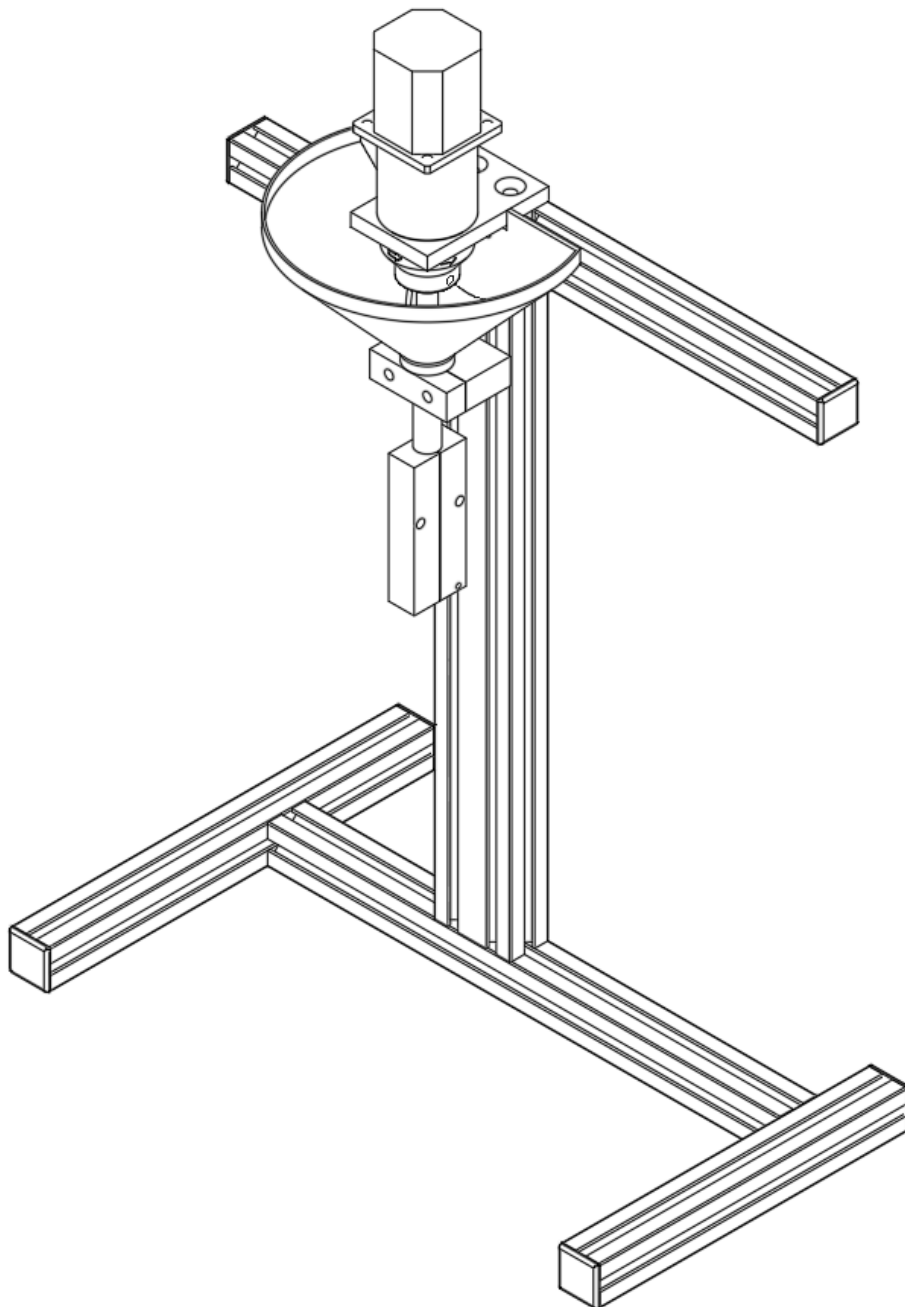


Assembly instructions

01 Extruder-Unit

Original Desktop Filament Extruder MK1 by ARTME 3D

Version 01.09.2022





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Additional tools required for this assembly section:

Phillips screwdriver PH1

Marking pen

spirit/nail polish remover or similar

Paper (normal paper with approx. 80g/m²)

Aluminum foil (normal household aluminum foil)

scissors

Hammer

Folding rule

Packages overview:

Package 0: Delivered carton

Package 1: Screws (SC)

Package 2: Spare Parts (SP)

Package 3: Custom Metal Parts (CM)

Package 4: Extruder Barrel (EB)

Package 5: Electronics (EL)

Package 6: Tools (TO)

Step 1:

Remove from package 0: Aluminum profile 30x60x500 (FR01)

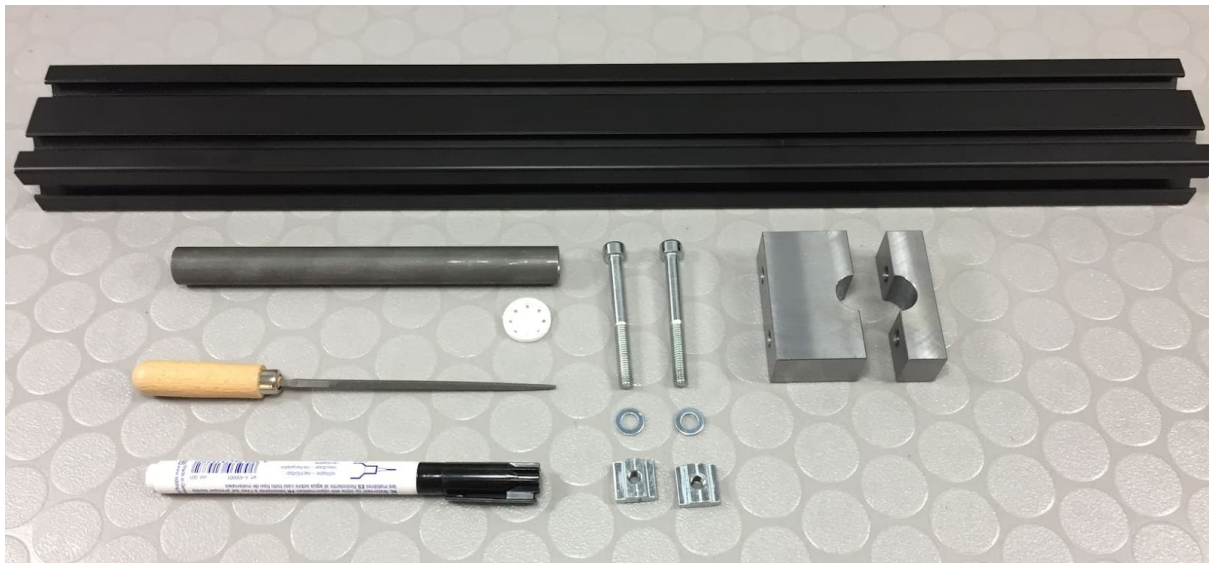
Remove from package 1: 2x cheese head screw M6x60 (SC07), 2x washer M6 (SC14), 2x slot nut M6 (SC18)

Remove from package 3: 1x extruder tube (CM01), tube holder 1 (CM05), tube holder 2 (CM06)

Remove from package 6: Key file square approx. 100mm long (TO09), Hexagon key 5mm (TO08)

3D print: drawing template (EB07)

Tool: Marking pen



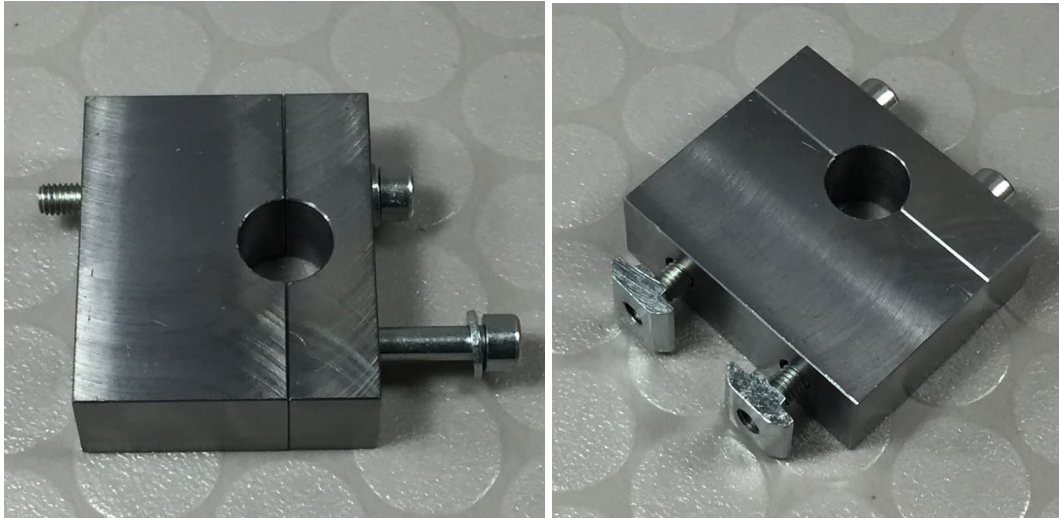
Step 2:

The drawing template is placed on the upper end of the tube. The thread of the tube is at the bottom. Draw in the holes with the pen. Remove the template again.



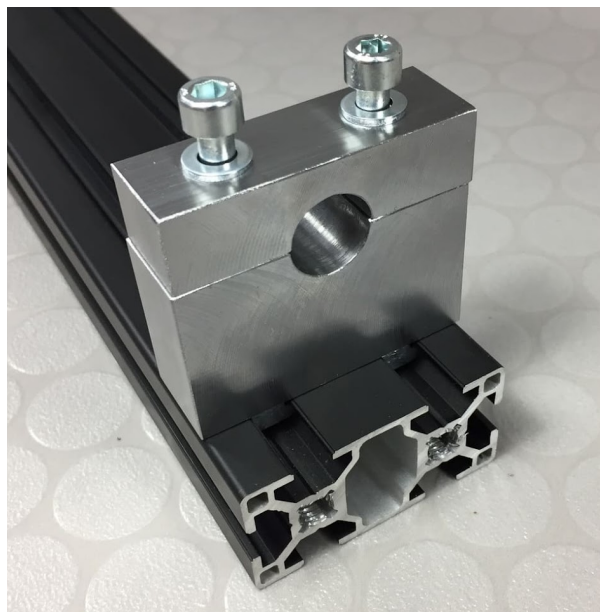
Step 3:

Position the barrel holder as shown. Place the washers on the cap screws and then guide them through the holes in the barrel holder. Screw the sliding blocks onto the thread of the cap screw. See picture for alignment.



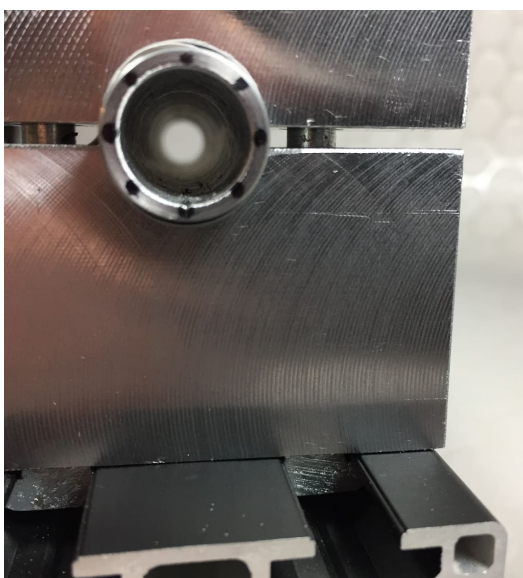
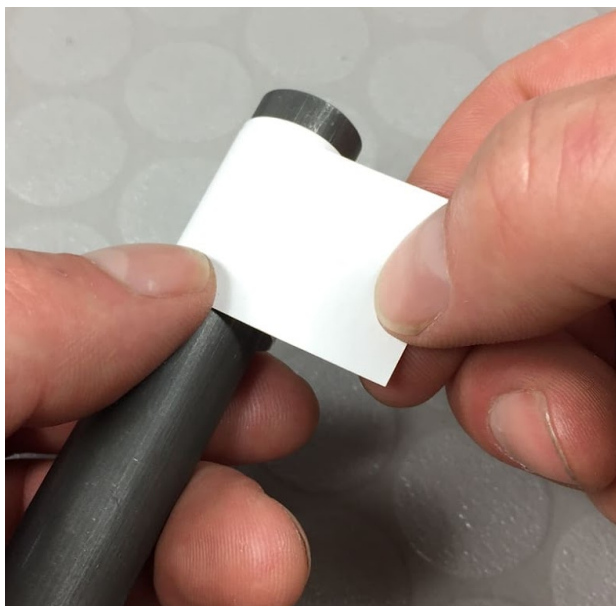
Step 4:

Slide the barrel holder onto the aluminum profile. To do this, push the sliding blocks from the front of the profile into the grooves. Do not tighten the screws yet. Make sure that you use the side of the aluminum profile that has 8 mm threaded holes. If there is a nameplate on the aluminum profile, it should be facing down. Use a base so that the profile is not scratched.



