PRUSA RESEARCH by JOSEF PRUSA

1. Introduction

Written By: Jakub Dolezal

TOOLS:

- Allen key 2.5 mm (1)
- Allen key 2.0 mm (1)
- Allen key 1.5 mm (1)
- Needle-nose pliers (1)

PARTS:

- Original Prusa i3 MK2/S to MK2.5 upgrade kit (1)

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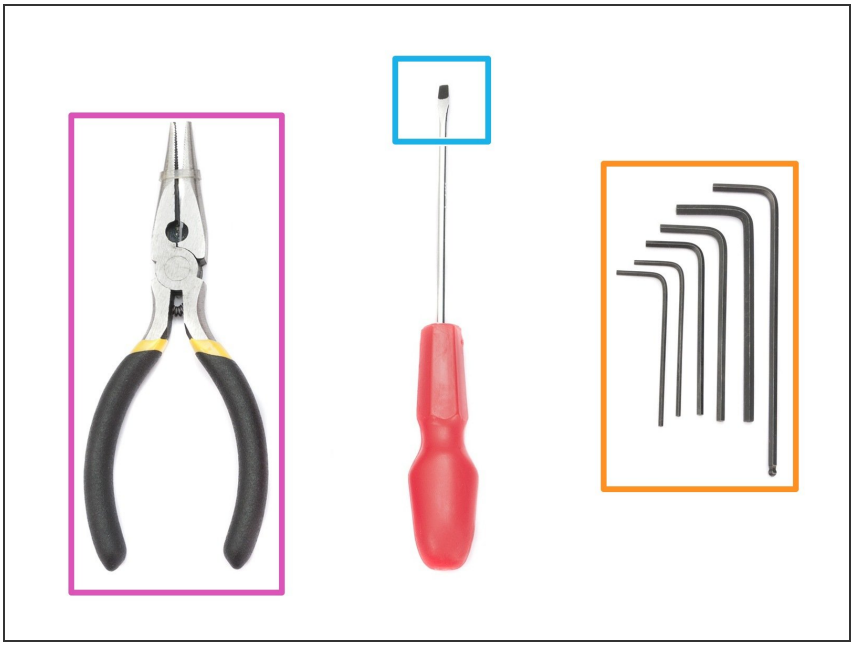
Step 1 — Preparing MK2.5 upgrade kit

- Welcome to the tutorial how to upgrade your Original Prusa i3 **MK2S** to Original Prusa i3 **MK2.5**
- Please prepare MK2.5 upgrade kit received from Prusa Research.

ⓘ This manual is describing upgrade from Original Prusa i3 MK2S to MK2.5. In case you have older version MK2, we strongly recommend upgrading to MK2S first.

Step 2 — Getting the necessary tools

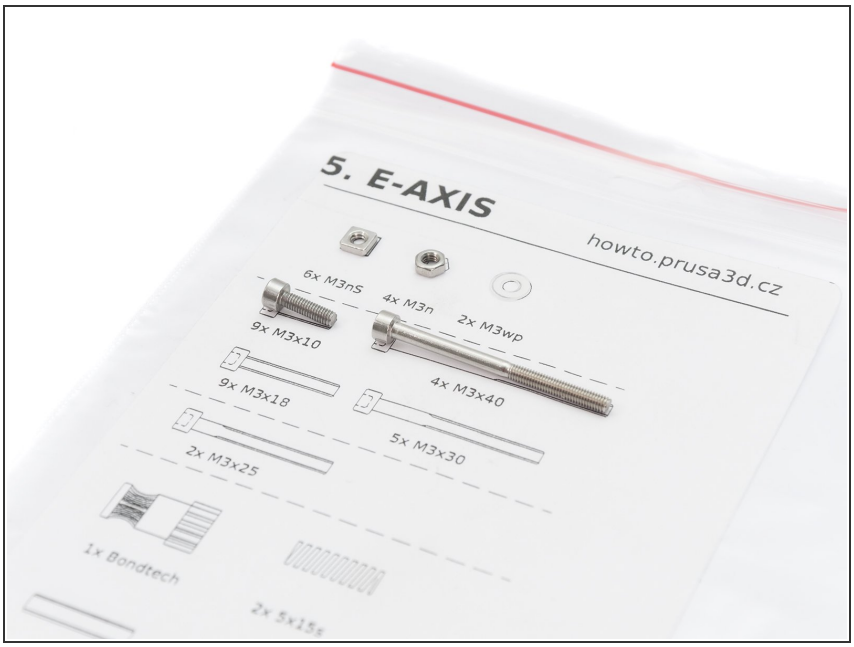


- For the MK2.5 upgrade you will need:
- Needle-nose pliers (1x)
- Allen key 2.5 mm
- Allen key 2.0 mm
- Allen key 1.5 mm
- Slotted screwdriver for the belt insertion

ⓘ No soldering is required.

ⓘ No wire crimping is required.

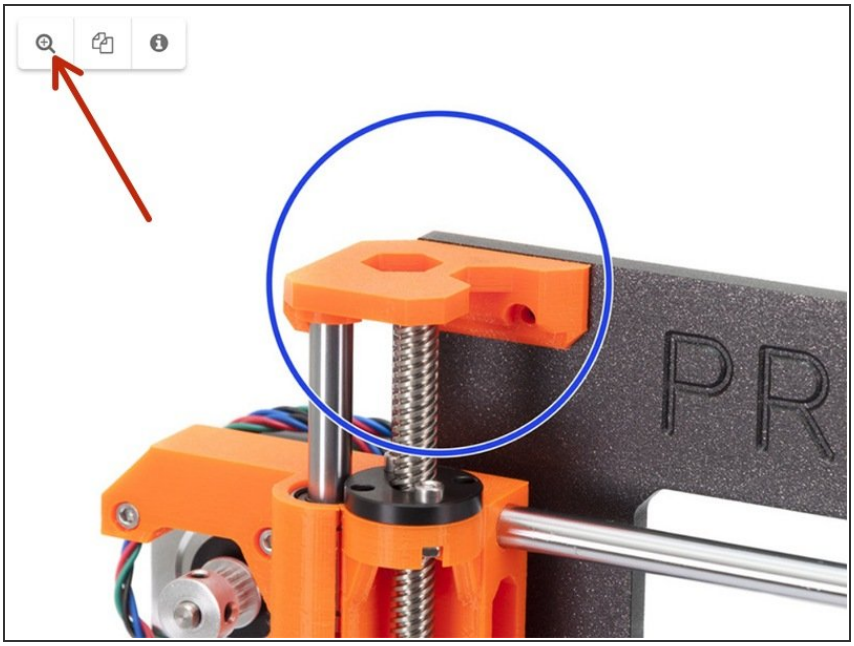
Step 3 — Use labels for reference



Most of the labels are scaled 1:1 and can be used to identify the part :-)

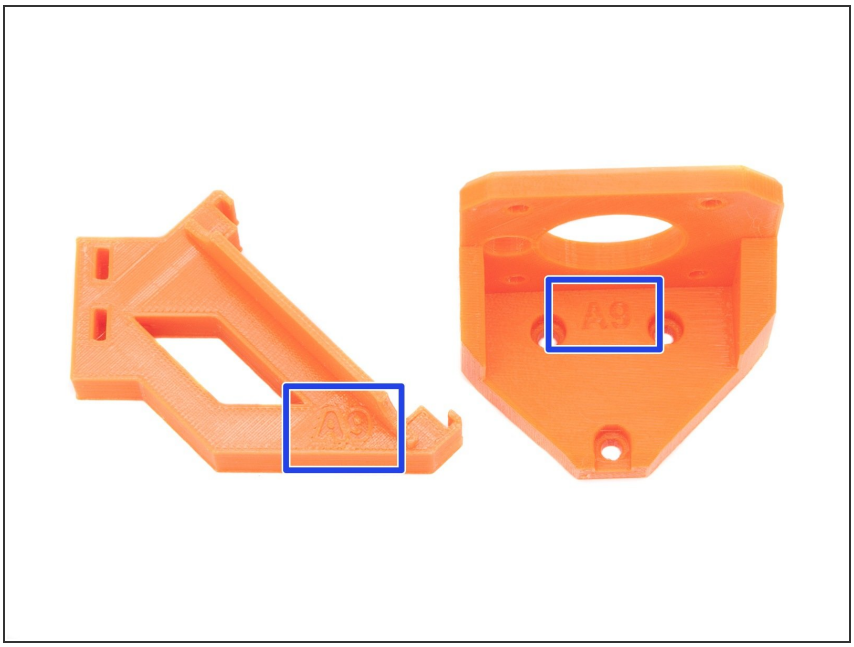
Label on the picture is used as an example, yours might be different.

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

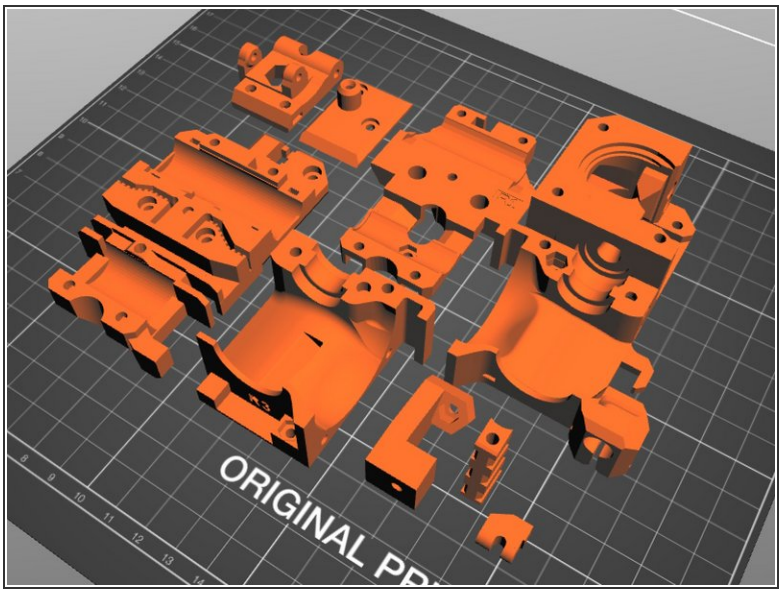


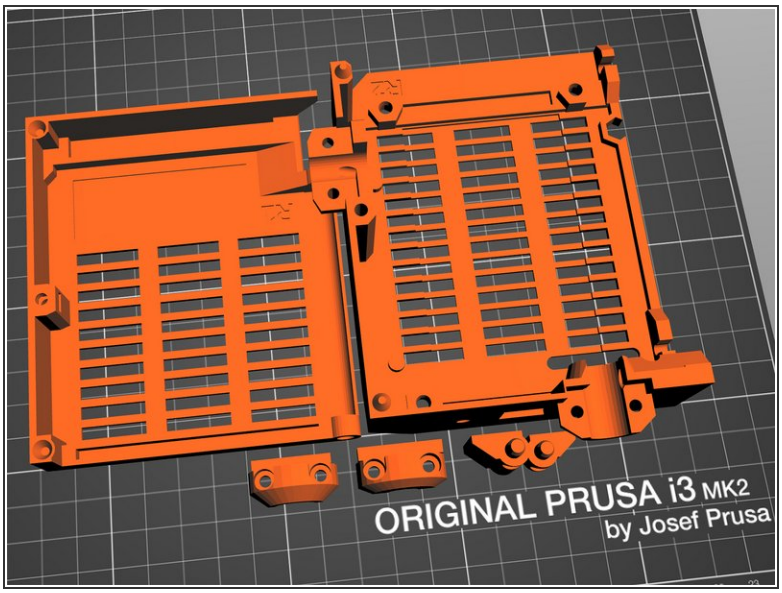
- Original Prusa i3 MK2.5 has most of the 3D printed parts marked with their version.

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 might be different.

Step 6 — Printed parts - using included filament





⚠ There is a **new design of the extruder** parts **R3**, make sure you print the correct design!!!

⚠ **Before we start disassembly, you need to print all your parts. For the MK2.5 there are two bundles to print:**

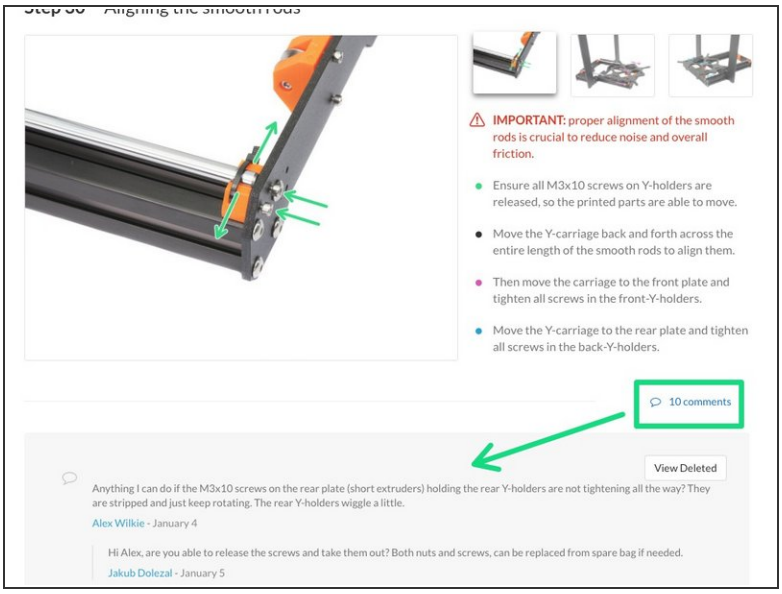
- **Extruder bundle**: entire extruder was redesigned to bring advanced features of the Original Prusa i3 MK3 to your MK2.5. **These parts must be printed in black color** because of the sensitivity of the filament sensor.
- **RAMBo cover bundle**: the casing for the RAMBo board is redesigned for easier assembly and better cable protection.
- All parts must be printed from PETG or similar material (ABS, etc.). G-codes are available on our website: prusa3d.com/prusa-i3-printable-parts

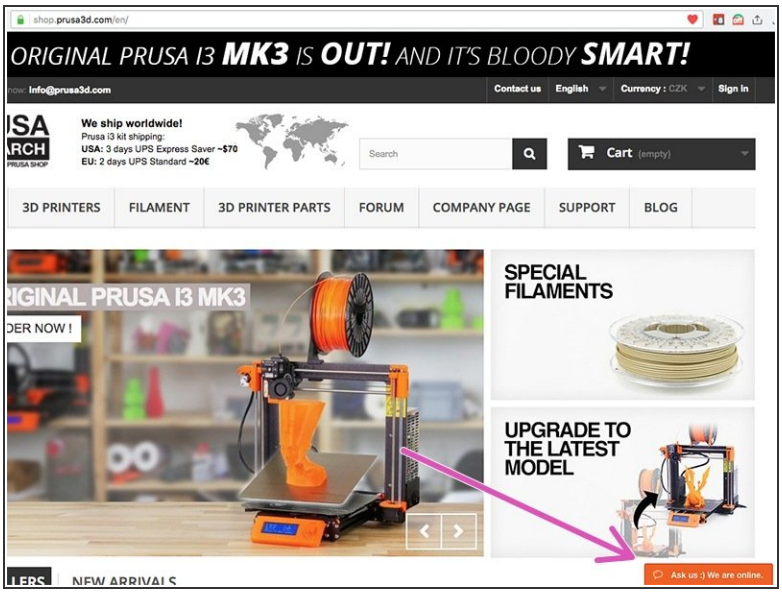
ⓘ For printing individual parts it is recommended to use Slic3r PE or PrusaControl with 0.2 mm layer height, GRID infill at 20%, no supports!

ⓘ Fan-nozzle must be printed from ABS only!!! This part is included in the upgrade package.

ⓘ The pictures might not include all the parts. Please use the official G-codes or parts list from the GitHub.

Step 7 — We are here for you!



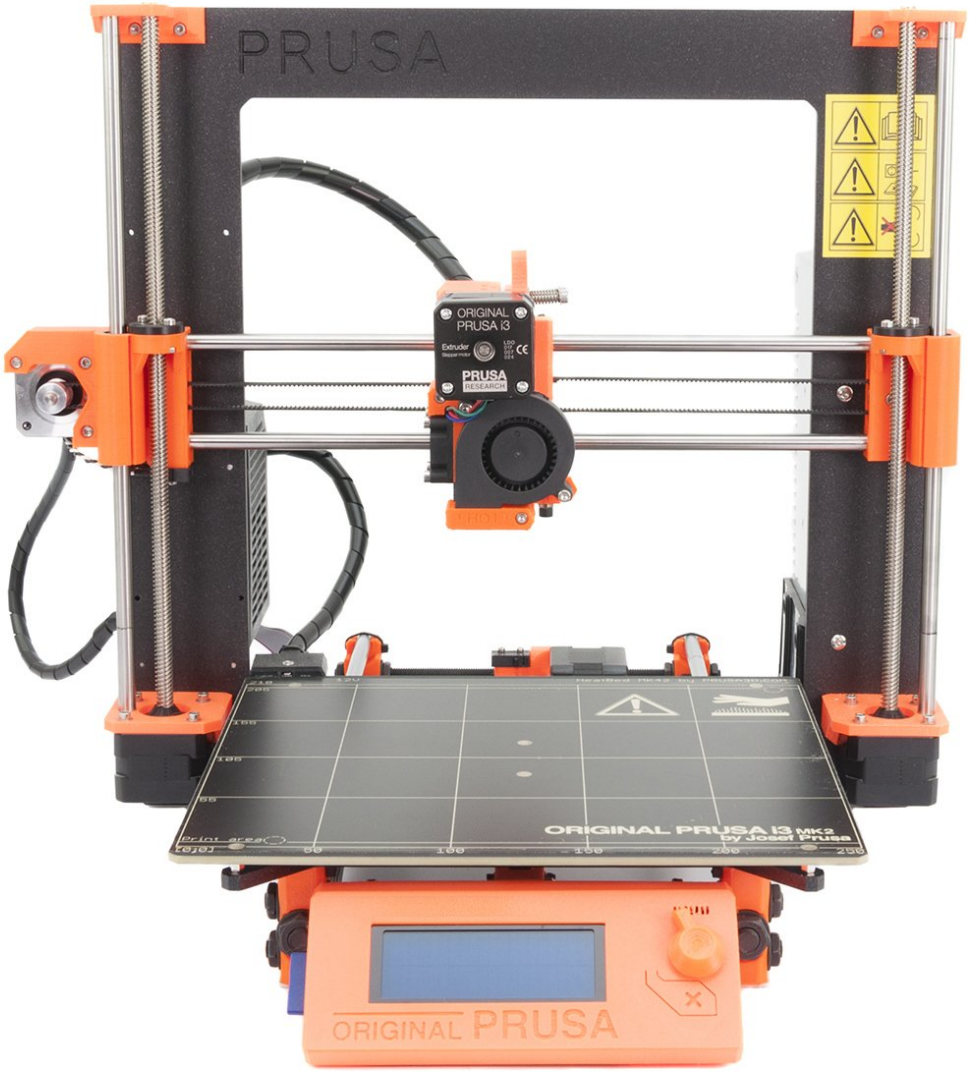


- Lost in the instructions, missing screw or cracked printed part? **Let us know!**
- You can contact us using following channels:
  - Using comments under each step.
  - Using our 24/7 live chat at shop.prusa3d.com
  - Writing an email to info@prusa3d.com
- Let's start with upgrade in the next chapter - 2. Disassembly

PRUSA RESEARCH by JOSEF PRUSA

2. Disassembly

Written By: Jakub Dolezal



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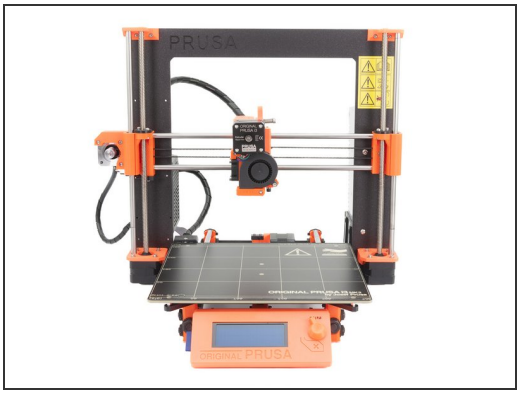
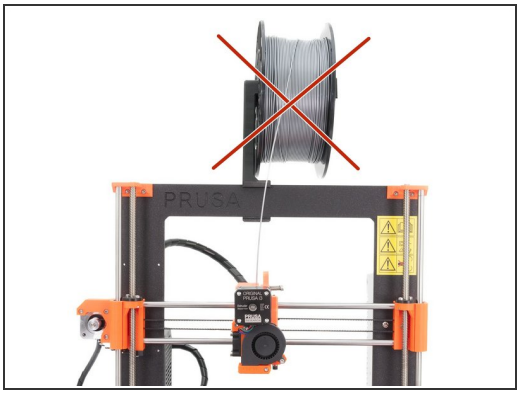
Step 1 — Preparing the printer





⚠ Make sure the filament is unloaded from the hotend and the printer is unplugged! Don't turn the printer off until it cools down, or you might experience filament jams in the future!

- Prepare tools included in the MK2S kit or get similar from the nearest hardware shop.
- Recommended hex sizes are: 2.5 mm, 2.0 mm and 1.5 (1.0) mm

ⓘ We strongly recommend getting a box or bowl for nuts and screws. You will need some of them later during assembly.

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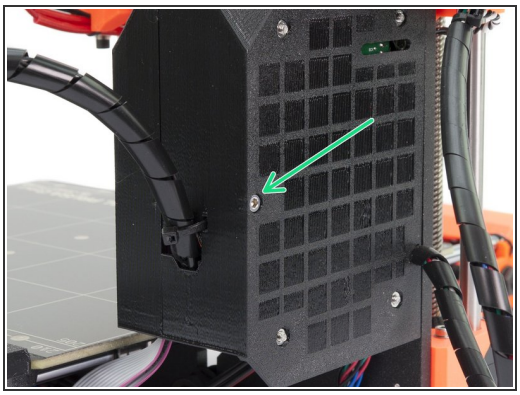
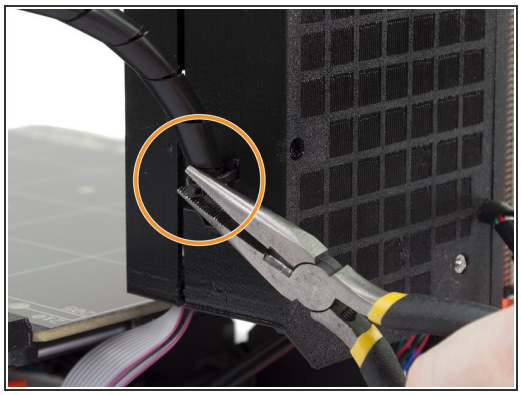
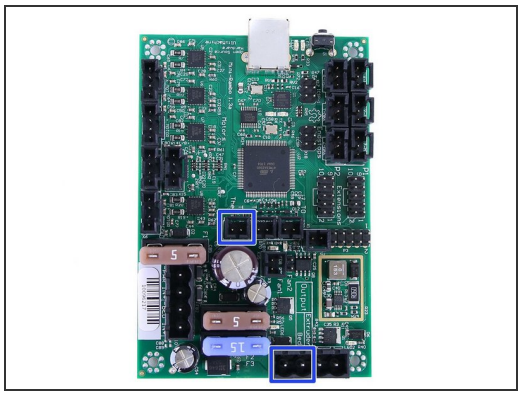
Step 2 — Y-axis: Heatbed disassembly (Part 1)

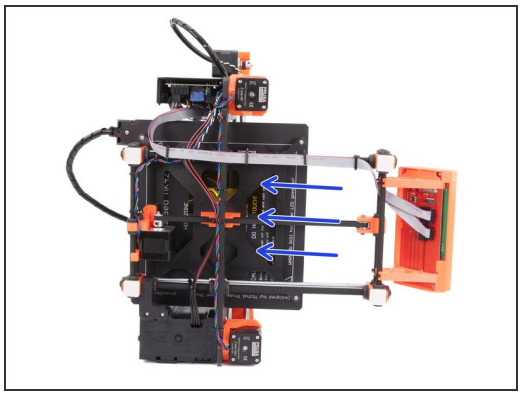
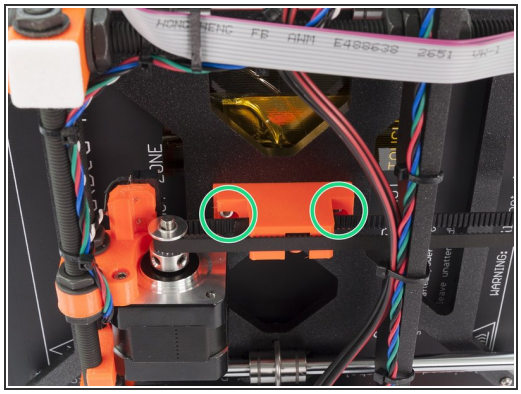
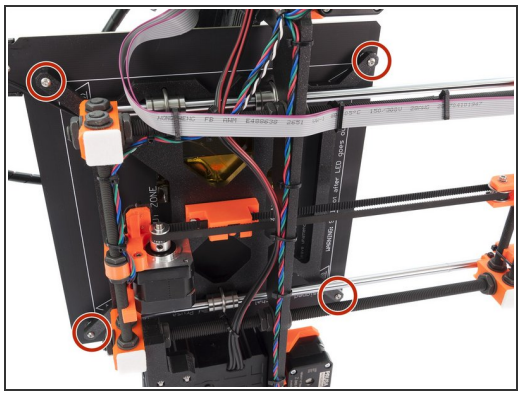
⚠ Ensure again the printer is not connected to the power outlet, otherwise, there is a risk of damage to the electronics!

- Turn left part of the printer with the RAMBo cover towards you. Release the M3x40 screw using a 2.5mm Allen key.
- Using pliers, cut the zip tie holding the cables from heatbed. Proceed carefully, you can break the cables.
- Unwrap at least two turns of the spiral wrap and follow the cables inside RAMBo cover, locate the connectors and unplug them. Unplug the connectors, **DO NOT PULL** the cables!

ⓘ Note there is a safety pin on the heatbed thermistor connector, you need to press it before you can unplug the cable.

- Remove all cables, spiral wrap and the nylon filament from the RAMBo cover.

Step 3 — Y-axis: Heatbed disassembly (Part 2)

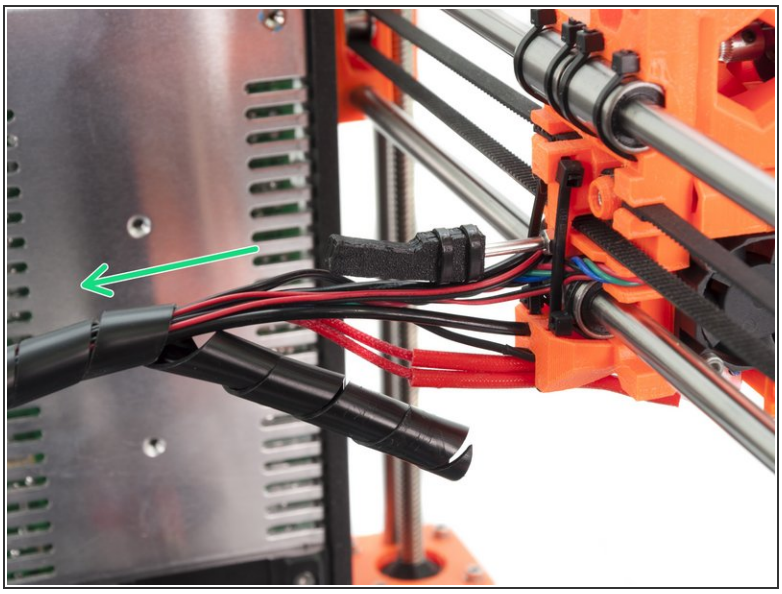
- Lay the printer on the PSU side and move the heatbed almost all the way to the back for better stability.
- Locate the Y-belt-holder and release slightly both screws using a 2.5mm Allen key. Leave the holder in the Y-carriage together with the screws and if needed you can secure them temporarily with M3n nuts.

⚠ Using a 2mm Allen key, release all 4 screws (marked red). When releasing the last screw **hold the heatbed**, otherwise, it will fall off!

- The heatbed will be no longer needed, store it somewhere safe. You can leave the spiral wrap on for better cable protection.

ⓘ Get your box for spare parts, you will reuse several components from now on.

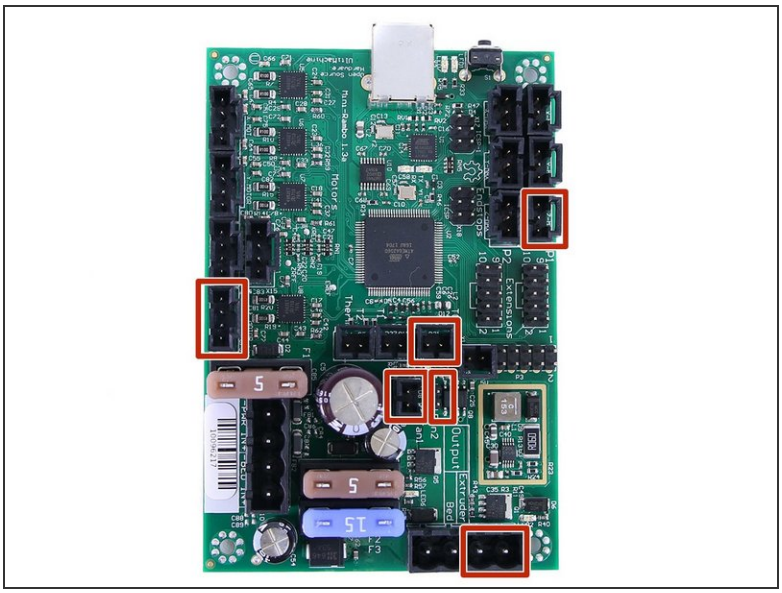
Step 4 — Extruder removal (part 1)



- Turn the printer back on its "feet".
- Using pliers, cut the zip tie holding the cables from the Extruder. Proceed carefully, you can break the cables.
- Using pliers, cut the zip ties on the spiral wrap behind Extruder. Again proceed carefully, you can break the cables. Unwrap the spiral wrap all the way to the RAMBo cover.

Proceed to the next step, where will unplug the Extruder cables.

Step 5 — Extruder removal (part 2)

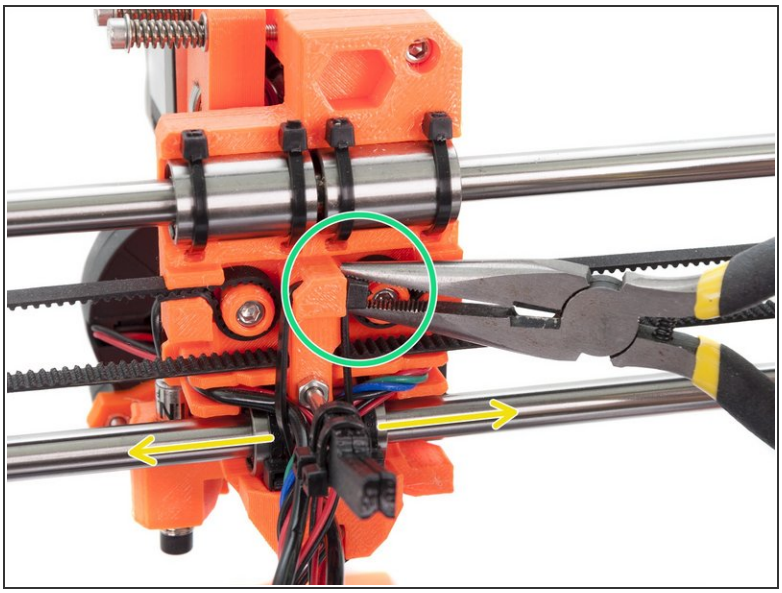


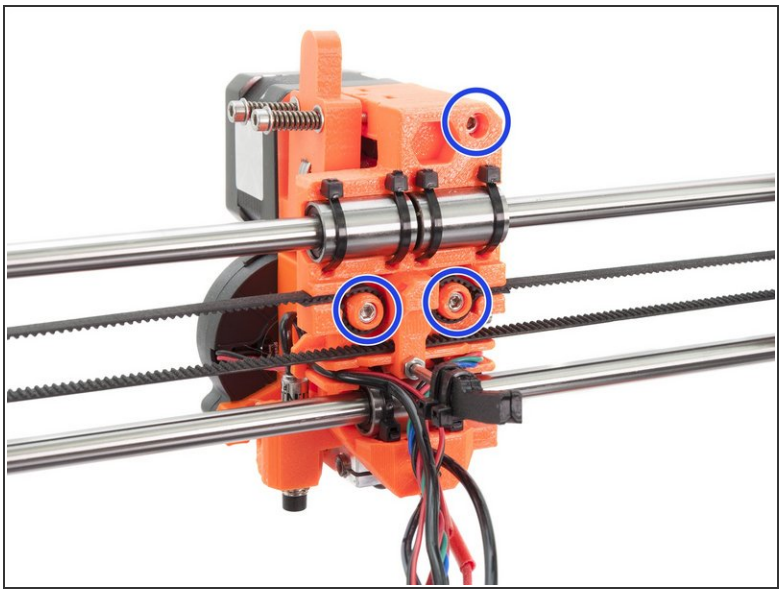
⚠ Follow the cables inside RAMBo cover, locate the connectors and unplug all of them (extruder only). Unplug the connector, **DO NOT PULL** the cable!

- Now, carefully remove all cables, spiral wrap and the filament away from the RAMBo case.

ⓘ Some connectors have a safety pin, make sure to press it first before you try to unplug the cable.

Step 6 — Extruder removal (part 3)





- Using pliers, cut the zip tie holding cables.
- Remove the zip tie and move the cables to both sides.
- Using a 2.5mm Allen key, release all three screws holding the Extruder body. While releasing the last screw **hold the Extruder**, it will fall off!
- Remove the Extruder from the printer and place it aside for now.

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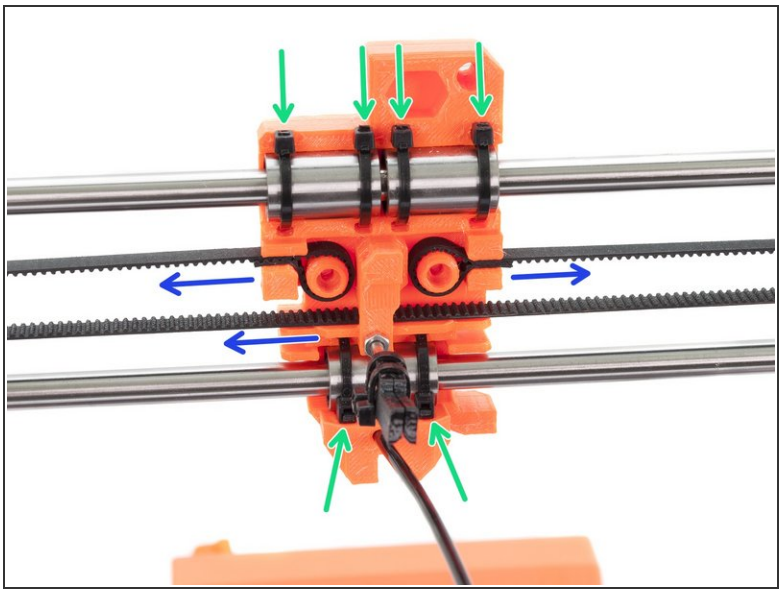
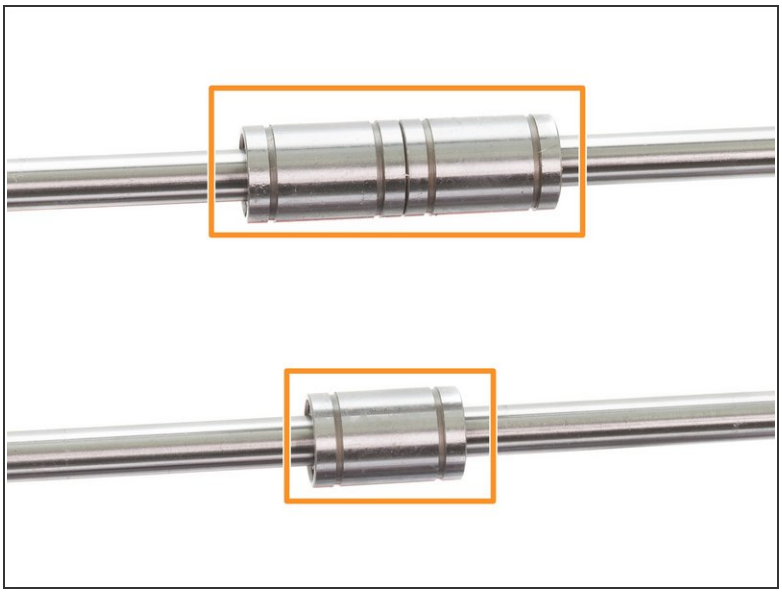
Step 7 — Extruder removal (part 4)





The X-carriage will be replaced by a new one including the NYLON filament and M3x40 screw, so you can remove it completely.

- First, remove the belt. Keep it for later.
- Cut zip ties and remove the X-carriage from the smooth rods.
- Keep the bearings on the rods, no further disassembly of the X-axis is needed.

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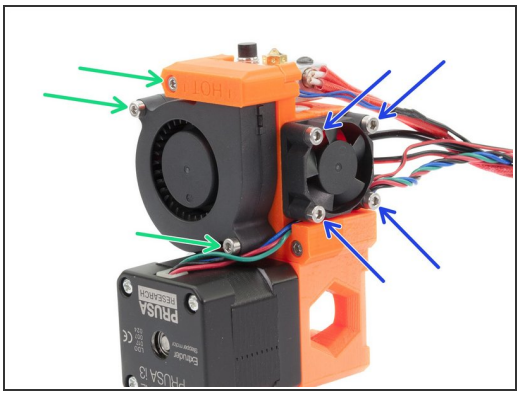
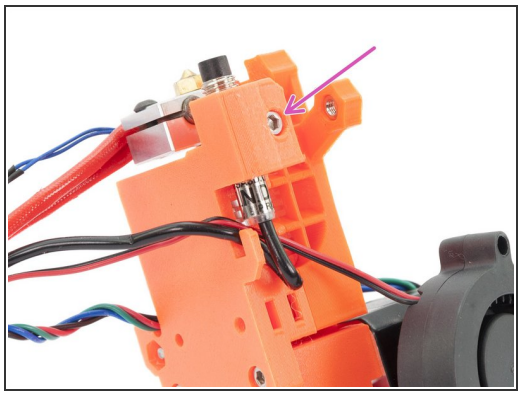
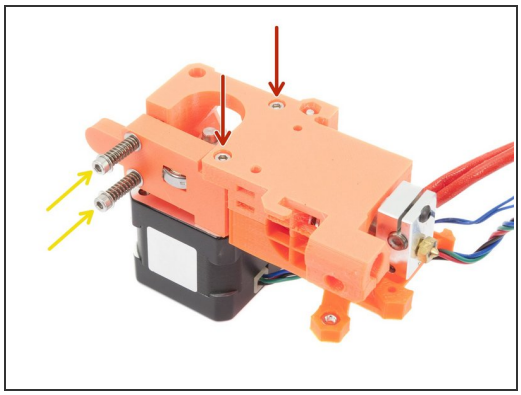
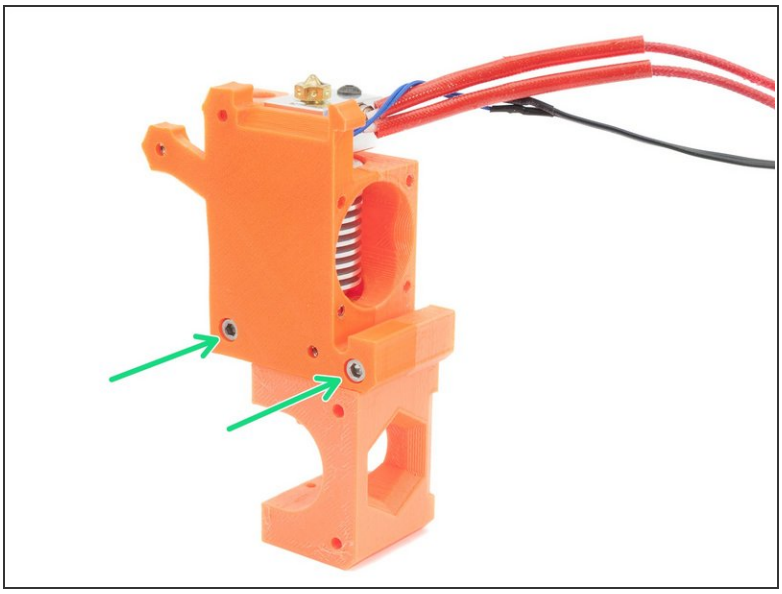
Step 8 — Extruder disassembly (part 1)

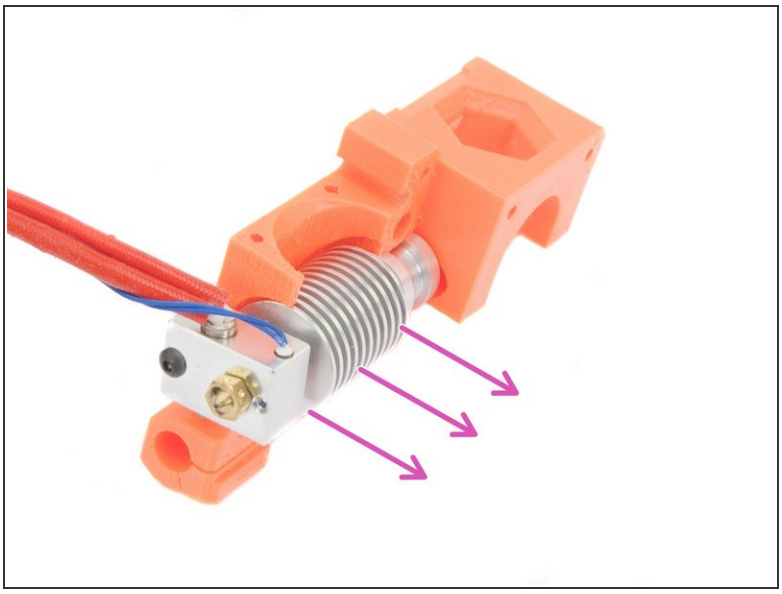




- Using a 2.5mm Allen key, release all three indicated screws on the Front print fan and fan nozzle. Don't try to remove the fan completely yet, you will need to release P.I.N.D.A. probe first.
- Using a 2.5mm Allen key release the 4 screws on the Left hotend fan. You can remove this fan completely. It will be replaced by a new one.
- Using a 2.5mm Allen key release the P.I.N.D.A. probe. Push it or screw it upwards and remove it completely. It will be replaced by a new one.
- Now, take away the Front print fan and keep it for the reassembly.
- Using a 2.5mm Allen key, remove the screws holding the Extruder idler.
- Using a 2.5mm Allen key, remove screws holding Extruder motor. Keep the motor for later use, but remove the pulley, which will be replaced.

ⓘ All printed parts from the Extruder will be replaced by new ones.

Step 9 — Extruder disassembly (part 2)



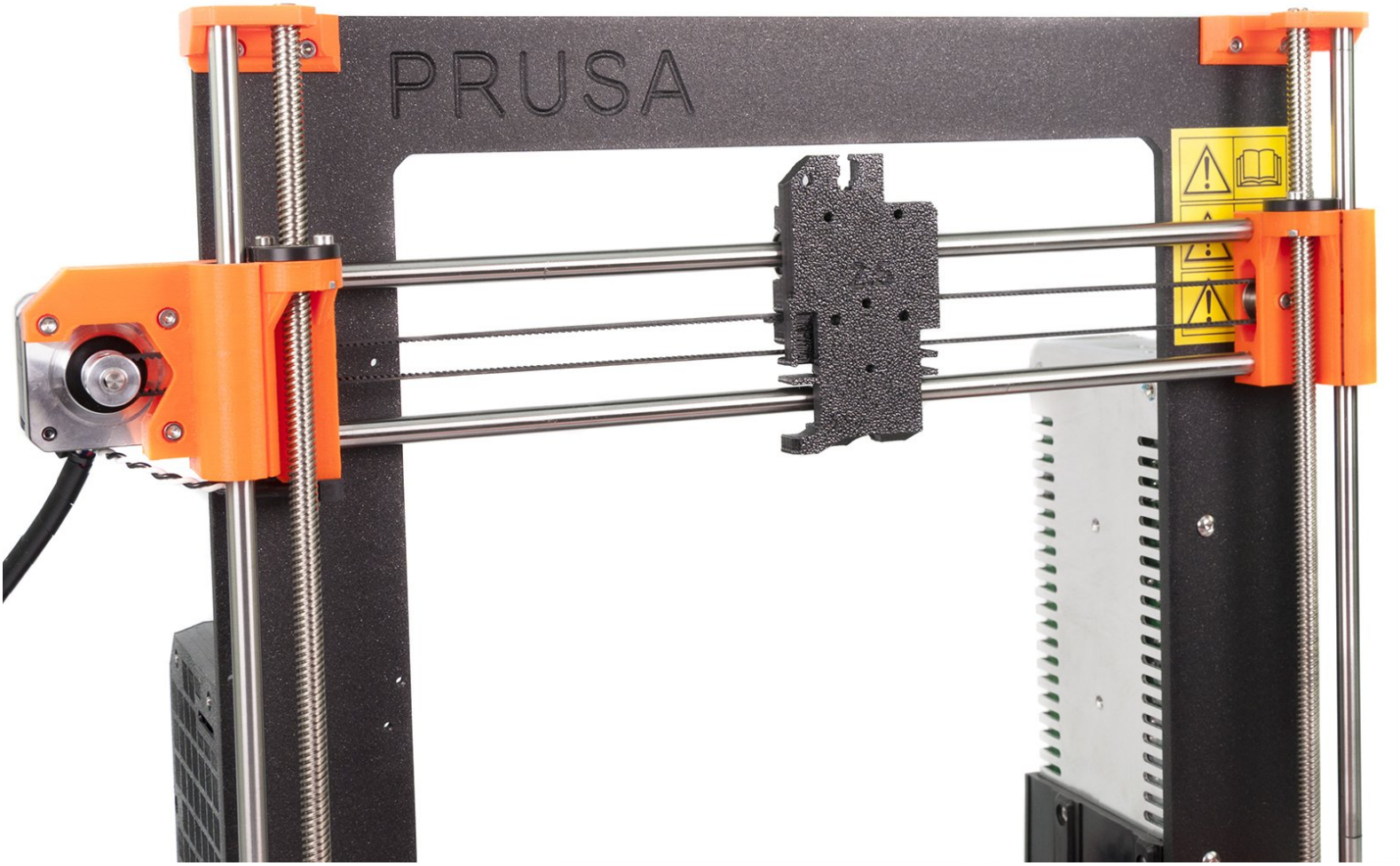


- Using a 2.5mm Allen key remove the screws and remove this part of the Extruder.
- Carefully remove the hotend, do not break the cables! Keep the hotend for later.
- **Everything disassembled? Let's start building MK2.5!** 3. X-axis reassembly

ⓘ All printed parts from the Extruder will be replaced by new ones.

3. X-axis reassembly

Written By: Jakub Dolezal



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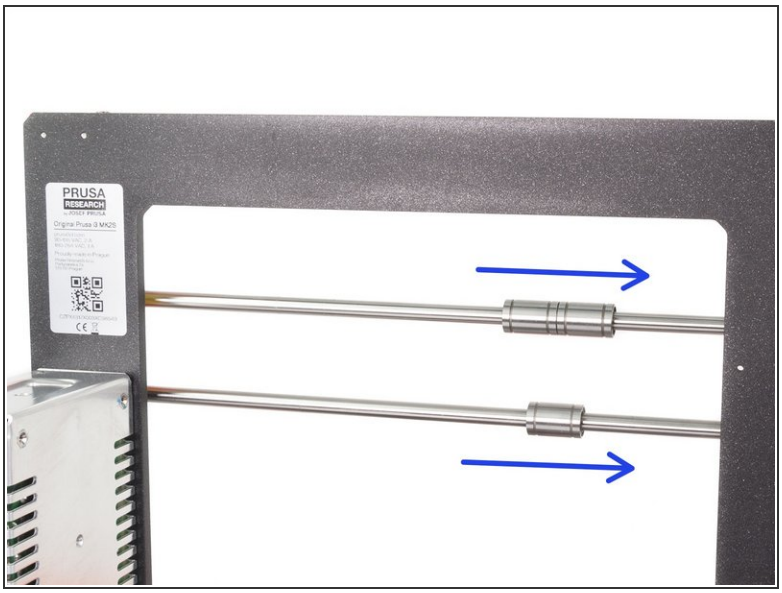
Step 1 — Tools necessary for this chapter

- Needle-nose pliers for tension check
- 2.5mm Allen key for M3 screws
- Slotted screwdriver for the belt insertion

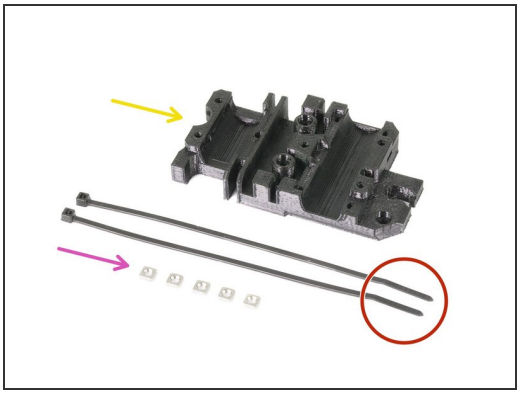
Use the bag "MK2.5 1"

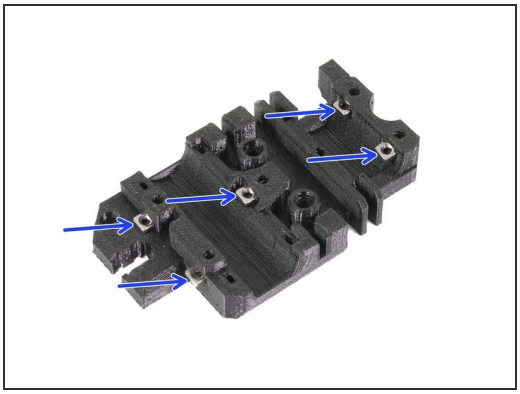
Step 2 — Printer's maintenance (optional)

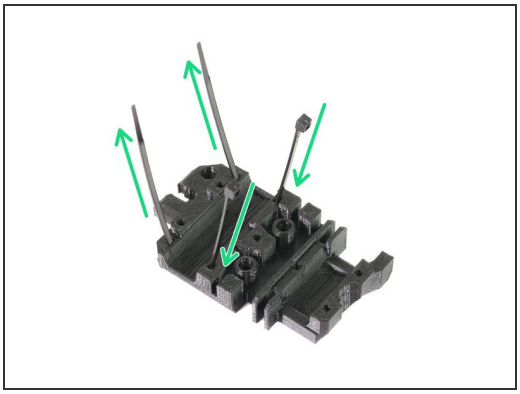


- Before we proceed further in the upgrade to MK2.5 it is a great time for quick maintenance.
- Move the bearings to side, to create a longer path for cleaning the smooth rods.
- Take a cloth/towel and wipe the smooth rods. Focus on the parts next to the X-ends where most of the dust is accumulated.
- You can also apply a little bit of general purpose machine oil on the smooth rods and move the bearings back and forth a couple of times.
- Regular maintenance is described in the Handbook for MK2.5, see chapter 12.1

Step 3 — The X-carriage preassembly



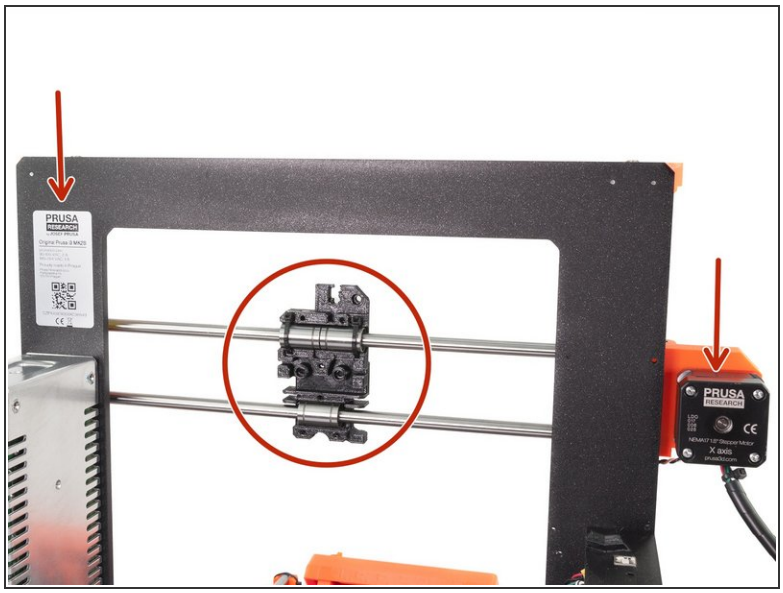


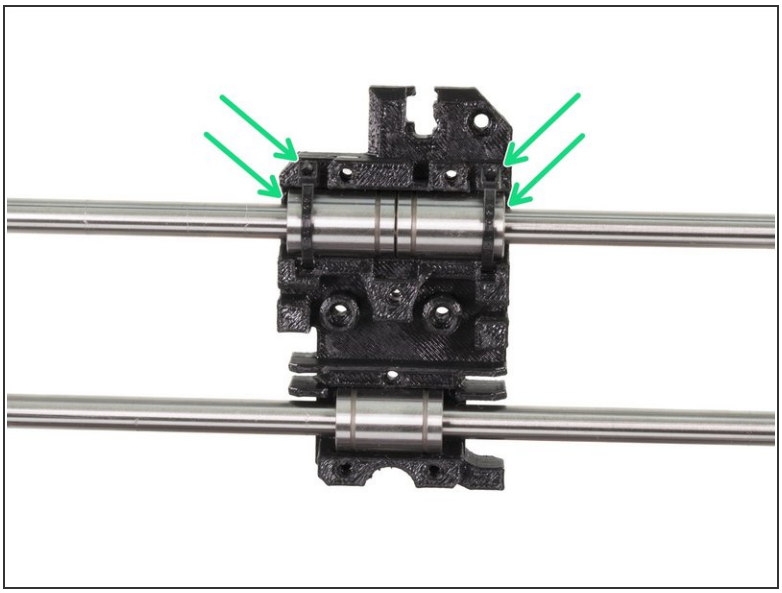


- For the following step, please prepare:
- X-carriage for MK2.5 (1x)
- M3nS nut (5x)
- Zip tie (2x)
- Insert nuts in the traps, as in the second picture. Ensure proper alignment with Allen key.
- Insert zip ties in the slots as shown in the last picture.

Note: Design of your X-carriage printed part might slightly differ, but the assembly process is the same.

Step 4 — The X-carriage assembly



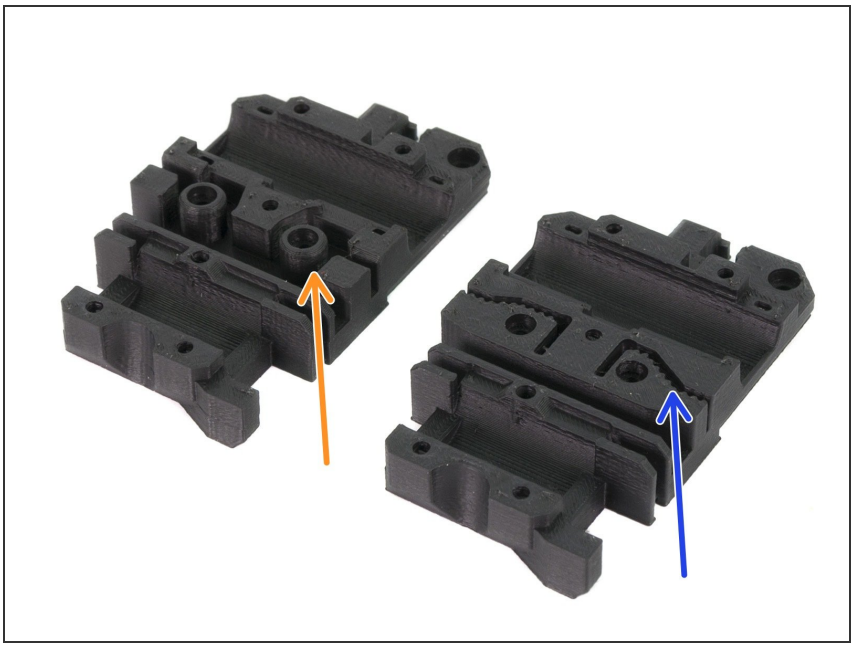


- Take your printed X-carriage for MK2.5 and place it on the X-axis.

⚠ Double check the correct orientation as in the picture!

- Align bearings and tighten the zip ties. When ready, trim the zip ties using pliers.

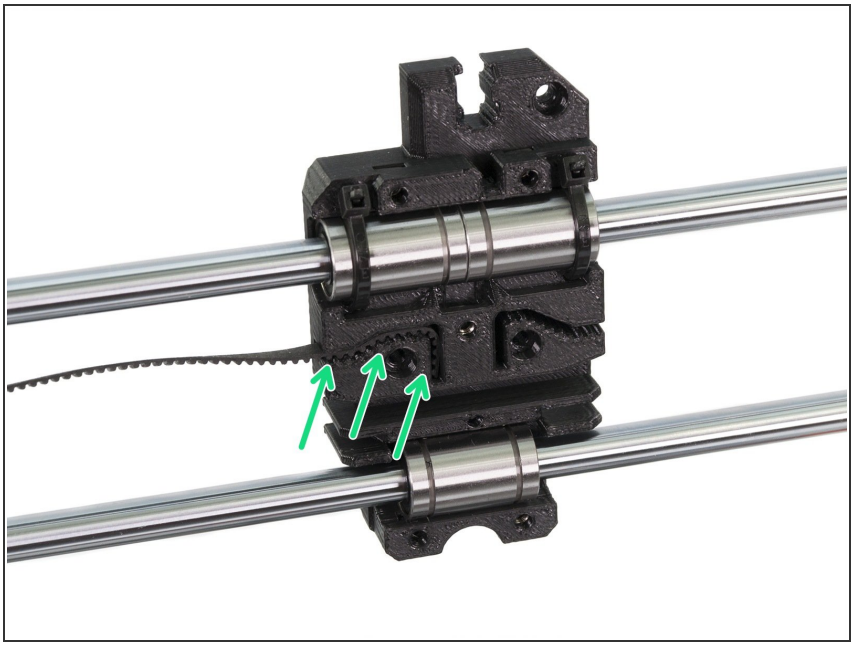
Step 5 — Different X-carriage design



⚠ There is an update to the X-carriage, the belt holding system was redesigned for better performance and endurance. The assembly manual covers both versions.

- Compare yours against the picture and choose from following:
- **The old design** is on the left side of the photo. Please proceed to Step 13
- **The new design** is on the right side of the photo. Please proceed to Step 6

Step 6 — Assembling the X-axis belt (part 1, new design)

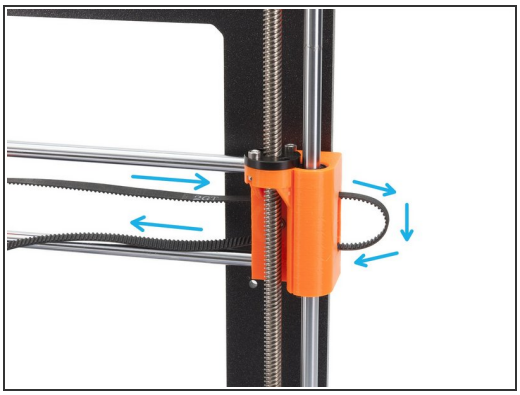
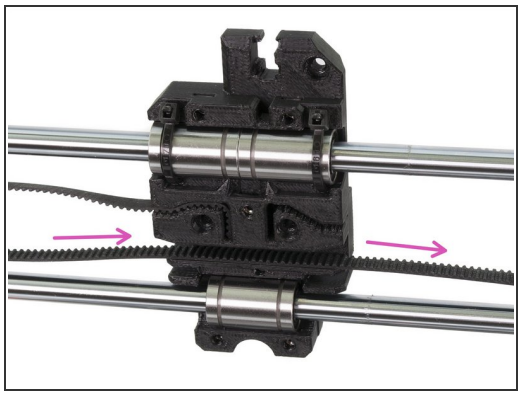
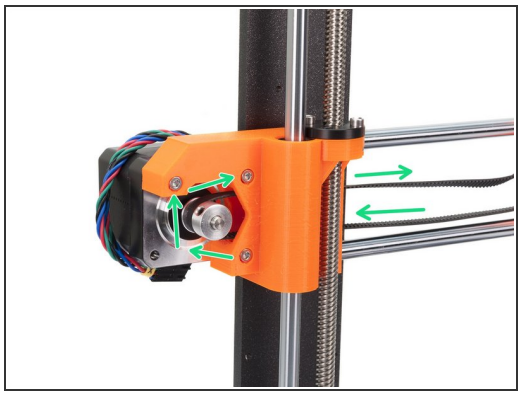


- Insert the flat part of the X-GT2 belt (850 mm) into the X-carriage as in the picture.

ⓘ Use a screwdriver or the smallest Allen key to push the belt in.

ⓘ Your design of the x-carriage might slightly differ. It does not affect the belt assembly.

Step 7 — Assembling the X-axis belt (part 2, new design)

- Guide the X-axis belt through the X-end-idler, around the 623h bearing with the housing and back.
- Continue with the belt through the X-carriage. Note there are slots below the belt, those will be used for cables.
- Guide the X-axis belt through the X-end-motor, around the GT2-16 pulley and back.

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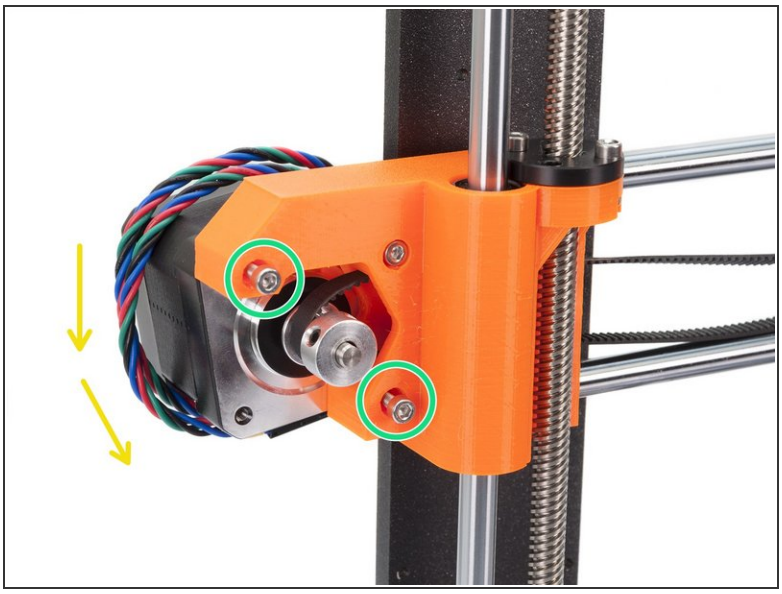
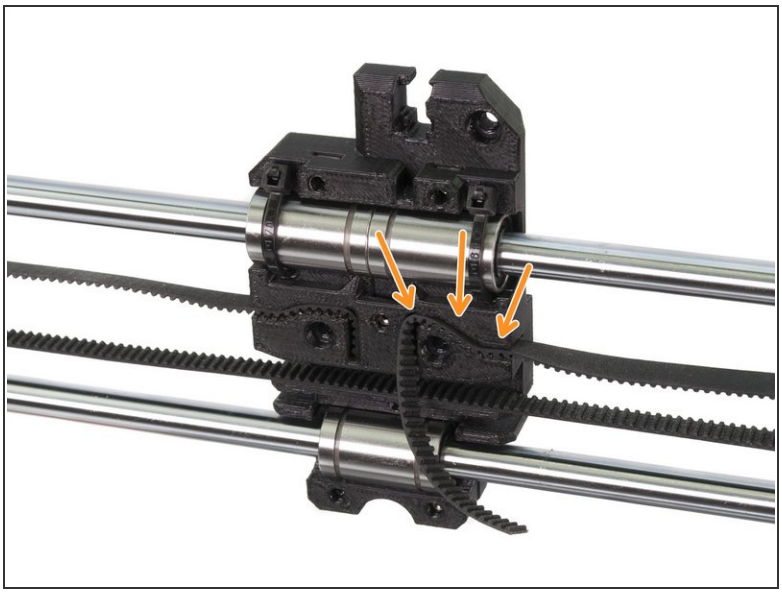
Step 8 — Assembling the X-axis belt (part 3, new design)



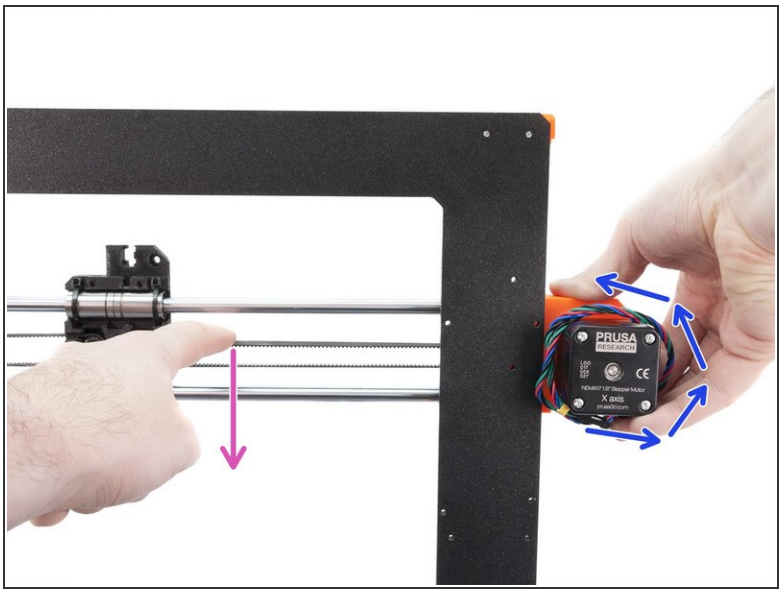


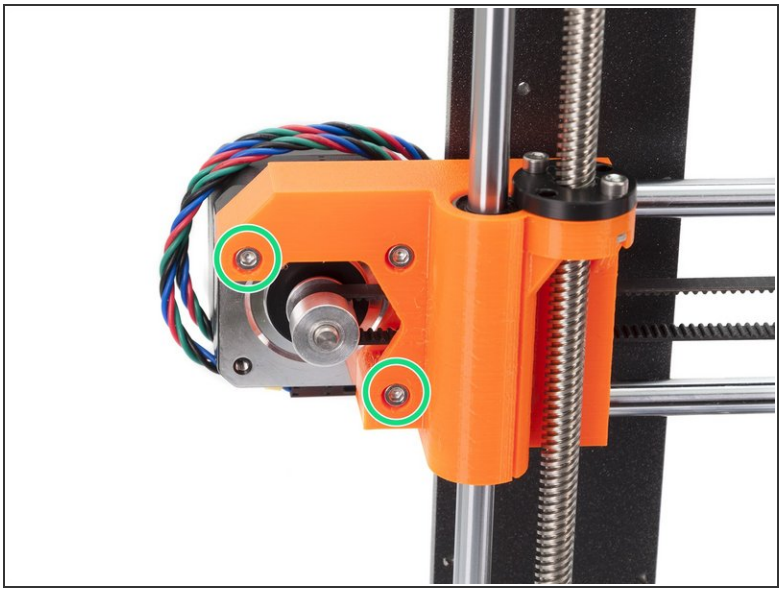
- Before you continue to guide the belt through the X-axis, please release two M3 screws on the X-end.
- Rotate the X-axis motor as indicated towards the frame.
- Insert the flat part of the X-GT2 belt into the X-carriage as in the second picture.

Use a screwdriver or the smallest Allen key to push the belt in.

There will be belt overhang on this side, **DON'T TRIM IT** yet.

Step 9 — Tensioning the X-axis belt (new design)



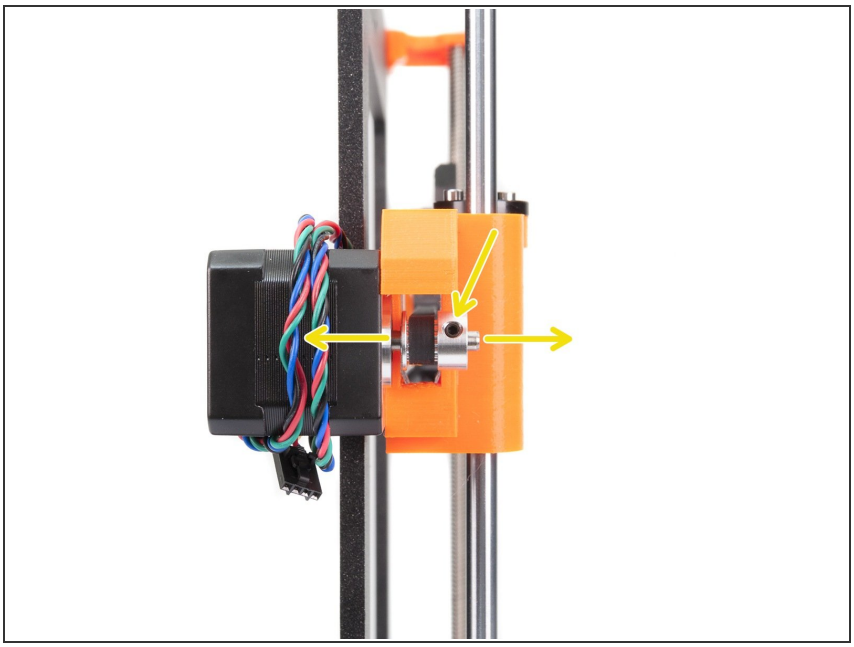


- Using right hand rotate the motor to its original position and hold it.
- Using a finger on your left hand push the belt down. Some force should be needed for bending the belt, BUT don't try to overstretch the belt as you might damage the printer.

ⓘ If you are struggling to rotate the motor back into position the belt tension is too high.

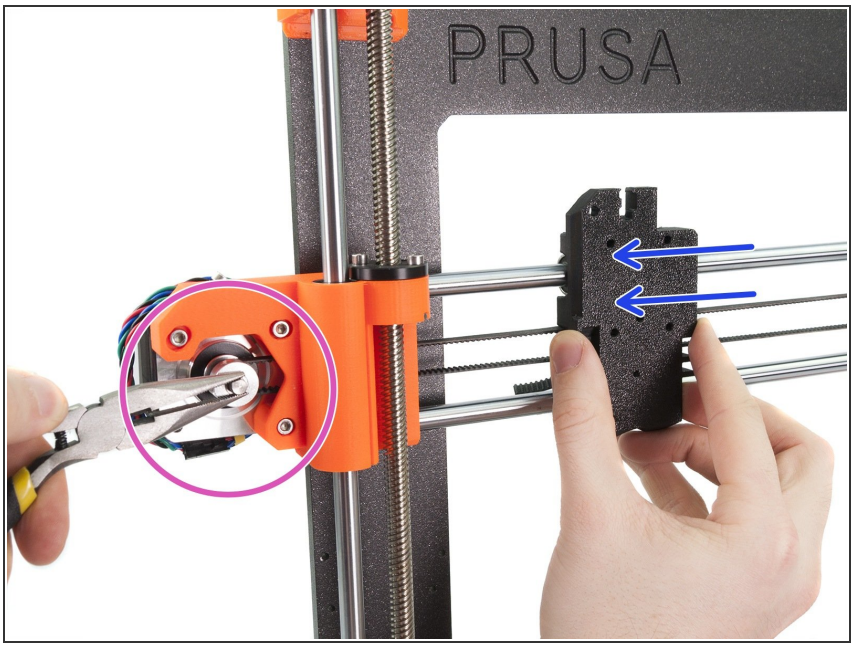
- Depending on the belt being under or overstretched, adjust the amount of the belt in the X-carriage.
- When done, rotate the motor to its original position and tighten the M3 screws again.

Step 10 — Aligning the X-axis belt (new design)



- Both top and bottom part of the belt should be parallel (above each other).
- To adjust the belt position, release the screws on the pulley and move it slightly until you reach the best position.
- Tighten both screws on the pulley.

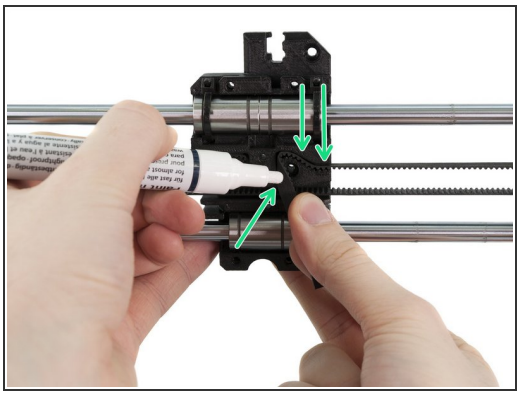
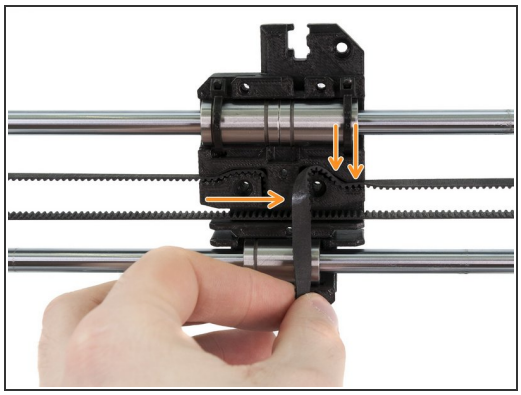
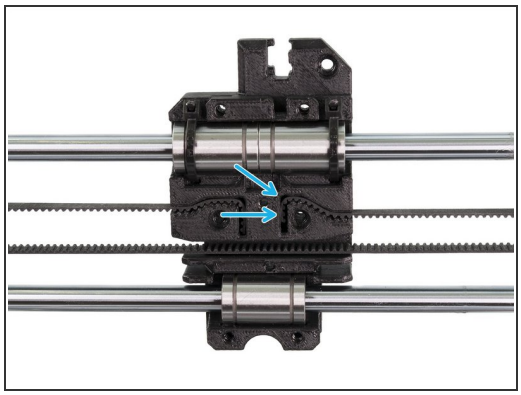
Step 11 — Testing the X-axis belt (new design)



- Use the technique described below to test if the belt is properly stretched.
- Use pliers to hold the X-axis motor shaft.
- Move the X-carriage towards the X-axis motor. Don't use excessive force.
- If the belt is stretched properly, you should feel a resistance and the X-carriage won't move at all. If the belt is too loose, it will deform (create a "wave") and jump over the teeth on the pulley.

Belt too loose? Return to step 8 and repeat all steps until now. You have to rotate the motor and retighten the belt in the X-carriage. Shortening the belt length by moving one or two teeth outside X-carriage should be enough.

Step 12 — Trimming the X-axis belt (new design)

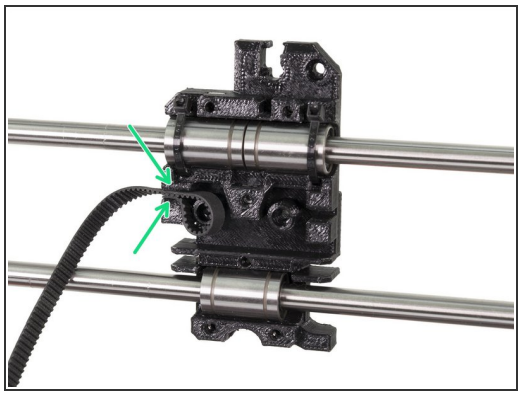
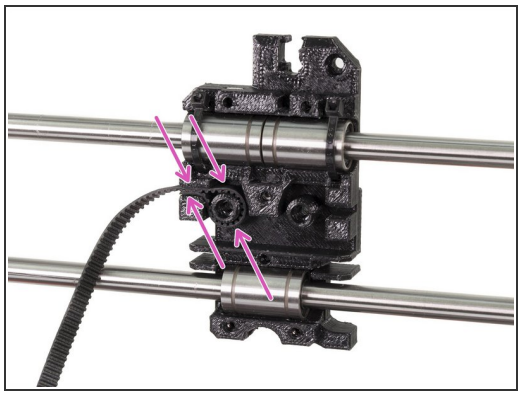
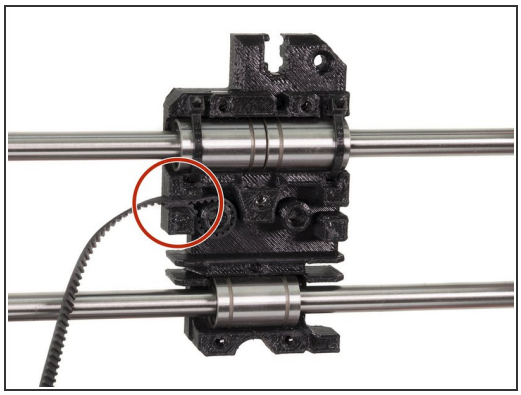




- For the following step we recommend getting a white marker, but you can also trim the belt without it.
- Measure the part, which must be trimmed and gently take the end of the belt away, from the X-carriage, but make sure at least 3-4 teeth are still in the X-carriage, as you don't want to lose the tension. If possible make a mark, where to cut the belt.
- Ensure again your mark is in the correct position and the belt is still stretched.
- Using pliers cut the belt and push it inside X-carriage. Use screwdriver or Allen key, if needed.

ⓘ You can cut the belt also with scissors (not included in the kit).

- Ready? Please jump to step Step 19

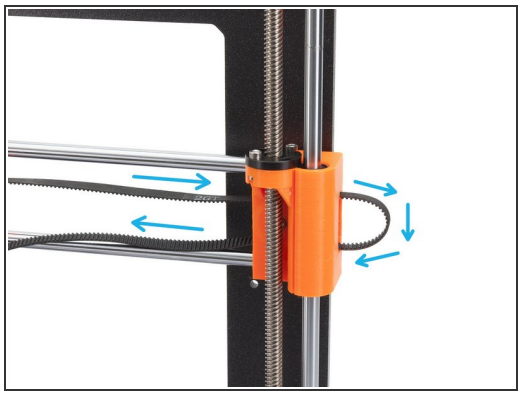
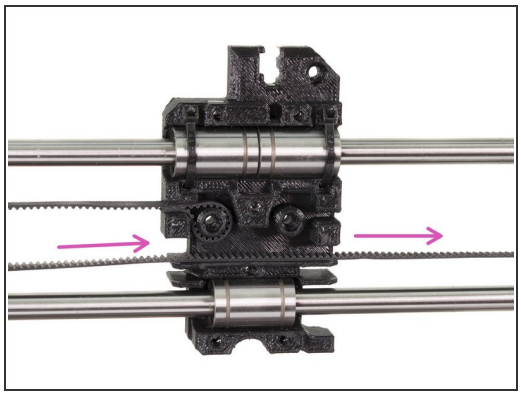
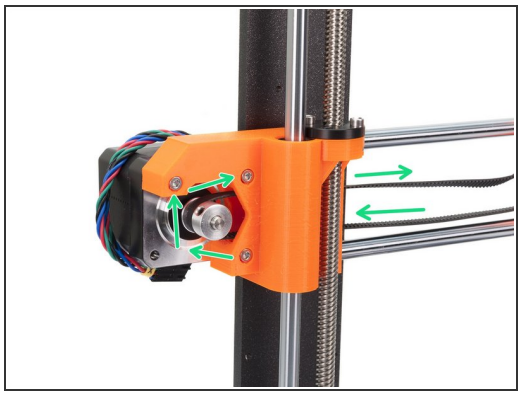
Step 13 — Assembling the X-axis belt (part 1, old design)

- Insert the flat part of the X-GT2 belt (850 mm) into the X-carriage as in the picture.
- Press the belt all the way in, use a screwdriver or an Allen key.

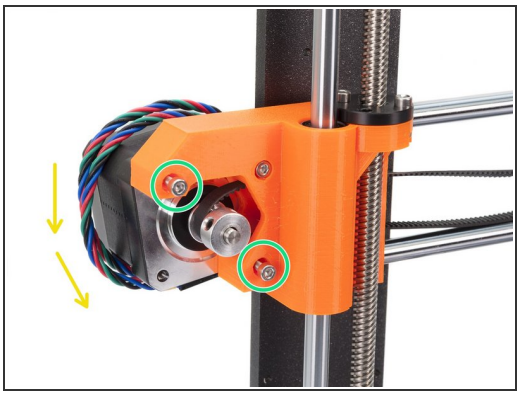
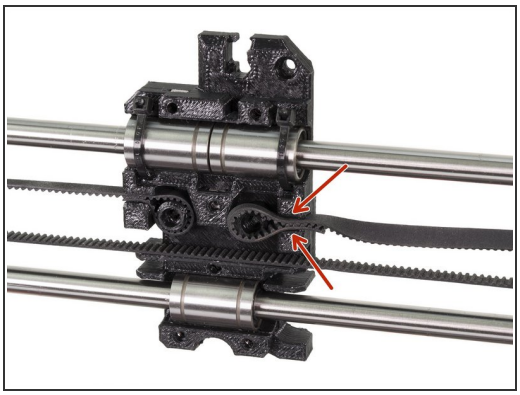
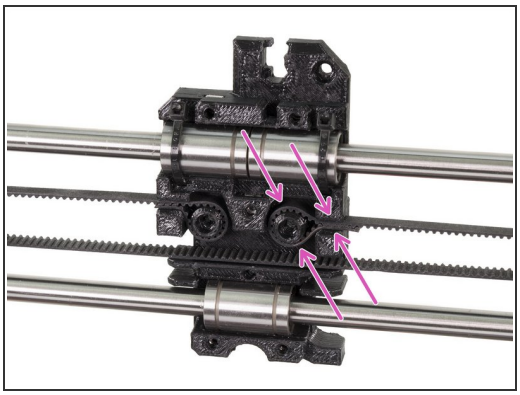
⚠ It's very **IMPORTANT** that the short end of the belt isn't sticking out of the X-carriage.

Step 14 — Assembling the X-axis belt (part 2, old design)

- Guide the X-axis belt through the X-end-idler, around the 623h bearing with the housing and back.
- Continue with the belt through the X-carriage. Note there are slots below the belt, those will be used for cables.
- Guide the X-axis belt through the X-end-motor, around the GT2-16 pulley and back.

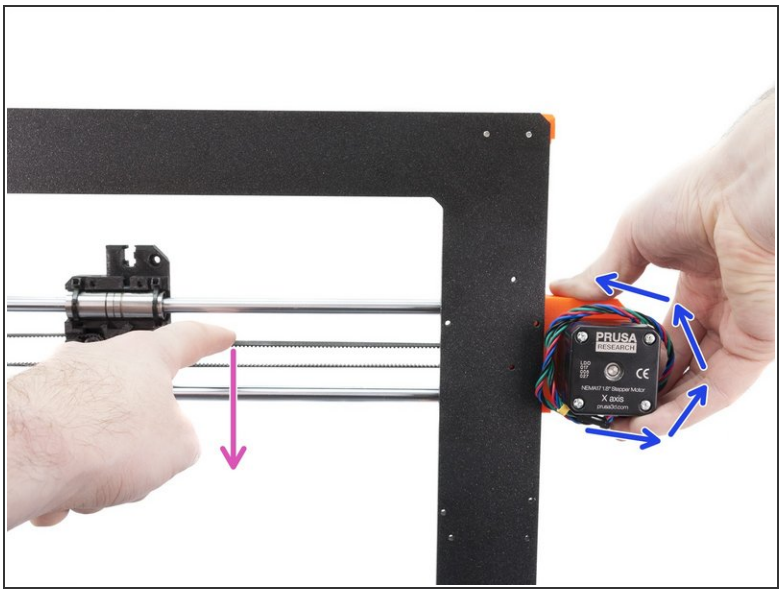
Step 15 — Assembling the X-axis belt (part 3, old design)

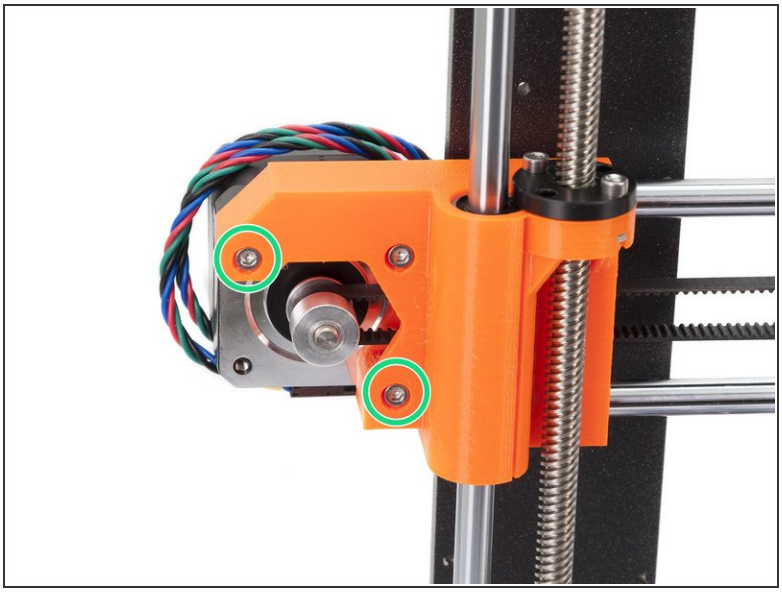




- Before you continue to guide the belt through the X-axis, please release two M3 screws on the X-end.
- Rotate the X-axis motor down.
- Insert the flat part of the X-GT2 belt into the X-carriage as in the second picture.
- Press the belt all the way in, use a screwdriver or an Allen key.

ⓘ There can be a slight belt overhang on this side, no need to trim it.

Step 16 — Tensioning the X-axis belt (old design)



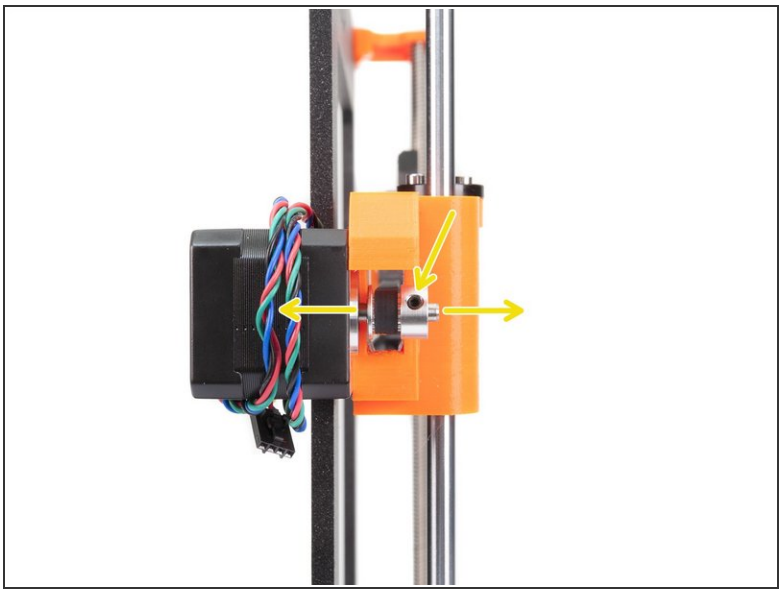


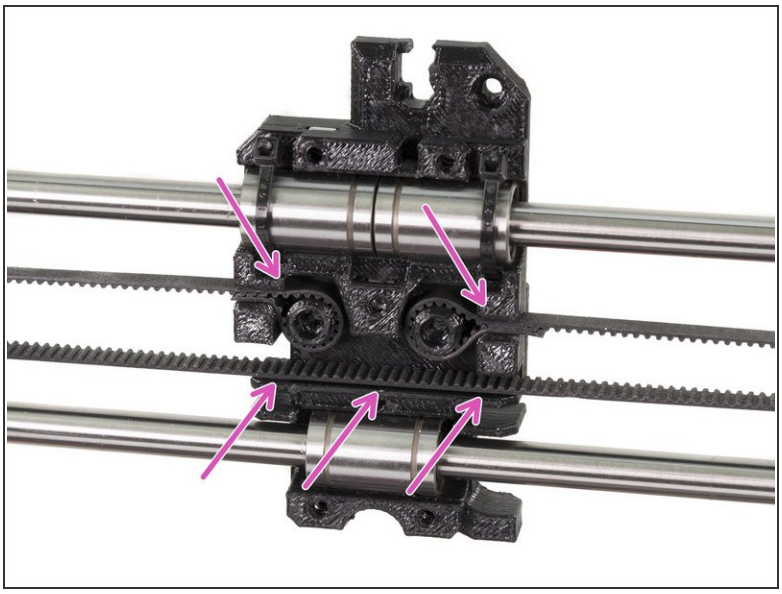
- Using right hand rotate the motor to its original position and hold it.
- Using a finger on your left hand push the belt down. Some force should be needed for bending the belt, BUT don't try to overstretch the belt as you might damage the printer.

ⓘ If you are struggling to rotate the motor back into position the belt tension is too high.

- Depending on the belt being under or overstretched, adjust the amount of the belt in the X-carriage.
- When done, rotate the motor to its original position and tighten the M3 screws again.

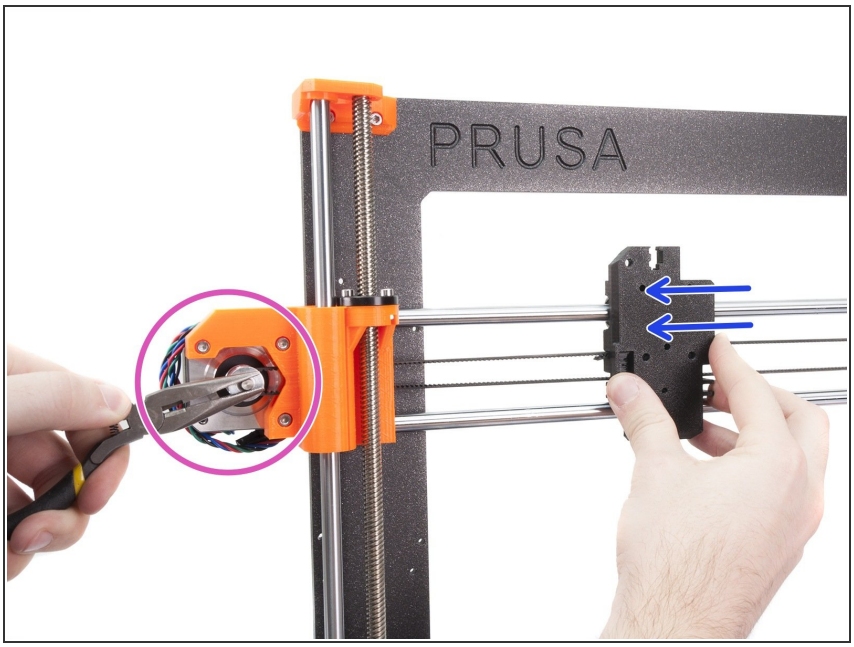
Step 17 — Aligning the X-axis belt (old design)





- Both top and bottom part of the belt should be parallel (above each other).
- To adjust the belt position, release the screws on the pulley and move it slightly until you reach the best position.
- In case you can't make the belt parallel, check if the belt is properly inserted in the X-carriage.
- Tighten both screws on the pulley.

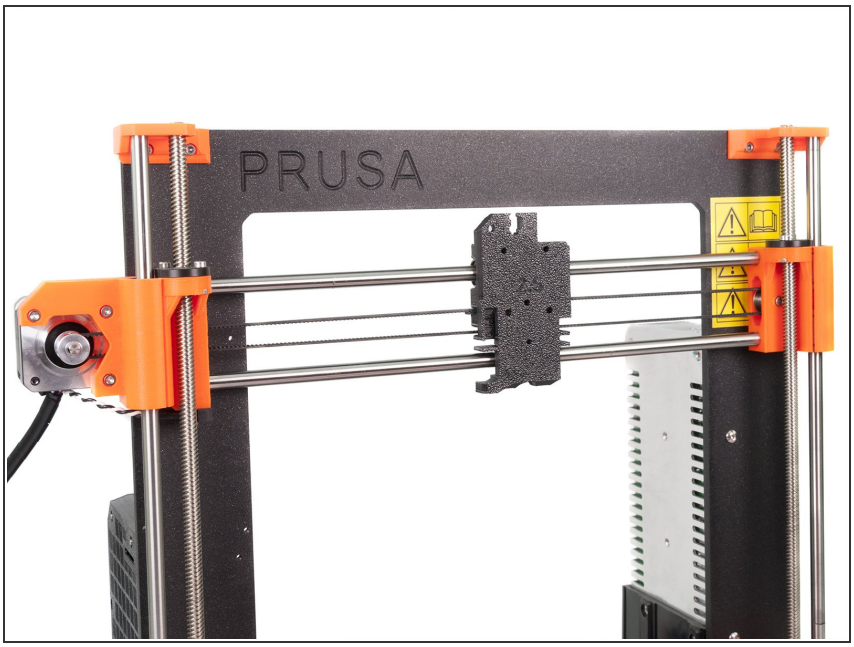
Step 18 — Testing the X-axis belt (old design)



- Use the technique described below to test if the belt is properly stretched.
- Use pliers to hold the X-axis motor shaft.
- Move the X-carriage towards the X-axis motor. Don't use excessive force.
- If the belt is stretched properly, you should feel a resistance and the X-carriage won't move at all. If the belt is too loose, it will deform (create a "wave") and jump over the teeth on the pulley.

