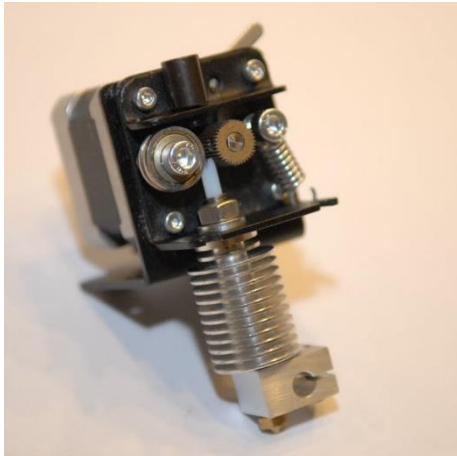


Instructions assembly hotend upgrade for the CraftBot and CraftBot PLUS

Thanks to Jan Houwers, Franci, Psanyi, Matthew and 3DForms for testing and advise.

(Dis)assembly time is about 10-15 minutes.



This is a "drop in" replacement for the standard hotend of the CraftBot. The standard hotend is fine, but isn't capable to print reliable with more "exotic" filaments.

NB: if you mainly print PLA, there's no reason to buy this hotend, as the original hotend does a good job and has a little higher max. flow.

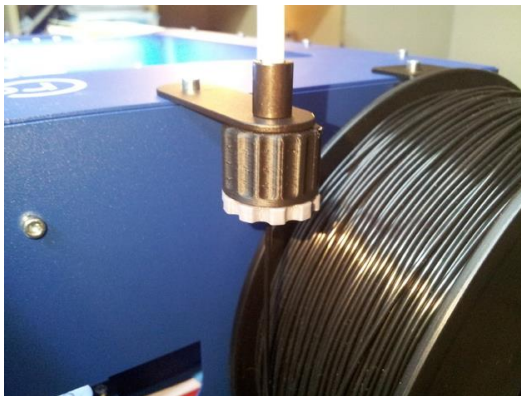
The advantages of this hotend upgrade are:

- print reliable with flexible, wood or metal filled filaments
- print at max 300 degrees extruder temperature (in stead of 260 grC with PEEK)
- less clogging: print more reliable because of a more consistent filament guide and cooling performance
- all metal hotend. (the filament lining is with PTFE though)
- drop-in replacement. This hotend is mounted like the original PEEK hotend.

With an ABS 3D printed fan-duct the hotend is properly cooled but you still have to respect the specifications of the filament. Set the extrusion temperature about 10-20 degrees above the melt temperature. When set much more (like 250 degrees for PLA, it's likely that clogging occurs. This because of the low Glas Transition Temperature of PLA (50grC). Which is a way too high extrusion temperature: the filament softens at places it shouldn't and a clog is the result.

Some additions to the first edition of the manual:

- **The thermistor has to be put** in the 2mm hole **on the right side of the heaterblock**, which is about 15mm deep! The shallow holes on the backside should **not** be used! Straighten the cable of the thermistor and put it in the hole as deep as possible. ~~You can add some thermal grease as well to get even more accurate temperature reading.~~ **You can fixate the thermistor with a little piece of Kapton tape, pushed with the smallest hex-key into the hole with thermistor.** See [here](#) for more info.
- **When installing / changing the PTFE tube in the hotend: that has to go with some resistance in the hollow mounting thread.** When it's too loose, it will move when printing because of the retraction and prime. By that clogging is likely.
- **Retraction and Prime must be limited to 2mm.**
- As PLA is the hardest to print with a metal hotend, Paul (3DForms) has pointed to a tip to **oil now and then the filament and by that the metal parts of the hotend.** Please click [here](#). So when printing PLA with my hotend it's advised to oil (olive oil for example) the filament a little to prevent sticking of the PLA to the stainless steel heatbreak. Also, you can print [this](#) by Kezat (Matthew), to mount a dust and oil thingy to the CraftBot filament tube holder.



- Franci has **applied thermal grease to the heat Cartridge as well the thermistor.** Be sure to use not hardening thermal paste. Thermal grease is added from now on, so you can use it for reassembling the thermal break as well mounting of the heater.
- From now: **a cutting mold for the PTFE tubes** is added together with a stanley-blade.
- A 0.29mm **metal spacer card** will be provided too.

- **For metal or Carbon filled filaments you have to use a Stainless steel Nozzle**, as made by E3D. Watch your filament gear too, as that's wearing fast as well.

When you want to set the temperature of the extruder higher than default (which is 250grC), you have to add a line in the startGcode as this:

M4003 S290

- That will raise the max temperature in the firmware to 290 degrees for example. You can't use that with the standard PEEK hotend, as that's max. capable to withstand 260 degrees.
- We have an cutting mold available that will cut your PTFE tube at exact the right length, including the pointy part on top.

The stl of the cutting mold can be downloaded [here](#).

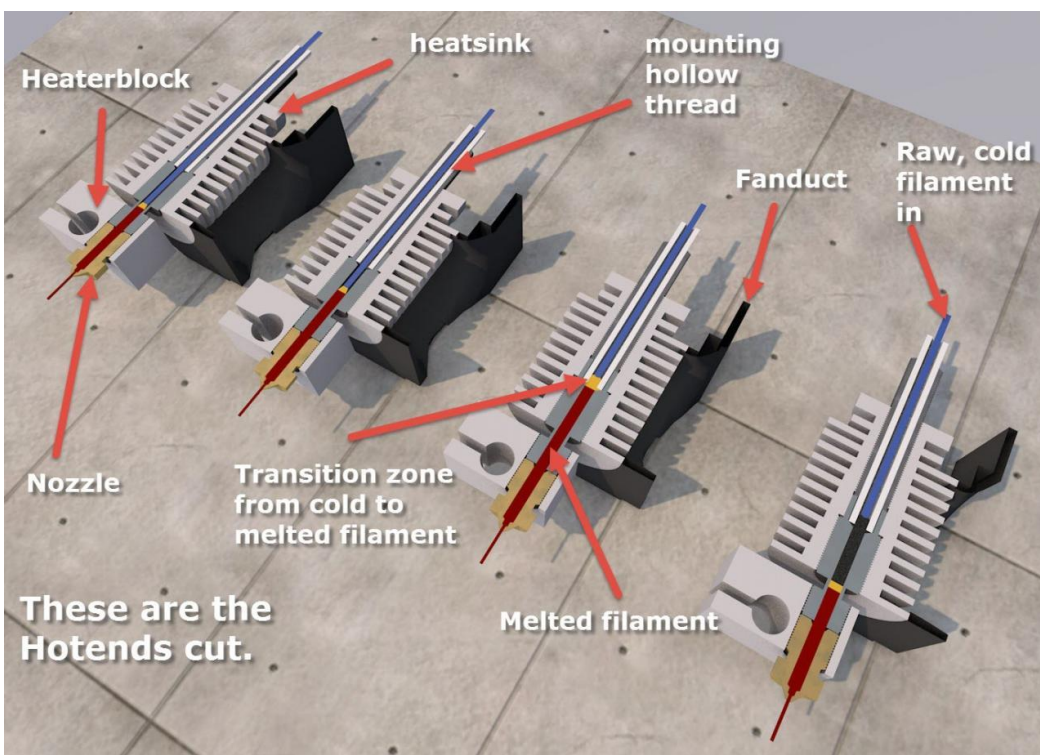
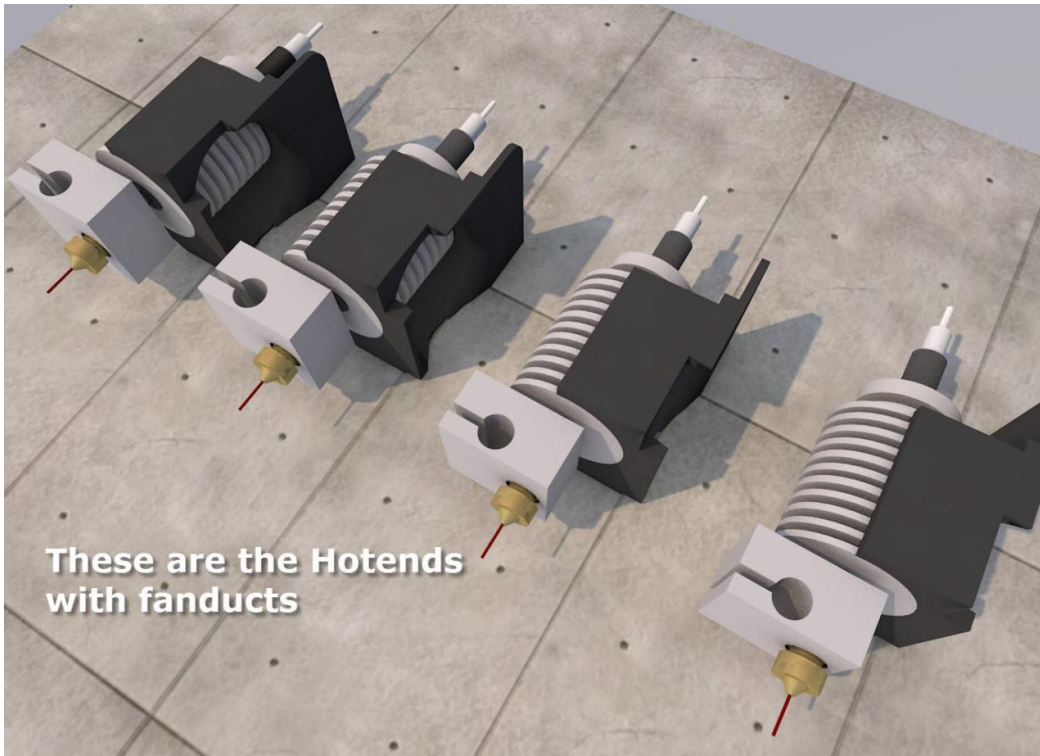


Advanced users

The temperature reading of the CraftBot is not accurate at high temperatures. Click [here](#) for the conversion table and how to make the reading accurate with a simple resistor soldered in series with the Thermistor.

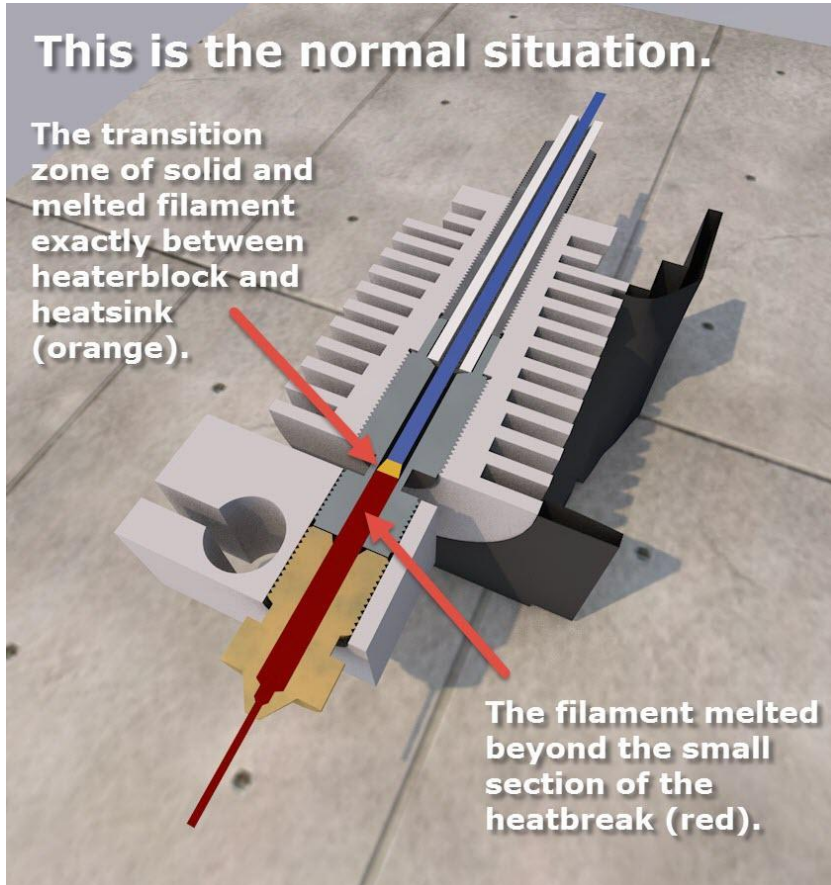
Some insights how the hotend works and what can cause clogging

Here some pictures to explain why and where clogging can occur when cooling is insufficient, or the extruder temperature is set to high. Clogging can also occur when PLA is sticking to the stainless steel heatbreak. For that you need to oil the filament a little with olive oil or so. See [here](#) for the post, and [here](#) for the model, to have a permanent oil solution as advised by Paul (3D Forms) and Franci. It's designed by CraftBot Guru Matthew.



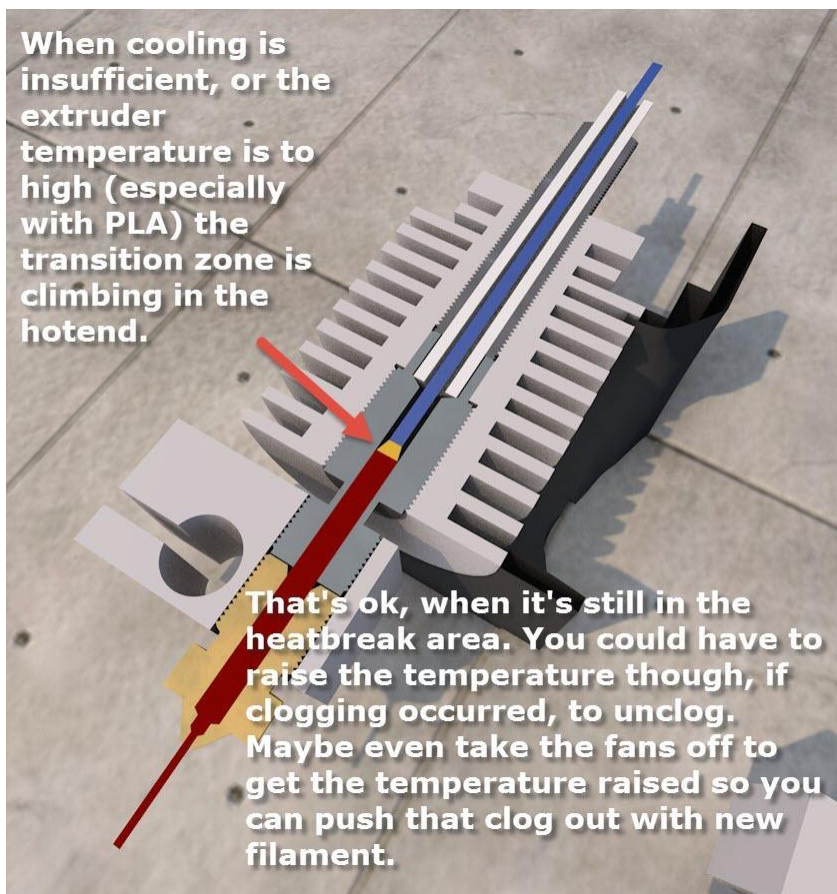
This is the normal situation.

The transition zone of solid and melted filament exactly between heaterblock and heatsink (orange).

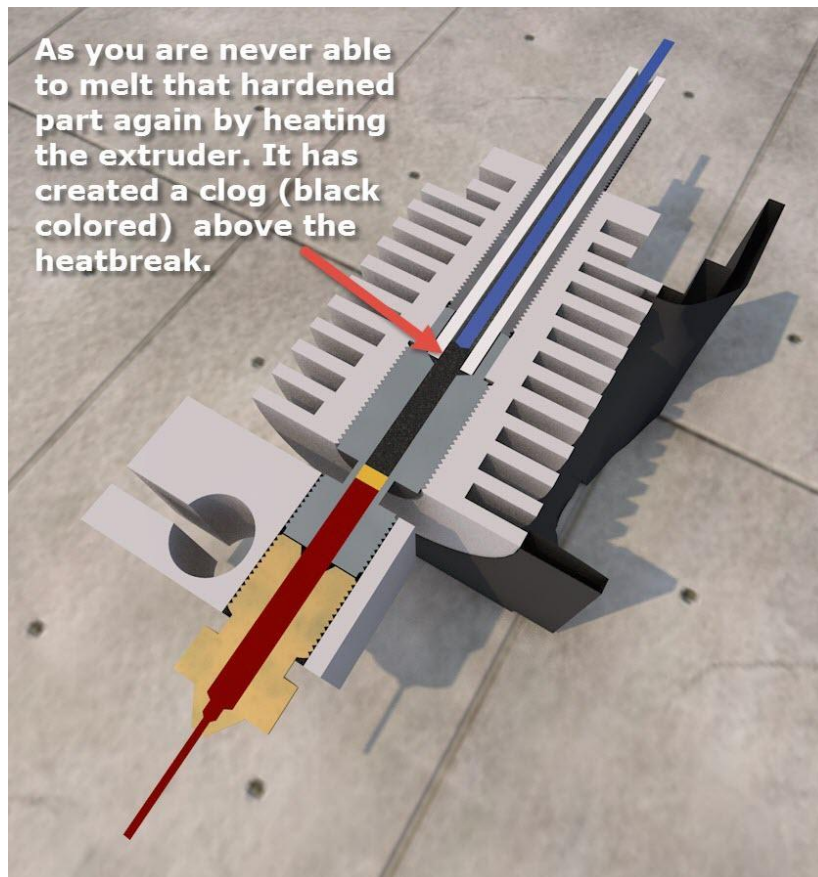
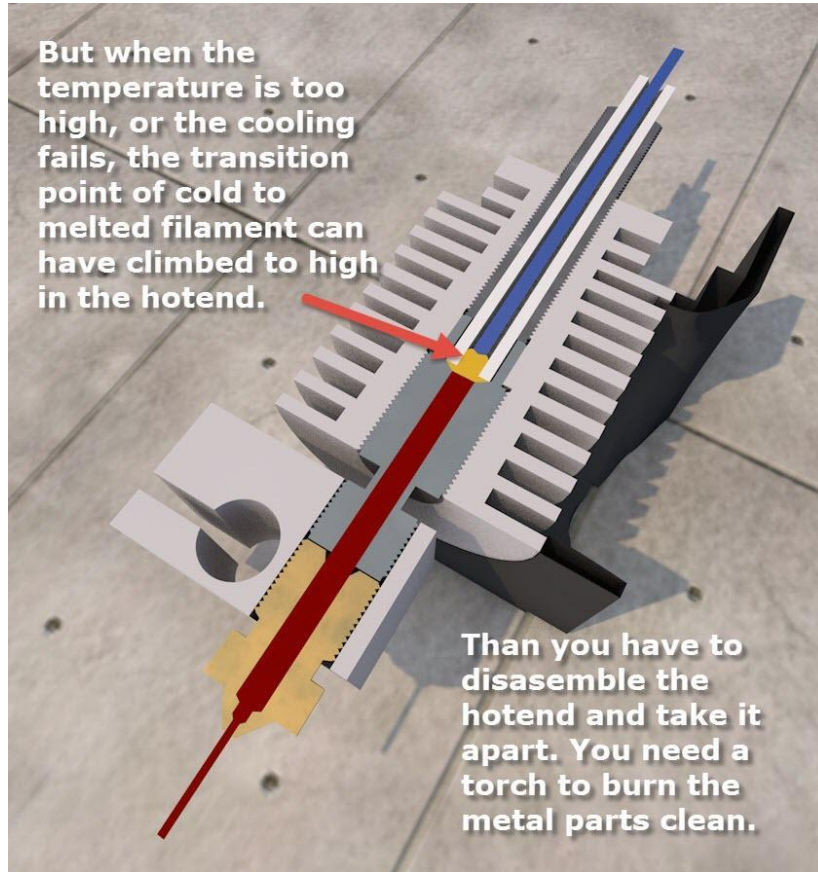


The filament melted beyond the small section of the heatbreak (red).

When cooling is insufficient, or the extruder temperature is too high (especially with PLA) the transition zone is climbing in the hotend.



