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PRINTING, PREPARATION OF THE PARTS AND ASSEMBLY

TheFrog, although its obvious simplicity, is a precision mechanism. Its parts barely move a couple of millimeters or rotate just a few degrees, therefore, assembly and plays have to be done with utmost care, but don't worry, once assembled, the mechanism is very robust.

This assembly guide has been written watching the details. Please read it complete although some steps may seem obvious to you. Do not skip any of the **dry tests**.

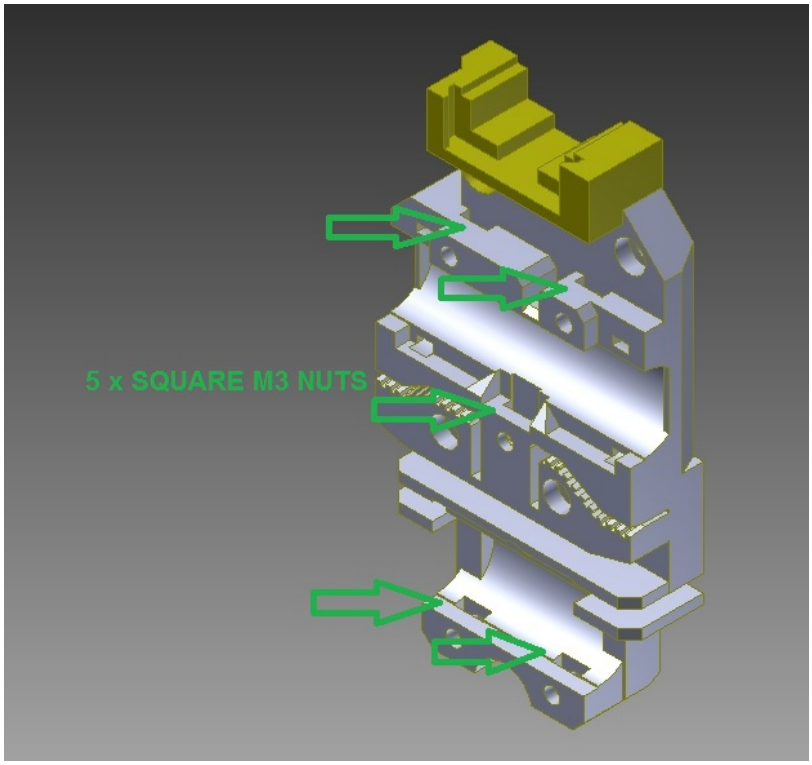
Printing all the STL files feature the part in the position it was printed by me with best results. Some of the parts demanded support, others asked for rafts. Some needed both, many of them none. I even used a support blocker in one part. Procceed according to your skill and experience.

Please follow all steps in the exact order for an easy assembly.

0 - Disassemble the stock extruder body as PRUSA's guide for extruder B6 to B7 upgradings says. Disassemble also the x-Carriage

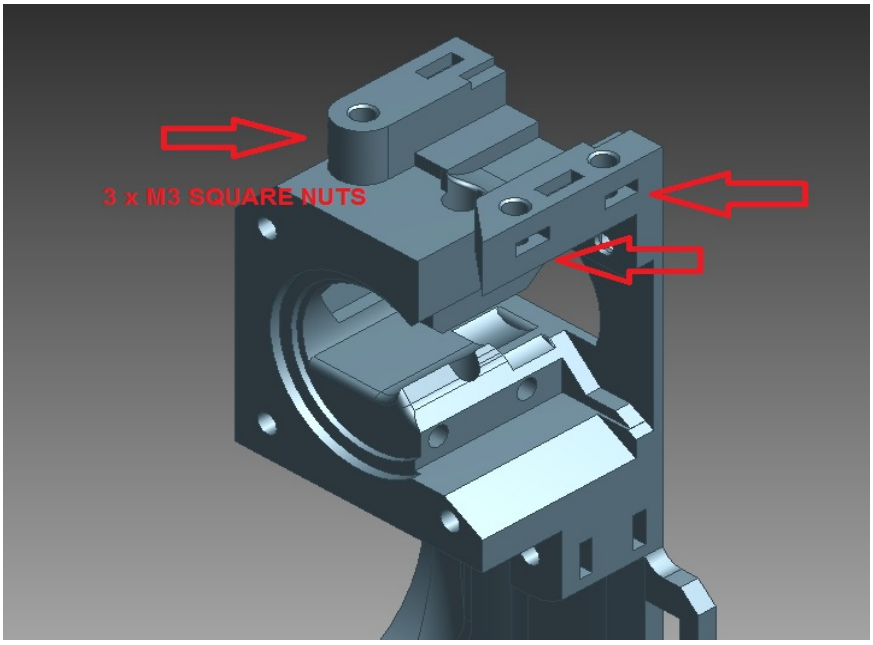
1 – x-CarriageMK7 (Part #2)

Printing: No support needed to print this part.