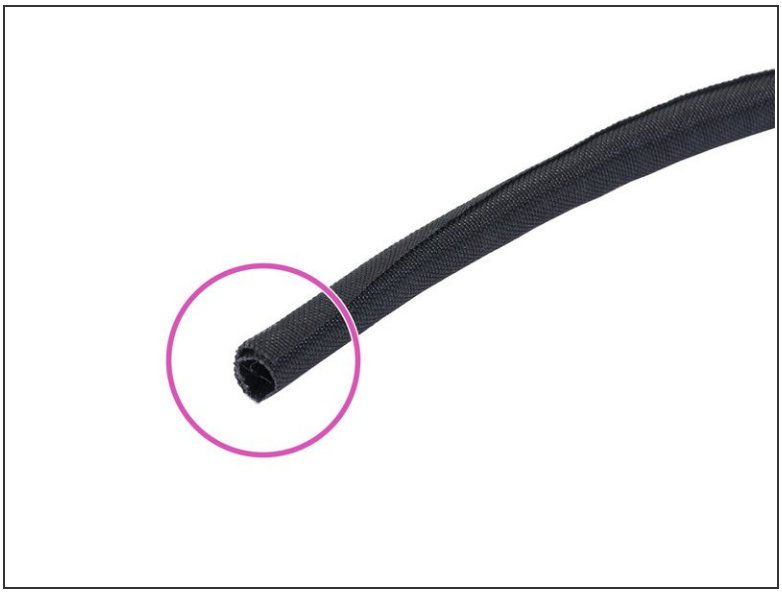
Belt too loose? Return to step 15 and repeat all steps until now. You have to rotate the motor and retighten the belt in the X-carriage. Shortening the belt length by moving two or three teeth outside X-carriage should be enough.

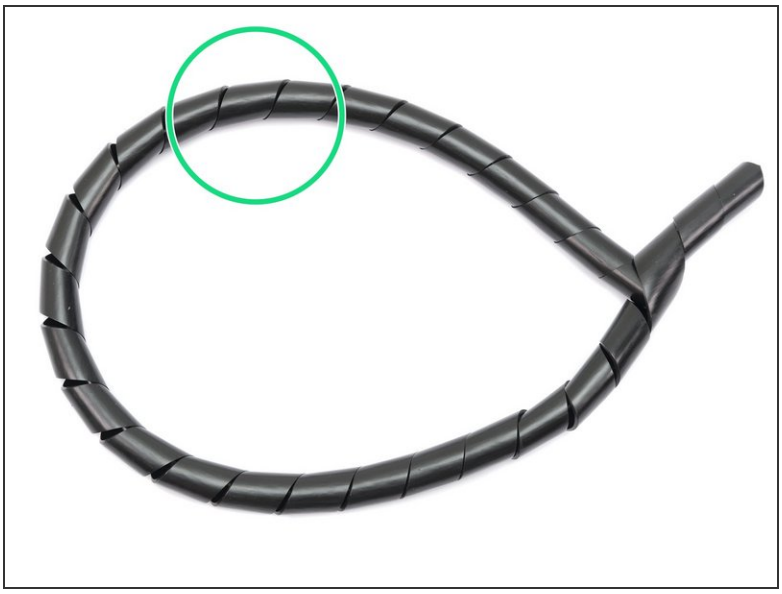
Step 19 — X-axis is finished!



- **X-axis is done!**
- Did you use the new X-carriage and tighten the belt properly?

Step 20 — Textile sleeve vs spiral wrap





⚠ Check the package and look for the spiral wraps or textile sleeves inside. There are two possibilities:

- **There are only textile sleeves present** in the kit, then proceed according to the: 4. E-axis assembly (textile sleeve)
- **There is a combination of spiral wraps and textile sleeve** in the kit, then proceed according to the: 4. E-axis assembly (spiral wrap)

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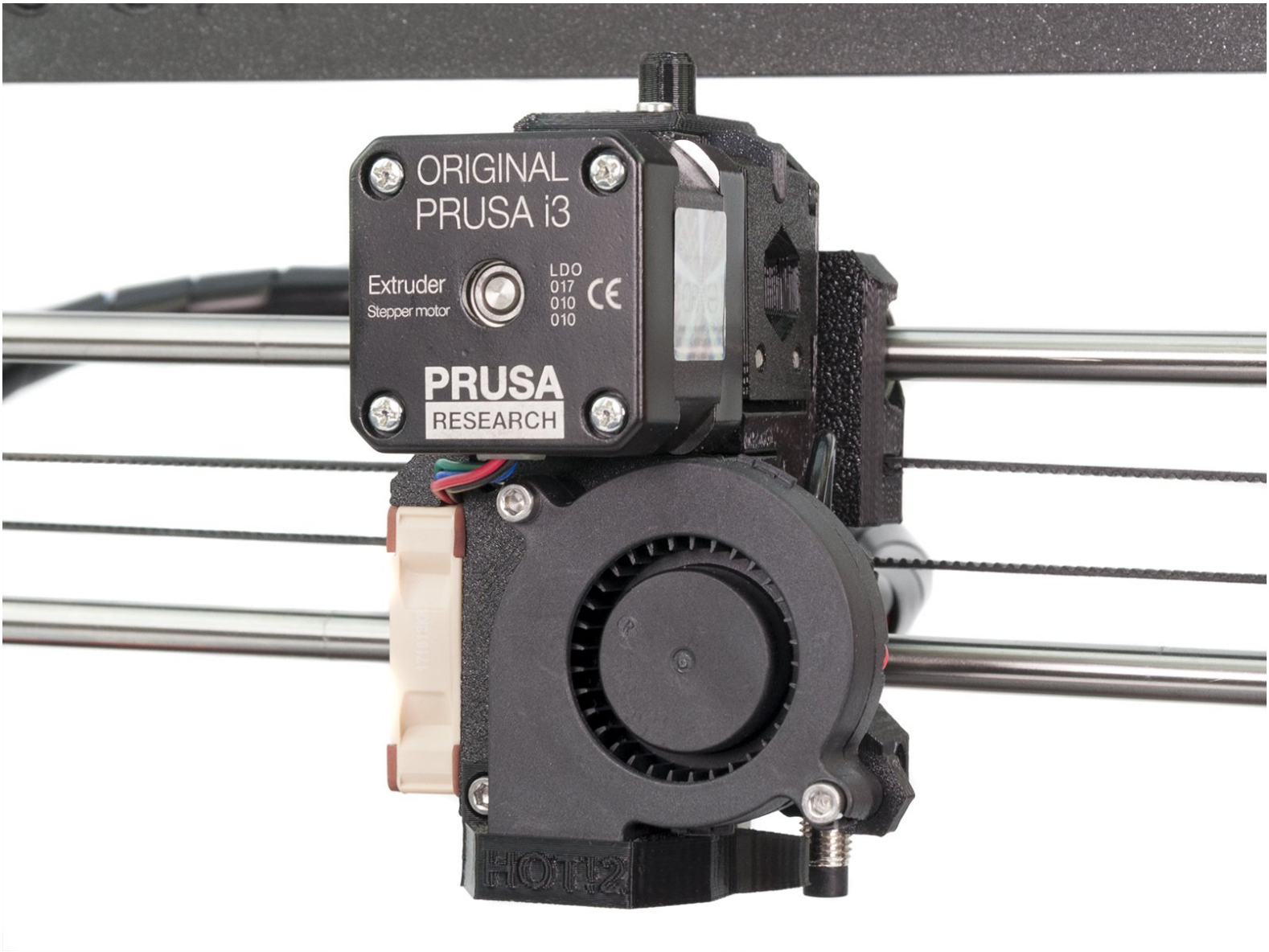
4. E-axis assembly (spiral wrap)

Written By: Jakub Dolezal



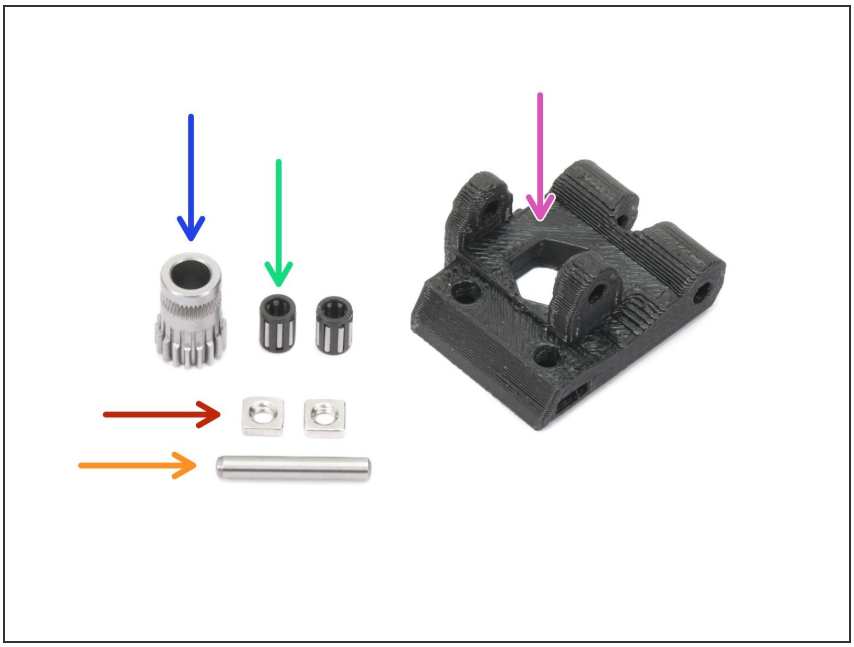
Step 1 — Tools necessary for this chapter

- Needle-nose pliers for zip tie trimming.
- 2.5mm Allen key for M3 screws
- 2mm Allen key for nut alignment
- 1.5mm Allen key for tightening the pulley

Use the bag "MK2.5 1"

Use the bag "2. Extruder"

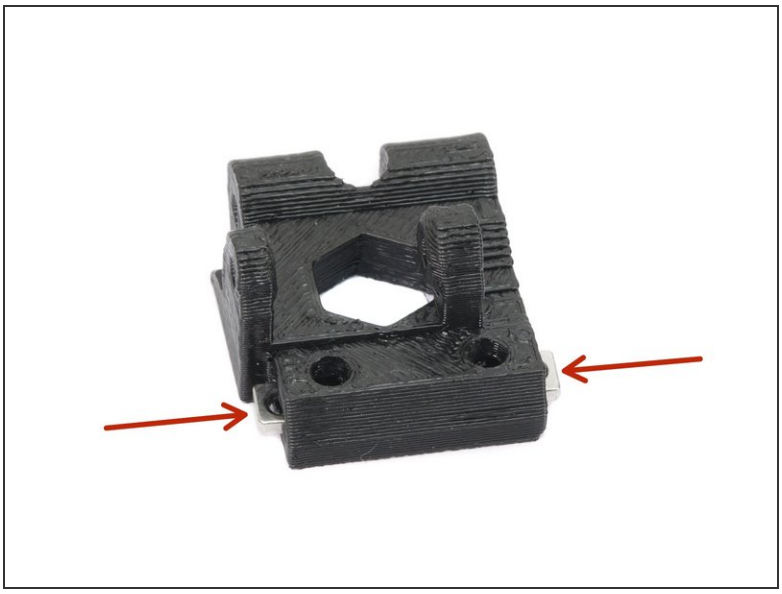
Step 2 — Idler assembly (part 1)

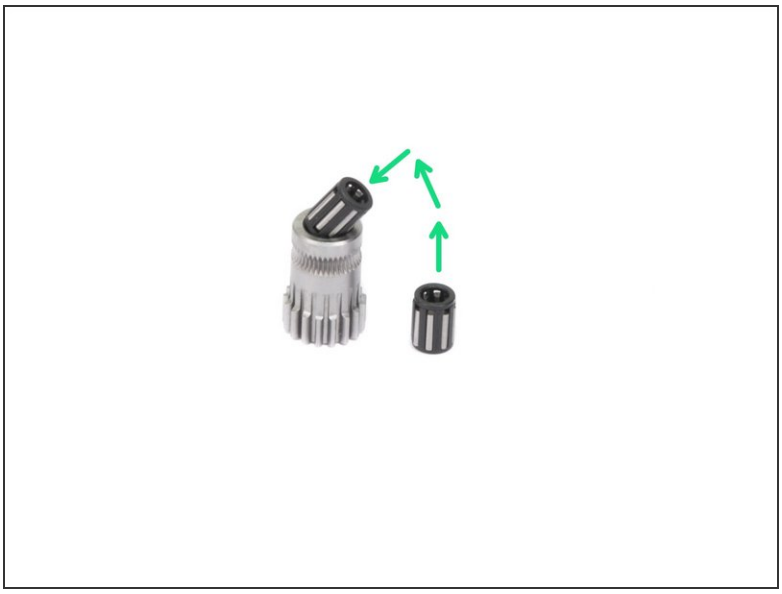


- For the following steps, please prepare:
- Extruder-idler (1x)
- Bondtech pulley **WITHOUT** the lock screw (1x)
- Bearing (2x) *might be stuck inside the gear*
- M3nS nut (2x)
- Pulley shaft (1x)

Note there are two types of the Bondtech pulley in the package (one with and without lock screw). Make sure you are using the correct one. For this step use the one WITHOUT the lock screw.

Step 3 — Idler assembly (part 2)

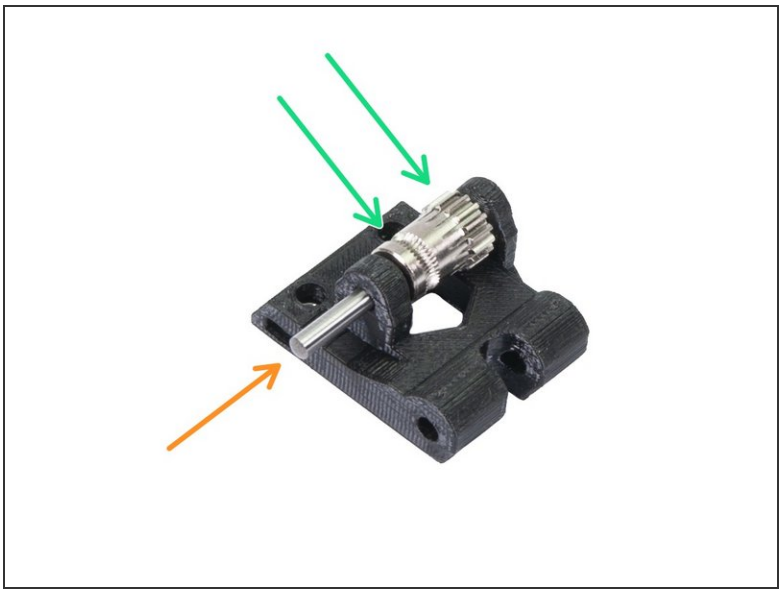


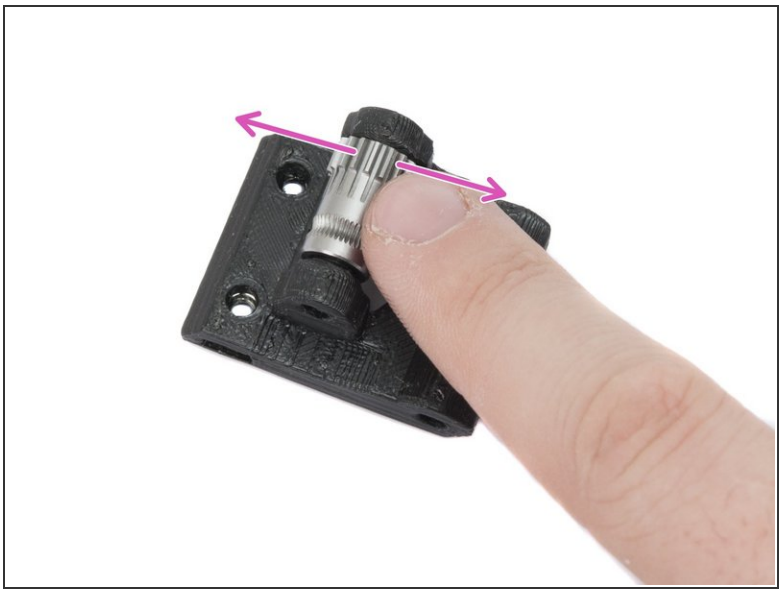


- Press the nuts to the slots on both sides of the idler.
- Insert **both** bearings in the pulley. Be aware that bearings can slip out during assembly.

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

Step 4 — Idler assembly (part 3)



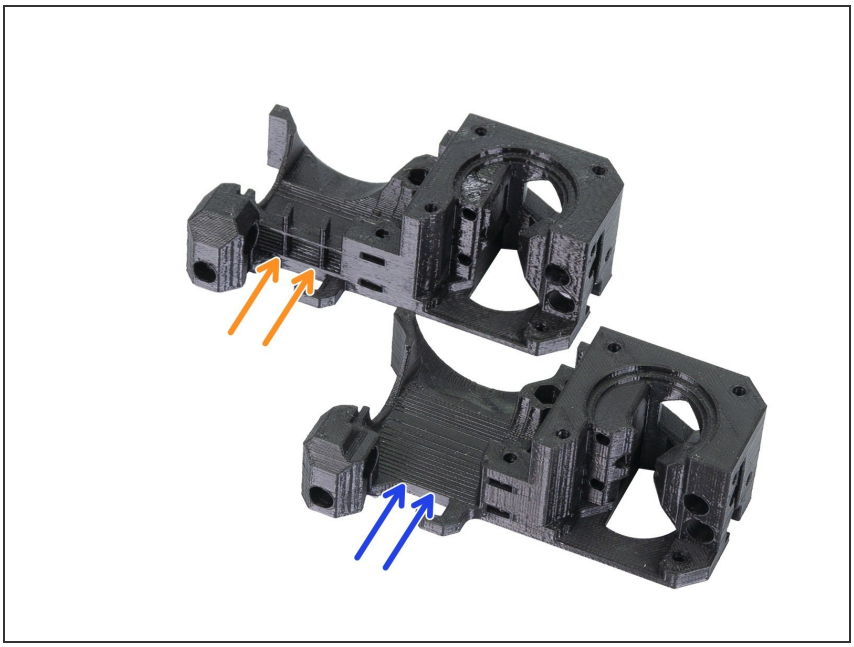


⚠ Ensure both bearings are inside the pulley!

ⓘ In case you have issues inserting the shaft in, please use 3mm drill bit and widen the hole first. Otherwise, you might crack this part.

- Insert the pulley in idler as shown in the picture.
- Slide the shaft through the idler and pulley. Use reasonable force or you will **BREAK** the printed part.
- Place your finger on the bearing and ensure it can rotate freely.

Step 5 — New printed parts - extruder body

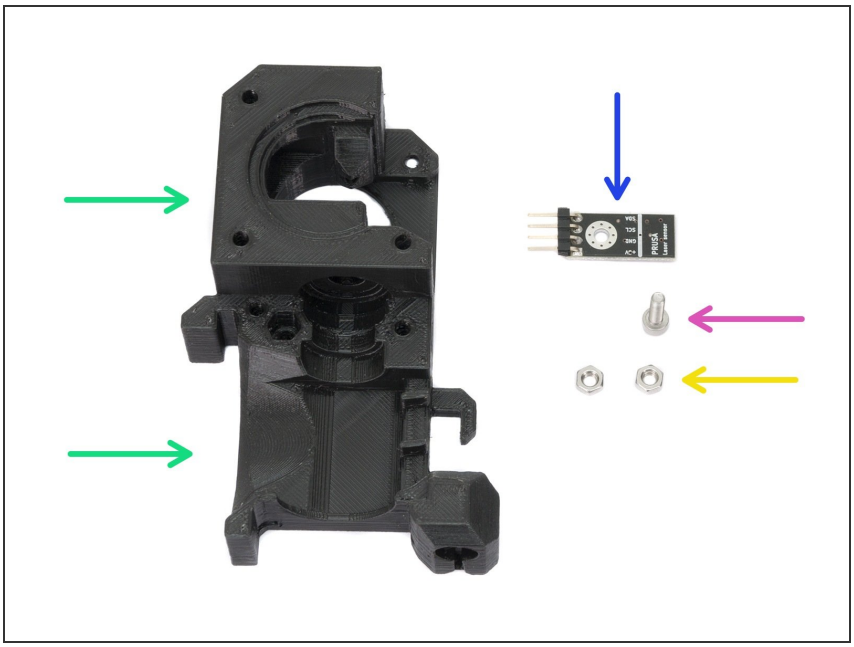


ATTENTION: 3D printed extruder parts were improved in order to achieve better cooling. More information including direct comparison can be found on our Prusa Research forum.

- The assembly of the printed parts is mostly the same. You will be informed in case extra attention is needed. Before you proceed to the next step, let's learn how to recognize your parts:
- **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).

If you have already printed the B6/R2 design you can proceed or if possible reprint the latest parts B7/R3.

Step 6 — Assembling filament sensor (part 1)

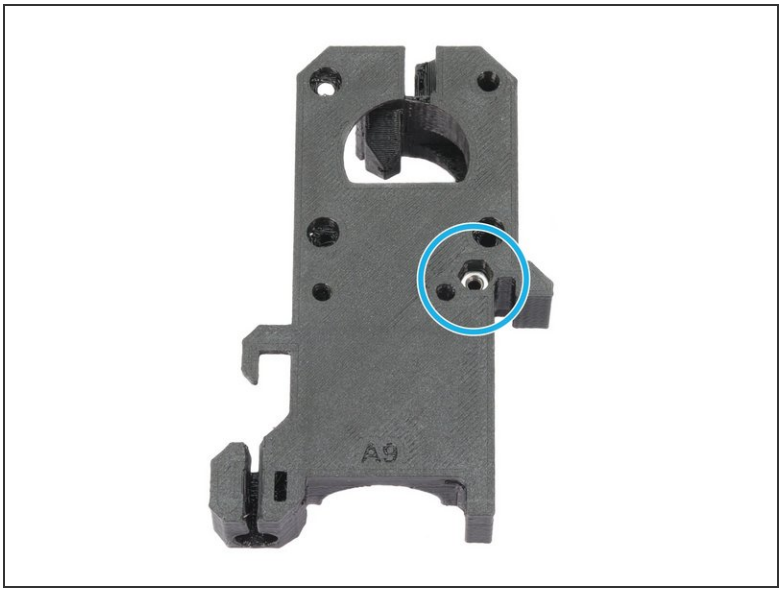


- For the following steps, please prepare:
- Extruder-body (1x)
- Filament sensor (1x)

⚠ **BE CAREFUL** with the filament sensor, do not touch the black PCB nor the chips on it.

- M3x10 screw (1x)
- M3n nut (2x)

Step 7 — Assembling filament sensor (part 2)

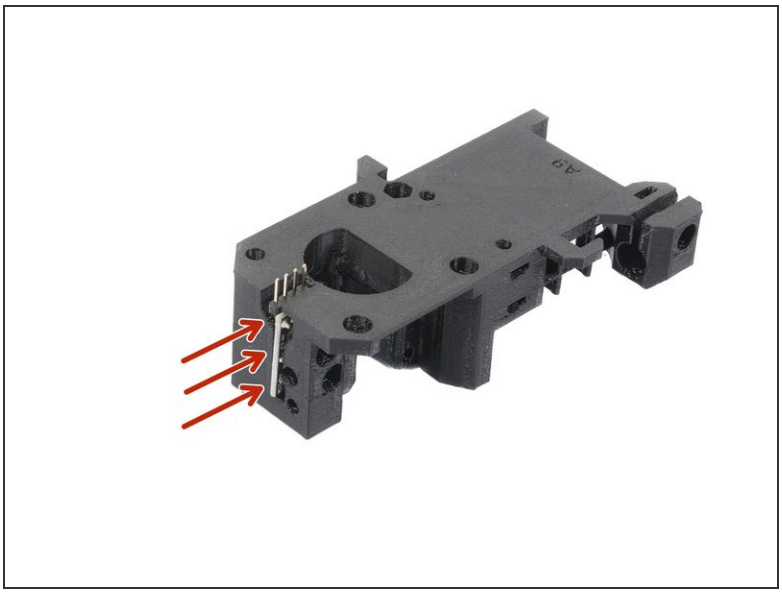


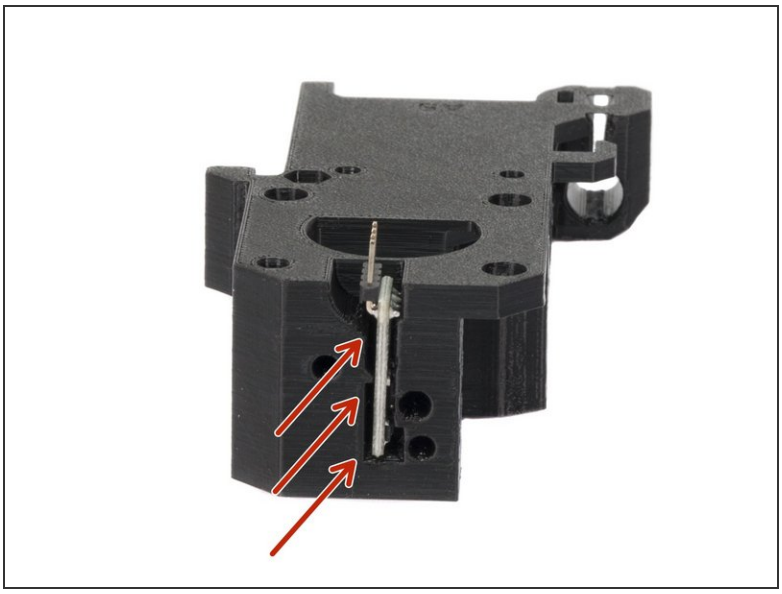
⚠ Before we continue with the assembly, we need to insert nuts in the Extruder-body. Take the extra time and effort to place them in properly. **You won't be able to reach them later.**

- 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.

ⓘ 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.

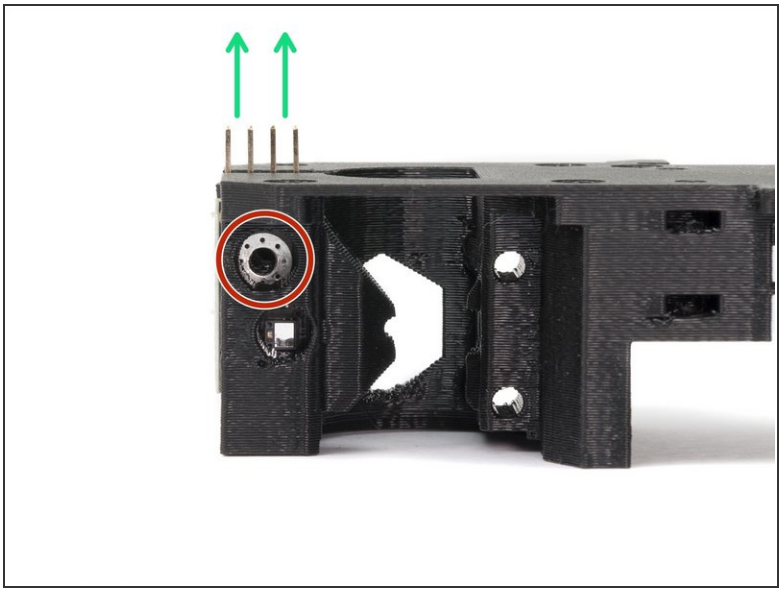
Step 8 — Assembling filament sensor (part 3)

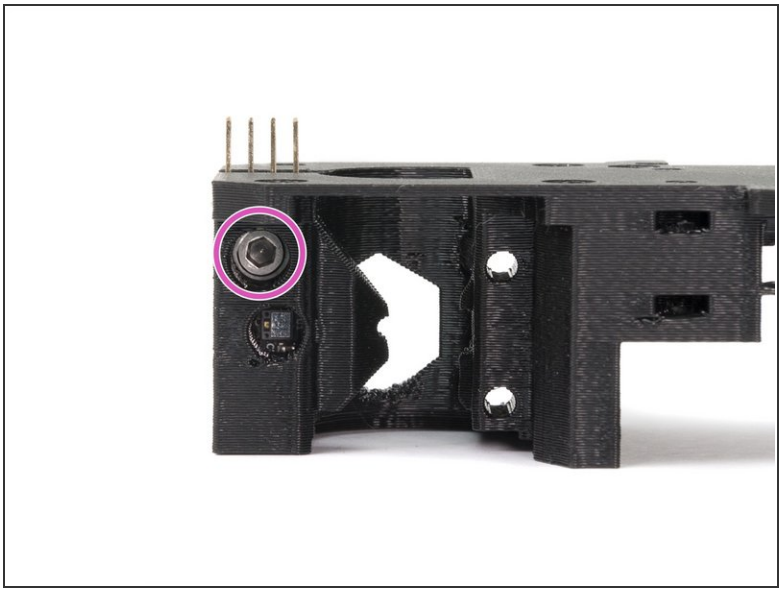




- **Carefully insert** the filament sensor in the slot, **do not use force** or you might damage the PCB!

Step 9 — Assembling filament sensor (part 4)



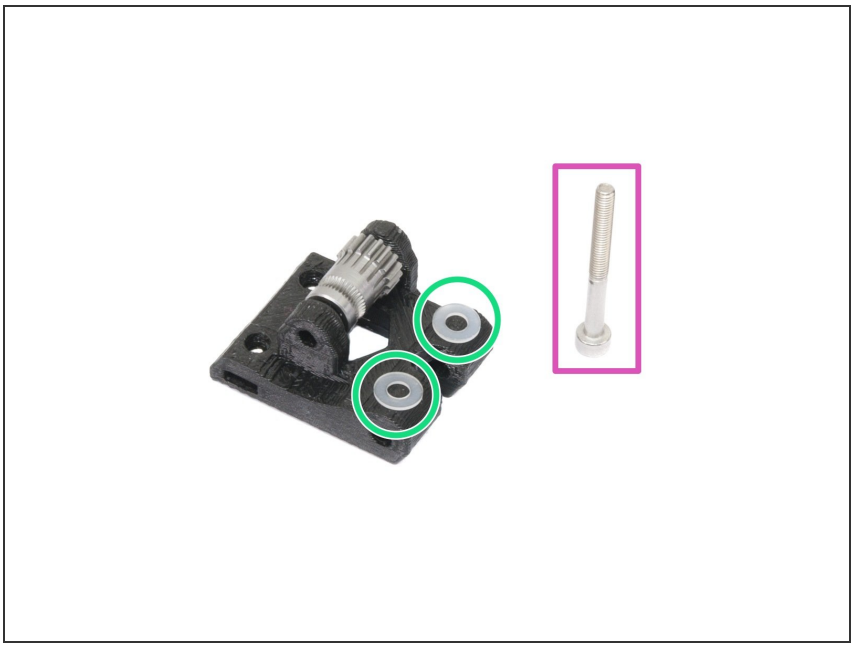


- Turn the extruder-body like in the picture. The pins of the filament sensor must be facing up.
- Locate the opening for the M3 screw.
- Take the M3x10 screw and tighten the sensor in place.

⚠ 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.

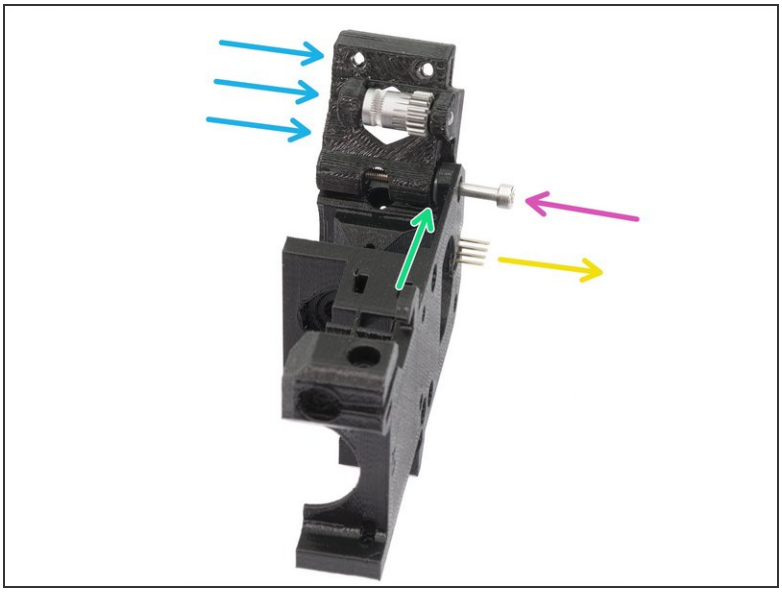
Step 10 — Extruder assembly - idler (part 1)

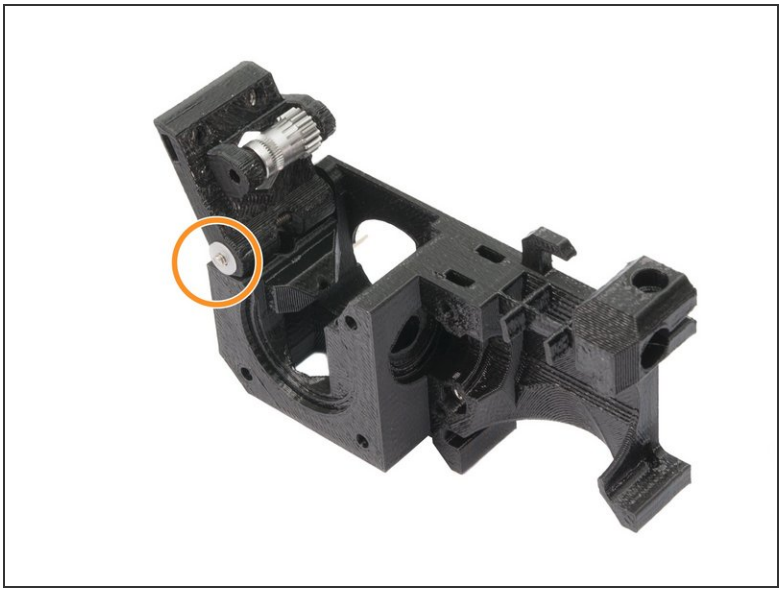


- For the following steps, please prepare:
- M3x30 screw (1x)
- M3 translucent washer (2x)

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

Step 11 — 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.

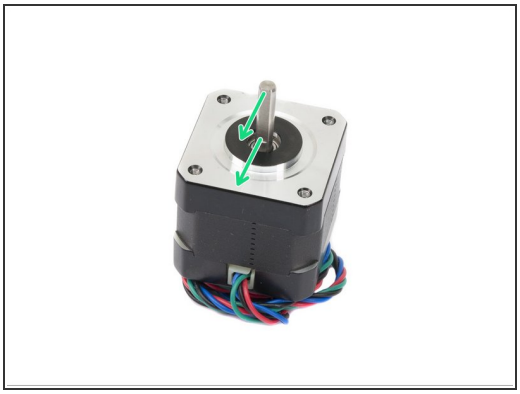
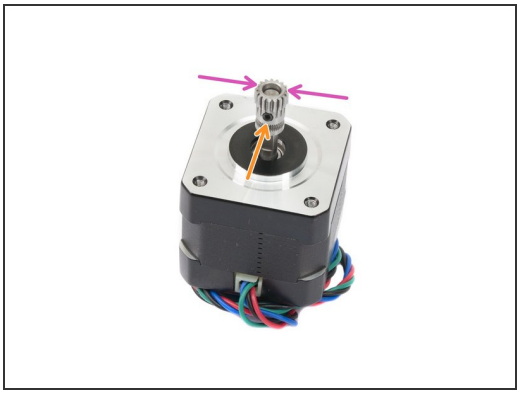
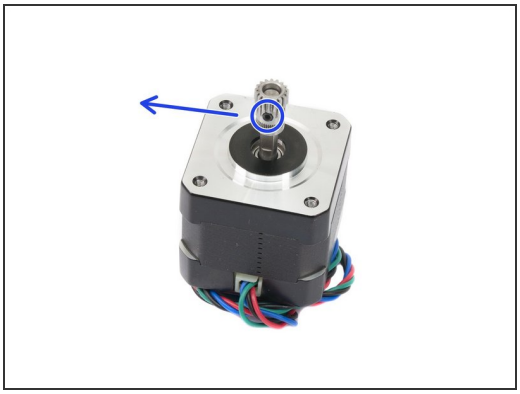
Step 12 — Assembling the Extruder motor pulley (part 1)

- For the following step, please prepare:
- Extruder motor (1x)
- Bondtech pulley **WITH** the lock screw (1x)

⚠ In case there is a pulley from the MK2S on the motor's shaft, please remove it now!

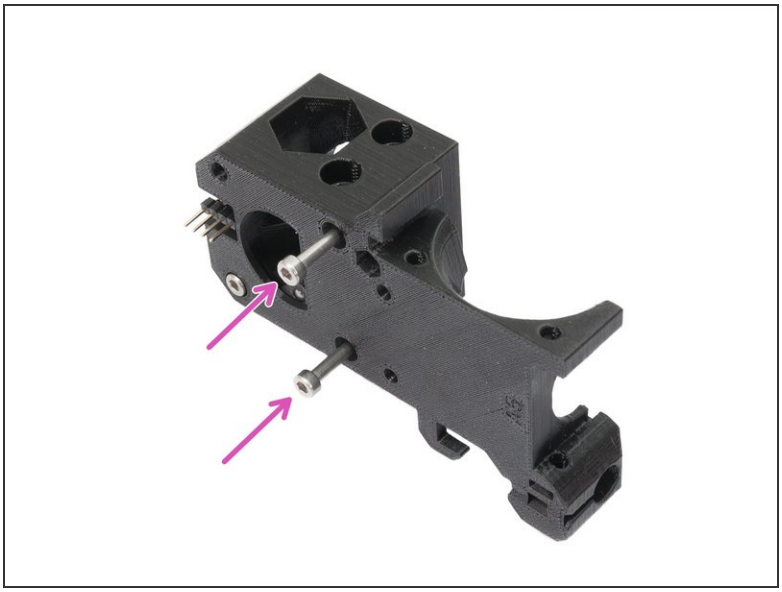
ⓘ There is a second spare lock screw in the package.

Step 13 — Assembling the Extruder motor pulley (part 2)

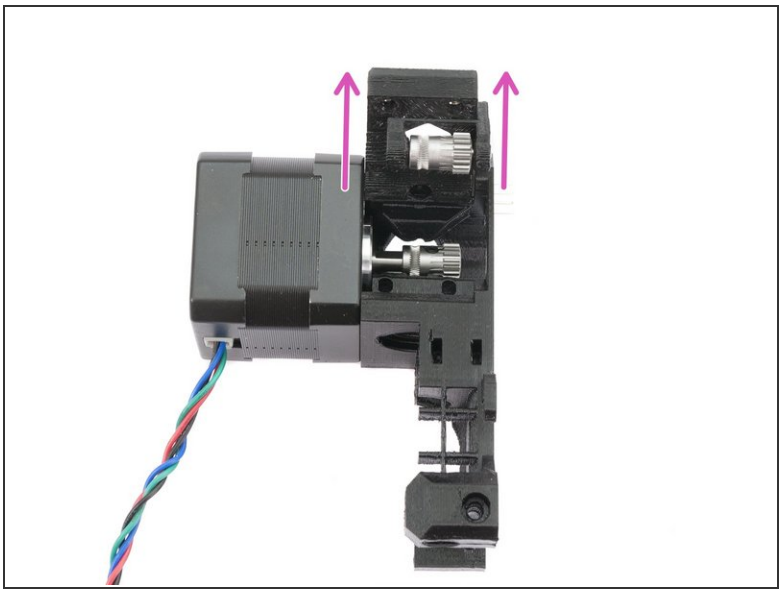
- There is a flat part on the motor shaft, rotate it towards you.
- ⚠ Slide the pulley on, note the **CORRECT** orientation.
- The screw must be facing directly against the pad (flat part) on the shaft. Slightly tighten the screw, the final adjustment will be done later.
- Don't press the pulley against the motor. Leave it on the very top of the shaft, see the picture.
- Before moving to the next step, rotate the pulley 90-degrees clockwise (the lockscrew will be facing to the left).

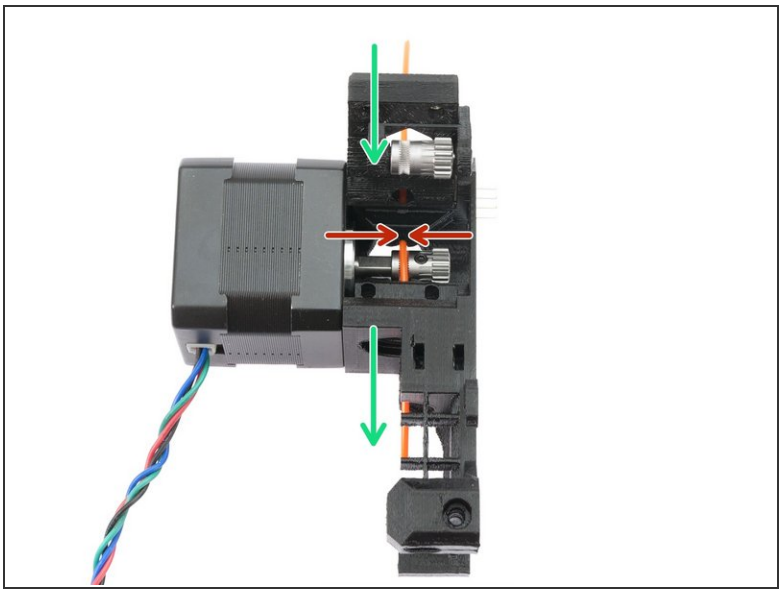
Step 14 — Mounting the Extruder motor



- Find in the package two M3x30 screws and insert them into the holes.
- Mount the motor on the extruder body as shown in the picture, double check the proper orientation of the motor cables.
- Tighten both screws firmly.
- Tighten the screw, but only slightly, keep in mind the idler must rotate freely.

Step 15 — Adjusting and tightening the pulley

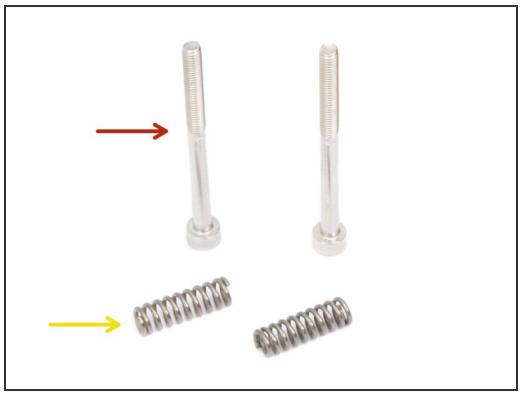


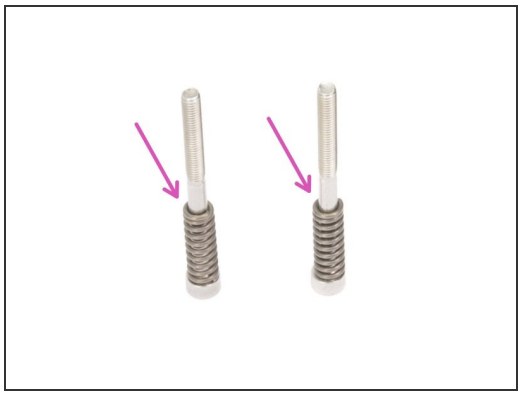


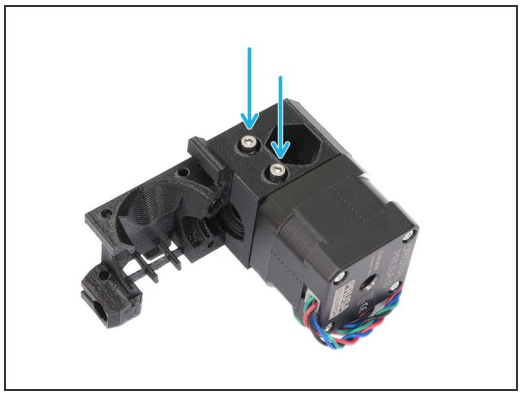
- Open idler fully to have direct access to the pulley.
- Use a piece of 1.75 mm filament (from the spool) to align the pulley with the openings for the filament (see the picture).
- Adjust the pulley and tighten it with 1.5mm Allen key. Use reasonable force as you might damage the thread.

ⓘ When ready with the alignment, please remove the filament.

Step 16 — Securing the Extruder idler

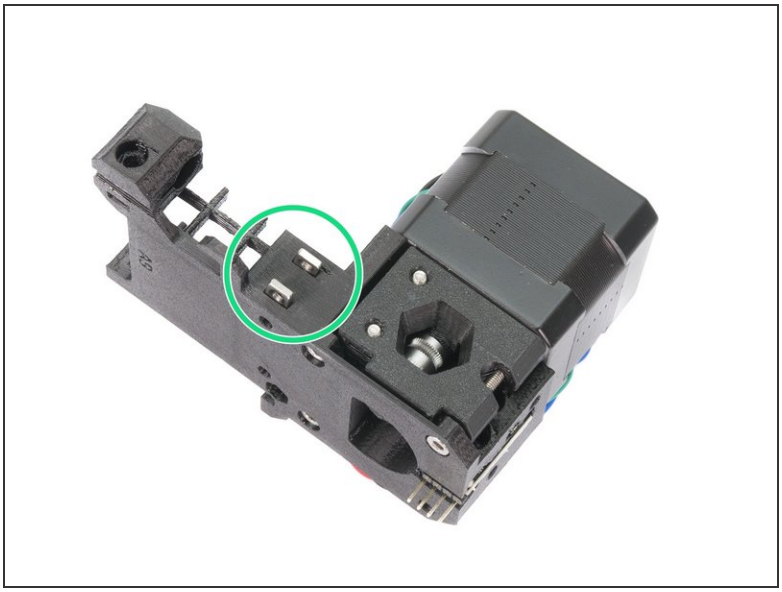


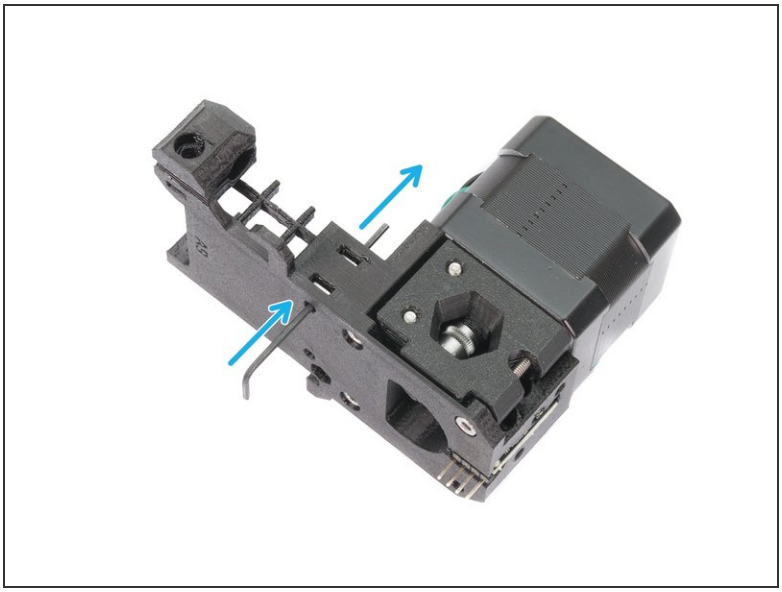




- For the following step, please prepare:
- M3x40 screw (2x)
- Extruder spring (2x)
- Assemble springs on both screws, see the second picture.
- Close the idler, so the screws can reach it.
- Place both screws into the Extruder body and tighten them. The screw's head should be almost aligned with the printed surface.

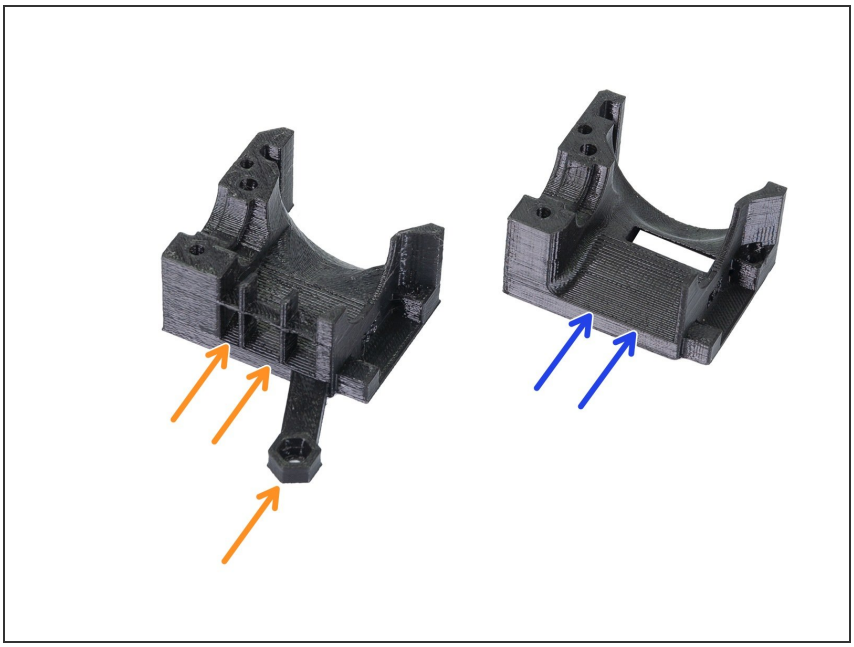
Step 17 — Mounting point for the Extruder body





- 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 18 — New printed parts - extruder cover

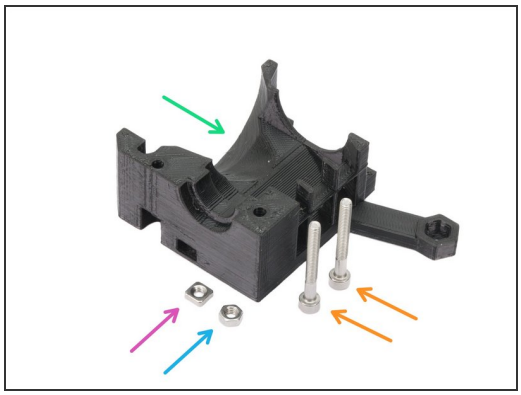
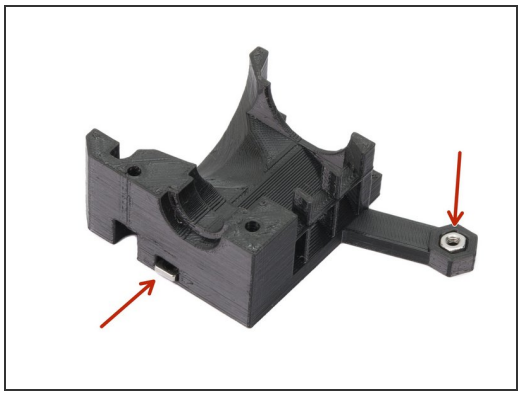
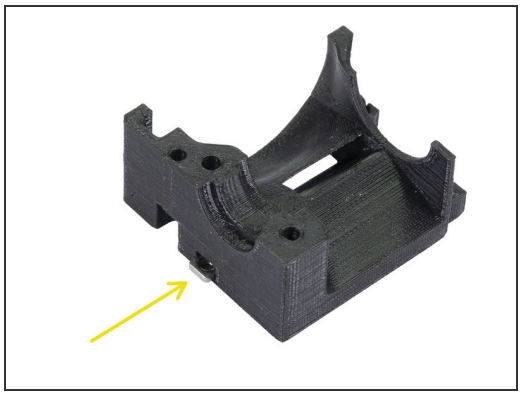


ATTENTION: 3D printed extruder parts were improved in order to achieve better cooling. More information including direct comparison can be found on our Prusa Research forum.

- The assembly of the printed parts is mostly the same. You will be informed in case extra attention is needed. Before you proceed to the next step, let's learn how to recognize your parts:
- **Previous design has a grill** on one side of the extruder cover **and extra fan arm**. This iteration has a label **B6** (printed by us) or **R2** (available on GitHub).
- **The latest design has NO grill** to improve airflow and also **the arm is not present**. This iteration has a label **B7** (printed by us) or **R3** (available on GitHub).

If you have already printed the B6/R2 design you can proceed or if possible reprint the latest parts B7/R3.

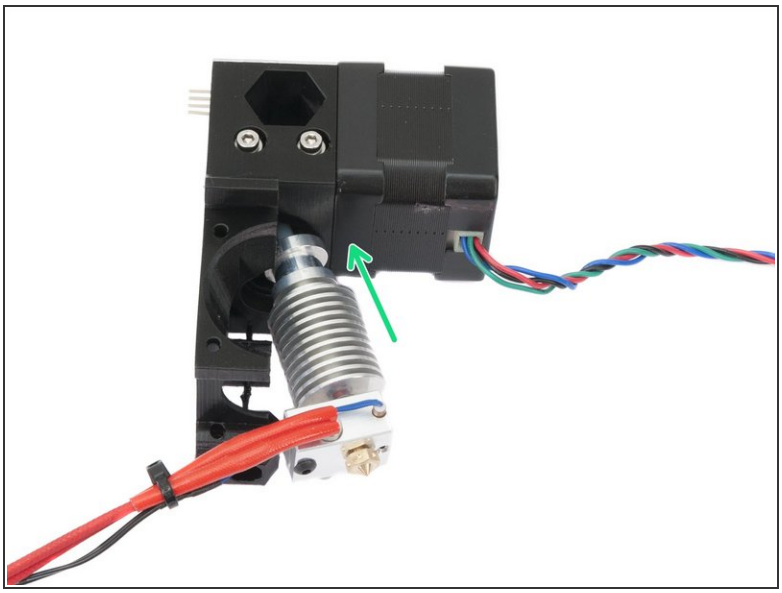
Step 19 — Preparing the extruder cover

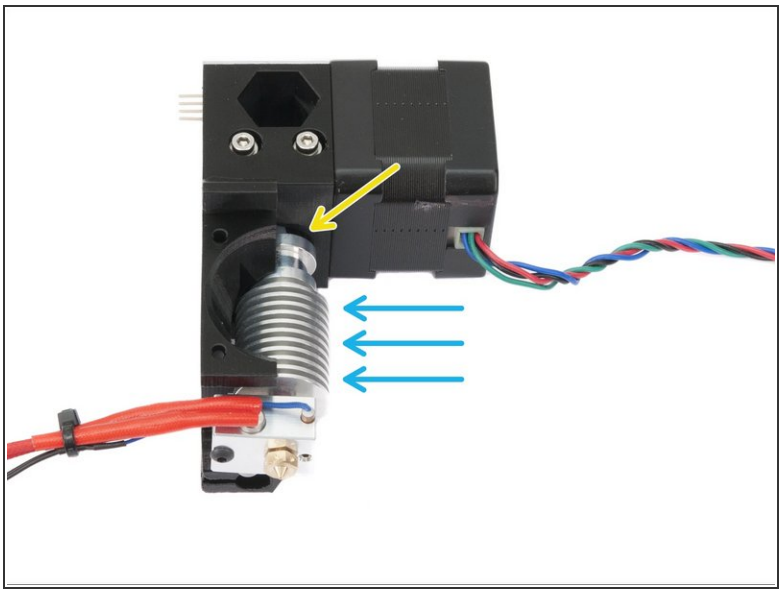




- For the following steps, please prepare:
- Extruder-cover (1x)
- M3nS nut (1x)
- M3n nut (1x) - *skip for R3/B7*
- M3x25 screw (2x)
- B6/R2 - insert both nuts in the printed part. See the second picture.
- B7/R3 - insert only M3nS nut. See the last picture.

In case you can't press the M3n nut in, don't use excessive force. Take M3 screw thread it from the opposite side of the printed part, as you tighten the screw, it will pull the nut in. Be careful not to break the printed part during tightening.

Step 20 — Inserting the E3D hotend



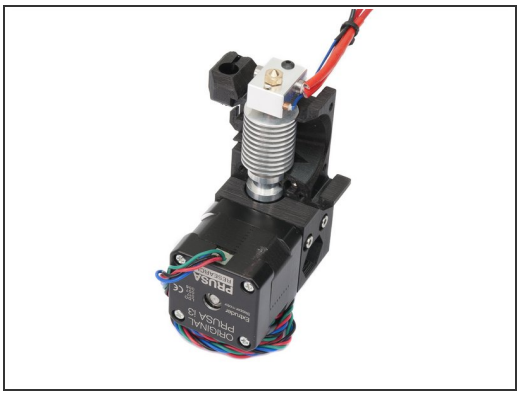
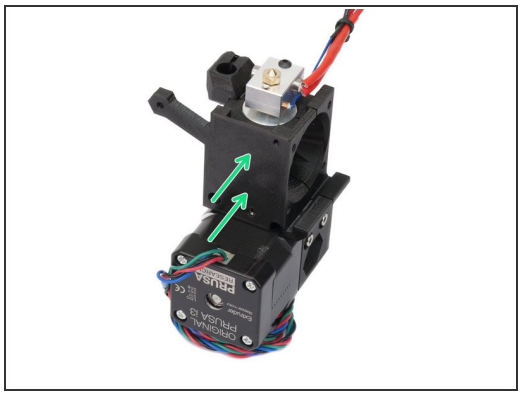


- Take the E3D hotend and place it inclined into the Extruder body. Make sure the white PTFE tube (already part of the hotend) fits in properly.
- Push the hotend into the Extruder body, see the picture.
- Make sure the hotend is fully seated and the upper part aligned (almost in contact) with the surface of the printed part.

⚠ Note the **CORRECT** orientation of the hotend.

⚠ Be **VERY CAREFUL** with the hotend wires from now on, you can damage them.

Step 21 — Mounting the extruder-cover

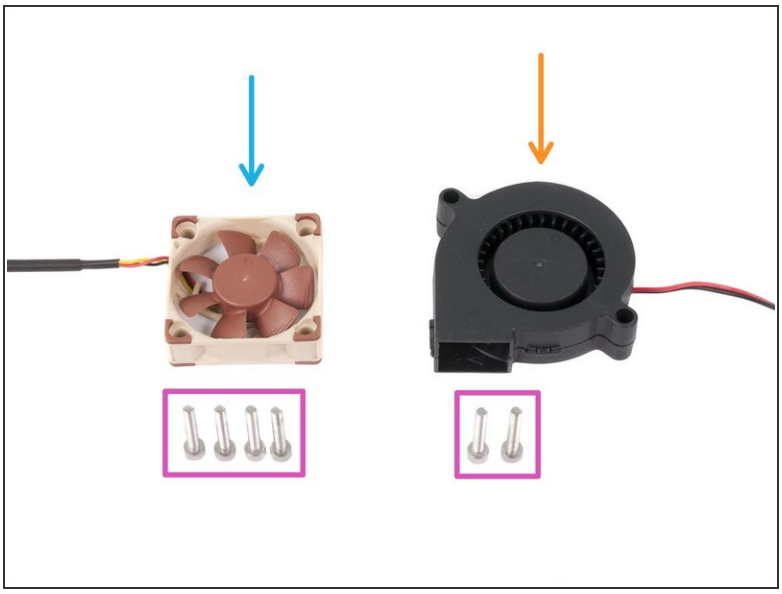



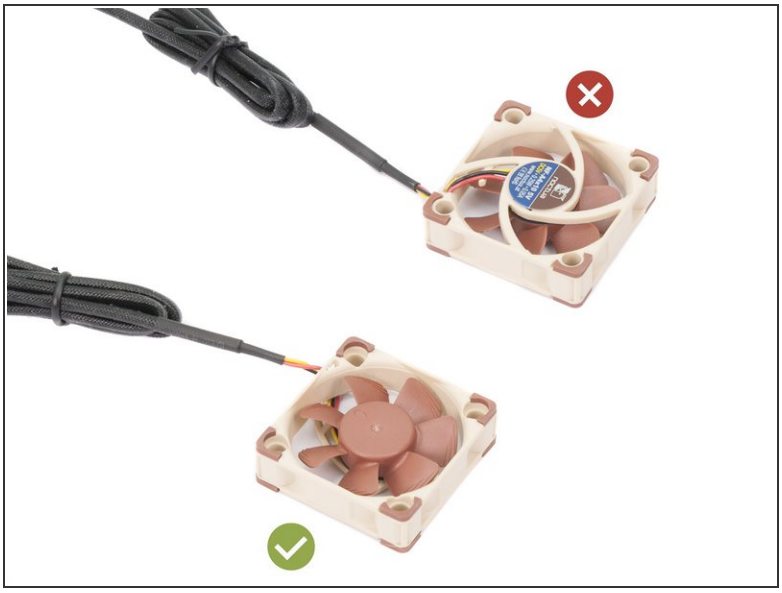

- Rotate the extruder as shown in the picture.
- Take the extruder-cover and place it on the extruder body. Both printed parts must be in direct contact.
- Using M3x25 screws tighten both parts together.

⚠ **Ensure again the hotend is properly assembled.** The surface of the heatsink (part of the hotend with cooling ribs) must be aligned with the surface of the printed parts. See the last picture.

ⓘ Note the B7/R3 extruder cover is missing the "arm". Otherwise the assembly is the same.

Step 22 — Preparing cooling fans





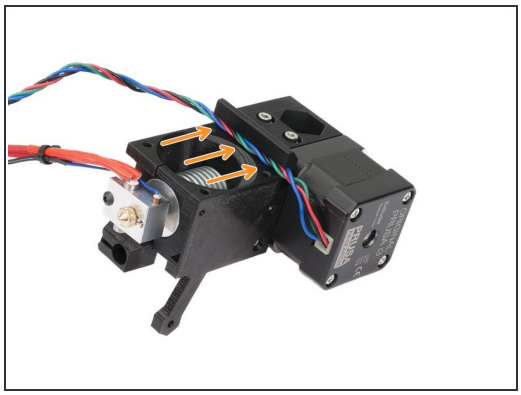
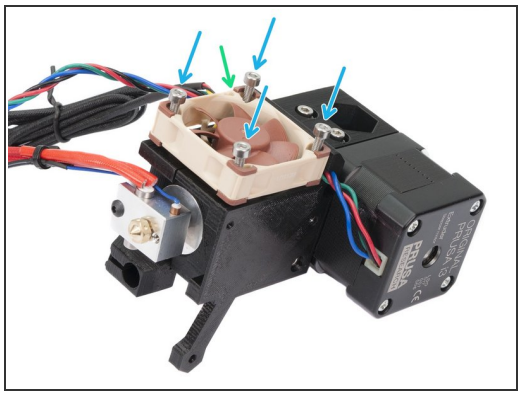
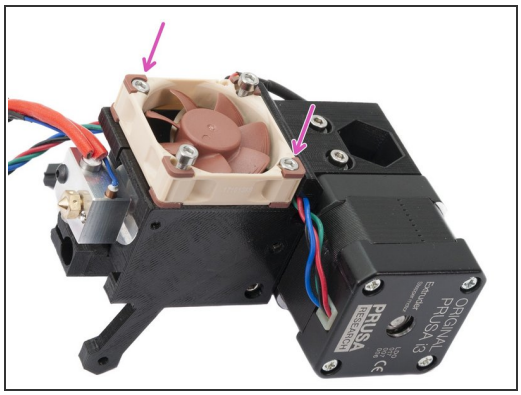
- For the following steps, please prepare:
- M3x18 screw (6x)
- New Left hotend fan (1x)
- Front print fan (1x)

⚠ The new Left hotend fan has two sides, but the side with sticker must be always facing the hotend (not visible when the fan is mounted). Otherwise, the cooling won't work properly.

ⓘ The left hotend fan (Noctua) can be also in a black colour without the rubber corners, other hardware parameters are the same.

ⓘ **Note for B7/R3** design **only five M3x18 screws are needed**, at the end of this chapter you might have one M3x18 left, which is OK ;)

Step 23 — Mounting the left hotend fan

- Place the Extruder on the side and guide the wires from the motor in the slot.
- Place the Left hotend fan on the Extruder. The cable must be placed in the top left corner, see the picture.

⚠ Note the correct orientation of the fan. The sticker has to face towards the hotend!

- Insert M3x18 screws and tighten them slightly.
- Now, tighten ALL screws, but on a diagonal. After tightening check, the fan can rotate freely.

⚠ **DON'T** tighten the screws too hard, all parts are made of plastic and you can break them.

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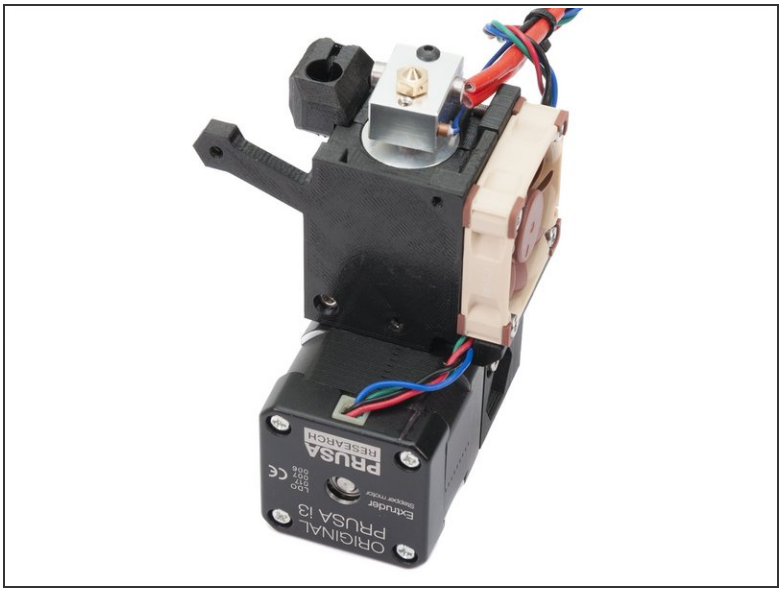
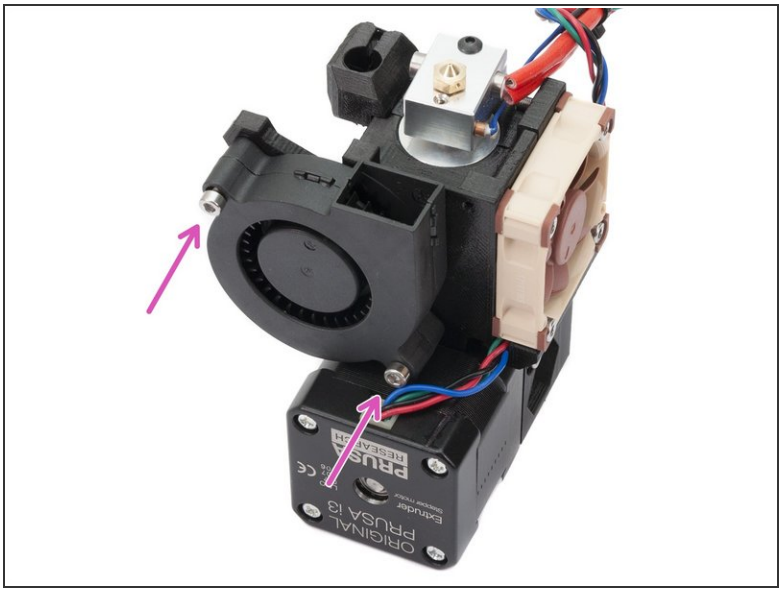
Step 24 — Mounting the front print fan - parts B6/R2



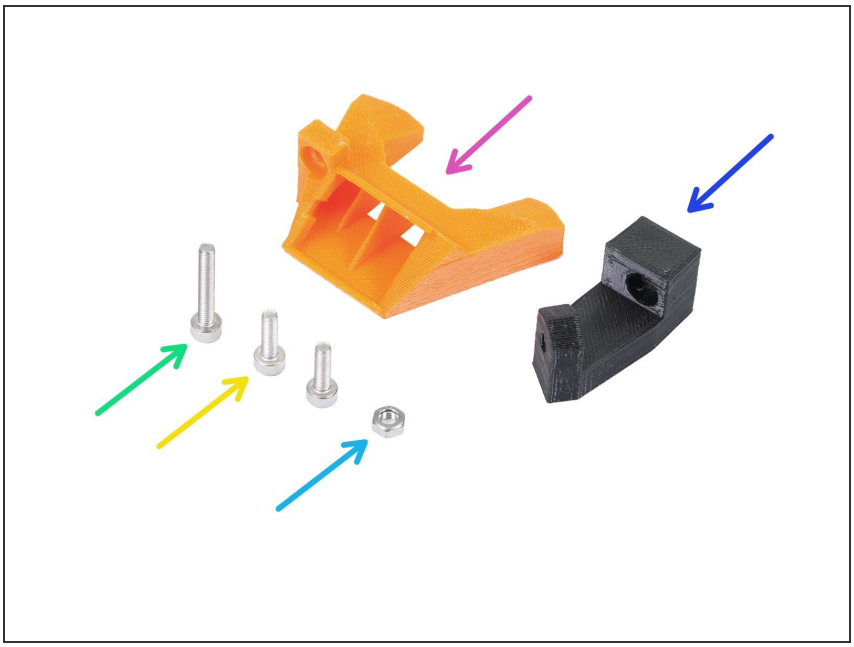


⚠ **This step is valid only for the design B6/R2** if you have new parts B7/R3 without the grill please skip to the Step25.

- Rotate the Extruder as in the first picture.
- Mount the Front print fan using two M3x18 screws.

⚠ **DON'T** tighten the screws too hard, all parts are made of plastic and you can break them.

Step 25 — Mounting the front print fan - parts B7/R3

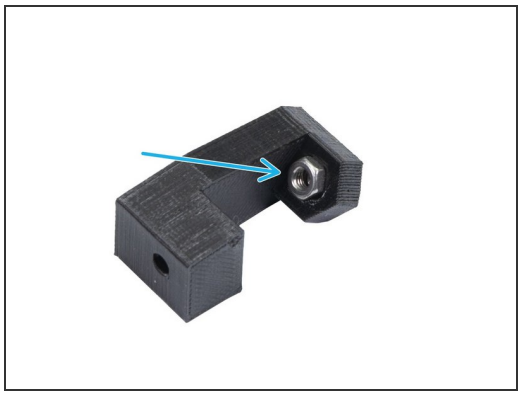
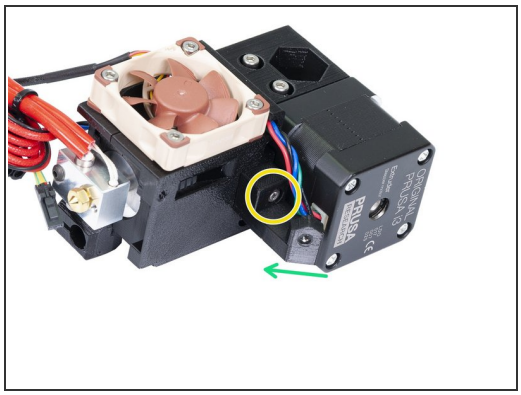
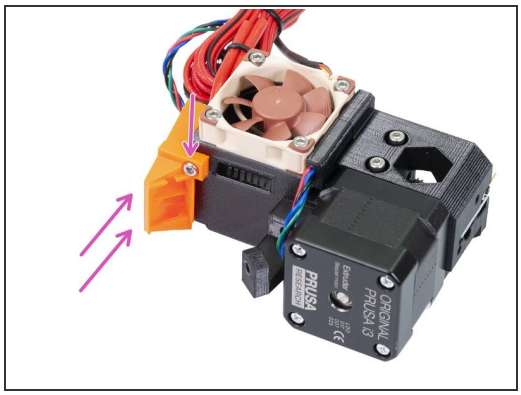


⚠ **Following steps are valid only for the latest design B7/R3**, if your Front print fan is already mounted, then skip to the Step28

- For the following steps, please prepare:
- nozzle-fan-45deg-support (1x)
- nozzle-fan-45deg (1x)
- M3x18 screw (1x) - *already prepared in step 22*
- M3x10 screw (2x)
- M3n nut (1x)

ⓘ Note your nozzle-fan might be black. If you received one M3x10 screw in a bag with the nozzle-fan, use it now.

Step 26 — Mounting the front print fan - parts B7/R3

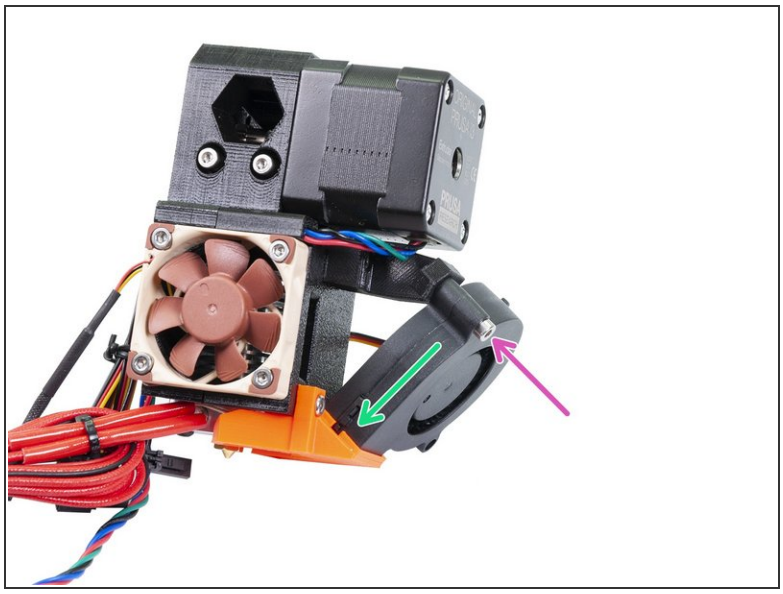




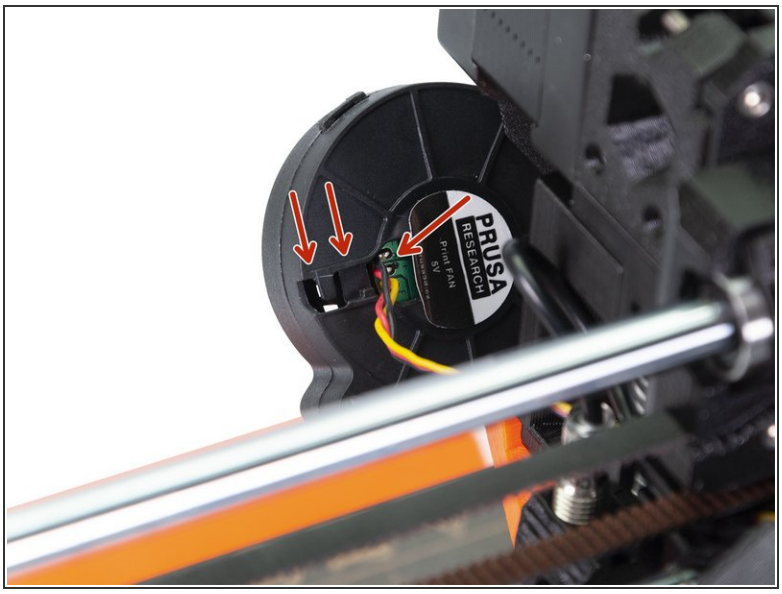
- Press the M3n nut in the support, all the way in. It will be barely visible. If needed use a screw from the other side to pull the nut in, then remove the screw.

⚠ **WARNING:** there are pins of the filament sensor on the other side of the extruder. Be careful as you might bend them during the following steps!!!

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

Step 27 — Mounting the front print fan - parts B7/R3





- Slide the Front print fan in the nozzle-fan.
- Secure the fan using a M3x18 screw.
- **In case you are upgrading already assembled printer**, it might happen the fan cable is too short and you can't incline the fan. First, try gently pull the cable from the spiral wrap. If this doesn't help unhook the cable (see the picture), **but be extremely careful as you might disconnect the wires from the fan!**

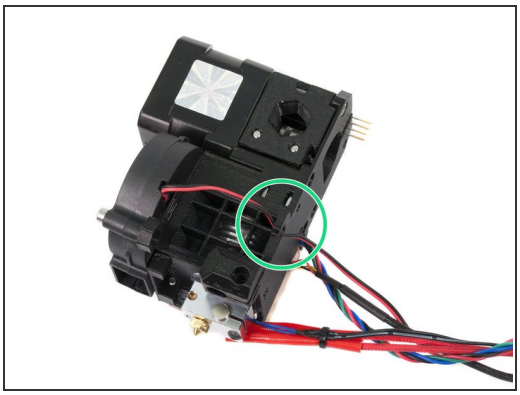
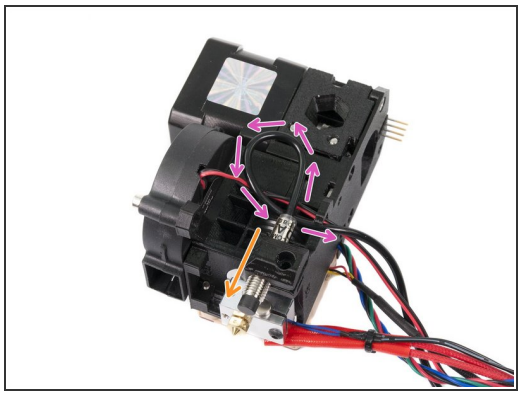
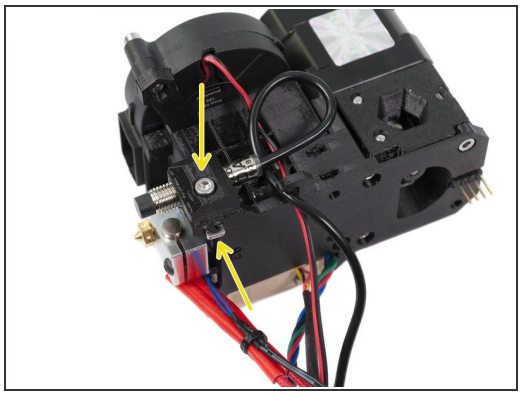
Step 28 — Preparing the P.I.N.D.A. probe

- For the following steps, please prepare:
- New P.I.N.D.A. probe (1x)
- M3x10 screw (1x)
- M3nS nut (1x)

⚠ The probe is a sensitive device, please handle it with care during the assembly!

ⓘ The P.I.N.D.A. cable can be either black or grey, both probes are the same.

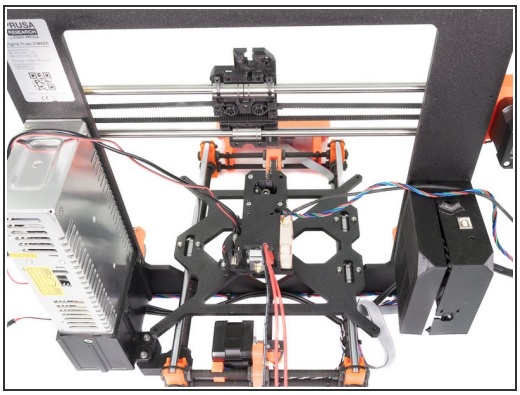
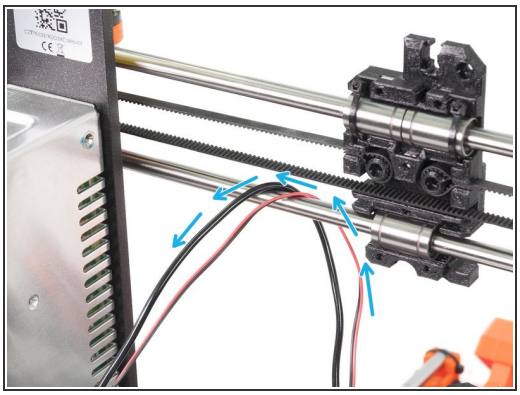
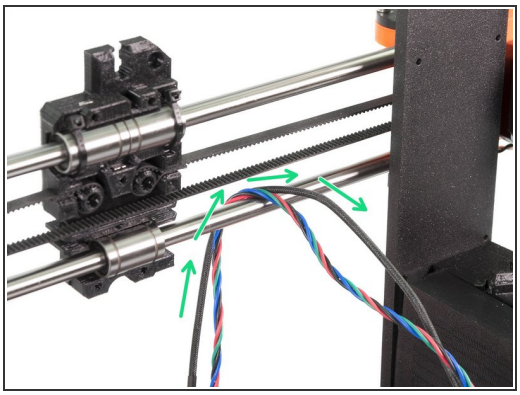
Step 29 — Mounting the P.I.N.D.A. probe

- Start with the front print fan wire and place it under the cable clip.
- Gently push the P.I.N.D.A. probe through the mount.
- Create a loop on the probe wire, then place the wire under the cable clip.
- Slide the M3nS nut in the slot and tighten the probe SLIGHTLY with the M3x10 screw.

ⓘ The exact position of the P.I.N.D.A. probe will be adjusted later (in Chapter 9, Preflight check), so there is no need to adjust the probe or tighten the screw fully at this point.

Step 30 — Extruder cables preparation

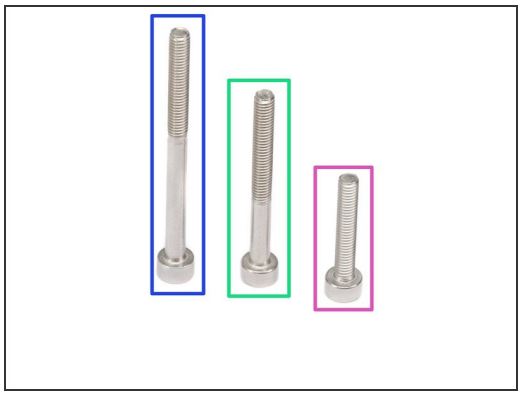
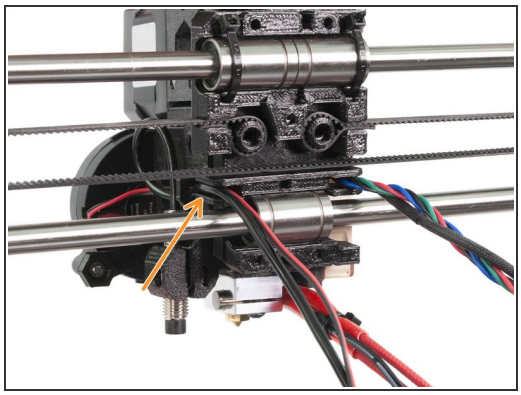
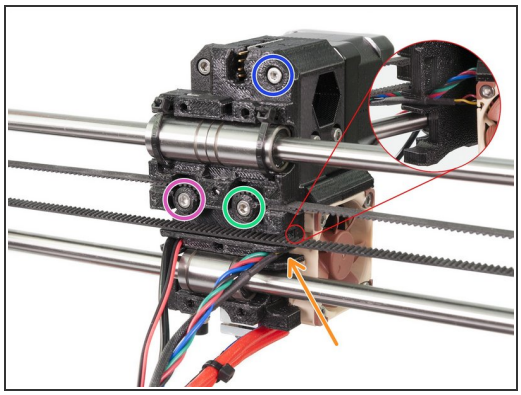




- Place the Extruder on the Y-carriage as in the first picture.
- Take the cables from P.I.N.D.A. probe and Front print fan, slide it between the lower smooth rod and belt.
- Take the cables from Extruder motor and Left hotend fan, slide it between the lower smooth rod and belt.

⚠ **IT IS VERY IMPORTANT** to place the cables as shown in the pictures. Please double check your steps.

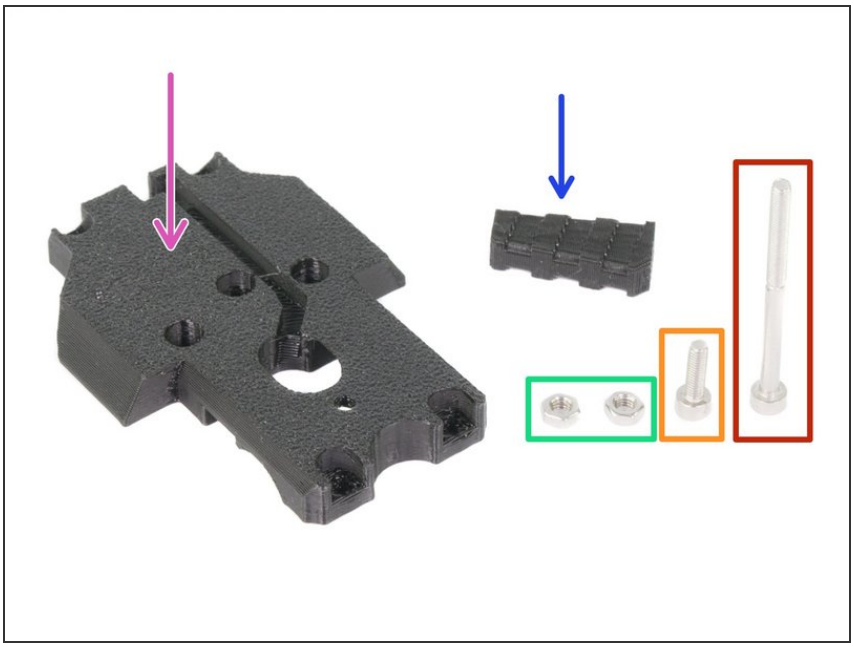
ⓘ Cables from hotend will be placed under the lowest smooth rod. We will arrange them later.

Step 31 — Mounting the Extruder

- For the following step, please prepare:
- M3x40 screw (1x)
- M3x30 screw (1x)
- M3x18 screw (1x)
- Mount the Extruder on the X-carriage using the screws above. Tighten all screws, but not fully. We need to arrange the cables first.
- Guide the cables through slots (channels) on both sides of the Extruder. On the left side, it is Front Print fan and P.I.N.D.A. probe, on the right side Extruder motor and Left Hotend fan.
- Ensure the cables are in the channels and not pinched between printed parts. Now, tighten all screws, equally to prevent issues.

Step 32 — Preparing the X-carriage-back (part 1)

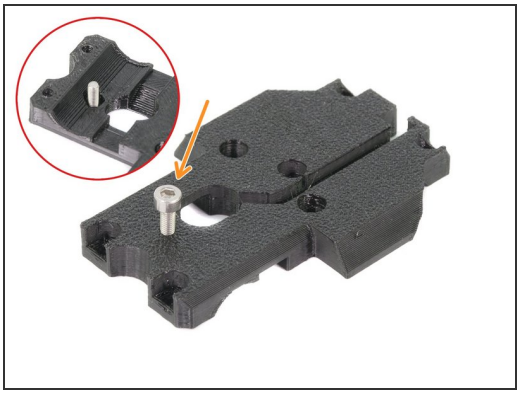


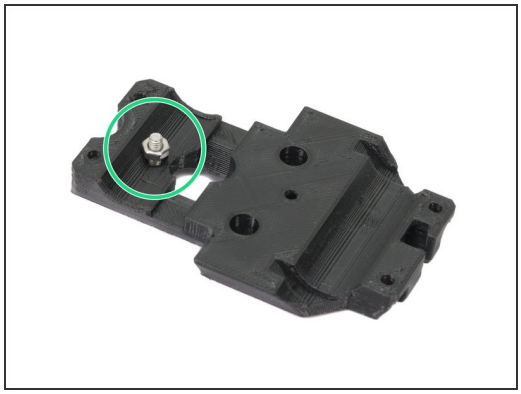
- For the following steps, please prepare:
- X-carriage-back (1x)
- Cable-holder (1x)
- M3n nut (2x)
- M3x10 screw (1x)

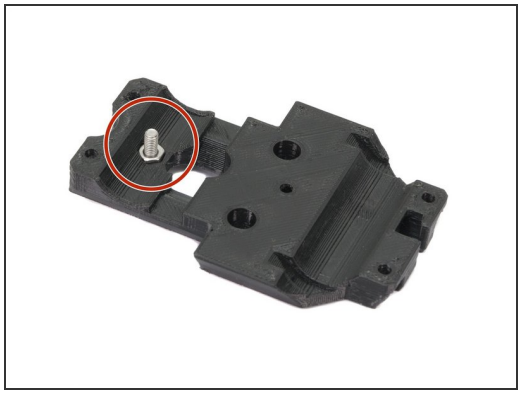
ⓘ The M3x10 screw will be used temporarily. Use any you have at your disposal.

- M3x40 screw (1x)

Step 33 — Preparing the X-carriage-back (part 2)

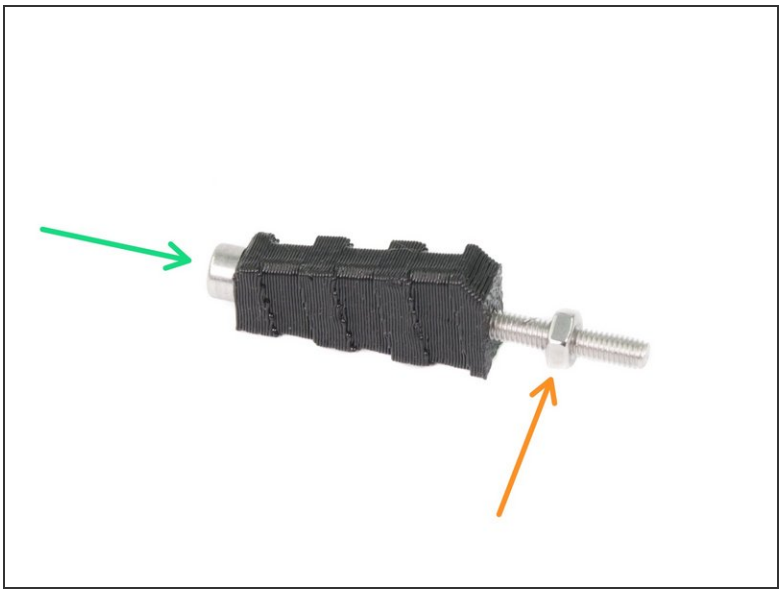






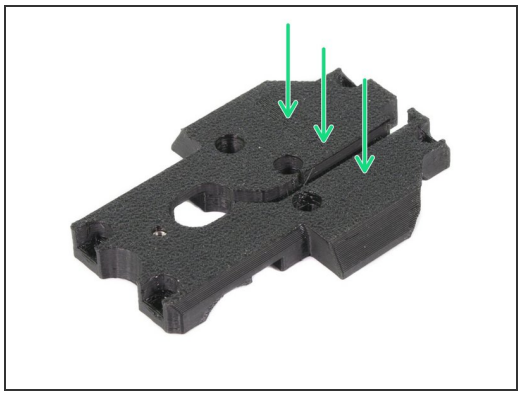
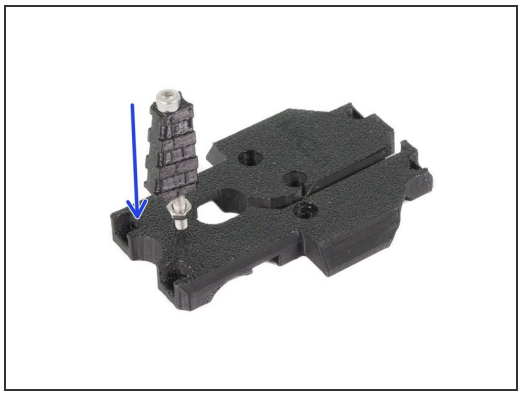
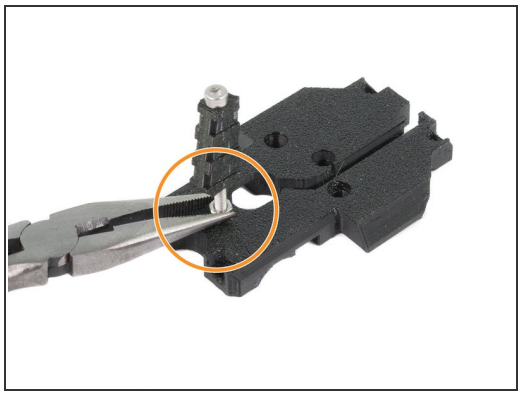
- Insert the M3x10 screw in the X-carriage-back. Tighten it completely.
- Rotate the printed part and insert the M3n nut.
- Tighten the M3x10 screw until the nut slides in the printed part. Note the shape of the cutout for the nut, you might need to adjust (rotate) the nut.
- Remove the M3x10 screw and place it back in the spare bag.

Step 34 — Preparing the X-carriage-back (part 3)



- Prepare the M3x40 screw, M3n nut and cable-holder from the previous step.
- Tighten the screw all the way through the printed part.
- Add the M3n nut, stop at about half the length of the screw's thread.

Step 35 — Preparing the X-carriage-back (part 4)

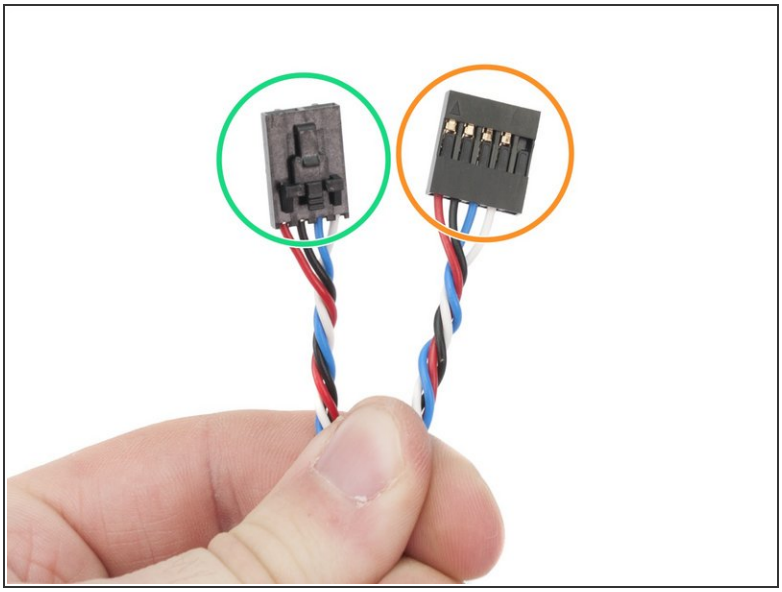




- Place the X-carriage-back as in the picture.
- Tighten the X-carriage-back and the cable-holder together.

⚠ The screw's tip should be aligned with the nut on the other side. Don't screw it "deeper", or you will have issues with assembling the X-carriage-back on the X-carriage.

