PRUSA RESEARCH

5. Extruder Assembly

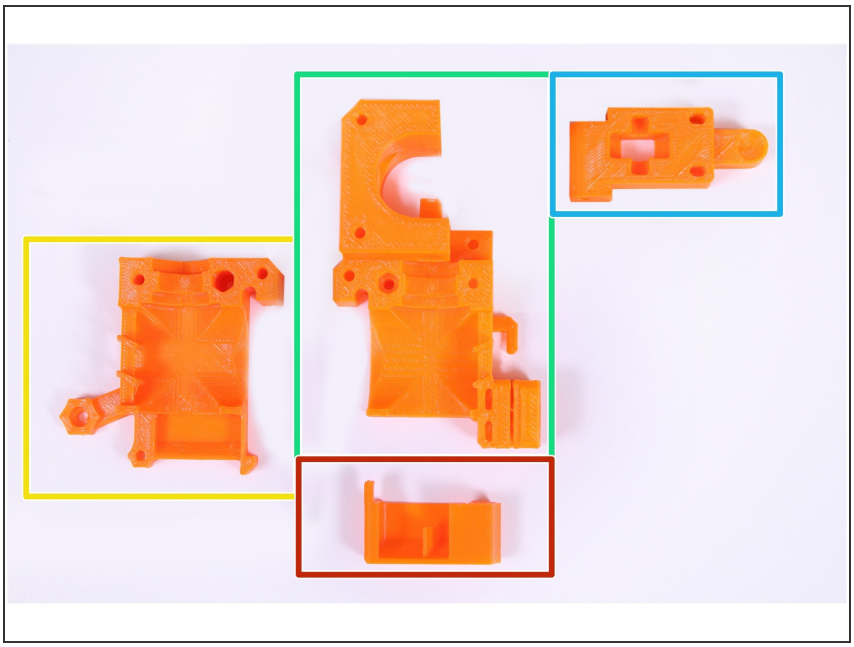
Guide for the assembly of the Extruder.

Written By: Josef Prusa

Step 1 — Get the necessary tools

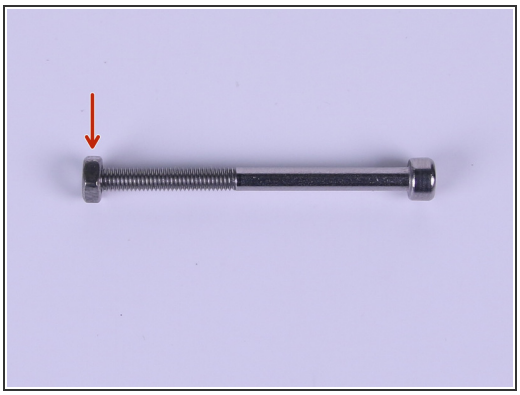
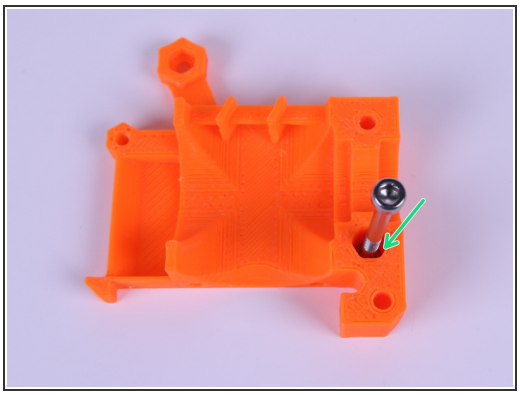
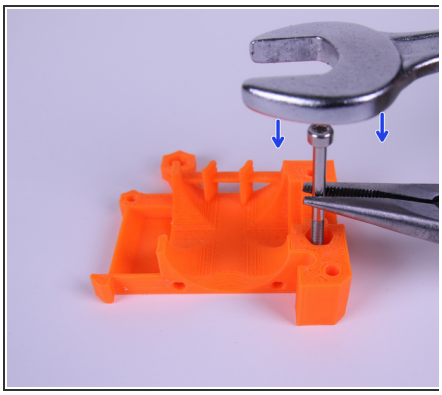
- 2.5 and 1.5 mm Allen key
- Needle-nose pliers

Step 2 — 3D printed parts



- Extruder cover
- Extruder body
- Extruder idler
- Fan nozzle (can be in black color, dimensions are the same).

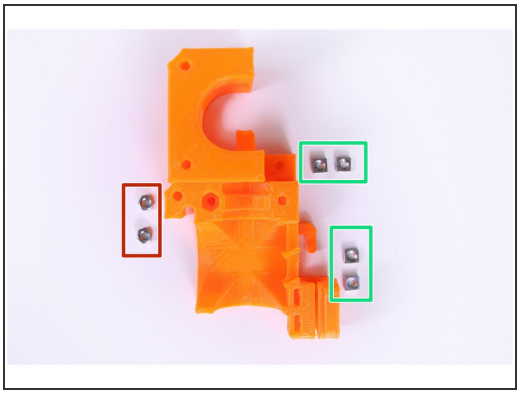
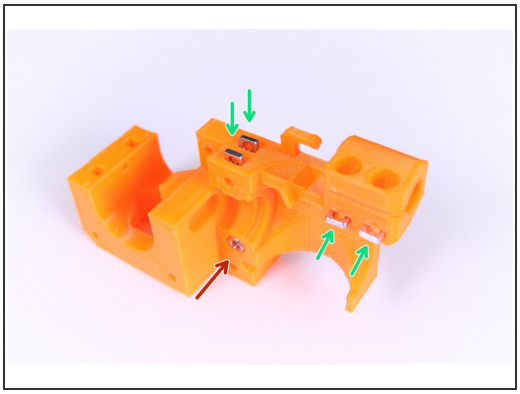
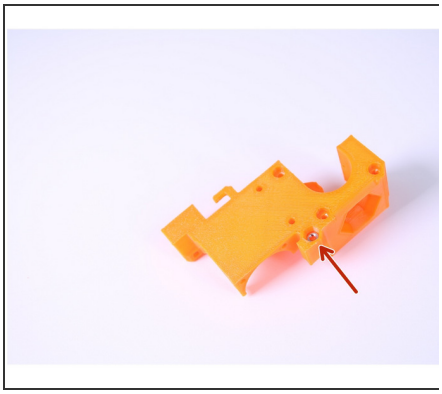
Step 3 — [TIP] Top nut insertion

If you're experiencing troubles with getting nut into the top hole, just follow these simple steps.

- Screw a M3 nut a bit on some long screw (M3x40 works best).
- Push the screw with the nut into the hole where it is supposed to be.
- Grab the screw with pliers and gently hammer the nut in place using a wrench.

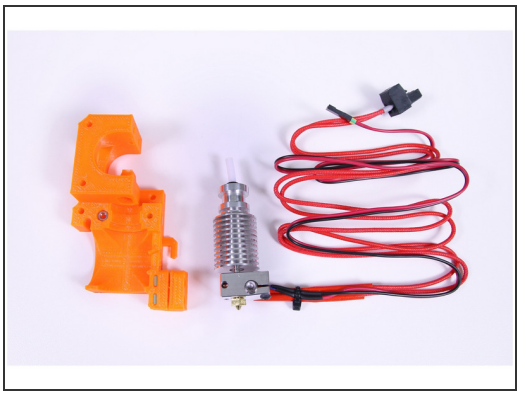
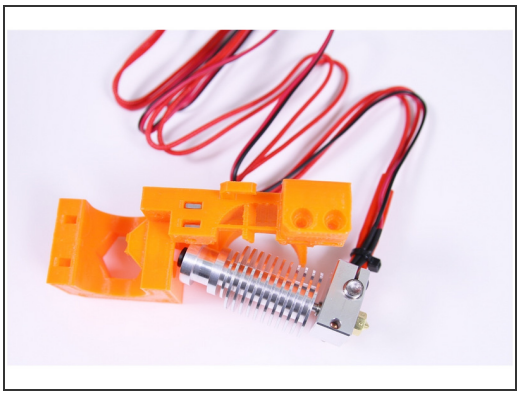
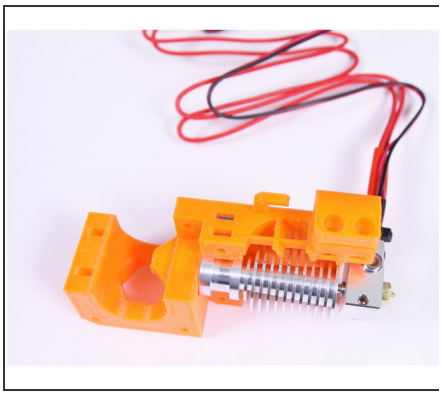
Step 4 — Placing the nuts

- Place the M3 nuts (2 pcs) into the traps on the left side of the extruder body.
- Slide the M3nS square nuts (4 pcs) into the traps on the right side of the extruder body.

