PRUSA RESEARCH

2. Y-axis assembly

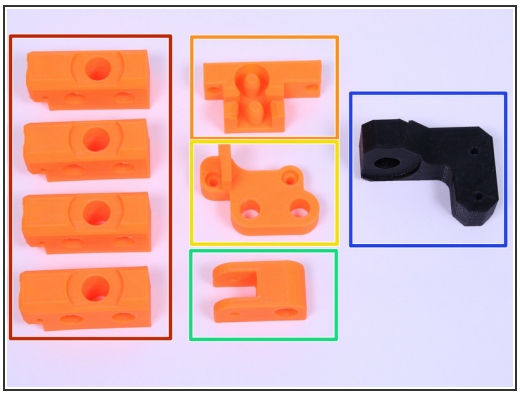
Y-axis assembly

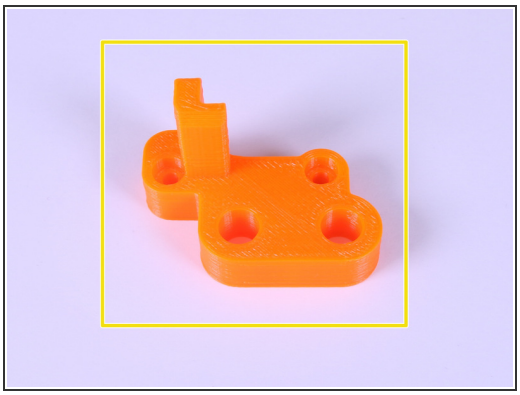
Written By: Josef Prusa

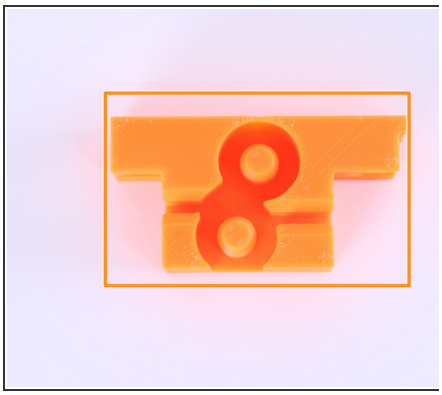
Step 1 — Get the necessary tools

- 13/17mm spanners
- 3.6mm flathead screwdriver
- Needle-nose pliers
- 2.5 and 1.5mm Allen key

Step 2 — 3D printed parts

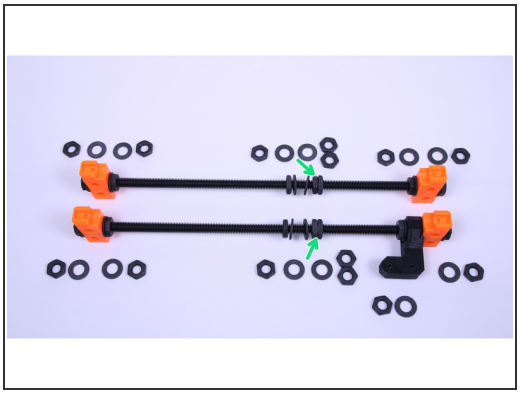


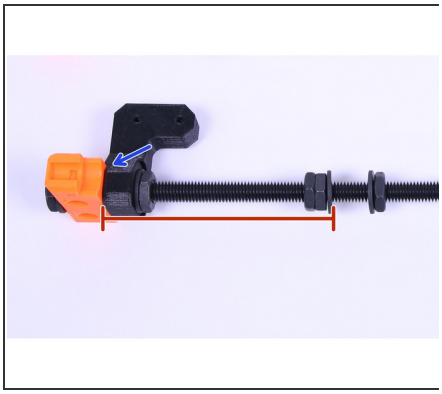




- Y-axis-corners
- Y-belt-holder (can also look like in the third picture)
- Y-motor-holder (can also look like in the second picture)
- Y-idler
- PSU-Y-part

Step 3 — Assemble the Y-axis rods





Use M10n nuts (14 pcs) , M10w washers (12 pcs) and M10 threaded rods (2 pcs).

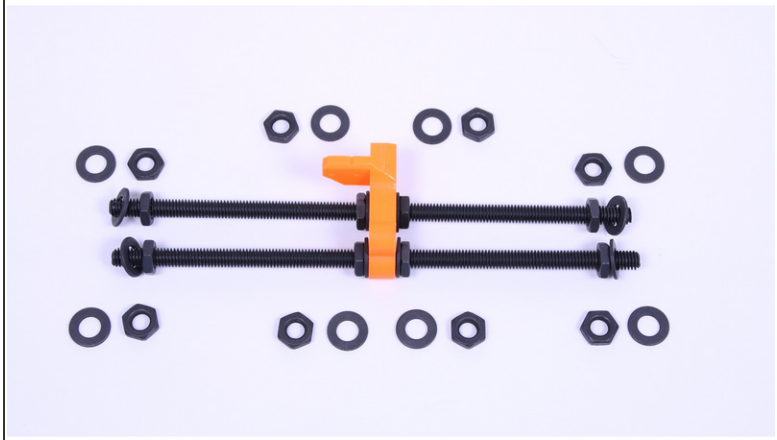
- Screw the nuts on and place washers, Y-corners and PSU-Y-part on the threaded rod as shown in the picture.

Ensure 100mm distance between a washer after counter-nut and the Y-axis corner. Use photo as reference.

- The 2 nuts have to be tightened against each other (counter-nut).
- Note that there is no gap between parts, they have to fit together.

For the initial position of Y-corners, you can temporarily mount the rods (see step 10, 11).

Step 4 — Assemble the Y-axis stage rear



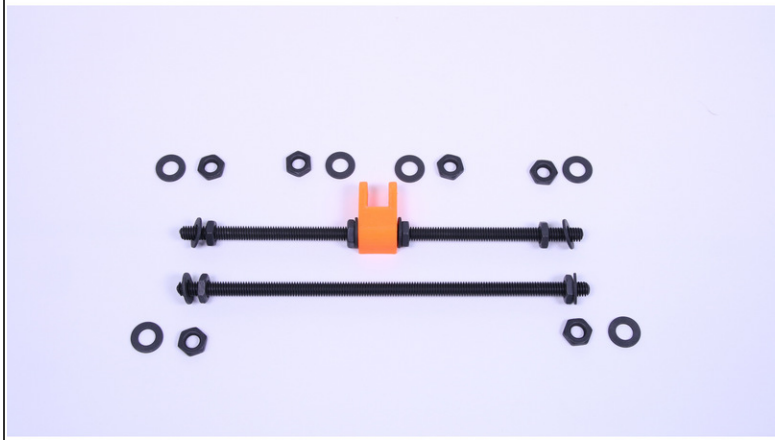
Use M8n nuts (8 pcs), M8w washers (8 pcs) and M8 threaded rods (2 pcs).

- Screw the nuts and place washers and Y-motor-holder on threaded rod as shown in the picture.

Y-motor-mount should be somewhere in the middle of the threaded rod. The precise position doesn't matter at this time.

Ensure the correct orientation of Y-motor-holder.

Step 5 — Assemble the Y-axis stage front

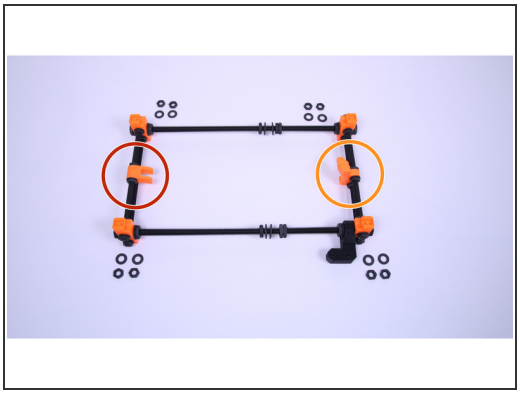


Use M8n nuts (6 pcs), M8w washers (6 pcs) and M8 threaded rods (2 pcs).

- Screw the nuts and place washers and Y-idler on threaded rod as shown in the picture.

Y-idler should be somewhere in the middle of the threaded rod. The precise position doesn't matter at this time.

Step 6 — Fully assemble the Y-axis stage

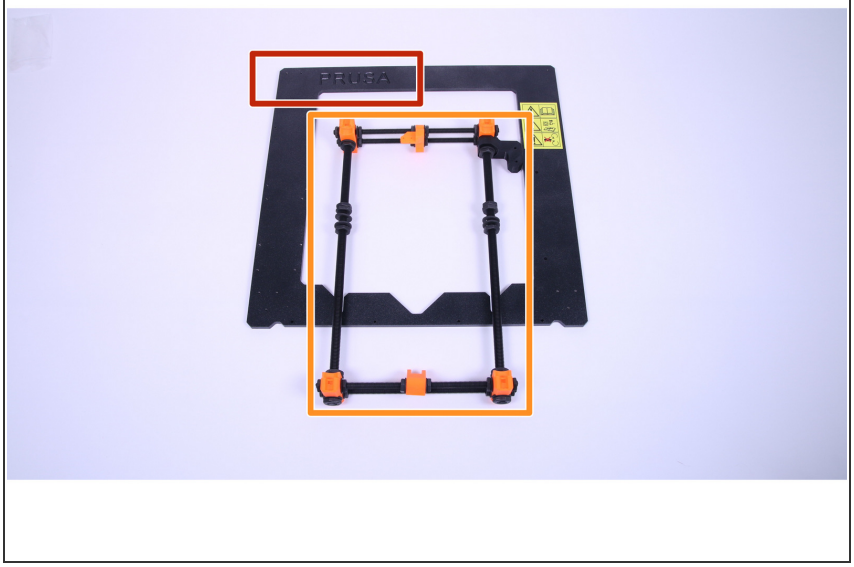


Use M8n nuts (8 pcs) and M8w washers (8 pcs).

- Y-axis stage front
- Y-axis stage back
- Insert Y-axis stage front and back into Y-axis side elements and lock it with washers and nuts like in the picture.

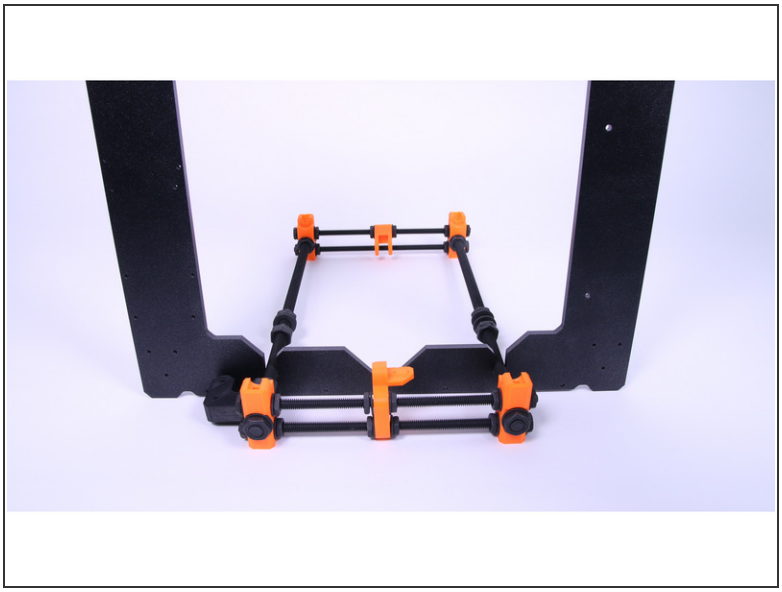
Ensure the correct placement. Y-axis rear stage has to be closer to the double-nuts!