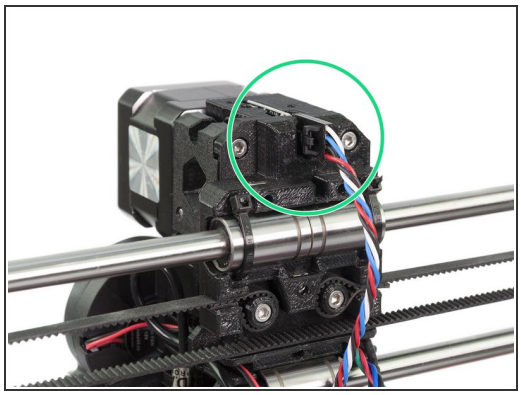
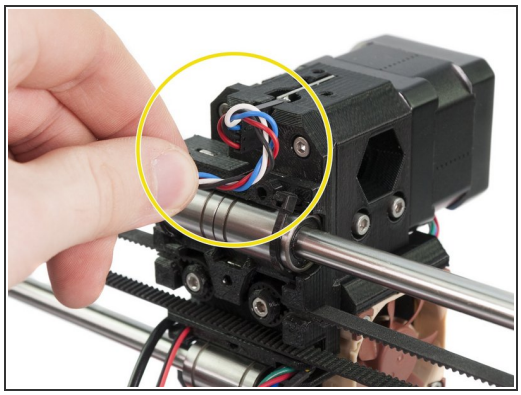
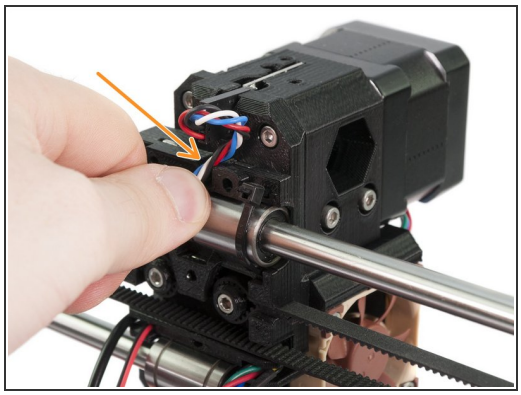
- Secure the screw by tightening the nut all the way to the surface. Do not use excessive force, as you might crack the printed part.

Step 36 — Cable for the filament sensor



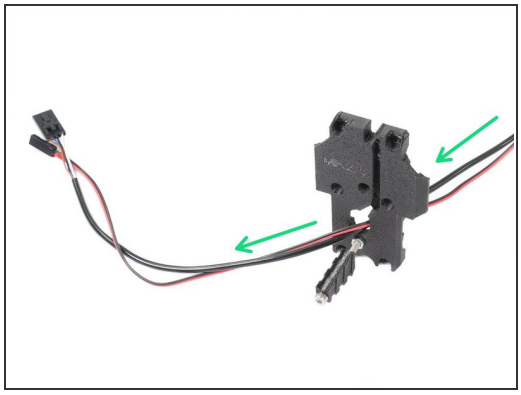
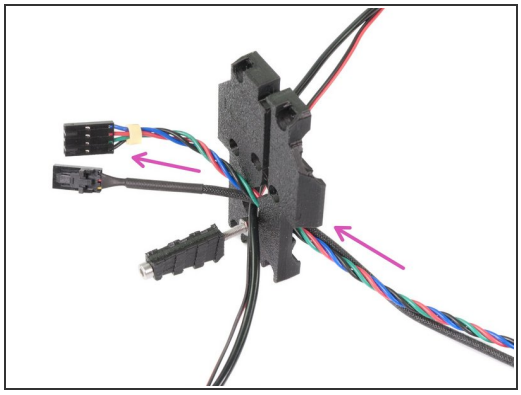
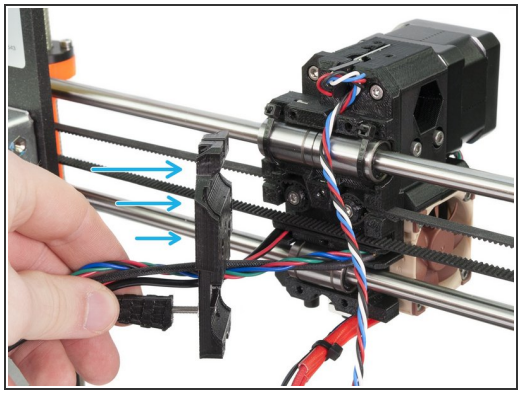
- Locate the cable for filament sensor in the package.
- There are two types of the connectors on the cable:
- Connector for the sensor (used now)
- Connector for the RAMBo board (used later)

Step 37 — Connecting the Filament sensor

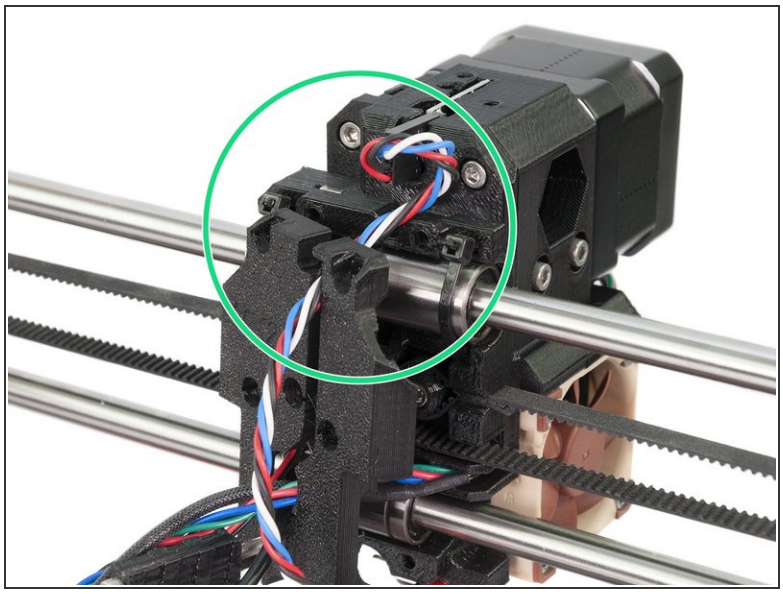
- Use the cable from the previous step and connect it carefully to the filament sensor.
- ⚠ Note the connector has two different sides. The side with safety pin must be on the left (white wire is facing up and red down).
- Gently rotate the cable (clockwise) to create a small loop, see the second picture.
- Push the cable through the opening on the X-carriage.

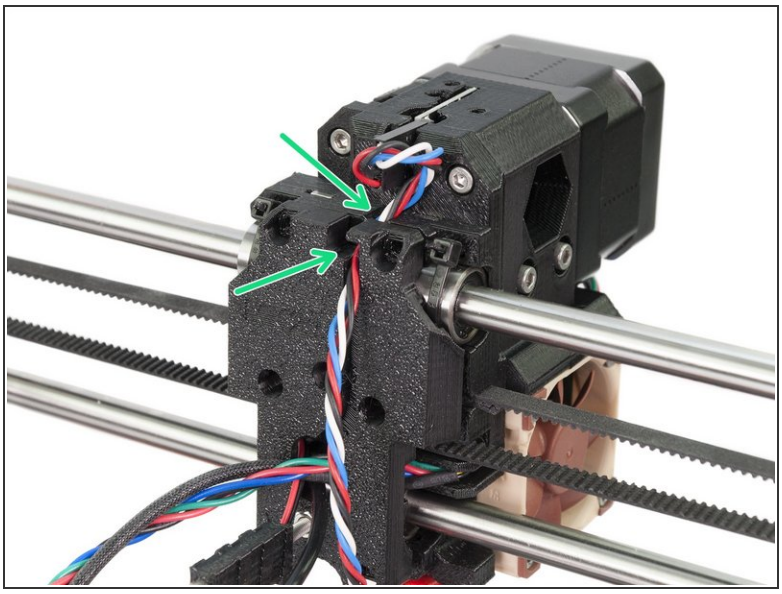
Step 38 — Assembling the X-carriage-back

- Push the cables from the Extruder **THROUGH** the X-carriage-back. Start with the Front print fan and P.I.N.D.A. probe cables.
- In the next step add Extruder motor and the Left hotend fan.
- ⚠ Cables from hotend and filament sensor are **NOT GOING** through the X-carriage-back!
- Slide the X-carriage-back towards the X-axis.

Step 39 — Adjusting the filament sensor cable

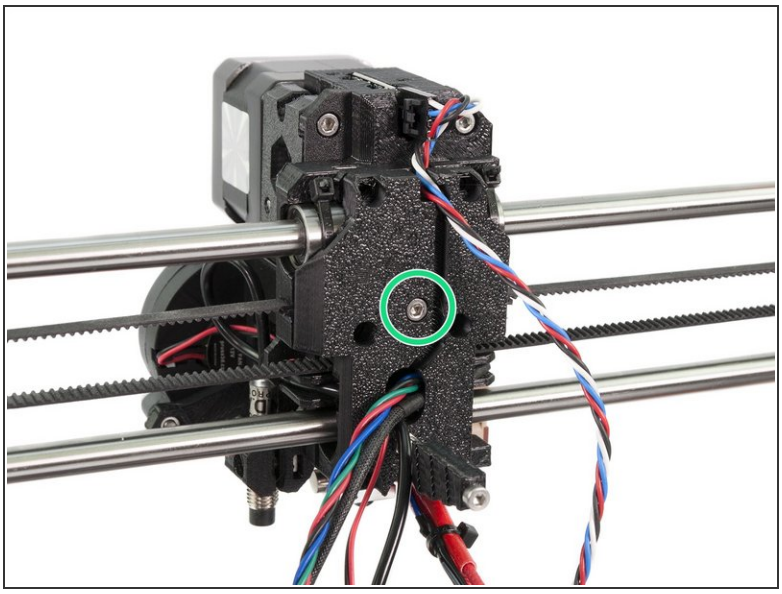


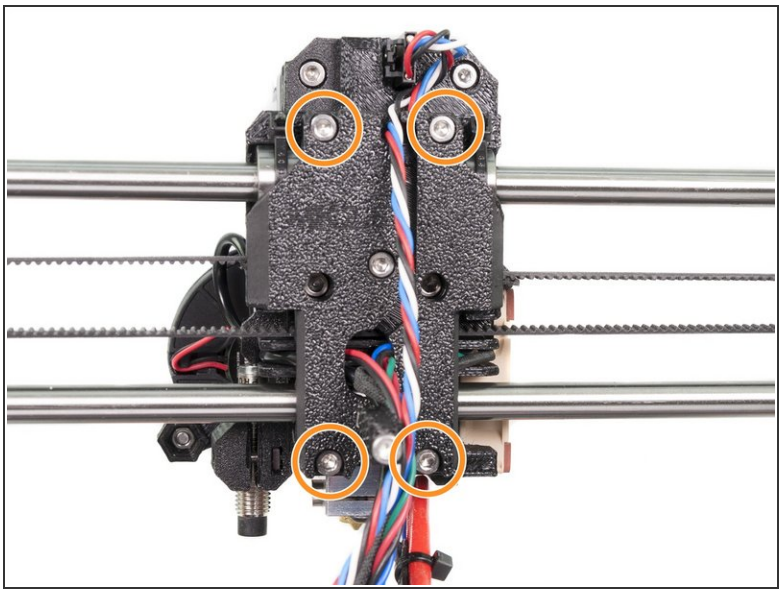


- Before pressing the X-carriage-back against the X-axis, place the filament sensor cable through the slot. See both pictures.

⚠ Check the cables are not pinched between the X-carriage-back and the X-axis!!!

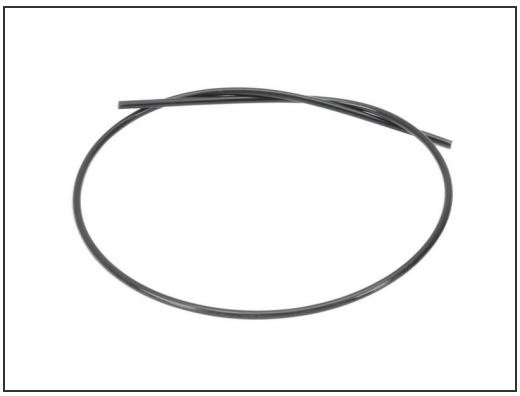
Step 40 — Mounting the X-carriage-back

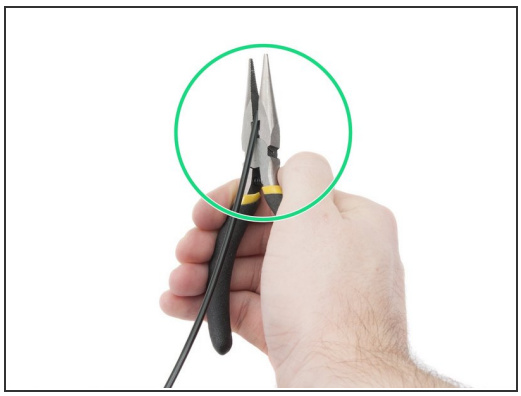


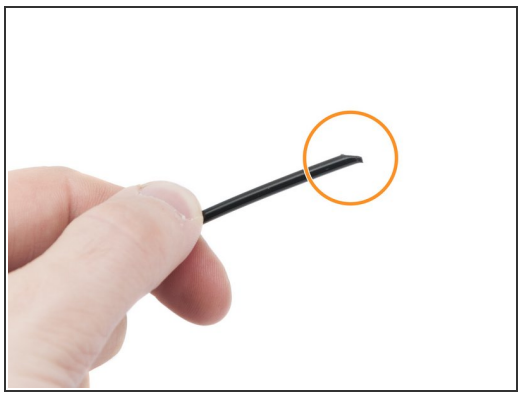


- Using five M3x10 screws tighten the parts together in following order:
- Start in the middle and ensure proper alignment.
- Continue in the corners, tighten all screws equally.

Step 41 — Preparing the NYLON filament

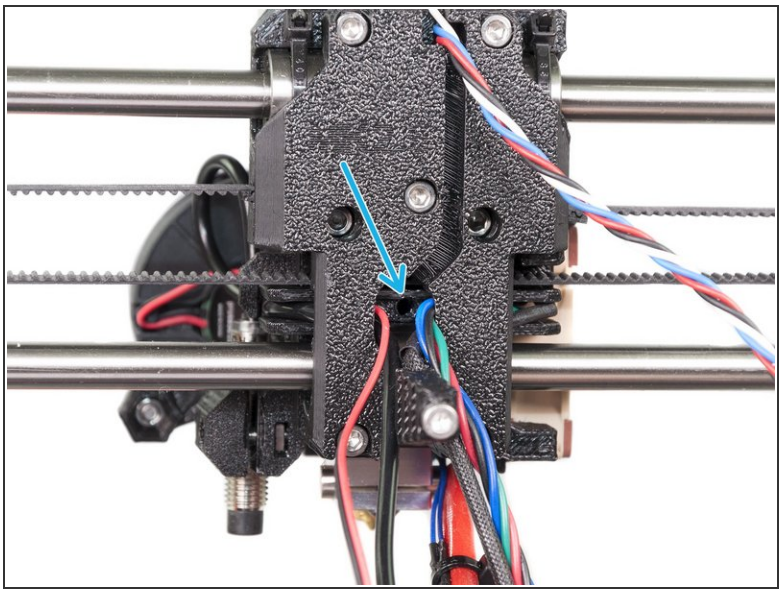






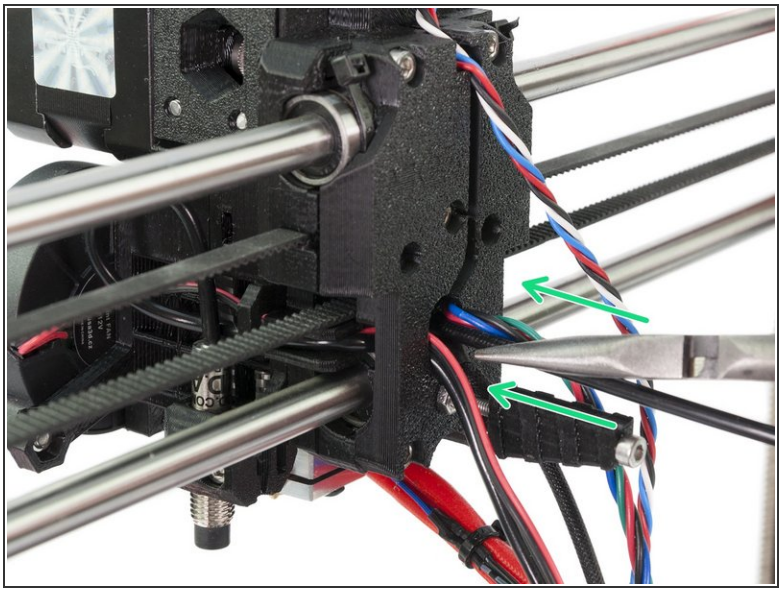
- There is a NYLON filament included in the kit with length 50 cm and Ø 3 mm. **DON'T TRIM it!**
- Using the pliers cut one end of the filament to create a tip.
- Check the tip is similar to the third picture.

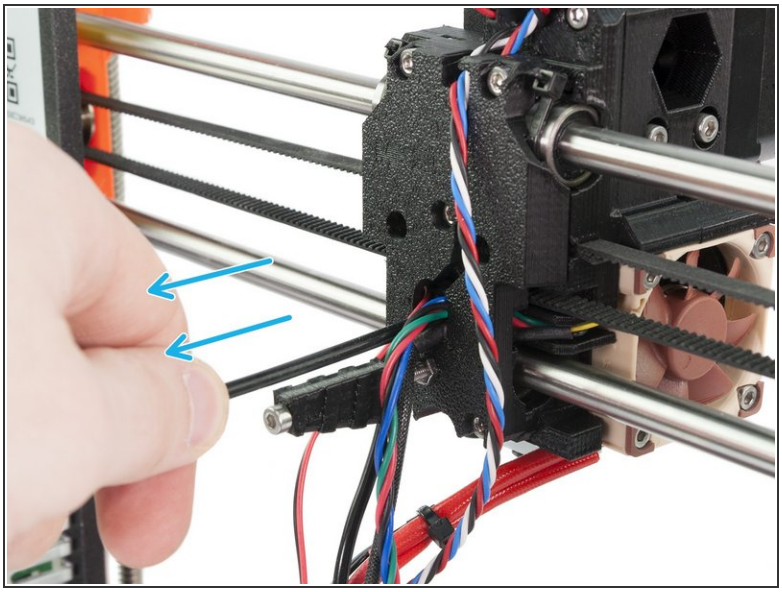
Step 42 — Finding the slot for the NYLON filament



- The NYLON filament must be pressed through the opening in the X-carriage-back to a circular slot in the X-carriage.
- See the second picture, where both printed parts are shown without cables.

Step 43 — Inserting the NYLON filament





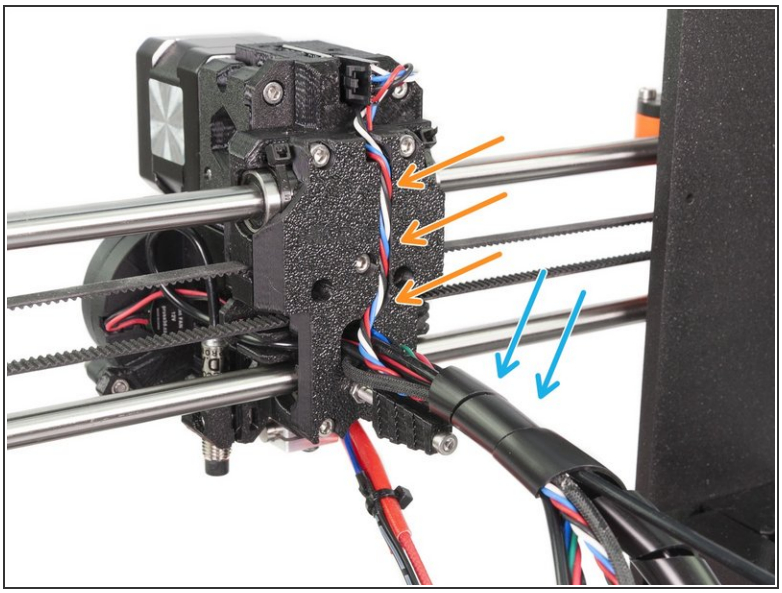
- Using the pliers insert the black NYLON filament in the slot.

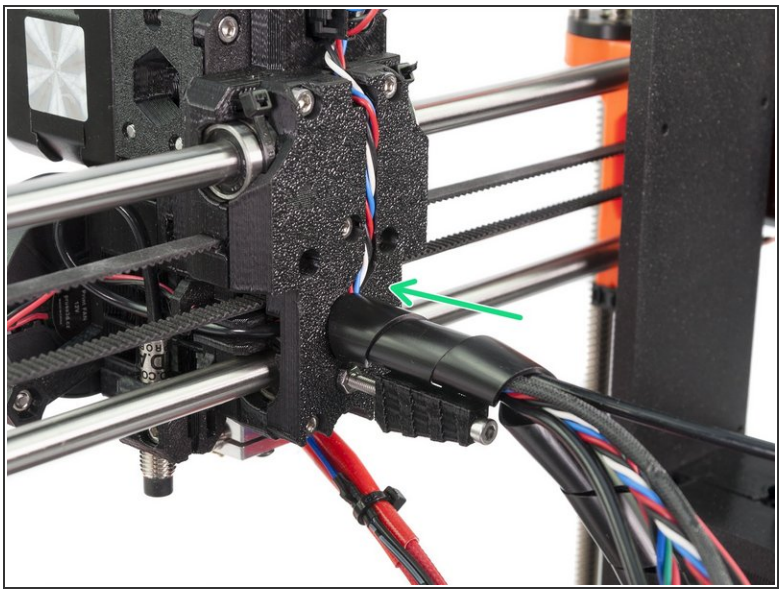
⚠ **BE EXTREMELY CAREFUL** as the pliers tend to slide and you can easily damage the wires!!!

- To check if the filament is seated properly, gently pull it with your hand. The X-axis should bend a little, but the filament must remain in the slot.

ⓘ If you have issues, try to adjust the tip on the filament.

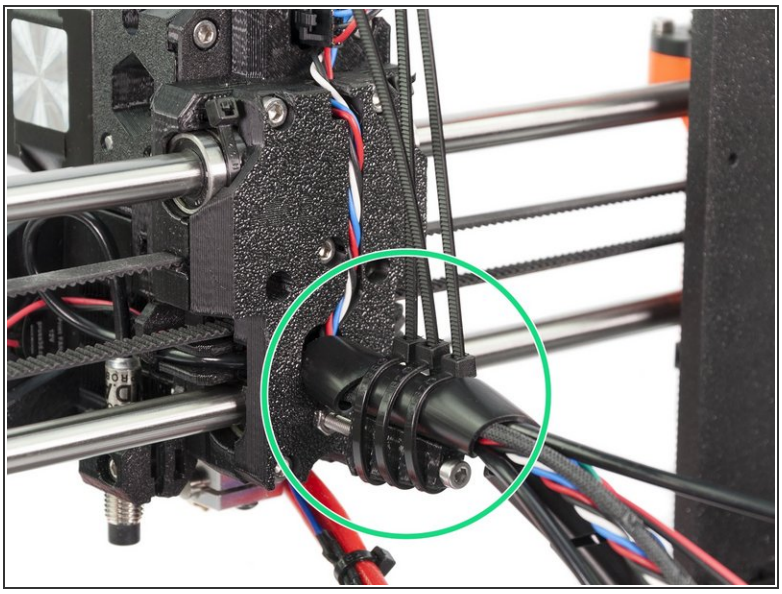
Step 44 — Cable management using spiral wrap

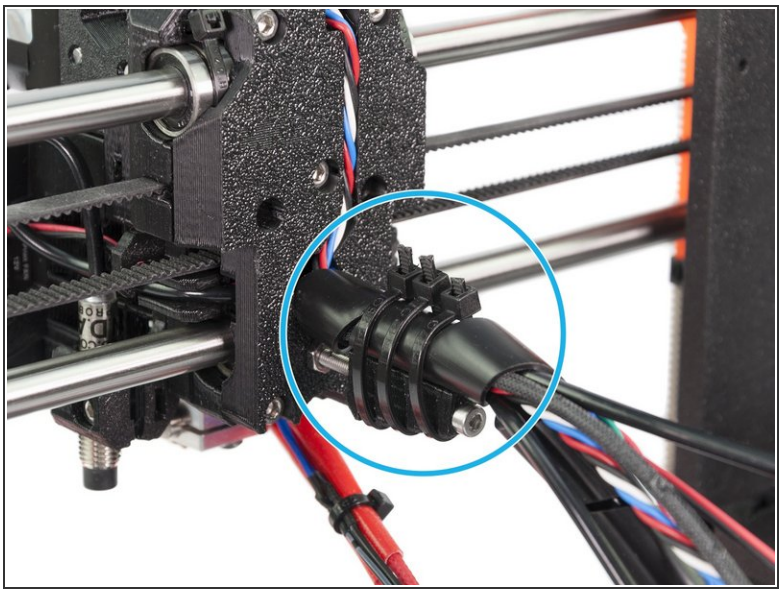




- Guide the filament sensor cable through the slot in the X-carriage-back and join the remaining cables.
- Wrap the spiral wrap (the largest and the longest one) around the cables and the nylon filament.
- Start with cables from the upper part, after 3-4 turns slide the wrap on the cable-holder. If possible, press the wrap slightly in the X-carriage-back.

Step 45 — Tightening the spiral wrap (Part 1)



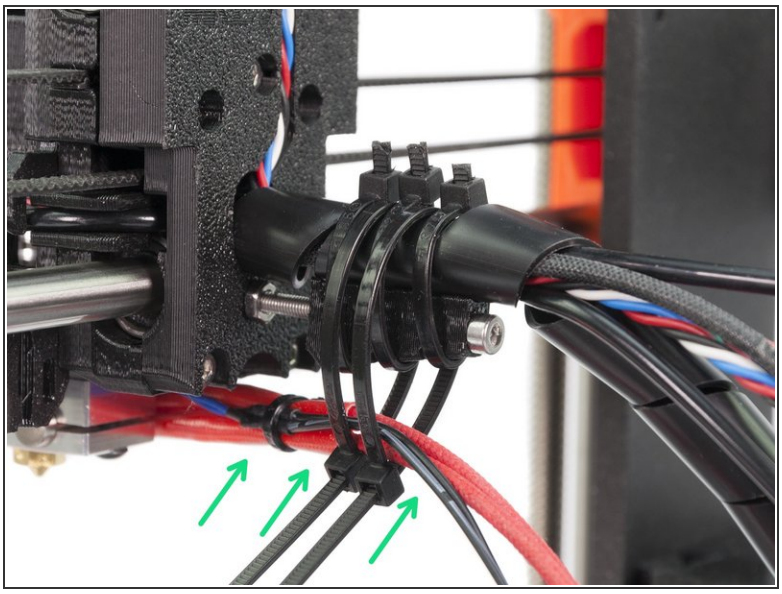


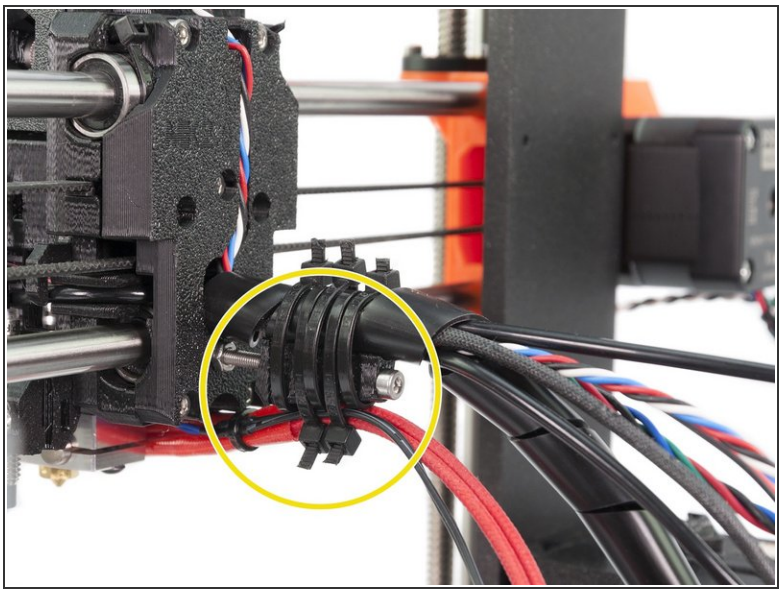
- Use three zip ties to fix the spiral wrap on to the cable-holder
- Check for the last time both the wrap and cables are seated properly.

⚠ **PAY GREAT ATTENTION** to the final position of the zip ties. If you don't follow the manual, you will have issues during prints!

- Tighten zip ties and cut remaining parts.

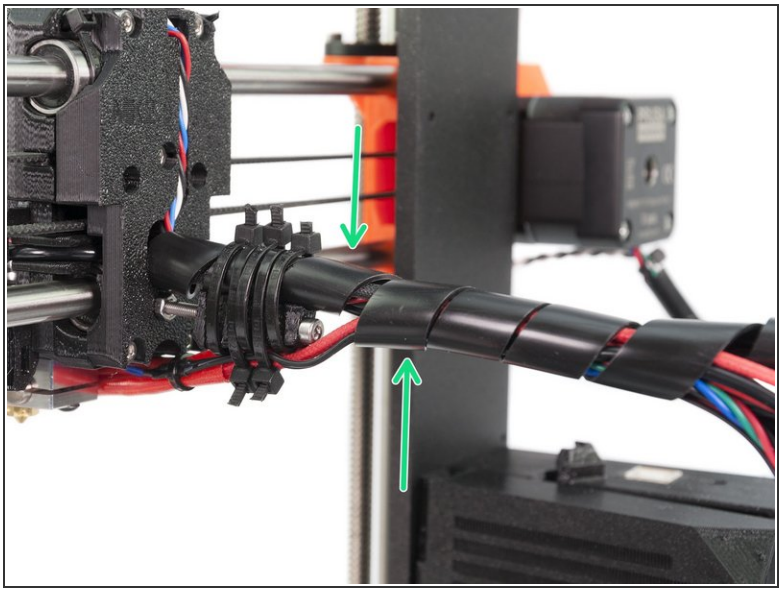
Step 46 — Tightening the spiral wrap (Part 2)

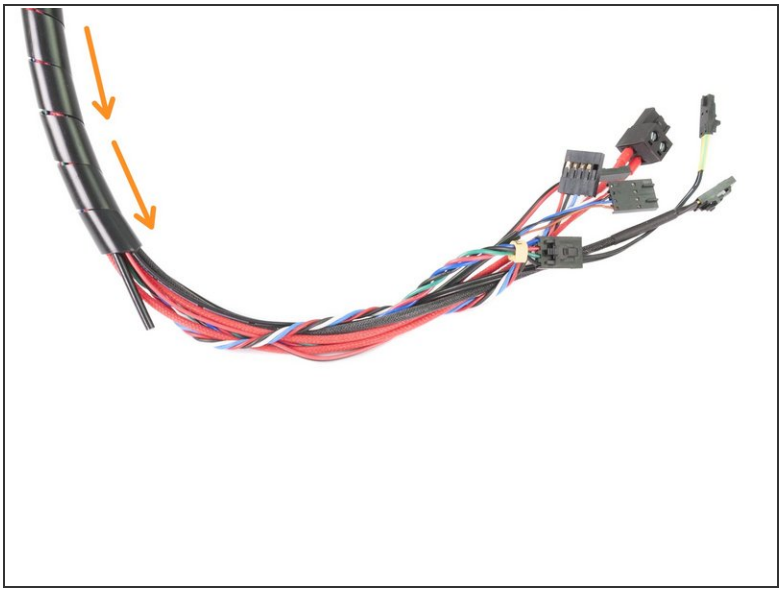




- Now, use two zip ties and before tightening them add the cables from the hotend.
- Once the hotend cables are included, tighten the zip ties and cut remaining parts.

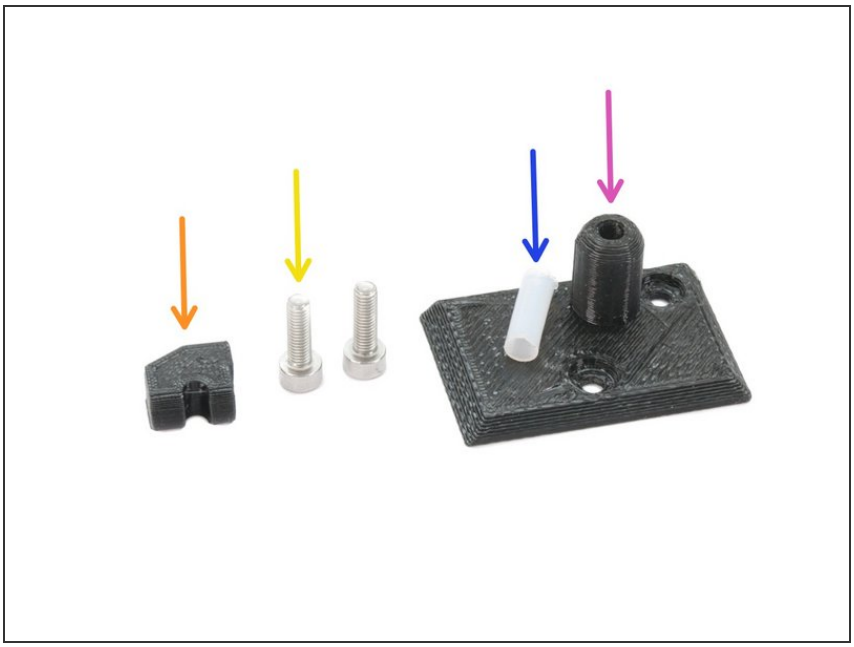
Step 47 — Finalizing the spiral wrap





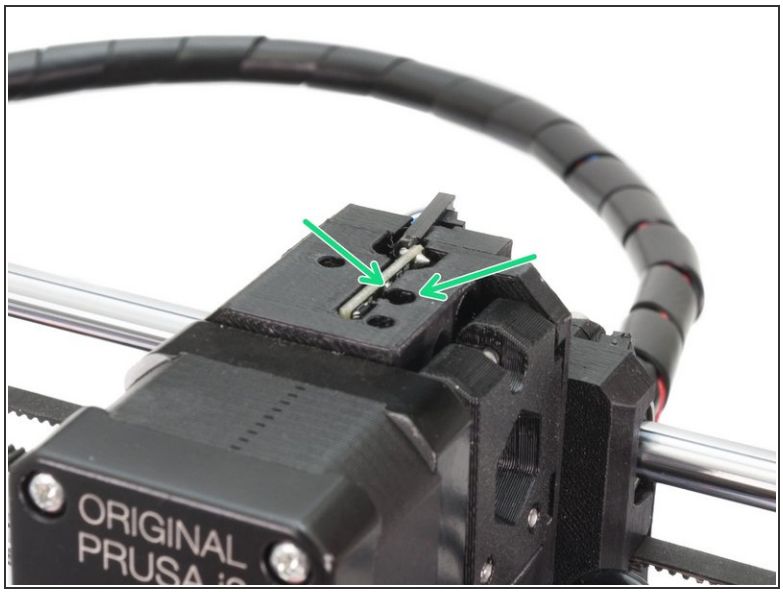
- Make one more turn of the spiral wrap, then add the cables from the hotend.
- Wrap the whole cable bundle.

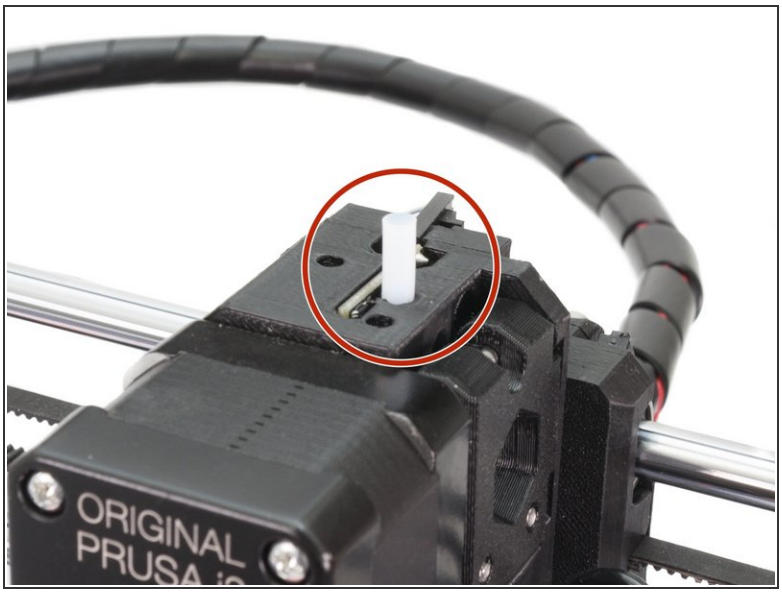
Step 48 — Mounting the Filament-sensor-cover (part 1)



- For the following steps, please prepare:
- Idler-plug (1x)
- Filament-sensor-cover (1x)
- PTFE tube (1x)
- M3x10 screw (2x)

Step 49 — Mounting the Filament-sensor-cover (part 2)

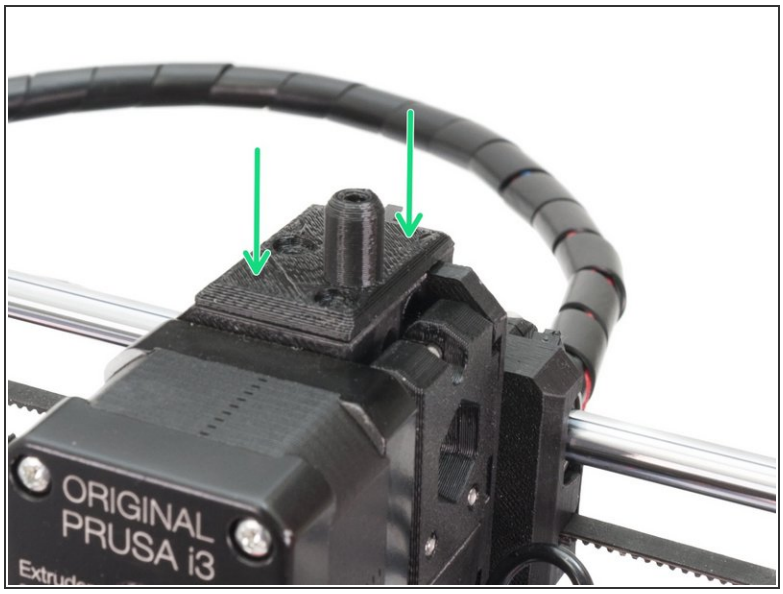


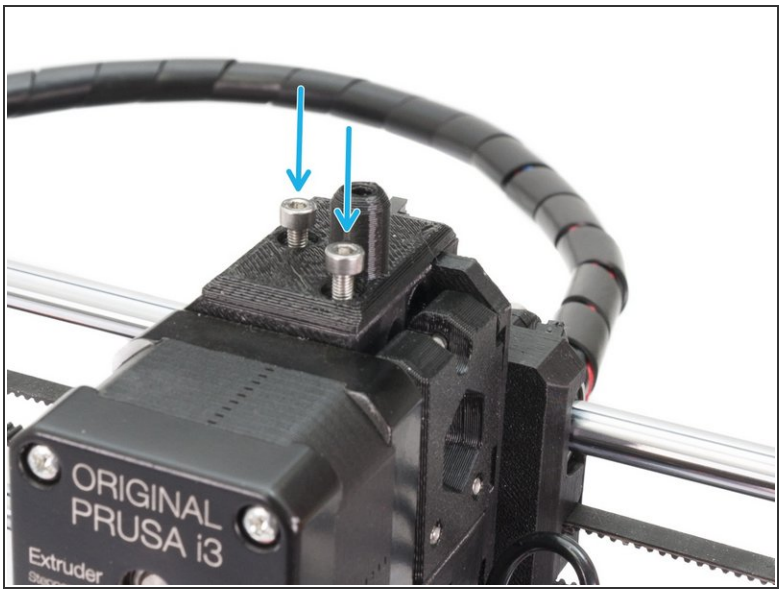


- Locate the largest circular opening for the PTFE tube on the top of the Extruder.
- Push the PTFE tube in. Most of the tube's length will stick out.

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

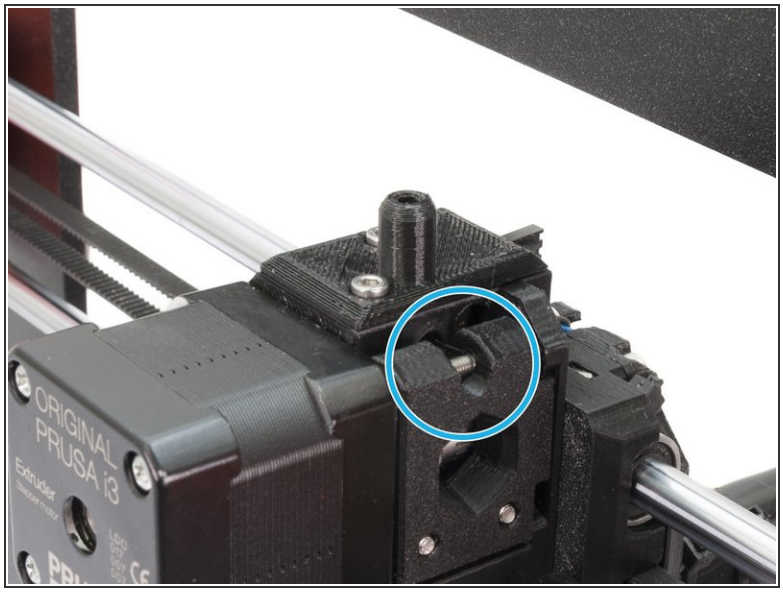
Step 50 — Mounting the Filament-sensor-cover (part 3)

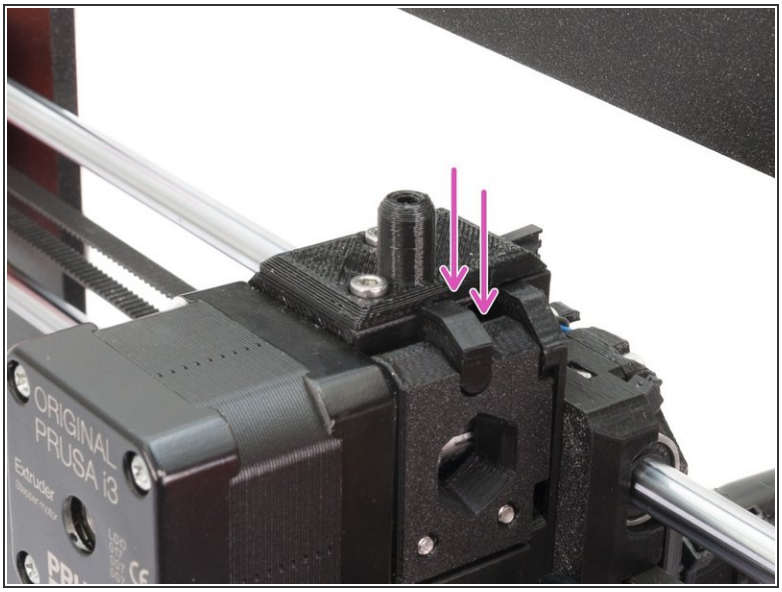




- Carefully slide the filament cover on the PTFE tube.
- Using two M3x10 screws mount the cover.

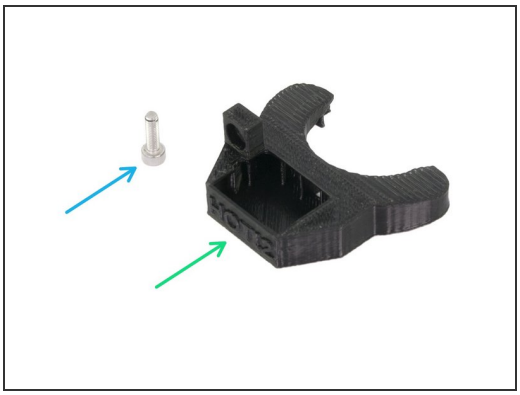
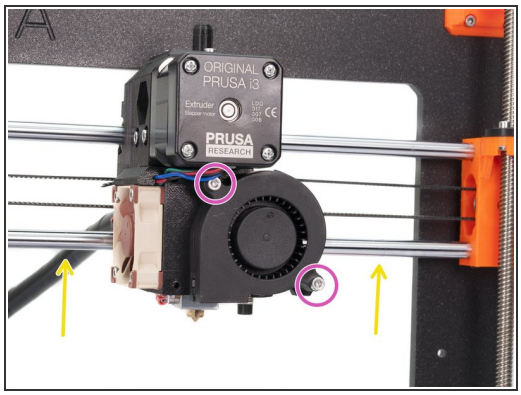
Step 51 — Assembling the idler-plug

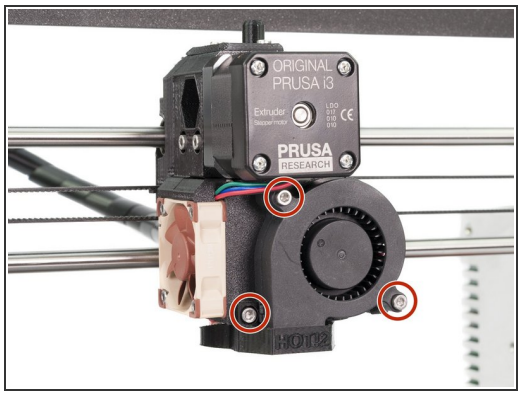




- Locate the part, where the idler is cut out (M3 screw is visible).
- Assemble the idler-plug and ensure it fits properly. Otherwise, it might fall down during the print.

Step 52 — Mounting the fan-nozzle

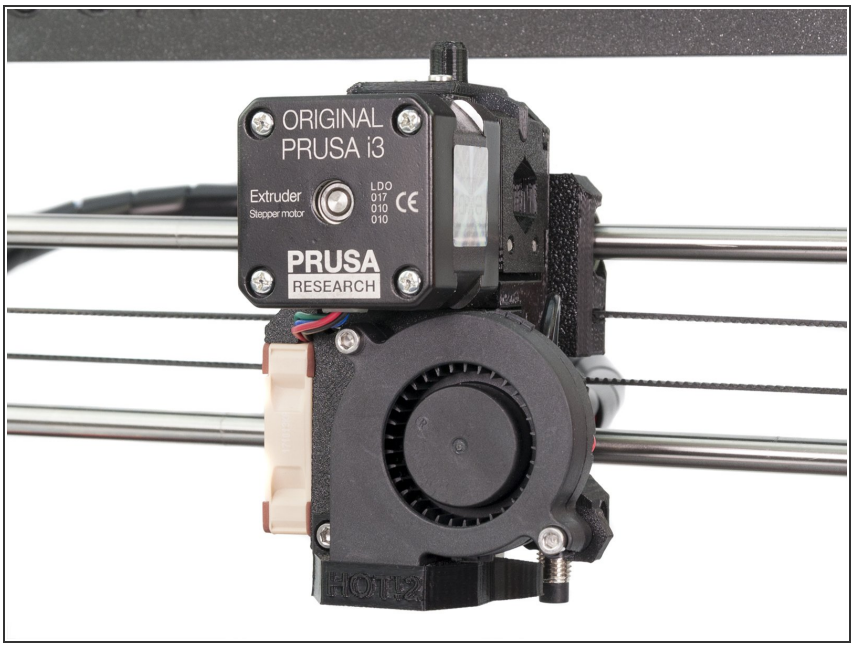





⚠ **In case of parts B7/R3 your fan-nozzle is already mounted** , skip this step.

- For the following step, please prepare:
- Fan-nozzle (1x)
- M3x10 screw (1x)
- Carefully slide the X-axis up so you have access to the lower part of the Extruder.
- Release slightly both screws on the front print fan.
- Assemble the fan-nozzle and tighten all three screws.

Step 53 — E-axis is finished!



- **Are we there yet? Almost!** You've just finished the hardest part of the assembly. Awesome job!
- Check the final look, compare it to the picture. Note with B7/R3 parts the extruder looks different.
- Checked everything? Let's move to: 5. Heatbed assembly

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4. E-axis assembly (textile sleeve)

Written By: Jakub Dolezal

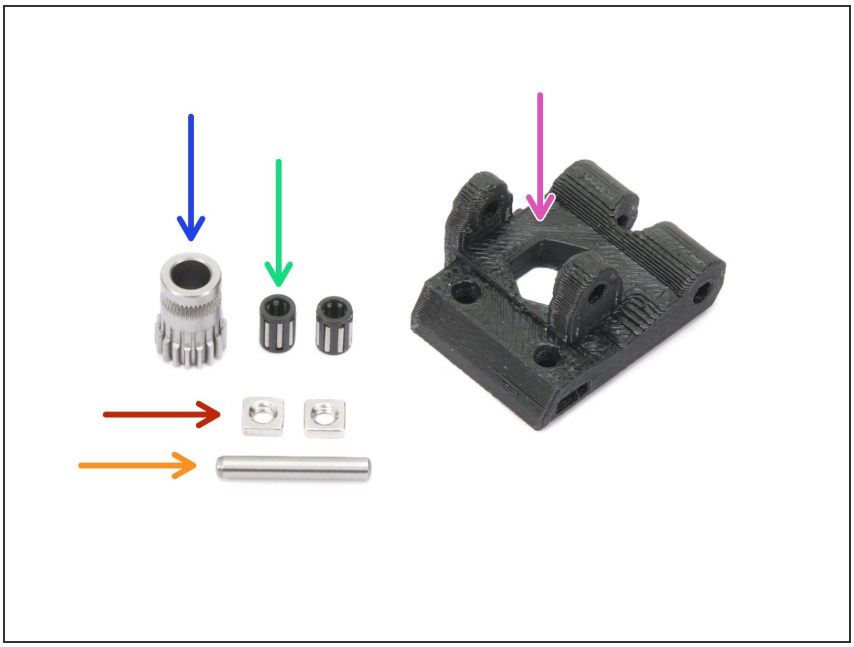
Step 1 — Tools necessary for this chapter

- Needle-nose pliers for zip tie trimming.
- 2.5mm Allen key for M3 screws
- 2mm Allen key for nut alignment
- 1.5mm Allen key for tightening the pulley

ⓘ Use the bag "MK2.5 1"

ⓘ Use the bag "2. Extruder"

Step 2 — Idler assembly (part 1)



- **For the following steps, please prepare:**
- Extruder-idler (1x)
- Bondtech pulley **WITHOUT** the hole for the lock screw (1x)
- Pulley bearing (2x)
- M3nS nut (2x)
- Pulley shaft (1x)

ⓘ Note there are two types of the Bondtech pulley in the package (one with hole and without hole for the lock screw). Make sure you are using the correct one.

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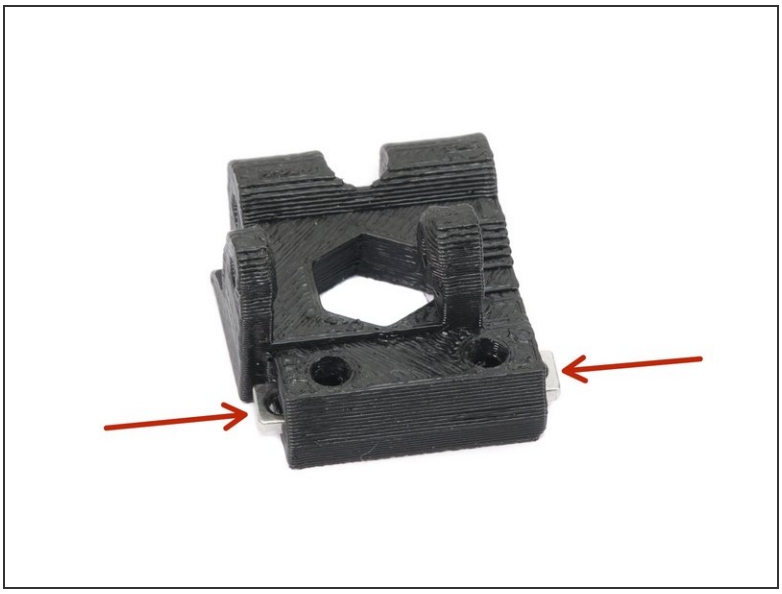
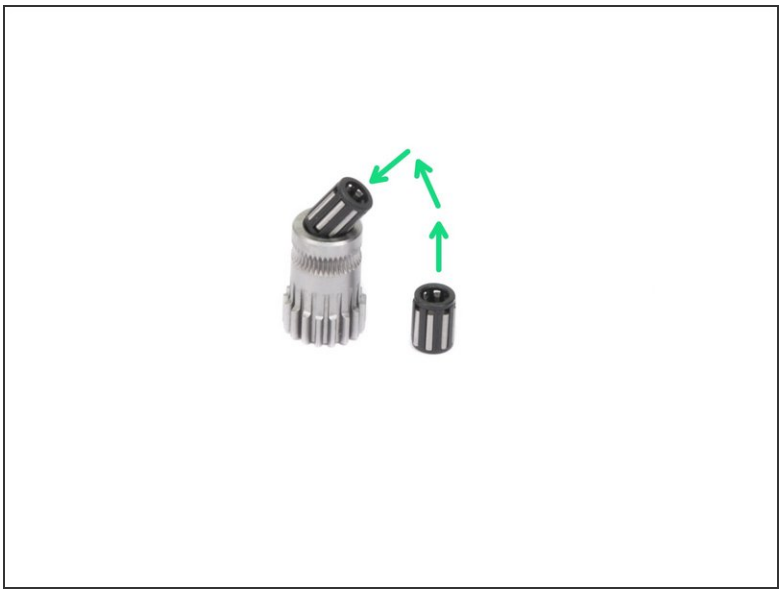
Step 3 — Idler assembly (part 2)

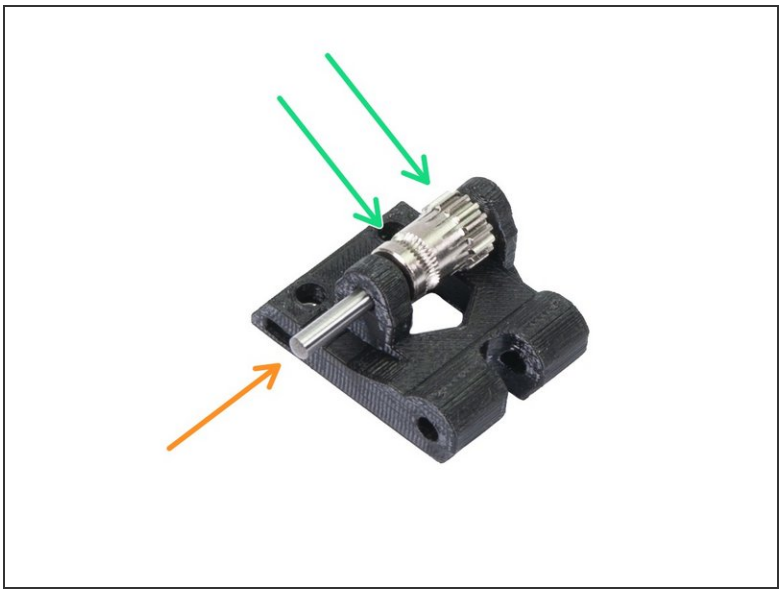


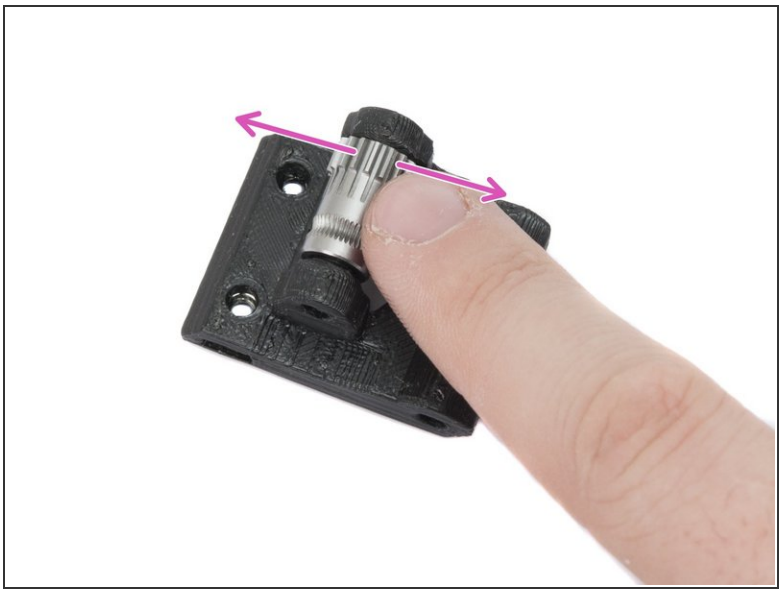


- Press the nuts to the slots on both sides of the idler.
- **Insert both bearings** in the pulley. Be aware that bearings can slip out during assembly.

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

Step 4 — Idler assembly (part 3)



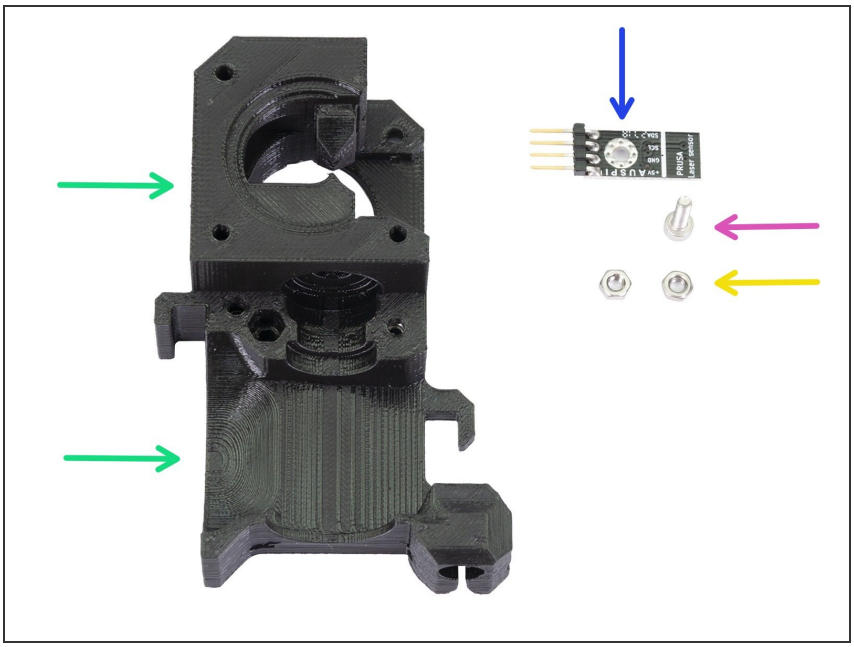


⚠ Ensure both bearings are inside the pulley!

ⓘ In case you have issues inserting the shaft in, please use 3mm drill bit and widen the hole first. Otherwise, you might crack this part.

- Insert the pulley in idler as shown in the picture.
- Slide the shaft through the idler and pulley. Use reasonable force or you will **BREAK** the printed part.
- Place your finger on the bearing and ensure it can rotate freely.

Step 5 — Assembling filament sensor (part 1)



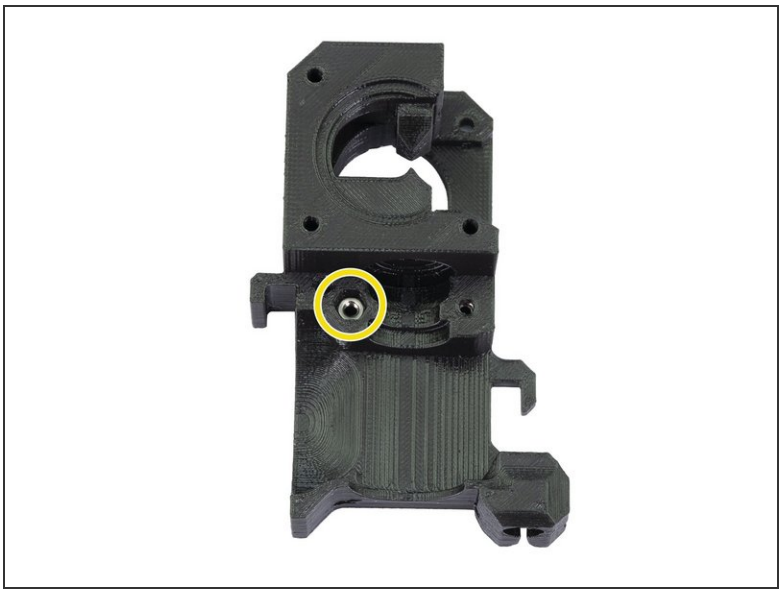
BE CAREFUL with the filament sensor, do not touch the black PCB nor the chips on it.

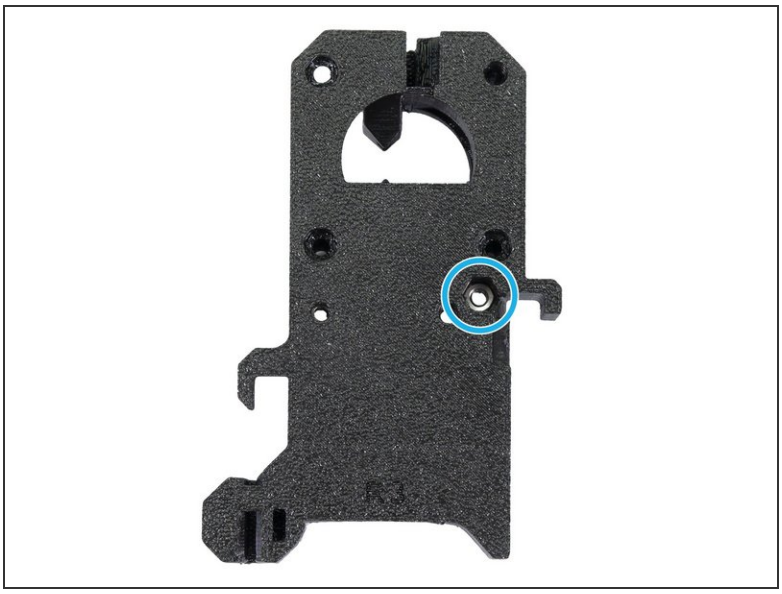
- **For the following steps, please prepare:**
- Extruder-body (1x)
- Filament sensor (1x)

The filament sensor is in the box labeled "2.3.4.5 SUP".

- M3x10 screw (1x)
- M3n nut (2x)

Step 6 — Assembling filament sensor (part 2)



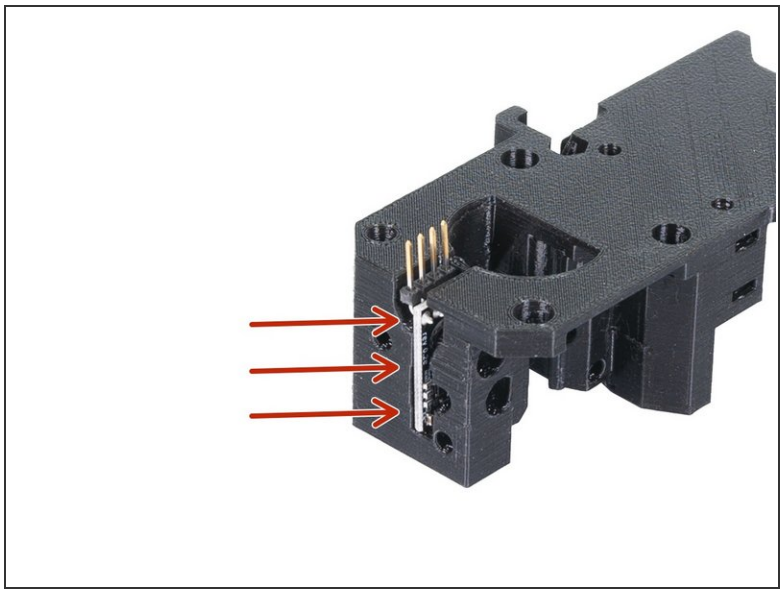


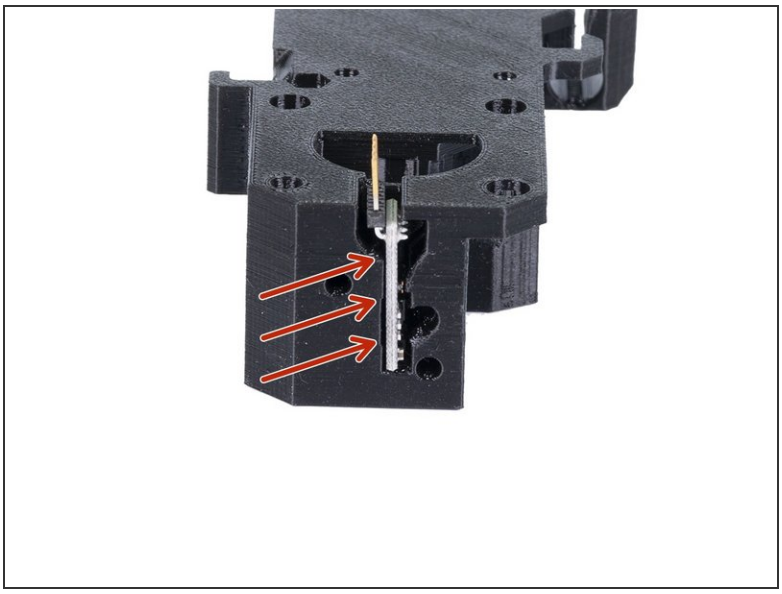
⚠ Before we continue with the assembly, we need to insert nuts in the Extruder-body. Take the extra time and effort to place them in properly. **You won't be able to reach them later.**

- 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.

ⓘ 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.

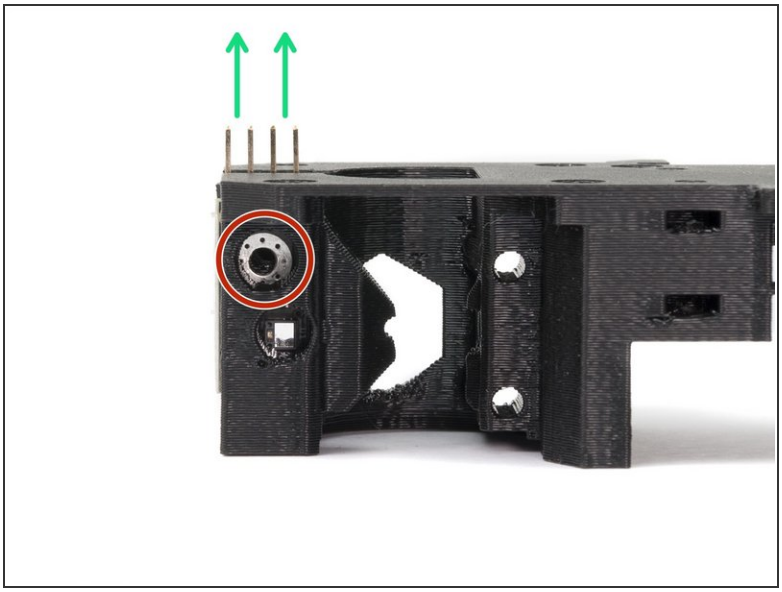
Step 7 — Assembling filament sensor (part 3)

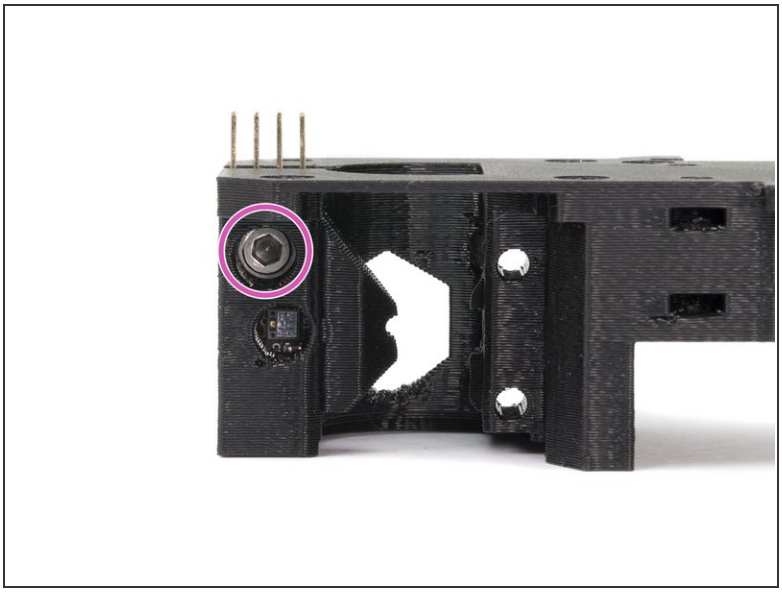




- **Carefully insert** the filament sensor in the slot, **do not use force** or you might damage the PCB!

Step 8 — Assembling filament sensor (part 4)



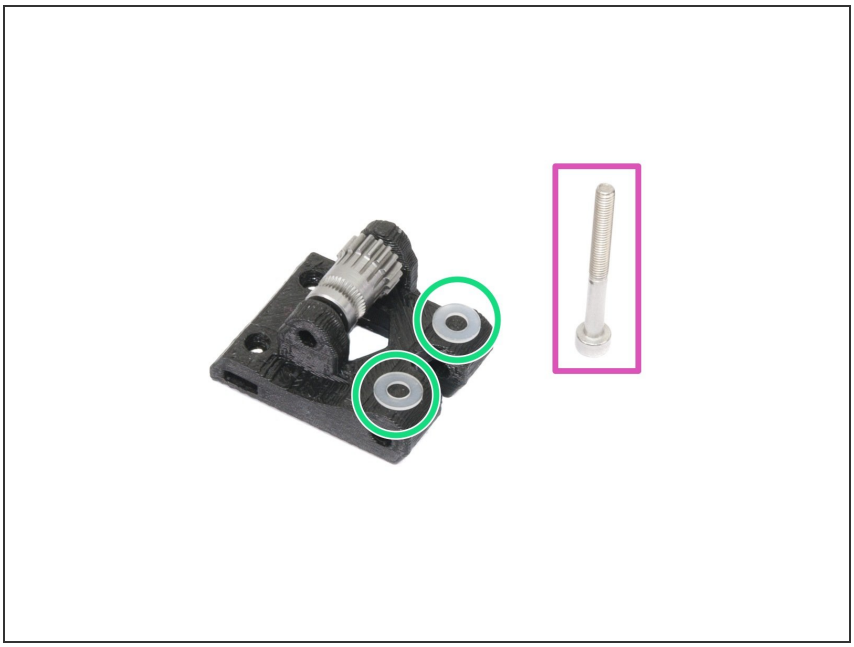


- Turn the extruder-body like in the picture. The pins of the filament sensor must be facing up.
- Locate the opening for the M3 screw.
- Take the M3x10 screw and tighten the sensor in place. No nut is needed, the screw will self-tap into the plastic.

⚠ The sensor must be tightened completely to prevent its movement (screw head touching the board) **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.

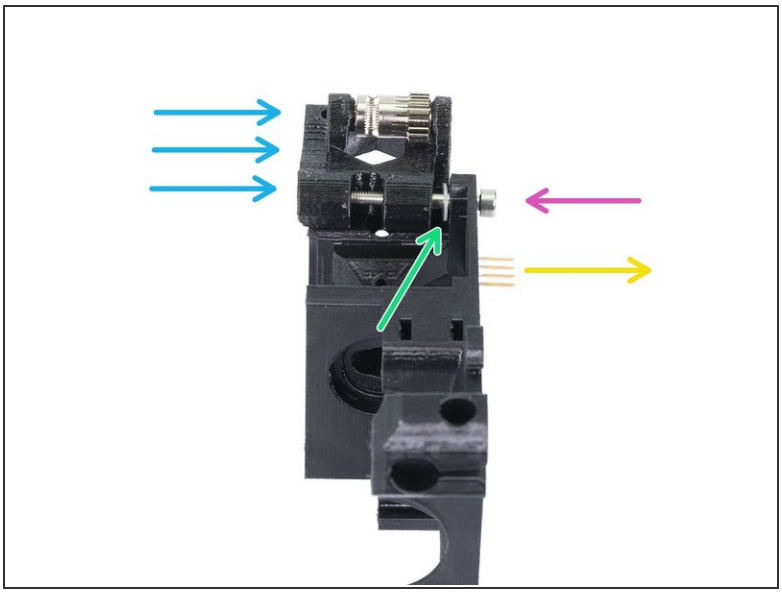
Step 9 — Extruder assembly - idler (part 1)



- **For the following steps, please prepare:**
- M3x30 screw (1x)
- M3 translucent washer (2x)

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

Step 10 — 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.

If the second washer keeps falling off. Use a M3n nut from the spare bag to fix it temporarily.

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Step 11 — Assembling the Extruder motor pulley (part 1)

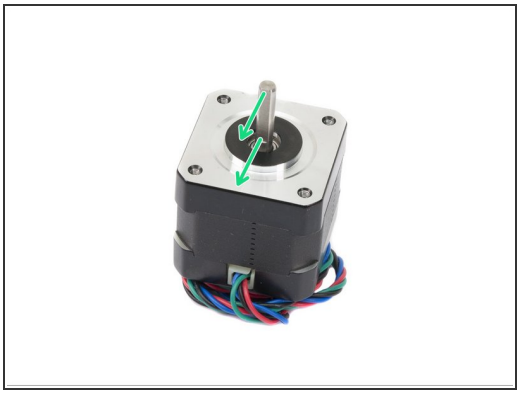
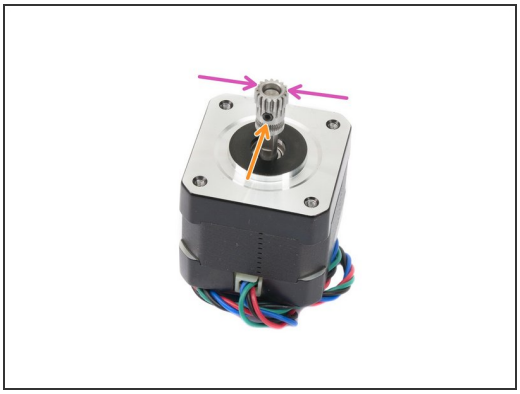
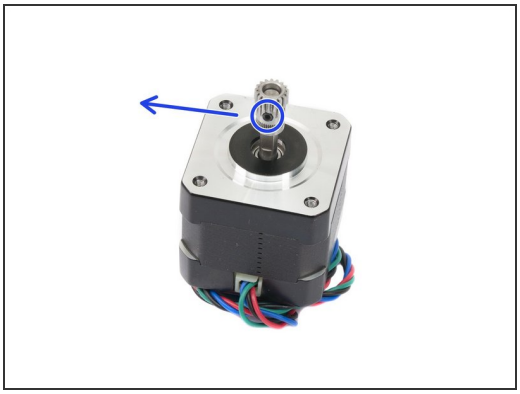
⚠ In case there is a pulley from the MK2S on the motor's shaft, please remove it now!

- **For the following step, please prepare:**
- Extruder motor (1x)
- Bondtech pulley **WITH** the hole for the lock screw (1x)

ⓘ In case the lock screw is sent separately, screw it in the pulley slightly. Ensure the tip of the lock screw isn't reaching to the internal part of the pulley as it might block the shaft in the next step.

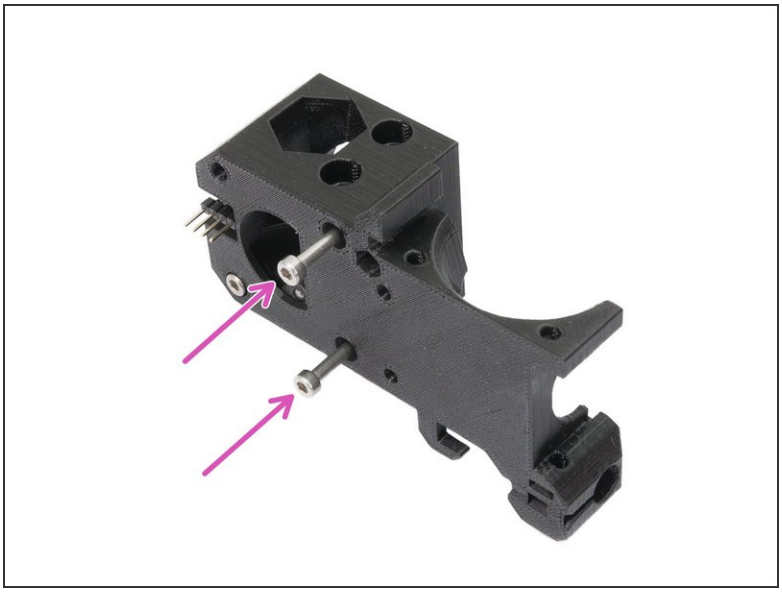
ⓘ There is a second spare lock screw in the package.

Step 12 — Assembling the Extruder motor pulley (part 2)

- There is a flat part on the motor shaft, rotate it towards you.
- ⚠ Slide the pulley on, note the **CORRECT** orientation.
- The screw must be facing directly against the pad (flat part) on the shaft. Slightly tighten the screw, the final adjustment will be done later.
- Don't press the pulley against the motor. Leave it on the very top of the shaft, see the picture.
- Before moving to the next step, rotate the pulley 90-degrees clockwise (the lockscrew will be facing to the left).

Step 13 — Mounting the Extruder motor

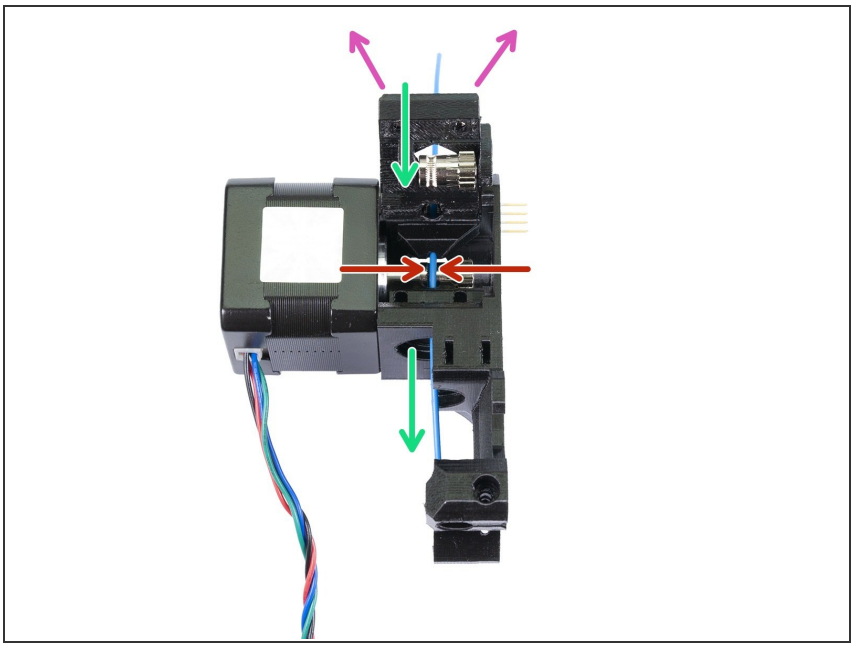


- Find in the package two M3x30 screws and insert them into the holes.

Before mounting the motor, ensure the second translucent washer is still on the top M3x30 screw.

- Mount the motor on the extruder body as shown in the picture, double check the proper orientation of the motor cables.
- Tighten both screws firmly.
- Tighten the screw, but only slightly, keep in mind the idler must rotate freely.

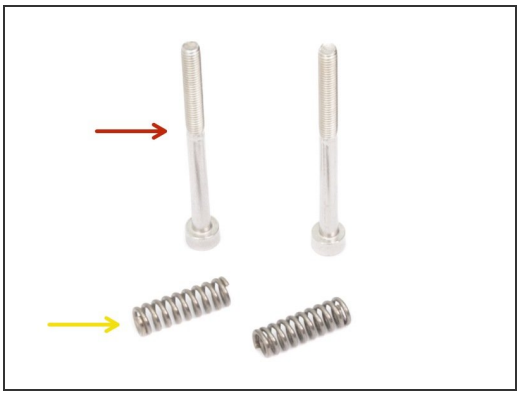
Step 14 — Adjusting and tightening the pulley

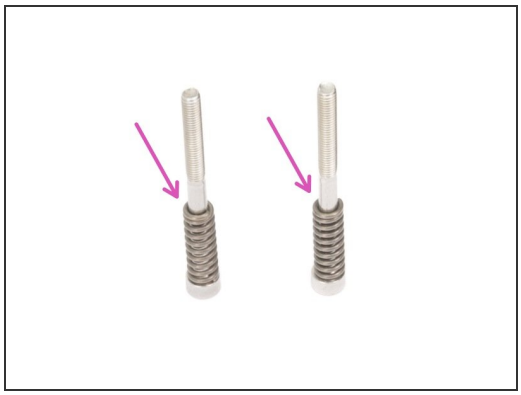


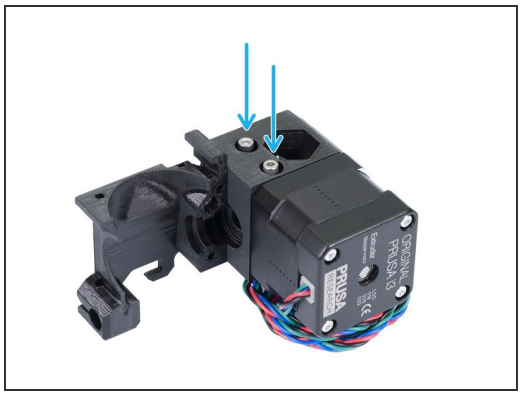
- Open idler fully to have direct access to the pulley.
- Use a piece of 1.75 mm filament (from the spool) to align the pulley with the openings for the filament (see the picture). Arrows only indicate the direction. **Don't use the 3mm nylon filament!**
- Adjust the pulley and tighten it with 1.5mm Allen key. Use reasonable force as you might damage the thread.

ⓘ When ready with the alignment, please remove the filament.

Step 15 — Securing the Extruder idler

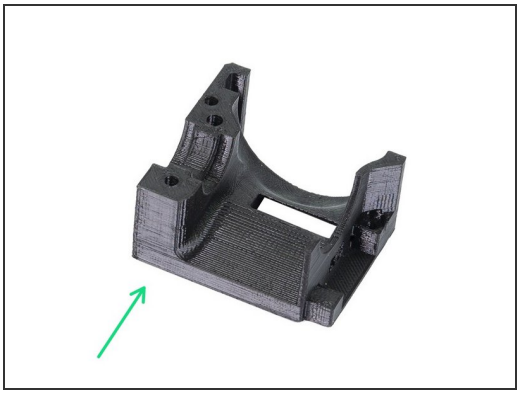


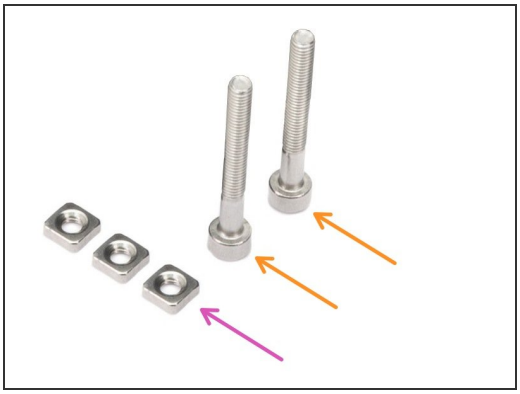


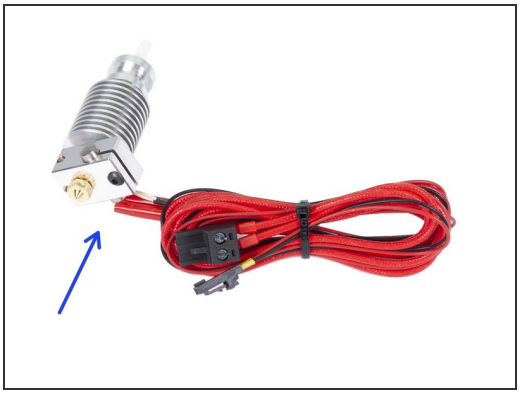


- **For the following step, please prepare:**
- M3x40 screw (2x)
- Extruder spring (2x)
- Assemble springs on both screws, see the second picture.
- Close the idler, so the screws can reach it.
- Place both screws into the Extruder body and tighten them. The screw's head should be almost aligned with the printed surface.

Step 16 — Preparing hotend and extruder-cover



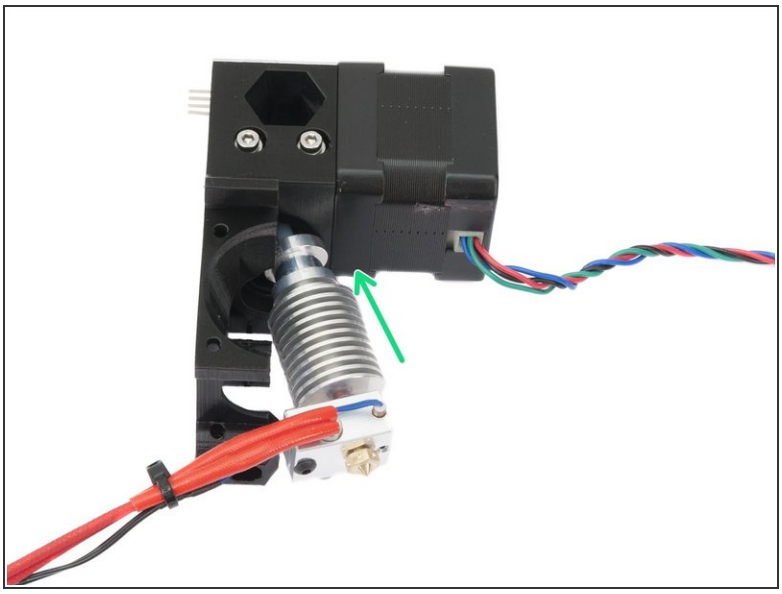


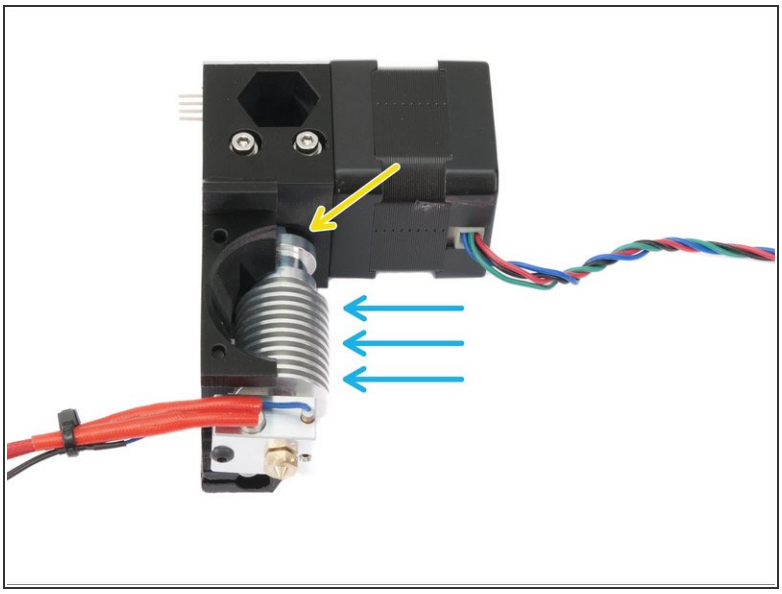


- **For the following steps, please prepare:**
- Extruder-cover (1x)
- M3nS nut (3x)
- M3x25 screw (2x)
- E3D hotend from your MK2/S (1x)

⚠ **In case you intend to upgrade to MMU2 afterwards**, please open the MMU2 upgrade package and locate the PTFE tube for the hotend, which has to be replaced. **Do it now!** Follow this guide (steps 8 & 9) and then return here.

Step 17 — Inserting the E3D hotend



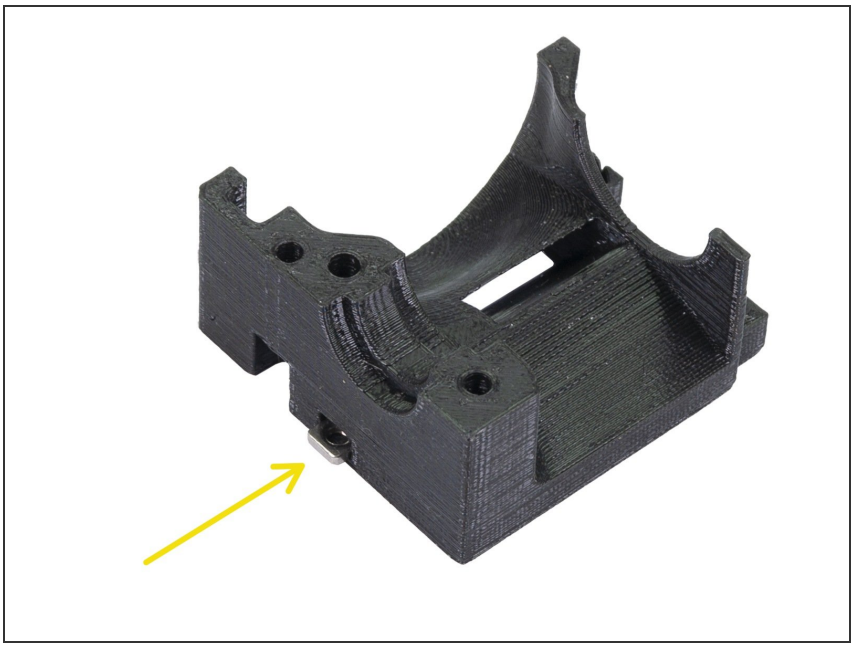


- Take the E3D hotend and place it inclined into the Extruder body. Make sure the white PTFE tube fits in properly.
- Insert the hotend into the Extruder body, see the picture.
- Make sure the hotend is fully seated and the upper part aligned (almost in contact) with the surface of the printed part.

⚠ Note the **CORRECT** orientation of the hotend.

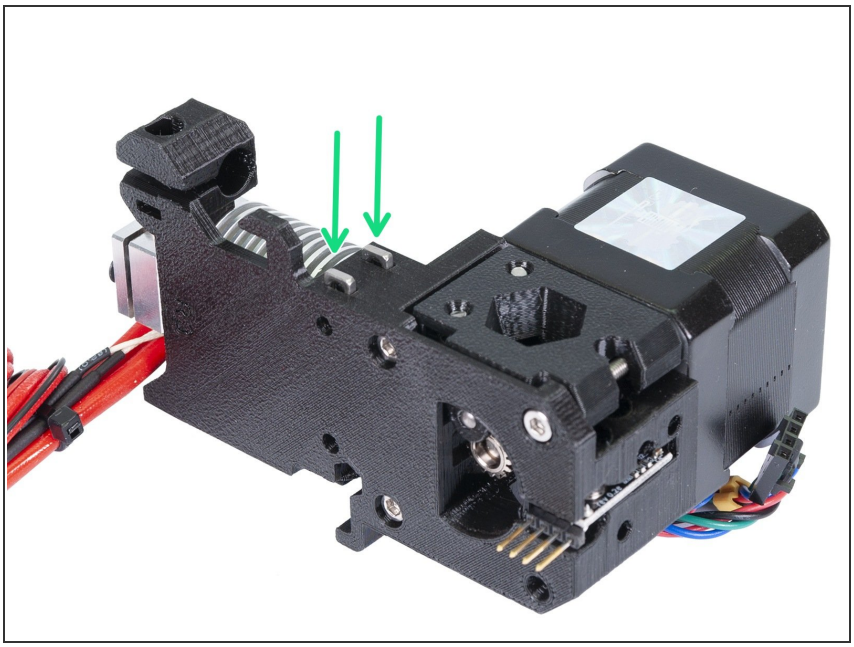
⚠ Be **VERY CAREFUL** with the hotend wires from now on, you can damage them.

Step 18 — Preparing the extruder-cover



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

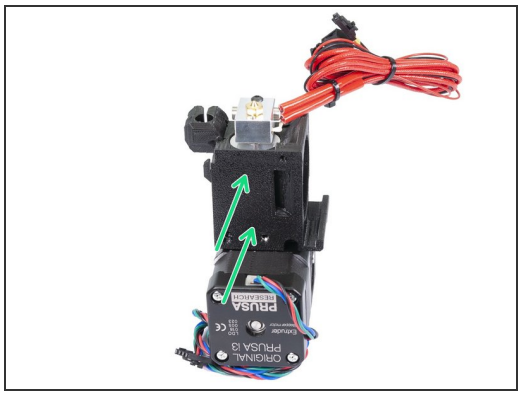
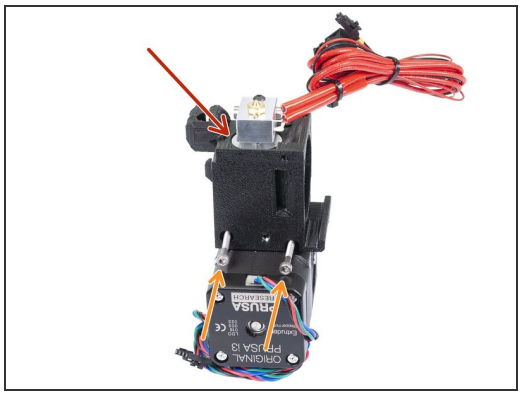
Step 19 — Mounting point for the Extruder body



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

Check proper alignment with the 1.5mm Allen key.