That's ok, when it's still in the heatbreak area. You could have to raise the temperature though, if clogging occurred, to unclog. Maybe even take the fans off to get the temperature raised so you can push that clog out with new filament.

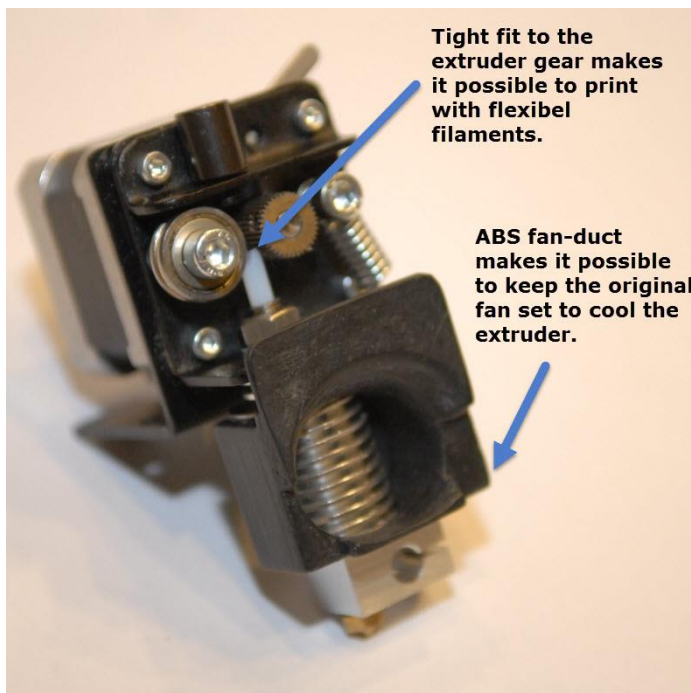
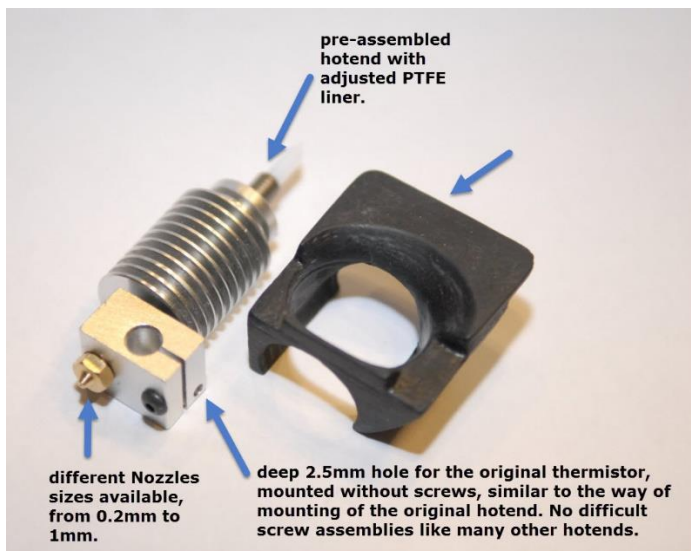


Clogging

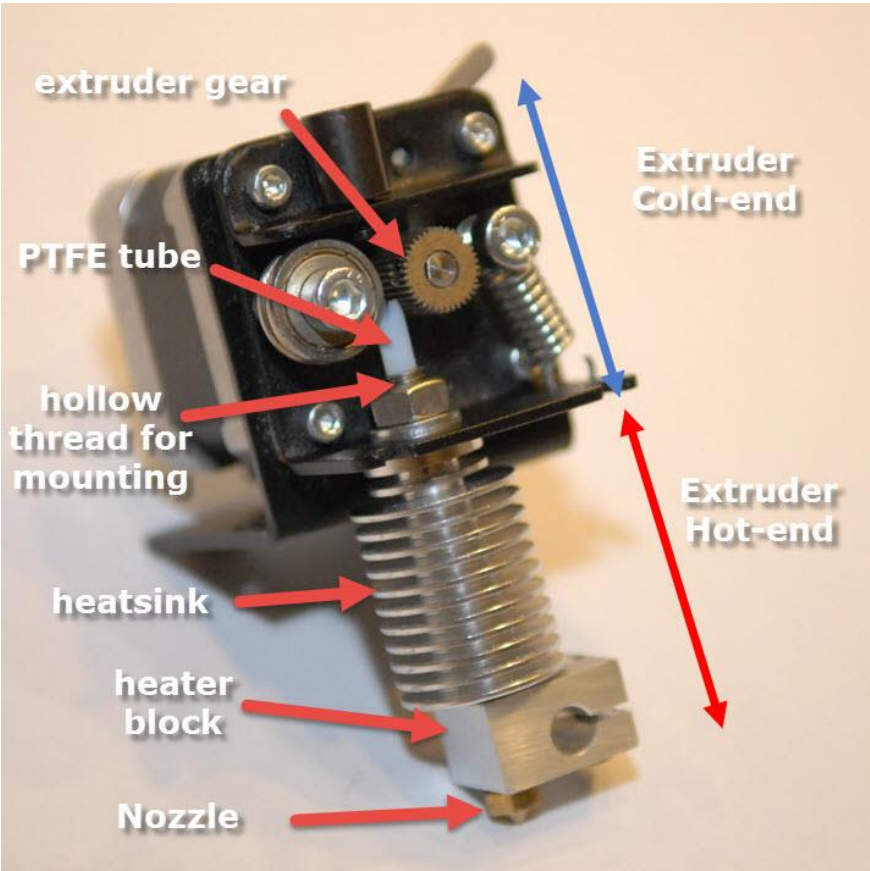
Advice Psanyi: With one (1) clog I had success by raising the temperature and blocking the fan with the smallest hexkey. After melting I've pushed the clog with a copper wire from above. Used a piece of 1.5 mm wire, it is pliable enough to be fed through the filament channel.

The fan can handle a little block, just stop it with your finger to the middle, then insert the hexkey to keep it stopped.

Features



Some terminology



What's in the box:

The complete drop in Hotend Upgrade with all extra's

- a fully assembled aluminium hotend
- an ABS printed fanduct
- nut and washer for assembly. A spare washer to adjust the distance to aluminium or glass bed.
- a spare 0.4mm Nozzle with drill to unclog
- three spare PTFE liners to adjust to your needs.
- a PTFE cutting mold with cutting blade is added
- two small bags of thermal grease are added (knead it before use)
- a PLA Oil / dust device
- a 0.3mm Metal calibration card with magnet is added.



The budget Hotend Upgrade:

It's the same but without the extra's:

- a fully assembled aluminum hotend with 0.4mm Nozzle assembled
- an ABS printed fanduct



Shipping, TAX and customs

Shipping costs are included in the price of the hotend upgrade. When you want the shipment to be register or insured, email us, so we can give an estimate for the additional costs.

Within the EU, the price of the Hotend is Dutch VAT included. At the moment it's 21%. For shipments outside the EU the price is excluding TAX. We provide an CN22 document on the back of the envelop with weight, price and description of the hotend. It's possible you have to pay an additional fee for customs and Tax for the hotend before or when receiving the shipment. We are not responsible for any problems with customs.

Registered mail

We offer the option of registered mail. It's more expensive of course. When not having chosen this option, the delivering is at your risk. When claims are limited, we are nice though, and sent you a second one without costs. For the second shipment you have to pay for registered mail anyway as we don't want to have the problem twice.

Warranty / Returns: if you simply don't like this hotend upgrade or it's not working as expected, you can return it within 3 months and get a full refund. We understand the hotend is used, has some minor scratches and filament in the Nozzle and Heatbreak.

Reasonable behavior

When the hotend is damaged beyond what's to be expected as 'normal use' or is damaged because of overtighten the threads, it can void the warranty completely or partially, to be determined by CraftBot.nl after receiving the hotend. How it will be handled by us –and us alone- depends if you are communicating in a reasonable way. When you do, we do too.

When returning: you have to pay yourself for the return shipping costs (which should be a couple of dollars/ euro's). Return address at the end of this document.

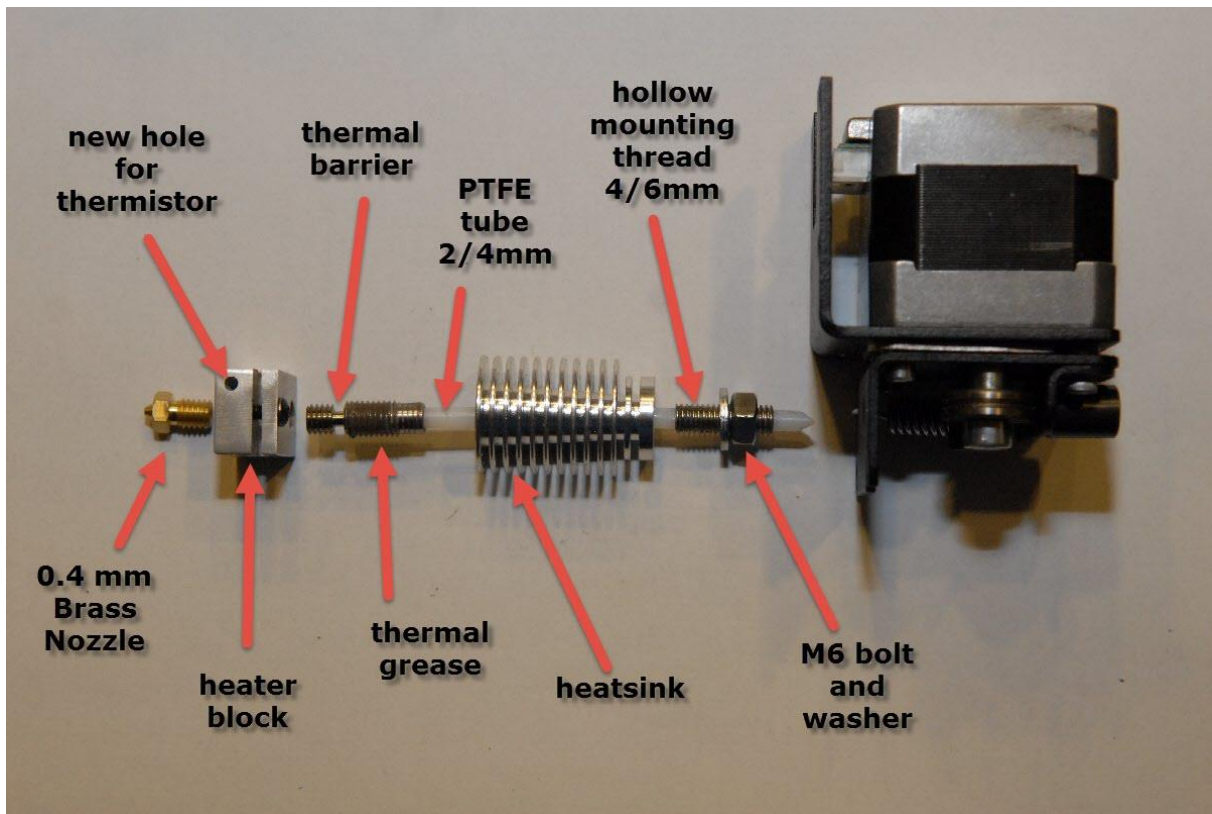
General remarks and warnings

1. The fan duct is absolutely necessary: without it, the cooling of the standard extruder fan is too less and is resulting in clogging.
2. The hollow threaded rod with which the hotend is mounted is 6mm at the outside and 4mm at the inside, so leaving a 1mm thick wall. When assembling just use enough force that it's fixated. When using too much force, the hollow threaded rod is likely to break.
3. The thermistor (the small thingy which is measuring the temperature) is now mounted at the right site of the heater block (in stead of the back side) . It's like the original one mounted: just push it in as far it's possible. When (dis)assembling the new hotend, you have to loosen the cable fastener under the extruder. Be sure when assembling again you have ordered the cables neatly. The thermistor cable is now on the right in stead of the left side. Make sure the cable can't move when mounted the cable fastener again. When the temperature measurements are changing a lot when printing, or there's a red error on the LCD, displaying a temperature error, you have to re-fit the temp-sensor cable in the hole of the heater and/or be sure that the cable is fitting tight by the cable fastener.
4. The heater (the steel thing with red cables to it) is mounted at the same way: just be sure it's that fastened (by fastening the little screw at the bottom) just so, it can't move anymore.
5. The heatbreak is mounted with thermal grease. When you have to assemble it again, you have to apply thermal grease again for a proper function.
6. The hotend is shipped with two 0.4mm brass Nozzles. When you use abrasive filaments like carbon or metal filled filaments it's advised to use Stainless steel Nozzles. For wood or Carbon filled filaments it's advised to choose a Nozzle with a larger opening, like 0.5 or 0.6mm, to avoid clogging in the Nozzle.
7. Abrasive filaments will also wear the filament gear. So check it if there's still enough grip on the filament, when not, replace the filament gear.

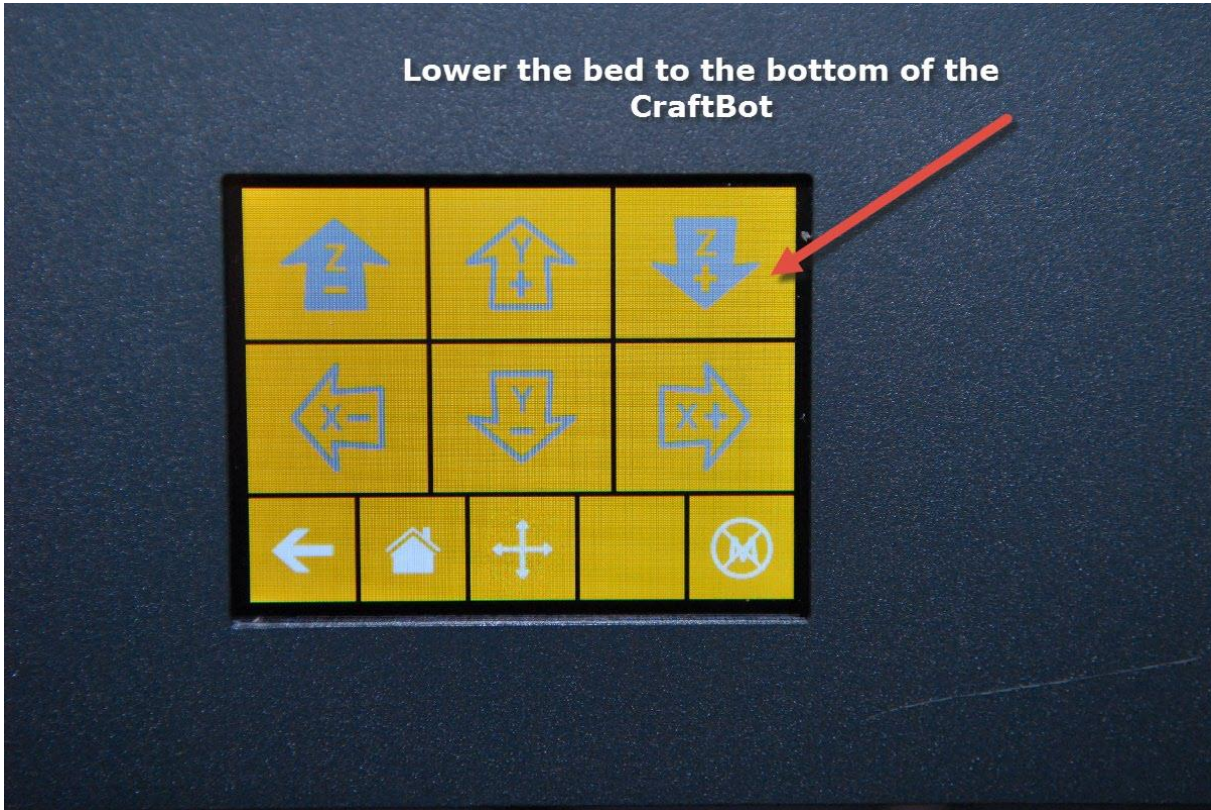
LEGAL DISCLAIMER

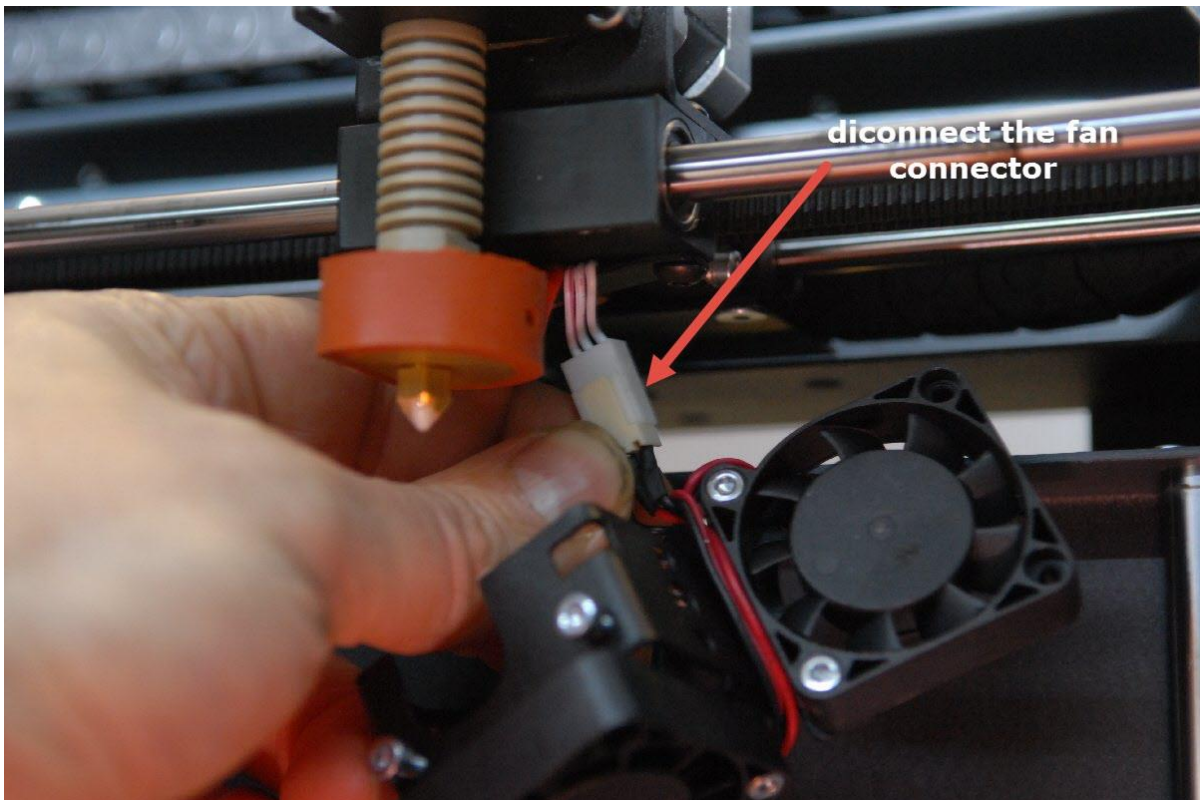
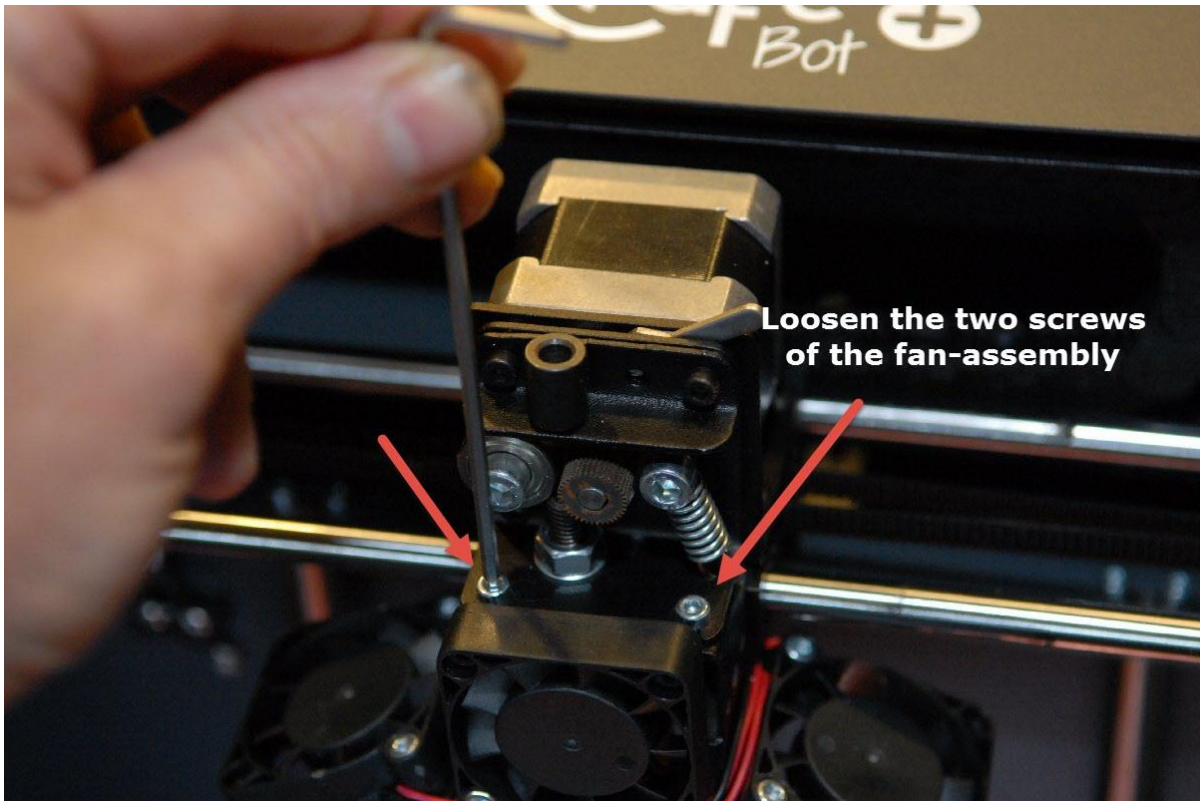
THE PRODUCTS SOLD ON THIS WEBSITE SHOULD ONLY BE USED BY EXPERIENCED INDIVIDUALS, OR UNDER THE DIRECT SUPERVISION OF EXPERTS. NO WARRANTY OF THEIR SUITABILITY FOR ANY PURPOSE WHATSOEVER IS MADE OR OFFERED BY US. YOUR USE OF THE PRODUCTS SOLD ON THIS WEBSITE IS ENTIRELY AT YOUR OWN RISK. YOUR PURCHASE OR USE OF ANY PRODUCT HEREFROM SHALL SERVE AS YOUR EXPLICIT ACKNOWLEDGEMENT THAT YOU UNDERSTAND AND CONSENT TO THE FACT THAT WE HEREBY DISCLAIM ANY RESPONSIBILITY OR LIABILITY FOR, ANY HARM, LOSS (ECONOMIC OR OTHERWISE), INJURY OR DEATH RESULTING FROM THE ASSEMBLY OR OPERATION OF OUR PRODUCTS, EITHER AS INSTRUCTED OR OTHERWISE, AND AFFIRM THAT UNDER NO CIRCUMSTANCES SHALL YOU BE ENTITLED TO ANY DAMAGES OF ANY SORT WHATSOEVER RELATED TO YOUR USE OR MISUSE OF OUR PRODUCTS.