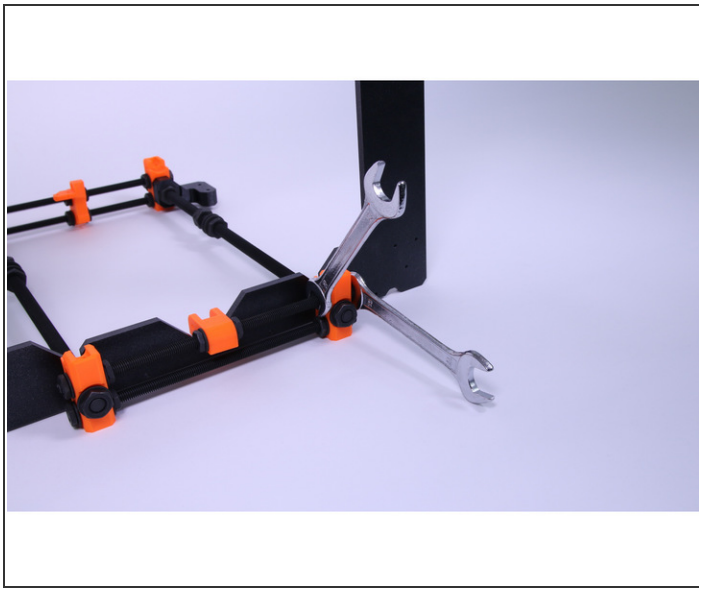
Step 7 — Preparing for Y-axis stage



- Prusa i3 frame
- Y-axis stage

Step 8 — Tighten the sides to the y-axis stage





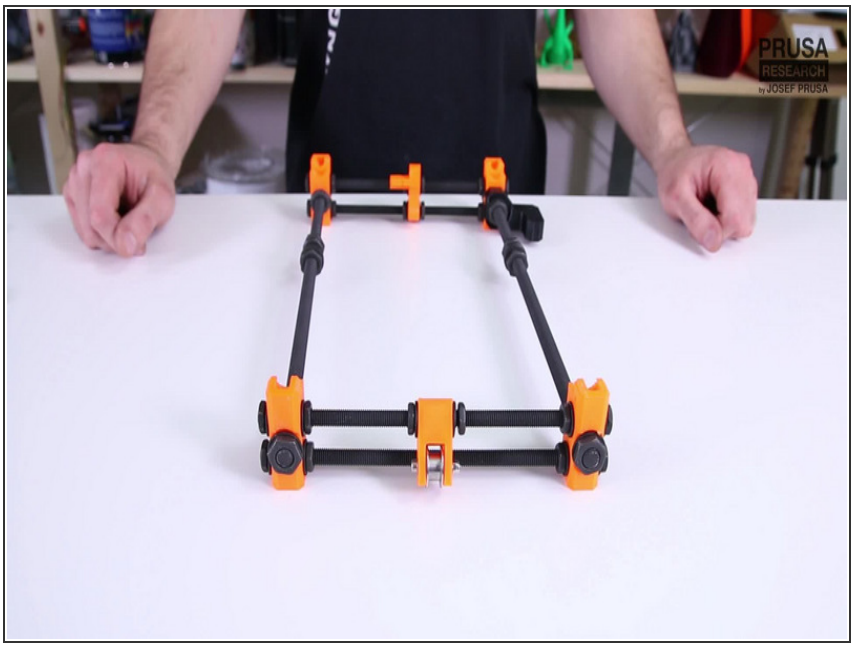
- Insert the Y-axis stage into the frame as close to Y-corners as possible.
- Adjust and tighten the M8n nuts.
- Rotate the Y-axis stage and repeat.

After adjusting, the Y-axis stage should cause minimum movement while inserted into the frame.

Tighten the M8n nuts gently or you'll risk damaging the 3D printed parts.

It is incredibly important that the axis is perfectly rectangular at this stage of construction, all rods need to be perfectly straight and level. If not, you'll have troubles calibrating later on!

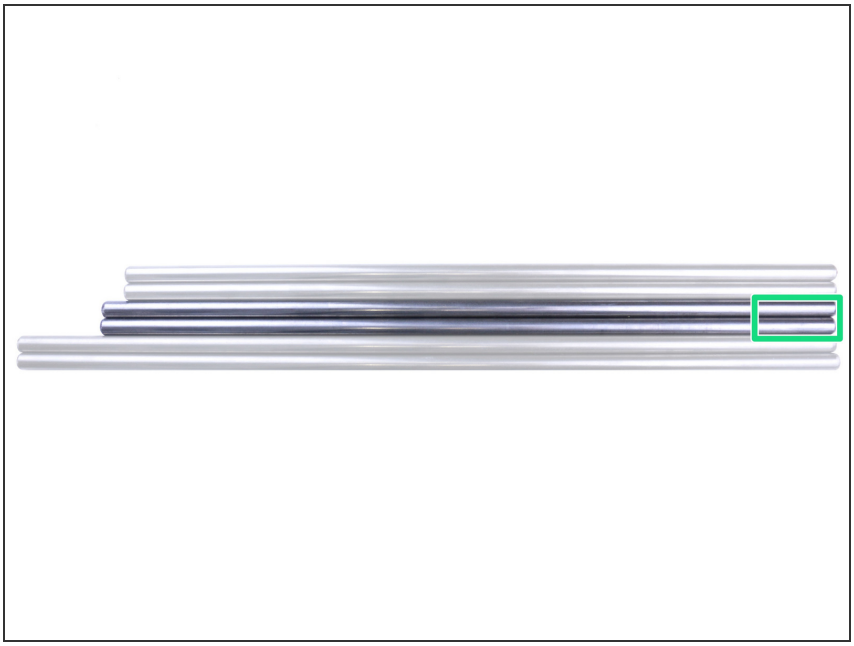
Step 9 — VIDEO for step 8



- Insert the Y-axis stage into the frame as close to Y-corners as possible. Adjust and tighten the M8n nuts. Rotate the Y-axis stage and repeat.
- Make sure Y-corners are vertical. If not, insert the spanners between the M8 threaded rods. Use any fabric to protect them from scratching. Push the spanners to straighten the corners.

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

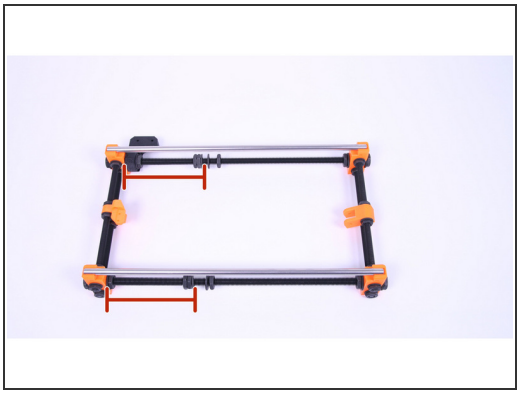
Step 10 — Identifying the length of rods



- In the following steps, use the mid-sized smooth rods (330 mm).

ⓘ Don't throw away included plastic spiral wraps, you will need them later for cable management.

Step 11 — Adjust the length of the Y-axis stage



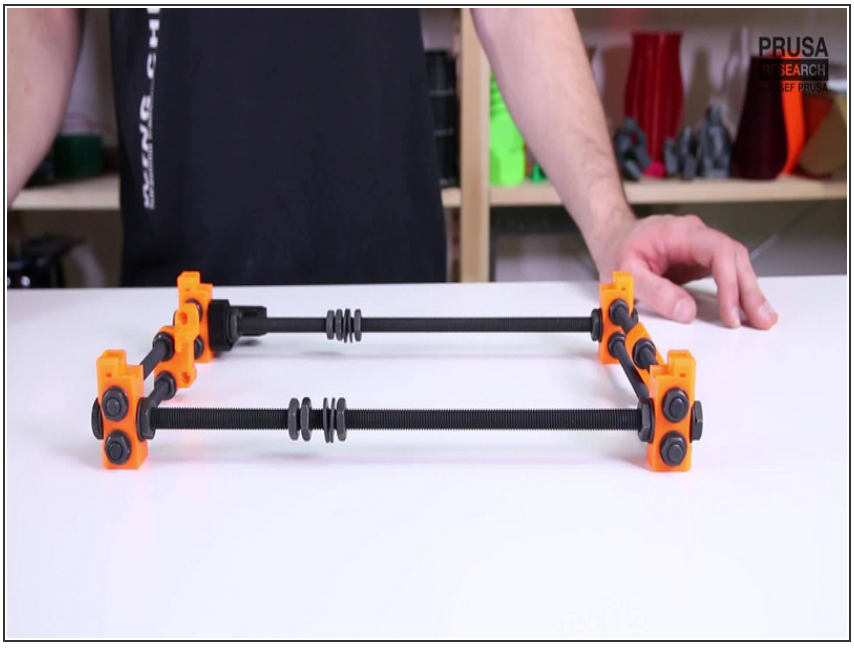
- Insert the two medium length 8mm smooth rods into the Y-axis stage.
- Adjust and tighten the M10n nuts.

ⓘ After tightening the nuts, there shouldn't be any gap between 8mm rods and Y-axis corners.

⚠ Retain 100mm distance between washer after counter-nut and Y-axis corner.

- Remove the 8mm rods.

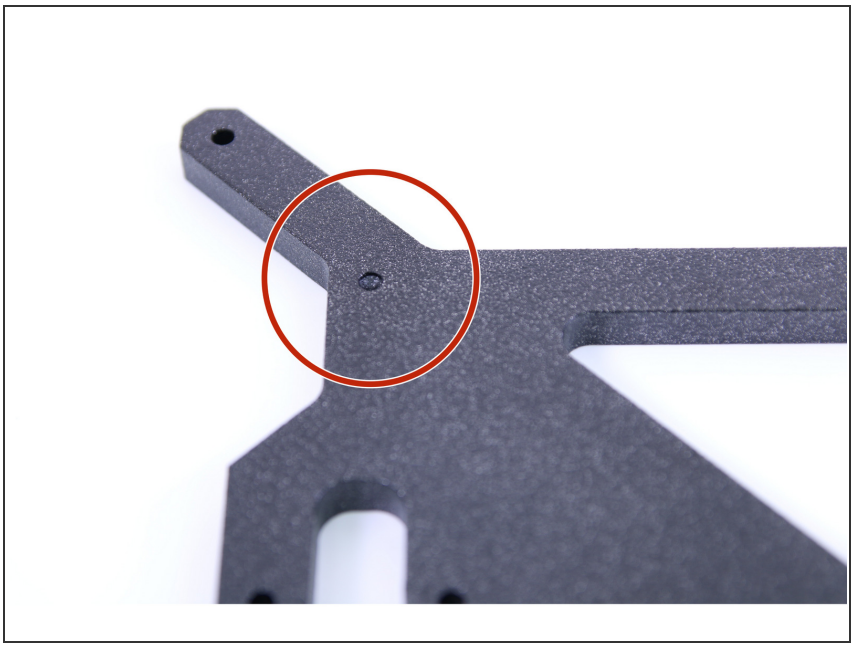
Step 12 — VIDEO for step 11



- Insert the two medium length 8mm smooth rods into the Y-axis stage. Adjust and tighten the M10n nuts. After tightening the nuts, there shouldn't be any gap between 8mm rods and Y-axis corners. Retain 100mm distance between a washer after counter-nut and the Y-axis corner. Remove the 8mm rods.