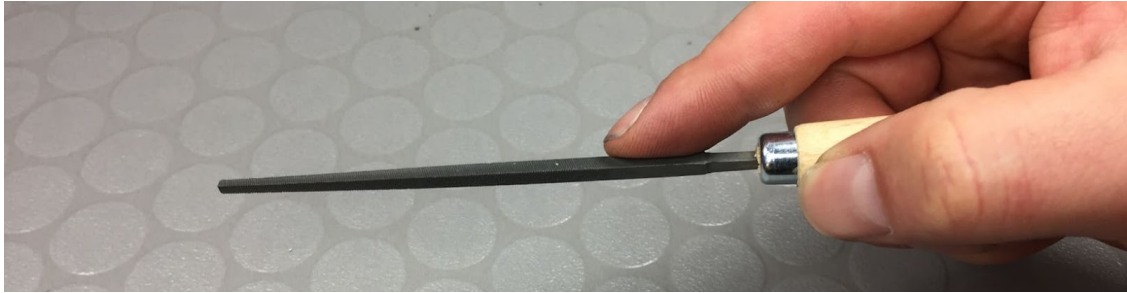
Step 5:

Cut a piece of paper to approx. 20x80 mm. On the side with the drawn marks, wrap the paper strip around the tube and hold it in place. Then lift the barrel holder and slide the barrel in between. Turn the barrel so that one marking point points exactly downwards. Then tighten the screws very lightly.



Step 6:

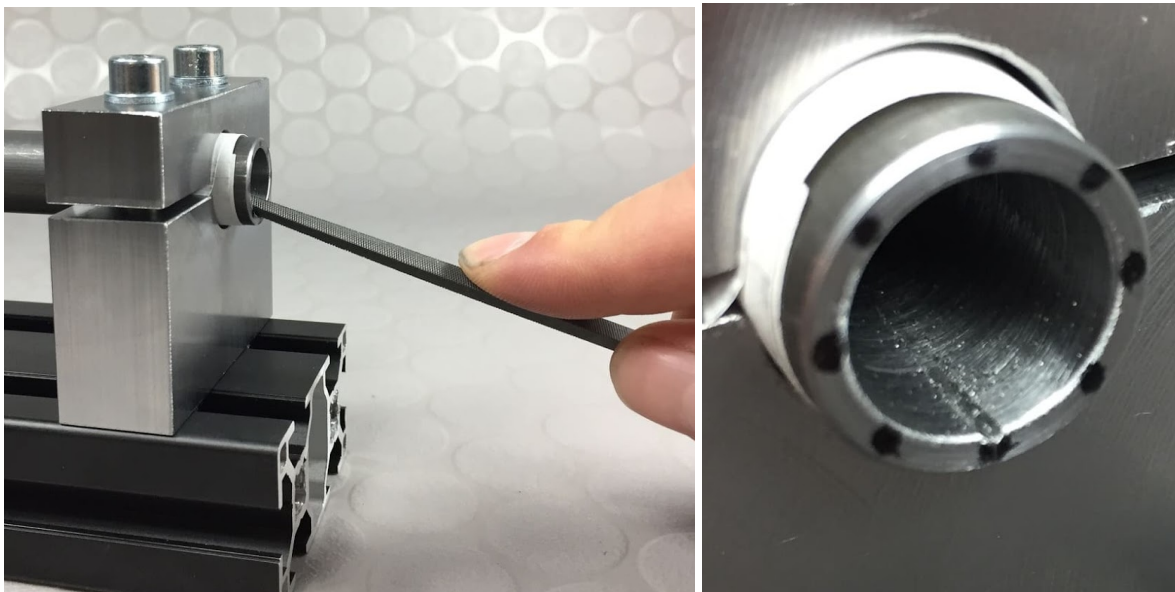
Take the file to hand. Turn the file so that it files exactly on the edge. In other words, rotated by 45° . If the file has a slight bend, align it so that it points upwards. Make sure that this posture is maintained for the following steps.



Step 7:

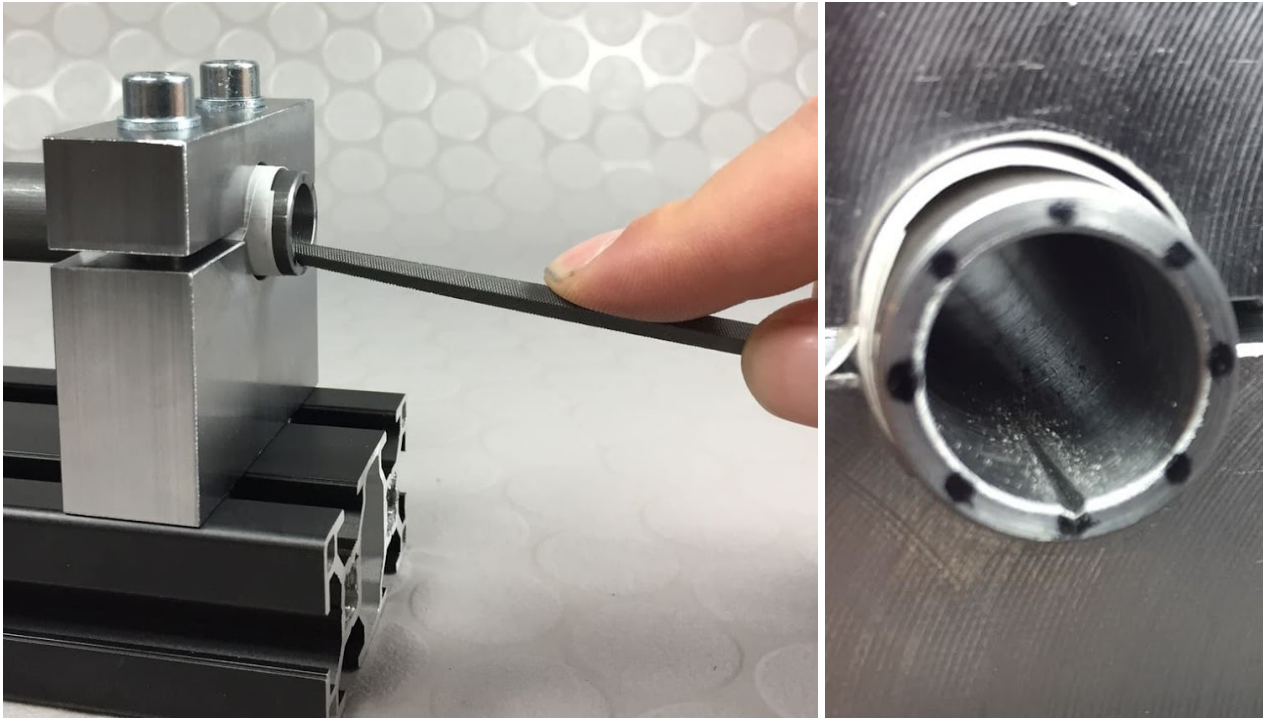
The file is placed at the bottom above the marking point. During the first movements of the file, tilt the file slightly downwards so that you only create a notch at first, see picture. File with slow, guided movements. Caution: The file poses a stabbing hazard. Especially if you hold the aluminum profile with the other hand. If you slip, you can injure yourself. If available, you can clamp the whole thing in a vise so you can leave out the second hand. If not, make sure your second hand is out of the stitch area in case you slip with the file.

Make sure that the file only ever rests on the edge and remains rotated exactly 45° .



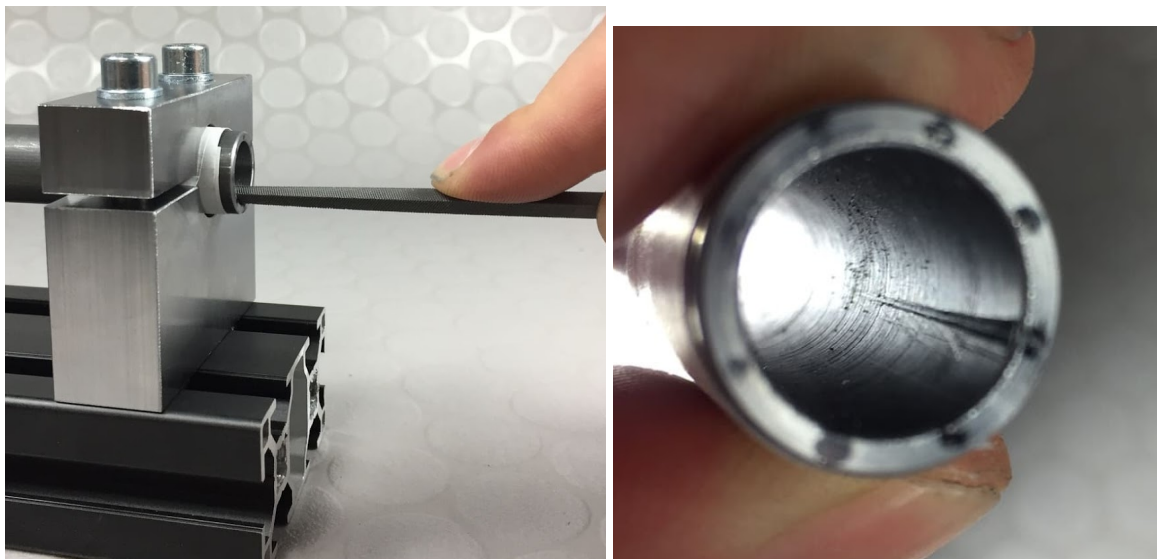
Step 8:

Now the file is tilted slightly less downwards so that the notch created guides the file and the groove created becomes longer.



Step 9:

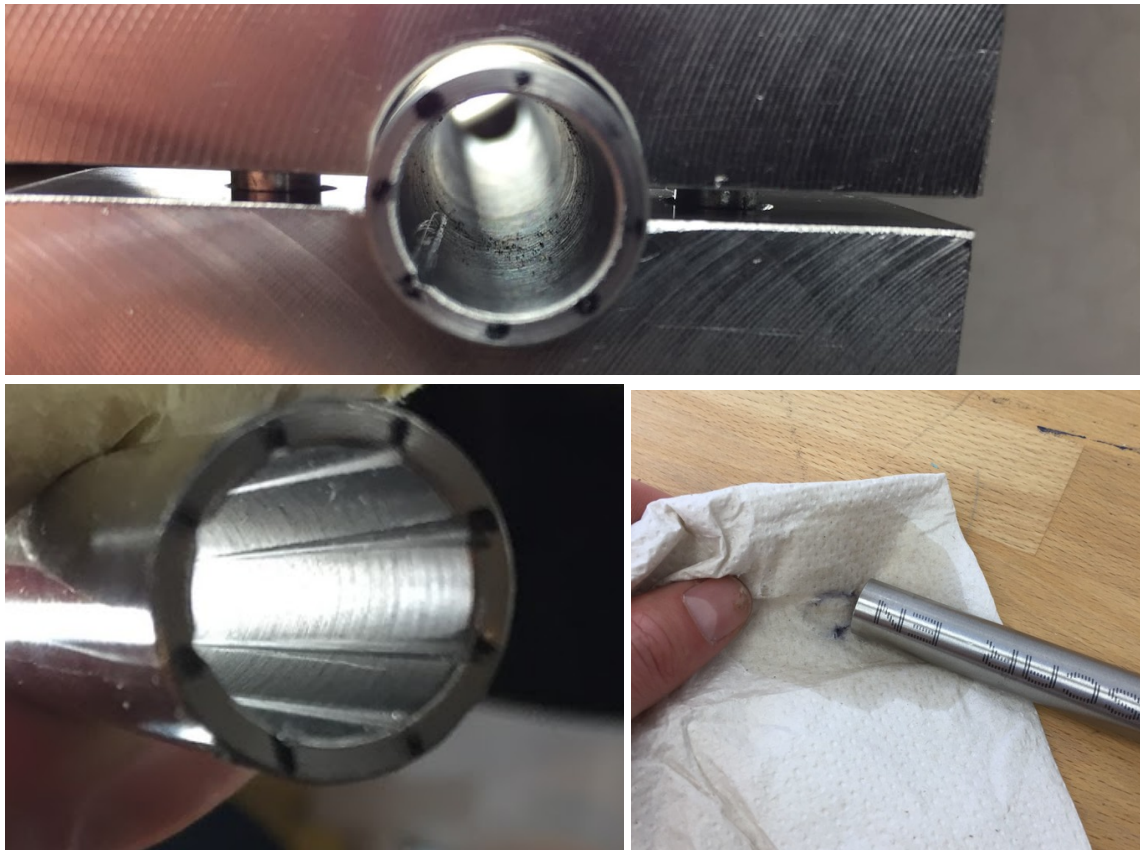
Now the file is lifted again a little so that almost only the front part of the file is still resting. This allows the groove to be filed into the tube even longer. Make sure that you stay in the groove and do not slip off to the outside. Be sure to keep the file rotated 45° and file with the edge only. The groove should become approximately 45mm long. The depth of the groove should not exceed 0.5mm. This depth is achieved when it can be seen continuously along the entire length. See picture.



Step 10:

When a groove is finished, loosen the screws on the tube holder and continue turning the tube to the next marking point. The tube may be slightly jammed, then unscrew the screws and move the tube up and down. Then turn the tube and align it so that the next marking point points exactly downwards again. Now file all grooves as described above.

When all grooves are filed, loosen the cap screws, remove the tube from the holder and remove the paper. If desired, the marks can be removed with spirit or nail polish remover (or similar) and a cloth.