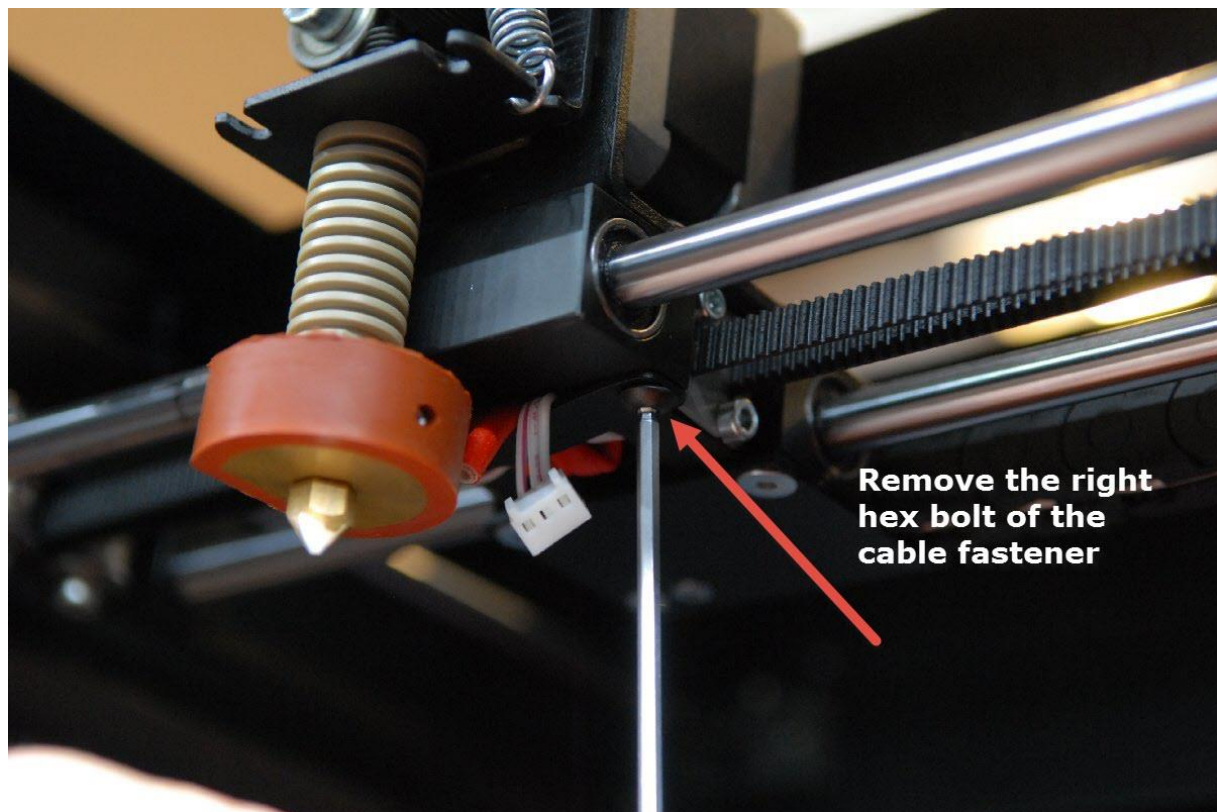
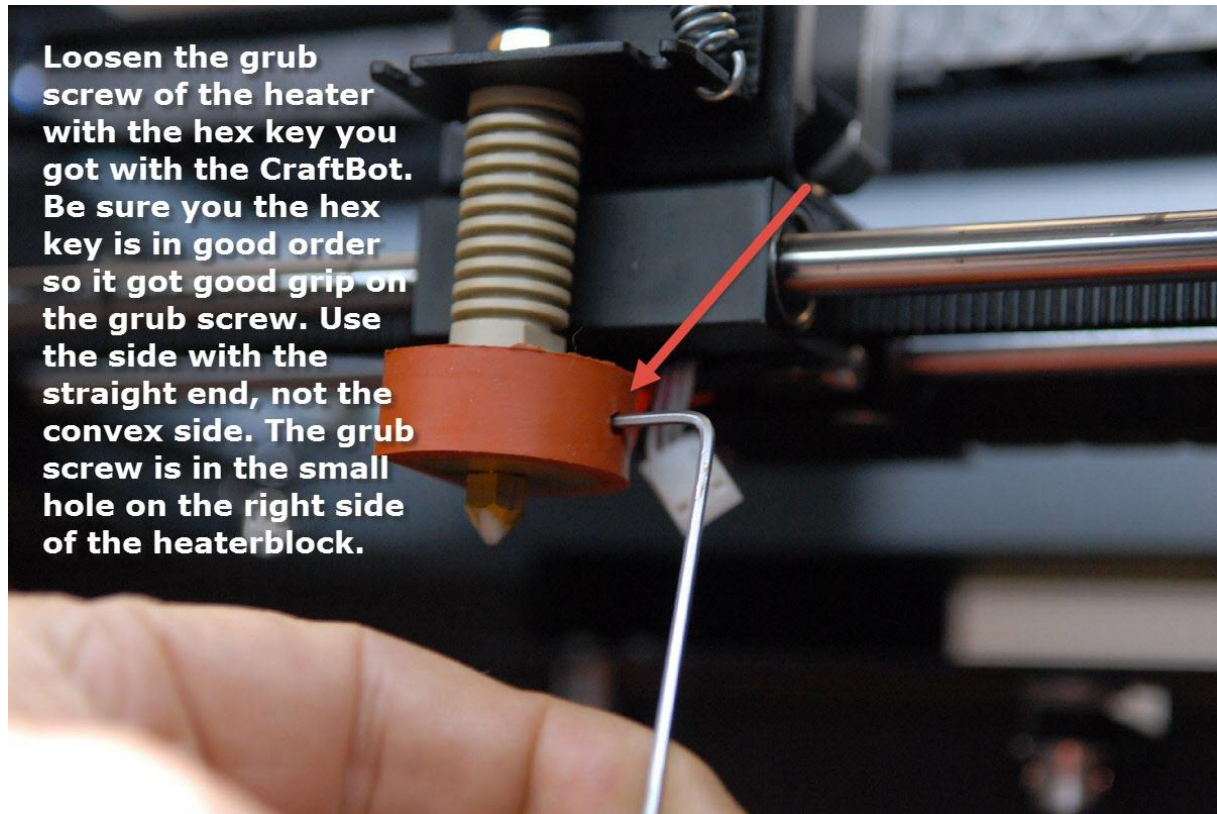
Parts

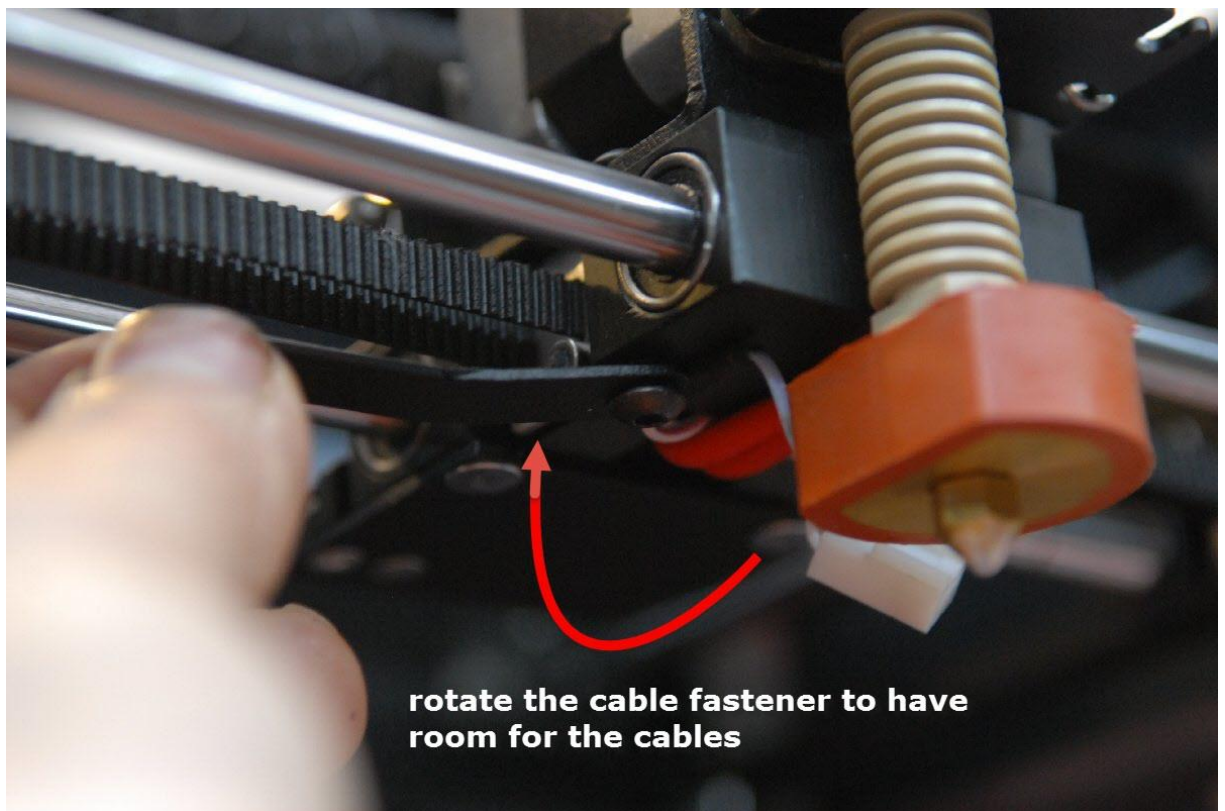
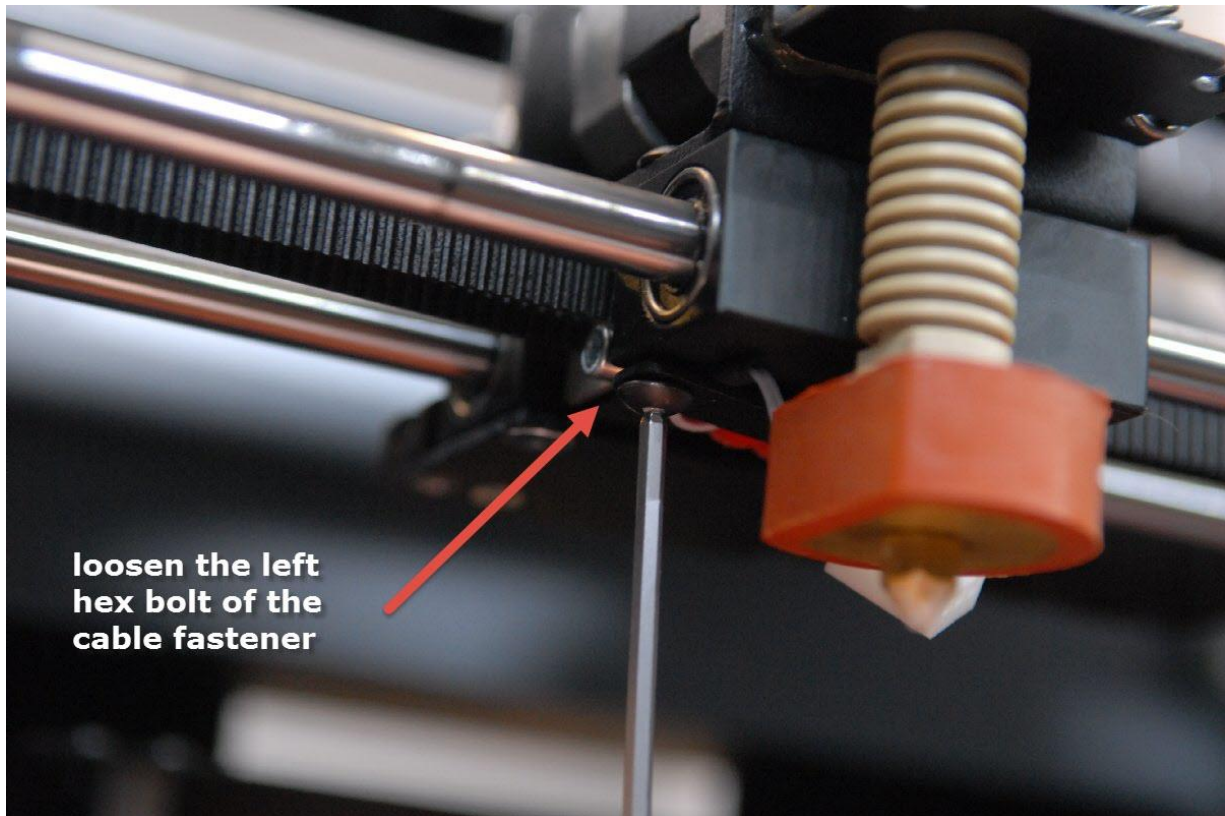


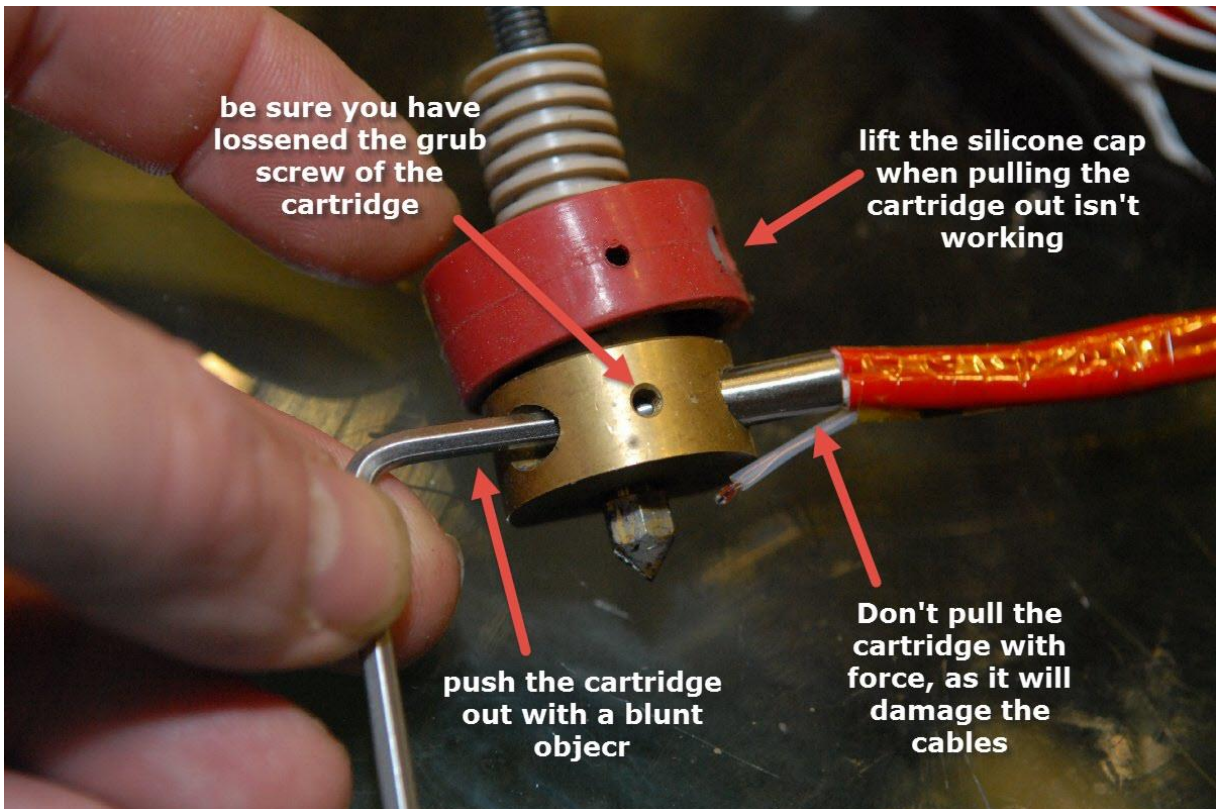
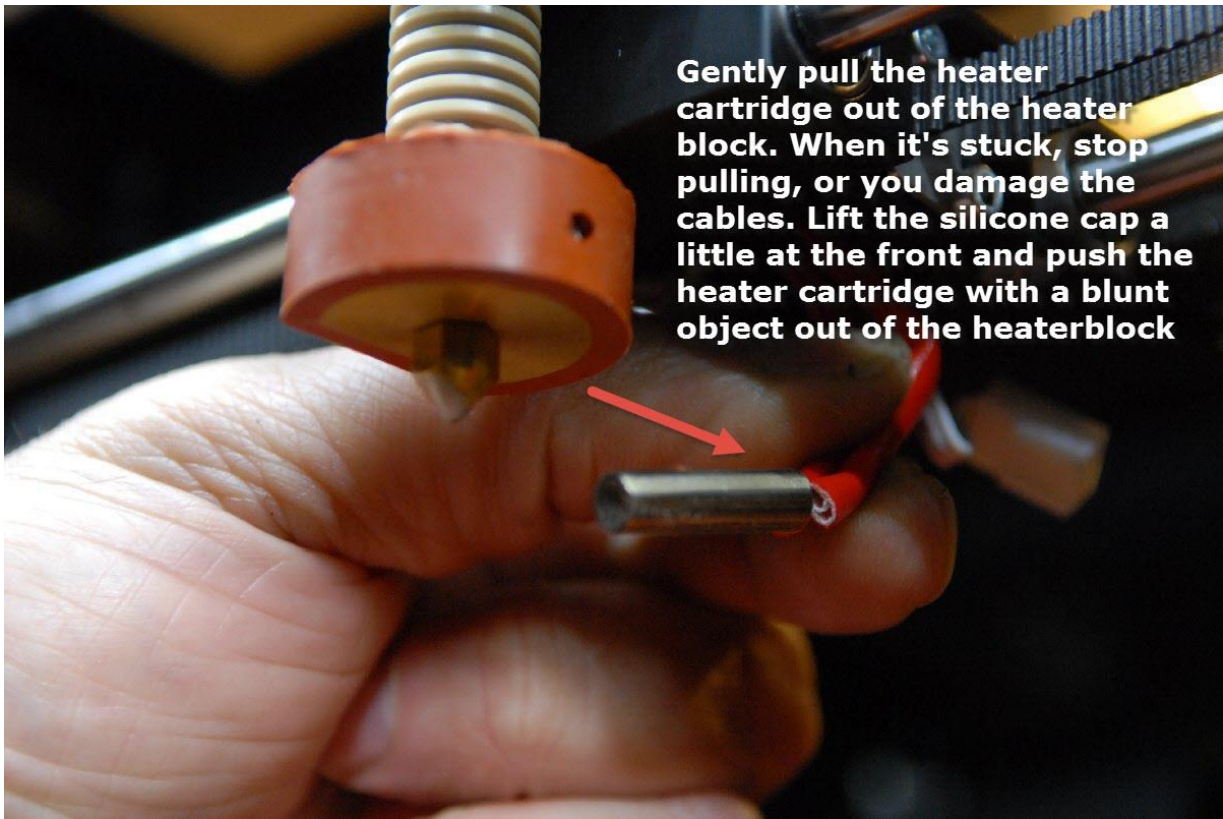
Step by step guide