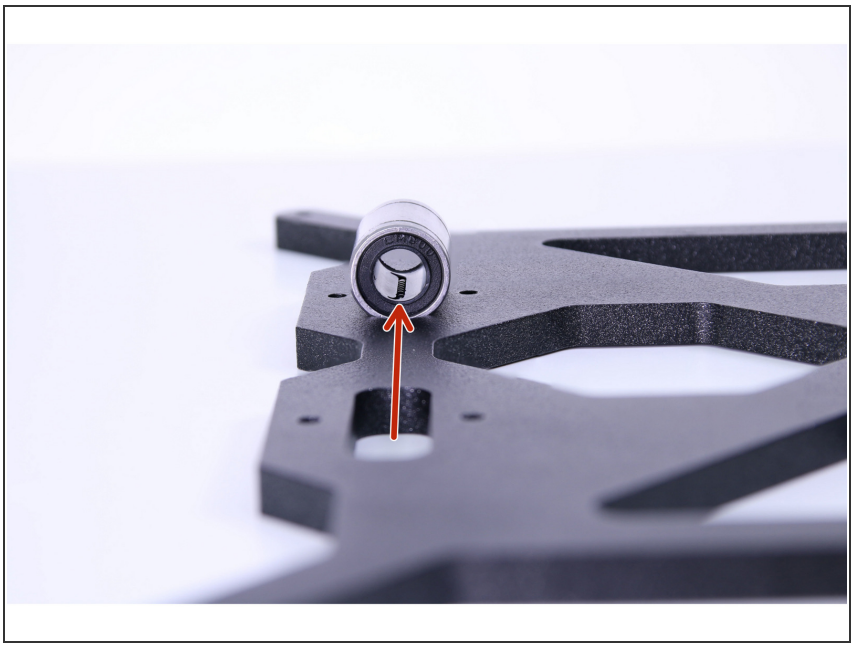
ⓘ Video is available in an online (digital) version only.

Step 13 — Marker identification



- The marker (used in the next steps) is made as a countersunk hole, see the picture.

Step 14 — Correct bearing orientation

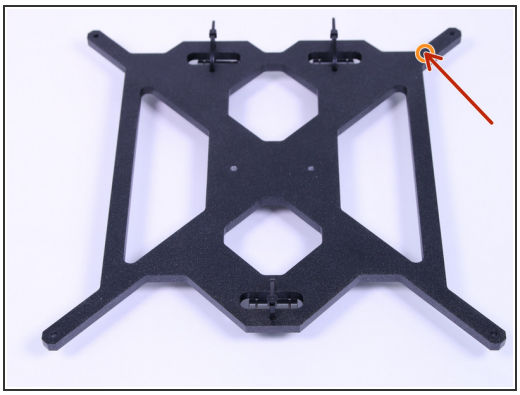
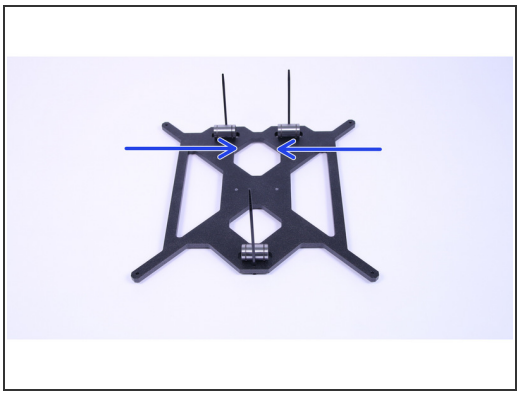
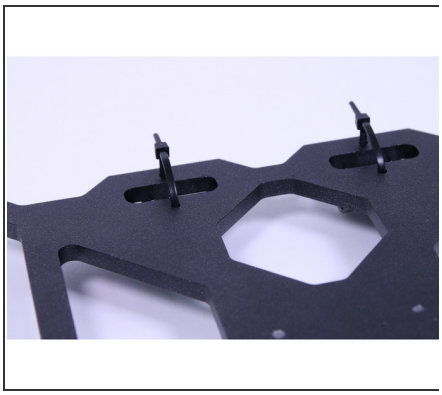


- When placing bearings onto the Y-carriage, make sure that they are oriented as shown in the picture. One of the ball lines has to be in axis with the cutout for the bearing!

⚠ This orientation has to be followed in all 3 bearings on the Y-carriage!

⚠ Marker on the Y-carriage must be facing the table (not visible)!

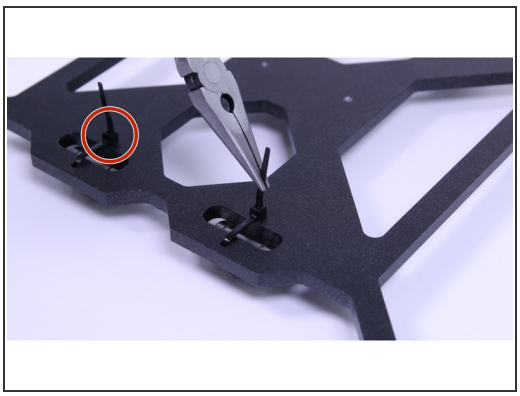
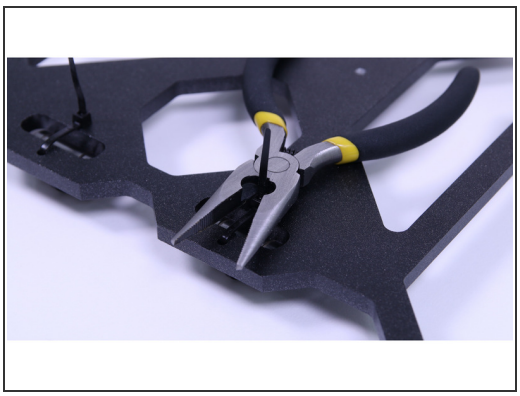
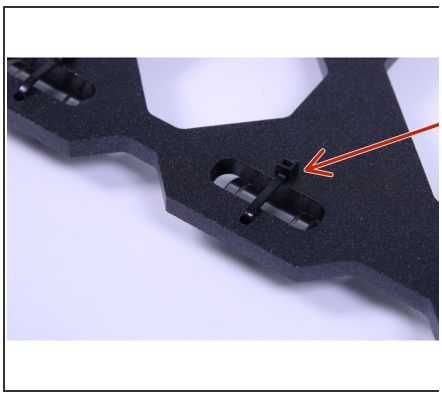
Step 15 — Assemble the Y-carriage

⚠ **Before the start pay attention to how the finalized part should look like. Check location of the position marker on Y-carriage. It's extremely important to have proper orientation - marker on right upper side while looking on Y-carriage with bearings located down and side with two bearings is at the top.**

- Insert zipties into the Y-carriage as shown on the picture.
- Place the linear bearings in cutouts.
- On side with two bearings slide bearings to the center, towards each other as close as possible.

Step 16 — Tighten Y-carriage zipties

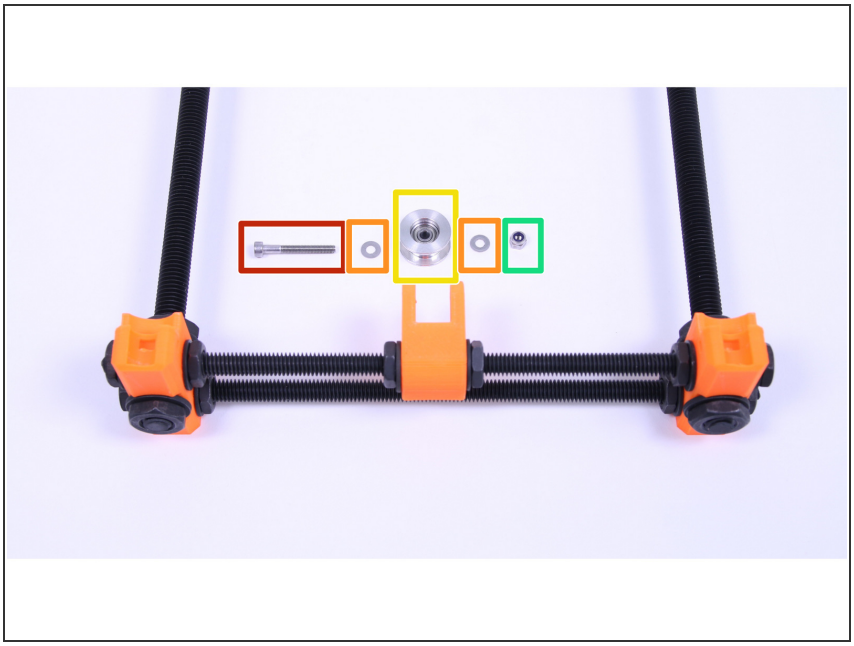




- Use pliers to tighten the zipties.

⚠ Ensure the correct position of ziptie connections as shown in the pictures, Otherwise your Y-axis will not move properly.

⚠ Trim the zipties as low as possible to avoid contact with heatbed (installed later).

Step 17 — Assembly of the Y-idler



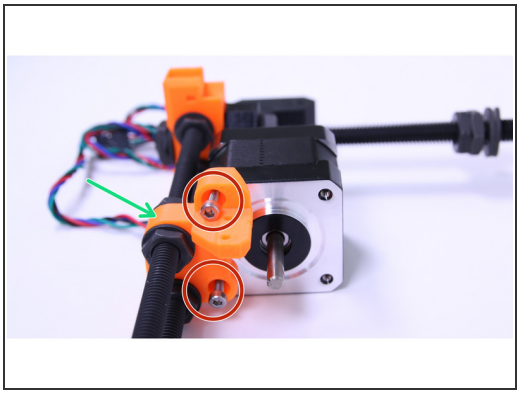
- M3x25 screw (1 pc)
- M3w washer (2 pcs)
- 623h bearing housing (1 pc)
- M3nN nylock nut (1 pc)

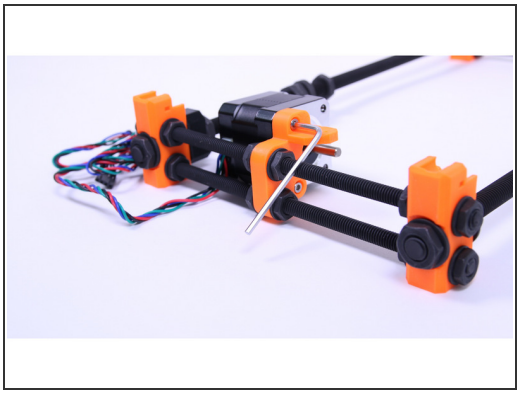
Step 18 — Tighten the Y-idler

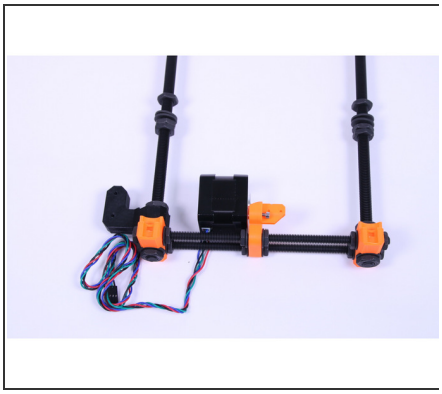
- To tighten the Y-idler, use the pliers and 2.5mm Allen key.

