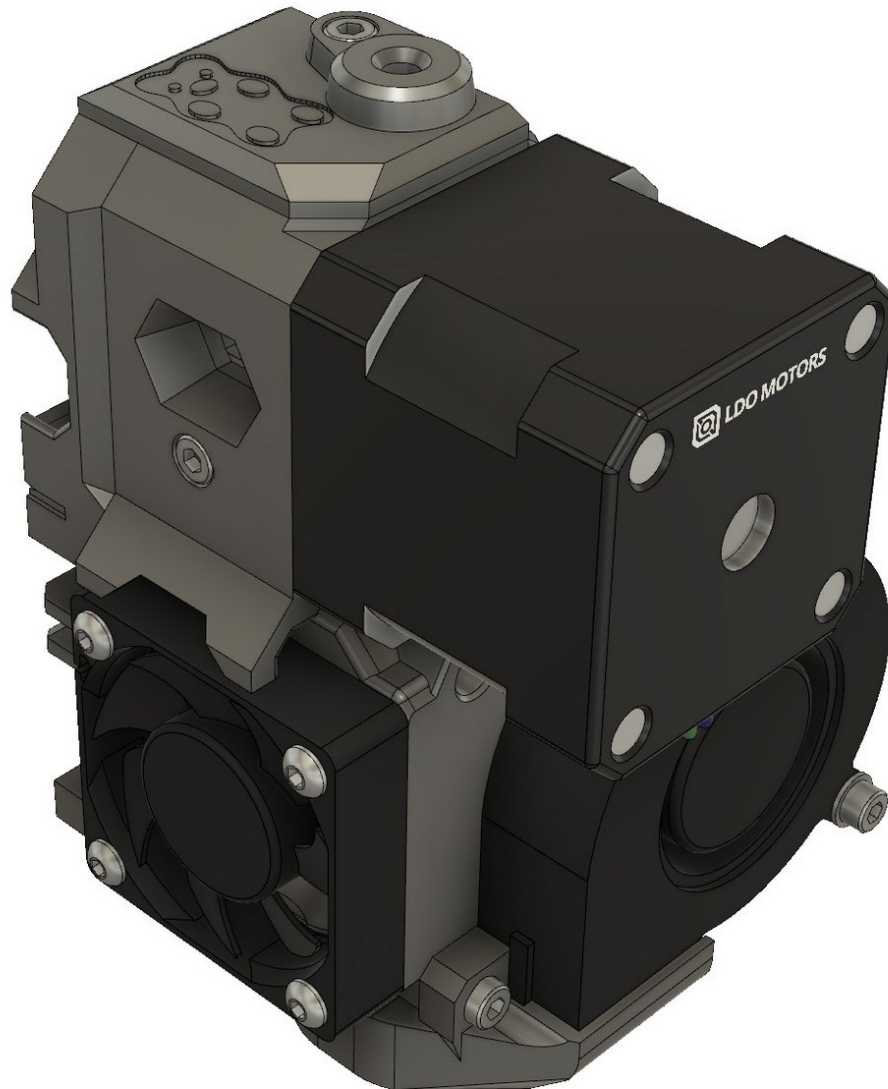


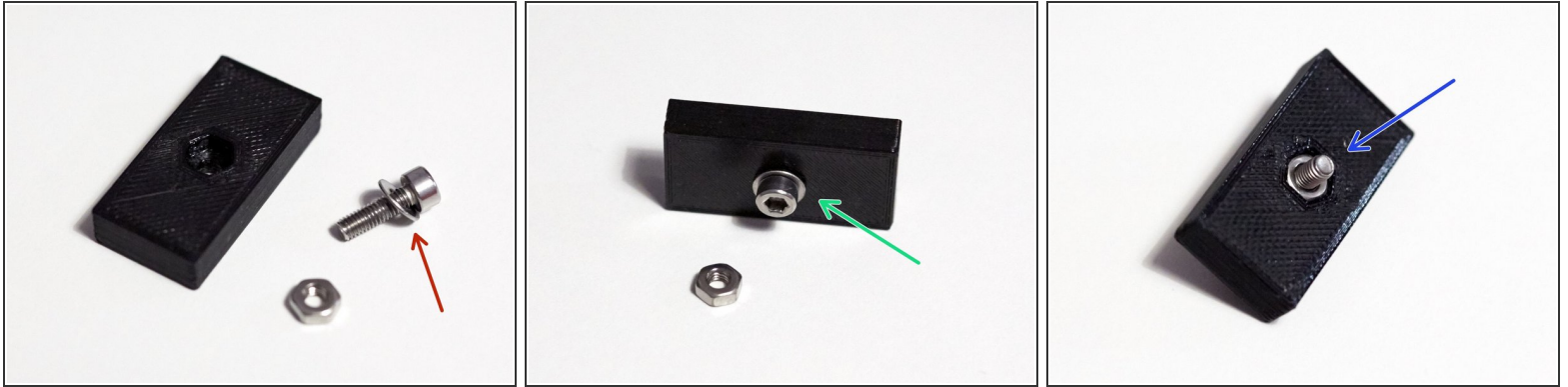
# Bear Lab

## 3. Extruder

Written By: Grégoire Saunier



## Step 1 — How to insert nuts



**i Inserting Hex Nuts:** To assure that hex nuts are properly seated, do the following:

- Add a washer to the screw, to avoid damaging the printed part.
- Insert the screw through the hole on the opposite side to the hexagonal cavity.
- Thread the hex nut onto the screw and tighten the screw.