Assembly: It uses the same five square M3 nuts as the PRUSA MK3 part, and it must be assembled identically

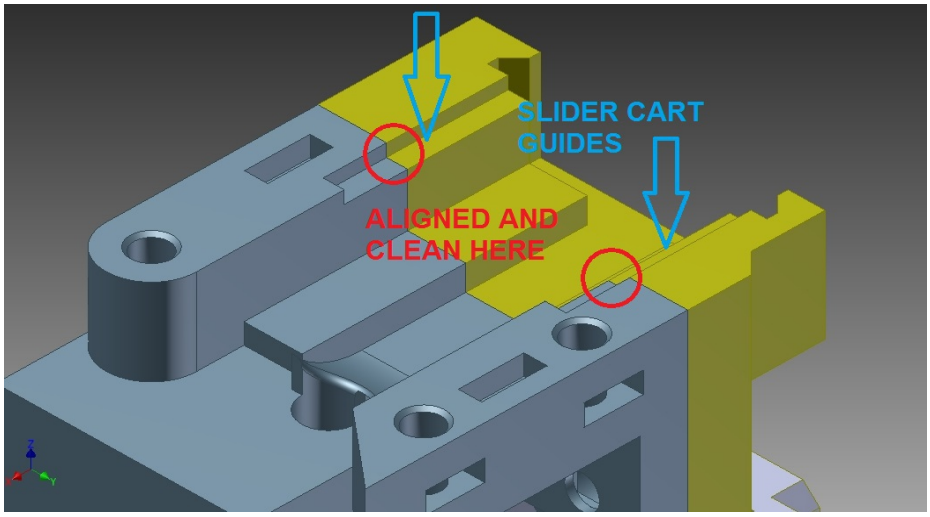
2 – ExtruderBody (Part #3)



Printing: No support needed to print this part.

Preparation: Clean well the filament passage with a 2 mm drill bit.

Assembly: Identical assembly as the stock PRUSA part, with the same hardware: bolts, nuts, hot end, fans, stepper, PINDA probe, etc. all the same.
Aditionally place three square nuts in the slots in the upper part of the body to secure the sensor cover (two at the right, one at the left). (Part #B)
IMPORTANT
When assembling the ExtruderBody in place against the X-Carriage, make sure that the guides for the SliderCart on top both parts are well aligned, both horizontally and vertically. A small edge might be present in both parts where they were in contact with the printing bed. Remove it. **Run a dry test** checking that the SliderCart can move well along the guides with no obstacles.



Assemble all elements of the extruder (heat end, fans, etc.) as indicated by PRUSA's guide

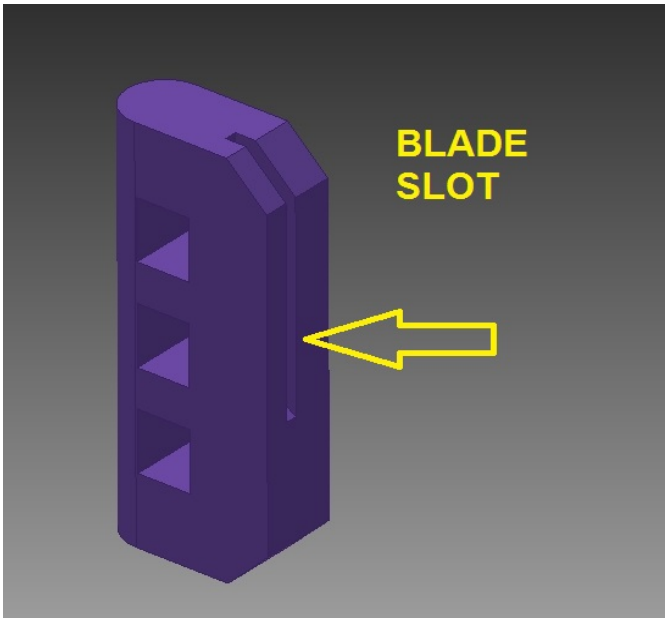
3 – CutterAssembly

Printing: Print the BladeHolder (Part #10) in vertical position. Open end of the blade slot upwards. Better if you use raft. No support needed.

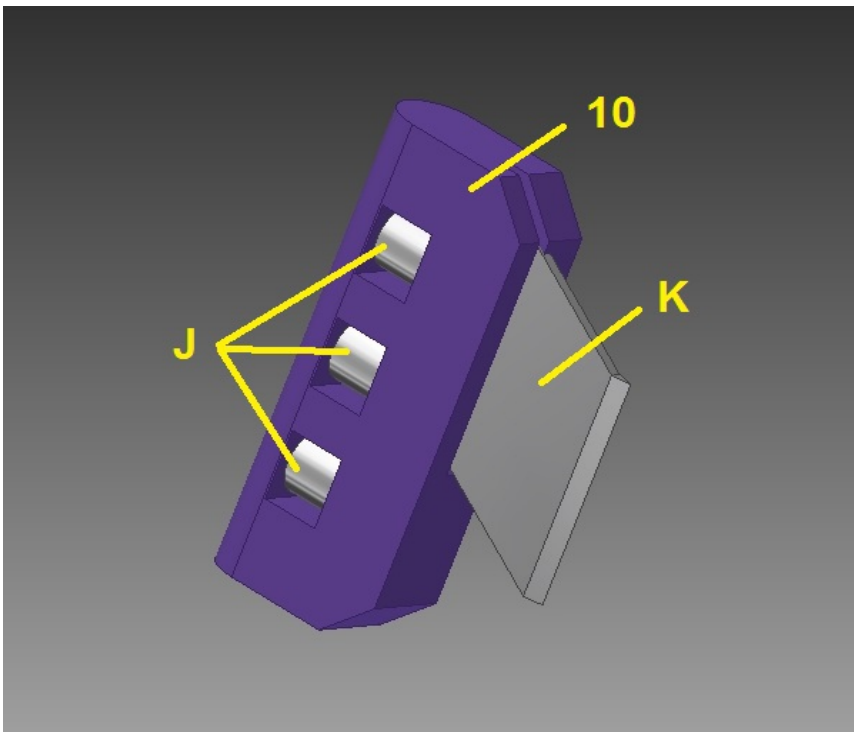
Preparation: Once printed, prepare meticulously the printed plastic part: First use the Blade (Part #K) to clean very well the blade slot. **Run dry tests** to check that the Blade sits well along all along the bottom. Do not glue the Blade yet.