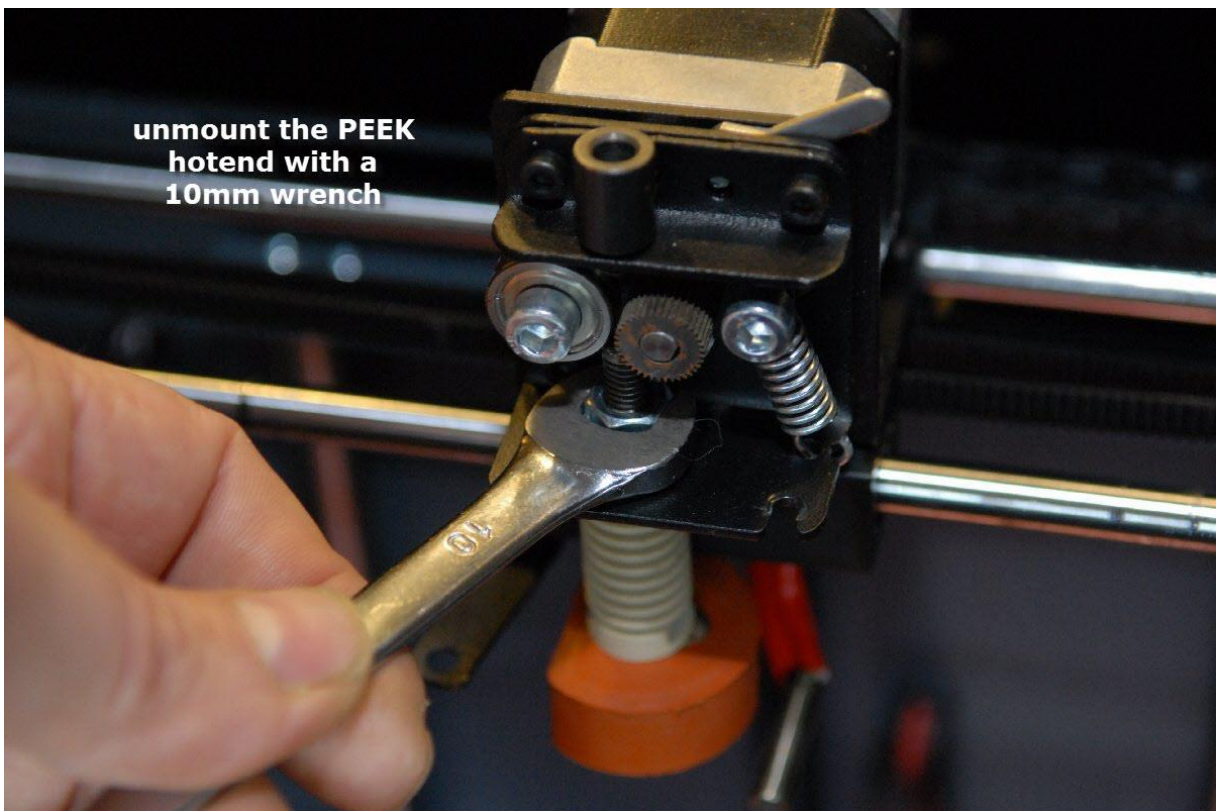
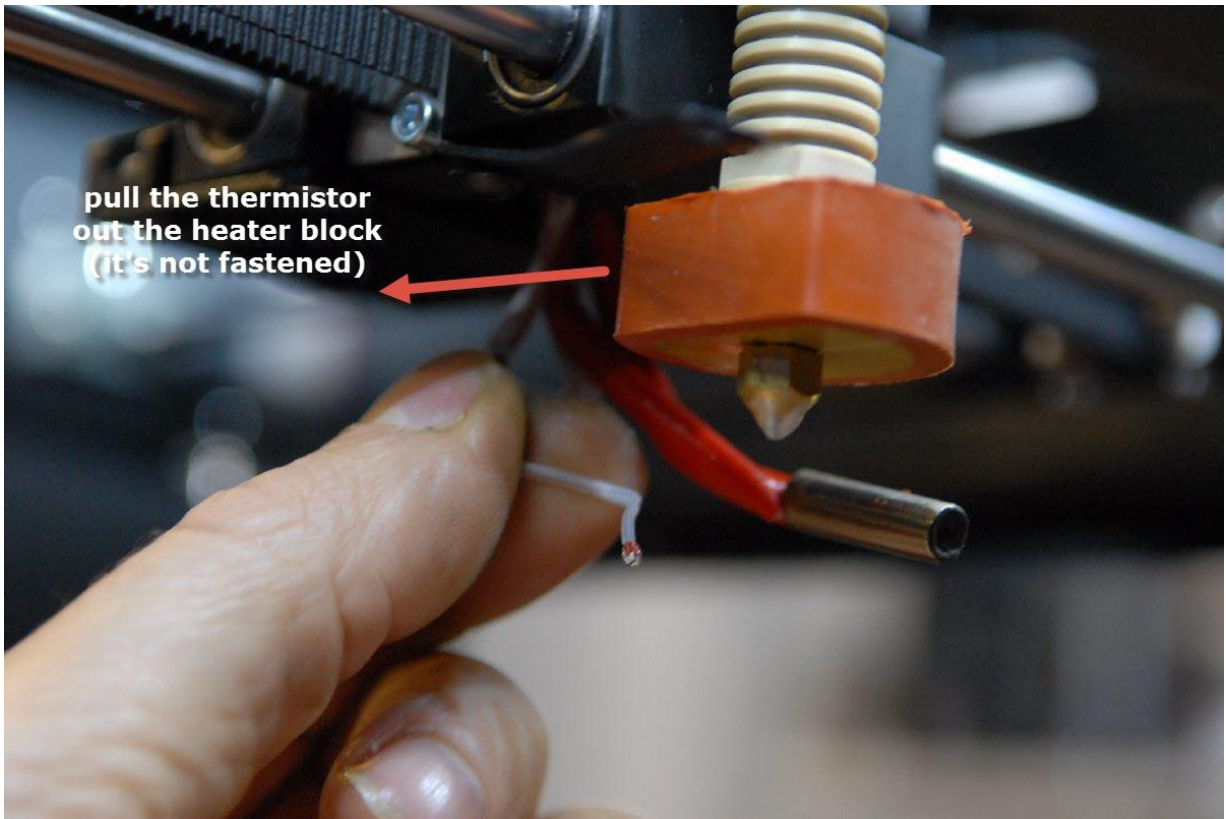


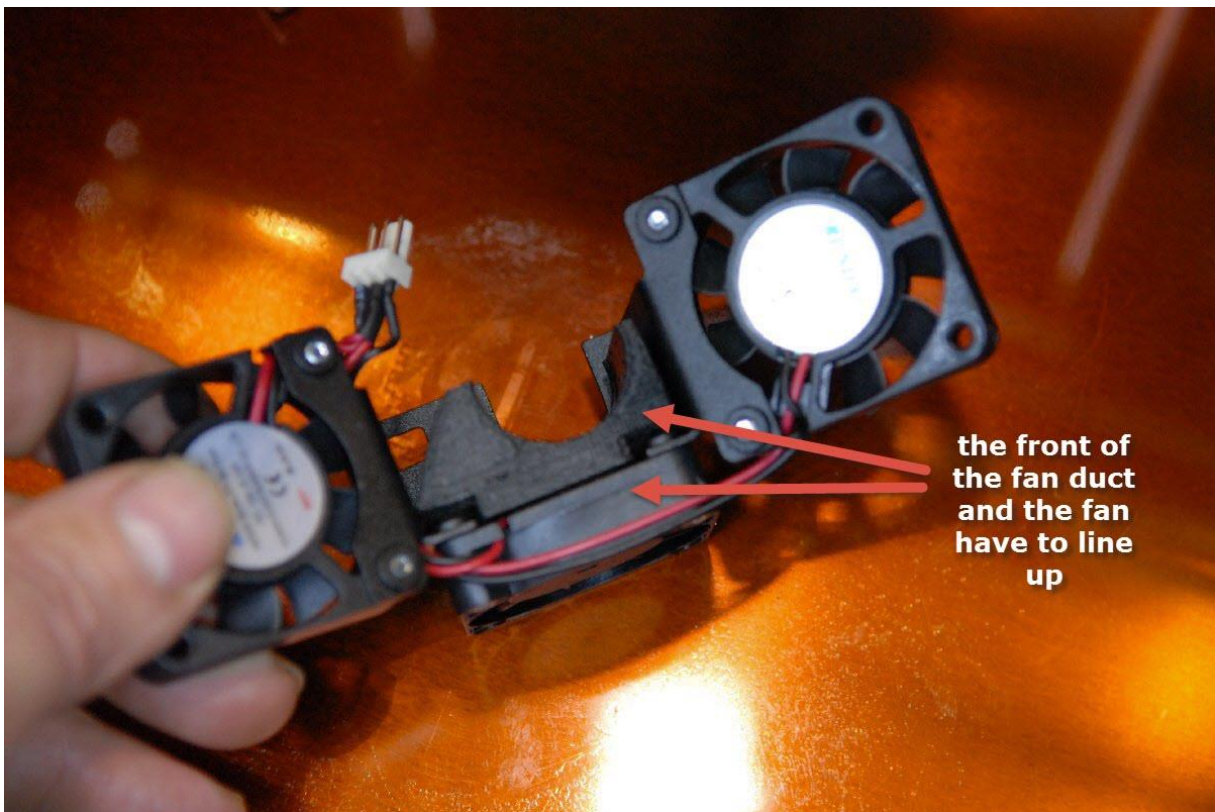
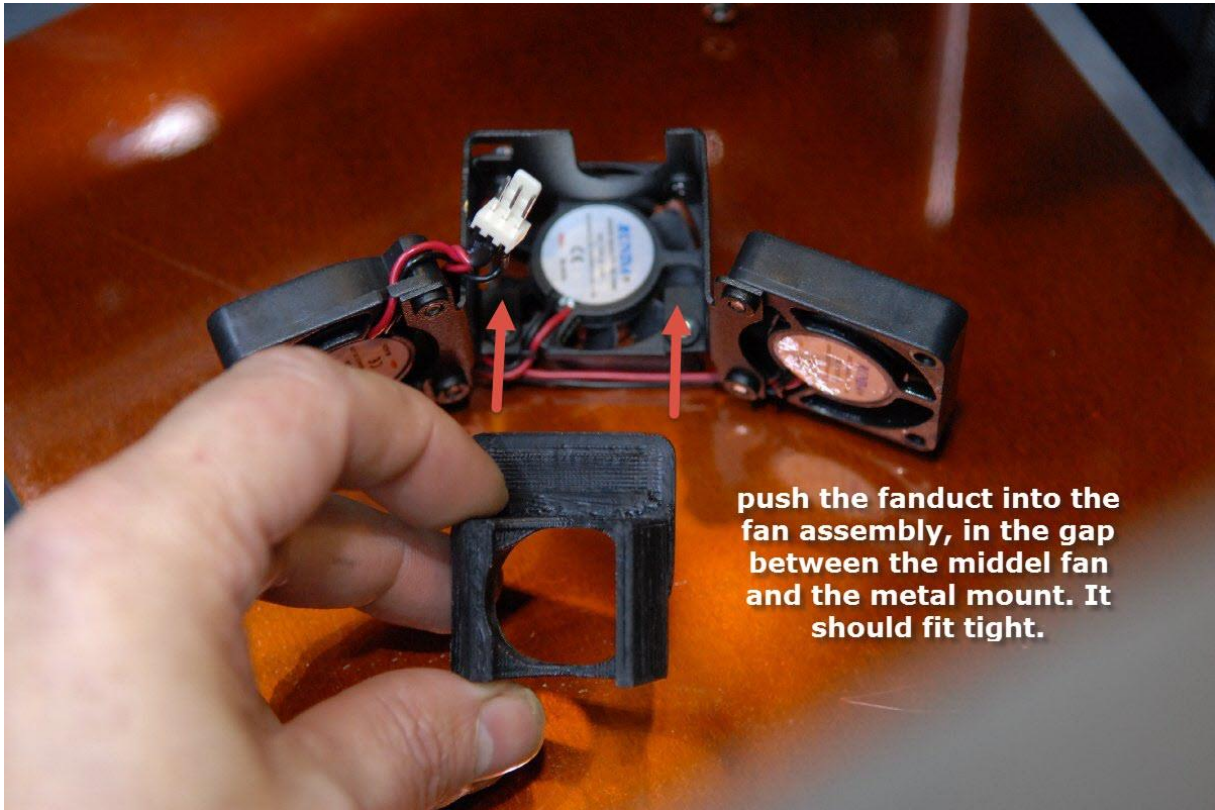


