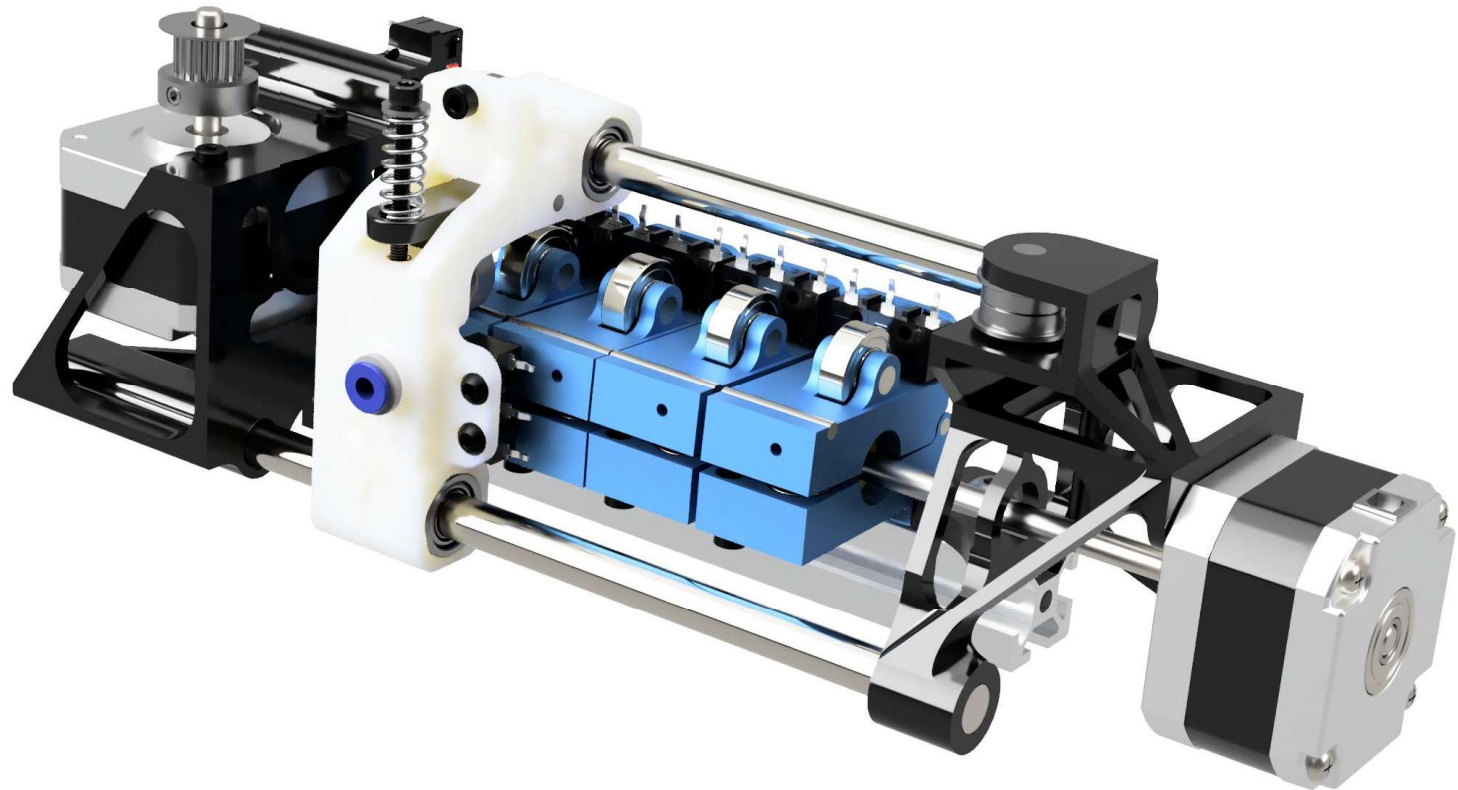


# CAMMU by



Designed by: Cameron Nefdt

Contributors: ABG3D

Matthew Tate

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# Introduction

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## Part Printing Guidelines

### Materials:

ABS

### Layer height:

0.2mm recommended

### Extrusion Width:

0.4mm forced

### Infill Type:

Adaptive cubic, rectilinear

### Infill Percentage:

30%

### Wall Count:

4 recommended

### Top/Bottom layers:

5 recommended

### Tools needed for assembly:

2mm drill bit

3mm drill bit

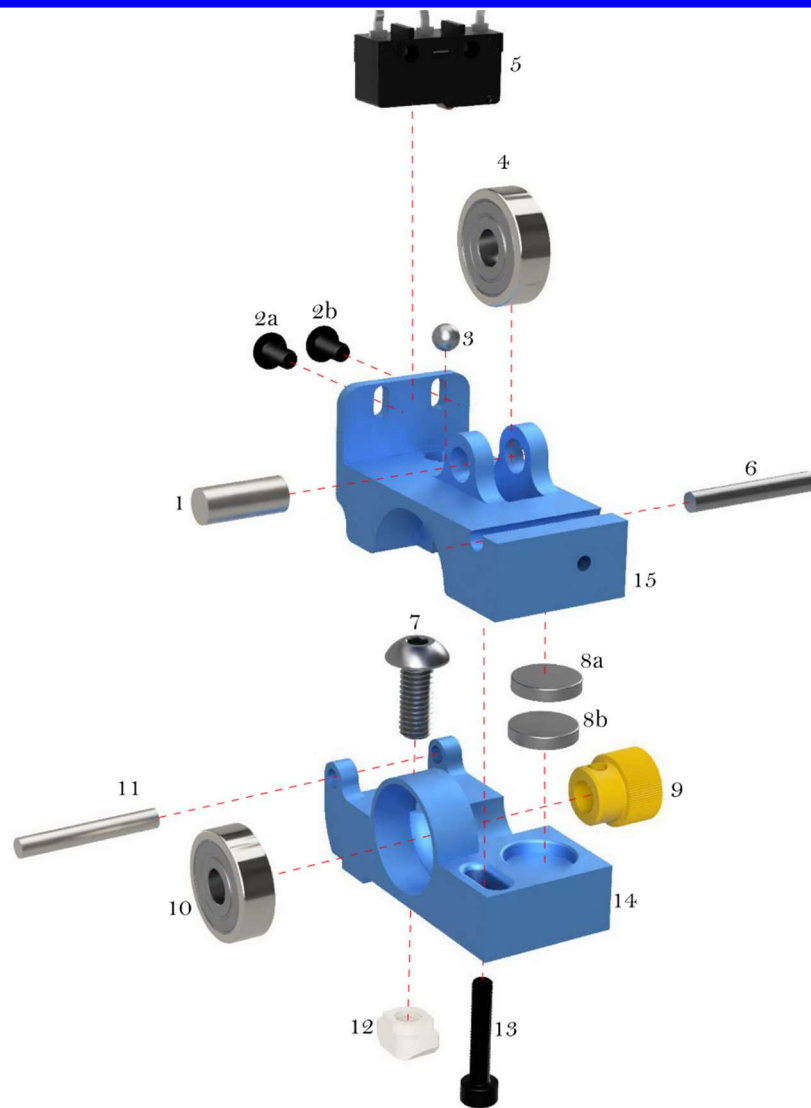
Pliers

2mm Allen key

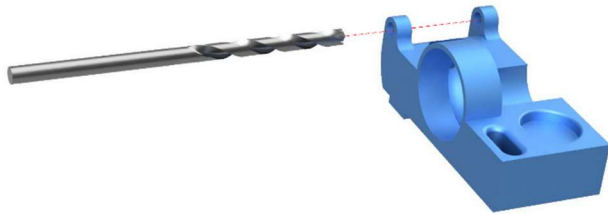
3mm Allen key

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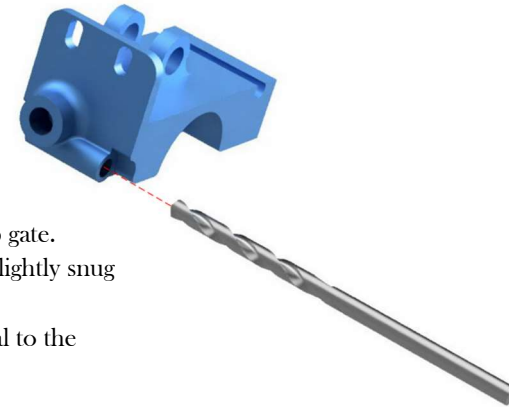
# GATES



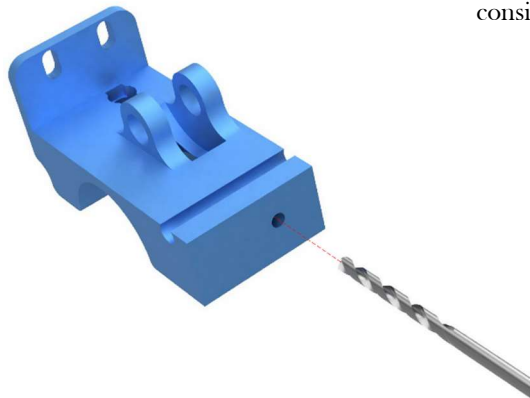