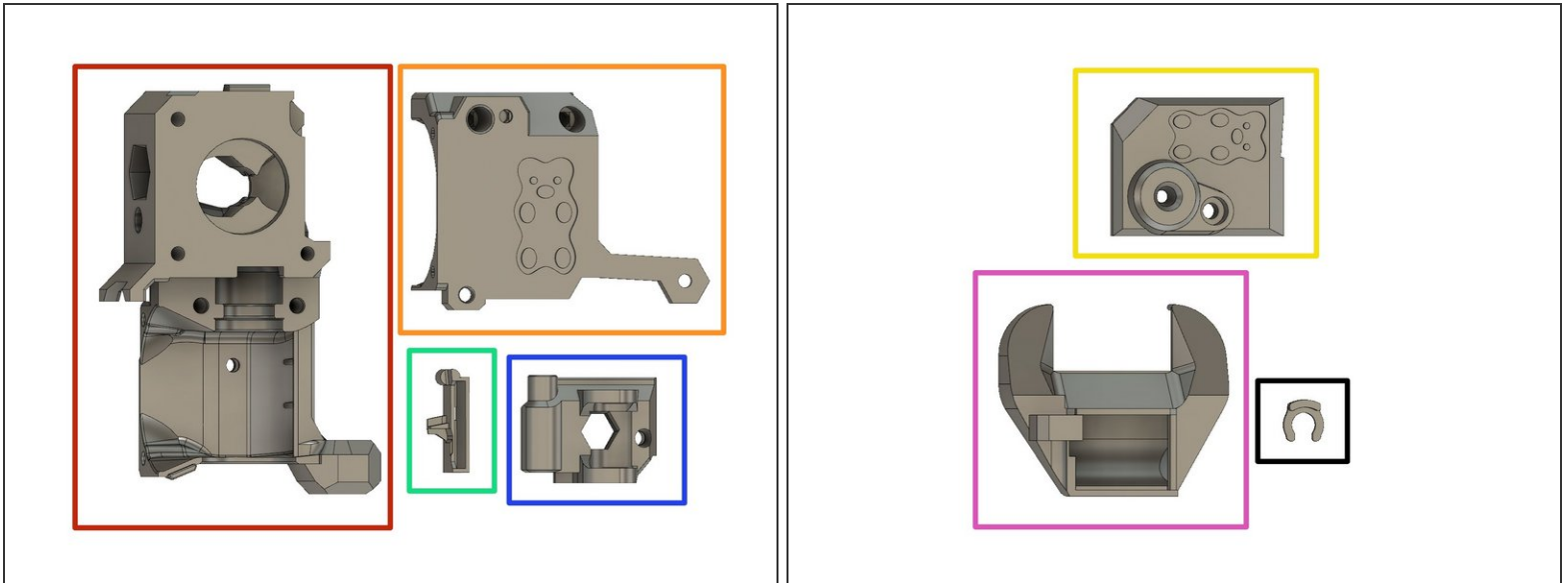
**⚠ Ensure the hex nut is aligned with the hex cavity while tightening.**

- When the nut is fully seated, remove the screw being careful not to dislodge the nut.

**i Inserting Nyloc Nuts:** You can use the same method as used for the hex nuts.

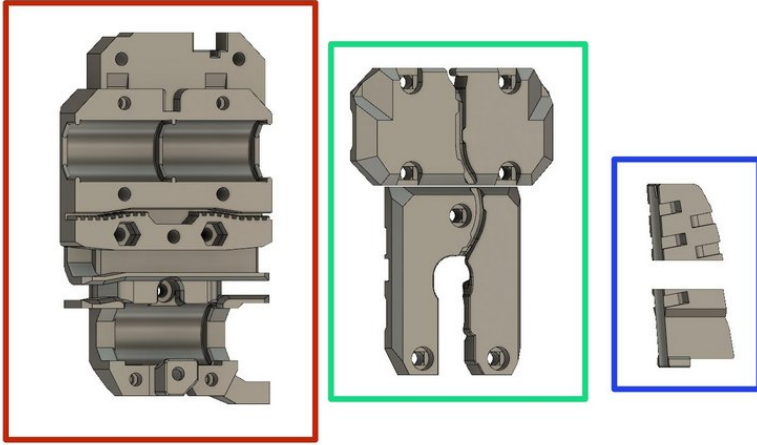
**i Inserting Square Nuts:** They tend to fall out if the piece holding them is inverted. After they are inserted, check that they are properly seated by inserting a screw to engage that nut.

## Step 2 — Extruder parts



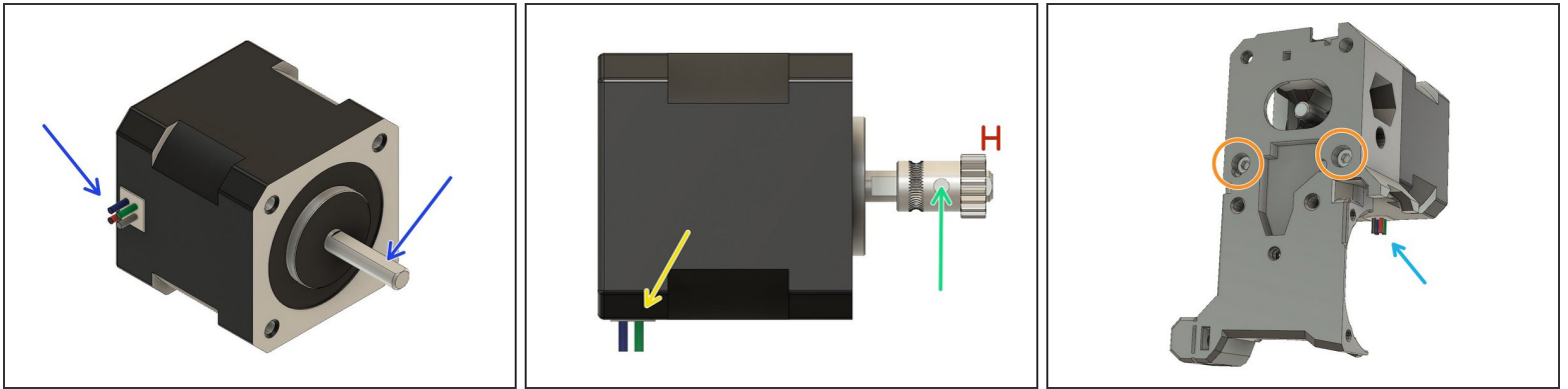
- *extruder\_body*
- *extruder\_cover*
- *extruder\_idler*
- *fs\_lever*
- *nozzle\_fan\_duct* (with print support removed)
- *filament\_sensor\_cover*
- *hotend\_collet\_clip*

## Step 3 — X carriage parts



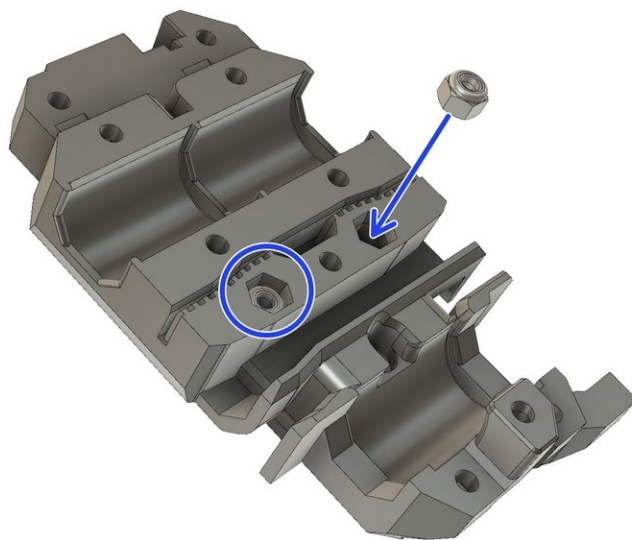
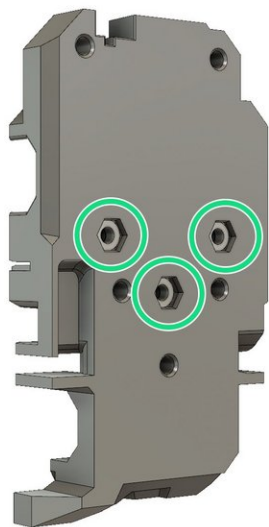
- *x\_carriage*
- *x\_carriage\_back* (two parts)
- *cable\_guide\_back* (part a and b)