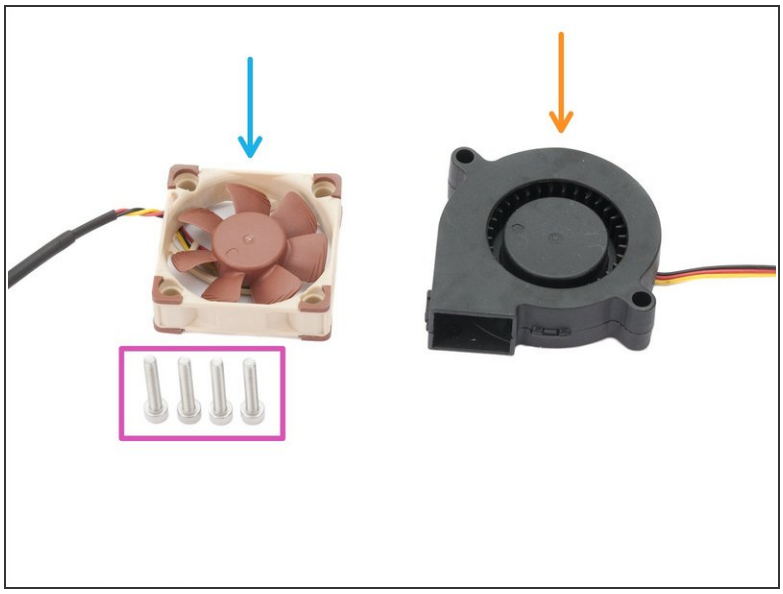
Step 20 — Mounting the extruder-cover

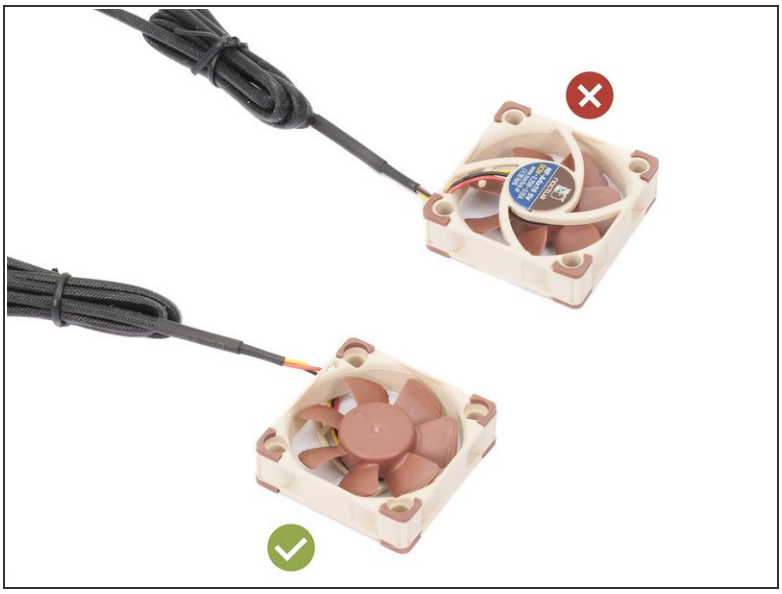




- Rotate the extruder as shown in the first picture.
- Take the extruder-cover and place it on the extruder body. Both printed parts must be in direct contact.
- Using M3x25 screws tighten both parts together. If you can't reach the nuts, use temporarily a longer screw from the spare bag (e.g. M3x30).

⚠ **Ensure again the hotend is properly assembled.** The surface of the heatsink (part of the hotend with cooling ribs) must be aligned with the surface of the printed parts. See the last picture.

Step 21 — Preparing cooling fans



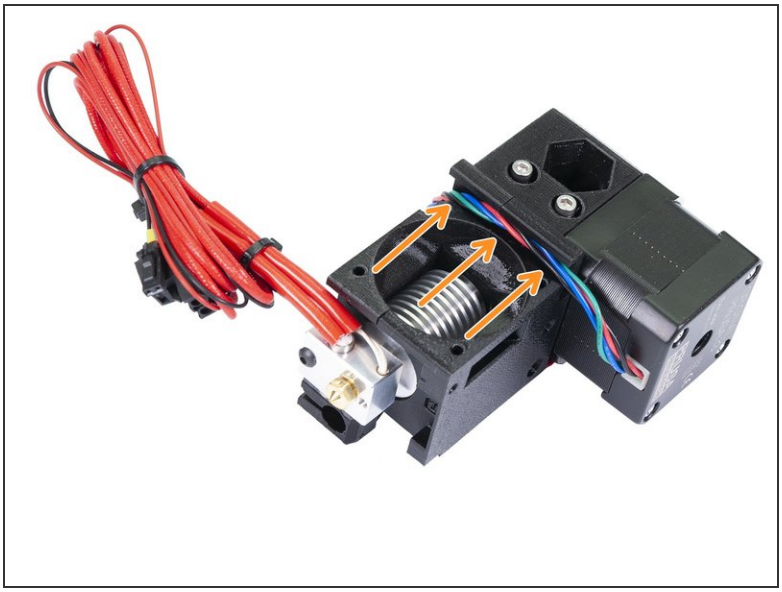


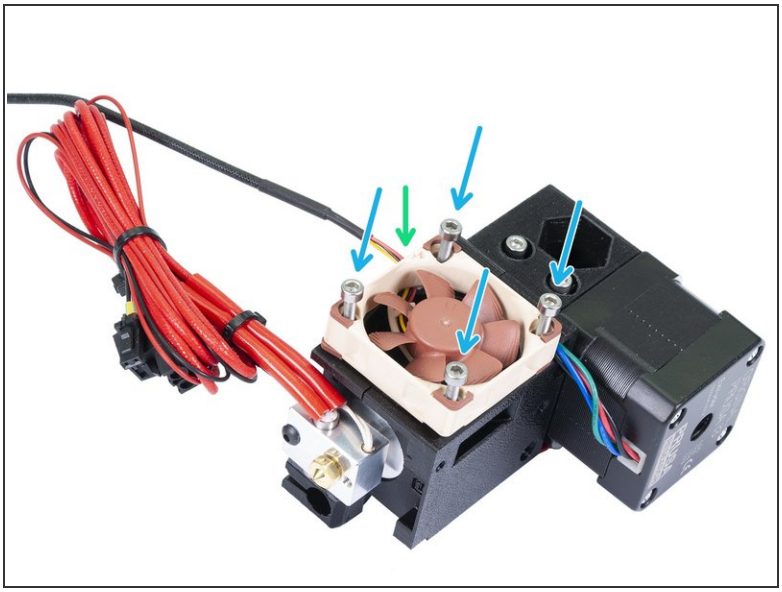
- **For the following steps, please prepare:**
- M3x18 screw (4x)
- Left hotend fan (1x)
- Front print fan (1x)

⚠ The left hotend fan has two sides, but the side with sticker must be always facing the hotend (not visible when the fan is mounted). Otherwise, the cooling won't work properly.

ⓘ The left hotend fan (Noctua) can be also in a black colour without the rubber corners, other hardware parameters are the same.

Step 22 — Mounting the left hotend fan





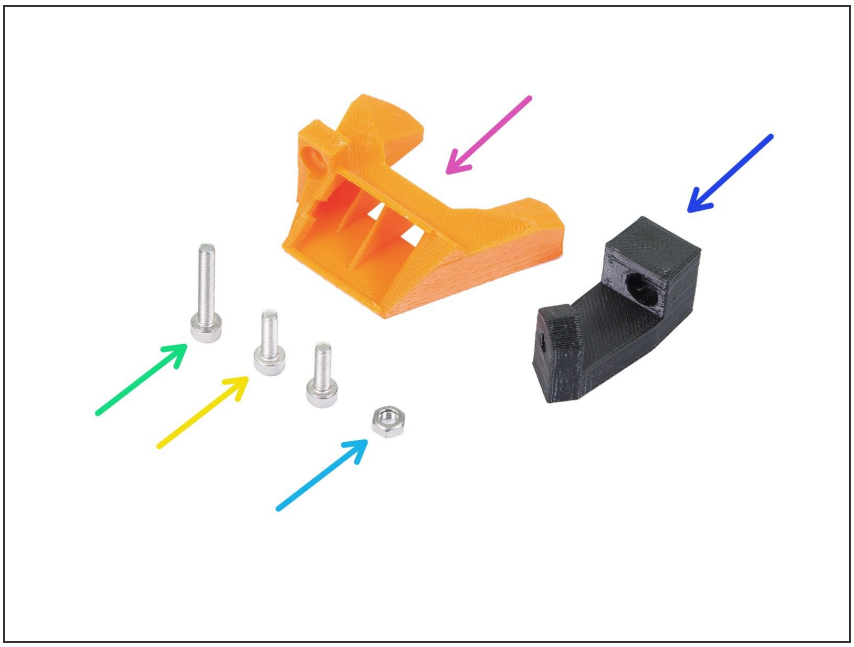
- Place the Extruder on the side and guide the wires from the motor in the slot.
- Place the Left hotend fan on the Extruder. The cable must be placed in the top left corner, see the picture.

⚠ Note the correct orientation of the fan. The sticker has to face towards the hotend!

- Insert M3x18 screws and tighten them slightly.
- Now, tighten ALL screws, alternating diagonals. After tightening, check that the fan can still rotate freely.

⚠ **DON'T** tighten the screws too hard, all parts are made of plastic and you can break them.

Step 23 — Mounting the front print fan - parts B7/R3

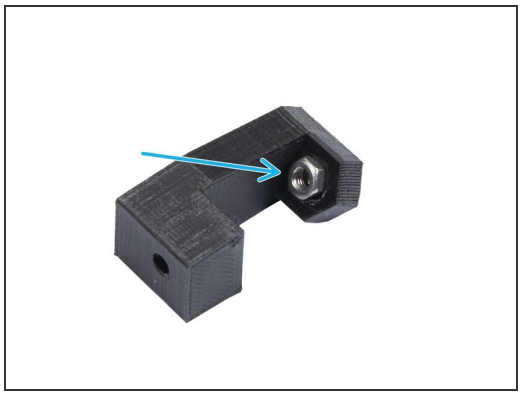
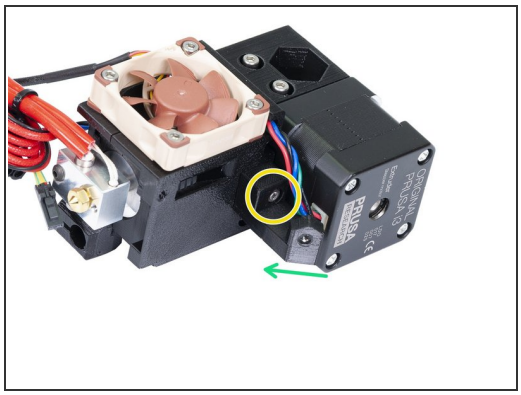
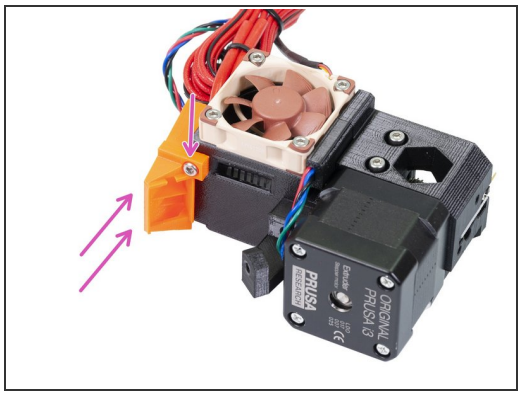


- **For the following steps, please prepare:**
- nozzle-fan-45deg-support (1x)
- nozzle-fan-45deg (1x)
- M3x18 screw (1x)
- M3x10 screw (2x)
- M3n nut (1x)

ⓘ In case you are missing one M3x10 screw please use the spare bag.

ⓘ Your nozzle-fan might be in the black colour.

Step 24 — Mounting the front print fan - parts B7/R3

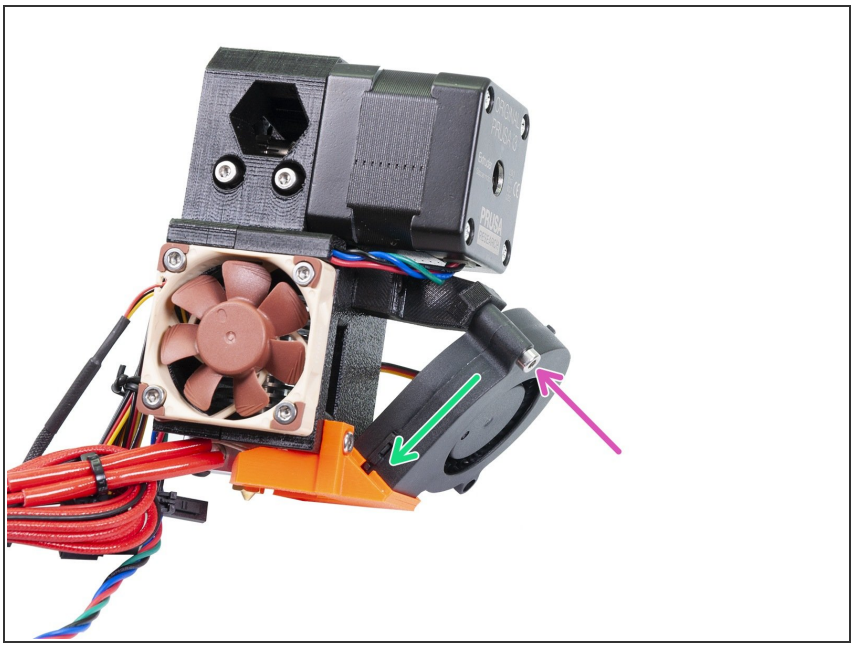




- Press the M3n nut in the support, all the way in. It will be barely visible. If needed use a screw from the other side to pull the nut in, then remove the screw.

⚠ **WARNING:** there are pins of the filament sensor on the other side of the extruder. Be careful as you might bend them during the following steps!!!

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

Step 25 — Mounting the front print fan



- Slide the Front print fan in the nozzle-fan.
- Secure the fan using a M3x18 screw.

Step 26 — Preparing the P.I.N.D.A. probe

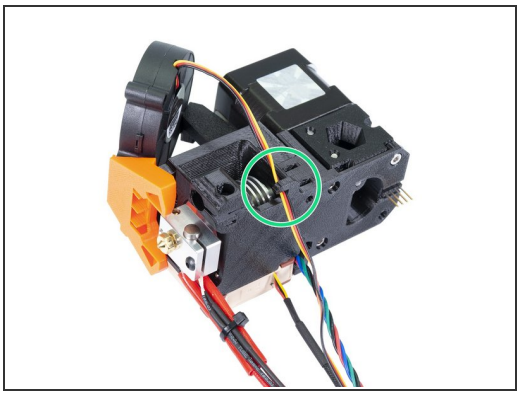
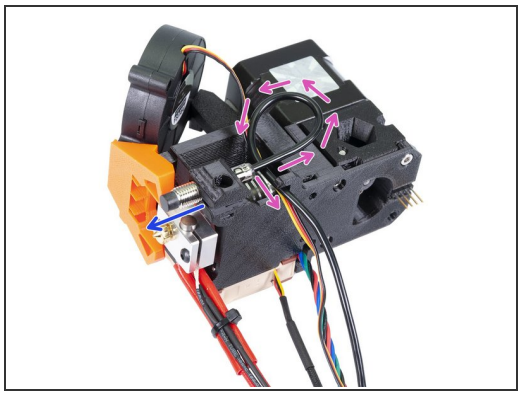
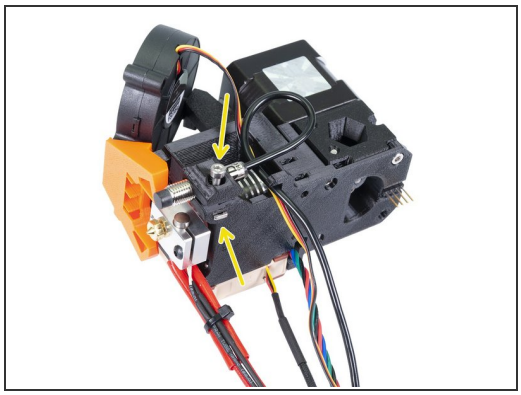
- **For the following steps, please prepare:**
- New P.I.N.D.A. probe (1x)
- M3x10 screw (1x)
- M3nS nut (1x)

⚠ The probe is a sensitive device, please handle it with care during the assembly!

ⓘ The P.I.N.D.A. cable can be either black or grey, both probes are the same.

⚠ Make sure there are **FOUR wires** in the connector, if not, please **stop the assembly** and contact our support asap.

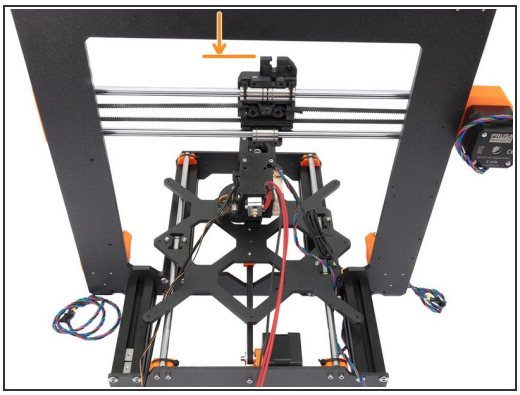
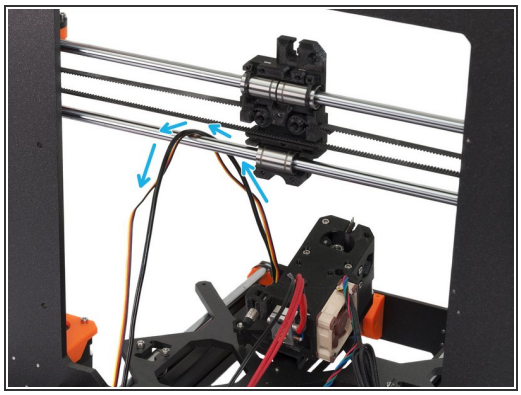
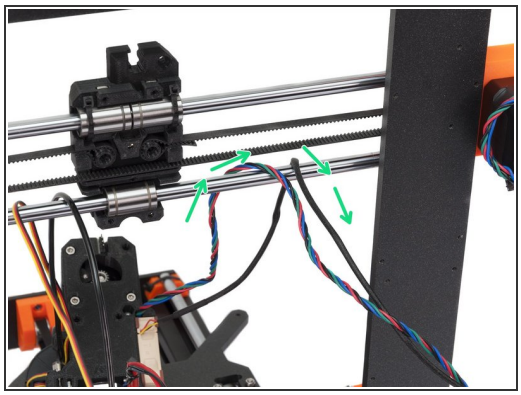
Step 27 — Mounting the P.I.N.D.A. probe

- Start with the front print fan wire and place it under the cable clip.
- Gently push the P.I.N.D.A. sensor through the holder. If the hole for the sensor is too tight, you can open it slightly, but **be very careful** as you might break it!
- Create a loop on the probe wire, then place the wire under the cable clip.
- Slide the M3nS nut in the slot and tighten the probe SLIGHTLY with the M3x10 screw.

ⓘ The exact position of the P.I.N.D.A. probe will be adjusted later (in Chapter 9, Preflight check), so there is no need to adjust the probe or tighten the screw fully at this point.

Step 28 — Extruder cables preparation

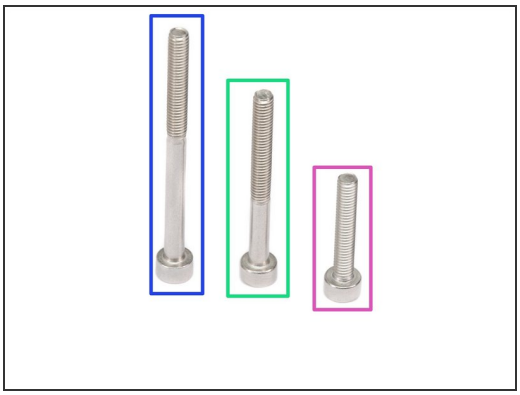
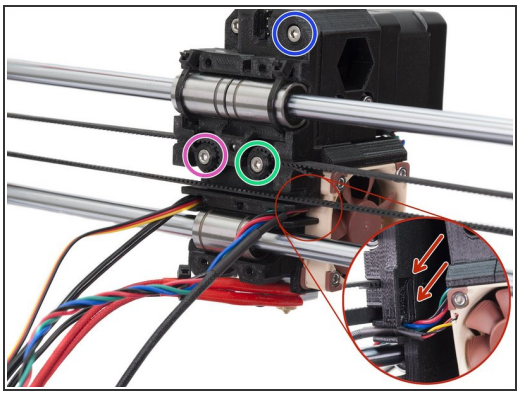
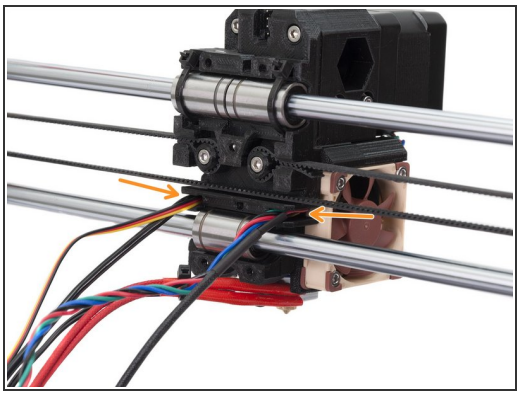




- Place the Extruder on the Y-carriage as in the first picture. Ensure the correct orientation of the printer, shorter extrusions must be facing towards you.
- If needed, lower the X-axis so you can see the entire X-carriage. It is needed for the next step.
- Take the cables from P.I.N.D.A. probe and front print fan, slide it between the lower smooth rod and belt.
- Take the cables from Extruder motor and left hotend fan, slide it between the lower smooth rod and belt.

⚠ **IT IS VERY IMPORTANT** to place the cables as shown in the pictures. Please double check your steps.

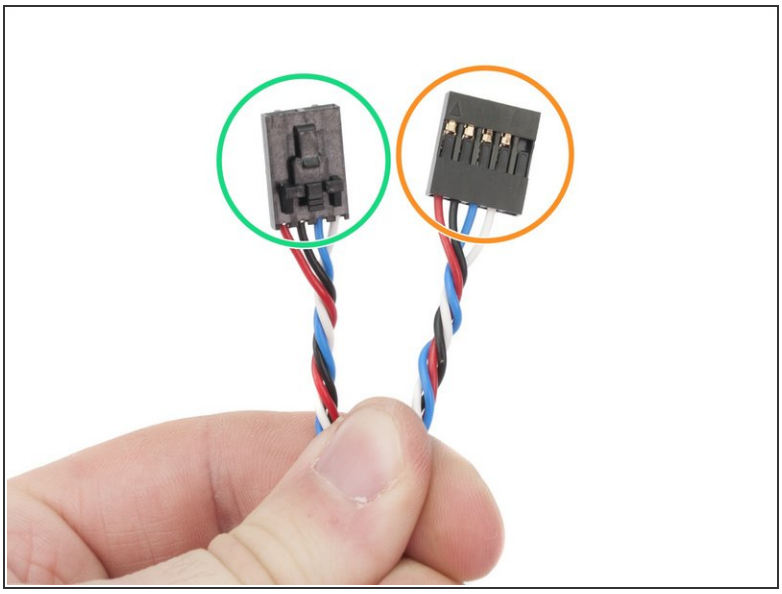
ⓘ Cables from hotend will be placed under the lowest smooth rod. We will arrange them later.

Step 29 — Mounting the Extruder

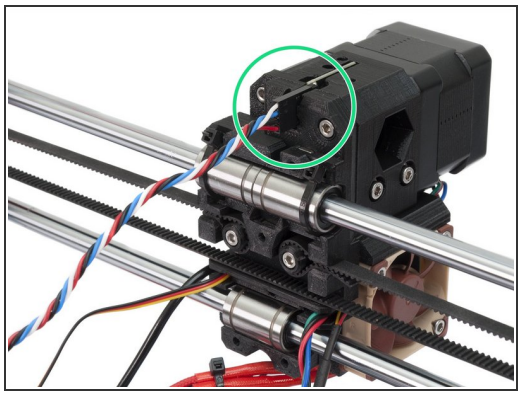
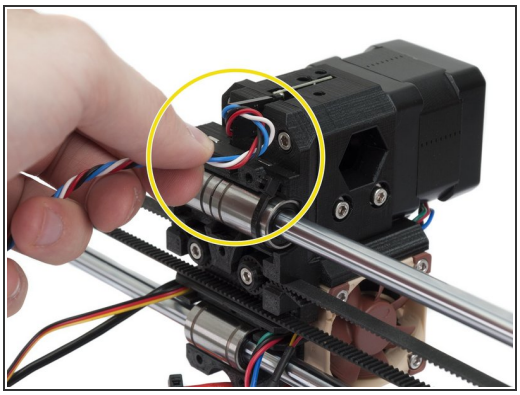
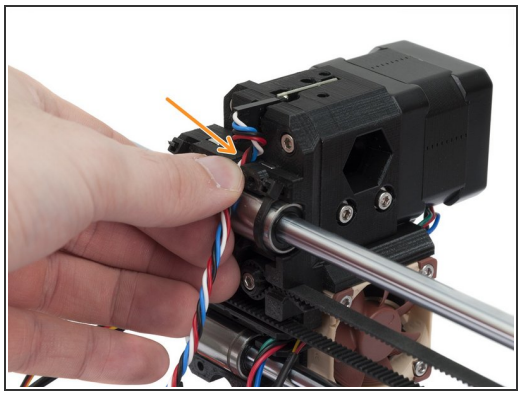
- For the following step, please prepare:
- M3x40 screw (1x)
- M3x30 screw (1x)
- M3x18 screw (1x)
- Place the Extruder near the X-carriage and check no wire is pinched. There is a slot in the X-carriage for the motor wires, see the picture. Bend the motor cable in it and leave the fan wires straight.
- Mount the Extruder on the X-carriage using the screws above. Tighten all screws, but not fully. We need to arrange the cables again, this time in the back.
- Guide the cables through slots (channels) on both sides of the Extruder. On the left side, it is Front Print fan and P.I.N.D.A. probe, on the right side Extruder motor and Left Hotend fan.
- Ensure again the cables are in the channels and not pinched between printed parts. Now, tighten all screws, equally to prevent issues.

Step 30 — Cable for the filament sensor



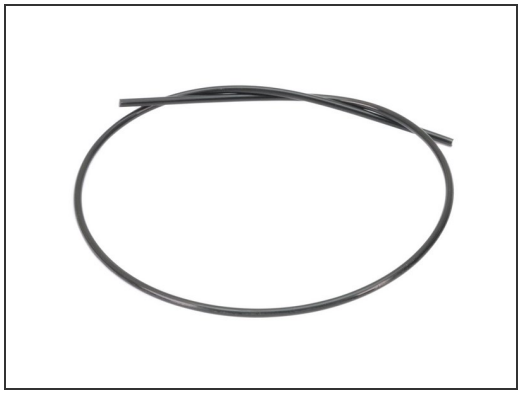
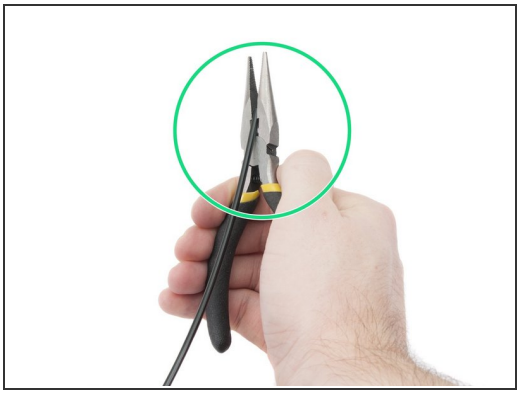
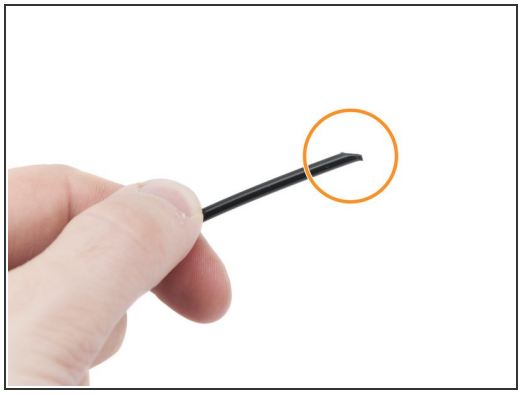
- Locate the cable for filament sensor in the package.
- There are two types of the connectors on the cable:
- The **4-pin connector** for the sensor (used now)
- The **5-pin connector** for the EINSY board (used later)

Step 31 — Connecting the Filament sensor

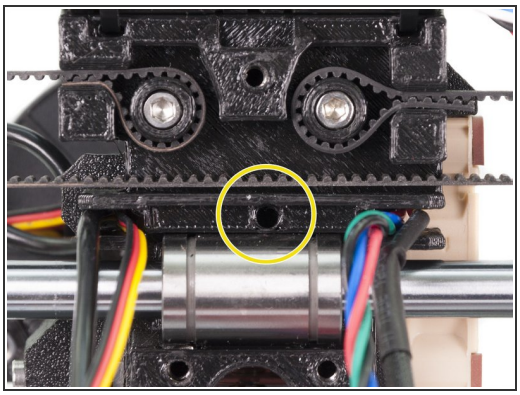
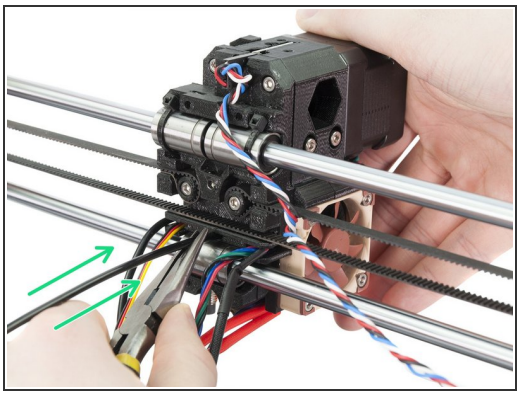
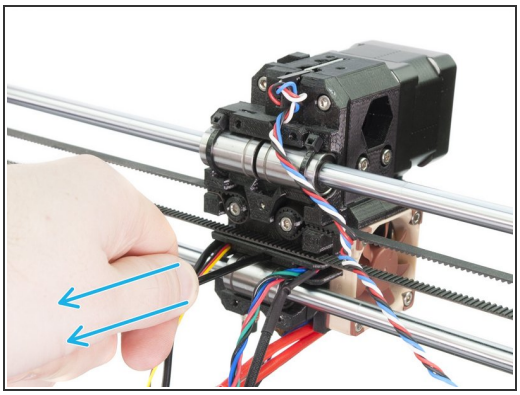
- Use the cable from the previous step and connect it carefully to the filament sensor.
- ⚠ Note the connector has two different sides. The side with safety pin must be on the left (white wire is facing up and red down).
- Gently rotate the cable (clockwise) to create a small loop, see the second picture.
- Push the cable through the opening on the X-carriage.

Step 32 — Preparing the NYLON filament

- ⚠ Starting mid of February 2018, there will be only one 50cm NYLON filament included.
- There are two NYLON filaments included in the kit with lengths 50 and 30 cm. Both have Ø 3 mm. For this step please **use the longer one** and **DON'T TRIM any of them!**
- Using the pliers cut one end of the filament to create a tip.
- Check the tip is similar to the third picture.

Step 33 — Inserting the NYLON filament

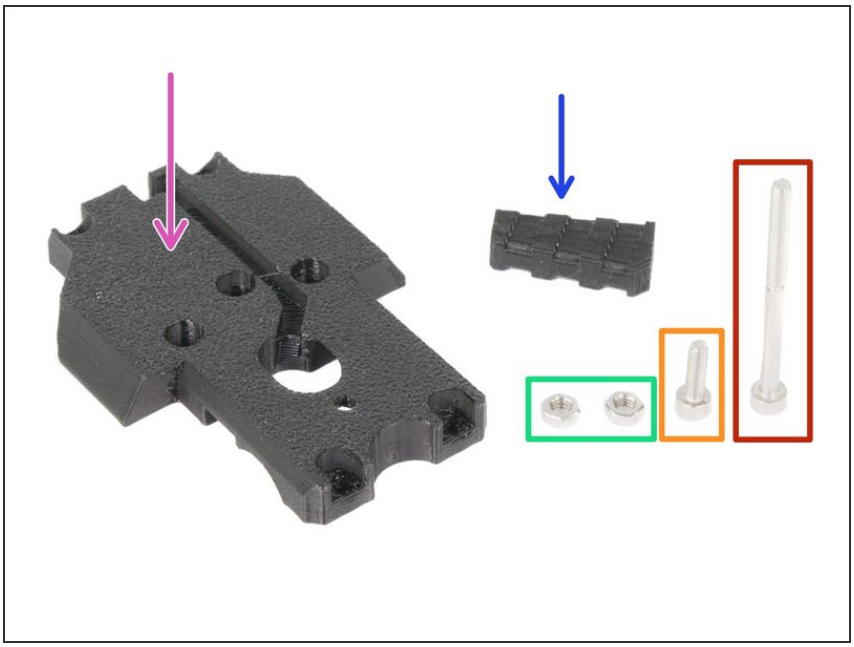
- Locate the hole for the NYLON filament. Using the smallest Allen key ensure there are no obstacles inside.
- Using the pliers **insert and twist the NYLON filament in the slot**. Hold the extruder with your second hand.

⚠ **BE EXTREMELY CAREFUL** as the pliers tend to slide and you can easily damage the wires!!!

- To check if the filament is seated properly, gently pull it with your hand. The X-axis should bend a little, but the filament must remain in the slot.

ⓘ If you have issues, try to adjust the tip on the filament.

Step 34 — Preparing the X-carriage-back (part 1)

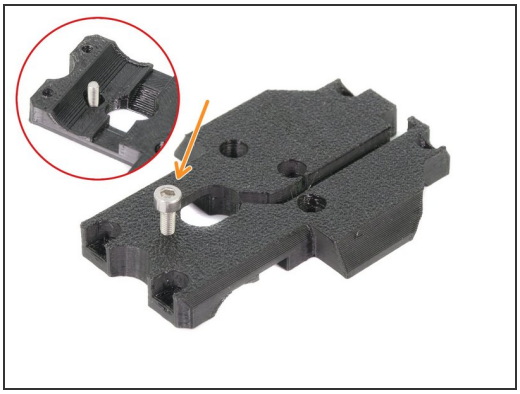


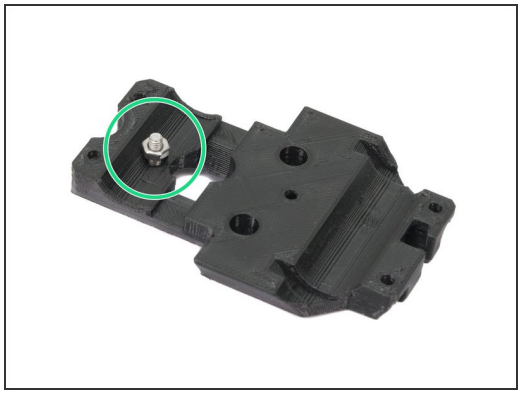
- For the following steps, please prepare:
- X-carriage-back (1x)
- Cable-holder (1x)
- M3n nut (2x)
- M3x10 screw (1x)

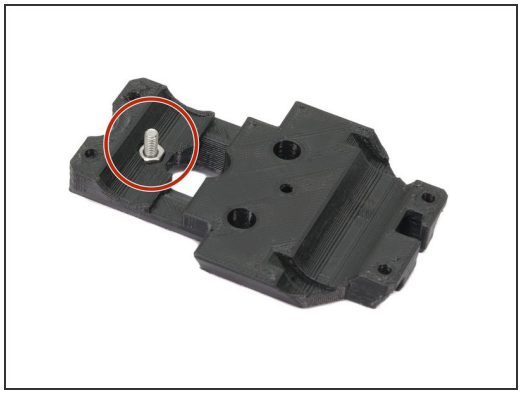
ⓘ The M3x10 screw will be used temporarily, use one from the spare bag.

- M3x40 screw (1x)

Step 35 — Preparing the X-carriage-back (part 2)

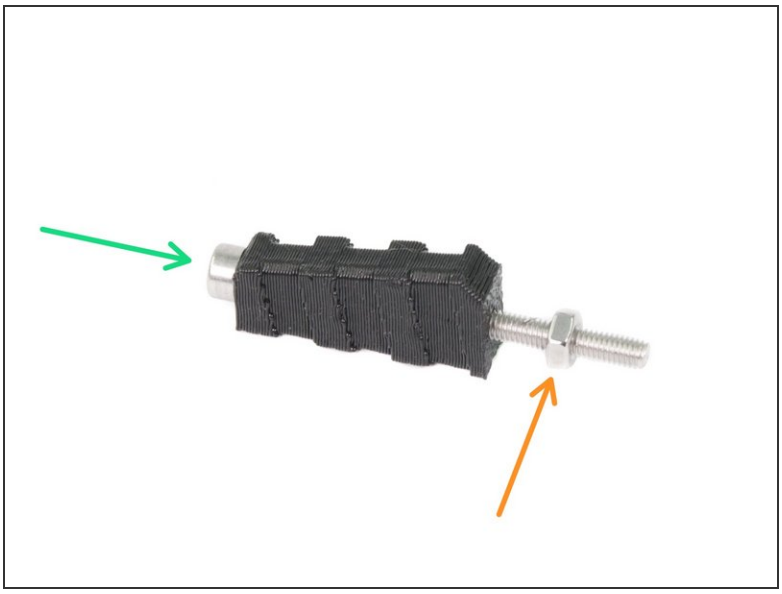






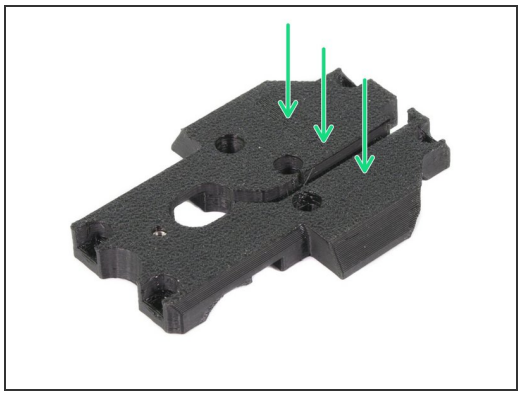
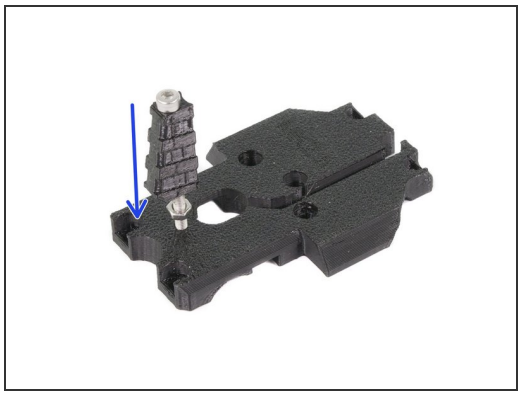
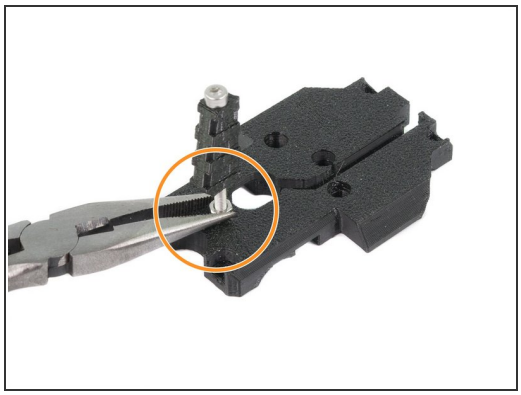
- Insert the M3x10 screw in the X-carriage-back. Tighten it completely.
- Rotate the printed part and insert the M3n nut.
- Tighten the M3x10 screw until the nut slides in the printed part. Note the shape of the cutout for the nut, you might need to adjust (rotate) the nut.
- Remove the M3x10 screw and place it back in the spare bag.

Step 36 — Preparing the X-carriage-back (part 3)



- Prepare the M3x40 screw, M3n nut and cable-holder from the previous step.
- Tighten the screw all the way through the printed part.
- Add the M3n nut, stop at about half the length of the screw's thread.

Step 37 — Preparing the X-carriage-back (part 4)

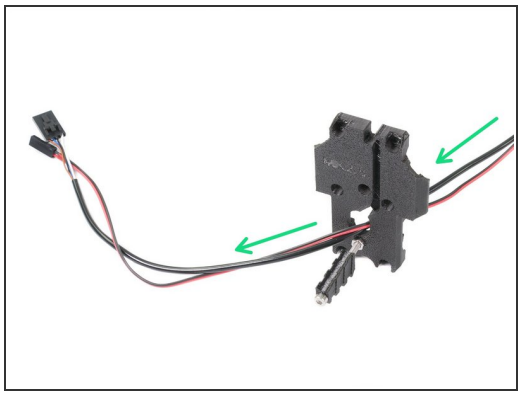
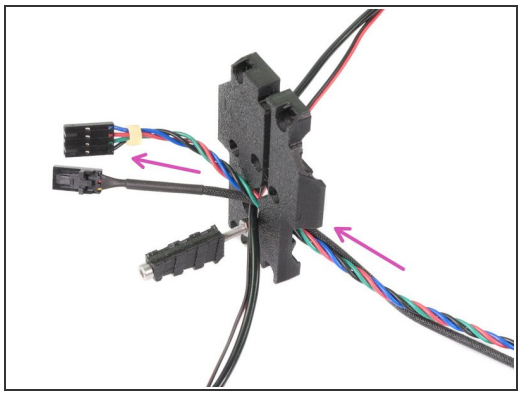
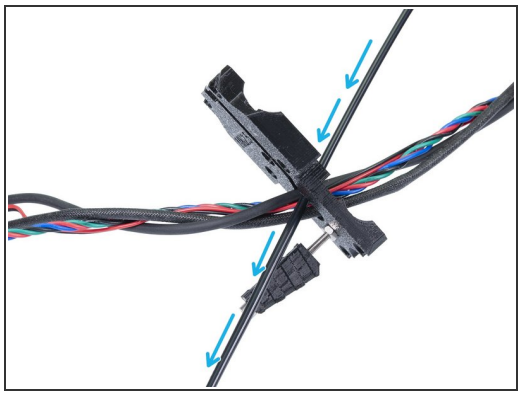




- Place the X-carriage-back as in the picture.
- Tighten the X-carriage-back and the cable-holder together.

⚠ The screw's tip should be aligned with the nut on the other side. Don't screw it "deeper", or you will have issues with assembling the X-carriage-back on the X-carriage.

- Secure the screw by tightening the nut all the way to the surface. Do not use excessive force, as you might crack the printed part.

Step 38 — Assembling the X-carriage-back

- Push the cables from the Extruder **THROUGH** the X-carriage-back. Start with Extruder motor and the Left hotend fan.
- In the next step add the Front print fan and P.I.N.D.A. probe cables.

⚠ Cables from hotend and filament sensor are **NOT GOING** through the X-carriage-back!

- Carefully insert the nylon filament and then slide the X-carriage-back towards the X-axis.

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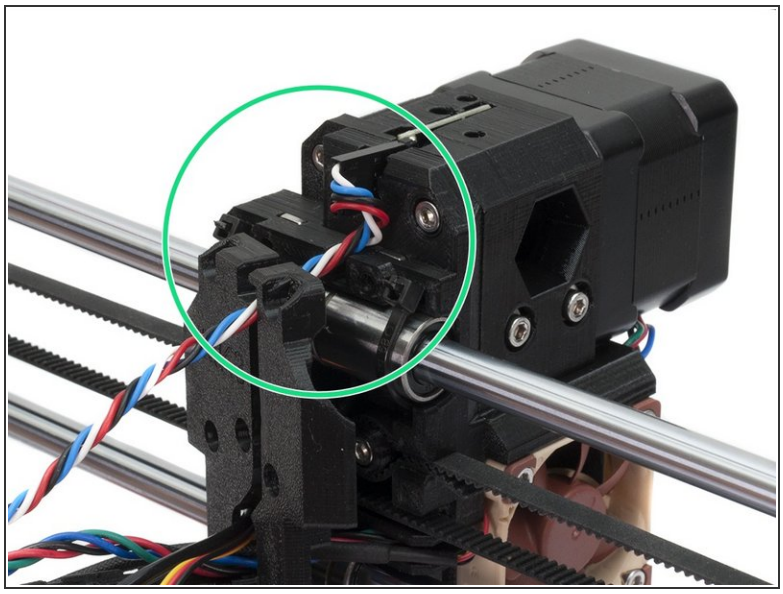
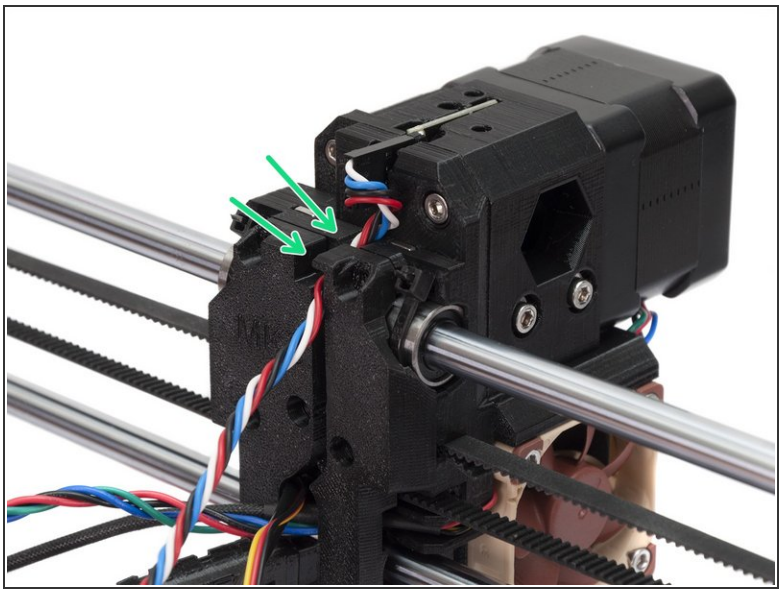
Step 39 — Adjusting the filament sensor cable

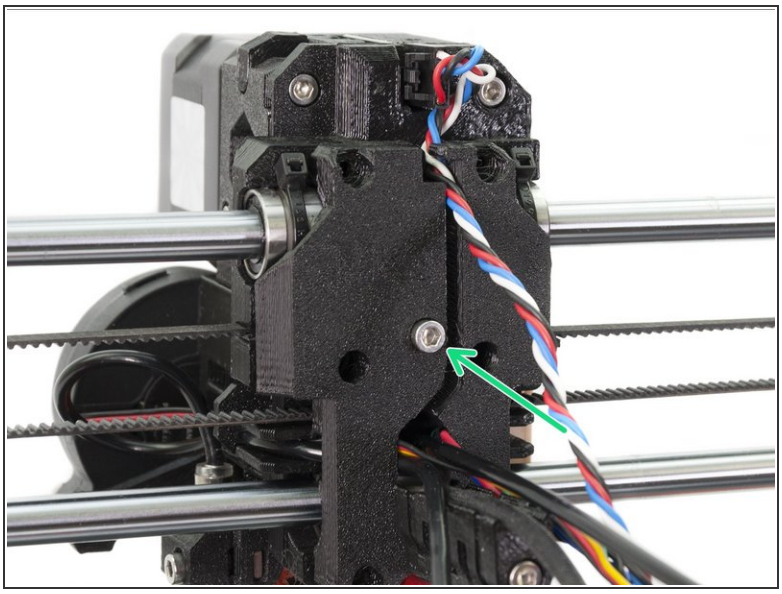


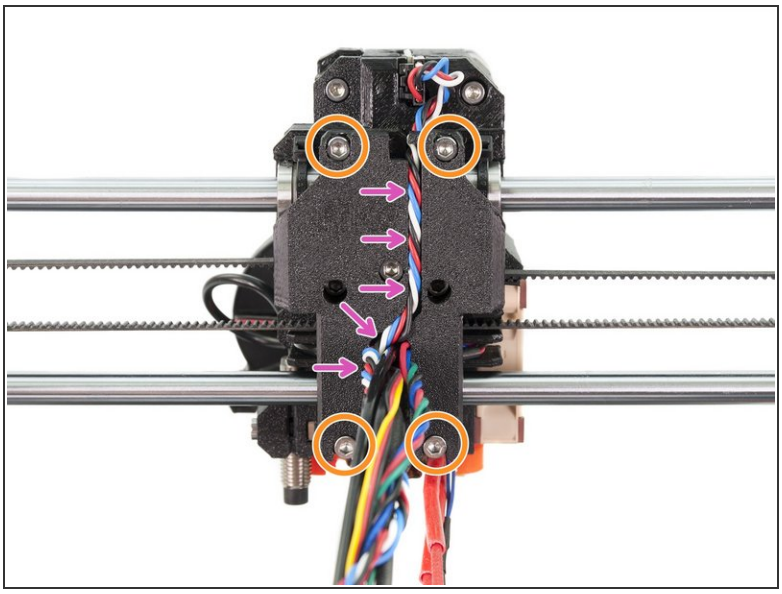


- Before pressing the X-carriage-back against the X-axis, place the filament sensor cable through the slot. See both pictures.

⚠ Check the cables are not pinched between the X-carriage-back and the X-axis!!!

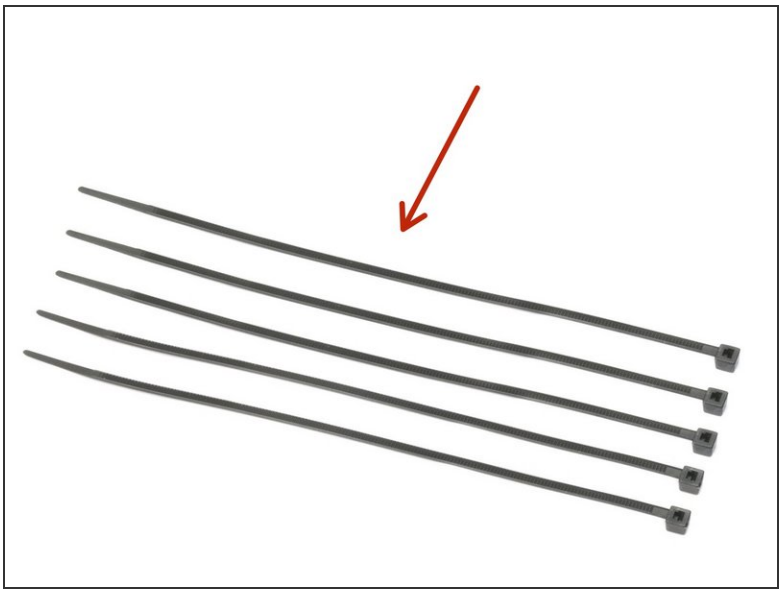
Step 40 — Mounting the X-carriage-back

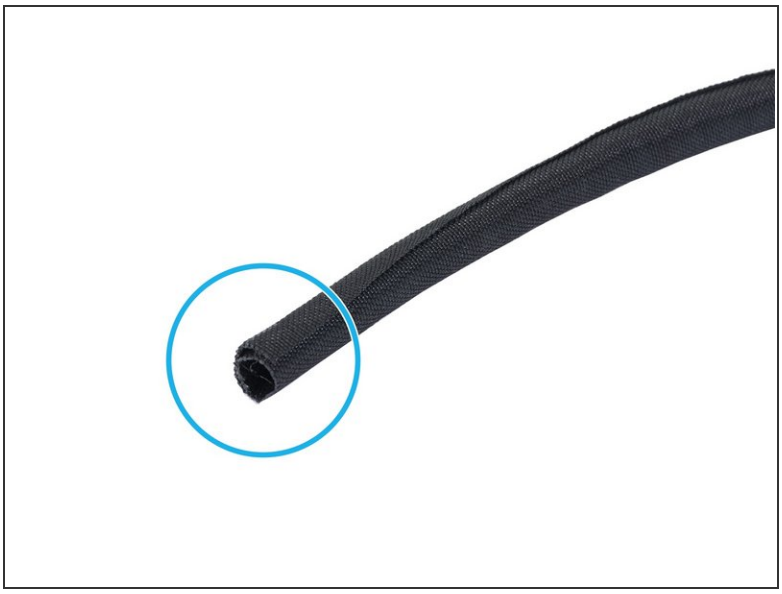




- Using five M3x10 screws tighten the parts together in following order:
- Start in the middle and ensure proper alignment.
- Continue in the corners, tighten all screws equally.
- After the tightening is done, push the filament sensor cable in the slot along X-carriage-back, join the remaining cables.

Step 41 — Tightening the textile sleeve (part 1)

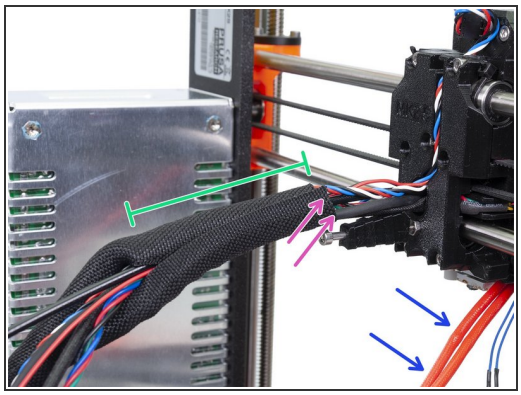
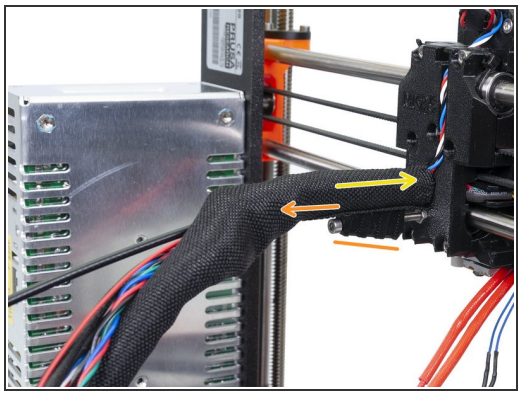
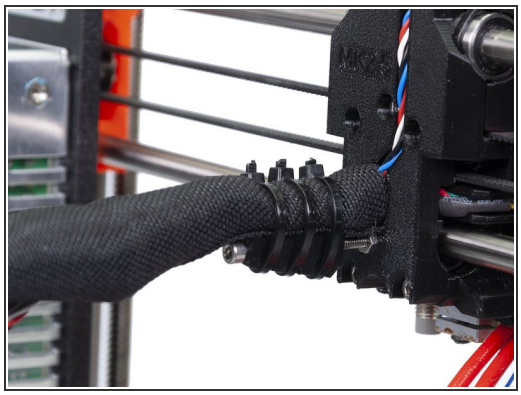




- For the following steps, please prepare:
- Zip tie (5x)
- Textile sleeve 13 x 490 mm (1x)

There are three textile sleeves in the package, use the largest one (both diameter and length).

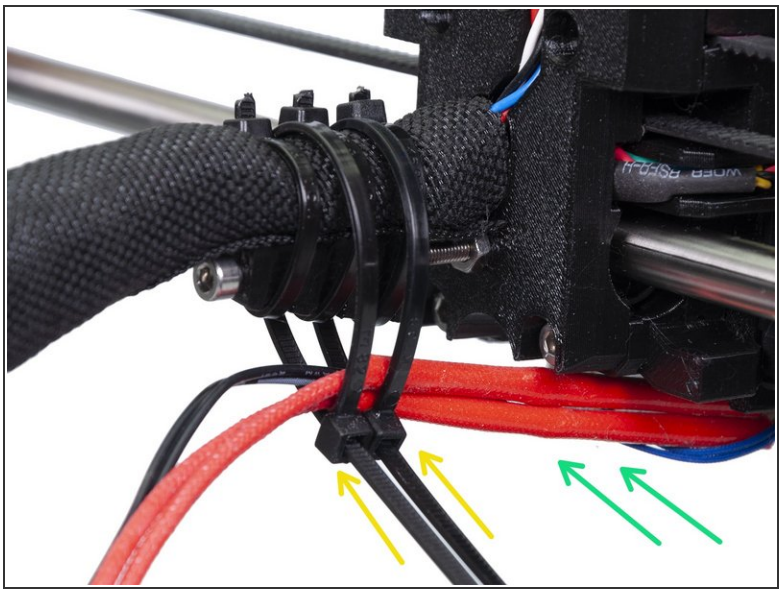
Step 42 — Tightening the textile sleeve (part 2)

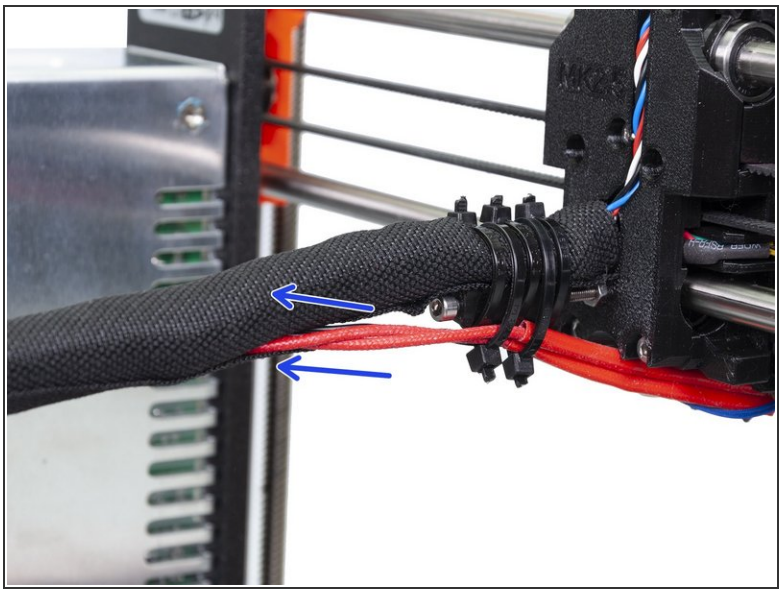




- Open one end of the textile sleeve and slide it on the cable bundle leading from the extruder. **Don't forget to include the nylon!**
- Leave the cables from the Hotend out for now.
- Length of the first wrap should be slightly longer than the cable-holder part.
- Gently twist the sleeve to make it smaller and tighter around the cables, orient the sleeve's seam downwards, then slide the sleeve towards the extruder.
- Ensure the cable-holder is properly oriented and at the end of the screw.
- **Take 3 zip ties** and tighten the textile sleeve to the holder.

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

Step 43 — Tightening the textile sleeve (part 3)





- Now, add the hotend cables to the cable-holder.
- Once the hotend cables are included, use two zip ties. Tighten them and cut remaining parts.
- Open the textile sleeve and insert the cables from the hotend.
- Finish wrapping all cables in the sleeve.

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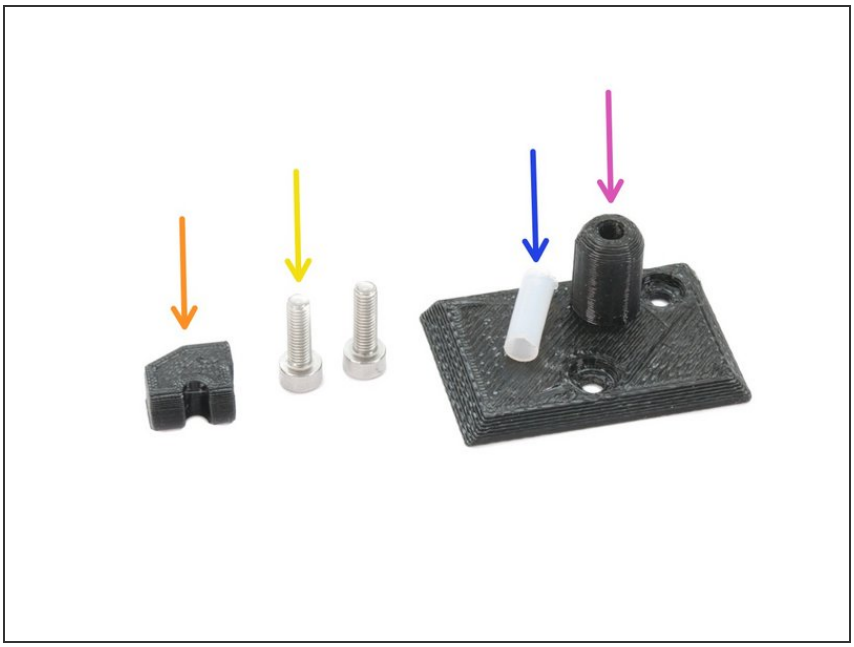
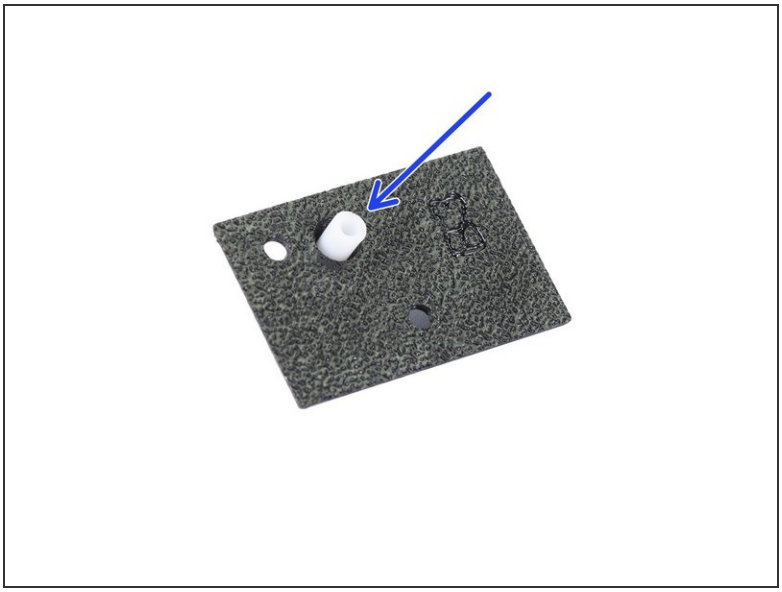
Step 44 — Mounting the Filament-sensor-cover (part 1)

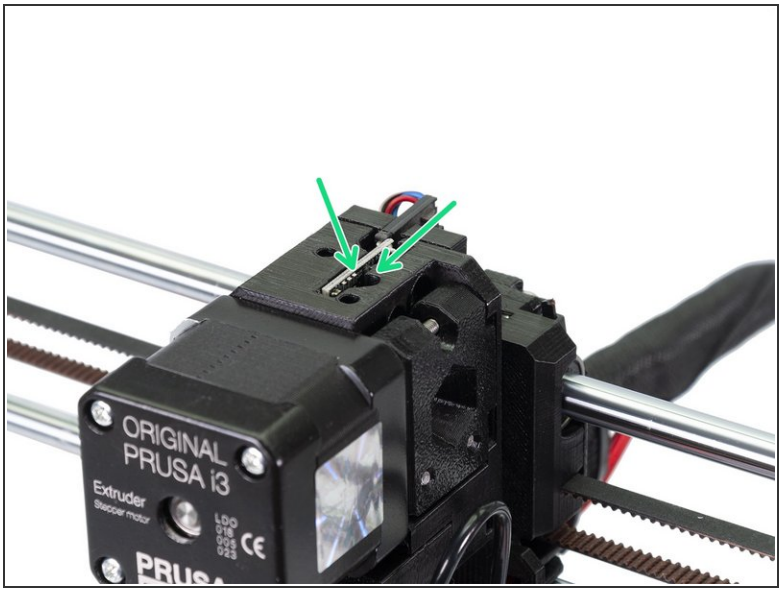


- For the following steps, please prepare:
- Idler-plug (1x)
- Filament-sensor-cover (1x)
- PTFE tube (1x)
- M3x10 screw (2x)

ⓘ In case you are missing one M3x10 screw please use the spare bag.

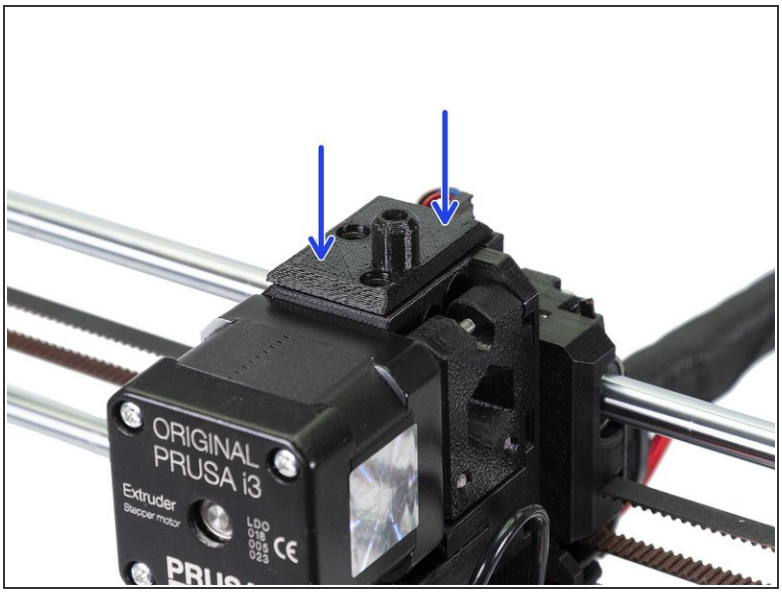
Step 45 — Mounting the Filament-sensor-cover (part 2)

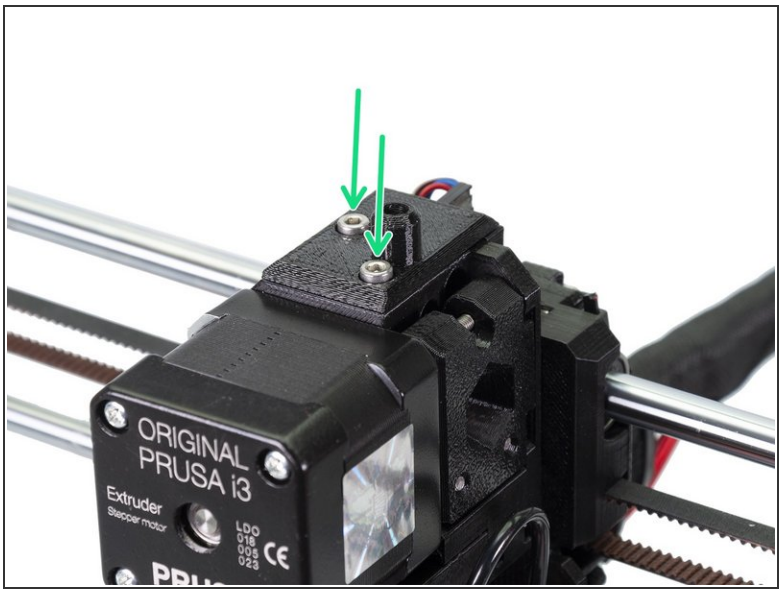




- Insert the short PTFE in the printed part from below. Orientation of the tube doesn't matter, both ends are the same.
- Locate the largest circular opening for the PTFE tube on the top of the Extruder.

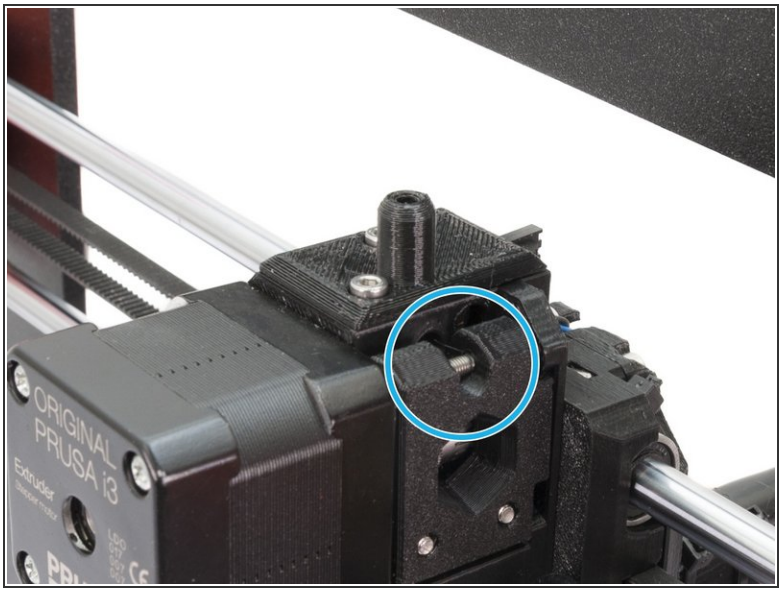
Step 46 — Mounting the Filament-sensor-cover (part 3)

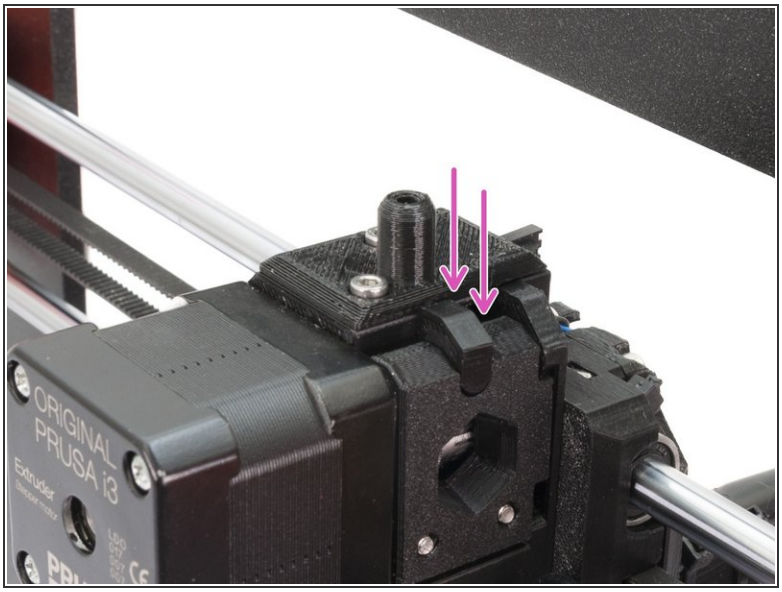




- Carefully slide the filament cover on the extruder.
- Using two M3x10 screws mount the cover.

Step 47 — Assembling the idler-plug





- Locate the part, where the idler is cut out (M3 screw is visible).
- Assemble the idler-plug and ensure it fits properly. Otherwise, it might fall down during the print.

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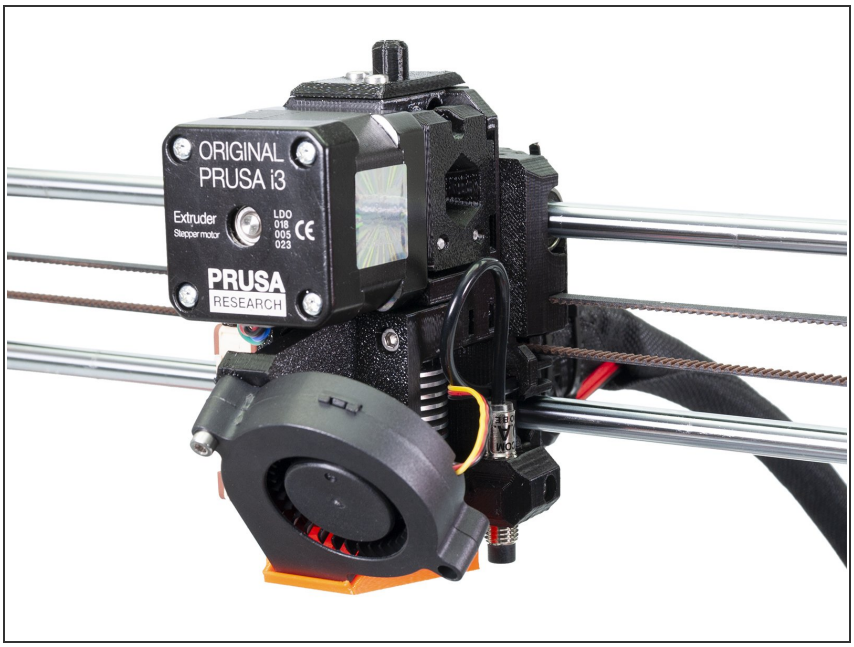
Step 48 — E-axis is finished!

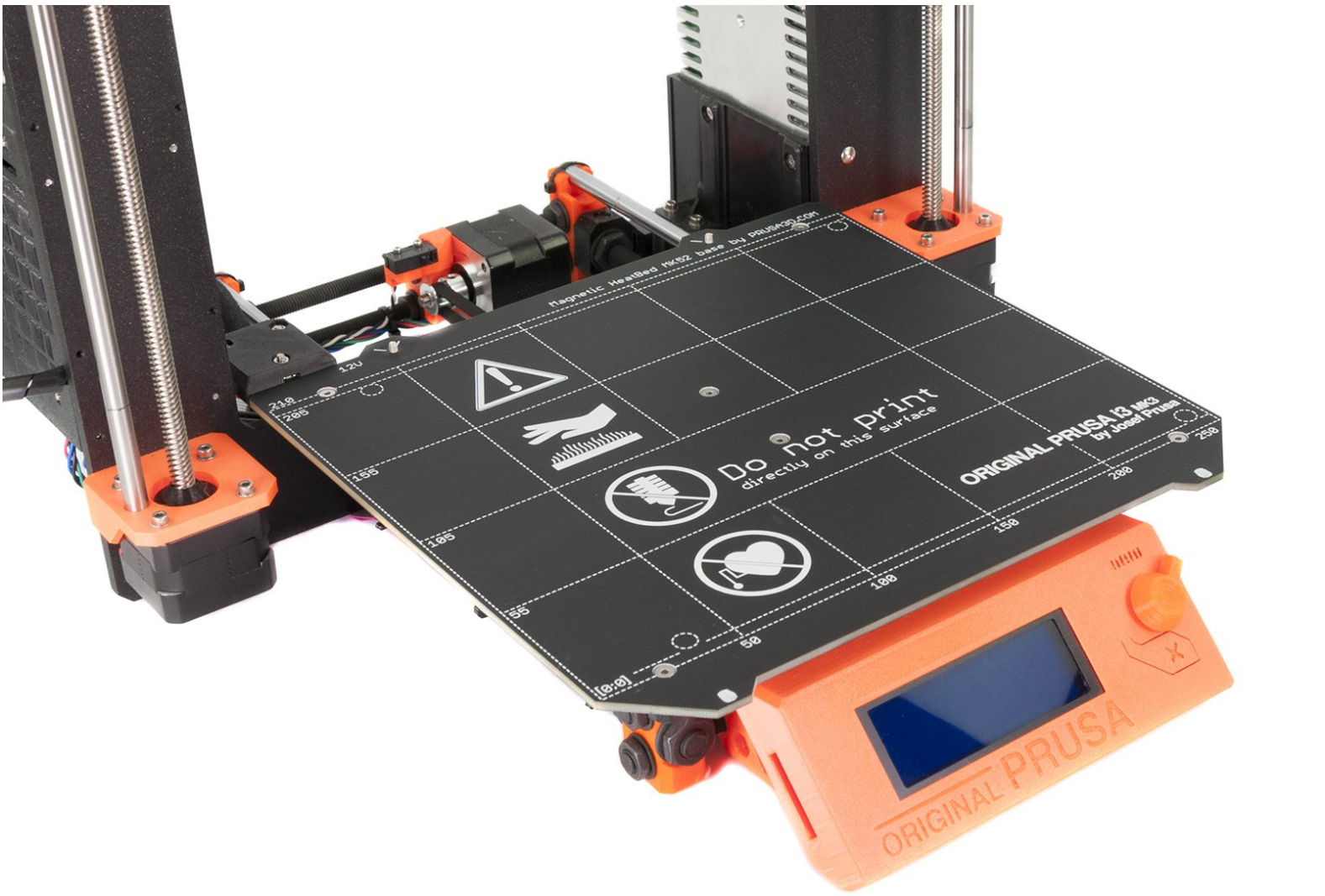


- **Are we there yet? Almost!** You've just finished the hardest part of the assembly. Awesome job!
- Check the final look, compare it to the picture. Note with B7/R3 parts the extruder looks different.
- Checked everything? Let's move to: 5. Heatbed assembly

PRUSA RESEARCH by JOSEF PRUSA

5. Heatbed assembly

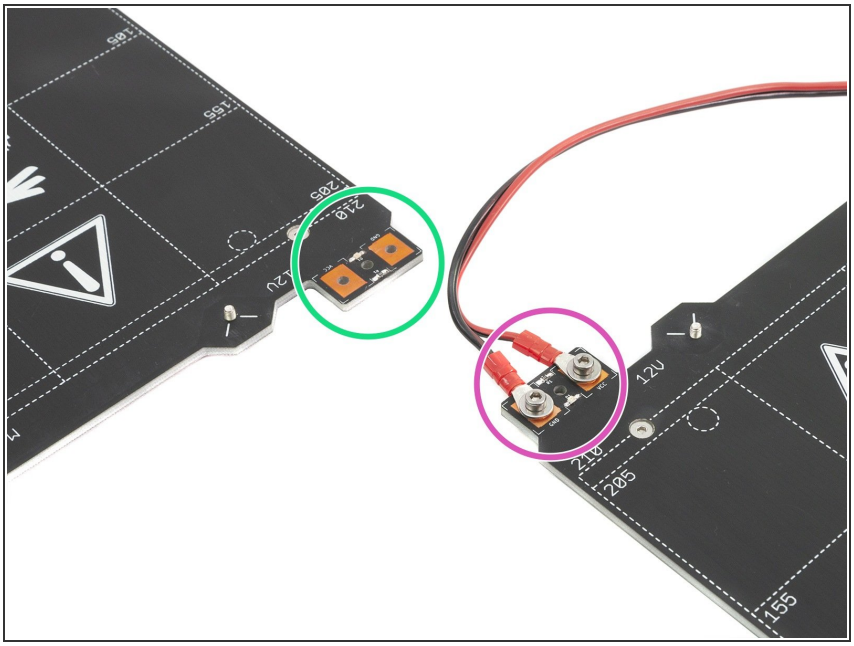
Written By: Jakub Dolezal



Step 1 — Tools necessary for this chapter

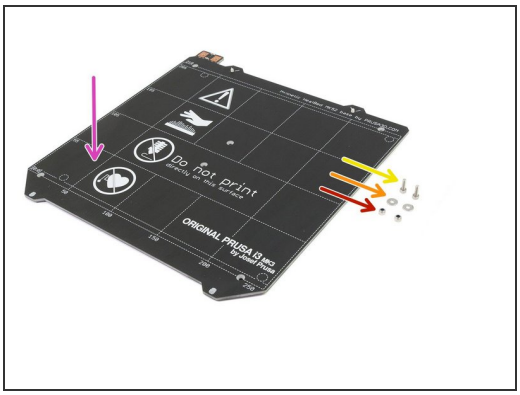
- 2.5mm Allen key for M3 screws
- 2mm Allen key for heatbed screws

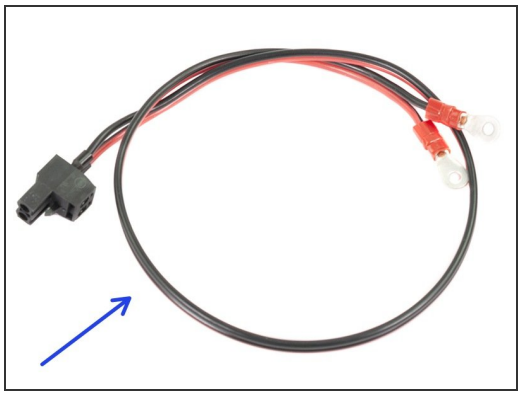
Step 2 — Different heatbed versions

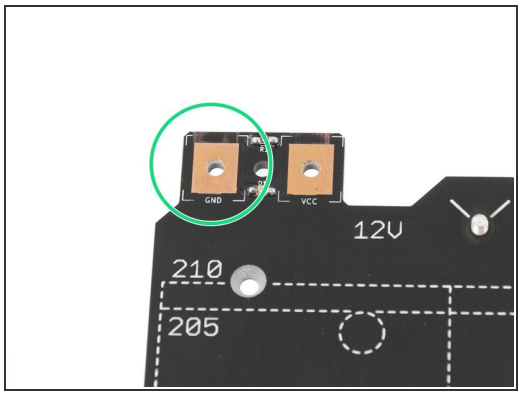


- Unpack your heatbed and check, which version you have:
- **without assembled cable**, please proceed to Step 3
- **with assembled cable**, please proceed to Step 6

Step 3 — Heatbed cable assembly (part 1)

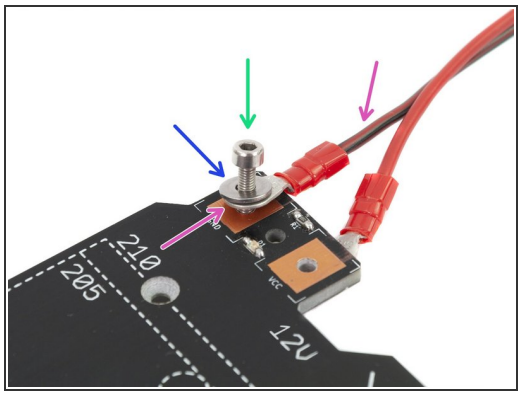


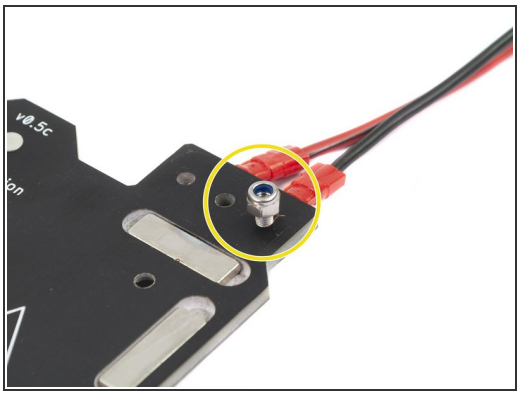


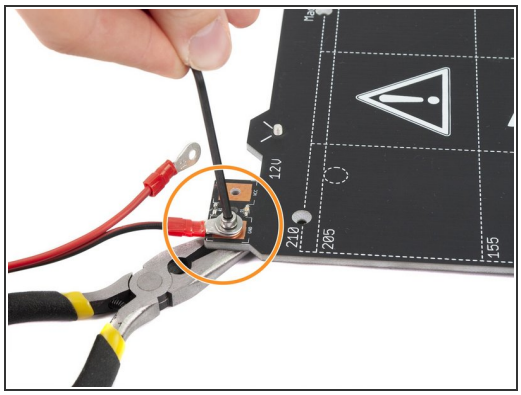


- For the following step please prepare:
- Heatbed MK52 12V (1x)
- M3x10 screw (2x)
- M3w washer (2x)
- M3nN nylock nut (2x)
- Power cable (1x)
- **IT IS VERY IMPORTANT** to connect the power cable correctly. Before you start the assembly have a look at the pins. The one on the left with **"GND"** sign must be connected to the **BLACK WIRE**.

Step 4 — Heatbed cable assembly (part 2)

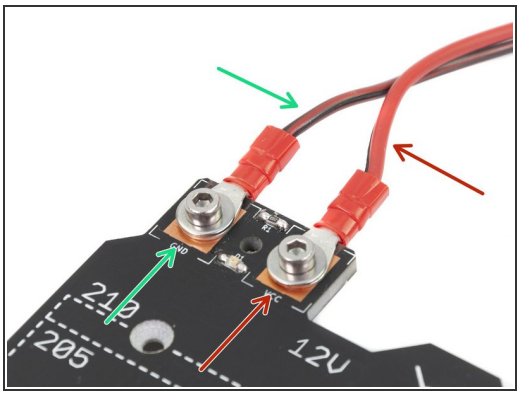


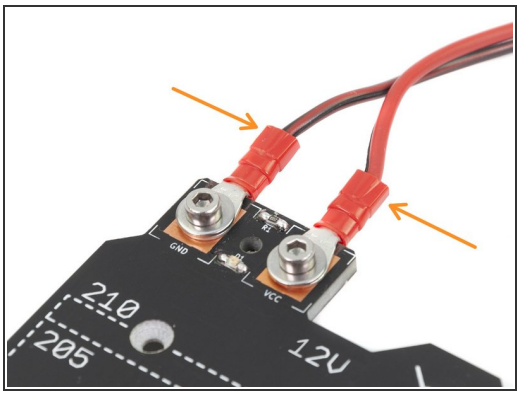


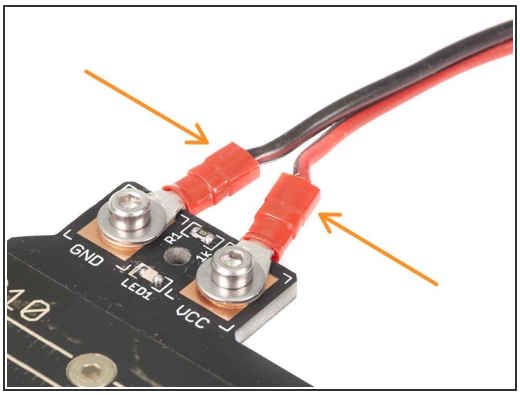


- Place the black wire above the pin with "GND" sign. Make sure you are using the **rounded connector**.
- Place the washer above the rounded cable connector.
- Press the M3x10 screw through all parts.
- Hold the screw and carefully turn the heatbed upside down.
- Place the M3nN nut on the top of the M3 screw and tighten it slightly.
- Turn the heatbed back, using pliers and Allen key tighten the screw. We need to adjust cable position in the next step, **therefore do not tighten the screw too firmly**.
- Repeat this procedure for the second (red) wire.

Step 5 — Heatbed cable assembly (part 3)







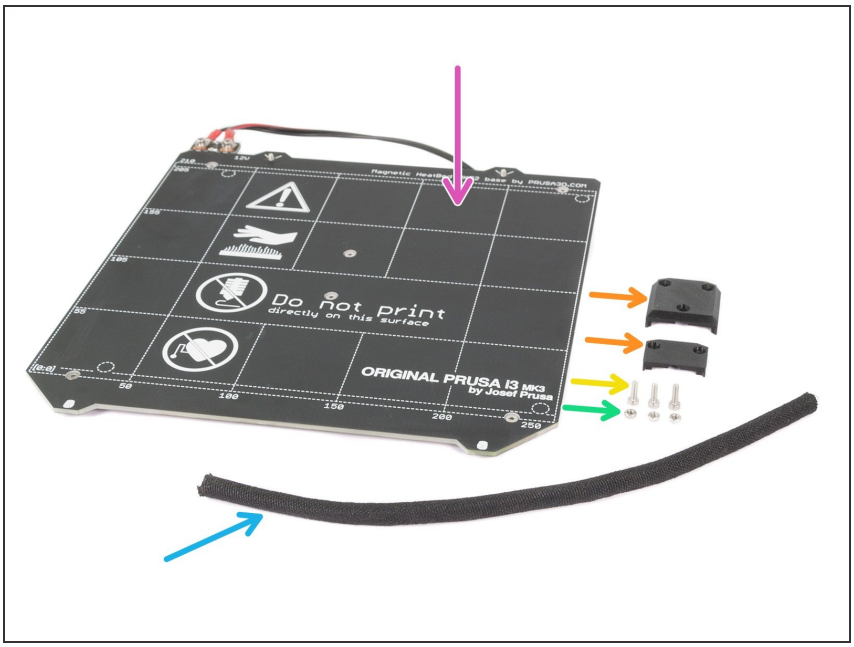
⚠ Before proceeding further, please check again the cable is connected correctly to the heatbed.

- **BLACK** wire must be connected to the **"GND"**
- **RED** wire must be connected to the **"VCC"**
- The cable cover, which will be applied later requires the connectors to be slightly inclined towards each other. Press them gently, but leave a gap between them.

ⓘ Design of your heatbed might slightly differ from the last picture.

- Now, tighten both screws using the Allen key and the pliers.

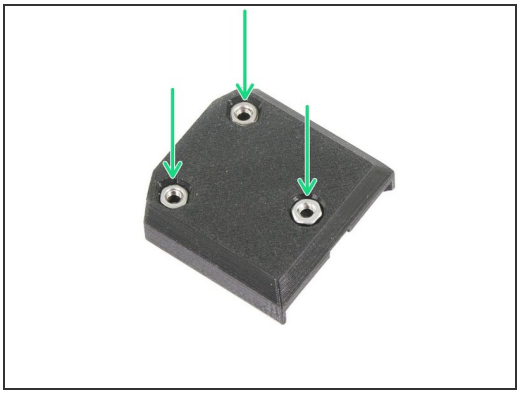
Step 6 — Preparing the heatbed

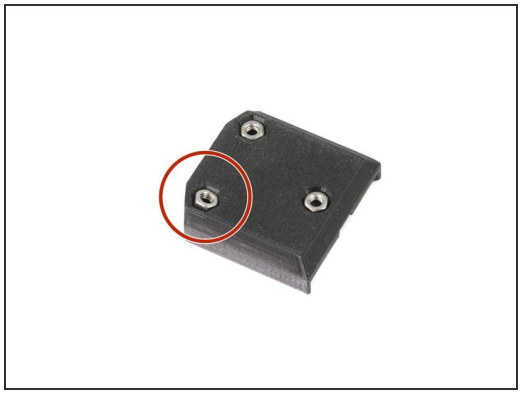


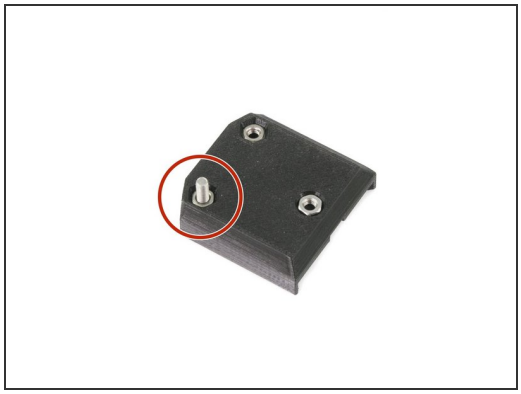
- For the following steps, please prepare:
- New Heatbed MK52 (1x)
- Textile sleeve 6 x 300 mm (1x)
- M3n nut (3x)
- M3x10 screw (3x)
- Heatbed-cable-cover (1x)

At this point you should have two sleeves 6x300 mm, use one now for the heatbed, second will be used later on.

Step 7 — Preparing the heatbed-cable-cover

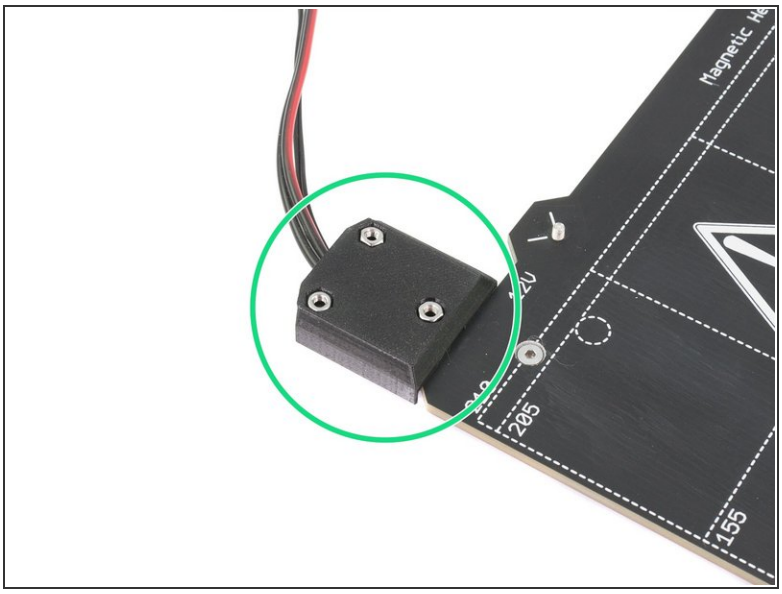


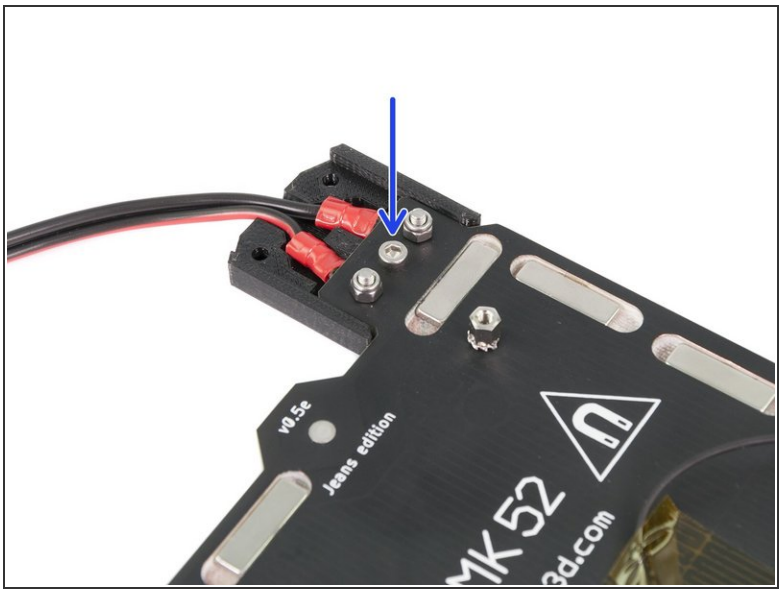




- Insert M3n nuts in the printed part.
- In case you can't press the M3n nut in, don't use excessive force. Take the M3x10 screw and thread it from the opposite side of the printed part, as you tighten the screw, it will pull the nut in. Be careful not the break the printed part during tightening.

