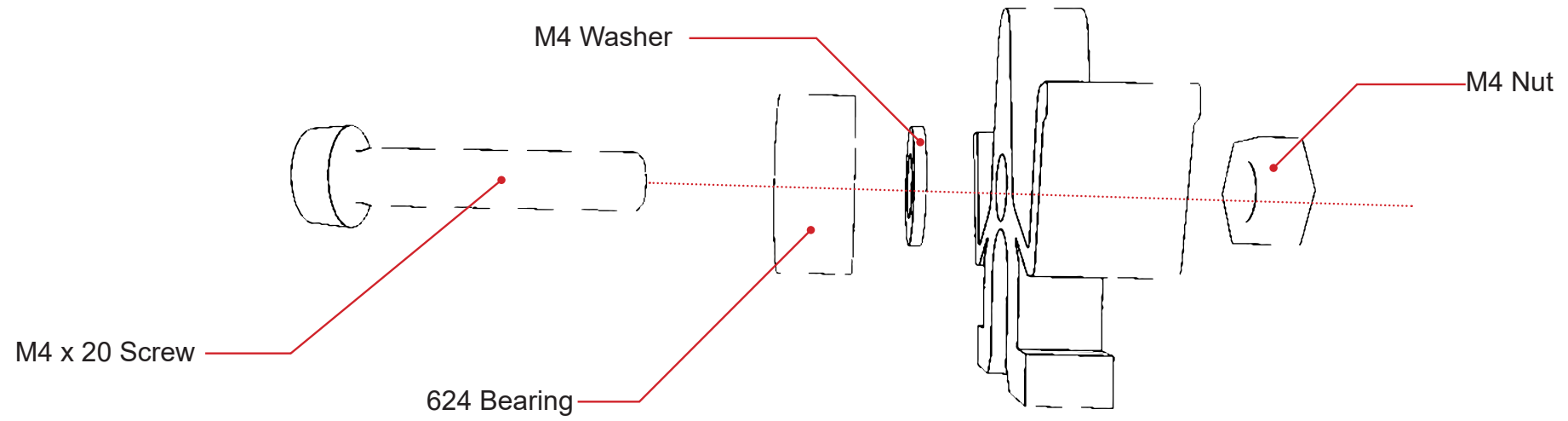
Note: documentation containing explanations for using the «Manual Update» is available on our website reprap-3d-printer.com, in the support section.