Step 11:

The areas in the tube where filing was performed are now still somewhat rough. This can scratch the flanks of the extruder screw. To reduce the roughness somewhat, push the extruder screw upside down (side with hole first) into the extruder barrel. A slight resistance may be felt. Turn and slide the extruder screw in and out. The resistance should decrease. Then you can push the extruder screw through the tube again the right way around (with the spiral in front). It should slip completely through without getting stuck. After that, clean the tube well inside and outside. Use a cloth and some spirit or nail polish remover for this. No chips should remain in the tube.



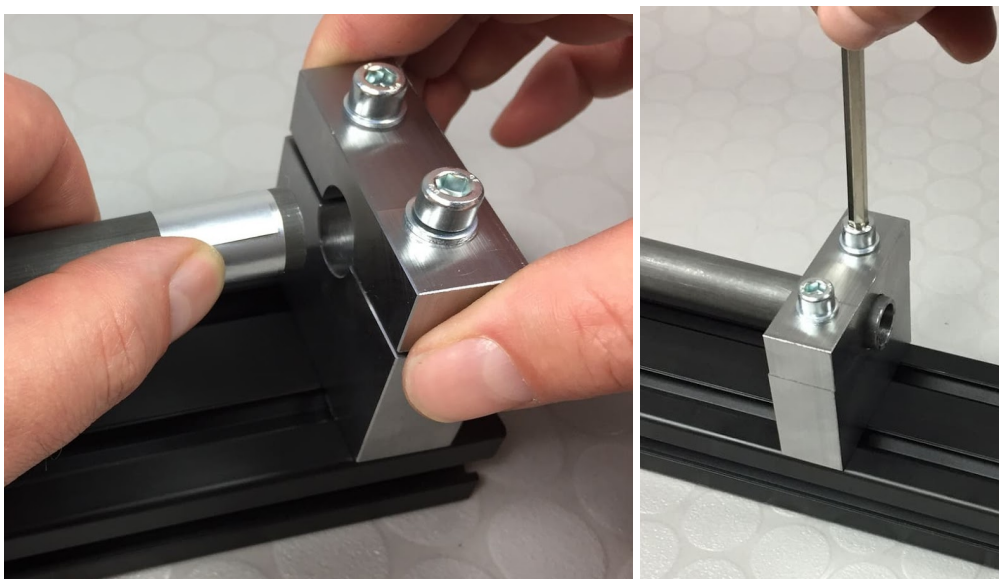
Step 12:

Cut a piece of aluminum foil into a strip measuring 20x140mm. Wrap the strip on the tube and hold it. 3mm distance to the top of the tube. The thread in the tube points downwards.



Step 13:

Slide the tube into the tube holder. To do this, loosen the screws so far that the upper holder can be lifted slightly. The end of the tube protrudes 3 mm beyond the tube holder. Push the tube holder further to the left and tighten the screws only very slightly. The exact positioning is done later.



Step 14:

Remove from package 0: 1x stepper motor Nema23 (MO01)

Remove from package 1: 4x countersunk screw M4x16mm (SC08), 2x countersunk screw M8x30 (SC09), 1x wood screw 2.5x10 (SC01), 1x cheese head screw M5x30 (SC06)

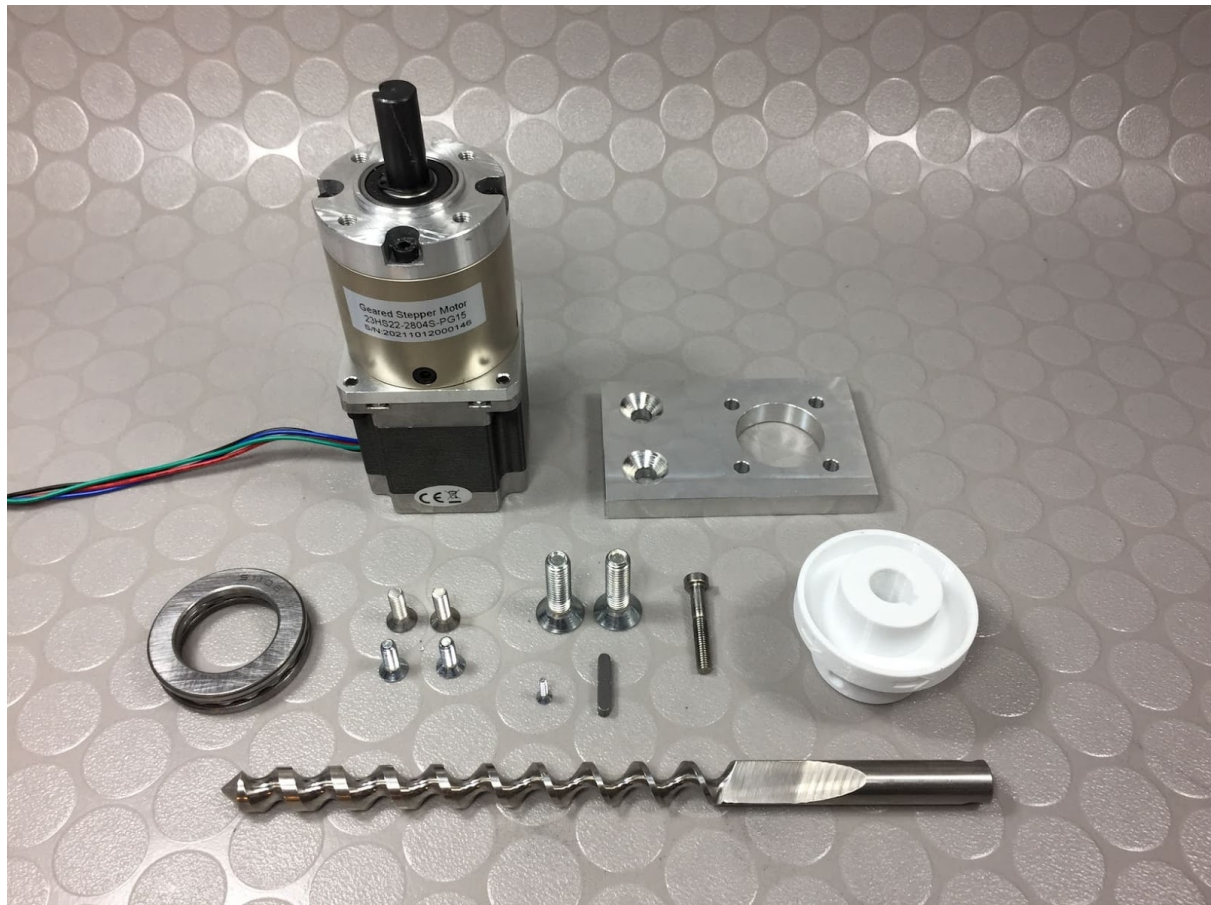
Remove from package 2: 1x thrust bearing (SP08), 1x feather key 4x4x20mm (SP02)

Remove from package 3: Extruder screw (CM02), Motor bracket (CM04)

Remove from package 6: Hexagon key 3mm (TO07), Hexagon key 5mm (TO08)

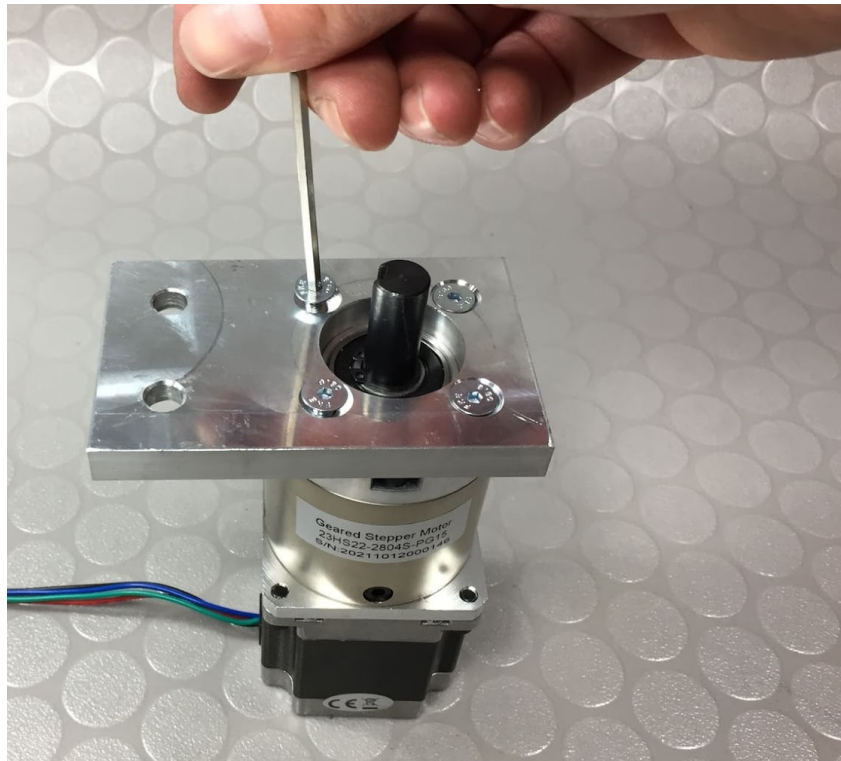
3D print: 1x coupling (ED01)

Tool: Phillips screwdriver PH1



Step 15:

Place the motor holder on the stepper motor. The four counterbores point upwards. The two 8mm holes point to the side of the motor connection cable. Insert and tighten the four countersunk screws.



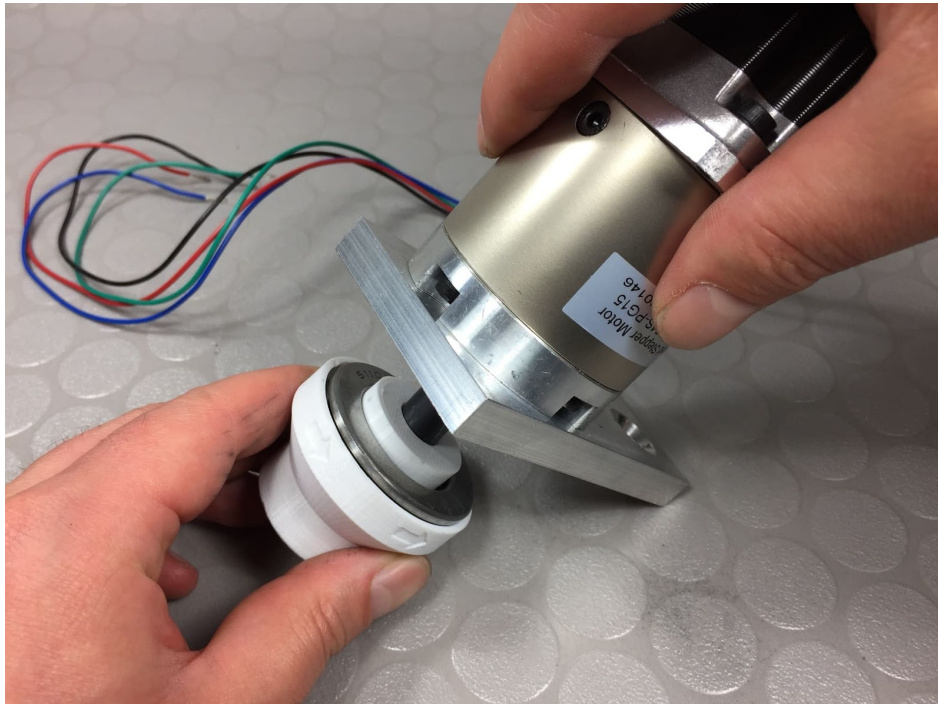
Step 16:

The thrust bearing consists of 3 parts. To prevent these from falling apart, the bearing is bound together with a band. Remove the tape and insert the bearing into the coupling, see picture. Then insert the key into the corresponding groove in the coupling, see picture.



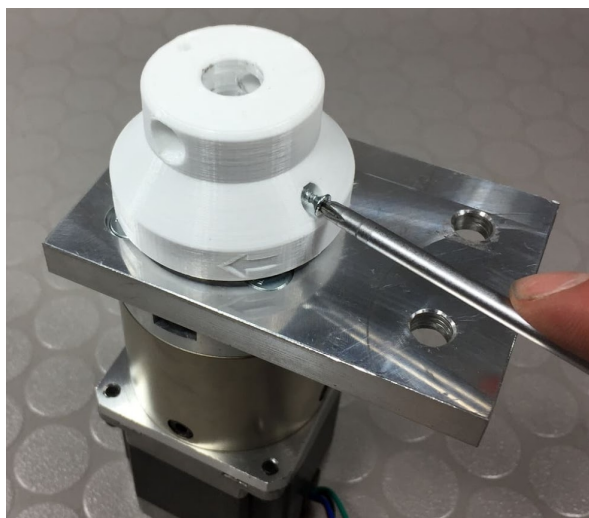
Step 17:

There is a groove on the shaft of the motor. This keyway is the counterpart to the key in the coupling. Turn the coupling so that the feather key meets the keyway in the shaft of the motor. Then push the coupling onto the motor shaft. Make sure that the axial bearing does not fall out.



Step 18:

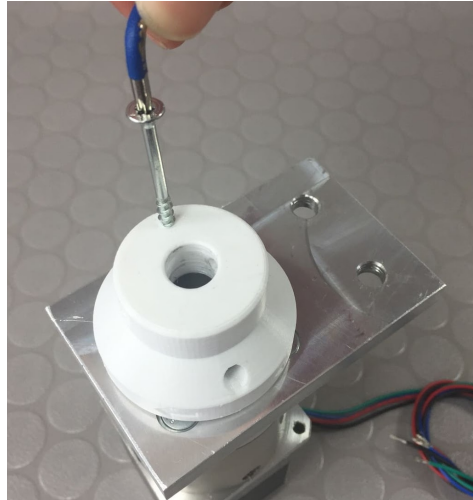
Place the motor upright and press the coupling again so that the thrust bearing is in good contact. Then screw the wood screw into the hole provided in the coupling and tighten it slightly. The screw serves to prevent the coupling from slipping off the motor shaft during further assembly.