## Step 4 — Extruder motor



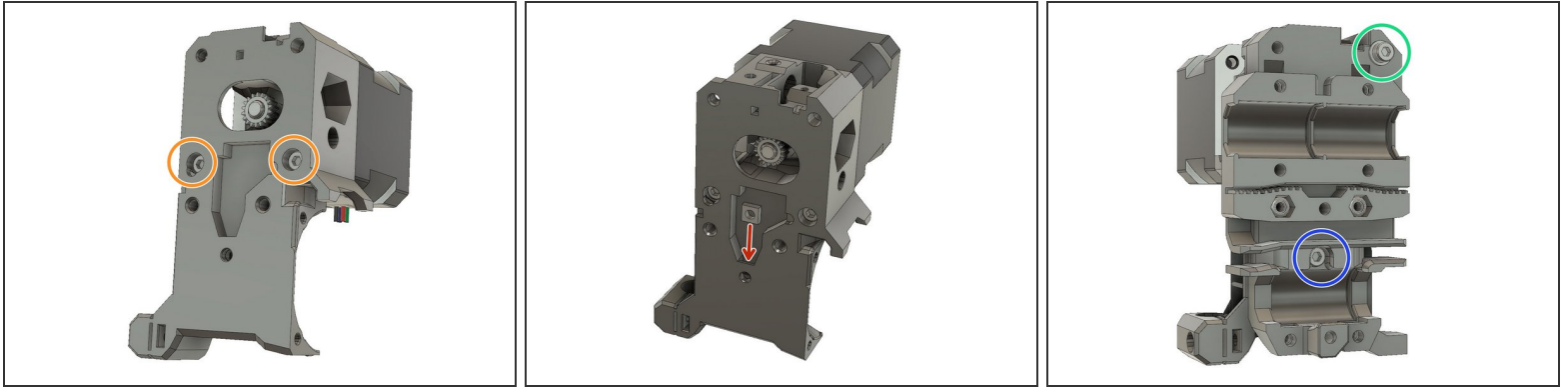
- Locate the extruder motor so the wires face to the left. Rotate the shaft so that the flat is facing up.
- Mount the Bondtech pulley on the extruder motor shaft so that the geared portion is furthest from the motor body and with the set screw contacting the flat portion of the shaft.
- The motor shaft should protrude from the pulley by approximately 1 mm.
- Secure the set screw to avoid the gear moving. We will fine tune the position later.
- Verify the orientation of the motor cables.
- Secure the extruder motor to the *extruder\_body* using two M3x25 screws.
- Verify the motor cables orientation

## Step 5 — X carriage preparation



- Insert three M3 hex nuts
- Insert two M3 nylock hex nuts

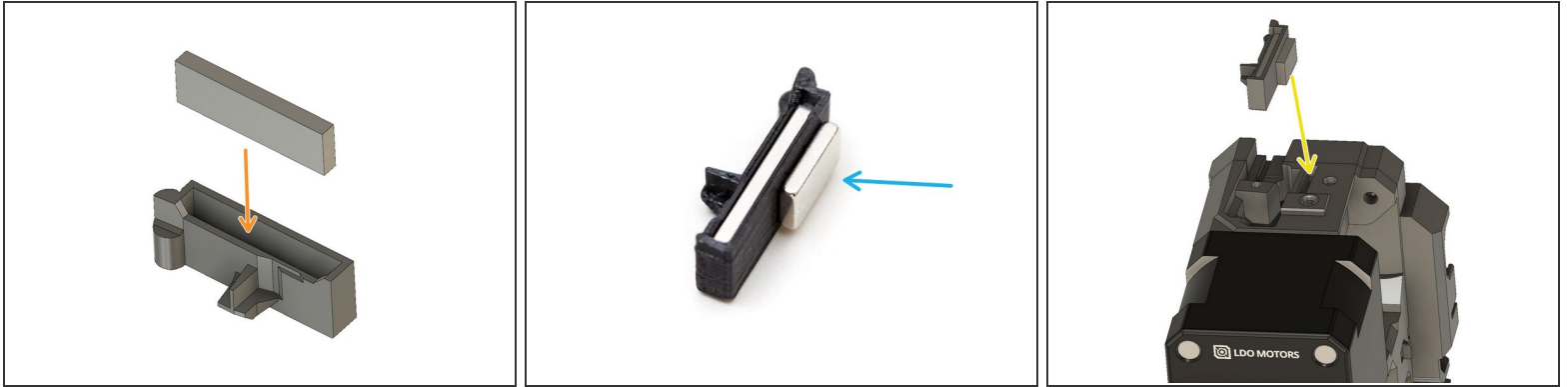
## Step 6 — X carriage assembly



- Verify that the M3x25mm screws are snug
- Slide an M3 square nut into the *extruder\_body*.
- Using an M3x10 screw attach the *extruder\_body* to the *x\_carriage*.
- Using an M3x40 screw with an M3 washer attach the *extruder\_body* to the *x\_carriage*.

⚠ Verify that *extruder\_body* and *x\_carriage* are correctly aligned. Adjust if necessary with the M3x10 and M3x40 screws

## Step 7 — Filament sensor assembly



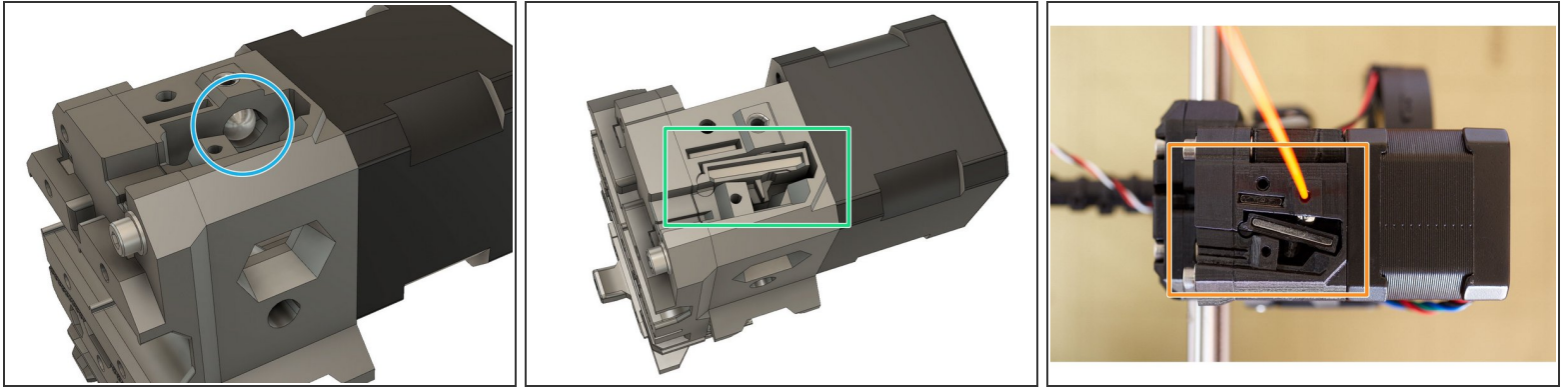
⚠ Verify that the *filament\_sensor\_lever* and the filament sensor pocket on top of the *extruder\_body* does not have strings and are well printed. Clean up if necessary.