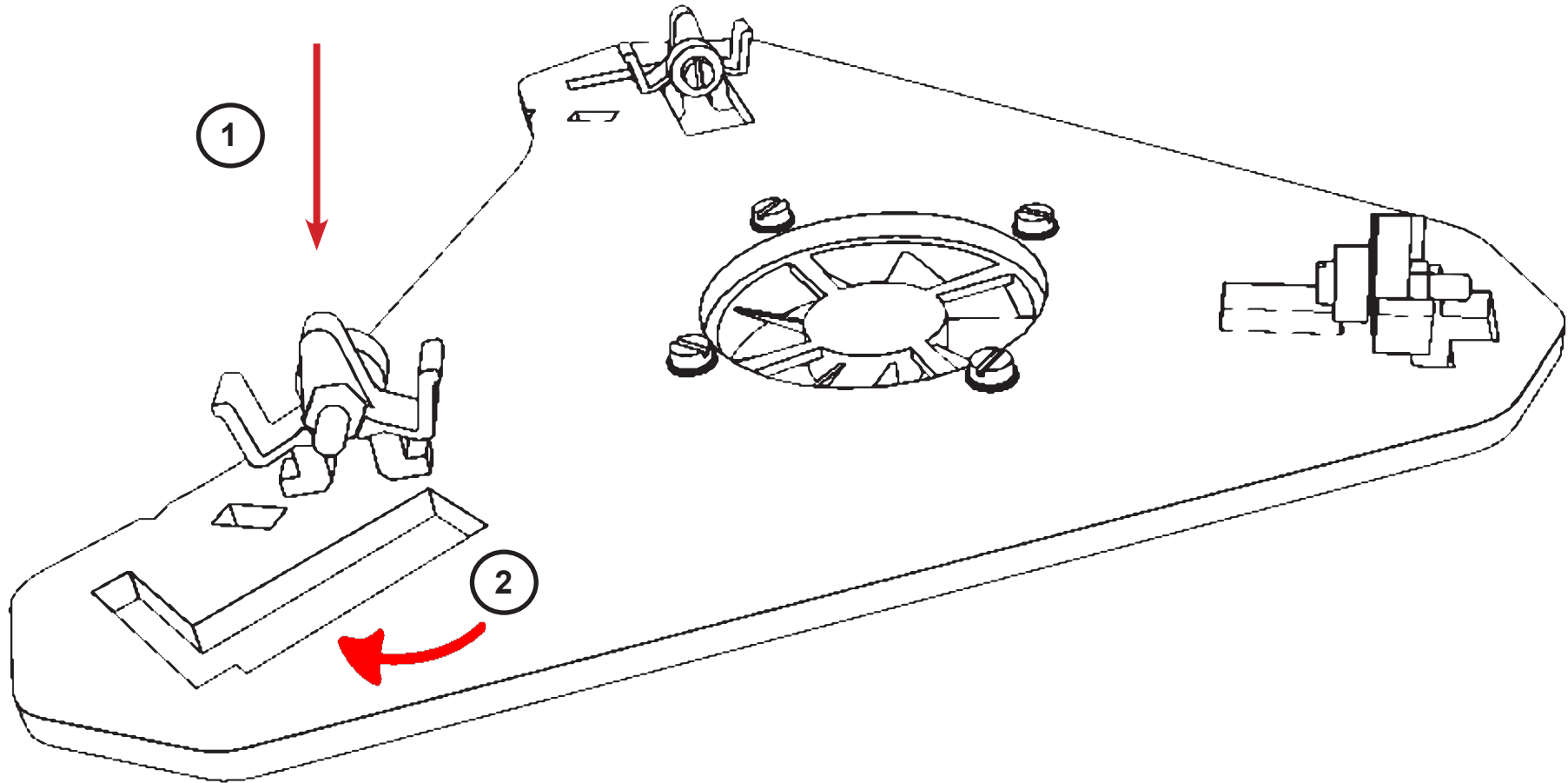
SPOOL HOLDER

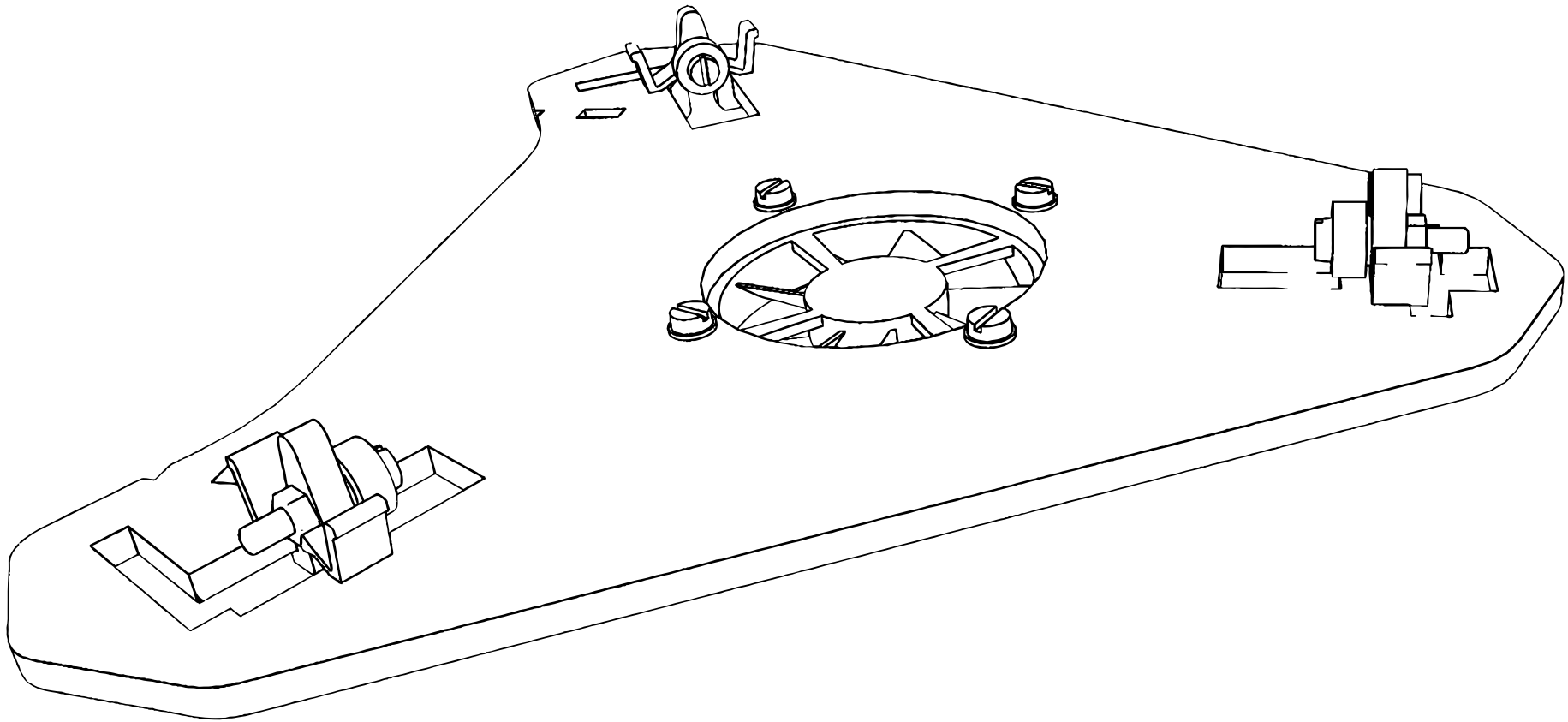
1. Hardware update