Step 19:

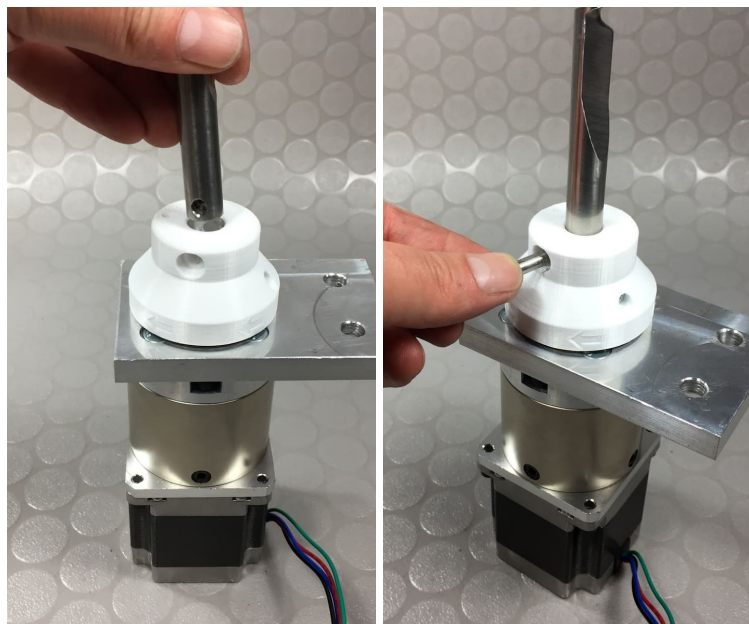
Remove from package 1: 1x wood screw 4x60mm (SC03).

If you are only processing plastic pellets or free-flowing granules, you can skip this step. If you want to process shredded 3D printing waste, the wood screw should be screwed into the hole provided in the coupling, see picture. The screw should protrude about 34-35 mm. The screw serves as a stirrer to keep poorly flowing granules in motion.



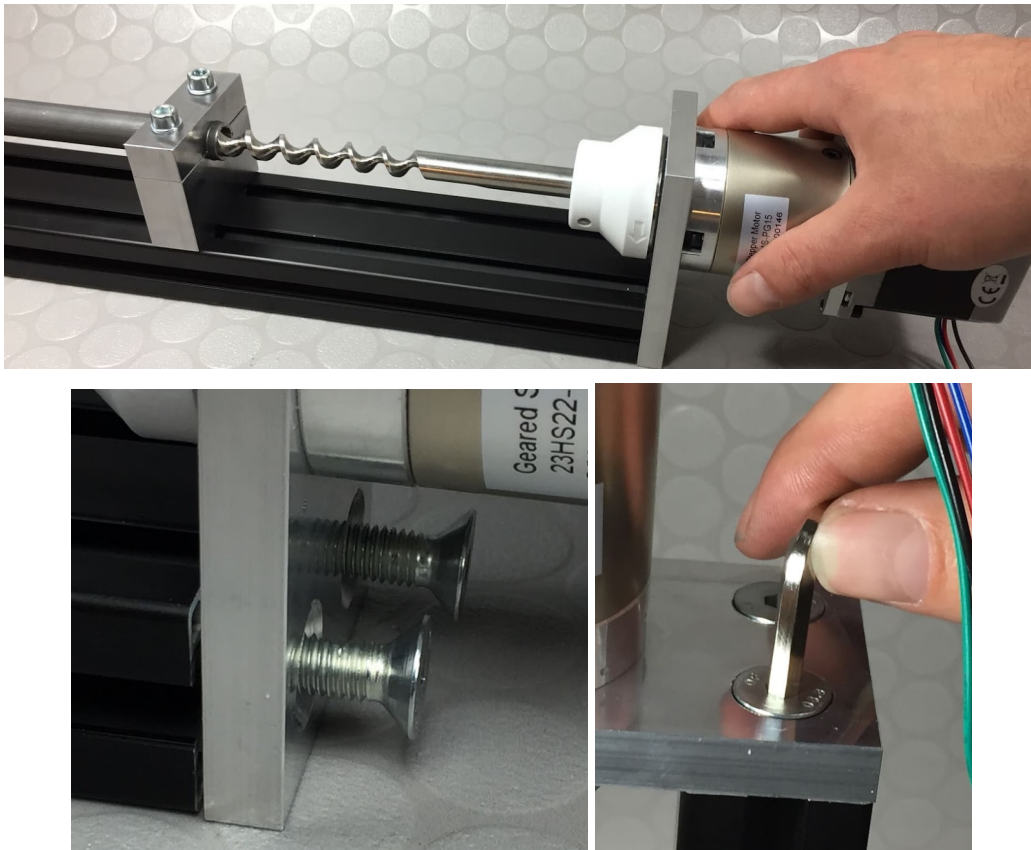
Step 20:

Insert the extruder screw into the coupling and align it so that the holes are on top of each other. It should then be possible to push the M5x30 cap screw into the hole in the coupling. If resistance is felt, turn the screw. Insert the screw from the side that is countersunk.



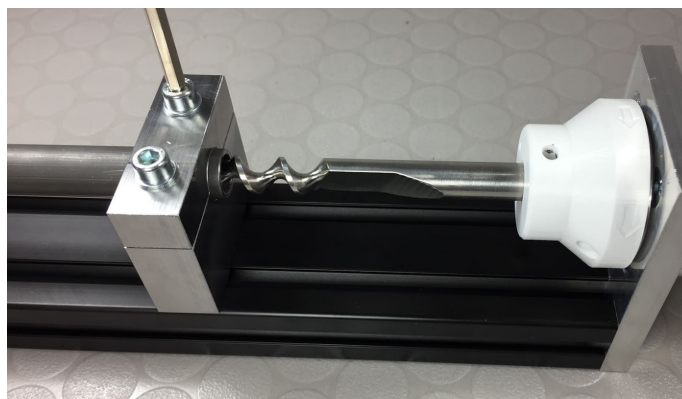
Step 21:

Align the motor so that the motor holder rests against the aluminum profile and the extruder screw meets the extruder tube. Then screw the two M8x30 countersunk screws through the motor holder into the threads in the aluminum profile and tighten. To tighten, straighten the aluminum profile.



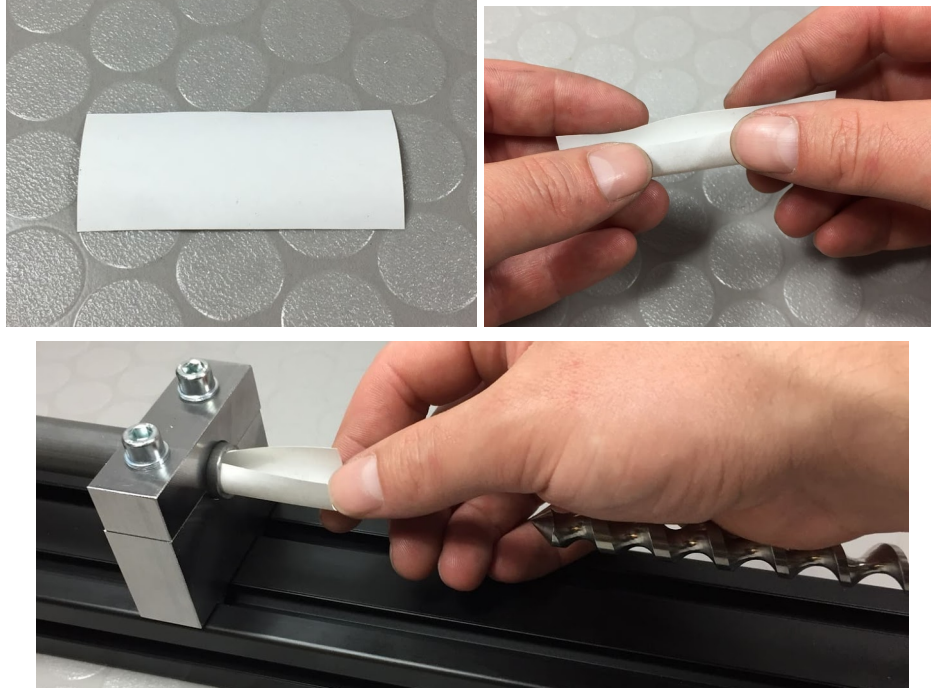
Step 22:

Loosen the cap screws on the tube holder and then slide the tube holder to the left so that the tube no longer touches the extruder screw.



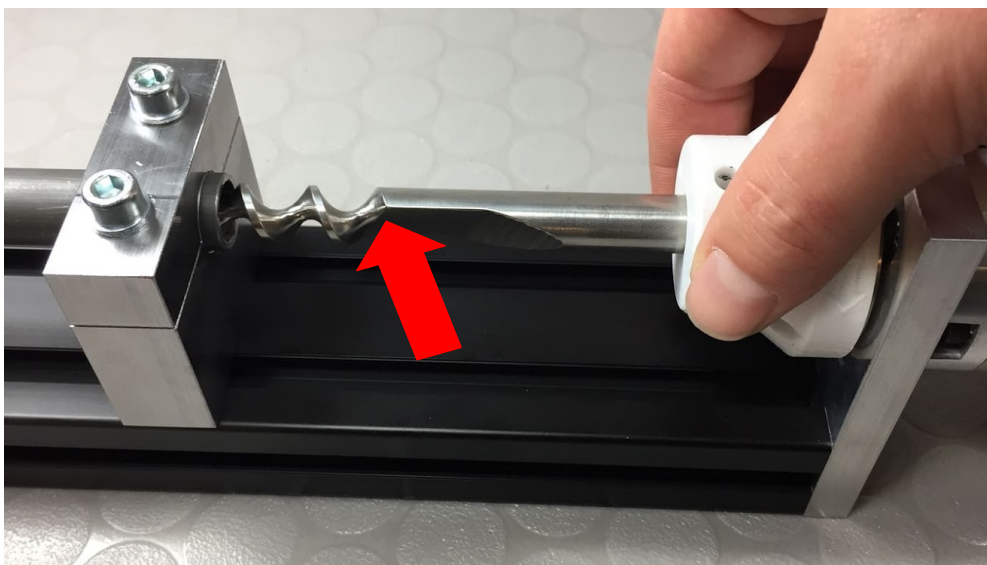
Step 23:

Cut a piece of paper with the dimensions 36x80 mm. Roll the paper into a tube. (Roll the long edge so that the tube is approx. 70 mm long). Push the tube into the extruder tube and leave approx. 5 - 10mm protruding.



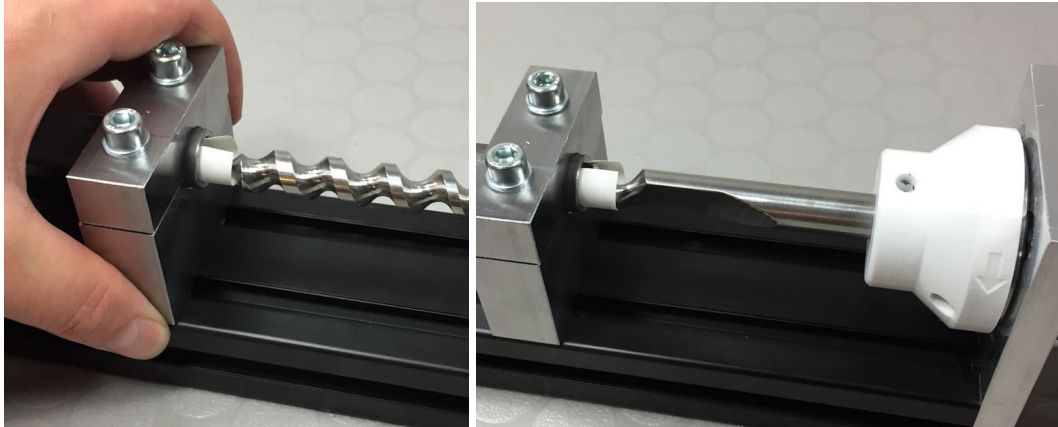
Step 24:

Turn the extruder screw so that the beginning of the spiral points upwards. (See picture for edge). To do this, grasp the coupling with your hand and turn the motor shaft.