- Insert the longer magnet (20x6x2mm) inside the *filament\_sensor\_lever*.
- Place the smaller magnet (10x6x2mm) so that it is attracted to the *filament\_sensor\_lever*. The smaller magnet should be on the flat side of the lever.
- Remove the smaller magnet from the *filament\_sensor\_lever*, taking care to keep the orientation the same. Insert the smaller magnet with the same orientation into the *extruder\_body*. **DO NOT** insert the *filament\_sensor\_lever* yet.

⚠ Verify that the smaller magnet is fully pressed into its cavity.

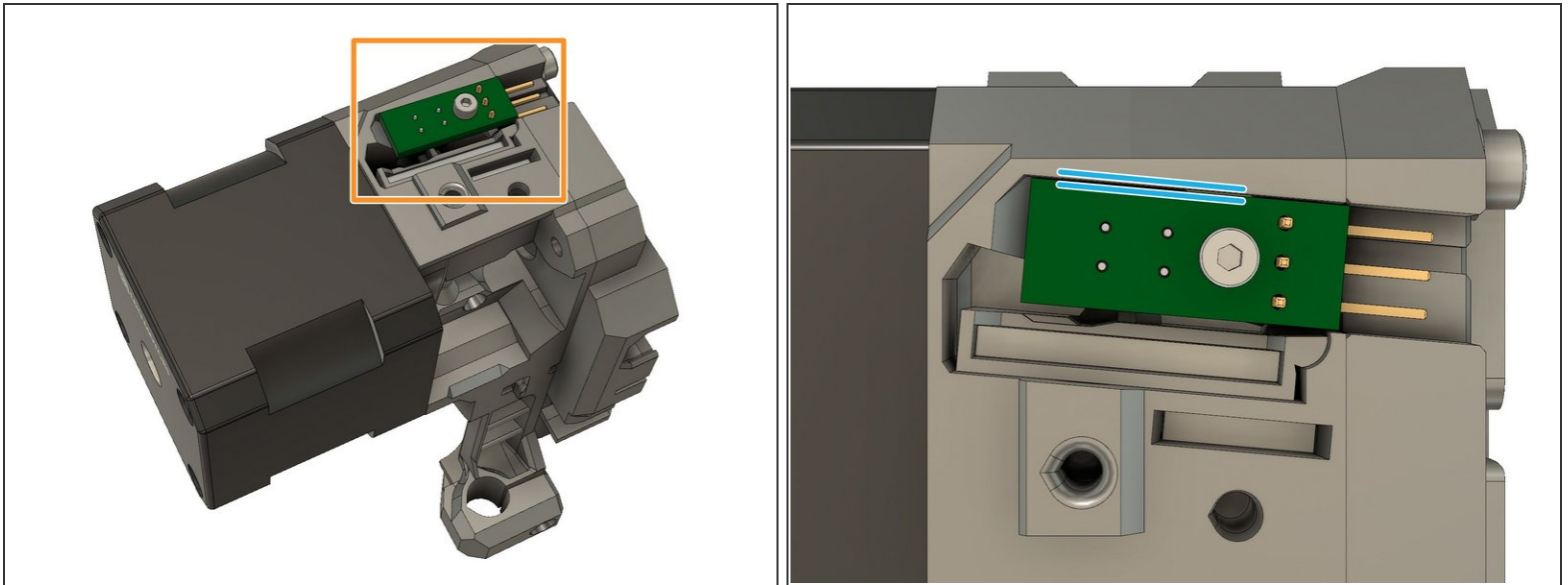


## Step 8 — Filament sensor assembly



- Insert the steel ball in the dedicated pocket of the *extruder\_body*.
  - Verify the steel ball is rolling smoothly and easily, inside its pocket.
  - Insert the *filament\_sensor\_lever*.
- i** You can use a flat screwdriver to keep the steel ball in its pocket when inserting the *filament\_sensor\_lever*.
- Test the *filament\_sensor\_lever* is moving correctly with a piece of filament.

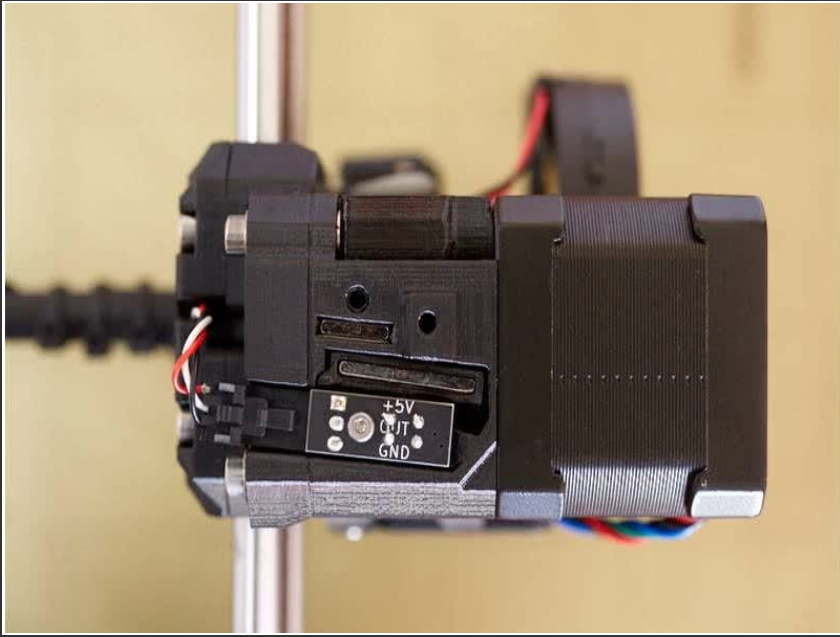
## Step 9 — Filament sensor assembly



**⚠** In order to avoid electrostatic discharge to the filament sensor, touch something metallic that is linked to the ground. Like pipework or a faucet.