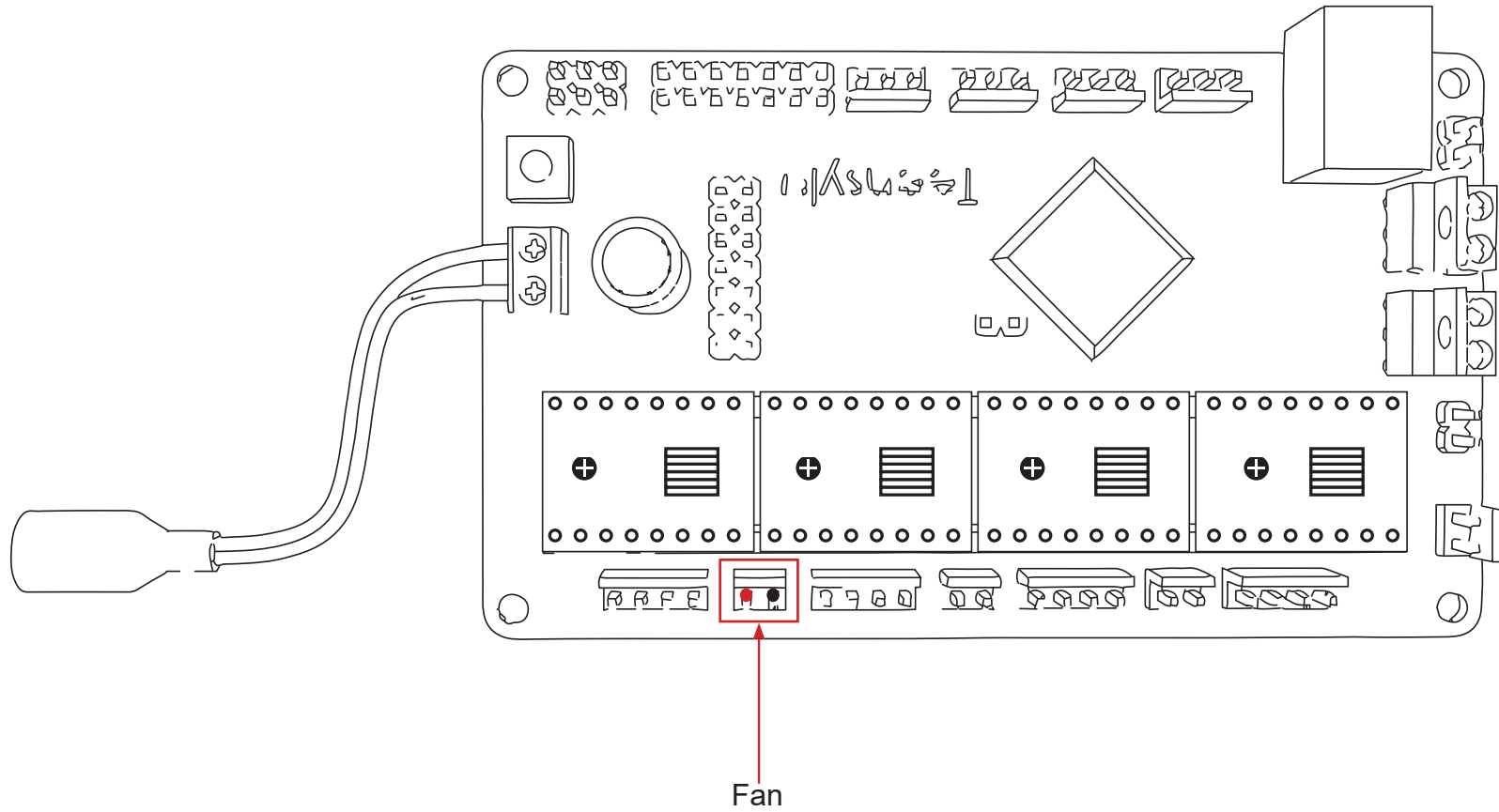
Note : the fan must have the sticker oriented in the opposite side of the acrylic part