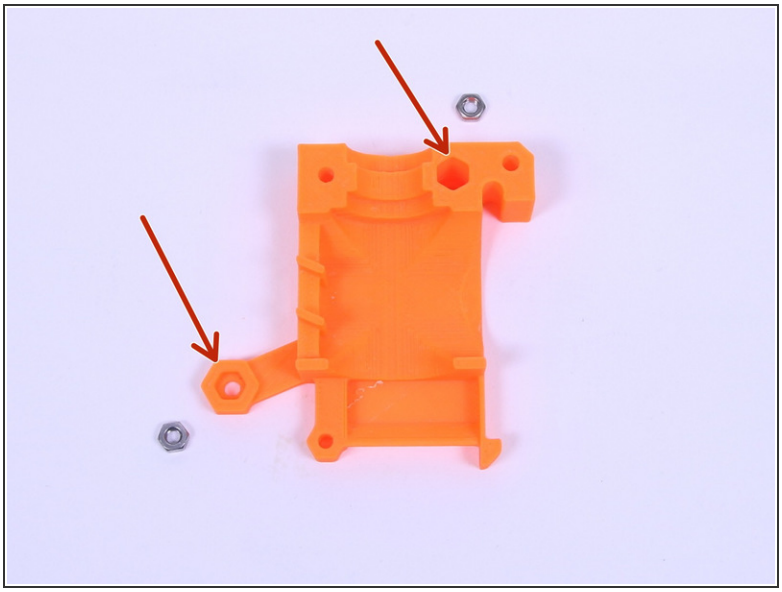
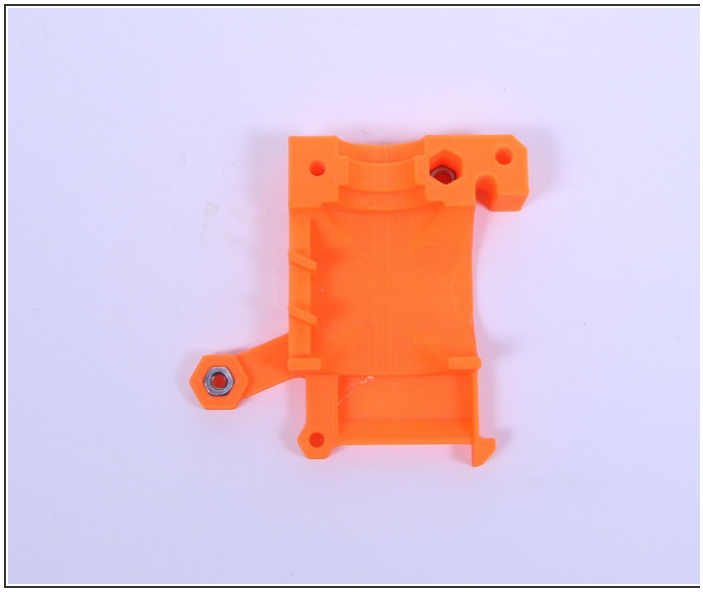
Place the nuts as deep as possible.

Step 5 — Preparing the extruder body

- Slide the extruder body on the nozzle as shown in the picture.
- Push the nozzle all the way down and make sure that cables are on the side as shown in the picture.

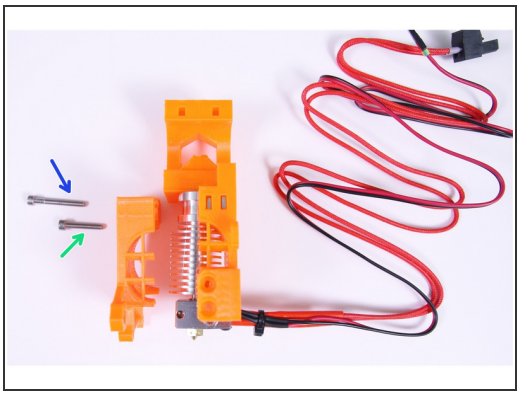
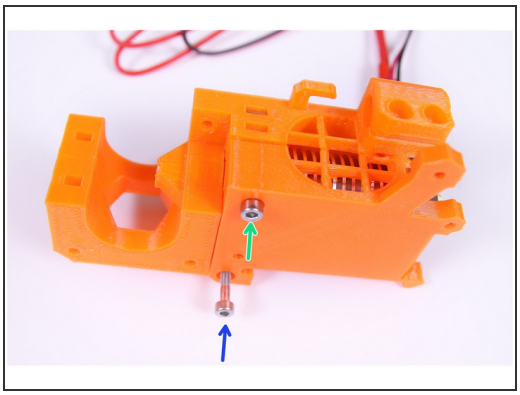
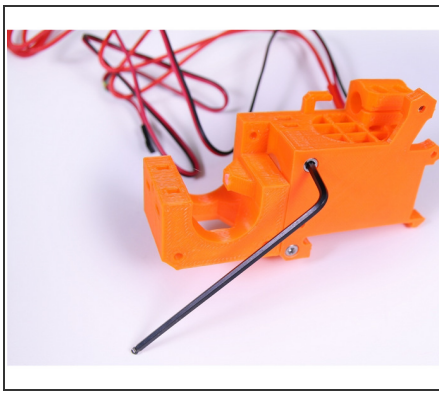
Step 6 — Preparing the extruder cover

- Place the M3 nuts (2 pcs) into the traps of the extruder cover.

⚠ Top nut needs to be pushed all the way down! (the nut trap has 2 diameters, only last 3 mm have correct diameter for the nut trap).

Step 7 — Placing the extruder cover

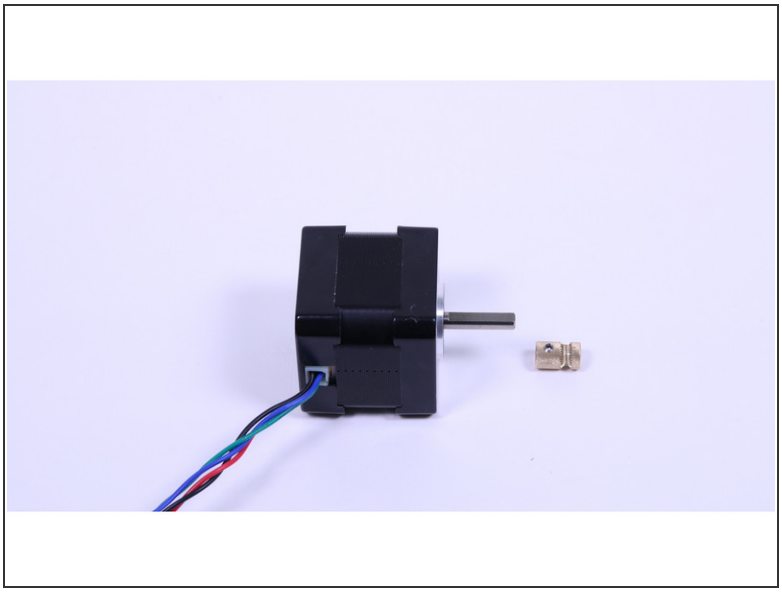




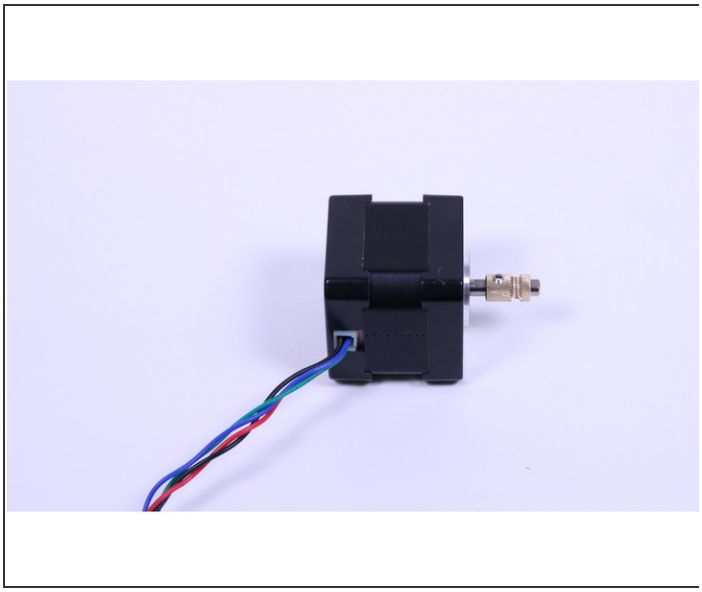
- M3x18 (1 pc)
- M3x25 (1 pc)
- Mind the correct orientation of cables leading from the extruder heater.
- Using the 2.5mm Allen key tighten both screws to mount the extruder cover on the extruder body.

⚠ Make sure to use the proper length of screws when mounting the extruder cover. Check all nuts are in their places.

⚠ Tighten until the nozzle stops moving in the extruder, if there's still a gap between the cover and the body it's alright.

Step 8 — Preparing the extruder motor





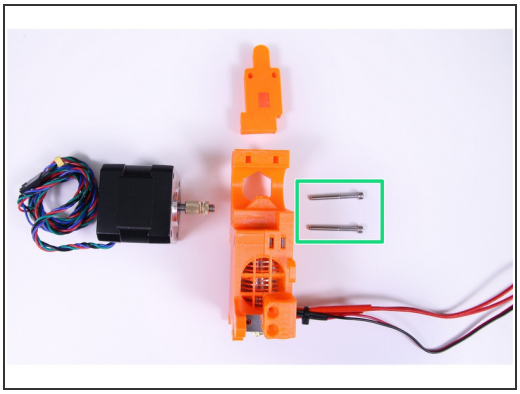
- Press the pulley on the motor.

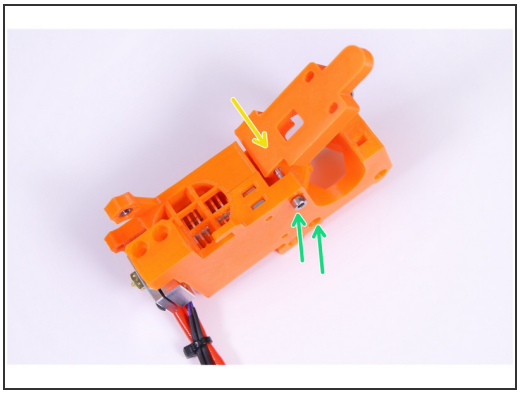
If you're experiencing trouble, loose the grub screw a bit.

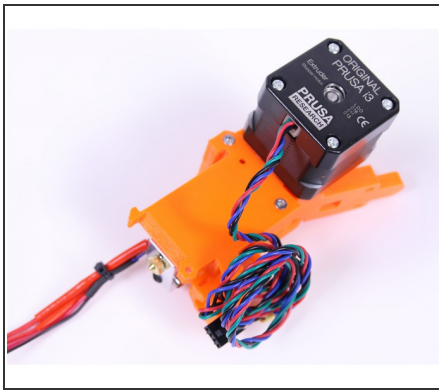
- Note the correct orientation (the screw has to be closer to the motor).

Don't tighten the pulley at the moment, we have still time for that.