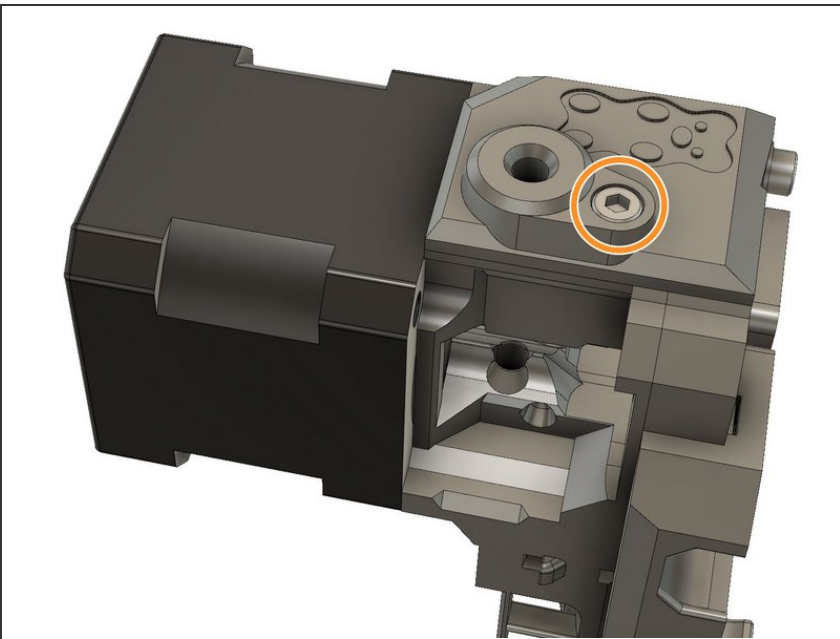
- Carefully secure the Prusa IR sensor with an M2x8 screw. Do not over tighten.
- Adjust the Prusa IR sensor to make sure that it is parallel to the border of the pocket. Finish tightening the screw; it only needs to be tightened sufficiently to hold the sensor in place

## Step 10 — Filament sensor assembly



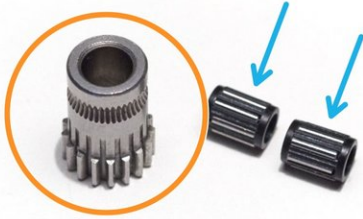
- With a piece of filament, verify the *filament\_sensor\_lever* is working smoothly.

## Step 11 — Filament sensor cover assembly



- Install and secure the *filament\_sensor\_cover* with an M3x10 screw.

## Step 12 — Extruder idler preparation



- Locate the Bondtech drive gear. This is the one that has NO set screw.
- Lubricate the needle bearings with a dab of lithium based grease
- Slide the two Bondtech needle bearings into the Bondtech drive gear.

## Step 13 — Extruder idler preparation



- Place the idler gear into the *extruder\_idler*. Note the orientation of the teeth.

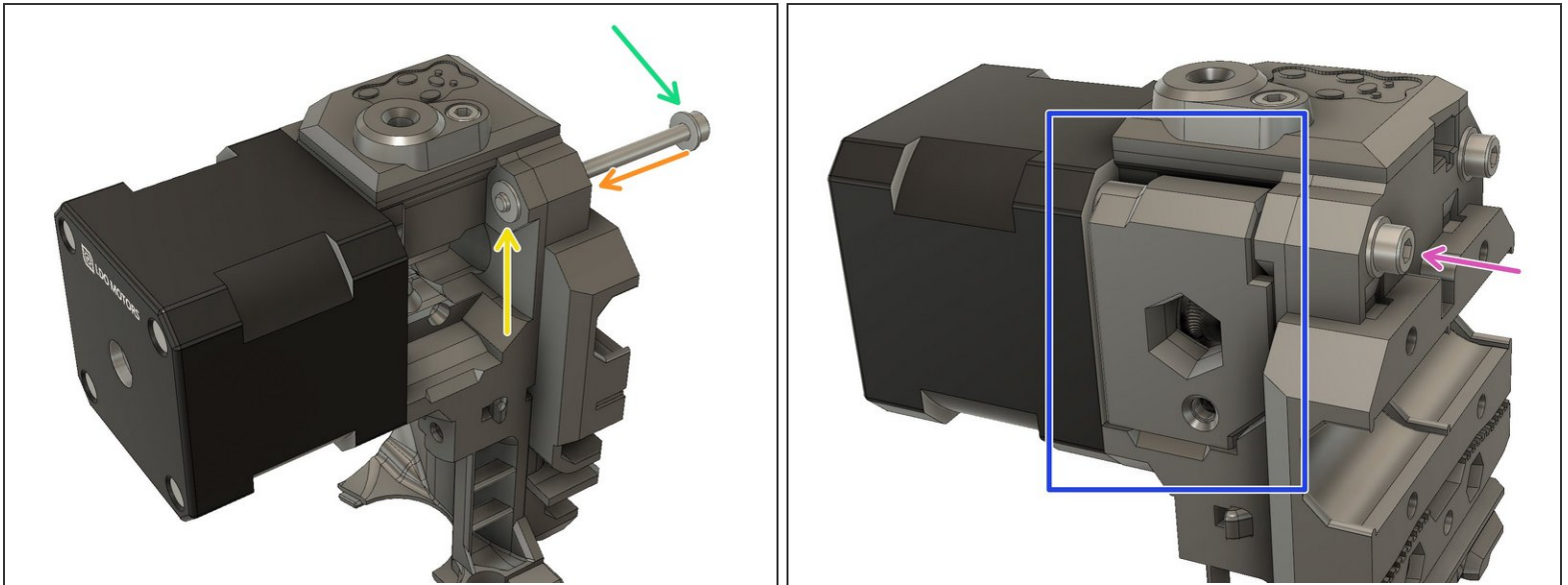
**⚠ Make sure that both needle bearings are still present in the idler gear.**

- Insert the shaft from the direction shown in the diagram. Fully insert the shaft, it should be flush with the printed part, else the the idler will not close properly.
- Insert a square nut in the lateral pocket.

**⚠ Double check the orientation of the gears.**

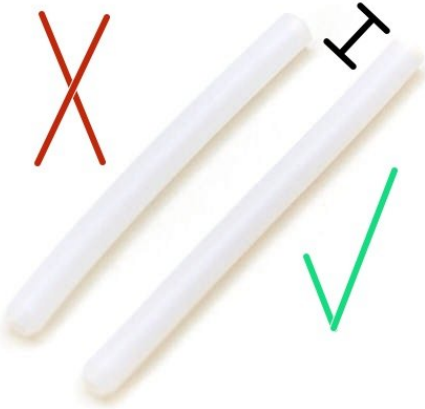
**⚠ Double check that no needle bearing has fallen out during these steps.**

## Step 14 — Extruder idler assembly



- Slide an M3 washer on an M3x40 screw.
- Insert the screw into the top, left, hole of the *x\_carriage*, until it protrudes just enough for you to place an M3 washer on it.
- Carefully place an M3 washer on the end of the screw.
- Carefully slide the *extruder\_idler* into the opening, taking care not to displace the M3 washer and insert the screw to act as the hinge for the idler door..
- Gently tighten the screw into the extruder motor, the *extruder\_idler* must rotate freely.