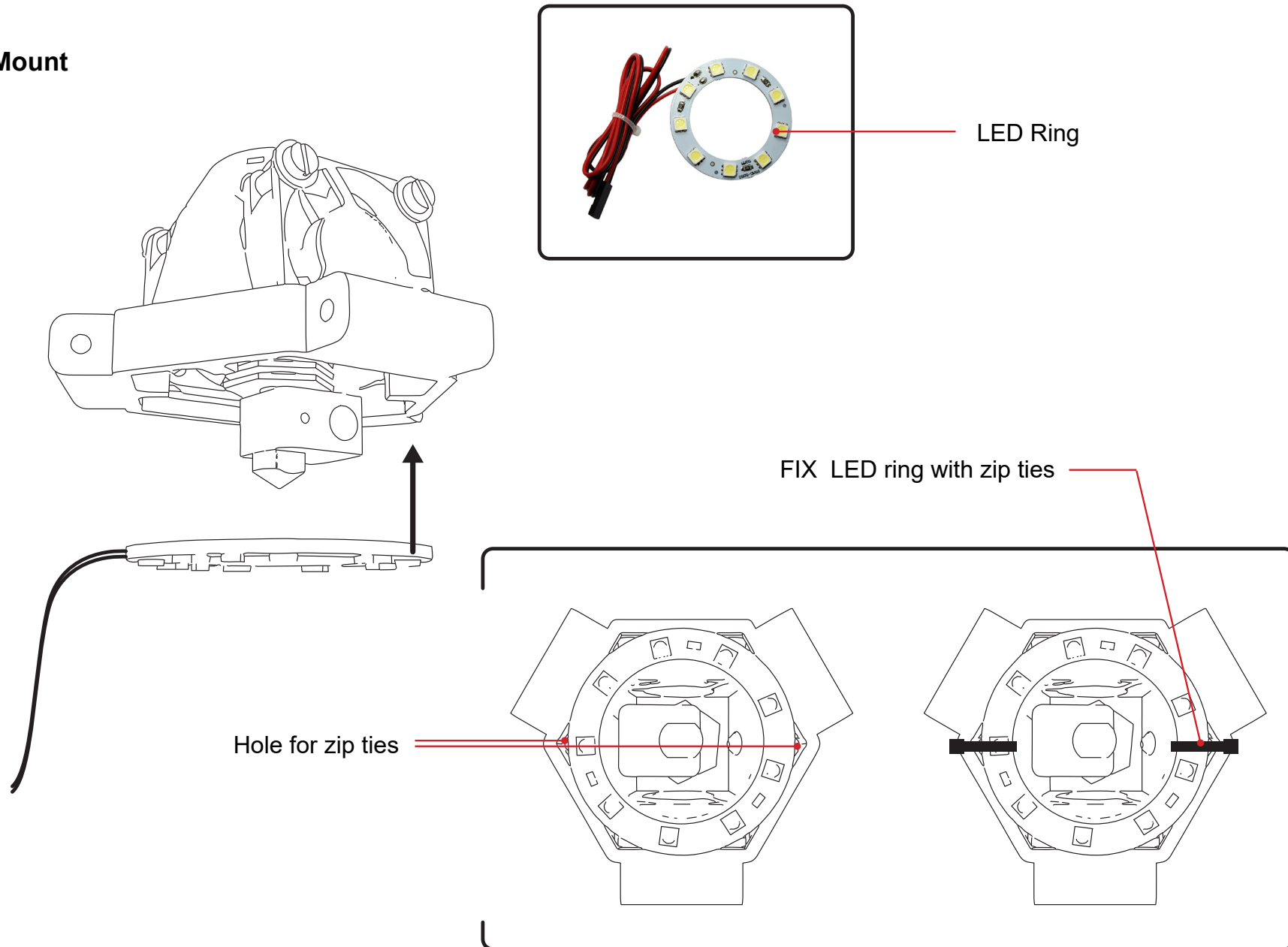


Fan plug

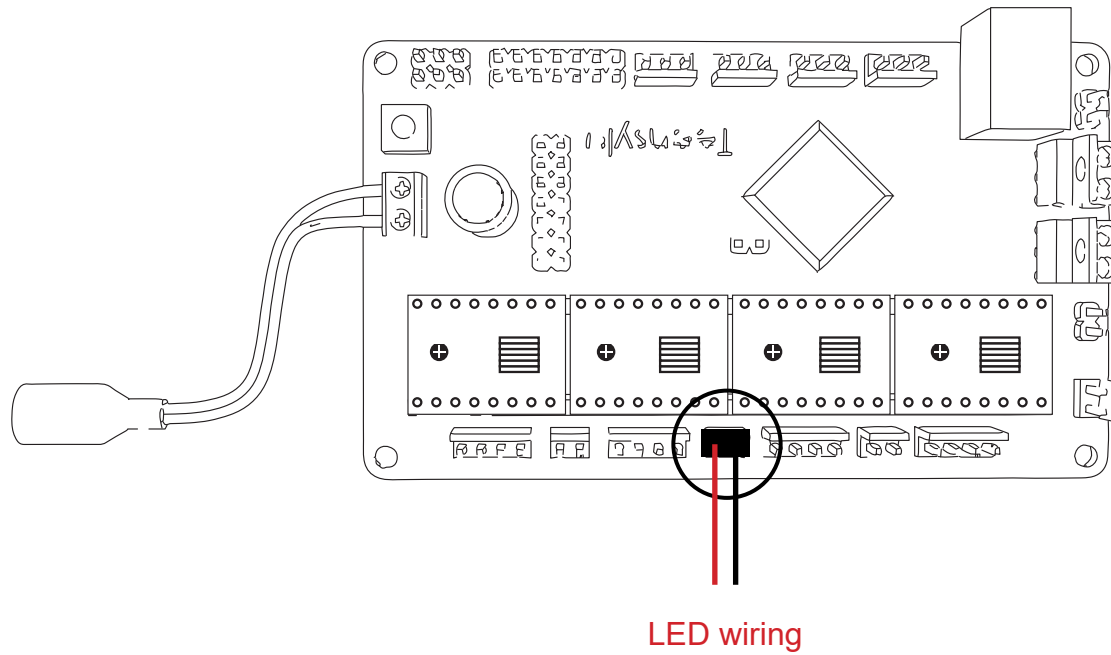


LED Ring

1. Mount



1. Wiring



Pass wire into the central sleeve.



MAINTENANCE

Maintenance

A monthly maintenance of the 3D printer is recommended.

Below are some recommendations:

with the help of a brush, dust the following elements :

- Teensylu board
- stepsticks heatsinks
- all fans and ensure that airflow is not blocked
- coldend of the print head

- clean the print head with the help of the guide dedicated to the Hexagon print head, here is the link :

http://data.emotion-tech.com/highlights_en/Hexagon%20-%20Hotend-guide-v1.1.pdf

- clean the drive wheel's teeth with the aid of a needle, the end of a tweezers or a cutter blade

- check the tightening of each screw equipping the 3D printer