Assembly: Set the three small Magnets (Part #J) in the slots with the same polarity facing the Blade. The easy way to check if all three Magnets in the BladeHolder have the same polarity is putting another magnet against the back of the part. It will seat straight and centered if the assembly is correct.

Now you can glue the Blade (Part #K) with a drop of CA glue in each side. Make sure it sits well in the bottom. If it doesn´t, just clean the slot of the dried glue and redo again. It is very important that the Blade sits well all along the bottom of the grove. It cannot be angled or tilted.



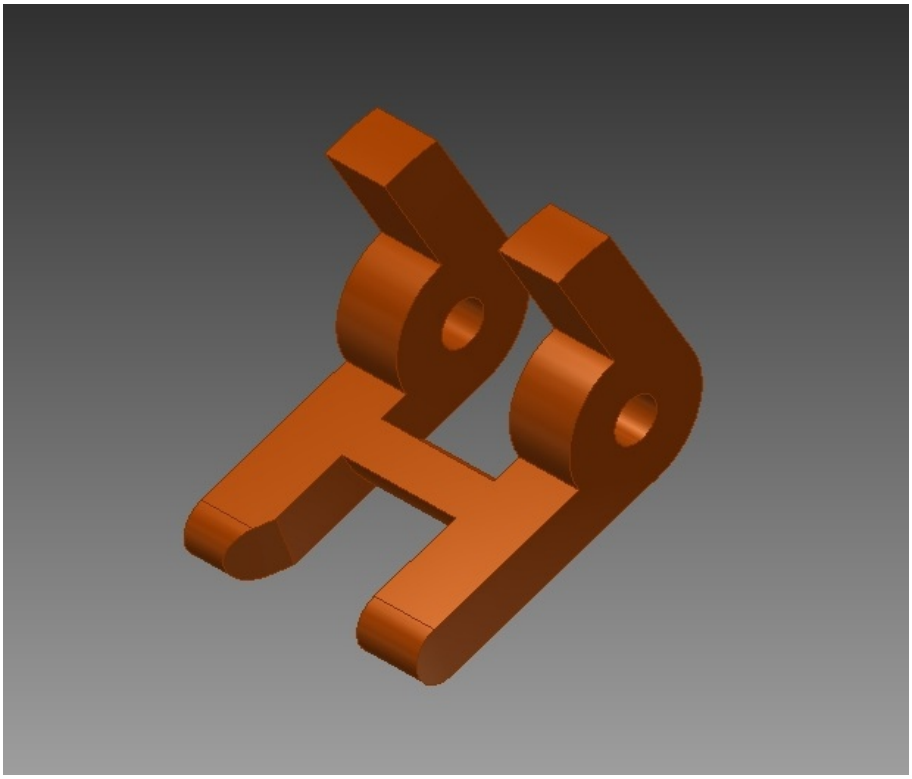
Note that the Blade slot is not centered in the BladeHolder, and when assembled the Magnets (Part #J) must be placed facing upwards.



The CutterAssembly is ready

4- CutterLever. (Part #11)

Printing: I printed this part with raft and support.

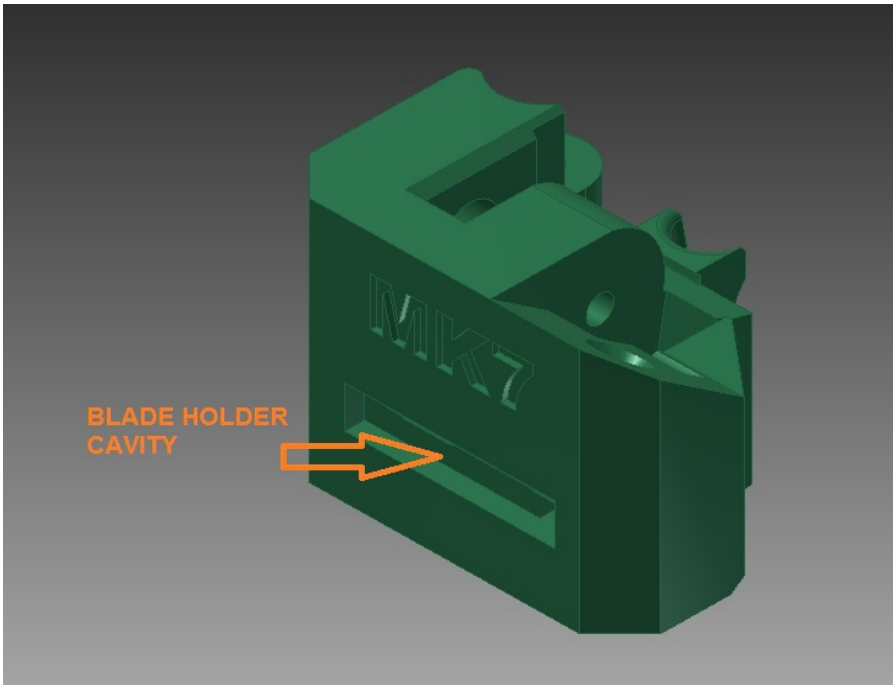


Preparation: The M3 bolt must not screw in the holes, it should be a tight fit but the part must be able to rotate freely with an M3 bolt as a shaft.