⚠ Tighten the screw gently, just half turn max after the washers touch the 3D printed part.

Step 19 — Y-axis motor



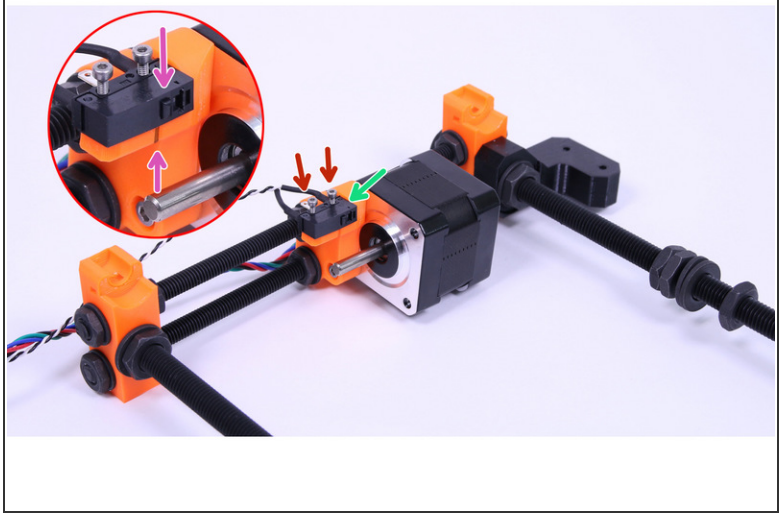


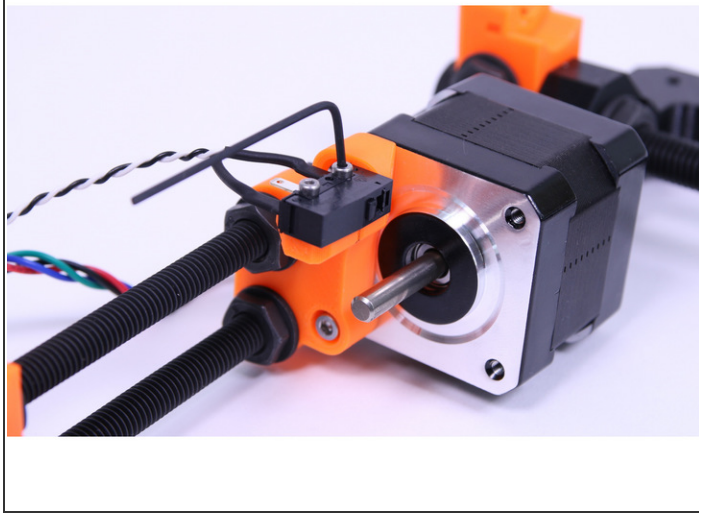


- Y-axis motor (the one labeled with Y axis)
- M3x10 screw (2 pcs)
- Using the 2.5mm Allen key, secure the motor to the 3D printed part. Motor cables must be facing threaded rods!

⚠ Tighten the motor gently to avoid damage to the 3D printed part.

Step 20 — Y-endstop





- M2x12 screw (2 pcs)
- Y-endstop
- To tighten the Y-endstop use 1.5mm Allen key.

⚠ Ensure the correct placement using marker on the printed part.

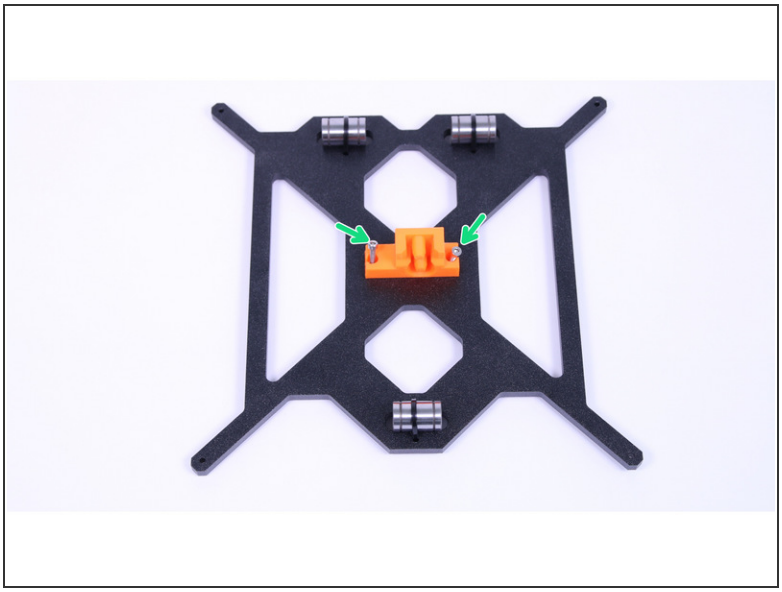
⚠ Tighten the Y-enstop gently to avoid damage to the printed part.

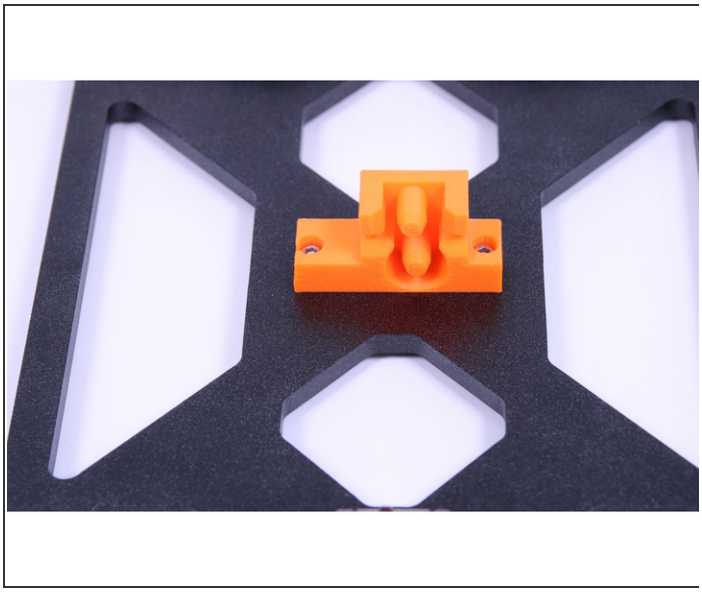
ⓘ Endstops are part of the box 2.3.4.5.SUP.

Step 21 — Y-endstop cable guide

- Guide the wires from Y-endstop to go side by side with motor cables as shown in the picture.

Step 22 — Assemble the Y-belt holder



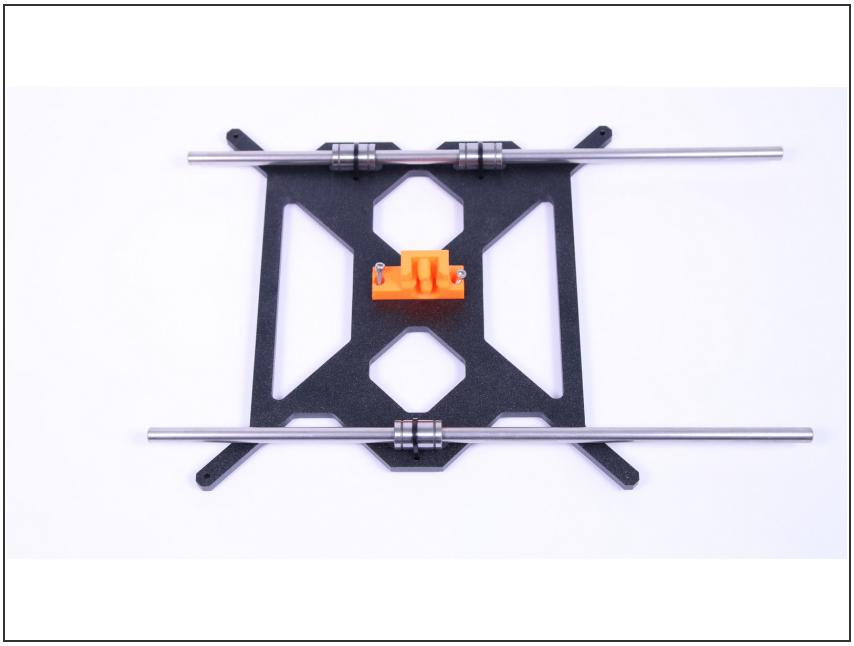


- Place Y-belt holder on the Y-carriage as shown in the picture.
- M3x12 screw (2 pcs)

⚠ Be aware of the orientation of Y-belt holder (belt entry should face towards single bearing).

ⓘ There's no thread in Y-carriage, just push the screws all the way in.

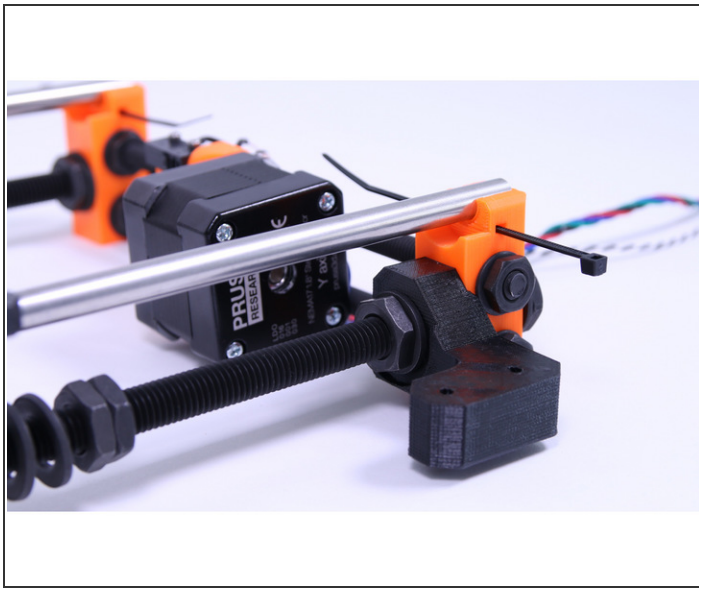
Step 23 — Assemble the Y-carriage rods



- Use the mid-sized smooth rods (330 mm).
- Insert the 8mm smooth rods into the linear bearings on Y-carriage.

⚠ Be very careful! Insert the rod straight into the bearings, do not apply too much force and do not tilt the rod!

Step 24 — Assemble the Y-axis stage



- Insert the assembled Y-carriage into the Y-axis stage.

⚠ Ensure the correct orientation of parts (Y-motor mount on the right and the single bearing on the bottom).