- lubricate all mechanical transmission elements with multi-purpose grease or PTFE based oil spray (avoid WD40 product that has a tendency to be too aggressive for the mechanical elements)

Recommendations

Shut down the 3D printer :

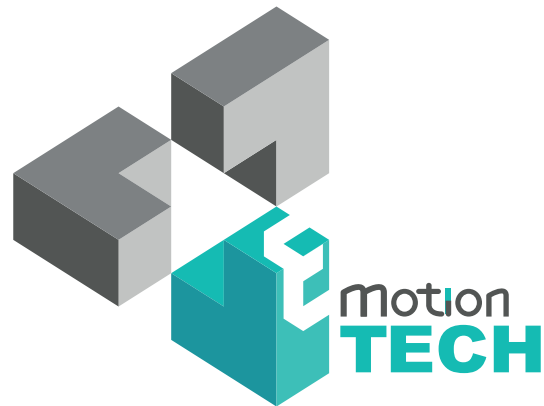
After printing, if you want to turn off the machine, wait until the print head has cooled to room temperature to ensure that the print head does not clog.

Transport :

If you have to move the machine by car or other means of transport, it is recommended to unplug stepper motors off the Teensylu board to avoid damaging components.

Troubleshooting :

A FAQ is available for the μ Delta on our website in the «Support» section, do not hesitate to consult it if you are having trouble with your machine, most failures are resolved through this tool, do not deprive yourself !



Thank you for choosing the μ Delta