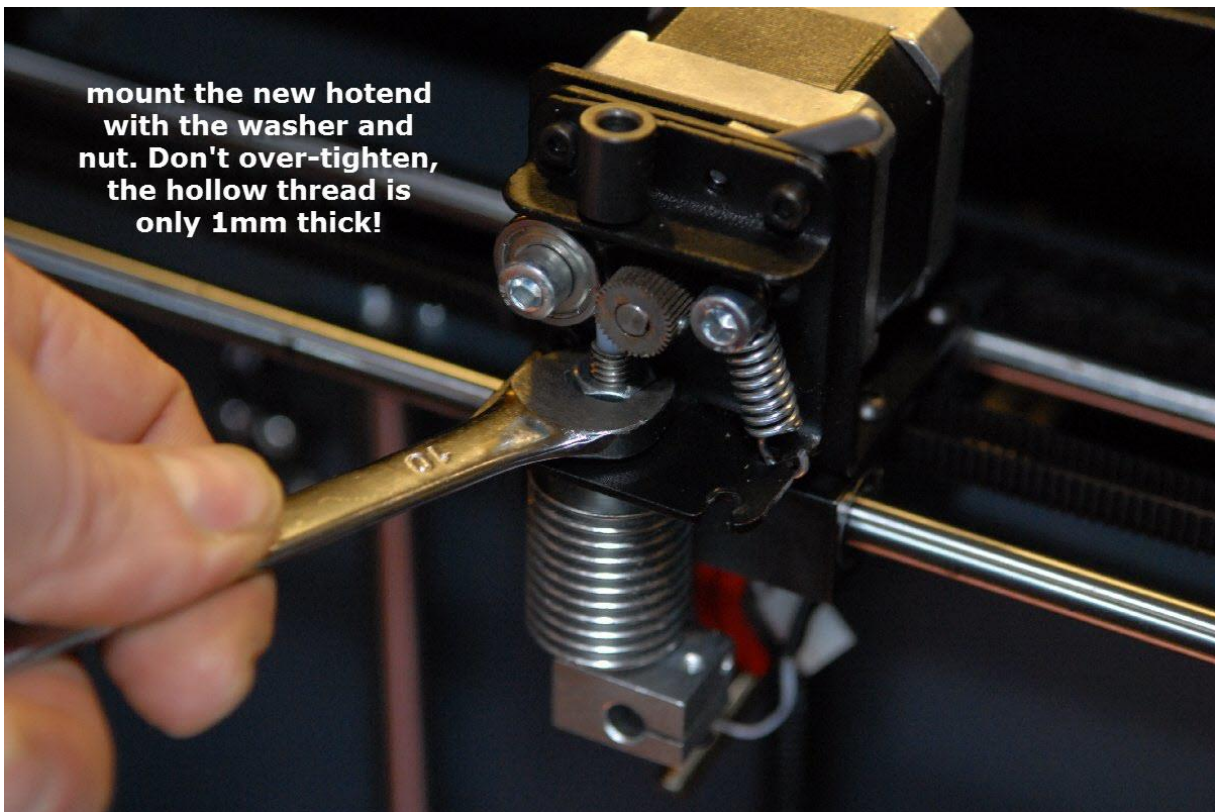


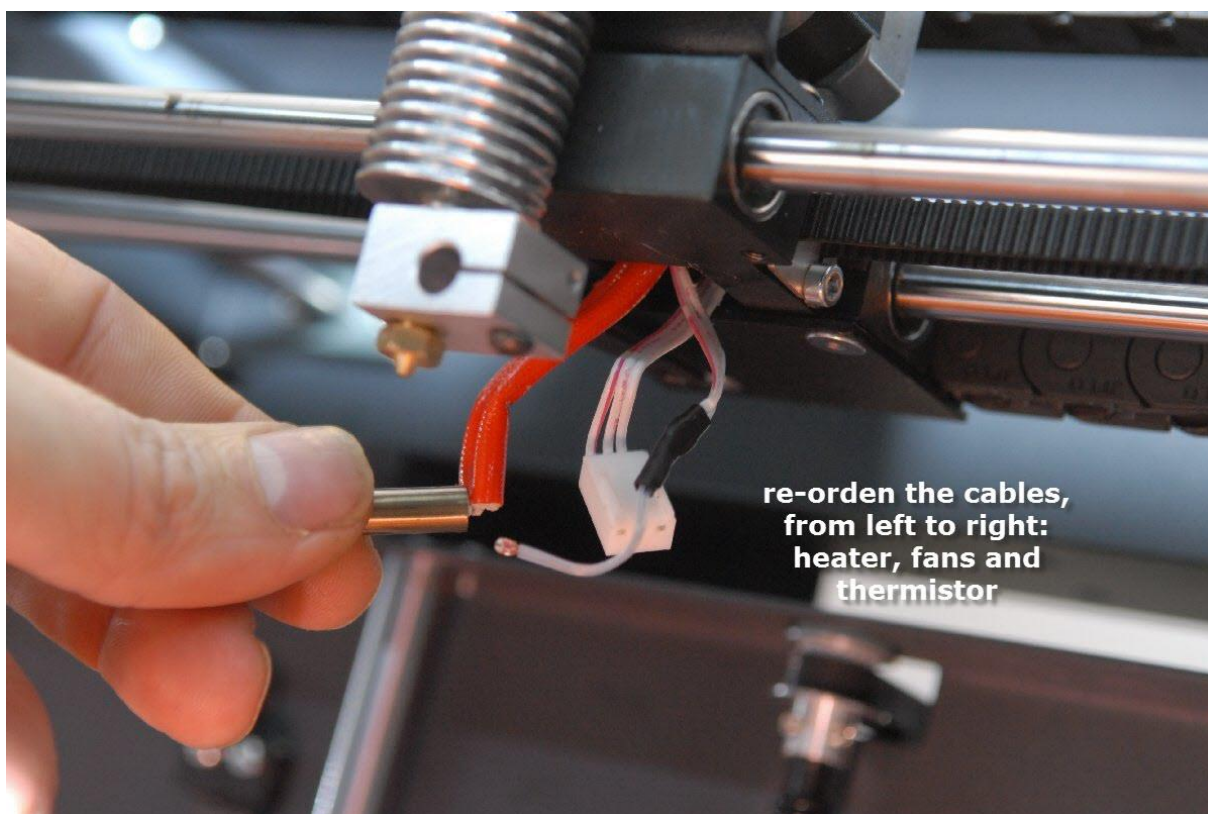
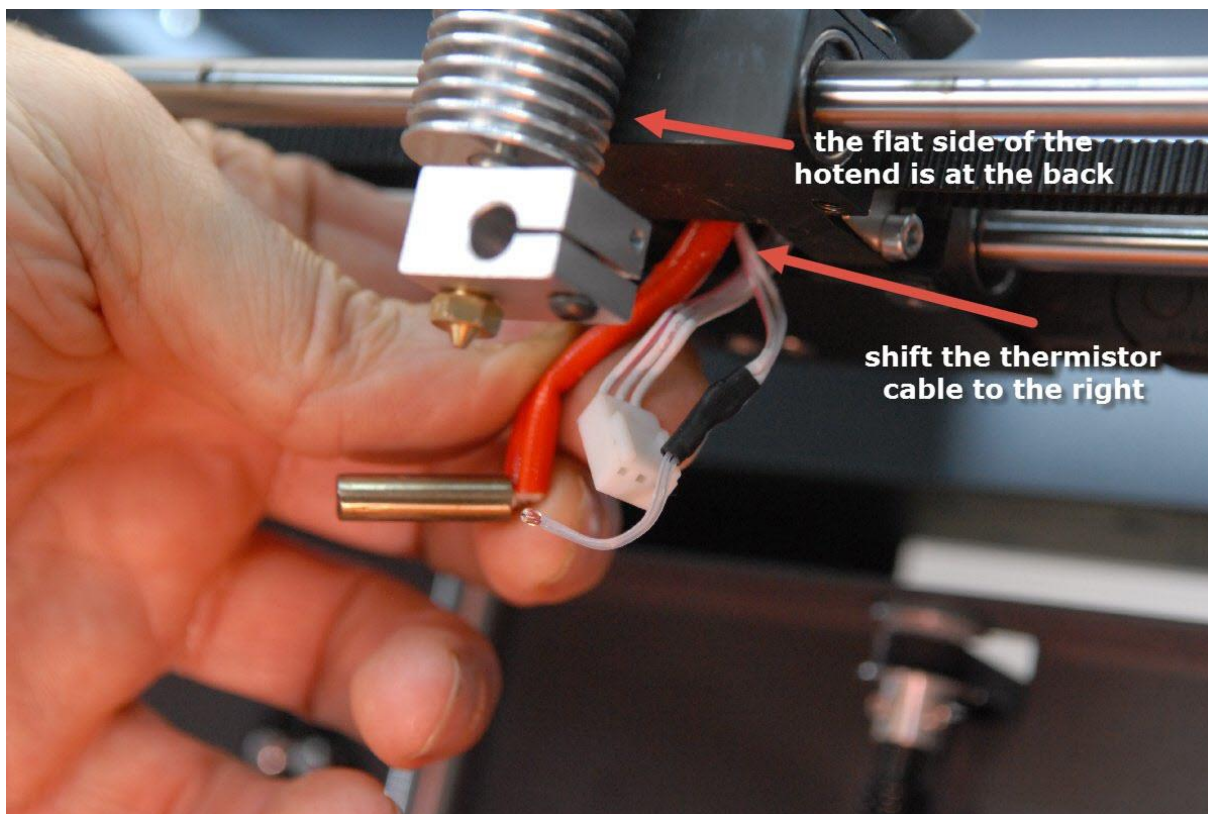


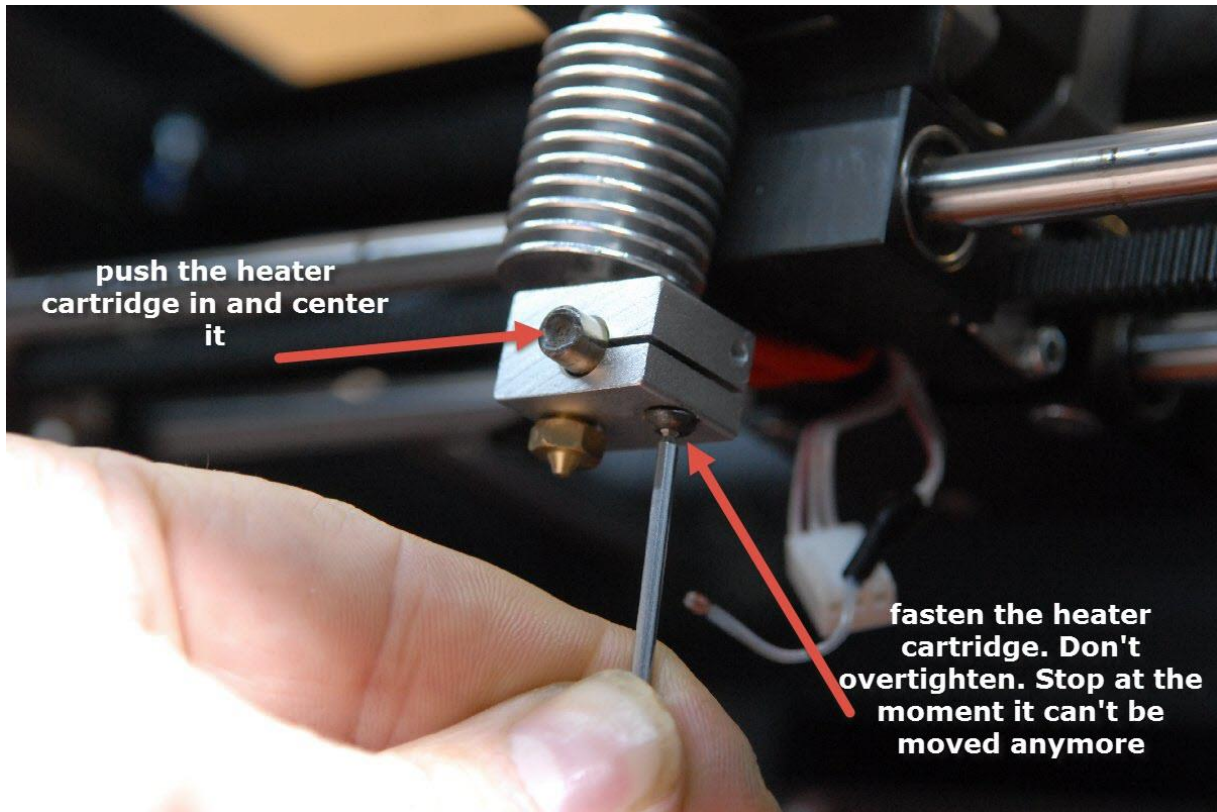




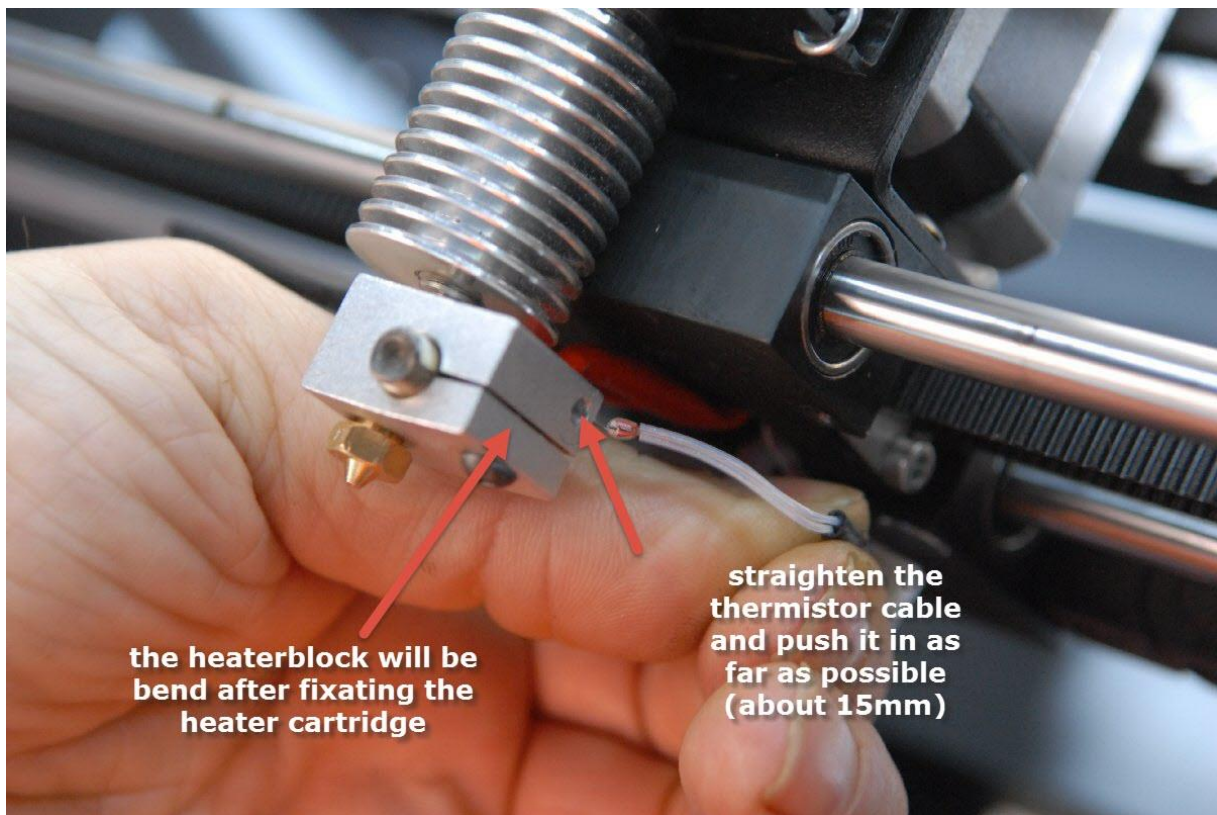




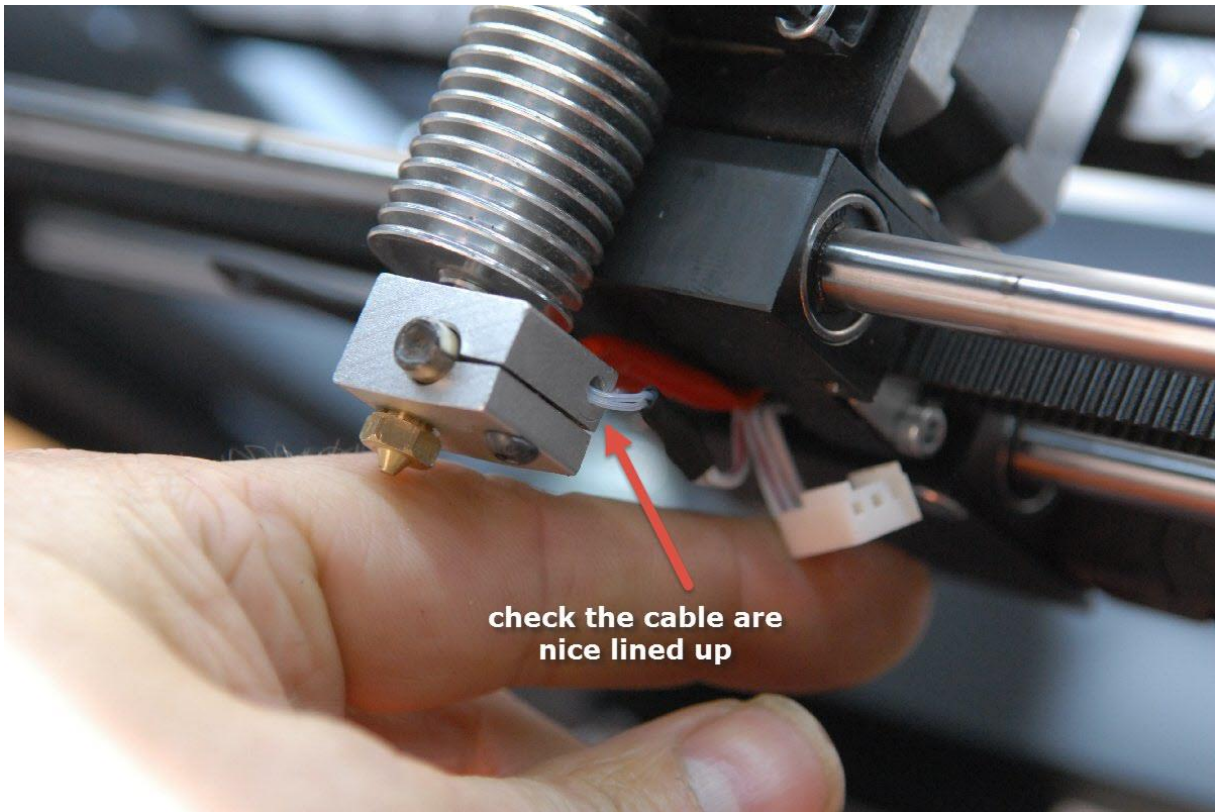




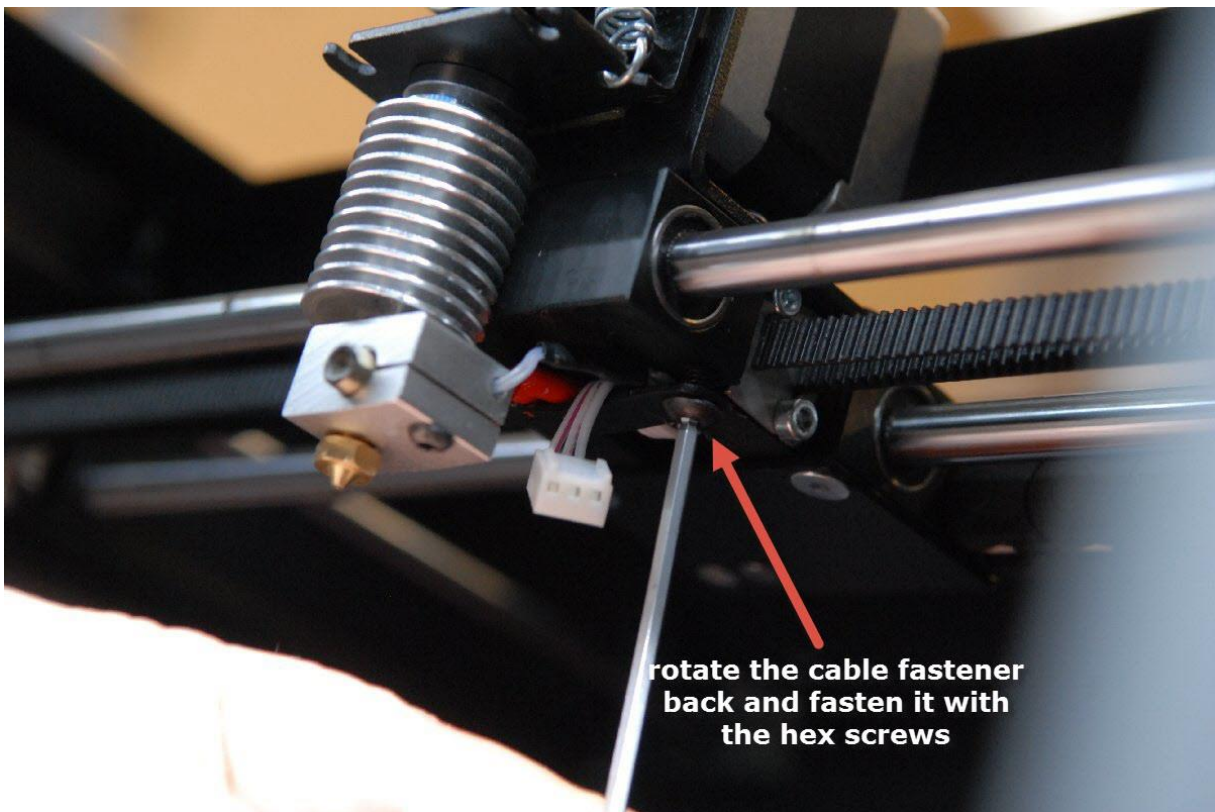
Your hotend can have a Phillips screw instead!



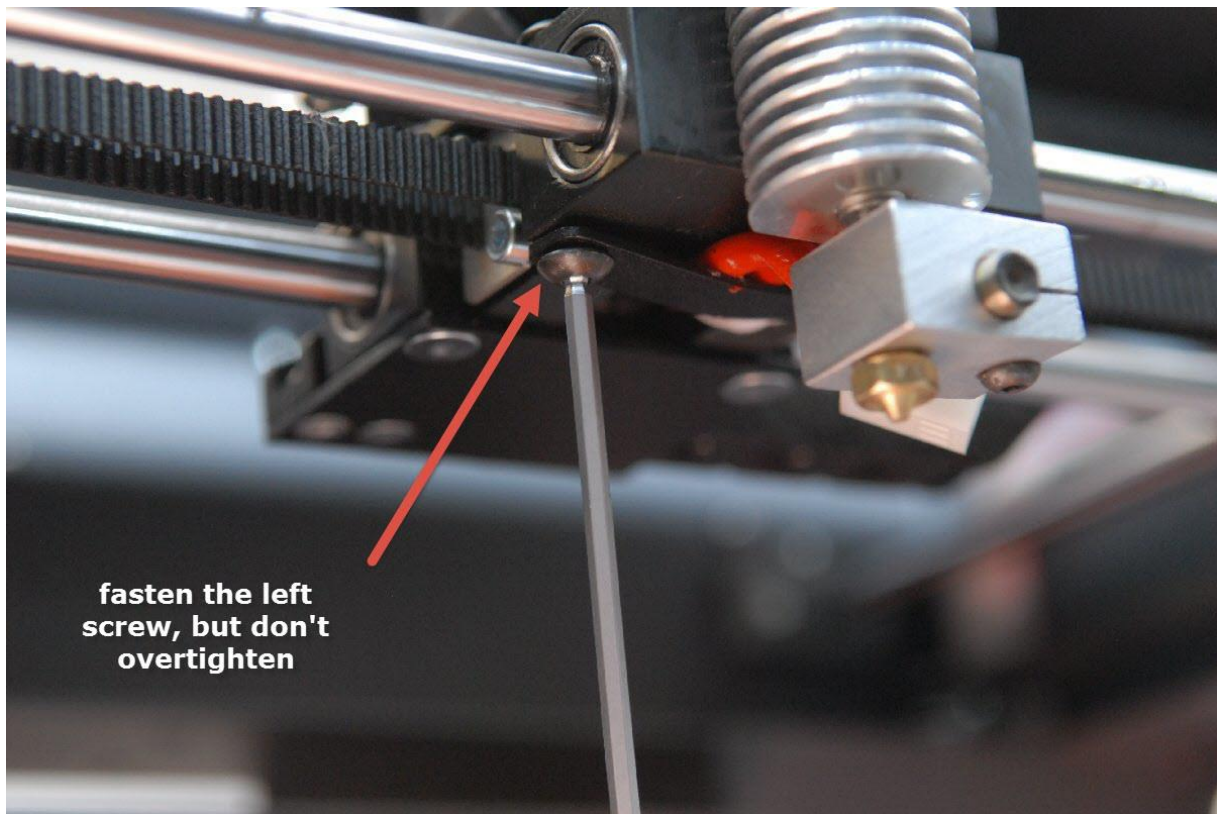
Be sure to use the hole on the right side for the thermistor, NOT the original E3D shallow hole on the backside!