5- FrontTrap (Part #5)

Printing: Print this part with the MK7 embossment facing down. No support needed.

Preparation: IMPORTANT Clean well all cavities. Clean specially well the blade slot. It is very important that you clean throughly specially the bottom part of the slot where the BladeHolder moves. Use a magnifying glass to check if necessary. You might have to sand a bit one end of the BladeHolder (Part #10), the one you printed in contact with the bed. The CutterAssembly must move really smooth inside the part. If your print oozed inside the cavity too much you might need to sand the BladeHolder.



There is only one M3 screw to be cut in the part. This bolt will be the CutterLever hinge shaft. I reccomend using a tap male because I do not like fighting, but I guess forcing a bolt through it (PRUSA's way) should also do. The one vertical blind hole does not need a screw.

FrontTrap is ready

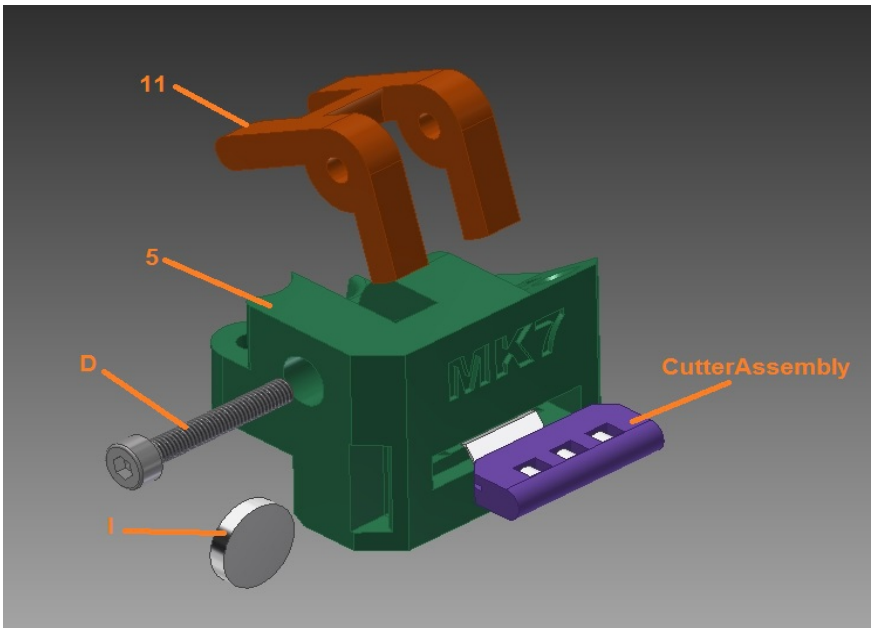
About Tap Males or thread cutters
Tap males are great to make perfect threads in a plastic part. This is something you will appreciate if you use bolts in your printing projects.
All threaded holes in TheFrog have been dimensioned so if there's a the screw, it can be carved simply screwing a bolt through, but a tap male will do a better thread that runs smoother. An M3 tap male set as the one in the picture costs as little as 5€.

6 – FrontTrapAssembly

Assembly:

1- Slide the CutterAssembly in the front slot of the FrontTrap with the Magnets facing upwards. Place the CutterLever (Part #11) from the top and fit the M3 x 18 bolt.(Part #D) The bolt must be loose enough so the lever moves easily.
2- Slide the back Magnet ((Part #I) in its slot. Polarity of the magnet must be set so that the magnets are atracted.
3- Start checking that the Blade is centered vertically in its slot. It means that you assembled it right and not angled.
4- Now check that the movement of the CutterAssembly is really smooth, and that when you pull the lever the blade shows about 2 mm. When retracted, the blade should not show AT ALL in the filament's path. The retraction of the blade must be smooth and perfect. ALWAYS. If it isn´t then disassemble and clean the blade holder slot again.

When retracted, the blade should not show at all in the filament's path. If it does, it means that the blade does not sit in the bottom of its slot in the blade holder (but at least the blade holder slot seems to be clean, because the blade holder went all the way to the bottom.

