PRUSA
RESEARCH
by JOSEF PRUSA

1. Introduction

Written By: Jakub Dolezal

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TOOLS:

- All tools are included (1)

PARTS:

- Original Prusa i3 MK3 Multi Material 2.0 upgrade kit (1)

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Step 1 — Preparing the MMU 2.0 upgrade kit

- Welcome to the tutorial on how to upgrade your Original Prusa i3 **MK3/MK2.5** to Original Prusa i3 **MK3/MK2.5 Multi Material 2.0**

⚠ This upgrade kit is **NOT compatible with Original Prusa i3 MK2/S!!!** You need to upgrade first to [Original Prusa i3 MK2.5](#).

⚠ This upgrade kit is also **NOT designed for the first generation of the MK2 Multi Material**. You should purchase: [Multi Material upgrade kit - from MK2 MMU to MK3/MK2.5 MMU 2.0](#)

⚠ Before proceeding further make sure the printer has **no filament loaded** to the extruder and **disconnect the printer from the electricity** (unplug the cable)!!!

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## Step 2 — All the required tools are included

- The kit includes:
- Needle-nose pliers (1x)
- Philips screwdriver (1x)
- Allen key (4x)
- 8mm wrench
- ⓘ No soldering is required.
- ⓘ No wire crimping is required.
- ⓘ The colour of the tools might differ.

Step 3 — Use labels for reference

- ⓘ Most of the labels are scaled 1:1 and can be used to identify the part :-)
- ⓘ Label on the picture is used as an example, yours might be different.

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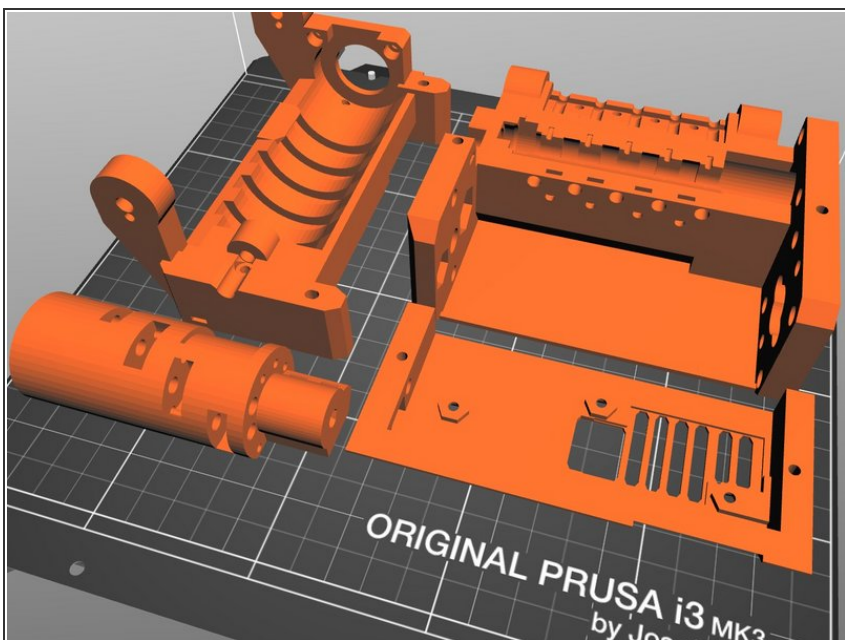
Step 4 — View high resolution images
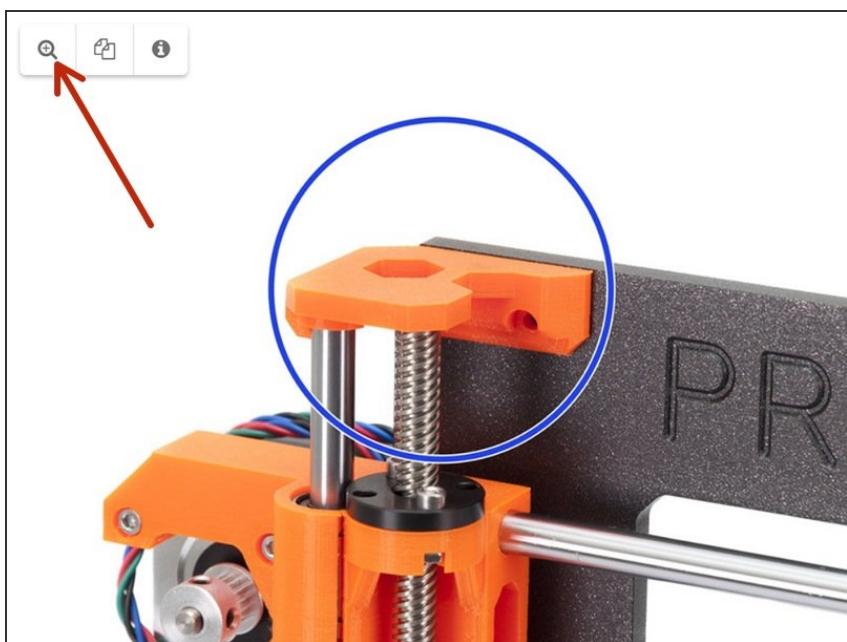
- When you browse the guide on manual.prusa3d.com, you can view the original images in high resolution for clarity.

- Just hover your cursor over the image and click the Magnifier button ("View original") in the top left corner.

Step 5 — Printed parts - versioning
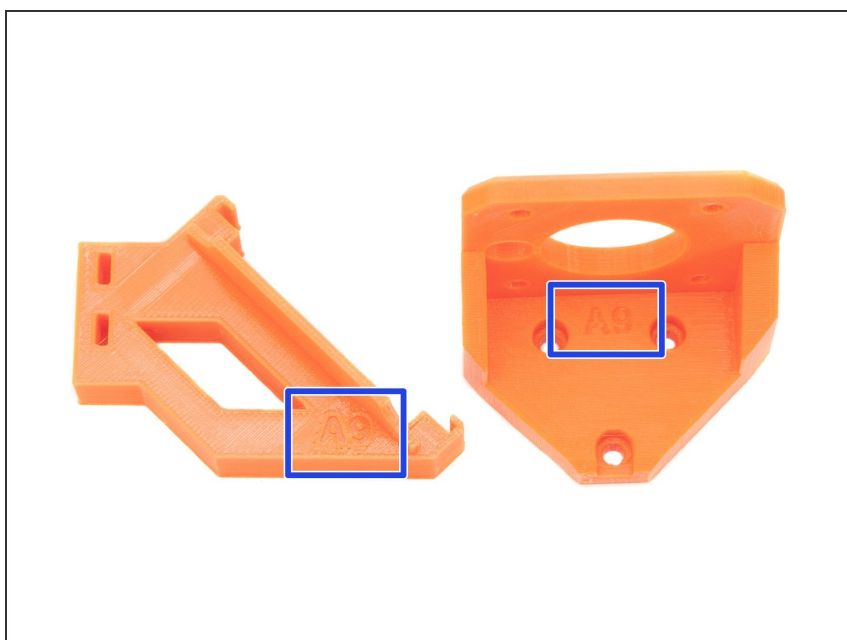
- Original Prusa i3 MK3/MK2.5 MMU 2.0 has most of the 3D printed parts marked with their version.

- ⓘ In case you have issues while printing or assembling certain printed part, please try to find this label and tell it to our support team.

- ⓘ Printed parts in the picture are used as an example, yours will be different.

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Step 6 — Printed parts - STL files

⚠️ **All parts necessary to finish this upgrade are included in the kit.**

● In case some parts get broken during the assembly, you can reprint them. Please check all plastic parts before starting your build to make sure there are no issues.

● The package with all MMU 2.0 STL files is available at prusa3d.com/prusa-i3-printable-parts/

ⓘ The recommended material is PETG, but you can use also ABS or any material with similar properties to PETG.

ⓘ For printing individual parts, it is recommended to use Slic3r PE with 0.2 mm layer height, GRID infill at 20%, no supports!

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Step 7 — We are here for you!

- Lost in the instructions, missing screws or a cracked printed part? **Let us know!**

- You can contact us using following channels:

  - Using comments under each step.

  - Using our 24/7 live chat at shop.prusa3d.com

  - Writing an email to info@prusa3d.com

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Step 8 — Treat yourself!

- Building a 3D printer is a challenge unlike any other and you should treat yourself for every milestone you reach. That is why a bag of Haribo Bears is included!

- ⚠️ **The biggest issue from the previous builds** (MK3, MK2/S) which we had to address was inadequate bear consumption. Many of you didn't have enough bears for all chapters, some even ate them all before they started!

- I'm glad to announce that **after countless weeks of academic research** (hundreds of eaten bears), we came to a solution! Thank us later ;)

- At the end of each chapter, you will be told a specific amount of bears to consume.

- Eating more or less bears than prescribed in the manual might lead to fatigue or nausea. Please consult a professional in the closest candy store.

- ⚠️ **Hide the Haribo for now!** From our experience an unattended bag with sweets tends to suddenly disappear. We are currently investigating this phenomenon.

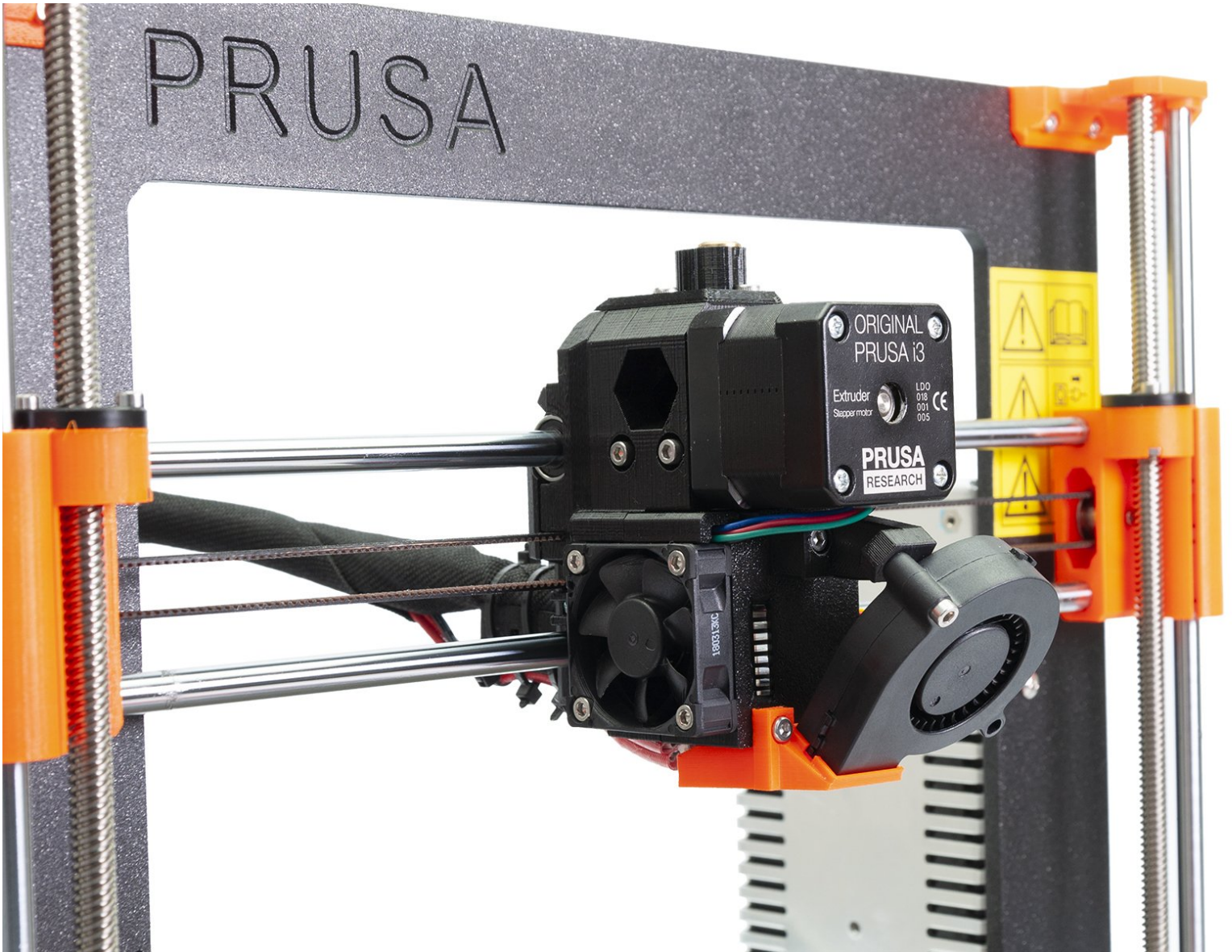This document was generated on 2021-04-23 03:18:02 AM (MST).

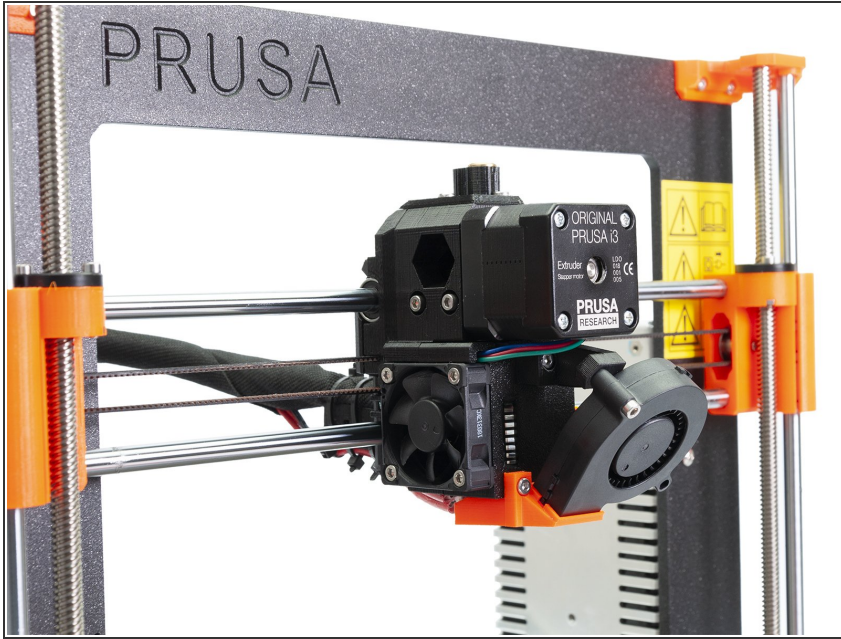## Step 9 — Upgrade your extruder (recommended)
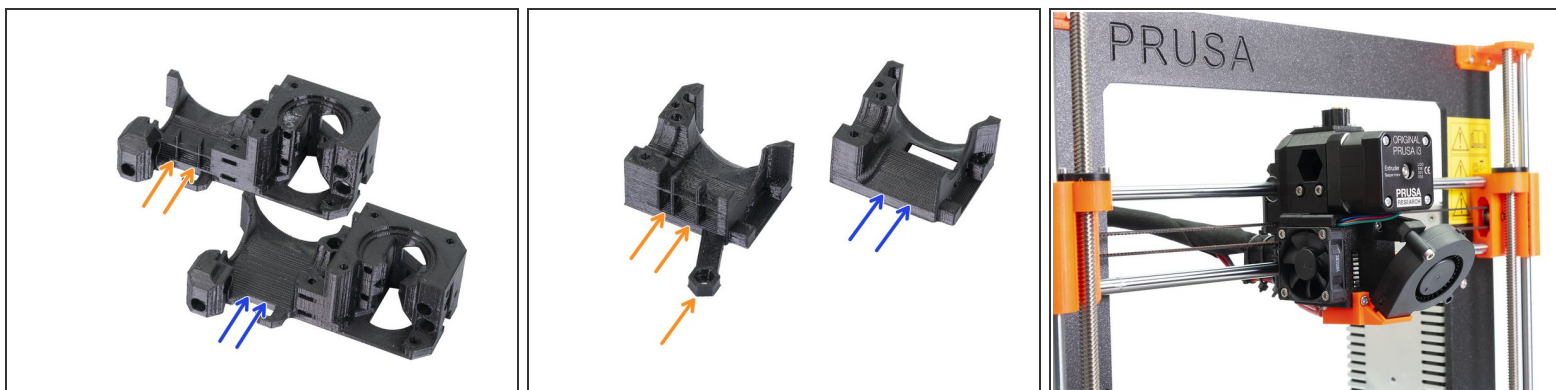
- Extruder parts for MK3 and MK2.5 were upgraded from version B6 to B7. There is a significant improvement to the temperature management.

- **Previous design has a grill** on one side of the extruder body. This iteration has a label **B6** (printed by us) or **R2** (available on GitHub).

- **The latest design has NO grill** to improve airflow. This iteration has a label **B7** (printed by us) or **R3** (available on GitHub).

- All printed parts are included in a separate bag including spare nuts.

- It is highly recommended to do this upgrade first. Continue here: <u>Upgrading extruder B6 to B7</u>

- In case you have B7 (R3) already installed, you can skip to the <u>1. Idler body assembly</u>

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2 Upgrading extruder B6 to B7

Written By: Jakub Dolezal

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Step 1 — Introduction

⚠️ This guide will take you through the entire process of how to **disassemble the MK3/MK2.5 extruder**, replace the printed parts B6 for B7, PTFE tube and assemble the extruder back. Note that MMU2 requires different PTFE tube.

● 3D printed extruder parts were improved in order to achieve better cooling. More information including direct comparison can be found on our [Prusa Research forum](#).

● This update is recommended to all MK3 and MK2.5 owners before assembling the MMU2 upgrade.

● All necessary parts are provided by Prusa Research in the MMU2 upgrade kit.

ⓘ Parts printed by Prusa Research for the upgraded extruder are labelled B7, same parts are available to download with label R3.

ⓘ This kit includes spare nuts, which might be difficult to retrieve from the disassembled extruder.

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⚠ **WARNING:** in case you have a custom hotend or you bought it directly from E3D, you need a special **Prusa MMU heatbreak**. You can purchase it on [Prusa eshop](#) or from [E3D](#). *This heatbreak is included with all MK3 and majority of MK2S printers.*

⚠ Your printer might be already upgraded to B7/R3 parts (see the forum for parts comparison). In that case you can skip to the next chapter [1. Idler body assembly](#)

Step 2 — Tools necessary for this guide
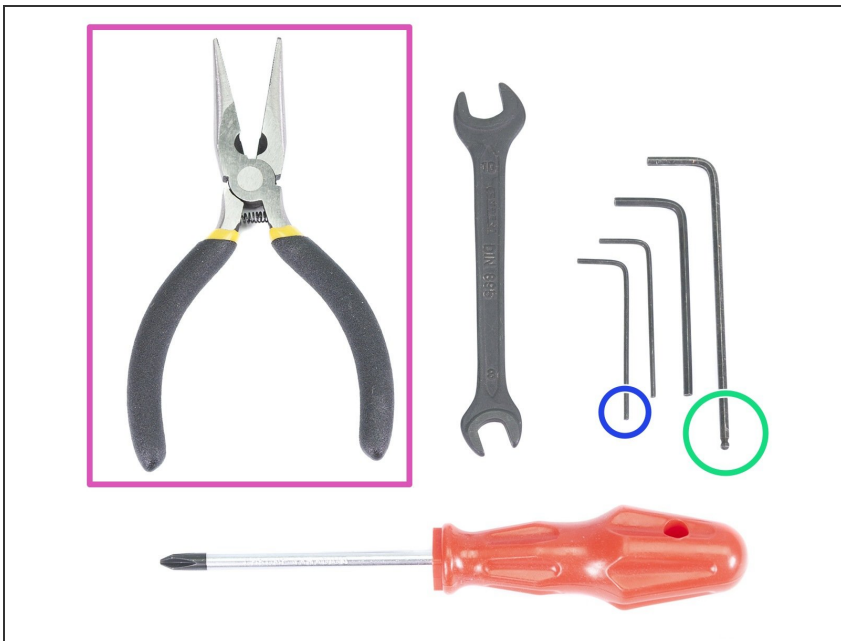
- **Please prepare tools for this chapter:**
  - 2.5mm Allen key for M3 screws
  - 1.5 or 2mm Allen key for nut alignment
  - Needle-nose pliers for zip ties
- ⓘ Apart from the mentioned tools, it is recommended getting a bowl or small box for the screws and parts you will remove during the disassembly, you will need some of them later.
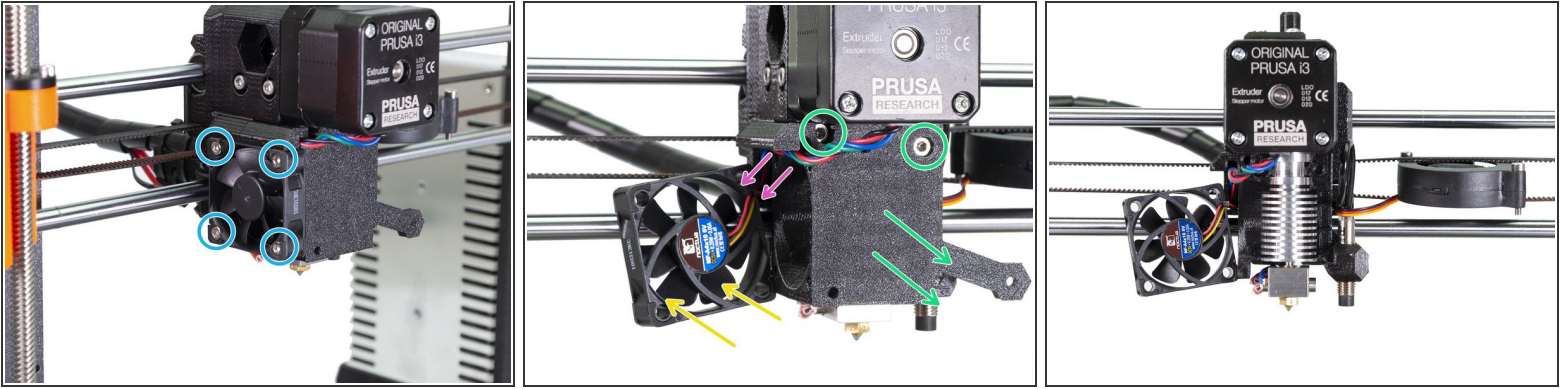
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Step 3 — Nozzle-fan and print fan removal
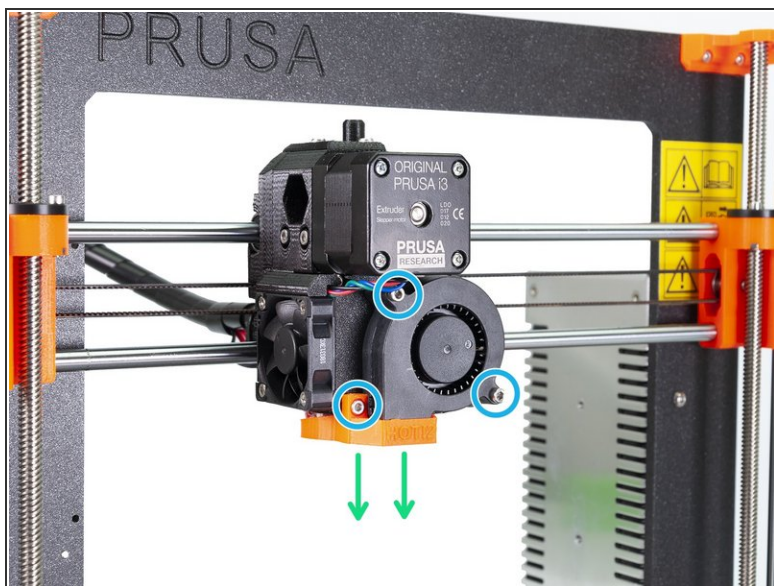
⚠️ Ensure the **filament is not loaded** in the hotend. **Remove it** before proceeding further.

- Release the marked M3 screws.

- Remove the nozzle-fan printed part completely.

- Carefully insert the Front print fan in the X-axis belt.

ⓘ The 3D printed part nozzle-fan will be replaced with a new one.

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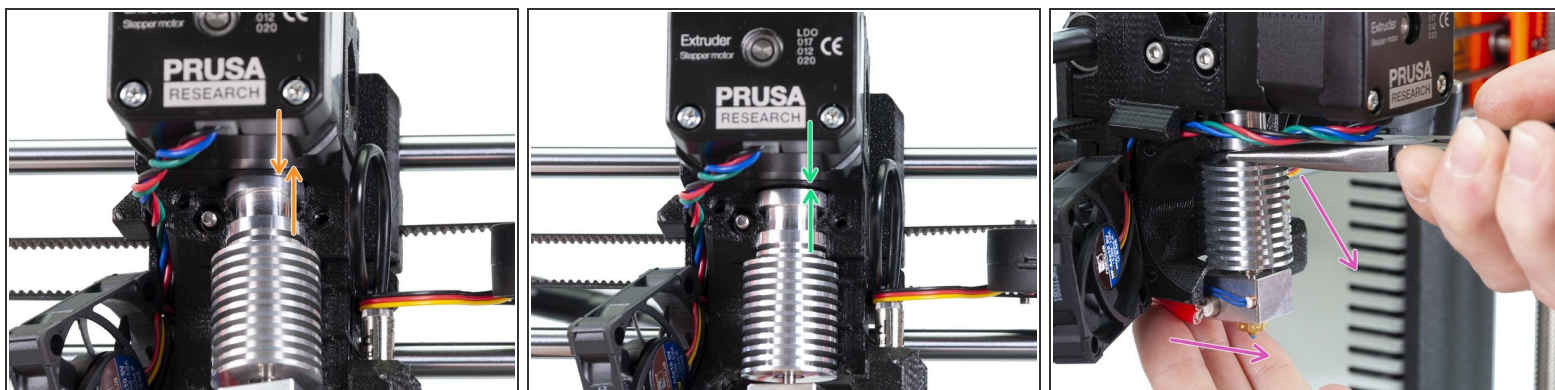
Step 4 — Left hotend fan removal

- Release and remove all four M3x18 screws on the Left hotend fan.

- Move the fan carefully away from the extruder body as far as the cable allows.

- Move the extruder motor cable from the channel.

- Release and remove both M3x25 screws, then remove carefully the extruder-cover part.

- Your extruder and fan arrangement should look like in the last picture.

- (i) The extruder-cover will be replaced with a new one.

Step 5 — Zip ties removal
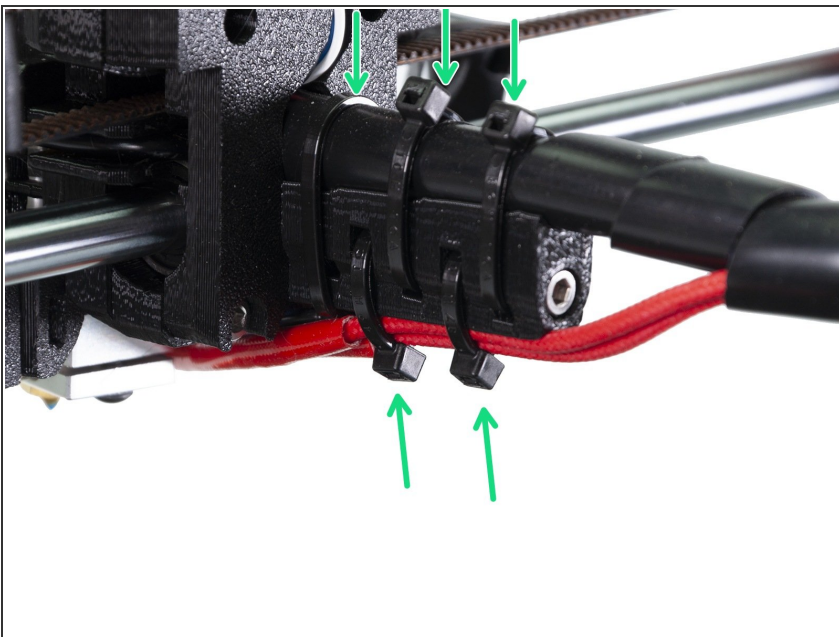
- Turn the printer around and cut **all five zip ties** on the extruder cable bundle. Be very careful while cutting!

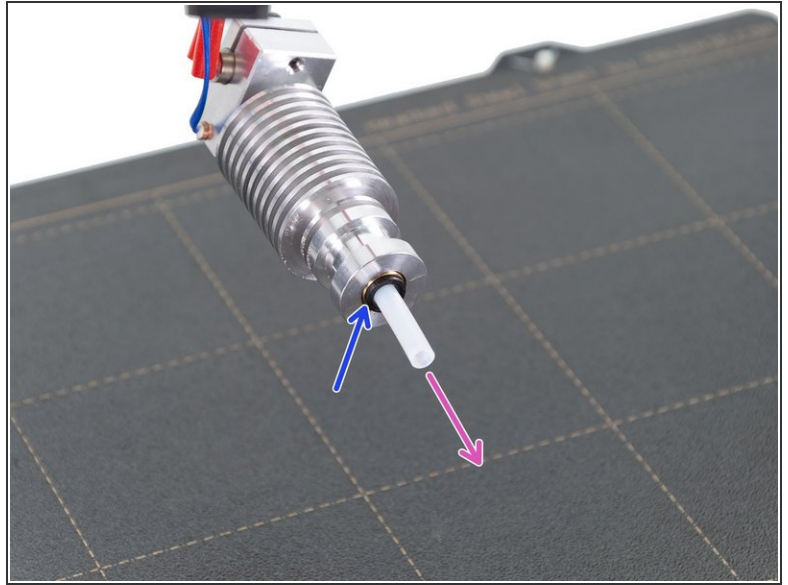- Remove all five zip ties from the extruder.

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Step 6 — Hotend removal

⚠️ **WARNING:** Removing hotend from the extruder needs a "special" technique, then the hotend slides out quite easily. Don't use excessive force, or you will damage some parts irreversibly!!!

- The hotend is removed by inclining and pulling at the same time. See the first picture showing the **WRONG inclination**. This hotend is inclined too much to the front and there is no gap between the hotend and the extruder body. Hotend is partly inside and you won't be able to remove it.

- The second picture is showing the **CORRECT inclination**. The hotend is tilted, but there is a gap between the hotend and the extruder body. You will be able to remove it.

- Now, let's incline the hotend properly. Take pliers in the second hand, grab the hotend above heatsink's ribs, pull downwards and slightly towards you. The hotend should "jump" out. Make sure you don't stretch the cables too much or you might damage them.

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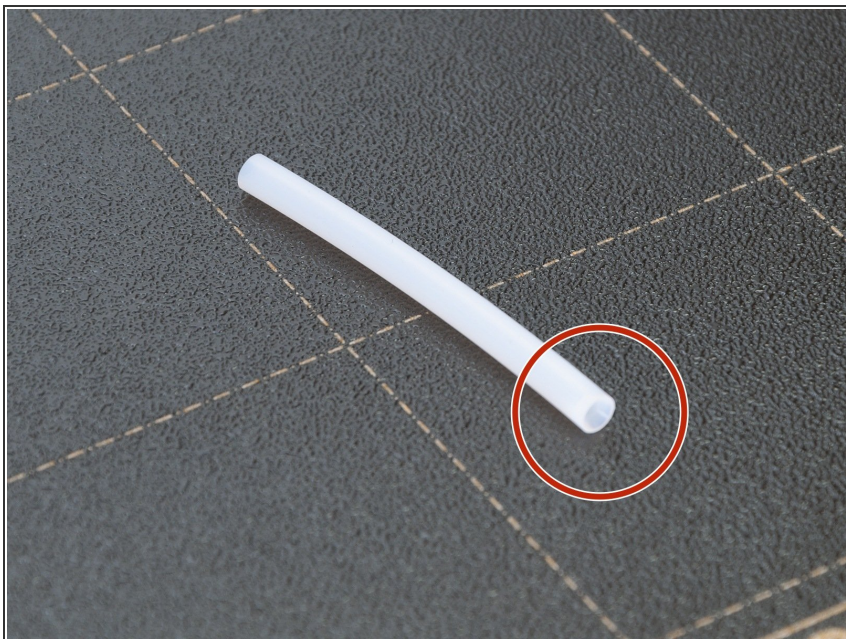
Step 7 — Removing the old PTFE tube

⚠️ **New PTFE tube is needed for MMU2 upgrade**.

● **Before you remove the PTFE tube**, check the heaterblock. In case there is a green dot, the PTFE tube is MMU2 compatible and there is no need to change it.

● Press the black plastic collet.

● Remove the PTFE tube from the hotend.

⚠️ **Throw this old tube immediately to the nearest trash bin** to avoid installing it back by accident ;)

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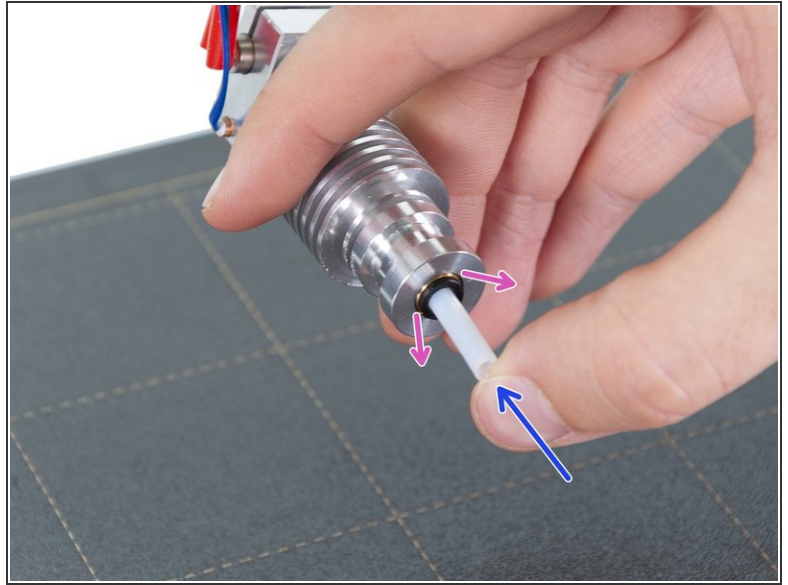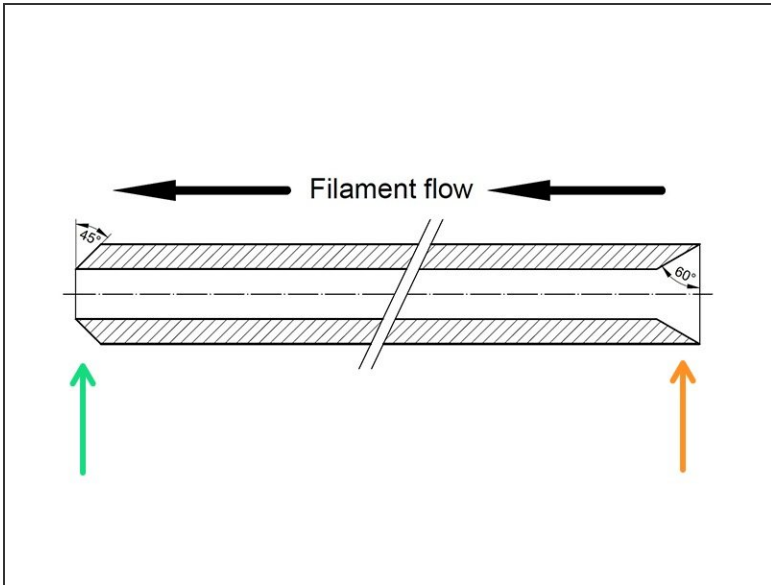
Step 8 — Preparing the necessary parts

- **For the following steps, please prepare:**

- PTFE tube 4x1.85x50 (1x)
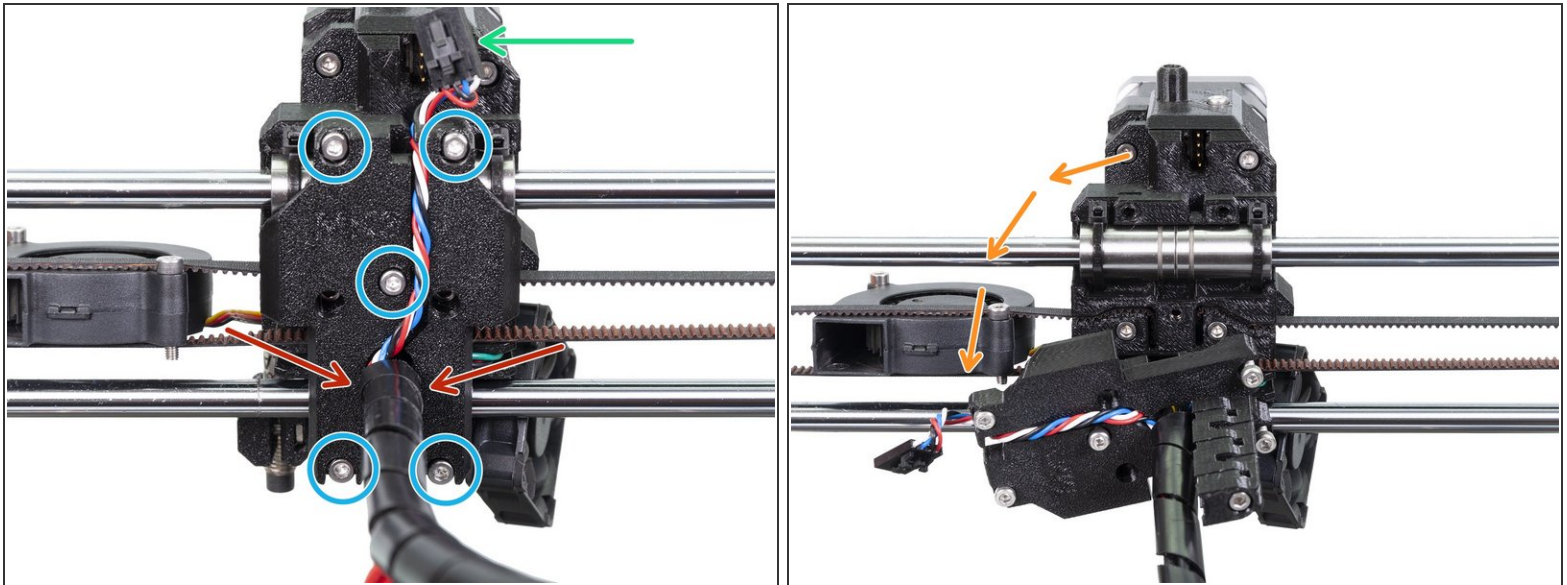
- *(i)* New PTFE tube is in the bag nr. 3.

- *(i)* There is an extra spare PTFE tube.

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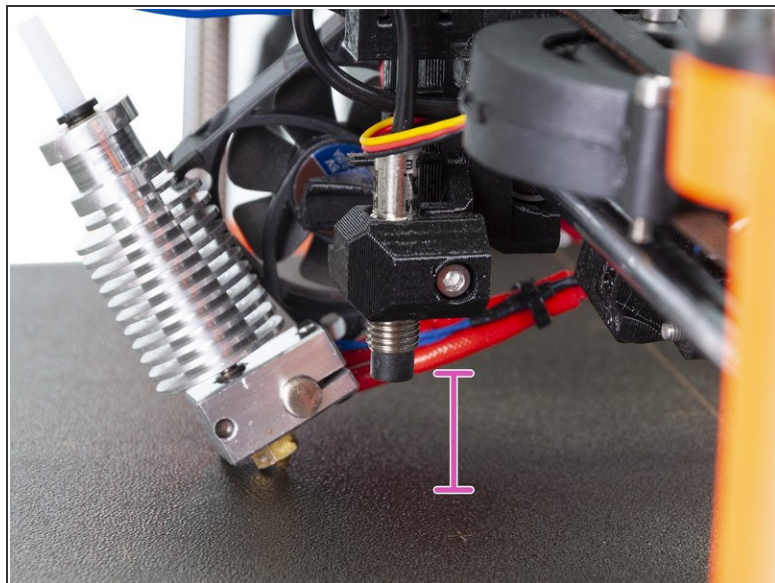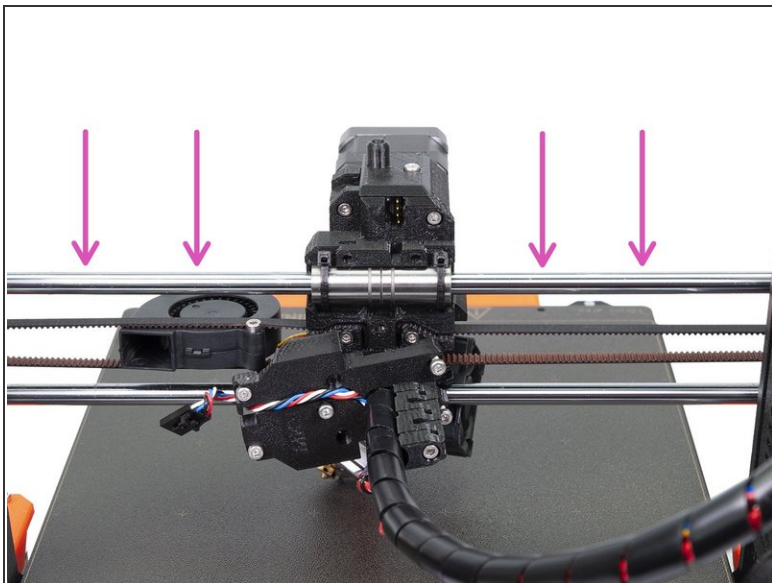Page 8 of 48

Step 9 — Assembling the new PTFE tube

- Now it is time to insert the new PTFE tube. Note there are two different ends.

- One end of the tube has **"rounded" outer edge**. This end must be **inside the hotend**.

- Look at the other end, where the tube is drilled inside, shape of the **edge is "conical"**. This is the side, where filament enters the tube. This part must be **outside the hotend**.

- Push the black collet in. Slide the tube all the way in and hold it!

- Using second hand pull the collet out and only then release the tube!!! **THIS IS CRUCIAL** for the hotend to work properly.

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Step 10 — Releasing the x-carriage-back

- Carefully push the unlock locking tab (safety pin) and unplug the filament sensor cable connector.

- **Release all five** M3x10 screws, you can leave them in the printed part.

- Make sure there are no zip ties left! Remove them before proceeding.

- Carefully rotate the x-carriage-back printed part to the left. Make sure you are not twisting the cables.

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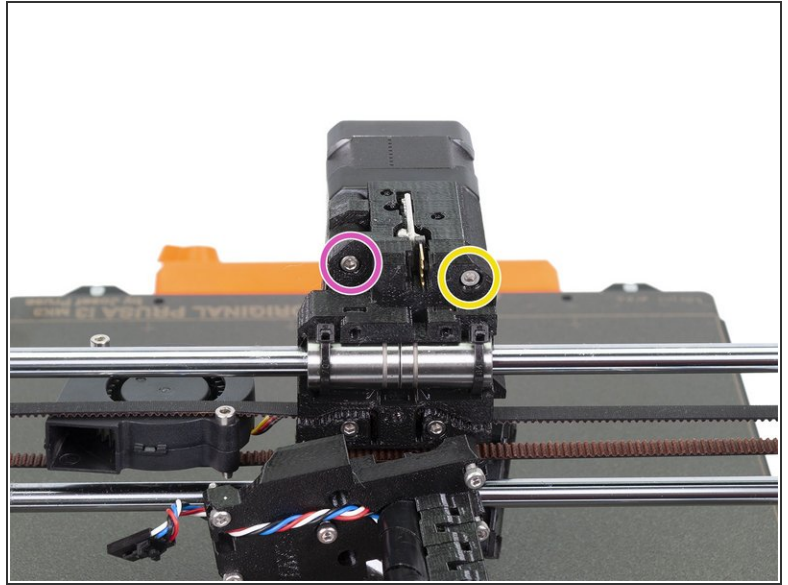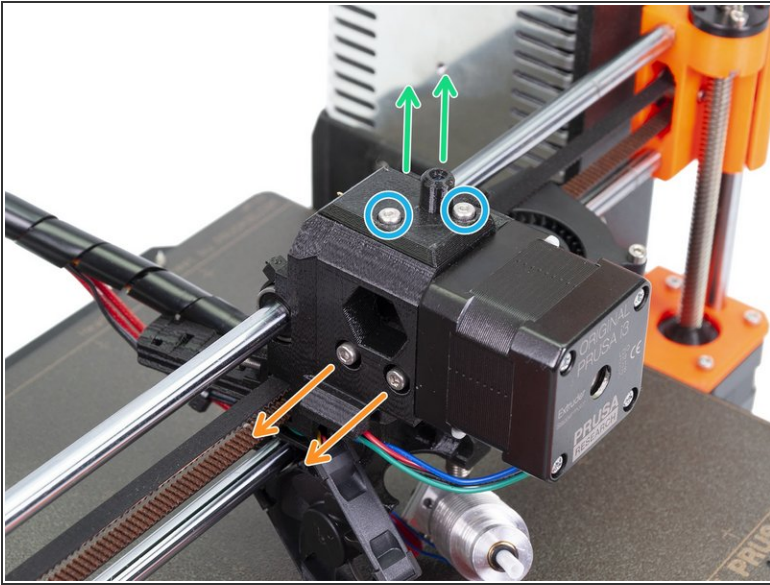
Step 11 — Moving the X-axis

- Using both hands lower slowly the X-axis down. Stop when the P.I.N.D.A. is around 2-3 cm above the surface.
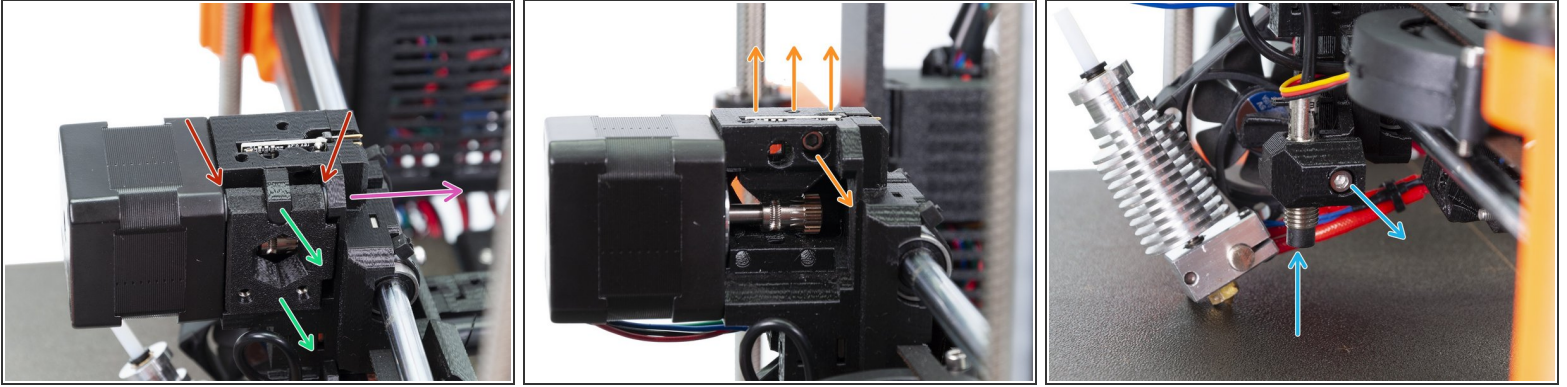
⚠ **Proceed carefully** as you might scratch the surface.

ⓘ In case you have a piece of fabric or bubble foil you can use it now, to protect the sheet against scratches.

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Step 12 — Removing the filament sensor cover

- Release both M3x10 screws and remove them.

- Remove the filament-sensor-cover part together with the (short) PTFE tube.

- Release and remove both M3x40 screws including the springs.

- Release the M3x30 screw, **but leave it in place**, we will remove it later.

- Release and remove the M3x40 screw.

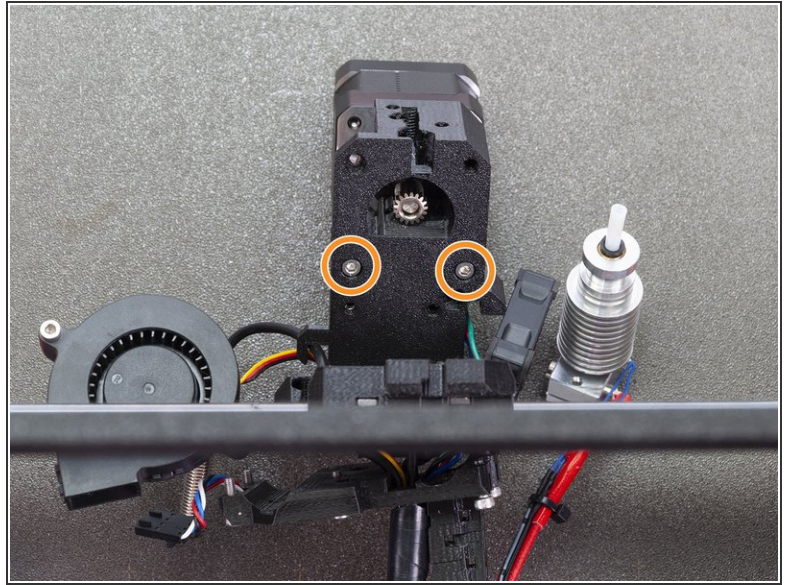This document was generated on 2021-04-23 03:18:30 AM (MST).
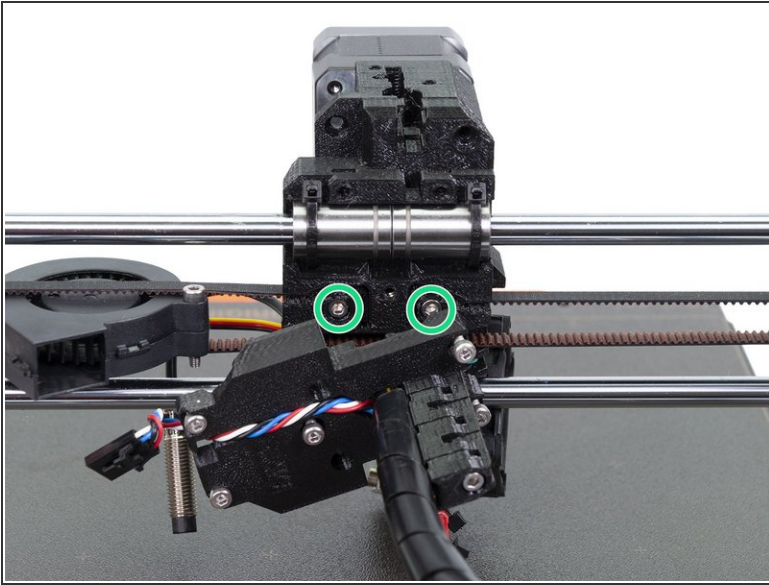
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Step 13 — Removing the idler and P.I.N.D.A. sensor

⚠️ In this step, we will remove the idler part. Before doing so, **make sure you catch two translucent washers**, which are on both sides!

● Remove the M3x30 screw from the idler.

● Remove the plug and the idler. Make sure you catch the translucent washers!

● Release the M3x10 screw and carefully remove the filament sensor. **Avoid touching the chips on the PCB!**

● Release the M3x10 screw and push from below the extruder to remove the P.I.N.D.A. sensor. **Avoid pulling the sensor out using cable!**

ⓘ In case you can't push the P.I.N.D.A. sensor up, very gently spread the holder around the sensor. Be careful as you might break it.

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Step 14 — Removing the extruder motor

⚠️ In this step, the extruder body will fall apart, **make sure you hold the motor in the front!**

● Release and remove both M3 screws holding the extruder-body on the X-axis.

● Have a look at the printer from the top, gently lay the extruder-body with the motor on the heatbed.

● Release and remove the last couple of M3 screws holding the motor and extruder-body together.

● Now, remove the extruder-body part.

ⓘ The extruder-body will be replaced with a new one.

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Step 15 — Extruder surgery is finished!
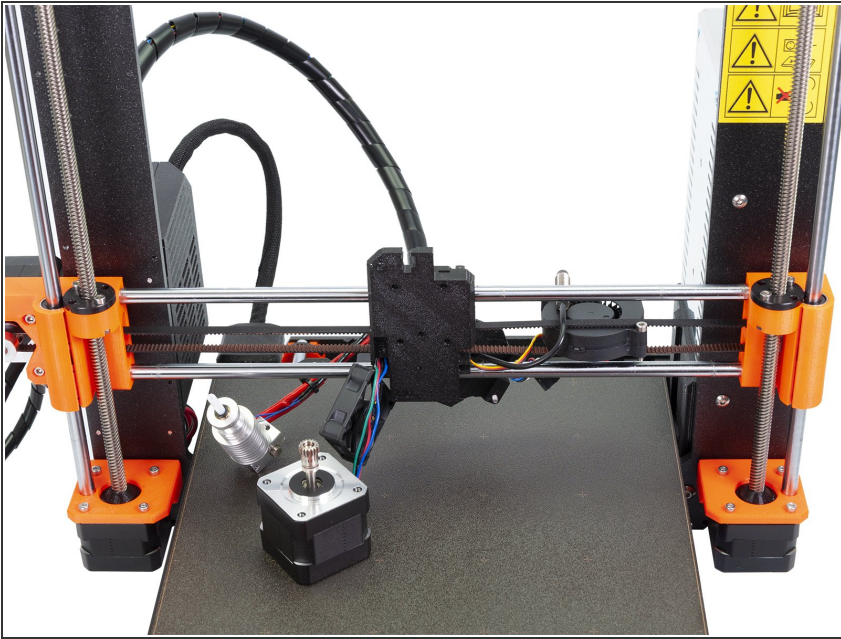
- The final check of the surgery!

- Majority of the extruder's printed parts should be removed. The only remaining parts are X-carriage and X-carriage-back.

- ⚠ Make sure all the cables aren't stretched! Lower the X-axis down if needed.

- ⓘ Try removing all the nuts and screws from the disassembled parts. You will need them for the reassembly. Some nuts might be a bit difficult to remove from the extruder-body or extruder-cover, you can use the ones sent in the bag with the plastic parts.

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Step 16 — Filament sensor cleanup
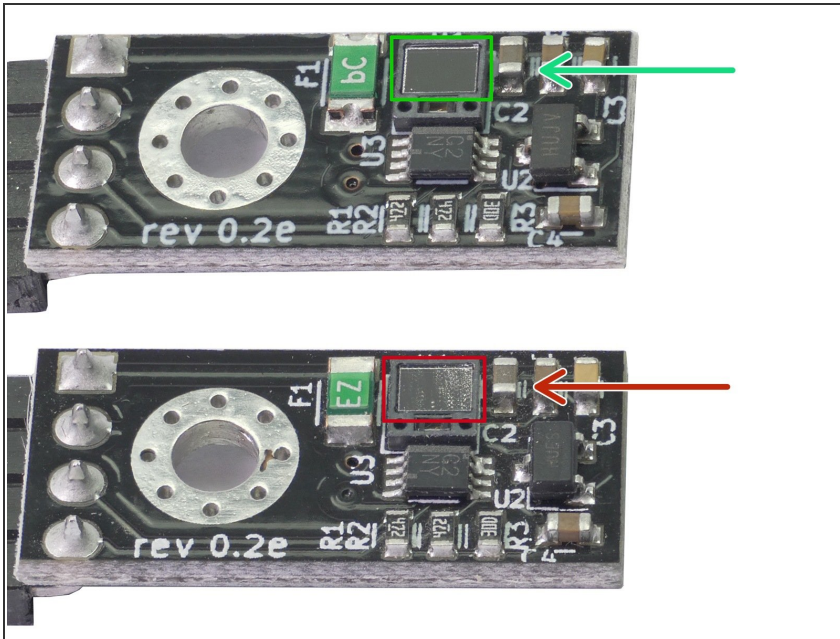
- Let's check the filament sensor. See the picture to compare two states of the sensor:

  - **A clean sensor** is without any dust particles or grease. It is necessary to keep the sensor clean for precise readings of the filament.

  - **A dirty sensor** is covered with dust and grease, which can significantly reduce its precision.

- (i) **How to clean it:** use a Microfiber cloth and gently wipe the sensor in one direction only. To remove the grease, spray a bit of IPA on the cloth, not directly on the sensor!

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Step 17 — Assembling filament sensor (part 1)
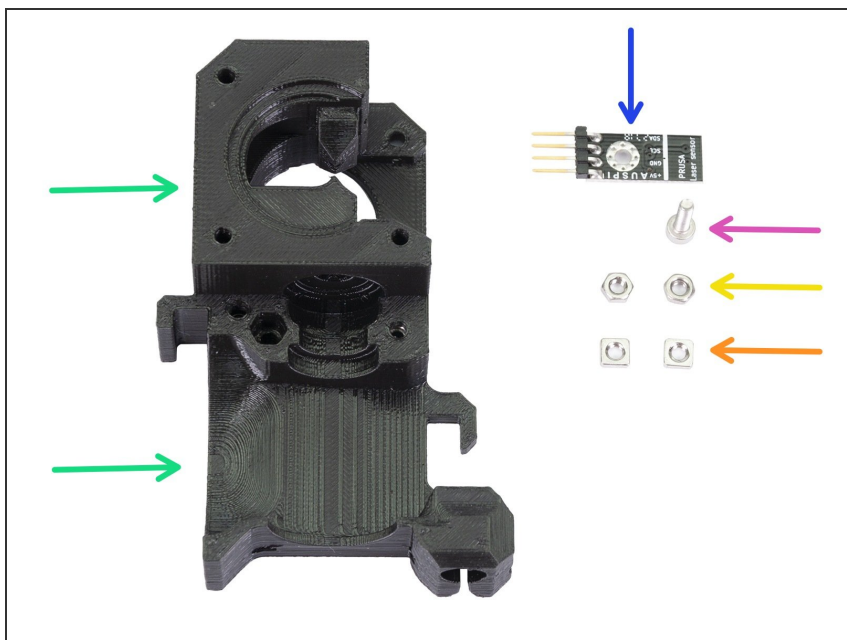
⚠️ **BE CAREFUL** with the filament sensor, do not touch the black PCB nor the chips on it.

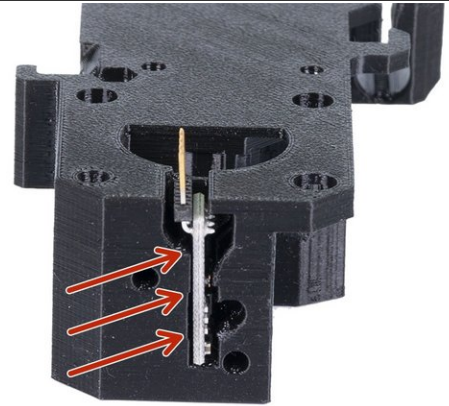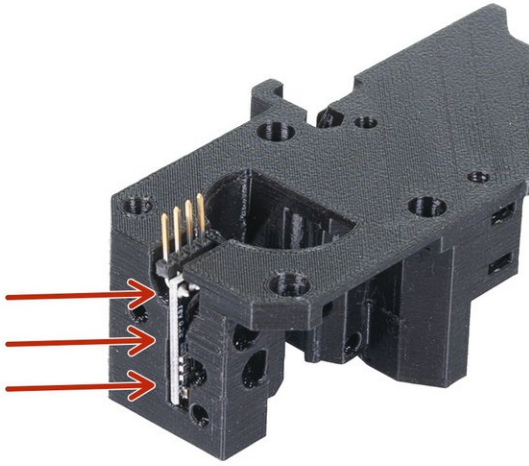- For the following steps, please prepare:

- Extruder-body B7 (1x)

- Filament sensor (1x)

- M3x10 screw (1x)

- M3n nut (2x)

- M3nS nut (2x)

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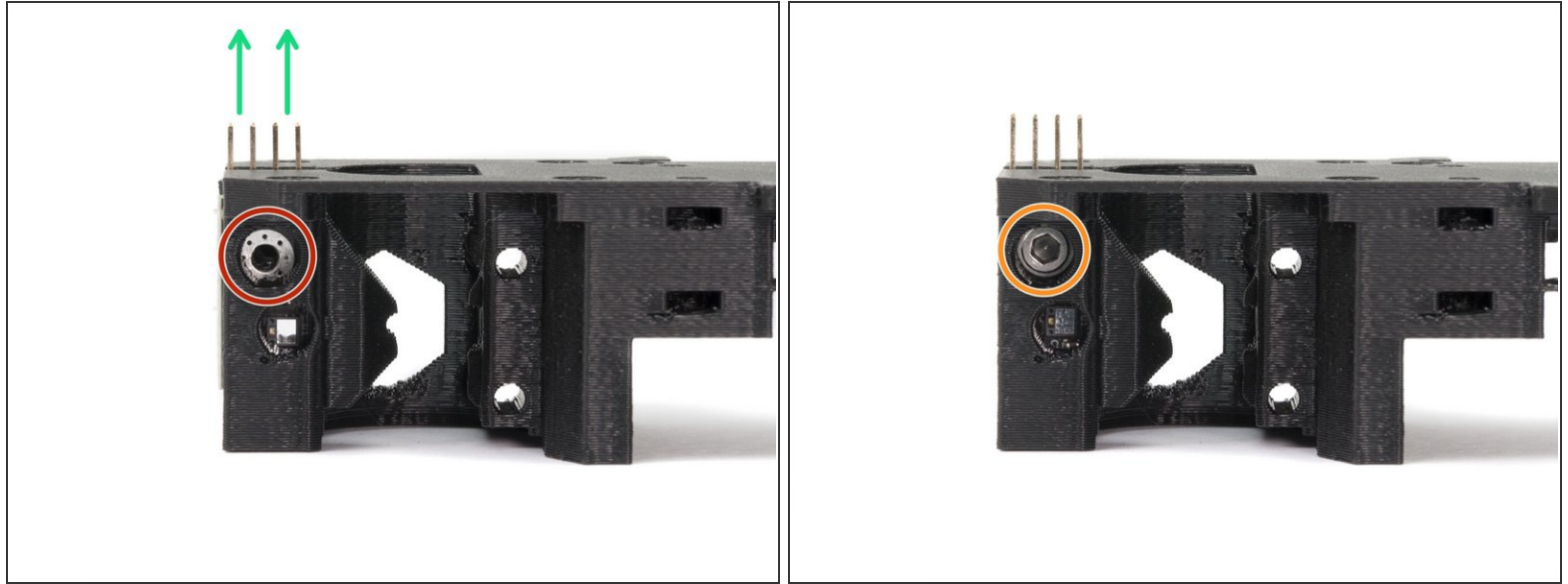## Step 18 — Assembling filament sensor (part 2)

- Before we continue with the assembly, we need to insert nuts in the Extruder-body. Take the extra time and effort to place them in properly. **You won't be able to reach them later.**

- Rotate the **front part** towards you and insert the M3 nut in the slot, all the way in.

- Rotate the **rear part** towards you and insert the M3 nut in the slot, all the way in.

- (i) If you can't push the nuts in, use a longer screw from the other side and tighten it until you "pull" the nut in.

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Step 19 — Assembling filament sensor (part 3)
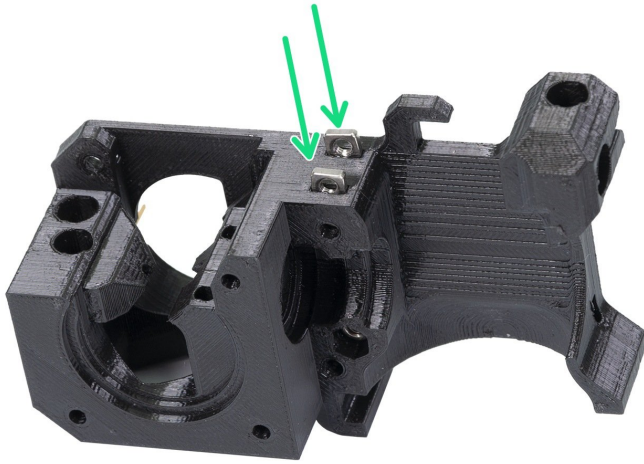

- **Carefully insert** the filament sensor in the slot, **do not use force** or you might damage the PCB!

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## Step 20 — Assembling filament sensor (part 4)

- Turn the extruder-body like in the picture. The pins of the filament sensor must be facing up.

- Locate the opening for the M3 screw.

- Take the M3x10 screw and tighten the sensor in place. No nut is needed, the screw will self-tap into the plastic.

- ⚠ The sensor must be tightened completely to prevent its movement **BUT BE CAREFUL** during tightening to avoid damage to the sensor.

- ⓘ Layers might be visible in this printed part due to the geometry. The functionality and strength remain unaffected.

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## Step 21 — Mounting point for the extruder body

- Take two M3nS nuts from the package and insert them in the slots, all the way in.

- ⓘ Check proper alignment with the 1.5mm Allen key.

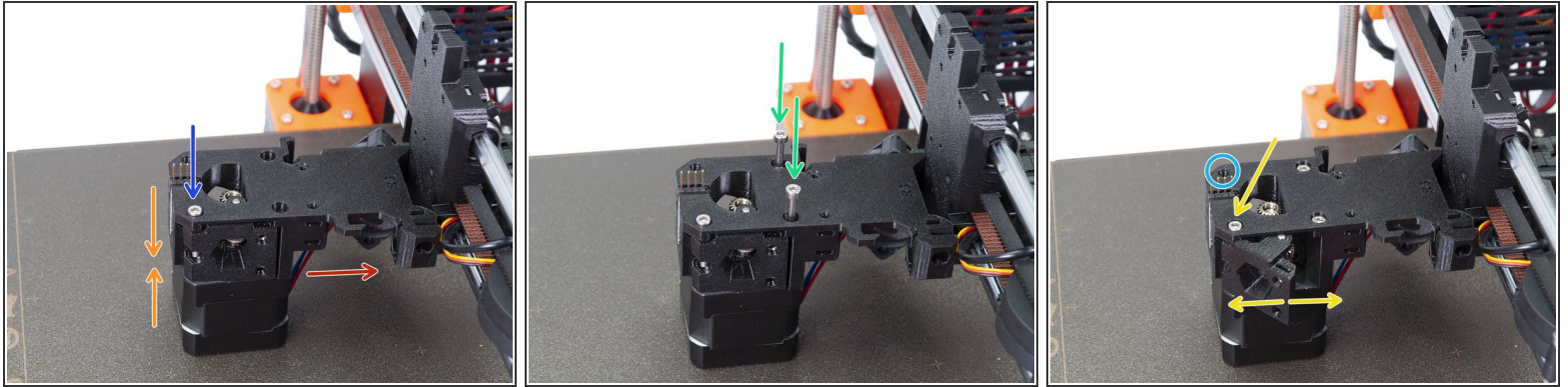## Step 22 — Extruder assembly - idler (part 1)
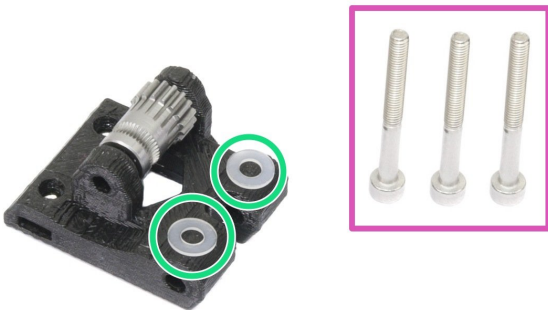
- For the following step, please prepare:

- M3x30 screw (3x)

- M3 translucent washer (2x)

- Translucent washers are placed on the idler for better visibility. No need to place them as in the picture ;)

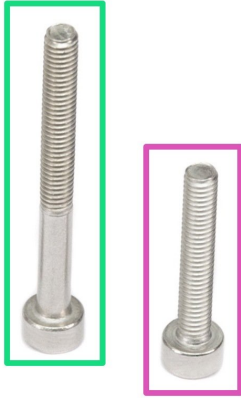## Step 23 — Extruder assembly - idler (part 2)
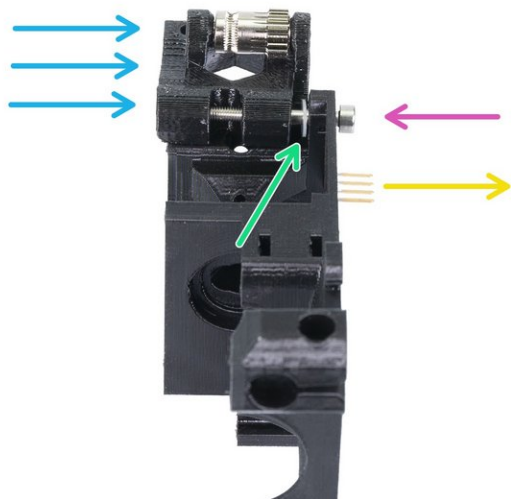
- Turn the Extruder-body like in the picture. The pins must be facing to the right.

- Insert M3x30 screw in the hole.

- Place a washer from the other side.

- Assemble the idler on the M3x30 screw.

- Finish the assembly with the second washer.

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Step 24 — Extruder motor assembly

- Connect carefully the extruder-body with the extruder motor and place it on the heatbed.

- Motor cable should be pointing in the indicated direction.

- Make sure both parts are properly aligned, then slightly tighten the M3x30 screw.

- Insert two M3x30 screws and tighten them firmly.

- Return to the idler screw and check, whether you can move with the idler part easily, if not release the screw. In case the idler part is too loose, you can tighten the screw a bit.