check the cable are
nice lined up



rotate the cable fastener
back and fasten it with
the hex screws

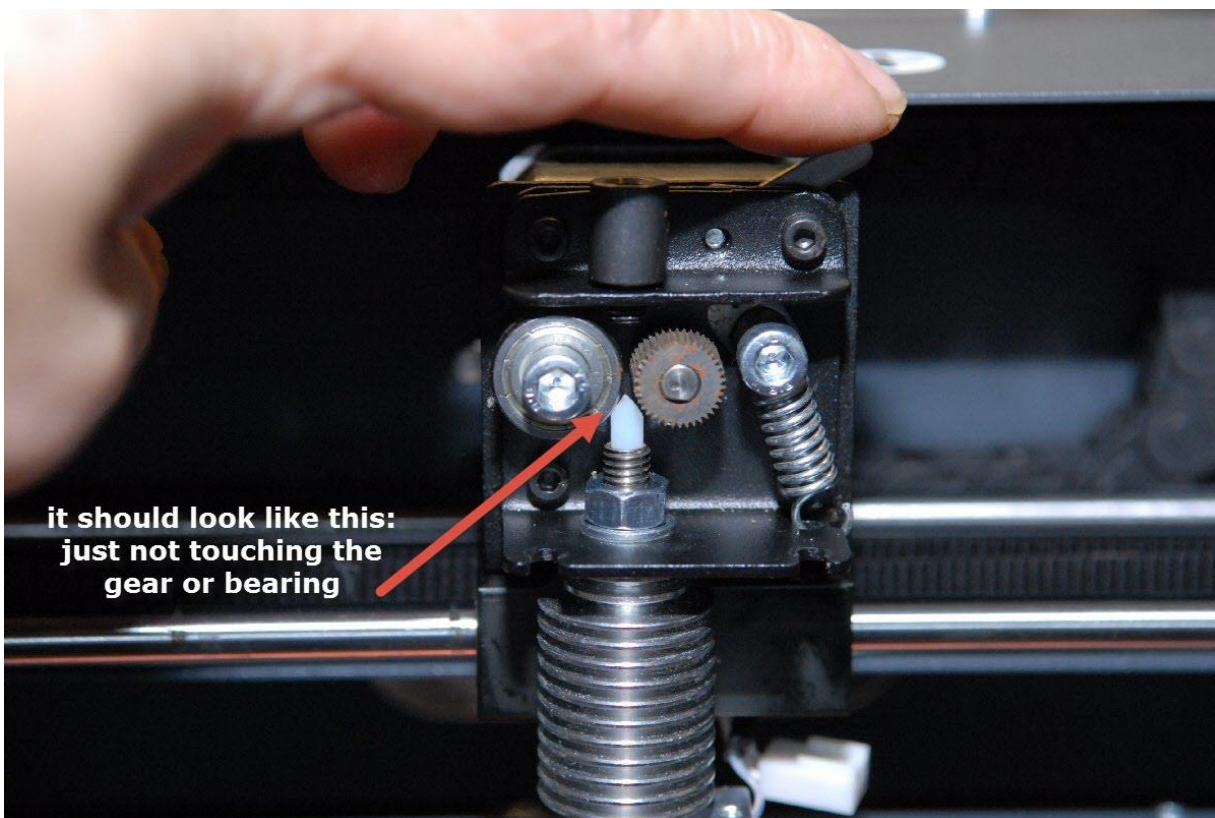
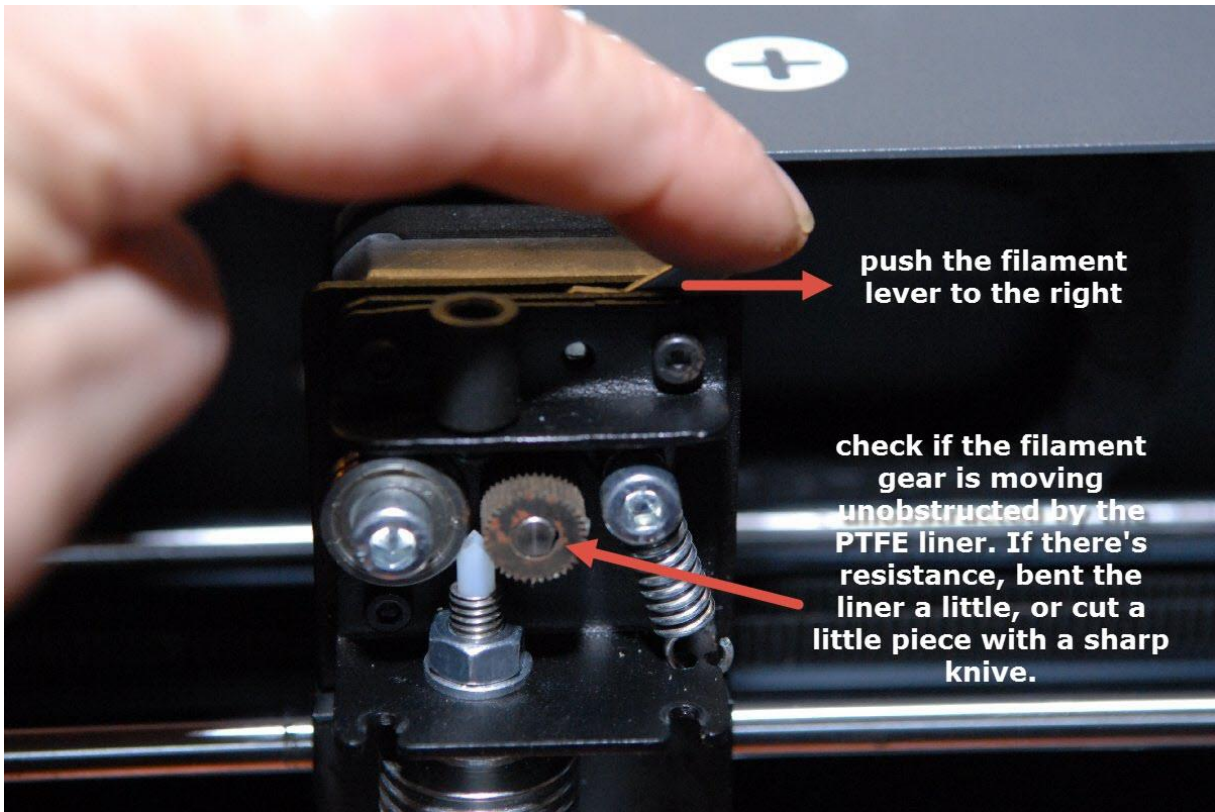


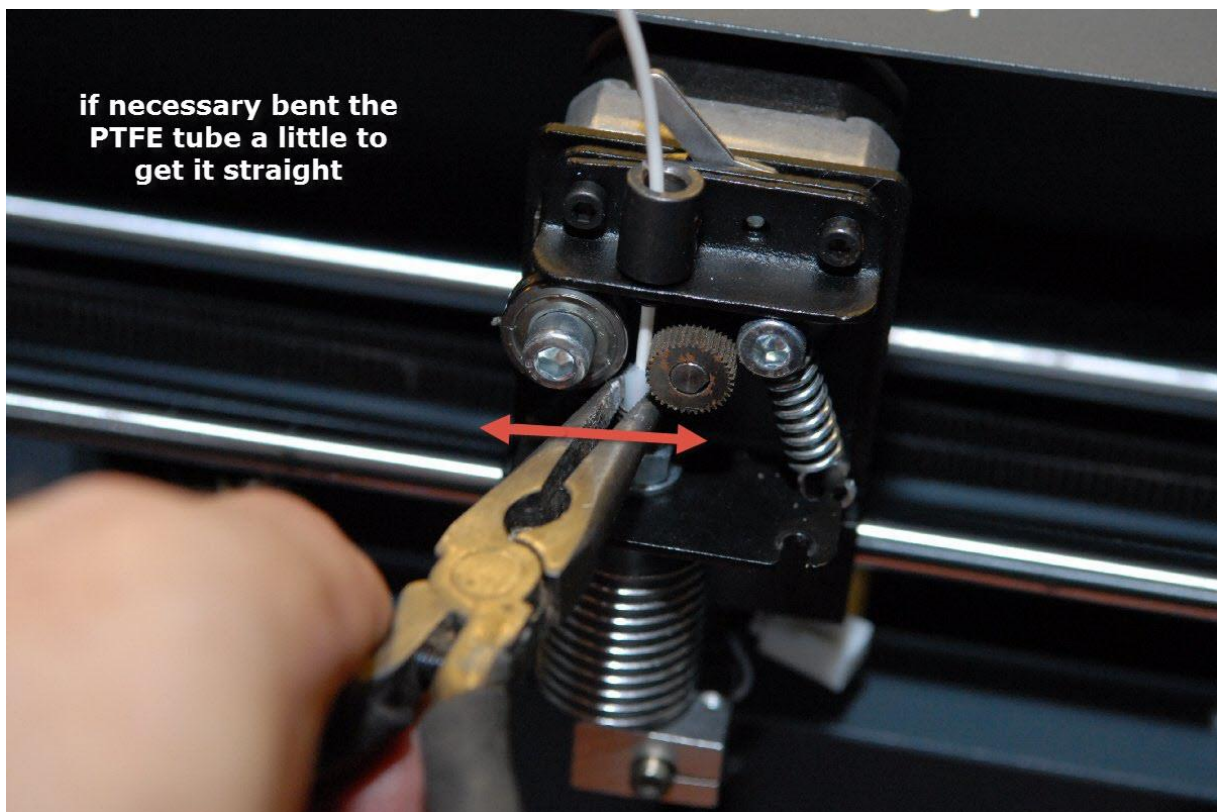
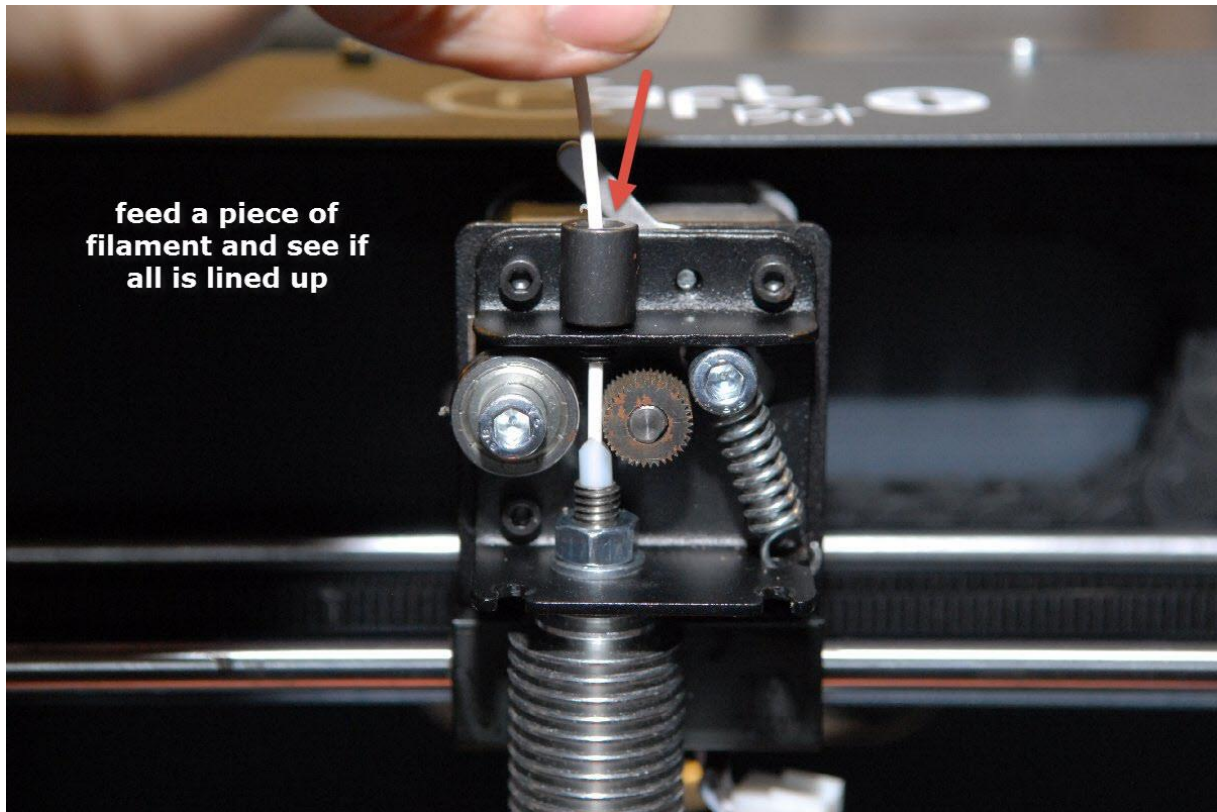
fasten the left
screw, but don't
overtighten

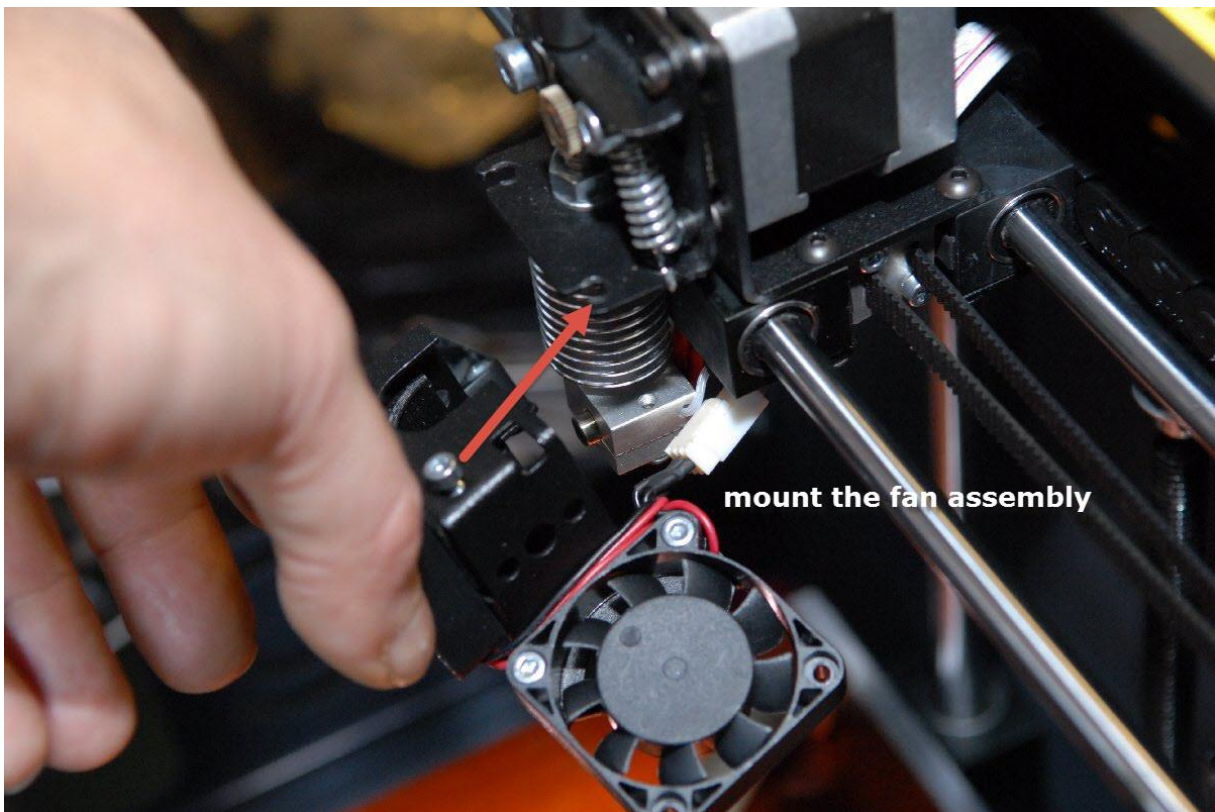
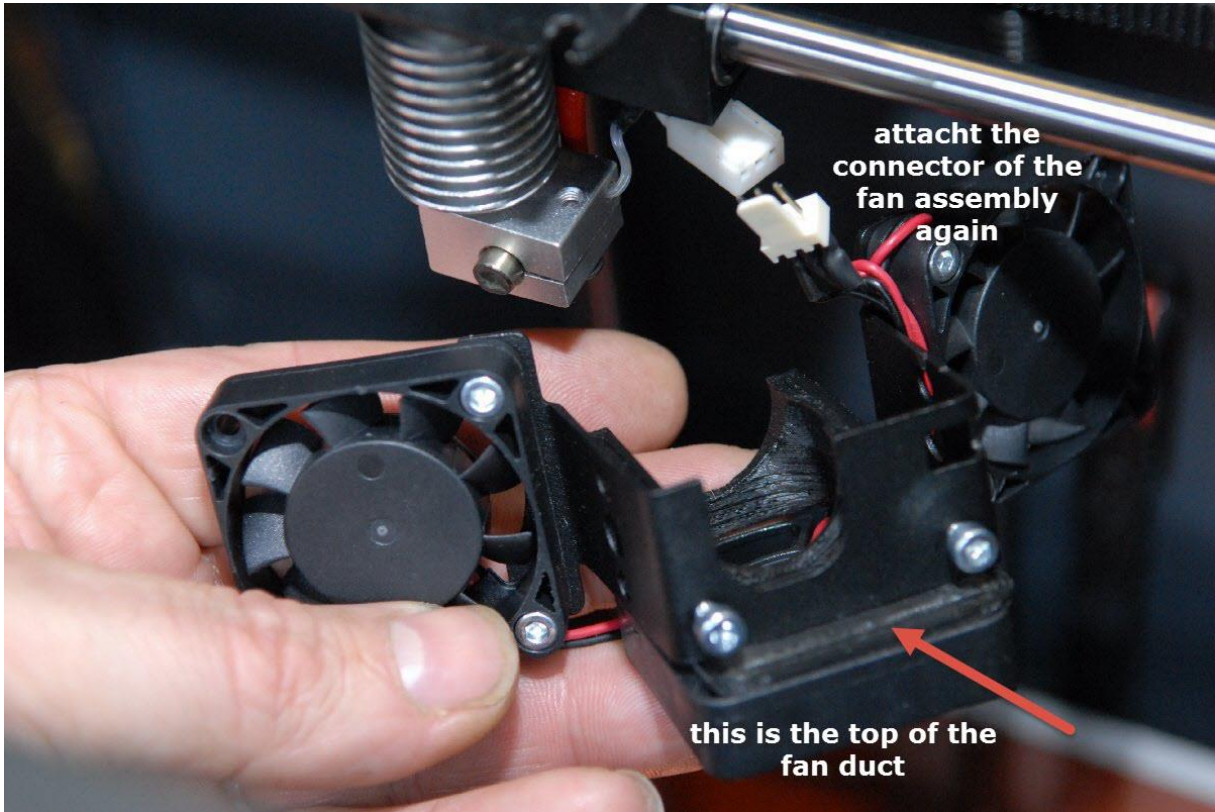