Step 9 — Mounting the motor and the idler



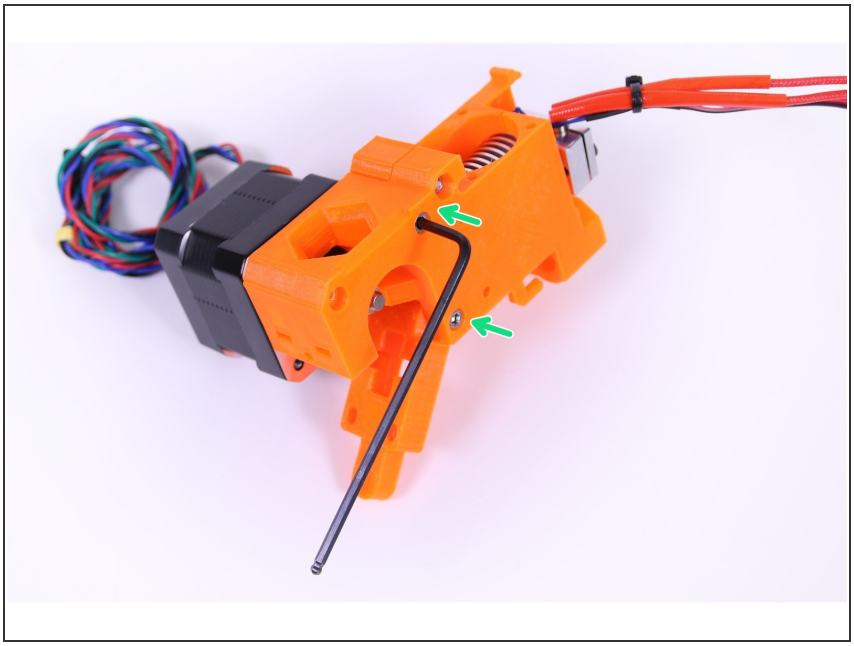




- M3x30 screws (2 pcs)
- Don't forget to have the idler in place (the screw has to go through it).
- Mount the motor on the the extruder body as shown in the picture, double check proper orientation of the motor cables.

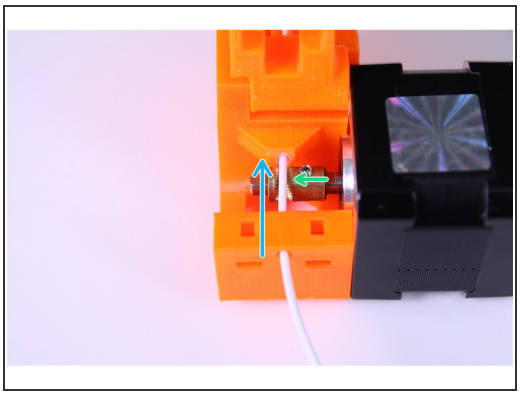
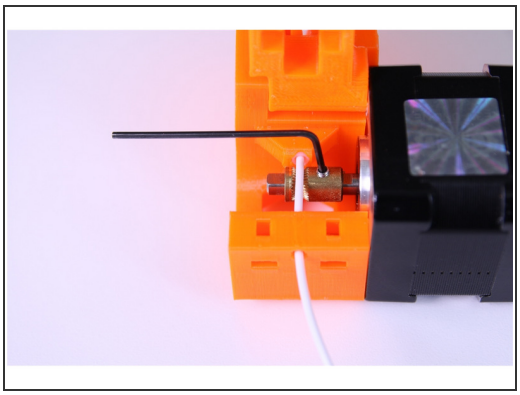
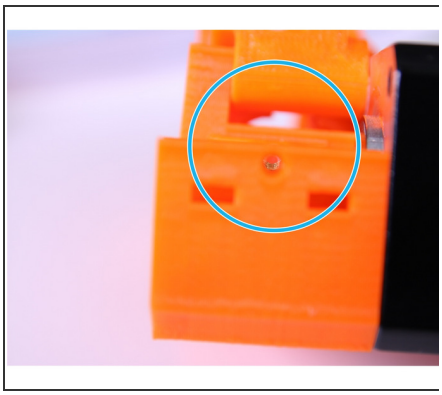
⚠ Mind the correct orientation of motor cables.

Step 10 — Tighten the motor screws gently.



- Tighten the motor screws gently.

Step 11 — Tightening the pulley

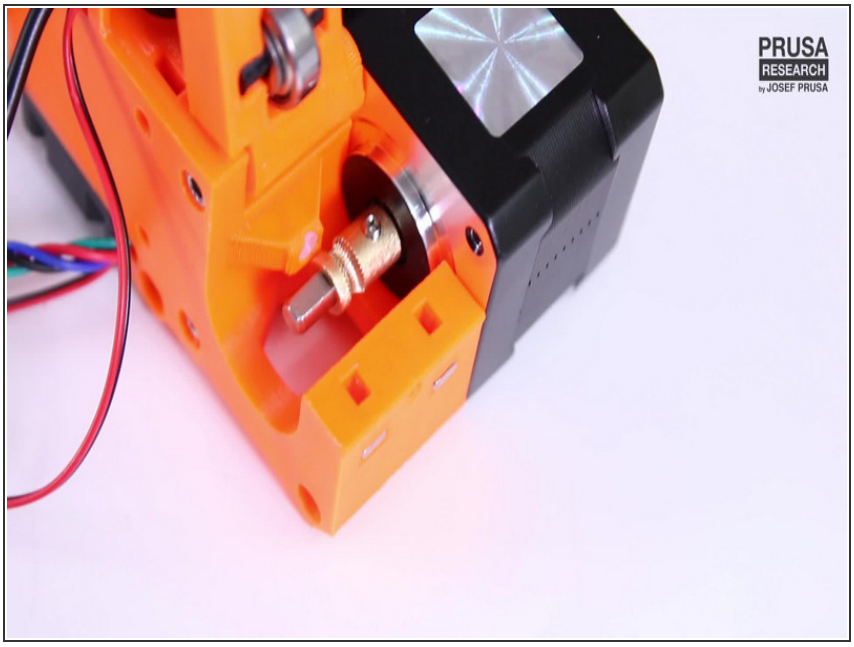
- Using the 1.5mm Allen key tighten the pulley.

⚠ Make sure that the part with smaller diameter is perfectly aligned with the nozzle entrance.

⚠ Make sure the pulley can rotate freely.

ⓘ Use a piece of 1,75 mm filament (from the spool) to align the pulley with the openings for the filament (see the picture).

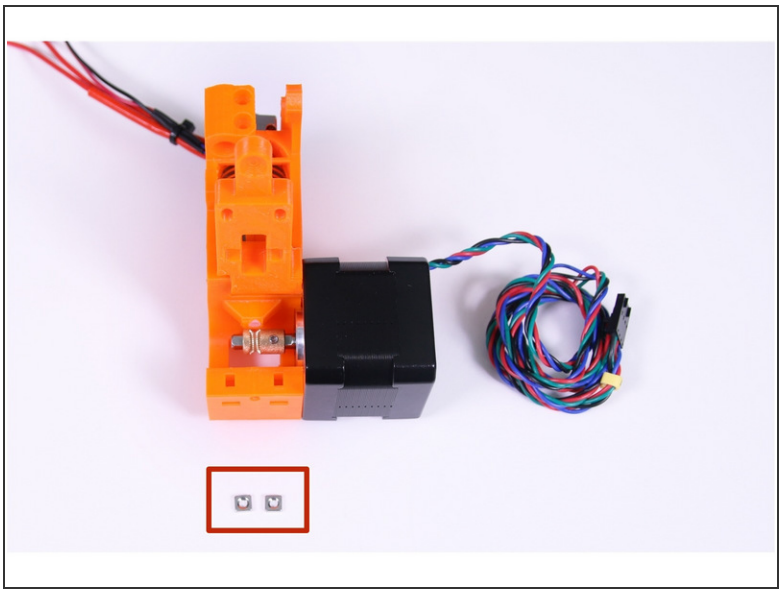
Step 12 — VIDEO for step 11

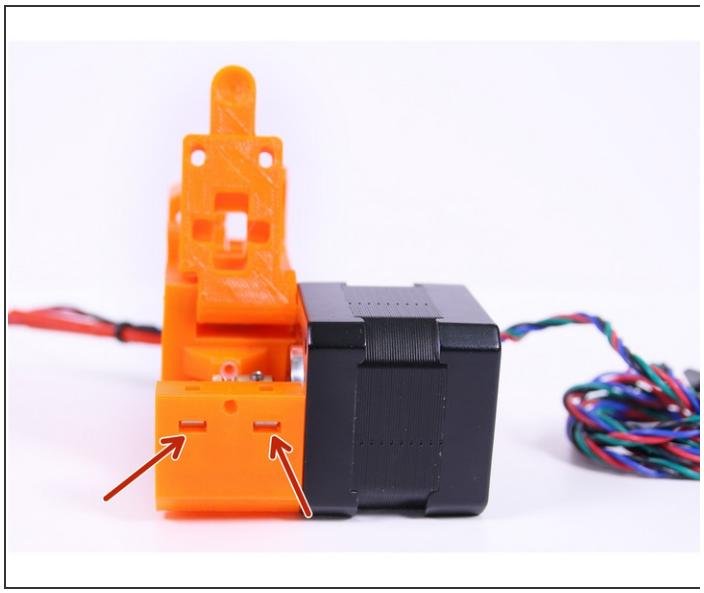


- Using the 1.5mm Allen key tighten the pulley. Make sure that the part with smaller diameter is perfectly aligned with the nozzle entrance. Use a piece of filament to align the pulley with the openings for the filament.

ⓘ Video is available in an online (digital) version only.

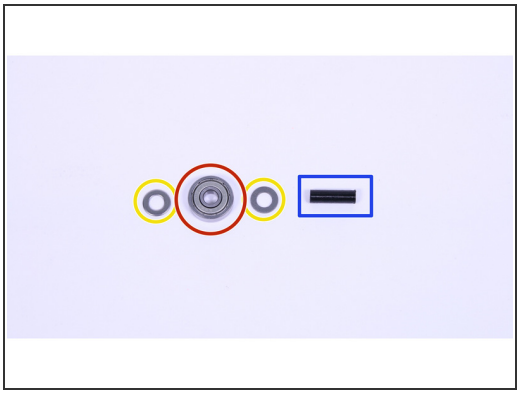
Step 13 — Prepare the Extruder idler

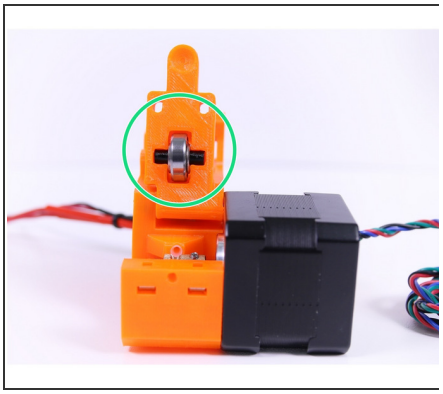




- Place the M3nS square nuts (2 pcs) into the traps of the extruder body.