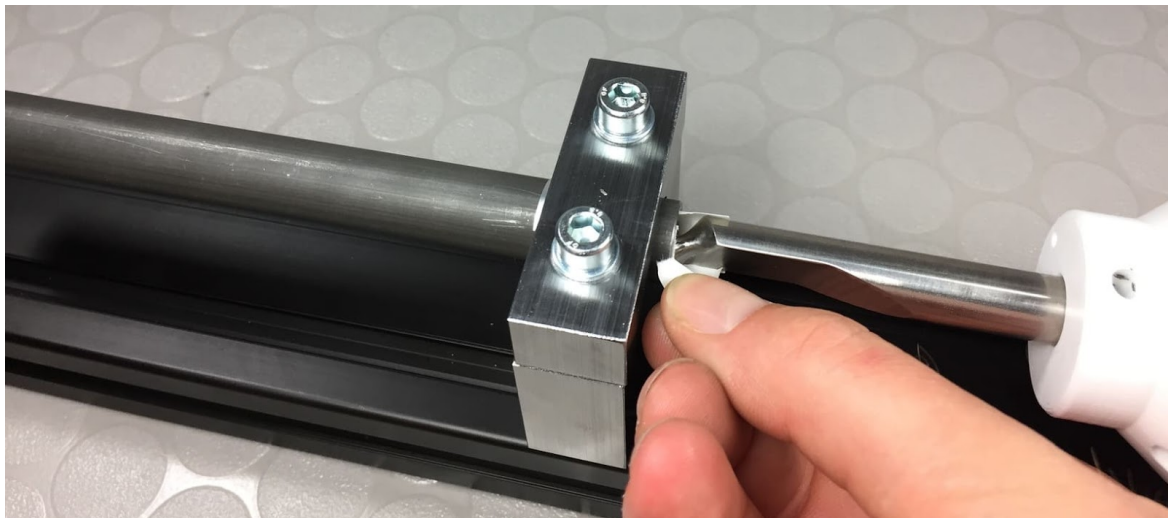
Step 25:

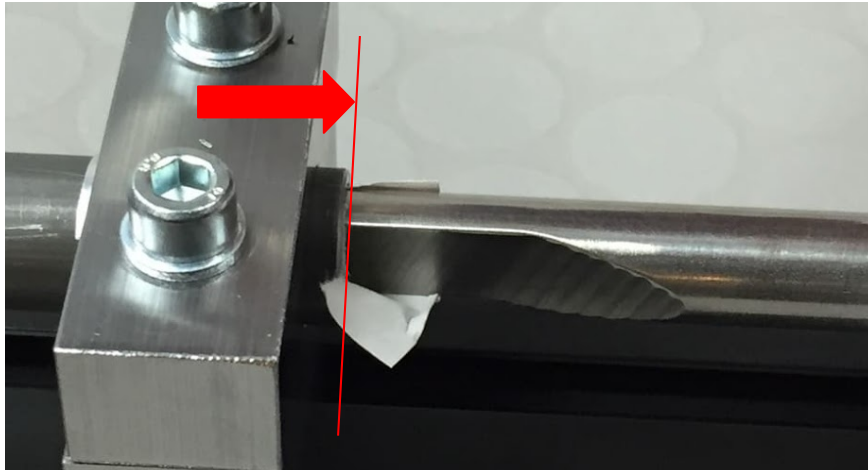
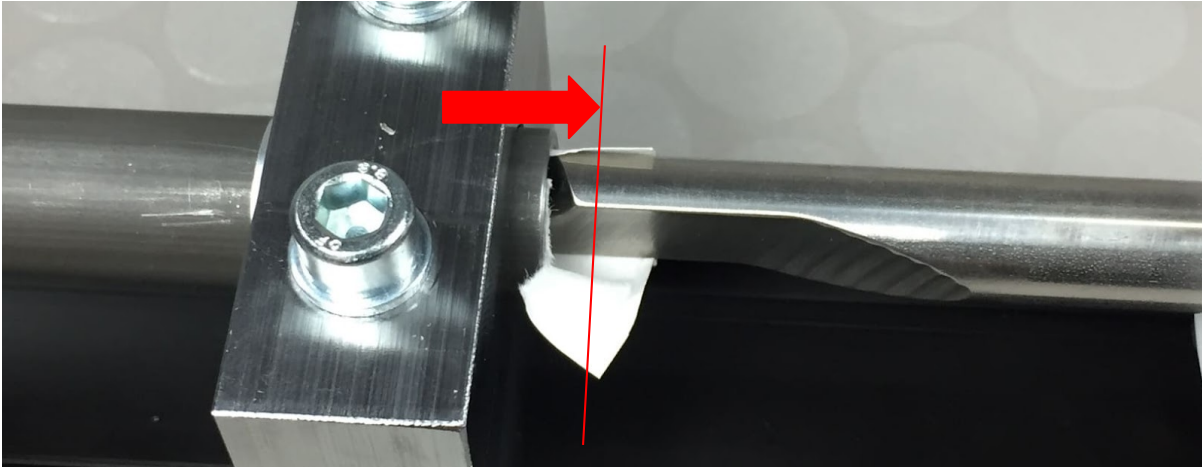
Slide the extruder tube over the extruder screw. Be careful not to push the paper too far into the tube. If the screw gets stuck and cannot be pushed in, you can replace the piece of paper with baking paper, which is less thick. Push the tube until just before the end of the spiral.



Step 26:

If some paper protrudes, tear it off so that the edge of the spiral start is visible. Now push the barrel over the edge so that the edge disappears about 2mm deep in the barrel. See pictures, also on the next page.

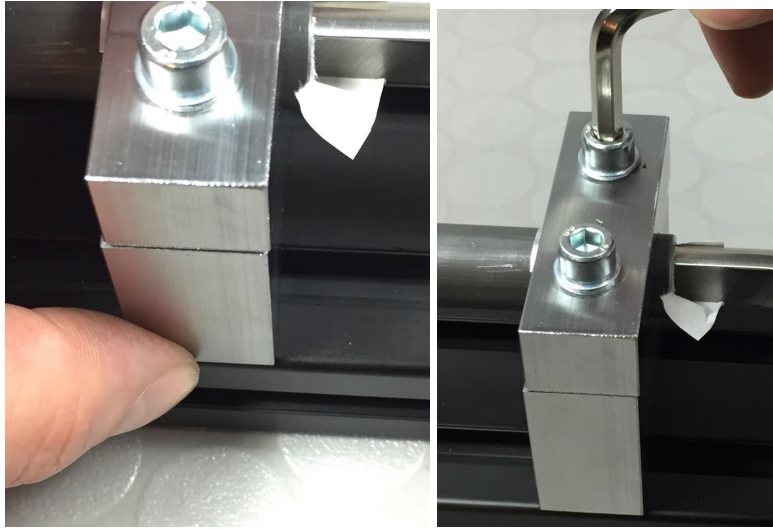




Step 27:

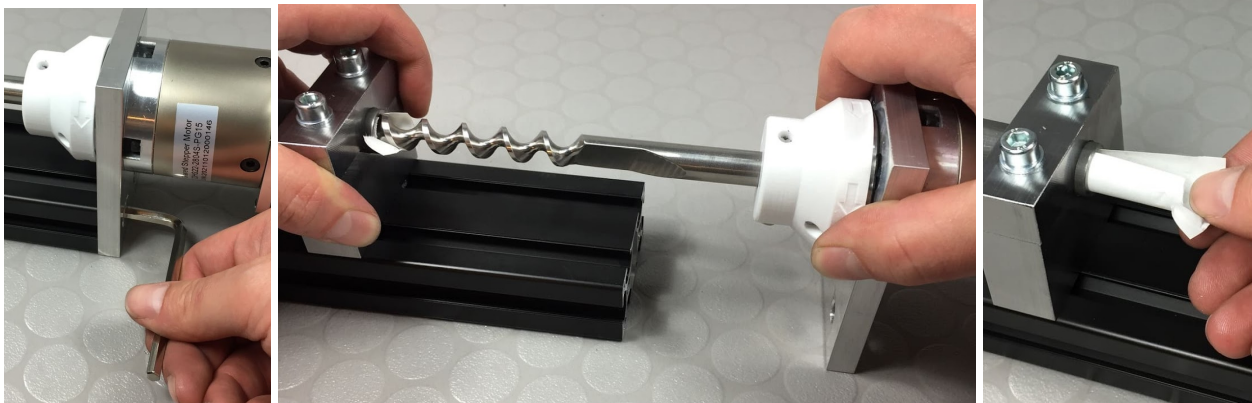
Now align the pipe so that it is exactly in line with the extruder screw and the aluminum profile. Look at the extruder unit from above and check whether the extruder screw and tube are parallel to the grooves of the aluminum profile. By moving the tube holder, you can influence the alignment. Then tighten the cap screws on the tube holder.





Step 28:

Now the motor is disassembled once again. To do this, loosen and remove the countersunk screws. Pull out the extruder screw with motor and lay it on its side. Remove the piece of paper.



Step 29:

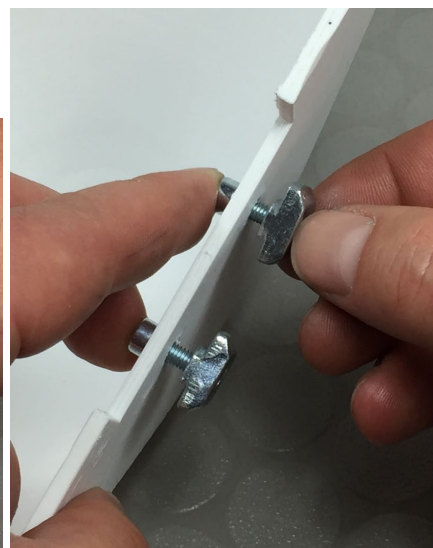
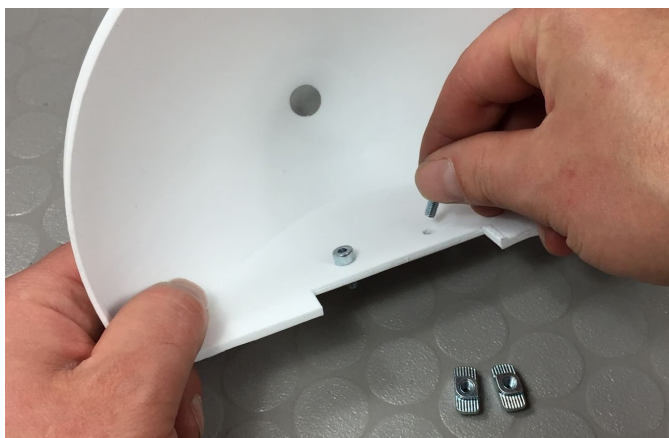
Remove from package 1: 2x cheese head screw M4x10 (SC05), 2x hammer nut M4 (SC16)

3D print: funnel part 1 (ED02)



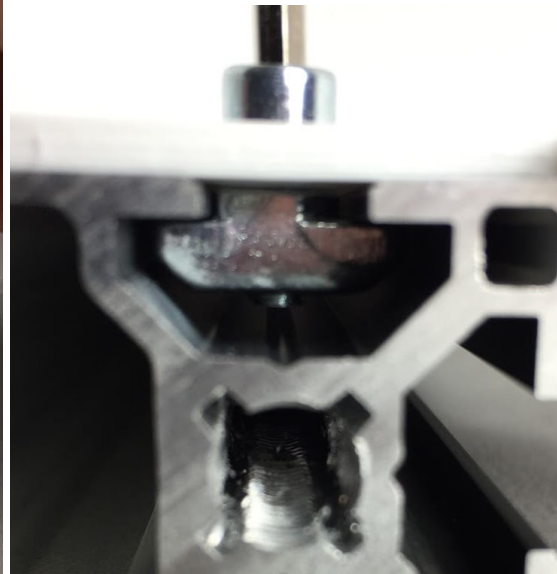
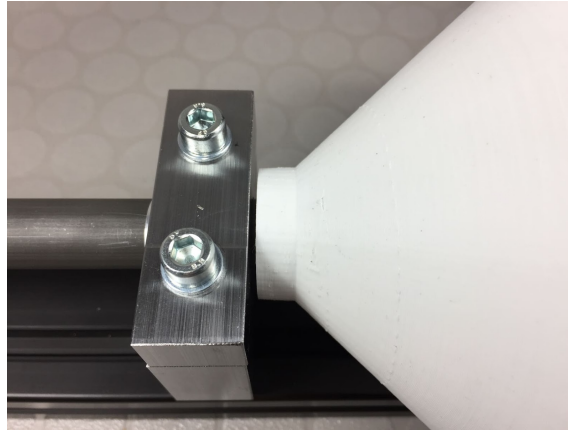
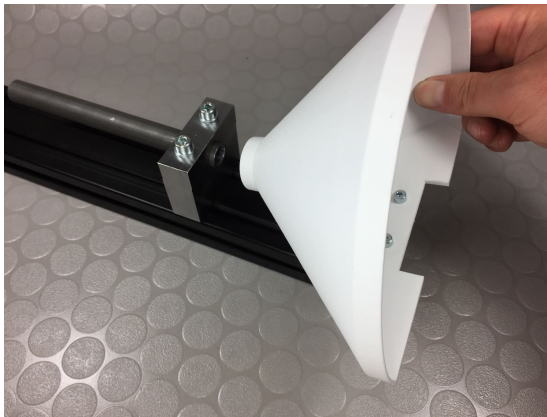
Step 30:

Insert the cap screws from the inside through the holes in the funnel. Turn the hammer nuts a few turns on the threads. See picture for alignment.



Step 31:

Place the funnel on the aluminum profile. The hammer nuts must fit into the grooves. Place the end piece of the funnel on the tube. If the pipe does not fit into the end piece of the funnel, remove the funnel and rework the opening on the funnel. Then tighten the cap screws. When doing this, the hammer nuts must rotate inside the groove so that they are transverse and can absorb force. Do not overtighten the screws, otherwise the 3D printing part may break.



Step 32:

Check that there is no air gap between the extruder tube and the funnel. Otherwise, loosen the cap screws on the hopper again and place the hopper completely on the tube.