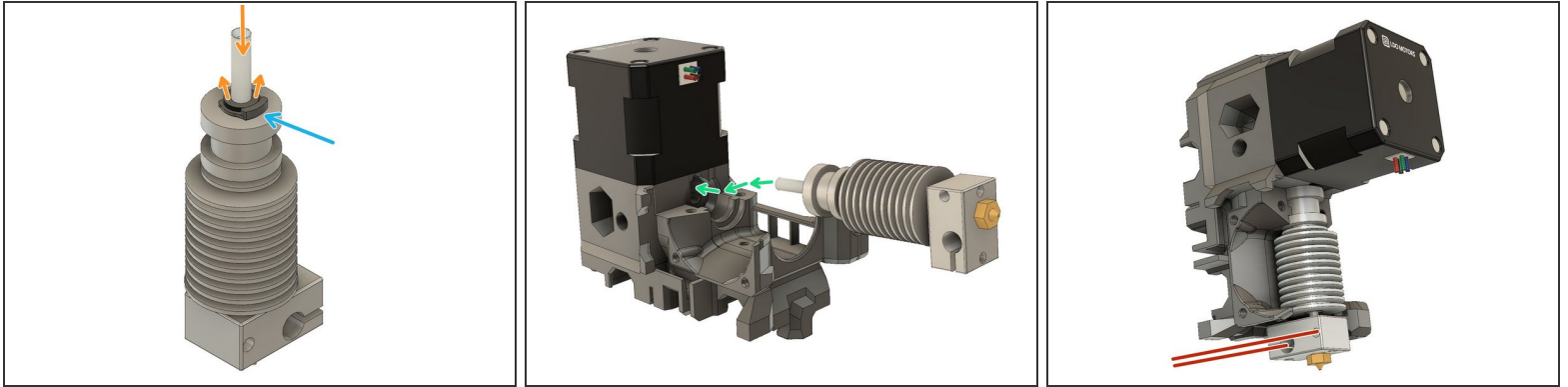
## Step 15 — Prepare the PTFE tube



**⚠** The Bear extruder uses a PTFE tube length of 50mm. It is the same PTFE tube than MK2S, MK2.5 (non-S) and MK3 (non-S). The original Prusa MK2.5S or MK3S extruder is using a PTFE tube length of 44.2mm which will be too short for the Bear extruder.

- You should have prepared the PTFE tube during guide [1. Preflight check and disassembly](#). Make sure you have followed those steps.

## Step 16 — Hotend assembly



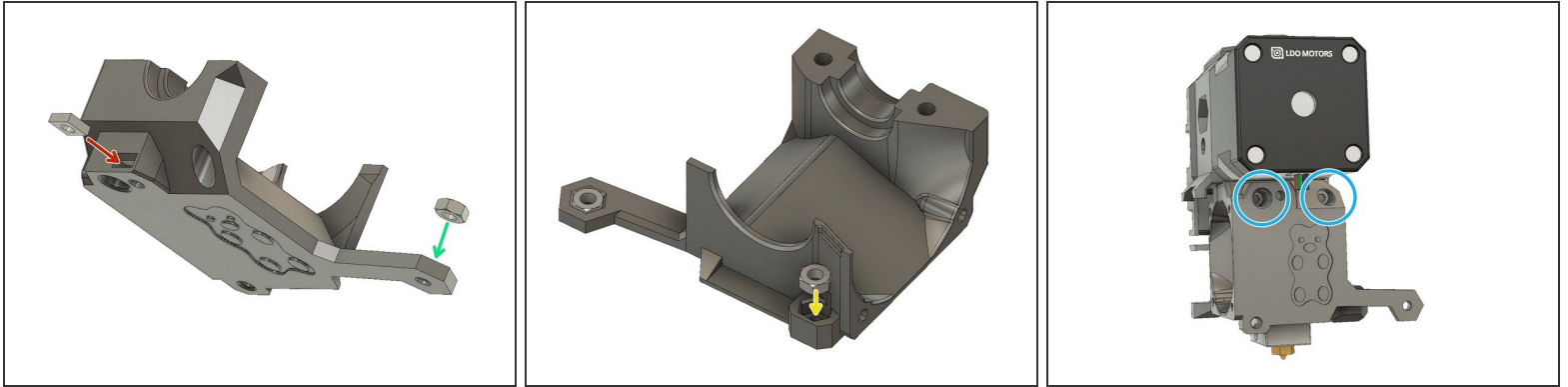
 Hotend wires are not visible on these images. Use the heatblock to orientate the hotend correctly.

 **Make sure your PTFE tube length is 50mm.**

- Push the collet (black plastic part) down and fully insert the PTFE tube. Whilst pressing the PTFE into the hotend, lift the collet upwards, to lock the PTFE tube in place
- Insert the *hotend\_collet\_clip*. This prevents the collet from loosening and keeps the PTFE tube locked in place.
- Insert the hot end into the *extruder\_body* so that the heater and thermistor wires are properly oriented.
- Note the position of the heater and thermistor wires.



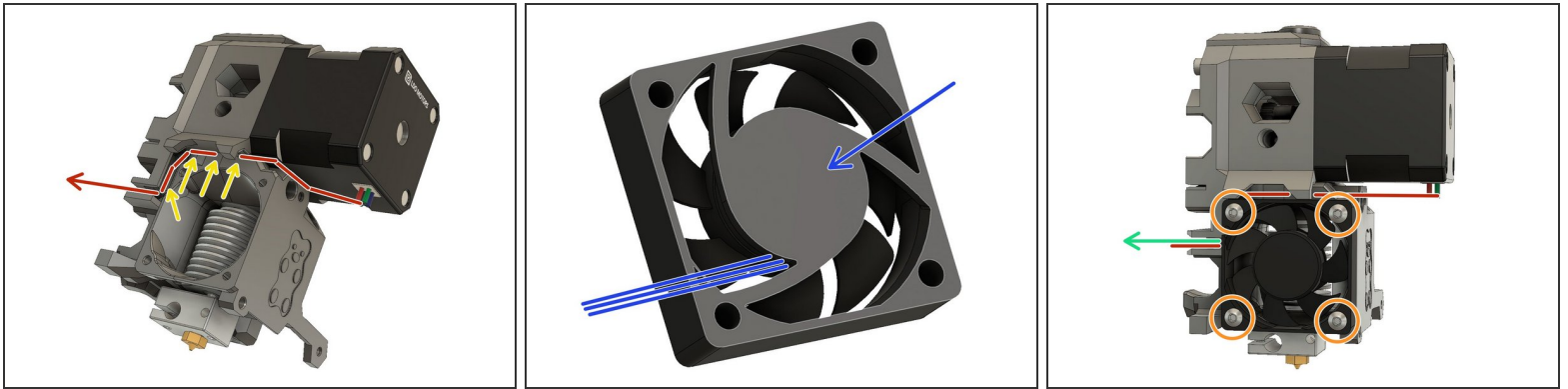
## Step 17 — Extruder cover assembly



- Insert one M3 square nut
- Insert one M3 hex nut
- Insert one M3 hex nut
- Insert two M3x40 screw to lock the hotend in place