Step 14 — Preparing shaft with bearing

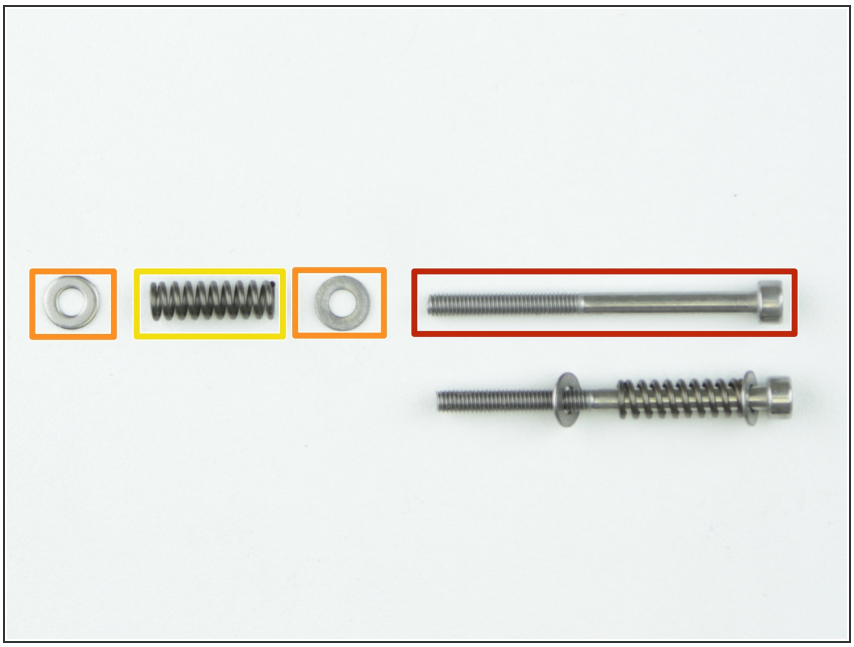




- 5x16sh shaft
- M5w washer (2 pcs)
- 625 bearing (1 pc)
- Place the washers and bearing on the shaft as shown in the picture.
- Place the shaft with bearing into the idler.

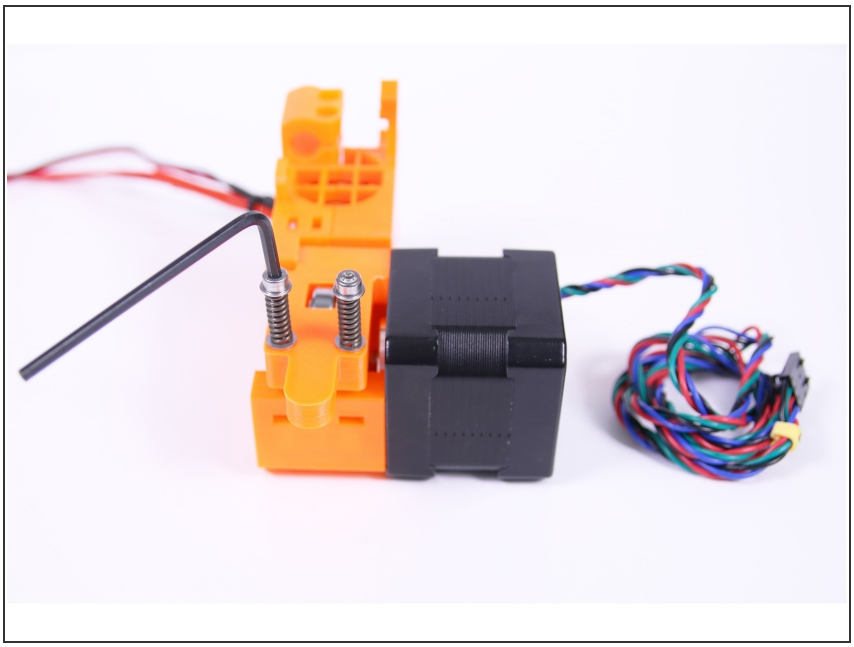
⚠ Check the shaft is pressed all the way in!

Step 15 — Prepare the Extruder idler screws



- M3x40 screw (2 pcs)
- M3w washer (4 pcs)
- Extruder spring (2 pcs)
- Assemble the screws as shown in the picture.

Step 16 — Placing the screws

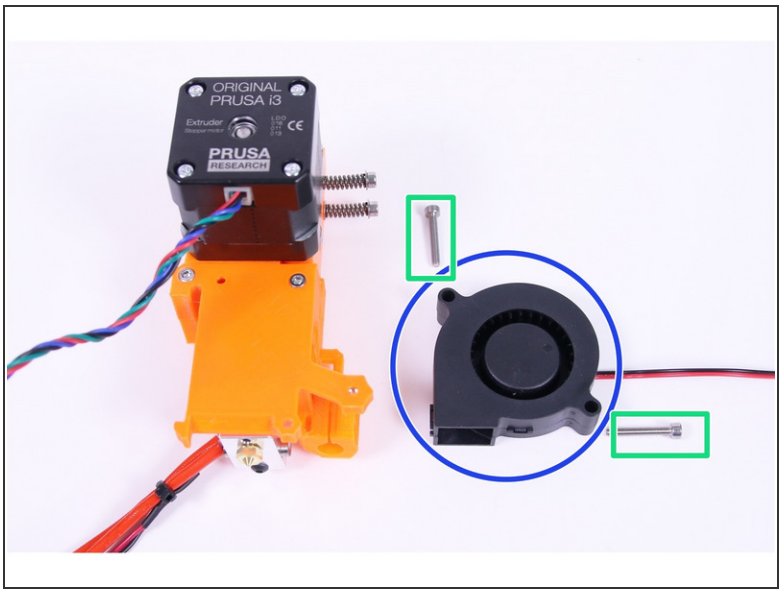


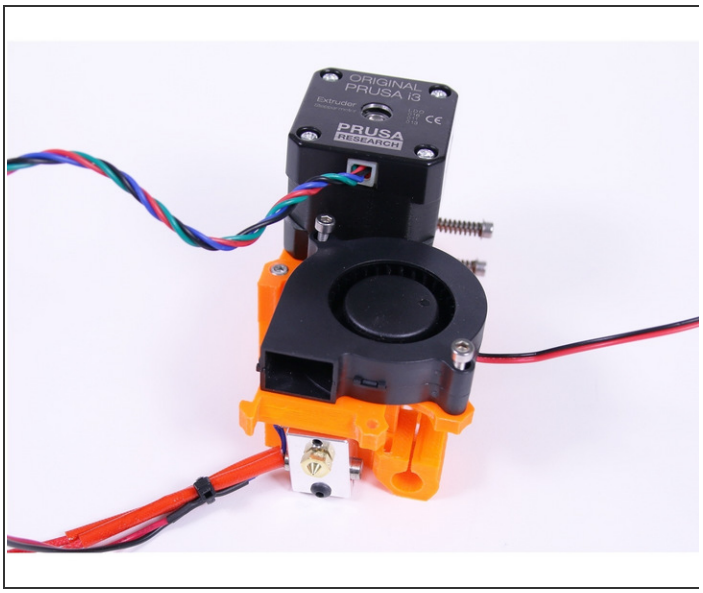
- Screw the extruder screws into the extruder body using the 2.5 mm allen key as shown in the picture.

ⓘ Length of the springs should be circa 13 mm when tightened.

ⓘ It is alright to tighten the screws with higher force, we need to induce pressure on the idler.

Step 17 — Preparing the print fan



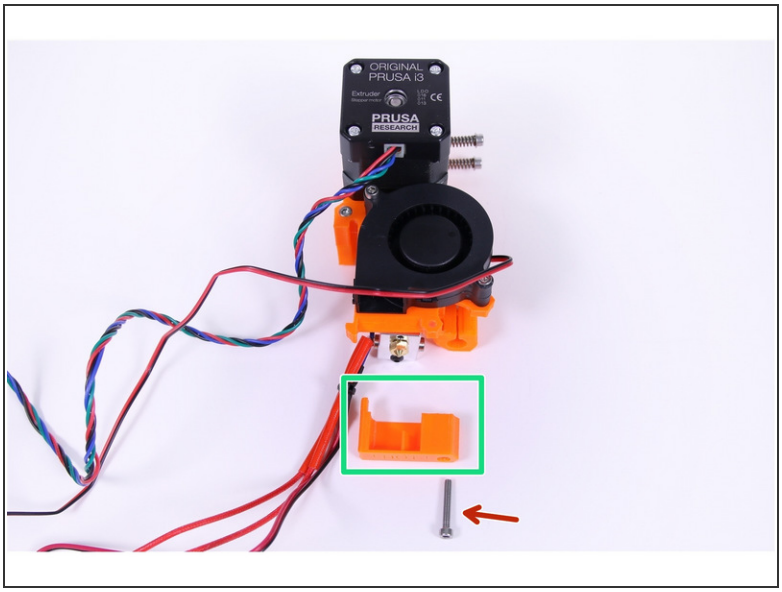


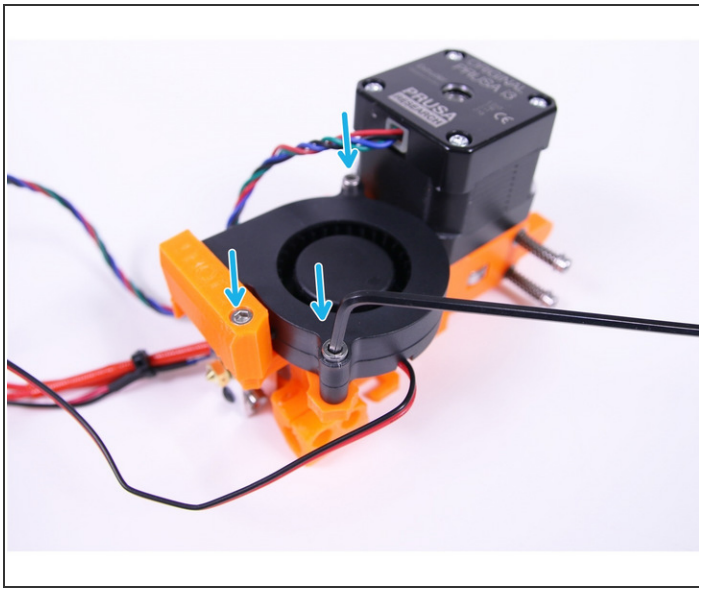
- 5015 print fan
- M3x20 screws (2 pcs)
- Screw the fan on to the extruder using the 2.5 mm Allen key as shown in the picture.