Step 33:

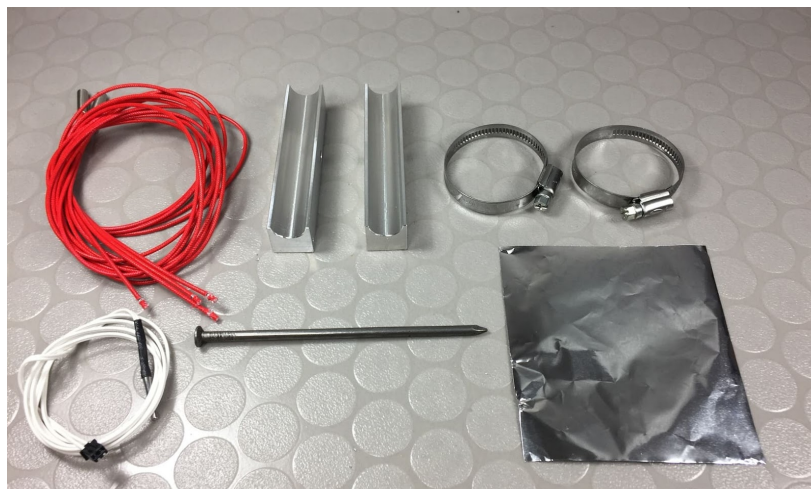
Remove from package 2: 1x nail (SP12), 2x hose clamp (SP13)

Remove from package 3: 2x heating element (CM03)

Remove from package 4: 2x heating cartridge (EB01), 1x thermistor (EB02)

Tools: Hammer, Phillips screwdriver PH1

miscellaneous: cut aluminum foil: 105x105mm



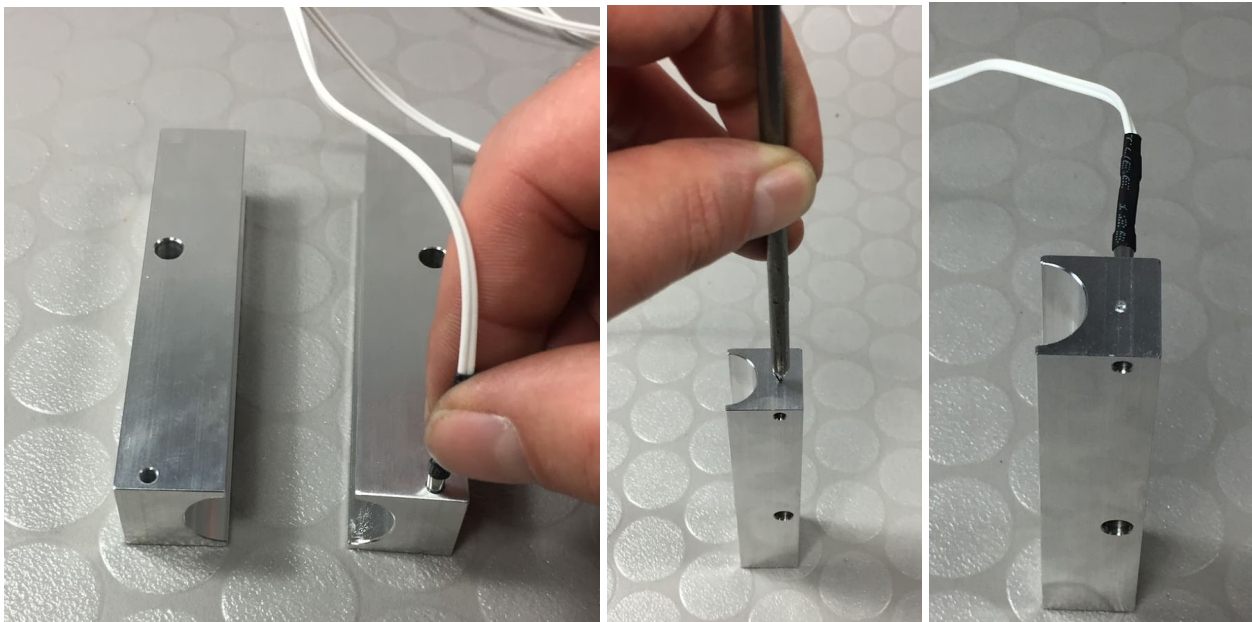
Step 34:

The heating elements are aligned as shown. The semicircular cutouts point inwards. The hole for the thermistor points downwards.



Step 35:

The thermistor is inserted into the corresponding holes of the right heating element. If it hooks, check whether the hole is clean. When the thermistor is inserted, it is secured against slipping out. To do this, raise the heating element so that the hole with the thermistor is facing up. Place the nail on the face of the heating element and align it so that it sits over the thermistor. Now hit the nail with the hammer. The resulting indentation will hold the thermistor in place. Check that it is securely seated and repeat the process if necessary.

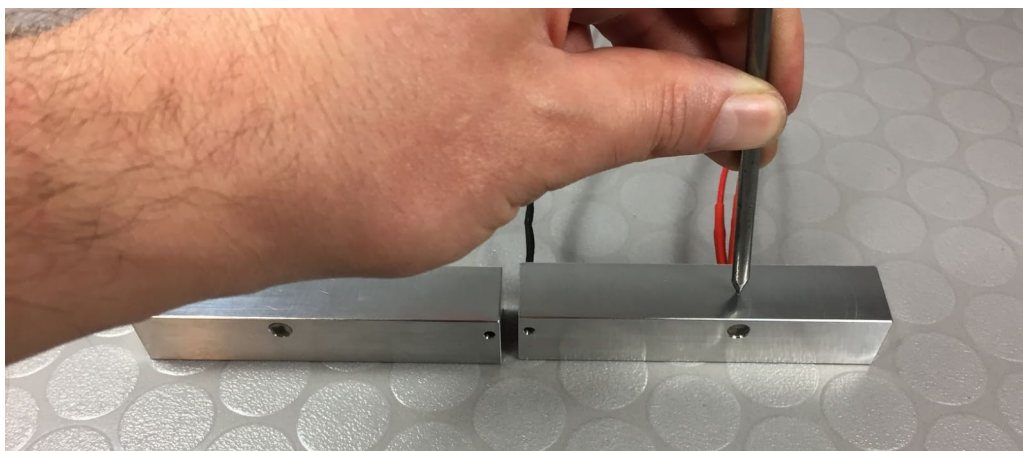
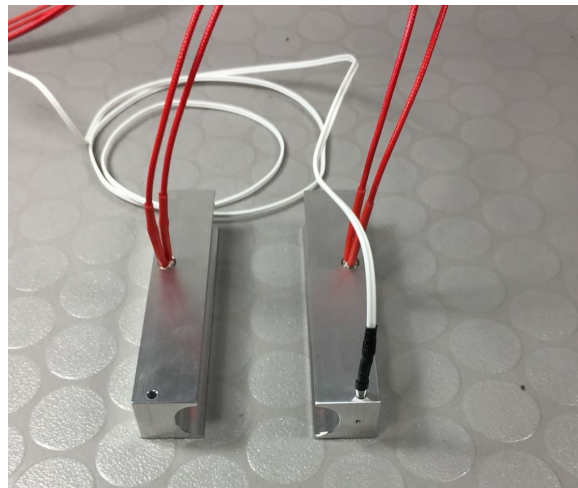


Step 36:

The heating elements are aligned as shown. The semicircular cutouts point inwards. The hole for the thermistor points downward.

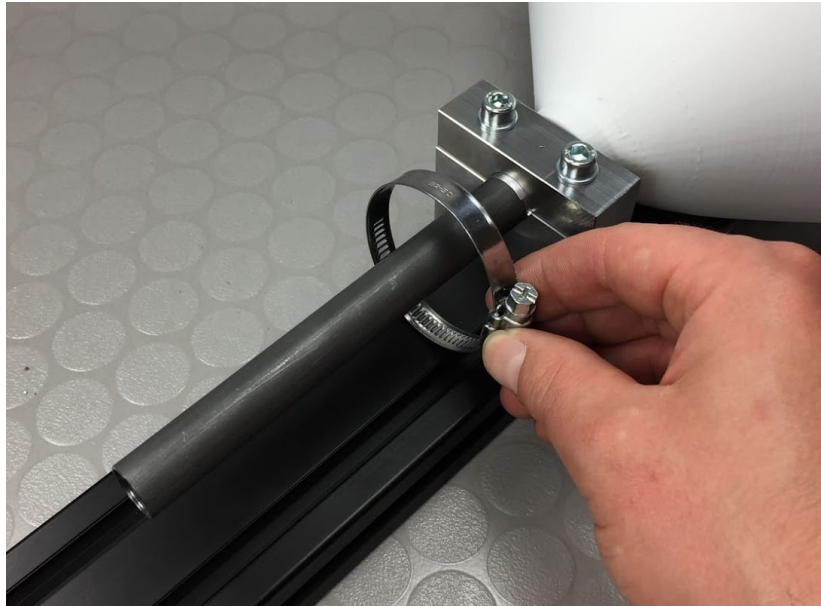
Insert the heating cartridges into the holes in the heating elements. If it hooks, check that the bore is clean.

The two heating cartridges are secured against slipping out. Place the nail on the side surface of the heating element and align it so that it sits above the heating cartridge. Now hit the nail with the hammer. The resulting indentation will hold the heating cartridge in place. Check that it is securely seated and repeat the process if necessary. Carry out this procedure for both heating cartridges.



Step 37:

Slide a hose clamp over the extruder tube as shown. See picture for alignment. The clamping screw must point upwards.



Step 38:

Remove from package 6: Socket wrench 6x7mm (TO01).

Have the socket wrench and a screwdriver ready for the next steps.

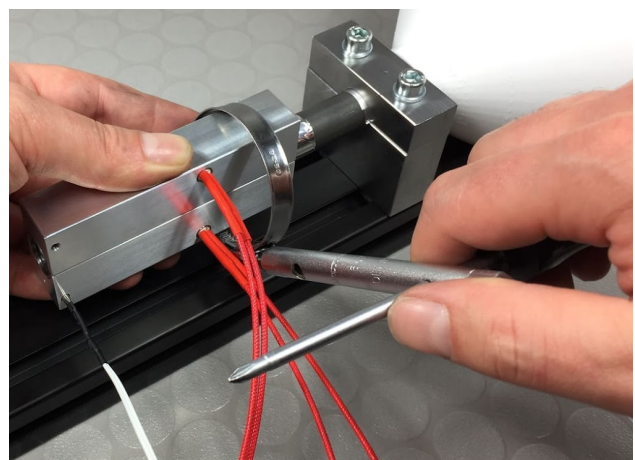
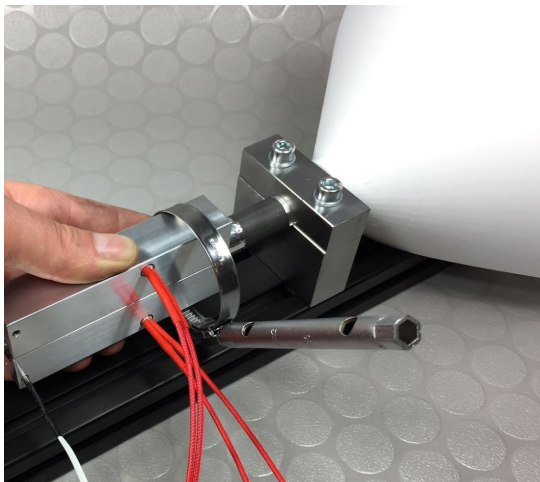
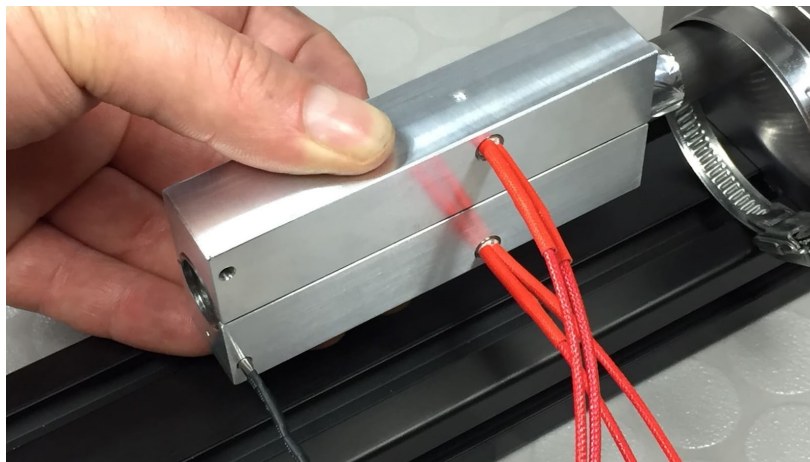
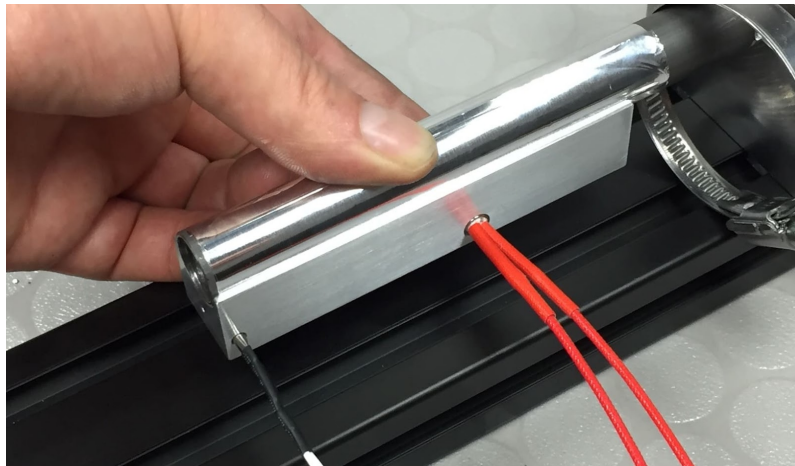
Step 39:

Wrap the aluminum foil around the tube. The foil must be flush with the thread in the tube at the bottom. If the foil wrinkles a bit, simply twist the foil even more after it is wrapped around the tube. Any voids should then disappear. There should be no kinks in the foil. If in doubt, cut a new piece of aluminum foil and try again.