1. 5mmx12mm rod	X1
2. M3x6 BHCS	X2
3. 4mm steel ball	X1
4. 625 bearing	X1
5. 10mmx20mm limit switch(lever removed)	X1
6. 3mmx21mm rod	X1
7. M5x12 BHCS	X1
8. 10mmx2mm magnets	X2
9. Extruder gear	X1
10. 625 bearing	X1
11. 3mmx21mm rod	X1
12. M5 T-nut	X1
13. M3x16 SHCS	X1
14. Gate Bottom	X1
15. Gate top	X1



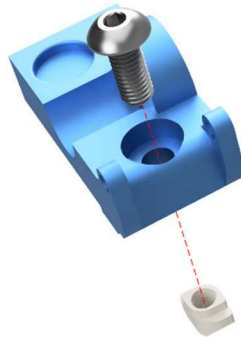
Using a 3mm drill bit by hand, ream the 2 ears on the bottom gate.  
Be careful not to go too far and use the 3mm rod to test the fit.  
The 3mm rod needs to fit tight enough to not move.



Using a 3mm drill bit by hand, ream the pivot of the top gate.  
Using the 3mm rod to test the fit, this needs to slide in slightly snug  
but not loose.  
Be gentle and go slow with this step, the fitment is crucial to the  
consistent clamping of the gates.