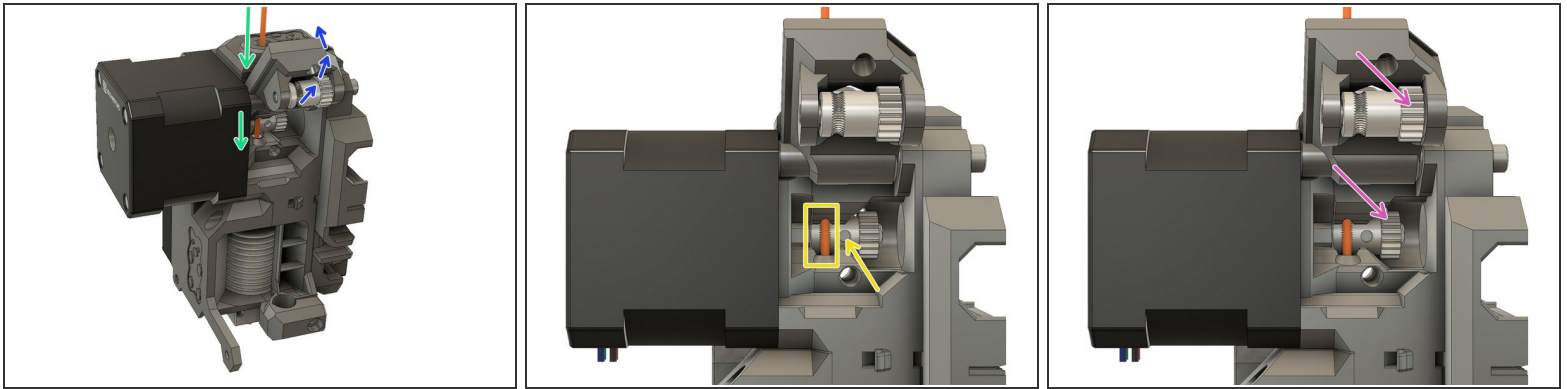
**⚠ Check that the hotend has not rotated, is perpendicular to the extruder body and is correctly oriented. Adjust if necessary.**

## Step 18 — Hotend fan assembly



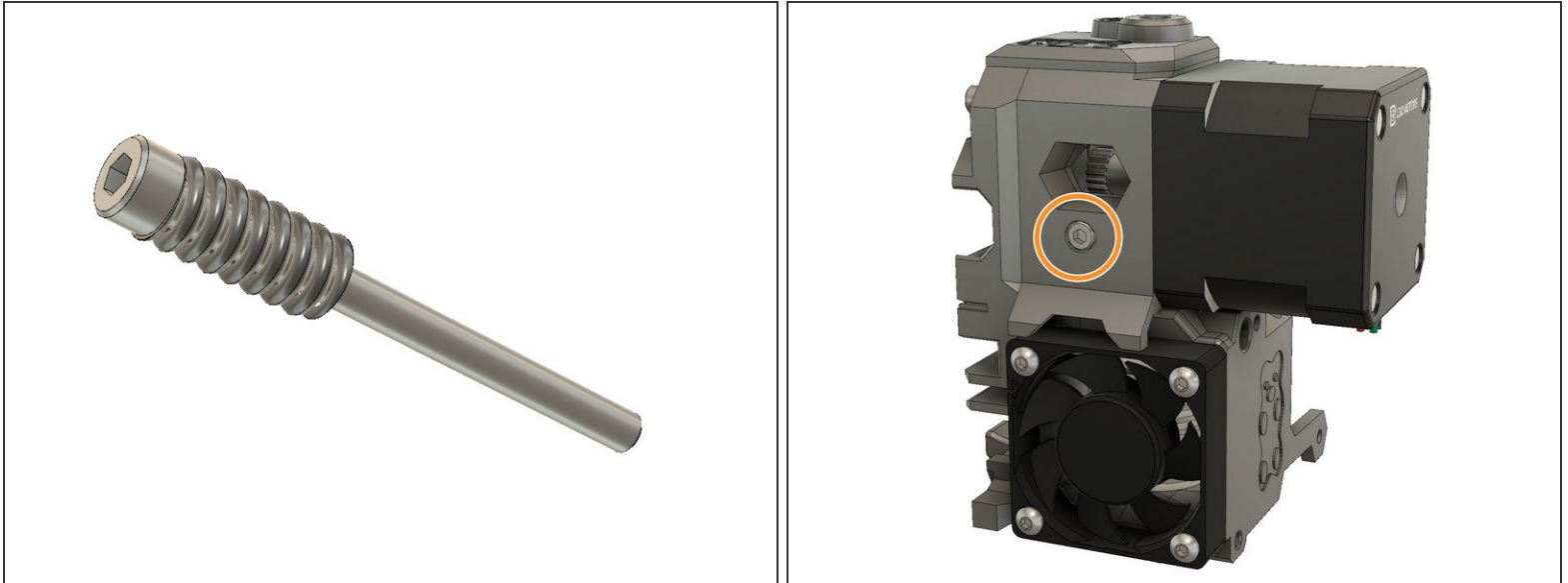
- Carefully route the motor wires as shown in the figure.
  - Make sure the wires sit correctly in the channel.
  - This surface will be touching the *extruder\_body*. It is the side with the manufacturers label on it. The wires come out from this side and the fan should be oriented so that they point towards the rear of the extruder.
  - Carefully route the hotend fan wires in the *x\_carriage*.
  - Attach the hotend fan with four screws. Follow the screw type according to your hotend fan:
    - Sunon & Delta : M3x16 button head screw
    - Noctua : M3x14 socket head screw
- ⚠ Check that no wires are pinched. Check the orientation of the hotend fan, the air should be blowing over the hotend heatsink. On the edge of the fan body, there are usually two arrows, indicating the direction of rotation and direction of flow. Ensure that the arrow indicating flow is pointing in towards the hotend.**