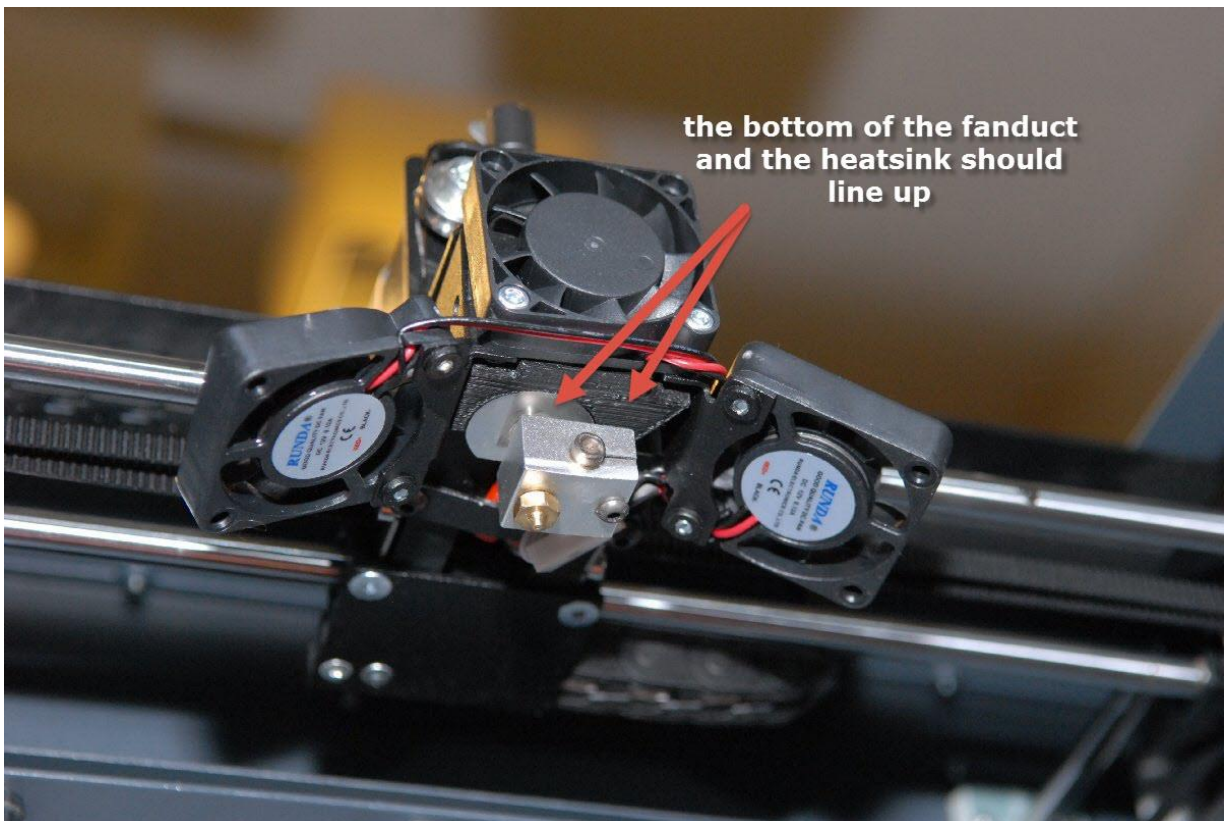
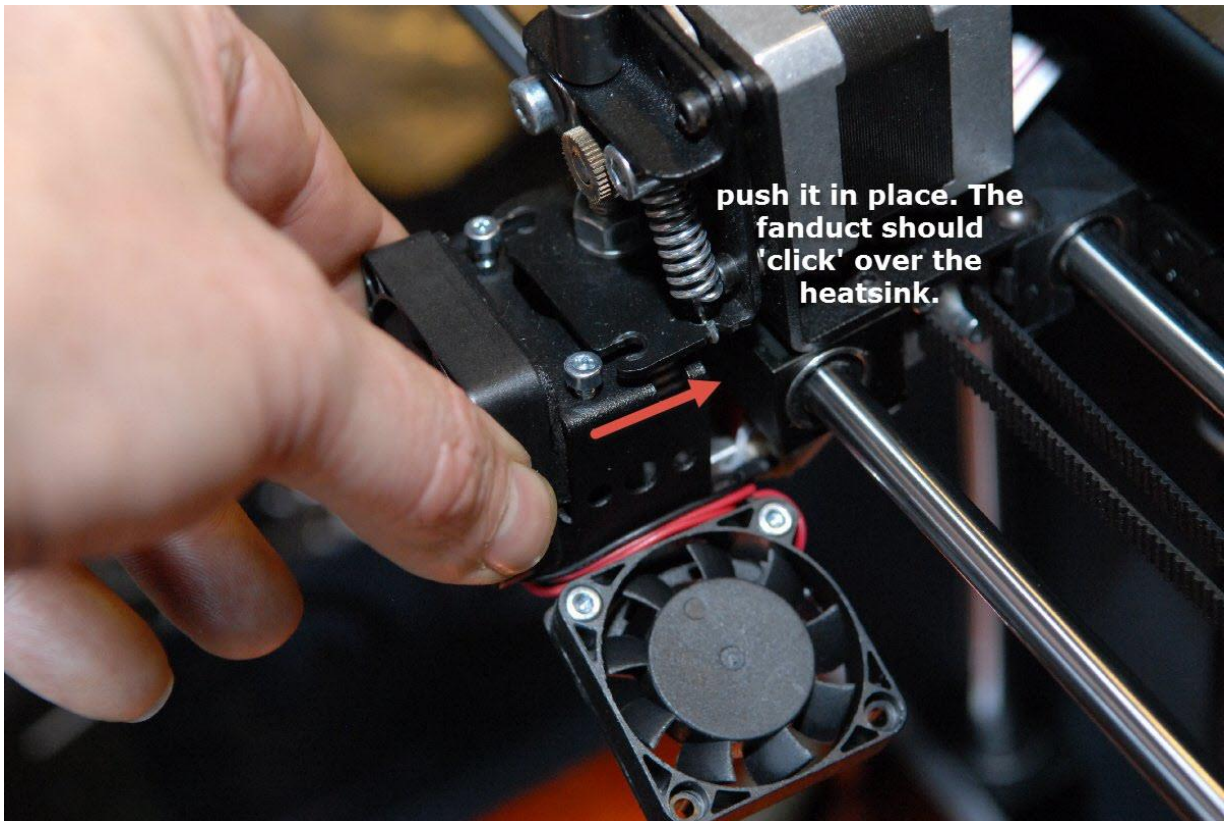
check if the cables,
especially the thermistor
cable, can't move in the
cable fastener.

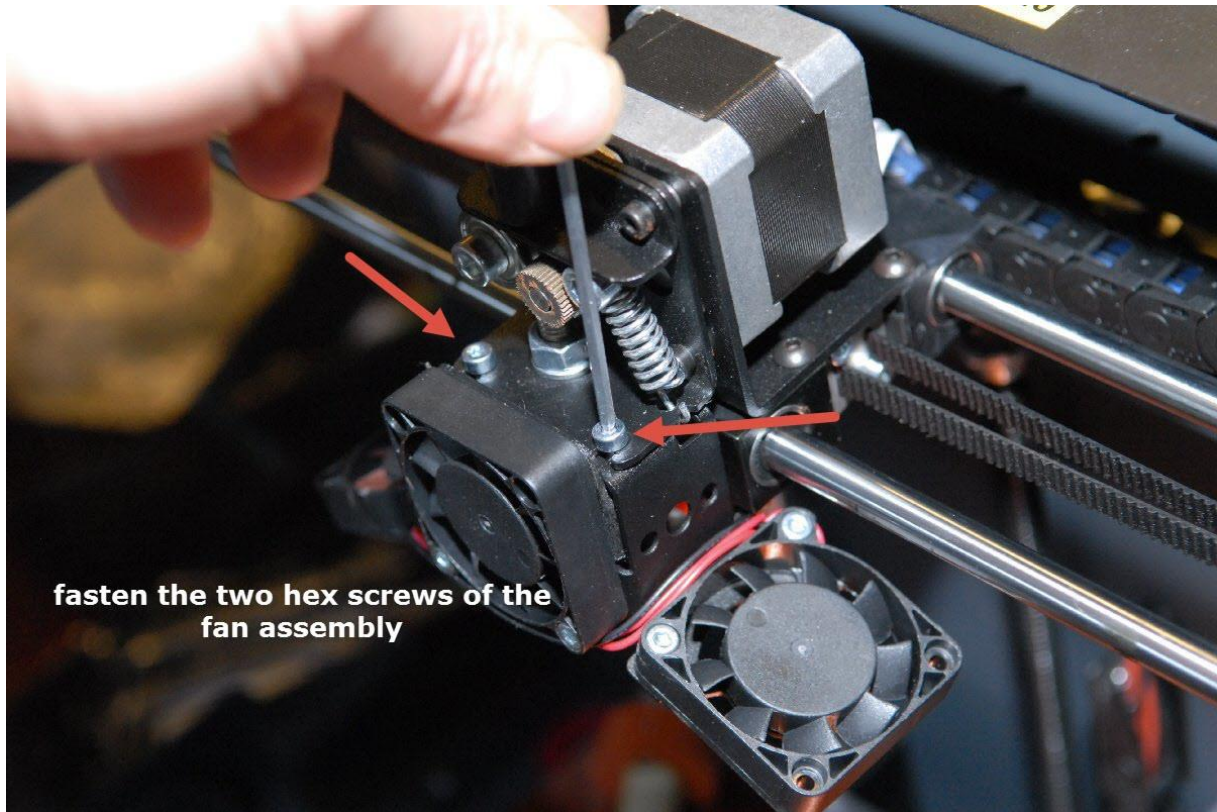
You can fixate the thermistor in the hole with a little piece of kapton, see the end of this manual.

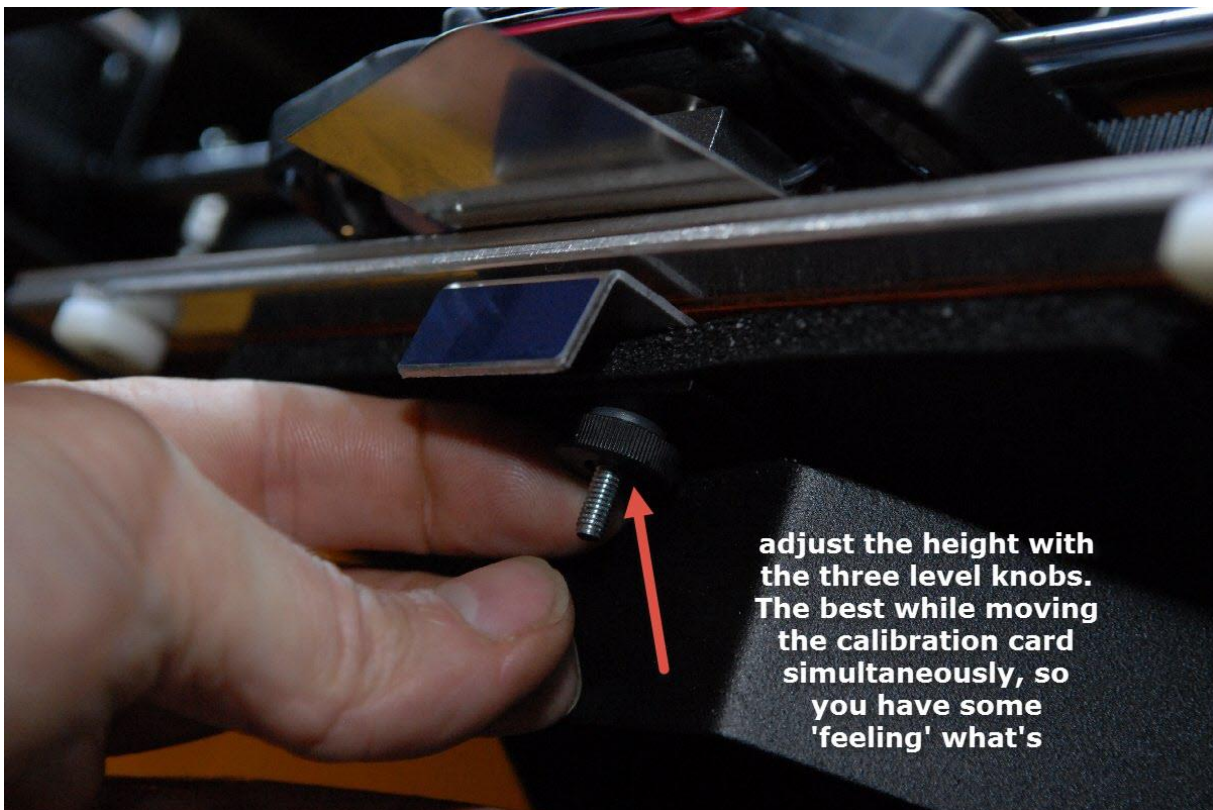
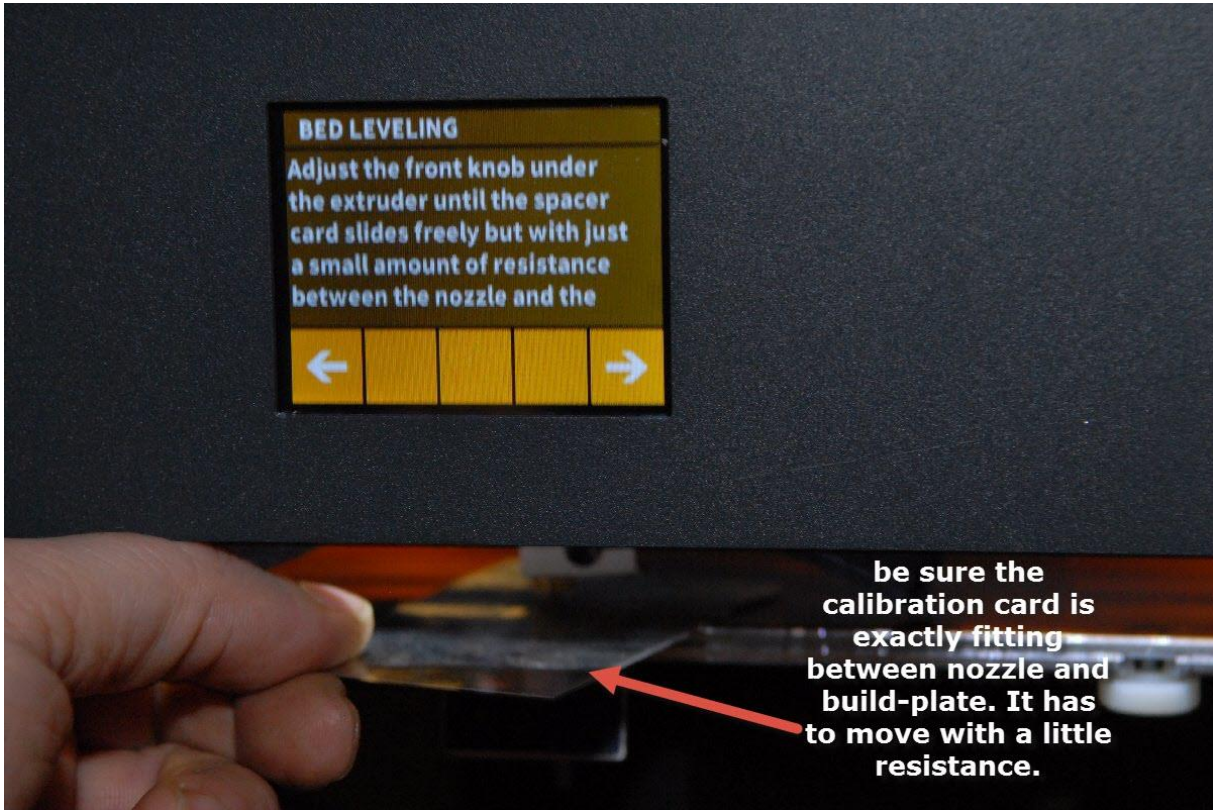


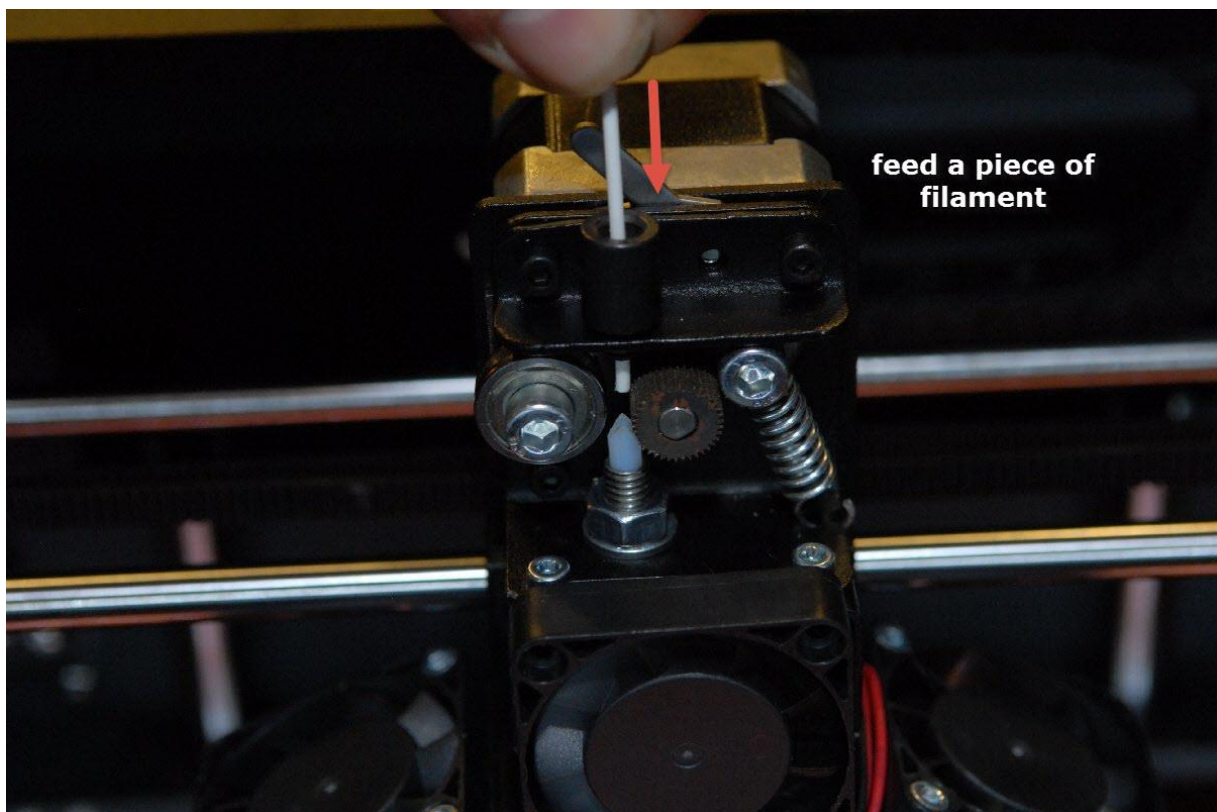
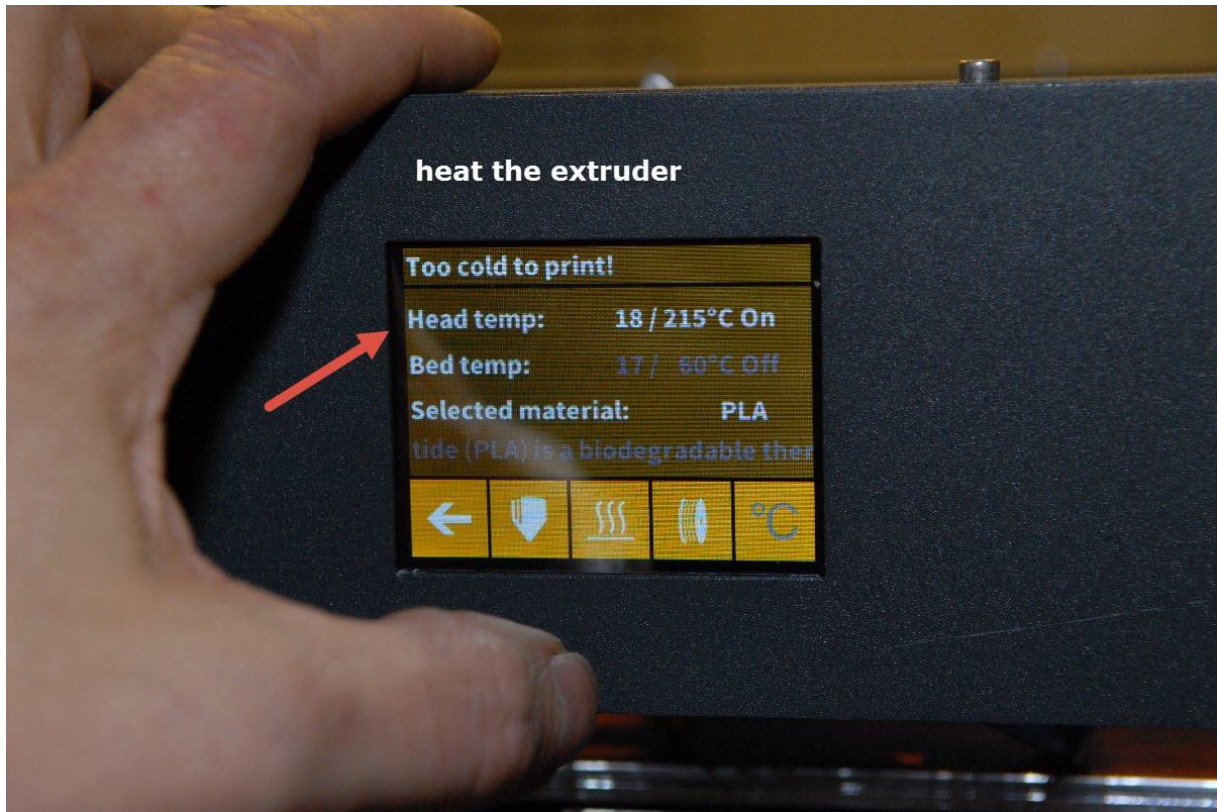