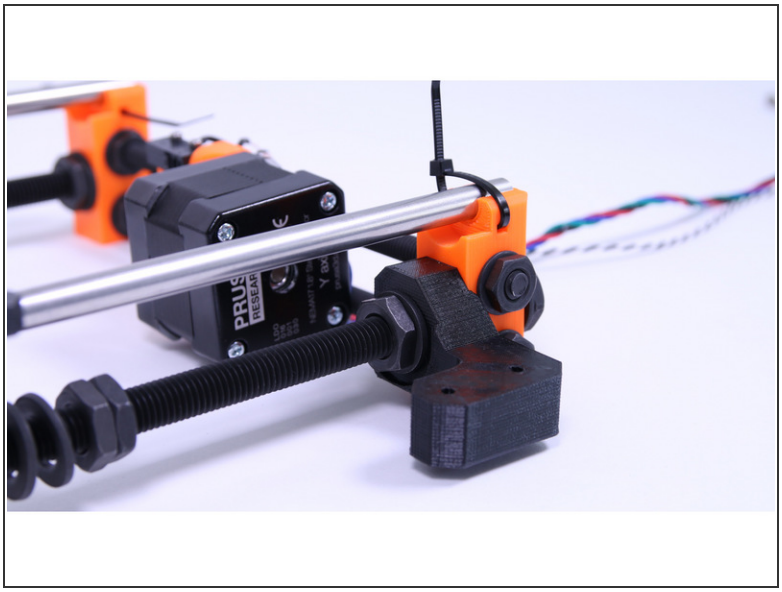
- **Note location of the Y-carriage orientation marker - it's important Y-carriage is oriented as in the picture !**

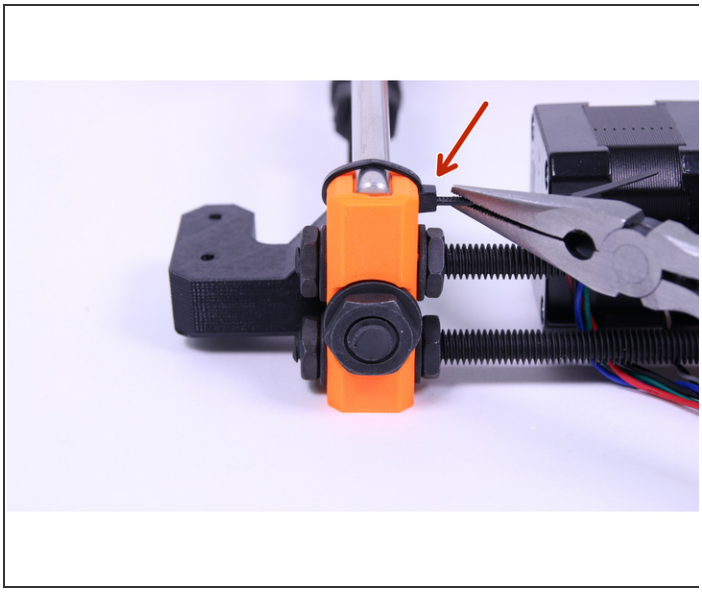
- Insert zipties into holes in Y-corners.

⚠ Ensure the correct orientation of zipties (head of the ziptie should be facing out from the Y-axis stage).

⚠ Press smooth rods (330 mm) all the way in the Y-corners holders. Don't use excessive force.

Step 25 — Tighten the zipties on the Y-axis stage

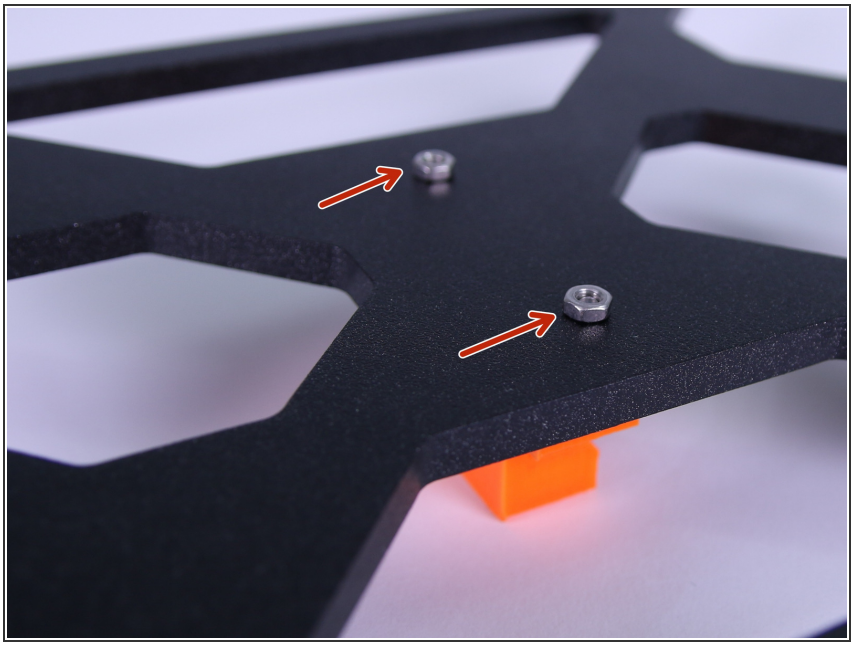




- Using pliers, tighten the zipties as shown in the picture.

⚠ Ensure the correct orientation of zipties connection.

Step 26 — Y-belt holder nuts

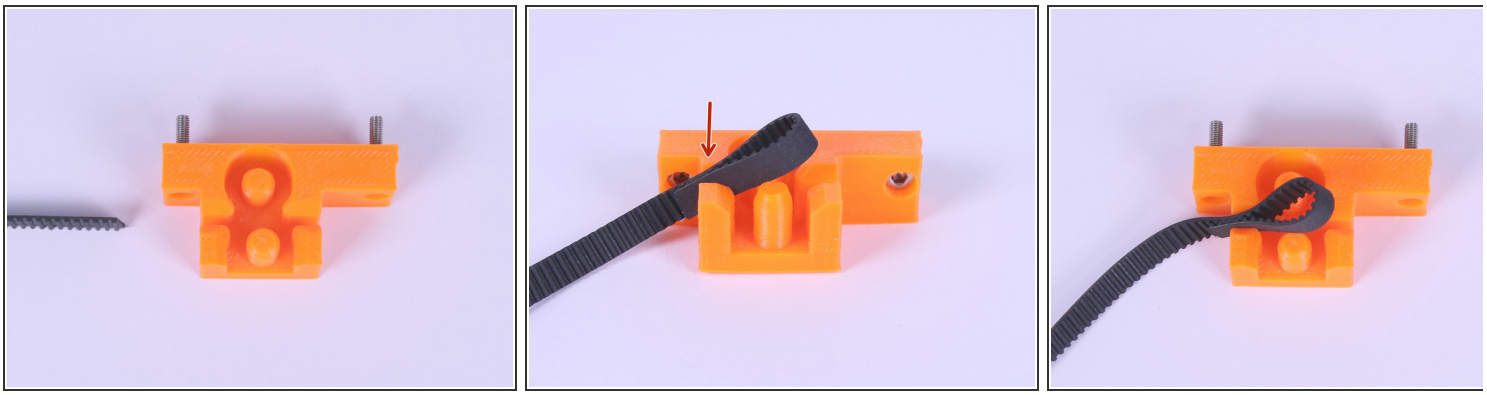


ⓘ For the next steps, it's good to assemble the optional nuts (taken from bag 9. SPARE) on screws holding the Y-belt-holder.

- Assemble the M3 nuts on the screws as shown in the picture.

The nuts will be removed in chapter 7.

Step 27 — Assemble the belt on Y-axis part 1

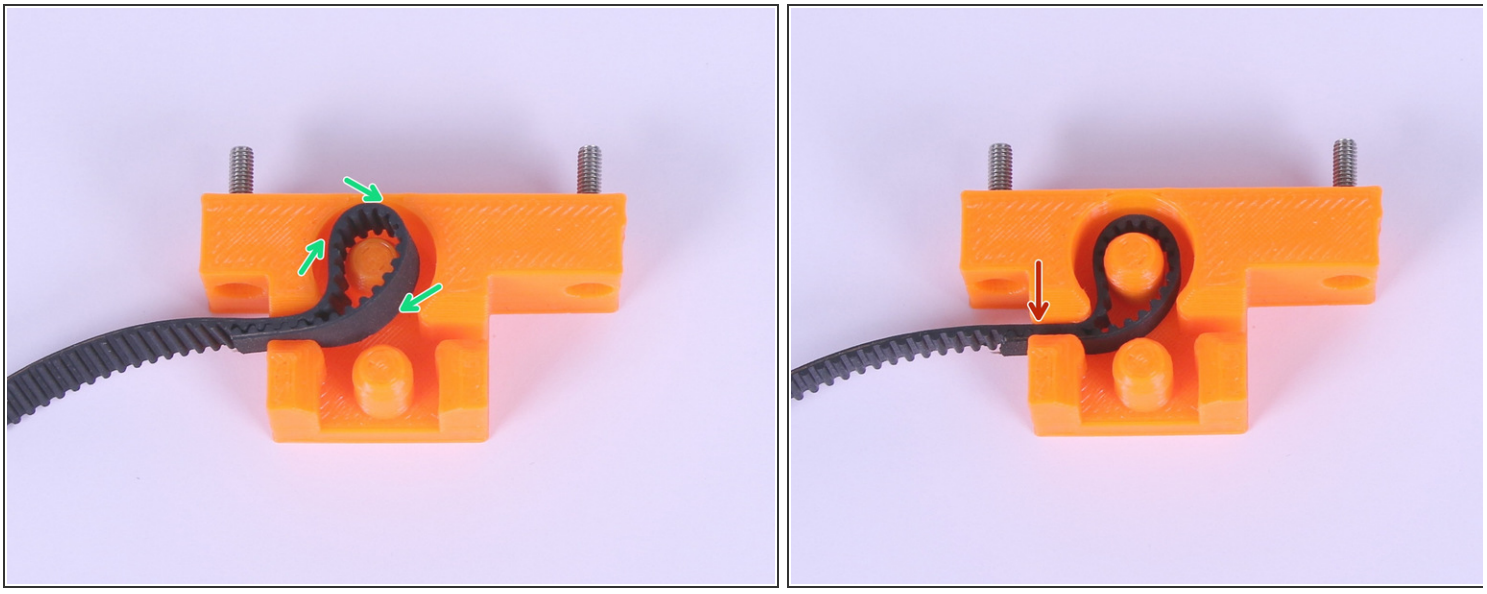


This step is illustrative, you don't have to take the printed part out of the Y-carriage.

- Insert the Y-GT2 belt (shorter one) in the Y-belt holder as shown in the picture.
- First insert the flat part of the belt in the holder.

A reference video is included at step 35 covering steps 27-34.