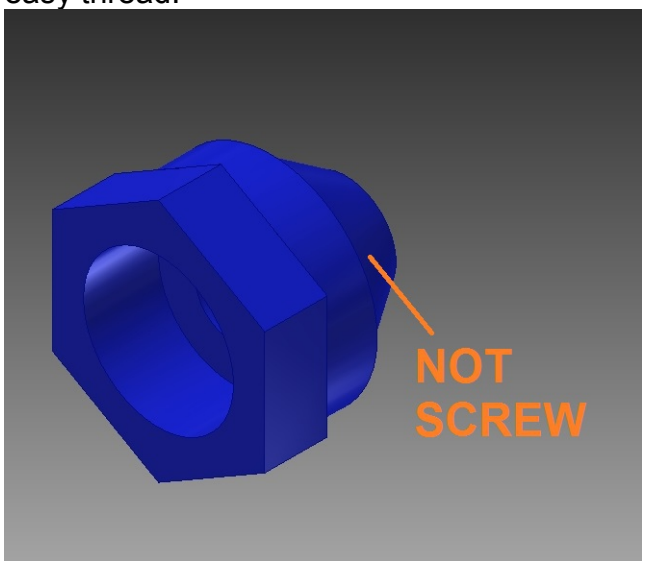


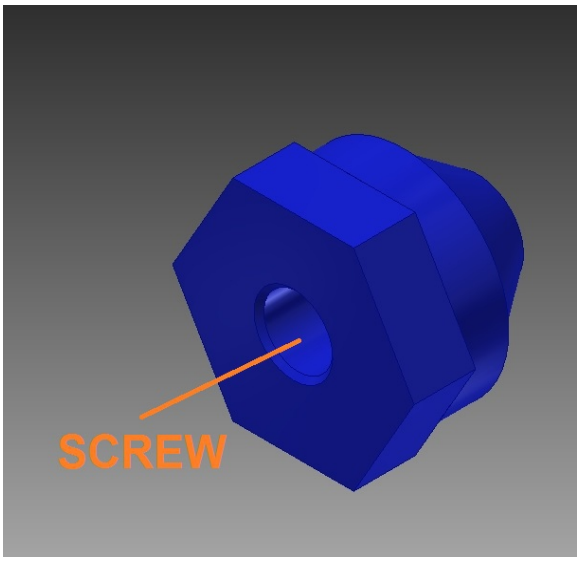
FrontTrapAssembly is ready

7-BearingFix A/B (Part #8 and Part #9)

Printing: Small parts like these, though they take less time to print can be difficult, specially if we need a good quality print, like in this case. The parts can be perfectly printed with a 0,4 nozzle, but the prints must be good. The hexagon area of both parts is not as important as the cone and the very top. I got my best results printing both parts at the same time with raft and support.

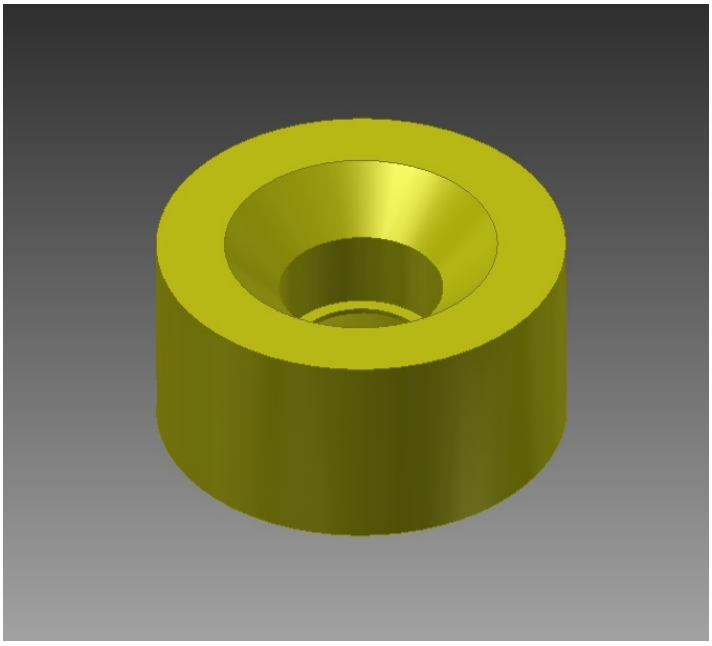
Preparation: It is very **IMPORTANT** to prepare and assemble these parts correctly, otherwise, the axial or tumbling play of the bearing could lead to false sensor misreadings. One of the parts holds the bolt head, and must not be thread. Use the tap male or a bolt to enlarge the hole until the bolt does not thread but has no play either..
The other part holds the tip of the bolt and must be screwed. Use a tap male or a bolt to cut the screw in the plastic part before proceeding with the assembly. Make it a nice and easy thread.





8 – Roller.(Part #1)

Printing: Print it in TPU. The softer the better. The blade will fight against the rugosity of this part (layer upon layer), so make it a good print. No support necessary. There's one good way to print this part and another wrong one. Make sure you position it properly or the bearing won`t sit right centered.



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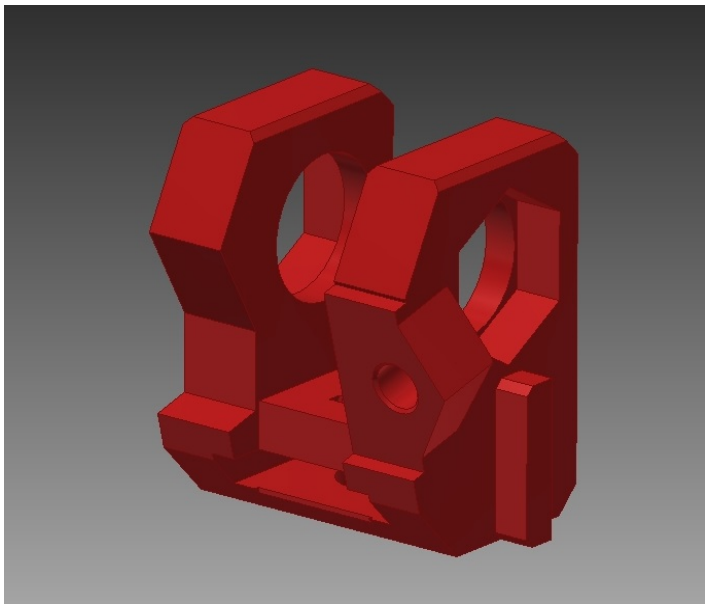
9- SliderCart. (Part #7)

Printing: A small but difficult part to print. Print it with the magnet side against the printing bed. My best prints have been using no raft, but supports and a support blocker in the magnet cavity.