- Leave the fourth hole empty for now, we will use it later ;)

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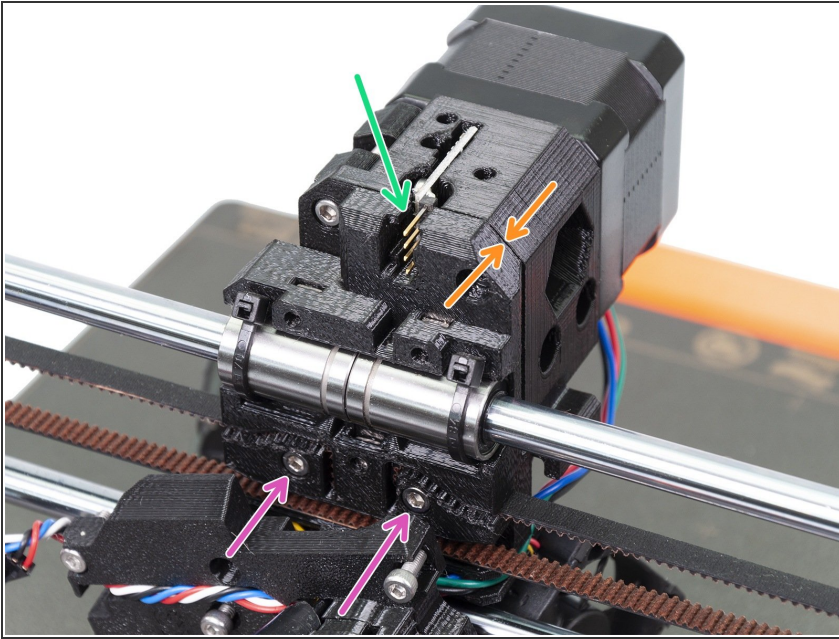## Step 25 — Mounting the extruder (part 1)

- For the following step, please prepare:

- M3x30 screw (1x)

- M3x18 screw (1x)

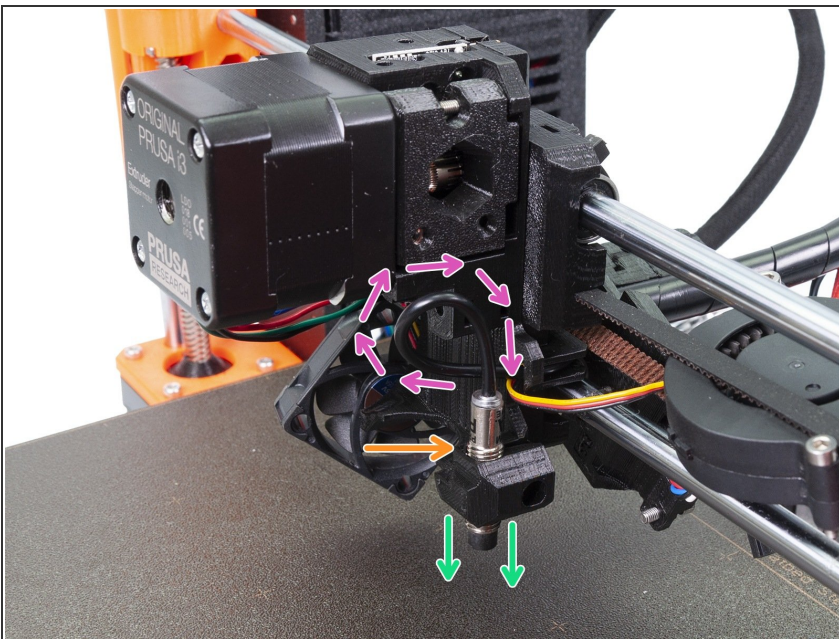## Step 26 — Mounting the extruder (part 2)
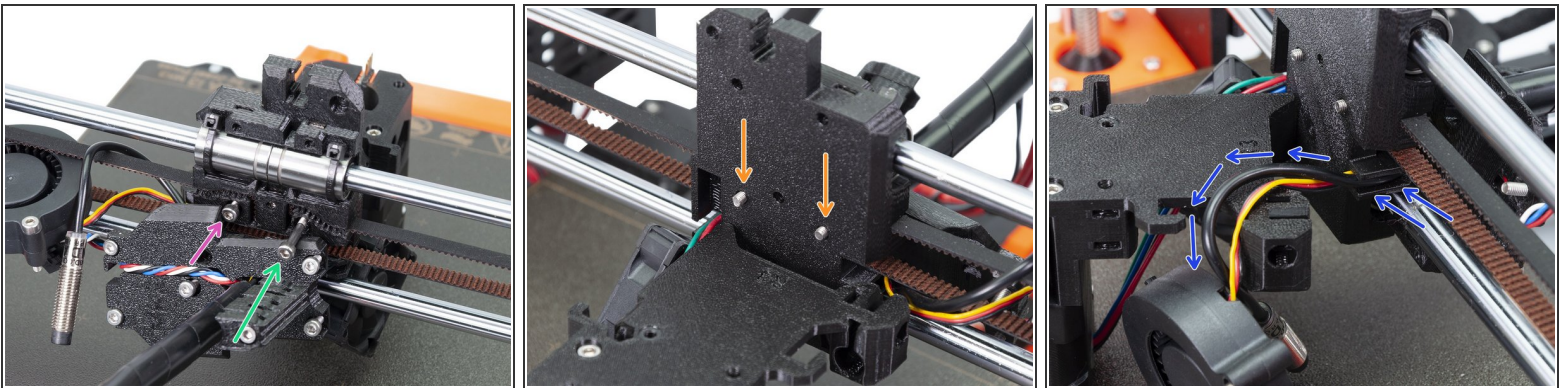
- Place the shorter M3x18 screw in the left hole.

- Place the longer M3x30 screw in the right hole.

- Check from the other side of the X-carriage, both screws should be sticking few millimetres out. It will help you during the assembly.

- Before you move to the next step, arrange the P.I.N.D.A. sensor and Front print fan cables. Push gently both cables in the channel and lay them over the extruder-body. See the third picture for details. **Pay attention to this part or you might pinch and break them!**

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Step 27 — Mounting the extruder (part 3)

- Mount the extruder-body on the X-carriage and tighten slightly both screws.

- Make sure no wires are pinched between both plastic parts.

- Make sure the pins of the filament sensor aren't bent or in contact with the printed parts.

- Check the proper alignment using the edge of both parts.

- Tighten both screws.
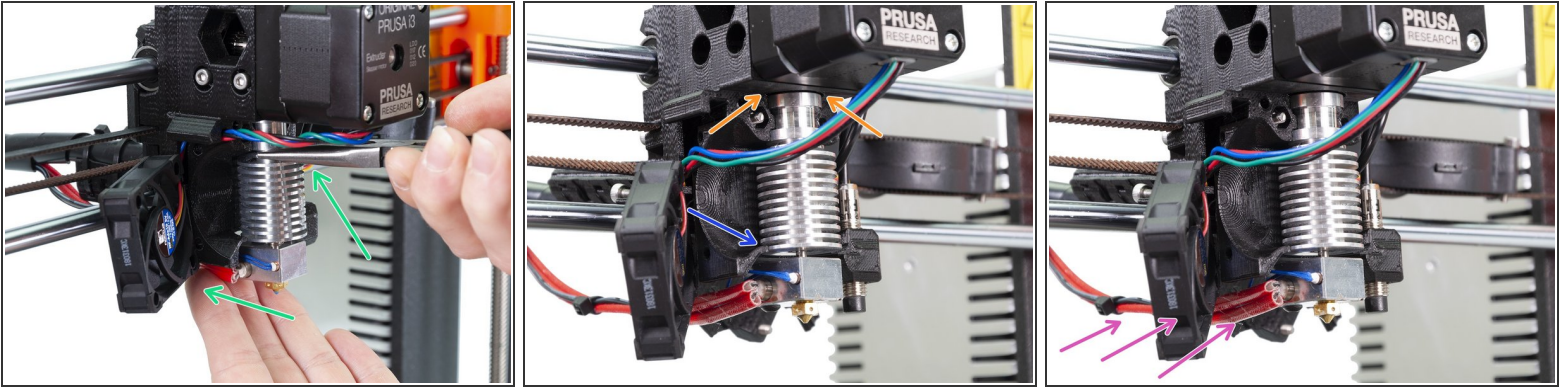
Step 28 — P.I.N.D.A. sensor reassembly

- Create a loop on the P.I.N.D.A. sensor cable.

- Slide the sensor in the holder on the extruder body.

- Exact position will be set later.

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Step 29 — Adjusting the X-axis
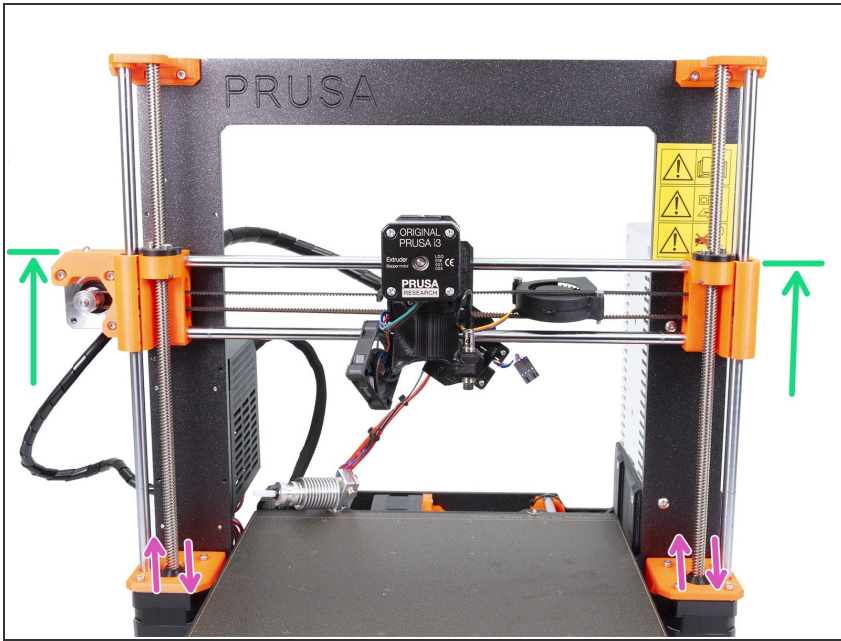
- To have a better access to the lower part of the extruder, move carefully the X-axis up. Stop slightly above the middle of the height of the printer's frame.

- Using your fingers rotate the lead screws to move the X-axis up. Pulling the X-axis isn't recommended.

- Move both sides up simultaneously!

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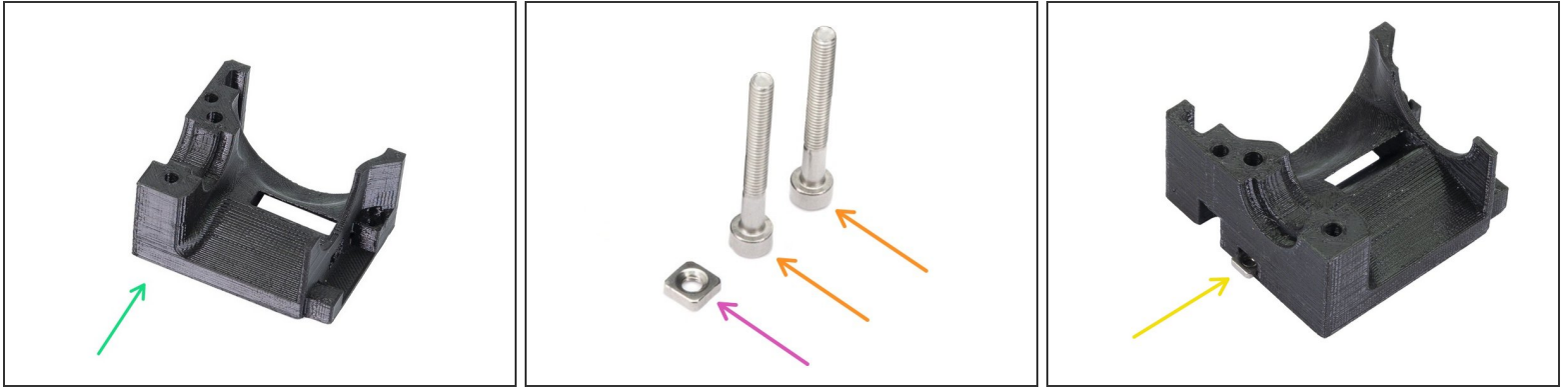Page 26 of 48

Step 30 — Inserting the E3D hotend

- Carefully slide the hotend back to the extruder-body.

⚠️ **CHECK THE PROPER ALIGNMENT** of the hotend in the extruder body. **THIS IS CRUCIAL.** Otherwise, you won't be able to calibrate the printer later!

- Where to check the alignment:
    - There should be no gap between the extruder-body and the hotend.
    - The last rib on the hotend's heatsink should be aligned with the printed part. See the photo.
- Make sure the hotend's cables are on the left side. Compare your assembly with the picture.

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## Step 31 — Mounting the extruder-cover (part 1)

- For the following steps, please prepare:

- Extruder-cover B7 (1x)

- M3nS nut (1x)

- M3x25 screw (2x)

- Insert the M3nS nut in the extruder-cover. Ensure proper alignment using the smallest Allen key.

## Step 32 — Mounting the extruder-cover (part 2)
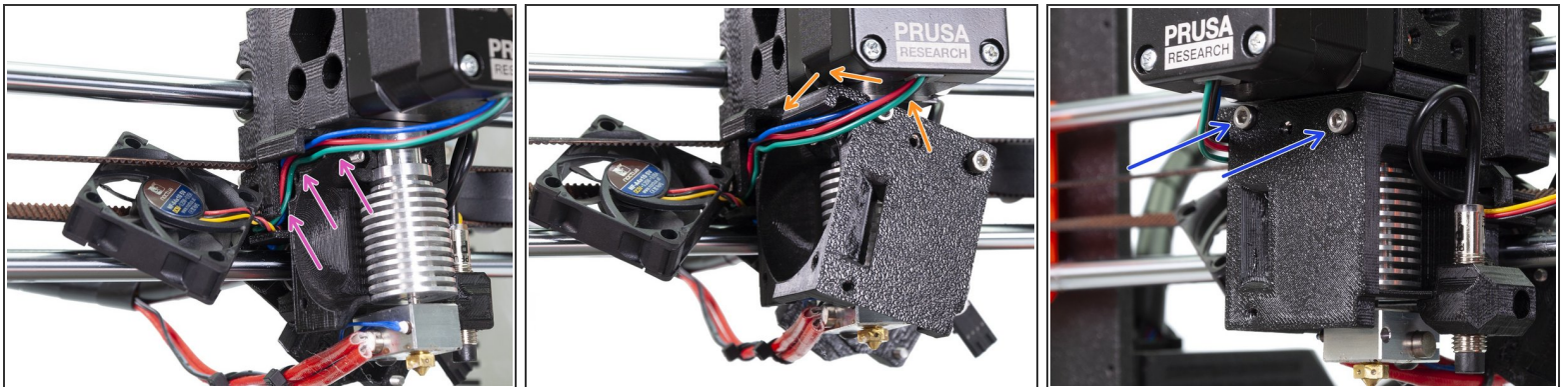
- Arrange the extruder motor cables in the channel all the way to the back.

- Insert both M3x25 screws in the extruder-cover and slide it in above the extruder motor cable.

- Check the parts alignment and tighten both parts together.

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Step 33 — Mounting the Left hotend fan (part 1)
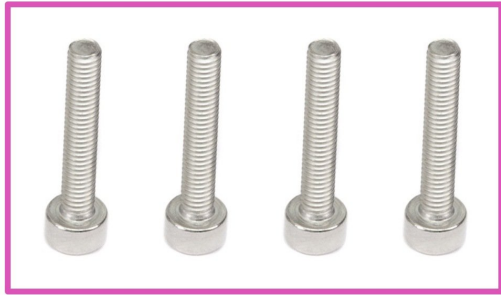
- For the following steps, please prepare:

- M3x18 screw (4x)

- ⓘ The screws might be already in the Noctua fan.

Step 34 — Mounting the Left hotend fan (part 2)
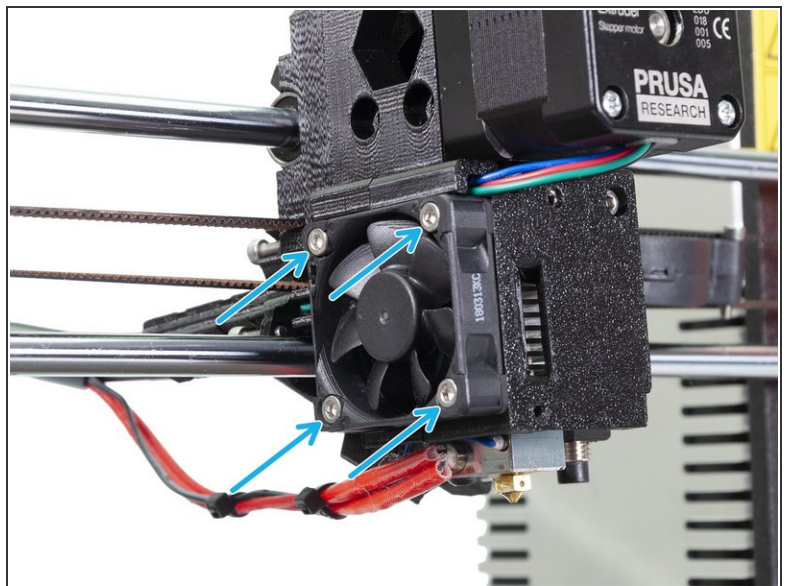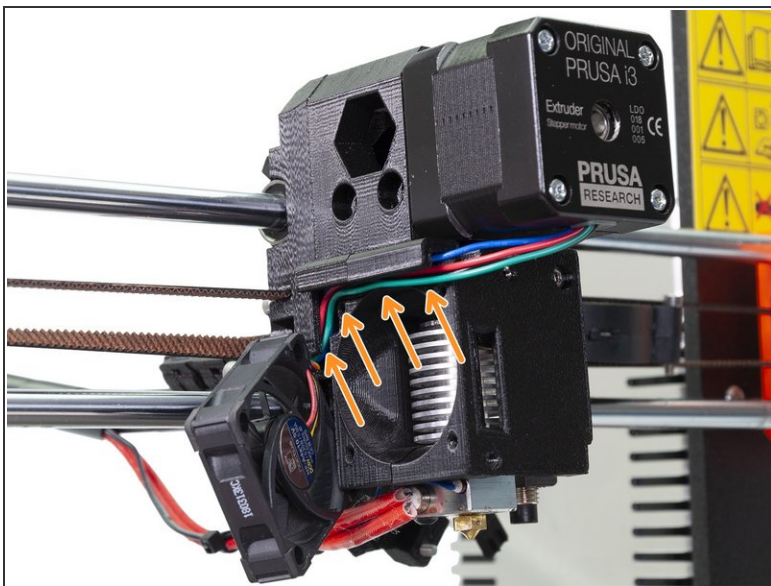
- Check again the arrangement of the extruder motor cables in the channel all the way to the back.

- Place back the Left hotend fan (Noctua) and make sure no wire is pinched.

- Insert and tighten all four M3x18 screws. Be careful with the tightening as you might break the plastic frame of the fan.

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Step 35 — Mounting the front print fan (part 1)
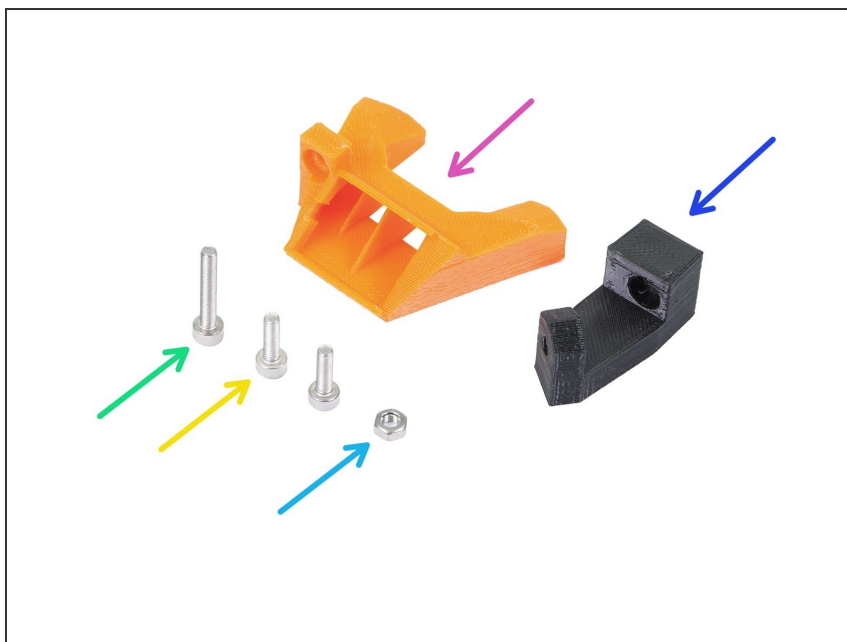
- For the following steps, please prepare:
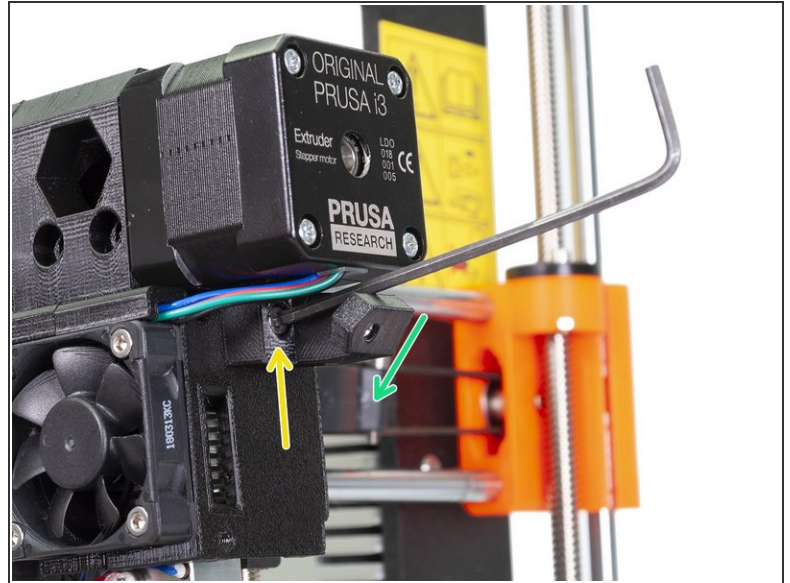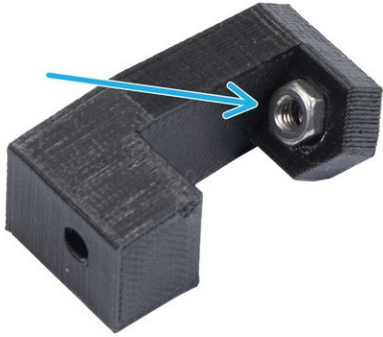
- nozzle-fan-45deg-support (1x)

- nozzle-fan-45deg (1x)

- M3x18 screw (1x)

- M3x10 screw (2x)

- M3n nut (1x)

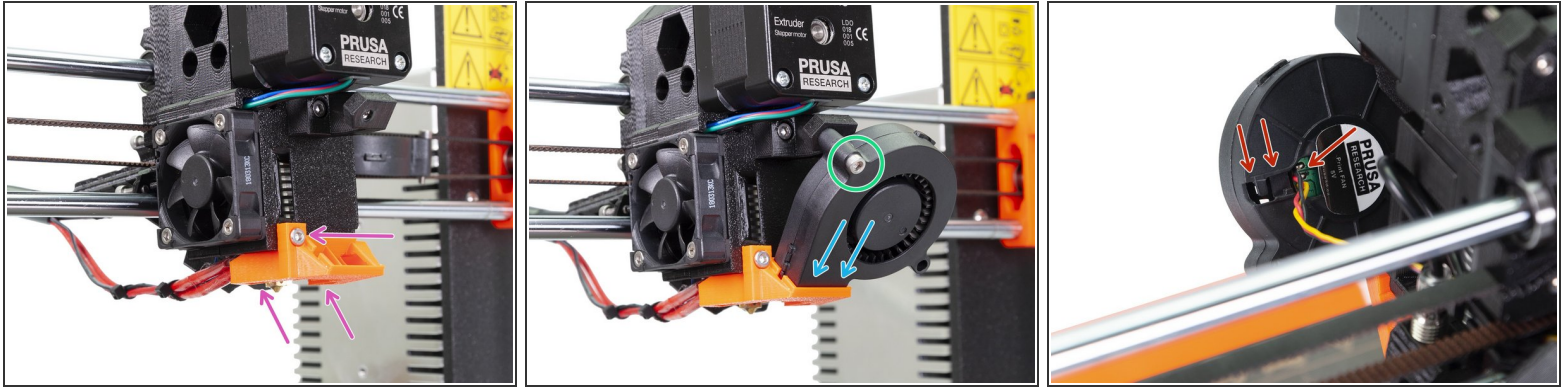- *(i)* In case you are missing one M3x10 screw please use the spare bag.

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Step 36 — Mounting the front print fan (part 2)

- Press the M3n nut in the support, all the way in. It will be barely visible. If needed use a screw from the other side to pull the nut in, then remove the screw.

- Connect the support to the extruder using the M3x10 screw. Note the correct orientation in the picture.

- The inclined part of the support must be facing to the extruder cover.

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## Step 37 — Mounting the front print fan (part 3)

- Place the nozzle-fan on the extruder and secure it using M3x10 screw.

- Slide the Front print fan in the nozzle-fan.

- Secure the fan using an M3x18 screw.

- (i) Note for the B7/R3 design only one instead of two M3x18 screws is needed you will have one M3x18 left, which is OK ;)

- It might happen the fan cable is too short and you can't incline the fan. First, try gently pulling the cable from the spiral wrap. If this doesn't help there are two options:

  - **In case you will be changing the spiral wrap for the textile sleeve,** you can move the entire cable later, without unhooking the cable from the fan. Secure the fan in the X-axis for now.

  - If you won't be changing the spiral wrap. Unhook the cable (see the picture), **but be extremely careful as you might disconnect the wires from the fan!**
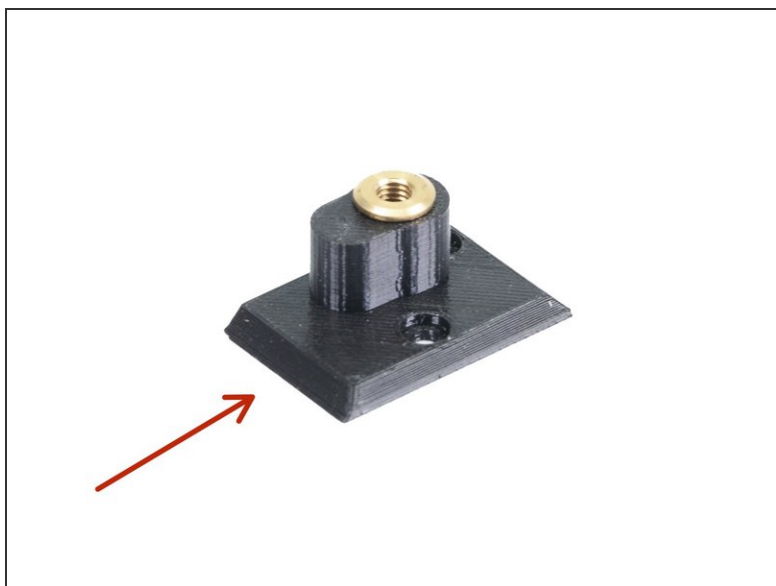
Step 38 — Securing the extruder idler (part 1)

- For the following step, please prepare:

- M3x40 screw (2x)

- Extruder spring (2x)

Step 39 — Securing the extruder idler (part 2)
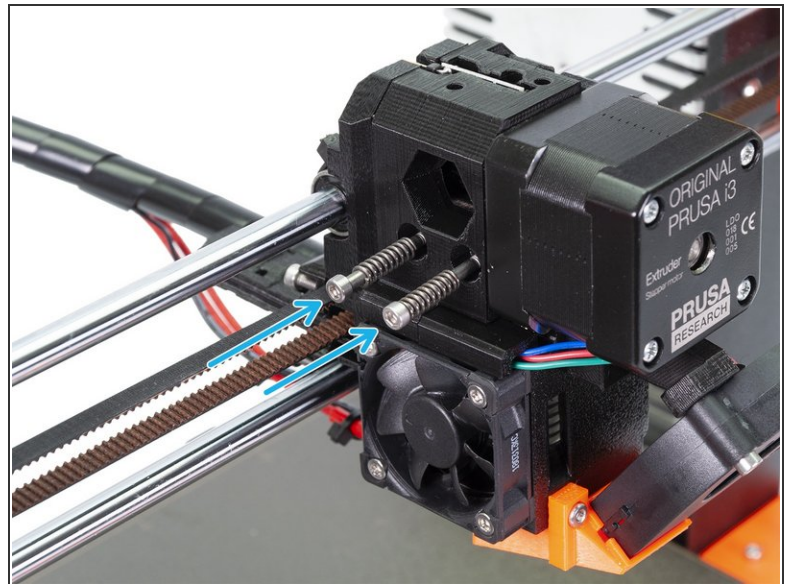
- Assemble springs on both screws.

- Close the idler on the extruder, so the screws can reach it.

- Place both screws into the extruder body and tighten them. The screw's head should be almost aligned with the printed surface.

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Step 40 — Mounting the Filament-sensor-cover (part 1)

- **For the this step, please prepare:**
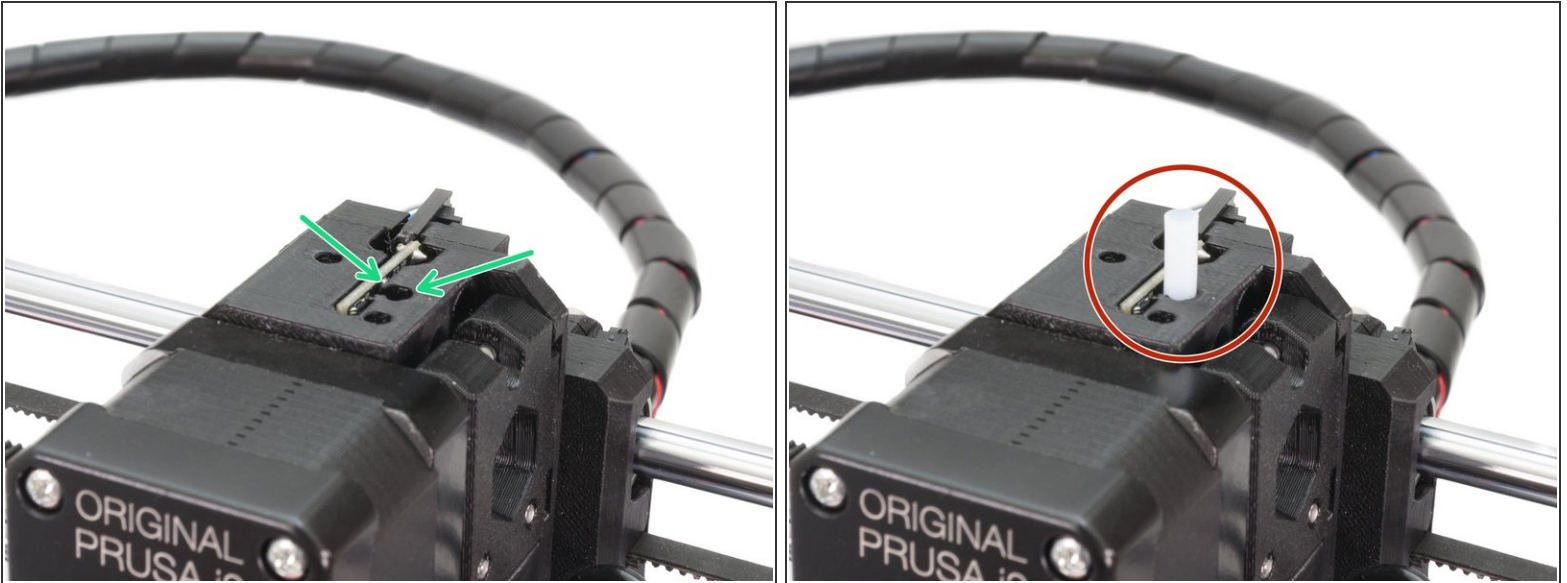
- mmu2-filament-sensor-cover (1x)

- Idler-plug (1x)

- M3x10 screw (2x)

- PTFE tube 4x13 (1x)

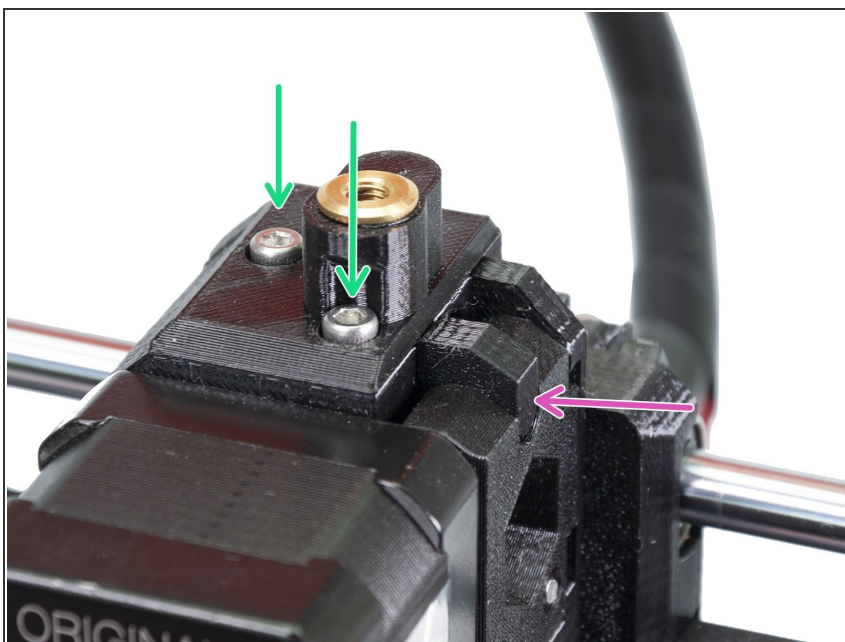- ⓘ Use a new PTFE tube (short 13 mm), which is in the MMU2 upgrade kit.

- ⓘ The new PTFE tube and mmu2-filament-sensor-cover are in the bag nr. 3.

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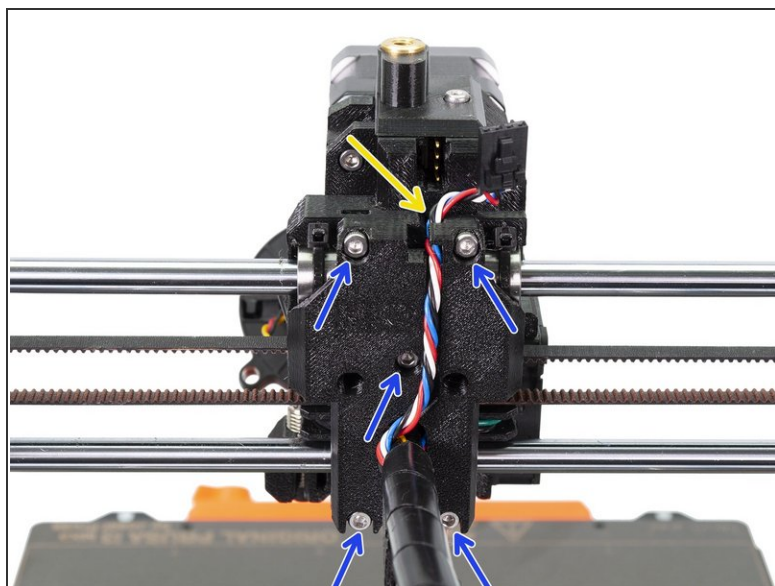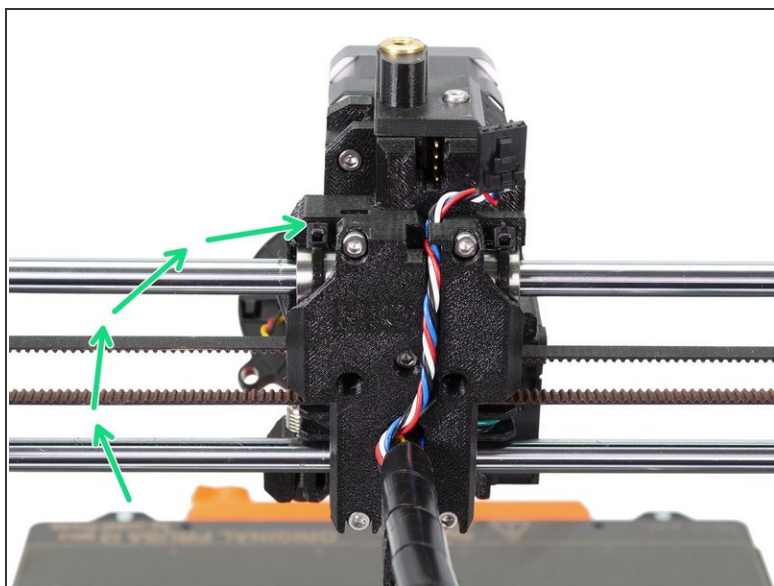## Step 41 — Mounting the Filament-sensor-cover (part 2)

- Locate the largest circular opening for the PTFE tube on the top of the Extruder.

- Push the PTFE tube in. Most of the tube's length will stick out. Orientation doesn't matter, both ends are the same.

- (i) In case the PTFE does not hold properly in the hole, you can assemble it to the cover first, BUT MAKE SURE there is no obstacle in the hole as you can easily deform the tube while placing as a part of the cover.

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Step 42 — Mounting the Filament-sensor-cover (part 3)

- Install the filament sensor cover and tighten it with the M3x10 screws from the previous cover.

- Assemble the idler-plug and ensure it fits properly. Otherwise, it might fall down during the print.

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Step 43 — X-carriage-back reassembly

- First, rotate back the X-carriage-back part.

- Ensure no cables are pinched between X-carriage and X-carriage-back.

- Guide the filament sensor cable as in the picture.

- Tighten all five M3x10 screws.

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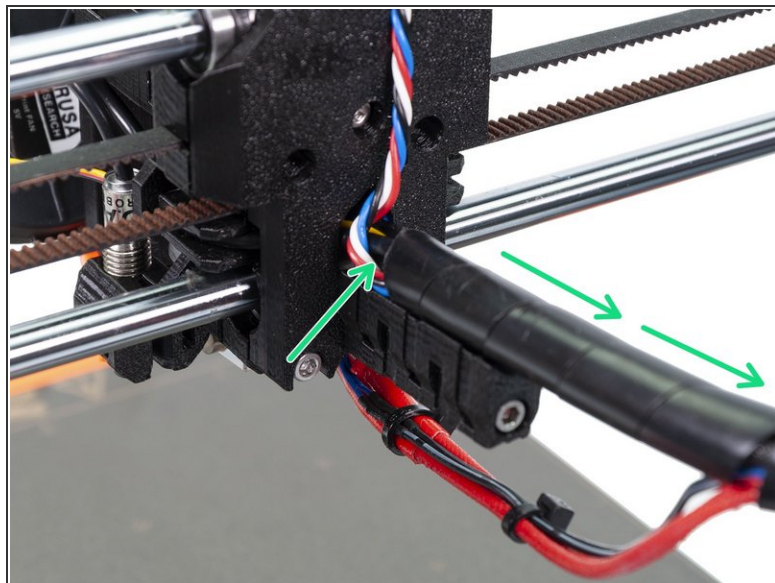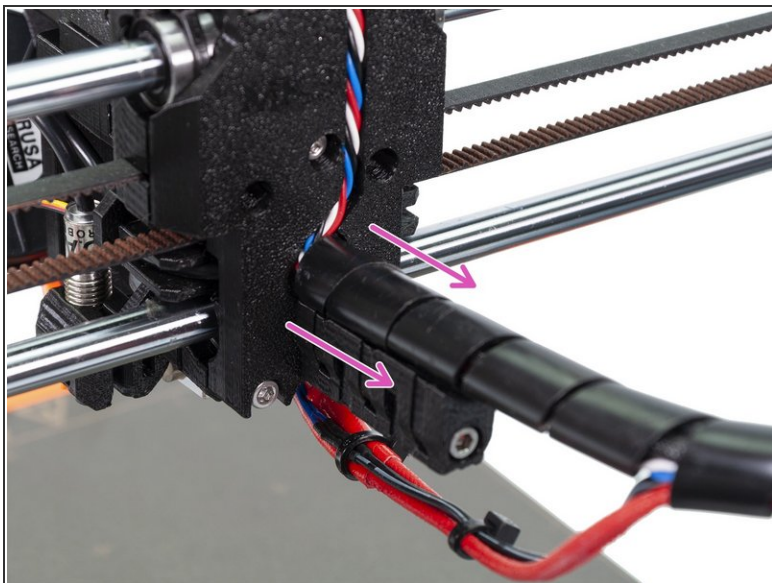### Step 44 — Finishing the extruder-body mounting (part 1)

- For the following steps, please prepare:

- M3x40 screw (1x)

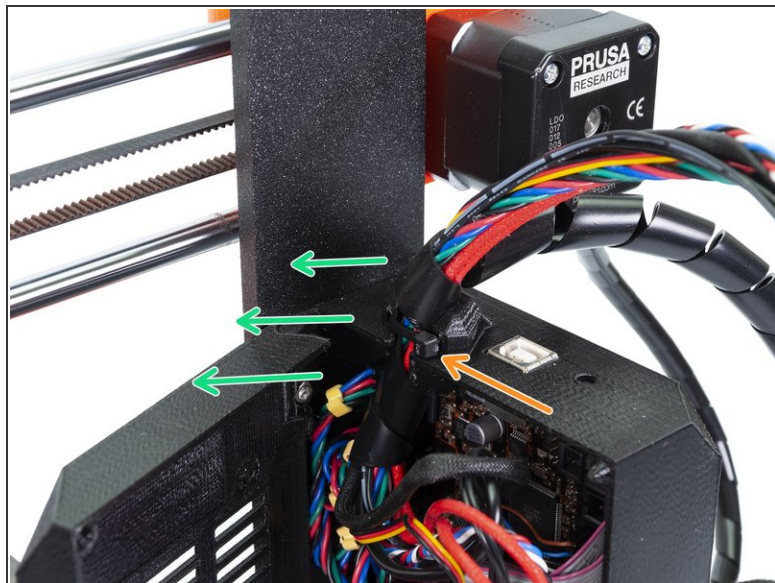### Step 45 — Finishing the extruder-body mounting (part 2)
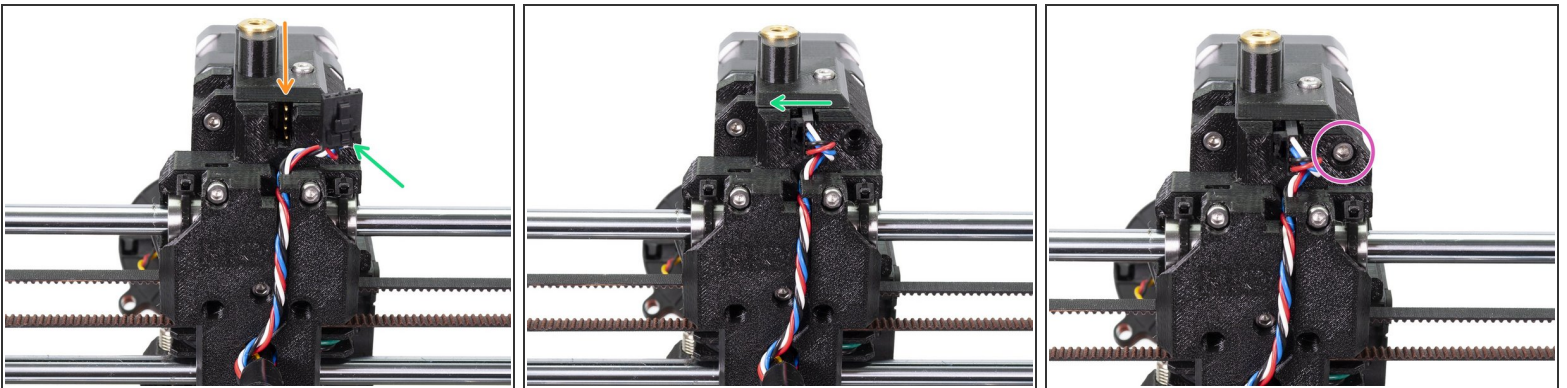
- Let's connect back the filament sensor, there are two important things:
  - There are four pins on the sensor, make sure the connector fits properly on them.
  - There is a safety pin on the connector, which must face to the left, when connected to the sensor.
- Secure the extruder-body with the screw M3x40.

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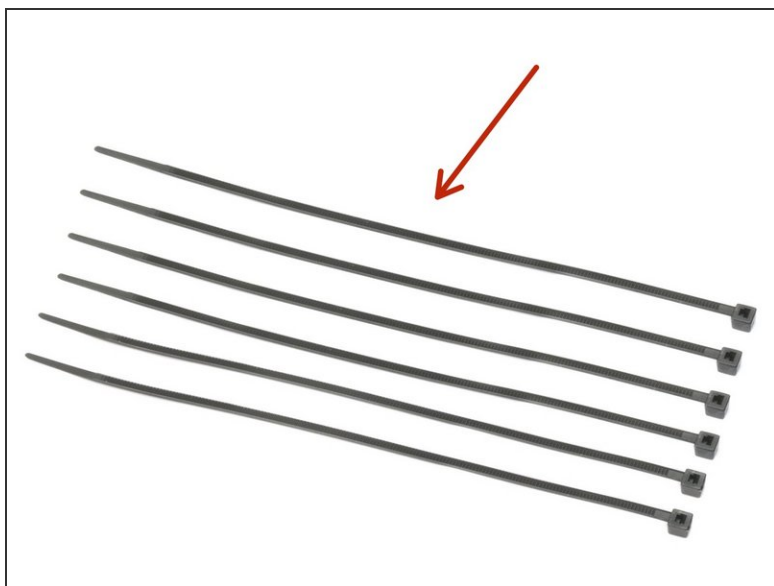## Step 46 — Removing the spiral wrap (part 1)

- Carefully slide the spiral wrap away from the X-carriage-back. One or two centimetres are enough.

- Find the end of the wrap and start unwrapping towards the EINSY-case.

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Step 47 — Removing the spiral wrap (part 2)

- Using an Allen key release the M3x40 holding the EINSY-door and open it.

- Using pliers cut the zip tie holding the wrap. Be very careful, avoid cutting any wire.

- Take the spiral wrap out including the cables and remove the wrap completely.

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Step 48 — Tightening the textile sleeve (part 1)
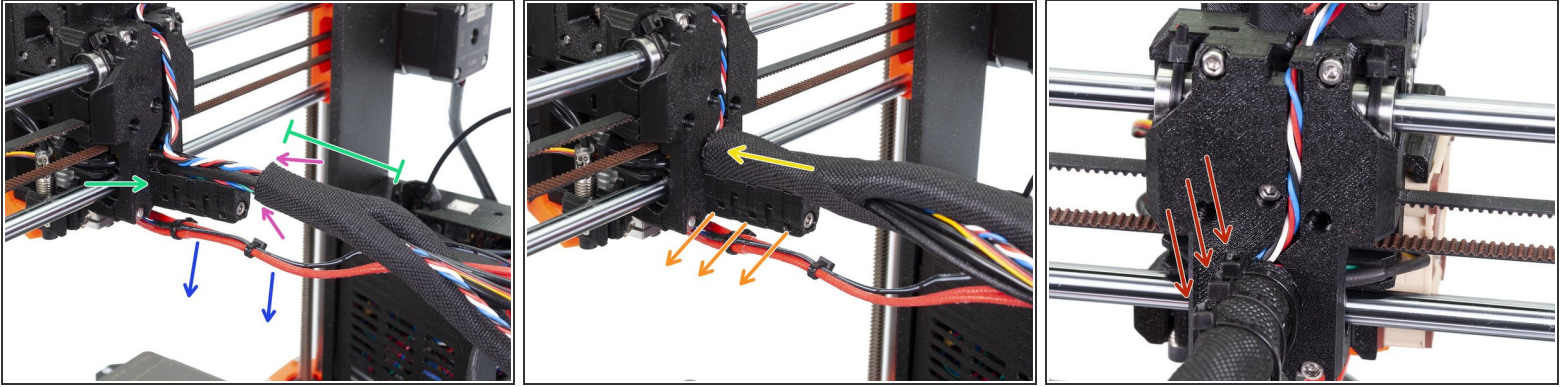

- For the following steps, please prepare:

- Zip tie (6x)

- Textile sleeve 13 x 490 mm (1x)

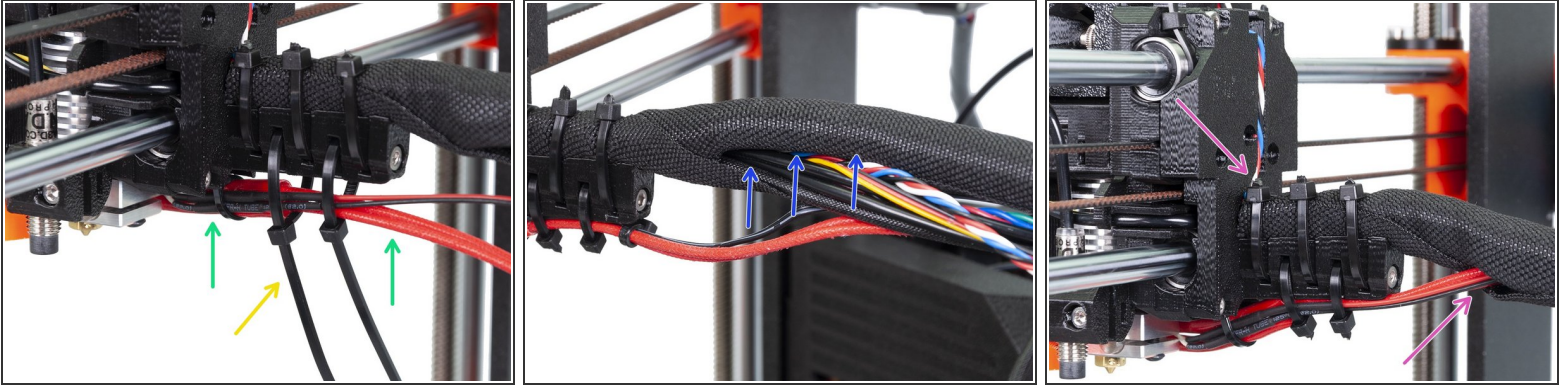- (i) There are two textile sleeves in the package, use the larger one (diameter).

- (i) Before wrapping the cables, you can adjust the cable length for the inclined front print fan.

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Step 49 — Tightening the textile sleeve (part 2)

- Open one end of the textile sleeve and slide it on the cable bundle from the extruder including the nylon.

- Leave the cables from the Hotend out for now.

- Length of the first wrap should be slightly longer than the cable-holder part, about 5 cm is enough.

- Gently twist the sleeve to make it smaller and tighter around the cables and slide the sleeve towards the extruder.

- **Use 3 zip ties** and insert them in the **lower row** of holes on the cable-holder.

- Twist the sleeve again (without twisting the cables inside) and tighten the zip ties.

- ⚠ **IMPORTANT:** Cut the remaining part of each zip tie using pliers as closest to the head as possible. Note the correct position of each zip ties's head (slightly off-centre to the left).

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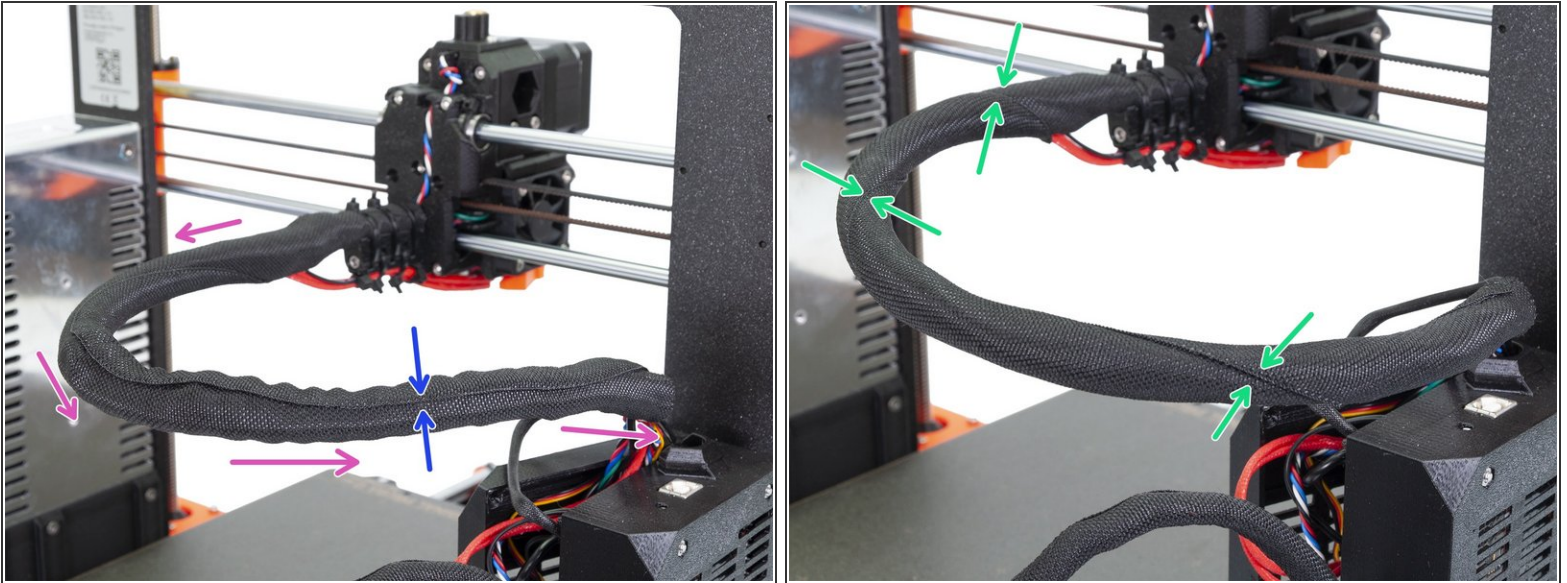
Step 50 — Tightening the textile sleeve (part 3)

- Use two zip ties and push them through the upper slots on the cable-holder.

- ATTENTION! Before tightening the zip ties add the cables from the hotend.

- Once the hotend cables are included, tighten the zip ties and cut remaining parts.

- Open the textile sleeve and insert the cables from the hotend.

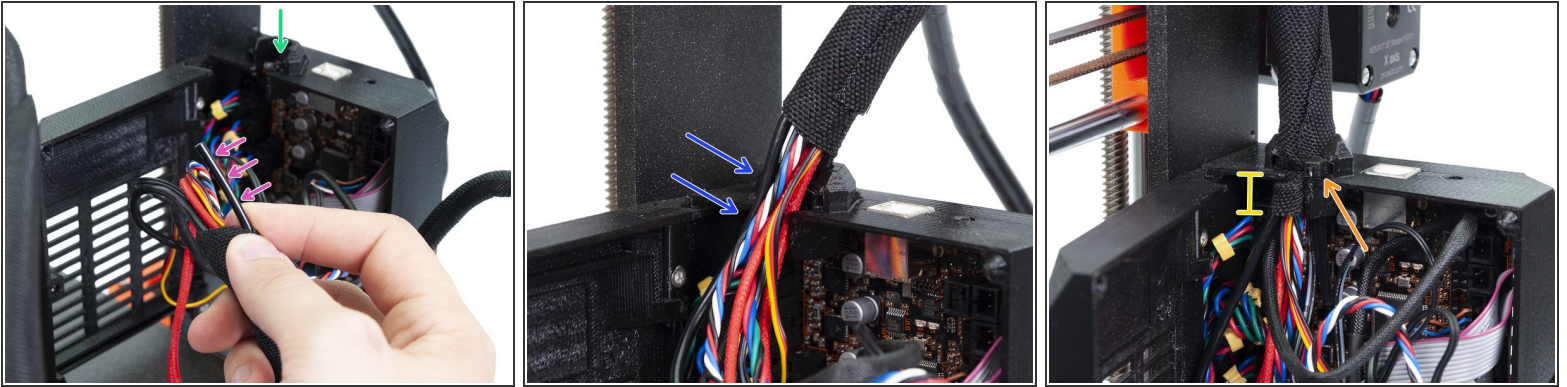- Compare the look of the cable management with the last picture.

⚠ The zip tie arrangement was tested with the injection molded double spool holder. If you are using any other frame mounted type holder, make sure the zip ties won't crash into it, which might result in a print failure.

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## Step 51 — Tightening the textile sleeve (part 4)

- Continue wrapping the cables in the textile sleeve all the way to the EINSY-case.

- Notice the line of the "seam" will be most probably straight. Let's fix it ;)

- Start twisting the textile sleeve (not the cables) to achieve a spiral like look. Thanks to this motion the sleeve will wrap evenly around the cables and it also prevent any cables from falling out of the bundle.

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Step 52 — Tightening the textile sleeve (part 5)

- Take the end of the cable bundle, find the nylon filament and separate 2-3 cm from the bundle.

- There is a small circular hole in the EINSY-case for the nylon filament. Find it and slide the filament in.

- Gently push the cables one by one to the opening in the EINSY-case.

- Slide the textile sleeve down at least 1 cm below lower edge of the opening.

- Secure the entire bundle using a zip tie.

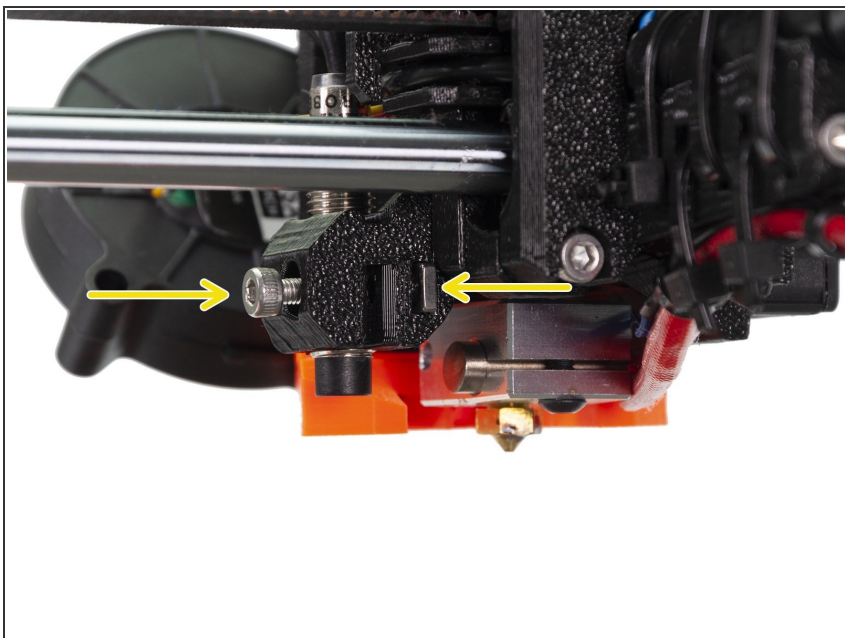## Step 53 — Tightening the textile sleeve (part 6)
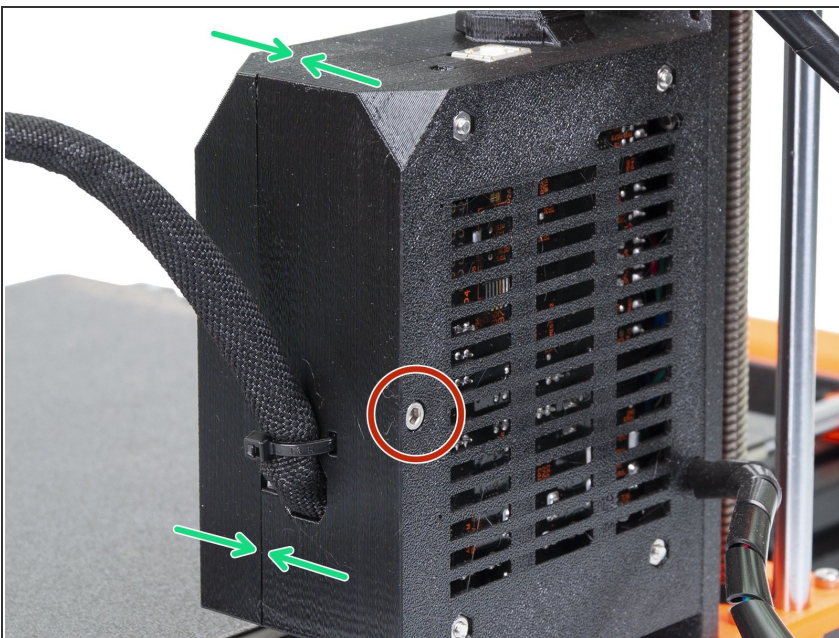
- Close the EINSY-door and make sure no wire is pinched.

- Use an Allen key and tighten the M3x40 screw.

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Step 54 — Tightening the P.I.N.D.A. probe (part 1)
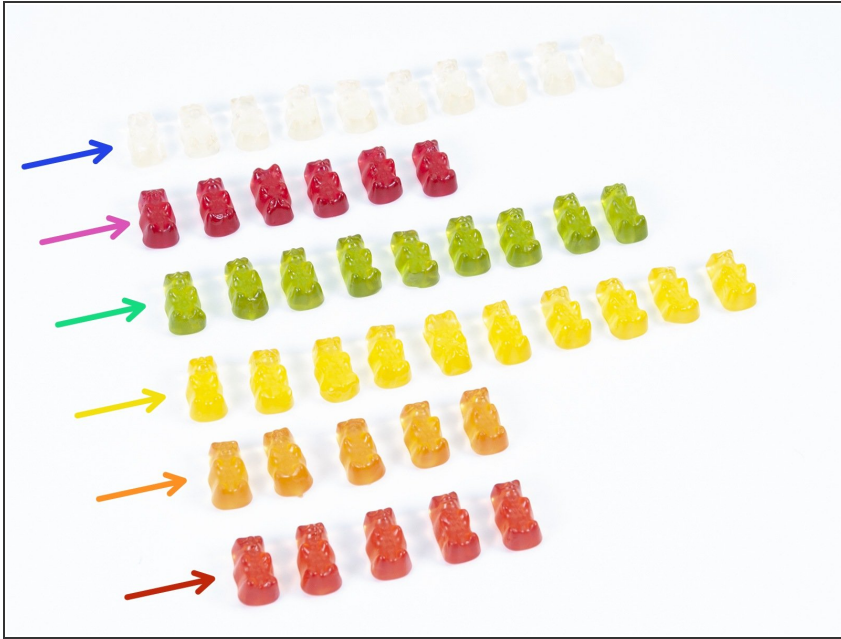

- For the following steps, please prepare:

- M3x10 screw (1x)

- M3nS nut (1x)

Step 55 — Tightening the P.I.N.D.A. probe (part 2)

- Slide the M3nS nut in the slot and tighten the probe SLIGHTLY with the M3x10 screw.

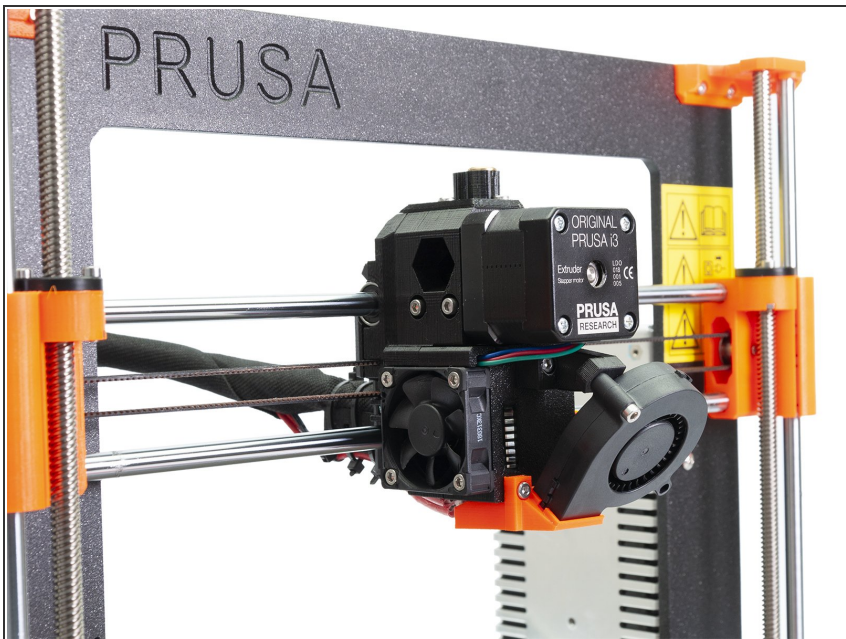- No need to set precise position of the sensor now, we will do it later.

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Step 56 — It's Haribo time!

⚠️ **Carefully and quietly** open the bag with the Haribo sweets. High level of **noise might attract nearby predators!**

- Sort the bears into six rows according to the following scheme (colours might differ):

- **Current chapter** was very difficult, at least **25 % of total amount is needed**.

- **Idler assembly** is quite easy, **10 %** is enough.

- **Pulley body assembly** requires your attention, eat no less than **20 %** of all bears.

- **Electronics assembly** is the last chapter with high level of difficulty, consume **25 %**.

- **Spool holders** are easy to make, research shows that **10 %** is enough.

- **Preflight check** is almost effortless. Experienced user will require no more than **10 %**.

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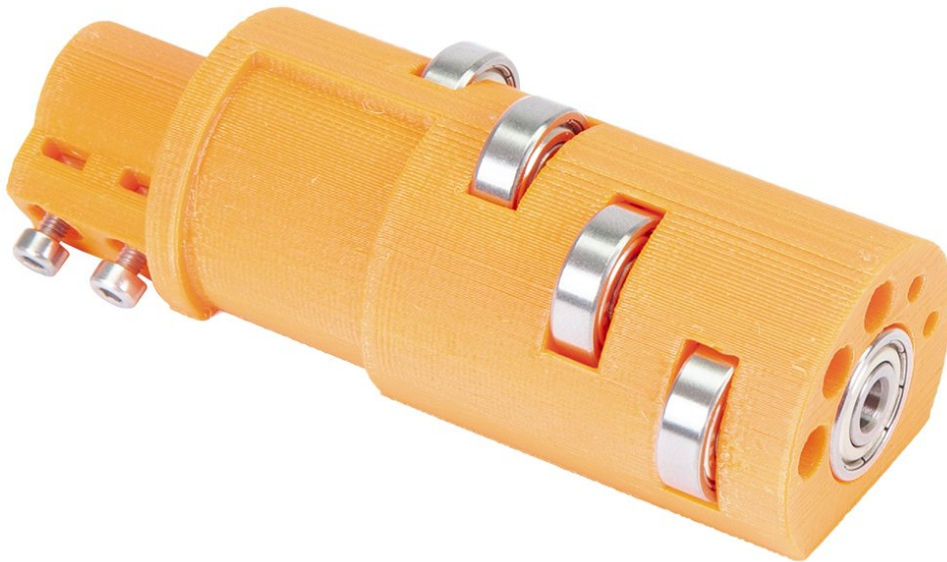
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Step 57 — Extruder rebuild is done

- You've just finished the upgrade of the extruder. Amazing job!

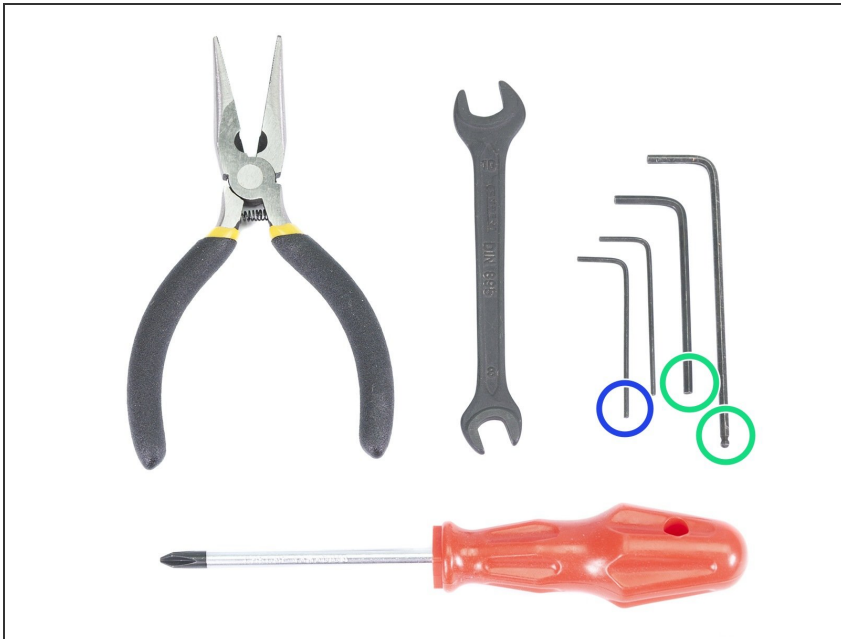- Let's start with MMU2 upgrade in the next chapter - 1. Idler body assembly

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RESEARCH
by JOSEF PRUSA

3. Idler body assembly

Written By: Jakub Dolezal

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Step 1 — Tools necessary for this chapter

- **Please prepare tools for this chapter:**
  - 2.5mm Allen key(s) for M3 screws
  - 1.5mm Allen key for nut alignment
- (i) Note there are two types of the 2.5mm Allen keys. Use the longer one for screws, which are difficult to reach as this Allen key has a ball end.
- (i) You can use your own tools if you find them more suitable for the build.

Step 2 — Idler parts preparation

- **For the following steps, please prepare:**
- mmu2-idler (1x)
- 625 bearing (6x)
- M3x10 screw (2x)
- M3nS nut (2x)
- Shaft 5x16sh (5x)
- (i) Note you need 6 bearings, but only 5 shafts ;)

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Step 3 — Idler bearings assembly (part 1)
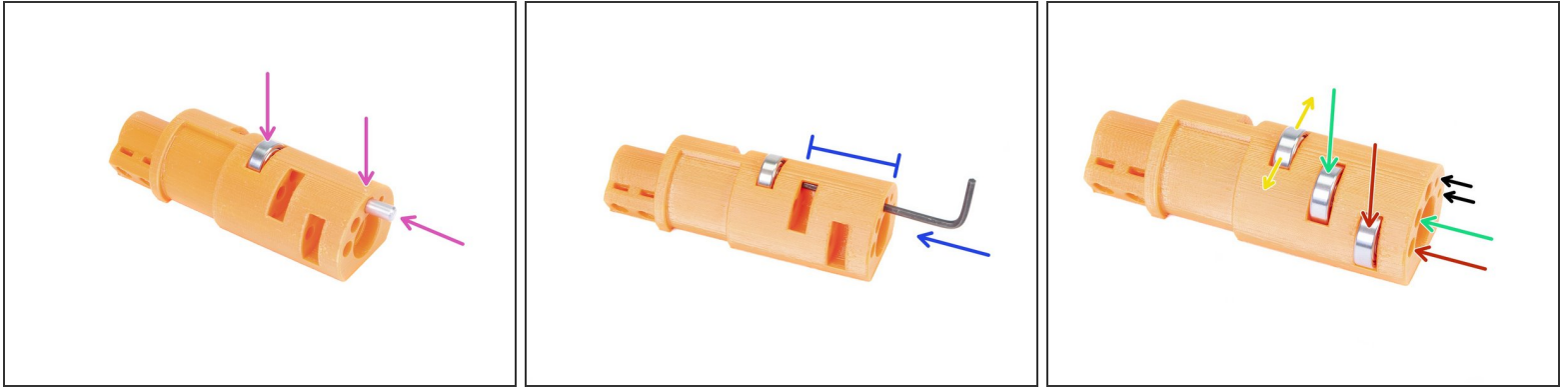
⚠ **WARNING:** read the instructions carefully, you have to **assemble bearings in the correct order**, otherwise you will encounter problems later!
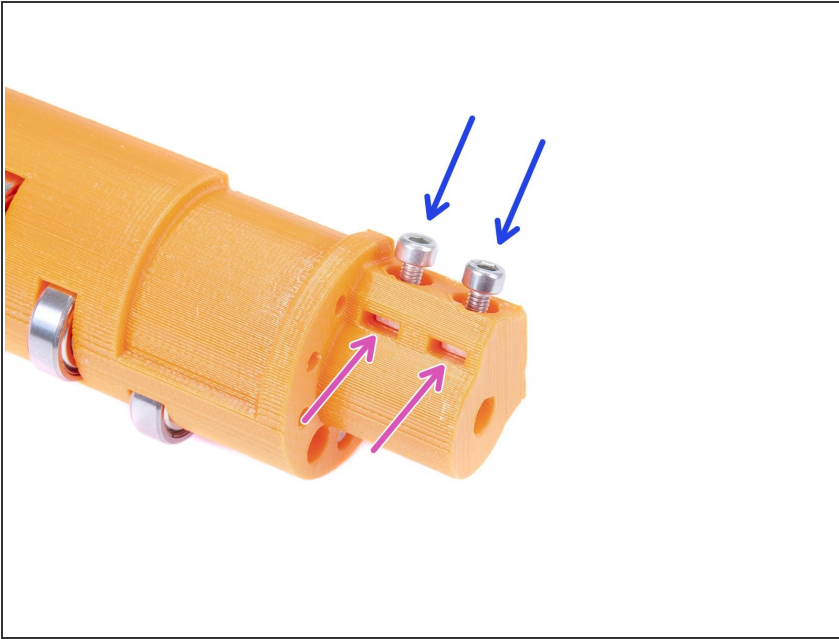
- Take the first bearing and place it in the middle of the idler. Insert the shaft as in the picture, make sure you are using the opening on the top.