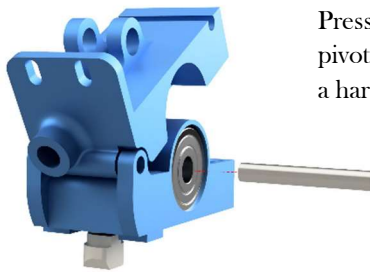
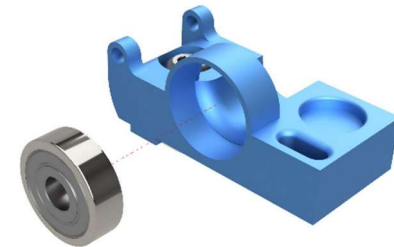


Use a 2mm drill bit to clean out the filament path on the top gate.  
You are not trying to widen the hole at all, only ensure that the  
path is clear.



Fit the M5x12 BCHS through the rear of the bottom gate and attach the M5 T-nut.

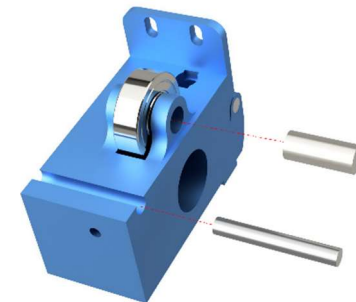
Fit 1 of the 625 bearings into the bottom gate. Press this in against a hard surface to ensure it goes in even and flat. This will be the drive shaft support.

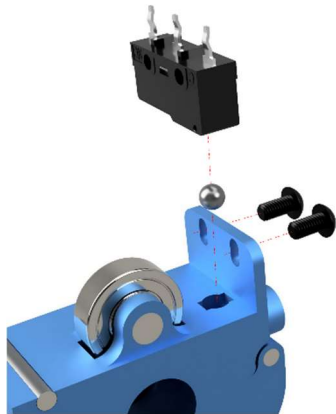


Press 1 of the 21mm long 3mm shafts into the rear pivot of the gate. Place one side of the gate against a hard surface while pressing it in.

Place a 625 bearing in the top of the top gate and fit the 12mm long 5mm shaft.

Press a 21mm long 3mm shaft into the top of the gate, ensuring that each end is inline with the sides of the gate.



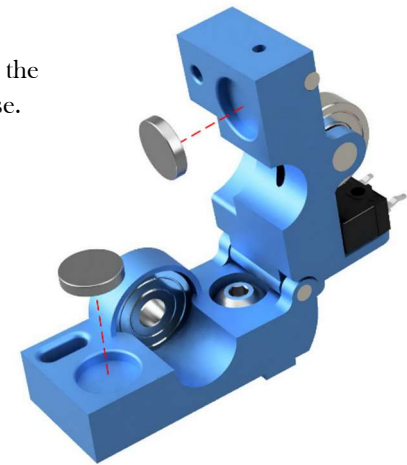


Insert a 4mm ball bearing into the top of the gate followed by 1 of the limit switches and tighten using 2 of the M3x6mm BHCS. The screws will start grabbing into the limit switch housing and cut its own thread. Use a piece of 1.75mm filament and test the fitment of the limit switch ensuring it enters smooth but consistently triggers the switch.

Press the 2 magnets into place ensuring they are placed as opposing force to one another. These will act as the spring for the gate ensuring it opens and doesn't grind the filament during use.

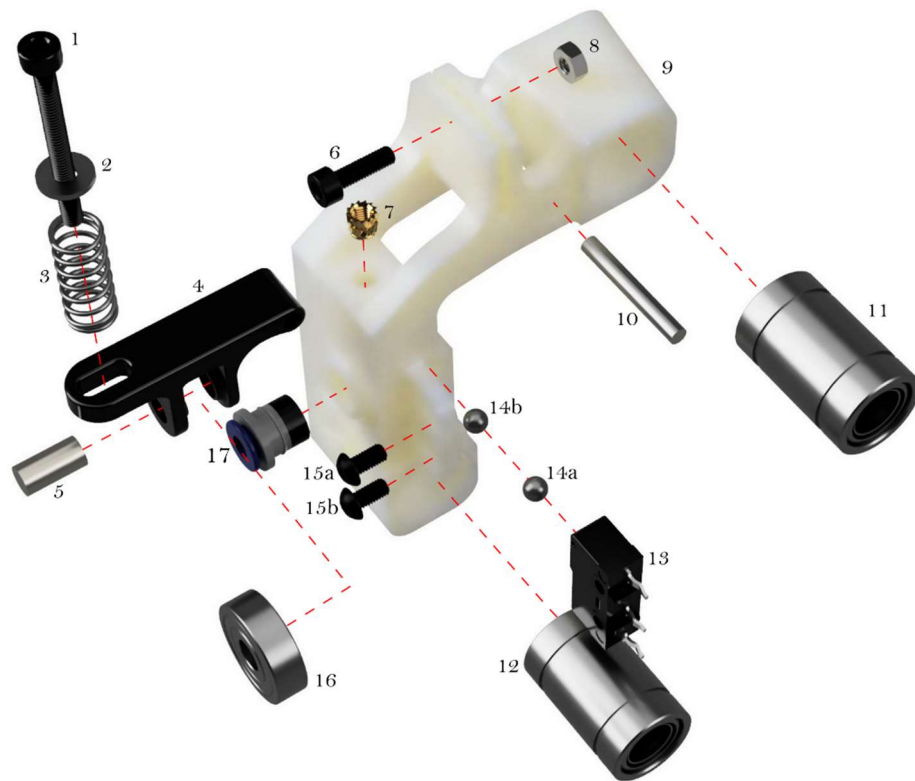


Temporarily fit the M3x16 SHCS through the bottom gate and into the top gate. Take care when fitting as to not strip out the threads, this will thread directly into the plastic and acts as a limiter for gate opening movement. It will need to be removed again later when assembling gates onto the extrusion.