## Step 19 — Bondtech gear alignment



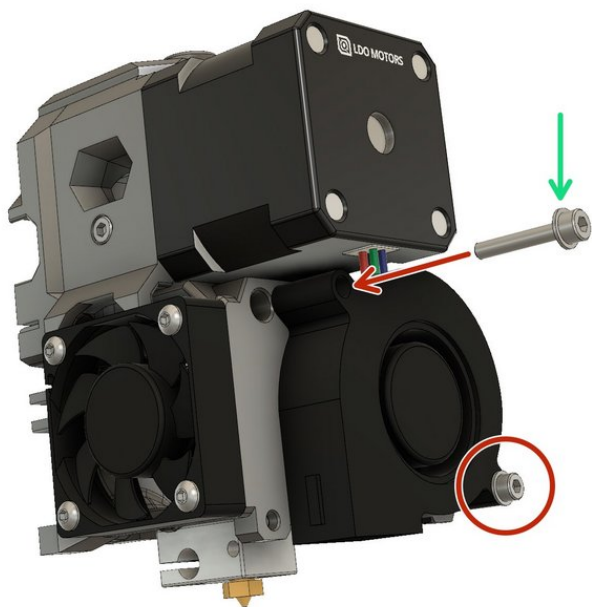
- Open the *extruder\_idler*
- Insert a piece of 1.75 mm filament through the *extruder\_body* into the PTFE tube.
- Using the Bondtech set screw, carefully center the filament on the drive teeth.
- Tighten the set screw. Don't tighten too much as you will damage the thread.
- Remove the filament.
- This is a good time to put a dab of lithium based grease on the gears. Make sure that you do not get any grease on the drive teeth.

## Step 20 — Extruder idler tensioner screw



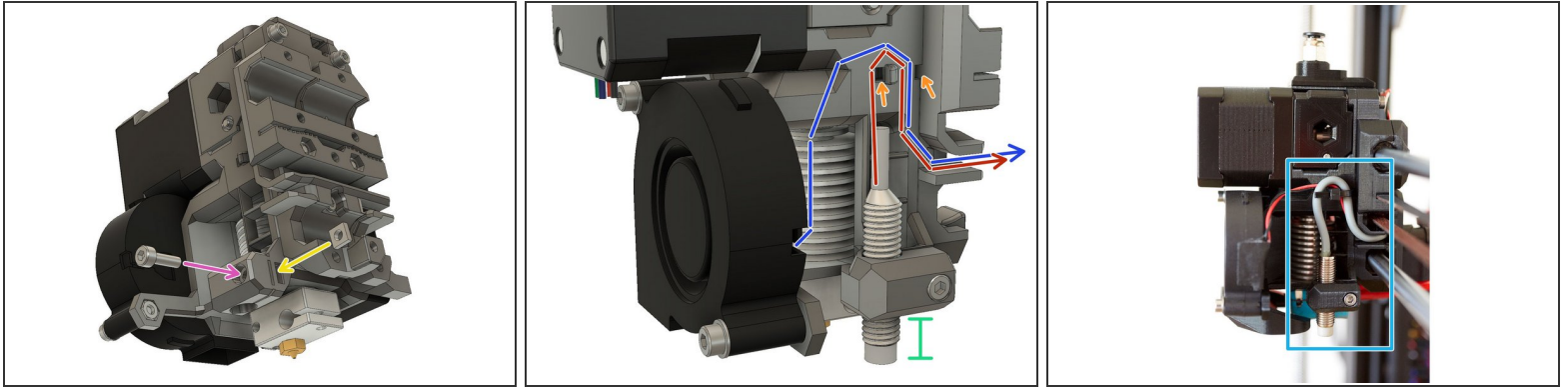
- Make sure that you have completely removed the filament from the *extruder\_body*.
  - Slide an extruder spring onto an M3x40 screw.
  - Close the *extruder\_idler* door.
  - Slide the screw with the extruder spring into the *extruder\_body*.
  - Tighten the screw into the *extruder\_idler* until the head is flush with the surface of the body.
- i** If you have trouble closing the *extruder\_idler*, try rotating the Bondtech idler gear, with a finger, to ensure that the gears are meshed.

## Step 21



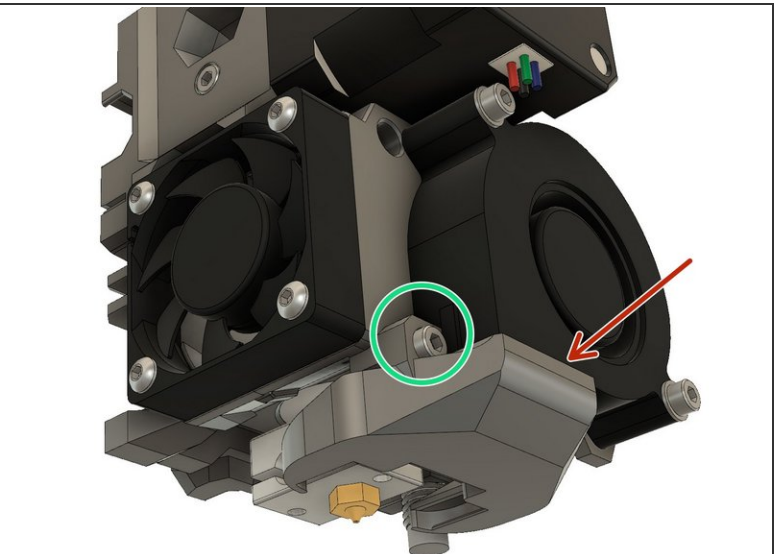
- Slide an M3 washer on an M3x18 screw. Do the same for another M3x18 screw.
  - Attach the print fan using the screws
- ⚠ Be careful not to over tighten to avoid damaging the fan.

## Step 22 — PINDA probe assembly



- Place a square nut in the *extruder\_body* for the *pinda\_mount*.
- Slide an M3x10 screw into the *pinda\_mount* and engage the square nut, but do not tighten yet.
- Insert the PINDA into the mount so that the sensor end is approximately 12mm below the bottom of the *pinda\_mount*. Tighten the screw just enough to keep the PINDA from falling out. The optimum PINDA position will be adjusted later.
- Route the PINDA wires
- Route the print fan wires
- Secure the cables with a zip tie. Be sure to leave some slack since the PINDA position will need to be adjusted later.
- This is the preferred example of how the PINDA and print fan cables should be wired.

## Step 23 — Print fan shroud assembly



- Make sure you have broken the support for the *nozzle\_fan\_duct*.
- Insert the print shroud. If necessary, slightly unscrew the print fan.
- Use an M3x10 screw to attach the shroud and secure the print fan.

## Step 24 — Next chapter



- Congratulations you have finished this chapter :-)
- Go to the next chapter: [4. Extruder and X axis assembly](#)