- Slide the shaft in using 2.5 mm Allen key. **Make sure the shaft is all the way in** and not blocking other slots for bearings.

- Take the second bearing with the shaft and assemble it in the same way as the previous one.

- Take the third bearing with the shaft and place it in the idler.

- Make final a check, ensure all three bearings can rotate freely.

- There are small openings on both sides of the idler, which can be used to push the shaft back.

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## Step 4 — Idler bearings assembly (part 2)
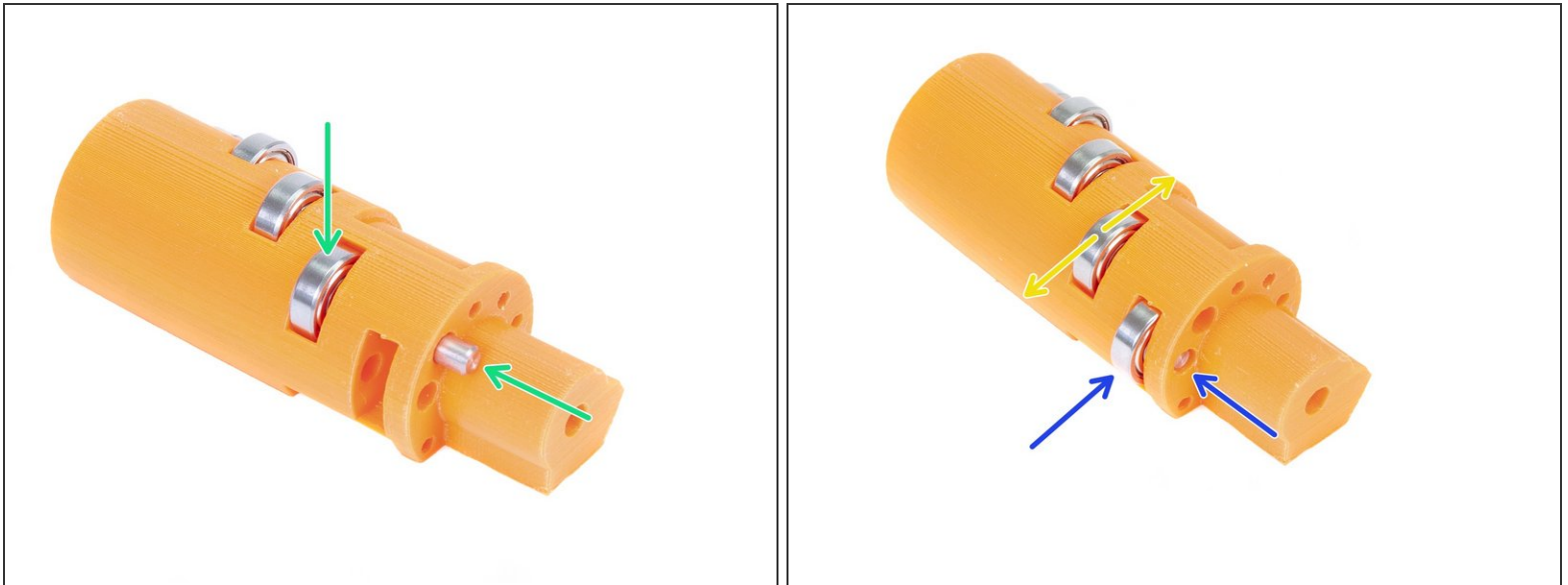
- Turn the idler around and continue with the bearing assembly.

- Start with the slot closest to the centre of the idler.

- Finish bearing assembly with the slot on the right side.

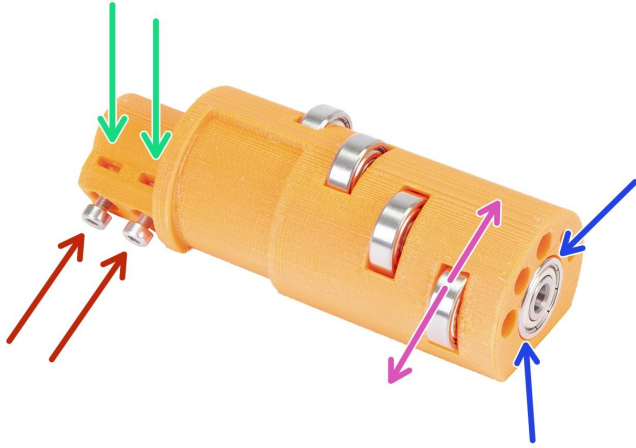- Make final a check, ensure both bearings can rotate freely.

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Step 5 — Idler nuts assembly

- Take two M3nS nuts and slide them in the idler all the way in.

- (i) Ensure proper alignment using a 1.5 mm Allen key.

- Grab two M3x10 screws and screw them slightly in the idler, just to catch the nuts. Five or six turns are enough for now.

Step 6 — Idler centre bearing assembly
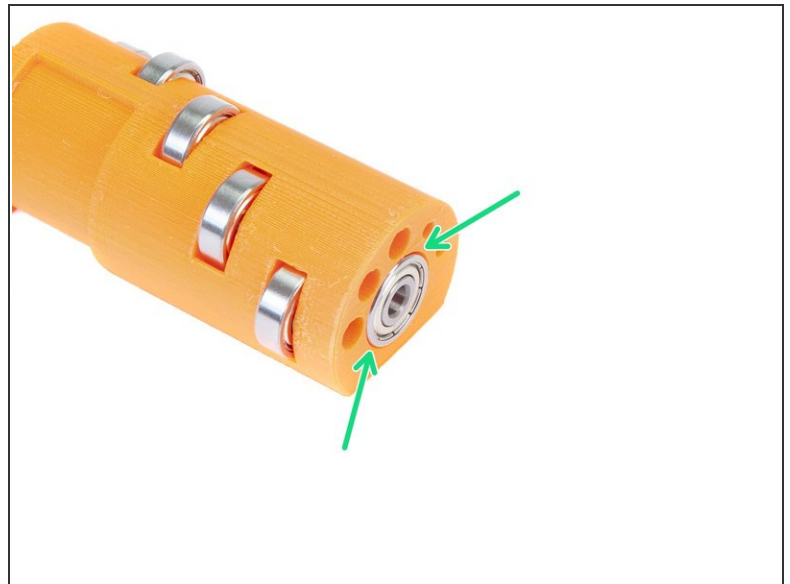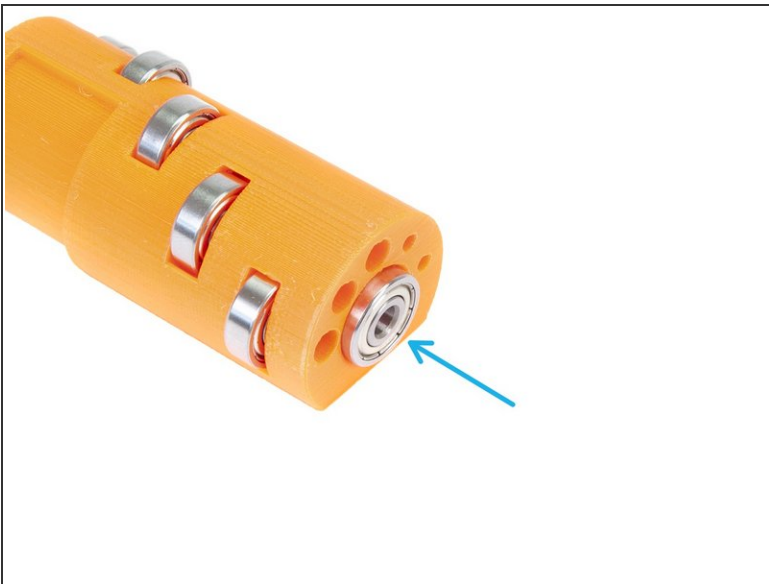
- Take the remaining bearing and slide it in the centre of the idler.

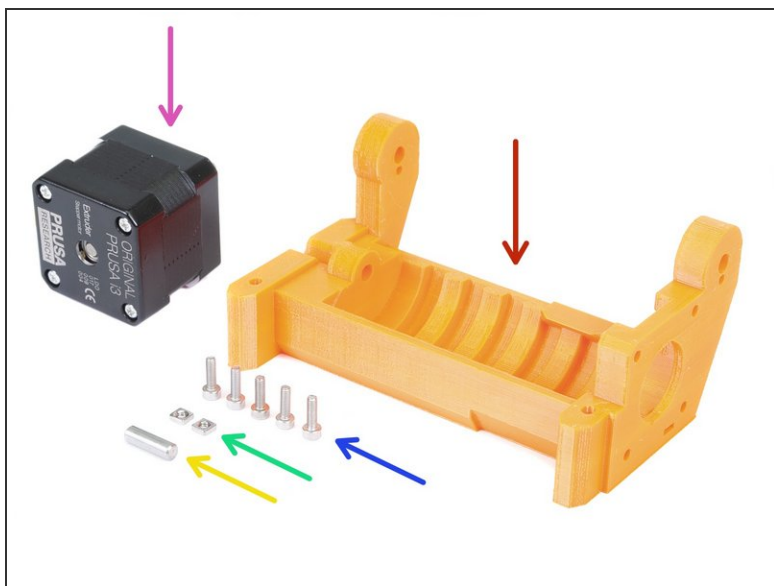- Make sure the bearing is aligned with the idler surface.

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Step 7 — Final check

- **Before proceeding, check following:**

- All five bearings are able to rotate freely.

- The sixth bearing is aligned with the surface of the printed part.

- Both nuts are inserted.

- Screws are just slightly tightened.
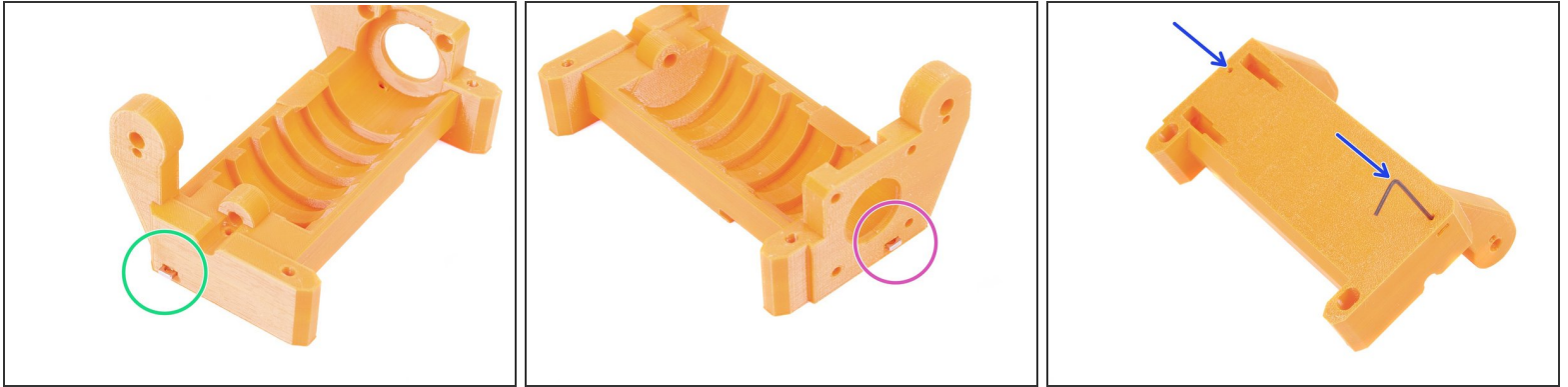
- (i) Keep the idler close, we will need it soon.

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Step 8 — Idler-body parts preparation

- **For the following steps, please prepare:**

- mmu2-idler-body (1x)

- M3x10 screw (5x)

- M3nS nut (2x)

- Shaft 5x16sh (1x)

- Extruder motor* (1x)

ⓘ * In case of the MMU1 to MMU2 upgrade use the motor from the disassembled MMU1. This motor is not included in the MMU1-MMU2 upgrade package

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Step 9 — Inserting M3nS nuts into idler-body

- Take the M3nS nut and insert in the slot of the idler-body, all the way in.

- Turn the idler-body to the other side, take the second M3nS nut and insert in the slot, all the way in.

- Ensure proper alignment of both nuts using 1.5mm Allen key.
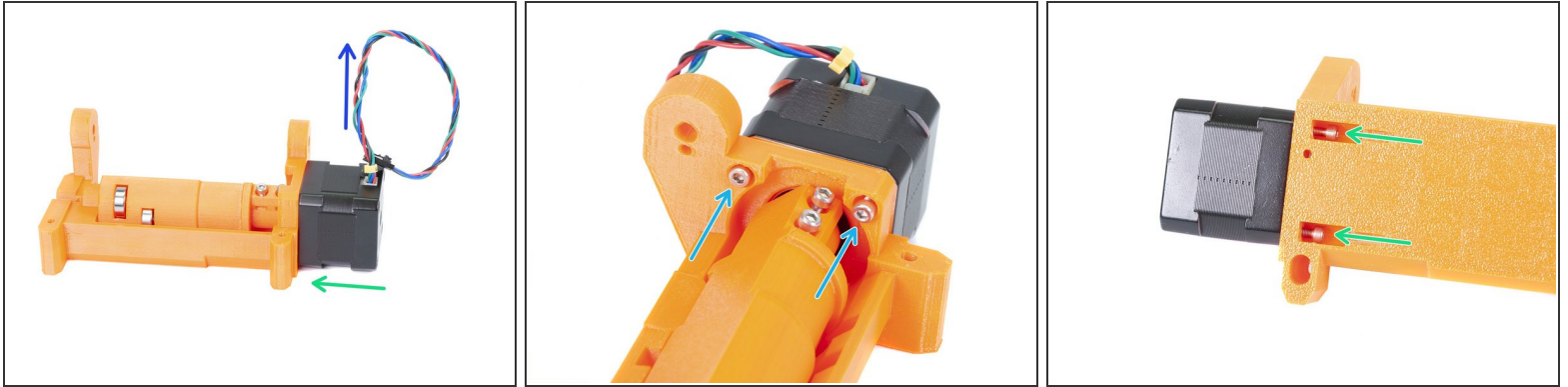
Step 10 — Inserting the idler in the idler-body
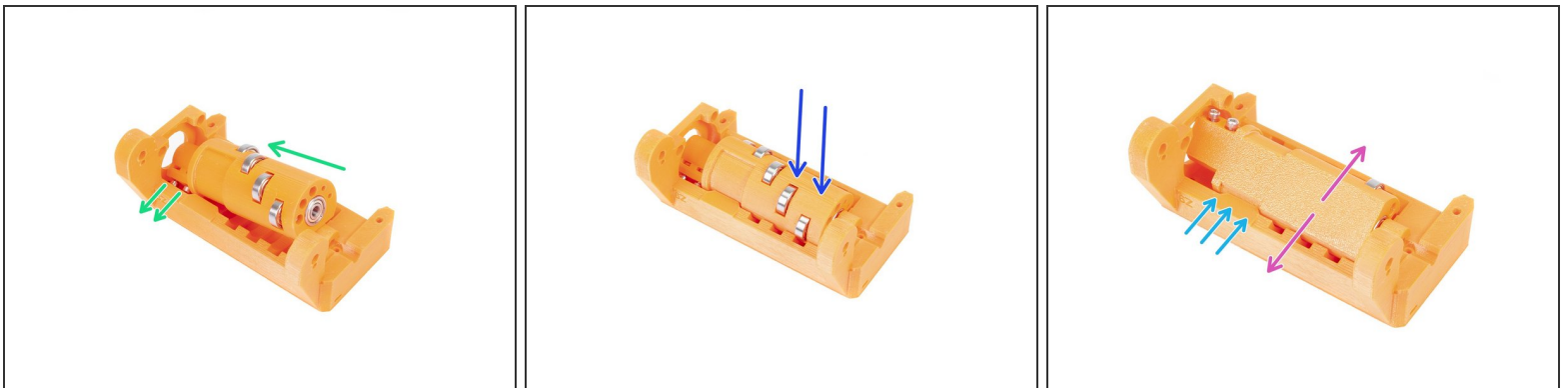
- Slide the idler into the idler-body. Mind the correct orientation of the M3x10 screws.

- Push the idler down.

- Using fingers rotate the idler back and forth to ensure smooth movement.

- Rotation of the idler is limited by the stop on the idler-body.

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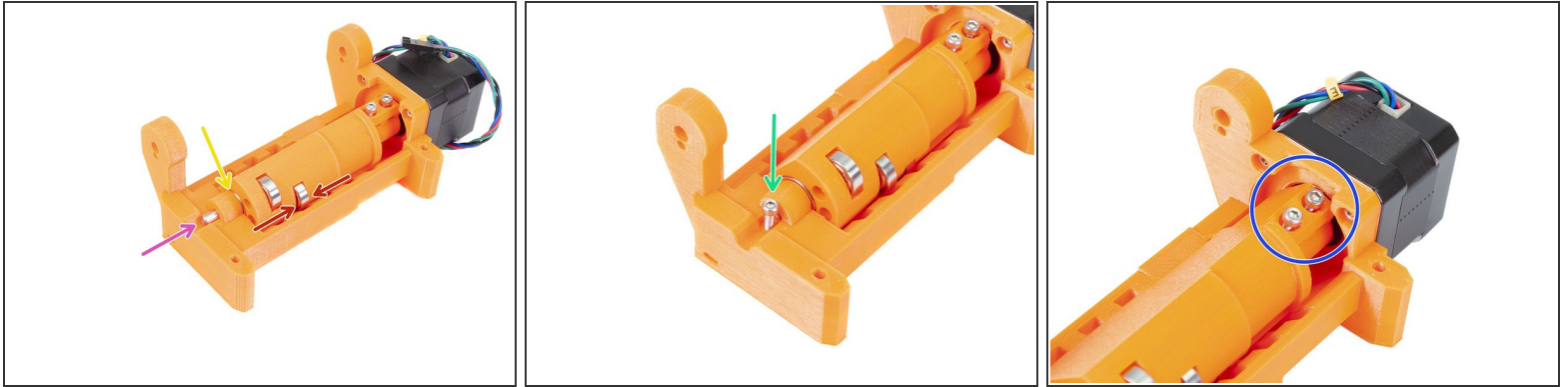## Step 11 — Extruder motor assembly (part 1)
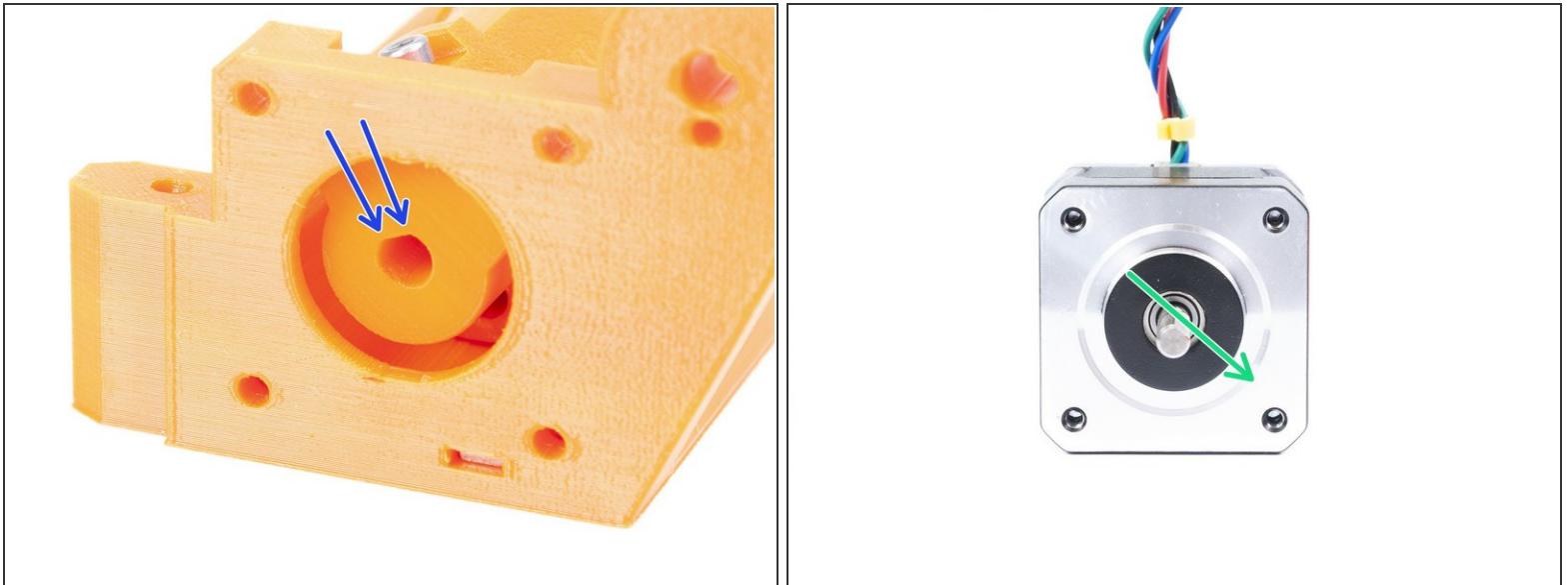
- Before we assemble the motor to the idler-body, we need to rotate the shaft properly.

- Check the idler opening, which **ISN'T ENTIRELY CIRCULAR!** There is a flat part, which matches the shape of the motor's shaft.

- Rotate the shaft as in the second picture. To match the opening in the idler.

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Step 12 — Extruder motor assembly (part 2)

- Move the motor towards the idle-body. If necessary **ADJUST THE ROTATION OF THE SHAFT** to match the opening in the idler.

- Make sure the **CABLE** from the motor is **FACING UP**.

- Slide two screws M3x10 in the opening on idler-body and tighten them slightly.

- Turn the entire assembly upside-down and insert second couple of the M3x10 screws, again tighten them slightly.

- Make sure the motor is seated properly (in direct contact with the idler-body), then tighten all four screws. Tighten screws on a diagonal.

- Use the longest 2.5mm Allen key to reach the M3 screws on the underside better.

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## Step 13 — Extruder motor assembly (part 3)

- ● Insert the shaft 5x16sh into the idler-body and align it with the surface. Make sure the shaft reached the idler.

- ● Ensure the bearings are in the middle of the grooves in the idler-body and you can rotate the idler easily, if not slide the entire idler.

- ● Check there is a small gap between the idler (barrel) and the idler-body. In case the parts are grinding you might have issues with the filament loading!

- ● Screw in the M3x10 screw as a safety.

- ● Tighten both M3x10 screws until you reach the motor's shaft. Tighten carefully, as you might crack the printed part (idler).

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Step 14 — It's Haribo time!
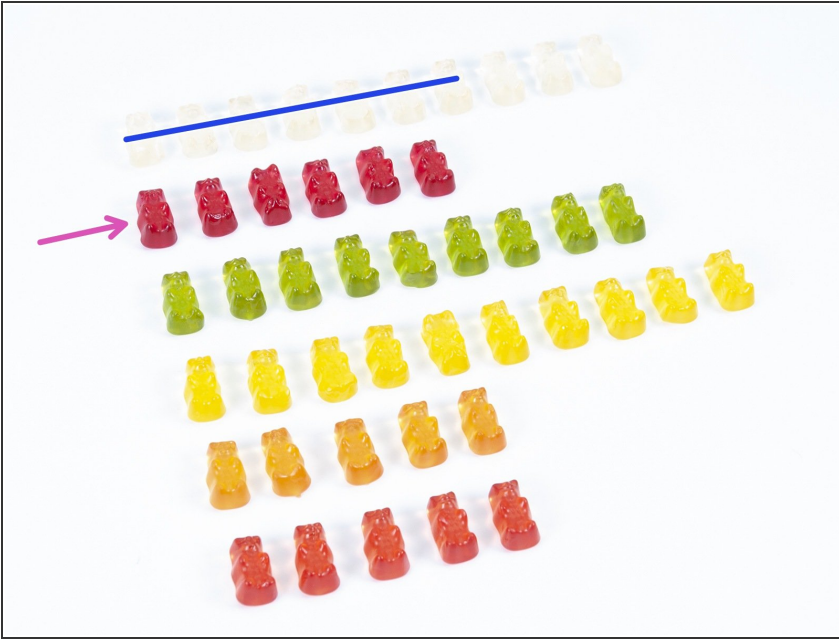
- Stop for a while and treat yourself ;)

- Idler assembly is quite easy, 10 % is enough.
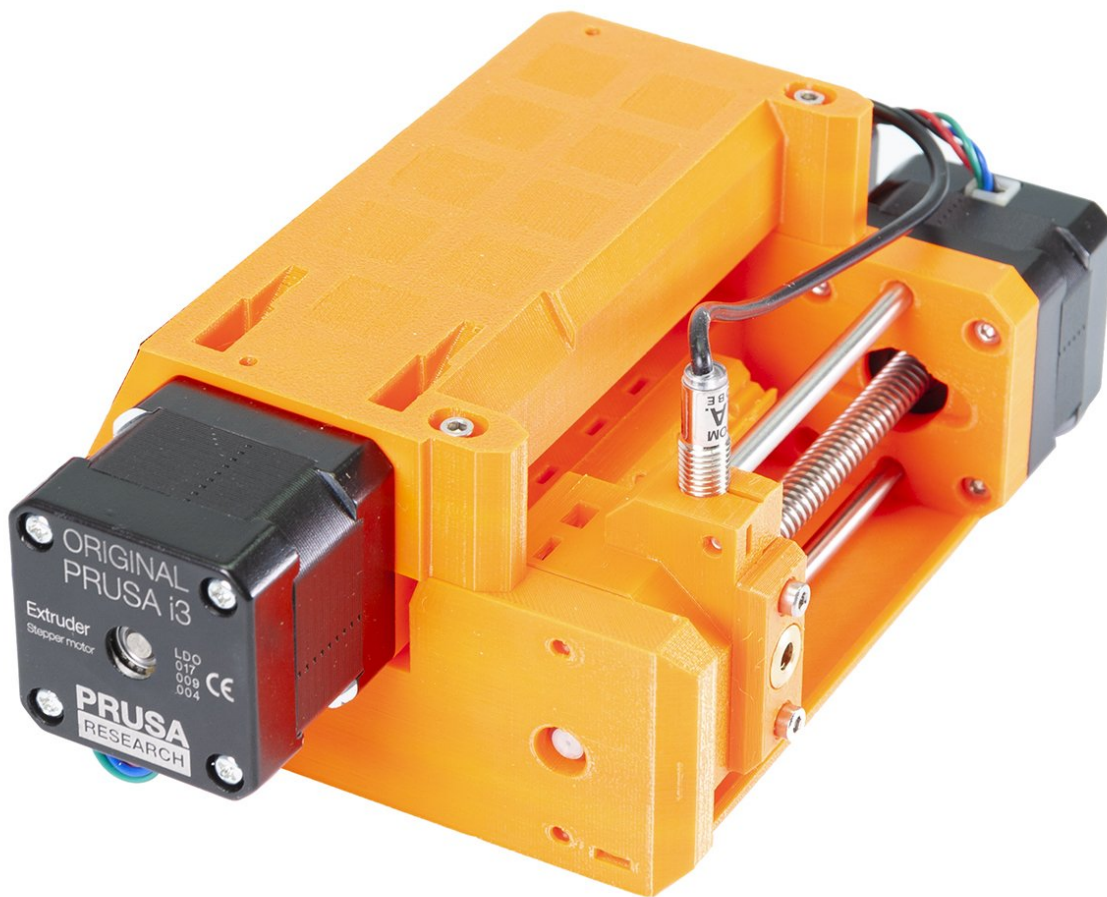
Step 15 — Final check
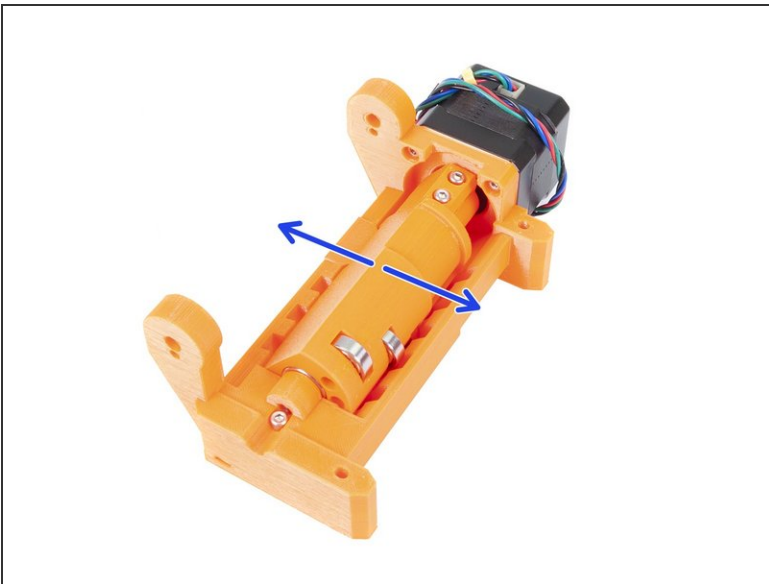
- Make sure the shaft rotates freely. The rotation is limited by stops, but within them it should be smooth.

- Make sure both M3nS nuts are in.

- Ready for more? Let's proceed to the 2. Pulley body assembly

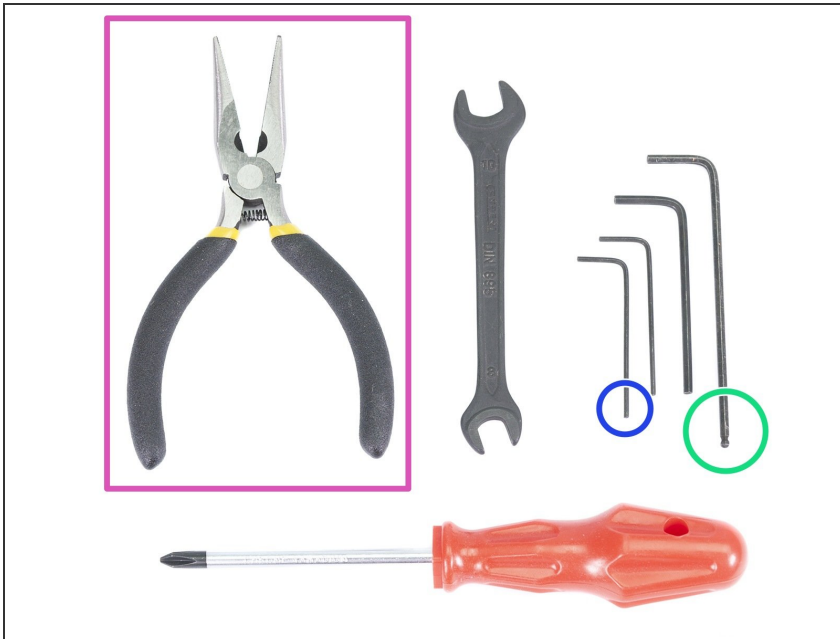This document was generated on 2021-04-23 03:19:12 AM (MST).

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4. Pulley body assembly

Written By: Jakub Dolezal

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Step 1 — Tools necessary for this chapter

- **Please prepare tools for this chapter:**
  - 2.5mm Allen key for M3 screws
  - 1.5mm Allen key for nut alignment
  - Needle-nose pliers for blade assembly
  - Measurement tool (optional), best is a digital caliper

Step 2 — Pulley-body parts preparation
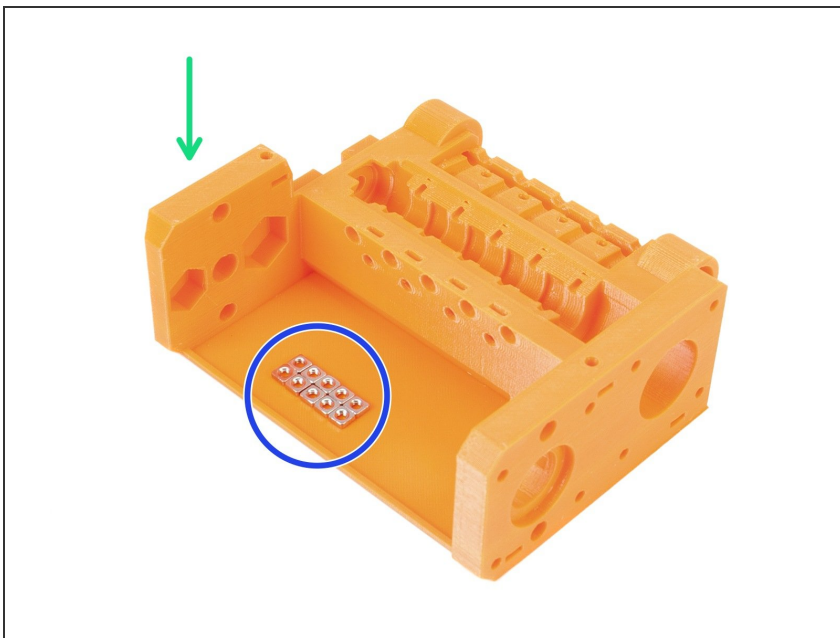
- **For the following steps, please prepare:**
- mmu2-pulley-body (1x)
- M3nS nut (10x)
- ⓘ Nuts are placed in the pulley-body because of the photography, no need to arrange them like this ;)

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Step 3 — Pulley-body assembly (part 1)
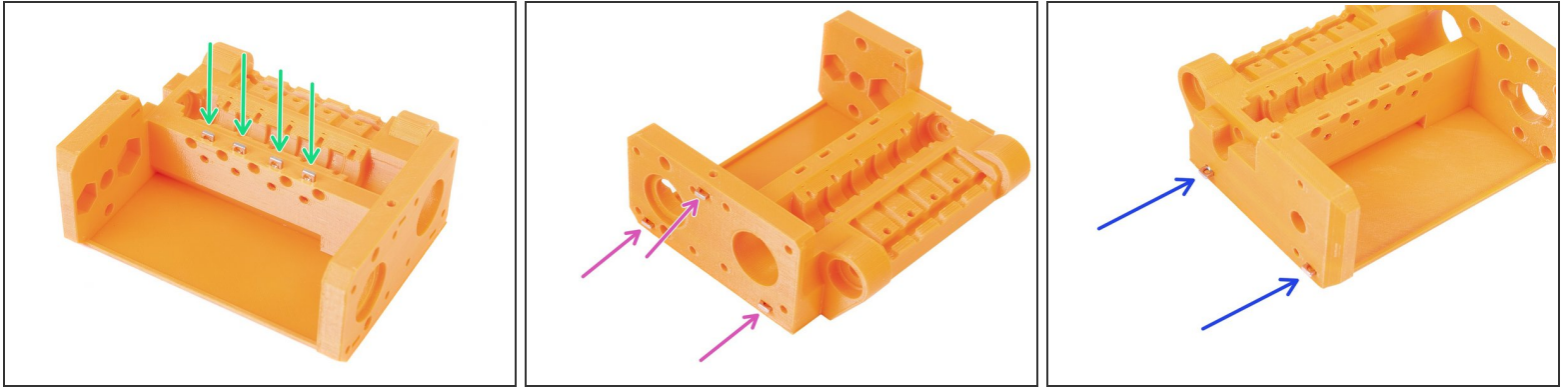
- Insert **four nuts** from the top of the pulley-body.

- Insert **three nuts** from the side of the pulley-body.

- Finally, insert **two nuts** from the other side of the pulley-body.

- Ensure proper alignment of all nuts using 1.5mm Allen key.

Step 4 — Pulley-body assembly (part 2)
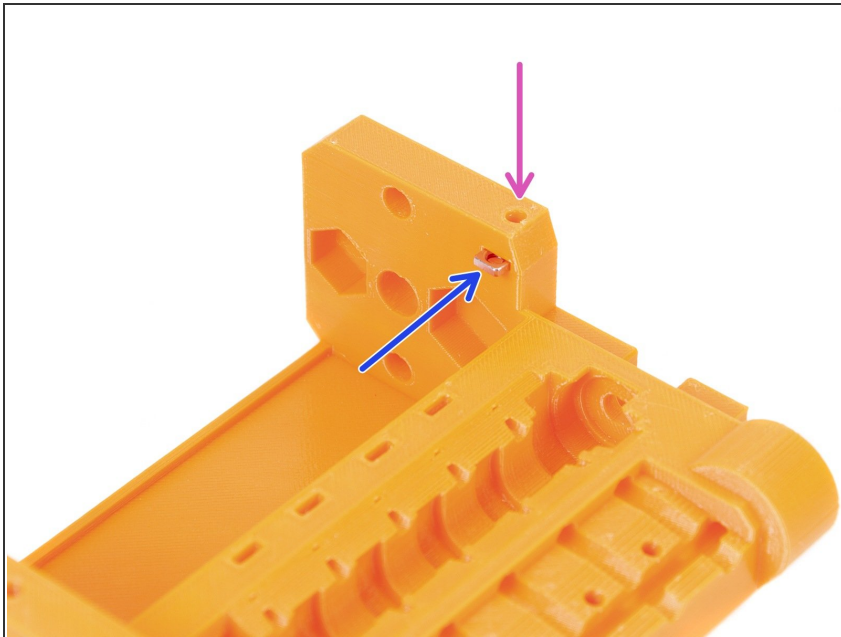
- Finally, insert the last (tenth) M3nS nut in the slot.

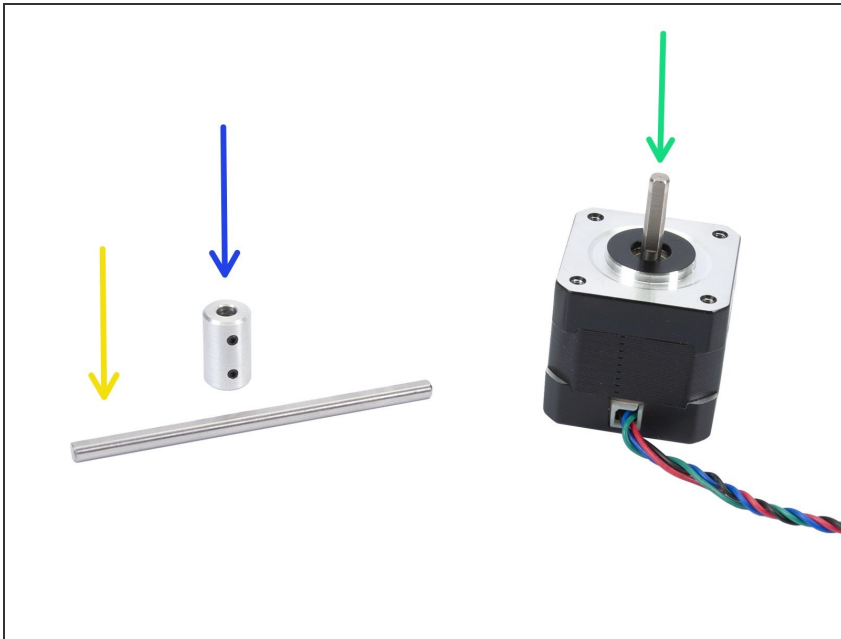- Ensure proper alignment of nut using 1.5mm Allen key.

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Step 5 — Pulley motor parts preparation

- **For the following steps, please prepare:**

- Pulley (5x)

- M3x10 screw (4x)

- 625 bearing (1x)

- Pulley motor* (1x)

- Filament with length 10-15 cm (1x)

- (i) The filament is not part of the upgrade kit, use any 1.75mm you have. Use a straight filament if possible.

- (i) * The pulley motor is not included in the MMU1 to MMU2 upgrade kit, see the next step.

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Step 6 — MMU1 to MMU2 upgrade (part 1)

⚠ This step is valid only for those, who are upgrading from MMU1 to MMU2. Skip to the [Step 9](#)

- ● **For the following steps, please prepare:**

- ● Shaft coupler (1x)

- ● Shaft 5h9x90 (1x)

- ● Extruder motor* (1x)

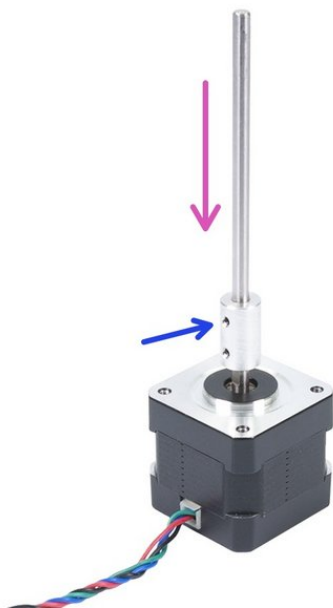ⓘ * Use the motor from the disassembled MMU1. This motor is not included in the MMU1-MMU2 upgrade package

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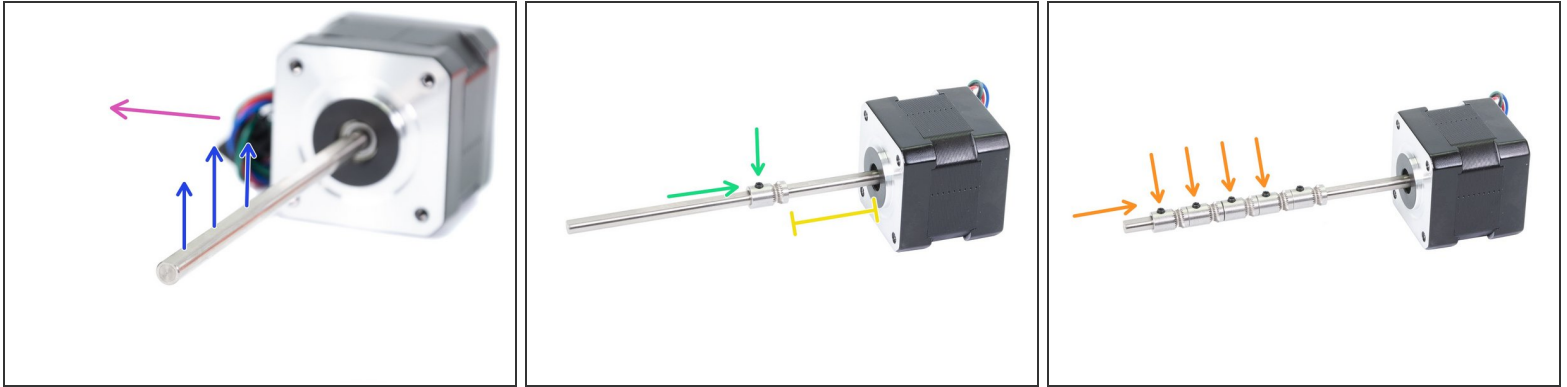
Step 7 — MMU1 to MMU2 upgrade (part 2)
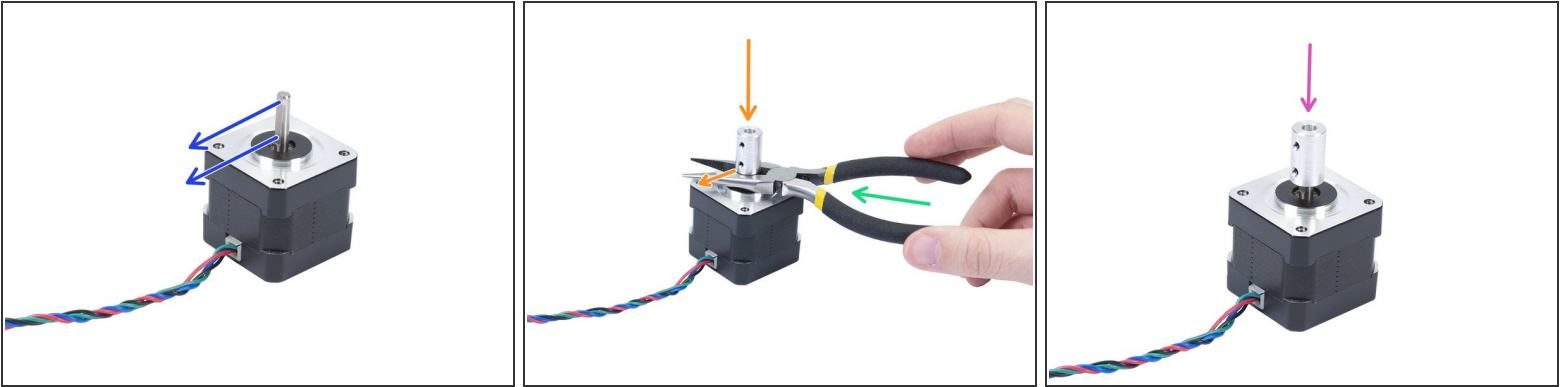
⚠ This step is valid only for those, who are upgrading from MMU1 to MMU2.

● Rotate the flat part of the shaft in the direction of the cable.

● Insert bundled pliers to create a gap between the motor and the shaft coupler. If you want to be precise, the gap should be 10 mm.

● Place the shaft coupler on the top of pliers and rotate the lock screw against the flat part of the shaft. Tighten the lower screw.

● Slightly press on the shaft coupler from the top to ensure the lower lock screw is engaged.

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Step 8 — MMU1 to MMU2 upgrade (part 3)

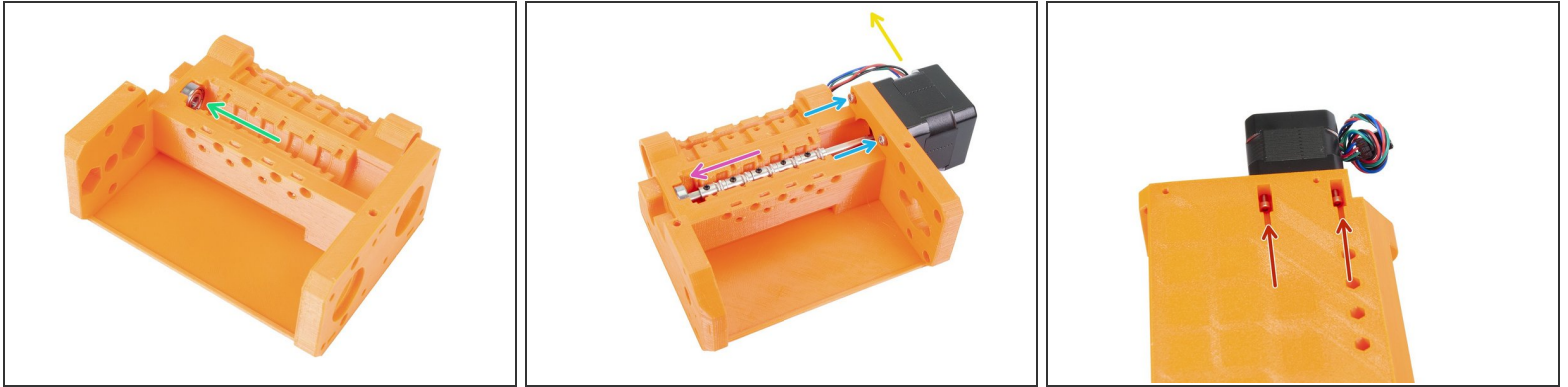⚠️ This step is valid only for those, who are upgrading from MMU1 to MMU2.

● Insert the shaft into the shaft coupler and rotate the flat part against the lock screw.

● Tighten the lock screw.

ⓘ Even though this motor is labelled "Extruder" consider it "Pulley motor" from now on.
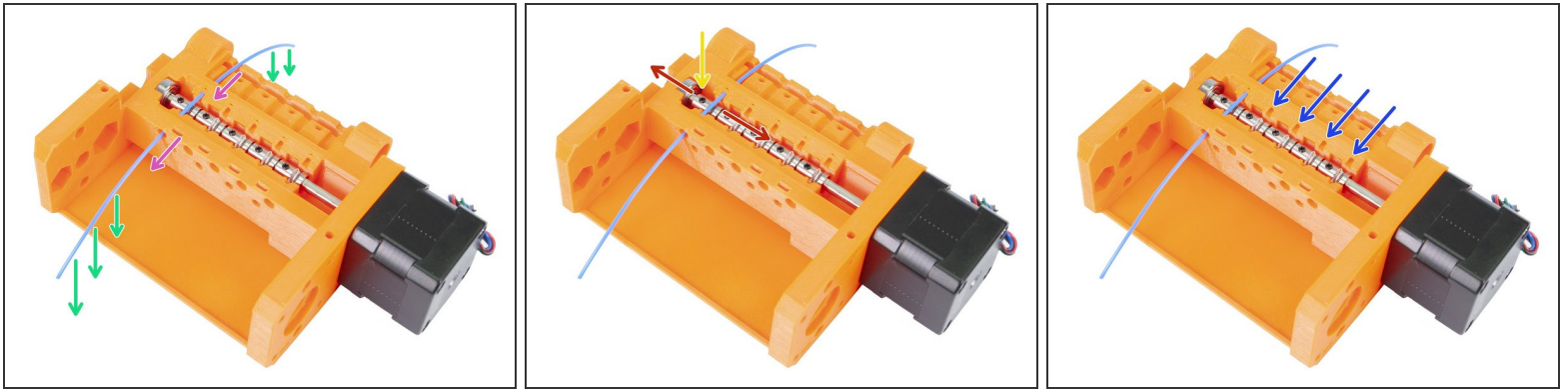
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Step 9 — Pulley motor assembly (part 1)

- First, make sure the motor cable is facing to the left.

- Find the flat part of the shaft and rotate it up.

- Slide the first pulley on the shaft, ensure the lock screw is on the top (against the flat part of the shaft). Tighten the lock screw just slightly.

- The first pulley should be around 30 mm (1.18 inch) from the black "ring" on the motor. Don't tighten the lock screw, you will need to adjust the position later.

- Slide the other pulleys in the same orientation (lock screw facing up). Tighten the lock screw on each just slightly.

- (i) Exact position of each pulley will be adjusted later.

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Step 10 — Pulley motor assembly (part 2)

- Insert the 625 bearing in the pulley-body. At the end the bearing should "snap" to the opening in the printed part.

- Slide in the Pulley motor, the shaft must enter the bearing.

- Cable of the motor should be oriented to the left, see the second photo.

- Slide two screws M3x10 in the opening on idler-body and tighten them slightly.

- Turn the entire assembly upside-down and insert second couple of the M3x10 screws, again tighten them slightly.

- Make sure the motor is seated properly (in direct contact with the idler-body), then tighten all four screws. Tighten screws on a diagonal.

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Step 11 — Pulley adjustment

⚠️ **WARNING:** this step is crucial for proper functioning of the Multi Material. **Please check your alignment multiple times!!!**

- Push the filament through the pulley body as in the picture.

- In case your filament is bent, make sure it is bent down, so the part above the pulley is straight.

- Adjust the position of the pulley, the teeth must be directly below the filament.

⚠️ Check again the proper position relative to the teeth on the pulley.

- Make sure the lock screw is still perpendicular to the flat part of the shaft and tighten it. Use reasonable force as you might strip the screw.

- Repeat these instructions on the 4 remaining pulleys.

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Step 12 — Front-PTFE-holder parts preparation
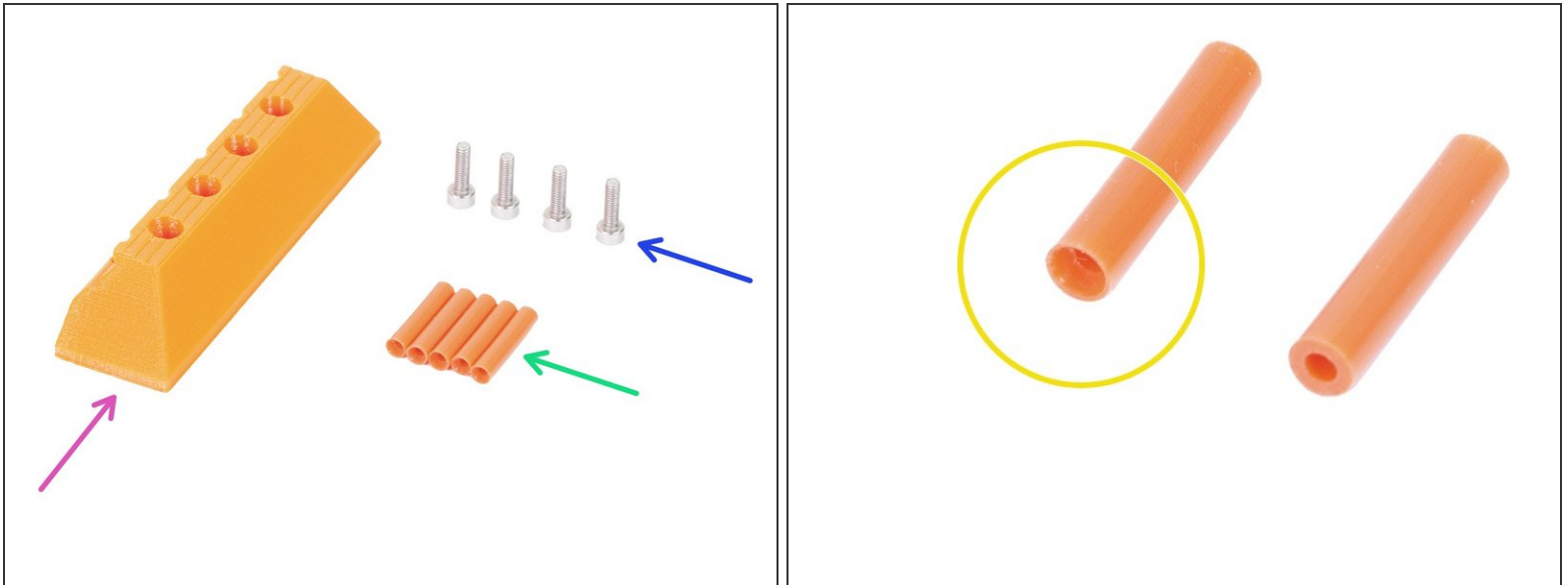
- **For the following steps, please prepare:**

- mmu2-front-PTFE-holder (1x)

- M3x10 screw (4x)

- PTFE 4x2x19 (5x)

- Note the PTFE tube has one end chamfered, please pay attention to the instructions about proper orientation.

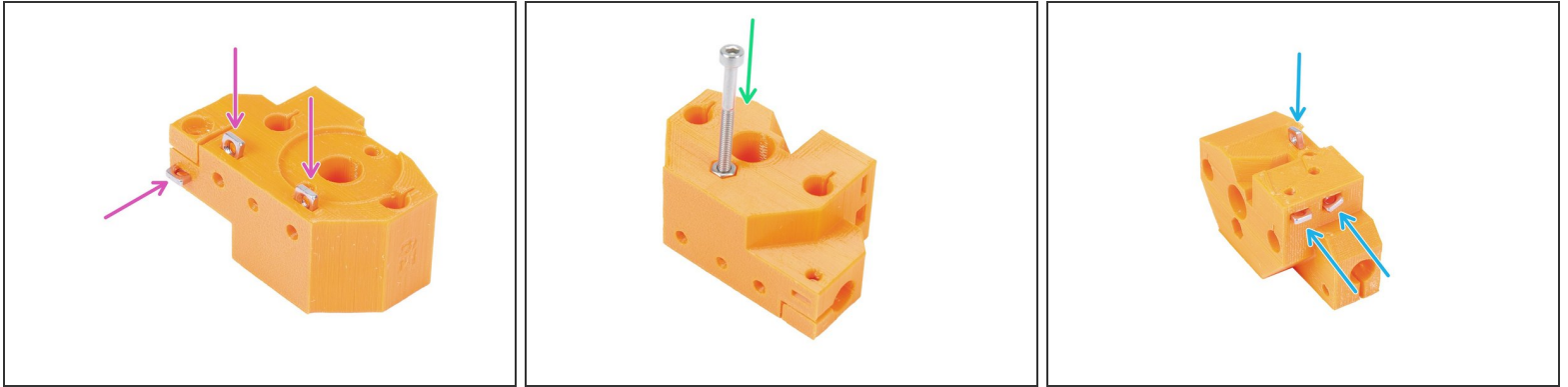- (i) The PTFE tubes can be also in white color, other parameters are same as the orange version.

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Step 13 — Front-PTFE-holder assembly
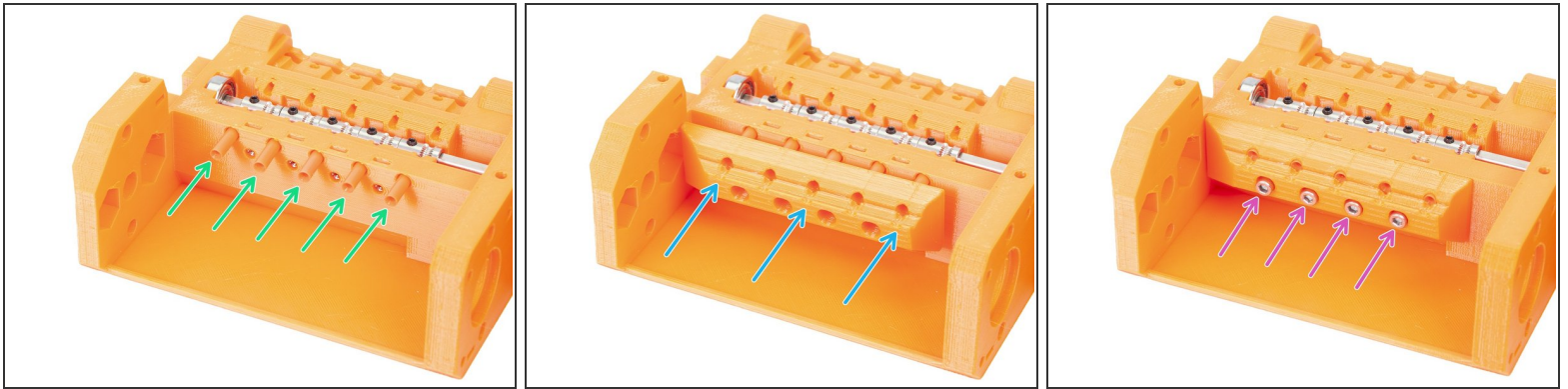
- Insert the PTFE tubes in the pulley-body all the way in. Approximately half of their length should stick out. **The chamfered end of the tube must be facing out!!!!**

- Slide on the front-PTFE-holder, note the upper circular openings are for the tubes.

- Secure the front-PTFE-holder using four M3x10 screws.

- (i) The pictures in the following steps might include old version of the tubes, which aren't chamfered.
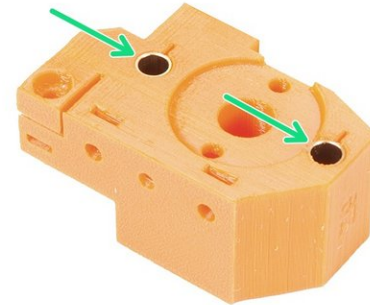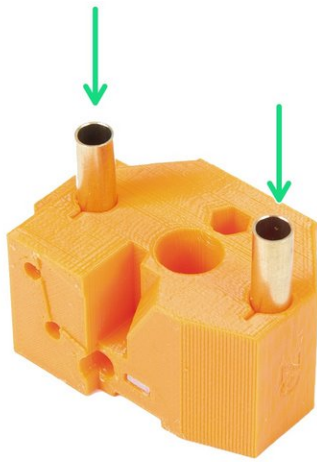
Step 14 — Selector-finda parts preparation
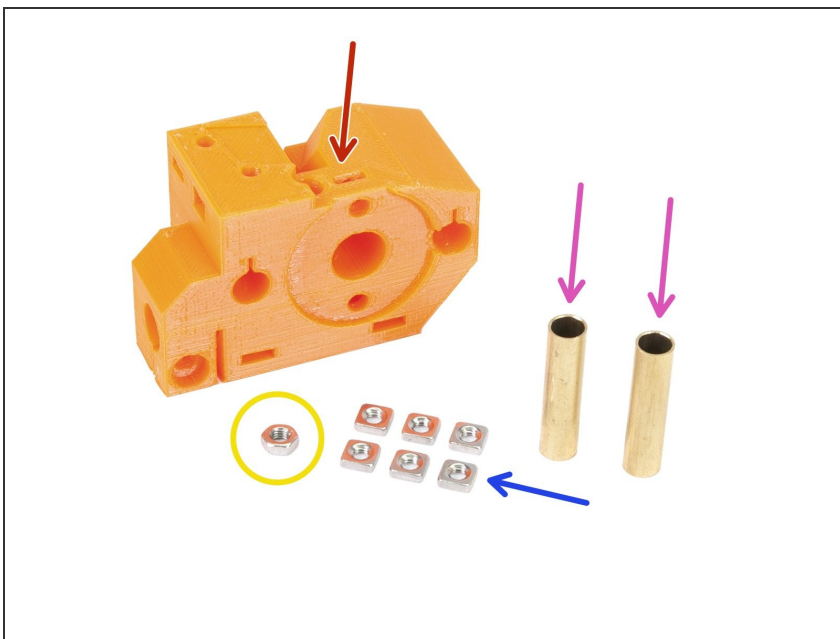
- **For the following steps, please prepare:**

- mmu2-selector (1x)

- M3nS nut (6x)

- M3n nut (1x)

- Tube 5x6x25bt (2x)

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Step 15 — Selector-finda assembly (part 1)

- Insert three M3nS nuts in the selector-finda body, all the way in. Ensure alignment with the 1.5mm Allen key.

- Slide in the M3n nut. If possible use long screw from the "Spare" bag or from your MK3 kit. Press the nut in using hand, hammer shouldn't be necessary.

- Insert remaining three M3nS nuts in the selector-finda body, all the way in. Ensure alignment with the 1.5mm Allen key.

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Step 16 — Selector-finda assembly (part 2)

- Rotate the selector-finda as in the picture. Holes for the tubes are bigger from this side.

- Insert the tubes all the way in. Both should be aligned with the surface of the printed part.

- (i) In case you can't push the tubes in, try first rotating the tube while pushing down. Then turn the printed part and a use flat surface to push the tubes in evenly. Avoid using hammer as you can damage the tube's rim!

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Step 17 — Selector motor parts preparation

- **For the following steps, please prepare:**

- mmu2-selector-front-plate (1x)

- M3x10 screw (7x)

- Smooth rod 5x120sh 120 mm (2x)

- Selector motor (1x)

- Lead screw nut (1x)

- (i) The nut is on the motor, take it off the lead screw.

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Step 18 — Nut assembly

- Rotate the selector-finda as in the picture. There is a cut out for the nut.

- Place the nut on the selector-finda part, it should fit in the cut out.

- Secure the nut with two M3x10 screws.

- (i) There are four holes in the nut, you can use any of them, they are the same.

- (i) Tip: if you can't reach the M3n nut, use a M3x18 screw from the spare bag and by tightening it, pull the nut closer.

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Step 19 — Selector-front-plate assembly
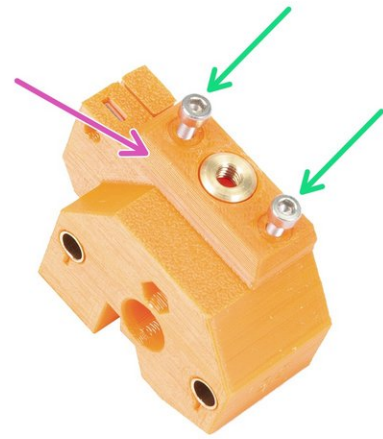
- Rotate the selector-finda as in the picture.

- Place the selector-front-plate as in the picture. Note, there is a flat and angled edge on this printed part. The angled edge should point toward the centre of the selector-finda body.

- Secure it with two M3x10 screws.

- (i) In the next step we will assemble the blade, but keep the parts you have prepared at step 14, we will use them soon.

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Step 20 — Blade-holder parts preparation
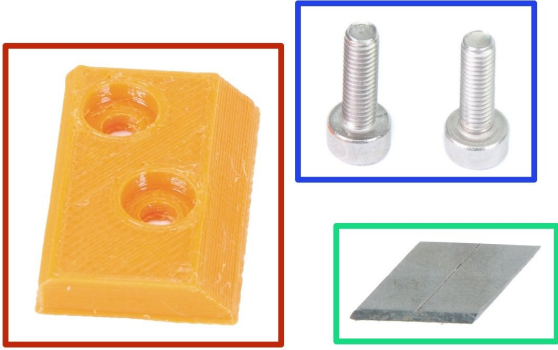
⚠️ **!!! WARNING:** in this and following steps you will be assembling the blade. **Make sure you don't cut yourself**. Use pliers or gloves to protect your fingers !!!

- **For the following steps, please prepare:**

- mmu2-blade-holder (1x)

- M3x10 screw (2x)

- blade (1x)

ⓘ There are two blades in the kit, the other one is a spare.

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Step 21 — Blade-holder assembly
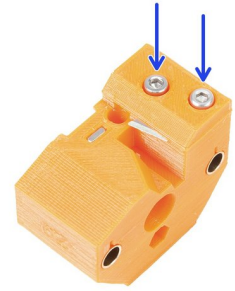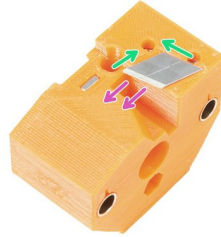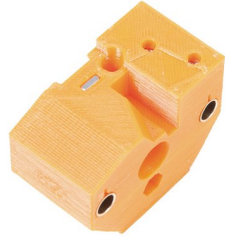
- Prepare the selector-finda part as in the picture.

- Carefully place the blade in the prepared cutout and align it with the top left corner.

- Make sure the sharp part of the blade is pointing in the indicated direction.

- Place the blade-holder on the top of the blade and secure it with two M3x10 screws. Before you tighten the screws fully, ensure the blade is seated properly. Gently push it with the Allen key.

⚠ From now on pay attention while handling this part. The blade sticks out and you can cut yourself!

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Step 22 — Selector motor assembly (part 1)
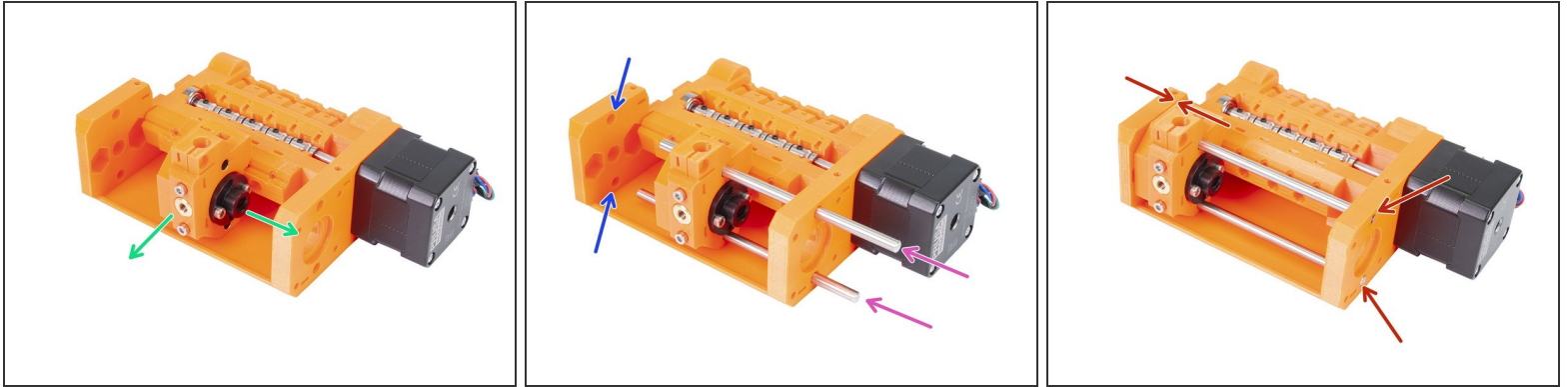
- Before assembling the motor we need to assemble the selector-finda part.

- Place the selector-finda part as in the picture. Important is correct orientation, exact position doesn't matter now.

- Insert both shafts through the pulley-body and the selector-finda part.

- Make sure both shaft reached the end of the pulley-body. There are two circular holes for them.

- Ensure the shafts are aligned with the pulley-body and move the selector-finda all the way to the left.

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Step 23 — Selector motor assembly (part 2)
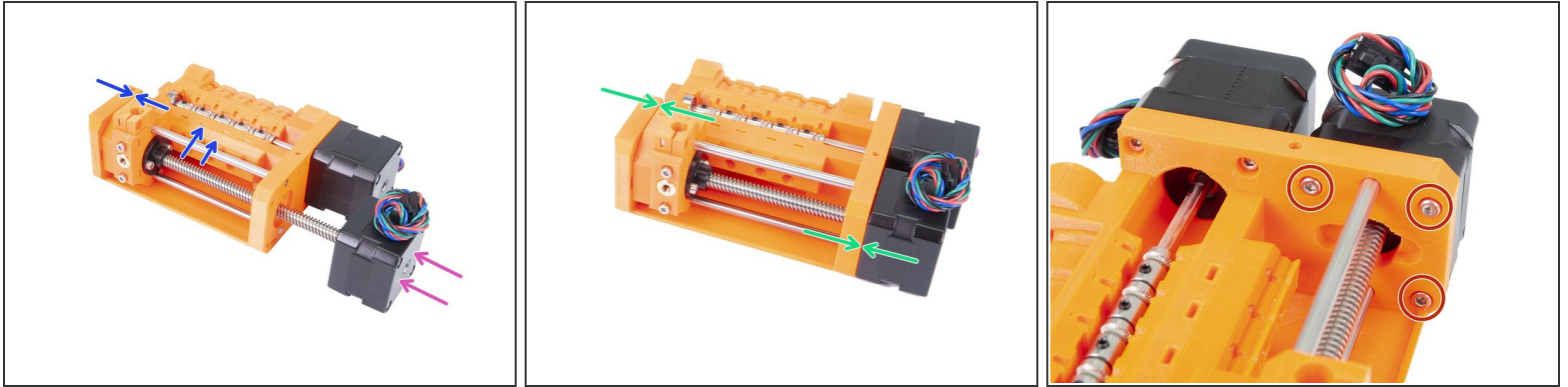
- Slide the Selector motor in, make sure the cable points up.

⚠ Check the thread on the shaft and ensure there is no piece of plastic in it. Otherwise, you might have issues with the assembly.

- As soon as you reach the thread of the nut, hold the selector-finda and start rotating the shaft clockwise.

- Rotate with the shaft until the motor touches the pulley body. Make sure the selector-finda is all the way to the left.

- Secure the Selector motor using three M3x10 screws.

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Step 24 — F.I.N.D.A. sensor parts preparation
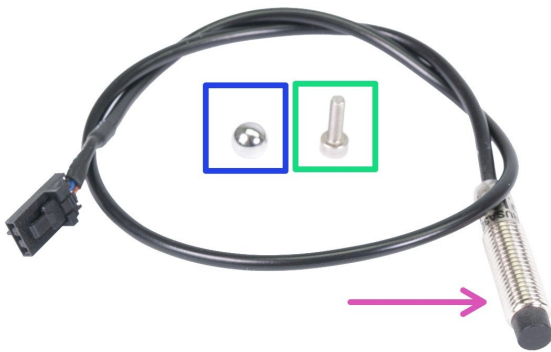
⚠ Though the design is similar, please note there is a **P.I.N.D.A.** used in the extruder on regular Original Prusa i3 printer and **new F.I.N.D.A.**, which is used only in the MMU unit.