Preparation: Clean meticulously this part. Use a magnifying glass if necessary. Inspect well looking for support traces in all surfaces of both guides at the sides Once printed and clean, make a screw for the filament sensor bolt (Part #G) in the hole. Again I reccomend using a tap male but you can force the screw with an M3 bolt.



10 – SliderCartAssembly.

Assembly: Though it looks very simple, this is one of the most delicate parts to assemble properly. MaKe sure you get a good assembly or the system won't perform as expected.

1- Place the Bearing (Part #H) in the TPU roller (Part #1). Check that the bearing gets well to the bottom of its seat. You'll see if it is well aligned if you **run a dry test** assembling the Roller and Bearing only with the BearingFixA &B and the shaft and making it rotate. Use a slotted 16 mm bolt (Part #C) as the shaft for the bearing.

2- When assembling it's better to first **run a dry test** without the bearing and the roller to check how deep the BearingFix parts get into their cases. Drive the Bearing's fixes A and B (Parts #8 and #9) to the bottom of their cases tightening the shaft bolt. Once they are in place, remove the bolt (Part #C), and get the two plastic parts out of their cases.

3- Now repeat the operation with the roller and bearing but without the bolt. Push the plastic parts into their cases with your finger or something like a screw driver, You should fit nicely the bearing, and (without exerting much force) the roller rotate as if it had a shaft with no contact with the slider cart.

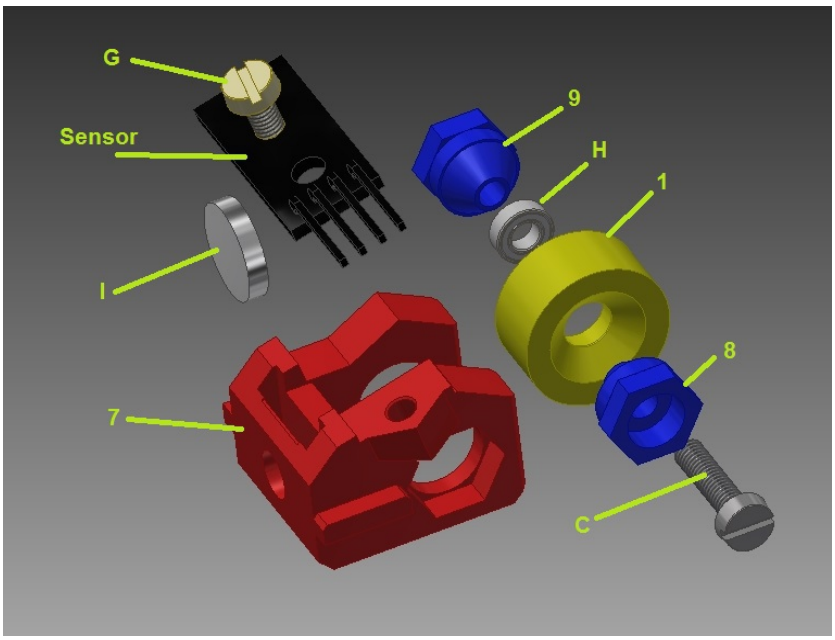
4- Now place the bolt / shaft. It is just to fix things in place, not to tighten anything, so make sure you do not tighten the bolt too much. The roller must rotate with barely any friction.

5 -Now check for play in the roller movement. There shouldn´t be any in the axial direction. There shouldn´t be either any tumbling play. If the roller is not properly assembled you might get false sensor readings. Once you are sure you have a nice roller movement with no play and no friction, you can proceed

6 - Place the magnet (Part #I) in the slot. Polarity must be set so when in position (the roller in contact with the blade), the BladeHolder magnets and the SliderCartAssembly magnet should repel each other (though they are pretty far away)

Polarity of all the magnets of the device, starting from the front and going to the back of the extruder must be set like this:
(+/-)(+/-)(-/+)(+/-)
(+FrontTrap 10 x 2 magnet-)(+BladeHolder 3 units x 3 x 2 magnets-) (-SliderCart 10 x 2 magnet+) (+BackTrap 10 x 2 magnet-)

7- Now you should test that you can assemble easily the filament sensor. Use the M3 x 4 Nylon6 bolt (Part #G). Remember that the mirror must be facing the roller, but do not assemble it just yet.