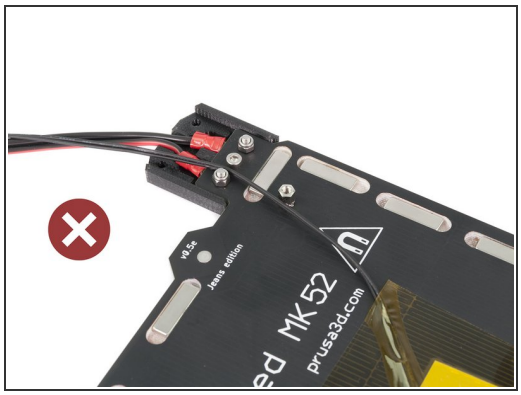
Step 8 — Mounting the heatbed-cable-cover

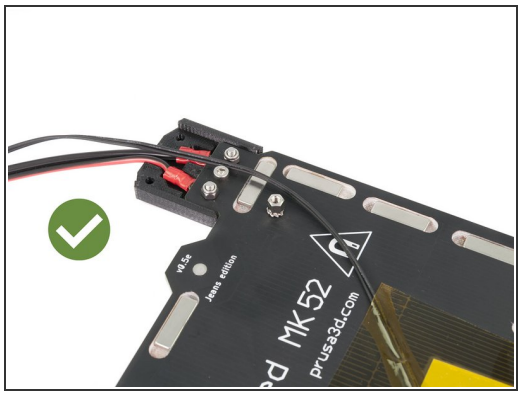


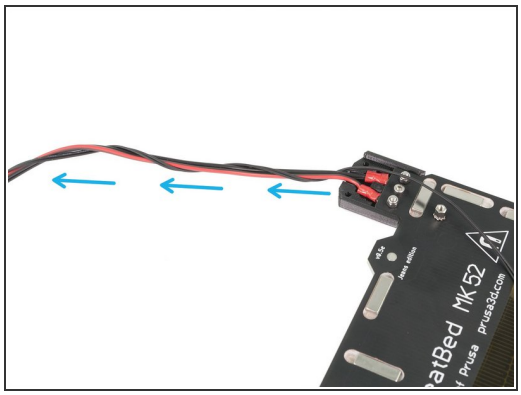


- Place the heatbed-cable-cover on the heatbed to cover the soldered cables and LED.
- Tighten the cover to the heatbed using M3x10 screw and Allen key. Be careful not to pinch (break) any wires from the heatbed!

Step 9 — Proper cable management







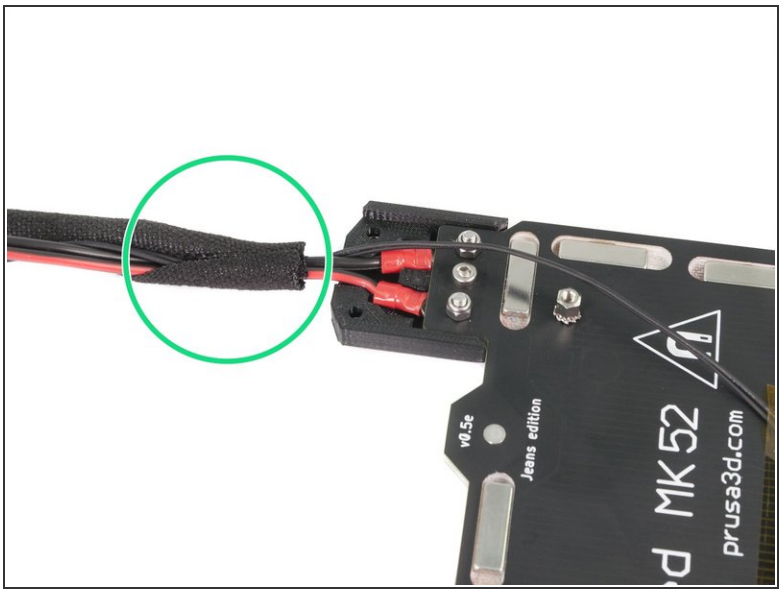
⚠ Do not stretch the black/white thermistor cable, leave some slack under the heatbed, so when the heatbed moves during print, the cable won't get stretched resulting in disconnection from the centre of the heatbed.

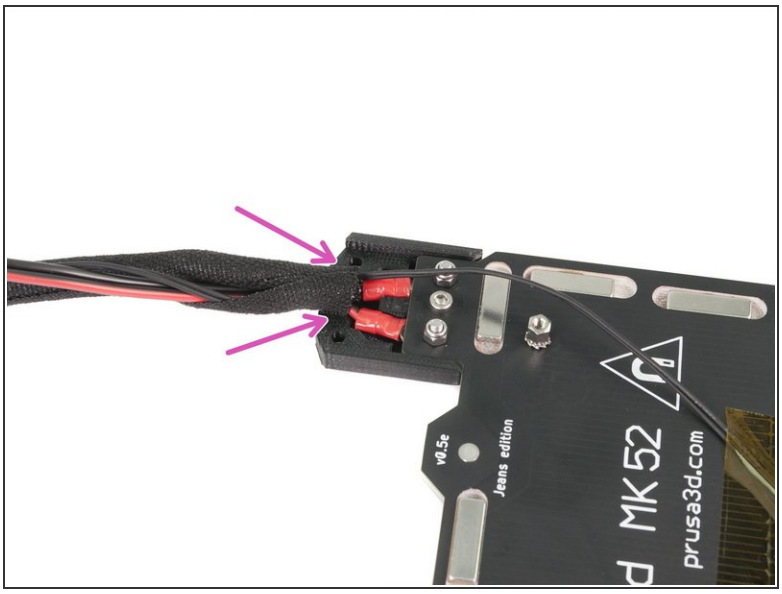
⚠ However, the slack shouldn't be causing the cable to sag down more than few millimetres. Otherwise, the cable might rub against the printer's frame and damage itself! Turn the heatbed upside-down to check this.

- Guide the black thermistor cable next to the heatbed heater cable and wrap it few times around (see the photo).

ⓘ The thermistor cable is in black or white colour, their functionality is the same.

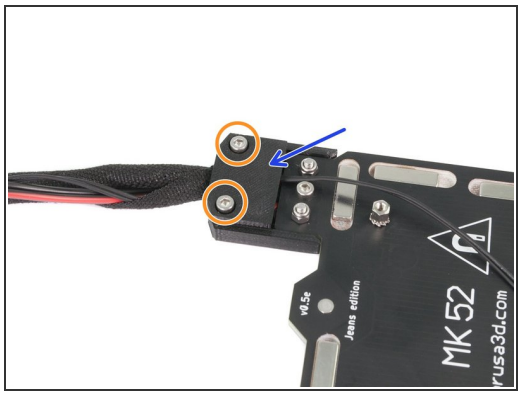
Step 10 — Wrapping the heatbed cables

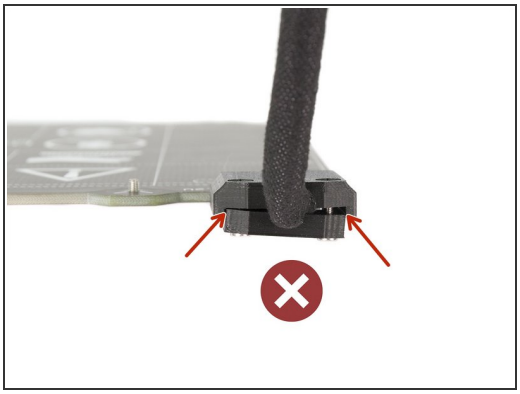




- Use the textile sleeve and wrap the cables from the heatbed. Start by few centimeters of the sleeve behind the heatbed cover.
- When the first "wrap" is ready, slide it inside the heatbed cover. Ensure it is at least 5-6 mm.
- Before you continue with wrapping the sleeve, we need to fix it in the cable cover. Please proceed to the next step.

Step 11 — Securing the sleeve in place






- Place second part of the cover on the top of the textile sleeve.

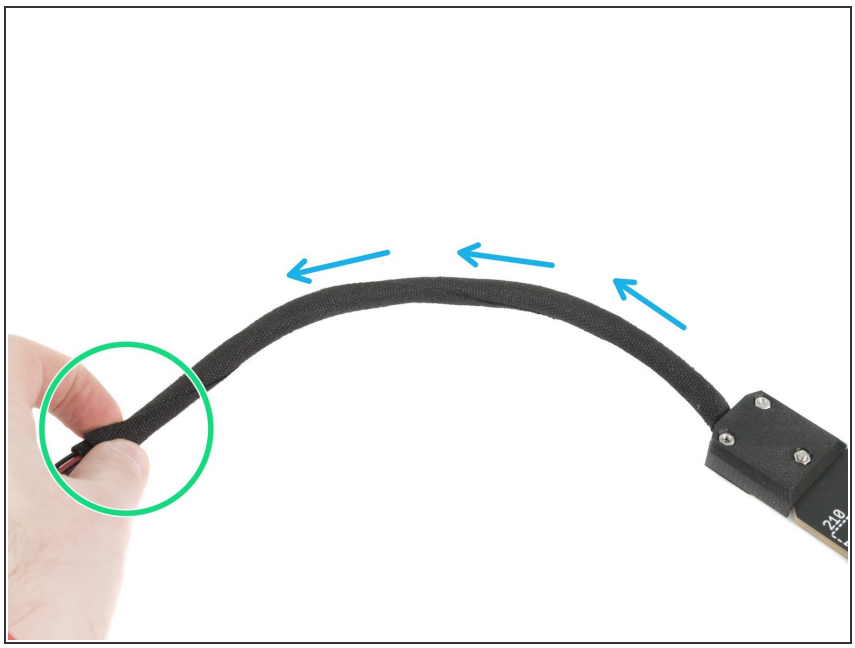
⚠ Make sure the thermistor cable is in the middle going through a cutout in the printed part!!! **Otherwise, you will pinch and possibly break the cable!!!**

- Insert two screws M3x10 and tighten them, proceed with caution and tighten both screws equally.

⚠ Don't tighten the screw completely on one side and then on the other (see the second picture)!

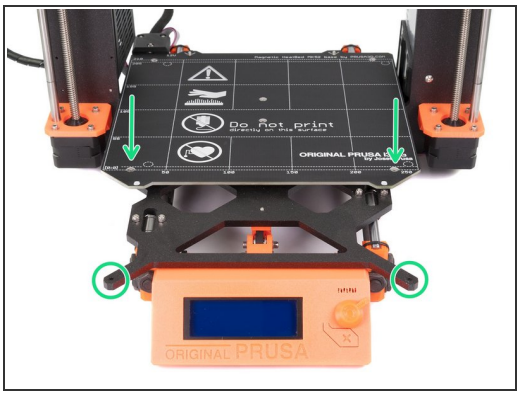
- Your tightened cover should look like the last picture.

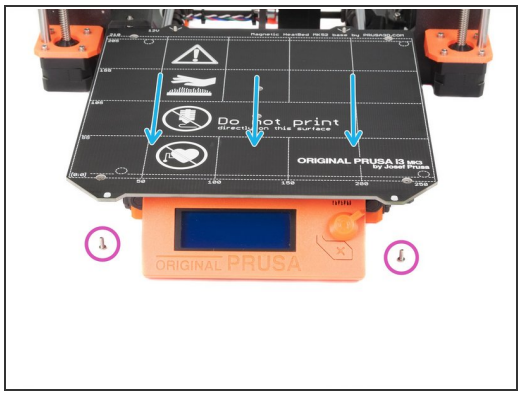
Step 12 — Finalizing the wrap

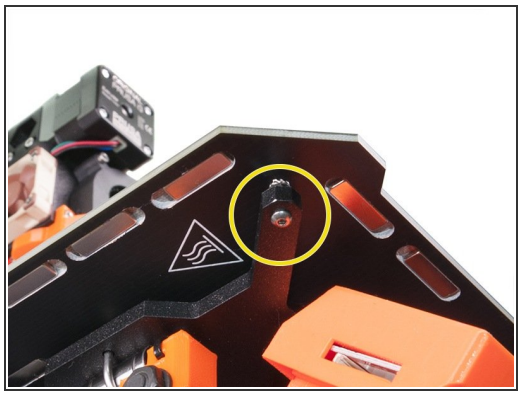


- Now, finish wrapping the cable into the textile sleeve.
- When done, slightly twist the sleeve (not the cables inside). The sleeve will evenly wrap all around the cable bundle.

Step 13 — Mounting the heatbed (part 1)

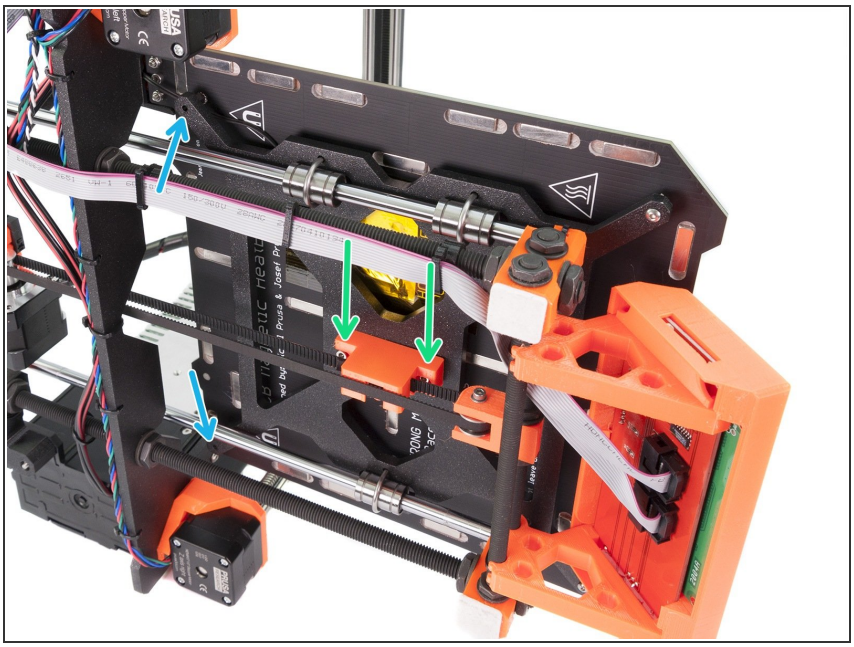






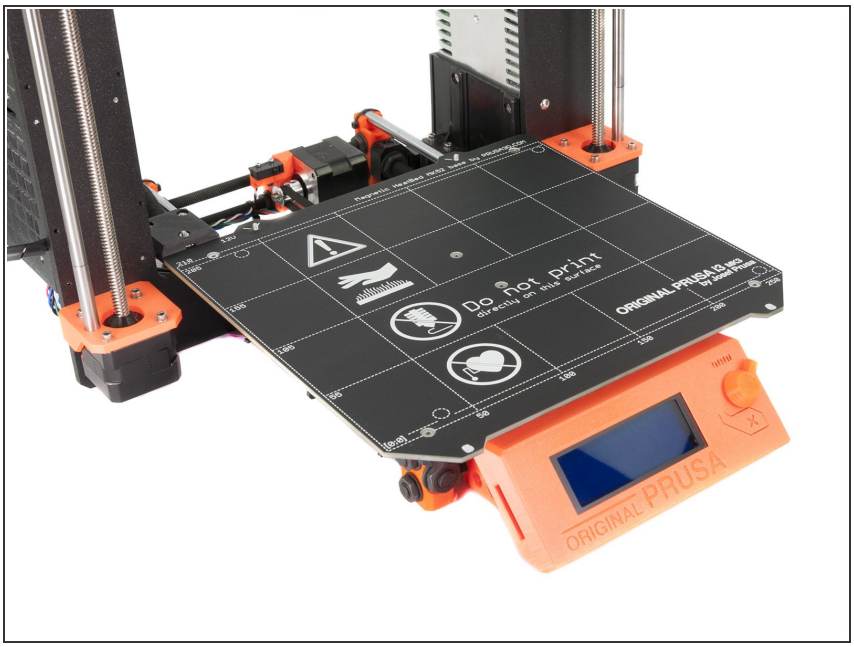
- Push the Y-carriage to the front and place the Heatbed slightly behind.
- Locate front holes in the Y-carriage and front screws on the heatbed (there are nuts with threads just below them).
- Place both holes and nuts above each other. You can use the smallest Allen key for alignment.
- M3x8r screw (2x)
- Move the printer carefully on the edge of your work bench and insert the screws from below. Tighten them both, but not completely, we will do it later.

Step 14 — Mounting the heatbed (part 2)



- Slide the Extruder all the way to the right side and turn the printer on the PSU side.
- M3x8r screw (2x)
- Insert the M3x8r screws in the highlighted holes and tighten them slightly. Make sure both entered the threads on the heatbed.
- Using 2.5mm Allen key tighten both screws (M3x12), which are in the Y-belt-holder. Make sure both entered the threads on the heatbed. Tighten them fully, but carefully as you might break the nuts.
- Using 2mm Allen key tighten all 4 M3x8r screws. Tighten them fully, but carefully as you might break the nuts.

Step 15 — Heatbed assembly is done!



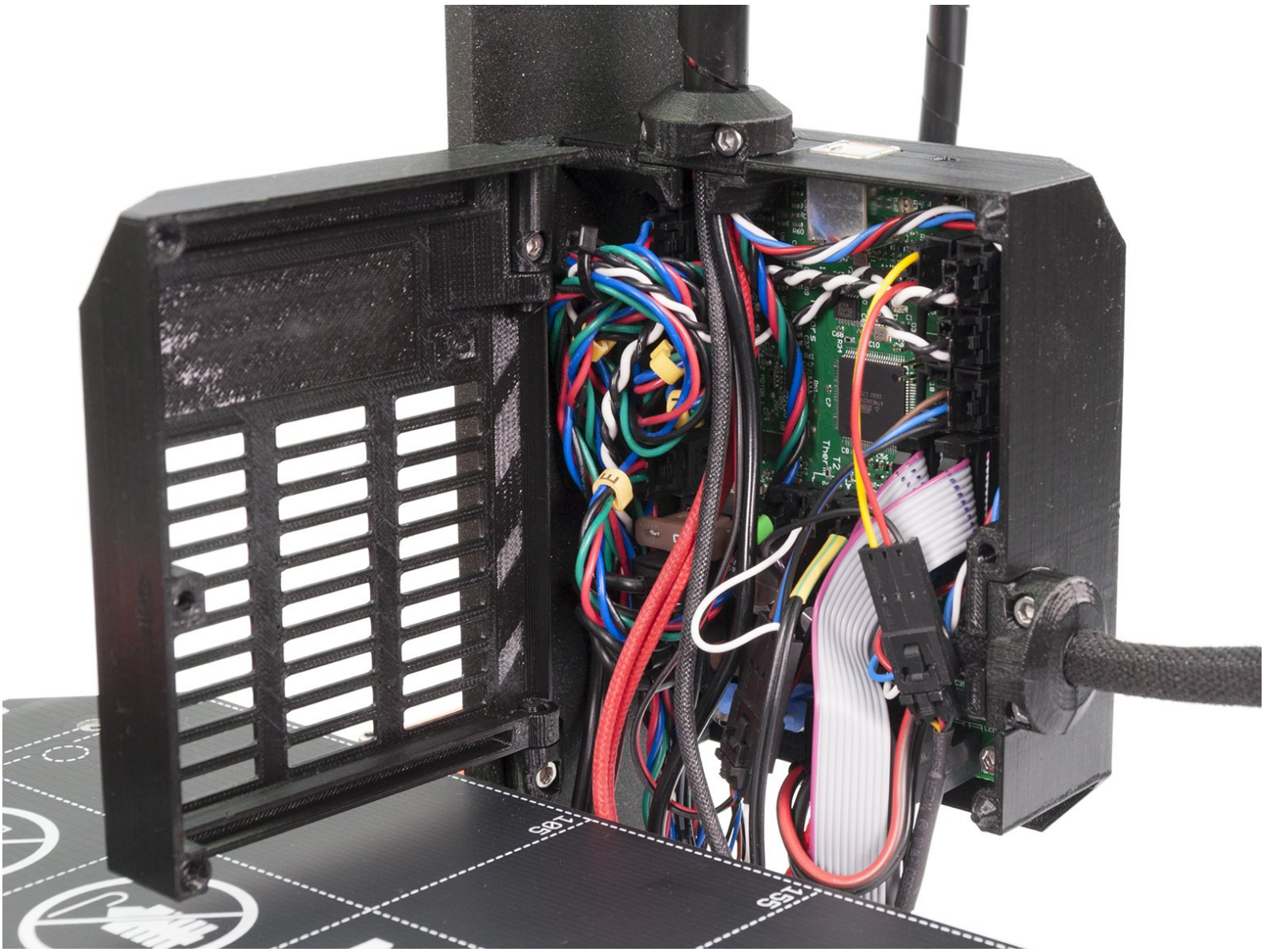
- **Getting closer!** Just one more chapter and the assembly is done!
- Check the final look, compare it to the picture.
- Ready for next chapter? Lets move to 6. Electronics

⚠ **Don't place the steel sheet on the heatbed yet.** Wait for the instructions in the Wizard during the calibration process.

PRUSA RESEARCH by JOSEF PRUSA

6. Electronics

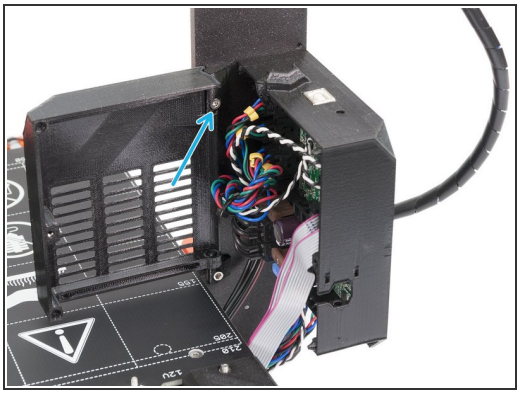
Written By: Jakub Dolezal

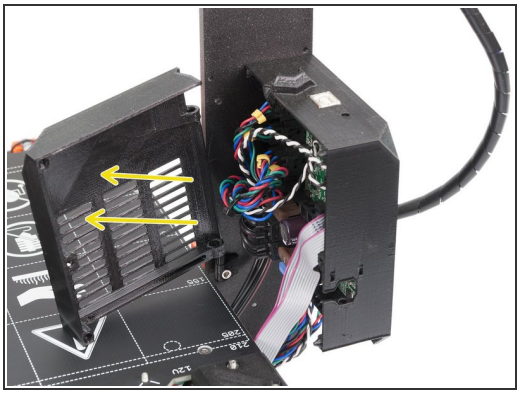


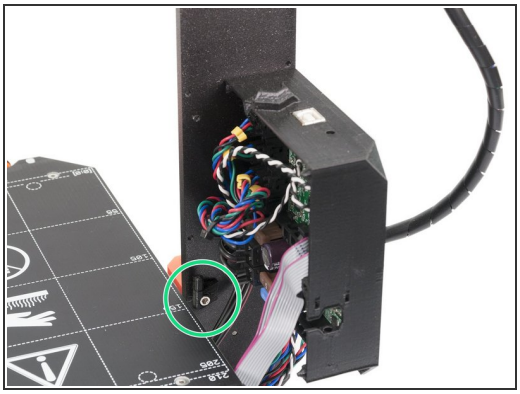
Step 1 — Tools necessary for this chapter

- 2.5mm Allen key for M3 screws
- 2mm Allen key for nut alignment

Step 2 — RAMBo door disassembly





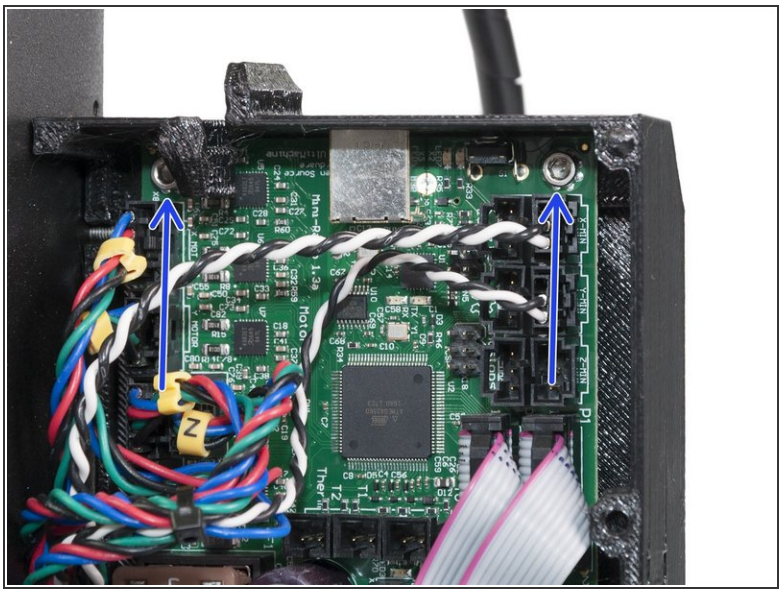


For MK2.5 there is a redesigned RAMBo cover case and door. In the following steps we will remove the older parts completely. **Proceed with caution, as you might break the cables.**

MAKE SURE you won't mix old and new parts!!! Their design is sometimes similar.

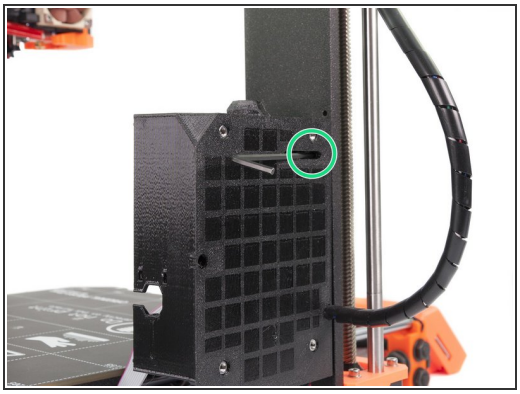
- Using 2.5mm Allen key, remove the M3x10 screw together with the upper hinge.
- Remove to the RAMBO cover door.
- Using 2.5mm Allen key, remove the M3x10 screw together with the lower hinge.

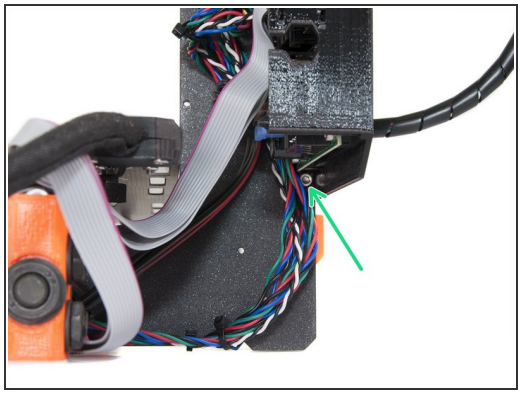
Step 3 — RAMBo cover disassembly (part 1)

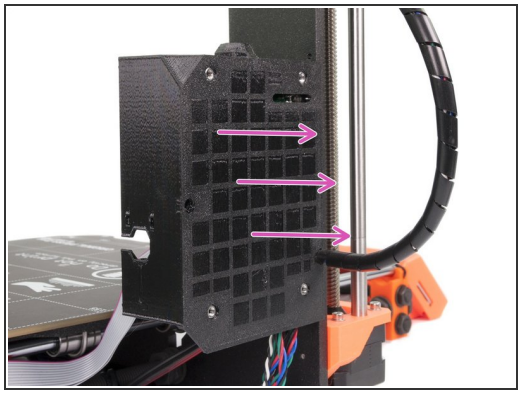


- Release upper two M3x10 screws holding the RAMBo board together with the RAMBo cover.
- Release lower two M3x10 screws holding the RAMBo board together with the RAMBo cover.

Step 4 — RAMBo cover disassembly (part 2)







- Slightly release two M3x10 screws holding the RAMBo cover on the frame. **DO NOT** unscrew them completely!!!
- Carefully slide the RAMBo cover from the frame. Plugged cables won't allow you more than few centimetres.
- Separate the cover from the RAMBo board.

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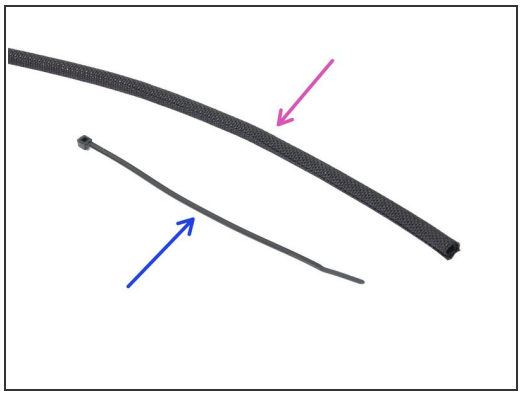
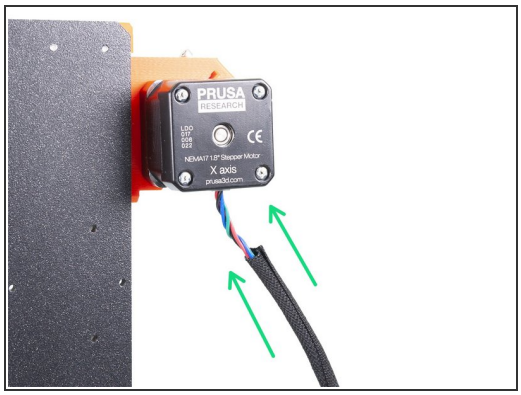
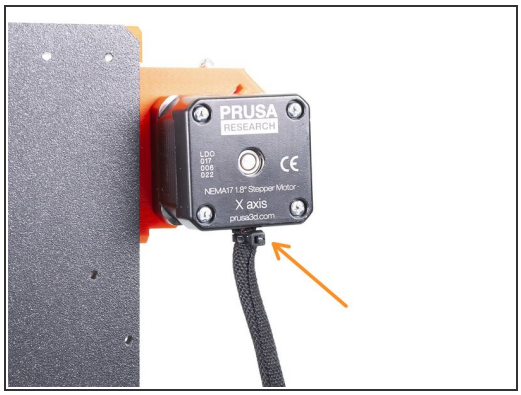
Step 5 — Wrapping X-axis cable (optional)



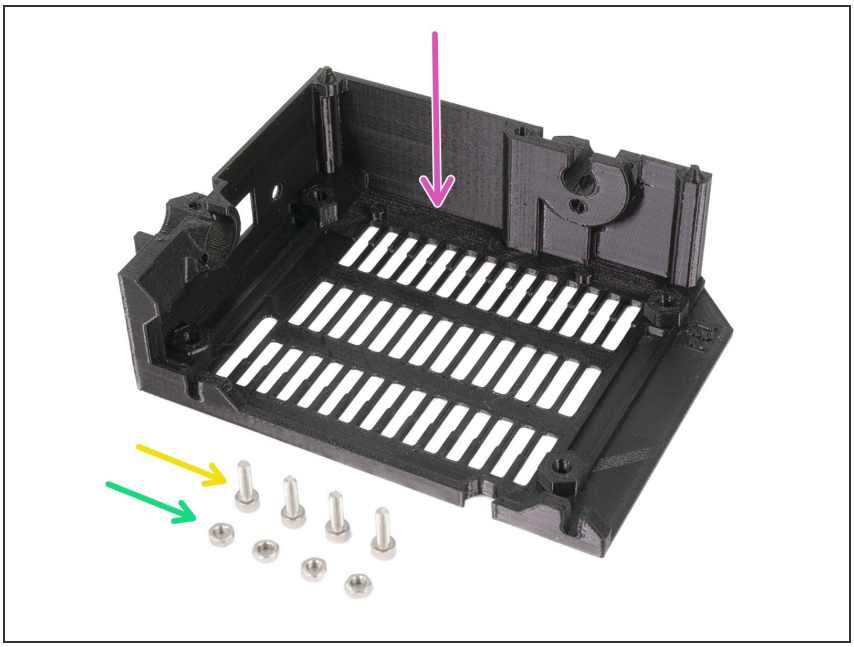




- In order to match the wrapping style of the printer, an extra textile sleeve is included for the X-axis motor cable. You can remove the spiral wrap and replace it with the textile sleeve, or leave the wrap in place. **It is up to you, this step is optional ;)**
- **For the following step, please prepare:**
- Textile sleeve 6 x 300 mm (1x)
- Zip tie (1x)
- Wrap the sleeve around the X-axis motor and endstop cable. The sleeve is shorter, than both cables.
- Secure the sleeve using a zip tie, you have to tighten the zip tie firmly and it is only a temporary fix until the Einsy case is assembled, but you can leave the zip tie in place afterwards.

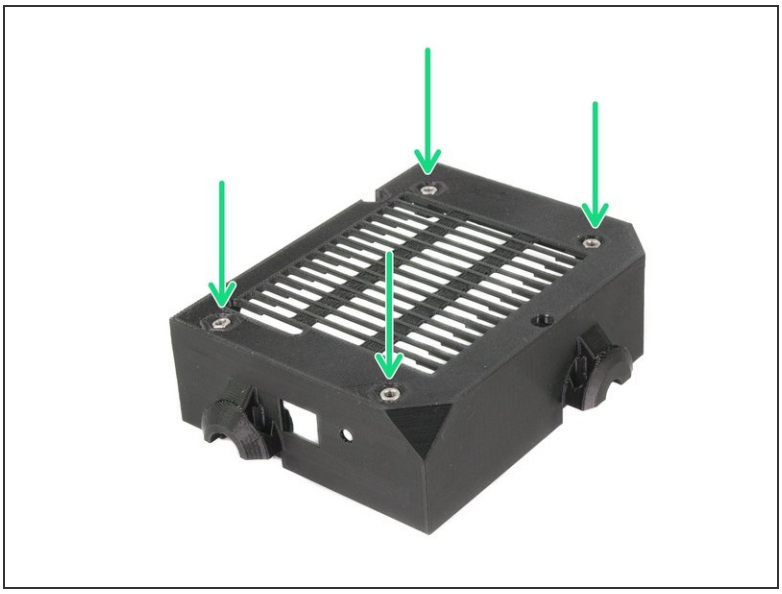
Note the rest of this chapter was photographed with the spiral wrap, but the assembly procedures are the same for the textile sleeve.

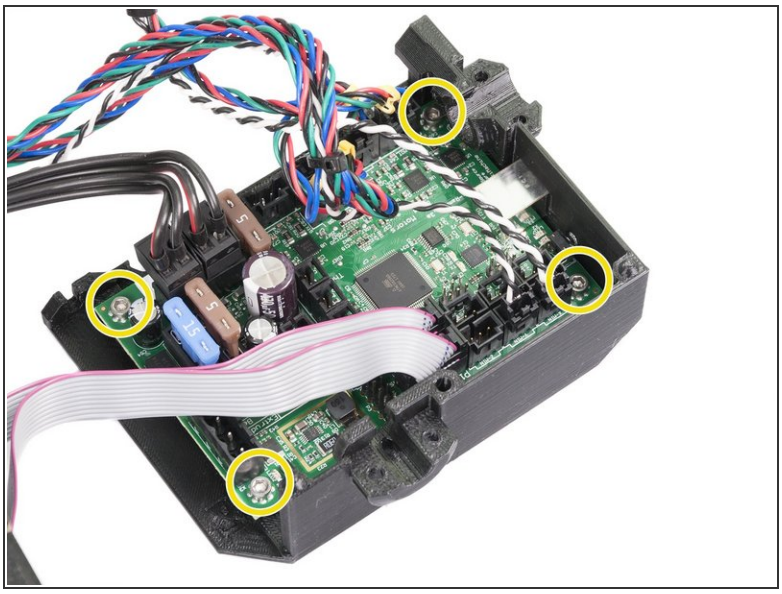
Step 6 — Preparing the RAMBo-cover-base (part 1)



- For the following steps, please prepare:
- RAMBo-cover-base (1x)
- M3n nut (4x)
- M3x10 screw (4x)

Step 7 — Preparing the RAMBo-cover-base (part 2)



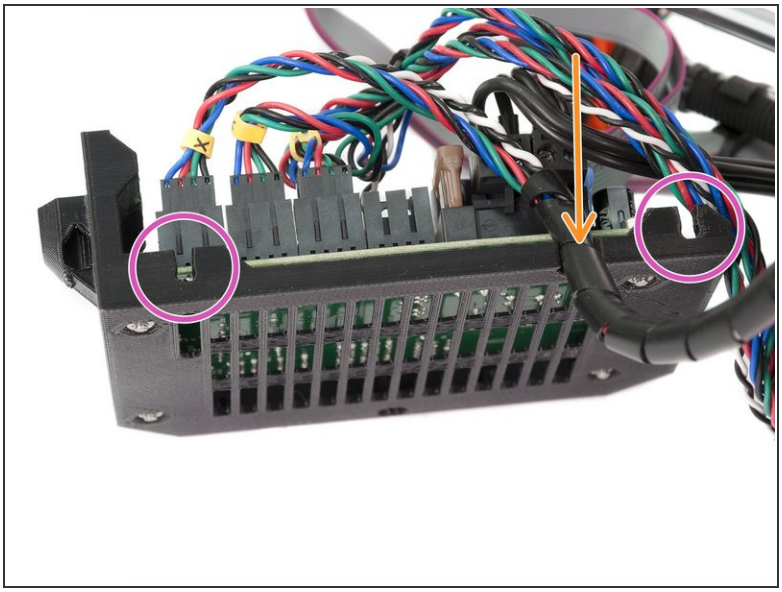


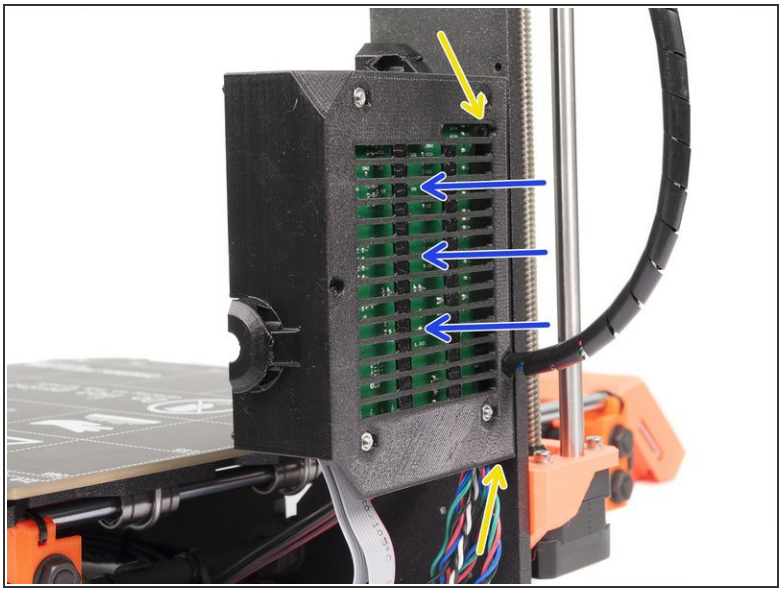
- Insert four M3n nuts in nut traps.
- Slide RAMBo inside the base and tighten it with four M3x10 screws.

⚠ Tighten the screws carefully, you can damage the board.

ⓘ Use the needle nose pliers to help with positioning the screws.

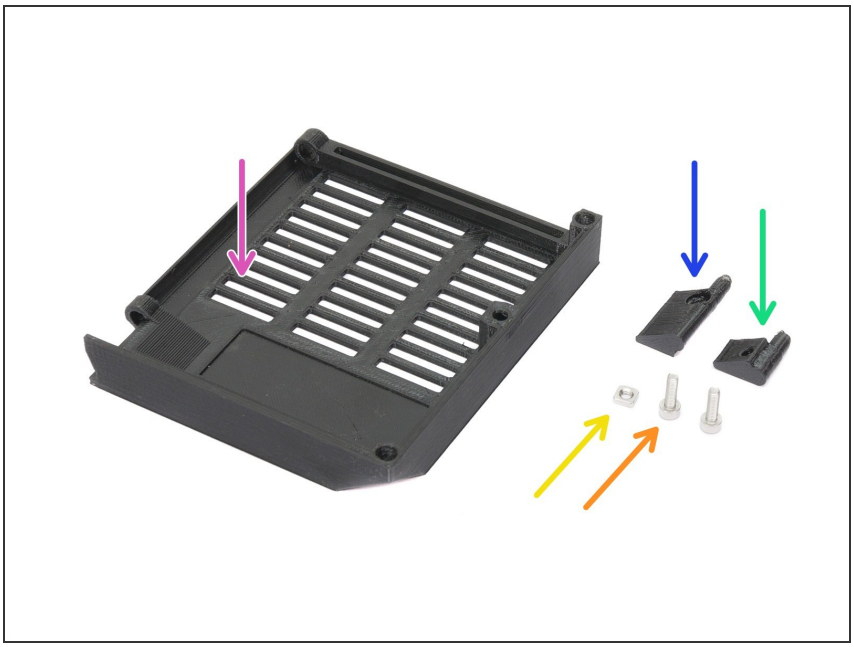
Step 8 — Mounting the RAMBo-cover-base (part 1)





- Push the spiral wrap in the slot and leave some slack of the cable along the board (don't stretch the cable).
- See the slots on the printed part, which will be used for the M3x10 screws (those are already on the frame).
- Slide the RAMBo-cover-base on the prepared M3x10 screws and align it with the edge of the Z-axis frame.
- Using 2.5mm Allen key tighten both screws.

Step 9 — Preparing the RAMBo-cover-door (part 1)

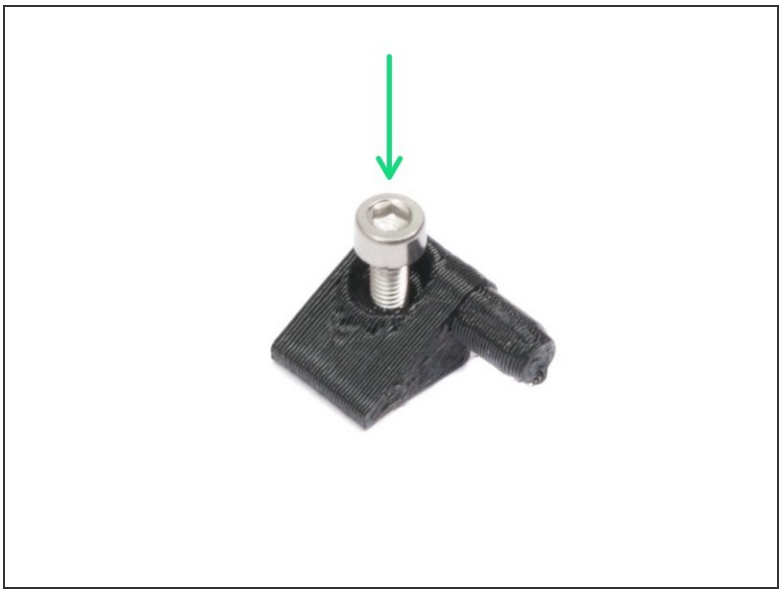


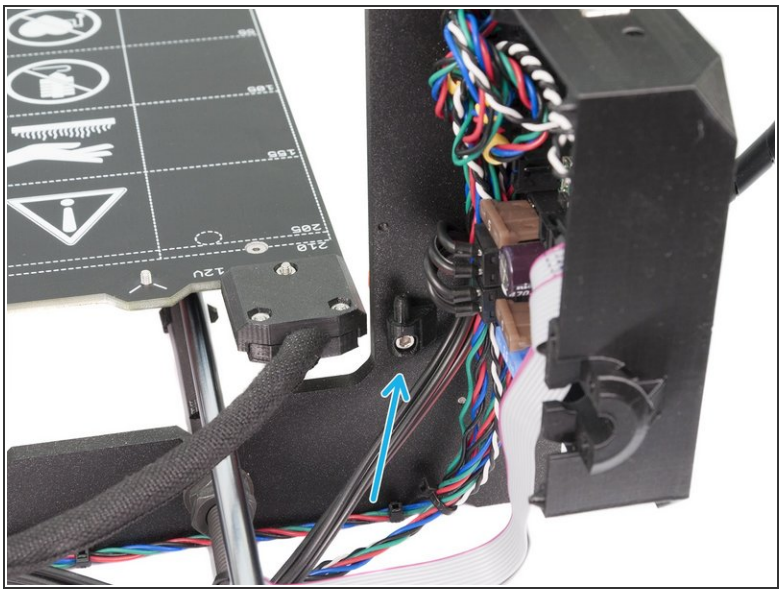
- For the following steps, please prepare:
- RAMBo-cover-door (1x)
- RAMBo-cover-hinge-top (1x)
- RAMBo-cover-hinge-bottom (1x)
- M3nS nut (1x)
- M3x10 screw (2x)

Step 10 — Preparing the RAMBo-cover-door (part 2)

- Insert M3nS nut all the way in. You can use the small screw driver to push it down if needed.
- Check the proper alignment with the Allen key.

Step 11 — Preparing the lower hinge



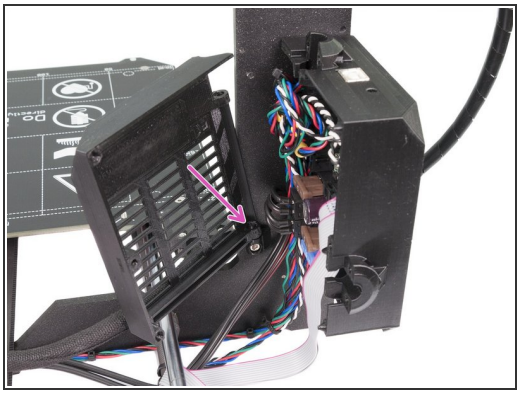


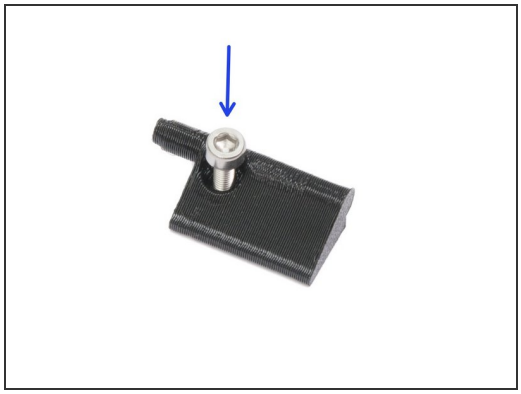
- Take the RAMBo-cover-hinge-bottom and push M3x10 screw through.

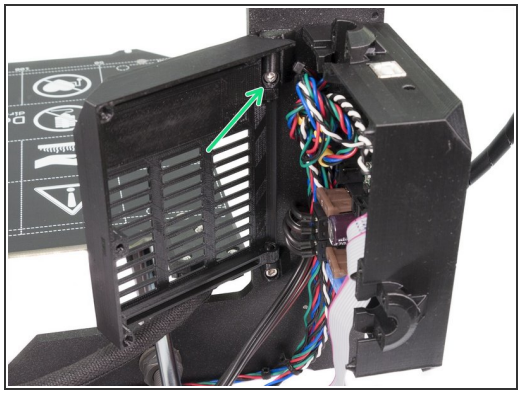
Note there is a cutout for the screw's head in the printed part.

- Place the hinge on the frame and tighten the screw. The hinge must be facing upwards.

Step 12 — RAMBo-cover-door assembly

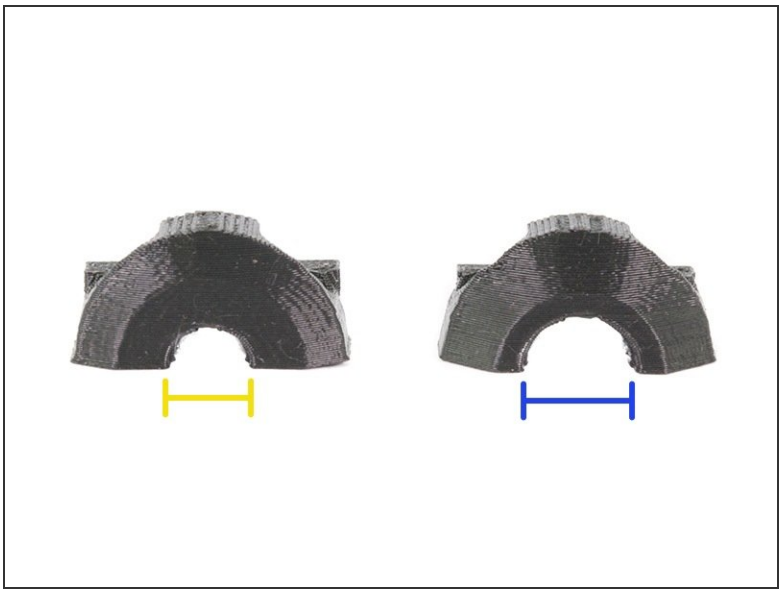


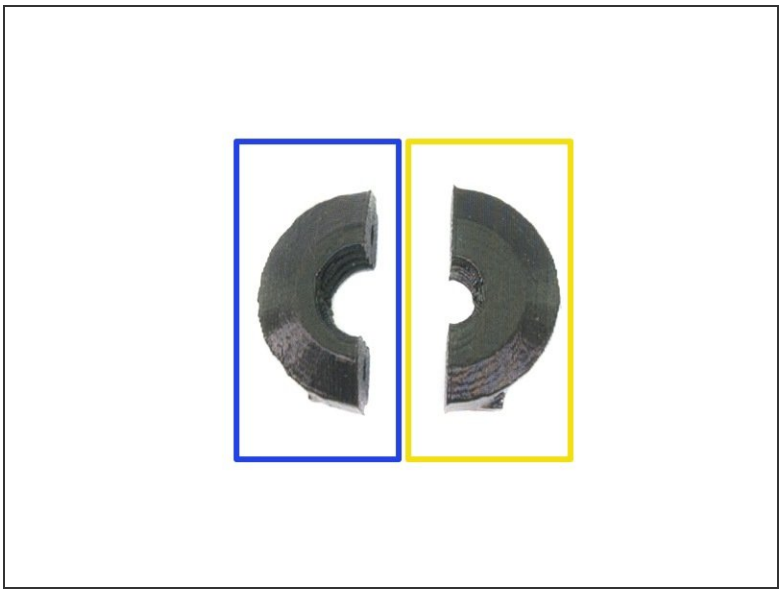




- Place the RAMBo-cover-door on the lower hinge.
- Take the RAMBo-cover-hinge-top and push M3x10 screw through.
- Assemble the RAMBo-cover-hinge-top in the door and mount it to the frame.

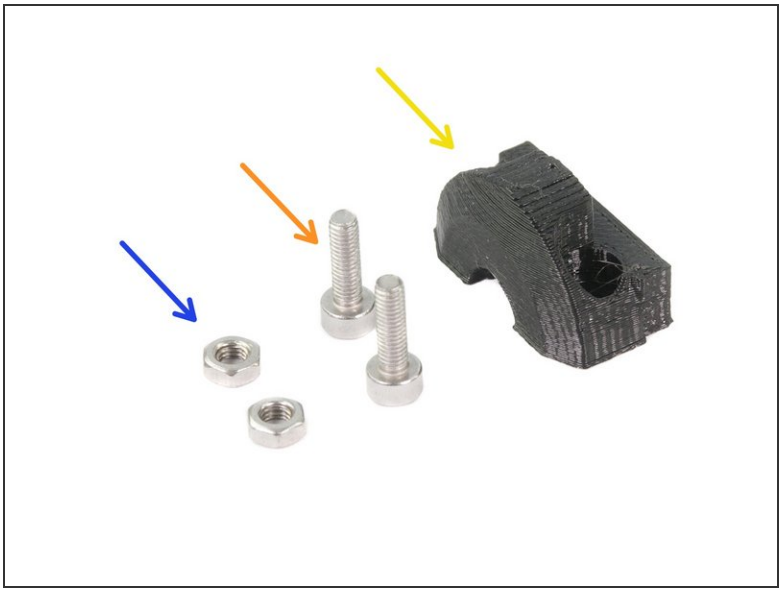
Step 13 — Different cable clips

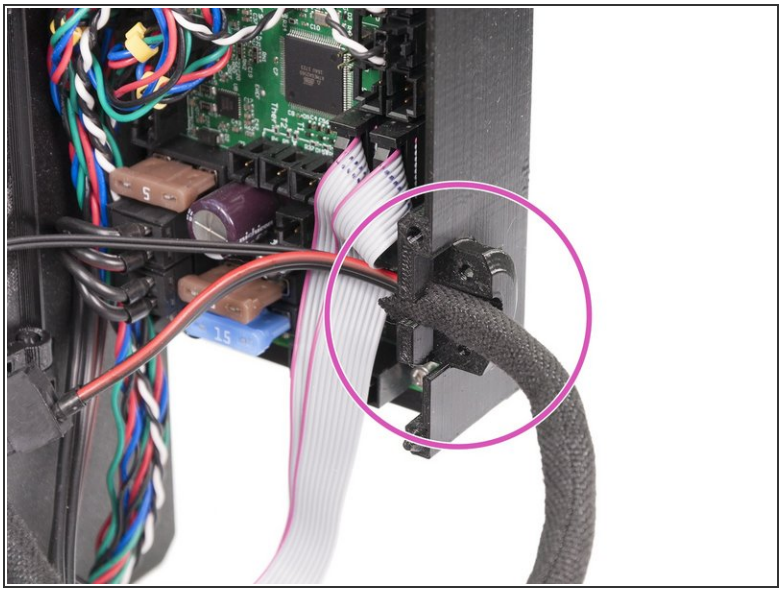




- Cable bundles are held in place by cable clips, which **HAVE DIFFERENT SIZES** of the inner cutout. Please ensure you are using the **CORRECT CLIP** for each cable bundle!
- **RAMBo-heatbed-cable-clip** is used for a smaller cable bundle, therefore **its opening is smaller**.
- **RAMBo-extruder-cable-clip** is used for a bigger (thicker) cable bundle, therefore **its opening is bigger**.

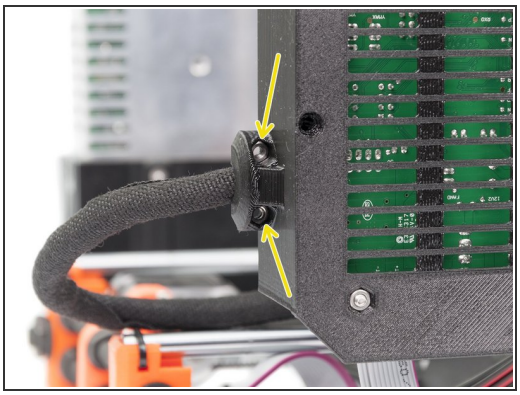
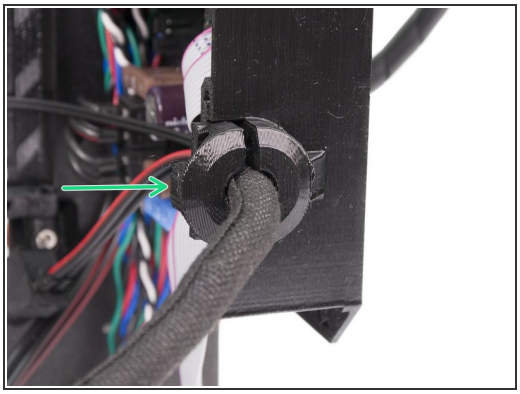
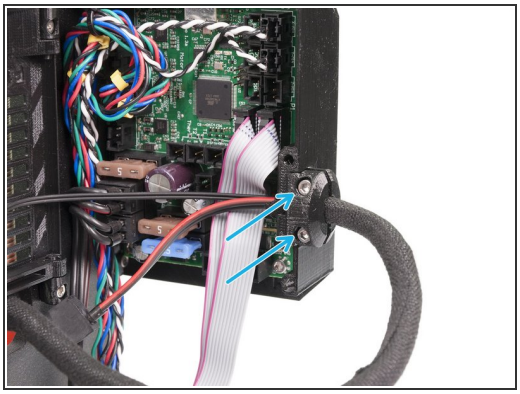
Step 14 — Connecting the heatbed cable bundle (part 1)





- For the following steps please prepare:
- Rambo-heatbed-cable-clip (1x)
- M3x10 screw (2x)
- M3n nut (2x)
- Press the cable bundle from the heatbed in the hole on RAMBo-cover-base. Make sure the textile sleeve is partly inside the cover.

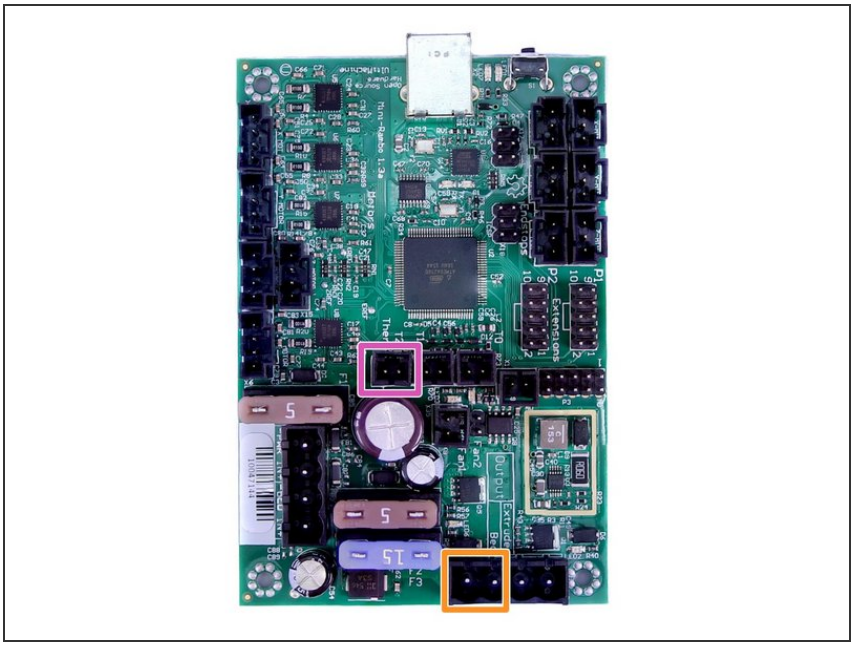
Step 15 — Connecting the heatbed cable bundle (part 2)

- Insert both M3n nuts in the traps on the RAMBo-cover-base, see the picture. Make sure the nuts are all the way in.
- Take the Rambo-heatbed-cable-clip and press it against the heatbed cable bundle.
- Using M3x10 screws fix the clip in place, tighten both screws equally.

ⓘ If you can't reach the nuts, use temporarily longer screws, from the spare bag.

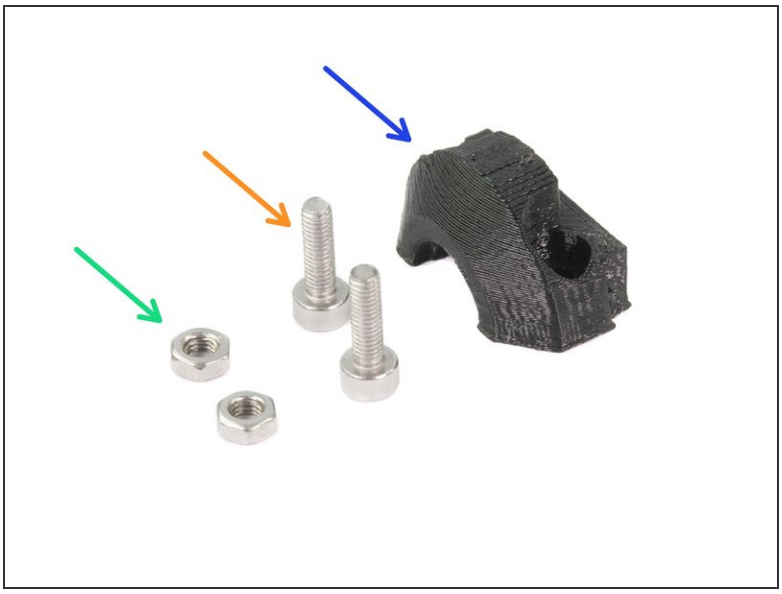
Step 16 — Connecting the heatbed cable bundle (part 3)

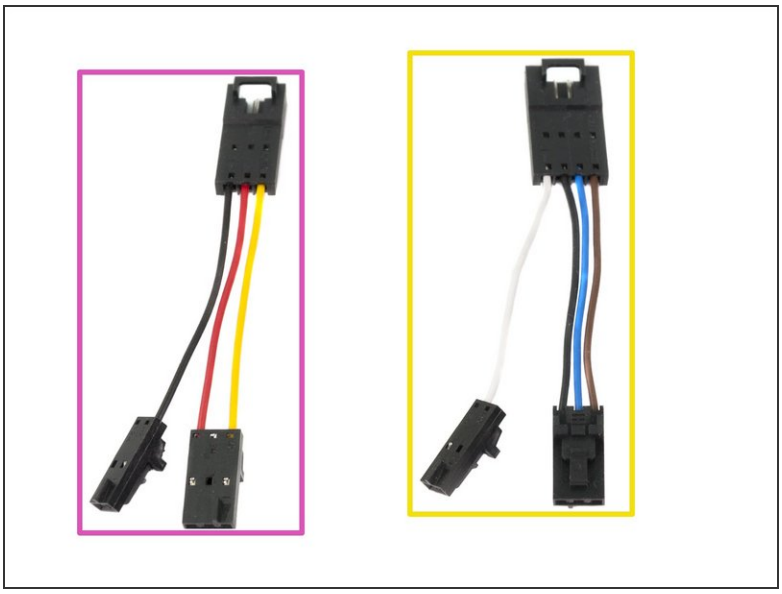


- Connect the cables from the heatbed to the RAMBo board:
- Heatbed thermistor
- Heatbed heater

ⓘ Thermistor cable can be also in white color and missing the green label. It's polarity doesn't matter, it can be plugged both ways.

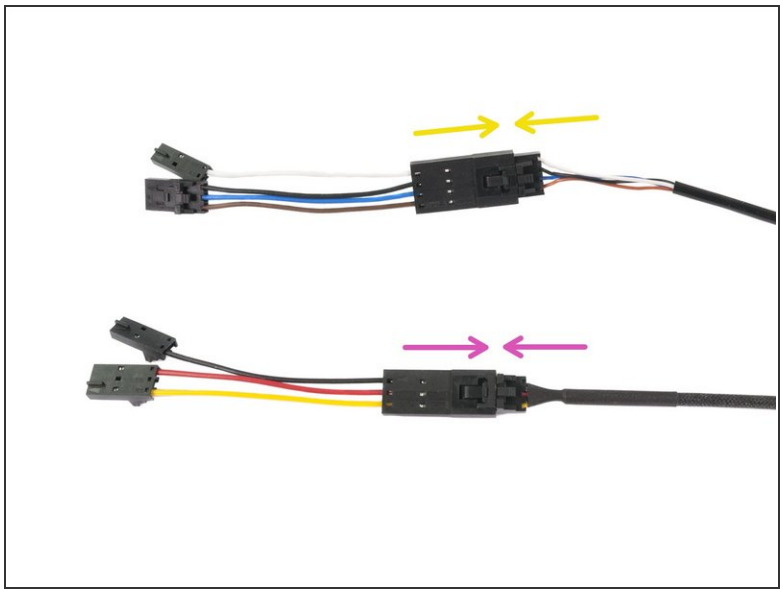
Step 17 — Connecting the extruder cable bundle (part 1)





- For the following steps please prepare:
- Rambo-extruder-cable-clip (1x)
- M3x10 screw (2x)
- M3n nut (2x)
- P.I.N.D.A. probe v-cable (1x)
- Left hotend fan v-cable (1x)

Step 18 — Connecting v-cables to the Extruder cables

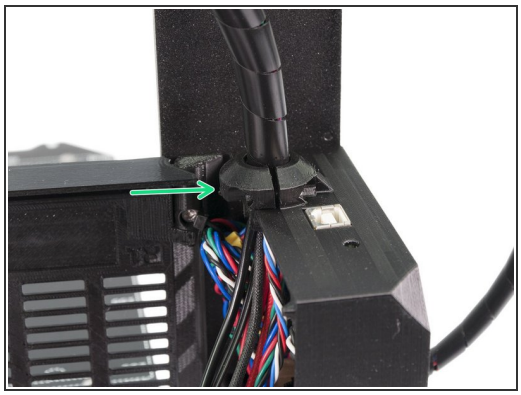
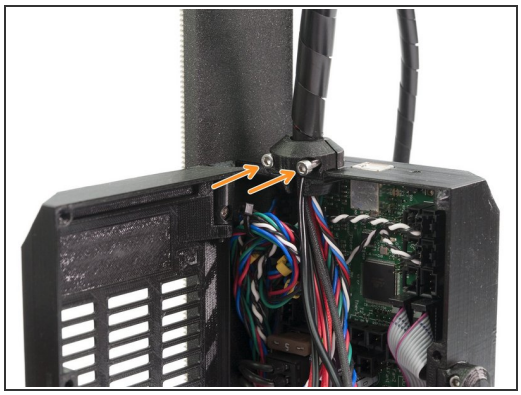


- Original Prusa i3 MK2.5 upgrade brings several improvements from the MK3, however, there are not enough pins on the on RAMBo 13a(10a) board's connectors. **Using v-cables we will split one cable into two connectors.**
- Take v-cable for the PINDA V2 probe and connect it to the PINDA probe cable from the Extruder.
- Take v-cable for the Left hotend fan and connect it to the Left hotend fan cable from the Extruder.

Quick check: PINDA probe is using 4 wires, therefore, you need to connect v-cable with 3+1 wires.

- Press the cable bundle from the Extruder in the hole on RAMBo-cover-base. Make sure the spiral wrap is partly in.
- The nylon filament stays as a part of the bundle. No need to separate it as on the older versions of the RAMBo cover.

Step 19 — Connecting the extruder cable bundle (part 2)

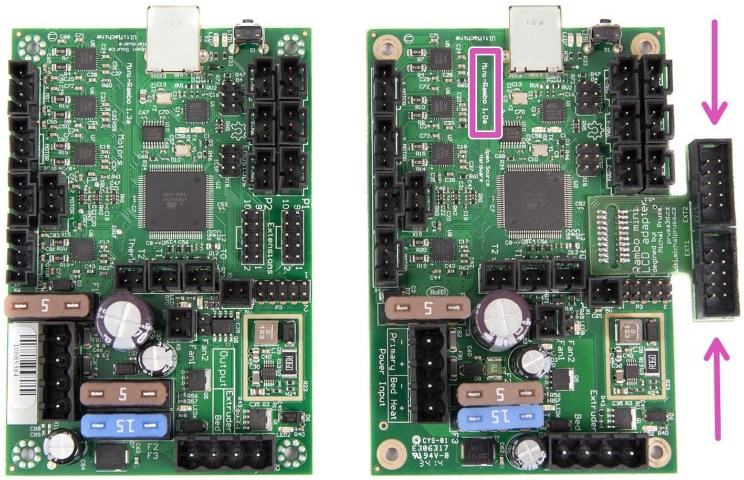




- Insert both M3n nuts in the traps on the RAMBo-cover-base, see the picture. Make sure the nuts are all the way in.
- Take the Rambo-extruder-cable-clip and press it against the extruder cable bundle.
- Using M3x10 screws fix the clip in place, tighten both screws equally.

⚠ **Read** the text and pictures in the next step **carefully**, as you need to connect the v-cables to multiple ports!

ⓘ This step was photographed with the spiral wrap, but the assembly procedure is the same for the textile sleeve.

Step 20 — Filament sensor cable (only RAMBo 1.0a)

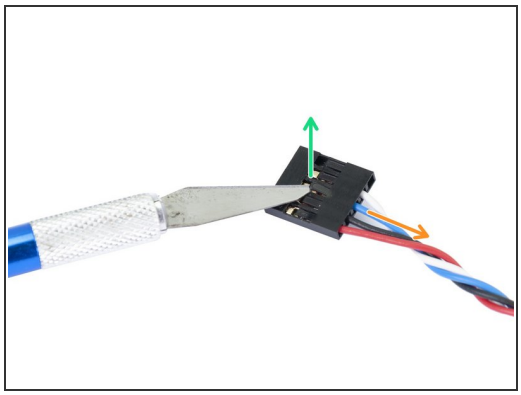
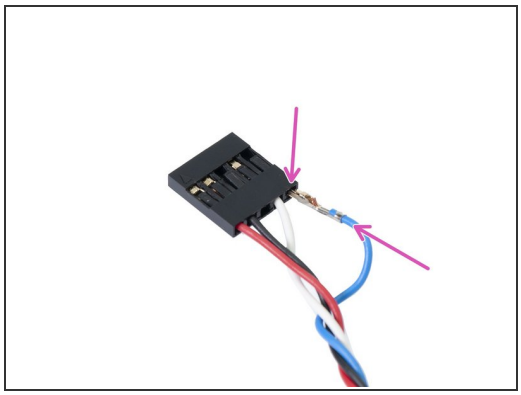
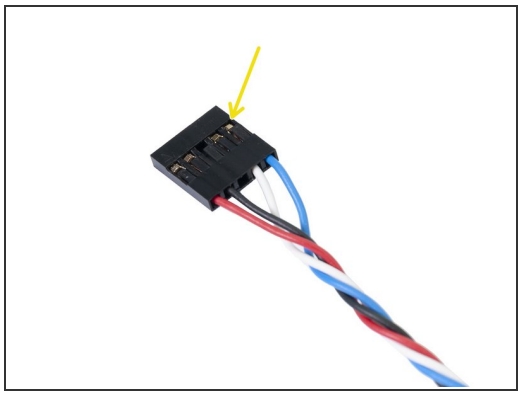


- **Following instructions are ONLY for users with Mini-RAMBo 1.0a!!!** In case you board is different, please skip this step.

⚠ Applying this procedure on a different board might lead to irreversible damage!!!

- **For the following step, please prepare:**
  - Filament sensor cable connector
  - Sharp tip (e.g. razor)

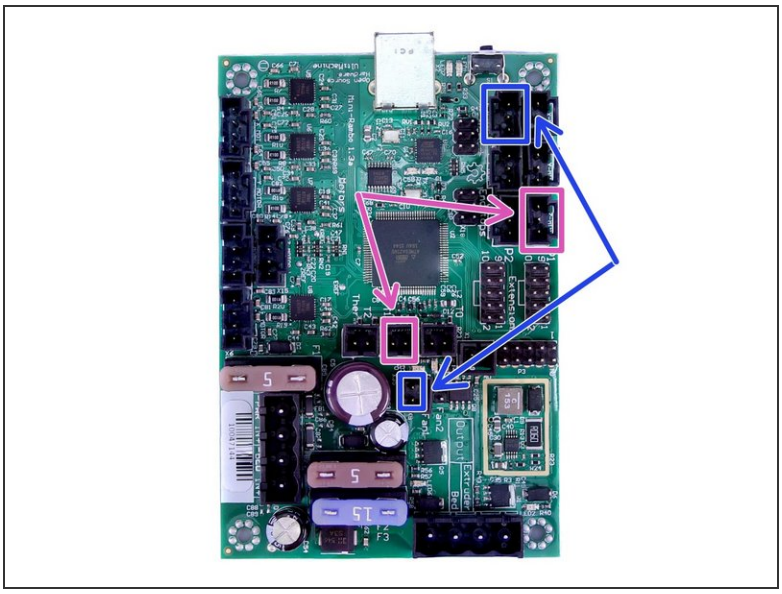
Step 21 — Filament sensor cable (only RAMBo 1.0a)

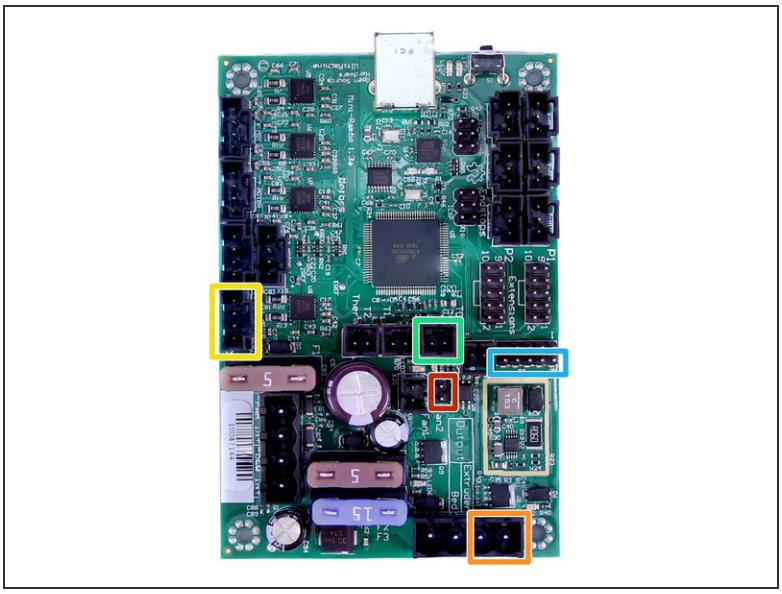




⚠ **Following instructions are ONLY for users with Mini-RAMBo 1.0a!!!** In case you board is different, please skip this step.

- Carefully insert the tip in the slot for the blue wire and lift the black plastic safety pin.
- While the safety pin is up, pull the blue wire gently out.
- Insert the blue wire in the empty slot on the right, mind the correct "rotation" of the steel pin on the wire.
- Ensure the wire is fully inserted and proceed with the assembly.

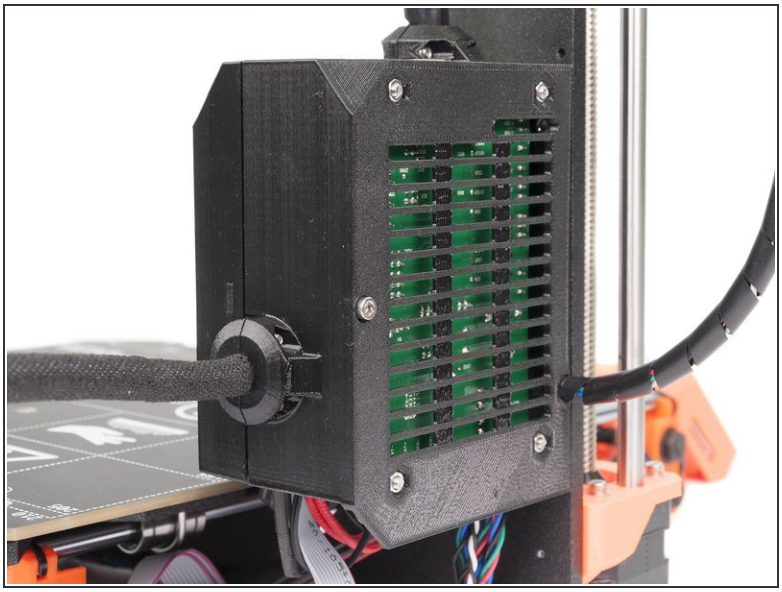
Step 22 — Connecting the extruder cable bundle (part 3)





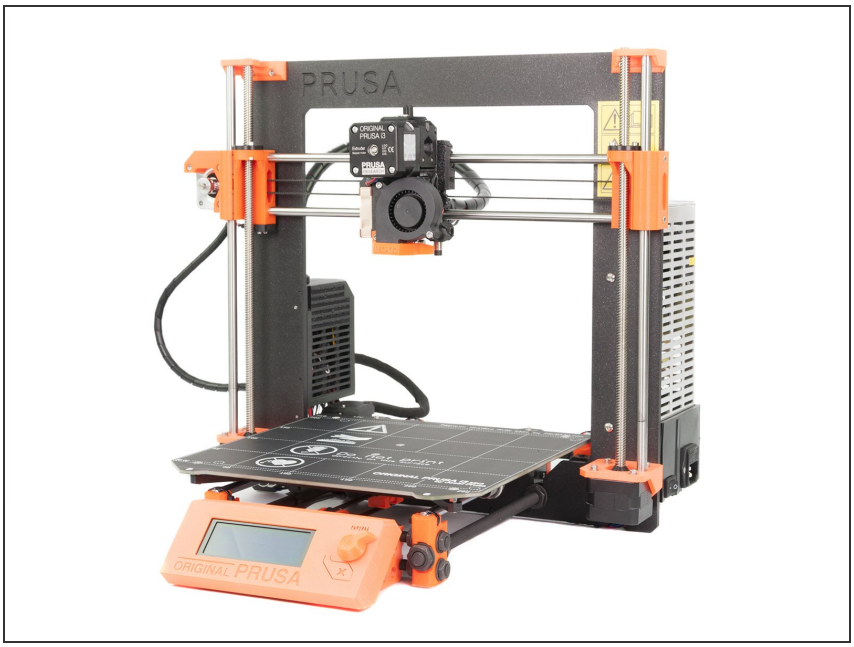
- Connect the cables from the extruder to the RAMBo board:
- P.I.N.D.A. probe (v-cable, 4 wires)
- Left hotend fan (v-cable, 3 wires)
- Extruder motor (yellow label with "E")
- Extruder heater
- Extruder thermistor (yellow/green heat shrink, orientation does not matter)
- Front print fan (red heat shrink, ensure that the red wire is closer to the extruder thermistor connector)
- Filament sensor cable (use the lower row of pins in the connector and ensure the red wire is on the right, facing the outside of the board)

Step 23 — Finalizing the RAMBo cover



- M3x40 screw (1x)
- Close the RAMBo-cover-door.
- ⚠ Make sure that no wire is pinched!
- Tighten the M3x40 screw.

Step 24 — The assembly is complete!

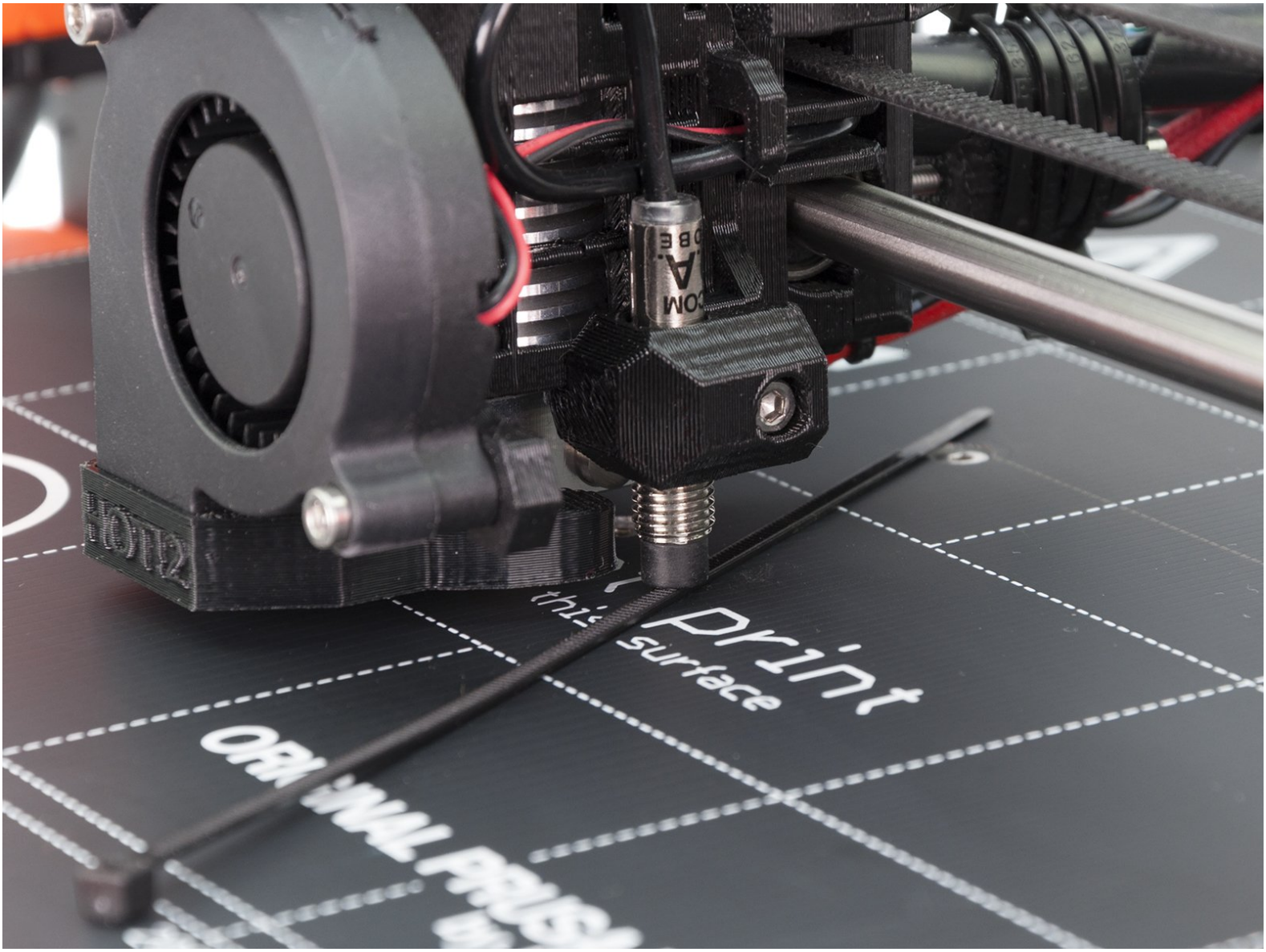


- Congratulations, you've just assembled the **Original Prusa i3 MK2.5 3D printer!**
- You're almost there... Just finish the chapter 7. Preflight check

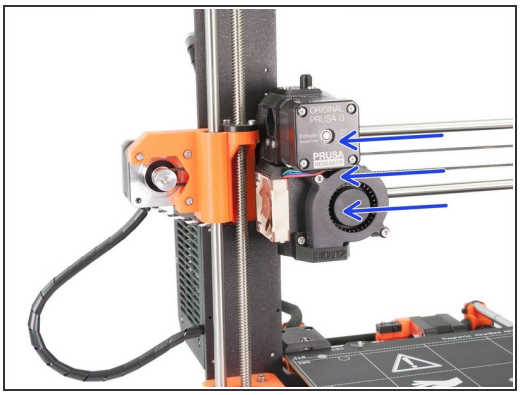
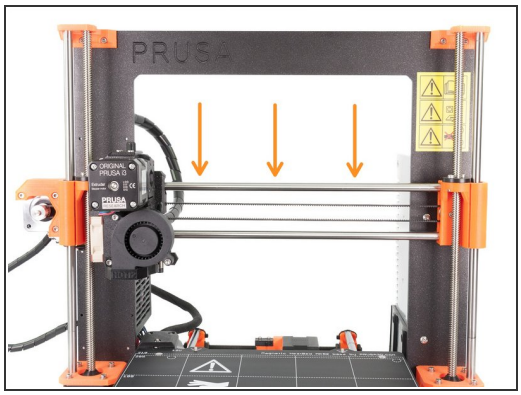
PRUSA RESEARCH by JOSEF PRUSA

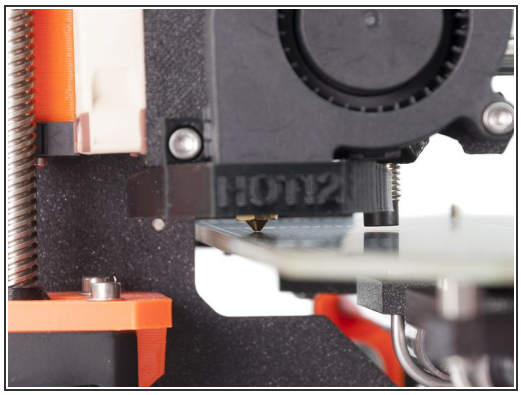
7. Preflight check

Written By: Jakub Dolezal



Step 1 — P.I.N.D.A. adjustment (part 1)



⚠ Ensure the printer is turned off and not plugged in.

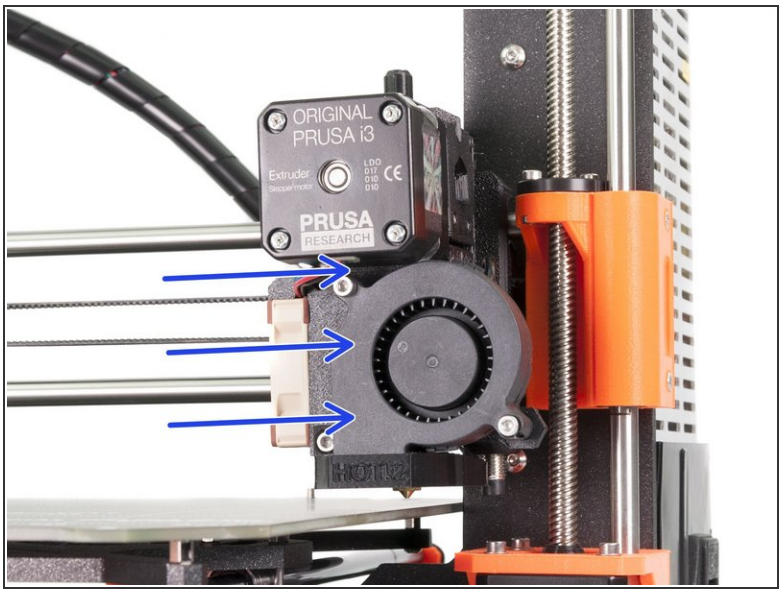
ⓘ While moving with the extruder, the X-axis motor works as a generator. You will create a small amount of electricity and the LCD might flicker. Move with the extruder reasonably slowly and in the future always use the printer's controls.

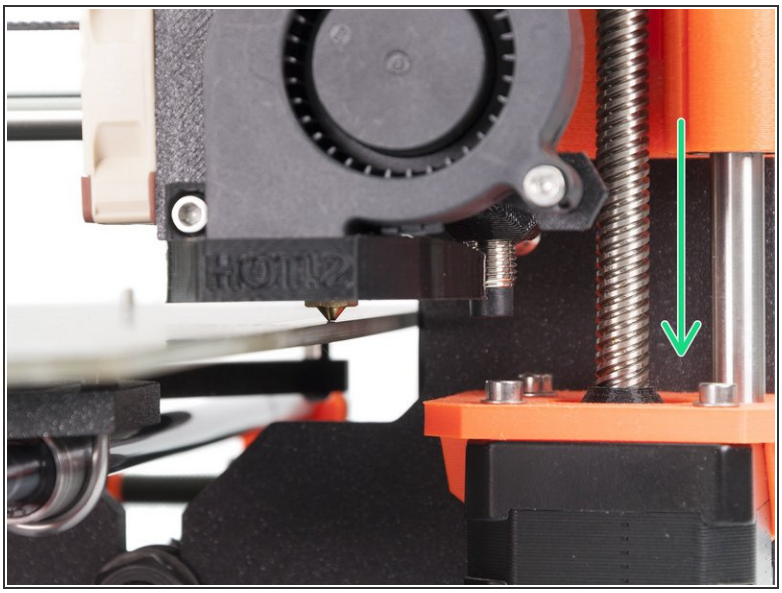
- Move the extruder manually all the way to the left.
- By rotating BOTH threaded rods at the same time on the Z-axis move the nozzle until you reach the heatbed. Try rotating both the rods equally!

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

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

Step 2 — P.I.N.D.A. adjustment (part 2)



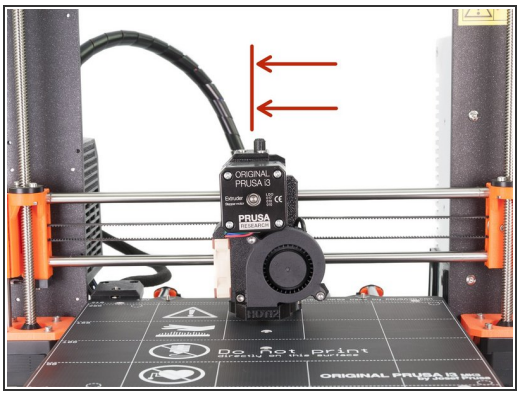
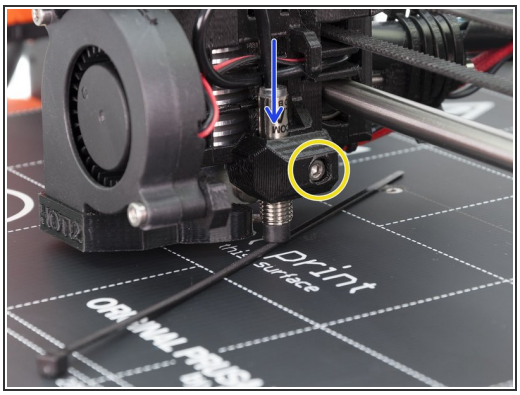
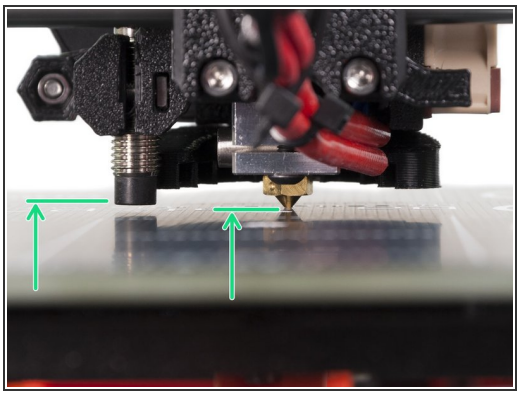


- Move the extruder carefully all the way to the right.

⚠ 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.

Step 3 — P.IN.D.A. adjustment (part 3)

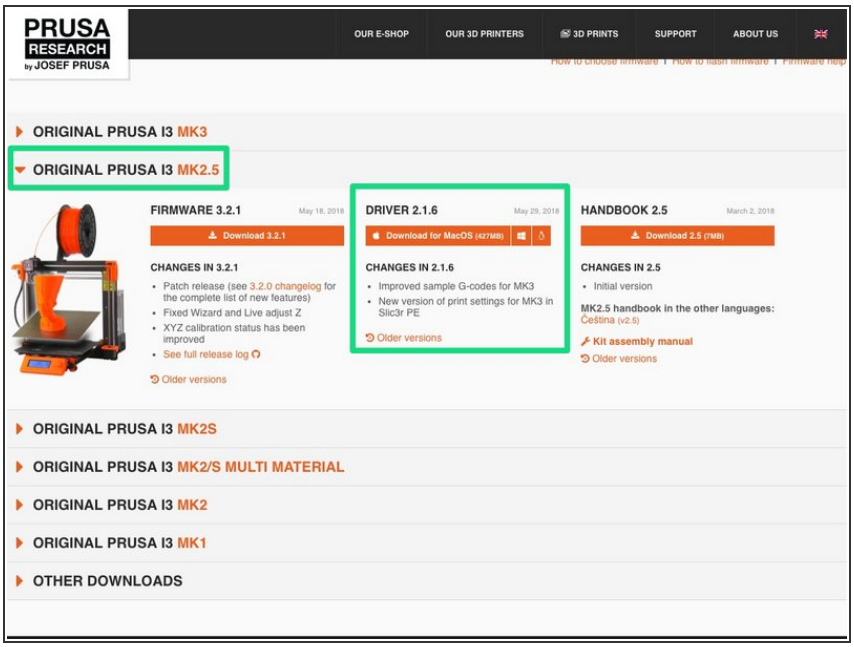




- Move the extruder to the centre of the X-axis.
- Take a zip tie from the package and place it under the P.I.N.D.A. sensor. Use the middle part of the zip tie, not the tip.
- Release the screw holding the P.I.N.D.A. sensor and gently press it against the zip tie.
- Tighten the screw on the P.I.N.D.A. holder again. **Proceed carefully as you might break the holder!**

⚠ !!! **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 !!!

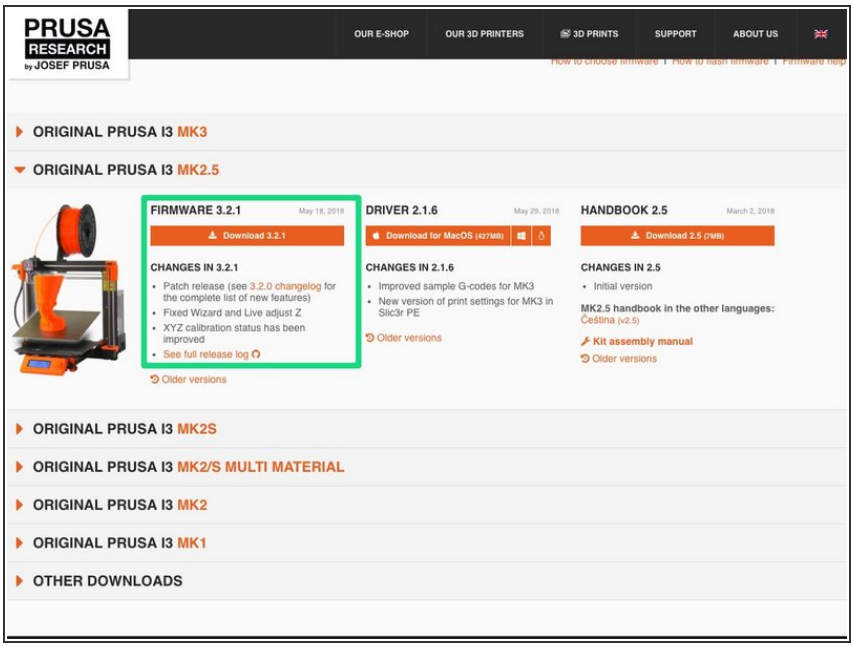
- A correct height of the P.I.N.D.A. sensor compared to the nozzle should be similar to the last picture.

Step 4 — Update drivers and software



- Go to www.prusa3d.com/drivers and download latest PRUSA3D drivers for your printer.
- Install the drivers.

Step 5 — Flashing MK2.5 firmware



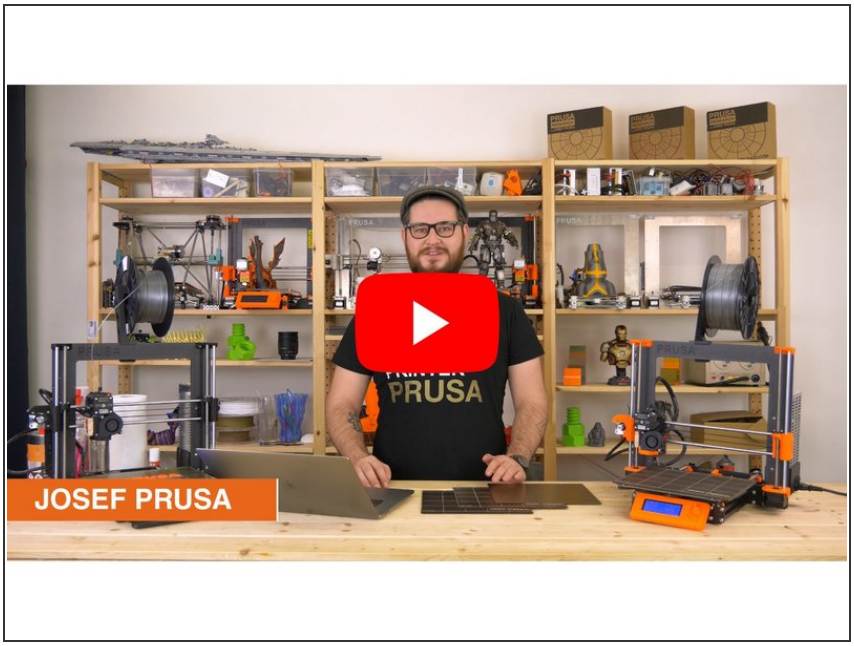
⚠ **YOU MUST UPDATE YOUR FIRMWARE** to MK2.5 version, otherwise your printer won't work !!!