⚠ Do not tight fully at this moment, fan should just be secured in place.

ⓘ Front fan is in the box 2.3.4.5.SUP

Step 18 — Preparing the fan nozzle





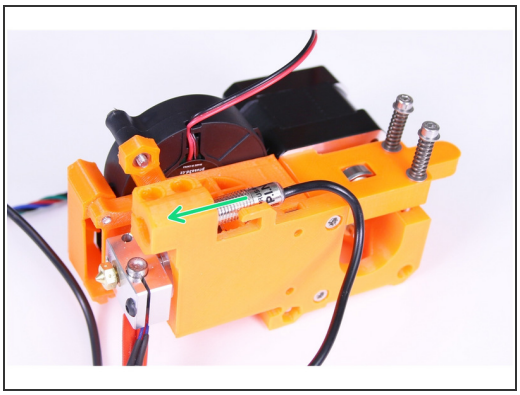
- Fan nozzle
- M3x20 screw (1 pc)
- Tighten the fan nozzle using the 2.5 mm Allen key. Gently tighten screws holding up the fan in place.

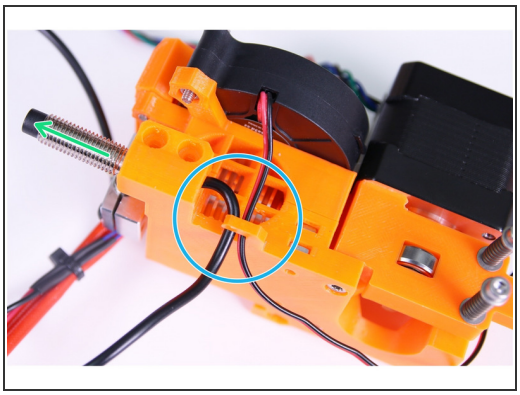
⚠ Double check that the fan can rotate freely.

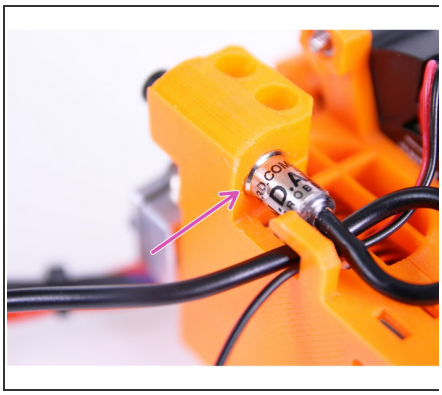
Step 19 — P.I.N.D.A. probe preparation

- Prepare the P.I.N.D.A. probe (autocalibration) by removing both of the nuts (if included in delivery)

Step 20 — P.I.N.D.A probe and print fan cables preparation







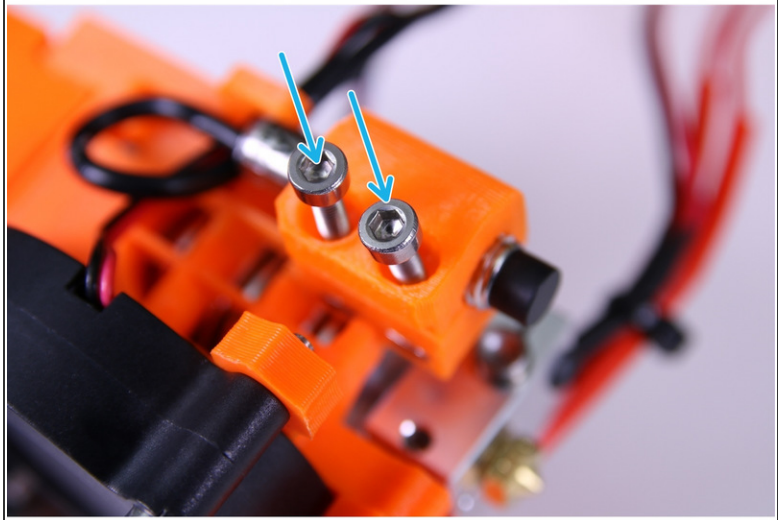
- Pass the P.I.N.D.A. probe through the mount.
- Guide both cables through a cable clip on the extruder body as shown in the picture.

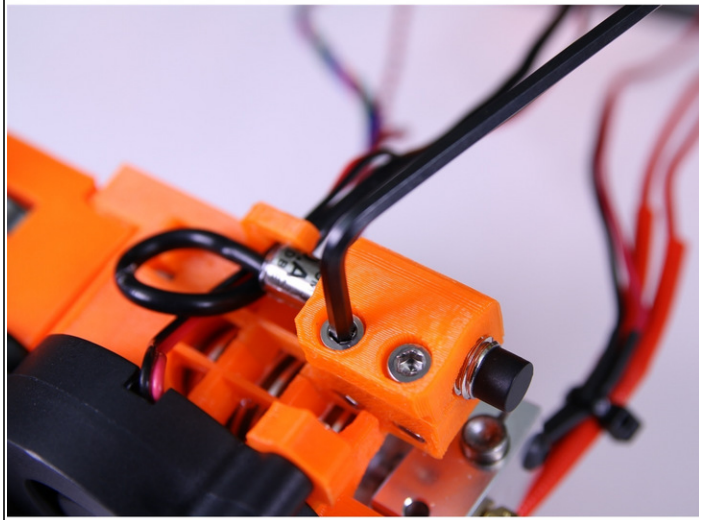
Exact position of the P.I.N.D.A. probe will be adjusted later (in Chapter 9, Preflight check), so there is no need to adjust or tighten fully at this point.

- The best position for mounting at this point is to align the last thread of the probe with the end of the mount

Note the loop on the cable from the probe, it's necessary to do it like that!

Step 21 — The P.I.N.D.A. probe tighting

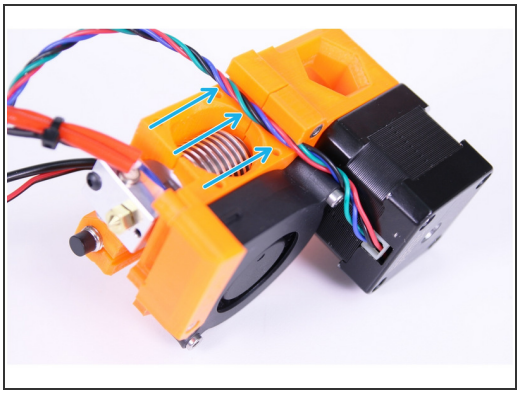
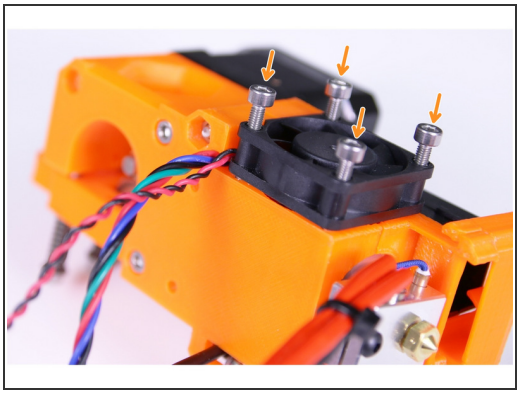
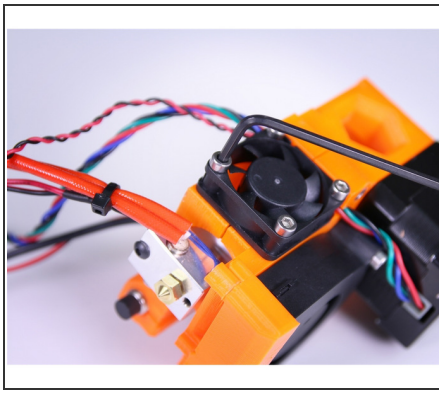




- Secure the P.I.N.D.A. probe with M3x10 screws

⚠ Note the loop on the cable from the probe, it's necessary to do it like that!

Step 22 — Mounting the fan

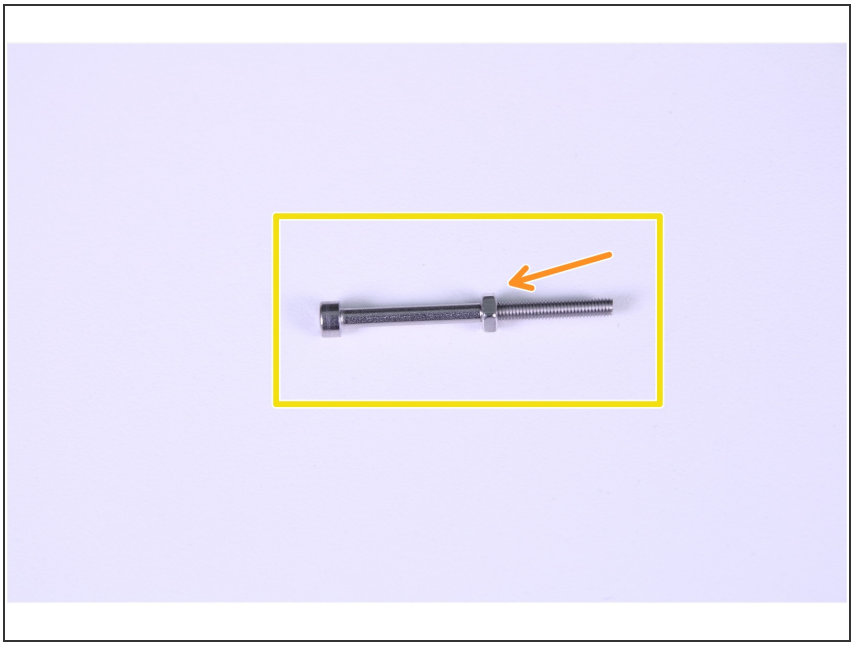
- M3x18 screws (4 pcs)

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

- Guide cables from the extruder motor via slot in the extruder body, put the fan in place.
- Using M3x18 screws mount the fan to the extruder body using the 2.5mm allen key as shown in the picture.
- Tighten fan screws gently using the 2.5 mm Allen key.