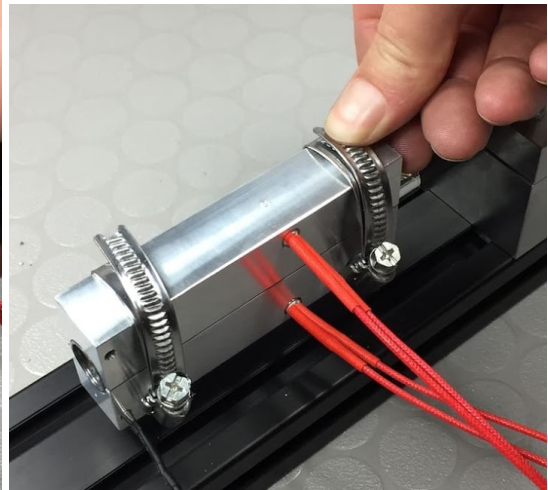
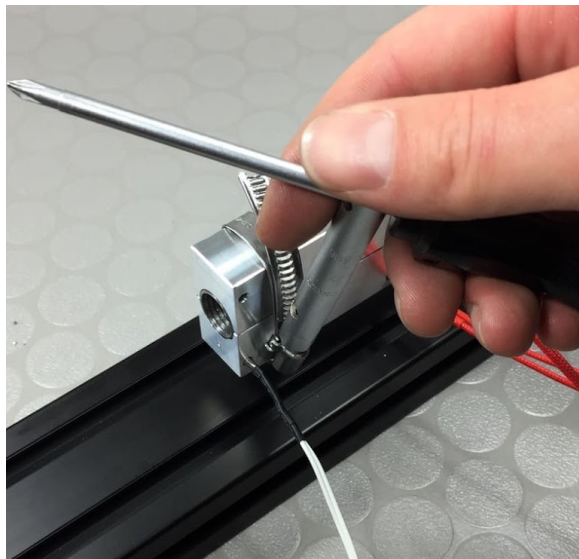
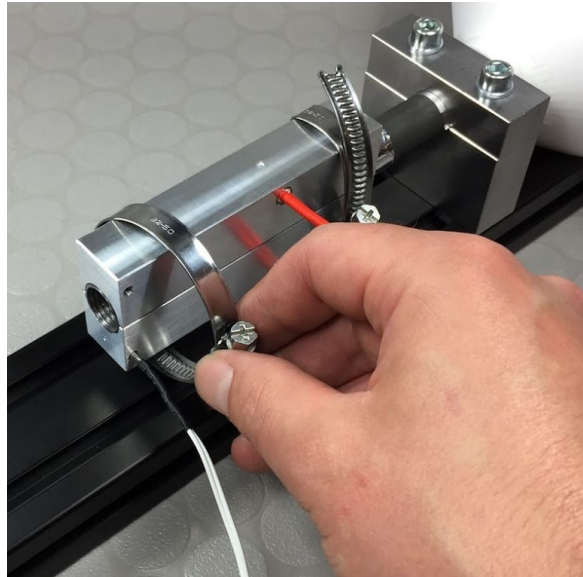
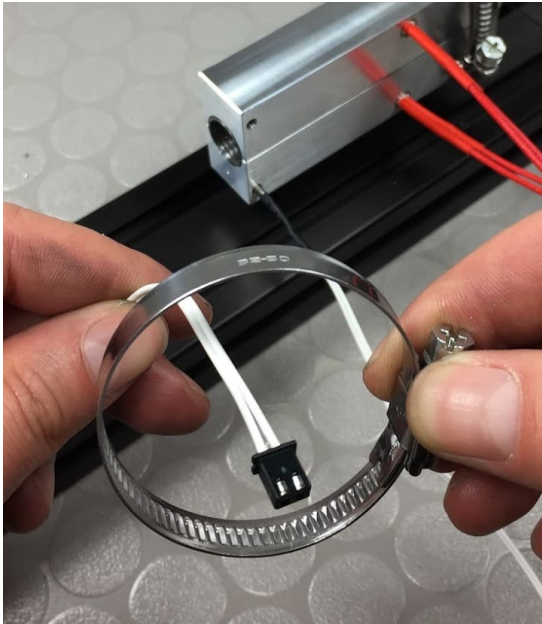
Step 40:

The heating element with heating cartridge AND thermistor is held against the tube from below. The thermistor points to the thread in the tube. The heating element is flush with the tube. The second heating element is placed from above. Press the two heating elements together firmly for a short time. Then slide the already positioned hose clamp over the heating elements. The socket wrench fits onto the clamping screw on the hose clamp. To be able to apply more force when turning, the screwdriver, for example, is inserted through a hole in the socket wrench. Tighten the hose clamp firmly.



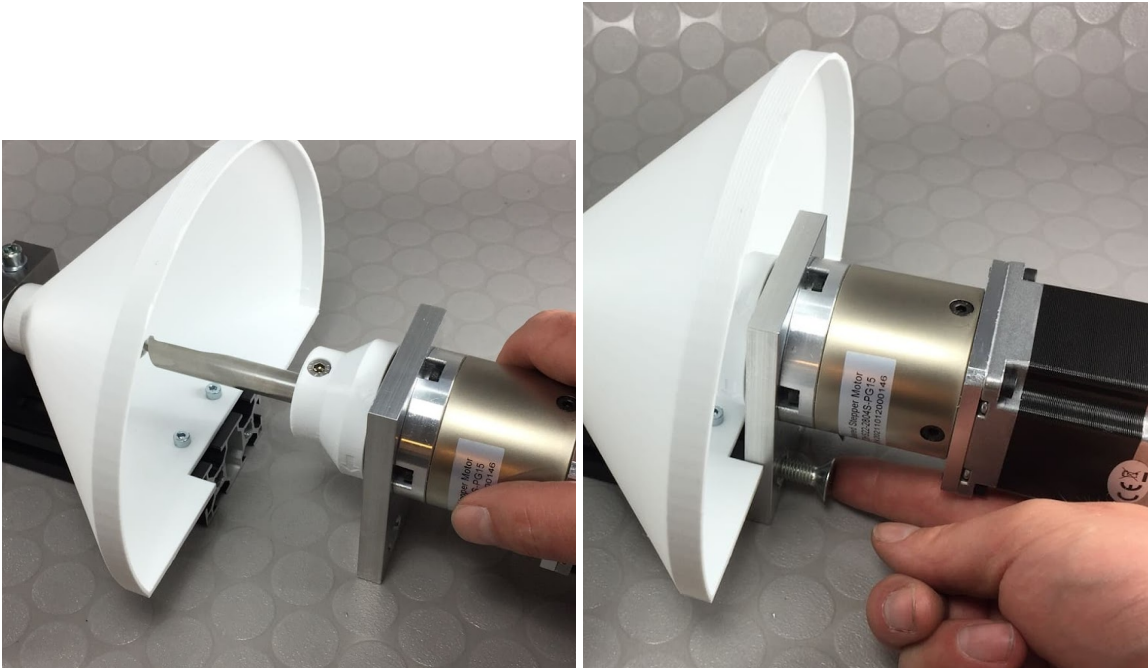
Step 41:

Hold the second hose clamp in your hand as shown in the picture and guide the thermistor cable through it. Then guide the hose clamp along the cable and place it on the heating elements. Then tighten the hose clamp again with a socket wrench and screwdriver. If the bands of the hose clamp protrude slightly, you can bend them over.



Step 42:

Push the extruder screw with motor back into the extruder tube and tighten the motor holder with the two countersunk screws.

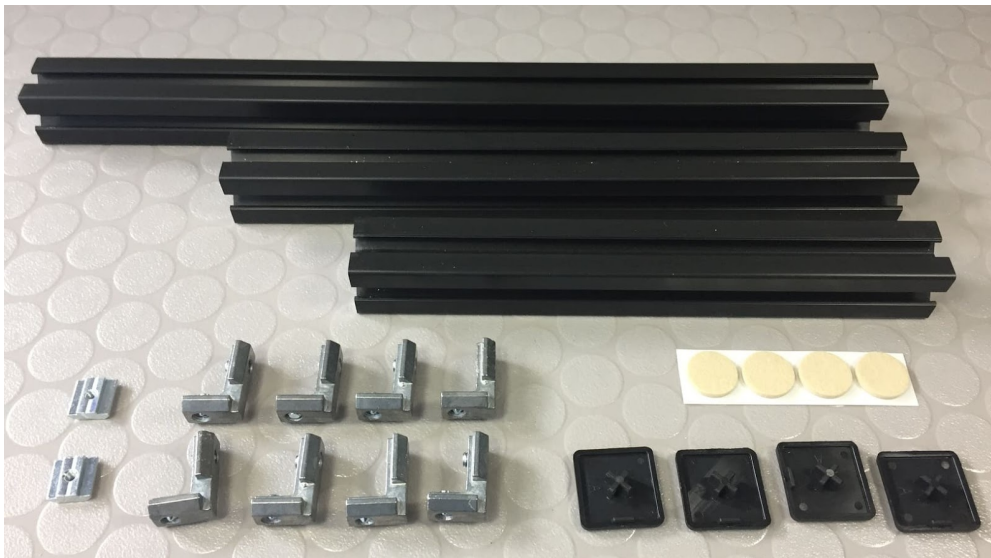


Step 43:

Remove from package 0: 1x aluminum profile 30x30x400 mm (FR02), 1x aluminum profile 30x30x300 mm (FR03), 1x aluminum profile 30x30x240 mm (FR04)

Remove from package 1: 2x slot nut M4 (SC17)

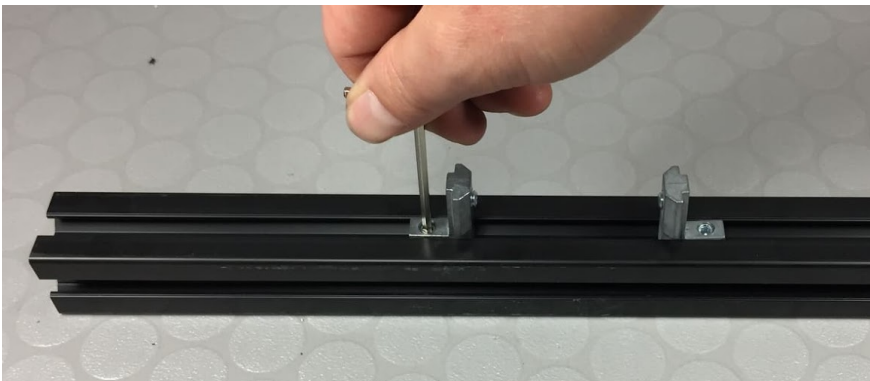
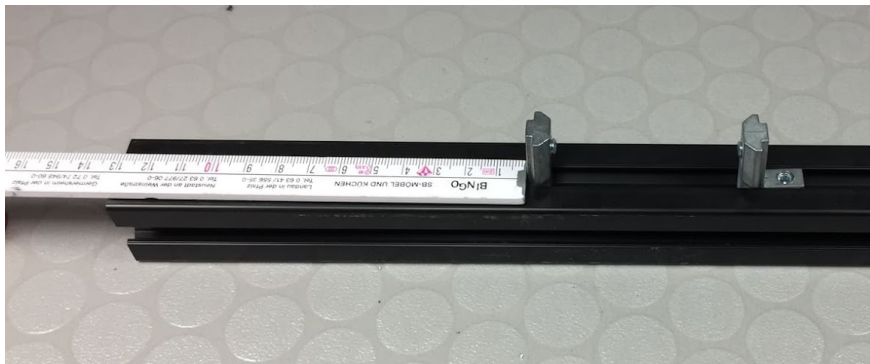
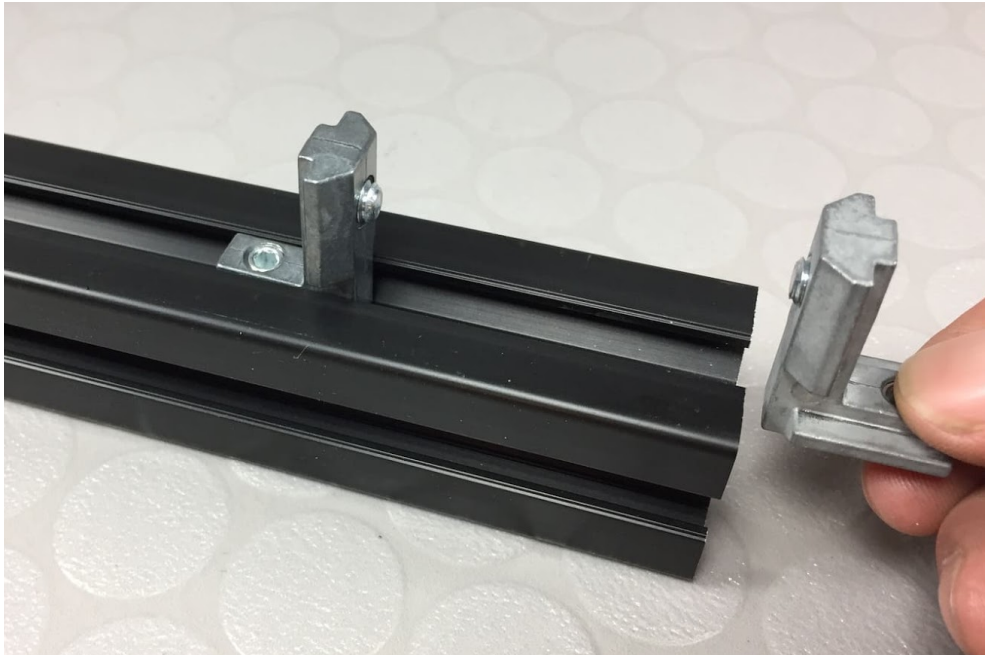
Remove from package 2: 4x cover cap (SP01) 8x connector for aluminum profile 90° (SP04), 4x felt glider (SP05)