- Download the zip file and extract it, the firmware file (*.hex file) is inside.
- If you have a **SuperPINDA sensor installed** on your printer. First, make sure you are running **firmware 3.9.3** or newer.

  ⚠ **MK2.5 and MK2.5S are unable to recognize the SuperPINDA automatically**, after you flash the latest firmware toggle the switch in the settings menu (LCD Menu -> Settings -> HW settings -> SuperPINDA -> ON).

ⓘ Updating firmware for the first time? Here is a step by step guide: http://manual.prusa3d.com/Guide/Upgradin...

Step 6 — Check out our New User Guide



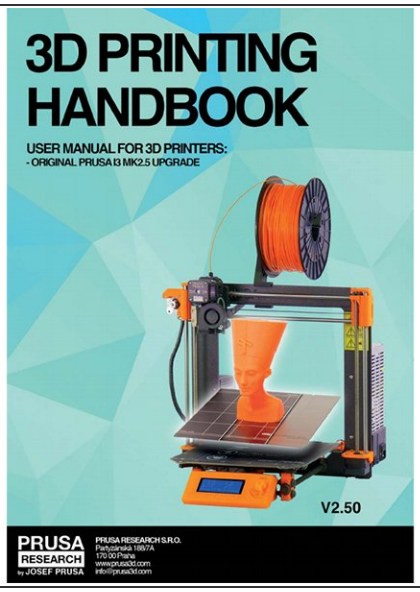
- Please watch our New User Guide before printing. http://www.prusa3d.com/buildvideoMK3

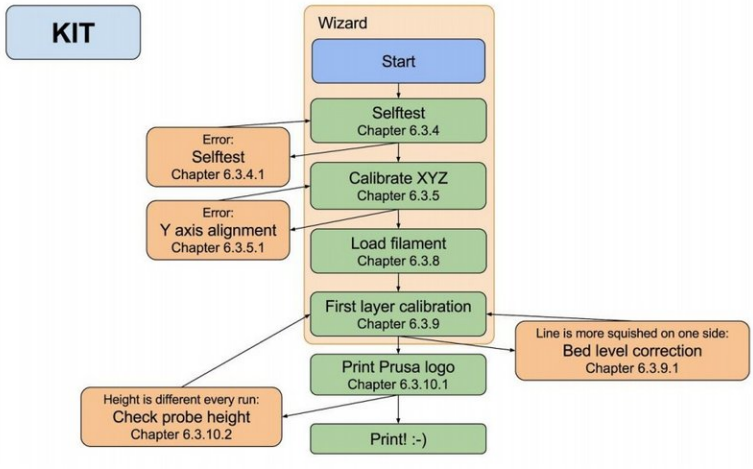
This video is describing features of Original Prusa i3 MK3, but your Original Prusa i3 MK2.5 shares some of them as well.

Step 7 — Common mistakes during the assembly

- Based on the examination of printers received back from the customers, we compiled a list of the most common problems causing poor print quality. Check them out and improve your 3D prints today!
- **Check the video here:** https://youtu.be/Lsa-PXAXdKY
- For other tips and tutorials go to: https://help.prusa3d.com/

Step 8 — Quick guide for your first prints



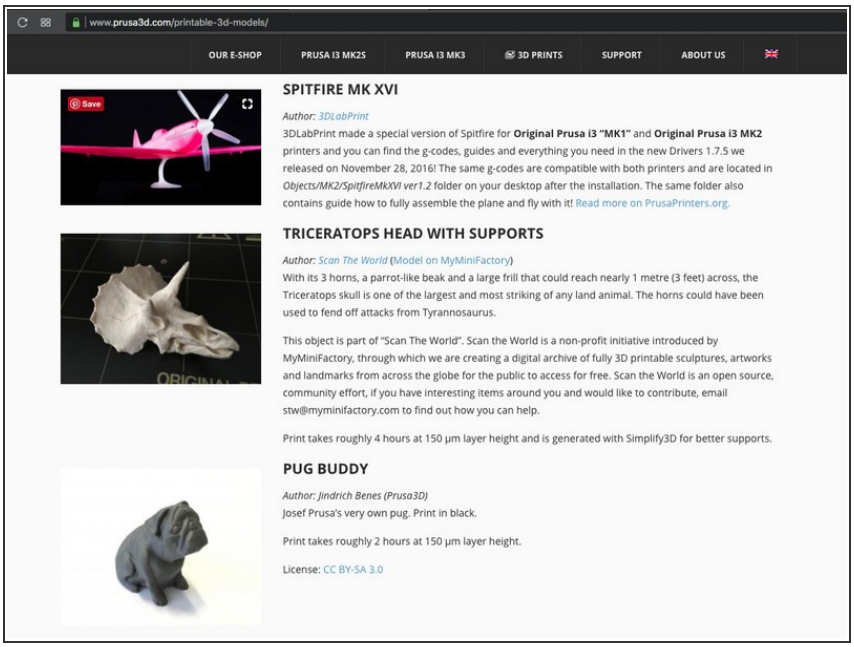


See our free **3D Printing Handbook** - https://www.prusa3d.com/3dhandbookMK25

- Read the chapters *3.2 Disclaimer* and *3.3 Safety instructions*
- Read the chapter *6.2 Setup before printing*.
- Download and install the drivers - chapter *9 Printer drivers*. Don't forget we have ready to print settings for Slic3r PE.

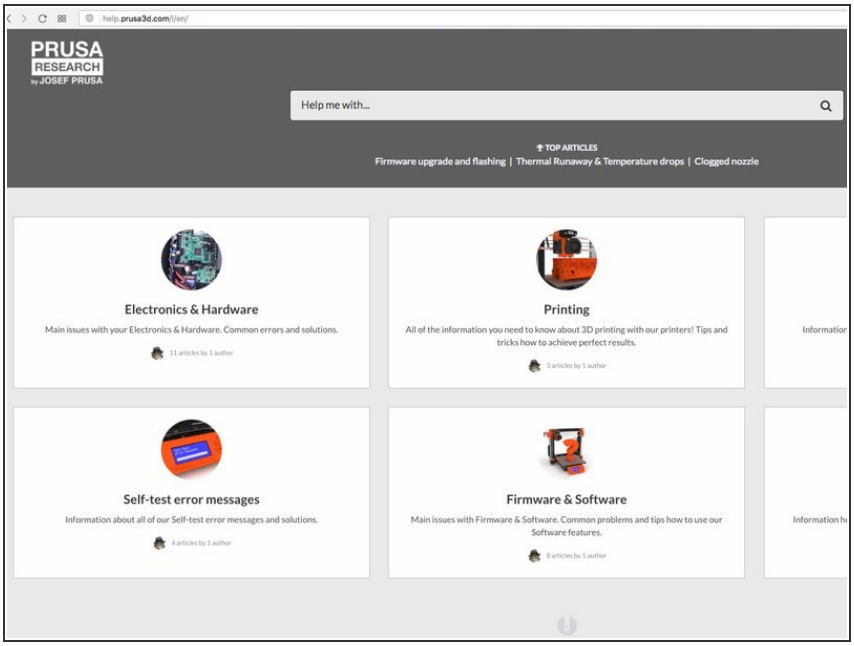
Calibrate the printer by following the chapter *6.2.1 Calibration flow and wizard*. Please follow the steps exactly, otherwise you can permanently damage the print surface!

Step 9 — Printable 3D models



- Read the chapter *7 Printing* of 3D Printing Handbook.
- **Congratulations! You should be ready to print by now ;-)**
- You can start by printing some of our test objects bundled on the included SD card - you can check them out here prusa3d.com/printable-3d-models

Step 10 — Prusa knowledge base

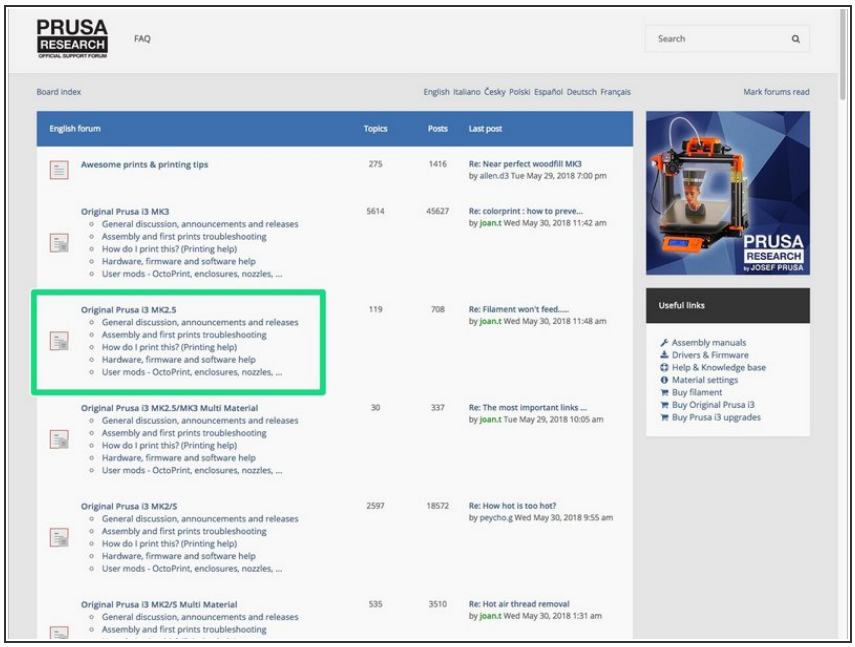


- If you encounter any problems at all, don't forget you can always check out our knowledge base at

This document was generated on 2021-02-08 03:53:34 AM (MST).

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

Step 11 — Prusa3D forum

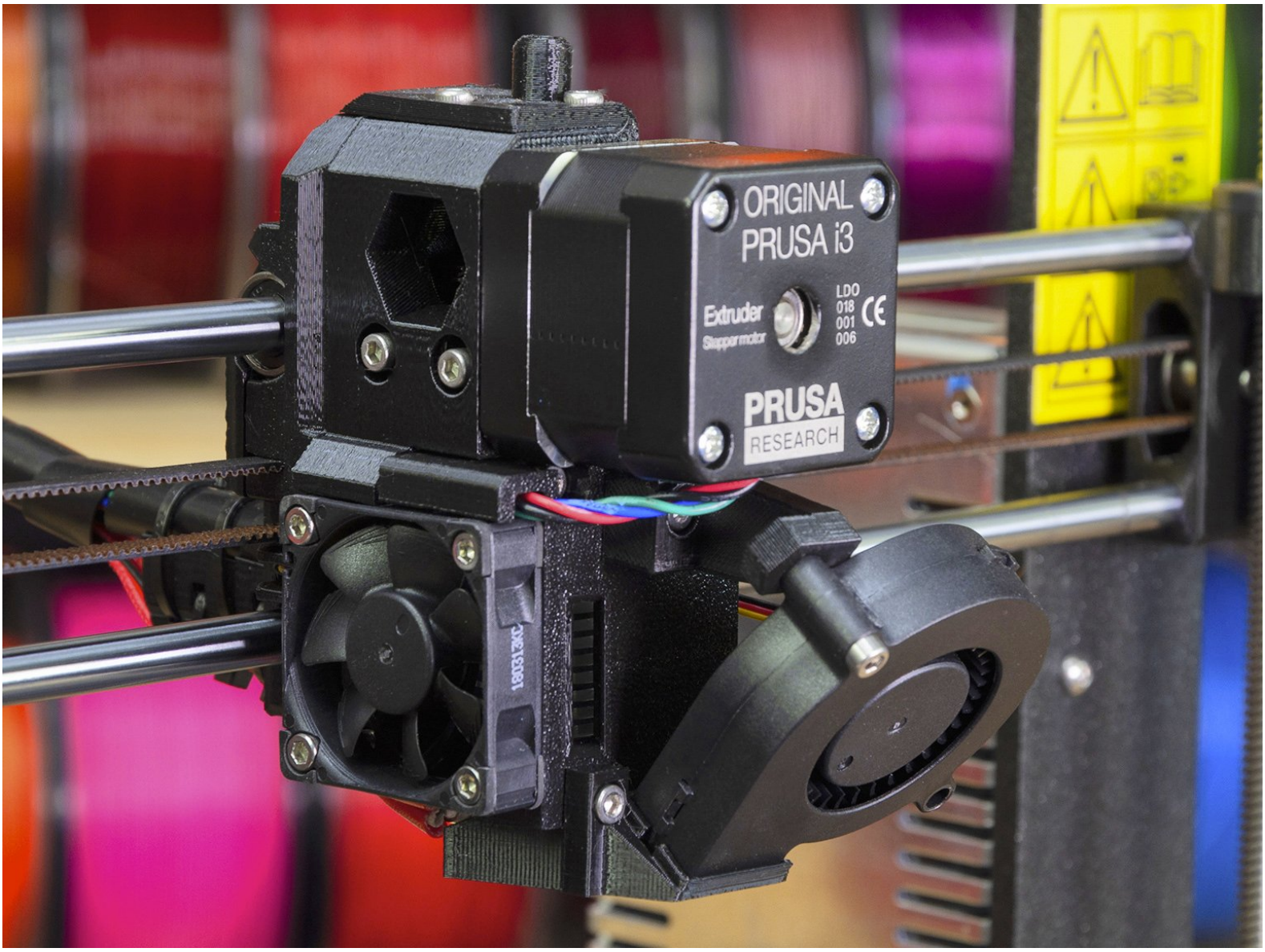


- If you need help with the build, check out our forum with great community :-)
- Account is shared with http://shop.prusa3d.com/
- Support forum is available at http://forum.prusa3d.com

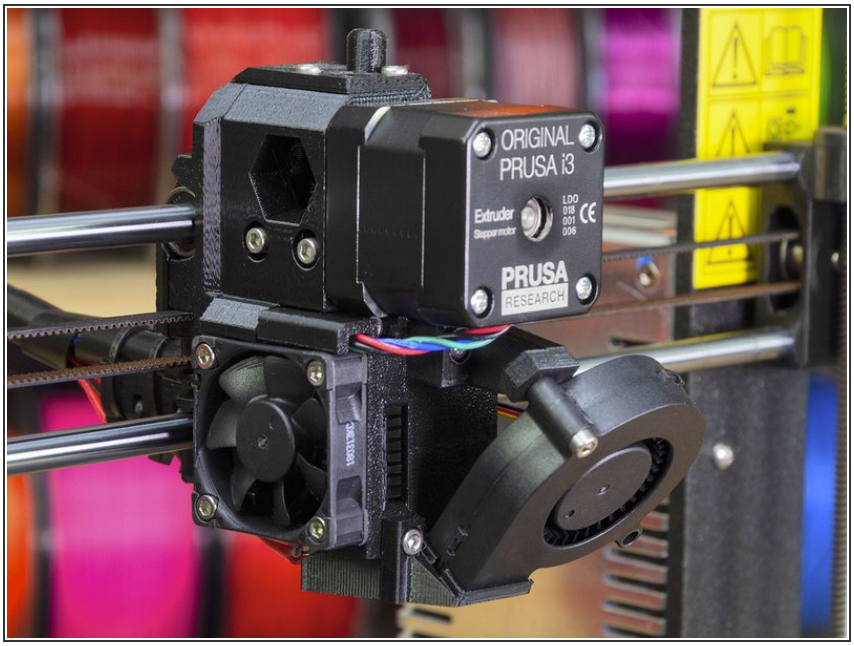
PRUSA RESEARCH by JOSEF PRUSA

Upgrading extruder B6/R2 to R3 on MK2.5 (self-printed parts)

Written By: Jakub Dolezal



Step 1 — Introduction



⚠ **This guide will take you through the entire process of how to:**

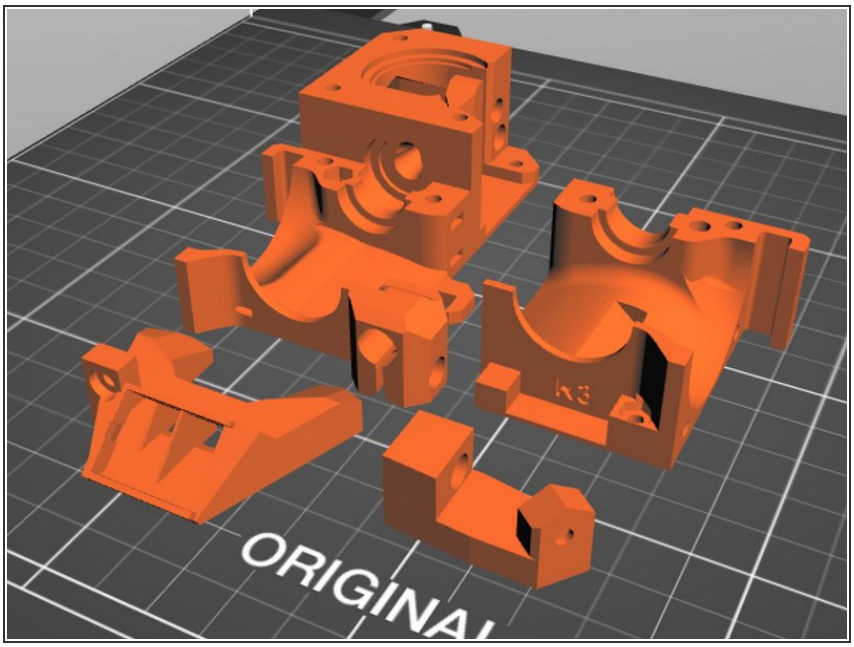
- replace the printed parts R2 (B6) for R3 (B7)
- replace the PTFE tube (optional)

- 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.

⚠ **You will need most of the screws and all nuts from the disassembled parts.** It is recommended to have some spares as it might be hard to retrieve all of them from the printed parts. You can use the spare bag from your printer, if you have it.

- **M3x10 screw (1x) - this is a must!** This is an extra screw, needed for the assembly.
- M3nS nut (4x) - optional, you might be able to retrieve them
- M3n (3x) - optional, you might be able to retrieve them

Step 2 — Upgraded printed parts R3



⚠ This guide is **valid only for the self-printed parts!!!** In case you've received the parts from Prusa Research use: Upgrading extruder B6 to B7 on MK3 (Prusa printed parts)

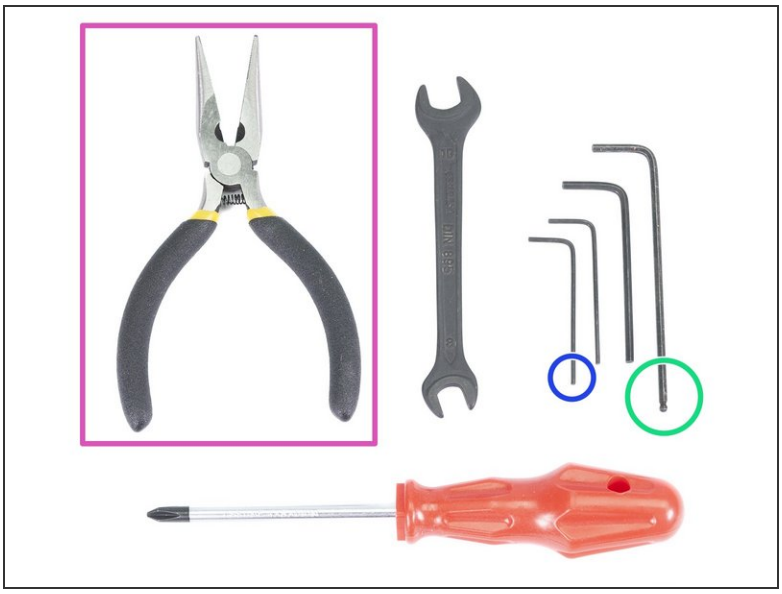
⚠ **Before we start disassembly, you need to print all the new parts:**

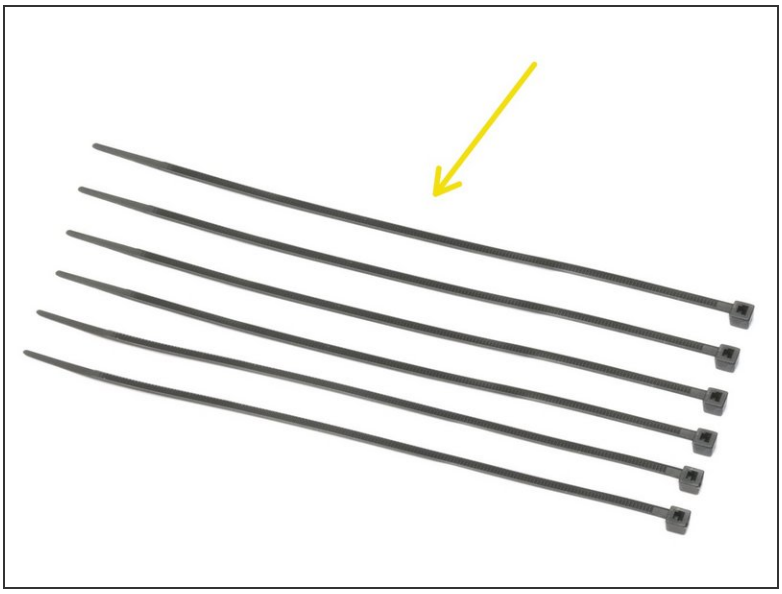
- Extruder-body (PETG, ABS, ...)
- Extruder-cover (PETG, ABS, ...)
- Nozzle-fan-45deg-support (PETG, ABS, ...)
- Nozzle-fan-45deg (ABS)

- Each part must be printed from the listed material(s). **Extruder body and cover must be black**. G-codes and STLs are available on our website: prusa3d.com/prusa-i3-printable-parts

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

Step 3 — Tools necessary for this guide

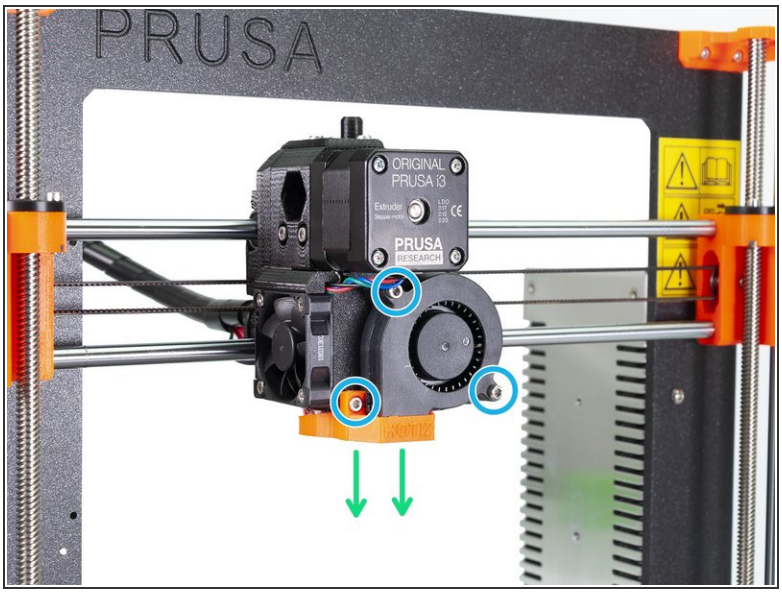




- **Please prepare tools for this chapter:**
  - 2.5mm Allen key for M3 screws
  - 1.5 or 2mm Allen key for nut alignment
  - Needle-nose pliers for zip ties
  - Zip tie 140-160 mm (6x)

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 most of them later.

Step 4 — Nozzle-fan and print fan removal

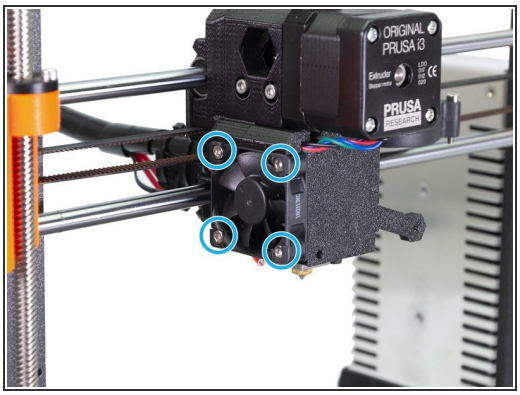


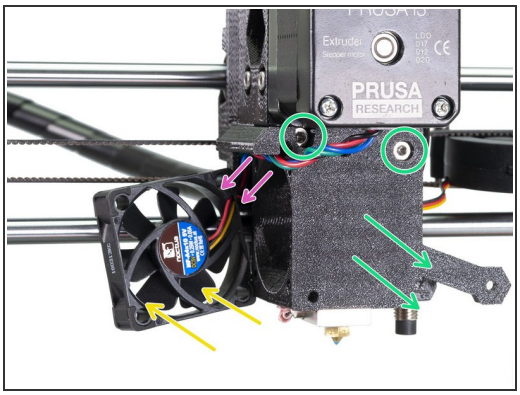
⚠ Ensure the **filament is not loaded** in the hotend. **Remove it** before proceeding further.

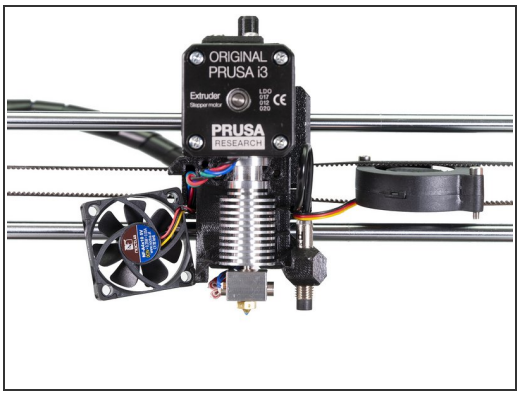
- Release the marked M3 screws.
- Remove the nozzle-fan printed part completely.
- Carefully insert the Front print fan in the X-axis belt.

ⓘ The nozzle-fan will be replaced with a new one.

Step 5 — Left hotend fan removal



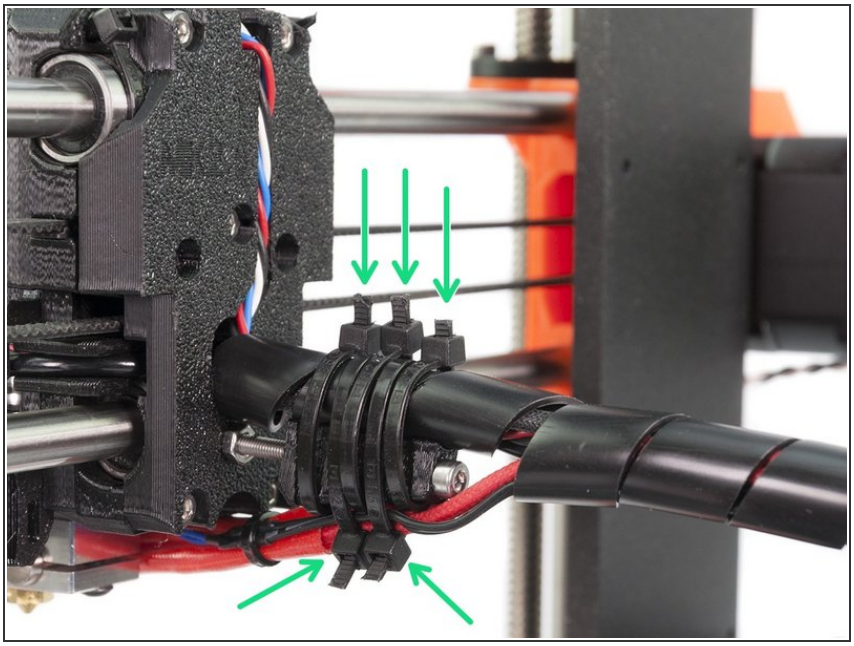




- Release and remove all four M3x18 screws on the Left hotend fan.
- Move the fan carefully away from the extruder body as far as the cable allows.
- Move the extruder motor cable from the channel.
- Release and remove both M3x25 screws, then remove carefully the extruder-cover part.
- Your extruder and fan arrangement should look like in the last picture.

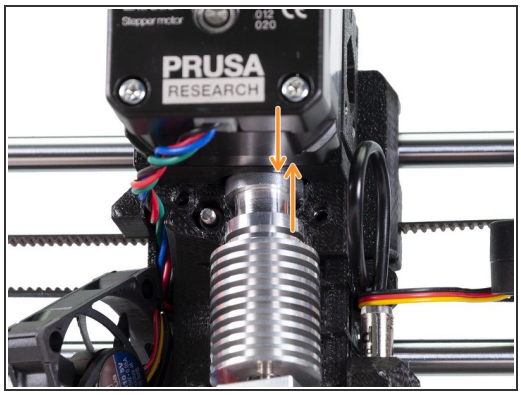
ⓘ The extruder-cover will be replaced with a new one.

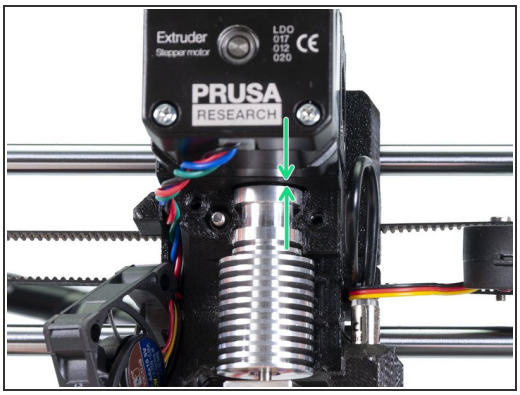
Step 6 — Zip ties removal

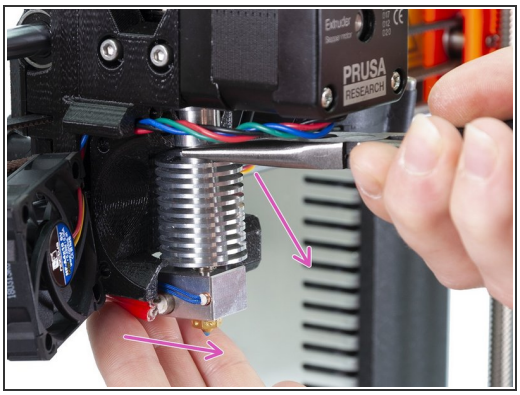


- Turn the printer around and cut **all five zip ties** on the extruder cable bundle. Be very careful while cutting!

Step 7 — 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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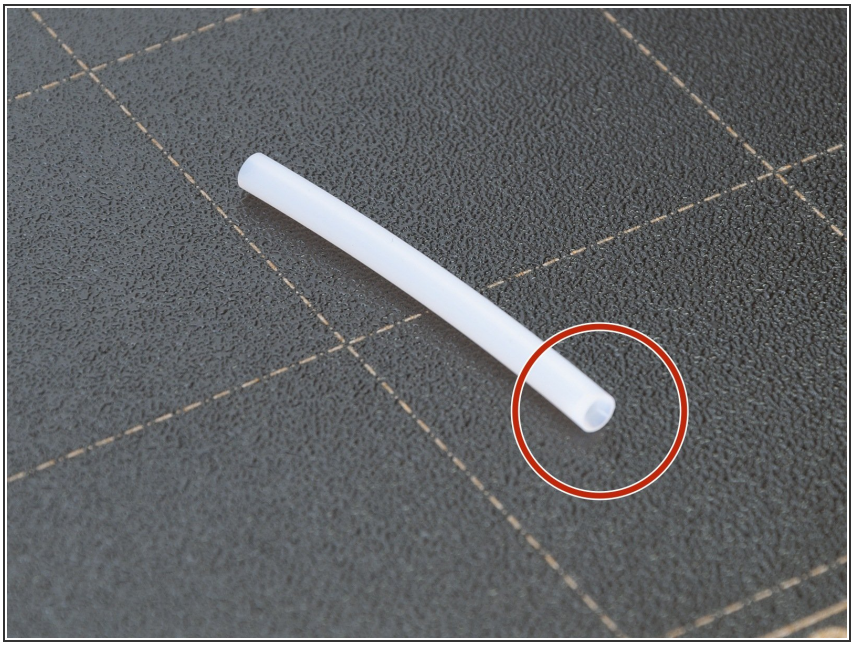
Step 8 — Removing the old PTFE tube (optional)

⚠ **This step is optional**, however if you have a spare PTFE tube it might be a good time to check your current tube for any defects and if needed replace it.

- In case your PTFE tube is fine or you don't have a spare, please skip to Step 11
- Press the black plastic collet.
- Remove the PTFE tube from the hotend.

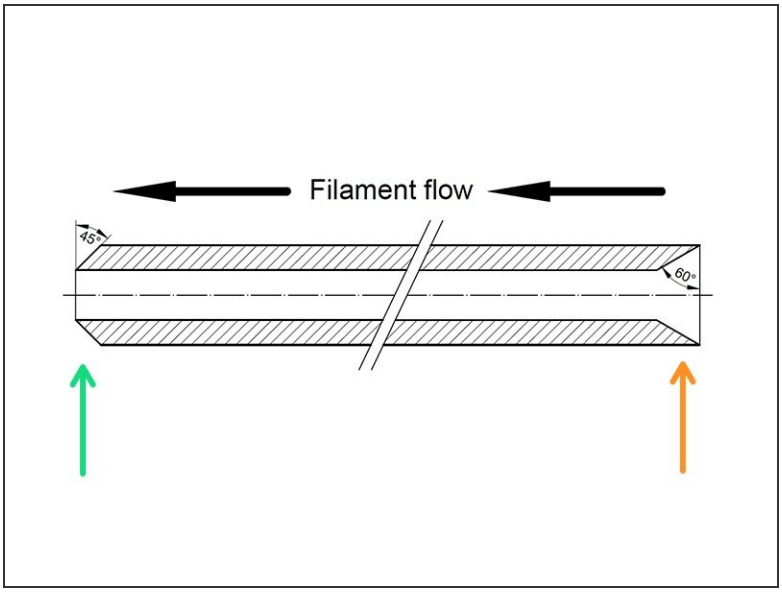
⚠ **Throw this old tube immediately to the nearest trash bin** to avoid installing it back by accident ;)

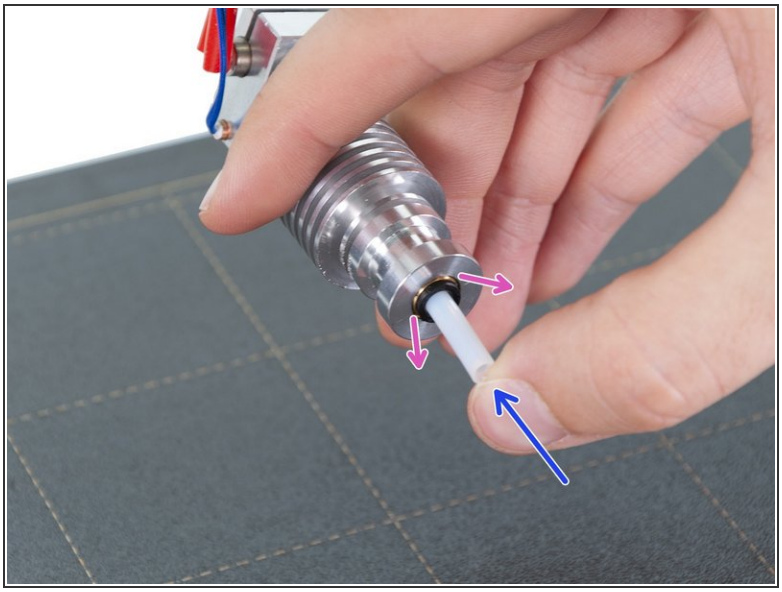
Step 9 — Preparing the necessary parts (optional)



- **For the following step, please prepare:**
- PTFE tube

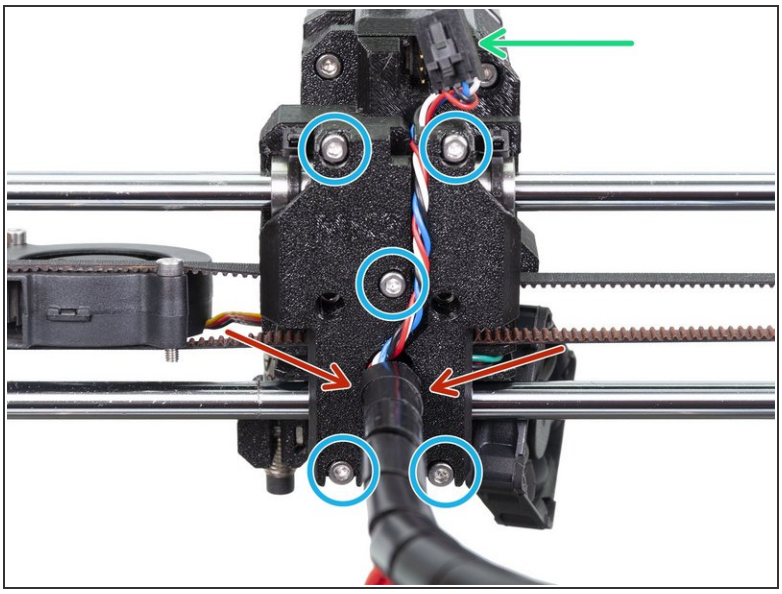
Step 10 — Assembling the new PTFE tube (optional)

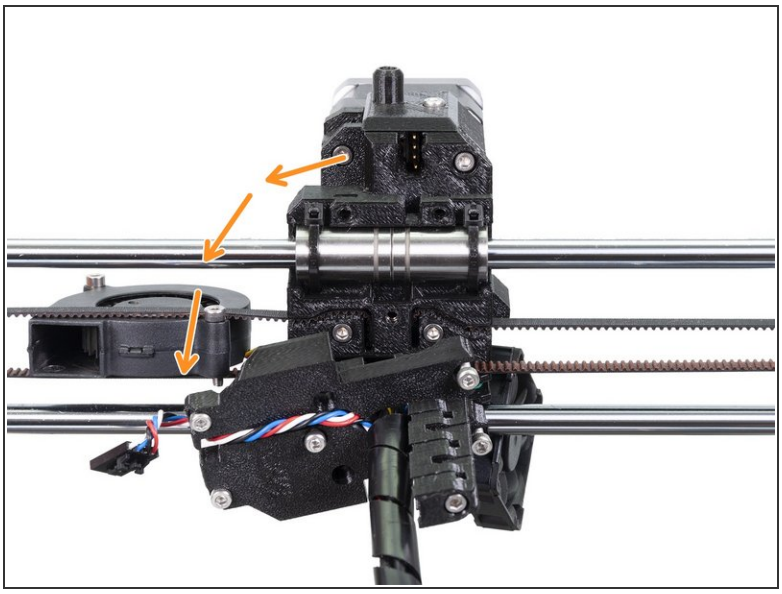




- Now it is time to insert the new PTFE tube. Note there are two different ends.
- One end of the tube has **"rounded" outer edge**. This end must be **inside the hotend**.
- Look at the other end, where the tube is drilled inside, shape of the **edge is "conical"**. This is the side, where filament 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.

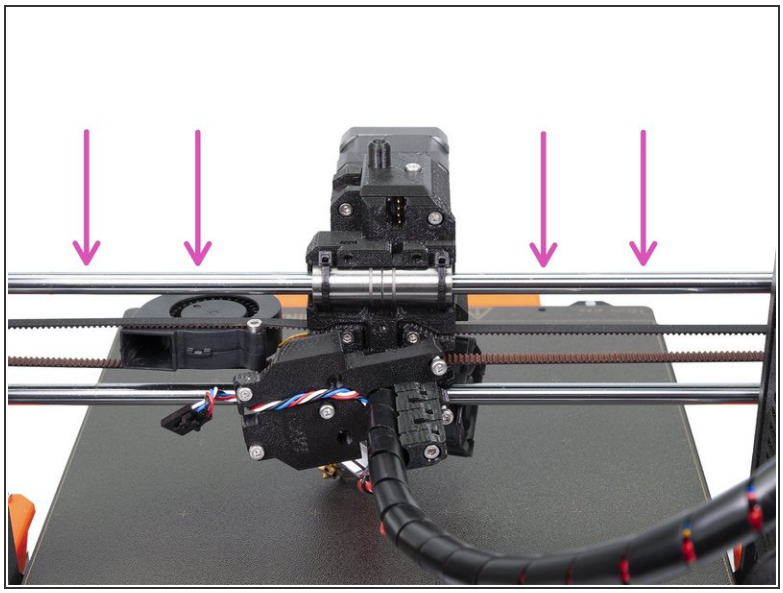
Step 11 — Releasing the x-carriage-back

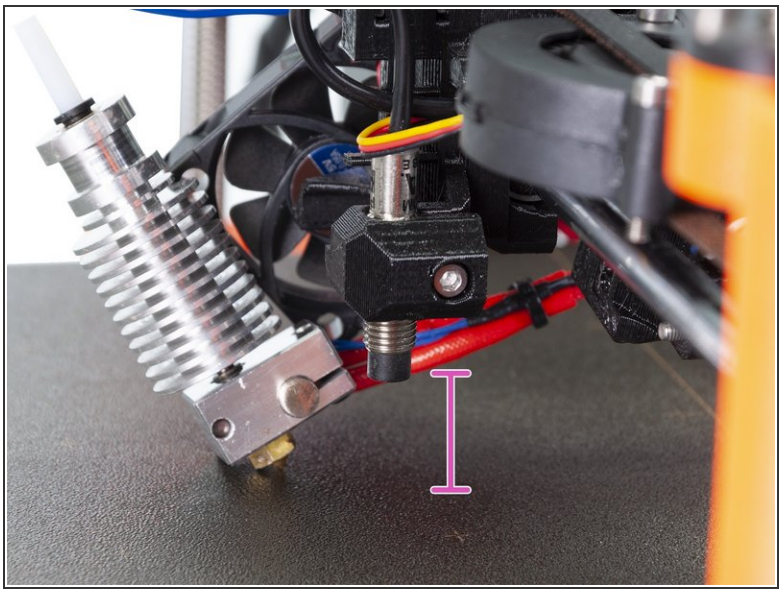




- Carefully press the safety pin and unplug the filament sensor cable connector.
- **Release all five** M3x10 screws, you can leave them in the printed part.
- Make sure there are no zip ties left! Remove them before proceeding.
- Carefully rotate the x-carriage-back printed part to the left. Make sure you are not twisting the cables.

Step 12 — Moving the X-axis

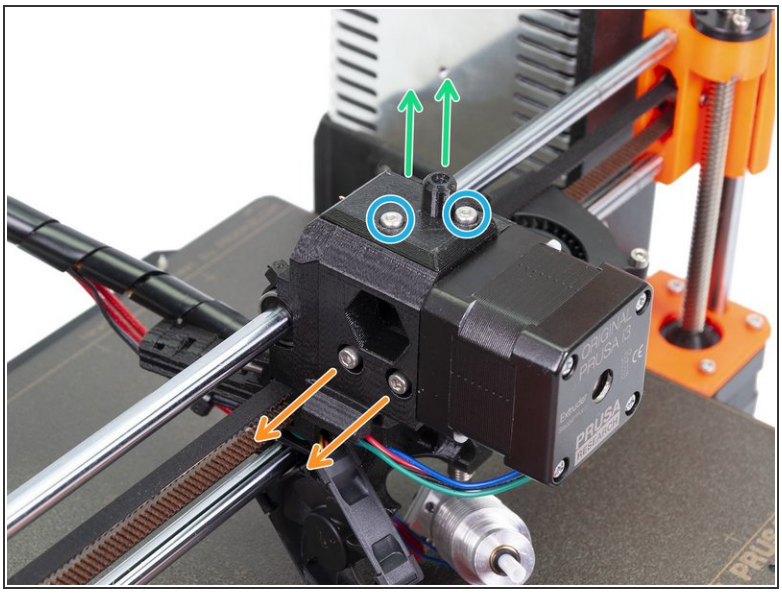


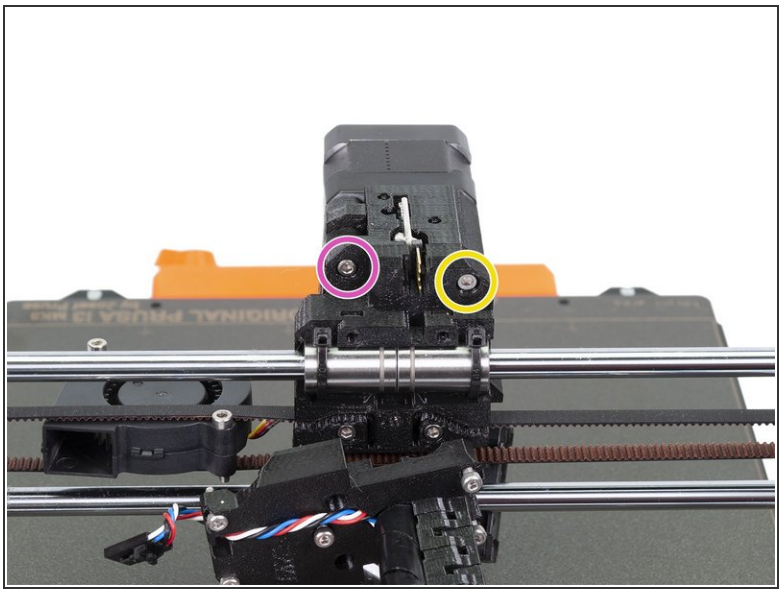


- Using both hands lower slowly the X-axis down. Stop when the P.I.N.D.A. is around 2-3 cm above the surface.

⚠ **Proceed carefully** as you might scratch the surface.

Step 13 — 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.

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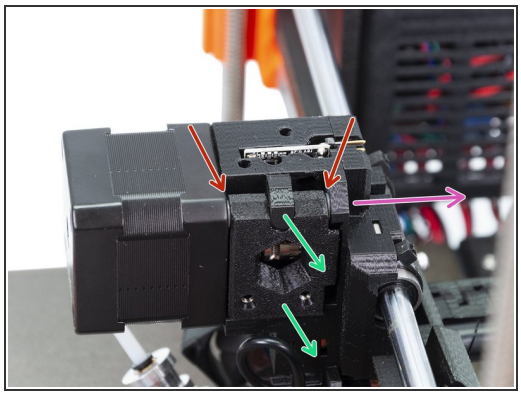
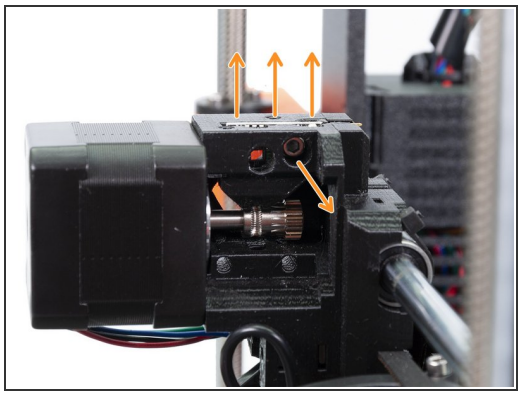
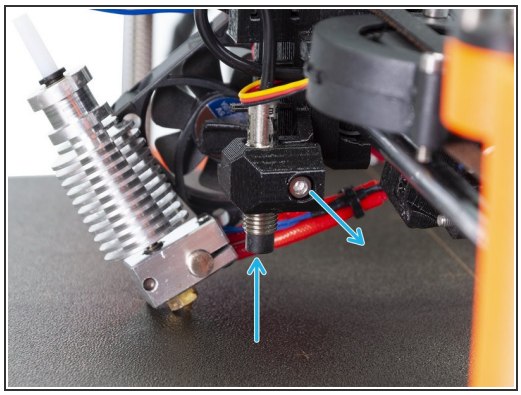
Step 14 — Removing the idler and P.I.N.D.A. sensor

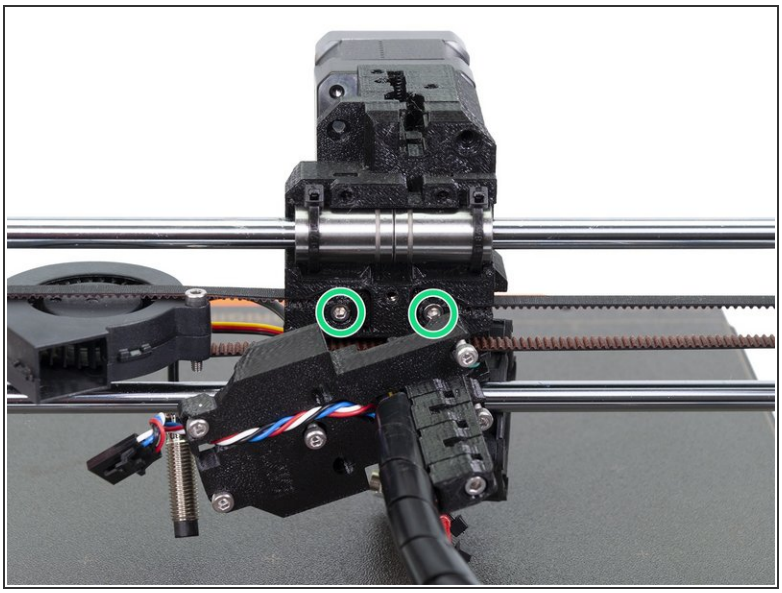




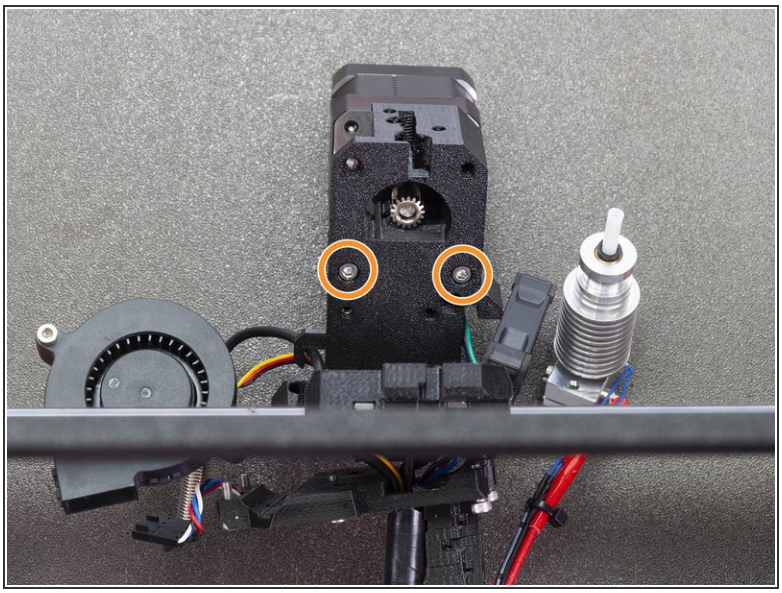
⚠ In this step, we will remove the idler part. Before doing so, **make sure you catch two translucent washers**, which are on both sides!

- 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.

Step 15 — Removing the extruder motor



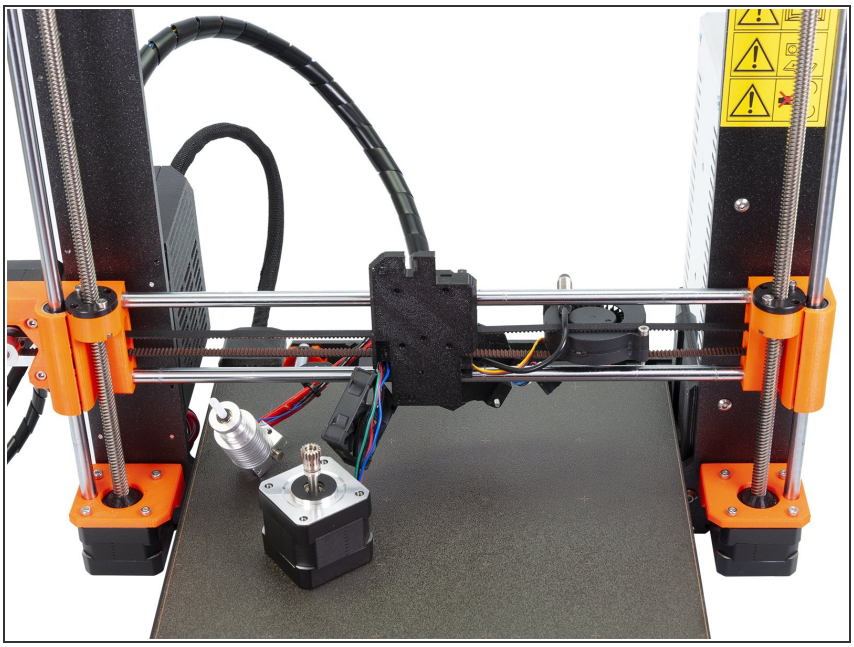


⚠ In this step, the extruder body will fall apart, **make sure you hold the motor in the front!**

- 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.

Step 16 — Extruder surgery is finished!

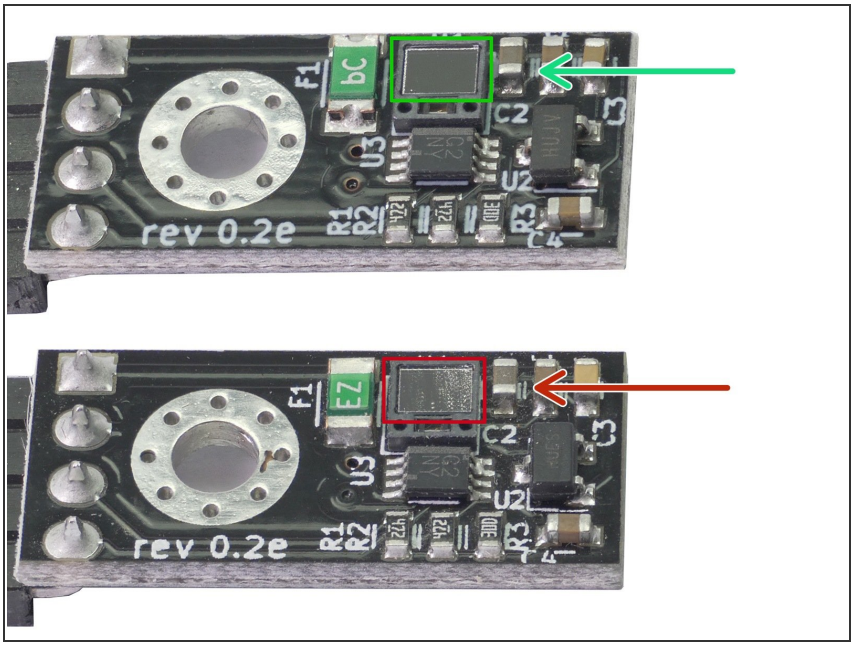


- The final check of the surgery!
- Majority of the extruder's printed parts should be removed. The only remaining parts are X-carriage and X-carriage-back.

⚠ 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.

Step 17 — Filament sensor cleanup



- Let's check the filament sensor. See the picture comparing 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.

How to clean it: use a Microfiber cloth and gently wipe the sensor in one direction only. To remove the

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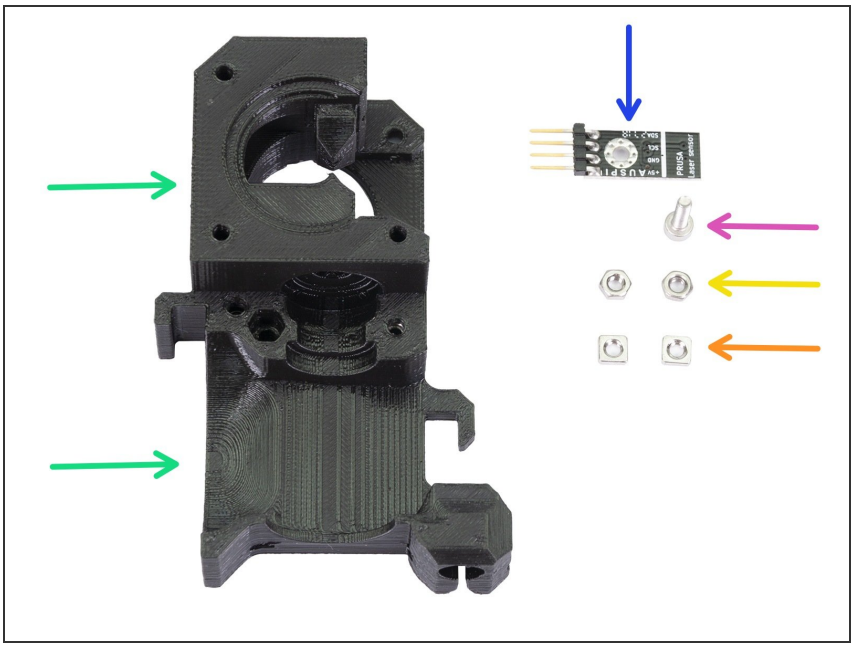
grease, spray a bit of IPA on the cloth, not directly on the sensor!

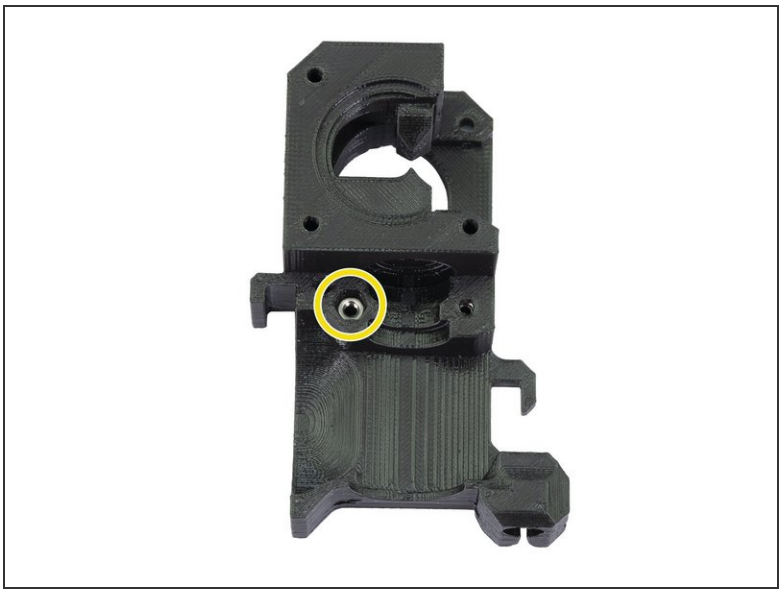
Step 18 — Assembling filament sensor (part 1)

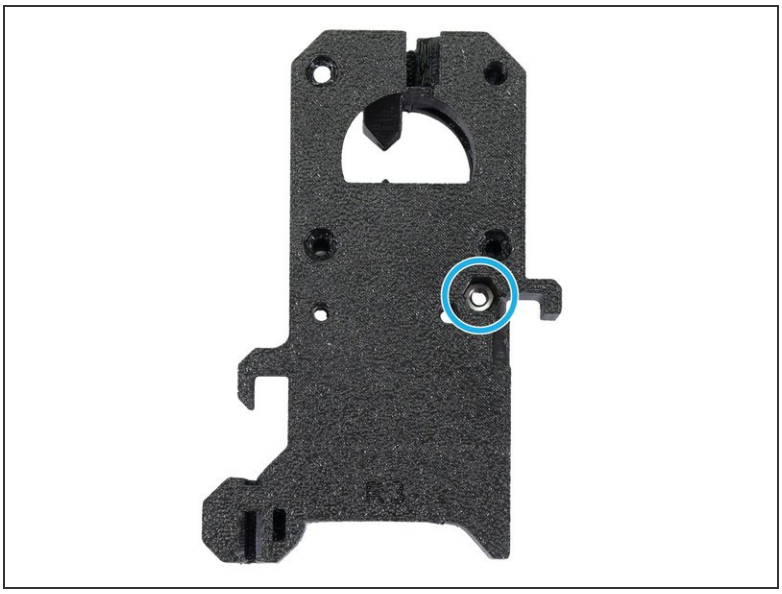


⚠ **BE CAREFUL** with the filament sensor, do not touch the black PCB nor the chips on it.

- For the following steps, please prepare:
- Extruder-body R3 (1x)
- Filament sensor (1x)
- M3x10 screw (1x)
- M3n nut (2x)
- M3nS nut (2x)

Step 19 — Assembling filament sensor (part 2)

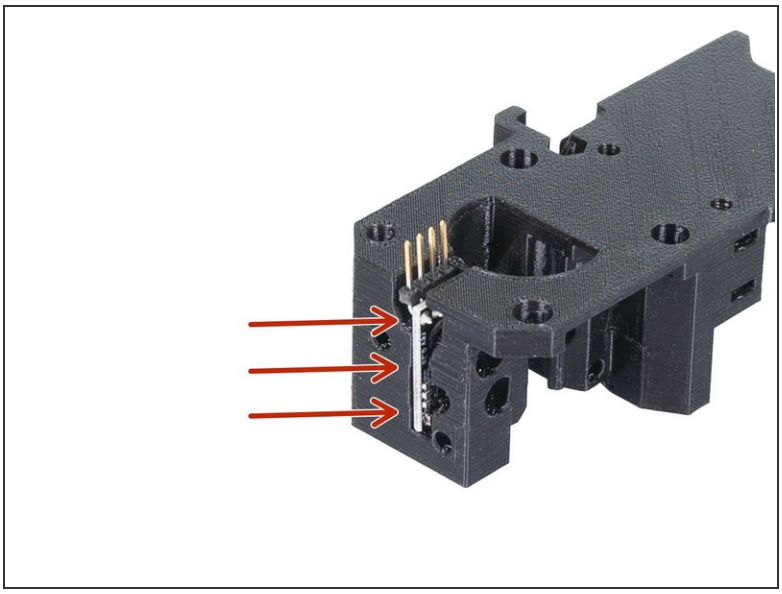


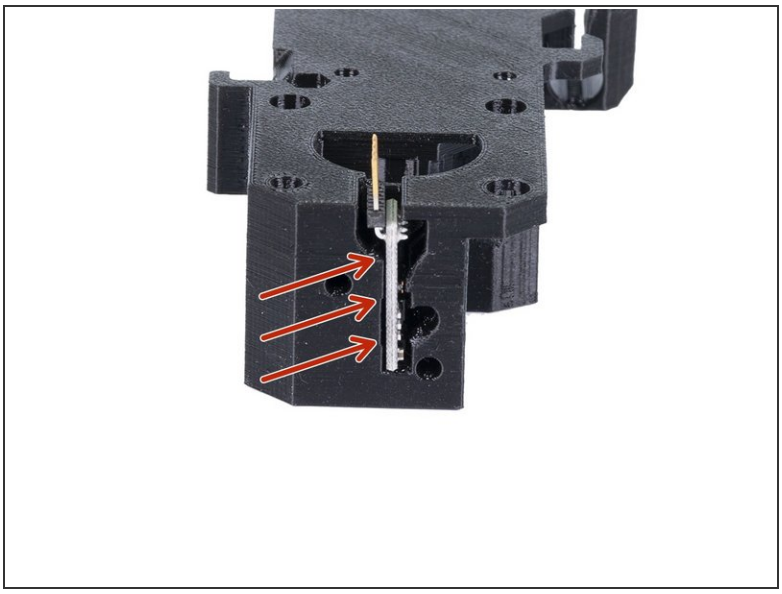


- Before we continue with the assembly, we need to insert nuts in the Extruder-body. Take the extra time and effort to place them in properly. **You won't be able to reach them later.**
- Rotate the **front part** towards you and insert the M3 nut in the slot, all the way in.
- Rotate the **rear part** towards you and insert the M3 nut in the slot, all the way in.

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.

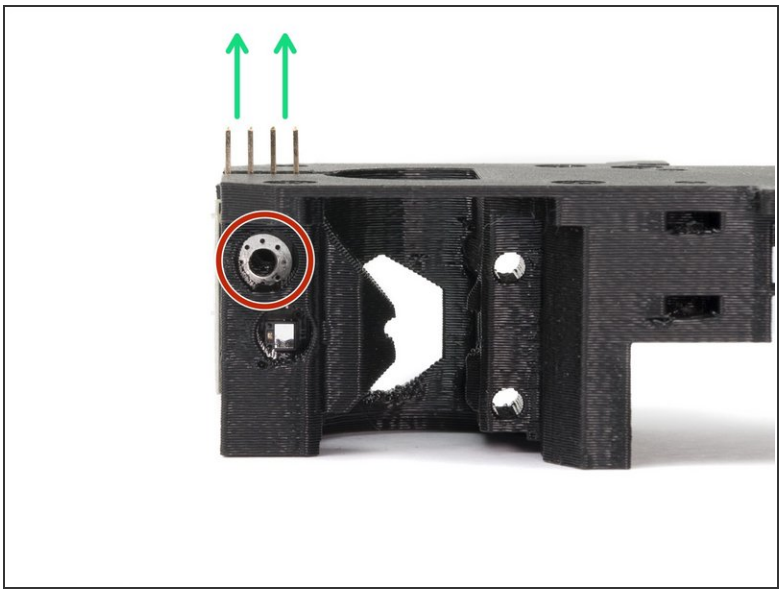
Step 20 — Assembling filament sensor (part 3)

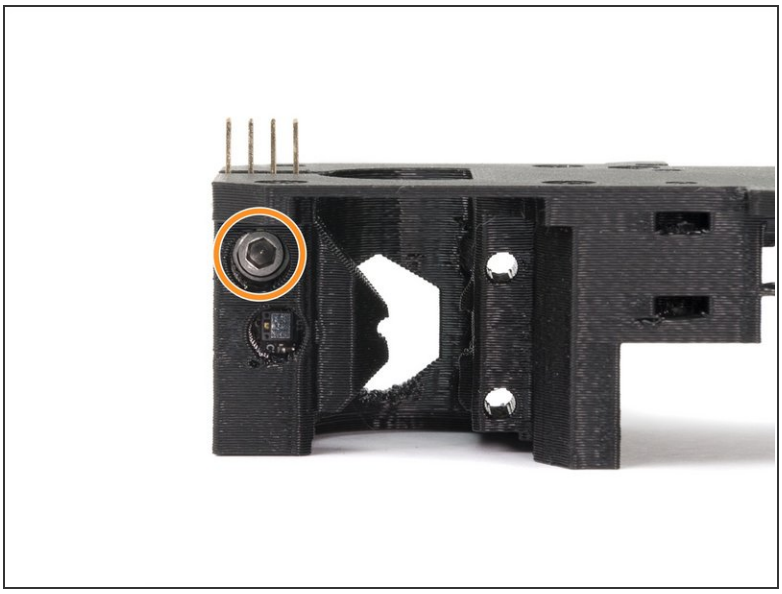




- **Carefully insert** the filament sensor in the slot, **do not use force** or you might damage the PCB!

Step 21 — 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.

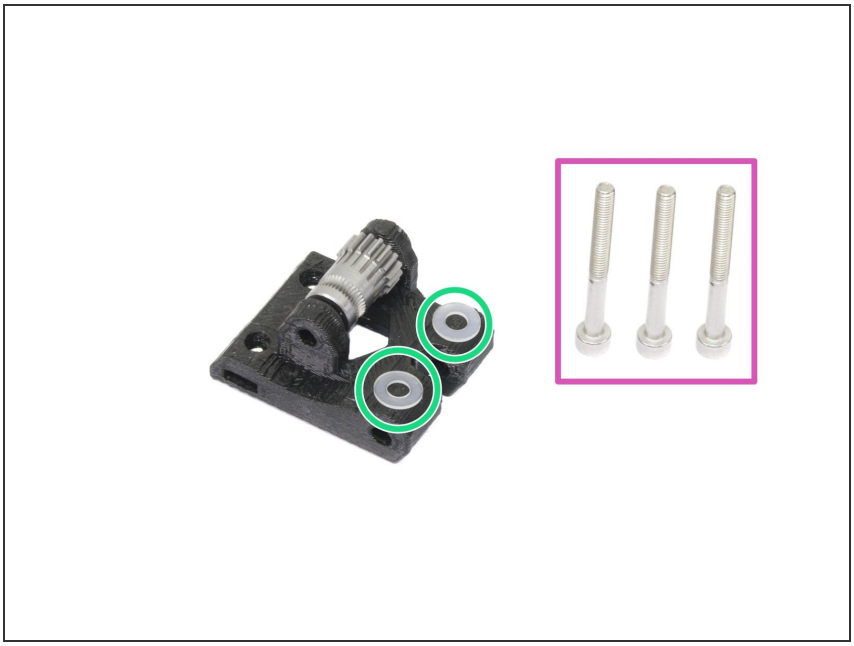
ⓘ Layers might be visible in this printed part due to the geometry. The functionality and strength remain unaffected.

Step 22 — Mounting point for the extruder body

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

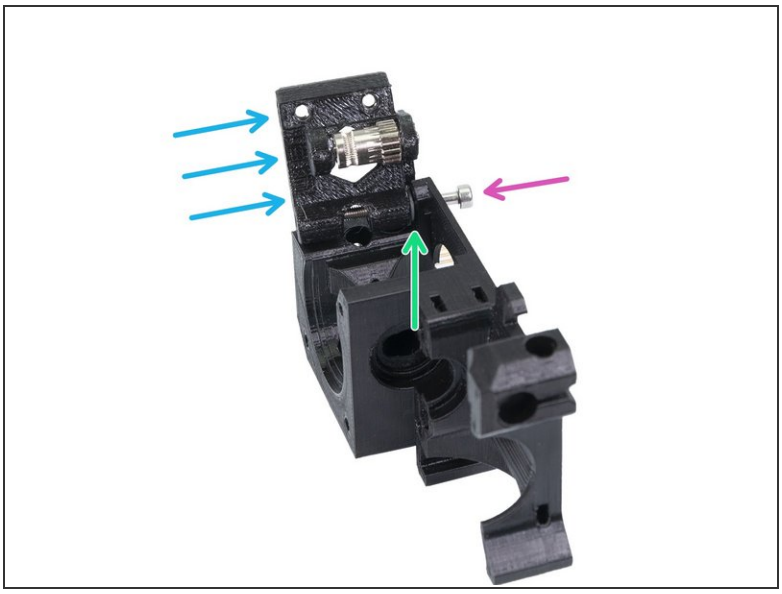
ⓘ Check proper alignment with the 1.5mm Allen key.

Step 23 — Extruder assembly - idler (part 1)



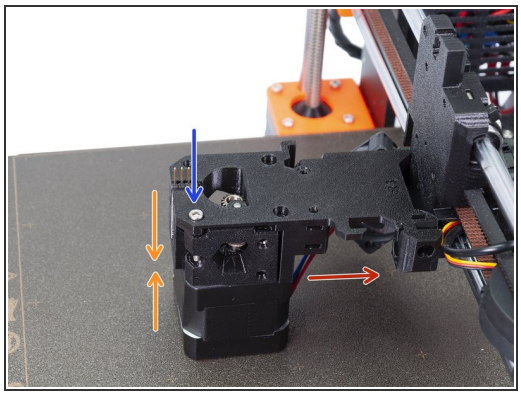
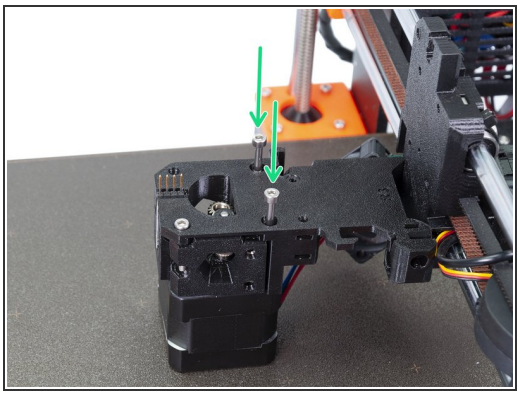
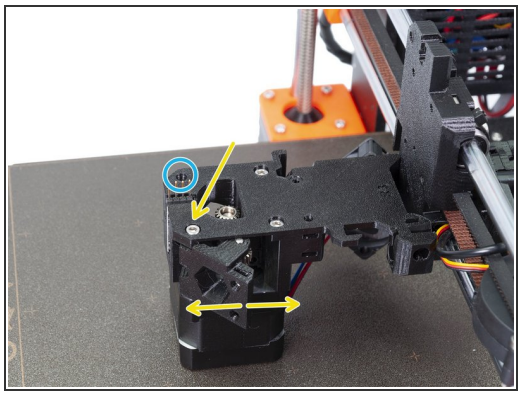
- For the following step, please prepare:
- M3x30 screw (3x)
- M3 translucent washer (2x)
- Translucent washers are placed on the idler for better visibility. No need to place them as in the picture ;)

Step 24 — Extruder assembly - idler (part 2)



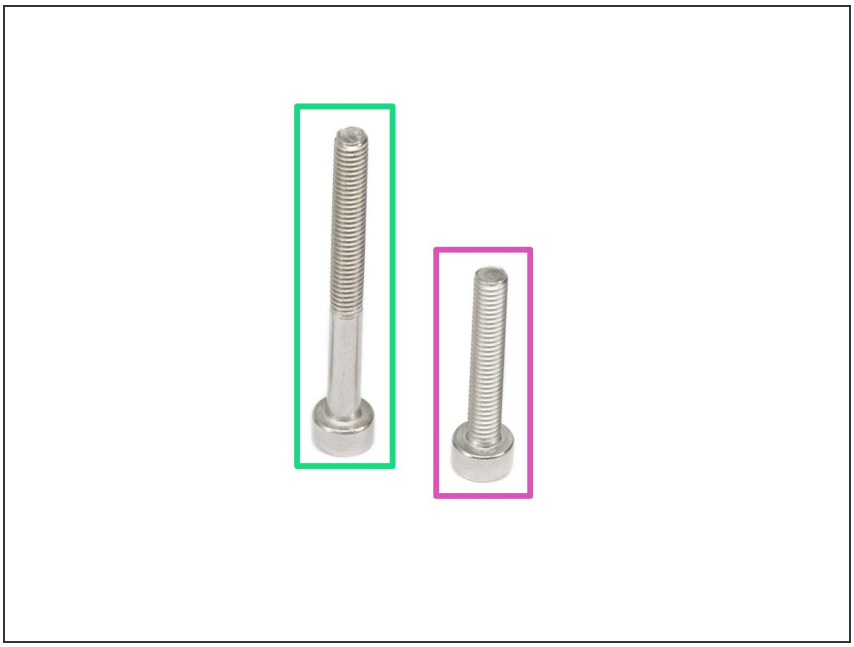
- Turn the Extruder-body like in the picture.
- Insert M3x30 screw in the hole.
- Place a washer from the other side.
- Assemble the idler on the M3x30 screw.
- Finish the assembly with the second washer.

Step 25 — Extruder motor assembly

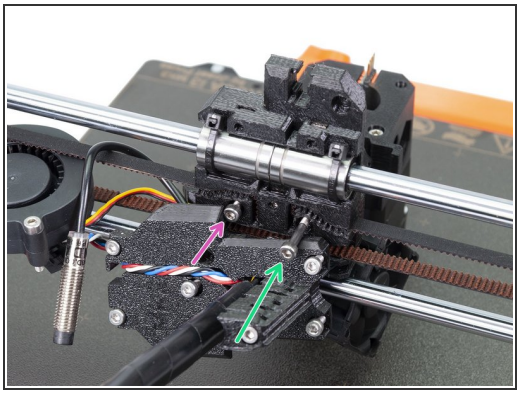
- Connect carefully the extruder-body with the extruder motor and place it on the heatbed.
- Motor cable should be pointing in the indicated direction.
- Make sure both parts are properly aligned, then slightly tighten the M3x30 screw.
- Insert two M3x30 screws and tighten them firmly.
- Return to the 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 ;)

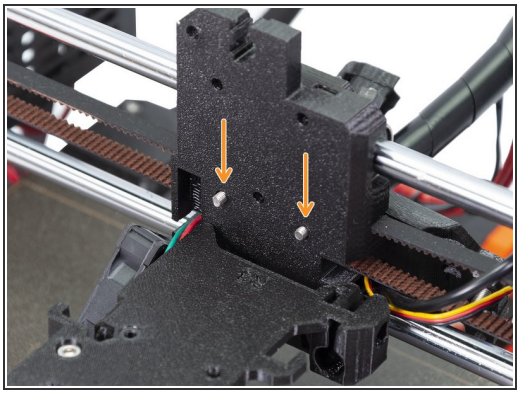
Step 26 — Mounting the extruder (part 1)

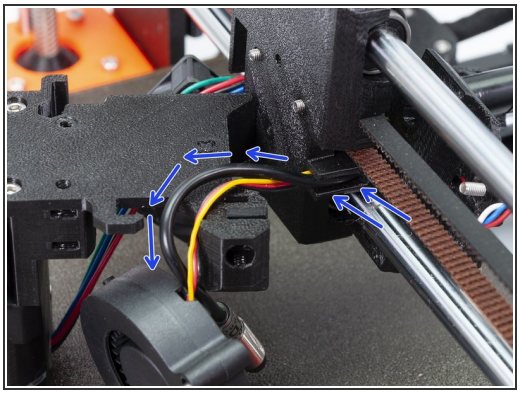


- For the following step, please prepare:
- M3x30 screw (1x)
- M3x18 screw (1x)

Step 27 — Mounting the extruder (part 2)

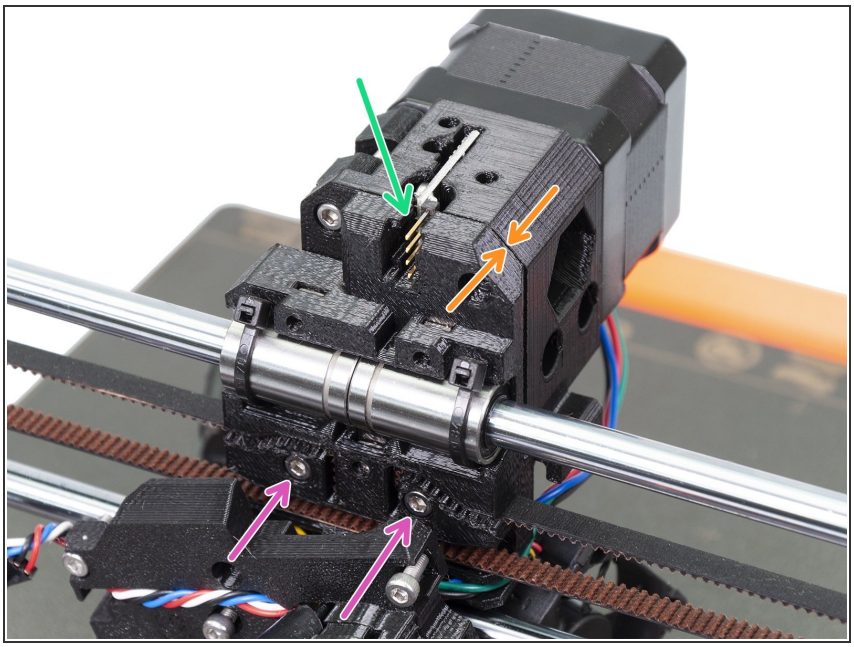






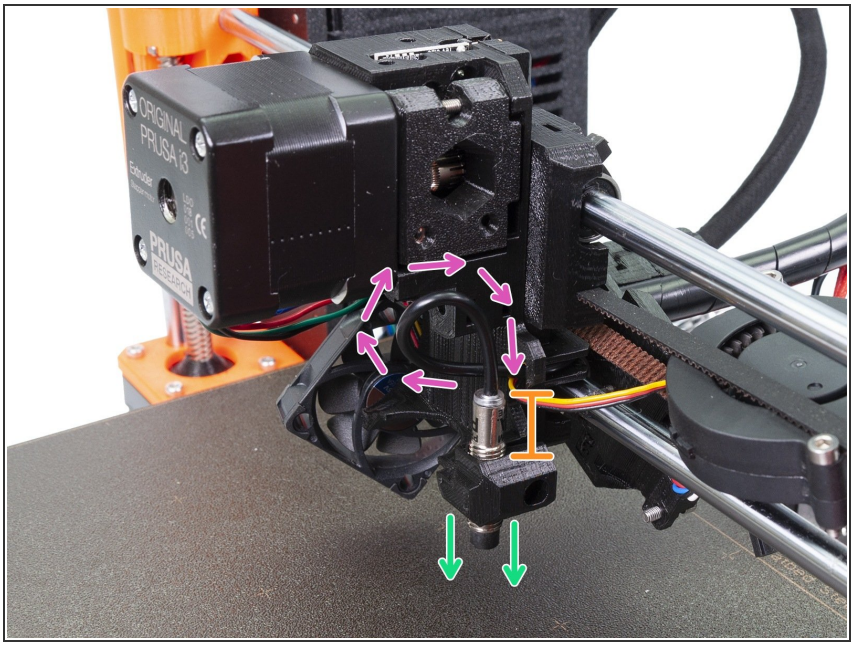
- Place the shorter M3x18 screw in the left hole.
- Place the longer M3x30 screw in the right hole.
- Check from the other side of the X-carriage, that both screws are few millimetres out. It will help you during the assembly.
- Before you move to the next step, arrange the P.I.N.D.A. sensor and Front 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!**

Step 28 — Mounting the extruder (part 3)



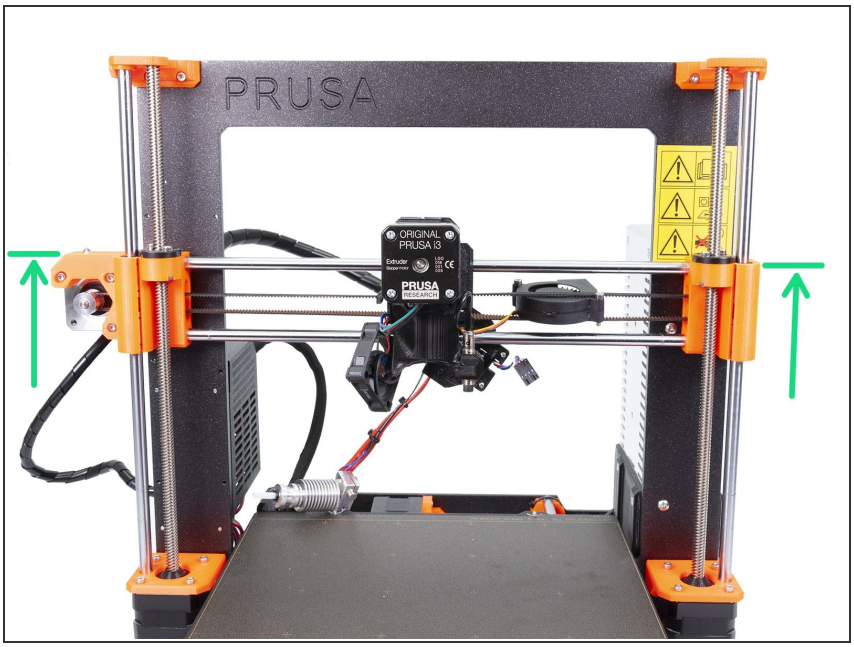
- Mount the extruder-body on the X-carriage and tighten slightly both screws.
- Make sure no wires are pinched between both plastic parts.
- Make sure the pins of the filament sensor aren't bent or in contact with the printed parts.
- Check the proper alignment using the edge of both parts.
- Tighten both screws.

Step 29 — P.I.N.D.A. sensor reassembly



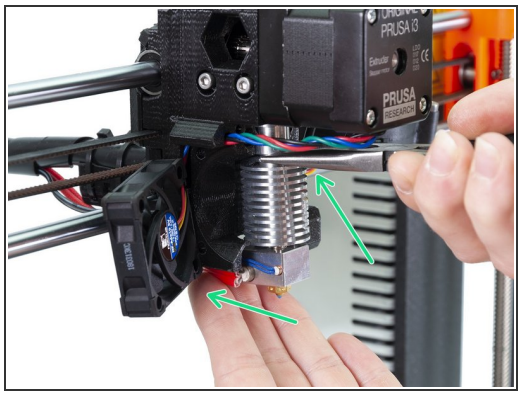
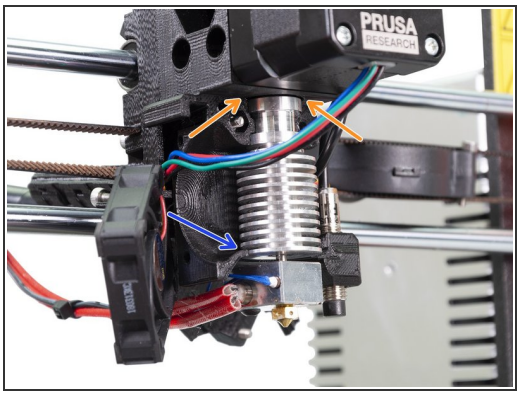
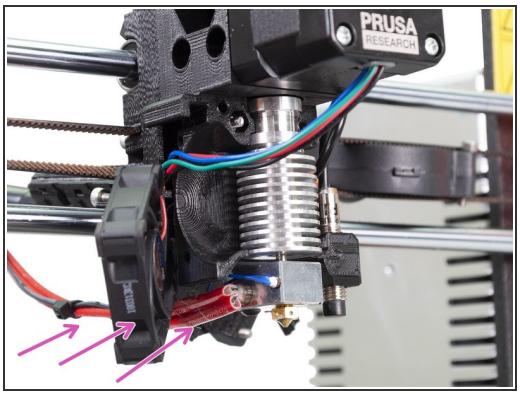
- Create a loop on the P.I.N.D.A. sensor cable.
- Slide the sensor in the holder on the extruder body.
- Exact position will be set later. For now, leave it about 10 mm (0.4 inch) above the holder.

Step 30 — 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.
- Move both sides up simultaneously!

Step 31 — Inserting the E3D hotend

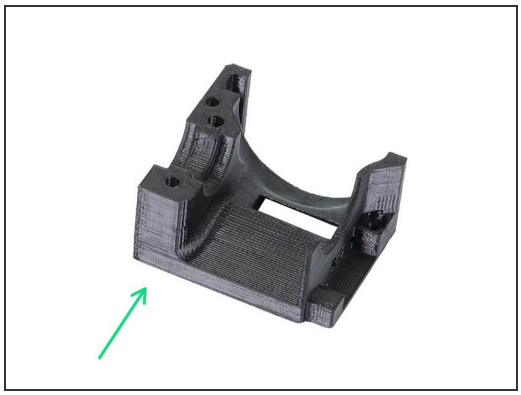
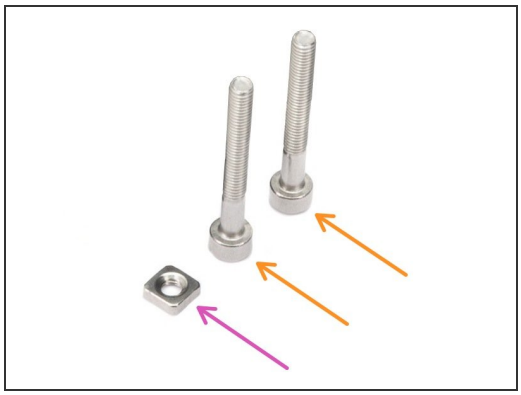
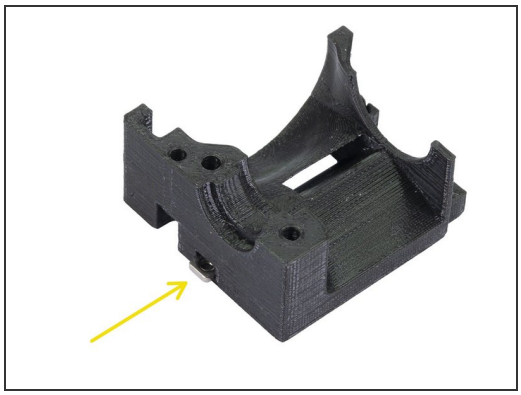




- Carefully slide the hotend back to the extruder-body.

⚠ **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!

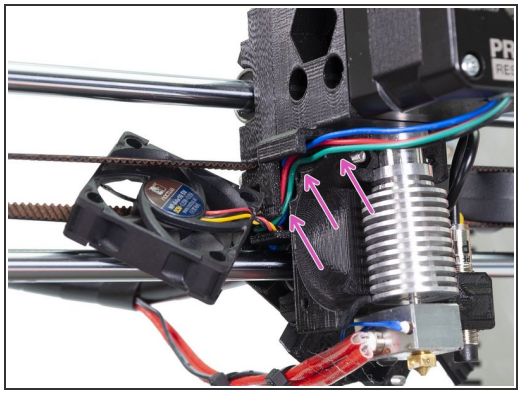
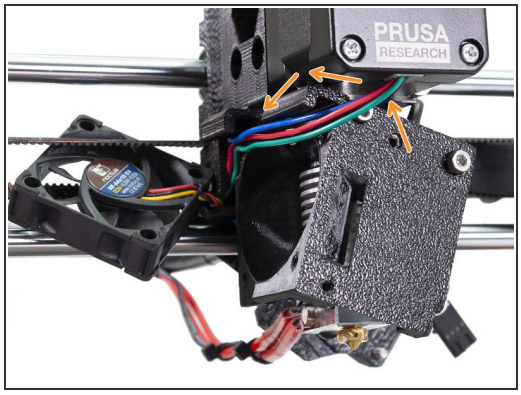
- Where to check the alignment:
  - There should be no gap between the extruder-body and the hotend.
  - The last rib on the hotend's heatsink is should aligned with the printed part. See the photo.
- Make sure the hotend's cables are on the left side. Compare your assembly with the picture.

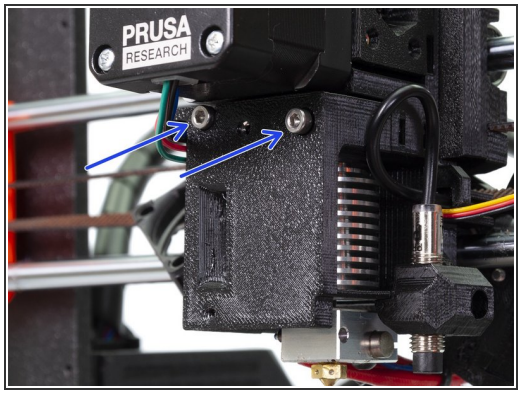
Step 32 — Mounting the extruder-cover (part 1)

- For the following steps, please prepare:
- Extruder-cover R3 (1x)
- M3nS nut (1x)
- M3x25 screw (2x)
- Insert the M3nS nut in the extruder-cover. Ensure proper alignment using the smallest Allen key.

Step 33 — Mounting the extruder-cover (part 2)



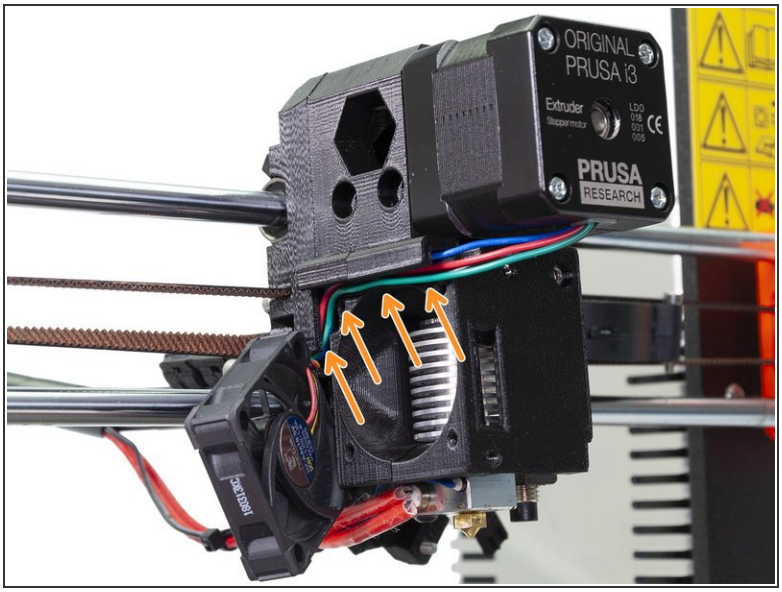
- Arrange the extruder motor cables in the channel all the way to the back.
- Insert both M3x25 screws in the extruder-cover and slide it in above the cables.
- Check the parts alignment and tighten both parts together.

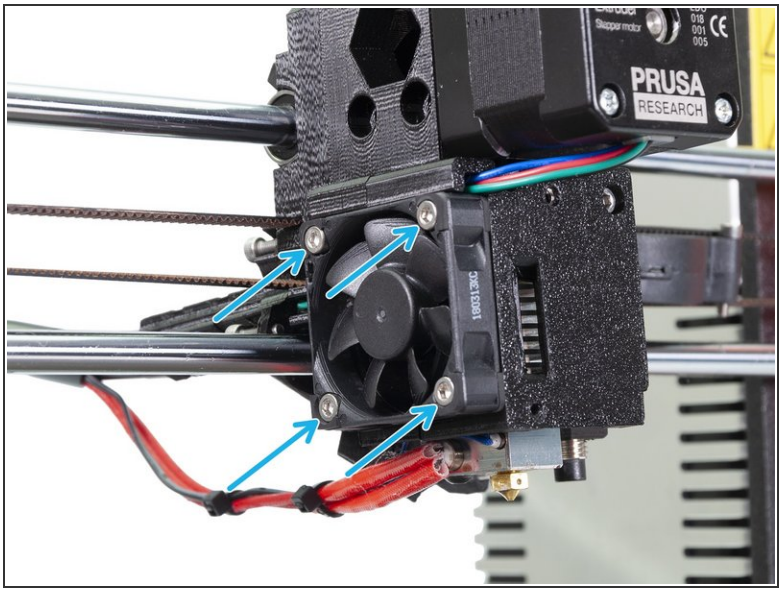
Step 34 — Mounting the Left hotend fan (part 1)

- For the following steps, please prepare:
- M3x18 screw (4x)

The screws might be already in the Noctua fan.