Repeat these steps for as many gates as you will be building for

# Selector



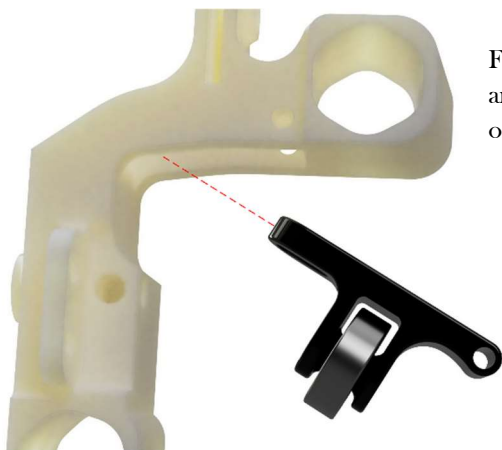
1. M3x30mm SHCS	X1
2. M3 flat washer	X1
3. Spring	X1
4. Tensioner arm	X1
5. 5mmx10mm Rod	X1
6. M3x10mm SHCS	X1
7. M3 heat insert	X1
8. M3 nut	X1
9. Selector body	X1
10. 3mmx22mm rod	X1
11. LM8UU bearing	X1
12. LM8UU bearing	X1
13. 10mmx20mm limit switch (arm removed)	X1
14. 4mm steel ball	X2
15. M3x6mm BHCS	X2
16. 625 bearing	X1
17. ECAS4 fitting	X1





Insert the M3 heat insert into the top of the selector body.

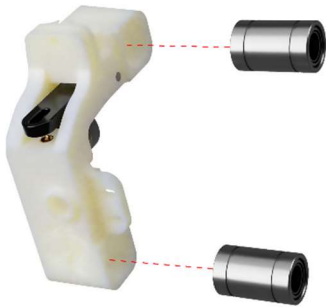
Fit a 625 bearing in the selector arm and press the 10mm long 5mm shaft in place.



From behind the selector body, tilt the tension arm at an angle and slide it up and into position of the selector body.

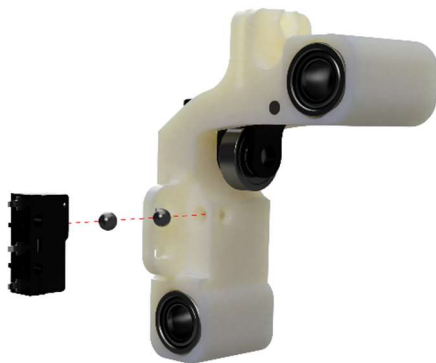
Once the selector arm is in position, you can press the 22mm long 3mm shaft through the selector body and tension arm pivot point. Ensure the tension arm can pivot freely, it only needs a few mm of movement. If the arm pivots too tight, remove it and clear it using a 3mm drill bit.





Press in the 2 LM8UU bearings into the selector body.

Remove the black rubber piece on the end of the ECAS fitting then press the ECAS04 into the front of the selector body.



Place 2x 4mm steel balls into the selector body followed by the limit switch. Use 2x M3x6mm screws to tighten into the limit switch. As with the gates, the screws will bite into the limit switch and cut their own threads.

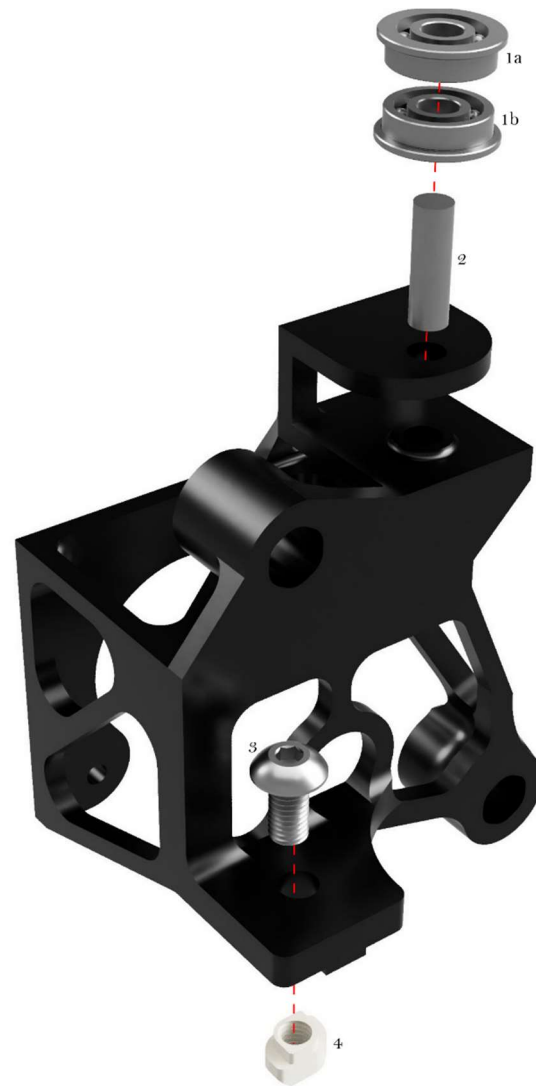




Insert the m3x30mm with the m3 washer and extruder spring through the tension arm and into the heat insert. This does not need to be tensioned yet, just give it a couple rotations to stay in place.