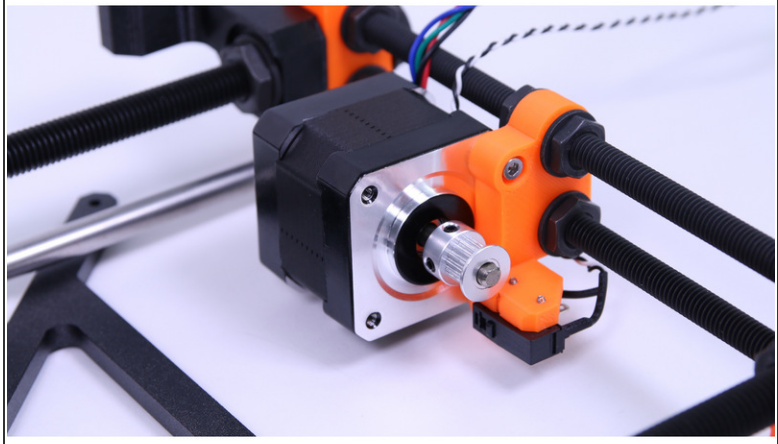
Step 28 — Assemble the belt on Y-axis part 2

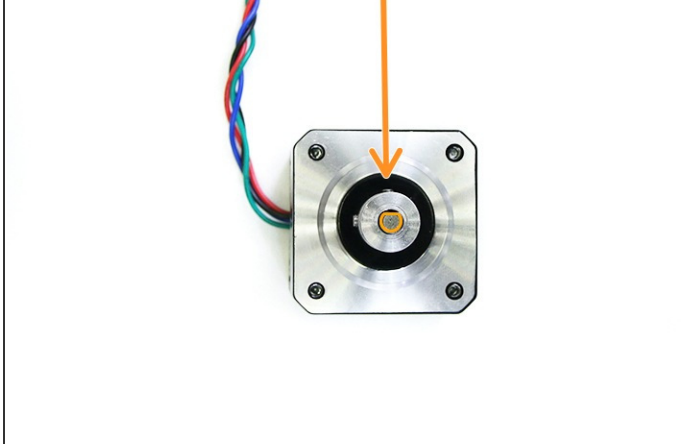


This step is illustrative, you don't have to take the printed part out of the Y-carriage.

- Guide the belt around the pin as shown in the picture.
- Push the belt all the way into the belt holder.

Step 29 — Assemble the Y-motor pulley



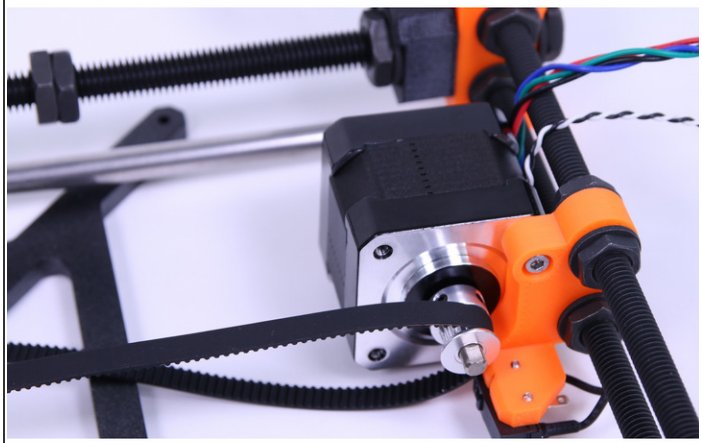


- Place a GT2-16 pulley on the Y-motor shaft as shown in the picture.

⚠ One of the screws must be facing directly against the pad (flat part) on the shaft. Note you don't have to remove the motor from the frame.

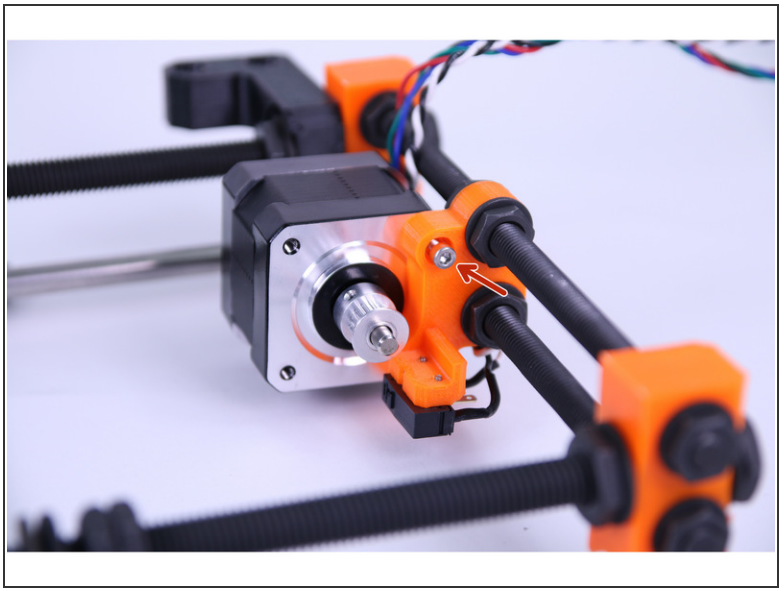
ⓘ Don't tighten it yet, we'll get to that later.

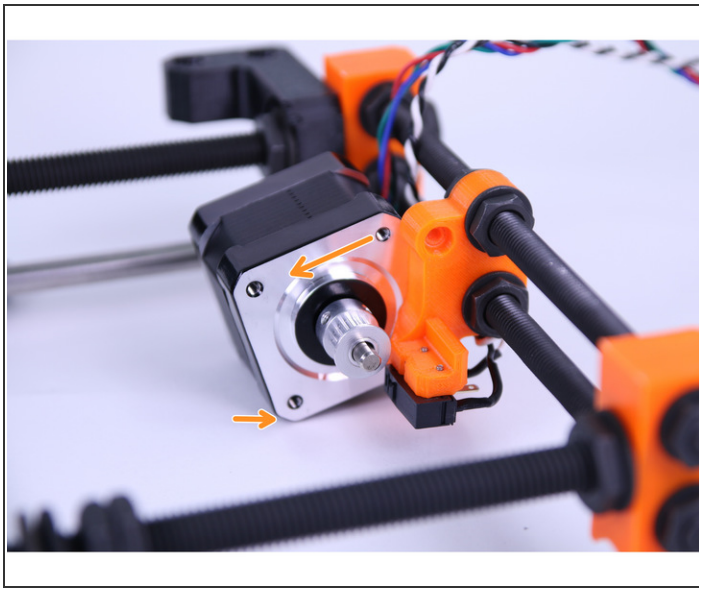
Step 30 — Y axis belt placement



- Run the Y-axis belt through the Y-motor pulley and the Y-idler part.

Step 31 — Loosening the motor

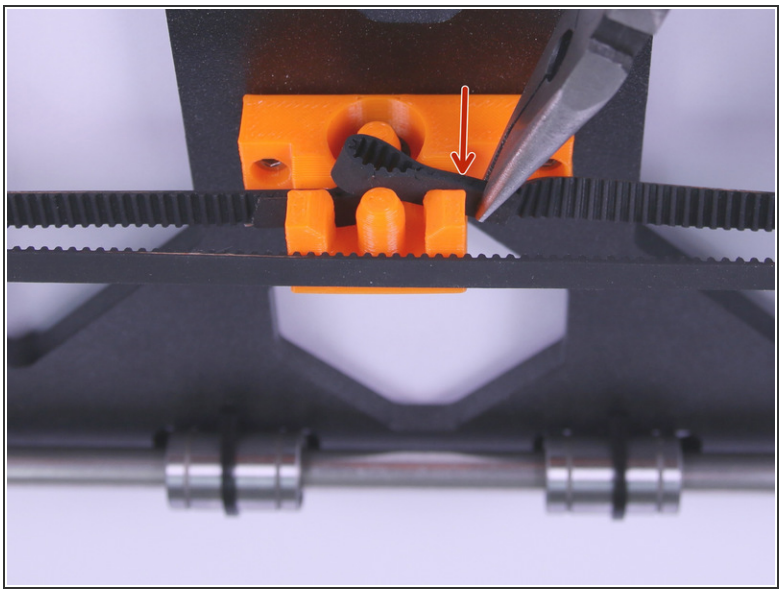


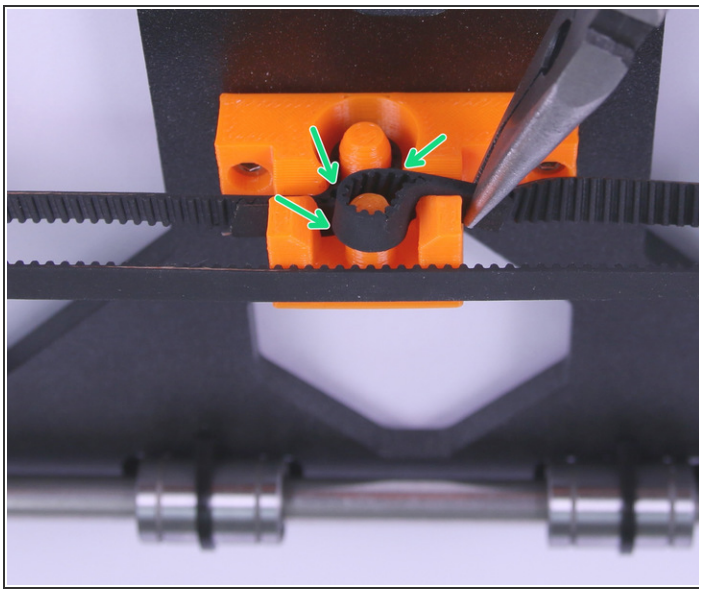


- Undo the M3x10 screw.
- Rotate the motor until it hits the ground as shown in the picture.

This step is illustrative, you don't have to remove the belt

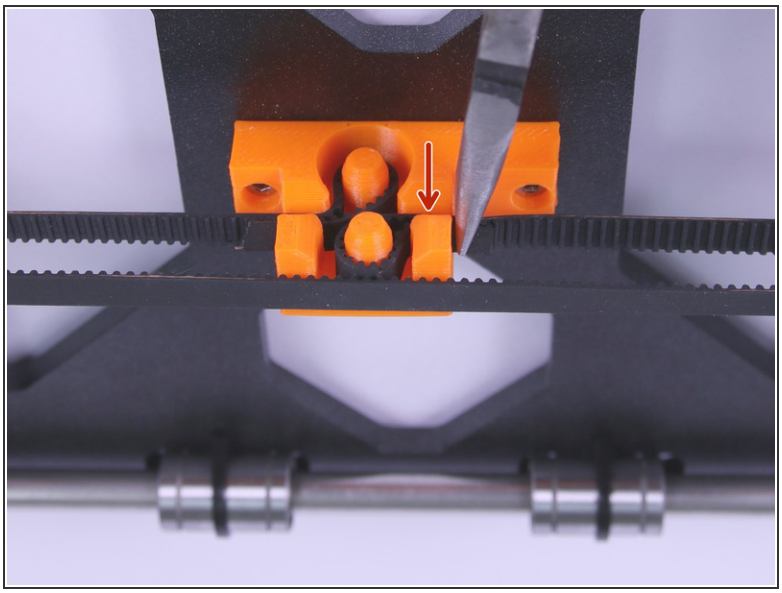
Step 32 — Tighten the Y-axis belt part 1

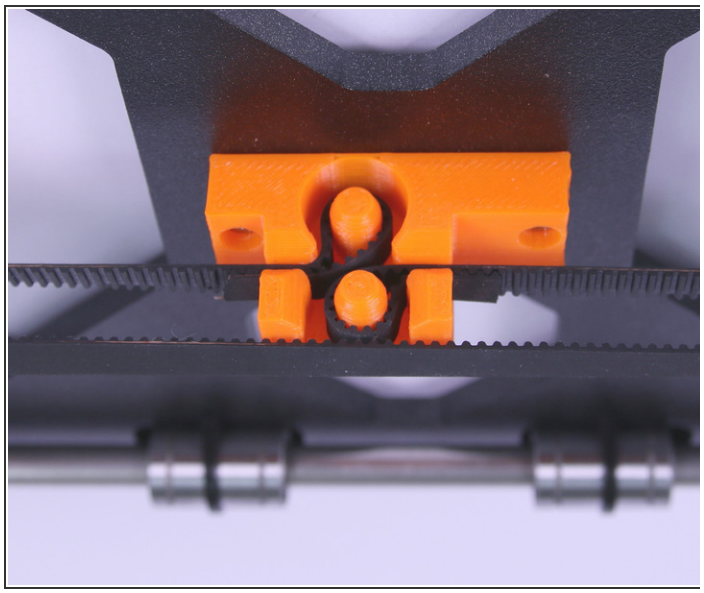




- Using the pliers, insert the belt and insert the flat part it into the Y-belt holder as shown in the picture.
- Then guide the belt around the bottom pit as shown in the second picture.