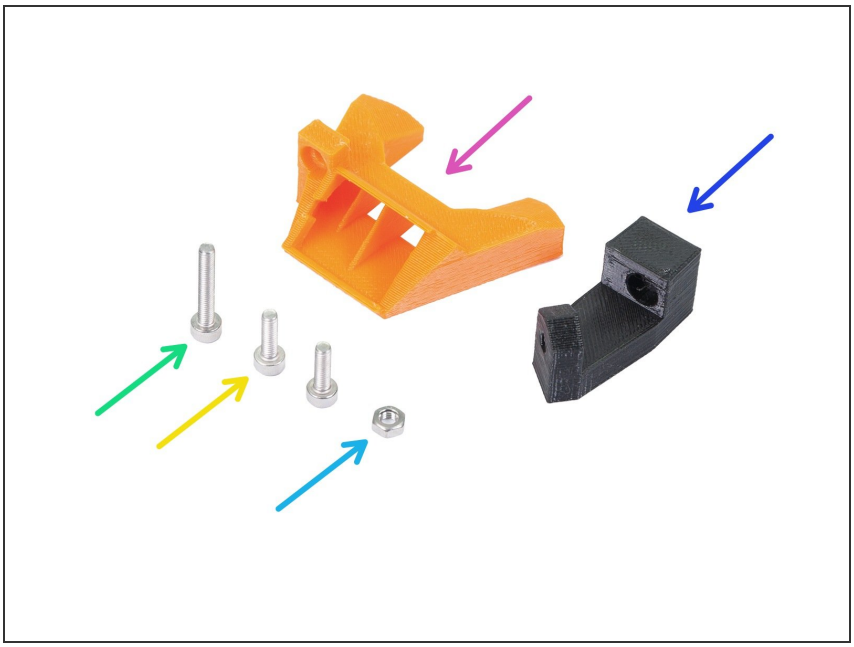
Step 35 — Mounting the Left hotend fan (part 2)





- 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.

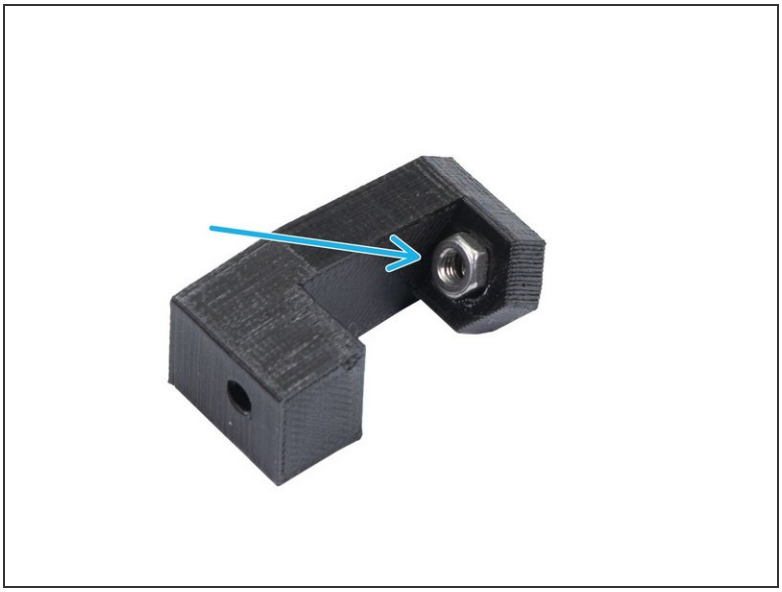
Step 36 — Mounting the front print fan (part 1)

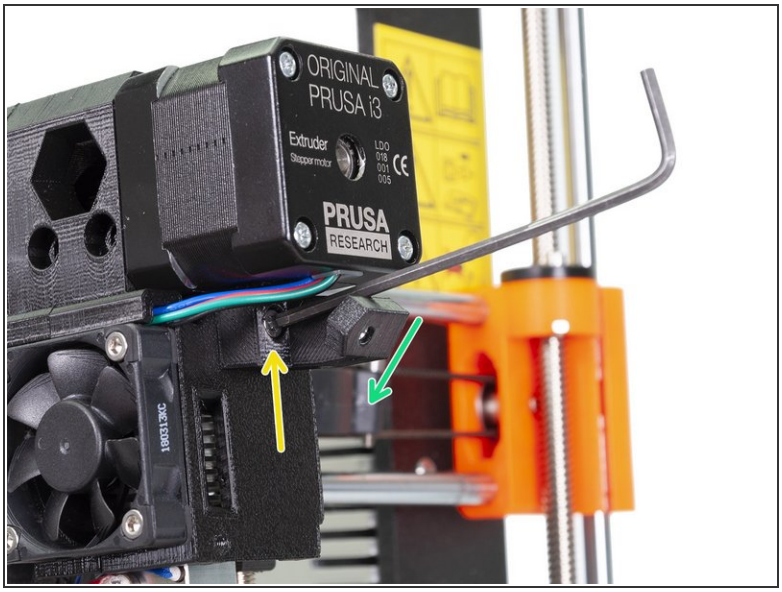


- For the following steps, please prepare:
- nozzle-fan-45deg-support (1x)
- nozzle-fan-45deg (1x)
- M3x18 screw (1x)
- M3x10 screw (2x)
- M3n nut (1x)

In case you are missing one M3x10 screw please use the spare bag.

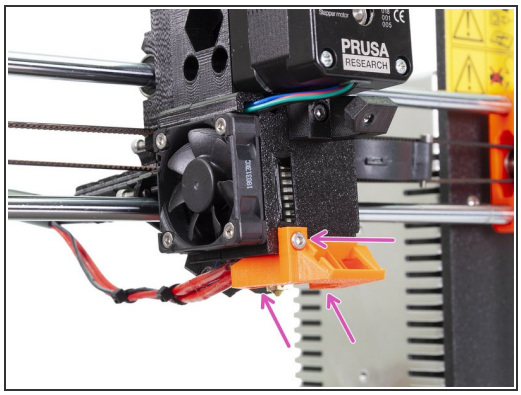
Step 37 — Mounting the front print fan (part 2)

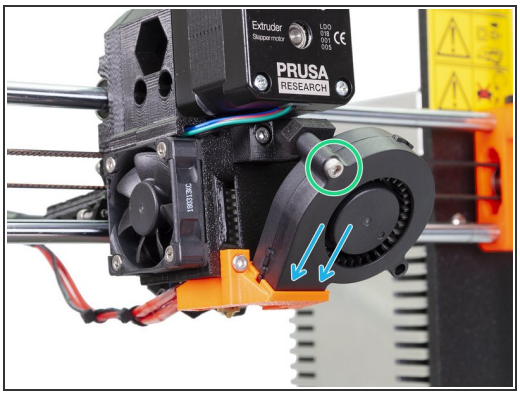


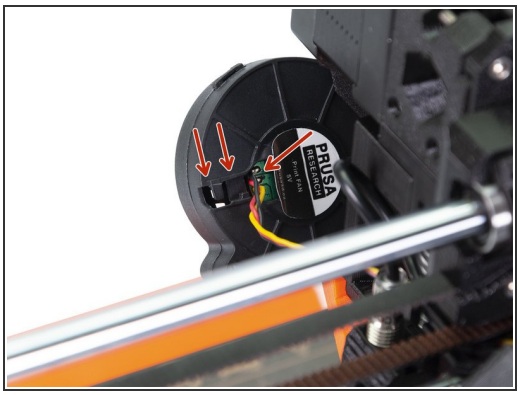


- Press the M3n nut in the support, all the way in. It will be barely visible. If needed use a screw from the other side to pull the nut in, then remove the screw.
- Connect the support to the extruder using the M3x10 screw. Note the correct orientation in the picture.
- The inclined part of the support must be facing to the extruder cover.

Step 38 — Mounting the front print fan (part 3)





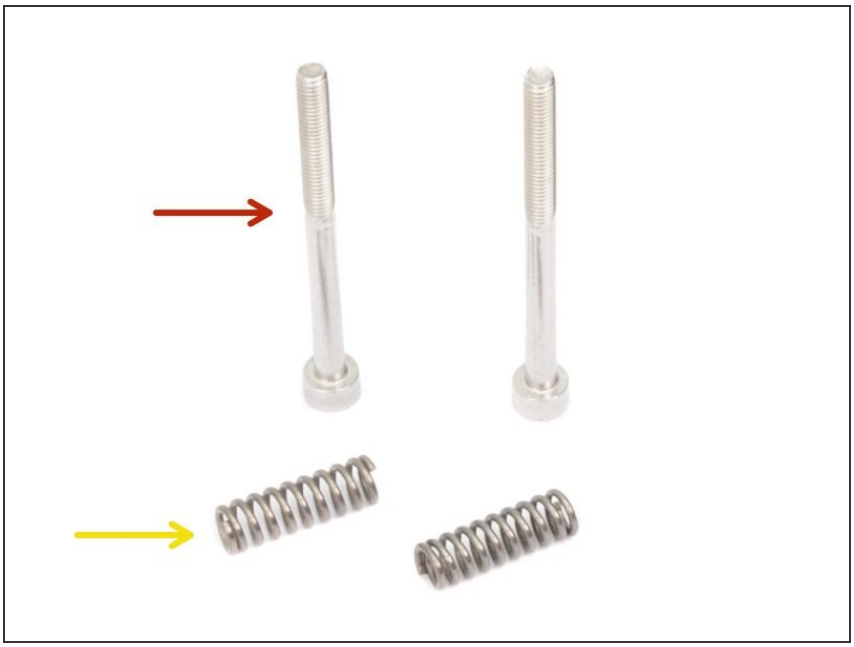


- Place the nozzle-fan on the extruder and secure it using M3x10 screw.
- Slide the Front print fan in the nozzle-fan.
- Secure the fan using an M3x18 screw.

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

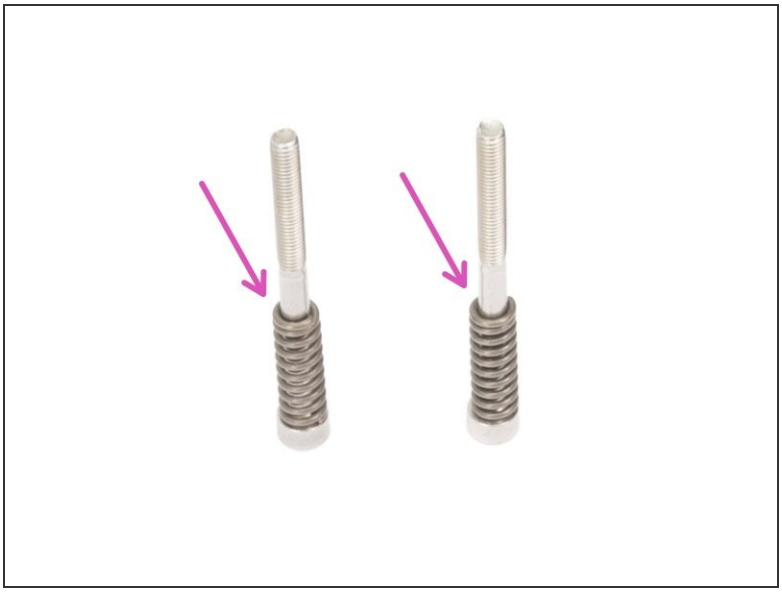
- It might happen the fan cable is too short and you can't incline the fan. First, try gently pulling the cable from the spiral wrap. If this doesn't help unhook the cable (see the picture), **but be extremely careful as you might disconnect the wires from the fan!**

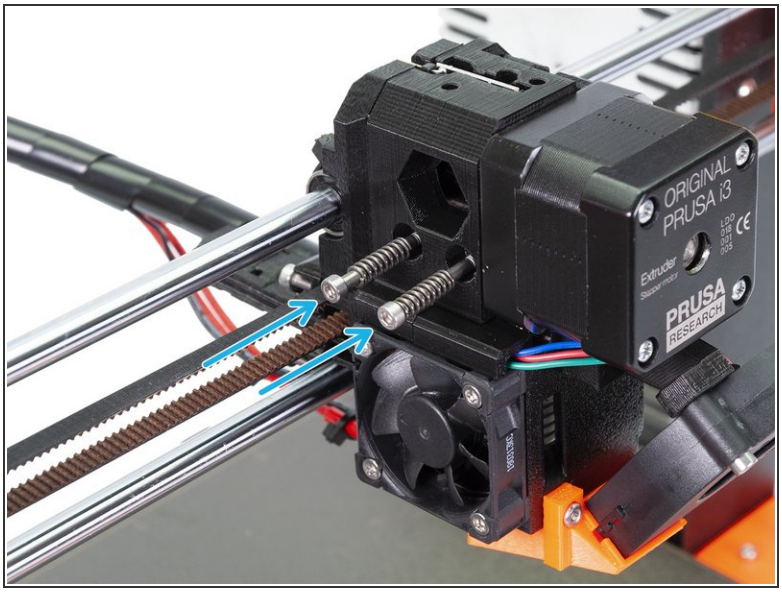
Step 39 — Securing the extruder idler (part 1)



- For the following step, please prepare:
- M3x40 screw (2x)
- Extruder spring (2x)

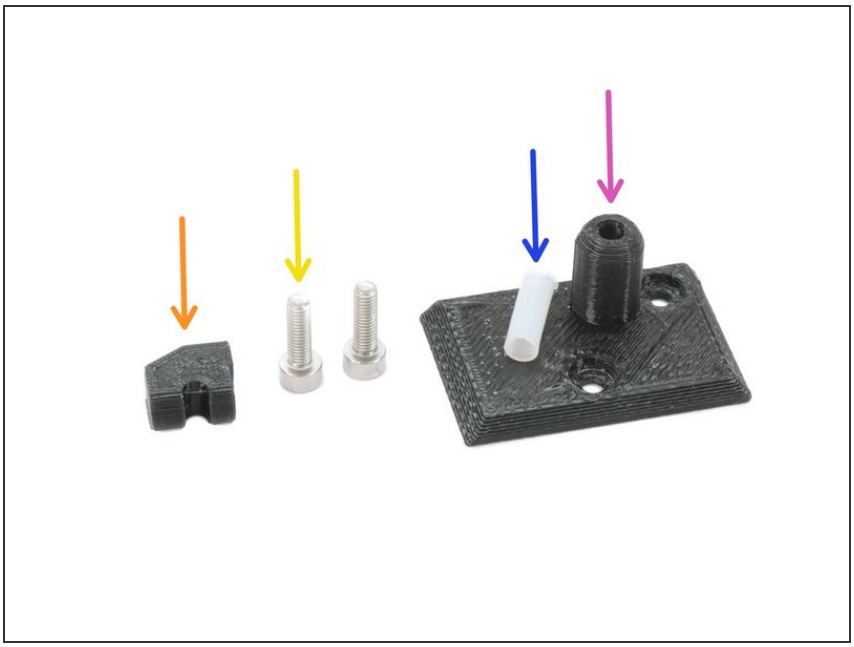
Step 40 — Securing the extruder idler (part 2)





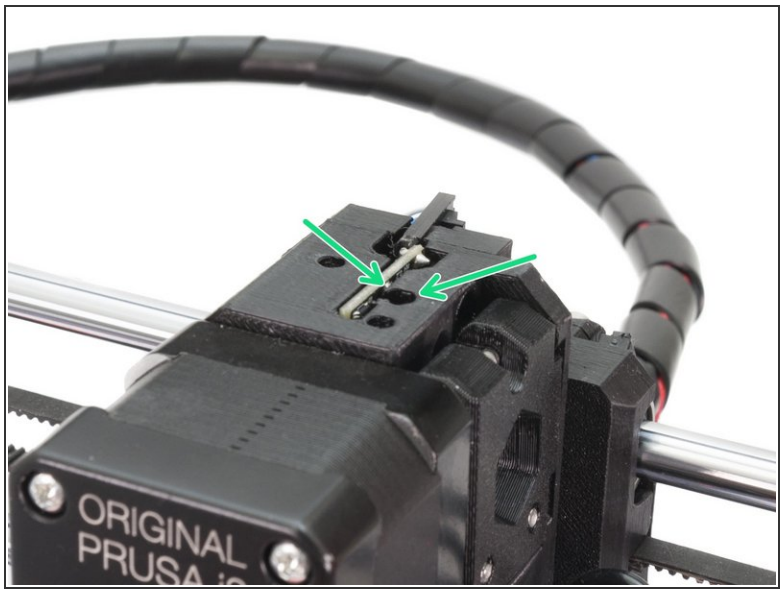
- Assemble springs on both screws.
- Close the idler on the extruder, so the screws can reach it.
- Place both screws into the extruder body and tighten them. The screw's head should be almost aligned with the printed surface.

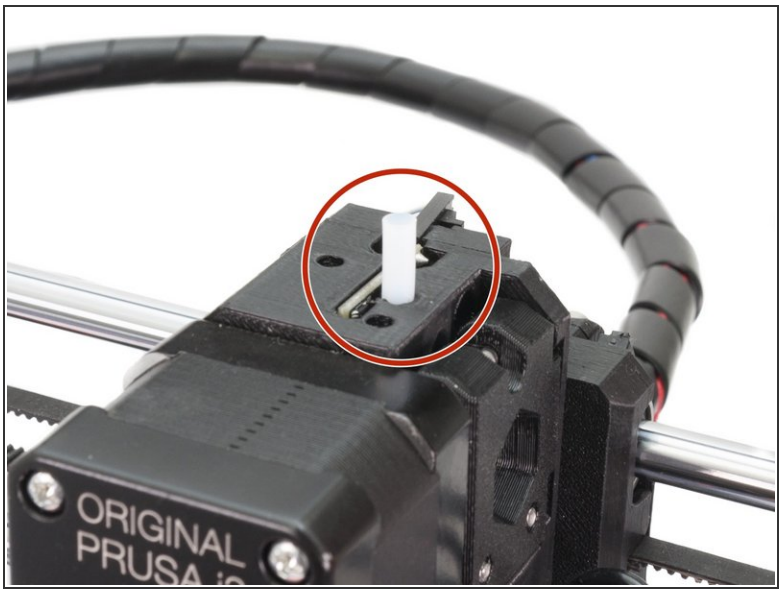
Step 41 — Mounting the Filament-sensor-cover (part 1)



- **For the this step, please prepare:**
- Filament-sensor-cover (1x)
- Idler-plug (1x)
- M3x10 screw (2x)
- PTFE tube 4x13 (1x)

Step 42 — Mounting the Filament-sensor-cover (part 2)

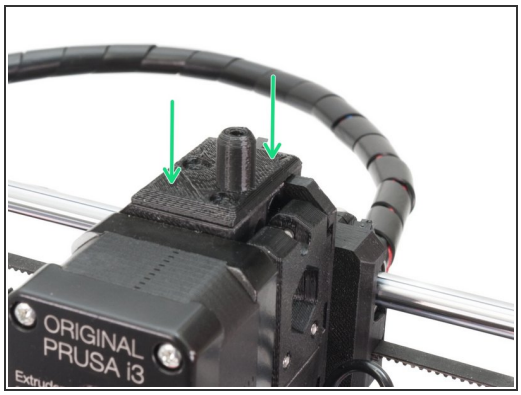


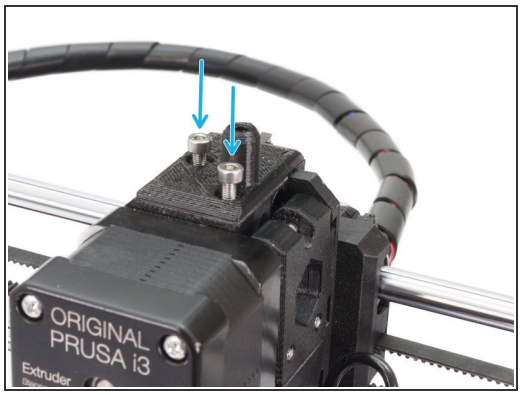


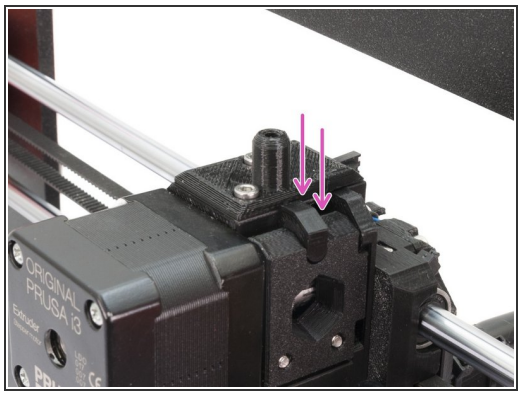
- Locate the largest circular opening for the PTFE tube on the top of the Extruder.
- Push the PTFE tube in. Most of the tube's length will stick out.

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.

Step 43 — Mounting the Filament-sensor-cover (part 3)

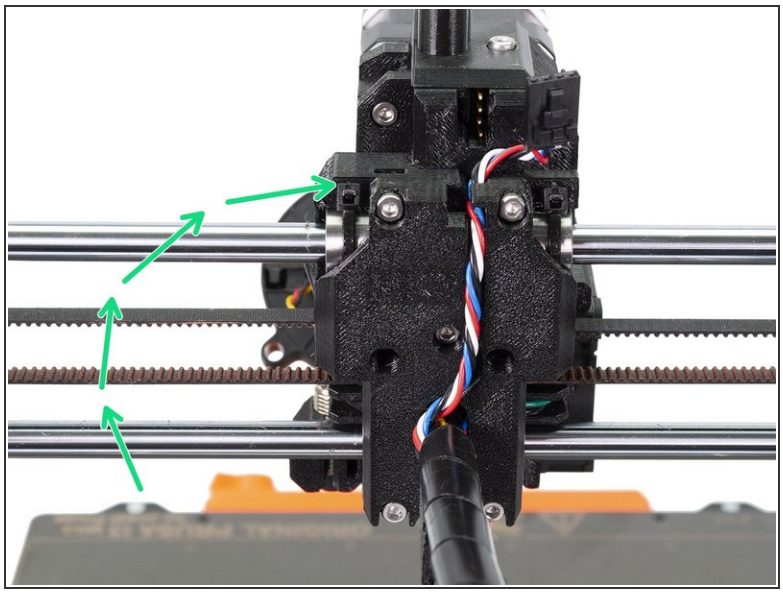


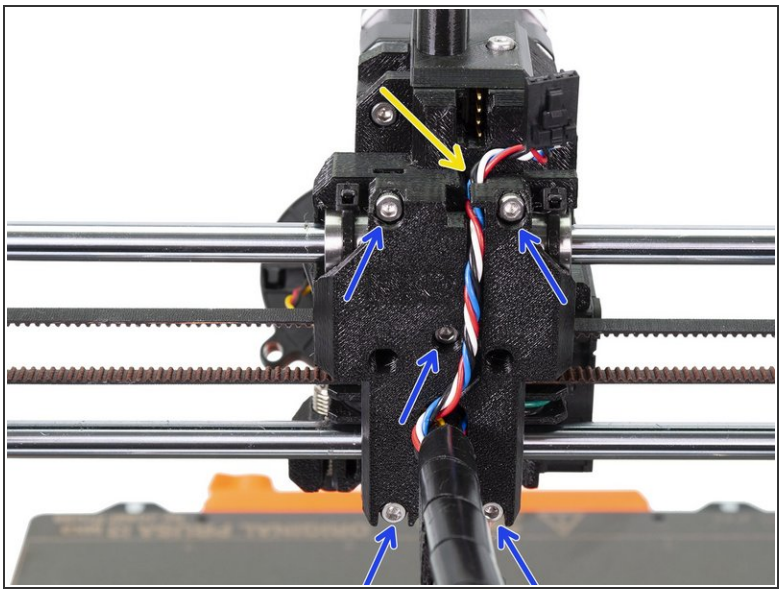




- Carefully slide the filament cover on the PTFE tube.
- Using two M3x10 screws mount the cover.
- Assemble the idler-plug and ensure it fits properly. Otherwise, it might fall down during the print.

Step 44 — X-carriage-back reassembly



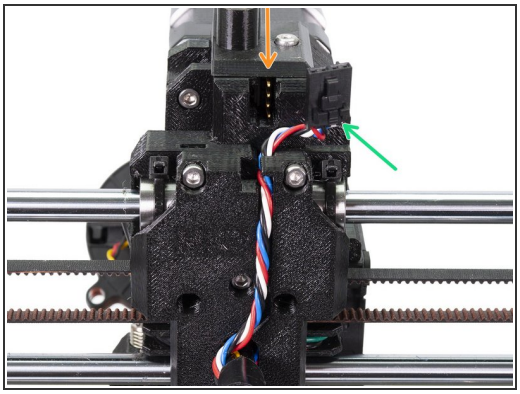


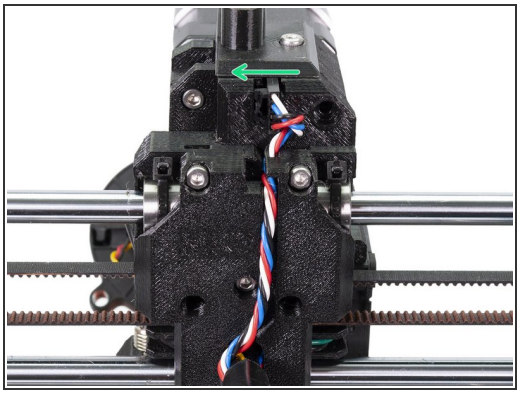
- First, rotate back the X-carriage-back part.
- Ensure no cables are pinched between X-carriage and X-carriage-back.
- Guide the filament sensor cable as in the picture.
- Tighten all five M3x10 screws.

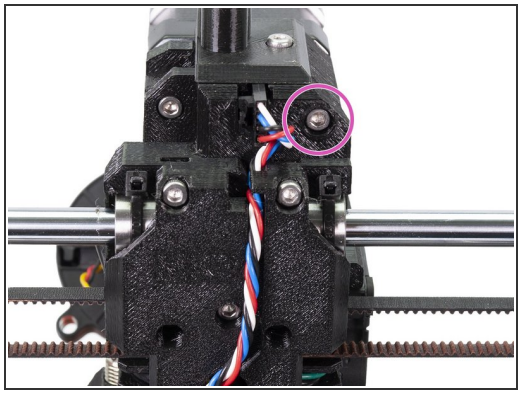
Step 45 — Finishing the extruder-body mounting (part 1)

- For the following steps, please prepare:
- M3x40 screw (1x)

Step 46 — Finishing the extruder-body mounting (part 2)

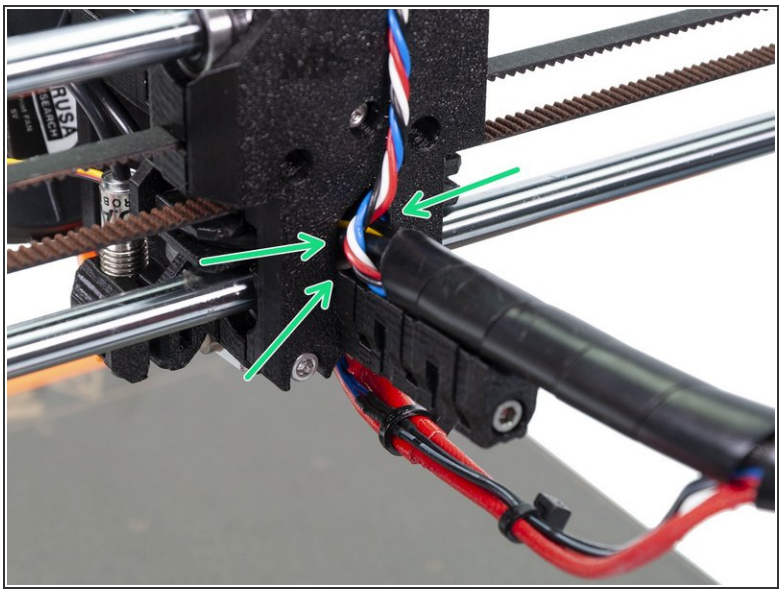


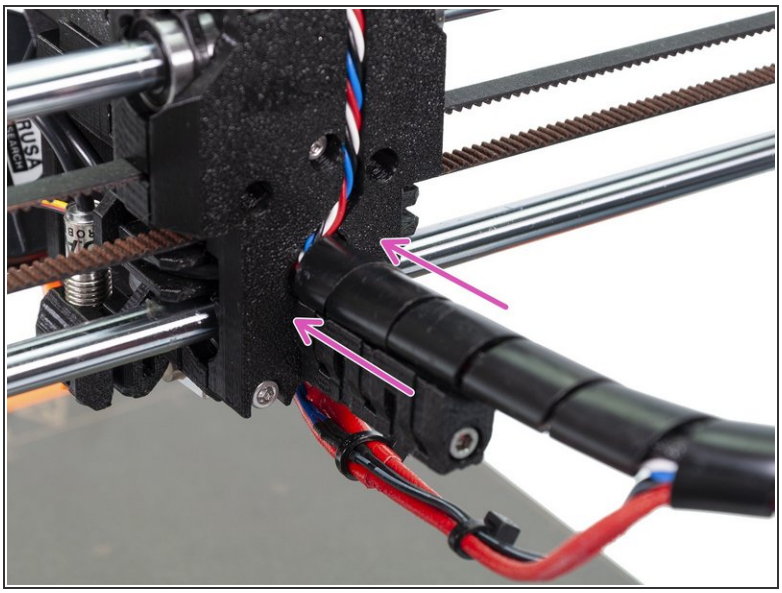




- Let's connect back the filament sensor, there are two important things:
  - There are four pins on the sensor, make sure the connector fits properly on them.
  - There is a safety pin on the connector, which must face to the left, when connected to the sensor.
- Secure the extruder-body with the screw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

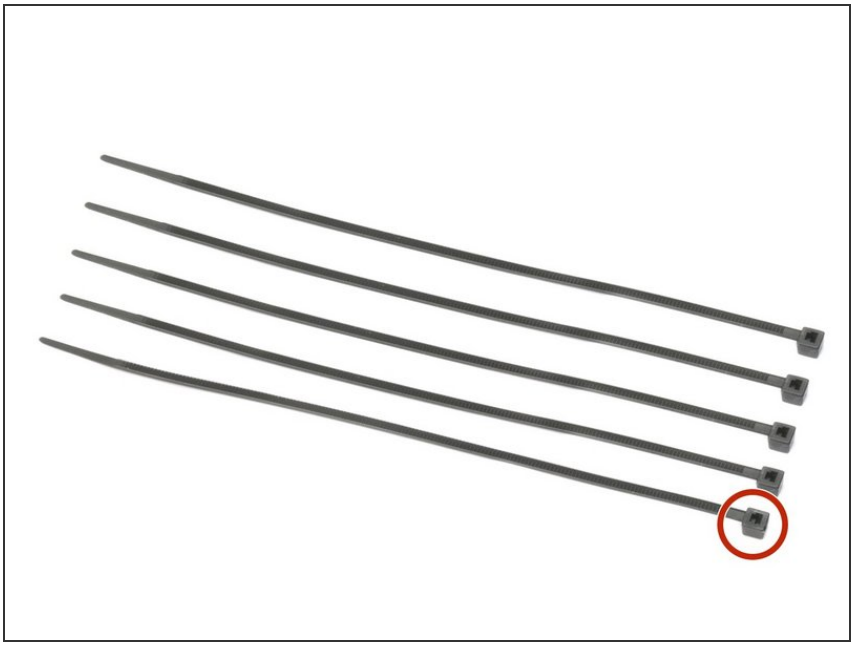
Step 47 — Arranging the spiral wrap





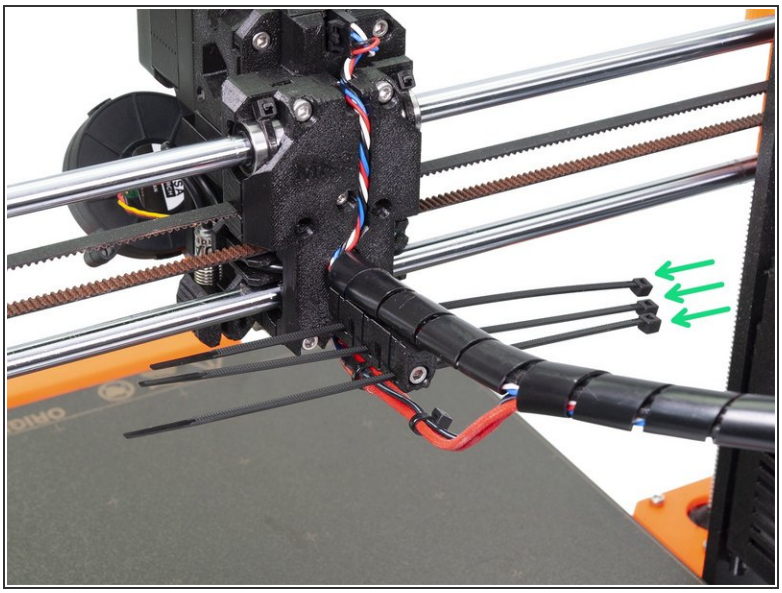
- The edge of the spiral wrap should be on the edge of the X-carriage-back or if the cables allow it, slightly pushed in.
- Carefully arrange all cables, then slide the spiral wrap towards the X-carriage-back.

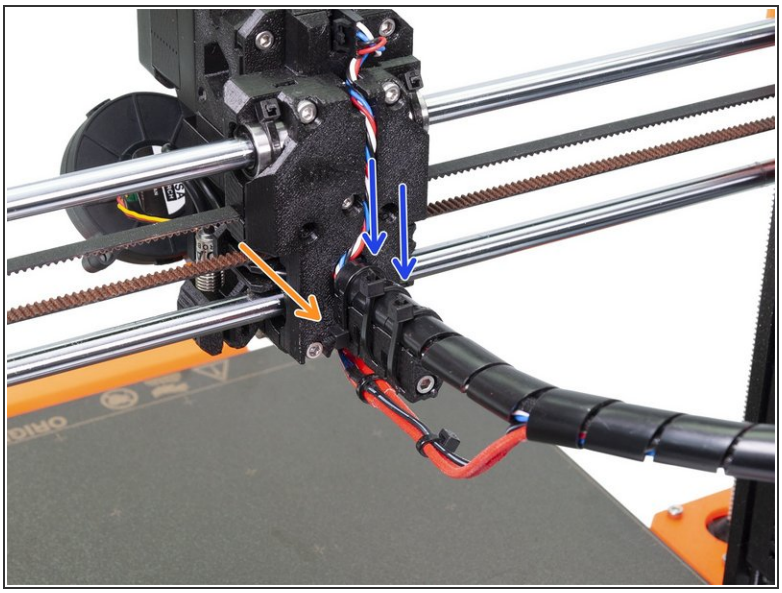
Step 48 — Tightening the spiral wrap (part 1)



- For the following step, please prepare:
- Zip tie (5x)

Step 49 — Tightening the spiral wrap (part 2)



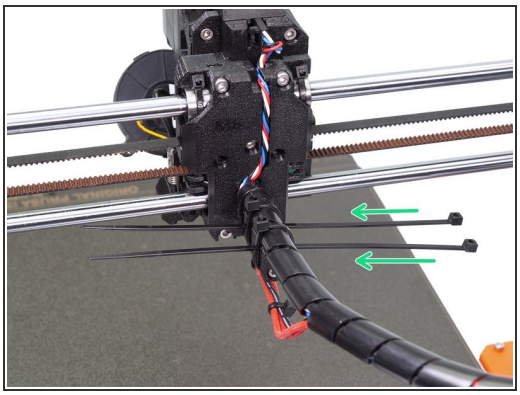
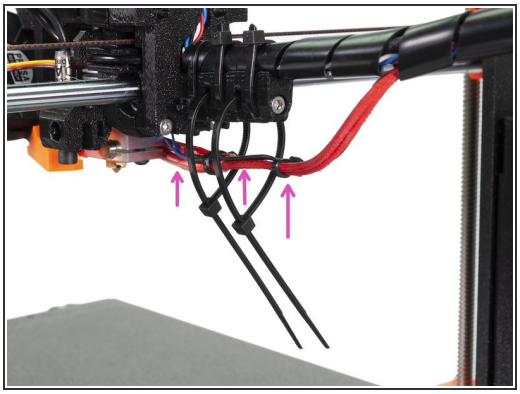
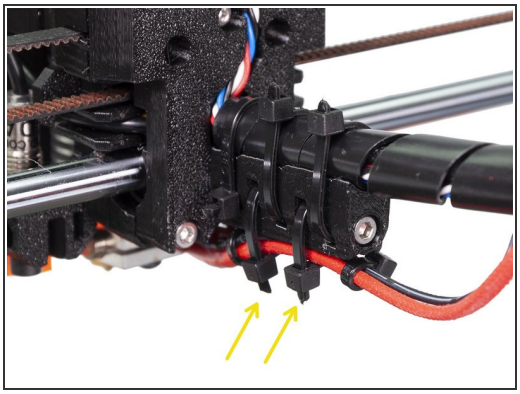


- Use three zip ties and push them through the lower slots on the cable-holder
- Check for the last time both the wrap and cables are seated properly.

⚠ **PAY GREAT ATTENTION** to the final position of the zip ties. If you don't follow the manual, you will have issues during prints!

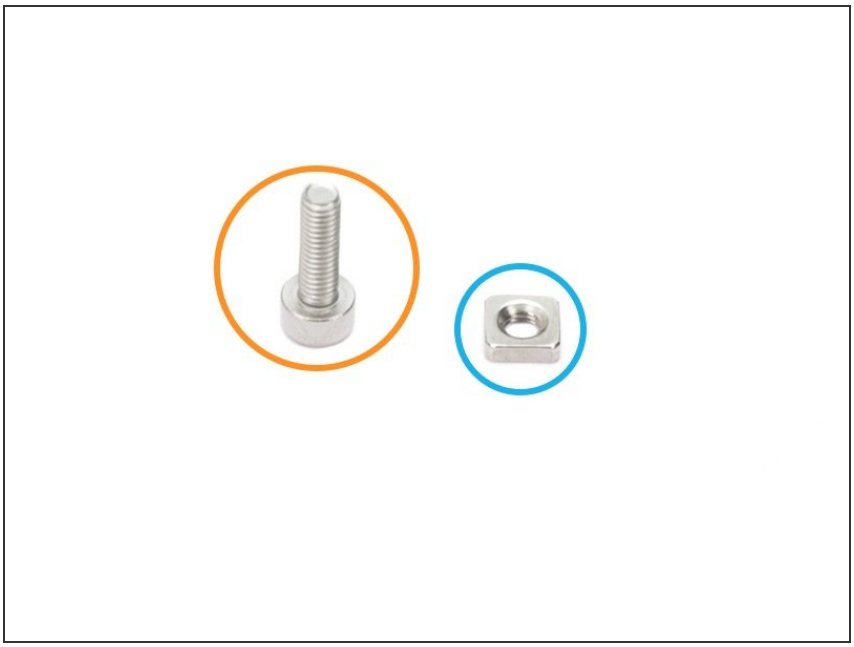
- Tighten first zip tie on the side of the cable-holder and cut the zip tie as close as possible to the printed part.
- Tighten second and third zip tie on the top, but note they both must be slightly **to the left**. Cut the zip ties as close as possible to the spiral wrap.

Step 50 — Tightening the spiral wrap (part 3)

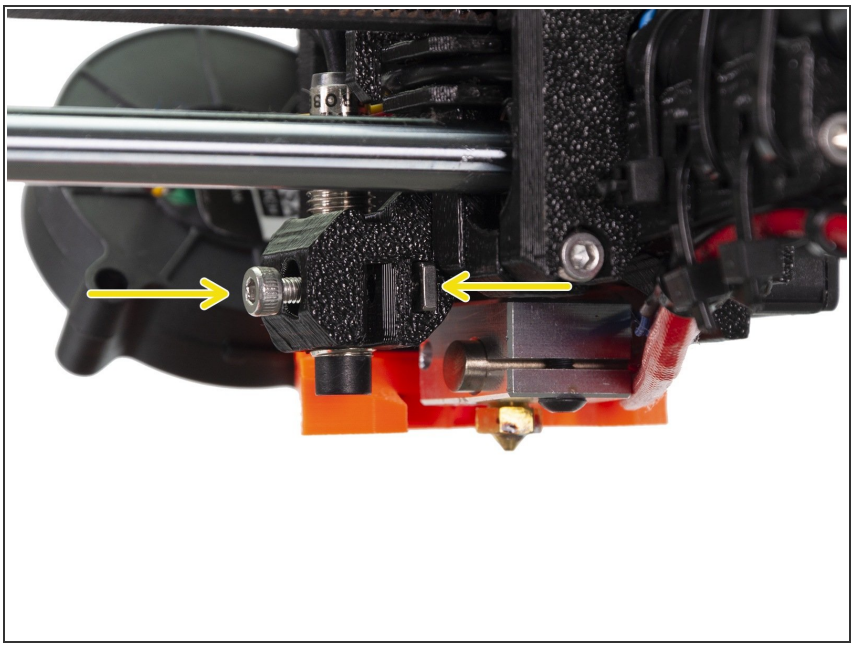
- Use two zip ties and push them through the upper slots on the cable-holder.
- **ATTENTION!** Before tightening the zip ties add the cables from the hotend.
- Once the hotend cables are included, tighten the zip ties and cut remaining parts.

Step 51 — Tightening the P.I.N.D.A. probe (part 1)



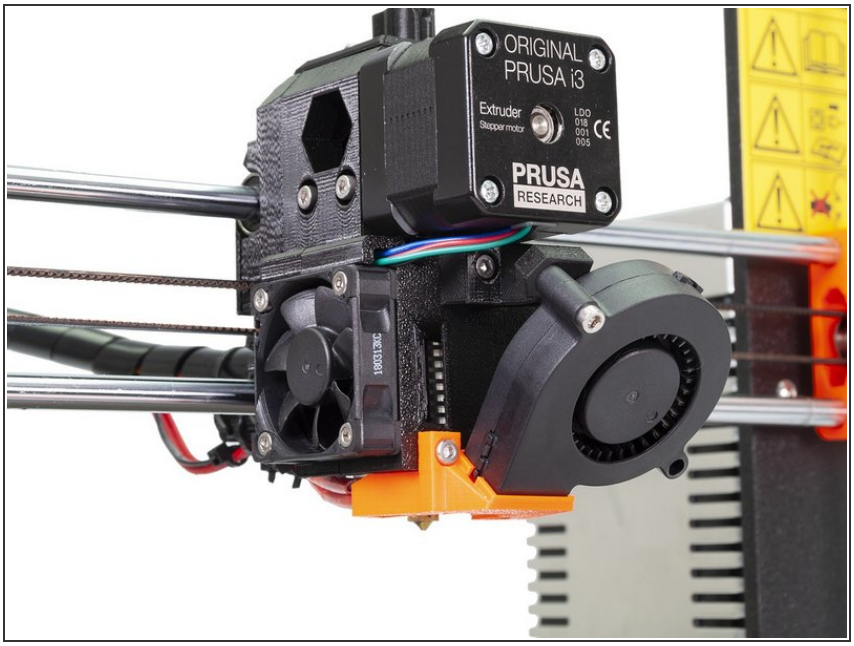
- For the following steps, please prepare:
- M3x10 screw (1x)
- M3nS nut (1x)

Step 52 — 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.

Step 53 — Extruder rebuild is done



- You've just finished the upgrade of the extruder. Awesome job!
- Now, let's adjust the height of the P.I.N.D.A. sensor. You can use for example the MK3 assembly: 9. Preflight check

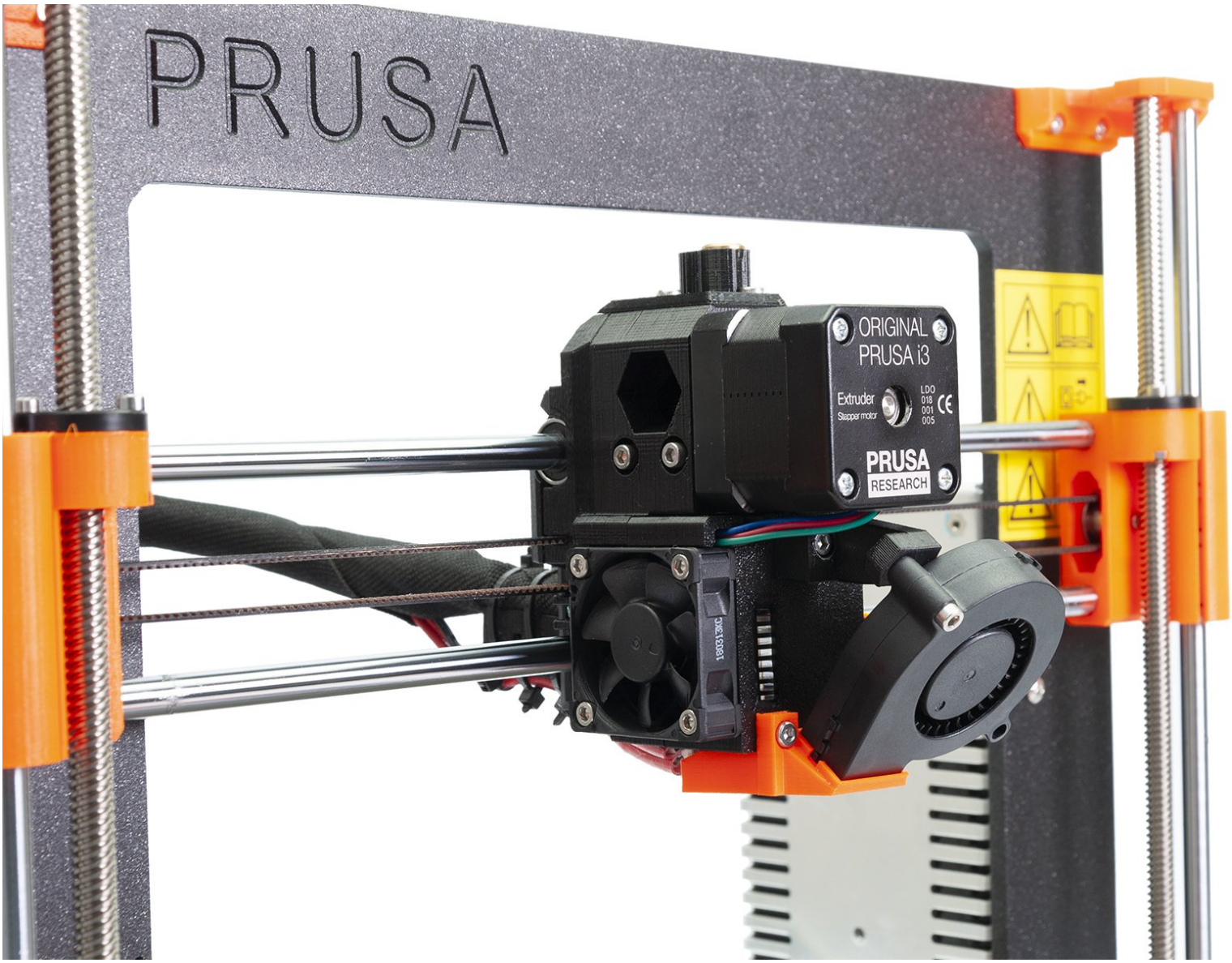
⚠ After you turn on the printer, run the **Calibrate Z** to make sure the X-axis is absolutely level! Then run the **1st layer calibration** as we moved with the P.I.N.D.A.

- That's it for today ;)

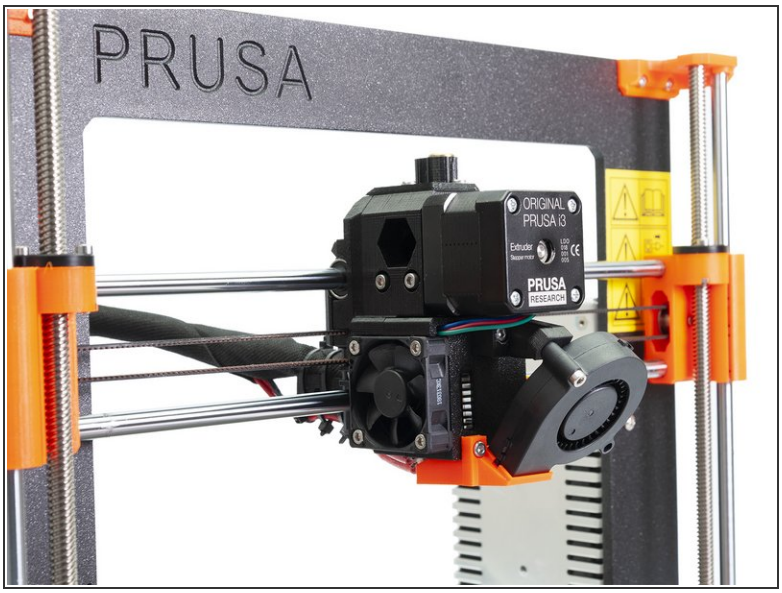
PRUSA RESEARCH by JOSEF PRUSA

Upgrading extruder B6 to B7 on MK2.5 (Prusa printed parts)

Written By: Jakub Dolezal



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 (optional) and assemble the extruder back.

⚠ **In case you have a MMU2 upgrade, please skip this particular guide** and use a special one, which is part of the MMU2 guide: Original Prusa i3 MK3 to MMU2 upgrade

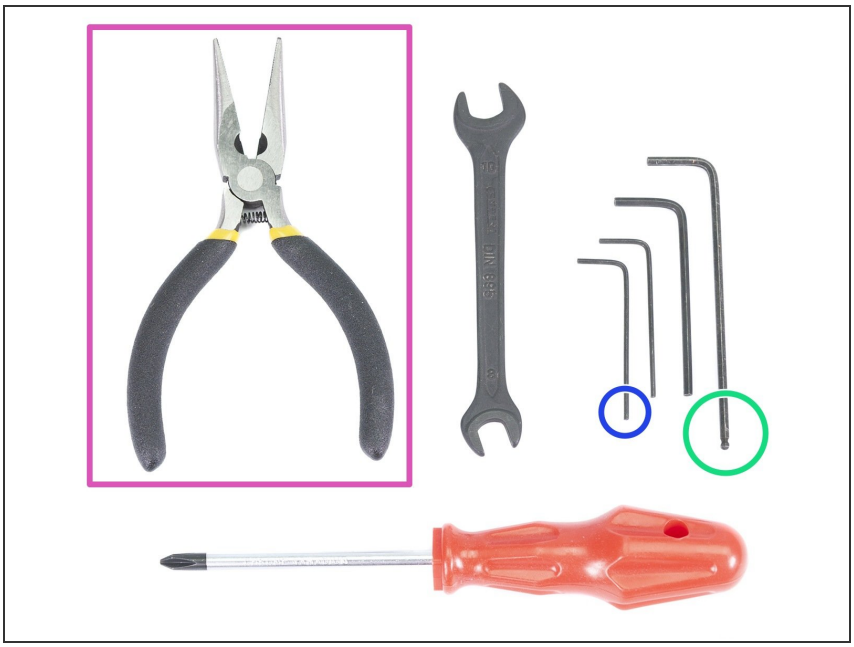
ⓘ This extruder upgrade kit is included in the MMU2 upgrade kit. More in the unboxing video by Josef ;)

- 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.
- All necessary parts are provided by Prusa Research in the 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.

Step 2 — Tools necessary for this guide

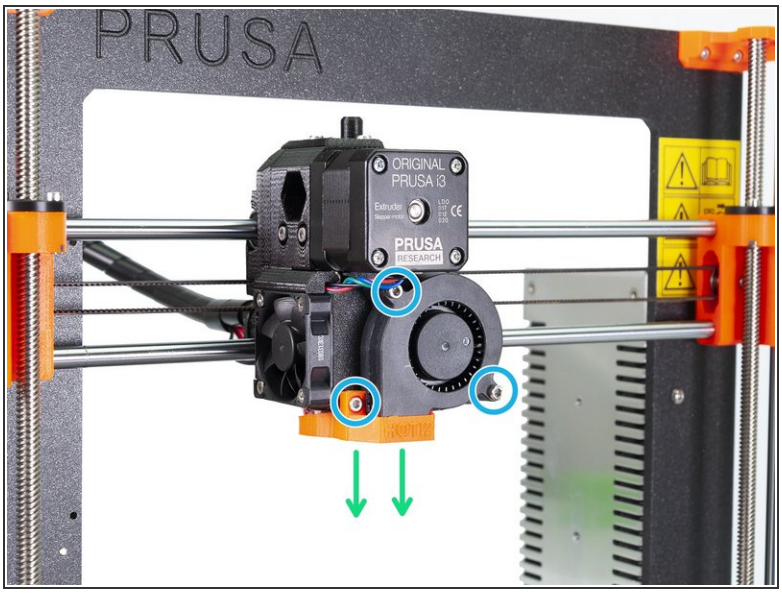


Attention: Tools aren't part of the upgrade package. You have to get yours.

- **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.

Step 3 — Nozzle-fan and print fan removal

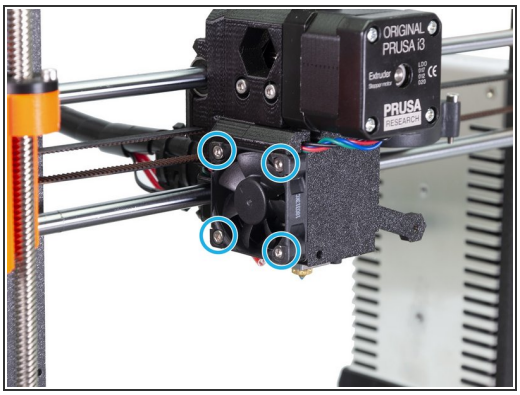


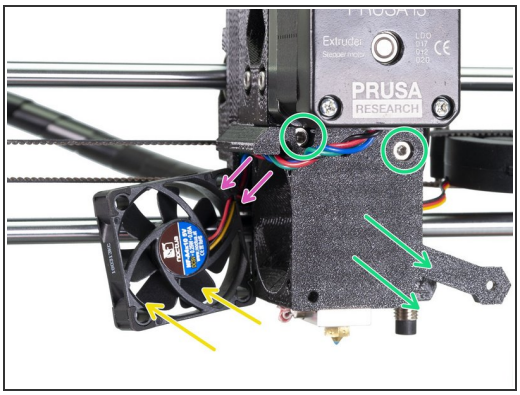
⚠ Ensure the **filament is not loaded** in the hotend. **Remove it** before proceeding further.

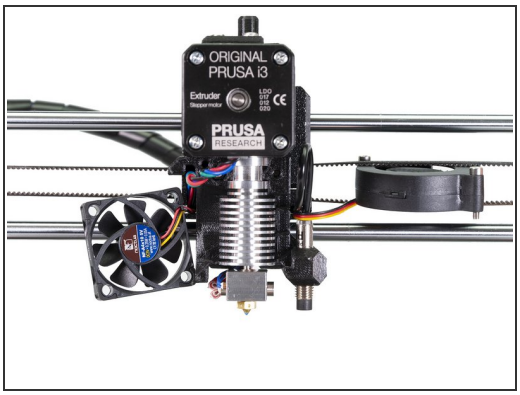
- Release the marked M3 screws.
- Remove the nozzle-fan printed part completely.
- Carefully insert the Front print fan in the X-axis belt.

ⓘ The nozzle-fan will be replaced with a new one.

Step 4 — Left hotend fan removal



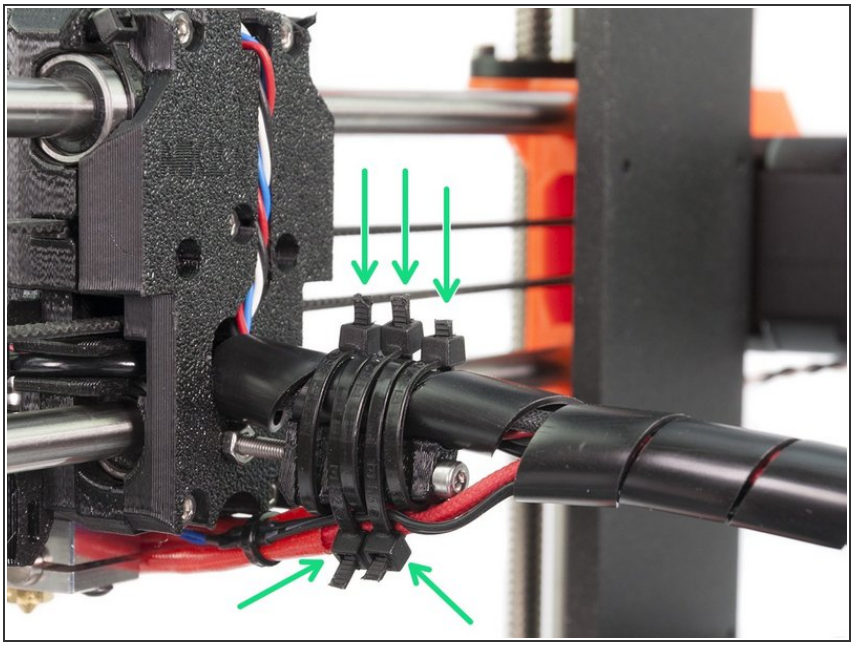




- Release and remove all four M3x18 screws on the Left hotend fan.
- Move the fan carefully away from the extruder body as far as the cable allows.
- Move the extruder motor cable from the channel.
- Release and remove both M3x25 screws, then remove carefully the extruder-cover part.
- Your extruder and fan arrangement should look like in the last picture.

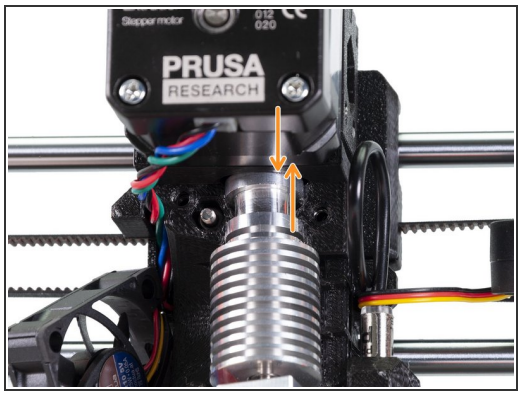
ⓘ The extruder-cover will be replaced with a new one.

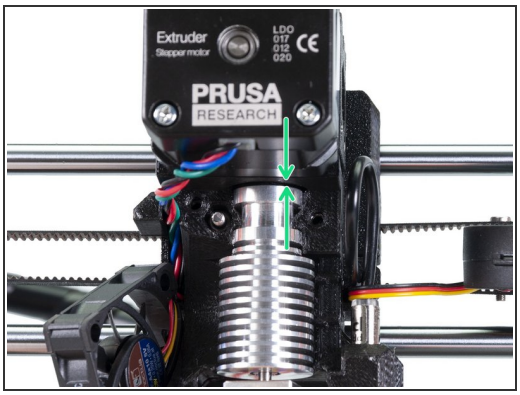
Step 5 — Zip ties removal

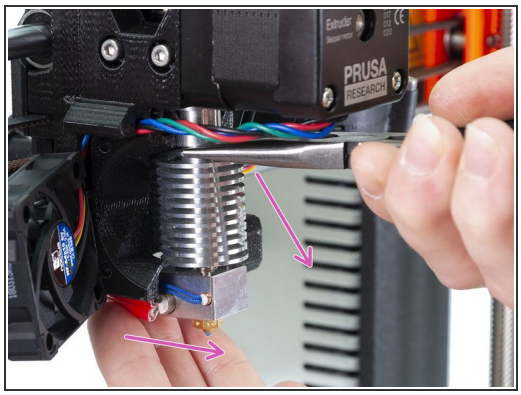


- Turn the printer around and cut **all five zip ties** on the extruder cable bundle. Be very careful while cutting!

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.

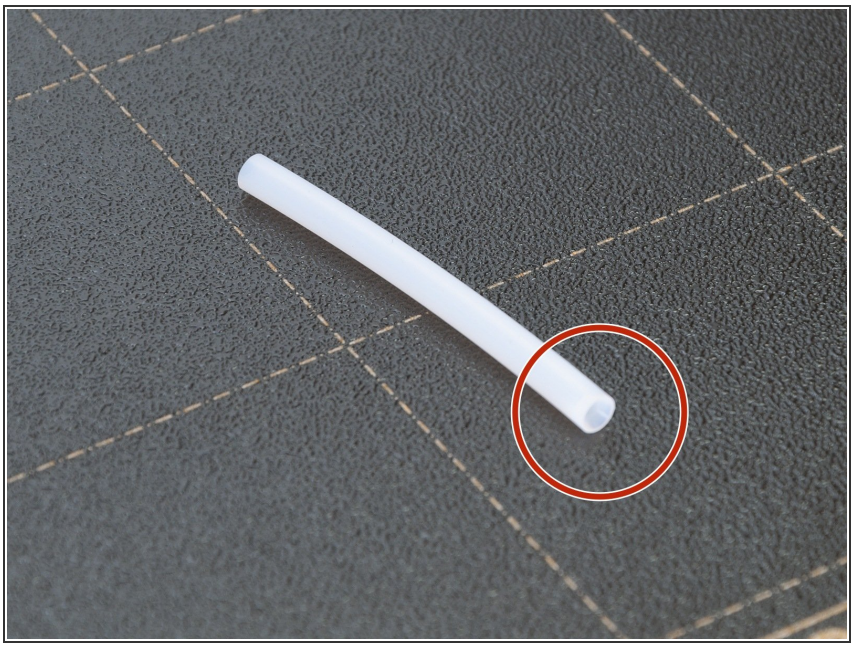
Step 7 — Removing the old PTFE tube (optional)

⚠ **This step is optional**, however if you have a spare PTFE tube it might be a good time to check your current tube for any defects and if needed replace it.

- In case your PTFE tube is fine or you don't have a spare, please skip to Step 11
- Press the black plastic collet.
- Remove the PTFE tube from the hotend.

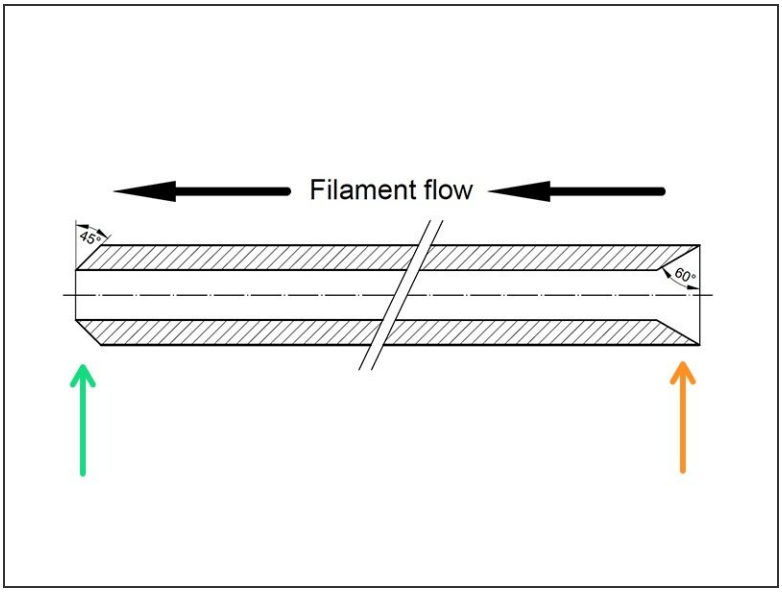
⚠ **Throw this old tube immediately to the nearest trash bin** to avoid installing it back by accident ;)

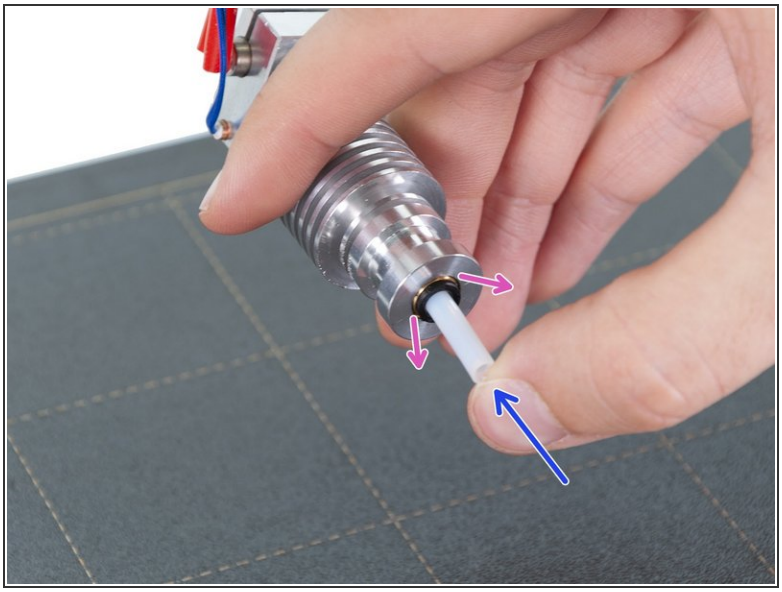
Step 8 — Preparing the necessary parts (optional)



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

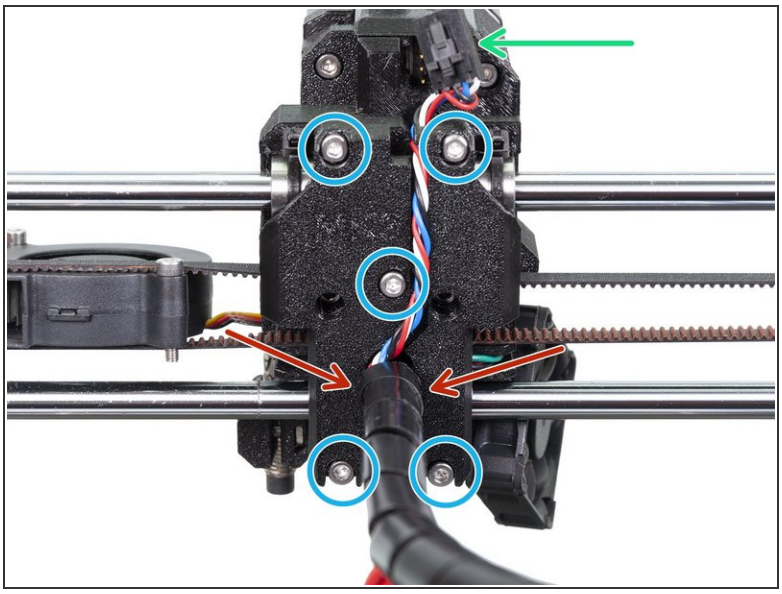
Step 9 — Assembling the new PTFE tube (optional)

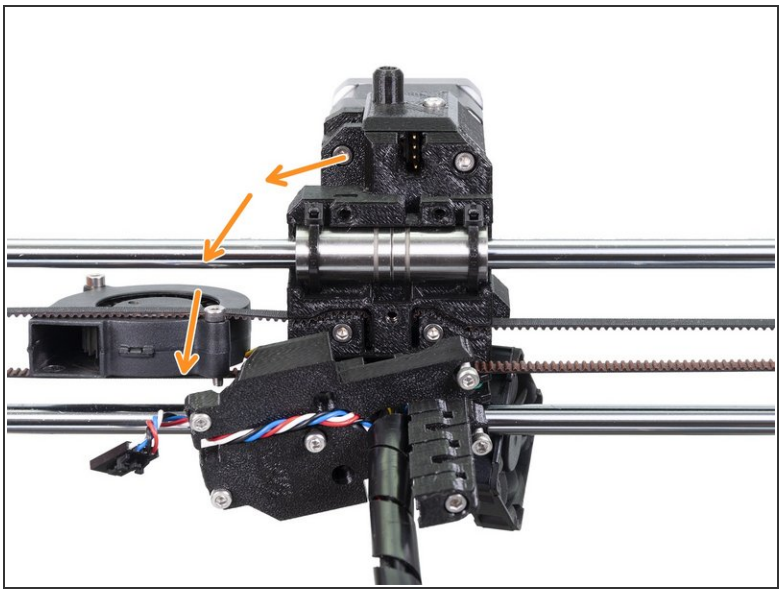




- Now it is time to insert the new PTFE tube. Note there are two different ends.
- One end of the tube has **"rounded" outer edge**. This end must be **inside the hotend**.
- Look at the other end, where the tube is drilled inside, shape of the **edge is "conical"**. This is the side, where filament 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.

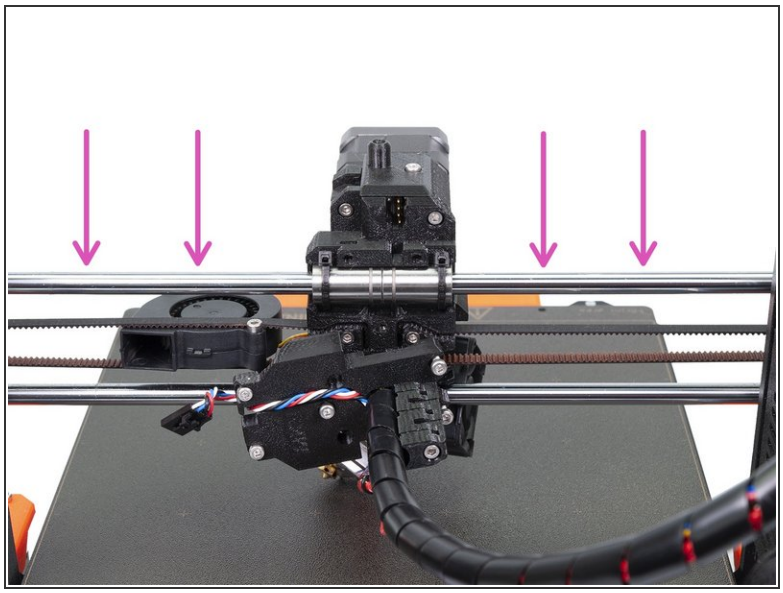
Step 10 — Releasing the x-carriage-back

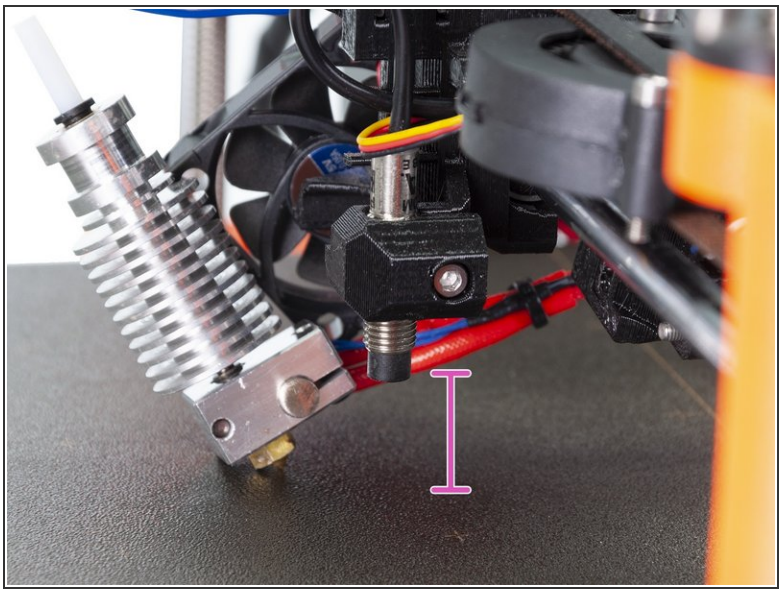




- Carefully press the safety pin and unplug the filament sensor cable connector.
- **Release all five** M3x10 screws, you can leave them in the printed part.
- Make sure there are no zip ties left! Remove them before proceeding.
- Carefully rotate the x-carriage-back printed part to the left. Make sure you are not twisting the cables.

Step 11 — Moving the X-axis

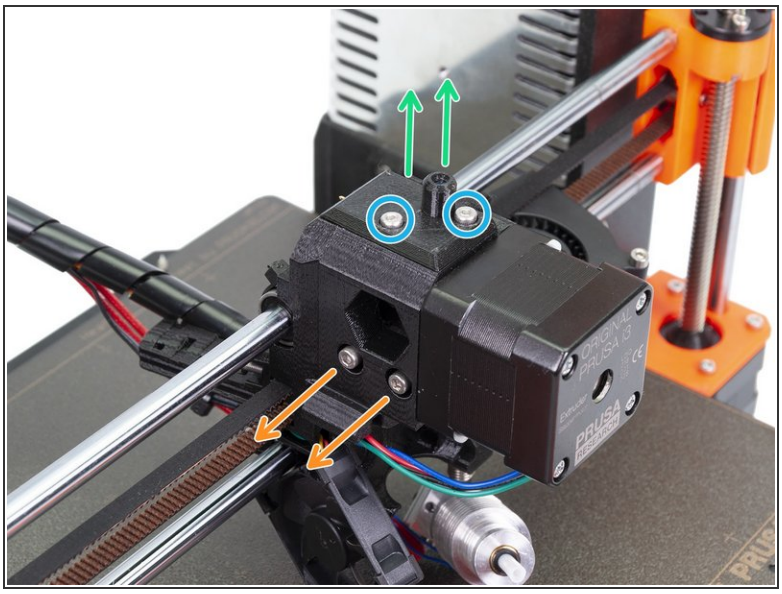


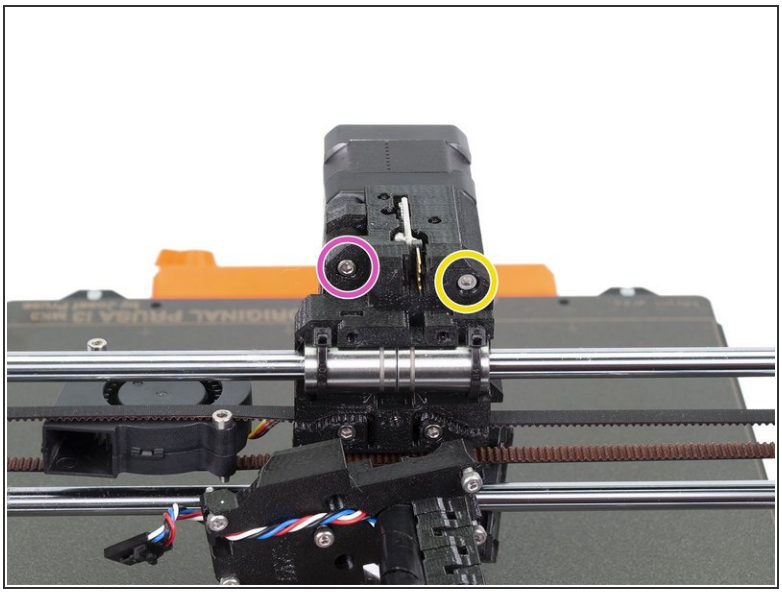


- Using both hands lower slowly the X-axis down. Stop when the P.I.N.D.A. is around 2-3 cm above the surface.

⚠ **Proceed carefully** as you might scratch the surface.

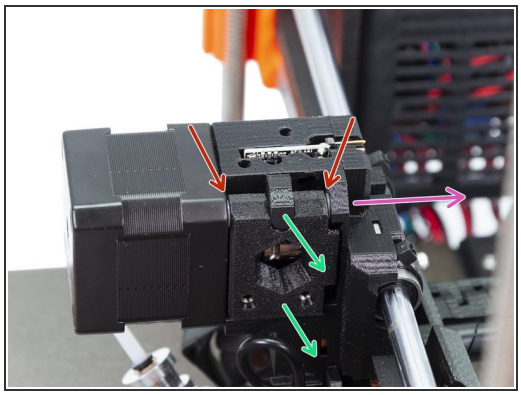
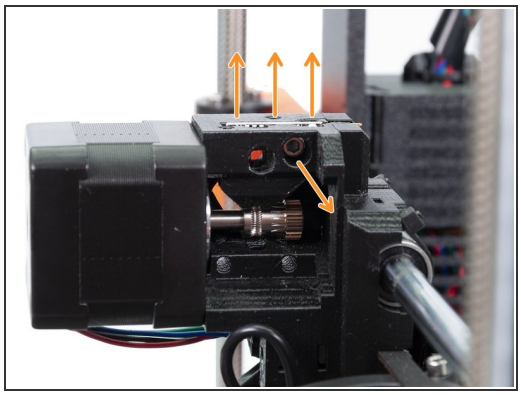
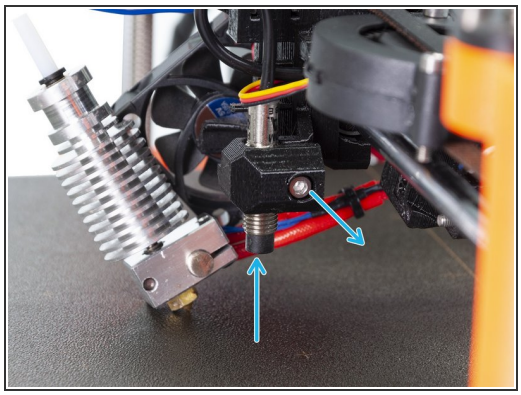
Step 12 — Removing the filament sensor cover





- 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.

Step 13 — Removing the idler and P.I.N.D.A. sensor

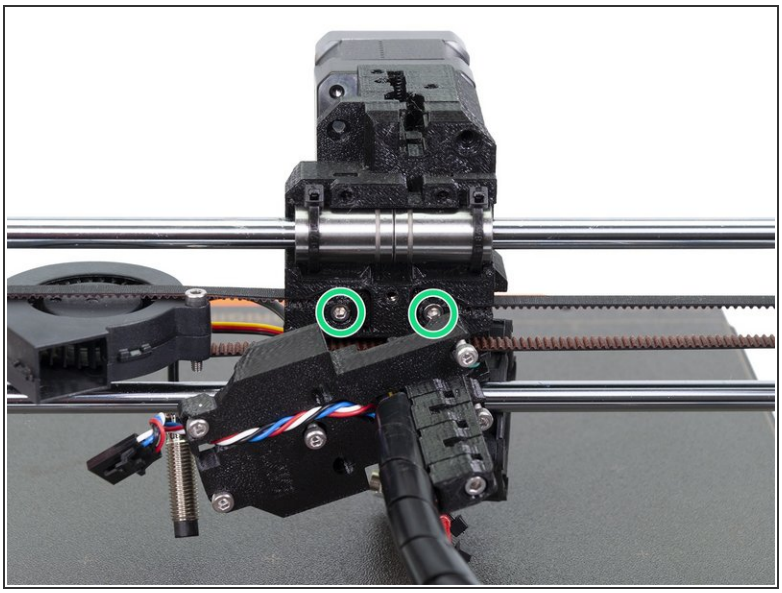




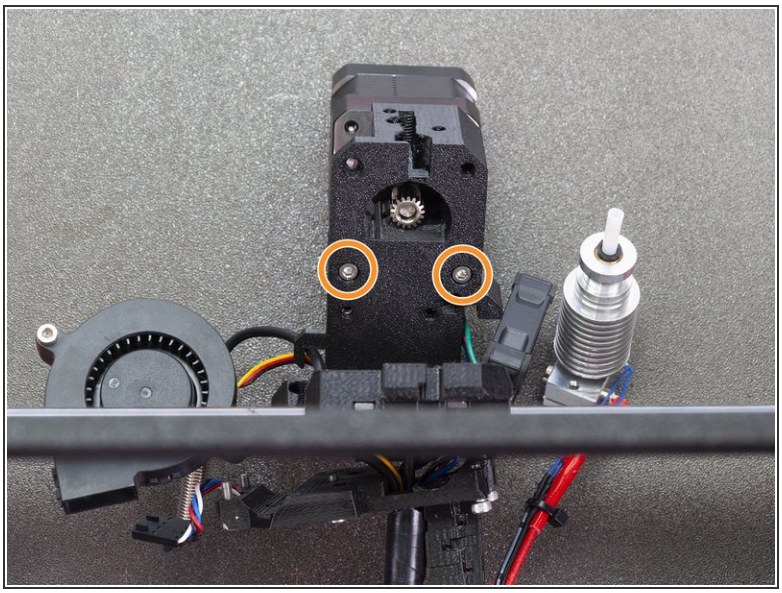
⚠ In this step, we will remove the idler part. Before doing so, **make sure you catch two translucent washers**, which are on both sides!

- 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.

Step 14 — Removing the extruder motor



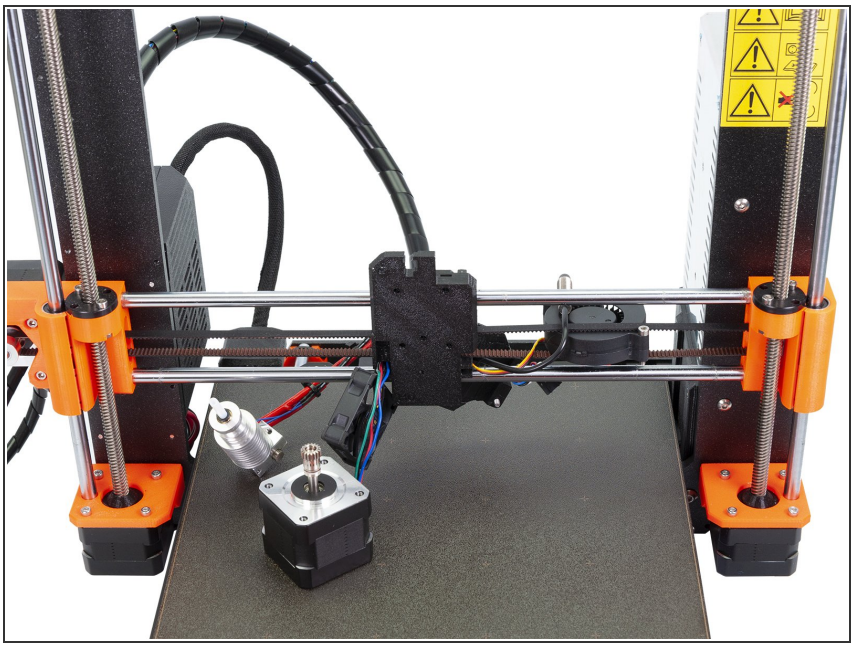


⚠ In this step, the extruder body will fall apart, **make sure you hold the motor in the front!**

- 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.

Step 15 — Extruder surgery is finished!

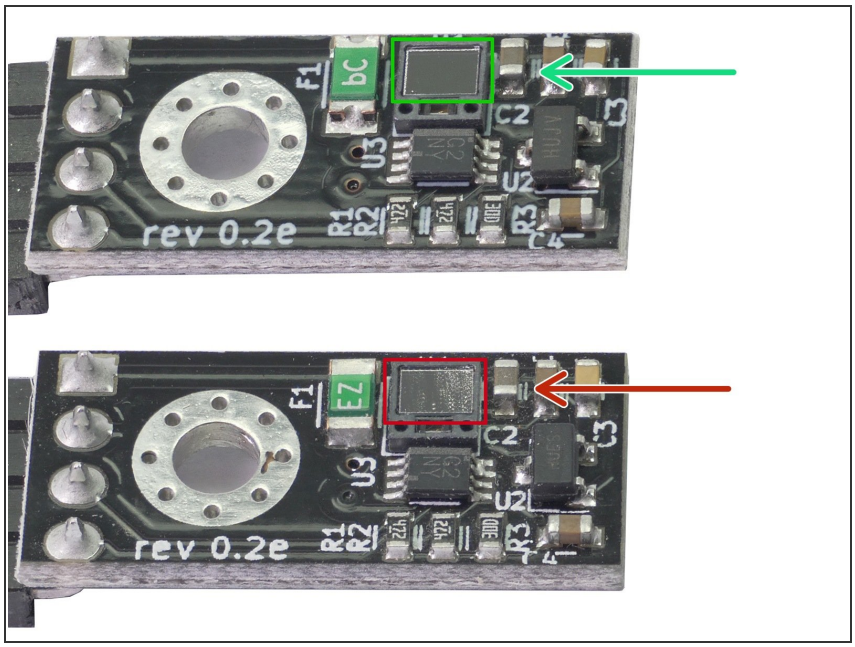


- The final check of the surgery!
- Majority of the extruder's printed parts should be removed. The only remaining parts are X-carriage and X-carriage-back.

⚠ 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.

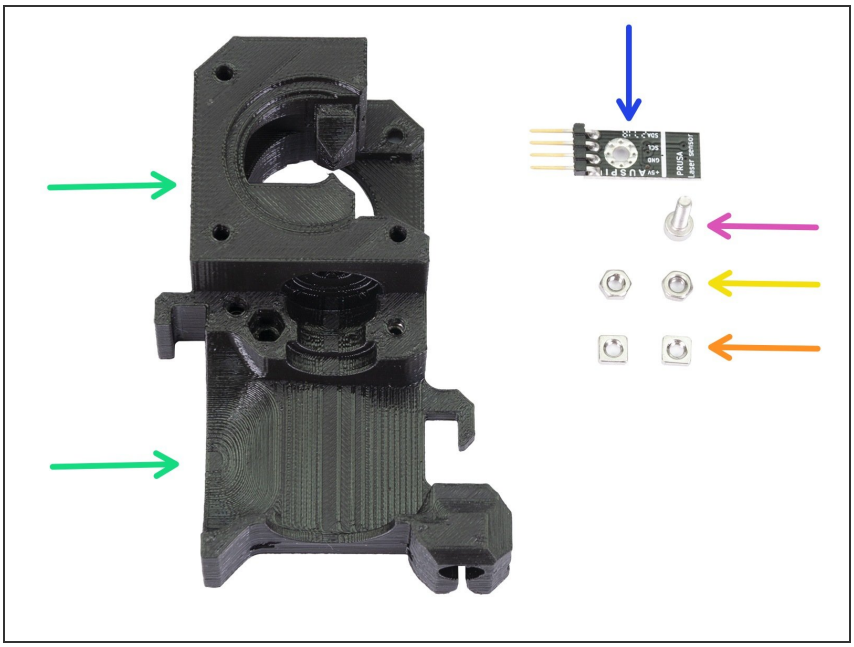
Step 16 — Filament sensor cleanup



- 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.

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!

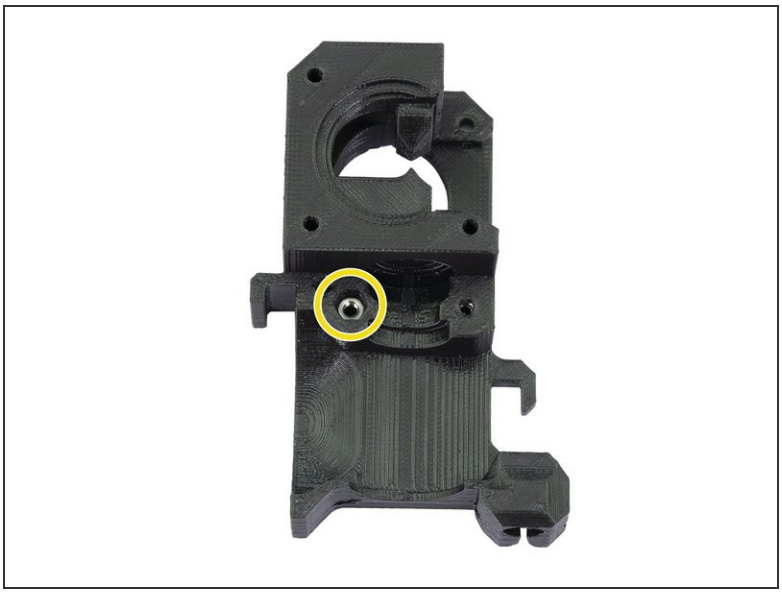
Step 17 — Assembling filament sensor (part 1)

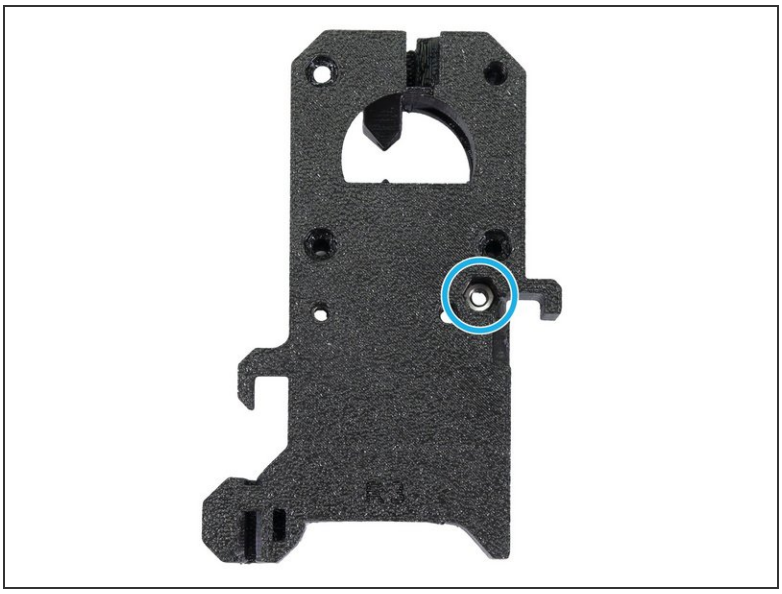


⚠ **BE CAREFUL** with the filament sensor, do not touch the black PCB nor the chips on it.

- For the following steps, please prepare:
- Extruder-body B7 (1x)
- Filament sensor (1x)
- M3x10 screw (1x)
- M3n nut (2x)
- M3nS nut (2x)

Step 18 — Assembling filament sensor (part 2)



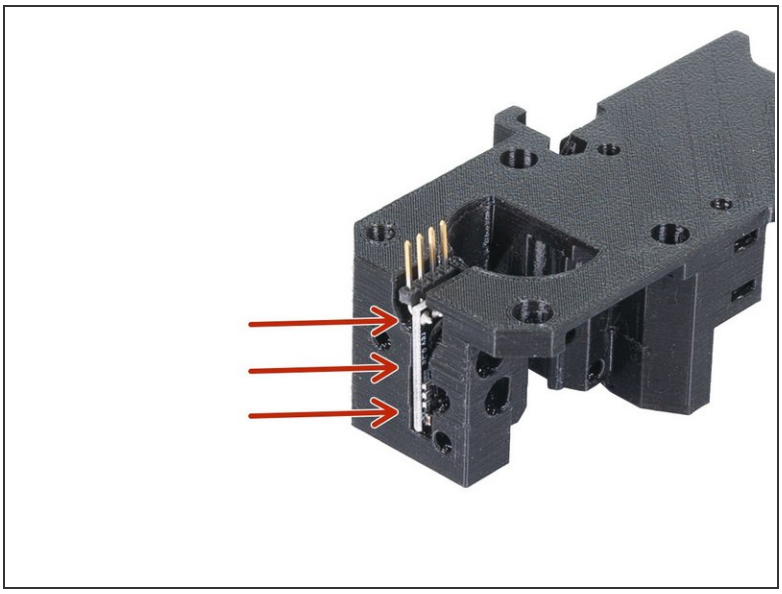


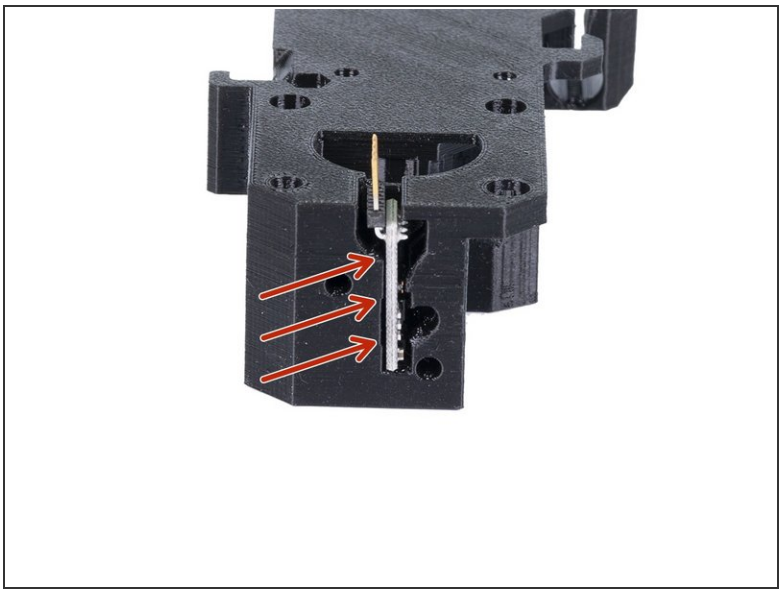
⚠ Before we continue with the assembly, we need to insert nuts in the Extruder-body. Take the extra time and effort to place them in properly. **You won't be able to reach them later.**

- 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.

ⓘ 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.