ⓘ Left fan is in the box 2.3.4.5.SUP

Step 23 — Preparation for step 24

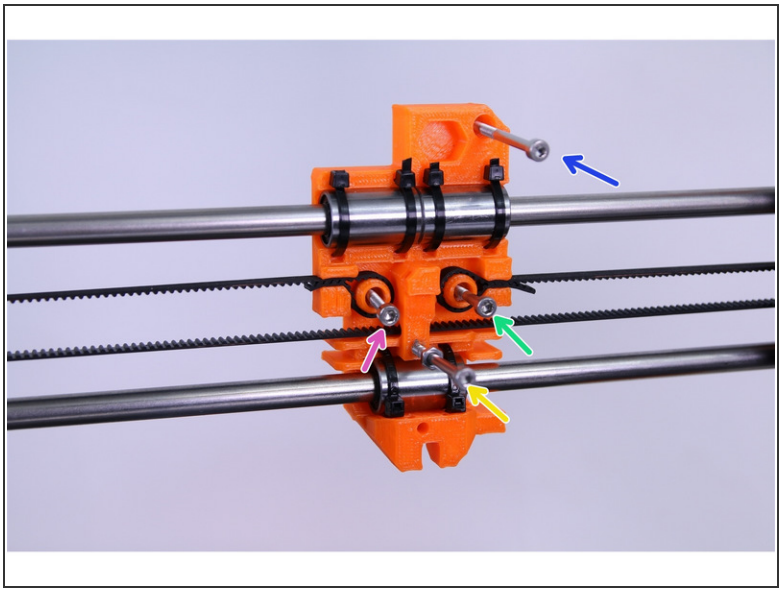


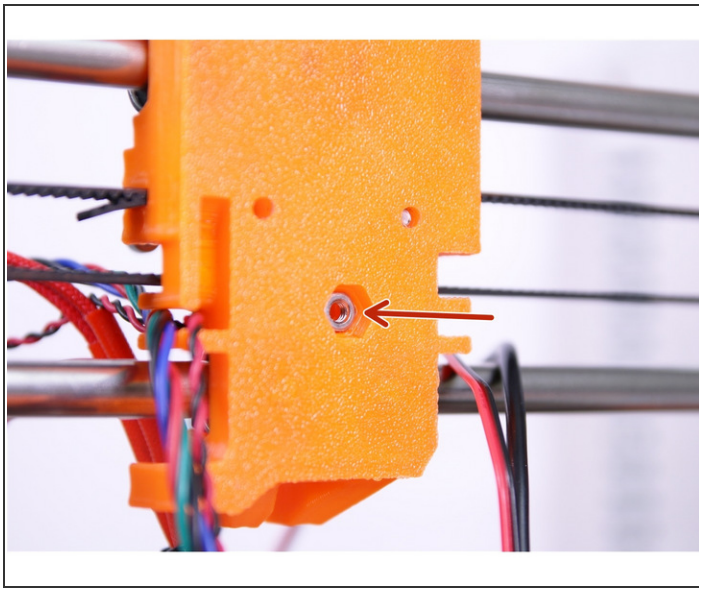
- M3x40 (1 pcs) with M3n nut (1 pcs)

ⓘ Printed manual might suggest to use screw M3x30, but the correct is M3x40.

- Screw the nut fully

Step 24 — Preparing for extruder mounting on the X-axis



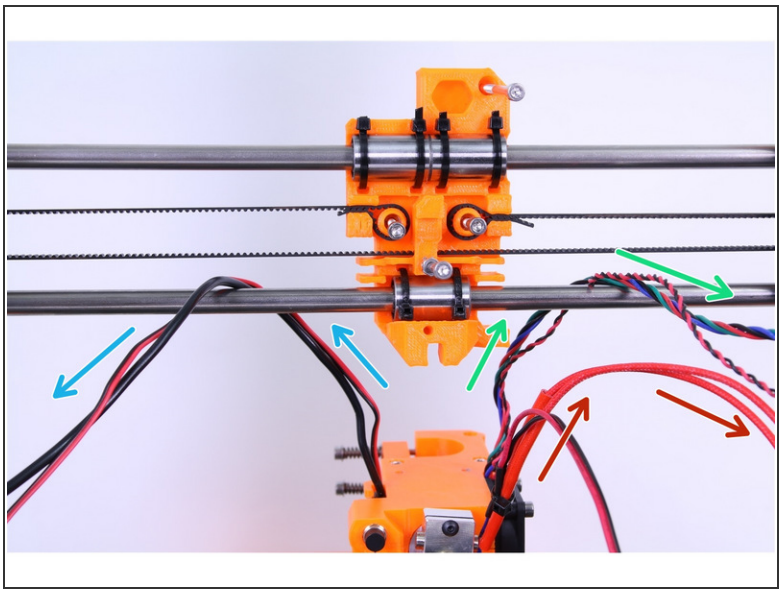


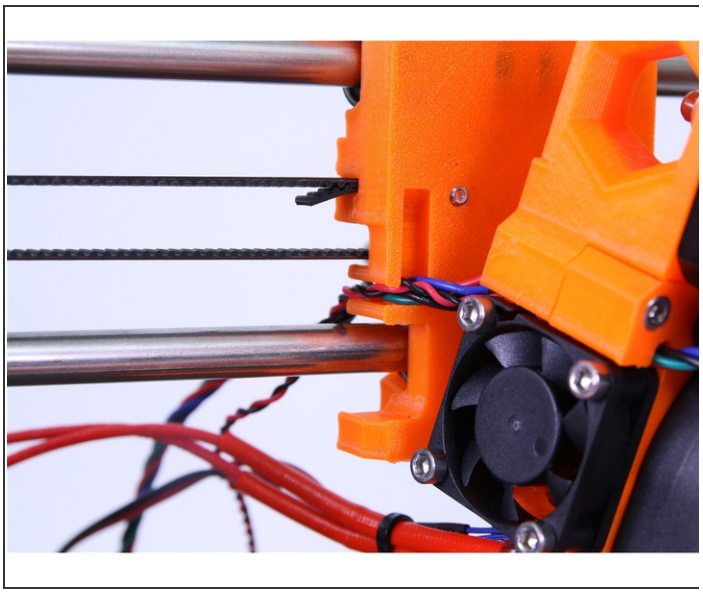
- M3x40 screws (1 pcs)
- M3x30 screw (1 pcs)
- M3x18 screw (1 pcs)
- M3x40 (1 pcs) with M3n nut (1 pcs)

⚠ Pay attention to use proper screws as indicated in the picture.

- Place the M3n nut (1 pcs) into the trap

Step 25 — Extruder cables preparation

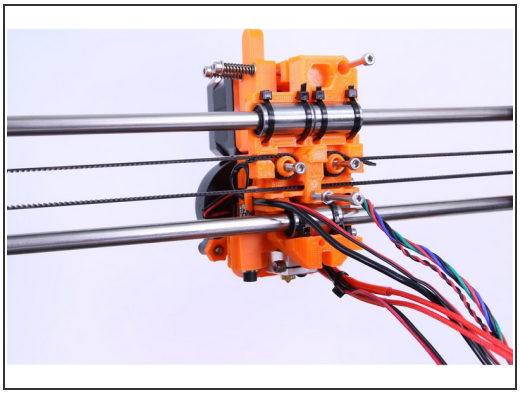


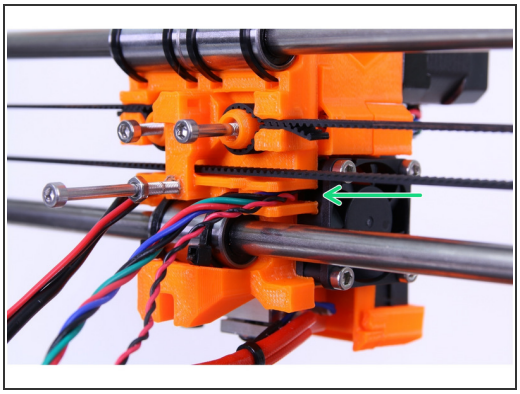


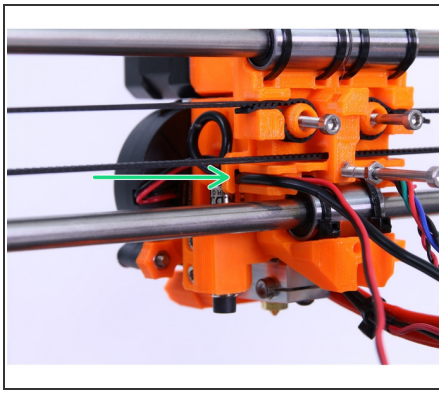
- Guide cables from the extruder as in the picture.

⚠ Cables from the P.I.N.D.A. probe, the extruder motor and both fans must pass the X-axis between the lower smooth rod and the X-axis belt.