# Extruder Drive

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- |    |                |    |
|----|----------------|----|
| 1. | F695 bearing   | X2 |
| 2. | 5mmX16mm shaft | X1 |
| 3. | M5x10mm BHCS   | X1 |
| 4. | M5 T-nut       | X1 |



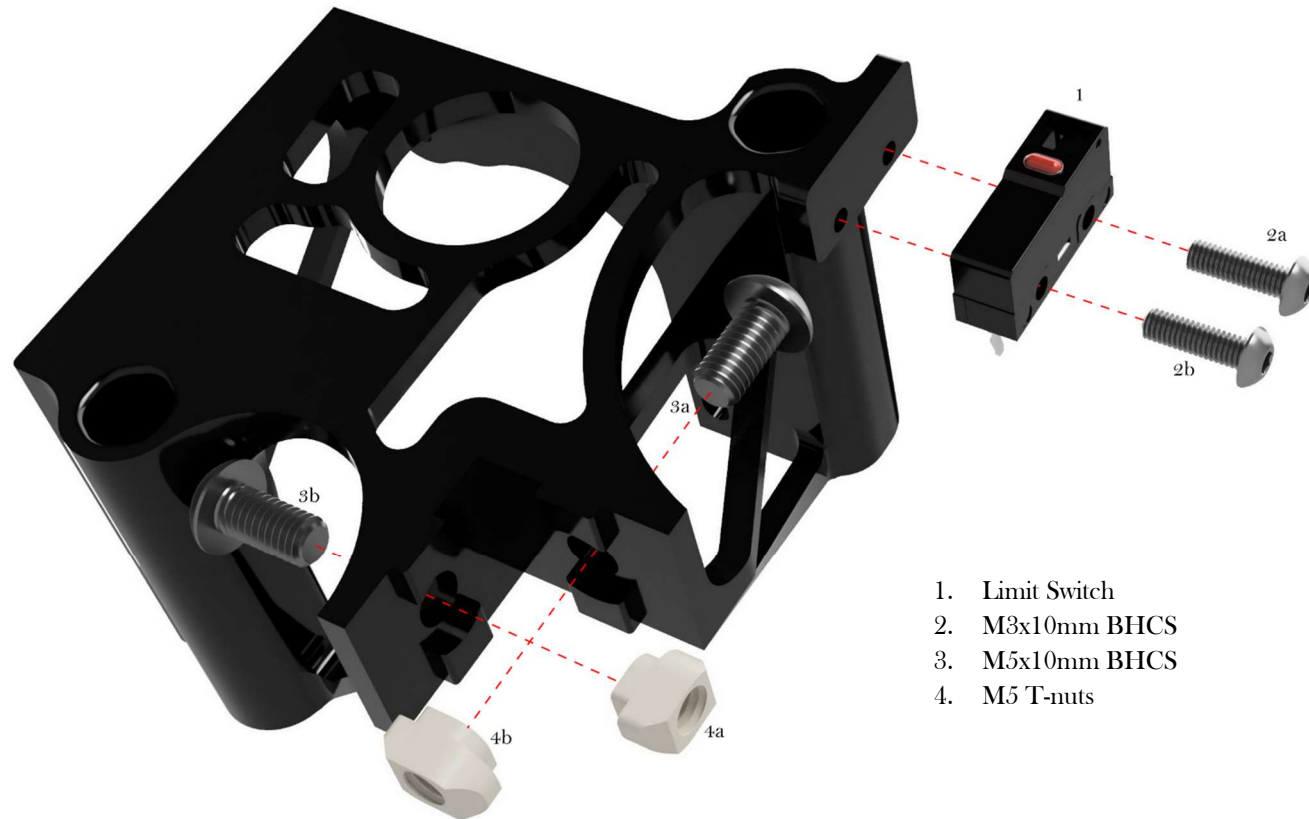
Fit the 2 F695 flanged bearings in the top of the extruder drive end and press in the 5mmX16mm shaft.



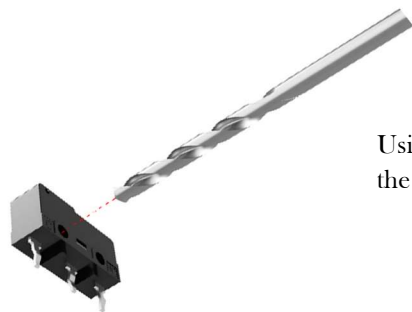
Fit the m5X10mm screw and M5 T-nut

# Selector Drive

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- |                 |    |
|-----------------|----|
| 1. Limit Switch | X1 |
| 2. M3x10mm BHCS | X2 |
| 3. M5x10mm BHCS | X2 |
| 4. M5 T-nuts    | X2 |



Using a 3mm drill, make the holes in the limit switch bigger so that the m3x10mm screws can pass through.