Step 33 — Tighten the Y-axis belt part 2



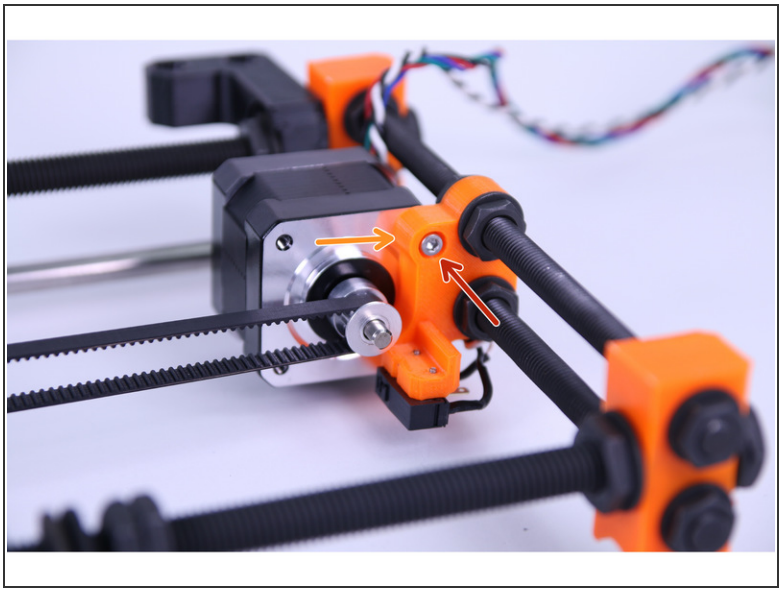


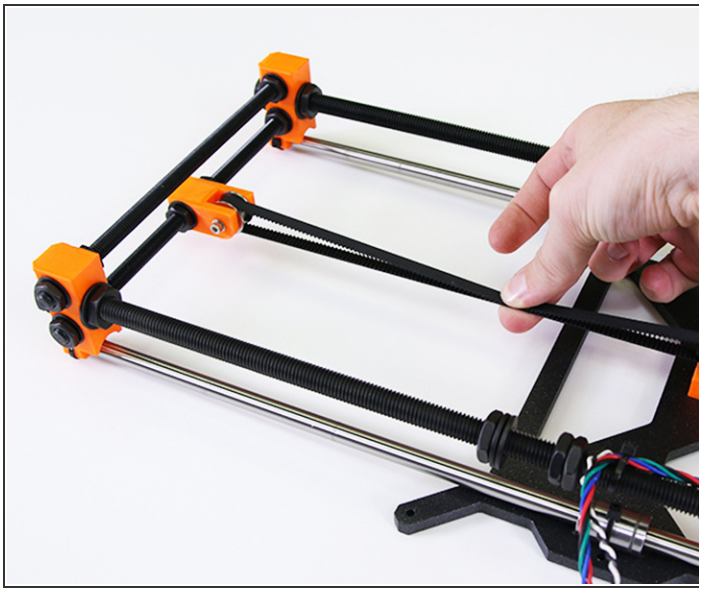
- Using the pliers insert the belt all the way into the belt holder.

⚠ Do not cut any excess of the belt, it should be evenly distributed on both sides as shown in the picture.

⚠ The belt shouldn't be tight at the moment.

Step 34 — Tensioning the belt



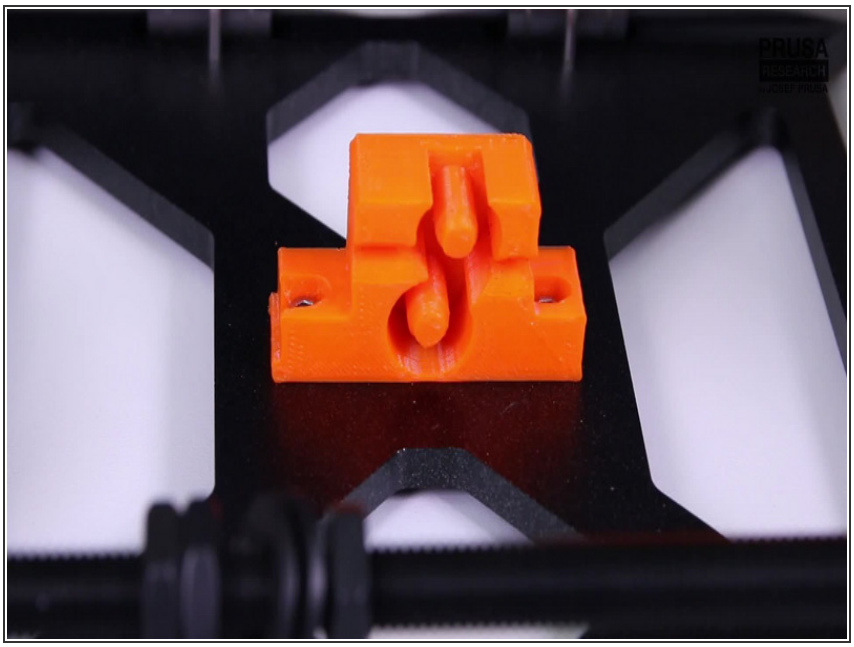


- Rotate the motor back.
- Screw in the removed M3x10 screw.

⚠ If you have to apply too much force and experiencing troubles, rotate the motor back, repeat previous step while making the belt more loose.

ⓘ The belt should be quite tight, check it by pressing together both sides in the middle of the frame by gentle force.

Step 35 — Video for steps 27-34



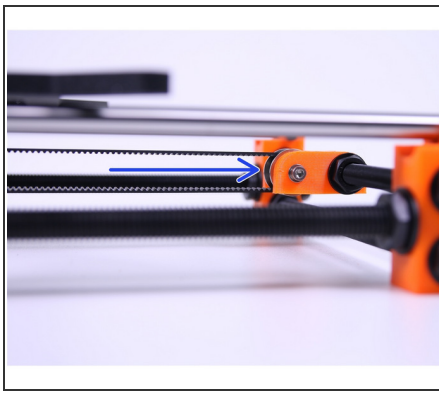
- Insert the Y-GT2 belt (shorter one) in the Y-belt holder. Run the Y-axis belt through Y-idler part and the Y-motor pulley. insert the belt all the way into the belt holder.
- The belt should be quite tight, check it by pressing together both sides in the middle of the frame by gentle force.

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

ⓘ Video is showing belt assembly on slightly different version of the printer, but the principle and components for this step are identical.

Step 36 — Adjust the Y-idler

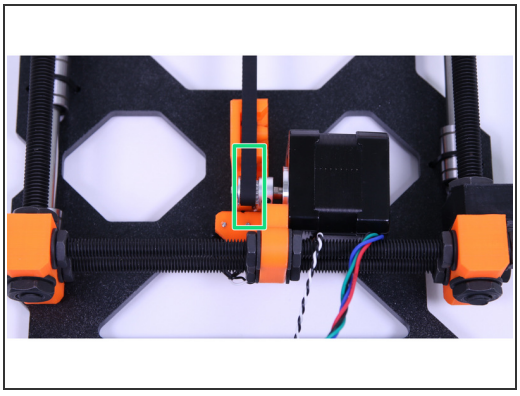
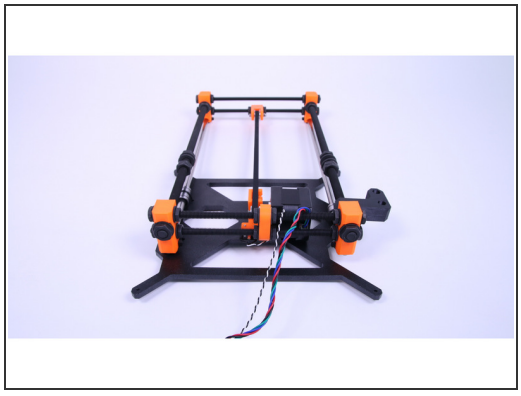




- Adjust the Y-idler as shown in the picture (623h bearing housing should be in axis with the belt).
- Move the Y-carriage as close as possible to the Y-end-motor.
- Before tightening the nuts, ensure the Y-idler is in horizontal position.

⚠ Tighten the M8n nuts gently to avoid damaging the 3D printed part.

Step 37 — Adjust the Y-motor-mount part

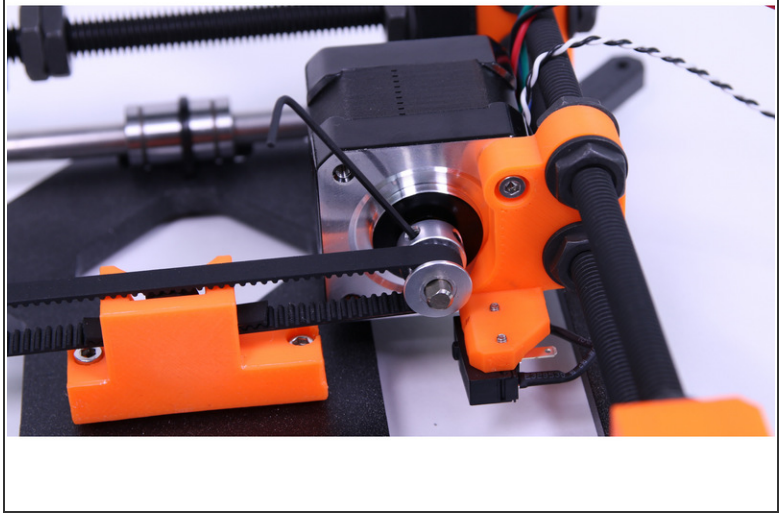



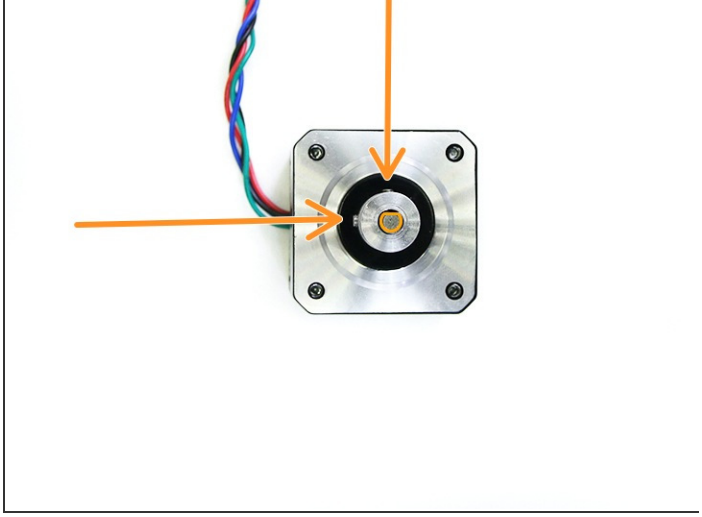

- Adjust the Y-motor-mount as shown in the picture (the belt must remain straight and the motor should not collide with the Y-belt holder part).
- Make sure that you heard "click" sound and the Y-endstop is triggered.