Step 44:

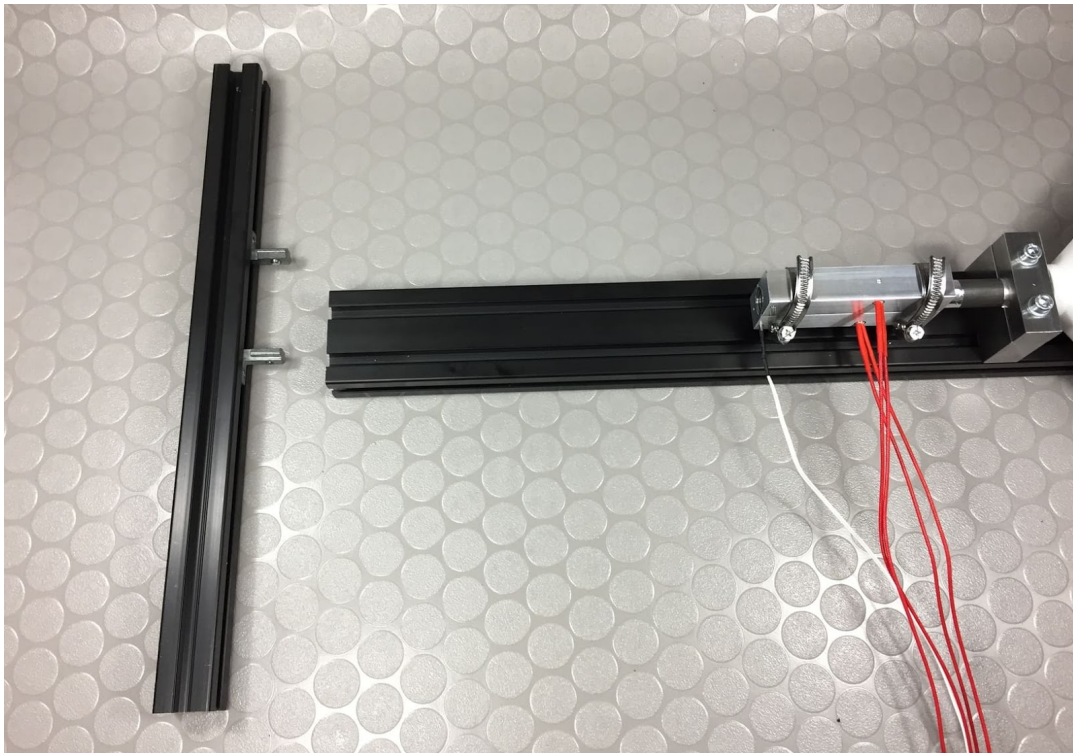
Remove from package 6: Hexagonal wrench 3mm (TO07)

Push 2 connectors into the groove of the 400 mm long aluminum profile. Alignment see picture. The left connector is 130mm from the left end of the aluminum profile. This connector is screwed tight at this position.



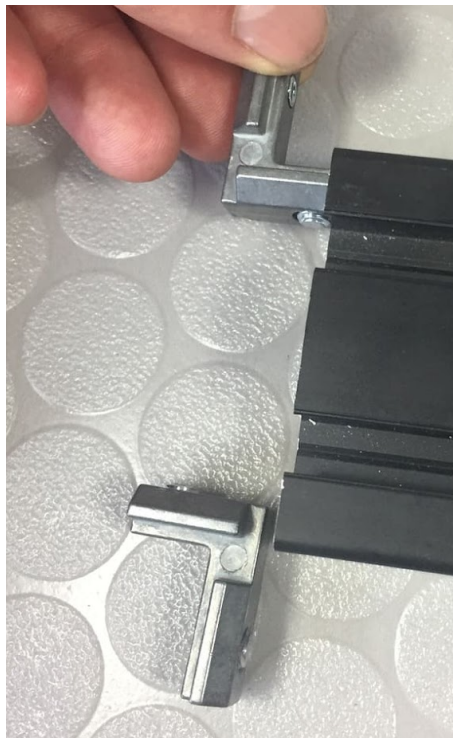
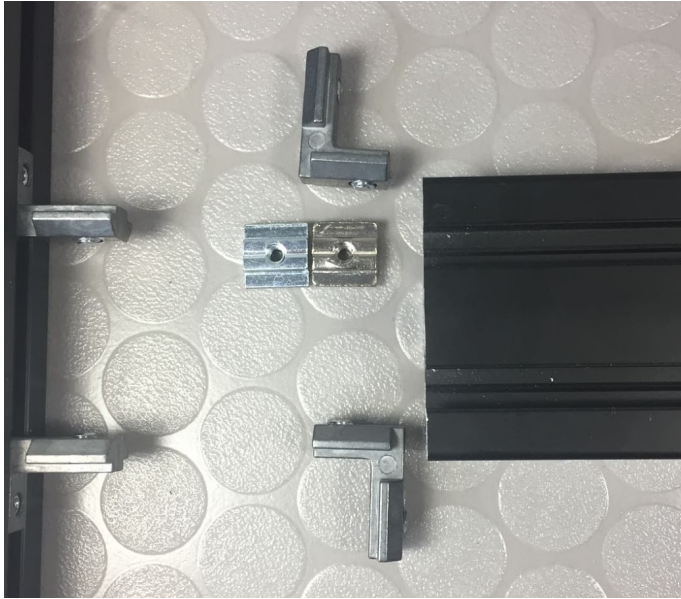
Step 45:

The 400mm long aluminum profile is turned on its side and aligned with the extruder unit as shown in the picture. The already clamped connector points upwards.



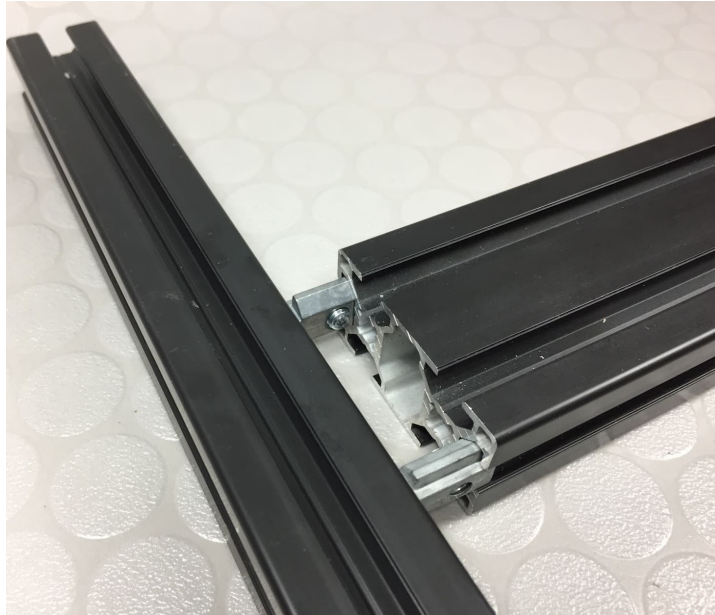
Step 46:

Position 2 sliding blocks and 2 connectors as shown in the picture. Insert 2 sliding blocks into the upper groove of the 30x60x500mm aluminum profile, see picture. Insert the two connectors into the respective lateral groove, see picture.



Step 47:

The connectors are inserted into the groove of the 30x60x500mm aluminum profile. The upper connector is already fixed on one side. The lower connector must be pushed into the correct position.



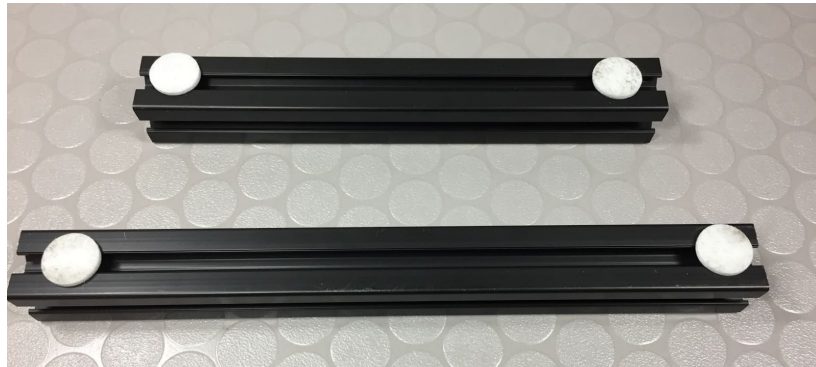
Step 48:

Now the upper connector is screwed tight first. Before the lower connector is tightened, the grub screws it contains must first be screwed in slightly. You can alternately screw in both grub screws until slight resistance is felt. Then check the correct position of the aluminum profiles, after which the grub screws are tightened. This sequence is important, otherwise the profile may shift/warp.



Step 49:

Glue the felt gliders to the 300 mm long and the 240 mm long aluminum profile. Then turn the profiles so that the felt gliders face each other. Then insert two connectors into the groove of each profile again. See picture for alignment. The distance between the left connector and the left edge of the aluminum profile is 160 mm. The left connector can be screwed tight again in this position.



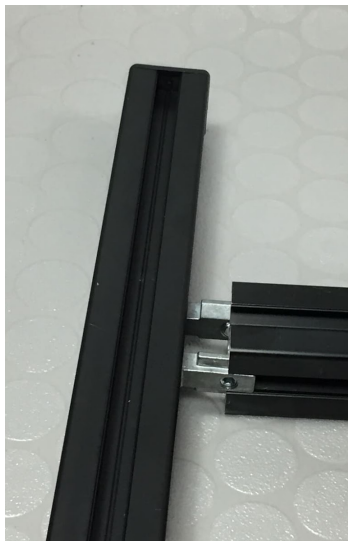
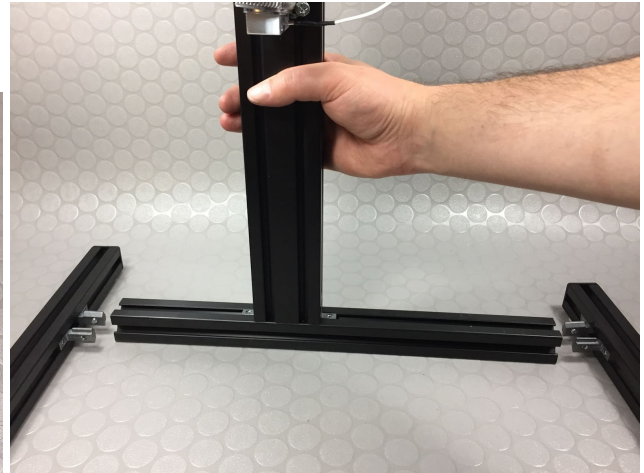
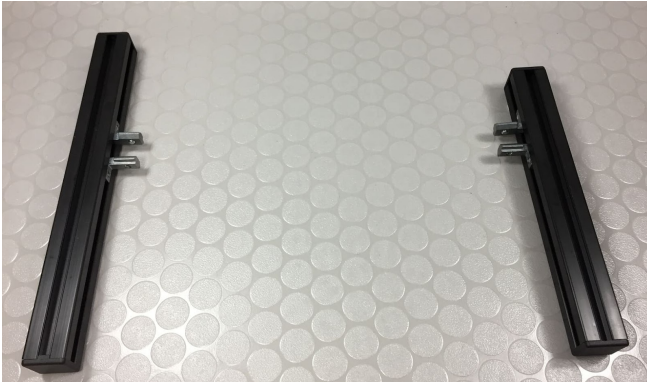
Step 50:

Place the cover caps on the ends of the aluminum profiles. Some caps are very tight and may need to be hammered in. Some cover caps are very loose and may need to be glued in place.



Step 51:

Turn the aluminum profiles again so that the felt gliders rest on the base. See picture for position. Then place the extruder unit upright between them. Insert the connectors in the ends of the 400 mm long aluminum profile. To do this, the extruder unit must be raised slightly, as there is a difference in height due to the felt glides. Then tighten the already fastened connectors first. Then first apply the grub screws to the other connectors and correct the position. Then tighten them as well.



Done:

The extruder unit is now completely assembled. Now continue with assembly instructions "02-Electronics build up".