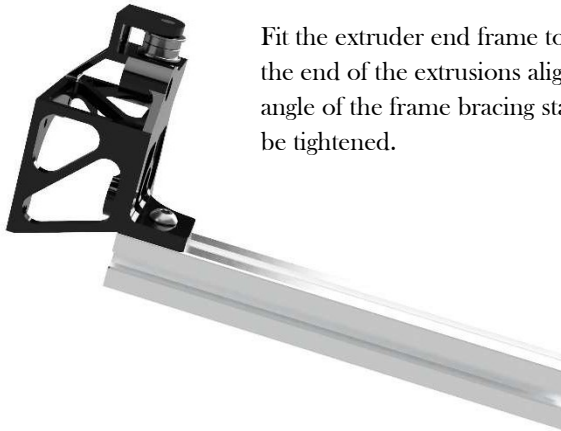
Fit the limit switch to the side of the selector drive body using the 2 M3x10mm screws.



Fit the 2 M5 T-nuts with the 2 M5x10mm BHCS.

# Complete Assembly

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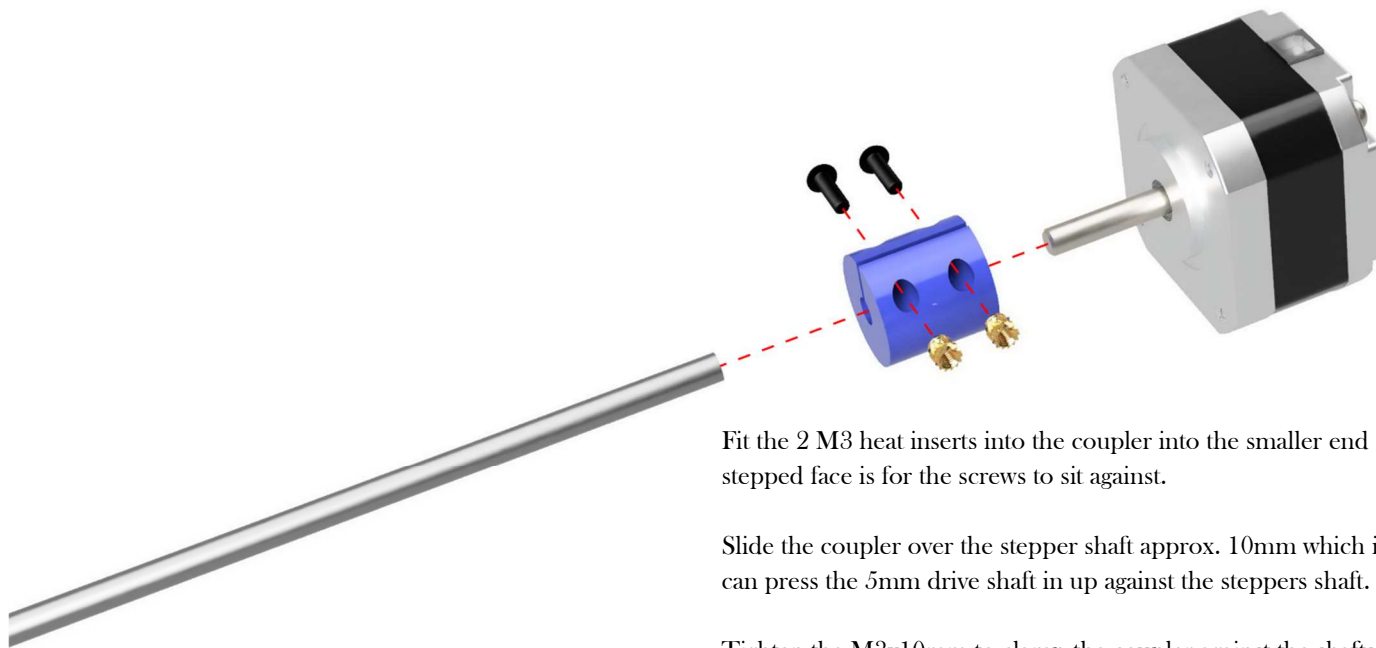


Fit the extruder end frame to the extrusion ensuring the end of the extrusions aligns to the where the angle of the frame bracing starts. The M5 screw can be tightened.

Remove the bottom M3X16mm screw from the bottom of each of the gates. Open them and fit each gate to the extrusion starting with the one closest to the extruder frame, placing it 2-3mm from the frame attachment to the extrusion. Then fit the rest of the gates placing them approximately 1mm apart from one another ensuring the gaps are even and the gates are straight with one another. Leave the M3x16mm screws out for now until the extruder gears and drive shafts in place.