Step 26 — Arranging extruder cables

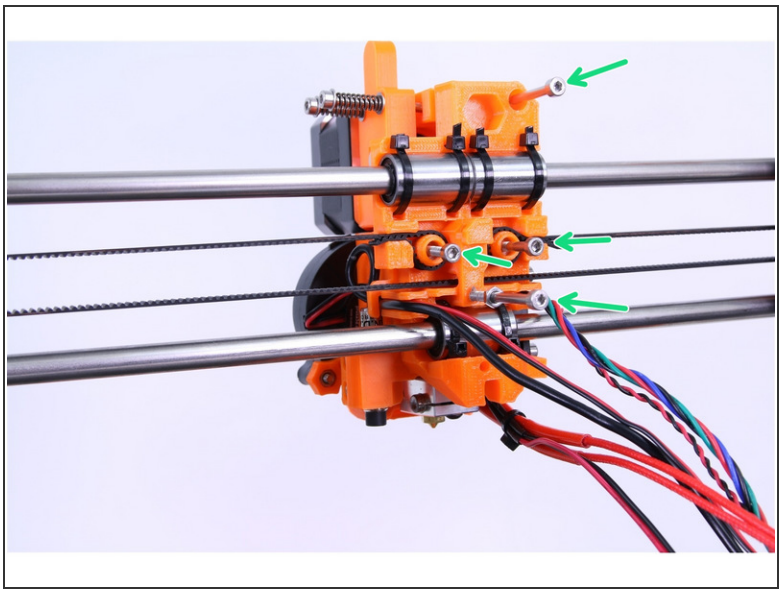


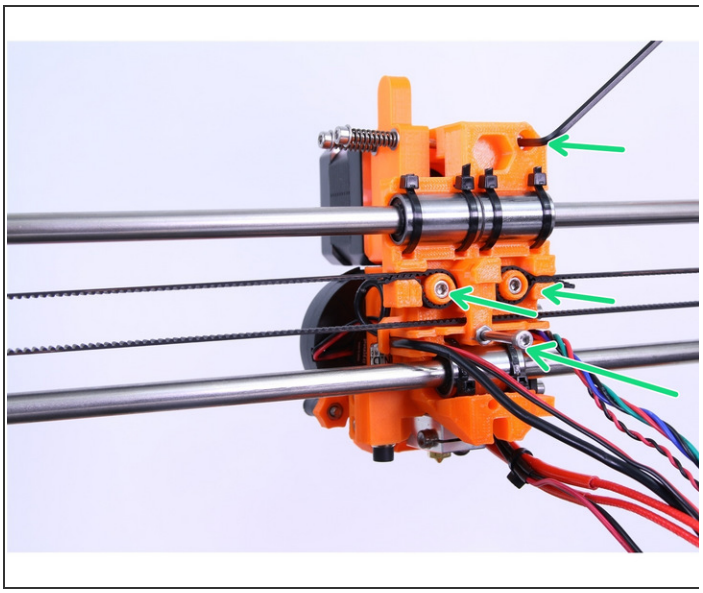




- Arrange cables from the extruder upper part neatly in extruder cable holders.
- Make sure the cables from the extruder motor are guided as shown in the picture

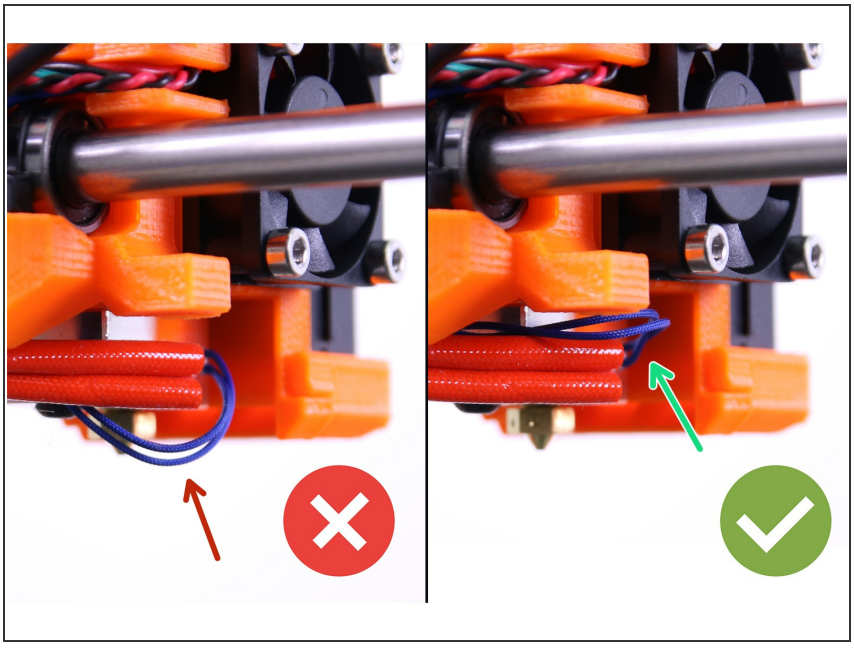
Step 27 — Securing extruder in place





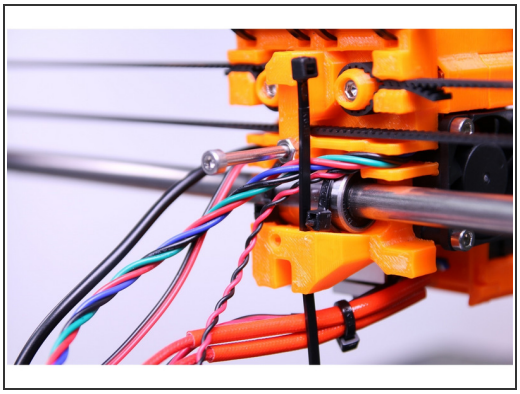
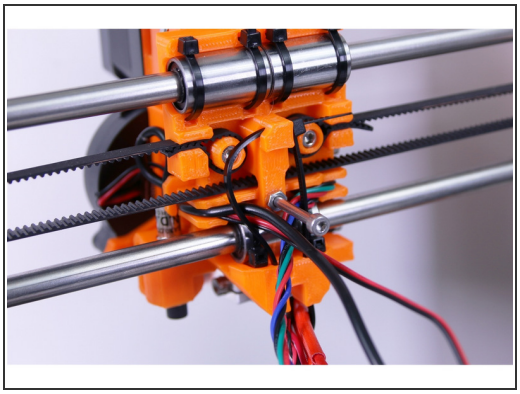
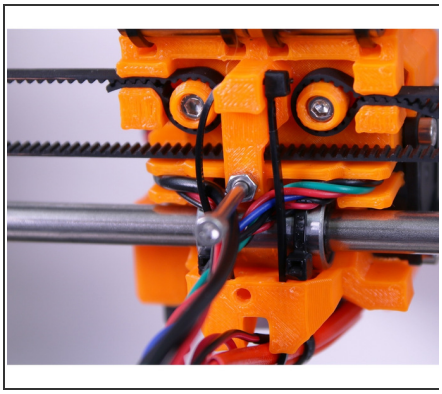
- Screw in all 4 screws.
- Tighten the extruder in place.

Step 28 — Cable management



- Guide the cables as shown in the picture.
- Make sure that the wires from the thermistor are going above the heater wires.
- Running them below will cause issues later, don't do that!

Step 29 — Cable management - right side

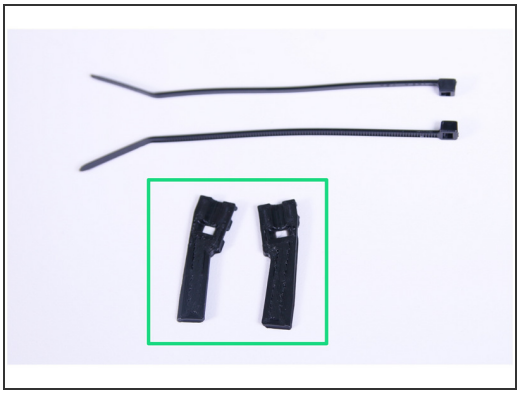
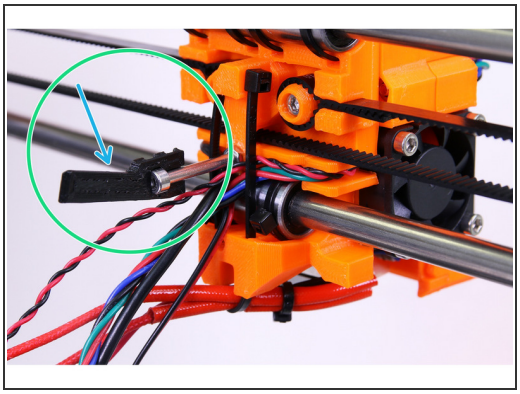
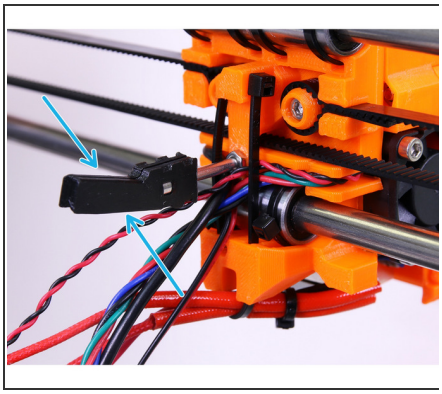
- Insert a ziptie (longer one in package) in the right side of the X-carriage so that cables from the extruder motor and the fan are below the ziptie and held in place.

⚠ Double check the orientation of the ziptie.

- Once all cables are neatly arranged, finalize it by tightening the ziptie and cutting off the excessive piece.

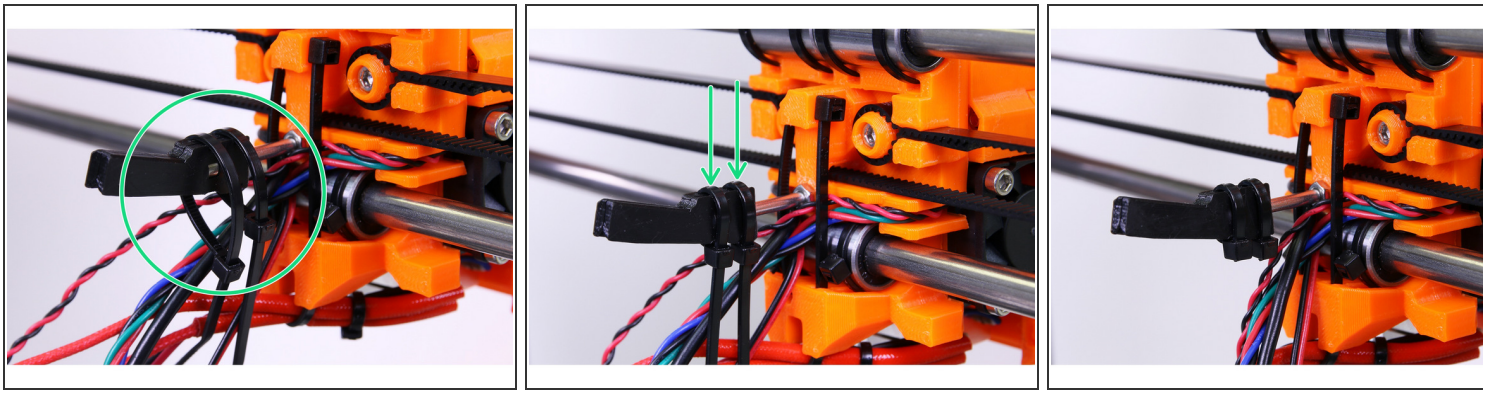
ⓘ Use pliers to cut off any excess ziptie.