● **For the following steps, please prepare:**

● F.I.N.D.A. sensor (1x)

● F.I.N.D.A. ball (1x)

● M3x10 screw (1x)

ⓘ Extra ball is in the spare package ;)

Step 25 — F.I.N.D.A. sensor assembly
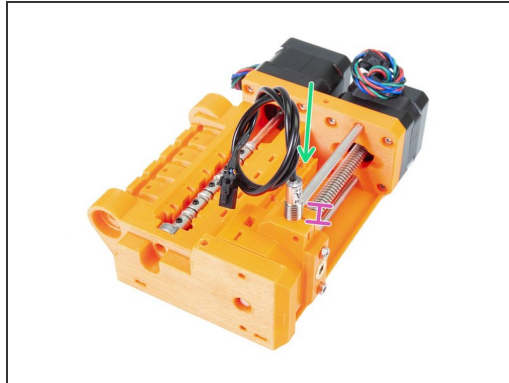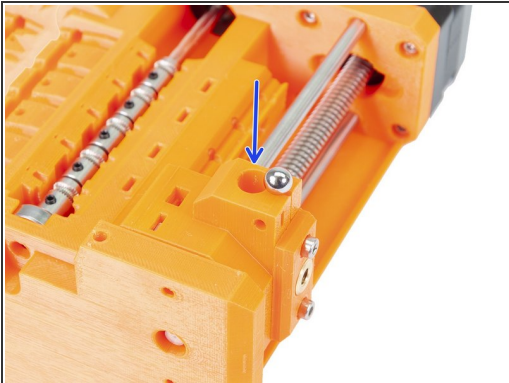
● Push the ball in the selector-finda circular opening.

● Carefully screw in the F.I.N.D.A. sensor. We recommend wrapping the cable as in the picture to avoid damaging it.

● Exact position of the F.I.N.D.A. sensor will be set in the next step. For now, let about 6-7 mm (0.24 - 0.28 inch) of the threaded part above the printed part.

● Insert M3x10 screw as in the picture, tighten it very slightly.

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Step 26 — F.I.N.D.A. sensor alignment
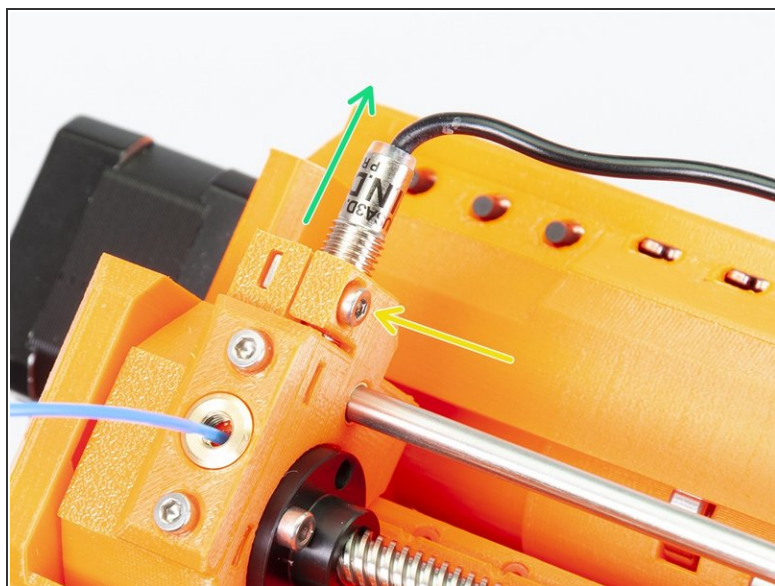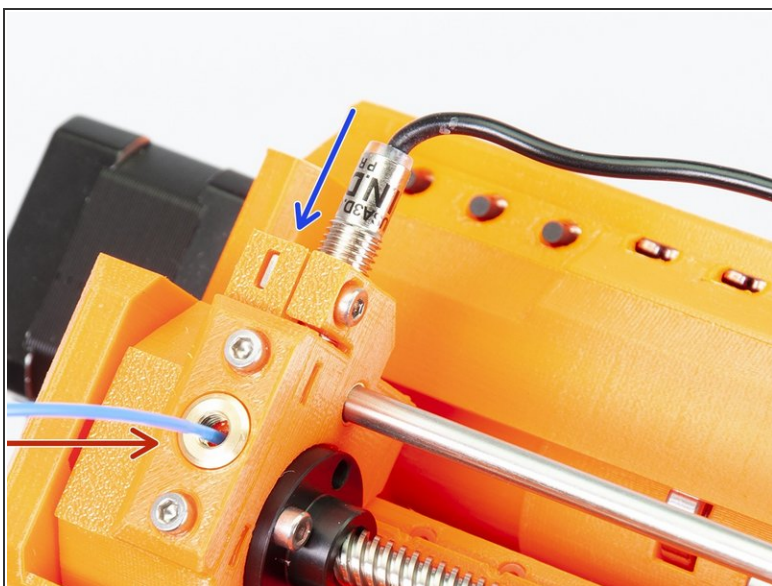
- Insert any 1.75mm filament in the selector.

- Start tightening the sensor. During tightening try moving with the filament, as soon as the tip of the sensor presses the filament, stop tightening.

- Turn the sensor counter-clockwise 90° to lift it up slightly.

- Tighten the M3x10 screw.

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Step 27 — MMU2 unit parts preparation
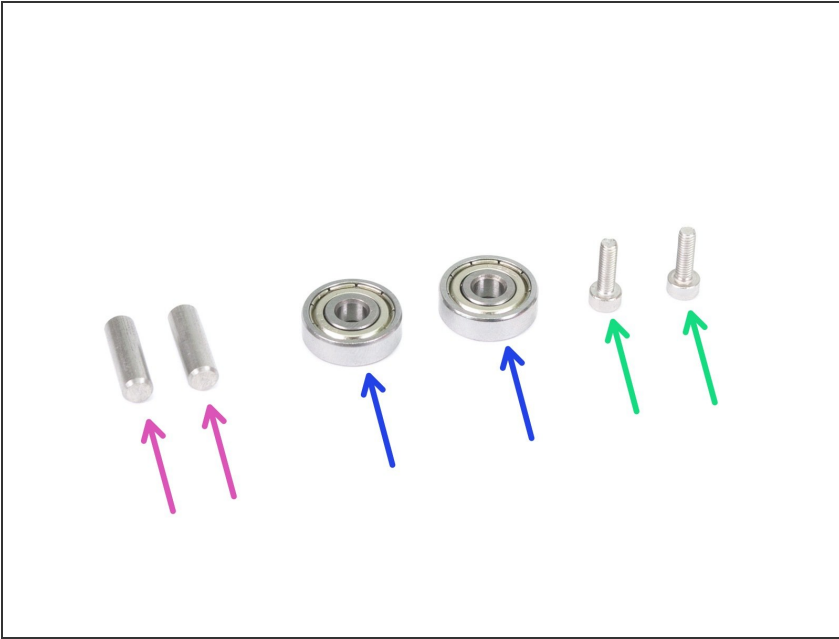
- **For the following steps, please prepare:**

- Shaft 5x16sh (2x)

- 625 bearing (2x)

- M3x10 screw (2x)

- *(i)* The MMU2 unit is considered as the set of all the printed parts, motors, shafts, etc. assembled together.

Step 28 — MMU2 unit assembly (part 1)
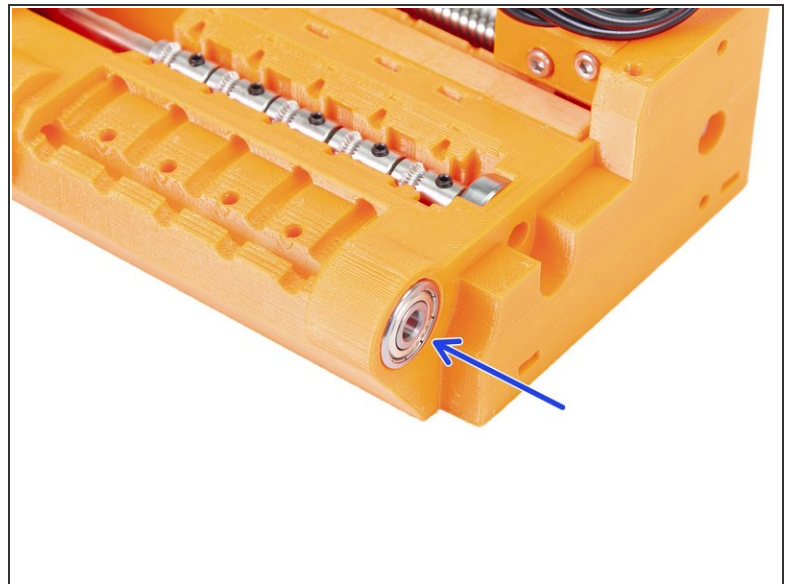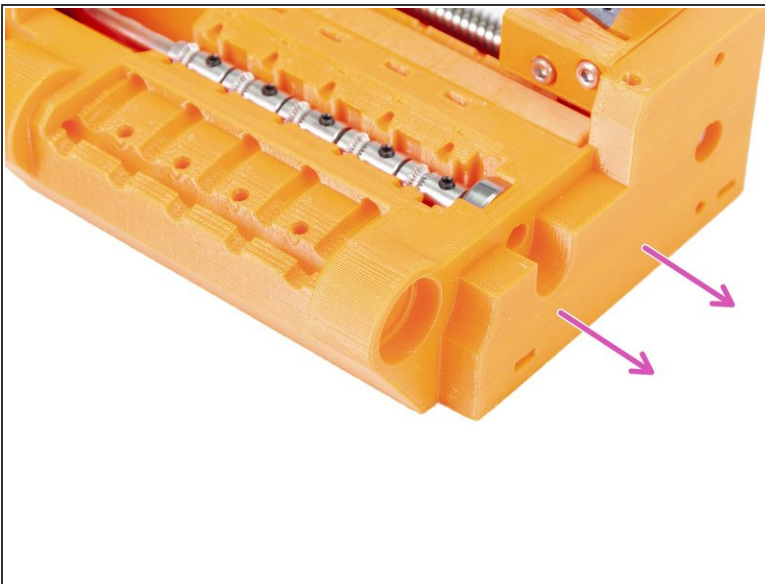
- Turn the pulley-body side without motors towards you.

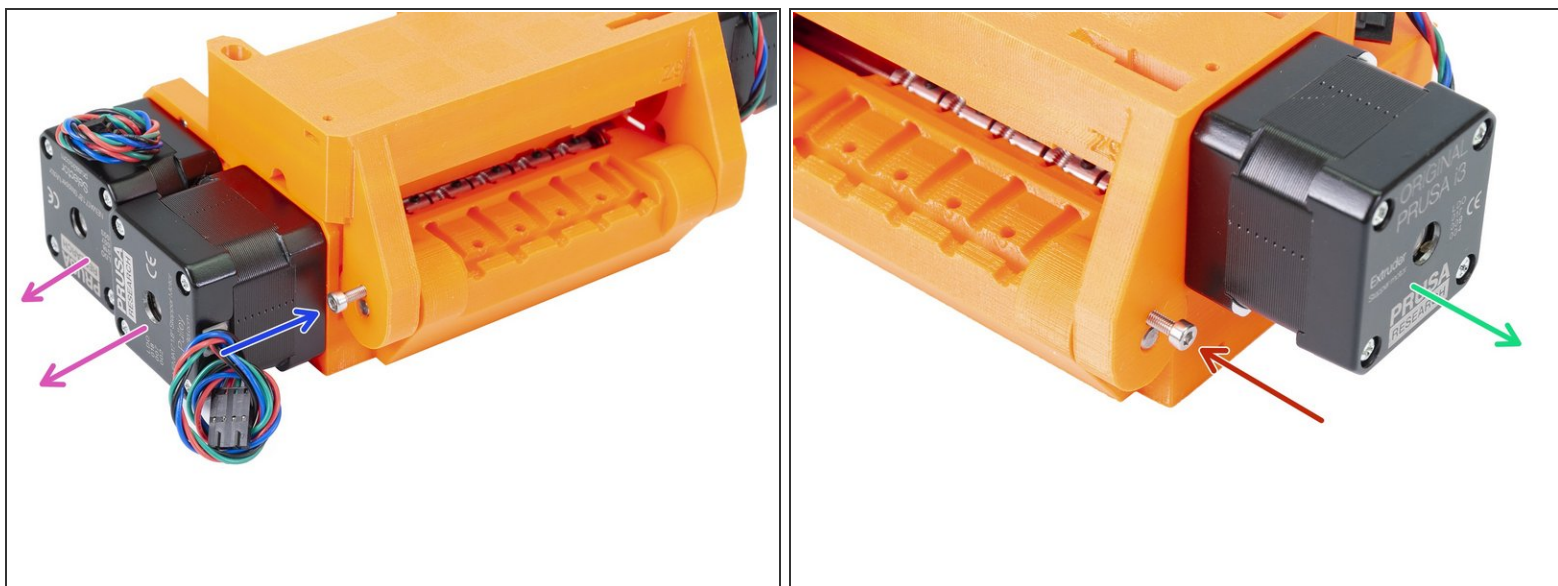- Push the bearing in. Make sure it is aligned with the pulley-body.

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Step 29 — MMU2 unit assembly (part 2)
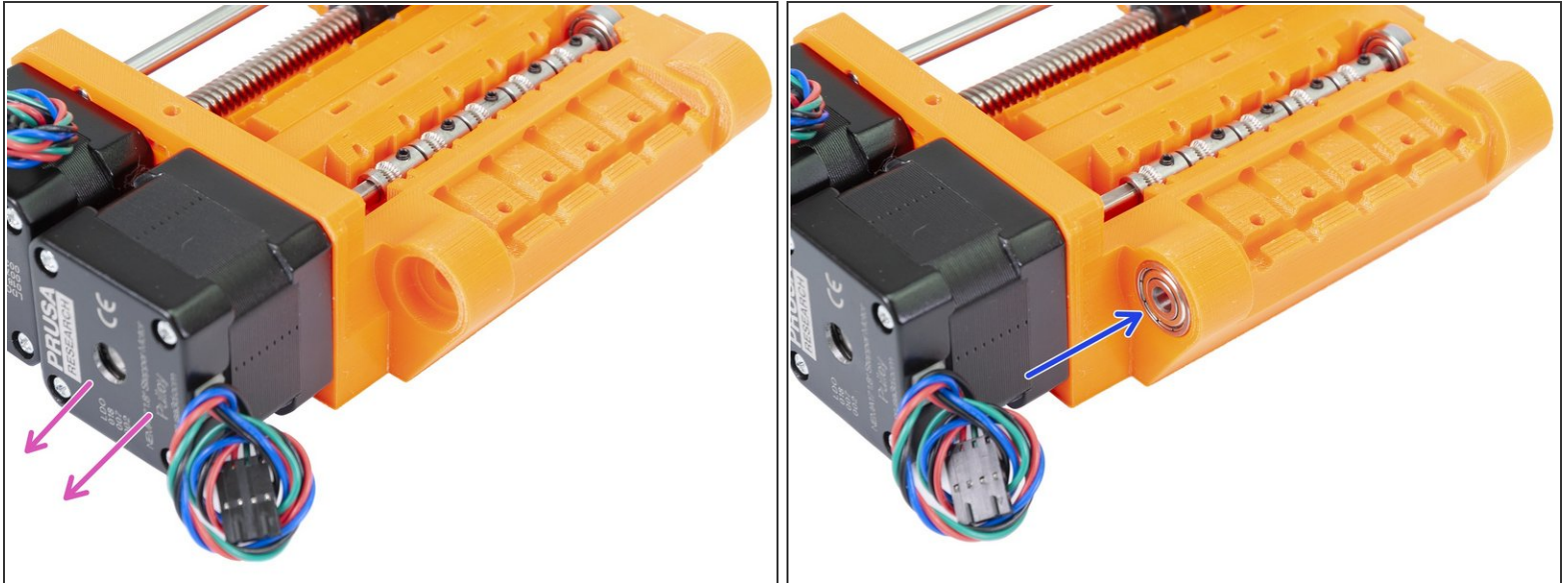
- Turn the pulley-body side with motors towards you.

- Push the bearing in. Make sure it is aligned with the pulley-body.

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Step 30 — MMU2 unit assembly (part 3)
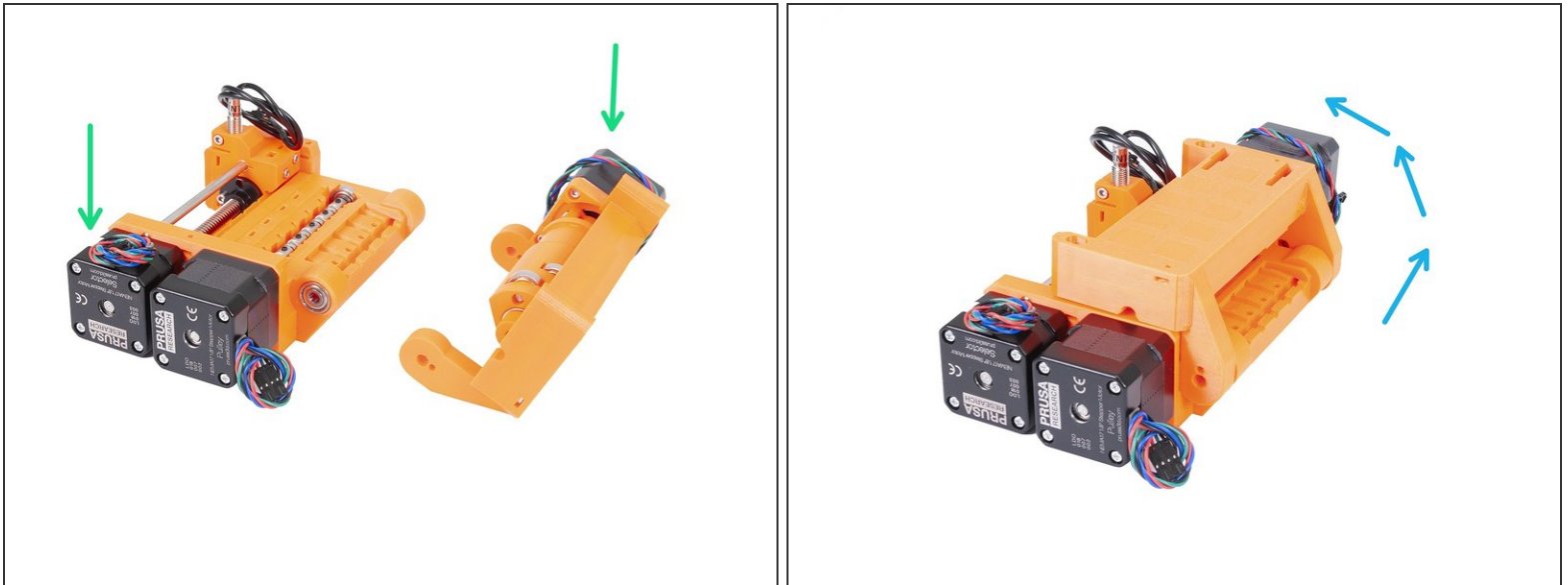
- Let's assemble the MMU2 unit ;)

- Prepare the pulley-body and idler-body as in the picture. Note position of the motors.

- "Rotate" the idler-body on the pulley body.

- Proper alignment will be done in the next step.

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Step 31 — MMU2 unit assembly (part 4)
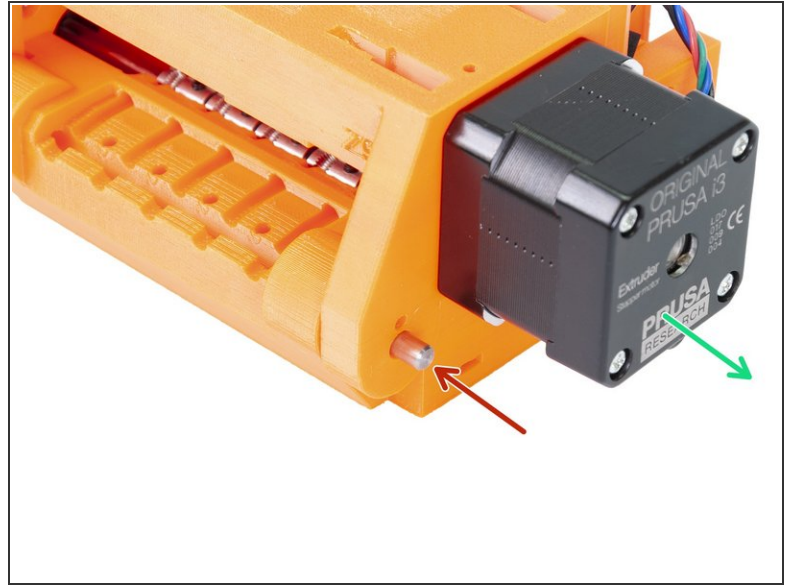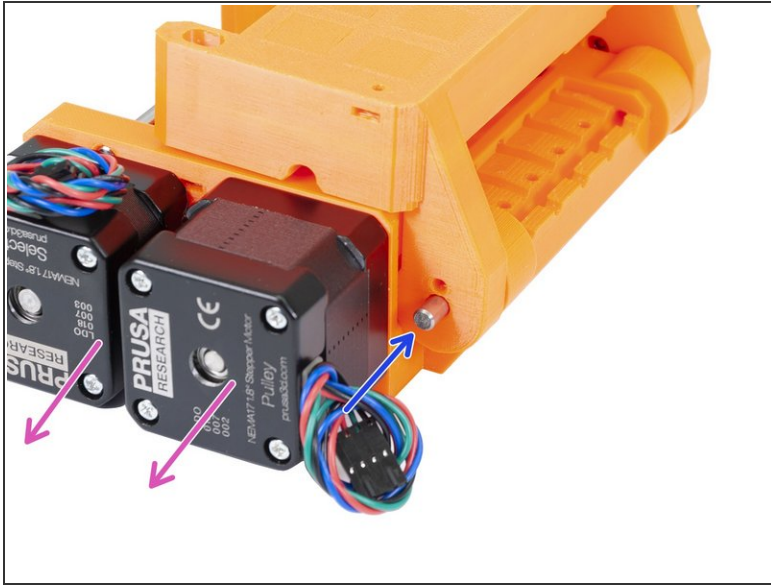
- Turn the side with two motors towards you.

- Slide in the shaft 5x16sh, align it with the outer surface.

- Turn the side with one motor towards you.

- Slide in the second shaft 5x16sh, align it with the outer surface.

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Step 32 — MMU2 unit assembly (part 5)

- Turn the side with two motors towards you.

- Use M3x10 screw to secure the shaft against falling out. Tighten the screw to the surface of the printed part.

- Turn the side with one motor towards you.

- Use second M3x10 screw to secure the shaft against falling out. Tighten the screw to the surface of the printed part.

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Step 33 — Tensioning parts preparation
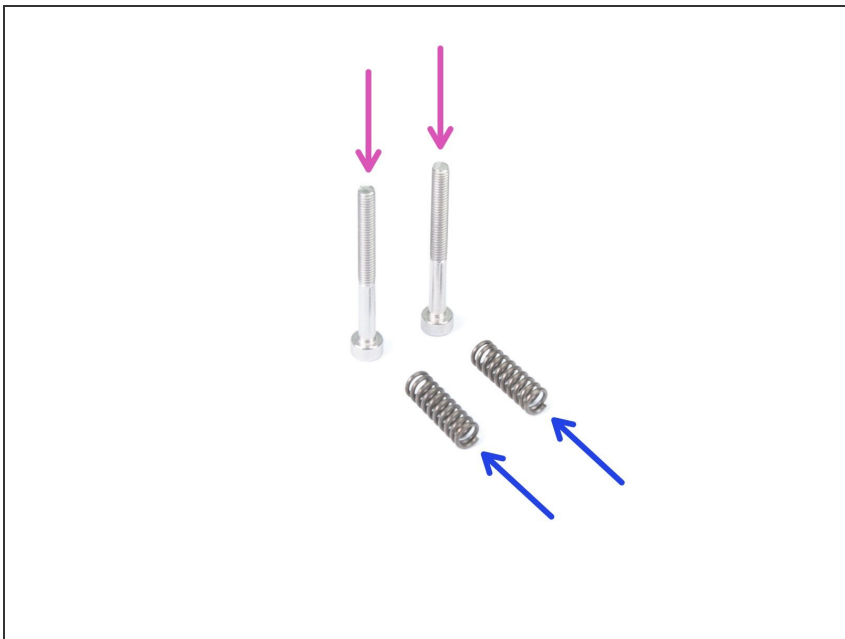
- **For the following steps, please prepare:**

- M3x30 screw (2x)

- spring 5x15s (2x)

Step 34 — Tensioning system assembly
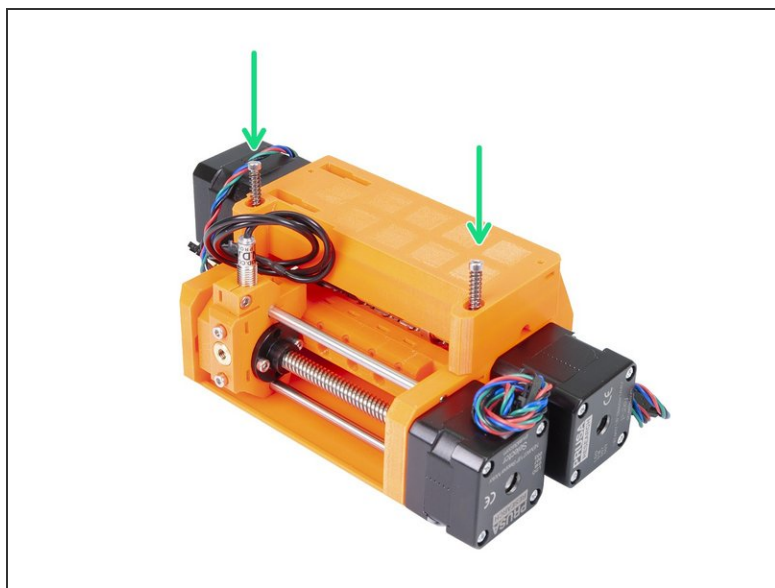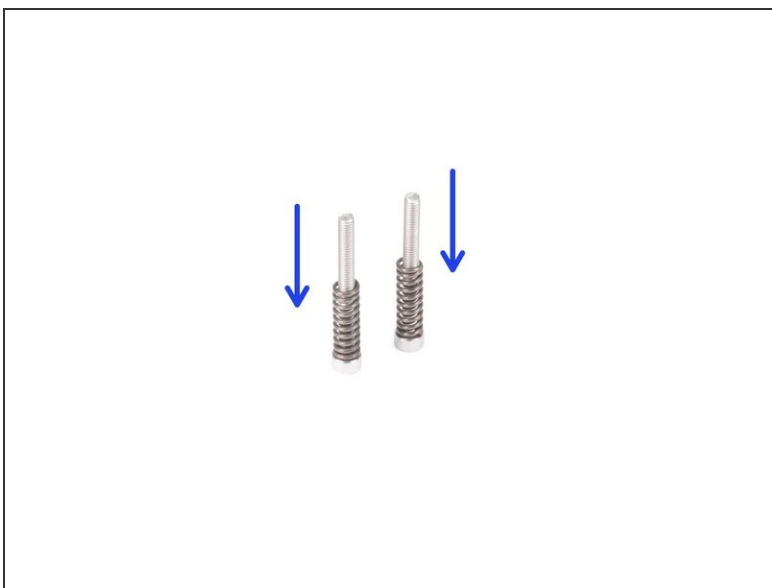
- Slide the springs on the screws.

- Insert screws with the springs in the holes on idler-body.

- Tighten the screw heads slightly below the surface of the printed part.

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Step 35 — It's Haribo time!
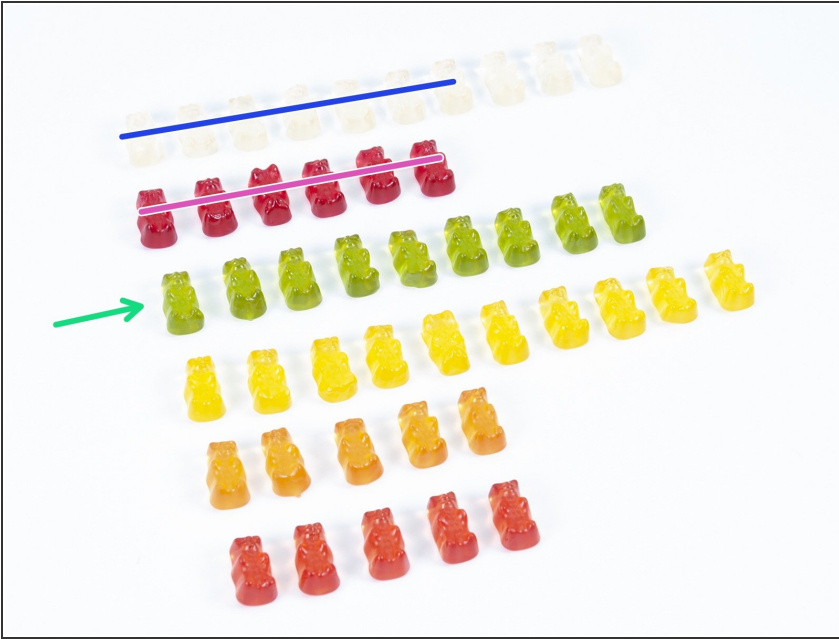
- Quite challenging chapter, wasn't it?

- Pulley body assembly required your attention, eat no less than 20 % of all bears.

Step 36 — Final check of the MMU2 unit
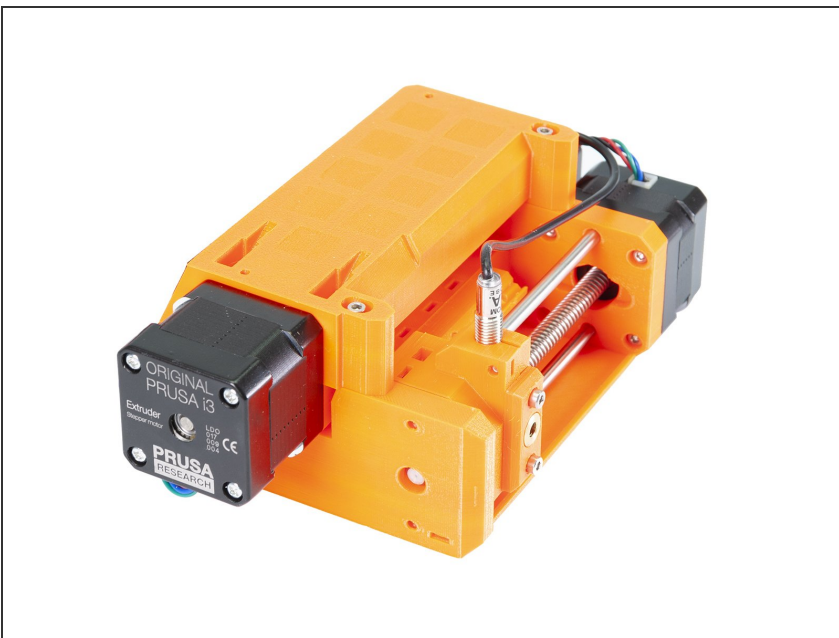
- Make sure all parts are tightened.

- The next chapter is waiting! [3. Electronics and MMU2 unit assembly](#)

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5. Electronics and MMU2 unit assembly

Written By: Jakub Dolezal
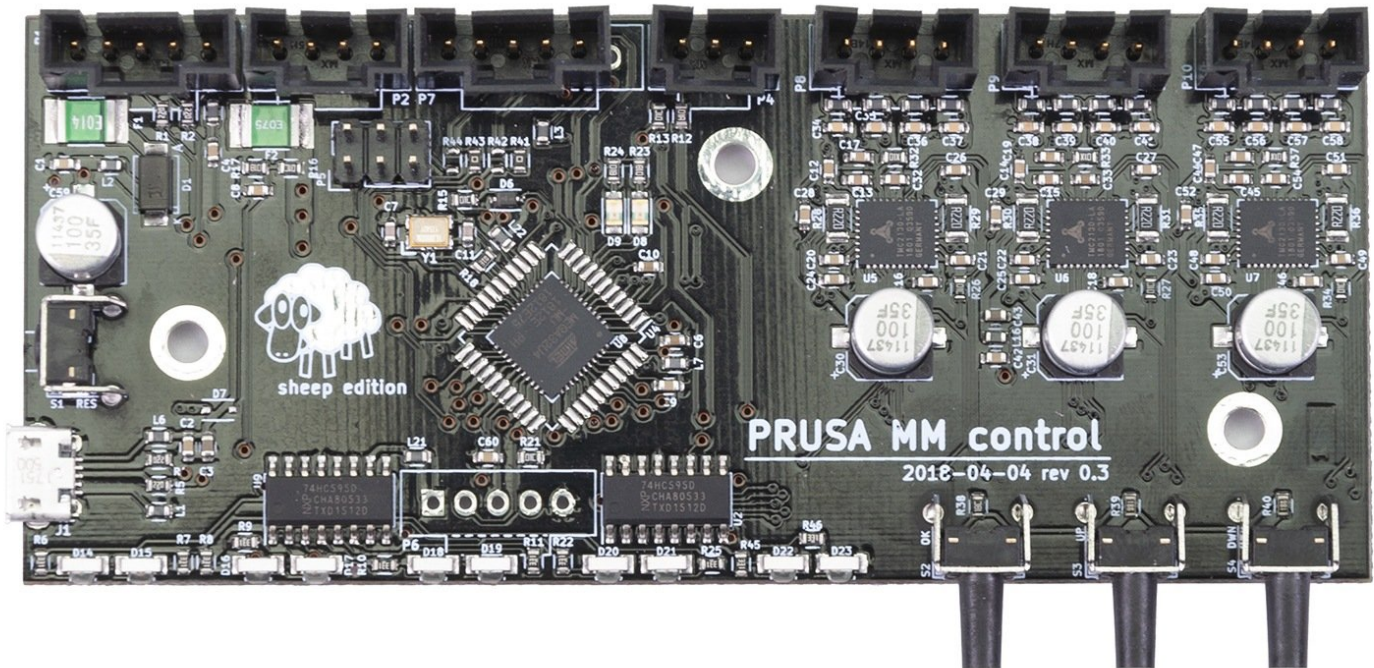
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Step 1 — Tools necessary for this chapter
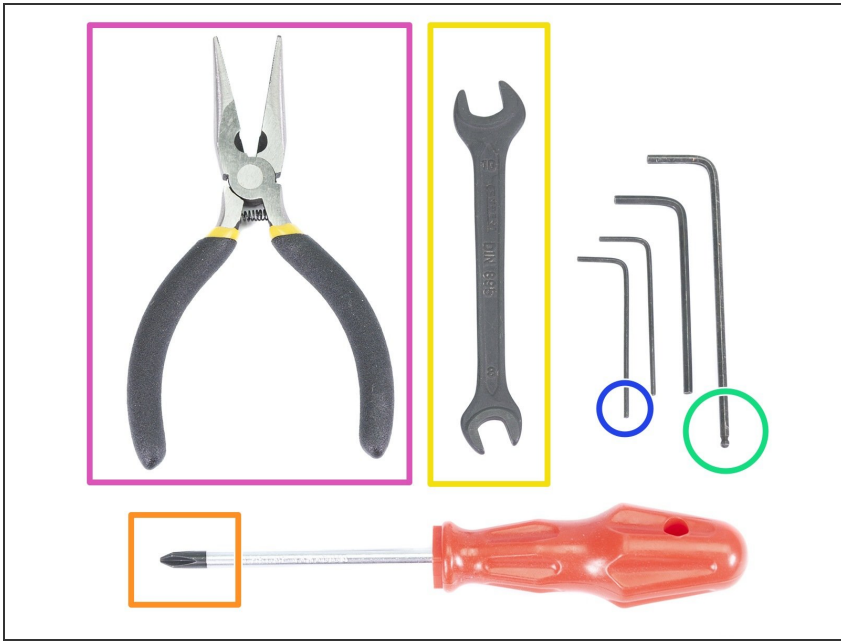
- **Please prepare tools for this chapter:**
  - 2.5mm Allen key for M3 screws
  - 2mm Allen key for nut alignment
  - Needle-nose pliers for zip tie trimming
  - Philips screw-driver for power cable assembly
  - 8mm wrench to tighten the QSM fittings

Step 2 — Electronic parts preparation
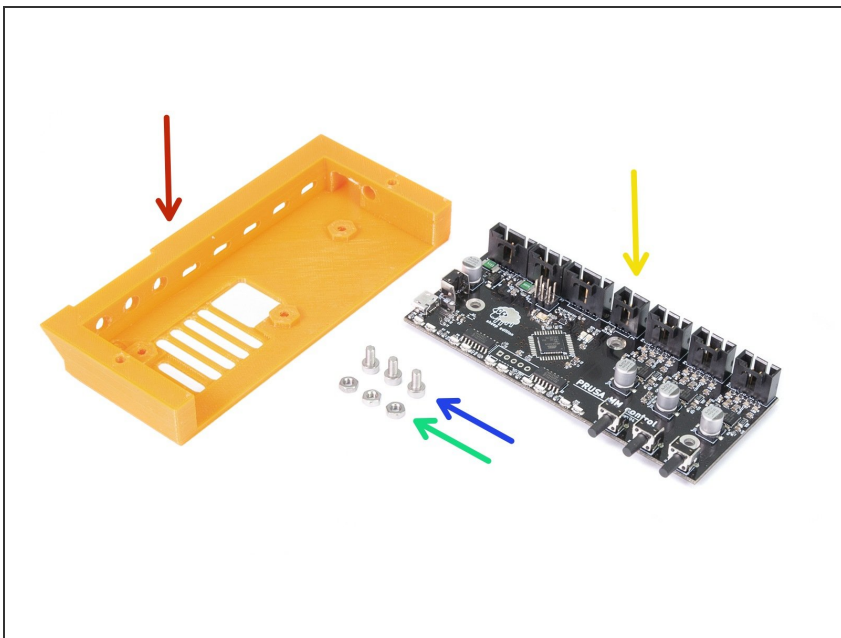
- **For the following steps, please prepare:**
- mmu2-ele-cover (1x)
- M3x6 screw (3x)
- M3n nut (3x)
- MMU2 control board (1x)

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Step 3 — Electronics assembly
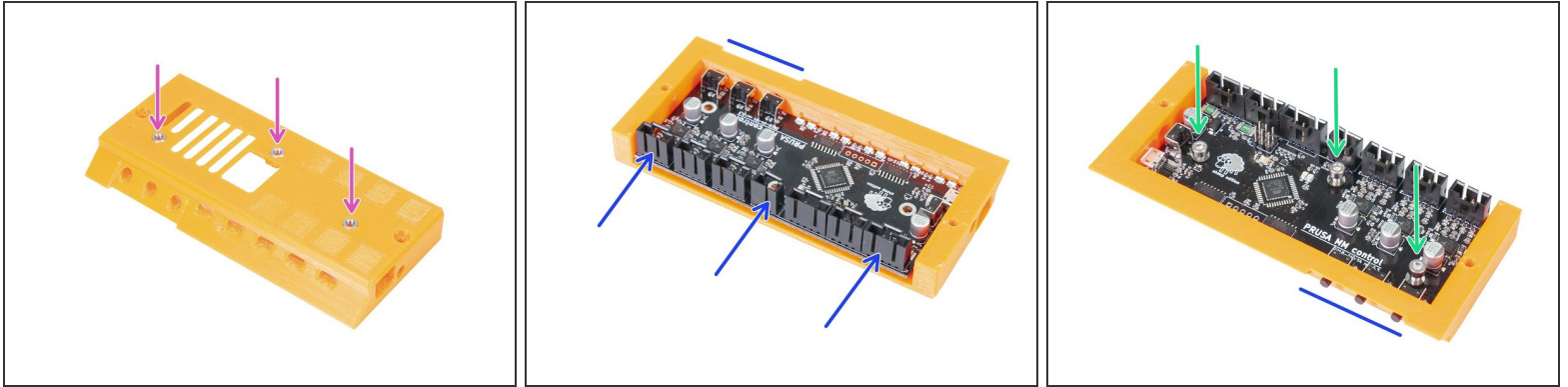
- Insert three M3n nuts in the ele-cover. Use a flat surface to push them in if necessary.

- Slide in the MMU2 control board. Make sure the three buttons are all the way through on the other side.

- Secure the board with three M3x6 screws. Tighten carefully.

- ⓘ Tip: If you can't press the nuts in, use a M3x6 screw to pull the nuts in before you slide in the board.

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Step 4 — Cables preparation
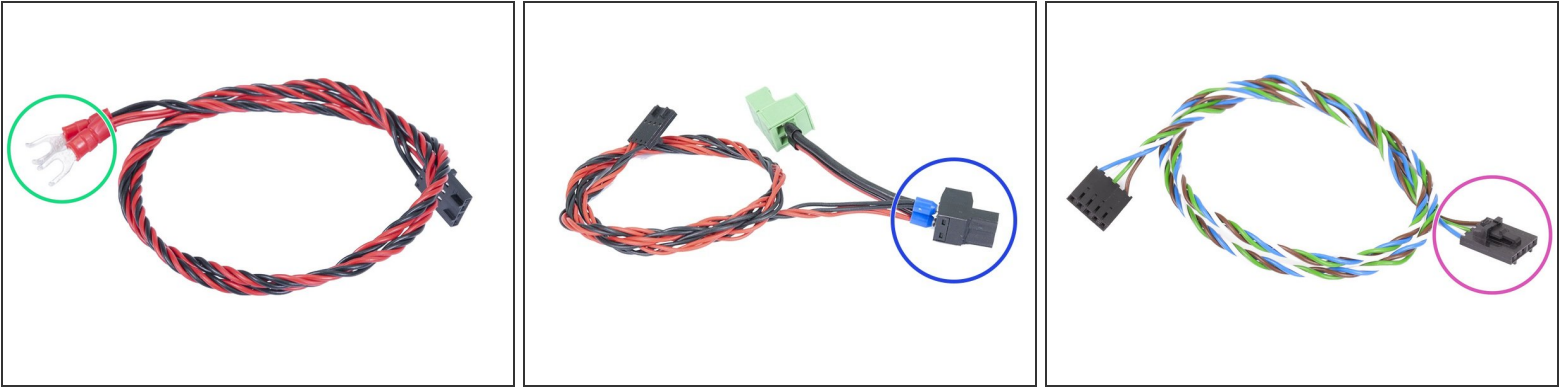
- **For the following steps, please prepare:**

- 🟢 Power cable for the MK3 (1x)

- 🔵 Power cable for the MK2.5 (1x)

⚠️ **Use the power cable depending on the type of your printer.** In case the cable is missing in your kit, please contact our support.

- 🟣 Signal cable (1x)

⚠️ Note the signal cable has two different connectors! One is smooth without **safety latch** and the other one has a latch. Use the latch for the MMU2 board.

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Step 5 — Connecting the cables
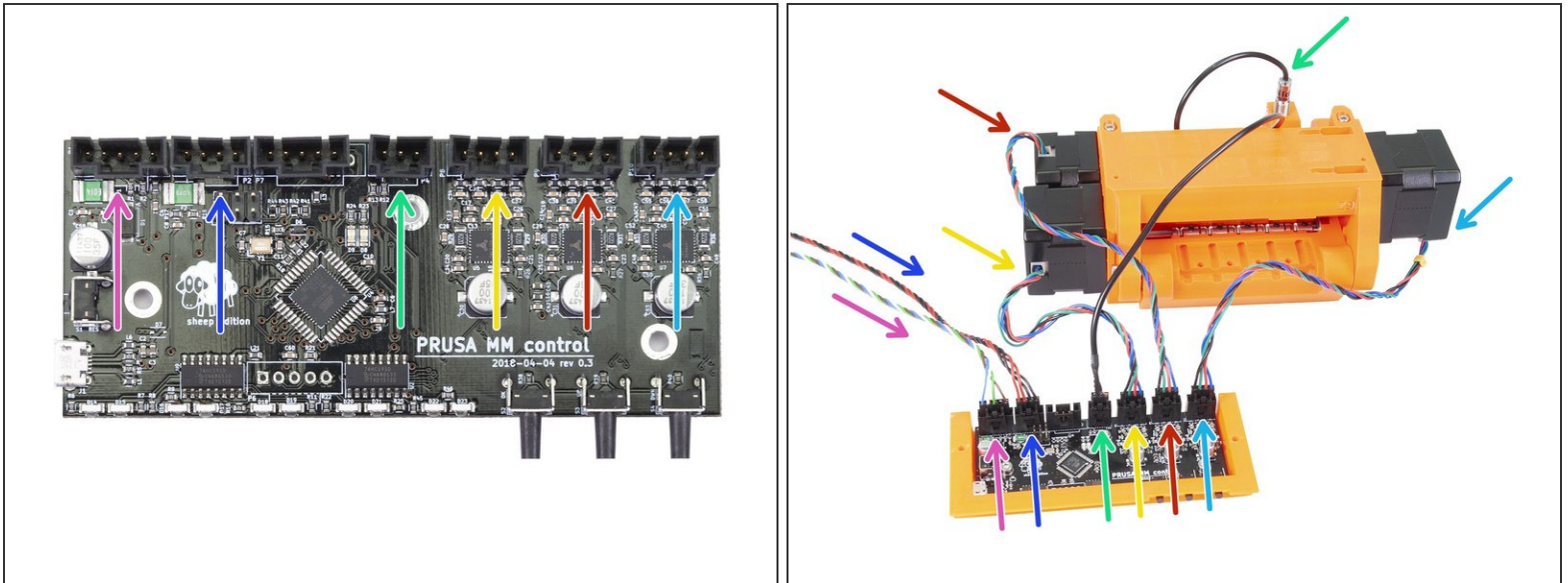
- Prepare the MMU2 unit and the board assembly as in the picture. Follow the cables to connect them correctly.

- Signal cable (use side with safety latch)

- Power cable

- F.I.N.D.A. sensor cable

- Pulley motor cable
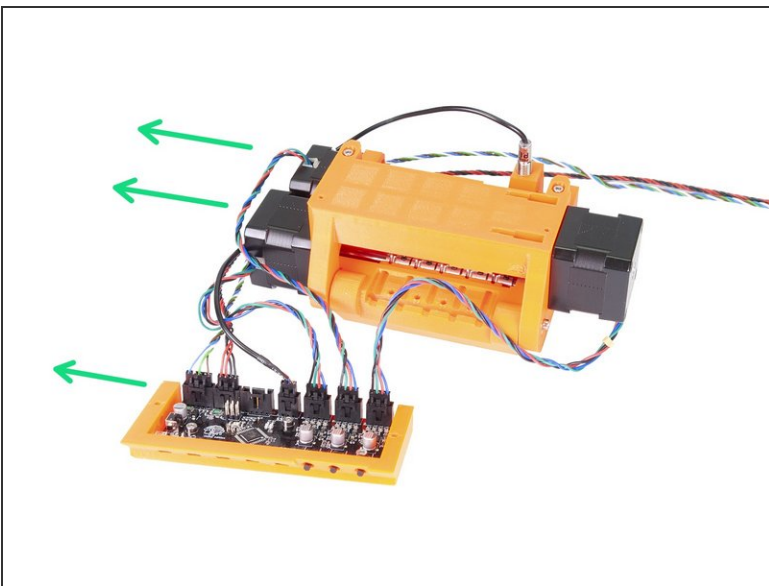
- Selector motor cable

- Extruder motor cable

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Step 6 — Cable management parts preparation
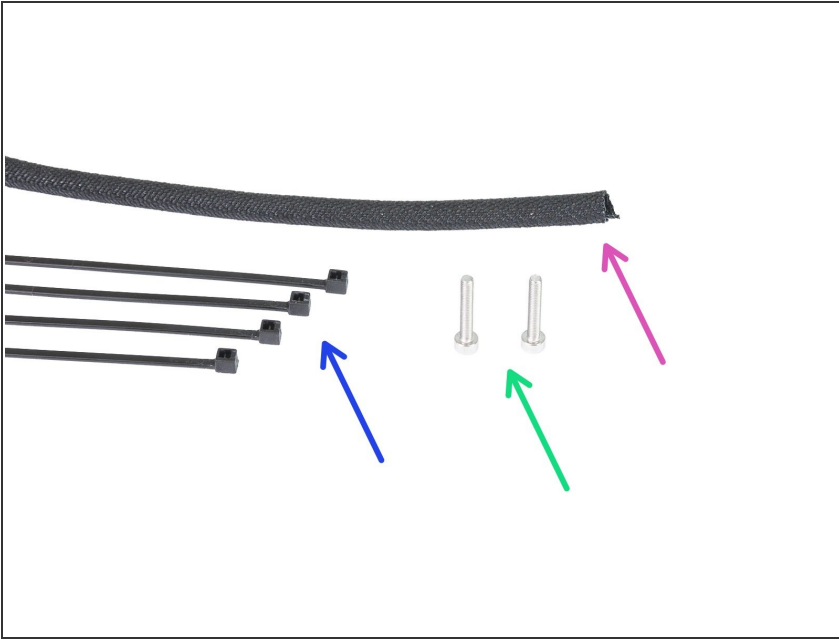
- **For the following steps, please prepare:**

- Textile sleeve (1x)

- Zip tie (4x)

- M3x18 screw (2x)

Step 7 — Cable management (part 1)
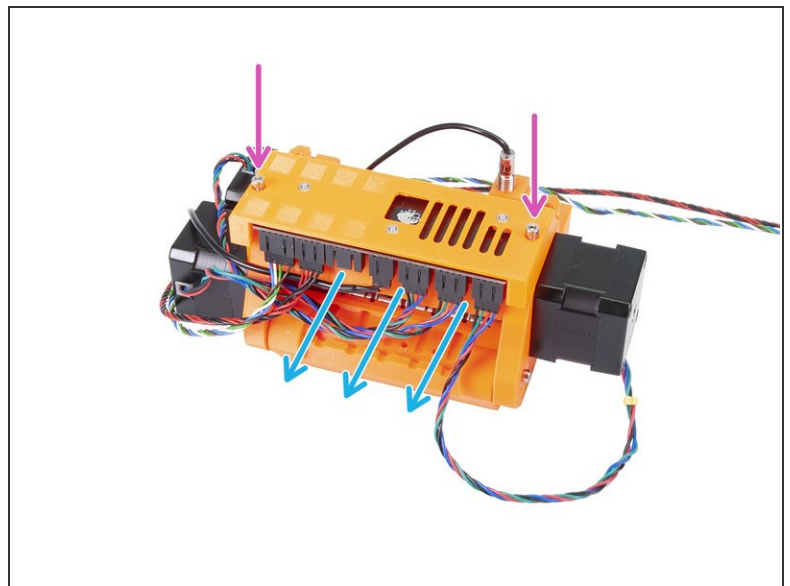
- Prepare the MMU2 unit and the electronics assembly like in the picture. Position the side with two motors to the left and signal cable to the left as well.

- Place the electronics on the MMU2 unit. The connectors must be facing towards you.

- Secure the electronics assembly with two M3x18 screws.

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Step 8 — Cable management (part 2)
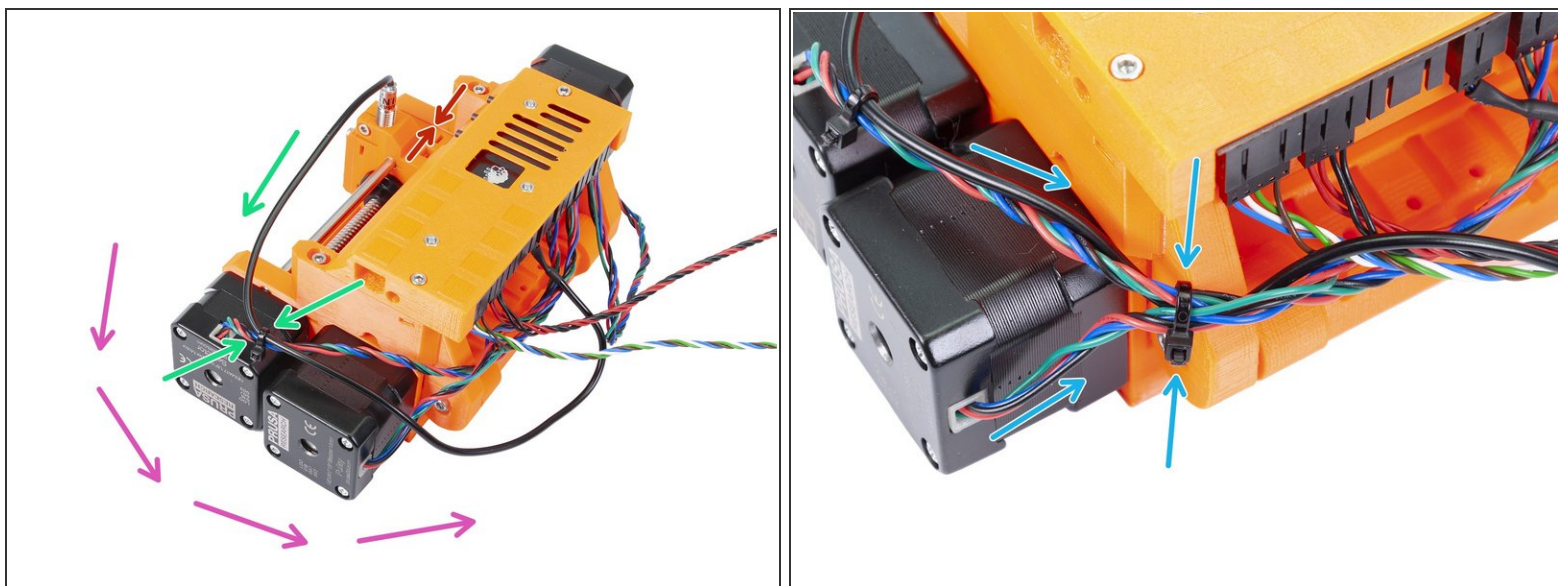
⚠️ **Make sure the selector** with F.I.N.D.A. **is all the way to the side** as in the picture!

- We will start the cable management from the F.I.N.D.A. sensor and counter-clockwise. Note the arrows.

ⓘ Tighten the cables firmly, but gently at the same time. You can damage (break) the wires.

- Carefully guide the cable from the F.I.N.D.A. sensor and couple it with the cable from the Selector motor. Use the first zip tie.

- Continue with the cable bundle and add the Pulley motor cable. Tighten these three cables using a second zip tie near the edge of the printed part (idler-body).
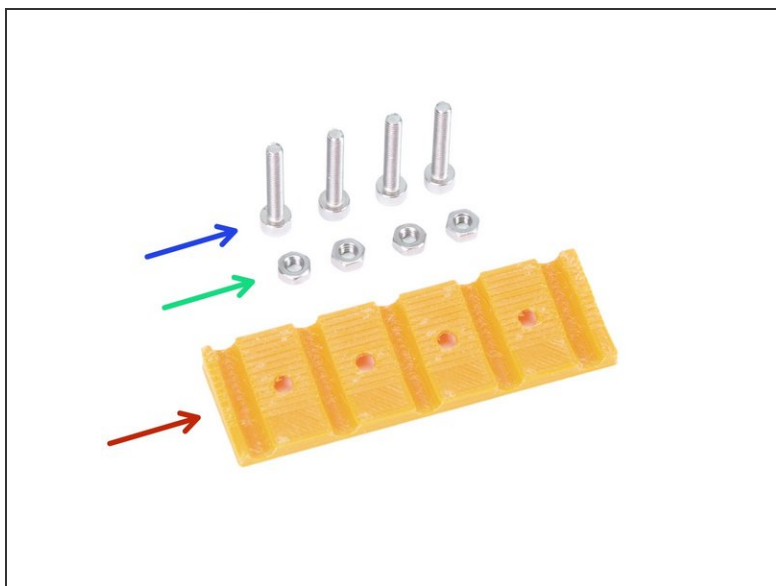
Step 9 — Cable management (part 3)
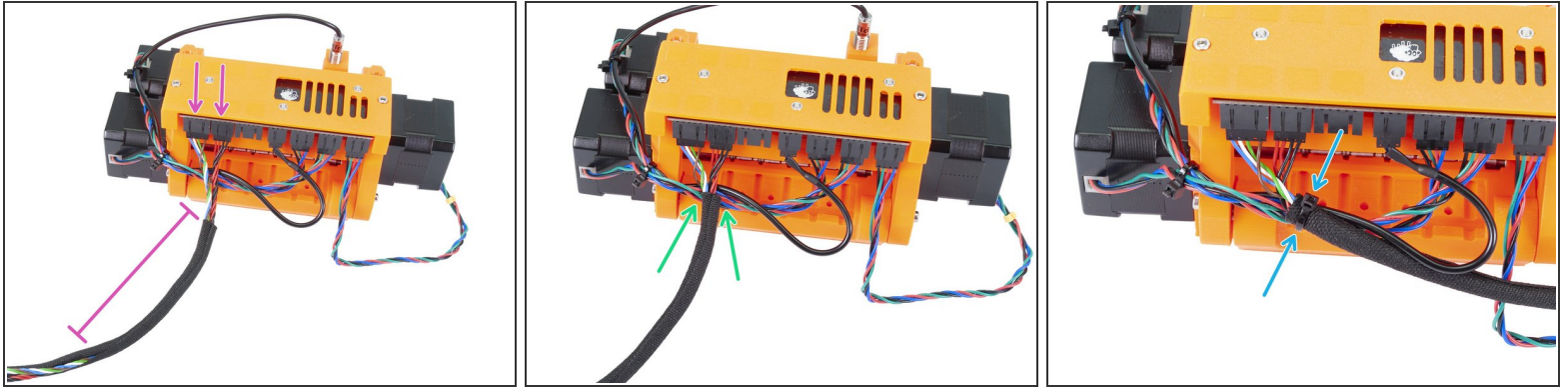
- Take the signal and power cable (first two from the left). Bundle them together and wrap around 10 cm (3.94 inch) in the textile sleeve.

- Slide the sleeve towards the MMU2 unit as much as the cable allows.

- Take the bundle from the motors and F.I.N.D.A. add the textile sleeve above it and tighten it using the third zip tie.

- Finish wrapping the cables in the textile sleeve.

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Step 10 — Cable management (part 4)
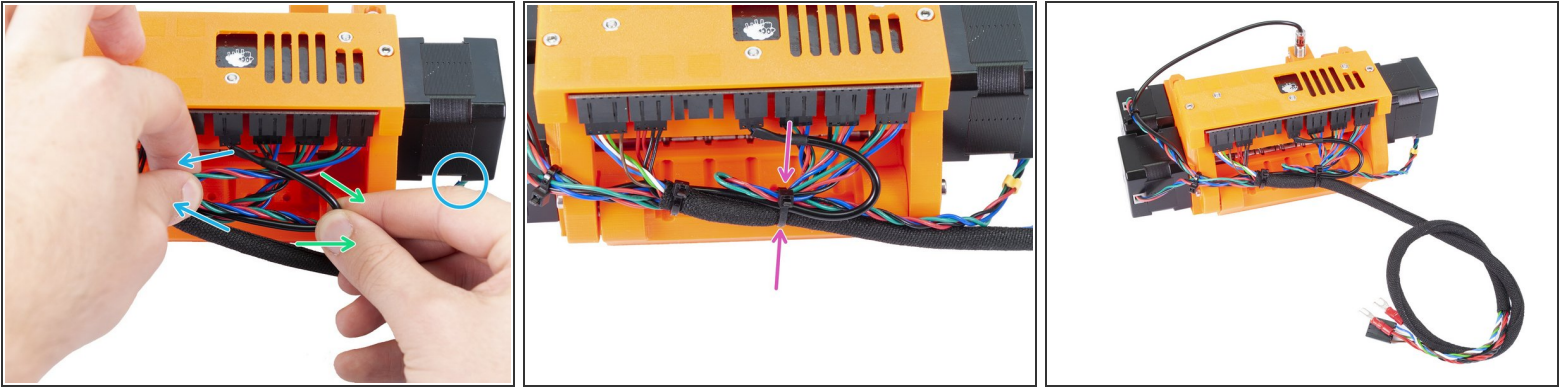
- Now using the left hand take the cable from the Extruder motor and pull it gently to the left.

- Using the right hand take the cable from F.I.N.D.A. sensor (black) and pull it gently to the right.

- Use the fourth zip tie and bundle all the cables together.

- Final cable management should be similar to the last picture.

- (i) Note: for the MK2.5 there will be different connectors at the end of the cable bundle.

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Step 11 — PTFE tubes parts preparation
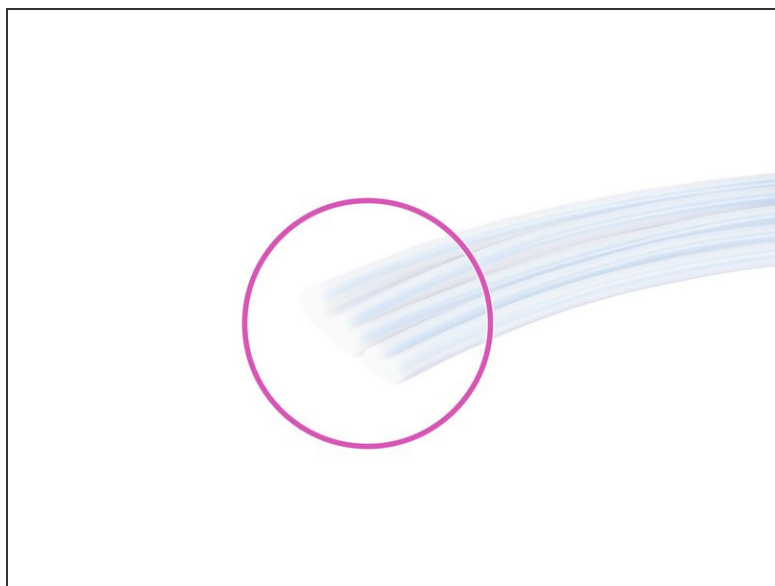
- **For the following steps, please prepare:**

- mmu2-rear-PTFE-holder (1x)

- M3x18 screw (4x)
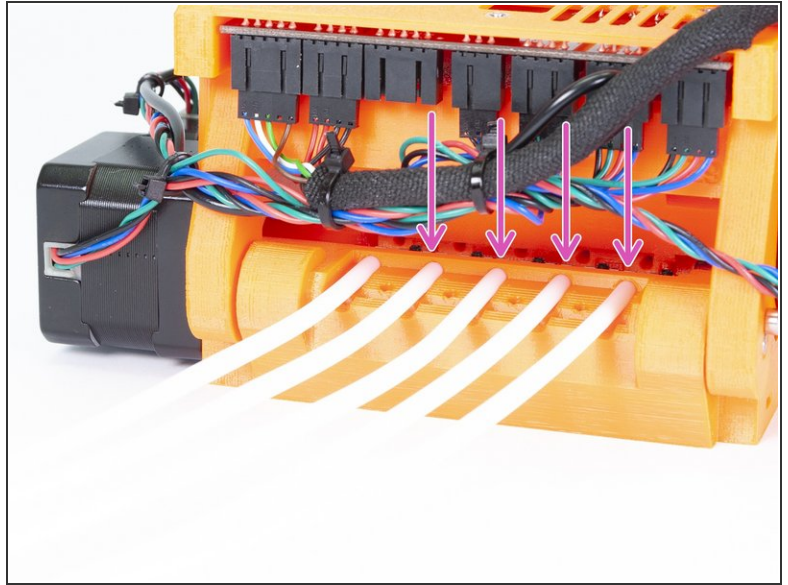
- M3n nut (4x)

- PTFE tube 4x2x650 (5x)

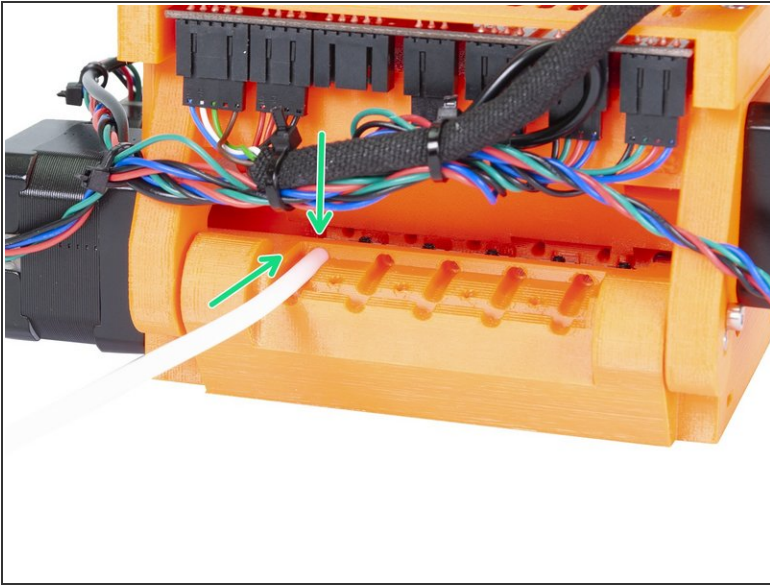- (i) PTFE tubes are installed as the last item to avoid damage to them. Be careful during the assembly ;)

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Step 12 — PTFE tubes assembly (part 1)
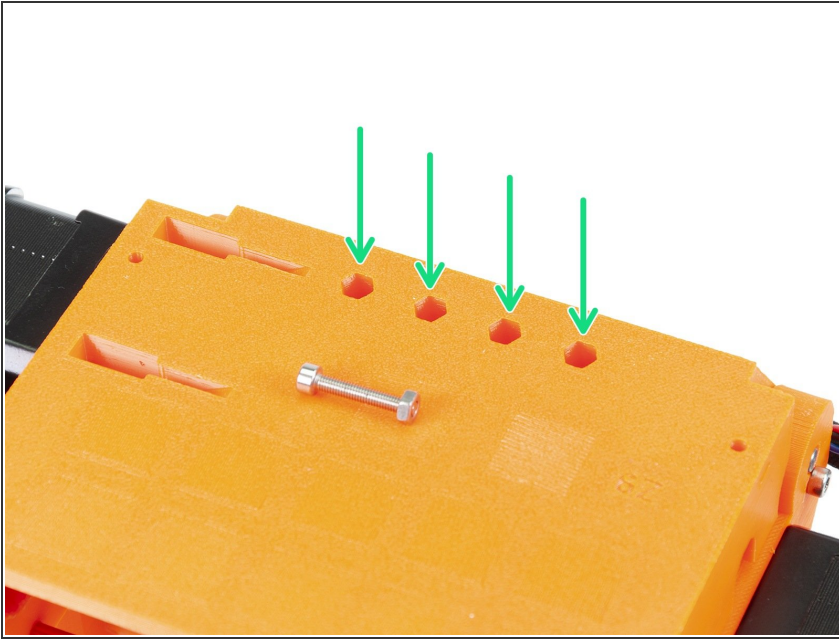
- Carefully turn the entire MMU2 unit upside-down.

- Slide in the M3n nuts. Use a M3x18 screw to press them in. Use your hand, hammer shouldn't be necessary.

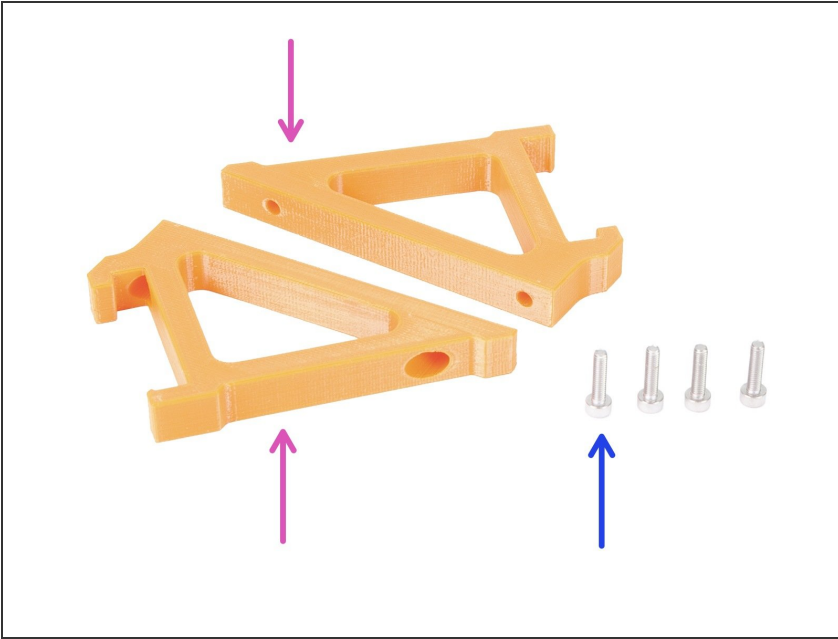- The hole for each nut is slightly narrower on the other end, therefore the nut should have a snug fit.

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Step 13 — PTFE tubes assembly (part 2)

- Take the first PTFE tube and slide it inside the MMU2 unit. All five tubes are bent in one direction, make sure the free end is now pointing up.

- There is a circular hole for each PTFE tube, you should be able to press at least 0.5 to 1 mm (0.02 - 0.04 inch) of the tube inside the hole.

- Continue by pressing in remaining four PTFE tubes.

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Step 14 — PTFE tubes assembly (part 3)
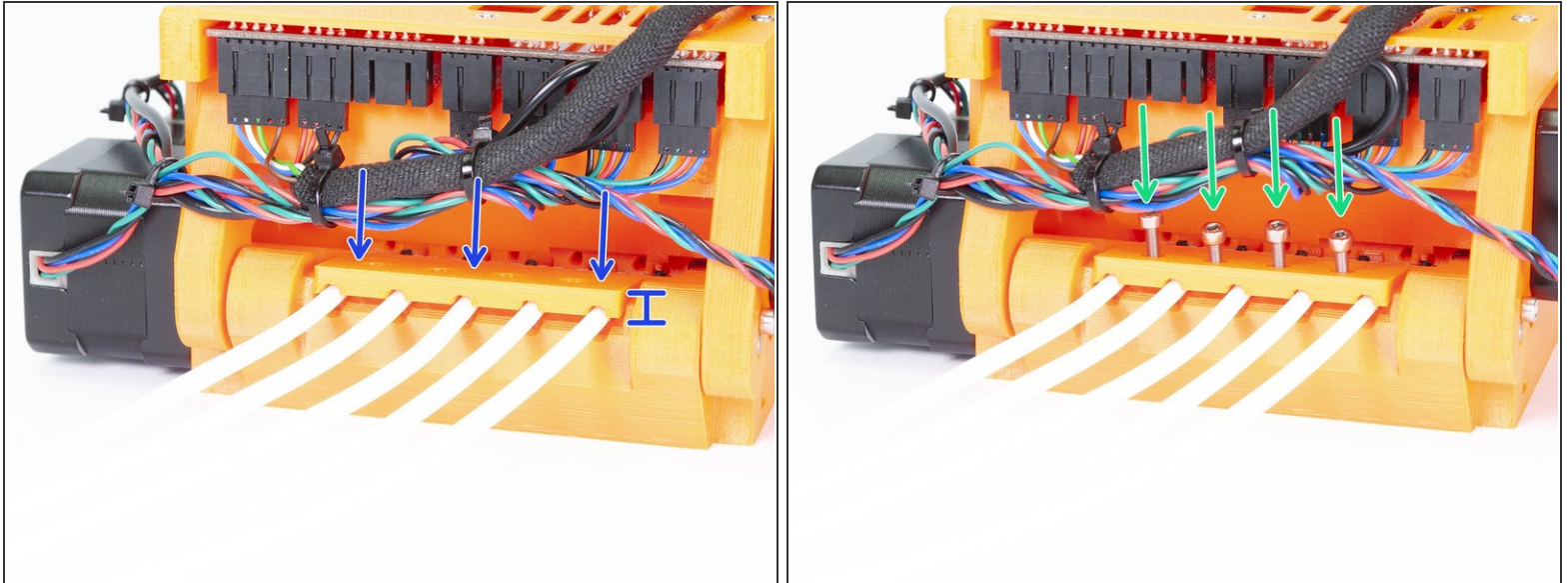
- Place the rear-PTFE-holder on the top of the PTFE tubes. Notice the printed part has thicker side, which must be facing out.