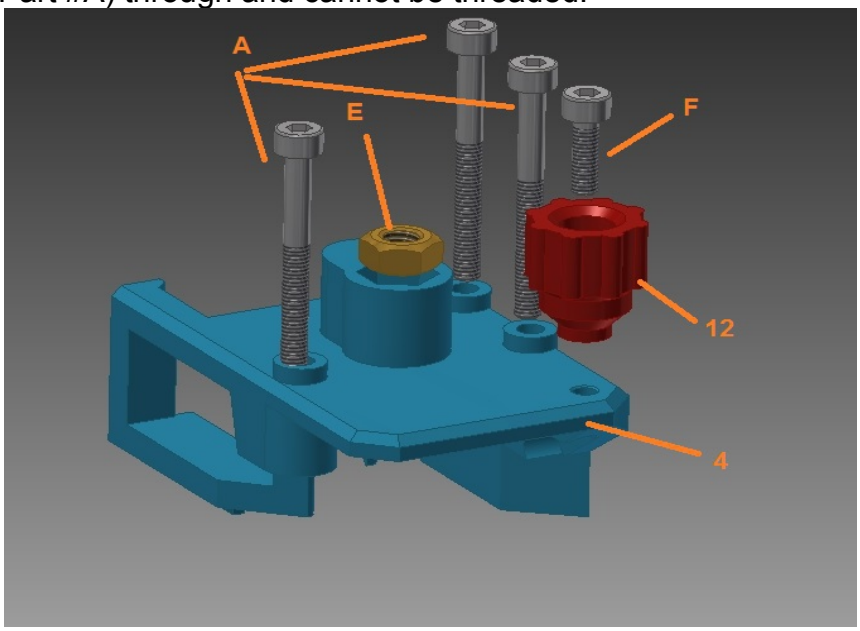


The SliderCartAssembly is ready.

11 – TopCover (Part #4)

Printing: Print it upside down with support.

Preparation: Make sure you clean well the filament passage and the four holes for the bolts. One of the holes (the flat one) must have a screw. It is best to use a Tap male for it because this hole is going to be the FrontTrapLock (Parts #F and #12) thet keeps the FrontTrap shut , so you want it to run really smoothly. The other three holes must let the M3 x 30 bolts (Part #A) through and cannot be threaded.



Use a hot soldering Iron tip to place the M5 nut (Part #E) for the Festo connector in place.Make sure it sits straight.

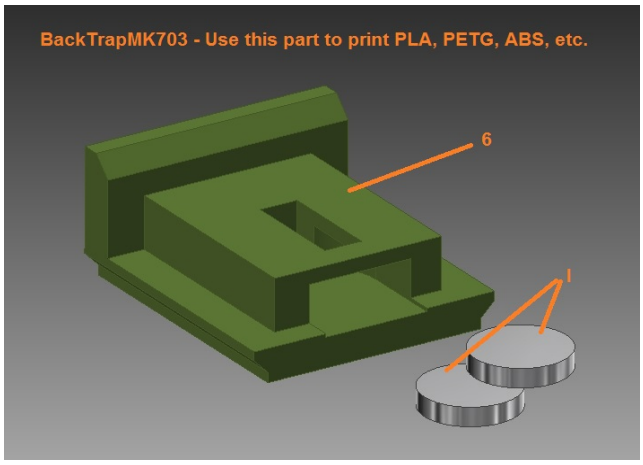
TopCover is ready

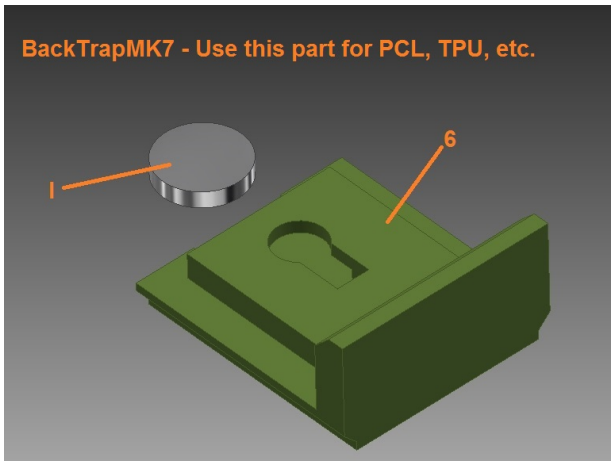
12 – BackTrap (Part #6).

Printing: Print this part with no support.

Assembly: Place the 10x2 mm magnet (Part #I). Polarity of the magnet must be so that the slider cart pulls away from the back trap and pushes towards the filament

Part BackTrapMK703 uses two magnets instead of one to achieve more pressure of the roller on the filament. If the two magnets tend to slide out you can use a bit of glue to hold them in place, You can use the one magnet versions (BackTrapMK7, BackTrapMK702) for softer materials like PCL or TPU.

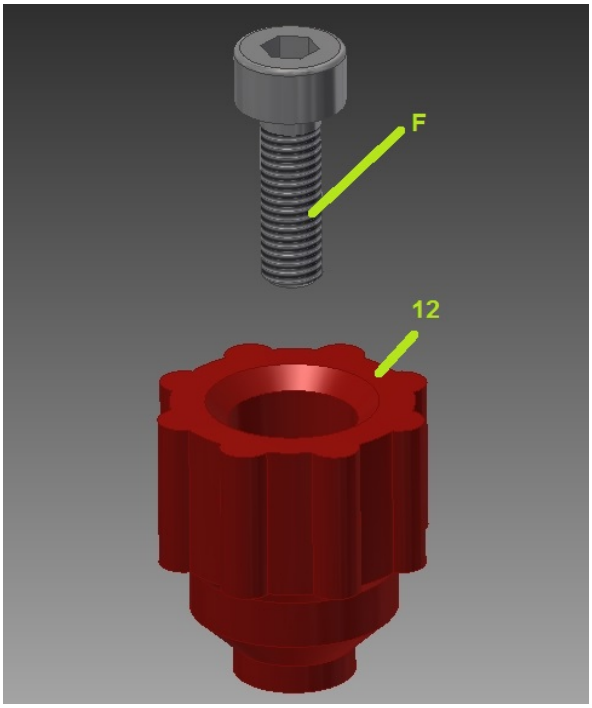




BackTrapAssembly is ready.