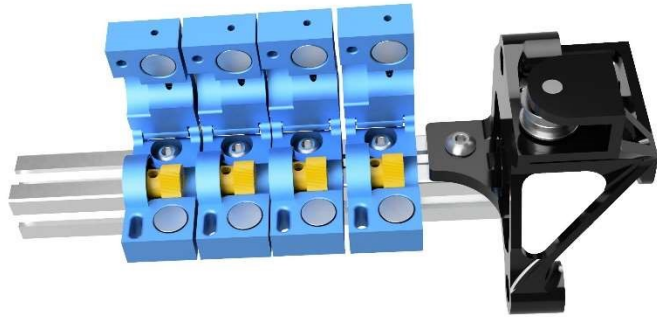




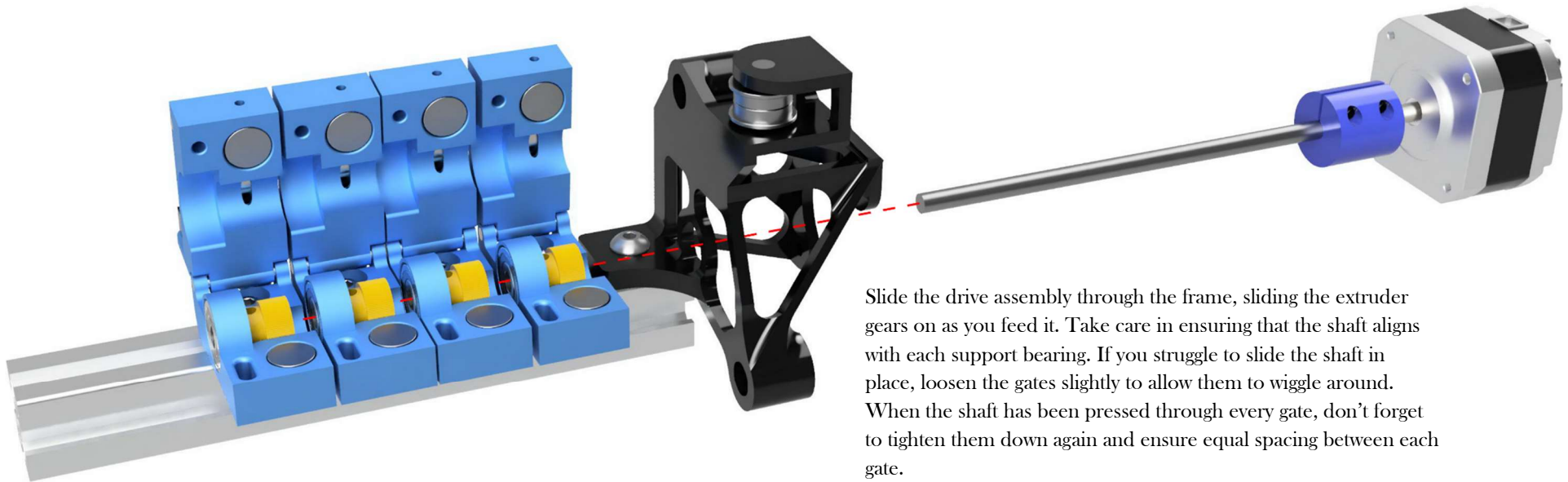
Fit the 2 M3 heat inserts into the coupler into the smaller end of the through holes. The side with the stepped face is for the screws to sit against.

Slide the coupler over the stepper shaft approx. 10mm which is half way in the coupler. Then you can press the 5mm drive shaft in up against the steppers shaft.

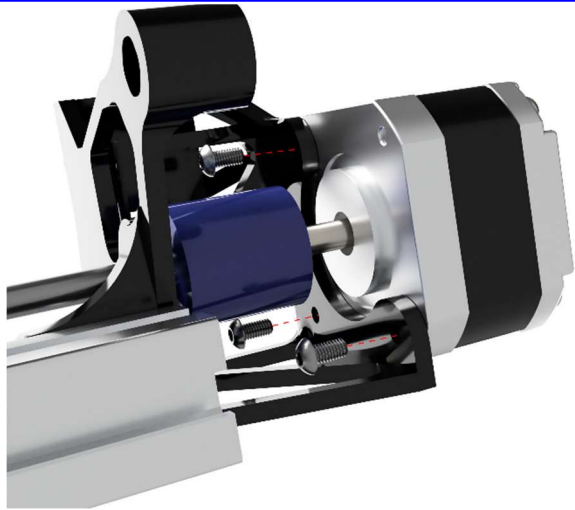
Tighten the M3x10mm to clamp the coupler against the shafts



Place the extruder gears in place on each gate with the grub screw side facing towards the support bearing.

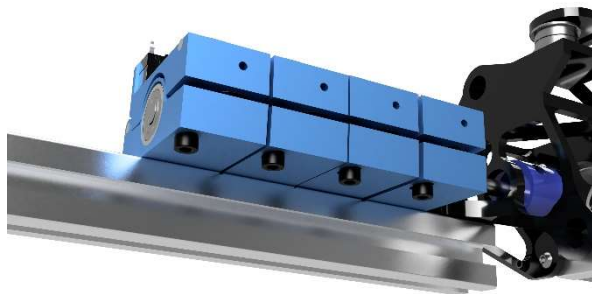
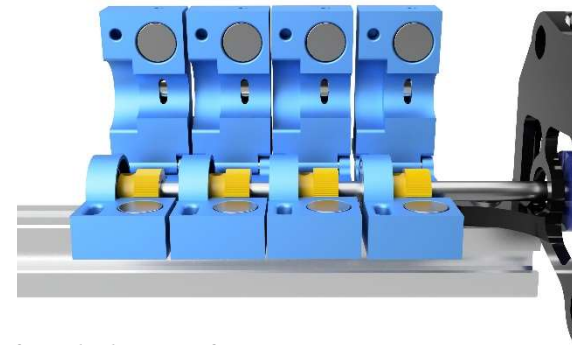


Slide the drive assembly through the frame, sliding the extruder gears on as you feed it. Take care in ensuring that the shaft aligns with each support bearing. If you struggle to slide the shaft in place, loosen the gates slightly to allow them to wiggle around. When the shaft has been pressed through every gate, don't forget to tighten them down again and ensure equal spacing between each gate.