- Secure the rear-PTFE holder using four M3x18 screws. Tighten the screws fully only after you ensure proper alignment of the printed part! Otherwise, you risk squishing the tubes and future filament jams.
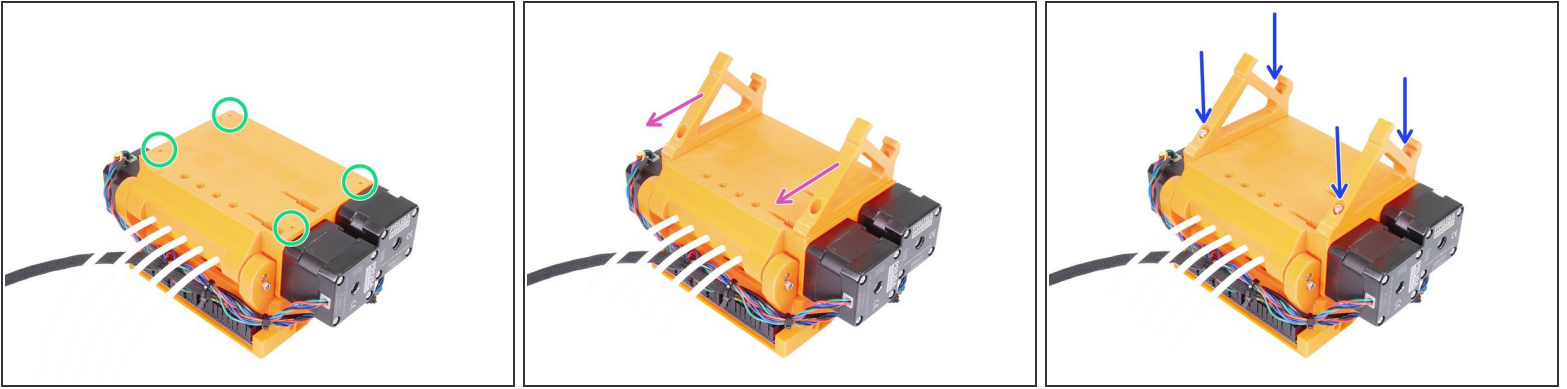
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Step 15 — Frame holder parts preparation

- **For the following steps, please prepare:**

- mmu2-frame-holder (2x)

- M3x12 screw (4x)

⚠ Be extra careful with the holders from now on. If you break them, you won't be able to mount the MMU2 unit on the frame.
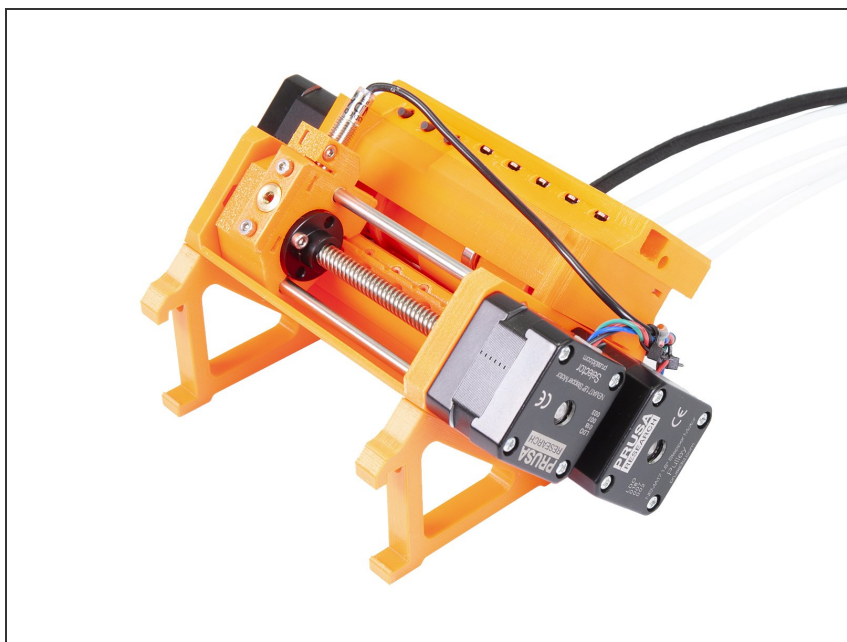
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Step 16 — Frame holder assembly

⚠ While the MMU2 unit is turned upside down, be EXTRA careful with the F.I.N.D.A. cable, which can get broken, if you tilt the unit on the F.I.N.D.A. sensor.

- Turn the MMU2 unit upside down like in the first picture. Locate the four holes for the M3 screws. Make sure there are nuts in them.

- Place both frame-holder parts on the MMU2 unit. The longest inclined part should be in the direction of the PTFE tubes.

- Ensure once again the correct orientation of the frame holders.

- Secure the holders using four M3x12 screws.

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Step 17 — MMU2 unit is finished!

- Great job, the MMU2 unit is finished!

- Compare the picture to your assembly.

⚠️ **DO NOT ASSEMBLE** the MMU2 unit on the **FRAME!!!** Wait for the instructions.

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Step 18 — Preparing the necessary parts
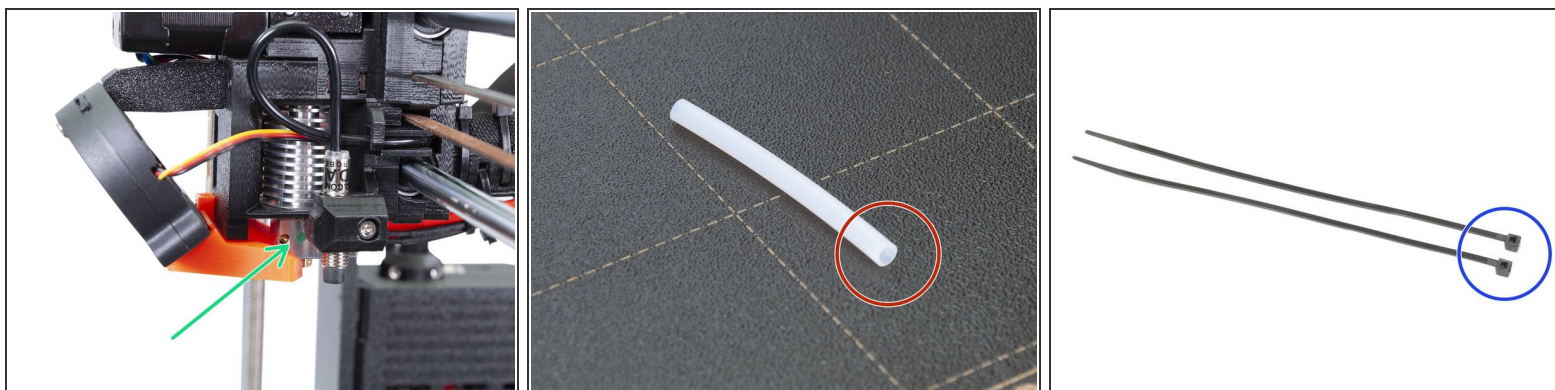
⚠️ **UPDATE:** To make the assembly easier, we started shipping hotends with the MMU2 PTFE already installed. **Look for a green dot** (see the first picture), then there is no need to change the tube. You can skip all the way to the [Step 29](#).

⚠️ Before we mount the MMU2 unit on the printer's frame **we have to first change the PTFE tube inside** the extruder for a new one, designed specifically for the MMU2. Don't use any other, than the one provided in this kit.

● In case you have upgraded the extruder's printed parts B6 to B7 and **changed the PTFE tube** according to the [2 Upgrading extruder B6 to B7](#) included in this MMU2 guide, you can skip to [Step 31](#). If your extruder was already at B7/R3 design before starting the entire MMU2 assembly, please follow these steps.

⚠️ Ensure the **filament is not loaded** in the hotend. **Remove it** before proceeding further.

● **For the following steps, please prepare:**
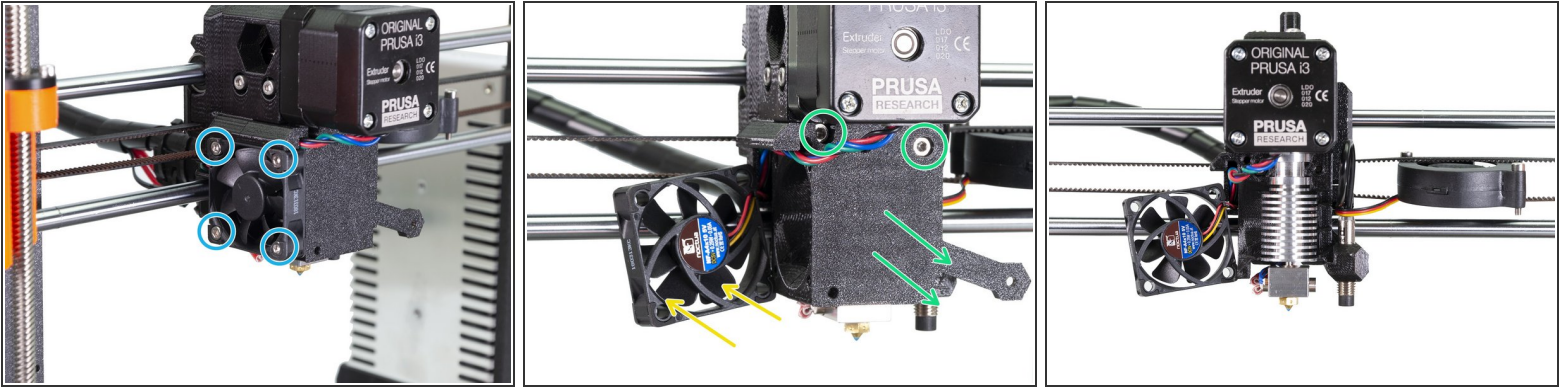
● PTFE tube 4x1.85x50 (1x)

● Zip tie (2x)

ⓘ The second tube in the package is a spare one.

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Step 19 — Extruder surgery (part 1)
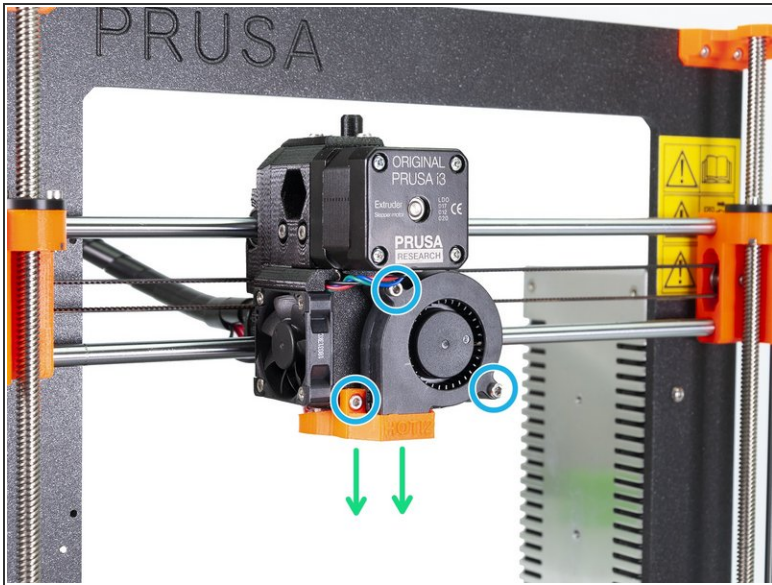
- Release marked M3 screws.

- Remove the fan-nozzle completely.

- Carefully insert the Front print fan in the X-axis belt.

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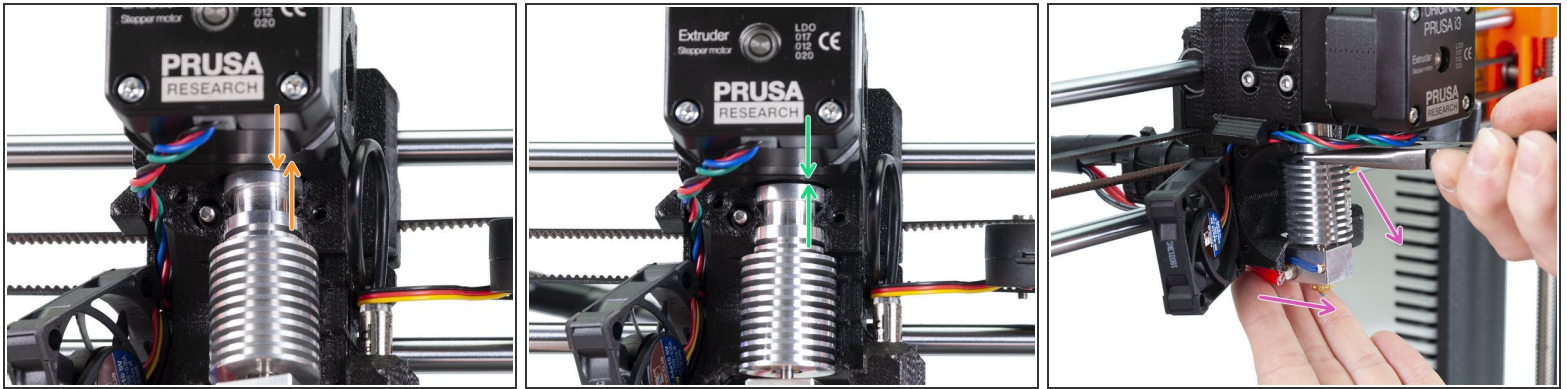
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Step 20 — Extruder surgery (part 2)

- Release and remove all four M3x18 screws on the Left hotend fan.

- Move the fan carefully away from the extruder body as far as the cable allows.

- Release and remove both M3x25 screws, then remove carefully the extruder-cover part.

- Your extruder and fan arrangement should look like in the last picture.

Step 21 — Extruder surgery (part 3)
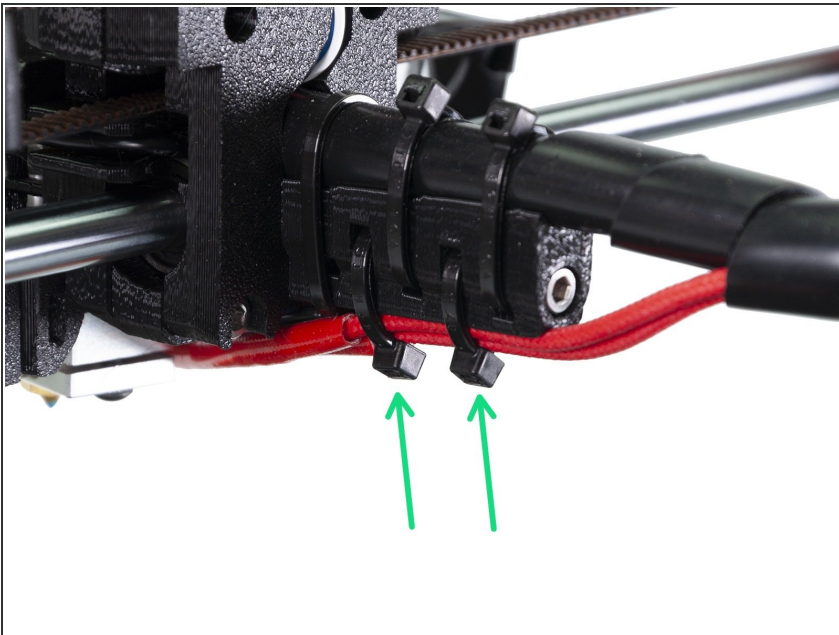
- Turn the printer around and cut two zip ties on the heater cables. Be very careful while cutting!

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Step 22 — Extruder surgery (part 4)

⚠ **WARNING:** Removing hotend from the extruder needs a "special" technique, then the hotend slides out quite easily. Don't use excessive force, or you will damage some parts irreversibly!!!
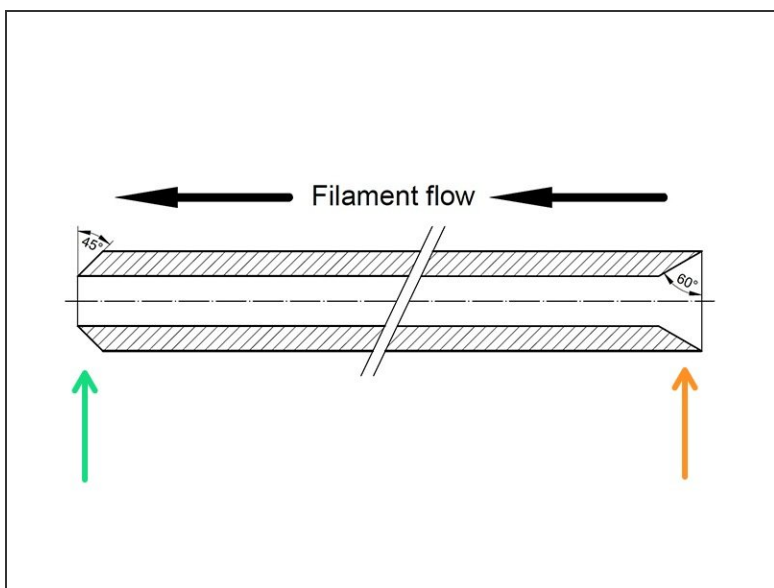
- The hotend is removed by inclining and pulling at the same time. See the first picture showing the **WRONG inclination**. This hotend is inclined too much to the front and there is no gap between the hotend and the extruder body. Hotend is partly inside and you won't be able to remove it.

- The second picture is showing the **CORRECT inclination**. The hotend is tilted, but there is a gap between the hotend and the extruder body. You will be able to remove it.

- Now, let's incline the hotend properly. Take pliers in the second hand, grab the hotend above heatsink's ribs, pull downwards and slightly towards you. The hotend should "jump" out. Make sure you don't stretch the cables too much or you might damage them.

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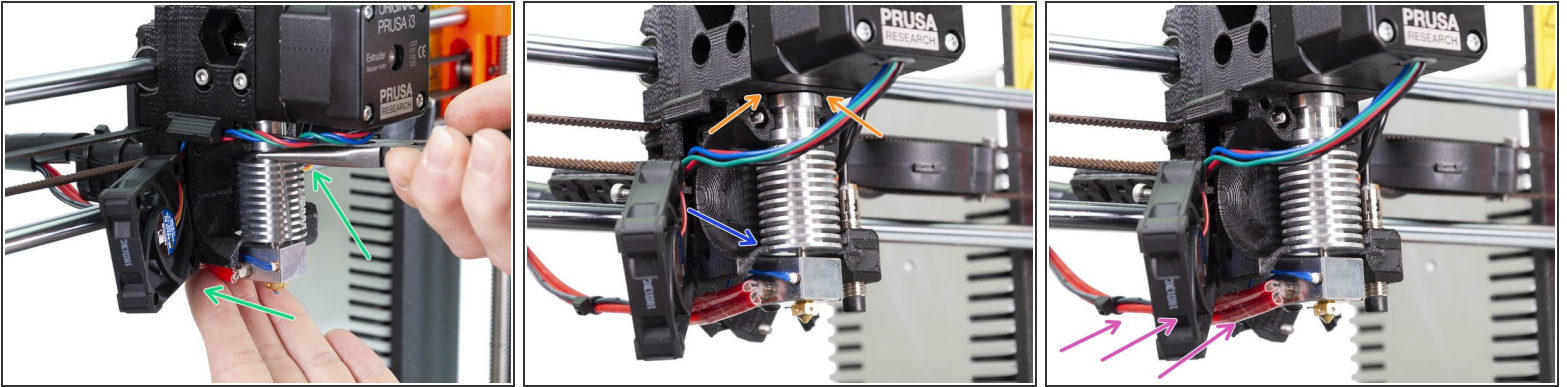
Step 23 — Removing the old PTFE tube
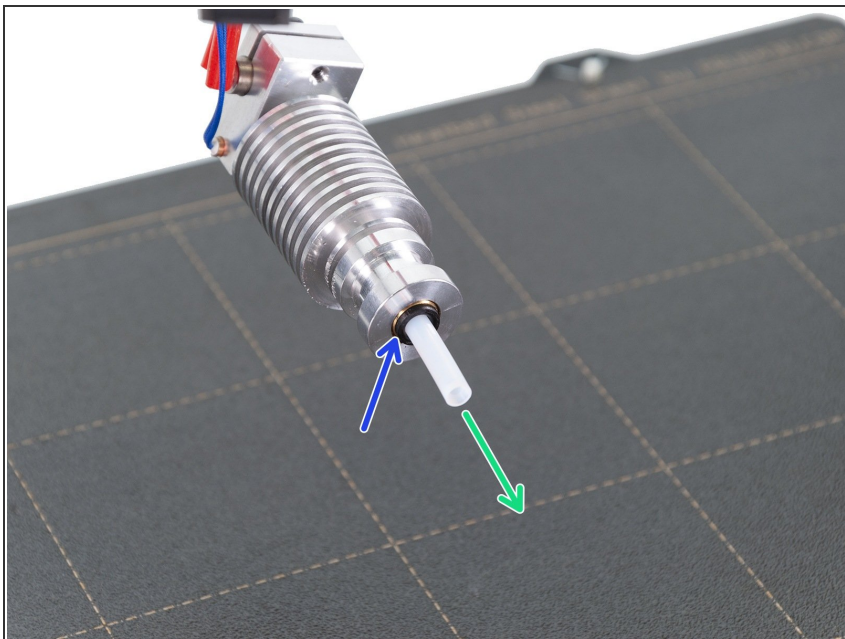
- Press the black plastic collet.

- Remove the PTFE tube from the hotend.

- ⚠️ **Throw this old tube immediately to the nearest trash bin** to avoid installing it back by accident ;)

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Step 24 — Assembling the new PTFE tube
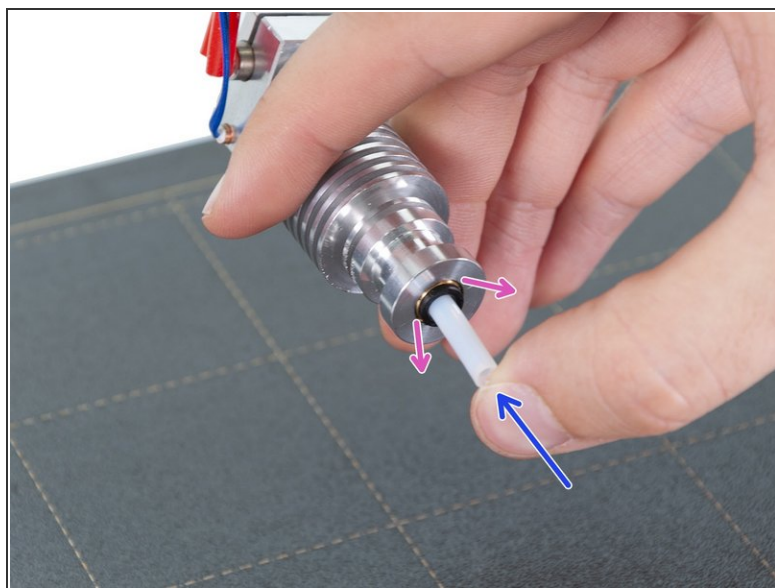
- Now it is time to insert the new PTFE tube. Note there are two different ends.

- One end of the tube has **"rounded" outer edge**. This end must be **inside the hotend**.

- Look at the other end, where the tube is drilled inside, shape of the **edge is "conical"**. This is the side, where filament enters the tube. This part must be **outside the hotend**.

- Push the black collet in. Slide the tube all the way in and hold it!

- Using second hand pull the collet out and only then release the tube!!! **THIS IS CRUCIAL** for the hotend to work properly.

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Step 25 — Extruder reassembly (part 1)

- Carefully slide the hotend back to the extruder-body.

- ⚠ **CHECK THE PROPER ALIGNMENT** of the hotend in the extruder body. **THIS IS CRUCIAL.** Otherwise you won't be able to calibrate the printer later!

- Where to check the alignment:
  - There should be no gap between the extruder-body and the hotend.
  - Last rib on the hotend's heatsink is should be aligned with the printed part. See the photo.

- Make sure the hotend's cables are on the left side. Compare your assembly with the picture

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Step 26 — Extruder reassembly (part 2)
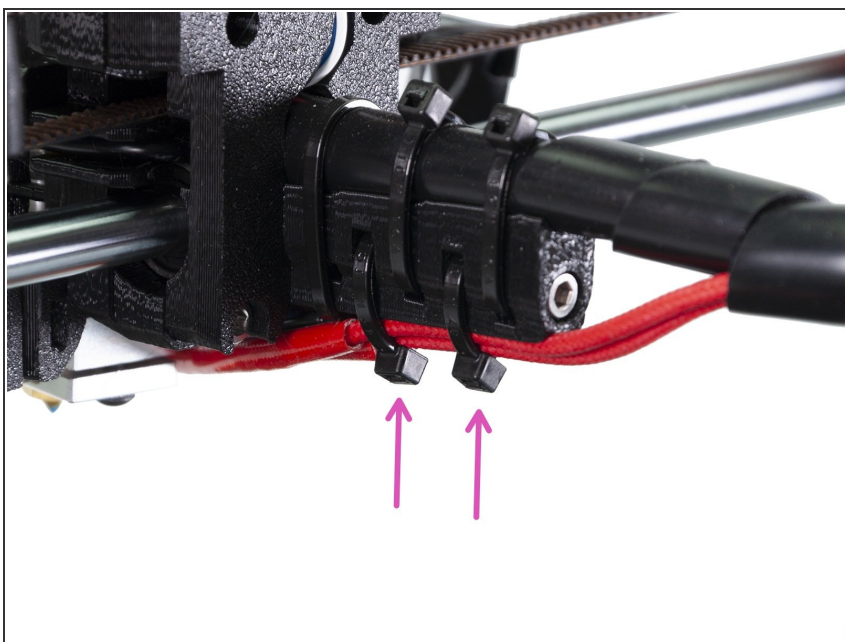
- Insert the zip ties in the slots of the cable-holder.

- **ATTENTION!** Before tightening the zip ties add the cables from the hotend.

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Step 27 — Extruder reassembly (part 3)
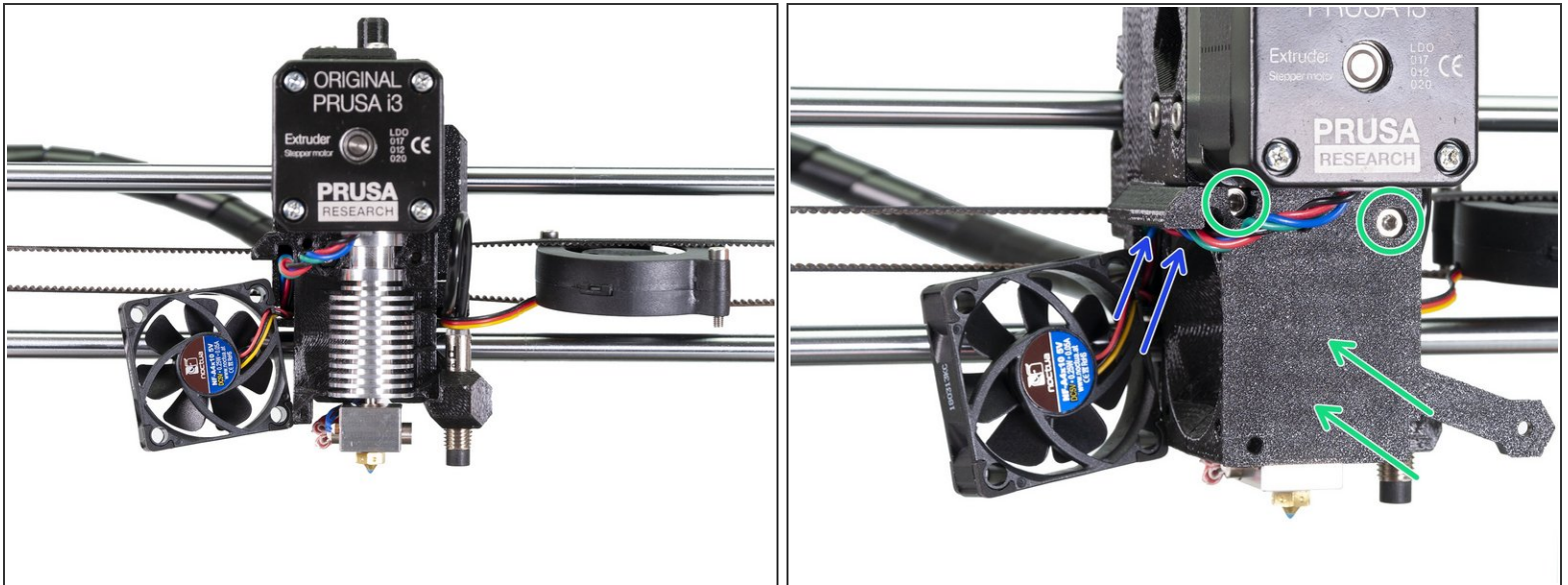
- Move back to the front side of the printer.

⚠ Be careful while assembling the extruder! Make sure you don't pinch any wire (e.g. P.I.N.D.A. cable).

- Assemble back the extruder-cover and tighten both M3x25 screws.

- Guide the motor cable back in the slot.

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Step 28 — Extruder reassembly (part 4)
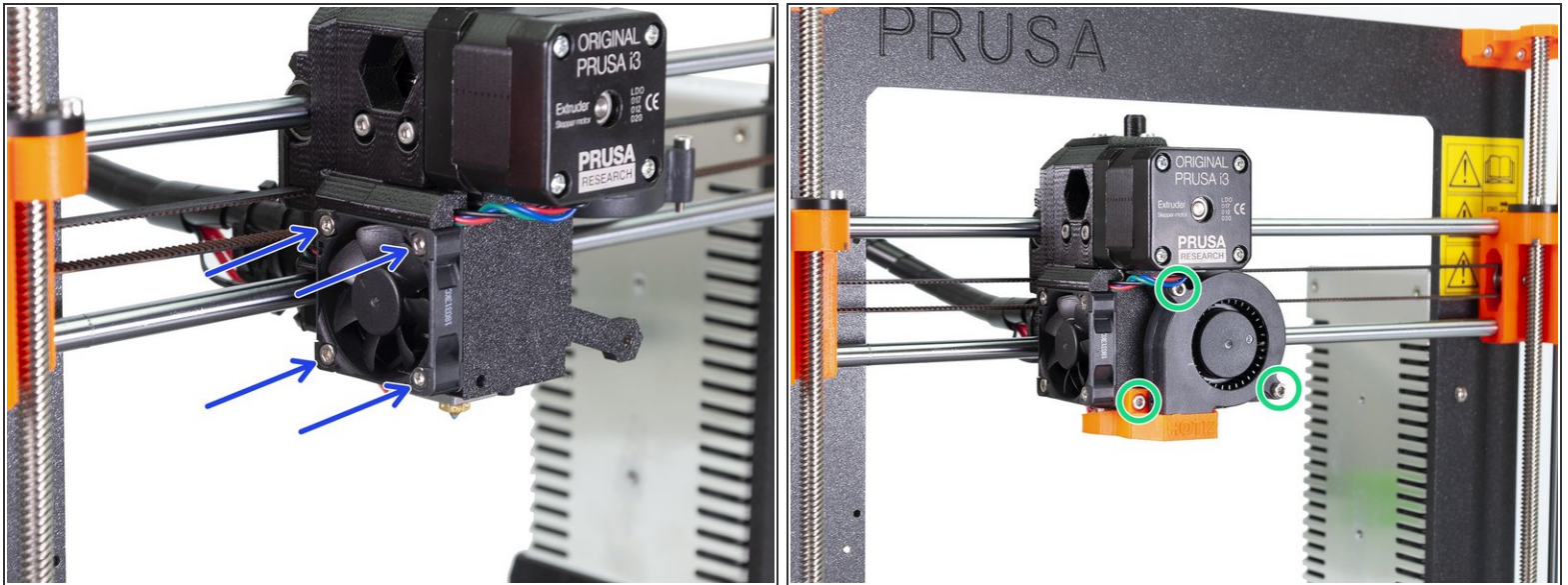
- Move back the Left hotend fan and tighten all four M3x18 screws. Tighten carefully, you can crack the plastic frame of the fan.

- Place back the Front print fan and the fan-nozzle. Tighten all three screws. Proceed carefully, you can crack the plastic frame of the fan.

- Extruder is reassembled! Let's continue with the MMU 2.0 assembly.

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Step 29 — New filament sensor cover preparation
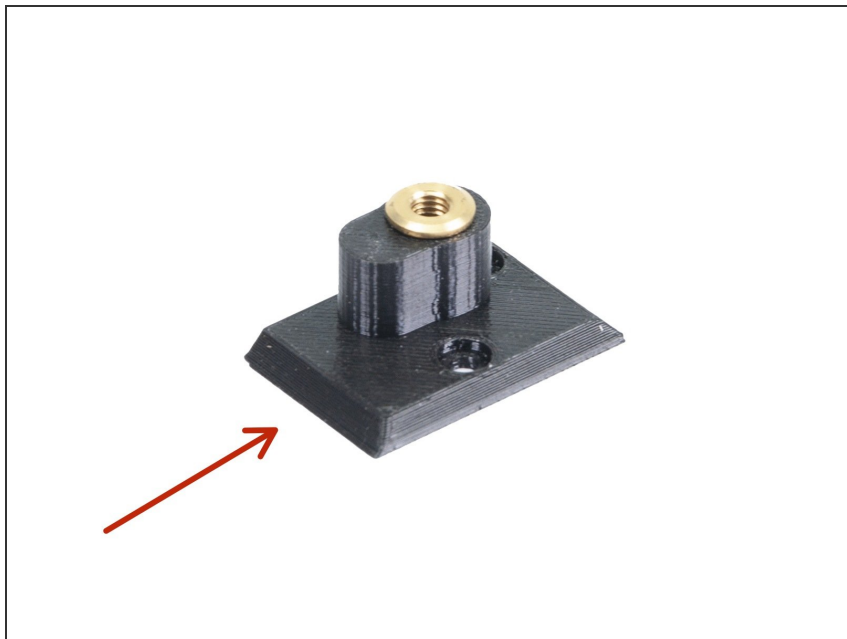
- **For the this step, please prepare:**

- mmu2-filament-sensor-cover (1x)

- PTFE tube 4x13 (1x)

- (i) Use a new PTFE tube (short 13 mm), which is in the MMU2 upgrade kit.

- (i) The new PTFE tube and mmu2-filament-sensor-cover are in the bag nr. 3.

Step 30 — New filament sensor cover assembly
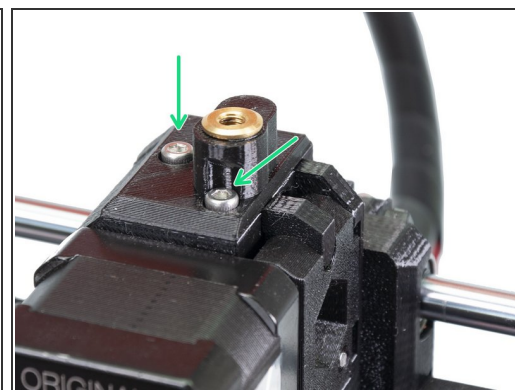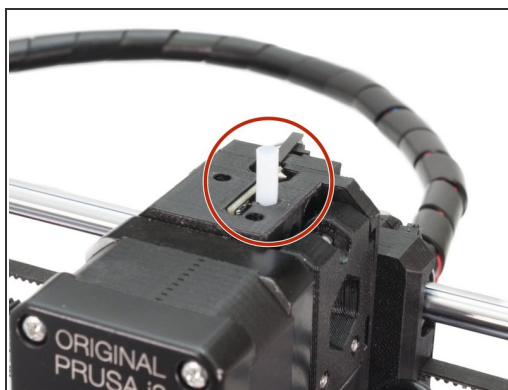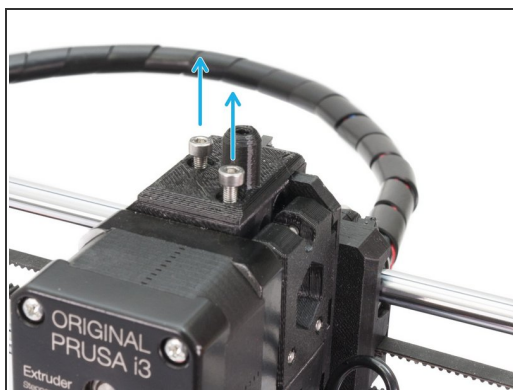
- Release both M3x10 screws and remove the old filament sensor cover.

- Remove the old PTFE tube and replace it with new one. You can insert the tube in the extruder body first or in the filament sensor cover.

- Install the new filament sensor cover and tighten it with the M3x10 screws from the previous cover.

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Step 31 — PTFE tube parts preparation
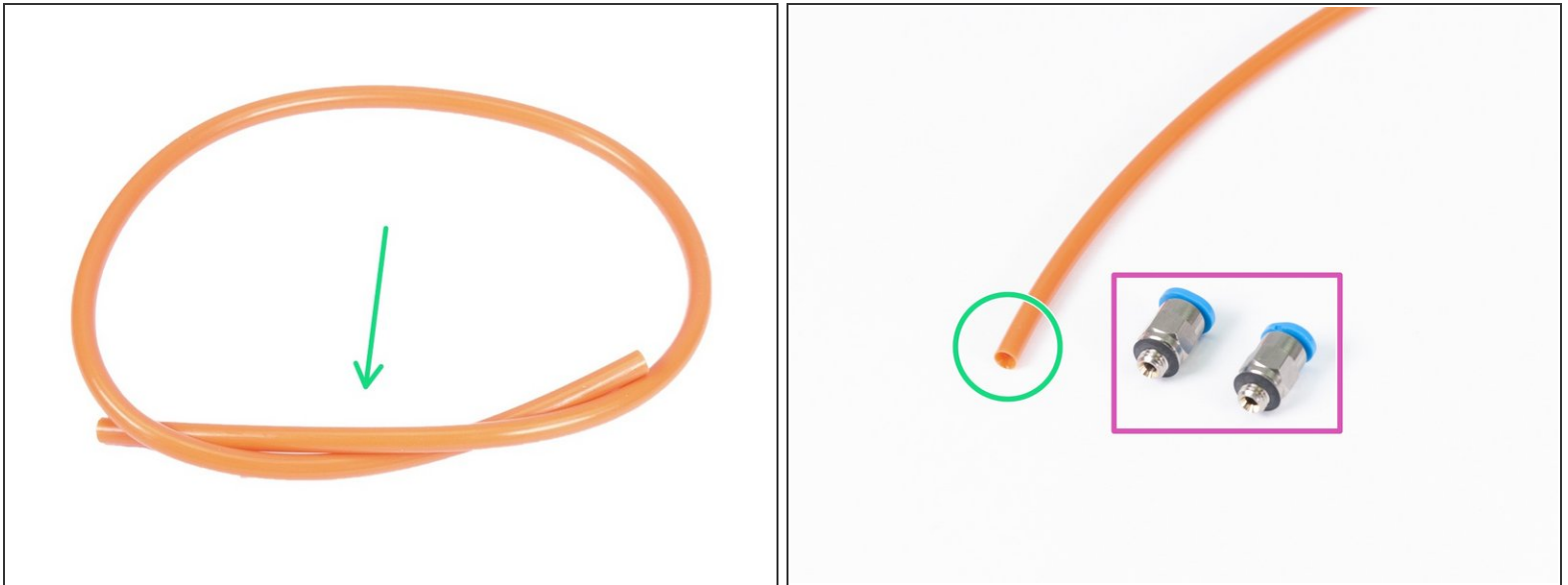
- For the following step, please prepare:

- PTFE tube 4x2x360 (1x)

- Fitting QSM-M5 (2x)

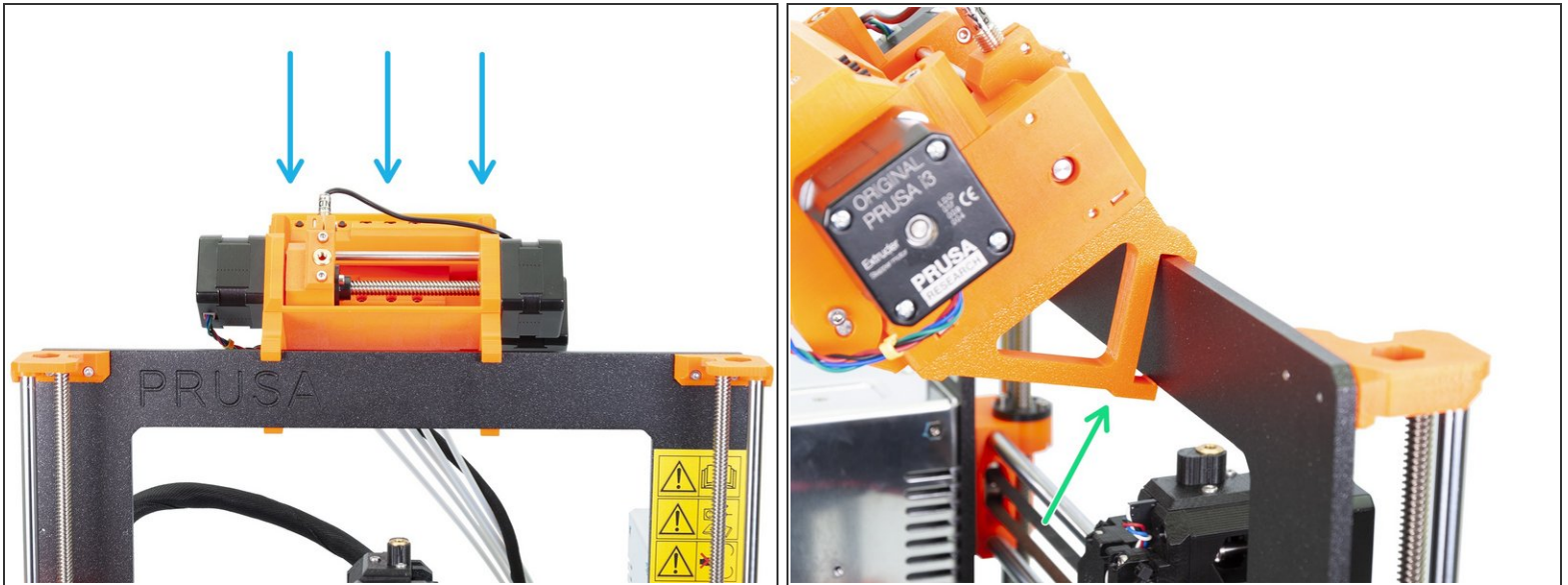- ⓘ Note this tube, can be also white. The dimensions and properties are the same.

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Step 32 — PTFE tube assembly
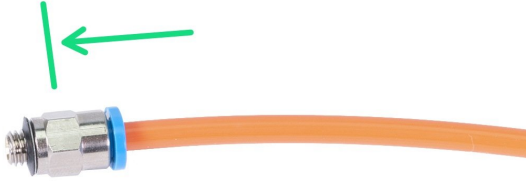
- Take one QSM-M5 fitting and slide the PTFE tube inside. You should feel the tube snapped in.

- Repeat this procedure on the other end.

- ⓘ As an alternative, you can first screw the fittings in the printer and then slide the tube in.

Step 33 — Assembling the MMU2 unit (part 1)
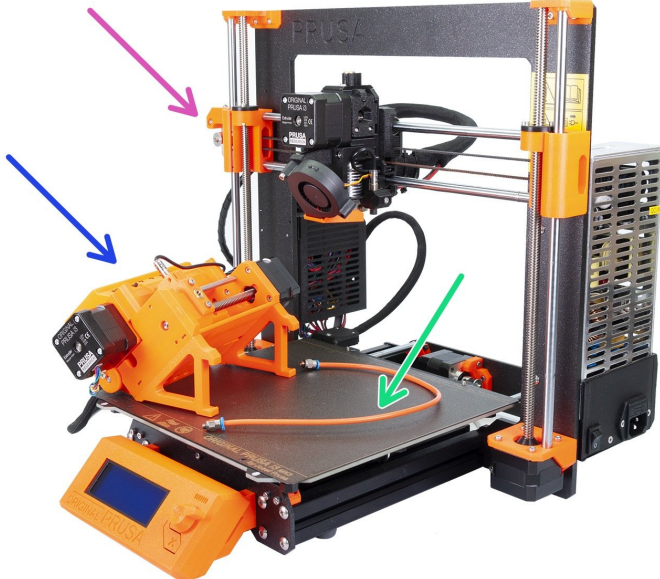
- **For the following steps, please prepare:**

- Original Prusa i3 MK3 printer

- MMU2 unit

- PTFE tube

- 8mm wrench

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Step 34 — Assembling the MMU2 unit (part 2)

ⓘ The MMU2 unit should be placed in the middle on the top part of the aluminium frame (next to the Prusa logo).

● Place the unit on the frame, do not try to fix it for now.

● Look from behind the printer, there are "clamps" on the MMU2 unit, which must be snapped (locked) to the frame. **Don't do it now**, wait for the next step!
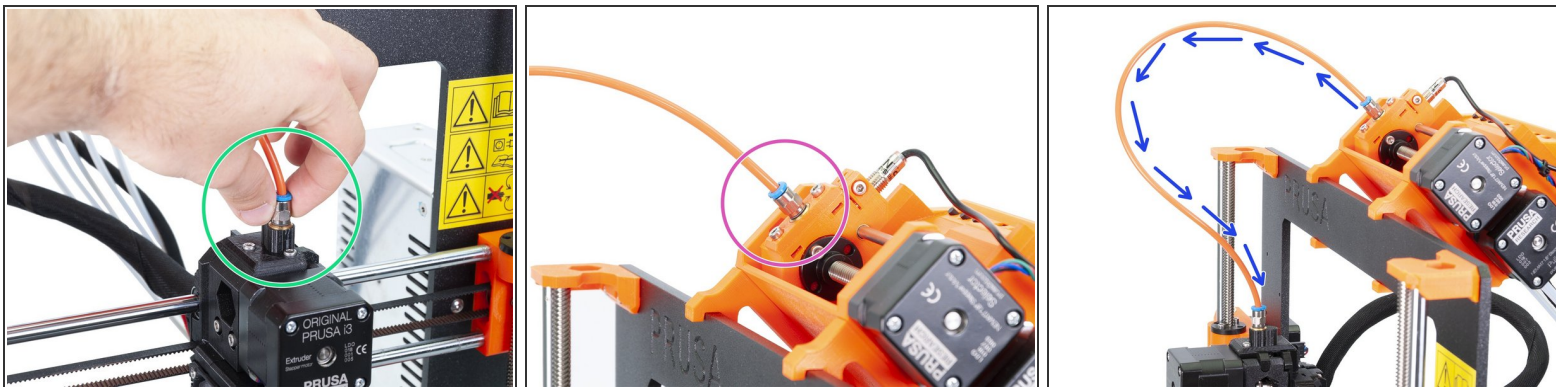
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Step 35 — Assembling the MMU2 unit (part 3)
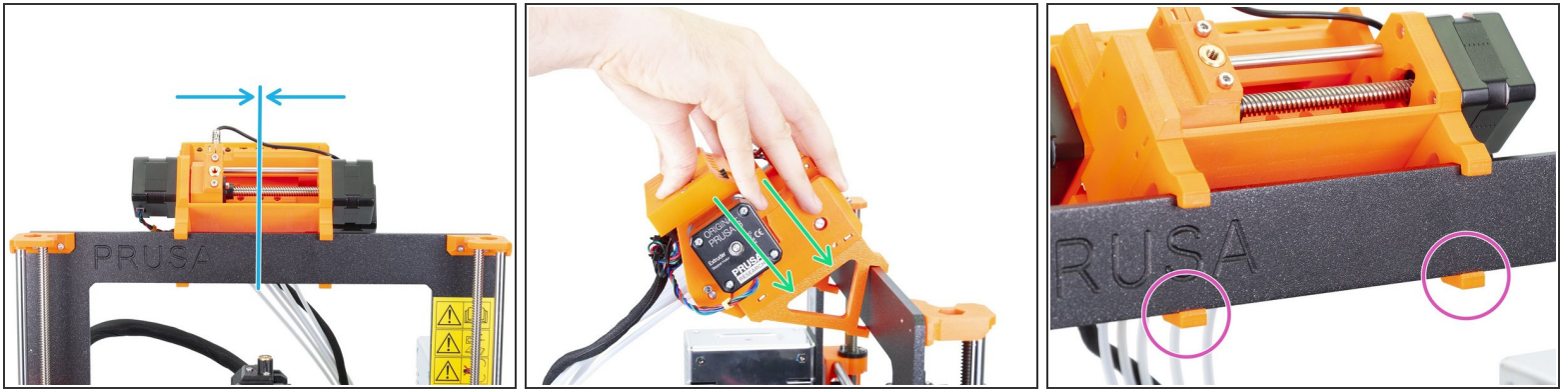
- Make sure once more the unit is in the middle of the frame, once we engage the clamps, **you won't be able to move it!**

- Using both hands, apply equal pressure along the top part of the MMU2 unit. Press downwards and slightly towards the frame. Press until the clamps lock to the frame.

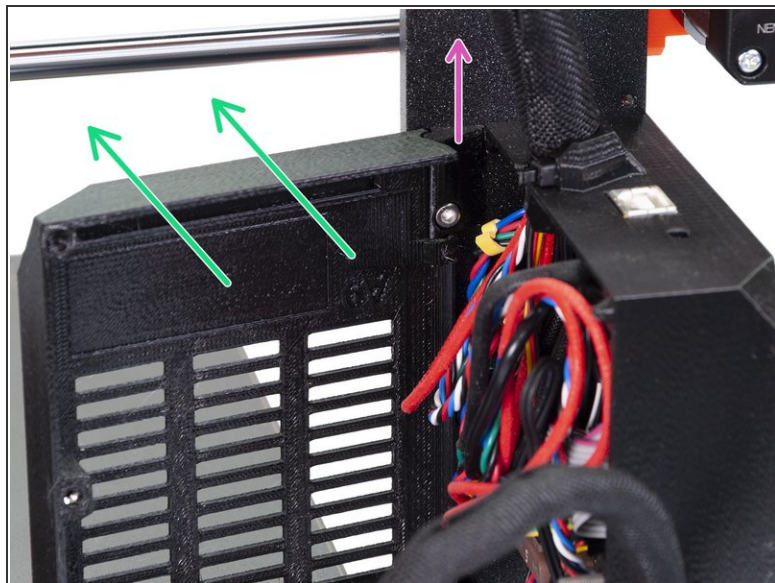- Check on the front side of the frame, both clamps of the holder are fully engaged.

- ⓘ That's it for the MMU2 unit ;)

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Step 36 — Connecting the extruder and MMU unit

- Take the PTFE tube you prepared earlier and connect it to the extruder. Both ends of the tube are the same. Use fingers to tighten the thread.

- Take the second end of the tube and connect it to the MMU unit. Tighten the fitting using fingers.

- Check both fittings on the tube are perpendicular to the surface of the extruder and the MMU unit. Make sure the tube is not distorted or twisted.

- Tighten both fittings using the 8mm side of the wrench, be very careful when tightening, don't use an excessive force!

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Step 37 — Connecting the electronics (part 1)

- Using 2.5 Allen key release the M3x40 screw and open the RAMBo-door.

- Open the door, release the M3x10 screw and remove the upper hinge.

- Remove the door.

- (i) Note your heated cable wrap can be textile or a spiral wrap. It doesn't affect this build.

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Step 38 — Connecting the electronics MK3 (part 2)
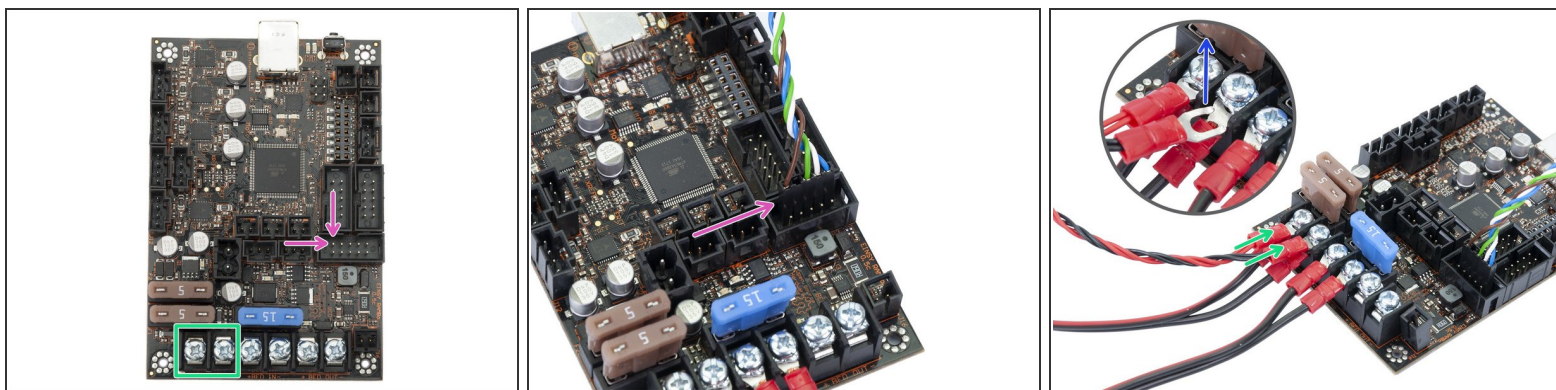
⚠ Connecting MMU2 unit to the printer differs depending on the printer you have. **For the MK3, please use this step.** For the MK2.5 please skip to the next.

● Signal cable (upper row of the pins, brown wire in the connector facing left)

⚠ **Make sure the signal cable is connected to all pins!** You can use the filament sensor connector to verify the alignment.

● Power cable (add it to the first two clamps from the left, leave the PSU cables connected). **Red wire is positive** and in the first slot, **black wire is negative** and in the second.

● The power cable connector "fork" has bended ends, make sure they point up, see the picture.

⚠ Make sure the power cables are tightened firmly!

ⓘ Use the Philips screw-driver to release the screws on the EINSY.

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Step 39 — Connecting the electronics MK2.5 (part 3)
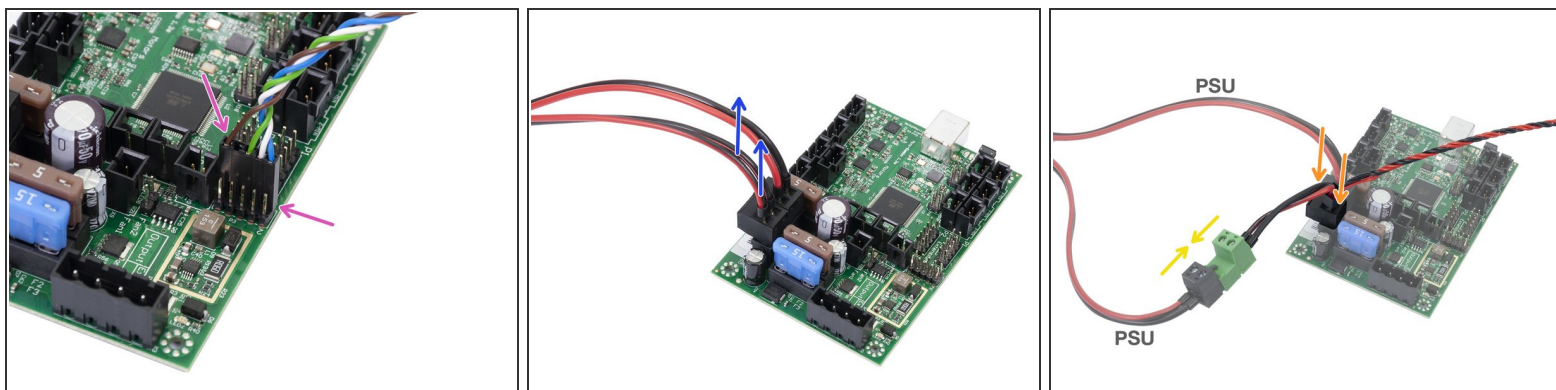
⚠️ **This step is for the MK2.5 owners**, in case you have MK3, please skip to the next.

● Signal cable (upper row of the pins, brown wire in the connector facing left)

⚠️ **Make sure the signal cable is connected to all pins!** You can use the filament sensor connector to verify the alignment.

● Follow the cables from the PSU and unplug one connector from the RAMBo board (both are the same).

● Connect the PSU cable to the power cable from the MMU2 unit. See the picture and ensure the connector is all the way in.

● Plug the power cable from the MMU2 unit to the board, where the PSU cable was plugged previously.

● Make sure the power cables are connected firmly!

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Step 40 — Connecting the electronics (part 4)

⚠ **WARNING:** we need to cut part of the plastic. Make sure you wear protective eyewear!

- Using pliers carefully cut the corner of the door. We need to create a space for the MMU unit cable bundle.

- Comparison between the trimmed door (left) and the original shape (right).

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Step 41 — Connecting the electronics (part 5)
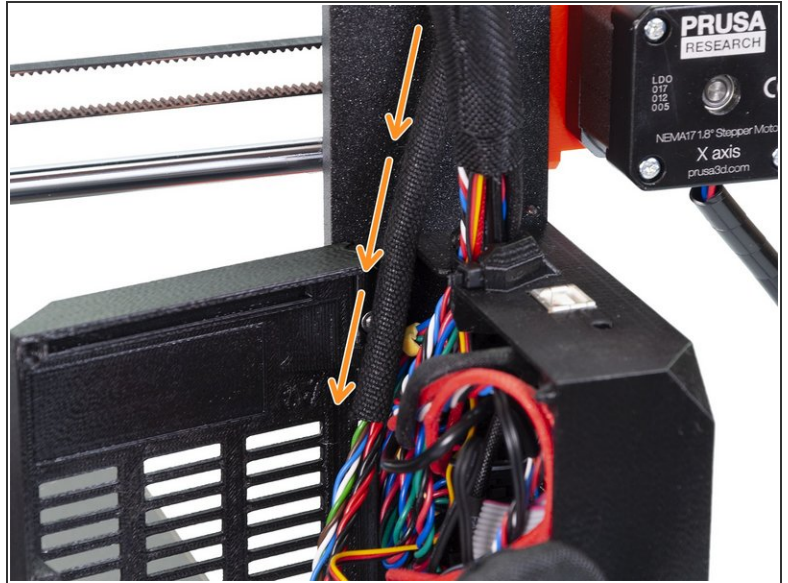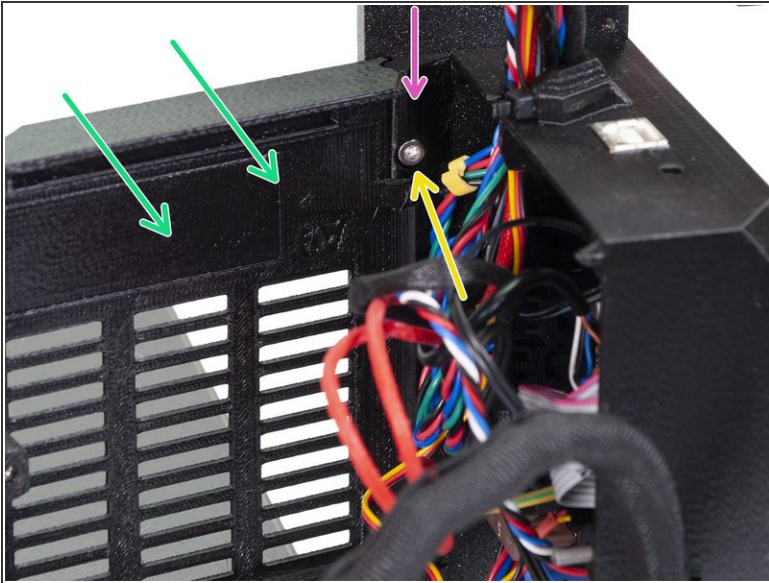
- Place the door back.

- Insert back the hinge.

- Tighten the M3x10 screw.

- Insert the cable bundle from the MMU unit.

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Step 42 — Connecting the electronics (part 6)
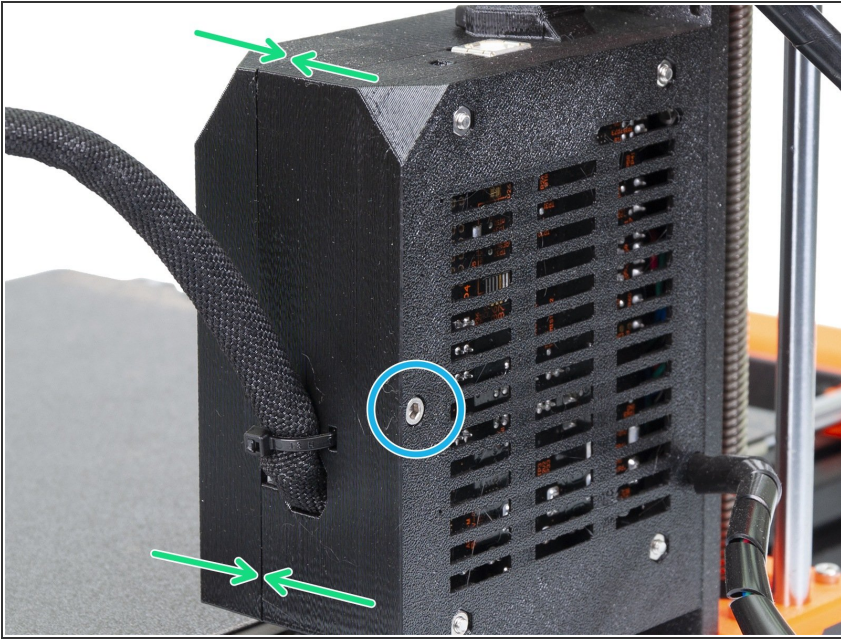
- Close the door and make sure no wire is pinched.

- Tighten the M3x40 screw.

Step 43 — It's Haribo time!
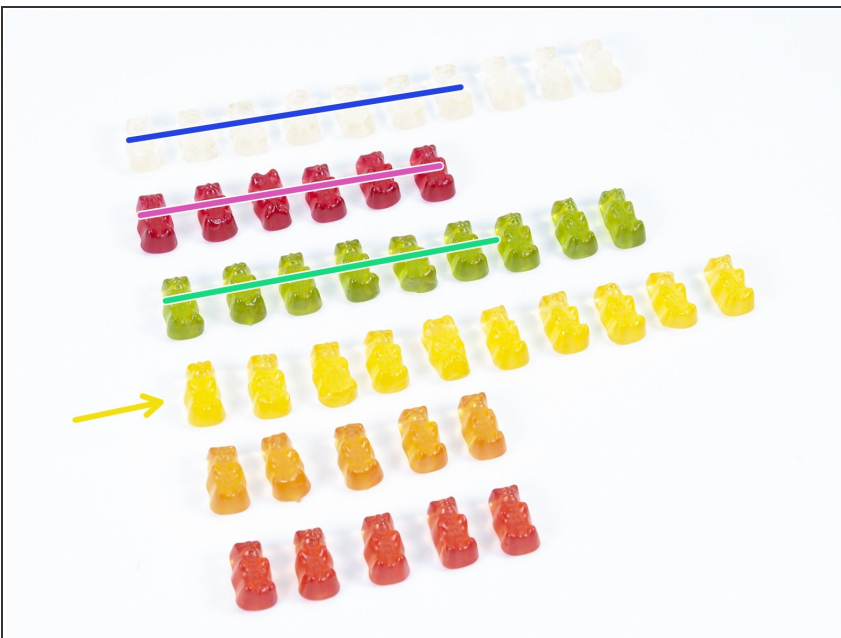
- Your sweets are well deserved, this was a tough part!

- Electronics assembly is the last chapter with high level of difficulty, consume 25 %.

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Step 44 — Final check!
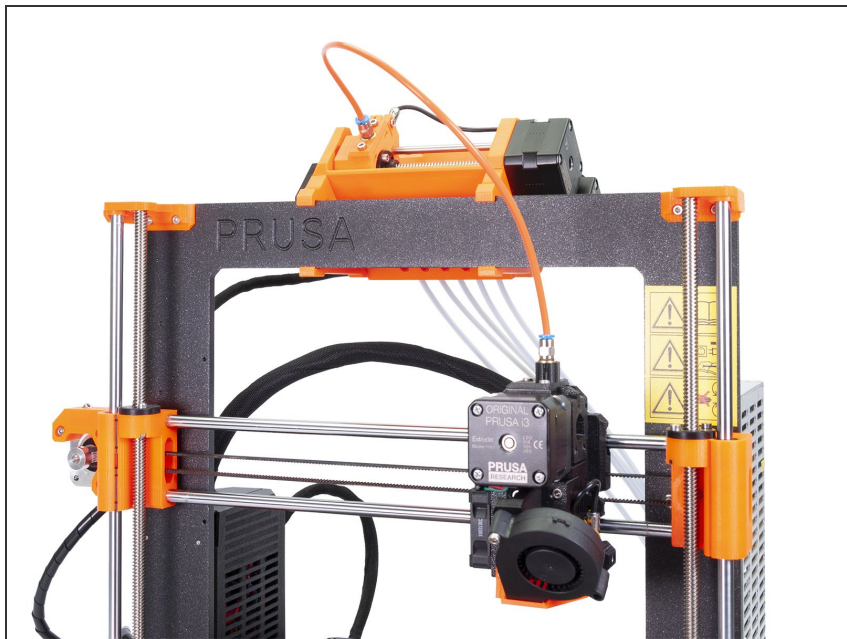
- Congrats, you've made through the toughest part of the build!

- Check the final look of the printer.

- Last assembly is in front of us! [4. Spool holder assembly](#)

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6. Spool holder assembly

Written By: Jakub Dolezal
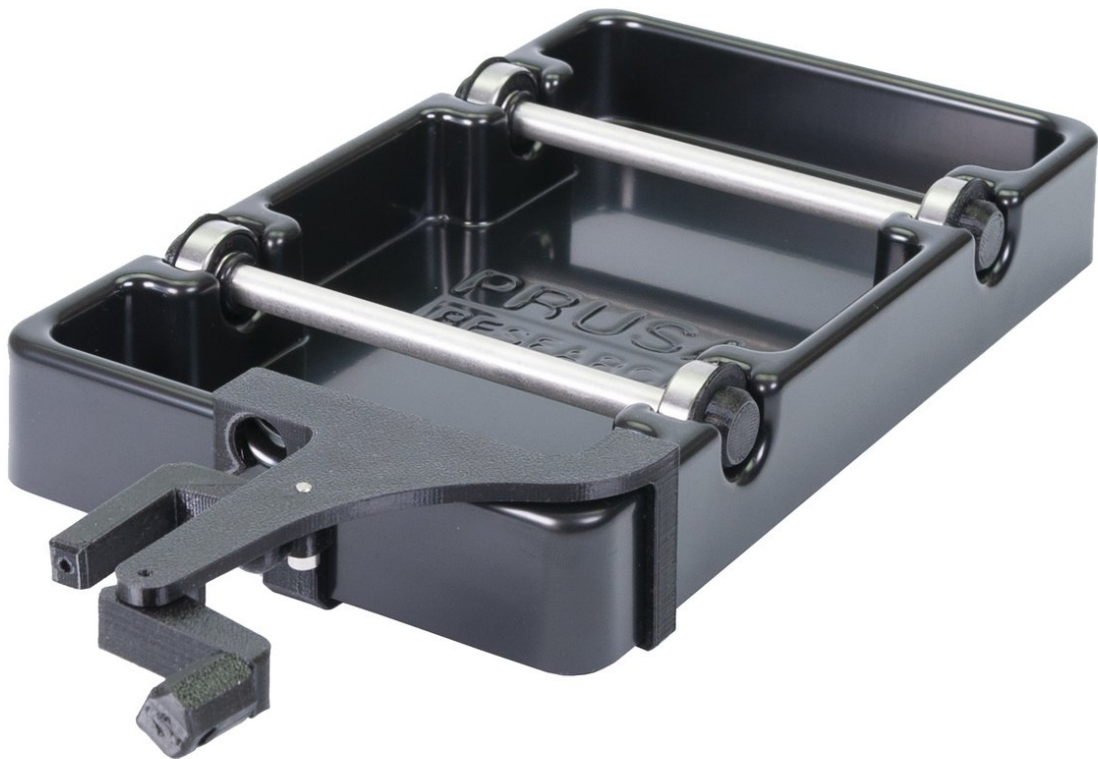
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Step 1 — Tools necessary for this chapter

- **Please prepare tools for this chapter:**
  - 2.5mm Allen key for M3 screws

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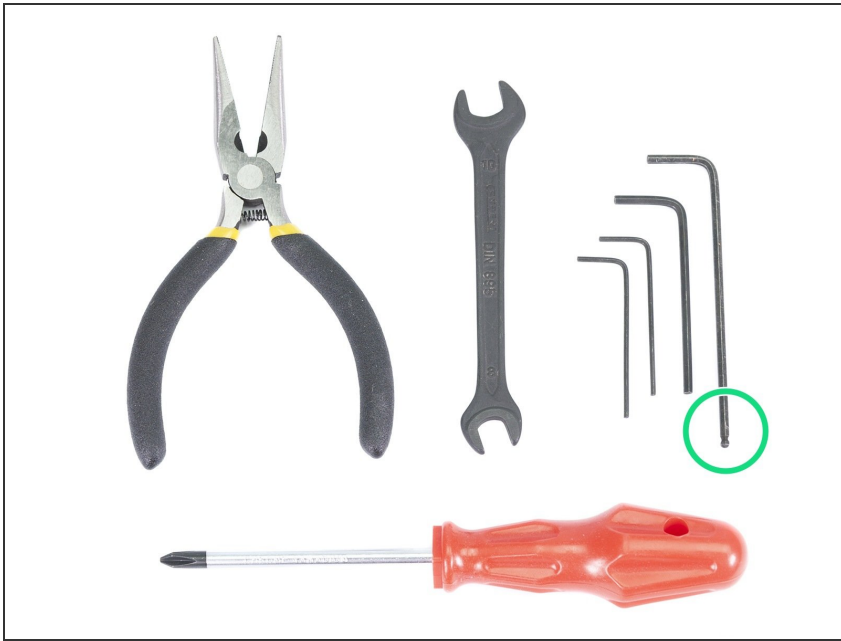
Step 2 — Cleaning the spool holder base (optional)

⚠️ This guide is describing an assembly of a single spool holder. Your package should include 5, simply repeat all the steps again until you finish all spool holders.

- Take the black plastic spool holder base and turn it upside down.

- Using cloth + detergent or IPA clean all four corners from dust and grease.

- Let the surface fully dry and proceed to the next step.