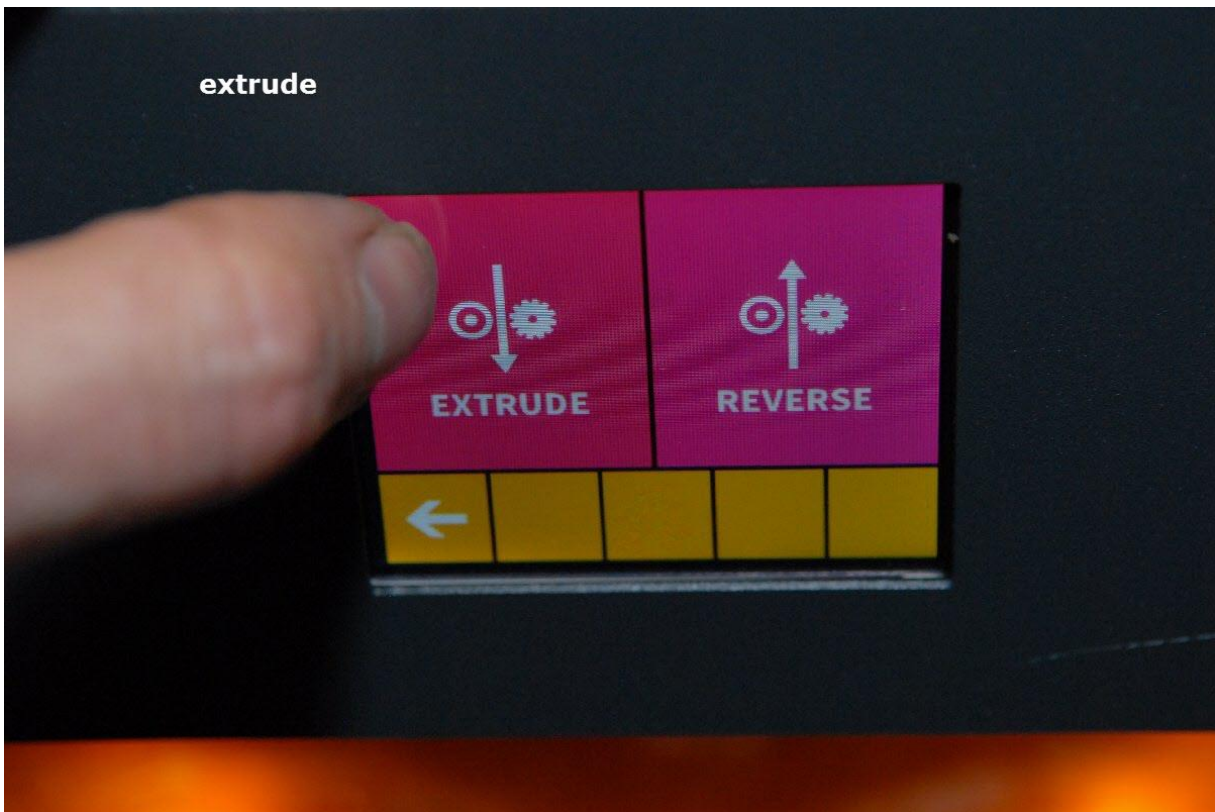
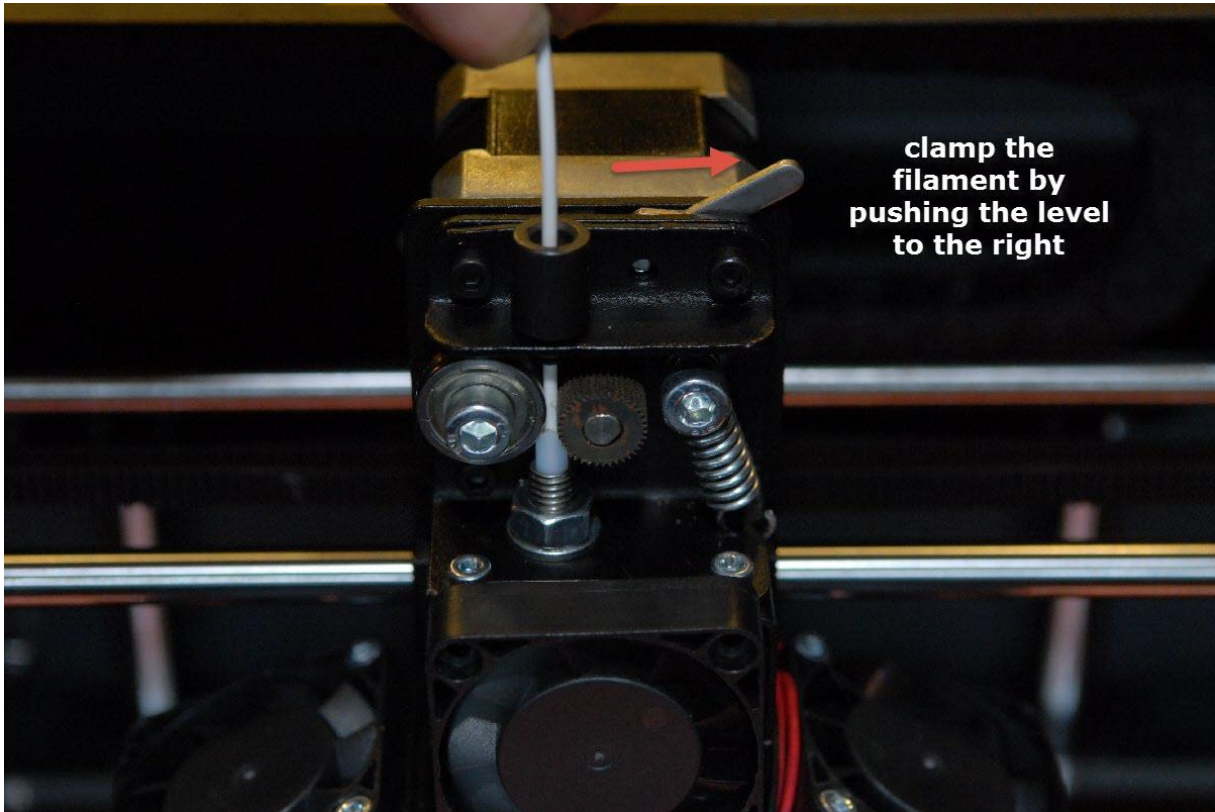


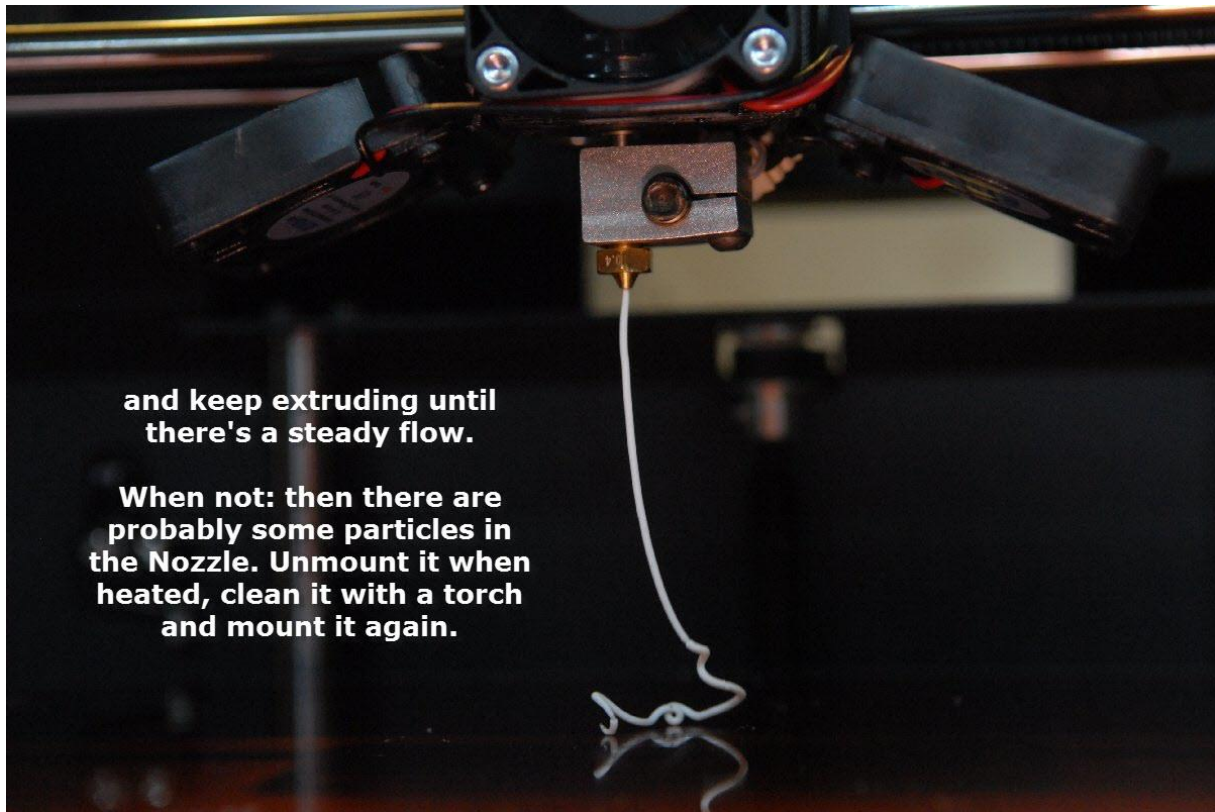












That's it ;-)

If you have questions, please mail at info@CraftBot.nl

Bart ter Haar

Conditions

General conditions CraftBot.nl: see <https://www.craftbot.nl/voorwaarden/>.

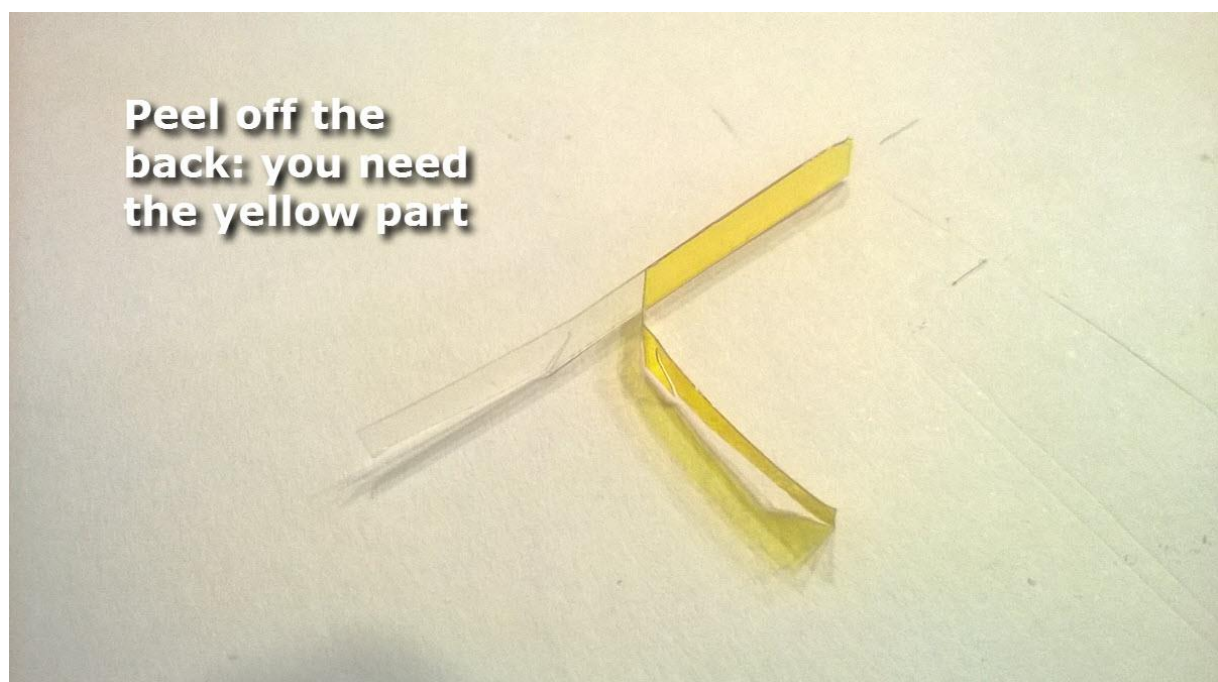
General warranty conditions see: <https://www.craftbot.nl/wp-content/uploads/2016/01/CraftBot-1-jaar-garantie-2016.pdf>

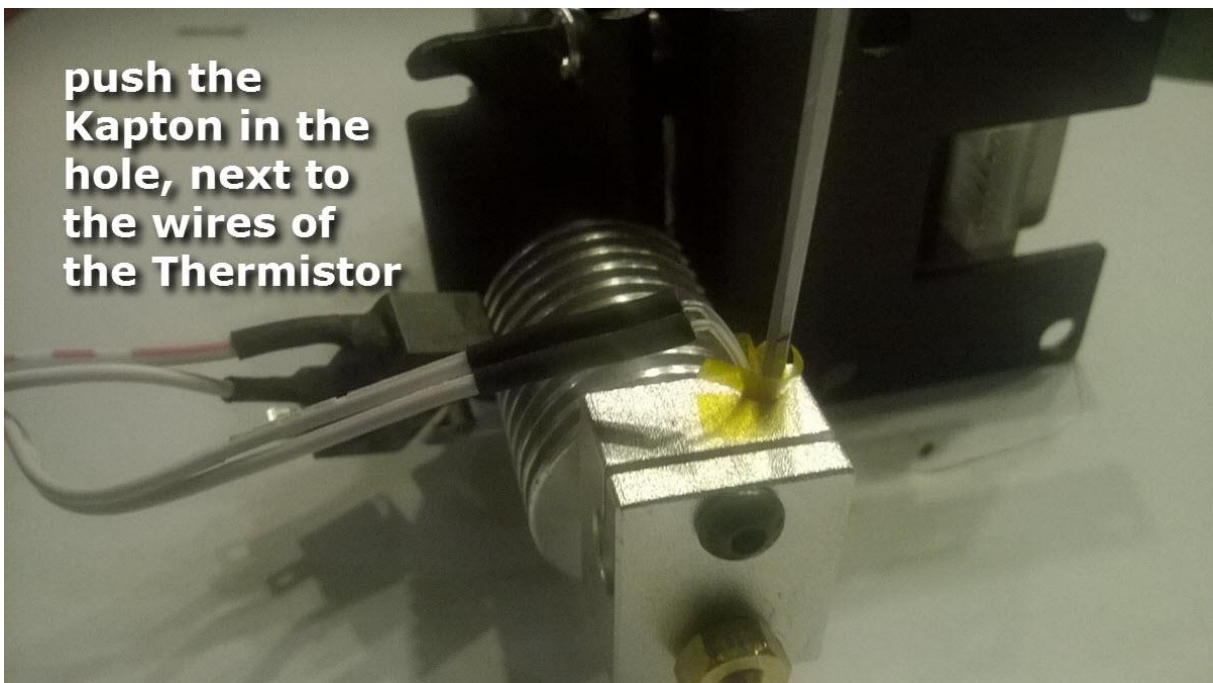
Return address:

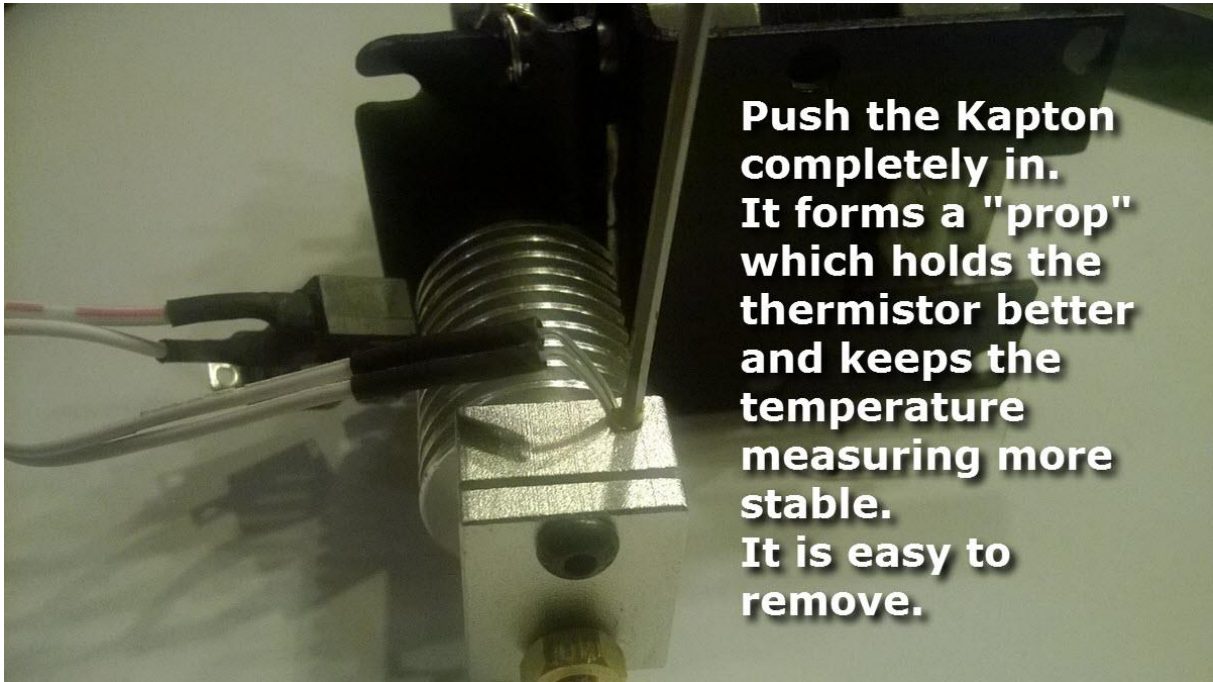
CraftBot.nl
t.a.v. B. ter Haar
Claes de Vrieselaan 47
3021JC Rotterdam
The Netherlands

+31(0)104778804

Fixating the Thermistor better and get more stable temperature readings.







Expert modus: Calibrating the measured and actual temperature of the hotend.

The temperature readings of the thermistor are not accurate at higher temperatures. Hopefully this will be addressed in the next firmware releases of the CraftBot.

Psanyi (Sandor) has measured the actual temperatures and made this conversion table:

CraftBot	Actual temperature
200	197.2
210	205.2
220	213.1
230	220.9
240	228.5
250	235.5
260	243.3
270	250.8
280	258.0
290	265.0
300	272.1

Based on Franci's idea, Sandor added a resistor of 66 Ohm in series with the thermistor and that was actually resulting in a more accurate temperature measuring:

CraftBot	Actual temperature with 66 Ohm in series
200	201.5
210	210.8
220	220.1
230	229.5
240	239.2
250	249.0
260	259.3
270	269.8
280	280.8
290	292.2
300	304.6

As you can see, there is a good match between 200C and 280C, but above 280C it overshoots.