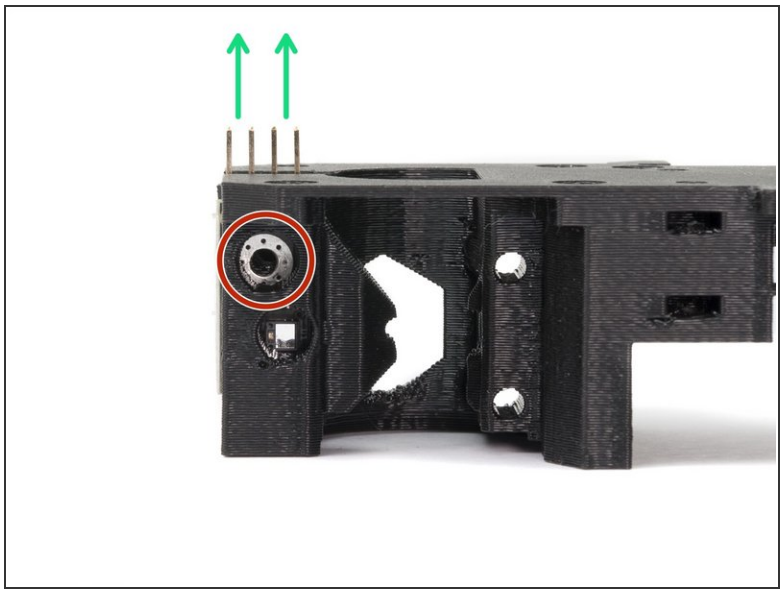
Step 19 — Assembling filament sensor (part 3)

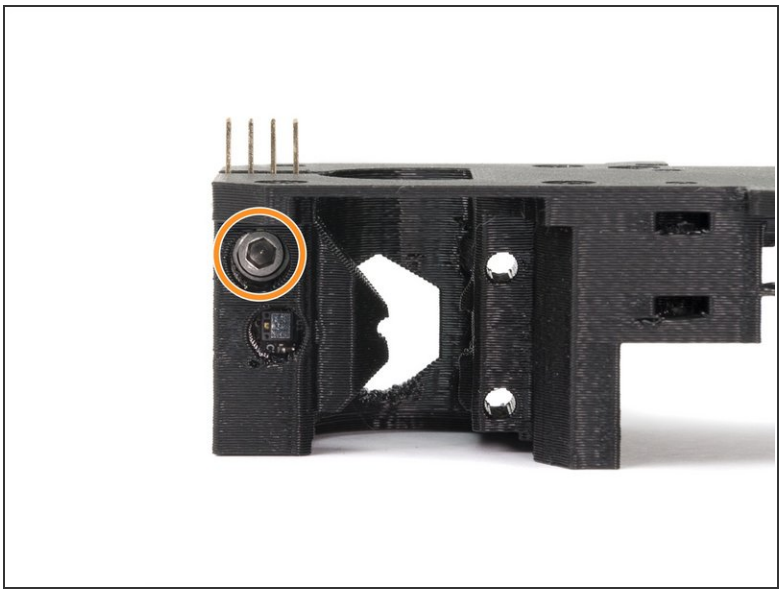




- **Carefully insert** the filament sensor in the slot, **do not use force** or you might damage the PCB!

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.

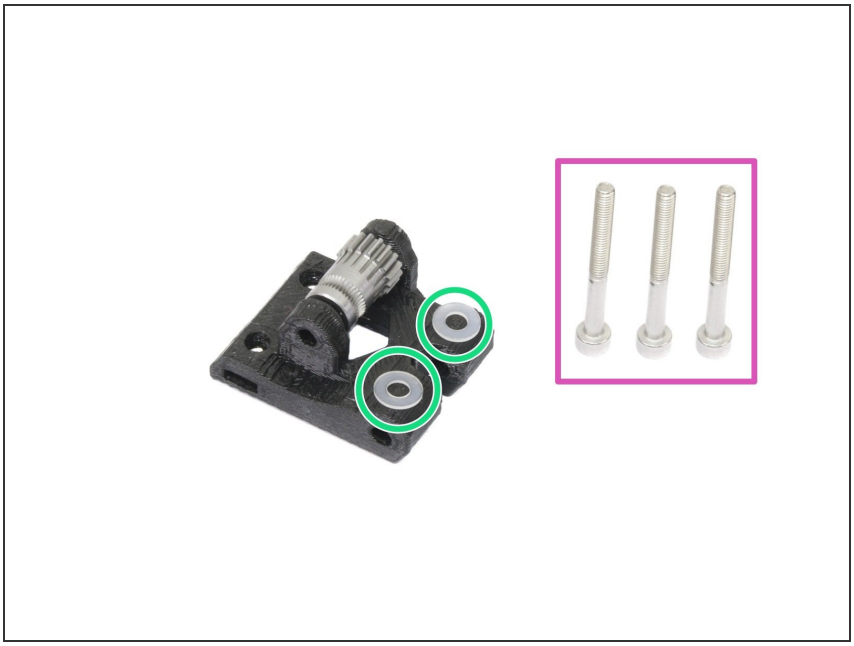
ⓘ Layers might be visible in this printed part due to the geometry. The functionality and strength remain unaffected.

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.

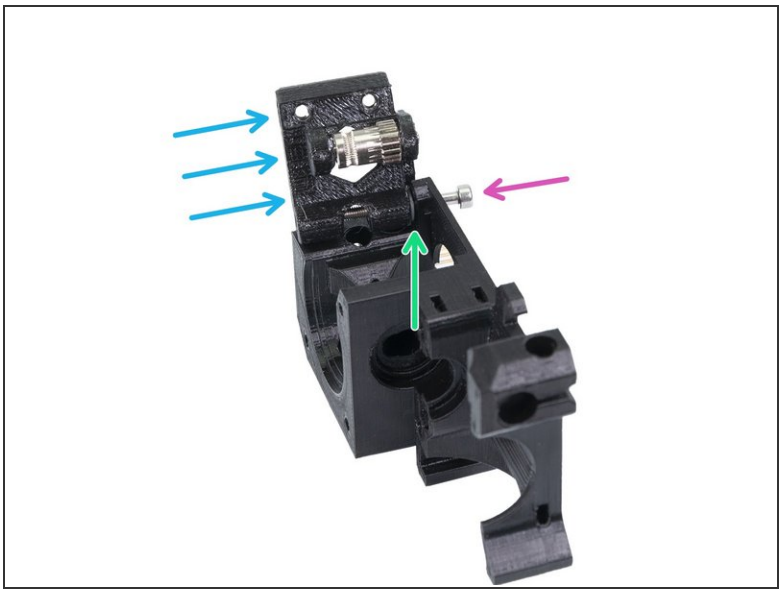
ⓘ Check proper alignment with the 1.5mm Allen key.

Step 22 — Extruder assembly - idler (part 1)



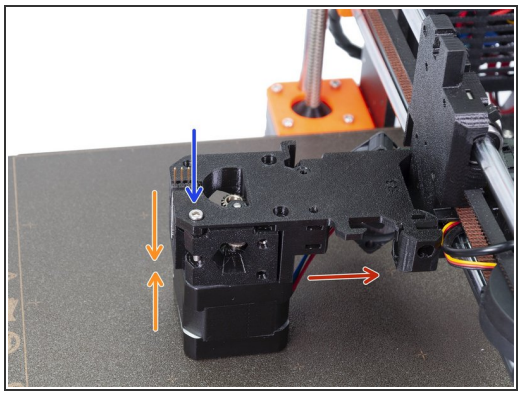
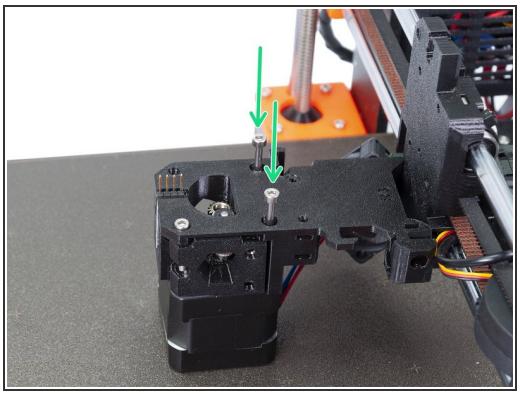
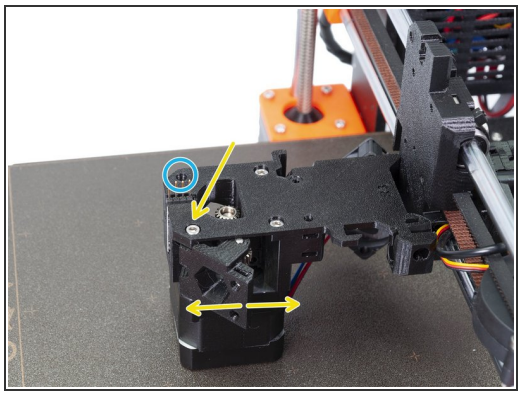
- For the following step, please prepare:
- M3x30 screw (3x)
- M3 translucent washer (2x)
- Translucent washers are placed on the idler for better visibility. No need to place them as in the picture ;)

Step 23 — Extruder assembly - idler (part 2)



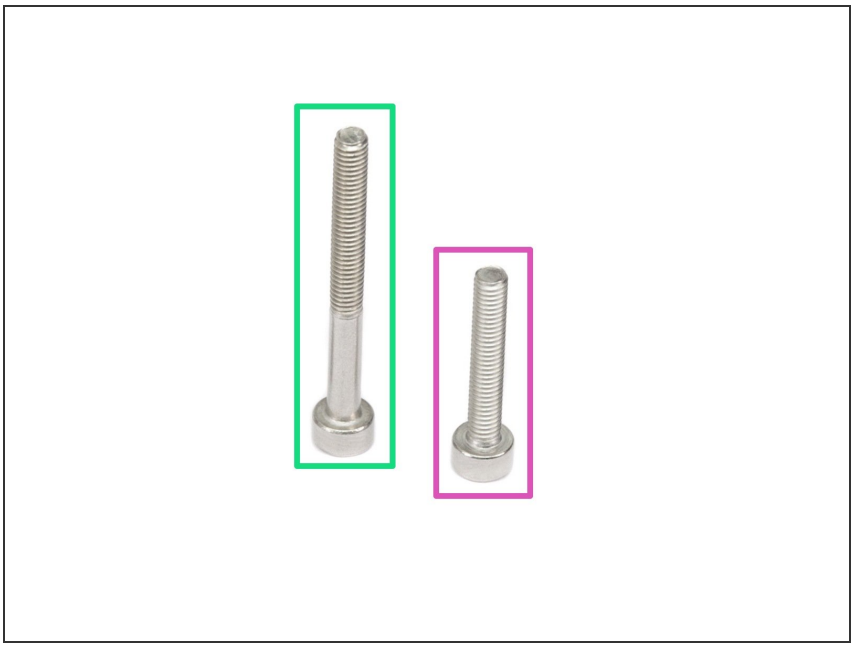
- Turn the Extruder-body like in the picture.
- Insert M3x30 screw in the hole.
- Place a washer from the other side.
- Assemble the idler on the M3x30 screw.
- Finish the assembly with the second washer.

Step 24 — Extruder motor assembly

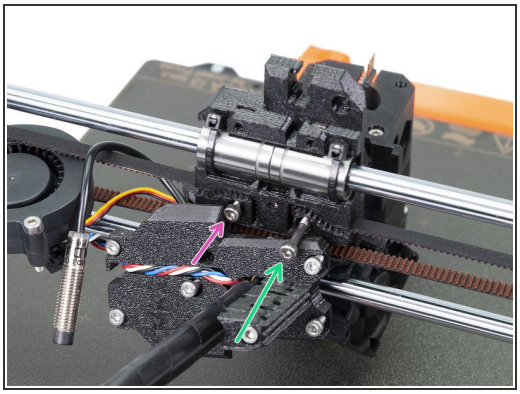
- Connect carefully the extruder-body with the extruder motor and place it on the heatbed.
- Motor cable should be pointing in the indicated direction.
- Make sure both parts are properly aligned, then slightly tighten the M3x30 screw.
- Insert two M3x30 screws and tighten them firmly.
- Return to the 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 ;)

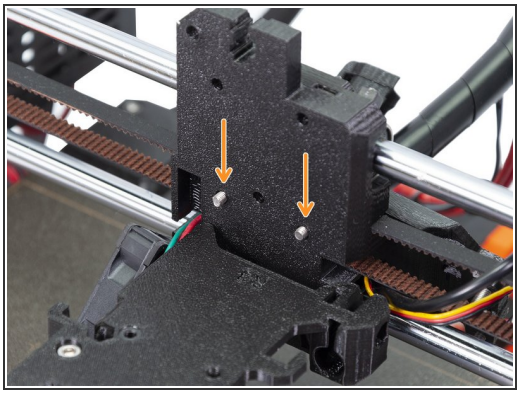
Step 25 — Mounting the extruder (part 1)

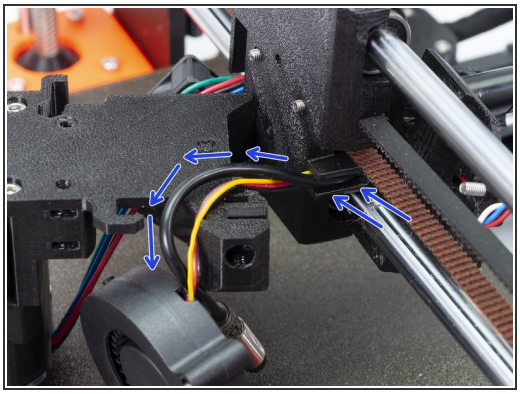


- For the following step, please prepare:
- M3x30 screw (1x)
- M3x18 screw (1x)

Step 26 — Mounting the extruder (part 2)

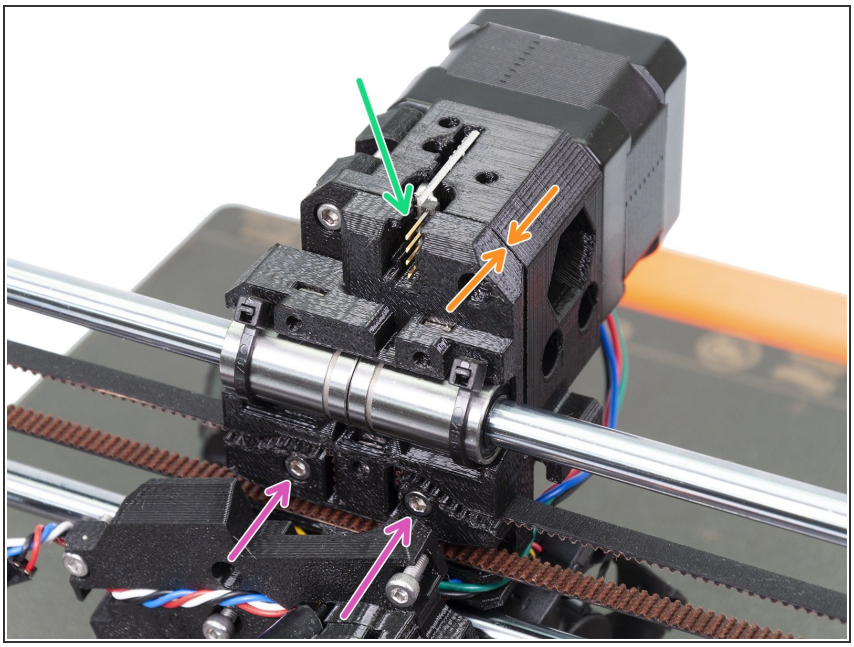






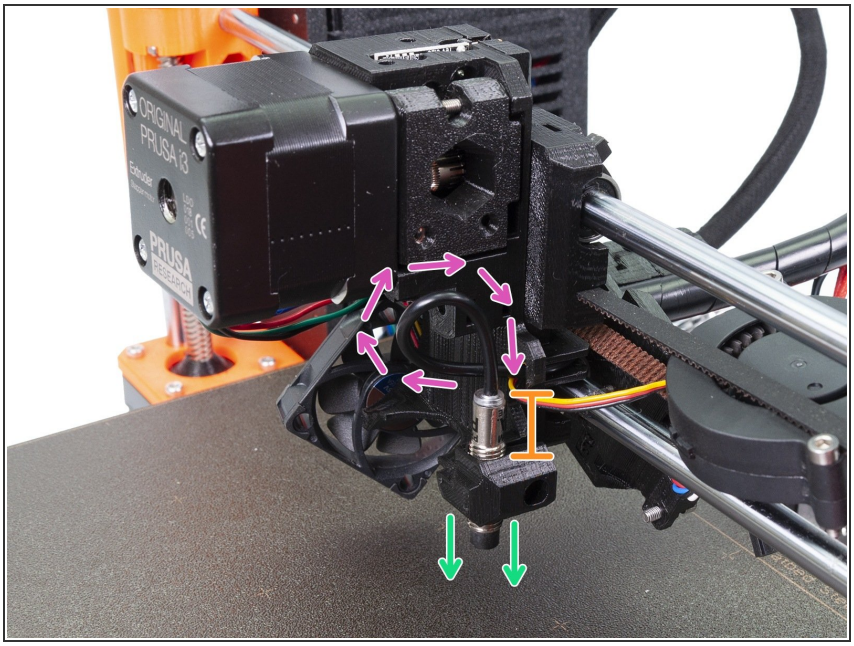
- Place the shorter M3x18 screw in the left hole.
- Place the longer M3x30 screw in the right hole.
- Check from the other side of the X-carriage, that both screws are few millimetres out. It will help you during the assembly.
- Before you move to the next step, arrange the P.I.N.D.A. sensor and Front 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!**

Step 27 — Mounting the extruder (part 3)



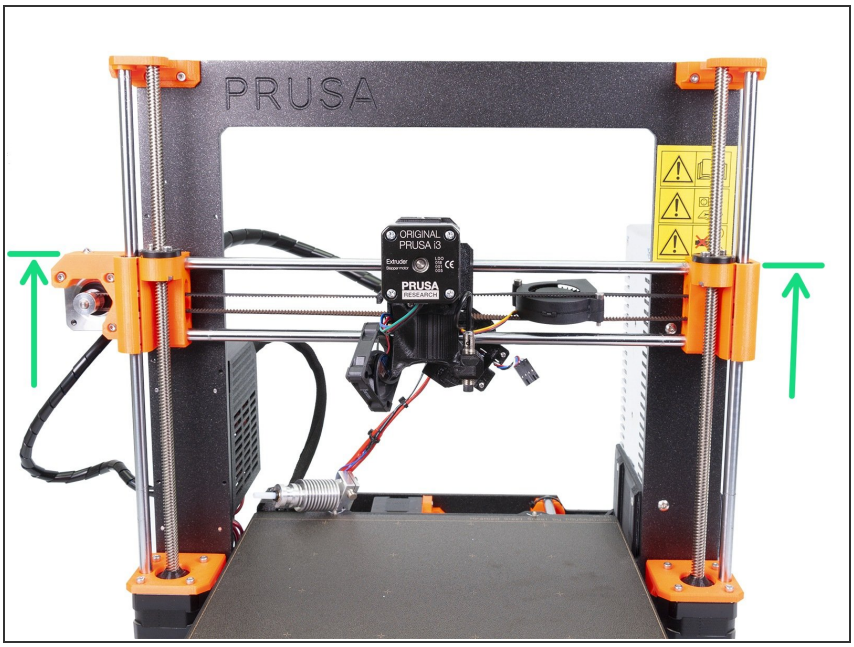
- Mount the extruder-body on the X-carriage and tighten slightly both screws.
- Make sure no wires are pinched between both plastic parts.
- Make sure the pins of the filament sensor aren't bent or in contact with the printed parts.
- Check the proper alignment using the edge of both parts.
- Tighten both screws.

Step 28 — P.I.N.D.A. sensor reassembly



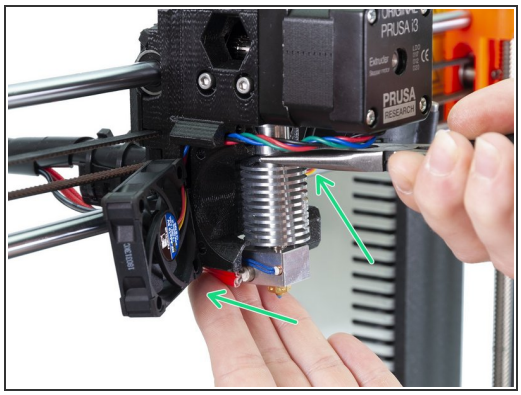
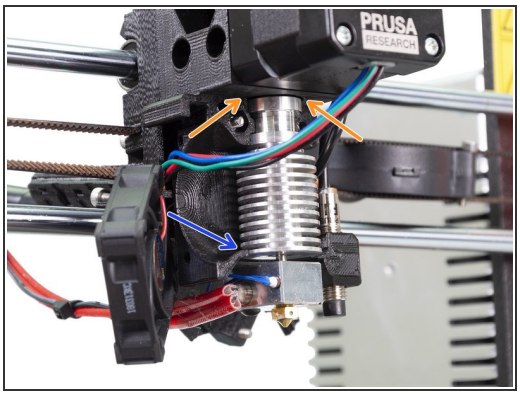
- Create a loop on the P.I.N.D.A. sensor cable.
- Slide the sensor in the holder on the extruder body.
- Exact position will be set later. For now, leave it about 10 mm (0.4 inch) above the holder.

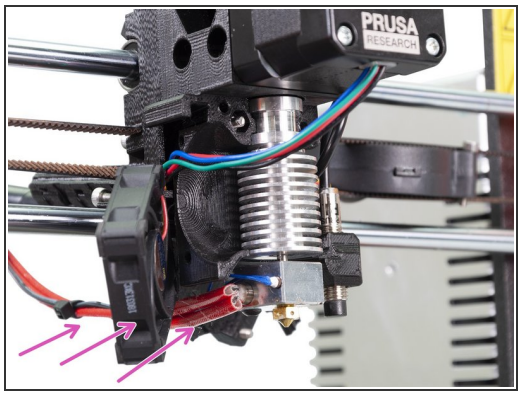
Step 29 — Adjusting the X-axis



- 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.
- Move both sides up simultaneously!

Step 30 — Inserting the E3D hotend

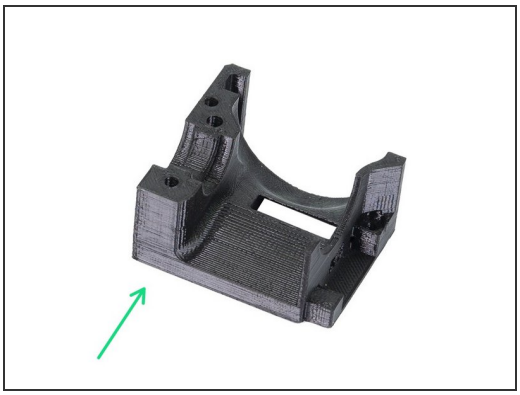
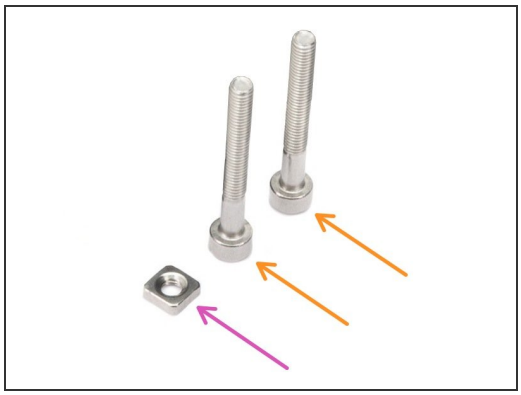
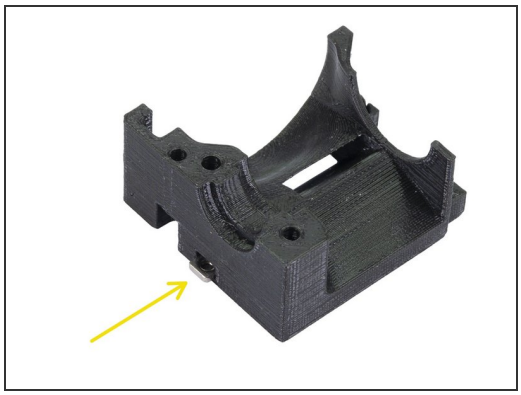


- Carefully slide the hotend back to the extruder-body.

⚠ **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!

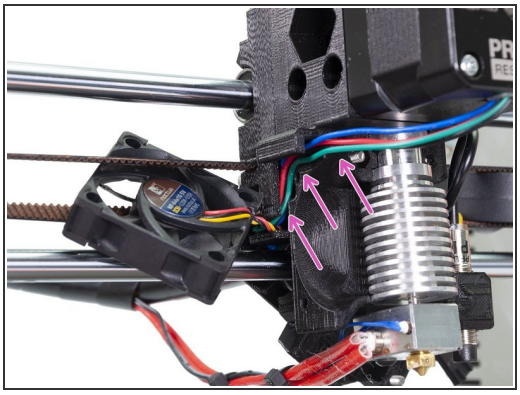
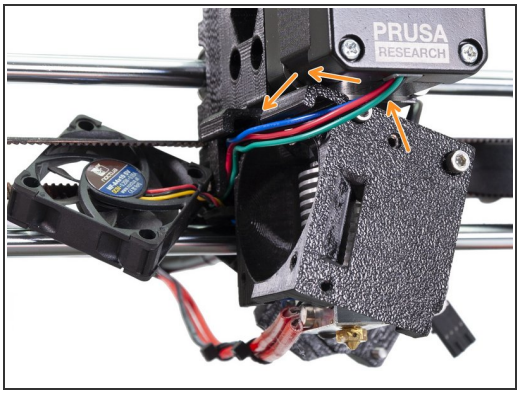
- Where to check the alignment:
  - There should be no gap between the extruder-body and the hotend.
  - The last rib on the hotend's heatsink is should aligned with the printed part. See the photo.
- Make sure the hotend's cables are on the left side. Compare your assembly with the picture.

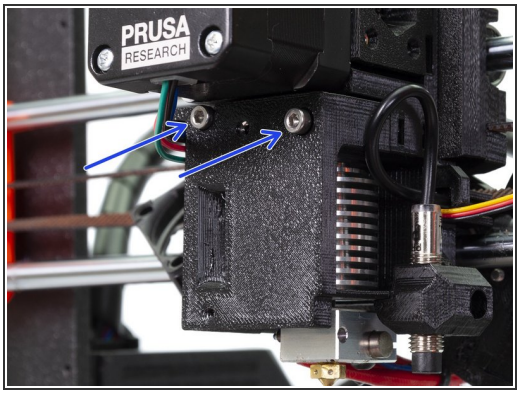
Step 31 — Mounting the extruder-cover (part 1)

- 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)



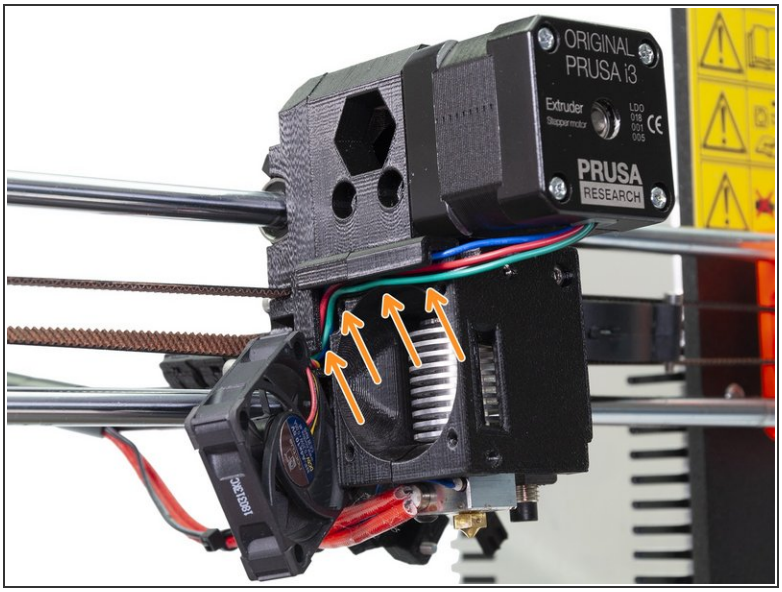
- Arrange the extruder motor cables in the channel all the way to the back.
- Insert both M3x25 screws in the extruder-cover and slide it in above the cables.
- Check the parts alignment and tighten both parts together.

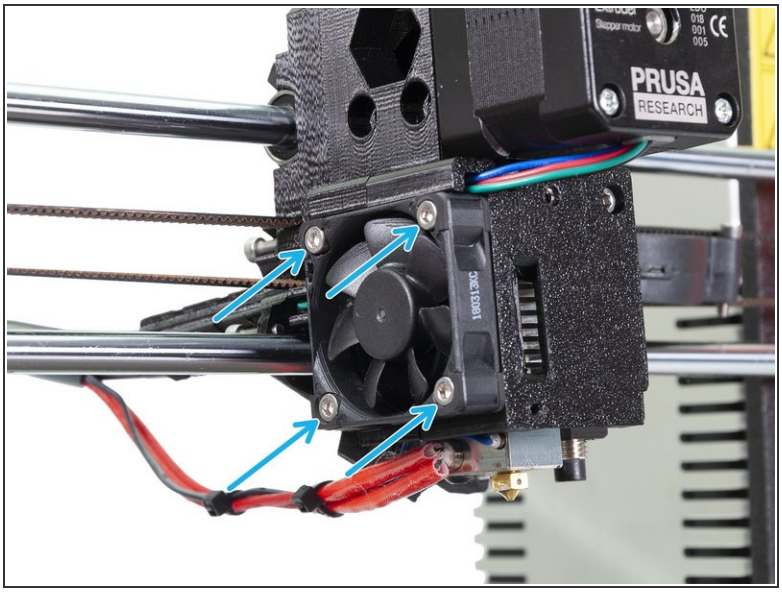
Step 33 — Mounting the Left hotend fan (part 1)

- For the following steps, please prepare:
- M3x18 screw (4x)

The screws might be already in the Noctua fan.

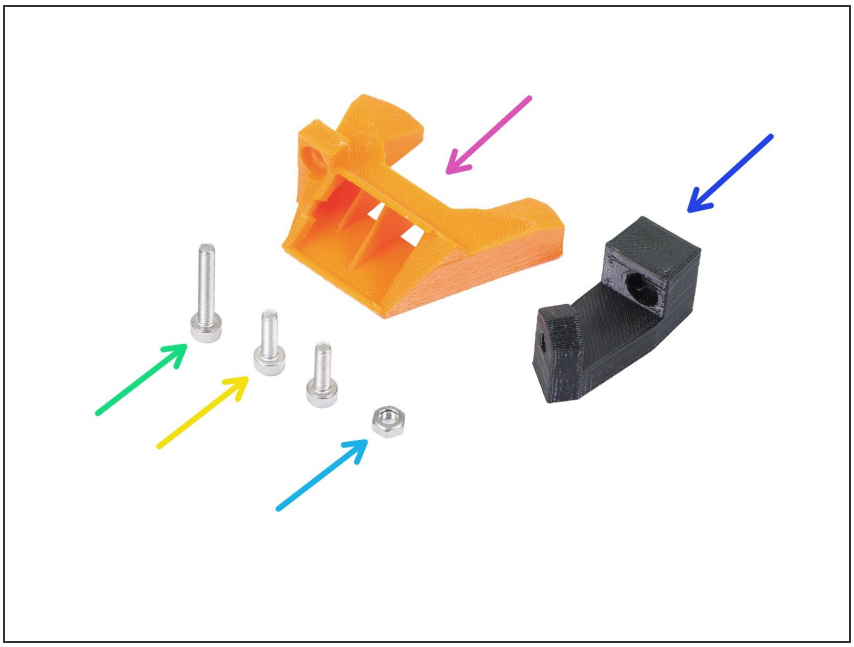
Step 34 — Mounting the Left hotend fan (part 2)





- 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.

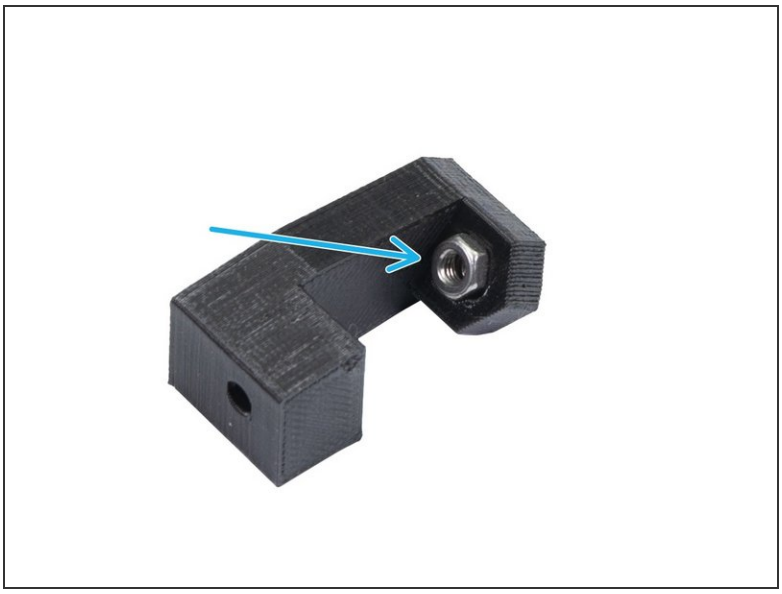
Step 35 — Mounting the front print fan (part 1)

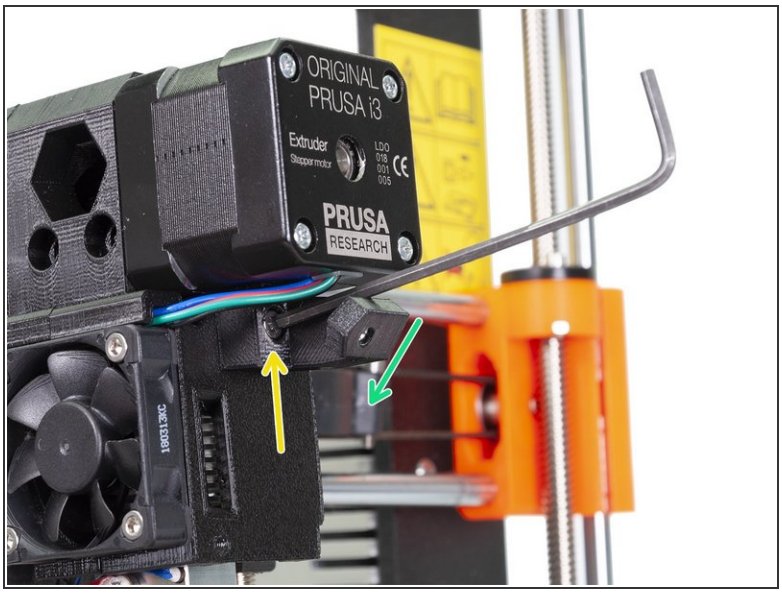


- For the following steps, please prepare:
- nozzle-fan-45deg-support (1x)
- nozzle-fan-45deg (1x)
- M3x18 screw (1x)
- M3x10 screw (2x)
- M3n nut (1x)

In case you are missing one M3x10 screw please use the spare bag.

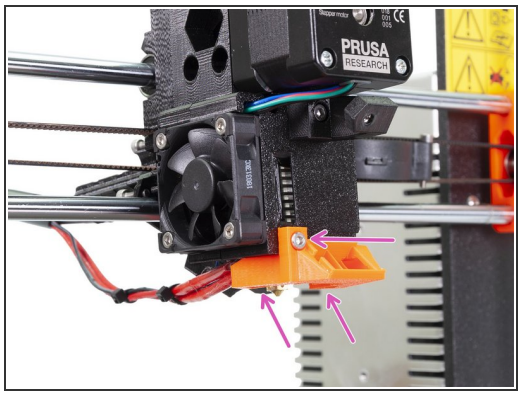
Step 36 — Mounting the front print fan (part 2)

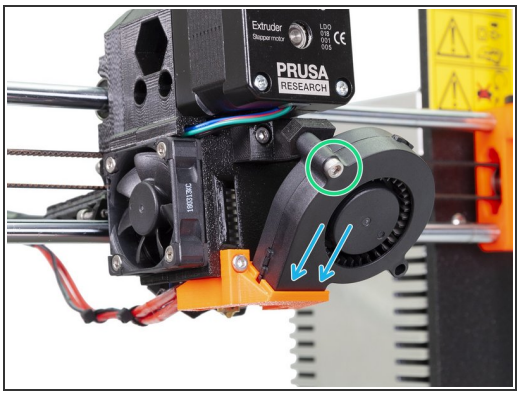


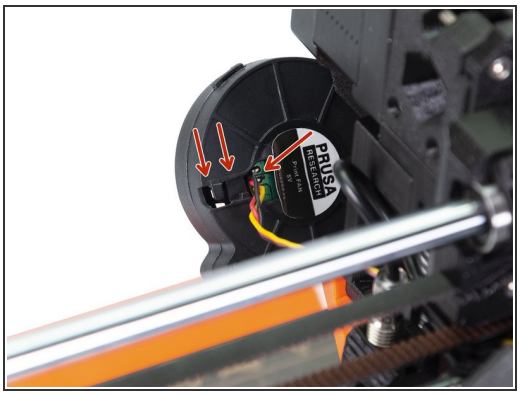


- Press the M3n nut in the support, all the way in. It will be barely visible. If needed use a screw from the other side to pull the nut in, then remove the screw.
- Connect the support to the extruder using the M3x10 screw. Note the correct orientation in the picture.
- The inclined part of the support must be facing to the extruder cover.

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





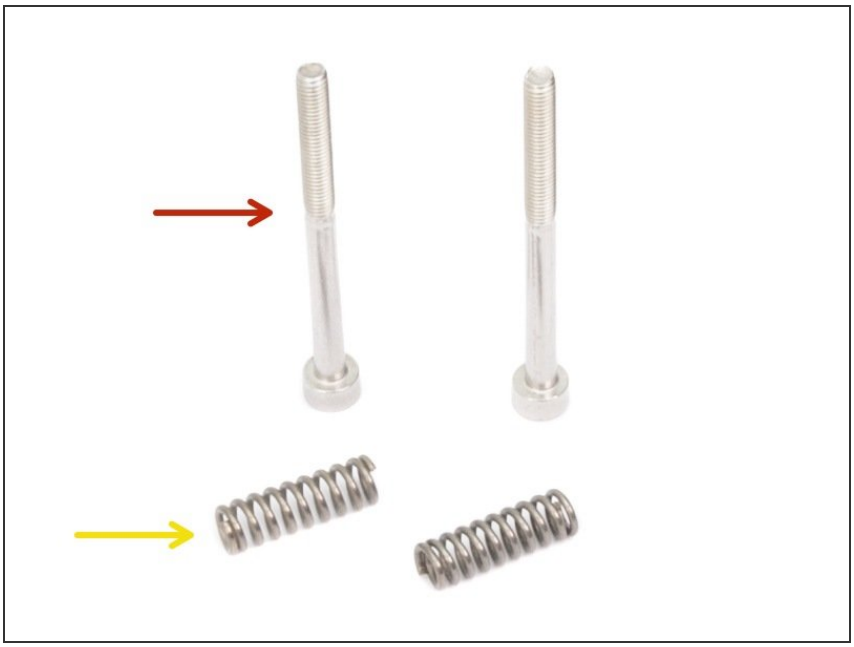


- Place the nozzle-fan on the extruder and secure it using M3x10 screw.
- Slide the Front print fan in the nozzle-fan.
- Secure the fan using an M3x18 screw.

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

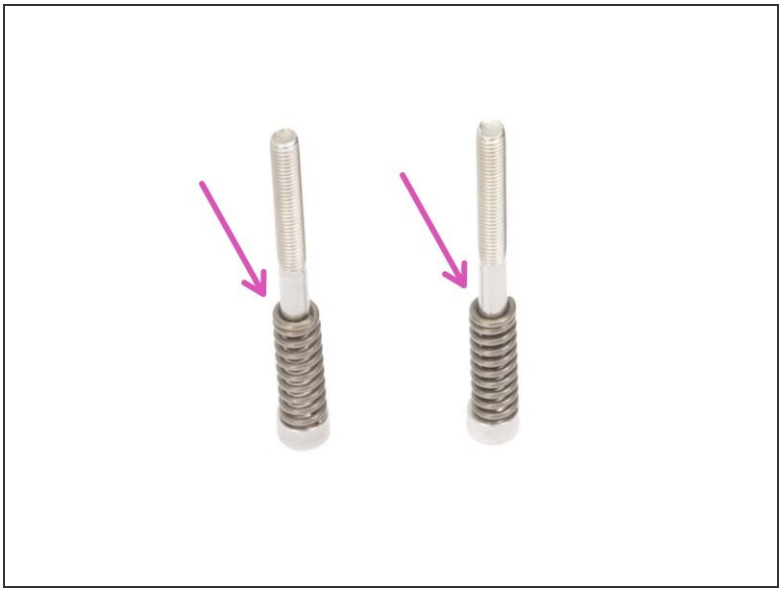
- It might happen the fan cable is too short and you can't incline the fan. First, try gently pulling the cable from the spiral wrap. If this doesn't help there are two options:
  - **In case you will be changing the spiral wrap for the textile sleeve,** you can move the entire cable later, without unhooking 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!**

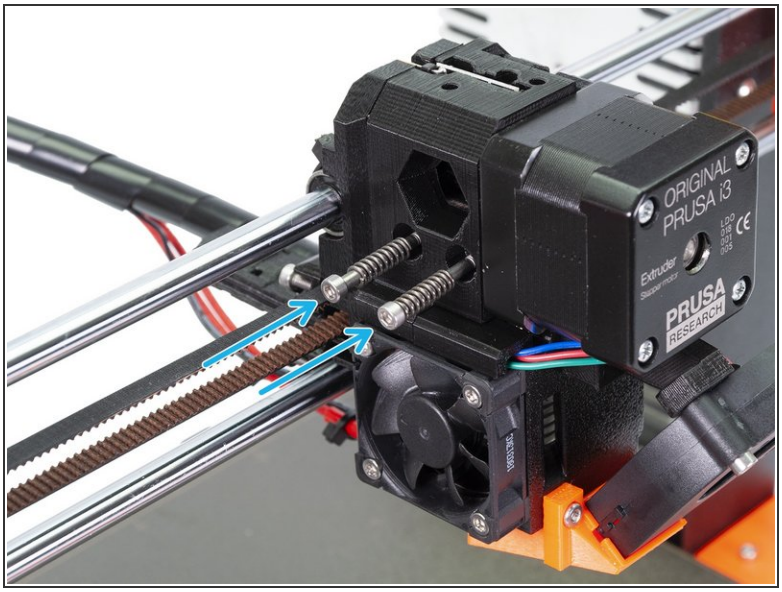
Step 38 — Securing the extruder idler (part 1)



- For the following step, please prepare:
- M3x40 screw (2x)
- Extruder spring (2x)

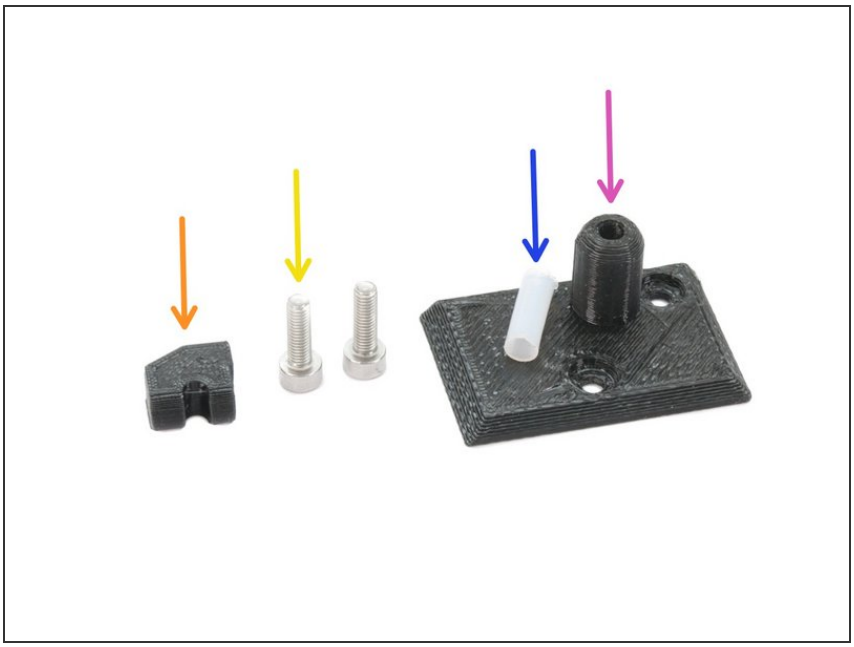
Step 39 — Securing the extruder idler (part 2)





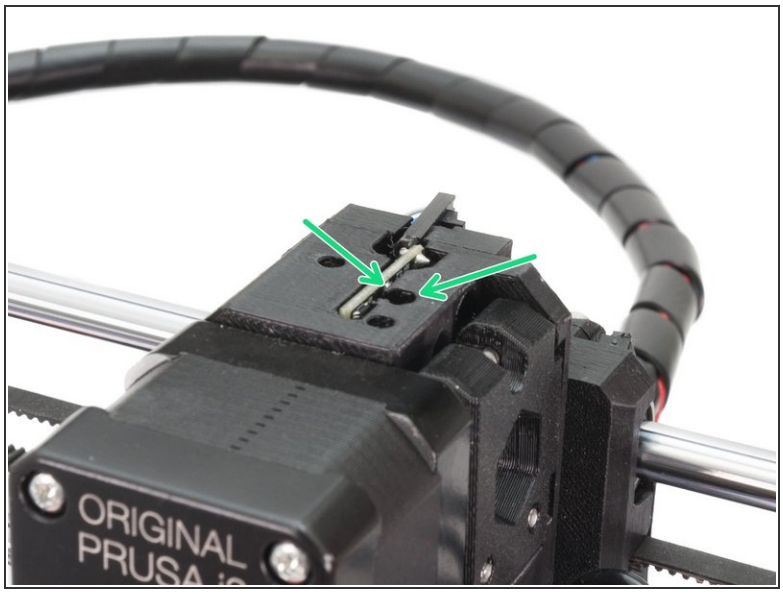
- Assemble springs on both screws.
- Close the idler on the extruder, so the screws can reach it.
- Place both screws into the extruder body and tighten them. The screw's head should be almost aligned with the printed surface.

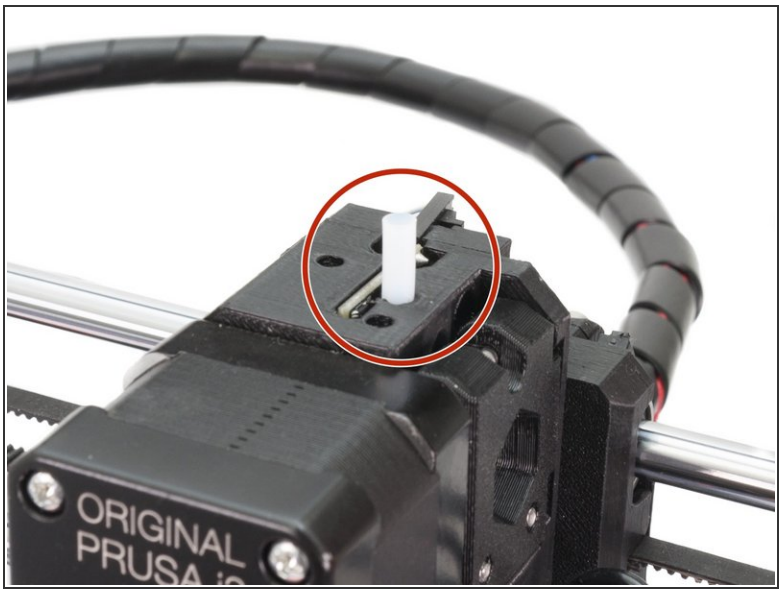
Step 40 — Mounting the Filament-sensor-cover (part 1)



- **For the this step, please prepare:**
- Filament-sensor-cover (1x)
- Idler-plug (1x)
- M3x10 screw (2x)
- PTFE tube 4x13 (1x)

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

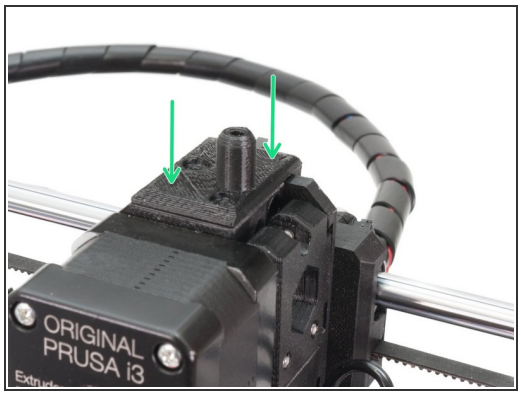


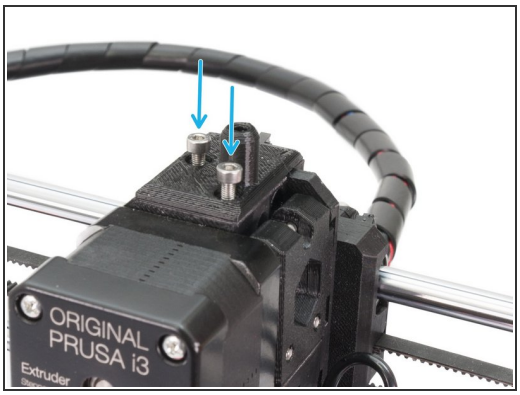


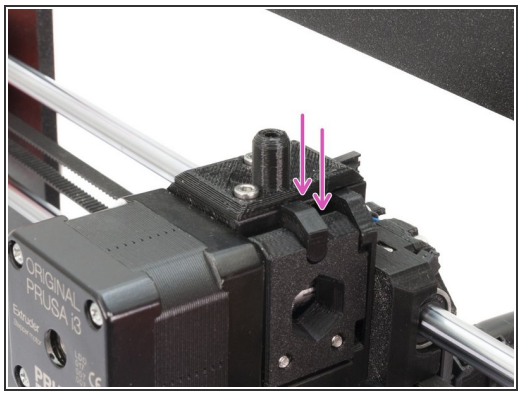
- Locate the largest circular opening for the PTFE tube on the top of the Extruder.
- Push the PTFE tube in. Most of the tube's length will stick out.

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.

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

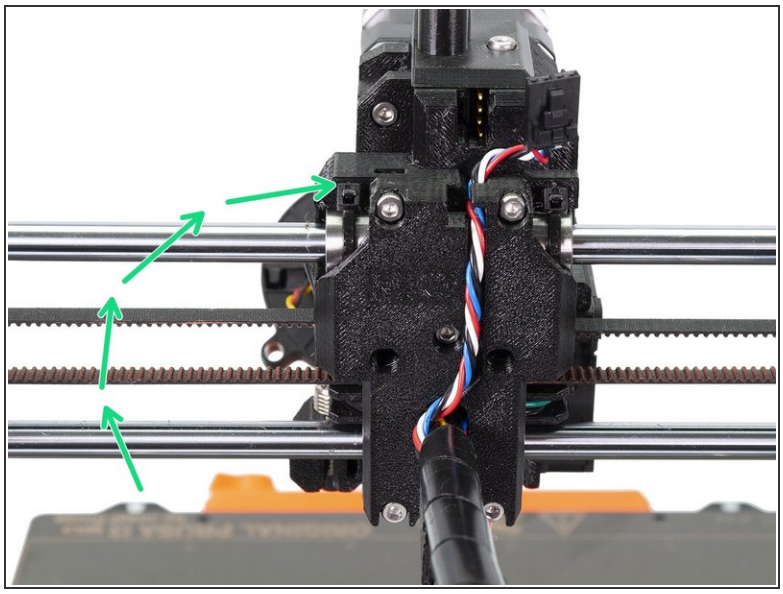


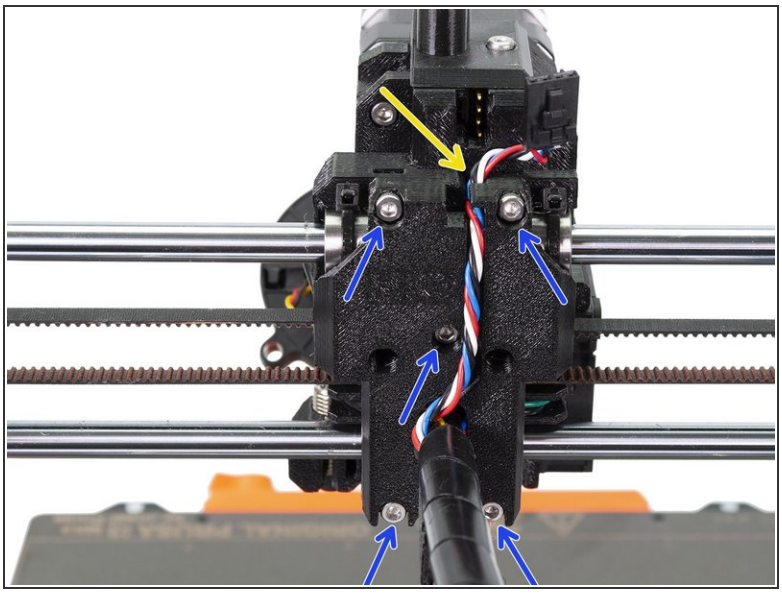




- Carefully slide the filament cover on the PTFE tube.
- Using two M3x10 screws mount the cover.
- Assemble the idler-plug and ensure it fits properly. Otherwise, it might fall down during the print.

Step 43 — X-carriage-back reassembly



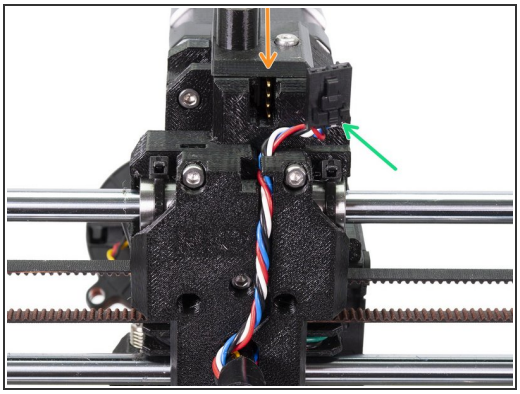


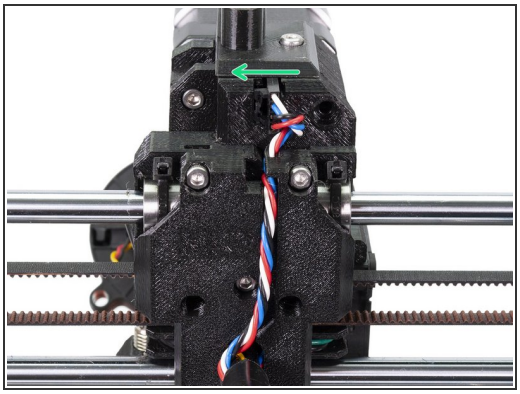
- First, rotate back the X-carriage-back part.
- Ensure no cables are pinched between X-carriage and X-carriage-back.
- Guide the filament sensor cable as in the picture.
- Tighten all five M3x10 screws.

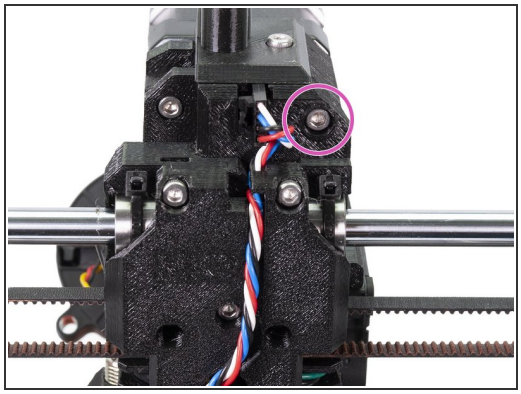
Step 44 — Finishing the extruder-body mounting (part 1)

- For the following steps, please prepare:
- M3x40 screw (1x)

Step 45 — Finishing the extruder-body mounting (part 2)

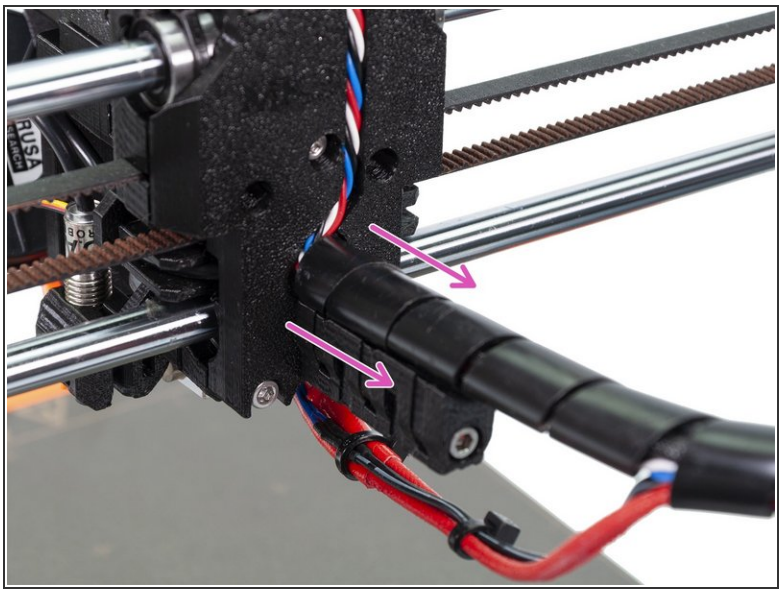


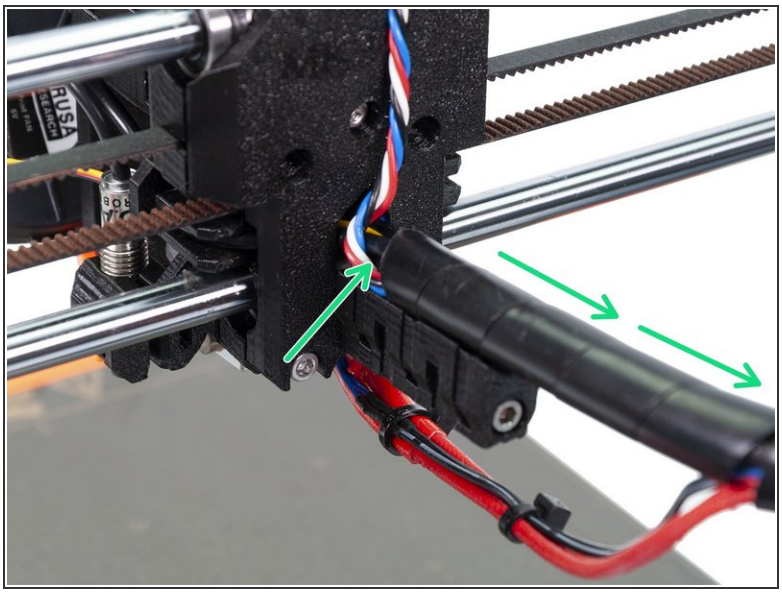




- Let's connect back the filament sensor, there are two important things:
  - There are four pins on the sensor, make sure the connector fits properly on them.
  - There is a safety pin on the connector, which must face to the left, when connected to the sensor.
- Secure the extruder-body with the screw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

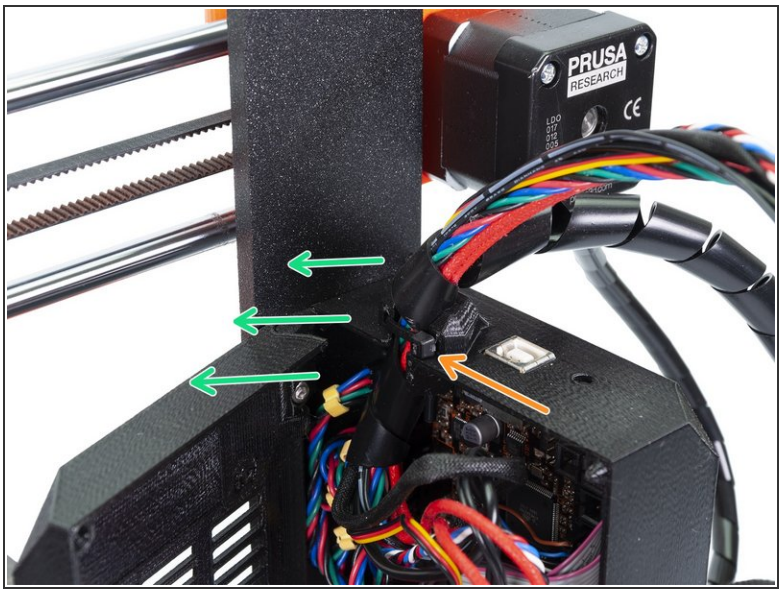
Step 46 — Removing the spiral wrap (part 1)





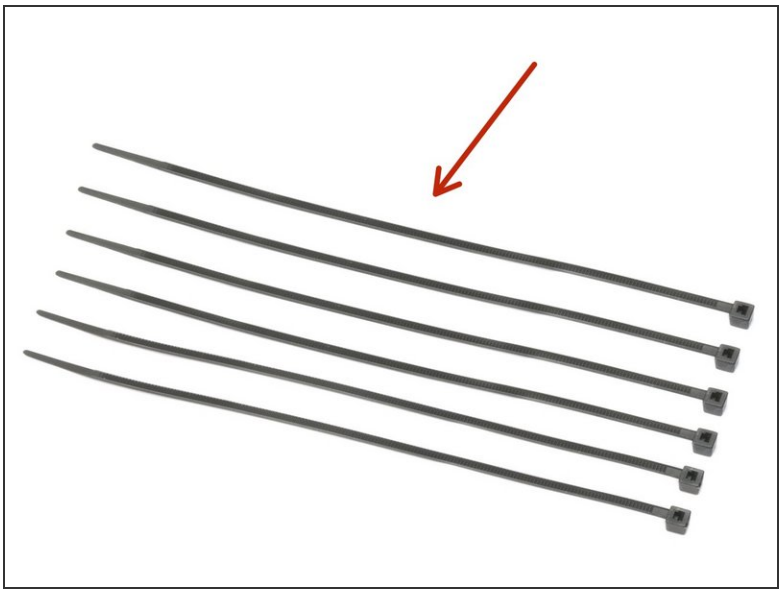
- Carefully slide the spiral wrap away from the X-carriage-back. One or two centimetres are enough.
- Find the end of the wrap and start unwrapping towards the RAMBo case.

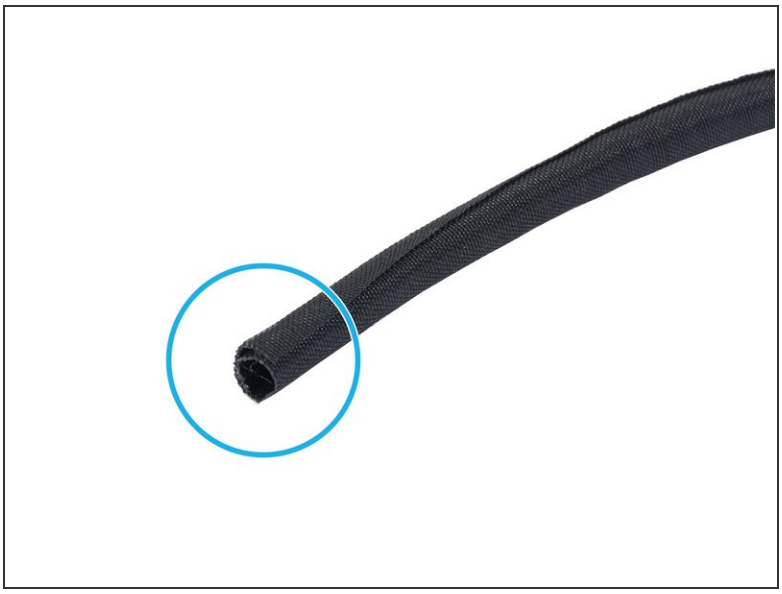
Step 47 — Removing the spiral wrap (part 2)



- Using an Allen key release the M3x40 holding the RAMBo 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.

Step 48 — Tightening the textile sleeve (part 1)

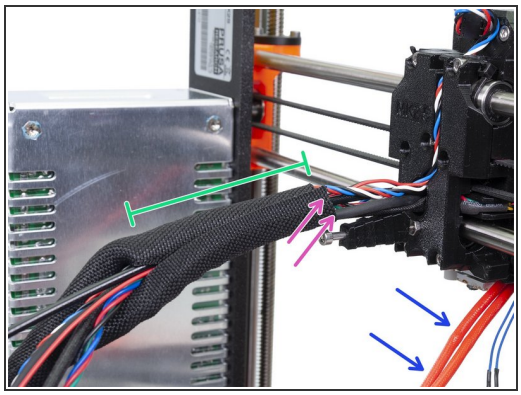
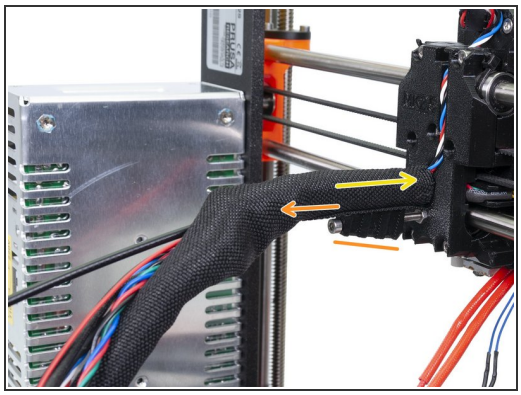
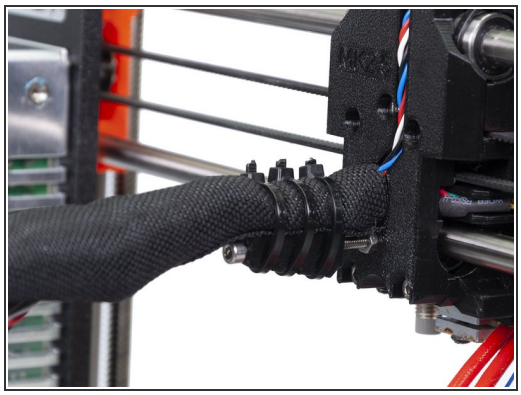




- For the following step, please prepare:
- Zip tie (6x)
- Textile sleeve 13 x 490 mm (1x)

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

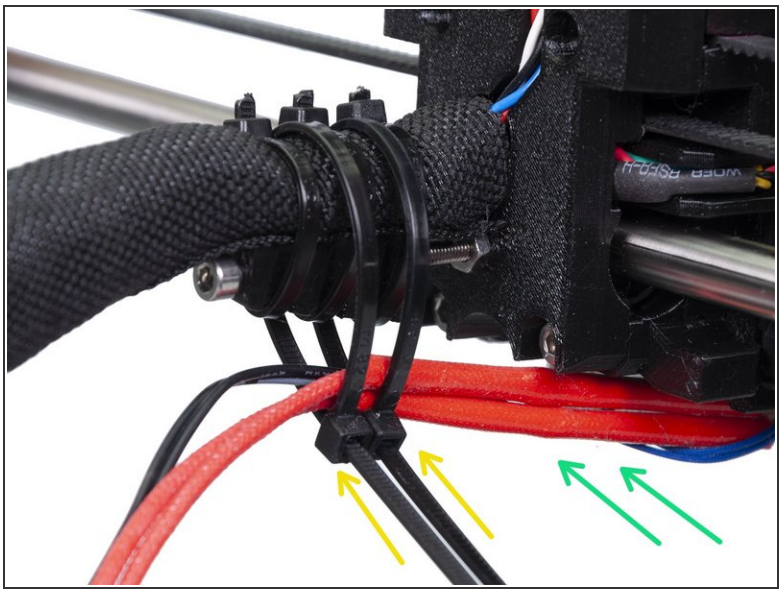
Step 49 — Tightening the textile sleeve (part 2)

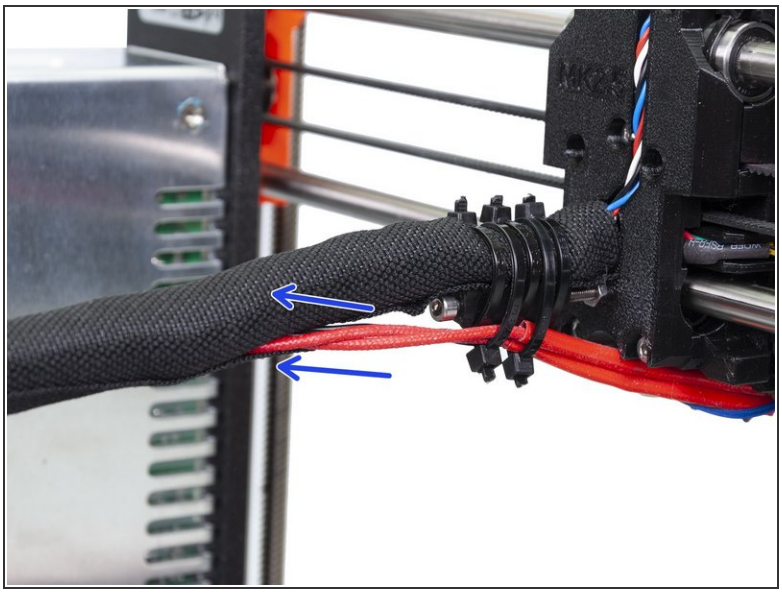




- Open one end of the textile sleeve and slide it on the cable bundle leading from the extruder. **Don't forget to include the nylon!**
- Leave the cables from the Hotend out for now.
- Length of the first wrap should slightly longer than the cable-holder part.
- Gently twist the sleeve to make it smaller and tighter around the cables, orient the sleeve's seam downwards, then slide the sleeve towards the extruder.
- Ensure the cable-holder is properly oriented and at the end of the screw.
- **Take 3 zip ties** and tighten the textile sleeve to the holder.

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

Step 50 — Tightening the textile sleeve (part 3)





- Now, add the hotend cables to the cable-holder.
- Once the hotend cables are included, use two zip ties. Tighten them and cut remaining parts.
- Open the textile sleeve and insert the cables from the hotend.
- Finish wrapping all cables in the sleeve.

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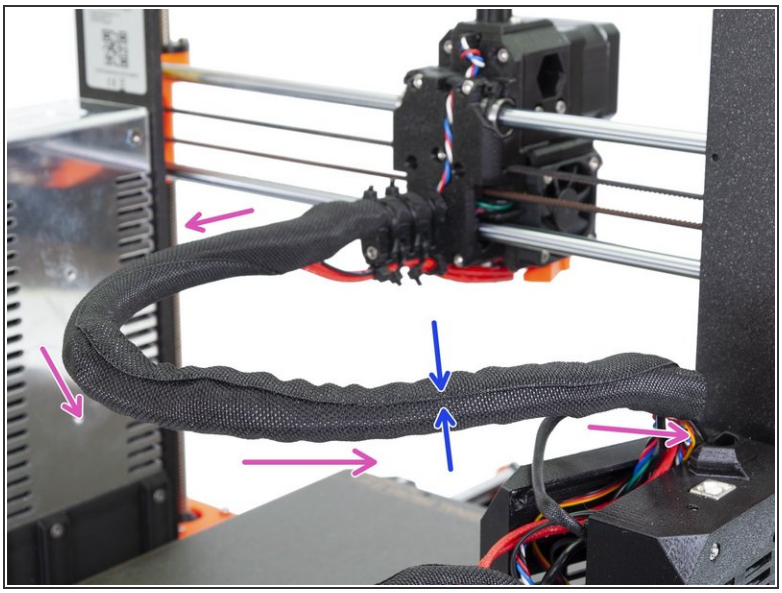
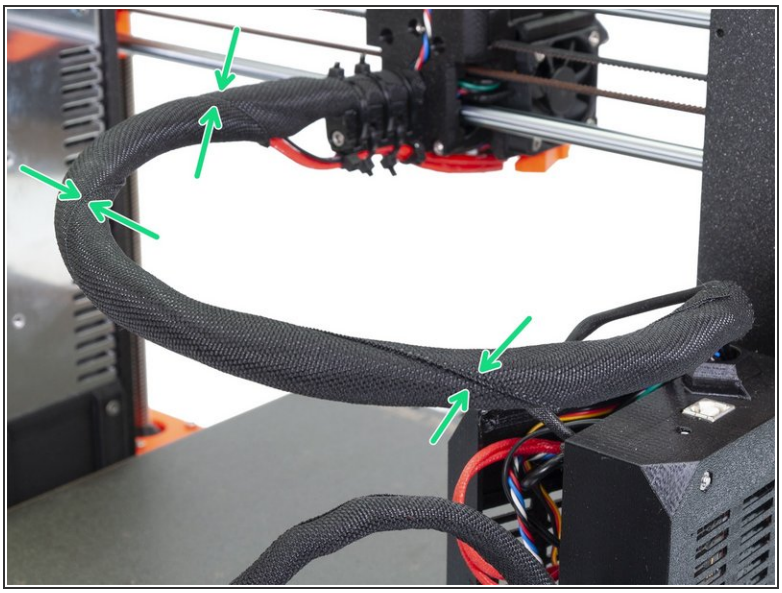
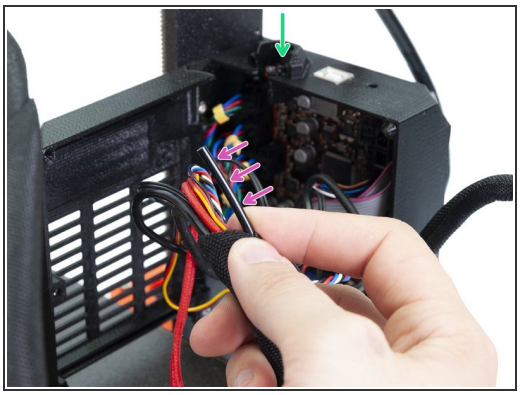
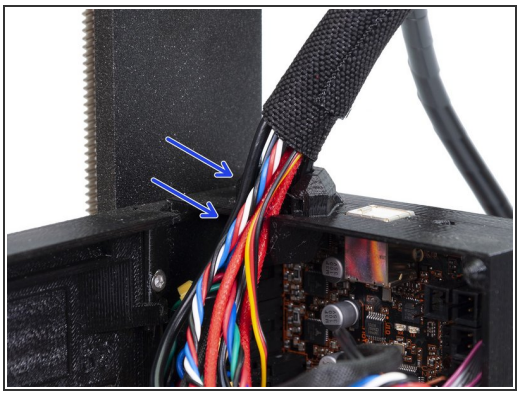
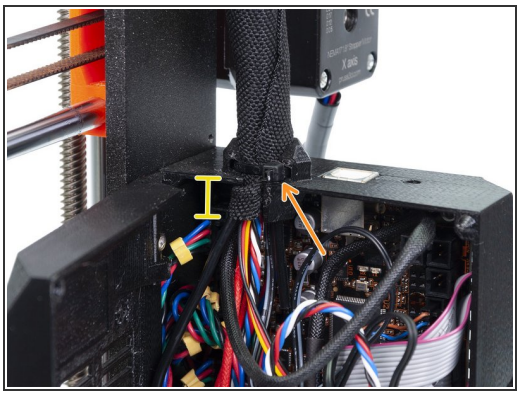
Step 51 — Tightening the textile sleeve (part 4)





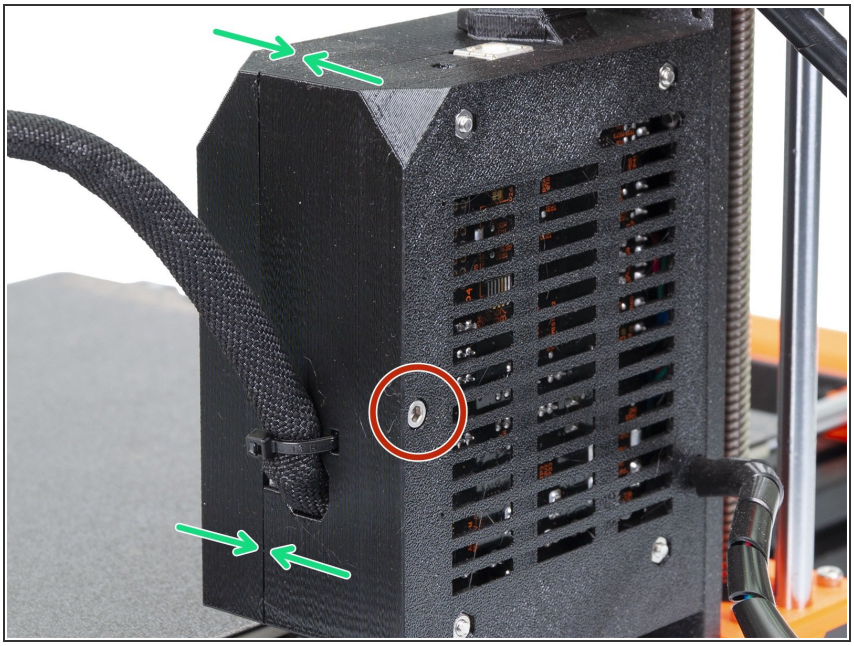
- Continue wrapping the cables in the textile sleeve all the way to the RAMBo case.
- Notice the line of the "seam" will be most probably straight. Let's fix it ;)
- Start twisting the textile sleeve (not the cables) to achieve a spiral like look. Thanks to this motion the sleeve will wrap evenly around the cables and it also prevent any cables from falling out of the bundle.

Step 52 — Tightening the textile sleeve (part 5)

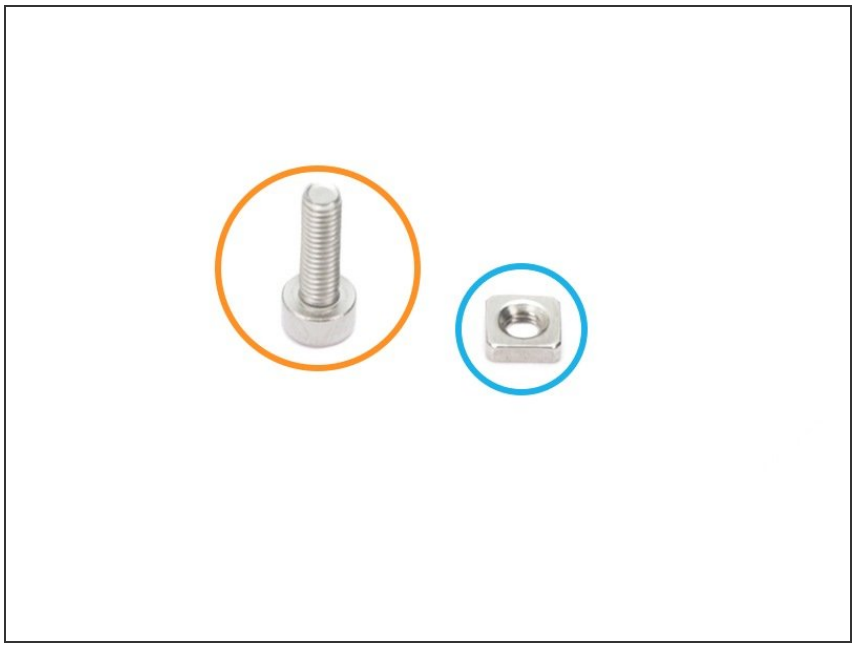
- Take the end of the cable bundle, find the nylon filament and separate 2-3 cm from the bundle.
- There is a small circular hole in the RAMBo cover for the nylon filament. Find it and slide the filament in.
- Gently push the cables one by one to the opening in the RAMBo case.
- Slide the textile sleeve 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)



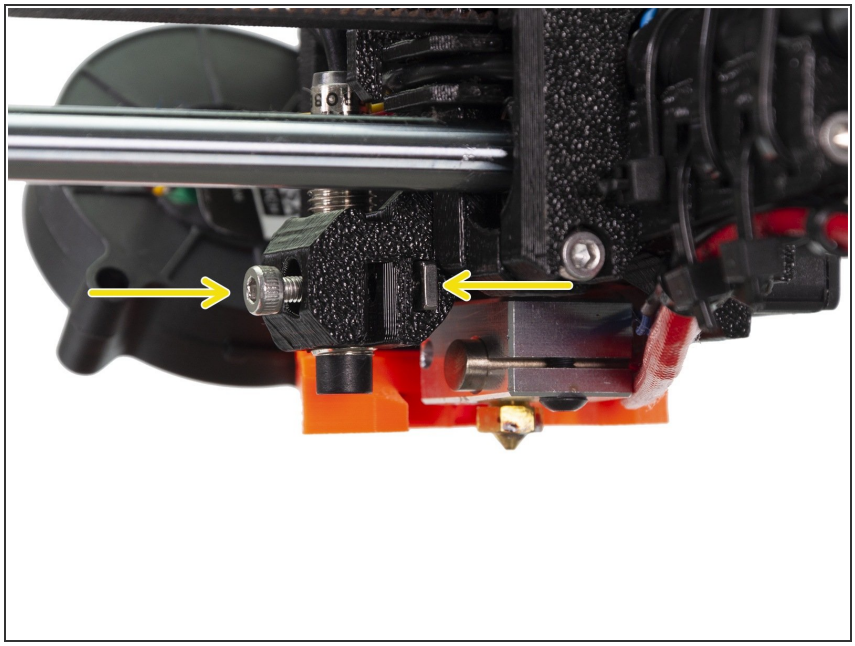
- Close the RAMBo cover door and make sure no wire is pinched.
- Use an Allen key and tighten the M3x40 screw.

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



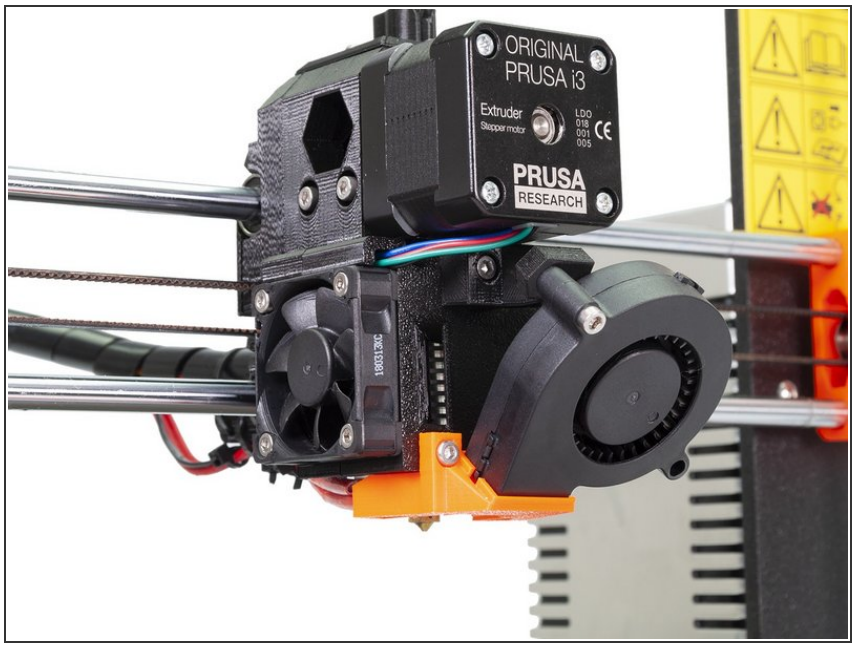
- For the following steps, please prepare:
- M3x10 screw (1x)
- M3nS nut (1x)

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.

Step 56 — Extruder rebuild is done

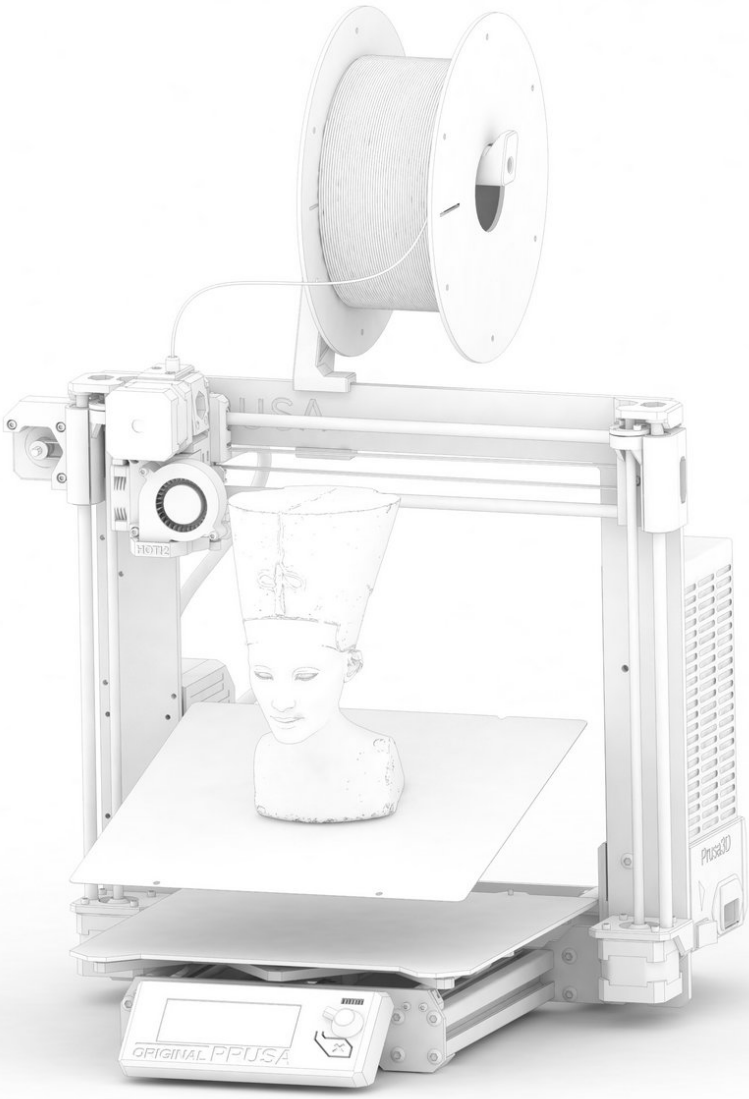


- You've just finished the upgrade of the extruder. Amazing job!
- Now, let's adjust the height of the P.I.N.D.A. sensor. You can use for example the MK3 assembly: 9. Preflight check
- ⚠ After you turn on the printer, run the **Calibrate Z** to make sure the X-axis is absolutely level! Then run the **1st layer calibration** as we moved with the P.I.N.D.A.
- That's it for today ;)

PRUSA RESEARCH by JOSEF PRUSA

Manual changelog MK2.5

Written By: Jakub Dolezal



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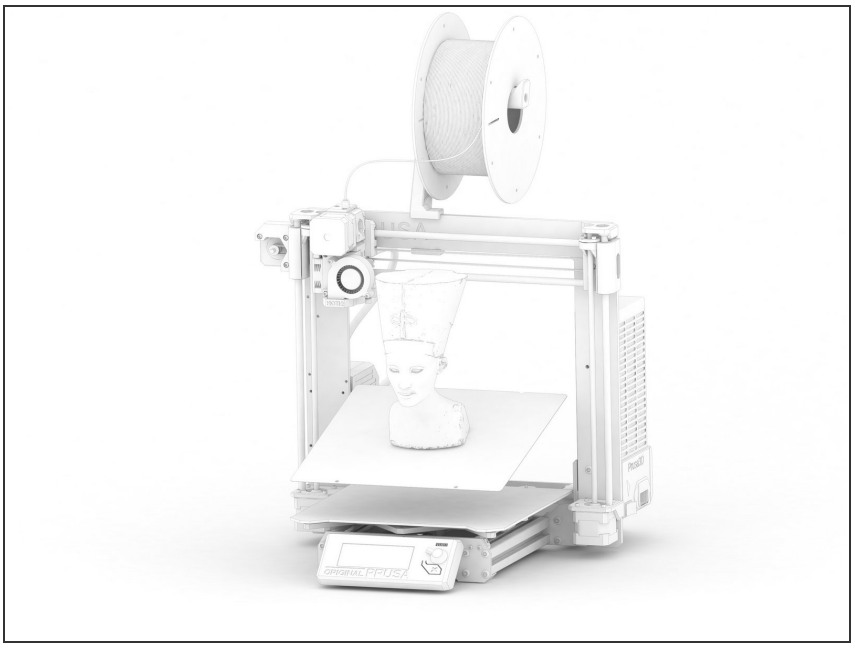
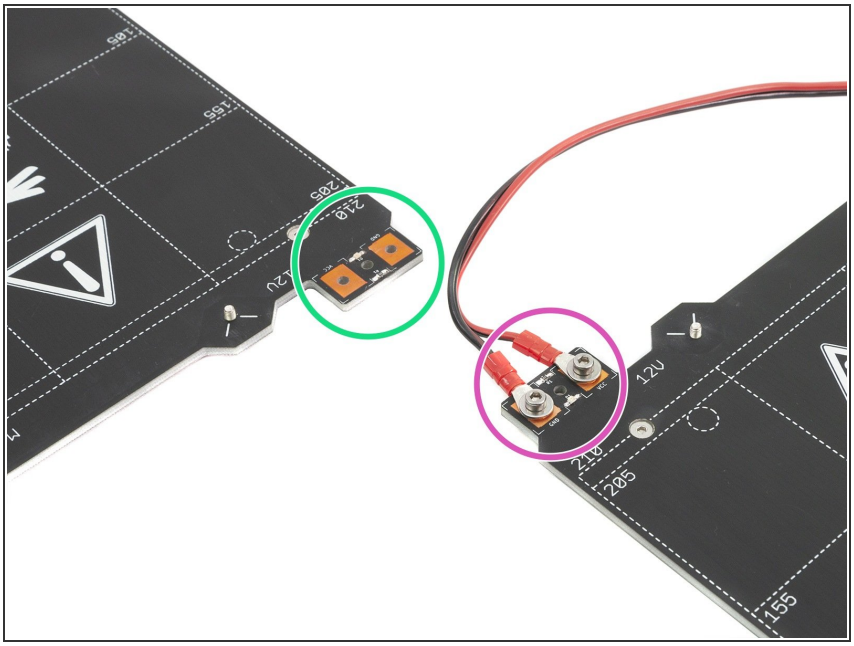
Step 1 — Versions history



- **Versions of the MK2.5 manual:**
  - 12/2017 - Initial version 2.50
  - 04/2018 - Updated to version 2.51
  - 08/2018 - Updated to version 2.52
  - 09/2018 - Updated to version 2.53

Major changes for each version are described in the next steps.

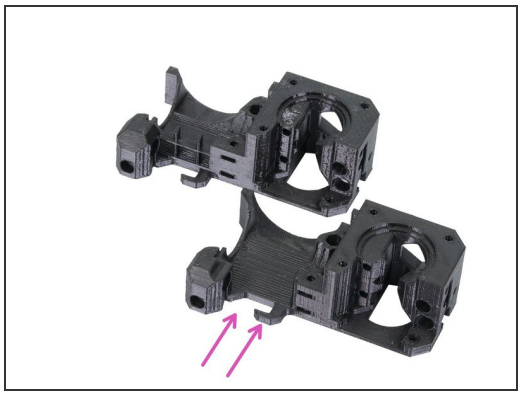
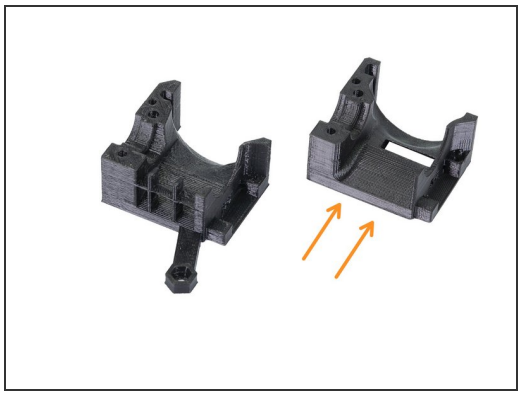
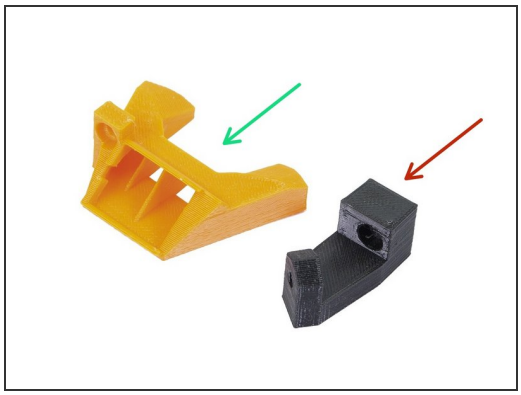
Step 2 — Changes to the manual (1)



- 04/2018 - Chapter 3
  - Assembly of the heatbed updated. In case the wires, aren't assembled user has to tighten the cable to the heatbed using M3 screws and nuts.
  - New chapter "Introduction" and overall content reorganisation for easier orientation.

Manual version 2.51

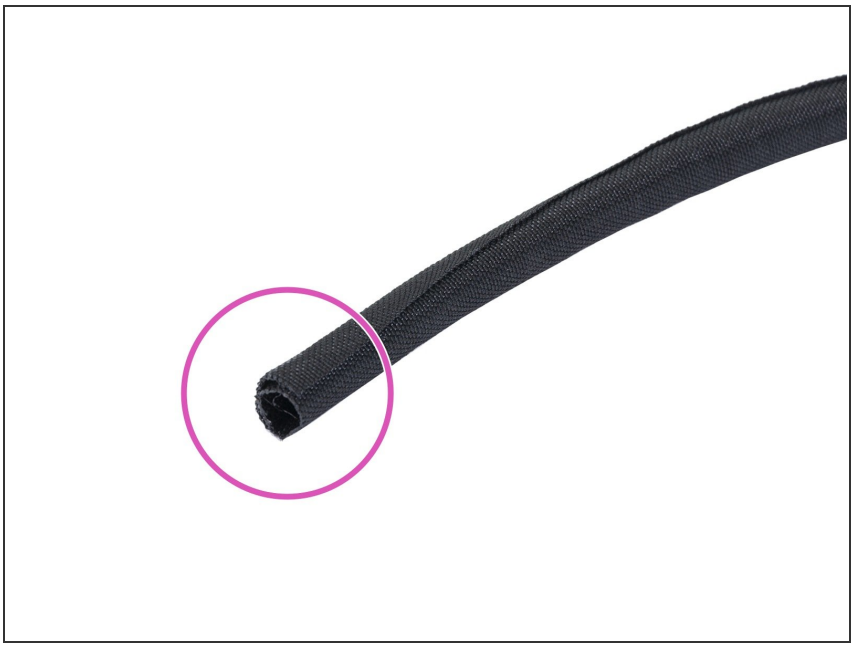
Step 3 — Changes to the manual (2)

- 08/2018 - Chapter 4 (Extruder parts)
  - In order to improve cooling efficiency, there are new extruder parts version B7/R3. The assembly process is mostly the same as before. For steps which differ or are completely new, the user is informed and all details are explained.
  - **Extruder body** (compared with previous B6)
  - **Extruder cover** (compared with previous B6)
  - **Nozzle-fan-45**
  - **Nozzle-fan-45-support**
  - More information including direct comparison can be found on our Prusa Research forum.

ⓘ Manual version 2.52

Step 4 — Changes to the manual (3)



- 09/2018 - Chapter 4 (textile sleeve)
  - There is an update to the cable management for the extruder. Previously used spiral wrap is replaced with a textile sleeve.
- Manual version 2.53