Step 3 — Sticking foam pads
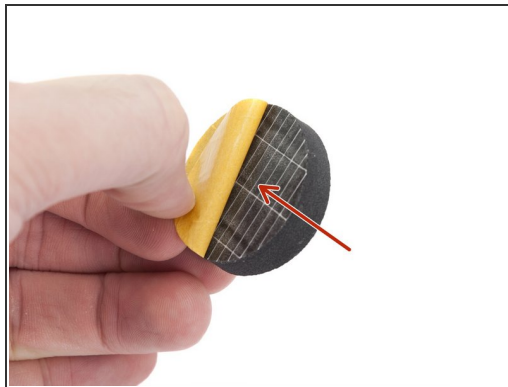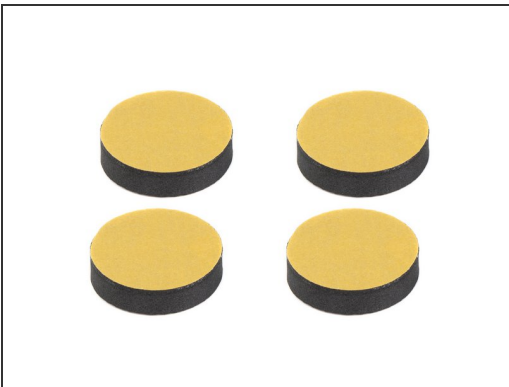
- For each spool holder base prepare 4 foam pads.

- Peel off the yellow foil completely.

- Stick the foam pad on the bottom of the spool holder base and hold it for a while. **DON'T** use too much force, you might deform the plastic shell.

- ⓘ The foam pads are important to increase contact between the spool holder base and the surface underneath and reduce the spool holder from moving.

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Step 4 — Assembling the spool shafts (part 1)
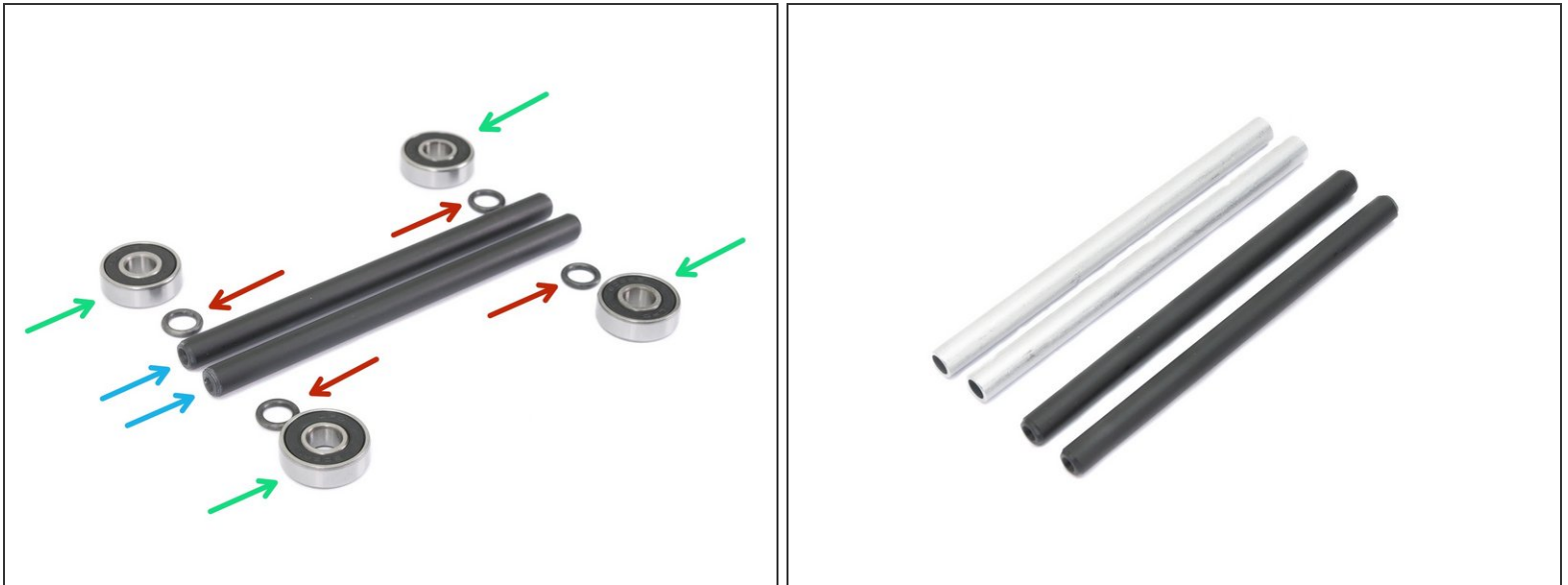
⚠️ **Rubber seals are no longer needed** due to the design improvements. In case you don't have them in your kit, please ignore the instructions to assemble them.

- Let's assemble the shafts holding the spools, you will need:

- Bearings (4x)

- Rubber seal (4x)

- Shaft (2x)

ⓘ Shafts can be black or silver, the dimensions are the same.

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Step 5 — Assembling the spool shafts (part 2)
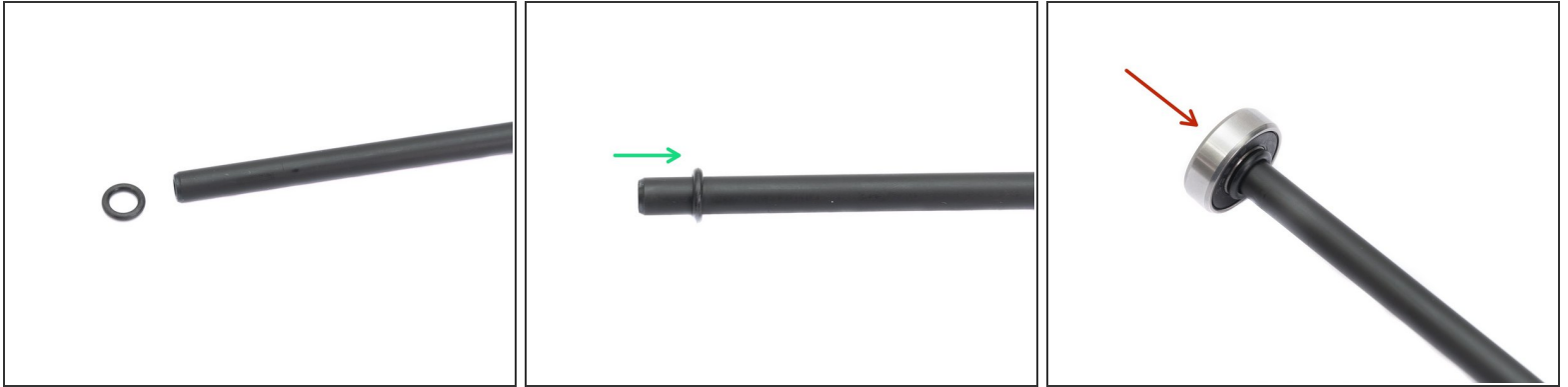
⚠️ **Rubber seals are no longer needed** due to the design improvements. In case you don't have them in your kit, please ignore the instructions to assemble them.

● Prepare two rubber seals and a shaft.

● Push the rubber seal on the shaft from both ends. The distance between shaft's end and rubber seal should be around 5 mm.

● Take two bearings and press it on the shaft from both ends. Ensure the rubber seal is right behind the bearing.

ⓘ Repeat these steps for the second shaft.

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Step 6 — Assembling the spool shafts (part 3)
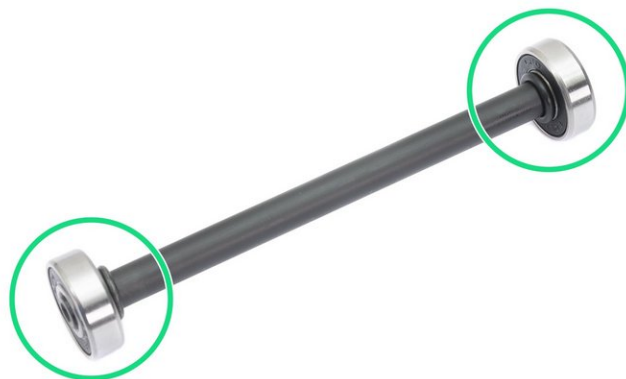
- Align the bearing with the end of the shaft.

- Correctly assembled shaft with bearings. Ensure both bearings are in a contact with rubber seal.

Step 7 — Assembling the filament guide (part 1)
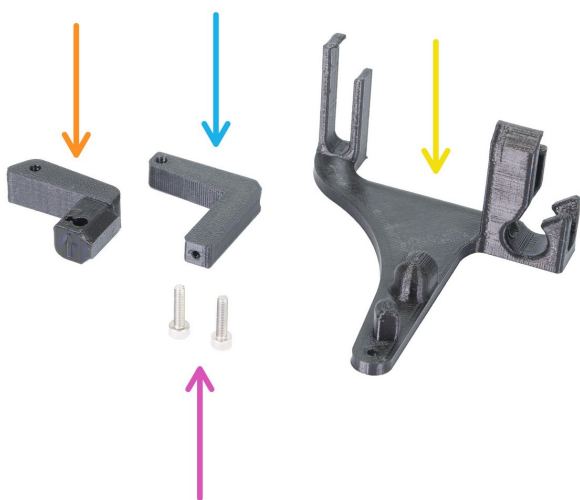
- For the following steps, please prepare:

- mmu2-s-holder-base (1x)

- mmu2-s-holder-lever-a (1x)

- mmu2-s-holder-lever-b (1x)

- M3x12 screw (2x)

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Step 8 — Assembling the filament guide (part 2)
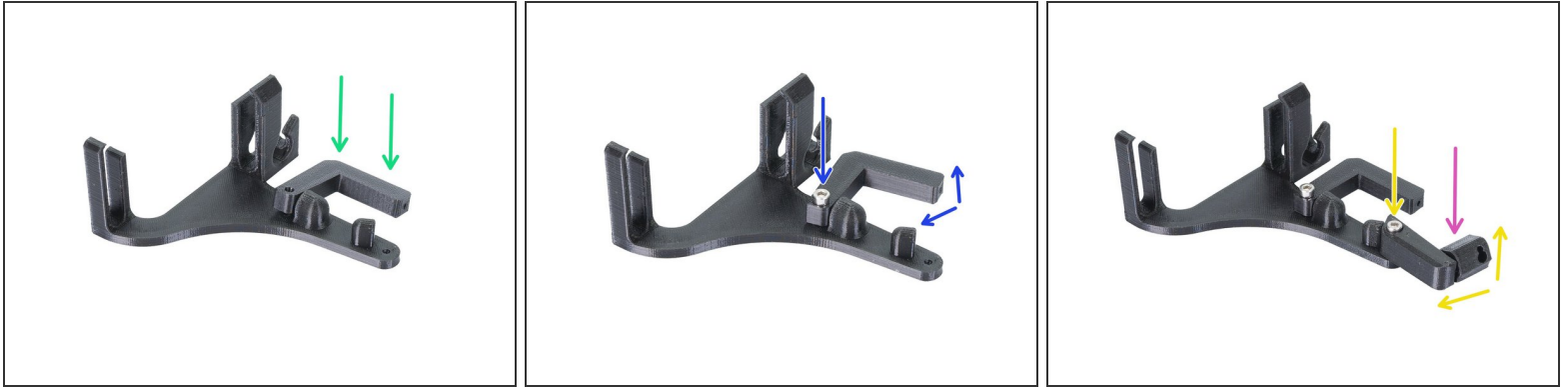
- Take the s-holder-lever-a and place it on the s-holder-base.

- Secure the lever-a using a M3x12 screw. Tighten it firmly, but the part must be able to rotate.

- Take the s-holder-lever-b and place it on the s-holder-base.

- Secure the lever-b using a M3x12 screw. Tighten it firmly, but the part must be able to rotate.

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Step 9 — Assembling the spool holder (part 1)
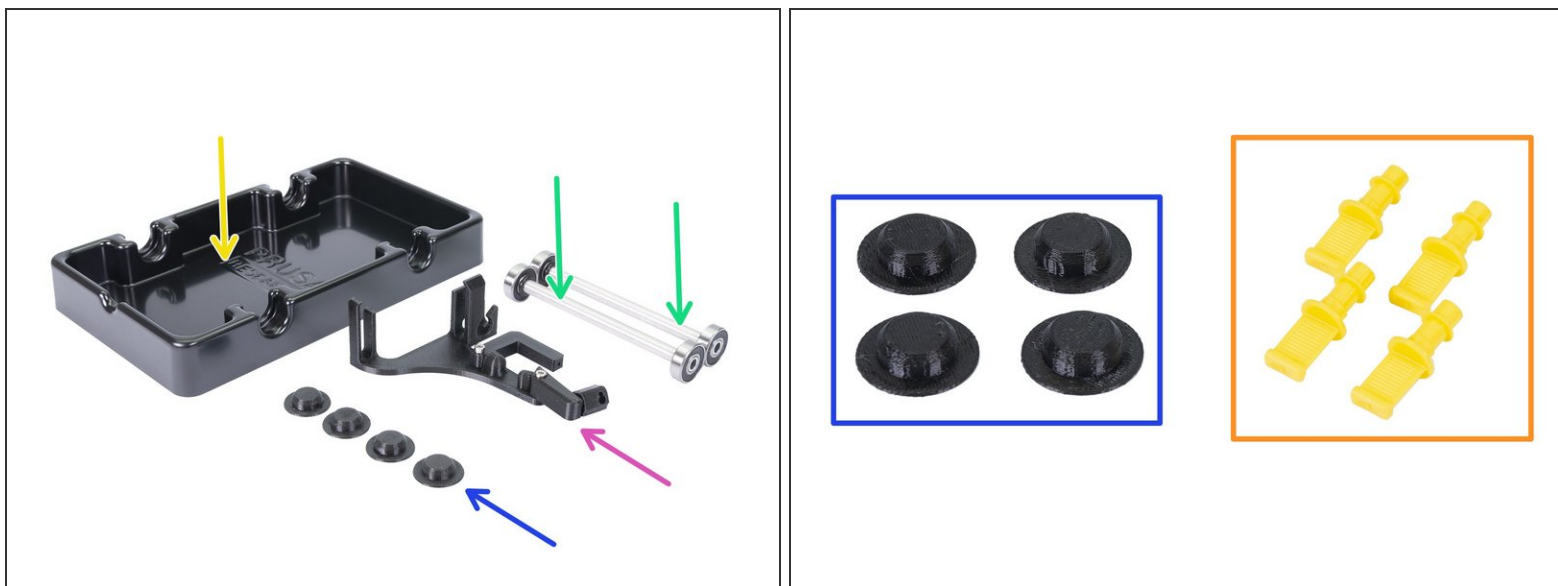
- For the following steps, please prepare:

- spool holder base (1x)

- shaft with bearings (2x)

- filament guide (1x)

- mmu2-s-holder-endstop-v1 (4x)

- mmu2-s-holder-endstop-v2 (4x)

ⓘ Note there are two versions of the endstops. Package always includes only v1 or v2, where v2 is the newest design.

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Step 10 — Assembling the spool holder (part 2)

- Rotate the base with the cutout part towards you.

- Insert the shafts into the spool holder base. Make sure all four bearings are seated properly.

- Depending on your version of the endstops use second or third picture. Insert the endstops in all four sockets. Push them all the way in, but make sure you won't deform the spool holder base.

- Make sure the shafts can rotate freely.

Step 11 — Assembling the spool holder (part 3)
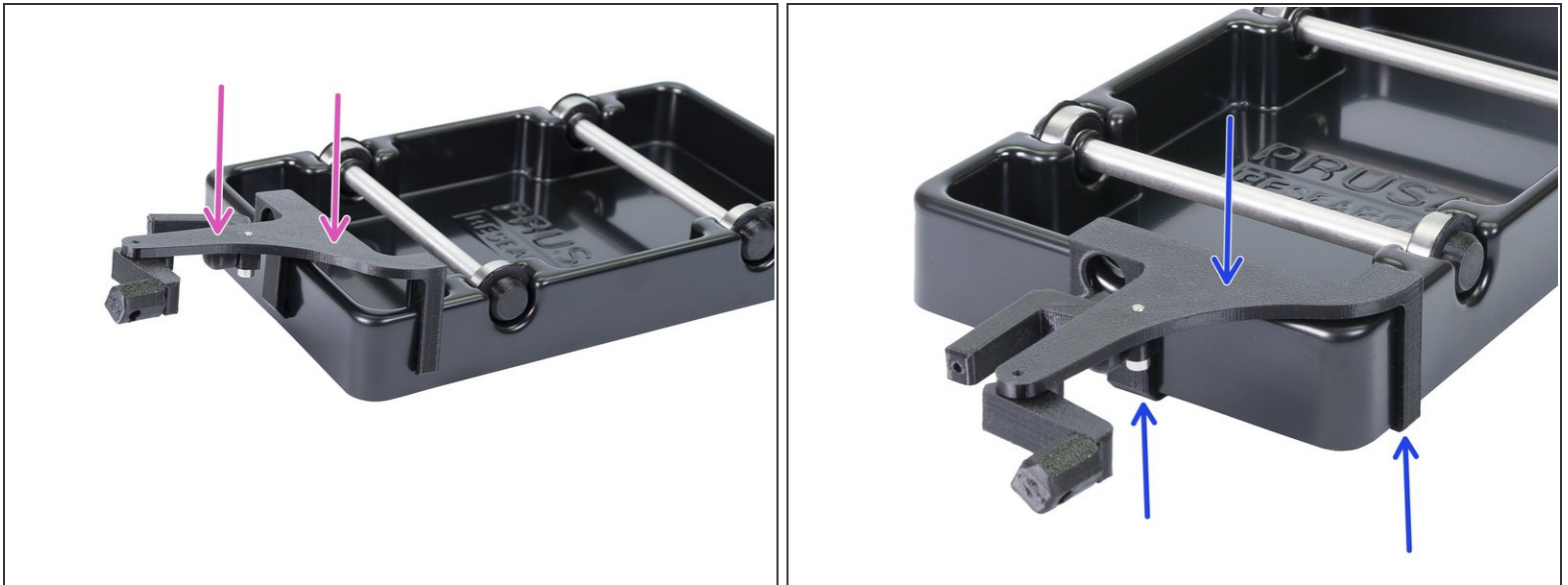
- Place the filament guide on the top of the base and align it above the cutout part.

- Push the filament guide down. It should snap on the spool holder base.

- (i) This is the end of the assembly, in case you have more spool holders, please repeat the entire chapter.

Step 12 — It's Haribo time!
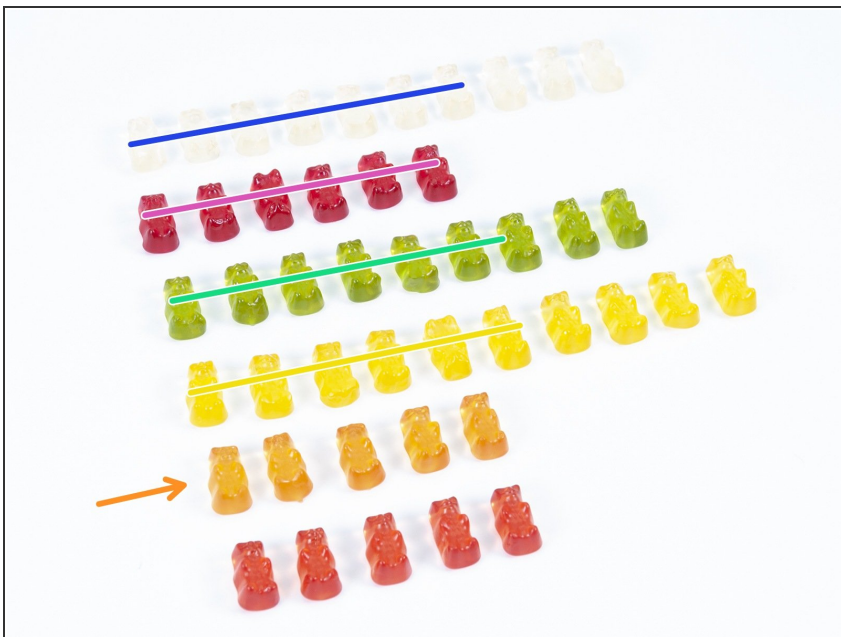
- That was easy, right?

- Spool holders are easy to make, research shows that 10 % is enough.

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Step 13 — Final check

- Did you assemble all five spool holders?

- Do they look like those in the photo?

(i) There will be 5 screws (M3x10) remaining, keep them for the next chapter ;)

- Now, just a [5. Preflight check](#) and the MMU 2.0 is ready!

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7. Preflight check

Written By: Jakub Dolezal

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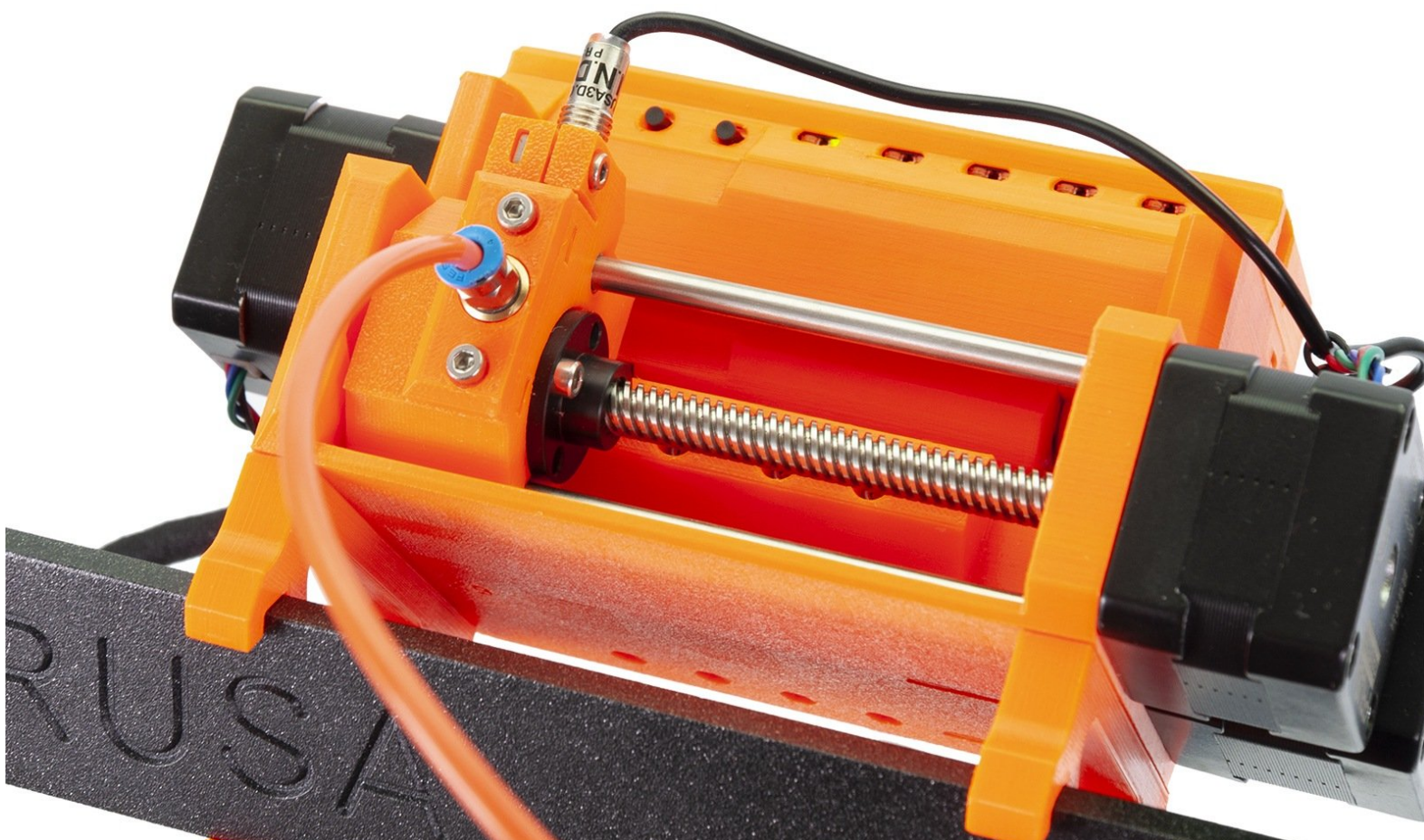
Step 1 — P.I.N.D.A. adjustment (part 1)
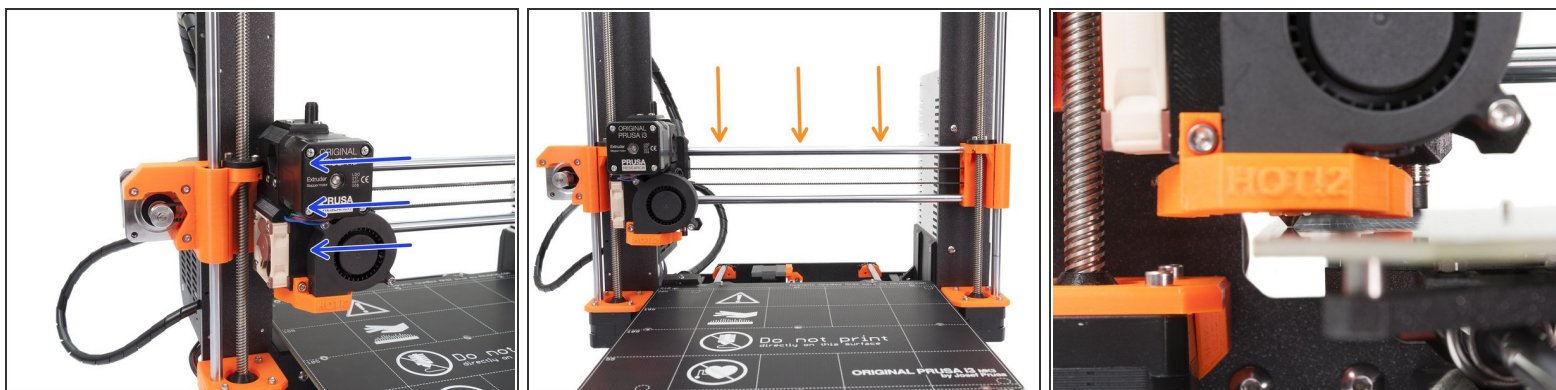
⚠️ Ensure the printer is turned off and not plugged in.

ⓘ Note your extruder is slightly different, but the principle of setting the height is the same.

⚠️ **Don't place the steel sheet on the heatbed** during the entire P.I.N.D.A. probe adjustment process. Wait for the Z calibration.

ⓘ While moving with the extruder, the X-axis motor works as a generator. You will create a small amount of electricity and the LCD might flicker. Move with the extruder reasonably slowly and in the future always use the printer's controls.

● Move the extruder manually all the way to the left.

● By rotating BOTH threaded rods at the same time on the Z-axis move the nozzle until you reach the heatbed. Try rotating both the rods equally!

⚠️ Check again from a different angle the nozzle is touching slightly the heatbed. Don't bend the heatbed!

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Step 2 — P.I.N.D.A. adjustment (part 2)
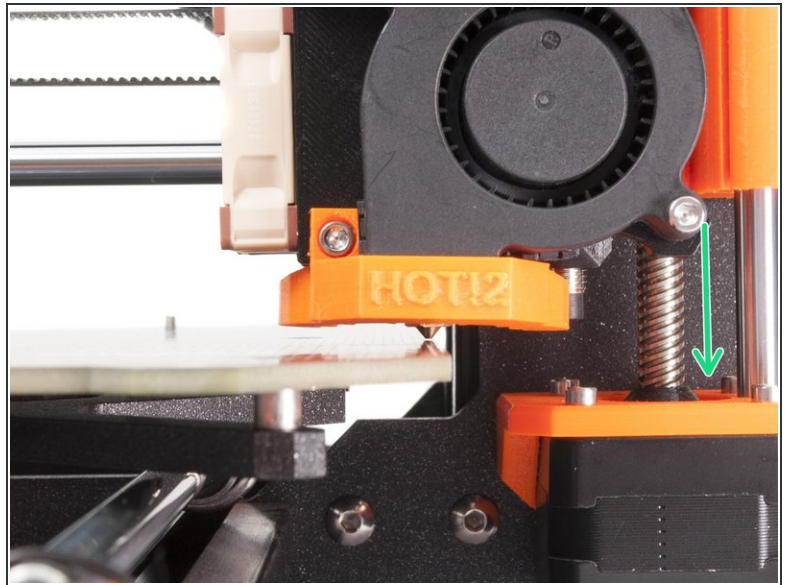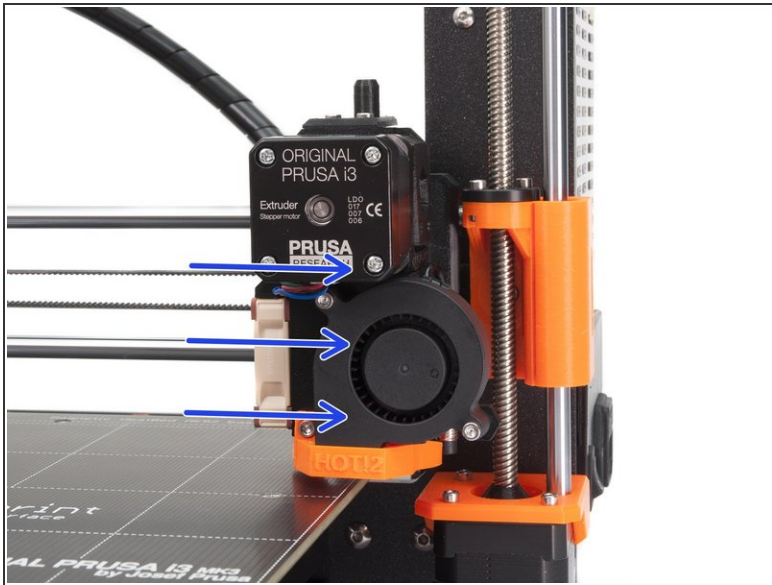
- Move the extruder carefully all the way to the right.

⚠ Make sure that the nozzle is not scratching the surface during the movement! If it does, rise the right side of the X-axis by rotating the right Z motor slightly clockwise.

- If an adjustment is needed, you can lower the nozzle height by rotating the right Z motor counter-clockwise.

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Step 3 — P.I.N.D.A. adjustment (part 3)
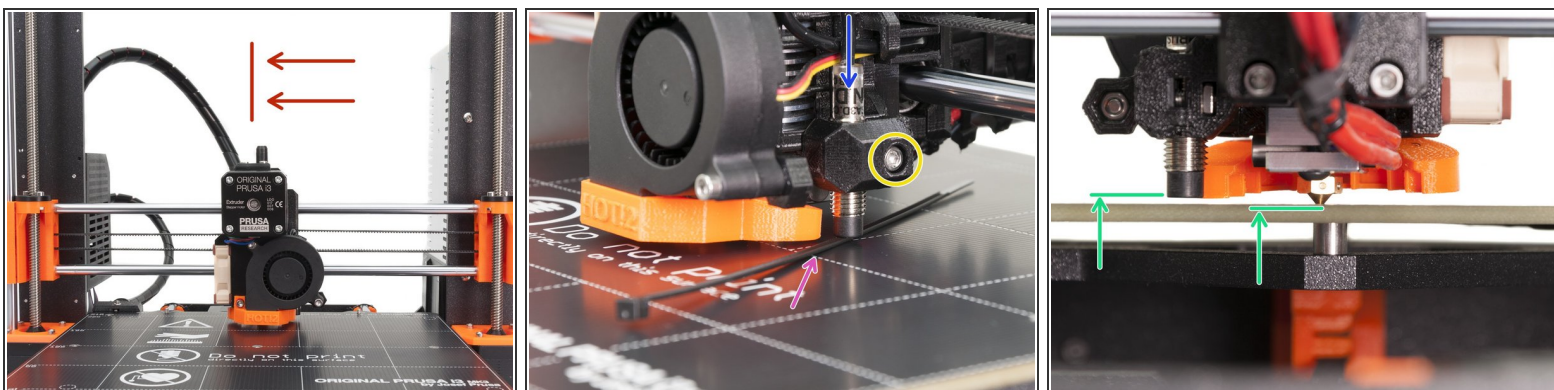
- Move the extruder to the centre of the X-axis.

- Take a zip tie from the package and place it under the P.I.N.D.A. sensor. Use the middle part of the zip tie, not the tip.

- Release the screw holding the P.I.N.D.A. sensor and gently press it against the zip tie.

- Tighten the screw on the P.I.N.D.A. holder again.

- ⚠ !!! **DO NOT use glue to fix P.I.N.D.A. probe** in the new type of holder with the M3 screw, you won't be able to release it again !!!

- A correct height of the P.I.N.D.A. sensor compared to the nozzle should be similar to the last picture.

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Step 4 — Two types of the MMU firmware
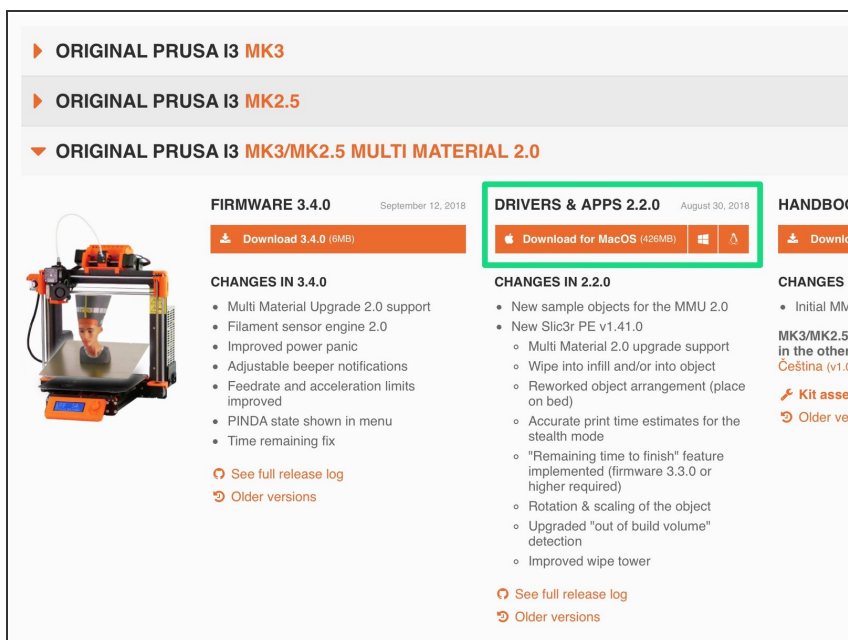
⚠️ **IMPORTANT!!!** There are **two types** of the **firmware for the MMU2**. Make sure you can distinguish between them.

ⓘ Slic3r PE won't let you accidentally flash incorrect firmware to each board.

● **EINSy/RAMBo firmware:** This firmware is flashed to the board, which is inside the black RAMBo box near the heatbed. Use **USB type B cable**. (e.g. FW_MK3-EINSy10a.hex or FW_MK25-RAMBo13a_cz.hex)

● **MMU2 board firmware:** This firmware is flashed to the new board, which is inside MMU2 unit on the top of the frame. Use **Micro-USB cable**. (e.g. prusa3d_fw_MMU2board_1_0_1.hex)

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Step 5 — Download the necessary software

- **Firmware updater is now part of the Slic3r PE**, starting version **1.41.0**. In case you have it already installed, you can skip to the next step.

- Go to prusa3d.com/drivers and select the MMU 2.0 printer.

- Find the driver section and download the latest package. Leave this page opened for the next step!

- Install drivers on your Windows, macOS or Linux system.

- ⓘ Part of the driver's package is Slic3r PE, which includes a tool for firmware upgrade.

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Step 6 — Download the new firmware

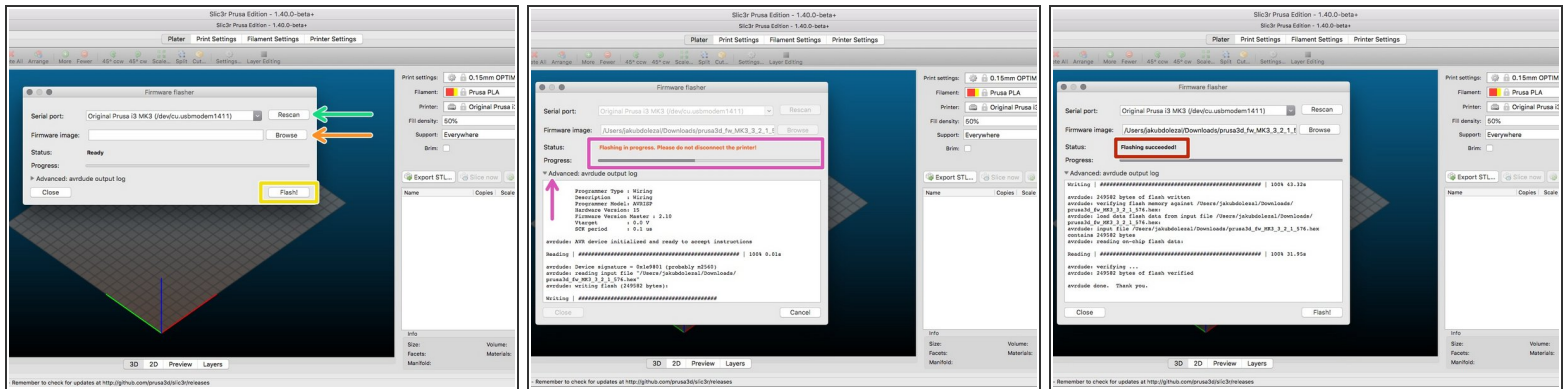- Go back to prusa3d.com/drivers to get the firmware for your printer.

- Download the zip file with the firmware for the MMU2 to your computer and unzip it.

- ⓘ Note there are two types of the firmware for the MMU2.

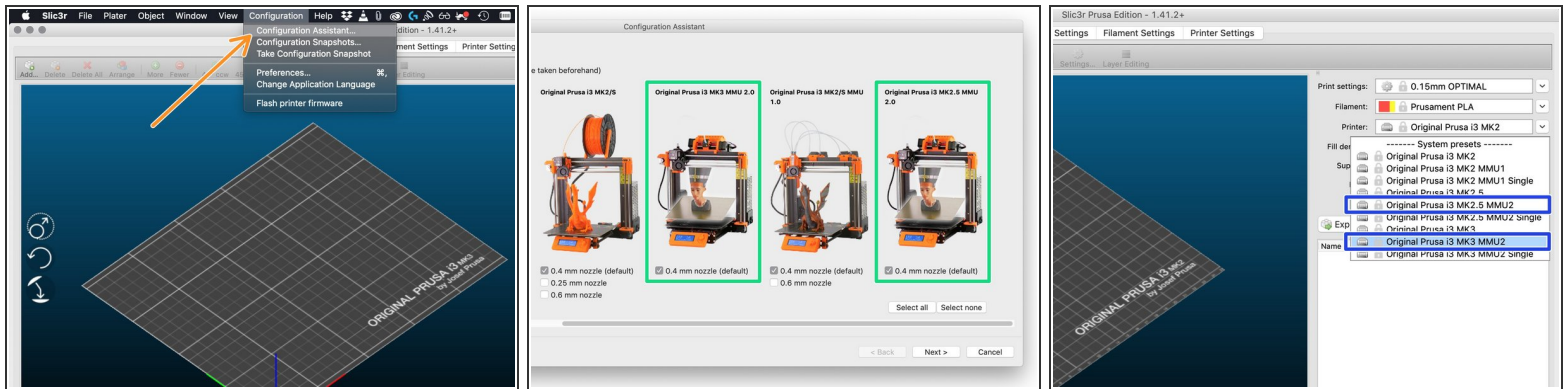- ⚠ **To flash the firmware, the printer must be plugged and turned on!**

- ⚠ **For the MK2.5 MMU2 use firmware combo 3.4.2 and 1.0.2 or latest.**

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Step 7 — Updating firmware using Slic3r PE

- Open Slic3r PE and from the menu select **Configuration ->Flash Printer Firmware**

- Connect the printer to your computer using the bundled USB cable and select it from the menu. Hit **Rescan** if the printer is not on the list

- Select the firmware file on your harddrive (*.hex). Do not place the firmware on a network share.

- Hit the **Flash** button.

- Wait until the process is completed. You can click on "Advanced: ..." to see the flashing process including detailed log.

- When the flashing process is done, you will be informed.

- **We're done here!** Your printer is ready to rock ;)

- ⓘ In case of issues with flashing the firmware please visit our troubleshooting article.

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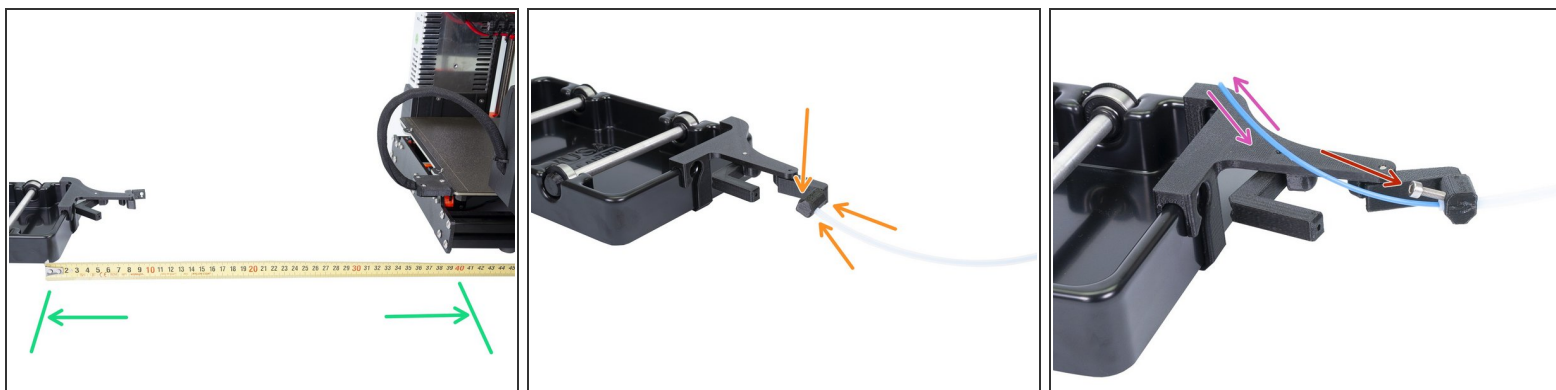
Step 8 — Adding MMU2 settings to the Slic3r PE

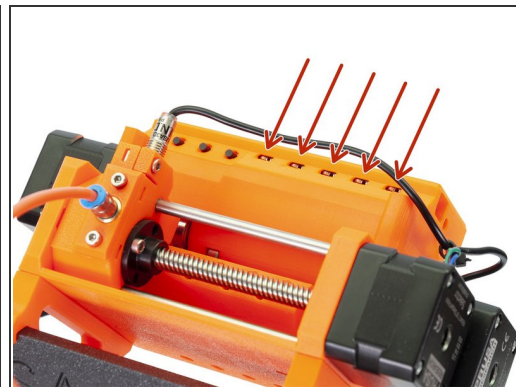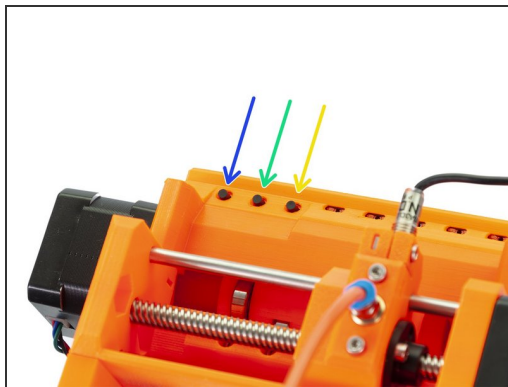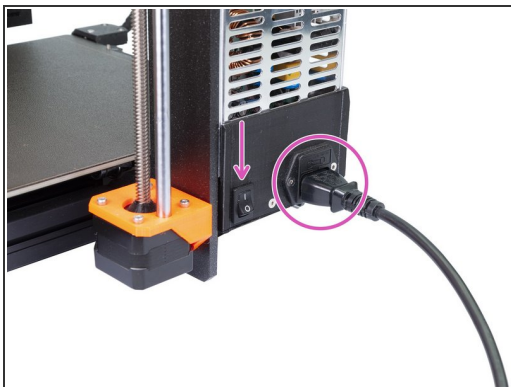⚠️ Before you leave Slic3r PE, please add the **MMU2 printer profiles!!!**

● From the top menu select **Configuration -> Configuration Wizard**

● Look for the MMU2 options and select your printer

● Click Next, then Finish.

● Expand the printer's menu and check if the MMU2 option is present. If not, please repeat the process again.

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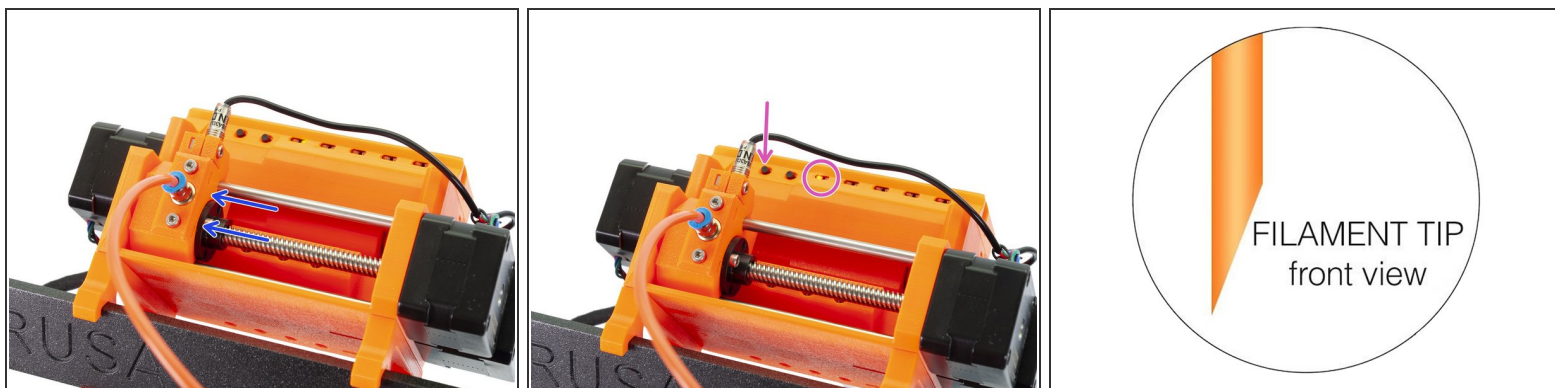
Step 9 — Placing the spool holder

- Place the spool holder at least 40 cm (15.75 inches) behind the back of the printer.

- Look at the printer from behind and take the PTFE tube closest to the right edge of the MMU unit.

- Slide the tube in the filament guide, all the way through. Leave about 1 mm sticking on the other side.

- Take a M3x10 screw (from the spoolholder assembly) and screw it inclined slightly in the holder, just 3-4 turns should be enough. This will prevent the PTFE tube from slipping out.

- Take a piece of the 1.75 mm filament and check if the tube isn't deformed. If you feel resistance, slightly release the M3x10 screw.

- ⓘ In case you have more spool holders, arrange them next to the first one in a similar distance to the printer.

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Step 10 — Loading the filament (part 1/3)

- Before we load the filament, let's fire up the printer.

- Plug the printer in and switch the button to the "ON" position. The PSU switches automatically between 110 and 230 V.

- Wait for the printer to finish initialisation.

- Have a look at the top of the MMU unit, there are three black buttons:

    - **Left button** moves the selector to the left

    - **Middle button** starts the filament load

    - **Right button** moves the selector to the right

- **There are five LEDs** on the MMU unit, each indicates a filament state. The arrangement of the LEDs corresponds to the arrangement of the PTFE tubes.

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Step 11 — Loading the filament (part 2/3)
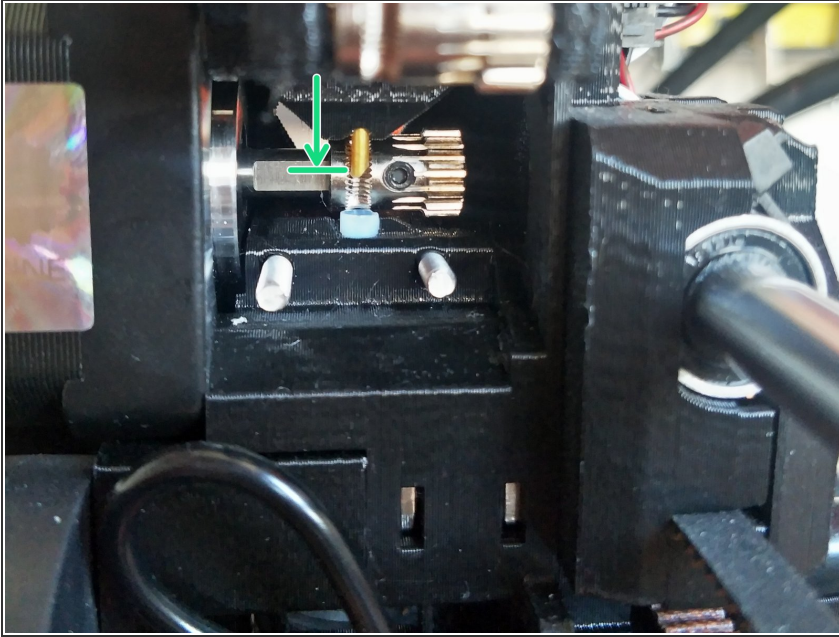

FILAMENT TIP
front view

- Using the left button (press & hold), move the selector all the way to the left.

- Press and hold the middle button to start the filament loading procedure. Notice the **LED will switch from the green to flashing red.**

- (i) This process won't end until filament is detected or procedure cancelled by the user.

- Before loading the filament, make a quick check, the tip should be sharp and first 5-7 cm of the filament must be straight. If the filament is bent, please straighten it.

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Step 12 — Loading the filament (part 3/3)

- Move behind the printer and place the spool with filament behind the spool holder. Make sure the filament will unwind as indicated.

- Guide the filament through the filament guide and into the PTFE. As soon as you reach the MMU unit, the pulleys will take care of the filament loading.

- When the filament reaches the filament sensor (F.I.N.D.A.) it will retract slightly back and **the LED will turn green**.

- Place the spool in the holder. Consider this filament loaded.

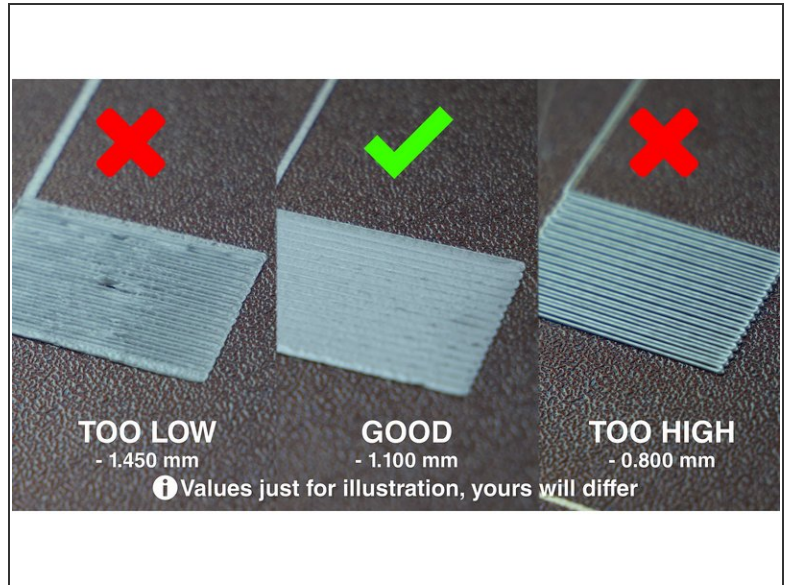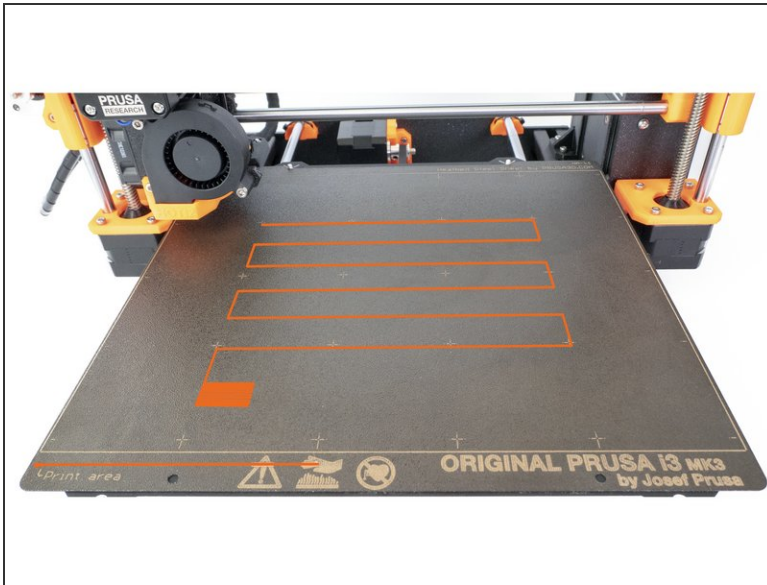- ⓘ To load remaining filaments, repeat the previous and this step.

- **Almost there!**

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Step 13 — Individual Filament Calibration

⚠️ **IMPORTANT:** Before you proceed to the first layer calibration, please enter the service menu and **check that all five filaments are loaded properly to the extruder**.
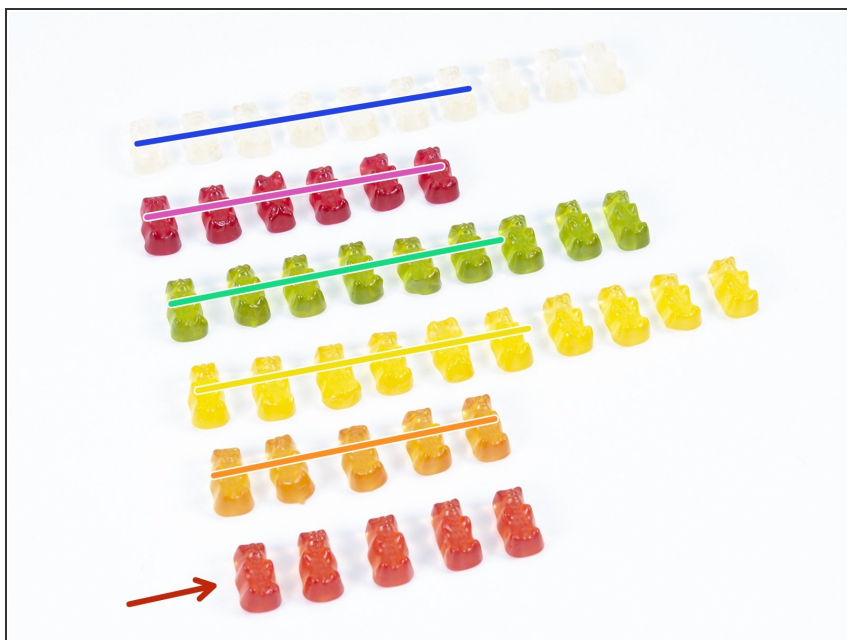
● Please follow this guide: [Service menu - Individual Filament Calibration](#)

● After a successful calibration, return to this chapter and continue with the next step.

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Step 14 — Calibrate Z and 1st layer calibration

- Put back the steel sheet and clean it with IPA to remove dust and grease.

⚠️ First, run the Calibrate Z to make sure the X-axis is absolutely level!

⚠️ Then run the 1st layer calibration as we moved with the P.I.N.D.A.

- **It's done, your MMU2 upgrade is ready!!! Awesome job ;)**

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Step 15 — It's Haribo time!

- It's over, eat the remaining bears and enjoy your MMU2. For start print the included G-codes.

- **We hope you've enjoyed this build, see you in the next one ;)**

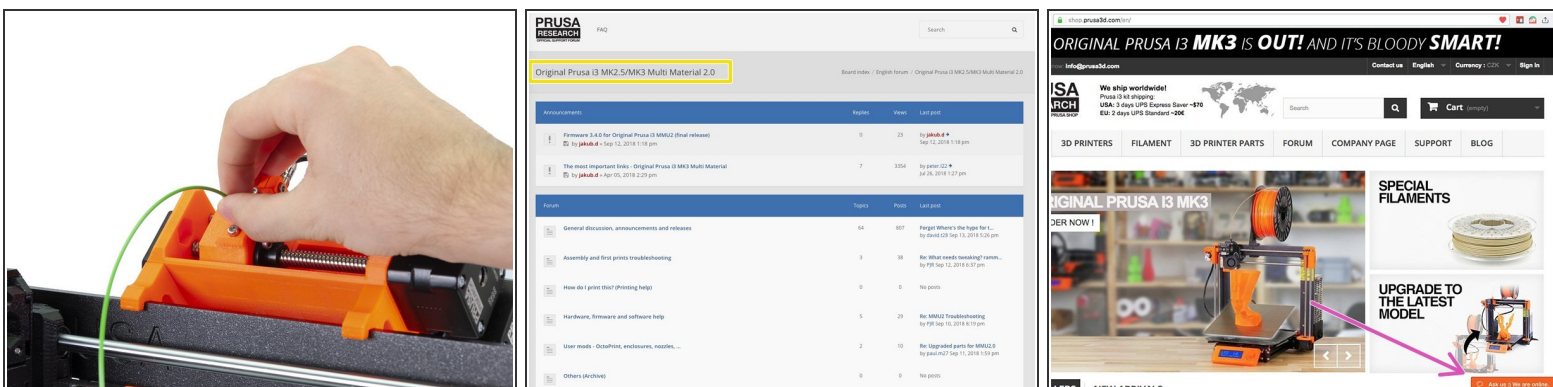## Step 16 — Quick guide for your first prints
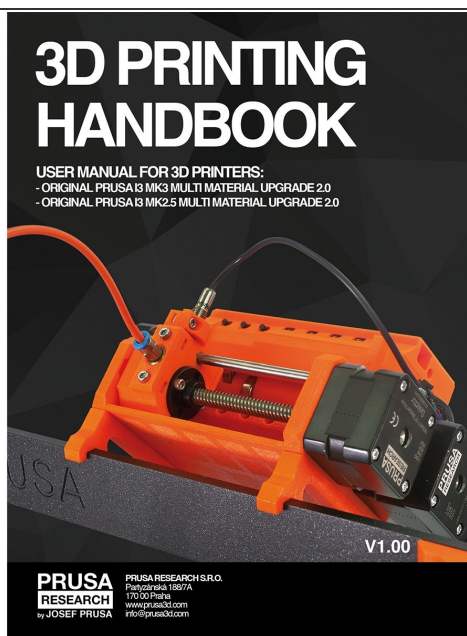
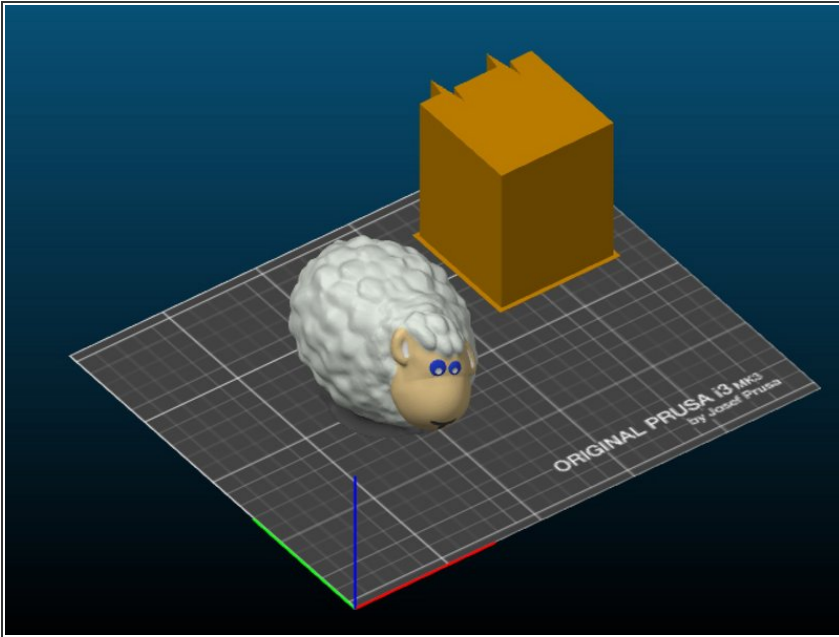- See our free **3D Printing Handbook** - prusa3d.com/3dhandbookMMU2

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Step 17 — Printable 3D models

- You can start by printing some of our test objects - you can check them out here: prusa3d.com/printable-3d-models

Step 18 — Troubleshooting

- In case of any troubles during the prints, please check the following:

- Troubleshooting tips are part of the **Handbook**: prusa3d.com/3dhandbookMMU2

- There are several **online guides**: https://manual.prusa3d.com/c/MMU2_Troubl...

- Check the MMU2 section on our forum

- **Contact our support** using live chat or via email (info@prusa3d.com)

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Step 19 — G-code preparation / custom models preparation

- Did you print all the bundled multi-material models from us? Time to print your own designs!

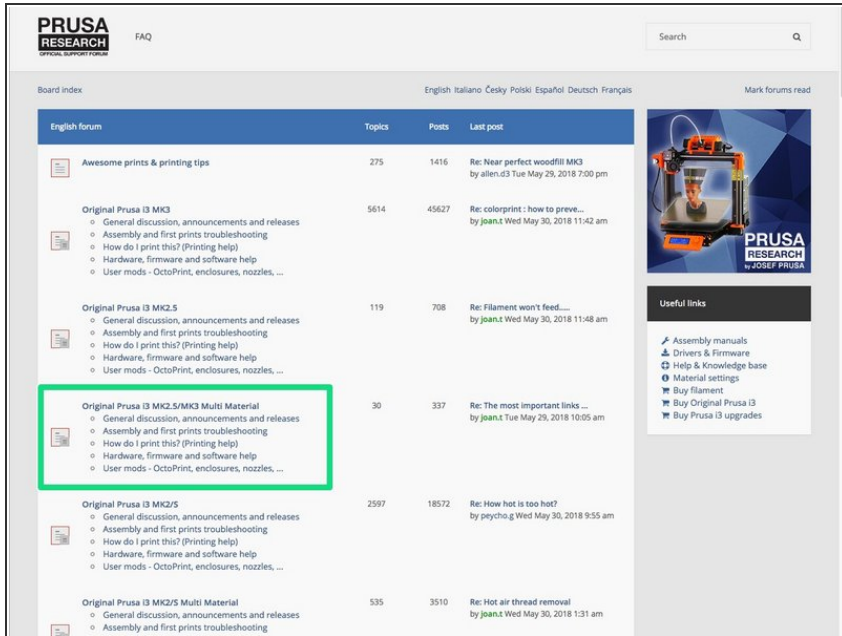- Basic steps are described in our section: https://manual.prusa3d.com/c/MMU2_Creati...

Step 20 — Prusa knowledge base
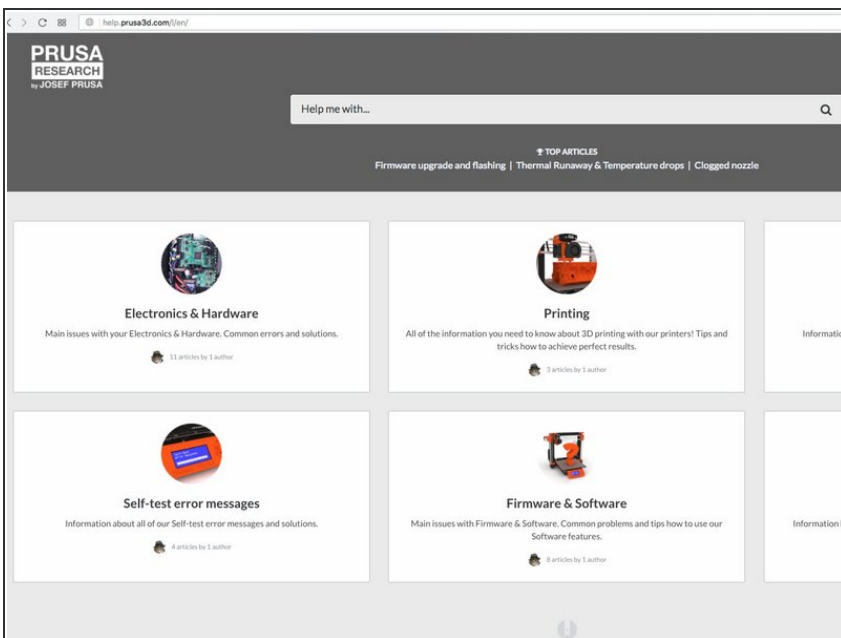
- If you encounter any problems at all, don't forget you can always check out our knowledge base at

http://help.prusa3d.com. We're adding new topics every day!

Step 21 — Prusa3D forum

- If you need help with the build, check out our forum with great community :-)
- Account is shared with http://shop.prusa3d.com/
- Support forum is available at forum.prusa3d.com

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PRUSA RESEARCH by JOSEF PRUSA

Manual changelog MMU 2.0

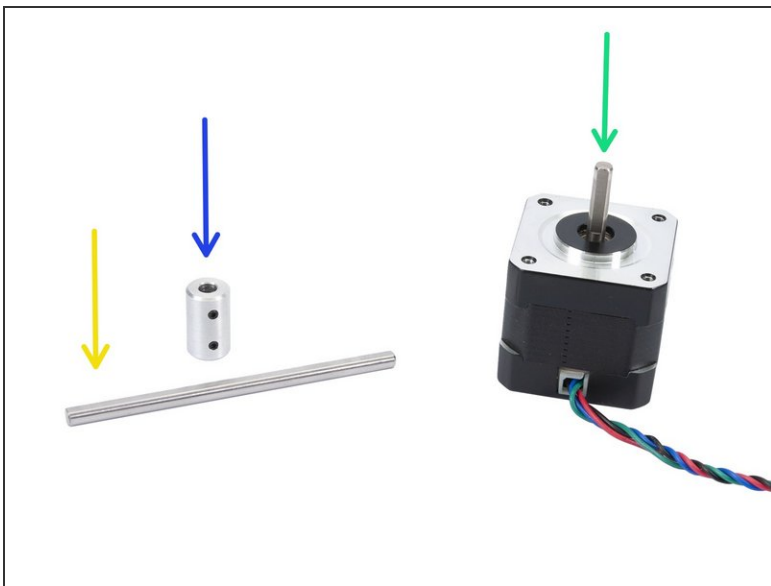## Written By: Jakub Dolezal
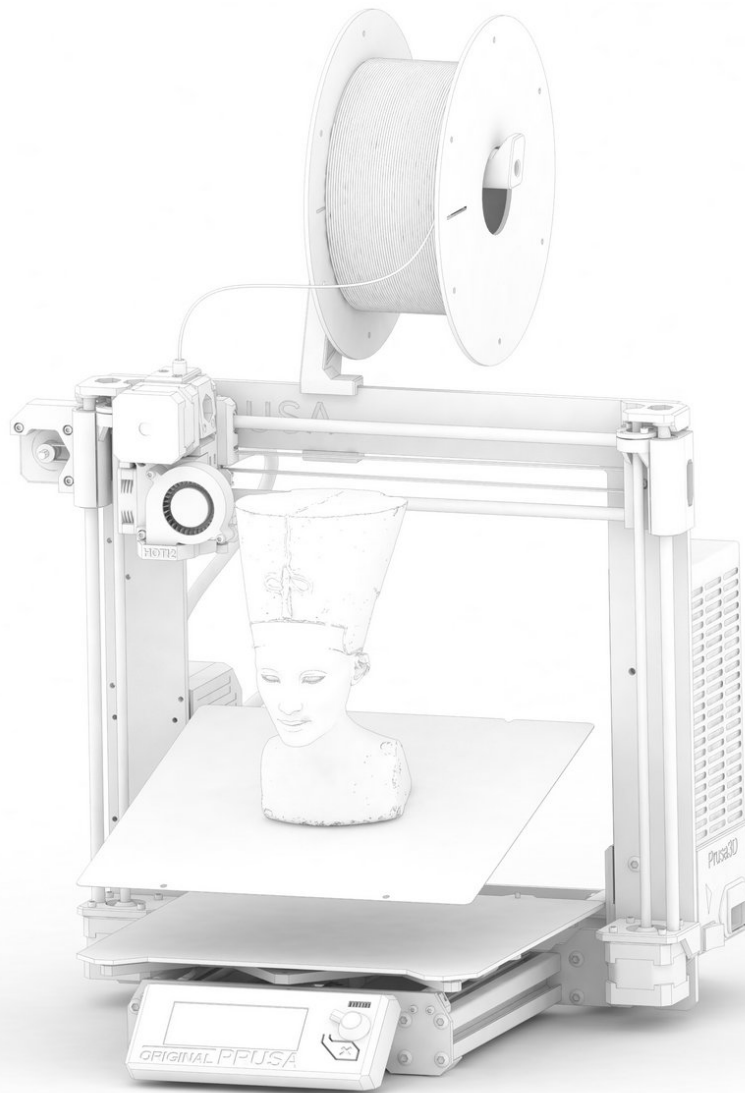
INTRODUCTION

The Original Prusa i3 MK3/MK2.5 Multi Material 2.0 is constantly evolving. Based on your feedback and improvements from Josef Prusa's team, the printer is getting new features and redesigned parts for easier assembly. All the changes are described below. In case you need help, please ask below the particular step in online manual or contact our support team.