13 – FrontTrapLock

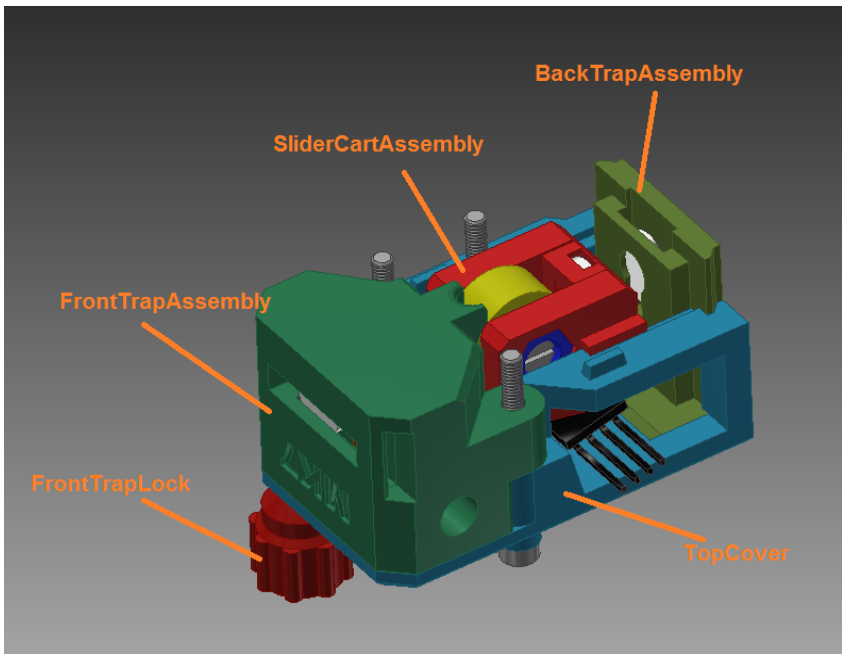
For the FrontTrapLock, the best is to use a bolt (Part #F) and a Plug (Part #12) for easy inspection with no need of tools. Fit the bolt (Part #F) into the Plug's hole (Part #12) with a nut and a washer from the other side until the bolt's head gets to the bottom. It will stay there. Remove nut and washer.



14- Top Assembly

Follow these steps in order:

1- Install the FrontTrapAssembly on the TopCover. Use both bolts (Part # A and #F) to set it correctly in place, but do not tighten them. The bolt on the left (M3x30) (Part #A) is the shaft fot the hinge of the FrontTrapAssembly. The one on the right is the FrontTrapLock
2- Slide the SliderCartAssembly FROM THE BACK into the TopCover.
3- Place the nylon bolt (Part # G) in the filament sensor hole.
4- Put the filament sensor with the bolt (Part #G) through the side window of the TopCover (Part #4)
5- TILTING the SliderCartAssembly you will easily be able to screw the filament sensor bolt into its hole in the SliderCart. Remember that the mirror must be facing the roller. The filament sensor could be bolted also into the SliderCartAssembly with the TopCover in place in the extruder, but I find that it is more difficult, uncomfortable and the procedure is finally much slower.
5- Slide the BackTrapAssembly into the TopCover FROM DE TOP, until it is flush.



TopAssembly is ready

15- In the assembled ExtruderBody, **put in place with care** the TopAssembly . First the BackTrap guides, then the bolts. Do not do it hastily. Take care that the filament sensor does not move while assembling.

16- Set the three M3 x 30 bolts (Part #A) but **do not tighten them**. Tolerances are tight, and the sensor cover has not been designed too strong so it would be light. If you tighten these bolts too much, plastic parts will bend ever so slightly, and the SliderCart might not move.

17- First **check** that the TopAssembly is correctly in place and everything looks nice and neat. Now open the FrontTrap and **check** with your finger that the Slider cart can move with ease. **Check** that it comes back to the front right away. Tighten the three bolts slowly and jumping from one bolt to the other. Stop and ease the moment you detect that the slider cart does not move as easily as before. There are no big forces there, those three bolts don´t need to be that tight. Just **check** that nothing moves loose and that the FrontTrapAssembly can be opened when you free the FrontTrapLock.

18 – **Last pre-flight check**: Loose the FrontTrapLock and open the FrontTrapAssembly

- Does the Roller rolls easily?
- Does the SliderCartAssembly moves backward easily when pressed with a finger?
- Does it come to the front right away once it is left alone?
- And in the FrontTrapAssembly:
- Does the blade gets out easily when the lever is actioned?
- Does the blade retract swiftly when the lever is no more actioned?
- Is the blade completely hidden from the filament's path when retracted?
- Close the FrontTrapAssembly again and secure the FrontTrapLock. If you didn´t close it well, the TopCover would raise and bend, and a creek would appear between the parts.

19- Place the **electrical connector** in the filament sensor's pins. Red cable at the front, white cable to the back of the machine. If the sensor cable is just a bit too short I reccomend redoing the textil seath work on the cables again. Ten minutes job but it's worth it. There's enough filament sensor cable (the one that is red, blue,white & black) in the MK3 to do a nice and neat job.

20 – Connect the **Festo**, and here we are ready to go.

The frog is assembled. Happy printing.