Step 30 — Attachment of the cable holder

- Cable holder
- Make sure the cable holder is oriented upwards.
- Place the two halfs of the cable stiffener on the M3x40 screw.

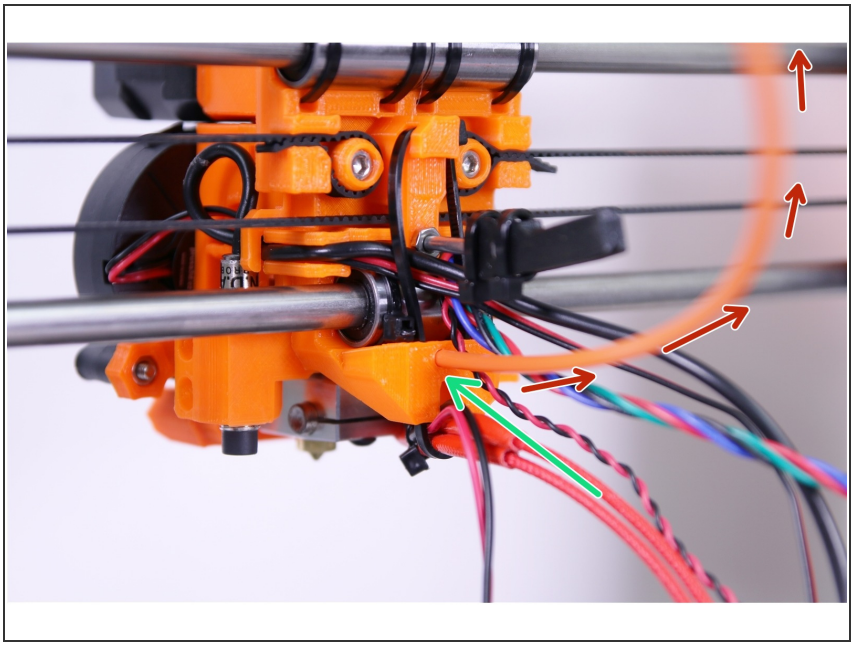
Step 31 — Tighten the cable holder



- Use two zipties for fastening.

ⓘ Use pliers to cut off any excess ziptie.

Step 32 — Preparing the filament



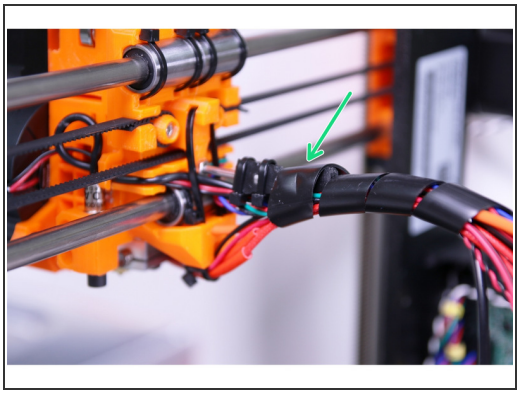
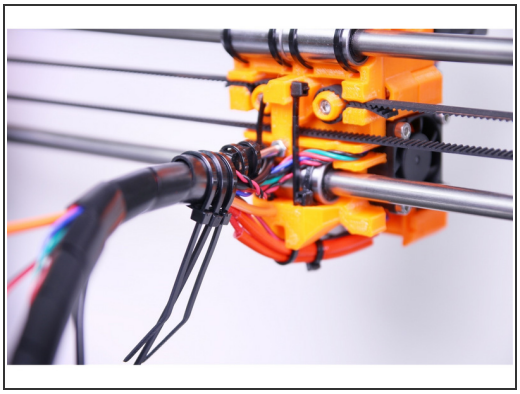
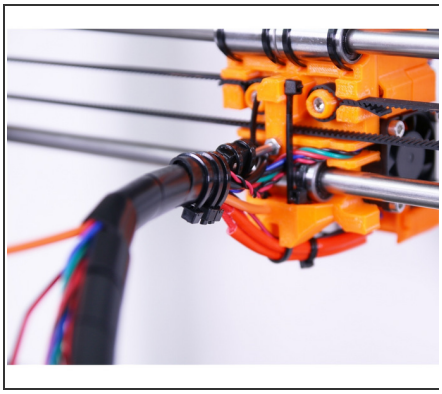
- Take the piece of filament that came with the parts (NYLON Ø 3 mm, about 50 cm long).

⚠ Push it all the way down. If you experience difficulties when inserting the filament use pliers to make a sharp tip on the filament.

ⓘ The filament is for the support of the whole harness. Don't cut it, it'll go all the way with the wires to the electronics.

⚠ Note the correct orientation of nylon filament, it needs to point up as shown in the picture!

Step 33 — Spiral wrap ziptie

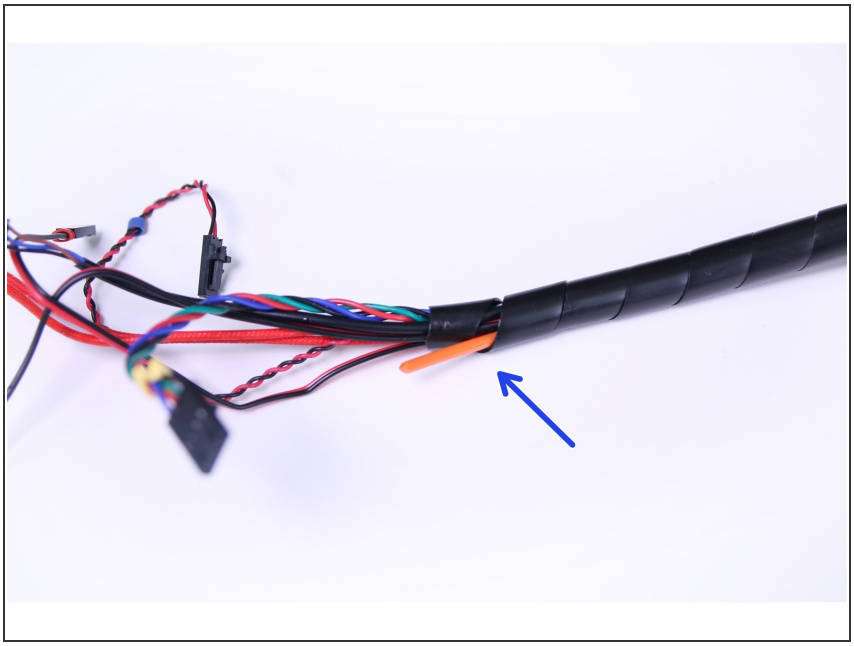
- Wrap the spiral wrap (the largest and the longest one) around the cables.
- Start with cables from the upper part, after 1 turn add cables from the hot end.

⚠ Double check by moving the extruder fully to the left or right that spiral wrap does not interfere with the printer frame.

- Use zipties and tighten the wrapped cables and spiral wrap. Tight the spriral wrap to the cable stiffener.
- Use one piece at the beginning of the spiral wrap.

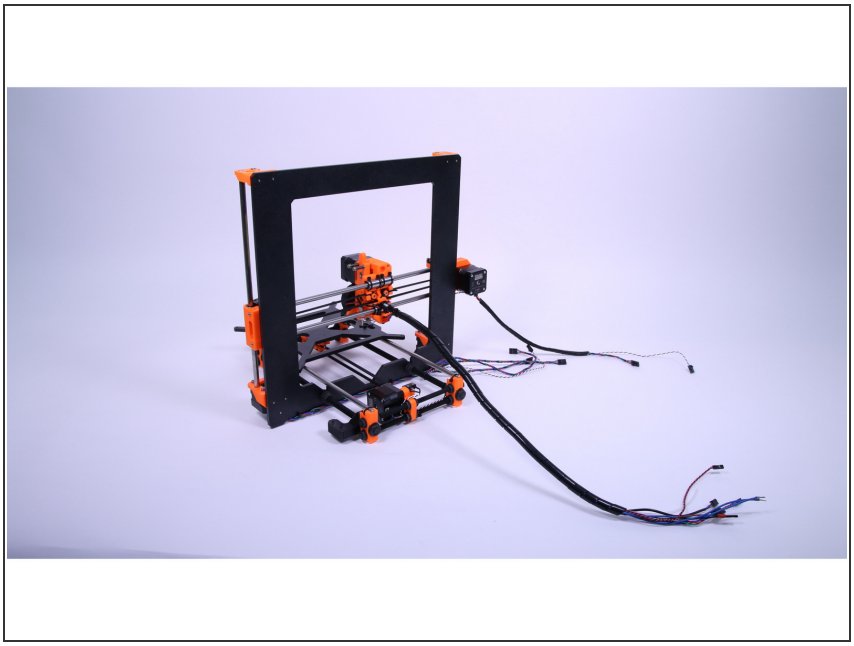
⚠ Tighten zip ties carefully, too much pressure can damage cables inside!

Step 34 — Finalizing the extruder



- Check for free movement of the X-carriage and inspect cables in the full left and right positions.
- Once you are satisfied with organisation of the extruder cables finalize spiral wrap to the full length.
- Separate the filament at the last whirl of the spiral wrap.

Step 35 — All done!



- Congratulations! You've just assembled the extruder.
- You can continue by assembling the LCD in the next chapter - 6. LCD assembly

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