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Step 1 — Versions history
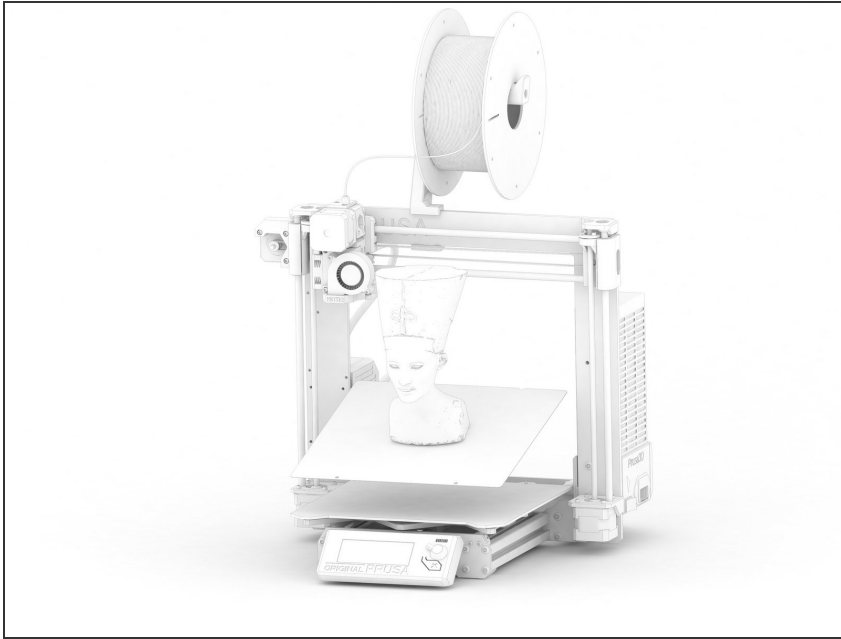
- **Versions of the MMU 2.0 manual:**
  - 07/2018 - Initial version V1.00
  - 10/2018 - Initial version V1.01
- ⓘ Major changes for each version are described in the next steps.
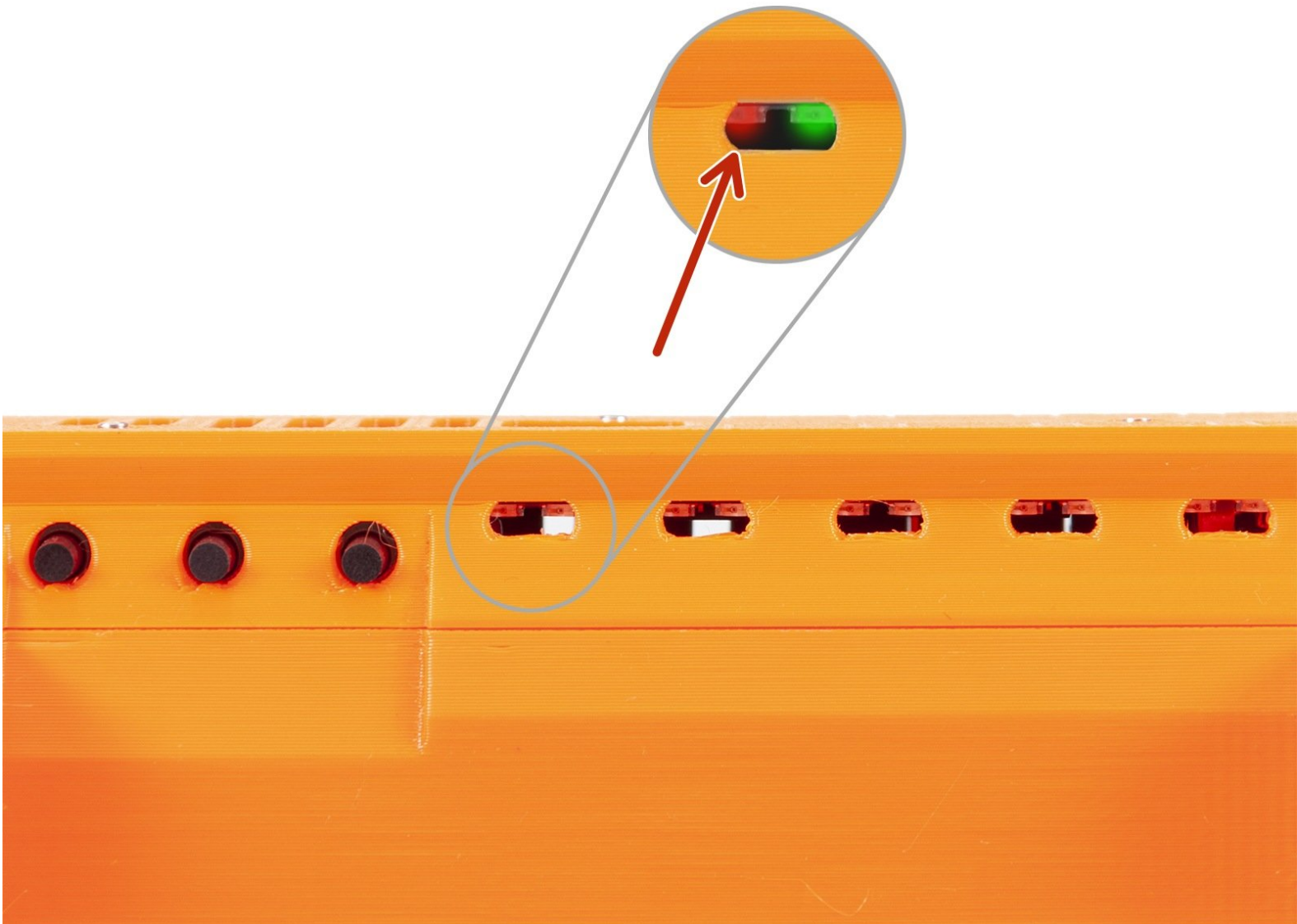
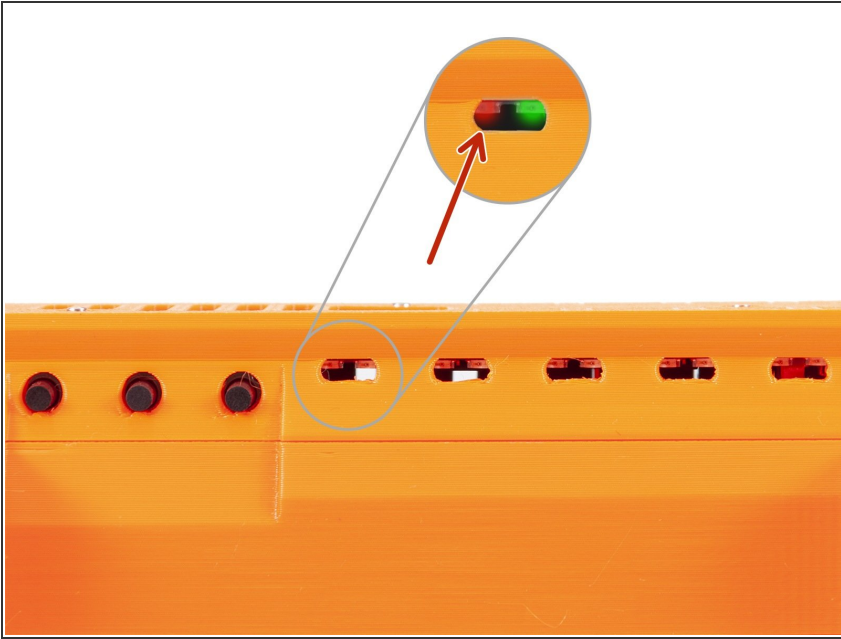## Step 2 — Changes to the manual (1)
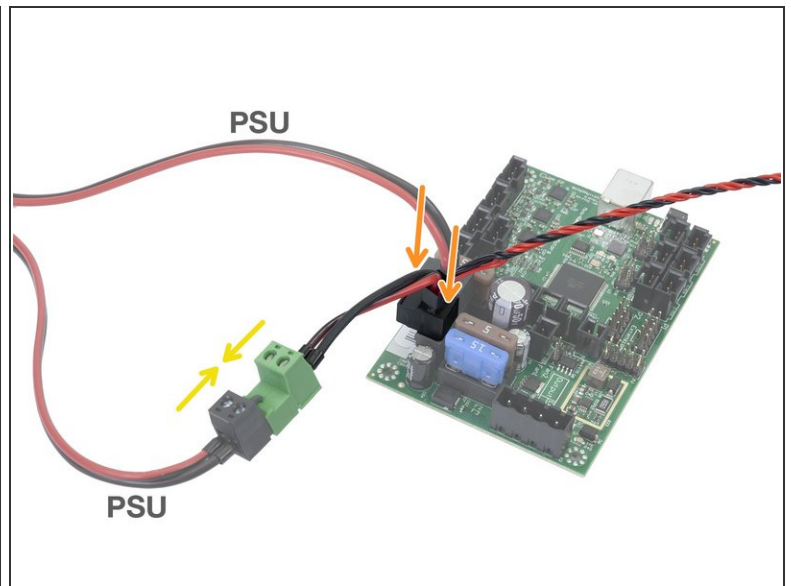
- 10/2018 - Chapter 3 - Step 6
  - Instructions added for the MMU1 to MMU2 assembly.
- 10/2018 - Chapter 3 - Step 39
  - Instructions added for the MK2.5 MMU2 power cable assembly.

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MMU2 filament jam

Written By: Jakub Dolezal

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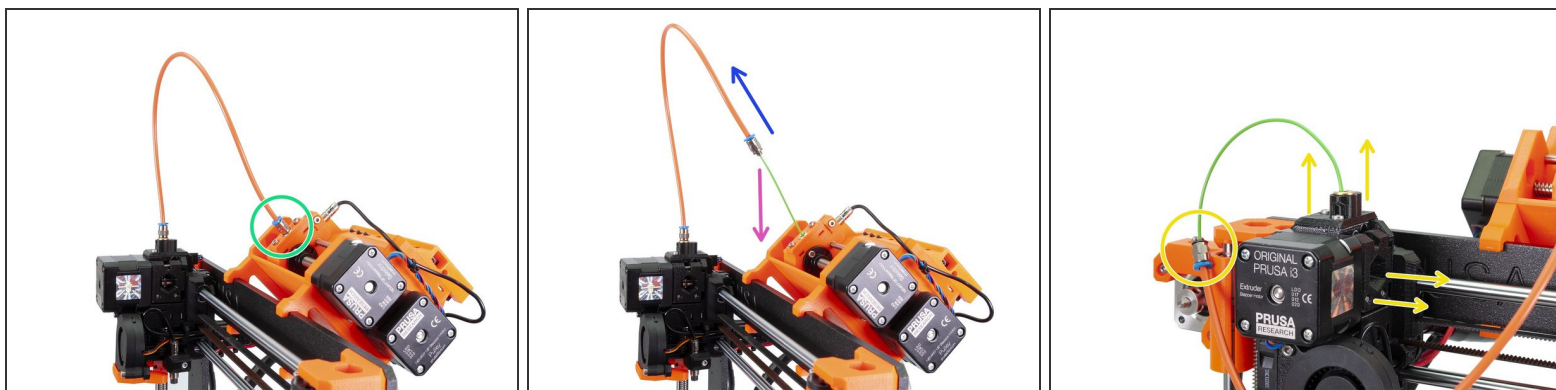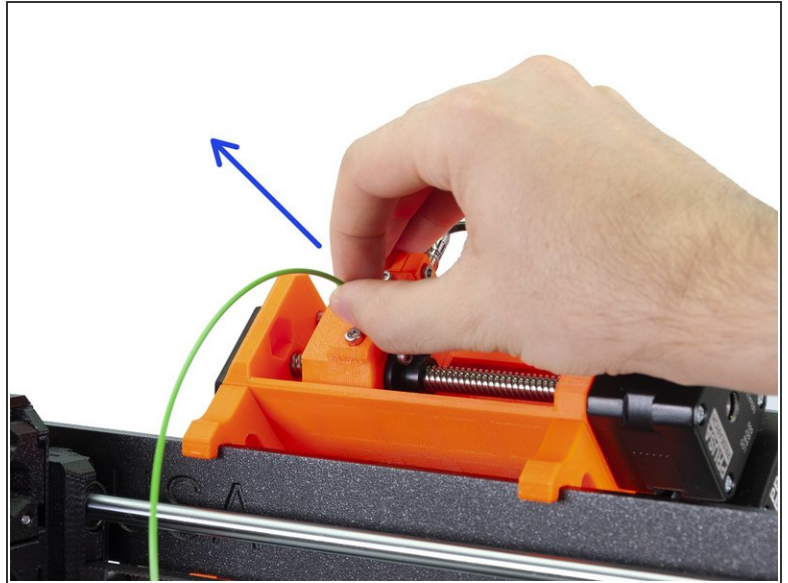
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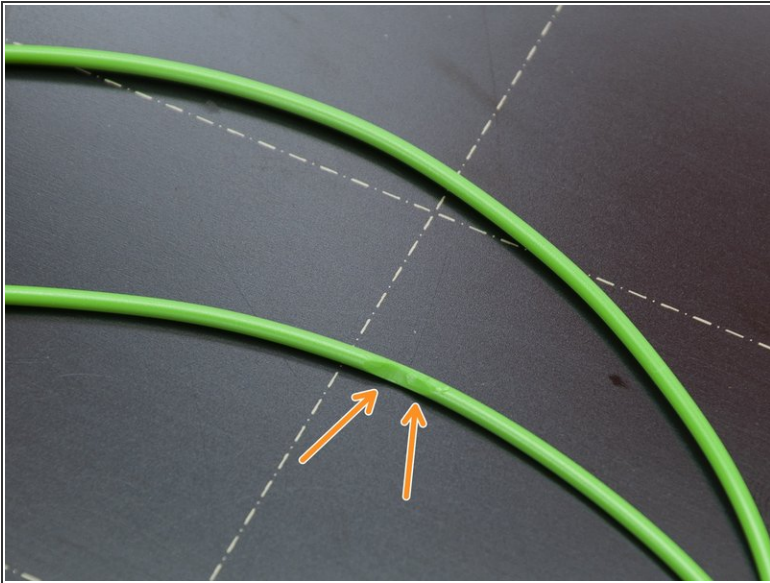
Step 1 — Filament jam

- During filament loading or unloading the filament can get stuck (jammed). The printer will try several times to fix it by itself, but if those attempts fail, it will light up LED above the affected filament.

- The LED will be flashing with RED light:

  - **Slow flashing** - fault during filament **load** (moving the filament in the printer)

  - **Rapid flashing** - fault during filament **unload** (moving the filament out from the printer)

- (i) Note: green LED lights up in case of successful filament load/unload.

- As soon as the filament jam is detected, the printer waits for the user's action. The print is paused, no need to cancel it. Following steps will explain how to fix it and continue printing.

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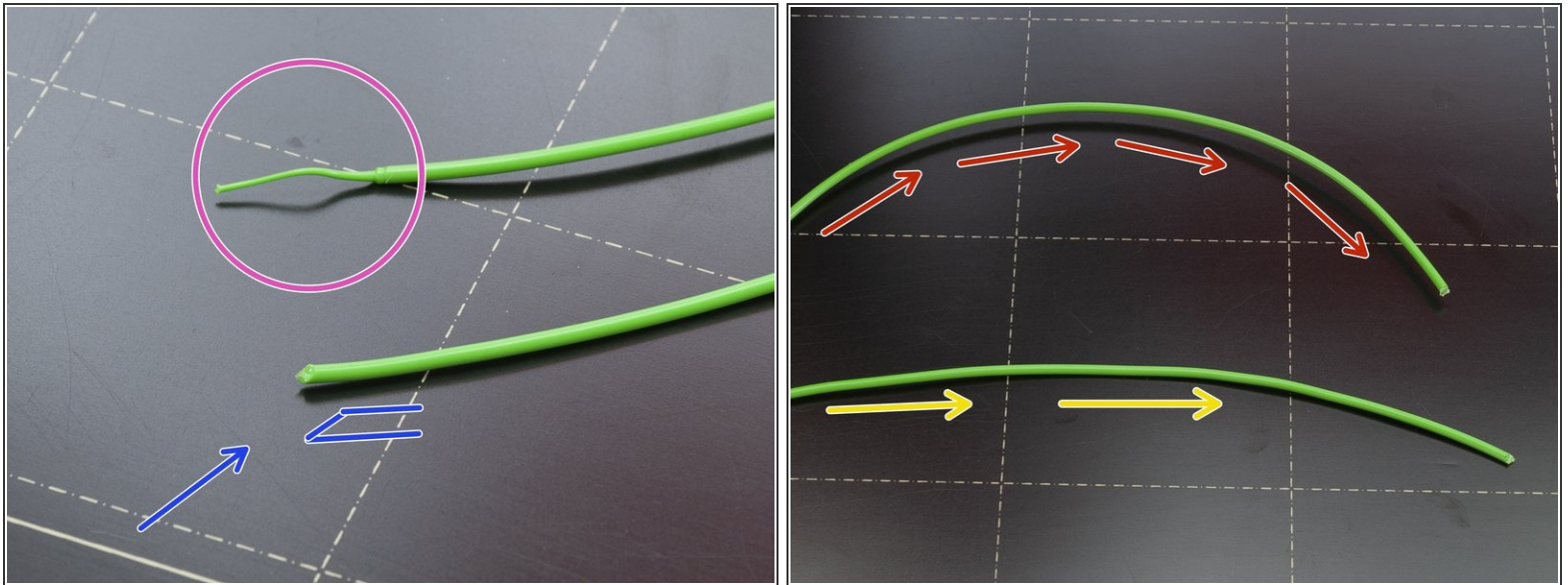
Step 2 — Finding the jam location

- Start with releasing the Festo fitting on the Selector. Note it might be tightened, use 8mm wrench or pliers to release it.

- Move the orange PFTE tube slightly up

- Move the filament out from the orange PTFE tube

- It might happen you won't be able to remove the filament from the tube, proceed to the other end of the tube, **release the Festo fitting** on the extruder and if needed remove the **filament sensor cover** and open the **extruder idler**.

⚠ In case the filament get's stuck inside the MMU unit, use the **left black button** on the unit. To **load or unload** the filament. *(If the printer is at loading stage the button works in loading mode, if the printer is at unloading stage, the button is in unloading mode).*

- If the "Left button" doesn't load the filament, it is possible the filament is only in the white PTFE tube (has fallen out from the MMU idler). Using your fingers, push the filament in.

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Step 3 — Moving the filament through MMU unit

- It might happen the pulley inside the MMU unit damaged (ground) the filament. To be sure the filament ok, let's do following.

- Using your fingers pull at least 10 cm of the filament from the MMU unit. This will ensure, a new and undamaged filament is loaded from the spool.

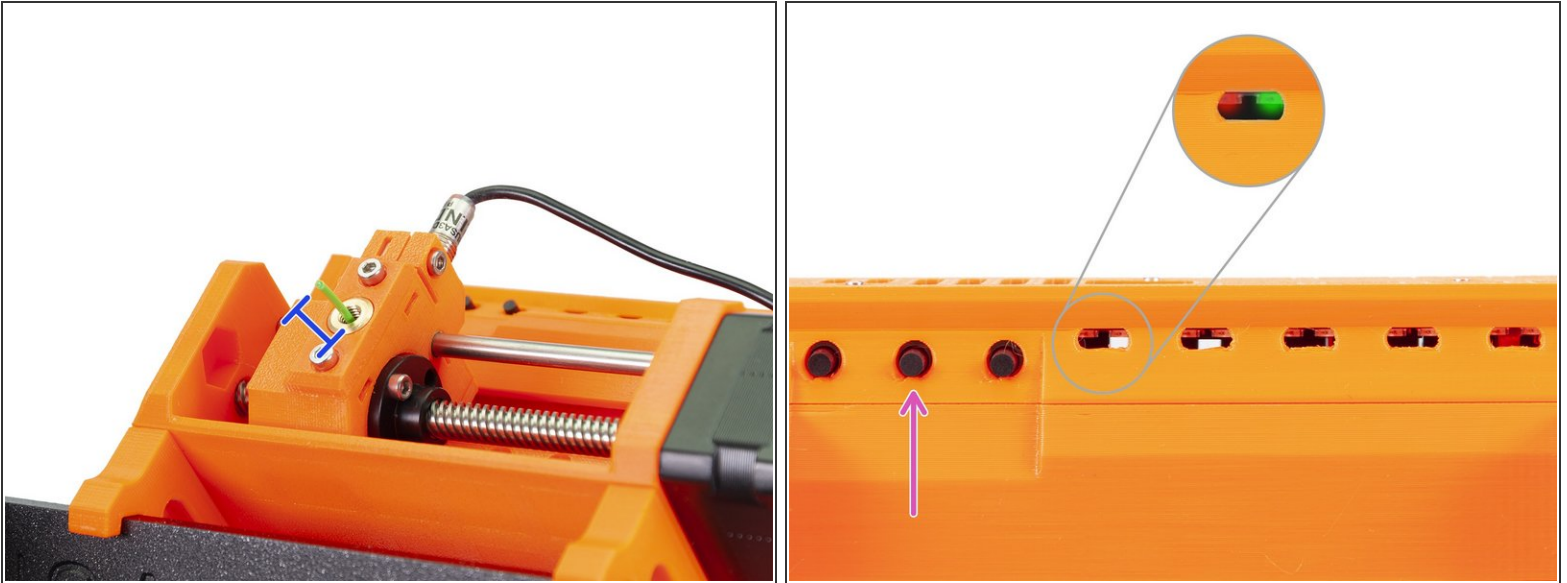⚠ The following step will show you, how to cut the filament. Always cut it close to the Selector and **make sure all the grinds are on the cut part you are going to remove**.

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Step 4 — Cutting and straightening the filament

⚠ While cutting the filament make sure it is close to the Selector and all the damaged parts of the filament are removed.

- Check the tip of the filament, which was in the orange PTFE tube:
  - Any kind of string, sphere shape or other irregularity is causing the jam.
  - Take pliers and cut a sharp tip
- While loading the filament to the MMU unit, its end (10-15 cm) should be as straight as possible:
  - Bent filament can be the cause of the jam.
  - Press the filament between your fingers and straighten it.

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Step 5 — Checking the filament

- Using fingers move the filament back in the MMU unit and leave about 1 cm sticking out.

- Now, let's use the three black buttons.

- The left button was already used if the filament was stuck inside the unit.

- The middle button will be used now. Press it once and wait for the printer to finish the auto-check procedure.

⚠ If the procedure **finishes correctly**, the LED above affected filament will turn to **red-green flashing**, if the **procedure fails** it will remain **red**.

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Step 6 — Successful filament jam removal
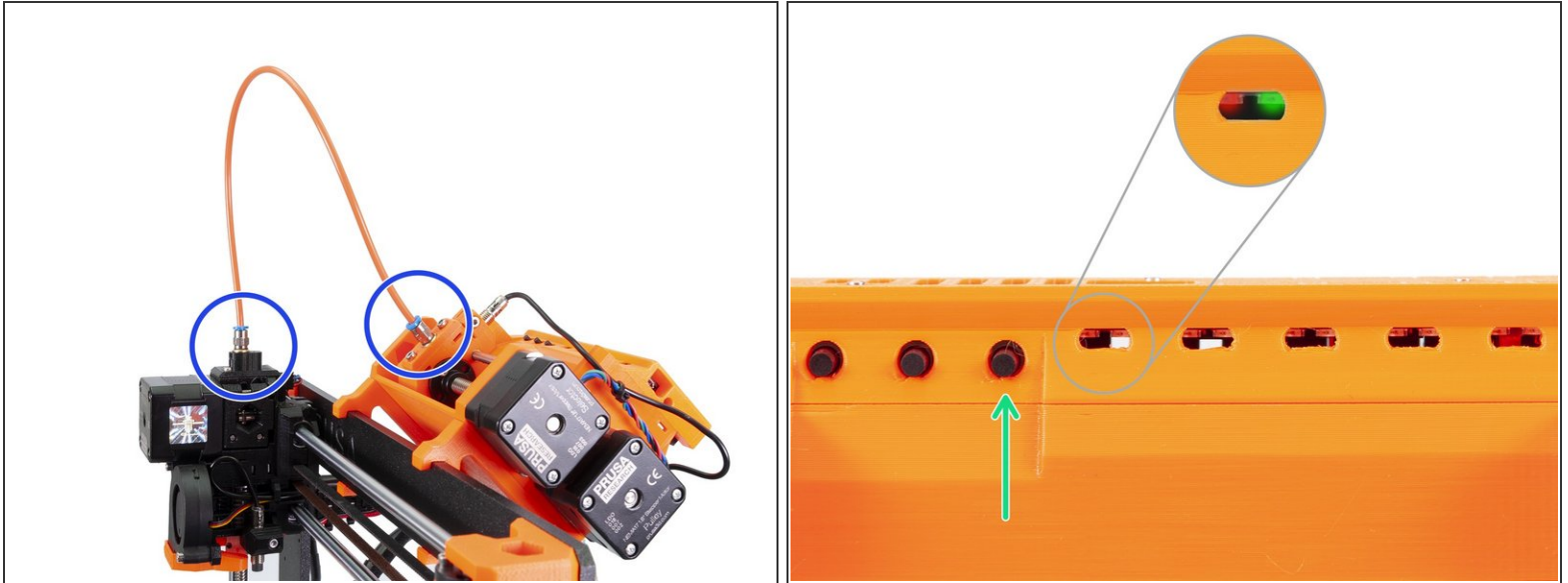
- Put back the orange PTFE tube, check both Festo fittings are tightened properly.

- Press the right button and the printer will continue printing.

- That's it!!! Consider yourself a 3D printing technician ;)

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Service menu - Factory Reset

Written By: Jakub Dolezal

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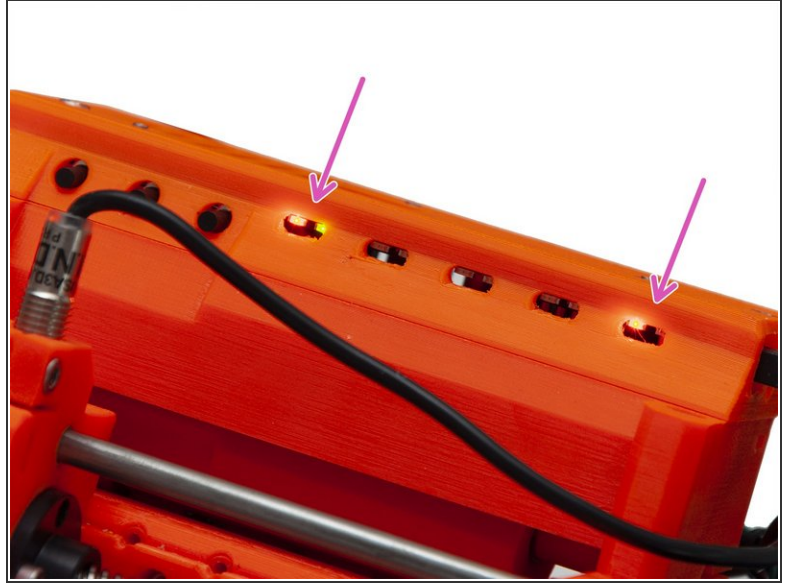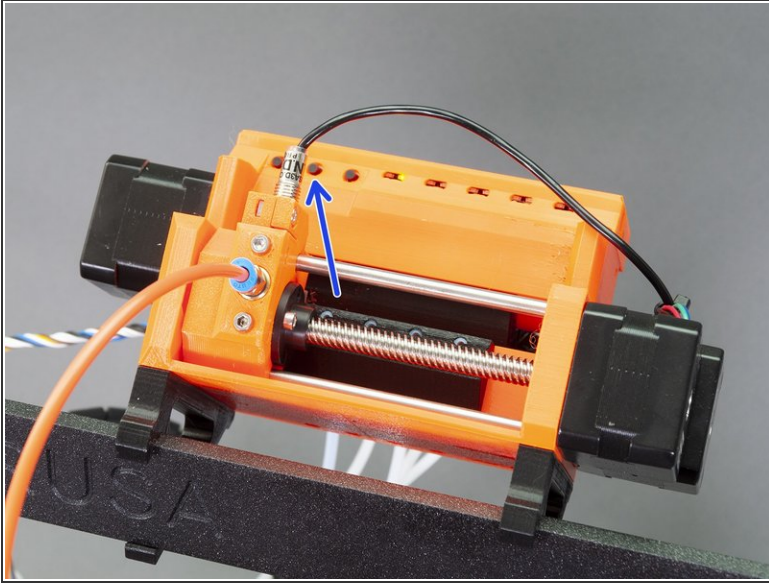
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Step 1 — Introduction

- This guide will take you through the factory reset of the MMU2 unit.

- **Read the entire guide first** to know, what is needed in order to get a successful factory reset.

- ⚠️ **This feature is available in firmware starting version 1.0.1, but it is recommended to upgrade to the 1.0.3 first**. Keep in mind this is a separate firmware and is flashed directly to the MMU2 board, not to the Einsy board.

- ⓘ The firmware for the MMU2 unit is available for download on our site together with the firmware for the printer: prusa3d.com/drivers
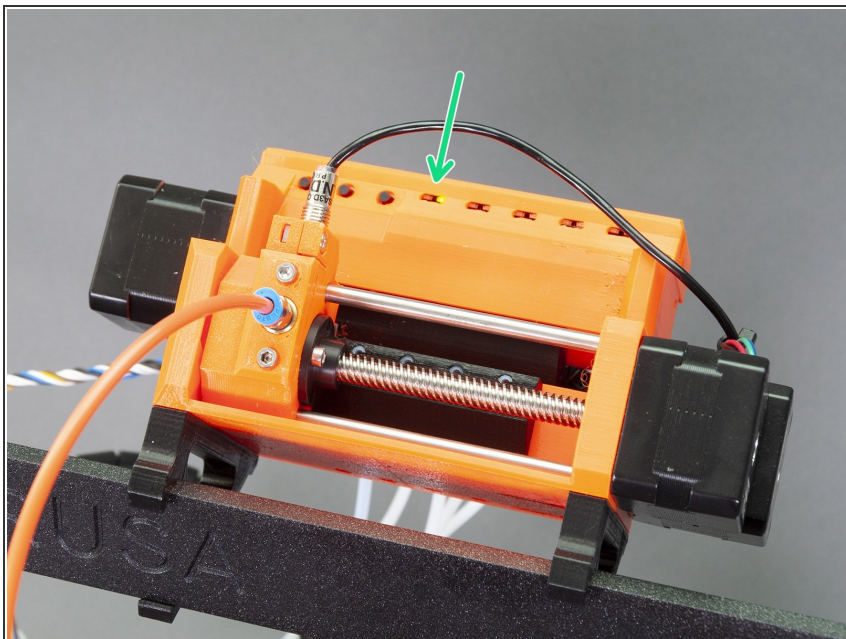
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Step 2 — Entering the service menu

- **How to enter the secret service menu:**
  - Start with the printer TURNED OFF.

  - **TURN** the printer **ON** and let it boot all the way. Then, reset the printer using the "X button" next to screen and immediately press the middle button on the MMU2 unit and hold until all LEDs turn red.

- After the sequence is finished, following LEDs will light up:
  - LED 1 - both LEDs are on

  - LED 5 - only red LED is on

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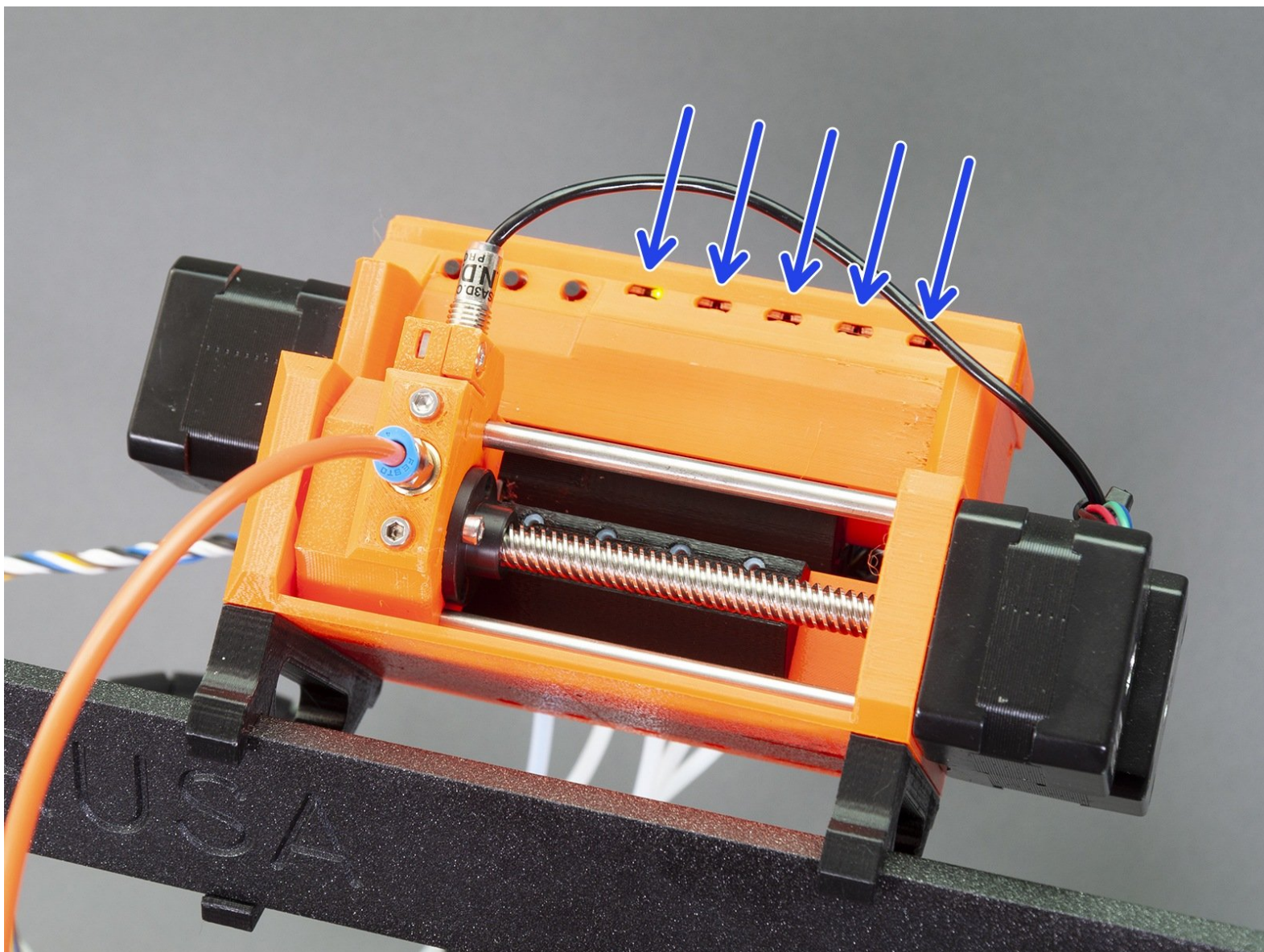
Step 3 — Erasing the EEPROM

- Using the **left**/**right button** select **LED 2** and confirm by pressing the **middle button** *(this will unlock the EEPROM erase function)*. Visually nothing will happen.

- Using the **left**/**right button** select **LED 3** and confirm by pressing the **middle button** *(this will erase the EEPROM)*.

- Wait until the board erases its memory and restarts itself. All LEDs will flash once, then the first LED will turn green. **The board is now erased and ready.**
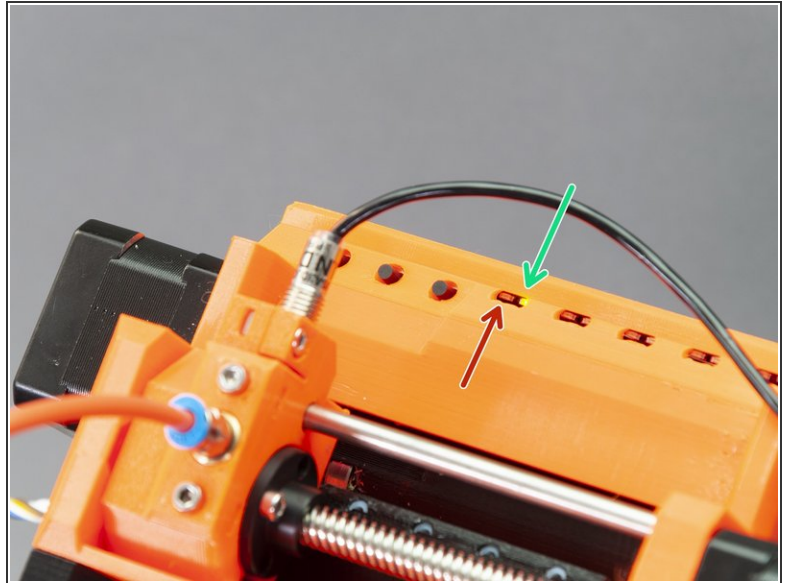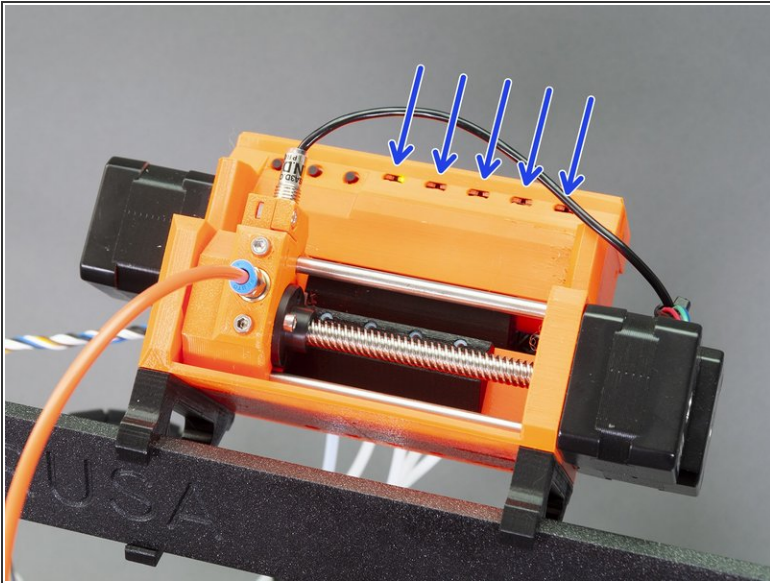
- ⚠️ Note you've just deleted all stored values, you should perform [Service menu - Individual Filament Calibration](#)

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PRUSA
RESEARCH
by JOSEF PRUSA

Status LED indications explained

Written By: Jakub Dolezal

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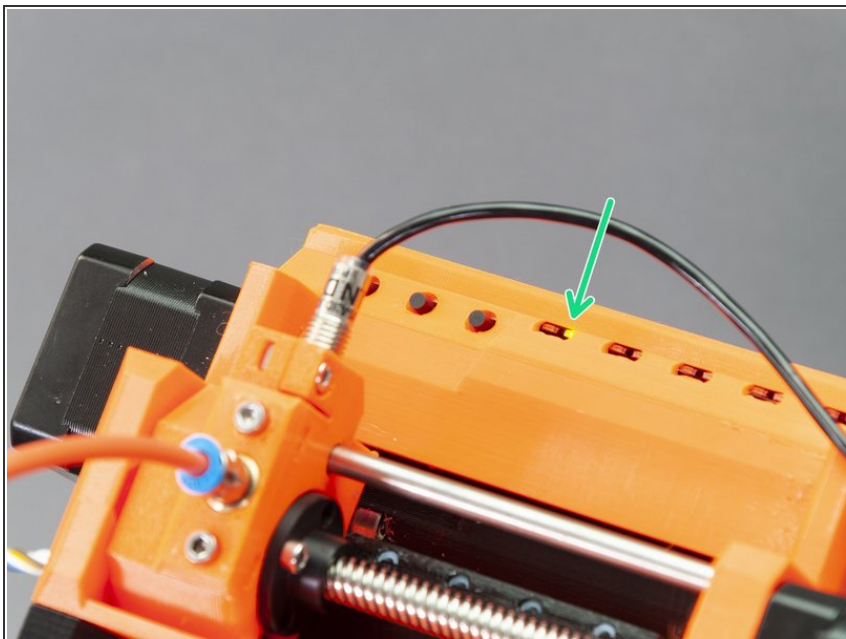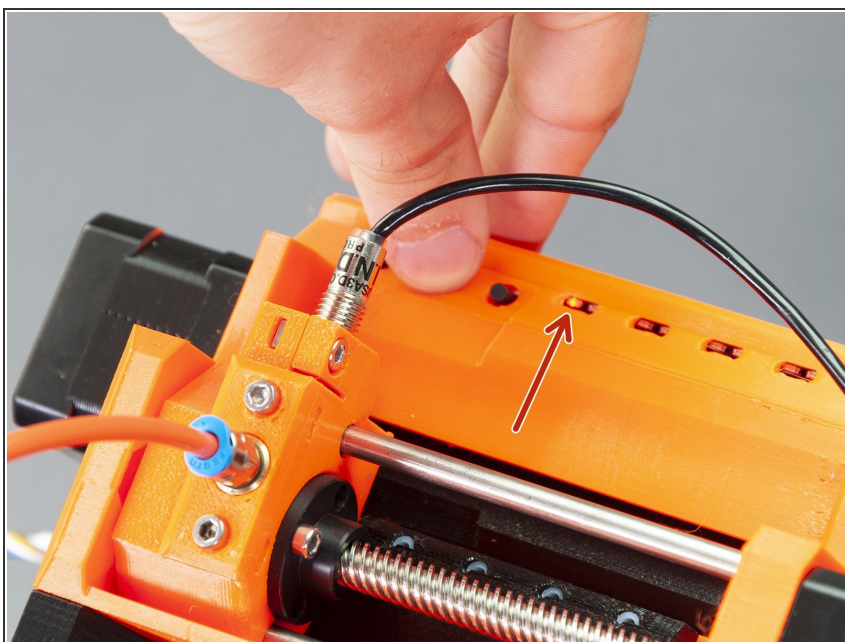
Step 1 — Status LED

- **There are five LEDs** on the MMU unit, each indicates a filament state. The arrangement of the LEDs corresponds to the arrangement of the PTFE tubes.

- Each LED consists of two sub LEDs:
  - Red status LED
  - Green status LED

- (i) See next steps for detailed explanation...

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Step 2 — Green status LED

- **Stable light (not flashing)** - selector moved to current position and ready.

- **Stable light after loading** - filament successfully loaded

- **Rapid flashing light (after pressing the middle button)** - loading the filament sequence

  - ⓘ Note, this sequence won't stop until FINDA senses the filament flowing through or the user cancels the operation pressing the middle button.
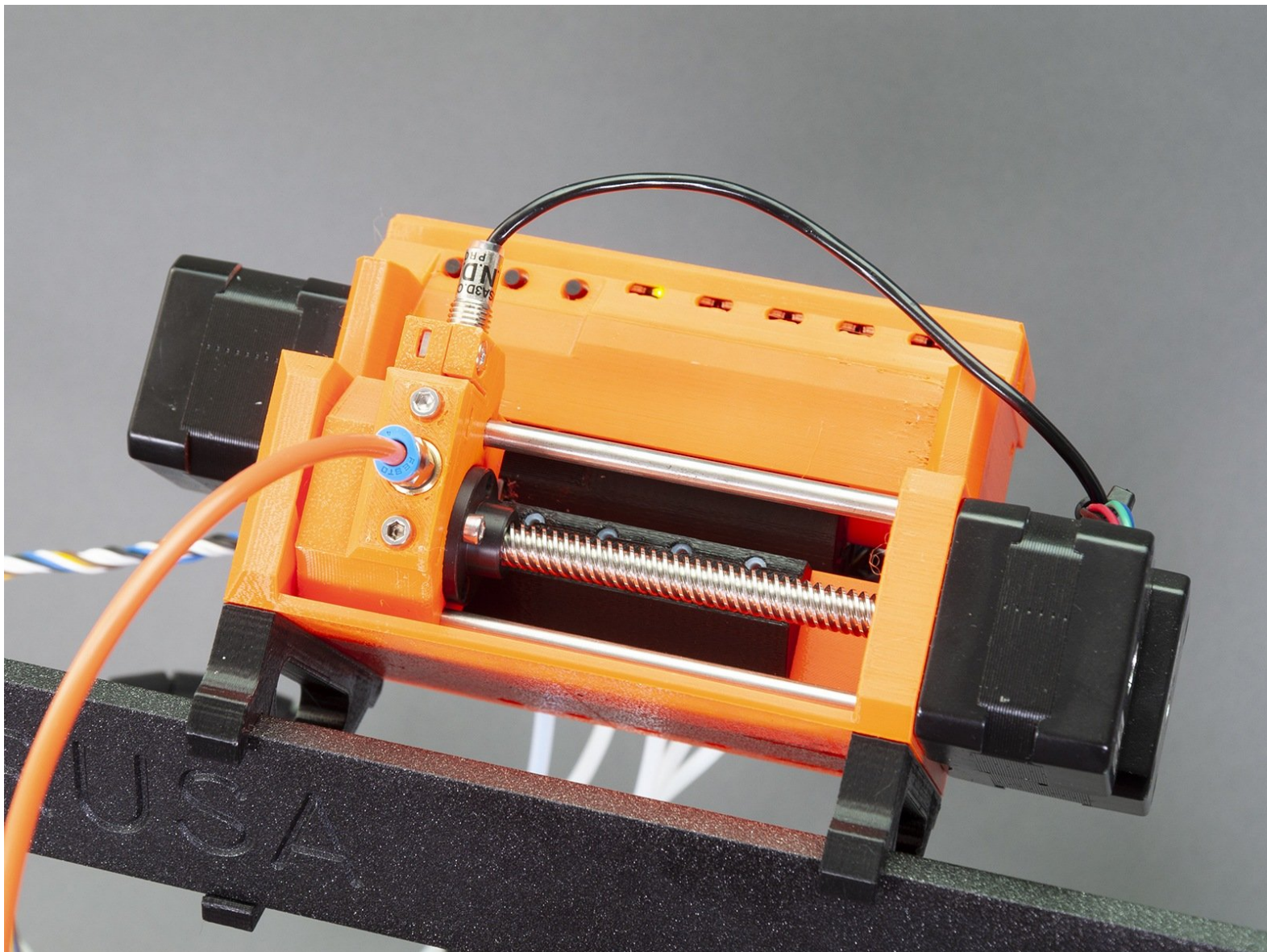
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Step 3 — Red status LED

- **Stable light (not flashing)** - work in progress, wait till the printer finishes

- **Slowly flashing during print** - fault during filament load (fix check the filament, press the middle button, to repeat the procedure)
  - To continue after fixing the issue, press the right button.

- **Rapid flashing during print** - fault during filament unload (fix check the filament, press the middle button, to repeat the procedure)
  - To continue after fixing the issue, press the right button.

- **All LED flashing on boot** - there is filament loaded through the unit and the selector can't move. Remove the filament manually first so the boot can continue. No need to press any button. As soon as you take the filament out, the printer will continue by itself.
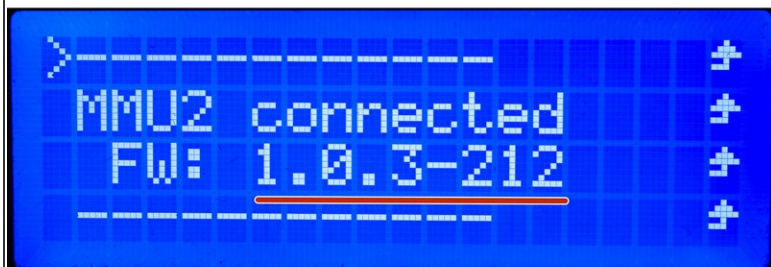
- ⓘ Ignore the pressed button.

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Service menu - Factory Reset

Written By: Jakub Dolezal

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Step 1 — Introduction

- This guide will take you through the factory reset of the MMU2 unit.

- **Read the entire guide first** to know, what is needed in order to get a successful factory reset.

- ⚠ **This feature is available in firmware starting version 1.0.1, but it is recommended to upgrade to the 1.0.3 first**. Keep in mind this is a separate firmware and is flashed directly to the MMU2 board, not to the Einsy board.

- ⓘ The firmware for the MMU2 unit is available for download on our site together with the firmware for the printer: prusa3d.com/drivers

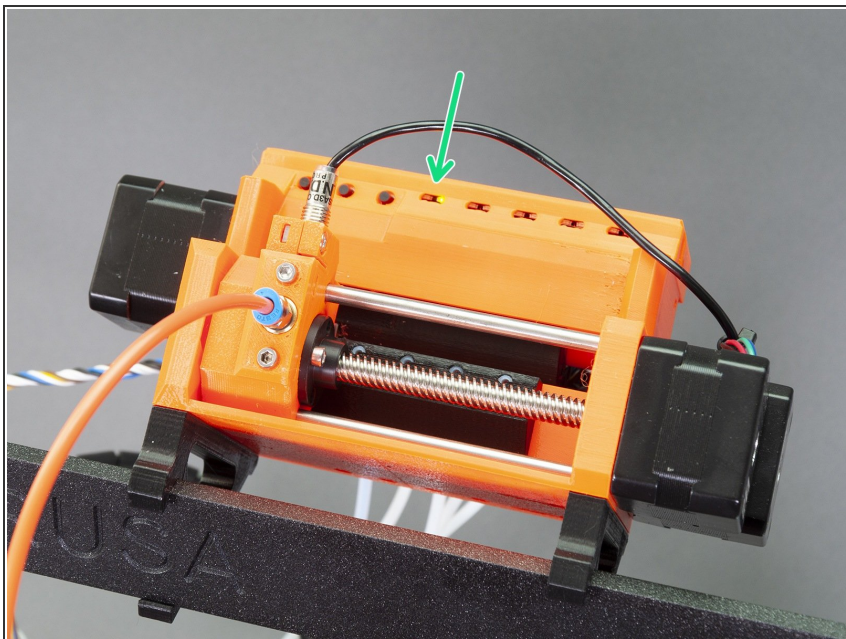## Step 2 — Entering the service menu

- **How to enter the secret service menu:**
  - Start with the printer TURNED OFF.

  - **TURN** the printer **ON** and let it boot all the way. Then, reset the printer using the "X button" next to screen and immediately press the middle button on the MMU2 unit and hold until all LEDs turn red.

- After the sequence is finished, following LEDs will light up:
  - LED 1 - both LEDs are on

  - LED 5 - only red LED is on

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Step 3 — Erasing the EEPROM

- Using the **left**/**right button** select **LED 2** and confirm by pressing the **middle button** *(this will unlock the EEPROM erase function)*. Visually nothing will happen.

- Using the **left**/**right button** select **LED 3** and confirm by pressing the **middle button** *(this will erase the EEPROM)*.

- Wait until the board erases its memory and restarts itself. All LEDs will flash once, then the first LED will turn green. **The board is now erased and ready.**
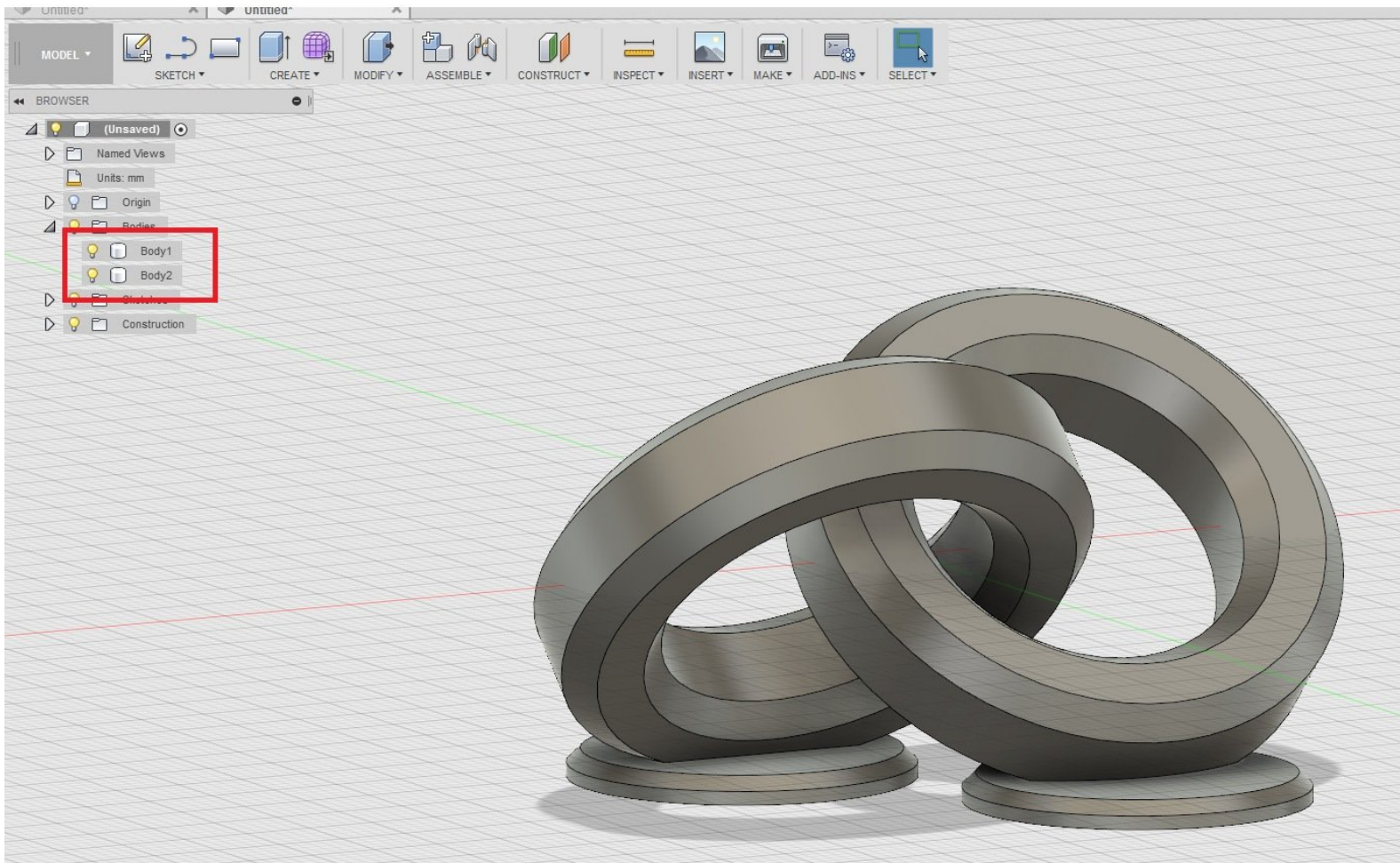
- ⚠ Note you've just deleted all stored values, you should perform [Service menu - Individual Filament Calibration](#)

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Export model from Fusion 360

Other CADs should work similarly.

Written By: Josef Prusa

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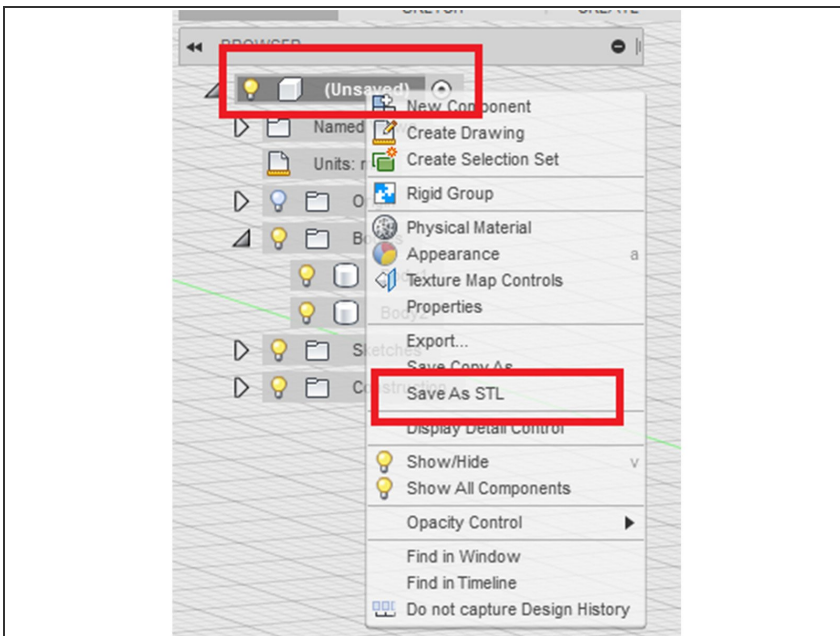© 2020

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Step 1 — Create a design with multiple parts
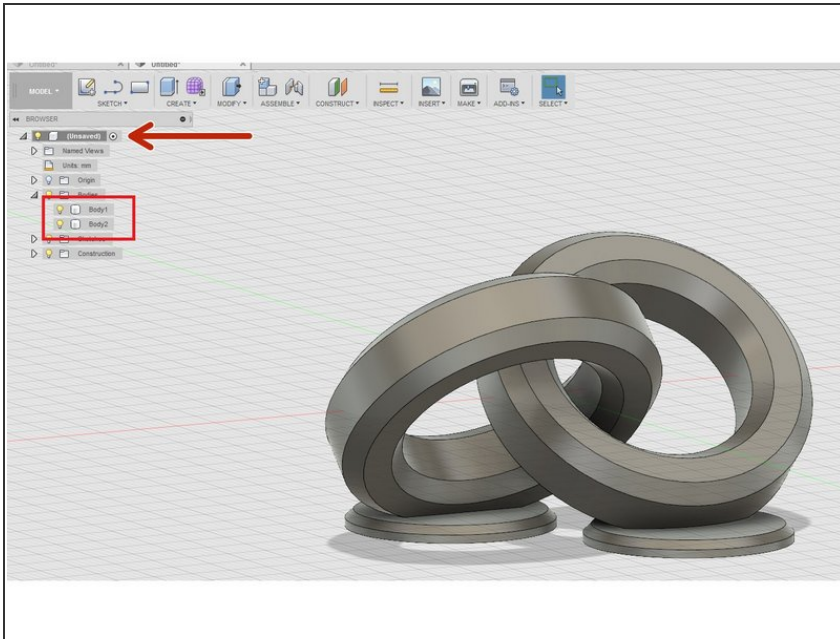
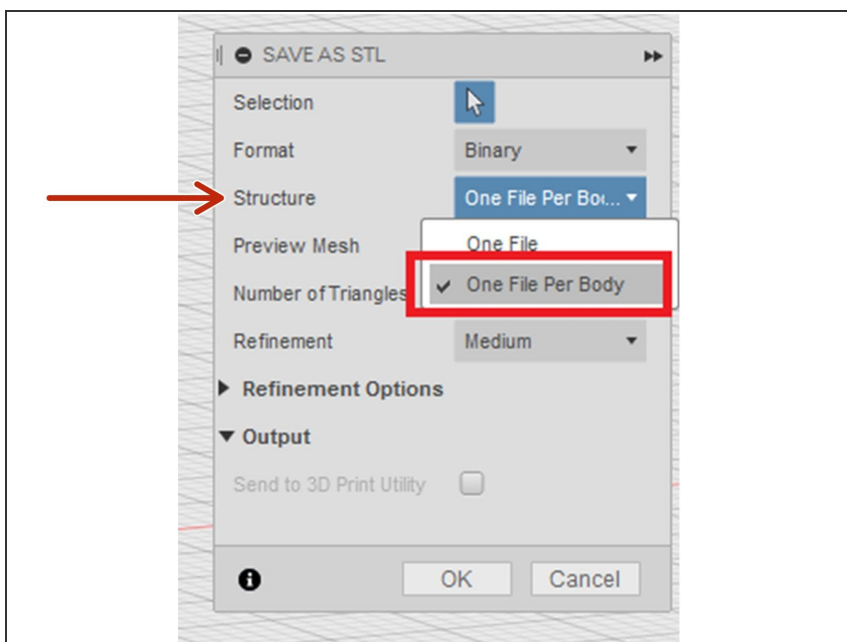- For start, you need to have a model (design) with multiple parts.

- Expand the menu and check if your model consists of multiple parts (bodies).

Step 2 — Open "Save As STL" menu

- To be able to import the model into a Slic3r Prusa Edition, you need to export it in a form of .stl file.

- Right click on the menu and choose **"Save As STL"**.

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Step 3 — Save each body in a different .stl file

- In the "SAVE AS STL" dialogue look for a row called **"Structure"**.

- Click on the drop-down menu and select **"One File Per Body"**.
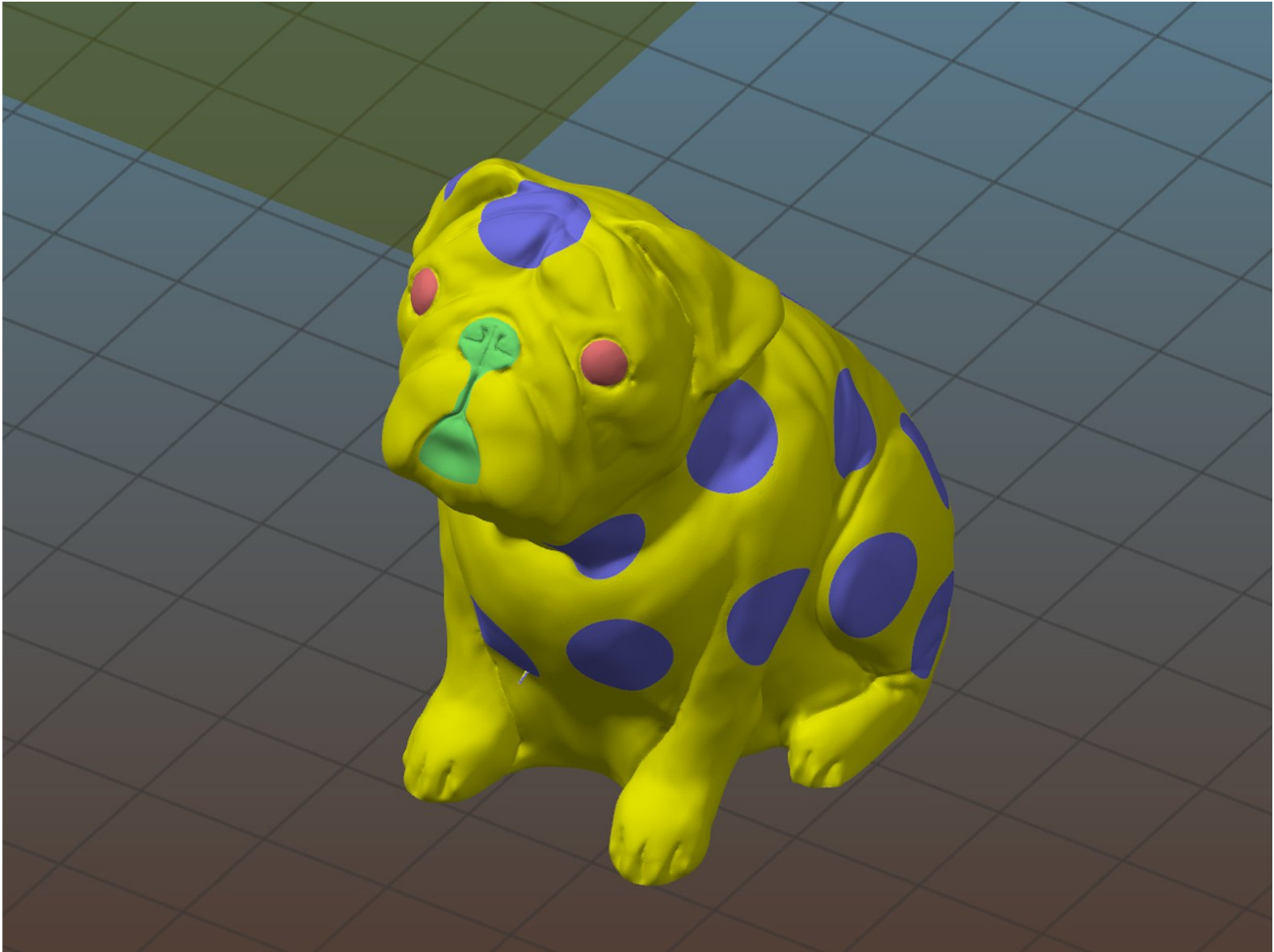
Step 4 — Open files in Slic3r PE
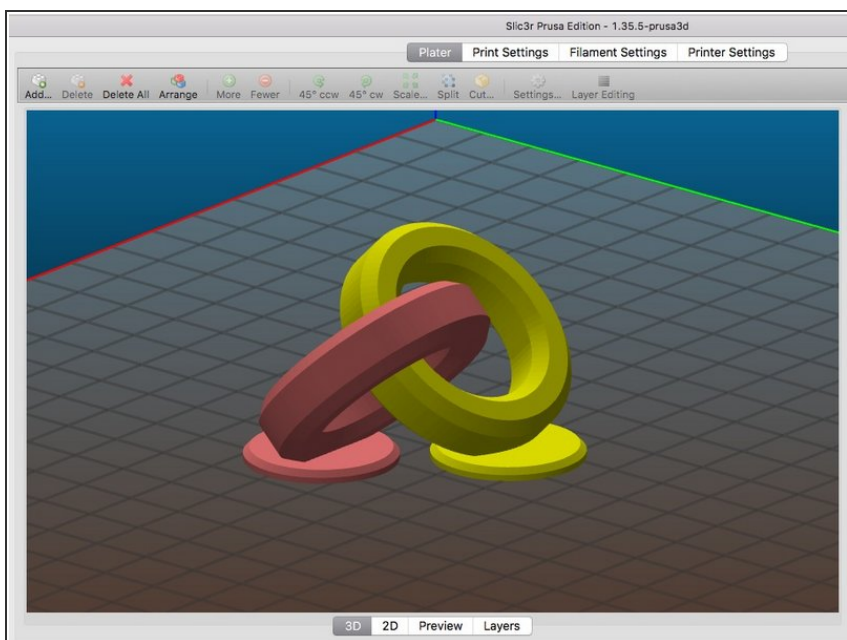
- Now you need to open Slic3r Prusa Edition and import all .stl files.

- We've prepared a step-by-step guide for Multi Material .stl import: http://manual.prusa3d.com/Guide/Gcode+pr...

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**PRUSA
RESEARCH
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Splitting STL using MeshMixer

Written By: Dominik Císař
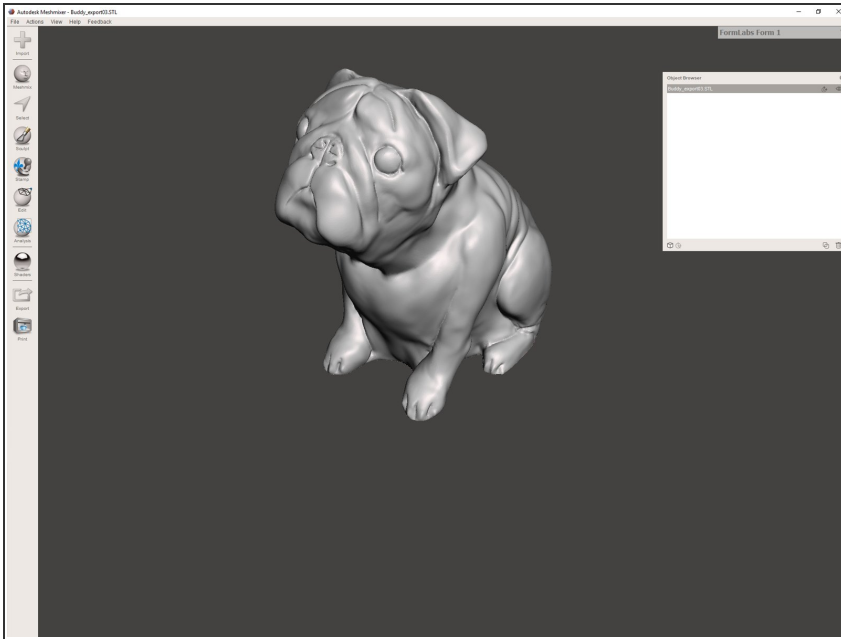
This document was generated on 2020-11-15 10:42:01 AM (MST).

Step 1 — Launch MeshMixer

(i) Software used in this tutorial is Autodesk Meshmixer, you can download it here: http://www.meshmixer.com/download.html

(i) Install MeshMixer on your PC or Mac.

● Import your STL file in MeshMixer.

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Step 2 — Select 1st eye
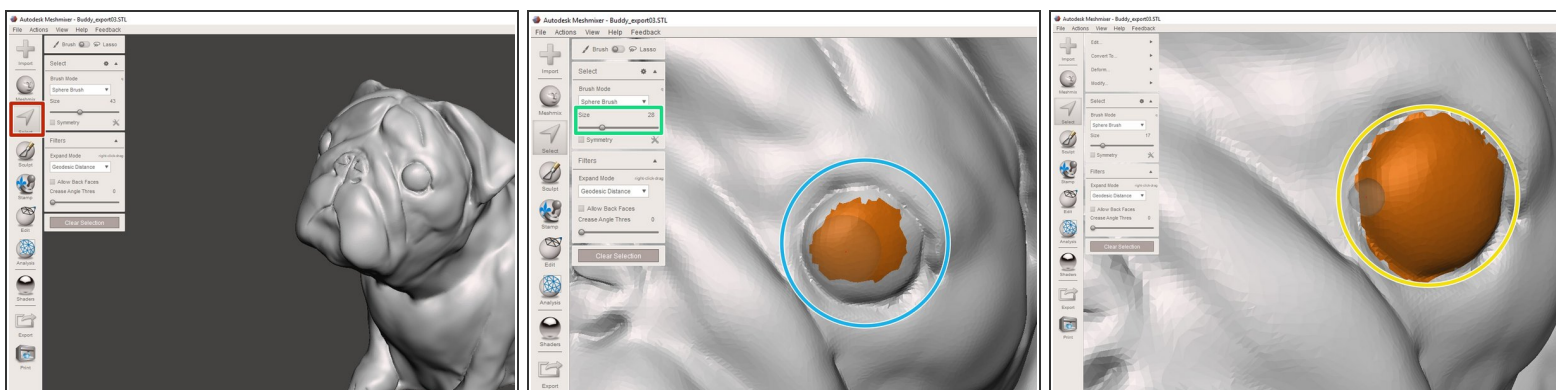
- Go to **Select**.

- Adjust Brush **Size**.

- Use mouse left-click to select mesh triangles.

- Finish selecting first Pug's eye.

- To unselect mesh triangles: on Windows hold CTRL and mouse left-click, on MacOS hold CMD and mouse left-click.

- Tip: Check the box Symmetry and set the symmetry plane to select both sides on symmetrical models.

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Step 3 — Select 2nd eye
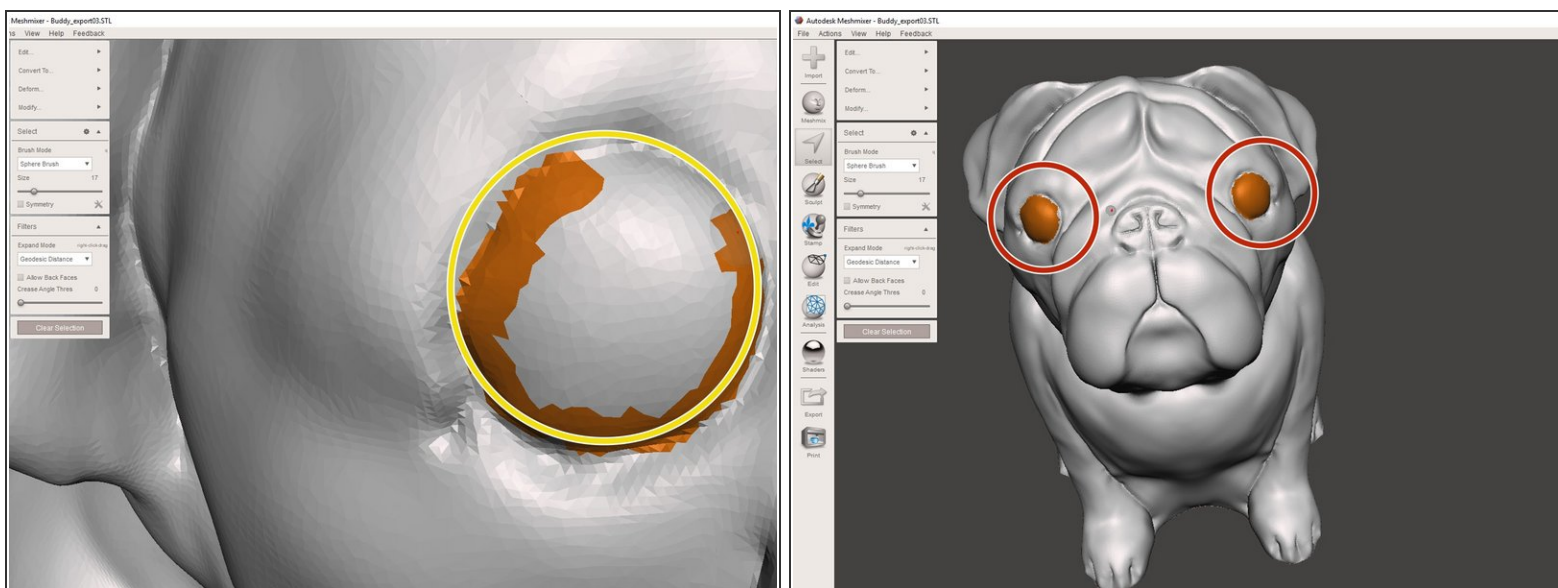
- Use the same method as in Step 2 to select second eye.

- Keep both eyes selected.