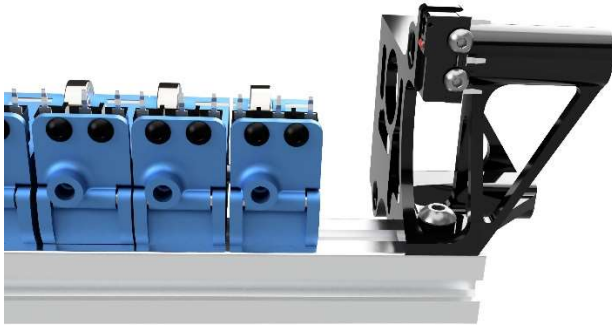


With the stepper now in place against the extruder drive end frame, use 3 M3x6mm BHCS to tighten the extruder in place

Aligning the centre of the extruder gear teeth with the centre of the filament path, you can now tighten the extruder gears in place



The stopper screws can now be placed back in from the bottom of the gates and each individually adjusted. Using a piece of filament, place it through the filament pathway in the top gate. Tighten the bottom adjuster until you can just start to feel the extruder gear grabbing the filament, then back it off 2 full rotations.



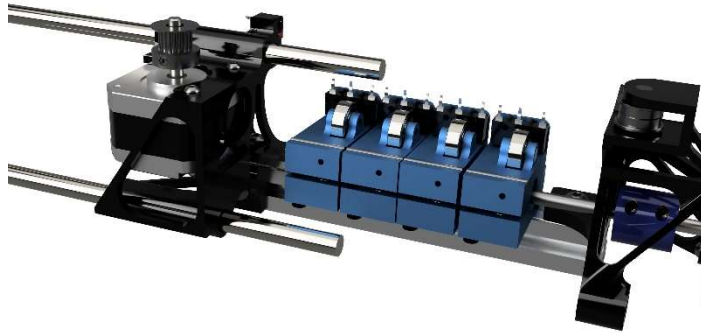
Slide the selector drive side frame into place on the extrusion positioning it approximately 20mm from the final gate, tighten the mounting screws. This empty space will be the 'neutral' position for the selector.



Using 3 M3x6mm BHCS, mount the servo to the selector drive side frame. Leave these slightly loose as this will be used to tension the selector belt.



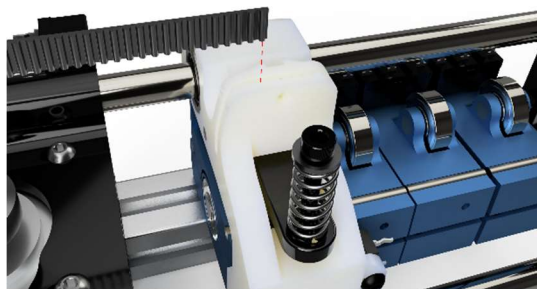
Fit the 20T pulley to the stepper with the bottom of the pulley approximately 5mm up from the mounting surface of the extruder.



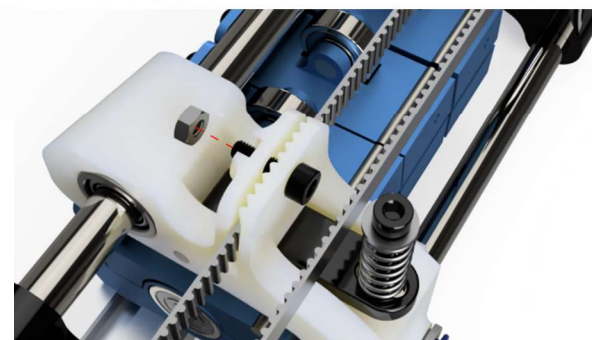
Slide the 8mm linear rods partly the way through the selector side frame bringing it at least up to the end of the first gate.



Slide the selector over the linear rods and push the rods the remainder of the way and into the extruder driver frame.



Slide in one side of the belt 3 or 4 teeth in on the top of the selector. Then feed it across and around the pulley on the stepper, across to the other side, around the idler pulley and back across to the selector. Trim the belt so that only 3 or 4 teeth will fit in the selector body while pulling slight tension on the belt.



Fit the M3X10mm screw and m3 nut to hold the belt in place. This does not need to be very tight as this only helps to keep the belt clamped but doesn't clamp the belt itself.

You can now tighten the screws for the selector side stepper while pulling the stepper out slightly to add a little more tension on the belt. The belt does not need a lot of tension so only slight pressure is required.

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Assembly of your CAMMU is now complete and all that is left is wiring, setup and fine tuning. We have not included a wiring guide at this point because the wiring layout and choices depends on the decision of controller and this will be covered in a separate guide.

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