⚠ The belt part of the pulley has to be in axis with the belt itself.

⚠ Tighten the M8n nuts gently to avoid damaging the 3D printed part.

Step 38 — Tighten the screws in the pulley



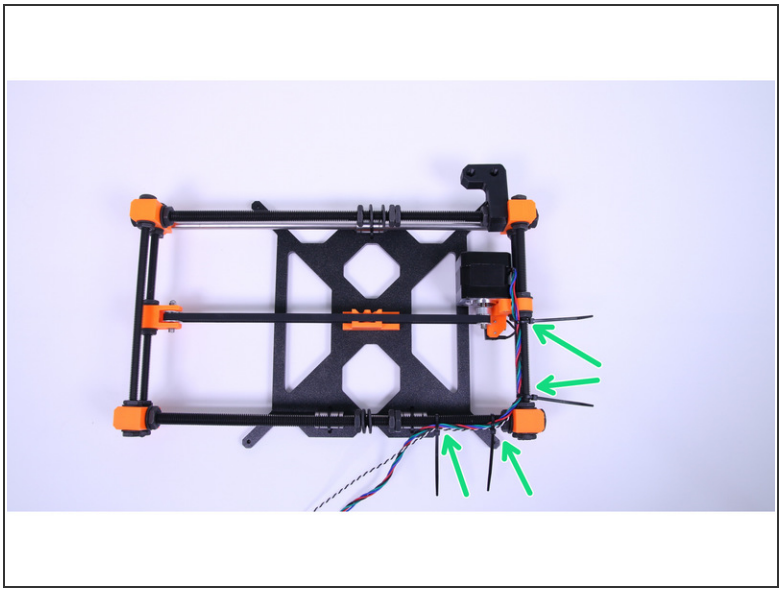


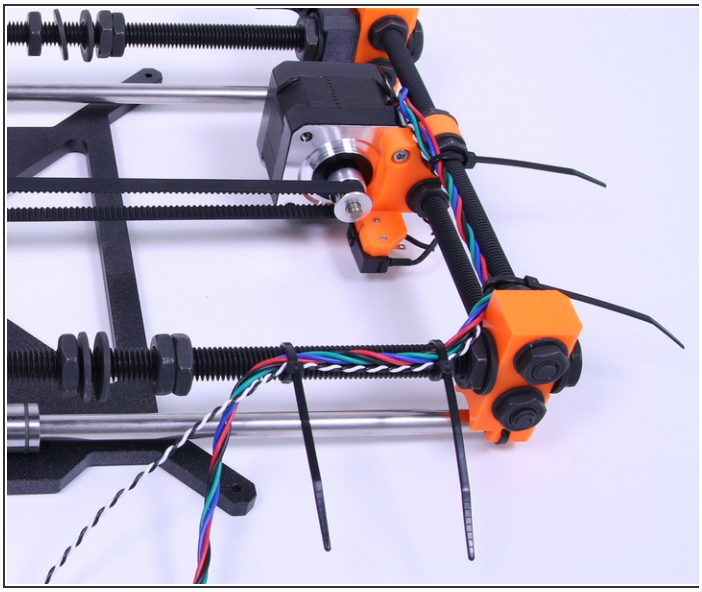
- Tighten the screws in the pulley.

⚠ One of the screws has to be tightened directly against the pad on the shaft.

⚠ Keep a small gap between the motor and pulley.

Step 39 — Y-axis stage cable management



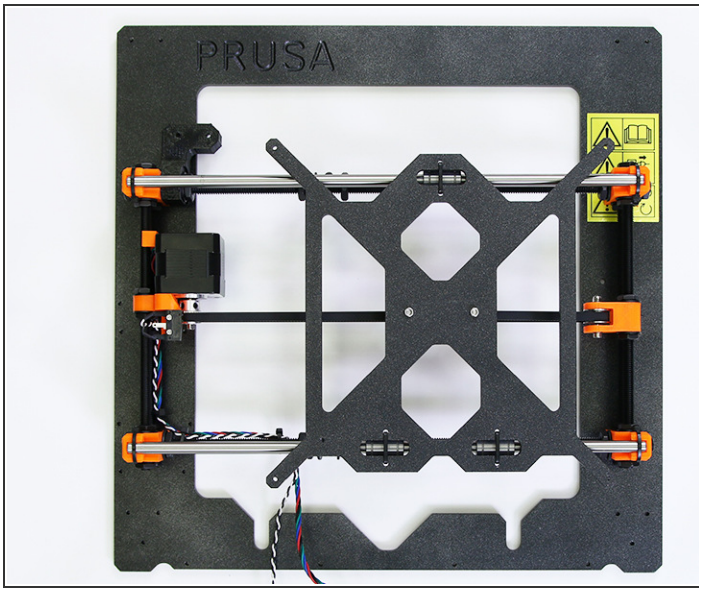


- Ziptie the cables to the threaded rods as shown in the picture.
- Cut and discard excess ziptie.

⚠ Tighten the zipties carefully to avoid damaging the wires.

⚠ Be careful while cutting the zipties to avoid cutting the wires.

Step 40 — Levelling the Y-axis



- Place the assembled Y-axis on a flat surface.
- Check if every corner is touching the ground.
- If some corner is in the air, try twisting the axis slightly.

You can also check it by tapping each corner and listen if it's making any noise.

This is your last chance to ensure the Y-axis is perfectly angled and level. It'll save you a lot of hassle later!

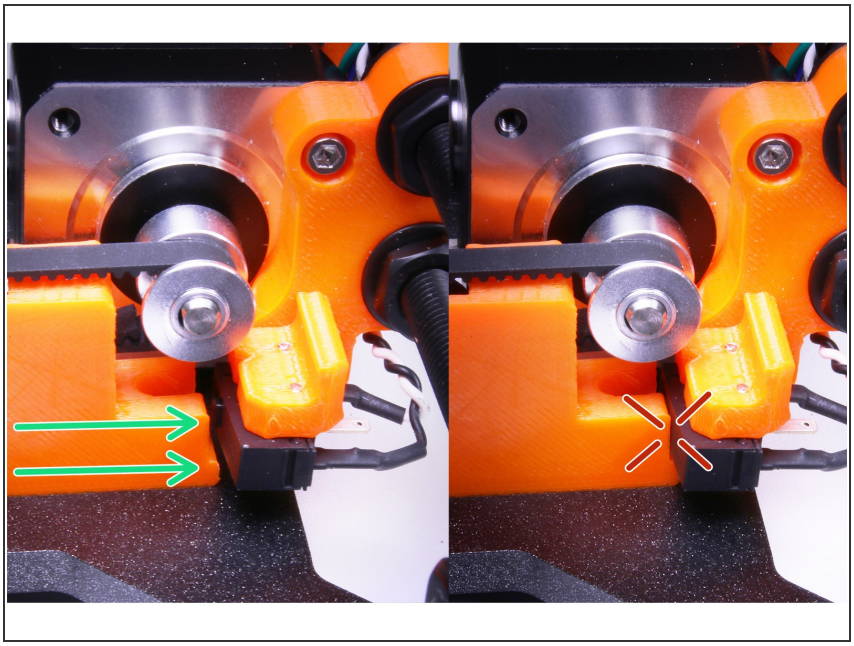
You can use aluminium frame for check, but be careful for possible scratches.

Step 41 — Secure the axis feet

- Stick the felt pad on each Y-corner.

Felt pad is in the box 2.3.4.5.SUP

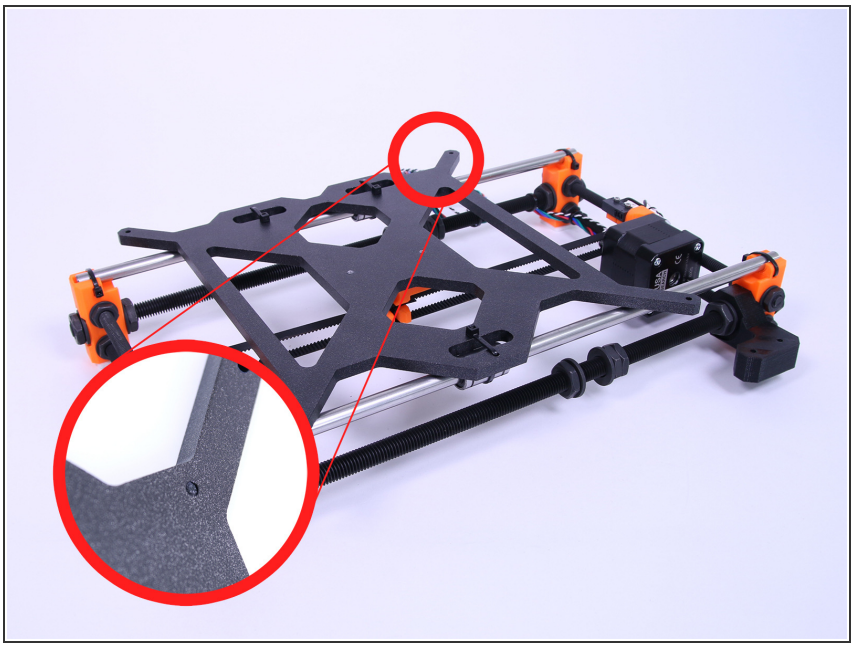
Step 42 — The Y-Endstop check



- Move the Y-carriage as close as possible to the Y-end-motor.
- Make sure that you heard "click" sound and the Y-endstop is triggered as shown in the picture.

The colors on the picture are a bit over-saturated to highlight the endstop button.

Step 43 — Double check Y-carriage!



⚠ This is crucial part of the assembly. Please check again you can see marked part of the Y-carriage (as shown on the picture), otherwise your heatbed won't fit properly!

Step 44 — All done!

- Congratulations, you have assembled Y-axis !
- You can continue by assembling X-axis in the next chapter - 3. X-axis assembly

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