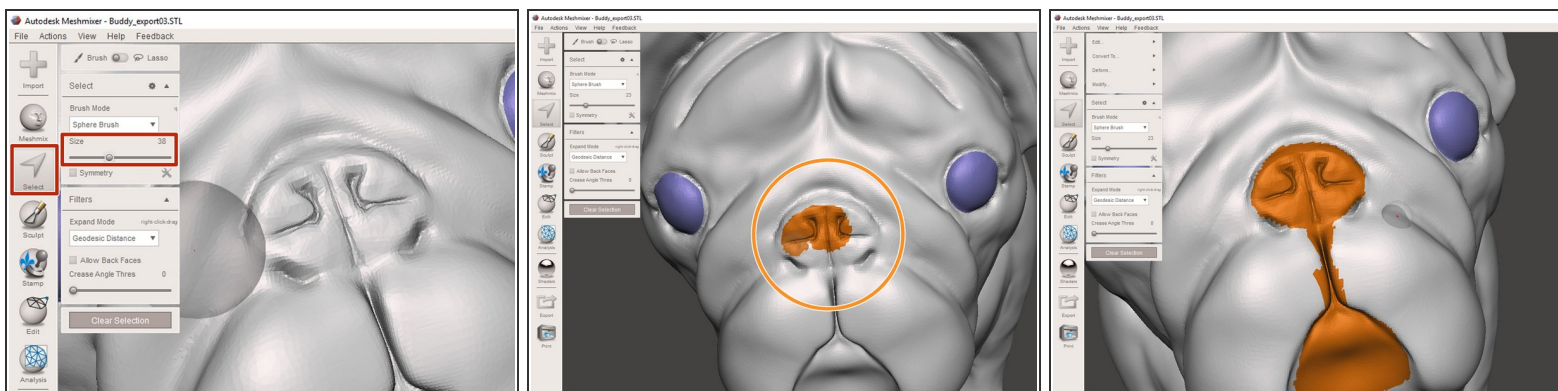## Step 4 — Smoothing the selection boundary
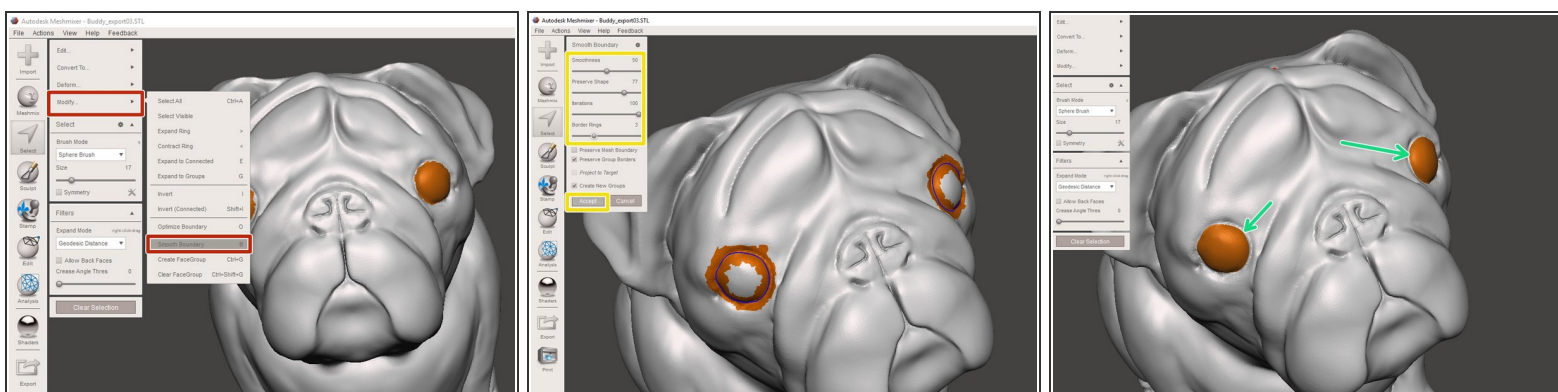
- In **Modify** option choose **Smooth Boundary**.

- Set smoothing options and click on **Accept**.

- Eyes boundary are now smoothed.

- (i) Decrease Border Rings number to prevent boundary overlapping.

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Step 5 — Creating Facegroup
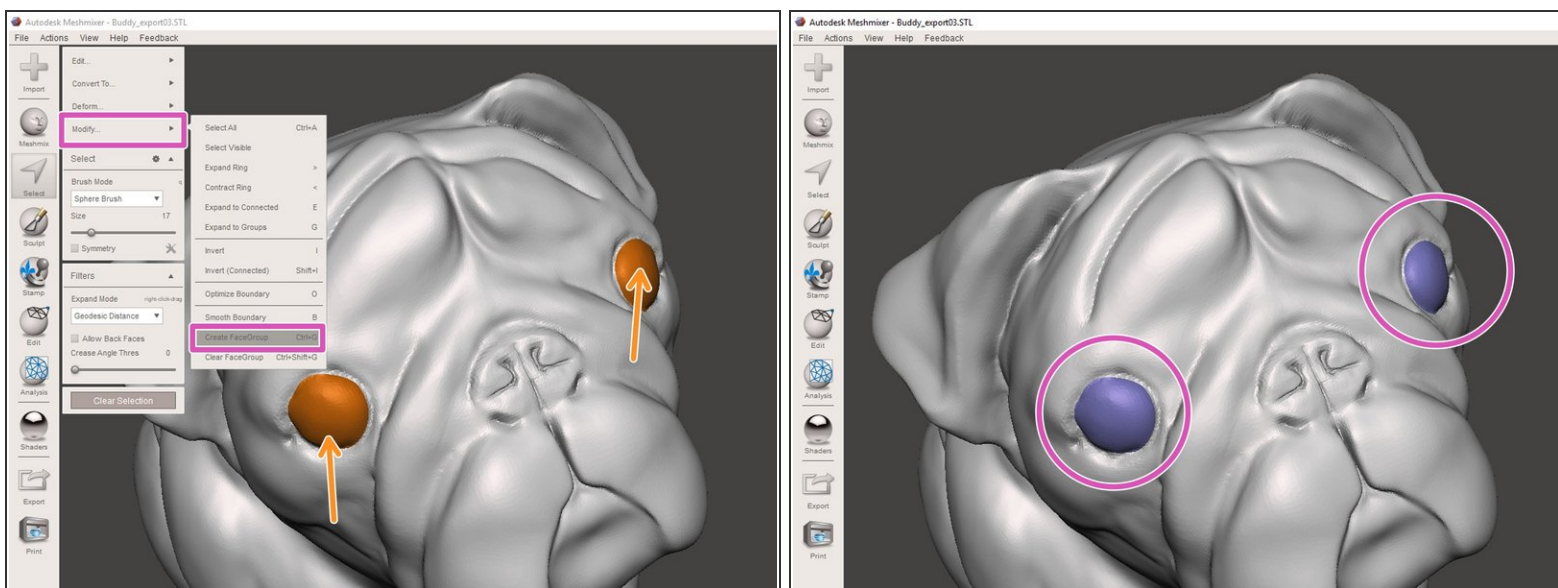
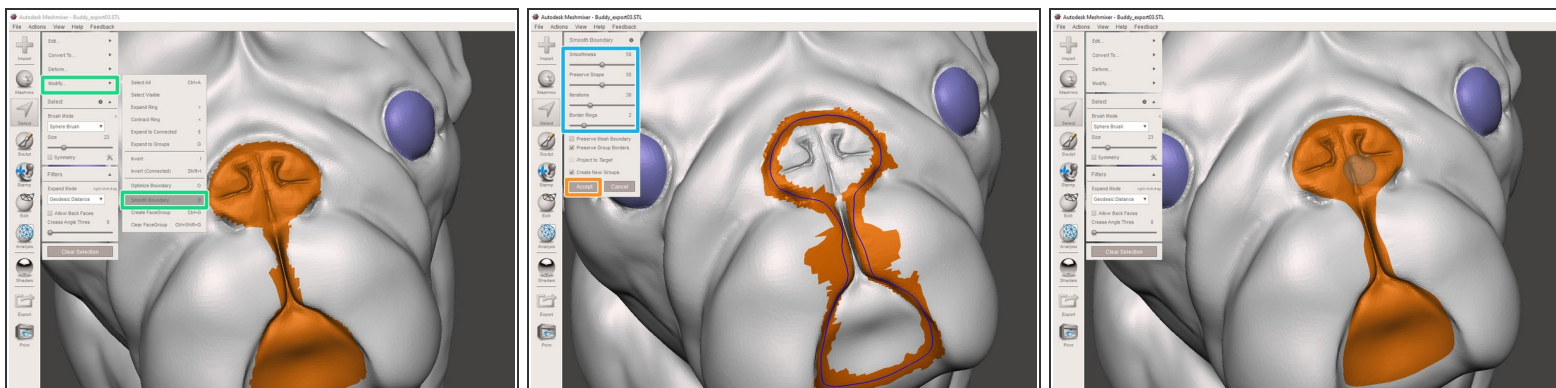- While having eyes area selected go to **Modify** and choose **Create FaceGroup**.

Step 6 — Selecting the muzzle surface

- Continue with selecting the muzzle surface.

- Click on **Select** and adjust the brush **Size**.

- Select the muzzle surface.

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Step 7 — Smoothing of the muzzle part

- Go to **Modify** and select **Smooth Boundary**.

- Adjust smoothing settings.

- **Accept** the changes.

Step 8 — Separation of the muzzle part
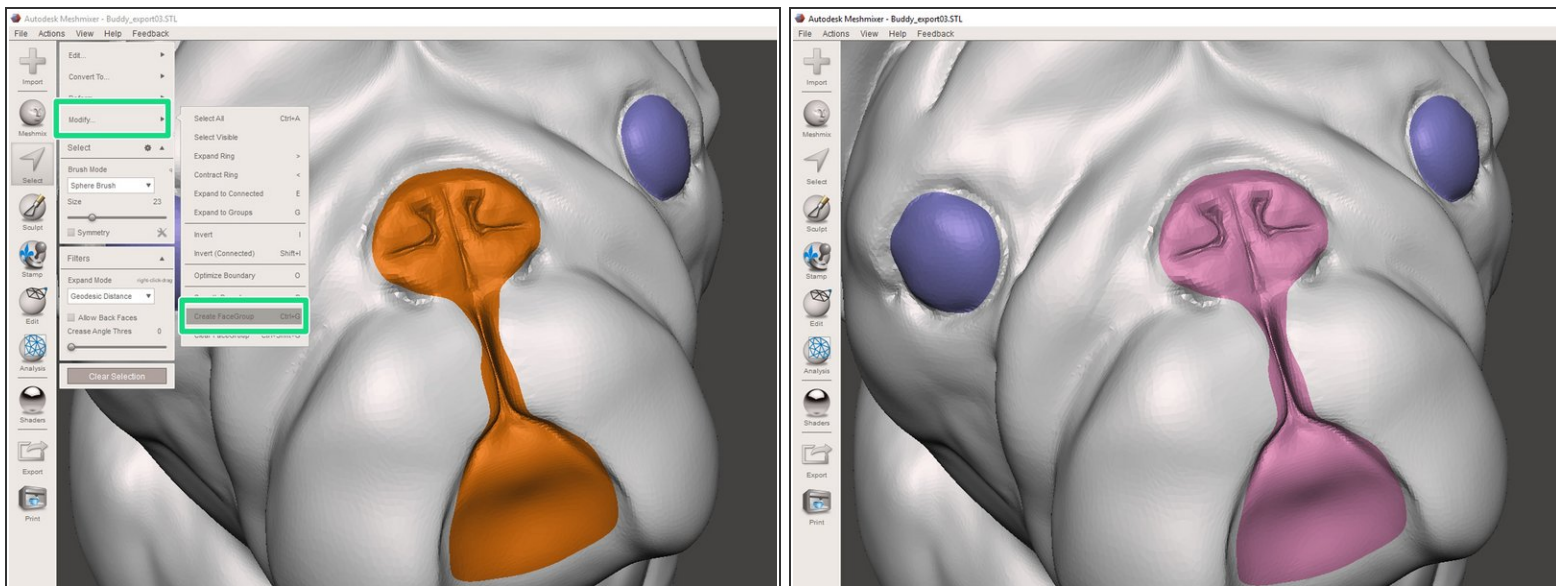
- Keep the muzzle part selected.

- Go to **Modify** and choose **Create FaceGroup**.

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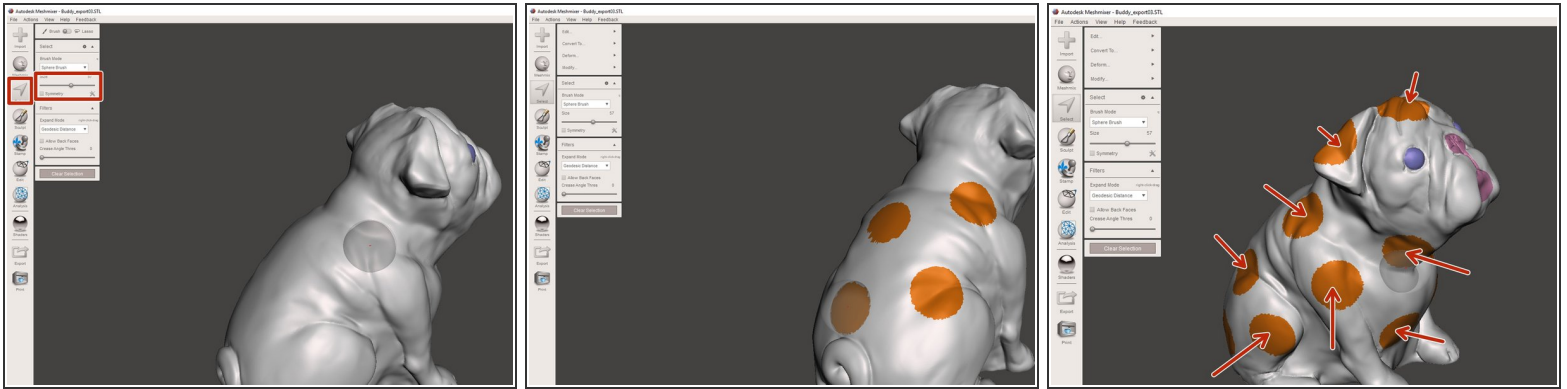
Step 9 — Selecting the dalmatin dots

- Continue with selecting dalmatin dots surfaces.

- Click on **Select**, set the brush **Size** and pick the relevant surfaces.

Step 10 — Smoothing dalmatin dots boundary
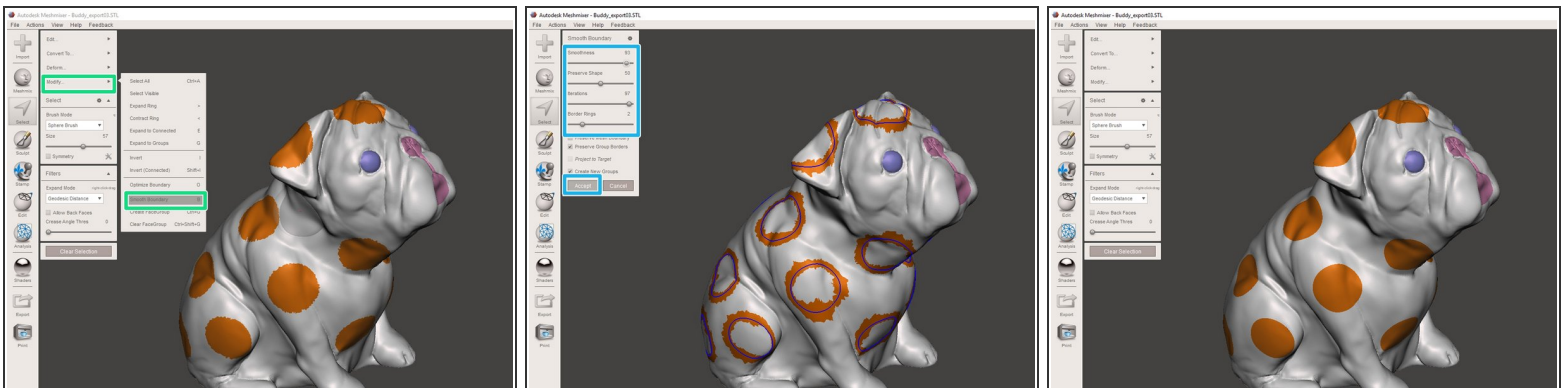
- Go to **Modify** and choose **Smooth Boundary**.

- Adjust boundary options and **Accept** changes.

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Step 11 — Creating dalmatin dots FaceGroup
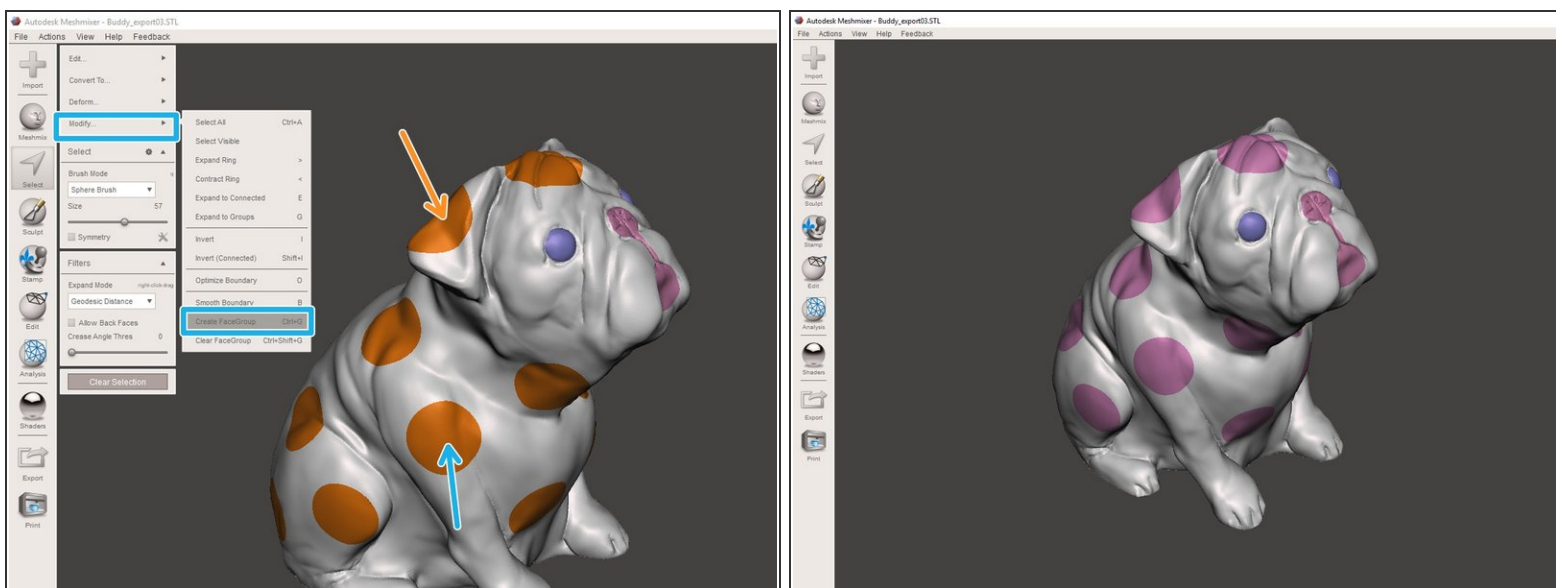
- Keep the surfaces selected.

- Go to **Modify** and choose **Create FaceGroup**.

Step 12 — Generating complex geometry

- Go to **Edit** and choose **Generate Complex**.

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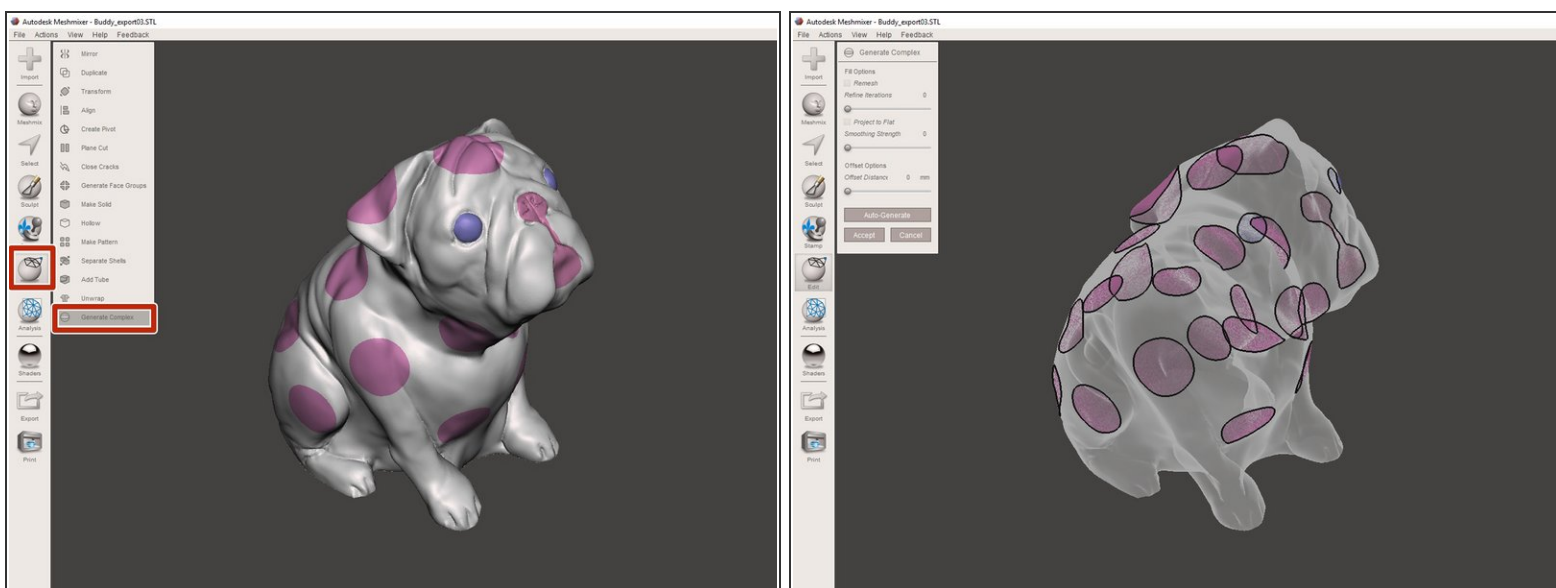
Step 13 — Offsetting the eye geometry

- Double-click on eye geometry.

- Click on the boundary - when the boundary goes red the **Offset Distance** option is enabled. Set the proper offset distance.

- Click on **Accept**.

Step 14 — Offsetting the muzzle geometry
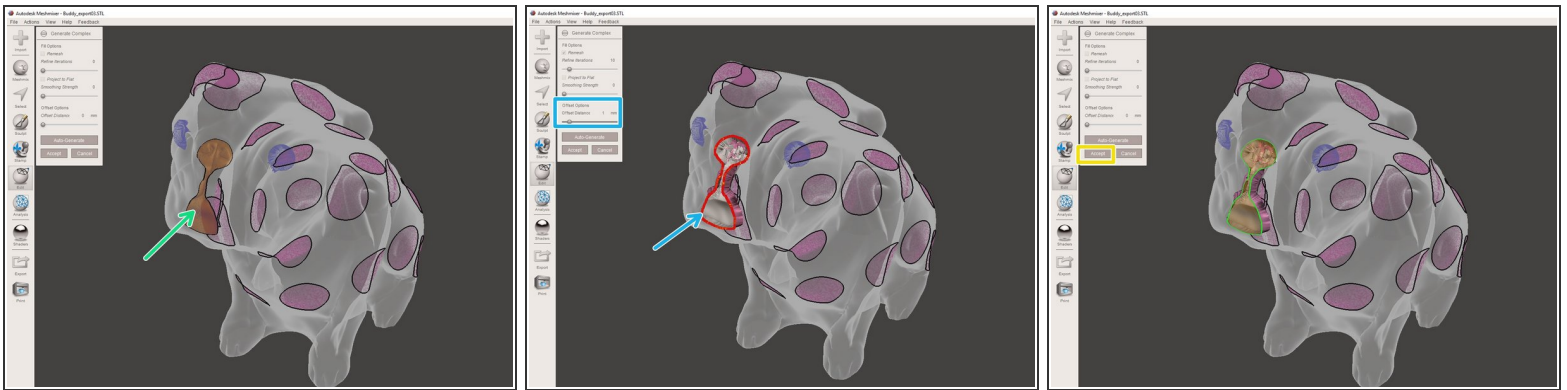
- Go to **Edit** and choose **Generate Complex**.

- Double-click on muzzle geometry.

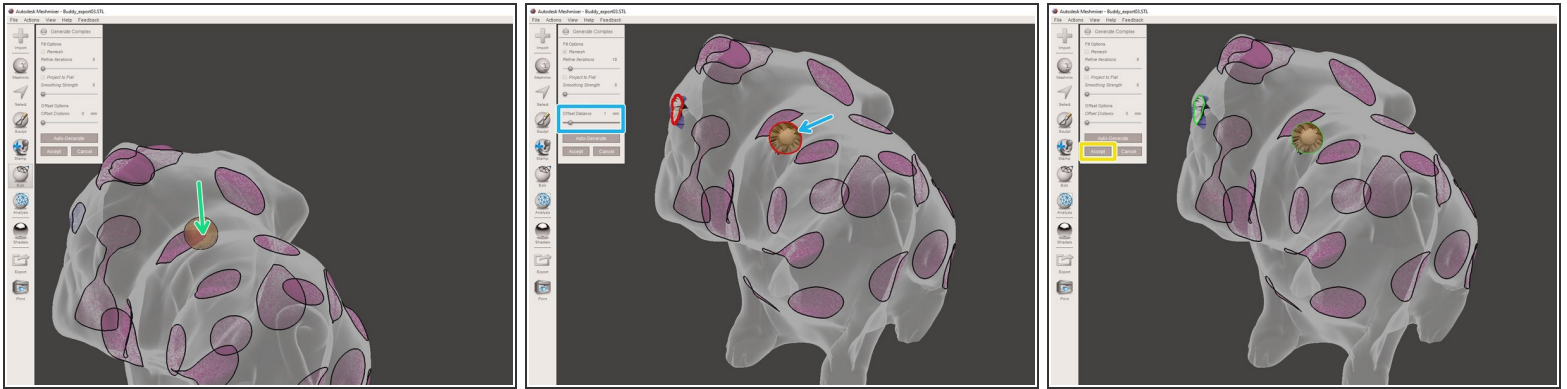- Click on the boundary - when the boundary goes red the **Offset Distance** option is enabled. Set the proper offset distance.

- Click on **Accept**.

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Step 15 — Offsetting the dalmatin dots geometry
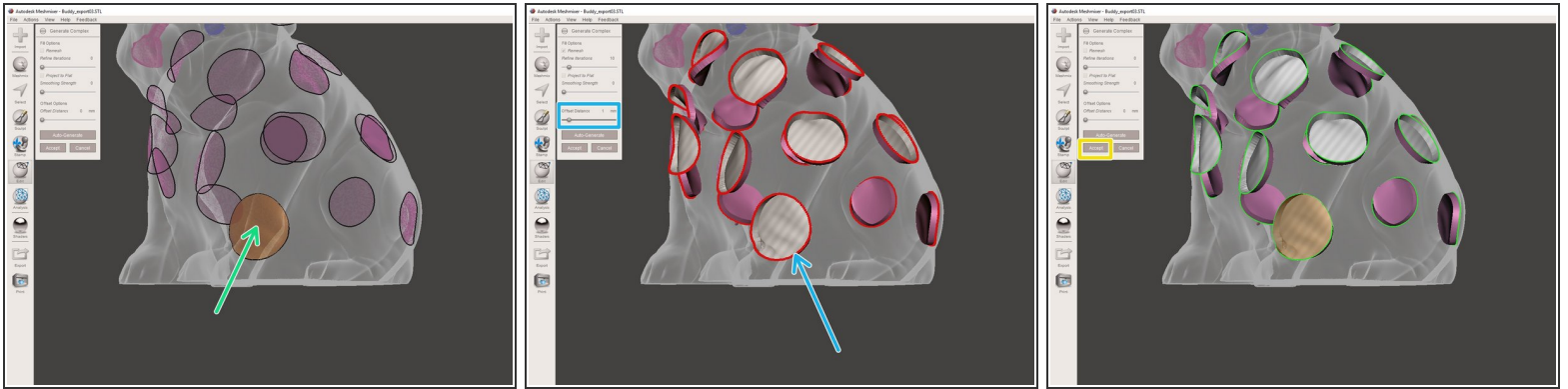

- Go to **Edit** and choose **Generate Complex**.

- Double-click on dots geometry.

- Click on the boundary - when the boundary goes red the **Offset Distance** option is enabled. Set the proper offset distance.

- Click on **Accept**.

Step 16 — Spliting complex geometry
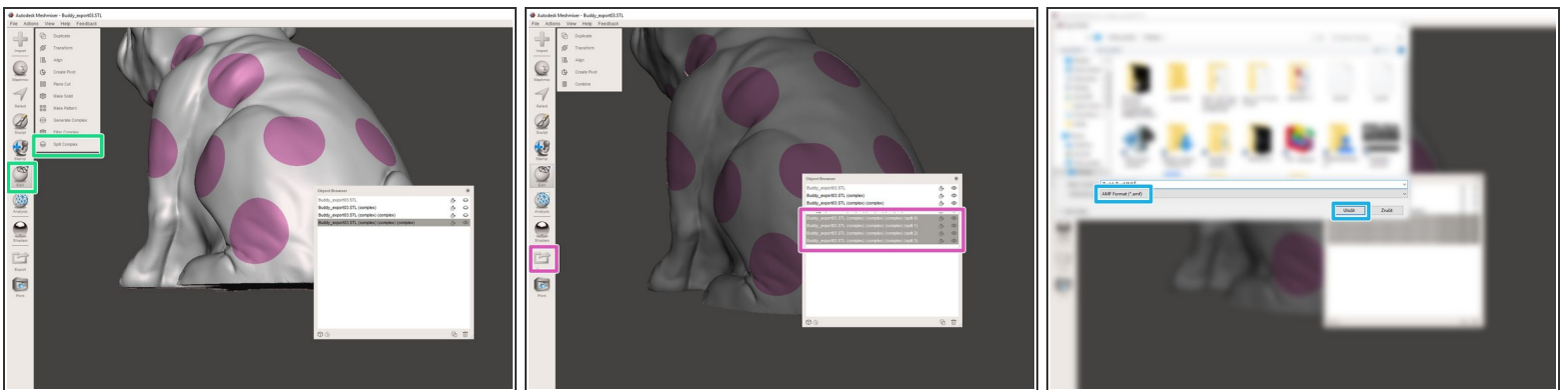
- Stay in **Edit** submenu and choose **Split Complex**.

- This will generate from each FaceGroup separated geometry. New objects will appear in Object Browser. Click on **Export**.

- **Save** the file. The .amf files works just great.

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Step 17 — Loading .amf into Slic3r PE
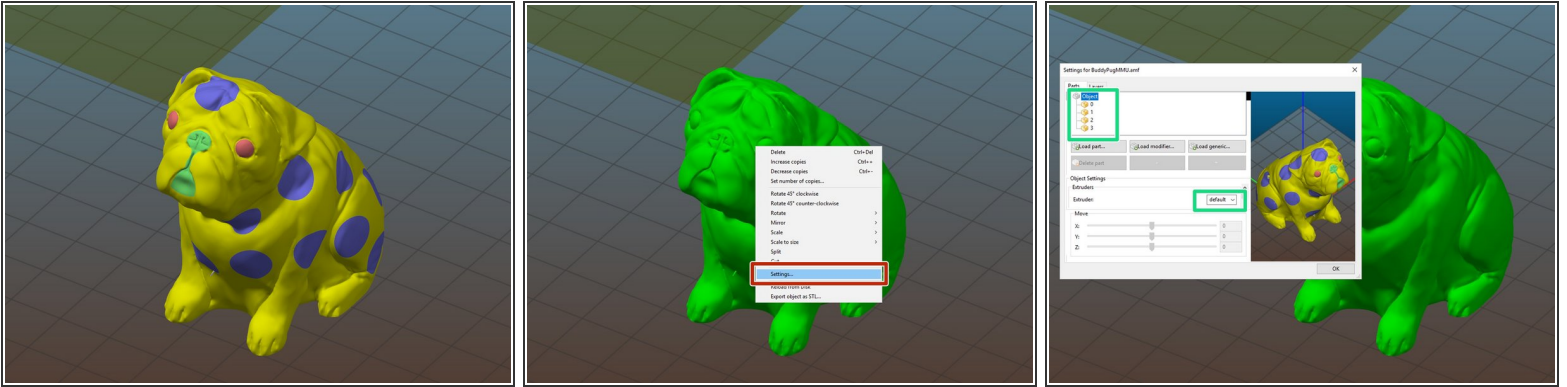
- **Load .amf file into the Slic3r PE.**

- Right-click on the object and choose **Settings**.

- **Assign extruder** to each part. And generate G-code as usual.

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Splitting STL with single compact part

This is the harder option and will probably require multiple tries. Again Autodesk Meshmixer is handy companion.

Written By: Josef Prusa

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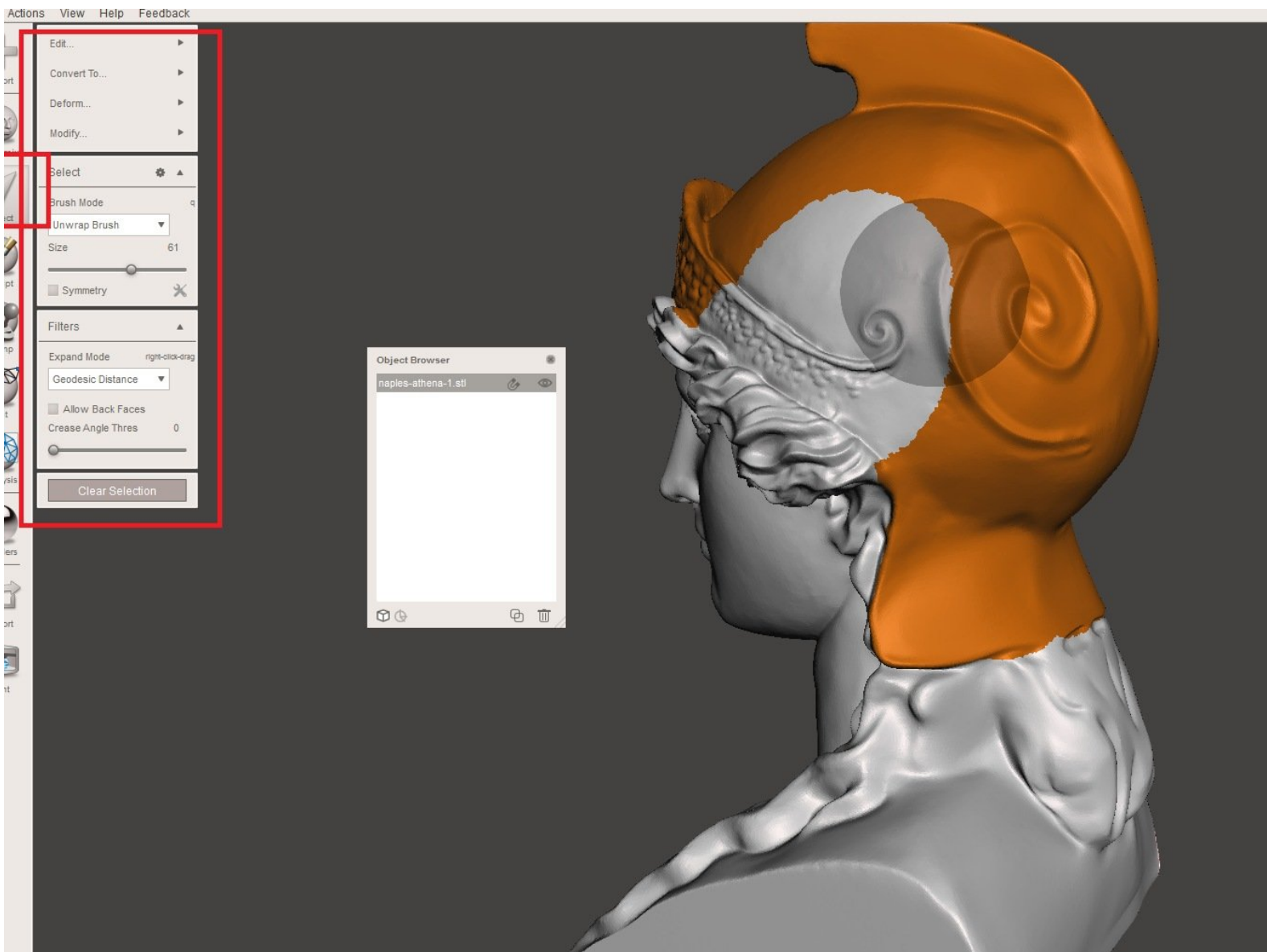
Step 1 — Choose Select tool and paint the area you want to separate.
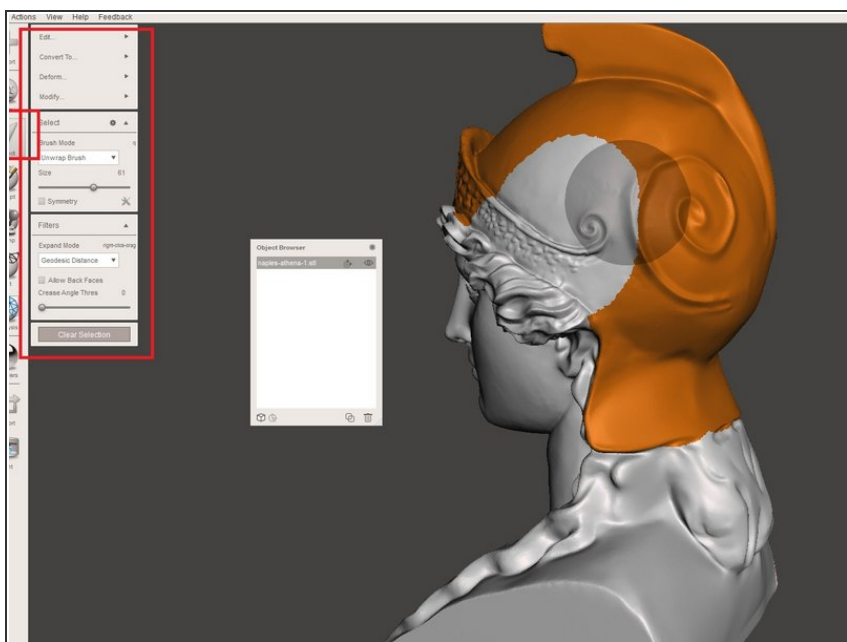
- In our case the helmet. (Note: Do not double click that would select whole part)

- ⓘ Software used in this tutorial is Autodesk Meshmixer, you can download it here: http://www.meshmixer.com

Step 2 — Use Edit -> Separate to separate the shells
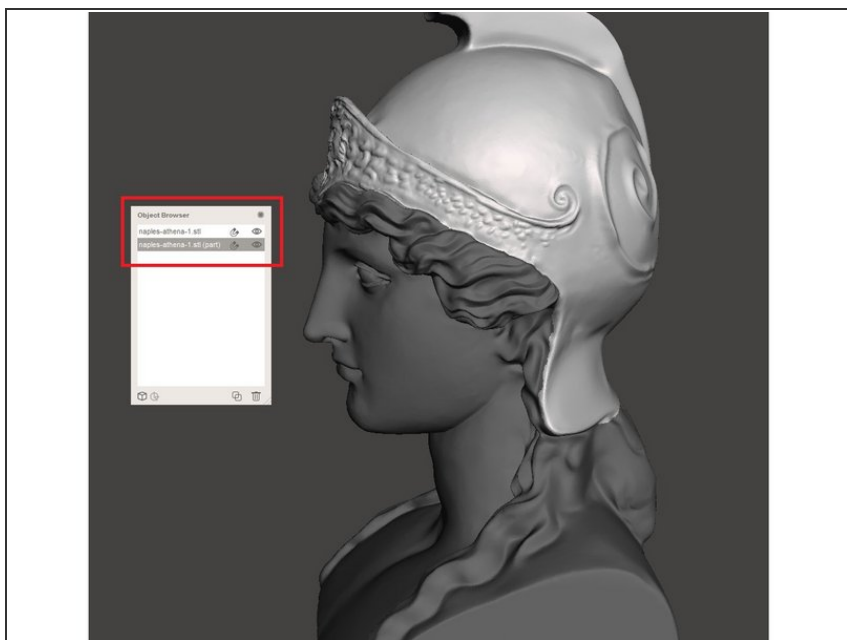
- Y as keyboard shortcut.

- You have now separated the shells, light grey is selected active body(ies), dark grey is unselected body.

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Step 3 — Hide dark grey body by clicking the eye icon in the Object Browser
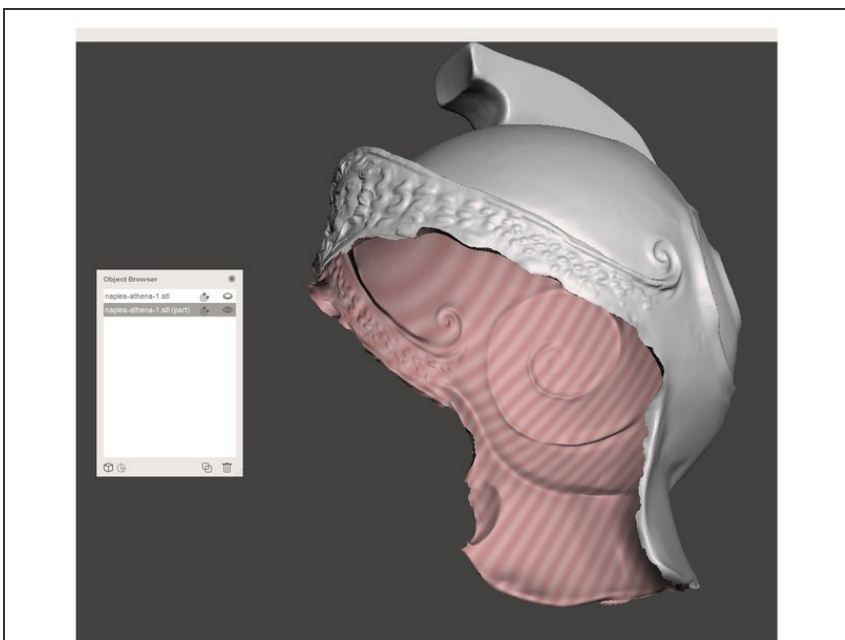
- Pink lines means object is non-manifold and needs to be closed.

Step 4 — Click Analysis, Inspector and Auto repair all
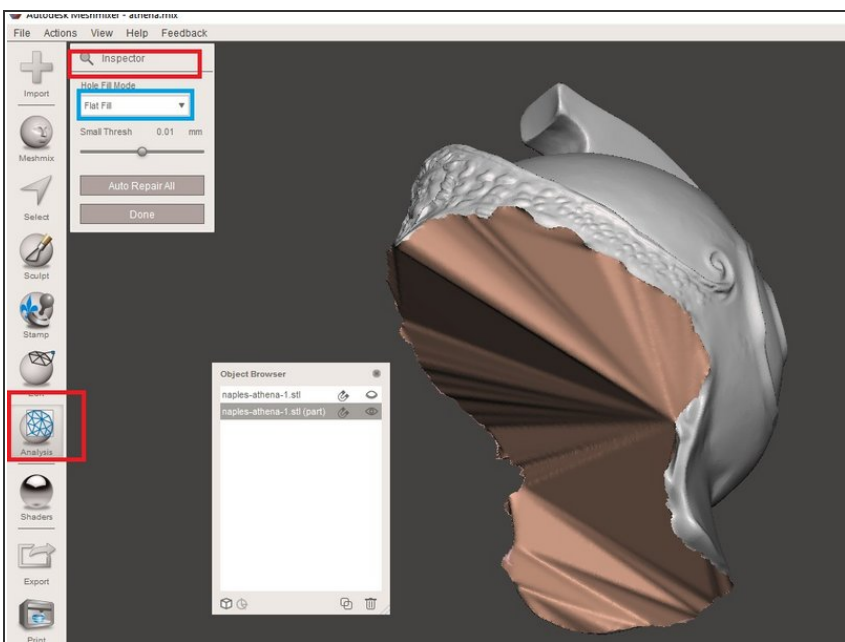
- Meshmixer will try to close the object.

- You can try other types of hole fill mode other than Flat Fill, depending on result.

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Step 5 — Close hole on the other object as well
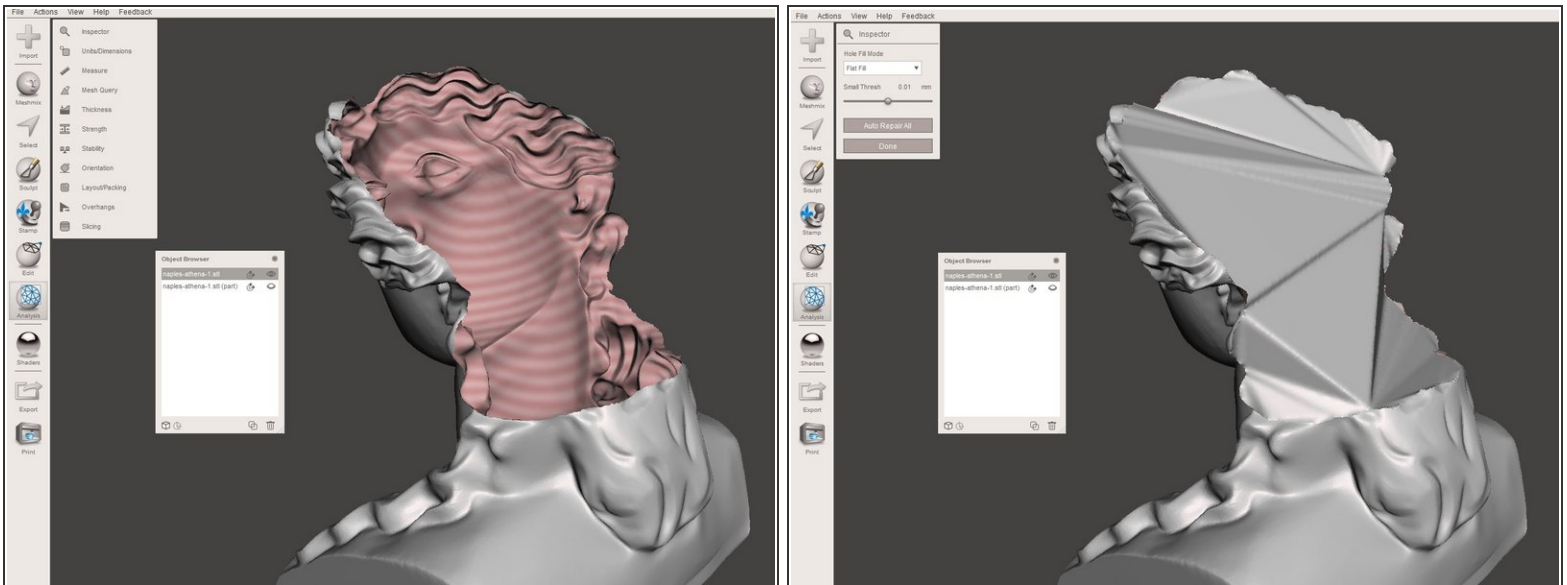
- Use the same type or repair for both shells.

Step 6 — You can now export both parts

- Use binary STL format

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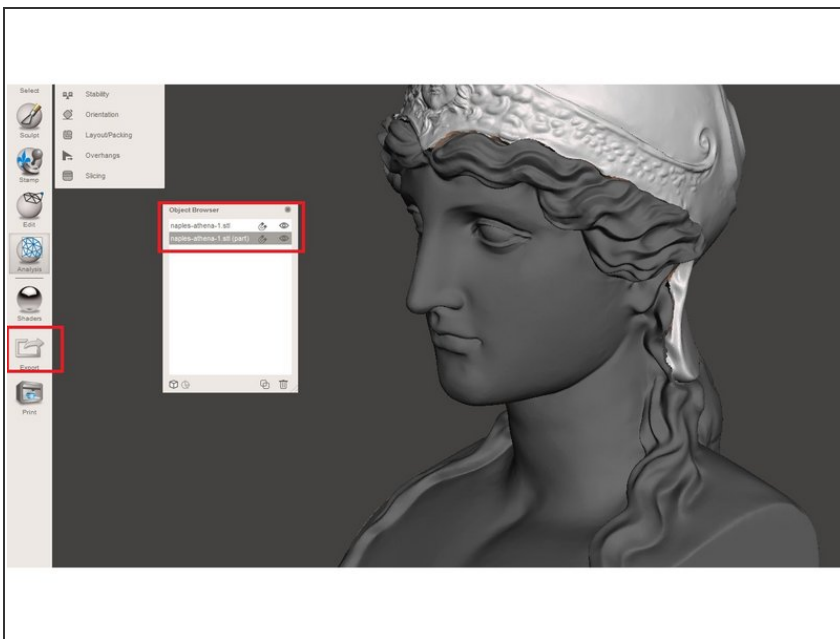
Step 7 — Open files in Slic3r
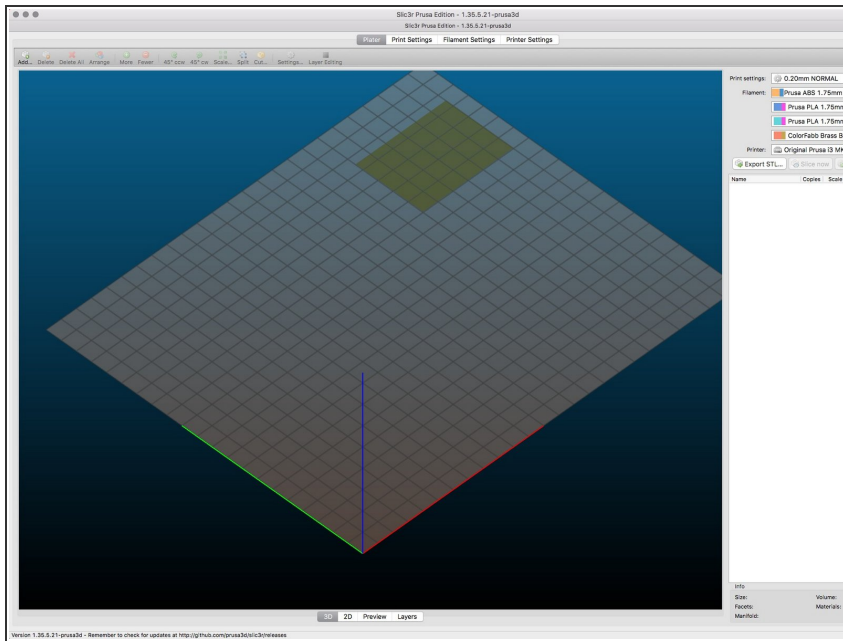
- Continue by opening this model in Slic3r Prusa Edition. Please follow this guide [Gcode preparation for Multi Material v2.0](#).

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Gcode preparation for Multi Material v2.0

Written By: Jakub Dolezal

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Step 1 — How to generate and print Original Prusa i3 MK2 Multi Material
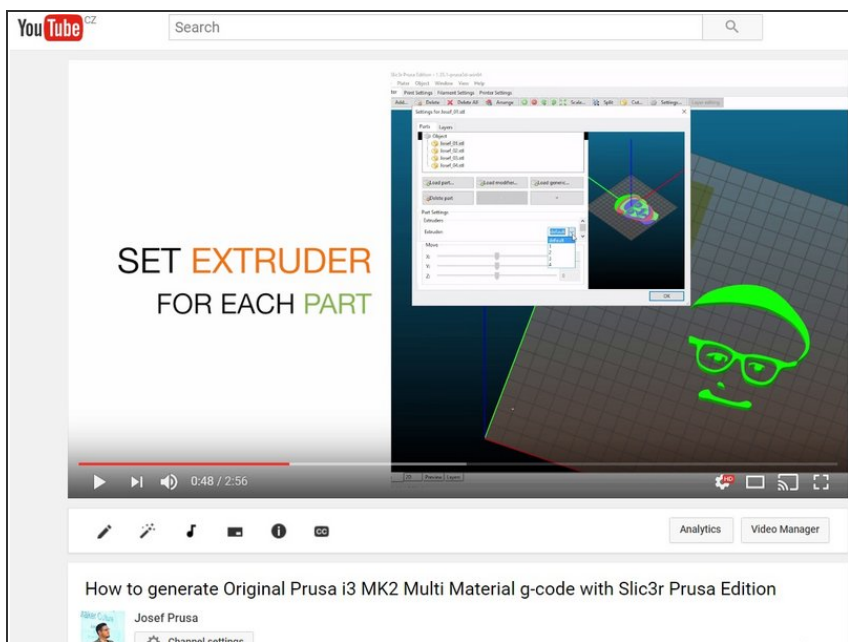
- **To generate Multi Material G-code, you can:**

- Watch a YouTube video http://www.prusa3d.com/mmuvideo

- Or follow this guide. The approach is the same.

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Step 2 — Download the latest drivers

- **We recommend to have installed always the latest release of Prusa drivers** , you can download them here: http://www.prusa3d.com/drivers

- After you finish the installation, run **Slic3r Prusa Edition**.

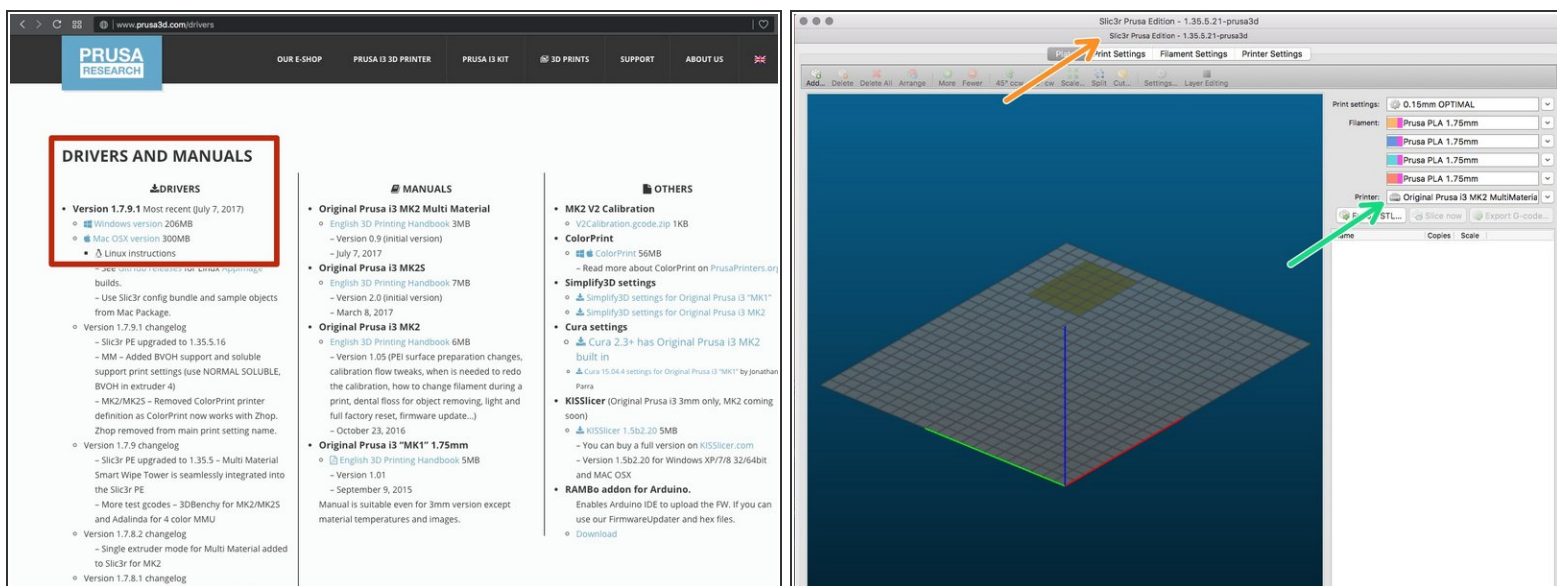- Ensure you have selected the proper settings for Multi Material print. You need to select **Original Prusa i3 MK2 Multi Material** printer.

- (i) This guide is based on drivers - version 1.7.9.1 (Slic3r PE 1.35.5.21).

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Step 3 — Add the first part of the object (.stl)
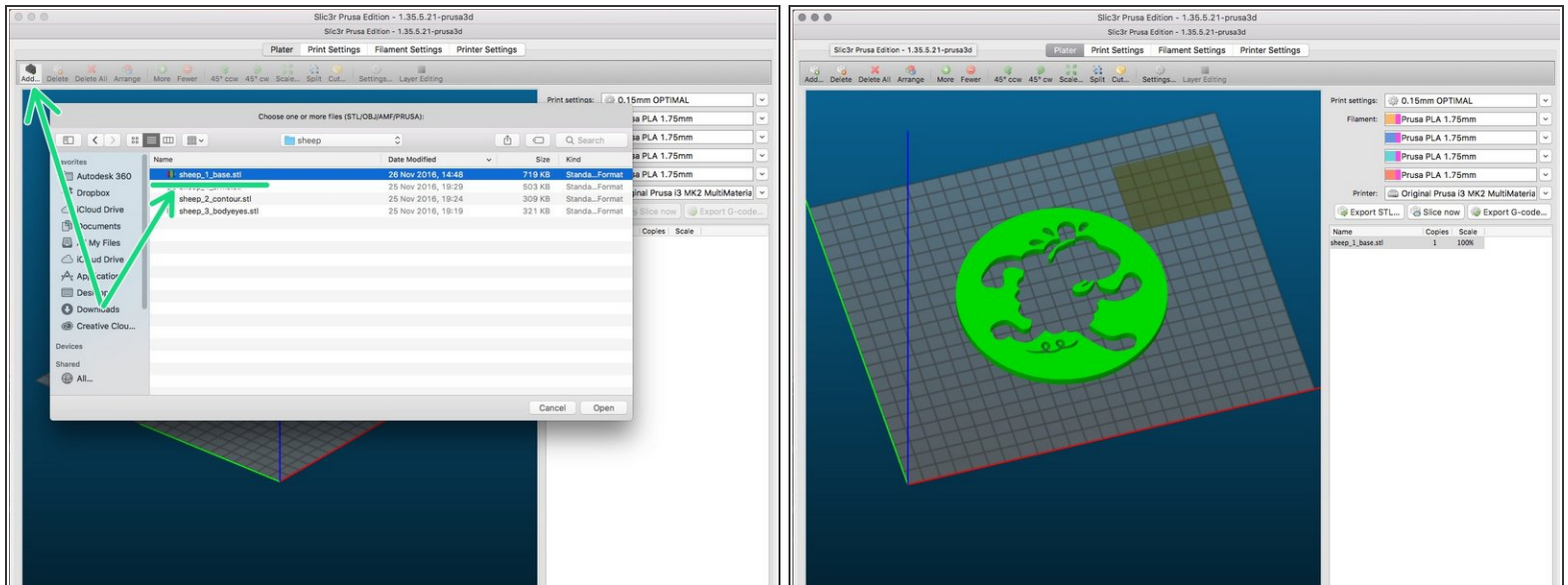
- Prepare your model separated in multiple .stl files, if you don't have it yet, please visit our guide: Export model from Fusion 360

- Load the first .stl file part by clicking on the button **Add**, you can also Drag&Drop the file into Slic3r PE.

⚠ The remaining parts (.stl files) must be added in a different way!!! Please see the next step.

ⓘ Sample model used in this guide 3D modelled by Roman Tyr.

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Step 4 — Loading the remaining parts of the object (.stl)
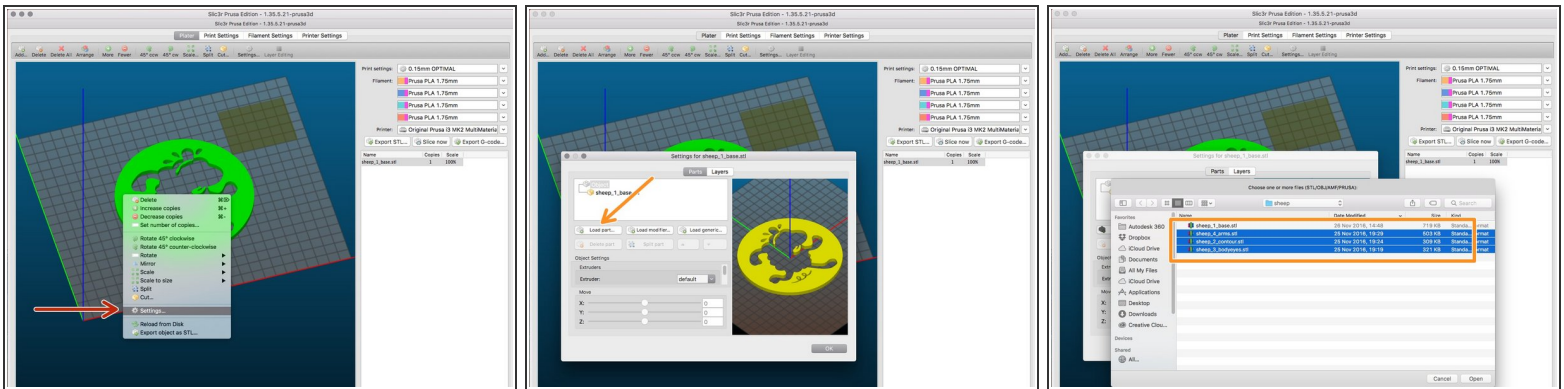
- Right-click on the object and select **Settings** from the context menu.

- Pop-up dialogue for adding additional parts of the model will appear.

- Use the button **Load** to add all parts of the object.
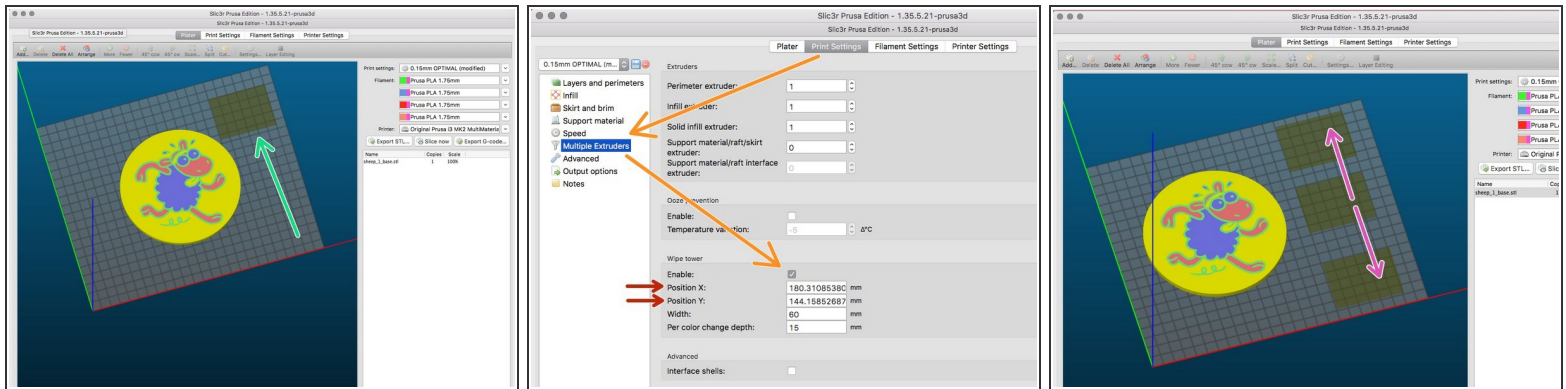
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Step 5 — Assign extruders
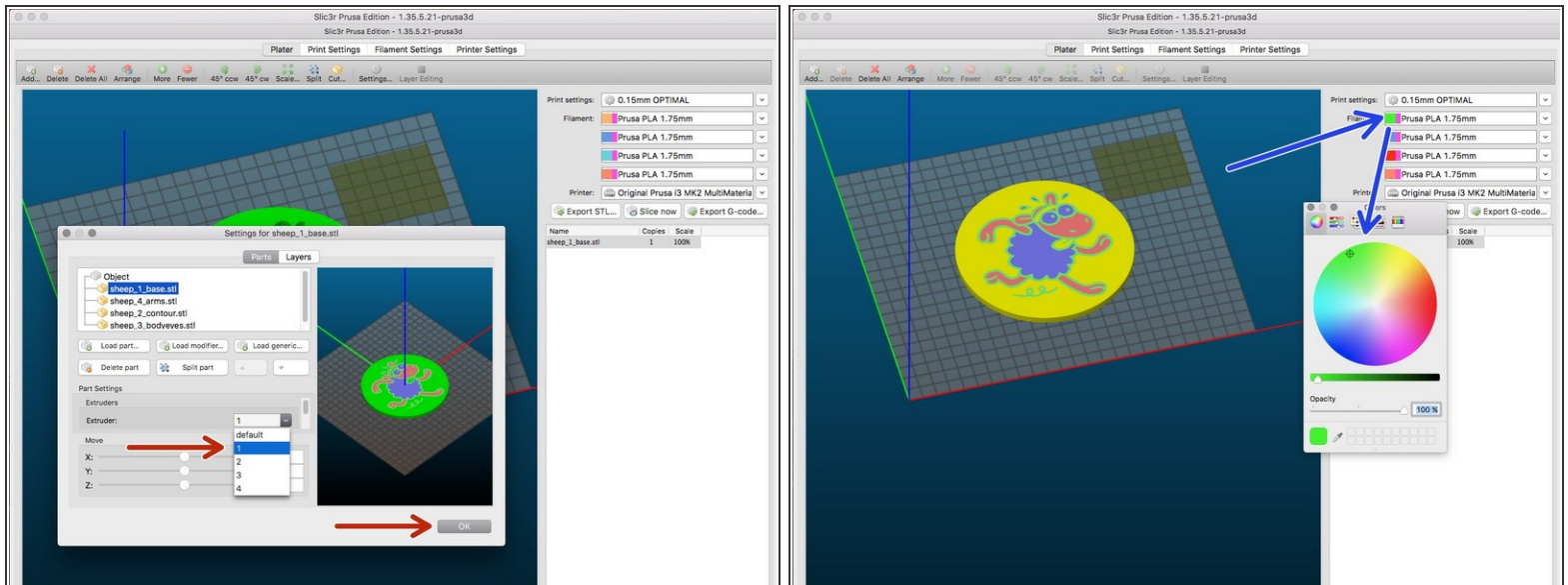
- Assign an extruder for each part of the object. Click **OK** when all parts are assigned.

- You can assign a colour for each extruder to preview the final look. Double-click on the left part of each Filament field a colour palette will appear.

- (i) Note the colour preview will be available in the tab **Preview** only after you slice the model by **Slice now**.

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Step 6 — Position the Wipe tower

- ● Ensure the **Wipe tower** is enabled.

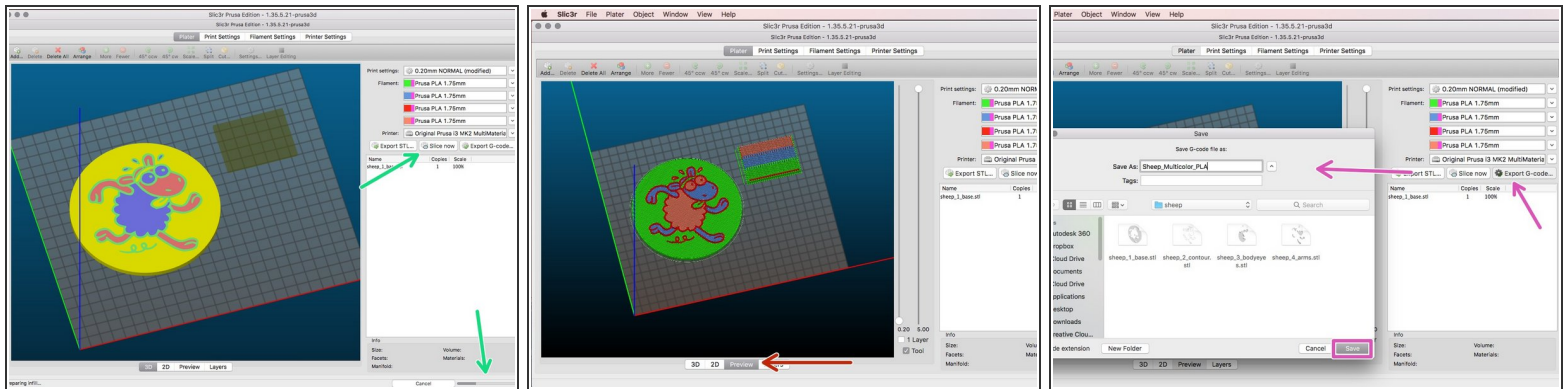- ● If you can't see the Wipe tower in the 3D view, open **Print settings** and click on **Multiple Extruders** and select **Enable**.

- ● You can adjust tower's position by:
  - ● Changing values of Position X and Position Y.
  - ● Using left-click and dragging the tower across the heatbed.

⚠ Ensure the Wipe tower **ISN'T COLLIDING** with the printed object!!!

- ● **Experienced users** can also experiment with the size of the tower by changing **Width** and **Per colour change depth**.

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Step 7 — Print settings and Filament
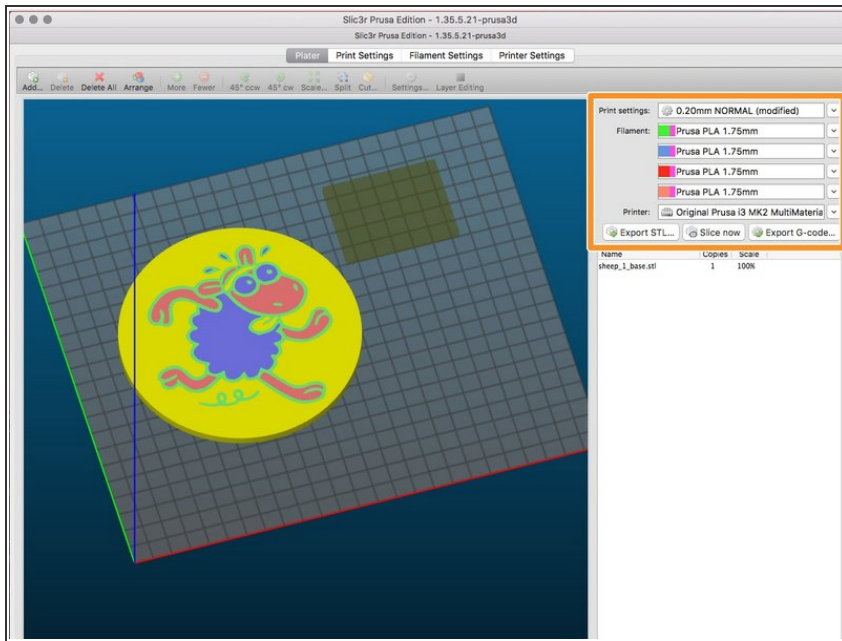
- Before you proceed to slicing, please select the **Print settings** (layer height) and your **Filaments** (material).

- For the latest list of supported materials and print quality please always read our Multi Material Handbook: http://www.prusa3d.com/downloads/manual/...

- (i) Slic3r PE offers many more settings to be changed. You can leave the recommended values or adjust them. However, this is for **experienced users**.

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Step 8 — Slice, export and print!

- **We are almost done, now just:**

- Press **Slice now** and wait until slicing is complete.

- Check your print including Wipe tower in the **Preview** tab.

- When you feel satisfied with the Preview, click on **Export G-code** and name your new model.

- Your file is ready! Happy printing!

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